# EMISSION CONTROL INFORMATION

To protect the environment in which we all live, Kawasaki has incorporated two emission control systems in compliance with the applicable regulations of the United States Environmental Protection Agency.

1. Crankcase Emission Control System

   This system eliminates the release of crankcase vapors into the atmosphere. Instead, the vapors are routed through an oil separator to the intake side of the engine. While the engine is operating, the vapors are drawn into the combustion chamber, where they are burned along with the fuel and air supplied by the carburetors.

2. Exhaust Emission Control System

   This system reduces the amount of pollutants discharged into the atmosphere by the exhaust of this motorcycle. The fuel and ignition systems of this motorcycle have been carefully designed and constructed to ensure an efficient engine with low exhaust pollutant levels.

The Clean Air Act, which is the Federal law covering motor vehicle pollution, contains what is commonly referred to as the Act's "tampering provisions".

"Sec. 203(a) The following acts and the causing thereof are prohibited...

(3)(A) for any person to remove or render inoperative any device or element of design installed on or in a motor vehicle or motor vehicle engine in compliance with regulations under this title prior to its sale and delivery to the ultimate purchaser, or for any manufacturer or dealer knowingly to remove or render inoperative any such device or element of design after such sale and delivery to the ultimate purchaser.

(3)(B) for any person engaged in the business of repairing, servicing, selling, leasing, or trading motor vehicles or motor vehicle engines, or who operates a fleet of motor vehicles knowingly to remove or render inoperative any device or element of design installed on or in a motor vehicle or motor vehicle engine in compliance with regulations under this title following its sale and delivery to the ultimate purchaser..."

Note: The phrase "remove or render inoperative any device or element of design" has been generally interpreted as follows:

1. Tampering does not include the temporary removal or rendering inoperative of devices or elements of design in order to perform maintenance.

EMISSION CONTROL INFORMATION (CONT.)

2. Tampering could include:
   a. Maladjustment of vehicle components such that the emission standards are exceeded.
   b. Use of replacement parts or accessories which adversely affect the performance or durability of the motorcycle.
   c. Addition of components or accessories that result in the vehicle exceeding the standards.
   d. Permanently removing, disconnecting, or rendering inoperative any component or element of design of the emission control systems.

To use, bend the manual back and match the desired section below against the black spot showing at the edge of these pages.

# Model Identification

**KZ1300 A1 Left Side View**


**KZ1300 A1 Right Side View**

# Specifications

## Table of Contents

## SPECIFICATIONS

| | | KZ1300-A1 | |
|---|---|---|---|
| **Dimensions** | | | |
| Overall length | | 2,295 mm | Ⓔ Ⓐ 2,335 mm |
| Overall width | | 905 mm | Ⓔ Ⓐ 840 mm |
| Overall height | | 1,280 mm | Ⓔ Ⓐ 1,155 mm |
| Wheelbase | | 1,580 mm | |
| Road clearance | | 137 mm | |
| Dry weight | | 297 kg | |
| Fuel tank capacity | | 27.0 ℓ | Ⓤ 21.4 ℓ |
| **Performance** | | | |
| Braking distance | | 12 m @50 kph | |
| Minimum turning radius | | 2.8 m | |
| **Engine** | | | |
| Type | | DOHC, 6 cylinder, 4 stroke, water-cooled | |
| Bore and stroke | | 62.0 x 71.0 mm | |
| Displacement | | 1,286 cc | |
| Compression ratio | | 9.9 | |
| Maximum horsepower | | 120 HP @8,000 rpm | |
| Maximum torque | | 11.8 kg-m @6,500 rpm | |
| Valve timing | | | |
| Inlet | Open | 20° BTDC | |
| | Close | 70° ABDC | |
| | Duration | 270° | |
| Exhaust | Open | 70° BBDC | |
| | Close | 30° ATDC | |
| | Duration | 280° | |
| Carburetors | | Mikuni BSW32 x 3 | |
| Lubrication system | | Forced lubrication (Wet sump) | |
| Engine oil | | SE class SAE 10W40, 10W50, 20W40, or 20W50 | |
| Engine oil capacity | | 4.6 ℓ | |
| Coolant Capacity | | 3.5 ℓ | |
| Starting system | | Electric starter | |
| Ignition system | | Battery and coil (transistorized ignition) | |
| Cylinder numbering method | | Left to right, 1–2–3–4–5–6 | |
| Firing order | | 1–5–3–6–2–4 | |
| Ignition timing | | From 10° BTDC @850 rpm to 38° BTDC @2,900 rpm | |
| Spark plugs | | NGK BP6ES or ND W20EP-U<br>Ⓔ Ⓒ NGK BPR6ES or ND W20EPR-U | |
| **Transmission** | | | |
| Type | | 5-speed, constant mesh, return shift | |
| Clutch | | Wet multi disc | |
| Gear ratio: | 1st | 2.29 (39/17) | |
| | 2nd | 1.67 (35/21) | |
| | 3rd | 1.28 (32/25) | |
| | 4th | 1.07 (29/27) | |
| | 5th | 0.93 (27/29) | |

| | | |
|---|---|---|
| Primary reduction ratio | | 1.84 (32/24 x 29/21) |
| Final reduction ratio | | 2.65 (20/24 x 35/11) |
| Overall drive ratio | | 4.55 (Top gear) |

**Electrical Equipment**

| | | |
|---|---|---|
| Alternator | | Kokusan GP9109 |
| Regulator/Rectifier | | Shindengen SH230-12D |
| Ignition coils | | Toyo Denso ZC005-TR12V |
| Igniter | | Toyo Denso UNT1005K-1000 |
| Battery | | Yuasa Y50-N18L-A (12V 20AH) |
| Starter | | Mitsuba SM-226-K |
| Headlight type | | Semi-sealed |
| Headlight | | 12V 60/55W (Quartz Halogen Light) |
| City light | | Ⓔ Ⓐ 12V 4W |
| Tail/Brake light | | 12V 8/27W Ⓔ Ⓐ 12V 5/21W |
| Meter lights | | 12V 3.4W |
| Indicator lights | | 12V 3.4W |
| Turn signal/running position lights | | Ⓤ 12V 23/8W |
| Turn signal lights | | 12V 23W Ⓔ Ⓐ 12V 21W |
| Horns | | 12V 2.5A |

**Frame**

| | | |
|---|---|---|
| Type | | Tubular, double cradle |
| Steering angle | | 38° to either side |
| Castor | | 28° |
| Trail | | 100 mm |
| Tire size | Front | 110/90V-18 4PR Ⓤ MN90-18 |
| | Rear | 130/90V-17 6PR Ⓤ MT90-17 |
| Suspension | Front | Telescopic fork (pneumatic) |
| | Rear | Swing arm |
| Suspension stroke | Front | 200 mm |
| | Rear | 105 mm |
| Front fork oil capacity (each fork) | | 391 cc |
| Front fork oil type | | SAE 10W20 |
| Final gear case oil | Type | API GL-5 Hypoid Gear Oil<br>SAE 90 (above 5°C)<br>SAE 80 (below 5°C) |
| | Capacity | 0.25 ℓ |

**Brakes**

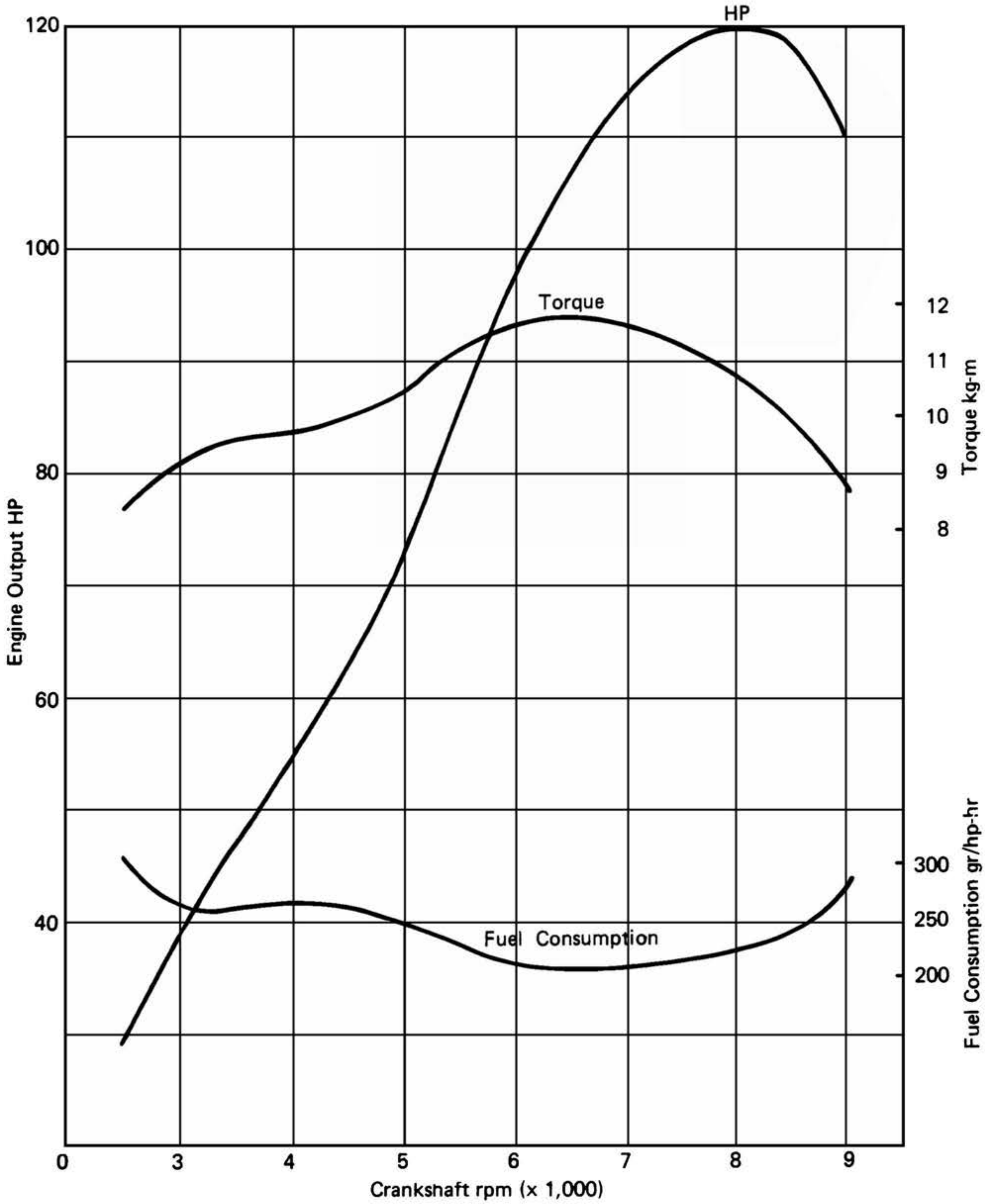
| | | |
|---|---|---|
| Type | Front and Rear | Disc brake |
| Effective disc diameter | Front | 260 mm |
| | Rear | 250 mm |

Ⓐ : Australian model Ⓒ : Canadian model Ⓔ : European model Ⓤ : US model

Specifications subject to change without notice, and may not apply to every country.

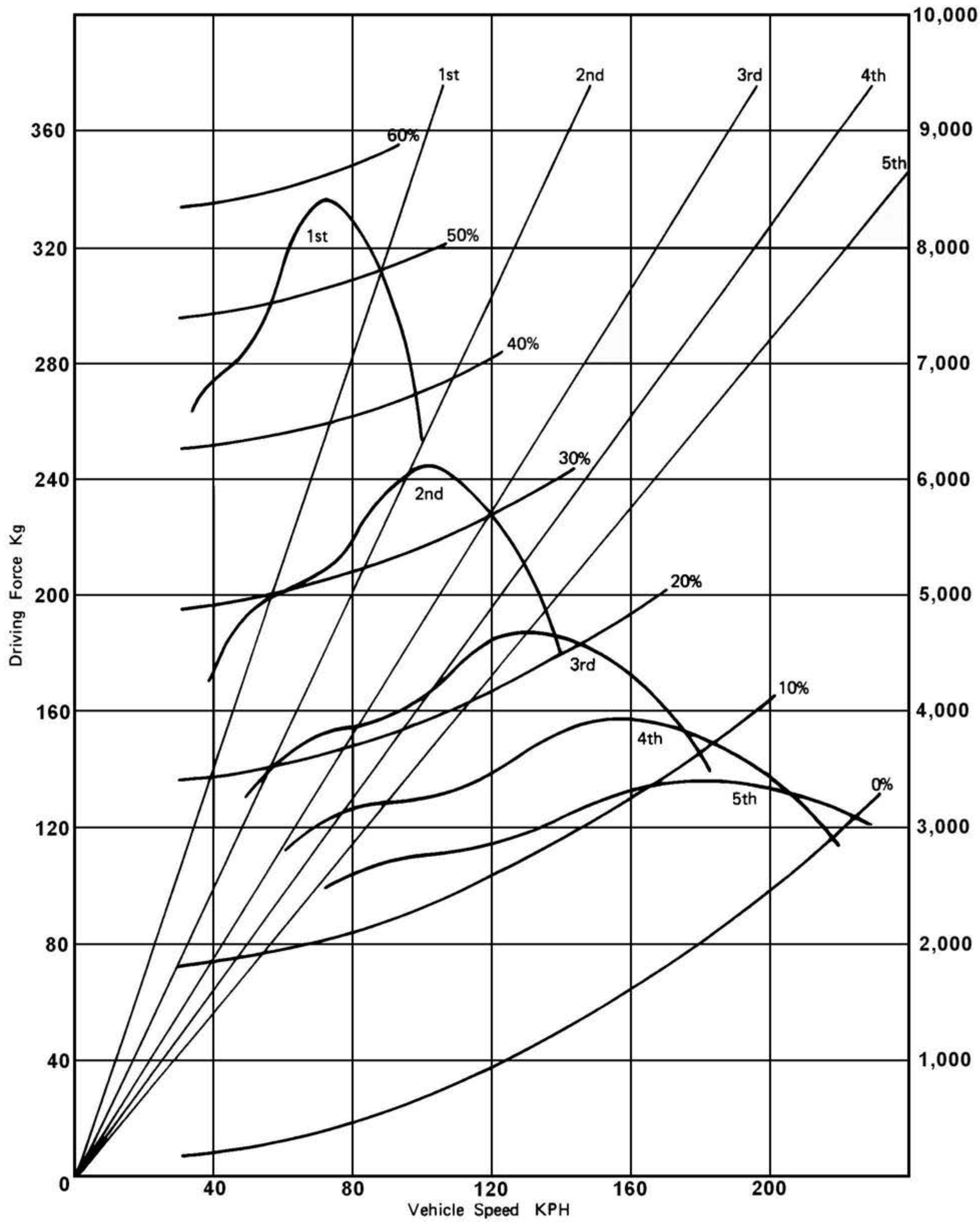
## ENGINE PERFORMANCE CURVES

**KZ1300-A1**
**KZ1300-A2**



## RUNNING PERFORMANCE CURVES

### KZ1300-A1



## PERIODIC MAINTENANCE CHART (KZ1300-A1)

The maintenance and adjustments must be done in accordance with this chart to keep the motorcycle in good running condition. **The initial maintenance is vitally important and must not be neglected.**

| OPERATION / FREQUENCY | Whichever comes first → ODOMETER READING* / ↓ Every | 800 km | 5,000 km | 10,000 km | 15,000 km | 20,000 km | 25,000 km | 30,000 km | See Page |
|---|---|---|---|---|---|---|---|---|---|
| Battery electrolyte level — check † | month | • | • | • | • | • | • | • | 230 |
| Brake, brake light switch adjustment — check † | | • | • | • | • | • | • | • | 27 |
| Brake wear — check † | | | • | • | • | • | • | • | 222 |
| Brake fluid level — check † | month | • | • | • | • | • | • | • | 221 |
| Brake fluid — change | year | | | • | | • | | • | 220 |
| Clutch — adjust | | • | • | • | • | • | • | • | 20 |
| Carburetors — adjust | | • | • | • | • | • | • | • | 18 |
| Throttle cables — adjust | | • | • | • | • | • | • | • | 14 |
| Steering play — check † | | • | • | • | • | • | • | • | 28 |
| Front fork — inspect/clean | | | • | • | • | • | • | • | 227 |
| Rear shock absorbers — inspect | | • | • | • | • | • | • | • | 228 |
| Nuts, Bolts, Fasteners — check and torque | | • | | • | | • | | • | 37~42 |
| Spark plugs — clean and gap † | | • | • | • | • | • | • | • | 12 |
| Valve clearance — check † | | • | • | • | • | • | • | • | 12 |
| Air suction valve — check † | | | • | • | • | • | • | • | 180 |
| Air cleaner element — clean | | | • | | • | | • | | 164 |
| Air cleaner element — replace | 5 cleanings | | | • | | • | | • | 47,164 |
| Fuel system — clean | | • | • | • | • | • | • | • | 22,165 |
| Tire tread wear — check † | | | • | • | • | • | • | • | 213 |
| Engine oil — change | year | • | • | • | • | • | • | • | 21 |
| Oil filter — replace | | • | | • | | • | | • | 21 |
| General lubrication — perform | | | • | • | • | • | • | • | 32 |
| Front fork oil — change | | | | • | | • | | • | 226 |
| Timing advancer — lubricate | | | | • | | • | | • | 240 |
| Swing arm — lubricate | | | | • | | • | | • | 228 |
| Wheel bearings — grease | 2 years | | | | | • | | | 216 |
| Steering stem bearings — grease | 2 years | | | | | • | | | 224 |
| Final gear case oil level — check † | | | | • | | • | | • | 32 |
| Final gear case oil — change | | • | | | | | | • | 32 |
| Propeller shaft sliding joint — lubricate | | | | • | | | | • | 218 |
| Coolant — change | 2 years | | | | | | | • | 23,203 |
| Radiator hoses, connections — check † | year | • | | • | | • | | • | 37~42 |

*For higher odometer readings, repeat at the frequency interval established here.
† Replace, add or adjust if necessary.

B

# Adjustment–Engine

## Table of Contents

## SPARK PLUGS

Neglecting the spark plug eventually leads to difficult starting and poor performance. If the spark plug is used for a long period, the electrodes gradually burn away and carbon builds up inside. See the Periodic Maintenance Chart (Pg. 10), for spark plug inspection, cleaning and resetting of the electrode gap.

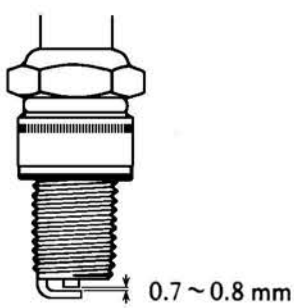
- Remove the spark plugs using a spark plug wrench.
- Clean the spark plug preferably in a sand-blasting device, and then clean off any abrasive particles. The plug may also be cleaned using a high flash-point solvent and a wire brush or other suitable tool. If the spark plug electrodes are corroded or damaged, or if the insulator is cracked, replace the plug. Use the standard plug or its equivalent.
- Measure the gap with a wire-type thickness gauge. If the gap is incorrect, carefully bend the outer electrode with a suitable tool to obtain the correct gap.

**Table B1 Spark Plug**

| | |
|---|---|
| Plug | NGK BP6ES or ND W20EP-U<br>Ⓒ Ⓔ NGK BPR6ES or ND W20EPR-U |
| Gap | 0.7 ~ 0.8 mm |
| Tightening Torque | 2.8 kg-m (20 ft-lbs) |

Ⓒ : Canadian Model Ⓔ : European Model

**Spark Plug Gap** B1




- Tighten the spark plugs in the cylinder head to 2.8 kg-m (20 ft-lbs) of torque.

## VALVE CLEARANCE

Valve and valve seat wear decreases valve clearance, upsetting valve timing. If valve clearance is not adjusted, the wear will eventually cause the valves to remain partly open, which lowers performance, burns the valves and valve seats, and may cause serious engine damage.

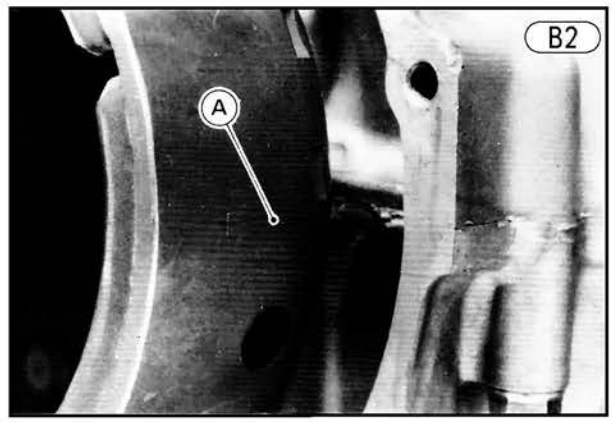
Valve clearance for each valve should be checked and adjusted in accordance with the Periodic Maintenance Chart (Pg. 10) and any time that clearance may have been affected by disassembly.

Be careful to adjust within the specified clearance. Adjusting to a larger value will disturb valve timing and cause engine noise.

**NOTE:** Valve clearance must be checked when the engine is cold (room or atmospheric temperature).

**To check the valve clearance:**

- Remove the fuel tank (Pg. 46).
- Disconnect the battery ground ( ) lead.
- Remove the spark plugs.
- Remove the vacuum switch valve (US model) (Pg. 48).
- Remove the two lower ignition coils (Pg. 49).
- Remove the cylinder head cover (Pg. 65).
- Remove the alternator cover (Pg. 85). The cover need not be removed completely from the crankcase, so the alternator leads may be left connected.
- Using a 14 mm wrench on the alternator rotor bolt, turn the crankshaft clockwise so that the "T" mark on the rotor is aligned with the crankcase mating surface on the front side of the crankshaft.

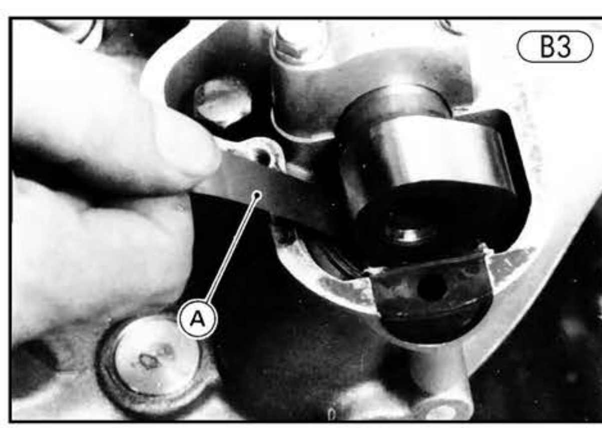



**A. "T" Mark**

- Check that the timing mark on the exhaust camshaft sprocket is aligned with the cylinder head cover mating surface on the front side of the exhaust camshaft. If it is not, turn the crankshaft another turn until the "T" mark is aligned with the crankcase mating surface again.

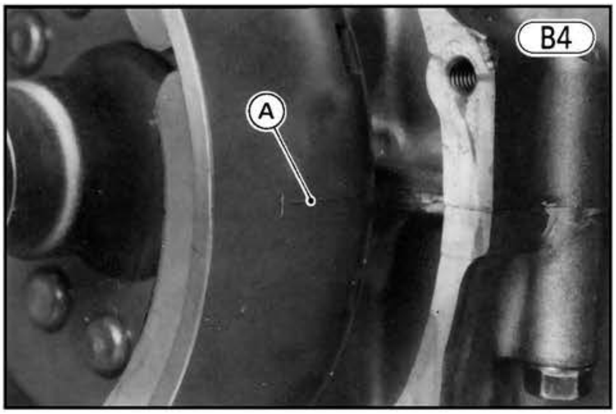
**NOTE:** At this position, the #1 (extreme left) piston is at top dead center (TDC) at the end of its compression stroke.

- At this crankshaft (0°) position, measure the clearance between the cam and the shim of the =1 inlet and exhaust valves. See Table B2.



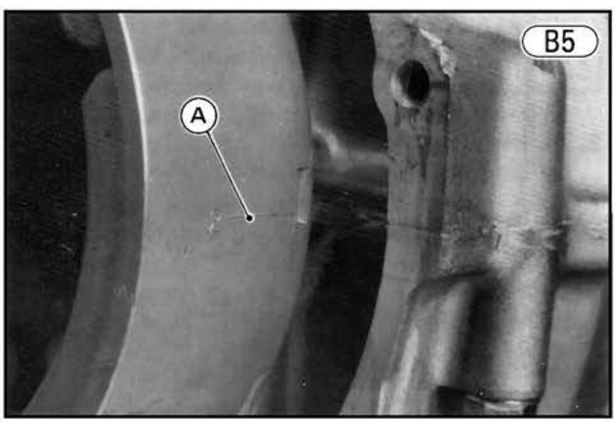

**A. Thickness Gauge**

- Next turn the crankshaft 1/3 turn (120°) clockwise and align the "1" mark on the rotor with the crankcase mating surface.




**A. "1" Mark**

- At this crankshaft (120°) position, measure the valve clearance of the #4 and #5 inlet and #6 exhaust valves.
- Repeat the preceding step, and measure the remaining valve clearances. Turn the crankshaft 1/3 turn (120°) at a time, and match the "2", "T", or "1" mark on the rotor with the mating surface. Measure the valve clearances specified in the table at each crankshaft position.



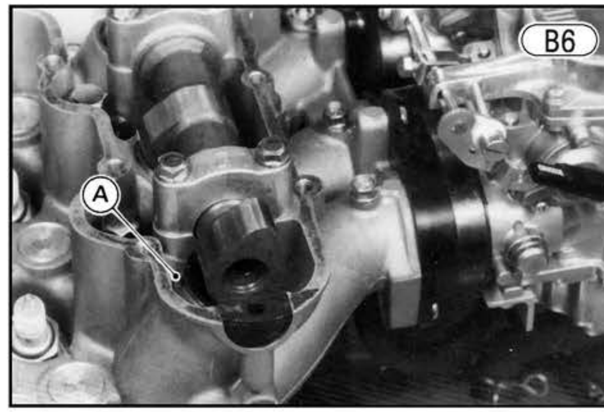

**A. "2" Mark**

**To adjust the valve clearance:**

If the valve clearance is incorrect, replace the present shim with a new shim to obtain the proper clearance. Use the valve lifter holder (special tool).

**NOTE:** If there is no clearance between the shim and cam, select a shim which is several sizes smaller and then remeasure the gap once it is installed.

- Turn the crankshaft so that the cam points away from the lifter. Position the notch in the lifter so it points toward the opposite camshaft. This will allow the shim to be lifted and removed later.




**A. Notch**

- Turn the crankshaft so that the cam is pushing the lifter down, and place the valve lifter holder (special tool) between the camshaft and the valve lifter rim.

**NOTE:** For #1, #3, #4, and #6 shim replacement, face the notched side of the tool toward the shim, and for #2, and #5 shim replacement, face the flat side of the tool toward the shim.

- While holding the tool in place, turn the crankshaft in the direction that will help the tool slide into place between the camshaft and the lifter rim. Finish with the cam pointing away from the lifter.

**NOTE:** The camshaft rotates in the same direction as the crankshaft.

**Turning Camshafts**

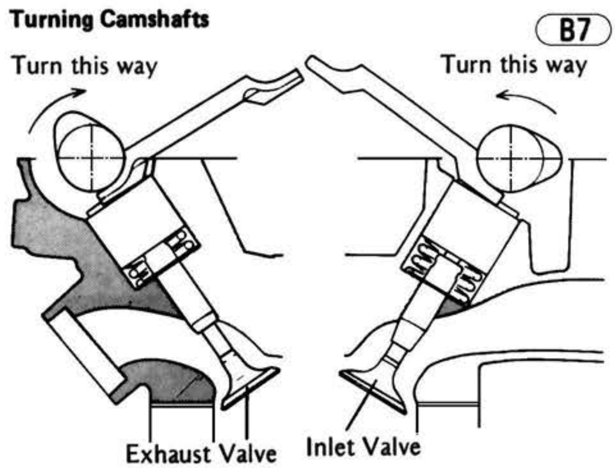
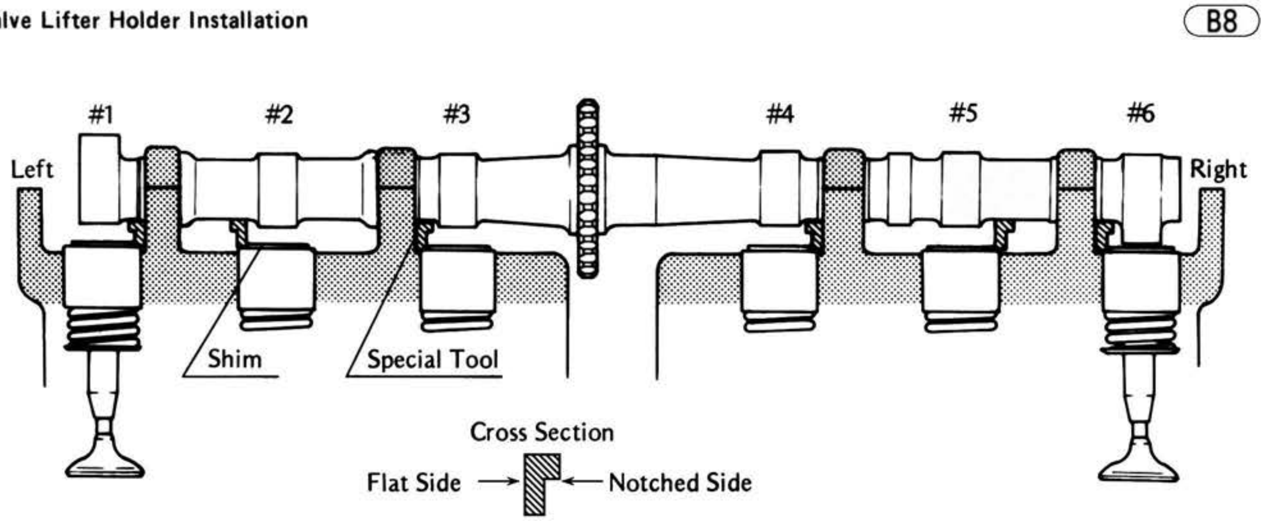
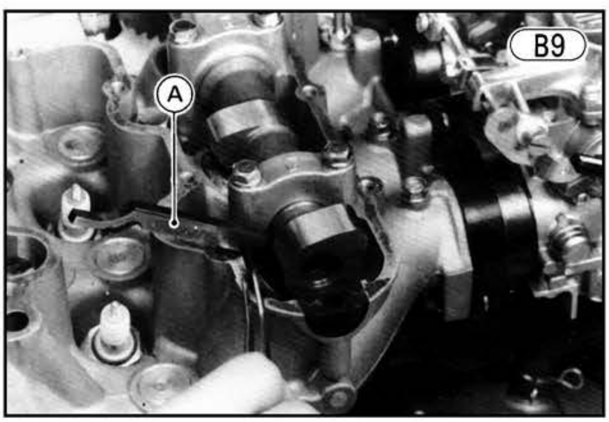



**Table B2 Valve Clearance Measurement Procedure**

| Crankshaft position degree (turns) | Rotor mark aligned with the mating surface | Appropriate Valves | | Valve Clearance mm | |
|---|---|---|---|---|---|
| | | Inlet | Exhaust | Inlet | Exhaust |
| 0° (0) | "T" | #1 | #1 | 0.05~0.15 | 0.15~0.25 |
| 120° (1/3) | "1" | #4 and #5 | #6 | | |
| 240° (2/3) | "2" | | #2 and #3 | | |
| 360° (3/3) | "T" | #6 | | | |
| 480° (4/3) | "1" | #2 and #3 | | | |
| 600° (5/3) | "2" | | #4 and #5 | | |

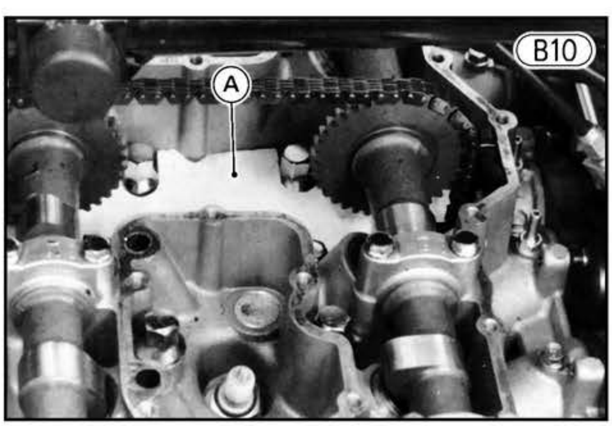
Valve Lifter Holder Installation




**A. Valve Lifter Holder (57001-1035)**

- Remove the shim carefully so that it does not pop out of the valve lifter top.
- Cut out a cover from a rubber plate using the pattern on Pg. 281, and stuff it in the camshaft chain tunnel so that no parts will fall into the crankcase.




**A. Stuff a damper plate.**

- Check the present shim thickness (shim size) which is printed on the shim surface. Refer to the Valve Adjustment Charts (Pgs. 15, 16), and select the shim which will bring the valve clearance within the specified limits. Shims are available in sizes from 2.00 to 3.20 mm, in increments of 0.05 mm.
- Insert the new shim on the valve lifter with the numbered side facing downwards so the number won't be polished off by the action of the cam.

**CAUTION** **1. Do not put shim stock under the shim. This may cause the shim to pop out at high rpm, causing extensive engine damage.**
**2. Do not grind the shim. This may cause it to fracture, causing extensive engine damage.**

**NOTE:** If the smallest shim does not sufficiently increase clearance, the valve seat is probably worn. In this case, (a) repair the valve seat (Pg. 176), (b) grind down the valve stem slightly (Pg. 175), (c) then recheck the clearance.

- Remove the rubber plate.
- While holding the tool, turn the crankshaft so that the cam is again pushing down the lifter, and remove the special tool.
- Make sure that the valve clearance is correct. If it is not, readjust.
- Install the alternator cover (Pg. 85).
- Install the cylinder head cover and air suction valve cover (Pg. 65).
- Install the spark plugs. Tighten them to 2.8 kg-m (20 ft-lbs) of torque.
- Install the ignition coils (Pg. 49).
- Install the vacuum switch valve (US model) (Pg. 48).
- Connect the battery ground (–) lead.
- Install the fuel tank (Pg. 46).

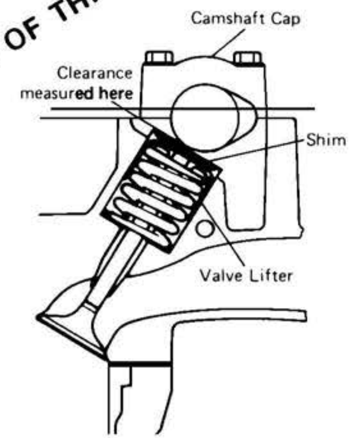
## THROTTLE CABLES

There are two throttle cables: an accelerator cable for opening the throttle valves, and a decelerator cable for closing them. If the cables are too loose due to

Table B3 Valve Adjustment Chart (Inlet)

| | PRESENT SHIM | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PART NUMBER (12037- ) | 001 | 002 | 003 | 004 | 005 | 006 | 007 | 008 | 009 | 010 | 011 | 012 | 013 | 014 | 015 | 016 | 017 | 018 | 019 | 020 | 021 | 022 | 023 | 024 | 025 |
| THICKNESS (mm) | 2.00 | 2.05 | 2.10 | 2.15 | 2.20 | 2.25 | 2.30 | 2.35 | 2.40 | 2.45 | 2.50 | 2.55 | 2.60 | 2.65 | 2.70 | 2.75 | 2.80 | 2.85 | 2.90 | 2.95 | 3.00 | 3.05 | 3.10 | 3.15 | 3.20 |
| **VALVE CLEARANCE (mm)** | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.00~0.02 | | | 2.00 | 2.05 | 2.10 | 2.15 | 2.20 | 2.25 | 2.30 | 2.35 | 2.40 | 2.45 | 2.50 | 2.55 | 2.60 | 2.65 | 2.70 | 2.75 | 2.80 | 2.85 | 2.90 | 2.95 | 3.00 | 3.05 | 3.10 |
| 0.03~0.04 | | 2.00 | 2.05 | 2.10 | 2.15 | 2.20 | 2.25 | 2.30 | 2.35 | 2.40 | 2.45 | 2.50 | 2.55 | 2.60 | 2.65 | 2.70 | 2.75 | 2.80 | 2.85 | 2.90 | 2.95 | 3.00 | 3.05 | 3.10 | 3.15 |
| 0.05~0.15 | SPECIFIED CLEARANCE / NO CHANGE REQUIRED | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.16~0.17 | 2.05 | 2.10 | 2.15 | 2.20 | 2.25 | 2.30 | 2.35 | 2.40 | 2.45 | 2.50 | 2.55 | 2.60 | 2.65 | 2.70 | 2.75 | 2.80 | 2.85 | 2.90 | 2.95 | 3.00 | 3.05 | 3.10 | 3.15 | 3.20 | |
| 0.18~0.22 | 2.10 | 2.15 | 2.20 | 2.25 | 2.30 | 2.35 | 2.40 | 2.45 | 2.50 | 2.55 | 2.60 | 2.65 | 2.70 | 2.75 | 2.80 | 2.85 | 2.90 | 2.95 | 3.00 | 3.05 | 3.10 | 3.15 | 3.20 | | |
| 0.23~0.27 | 2.15 | 2.20 | 2.25 | 2.30 | 2.35 | 2.40 | 2.45 | 2.50 | 2.55 | 2.60 | 2.65 | 2.70 | 2.75 | 2.80 | 2.85 | 2.90 | 2.95 | 3.00 | 3.05 | 3.10 | 3.15 | 3.20 | | | |
| 0.28~0.32 | 2.20 | 2.25 | 2.30 | 2.35 | 2.40 | 2.45 | 2.50 | 2.55 | 2.60 | 2.65 | 2.70 | 2.75 | 2.80 | 2.85 | 2.90 | 2.95 | 3.00 | 3.05 | 3.10 | 3.15 | 3.20 | | | | |
| 0.33~0.37 | 2.25 | 2.30 | 2.35 | 2.40 | 2.45 | 2.50 | 2.55 | 2.60 | 2.65 | 2.70 | 2.75 | 2.80 | 2.85 | 2.90 | 2.95 | 3.00 | 3.05 | 3.10 | 3.15 | 3.20 | | | | | |
| 0.38~0.42 | 2.30 | 2.35 | 2.40 | 2.45 | 2.50 | 2.55 | 2.60 | 2.65 | 2.70 | 2.75 | 2.80 | 2.85 | 2.90 | 2.95 | 3.00 | 3.05 | 3.10 | 3.15 | 3.20 | | | | | | |
| 0.43~0.47 | 2.35 | 2.40 | 2.45 | 2.50 | 2.55 | 2.60 | 2.65 | 2.70 | 2.75 | 2.80 | 2.85 | 2.90 | 2.95 | 3.00 | 3.05 | 3.10 | 3.15 | 3.20 | | | | | | | |
| 0.48~0.52 | 2.40 | 2.45 | 2.50 | 2.55 | 2.60 | 2.65 | 2.70 | 2.75 | 2.80 | 2.85 | 2.90 | 2.95 | 3.00 | 3.05 | 3.10 | 3.15 | 3.20 | | | | | | | | |
| 0.53~0.57 | 2.45 | 2.50 | 2.55 | 2.60 | 2.65 | 2.70 | 2.75 | 2.80 | 2.85 | 2.90 | 2.95 | 3.00 | 3.05 | 3.10 | 3.15 | 3.20 | | | | | | | | | |
| 0.58~0.62 | 2.50 | 2.55 | 2.60 | 2.65 | 2.70 | 2.75 | 2.80 | 2.85 | 2.90 | 2.95 | 3.00 | 3.05 | 3.10 | 3.15 | 3.20 | | | | | | | | | | |
| 0.63~0.67 | 2.55 | 2.60 | 2.65 | 2.70 | 2.75 | 2.80 | 2.85 | 2.90 | 2.95 | 3.00 | 3.05 | 3.10 | 3.15 | 3.20 | | | | | | | | | | | |
| 0.68~0.72 | 2.60 | 2.65 | 2.70 | 2.75 | 2.80 | 2.85 | 2.90 | 2.95 | 3.00 | 3.05 | 3.10 | 3.15 | 3.20 | | | | | | | | | | | | |
| 0.73~0.77 | 2.65 | 2.70 | 2.75 | 2.80 | 2.85 | 2.90 | 2.95 | 3.00 | 3.05 | 3.10 | 3.15 | 3.20 | | | | | | | | | | | | | |
| 0.78~0.82 | 2.70 | 2.75 | 2.80 | 2.85 | 2.90 | 2.95 | 3.00 | 3.05 | 3.10 | 3.15 | 3.20 | | | | | | | | | | | | | | |
| 0.83~0.87 | 2.75 | 2.80 | 2.85 | 2.90 | 2.95 | 3.00 | 3.05 | 3.10 | 3.15 | 3.20 | | | | | | | | | | | | | | | |
| 0.88~0.92 | 2.80 | 2.85 | 2.90 | 2.95 | 3.00 | 3.05 | 3.10 | 3.15 | 3.20 | | | | | | | | | | | | | | | | |
| 0.93~0.97 | 2.85 | 2.90 | 2.95 | 3.00 | 3.05 | 3.10 | 3.15 | 3.20 | | | | | | | | | | | | | | | | | |
| 0.98~1.02 | 2.90 | 2.95 | 3.00 | 3.05 | 3.10 | 3.15 | 3.20 | | | | | | | | | | | | | | | | | | |
| 1.03~1.07 | 2.95 | 3.00 | 3.05 | 3.10 | 3.15 | 3.20 | | | | | | | | | | | | | | | | | | | |
| 1.08~1.21 | 3.00 | 3.05 | 3.10 | 3.15 | 3.20 | | | | | | | | | | | | | | | | | | | | |
| 1.13~1.17 | 3.05 | 3.10 | 3.15 | 3.20 | | | | | | | | | | | | | | | | | | | | | |
| 1.18~1.22 | 3.10 | 3.15 | 3.20 | | | | | | | | | | | | | | | | | | | | | | |
| 1.23~1.27 | 3.15 | 3.20 | | | | | | | | | | | | | | | | | | | | | | | |
| 1.28~1.35 | 3.20 | | | | | | | | | | | | | | | | | | | | | | | | |

INSTALL THE SHIM OF THIS THICKNESS (mm)




1. Align the mark on the alternator rotor with the crankcase mating surface, and measure the clearance (cold).
2. Check present shim size.
3. Match clearance in vertical column with present shim size in horizontal column.
4. The shim specified where the lines intersect is the one that will give you the proper clearance.

**NOTE:** If there is no clearance between the shim and the cam, select a shim which is several sizes smaller and then remeasure the clearance.

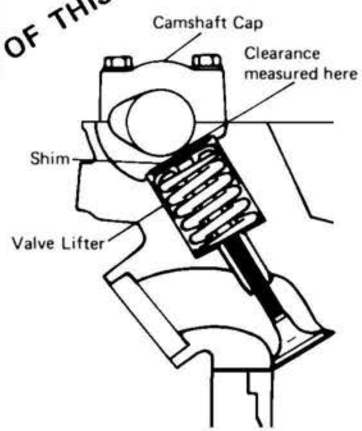
**CAUTION**

**1. Do not put shim stock under the shim. This may cause the shim to pop out at high rpm, causing extensive engine damage.**
**2. Do not grind the shim. This may cause it to fracture, causing extensive engine damage.**
**3. Check the valve clearance with the proper method in the text. Checking the clearance at any other cam position may result in improper valve clearance.**

**Table B4 Valve Adjustment Chart (Exhaust)**

| | PRESENT SHIM | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PART NUMBER (12037- ) | 001 | 002 | 003 | 004 | 005 | 006 | 007 | 008 | 009 | 010 | 011 | 012 | 013 | 014 | 015 | 016 | 017 | 018 | 019 | 020 | 021 | 022 | 023 | 024 | 025 |
| THICKNESS (mm) | 2.00 | 2.05 | 2.10 | 2.15 | 2.20 | 2.25 | 2.30 | 2.35 | 2.40 | 2.45 | 2.50 | 2.55 | 2.60 | 2.65 | 2.70 | 2.75 | 2.80 | 2.85 | 2.90 | 2.95 | 3.00 | 3.05 | 3.10 | 3.15 | 3.20 |
| **VALVE CLEARANCE (mm)** | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.00 ~ 0.02 | | | | | 2.00 | 2.05 | 2.10 | 2.15 | 2.20 | 2.25 | 2.30 | 2.35 | 2.40 | 2.45 | 2.50 | 2.55 | 2.60 | 2.65 | 2.70 | 2.75 | 2.80 | 2.85 | 2.90 | 2.95 | 3.00 |
| 0.03 ~ 0.07 | | | | 2.00 | 2.05 | 2.10 | 2.15 | 2.20 | 2.25 | 2.30 | 2.35 | 2.40 | 2.45 | 2.50 | 2.55 | 2.60 | 2.65 | 2.70 | 2.75 | 2.80 | 2.85 | 2.90 | 2.95 | 3.00 | 3.05 |
| 0.08 ~ 0.12 | | | 2.00 | 2.05 | 2.10 | 2.15 | 2.20 | 2.25 | 2.30 | 2.35 | 2.40 | 2.45 | 2.50 | 2.55 | 2.60 | 2.65 | 2.70 | 2.75 | 2.80 | 2.85 | 2.90 | 2.95 | 3.00 | 3.05 | 3.10 |
| 0.13 ~ 0.14 | | 2.00 | 2.05 | 2.10 | 2.15 | 2.20 | 2.25 | 2.30 | 2.35 | 2.40 | 2.45 | 2.50 | 2.55 | 2.60 | 2.65 | 2.70 | 2.75 | 2.80 | 2.85 | 2.90 | 2.95 | 3.00 | 3.05 | 3.10 | 3.15 |
| 0.15 ~ 0.25 | SPECIFIED CLEARANCE / NO CHANGE REQUIRED | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.26 ~ 0.27 | 2.05 | 2.10 | 2.15 | 2.20 | | 2.30 | 2.35 | 2.40 | 2.45 | 2.50 | 2.55 | 2.60 | 2.65 | 2.70 | 2.75 | 2.80 | 2.85 | 2.90 | 2.95 | 3.00 | 3.05 | 3.10 | 3.15 | 3.20 | |
| 0.28 ~ 0.32 | 2.10 | 2.15 | 2.20 | 2.25 | 2.30 | 2.35 | 2.40 | 2.45 | 2.50 | 2.55 | 2.60 | 2.65 | 2.70 | 2.75 | 2.80 | 2.85 | 2.90 | 2.95 | 3.00 | 3.05 | 3.10 | 3.15 | 3.20 | | |
| 0.33 ~ 0.37 | 2.15 | 2.20 | 2.25 | 2.30 | 2.35 | 2.40 | 2.45 | 2.50 | 2.55 | 2.60 | 2.65 | 2.70 | 2.75 | 2.80 | 2.85 | 2.90 | 2.95 | 3.00 | 3.05 | 3.10 | 3.15 | 3.20 | | | |
| 0.38 ~ 0.42 | 2.20 | 2.25 | 2.30 | 2.35 | 2.40 | 2.45 | 2.50 | 2.55 | 2.60 | 2.65 | 2.70 | 2.75 | 2.80 | 2.85 | 2.90 | 2.95 | 3.00 | 3.05 | 3.10 | 3.15 | | | | | |
| 0.43 ~ 0.47 | 2.25 | 2.30 | 2.35 | 2.40 | 2.45 | 2.50 | 2.55 | 2.60 | 2.65 | 2.70 | 2.75 | 2.80 | 2.85 | 2.90 | 2.95 | 3.00 | 3.05 | 3.10 | 3.15 | 3.20 | | | | | |
| 0.48 ~ 0.52 | 2.30 | 2.35 | 2.40 | 2.45 | 2.50 | 2.55 | 2.60 | 2.65 | 2.70 | 2.75 | 2.80 | 2.85 | 2.90 | 2.95 | 3.00 | 3.05 | 3.10 | 3.15 | 3.20 | | | | | | |
| 0.53 ~ 0.57 | 2.35 | 2.40 | 2.45 | 2.50 | 2.55 | 2.60 | 2.65 | 2.70 | 2.75 | 2.80 | 2.85 | 2.90 | 2.95 | 3.00 | 3.05 | 3.10 | 3.15 | 3.20 | | | | | | | |
| 0.58 ~ 0.62 | 2.40 | 2.45 | 2.50 | 2.55 | 2.60 | 2.65 | 2.70 | 2.75 | 2.80 | 2.85 | 2.90 | 2.95 | 3.00 | 3.05 | 3.10 | 3.15 | | | | | | | | | |
| 0.63 ~ 0.67 | 2.45 | 2.50 | 2.55 | 2.60 | 2.65 | 2.70 | 2.75 | 2.80 | 2.85 | 2.90 | 2.95 | 3.00 | 3.05 | 3.10 | 3.15 | 3.20 | | | | | | | | | |
| 0.68 ~ 0.72 | 2.50 | 2.55 | 2.60 | 2.65 | 2.70 | 2.75 | 2.80 | 2.85 | 2.90 | 2.95 | 3.00 | 3.05 | 3.10 | 3.15 | 3.20 | | | | | | | | | | |
| 0.73 ~ 0.77 | 2.55 | 2.60 | 2.65 | 2.70 | 2.75 | 2.80 | 2.85 | 2.90 | 2.95 | 3.00 | 3.05 | 3.10 | 3.15 | 3.20 | | | | | | | | | | | |
| 0.78 ~ 0.82 | 2.60 | 2.65 | 2.70 | 2.75 | 2.80 | 2.85 | 2.90 | 2.95 | 3.00 | 3.05 | 3.10 | 3.15 | 3.20 | | | | | | | | | | | | |
| 0.83 ~ 0.87 | 2.65 | 2.70 | 2.75 | 2.80 | 2.85 | 2.90 | 2.95 | 3.00 | 3.05 | 3.10 | 3.15 | 3.20 | | | | | | | | | | | | | |
| 0.88 ~ 0.92 | 2.70 | 2.75 | 2.80 | 2.85 | 2.90 | 2.95 | 3.00 | 3.05 | 3.10 | 3.15 | 3.20 | | | | | | | | | | | | | | |
| 0.93 ~ 0.97 | 2.75 | 2.80 | 2.85 | 2.90 | 2.95 | 3.00 | 3.05 | 3.10 | 3.15 | 3.20 | | | | | | | | | | | | | | | |
| 0.98 ~ 1.02 | 2.80 | 2.85 | 2.90 | 2.95 | 3.00 | 3.05 | 3.10 | 3.15 | 3.20 | | | | | | | | | | | | | | | | |
| 1.03 ~ 1.07 | 2.85 | 2.90 | 2.95 | 3.00 | 3.05 | 3.10 | 3.15 | 3.20 | | | | | | | | | | | | | | | | | |
| 1.08 ~ 1.12 | 2.90 | 2.95 | 3.00 | 3.05 | 3.10 | 3.15 | 3.20 | | | | | | | | | | | | | | | | | | |
| 1.13 ~ 1.17 | 2.95 | 3.00 | 3.05 | 3.10 | 3.15 | 3.20 | | | | | | | | | | | | | | | | | | | |
| 1.18 ~ 1.22 | 3.00 | 3.05 | 3.10 | 3.15 | 3.20 | | | | | | | | | | | | | | | | | | | | |
| 1.23 ~ 1.27 | 3.05 | 3.10 | 3.15 | 3.20 | | | | | | | | | | | | | | | | | | | | | |
| 1.28 ~ 1.32 | 3.10 | 3.15 | 3.20 | | | | | | | | | | | | | | | | | | | | | | |
| 1.33 ~ 1.37 | 3.15 | 3.20 | | | | | | | | | | | | | | | | | | | | | | | |
| 1.38 ~ 1.45 | 3.20 | | | | | | | | | | | | | | | | | | | | | | | | |

INSTALL THE SHIM OF THIS THICKNESS (mm)




1. Align the mark on the alternator rotor with the crankcase mating surface, and measure the clearance (cold).
2. Check present shim size.
3. Match clearance in vertical column with present shim size in horizontal column.
4. The shim specified where the lines intersect is the one that will give you the proper clearance.

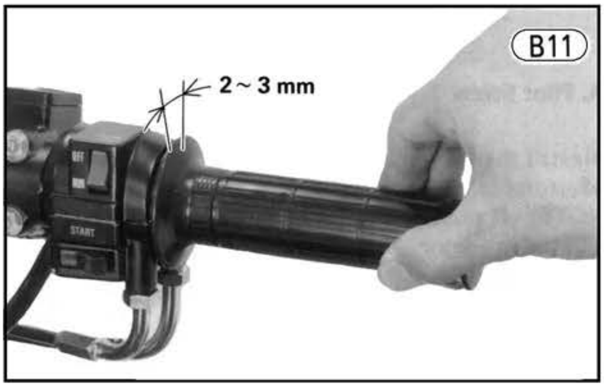
**NOTE:** If there is no clearance between the shim and the cam, select a shim which is several sizes smaller and then remeasure the clearance.

**CAUTION**
1. Do not put shim stock under the shim. This may cause the shim to pop out at high rpm, causing extensive engine damage.
2. Do not grind the shim. This may cause it to fracture, causing extensive engine damage.
3. Check the valve clearance with the proper method in the text. Checking the clearance at any other cam position may result in improper valve clearance.

cable stretch or maladjustment, the excessive play in the throttle grip will cause a delay in throttle response, which will be especially noticeable at low rpm. Also, the butterfly valves may not open fully at full throttle. On the other hand, if the cables are too tight, the throttle will be hard to control, and the idle speed will be erratic.

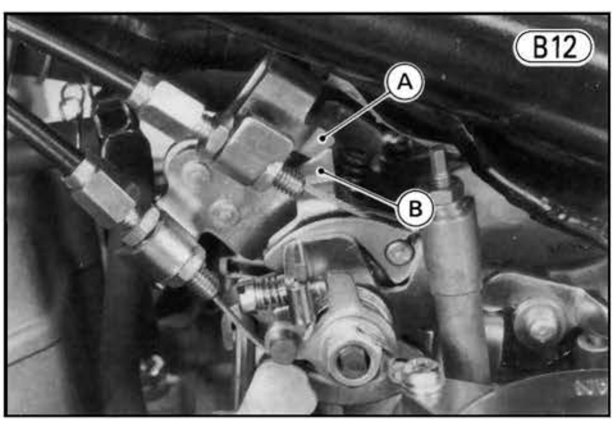
**To check the throttle cable adjustment:**

- Check that there is 2 ~ 3 mm throttle grip play.




- Push the throttle grip completely closed. At this time there should be no clearance between the cable bracket and the stop.

**NOTE:** This assures that the stress of throttle grip return will be taken by the pulley, protecting the carburetor linkage mechanism.

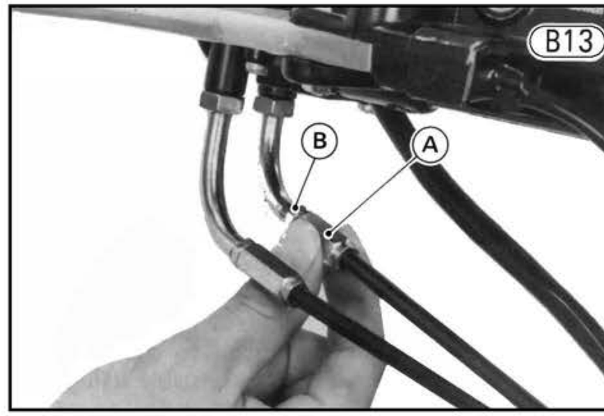



**A. Cable Bracket** **B. Stop**

**To adjust the throttle cables:**

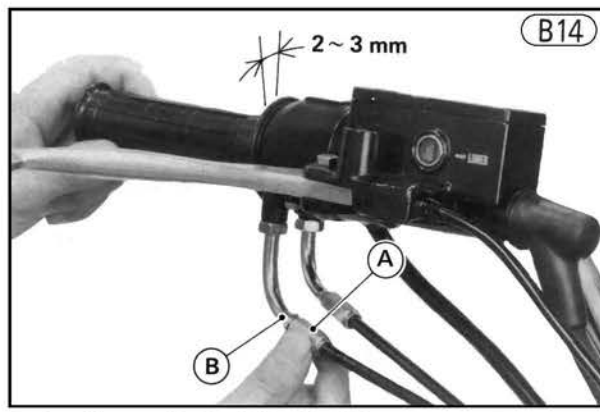
If any one of the above checks shows improper adjustment, adjust the throttle cables as follows:

- Loosen the locknuts, and screw both throttle cable adjusting nuts in fully at the upper end of the throttle cables so as to give the throttle grip plenty of play.
- Turn out the decelerator cable adjusting nut until there is no clearance between the cable bracket and the stop when the throttle grip is completely closed. Tighten the locknut.




**A. Decelerator Cable Adjusting Nut** **B. Locknut**

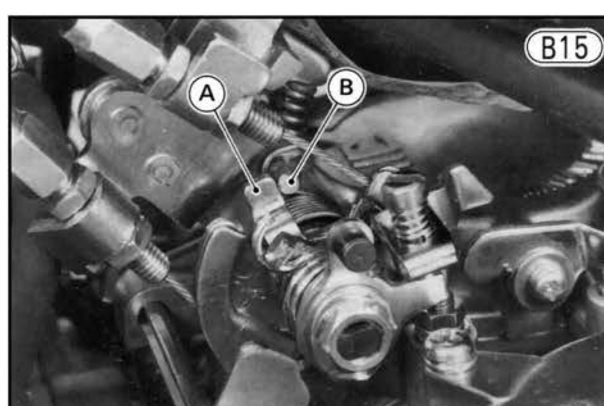
- Turn the accelerator cable adjusting nut until 2 ~ 3 mm of throttle grip play is obtained. Tighten the locknut.




**A. Accelerator Cable Adjusting Nut** **B. Locknut**

**NOTES:** 1. If the throttle cables cannot be adjusted by using the cable adjusting nuts at the upper end of the throttle cables, use the cable adjusters at the lower ends of the throttle cables. Do not forget to securely tighten the adjuster mounting nuts.

2. If grip play is adjusted too large, the butterfly valves may not open fully at full throttle. To check this, check to see that the pulley stops against the stop pin on the carburetor body when the throttle grip is fully turned.




**A. Pulley** **B. Stop Pin**

## CARBURETOR

For internal carburetor maintenance and adjustment of parts, see the maintenance section (Pg. 168) of this manual. The following procedure covers the idling adjustment, which should be inspected during periodic maintenance or whenever the idling setting has been disturbed. This procedure also includes the necessary steps for obtaining proper carburetor synchronization.

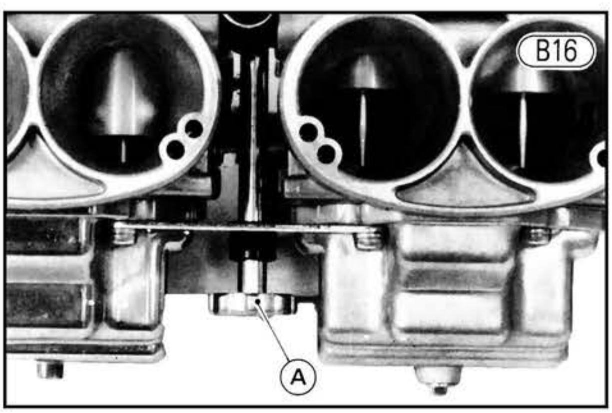
When the idle speed is too low, the engine may stall. When the idle speed is too high, fuel consumption will be excessive, and the resulting lack of engine braking may make the motorcycle difficult to control. Poor carburetor synchronization causes unstable idling, sluggish throttle response, and reduced engine power and performance.

The following procedure consists of two parts: idling adjustment and synchronization.

### Idling Adjustment

1) Idle speed adjustment

- Start the engine, and warm it up until the water temperature gauge needle comes between the two center lines.
- Adjust idle speed to 800~900 rpm by turning the idle adjusting screw.




**A. Idle Adjusting Screw**

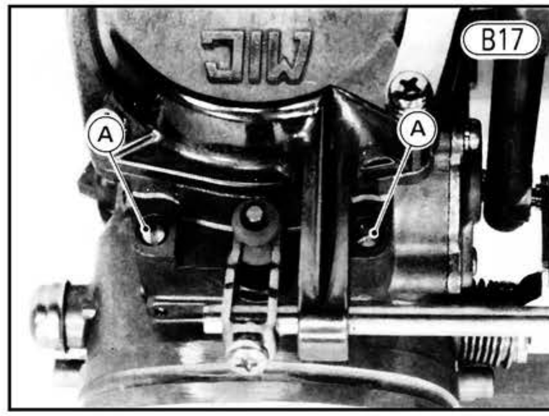
- Open and close the throttle a few times to make sure that the idle speed does not change. Readjust if necessary.

**NOTE**: With the engine idling, turn the handlebar to either side. If handlebar movement changes idle speed, the throttle cables may be improperly adjusted or incorrectly routed, or they may be damaged.

**WARNING** **Operation with improperly adjusted, incorrectly routed, or damaged cables could result in an unsafe riding condition.**

2) Idle mixture adjustment

- Remove the fuel tank (Pg. 46).
- Check that the paint is on each pilot screw. If the paint has come off and the correct screw position is doubtful, turn in the screw until it seats lightly, and then back it out 1¾ turns.




**A. Pilot Screw**

- Install the fuel tank (Pg. 46).
- Perform idle speed adjustment.

**NOTE**: If proper idle speed cannot be obtained by this adjustment alone, first check the following and correct as necessary.

Engine oil (Pg. 21)
Spark Plugs (Pg. 12)
Ignition Timing (Pg. 239)
Throttle Cables (Pg. 138)
Cylinder Compression (Pg. 182)
Air Cleaner Element (Pg. 164)
Air Cleaner Duct and Carburetor Holder Leakage
Valve Clearance (Pg. 12)

### Carburetor Synchronization

To accurately synchronize each carburetor, the use of vacuum gauges is essential.

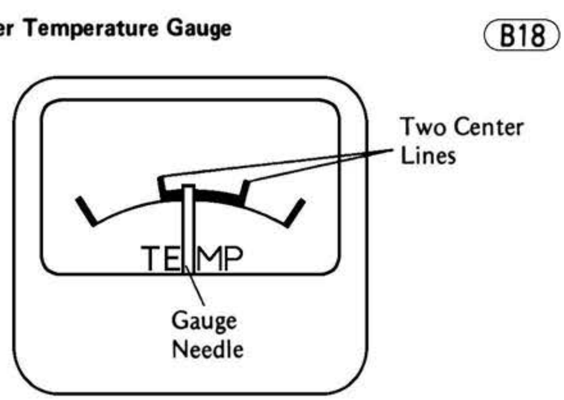
**NOTE**: During carburetor synchronization, the fuel tank will be removed. In most cases, it will be necessary to temporarily replace the standard fuel line with line long enough to reach the fuel tank while it is located on your workbench.

**WARNING** **Use extreme caution when working with gasoline, open fuel lines, etc. to avoid a fire or explosion.**

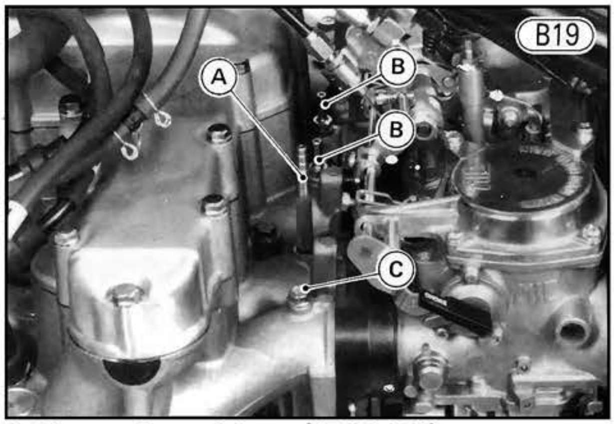
**To check carburetor synchronization:**

- Start the engine, and warm it up until the water temperature gauge needle comes between the two center lines.

**Water Temperature Gauge**



- Perform idling adjustment (Pg. 18).
- Stop the engine.
- Remove the fuel tank (Pg. 46), and supply fuel for the carburetors by some means during adjustment.
- For US model, unscrew the vacuum plugs (4) from the #1, #2, #5, and #6 manifolds, and pull off the vacuum hoses (2) from the #3 and #4 manifolds sliding the hose clamps out of position.
- Except for US model, unscrew the vacuum plugs (6) from each manifolds.
- Screw the vacuum gauge adapter (special tool) into each vacuum plug hole, and connect the vacuum gauge hoses to the adapters (6, 4 for US model) and vacuum hose fittings (2 only for US model).

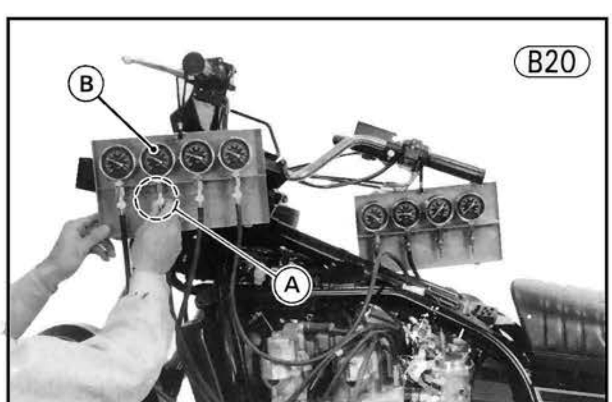



**A. Vacuum Gauge Adapter (57001-401)**
**B. Fitting C. Vacuum Plug**

- Completely close the vacuum gauge damper valves, and then start the engine.
- With the engine running at idle speed, slowly open each damper valve until gauge needle flutter is less than 3 cmHg, and note the gauge readings.
- Calculate three averages of each two combined carburetors, i.e., #1 and #2, #3 and #4, and #5 and #6. If there is a difference of more than the specified value between any two avarages, synchronize the carburetors according to the following procedure.

**Table B5 Vacuum Difference**

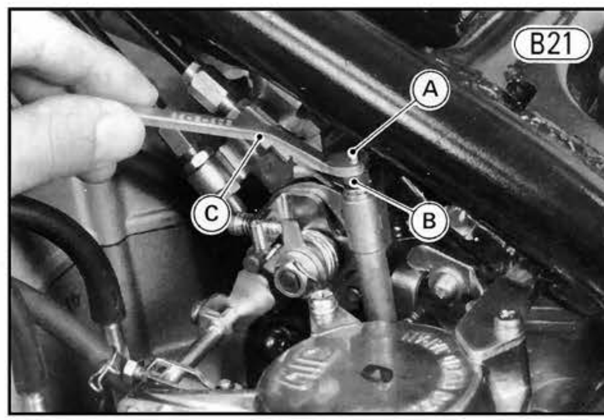
| Difference between Two Averages |
|---|
| under 2 cmHg |




**A. Damper Valve B. Vacuum Gauge (57001-226)**

**To synchronize carburetors:**
- Stop the engine.
- Loosen the locknuts (3) of the balance adjusting screws.
- Turn each adjusting screw in until it seats lightly, and then back it out 1½ turns.

**NOTE:** Carburetor synchronization should be adjusted by turning the balance adjusting screws within the range between ½ ~ 2½ turned back position. If the adjusting screws are turned in exceeding the range, the operation of the link mechanism may become stiff. If the adjusting screws are turned out exceeding the range, the link mechanism may have play.
- Start the engine and adjust idle speed, use the balance adjuster (special tool) to alter the balance adjusting screw position. Adjust to a difference in readings which is less than the specified value.




**A. Balance Adjusting Screw**
**B. Locknut**
**C. Balance Adjuster (57001-1034)**

**NOTE:** There is only one adjusting screw to control both butterfly valves of each 2-throat carburetor. Normally there will be little or no difference between the vacuum of each throat passage.
- Perform idle speed adjustment again.
- Check that the mechanism moves smoothly without binding. Open the throttle grip and let it snap shut a few times. Make sure the vacuum readings stay within the specified vacuum reading. If they do not, the adjusting screws may be out of the adjusting range (½ ~ 2½ turned back position).
- If any gauge reading is below 14 cmHg after synchronizing the carburetors, recheck the points listed in the end of the Idling Adjustment (Pg. 18).
- After the carburetors are properly synchronized, tighten the locknuts without changing the positions of the screws.
- Detach the vacuum gauges, install the vacuum plugs and their washers (4 ea). Connect the vacuum hoses (2) to the fittings. Slide the hose clamps back into place.
- Check the operation of the fast idle speed, and adjust if necessary (Pg. 50).
- Install the fuel tank (Pg. 46).

## CLUTCH

Stretching of the clutch cable causes the clutch lever to develop excessive play. Too much play prevents complete disengagement and may result in shifting difficulty and possible clutch and transmission damage. Most of the play must be adjusted out, but a small amount must remain so that the clutch release lever will function properly.

Clutch plate wear also causes the clutch to go out of adjustment. This wear causes the play between the push rod and the adjusting screw to gradually diminish until the push rod touches the adjusting screw. When this play is lost, the clutch will not engage fully, causing the clutch to slip.

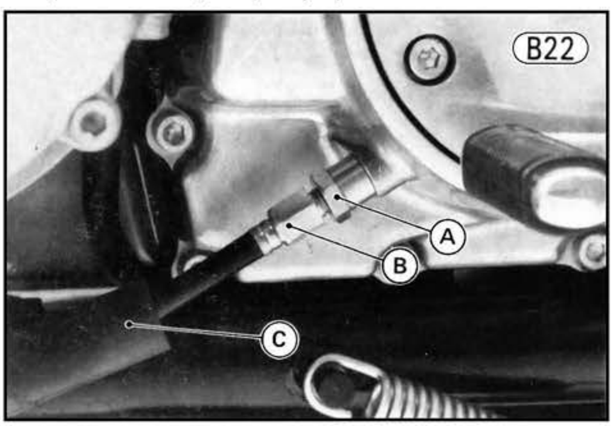
**NOTE**: Even though the proper amount of play exists at the clutch lever, clutch lever play alone cannot be used to determine whether or not the clutch requires adjustment.

The adjustment procedure which follows compensates for both cable stretch and plate wear.

**To adjust the clutch:**

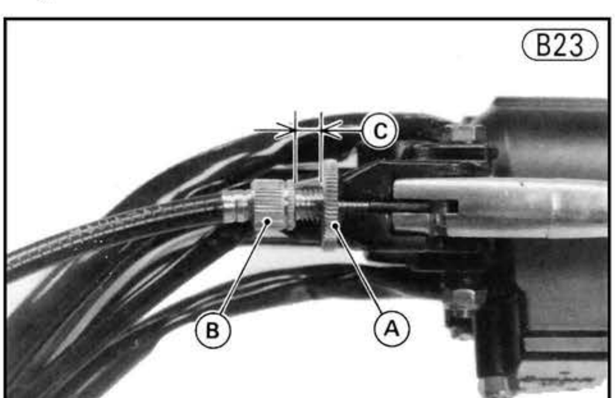
**WARNING** **To avoid a serious burn, never touch the engine or exhaust pipe during clutch adjustment.**

- Pull the dust cover out of the way, loosen the locknut, and turn the adjuster at the bottom of the clutch cable to give the cable plenty of play.



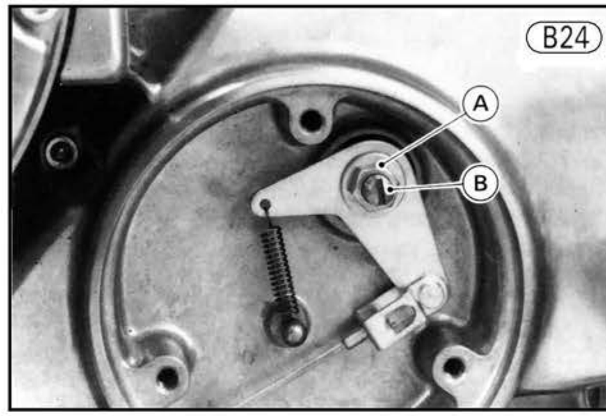

**A. Locknut  B. Adjuster  C. Dust Cover**

- Loosen the knurled locknut at the clutch lever just enough so that the adjuster will turn freely, and then turn the adjuster to make a 5~6 mm gap between the adjuster and knurled locknut.




**A. Knurled Locknut  B. Adjuster  C. 5~6 mm**

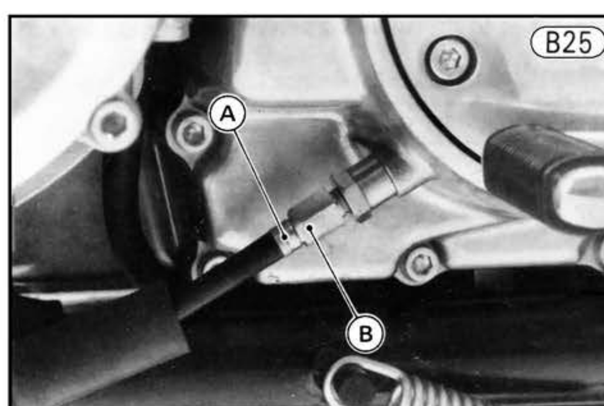
- Remove the clutch release cover.
- Loosen the locknut, and back out the clutch adjusting screw 3 or 4 turns until the screw turns without drag.




**A. Locknut  B. Adjusting Screw**

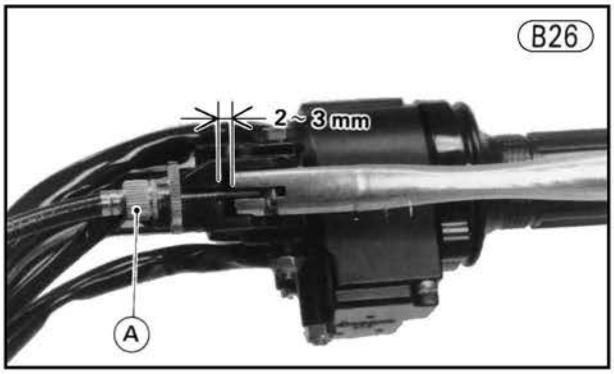
- Turn the adjusting screw in until it becomes hard to turn. This is the point where the clutch is just starting to release.
- Back out the adjusting screw ¼ turn from that point, and tighten the locknut.
- Take up all the cable play with the adjuster at the bottom of the cable, and then tighten the locknut.
- Make sure the lower end of the clutch outer cable is properly fitted into the hole in the external shift mechanism cover. Slide the dust cover onto the adjuster.

**WARNING** **If the outer cable is not fully seated in the adjuster, it could slip into place later and the clutch would not disengage.**




**A. Clutch Outer Cable  B. Adjuster**

- Turn the adjuster at the clutch lever so that the clutch lever will have 2 ~ 3 mm of play and tighten the knurled locknut.




**A. Adjuster**

- Install the clutch release cover.
- Start the engine and check that the clutch has no slippage and that it releases properly.

## ENGINE OIL

In order for the engine, transmission, and clutch to function properly, always maintain the engine oil at the proper level and change the oil in accordance with the Periodic Maintenance Chart (Pg. 10).

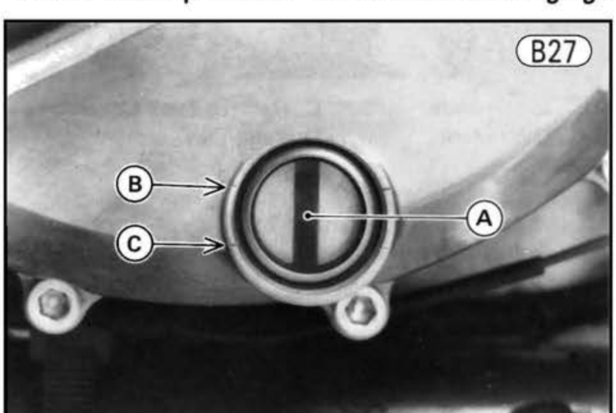
**WARNING** **Motorcycle operation with insufficient, deteriorated, or contaminated engine oil will cause accelerated wear and may result in engine or transmission seizure and accident and injury.**

### Oil Level Inspection

- If the oil has just been changed, start the engine and run it for several minutes at idle. This fills the oil filter with oil. Then wait several minutes until the oil settles.

**CAUTION** **Run the engine at idle at least until the oil pressure light turns off. Racing the engine before the oil reaches every part can cause engine damage and seizure.**

- If the motorcycle has just been used, wait several minutes for all the oil to drain down.
- Check the engine oil level through the oil level gauge in the lower right side of the engine. With the motorcycle held level or on the center stand, the oil level should come up between the lines next to the gauge.




**A. Oil Level Gauge** **C. Lower Level**
**B. Upper Level**

- If the oil level is too high, remove the excess oil, using a syringe or some other suitable device.
- If the amount of oil is insufficient, add oil through the oil filler opening. Use the same type and brand of oil that already is in the engine.

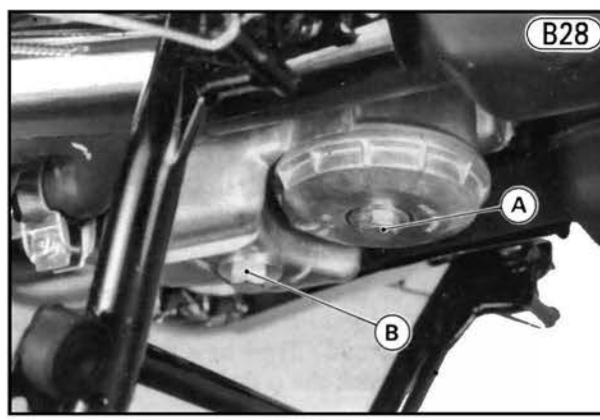
**CAUTION** **If the engine oil level gets extremely low or if the oil pump or oil passages clog up or otherwise do not function properly, the red oil pressure warning light in the switch panel will light. If this light stays on when the engine speed is above 1,200 rpm, stop the engine immediately and find the cause.**

**WARNING** **If the engine is run without oil, it will be severely damaged. In addition, the engine may suddenly seize, locking the rear wheel and causing an accident if the clutch lever is not pulled in fast enough.**

### Oil and/or Oil Filter Change

- Warm up the engine thoroughly, and then stop the engine.
- Set the motorcycle up on its center stand, place an oil pan beneath the engine, and remove the engine and oil filter drain plugs. Clean them off before reinstalling them.

**NOTE:** If water pollution is found in the engine oil, check the cooling system (Pg. 202). Then flush the engine using a special flushing agent.




**A. Oil Filter Mounting Bolt** **B. Engine Drain Plug**

- If the oil filter is to be changed, replace the oil filter as explained on Pg. 89.
- After the oil has completely drained out, install the engine drain plug. Proper torque for the drain plug is 2.3 kg-m (16.5 ft-lbs).

**Table B6 Engine Oil**

| Grade | Viscosity | Filling Engine Oil Capacity | |
|---|---|---|---|
| | | When filter is not changed | When filter is changed |
| SE Class | SAE 10W40 10W50 20W40 20W50 | 4.0 liters | 4.6 liters |

- Fill the engine up to the upper level with a quality motor oil specified in the table.

**NOTE:** After the engine has been run and then stopped for a few minutes, the oil level should come to between the upper and lower marks.

## FUEL SYSTEM

Accumulation of water in the fuel tank will restrict the flow of fuel and cause the carburetor to malfunction. The fuel system should be cleaned out periodically in the following manner.

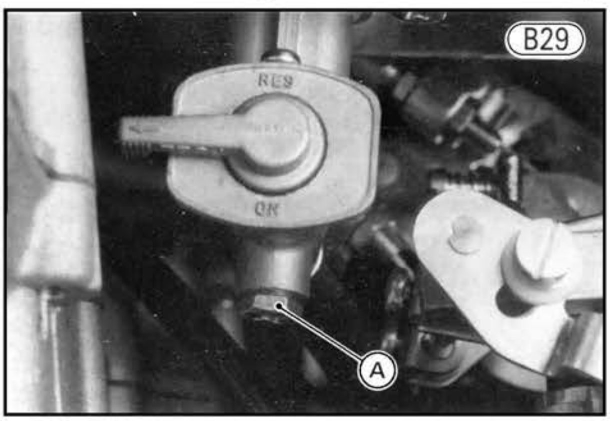
**WARNING**

**1. Clean the fuel system in a well-ventilated area, and take ample care that there are no sparks or flame anywhere near the working area.**

**2. Never clean out the fuel system when the engine is still warm.**

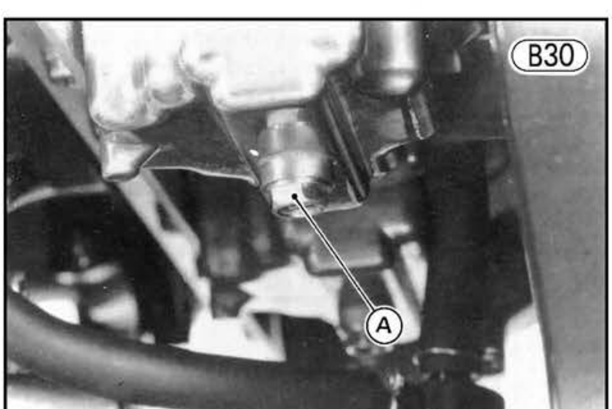
**3. Wipe any fuel off the engine before starting it.**

- Turn the fuel tap lever to the "OFF" position.
- Remove the drain plug at the bottom of the fuel tap.




**A. Drain Plug**

- Holding a container under the fuel tap, turn the tap lever to the "RES" position to drain the tank until only gasoline comes out. Then turn the lever to the "OFF" position. Install the gasket and the drain plug on the tap.
- If water has accumulated in the fuel tank, water may also have accumulated in the float bowl.
- Remove the drain plug from the bottom of each carburetor float bowl to drain the bowls.




**A. Drain Plug**

- Install the gaskets and drain plugs on the float bowls.

## COOLANT

Coolant absorbs excessive heat from the engine and transfers it to the air at the radiator. If the coolant level becomes low, the engine overheats and may suffer severe damage. Check the coolant level each day before riding the motorcycle, and replenish coolant if the level is low. Change the coolant in accordance with the Periodic Maintenance Chart (Pg. 10).

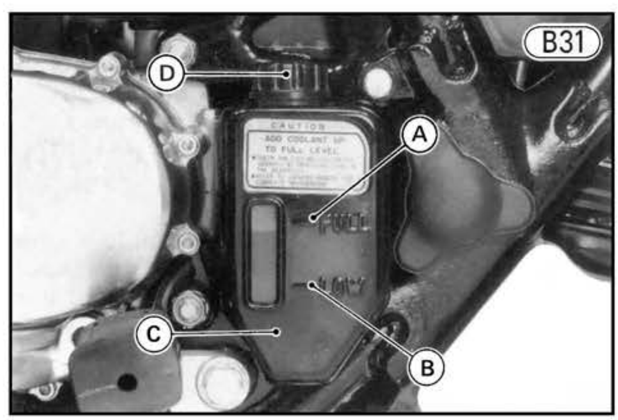
**NOTE:** Refer to the maintenance section for detailed information on coolant (Pg. 203).

### Coolant Level Inspection

- Situate the motorcycle so that it is perpendicular to the ground (on its center stand).
- Inspect the coolant (Pg. 203), and check the level through the coolant level gauge in the reserve tank cover. The coolant level should be between the "FULL" and the "LOW" marks.

**NOTES:** 1. Check the level when the engine is **cold** (room or atmospheric temperature).

2. Do not check the level through the coolant filler of radiator by removing the cap. If it is done, the air may comes into the coolant path of engine and radiator and lowers the cooling efficiency.




**A. "FULL" Mark** **C. Reserve Tank Cover**
**B. "LOW" Mark** **D. Tank Cap**

- If the amount of coolant is insufficient, unscrew the cap from the reserve tank, and add coolant through the filler opening to the "FULL" mark. Install the tank cap.

**NOTES:** 1. For refilling, add the specified mixture of coolant and soft water. Adding water alone dilutes the coolant and degrades its anti-corrosion properties. The diluted coolant can attack the aluminum engine parts. In an emergency, soft water can be added. But the diluted coolant must be returned to the correct mixture ratio by addition of coolant concentrate within a few days.

2. If coolant must be added often, or the reserve tank has run completely dry; there is probably leakage in the cooling system. Check the system for leaks (Pg. 205).

## Coolant Change

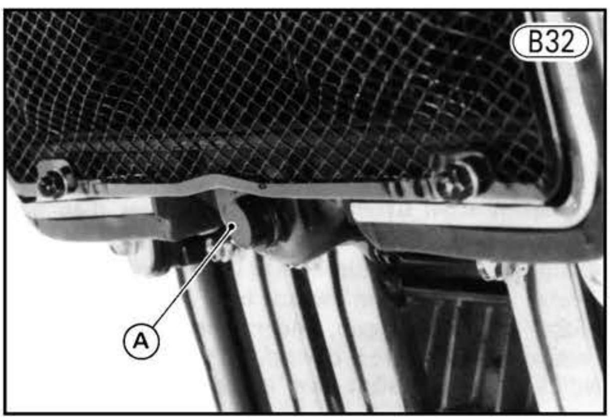
**WARNING** **To avoid scalds, do not remove the radiator cap or try to change the coolant when the engine is still hot. Wait until it cools down.**

•Set the motorcycle up on its center stand.

•Place a container under the radiator drain plug, and drain the coolant from the radiator by removing the drain plug at the bottom of the radiator. Coolant begins to flow out when the plug is loosened several turns. Immediately wipe up or wash out any coolant that spills on the frame, engine, or wheels.

**WARNING** **Coolant entires will make them slippery and can cause an accident and injury.**

**NOTE:** Inspect the coolant (Pg. 203).

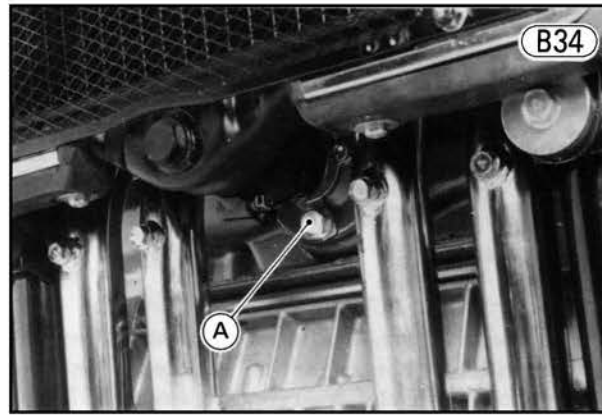



**A. Radiator Drain Plug**

•Remove the radiator cap at the two steps. First turn the cap counterclockwise to the first stop and wait there for a few seconds. Then push and turn it to the same direction further and remove the cap.


**A. Radiator Cap**

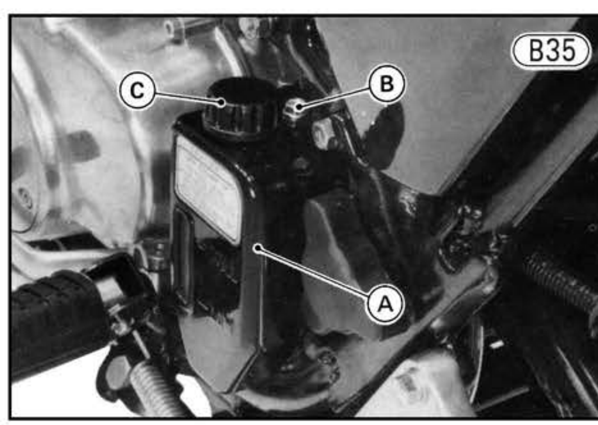
•Unscrew the drain plug at the water pump cover using a socket wrench to drain coolant from the engine.




**A. Drain Plug**

•Visually inspect the old coolant. If whitish cotton-like wafts is observed, aluminum parts in the cooling system are corroded. The brownish color of the coolant indicates rusting of iron parts. In these cases, flush the cooling system (Pg. 208). If the coolant gives off abnormal smell when changing, check the leak from cooling system (Pg. 203). It may be caused that exhaust gas sinks into the cooling system (coolant leaks into engine).

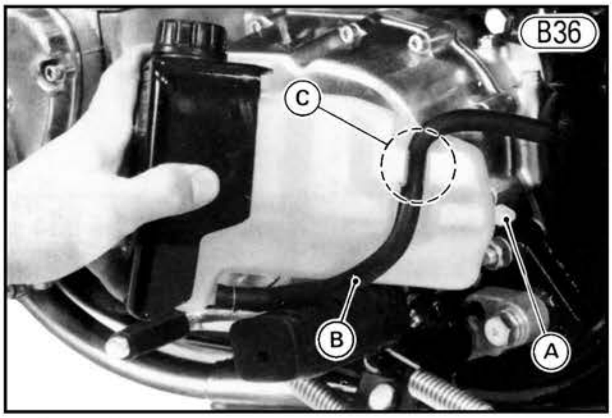
•Unscrew the bolt, and pull the reserve tank and its cover toward the left of the motorcycle.




**A. Reserve Tank Cover**
**B. Bolt**
**C. Tank Cap**

•Unscrew the cap, and pour the coolant into a container.

•Install the reserve tank and its cover, inserting the projection on the tank into the hole at the bottom of the air cleaner housing. The reserve tank hose should be routed into the groove on the tank.




A. Projection C. Groove
B. Reserve Tank Hose

•Install the drain plugs. Always replace the O ring and gasket with new ones, if they are damaged. Tightening torque for the radiator drain plug is 0.4 kg-m (35 in-lbs), and the cylinder drain plug 2.0 kg-m (14.5 ft-lbs).

•Fill the radiator up to the radiator filler neck with coolant, and install the cap turning it clockwise by about ¼ turn.

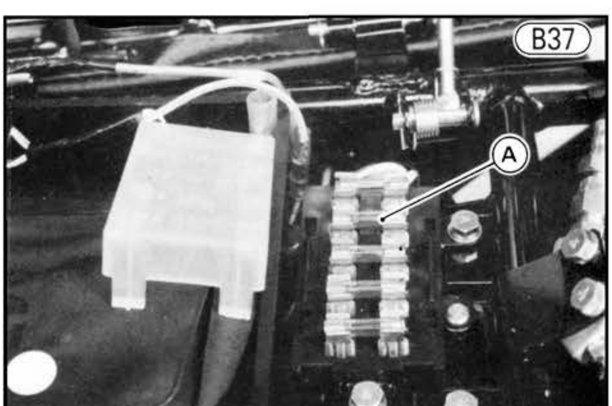
**NOTES:** 1. Do not pour the coolant rapidly so that it can expel the air from the engine and radiator.
2. The radiator cap must be installed at two steps. First turn the cap clockwise to the first stop. Then turn it further to same direction pushing the cap.

•Fill the reserve tank up to the "FULL" mark with coolant, and install the cap. Total refill will take about 3.5 liters after the air inside the system is expelled.

•Before putting the motorcycle into operation, any air trapped in the cooling system must be removed as follows.

## Air Bleeding

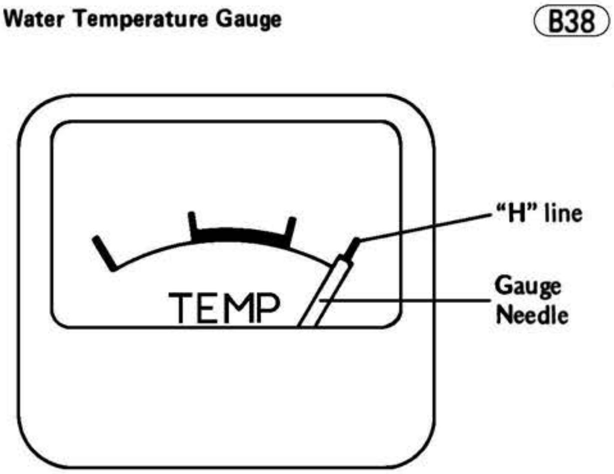
•Remove the 10A fuse for the fan motor out of the fuse box.




A. 10A Fuse

•Start the engine and warm it up by running it at idle [850 rpm (r/min)]. Continue warming up until the water temperature gauge indicates the "H" line.

**Water Temperature Gauge**




**NOTE:** It will usually take about 15 minutes to reach the above "H" line. If the gauge needle does not reach the "H" line after 15 minutes, raise the engine rpm a little.

**CAUTION** **1. Do not let the engine continue to run after the gauge needle reaches the "H" line. Prolonged engine operation will result in severe damage from overheating.**
**2. When coolant with a low mixture ratio is used, it may boil and overflow from the reserve tank before the gauge reading indicates the "H" line. When the coolant level of the reserve tank starts to rise rapidly, stop the engine at once and cool it to keep the coolant from overflowing. The air has then been expelled.**

•Stop the engine by turning the ignition switch off, and install the 10A fuse in the fuse box.

•Start the engine again, and run the engine until the coolant temperature is normal.

**NOTE:** Check coolant level in the reserve tank several times while the engine is cooling down, and replenish as necessary. If the coolant in the reserve tank runs completely out any time during cooling, the air bleeding operation must be repeated from the beginning, since air will have entered the system.

•Stop the engine, and check the coolant level after the engine cools down. Add coolant up to the "FULL" mark.

•Inspect the drain plugs and the radiator cap for leaks.

# Adjustment—Chassis

## Table of Contents

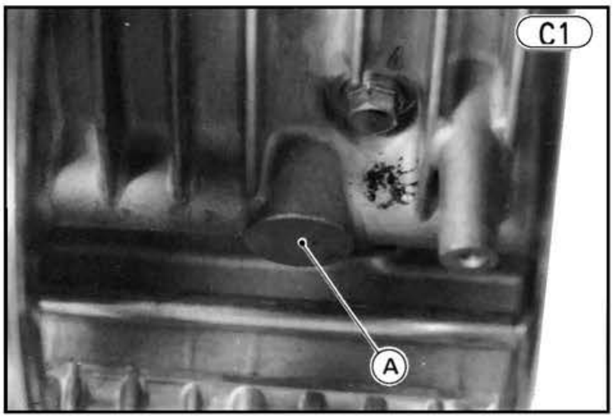
C

## FRONT FORK

The front forks can be adjusted to any air pressure within the usable range to suit various riding and load conditions. They can be adjusted to lower air pressure for cruising on smooth roads, but should be adjusted to higher pressure for high speed riding, or riding on bad roads. Before making any adjustments, however, read the procedures in this chapter.

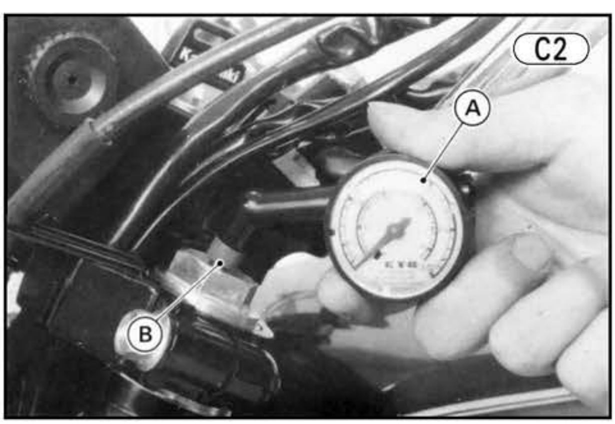
**To check the front forks:**

- Put the motorcycle up on its center stand.
- Raise the front wheel off the ground by using a jack at the specified location. All weight must be off the front wheel.




**A. Place the jack at this location.**

- Remove the rubber cover and air valve cap, and check the air pressure with the air pressure gauge (special tool).




**A. Air Pressure Gauge (52005-1003)**
**B. Air Valve**

**NOTES:** 1. Check the air pressure when the front forks are cold.
2. Do not use tire gauges for checking air pressure. They may not indicate the correct air pressure because of air leaks that occur when the gauge is applied to the valve.

- Inject air through the valve with a pump until the pressure gauge reads the specified value, but do not exceed 2.5 kg/cm² (36 psi).

**NOTE:** A normal tire pump can be used.

**Table C1 Air Pressure**

| Standard | Usable Range |
|---|---|
| 0.60 kg/cm² (8.5 psi) | 0.50~0.70 kg/cm² (7.1~10 psi) |

**CAUTION** **1. Try to set the air pressure of the right and left fork legs as equally as possible. The difference in air pressure between the right and left fork legs must be within 0.1 kg/cm² (1.4 psi).**
**2. Inject air little by little so that air pressure does not rise rapidly. Air pressure exceeding 2.5 kg/cm² (36 psi) may damage the oil seals.**

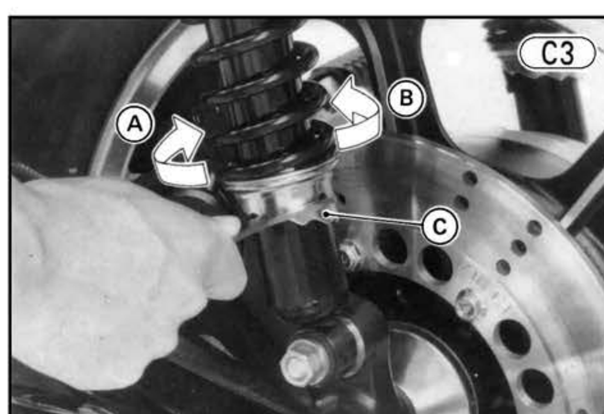
**WARNING** **1. Be sure to adjust the air pressure within the usable range. Front forks adjusted too low or too high adversely affect handling and stability and could lead to accident and injury.**
**2. Only air or nitrogen gas can be used. Never inject oxygen or any other kind of gas. Other gases could produce an explosion.**
**3. Do not incinerate the front fork.**

## REAR SHOCK ABSORBERS

The rear shock absorbers can be adjusted to one of five positions to suit riding conditions. They can be left soft for average riding but should be adjusted harder for high speed riding, riding on bad roads, or riding with a passenger. Shock absorbers adjusted either too soft or too hard adversely affect riding comfort and stability.

**To adjust the rear shock absorbers:**

- Turn the adjusting sleeve on each shock absorber to the desired position with a hook spanner. The higher the adjusting sleeve is positioned, the stronger the spring tension, and the harder the ride.




**A. Harder B. Softer C. Adjusting Sleeve**

•Check to see that both adjusting sleeves are turned to the same relative position.

**WARNING** **If they are not adjusted to the same position, an unsafe riding condition may result.**

## BRAKES AND BRAKE LIGHT SWITCHES

### Front Brake and Front Brake Light Switch

Disc and disc pad wear is automatically compensated for and has no effect on the brake lever action. There are no parts that require adjustment on the front brake. However if the brake lever has a soft or "spongy" feeling, check the brake fluid level in the master cylinder and bleed the air from the brake line (Pg. 221).

The front brake light switch, mounted on the front master cylinder, operates mechanically and is nonadjustable.

### Rear Brake and Rear Brake Light Switch

Disc and disc pad wear is automatically compensated for and has no effect on brake pedal action. However, the brake pedal may occasionally require adjustment due to wear inside the pedal assembly itself, or in case of disassembly. Excessive play must be taken up to keep the braking action lag time to a minimum, but enough play must be left to ensure a full braking stroke.

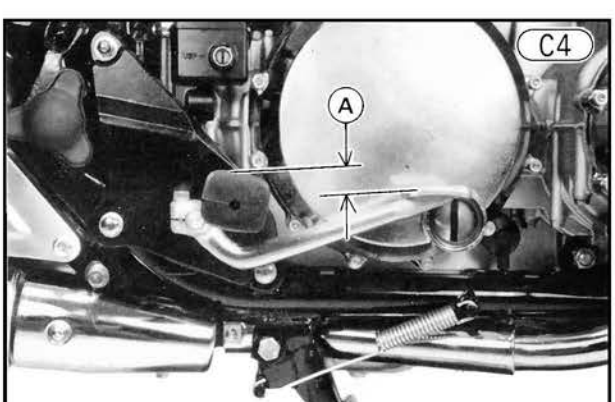
**NOTE:** Check the brake fluid level in accordance with the Periodic Maintenance Chart (Pg. 10). Before adjusting the brakes, be sure that air is bled from the brake lines (Pg. 221).

The rear brake light switch, activated by a lever mounted to the master cylinder push rod, requires periodic adjustment to compensate for any change of the push rod position.

**Rear Brake Pedal Position, Pedal Play, and Rear Brake Light Switch**

**To check the brake pedal position:**

•When the brake pedal is in its rest position, it should be 0 ~ 30 mm lower than the top of the footpeg.



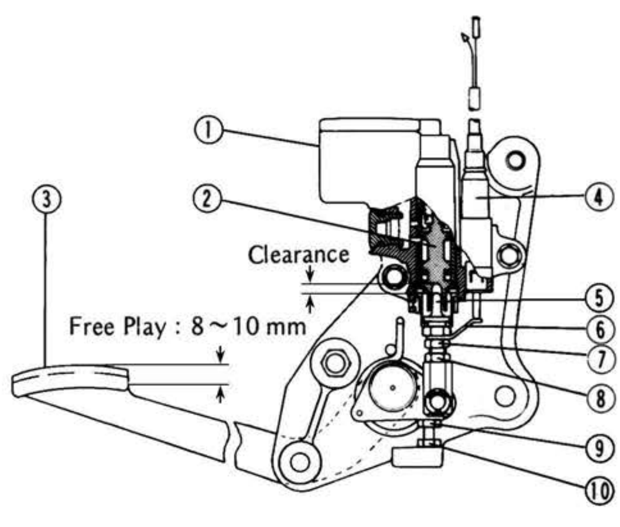

**A. 0 ~ 30 mm**

**To check the brake pedal play:**

•The brake pedal should have 8 ~ 10 mm of free play from the rest position before the push rod contacts the master cylinder piston.

**WARNING** **Lack of free play may cause the brake pads to drag on the disc causing heat build-up, possible brake lock-up and loss of control.**

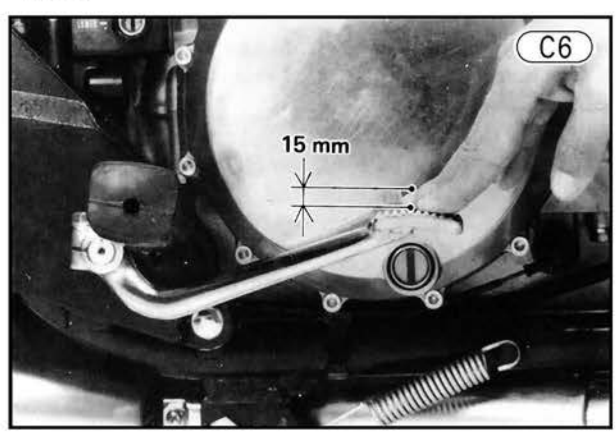
**Brake Pedal Free Play** C5




1. Master Cylinder
2. Piston
3. Brake Pedal
4. Brake Light Switch
5. Push Rod
6. Lever
7. Lever Locknut
8. Push Rod Locknut
9. Pedal Adjusting Bolt
10. Locknut

**To check the brake light switch:**

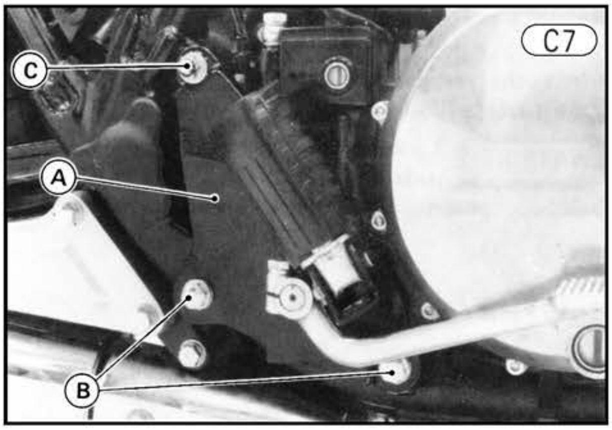
•Check the operation of the switch by turning on the ignition switch and depressing the brake pedal. The brake light should go on after about 15 mm of pedal travel.




**To adjust the brake pedal position, brake pedal play, and brake light switch:**

Adjust as follows:

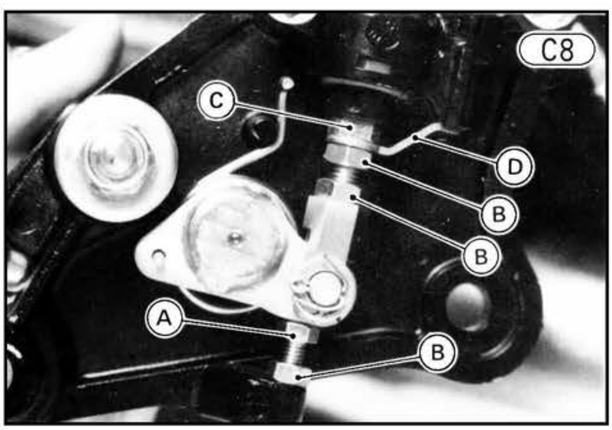
•Remove the two bolts and nut, and take off the mounting bracket.




A. Mounting Bracket B. Bolts C. Nut

- Loosen the locknut of the lever.
- To obtain the correct pedal position, loosen the locknut, and then turn the brake pedal adjusting bolt.
- Tighten the locknut.

**NOTE:** If pedal position is too high, loosen the locknut, and turn the master cylinder push rod to give the brake pedal plenty of play before turning the brake pedal adjusting bolt.




A. Adjusting Bolt C. Master Cylinder Push Rod
B. Locknut D. Lever

- To adjust pedal free play, loosen the locknut, and turn the master cylinder push rod. Tighten the locknut.
- To obtain correct brake light timing, bend the lever to proper angle. Tighten the locknut.
- Install the mounting plate with bolts and nut lightly.
- Check the brake pedal position, pedal play, and operation of brake light switch.
- Check for brake drag.
- Check braking effectiveness.
- Tighten the mounting bolts and nut of mounting plate securely.

**NOTES:** 1. Be sure to adjust the pedal play and brake light switch after adjusting the pedal position, and to adjust the brake light switch after adjusting pedal play.
2. Always make sure locknuts are secure after brake adjustment.
3. Always check for the specified free play after adjusting brake pedal position or free play.

**WARNING** **Incorrect adjustment with insufficient free play can cause brake heating and drag. Skidding and loss of control may result.**

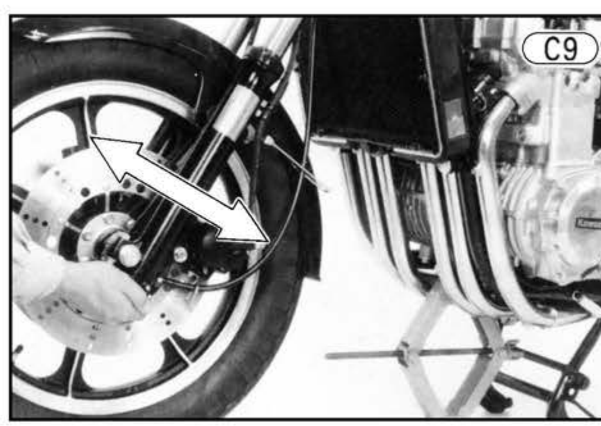
## STEERING

For safety, the steering should always be kept adjusted so that the handlebar will turn freely but have no play.

If the steering is too tight; it will be difficult to turn the handlebar quickly, the motorcycle may pull to one side, and the steering stem bearings may be damaged. If the steering is too loose, the handlebar will vibrate and the motorcycle will be unstable and difficult to steer in a straight line.

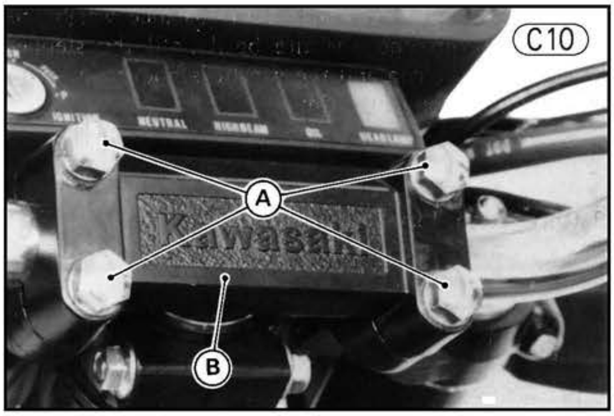
**To check the steering adjustment:**

- Set the motorcycle on its center stand.
- Using a jack at the specified location under the engine, lift the front wheel off the ground (Fig. G2).
- Push the handlebar slightly to either side. If it continues moving under its own momentum, the steering is not too tight.
- Squat in front of the motorcycle and grasp the lower ends of the front fork. Push and pull the fork end back and forth. If play is felt, the steering is too loose.



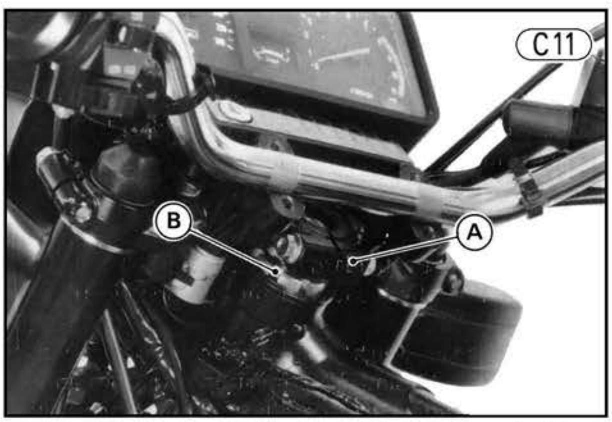

**To adjust the steering:**

- Remove the fuel tank (Pg. 46) to avoid damaging the painted surface.
- Loosen the front fork upper clamp bolts (2) and stem head clamp bolt.
- Remove the handlebar clamp bolts and lockwashers (4 ea), and remove the clamp.




A. Clamp Bolts B. Handlebar Clamp

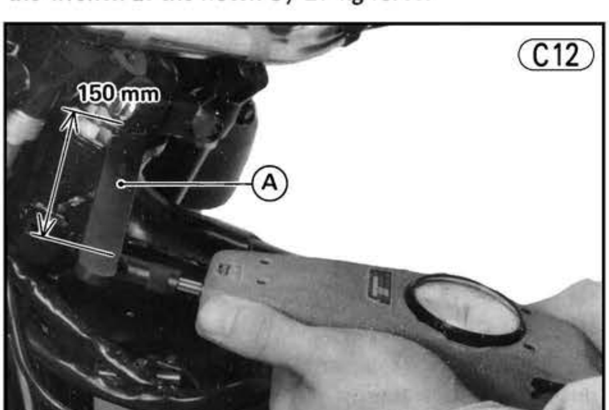
- Remove the steering stem head bolt and lockwasher.
- Tap lightly on the bottom of the stem head with a mallet, and lift the stem head slightly to loosen the upper steering stem locknut.




A. Stem Head B. Upper and Lower Stem Locknuts

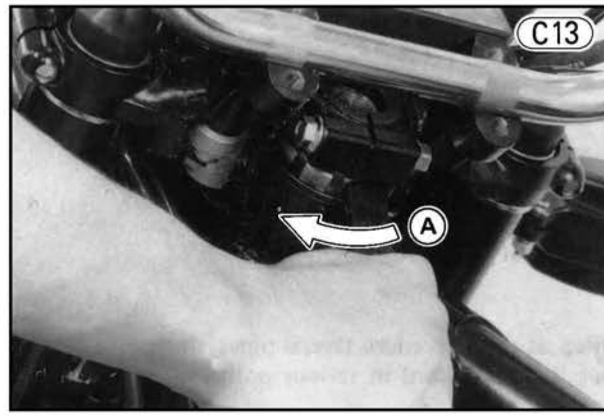
- Loosen the upper stem locknut all the way with the stem nut wrench (special tool), and loosen the lower stem locknut a fraction of a turn until it turns lightly.
- Using the stem locknut wrench, tighten the lower stem locknut to 4.0 kg-m (29 ft-lbs) of torque.

**NOTE:** To tighten the steering stem locknut to the specified torque, firstly make a notch on the stem nut wrench at the 150 mm from the locknut center, secondly hook the wrench on the stem locknut, and then push the wrench at the notch by 27 kg force.




A. Steering Stem Nut Wrench (57001-134)

- Check that there is no play and the steering stem turns smoothly without the rattle. If not, the steering stem bearing may be damaged.
- Again back out the lower steering stem locknut a fraction of turn until it turns lightly.
- Turn the lower steering stem locknut lightly clockwise until it just becomes hard to turn. Do not overtighten, or the steering will be too tight.




A. Turn lightly.

- Keeping the lower stem locknut at the position, tighten the upper stem locknut lightly.
- Tighten the steering stem head bolt to 4.5 kg-m (33 ft-lbs) of torque.
- Tighten the steering stem head clamp bolt to 1.8 kg-m (13.0 ft-lbs) of torque.
- Tighten the front fork upper clamp bolts (2) to 3.0 kg-m (22 ft-lbs) of torque.
- Check the steering again. If the steering is too tight or too loose in spite of correct adjustment, inspect the steering stem parts according to the maintenance section (Pg. 224).
- Install handlebar, handlebar clamp, lockwashers, and clamp bolts (Pg. 145).
- Remount the fuel tank (Pg. 46).

## WHEEL BALANCE

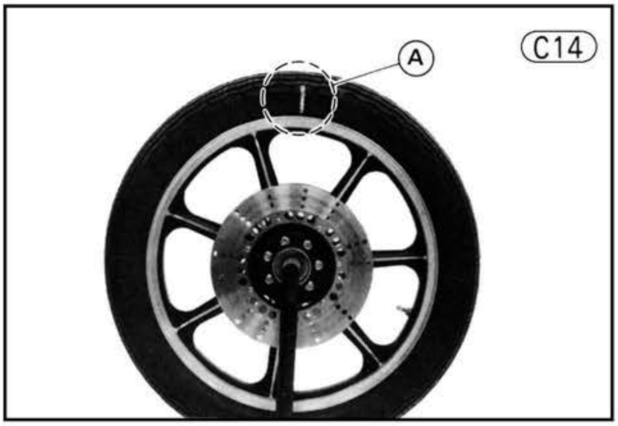
To improve stability and decrease vibration at high speed, the front and rear wheels must be kept balanced.

Check and balance the wheels when required, and when a tire is replaced with a new one.

**To check the wheel balance:**

- Remove the wheel (Pg. 121 or 129).
- Check that the wheel is not damaged.
- Suspend the wheel so that it can be spun freely.

•Spin the wheel slowly, and mark the rim at the top when the wheel stops.



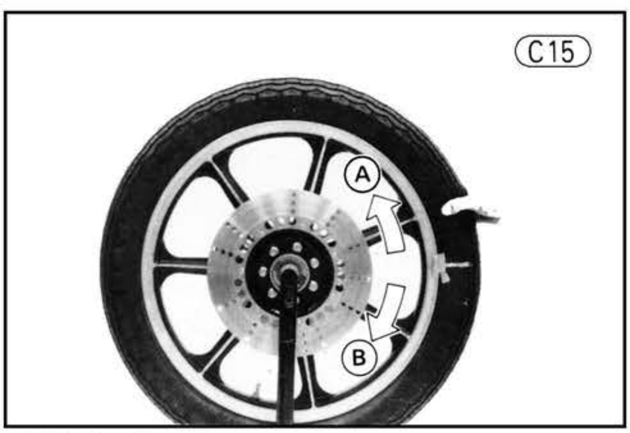

A. Mark at the top.

•Repeat this procedure several times. If the wheel stops of its own accord in various positions, it is well balanced.

**To adjust the wheel balance:**

•If the wheel always stops in one position, temporarily attach a balance weight on the rim at the marking with tape.

•Rotate the wheel ¼ turn, and see whether or not the wheel stops in this position. If it does, the correct balance weight is being used.




A. Use heavier weight. B. Use lighter weight.

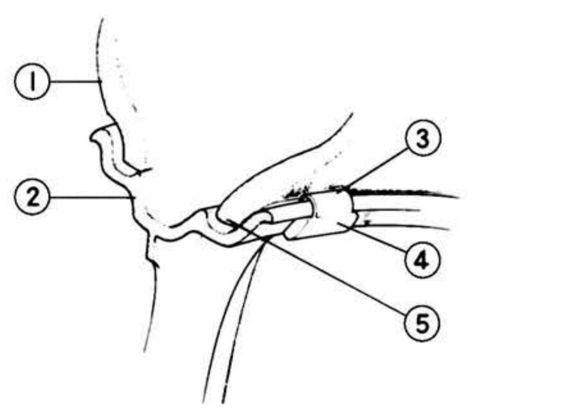
•If the weighted location still stops at the top, try a heavier weight. If the weighted position always stops at the bottom, use slightly less weight. Repeat these steps until the wheel remains at rest after being rotated ¼ turn.

•Rotate the wheel another ¼ turn and then another ¼ turn to see if the wheel is correctly balanced.

•Repeat the entire procedure as many times as necessary to achieve correct wheel balance.

•To install the balance weights on the rim, first reduce the tire pressure, pry the tire bead from the rim, and then insert the blade part of the balance weight between the rim and the tire bead until the stepped portions of the rim and the weight is hooked over the overhang portion of the rim.

**Balance Weight Installation**




1. Tire
2. Rim
3. Blade
4. Balance Weight
5. Tire Bead

•Inflate the tire to standard pressure (Pg. 213).

•Reinstall the wheel back on the motorcycle (Pg. 121 or 129).

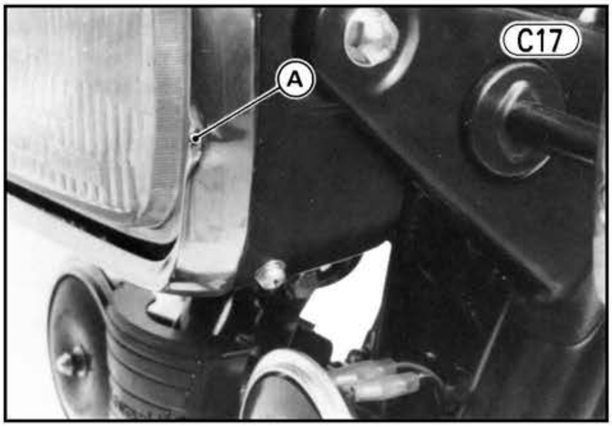
**NOTE:** Balance weights are available from Kawasaki dealers in 10, 20, and 30 gram sizes. An imbalance of less than 10 grams will not usually affect running stability.

## HEADLIGHT

The headlight beam is adjustable both horizontally and vertically. If not properly adjusted horizontally, the beam will point to one side rather than straight ahead. If adjusted too low vertically, neither low nor high beam will illuminate the road far enough ahead. If adjusted too high vertically, the high beam will fail to illuminate the road close ahead, and the low beam will dazzle oncoming drivers. In most areas it is illegal to ride with improperly adjusted headlight.

### Horizontal Adjustment

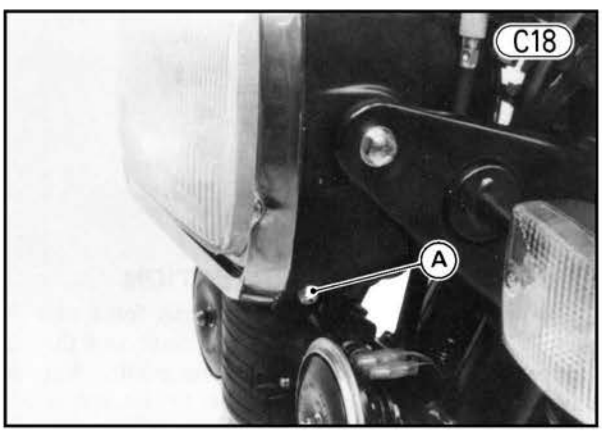
•Turn the small screw on the headlight rim in or out until the beam points straight ahead. Turning the adjusting screw clockwise moves the headlight beam to the right.




A. Adjusting Screw

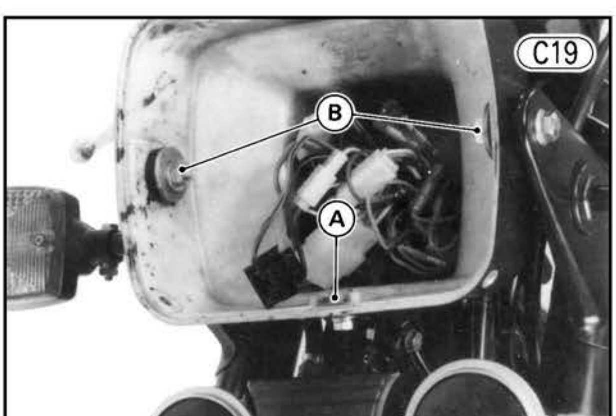
### Vertical Adjustment

- Remove the two screws from the lower side of the headlight housing, and drop out the headlight unit.




A. Screw

- Loosen the headlight housing stay bolt underneath the headlight.

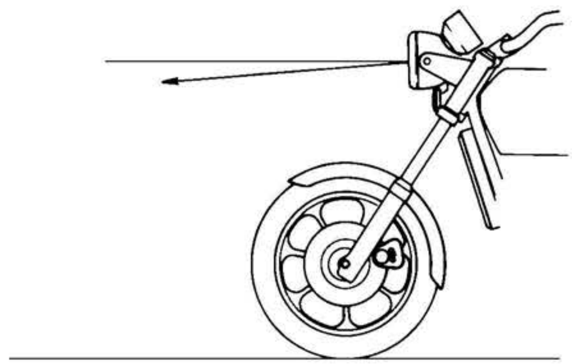



A. Bolt B. Housing Mounting Nuts

- Loosen the headlight housing mounting nuts, and adjust the headlight vertically.

**NOTE:** On high beam, the brightest point should be slightly below horizontal. Adjust the headlight to the proper angle according to the regulation that applies to its operation. Adjust with normal operational weight loaded on the motorcycle.

**Vertical Adjustment** C20



- Tighten the headlight housing mounting nuts, and remount the headlight unit.
- Tighten the headlight housing stay bolt.

## FINAL GEAR CASE OIL

In order for the pinion and ring gears to function properly, maintain the final gear case oil at the proper level, and change the oil in accordance with the Periodic Maintenance Chart (Pg. 10).

**WARNING** **Motorcycle operation with insufficient, deteriorated, or contaminated oil causes accelerated wear and may result in seizure of the pinion and ring gears. Seizure can lock the rear wheel and skid the rear tire, with consequent loss of control.**

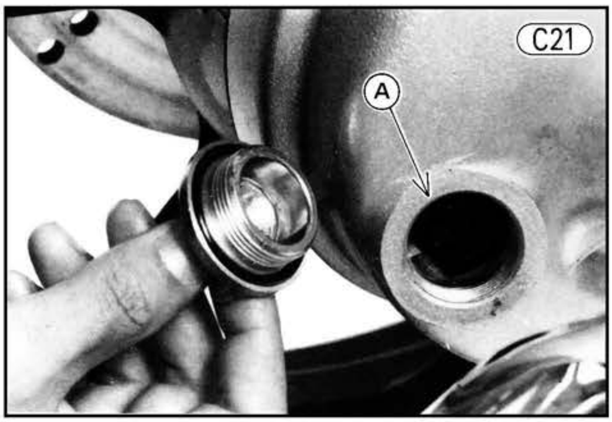
## Oil Level Inspection

- Situate the motorcycle so that it is perpendicular to the ground.
- Remove the filler cap.

**CAUTION** **Be careful not to allow any dirt or foreign materials to enter the gear case.**

- Check the oil level. If it is insufficient, add oil as necessary. The oil level should come to the bottom thread of the filler opening.

**NOTE**: Use the same type and make of oil that is already in the final gear case.



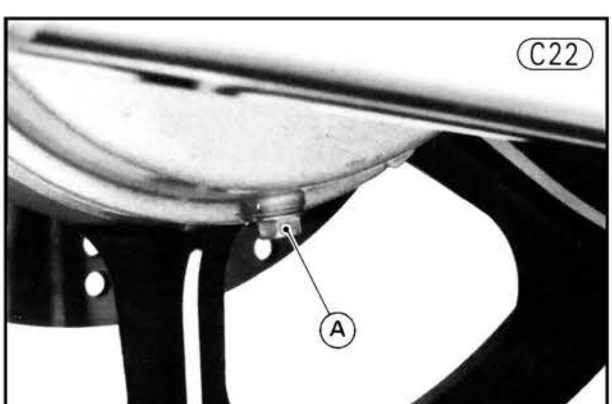

**A. Filler Opening**

## Oil Change

**NOTE**: Final gear case oil drains easily and picks up any sediment when the oil is warmed up by running the motorcycle.

- Situate the motorcycle so that it is perpendicular to the ground.
- Place an oil pan beneath the gear case.
- Remove the filler cap and the drain plug.

**WARNING** **When draining or filling the gear case, be careful that no oil gets on the tire, rim, or brake disc. Oil spillage may cause the tire to slip with consequent loss of control. Clean off any oil that inadvertently gets on them with a high flash-point solvent.**




**A. Drain Plug**

- After the oil has completely drained out, install the drain plug and gasket. Replace the damaged gasket with a new one. Proper torque for the drain plug is 2.0 kg-m (14.5 ft-lbs).
- Fill the gear case up to the bottom thread of filler opening with the oil specified below.

**Table C2 Final Gear Case Oil**

| | |
|---|---|
| Oil Capacity | about 250 cc |
| Oil Type | API "GL-5" Hypoid gear oil<br>SAE 90 [when above 5°C (41°F)]<br>SAE 80 [when below 5°C (41°F)] |

**NOTE**: "GL-5" indicates a quality and additive rating. "GL-6" rated hypoid gear oils can also be used.

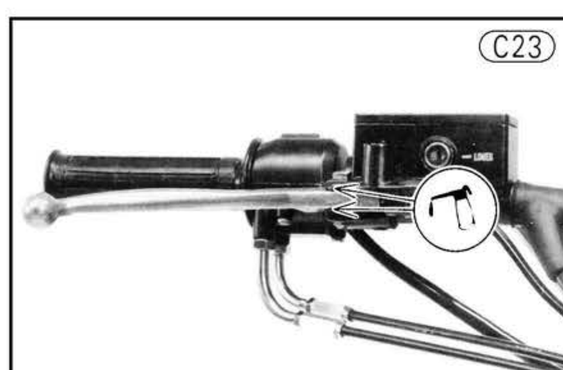
- Install the filler cap.

## LUBRICATION AND PROTECTION

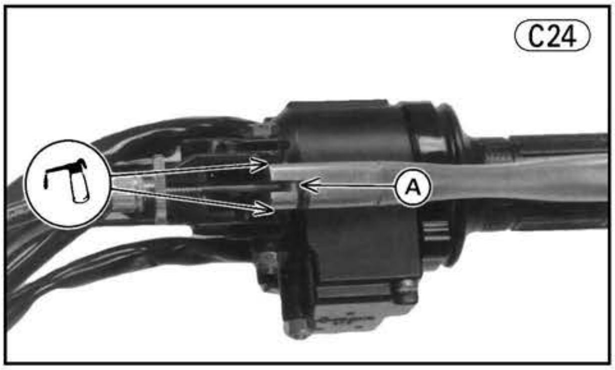
Avoid spraying water with any great force near the meter assembly, and under the fuel tank and the seat to prevent damage to electrical components. Exposed parts that are subject to rust can be treated with a protective polish or a water-displacing oil (brand-name examples: WD-40, LPS).

**WARNING** **Never wax or lubricate brake discs. Loss of braking and an accident could result. Clean discs with an oilless solvent such as trichloroethylene or acetone. Observe solvent manufacturer's warnings.**

## Brake Lever



### Clutch Lever

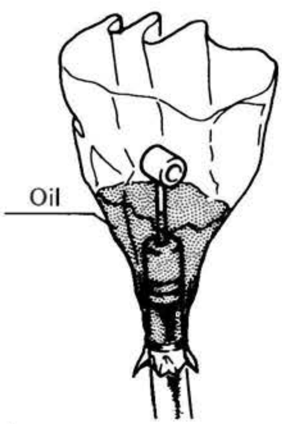



A. Grease.

### Clutch and Throttle Cables

Lubricate the clutch cable and throttle cables, as shown in the figure. Use a lubricant designed for cable lubrication. Refer to Pg. 137 or 138 for cable removal.

**Cable Lubrication** (C25)

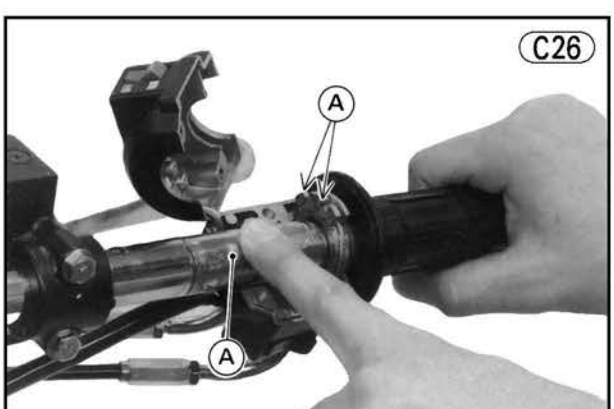



### Throttle Grip

Apply a light coat of grease to the handlebar where the throttle grip turns.

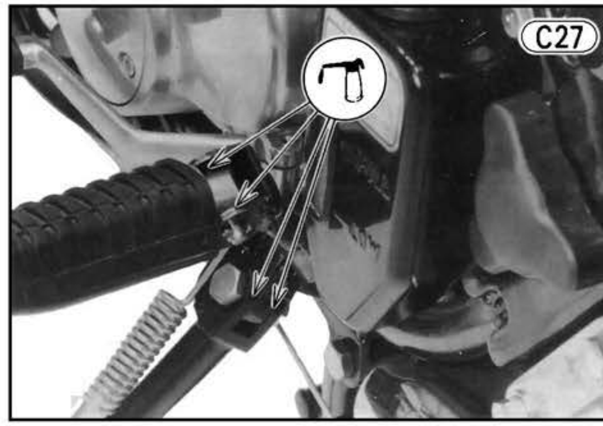
Apply a light coat of grease to the exposed portion of the throttle grip inner cables and their catches in the throttle grip.

Fit the throttle cables into the throttle grip. Refer to throttle cable installation (Pg. 138).

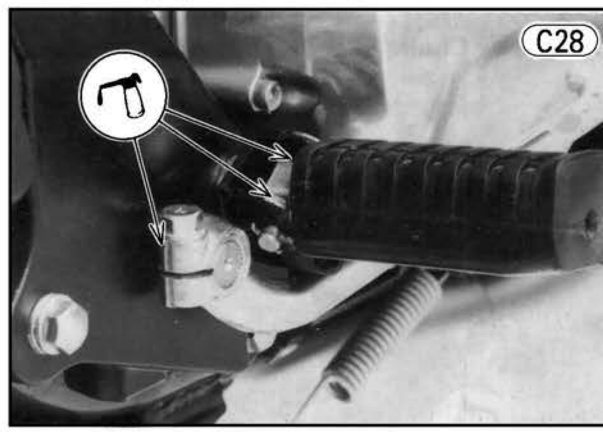


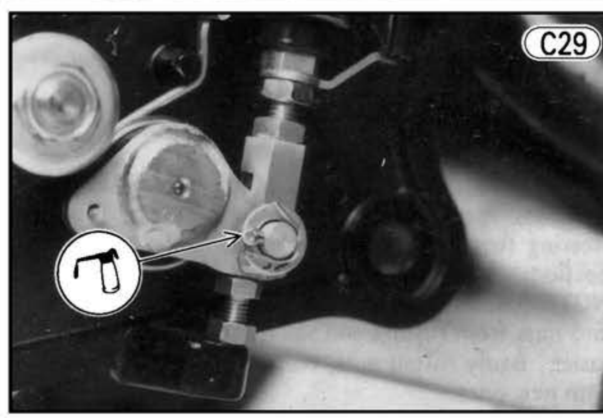

A. Grease

### Left Footpeg, Side Stand




### Right Footpeg, Brake Pedal, and Brake Push Rod

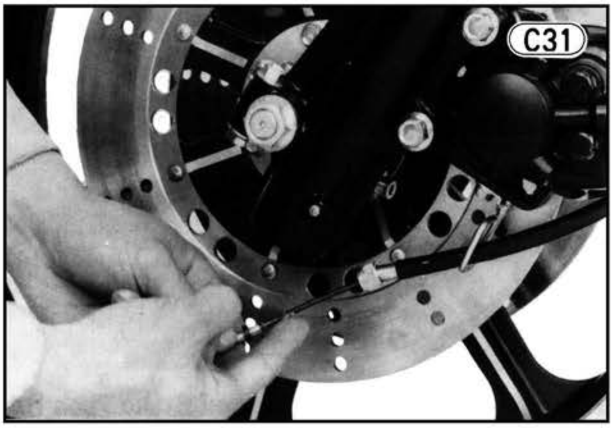


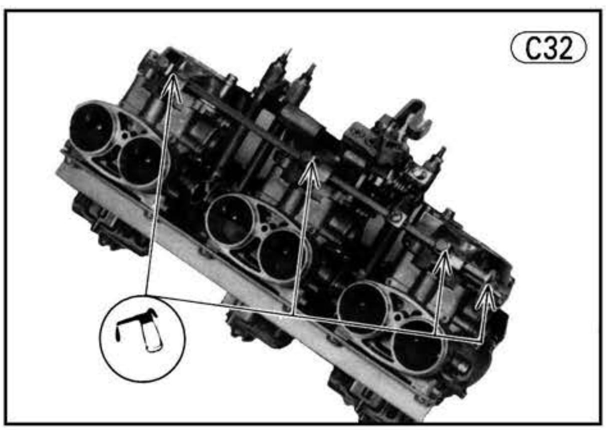

### Center Stand

## Speedometer and Tachometer Cables

Apply grease sparingly to the inner cables.




## Carburetor Choke Link Mechanism




## Others

Lubricate the pinion joint of the drive shaft, wheel bearings, speedometer gear housing, swing arm, and steering stem bearings as explained in the Maintenance Section.

**NOTE:** A few drops of oil are effective to keep bolts and nuts from rusting and sticking. This makes removal easier. Badly rusted nuts, bolts, etc. should be replaced with new ones.

# Disassembly—Introduction

## Table of Contents



D

## INTRODUCTION TO DISASSEMBLY

Detail has not been spared in this section in order that the motorcycle can not only be taken apart but also put back together properly as well. Photographs, diagrams, notes, cautions, warnings, and detailed descriptions have been included wherever necessary. Nevertheless, even a detailed account has limitations; a certain amount of basic knowledge is also required for successful work.

**Especially note the following:**

**(1) Edges**
Watch for sharp edges, especially during major engine disassembly and assembly. Protect your hands with gloves or a piece of thick cloth when lifting the engine or turning it over.

**(2) Dirt**
Before removal and disassembly, clean the motorcycle. Any dirt entering the engine, carburetor or other parts will work as an abrasive and shorten the life of the motorcycle. For the same reason, before installing a new part, clean off any dust or metal fillings.

**(3) Tightening Sequence**
Where there is a tightening sequence indication in this Service Manual; the bolts, nuts, or screws must be tightened in the order and method indicated. When installing a part with several bolts, nuts, or screws; they should all be started in their holes and tightened to a snug fit. Then tighten them evenly, according to the tightening sequence, to the specified torque. This is to avoid distortion of the part and/or causing gas or oil leakage. Conversely when loosening the bolts, nuts, or screws; loosen all of them about a quarter of turn and then remove them.

**(4) Torque**
The torque values given in this Service Manual should always be adhered to. Either too little or too much torque may lead to serious damage. Use a good quality, reliable torque wrench.

**(5) 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 removal of screws held by a locking agent) in order to avoid damaging the screw heads.

**(6) Lubricant**
Don't use just any oil or grease. 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.

**(7) Battery Ground**
Before performing any disassembly operations on the motorcycle, remove the ground (–) lead from the battery to prevent the possibility of accidentally turning the engine over while partially disassembled.

**(8) Engine Rotation**
When turning the crankshaft by hand, always turn it in the direction of normal rotation; which is counterclockwise, viewed from the right side of the engine. This will ensure proper adjustments.

**(9) Lubrication**
Engine wear is generally at its maximum while the engine is warming up and before all the rubbing surfaces have an adequate lubricative film. During assembly, oil or grease (whichever is more suitable) should be applied to any rubbing surface which has lost its lubricative film. Old grease and dirty oil should be cleaned off. Deteriorated grease has lost its lubricative quality and may contain abrasive foreign particles.

**(10) Press**
A part installed using a press or driver, such as a wheel bearing, should first be coated with oil on its outer or inner circumference so that it will go into place smoothly.

**(11) Oil Seal, Grease Seal**
Replace any oil or grease seals that were removed with new ones, as removal generally damages seals. A seal guide is required for certain oil or grease seals during installation to avoid damage to the seal lips. Before a shaft passes through a seal, apply a little oil, preferably high temperature grease on the lips to reduce rubber to metal friction.

**(12) Gasket, O Ring**
When in doubt as to the condition of a gasket or O ring, replace it with a new one. The mating surfaces around the gasket should be free of foreign matter and perfectly smooth to avoid oil or compression leaks.

**(13) Liquid Gasket, Non-permanent Locking Agent**
Follow manufacturer's directions for cleaning and preparing surfaces where these compounds will be used. Apply sparingly. Excessive amounts may block engine oil passages and cause serious damage. An example of a non-permanent locking agent commonly available in North America is Loctite Lock'n Seal (Blue).

**(14) Ball Bearing, Oil Seal, Grease Seal Installation**
When installing a ball bearing, the bearing race which is affected by friction should be pushed by a suitable driver. This prevents severe stress on the balls and races, and prevents races and balls from being dented. Press a ball bearing until it stops at the stop in the hole or on the shaft. Seals should be pressed into place using a suitable driver, which contacts evenly with the side of the seal until the face of the seal is even with the end of the hole.

**(15) Circlip, Retaining Ring**
Replace any circlips and retaining rings that were removed with new ones, as removal weakens and deforms them. When installing circlips and retaining rings, take care to compress or expand them only enough to install them and no more.

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

**(17) Molybdenum Disulfide ($MoS_2$) Grease**
This manual makes reference to molybdenum disulfide grease in the assembly of certain engine and chassis parts. Always check manufacturer recommendations before using such special lubricants.

**(18) Electrical Leads**
All the electrical leads are either single-color or two-color and, with only a few exceptions, must be connected to leads of the same color. On any of the two-color leads there is a greater amount of one color and a lesser amount of a second color, so a two-color lead is identified by first the primary color and then the secondary 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 to make red the main color.

## TORQUE AND LOCKING AGENT

Tighten all bolts and nuts to the proper torque using an accurate torque wrench. If insufficiently tightened, a bolt or nut may become damaged or fall off, possibly resulting in damage to the motorcycle and injury to the rider. A bolt or nut which is overtightened may become damaged, strip an internal thread, or break and then fall out. The following table lists the tightening torque for the major bolts and nuts, and the parts requiring use of a non-permanent locking agent.

Parts marked with an asterisk (*) must be retorqued according to the Periodic Maintenance Chart (Pg. 10). One at a time, loosen each bolt or nut ½ turn, then tighten it to the specified torque. Follow the sequence if specified. For engine fasteners, retorque them when the engine is cold (at room temperature).

**NOTE:** Marks used in the "Remark"

- ● : Apply a non-permanent locking agent to the thread.
- ★ : Apply a liquid gasket to the thread.
- ○ : Apply a molybdenum disulfide engine assembly grease to specified portion.

**ENGINE**

( ) : This marked value is for US model.

| Part | Quantity | Metric (kg-m) | English (ft-lbs) | Remark | See Pg. |
|---|---|---|---|---|---|
| Air suction valve cover bolts ϕ6 P1.0 | 12 | 1.5 (0.90) | 11.0 (78 in-lbs) | – | 65 |
| Alternator rotor bolt ϕ10 P1.25 | 1 | 7.0 | 51 | – | 87 |
| Alternator stator Allen bolts ϕ5 P0.8 | 3 | 0.80 | 69 in-lbs | ● | 86 |
| Camshaft cap bolts ϕ6 P1.0 | 16 | 1.2 | 104 in-lbs | – | 68 |
| Camshaft chain guide screws ϕ6 P1.0 | 2 | – | – | ● | 73 |

| Part | Quantity | Metric (kg-m) | English (ft-lbs) | Remark | See Pg. |
|---|---|---|---|---|---|
| Carburetor holder screws $\phi$6 P1.0 | 9 | – | – | ● | 55 |
| Carburetor mounting screws $\phi$6 P1.0 | 6 | – | – | ● | 54 |
| Clutch hub nut $\phi$20 P1.5 | 1 | 12.0 | 87 | – | 89 |
| Clutch release stop mounting bolt $\phi$6 P1.0 | 1 | 1.0 | 87 in-lbs | – | 85 |
| Clutch spring bolts $\phi$6 P1.0 | 5 | 1.0 | 87 in-lbs | – | 89 |
| Connecting rod big end cap | | | | | |
| bolts $\phi$8 P0.75 | 6 | 3.5 | 25 | ○ | 112 |
| nuts $\phi$8 P0.75 | 6 | 3.5 | 25 | ○ | 112 |
| Crankcase bolts | | | | | |
| $\phi$8 P1.25 | 18 | 2.5 | 18.0 | – | 101 |
| $\phi$6 P1.0 | 29 | 1.0 | 87 in-lbs | – | 101 |
| Crankshaft torsion damper bolt $\phi$10 P1.25 | 1 | 7.0 | 51 | – | 80 |
| Cylinder bolts $\phi$6 P1.0 | 4 | 1.0 | 87 in-lbs | – | 70 |
| Cylinder drain plug $\phi$8 P1.25 | 1 | 2.0 | 14.5 | – | 24 |
| *Cylinder head | | | | | |
| bolts $\phi$6 P1.0 | 4 | 1.0 | 87 in-lbs | – | 70 |
| nuts $\phi$10 P1.25 | 16 | 4.0 | 29 | – | 70 |
| Cylinder head cover bolts $\phi$6 P1.0 | 32 | 1.5 | 11.0 | – | 66 |
| Driven shaft bevel gear nut $\phi$24 P1.5 | 1 | 12.0 | 87 | ● | 107 |
| Engine drain plug $\phi$20 P1.5 | 1 | 2.3 | 16.5 | – | 21,90 |
| *Engine mounting bolts $\phi$10 P1.25 | 4 | 4.0 | 29 | – | 98 |
| Engine mounting bracket bolts $\phi$8 P1.25 | 8 | 1.8 | 13.0 | – | 98 |
| *Exhaust pipe clamp bolts $\phi$8 P1.25 | 4 | – | – | – | 56 |
| *Exhaust pipe mounting nuts $\phi$6 P1.0 | 12 | – | – | – | 56 |
| *Muffler clamp bolts $\phi$8 P1.25 | 2 | – | – | – | 55 |
| Neutral switch $\phi$10 P1.25 | 1 | 1.5 | 11.0 | – | 82 |
| Oil filter mounting bolt $\phi$20 P1.5 | 1 | 2.0 | 14.5 | – | 90 |
| Oil passage plugs at oil pan $\phi$20 P1.5 | 2 | 2.3 | 16.5 | – | – |
| Oil pressure relief valve $\phi$12 P1.25 | 1 | 1.5 | 11.0 | ● | 90 |
| Oil pressure switch PT1/8 | 1 | 1.5 | 11.0 | ★ | 89 |

| Part | Quantity | Metric (kg-m) | English (ft-lbs) | Remark | See Pg. |
|---|---|---|---|---|---|
| Oil receiver bolts φ6 P1.0 | 2 | 1.0 | 87 in-lbs | • | 109 |
| Output shaft bearing cap bolts φ6 P1.0 | 4 | 1.2 | 104 in-lbs | • | 101 |
| Output shaft coupling nut φ20 P1.5 | 1 | 12.0 | 87 | • | 108 |
| Overshift limiter bolt φ8 P1.25 | 1 | 2.5 | 18.0 | – | 84 |
| Radiator drain plug φ12 P1.25 | 1 | 0.40 | 35 in-lbs | – | 24 |
| *Radiator hose clamp bolts φ6 P1.0 | 4 | – | – | – | 55 |
| *Radiator mounting bolts φ8 P1.25 | 3 | – | – | – | 55 |
| Shift drum bearing holder bolts φ6 P1.0 | 2 | 1.0 | 87 in-lbs | • | 92 |
| Shift drum pin holder bolt φ6 P1.0 | 1 | 1.0 | 87 in-lbs | – | 92 |
| Shift drum positioning pin bolt φ16 P1.5 | 1 | 3.5 | 25 | – | 91 |
| *Shift pedal bolt φ6 P1.0 | 1 | – | – | – | 82 |
| Shift pedal return spring pin φ8 P1.25 | 1 | 2.0 | 14.5 | • | 84 |
| Spark plugs φ14 P1.25 | 6 | 2.8 | 20 | – | 12 |
| Starter motor clutch Allen bolts φ8 P1.25 | 3 | 3.9 | 28 | ○ | 80 |
| Starter motor lead nuts | 2 | 0.50 | 43 in-lbs | – | 81 |
| Starter motor mounting bolts φ6 P1.0 | 2 | 1.0 | 87 in-lbs | – | 81 |
| Studs at | | | | | |
| crankcase φ10 P1.5 | 16 | 0.9 | 78 in-lbs | • | 79 |
| cylinder head φ6 P1.0 | 12 | – | – | • | – |
| Tachometer pinion holder Allen bolt φ6 P1.0 | 1 | 0.90 | 78 in-lbs | – | 66 |
| Thermostat cover Allen bolt φ6 P1.0 | 2 | 1.0 | 87 in-lbs | – | 64 |
| Thermostatic fan switch PT1/8 | 1 | 0.50 | 43 in-lbs | • | 61 |
| Timing advancer Allen bolt φ8 P1.25 | 1 | 2.0 | 14.5 | • | 59 |
| Timing advancer drive gear bolt φ8 P1.25 | 1 | 2.0 | 14.5 | – | 76 |
| Timing advancer gear bolt φ8 P1.25 | 1 | 2.0 | 14.5 | – | 59 |
| Timing chain sprocket bolt φ8 P1.25 | 1 | 2.0 | 14.5 | – | 76 |
| Universal joint coupling bolts φ12 P1.25 | 4 | 7.5 | 54 | – | 98 |
| Water pump bevel gear nut φ8 P1.25 | 1 | 2.0 | 14.5 | – | 77 |
| Water temperature sender φ16 P1.5 | 1 | 2.0 | 14.5 | – | 61 |

## CHASSIS

| Part | Quantity | Metric (kg-m) | English (ft-lbs) | Remark | See Pg. |
|---|---|---|---|---|---|
| *Clutch lever holder bolt $\phi$6 P1.0 | 1 | – | – | – | 145 |
| Final gear case cover bolts $\phi$8 P1.25 | 8 | 2.3 | 16.5 | – | 153 |
| Final gear case drain bolt $\phi$8 P1.25 | 1 | 2.0 | 14.5 | – | 32 |
| *Final gear case mounting nuts $\phi$10 P1.25 | 4 | 3.0 | 22 | – | 151 |
| *Footpeg mounting | | | | | |
| bolt $\phi$12 P1.25 | 1 | – | – | – | 82 |
| nut $\phi$12 P1.25 | 1 | – | – | – | 55 |
| *Front axle clamp bolts $\phi$8 P1.25 | 4 | 1.8 | 13.0 | – | 121 |
| *Front axle nut $\phi$16 P1.5 | 1 | 8.0 | 58 | – | 121 |
| *Front fender mounting bolts $\phi$8 P1.25 | 4 | – | – | – | 148 |
| Front fork air valve $\phi$10 P1.25 | 2 | 1.2 | 104 in-lbs | ● | 150 |
| Front fork bottom Allen bolts $\phi$12 P1.50 | 2 | 3.7 | 27 | ● ★ | 150 |
| *Front fork clamp bolts | | | | | |
| lower $\phi$8 P1.25 | 4 | 1.8 | 13.0 | – | 148 |
| upper $\phi$10 P1.25 | 2 | 3.0 | 22 | – | 148 |
| Front fork drain screws $\phi$4 P0.7 | 2 | – | – | ★ | 226 |
| Front fork top bolts $\phi$35 P1.0 | 2 | 2.3 | 16.5 | – | 150 |
| *Handlebar clamp bolts $\phi$8 P1.25 | 4 | 1.8 | 13.0 | – | 145 |
| Pinion gear nut $\phi$16 P1.5 | 1 | 12.0 | 87 | – | 154 |
| *Rear axle nut $\phi$18 P1.5 | 1 | 14.0 | 101 | – | 129 |
| *Rear shock absorber nuts | | | | | |
| lower $\phi$10 P1.25 | 2 | 2.5 | 18.0 | – | 151 |
| upper $\phi$12 P1.25 | 2 | 2.5 | 18.0 | – | 151 |
| Ring gear bearing holder mounting screws $\phi$10 P1.25 | 3 | – | – | ● | 152 |
| *Side stand pivot nut $\phi$10 P1.25 | 1 | – | – | – | 33 |
| *Steering stem head clamp bolt $\phi$8 P1.25 | 1 | 1.8 | 13.0 | – | 29 |
| *Steering stem head bolt $\phi$16 P1.5 | 1 | 4.5 | 33 | – | 29 |

| Part | Quantity | Metric (kg-m) | English (ft-lbs) | Remark | See Pg. |
|---|---|---|---|---|---|
| Studs at | | | | | |
| final gear case ϕ10 P1.5 | 4 | – | – | • | 155 |
| ϕ12 P1.75 | 1 | 4.5 | 33 | • | 155 |
| rear caliper ϕ12 P1.75 | 1 | 4.5 | 33 | • | 133 |
| Swing arm pivot shafts ϕ20 P1.25 | 2 | 1.5 | 11.0 | – | 160 |
| *Swing arm pivot shaft bracket bolts ϕ8 P1.25 | 6 | 2.5 | 18.0 | – | 160 |
| *Swing arm pivot shaft locknuts ϕ20 P1.25 | 2 | 8.0 | 58 | – | 160 |
| Tire air valve nuts ϕ8 P0.8 | 2 | 0.13 | 113 in-lbs | – | 136 |
| Universal joint coupling bolts ϕ12 P1.25 | 4 | 7.5 | 54 | – | 161 |
| Wheel coupling ring nut ϕ75 P2.0 | 1 | 12.0 | 87 | – | 153 |
| Disc brake parts | See Table G1 on Pg. 124. | | | | |
| Bleed valve ϕ7 P1.0 | 3 | 0.80 | 69 in-lbs | – | 221 |
| Brake pedal bolt ϕ8 P1.25 | 1 | – | – | – | 133 |
| *Caliper mounting bolts | | | | | |
| front caliper ϕ10 P1.25 | 4 | 3.0 | 22 | – | 125 |
| rear caliper ϕ12 P1.25 | 1 | 4.0 | 29 | – | 129 |
| Disc plate mounting bolts ϕ8 P1.25 | 21 | 2.3 | 16.5 | – | 123,130 |
| Fitting banjo bolts ϕ10 P1.25 | 7 | 3.0 | 22 | – | 125 |
| Front brake lever | | | | | |
| pivot bolt ϕ6 P1.0 | 1 | 0.30 | 26 in-lbs | – | 128 |
| pivot bolt locknut ϕ6 P1.0 | 1 | 0.60 | 52 in-lbs | – | 128 |
| Front caliper holder shaft nuts ϕ10 P1.25 | 4 | 2.6 | 19.0 | – | 125 |
| *Front master cylinder clamp bolts ϕ6 P1.0 | 2 | 0.90 | 78 in-lbs | – | 127 |
| Pad mounting screws ϕ6 P1.0 | 2 | – | – | • | 124 |
| Rear caliper half Allen bolts ϕ10 P1.25 | 2 | 3.0 | 22 | – | 132 |
| *Rear master cylinder bracket | | | | | |
| bolts ϕ10 P1.25 | 2 | – | – | – | 133 |
| nut ϕ8 P1.25 | 1 | – | – | – | 133 |

The table below, relating tightening torque to thread diameter and pitch, lists the basic torque for the bolts and nuts used on Kawasaki Motorcycles. However, the actual torque that is necessary may vary amount bolts and nuts with the same thread diameter and pitch. The bolts and nuts listed on Pg. 37 ~ 41 vary to a greater or lesser extent from what is given in this table. Refer to this table for only the bolts and nuts not included in the table on Pg. 37 ~ 41. All of the values are for use with dry solvent-cleaned threads.

Coarse threads

| dia (mm) | pitch (mm) | kg-m | ft-lbs |
|---|---|---|---|
| 5 | 0.80 | 0.35 ~ 0.50 | 30 ~ 43 in-lbs |
| 6 | 1.00 | 0.60 ~ 0.90 | 52 ~ 78 in-lbs |
| 8 | 1.25 | 1.6 ~ 2.2 | 11.5 ~ 16.0 |
| 10 | 1.50 | 3.1 ~ 4.2 | 22 ~ 30 |
| 12 | 1.75 | 5.4 ~ 7.5 | 39 ~ 54 |
| 14 | 2.00 | 8.3 ~ 11.5 | 60 ~ 83 |
| 16 | 2.00 | 13.0 ~ 18.0 | 94 ~ 130 |
| 18 | 2.50 | 18.0 ~ 25.0 | 130 ~ 181 |
| 20 | 2.50 | 26.0 ~ 35.0 | 188 ~ 253 |

Fine threads

| dia (mm) | pitch (mm) | kg-m | ft-lbs |
|---|---|---|---|
| 5 | 0.50 | 0.35 ~ 0.50 | 30 ~ 43 in-lbs |
| 6 | 0.75 | 0.60 ~ 0.80 | 52 ~ 69 in-lbs |
| 8 | 1.00 | 1.4 ~ 1.9 | 10.0 ~ 13.5 |
| 10 | 1.25 | 2.6 ~ 3.5 | 19.0 ~ 25 |
| 12 | 1.50 | 4.5 ~ 6.2 | 33 ~ 45 |
| 14 | 1.50 | 7.4 ~ 10.2 | 54 ~ 74 |
| 16 | 1.50 | 11.5 ~ 16.0 | 83 ~ 116 |
| 18 | 1.50 | 17.0 ~ 23.0 | 123 ~ 166 |
| 20 | 1.50 | 23.0 ~ 33.0 | 166 ~ 239 |

# Disassembly–Engine Installed

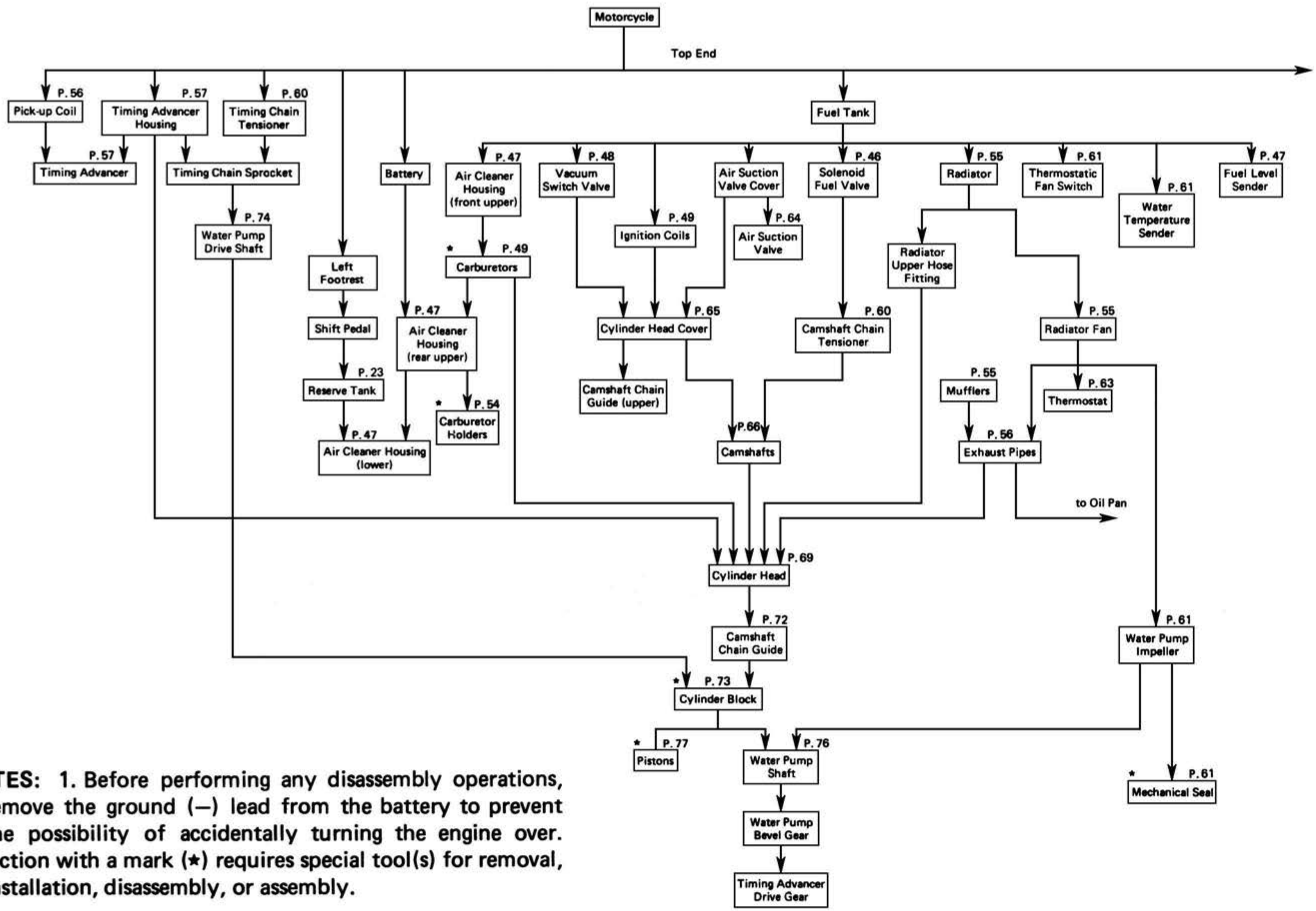
## Table of Contents



E

## FLOW CHART
### Disassembly – Engine Installed

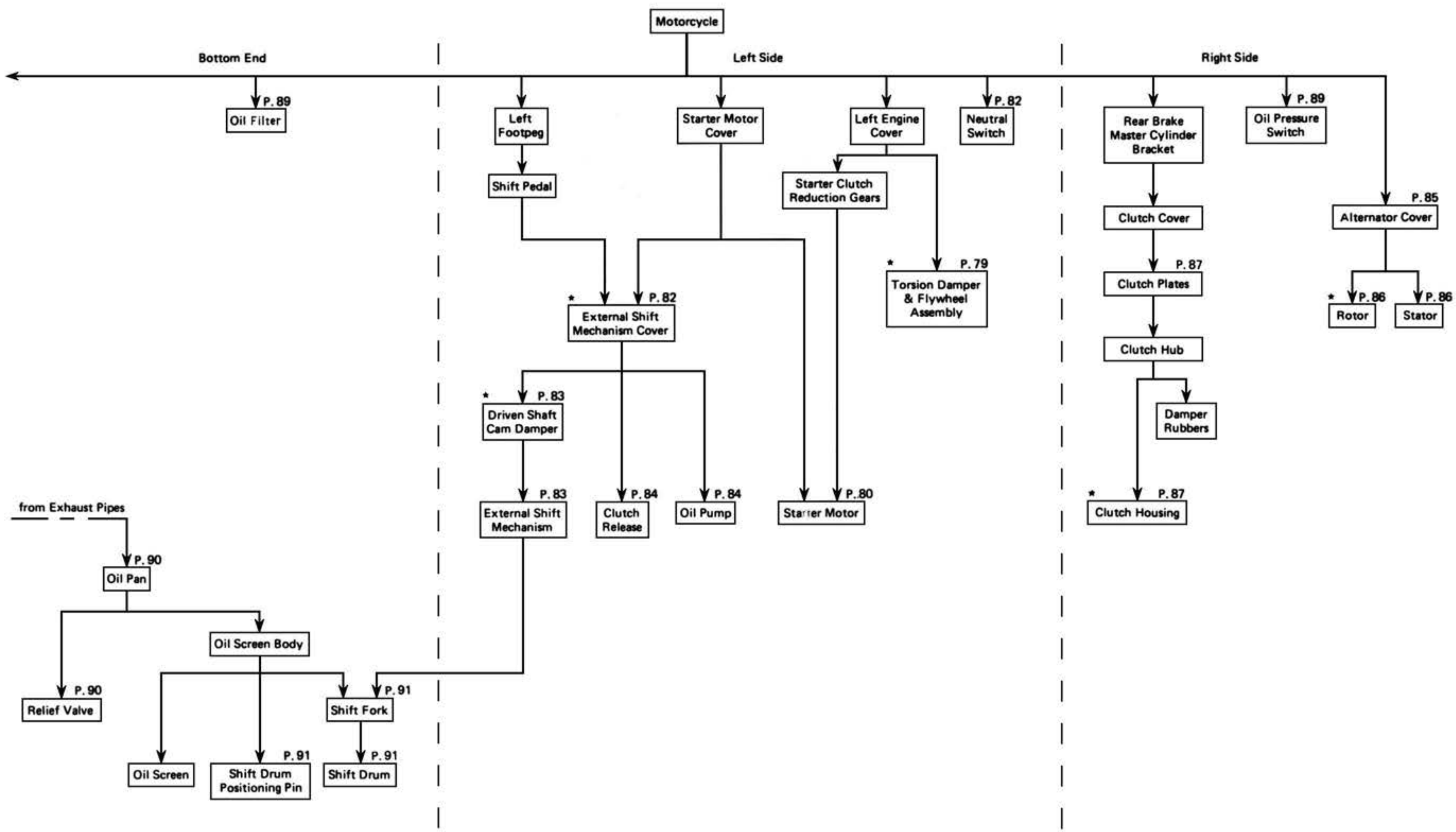
This chart is intended to be aids to proper removal. Select the component you wish to remove and follow the arrows to that point on the chart.




**NOTES:** 1. Before performing any disassembly operations, remove the ground (–) lead from the battery to prevent the possibility of accidentally turning the engine over.
2. Action with a mark (★) requires special tool(s) for removal, installation, disassembly, or assembly.

## FLOW CHART
**Disassembly — Engine Installed**

**This chart is intended to be aids to proper removal. Select the component you wish to remove and follow the arrows to that point on the chart.**

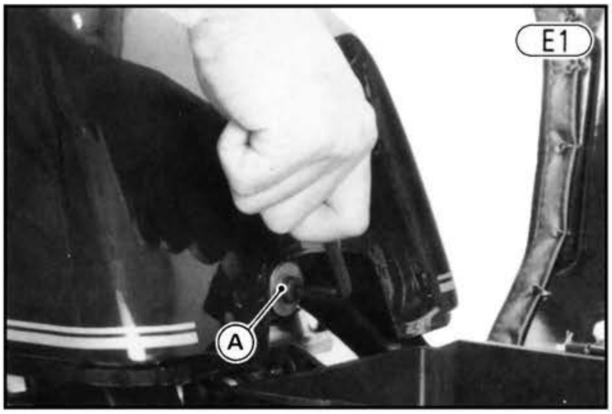



**NOTES:** 1. Before performing any disassembly operations, remove the ground (–) lead from the battery to prevent the possibility of accidentally turning the engine over.
2. Action with a mark (★) requires special tool(s) for removal, installation, disassembly, or assembly.

## FUEL TANK

### Removal:

●Unlock the seat, and swing it open.
●Remove the fuel tank mounting Allen bolt, washer, and flat washer.




**A. Bolt**

●Turn the fuel tap to the "OFF" position, slide down the hose clamp, and pull the fuel hose off the tap.

**WARNING** **An open fuel hose is a fire hazard. Keep all sources of spark and flame away. Have an appropriate fire extinguisher available.**

●Disconnect the 2-pin connector from the fuel level sender.
●Pull the fuel tank off towards the rear.

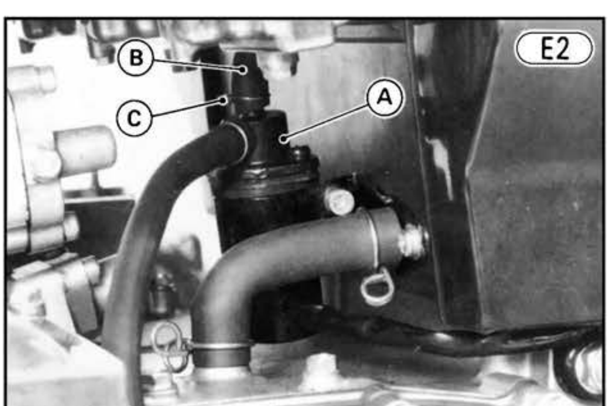
### Installation Notes:

1. Check the fuel hose for deterioration or damage. Replace it if damaged.
2. Slide the hose clamp back into place after fitting the fuel hose on the fuel tap.
3. Route the drain hose of fuel level sender cover inside the right hand side cover and through the right side of swing arm.

## SOLENOID FUEL VALVE

### Removal:

●Remove the fuel tank (Pg. 46).
●Disconnect the 4-pin connector at the frame top tube.
●Slide the hose clamps out of position, and pull off the fuel hose to the carburetor from the solenoid valve.

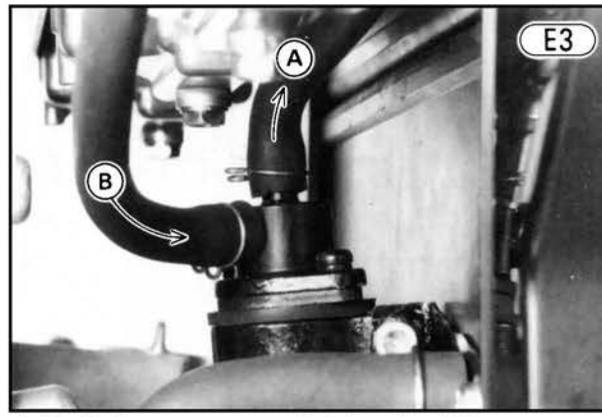



**A. Solenoid Fuel Valve** **C. Clamp**
**B. Remove this fuel hose.**

●Remove the Allen bolt and nut with a lockwasher, and remove the fuel valve.

### Installation Note:

●Hoses from the fuel tap and to the carburetor are connected to each hose fitting as shown below.

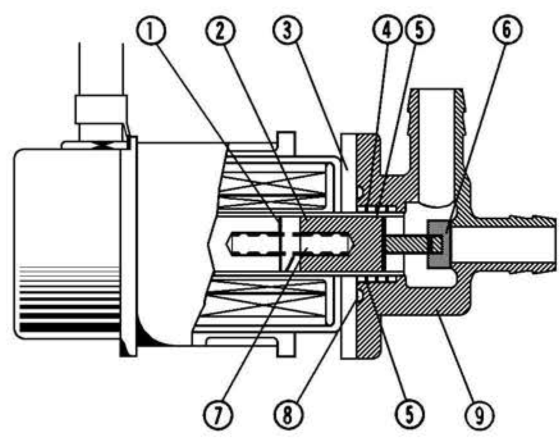



**A. To Carburetors** **B. From Fuel Tap**

### Disassembly:

●Remove the screws with the lockwashers (2 ea), and separate the valve cap ⑨ from the body.
●Take out the valve ⑥, plunger ②, spring ⑦, and spacer ① from the body.
●Take out the **O** ring ⑤, spacer ④, **O** ring, thick spacer ③, and large **O** ring from the cap.

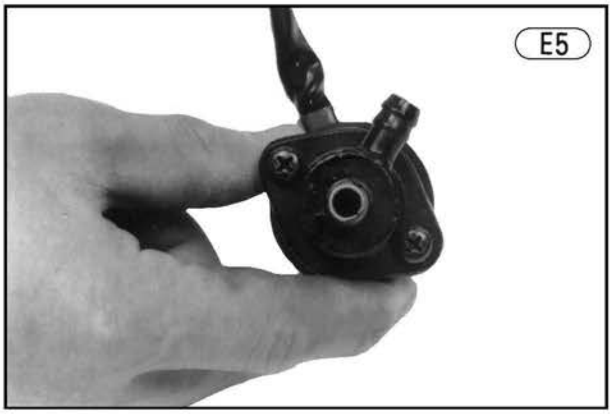
**Solenoid Fuel Valve** E4




1. Spacer
2. Plunger
3. Spacer
4. Spacer
5. **O** Ring
6. Valve
7. Spring
8. **O** Ring
9. Valve Cap

### Assembly Notes:

●Install the valve cap on the body so that the hose fittings face in the direction as shown.



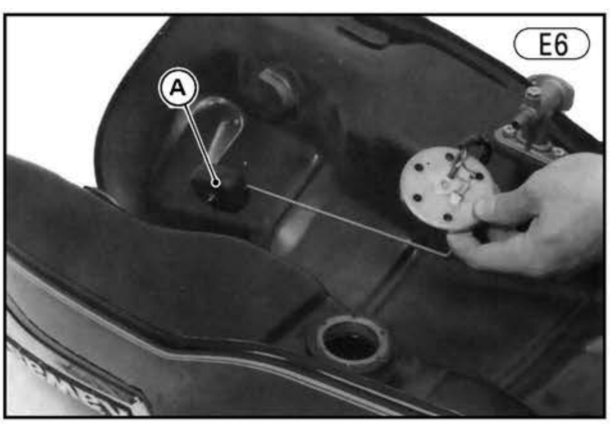

## FUEL LEVEL SENDER

### Removal:

- Turn the fuel tap lever to the "OFF" position.
- Remove the drain plug and gasket at the bottom of the fuel tap.
- Holding a container under the fuel tap, turn the tap lever to the "RES" position to drain the tank.
- Remove the fuel tank (Pg. 46), and completely drain the fuel inside the tank.
- Remove the fuel level sender cover prying the outside of cover with a driver.
- Remove the fuel level sender and its gasket by removing the bolts (6).

### Installation Note:

- Match the bolt holes so that the float is positioned directly forward of the sender body. Float movement will be hindered in any other position.

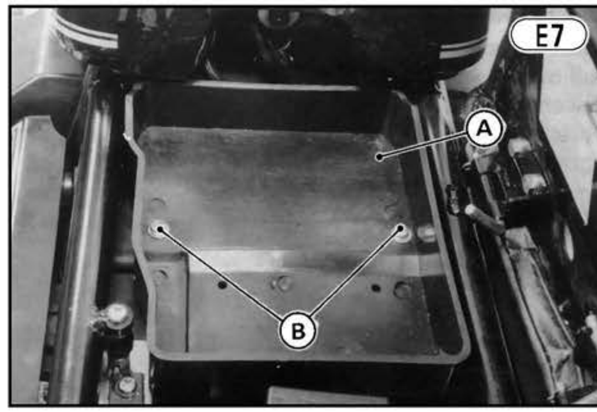



**A. Float**

## AIR CLEANER ELEMENT

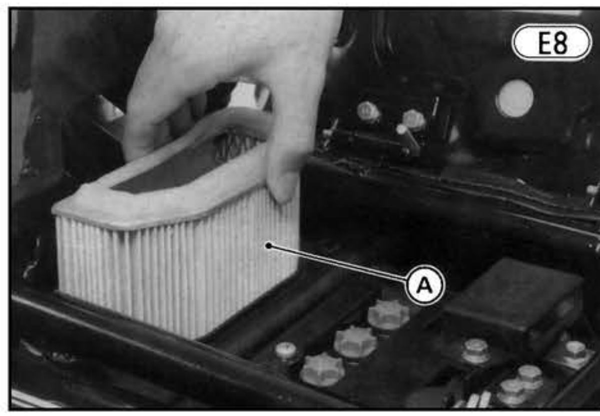
### Removal:

- Unlock the seat and swing it open.
- Remove the tool kit, and remove its retaining bolts (2) with the washers.




**A. Tool Tray** **B. Retaining Bolts**

- Take off the tray, and pull out the air cleaner element.

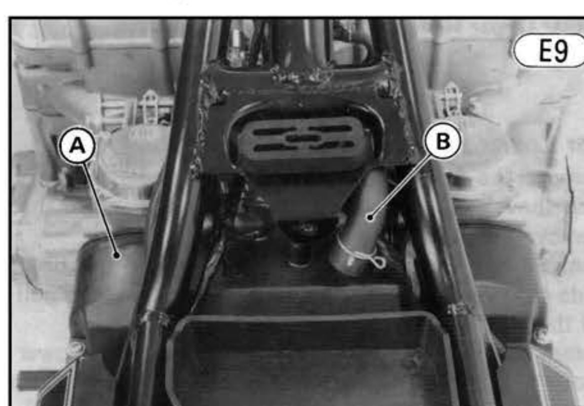



**A. Air Cleaner Element**

## AIR CLEANER HOUSING

### Front Upper Housing Removal:

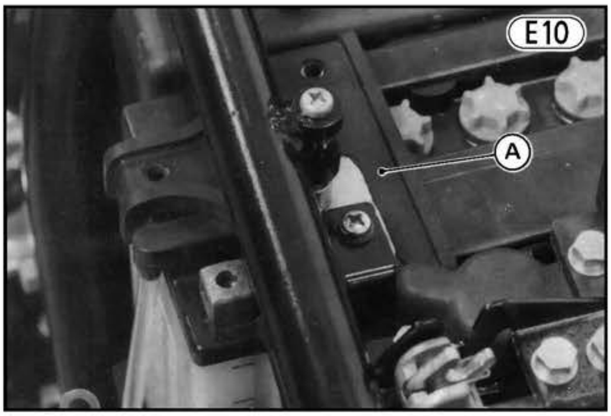
- Remove the fuel tank (Pg. 46).
- Pull off both covers from the air cleaner housing.
- Slide up the clamp, and pull off the air hose to the vacuum switch valve from the housing.
- Remove the mounting screws (2) with the lockwashers and flat washers.
- Put the main harness right side and the reserve tank hose left side. Pull the housing off to the rear, and slide it sideways.




**A. Front Upper Housing** **B. Air Hose (US model)**

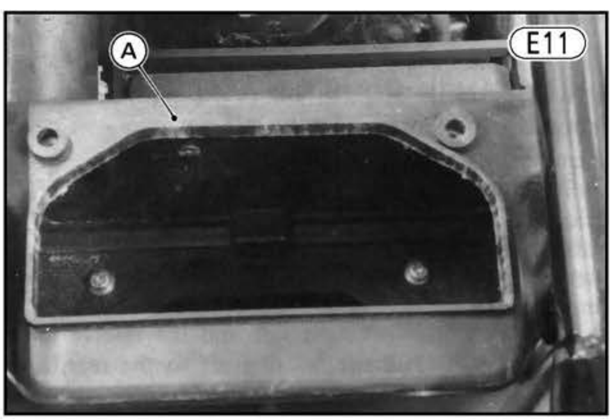
### Rear Upper Housing Removal:

- Remove the air cleaner element (Pg. 47).
- Pull off the left side cover.
- Disconnect first the negative (–) lead and the black/white lead, and then the positive (+) lead and the white/red lead from the battery.
- Remove the screws, pull off the battery holding plate, and remove the battery.




**A. Battery Holding Plate**

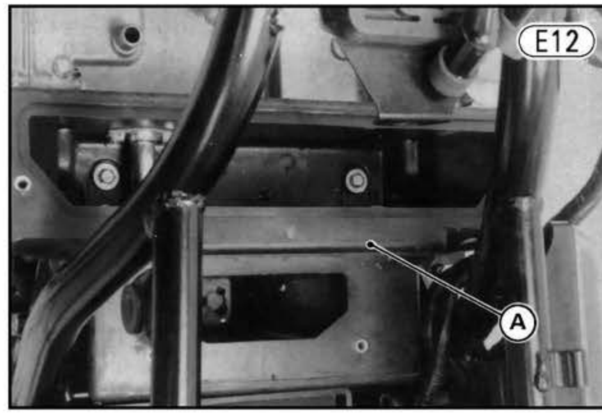
- Remove the housing mounting screws and flat washers (2 ea), and remove the housing.




**A. Rear Upper Housing**

### Rear Lower Housing Removal:

- Remove the front upper and the rear upper housings (See above).
- Remove the carburetor (Pg. 49).
- Remove the reserve tank with unscrewing the bolt.
- Slide the breather hose clamp out of position, and pull off the breather hose from the housing.
- Remove the solenoid fuel valve from the rear lower housing (Pg. 46).
- Remove the mounting bolts (2) and flat washers (2), and remove the housing.

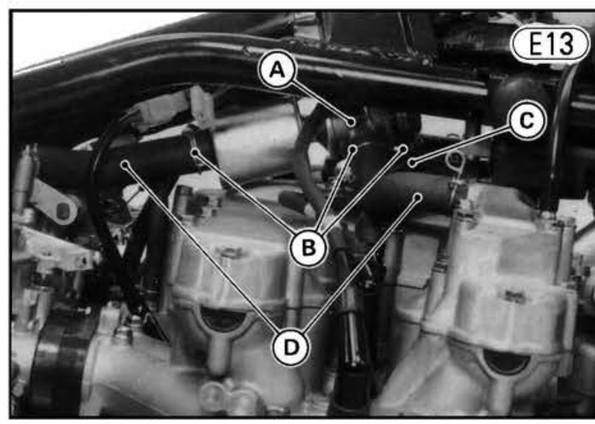



**A. Rear Lower Housing**

## VACUUM SWITCH VALVE (US model)

### Removal:

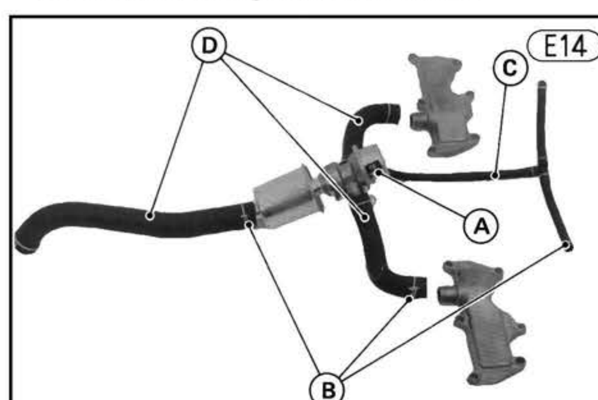
- Remove the fuel tank (Pg. 46).
- Slide the hose clamps (4) out of place, and pull off the vacuum hose from the vacuum switch valve. Remove the air hoses (3) from the air suction valve covers and the air cleaner housing.




**A. Vacuum Switch Valve** **C. Vacuum Hose**
**B. Hose Clamps** **D. Air Hoses**

### Installation Notes:

1. Connect the paint-marked end of the air hoses to the vacuum switch valve, and secure each hose end fitting with a hose clamp. Be sure that all the hoses are routed without being flattened or kinked.



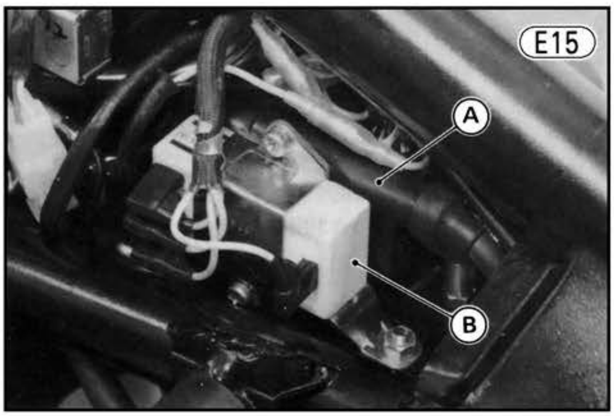

**A. Vacuum Switch Valve** **C. Vacuum Hose**
**B. Hose Clamps** **D. Air Hoses**

2. Do not turn the paint-locked screw of the vacuum switch valve, which location determines the pre-load of valve spring. Turning it will cause the mulfunction of the valve.

## IGNITION COILS, RESISTOR

### Removal:

●Remove the fuel tank (Pg. 46).
●Unplug the ignition coil primary leads (two from each), and resistor leads (4).

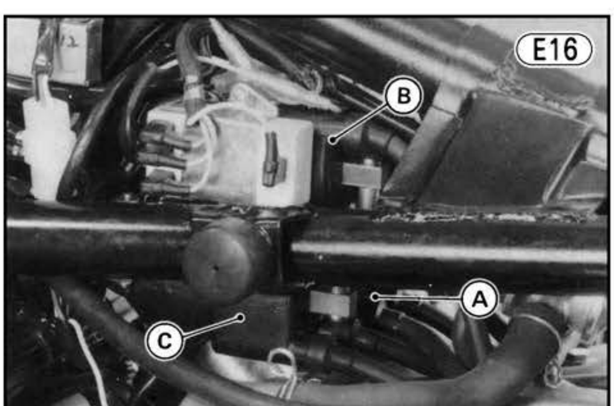



**A. Ignition Coil B. Resistor**

●Pull off the spark plug caps from the spark plugs.
●Remove the nuts (two from each), remove the ignition coils and resistor.

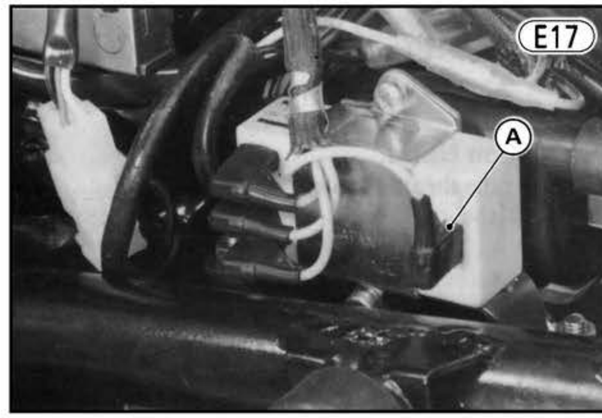
### Installation Notes:

1. Install the ignition coil for #1 and #6 cylinders (labeled with the numbers on the spark plugs) at the center, for #2 and #5 at the right side, and for #3 and #4 at the left side.




**A. #2 and #5 coil C. #3 and #4 coil**
**B. #1 and #6 coil**

2. Connect the yellow lead to the terminal which is apart from the other three terminals. The three pink leads can be connected to any three terminals.

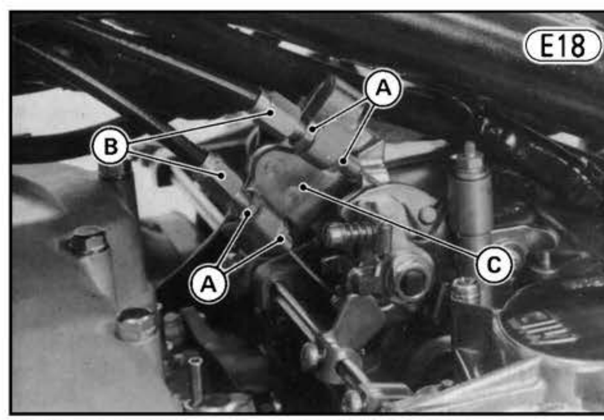



**A. Terminal for Yellow Lead**

## CARBURETORS

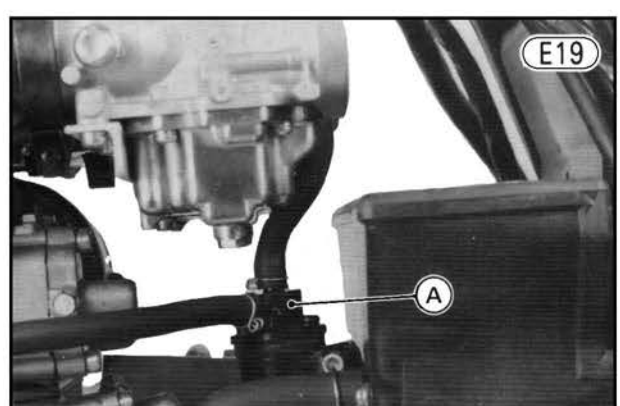
### Removal:

●Remove the fuel tank (Pg. 46).
●Remove the front upper air cleaner housing (Pg. 47).
●Loosen the mounting nuts for both throttle cable adjusters fully, remove the throttle cable adjusters from the cable bracket, and slip the tips of the inner cables out of the pulley.




**A. Mounting Nuts C. Cable Bracket**
**B. Adjusters**

●Slide the hose clamp, and pull off the fuel hose from the solenoid fuel valve.




**A. Solenoid Fuel Valve**

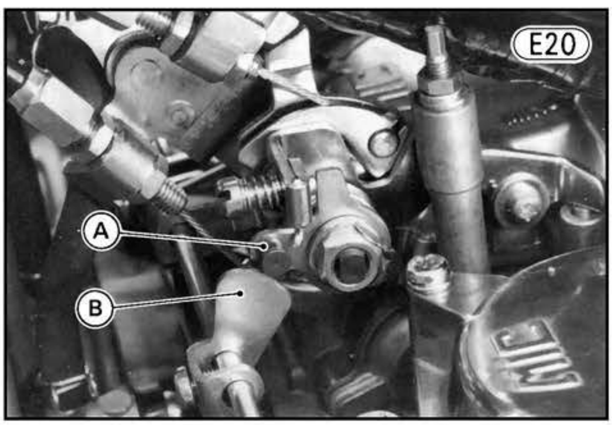
• Loosen the screws (3) of the carburetor holder clamps (3), pull the carburetor assembly off to the rear and out.

### Installation Notes:

1. Adjust the throttle cables (Pg. 14).
2. Check the carburetors, and adjust if necessary (Pg. 18).
3. If the carburetors were disassembled, adjust the fast idle mechanism after mounting the carburetors on the engine.

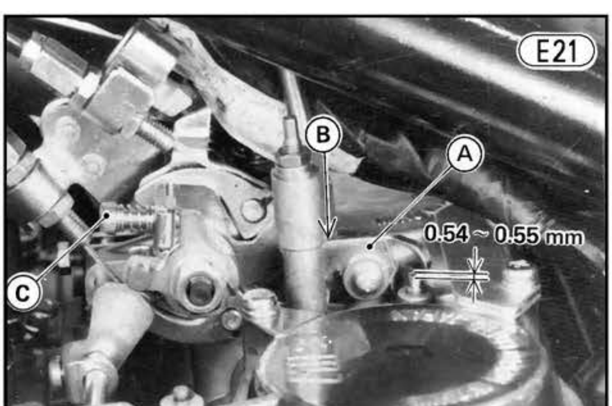
**To adjust the fast idle mechanism:**

○Supply fuel for the carburetors during adjustment.
○Warm up the engine to normal operating temperature.
○Adjust the idle speed, and synchronize the carburetors (Pg. 18).
○Carefully pull up the choke lever, and stop the lever at the position where the roller on the fast idle cam lever rides on the highest position of the fast idling cam.



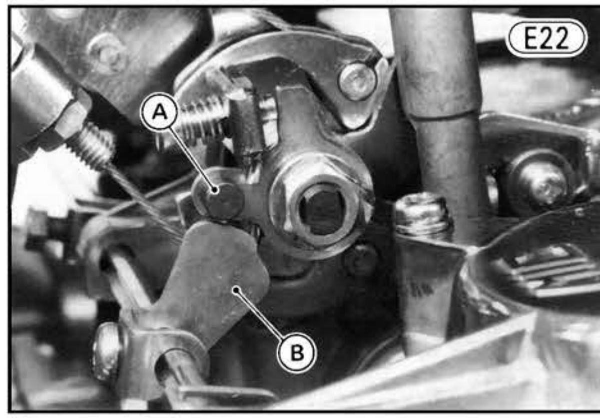

**A. Roller B. Fast Idling Cam**

○With the throttle grip being left at the closed (idle) position, and pushing down the front end of the lever (48), measure the clearance between the idle adjusting screw and the lever with a thickness gauge.
○The clearance should be 0.54 ~ 0.55 mm. If it is not, adjust clearance by turning the fast idle adjusting screw.




**A. Lever C. Adjusting Screw**
**B. Push down the front end.**

○Check to see that the choke lever moves up and down smoothly without binding. When the choke lever is pushed down, check each starter plunger to make sure it is seated. Push down on the plunger; if it moves slightly, it is not seating.
○Check to see that the roller on the fast idling cam lever turns freely when the choke lever is pushed down all the way, and when the lever is pulled up all the way.

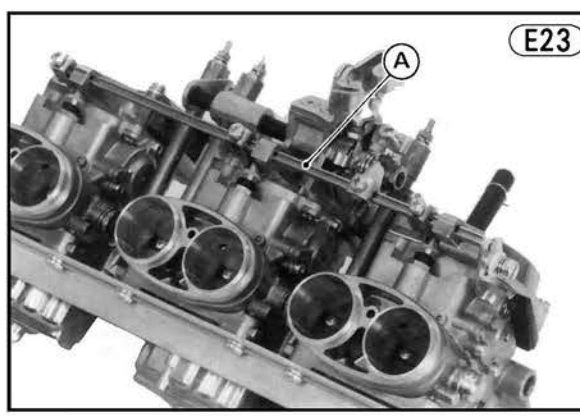



**A. Roller B. Fast Idling Cam**

## Carburetor Disassembly (each carburetor):

**Top End:**

• Loosen the mounting screws (69), (73) (4) of the starter plunger levers (74) and fast idling cam (68). Remove the screw (100), spring (99), steel washer (98), and plastic washer (97), and pull off the choke linkage shaft (71).

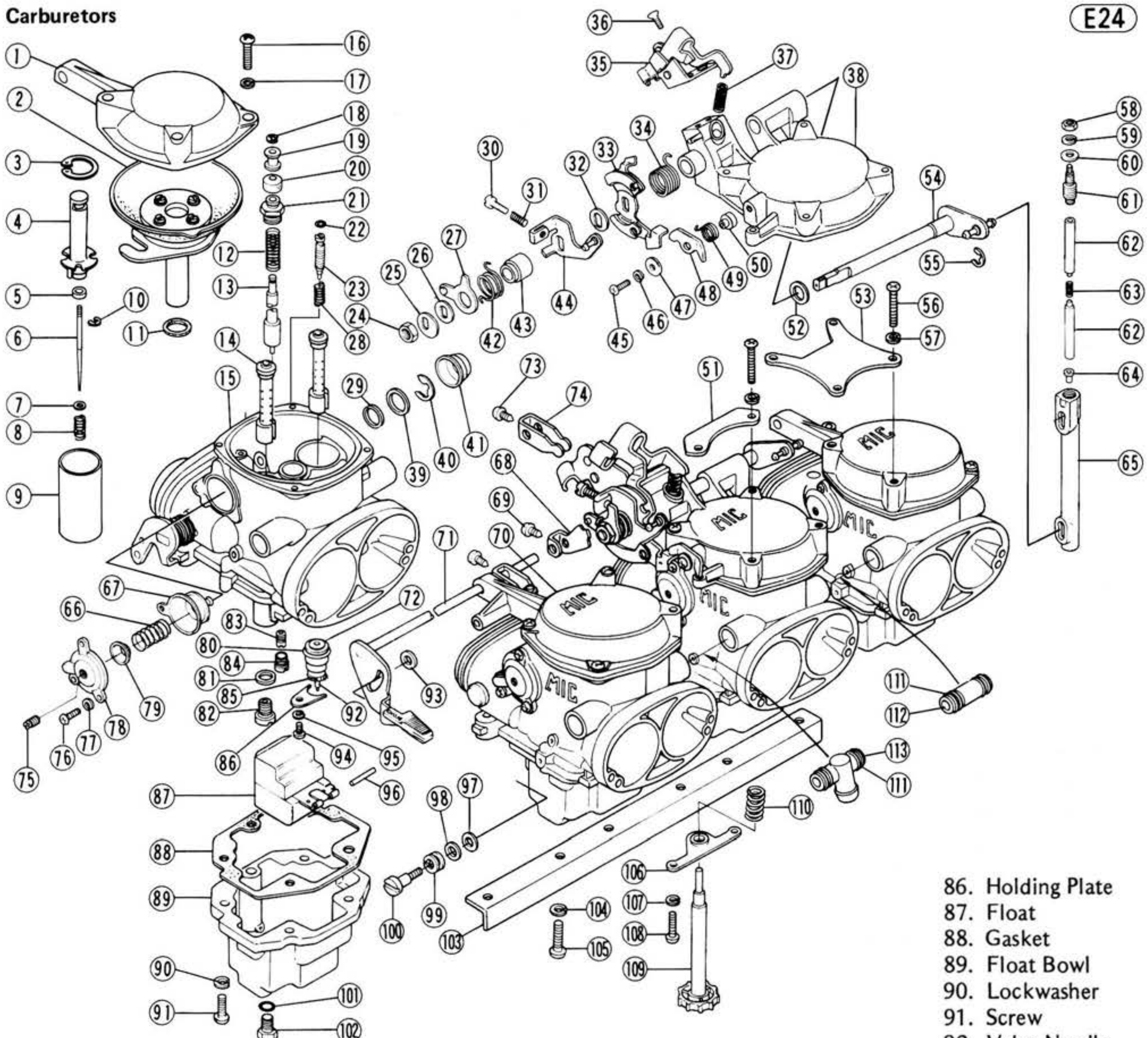



**A. Choke Linkage Shaft**

• If the upper chamber cover (38) of the carburetor is to be removed; unscrew the idle adjusting screw (109) and its spring (110). Loosen the locknuts (58), unscrew the balance adjusting screws (61) together with the locknuts, lockwashers (59), and flat washers (60) (3 ea). Pull off the link rod upper ends from the joint balls. The rod (62), spring (63), rod, and ball seat (64) may fall out of each link rods (See Fig. E24).
• Remove the screws (56) with lockwashers, and take off the upper chamber cover (76), (38), or (1), and the upper mounting plate (51) or (53).
• Remove the diaphragm (2) together with the two vacuum pistons (9) and the plastic washer (11).

**Carburetors**

E24



1. Upper Chamber Cover (right)
2. Diaphragm
3. Circlip
4. Jet Needle Holder
5. Spacer
6. Jet Needle
7. Spring Seat
8. Spring
9. Vacuum Piston
10. Clip
11. Plastic Washer
12. Spring
13. Starter Plunger
14. Needle Jet
15. Carburetor Body
16. Screw
17. Lockwasher
18. Clip
19. Bush
20. Dust Seal
21. Plunger Cap
22. O Ring
23. Pilot Screw
24. Nut
25. Lockwasher
26. Flat Washer
27. Cam Lever
28. Spring
29. Seal
30. Adjusting Screw
31. Spring
32. Flat Washer
33. Pulley
34. Return Spring
35. Cable Bracket
36. Screw
37. Spring
38. Upper Chamber Cover (center)
39. Washer
40. Circlip
41. Cap
42. Spring
43. Bushing
44. Arm
45. Screw
46. Lockwasher
47. Washer
48. Lever
49. Spring
50. Bushing
51. Mounting Plate
52. Plastic Washer
53. Mounting Plate
54. Pulley Shaft
55. Circlip
56. Screw
57. Lockwasher
58. Locknut
59. Lockwasher
60. Flat Washer
61. Adjusting Screw
62. Rod
63. Spring
64. Ball Seat
65. Link Rod
66. Spring
67. Diaphragm
68. Fast Idling Cam
69. Screw
70. Upper Chamber Cover (left)
71. Linkage Shaft
72. Valve Seat
73. Screw
74. Plunger Lever
75. Adjusting Screw
76. Screw
77. Lockwasher
78. Cover
79. Spring Seat
80. O Ring
81. Washer
82. Main Jet
83. Pilot Jet
84. Plug
85. Clip
86. Holding Plate
87. Float
88. Gasket
89. Float Bowl
90. Lockwasher
91. Screw
92. Valve Needle
93. Washer
94. Screw
95. Lockwasher
96. Pin
97. Plastic Washer
98. Steel Washer
99. Spring
100. Screw
101. O Ring
102. Drain Plug
103. Mounting Plate
104. Lockwasher
105. Screw
106. Mounting Plate
107. Lockwasher
108. Screw
109. Idle Adjusting Screw
110. Spring
111. O Ring
112. Joint
113. 3-way Joint

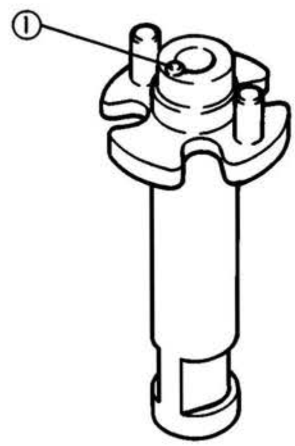
**CAUTION** **During carburetor disassembly, be careful not to damage the diaphragm. Never use a sharp edge to remove the diaphragm.**

- To remove the jet needle (6) from the vacuum piston, remove the circlip (3) with a circlip pliers, and remove the jet needle holder (4), spacer (5), jet needle with the clip (10), spring seat (7), and spring (8) from the vacuum piston (9).

**NOTE**: There is a small projection of about 0.5 mm height on the bottom of the jet needle holder, which positions the jet needle. Be careful not to chip it off.

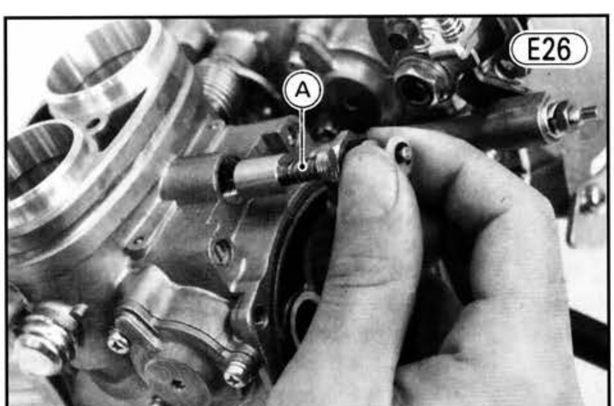
**Jet Needle Holder**

(E25)




1. Small Projection

- Turn in the pilot screw and count the number of turns until it seats fully but not tightly. Record the number of turns for that carburetor, and then remove the pilot screw and spring (28).
- Unscrew the starter plunger cap (21), and pull out the starter plunger assembly.



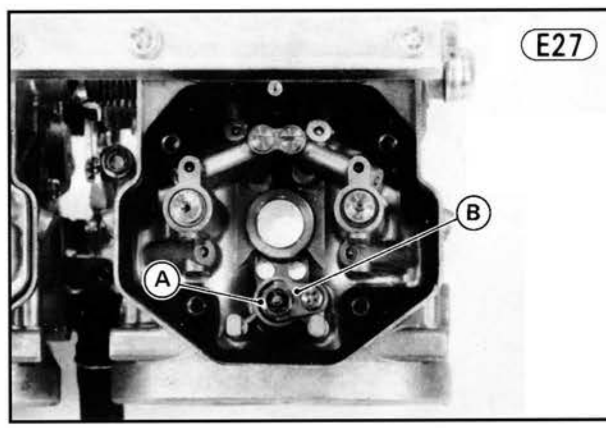

**A. Starter Plunger Assembly**

- Remove the clip (18), and separate the bush (19), starter plunger cap, spring (12), and starter plunger (13).
- After separating the carburetors (See Pg. 53), remove the diaphragm cover (78) of the coasting enricher by unscrewing the screws (3) with the lockwashers. The spring seat (79), spring (66), and diaphragm (67) will come out.

**CAUTION** **Do not turn the paint-locked screw on the diaphragm cover, which location determines the pre-load of the spring. Turning it will cause the mulfunction of the carburetor.**

**Bottom End:**

- Remove the idle adjusting screw (109) and its spring (110), and remove the lower rear mounting plate (106) if the left or center pair of carburetors are disassembled.
- Remove the screws (91) with lockwashers, and take off the float bowl (89) and gasket (88).
- To remove the pilot jet (83), unscrew the plug (84).
- Unscrew the main jet (82), and remove the washer (81).
- Remove the float (87) by pushing out the pin (96).
- To remove the float valve assembly, remove the screw (94) with lockwashers and holding plate (86), and pull out the valve assembly (clip (85), valve needle (92), valve seat (72), and **O** ring (80)).




**A. Float Valve Assembly** **B. Holding Plate**

- To remove the needle jet (14), first remove the upper chamber cover (1) and vacuum piston diaphragm (2) (See above), and main jet (82), then push out the needle jet toward the upper chamber.

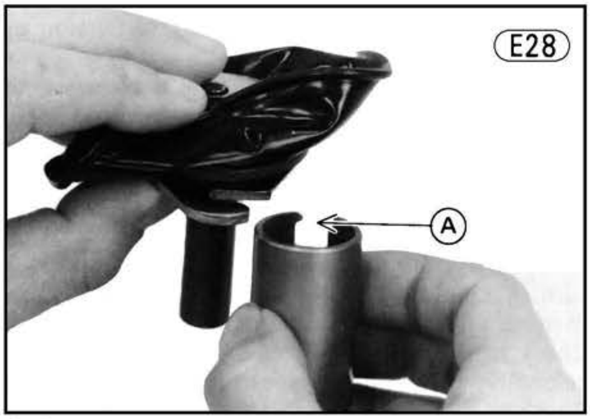
## Carburetor Assembly Notes (each carburetor):

**General Information:**

1. Replace any **O** rings and gaskets with new ones if damaged or deteriorated.
2. Apply a thin coat of grease to the joint balls and ball seats in the link rods.
3. Adjust the butterfly valve link mechanism (Pg. 54) and fast idle mechanism (Pg. 50).

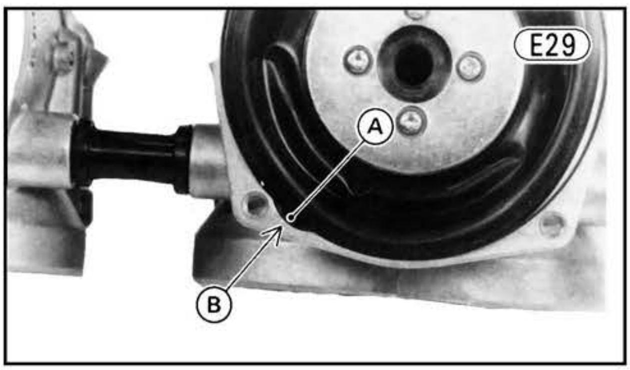
**Top End:**

1. When installing the diaphragm and the vacuum pistons, note the following:
   - Fit each vacuum piston so that the groove in the jet needle holder goes into the "U" shaped notch.




**A. Groove**

○Align the diaphragm tongue with the notch in the mating surface of the upper chamber cover, and fit the diaphragm sealing lip into its groove.




**A. Tongue** **B. Notch**

○After installing the upper chamber cover, check that the vacuum pistons slide up and down smoothly without binding in the carburetor bores.

2. Pilot screw installation: Turn in the pilot screw fully but not tightly, and then back it out the same number of turns counted during disassembly. **Without turning the pilot screw, push the pilot screw limiter on so that it points in the original direction against the counterclockwise stop.**

**Bottom End:**

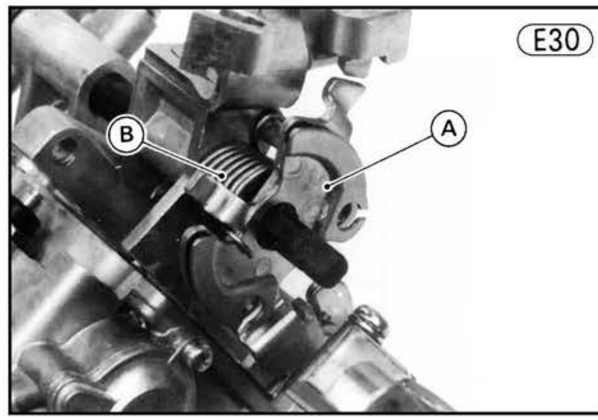
- If the float valve and/or float is replaced, check the fuel level and adjust if necessary (See Pg. 170).

## Pulley, Pulley Shaft Removal:

- Loosen the mounting screws (69), (73) of the starter plunger levers (74) and fast idling cam (68).
- Remove the screw (100), spring (99), steel washer (98), and plastic washer (97). Pull off the choke linkage shaft (71).
- To remove the pulley shaft (54), first loosen the locknuts (58), unscrew the balance adjusting screws (61) together with the locknuts, lockwashers (59), and flat washers (60) (3 ea).
- Pull off the link rod upper ends from the joint balls. The rod (62), spring (63), rod (62), and ball seat (64) may fall out of each link rod (See Fig. E24).
- Straighten the bent side of the lockwasher (25), and then remove the nut (24), lockwasher, and flat washer.
- Pull off the fast idling cam lever (27), spring (42), and bushing (43) from the shaft.
- Remove the link rod arm (44).
- Pull off the thick flat washer (32), pulley (33), and return spring (34) from the shaft.
- Pull off the shaft together with the plastic washer (52) and circlip (55).

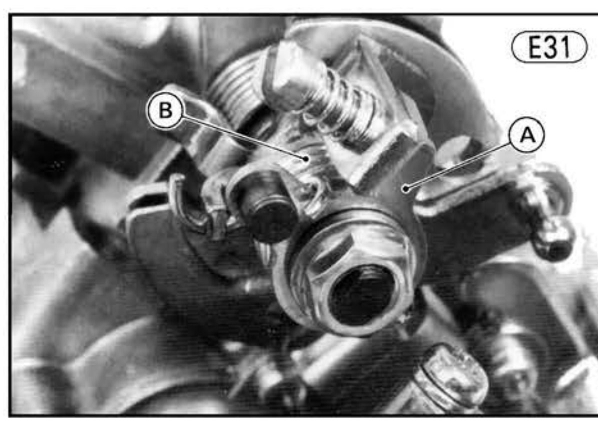
## Pulley, Pulley Shaft Installation Notes:

1. Apply a thin coat of grease to the shaft and joint balls.
2. Install the pulley in the direction shown in the figure. Hook the return spring end as shown in the figure.




**A. Pulley** **B. Return Spring**

3. Install the fast idling cam lever in the direction shown in the figure, and after finger-tightening the nut, hook the spring ends at the places shown in the figure.



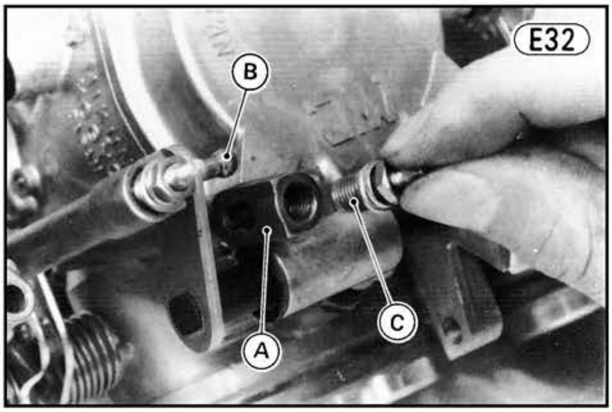

**A. Lever** **B. Spring**

4. After tightening the nut securely, bend one side of the lockwasher over the side of the nut. Use a new lockwasher.
5. Adjust the butterfly valve link mechanism (Pg. 54).

## Separation of Carburetors:

- Loosen the mounting screws (69), (73) of the starter plunger levers (74) and fast idling cam (68).

- Remove the screw 100, spring 99, steel washer 98, and plastic washer 97. Pull off the choke linkage shaft 71.
- Remove the upper mounting plates 51 and 53 by removing the screws 56 with the lockwashers.
- Remove the idle adjusting screw 109 and its spring 110, and remove the lower rear mounting plate 106.
- Loosen the locknuts 58 (3), screw off the balance adjusting screws 61 together with the locknuts, lockwashers 59, and flat washers 60 (3 ea), and pull off the link rod upper ends from the joint balls. The rod 62, spring 63, rod 62, and ball seat 64 may fall out of each link rod.

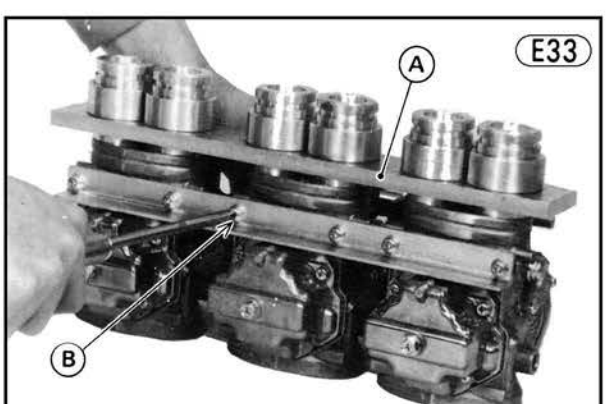



**A. Link Rod** **C. Adjusting Screw**
**B. Joint Ball**

- Remove the screws 105 (6) with the lockwashers from the lower front mounting plate 103, and separate the three pairs of carburetors.

## Assembly Notes:

1. The 3-way joint of the fuel hoses must be installed between the center and the left pairs of carburetors.
2. To prevent air leaks from the carburetor holders, all carburetor bore openings must be on the same plane and their centers must be spaced correctly. Put the carburetors on the carburetor and carburetor holder alignment jig (special tool), and then tighten the mounting screws (6). Apply a non-permanent locking agent to the threads before installation.




**A. Alignment Jig (57001-1036)**
**B. Apply a non-permanent locking agent.**

3. Measure the service fuel level for each carburetor, and adjust it if necessary (Pg. 170).

**CAUTION** **If the service fuel level is incorrect, the proper fuel/air mixture for good engine performance cannot be obtained.**

4. Adjust the butterfly valve link mechanism before mounting the carburetors on the engine as follows:

**To adjust the butterfly valve link mechanism:**

- For each balance adjusting screw, loosen the locknut, turn in the adjusting screw until it seats lightly, and then back it out 1½ turns. Tighten the locknut.
- Check to see that all butterfly valves open and close smoothly without binding when turning the pulley.
- Check to see that the choke lever moves up and down smoothly without binding. When the choke lever is pushed down, check each starter plunger to make sure it is seated. Push down on the plunger; if it moves slightly, it is not seating.

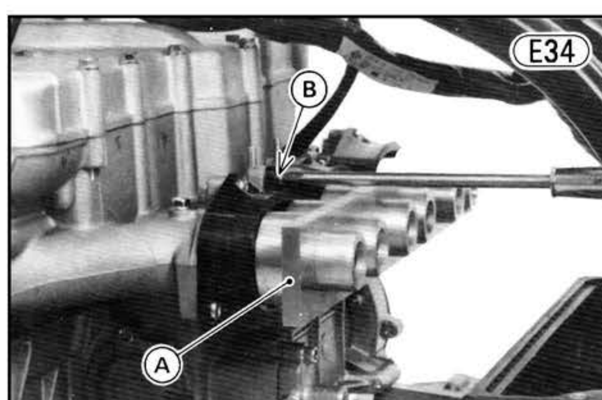
## CARBURETOR HOLDERS

### Removal (each carburetor holder):

- Remove the fuel tank (Pg. 46).
- Remove the vacuum switch valve (Pg. 48).
- Remove the air cleaner element (Pg. 47).
- Remove the rear upper air cleaner housing (Pg. 48).
- Remove the front upper air cleaner housing (Pg. 47).
- Remove the carburetors (Pg. 49).
- Remove the clamp on the carburetor holders.
- Remove the carburetor holders by removing the screws (3).

### Installation Notes (each carburetor holder):

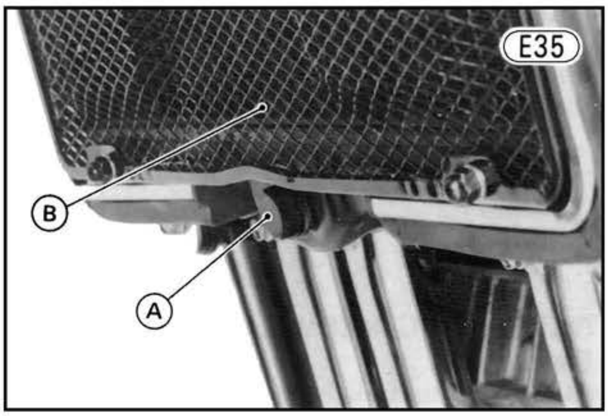
1. Three carburetor holders are identical. Install the middle one upside down.
2. To prevent air leaks, position the carburetor holders at the correct angle and pitch by using the carburetor and carburetor holder alignment jig (special tool).




**A. Carburetor and Carburetor Holder Alignment Jig (57001-1036)**
**B. Apply a non-permanent locking agent.**

3. Apply a non-permanent locking agent to the bolt threads before installation.

## RADIATOR
### Removal:
- Wait until coolant cools down.
- Remove the fuel tank (Pg. 46).
- Disconnect the battery ground (–) lead.
- Remove the radiator cap.
- Remove the radiator drain plug to drain out the coolant.

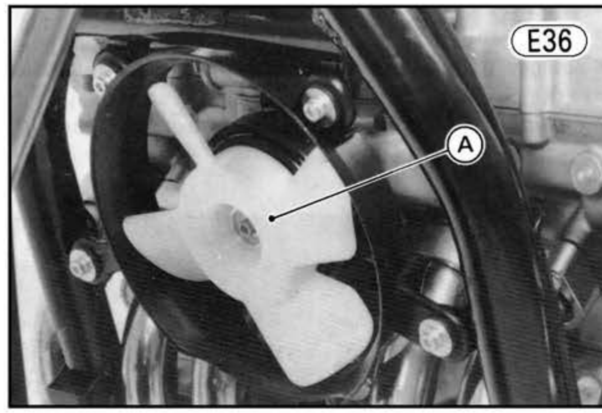



**A. Drain Plug B. Radiator**

- Loosen the hose clamps at the upper and lower radiator hoses.
- Remove the radiator mounting bolts and flat washers (3 ea). The rubber dampers may fall off.
- Slide the radiator forward slightly, and pull the reserve tank hose off the radiator after sliding the hose clamp out of position.
- Complete the radiator removal taking care not to damage the radiator core.

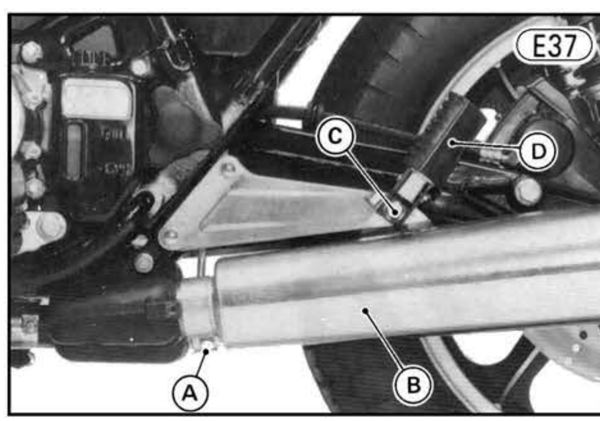
### Installation Notes:
1. Inspect the hoses, and replace them with new ones if damaged.
2. Be sure to install the upper radiator hose to the radiator and tighten the bolt keeping it down side, before install the radiator to the engine.
3. After filling the radiator with coolant, bleed air from the cooling system (Pg. 24).

## RADIATOR FAN
### Removal:
- Remove the fuel tank (Pg. 46).
- Disconnect the battery ground (–) lead.
- Remove the radiator (See above).
- Disconnect the 2-pin connector of the fan motor leads.
- Remove the Allen mounting bolts, collars (4 ea), and free the radiator fan from the motorcycle. The rubber dampers may fall out.




**A. Radiator Fan**

## MUFFLERS
### Removal (either side):
- Remove the muffler cover by removing the screw, bolt, flat washers and lockwashers (2 ea).
- Loosen the clamp bolt at the connection of the muffler and the power chamber.




**A. Clamp Bolt C. Mounting Bolt**
**B. Muffler D. Rear Footpeg**

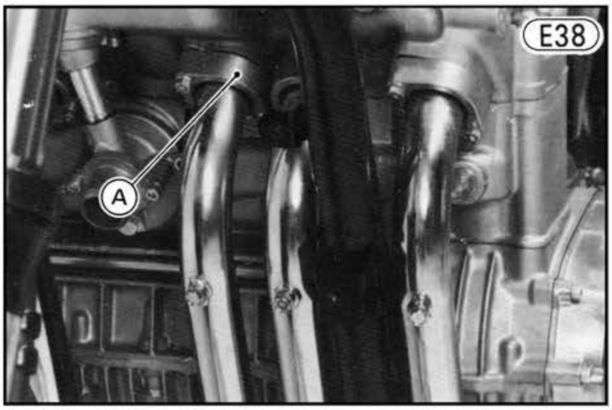
- Remove the mounting bolt, lockwasher, and flat washer, remove the rear footpeg, and pull the muffler toward the rear.

### Installation Note (either side):
- Check the gaskets at each muffler, and replace them if damaged.

## EXHAUST PIPES

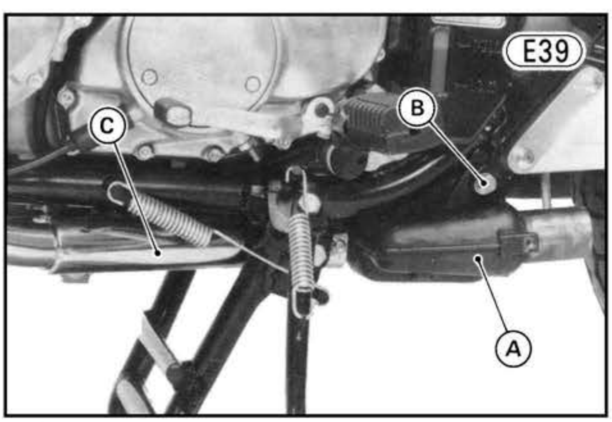
### Removal (either side):

•Remove the fuel tank (Pg. 46).
•Remove the radiator (Pg. 55).
•Remove the radiator fan (Pg. 55).
•Remove the muffler (Pg. 55).
•Remove the mounting bolt, lockwasher, and flat washer at the power chamber.
•Remove the exhaust pipe holder nuts (6), and slide the holders (3) off the studs.




**A. Exhaust Pipe Holder**

•Loosen the clamp bolts (2) at the connections of the exhaust pipes and the power chamber.
•Remove the bolt and lockwasher, and lockwashers (2), and remove the exhaust pipe cover.
•Remove the power chamber mounting bolt, and remove the power chamber and the exhaust pipes (2).

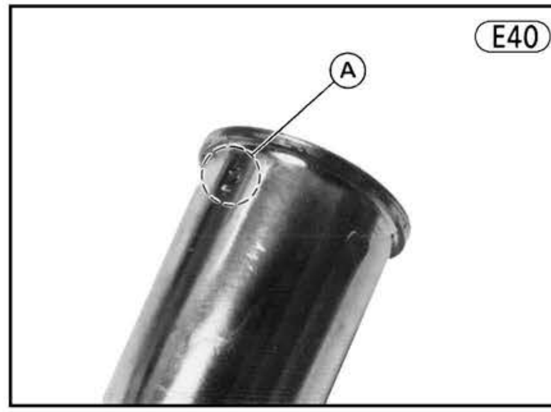



**A. Power Chamber** **C. Cover**
**B. Mounting Bolt**

•Remove the exhaust pipe holders, split keepers, and gaskets in the exhaust ports (3).

### Installation Notes (either side):

1. Check the gaskets at each muffler or exhaust pipe connection, and replace them if damaged.
2. There is an identification mark on the exhaust pipes to show the cylinder number to be installed on. Fit these exhaust pipes to the correct position.



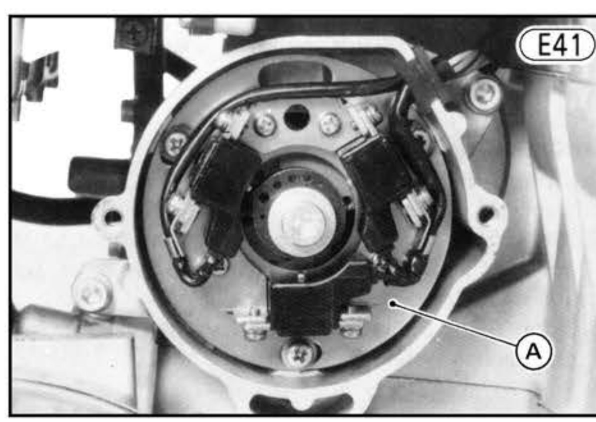

**A. Identification Mark**

3. After finger-tightening the mounting bolts and clamp bolts, first tighten the nuts of the exhaust pipe holders evenly to avoid exhaust leaks, and then tighten the mounting bolts and clamp bolts.
4. Thoroughly warm up the engine, and after completely cooling down, retighten all clamp bolts.

## PICK-UP COIL ASSEMBLY

### Removal:

•Remove the fuel tank (Pg. 46).
•Disconnect the 6-pin connectors that join the pick-up coil leads to the IC igniter and slide the leads from the engine through the clamps.
•Remove the pick-up coil cover and gasket by removing the Allen bolts (2).
•Remove the mounting screws (3) with a flat washer and a lockwasher, and remove the pick-up coil assembly.

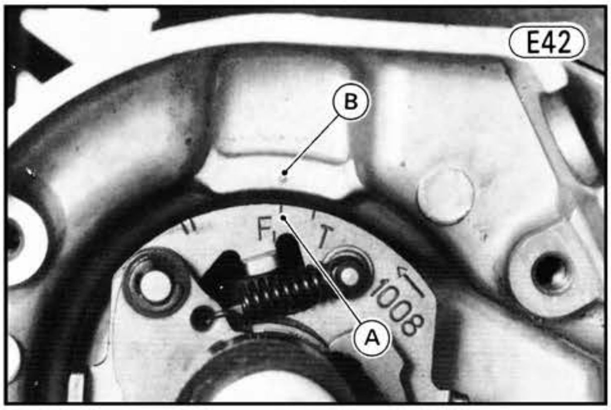



**A. Pick-up Coil Assembly**

### Installation:

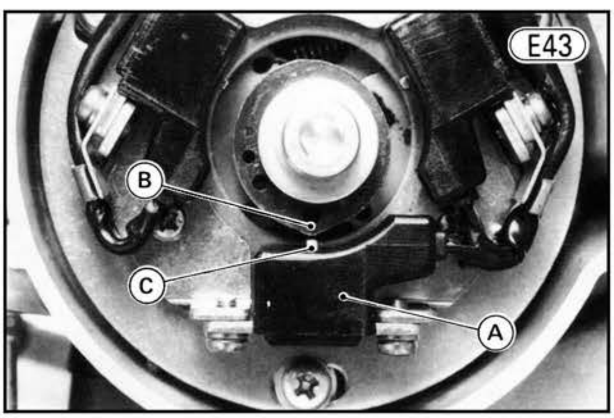
•Remove the alternator cover (Pg. 85). Complete removal is not required, so the leads may be left connected.
•Turn the crankshaft clockwise using a 14 mm wrench on the alternator rotor bolt until the "F" mark on the timing advancer aligns with the timing mark on the housing.

**CAUTION** **To rotate the automatic timing advancer, always turn the crankshaft with a wrench. Do not try to turn the timing advancer with a wrench on the timing advancer mounting bolt.**




**A. "F" Mark** **B. Timing Mark**

- Install the pick-up coil assembly so that the projection on the timing rotor aligns with the pick-up coil core for #1 and #6 cylinders.




**A. Pick-up Coil for #1 and #6 Cylinder** **C. Coil Core**
**B. Projection**

- Tighten the mounting screws (3).
- Fit the lead grommet into the notch in the housing, and install the gasket and cover.
- Route the pick-up coil leads through the hole in the cylinder head, and connect the 6-pin connectors.
- Install the alternator cover (Pg. 85).
- Install the fuel tank (Pg. 46).

## AUTOMATIC TIMING ADVANCER HOUSING, AUTOMATIC TIMING ADVANCER

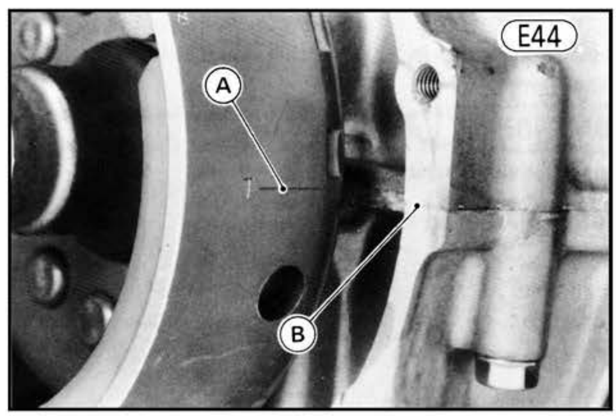
### Removal:

- Remove the pick-up coil cover and gasket by removing the Allen bolts (2).
- Remove the mounting screws (3) with a flat washer and a lockwasher, and remove the pick-up coil assembly.
- Remove the Allen bolts (2), and pull off the automatic timing advancer housing. There is an **O** ring on the cover mating surface, and one on the boss of the housing.

### Installation:

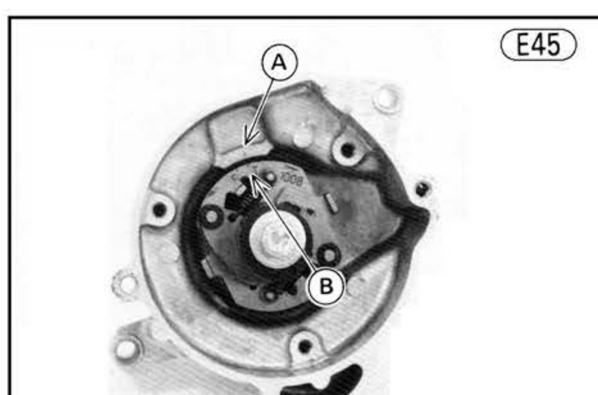
**NOTE:** If the housing itself is replaced with a new one, mark a new timing mark on the housing as mentioned in the "Assembly Notes" of the automatic timing advancer housing (Pg. 59).

- Remove the alternator cover (Pg. 85). Complete removal is not required, so the leads may be left connected.
- With a 14 mm wrench on the alternator rotor bolt, turn the crankshaft clockwise until the "T" mark on the alternator rotor is aligned with the crankcase halves mating surface on the front side of the alternator rotor. At this point, pistons #1 and #6 are at top dead center (TDC).




**A. "T" Mark** **B. Mating Surface**

- Apply a little engine oil to the **O** ring on the housing, and place the **O** ring on the cover mating surface with a little grease applied to it.
- Turn the timing advancer so that the "T" mark on the timing advancer is aligned with the timing mark on the housing.




**A. Timing Mark** **B. "T" Mark**

- Aligning the bolt holes in the housing and the cylinder block, and meshing the gears, install the housing. Check that the "T" mark on the timing advancer aligns with the timing mark on the housing. If it does not, remove the housing and reinstall it.
- Tighten the housing mounting bolts.
- Turn the crankshaft clockwise until the "F" mark on the timing advancer aligns with the timing mark on the housing.

**CAUTION** **Do not use a wrench on the advancer mounting Allen bolt to rotate the advancer, always turn the crankshaft. This is to prevent the timing advancer (plastic) gear from being damaged.**

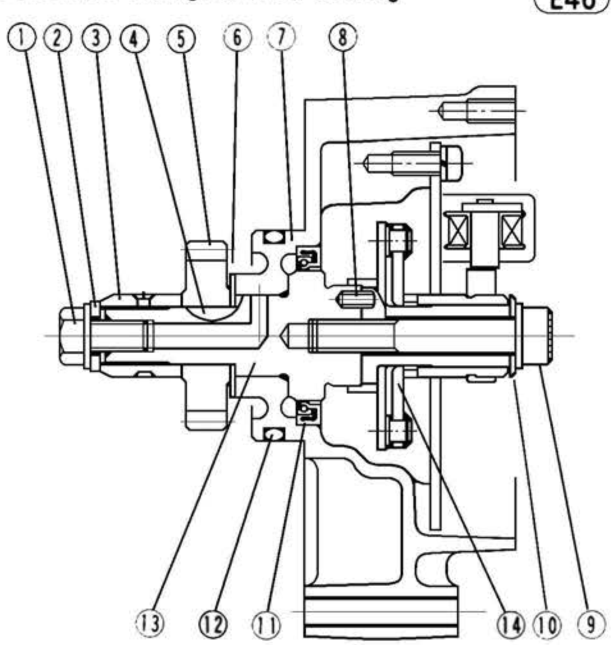
- Install the pick-up coil assembly so that the projection on the timing rotor aligns with the pick-up coil core for #1 and #6 cylinders (See Fig. E43).
- Tighten the mounting screws (3).
- Install the gasket and pick-up coil cover, and tighten the cover bolts.
- Install the alternator cover (Pg. 85).

## Disassembly (including automatic timing advancer removal):

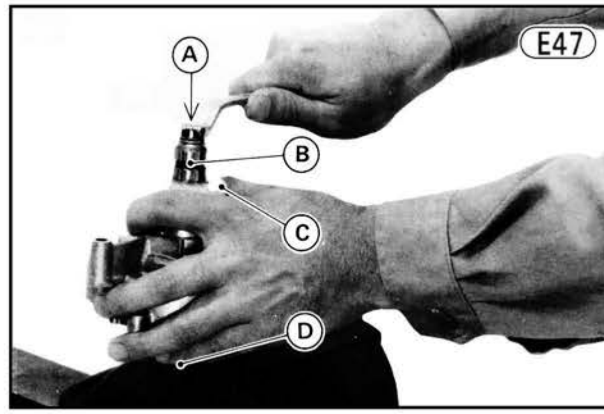
- Unscrew the timing advancer gear mounting bolt by securing the advancer mounting Allen bolt, and remove the washer.

**CAUTION** **Do not hold the timing advancer (plastic) gear to loosen or tighten the bolt on the timing advancer shaft.**

**Automatic Timing Advancer Housing** (E46)

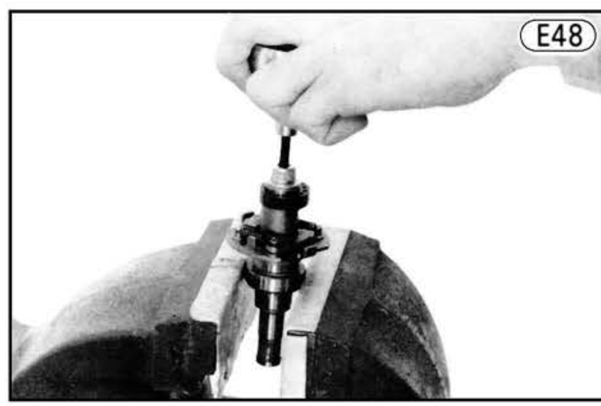



1. Mounting Bolt
2. Washer
3. Sleeve
4. Woodruff Key
5. Timing Advancer Gear
6. Washer
7. Timing Advancer Housing
8. Knock Pin
9. Allen Bolt
10. Washer
11. Oil Seal
12. O Ring
13. Timing Advancer Shaft
14. Automatic Timing Advancer




**A. Bolt** **C. Timing Advancer Gear**
**B. Sleeve** **D. Allen Wrench**

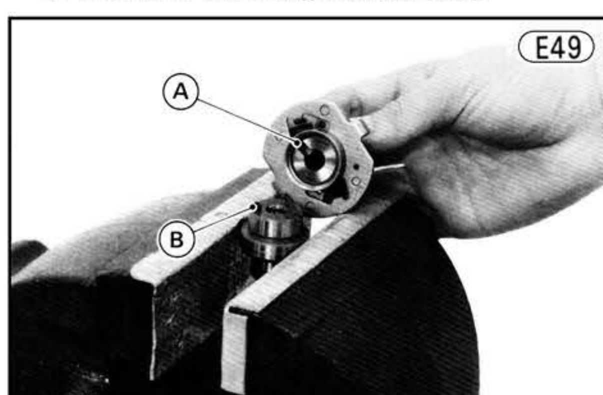
- Pull off the sleeve and timing advancer gear.
- Remove the woodruff key and thrust washer, and pull out the timing advancer shaft and timing advancer from the housing.
- Remove the oil seal using a hook.
- Unscrew the timing advancer mounting Allen bolt with securing the oil seal lip sealing surface of advancer shaft with a vise, and separate the timing advancer from the shaft.




**CAUTION** **Use the vice with copper jaw covers to keep the shaft surface from being damaged.**

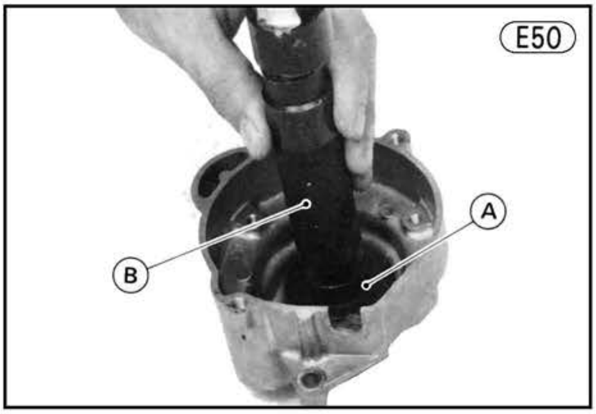
## Assembly Notes:

1. Match the notch in the advancer body with the pin on the end of the timing advancer shaft.



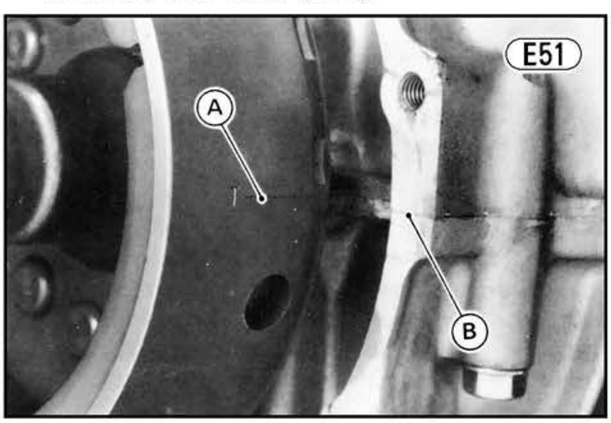

**A. Notch** **B. Pin**

2. Install a new oil seal using the bearing driver and bearing driver holder (special tools). Press the oil seal until it stops at the shoulder in the hole.



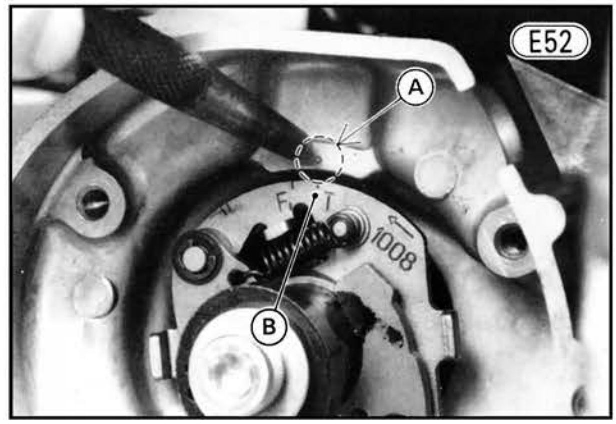

**A. Bearing Driver (57001-293)**
**B. Bearing Driver Holder (57001-139)**

3. Install the sleeve on the timing advancer shaft so that its chamfered end is opposite the gear.
4. Apply a non-permanent locking agent to the thread of the timing advancer Allen bolt, and tighten it to 2.0 kg-m (14.5 ft-lbs) of torque.
5. The tightening torque for the gear mounting bolt is 2.0 kg-m (14.5 ft-lbs) of torque.
6. Install the pick-up coil assembly so that the ignition timing will be correct set (Pg. 56).
7. If the timing advancer housing is replaced with a new one, make a timing mark on the housing as follows before installing the pick-up coil assembly.
   ○With a 14 mm wrench on the alternator rotor bolt, turn the crankshaft clockwise until the "T" mark on the alternator rotor is aligned with the crankcase halves mating surface on the front side of the alternator rotor. At this point, the pistons #1 and #6 are at top dead center (TDC).




**A. "T" Mark** **B. Mating Surface**

   ○Apply a little engine oil to the **O** ring on the housing, and place the **O** ring on the cover mating surface with a little grease applied to it.
   ○Turn the automatic timing advancer so that the "T" mark on the timing advancer is positioned at the center of the marking area.
   ○Aligning the bolt holes in the housing and the cylinder block, and meshing the gears, install the housing. Turn the timing advancer a little to mesh the gears.
   ○Tighten the housing mounting bolt.
   ○Make a timing mark on the housing which aligns with the advancer "T" mark. Be sure that the pistons #1 and #6 are still at the TDC.

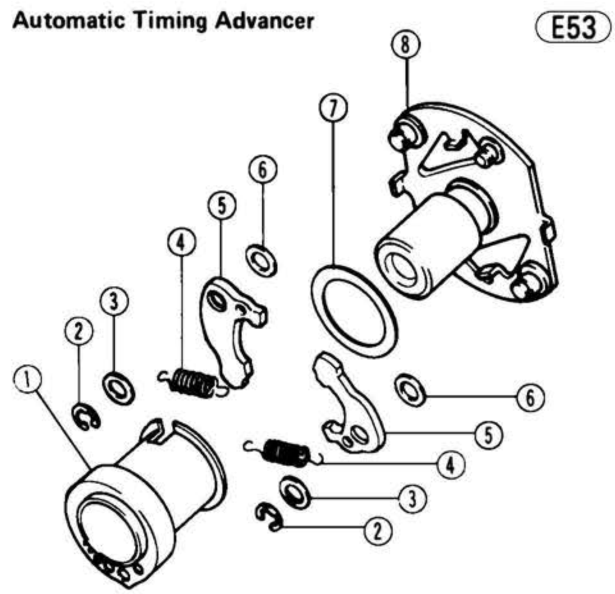



**A. Punch a timing mark.** **B. "T" Mark**

## Automatic Timing Advancer Disassembly:

- Turn the timing rotor ① counterclockwise, and pull off the rotor.
- Remove the clips ② (2) and thick washers ③ (2), and pull off the weights ⑤ (2) together with the springs ④ (2).

**Automatic Timing Advancer**



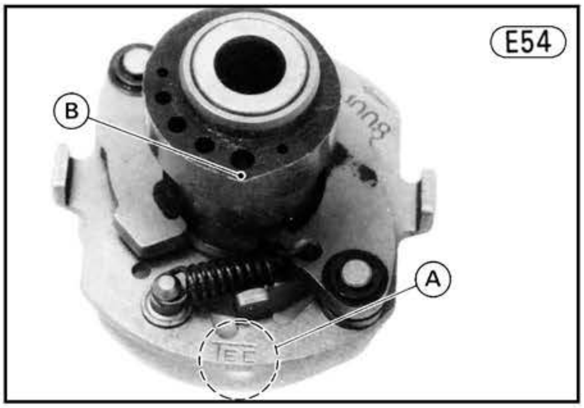

| | |
|---|---|
| 1. Timing Rotor | 5. Weight |
| 2. Clip | 6. Washer |
| 3. Washer | 7. Washer |
| 4. Spring | 8. Timing Advancer Body |

- Remove the thin washers ⑥ (2) from the weight pivot shafts, and remove the thrust washers ⑦ (2) from the rotor shaft.

## Automatic Timing Advancer Assembly Notes:

1. Wipe the advancer parts clean, and lubricate them (Pg. 240).

2. Install the timing rotor so that the rotor projection is on the "TEC" mark side.

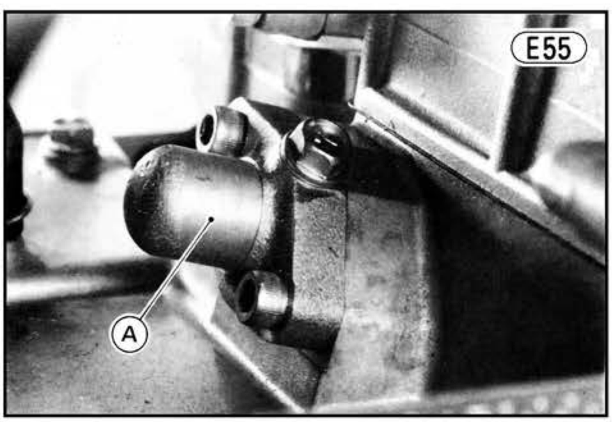



**A. "TEC" Mark B. Projection**

## CAMSHAFT CHAIN TENSIONER

### Removal:

- Unlock the seat, swing it open, and disconnect the battery ground lead.
- Remove the solenoid fuel valve (Pg. 46).
- Fully remove the Allen bolts (2), and pull out the camshaft chain tensioner and **O** ring.



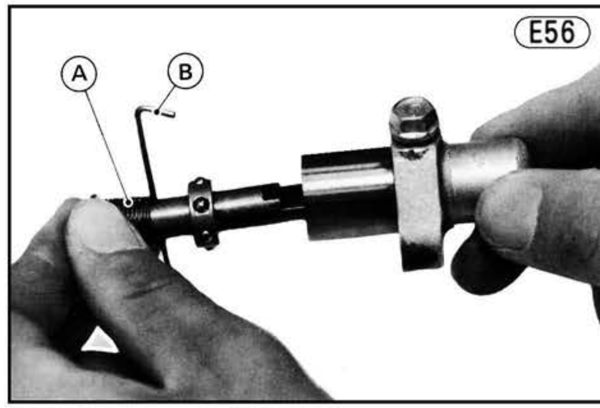

**A. Camshaft Chain Tensioner**

**CAUTION 1. When removing the chain tensioner, do not take out the mounting bolts only halfway. Retightening the mounting bolts from this position could damage the chain tensioner and the camshaft chain. Once the bolts are loosened, the tensioner must be removed and reset as described below.**

**2. Do not turn over the crankshaft while the camshaft chain tensioner is removed. This could upset the camshaft chain timing, and damage the engine.**

### Installation:

- Loosen the lock bolt several turns, and take out the push rod and spring.
- Compressing the spring against the push rod head, insert a thin wire through the hole in the push rod to keep the spring in place.



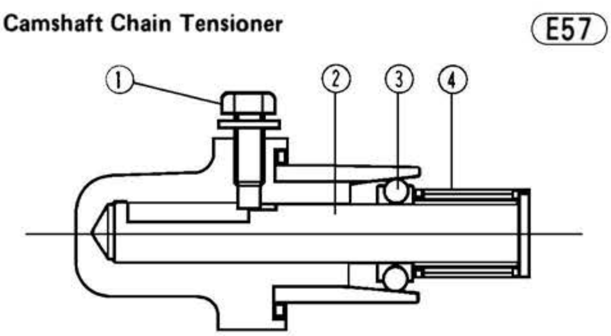

**A. Spring B. Wire**

- Insert the push rod upwards into the tensioner body going through the ball retainer. Hold the tensioner body with the open end down so that the balls will fall away from the ramp inside the tensioner and allow the push rod to go in. Keep the flat side of the push rod toward the lock bolt, and push in the rod by hand until the wire rests against the tensioner.

**CAUTION If the flat side is facing away from the bolt, the push rod may be gouged and the tensioner will not automatically take up chain slack.**

- Holding the push rod in position and facing the flat side toward the bolt, tighten the lock bolt securely to prevent the push rod from sticking out.

**Camshaft Chain Tensioner**




1. Lock Bolt
2. Push Rod
3. Ball
4. Spring

- Pull out the wire, and install the chain tensioner on the crankcase with the lock bolt up. If the **O** ring is damaged, replace it.
- Loosen the lock bolt and then tighten it. With the bolt loose, the spring inside takes up any slack automatically, and the lock bolt can be turned in fully until the bolt head seats closely on the washer.
- Install the solenoid fuel valve (Pg. 46).
- Connect the battery ground lead.

## TIMING CHAIN TENSIONER

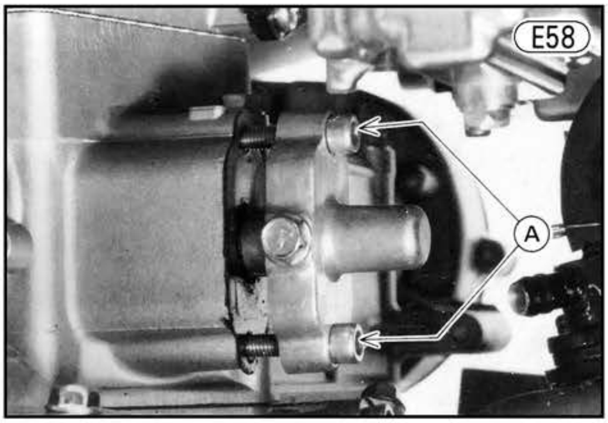
### Removal:

- Unlock the seat, swing it open, and disconnect the battery ground lead.

- Unscrew the Allen bolts (2) evenly, and remove the timing chain tensioner.

### Installation:

- Install a new gasket on the mating surface, and install the tensioner to the cylinder by evenly screwing the Allen bolts.




**A. Tighten the bolts evenly.**

- Connect the battery ground lead.

## THERMOSTATIC FAN SWITCH

### Removal:

- Wait until coolant cools down.
- Remove the fuel tank (Pg. 46).
- Disconnect the battery ground (–) lead.
- Remove the radiator cap.
- Remove the radiator drain plug to drain out the coolant.
- Pull off the lead, and unscrew the thermostatic fan switch.

**CAUTION** **When handling the fan switch, the switch should never be allowed to fall on a hard surface. Such a shock to the switch can damage it.**


**A. Thermostatic Fan Switch**

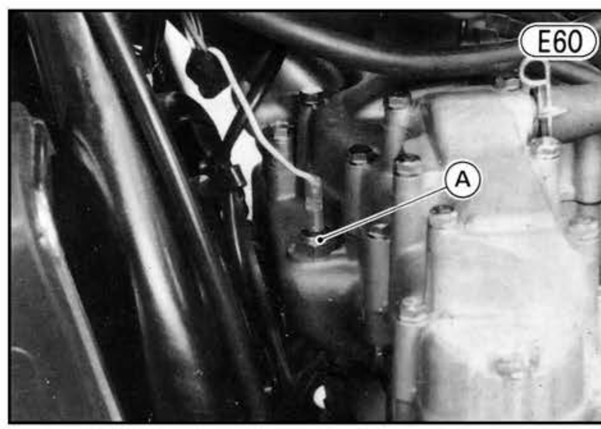
### Installation Notes:

1. Apply a liquid gasket compound to the switch threads before mounting it.
2. Tighten the switch to 0.50 kg-m (43 in-lbs) of torque.
3. After filling the radiator with coolant, bleed the air from the cooling system (Pg. 24).

## WATER TEMPERATURE SENDER

### Removal:

- Wait until coolant cools down.
- Remove the fuel tank (Pg. 46).
- Disconnect the battery ground (–) lead.
- Remove the radiator cap.
- Remove the radiator drain plug to drain out the coolant.
- Pull off the lead, and unscrew the water temperature sender.




**A. Water Temperature Sender**

### Installation Notes:

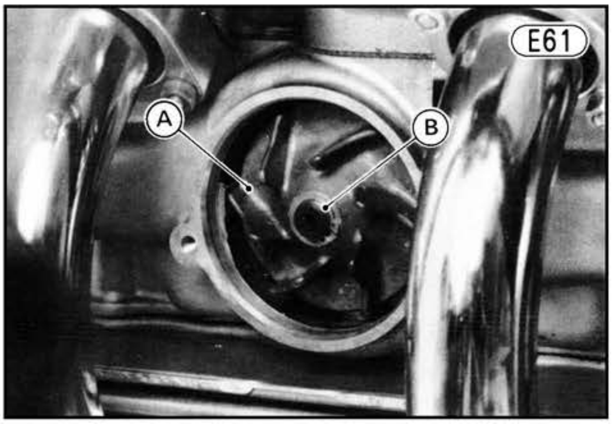
1. Check the **O** ring, and replace it with a new one if it is damaged.
2. Tighten it to 2.0 kg-m (14.5 ft-lbs) of torque.
3. After filling the radiator with coolant, bleed the air from the cooling system (Pg. 24).

## WATER PUMP IMPELLER, MECHANICAL SEAL

### Removal:

- Remove the fuel tank (Pg. 46).
- Remove the radiator (Pg. 55).
- Remove the radiator fan (Pg. 55).
- Remove the circlip from its groove, and push the bypass pipe down into the water pump cover until the upper end of the pipe comes out of the thermostat cover (Fig. E70).
- Remove the water pump cover and its **O** ring by removing the Allen bolts (2).

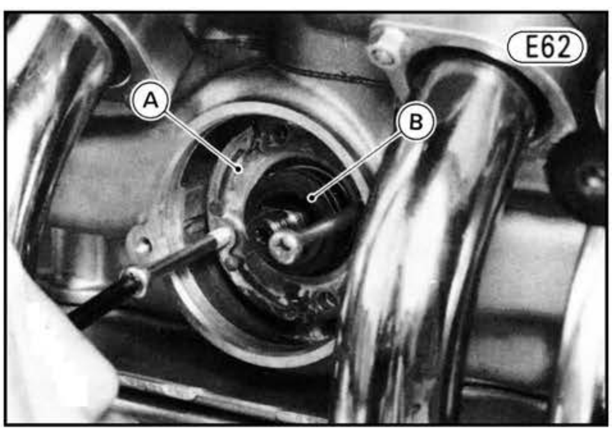
•Remove the circlip, and pull the impeller ② off the water pump shaft.




**A. Impeller B. Circlip**

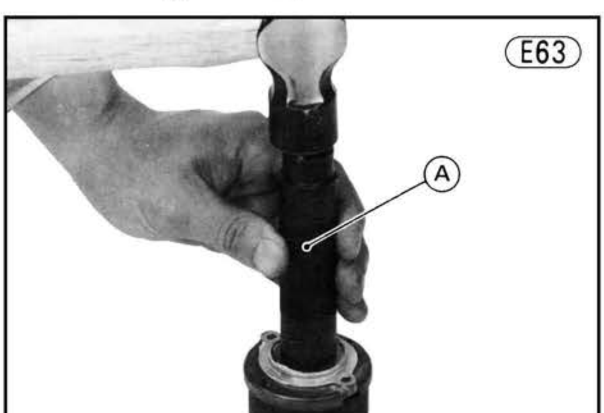
•Remove the mechanical seal retainer screws (2), and turn 6 mm diameter bolts or screws (with 1.0 mm pitch threads) about 30 mm long evenly into the threaded holes provided in the retainer ⑦ to pull the retainer from the cylinder block.

**CAUTION** **Be careful not to damage the sealing surface of the mechanical seal during operation.**




**A. Mechanical Seal Retainer B. Sealing Surface**

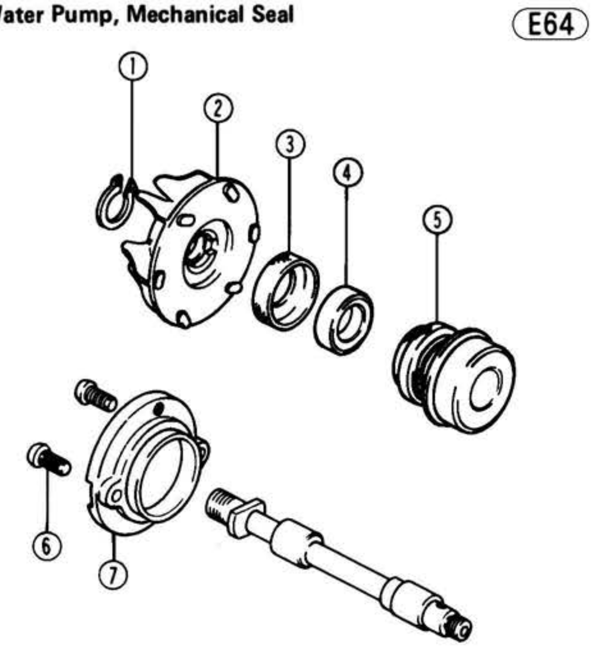
•Press out the mechanical seal ⑤ by using the bearing driver holder (special tool).




**A. Bearing Driver Holder (57001-139)**

•Pull out the sealing seat ④ and rubber seal ③ from the impeller. It will be removed easily by hand.

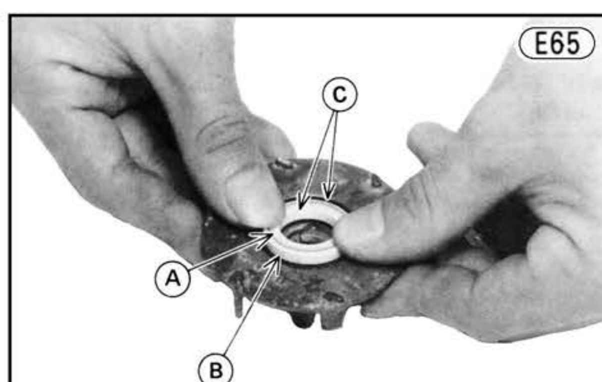
**Water Pump, Mechanical Seal**




1. Circlip
2. Impeller
3. Rubber Seal
4. Sealing Seat
5. Mechanical Seal
6. Screw
7. Retainer

## Installation:

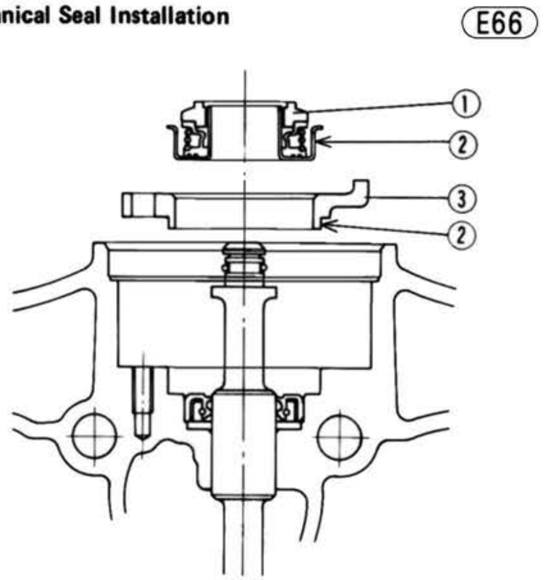
•Apply coolant to the surfaces of the rubber seal and sealing seat, and install the rubber seal and sealing seat into the impeller by pressing them by hand until the seat stops at the bottom of the hole.



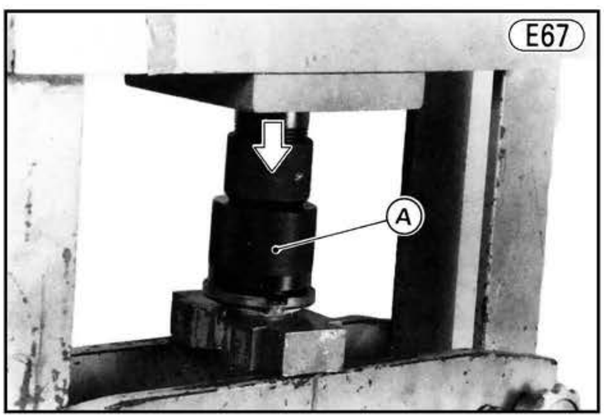

**A. Sealing Seat C. Apply coolant to the surfaces.**
**B. Rubber Seal**

•Apply a liquid gasket compound to the mating surface of the mechanical seal body (Fig. E66), and press it into the retainer using the front fork oil seal driver (special tool). Press it until the flange of the mechanical seal body comes in contact with the retainer.

**Mechanical Seal Installation**



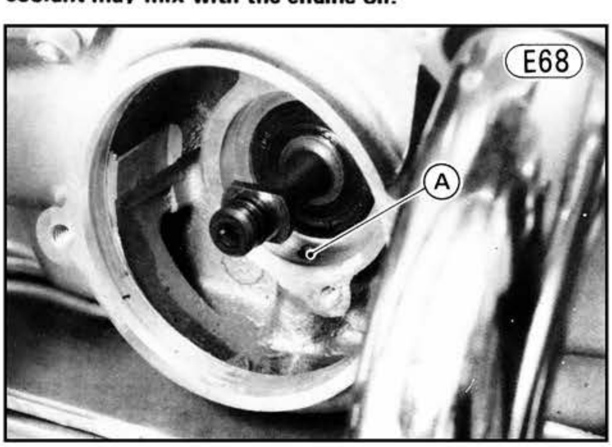

1. Mechanical Seal
2. Apply a Liquid Gasket Compound
3. Retainer




**A. Front Fork Oil Seal Driver (57001-191)**

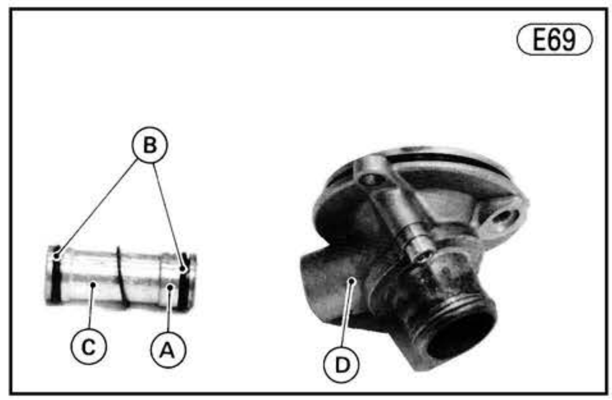
- Apply a liquid gasket compound to the mating surface of the mechanical seal retainer (Fig. E66), and install it in the cylinder block.

**CAUTION** **Do not apply liquid gasket so much that it clogs up the drain hole. If it does, the coolant may mix with the engine oil.**




**A. Drain Hole**

- Replace the **O** ring on the water pump shaft with a new one, and apply a little coolant to it so that the impeller will slide over it easily.
- Clean the slipping surface of the mechanical seal with a high flash-point solvent, and apply a little coolant to the slipping surface to give the mechanical seal initial lubrication.
- Install the impeller on the shaft, matching its recess with the stop of shaft. While holding the impeller in place, install the circlip in the groove on the shaft.
- Replace the **O** rings on the water pump cover and bypass pipe with new ones. Apply a little coolant to them to ease installation.
- Insert the bypass pipe completely into the pump cover, with the circlip groove going into the cover.




**A. Circlip Groove** **C. Bypass Pipe**
**B. O Rings** **D. Water Pump Cover**

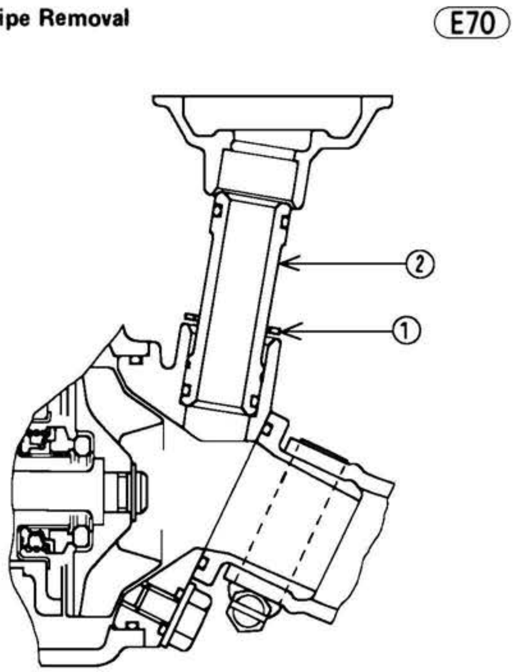
- Install the pump cover with the circlip put on the bypass pipe. Before tightening the cover Allen bolts, slide up the bypass pipe into the thermostat cover, and install the circlip in the groove.
- Tighten the cover bolts.
- Install the drain plug with its **O** ring, and tighten the plug to 2.0 kg-m (14.5 ft-lbs) of torque.
- Install the radiator fan (Pg. 55).
- Install the radiator (Pg. 55).
- Install the fuel tank (Pg. 46).

## THERMOSTAT

### Removal:

- Remove the fuel tank (Pg. 46).
- Remove the radiator (Pg. 55).
- Remove the radiator fan (Pg. 55).
- Unscrew the thermostat cover mounting bolts (2).
- Remove the circlip from its groove, and push the bypass pipe down into the water pump cover until the upper end of the pipe comes out of the thermostat cover.

**Bypass Pipe Removal**




1. Remove the Circlip from the Groove.
2. Push the Bypass Pipe down.

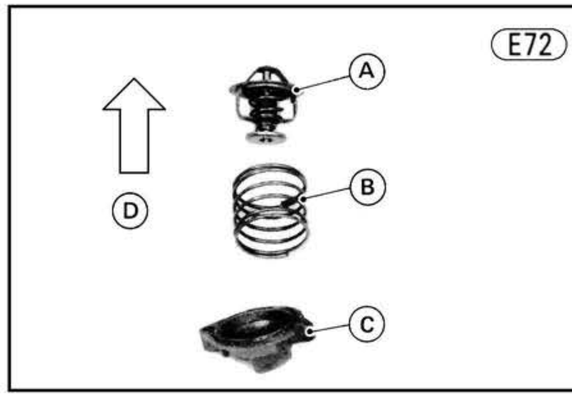
●Remove the thermostat cover, and the spring and the thermostat come out on cover removal.

### Installation:

●Pull off the bypass pipe, and replace the **O** rings on it with new ones. Apply a little coolant to them to ease installation.
●Insert the bypass pipe completely into the water pump cover with the circlip groove going into the cover.


**A. Bypass Pipe**

●Put the circlip on the bypass pipe.
**NOTE**: The circlip need not be installed this stage. It will be set in the groove after installation of the thermostat cover.
●Install the thermostat, spring, new gasket, and thermostat cover on the cylinder head in that order.
●Apply a non-permanent locking agent to the threads of the cover bolts, and tighten the cover bolts (2) loosely.




**A. Thermostat** **C. Cover**
**B. Spring** **D. Upward**

**NOTE**: Install the gasket in the correct position so that its shape matches the mating surface on the cylinder head.


**A. New Gasket**

●Slide up the bypass pipe fully into the thermostat cover, and set the circlip in the groove.
**NOTE**: If the bypass pipe is hard to slide, wrap a piece of clean cloth around it, and grasp it with pliers. Be careful not to deform or hurt it.
●Tighten the thermostat cover bolt (2) to 1.0 kg-m (87 ft-lbs) of torque.
●Install the radiator fan (Pg. 55).
●Install the radiator (Pg. 55).
●Install the fuel tank (Pg. 46).

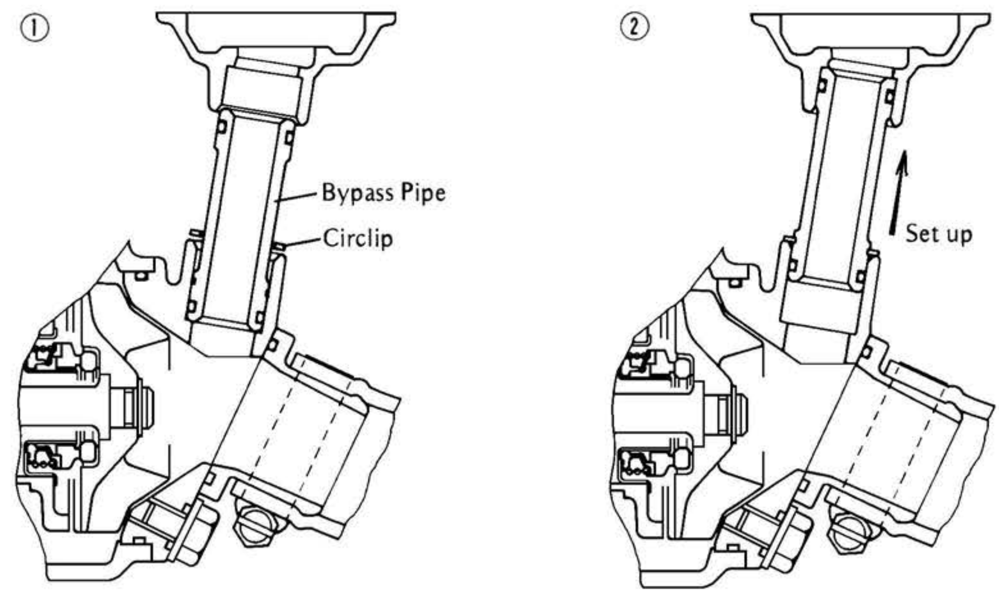
## AIR SUCTION VALVES

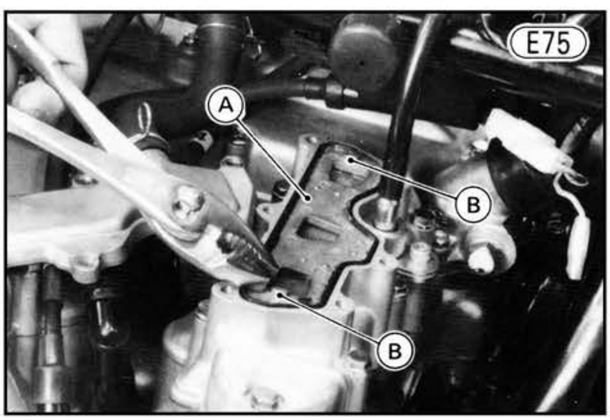
### Removal (either side):

●Remove the fuel tank (Pg. 46).
●Remove the air suction valve cover bolts (6), and lift the cover off the air suction valve assembly.
●For US model, remove the valve assembly taking care not to damage the valve reeds and reed contact areas. If the valve assembly sticks in the cylinder head cover, pull it up by grasping the projection with pliers.
●For other models, remove the aluminum plate and gasket.

**Bypass Pipe Installation**

(E74)




**A. Air Suction Valve Assembly** **B. Projection**

## Installation Notes (either side):

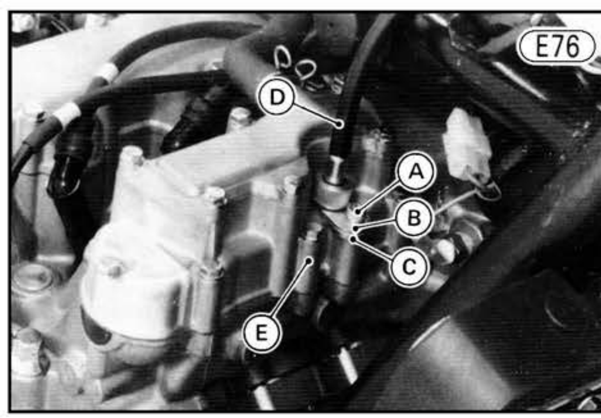
1. Check the valve assembly, and replace it with a new one if it is damaged (Pg. 180).
2. Tighten the cover bolts (6) to 0.90 kg-m (78 in-lbs) of torque for U.S. model or 1.5 kg-m (11.0 ft-lbs) of torque for other models. Retorque the cover bolts after the engine is completely warmed up and cooled down.

## CYLINDER HEAD COVER

### Removal:

•Remove the fuel tank (Pg. 46).
•Disconnect the battery ground (–) lead.
•Remove the Allen bolt, stop, and holder, and pull the tachometer pinion holder and pinion with the tachometer cable off the cylinder head cover.

**CAUTION** **When later installing the cylinder head cover, attempting to install it with the tachometer pinion left in the cylinder head may cause tachometer gear damage.**

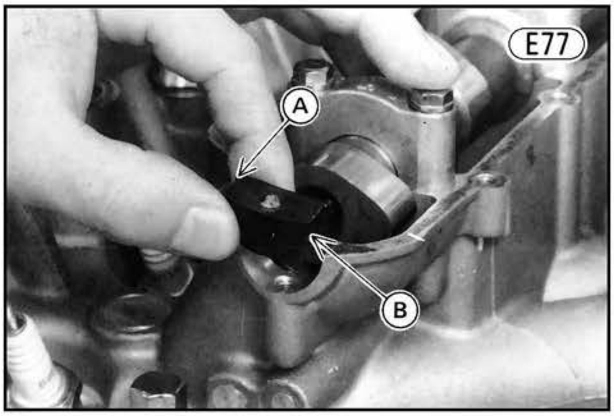



**A. Allen Bolt** **D. Tachometer Cable**
**B. Stop** **E. Cylinder Head Cover**
**C. Holder**

•Remove the vacuum switch valve (Pg. 48).
•Remove one of the air suction valve covers by unscrewing the cover bolts (6).
•Remove the two lower ignition coils (Pg. 49).
•Remove the cylinder head cover bolts (32), and slip the cover off the cylinder head toward the side on which the other air suction valve cover remains. There is a knock pin just at the front side of the tachometer pinion.

### Installation Notes:

1. Replace the cylinder head rubber plugs (4) and cover gasket with new ones. Apply a liquid gasket compound to both ends of each rubber plug before installation. The projections must be on camshaft side.



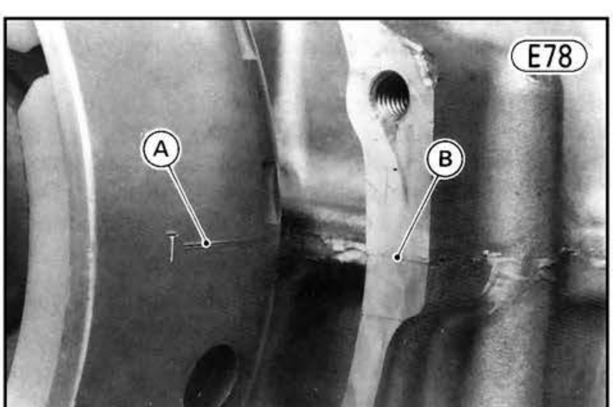

**A. Projection B. Apply liquid gasket.**

2. Before installing the cylinder head cover in place, make sure that there is the knock pin in front of the tachometer worm gear.
3. Tighten the cylinder head cover bolts (32) to 1.5 kg-m (11.0 ft-lbs) of torque, and the air suction valve cover bolts (6) to 0.80 kg-m (69 in-lbs) of torque. The four bolts which go through the rubber plugs are 5 mm longer than the others.
4. Thoroughly warm up the engine, wait until the engine grows cold, and retighten the cover bolts to the specified torque.
5. Tighten the tachometer pinion holder Allen bolt to 0.90 kg-m (78 in-lbs) of torque.

## CAMSHAFTS

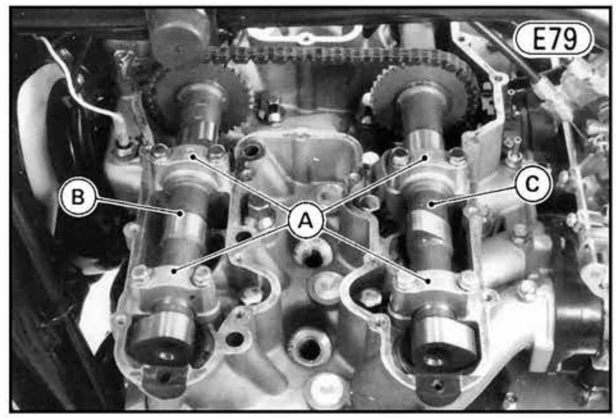
### Removal:

•Remove the fuel tank (Pg. 46).
•Disconnect the battery ground (–) lead.
•Remove all the spark plugs.
•Remove the alternator cover (Pg. 85). The cover need not be removed completely from the crankcase, so alternator leads may be left connected.
•Using a wrench on the alternator rotor bolt, turn the crankshaft until the "T" mark on the rotor is aligned with the crankcase mating surface on the front side of the rotor. At this point, the pistons #1 and #6 are at top dead center (TDC).




**A. "T" Mark B. Mating Surface**

•Remove the vacuum switch valve (Pg. 48).
•Remove the two lower ignition coils (Pg. 49).
•Remove the cylinder head cover (Pg. 65).
•Cut out a cover from a rubber plate using the pattern on Pg. 281, and stuff it in the camshaft chain tunnel so that no parts will fall into the crankcase.
•Remove the solenoid fuel valve (Pg. 46).
•Remove the camshaft chain tensioner (Pg. 60).
•Remove the camshaft cap bolts (16), and take off the camshaft caps (8).




**A. Camshaft Caps C. Inlet Camshaft**
**B. Exhaust Camshaft**

•Remove the camshafts. Use a screwdriver or wire to keep the chain from falling down into the cylinder block.

**CAUTION Always pull the camshaft chain taut during the turning of the crankshaft while the camshaft chain is loose, to avoid kinking the chain on the lower (secondary shaft) sprocket. A kinked chain could damage the chain and sprocket.**

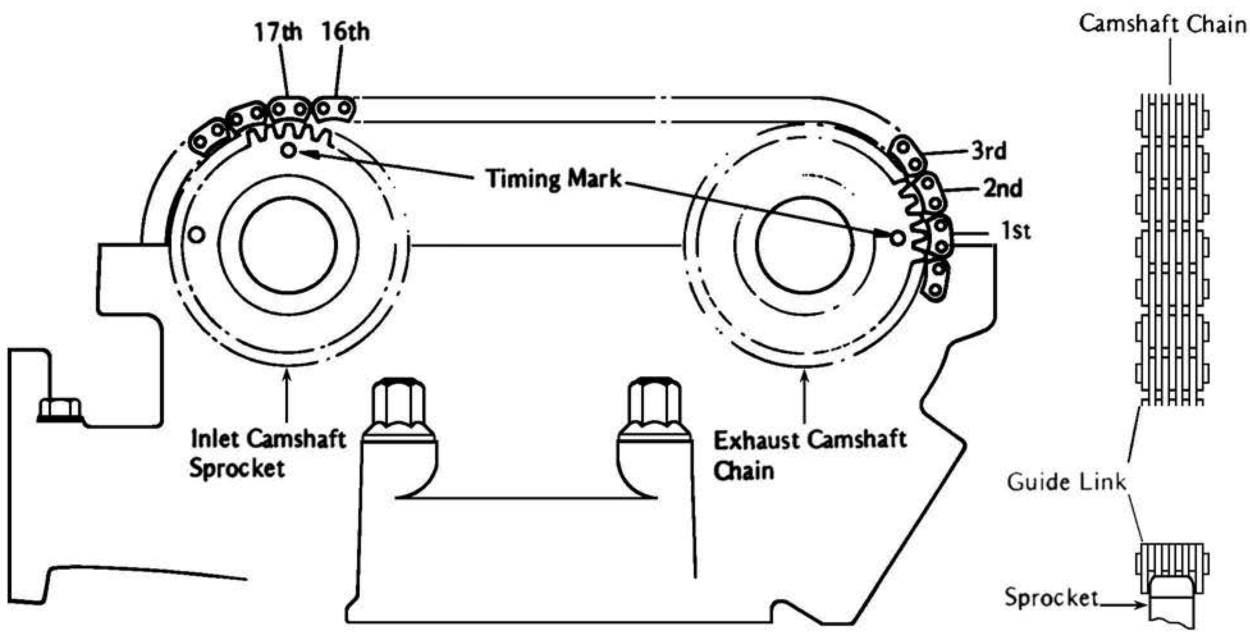
### Installation:

•Check that the cylinder head cover gasket and four rubber plugs are removed, all shims are properly fitted in the valve lifter, and all knock pins (16) of the camshaft caps are installed.
•Check crankshaft position to see that pistons #1 and #6 are still at TDC (Fig. E78), and readjust if necessary. Remember to pull the camshaft chain taut before rotating the crankshaft.
•Apply clean engine oil to all cam parts. If the camshaft(s) and/or cylinder head are replaced with new ones, apply a thin coat of a molybdenum disulfide engine assembly grease on the new cam part surfaces.
•Check to see that the camshaft chain is engaged with the lower (secondary shaft) sprocket, and keep it taut.

**Engaging the Camshaft Chain 1**

E80

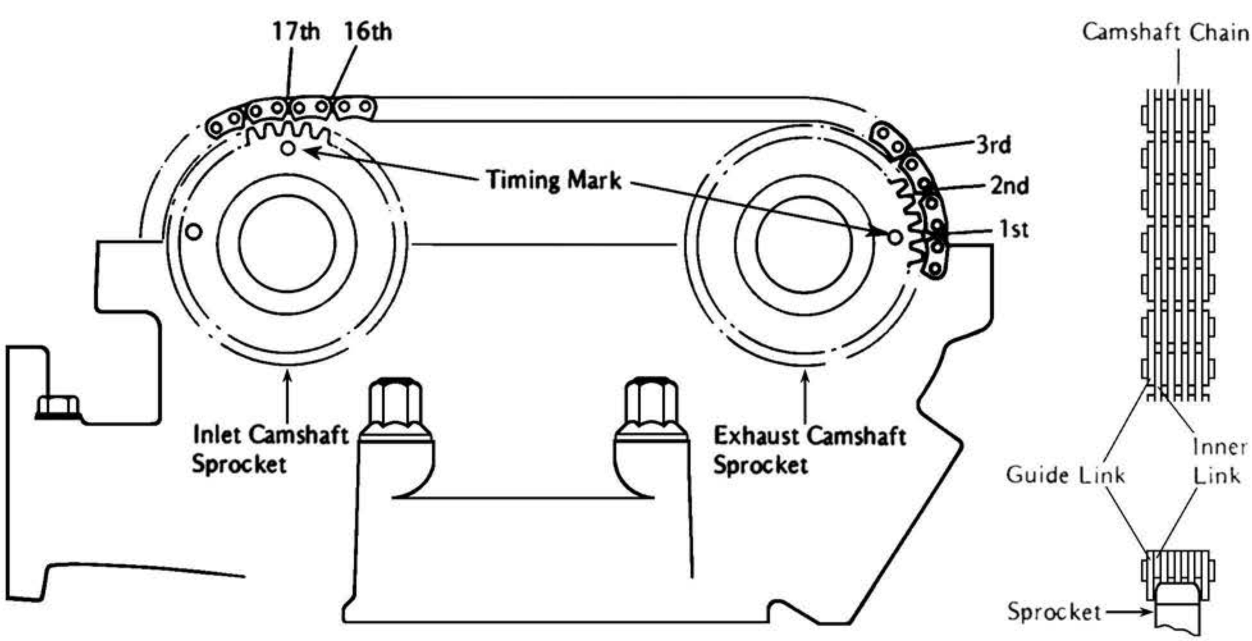
**NOTE:** "T" mark on the alternaotr rotor must be aligned with the crankcase mating surface on the front side.




**Engaging the Camshaft Chain 2**

E81

**NOTE:** "T" mark on the alternator rotor must be aligned with the crankcase mating surface on the front side.

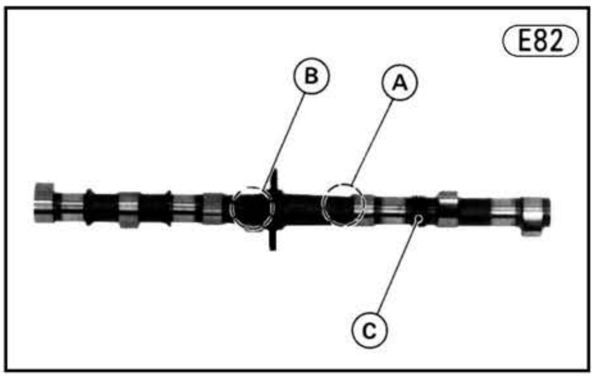


If the chain is properly engaged, the chain does not run over the sprocket when the chain is pulled.

**NOTE:** Do not allow the chain to loosen even for a moment during camshaft installation mentioned below. This is the critical point in camshaft chain timing.

- Feed the exhaust camshaft through the chain.

**NOTE:** The exhaust camshaft has a tachometer gear worm while the inlet camshaft has none. For both camshafts, there are "L" and "R" marks on them, and the "L" mark must go on the left side and the "R" mark on the right.




**A. "R" Mark B. "L" Mark C. Gear Worm**

- Properly engage the **exhaust** camshaft sprocket with the chain as follows: First, fit the chain on the sprocket so that the **bottom** of the circle timing mark on the sprocket becomes level the most closely with the cylinder head cover mating surface.
- Place the exhaust camshaft in the bearings, and feed the inlet camshaft through the chain.
- Properly engage the **inlet** camshaft sprocket with the chain as follows:

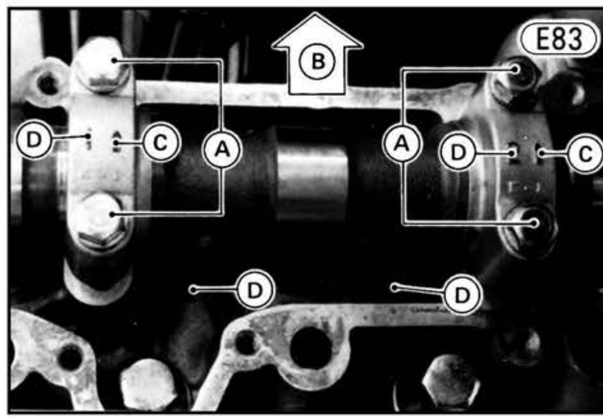
1. In case that the circle timing mark on the exhaust camshaft sprocket is at the center of the guide link. (See Fig. E80.)
   - Find the guide link centered on the circle timing mark on the exhaust camshaft sprocket – that is link no. 1.
   - Count 17 guide links as shown in Fig. E80.
   - Mesh the chain on the inlet camshaft sprocket so that the 17th guide link is centered on the circle timing mark on the inlet camshaft sprocket.
2. In case that the circle timing mark on the exhaust camshaft sprocket is between the two guide links. (See Fig. E81.)
   - Find the inner link centered on the circle timing mark on the exhaust camshaft sprocket – that is link no. 1.
   - Count 17 inner links as shown in Fig. E81.
   - Mesh the chain on the inlet camshaft sprocket so that the 17th inner link is centered on the circle timing mark on the inlet camshaft sprocket.

- Place the inlet camshaft on the cylinder head.
- Set the exhaust camshaft caps (4) into place with the number on the caps matching the number on the cylinder head, and with the arrow on the cap pointing forward (toward the exhaust side).

**CAUTION The camshaft caps are machined together with the cylinder head. So, if a cap is installed in the wrong location, the camshaft may seize because of improper oil clearance in the bearings.**

- First tighten the exhaust camshaft caps. The two bolts for each cap must be tightened evenly.

**CAUTION During tightening the camshaft cap bolts, check to see that the shims are not pushed out of the valve lifter by the cam lobes. If the bolts are tightened with the shim out of place, the cylinder head and the camshaft will be damaged.**



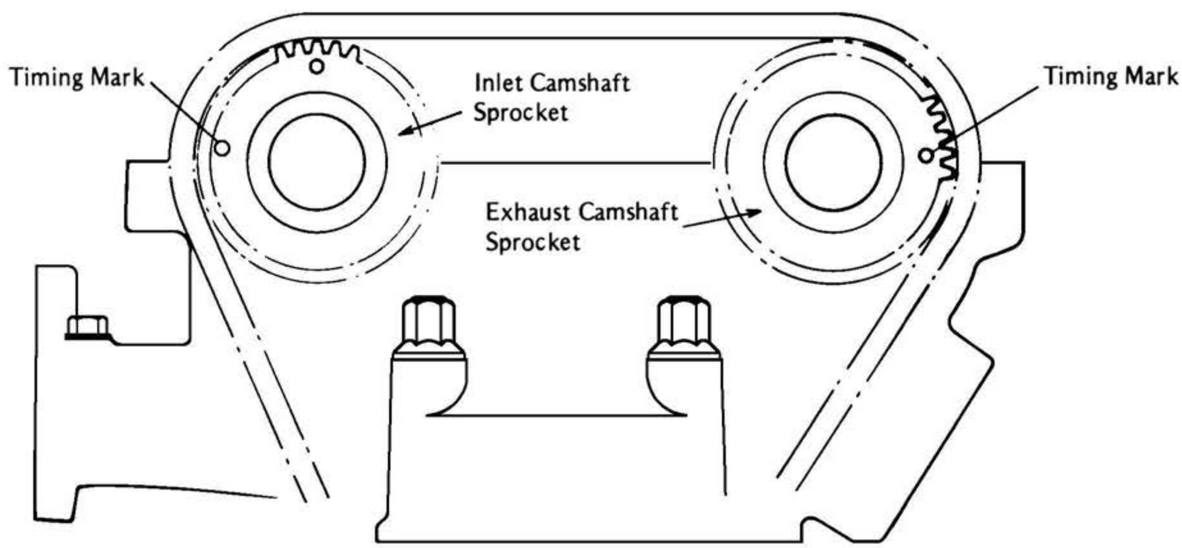

**A. Evenly tighten two bolts. C. Arrow**
**B. Front D. Number**

- To set the inlet camshaft in the bearings, turn the crankshaft clockwise a little with a wrench, while pulling the inlet camshaft toward the carburetors. Do not turn the crankshaft more than needed to seat the camshaft in place. At this time also check to see that the shims are not pushed out of the valve lifter by the cam lobes. Fit shims on the valve lifter if they get out of place.
- Position the inlet camshaft caps (4) in place, and tighten the bolts (8) in the same way as the exhaust camshaft cap.
- After both camshafts are seated in place, fully tighten all the bolts (16) to 1.2 kg-m (104 in-lbs) of torque.
- Install the camshaft chain tensioner (Pg. 60).

**NOTE:** With the camshaft chain tensioner removed, do not turn the crankshaft. This could upset the camshaft chain timing, and necessitate camshaft removal and installation again.

- To verify that the camshaft chain timing will be correct, turn the crankshaft two turns clockwise until pistons #1 and #6 are at TDC (Fig. E78), and recheck the camshaft timing. If the bottoms of both circle timing marks (on the exhaust camshaft sprocket and inlet camshaft sprocket) are level with the cylinder head cover mating surface, the camshaft chain timing is correct (See Fig. E84).

**Camshaft Chain Timing**




**WARNING** **1. Do not try to turn the crankshaft and camshafts with a wrench on the camshaft sprocket. Use a wrench on the alternator rotor bolt.**

**2. If any resistance is felt when turning the crankshaft, stop immediately. Turn the crankshaft back to the starting position, and check the three timing mark positions. If the timing is incorrect and the crankshaft is turned, the valves may be bent.**

- Check valve clearance at this time, and adjust if necessary (Pg. 12).
- Install the solenoid fuel valve (Pg. 46).
- Install the alternator cover (Pg. 85).
- Install the cylinder head cover (Pg. 65).
- Install the ignition coils (Pg. 49).
- Install the vacuum switch valve (Pg. 48).
- Connect the battery ground lead.
- Install the fuel tank (Pg. 46).
- Check ilding, and adjust the carburetors if necessary (Pg. 18).

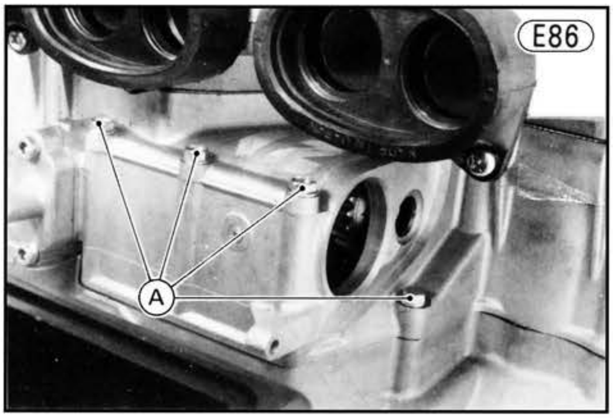
## CYLINDER HEAD

### Removal:

- Remove the fuel tank (Pg. 46).
- Remove the radiator (Pg. 55).
- Remove the radiator fan (Pg. 55).
- Remove the mufflers and exhaust pipes on both sides (Pgs. 55 and 56).
- Remove the thermostat (Pg. 63).
- Remove the vacuum switch valve (Pg. 48).
- Remove the front upper air cleaner housing (Pg. 47).
- Remove the carburetors (Pg. 49).
- Remove the two lower ignition coils (Pg. 49).
- Remove the cylinder head cover (Pg. 65).
- Remove the alternator cover (Pg. 85). Complete removal is not required, so the leads may be left connected.
- Disconnect the yellow/white water temperature sender lead.
- Remove the camshaft chain tensioner (Pg. 60).
- Remove both camshafts (Pg. 66).
- Disconnect the 6-pin connector of the pick-up coil, and free the pick-up coil leads from the cylinder block.
- Remove the radiator upper hose fitting and gasket from the cylinder head by removing the bolts.


**A. Hose Fitting**

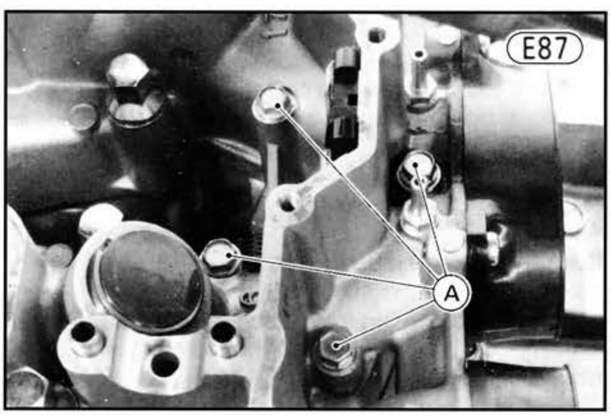
•Remove the automatic timing advancer housing (Pg. 57), and loosen the 6 mm cylinder bolts (4) at the rear side of the cylinder.




**A. Cylinder Bolts**

•Cut out a cover from a rubber plate using the pattern on Pg. 281, and stuff it in the camshaft chain tunnel so that no parts will fall into the crankcase (See Fig. B10).

•First remove the 6 mm bolts (4) in the center rear portion, and then remove the 10 mm nuts and washers (16 ea).

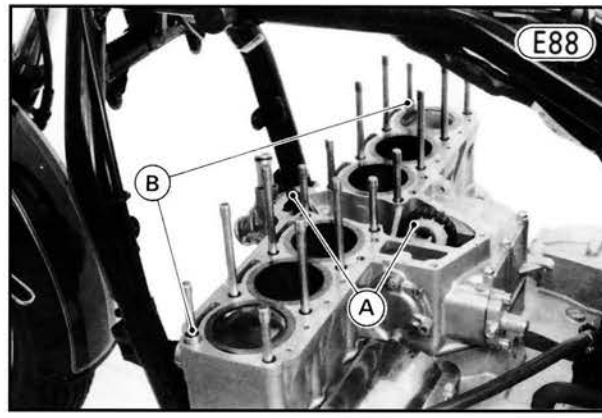



**A. Cylinder Head Mounting Bolts**

•Take off the cylinder head and gasket. There are knock pins (2) in the mating surface.

### Installation Notes:

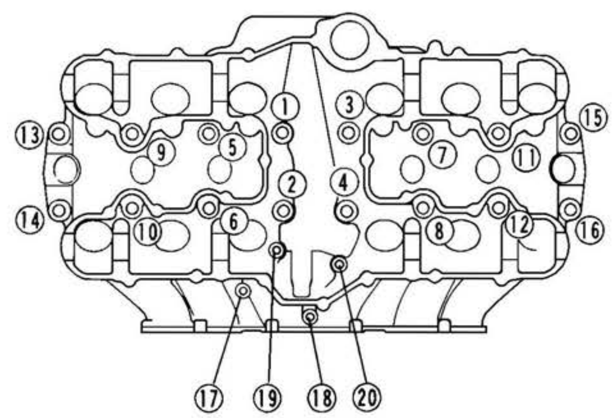
1. The camshaft caps are machined together with the cylinder head. If a new cylinder head is installed, use the caps that are supplied with the new cylinder head.
2. Be sure that the rear upper camshaft chain guide is installed in the cylinder head (Pg. 72).
3. Be sure that the camshaft chain guides (front and rear) and the knock pins (2) are in place, and install a new gasket.




**A. Camshaft Chain Guides** **B. Knock Pins**

4. First tighten the cylinder head nuts (16) to about 2.5 kg-m (18.0 ft-lbs) of torque and bolts (4) to 0.6 kg-m (52 in-lbs) of torque, and then nuts to 4.0 kg-m (29 ft-lbs) of torque and bolts to 1.0 kg-m (87 in-lbs) of torque following the tightening sequence shown in Fig. E89.

**Cylinder Head Nut and Bolt Tightening Order** E89




5. Tighten the 6 mm cylinder bolts (4) to 1.0 kg-m (87 in-lbs) of torque after tightening the cylinder head nuts and bolts.
6. Install the automatic timing advancer housing as explained in Pg. 57.
7. Thoroughly warm up the engine, wait until the engine grows cold, and retighten the cylinder head nuts and bolts to the specified torque.

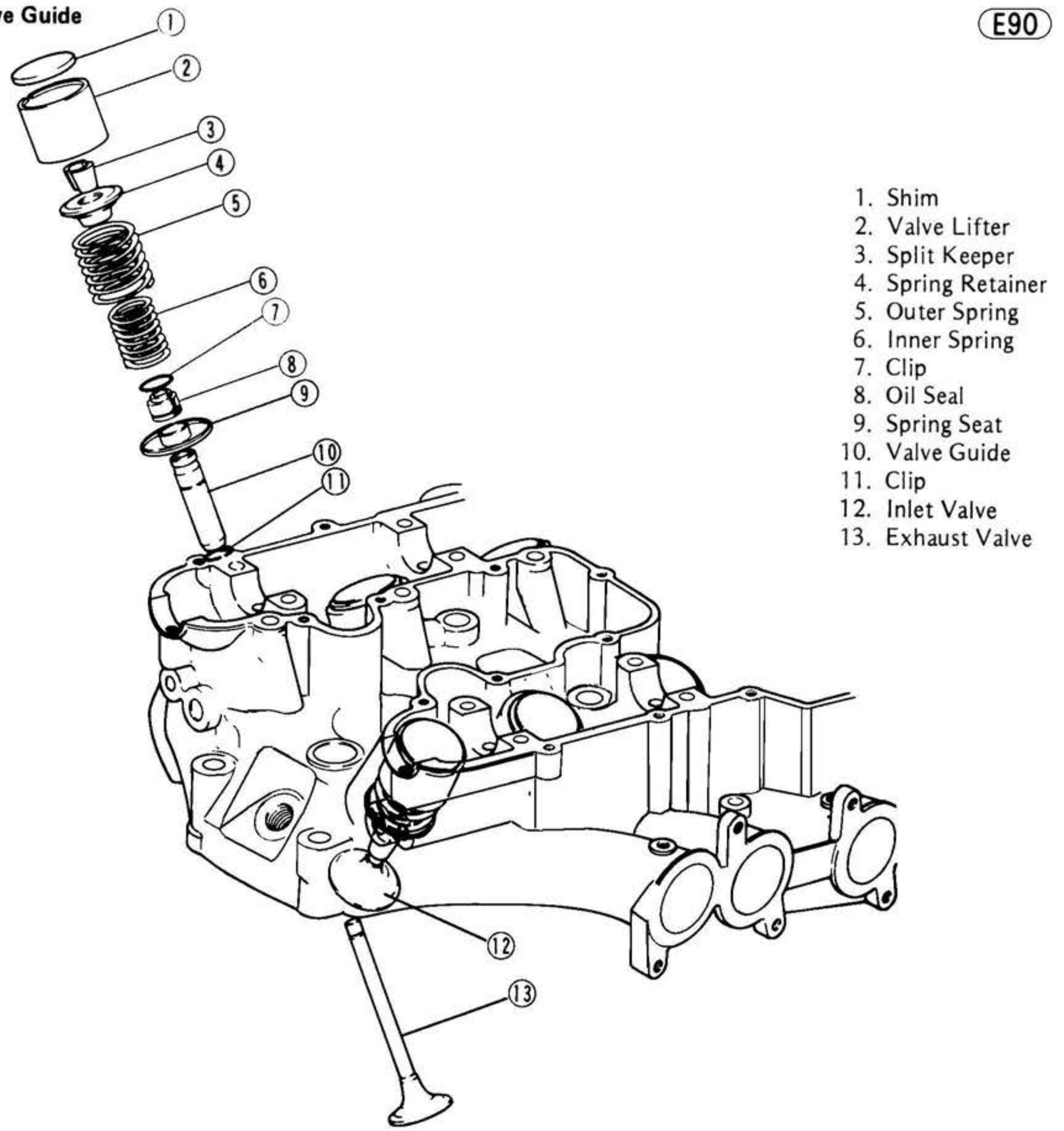
### Valves, Valve Guides Removal (each valve and valve guide):

•Pull out the valve lifters (12) and shims (12). Record their locations.

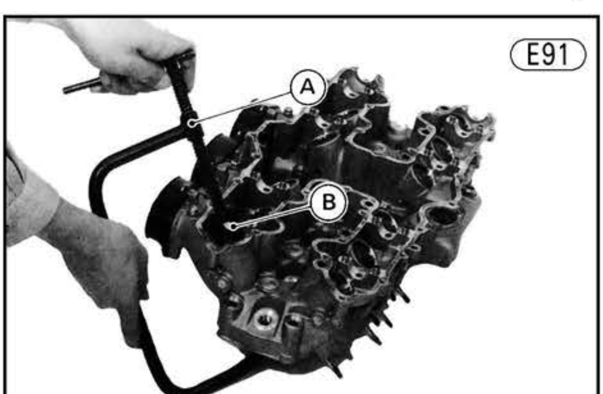
**NOTE:** If more than one valve is to be removed, mark and record their locations so they can be reinstalled in their original positions.

•Using the valve spring compressor assembly (special tool) to press down the valve spring retainer ④, remove the split keeper ③.

**Valve and Valve Guide**



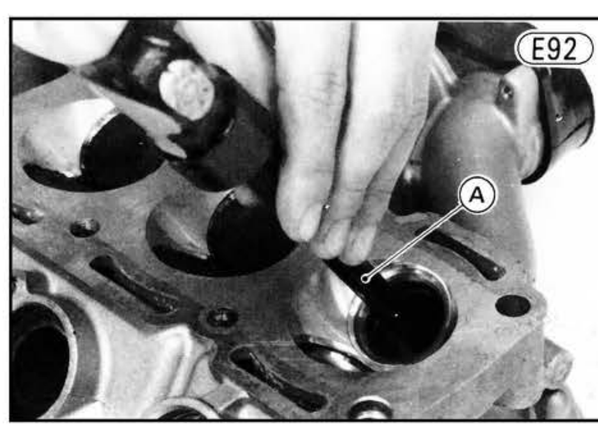

1. Shim
2. Valve Lifter
3. Split Keeper
4. Spring Retainer
5. Outer Spring
6. Inner Spring
7. Clip
8. Oil Seal
9. Spring Seat
10. Valve Guide
11. Clip
12. Inlet Valve
13. Exhaust Valve




**A. Valve Spring Compressor (57001-241)**
**B. Adapter (57001-243)**

•Remove the tool, and then remove the spring retainer ④, outer spring ⑤, and inner spring ⑥.
•Push out the valve ⑫ or ⑬.
•Remove the clip ⑦ and pull off the oil seal ⑧ using a hook.

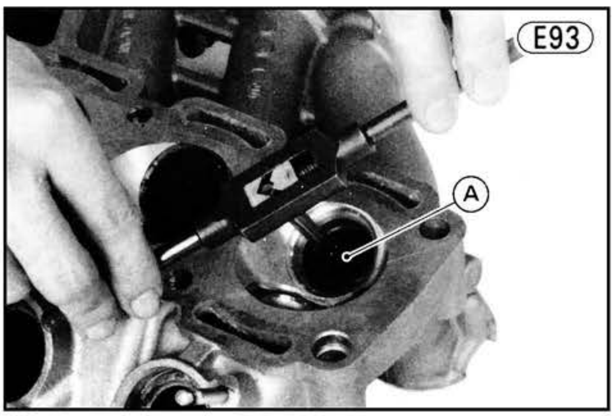
•Remove the spring seat ⑨.
•Heat the area around the guide to about 120 ~ 150°C (248 ~ 302°F), and hammer lightly on the valve guide arbor (special tool) to press out the guide toward the top of the cylinder head.




**A. Valve Guide Arbor (57001-163)**

### Valve, Valve Guide Installation (each valve and valve guide):

- Apply oil to the valve guide, and snap the circlip ⑪ into the groove on the valve guide.
- Heat the area around the valve guide hole to about 120 ~ 150°C (248 ~ 302°F), and drive the valve guide in from the top of the head using the valve guide arbor (special tool). The circlip stops the guide from going too far.
- Ream the valve guide with the valve guide reamer (special tool) even if the old guide is reused.



**A. Valve Guide Reamer (57001-162)**

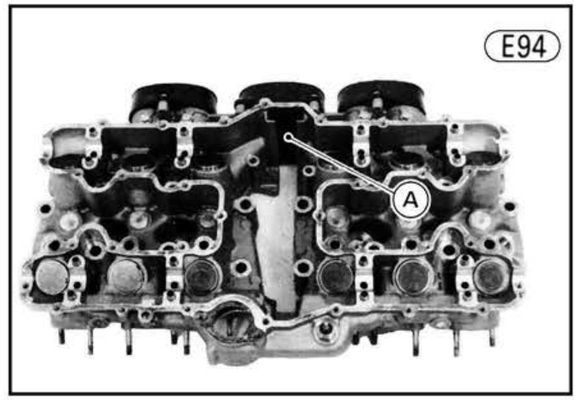
- Lap the valve to check that it is seating properly. If it is uneven, refer to the Maintenance Section (Pg. 177).
- Push a new oil seal into place, and install its clip.
- Apply a thin coat of molybdenum disulfide engine assembly grease to the valve stem. Insert the valve, and install the spring seat and the outer and inner springs.
- Install the spring retainer, press it down with the valve spring compressor assembly (special tool), and put on the split keeper.
- After making sure that the split keeper, spring retainer, and valve stem are all properly fitted, remove the valve spring compressor assembly.
- Apply engine oil to the valve lifters and shims and mount them in their original locations.

## CAMSHAFT CHAIN GUIDES

### Rear Upper

### Removal:

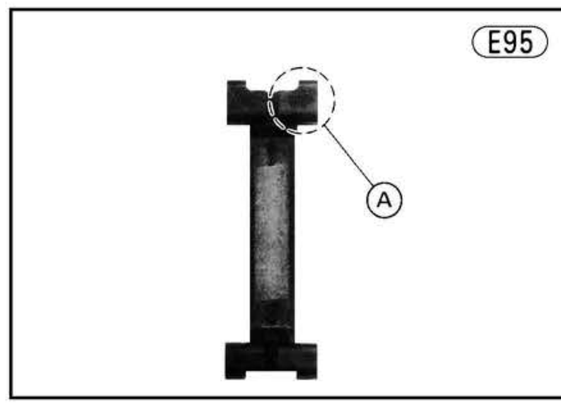
- Remove the cylinder head (Pg. 69).
- Remove the guide from the cylinder head.



**A. Rear Upper Camshaft Chain Guide**

### Installation Note:

- Install the guide with the end marked "UP" facing upwards.

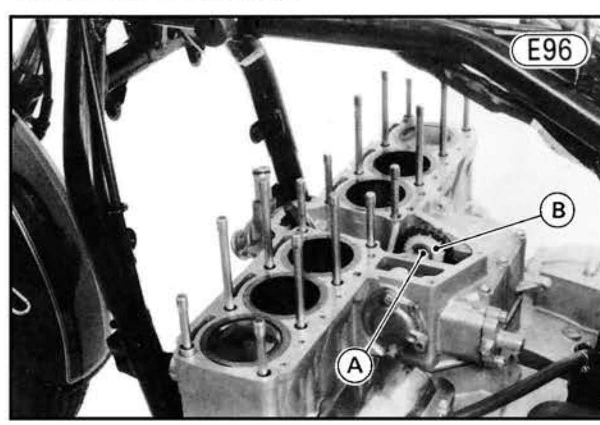


**A. "UP" Mark**

### Rear Lower

### Removal:

- Remove the cylinder head (Pg. 69).
- Remove the rubber dampers, pull the sprocket shafts, and remove the sprocket.

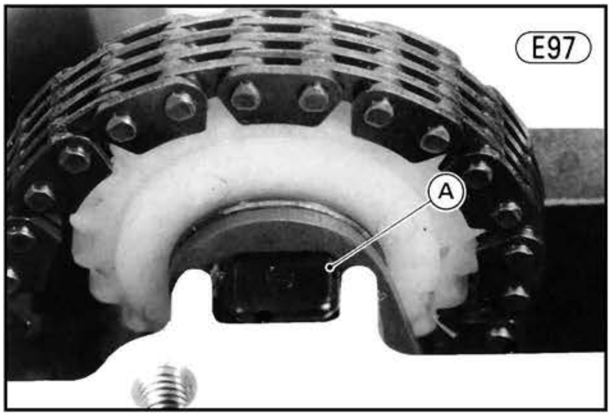


**A. Rubber Damper** **B. Sprocket**

- Move the camshaft chain forward, and take out the guide holder.
- Take off the circlip, and remove the roller shaft and the roller from the guide.

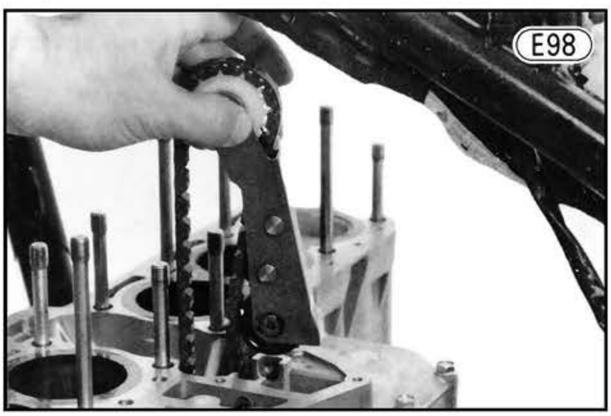
### Installation Notes:

1. Install the rubber dampers on the sprocket shaft ends using a suitable adhesive. Install the sprocket shaft in the cylinder with the rubber damper facing upwards.




**A. Rubber Damper**

2. If the shafts and/or guide sprockets are replaced with new ones, apply engine oil to them.
3. Don't forget to run the camshaft chain between the sprocket and the holder.

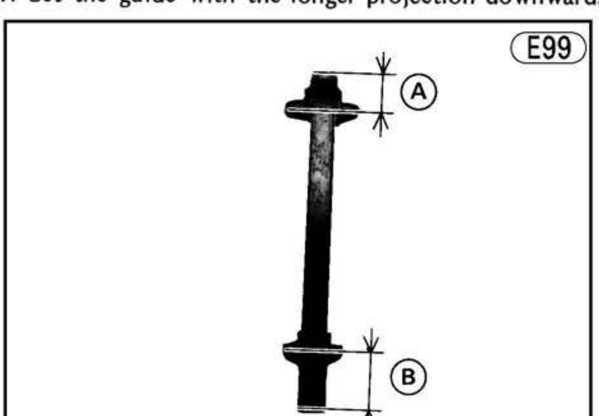



### Front
### Removal:

•Remove the cylinder head (Pg. 69).
•Take out the guide.

### Installation Notes:

1. Set the guide with the longer projection downward.

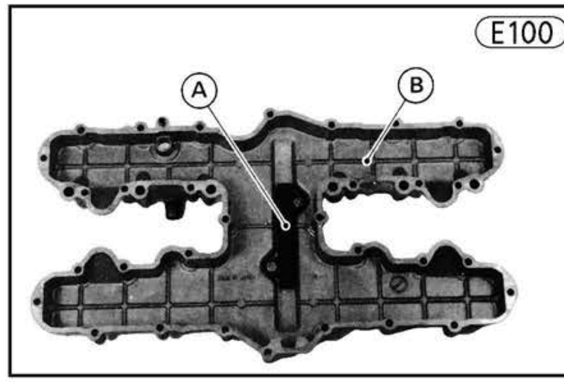



**A. Short** **B. Long**

2. When setting the lower projections of the guide into the grooves of the crankcase, it is easier to set the right side first.

### Upper
### Removal:

•Remove the cylinder head cover, unscrew the nuts (2), and remove the guide.




**A. Guide** **B. Cylinder Head Cover**

### Installation Note:

•If the screws are replaced with new ones, apply a non-permanent locking agent to the threads. Don't apply any on the lower half of the threads, where the chain guide mounting nuts will be screwed on.

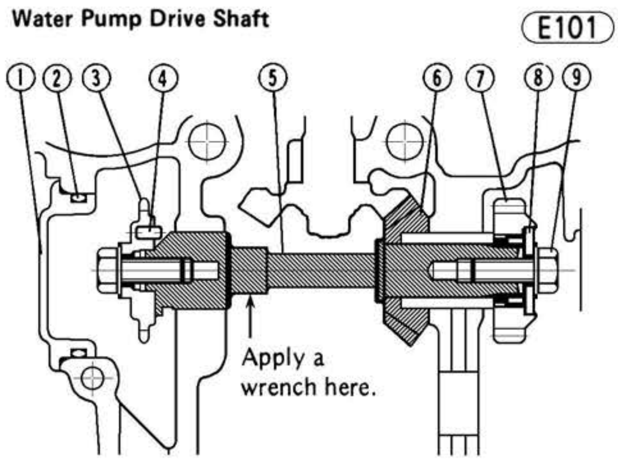
## CYLINDER BLOCK
### Removal:

•Remove the fuel tank (Pg. 46).
•Remove the radiator (Pg. 55).
•Remove the radiator fan (Pg. 55).
•Remove the mufflers and exhaust pipes on both sides (Pgs. 55 and 56).
•Remove the thermostat (Pg. 63), and pull off the bypass pipe.
•Remove the vacuum switch valve (Pg. 48).
•Remove the front upper air cleaner housing (Pg. 47).
•Remove the carburetor (Pg. 49).
•Remove the two lower ignition coils (Pg. 49).
•Remove the cylinder head cover (Pg. 65).
•Remove the alternator cover (Pg. 85). Complete removal is not required, so the leads may be left connected.
•Remove the solenoid fuel valve (Pg. 46).
•Remove the camshaft chain tensioner (Pg. 60).
•Remove both camshafts (Pg. 66).
•Remove the cylinder head (Pg. 69).

**NOTE:** Unscrew the 6 mm cylinder bolts (4) at the rear side of cylinder before removing the cylinder head nuts (16).

- Remove the camshaft chain guides (Pg. 72).
- Remove the timing chain tensioner (Pg. 60).
- Remove the bolts (2), and take off the starter motor cover.
- Remove the Allen bolts (2), and pull off the cover of timing chain sprocket. There is an **O** ring on the sprocket cover.

**Water Pump Drive Shaft**



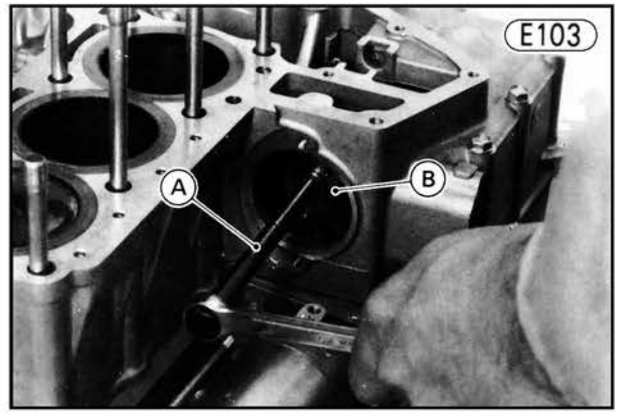

1. Sprocket Cover
2. **O** Ring
3. Timing Chain Sprocket
4. Pin
5. Water Pump Drive Shaft
6. Water Pump Drive Gear
7. Timing Advancer Drive Gear
8. Washer
9. Bolt

- With a 12 mm open end wrench on the water pump drive shaft to keep the shaft from turning, remove the bolts from both ends of the shaft, and take off the timing chain sprocket.

**NOTE:** To remove the sprocket from the shaft, insert a 10 mm diameter bolt (with 1.25 mm pitch threads) about 15 mm long. There is a knock pin on the sprocket.

**CAUTION** **Do not use an open end wrench on the water pump shaft when loosening or tightening the gear and sprocket bolts. This is to prevent the plastic bevel gear from being damaged.**


A. 12 mm Wrench




**A. Screw in a 10 mm diameter bolt.**
**B. Timing Chain Sprocket**

- Pull out the water pump drive shaft toward the left.
- Remove the bolts (4), and remove the cylinder block, gasket, and **O** rings (4). There are knock pins (2) at the cylinder base.

**NOTE:** Place the cylinder upside down on the work bench. This is to prevent the cylinder sleeves from being pushed out by weight of the block. Each cylinder sleeve is press-fitted lightly.

- Wrap a clean cloth around the base of each piston so that no parts or dirt will fall into the crankcase.

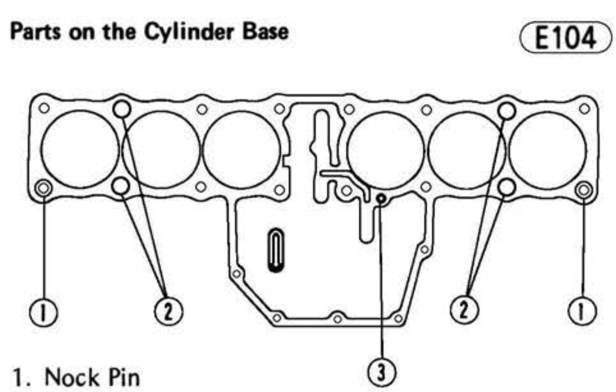
## Installation:

- If the cylinder block is replaced with a new one, piston-to-cylinder clearance must be checked against the specified value (Pg. 183).
- With compressed air, blow the oil and coolant passages to remove dirt or particles which may obstruct oil or coolant flow.
- Remove the cloth from under each piston.
- Check to see that the water pump shaft is assembled into the cylinder block (Pg. 76).
- Be sure that the knock pins (2) and oil passage nozzle are in place.

**NOTE:** Check to see that the oil passage nozzle does not protrude from the mating surface.

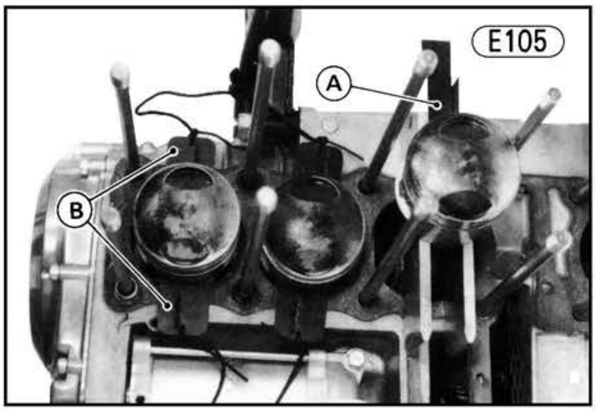
- On each side, put new **O** rings (4) at the second tension studs from the end.

**Parts on the Cylinder Base**




1. Nock Pin
2. **O** Rings
3. Oil Passage Nozzle

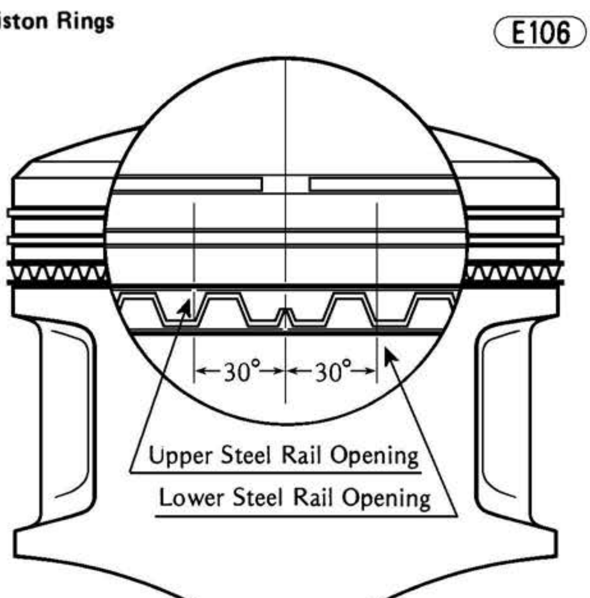
- Install a new cylinder base gasket.
- Lifting up the camshaft and timing chains so they do not get caught, turn the crankshaft so that #3 and #4 pistons are at T.D.C. position.
- Using the piston bases (special tools) at the bottom of pistons, hold the pistons level during cylinder installation. For each piston of #1, 2, 5, and 6 pistons, insert the piston holders at the front and the rear of the piston.



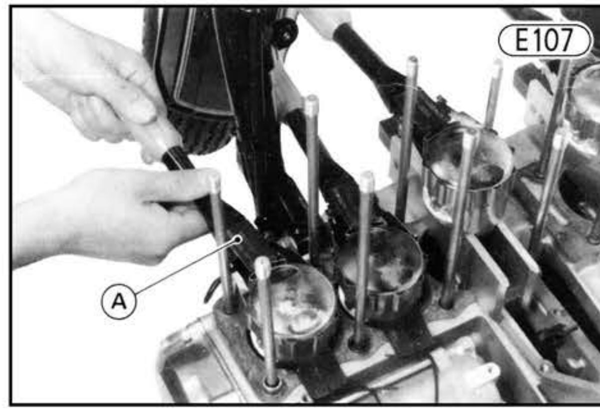

**A. Piston Base (57001-1038)**
**B. Piston Holder (57001-1030)**

- Position each piston ring so that the opening in the top and the oil ring expander of each piston is facing forward, and the second ring opening faces the rear. The openings of the oil ring steel rails must be positioned so that one is about 30° on one side of the opening of the expander, and the other about 30° on the other side of the expander opening.

**Piston Rings**




- Apply engine oil to the piston rings and the cylinder inside surfaces. If the pistons and/or cylinder block are replaced, apply a thin coat of a molybdenum disulfide engine assembly grease on the new pistons and cylinder bores.
- Compress the piston rings using the piston ring compressor (special tools).

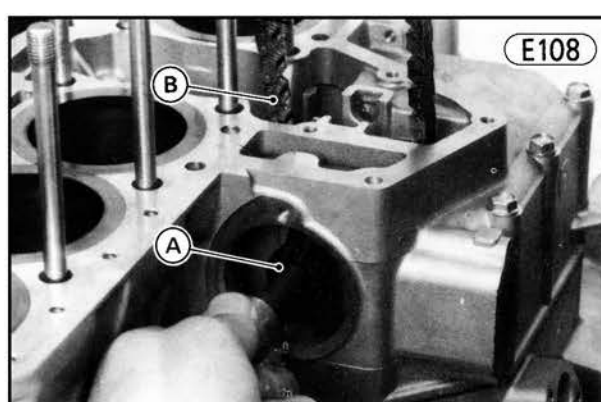



**A. Piston Ring Compressor (57001-921)**

- Set the cylinder block on the #3 and #4 pistons, and press down the cylinder block little by little while keeping it level. After the cylinder sleeves slide over the piston rings, remove the special tools from the #3 and #4 pistons.

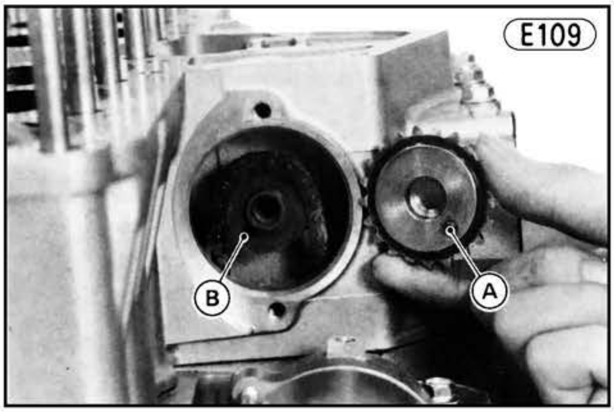
**CAUTION** **If the pistons cock at an angle and the piston rings slip out of the piston ring compressors before the cylinder sleeves slide over the rings, reset the piston ring compressor to compress the rings. Otherwise the piston rings will be broken.**

- Continue pressing down the cylinder block until it passes over the piston rings of #1, 2, 5, and 6 pistons, and remove the special tools.
- Press down the cylinder block completely until it seats closely on the crankcase.
- Install and tighten four cylinder bolts to 1.0 kg-m (87 in-lbs) of torque.
- Apply a molybdenum disulfide engine assembly grease to the water pump drive shaft, and insert it through the timing and camshaft chain loops.




**A. Timing Chain** **B. Camshaft Chain**

- Engage the timing chain on the sprocket, and fit the sprocket on the shaft, matching its knock pin with the notch in the shaft end. Finger-tighten the bolt.

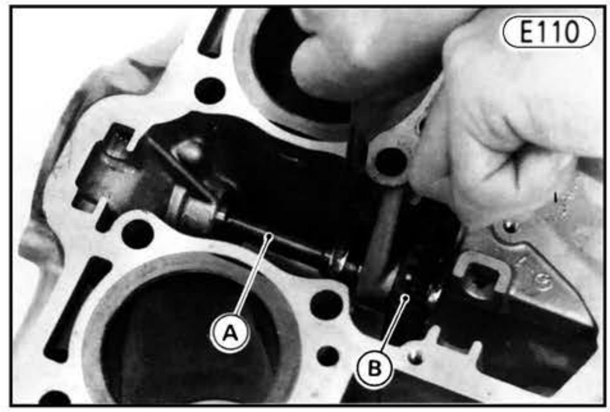



A. Knock Pin B. Notch

•Finger-tighten the timing advancer drive gear mounting bolt.
•Tighten both sprocket and gear mounting bolts to 2.0 kg-m (14.5 ft-lbs) of torque, keeping the water pump drive shaft from turning with a 12 mm wrench on the shaft.
•Apply a little engine oil to the **O** ring on the cover, and install the timing chain sprocket cover with the Allen bolts (2).
•Install the starter motor cover with the bolts (2).
•Install the timing chain tensioner (Pg. 61).
•Install the camshaft chain guides (Pg. 72).
•Install the cylinder head (Pg. 70).
•Install the camshafts (Pg. 66).
•Install the camshaft chain tensioner (Pg. 60).
•Install the cylinder head cover (Pg. 65).
**NOTE**: Check valve clearance (Pg. 12), and adjust if necessary before the cylinder head cover is installed.
•Install the timing advancer housing (Pg. 57).
•Install the alternator cover (Pg. 85).
•Install the ignition coils (Pg. 49).
•Install the carburetors (Pg. 50).
•Install the air cleaner housing (Pg. 47).
•Install the vacuum switch valve (Pg. 48).
•Install the thermostat (Pg. 63).
•Install the mufflers and exhaust pipes (Pgs. 55 and 56).
•Install the radiator fan (Pg. 55).
•Install the radiator (Pg. 55).
•Install the fuel tank (Pg. 46).
•Adjust the throttle cables (Pg. 14).
•Fill the cooling system with coolant, and bleed air from the system (Pg. 22).
•Check idling, and adjust the carburetors if necessary (Pg. 18).

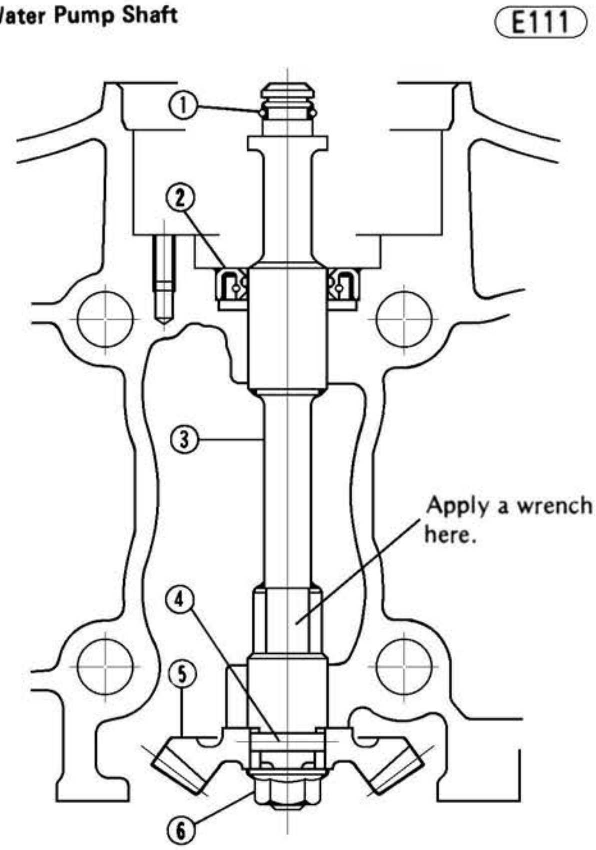
## Cylinder Block Disassembly:

•Remove the water pump impeller and mechanical seal (Pg. 61).
•With a 12 mm open end wrench on the water pump shaft to keep the shaft from turning, remove the nut and water pump bevel gear.




A. Water Pump Shaft B. Water Pump Bevel Gear

**Water Pump Shaft**

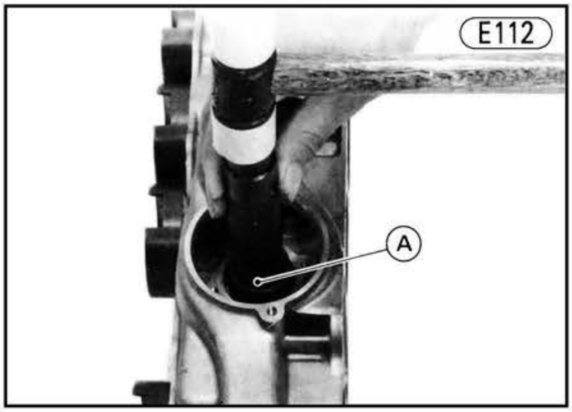



1. **O** Ring
2. Oil Seal
3. Water Pump Shaft
4. Pin
5. Bevel Gear
6. Nut

•Push out the pin from the water pump shaft at the bevel gear, and pull out the shaft toward the water pump.
•Remove the pump shaft oil seal by using a hook.
•Pull out the water pump drive bevel gear (plastic), and the timing advancer drive gear will fall off.

## Cylinder Block Assembly Notes:

1. Install the oil seal of the water pump shaft using the driver (special tool).

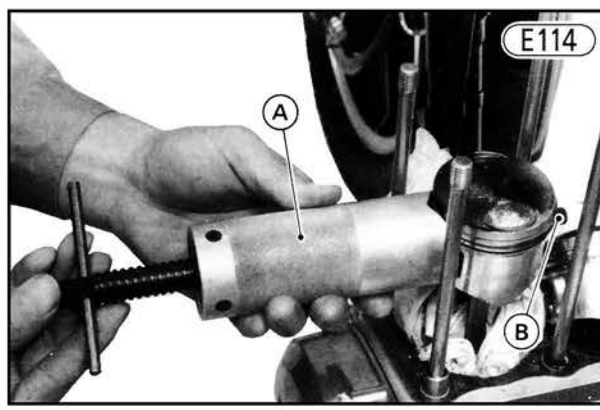



**A. Driver (57001-286)**

2. The tightening torque for the bevel gear mounting nut is 2.0 kg-m (14.5 ft-lbs).

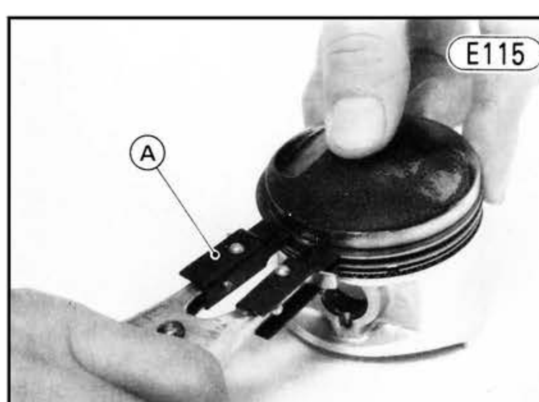

**A. Snap Ring**

•Remove each piston by pushing its piston pin out the side that the snap ring was removed. Use the piston pin puller and adapter "B" (special tools) if necessary.



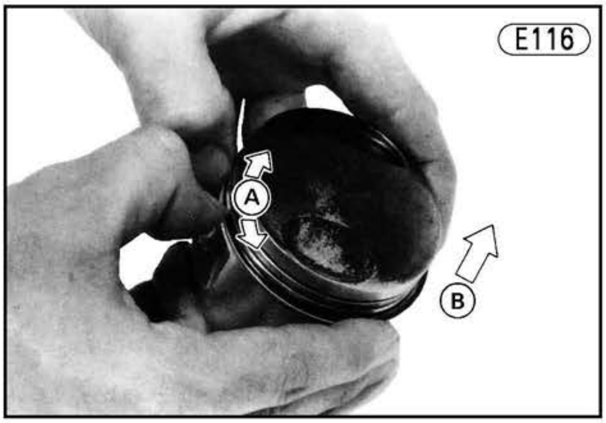

**A. Piston Pin Puller (57001-910)**
**B. Adapter "B" (57001-913)**

•Remove the top and second rings with the piston ring pliers (special tool). To remove a ring by hand, spread the ring opening with both thumbs, and then push up on the opposite side.




**A. Piston Ring Pliers (57001-115)**

## PISTONS, PISTON RINGS
### Removal:
•Remove the fuel tank (Pg. 46).
•Remove the radiator (Pg. 55).
•Remove the radiator fan (Pg. 55).
•Remove the mufflers and exhaust pipes on both sides (Pgs. 55 and 56).
•Remove the thermostat (Pg. 63).
•Remove the vacuum switch valve (Pg. 48).
•Remove the upper front air cleaner housing (Pg. 47).
•Remove the carburetors (Pg. 49).
•Remove the two lower ignition coils (Pg. 49).
•Remove the cylinder head cover (Pg. 65).
•Remove the alternator cover (Pg. 85). Complete removal is not required, so the leads may be left connected.
•Remove the camshaft chain tensioner (Pg. 60).
•Remove both camshafts (Pg. 66).
•Remove the cylinder head (Pg. 69).
•Remove the camshaft chain guides (Pg. 72).
•Remove the timing advancer housing (Pg. 57).
•Remove the timing chain tensioner (Pg. 60).
•Remove the solenoid fuel valve (Pg. 46).
•Remove the cylinder block (Pg. 73).
•Wrap a clean cloth around the base of each piston to secure it in position for removal and so that no parts or dirt will fall into the crankcase.
•Remove the piston pin snap ring from the outside of each piston.



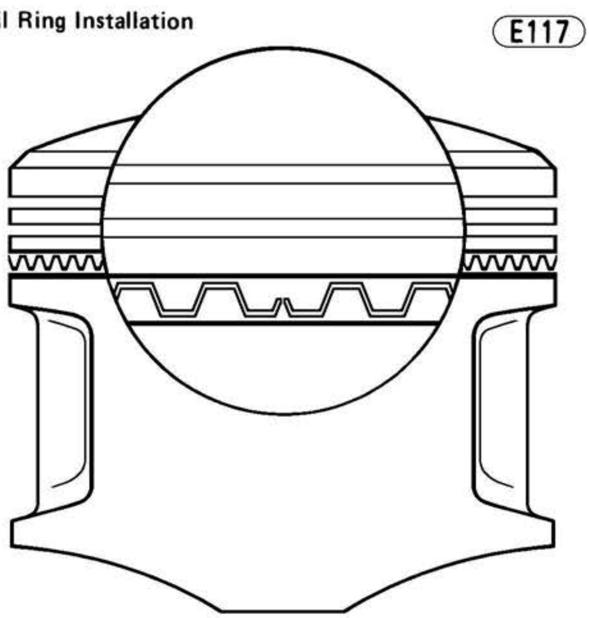

A. First, spread the opening.
B. Second, push up on the opposite.

•Remove the upper and lower piston ring steel rails, and then remove the expander.

## Installation Notes:

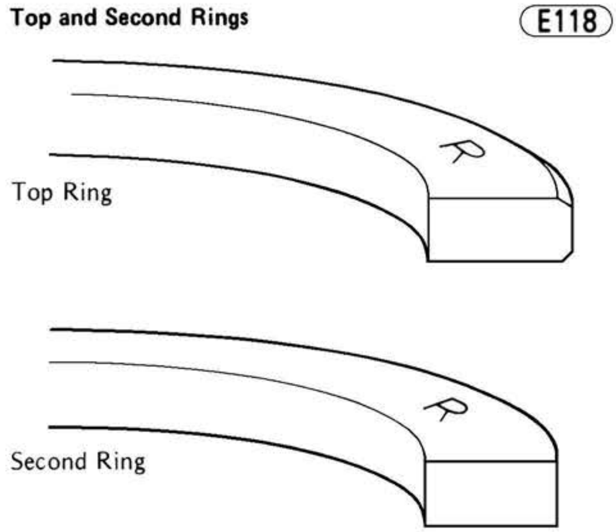
1. If the piston is replaced with a new one, check that piston-to-cylinder clearance has the specified value (Pg. 183). Also, when a new piston or piston pin is installed, check that the piston-to-pin clearance has the specified value (Pg. 185).
2. To install the oil ring, first install the expander so that the expander ends butt together, and then install the upper and lower steel rails. There is no "up" or "down" to the rails: they can be installed either way.

**Oil Ring Installation**

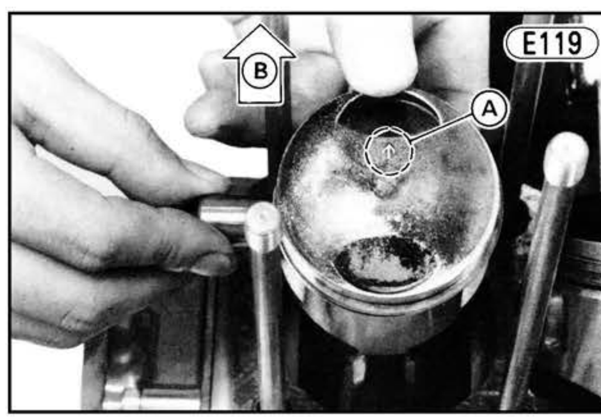



3. Install the second and top rings so that "R" mark faces up. Do not mix up the top and second rings. The outer edges of the top ring are chamfered; the edges of the second ring are not chamfered.

**Top and Second Rings**




4. Install the piston on the connecting rod so that the arrow on the top of each piston points towards the front, and fit a new piston pin snap ring into the side of each piston. Removal weakens and deforms the snap ring. Check that a snap ring is installed on each side of every piston.




A. Arrow Mark B. Front

## CRANKCASE STUDS

### Removal:

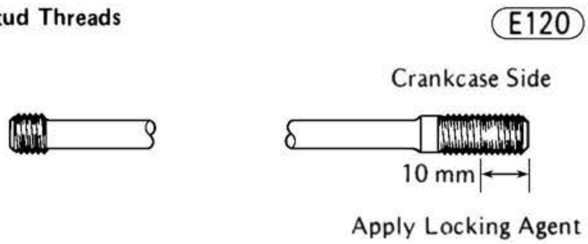
•Remove the cylinder block (Pg. 73).
•Remove the studs using a stud wrench.

### Installation Notes:

1. The ends having the longer threads are on the crankcase side. Apply a non-permanent locking agent to the threads on the crankcase side.

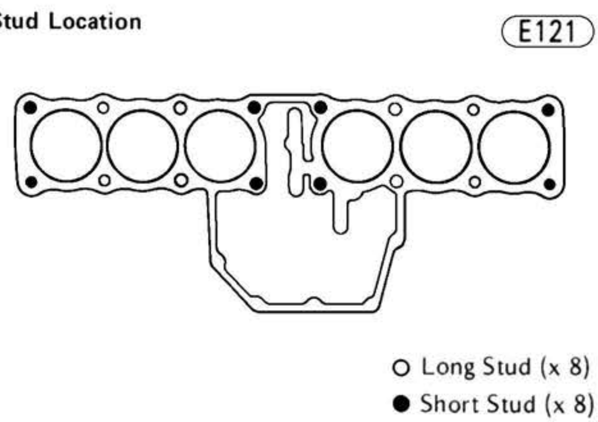
**CAUTION** So that no locking agent will clog up the oil passage, apply locking agent only on the area within 10 mm from the stud end.

**Stud Threads**




2. The figure below shows stud location. Screw the long studs (218 mm length) into the threaded holes marked with a circle (○), and the short studs (176 mm length) into the places marked with a dot (●). Wipe clean the excess locking agent that adheres to the mating surface.

**Stud Location**



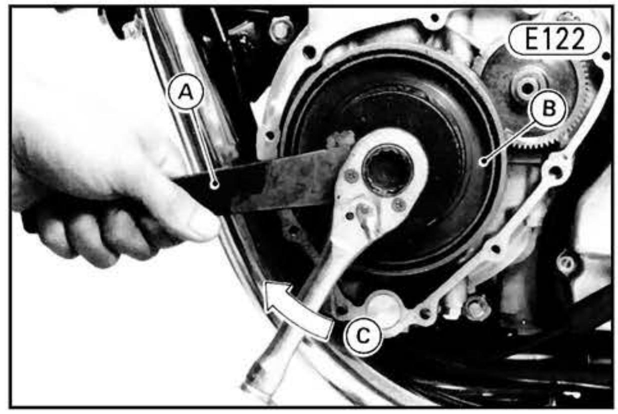

3. Tighten the studs to 0.90 kg-m (78 in-lbs) of torque.

## TORSION DAMPER, STARTER MOTOR CLUTCH

### Removal:

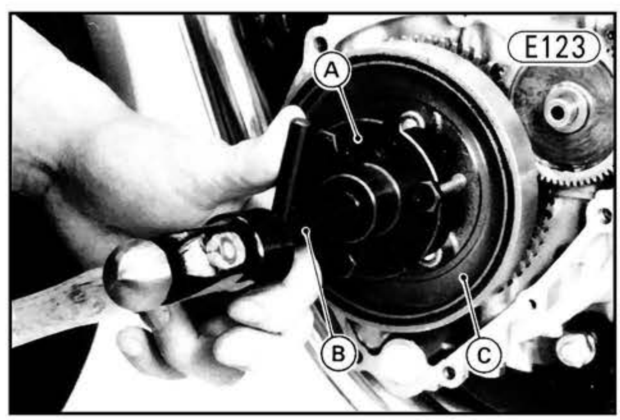
- Set the motorcycle up on its center stand and put an oil pan beneath the left engine cover.
- Unscrew the left engine cover Allen bolts (10) and remove the cover.
- Holding a torsion damper with the holder (special tool), remove the torsion damper mounting bolt and washer.

**NOTE:** The bolt is a left hand thread and must be turned clockwise.




**A. Holder (57001-1037)**
**B. Torsion Damper**
**C. Turn clockwise to loosen.**

- Pull out the torsion damper and starter motor clutch assembly using the pullers (special tools). Be careful not to drop the reduction gear and/or starter clutch gear.



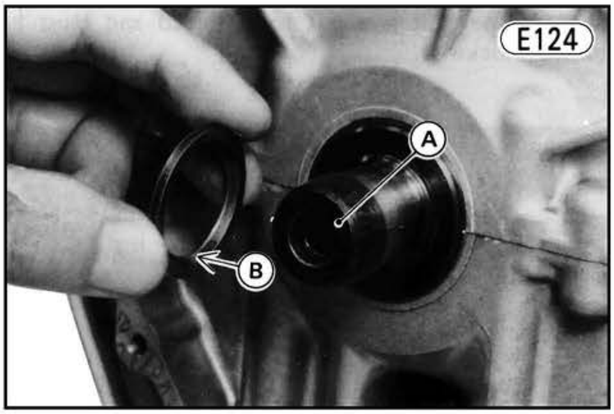

**A. Magneto Puller (57001-259)**
**B. Rotor Puller (57001-1016)**
**C. Torsion Damper**

- Remove the starter clutch gear, washers (2), reduction gear, and its shaft.

### Installation:

- Using a high flash-point solvent, clean off any oil or dirt that may be on the crankshaft taper and torsion damper tapered hole.
- Install the thrust washer, starter clutch gear, thrust washer, and torsion damper while turning it counterclockwise.

**NOTE:** Be sure to place the chamfered side of the inner thrust washer toward the inside so that the washer will fit on the crankshaft.




**A. Crankshaft** **B. Chamfer faces in.**

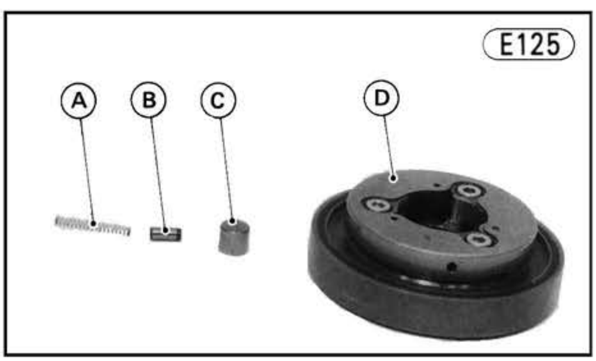
- Install a washer and torsion damper mounting bolt, and torque the bolt to 7.0 kg-m (51 ft-lbs).
- Install the left engine cover with the Allen bolts (10).

**NOTE:** Check that the two knock pins are in place.

- Check the engine oil level (Pg. 21) and add oil if insufficient.

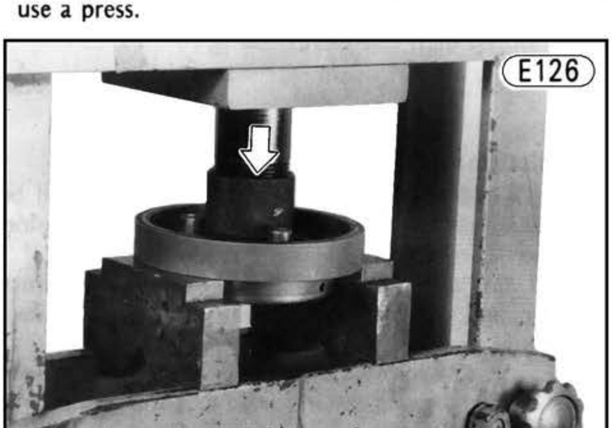
### Disassembly:

- Remove the rollers, springs, and spring caps (3 ea) from the starter motor clutch.

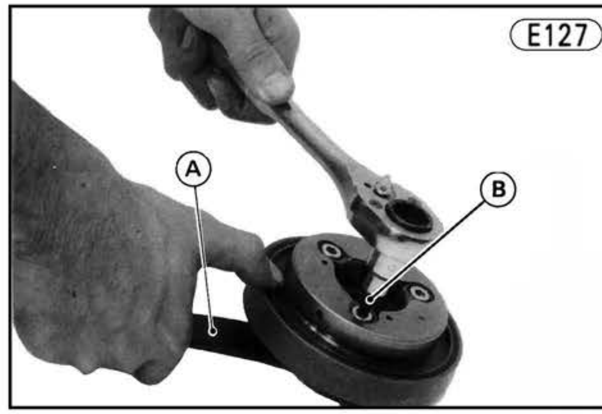



**A. Spring** **C. Roller**
**B. Spring Cap** **D. Starter Motor Clutch**

- To separate the inner torsion damper from outer one, use a press.




- Holding the torsion damper with the holder (special tool), remove the Allen bolts (3) to separate the damper and starter motor clutch.




**A. Holder (57001-1037)** **B. Allen Wrench**

- Remove the steel plate from the damper.

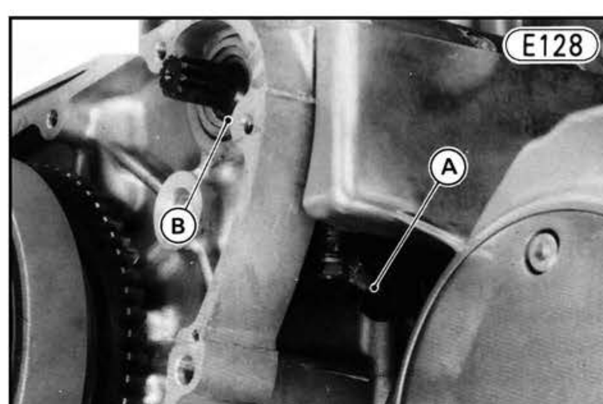
### Assembly Notes:

1. Press the inner torsion damper into the outer one, being careful not to become sideways.
2. Apply a molybdenum disulfide engine assembly grease to the underside of each Allen bolt head, and tighten them to 3.9 kg-m (28 ft-lbs) of torque.

## STARTER MOTOR

### Removal:

- Unscrew the Allen bolts (10), remove the left engine cover, and remove the starter motor reduction gear.
- Remove the bolts (2) and the starter motor cover.
- Unscrew the nut and disconnect the starter motor lead.

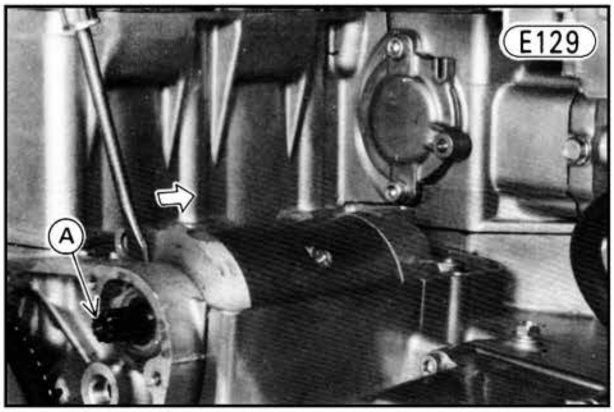



**A. Starter Motor Lead** **B. Starter Motor**

- Remove the starter motor mounting bolts (2).

•Pry the starter motor loose from the crankcase with a screwdriver. Slide the starter motor off towards the right side of the engine, and then lift it upwards.

**CAUTION** **Do not tap on the starter motor shaft or body. Tapping on the motor may damage it.**




**A. Do not tap on the shaft or body to remove the starter motor.**

### Installation Notes:

1. Clean the contact portions of starter motor and crankcase where the starter motor is grounded.
2. Replace the **O** ring with a new one if it is deteriorated or damaged. Apply a little oil to it.
3. Torque the starter motor retaining bolts (2) to 1.0 kg-m (87 in-lbs) and the nuts of starter lead to 0.5 kg-m (43 in-lbs).
4. Check the oil level and add oil (Pg. 21).

### Disassembly:

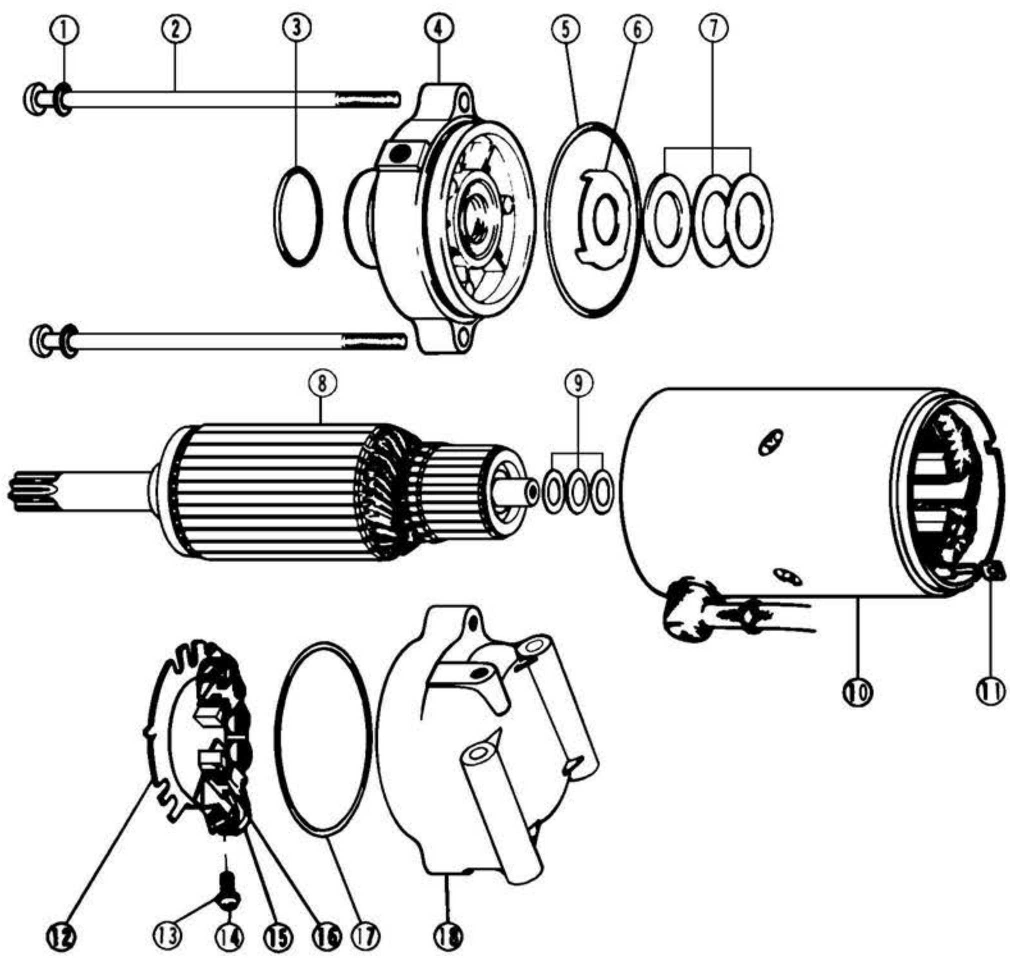
•Remove the screws ② (2), lockwashers ① (2), and remove one end cover ⑱, **O** ring ⑰, and shims ⑨.
•Remove the screw ⑭ which connects the brush lead ⑮ to the field coil lead ⑪, and remove the brush plate ⑫ and brushes ⑯. The screw has a lockwasher.
•Take off the other end cover ④ and **O** ring ⑤, and remove the yoke assembly ⑩ and armature ⑧. There are shims ⑦ and a toothed washer ⑥ on this side of the armature shaft.

**NOTE**: The yoke assembly ⑩ is not meant to be disassembled.

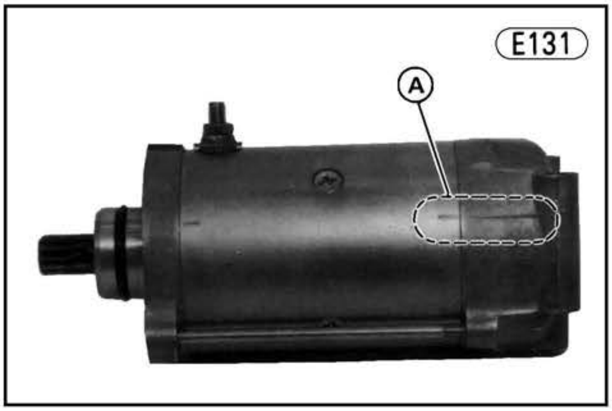
### Assembly Notes:

1. Replace any **O** rings that are deteriorated or damaged.
2. Align the line on the end cover with the line on the housing. See Fig. E131.

**Starter Motor**

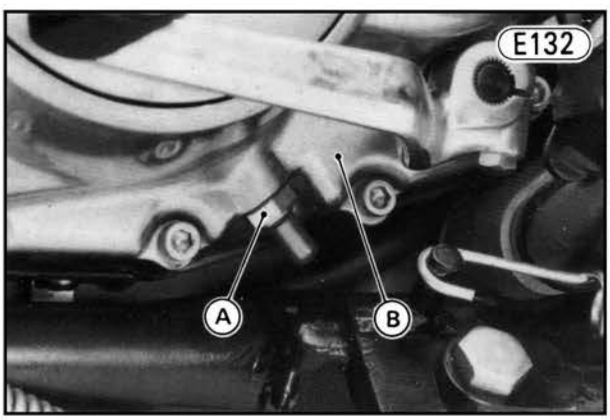



1. Lockwasher
2. Screw
3. **O** Ring
4. End Cover
5. **O** Ring
6. Toothed Washer
7. Shims
8. Armature
9. Shims
10. Yoke Assembly
11. Field Coil Lead
12. Brush Plate
13. Lockwasher
14. Screw
15. Brush Lead
16. Brush
17. **O** Ring
18. End Cover




A. Align the lines.

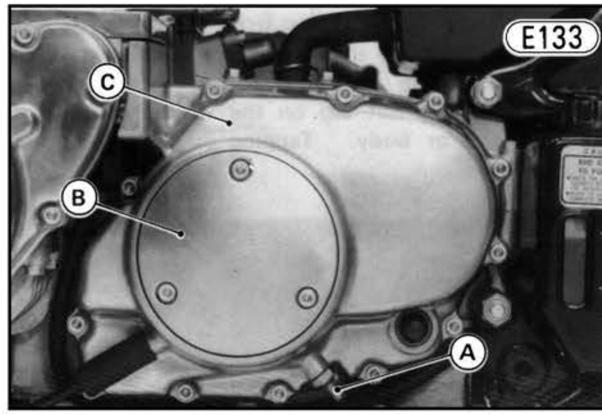
## NEUTRAL SWITCH
### Removal:
- Set the motorcycle on its center stand and drain the engine oil (Pg. 21)
- Disconnect the neutral switch lead and unscrew the switch.




A. Neutral Switch
B. External Shift Mechanism Cover

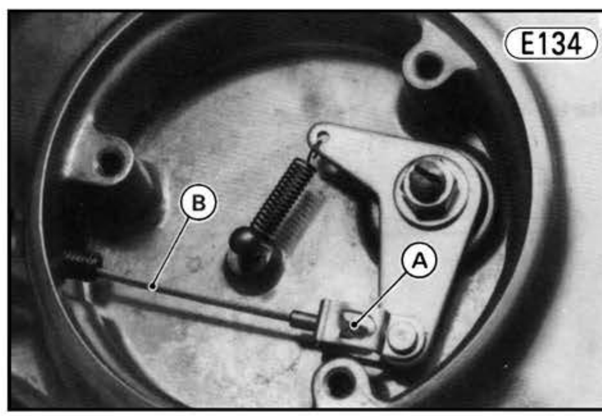
### Installation Notes:
1. Torque the switch to 1.5 kg-m (11.0 ft-lbs).
2. Fill the engine oil (Pg. 21).

## EXTERNAL SHIFT MECHANISM COVER
### Removal:
- Set the motorcycle up on its center stand.
- Drain the engine oil (Pg. 21).
- Remove the left footpeg bolt, flat washer, lockwasher, and left footpeg.
- Take out the shift pedal bolt, and remove the shift pedal.
- Detach the neutral switch lead at the bottom of the external shift mechanism cover.



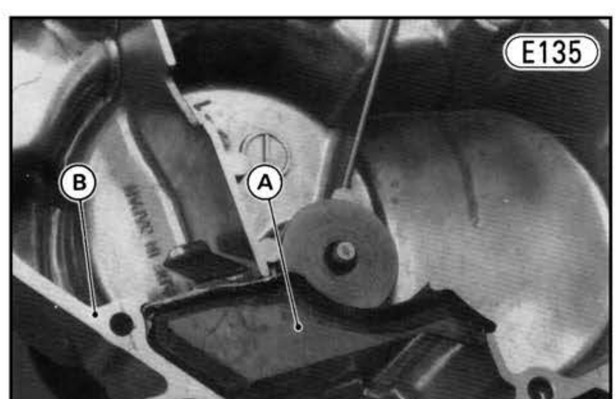

A. Neutral Switch Lead
B. Clutch Adjusting Cover
C. External Shift Mechanism Cover

- Take out the bolts (2), and remove the starter cover.
- Remove the clutch adjusting cover Allen bolts (3) and the cover.
- Unscrew the Allen bolts (12) of the external shift mechanism cover, and remove the cover.
- Pry open the tab that holds the tip of the clutch cable in place, and free the tip of the cable from the clutch release lever.



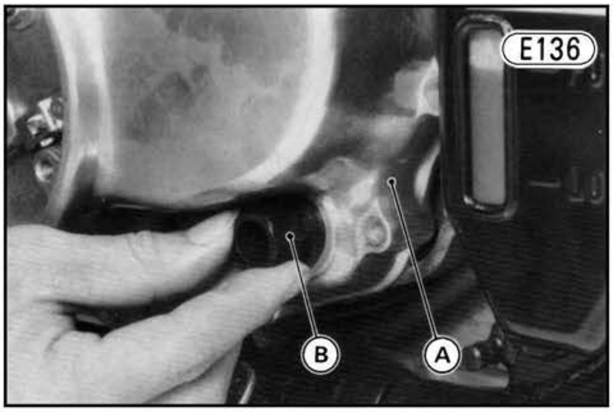

A. Tab B. Clutch Cable

### Installation Notes:
1. Check that the baffle plate is set in the external shift mechanism cover correctly. The knock pins (2) must be in place before installing the cover.



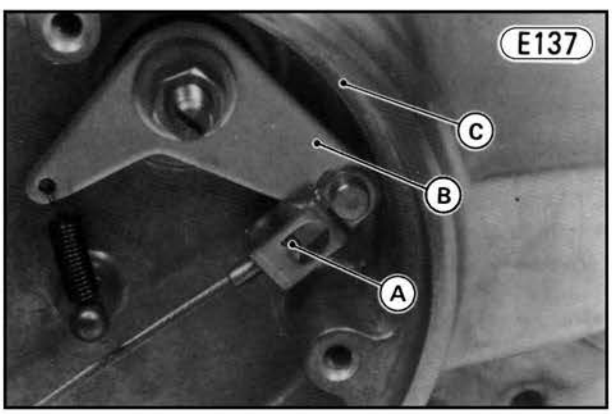

A. Baffle Plate B. External Shift Mechanism Cover

2. Check that the clutch release is set in place.
3. Use the shift shaft oil seal guide (special tool) when installing the external shift mechanism cover.




**A. External Shift Mechanism Cover**
**B. Shift Shaft Oil Seal Guide (57001-264)**

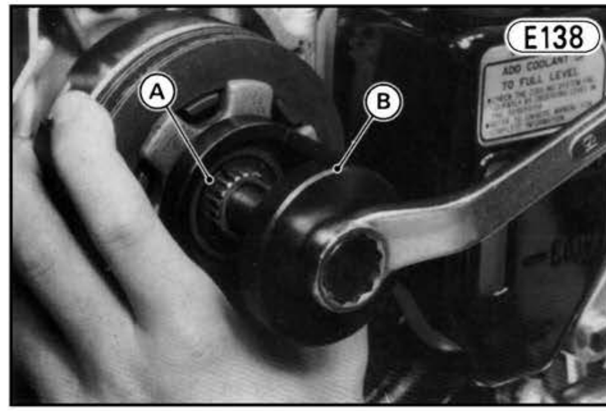
4. Bend the tab of the clutch release lever to secure the cable tip.




**A. Tab**
**B. Clutch Release Lever**
**C. External Shift Mechanism Cover**

5. Check and adjust the clutch (Pg. 20).
6. Fill the engine oil. (Pg. 21).

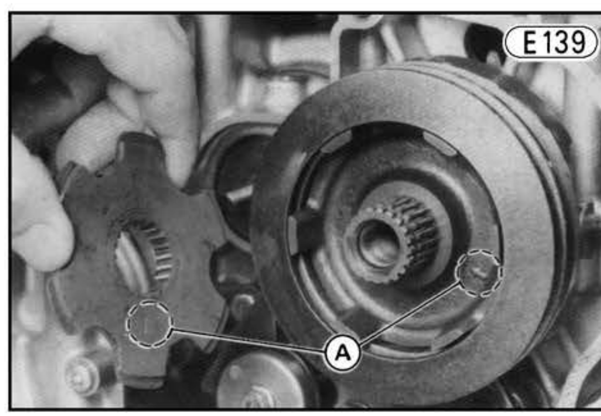
## DRIVEN SHAFT CAM DAMPER
### Removal:
- Disconnect the battery ground lead from the battery.
- Remove the external shift mechanism cover (Pg. 82).
- Using the cam damper compressor "B" (special tool), remove the retainers (2).




**A. Retainers**
**B. Cam Damper Compressor "B" (57001-1042)**

- Pull off the shims, spring stop, damper springs (4), and damper cam.
- Take out the circlip, shims, washer, and damper cam follower.

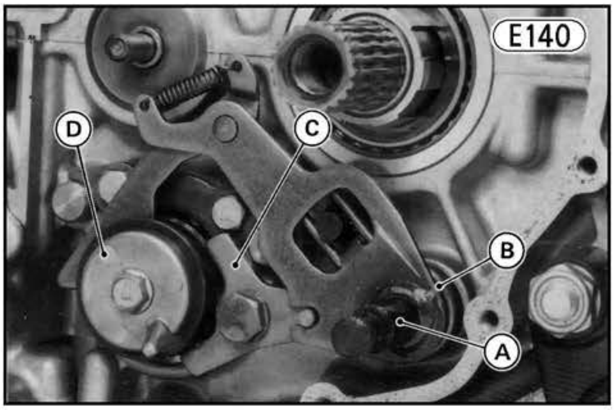
### Installation Notes:
1. When installing spring stop, align the "1" marks on the spring stop and the damper cam.




**A. Align the marks.**

2. Perform the shim adjustment when replacing any cam damper parts (Pg. 115).

## EXTERNAL SHIFT MECHANISM
### Removal:
- Remove the external shift mechanism cover (Pg. 82).
- Remove the driven shaft cam damper (Pg. 83).
- Pull off the shift shaft and return spring.

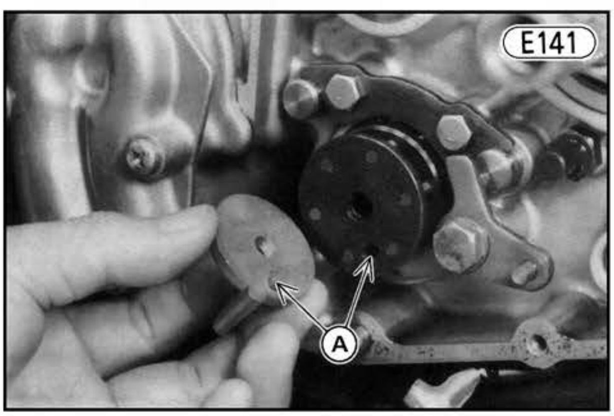



A. Shift Shaft C. Overshift Limiter
B. Return Spring D. Pin Holder

•Unscrew the bolt and put off the overshift limiter.
•Unscrew the bolt and remove the pin holder.

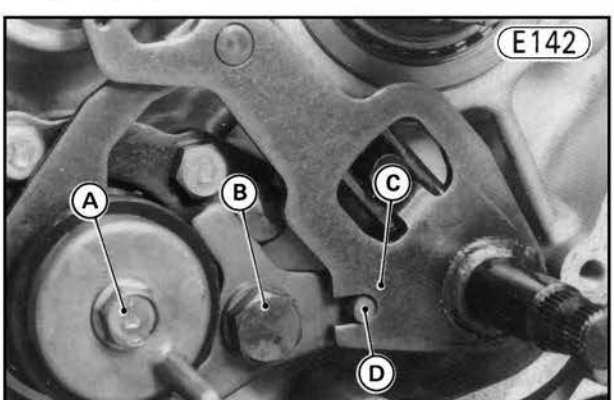
### Installation Notes:

1. Match the positioning pin on the pin holder with the hole in the shift drum, and the pin on the neutral switch lever with the hole in the pin holder.




A. Align the pins with the holes.

2. Torque the pin holder bolts to 1.0 kg-m (87 in-lbs), and overshift limiter bolt to 2.5 kg-m (18.0 ft-lbs).
3. Match the pin of overshift limiter with the notch of shift lever.



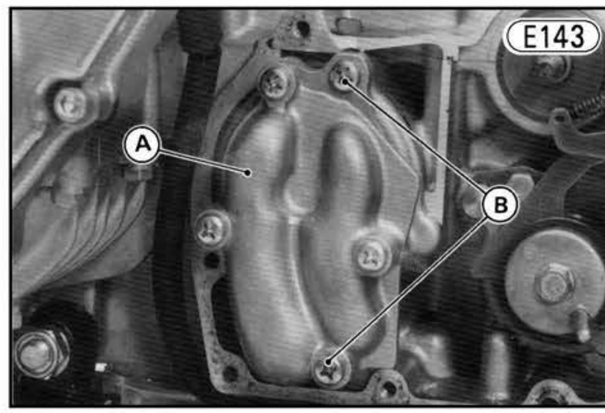

A. Pin Holder Bolt C. Shift Lever
B. Overshift Limiter Bolt D. Pin

4. If the return spring pin is loose, remove it. Apply a non-permanent locking agent to the threads, and tighten it to 2.0 kg-m (14.5 ft-lbs) of torque.

## OIL PUMP

### Removal:

•Remove the external shift mechanism cover (Pg. 82).
•Unscrew the pump mounting screws (2), and pull the oil pump straight out.




A. Oil Pump B. Mounting Screws

### Installation Note:

•Be sure to replace the oil pump gasket with a new one.

### Disassembly:

•Remove the oil pump cover screws ②, and the cover ③.
•Take out the rotors ④.
•Pull out the pin from the oil pump shaft so that the shaft press-fitted to the oil pump gear can be pulled out.

### Assembly Note:

•After assembling, check the oil pump shaft to make sure it rotates freely.

## CLUTCH RELEASE

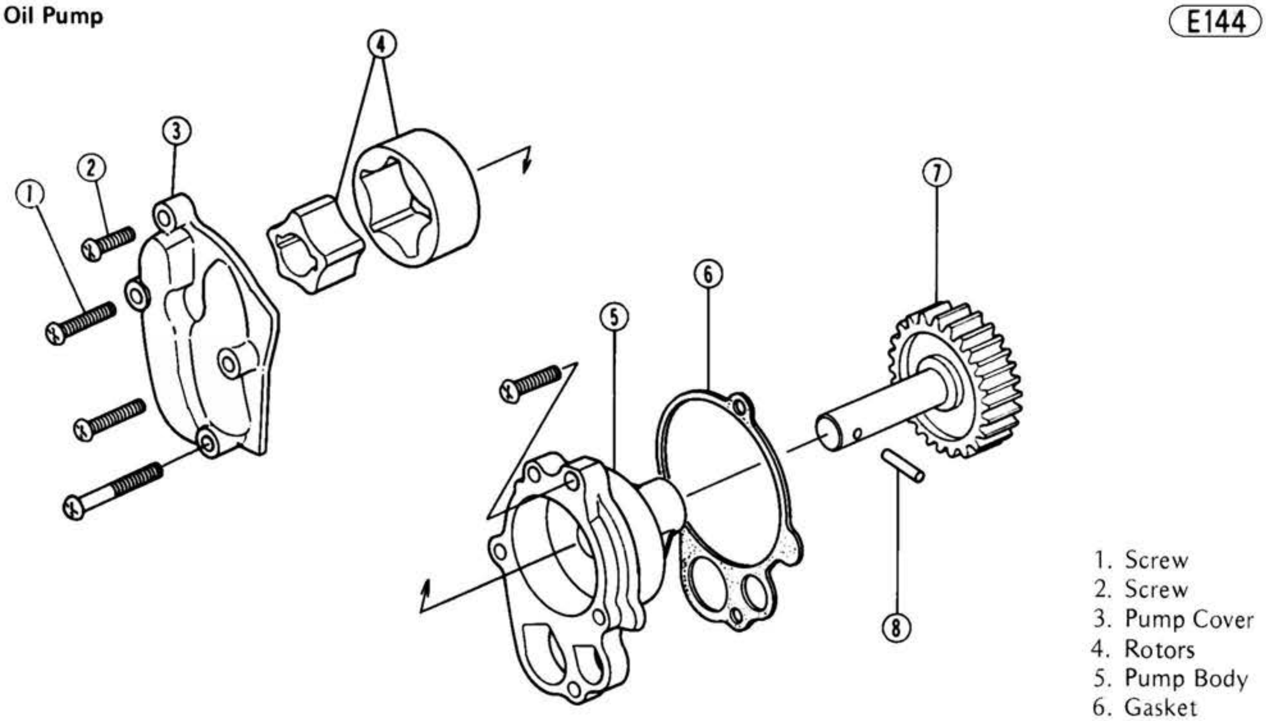
### Removal:

•Remove the external shift mechanism cover (Pg. 82).
•Remove the locknut, washer, and release lever.
•Take out the bolt and stop, and pull out the release.

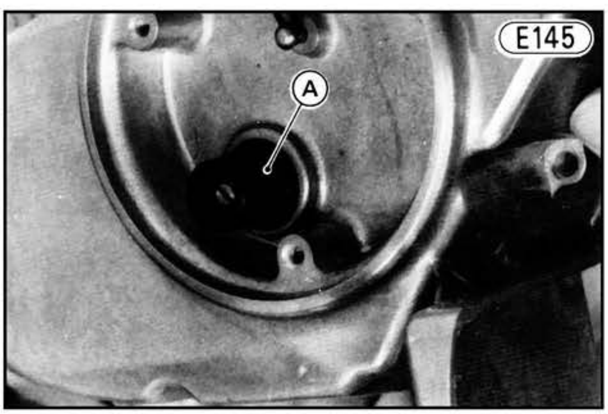
### Installation:

•Matching the positioning pin with the hole of the external shift mechanism cover, install the outer release shaft to the cover.
•Install the steel ball assembly.
•Install the inner release shaft using the oil seal guide (special tool) to prevent the oil seal from being damaged.

**Oil Pump**

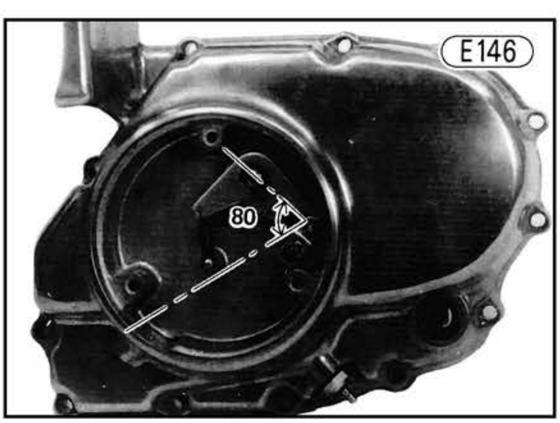



1. Screw
2. Screw
3. Pump Cover
4. Rotors
5. Pump Body
6. Gasket
7. Pump Gear
8. Pin




**A. Oil Seal Guide (57001-261)**

- Install the clutch release lever, flat washer, and locknut on the inner shaft so that the release lever is positioned as shown in the figure.




- Tighten the clutch release stop mounting bolt with the stop to 1.0 kg-m (87 in-lbs) of torque.
- Install the external shift mechanism cover (Pg. 82).
- Adjust the clutch (Pg. 20).

## ALTERNATOR COVER

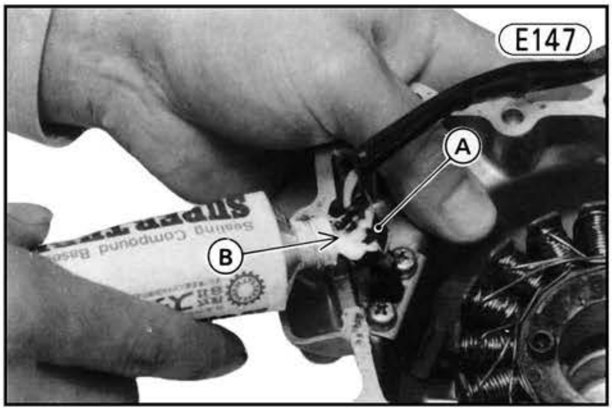
### Removal:

**NOTE:** To keep the loss of engine oil to a minimum, set the motorcycle on the side stand.

- Unscrew the master cylinder bracket nut and bolts,(2) with the flat washers and lockwashers (3 ea), and remove the bracket.
- Remove the right side cover, remove the igniter mounting bolts (2), and detach the alternator lead connector (4-pin) and leads.
- Disconnect the oil pressure switch lead.
- Remove the screws with lockwashers (2 ea) and holding plate of the alternator leads.
- Remove the strap from the frame pipe.
- Put an oil pan beneath the alternator cover.
- Unscrew the alternator cover Allen bolts (8), and remove the alternator cover.

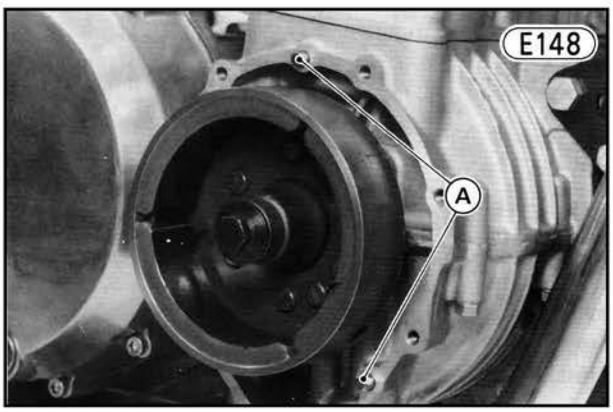
### Installation Notes:

1. Apply a liquid gasket around the circumference of the lead grommet before setting it in the notch of the alternator cover (Fig. E147).




**A. Grommet B. Apply a liquid gasket.**

2. Check that knock pins (2) are in place on the crankcase.




**A. Knock Pins**

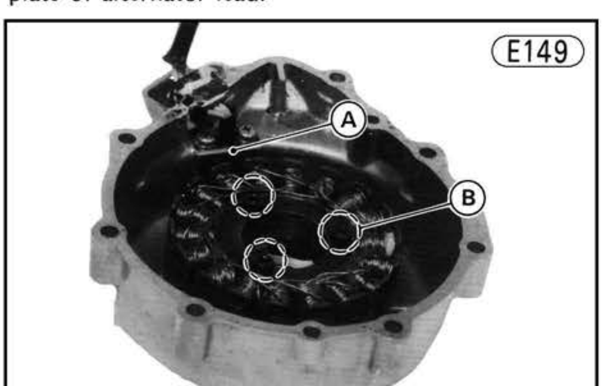
3. Alternator leads should be routed beneath the clutch cover and under the right rear upper engine bracket.
4. Check the engine oil level. Add oil as necessary (Pg. 21).

## ALTERNATOR STATOR

### Removal:

**NOTE:** To keep the loss of engine oil to a minimum, set the motorcycle on the side stand.

- Remove the alternator cover (Pg. 85).
- Remove screws (2), lockwashers (2), and the holding plate of alternator lead.




**A. Holding Plate B. Allen Bolt**

- Unscrew the Allen bolts (3) and remove the stator.

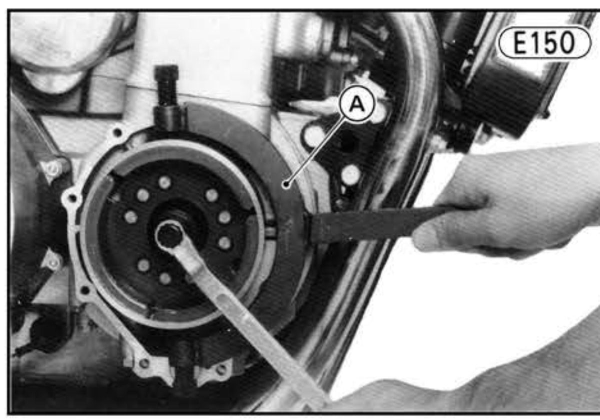
### Installation Notes:

1. Apply a liquid gasket around the circumference of the lead grommet before setting it in the notch of the alternator cover (Fig. E147).
2. Apply a non-permanent locking agent to the threads of the stator mounting Allen bolts (3), and tighten them to 0.80 kg-m (69 in-lbs) of torque.

## ALTERNATOR ROTOR

### Removal:

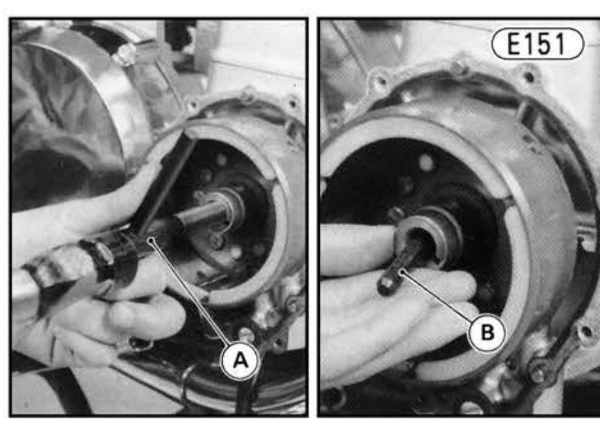
- Remove the alternator cover (Pg. 85). The cover need not be removed completely, so the lead may be left connected.
- Disconnect the battery ground (–) lead from the battery.
- Using the flywheel holder (special tool), remove the rotor bolt.




**A. Flywheel Holder (57001-308)**

- Using the rotor puller and adapter (special tools), remove the rotor.

**CAUTION** **If the rotor is difficult to remove and a hammer is used, turn the bar with hand tapping the head of the puller shaft with a hammer. Do not attempt to strike the bar or the alternator rotor itself. Striking the bar or the rotor can cause the bending or the magnets to lose their magnetism.**




**A. Rotor Puller (57001-1016)**
**B. Adapter (57001-1109)**

•Remove the woodruff key.

### Installation Notes:

1. Using a high flash-point solvent, clean off any oil or dirt that may be on the crankshaft taper and rotor tapered hole.
2. Torque the rotor bolt to 7.0 kg-m (51 ft-lbs).

**NOTE:** After tightening the bolt to 7.0 kg-m (51 ft-lbs) of torque, loosen the bolt and re-tighten the bolt to the same torque.

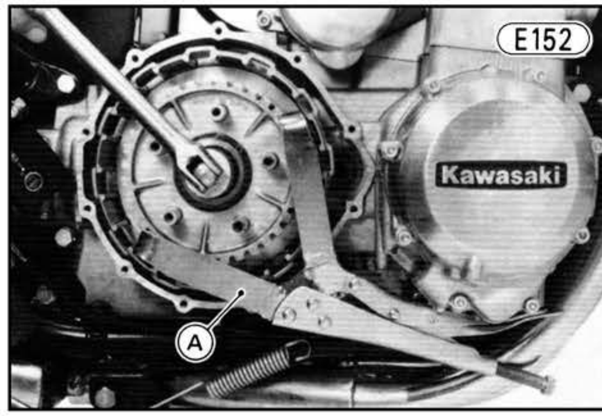
3. Check the engine oil level and add oil as necessary (Pg. 21).

## CLUTCH

### Removal:

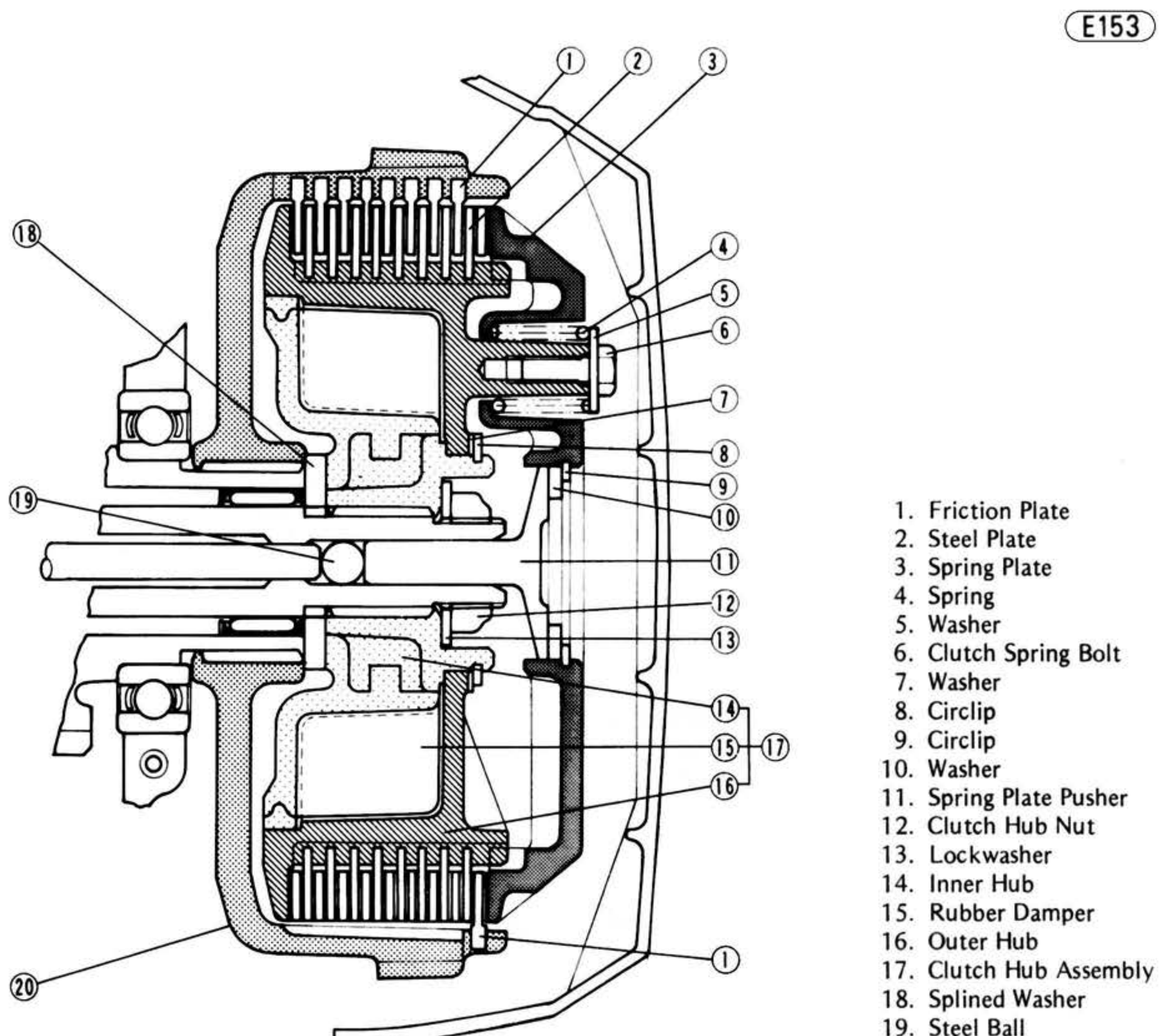
**NOTE:** To keep the loss of engine oil to a minimum, set the motorcycle on its side stand.

•Disconnect the battery ground lead from the battery.
•Unscrew the nut and bolts (2) with flat washers and lockwashers (3 ea), and remove the master cylinder bracket.
•Put an oil pan beneath the clutch cover, and remove the Allen bolts (11) and the cover.
•Remove the clutch spring bolts ⑥ (5), washers ⑤ (5), and springs ④ (5).
•Pull off the spring plate ③, washer ⑩, and spring plate pusher ⑪.
•Remove the friction plates ① (9) and steel plates ② (8).
•Using the clutch hub holder (special tool), remove the clutch hub nut ⑫ and spring washer ⑬.



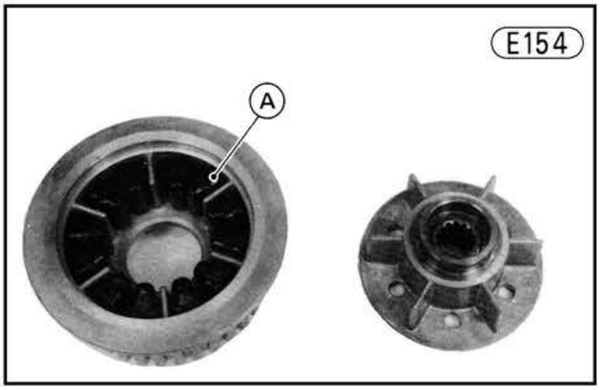

**A. Clutch Hub Holder (57001-305)**

**Clutch**




1. Friction Plate
2. Steel Plate
3. Spring Plate
4. Spring
5. Washer
6. Clutch Spring Bolt
7. Washer
8. Circlip
9. Circlip
10. Washer
11. Spring Plate Pusher
12. Clutch Hub Nut
13. Lockwasher
14. Inner Hub
15. Rubber Damper
16. Outer Hub
17. Clutch Hub Assembly
18. Splined Washer
19. Steel Ball
20. Housing

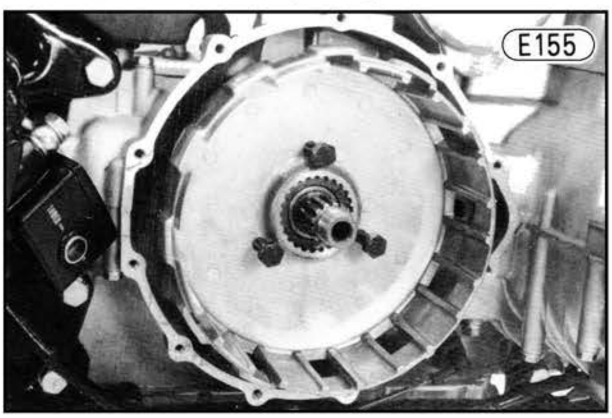
- Remove the clutch hub assembly ⑰ and splined washer ⑱.
- Remove the circlip ⑧ and washer ⑦, and separate the hub assembly into the inner hub ⑭ and the outer hub ⑯. Remove the rubber dampers ⑮ (12).




**A. Rubber Damper**

- Use three 8 mm diameter bolts (with 1.25 mm pitch threads) about 50 mm long to pull off the clutch housing ⑳. Screw the three bolts in evenly.

**CAUTION** **Do not pull off the clutch housing by any other method. This is to prevent the secondary chain from being damaged.**




## Installation:

- Apply engine oil to the rubber dampers (12), and push them into the outer hub.
- Press the inner hub into the outer hub until the circlip groove of the inner hub appears.
- Install the washer and set the circlip in the groove. Check the circlip position by confirming that it turns in the groove easily.
- Using the clutch housing pusher (special tool), install the clutch housing onto the secondary chain driven sprocket as follows:

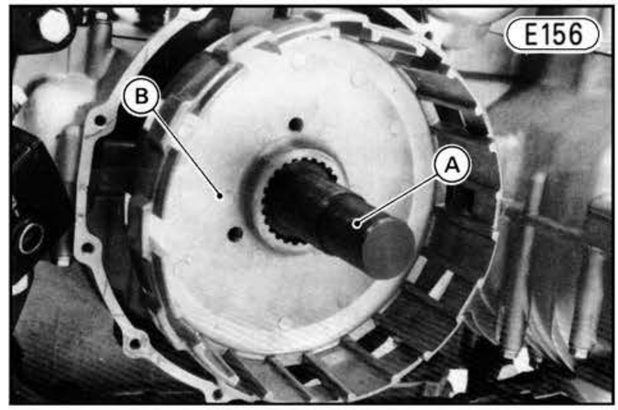
**CAUTION** **Do not push the drive shaft to keep the secondary chain from being damaged.**

○Install the extender (special tool) on the transmission main shaft end.

○Soak the clutch housing in oil and heat the oil to approximately 100°C (212°F).

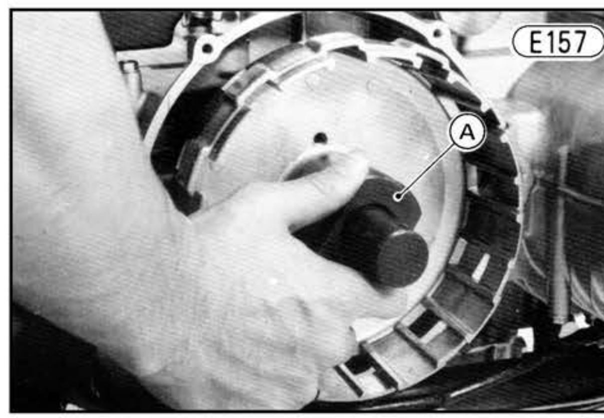
**CAUTION** **Do not heat the housing with a torch. This will warp the housing.**

○Meshing the splines, fit the clutch housing on the secondary chain driven sprocket end.




**A. Extender (57001-1039) B. Clutch Housing**

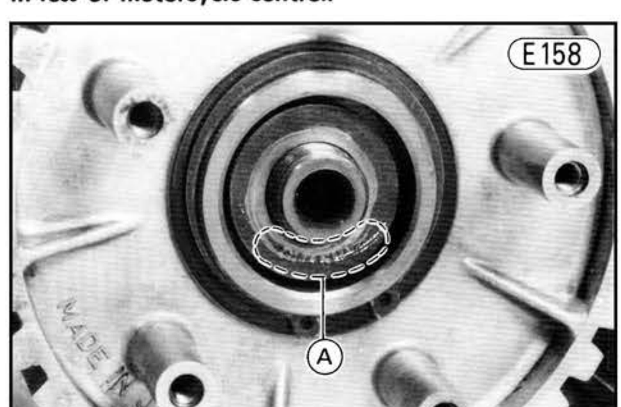
○Fit the pusher (special tool) on the extender, and turn it to drive the clutch housing until the ends of the clutch housing and the secondary chain driven sprocket are flush.




**A. Pusher (57001-1039)**

- Install the splined washer, hub assembly, and spring washer.

**WARNING** **The spring washer between the clutch hub and the clutch hub nut must be installed with the side marked "OUT SIDE" facing out. If this washer is installed backwards, the hub nut might loosen during operation. This causes clutch disengagement and might cause clutch cover breakage, resulting in loss of motorcycle control.**

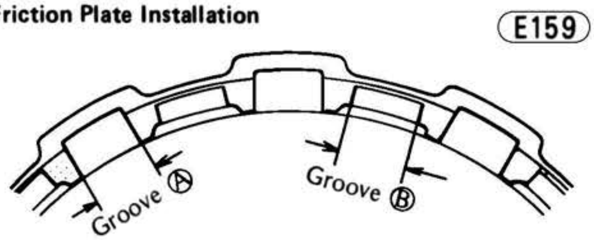



**A. "OUT SIDE" Mark**

- Install a new clutch hub nut, and tighten it to 12 kg-m (87 ft-lbs) of torque while holding the clutch hub with the clutch hub holder (special tool).
- Install the friction plates (9) and steel plates (8), starting with a friction plate and alternating them.

**NOTE:** First, install the eight friction plates fitting the tangs of plates in the grooves Ⓐ in the clutch housing. And then, install the last one fitting the tangs in the grooves Ⓑ in the housing (See Fig. E159).

**Friction Plate Installation**




**CAUTION** **If new dry steel plates and friction plates are installed, apply engine oil to the surfaces of each plate to avoid clutch plate seizure.**

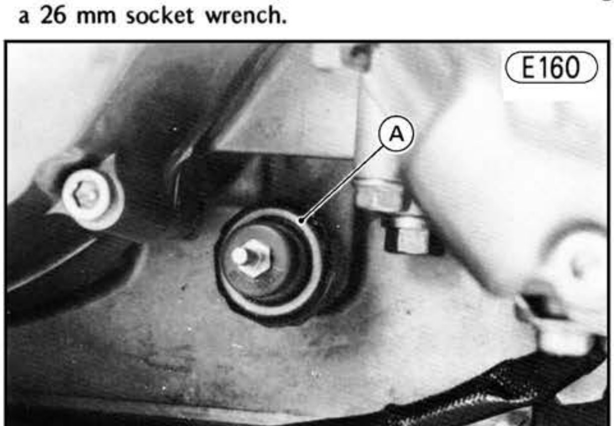
- Check that the steel ball is in the hole of the transmission main shaft, and insert the spring plate pusher applying a molybdenum disulfide engine assembly grease to their surfaces.
- Set the washer to the spring plate, and install the spring plate, springs (5), washers (5), and bolts (5). Cross tighten the bolts evenly to 1.0 kg-m (87 in-lbs) of torque.
- Install the clutch cover with a new gasket.
- Install the master cylinder bracket.
- Check the engine oil level and add oil, if necessary (Pg. 21).
- Check the rear brake (Pg. 27).

## OIL PRESSURE SWITCH

### Removal:

**NOTE:** To keep the loss of engine oil to a minimum, set the motorcycle on the side stand.

- Put an oil pan beneath the oil pressure switch.
- Pull the switch lead off, and unscrew the switch using a 26 mm socket wrench.




**A. Oil Pressure Switch**

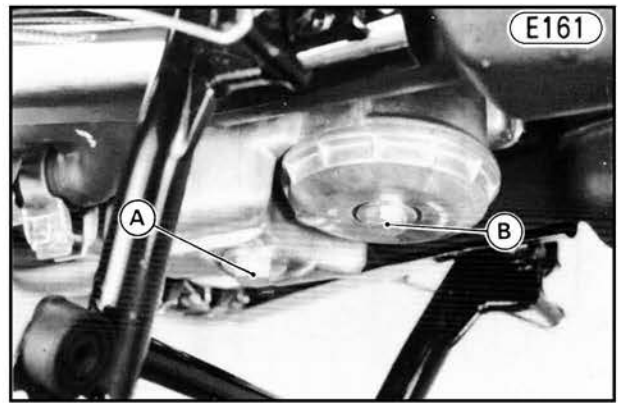
### Installation Notes:

1. Apply a liquid gasket to the threads of the switch before installing it.
2. Tighten the switch to 1.5 kg-m (11.0 ft-lbs) of torque.
3. Check the engine oil level and add it (Pg. 21).

## OIL FILTER

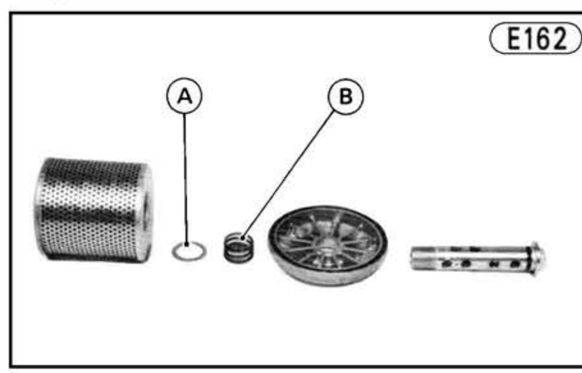
### Removal:

- Remove the engine drain plug. Drain the oil from the filter and the engine.




**A. Engine Drain Plug B. Filter Mounting Bolt**

- Remove the filter mounting bolt and drop out the filter.
- Pull the filter off the mounting bolt. There is a spring seat and spring between the oil filter and the filter cover.



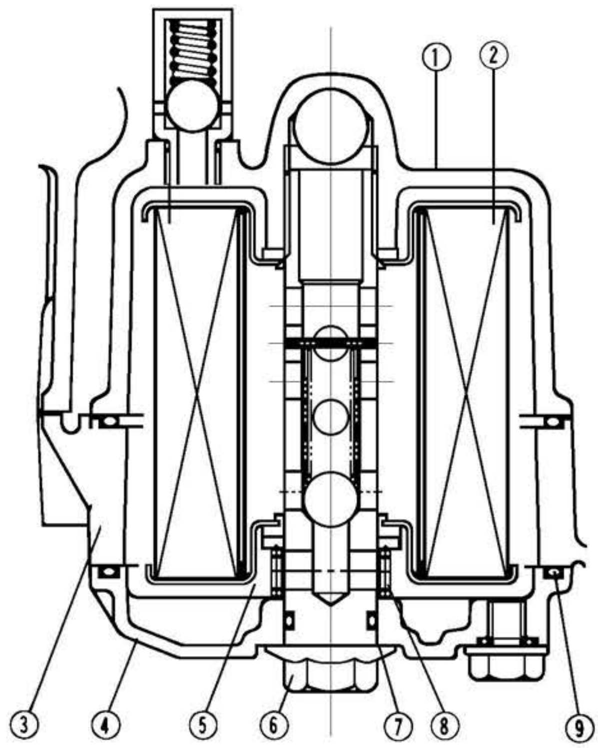

**A. Spring Seat B. Spring**

### Installation:

- Remove the filter mounting bolt from the filter cover. Make sure that the **O** rings on the filter mounting bolt, drain plug, and filter cover and all properly in place. Replace the **O** ring with a new one if deteriorated or damaged.

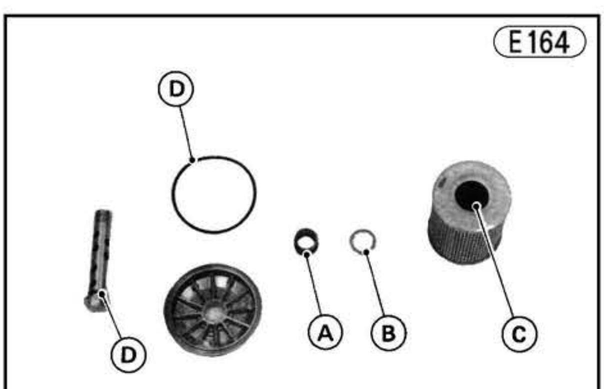
**CAUTION** **Using damaged or deteriorated O rings instead of replacing them with new ones will cause oil leaks and eventually result in little or no oil left in the engine. This will cause serious engine damage. The oil in the oil filter housing is pressurized by the engine oil pump, so these O rings must be inspected with special care. Look for discoloration (indicating the rubber has deteriorated), hardening (the sides which face the mating surfaces are flattened), scoring, or other damage.**

**Oil Filter** (E163)




1. Oil Filter Housing
2. Filter Element
3. Oil Pan
4. Filter Cover
5. Spring Seat
6. Mounting Bolt
7. **O** Ring
8. Spring
9. **O** Ring

•Apply a little engine oil to the **O** ring on the filter mounting bolt, fit the filter cover on the bolt, and install the spring and spring seat in this sequence.




**A. Spring** **B. Spring Seat** **C. Filter Grommet** **D. "O" Ring**

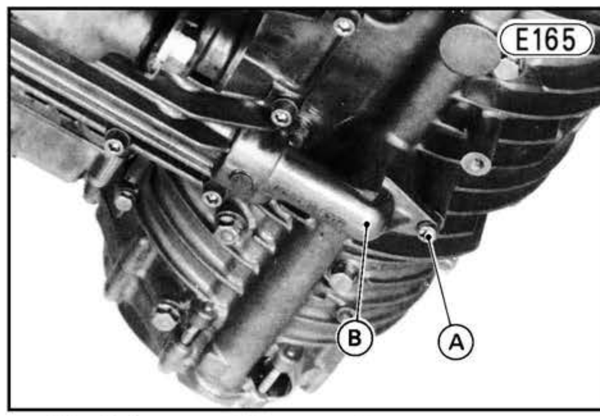
•Apply a little engine oil on the oil filter grommets, and turn the filter mounting bolt to work the new filter into place while holding the filter steady. Be careful that the filter grommets do not slip out of place.

•Install the oil filter and tighten its bolt to 2.0 kg-m (14.5 ft-lbs) of torque.
•Install the engine drain plug and tighten it to 2.3 kg-m (16.5 ft-lbs) of torque.
•Fill the engine with oil, check the level (Pg. 21), and add more if necessary.

## RELIEF VALVE

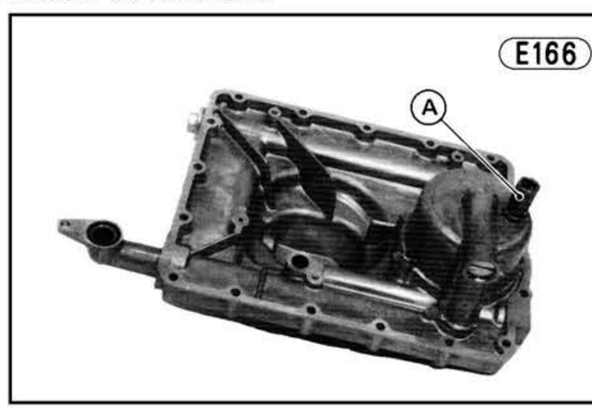
### Removal:

•Unscrew the engine drain plug, and drain the engine oil (Pg. 21).
•Remove the mufflers and exhaust pipes (Pgs. 55 and 56).
•Remove the Allen bolt of the oil passage elbow.




**A. Allen Bolt** **B. Oil Passage Elbow**

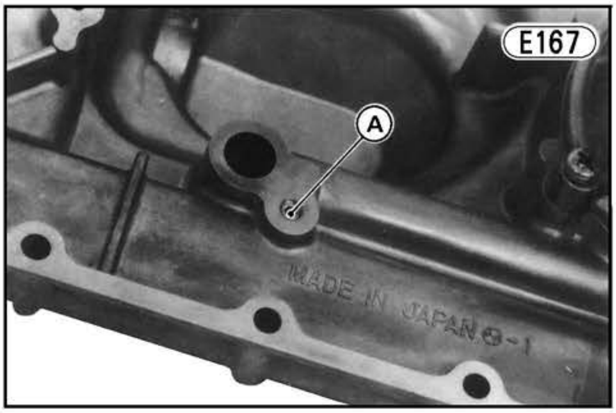
•Unscrew the oil pan Allen bolts (17), and remove the oil pan and its gasket.
•Remove the relief valve.



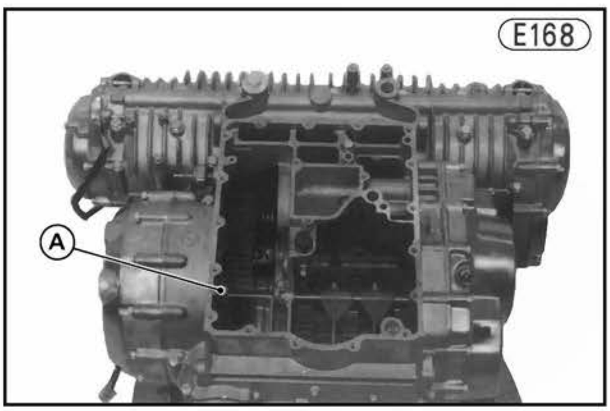

**A. Relief Valve**

### Installation Notes:

1. Apply a non-permanent locking agent to the relief valve and torque it to 1.5 kg-m (11.0 ft-lbs).
2. Check that nozzles are in place on the mating surface of lower crankcase and oil pan.




**A. Nozzle**



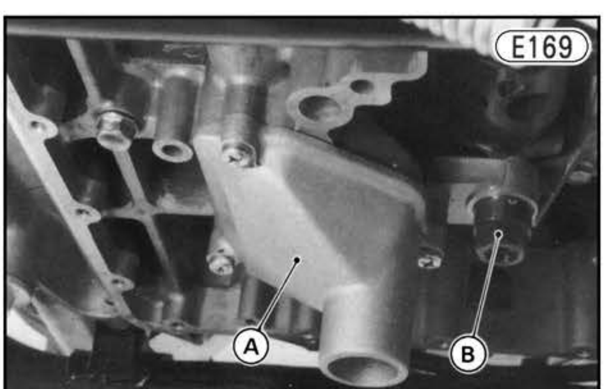

**A. Nozzle**

3. Before installing the oil pan on the crankcase, insert the oil passage elbow into the oil pan.

## SHIFT DRUM POSITIONING PIN

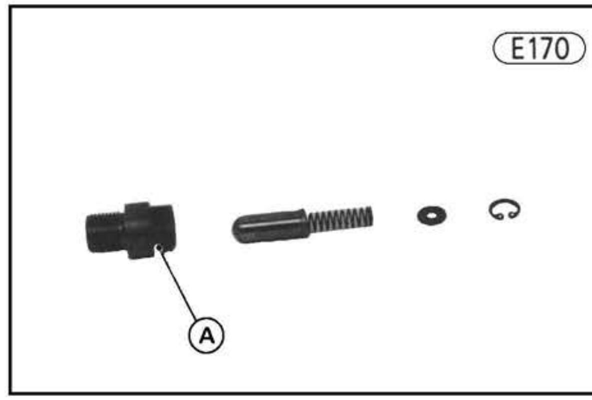
### Removal:

- Unscrew the engine drain plug, and drain the engine oil (Pg. 21).
- Remove the mufflers and exhaust pipes (Pgs. 55 and 56).
- Remove the screw of the oil passage elbow (Fig. E165).
- Unscrew the oil pan Allen bolts (17), and remove the oil pan and its gasket.
- Remove the screen body by unscrewing the screws (3).




**A. Body** **B. Positioning Pin Bolt**

- Unscrew the shift drum pin bolt.
- Unscrew the positioning pin bolt.




**A. Positioning Pin Bolt**

- Remove the circlip from the shift drum positioning pin bolt. Take out the washer, spring and positioning pin.

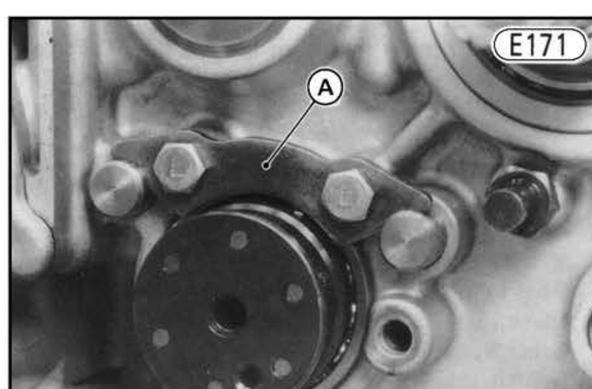
### Installation Notes:

1. Check to see that the positioning pin slides smoothly without binding in the bolt.
2. Tightening torque for the positioning pin bolt is 3.5 kg-m (25 ft-lbs).

## SHIFT DRUM, SHIFT FORKS

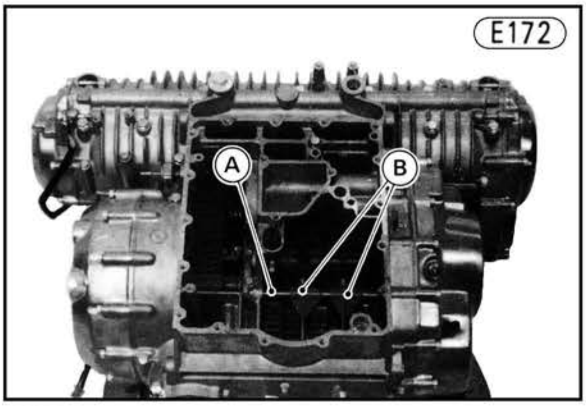
### Removal:

- Unscrew the engine drain plug, and drain the engine oil (Pg. 21).
- Remove the mufflers and exhaust pipes (Pgs. 55 and 56).
- Remove the external shift mechanism cover (Pg. 82). Removal of clutch cable is not necessary.
- Remove the driven shaft cam damper (Pg. 83).
- Remove the external shift mechanism (Pg. 83).
- Remove the shift drum bearing holder by unscrewing the bolts (2).



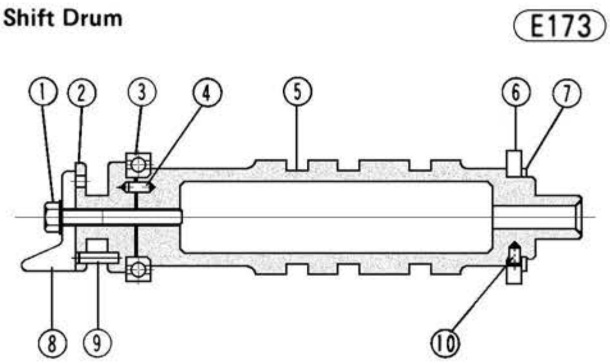

**A. Bearing Holder**

- Remove the screw of the oil passage elbow (Fig. E165).
- Unscrew the oil pan Allen bolts (17), and remove the oil pan and its gasket.
- Remove the screen body by unscrewing the screws (3).
- Pull out the shift rod on the driven shaft side, and remove the shift forks (2).




A. Shift Rod B. Shift Forks

**Shift Drum**




1. Mounting Bolt
2. Bearing Holder
3. Ball Bearing
4. Pin
5. Shift Drum
6. Operating Plate
7. Circlip
8. Pin Holder
9. Pin
10. Pin

- Pull out the shift rod on the drive shaft side, and separate the fork from the shift drum 5.
- Pull out the shift drum halfway, and remove the circlip 7 and operating plate 6. The pin 10 may drop out.
- Pull the shift drum free from the crankcase. The shift fork for the drive shaft gear can now be removed.

## Installation Notes:

1. The operating plate can be installed either way.
2. Apply a non-permanent locking agent to the threads of the bolts for the ball bearing holder, and tighten them to 1.0 kg-m (87 in-lbs) of torque.
3. The two shift forks for the driven shaft gears are identical.
4. Tighten the shift drum pin holder bolt to 1.0 kg-m (87 in-lbs) of torque.

# Disassembly—Engine Removed

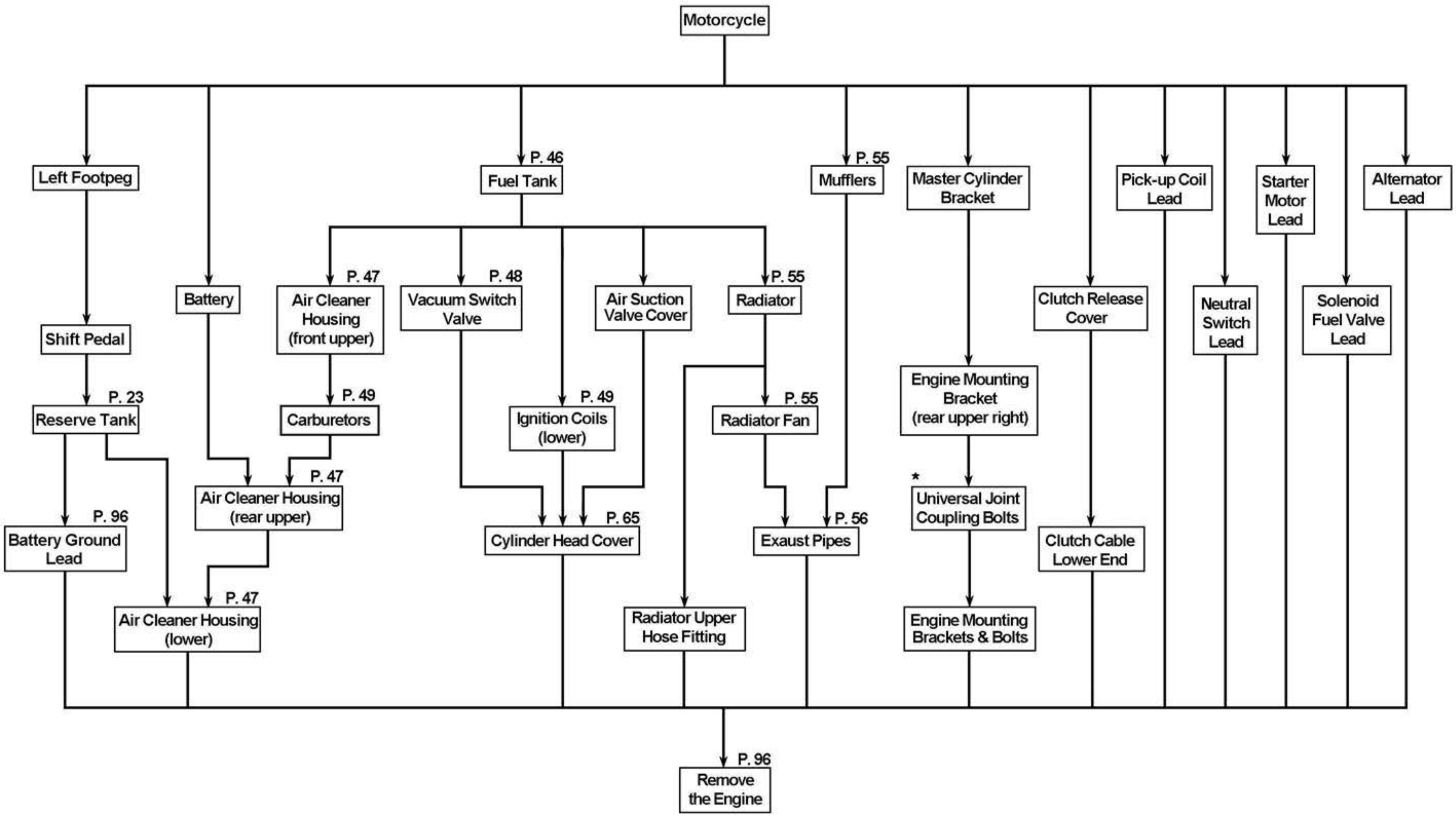
## Table of Contents



F

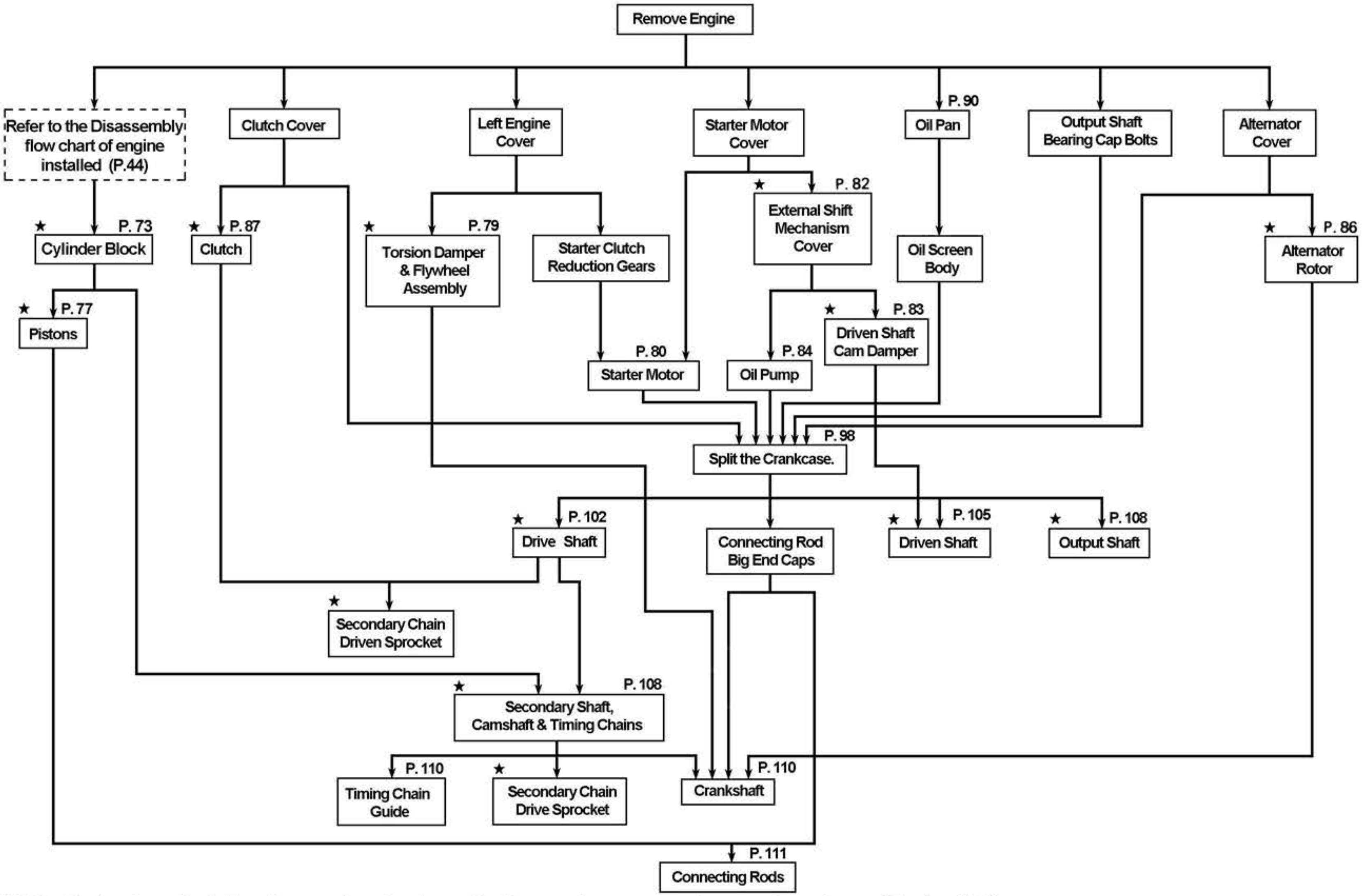
FLOW CHART
Engine Removal

**The following charts are intended to be aids to proper removal. Select the component you wish to remove and follow the arrows to that point on he chart**




**NOTE: Action with a Mark (*) requires a special tool(s) for removal, installation, disassembly or assembly**

## FLOW CHART
### Diassembly – Engine Removed

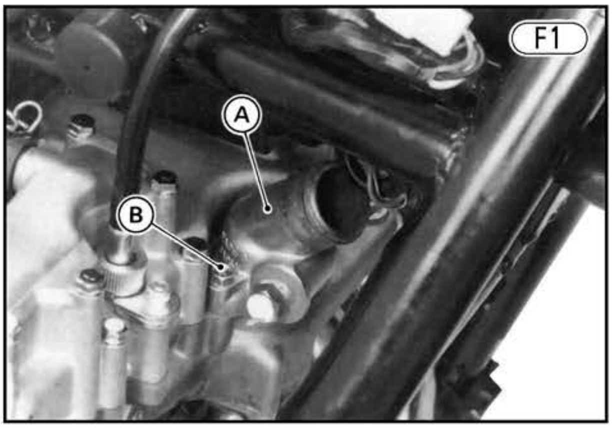



**NOTES:** 1. Action that has been already done in the engine removal procedure is omitted. Action that is not necessarily required for engine disassembly off the motorcycle is also omitted.
2. Action with a mark (★) requires special tool(s) for removal, installation, disassembly, or assembly.

## ENGINE REMOVAL

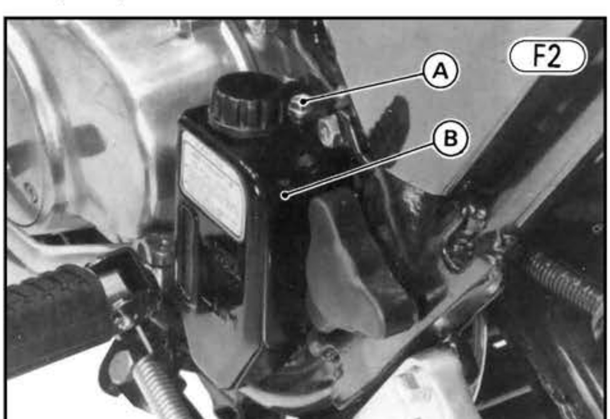
**Removal:**

- Set the motorcycle up on its center stand, and drain the engine (Pg. 21) and coolant (Pg. 23).
- Remove the fuel tank (Pg. 46).
- Remove the radiator (Pg. 55) and the radiator fan (Pg. 55).
- Unscrew the radiator upper hose fitting bolts (2) and remove the fitting.



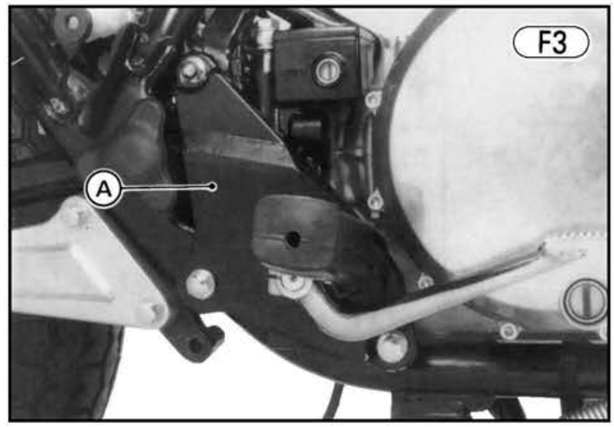

**A. Radiator Upper Hose Fitting B. Fitting Bolt**

- Pull off the water temperature sender lead.
- Remove the mufflers and exhaust pipes (Pgs. 55 and 56).
- Remove the upper-front and upper-rear air cleaner housings (Pgs. 47 and 48).
- Remove the carburetors (Pg. 49).
- Remove the two lower ignition coils (Pg. 49).
- Remove the vacuum switch valve (Pg. 48).
- Remove the tachometer cable lower end from the engine.
- Remove the cylinder head cover (Pg. 65).
- Free the lower end of clutch cable from the external shift mechanism cover (Pg. 137).
- Remove the clutch cable clamp at the left bottom of crankcase.
- Remove the left footpeg and shift pedal.
- Take out the reserve tank by removing the mounting bolt, and pull out the reserve hose.



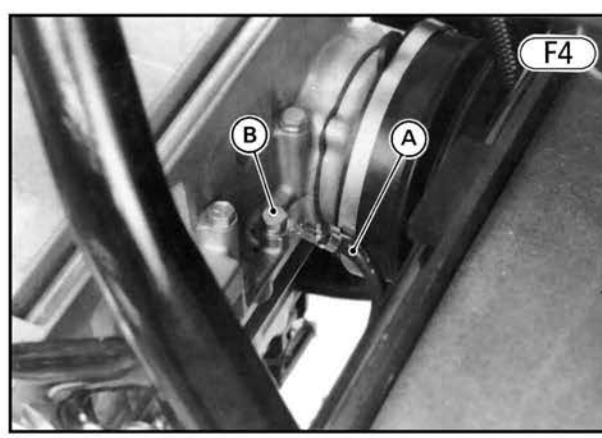

**A. Mounting Bolt B. Reserve Tank**

- Remove the lower air cleaner housing (Pg. 48).
- Pull the neutral switch lead off the switch.
- Pull the starter motor lead off the relay, and pull out the lead from the chassis.
- Unscrew the bolts (2) and nut, and remove the rear brake master cylinder bracket, and hang it on a frame pipe toward the rear.



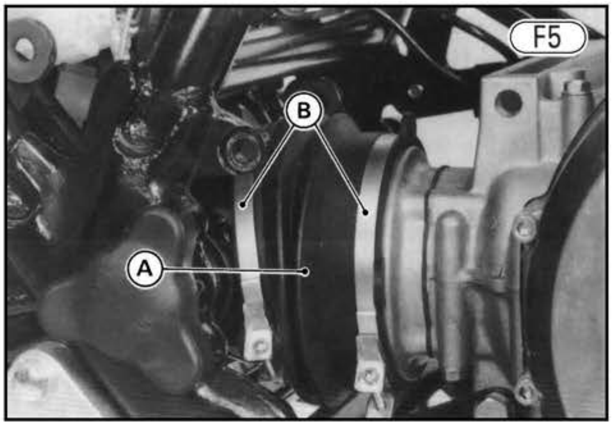

**A. Master Cylinder Bracket**

- Detach the alternator wiring connector (4-pin) inside of the right side cover, detach the pick-up coil connector (6-pin) at the frame top tube, and pull out the leads from the chassis.
- Detach the battery ground lead from the crankcase.



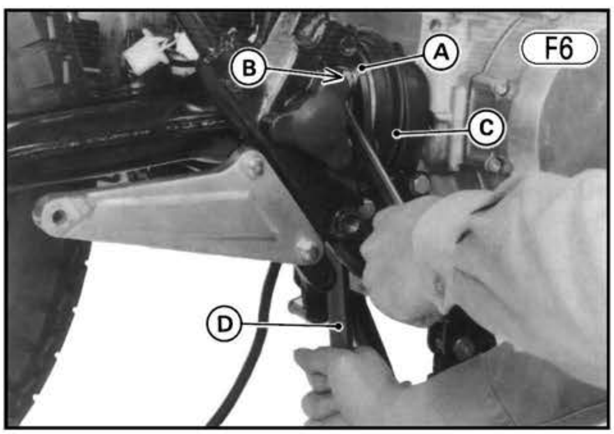

**A. Battery Ground Lead B. Bolt**

- Remove the self-locking nut and lockwasher, and pull the rear upper mounting bolt ④ off the engine. Remove the bolts ⑧ (2) and lockwashers (2), and remove the rear upper right mounting bracket. (See Figs. F7 and F8).
- Loosen the clamp screws (2) and slide the universal joint dust cover forward so that the universal joint coupling bolt can be loosened.

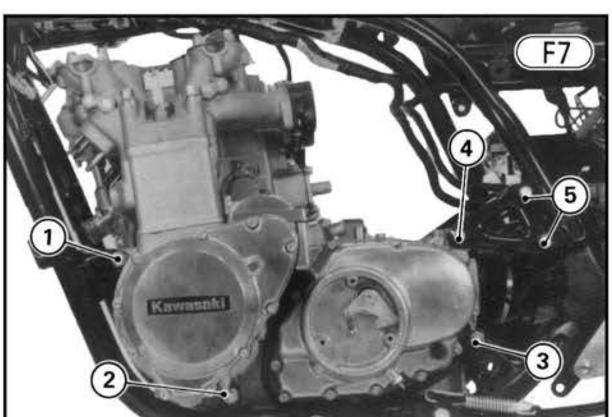



A. Dust Cover B. Clamps

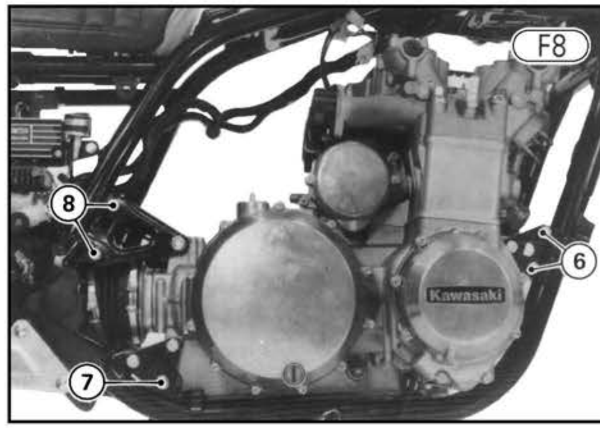
●Holding the universal joint coupling with the holder (special tool), unscrew the coupling bolts (4). Push the universal joint into the swing arm.




A. Universal Joint Coupling
B. Coupling Bolt
C. Dust Cover
D. Holder (57001-1040)

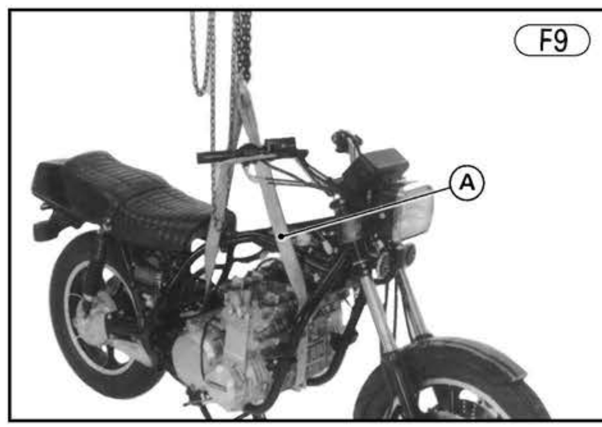



1. Front Upper Mounting Bolt
2. Front Lower Mounting Bolt
3. Rear Lower Mounting Bolt
4. Rear Upper Mounting Bolt
5. Rear Upper Left Mounting Bracket Bolts

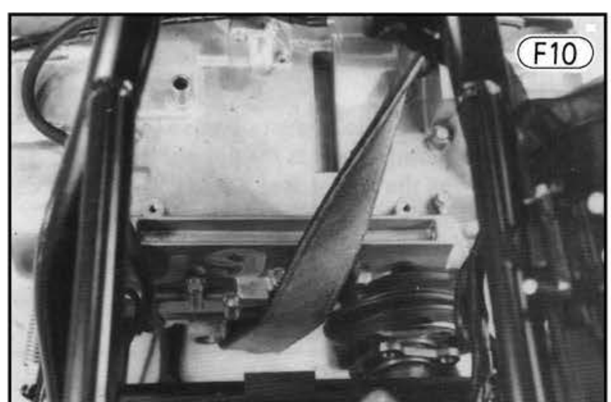



6. Front Upper Right Mounting Bracket Bolts
7. Rear Lower Right Mounting Bracket Bolt
8. Rear Upper Right Mounting Bracket Bolts

●To lift the engine, use a strap.

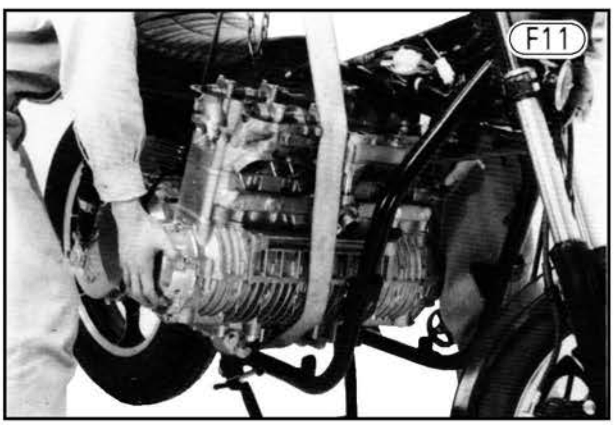



A. Strap




●Make sure that the following cables and leads are free, and properly positioned on the engine and frame so that they will not get damaged during engine removal: starter lead, pick-up coil leads, water temperature sender lead, neutral switch lead, alternator leads, battery negative ground lead, tachometer cable, clutch cable and throttle cables.

- Unscrew the bolts ⑤ (2), and remove the lockwashers (2) and the rear upper left mounting bracket.
- Remove the self-locking nut and lockwasher, and pull the front upper mounting bolt ①. Remove the bolts ⑥ (2), lockwashers (2), and front upper right mounting bracket.
- Remove the self-locking nuts and lockwashers, and pull the rear lower and front lower mounting bolts ②, ③.
- Remove the bolts ⑦ (2) and the rear lower right mounting bracket.
- Level the engine and slowly lift it up a little.
- Operating the lift, pull the engine out toward the right side, and set the engine on a clean surface. Be careful that camshafts don't hit the frame and that the output shaft coupling doesn't hit the universal joint coupling.




**CAUTION** **Put the engine on a certain stand to keep the oil passage elbow from being damaged.**

## Installation Notes:

1. Install the universal joint dust cover so that the arrow on the cover points towards the engine.
2. When securing the engine, see Table F1 for bolt location.
3. Torque the universal joint coupling bolts (4) to 7.5 kg-m (54 ft-lbs).
4. Fit the grooves of universal joint dust rubber with the flanges of swing arm and output shaft bearing cap.
5. Route the starter motor and neutral switch leads so that they do not contact the power chamber.

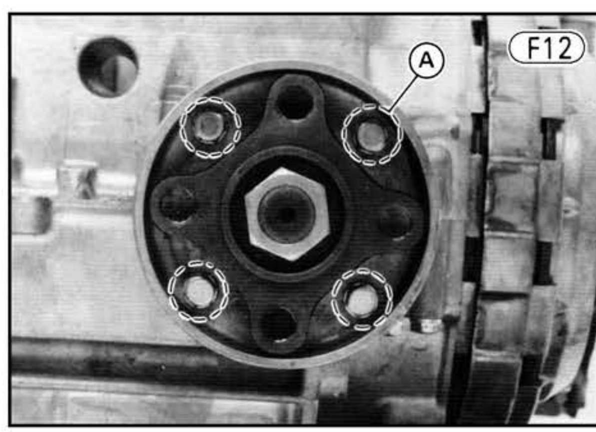
## CRANKCASE SPLIT

### Disassembly:

- Set the motorcycle on its center stand, put an oil pan beneath it, and drain the engine (Pg. 21) and coolant (Pg. 22).
- Remove the engine (Pg. 96).

**CAUTION** **Put the engine on a certain stand to keep the oil passage elbow and oil pan from being damaged.**

- Remove the alternator cover (Pg. 85), clutch cover, left engine cover, and external shift mechanism cover (Pg. 82).
- Remove the oil pump (Pg. 84).
- Remove the starter motor (Pg. 80).
- Unscrew the output shaft bearing cap bolts (4).

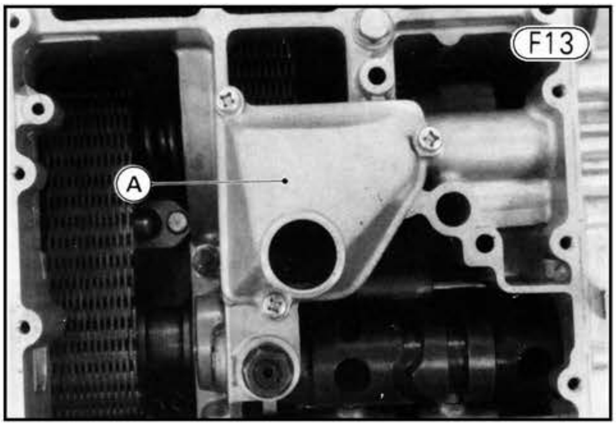



**A. Output Shaft Bearing Cap Bolt**

**Table F1 Engine Bolt Tightening Torque**

| Bolt | | Length | Quantity | Torque |
|---|---|---|---|---|
| Front Upper Right Mounting Bracket Bolt ⑥ | | 22 mm | 2 | 1.8 kg-m (13.0 ft-lbs) |
| Rear Upper Mounting Bracket Bolt | Right ⑧ | 40 mm, 25 mm | each 1 | |
| | Left ⑤ | 40 mm, 25 mm | 2 | |
| Rear Lower Right Mounting Bracket Bolt ⑦ | | 16 mm, 40 mm | each 1 | |
| Front Upper Mounting Bolt ① | | 369 mm | 1 | 4.0 kg-m (29 ft-lbs) |
| Front Lower Mounting Bolt ② | | 313 mm | 1 | |
| Rear Upper Mounting Bolt ④ | | 287 mm | 1 | |
| Rear Lower Mounting Bolt ③ | | 305 mm | 1 | |

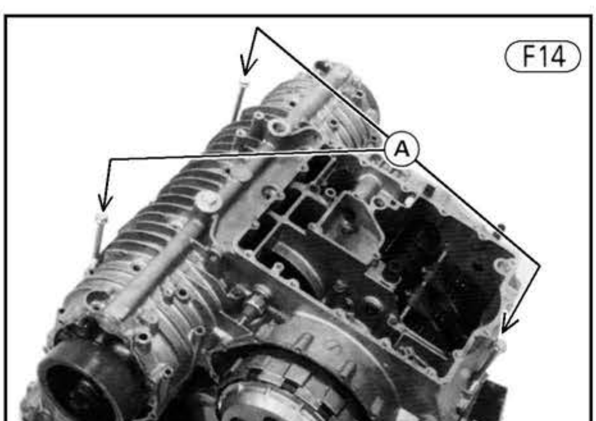
•Remove the 6 mm upper crankcase half bolts (10). See Fig. F17.
•Turn the engine upside down.
•Remove the oil passage elbow mount screw.
•Unscrew the oil pan Allen bolts (17) and remove the oil pan and its gasket.
•Remove the screws (3) and the screen body.




**A. Screen Body**

•Remove the 6 mm lower crankcase half bolts (19) and the 8 mm bolts (18). See Fig. F17. Be sure to unscrew the 8 mm bolt in the screen body.
•Screw three 8 mm crankcase bolts evenly into the holes provided in the lower crankcase to split the two crankcase halves apart.

**CAUTION If there is any resistance, loosen the screws, and make certain that all crankcase bolts are removed. Excessive force can crack the crankcase, requiring replacement.**

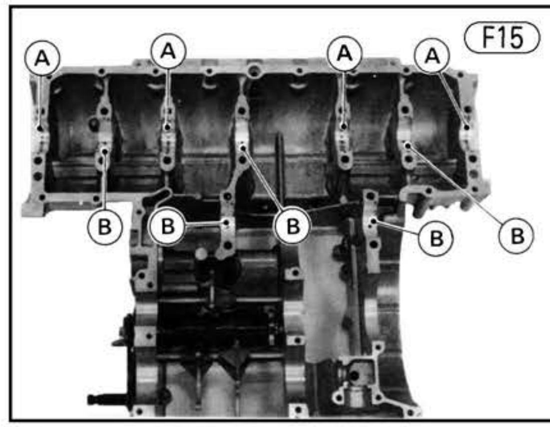



**A. Screw in 8 mm bolts.**

•Mark bearing inserts so that they can be reinstalled in their original locations.

## Assembly:

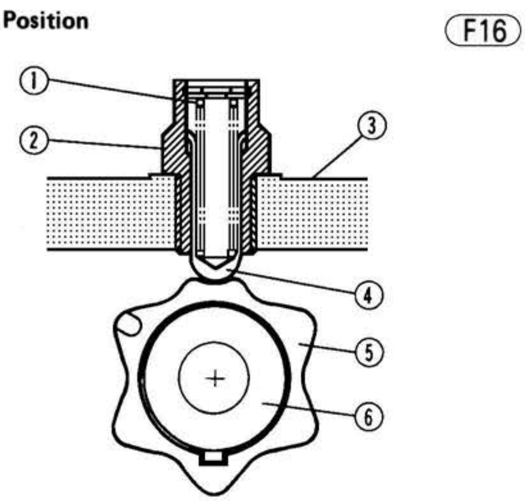
**NOTE:** The upper and the lower crankcase halves are machined at the factory as an assembly, so they must be replaced together as a set.
•With a high flash-point solvent, clean off the mating surface of the crankcase halves, and wipe dry.
•Check the following items on the lower crankcase half.
1. Note the locations of the bearing inserts (4) with oil grooves and the inserts (5) without oil grooves.




**A. Bearing Insert with Oil Groove**
**B. Bearing Insert without Oil Groove**

2. The oil pump must be removed.
3. The shift drum must be in the neutral position. The figure below shows the neutral detent in the operating plate, and the positioning pin in the neutral detent.

**Neutral Position**




1. Spring
2. Bolt
3. Crankcase
4. Positioning Pin
5. Operating Plate
6. Shift Drum

4. The pins of shift forks must be correctly placed in the grooves of the shift drum. The center groove is for the main shaft shift fork.

•Check the following items on the upper crankcase half.

F17

**Crankcase Bolt Location**

(1) Lower Crankcase Half

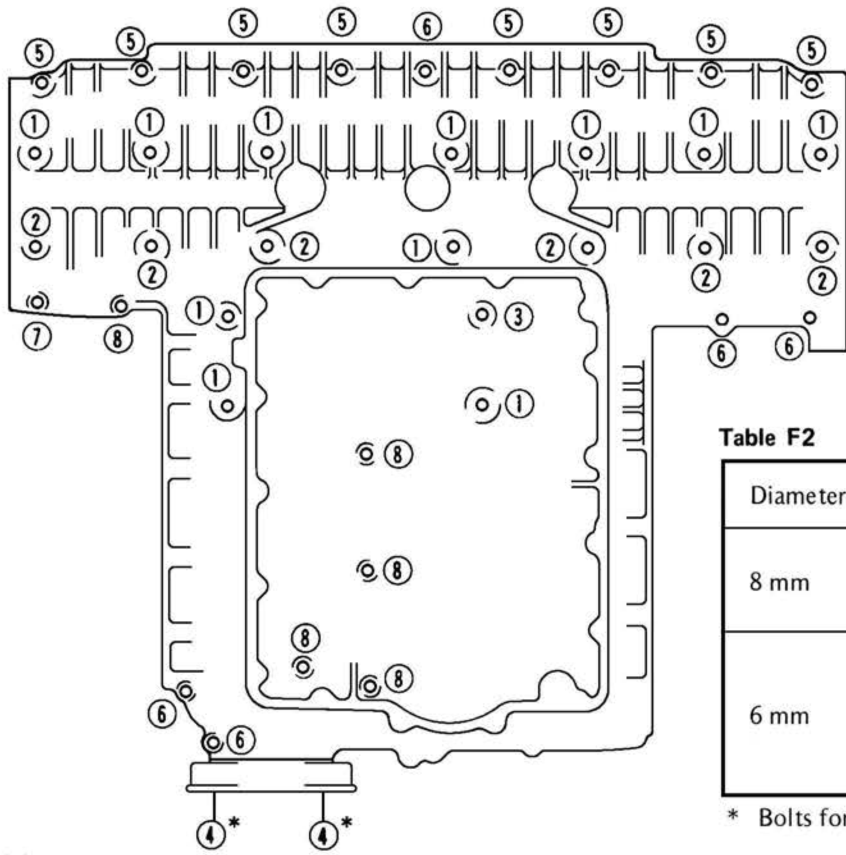


**Table F2 Lower Crankcase Half Bolts**

| Diameter | Refrence Number | Length | Quantity |
|---|---|---|---|
| 8 mm | 1 | 95 mm | 11 |
| | 2 | 105 mm | 6 |
| | 3 | 130 mm | 1 |
| 6 mm | 4* | 28 mm | 2 |
| | 5 | 38 mm | 8 |
| | 6 | 48 mm | 5 |
| | 7 | 65 mm | 1 |
| | 8 | 85 mm | 5 |

* Bolts for the Output Shaft Ball Bearing Cap

(2) Upper Crankcase Half

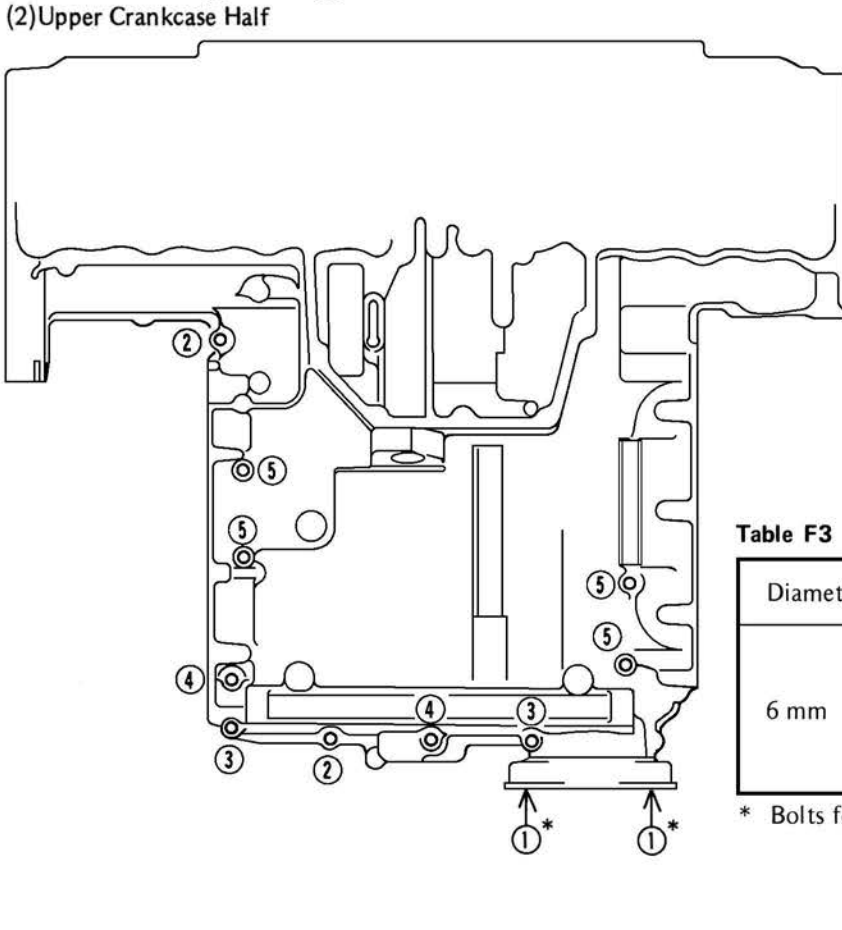
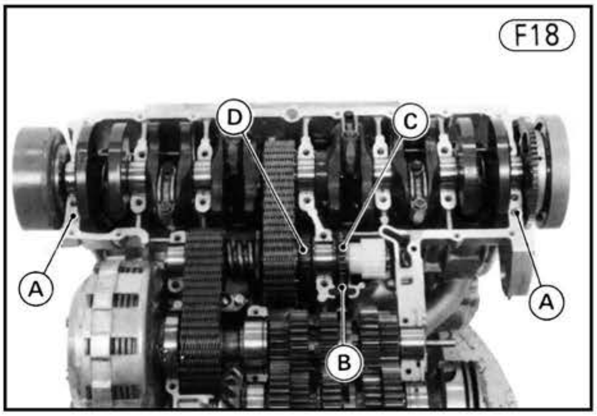


**Table F3 Upper Crankcase Half Bolts**

| Diameter | Refrence Number | Length | Quantity |
|---|---|---|---|
| 6 mm | 1* | 28 mm | 2 |
| | 2 | 38 mm | 2 |
| | 3 | 48 mm | 2 |
| | 4 | 65 mm | 2 |
| | 5 | 85 mm | 4 |

* Bolts for the Output Shaft Bearing Cap

1. The knock pins (2), timing chain guide, and rubber plug must be in place.

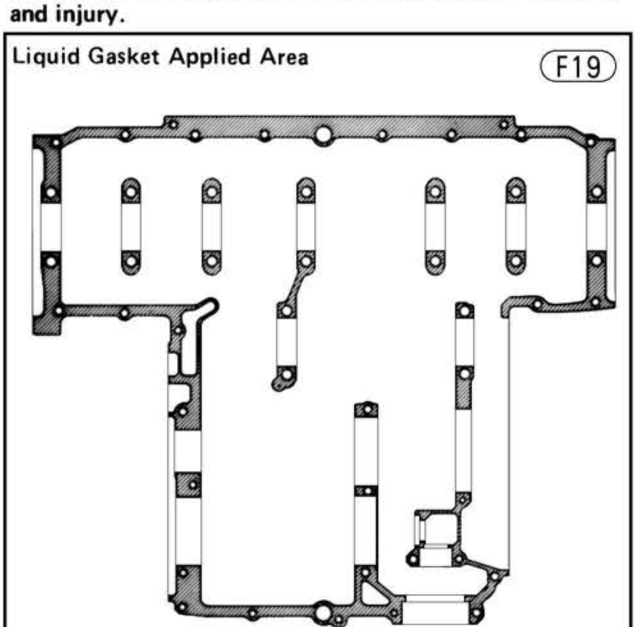



**A. Knock Pin**
**B. Timing Chain Guide and Rubber Plug**
**C. Timing Chain**
**D. Camshaft Chain**

2. The output shaft bearing cap must be installed in the upper crankcase half lightly with two bolts.
3. The timing chain and camshaft chain must be engaged with each sprocket.
4. The primary chain must be engaged with the crankshaft and the secondary shaft synchronized (Pg. 109).
5. Check that the set rings for bearing outer races (3) don't stick out from the upper crankcase half.
6. Outer race of drive shaft needle bearing must be fit with a set pin correctly and must be contact with the upper crankcase half journal.
7. Check that there are no clearance between the secondary chain driven sprocket and the collar, and between the drive chain ball bearing inner race and the collar.

•Apply liquid gasket to the area of the mating surface of the lower crankcase half, as shown below.

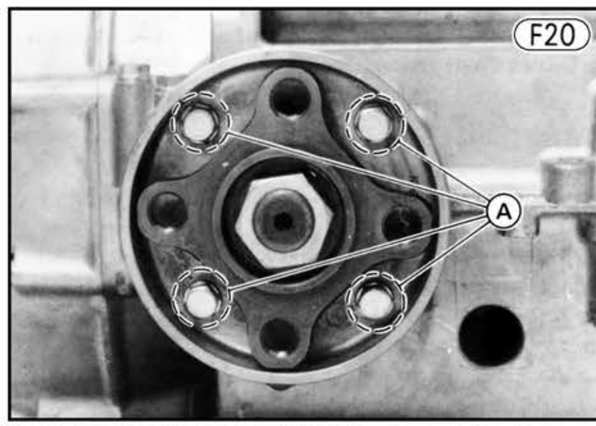
**WARNING If liquid gasket adheres to any areas not indicated, the engine oil passages may be obstructed, causing engine seizure and possible accident and injury.**




•Fit the lower crankcase half on the upper one, putting the fingers of each shift fork into the grooves of the gears.

**CAUTION Be careful that the gasket of the output shaft bearing cap doesn't get pinched between crankcase halves.**

•Put each of the bolts (37) into the lower crankcase half (See Fig. F17), and finger-tighten them.
•Follow the tightening sequence numbers on the lower crankcase half: tighten the 8 mm bolts (18) first to about 1.5 kg-m (11 ft-lbs) and finally to 2.5 kg-m (18.0 ft-lbs) of torque.
•Tighten the 6 mm bolts (19) to 1.0 kg-m (87 in-lbs) of torque.
•Check to see that the drive shaft, driven shaft, and output shaft turn freely. Spinning the driven shaft, shift the transmission through all gears to make certain there is no binding and that all gears shift properly.
•Apply a non-permanent locking agent to the threads of output shaft bearing cap bolts (4), and tighten them to 1.2 kg-m (104 in-lbs) of torque.




**A. Apply a non-permanent locking agent to the threads.**

•Clean the screen and push it in the screen body.
•Install the screen body with screws (3).
•Check that nozzles (2) are in place on the mating surface of low crankcase half and oil pan (See Figs. E167 and E168), and then install the oil pan.
•Install the oil pump (Pg. 84).
•Turn the engine upright.
•Put each of the 6 mm bolts (10) into the upper crankcase half as shown in Fig. F17, and tighten them to 1.0 kg-m (87 in-lbs) of torque.

**NOTE:** Do not forget to install the pick-up coil lead guide with the front right 6 mm bolt with 85 mm length.

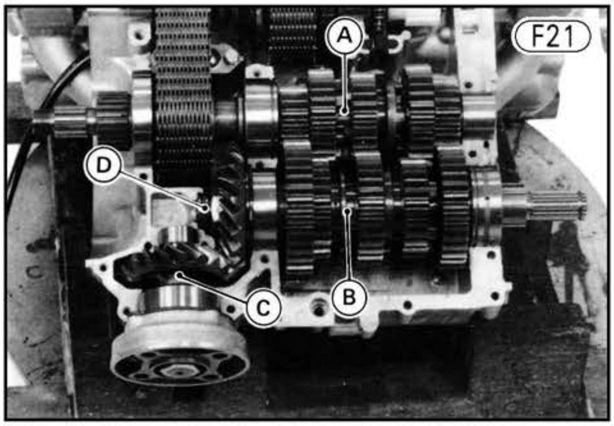
•Install the starter motor (Pg. 81).
•Install the alternator cover (Pg. 85), clutch cover, left engine cover, and external shift mechanism cover (Pg. 82).
•Install the engine (Pg. 98).

## TRANSMISSION

### Removal:

**NOTE:** When the drive shaft is to be disassembled, remove the clutch while the engine is in the frame (Pg. 87). When the driven shaft is to be disassembled,

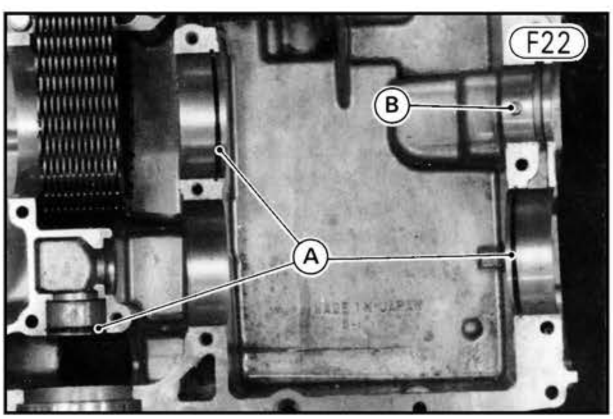
remove the driven shaft cam damper while the engine is in the frame (Pg. 83).
- Remove the engine (Pg. 96).
- Split the crankcase (Pg. 98).
- Take out the drive shaft, driven shaft, and output shaft assemblies. The needle thrust bearing and the shim(s) may fall off the end of the driven shaft.




**A. Drive Shaft Assembly** **C. Output Shaft Assembly**
**B. Driven Shaft Assembly** **D. Needle Thrust Bearing**

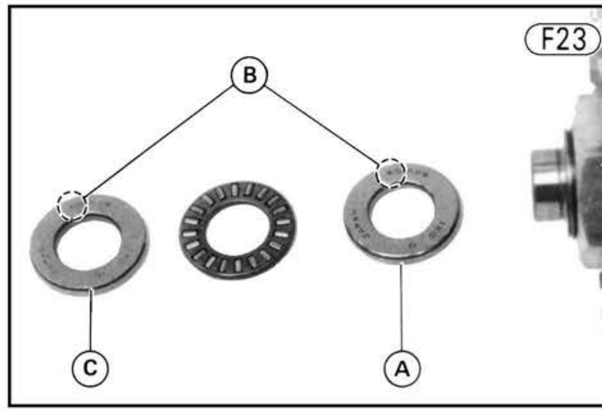
### Installation:
- Check to see that the following parts are in place on the upper crankcase half: drive shaft set pin and set ring, driven shaft set ring, output shaft set ring.

**NOTE:** If the standard set ring (P/N: 14013-1004) cannot be put into the crankcase groove, use a thin set ring (P/N: 14013-013) instead of the standard set rings.




**A. Set Rings** **B. Set Pin**

- Install the drive shaft pushing the secondary chain driven sprocket toward the collar, and fit the secondary chain on the sprocket. Check that the set pin goes into the hole in the needle bearing outer race, and that the set ring fits into the groove in the ball bearing, and that there are no gap between the driven sprocket and the collar, and between the drive shaft ball bearing and the collar.
- Put the needle thrust bearing on the end of the driven shaft. The proper sequence, started from the bevel gear side, is: the flat race marked "WS", needles, and flat race marked "GS". The surfaces marked "GS" or "WS" should be on opposite sides of the needle bearing.

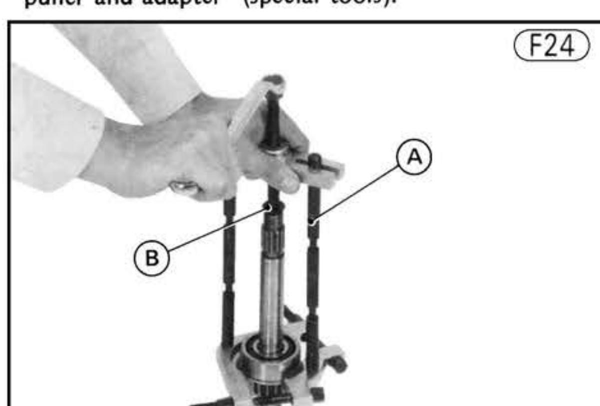



**A. Flat Race marked "WS"**
**B. Marking** **C. Flat Race marked "GS"**

- Install the driven shaft and output shaft assemblies on the upper crankcase half while engaging the bevel gears. Check that the driven shaft set ring fits into the groove in the driven shaft needle bearing, and that the output shaft set ring stops the output shaft needle bearing from coming out.
- Install the shims outside of the needle thrust bearing. Put the thinner one inside and the thicker one outside.

**NOTE:** For adjustment of the needle thrust bearing, refer to Pg. 115.
- Assemble the crankcase halves (Pg. 99).
- Install the engine (Pg. 98).

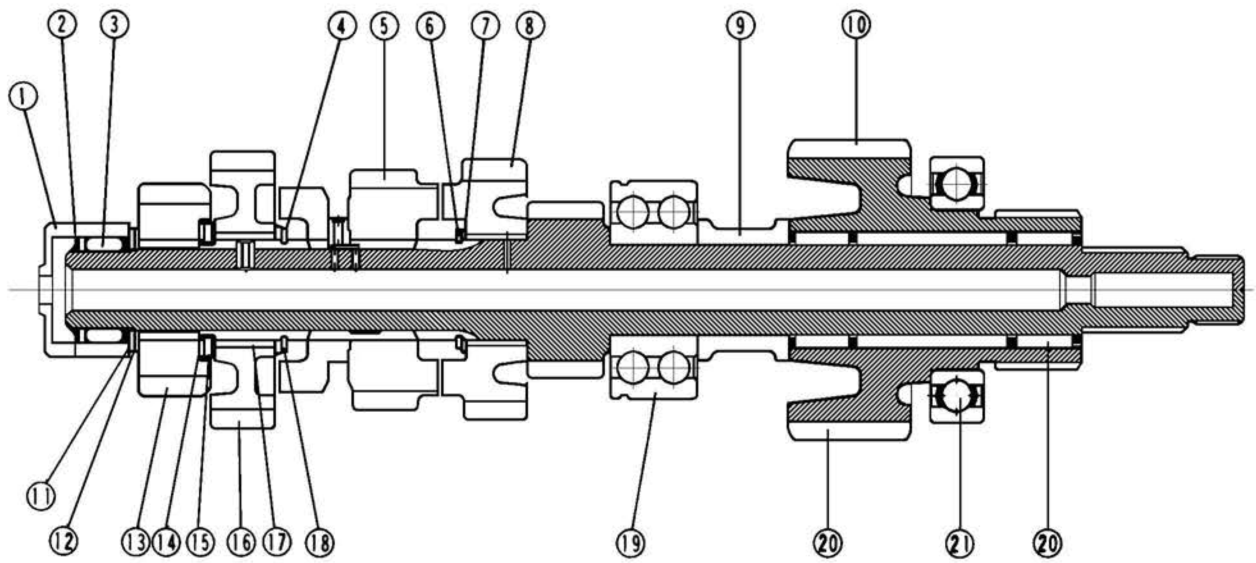
## Drive Shaft
### Disassembly:
- Pull off the secondary chain driven sprocket ⑩ and collar ⑨ from the right end.
- Remove the needle bearing outer race ① from the left end.
- Remove the circlip ②, and take out the needle bearing ③, steel washer ⑪, copper washer ⑫, 2nd gear ⑬, splined washer ⑭ with the locking tabs, thick splined washer ⑮, 5th gear ⑯, bushing ⑰, and thin splined washer ⑱.
- Remove the circlip ④, and pull off the 3rd gear ⑤.
- Remove the circlip ⑥, and remove the thin splined washer ⑦, and 4th gear ⑧.
- Remove the drive shaft ball bearing using the bearing puller and adapter (special tools).




**A. Bearing Puller (57001-158)**
**B. Adapter (57001-317)**

**Drive Shaft**

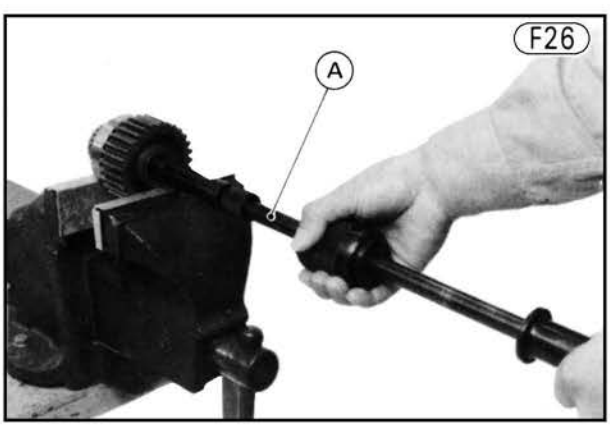
F25




1. Needle Bearing Outer Race
2. Circlip
3. Needle Bearing
4. Circlip
5. 3rd Gear
6. Circlip
7. Splined Washer
8. 4th Gear
9. Collar
10. Secondary Chain Driven Sprocket
11. Steel Washer
12. Copper Washer
13. 2nd Gear
14. Splined Washer
15. Splined Washer
16. 5th Gear
17. Bushing
18. Splined Washer
19. Ball Bearing
20. Needle Bearing
21. Ball Bearing

- To remove the ball bearing 21 on the sprocket, use the bearing puller (special tool: P/N 57001-158).
- Pull out the needle bearings 20 from the secondary chain driven sprocket using the oil seal and bearing remover (special tool).

F26



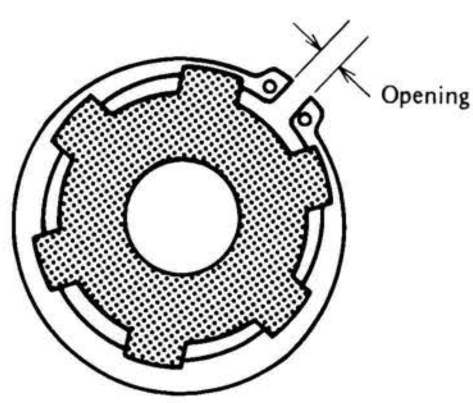

A. Oil Seal and Bearing Remover (57001-1058)

## Assembly:

**NOTES:** 1. Use new circlips. Never re-use circlips that have been removed. Install circlips so that the opening coincides with one of the splined grooves in the shaft.

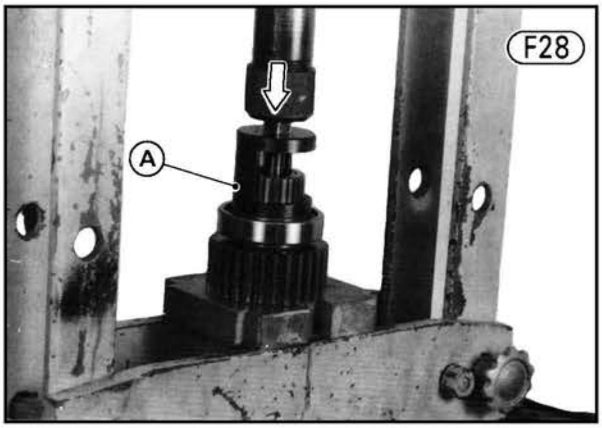
**Circlip Installation**

F27




2. To avoid distortion of circlips during installation, press them using a gear bushing or gear while spreading the opening as necessary for the circlip to slide over the shaft.

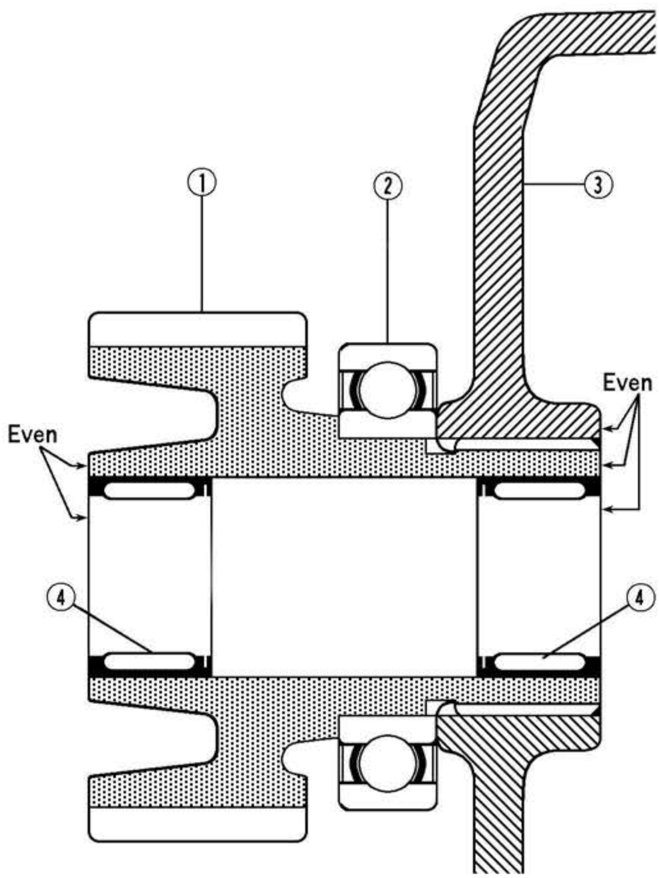
- Install the needle bearings using a suitable driver. Press them into place until the bearing end is even with the end of the hole.
- Using the spring compressor-(special tool), drive the ball bearing on until it stops at the stepped portion of the sprocket.




A. Spring Compressor (57001-1042)

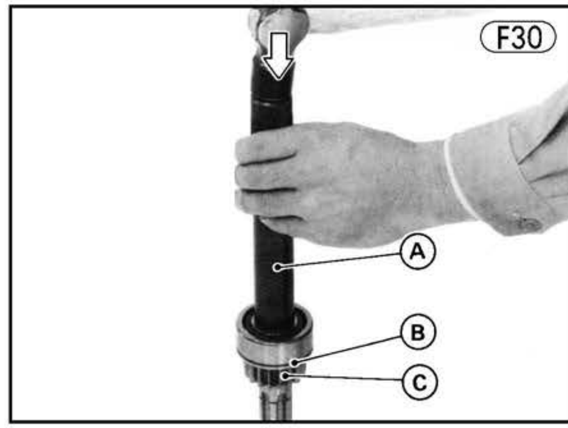
- Using a suitable driver, drive the clutch housing on until the hub end is even with the end of the sprocket.

**Secondary Chain Driven Sprocket**



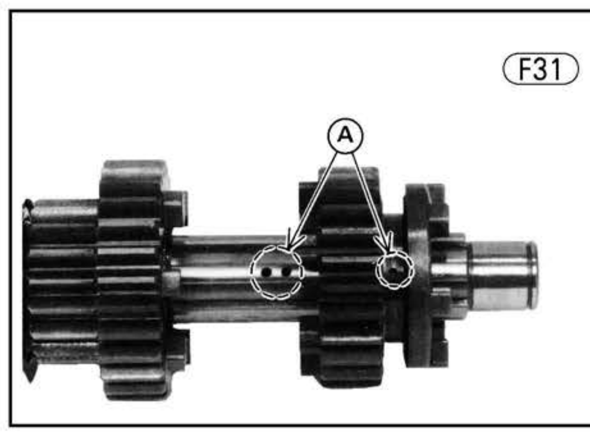

1. Seconaary Chaın Driven Sprocket
2. Ball Bearings
3. Clutch housing
4. Needle bearing

- Press the drive shaft ball bearing using the transmission circlip driver (special tool). The set ring groove must be toward the 1st gear side.



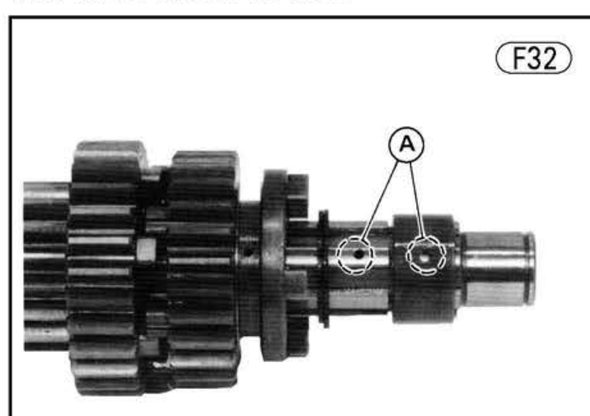

A. Transmission Circlip Driver (57001-382)
B. Set Ring Groove
C. 1st Gear

- Install the 4th gear. The gear dogs face away from the 1st gear.
- Install the thin splined washer, and install a new circlip in the groove.
- Install the 3rd gear. Align its oil hole with the oil holes in the shaft. The groove for the shift fork faces away from the 4th gear.



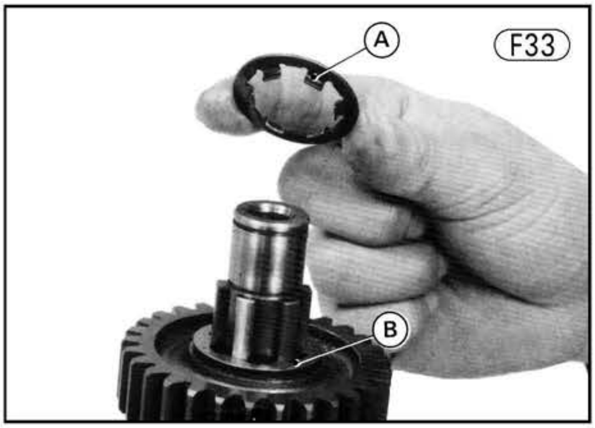

A. Align oil holes.

- Install the circlip, thin splined washer, and gear bushing in this sequence. Align the oil hole in the bushing with the oil hole in the shaft.




A. Align oil holes.

- Install the 5th gear. The dog recesses face toward the 3rd gear.
- Install the thick splined washer, and turn it so that the teeth coincide with the ridges of the spline.
- Install the splined washer with the locking tabs. The locking tabs must go into the thick splined washer.

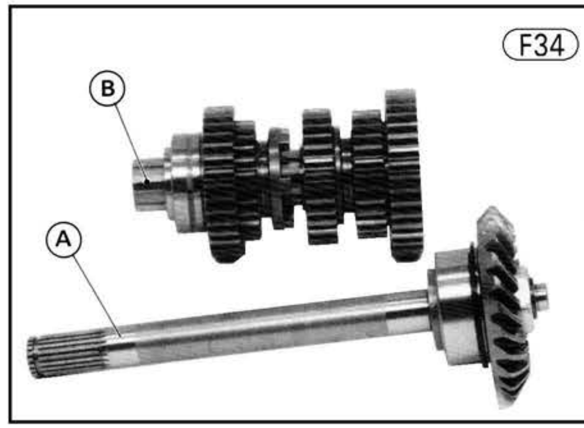



**A. Locking Tabs** **B. Thick Splined Washer**

- Install the 2nd gear with its recess toward the 5th gear.
- Install the copper washer, steel washer, and needle bearing in this order.
- Install the circlip and needle bearing outer race.
- On the ball bearing side of the shaft, install the collar and the secondary chain driven sprocket.

## Driven Shaft
### Disassembly:

- Remove the needle thrust bearing ⑦ and its shim(s) ⑧.
- Pull the inner shaft ⑤ off the outer shaft ⑯, and remove the needle bearing ⑲ from the outer shaft.

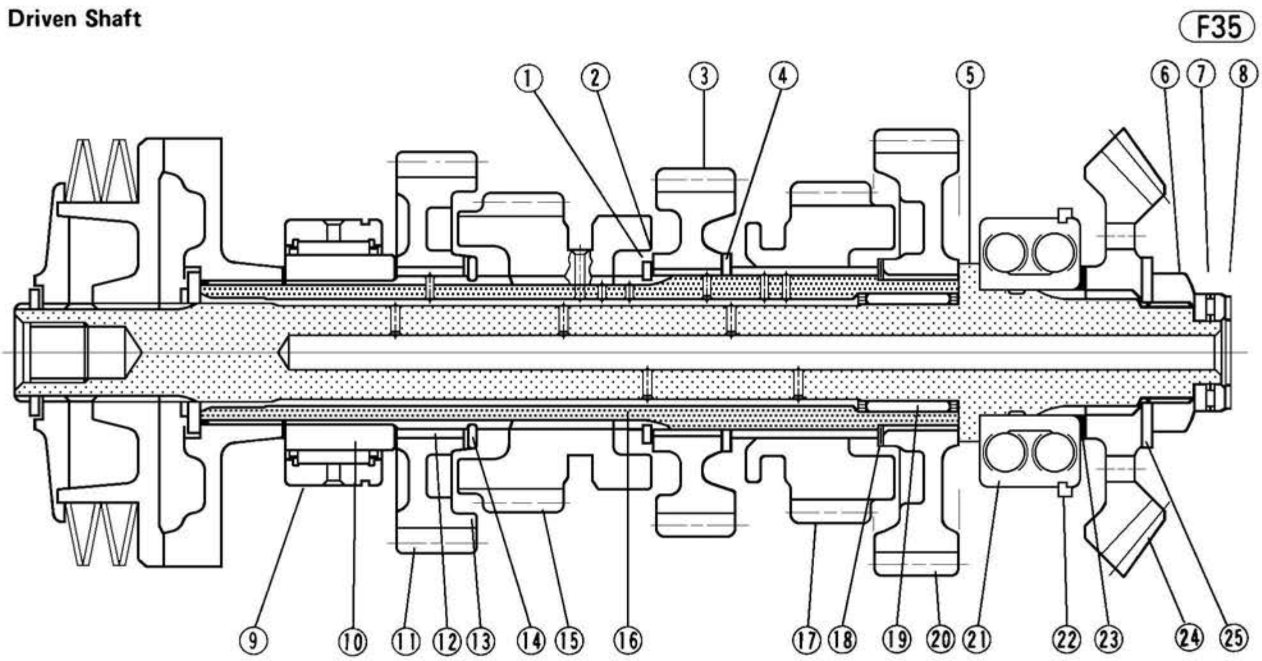



**A. Inner Shaft** **B. Outer Shaft**

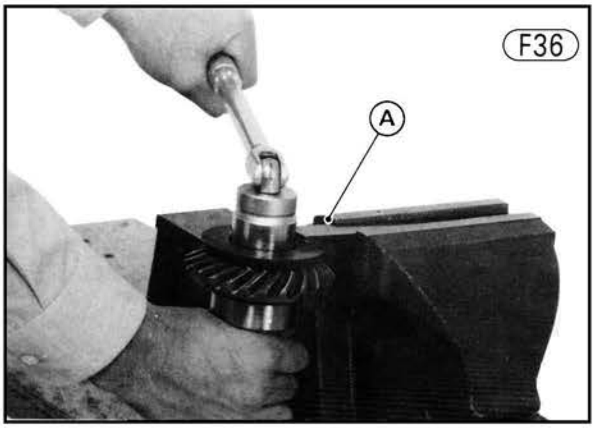
**Inner Shaft:**

- Unscrew the nut ⑥ while holding the bevel gear ㉔ with the holder (special tool).

**Driven Shaft**

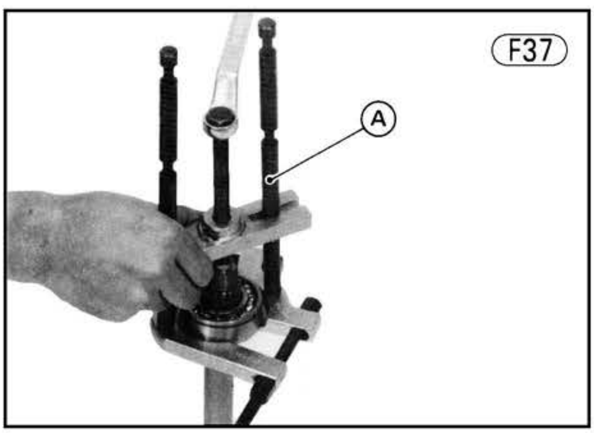



1. Circlip
2. Splined Washer
3. 3rd Gear
4. Washer
5. Inner Shaft
6. Nut
7. Needle Thrust Bearing
8. Shim(s)
9. Needle Bearing
10. Needle Bearing Inner Race
11. 2nd Gear
12. Bushing
13. Splined Washer
14. Circlip
15. 5th Gear
16. Outer Shaft
17. 4th Gear
18. Washer
19. Needle Bearing
20. 1st Gear
21. Ball Bearing
22. Set Ring
23. Shim(s)
24. Bevel Gear
25. Lockwasher




**A. Bevel Gear Holder (57001-1043)**

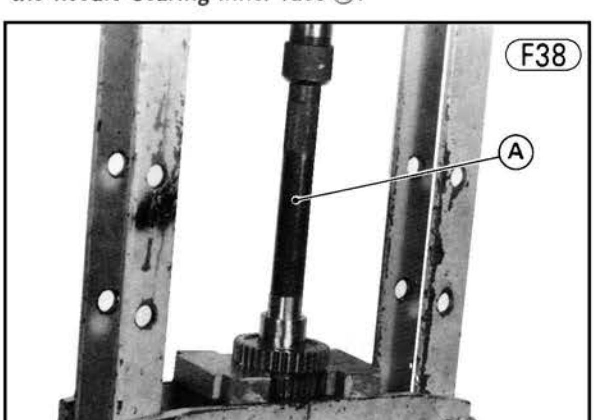
- Remove the lockwasher ㉕, bevel gear, shim(s) ㉓.
- Remove the set ring ㉒ from the ball bearing ㉑ with circlip pliers.
- Pull off the ball bearing using the bearing puller (special tool).




**A. Bearing Puller (57001-158)**

**Outer Shaft:**

- Pull off the 1st gear ⑳, washer ⑱, and 4th gear ⑰ from the outer shaft, and the needle bearing ⑨ from the other end.
- Support the 2nd gear ⑪ on a press, and push the outer shaft with the circlip driver (special tool) to pull off the needle bearing inner race ⑩.




**A. Transmission Circlip Driver (57001-380)**

- Remove the 2nd gear ⑪, bushing ⑫, and splined washer ⑬.
- Remove the circlip ⑭, and pull off the 5th gear ⑮.
- Remove the circlip ①, and pull off the splined washer ②, 3rd gear ③, and washer ④.

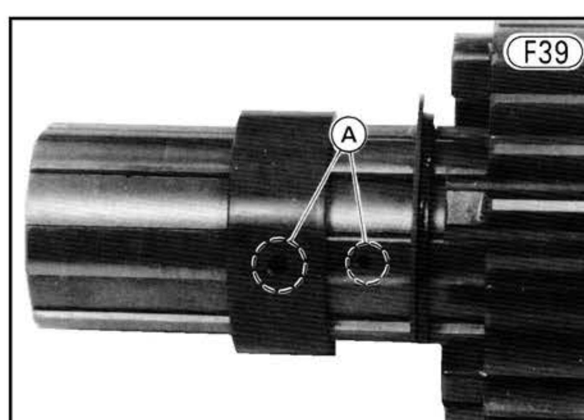
## Assembly:

**NOTES:** 1. The bevel gears on the driven shaft and the output shaft are lapped as a set in the factory to get the best tooth contact. They must be replaced together as a set.

2. Adjust the clearance between the needle thrust bearing and the crankcase when replacing the inner shaft parts and/or needle thrust bearing (Pg. 115).
3. After completing the needle thrust bearing adjustment, adjust the bevel gear backlash and tooth contact pattern when replacing the bevel gears, ball bearing, and/or set ring (Pg. 112).
4. Adjust the cam damper shim when replacing the cam damper parts, inner shaft, outer shaft, and/or needle bearing inner race (Pg 115).
5. Replace any circlips that were removed with new ones, and install them so that the opening coincides with one of the splined grooves in the shaft (Fig. F 27).
6. To avoid distortion of circlips during installation, press them using a gear bushing or gear while spreading the opening as necessary for the circlip to slide over the shaft.

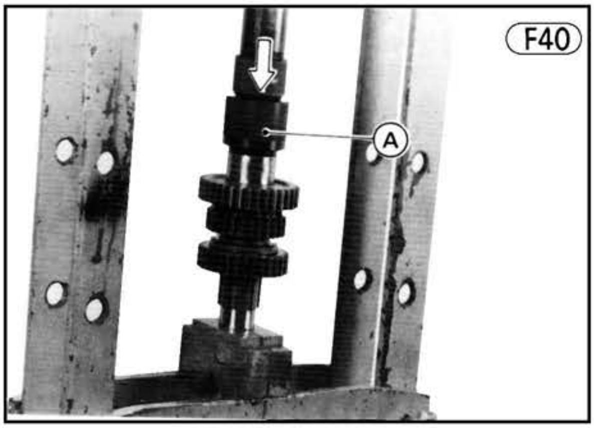
**Outer Shaft:**

- Install the washer, 3rd gear, and splined washer in that order. The gear dog recesses are on the opposite side of the washer.
- Install the circlip.
- Install the 5th gear. Align the oil hole with the oil hole in the shaft. The groove for shift fork faces toward the 3rd gear.
- Install the circlip.
- Install the splined washer and bushing in that order. Align the bushing oil hole with the oil hole in the shaft.




**A. Align oil holes.**

- Install the 2nd gear with the dog recesses toward the 5th gear.
- Press fit the needle bearing inner race using the front fork oil seal driver (special tool) until it stops at the stepped portion.

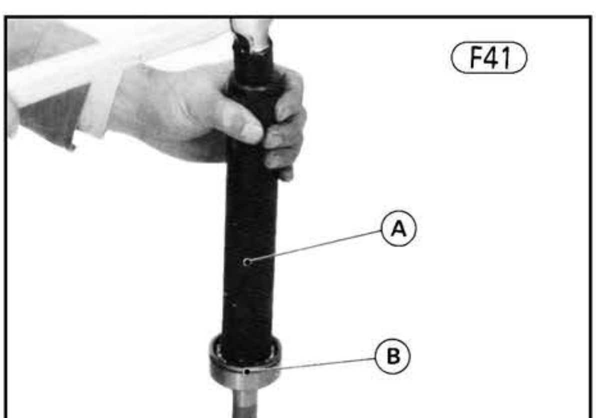



**A. Front Fork Oil Seal Driver (57001-191)**

- Install the needle bearing with the set ring groove toward the 2nd gear.
- Install the 4th gear on the opposite end of the needle bearing, aligning its oil hole with the oil hole in the shaft. The groove for the shift fork faces toward the 3rd gear.
- Install the washer and 1st gear in that order. The dog recesses face toward the 4th gear.
- Fit the needle bearing into the outer shaft end.

**Inner Shaft:**

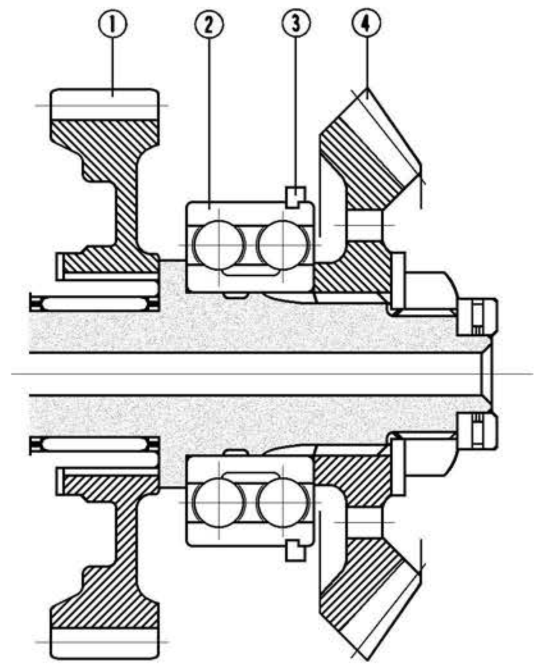
- Install the ball bearing using the stem bearing driver (special tool). The set ring groove must be on the bevel gear side.




**A. Stem Bearing Driver (57001-137)** **B. Groove**

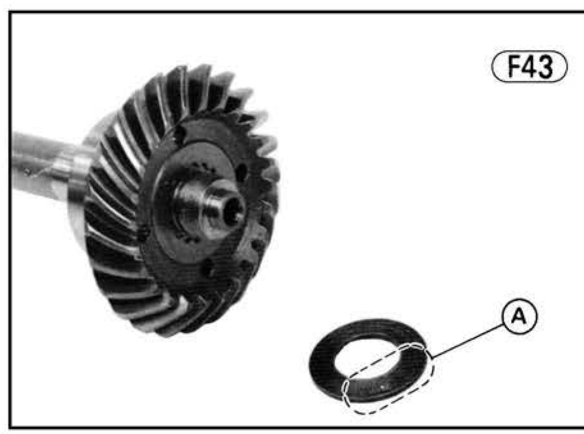
- Install the set ring in the groove of the ball bearing. The notched side of the set ring is on the bevel gear side.

**Set Ring**




1. 1st Gear
2. Ball Bearing
3. Set Ring
4. Driven Shaft Bevel Gear

- Install the shim(s), bevel gear, and lockwasher ("OUT SIDE" marking faces out).




**A. "OUT SIDE" Marking**

- Apply a non-permanent locking agent to the threads, and screw the nut on the inner shaft.

**NOTE:** If bevel gear backlash and tooth contact pattern is to be adjusted later, a non-permanent locking agent is not needed, and torque the nut to more than 3.0 kg-m (22 ft-lbs). After the bevel gear adjustments are completed, install the nut in the following manner:

- Holding the bevel gear with the special tool, tighten the nut to 12.0 kg-m (87 ft-lbs) of torque.
- Insert the inner shaft into the outer shaft from the 1st gear side.
- Put the needle thrust bearing and shim(s) on the inner shaft end. Correct sequence starting with next to the nut is the flat race (marked "WS"), caged needles, flat

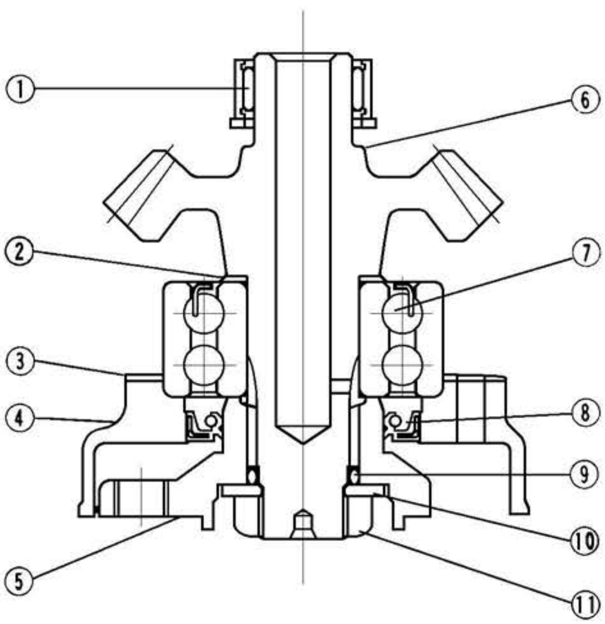
race (marked "GS"), and shim(s). Set the flat races facing the marked surface on the opposite side of the needle bearing.

## Output Shaft

### Disassembly:

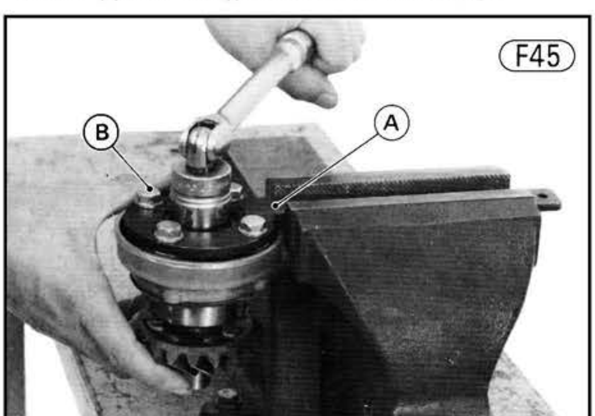
●Remove the needle bearing.

**Output Shaft** (F44)




1. Needle Bearing
2. Shim(s)
3. Gasket
4. Bearing Cap
5. Output Shaft Coupling
6. Output Shaft
7. Ball Bearing
8. Oil Seal
9. O Ring
10. Lockwasher
11. Nut

●Hold the output shaft coupling ⑤ steady using the holder (special tool), and unscrew the nut ⑪.

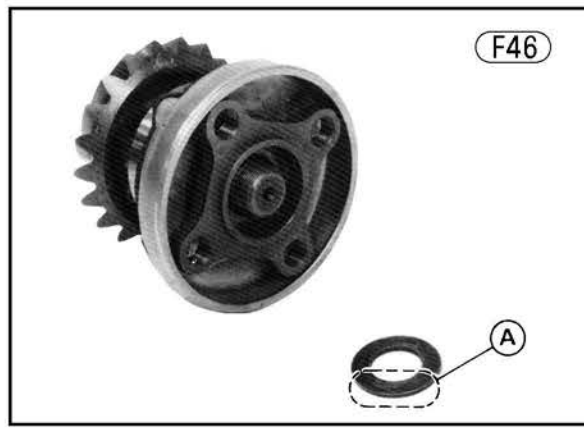



**A. Output Shaft Holder (57001-1044)**
**B. Universal Joint Coupling Bolt**

●Remove the lockwasher ⑩, O ring ⑨, output shaft coupling, bearing cap, and its gasket.
●Remove the ball bearing and shim(s). The bearing can be easily pulled off by hand.

### Assembly Notes:

1. The bevel gears on the output shaft and the driven shaft are lapped as a set at the factory to get the best tooth contact. They must be replaced together as a set.
2. Adjust the bevel gear backlash and tooth contact pattern when replacing the bevel gears and/or ball bearing.
3. The "OUT SIDE" marking on the lockwasher must be on the nut side.



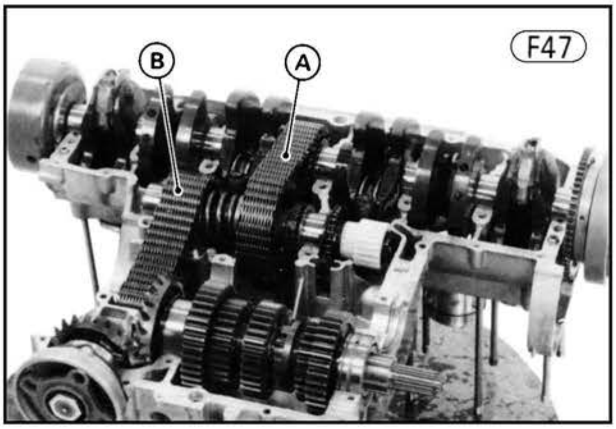

**A. "OUT SIDE" Marking**

4. Apply a non-permanent locking agent to the threads, and tighten the nut to 12.0 kg-m (87 ft-lbs) of torque. If bevel gear backlash and tooth contact pattern is to be adjusted later, a non-permanent locking agent is not needed. Torque the nut to more than 3.0 kg-m (22 ft-lbs) during bevel gear adjustment.

## SECONDARY SHAFT, SECONDARY CHAIN, CAMSHAFT CHAIN, TIMING CHAIN

### Removal:

●Remove the cylinder block (Pg. 73).
●Remove the engine (Pg. 96).
●Split the crankcase (Pg. 98).
●Remove the drive shaft (Pg. 101).
●Pull up and keep the camshaft chain and timing chain out of the upper crankcase half.
●Remove the secondary shaft, disengaging the primary chain and secondary chain.

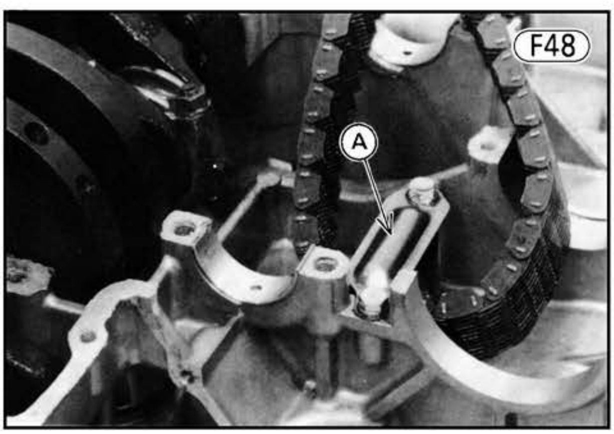



**A. Primary Chain** **B. Secondary Chain**

•Remove the oil receiver and secondary chain.

## Installation Notes:

1. Apply a non-permanent locking agent to the oil receiver mounting bolts (2) and tighten them to 1.0 kg-m (87 in-lbs) of torque. The oil receiver must be installed on the crankcase half as shown below.

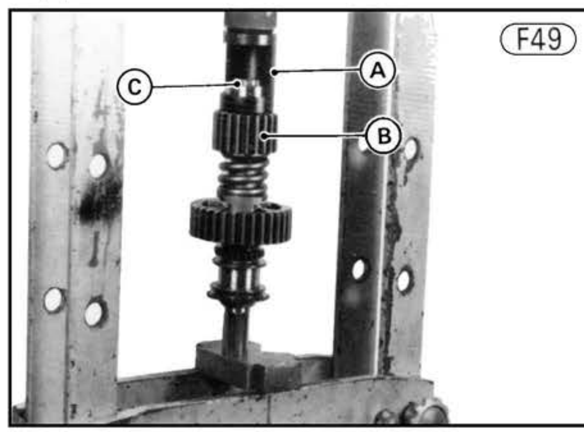



**A. Convex side is up.**

2. Check that the bearing inserts (2) are in place.
3. Check that the crankshaft and the secondary shaft are properly timed as follows:
   ○Turn the crankshaft so that the timing mark on the primary chain drive sprocket is at its highest position.
   ○Find the guide link aligned with the timing mark on the primary chain drive sprocket – that is link no. 1.
   ○Count 7 links as shown. Link no. 7 should be centered on the timing mark of the primary chain driven sprocket.
   ○If it is not, correct the timing.

## Secondary Shaft Disassembly:

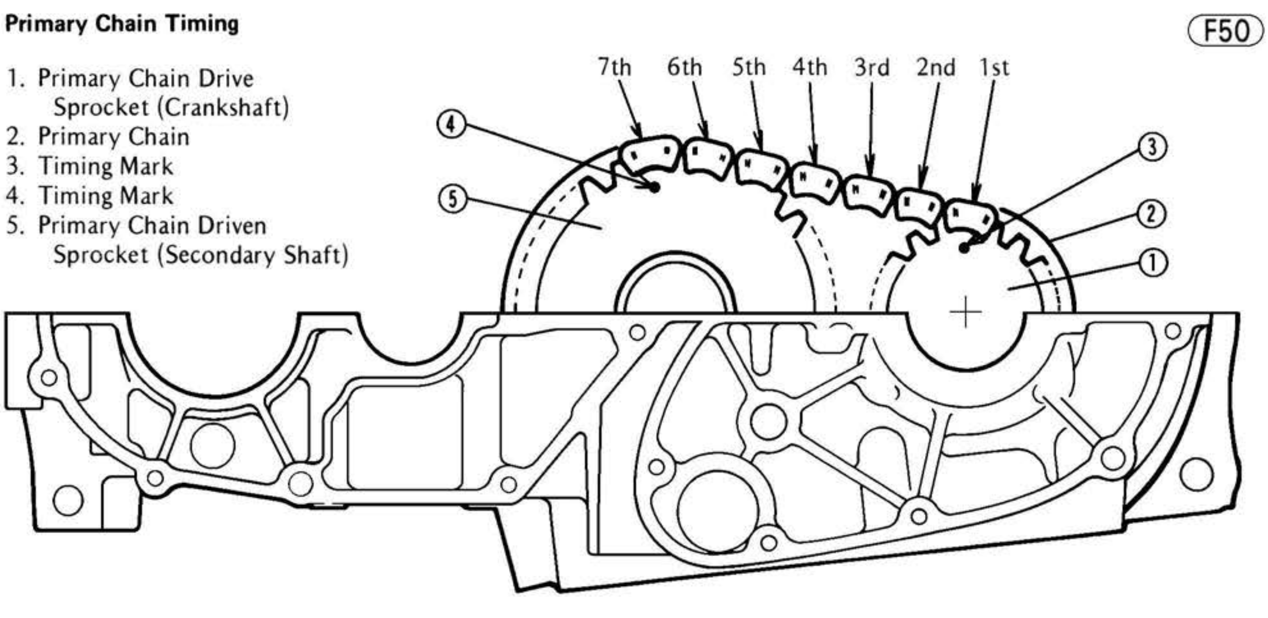
•Take out the circlip ②, and remove the washer ③ and oil pump drive gear ④.
•Press the secondary chain drive sprocket ⑨ using the compressor (special tool), and take out the retainers ⑩ (2).




**A. Compressor (57001-1041)** **C. Retainer**
**B. Secondary Chain Drive Sprocket**

•Remove the secondary chain driven sprocket ⑨, spring ⑧, damper cam follower ⑦, primary chain driven sprocket ⑥, and camshaft chain and timing chain sprockets ⑤.

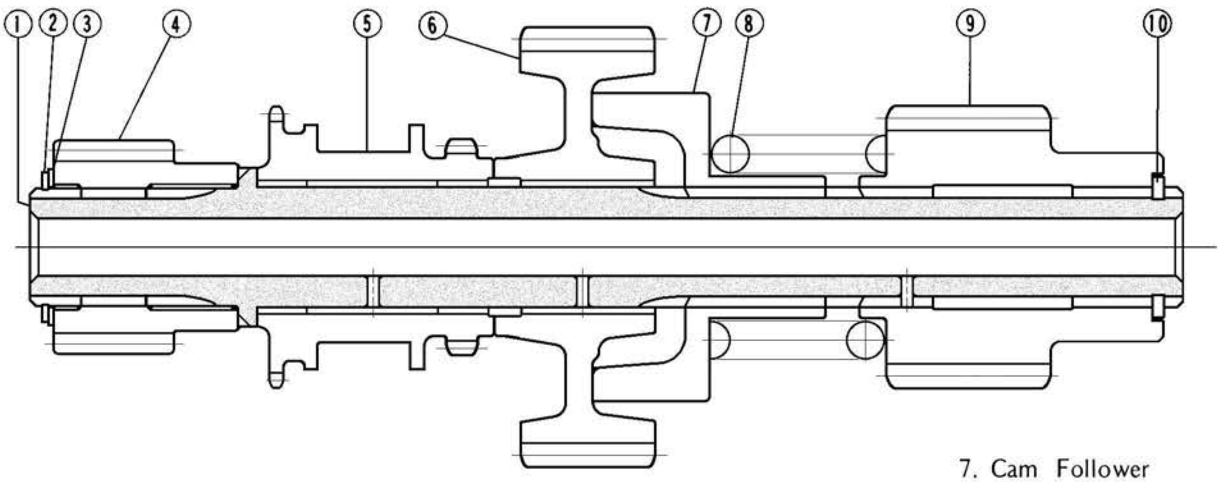
**Primary Chain Timing**




1. Primary Chain Drive Sprocket (Crankshaft)
2. Primary Chain
3. Timing Mark
4. Timing Mark
5. Primary Chain Driven Sprocket (Secondary Shaft)

**Secondary Shaft**

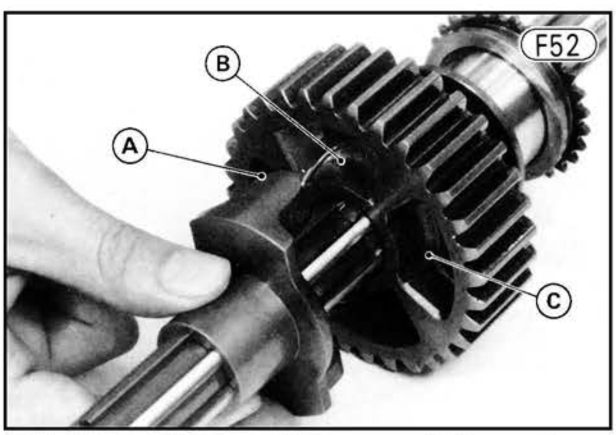
(F51)




1. Secondary Shaft
2. Circlip
3. Washer
4. Oil Pump Drive Gear
5. Camshaft Chain and Timing Chain Sprockets
6. Primary Chain Driven Sprocket
7. Cam Follower
8. Spring
9. Secondary Chain Drive Sprocket
10. Retainers

**Secondary Shaft Assembly Notes:**

1. Be sure to fit the damper cam into the concave recess.

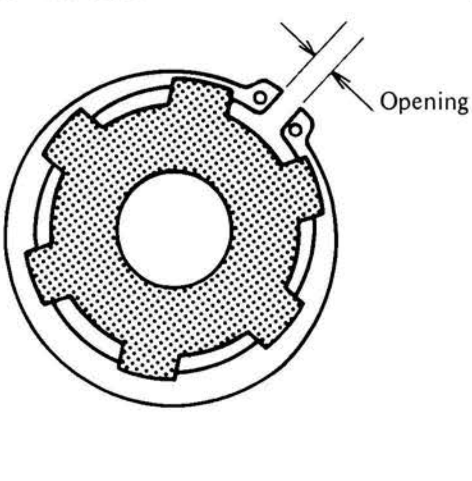



**A. Cam B. Concave Recess C. Square Recess**

2. Replace any circlips that were removed with new ones. Install the circlip so that its opening coincides with one of the splined grooves in the secondary shaft.

**Circlip Installation**

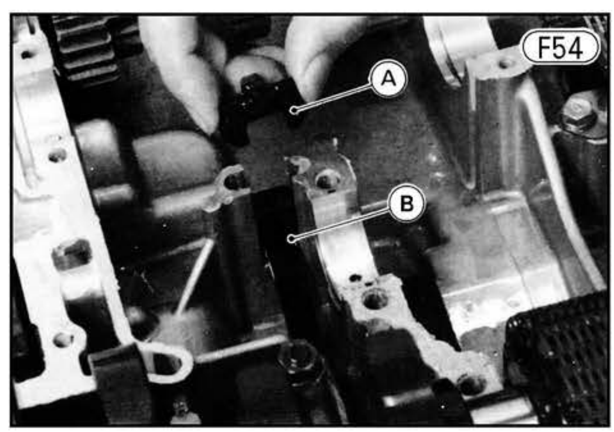
(F53)




## TIMING CHAIN GUIDE

### Removal:

- Remove the cylinder block (Pg. 73).
- Remove the engine (Pg. 96).
- Split the crankcase (Pg. 98).
- Remove the secondary shaft, camshaft chain, timing chain, and secondary chain (Pg 108).
- Remove the rubber plug, and pull out the timing chain guide from the upper crankcase half.




**A. Rubber Plug B. Timing Chain Guide**

## CRANKSHAFT, PRIMARY CHAIN

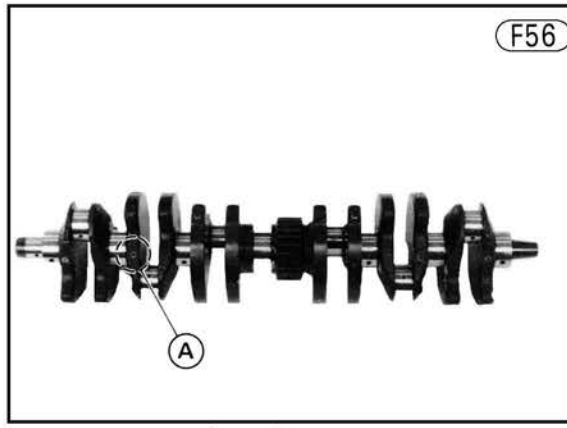
### Removal:

- Remove the cylinder block (Pg. 73) to avoid overstress on the four cylinder bolts.
- Remove the alternator rotor (Pg. 86).
- Remove the torsion damper (Pg. 79).
- Remove the engine (Pg. 96).
- Split the crankcase (Pg. 98).

- Remove the drive shaft and secondary shaft (Pg. 101)
- Mark the connecting rod big end caps as to location so that they can be reinstalled in their original locations.
- Remove the nuts (6) and bolts (6), and pull off the connecting rod big end caps.

**CAUTION To prevent damage, do not allow the big end cap bolts to bump against the crankshaft journals.**

- Slip a 35 mm long hose onto each rod bolt as the cap is removed. This keeps the bolt from scratching the bearing surface.
- Lift off the crankshaft with the camshaft chain.
- Slip the camshaft chain off the crankshaft.




**A Crankshaft Mark (Circle)**

### Installation Notes:

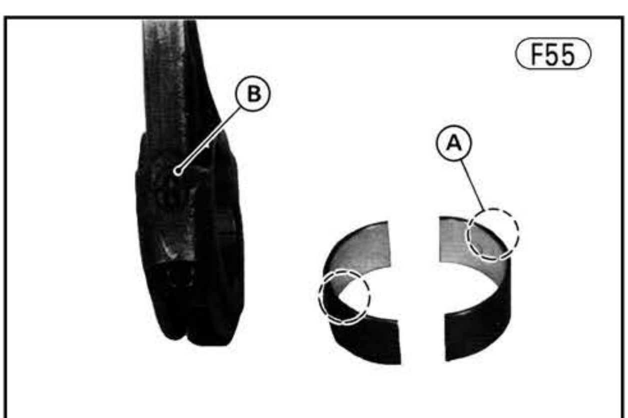
1. There are oil passages running between the crankshaft journals. Use compressed air to remove any foreign particles or residue that may have accumulated in these passages.
2. Be sure to replace the big end cap bolts (12) and nuts (6) with new ones to get the correct tightening force.

**CAUTION Reuse of the old bolts and nuts could lead to subsequent bolt failure or loosening, with extensive engine damage.**

3. If a new crankshaft and/or connecting rod is used, select the proper bearing insert in accordance using the combination table (Table F4) for the connecting rod and the crankshaft marks (Figs. F55 and F56).
4. Set the primary chain so that the crankshaft and secondary shaft are timed (See Pg. 109).
5. Check to see that the main journal and big end bearing inserts are in place (Fig. F15).
6. Slip a 35 mm long hose onto each rod bolt before installing the crankshaft. This keeps the bolt from scratching the bearing surface.
7. Apply a molybdenum disulfide engine assembly grease to the big end bolt threads and seating surface of the bolt and the nut. Figner-tighten the nuts first, then finger-tighten the bolts. Finally tighten the nuts and bolts in the same sequence to 3.5 kg-m (25 ft-lbs) of torque.

**Table F4 Bearing Insert Selection**

| Con-Rod Marking / Crankshaft Marking | ○ | No mark |
|---|---|---|
| ○ | Black P/N 92028-1050 | Brown P/N 92028-1051 |
| No mark | Green P/N 92028-1049 | Black P/N 92028-1050 |




**A. Color Mark**
**B. Connecting Rod Mark (Circle)**

## CONNECTING RODS

### Removal:

- Remove the cylinder block (Pg. 73).
- Remove the pistons and piston pins (Pg. 77).
- Remove the engine (Pg. 96).
- Split the crankcase (Pg. 98).
- Mark the connecting rods and big end caps as to location so that they can be reinstalled in their original locations.
- Remove the nuts (6) and bolts (12), and pull off the connecting rod big end caps and connecting rods.

**CAUTION To prevent damage, do not allow the big end cap bolts to bump against the crankshaft journals.**

- Mark the bearing inserts as to location so that they can be reinstalled in their original locations.
- Remove the connecting rod bearing insert halves from the connecting rod big ends and the big end caps.

### Installation Notes:

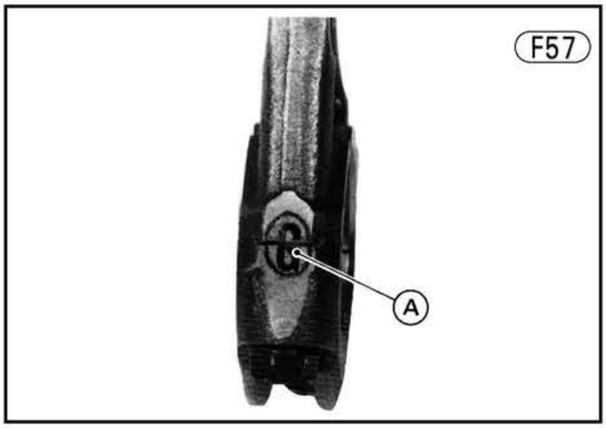
1. Be sure to replace the big end cap bolts (12) and nuts (6) with new ones to get the correct tightening force.

**CAUTION Reuse of the old bolts and nuts could lead to subsequent bolt failure or loosening, with extensive engine damage.**

2. When installing new connecting rods, use connecting rods having the same weight mark. This weight

mark, indicated by a capital letter, is stamped on the connecting rod big end.

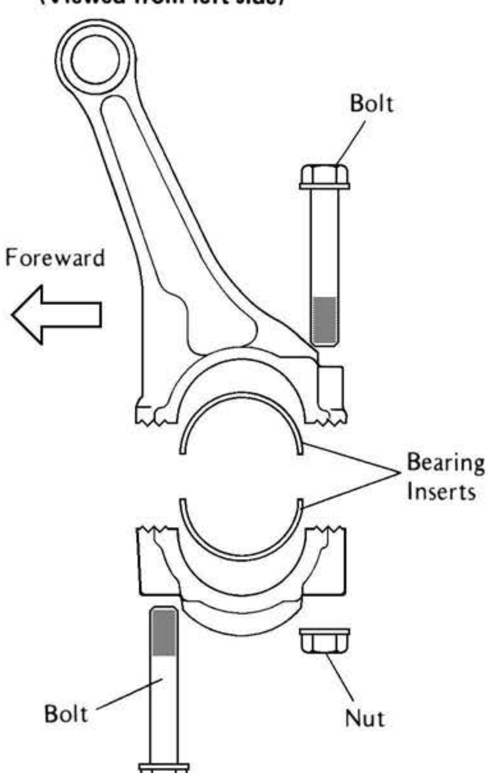
(F57)




**A. Weight Mark (Alphabet)**

3. The connecting rod big end cap is machined with the connecting rod as a set, so it must be replaced together with the connecting rod as a set.
4. If a new crankshaft and/or connecting rod is used, select the proper bearing insert in accordance with the combination table (Table F4) for the connecting rod and the crankshaft marks (Figs. F55 and F56). If the crankshaft is not replaced, first measure the diameter of connecting rod journal of the crankshaft. Then mark its flywheel with the diameter (Pg. 187), and select the proper bearing insert in accordance with Table F4.
5. The connecting rods are not symmertrical. Install them in the direction shown in the figure.

**Connecting Rod Installation (Viewed from left side)** (F58)




6. Check to see that the big end bearing inserts are in place.
7. Apply a molybdenum disulfide engine assembly grease to the big end bolt threads and seating surface of the bolt and the nut. Finger-tighten the nuts first, then finger-tighten the bolts. Finally tighten the nuts and bolts in the same sequence to 3.5 kg-m (25 ft-lbs) of torque.

## CRANKCASE

### Removal:

- Remove the pistons (Pg. 77).
- Remove the engine (Pg. 96).
- Split the crankcase (Pg. 98).
- Remove the transmission (Pg. 101).
- Remove the secondary shaft, camshaft chain, timing chain, and secondary chain (Pg. 108).
- Remove the crankshaft together with the connecting rods, primary chain, alternator rotor, and crankshaft torsion damper.
- Remove the timing chain guide (Pg. 110).
- Remove the oil pressure switch (Pg. 89).
- Remove the external shift mechanism (Pg. 83).
- Remove the shift drum positioning pin (Pg. 91).
- Remove the shift drum and forks (Pg. 91).

### Installation Notes:

1. The upper and lower crankcase halves are machined at the factory as an assembly, and must be replaced together as a set.
2. When the crankcase halves are replaced, install the original shims, check the clearance between the needle thrust bearing and the crankcase and the bevel gear backlash and tooth contact pattern. Adjust them if necessary (Pg. 115 and Pg. 112).

## SHIM ADJUSTMENT

### Backlash and Tooth Contact of Bevel Gears

Improper backlash and/or tooth contact of bevel gears lead to noise and damage of gears.

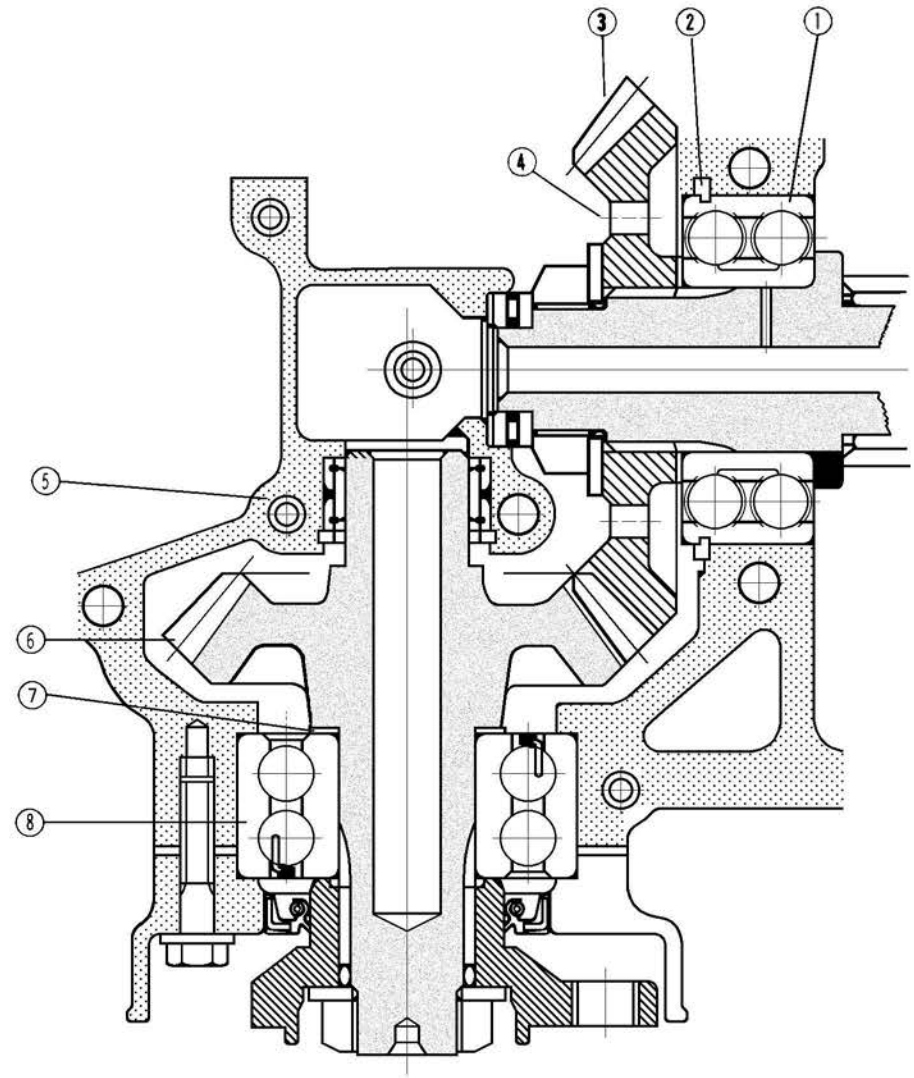
When replacing any one of the following parts which influence the backlash and tooth contact of bevel gears, make sure to check and adjust them. First, adjust the backlash of gears, and then get the correct tooth contact pattern by replacing shims.

Parts which change the backlash and tooth contact are:

Output Shaft Bevel Gear ⑥
Driven Shaft Bevel Gear ③
Crankcase ⑤
Driven Shaft Ball Bearing ①
Set Ring ②
Output Shaft Ball Bearing ⑧

**Parts which Influence the Backlash and Tooth Contact (Viewed from the bottom)**

F59




1. Driven Shaft Ball Bearing
2. Set Ring
3. Driven Shaft Bevel Gear
4. Shim(s) for Driven Shaft Bevel Gear
5. Crankcase
6. Output Shaft Bevel Gear
7. Shim(s) for Output Shaft Bevel Gear
8. Output Shaft Ball Bearing

**CAUTION The bevel gears on the driven shaft and the output shaft are lapped as a set at the factory to get the best tooth contact. They must be replaced togother as a set.**

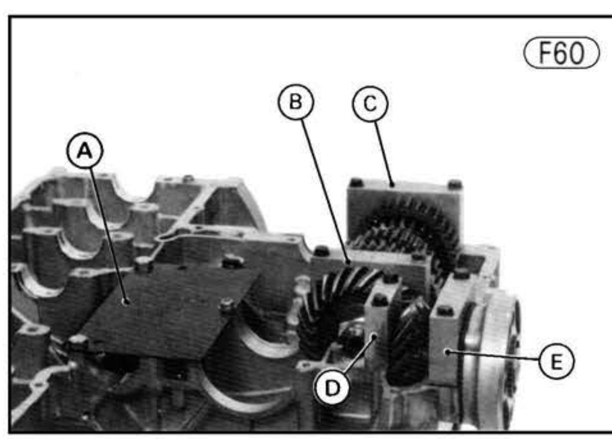
**Backlash Adjustment:**

- Clean any dirt and oil off the teeth of the bevel gears.
- Check and adjust the clearance between the driven shaft needle thrust bearing and crankcase (**Pg.** 115).
- Set the driven shaft assembly, output shaft assembly, driven shaft needle thrust bearing, and the shims on the upper crankcase half.

**NOTE:** When adjusting backlash, remove the secondary shaft with inserts and the drive shaft.

- To set the dial gauge, secure the holder (special tool) on the upper crankcase half with bolts (2).
- Secure the driven shaft bearing ① with the holders (special tools). Push the bevel gear so that the set ring ② contacts the upper crankcase half.
- Install the bearing cap of the output shaft on the crankcase half, using the bearing cap mounting bolts (2).
- Secure the output shaft bearing ⑧ with the holders (special tools).

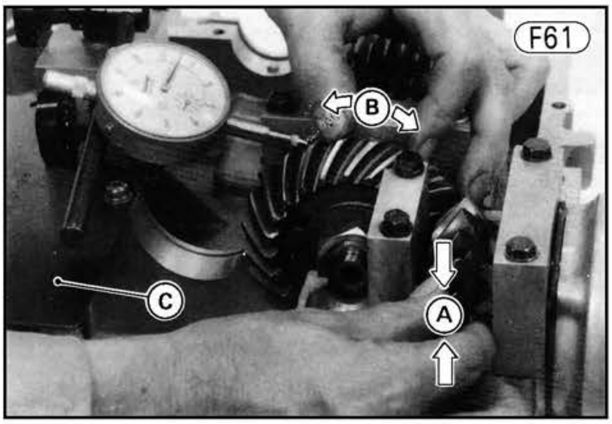
F60




A. Dial Gauge Holder (57001-1049)
B. Holder (57001-1046)
C. Holder (57001-1045)
D. Holder (57001-1048)
E. Holder (57001-1047)

•To measure the backlash, set a dial gauge against a tooth on the driven shaft bevel gear, and move the gear back and forth while holding the output shaft steady (See Fig. F61). The difference between the highest and the lowest gauge reading is the amount of backlash.

**NOTE:** Backlash, or gear lash, is the amount of movement of one gear relative to the other, measured with one gear stationary.




**A. Locked**
**B. Backlash (total movement)**
**C. Dial Gauge Holder (57001-1049)**

•If the amount of backlash is out of the standard range, replace the shims and check the backlash as mentioned above.

**Table F5 Gear Backlash**

| | |
|---|---|
| Standard | 0.10~0.15 mm |

**NOTES:** 1. For assembly and disassembly of the inner driven shaft and output shaft ⑥ for replacing shims, see "Inner Shaft" (Pg. 105 and Pg. 107) and "Output Shaft" (Pg. 108).

2. Shims ④ and ⑦ are available in the various sizes shown in the table.

**Table F6 Shim Sizes**

| Thickness (mm) | Part Number | |
|---|---|---|
| | Shim ④ for driven shaft bevel gear | Shim ⑦ for output shaft bevel gear |
| 0.1 | 92025-1009 | 92025-1016 |
| 0.15 | 92025-1010 | 92025-1017 |
| 0.2 | 92025-1011 | 92025-1018 |
| 0.3 | 92025-1012 | 92025-1019 |
| 0.6 | 92025-1006 | 92025-1013 |
| 0.9 | 92025-1007 | 92025-1014 |
| 1.2 | 92025-1008 | 92025-1015 |

3. When increasing the thickness of one of shims (④or ⑦) by 0.1 mm, the backlash will decrease about 0.06 mm and vice versa. So the following formula can be used to estimate the most desirable shim(s) (④or ⑦) thickness from the present shim(s) (④or ⑦) thickness, when the backlash is out of the standard range.

$$A = B + 1.7 \times (C - 0.13)$$

A : Desirable Shim(s) (④or⑦) Thickness (mm)
B : Present Shim(s) (④or⑦) Thickness (mm)
C : Backlash when present shims are installed (mm)

**Tooth Contact Adjustment:**

•Apply checking compound to 4 or 5 teeth of the driven shaft bevel gear.

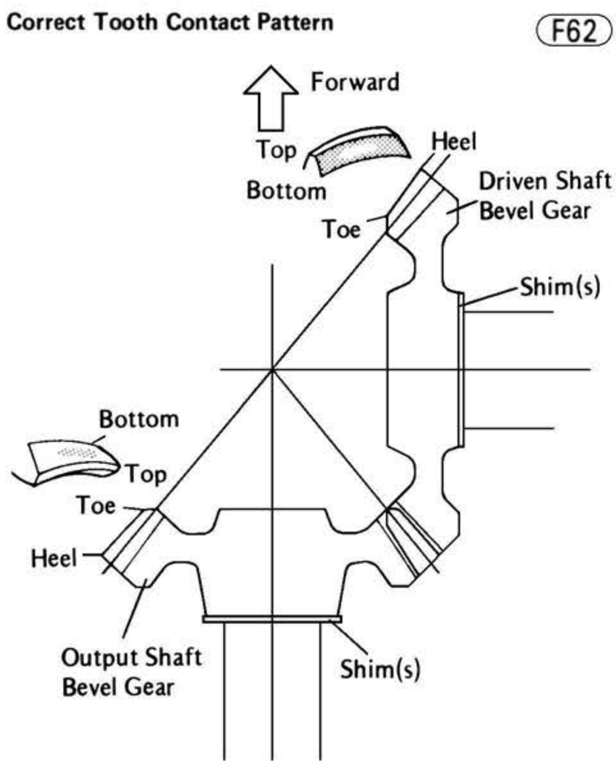
**NOTES:** 1. Check to see that there is no dirt or oil on the teeth.

2. Special compounds are available from automotive supply stores for the purpose of checking differential gear tooth patterns and contact. Use this for checking the bevel gears.
3. The checking compound must be smooth and firm, with the consistency of tooth paste.
4. Apply to the teeth quite thinly with a fairly stiff paint brush. If painted too thickly, the exact tooth pattern may not appear.

•Turn the output shaft for 3 or 4 revolutions in the drive and the reverse (coast) direction, while creating a drag on the driven shaft.

•Check the drive pattern and coast pattern of the bevel gear teeth.

**Correct Tooth Contact Pattern**



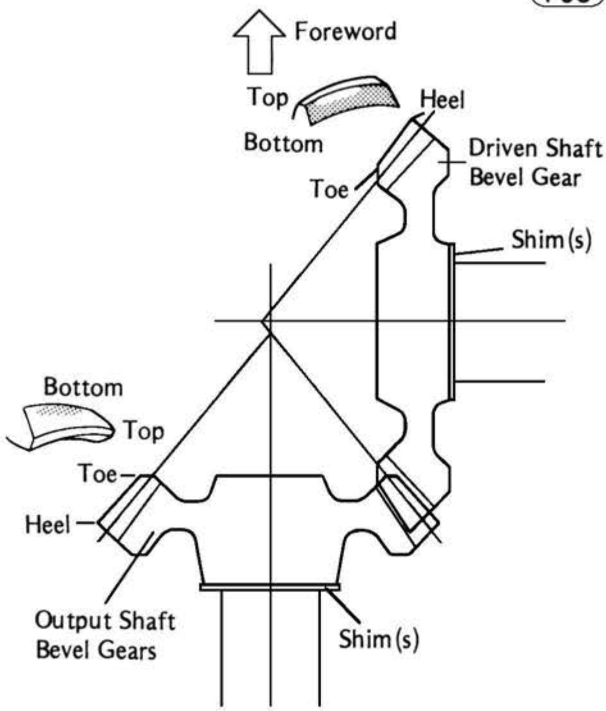

**NOTE:** The tooth contact patterns (of both drive and coast sides) should be centrally located between the top and bottom of the tooth. The drive side of the driven shaft is the convex side, and the coast side is the concave side.

•If correct tooth contact pattern cannot be obtained, replace shims in the following manner. Then erase the original tooth contact pattern, and check the new pattern. Check the backlash every time the shims are replaced.

Ex. 1 Incorrect tooth contact pattern 1

Decrease the driven shaft shim thickness by 0.05 mm and increase the output shim thickness by the same amount to correct the pattern shown below. Repeat in 0.05 mm steps if necessary.

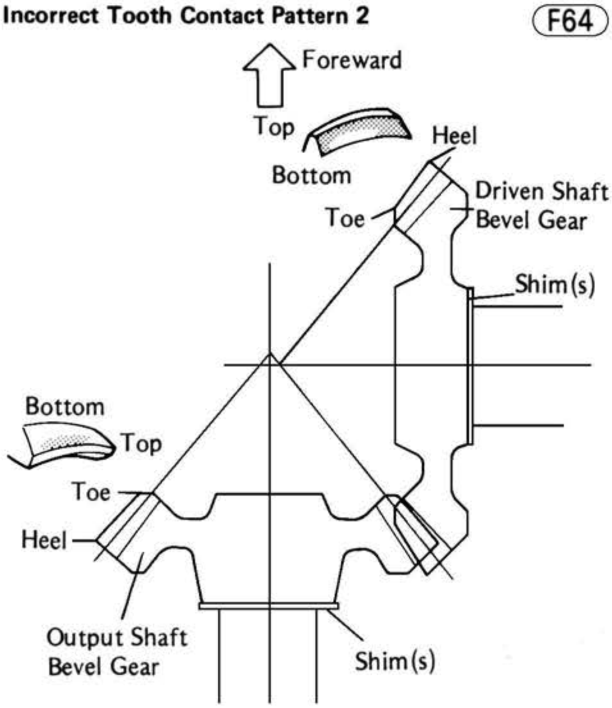
**Incorrect Tooth Contact Pattern 1** (F63)




Ex. 2 Incorrect tooth contact pattern 2

Increase the driven shaft shim thickness by 0.05 mm and decrease the output shaft shims by the same amount. Check the tooth contact pattern. Repeat the shim change procedure in 0.05 mm steps if necessary.

**Incorrect Tooth Contact Pattern 2** (F64)




- When the correct pattern is obtained, clean the checking compound off the gear teeth.

## Needle Thrust Bearing/Crankcase Clearance

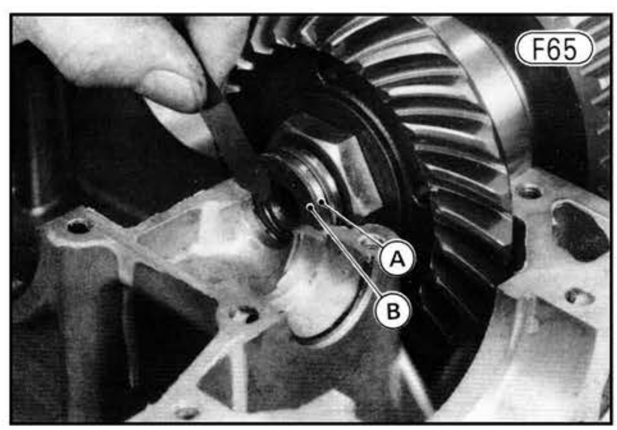
When replacing the inner driven shaft parts, needle thrust bearing, and/or crankcase halves, adjust the clearance between the needle thrust bearing and the crankcase. Also, after completion of transmission bevel gear adjustment, perform this clearance adjustment.

- Fit the driven shaft assembly and needle thrust bearing on the upper crankcase half (Pg. 102), and push the bevel gear so that the set ring on the ball bearing is pressed against the crankcase.
- Insert the shims between the flat race and the crankcase so that the clearance between the shims and the crankcase is less than 0.05 mm.

**NOTE:** Insert thinner shims on the thrust bearing side.

**Table F7 Shim Sizes**

| Thickness (mm) | Part Number |
|---|---|
| 0.1 | 92025-1023 |
| 0.15 | 92025-1024 |
| 0.2 | 92025-1025 |
| 0.3 | 92025-1026 |
| 0.6 | 92025-1020 |
| 0.9 | 92025-1021 |
| 1.2 | 92025-1022 |



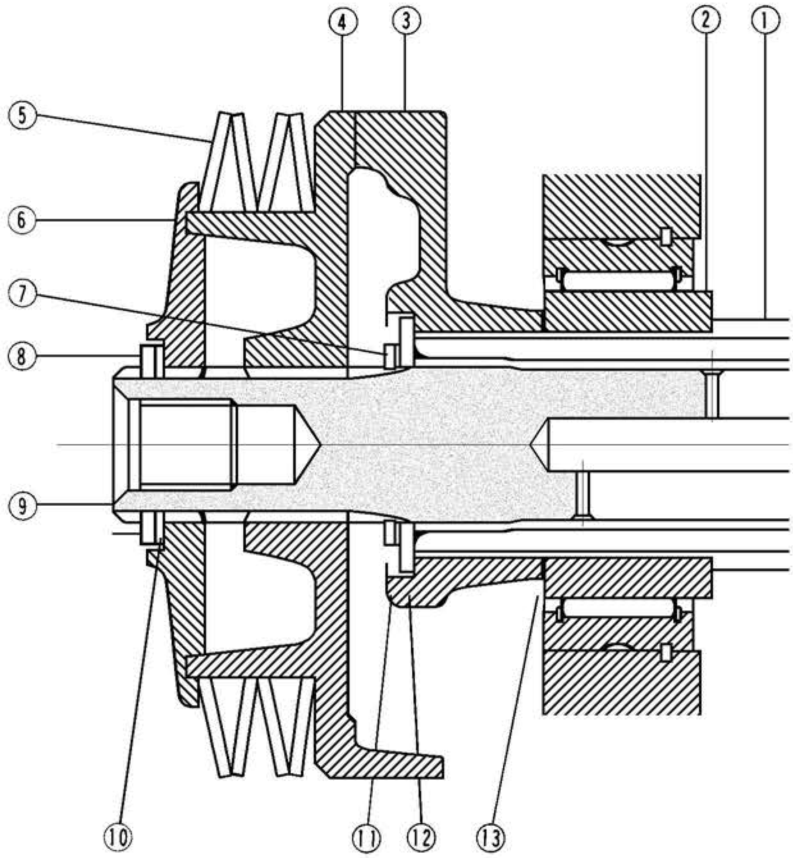

**A. Flat Race** **B. Shims**

## Cam Damper

The damper spring ⑤ must be compressed to the specified length to give the cam damper correct preload. This length will change, and therefore will need to be adjusted, if any cam damper parts, inner driven shaft ⑨, outer driven shaft ①, and/or needle bearing inner race ② of the driven shaft are replaced.

**Driven Shaft Cam Damper**

F66




1. Outer Shaft
2. Inner Race
3. Cam Follower
4. Damper Cam
5. Damper Spring
6. Spring Stop
7. Circlip
8. Retainers
9. Inner Shaft
10. Shim C
11. Shim B
12. Washer
13. Shim A

The cam damper is adjusted by the shims at the three places A, B, and C shown in the figure. These shims are interrelated, so they must be adjusted starting with A, then B, and then C. The table below shows which shims must be adjusted when the following parts are replaced.

**Table F8 Replacement Parts and Shim Adjustment**

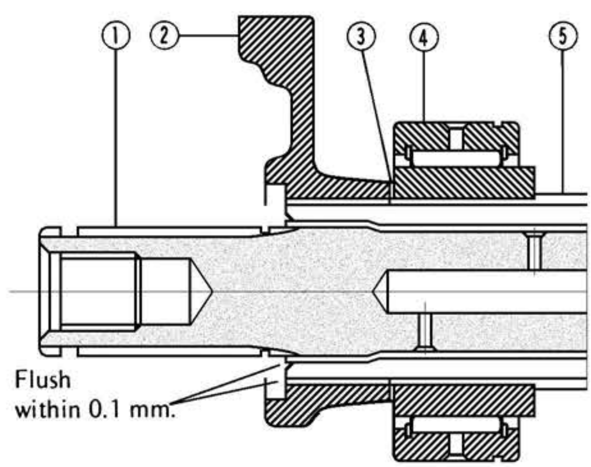
| Nomenclature | Adjust Shim | | |
|---|---|---|---|
| | A | B | C |
| Damper cam ④ | — | — | ● |
| Spring stop ⑥ | — | — | ● |
| Retainers ⑧ | — | — | ● |
| Washer ⑫ | — | ● | — |
| Circlip ⑦ | — | ● | — |
| Inner shaft ⑨ | — | ● | ● |
| Outer shaft ① | ● | ● | ● |
| Inner race ② | ● | ● | ● |
| Cam follower ③ | ● | ● | ● |

**Shim A Adjustment:**

- Adjust shim(s) A so that the ends of the outer driven shaft and damper cam follower are flush (within 0.1 mm).

**Shim A Adjustment**

F67




1. Inner Shaft
2. Cam Follower
3. Shim A
4. Needle Bearing
5. Outer Shaft

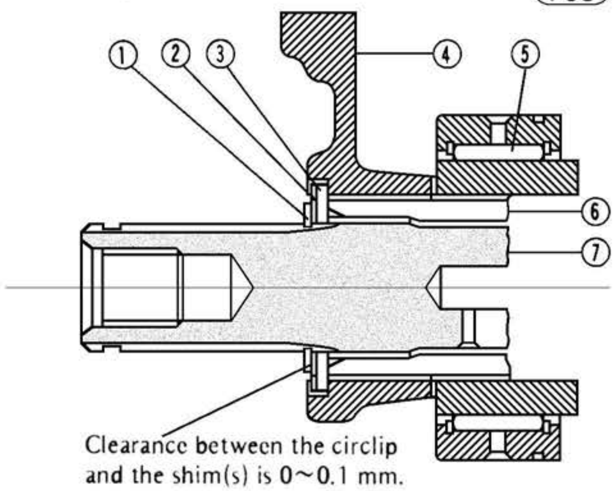
**Table F9 Shim A**

| Thickness | Part Number |
|---|---|
| 0.1 mm | 92025-1002 |
| 0.3 mm | 92025-1003 |

**Shim B Adjustment:**

- Adjust shim(s) **B** so that the clearance between the circlip and the shim(s) is 0~0.1 mm.

**Shim B Adjustment** (F68)



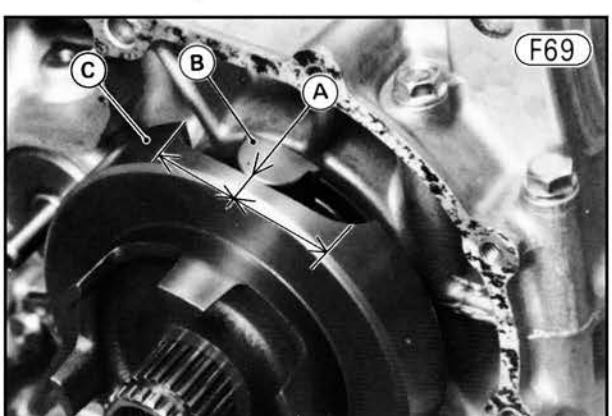

1. Circlip
2. Shim **B**
3. Washer
4. Cam Follower
5. Needle Bearing
6. Outer Shaft
7. Inner Race

**Table F10 Shim B**

| Thickness | Part Number |
|---|---|
| 0.1 mm | 92025-1004 |
| 0.3 mm | 92025-1005 |

**Shim C Adjustment:**

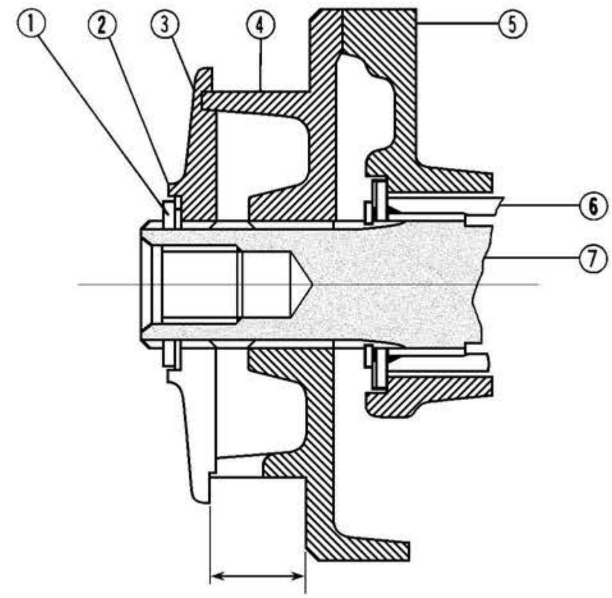
- See Fig. E139 on **Pg. 83** when installing the damper cam and spring stop. Install the damper cam, stop, and retainers on the inner shaft.
- Turn the damper cam so that the center of cam and cam follower align.




**A. Align the center.**
**B. Cam Follower**
**C. Damper Cam**

- Push the cam against the follower, and pull the spring stop against the retainer so that the spring installed length is maximum.
- Measure the spring installed length (the distance between the spring stop and the cam follower).

**Shim C Adjustment** (F70)




1. Retainer
2. Shim C
3. Stop
4. Damper Cam
5. Cam Follower
6. Outer Shaft
7. Inner Shaft

- Adjust shim(s) C so that the spring installed length is 17.9 ~ 18.1 mm. Shim(s) C are the same parts as shims **B**.

# Disassembly–Chassis

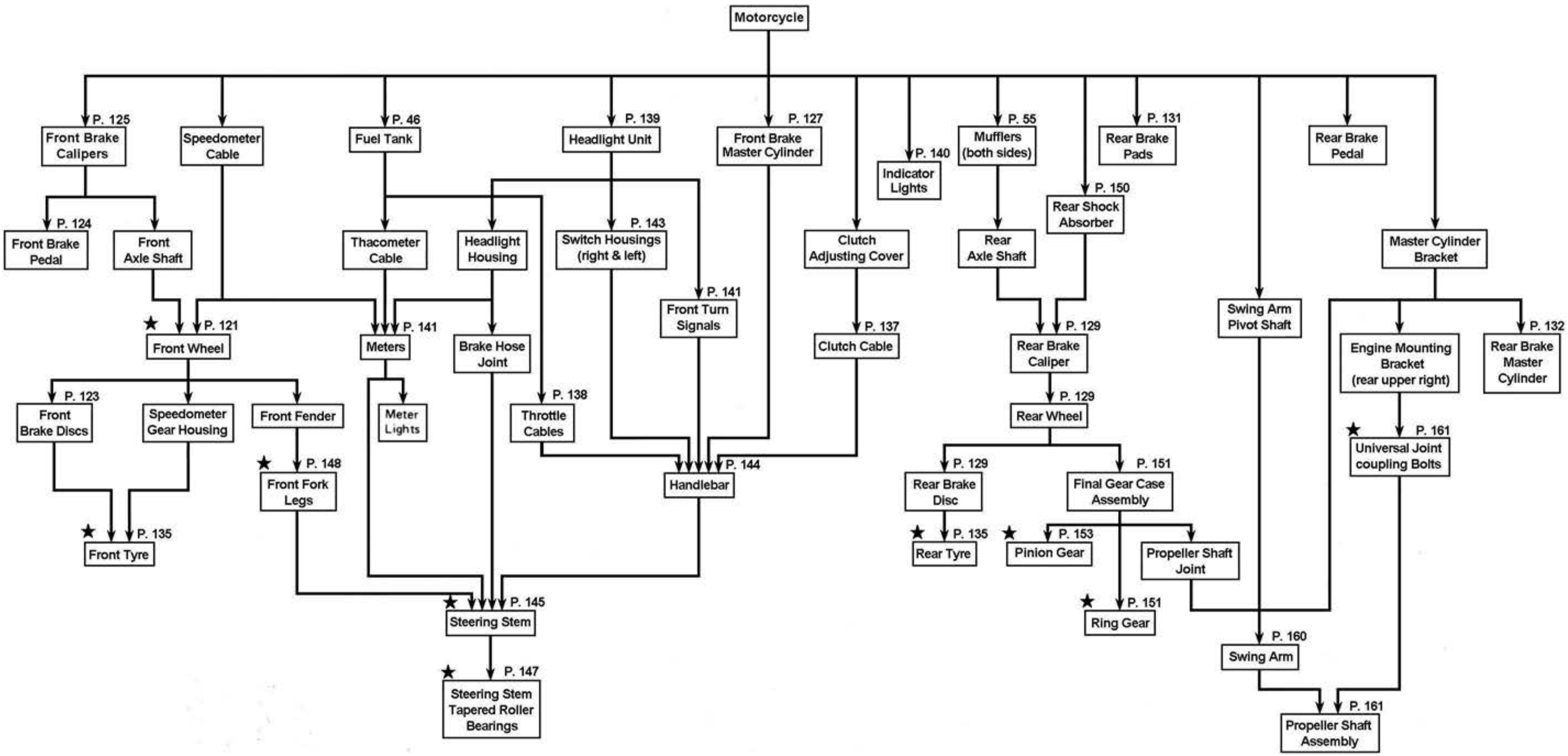
## Table of Contents



G

# FLOW CHART
## Disassembly – Chassis

**This chart is intended to be aids to proper removal. Select the component you wish to remove and follow the arrows to that point on the chart.**

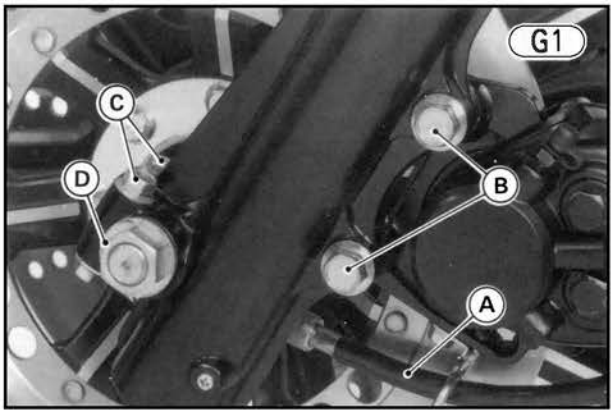



**NOTE: Action With a mark ( ) requires special tool(s) for removal, installation, disassembly or assembly**

## FRONT WHEEL

### Removal:

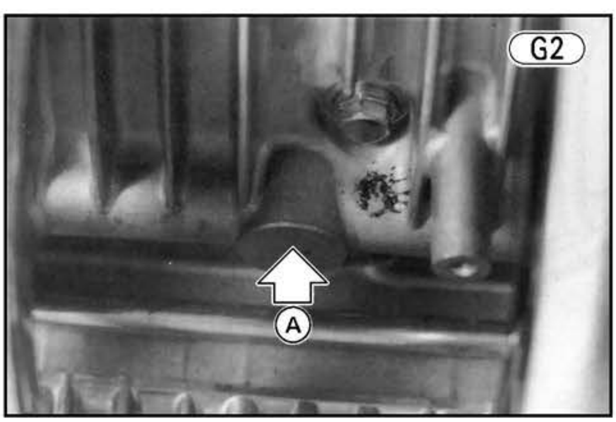
- Set the motorcycle on its center stand.
- Disconnect the lower end of the speedometer cable with pliers.




**A. Speedometer Cable** **C. Axle Clamp Bolts**
**B. Caliper Mounting Bolts** **D. Axle Nut**

- Remove the mounting bolts, lockwashers, and flat washers (2 ea), and remove one of the calipers from the fork leg. The brake hose need not be disconnected from the caliper.
- Insert a wood wedge (5 ~ 6 mm thick) between the disc brake pads. This prevents the pads from being pushed out of position if the brake lever is accidentally squeezed.
- Loosen the axle nut and clamp bolts (4).
- Using a jack at the specified location under the engine, lift the front wheel off the ground.

**CAUTION** **If a jack is applied at locations other than specified, engine damage could result.**




**A. Apply a jack at this location.**

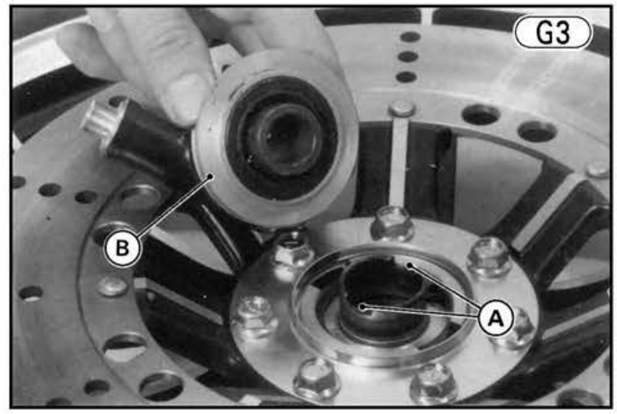
- Pull out the axle and remove the wheel.

**CAUTION** **Do not let the wheel lean on the discs or allow the discs to touch the ground. This can damage or warp the disc. Place blocks under the wheel so that the discs do not touch the ground.**

- Insert a wood wedge (6 ~ 7 mm thick) between the pads of the other caliper.

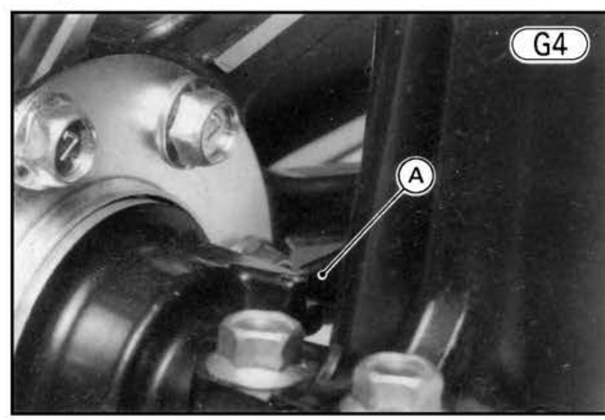
### Installation Notes:

1. Install the speedometer gear housing so that the tabs on the speedometer gear fit in the notches in the speedometer gear drive.



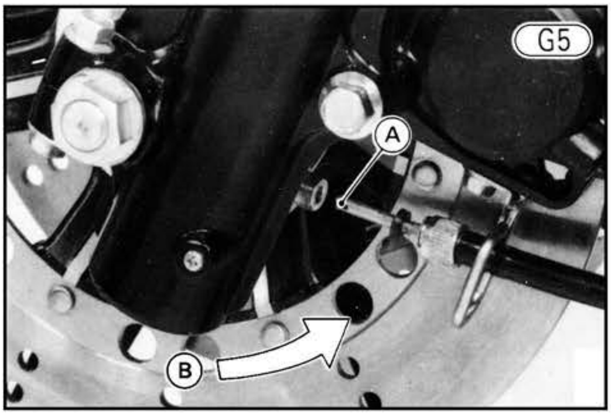

**A. Notches** **B. Speedometer Gear Housing**

2. Before installing the wheel, use a high flash-point solvent to completely clean off any grease that may have gotten on either side of the discs. Do not use a solvent which will leave an oily residue.
3. Insert the front axle from right to left.
4. Turn the speedometer gear housing counterclockwise until it comes to rest against the stop on the fork leg.




**A. Stop**

5. Tighten the axle nut and clamp nuts (4) as follows:
   - ○Tighten the axle nut and clamp nuts (4) to a snug fit.
   - ○Tighten the axle nut to 8.0 kg-m (58 ft-lbs) of torque. Prevent the axle from turning by inserting a metal rod through the axle.
   - ○Tighten the axle clamp nuts (2) on the left fork leg to 1.8 kg-m (13.0 ft-lbs) of torque.
   - ○Loosen the axle clamp nuts on the right fork leg, and pump the front fork several times. This operation aligns both front fork legs so that they are parallel to each other.
   - ○Tighten the axle clamp nuts on the right fork leg to 1.8 kg-m (13.0 ft-lbs) of torque.
6. Insert the speedometer inner cable into the housing while turning the wheel so that the slot in the end of the cable will mesh with the tongue of the speedometer pinion.




**A. Slot** **B. Turn the wheel.**

7. Tighten the caliper mounting bolts (2) to 4.0 kg-m (29 ft-lbs) of torque.

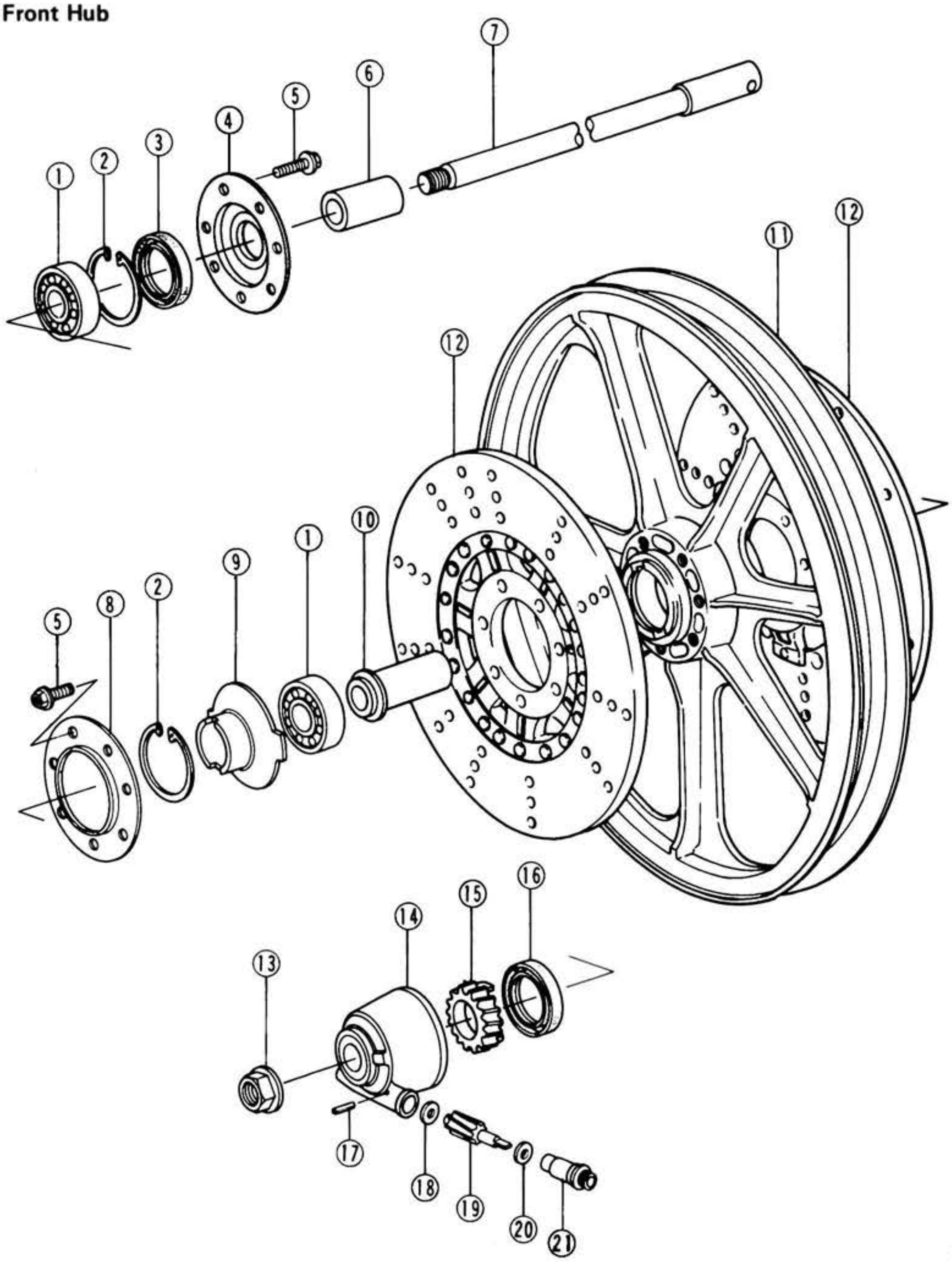
**WARNING** **Do not ride the motorcycle until the pads are seated against the discs. Pump the brake lever several times until a full, firm lever "feel" is obtained. The front brakes will not function on the first application of the lever if this is not done.**

### Front Hub Disassembly:

●Pull the speedometer gear housing ⑭ and collar ⑥ off the front hub.

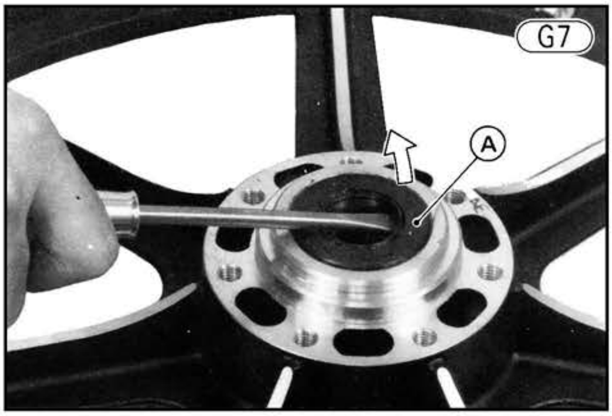
**Front Hub**

G6




1. Bearing
2. Circlip
3. Grease Seal
4. Wheel Cap
5. Bolt
6. Distance Collar
7. Axle Shaft
8. Speedometer Gear Drive Holding Plate
9. Speedometer Gear Drive
10. Distance Collar
11. Front Hub
12. Disc
13. Axle Nut
14. Speedometer Gear Housing
15. Speedometer Gear
16. Grease Seal
17. Pin
18. Washer
19. Speedometer Pinion
20. Washer
21. Bushing

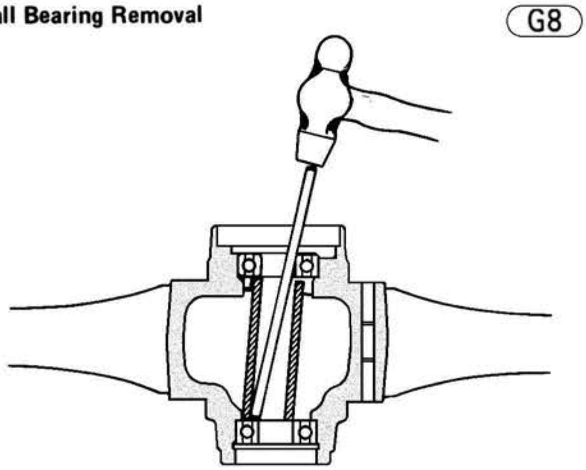
- Remove the wheel cap ④ and holding plate ⑧. Remove both discs ⑫ by unscrewing the mounting bolts ⑤ (14).
- Remove the circlip ② on the left side, and remove the speedometer gear drive ⑨.
- Pry out the grease seal ③ on the right side, and remove the circlip ②.



**A. Grease Seal**

- Insert a metal rod from the left side, tap the inner race of the right side ball bearing ① evenly, and remove the ball bearing. The distance collar ⑩ will come out when the bearing is removed.

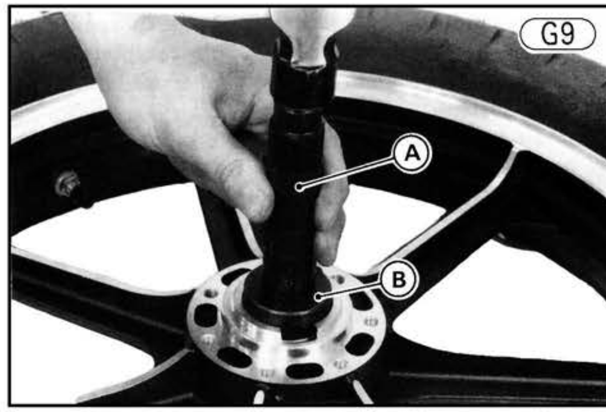
**Ball Bearing Removal**




- Tap out the other ball bearing ①.

### Front Hub Assembly Notes:

1. Inspect the bearings, and replace if necessary (Pg. 216).
2. Before installing the wheel bearings, blow any dirt or foreign particles out of the hub with compressed air. Lubricate the ball bearings (Pg. 216).
3. Install the ball bearings using the bearing driver and the bearing driver holder (special tools) with the shield of each bearing facing outside. Install the left bearing first.



**A. Bearing Driver Holder (57001-139)**
**B. Bearing Driver (57001-290)**

4. Put the distance collar in the hub so that the flange of the collar is on the left side, then install the right bearing.
5. Install the grease seal using the bearing driver and the bearing driver holder (special tools: P/N 57001-296, 57001-139).
6. Tighten the disc mounting bolts (14) to 2.3 kg-m (16.5 ft-lbs) of torque.
7. After installing the disc on the hub, check disc runout (Pg. 223).

## FRONT DISC BRAKE

Removal, installation, disassembly, and assembly of the front disc brake is divided as follows:

Pad Replacement
Caliper Removal
Caliper Installation Notes
Caliper Disassembly
Caliper Assembly
Master Cylinder Removal
Master Cylinder Installation Notes
Master Cylinder Disassembly
Master Cylinder Assembly Notes
Brake Hose Replacement

**NOTE:** Disc removal and installation are covered in front hub disassembly and front hub assembly sections (Pgs. 122~123).

Before working on the disc brake, take note of the following:

**CAUTION** **1. Use only disc brake fluid, isopropyl alcohol, or ethyl alcohol for cleaning brake parts (except disc pads and discs). Do not use any other fluid for cleaning these parts. Gasoline, motor oil, or any other petroleum distillate will cause**

**deterioration of the rubber parts. Oil spilled on any part will be difficult to wash off completely, and will eventually deteriorate the rubber used in the disc brake system.**

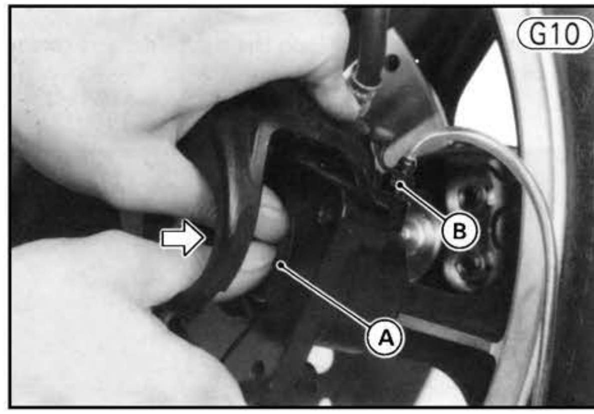
2. **When handling the disc pads or disc, be careful that no disc brake fluid or any oil gets on them. Clean off any fluid or oil that inadvertently gets on the pads or disc with a high flash-point solvent. Replace the pads with new ones if they cannot be cleaned satisfactorily.**
3. **Brake fluid quickly ruins painted surfaces; any spilled fluid should be completely wiped up immediately.**
4. **If any of the brake line fittings or the bleed valve is opened at any time, AIR MUST BE BLED FROM THE BRAKE SYSTEM (Pg. 221).**
5. **When installing or assembling the disc brake, tighten the disc brake fittings to the values given in Table G1. Improper torque may cause the brake to malfunction.**

**Table G1 Disc Brake Torque**

| | | |
|---|---|---|
| Bleed valve | 0.80 kg-m | 69 in-lbs |
| Brake lever pivot bolt | 0.30 kg-m | 26 in-lbs |
| Brake lever pivot bolt locknut | 0.60 kg-m | 52 in-lbs |
| Front caliper holder shaft nuts | 2.6 kg-m | 19.0 ft-lbs |
| Disc plate mounting bolts | 2.3 kg-m | 16.5 ft-lbs |
| Fitting (banjo) bolts | 3.0 kg-m | 22 ft-lbs |
| Front caliper mounting bolts | 3.0 kg-m | 22 ft-lbs |
| Hose joint mounting bolt | 0.80 kg-m | 69 in-lbs |
| Master cylinder clamp bolts | 0.90 kg-m | 78 in-lbs |
| Rear caliper half Allen bolts | 3.0 kg-m | 22 ft-lbs |
| Rear caliper mounting bolt | 4.0 kg-m | 29 ft-lbs |

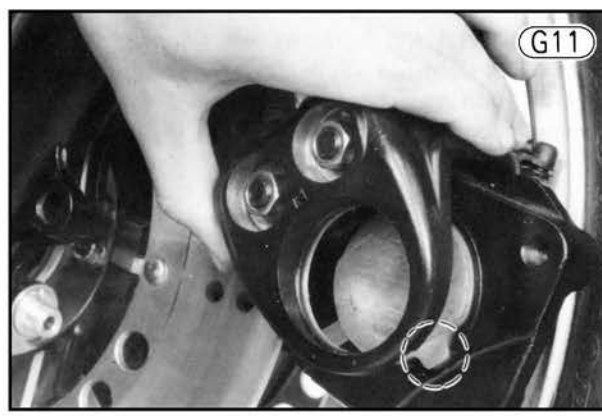
## Pad Replacement (each side):

•For left caliper removal, disconnect the lower end of the speedometer cable.
•Remove the caliper mounting bolts (2).
•Lift the caliper off the disc, take out the mounting screw for pad B, and remove the pad. A lockwasher and metal plate also come off.
•After pad B is removed, slide the caliper holder to the piston side and remove pad A.
•Remove the bleed valve cap on the caliper, attach a clear plastic hose to the bleed valve, and run the other end of the hose into a container.
•Open (loosen) the valve slightly, push the piston in by hand as far as it will go, and then close (tighten) the valve. Wipe up any spilled fluid, and recap the bleed valve.

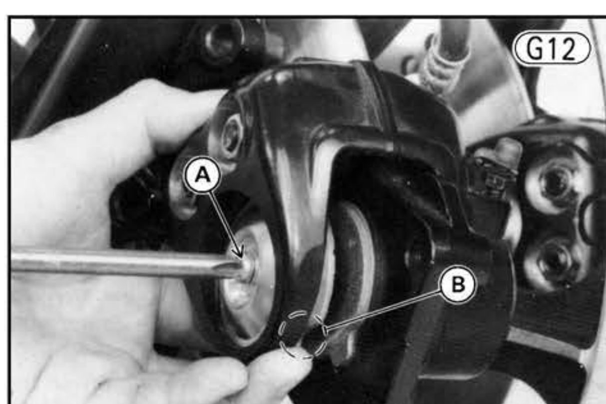



**A. Piston B. Bleed Valve**

•Install pad A in the caliper holder, aligning the tongue on the pad with the groove in the caliper.




•Fit pad B, aligning the tongue on the pad with the groove in the caliper. Install the metal plate, lockwasher and mounting screw. Use a non-permanent locking agent on the screw.



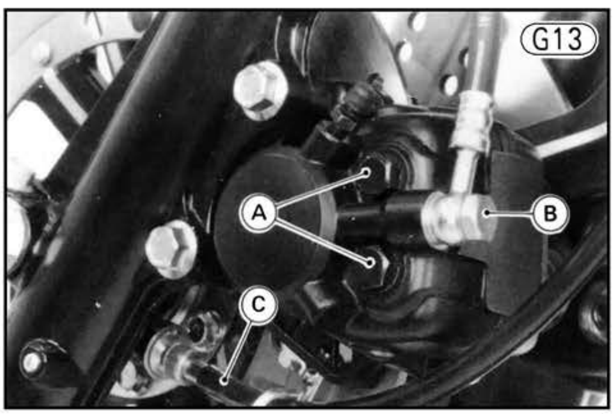

**A. Apply a non-permanent locking agent.**
**B. Fit the tongue in the groove.**

•Install the caliper, tightening the caliper mounting bolts to 3.0 kg-m (22 ft-lbs) of torque.
•Since brake fluid was drained when the bleed valve was opened, check the fluid level in the master cylinder and bleed the air from the brake system (Pg. 221).
•Check the front brake.

**WARNING** **Do not ride the motorcycle until the pads are seated against the discs. Pump the brake lever several times until a full, firm lever "feel" is obtained. The brakes will not function on the first application of the lever if this is not done.**

## Caliper Removal (each side):

•Remove the brake fluid (Pg. 220).
•When the left side caliper is to be removed, disconnect the lower end of the speedometer cable.
•If the caliper is to be disassembled, loosen the caliper holder shafts (2).




**A. Shafts** **C. Speedometer Cable**
**B. Banjo Bolt**

•Remove the banjo bolt at the caliper, and temporarily elevate the end of the brake hose above the caliper to prevent fluid loss minimum. There is a flat washer on each side of the hose fitting.
•Remove the mounting bolts (2), and take off the caliper.

## Caliper Installation Notes:

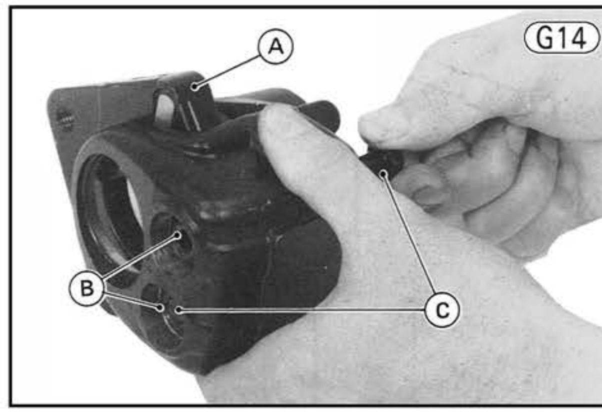
1. Tighten the mounting bolts to 3.0 kg-m (22 ft-lbs) of torque.
2. Tighten the caliper holder shaft nuts to 2.6 kg-m (19.0 ft-lbs) of torque.
3. Put a new flat washer on each side of the brake hose fitting and connect the brake hose to the caliper. Tighten the banjo bolt to 3.0 kg-m (22 ft-lbs) of torque.
4. Check the fluid level in the master cylinder, and bleed the brake line (Pg. 221).

**WARNING** **Do not ride the motorcycle until the pads are seated against the discs. Pump the brake lever several times until a full, firm lever "feel" is obtained. The brakes will not function on the first application of the lever if this is not done.**

## Caliper Disassembly:

•Take out the mounting screw ⑯ for pad B ⑬, and remove the pad. A lockwasher ⑮ and metal plate ⑭ also come off.
•Remove the nuts ④ (2), and pull out the caliper holder shafts ⑤ (2) and the spacers ③ (2) taking care not to damage the dust covers ⑫ (4). Remove the caliper holder ⑪, and push out pad A ⑩.

**CAUTION** **To avoid damage to the dust covers, alternately unscrew each shaft a little at a time.**

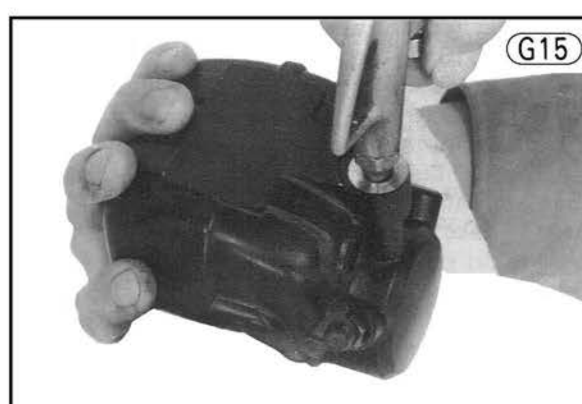



**A. Caliper Holder** **C. Holder Shafts**
**B. Dust Covers**

•Remove the dust seal ⑨ around the piston ⑧.
•Cover the caliper opening with a clean, heavy cloth, and remove the piston by lightly applying compressed air to where the brake line fits into the cylinder.

**WARNING** **To avoid serious injury, never place your fingers or palm inside the caliper opening. If you blow compressed air into the caliper, the piston may crush your hand or fingers.**

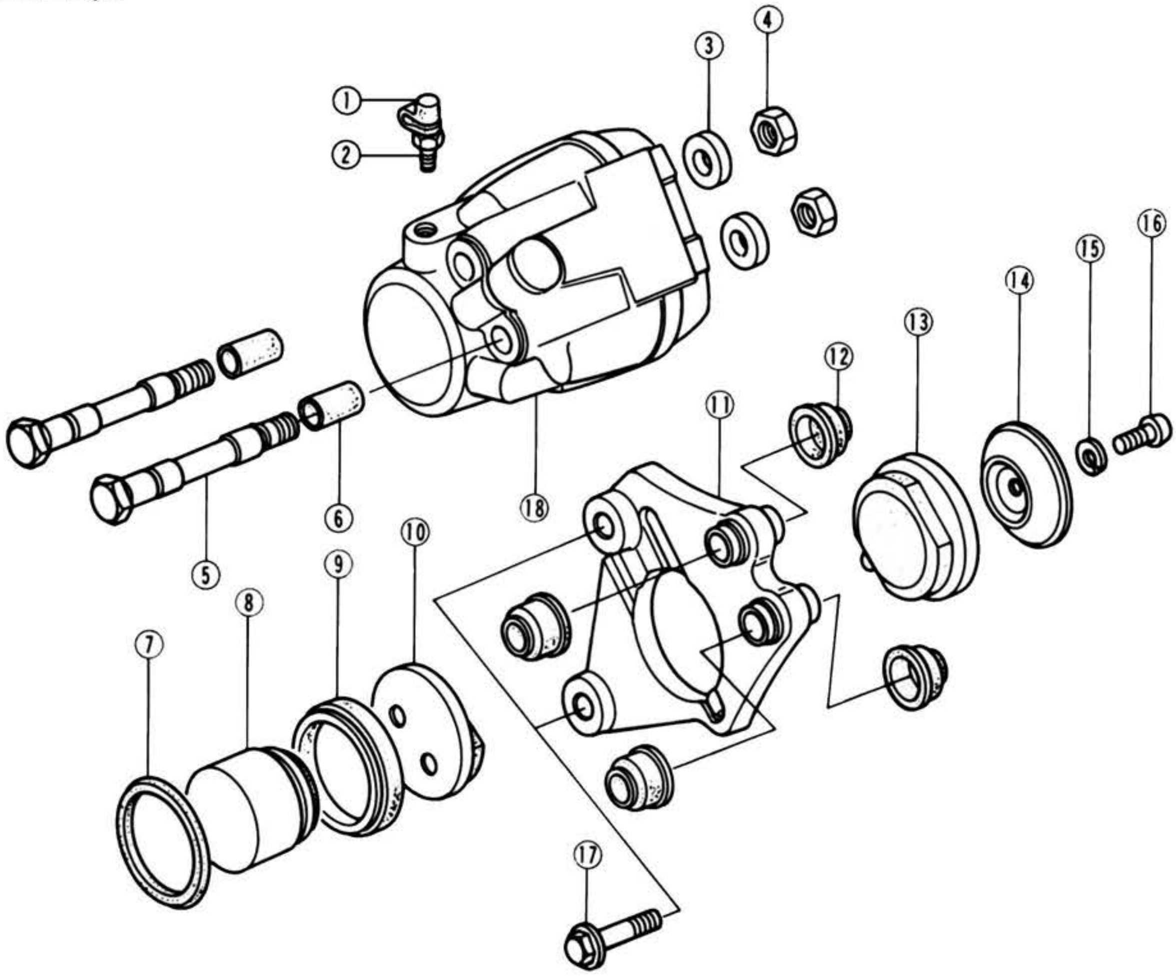
**NOTE:** If compressed air is not available, reconnect the brake line and pump the piston out with the brake lever.




•Taking care not to damage the cylinder surface, remove the fluid seal ⑦ with a hook.

**Front Caliper**

(G16)



1. Bleed Valve Cap
2. Bleed Valve
3. Spacer
4. Nut
5. Caliper Holder Shaft
6. Friction Boots
7. Fluid Seal
8. Piston
9. Dust Seal
10. Pad A
11. Caliper Holder
12. Dust Cover
13. Pad B
14. Metal Plate
15. Lockwasher
16. Mounting Screw
17. Caliper Mounting Bolt
18. Caliper

## Caliper Assembly:

- Clean the caliper parts with brake fluid or alcohol (See CAUTION – Pgs. 123 ~ 124).
- Fit a new fluid seal in place inside the cylinder.

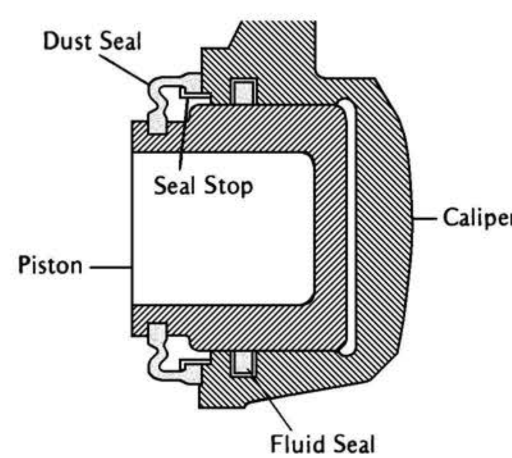
**NOTE:** Whenever the fluid seal is removed, it should be replaced with a new one.

- Apply brake fluid to the outside of the piston and the fluid seal, and push the piston into the cylinder by hand. Take care that neither the cylinder nor the piston skirt get scratched.
- Install the dust seal around the dust seal stop. Check that the dust seal is properly fitted into the groove in the piston and on the dust seal stop.
- Apply a thin coat of PBC (Poly Butyl Cuprysil) grease to the caliper holder shafts and the holder holes. (PBC grease is a special high temperature, water-resistant grease).

**NOTE:** Replace the dust covers and rubber friction boots if they were damaged.

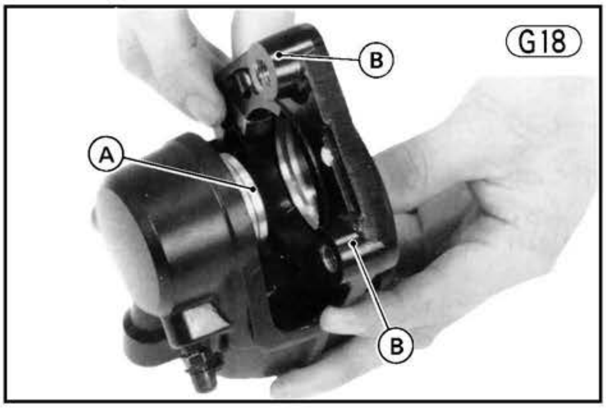
**Caliper Dust Seal**

(G17)



•Position the caliper holder for installation. To avoid damaging the dust covers, carefully turn the caliper holder shafts as they are inserted.

**NOTE:** The bosses of the threaded holes for the caliper mounting bolts must face the piston side.




**A. Piston** **B. Boss**

•Install the spacers and nuts. Finger tighten the nuts loosely.

**NOTE:** Do not forget to tighten the nuts after installing the caliper on the motorcycle (Pg. 125).

•Install pad A in the caliper holder.

•Fit pad B, aligning the tongue on the pad with the groove in the caliper. Install the metal plate, lockwasher, and mounting screw using a non-permanent locking agent on the screw (Fig. G12).

## Master Cylinder Removal:

•Remove the brake fluid (Pg. 220).

•Take off the right rear-view mirror.

•Push the front brake switch locking tab and remove the switch.

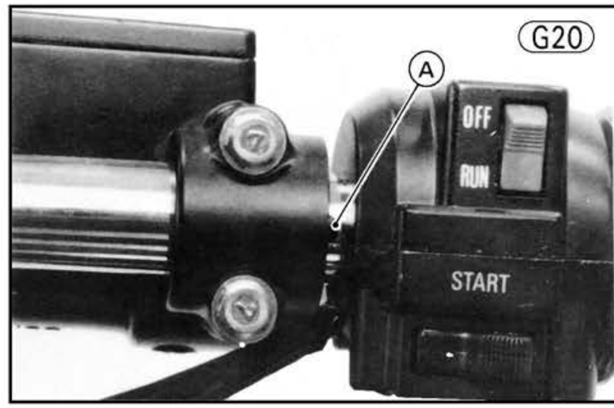
•Pull back the dust cover, and remove the banjo bolt to disconnect the upper brake hose from the master cylinder. There is a flat washer on each side of the hose fitting.


**A. Banjo Bolt** **B. Clamp Bolts**

•Remove the clamp bolts (2), and take off the master cylinder. There is a flat washer for each master cylinder clamp bolt. Immediately wipe up any brake fluid that spills.

## Master Cylinder Installation Notes:

1. The master cylinder clamp is installed with the small projection towards the throttle grip. Tighten the upper clamp bolt first, and then the lower clamp bolt, both to 0.90 kg-m (78 in-lbs) of torque.




**A. Projection**

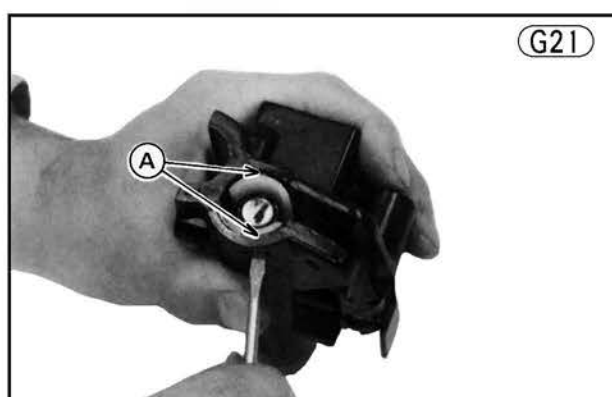
2. Banjo bolt torque is 3.0 kg-m (22 ft-lbs).
3. Bleed the brake line after master cylinder installation (Pg. 221).

## Master Cylinder Disassembly:

•Remove the locknut ⑩ and pivot bolt ⑧, and remove the brake lever ⑨.

•Remove the screws (2), take off the master cylinder cap ⑥ and diaphragm ⑤, and empty out the brake fluid.

•Using a thin-bladed screwdriver or some other suitable tool, press in the liner tabs which catch in the holes in the master cylinder, and remove the liners ⑲.




**A. Tab**

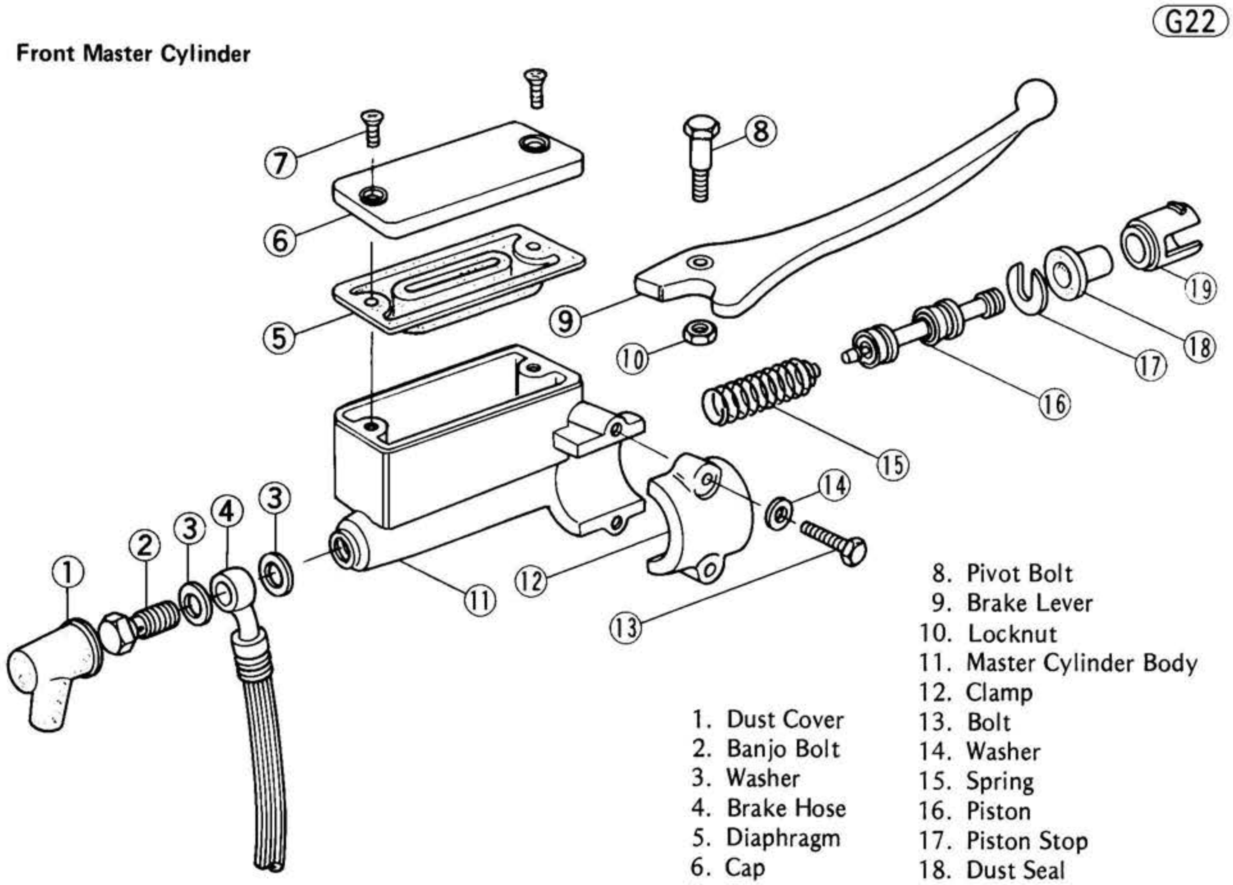
•Pull out the piston ⑯ and spring ⑮.

•Remove the spring ⑮, dust seal ⑱, and piston stop ⑰ from the piston.

## Master Cylinder Assembly Notes:

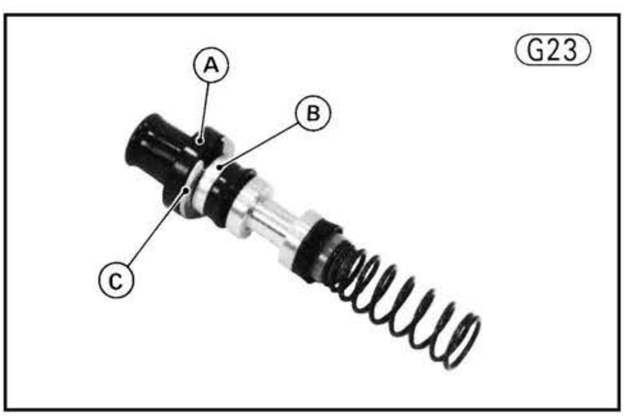
1. Before assembly, clean all parts including the master cylinder with brake fluid or alcohol (See CAUTION

**Front Master Cylinder**




1. Dust Cover
2. Banjo Bolt
3. Washer
4. Brake Hose
5. Diaphragm
6. Cap
7. Screw
8. Pivot Bolt
9. Brake Lever
10. Locknut
11. Master Cylinder Body
12. Clamp
13. Bolt
14. Washer
15. Spring
16. Piston
17. Piston Stop
18. Dust Seal
19. Liner

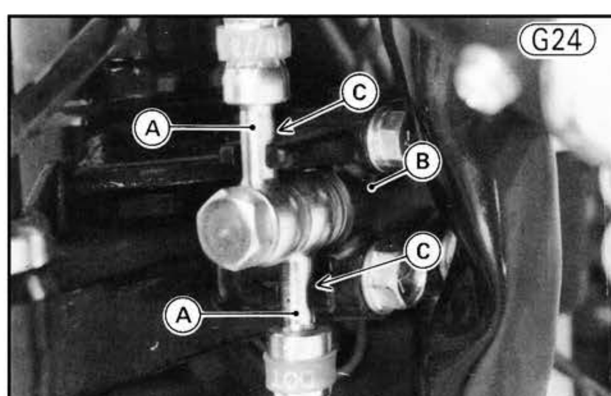
– Pg. 123). Apply brake fluid to the parts removed and to the inner wall of the cylinder.
2. Be sure that the piston stop ⑰ is between the piston and dust seal ⑱.




**A. Dust Seal** **B. Piston** **C. Piston Stop**

## Brake Hose Replacement:

- Pump the brake fluid out of the line as explained in the Maintenance Section – *Changing the brake fluid* (Pg. 220).
- Remove the banjo bolts at the hose joint and at the caliper or master cylinder (depending on the hose), and remove the brake hose. There is a flat washer on each side of the hose fitting.
- Install a new flat washer on each side of the brake hose fittings and connect the new brake hose to the hose joint and the caliper or master cylinder.
- Be sure that the metal pipe is properly fitted into the U-shaped notch in the hose joint and tighten the banjo bolts to the specified torque.



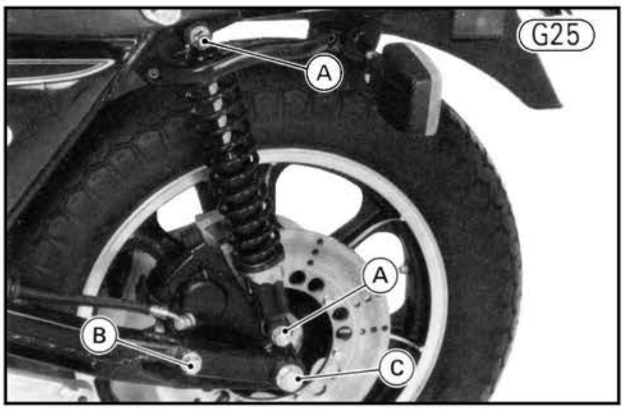

**A. Metal Pipe** **B. Hose Joint** **C. Notch**

- Fill the reservoir with fresh brake fluid, and bleed the brake line (Pg. 221).

## REAR WHEEL, REAR CALIPER

### Removal:

- Set the motorcycle up on its center stand.
- Remove both mufflers (Pg. 55).
- If the rear caliper is to be completely removed, drain the brake fluid from the line (Pg. 220), unscrew the banjo bolt, and free the brake hose from the caliper. If only the rear wheel is to be removed, these operations are not necessary.
- Unscrew the lower mounting nut of the left rear shock absorber, loosen its upper mounting nut, and pull the lower end of the shock absorber off the rear caliper stud.




A. Nut    B. Bolt    C. Axle Nut

- Raise the rear wheel enough to pull out the axle, and remove the axle halfway.
- Rest the caliper on some kind of stand so that the brake hose is not damaged, and insert a wood wedge (7~8 mm thick) between the disc brake pads.
- Pull out the axle completely, and disengage the rear wheel coupling by sliding the wheel to the left. The wheel cap and collar may fall from the left and the right respectively.
- Take out the rear wheel from the left side of the rear fender.

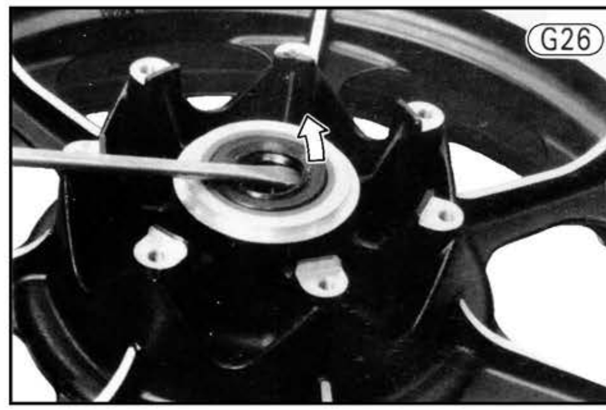
**CAUTION** **Do not lay the wheel on the ground with the disc facing down. This can damage or warp the disc. Place blocks under the wheel so that the disc does not touch the ground.**

### Installation Notes:

1. Before installing the wheel, use a high flash-point solvent to completely clean off any grease that may have gotten on either side of the disc. Do not use a solvent which will leave an oily residue.
2. Insert the rear axle from right to left.
3. If the brake hose was removed from the caliper, use new washers on both sides of the brake hose fitting, tighten the banjo bolt to 3.0 kg-m (22 ft-lbs) of torque, and bleed the brake line (Pg. 221).
4. Tightening torques for the bolt and nuts are as follows.
   Caliper mounting bolt: 4.0 kg-m (29 ft-lbs)
   Axle nut: 14.0 kg-m (101 ft-lbs)
   Rear shock absorber nuts: 3.0 kg-m (22 ft-lbs)
5. Do not ride the motorcycle until the brake pads are seated against the disc. Pump the brake pedal until a firm, full "feel" is obtained. The brake will not function on the first application of the pedal if this is not done.

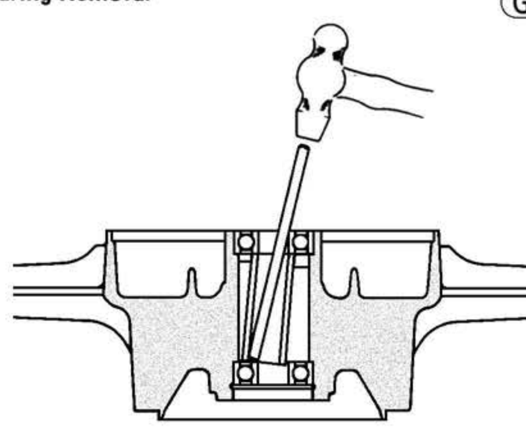
### Rear Hub Disassembly:

- Remove the rubber damper ⑪ and wheel cap ② from the cast wheel ⑦.
- Remove the disc ③ by unscrewing the bolts ⑩ (7).
- Pry off the grease seal ④, and remove the circlip ⑤.




- Insert a metal rod from the right side, and remove the left side bearing ⑥ by tapping evenly around the bearing inner race. The distance collar ⑧ will come out with the bearing.

**Bearing Removal** G27

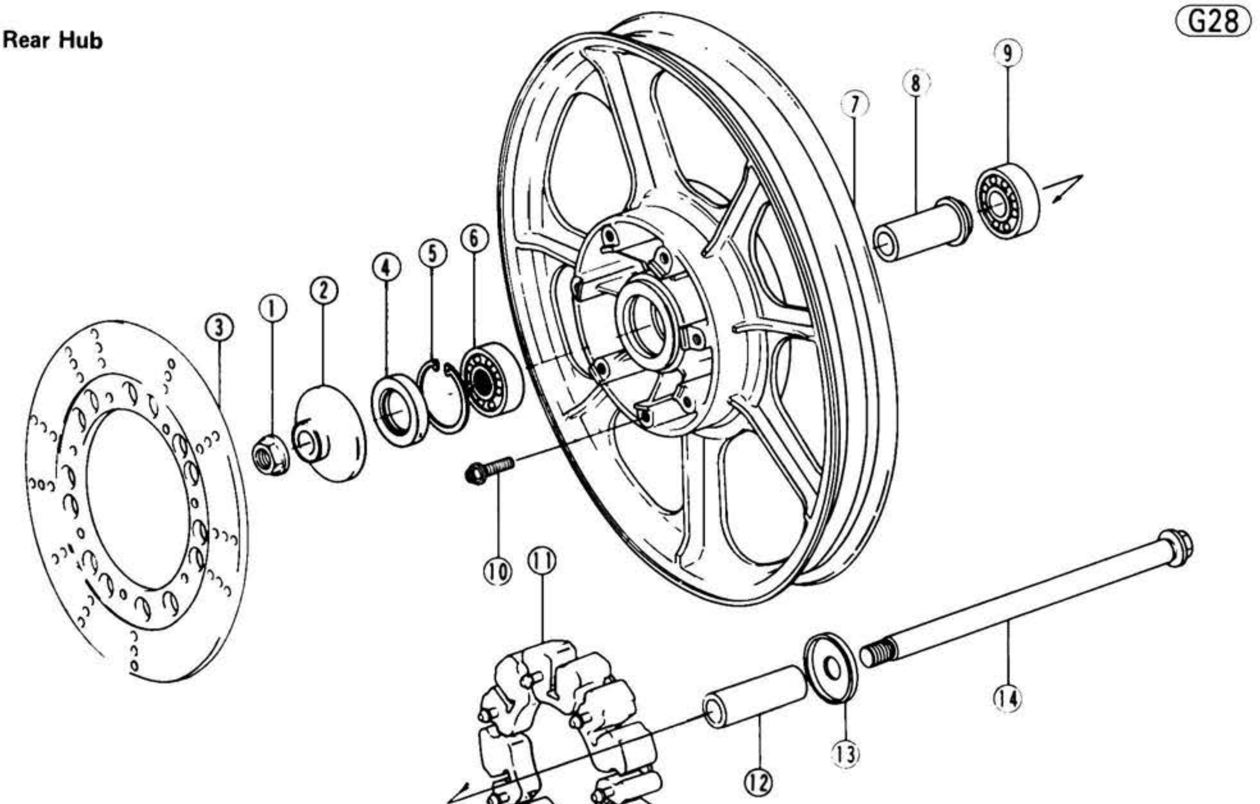


- Insert the metal rod into the hub from the other side, and tap out the remaining bearing ⑨.

### Assembly Notes:

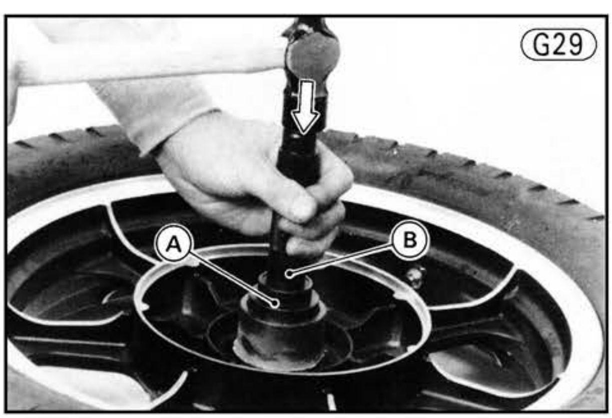
1. Inspect the bearings, and replace if necessary (Pg. 216).
2. Before installing the wheel bearings, blow any dirt or foreign particles out of the hub with compressed air. Lubricate the ball bearings (Pg. 216).

**Rear Hub**




1. Axle Nut
2. Wheel Cap
3. Disc
4. Grease Seal
5. Circlip
6. Ball Bearing
7. Cast Wheel
8. Distance Collar
9. Ball Bearing
10. Bolt
11. Rubber Damper
12. Collar
13. Cap
14. Rear Axle

3. Use the bearing driver and the bearing driver holder (special tools) to install the wheel bearings. Install the left bearing first. The shield of each bearing must face outside.




**A. Bearing Driver (57001-140)**
**B. Holder (57001-139)**

4. Put the distance collar into the hub so that the flange on the collar is on the right side, and install the right bearing.
5. Install the grease seal using the bearing driver and the bearing driver holder (special tools: P/N 57001-296, 57001-139).
6. Tighten the disc mounting bolts (7) to 2.3 kg-m (16.5 ft-lbs) of torque.
7. After installing the disc or the hub, check disc runout (Pg. 223).

## REAR DISC BRAKE, REAR BRAKE LIGHT SWITCH

Removal, installation, disassembly, and assembly of the rear disc brake are divided as follows:

Pad Replacement
Caliper Disassembly
Caliper Assembly
Master Cylinder and Rear Brake Light Switch Removal
Master Cylinder Installation Notes
Master Cylinder Disassembly
Master Cylinder Assembly

**NOTES:**

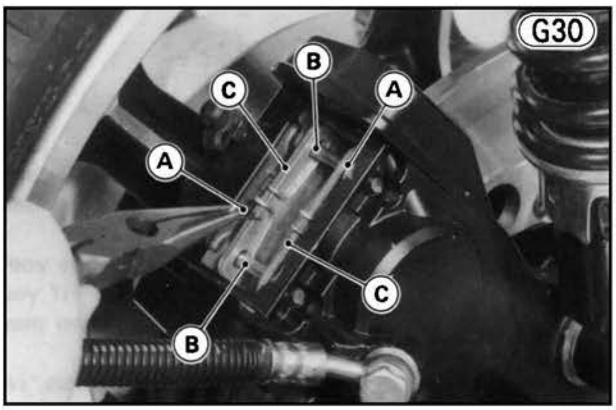
1. Disc removal and disc installation are covered in the rear hub disassembly and assembly sections (See above).

2. Caliper removal and caliper installation are covered in the rear wheel removal and installation sections (Pg. 132).
3. Refer to the CAUTION (Pg. 123) for general disc brake information.

## Pad Replacement:

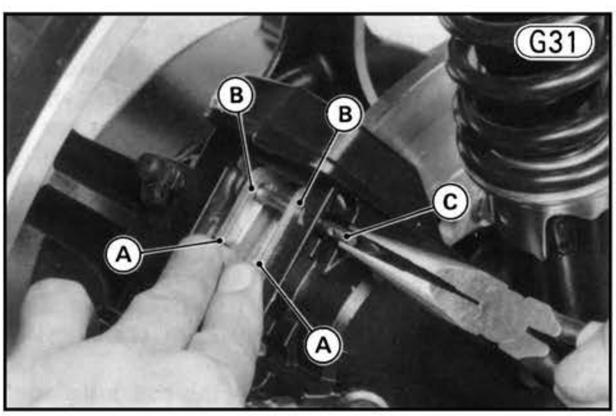
### Pad Removal:

- Remove the pad cover on the caliper.
- Remove the clips (2) from the pins (2).




A. Clip B. Pin C. Pad

- Place your thumb against the anti-rattle springs to keep them from flying off, and pull the pins from the caliper.

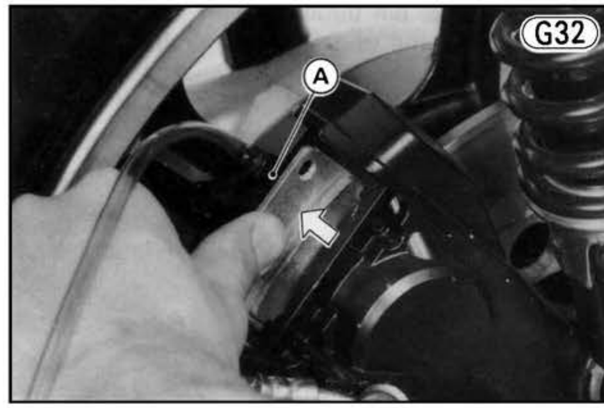



A. Anti-rattle Spring B. Pad C. Pin

- Remove the pads (2) from the caliper.

### Pad Installation:

- Remove the bleed valve cap, attach a clear plastic hose to the bleed valve, and run the other end of the hose into a container.
- Open (loosen) the valve slightly, push both pistons in by hand as far as they will go. Use a discarded brake pad to help push in the pistons. Close (tighten) the valve. Wipe up any spilled fluid, and recap the bleed valve.

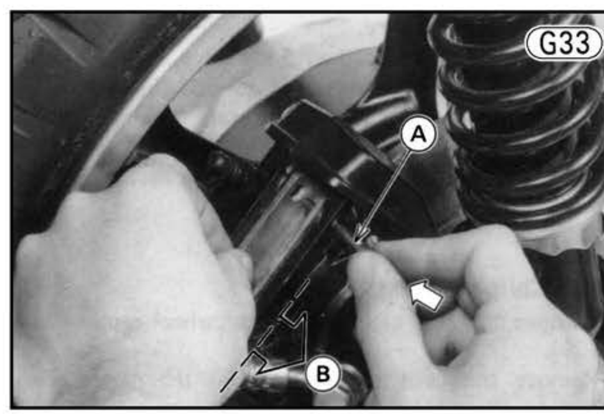



A. Bleed Valve

**CAUTION** **Do not lever the pistons against the disc with a screwdriver. This can damage or warp the disc.**

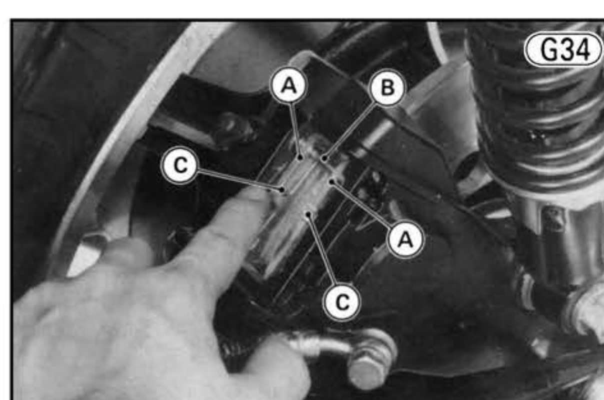
- Insert one pin through the following: caliper outer wall, both pads, and into the caliper inner wall.

NOTES:
1. When inserting the pads into the caliper, be careful not to push the rubber dust seals out of place.
2. Install the pins with the holes toward the outside.



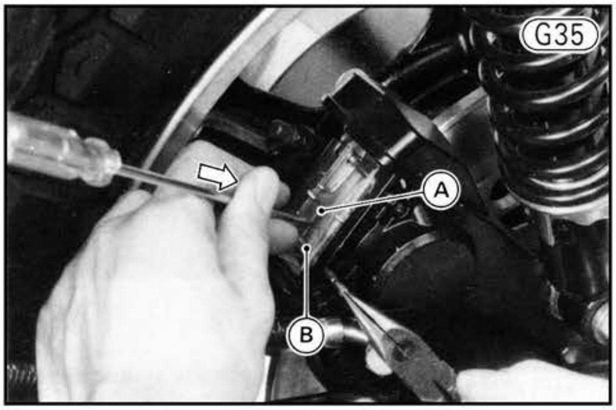

A. Hole B. Outside

- Install the anti-rattle springs. Be sure that the end of each spring goes under the installed pin, and that the top of each spring rides on the pad.




A. Pad B. Pin C. Anti-rattle Spring

•Insert the other pin through caliper and pads. Press down the free end of each spring so that the pin can pass over it.



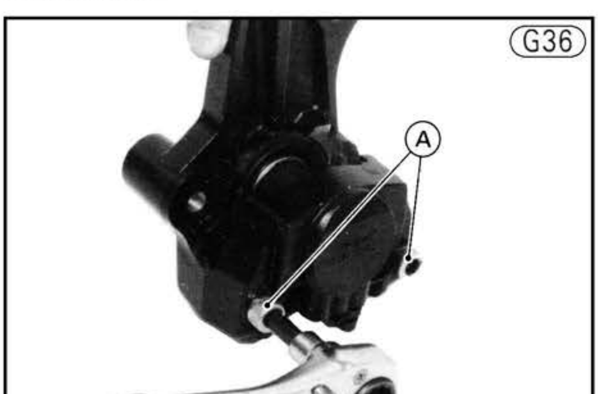

A. Anti-rattle Spring B. Pin

•Insert the clips through the pins on the left side of the left pad.
•Install the pad cover.
•Since some brake fluid was lost when the bleed valve was opened, check the fluid level in the master cylinder and bleed the air from the brake system (Pg. 221). Add fluid if necessary.
•Push the bleed valve cap onto the valve.

**WARNING** **Do not attempt to ride the motorcycle until the pads are seated against the disc. Pump the brake pedal until a firm, full "feel" is obtained. The brake will not function on the first application of the pedal if this is not done.**

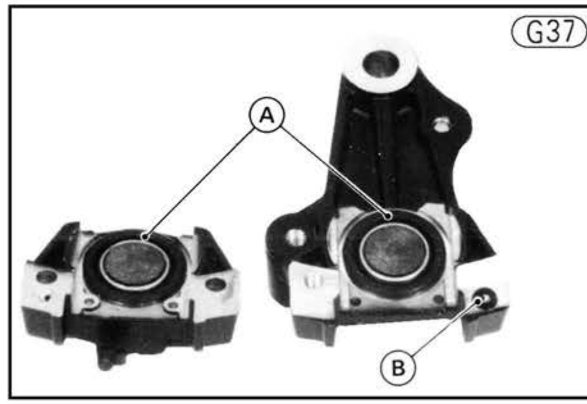
## Rear Caliper Disassembly:

•Remove the rear caliper (see rear wheel removal, Pg. 129).
•Remove the pads as explained in the pad removal section (Pg. 131).
•Remove the Allen bolts ⑤ (2) and separate the right caliper half ④.




A. Allen Bolts

•Remove the **O** ring ⑦ and the dust seals ⑧ (2) around the pistons.




A. Dust Seals B. "O" Ring

•Wrap each caliper half with a clean, heavy cloth, and remove each piston ⑨ by lightly applying compressed air to the brake fluid passage.

**WARNING** **To avoid serious injury, never place your fingers or palm on the piston. If you apply compressed air into the caliper, the piston may crush your hand or fingers.**

•Taking care not to damage the cylinder surfaces, remove the fluid seals ⑩ with a hook.

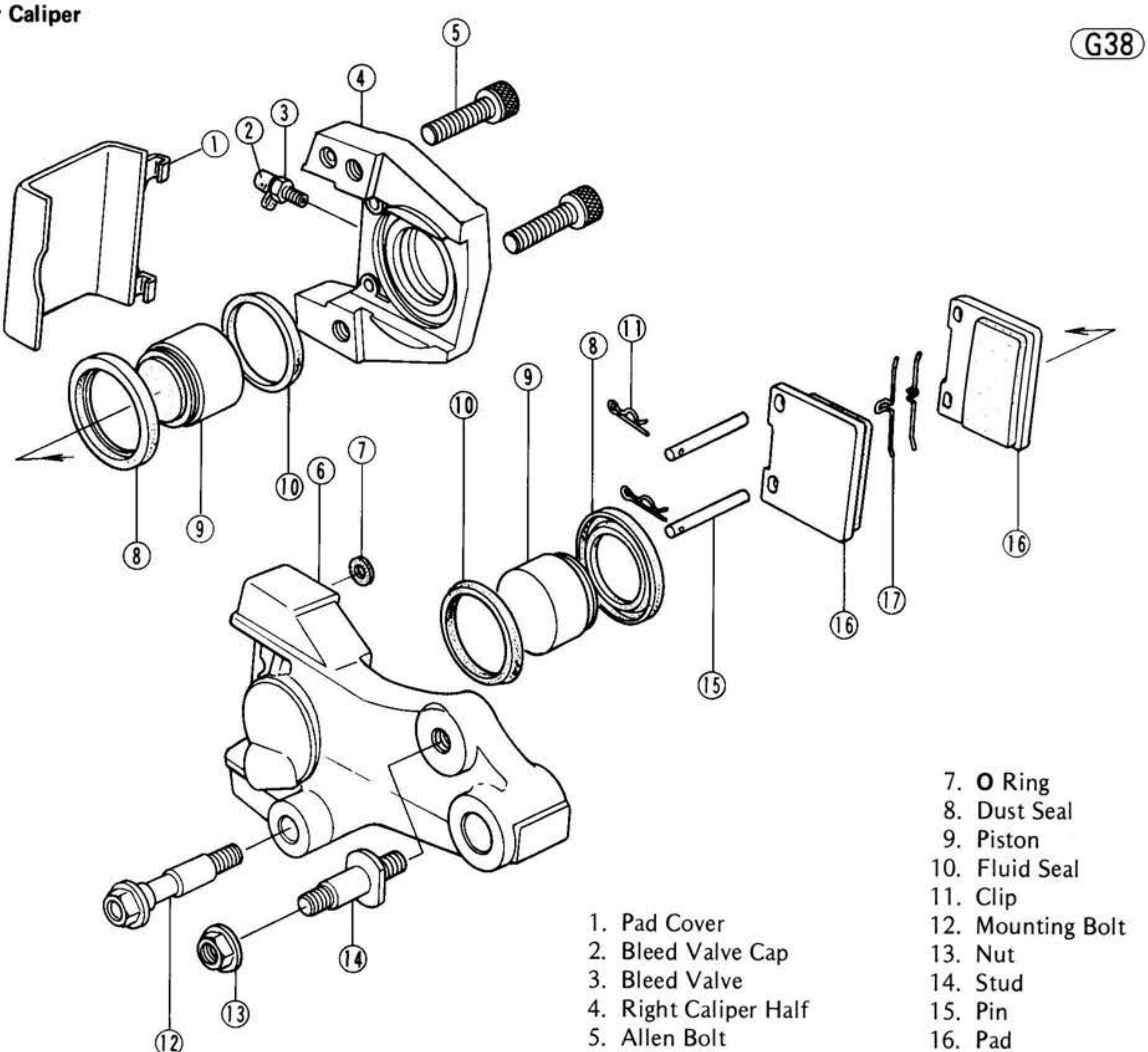
## Caliper Assembly:

•Clean the caliper parts with brake fluid or alcohol (See CAUTION – Pgs. 123~124).
•Fit a new fluid seal in place inside each cylinder.
**NOTE:** If the rubber caliper components are removed, they should be replaced with new parts.
•Apply brake fluid to the outside of each piston and fluid seal, and then push the piston into the cylinder by hand. Take care that neither the cylinder nor the piston skirt are scratched.
•Install a new dust seal around each piston. Check that the dust seals are properly fitted into the grooves in the piston and the caliper halves.
•Fit a new **O** ring onto the right caliper half, and install the left caliper half with the Allen bolts.
•Tighten the Allen bolts to 3.0 kg-m (22 ft-lbs) of torque.
•Install the pads as explained in the pad installation section (Pg. 131).
•Install the caliper and rear wheel (Pg. 129).
•Check the fluid level in the master cylinder, and bleed the brake line (Pg. 221).

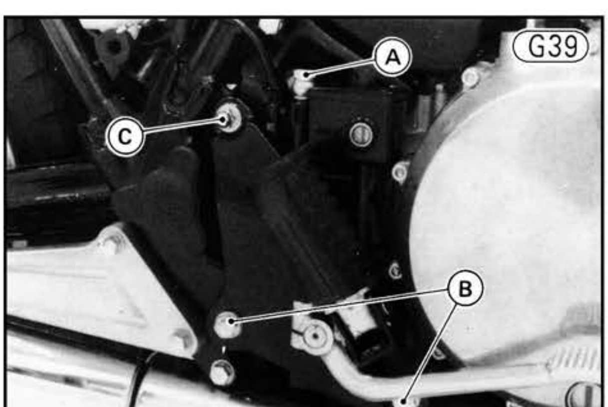
## Rear Master Cylinder and Rear Brake Light Switch Removal:

•Remove the right side cover.
•Pull off the rear brake light switch leads.
•Remove the banjo bolt and two flat washers to disconnect the brake hose from master cylinder. Immediately wipe up any brake fluid that spills.

**Rear Caliper**



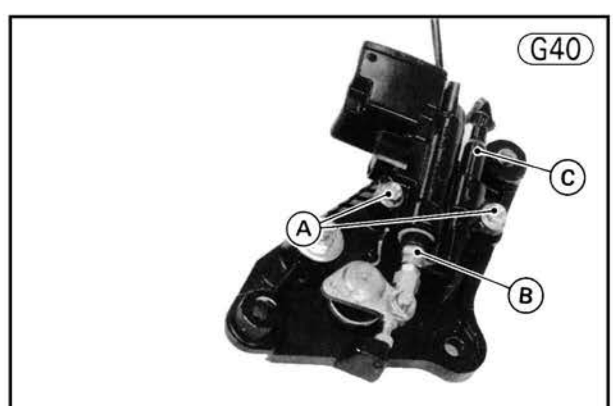

1. Pad Cover
2. Bleed Valve Cap
3. Bleed Valve
4. Right Caliper Half
5. Allen Bolt
6. Left Caliper Half
7. **O** Ring
8. Dust Seal
9. Piston
10. Fluid Seal
11. Clip
12. Mounting Bolt
13. Nut
14. Stud
15. Pin
16. Pad
17. Anti-rattle Spring




**A. Banjo Bolt** **C. Mounting Nut**
**B. Mounting Bolts**

•Remove the mounting bolts (2), cap nut, flat washers, and lockwashers.
•Take out the master cylinder bracket.

•Take out the master cylinder mounting bolts (2) turn the push rod, and remove the master cylinder.




**A. Master Cylinder Mounting Bolts (2)**
**B. Push Rod**
**C. Rear Brake Light Switch**

●Remove the rear brake switch by using a thin-bladed screwdriver or other suitable tool to press in the tabs which hold the rear brake switch in the master cylinder.

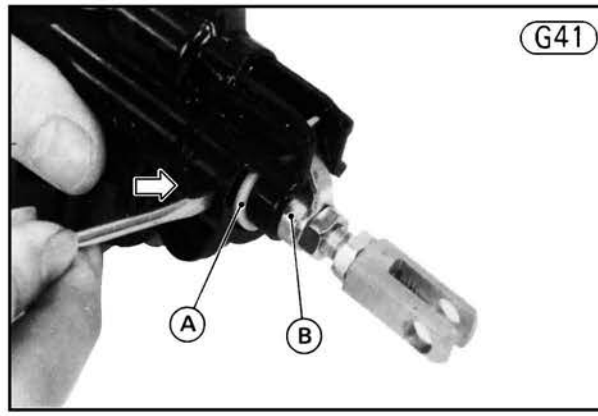
### Rear Master Cylinder Installation Notes:

1. Replace the flat washer on each side of the brake hose fitting with new ones, and tighten the banjo bolt to 3.0 kg-m (22 ft-lbs) of torque.
2. Bleed the brake line after master cylinder installation (Pg. 221).
3. Adjust the rear brake (Pg. 28) and rear brake switch (Pg. 28).

### Rear Master Cylinder Disassembly:

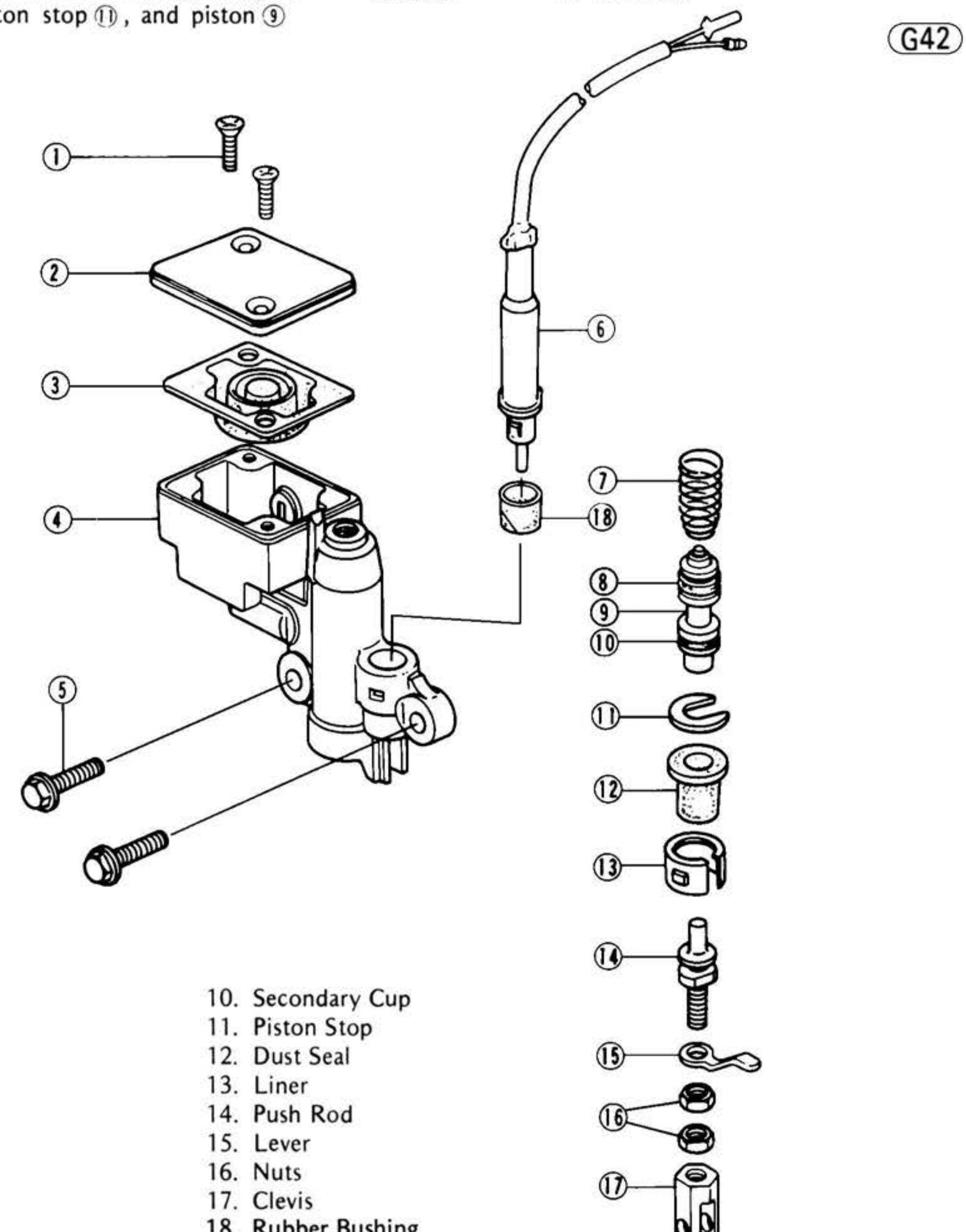
●Take off the master cylinder cap ② and diaphragm ③, and empty the brake fluid into a suitable container.
●Remove the liner ⑬ with a thin screwdriver, and pull out the push rod ⑭, piston stop ⑪, and piston ⑨

Do not remove the secondary cup ⑩ from the piston since removal will damage the cup.




**A. Liner** **B. Push Rod**

**Rear Master Cylinder**




1. Screw
2. Master Cylinder Cap
3. Diaphragm
4. Master Cylinder Body
5. Mounting Bolt
6. Rear Brake Light Switch
7. Return Spring
8. Primary Cup
9. Piston
10. Secondary Cup
11. Piston Stop
12. Dust Seal
13. Liner
14. Push Rod
15. Lever
16. Nuts
17. Clevis
18. Rubber Bushing

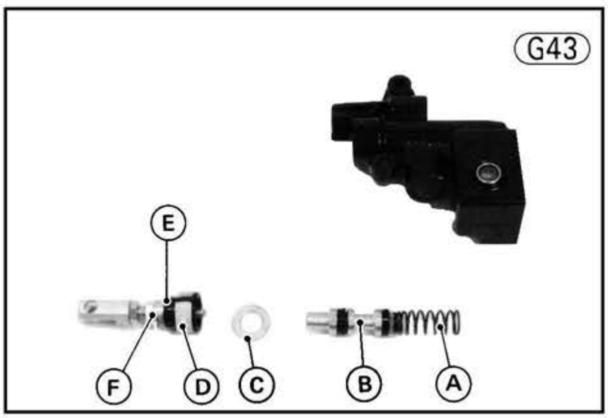
•Remove the return spring ⑦ and primary cup ⑧ by carefully applying compressed air to the outlet hole.

**Rear Master Cylinder Assembly:**

•Before assembly, clean all parts including the master cylinder with brake fluid or alcohol (See CAUTION – Pgs. 123 ~ 124), and apply brake fluid to the removed parts and the inner wall of the cylinder. Take care not to scratch the piston or the inner wall of the cylinder.

•Install the return spring, piston, piston stop, liner, dust seal, and push rod.

**NOTE:** The piston stop must be between the piston and the dust seal.




**A. Return Spring**
**B. Piston**
**C. Piston Stop**
**D. Liner**
**E. Dust Seal**
**F. Push Rod**

•Install the piston, push rod, and stop. Use a suitable rod to install the piston retainer as far in as it will go.

•Fit the diaphragm and the master cylinder cap.

•Fit the push rod dust cover.

## TIRES

Damage to the rim flanges and tire beads spoil the airtightness of tubeless tires and rims. When handling tubeless tires and rims, be careful not to damage the air-sealing surfaces. See the Maintenance Section for detailed information regarding tubeless tires (Pg. 212).

The following explanation covers tire removal and installation using bead breaker, rim protectors, and tire irons (special tools). If tires are to be removed and installed using a tire changer, operate it in the manner prescribed by the manufacturer.

**NOTE:** A tire changer suitable for tubeless and tube-type tires is available as a Kawasaki special tool.

**WARNING** **1. To ensure safe handling and stability, use only wheels, valves, and tires recommended may result in an unsafe condition, leading to accident and injury.**

**2. Never install a tube on the rims on this motorcycle. They are designed for tubeless tires only.**

**Removal:**

•Remove the wheel from the motorcycle. (See Pg. 121 for the front wheel and Pg. 129 for the rear wheel).

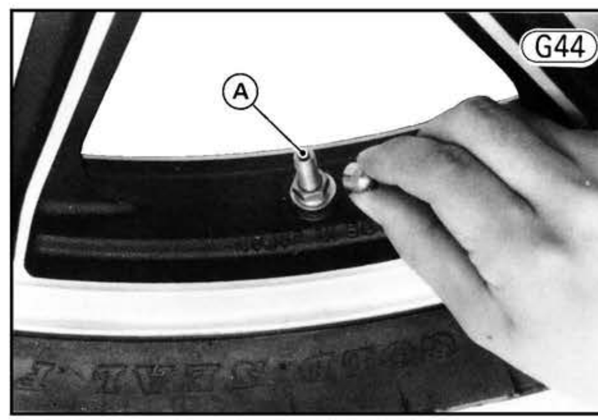
**CAUTION** **Raise the front wheel off the ground by using a jack only at the proper location under the engine. Placing the jack in any position not recommended may damage the engine (Fig. G2).**

•Remove the wheel cap and collar, and remove the disc(s) from the hub.

•For the front wheel, remove the circlip and take off the speedometer drive gear from the left side of the hub.

•To maintain wheel balance, mark the valve stem position on the tire with chalk so that the tire will be reinstalled in the same position.

•Take out the valve core to let out the air.

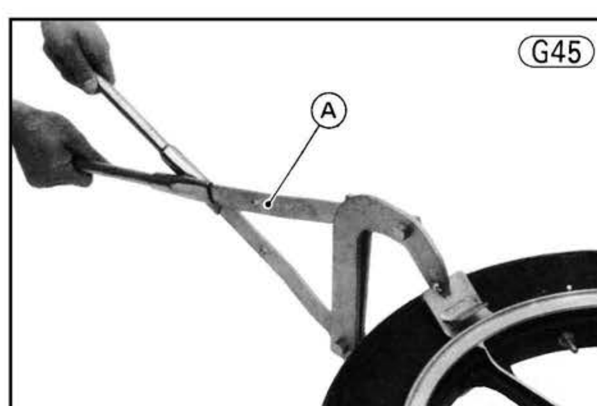



**A. Valve Core**

•Lubricate the tire beads and rim flanges on both sides with a soap and water solution or rubber lubricant. This helps the tire beads slip off the rim flanges.

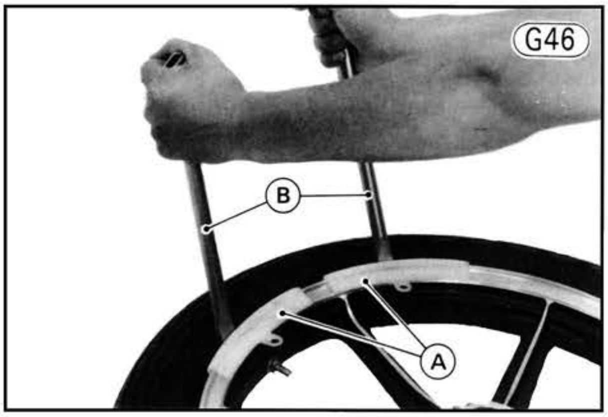
**CAUTION** **Never lubricate with mineral oil (engine oil) or gasoline because they will cause deterioration of the tire.**

•Break the beads away from both sides of the rim with the bead breaker (special tool).




**A. Bead Breaker (57001-1072)**

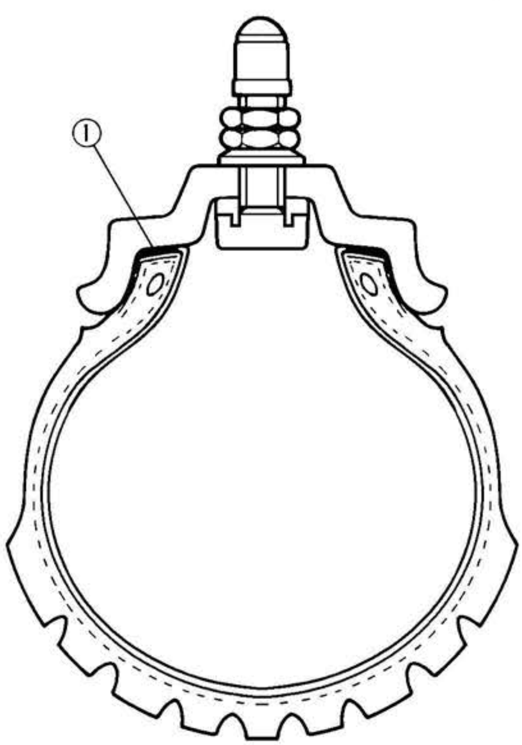
- Install the rim protectors (special tools) around the valve stem. Lubricate the tire irons and rim protectors with a soap and water solution, or rubber lubricant.
- Step on the side of the tire opposite the valve stem, and start prying the tire off the rim near the valve stem with tire irons (special tools).




A. Rim Protectors (57001-1063)
B. Tire Irons (57001-1073)

**CAUTION** **Be careful not to scratch the air sealing surfaces of the rim and tire with the tire irons. A scratched surface may allow air to leak.**

**Air Sealing Surfaces** (G47)




1. Air Sealing Surfaces

**NOTE:** For easier removal, always position the tire bead opposite the valve stem in the rim well, and pry the tire bead a little at a time.

- After removing the bead on one side, turn the wheel over and remove the other side.
- Remove the rim from the tire.


- Remove the rim protectors from the rim.

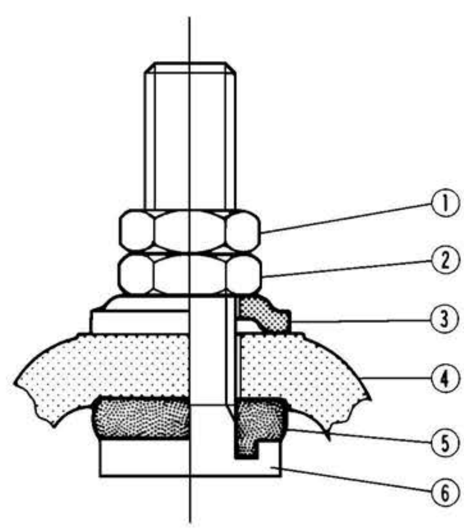
## Installation:

- Check the tire for wear and damage (See Pg. 213). Replace it with a new one if necessary.

**NOTE:** Refer to Pg. 213 for tire repair.

- Check the rim for damage (See Pg. 216). Replace it with a new one if necessary.
- Clean the sealing surfaces of the rim and smooth them with a fine emery cloth if necessary.
- Replace the valve with a new one. Tighten the mounting nut and locknut to 0.13 kg-m (113 in-lbs) of torque.

**Valve** (G49)




1. Locknut
2. Nut
3. Washer
4. Cast Wheel
5. Grommet
6. Valve Stem

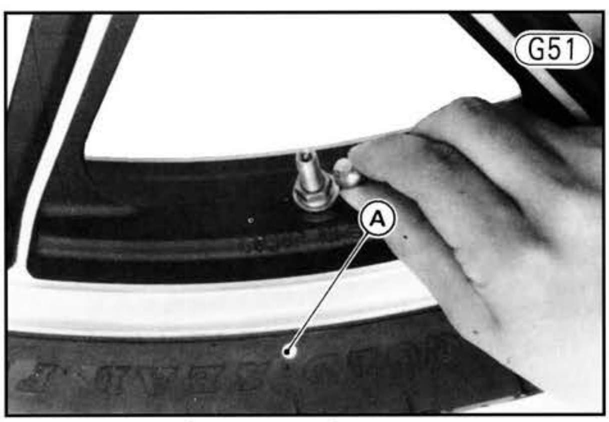
- Apply a soap and water solution, or rubber lubricant to the rim flanges, rim protectors, tire beads, and tire irons.

•Check the tire rotation mark on the rear tire and install it on the rim accordingly.

**NOTE:** The direction of the tire rotation is shown by an arrow on the tire sidewall.


**A. Rotation Mark (Arrow)**

•Position the tire on the rim so that the valve is at the tire balance mark (the chalk mark made during removal, or the yellow paint mark on a new tire).




**A. Balance Mark (Yellow Paint)**

•Fit the rim protectors on the rim flange near the valve stem.
•By hand, slide as much as possible of the lower side of the tire bead over the rim flange, starting at the side opposite the valve.
•Use tire irons to install the remaining part of the tire bead which cannot be installed by hand. For easy tire installation, position the part of the bead which is already over the rim flange in the rim well.

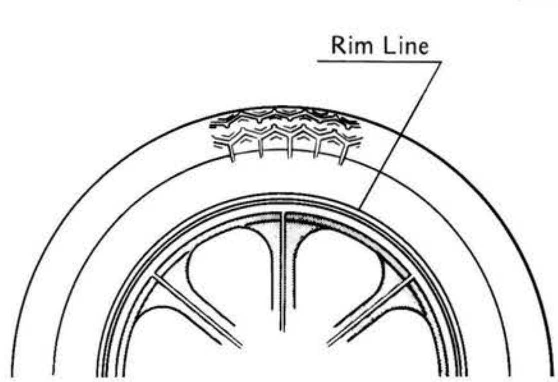
**NOTE:** To prevent rim damage, be sure to place the rim protectors at any place the tire irons are applied.

•Install the other side of the tire bead onto the rim in the same manner.
•Lubricate the tire beads and rim flanges with a soap and water solution or rubber lubricant to help seat the tire beads in the sealing surfaces of the rim while inflating the tire.
•Center the rim in the tire beads, and inflate the tire with compressed air until the tire beads seat in the sealing surfaces.

**WARNING** **Be sure to install the valve core whenever inflating the tire, and do not inflate the tire to more than 4.0 kg/cm² (57 psi). Overinflation can explode the tire with possibility of injury and loss of life.**

•Check to see that the rim lines on both sides of the tire sidewalls are parallel with the rim flanges.

**Rim Line**

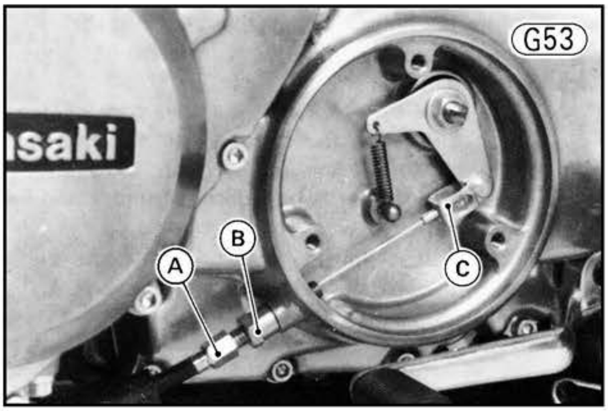



•If the rim lines and tire sidewall lines are not parallel, remove the valve core. Lubricate the rim flanges and tire beads. Install the valve core and inflate the tire again.
•After the tire beads seat in the rim flanges, check for air leaks. Inflate the tire slightly above standard inflation. Use a soap and water solution or submerge it, and check for bubbles that would indicate leakage.
•Adjust the air pressure to the specified pressure (Pg. 213).
•Adjust the wheel balance (Pg. 29).
•Install the wheel (Pg. 121 or 129).

## CLUTCH CABLE

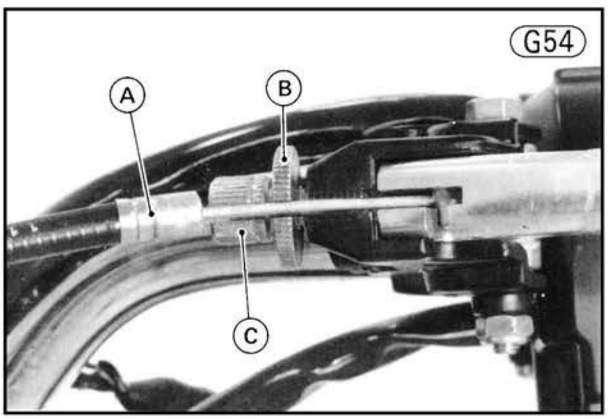
### Removal:

•Remove the screw, lockwasher, and the tachometer cable guide under the engine.
•Remove the clutch adjusting cover Allen bolts (3) and the cover.
•Loosen the clutch release locknut and back out the clutch adjusting screw.
•Straighten the tab holding the clutch cable tip, and take off the tip.
•Loosen the cable adjuster locknut on the external shift mechanism cover, unscrew the cable adjuster, and pull out the clutch cable.




A. Adjuster B. Locknut C. Tab

- Loosen the knurled locknut on the clutch lever, line up the slots in the clutch lever holder, locknut, and adjuster, and then free the cable from the lever.




A. Outer Cable
B. Knurled Locknut
C. Adjuster

- Pull the cable downward and free of the motorcycle.

**Installation Notes:**

1. Before installing the clutch cable, lubricate it (Pg. 33).
2. Adjust the clutch (See Pg. 20).

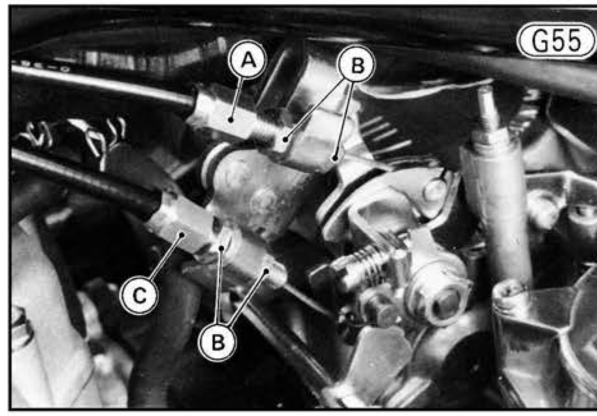
## THROTTLE CABLES

### Removal:

- Remove the fuel tank (Pg. 46).
- Give the throttle cables plenty of play by loosening the upper (handlebar) locknuts and adjusting nuts.

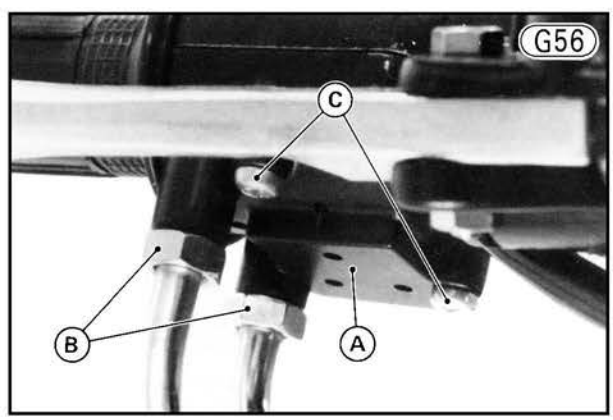
**CAUTION** **Attempting to remove the throttle cables from the carburetors without enough cable play may cause throttle cable damage.**

- Loosen the throttle cable adjuster mounting nuts (4) on the carburetor. Remove the cable adjusters from the cable bracket on the carburetor, and slip the ends of the inner cables out of the pulley.




A. Decelerator Cable Adjuster
B. Locknuts
C. Accelerator Cable Adjuster

- Loosen both cable elbow nuts, and pull the cables out between the right front fork leg and the head pipe.
- Remove the right switch housing screws (2), and open the housing.



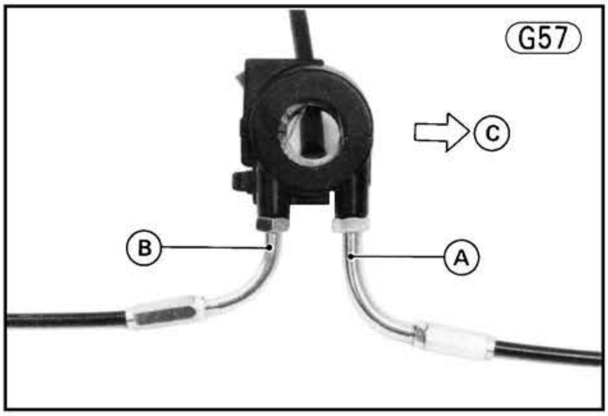

A. Switch Housing
B. Elbow Nuts
C. Switch Housing Screws

- Slip both throttle cable tips from their catches in the throttle grip.
- Unscrew the accelerator throttle cable elbow, and pull the cable out of the right switch housing. Then do the same with the decelerator throttle cable elbow to free the throttle cables from the motorcycle.

### Installation:

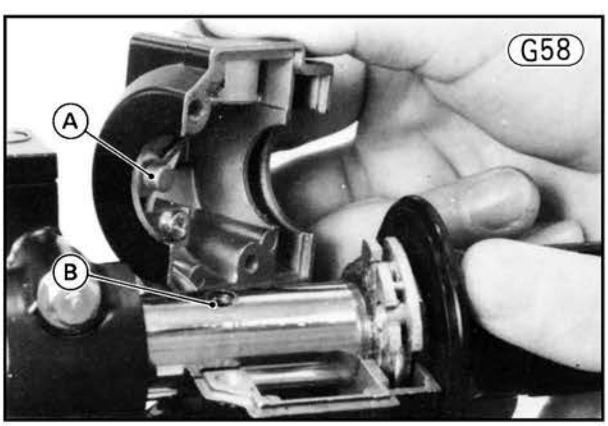
- Before installing the throttle cables, lubricate them (Pg. 33).

- Screw the decelerator throttle cable elbow (which is shorter than the accelerator throttle cable elbow) into the front hole in the right switch housing. Screw it in almost all the way, and then lightly tighten the elbow nut.



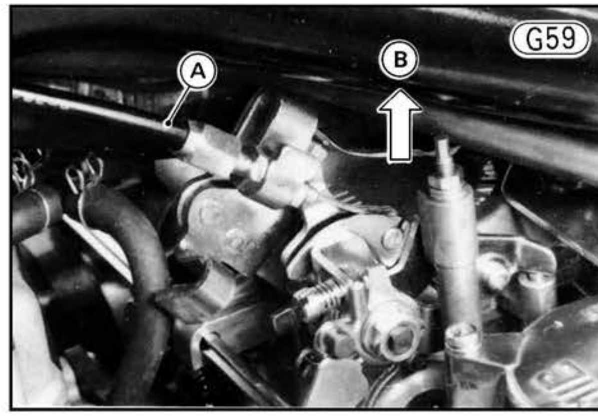

**A. Accelerator Cable Elbow** **C. Front**
**B. Decelerator Cable Elbow**

- Screw in the accelerator cable elbow almost all the way, and then lightly tighten the elbow nut.
- The cables should be routed so that they are not twisted around each other.
- Turn the throttle grip so that the cable catches are facing up. Fit the accelerator throttle cable tip into the front catch and the other cable tip into the rear catch.
- Put together the right switch housing, and tighten its screws. The upper half of the housing has a small projection which fits into a small hole in the handlebar. The front switch housing screw is longer than the rear screw.




**A. Projection** **B. Hole**

- Fit the tip of the decelerator throttle cable into the upper catch in the pulley on the carburetor, and install its adjuster into the bracket.



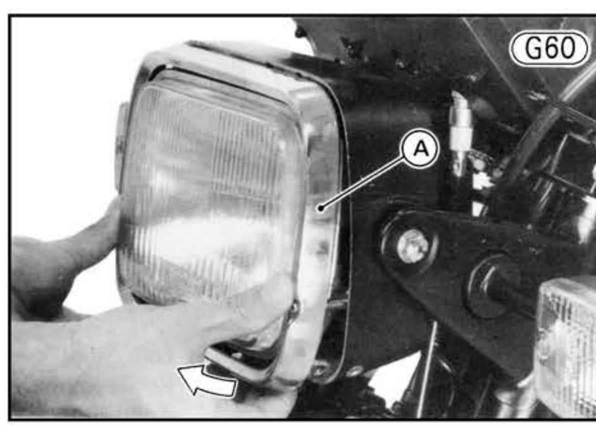

**A. Decelerator Throttle Cable** **B. Upper**

- Fit the tip of the other cable into the other catch, and install its adjuster into the bracket while turning the throttle grip at the same time, if necessary.
- Center each adjuster in its place in the bracket, and then tighten the mounting nuts.
- Turn each elbow in the direction of its cable, and tighten its elbow nut to secure the elbow in the proper position.
- Install the fuel tank (Pg. 46).
- Adjust the throttle cables (Pg. 14).

## HEADLIGHT UNIT

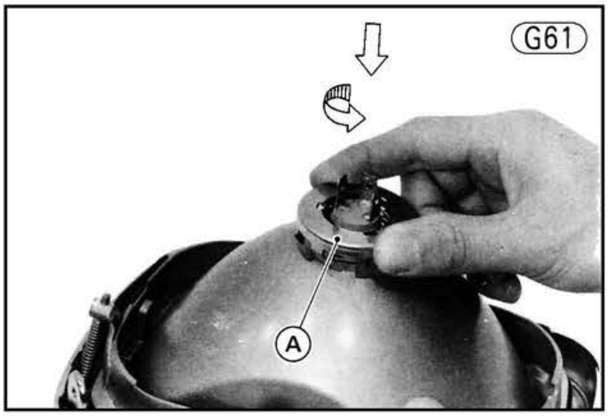
### Removal:

- Take out the retaining screws ⑬ (2).
- Swing the outer rim ② out from the housing, and disconnect the headlight socket from the rear of the unit.




**A. Headlight Rim**

- Remove the rubber boot.
- Push the bulb stop ⑩ and turn it counterclockwise so that the bulb stop can be removed, and then remove the bulb ⑨.

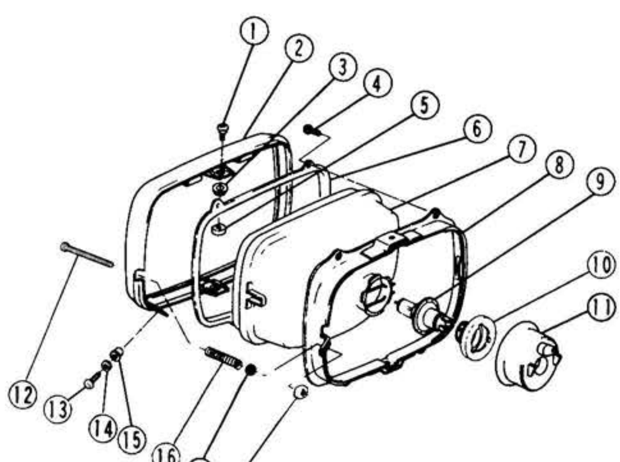



A. Bulb Stop

**CAUTION** **When handling the quartz-halogen bulb, never touch the glass portion with bare hands. Always use a clean cloth. Oil contamination from hands or dirty rags can reduce bulb life or even cause the bulb to explode.**

- Remove the pivot screws ①, nuts ⑤ with rubber dampers ③ (2 ea), and the beam horizontal adjusting screw ⑫. The nut ⑱, spring seat ⑰, and spring ⑯ will come off with the adjusting screw.
- Separate the outer rim ② from the inner rim ⑥.
- Remove the screws ④ (4), and separate the semi-sealed beam unit from the inner rim and mounting rim.

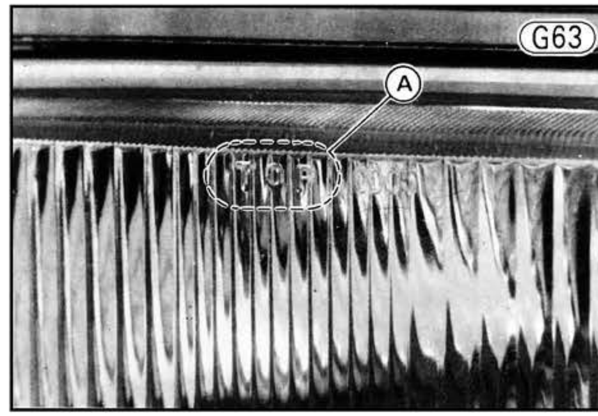
**Headlight Unit** G62




1. Pivot Screw
2. Outer Rim
3. Rubber Damper
4. Screw
5. Nut
6. Inner Rim
7. Semi-sealed beam unit
8. Mounting Rim
9. Headlight Bulb
10. Bulb Stop
11. Rubber Boot
12. Adjusting Screw
13. Screw
14. Lockwasher
15. Collar
16. Spring
17. Spring Seat
18. Nut

**Installation Notes:**

1. The spring seat on the adjusting screw goes between the spring and the bracket.
2. The top of the semi-sealed beam unit is marked "TOP".



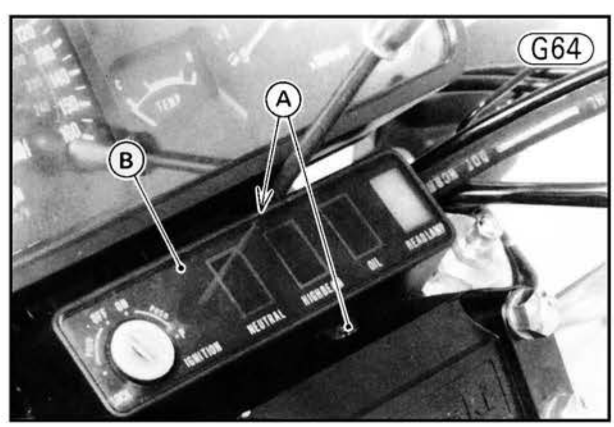

A. Top Mark

3. Adjust the headlight after installation (Pg. 30).

## INDICATOR LIGHTS (Neutral, High Beam, Oil, Headlight)

### Bulb Replacement:

- Unscrew the screws (2), and remove the indicator light cover.



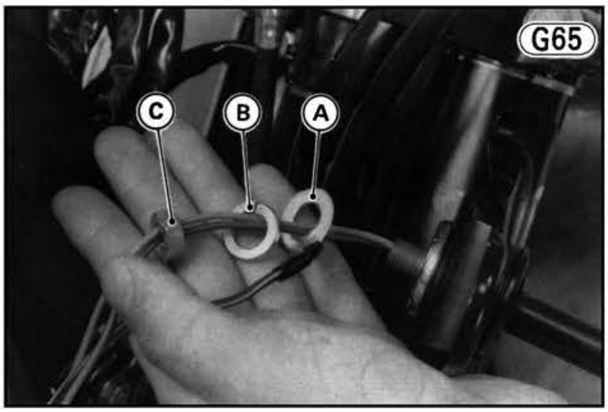

A. Screws B. Cover

- Take out the damper rubber from the indicator light body, and remove the bulbs.
- Install new bulb (rated 12V 3.4W).
- Install the indicator light cover.

## TURN SIGNAL ASSEMBLY

### Removal (front, either side):

•Remove the headlight unit (Pg. 139).
•Disconnect the turn signal/running position light leads (gray and blue) in the headlight housing.
•Remove the headlight housing.
•Remove the mounting nut, lockwasher, and black/yellow ground lead terminal, and pull the front turn signal from the front fork cover stay.




**A. Ground Lead Terminal** **C. Nut**
**B. Lockwasher**

### Installation Notes (front, either side):

1. Connect the gray lead of the left turn signal to the green lead of the main wiring harness.
2. Adjust the headlight (Pg. 30).

### Removal (rear, either side):

•Unlock the seat and swing it open.
•Remove the bolt and flat washer, and remove the document compartment.
•Disconnect the gray lead of the turn signal.


•Remove the mounting nut, lockwasher, flat washer, and ground lead terminal, and pull off the turn signal assembly.

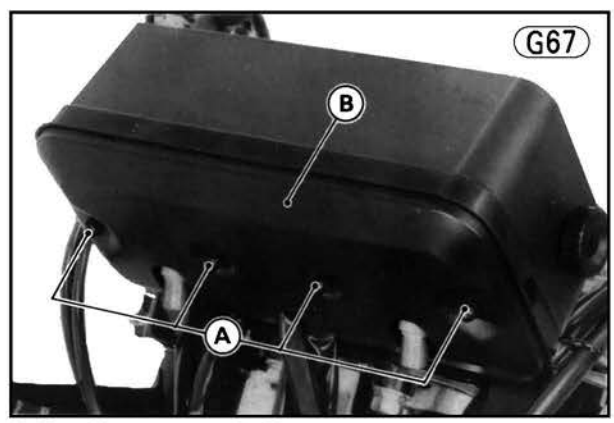
### Installation Note (rear, either side):

•Connect the gray lead of the left turn signal to the green lead of the main wiring harness.

## METER ASSEMBLY (Speedometer, Tachometer, Fuel Gauge, Distance Sensor, Water Temperature Gauge)

### Removal:

•Remove the headlight unit (Pg. 139).
•Disconnect all leads and connectors in the headlight housing.
•Remove the headlight housing stay bolt and nut under the housing.
•Remove the housing mounting bolts, nuts, flat washers, and lockwashers (2 ea), and remove the headlight housing.
•Disconnect the speedometer and tachometer cables from the meters.
•Remove the cap nuts (4), and remove the cover.




**A. Cap Nuts** **B. Cover**

•Disconnect the leads (3) and connectors (3) from the meter assembly, and lift up the meter assembly.

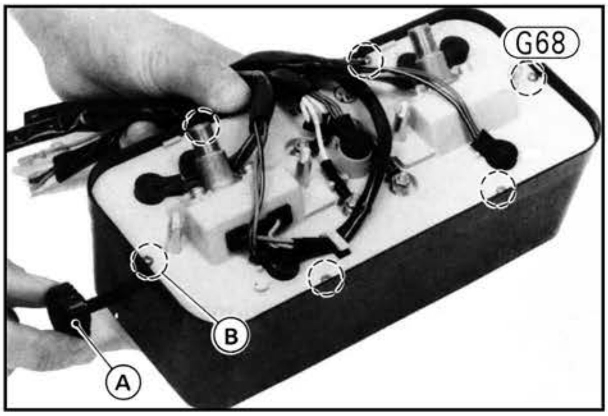
**CAUTION** **Place the meter assembly so that the correct side of the assembly is up. If a meter is left upside down or sideways for any length of time, it will malfunction.**

### Installation Note:

•Be careful that leads are not pinched between the mounting plate and the meter assembly.

### Disassembly:

•Unscrew the trip meter reset knob. The knob has a left hand thread and must be turned clockwise for removal.
•Remove the screws (6), and pull the meter assembly out of the upper cover.

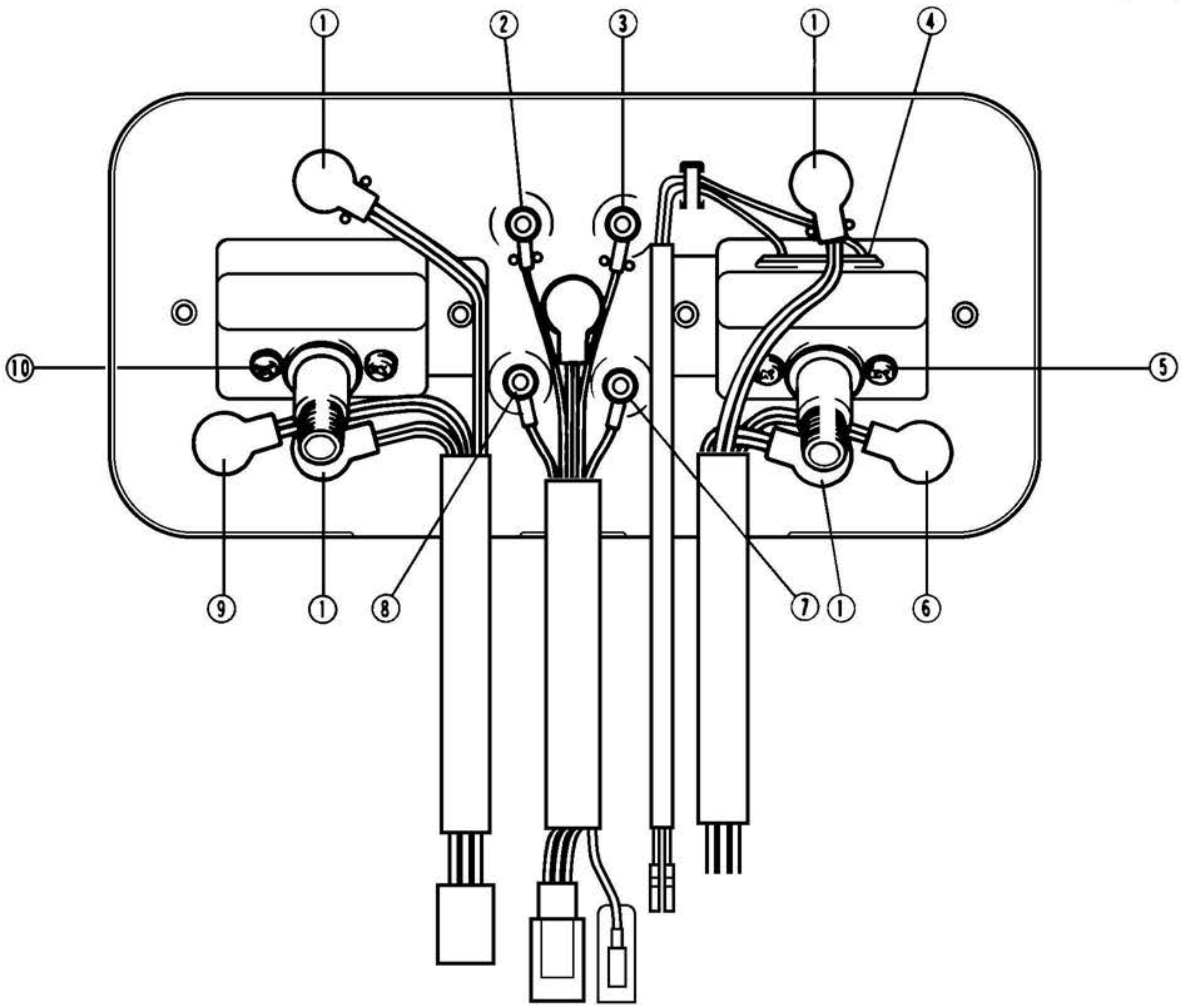



A. Knob B. Screws

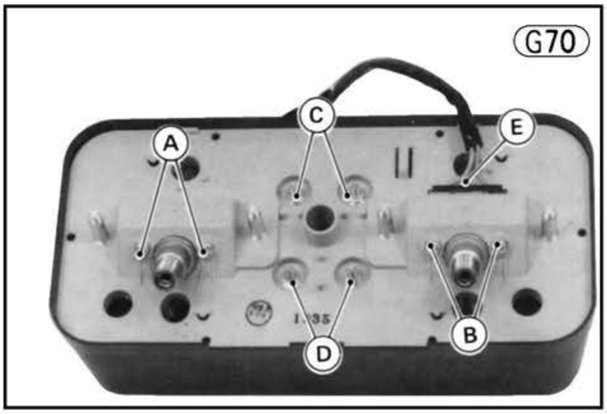
**CAUTION** **Do not touch the inside surface of the cover transparent part, as this could wipe off or spoil the anti-dim coating on the cover.**

- Unscrew the nuts and lockwashers (4 ea), and remove the leads (4) from the fuel gauge and water temperature gauge.
- Pull the bulb sockets from the meter assembly.
- To remove the tachometer or speedometer, unscrew the screws (2) and remove the meter. Each screw has a lockwasher and a flat washer.

**Location of Meters, Gauges, and Lights**




1. Meter Light with Red/ Blue Lead and Blace/Yellow Lead
2. Fuel Gauge Mounting Nut and Yellow Lead
3. Fuel Gauge Mounting Nut and White Lead
4. Distance Sensor with Red Lead and Light Green Lead
5. Speedometer Mounting Screw
6. Left Turn Signal Indicator Light with Green Lead and Blace/Yellow Lead
7. Temperature Gauge Mounting Nut and Yellow/White Lead
8. Temperature Gauge Mounting Nut and Yellow Lead
9. Right Turn Signal Indicator Light with Gray Lead and Black/Yellow Lead
10. Tachometer Mounting Screw




**A. Tachometer Mounting Screws**
**B. Speedometer Mounting Screws**
**C. Fuel Gauge Mounting Nuts**
**D. Water Temperature Gauge Mounting Nuts**
**E. Distance Sensor**

•To remove the fuel gauge or water temperature gauge, unscrew the nuts, lockwashers, and flat washers (2 ea), and remove the gauge.

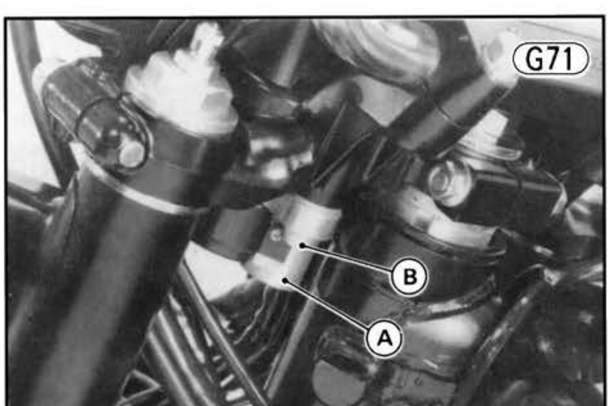
### Assembly Note:

•Install the meters, gauges, indicators, meter lights, and meter leads as shown in Fig. G69.

## IGNITION SWITCH, STEERING LOCK ASSEMBLY

### Removal:

•Remove the headlight unit (Pg. 139).
•Disconnect the ignition switch 6-pin connector in the headlight housing.
•Remove the headlight housing stay bolt and nut under the housing.
•Remove the housing mounting bolts, nuts, flat washers, and lockwashers (2 ea), and remove the headlight housing.
•Remove the Allen bolts and lockwashers (2 ea), and remove the ignition switch and steering lock assembly.




**A. Ignition Switch and Steering Lock Assembly**
**B. Allen Bolt**

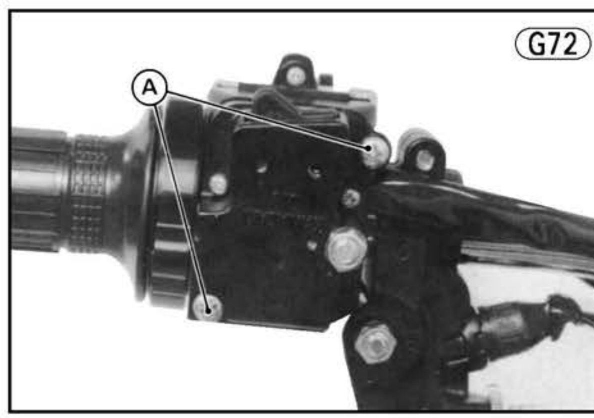
### Installation Note:

•Adjust the headlight (Pg. 30), after installation.

## LEFT SWITCH HOUSING

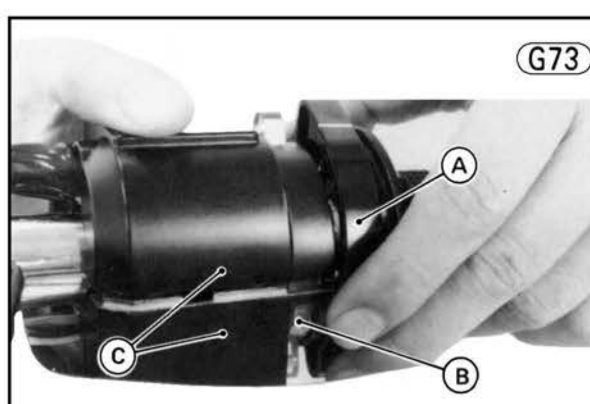
### Removal:

•Remove the fuel tank (Pg. 46).
•Remove the straps which hold the switch housing harnesses to the handlebar and frame top tube.
•Disconnect the connectors (3) from the switch housing at the frame top tube.
•Unscrew the mounting screws of the outer ring for the dimmer switch, and unscrew the switch housing screws.




**A. Housing Screws**

•Loosen the clamp bolt of the clutch lever holder, and slide the clutch lever holder and switch housing to slip the outer ring off the inner ring.

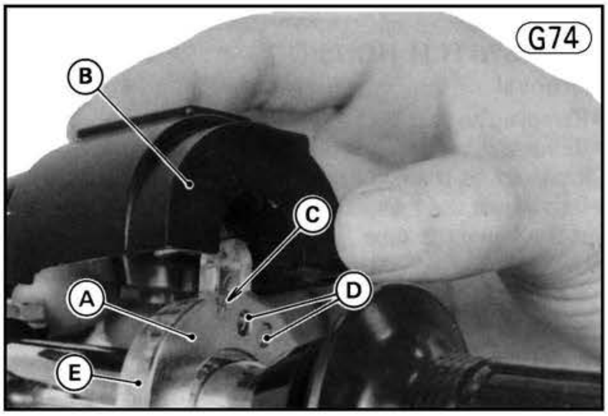



**A. Outer Ring** **C. Switch Housing**
**B. Inner Ring**

•Remove the switch housing from the handlebar.

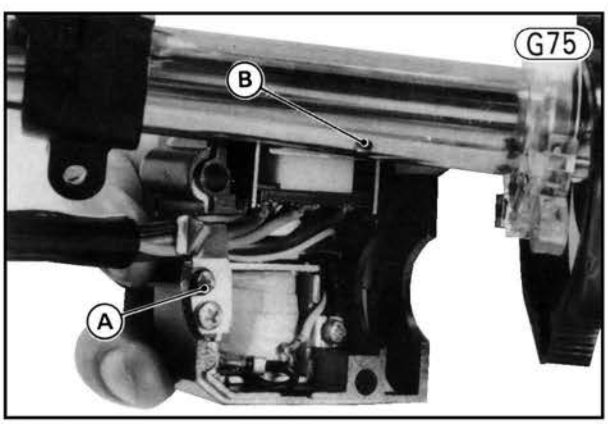
**Installation Notes:**

1. First, fit the positioning plate and the inner ring in the upper half of the switch housing. Turn the positioning plate so that the notch in the plate meshes with the knob in the housing. The switch electrical points on the inner ring and the holes in the positioning plate must be in the upper housing half.




**A. Positioning Plate** **D. Holes**
**B. Upper Half** **E. Inner Ring**
**C. Notch**

2. The lower half of the switch housing has a small projection which fits into a hole in the handlebar.

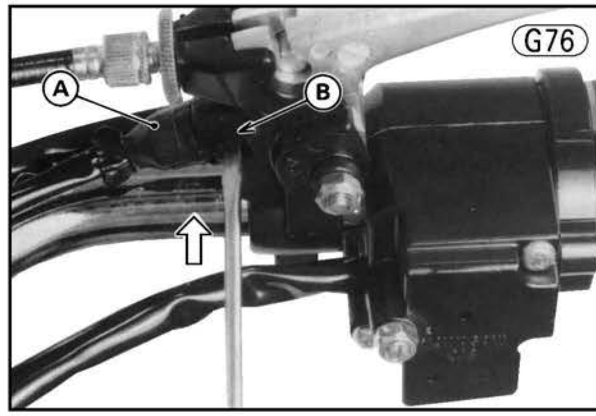



**A. Projection** **B. Hole**

## HANDLEBAR

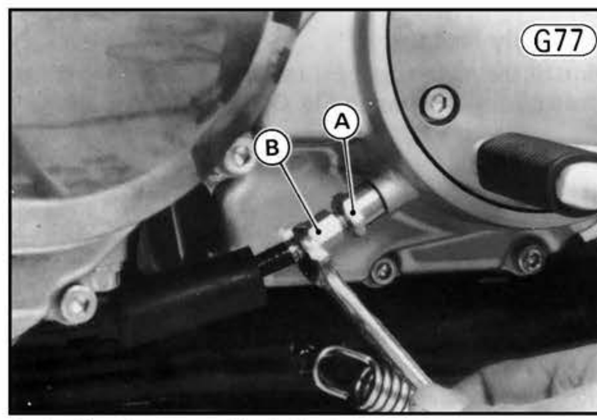
### Removal:

- Take off the rear view mirrors.
- Remove the fuel tank (Pg. 46) or cover it with a thick cloth to avoid damaging the painted surface.
- To remove the starter lockout switch, depress the lock tab in the hole, and pull out the switch.



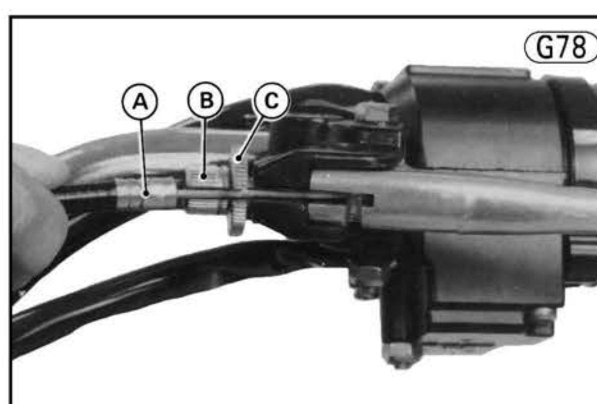

**A. Starter Lockout Switch** **B. Hole**

- Pull the dust cover out of the way at the lower end of the clutch cable, loosen the locknut, and turn in the clutch cable adjuster to give the clutch cable plenty of play.



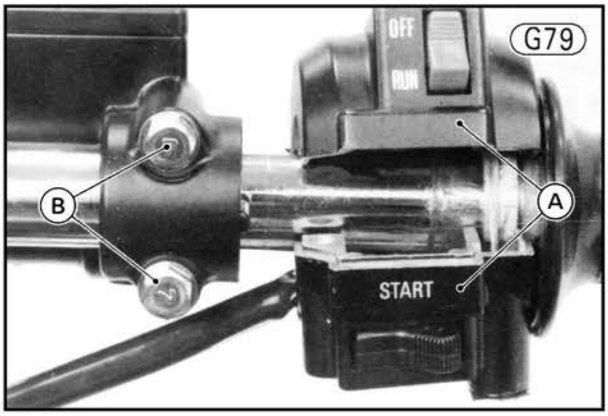

**A. Locknut** **B. Adjuster**

- Loosen the knurled locknut on the clutch lever, and turn in the adjuster. Line up the slots in the clutch lever, locknut, and adjuster, and free the inner cable from the lever.



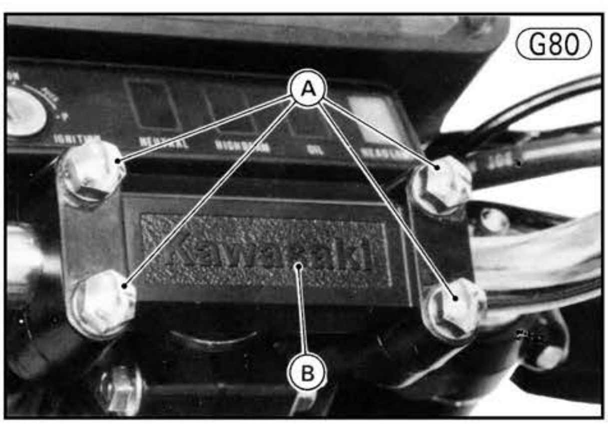

**A. Clutch Cable** **C. Knurled Locknut**
**B. Adjuster**

- Remove the straps which hold the left switch wiring harness and right switch wiring harness to the handlebar.
- Remove the left switch housing from the handlebar (Pg. 143).
- Remove the right switch housing screws (2), and open up the housing.
- Loosen the master cylinder clamp bolts (2).




**A. Right Switch Housing**
**B. Master Cylinder Clamp Bolts**

- Remove the handlebar clamp bolts and lockwashers (4 ea), remove the clamp, and slide the handlebar from the throttle grip, right switch housing, and master cylinder.

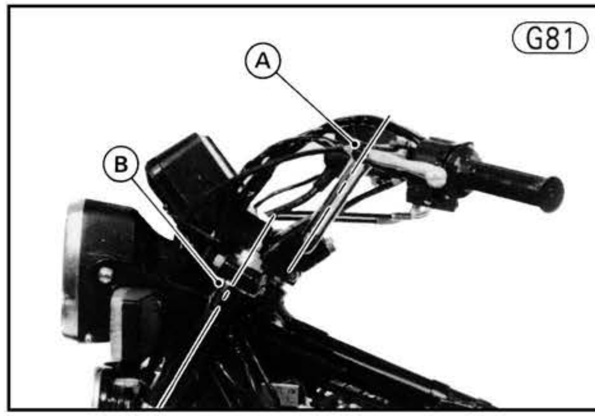



**A. Handlebar Clamp Bolts** **B. Clamp**

- To remove the clutch lever, left switch outer ring, inner ring, and positioning plate, loosen the clutch lever holder bolt, cut off the left hand grip, which is bonded to the handlebar, and slide off the clutch lever. During reassembly a new left hand grip must be bonded to the handlebar. Be sure to use a left hand grip of the correct inside diameter and length.

**Installation Notes:**

1. Install the handlebar, handlebar clamps, lockwashers, and clamp bolts so that the angle of the handlebar matches the angle of the front fork as shown, and tighten the clamp bolts evenly to 1.8 kg-m (13.0 ft-lbs) of torque.




**A. Handlebar** **B. Front Fork**

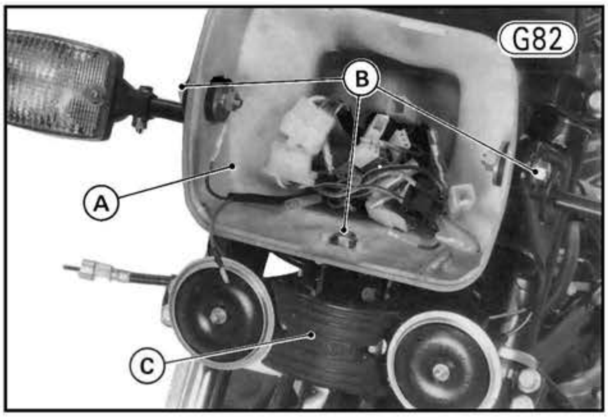
2. Install the right switch housing, and tighten its screws. The upper half of the housing has a small projection which fits into a small hole in the handlebar (Fig. G58). The front switch housing screw is longer than the rear screw.
3. With the brake lever mounted at the proper angle, tighten the upper and then the lower master cylinder clamp bolt to 0.80 kg-m (69 in-lbs) of torque.
4. Check and adjust the following items.
   - Front brake
   - Throttle cable (Pg. 14)
   - Clutch (Pg. 20)
   - Rear view mirror

## STEERING STEM

### Removal:

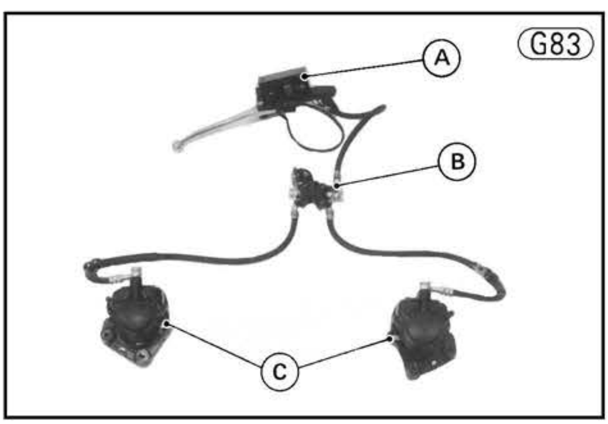
- Remove the fuel tank (Pg. 46).
- Remove the speedometer and tachometer cable.
- Remove both of the front disc brake calipers leaving the brake hoses connected, and remove the front wheel (Pg. 121).
- Remove the brake hose guides at the left and right front fork outer tubes.
- Remove the headlight unit (Pg. 139).
- Disconnect all the leads and plugs in the headlight housing.

•Remove the headlight housing mounting bolts (3) and remove the headlight housing. Each bolt has a flat washer and nut.




**A. Headlight Housing** **C. Plastic Cover**
**B. Mounting Bolts**

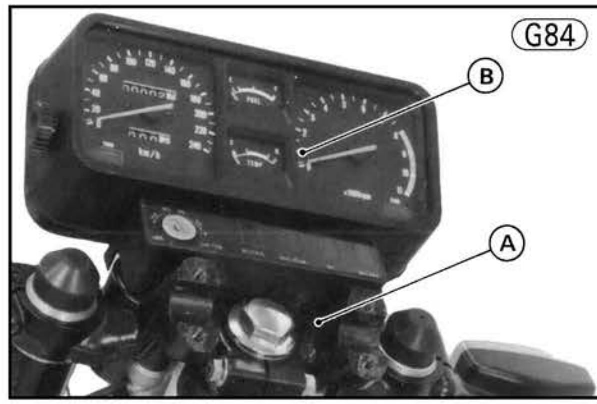
•Remove the plastic cover, and remove the two bolts which mount the horns and hose joint.
•Remove the fork leg upper clamp bolts on both sides, and remove the cable guide and the hose clamp.
•Remove the clamp bolts (2), and take off the master cylinder. Do not disconnect the brake hoses.




**A. Master Cylinder** **C. Calipers**
**B. Hose Joint**

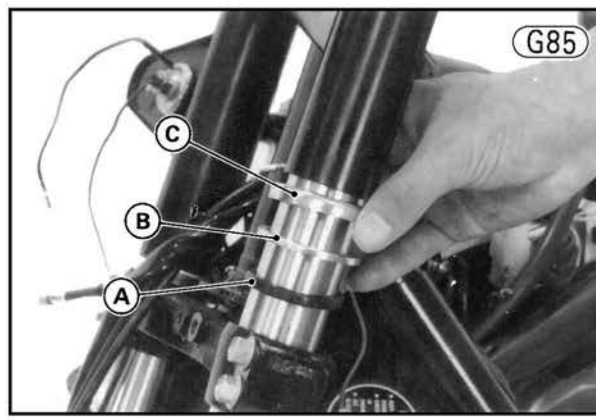
•Remove the handlebar (Pg. 144).
•Loosen the stem head clamp bolt, and then remove the stem head bolt, lockwasher, and flat washer.
•Tap lightly on the bottom of the stem head with a mallet, and then remove the steering stem head together with the meter assembly.

**CAUTION** **Place the stem head so that the correct side of the meter assembly is up. If a meter is left upside down or sideways for any length of time, it will malfunction.**



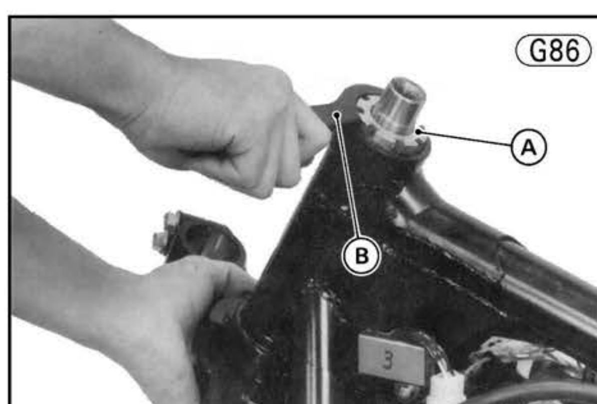

**A. Stem Head** **B. Meter Assembly**

•Remove the fork covers with the turn signals. Each fork cover has a ring cap, stem base cover, damper ring, and rubber damper at the bottom.




**A. Rubber Damper** **C. Base Cover**
**B. Damper Ring**

•Loosen the front fork lower clamp bolts (4) on both sides, and pull out both fork legs and front fender at a time with a twisting motion.
•Push up on the stem base, and remove the steering stem locknuts with the stem nut wrench (special tool); then remove the steering stem.

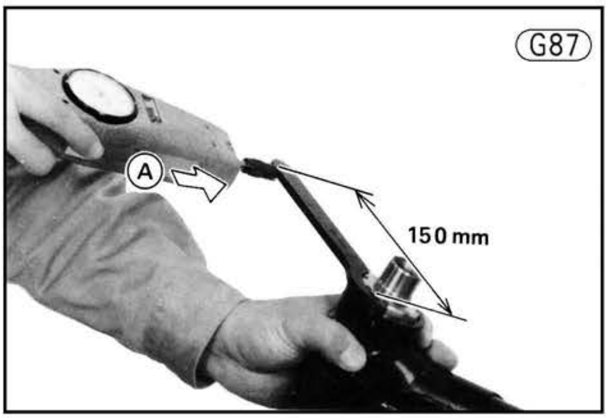



**A. Stem Locknuts**
**B. Stem Nut Wrench (57001-134)**

•Remove the steering stem cap and upper tapered roller bearing inner race.

### Installation Notes:

1. Apply grease to the upper and lower tapered roller bearings (Pg. 224).
2. After installing the steering stem, upper tapered roller bearing inner race, steering stem cap, and lower (thick) stem locknut; check and adjust the steering bearings.
   ○Tighten the lower stem locknut to 4.0 kg-m (29 ft-lbs) of torque.
   **NOTE:** To tighten the steering stem locknut to the specified torque, firstly make a notch on the stem nut wrench at the 150 mm from the locknut center, secondly hook the wrench on the stem locknut, and then push the wrench at the notch by 27 kg force.



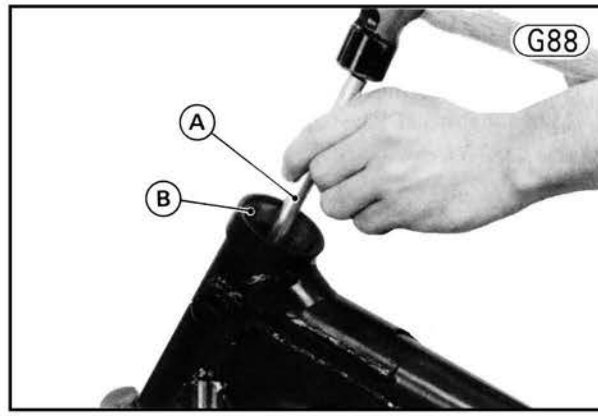

**A. 27 kg Force**

   ○Check that there is no play and the steering stem turns smoothly without the rattle. If not, check the stem bearings (Pg. 224).
   ○Loosen the lower stem locknut, and clamp it again with finger tight pushing the stem base to the head pipe. Do not overtighten it, or the steering stem will be tight.
   ○Check that there is no play.
   ○Keeping the lower stem locknut at the position, clamp the upper stem locknut with finger tight.
3. Tightening torque for the stem head clamp bolt is 1.8 kg-m (13.0 ft-lbs), and the top bolt torque is 4.5 kg-m (33 ft-lbs).
4. Install the front fork referring to the front fork "Installation Notes". See Pg. 148.
5. Route the cables and harnesses.
6. Check and adjust the following items.
   ○Steering (Pg. 28).
   ○Front brake (Pg. 27).
   ○Clutch (Pg. 20).
   ○Throttle cables (Pg. 14).

## STEERING STEM BEARING

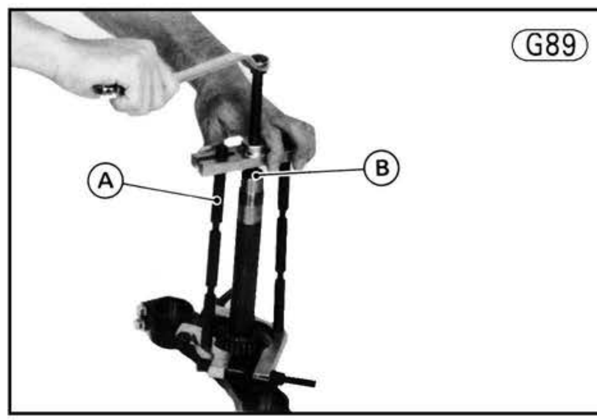
### Removal:

•Remove the steering stem (Pg. 145).
•To remove the outer races pressed into the head pipe, insert a bar into the head pipe and hammer evenly around the circumference of the opposite race to drive it out.




**A. Bar B. Outer Race**

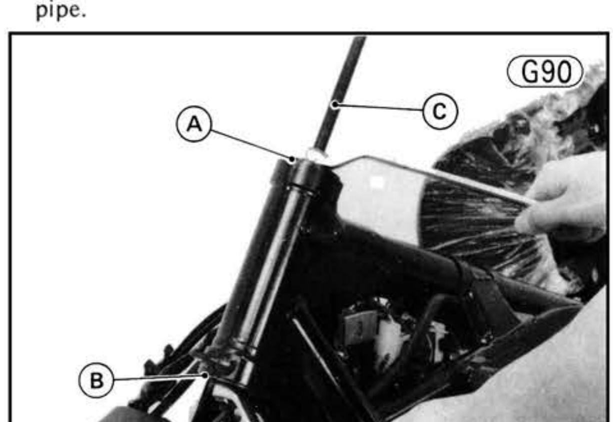
•To remove the lower inner race, which is pressed onto the steering stem, use the bearing puller and adapter (special tools).




**A. Bearing Puller (57001-158)**
**B. Adapter (57001-317)**

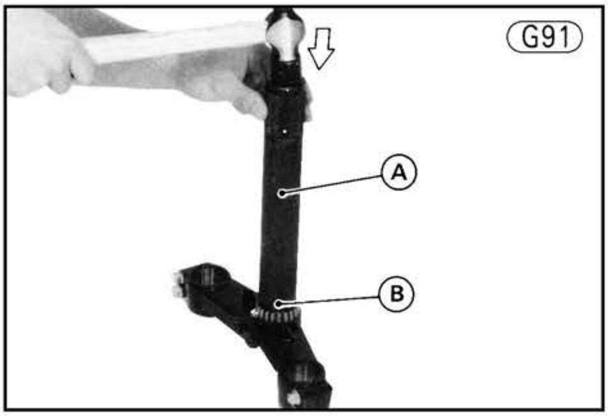
### Installation Notes:

1. Apply grease to the outer races, and then drive them into the head pipe using the drivers and the driver press shaft (special tools). Be sure to press them until they stop at the stepped portion in the head pipe.




**A. Driver (57001-1076)**
**B. Driver (57001-1077)**
**C. Driver Press Shaft (57001-1075)**

2. Replace the lower tapered roller bearing with a new one, if the grease seal is damaged. Apply grease to the lower tapered roller bearing inner race, and then drive it onto the steering stem using the stem bearing driver and adapter (special tools). The "UP" mark on the adapter must face upwards. Be sure to press it until it stops at the stem base.

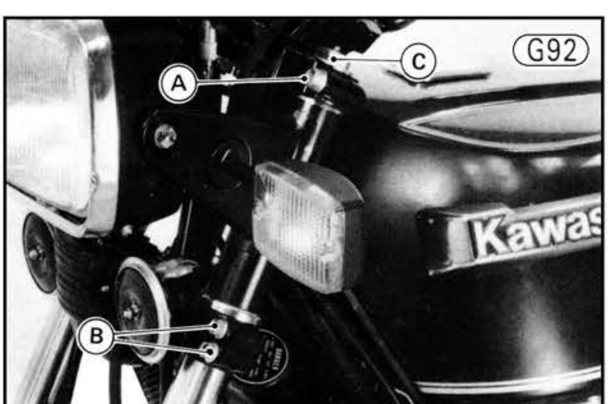



**A. Stem Bearing Driver (57001-137)**
**B. Adapter (57001-1074)**

## FRONT FORK

### Removal (each fork leg):

- Set the motorcycle on its center stand, and lift the front wheel off the ground using a jack at the specified location under the engine or by other suitable means. See Fig. G2.
- Remove the front wheel (Pg. 121).
- Remove the bolts and lockwashers (4 ea), and remove the front fender.
- If the fork leg is to be disassembled after removal, release the air through the air valve and loosen the air valve and the top bolt now.
- Loosen the upper and lower clamp bolts (3).



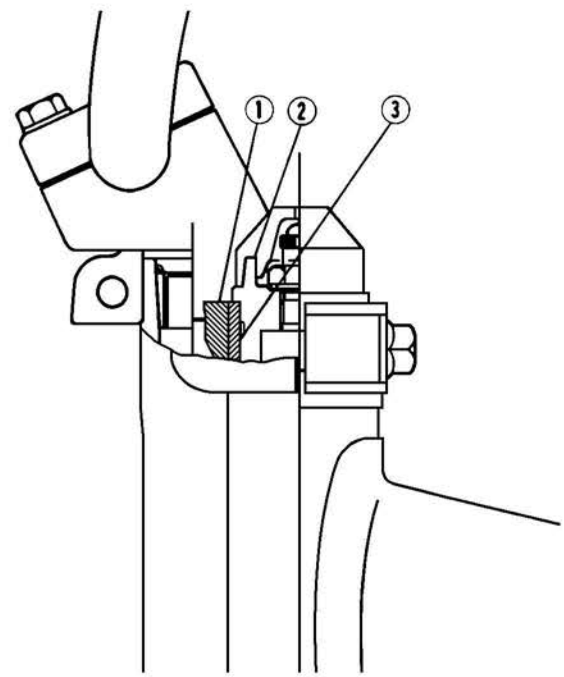

A. Upper Clamp Bolt C. Top Bolt
B. Lower Clamp Bolts

- With a twisting motion, work the fork leg down and out.

### Installation Notes (each fork leg):

1. Slide the fork leg up through the lower and upper clamps until the mating surface of the top bolt flange and the inner tube end is even with the upper surface of the stem head. Tighten the upper clamp bolt to 3.0 kg-m (22 ft-lbs) of torque and the lower clamp bolts to 1.8 kg-m (13.0 ft-lbs).

**Front Fork Installation** G93




1. Stem Head
2. Top Bolt
3. Inner Tube

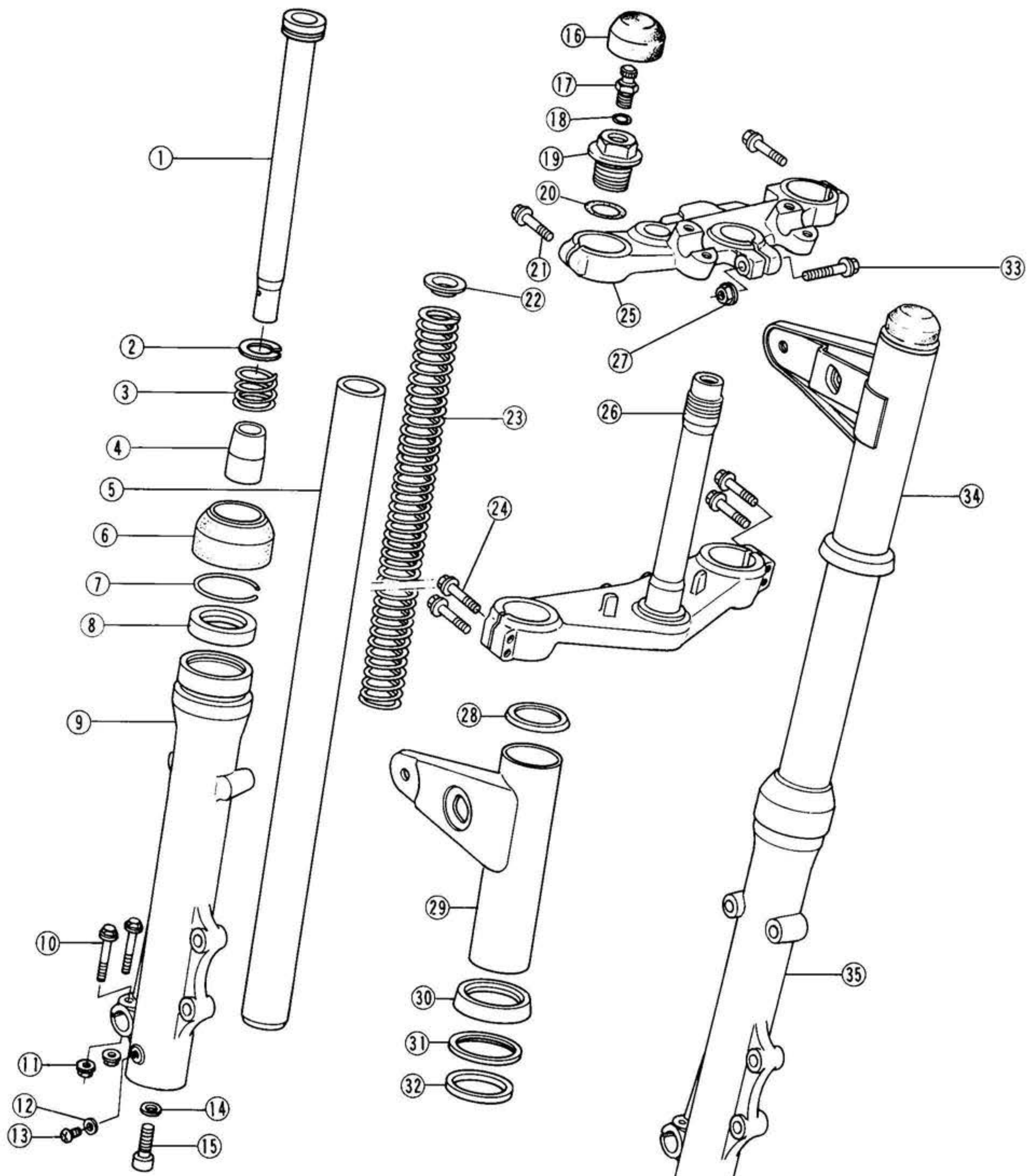
2. If the fork leg was disassembled, tighten the top bolt to 2.3 kg-m (16.5 ft-lbs) of torque and apply a non-permanent locking agent to the thread of air valve and tighten the valve to 1.2 kg-m (104 in-lbs) of torque. And then inject air through the air valve. (See Pg. 26).
3. Check the front brake (Pg. 27).

### Disassembly:

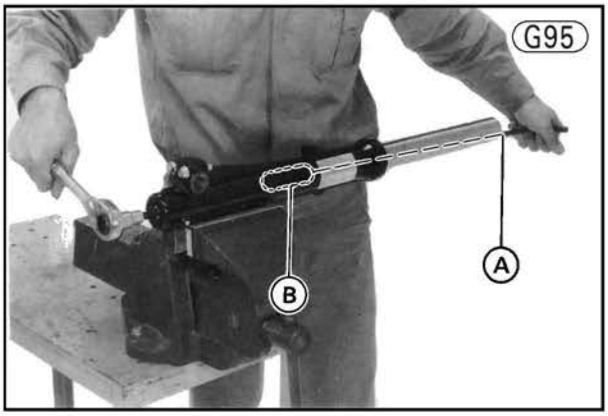
- Remove the air valve ⑰, its **O** ring ⑱, and top bolt ⑲, and pull out the spring seat ㉒ and spring ㉓.
- Pour the oil into a suitable container, pumping as necessary to empty out all the oil.
- To keep the fork cylinder ① from turning, use the front fork cylinder holder handle and adapter (special tools). Unscrew the Allen bolt ⑮ and gasket ⑭ from the bottom of the outer tube ⑨ or ㉟, and then separate the inner tube ⑤ from the outer tube by pulling it out.

**Front Fork**

G94

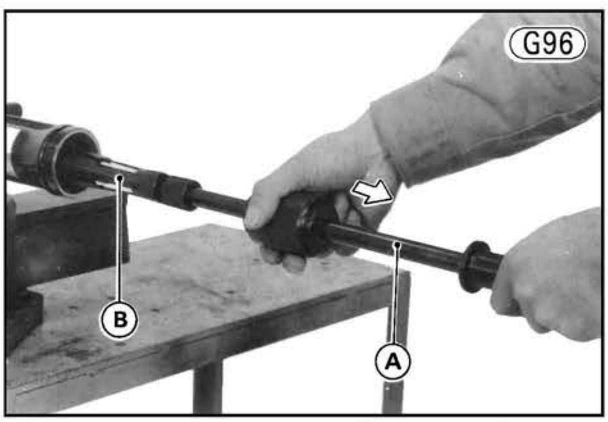



1. Fork Cylinder
2. Piston Ring
3. Spring
4. Cylinder Base
5. Inner Tube
6. Dust Seal
7. Retainer
8. Oil Seal
9. Left Outer Tube
10. Bolt
11. Nut
12. Gasket
13. Drain Screw
14. Gasket
15. Allen Bolt
16. Rubber Cap
17. Air Valve
18. O Ring
19. Top Bolt
20. O Ring
21. Bolt
22. Spring Seat
23. Spring
24. Bolt
25. Stem Head
26. Stem
27. Nut
28. Cap
29. Left Fork Cover
30. Base Cover
31. Damper Ring
32. Rubber Damper
33. Bolt
34. Right Fork Cover
35. Right Outer Tube




**A. Front Fork Cylinder Holder Handle (57001-183)**
**B. Adapter (57001-1057)**

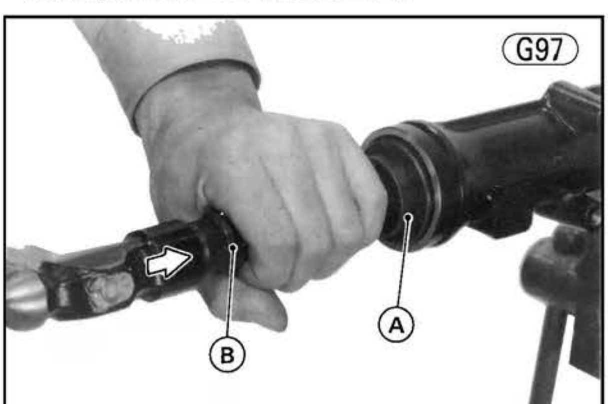
- Remove the dust seal ⑥ from the outer tube.
- Slide or push the cylinder ① and its spring ③ out the top of the inner tube.
- Remove the cylinder base ④.
- Remove the retainer ⑦ from the outer tube with a sharp hook. Pull out the oil seal ⑧ using the oil seal and bearing remover and adapter B (special tool).




**A. Oil Seal and Bearing Remover (57001-1058)**
**B. Adapter B**

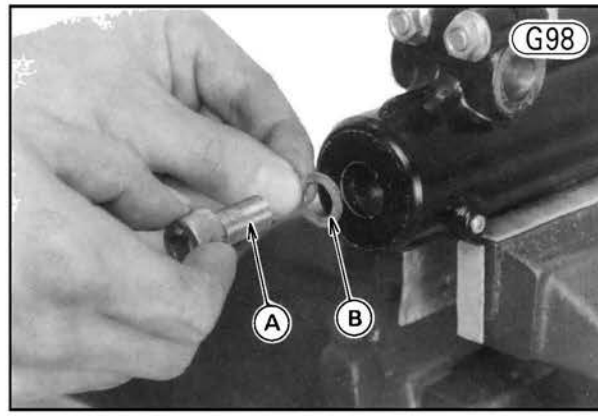
### Assembly Notes:

1. Replace the oil seal with a new one, apply oil to the outside, and install it with the bearing driver and the bearing driver holder (special tools).




**A. Bearing Driver (57001-140)**
**B. Holder (57001-139)**

2. Apply liquid gasket to both sides of the gasket and apply a non-permanent locking agent to the Allen bolt ⑮. Tighten the bolt using the front fork cylinder holder handle and adapter (special tools) to keep the cylinder from turning. The torque for the Allen bolt is 3.7 kg-m (27 ft-lbs).



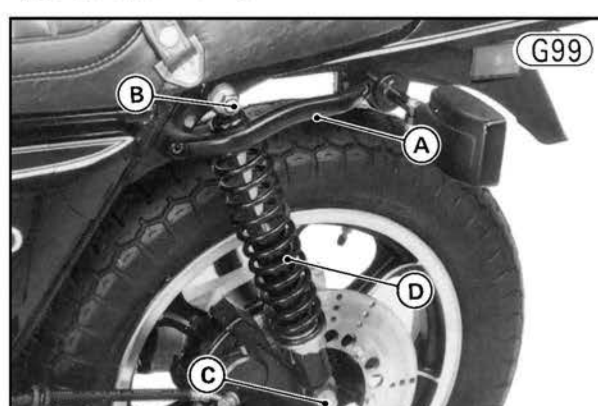

**A. Apply a non-permanent locking agent.**
**B. Apply liquid gasket.**

3. If the drain screw is removed, check the gasket ⑫ for damage. Replace the damaged gasket with a new one. Before installing the drain screw, apply a liquid gasket to the threads of the screw, and tighten the screw securely.
4. Pour in the type and amount of fork oil specified in Table J12 on Pg. 226, and adjust the oil level as explained in Pg. 226.
5. Check the O rings ⑱ and ⑳ for damage. Replace them with new ones if damaged.
6. After installing the front fork leg, tighten the top bolt to 2.3 kg-m (16.5 ft-lbs) of torque. Apply a non-permanent locking agent to the threads of the air valve, and tighten the valve to 1.2 kg-m (104 in-lbs) of torque. Inject air through the air valve (See Pg. 26).

## REAR SHOCK ABSORBERS

### Removal (either side):

- Set the motorcycle up on its center stand.
- If the left shock absorber is to be removed, remove the grab rail by removing the Allen bolts.




**A. Grab Rail** **C. Nut**
**B. Cap Nut** **D. Rear Shock Absorber**

•Remove the cap nut, lockwasher, and flat washer from the upper end, and remove the nut from the lower end.
•Pull off the rear shock absorber.

### Installation Notes:

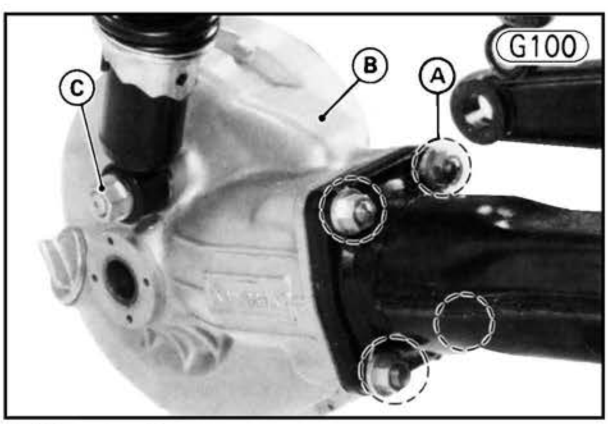
1. Tighten the mounting nuts to 2.5 kg-m (18.0 ft-lbs) of torque.
2. Check to see that both adjusting sleeves are turned to the same relative position so that the same spring preload is obtained.

**WARNING** **If they are not adjusted to the same position, an unsafe riding condition may result.**

## FINAL GEAR CASE

### Removal:

•Put the motorcycle up on its center stand.
•If the final gear case is to be disassembled, remove the drain bolt and filler cap, and drain the oil (Pg. 32).
•Remove the rear wheel (Pg. 129).
•Place a stand under the swing arm so that the swing arm will not swing down. This is to prevent the universal joint dust cover from damaging.
•Remove the final gear case mounting nuts (4).



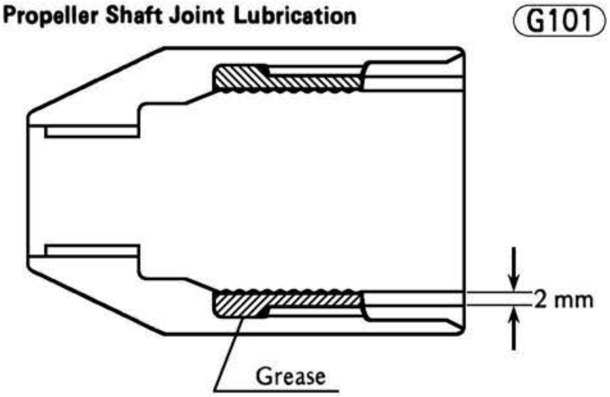

**A. Mounting Nuts**
**B. Final Gear Case**
**C. Shock Absorber Mounting Nut**

•Remove the upper and lower mounting nuts of the right rear shock absorber, and then remove the final gear case.

### Installation Notes:

1. Before installing the final gear case, clean out the old grease in the propeller shaft joint and on the pinion shaft joint, pack the internal splines of the propeller shaft joint with a high temperature grease to a depth of about 2 mm at the splines, and coat the grease seal lip on the pinion shaft joint with the grease. It will take approximately 25 cc of grease.

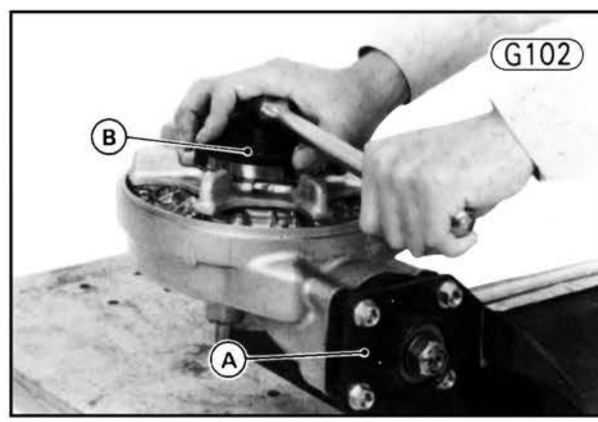
**Propeller Shaft Joint Lubrication**




2. Tighten the mounting nut of the rear shock absorber to 3.0 kg-m (22 ft-lbs) of torque, and nuts (4) of the final gear case to 3.0 kg-m (22 ft-lbs) of torque.
3. Check the oil level. Add oil if necessary to bring the level up to the correct point (Pg. 32).

### Ring Gear Disassembly:

•Pry and straighten the tab of the lockwasher ②.
•Securing the pinion shaft with the pinion joint holder and spacer (special tool), loosen the ring nut ① with the ring nut wrench (special tool).



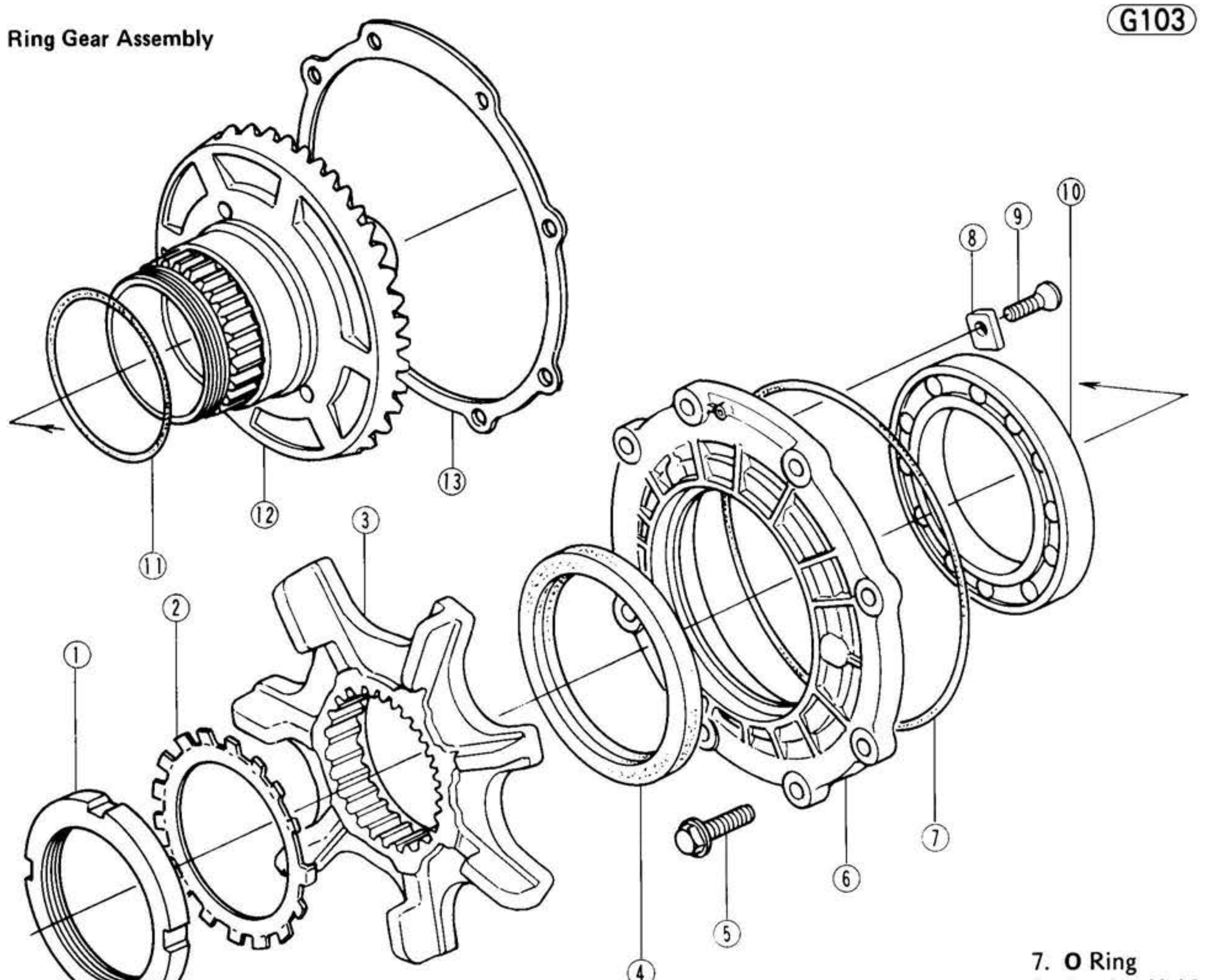

**A. Pinion Joint Holder and Spacer (57001-1050)**
**B. Ring Nut Wrench (57001-1051)**

•Pull the wheel coupling ③ from the ring gear ⑫, and remove the ring gear O ring ⑪.

**CAUTION** **To avoid damaging the oil seal ④, do not use a screwdriver or other tool to pry between the wheel coupling and the final gear case cover ⑥.**

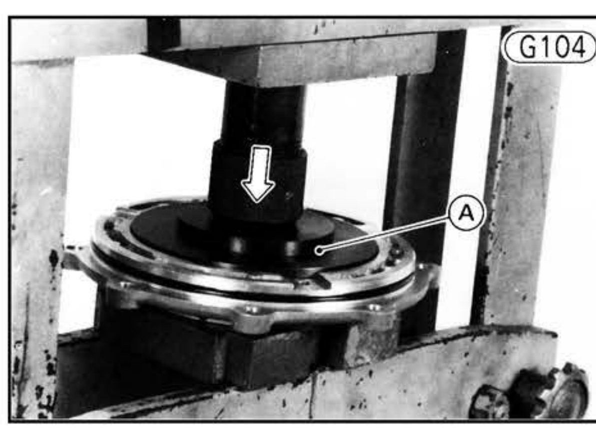
•If the oil seal ④ and/or the ring gear ball bearing ⑩ is to be replaced, pry out the oil seal.
•Remove the final gear case cover mounting bolts (8) ⑤, and pull out the ring gear ⑫ with the final gear case cover ⑥.
•Remove the shim(s) ⑬.
•Pry off the oil seal ④ from the cover.
•Separate the final gear case cover from the ring gear, remove the bearing holder mounting screws (3) ⑨, and remove the bearing holders (3) ⑧.

Ring Gear Assembly




1. Ring Nut
2. Lockwasher
3. Wheel Coupling
4. Oil Seal
5. Mounting Bolt
6. Final Gear Case Cover
7. **O** Ring
8. Bearing Holder
9. Screw
10. Ring Gear Ball Bearing
11. **O** Ring
12. Ring Gear
13. Shim(s)

●Press the ring gear ball bearing ⑩ out with a suitable driver.



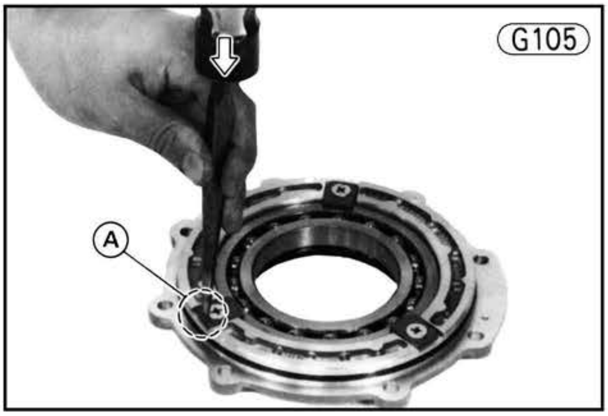

**A. Bearing Driver (57001-1054)**

## Ring Gear Assembly Notes:

1. The ring gear and pinion gear are lapped as a set in the factory to get the best tooth contact. They must be replaced together as a set.
2. If the ring gear ⑫, ring gear ball bearing ⑩, or final gear case cover ⑥ is replaced, be sure to check and adjust the backlash and tooth contact of the bevel gears (Pg. 157).
3. Use the driver (special tool) to press in the final gear case cover ball bearing and oil seal. Tap the bearing into the cover with a hammer and finish by pressing it all the way in.

**CAUTION** **Always keep the ball bearing and oil seal level with the cover.**

4. Replace the bearing holder mounting screws ⑨ with new ones, and apply a non-permanent locking agent to the screw threads. Stake the screw heads with a punch after tightening them.

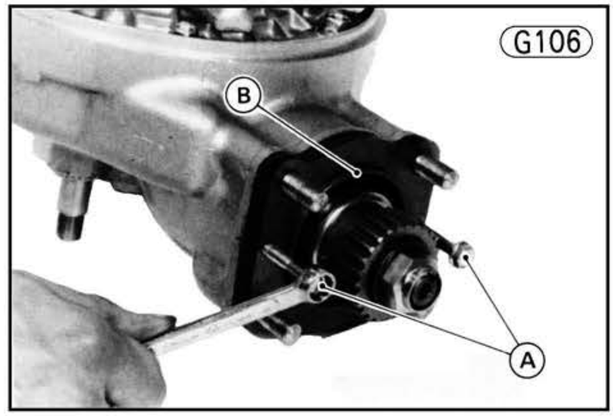



**A. Stake the bearing holder mounting screws.**

5. Tighten the final gear case cover mounting bolts (8) to 2.3 kg-m (16.5 ft-lbs) of torque.
6. Replace the lockwasher ② with a new one, and install the ring nut ① facing the chamfered side toward the lockwasher.
7. Tighten the ring nut ① to 12.0 kg-m (87 ft-lbs) of torque, using the pinion joint holder and ring nut wrench (special tools) (See Fig. G102). Bend the tab back into the notch of the ring nut.

## Pinion Gear Disassembly:

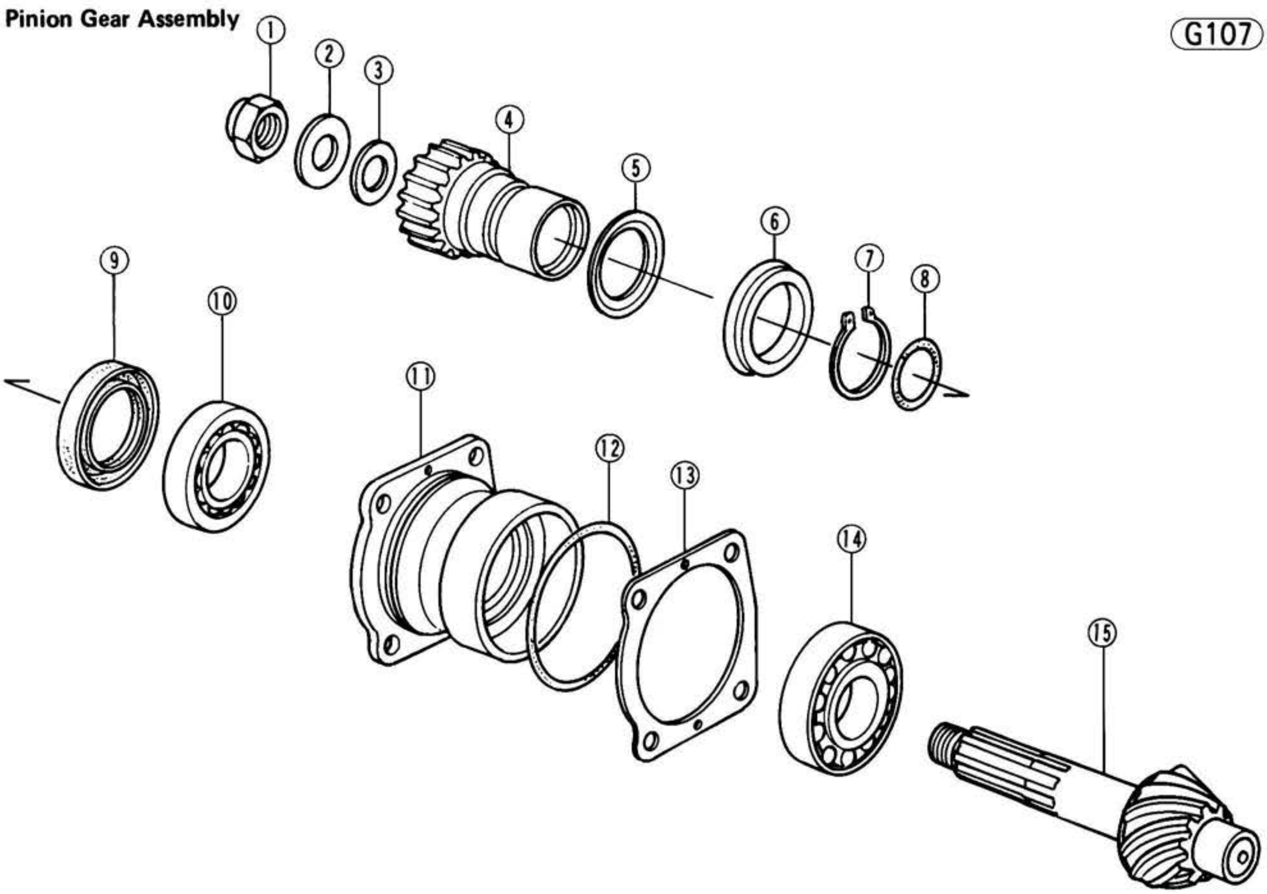
- Pull the pinion gear assembly from the final gear case with $\phi 6$ x P1.0 jacking bolts and remove the shim(s) ⑬.



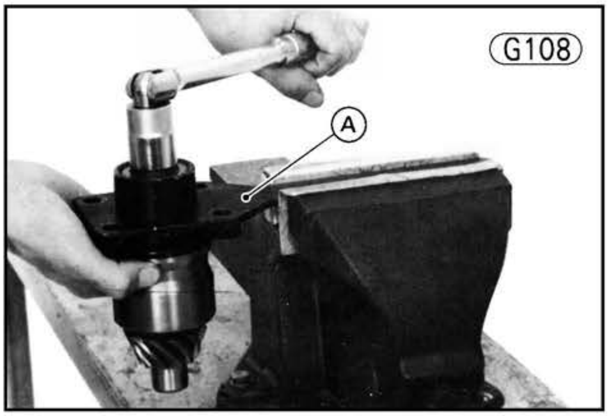

**A. Jacking Bolts** **B. Pinion Gear Assembly**

- Pry open the staking of the pinion gear nut ① with a small chisel. Secure the pinion gear assembly in a vise using the pinion joint holder (special tool), and then loosen the nut.

**Pinion Gear Assembly**

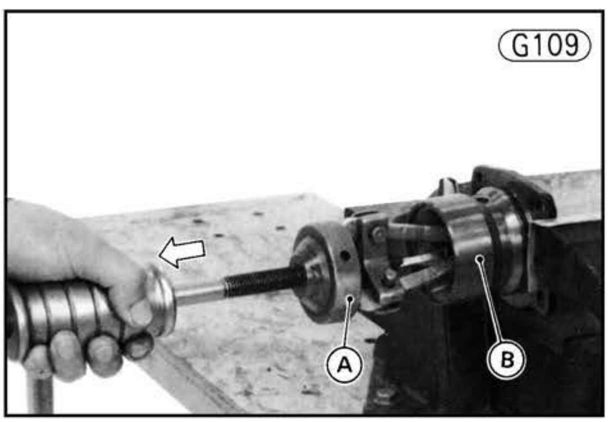



1. Nut
2. Flat Washer
3. Shim(s)
4. Pinion Shaft Joint
5. Grease Seal Stop
6. Grease Seal
7. Circlip
8. **O** Ring
9. Oil Seal
10. Tapered Roller Bearing
11. Bearing Housing
12. **O** Ring
13. Shim(s)
14. Tapered Roller Bearing
15. Pinion Gear



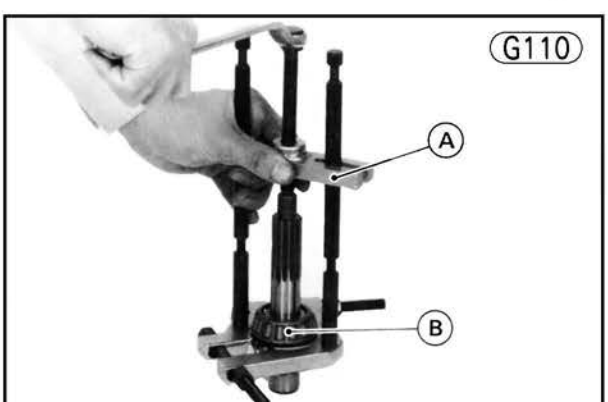

A. Pinion Joint Holder (57001-1050)

- Remove the flat washer ② and shim(s) ③, and pull out the pinion shaft joint ④ and **O** ring ⑧.
- Remove the circlip ⑦ from the pinion shaft joint, and then take out the grease seal ⑥ using the puller (special tool: P/N 57001-158).
- Pull the pinion gear ⑮ from the bearing housing ⑪.
- Pry the oil seal ⑨ from the bearing housing, and remove the inner race of the tapered roller bearing ⑩.
- Using a suitable puller, remove the outer races of the tapered roller bearings ⑩, ⑭ from the bearing housing.




A. Puller B. Bearing Housing

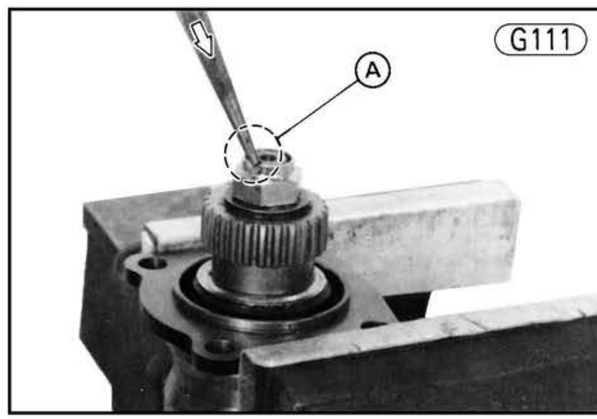
- Using the puller (special tool), pull the inner race of the tapered roller bearing ⑭ from the pinion gear.




A. Puller (57001-158) B. Inner Race

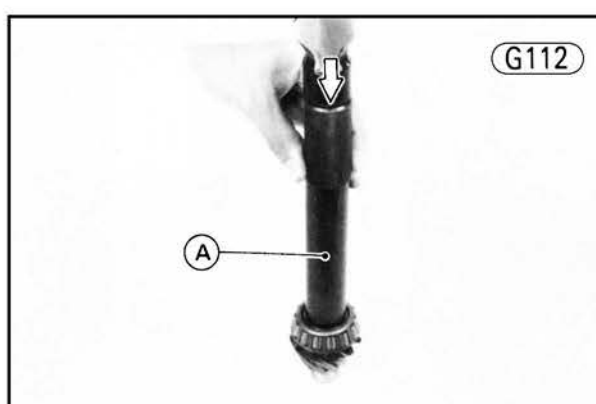
## Pinion Gear Assembly Notes:

1. The pinion gear and ring gear are lapped as a set in the factory to get the best tooth contact. They must be replaced as a set.
2. Check and adjust the preload of the tapered roller bearings (Pg. 156).
3. If the pinion gear ⑮, tapered roller bearing ⑭, or the bearing housing was replaced, be sure to check and adjust the backlash and tooth contact of the bevel gears (Pg. 157).
4. Replace the pinion gear nut ① with a new one. After adjusting the preload of the tapered roller bearings (See Pg. 156.), tighten the nut to 12.0 kg-m (87 ft-lbs) of torque using the pinion joint holder (special tool: P/N 57001-1050) (See Fig. G108). Stake the head of the nut with a punch.



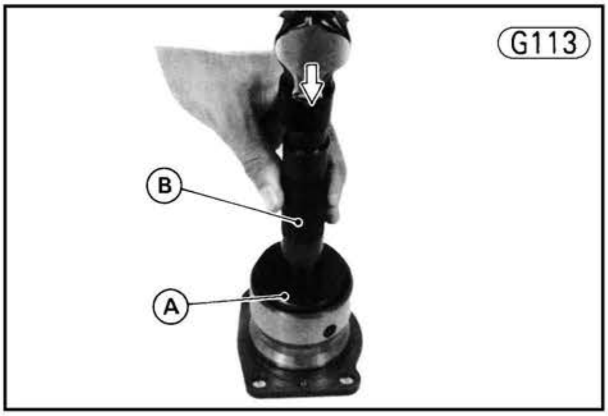

A. Stake the pinion gear nut.

5. Using the driver (special tool), install the inner race of the tapered roller bearing ⑭ on the pinion gear.




A. Driver (57001-380)

6. Using the drivers and holder (special tool), install the outer races of the tapered roller bearings ⑩, ⑭.




**A. Bearing Driver (57001-289, 57001-296)**
**B. Bearing Driver Holder (57001-139)**

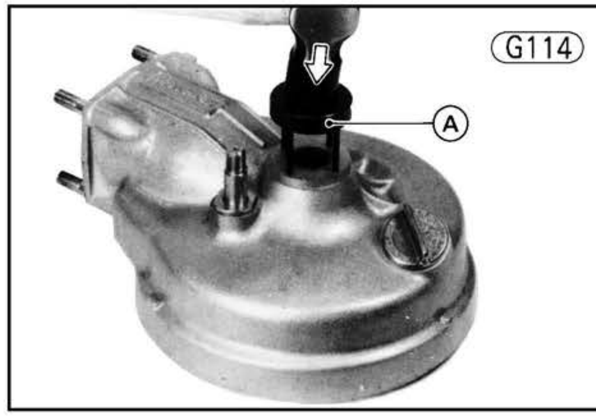
7. After putting the inner race of the tapered roller bearing ⑩ into the bearing housing ⑪, use the driver and holder (special tools: P/N 57001-289 and 57001-139) to install the oil seal ⑨.
8. Using the driver (special tool: P/N 57001-141), install the grease seal ⑥ on the pinion shaft joint ④, and install a new circlip ⑦.

## Final Gear Case Disassembly:

- Remove the needle bearing retainer ⑥.
- Soak the final gear case in oil and heat the oil to approximately 100° (212°F).

**CAUTION** **Do not heat the case with a torch. This will warp the case.**

- Insert the remover (special tool) into four holes in the final gear case, and tap the needle bearing ⑦ and oil seal ⑧ out.



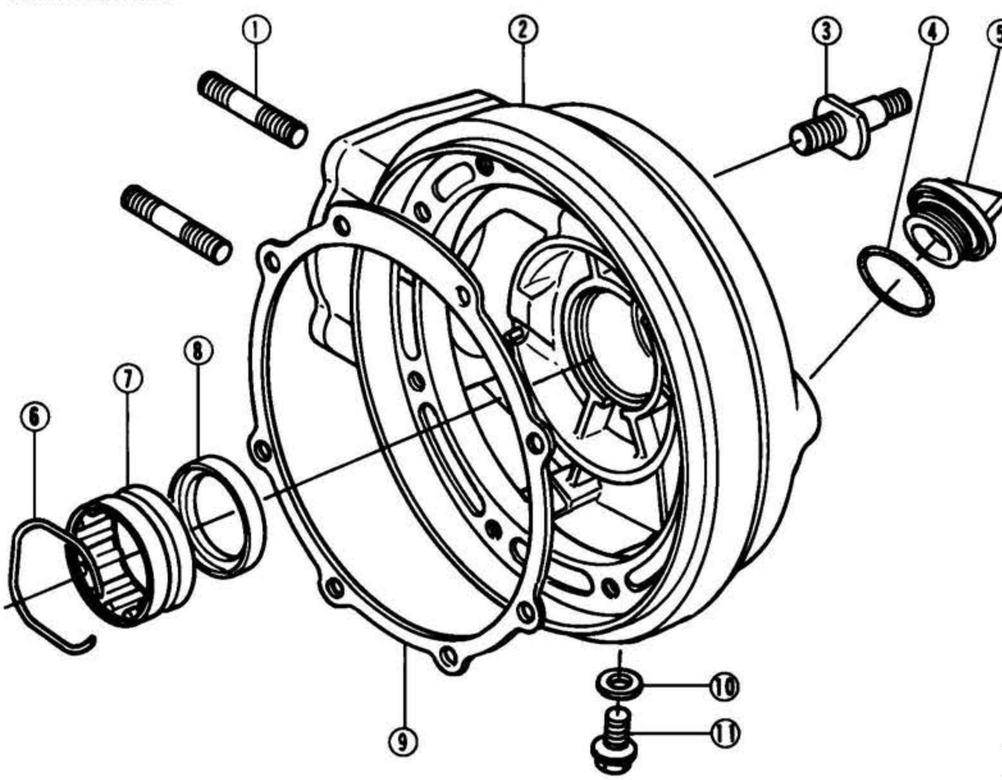

**A. Oil Seal Remover (57001-1052)**

## Final Gear Case Assembly Notes:

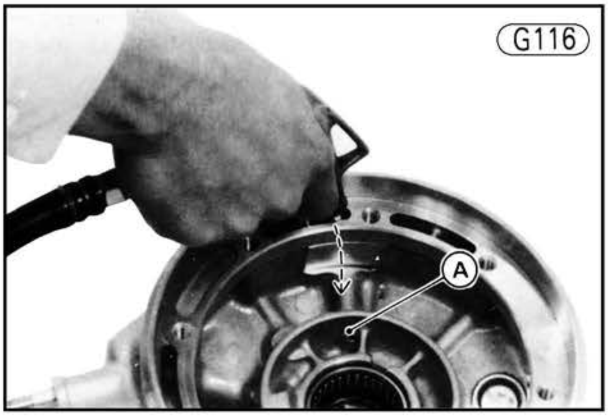
1. Use the driver and holder (special tools: P/N 57001-1053 and 57001-139) for the installation of the oil seal ⑧. The flat side of the seal must go in first.
2. Align the oil hole in the needle bearing ⑦ with the oil hole in the final gear case ②, and use the driver and holder (special tools: P/N 57001-1053 and 57001-139) to press in the ring gear needle bearing ⑦.
3. Clean the breather passage in the gear case by blowing it out with compressed air.

**Final Gear Case**

G115




1. Stud Bolt
2. Final Gear Case
3. Stud Bolt
4. O Ring
5. Filler Cap
6. Needle Bearing Retainer
7. Needle Bearing
8. Oil Seal
9. Shim(s)
10. Washer
11. Drain Bolt




A. Breather Passage

4. If the final gear case was replaced, be sure to check and adjust the backlash and tooth contact of the bevel gears (Pg. 157).

## SHIM ADJUSTMENT

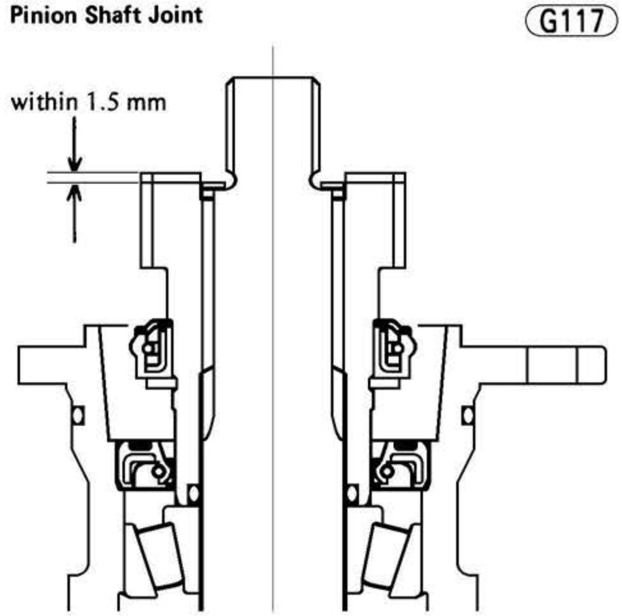
### Preload of Tapered Roller Bearings

Improper tapered roller bearing preload can lead to bearing and bevel gear damage. When the pinion gear assembly is disassembled, preload adjustment must be done.

**NOTE:** Preload can be measured either with a spring scale hooked on the pinion joint holder (special tool) or with a beam type torque wrench. When measured with a spring scale, the preload is designated by force (kg), and when measured with a torque wrench, it is designated by torque (kg-m, ft-lbs).

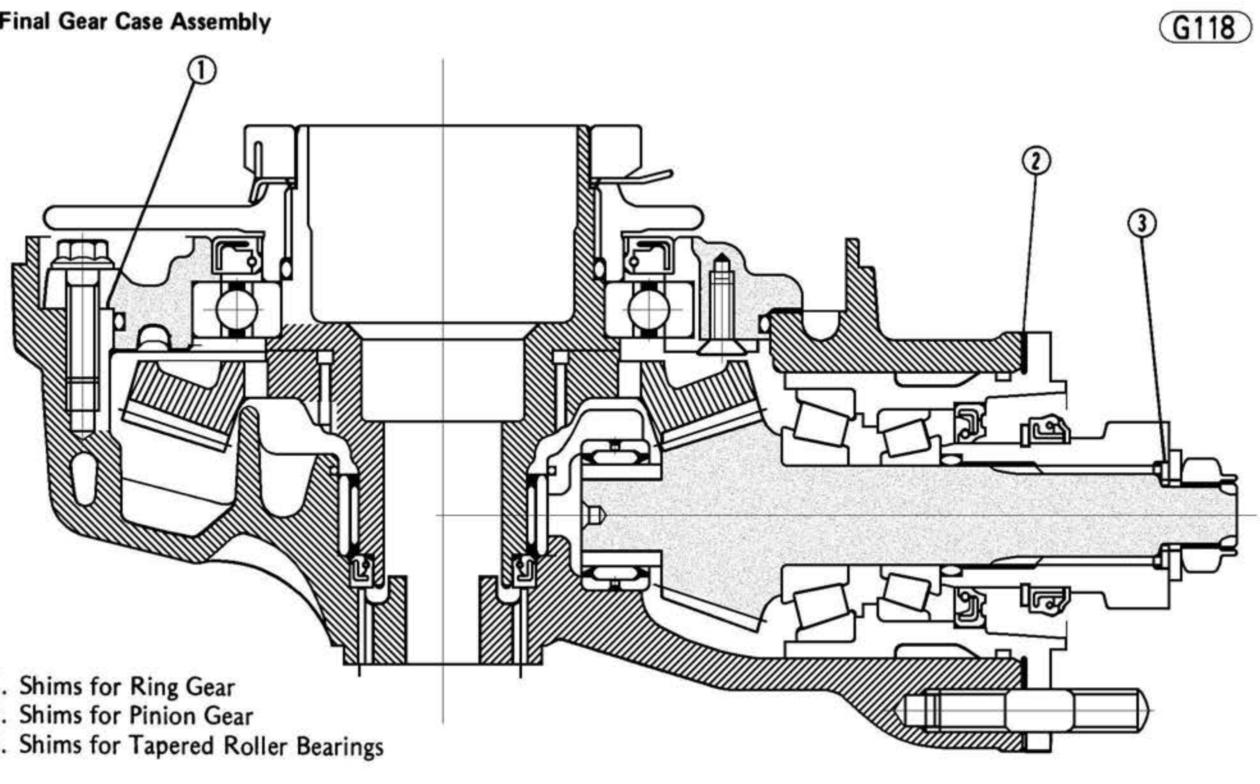
**CAUTION** **Always select the shims so that the end of the pinion shaft joint and the shims are flush within 1.5 mm. If it is not done, the tapered roller bearings may be damaged by the huge pressure when the pinion gear nut is tightened.**

**Pinion Shaft Joint**

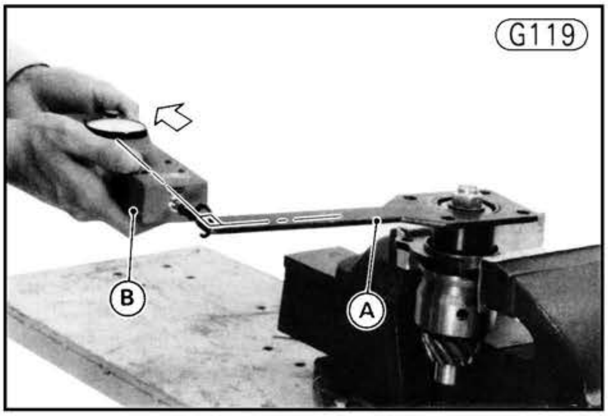



- After the pinion gear assembly is completed, apply oil to the bearings and oil seals, and then rotate the pinion shaft clockwise and counterclockwise 20 times using the pinion gear holder (special tool), so that the preload becomes constant.
- Hook a spring scale on the hole of pinion gear holder and measure the preload needed to start the pinion gear turning.

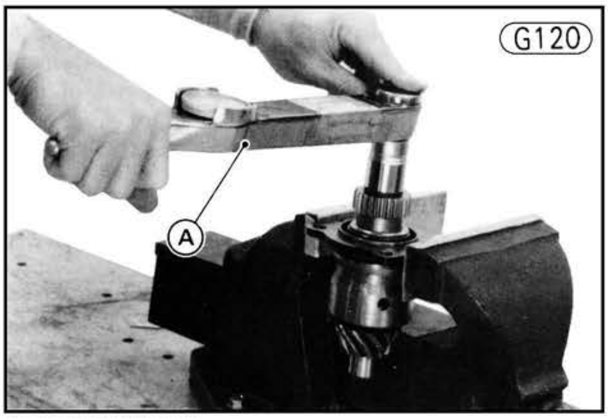
**Final Gear Case Assembly**




1. Shims for Ring Gear
2. Shims for Pinion Gear
3. Shims for Tapered Roller Bearings




**A. Pinion Joint Holder (57001-1050)**
**B. Spring Scale**




**A. Torque Wrench**

- If the preload is out of the standard range, remove the pinion gear nut and flat washer, replace the shim(s) ③, and re-check the preload.

**Table G2 Preload**

| | Standard | |
|---|---|---|
| | Measued with Spring Scale | Measued with Torque Wrench |
| When oil seal is installed | 0.45~0.70 kg | 0.09~0.14 kg-m (7.8~12.2 in-lbs) |
| When oil seal is removed | 0.30~0.50 kg | 0.06~0.10 kg-m (5.2~8.7 in-lbs) |

**NOTES:** 1. For the spring scale method, when the shim thickness is to be increased by 0.015 mm, the preload will be decreased by about 0.1 kg, and vice versa. For the torque wrench method, a 0.015 mm shim increase decreases preload by 0.02 kg-m (1.7 in-lbs).

When the preload is out of the standard range, the following formula can be used to estimate the most desirable shim(s) thickness from the present shim(s) thickness.

$A = B + C(D - E)$

A : Desirable Shim(s) Thickness (mm)
B : Present Shim(s) Thickness (mm)
C : 0.15 mm/kg (when measured with the spring scale), or 0.75 mm/kg-m (when measured with the torque wrench)
D : Preload when present shim(s) is installed
E : Standard Preload shown in Table G2

2. Shims ③ are available in the sizes shown in the table.

**Table G3 Shim Sizes**

| Thickness (mm) | Part Number |
|---|---|
| 0.1 | 92025-1032 |
| 0.2 | 92025-1033 |
| 0.3 | 92025-1034 |
| 0.5 | 92025-1035 |
| 0.9 | 92025-1036 |
| 1.30 | 92025-1027 |
| 1.32 | 92025-1028 |
| 1.34 | 92025-1029 |
| 1.36 | 92025-1030 |
| 1.38 | 92025-1031 |

- Install the flat washer and tighten the pinion gear nut to 12.0 kg-m (87 ft-lbs) of torque. Check the preload. Repeat if necessary.

## Backlash and Tooth Contact of Bevel Gears

Improper backlash and/or tooth contact of bevel gears leads to noise and gear damage.

When replacing any one of the following parts, make sure to check and adjust backlash and tooth contact.

○Ring Gear (⑫ on Fig. G103)
○Ring Gear Ball Bearing (⑩ on Fig. G103)
○Final Gear Case Cover (⑥ on Fig. G103)
○Pinion Gear (⑮ on Fig. G107)
○Tapered Roller Bearing (⑭ on Fig. G107)
○Bearing Housing (⑪ on Fig. G107)
○Final Gear Case (② on Fig. G115)

**NOTE:** After replacing any one of the parts listed above, install the 1.0 mm thickness of a shim both at the ring gear side and the pinion gear side, which is the largest possible shim size.

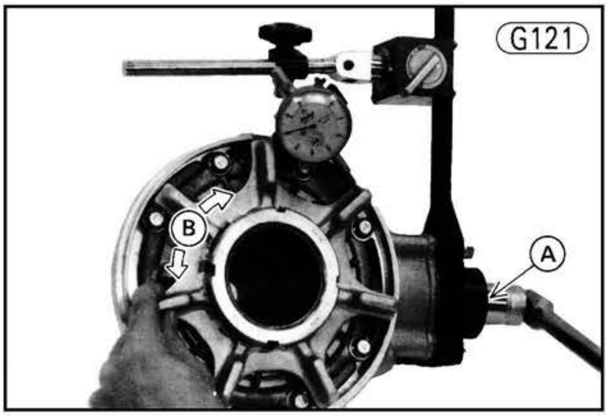
The amount of backlash is influenced by the ring gear position more than by the pinion gear position. Tooth contact location is influenced by pinion gear position more than by ring gear position.

First change ring gear shim(s) ① until the backlash is correct, then adjust the tooth contact by changing the pinion gear shim(s) ②.

**CAUTION The ring gear and pinion gears are lapped as a set at the factory to get the best tooth contact. They must be replaced together.**

**Backlash Adjustment:**

- Clean any dirt and oil off the teeth of the bevel gears.
- Assemble the final gear case assembly (Pgs. 151~156), and secure the pinion gear holder and spacers (special tool) on the final gear case with the final gear case nuts (4).
- To measure the balcklash, secure a dial gauge on the pinion gear holder (special tool). Set the needle against the end of the rear hub coupling. Move the ring gear back and forth while holding the pinion gear steady. The difference between the highest and the lowest gauge reading is the amount of backlash.




**A. Locked**
**B. Backlash (Total Amount)**

**NOTE:** Backlash, or gear lash is the amount of movement of one gear relative to the other, measured with one gear stationary.

- If the amount of backlash is out of the standard range, replace the shim(s) ① of the ring gear and check the backlash as described below. Repeat if necessary.

**Table G4 Gear Backlash**

| | |
|---|---|
| Standard | 0.18~0.25 mm |

**NOTES:** 1. For final gear case cover shim replacement, see "Ring Gear" (Pg. 151).
2. Shims ① are available in the sizes shown in the table.

**Table G5 Shim Sizes for Ring Gear**

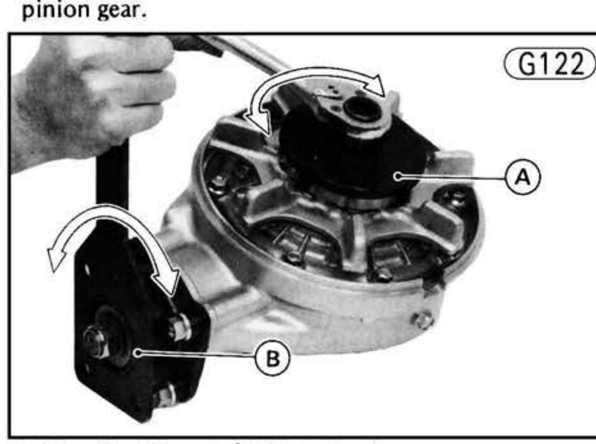
| Thickness (mm) | Part Number |
|---|---|
| 0.1 | 92025-1048 |
| 0.15 | 92025-1049 |
| 0.2 | 92025-1050 |
| 0.3 | 92025-1051 |
| 0.6 | 92025-1045 |
| 0.9 | 92025-1046 |
| 1.2 | 92025-1047 |

3. If the shim(s) ① thickness is to be increased by 0.1 mm, the backlash will be increased by about 0.075 mm. Oppositely, when the shim thickness is decreased by 0.1 mm, backlash will be decreased by about 0.075 mm. So the following formula can be used to estimate the most desirable shim(s) thickness from the present shim(s), when the backlash is out of the standard range.
   $A = B + 1.3 \times (0.22 - C)$
   A : Desirable Shim(s) ① Thickness (mm)
   B : Present Shim(s) ① Thickness (mm)
   C : Backlash when present shims are installed (mm)

**Tooth Contact Adjustment**

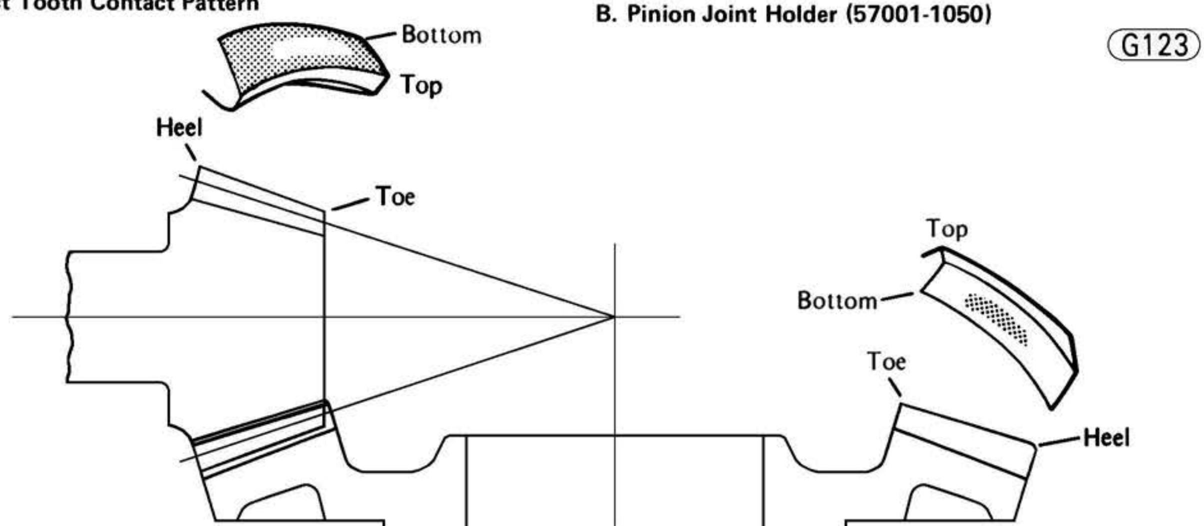
**NOTES:** 1. Check to see that there is no dirt and oil on the gear teeth.
2. Special compounds are available from automotive supply stores for the purpose of checking differential gear tooth patterns and contact. Use one of these for checking the bevel gears.
3. The checking compound must be smooth and firm, with the consistency of tooth paste.
4. Using a paint brush, apply a thin layer to the teeth. If painted too thickly, the exact tooth pattern may not appear.

- Apply checking compound to 4 or 5 teeth of the pinion gear.




**A. Ring Nut Wrench (57001-1051)**
**B. Pinion Joint Holder (57001-1050)**

**Correct Tooth Contact Pattern**



- Set the pinion gear assembly in the final gear case (Pg. 154).
- Turn the pinion gear for one revolution, first in the drive direction and then in the reverse (coast) direction. Turn with the pinion joint holder (special tool), while creating a drag on the ring gear with the ring nut wrench (special tool).
- Pull out the pinion gear assembly, and check the drive pattern and coast pattern of the bevel gear teeth.

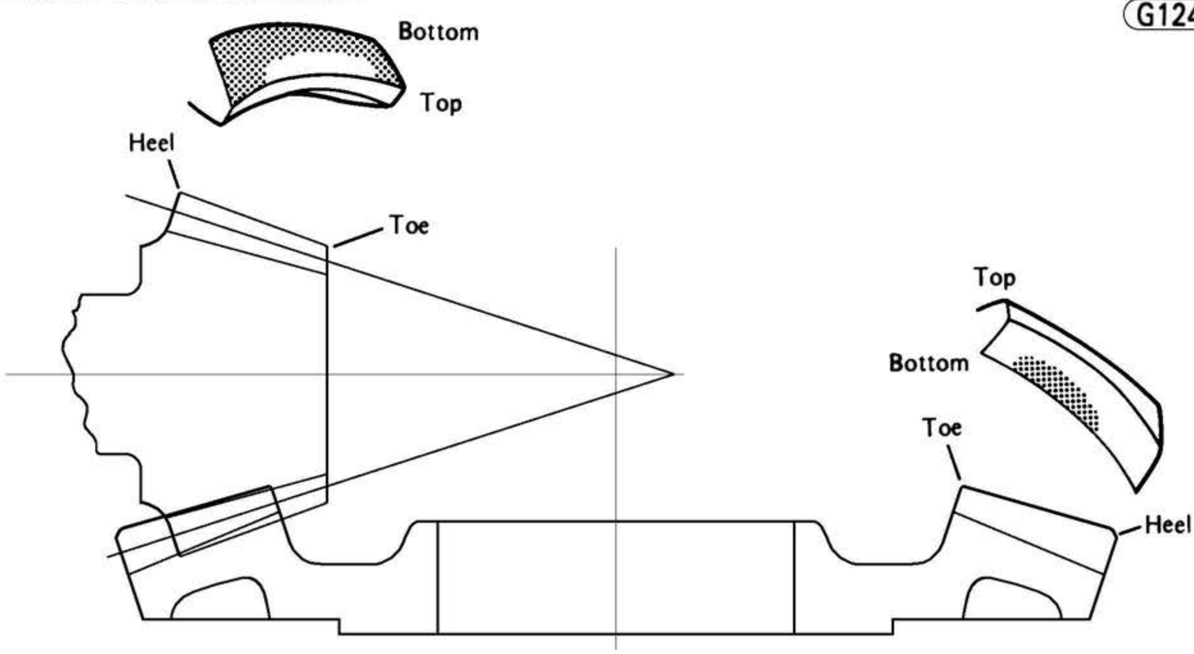
**NOTE:** The tooth contact patterns of both (drive and coast) sides should be centrally located between the top and bottom of the tooth. The drive pattern can be a little closer to the toe and the coast pattern can be somewhat longer and closer to the toe. The drive side of the ring gear tooth is the convex side, and the coast side is the concave side.

- If the correct tooth contact pattern cannot be obtained, replace shims in the manner described below. Then erase the original tooth contact pattern, and apply checking compound as mentioned in the preceding step.

Ex. 1. Incorrect Tooth Contact Pattern 1
Increase the pinion gear shim(s) thickness by 0.05 mm to correct the pattern shown below. Repeat in 0.05 mm steps if necessary.

**Incorrect Tooth Contact Pattern 1**

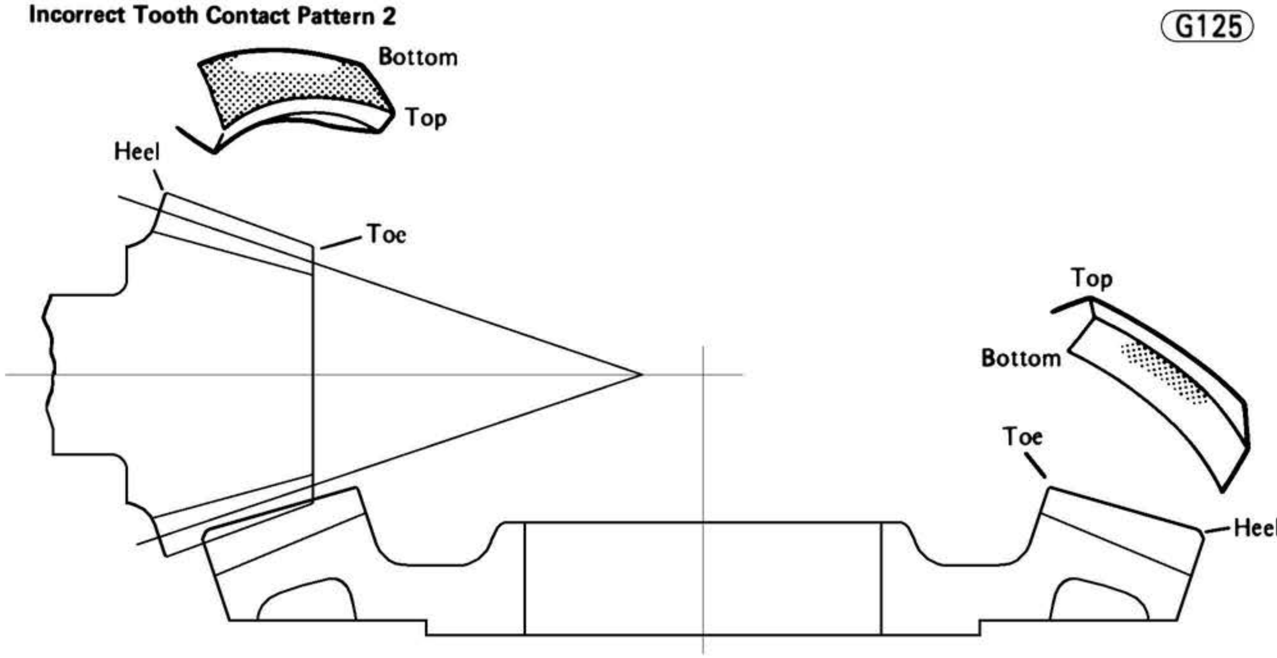
(G124)




Ex. 2. Incorrect Tooth Contact Pattern 2
Decrease the shim(s) thickness for pinion gear by 0.05 mm to correct the pattern shown below. Repeat in 0.05 mm steps if necessary.

**Incorrect Tooth Contact Pattern 2**

(G125)



**NOTE:** Shims ② are available in the sizes shown in the table.

**Table G6 Shim Sizes for Pinion Gear**

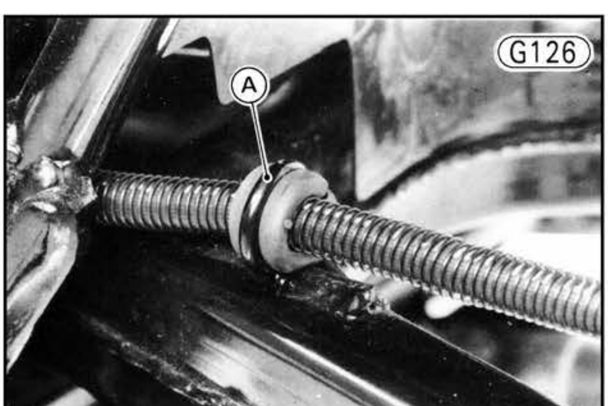
| Thickness (mm) | Part Number |
|---|---|
| 0.1 | 92025-1040 |
| 0.15 | 92025-1041 |
| 0.2 | 92025-1042 |
| 0.3 | 92025-1043 |
| 0.6 | 92025-1037 |
| 0.9 | 92025-1038 |
| 1.2 | 92025-1039 |

- Check to see that the backlash is in the standard range, and then check the tooth contact pattern.
- When the correct pattern is obtained, remove all checking compound from the gear teeth.

## SWING ARM

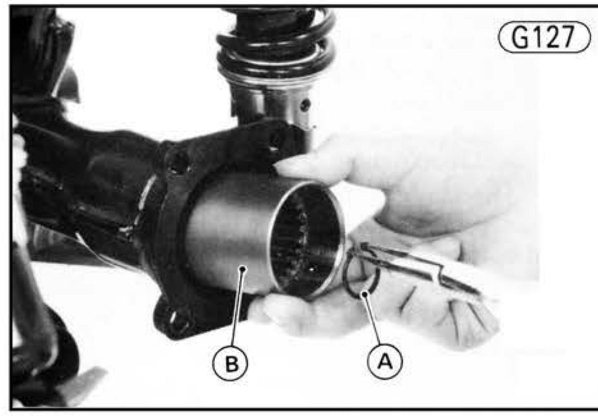
### Removal:

- Set the motorcycle up on its center stand.
- Remove the master cylinder bracket, and slip the universal joint dust cover towards the engine.
- Remove the rear wheel and rear brake caliper (Pg. 129). Slip the brake hose out of the guide on the swing arm. The brake hose need not be disconnected from the caliper.




**A. Guide**

- Remove the final gear case (Pg. 151) being careful that the propeller shaft joint does not get dirty from contact with the ground.
- Remove the circlip on the propeller shaft end, and pull off the propeller shaft joint.

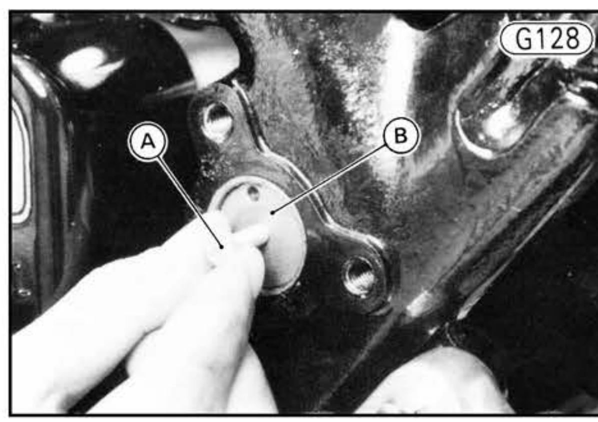



**A. Circlip B. Joint**

- Remove both the right and left swing arm pivot covers.
- Unscrew the bracket mounting bolts ③ and lockwashers (each 3) on both the right and left side, and then remove both brackets ⑧ (Fig. G129).

**NOTE:** For convenience in later installation, loosen the locknuts ⑤ (2), and turn out both adjusting screws ⑥ a couple of turns before removing the brackets.

- Using a 5 mm diameter bolt (with 0.8 mm pitch threads) in the pivot shaft, pull out the pivot shafts to remove the swing arm.

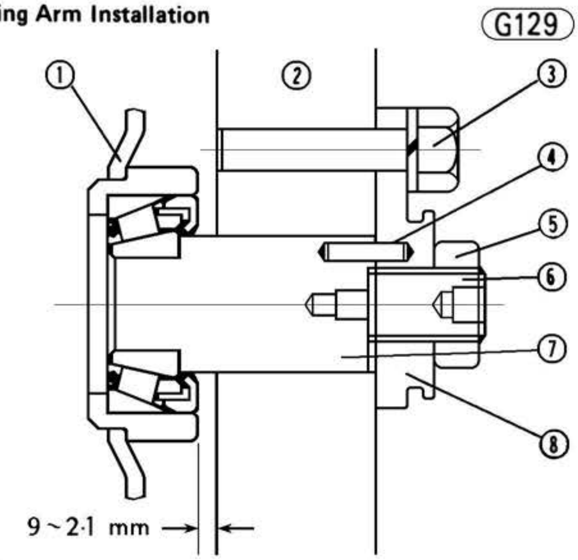



**A. $\phi$5 P0.8 Bolt B. Pivot Shaft**

### Installation Notes:

1. Install the universal joint dust cover so that the arrow on the cover points towards the front.
2. Clean the old grease from the tapered roller bearings, and apply fresh grease.
3. Fit the knock pin of the bracket into the hole in the pivot shaft, and tighten the bracket mounting bolts to 2.5 kg-m (18.0 ft-lbs) of torque.
4. Adjust the right side gap between the swing arm and frame to 1.9 ~ 2.1 mm by turning the right and left adjusting screws. The adjusting screw will move 1.5 mm with one turn. Then tighten the left side pivot shaft to 1.5 kg-m (11.0 ft-lbs) of torque. Tighten the right and left locknuts to 8.0 kg-m (58 ft-lbs) of torque. Check that the swing arm swings smoothly and without binding.
5. Replace the damaged **O** ring on the propeller shaft end.

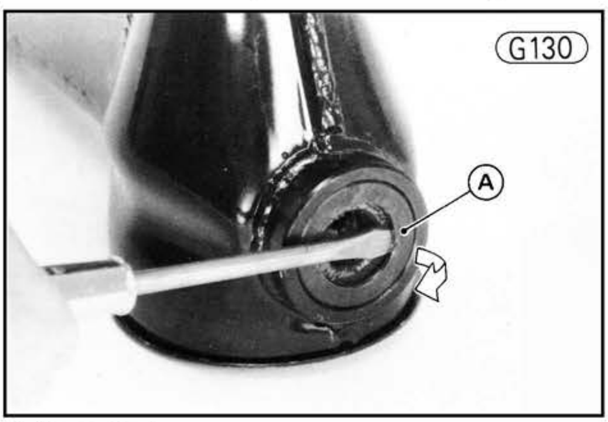
**Swing Arm Installation**




1. Swing Arm
2. Frame
3. Bolt
4. Knock Pin
5. Locknut
6. Adjusting Screw
7. Pivot Shaft
8. Bracket

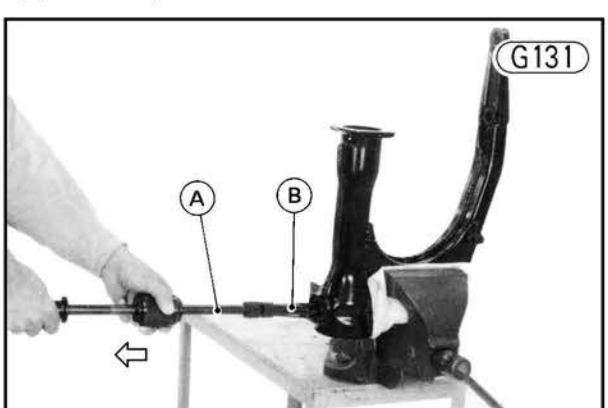
## Disassembly:

•Pry the grease seals off the swing arm, and take out the tapered roller bearing inner races and caged rollers.




**A. Grease Seal**

•Pull out the outer races of the tapered roller bearings using the oil seal and bearing remover and adapter "A" (special tool).




**A. Remover (57001-1058) B. Adapter "A"**

## Assembly:

•Install the outer races of the tapered roller bearings using the bearing driver and the bearing driver holder (special tools: P/N 57001-139 and 57001-140). Press in each outer race until it stops at the bottom of the hole.

•Apply a molybdenum disulfide chassis assembly grease to each set of rollers, and fit it in the outer races.

•Install each grease seal using the same special tools that were used to install the outer races. Press in each seal until it stops at the outer race.

# PROPELLER SHAFT ASSEMBLY

## Removal:

•Set the motorcycle up on its center stand.

•Remove the rear master cylinder bracket (Pg.132).

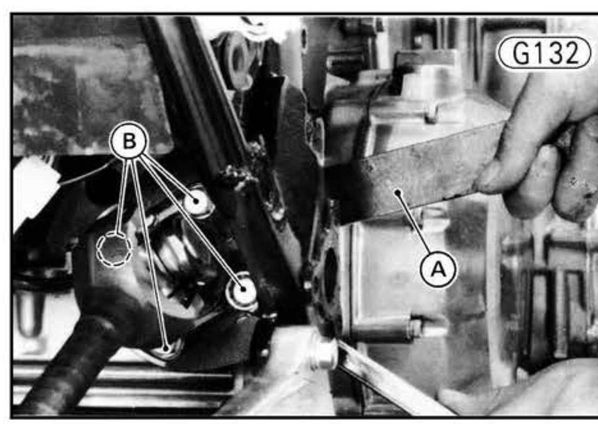
•Remove the rear wheel and caliper (Pg.129).

•Remove the final gear case (Pg.151).

•Remove the swing arm (Pg. 160).

•Loosen and remove the universal joint coupling bolts (4) while holding the coupling with the holder (special tool), and remove the propeller shaft assembly.

**NOTE:** "Propeller Shaft Assembly" does not mean it can be disassembled. If any part of the assembly is damaged, the propeller shaft assembly must be replaced as a unit.




**A. Holder (57001-1040) B. Coupling Bolts**

## Installation Note:

•Torque the coupling bolts (4) to 7.5 kg-m (54 ft-lbs).

# Maintenance—Engine

## Table of Contents



H

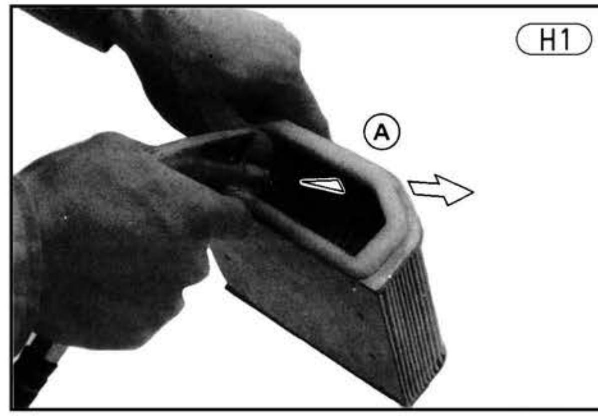
## AIR CLEANER

### *Cleaning and replacement*

The air cleaner element must be cleaned periodically (Pg. 10). In extremely dry, dusty areas, the element will need to be cleaned more often. After riding through rain or on muddy roads, the element should be inspected and cleaned if necessary.

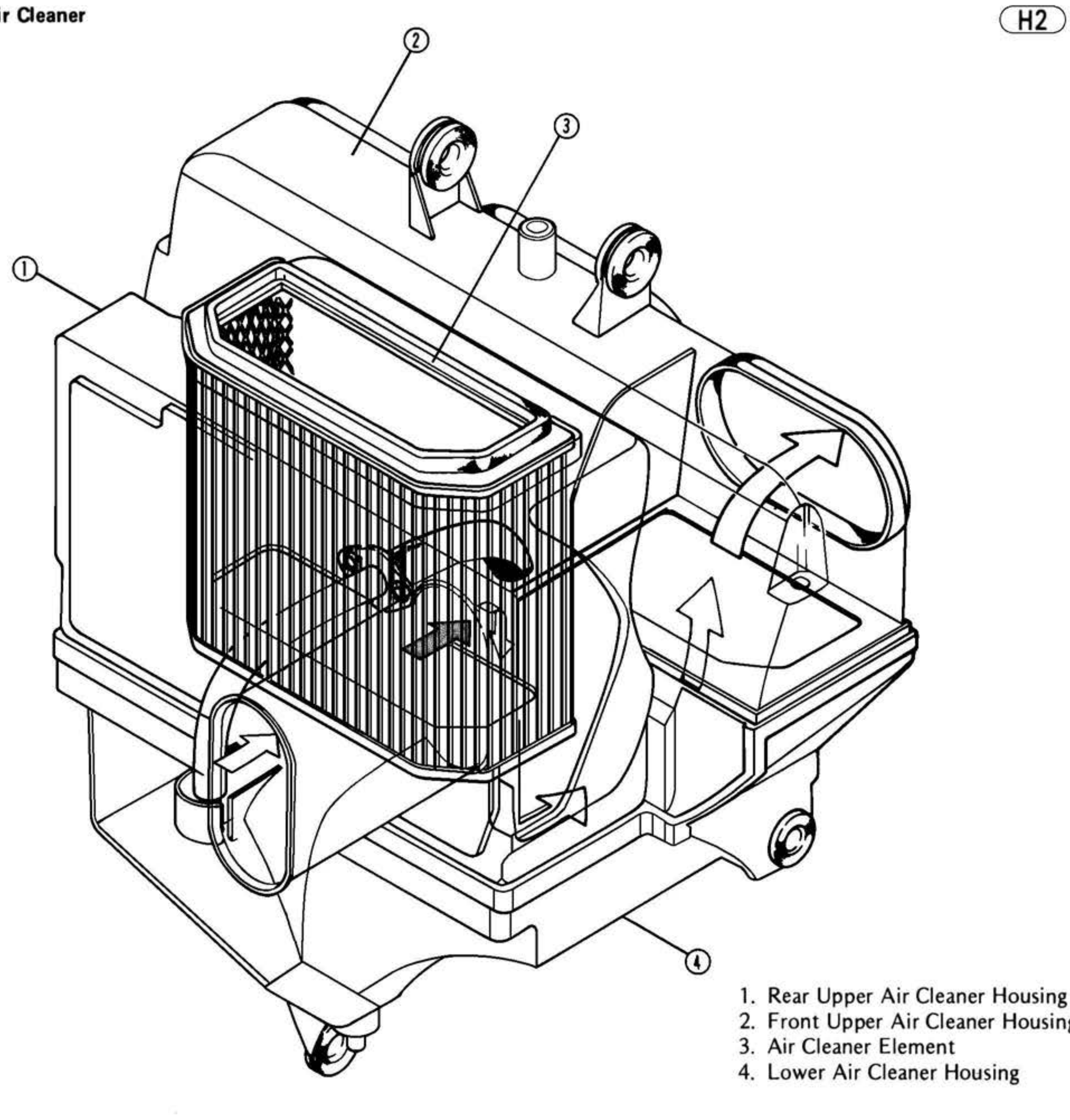
Remove the air cleaner element (Pg. 47). Clean it in a bath of a high flash-point solvent, and then dry it from the inside using compressed air. Since this is a dry-type element, do not use kerosene or any fluid which would leave the element oily.

**WARNING** **Clean the element in a well-ventilated area, and take care that there is no spark or flame anywhere near the working area. Because of the danger of highly flammable liquids, do not use gasoline or low flash-point solvents to clean the element.**




A. Blow from inside.

**Air Cleaner**




1. Rear Upper Air Cleaner Housing
2. Front Upper Air Cleaner Housing
3. Air Cleaner Element
4. Lower Air Cleaner Housing

If the sponge gasket on the side of the element comes loose, stick it back on with an adhesive sealant. If the sponge or the element is damaged, replace the element.

Since repeated cleaning opens the pores of the element, replace it with a new one in accordance with the Periodic Maintenance Chart (Pg. 10). Also, if there is a break in the element material or any other damage to the element, replace the element with a new one.

## FUEL TANK, FUEL TAP, SOLENOID FUEL VALVE

The fuel tank capacity is 27.0 liters, 4.6 liters of which form the reserve supply. For US model, the fuel tank capacity is 21.4 liters, 4.9 liters of which form the reserve supply.

The solenoid fuel valve is installed in the fuel line between the fuel tap and the carburetors. This valve operates electrically, and allows the fuel to reach the carburetor only when the engine is running or the clutch lever is pulled in. Whether the engine is running or not is detected by the alternator output.

### *Inspection and cleaning*

If fuel leaks from the tank cap or from around the fuel tap, the cap gasket or tap **O** ring may be damaged. Visually inspect these parts, and replace them if necessary.

Examine the air vent in the tank cap to see if it is obstructed. Use compressed air to clear an obstructed vent.

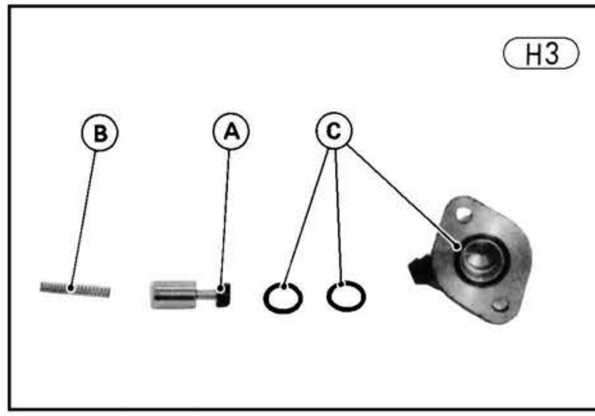
Any water in the fuel tank and the carburetors can be drained through the drain plugs (Pg. 22). If water cannot be drained completely by removing the drain plugs, remove the fuel tap, and flush out the tank with a high flash-point solvent. For thorough cleaning of the carburetors, remove and disassemble the carburetors (Pg. 49).

### Solenoid Fuel Valve Troubleshooting Guide

If trouble is suspected in the solenoid fuel valve, check the wiring and valve by the following procedure.

### *Internal part inspection*

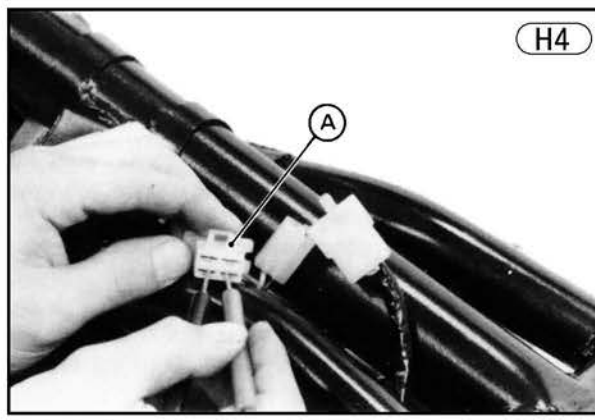
- Remove the solenoid fuel valve and disassemble (Pg. 46).
- Inspect the spring, **O** rings, and rubber valve. Replace any damaged parts.




**A. Valve B. Spring C. "O" Rings**

### *Wiring inspection*

- Disconnect the 4-pin connector of the valve.
- Measure the voltage at the 4-pin connector as shown in Table H1.




**A. 4-pin Connector**

- If any one of the meter readings shows an improper value, check the wiring, connections, and switches. Replace or repair damaged parts.
- Check the connection in the yellow lead and alternator. Replace or repair damaged parts.

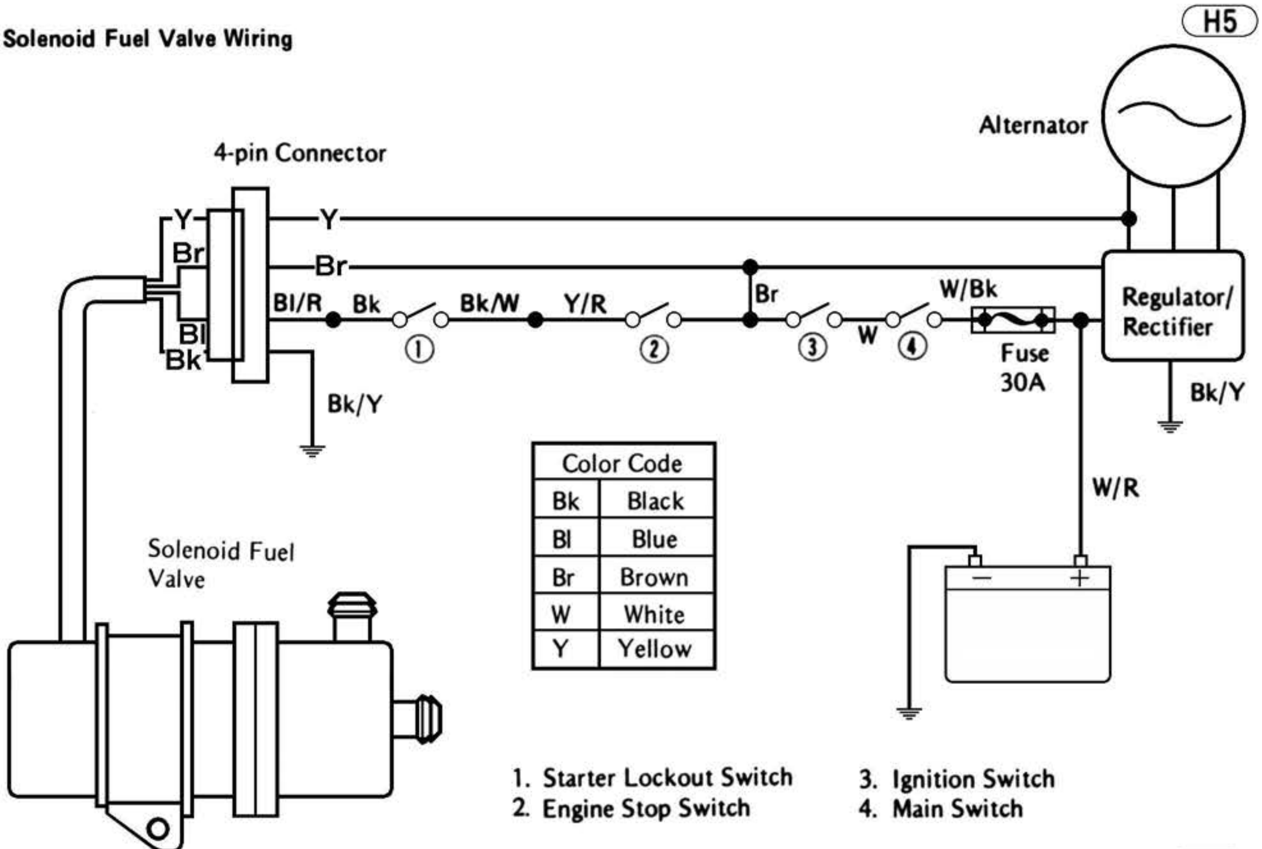
### *Solenoid fuel valve check (out of circuit check)*

- Turn the fuel tap to the "Off" position, and remove the fuel valve (Pg. 46).

**Table H1 Wiring Inspection**

| Meter Range | Connections | Ignition and Main Switches | Engine Stop and Lockout Switches | Reading |
|---|---|---|---|---|
| 20V DC | Meter (+) → Brown<br>Meter (–) → Black/Yellow | On | Any (on or off) | Battery voltage |
| | | Off | Any | 0 V |
| | Meter (+) → Blue/Red<br>Meter (–) → Black/Yellow | On | On | Battery voltage |
| | | | Off | 0 V |
| | | Off | Any | 0 V |

**Solenoid Fuel Valve Wiring** (H5)




| Color Code | |
|---|---|
| Bk | Black |
| Bl | Blue |
| Br | Brown |
| W | White |
| Y | Yellow |

1. Starter Lockout Switch
2. Engine Stop Switch
3. Ignition Switch
4. Main Switch

- Check that the fuel valve is shut off by blowing the hose fitting with breath. If the valve is open, the valve is defective. Disassembly the solenoid fuel valve (Pg. 46), and check the rubber valve and O rings. Replace any damaged parts.
- Prepare a 12 volt battery and four auxiliary leads.
- Using the two leads, connect the black lead to the battery – terminal, and the brown lead to the battery + terminal.
- Using another lead, connect and then disconnect the blue lead to the battery + terminal to simulate engine starting by the starter. At this time the valve should operate with a clicking sound as shown in Table H2.

**CAUTION Do not connect the valve leads to the battery terminals for the time needed to check the valve operation, as it could burn out the solenoid.**

**Table H2 Simulation Test of Engine Starting**

| Starter Motor | Connections* | Fuel Valve |
|---|---|---|
| Runs | Blue → Battery + | Opens |
| Stops | Blue → Disconnected (Open) | Closes |

*Connect the black lead to the battery – terminal, and the brown lead to the battery + terminal.

- Connect the yellow lead to the battery + terminal. Connect and then disconnect the blue lead to simulate engine running after starting. After the blue lead is disconnected, the valve should stay open. See Table H3.

**Solenoid Fuel Valve Check** (H6)

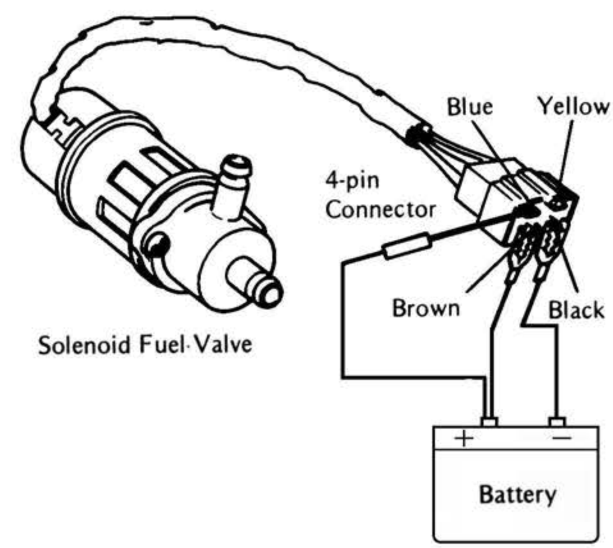



**Table H3 Simulation Test of Engine Running**

| | Engine | Connections* | Fuel Valve |
|---|---|---|---|
| First | Starting | Yellow → Battery +<br>Blue → Battery + | Opens |
| Second | Running | Yellow → Battery +<br>Blue → Disconnected (Open) | Opens |

*Connect the black lead to the battery – terminal, and brown lead to the battery + terminal.

- To open the valve, connect the yellow and the blue leads to the battery + terminal, and disconnect the blue lead. Then disconnect the yellow lead to simulate engine stopping. At this time the valve should close about 1 second later (Table H4).
- Disconnect all leads from the battery terminals.
- If any one of above checks shows a faulty operation, replace the solenoid fuel valve.

**Table H4 Simulation Test of Engine Stopping**

| | Connections* | Fuel Valve |
|---|---|---|
| First | Yellow → Battery + | Opens |
| Second | Yellow → Disconnected (Open) | Closes about 1 second later |

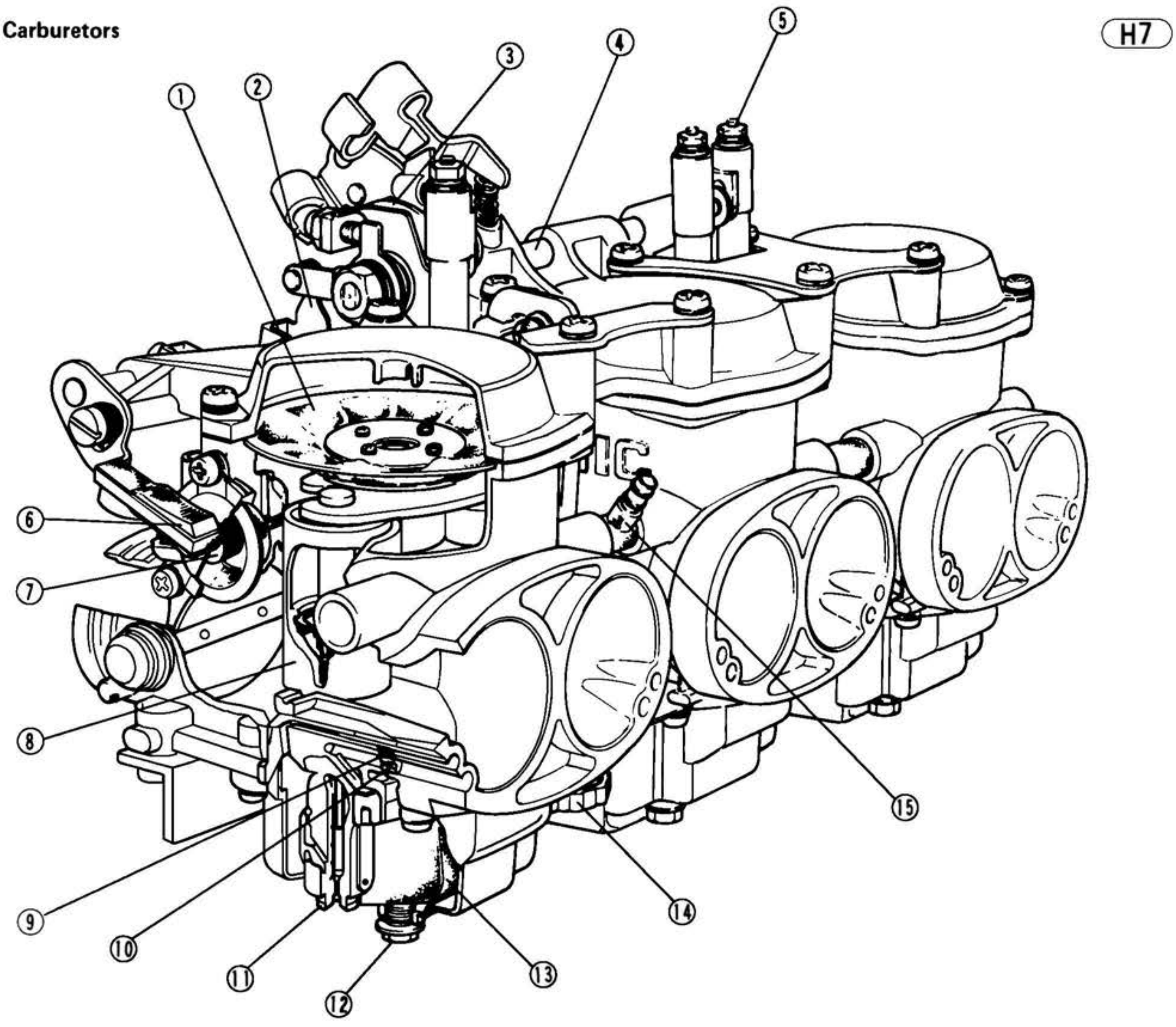
*1. Connect the black lead to the battery – terminal, and the brown lead to the battery + terminal.
2. Connect and then disconnect the blue lead to the battery + terminal to open the valve.

## CARBURETORS

The carburetor is a two-throat type, and has two bores to supply fuel and air mixture for two cylinders. Each bore has its own main and pilot systems, and the carburetor has two sets of parts for these systems. The two bores have starter and float systems in common, so the carburetor has only one set of these components.

The carburetor is essentially a CV (constant velocity) type. The vacuum pistons are attached to the diaphragm and rise only between ¼ and ¾ throttle. Through the hole in the bottom of the piston, the air pressure in the chamber above the diaphragm is reduced by engine intake vacuum. The air vent maintains atmospheric pressure in the chamber under the diaphragm. As engine speed increases, air pressure in the upper chamber decreases. The different between this pressure and atmospheric pressure in the lower chamber becomes greater. The force of the spring and the weight of the pistons are overcome, and the pistons rise to an extent corresponding

**Carburetors** H7




1. Diaphragm
2. First Idle Cam
3. Pulley
4. Throttle Shaft
5. Synchronization Adjusting Screw
6. Choke Lever
7. Coasting Enricher
8. Vacuum Piston
9. Pilot Air Jet
10. Main Air Jet
11. Main Jet
12. Drain Plug
13. Float
14. Idle Adjusting Screw
15. Fuel Hose Joint

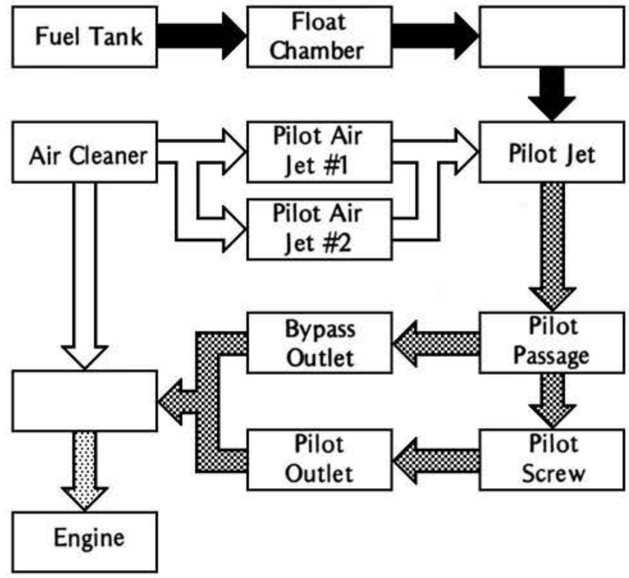
to this pressure difference. The diaphragm is made of rubber and absorbs the vibration caused by engine intake pulsing to prevent the vacuum pistons from wearing.

The quantity of air drawn in by engine intake is in direct proportion to engine rpm, and the speed of the air flow is almost constant while the vacuum pistons rise from ¼ to ¾ throttle. In a conventional slide-type carburetor, the size of the air passage above the needle jet changes with throttle movement rather than with engine intake (demand). The venturi effect creates a momentary drop in air flow speed when the throttle is opened suddenly. This often causes a slight stall in acceleration. However, the vacuum piston-butterfly valve arrangement controls both the air and fuel supplies during sudden throttle movements for smooth and immediate engine response.

The coasting enricher system is provided in the carburetor to prevent backfiring during engine braking by supplying a rich fuel mixture to the engine. The system includes the inlet vacuum passage ⑥, vacuum chamber ⑤, diaphragm ② with valve ⑦, return spring ④, spring seat ③, cover ①, pilot air passage #2 ⑧, and pilot air jet #2 ⑨.

When the motorcycle is cruising or accelerating, the engine vacuum is low, and the return spring pushes the valve toward the extreme right position. At this time, the pilot air passage #2 is open, and the air is supplied to the pilot jet ⑫ for better atomization through both pilot air jets #1 and #2.

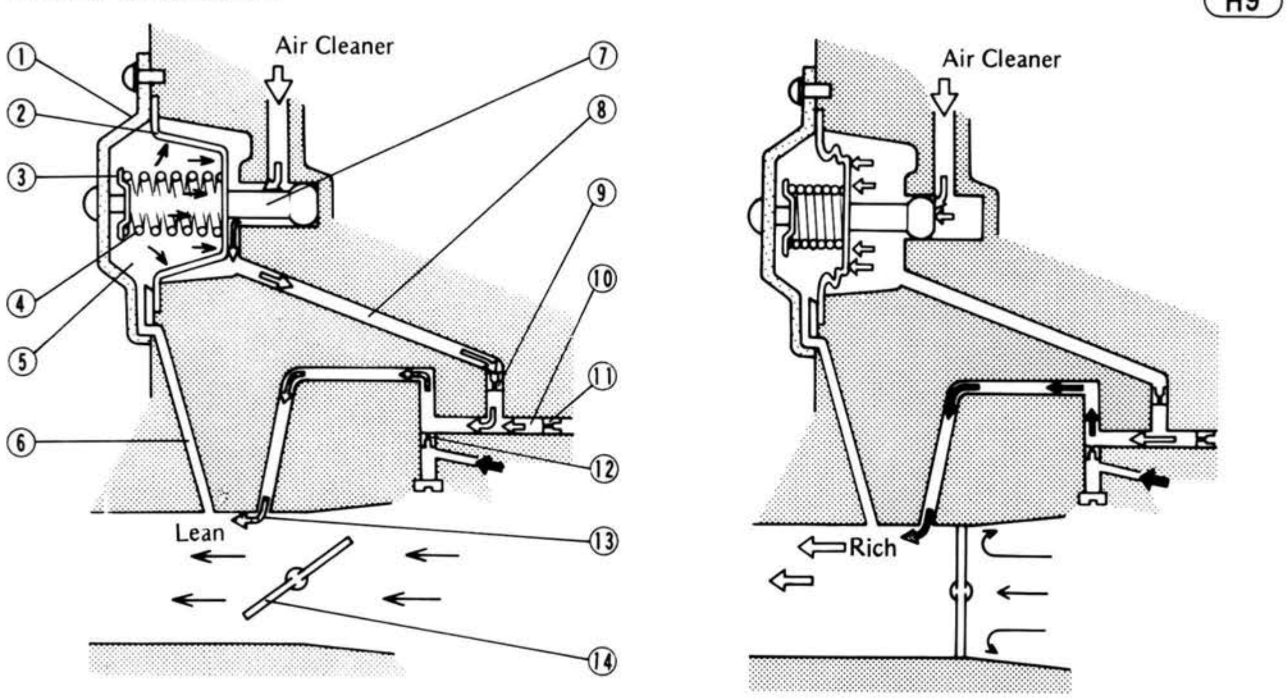
**Fuel and Air Supply of Enricher System** (H8)




*Pilot Air Jet #2 is shut off during engine braking.

During engine braking, a high vacuum (low pressure) is developed at the engine side of the carburetor bores. This moves the diaphragm toward the left against the return spring, and closes pilot air passage #2. At this time, the fuel mixture is enriched by the amount of air through the pilot air jet #2 is cut off.

**Coasting Enricher System** (H9)




1. During cruising or acceleration

2. During engine braking

1. Cover
2. Diaphragm
3. Spring Seat
4. Spring
5. Vacuum Chamber
6. Inlet Vacuum Passage
7. Valve
8. Pilot Air Passage #2
9. Pilot Air Jet #2
10. Pilot Air Passage #1
11. Pilot Air Jet # 1
12. Pilot Jet
13. Pilot Outlet
14. Butterfly Valve

Carburetor trouble can be caused by dirt, wear, maladjustment, or improper fuel level in the float chamber. A dirty or damaged air cleaner can also alter the fuel-to-air ratio.

**Table H5 Mixture Trouble Symptoms**

| |
|---|
| Poor running |
| Overheating |
| Exhaust smokes excessively |
| Frequent backfiring in the exhaust system during engine braking |

The following explanation covers the cleaning and inspection of the carburetor.

### *Cleaning*

**CAUTION** **1. Remove the diaphragm and float before cleaning the carburetor with compressed air, or they will be damaged.**

**2. Remove as many rubber or plastic parts from the carburetors as possible before cleaning the carburetors with a cleaning solution. This will prevent damage or deterioration of the parts.**

**3. The carburetor body has plastic parts that cannot be removed. DO NOT use a strong carburetor cleaning solution which could attack these parts; instead, use a mild cleaning solution safe for plastic parts.**

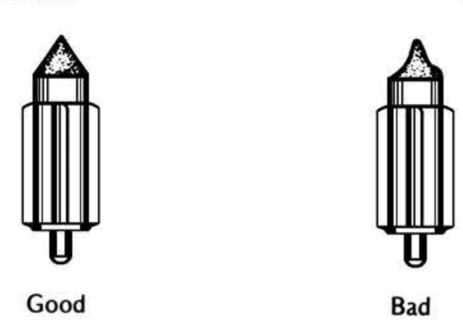
**4. Do not use wire for cleaning as this could damage the jets.**

Disassemble the carburetors. Wash the disassembled parts, and air and fuel passages with a high flash-point solvent then blow them clean with compressed air. If necessary, use a bath of automotive type carburetor cleaner.

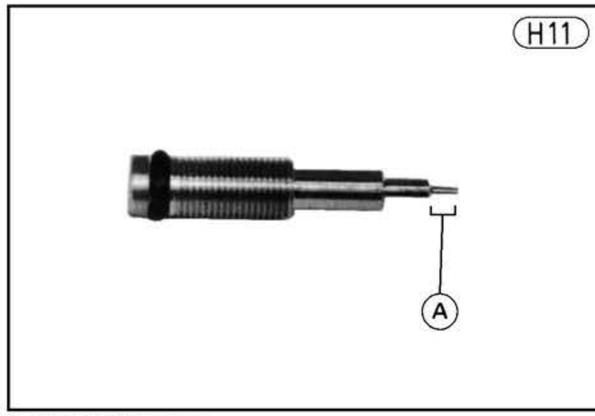
### *Inspection*

Examine the float, and replace if damaged. If the needle is worn as shown in the diagram, replace the valve needle and valve seat as a set.

**Valve Needle**

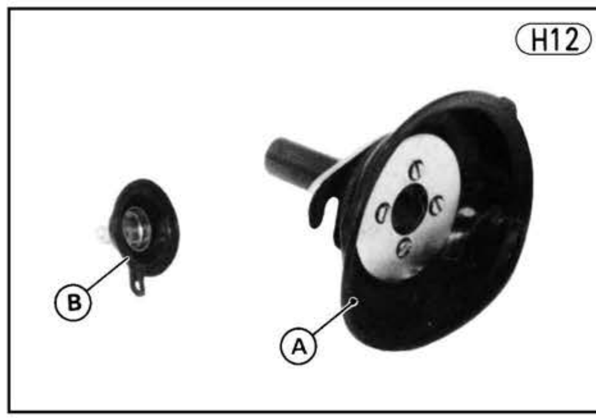



Remove the pilot screw (See Pg. 52), and check that the tapered portion of the pilot screw is not worn or otherwise deformed. If it is, replace the screw.



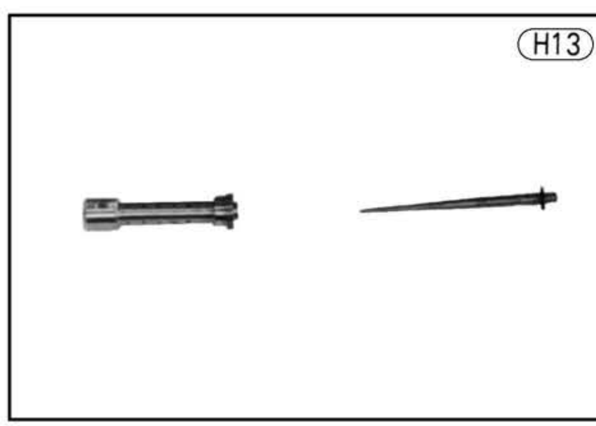

**A. Tapered Portion**

Visually inspect the diaphragms of the vacuum pistons and coasting enricher. If there is any damage, the diaphragm should be replaced.




**A. Vacuum Piston Diaphragm**
**B. Coasting Enricher Diaphragm**

Check the jet needle and needle jet. A worn needle jet and jet needle should be replaced.




**NOTE:** The last number of the jet needle number ("3" of 5P3-3 or 5P2-3) is not stamped on the needle, but is

**Table H6 Carburetor Specifications**

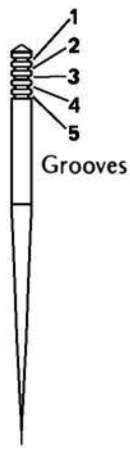
| Type | Main Jet | Needle Jet | Jet Needle | Pilot Jet | Service Fuel Level |
|---|---|---|---|---|---|
| BSW32 | 110R Ⓖ 105R | Y-8 | 5P3-3 Ⓤ 5P2-3 | 42.5 | 6.5~8.5 mm |

Ⓖ : West German Model Ⓤ : US Model

the number of the groove in which the clip **must** be installed. The groove numbers are counted from the topmost groove, 5 being the lowest groove.

**CAUTION** **If the clip is put in any but the specified groove, exhaust emission will be increased, and the engine may suffer serious damage which could result in a crash.**

**Jet Needle** (H14)



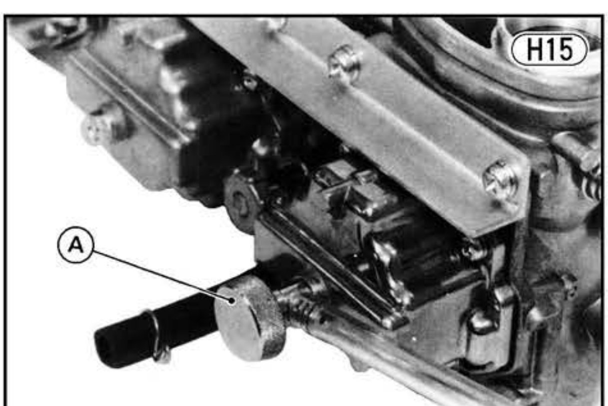

## *Service fuel level measurement and adjustment*

If the motorcycle exhibits symptoms of improper fuel mixture, measure the service fuel level.

- Remove the carburetors, and secure each in a true vertical position on a stand.

**WARNING** **Check the fuel level in a well-ventilated area, and take ample care that there are no sparks or flame anywhere near the working area.**

- Remove the drain plug from the bottom of the float bowl, and install the fuel level gauge (special tool).




**A. Fuel Level Gauge (57001-208)**

- Keeping the calibrated plastic pipe of the gauge higher than the float bowl, supply fuel for the carburetors by some means (such as a tube from a small fuel container). Wait until the fuel level in the tube settles.
- Keeping the calibrated plastic tube vertical, slowly lower the calibrated plastic tube until the "0" line is even with the bottom edge of the carburetor body.

**NOTE:** Do not lower the "0" line below the bottom edge of the carburetor body. If the calibrated plastic tube is moved upward, the fuel level measurement must be repeated from the beginning.

- Read the service fuel level in the plastic pipe.

**Service Fuel Level Measurement** (H16)

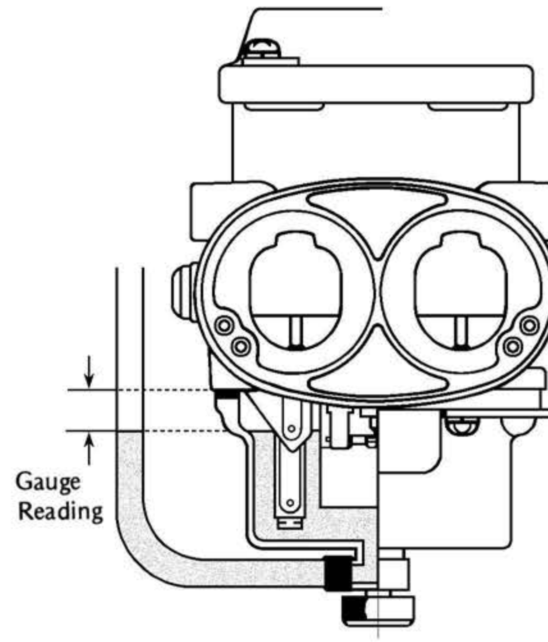
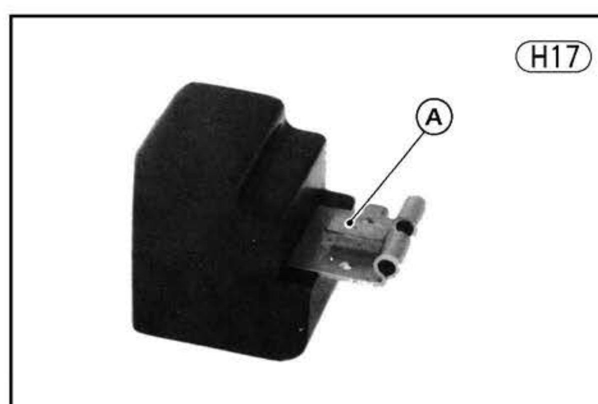



**Table H7 Service Fuel Level**

| Standard |
|---|
| 6.5 ~ 8.5 mm below from the bottom edge of the carburetor body to the fuel level |

- If the fuel level is incorrect, remove the float bowl and float.
- Bend the tang on the float a very slight amount to change the fuel level. Bending it up toward the valve closes the valve sooner and lowers the fuel level; bending it down raises the level.



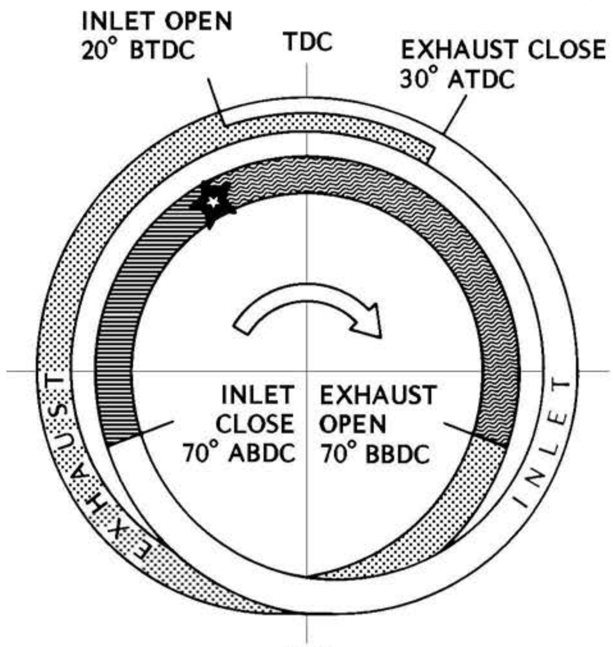

**A. Tang**

•After adjustment, measure the service fuel level again, and readjust if necessary.

## CAMSHAFTS

**Valve Timing**

(H18)




### *Cam wear*

Remove the camshafts, and measure the height of each cam with a micrometer. If the cams are worn down past the service limit, replace the camshafts.

**Cam Height Measurement**

(H19)

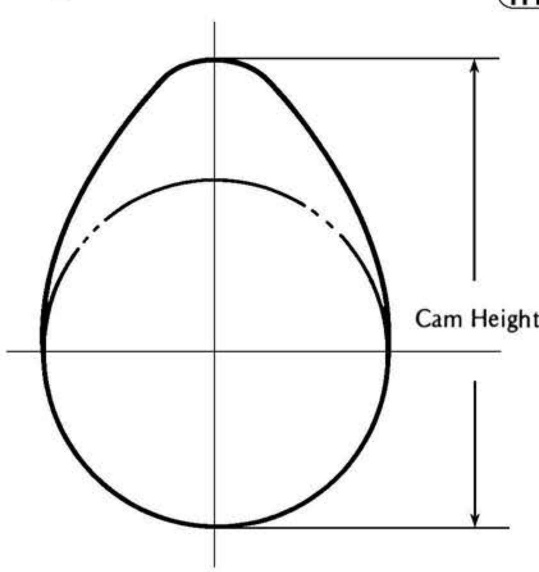



**Table H8 Cam Height**

| | Inlet | Exhaust |
|---|---|---|
| Service Limit | 36.10 mm | 35.60 mm |

### *Journal, bearing wear*

The journal wear is measured using plastigauge (press gauge), which is inserted into the clearance to be measured. The plastigauge indicates the clearance by the amount it is compressed and widened when the parts are assembled.

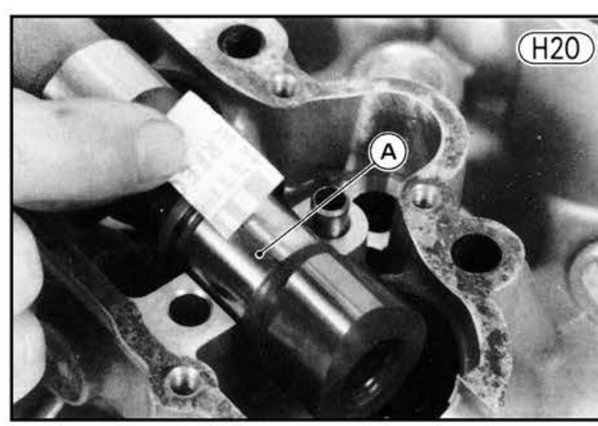
**NOTE:** Measure the camshaft journal to camshaft cap clearance while the cylinder head is off the engine and all the valves are removed, or in accordance with the following procedure.

Remove the cylinder head cover and remove half of the camshaft caps (which have odd numbers or even numbers) at a time, and wipe each journal and camshaft cap surface clean of oil. Cut strips of plastigauge to journal width. Place a strip on each journal parallel to the camshaft and so that the plastigauge will be compressed between the journal and camshaft cap. Tighten the camshaft cap bolts to the specified torque (Pg. 37).

Next, remove the camshaft cap again, and measure the plastigauge width to determine the clearance between each journal and the camshaft cap.

Measure the remaining clearances as explained above.

If any clearance exceeds the service limit, measure the diameter of the camshaft journal. If camshaft replacement does not bring the journal clearance within the service limit, replace the cylinder head and camshaft caps.

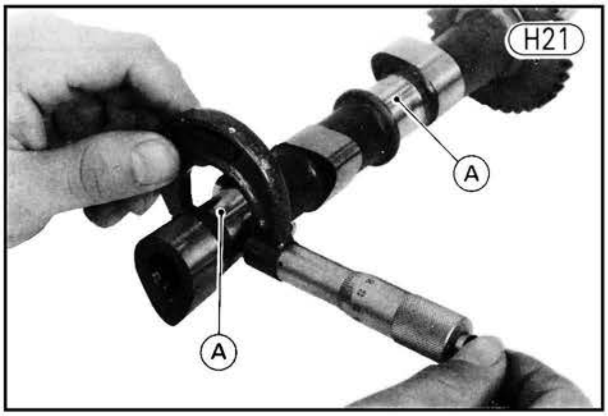



**A. Plastigauge**

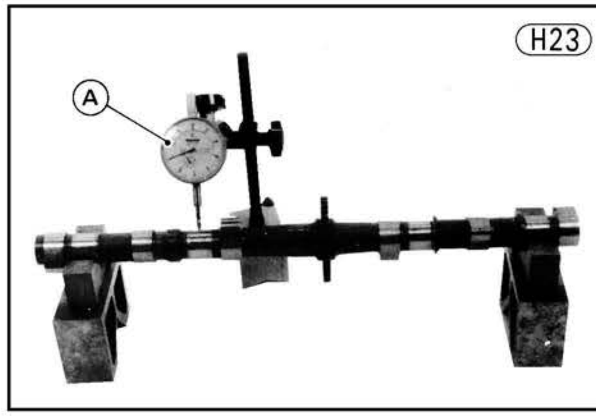
**Table H9 Camshaft Journal/Camshaft Cap Clearance**

| | |
|---|---|
| Service Limit | 0.19 mm |

Measure the diameter of each camshaft journal with a micrometer. If the diameter of any journal is less than the service limit, replace the camshaft.




A. Camshaft Journal



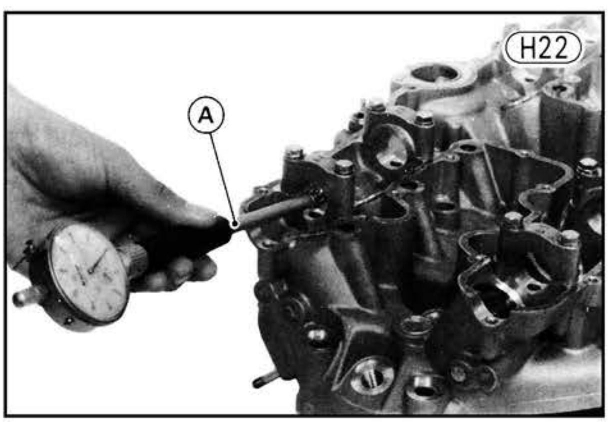

A. Dial Gauge

**Table H10 Camshaft Journal Diameter**

| | |
|---|---|
| Service Limit | 24.42 mm |

Remove the camshafts, and tighten the camshaft caps to the specified torque (Pg. 37). Measure the vertical inside diameter of each bearing with a cylinder gauge.

If it exceeds the service limit, replace the cylinder head and camshaft cap as a set since the camshaft caps are machined together with the cylinder head.




A. Cylinder Gauge

**Table H11 Camshaft Bearing Inside Diameter**

| | |
|---|---|
| Service Limit | 24.62 mm |

*Camshaft runout*

Remove the camshaft. Set the shaft on **V** blocks at the outside journals as shown in the figure. Measure runout with a dial gauge at the two inside journals, and replace the shaft if the runout exceeds the serrvice limit.

**Table H12 Camshaft Runout**

| | |
|---|---|
| Service Limit | 0.1 mm |

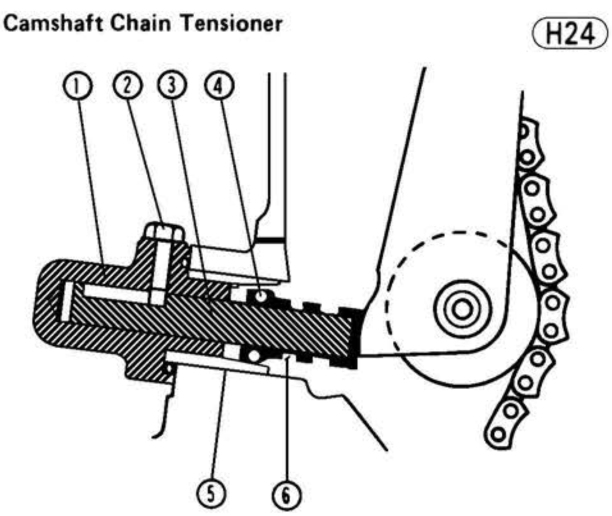
## CAMSHAFT CHAIN, GUIDES, TENSIONER

The camshaft chain, which is driven by the secondary shaft, drives the two camshafts at one-half crankshaft speed. For maximum durability and minimum noise, an endless-type silent chain with no master link is used.

The automatic camshaft chain tensioner of ball-lock type is utilized for this machine. Periodic adjustment of the tensioner is not needed since chain slack is removed automatically.

The tensioner consists of push rod ③, lock balls ④, spring ⑥, sleeve ⑤ (press-fifted onto the tensioner body), tension body, and bolt. When the slack appears on the chain, the push rod is pushed out to the chain by the spring, and it cannot be pushed back in because of the lock balls locking on the ramp of the sleeve pressed into tensioner body. The bolt is used to keep the push rod from flying out during installation.

**Camshaft Chain Tensioner**




1. Tensioner Body
2. Bolt
3. Push Rod
4. Lock Ball
5. Sleeve
6. Spring

### *Camshaft chain wear*

Remove the cylinder head cover, hold the chain taut by rotating the crankshaft slightly, and measure a 20-link length. If the chain has lengthened beyond the service limit, replace it with a new one.

**Camshaft Chain Measurement** H25

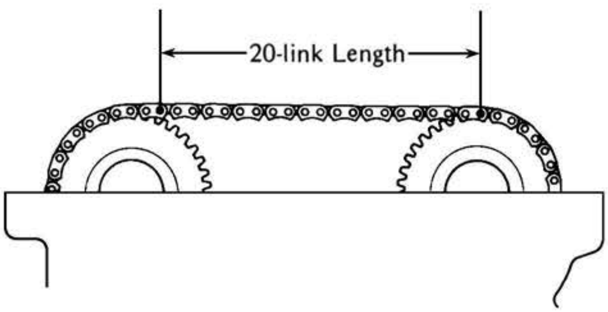



**Table H13 Camshaft Chain 20-link Length**

| | |
|---|---|
| Service Limit | 128.9 mm |

### *Chain guide wear*

Remove the chain guides, and inspect them visually. Replace a guide if the rubber or any other portion is damaged.

Measure the depth of the grooves where the chain links run. Replace a guide if the wear exceeds the service limit.

**Chain Guide Rubber Wear** H26

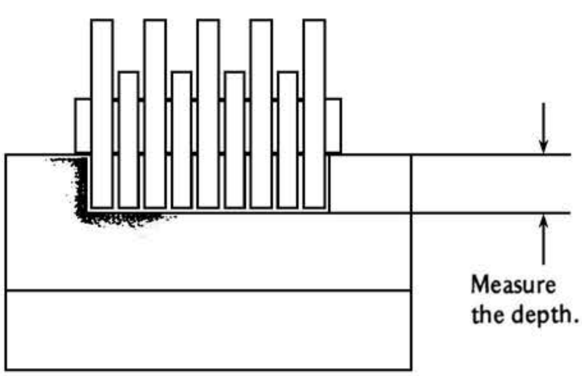



**Table H14 Camshaft Chain Guide Wear**

| | Upper | Front | Rear |
|---|---|---|---|
| Service Limit | 1.5 mm | 3.0 mm | 1.5 mm |

### *Chain tensioner inspection*

Remove the camshaft chain tensioner. Visually inspect the push rod, the sleeve in the tensioner body and the lock ball. If there is any damage or dent, replace the part with a new one.

Measure the spring free length. Replace the spring if the free length exceeds the service limit.

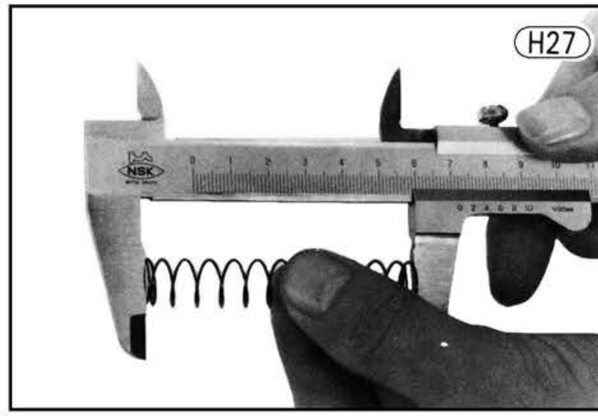

H27

**Table H15 Chain Tensioner Spring Free Length**

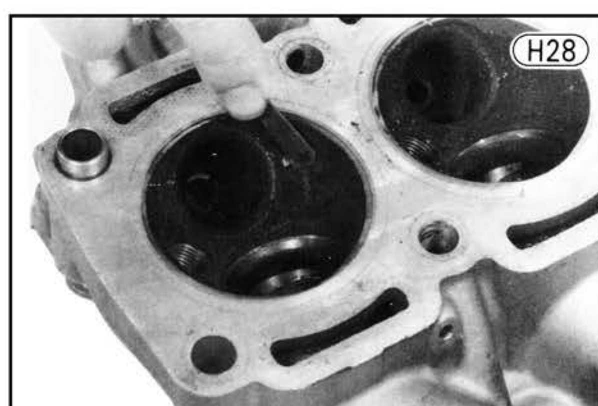
| | |
|---|---|
| Service Limit | 71.3 mm |

## CYLINDER HEAD, VALVES

### Cylinder Head

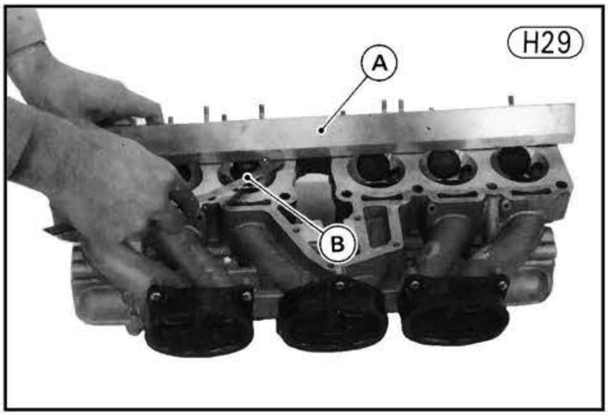
### *Cleaning and inspection*

Remove the cylinder head (Pg. 69) and valves (Pg. 70). Scrape out any carbon, and wash the head with a high flash-point solvent.


H28

### *Cylinder head warp*

Lay a straightedge across the lower surface of the head at several different points, and measure warp by inserting a thickness gauge between the straightedge and the head. If warp exceeds the service limit, repair the mating surface. Replace the cylinder head if the mating surface is badly damaged.




**A. Straightedge B. Thickness Gauge**

**Table H16 Cylinder Head Warp**

| | |
|---|---|
| Service Limit | 0.05 mm |

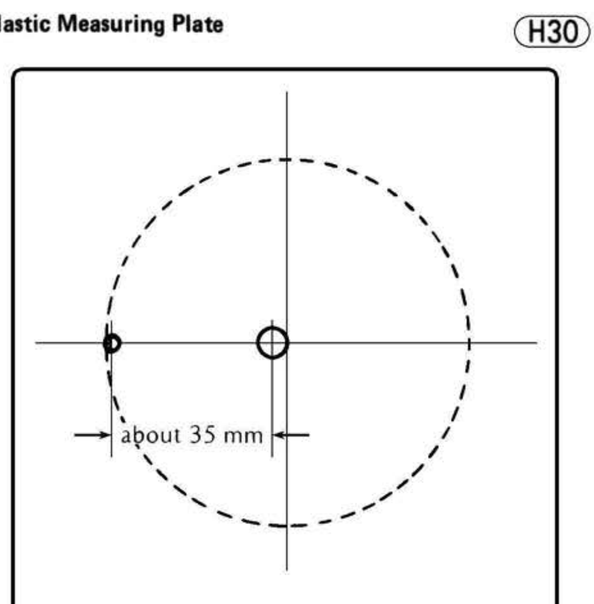
### *Combustion chamber volume measurement*

The combustion chamber volume should be measured any time that compression measurement results in compression pressures well below or above the standard.

**NOTES:**

1. Another person will be needed to help expel air bubbles out of the combustion chamber.
2. Prepare a piece of transparent plastic plate which has a flat surface and two holes about 35 mm apart in its center portion. One hole should be about 6 mm in diameter, the other about 3 mm in diameter. The plate must be oil resistant, about 120 mm square, and at least 3 mm thick.

**Plastic Measuring Plate**

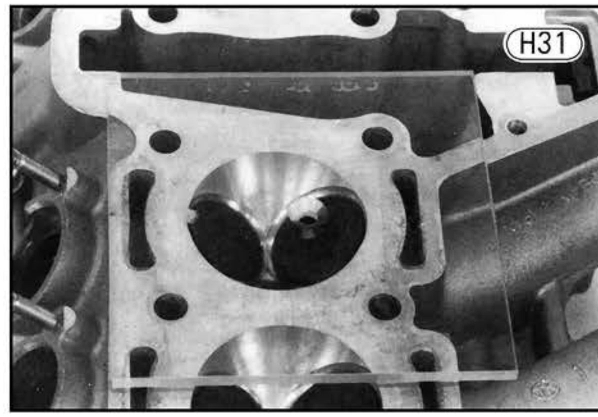



3. Obtain a burette or syringe which is calibrated at one-cc or smaller graduations. Fill it with thin oil.

Prior to the combustion chamber volume measurement, clean off any carbon in the combustion chamber, and remove any gasket flakes on the cylinder head mating surface. The standard spark plug should be installed in the chamber to be measured.

**NOTE:** The valves must seat well to prevent the oil from leaking out.

Apply a thin coat of grease to the cylinder head mating surface and place the plastic plate over the cylinder head combustion chamber, fitting its small hole near the edge of the combustion chamber.




Place the cylinder head on a level surface. Through the large hole, fill the combustion chamber with light oil such as 2-stroke oil until the chamber is completely but not overly filled. Tilt the cylinder head slightly so that air bubbles come out through the small hole. The oil should just rise to the bottom edge of the holes in the plate.

The amount of oil used to fill the chamber is the combustion chamber volume.

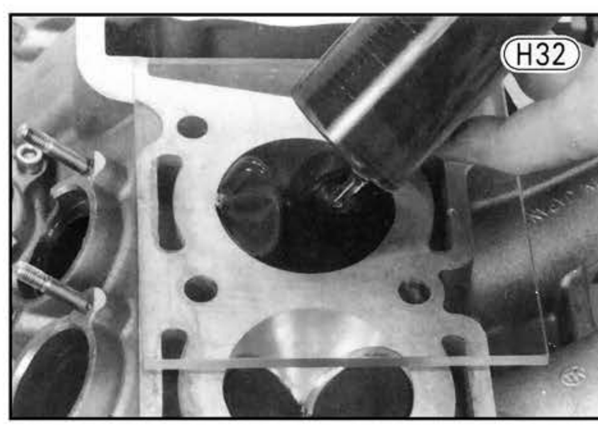



**Table H17 Combustion Chamber Volume**

| | |
|---|---|
| Standard | 27.1~27.9 cc |

If the combustion chamber volume is too small, it is possible that the cylinder head was modified for higher compression. Make sure that all carbon deposits have been cleaned out of the chamber.

If the combustion chamber volume is too large, it is possible that the valves and valve seats have been resurfaced so much that the volume is increased. Make sure that the spark plug is the standard type and that it is fully tightened.

## Valve, Valve Guide, Valve Seat

### *Valve inspection*

Visually inspect the valve face, and replace the valve if it shows deformation or uneven wear.

Measure the thickness of the valve head using vernier calipers, and replace the valve if the thickness is under the service limit.

**Valve Shape** (H33)

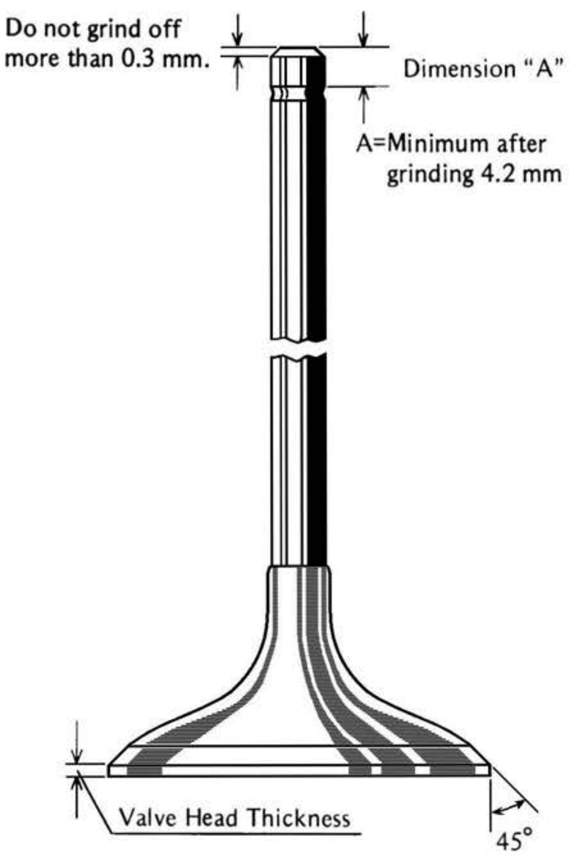



**Table H18 Valve Head Thickness**

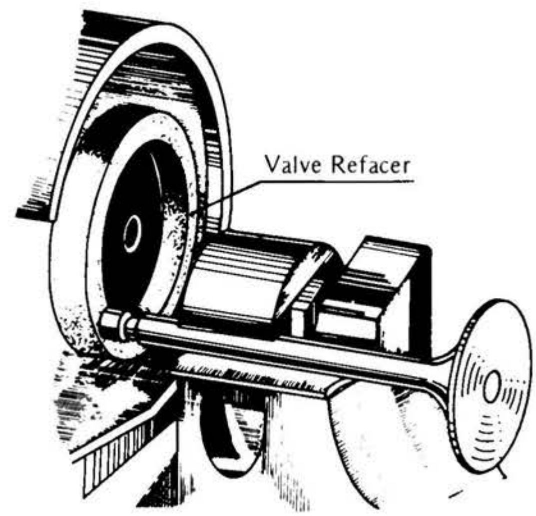
| | |
|---|---|
| Service Limit | 0.7 mm |

If the seating surface of the valve or the end of the valve stem is damaged or badly worn, repair the valve with a valve refacer. The angle of the seating surface is 45°.

The valve stem end may be ground to permit additional valve clearance, use a refacing grinder to assure a flat, square surface.

**CAUTION If the valve's Dimension "A" is less than specified, the valve lifter may contact the valve spring retainer during operation, allowing the keepers to loosen. Consequently, the valve may drop into the engine, causing serious damage.**

**Valve Stem Grinding** (H34)




Support the valve at both ends of the straight stem portion, and set a dial gauge against the center of the stem. One example is shown in Fig. H35.

Turn the valve and read the variation in the dial gauge. Replace the valve if it is bent over the service limit.

**Valve Stem Bend** (H35)

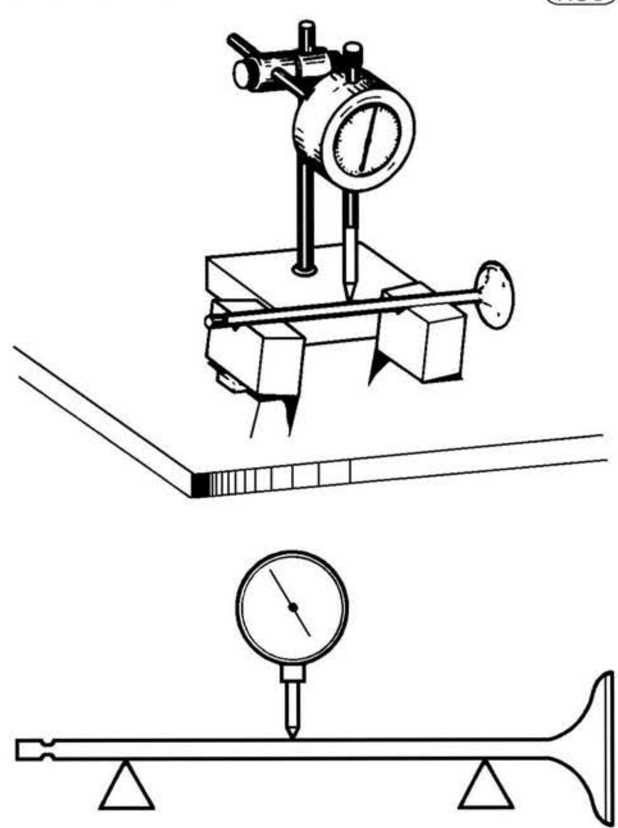
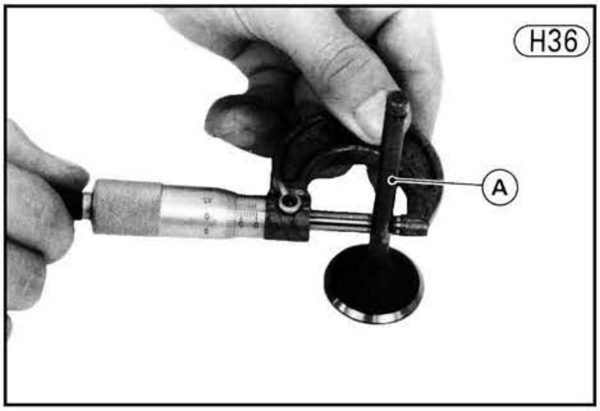


**Table H19 Valve Stem Bend**

| | |
|---|---|
| Service Limit | 0.05 mm |

Measure the diameter of the valve stem with a micrometer. Since the stem wears unevenly, take measurements at four places up and down the stem, keeping the micrometer at right angles to the stem.

Replace the valve if the stem is worn to less than the service limit.




**A. Valve Stem**

**Table H20 Valve Stem Diameter**

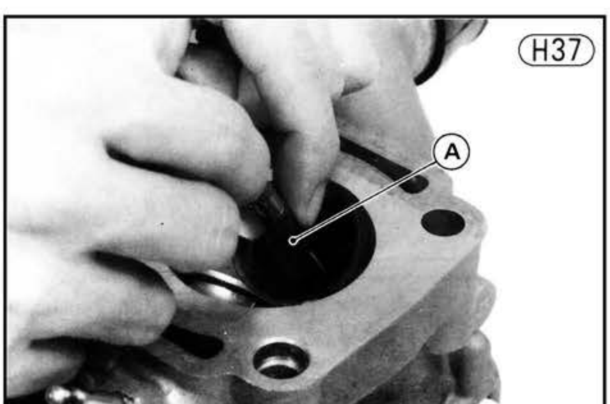
| | Inlet | Exhaust |
|---|---|---|
| Service Limit | 6.90 mm | 6.89 mm |

*Valve guide inspection*

Remove the valve, and measure the inside diameter of the valve guide using a small bore gauge and micrometer. Since the guide wears unevenly, measure the diameter at four places up and down the guide. If any measurement exceeds the service limit, replace the guide.

**Table H21 Valve Guide Inside Diameter**

| | |
|---|---|
| Service Limit | 7.08 mm |



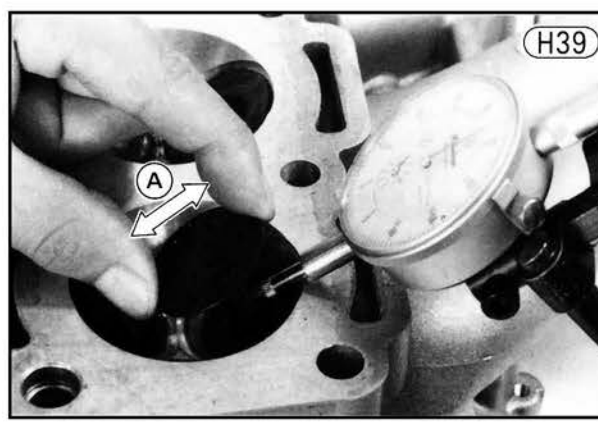

**A. Small Bore Gauge**


If a small bore gauge is not available, inspect the valve guide wear by measuring the valve to valve guide clearance with the wobble method, as indicated below.

Insert a new valve into the guide and set a dial gauge against the stem perpendicular to it as close as possible to the cylinder head mating surface. Move the stem back and forth to measure valve/valve guide clearance. Repeat the measurement in a direction at a right angle to the first.

If the reading exceeds the service limit, replace the guide.

**NOTE:** The reading is not actual valve/valve guide clearance because the measuring point is above the guide.




**A. Move the valve.**

**Table H22 Valve/Valve Guide Clearance (Wobble Method)**

| | Inlet | Exhaust |
|---|---|---|
| Service Limit | 0.23 mm | 0.24 mm |

*Valve seat inspection and repair*

The valve must seat in the valve seat evenly around the circumference over the specified area. If the seating area is too wide, the seating pressure per unit of area is reduced, which may result in compression leakage and carbon accumulation on the seating surface. If the seating area is too narrow, heat transfer from the valve is reduced and the valve will overheat and warp. Uneven seating or seat damage will cause compression leakage.

**Valve Seating Width**

(H40)

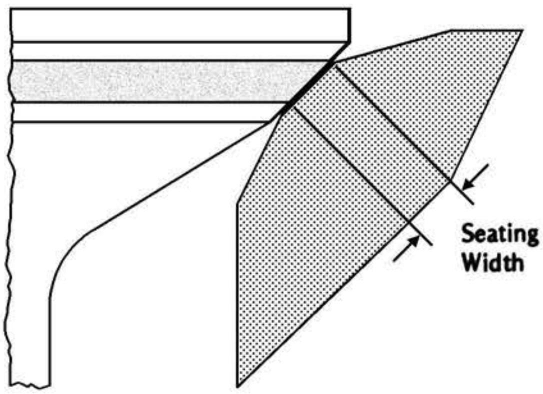



**Table H23 Valve Seating Width**

| | |
|---|---|
| Standard | 0.5～1.0 mm |

To determine whether or not the valve seat requires repair, first remove the valve, apply machinist's dye to the valve seat, and then use a lapper to tap the valve lightly into place. Remove the valve, and note where the dye adheres to the valve seating surface. The valve seating surface should be in the middle of the valve face (Fig. H40). The distribution of the dye on the seating surface gives an indication of seat condition (Fig. H42). **NOTE:** The valve and valve guide must be in good condition before this check will give an accurate indication of valve seat condition.

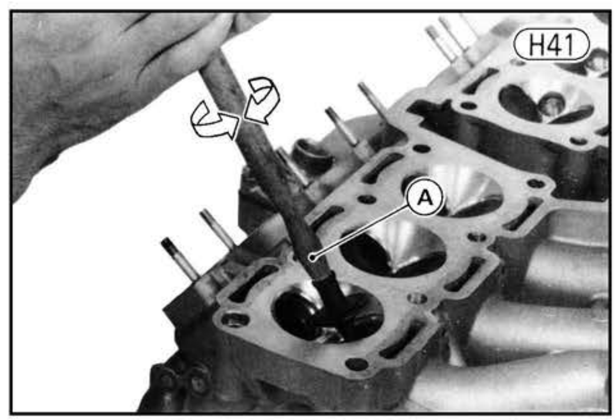
A valve seat which requires repair is cut with a set of valve seat cutters. Four cutters are required for complete repair; one 30° (inlet valve seat only); one 45°; and two 75° cutters, one for the inlet and the other for the exhaust.

First, cut the seating surface of the valve seat with the 45° cutter. Cut only the amount necessary to make a good surface; overcutting will reduce the valve clearance, possibly making it no longer adjustable.

Next, use the 30° cutter (inlet valve seat only) to cut the surface inside the seating surface, and then use the 75° cutter to cut the outermost surface. Cut these two surfaces so that the seating surface will have a specified width.

After cutting, lap the valve to properly match the valve and valve seat surfaces. Start off with coarse lapping compound, and finish with fine compound.

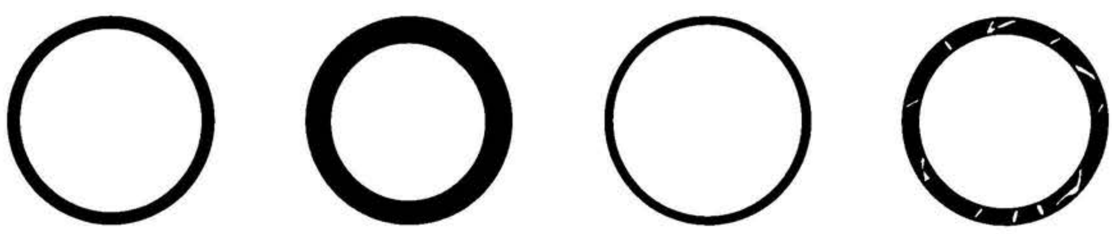
Apply compound to the valve seat, and tap the valve lightly into place while rotating it with a lapper, repeating this until a smooth, matched surface is obtained.




**A. Lapper**

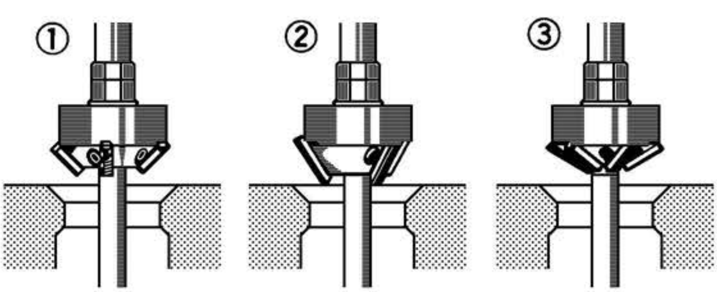
**Valve/Valve Seat Contact Area**

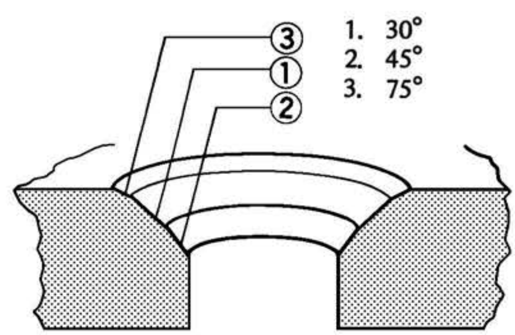
(H42)




**Cutting Angle of Valve Seat**

(H43)



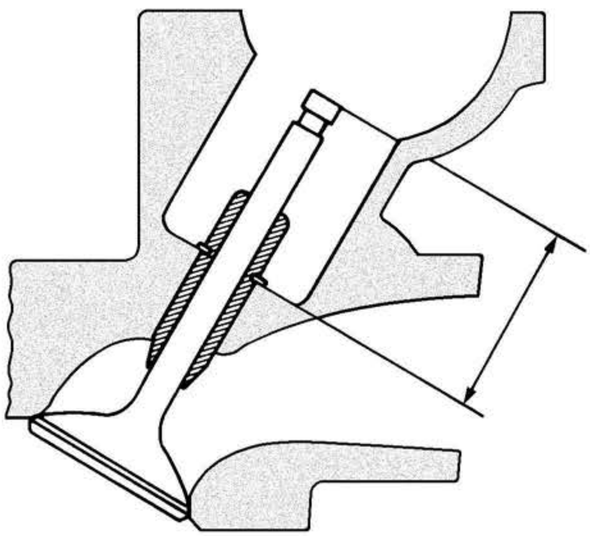




1. 30°
2. 45°
3. 75°

### *Valve stem height inspection*

When lapping is completed, check the valve stem height and adjust if necessary.

**Valve Stem Height** (H44)



After grinding the valve or valve seats and before assembling the cylinder head, measure the installed valve height from the bottom of the cylinder head lifter hole to the end of the valve stem with a vernier caliper. Refer to Table H26 for the recommended repair.

Be sure to mark each valve so it will be properly matched to its corresponding valve seat during assembly.

A selection of various thickness valve shims are available for adjusting the valve clearance. There is, however, a limit to the amount of adjustment possible using the shims. Resurfacing of the valve face and valve seat inevitably drops the valve deeper into the valve seat, allowing the valve stem end to come closer to the camshaft. Consequently, a thinner shim must be used to compensate for the reduced valve clearance.

Over a period of long use and repeated resurfacing, the valve may drop so far into the valve seat that even the thinnest shim cannot give adequate clearance. In this case, it is possible to grind the end of the valve stem to reduce the valve installed height and so gain the needed clearance (See Caution in Pg. 175).

If the valve drops so far into the valve seat that the installed height becomes quite large, either by a resurfacing error or heavy wear, it may be necessary to replace the valve and remeasure the installed height. If this is not successful, it will be necessary to replace the cylinder head. Replacement valve seats are not available.

## Valve Springs

### *Spring tension*

Remove the springs and check each on a spring tension testing device. Compress the spring, and read the tension at the test length. If the spring tension at the specified length is weaker than the service limit, replace the spring.

**Valve Spring Tension Measurement** (H45)

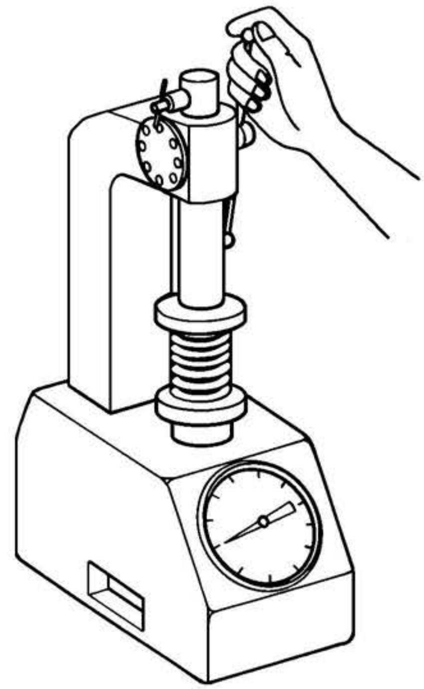


**Table H24 Valve Spring Tension**

| | Test Length | Service Limit |
|---|---|---|
| Inner | 23.6 mm | 23.6 kg |
| Outer | 25.6 mm | 44.1 kg |

### *Squareness*

Measure the squareness of each spring by standing each end on a surface plate and setting a square against it. Replace any spring for which the distance between the top of the spring and the square is greater than the service limit.

**Valve Spring Squareness** (H46)

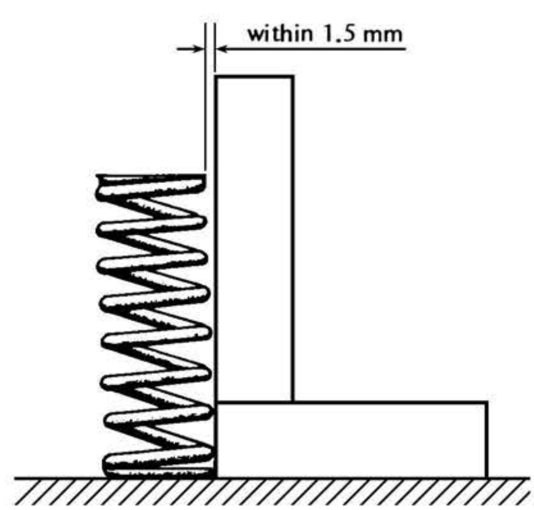



**Table H19 Valve Stem Bend**

| | |
|---|---|
| Service Limit | 1.5 mm |

**Table H26 Valve Installed Height**

(a) Inlet Valve

| MEASUREMENT | PROBABLE CAUSE | RECOMMENDATION |
|---|---|---|
| Less than 36.90 mm | Valve stem excessively ground. | 1. Replace valve. Remeasure. |
| 36.90～37.19 mm | Valve stem previously ground. | 1. Be sure to leave at least 4.2 mm of stem end above the groove. See Pg. 175.<br>2. Move valve to deeper cut seat. Remeasure.<br>3. Grind valve face to drop it farther into seat. Keep valve head thickness within service limit. See Pg. 175.<br>4. Replace valve. Remeasure. |
| 37.20～38.00 mm | Normal/acceptable. | 1. After assembling check and adjust valve clearance. |
| 38.01～38.30 mm | Wear, or valve face and seat grounding have dropped valve too far into seat. | 1. Move valve to shallower cut seat. Remeasure.<br>2. Grind 0.3 mm maximum off valve stem. See CAUTION, Pg. 175. Remeasure. |
| More than 38.30 mm | Valve face or seat worn out, or ground excessively. | 1. Replace valve. Remeasure.<br>2. Replace cylinder head. Remeasure. |

(b) Exhaust Valve

| MEASUREMENT | PROBABLE CAUSE | RECOMMENDATION |
|---|---|---|
| Less than 36.80 mm | Valve stem excessively ground. | 1. Replace valve. Remeasure. |
| 36.80～37.09 mm | Valve stem previously ground. | 1. Be sure to leave at least 4.2 mm of stem end above the groove. See Pg. 175.<br>2. Move valve to deeper cut seat. Remeasure.<br>3. Grind valve face to drop it farther into seat. Keep valve head thickness within service limit. See Pg. 175.<br>4. Replace valve. Remeasure. |
| 37.10～37.90 mm | Normal/acceptable. | 1. After assembling check and adjust valve clearance. |
| 37.91～38.20 mm | Wear, or valve face and seat grounding have dropped valve too far into seat. | 1. Move valve to shallower cut seat. Remeasure.<br>2. Grind 0.3 mm maximum off valve stem. See CAUTION, Pg. 175. Remeasure. |
| More than 38.20 mm | Valve face or seat worn out, or ground excessively. | 1. Replace valve. Remeasure.<br>2. Replace cylinder head. Remeasure. |

## Oil Seals

The oil seal around each valve stem prevents oil from leaking down into the combustion chamber. If an oil seal is damaged or deteriorated, oil consumption will increase, and carbon may build up in the combustion chambers. This may be indicated by white exhaust smoke.

If an oil seal appears damaged or deteriorated or if there is any doubt as to its condition, replace it with a new one.

## CLEAN AIR SYSTEM (US model)

This motorcycle adopts the air injection system for the clean air system.

The secondary air injection helps the fuel/air mixture burn more completely. Following the power stroke, the exhaust valve opens. As the burned fuel charge passes the exhaust valve, it is still hot enough to burn if air is supplied. By introducing a stream of fresh air into the hot exhaust gases just as they pass the exhaust valve, the burning is both intensified and prolonged. This increased burning action tends to burn up a great deal of the normally unburned gases, as well as changing a significant portion of the carbon monoxide into relatively harmless carbon dioxide.

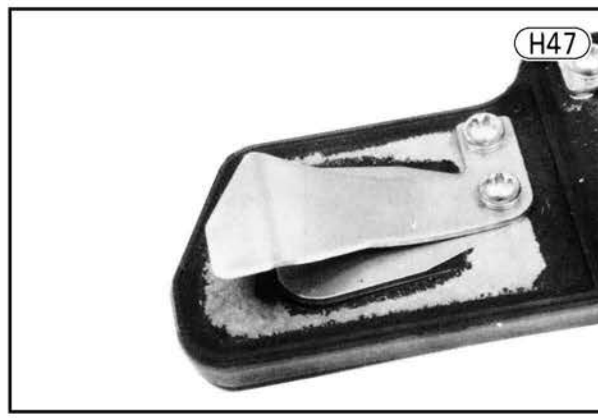
The secondary air injection system consists of a vacuum switch valve, two air suction valves which have 3 each reeds, and air hoses. Without the use of an air pump, this system introduces fresh air into the exhaust system near the exhaust ports in response to pressure differentials generated by pulses in the exhaust.

## Air Suction Valves

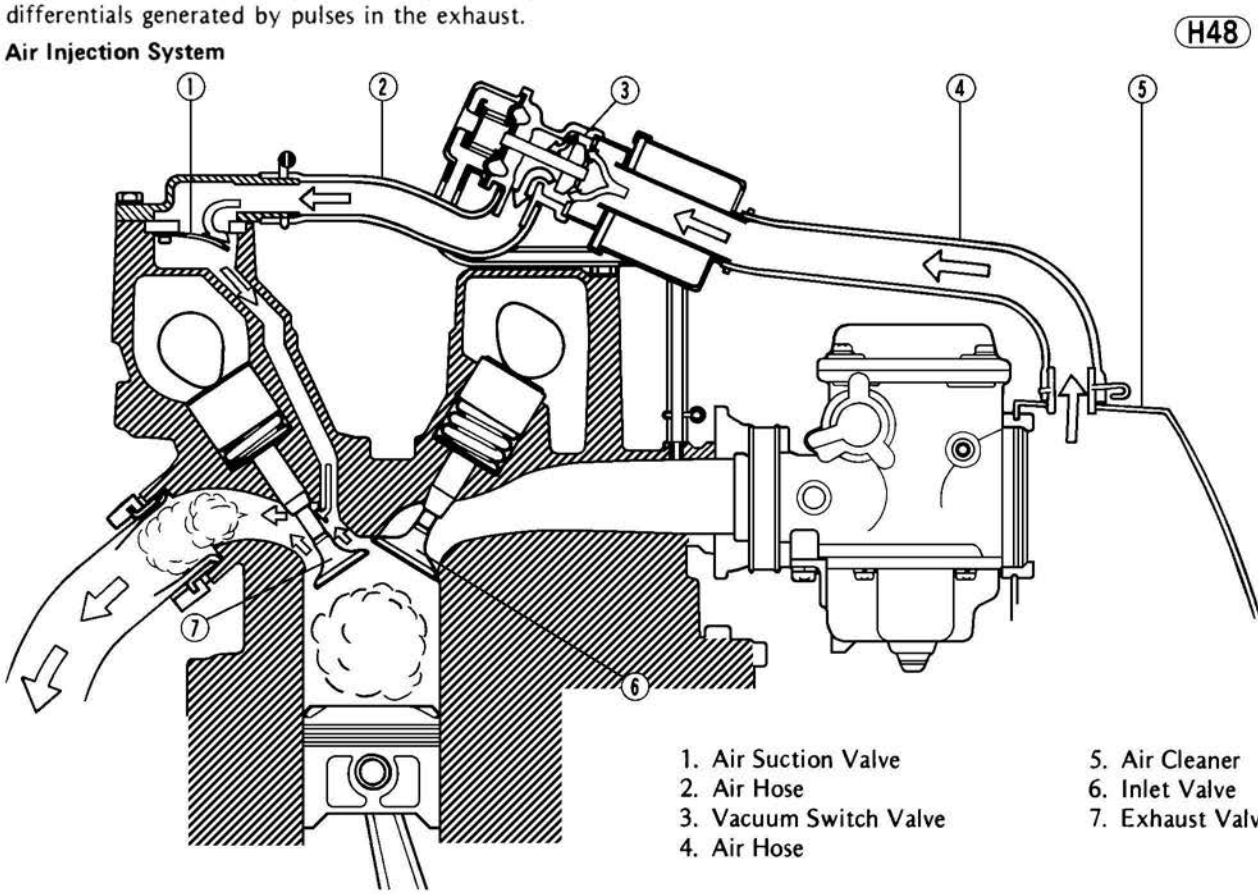
The air valve is essentially a check valve which allows fresh air to flow only from the air cleaned into the exhaust port. Any air that has passed the air suction valve is prevented from returning. Remove and inspect the air suction valves periodically (Pg. 10). Also, remove and inspect the air suction valves whenever the idle is unstable, engine power is greatly reduced, or there are abnormal engine noises.

### *Inspection*

Visually inspect the reeds for cracks, folds, warping, heat damage, or other damage. If there is any doubt as to the condition of a reed, replace the air suction valve as an assembly.




**Air Injection System**




1. Air Suction Valve
2. Air Hose
3. Vacuum Switch Valve
4. Air Hose
5. Air Cleaner
6. Inlet Valve
7. Exhaust Valve

Check the reed contact areas of the valve holder for grooves, scratches, any signs of separation from the holder, or heat damage. Check the sealing lip coating on the valve holder for the same signs. If there is any doubt as to the condition of the reed contact areas or the sealing lip, replace the air suction valve as an assembly.

If any carbon or other foreign particles have accumulated between the reed and the reed contact area, wash the valve assembly with a high flash-point solvent.

**CAUTION Do not scrape off the deposits as this could damage the rubber, necessitating air suction valve assembly replacement.**

## Vacuum Switch Valve

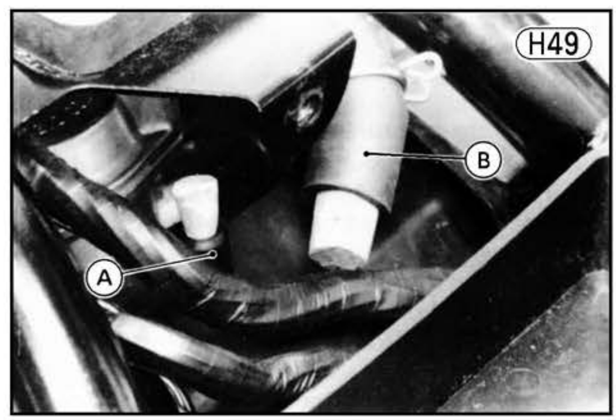
Although the vacuum switch valve usually permits secondary air flow, it shuts off the air flow when a high vacuum (low pressure) is developed at the engine side of the carburetor bores during engine braking. This is to prevent explosions in the exhaust ports which might be caused by extra unburned fuel in the exhaust during deceleration, if fresh air were injected into the exhaust ports. These explosions or "backfiring" in the exhaust system could damage the air suction valves.

Regular inspection of the vacuum switch valve is not needed. If backfiring occurs frequently in the exhaust system during engine braking or if there are abnormal engine noises, check the vacuum switch valve as follows:

**CAUTION Do not attempt to turn the paint-locked screw on the vacuum switch valve. This screw position is preset to determine spring preload. Turning the screw will cause valve malfunction.**

### *Inspection*

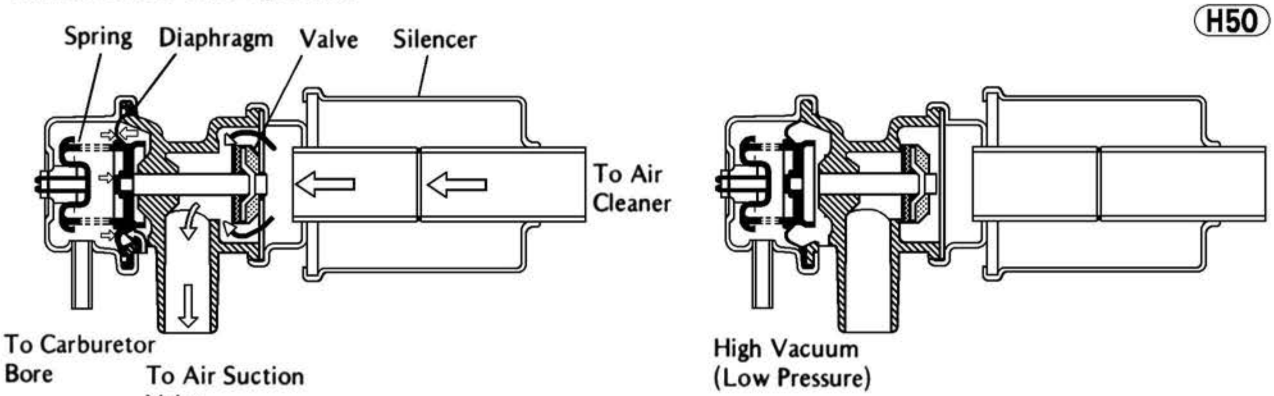
- Be certain that all the hoses are routed without being flattened or kinked, and are connected correctly to the air cleaner housing, vacuum switch valve, #3 and #4 carburetor holders, and air suction valve covers. If they are not, correct them or replace them if damaged.
- Warm up the engine thoroughly.
- Note the frequency and the loudness of backfiring in the exhaust system which takes place when the throttle valves are quickly opened and then closed. Rev the engine to about 4,000 rpm. Too low a speed does not generate a high enough vacuum to operate the vacuum switch valve, and too high a speed is not necessary and may be harmful to the engine.
- Stop the engine.
- Remove the fuel tank (Pg. 46).
- At the air cleaner housing, disconnect the hose which connects the air cleaner housing and the vacuum switch valve.
- Plug the hose fitting on the air cleaner housing so that unfiltered air does not enter the air cleaner housing through the hose fitting. Plug the hose that is disconnected so that no air can flow to the air suction valves through the vacuum switch valve.




**A. Hose Fitting** **B. Hose**

- Start the engine, and note the frequency and loudness at the backfiring as before.
- If the backfiring occurs in the same manner in both cases, the vacuum switch valve works properly. If the backfiring is different the second time, the vacuum switch valve is defective and must be replaced with a new one. Vacuum switch adjustment is not permitted.

**Vacuum Switch Valve Operation**




Secondary Air Flows (Valve is opened)

Secondary Air cannot flow during Engine Braking (Valve is shut off)

## CYLINDER BLOCK, PISTONS

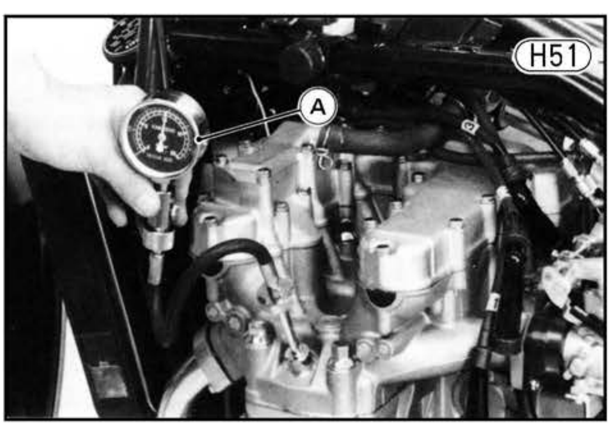
The inspection and maintenance of cylinder block and the pistons include the following items.

- ○Compression measurement
- ○Cylinder, piston wear
- ○Piston/cylinder clearance
- ○Boring, honing
- ○Piston/cylinder seizure
- ○Piston cleaning
- ○Piston ring, piston ring groove wear
- ○Piston ring end gap
- ○Piston, piston pin, connecting rod wear
- ○Water pump shaft journal wear
- ○Water pump drive bevel gear inspection, and journal wear
- ○Water pump bevel gear inspection, water pump shaft journal wear
- ○Timing advancer drive gear inspection
- ○Cylinder bearing wear

### *Compression measurement*

Before measuring compression, check that the battery is fully charged (Pg. 230). Thoroughly warm up the engine so that engine oil between the pistons and cylinder walls will help seal compression as it does during normal running. While the engine is running, check that there is no gas leakage from around the cylinder head gasket and from the spark plugs.

Stop the engine, remove the spark plugs, and attach the compression gauge (special tool) firmly into one spark plug hole. Using the starter motor, turn the engine over with the throttle fully open until the compression gauge stops rising; the compression is the highest reading obtainable. Repeat the measurement for the other cylinder.




**A. Compression Gauge (57001-123)**

**Table H27 Cylinder Compression†**

| | |
|---|---|
| Usable Range | 8.4 ~ 12.0 kg/cm² (119 ~ 171 psi), or less than 1 kg/cm² (14 psi) difference between any two cylinders |

† Engine hot, spark plugs removed, throttle fully opened, cranking the engine with the starter motor.

If cylinder compression is higher than the usable range, check the following:

1. Carbon build-up on the piston head and cylinder head – clean off any carbon on the piston head and cylinder head.
2. Cylinder head gasket, cylinder base gasket – use only the proper gasket for the cylinder head. The use of a gasket of incorrect thickness will change the compression.
3. Valve stem oil seals and piston rings – rapid carbon accumulation in the combustion chambers may be caused by damaged valve stem oil seals and/or damaged piston oil rings. This may be indicated by white exhaust smoke.
4. Cylinder head volume (Pg. 174).

If cylinder compression is lower than the usable range, check the following:

1. Gas leakage around the cylinder head – replace the damaged gasket and check the cylinder head warp (Pg. 174).
2. Condition of the valve seating (Pg. 177).
3. Valve clearance (Pg. 12).
4. Piston/cylinder clearance, piston seizure
5. Piston ring, piston ring groove

### *Cylinder, piston wear*

Since there is a difference in cylinder wear in different directions, take a side-to-side and a front-to-back measurement at each of the 3 locations (total of 6 measurements) shown in Fig. H52. If any of the cylinder inside diameter measurements exceeds the service limit, the cylinder will have to be bored to oversize and then honed. However, if the amount of boring necessary would make the inside diameter greater than 62.5 mm, the cylinder block must be replaced.

**Cylinder Inside Diameter** (H52)

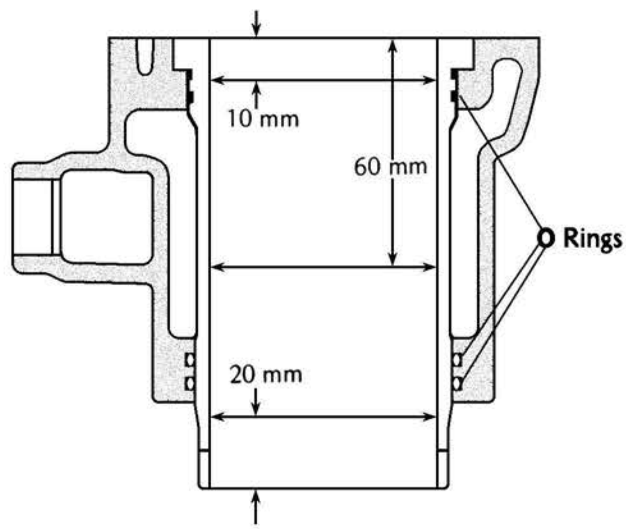



**Table H28 Cylinder Inside Diameter**

| | |
|---|---|
| Service Limit | 62.10 mm, or more than 0.05 mm difference between any two measurements |

Measure the outside diameter of each piston 5 mm up from the bottom of the piston at a right angle to the direction of the piston pin. If the measurement is under the service limit, replace the piston.

**NOTE**: Abnormal wear such as a marked diagonal pattern across the piston skirt may mean a bent connecting rod or crankshaft.

**Piston Diameter Measurement**

(H53)

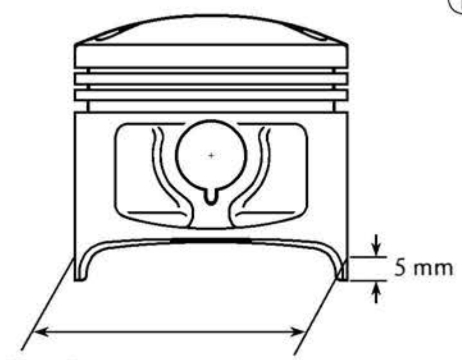



**Table H29 Piston Diameter**

| | |
|---|---|
| Service Limit | 61.80 mm |

Table H28 applies only to a cylinder that has not been bored to oversize, and Table H29 applies only to the standard size piston. For the service limit of a bored cylinder and oversize piston, see the "Boring, honing" paragraph.

**NOTE**: Whenever a piston or cylinder block has been replaced with a new one, the motorcycle must be broken in the same as with a new machine.

### *Piston/cylinder clearance*

The piston-to-cylinder clearance is measured whenever a piston or the cylinder block is replaced with a new one, or whenever a cylinder is rebored and an oversize piston installed. The standard piston-to-cylinder clearance must be adhered to whenever the cylinder block is replaced or a cylinder rebored. If only a piston is replaced, the clearance may exceed the standard slightly. But it must not be less than the minimum, in order to avoid piston seizure.

The most accurate way to find the piston clearance is by making separate piston and cylinder diameter measurements and then computing the difference between the two values. Measure the piston diameter as just described, and measure the cylinder diameter at the very bottom of the cylinder.

**Table H30 Piston/Cylinder Clearance**

| | |
|---|---|
| Standard | 0.031 ~ 0.058 mm |

### *Boring, honing*

When boring and honing a cylinder, note the following:

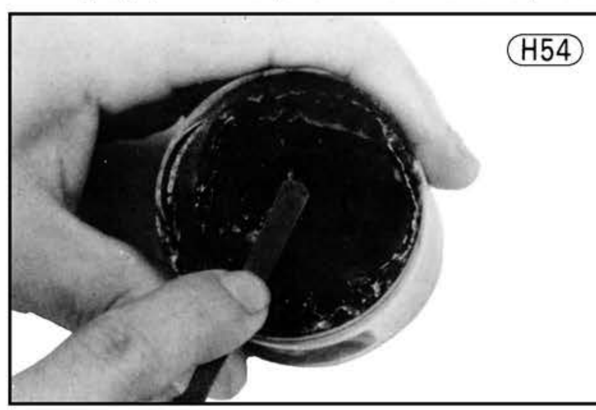
1. Before boring a cylinder, first measure the exact diameter of the oversize piston, and then, in accordance with the standard clearance given in Table H30, determine the diameter of the rebore.
2. Never separate the liners from the cylinder when boring and honing the liners, because the top surface of cylinder and liners is machined at the factory as an assembly to get the proper surface.
3. Cylinder inside diameter must not vary more than 0.01 mm at any point.
4. 0.5 mm oversize pistons are available. Oversize pistons require oversize rings.
5. Be wary of measurements taken immediately after boring since the heat affects cylinder diameter.
6. In the case of a rebored cylinder and oversize piston, the service limit for the cylinder is the diameter that the cylinder was bored to plus 0.1 mm and the service limit for the piston is the oversize piston original diameter minus 0.15 mm. If the exact figure for the rebored diameter is unknown, it can be roughly determined by measuring the diameter at the base of the cylinder.

### *Piston/cylinder seizure*

Remove the cylinder block and pistons to check the damage. If there is only slight damage, the piston may be smoothed with #400 emery cloth, and any aluminum deposits removed from the cylinder with either #400 emery cloth or light honing. However, in most cases, the cylinder will have to be bored to oversize and honed, and an oversize piston installed.

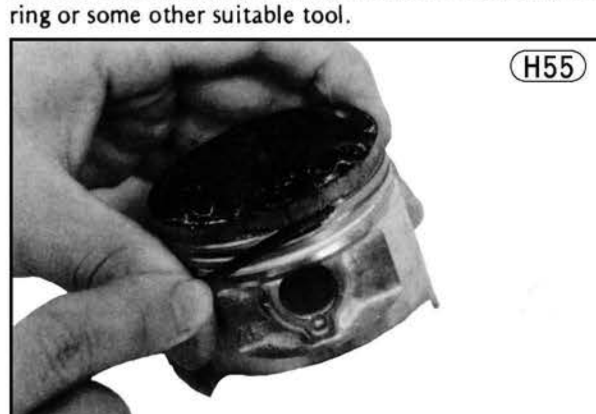
### *Piston cleaning*

Built-up carbon on the piston head reduces the cooling capability of the piston and raises compression, leading to overheating which could possibly even melt the top of the piston. To decarbonize the piston head, remove the piston (Pg. 77), scrape off the carbon, and then lightly polish the piston with fine emery cloth.



(H54)

Carbon accumulated in the piston ring grooves can cause the rings to stick. Remove the rings, and clean out any carbon deposits using an end of a broken piston ring or some other suitable tool.



(H55)

**CAUTION 1. When removing carbon, take ample care not to scratch the side of the piston, or the piston ring grooves.**

**2. Never clean the piston heads with the engine assembled. If the carbon is scraped from the piston heads with the cylinder left in place, carbon particles will unavoidably drop between the pistons and cylinder walls onto the rings and eventually find their way into the crank chamber. Carbon particles, which are very abrasive, drastically shorten the life of the rings, pistons, cylinders, crankshaft bearings, and oil seals.**

### *Piston ring, piston ring groove wear*

Visually inspect the piston rings and the piston ring grooves. If the rings are worn unevenly or damaged, they must be replaced. If the piston ring grooves are worn unevenly or damaged, the piston must be replaced and fitted with new rings.

With the piston rings in their grooves, make several measurements with a thickness gauge to determine piston ring/groove clearance. If the clearance exceeds the service limit, measure the thickness of the piston rings and the width of the ring grooves. If the ring has worn down to less than the service limit, replace the ring; if the groove width exceeds the service limit, replace the piston.


**A. Thickness Gauge**

**Table H31 Piston Ring/Groove Clearance**

| | Top | 2nd |
|---|---|---|
| Service Limit | 0.17 mm | 0.16 mm |

**Table H32 Piston Ring Thickness**

| | |
|---|---|
| Service Limit (Top & 2nd) | 0.90 mm |

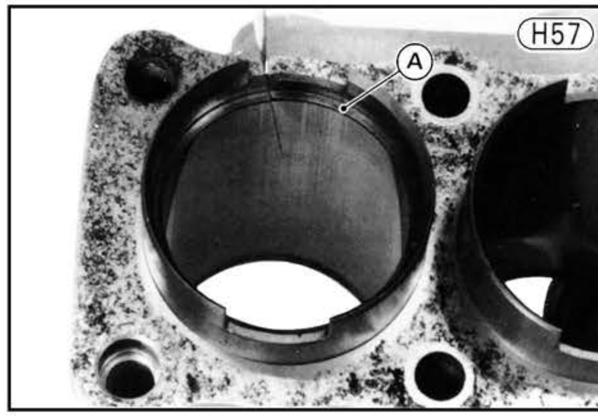
**Table H33 Piston Ring Groove Width**

| | Top | 2nd | Oil |
|---|---|---|---|
| Service Limit | 1.12 mm | 1.11 mm | 2.61 mm |

When new rings are being fitted into a used piston, check for uneven groove wear by inspecting the ring seating. The rings should fit perfectly paralled to the groove surfaces. If not, the piston must be replaced.

### *Piston ring end gap*

Place the piston ring inside the cylinder, using the piston to locate the ring squarely in place. Set it close to the bottom of the cylinder, where cylinder wear is low. Measure the gap between the ends of the ring with a thickness gauge. If the gap is wider than the service limit, the ring is overworn and must be replaced.




**A. Piston Ring**

**Table H34 Piston Ring End Gap**

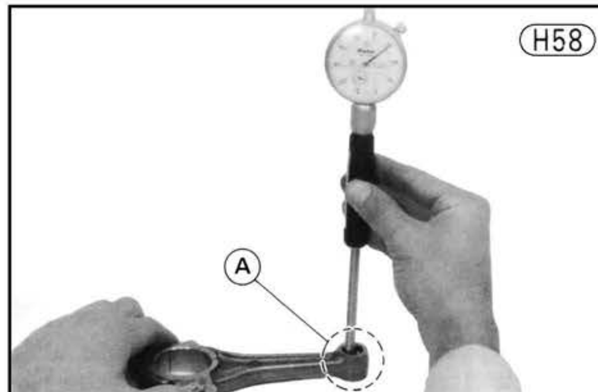
| | |
|---|---|
| Service Limit (Top & 2nd) | 0.7 mm |

**NOTE:** The service limit is effective also for the bored cylinder, oversize piston, and piston rings.

### *Piston, piston pin, connecting rod wear*

Measure the diameter of the piston pin with a micrometer, and measure the inside diameter of both piston pin holes in the piston. If the piston pin diameter is less than the service limit at any point, replace the piston pin. If either piston pin hole diameter exceeds the service limit, replace the piston.

Measure the inside diameter of the connecting rod small end. If the diameter exceeds the service limit, replace the connecting rod.




**A. Connecting Rod Small End**

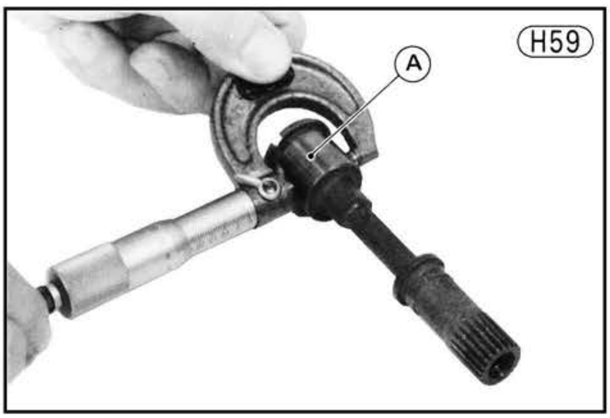
**Table H35 Piston Pin, Piston Pin Hole, Small End Diameter**

| | Pin | Pin Hole | Small End |
|---|---|---|---|
| Service Limit | 14.96 mm | 15.07 mm | 15.05 mm |

**NOTE:** When a new piston or pin is used, also check that piston-to-pin clearance is 0.006 ~ 0.015 mm, and that pin to small end clearance is within 0.005 ~ 0.020 mm.

### *Water pump drive shaft journal wear*

Measure the diameter of water pump drive shaft journal with a micrometer. If the journal diameter is less than the service limit at any point, replace the water pump drive shaft.



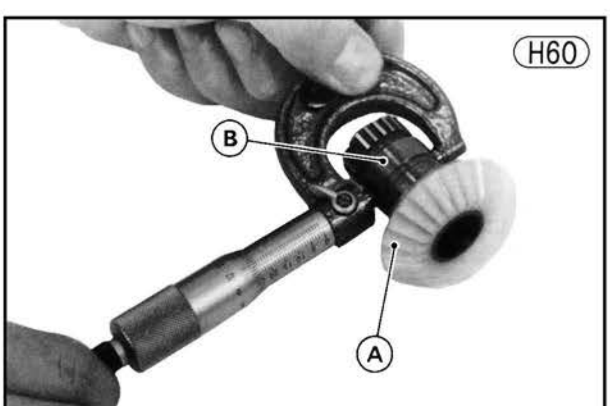

**A. Water Pump Drive Shaft Journal**

**Table H36 Water Pump Drive Shaft Journal Diameter**

| | |
|---|---|
| Service Limit | 23.95 mm |

### *Water pump drive bevel gear inspection, and journal wear*

Visually inspect the water pump drive bevel gear tooth and measure the diameter of the journal with a micrometer. If there is any abnormal damage or wear on the tooth and/or the journal diameter is less than one of service limit at any point, replace the water pump drive bevel gear.




**A. Bevel Gear Tooth** **B. Bevel Gear Journal**

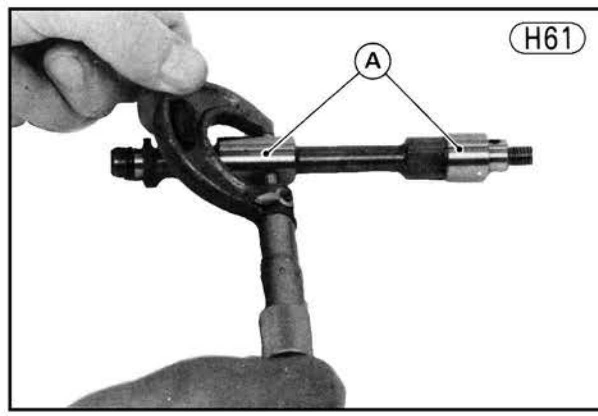
**Table H37 Water Pump Drive Bevel Gear Journal Diameter**

| | |
|---|---|
| Service Limit | 23.94 mm |

### *Water pump bevel gear inspection, water pump shaft journal wear*

Visually inspect the water pump bevel gear. If there is any abnormal damage or wear, replace it.

Measure two water pump shaft journal diameters with a micrometer. If the diameter is less than the service limit at any point, replace the water pump shaft.




**A. Water Pump Shaft Journals**

**Table H38 Water Pump Shaft Journal Diameter**

| | |
|---|---|
| Service Limit | 16.96 mm |

### *Timing advancer drive gear inspection*

Visually inspect the gear teeth. If there is any abnormal damage and/or wear, replace the gear.

### *Cylinder bearing hole wear*

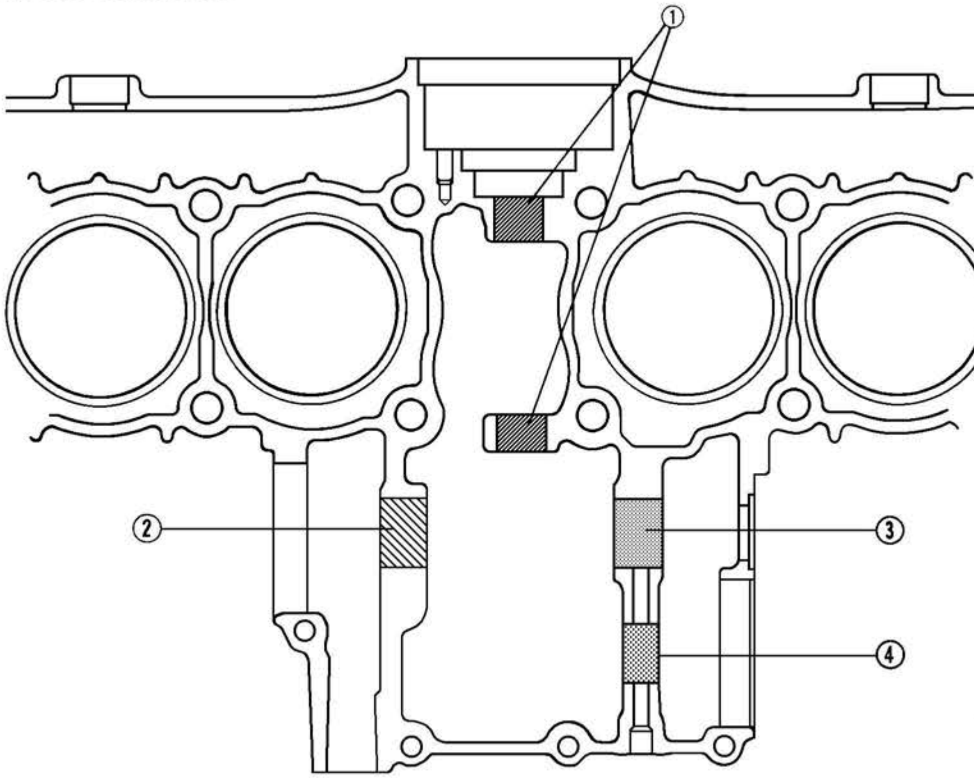
Measure the five bearing inside diameters where the water pump drive shaft, water pump drive bevel gear, water pump shaft and timing advancer shaft are supported in the cylinder. If the any of the diameters exceed the service limit, replace the cylinder.

**Table H39 Cylinder Bearings Inside Diameter**

| | Service Limit |
|---|---|
| for Water Pump Drive Shaft | 24.04 mm |
| for Water Pump Drive Bevel Gear | 24.04 mm |
| for Water Pump Shaft | 17.04 mm |
| for Timing Advancer Shaft | 20.04 mm |

**Cylinder Bearing Holes**

(H62)




1. Water Pump Shaft Bearings
2. Water Pump Drive Shaft Bearing
3. Water Pump Drive Bevel Gear Bearing
4. Timing Advancer Shaft Bearing

## CRANKSHAFT, CONNECTING RODS, PRIMARY CHAIN

The torsion damper (also called vibration damper) is installed on the left end of the crankshaft. The damper absorbs torsional vibration (oscillating twisting motion) of the crocked crankshaft, and prevents the crankshaft from being subjected to intense stress, which is caused if the damper is not installed. The torsion damper consists of three parts; the inner part of the hub ③, damper rubber ②, and outer part of the rim ①. The torsion damper absorbs twisting motion of the crankshaft by vibrating the rim on the hub.

Crankshaft or connecting rod trouble, such as worn crankshaft journals or a bent connecting rod, will multiply the stress caused by the intermittent force on the pistons. This results in not only rapid crankshaft bearing wear, but also noise, power loss, vibration, and shortened engine life. A defective crankshaft or connecting rod should always be detected at an early stage and then replaced immediately.

The following explanation concerns the most common crankshaft and connecting rod problems, giving the procedure for detecting damage and measuring wear and runout.

### *Connecting rod big end side clearance*

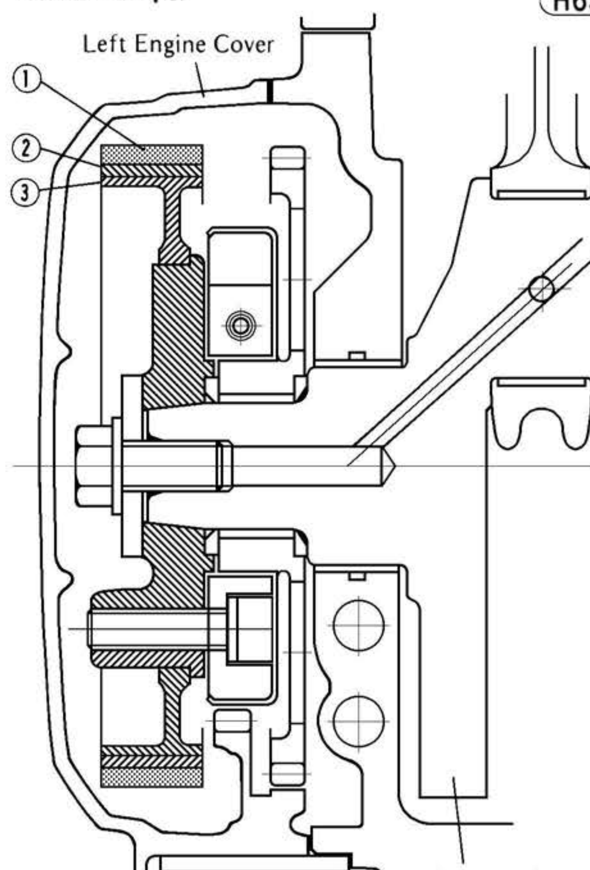
Split the crankcase, and measure the side clearance of the connecting rod big end with a thickness gauge as shown. Replace the crankshaft and the connecting rod if the clearance exceeds the service limit.

**Table H40 Big End Side Clearance**

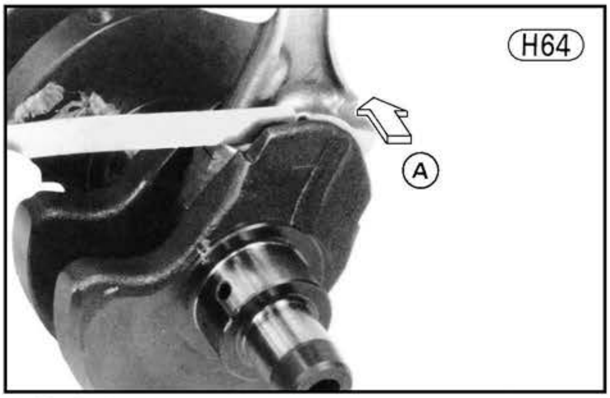
| | |
|---|---|
| Service Limit | 0.50 mm |

**Torsion Damper**

(H63)




1. Rim
2. Damper Rubber
3. Hub



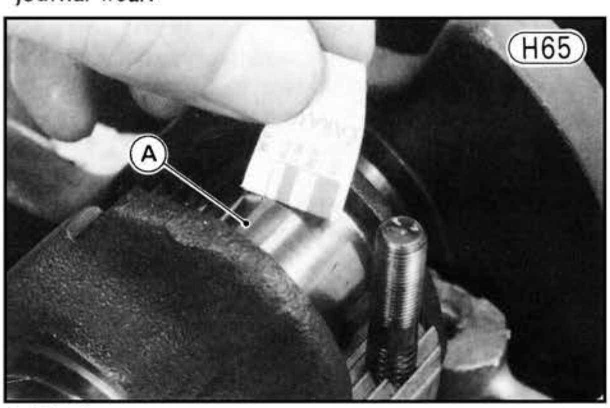

**A. Push the big end.**

## *Connecting rod bearing insert/journal wear*

Bearing insert wear is measured using a plastigauge (press gauge), which is inserted into the clearance to be measured. The plastigauge indicates the clearance by the amount it is compressed and widened when the parts are assembled.

**NOTE**: Do not turn the crankshaft during clearance measurement.

- Split the crankcases, and remove the connecting rod big end caps.
- Wipe each journal and insert surface clean of oil.
- Cut strips of plastigauge to bearing insert width. Place a strip on the connecting rod big end journal for each connecting rod parallel to the crankshaft so that plastigauge will be compressed between the bearing insert and the connecting rod journal.
- Install the connecting rod big end caps, tightening the nuts and bolts in the correct sequence to the specified torque (Pg. 112).
- Remove the connecting rod big end cap, and measure the plastigauge width to determine the bearing insert/journal wear.




**A. Plastigauge**

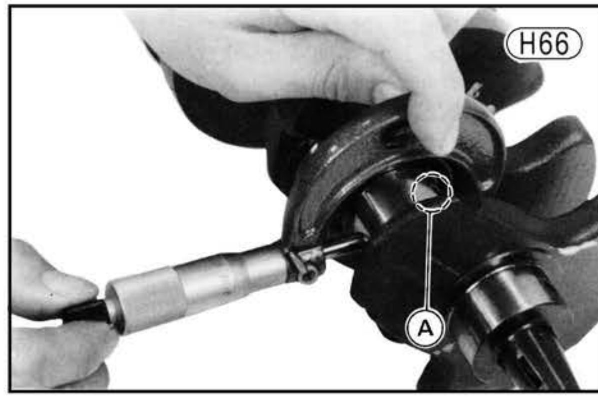
**Table H41 Connecting Rod Bearing Insert/ Journal Clearance**

| | |
|---|---|
| Service Limit | 0.10 mm |

If the clearance exceeds the service limit, replace the bearing inserts as follows:

- With a micrometer, measure the diameter of the crankshaft journals on which the connecting rods fit.
- Mark each flywheel in accordance with the journal diameter (Table H42). If the measurement is less than the service limit, replace the crankshaft. If the measurement is less than the standard value, but is not under the service limit; use bearing inserts painted green.

**NOTE:** Any mark already on the flywheel should not be referred to during servicing.




**A. Avoid the oil hole for measurement.**

**Table H42 Connecting Rod Journal Diameter**

| Marking | Standard | Service Limit |
|---|---|---|
| No mark | 35.984~35.994 mm | 35.97 mm |
| ○ | 35.995~36.000 mm | |

- Put the connecting rod big end caps on the rods and tighten the nuts and bolts in the correct sequence to the specified torque (Pg. 112).
- Measure the inside diameter, and mark each connecting rod big end in accordance with the inside diameter (Table H43).

**NOTE:** The mark already on the big end should almost coincide with the measurement.

**Table H43 Connecting Rod Big End Diameter**

| Marking | Standard |
|---|---|
| ○ | 39.009~39.016 mm |
| No Mark | 39.000~39.008 mm |

- Select the proper bearing insert in accordance with the combination of the connecting rod and crankshaft coding.

**Table H44 Bearing Insert Selection**

| Con-Rod Marking / Crank-Shaft Marking | ○ | No Mark |
|---|---|---|
| ○ | Black P/N 92028-1050 | Brown P/N 92028-1051 |
| No Mark | Green P/N 92028-1049 | Black P/N 92028-1050 |

**Table H45 Bearing Insert Thickness**

| Color | Standard |
|---|---|
| Green | 1.485~1.490 mm |
| Black | 1.480~1.485 mm |
| Brown | 1.475~1.480 mm |

### *Connecting rod bend, twist*

- Remove the connecting rod big end bearing inserts and install the connecting rod big end cap.
- Select an arbor of the same diameter as the connecting rod big end and of optional length, and insert it through the big end of the connecting rod.
- Select an arbor of the same diameter as the piston pin and of optional length, and insert it through the small end of the connecting rod.
- On a surface plate, set the big-end arbor on **V** blocks so that the connecting rod is perpendicular to the surface plate as shown in the figure.
- Using a height gauge or dial gauge, measure the difference in the height of the small-end arbor above the surface plate over a 100 mm length to determine the amount the connecting rod is bent.
- If the measurement exceeds the service limit, replace the connecting rod.

**Connecting Rod Bend Measurement** (H67)

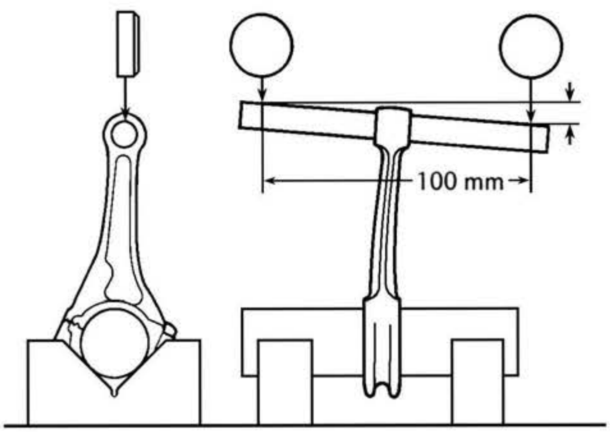



**Table H46 Connecting Rod Bend/100 mm**

| | |
|---|---|
| Service Limit | 0.2 mm |

- Swing the connecting rod 90° to one side and support it parallel to the surface plate as shown in the figure.
- Measure the difference in the height of the small-end arbor above the surface plate over a 100 mm length to determine the amount the connecting rod is twisted.
- If the measurement exceeds the service limit replace the connecting rod.

**Connecting Rod Twist Measurement** (H68)

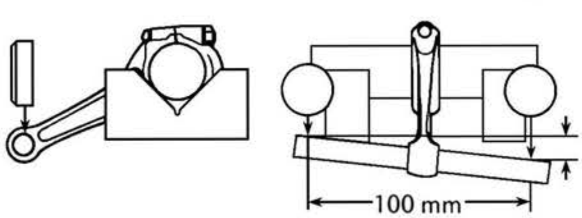



**Table H47 Connecting Rod Twist/100 mm**

| | |
|---|---|
| Service Limit | 0.2 mm |

### *Crankshaft runout*

- Set the crankshaft in a flywheel alignment jig or on **V** blocks, and place a dial gauge against each crankshaft journal.
- Turn the crankshaft slowly. The maximum difference in gauge readings is the crankshaft runout.
- If the measurement exceeds the service limit, replace the crankshaft.

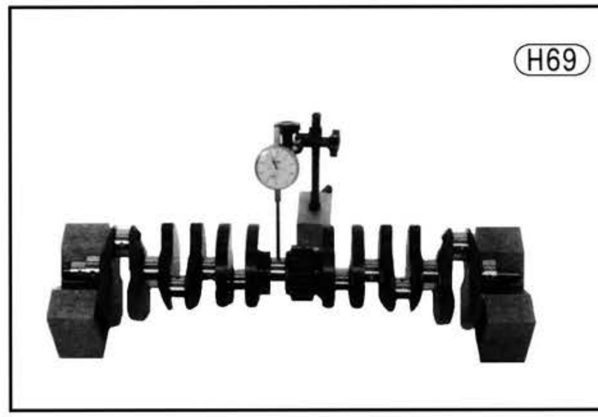



**Table H48 Crankshaft Runout**

| | |
|---|---|
| Service Limit | 0.08 mm |

### *Crankshaft bearing insert/journal wear*

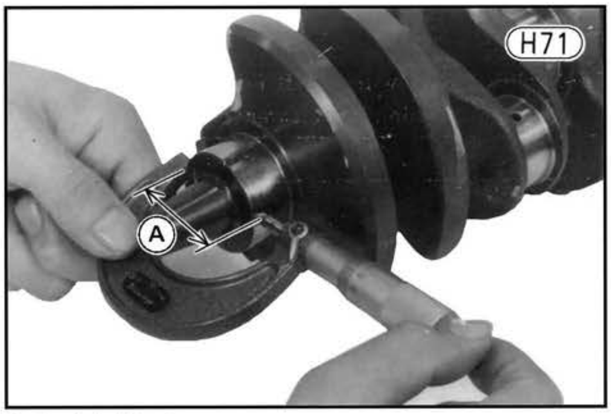
- Split the crankcase, and clean off the mating surfaces of the crankcase halves.
- Cut strips of plastigauge to bearing insert width. Place a strip on each journal parallel to the crankshaft so the plastigauge will be compressed between the bearing insert and the crankshaft journal.
- Install the lower crankcase half without turning the crankshaft, and tighten the bolts in the correct sequence to the specified amount of torque (Pg. 101).
- Remove the lower crankcase half (making sure that the crankshaft does not turn at any time), and measure the plastigauge width to determine the bearing insert/journal wear.
- If any clearance exceeds the service limit, replace all bearing inserts (14), and check the crankshaft journals.


**A. Plastigauge**

**Table H49 Crankshaft Bearing Insert/ Journal Clearance**

| | |
|---|---|
| Service Limit | 0.11 mm |

- Measure the journal diameters which wear on these bearing inserts. If the micrometer reading is less than the service limit, replace the crankshaft.



A. Avoid oil hole.

**Table H50 Crankshaft Journal Diameter**

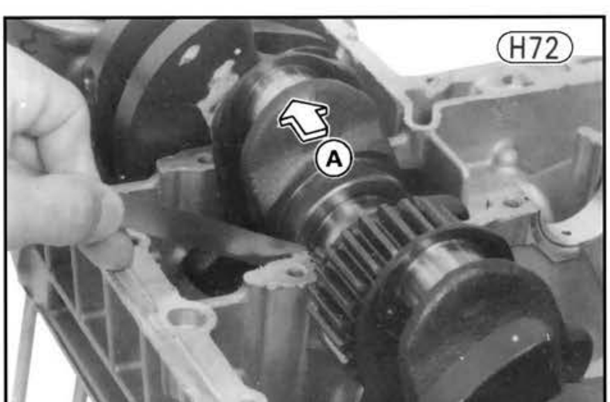
| | |
|---|---|
| Service Limit | 39.96 mm |

### *Crankshaft side clearance*

Both sides of the #4 crankshaft bearing work as thrust bearings (stoppers of crankshaft axial movement).

Measure the crankshaft side clearance with a thickness gauge as shown. Replace the crankcase halves as a set, if the clearance exceeds the service limit.

**NOTE:** The upper crankcase and lower crankcase halves are machined at the factory in the assembled state, so they must be replaced as a set.



A. Push the crankshaft toward one side.

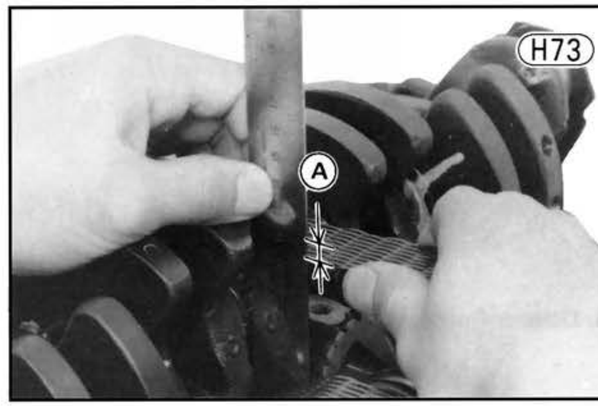
**Table H51 Crankshaft Side Play**

| | |
|---|---|
| Service Limit | 0.50 mm |

### *Primary chain wear*

A primary chain which has worn so that it is 1.4% or more longer than when new is no longer safe for use and should be replaced. Inspect the chain wear by measuring the chain slack.

Split the crankcases, and measure the chain slack (the vertical movement midway between the sprockets). Replace the chain if it has worn past the service limit.



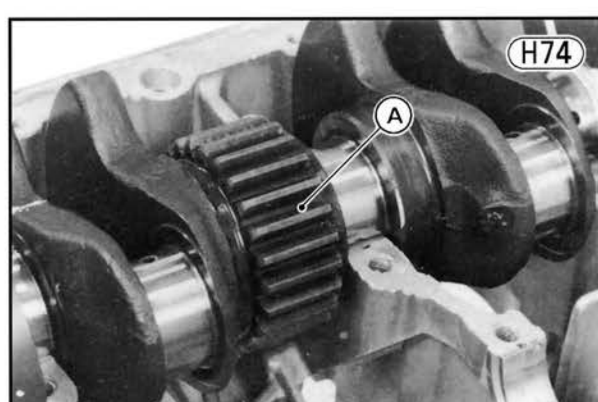
A. Measure at the center.

**Table H52 Primary Chain Slack**

| | |
|---|---|
| Service Limit | 22 mm |

### *Primary chain drive sprocket damage*

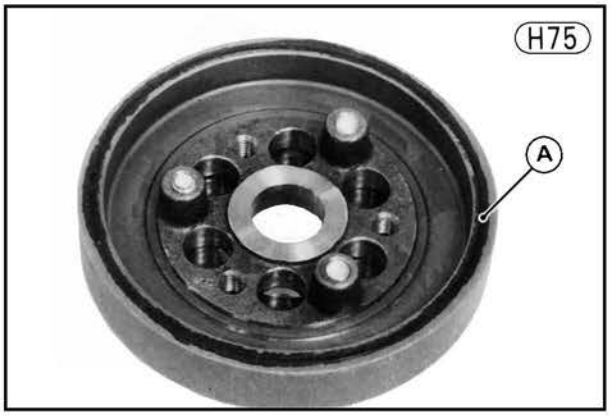
Inspect the teeth on the primary chain drive sprocket (located at the center of the crankshaft). Any light damage can be corrected with an oilstone, but the crankshaft must be replaced if the teeth are badly damaged. Damaged teeth on the primary chain drive sprocket indicate that the primary chain, by which it is driven, may also be damaged. At the same time that the primary chain drive sprocket is repaired or replaced, the primary chain and the primary chain driven sprocket (located on the secondary shaft) should be inspected, and then replaced if necessary.



A. Primary Chain Drive Sprocket

### *Torsion damper inspection*

Check the torsion damper for deformation or any other damages. Check the damper rubber if it is not cracked or otherwise damaged. If there is any damage on the torsion damper by visual check, replace it.




**A. Damper Rubber**

## SECONDARY SHAFT, SECONDARY CHAIN, TIMING CHAIN

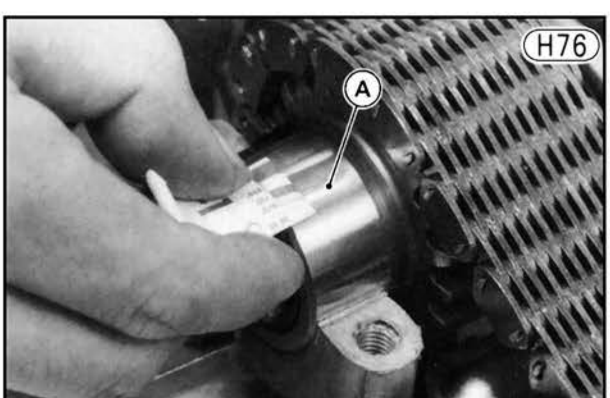
The secondary shaft has the oil pump drive gear, timing chain and cam chain sprockets, coupling, and secondary chain drive sprocket on it.

It is supportedby two journals on the timing chain and cam chain sprockets and secondary chain drive sprocket.

The timing chain transfers power to the oil pump drive shaft for working the oil pump and timing advancer.

### *Secondary shaft bearing insert/journal wear*

- Split the crankcases, and clean off the each journal, bearing inserts, and mating surface of crankcase halves.
- Cut strips of plastigauge to each bearing insert width. Place strips on each journals parallel to the secondary shaft so the plastigauge strips will be compressed between the bearing inserts and the crankshaft journals.



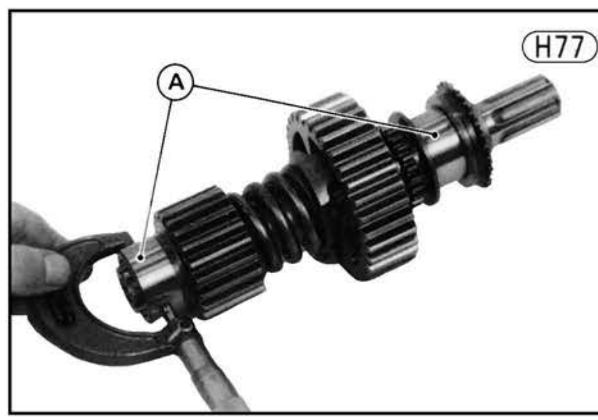

**A. Plastigauge**

- Install the lower crankcase half without turning the secondary shaft, and tighten the bolts in the correct sequence to the specified amount of torque (Pg. 101).
- Remove the lower crankcase half (making sure that the crankshaft does not turn at any time), and measure each plastigauge width to determine the bearing insert/journal wear.
- If any clearance exceeds the service limit, replce all bearing inserts (4), and check the secondary shaft journals.

**Table H53 Secondary Shaft Bearing Insert/ Journal Clearance**

| | |
|---|---|
| Service Limit | 0.11 mm |

- Measure the journal diameters. If the micrometer reading is less than the service limit, replace the timing chain and cam chain sprockets, and/or the secondary chain drive sprocket.



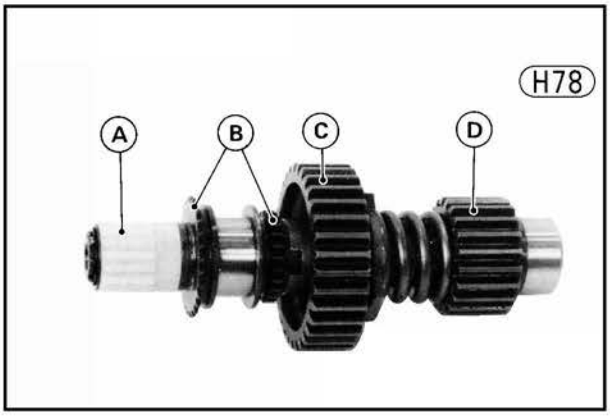

**A. Journals**

**Table H54 Secondary Shaft Journal Diameter**

| | |
|---|---|
| Service Limit | 39.96 mm |

### *Primary chain driven sprocket, timing chain and cam chain sprockets, secondary chain drive sprocket, oil pump drive gear*

Visually inspect the teeth on each sprocket and gear. Any light damage can be corrected with an oilstone, but the sprockets and gear must be replaced if the teeth are badly damaged. Damaged teeth on each sprocket indicates that the chain which runs on the sprocket may also be damaged. When these sprockets and gear are repaired or replaced, the corresponding gear or sprocket on the same chain should also be inspected, and repaired or replaced as necessary.




**A. Oil Pump Drive Gear**
**B. Timing Chain and Camshaft Chain Sprockets**
**C. Primary Chain Driven Sprocket**
**D. Secondary Chain Drive Sprocket**

Visually inspect the bushes of timing chain and cam chain sprockets. If there is any significant damage or wear, replace the sprockets. At the same time, check and replace the secondary shaft, if necessary.

### *Cam damper spring, cam damper*

Measure the cam damper spring free length with a vernier caliper. If the length is less than the service limit, replace it.

**Table H56 Damper Spring Free Length**

| | |
|---|---|
| Service Limit | 41.0 mm |

Visually inspect the cam of the primary chain driven sprocket and cam follower. If there is significant damage or wear, (for example, "stepped" wear stratches, etc.) replace the sprocket and follower as necessary.

### *Secondary chain wear*

Measure the chain slack (the vertical movement midway between the sprockets). Replace the chain if it has worn past the service limit.


**A. Measure at the center**

**Table H55 Secondary Chain Slack**

| | |
|---|---|
| Service Limit | 21 mm |

### *Timing chain, timing chain tensioner, timing chain guide*

Timing chain transmits the power from the secondary shaft to oil pump drive shaft to work the water pump and timing advancer shaft.

The tensioner consists of a push rod, spring, tensioner body, and bolt.

### *Timing chain wear*

Hold the chain taut with a force of about 5 kg in some manner, and measure a 20-link length. Since timing chain may wear unevenly, take measurements at several places. If any measurement exceeds the service limit, replace the chain.

**Timing Chain Measurement**

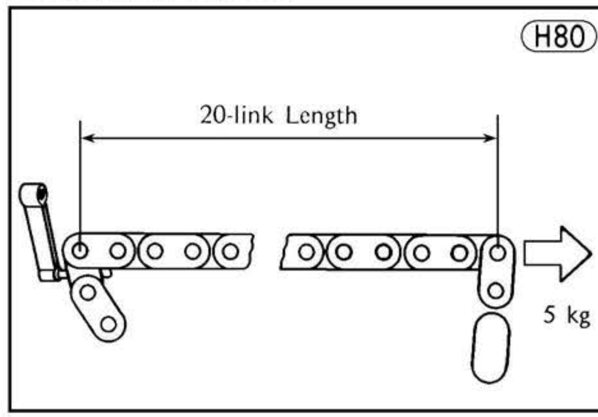



**Table H57 Timing Chain 20-link Length**

| | |
|---|---|
| Service Limit | 128.9 mm |

### *Chain tensioner inspection*

Remove the timing chain tensioner. Visually inspect the push rod and the tensioner body hole. If there is any damage, replace it.

Measure the spring free length. Replace the spring if the free length exceeds the service limit.


**Table H58 Chain Tensioner Spring Free Length**

| | |
|---|---|
| Service Limit | 58.6 mm |

*Chain guide wear*

Remove the chain guides, and inspect them visually. Replace a guide if the rubber or any other portion is damaged.

Measure the depth of the grooves where the chain links run. Replace a guide if the wear exceeds the service limit.

**Timing Chain Guide Rubber Wear** (H82)

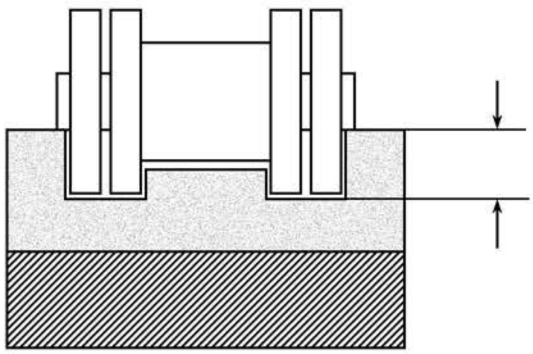


**Table H59 Timing Chain Guide Wear**

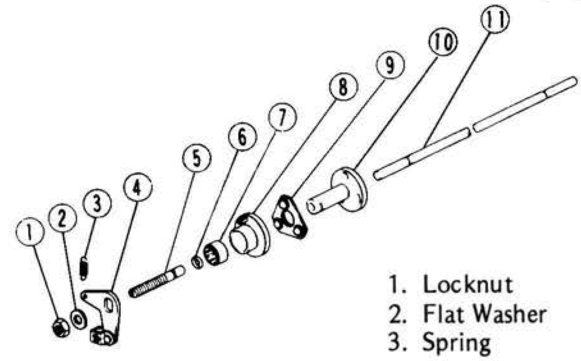
| | |
|---|---|
| Service Limit | 1.5 mm |

## CLUTCH

Fig. H84 shows the construction of clutch, which is a wet, multi-plate type with 9 friction plates ⑧ and 8 steel plates ⑨. The shock damper rubbers are installed in the clutch hub to absorb shock from the drive train.

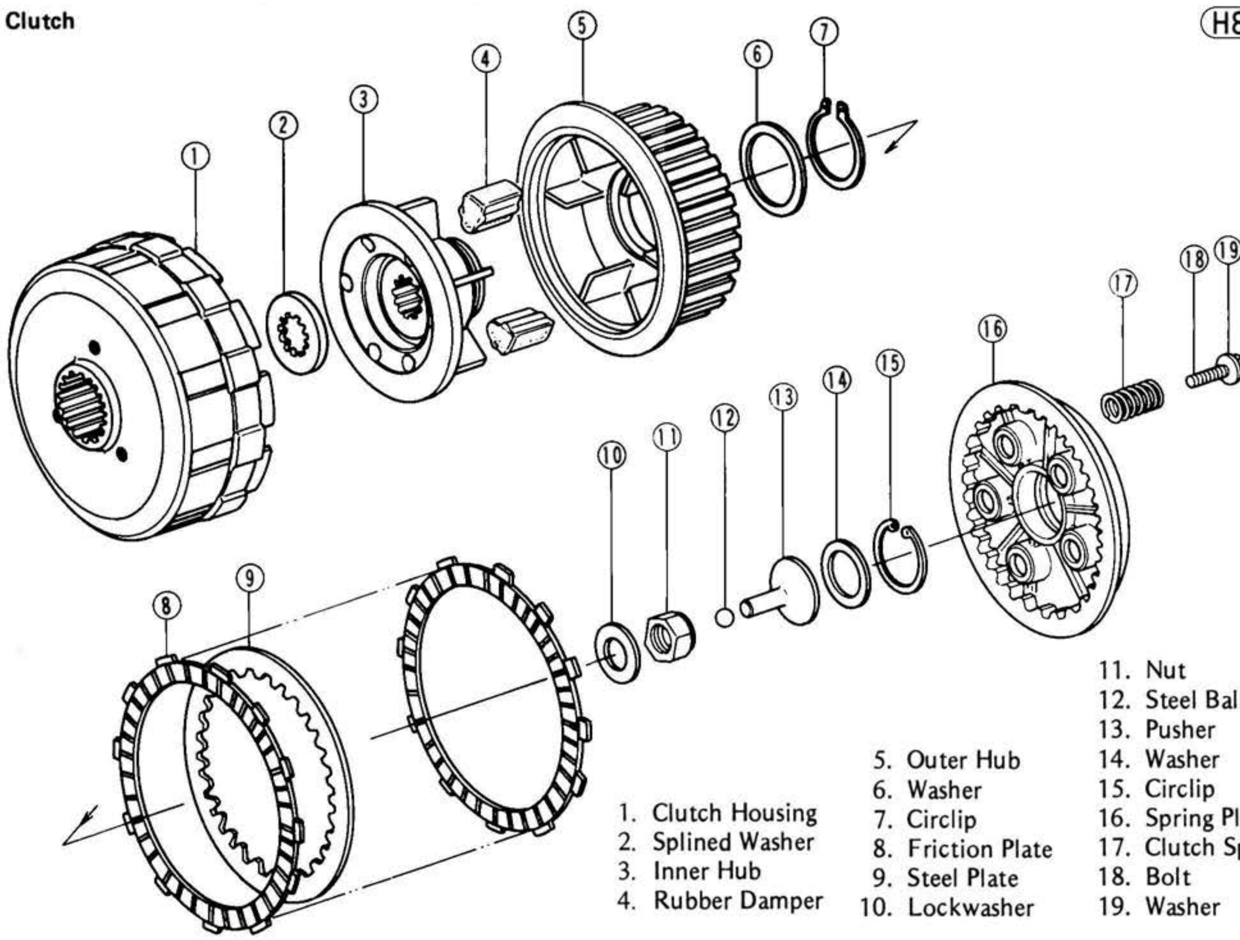
The clutch release mechanism is shown in Fig. H83. When the clutch release lever ④ turns, the inner shaft ⑩ rides on the steel balls ⑨, and the adjusting screw ⑤ pushes the push rod ⑪ toward the clutch. The clutch release assembly is installed in the external shift mechanism cover.

**Clutch Release Mechanism** (H83)




1. Locknut
2. Flat Washer
3. Spring
4. Release Lever
5. Adjusting Screw
6. O Ring
7. Needle Bearing
8. Outer Shaft
9. Ball Assembly
10. Inner Shaft
11. Push Rod

**Clutch** (H84)




1. Clutch Housing
2. Splined Washer
3. Inner Hub
4. Rubber Damper
5. Outer Hub
6. Washer
7. Circlip
8. Friction Plate
9. Steel Plate
10. Lockwasher
11. Nut
12. Steel Ball
13. Pusher
14. Washer
15. Circlip
16. Spring Plate
17. Clutch Spring
18. Bolt
19. Washer

A clutch that does not properly disengage will cause shifting difficulty and possible transmission damage. On the other hand, a slipping clutch will reduce power transmission efficiency and may overheat and burn out. A clutch that does not properly disengage may be caused by:

1. Excessive clutch lever play
2. Clutch plates that are warped or too rough
3. Uneven clutch spring tension
4. Deteriorated engine oil
5. Engine oil viscosity too high
6. Engine oil level too high
7. The clutch housing frozen on the drive shaft
8. A defective clutch release mechanism
9. An unevenly worn clutch hub or housing
10. Missing parts

A slipping clutch may be caused by:

1. No clutch lever play
2. Worn friction plates
3. Weak clutch springs
4. The clutch cable not sliding smoothly
5. A defective clutch release mechanism
6. An unevenly worn clutch hub or housing

Clutch noise may be caused by:

1. Excessively worn primary chain and sprockets
2. Damaged sprocket teeth
3. Too much clearance between the friction plate tangs and the clutch housing
4. Weak or damaged damper spring(s)

### *Spring tension*

Remove the clutch springs, and set them, one at a time, on a spring tension testing device (Fig. H45). Compress the spring, and read the tension at the test length. If the spring tension at the specified length is weaker than the service limit, replace the spring.

**Table H60 Clutch Spring Tension**

| Length | Service Limit |
|---|---|
| 23.5 mm | 24.9 kg |

### *Friction plate wear, damage*

Visually inspect the friction plates to see whether they show any signs of seizure, overheating, or uneven wear. Measure the thickness of the plates with vernier calipers.

If any plates show signs of damage, or if they have worn past the service limit, replace them with new ones.

**Friction Plate Thickness Measurement** (H85)

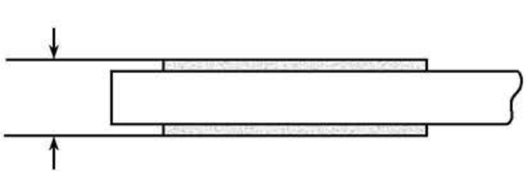


**Table H61 Friction Plate Thickness**

| | |
|---|---|
| Service Limit | 3.2 mm |

### *Clutch plate warp*

Place each clutch plate on a surface plate, and measure the gap between each clutch plate and the surface plate. This gap is the amount of clutch plate warp. Replace any plates warped over the service limit.

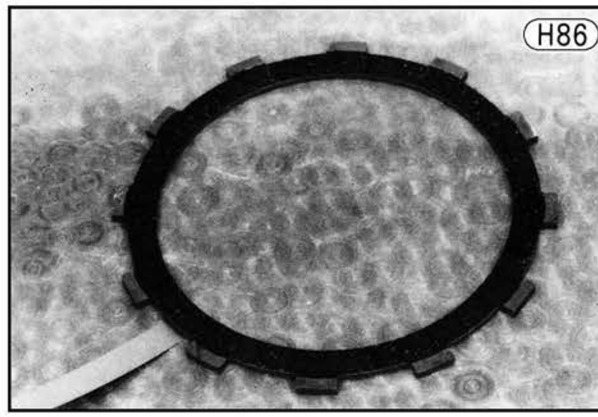

(H86)

**Table H62 Clutch Plate Warp**

| | |
|---|---|
| Service Limit | 0.4 mm |

### *Friction plate/clutch housing clearance*

Measure the clearance between the tangs on the friction plates and the fingers of the clutch housing. If this clearance is excessive, the clutch will be noisy.

If the clearnce exceeds the service limit, replace the friction plates. Also, replace the clutch housing if it is unevenly or badly worn where the friction plates wear against it.

**Friction Plate/Clutch Housing Clearance** (H87)

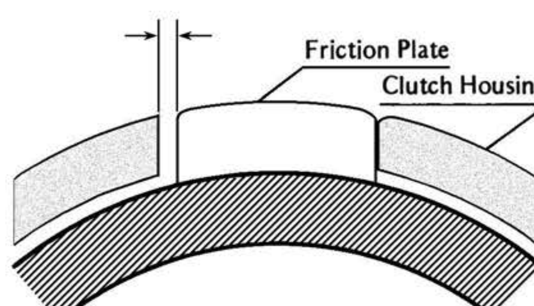



**Table H63 Friction Plate/Clutch Housing Clearance**

| | |
|---|---|
| Service Limit | 0.6 mm |

Inspect the fingers of the housing where the tangs of the friction plates hit them. If they are badly worn or if there are grooves cut where the tangs hit, replace the clutch housing.

### *Clutch hub damage*

Inspect where the teeth on the steel plates wear against the splines of the clutch hub. If there are notches worn into the splines, replace the clutch hub.

### *Shock damper rubber*

Visually inspect the shock damper rubbers. If there is any damage or excessive wear, replace them.

### *Clutch release mechanism wear*

Visually inspect the clutch release lever, balls, and ball ramp for damage or excessive wear. If there is any damage or excessive wear, replace the clutch release lever, balls, and ball ramp as a set.

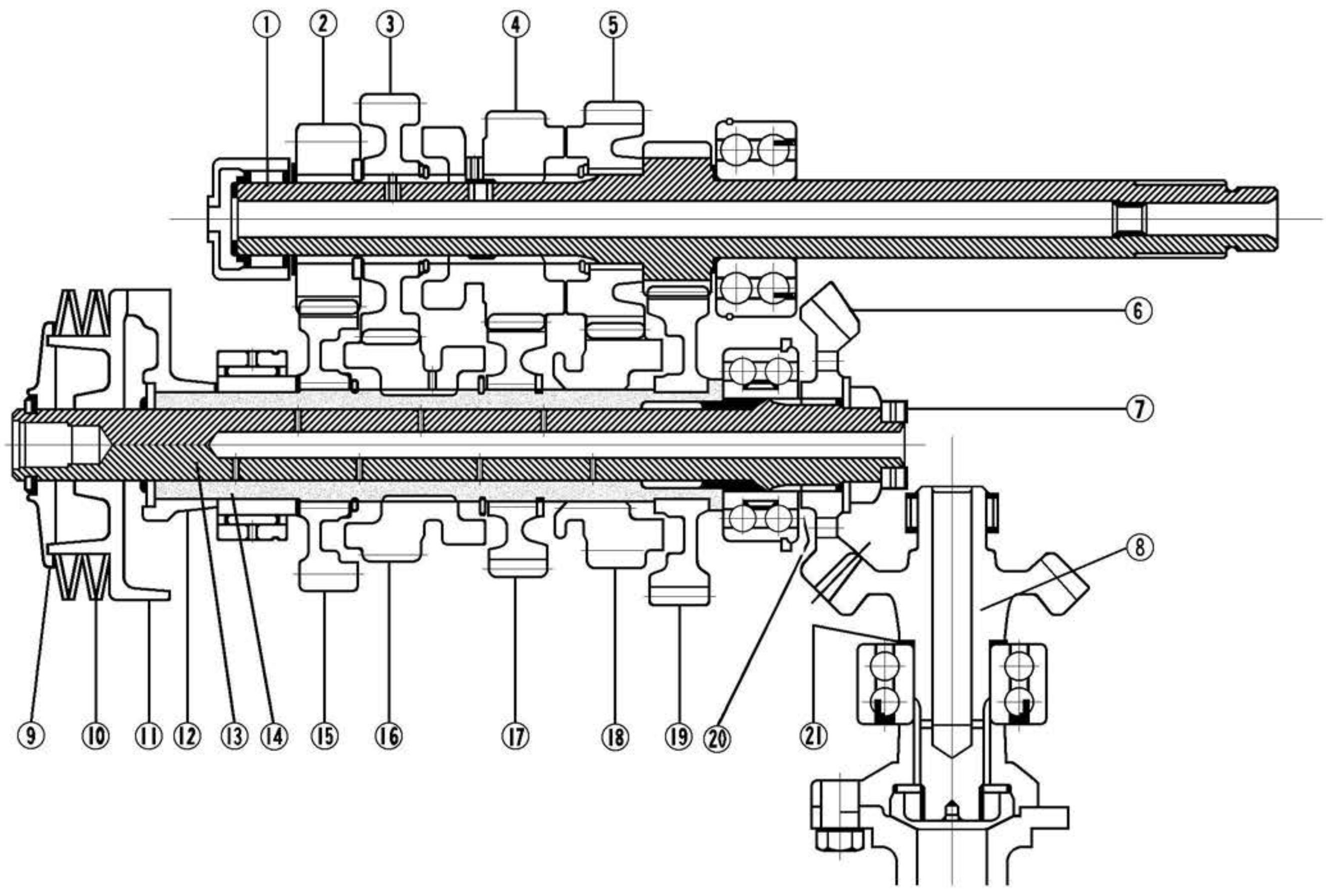
## TRANSMISSION, BEVEL GEARS

The transmission is a 5-speed, constant mesh, return shift type. Its cross section is shown in Fig. H88. The engine rpm is reduced in the transmission, and the power flow changes direction at a right angle (90°) at the bevel gearing, then drives the propeller shaft.

### Cam Damper

The cam damper is installed at the left end of the transmission driven shaft to absorb shocks in the drive train. The driven shaft is divided up into the inner and the outer shafts, and the inner and outer shafts are

**Transmission, Cam Damper, and Bevel Gears** (H88)




1. Drive Shaft
2. Drive 2nd Gear
3. Drive 5th Gear
4. Drive 3rd Gear
5. Drive 4th Gear
6. Driven Shaft Bevel Gear
7. Shim (s)
8. Output Shaft
9. Spring Stop
10. Spring
11. Damper Cam
12. Cam Follower
13. Inner Driven Shaft
14. Outer Driven Shaft
15. Driven 2nd Gear
16. Driven 5th Gear
17. Driven 3rd Gear
18. Driven 4th Gear
19. Driven 1st Gear
20. Shim (s)
21. Shim (s)

coupled by the cam damper. The cam damper includes the cam follower ⑫, damper cam ⑪, springs ⑩, and spring stop ⑨. The cam follower is fixed on the outer shaft, and rotates with the outer shaft and unable to move sideways. The damper cam is serrated, and rotates with the inner shaft but can slide sideways. When shocks reach the cam damper, the cam follower turns relative to the damper cam, absorbing the shocks.

### Spiral Bevel Gears

The bevel gears are a spiral type, and carry higher loads and run more quietly than straight bevel gears. This is due to the following condition: before one tooth rolls out of contact with another, a new tooth contact is made. This distributes the torque load over several teeth, as well as making for quiet operation. The bevel gears are constructed as pairs. Thus, individual gears are not interchangeable. These gears must be replaced as a matched set. Supporting shafts and bearings must be rigid to maintain proper tooth contact.

If the correct alignment of the bevel gears is upset by incorrect shim adjustment or damaged bearing(s), the bevel gears become noisy and eventually break.

Transmission or external shift mechanism damage, causing the transmission to misshift, overshift, and/or jump out of gear, brings about more damage to the transmission and also overrev damage to the engine itself. An improperly functioning transmission or external shift mechanism may be caused by the following:

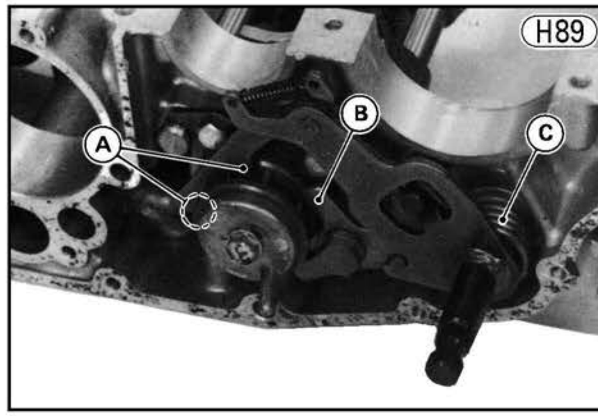
1. Loose return spring pin, and/or broken or weakened return spring
2. Broken or weakened shift drum positioning pin spring
3. Broken or weakened shift pawl spring
4. Damaged shift mechanism arm and/or overshift limiter
5. Loose shift drum bearing holder
6. Bent or worn shift fork(s)
7. Worn shift fork grooves on gears
8. Worn shift fork guide pin(s)
9. Worn shift drum groove(s)
10. Binding of shift drum positioning pin in the positioning bolt.
11. Worn or damaged gear dogs, gear dog holes, and/or gear dog recesses
12. Improperly functioning clutch or clutch release
13. Improper assembly or missing parts

Transmission noise results from the following:

1. Worn or damaged shafts, bearings, gear hubs or teeth, etc.
2. Worn or damaged damper cam, cam follower, or serrated portions of the driven shaft
3. Improper backlash and/or tooth contact pattern of bevel gears

### *External shift mechanism inspection*

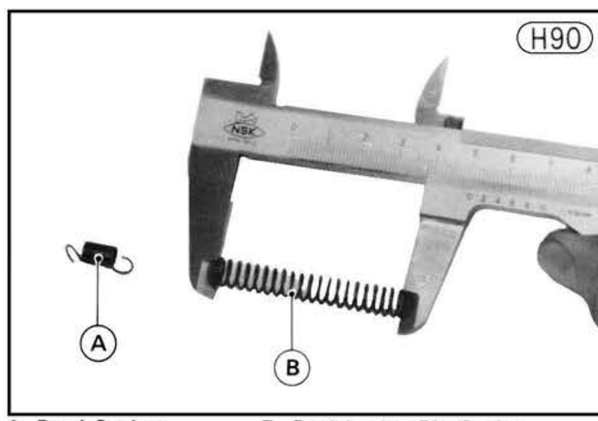
Inspect the shift pawls, overshift limiter, and return spring. Replace any broken or otherwise damaged parts.




**A. Shift Pawls** **C. Return Spring**
**B. Overshift Limiter**

Measure the free length of the pawl spring. If it is longer than the service limit, replace it with a new one.

Measure the free length of the shift drum positioning pin spring. If it is shorter than the service limit, replace it with a new one.




**A. Pawl Spring** **B. Positioning Pin Spring**

**Table H64 Pawl Spring, Positioning Pin Spring Free Length**

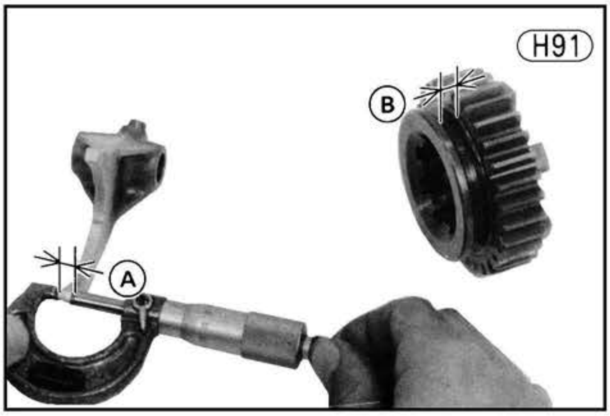
| | Service Limit |
|---|---|
| Pawl Spring | 18.9 mm |
| Positioning Pin Spring | 49.4 mm |

### *Shift fork bending*

Visually inspect the shift forks, and replace any fork that is bent. A bent fork could cause difficulty in shifting or allow the transmission to jump out of gear when under power.

### *Shift fork/gear groove wear*

Measure the thickness of the ears of each shift fork, and measure the width of the shift fork grooves on the gears. If the thickness of a shift fork ear is under the service limit, the shift fork must be replaced. If a gear shift fork groove is worn over the service limit, the gear must be replaced.




**A. Shift Fork Thickness B. Shift Fork Groove Width**

**Table H65 Shift Fork Thickness**

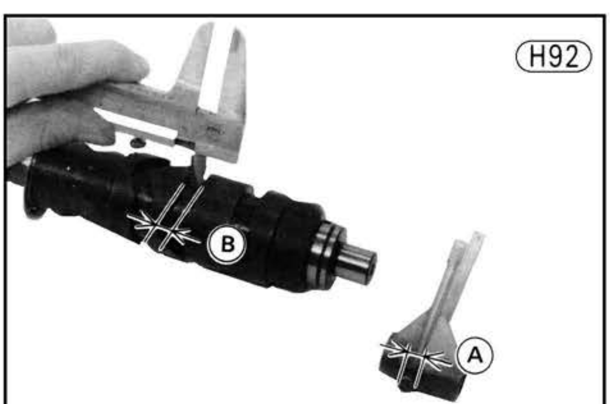
| | |
|---|---|
| Service Limit | 5.7 mm |

**Table H66 Gear Shift Fork Groove Width**

| | |
|---|---|
| Service Limit | 6.25 mm |

### *Shift fork guide pin/shift drum groove wear*

Measure the diameter of each shift fork guide pin, and measure the width of each shift drum groove. Replace any shift fork on which the guide pin has worn past the service limit. If a shift drum groove is worn past the service limit, replace the shift drum.




**A. Guide Pin Diameter B. Shift Drum Groove Width**

**Table H67 Shift Fork Guide Pin Diameter**

| | |
|---|---|
| Service Limit | 7.85 mm |

**Table H68 Shift Drum Groove Width**

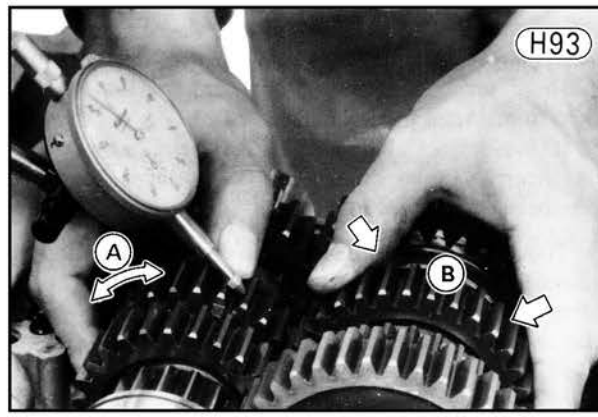
| | |
|---|---|
| Service Limit | 8.25 mm |

### *Shift rod inspection*

Visually inspect the shift rods. If they are badly worn or if they show stepped wear, replace the shift rods.

### *Gear backlash*

- Split the crankcases, leaving the drive shaft and driven shaft assemblies in place.
- To measure the gear backlash, set a dial gauge against the tooth on one gear, and move the gear back and forth lightly while holding the other gear steady.
- The difference between the highest and the lowest gauge reading is the amount of back lash. Replace both gears if the amount of backlash exceeds the service limit.



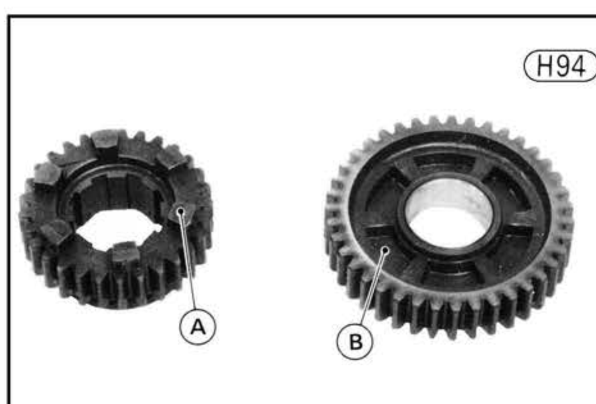

**A. Move back and forth lightly. B. Hold steady.**

**Table H69 Gear Backlash**

| | |
|---|---|
| Service Limit | 0.30 mm |

### *Gear dog, gear dog recess damage*

Visually inspect the gear dog and dog recesses. Replace any gears that have damaged, or unevenly or excessively worn dogs or dog recesses.




**A. Gear Dog B. Dog Recess**

### *Gear/shaft wear*

Measure the diameter of each shaft and bushing with a micrometer, and measure the inside diameter of each gear listed below. Find the difference between the two readings to figure clearance, and replace any gear where clearance exceeds the service limit.


**Table H70 Gear/Shaft, Gear/Bushing Clearance**

| | Gear | Service Limit |
|---|---|---|
| Driven Shaft | 1st, 2nd, and 3rd | 0.17 mm |
| Drive Shaft | 5th | |
| | 4th | 0.16 mm |

### *Shaft bearing, bushing wear, damage*

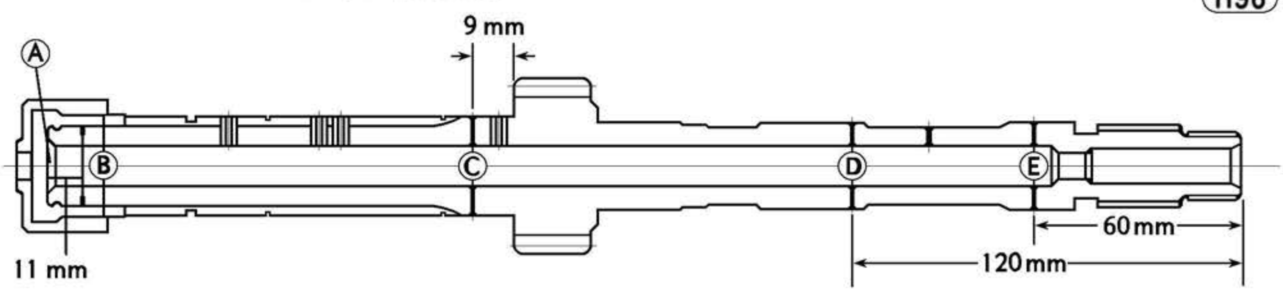
Check all the ball and needle bearings, and bushing of the transmission shafts. See Pg. 209 for ball and needle bearing inspection. If there is any doubt as to the condition of either bearing, replace it. If the bushing is damaged, replace the outer shaft.

Measure the diameter of the drive, driven (inner and outer), and output shafts where it passes through the needle bearing or bushing. Replace the shaft if they wear past the service limit. Measure the inside diameter of the needle bearing outer race and the outer shaft with a cylinder gauge. Replace the needle bearing outer or outer shaft race if the diameter exceeds the service limit. When replacing the shaft and/or needle bearing outer race, replace the needle bearing also.

**Table H71 Drive Shaft and Needle Bearing Wear**

| Location | Service Limit |
|---|---|
| A | 21.96 mm |
| B | 30.04 mm |
| C | 27.94 mm |
| D and E | 24.96 mm |

**Drive Shaft and Needle Bearing Measurement** (H96)




**Inner and Outer Driven Shafts and Needle Bearing Measurement** (H97)

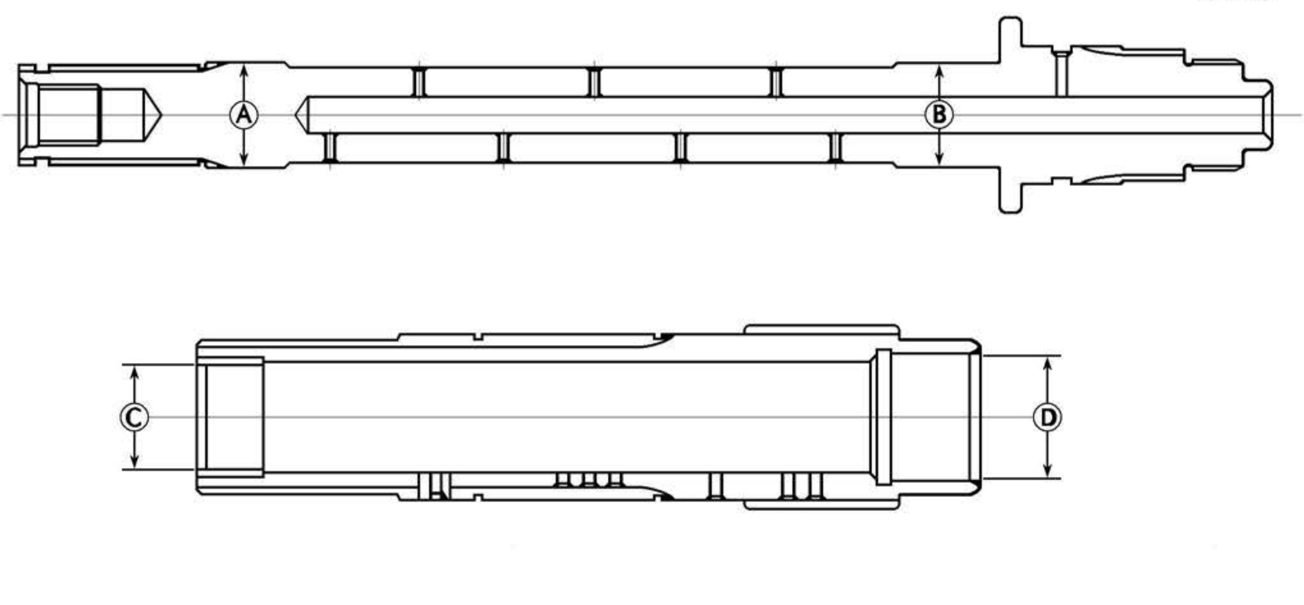


**Table H72 Inner and Outer Driven Shafts and Needle Bearing Wear**

| Location | Service Limit |
|---|---|
| A | 22.94 mm |
| B | 22.97 mm |
| C | 23.04 mm |
| D | 28.03 mm |

**Output Shaft Wear**

H98

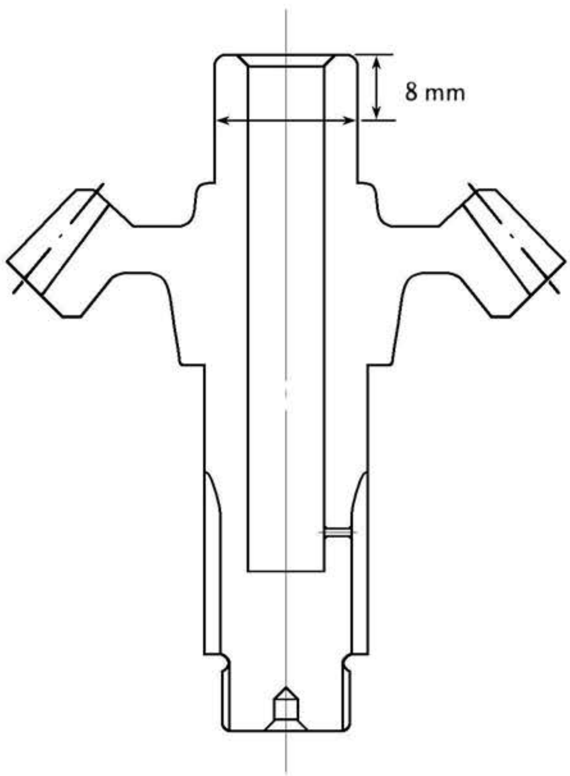


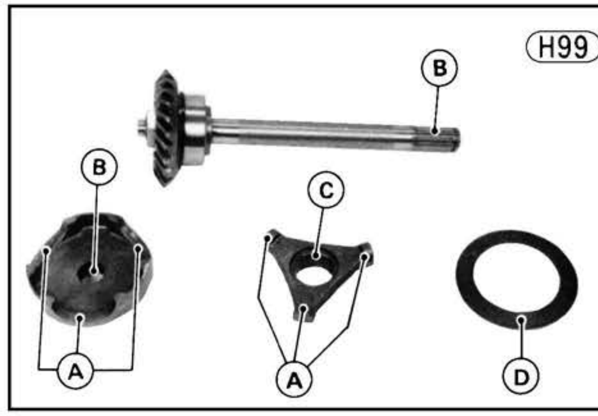

**Table H73 Output Shaft Wear**

| Service Limit | 21.98 mm |
|---|---|

*Cam damper inspection*

Visually inspect the cam surfaces of the damper cam and cam follower. Check the splined or serrated portions of the cam, cam follower, and inner and outer shafts. If they are badly worn, replace them with new ones.

Visually inspect the damper springs for cracks or other damage. If they are damaged replace them with new ones.




**A. Cam Surfaces** **C. Serrated Portions**
**B. Splined Portions** **D. Damper Springs**

*Bevel gear inspection*

Visually inspect the teeth of bevel gears. If there is any kind of damage, replace the two bevel gears as a set.

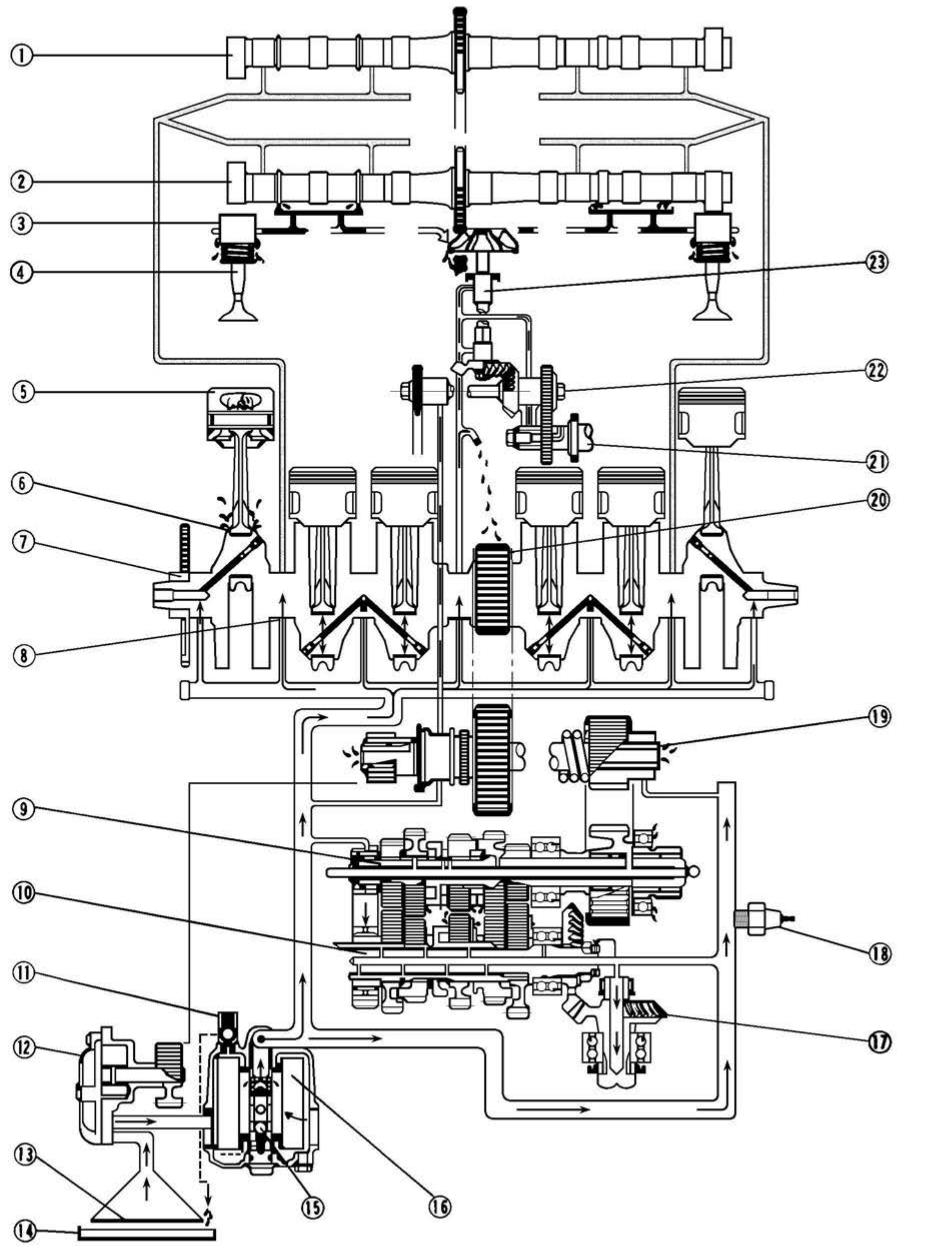
## ENGINE LUBRICATION SYSTEM

The engine lubrication system includes the oil screen, engine oil pump, oil filter, oil bypass valve, oil pressure relief valve, and oil passages. An oil breather keeps crankcase pressure variations to a minimum and reduces emissions by recirculating blowby gases. The discussion here concerns how these parts work together, and how the oil reaches the various parts of the engine. Details on the relief valve, engine oil pump, and oil filter are given in the sections (Pgs. 201 ~ 202) following engine lubrication.

Since the engine lubrication system is a wet sump type, there is always a supply of oil in the crankcase at the bottom of the engine. The oil is drawn through the wire screen into the oil pump as the pump rotors turn.

The pump is driven by the gear attached to the left side of secondary shaft. The screen removes any metal particles and other foreign matter which could damage the oil pump. From the pump the oil passes through the oil filter element for filtration. If the element is badly clogged, slowing the flow of oil through it, oil bypasses the element through a bypass valve in the oil filter mounting bolt. After passing through the filter, the oil branches into five lubrication routes in the oil pan. One of these routes is to the crankcase main oil passage. Through the main oil passage, the oil flows to the crankshaft main bearings, then to the connecting rod big end journals, starter gear journal, camshaft journals, right side water pump drive shaft journal, water pump shaft journals, governer shaft journals, and primary chain.

**Engine Lubrication System** (H100)




1. Exhaust Camshaft
2. Inlet Camshaft
3. Valve Lifter
4. Valve
5. Piston
6. Con-Rod Journal
7. Starter Motor Clutch
8. Crankshaft Journal
9. Drive Shaft
10. Driven Shaft
11. Relief Valve
12. Oil Pump
13. Oil Screen
14. Oil Pan
15. Bypass Valve
16. Oil Filter
17. Output Shaft
18. Oil Pressure Switch
19. Secondary Shaft
20. Primary Chain
21. Timing Advancer Shaft
22. Water Pump Drive Shaft
23. Water Pump Shaft

The second route for filtered oil is to the left side drive shaft needle bearing, journals of drive gears, and left side driven shaft needle bearing.

The third route for filtered oil is to the timing chain and cam chain sprocket journal and left side water pump drive shaft journal.

The fourth route for filtered oil is to the secondary chain sprocket journal.

The fifth route for filtered oil is to the output shaft needle bearing, output shaft ball bearing, driven shaft needle thrust bearing, right side driven shaft ball bearing, and driven gear journals.

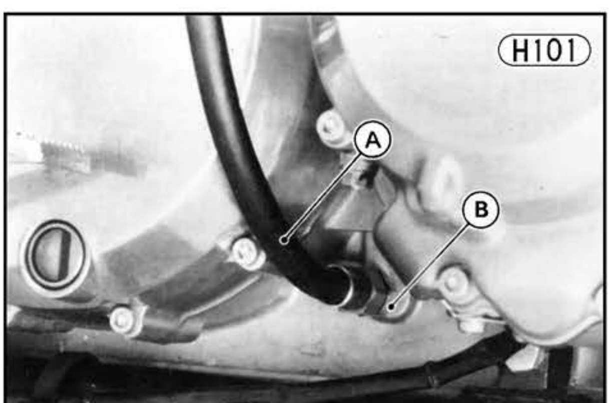
Both the oil pressure switch and the oil pressure relief valve are important for maintaining a constant oil pressure. The oil pressure switch, mounted on the right side of the lower crankcase halves, checks on the oil pressure in the main oil passage and lights the oil pressure warning light is the pressure falls below a safe level. If the oil pressure is insufficient, the oil pump is worn or malfunctioning or there is an insufficient oil supply to the pump. On the other hand, if the oil pressure becomes excessive, such as when the engine is first started (especially in cold weather), the relief valve reduces the oil pressure. The relief valve opens whenever a pressure of 5.2 kg/cm$^2$ (74 psi) is exerted on the valve spring.

### *Oil pressure measurement*

To inspect the relief valve operation, check the oil pressure with the engine cold (about room temperature).

**NOTE:** If the engine is warmed up already, begin by measuring the oil pressure at the normal operating temperature.

The engine must be stopped. Remove the oil pressure indicator switch from the right side of the crankcase, and connect the oil pressure gauge and adapter (special tools) in its place to measure oil pressure.




**A. Oil Pressure Gauge (57001-164)**
**B. Adapter (57001-1033)**

Start the engine, and note the oil pressure while running the engine at various speeds. A normal relief valve keeps the maximum oil pressure between the values in Table H74. If the oil pressure exceeds 6.0 kg/cm$^2$ (85 psi) by very much, the relief valve is stuck in its closed position. If the oil pressure is much lower than 4.4 kg/cm$^2$ (63 psi) at more than 5,000 rpm, the relief valve may be stuck open, or there may be other damage in the lubrication system.

**Table H74 Relief Valve Opening Pressure**

| | |
|---|---|
| Standard | 4.4 ~ 6.0 kg/cm$^2$ (63 ~ 85 psi) |

Warm up the engine, and measure the oil pressure at the normal operating temperature.

Run the engine at the specified speed (Table H75) and read the oil pressure gauge.

**Table H75 Oil Pressure**

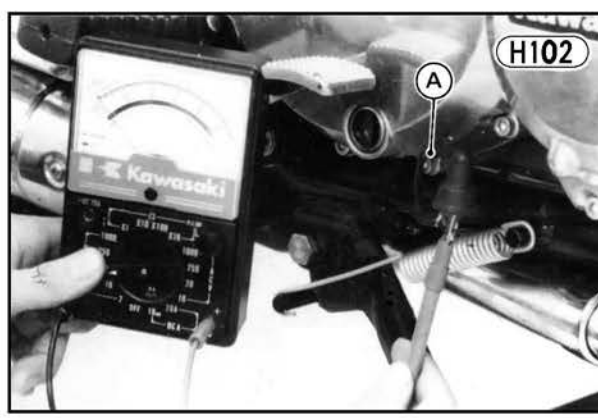
| Oil Pressure @4,000 rpm, 100°C (212°F) |
|---|
| About 2.0 kg/cm$^2$ (28 psi) |

If the oil pressure is significantly below the standard pressure, inspect the engine oil pump and relief valve. If the pump and relief valve are not at fault, inspect the rest of the lubrication system.

### *Oil pressure switch inspection*

The switch should turn on the warning light whenever the ignition switch is on with the engine not running.

If the light does not go on, disconnect the switch lead. Connect the positive lead of a 20V DC range voltmeter to the switch lead and ground the voltmeter negative lead to the engine. Turn the ignition switch to the "ON" position, and read the voltmeter. If the voltmeter does not indicate battery voltage, the trouble is either defective wiring or a burned-out indicator bulb.




**A. Switch Lead**

If the voltmeter does indicate battery voltage, then the oil pressure switch may be defective. Use an ohmmeter to check for continuity between the switch terminal and the switch body. With the switch lead disconnected, and the engine stopped, any reading other than zero ohms indicates that the switch is at fault.

The switch should turn off the warning light whenever the engine is running faster than the specified speed. If the light stays on, stop the engine immediately, disconnect the lead from the switch, and connect the ohmmeter between the switch terminal and the engine (chassis ground). The meter should read zero ohms when the engine is off and infinity when the engine is running above the specified speed (Table H76). If the meter reads zero ohms when the engine is running at the specified speed, stop the engine and measure the oil pressure (Pg. 200). If the oil pressure is more than the specified value with the engine running at the specified speed, the oil pressure switch is defective, and must be replaced.

**Table H76 Oil Pressure Switch Inspection**

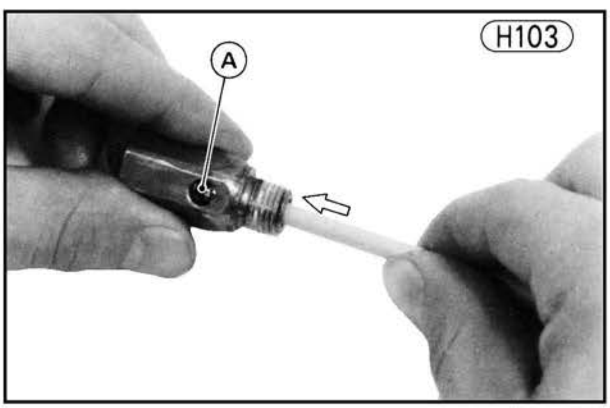
| Meter | Engine Speed | Oil Pressure Switch |
|---|---|---|
| x 1 Ω | Stopped | ON (Ohmmeter reads zero ohms) |
| | More than idle rpm | OFF (Ohmmeter reads infinity) |

## Relief Valve

### *Relief valve inspection*

Check to see if the steel ball inside the valve slides smoothly when pushing it in with a wooden or other soft rod, and see if it comes back to its seat by valve spring pressure.

**NOTE:** Inspect the valve in its assembled state. Disassembly and assembly may change the valve performance.




**A. Steel Ball**

If any rough spots are found during the above inspection, wash the valve clean with a high flash-point solvent and use compressed air to blow out any foreign particles that may be in the valve.

If cleaning does not solve the problem, replace the relief valve as an assembly. The relief valve is precision made with no allowance for replacement of individual parts.

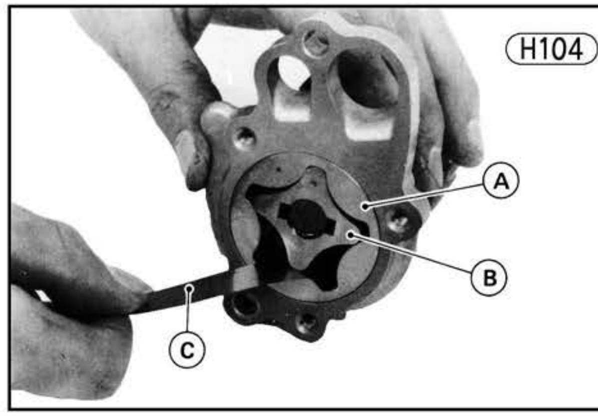
## Engine Oil Pump

The oil pump, installed in the left side of the crankcase, is a simple trochoid type with an outer and an inner rotor. The gear on the pump is driven by a gear attached to the secondary shaft.

If the oil pump becomes worn, it may no longer be able to supply oil to lubricate the engine adequately.

### *Outer rotor/inner rotor clearance*

Measure the clearance between the outer rotor and inner rotor with a thickness gauge. If the clearance exceeds the service limit, replace the rotors.



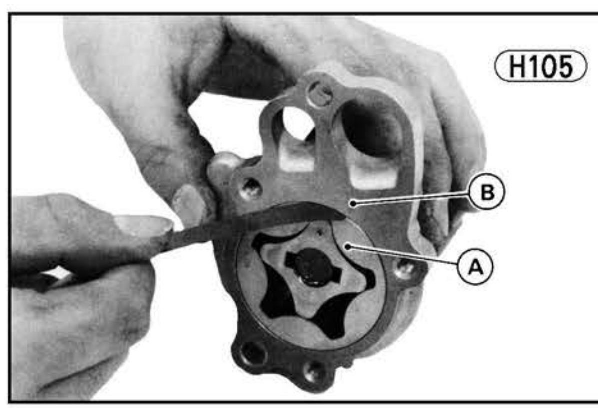

**A. Outer Rotor** **C. Thickness Gauge**
**B. Inner Rotor**

**Table H77 Outer Rotor/Inner Rotor Clearance**

| | |
|---|---|
| Service Limit | 0.18 mm |

### *Outer rotor/pump body clearance*

Measure the clearance between the outer rotor and the pump body with a thickness gauge. If the clearance exceeds the service limit, check the diameter of the outer rotor and the inside diameter of the pump body. Then replace the part or parts which exceed the service limit.




**A. Outer Rotor** **B. Pump Body**

**Table H78 Outer Rotor/Pump Body Clearance**

| | |
|---|---|
| Service Limit | 0.26 mm |

**Table H79 Outer Rotor Diameter**

| | |
|---|---|
| Service Limit | 49.94 mm |

**Table H80 Pump Body Inside Diameter**

| | |
|---|---|
| Service Limit | 50.20 mm |

*Rotor side clearance*

Lay a straightedge on the oil pump body, and measure the clearance between the straightedge and the rotors with a thickness gauge. If the clearance exceeds the service limit, check the thickness of the inner and outer rotors and the depth of the pump body. Then replace the rotors and/or pump body which exceed(s) the service limit.

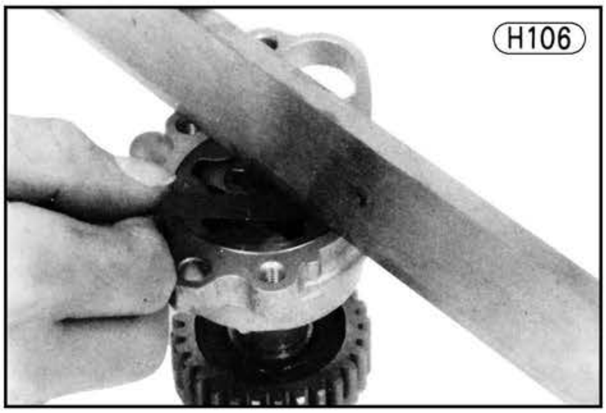



**Table H81 Rotor Side Clearance**

| | |
|---|---|
| Service Limit | 0.12 mm |

**Table H82 Rotor Thickness**

| | |
|---|---|
| Service Limit | 15.96 mm |

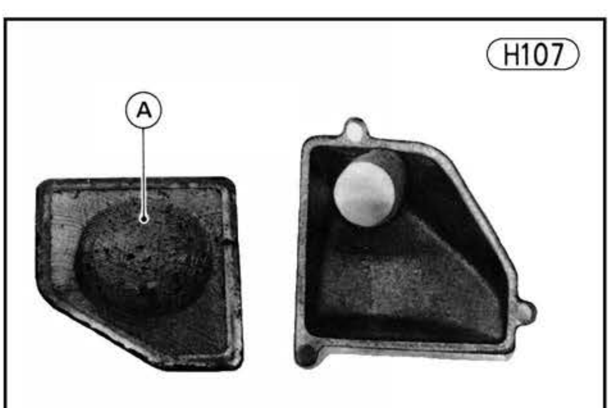
**Table H83 Pump Body Depth**

| | |
|---|---|
| Service Limit | 16.08 mm |

## Oil Screen

The oil screen, installed in the lower part of the crankcase, removes any metal particles and other foreign matter which could damage the oil pump.

When the oil pan is removed, remove the oil screen, and clean any metal particles and other dirt out of the screen. If the oil screen is damaged, replace it with a new one.




**A. Oil Screen**

## Oil Filter

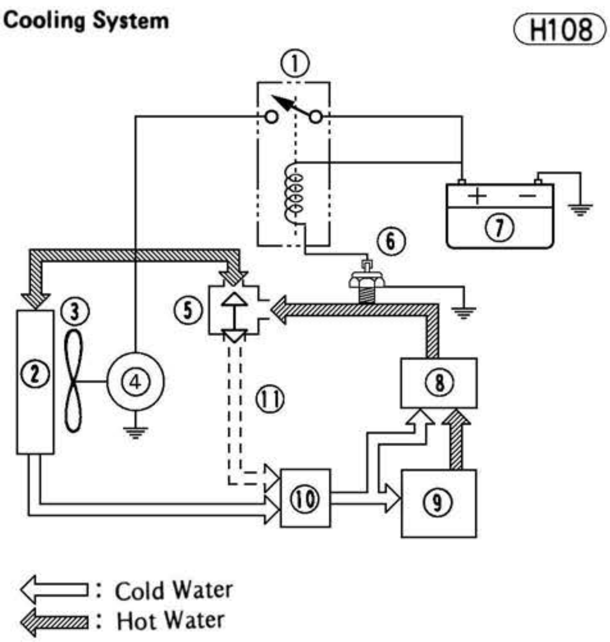
The oil filter, located in the lower part of the crankcase, removes impurities from the oil.

As the filter element becomes dirty and clogged, its filtering efficiency is impaired. If it becomes so clogged that is seriously impedes oil flow, a pressure-activated bypass valve in the oil filter mounting bolt opens so that sufficient oil will still reach the parts of the engine needing lubrication. When the filter becomes clogged such that the oil pressure difference between the inlet and outlet for the filter reaches a certain pressure, the oil on the inlet side pushing on the valve spring opens the valve, allowing oil to flow to the oil passage, bypassing the filter.

## COOLING SYSTEM

The water cooling system is a pressurized forced-circulation type. When the engine load varies, this system controls the engine temperature within narrow limits where the engine operates most efficiently. In this way the engine performs stably in various riding conditions, and possesses high durability. Since the engine top end is surrounded with water which absorbs the engine noise, the engine runs quietly.

**Cooling System**




1. Fan Relay
2. Radiator
3. Fan
4. Electric Motor
5. Thermostat
6. Fan Switch
7. Battery
8. Cylinder Head
9. Cylinder
10. Water Pump
11. Bypass

The cooling system consists of the coolant, water pump, mechanical seal, radiator, radiator cap, radiator hoses, thermostat, radiator fan, fan switch, and fan relay. There are three modes of coolant circulation: (a) cold engine, (b) normal operating temperature, (c) hot engine. When the engine is cold such as during warming up, the water is cold, and the thermostat is closed. The water, forced out from the water pump, goes up around the cylinders and through the cylinder head, then takes a short cut through the bypass pipe and returns to the pump.

This brings a cold engine up to proper temperature quickly. While the engine is in normal operating temperature range, the thermostat opens only partially. The size of the valve opening of the thermostat, and the amount of water flowing to the radiator, changes depending on water temperature. The higher the water temperature becomes, the more water goes through the radiator, keeping the temperature of the returning water constant. When the water temperature exceeds the normal operating temperature, the thermostat opens fully to allow all water to flow through the radiator. If the water temperature goes up beyond the predetermined level, the thermostatic fan switch conducts to operate the fan relay. The fan relay closes its contacts, completes the fan motor circuit, and the cooling fan turns to speed up the cooling action of the radiator. When the water cools down; the fan switch cuts the relay current, and the fan stops. This electric cooling fan system saves engine power, and reduces the battery load.

**WARNING The radiator fan and fan switch are connected directly to the battery. The radiator fan may start even if the ignition switch is off. NEVER TOUCH THE RADIATOR FAN UNTIL THE ENGINE COMPLETELY COOLS OFF. TOUCHING THE FAN BEFORE THE ENGINE COOLS COULD CAUSE INJURY FROM THE FAN BLADES.**

## Coolant

By circulating in the cooling system, the coolant transfers the heat generated at the engine to the radiator. To protect the cooling system (consisting of the aluminum engine and radiator) from rust and corrosion, the use of corrosion and rust inhibitor chemicals in the water is essential. If coolant containing corrosion and rust inhibitor chemicals is not used, over a period of time, the cooling system accumulates rust and scale in the water jacket and radiator. This will clog up the water passages, and considerably reduce the efficiency of the cooling system.

**WARNING Use coolant containing corrosion inhibitors made specifically for aluminum engines and radiators in accordance with the instructions of the manufactures. Chemicals are harmful to the human body.**

Soft or distilled water must be used with the inhibitor chemicals and the antifreeze (see below for antifreeze) in the cooling system.

**CAUTION If hard water is used in the system, it causes scale accumulation in the water passages, and considerably reduces the efficiency of the cooling system.**

If the lowest ambient temperature encountered falls below the water freezing point in the winter, protect the cooling system against engine and radiator freeze-up, as well as from rust and corrosion. Use a permanent type of antifreeze (soft water and ethylene glycol plus corrosion and rust inhibitor chemicals for aluminum engines and radiators) in the cooling system. On the mixture ratio of coolant, choose the suitable one referring the relation between freezing point and strength directed on the container.

**CAUTION Permanent types of antifreeze on the market have anti-corrosion and anti-rust properties. When it is diluted excessively, it looses its anti-corrosion property. Dilute a permanent type of antifreeze in accordance with the instructions of the maker.**

**NOTE:** A permanent type of antifreeze is installed in the cooling system when shipped. It is colored green, includes the 43% solution of ethylene glycol, and has the freezing point of –30°C (–22°F).

### *Coolant inspection*

Visually inspect the coolant in the reserve tank. If small whitish cotton-like clusters are observed, aluminum parts in the cooling system are corroded. The brownish color of the coolant indicates rusting of steel parts. In these cases, flush the cooling system (Pg. 208).

If the coolant gives off an abnormal smell when changing, check for a cooling system leak (Pg. 209). It may be caused by exhaust gas leaking into the cooling system.

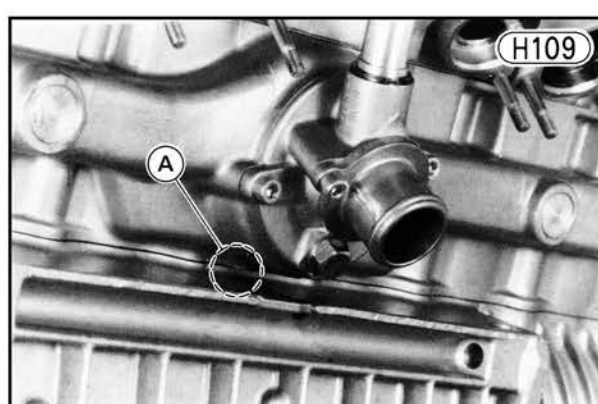
**NOTE:** Be sure to inspect the coolant at the reserve tank. If the coolant is checked at the radiator by removing the radiator cap, the air must be bled from the cooling system (Pg. 24).

## Water Pump, Mechanical Seal

The water pump lets the coolant circulate in the cooling system. The mechanical seal prevents the coolant from leaking along the pump shaft.

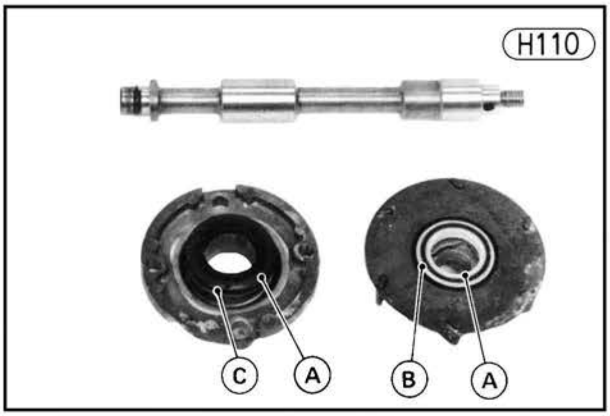
### *Inspection*

If the mechanical seal is damaged, the coolant leaks through the seal, and the leaking coolant is drained through the passage into the cylinder block.




**A. Drainage Outlet**

Remove the water pump impeller, and visually inspect the sealing surfaces, rubber seal, and diaphragm of the mechanical seal, and the **O** ring on the pump shaft. If any one of the mechanical seal parts is damaged, replace the mechanical seal with a new one. Replace the damaged **O** ring.




**A. Sealing Seat** **C. Diaphragm**
**B. Rubber Seal**

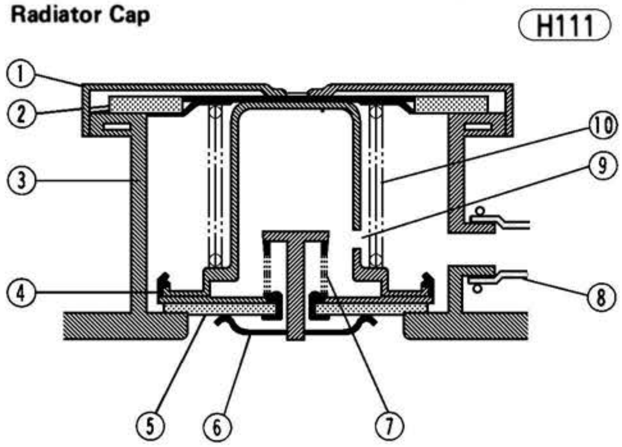
Visually check the impeller. If the surface is corroded, or if the blades are damaged, replace the impeller.

## Radiator, Radiator Cap, Radiator Hoses

When the water leaves the engine, it is so hot that it must be cooled before it can be reused. As the water makes it way down through the tubes of the radiator, it gives off heat to the air via the fins, and becomes cool enough to reuse.

By placing the radiator cap (pressure cap) on the radiator filler neck, the cooling system is presurized.

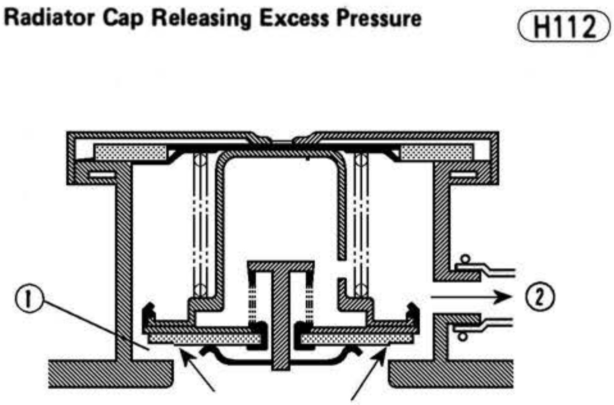
**Radiator Cap**




1. Radiator Cap
2. Top Valve Seal
3. Filler Neck
4. Pressure Valve
5. Bottom Valve Seal
6. Vacuum Valve
7. Spring
8. Reserve Tank Hose
9. Vacuum Hole
10. Spring

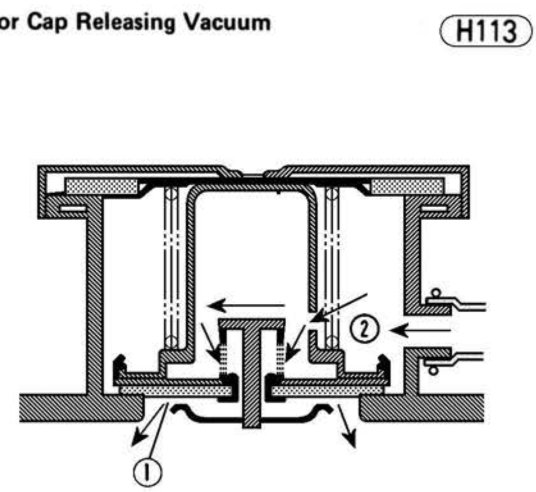
The cap has two valves. One is a pressure valve, which holds the pressure in the radiator when the engine is running and the water expands. When the pressure exceeds the limit, the pressure valve no longer holds and allows the pressure to release to the reserve tank. As soon as pressure escapes, the valve closes, and keeps the predetermined pressure constant. When the engine stops and cools down, another small valve (vacuum valve) in the cap opens. As the water cools, it contracts and tires to form a vacuum in the radiator. This draws the vacuum valve open and allows the water from the reserve tank to enter the radiator.

**Radiator Cap Releasing Excess Pressure**




1. The pressure valve is raised off its seat.
2. Excess pressure leaves to the reserve tank.

**Radiator Cap Releasing Vacuum**




1. The vacuum valve is drawn open.
2. Coolant from the reserve tank passes into the radiator through the vacuum hole.

**WARNING** **Never open the cap on a hot radiator. If this is done, dangerously hot water and steam will violently escape, causing serious burns to anyone nearby.**

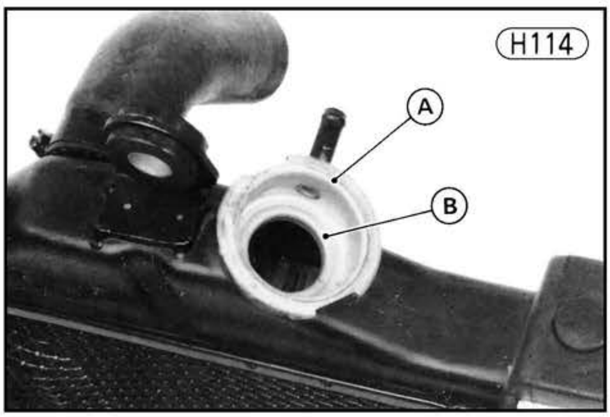
Wait until the radiator cools. Cover the cap with a rag. Open the cap slowly to the first stop, but keep your face well away from the radiator. Wait a few seconds, then finish removing the cap.

### *Radiator inspection*

Check the radiator core. If there are obstructions to air flow, remove them. If the corrugated fins are deformed, carefully straighten them with the thin blade of a screwdriver.

If the air passage of the radiator core is clogged up more than 20% by unremovable obstructions or unrepairably deformed fins, replace the radiator with a new one.

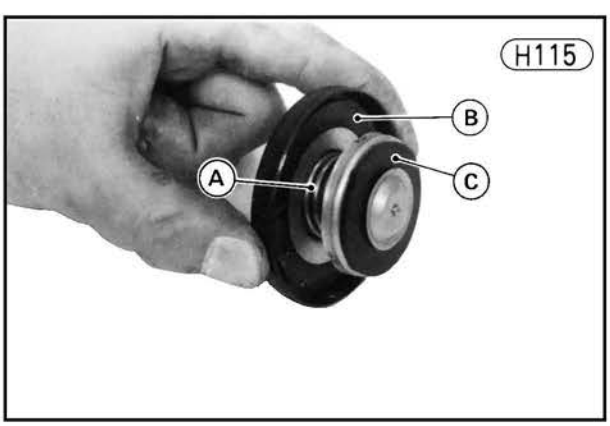
Check the radiator filler neck for signs of damage. Check the condition of the top and bottom sealing seats in the filler neck. It must be smooth and clean for the radiator cap to function properly.




**A. Top Sealing Seat** **B. Bottom Sealing Seat**

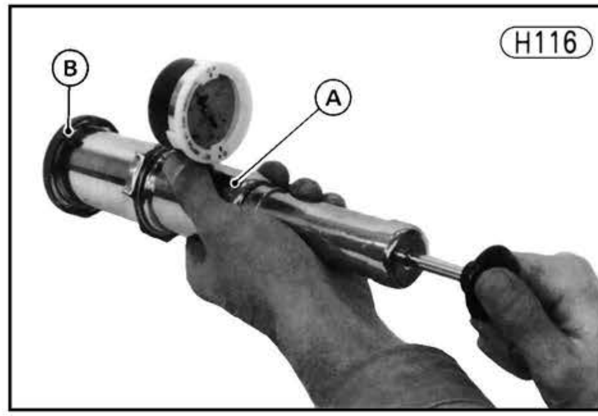
### *Radiator cap inspection*

Check the condition of the valve spring, and the top and bottom valve seals of the radiator cap. If any one of them shows visible damage, replace the cap.




**A. Valve Spring** **C. Bottom Seal**
**B. Top Seal**

Install the cap on a cooling system pressure tester. Watching the pressure gauge, pump the pressure tester to build up the pressure. The cap must retain the pressure. (Watch the pressure gauge at least 6 seconds to check that the pressure holds steady.) But the cap must open at the pressure of the rating specified shown in Table H84, and relieve the pressure greater than the specified.




**A. Pressure Tester** **B. Radiator Cap**

**Table H84 Radiator Cap specification**

| | |
|---|---|
| Pressure Valve Opening Pressure | $0.75 \sim 1.05$ kg/cm$^2$ ($11 \sim 15$ psi) |

### *Radiator hose inspection*

In accordance with the Periodic Maintenance Chart (Pg. 10), visually inspect the hoses for signs of deterioration. Squeeze the hose. A hose should not be hard and brittle, nor should it be soft or swollen. Replace any damaged hose. Tighten the hose clamps securely.

## Thermostat

The thermostat is a wax pellet type, and operates by heat. This type of the thermostat is not pressure sensitive, and works well in a fully pressurized system. The thermostat constantly changes the sizes of its two valve openings to keep the water temperature to the proper level. The sizes of the valve openings are determined by the amount that the wax in the cylinder expands.

### *Thermostat inspection*

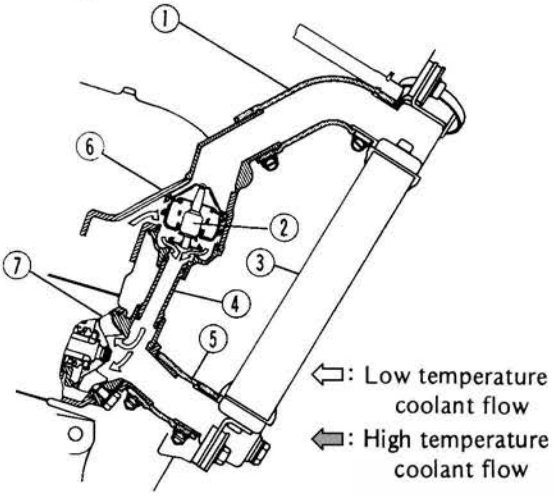
Remove the thermostat, and inspect the thermostat valve at room temperature. If the valve is opened, replace the valve with a new one.

Measure the bypass valve height from the valve frame, and note it. This is to know the full valve lift tested later. (See Fig. H119).

To check valve opening temperature, suspend the thermostat in a container of water. The thermostat must be completely submerged, and must not touch the container sides or bottom. Suspend an accurate thermometer in the water. It must not touch the container, either. Place the container over a source of heat and

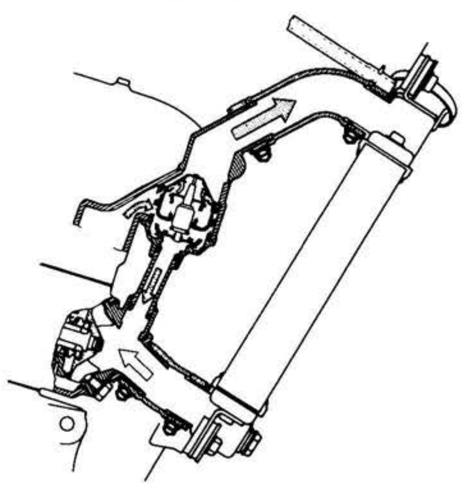
**Thermostat Operation** (H117)

(a) Cold Engine

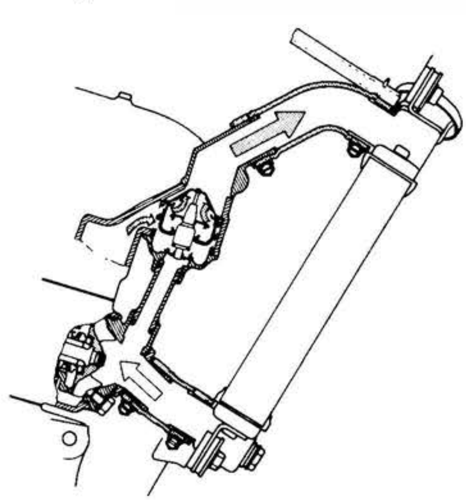



1. Upper Radiator Hose
2. Thermostat
3. Radiator
4. Bypass Pipe
5. Lower Radiator Hose
6. Cylinder Head
7. Impeller

(b)Normal Operating Temperature

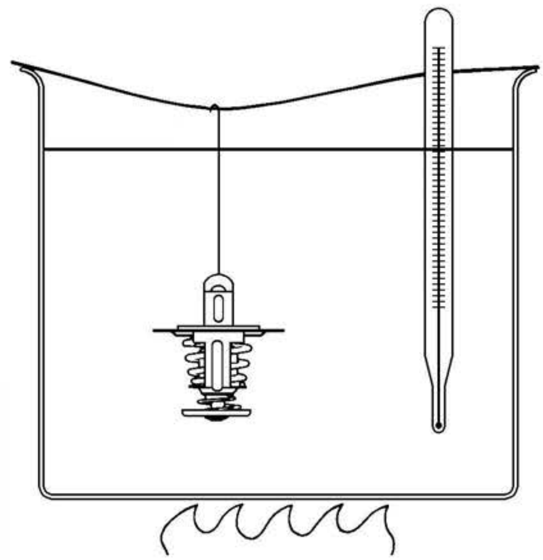


(c) Hot Engine



gradually raise the temperature of the water while stirring the water gently.

**Valve Opening Temperature Measurement** (H118)



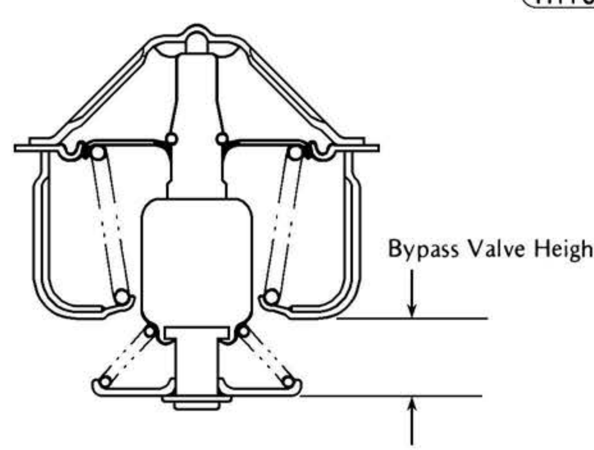
Watch the valve. As soon as the valve starts to open, note the temperature. It should be within the range specified in Table H85. If it is out of the service limit, replace the thermostat.

**Table H85 Valve Opening Temperature**

| | |
|---|---|
| Service Limit | 78~86°C (172~187°F) |

Continue heating until the water temperature is 95°C (203°F), and hold the water at the temperature for five minutes. Then measure the bypass valve height. The difference between the two bypass valve heights, measured at room temperature and at 95°C (203°F), is the full valve lift. If it is less than the service limit, replace the thermostat.

**Valve Lift Measurement** (H119)




The bypass valve height difference is the valve lift.

**Table H86 Valve Lift**

| Temperature | Standard | Service Limit |
|---|---|---|
| 95°C (203°F) | More than 8 mm | 7 mm |

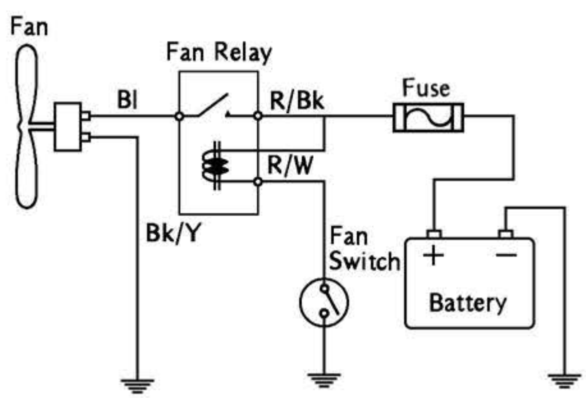
## Radiator Fan, Fan Switch, Fan Relay

The fan switch monitors the water temperature. The fan switch is open when the temperature is below the specified level, and conducts when the temperature exceeds the predetermined level.

The fan relay controls the power supply to the fan motor, and permits the fan motor current to flow only when the fan switch is conducted.

The radiator fan draws air through the radiator core when there is not sufficient air flow, such as when the engine is idling. This speeds up the cooling action of the radiator. The shroud is provided to prevent the air recirculation around the ends of the fan blades, which causes the loss of fan efficiency.

**Cooling Fan System Circuit** (H120)



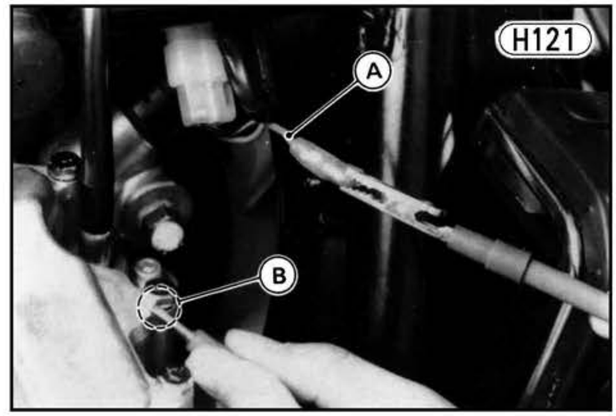

If the radiator fan does not turn when the water temperature gauge swings to the right side of the water temperature gauge, either the circuit of the water temperature gauge or the cooling fan system is defective. Check the cooling fan system as following.

**NOTE:** Refer to Pgs. 262 ~ 263 for the inspection of the water temperature gauge.

### *Initial check*

Pull off the fan switch lead, and ground the lead to the engine with a suitable lead. If the fan turns, the cooling system except for the fan switch works properly, and the fan switch should be inspected. If the fan does not turn, there is a fault in the fan, fan relay, fan switch, or wiring.

**WARNING** **This fan blades can cause injury. Be very careful to not allow any part of your body or the wire lead to touch the fan.**

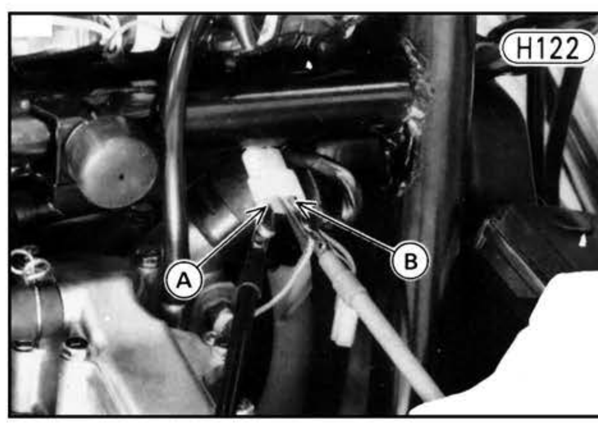



**A. Fan Switch Lead B. Ground the lead.**

### *Radiator fan inspection*

Remove the fuel tank, and visually inspect the radiator fan. If the fan blades or shroud is damaged, replace the part.

Disconnect the 2-pin connector of the fan leads, and connect the black fan lead to the battery – terminal, and the blue fan lead to the battery + terminal. If the fan does not turn at this time, the motor is defective and must be replaced.



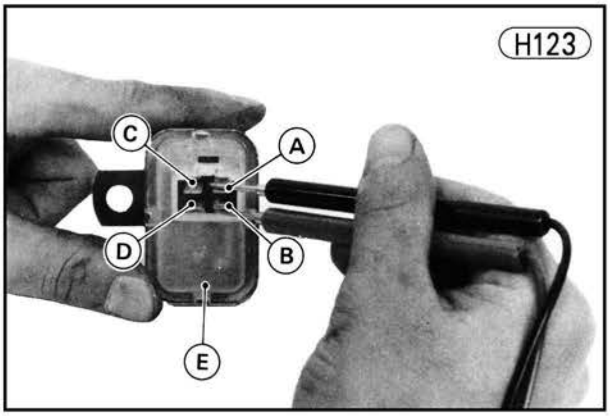

**A. Black Lead to Battery – Terminal**
**B. Blue Lead to Battery + Terminal**

### *Fan relay inspection*

- Remove the fan relay from under the fuse box.
- Measure the relay coil resistance using an ohmmeter as shown in Table H87. If the resistance is out of the specified range, replace the fan relay.

**Table H87 Relay Coil Resistance**

| Connections | Reading |
|---|---|
| One meter lead → Terminal #1<br>The other meter lead → Terminal #2 | 65~85 Ω |

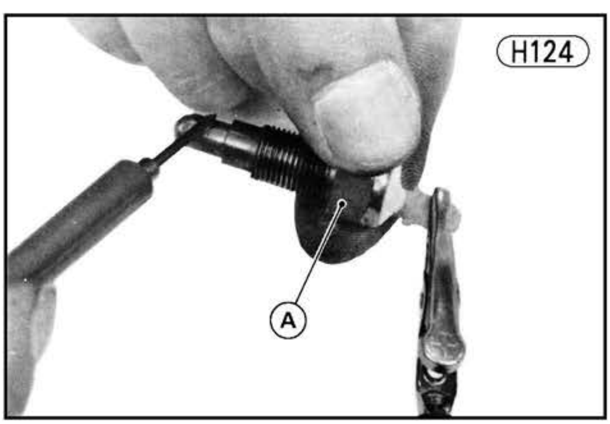



A. Terminal #1 (for Red/Black Lead)
B. Terminal #2 (for Red/White Lead)
C. Terminal #3 (for Black Lead)
D. Terminal #4 (for Blue Lead)
E. Fan Relay

- Connect the ohmmeter leads to the relay terminals #3 and #4. At this time, the meter should read infinity. If not, replace the relay.
- With the ohmmeter connected to the terminals #3 and #4, connect the terminal #1 to the battery + terminal, and the terminal #2 to the battery – terminal. At this time, the meter should read zero ohms. If not, replace the relay.

### *Fan switch inspection*

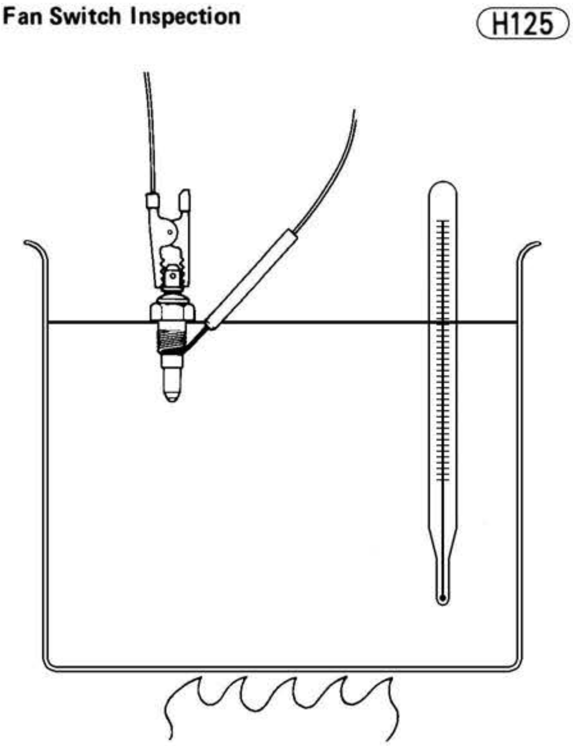
Remove the fan switch, and check the internal resistance of the fan switch across the switch terminal and the body. There should be no conduction at room temperature.




A. Fan Switch

Suspend the switch in a container of water so that the temperature-sensing projection and threaded portion are submerged. The switch must not touch the container sides or bottom. Suspend an accurate thermometer in the water, It must not touch the container, either. Place the container over a source of heat and gradually raise the temperature of the water while stirring the water gently.

**Fan Switch Inspection**




The internal resistance of the fan switch should change as shown in Table H88. If it does not, replace the switch.

**Table H88 Internal Resistance of Fan Switch**

| | Resistance change | Temperature |
|---|---|---|
| Raising temperature | From more than 1 mega Ω to less than 0.5 Ω | 94~100°C (201~212°F) |
| Lowering temperature | From less than 0.5 Ω to more than 1 mega Ω | above 91°C (196°F) |

## Reserve Tank, Hoses

As the engine warms up, the coolant in the radiator and the water jacket expands. The excess coolant flows through the radiator cap and hose to the reserve tank to be stored there temporarily. Conervsely, as the engine cools down, the coolant in the radiator and the water jacket contracts, and the stored coolant flows back to the radiator from the reserve tank.

### *Inspection*

Visually inspect the reserve tank hose for signs of deterioration. Squeeze the hose. The hose should not be hard and brittle, nor should it be soft or swollen. Replace any damaged hose. The hose clamps must be in place.

### *Flushing*

Over a period of time, the cooling system accumulates rust, scale, and lime in the water jacket and radiator. When this accumulation is suspected or observed, flush

the cooling system. If this accumulation is not removed, it will clog up the water passages and considerably reduce the efficiency of the cooling system.
- Drain the cooling system.
- Fill the cooling system with fresh water mixed with a flushing compound.

**CAUTION Avoid the use of a flushing compound which is harmful to the aluminum engine and radiator. Carefully follow the instructions supplied by the manufacturer of the cleaning product.**

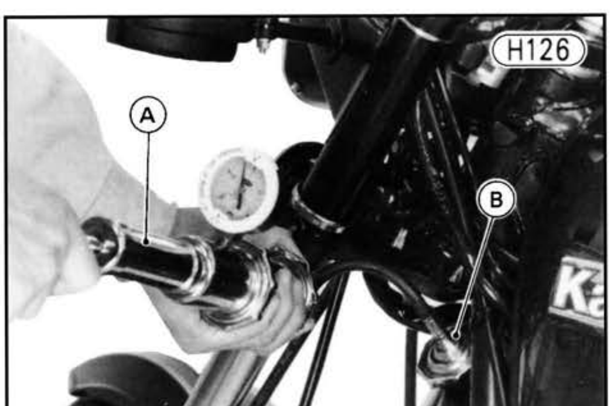
- Warm up the engine, and run it at normal operating temperature for about ten minutes.
- Stop the engine, and drain the cooling system.
- Fill the system with fresh water.
- Warm up the engine, and drain the system.
- Repeat the previous two steps once more.
- Fill the system with a permanent type coolant, and bleed the air from the system (Pg. 24).

### *Pressure testing*

Any time the system slowly looses water, the system should be pressure tested.

**CAUTION During pressure testing operation, do not exceed the pressure for which the system is designed to work. The maximum pressure is 1.05 kg/cm$^2$ (15 psi).**

- Set the motorcycle up on its center stand.
- Remove the radiator cap, and install a cooling system pressure tester on the radiator filler neck.
- Build up pressure in the system carefully until the pressure reaches 1.05 kg/cm$^2$ (15 psi).
- Watch the gauge for at least 6 seconds. If the pressure holds steady, the system is all right.




**A. Pressure Tester** **B. Adapter**

- Remove the pressure tester, replenish the coolant, and install the radiator cap.
- Run the engine until normal operating temperature is obtained.
- Remove the radiator cap carefully, and recheck for leaks when hot.
- If the pressure drops, check all areas for external leakage. Any trace or source of leakage shows the damaged seal or part.

**NOTE:** Coolant leakage from the drainage outlet in the cylinder block shows the damaged mechanical seal (Fig. H110).

- If the pressure drops and no external source is found, check for internal leaks. Droplets in the engine oil indicate internal leakage. Internal water sealing is accomplished by **O** rings between the cylinder sleeves and the cylinder block, cylinder head gasket, and mechanical seal at the water pump.

## BALL, NEEDLE BEARINGS

### *Ball bearing wear, damage*

Since the ball bearings are made to extremely close tolerances, the wear must be judged by feel rather than by measurement.

Clean each bearing in a high flash-point solvent, dry it (do not spin it while it is dry), and oil it. Spin it by hand to check its condition. If it is noisy, does not spin smoothly, or has any rough spots, replace it.

### *Needle bearing wear, damage*

The rollers in the needle bearings wear so little that the wear is difficult to measure. Instead, inspect the bearings for abrasion, color change, or other damage. If there is any doubt as to the condition of either bearing, replace it.

## OIL SEALS

The crankshaft oil seal in the right engine cover forms a seal between the crankchamber and the contact breaker point cavity. If this seal is damaged, oil will leak into the contact breaker point cavity, and foul the contact breaker points. Any damaged, hardened, or otherwise defective oil seal will allow oil to leak.

### *Oil seal damage*

Inspect the oil seals, and replace any if the lips are misshapen, discolored (indicating the rubber has deteriorated), hardened, or otherwise been damaged. Since an oil seal is nearly always damaged on removal, removed oil seals must be replaced. When pressing in an oil seal which has manufacturer's marks, press it in with the marks facing out. Press the seal in so that the face of the seal is level with the surface of its hole.

# Maintenance—Chassis

## Table of Contents



J

## WHEELS

Tubeless tires are installed on the wheels of this motorcycle. The main advantage of tubeless tires is an added measure of driving safety. In the event of a puncture, tubeless tire do not blow out but instead tend to lose air gradually. Another advantage is cooler running characteristics.

The tire and rim form a leakproof unit by making airtight contacts at the tire chafers and the rim flanges instead of using an inner tube.

**WARNING The tires, rims, and air valves on this motorcycle is designed only for tubeless type wheels. The recommended standard tires, rims, and air valves must be used for replacement. For correct performance, do not install a tube in a tubeless tire.**

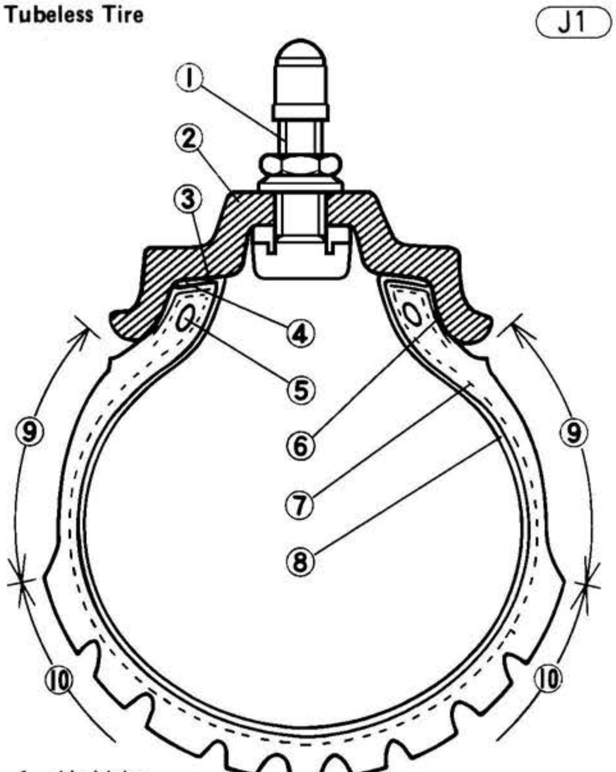
### Tires

Structure of the tubeless tire is characterized by an inner liner and chafers.

The inner liner is a layer of thicker rubber which covers the inside wall of the tire. The inner liner is made from special quality of rubber which is hard to admit the air. Generally chafers reinforce tire beads which are likely damaged by friction with the rim. The chafers of tubeless tires have a characteristic of airtightness as well.

Since airtightness of tubeless tires is accomplished by closely seating the chafers in good condition on the rim, be careful not to damage the chafers when handling tubeless tires.

**Tubeless Tire** (J1)




1. Air Valve
2. Rim
3. Rim Sealing Area
4. Bead Sealing Area
5. Bead Wires
6. Chafers
7. Plies
8. Inner Liner
9. Side Wall
10. Tread

The indication of "TUBELESS" on the tire sidewall shows that the tire is designed for tubeless use.

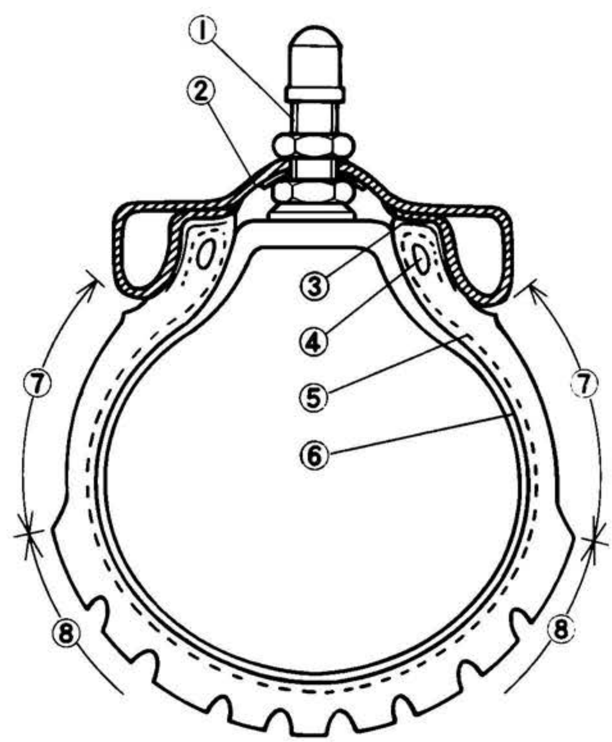

**A. "TUBELESS"**

The tires are designed to provide good traction and power transmission during acceleration and braking, even on bad surfaces. To do this, they must be inflated to the correct pressure and not overloaded. The maximum recommended load, in addition to vehicle weight, is 212.5 kg.

If the tires are inflated to too high a pressure, the ride is rough, the center portion of the tread wears quickly, and the tires are easily damaged.

If inflation pressure is too low, the shoulder portions wear quickly, the cord suffers damage, fuel consumption is high and handling is poor. In addition, heat builds up at high speeds, and tire life is greatly shortened.

**Tube Tire** (J3)




1. Air Valve
2. Rim
3. Chafers
4. Bead Wires
5. Plies
6. Tube
7. Side Wall
8. Tread

**WARNING** **To ensure safe handling and stability, use only the recommended standard tires for replacement, inflated to the standard pressure (Table J1). A certain variation from the standard pressure may be desired depending on road surface conditions (rain, snow, rough surface, etc.).**

**Table J1 Tires, Air Pressure (measured when cold)**

| | Air Pressure | | Size | Make, Type |
|---|---|---|---|---|
| Front | 2.00 kg/cm$^2$ (28 psi) | | 110/90V-18 4PR Ⓤ MN90-18 | Dunlop Gold Seal F8 Nylon Tubeless |
| Rear | Up to 97.5 kg load | 2.50 kg/cm$^2$ (36 psi) | 130/90V-17 6PR Ⓤ MT90-17 | Dunlop Gold Seal K100M Nylon Tubeless |
| | 97.5 ~ 212.5 kg load | 2.80 kg/cm$^2$ (40 psi) | | |
| | Over 210 kph | | | |

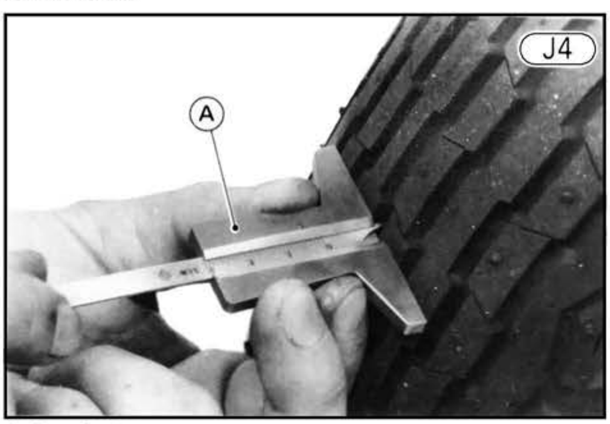
Ⓤ : US model

### *Tire wear, damage*

Tires must not be used if they are nearly bald, or if they are cut or otherwise damaged. As the tire tread wears down, the tire becomes more susceptible the puncture and failure. 90% of tire failures occur during the last 10% of tire life.

Visually inspect the tire for cracks and cuts. Replace the tire in case of bad damage. Remove any imbedded stones or other foreign particles from the tread. Swelling or high spots indicate internal damage, requiring tire replacement unless the damage to the fabric is very minor.

Measure the depth of the tread with a depth gauge, and replace the tire if the tread depth is less than the service limit.




**A. Depth Gauge**

**Table J2 Tire Tread Depth**

| | Service Limit (Minimum Tread Depth) | |
|---|---|---|
| | Under 130 kph | Over 130 kph |
| Front | 1 mm | 1 mm |
| Rear | 2 mm | 3 mm |

### *Tire repair*

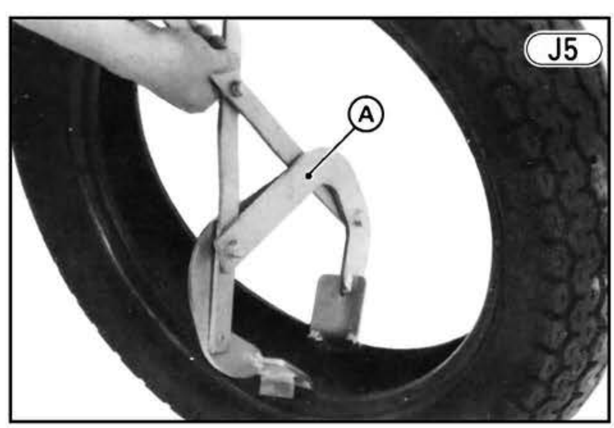
Currently two types of repair for tubeless tires have come into wide use. One type is called temporary (external) repairs which can be carried out without removing the tire from the rim, and another type is called permanent (internal) repairs which require tire removal. It is generally understood that higher running durability is obtained by permanent (internal) repairs than by temporary (external) ones. Also, permanent (internal) repairs also have the advantage of permitting a thorough examination for secondary damage not visible from external inspection of the tire. For these reasons, Kawasaki does not recommend temporary (external) repair. Only appropriate permanent (internal) repairs are recommended.

The tubeless tire repair methods described here describe the methods for COMBI UNITS made by TIP TOP (trade names). Repair methods may vary slightly from make to make. Follow the repair methods indicated by the manufacturer of the repair tools and materials so that safe results can be obtained.

**WARNING** **Tires that have been punctured and repaired do not have the same capabilities as unchanged tires. When being repaired with COMBI UNITS made by TIP TOP, do not exceed 80 kph within 24 hours after repair, and 180 kph (113 mph) at any time after that.**

●Locate and mark the puncture and remove the injuring object.
●Remove the tire from rim (Pg. 135).
●Inspect the tire carefully. If any damage mentioned below is found, replace the tire with a new one:
1. Puncture or tear larger than 3 mm diameter.
2. Two punctures within 40 cm distance.
3. Three punctures or more in one tire.
4. Puncture or damage on sidewall.
●Inspect the rim. If there is any damage such as is mentioned on Pg. 216, replace the rim with a new one.
●Repair the tire puncture. COMBI UNITS made by TIP TOP are used here to describe the internal repair methods of tubeless tires.
○Spread the tire slightly at the injury with the bead breaker (special tool). Choose a drill bit of slightly greater diameter than the injury.

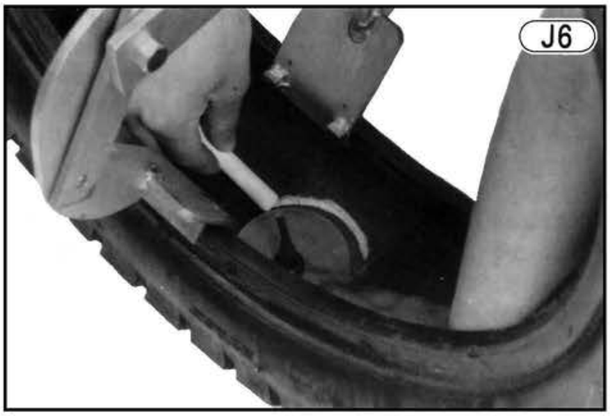
**NOTE:** The diameter of a drill must be less than 3 mm at maximum.




**A. Bead Breaker (57001-1072)**

○Before buffing the tires, thoroughly clean the area around the puncture with a suitable solvent and scrape out all mold lubricants (i.e. silicon, graphite, etc.). Let dry before buffing.

○Center the COMBI UNIT on the puncture inside of the tire and draw an outline (do not use crayon).


J6

○Buff the area slightly larger than the COMBI UNIT, remove the buffing dust.


J7

○Center the drill in the break inside of the tire and screw into the puncture.

**NOTE:** Be careful not to expand the injury with the drill.

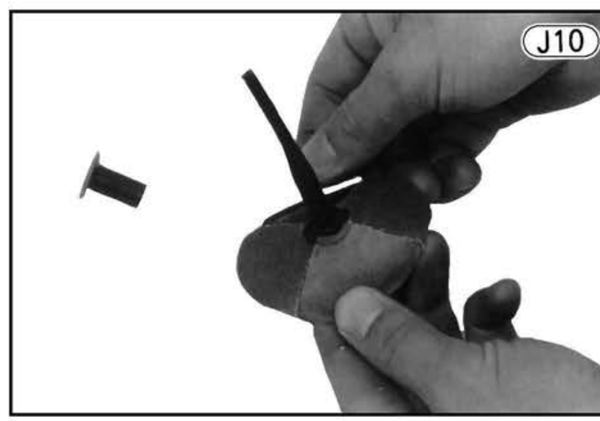

J8

○Clean the buffed area thoroughly.

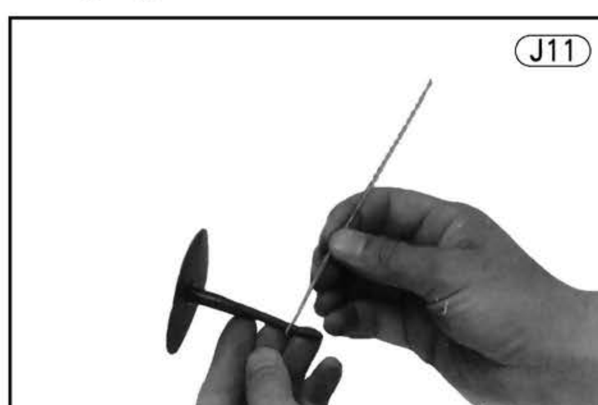
○Coat the puncture channel with a heavy layer of Rema Special Tire Cement. Using clean fingers or a brush, spread a thin, even coat of the same Cement to the buffed surface. Keep the repair area up to permit faster evaporation of solvent. Allow approximately 10 minutes for drying.


J9

○Use the COMBI UNIT for motorcycle tires. Remove the protective sleeve from the stem of the COMBI UNIT. Break the metal foil across the center and peel the foil toward the edge. Coat the surface with a thin layer of Special Tire Cement. Do not touch the patch area.

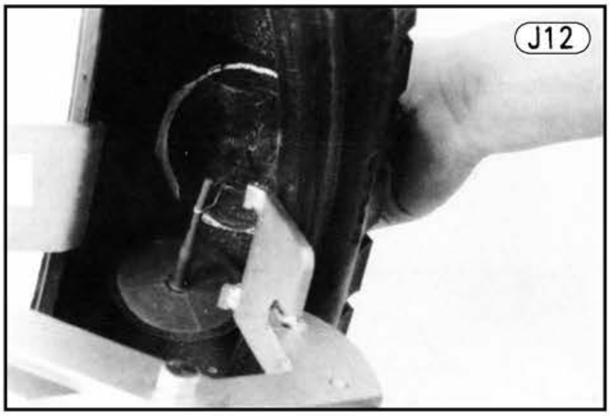

J10

○Run the stem of the COMBI UNIT patch through the insertighting wire.


J11

○Apply Special Tire Cement to the upper end of the stem (30 mm above the patch) so that the stem of COMBI UNIT patch slips smoothly.

○Pull the end of the stem through the puncture without turning until the base presses against inside of the tire.




○Roll the stitcher over the patch as hard as possible, keeping strokes close together and working from the center outwards.
○Cut off the protruding rubber tail flush with the tire surface.


●Install the tire on the rim (Pg. 136).
●Balance the wheel (Pg. 29).

## Rim

The rims for tubeless tires are specially designed in shape, size and finish to be airtight and to keep the tire from coming off the rim.

The indication "TUBELESS" on the rim shows that the rim is specially designed for tubeless tires.

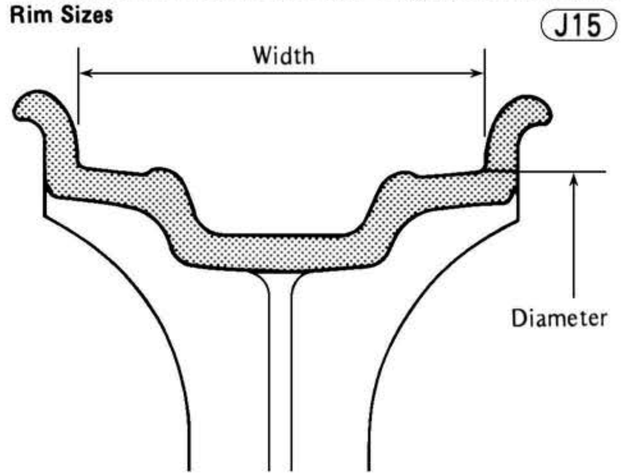

A. "TUBELESS"

**Table J3 Rim Size***

| Front | Rear |
|---|---|
| 18 x MT2.15 | 17 x MT3.00 |

*The rim size shown in the table is the bead seat diameter and inner width of the rim flanges, both in inches.

**Rim Sizes**

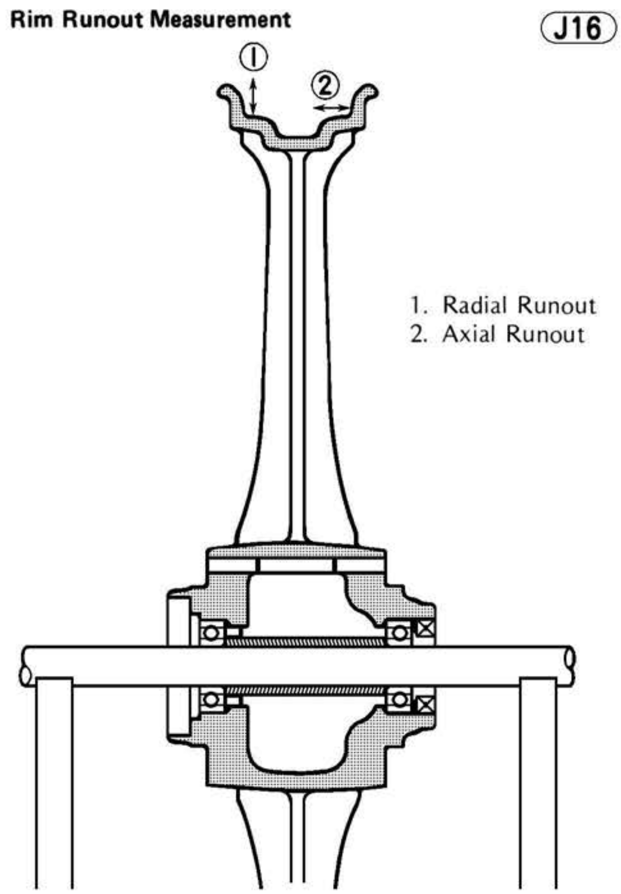



### *Rim runout measurement*

If there is any doubt as to the condition of the wheel, or if the wheel has received a heavy impact, check the rim runout as follows:

Remove the tire and suspend the wheel by the axle. Set a dial gauge against the side of the rim, and rotate the wheel to measure the axial runout. The difference between the highest and lowest dial readings is the amount of runout.

**Rim Runout Measurement**



Set the dial gauge against the outer circumference of the rim, and rotate the wheel to measure radial runout. The difference between the highest and lowest dial readings is the amount of runout.

If rim runout exceeds the service limit, check the wheel bearings first. Replace them if they are damaged. If the problem is not due to the bearings, the wheel must be replaced. Do not attempt to repair a damaged wheel.

**Table J4 Rim Runout (with tire removed)**

| | Axial | Radial |
|---|---|---|
| Service Limit | 0.5 mm | 0.8 mm |

### *Rim damage*

Carefully inspect the wheel for small cracks, dents, bends, or warps. If there is any damage to the wheel, it must be replaced.

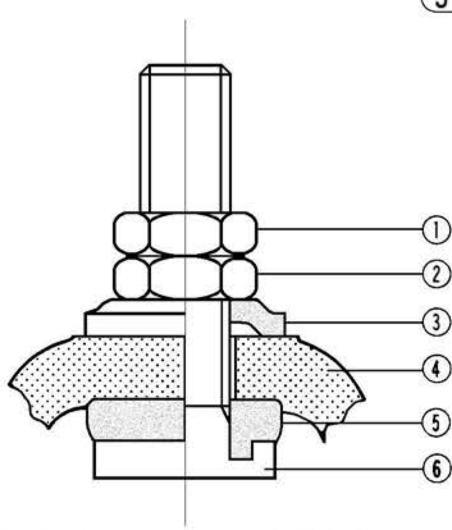
**WARNING** **Never attempt to repair a damaged wheel. If there is any damage besides wheel bearings, the wheel must be replaced to insure safe operational condition.**

If the rim has a scratch deeper than 0.5 mm and/or across the rim sealing surface, replace the wheel.

## Air Valve

For tubeless tires, the air valve is installed directly on the rim. The airtightness between the rim and the valve stem is ensured with a rubber grommet.

**Air Valve** (J17)




1. Locknut
2. Nut
3. Washer
4. Cast Wheel
5. Grommet
6. Valve Stem

## Axle

A bent axle causes vibration, poor handling, and instability.

To measure axle runout, remove the axle, place it in **V** blocks that are 100 mm apart, and set a dial gauge against the axle at a point halfway between the blocks. Turn the axle to measure the runout. The amount of runout is the amount of dial variation.

If runout exceeds the service limit, straighten the axle or replace it. If the axle cannot be straightened to within tolerance, or if runout exceeds the repair limit, replace the axle.

**Axle Runout Measurement** (J18)

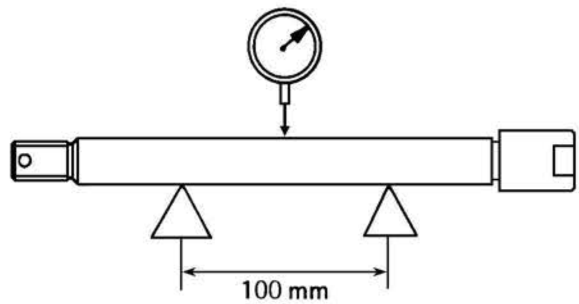



**Table J5 Axle Runout/100 mm**

| Service Limit | Repair Limit |
|---|---|
| 0.2 mm | 0.7 mm |

## Wheel Bearings, Grease Seals

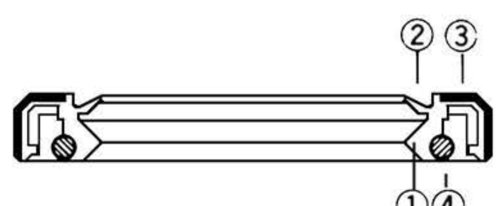
Since the grease seal not only seals in the wheel bearing grease but also keeps dirt and moisture from entering the hub, the use of a damaged grease seal will cause the wheel bearing to wear quickly.

A wheel bearing is fitted in both sides of each hub. Since worn wheel bearings will cause play in the wheel (resulting in vibration and instability), they should be cleaned, inspected, and greased periodically (Pg. 10).

### *Inspection and lubrication*

If the grease seals are examined without removing the seals themselves, look for discoloration (indicating the rubber has deteriorated), hardening, damage to the internal ribbing, or other damage. If the seal or internal ribbing has hardened, the clearance between the seal and the axle sleeve will not be taken up, which will allow dirt and moisture to enter and reach the bearing. If in doubt as to its condition and whenver the seal is removed for greasing the bearing, the seal should be replaced. The seals are generally damaged upon removal.

**Grease Seal** (J19)




1. Primary Lip
2. Secondary Lip
3. Metal Band
4. Wire Spring Band

Since the wheel bearings are made to extremely close tolerances, the clearance cannot normally be measured.

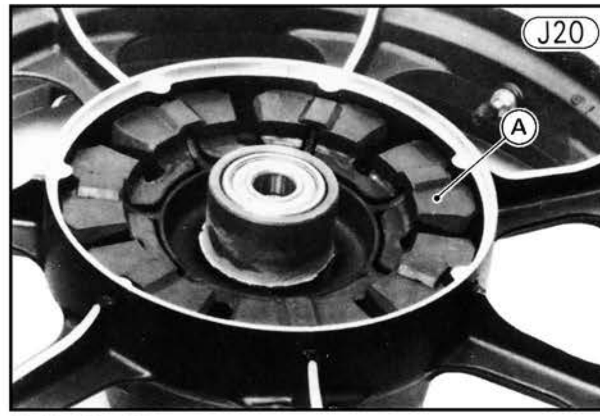
Wash the bearing with a high flash-point solvent, dry it (do not spin it while it is dry), and oil it. Spin it by hand to check its condition. If it is noisy, does not spin smoothly, or has any rough spots, it must be replaced. If the same bearing is to be used again, rewash it with a high flash-point solvent, dry it, and pack it with good quality bearing grease before installation. Turn the bearing by hand a few times to make sure the grease is distributed uniformly inside the bearing, and wipe the old grease out of the hub before bearing installation. Clean and grease the wheel bearings in accordance with the Periodic Maintenance (Pg. 10).

### Rear Wheel Coupling

*Damper inspection*

Remove the rear wheel (Pg. 129), and inspect the rubber damper.

Replace the damper if it appears damaged or deteriorated.



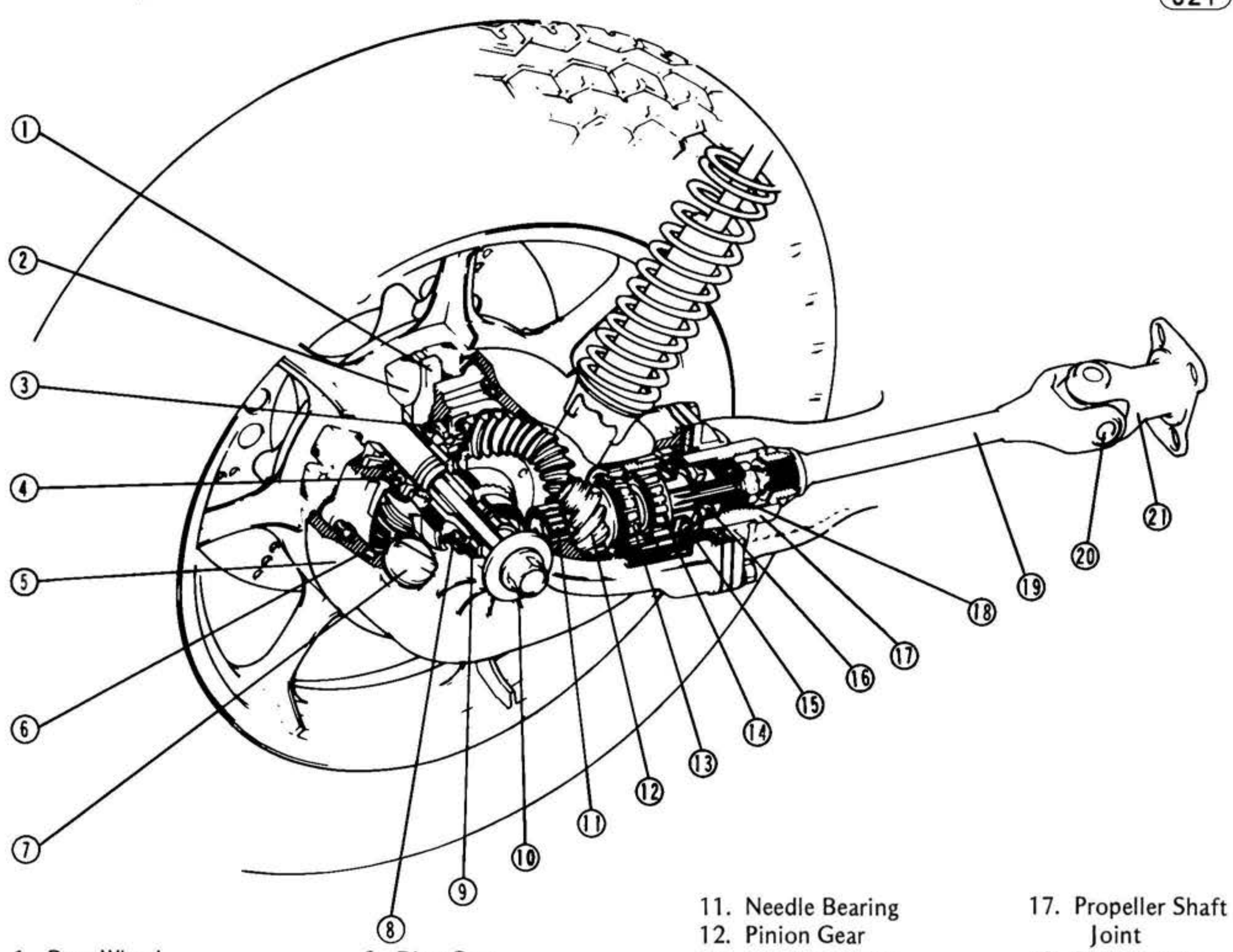

**A. Rubber Damper**

## PROPELLER SHAFT, FINAL GEAR CASE

This motorcycle uses the shaft drive system for final drive. Advantages of this system are high reliability and

**Shaft Drive System**

J21




1. Rear Wheel Coupling
2. Rubber Damper
3. Oil Seal
4. Ball Bearing
5. Final Gear Case
6. Ring Gear
7. Final Gear Case Oil Filler
8. Needle Bearing
9. Oil Seal
10. Axle Shaft
11. Needle Bearing
12. Pinion Gear
13. Tapered Roller Bearing
14. Tapered Roller Bearing
15. Oil Seal
16. Grease Seal
17. Propeller Shaft Joint
18. Pinion Shaft Joint
19. Propeller Shaft
20. Universal Joint
21. Universal Joint Coupling

easy maintenance compared to a chain drive system.

Engine power is transmitted from the output shaft to the propeller shaft ⑲, pinion gear ⑫ through the pinion shaft joint ⑱, ring gear ⑥, and then to the rear wheel.

Required periodical maintenance is the level check and change of final gear case oil (Pg. 31) and the change of propeller shaft joint grease.

## Propeller Shaft

The propeller shaft ⑲ connects the output shaft with the pinion gear to transmit the engine power to the rear wheel.

The engine is mounted on the frame, and the rear wheel moves up and down in relation to the frame. When the rear wheel moves up and down, the propeller shaft must be able to flex. To allow the propeller shaft to move without breaking, a universal joint is used at the front end of the propeller shaft.

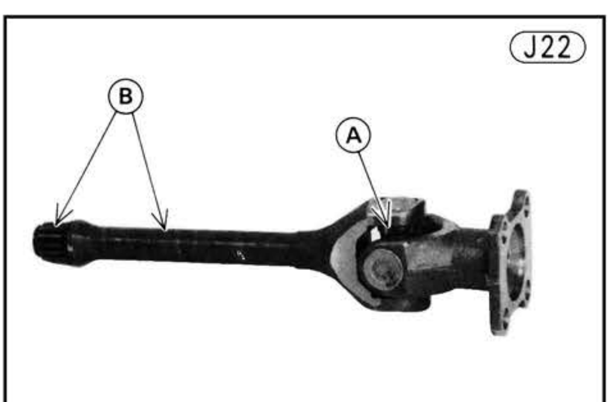
As the rear wheel moves up and down, it swings on an arc that is different from that of the drive line. As a result, the distance between the output shaft and the pinion gear ⑫ will change to some extent. To allow the propeller shaft to adjust to these variations in length, a sliding joint, which includes the propeller shaft joint ⑰ and pinion shaft joint ⑱, is used at the rear end of the propeller shaft.

The splines of the pinion shaft joint ⑱ are curved, thereby allowing the sliding joint to compensate for slight misalignment of the propeller shaft.

### *Propeller shaft inspection*

Check that the universal joint works smoothly without rattling or sticking. If it does not, the needle bearings of the universal joint are damaged. Replace the propeller shaft assembly with a new one.

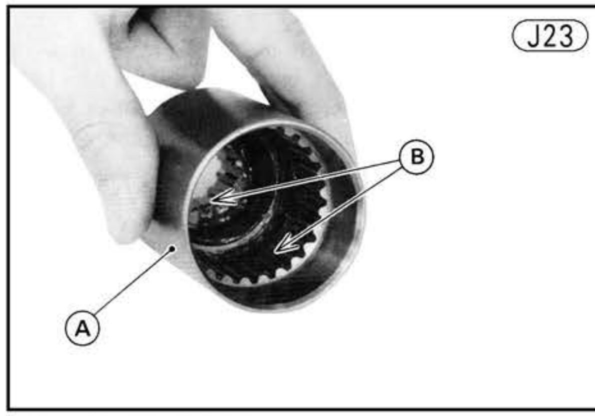
Visually inspect the bending of the shaft and the wear of the splined section at the rear end of the shaft. If it is bent at all, replace the propeller shaft assembly. Do not attempt to straighten the bent shaft.




**A. Checking the Universal Joint**
**B. Inspecting the Shaft and Splined Portion**

### *Propeller shaft joint inspection*

Visually inspect the internal splines of the propeller shaft joint ⑰. If they are badly worn or chipped, replace the joint with a new one.



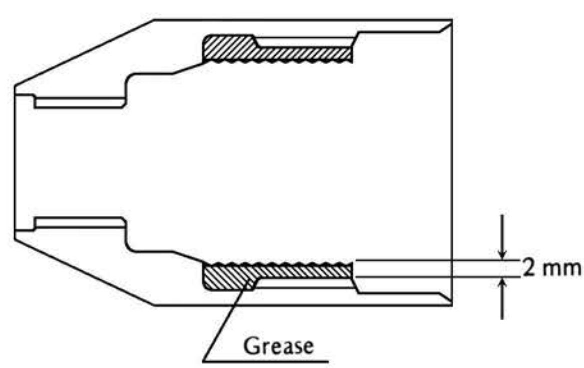

**A. Propeller Shaft Joint**
**B. Check the Splined Portion.**

### *Propeller shaft joint lubrication*

In accordance with the Periodic Maintenance Chart, (Pg. 10), and whenever the drive line is disassembled, the propeller shaft joints ⑰ of the propeller shaft should be lubricated.

Wipe off all the old grease, washing them in a high flash-point solvent if necessary. Coat the inside of the propeller shaft joint to a depth of about 2 mm at the splines with a high temperature grease. It will take 25 cc of grease.

**Propeller Shaft Joint Lubrication** J24




### *Pinion shaft joint inspection*

Visually inspect the splines of the pinion shaft joint ⑱. If they are badly worn or chipped, replace the shaft joint with a new one.


**A. Check splined portion.**

### Tapered Roller Bearings

A pair of opposed tapered roller bearings ⑬, ⑭, are used for the pinion gear bearing to reduce the axial movement of the gear which especially influences the tooth contact of bevel gears.

The bearings must be properly preloaded when the pinion gear assembly is disassembled (Pg. 153).

#### *Inspection*

Visually inspect the bearings for abrasion, color change, or other damage. If there is any doubt as to the condition of a bearing, replace it.

### Bevel Gears

A set of bevel gears ⑥, ⑫, are used to transmit the engine power from the propeller shaft to the rear wheel rectangularly.

The bevel gears are lapped together as a set at the factory to get the best tooth contact. They must be replaced as a set.

The backlash and tooth contact pattern of the bevel gears are very important as strength, wear, and quiet operation are to be of the best quality. The backlash and tooth contact pattern of the bevel gears must be checked and adjusted when replacing any of the parts which have influence on them.

These patterns are brought out by coating the teeth with a checking compound.

#### *Inspection*

Visually check the bevel gears for scoring, chipping, or other damage. Replace the bevel gears as a set if either gear is damaged.

#### *Ring gear bearing inspection*

Since the ball bearing ④ in the ring gear assembly is made to extremely close tolerances, the wear must be judged by feel rather than by measurement. Clean the ball bearing in a high flash-point solvent, dry it (do not spin it while it is dry), and oil it. Spin it by hand to check its condition. If it is noisy, does not spin smoothly, or has any rough spots, replce the final bevel gears as a set.

#### *Needle bearings inspection*

Visually inspect the bearings ⑧, ⑪, for abrasion, color change, or other damage. If there is any doubt as to the condition of a bearing, replace it.

#### *Oil seal and grease seal damage*

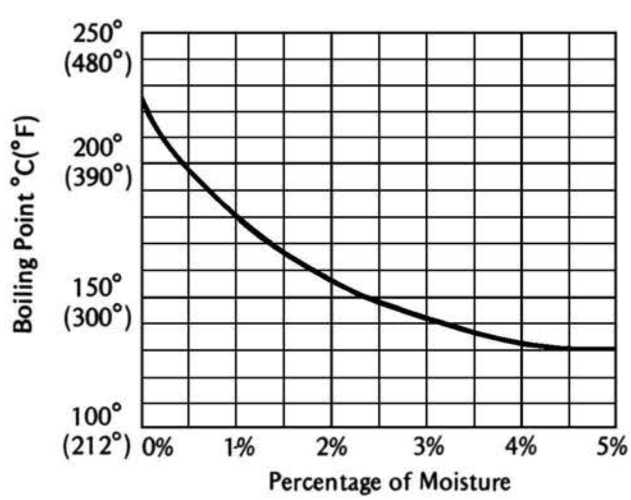
Inspect the oil seals and grease seal ③, ⑨, ⑮, ⑯, and replace any if the lips are misshapen, discolored (indicating that the rubber has deteriorated), hardened, or been otherwise damaged. Since an oil seal is nearly always damaged on removal, any removed oil seals must be replaced. When pressing in an oil seal which displays manufacturer marks, press it in with the marks facing outward. Press the seal in so that the face of the seal is level with the surface of the hole.

## DISC BRAKES

### Brake Fluid

When the brake is applied, heat is generated by the friction between the disc and the brake pads. While much of this heat is immediately dissipated, some of it is transmitted to the brake fluid and may raise fluid temperature to as high as 150°C (300°F) during brake operation. This temperature could boil the brake fluid and cause a vapor lock in the lines unless fluid with a high boiling point is used and has been kept from being contaminated with dirt, moisture, or a different type of fluid. Poor quality or contaminated fluid can also deteriorate from contact with the recommended brake fluids.

**Brake Fluid Boiling Point** (J26)




The graph of Fig. J26 shows how brake fluid contamination with moisture lowers the fluid boiling point. Although not shown in the graph, the boiling point also lowers as the fluid gets old, is contaminated with dirt, or if two different types of brake fluid are mixed.

**When working with the disc brake, observe the precautions listed below.**

1. Never reuse old brake fluid.
2. Do not use fluid from a container that has been left unsealed or that has been open a long time.
3. Do not mix two types 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. Recommended fluids are given in the table.
   **NOTE:** The type of fluid originally used in the disc brake is not available in most areas, but it should be necessary to add very little fluid before the first brake fluid change. After changing the fluid, use only the same type thereafter.

   **Table J6 Recommended Disc Brake Fluid**

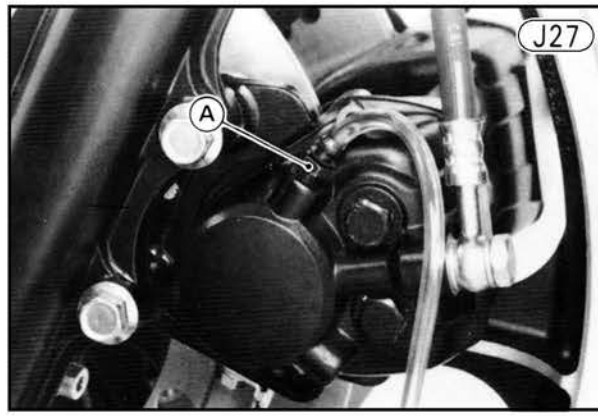
   | |
   |---|
   | Atlas Extra Heavy Duty |
   | Shell Super Heavy Duty |
   | Texaco Super Heavy Duty |
   | Wagner Lockheed Heavy Duty |
   | Castrol Girling-Green |
   | Castrol GT (LMA) |
   | Castrol Disc Brake Fluid |

   **The correct fluid will come in a can labeled D.O.T.3. Do not use fluid that does not have this marking.**
4. Don't leave the reservoir cap off for any length of time to avoid moisture contamination of the fluid. Brake fluid is hygroscopic; that is, it tends to attract water vapor.
5. Don't change the fluid in the rain or when a strong wind is blowing.
6. Except for the disc pads and discs, use only disc brake fluid, isopropyl alcohol, or ethyl alcohol for cleaning brake parts. Do not use any other fluid for cleaning these parts. Gasoline, motor oil, or any other petroleum distillate will cause deterioration of the rubber parts. Oil spilled on any part will be difficult to wash off completely and will eventually reach and break down 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. Do not use one which will leave an oily residue. Replace the pads with new ones if they cannot be cleaned satisfactorily.
8. Brake fluid quickly ruins painted surfaces; any spilled fluid should be completely wiped up 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.**
10. When installing or assembling the disc brake, tighten the disc brake fittings to the values given in Table G1. Improper torque may cause the brake to malfunction. Improperly tightened or adjusted brake components may lead to brake failure and subsequent accident and injury.

### *Changing the brake fluid*

The brake fluid should be changed in accordance with the Periodic Maintenance Chart (Pg. 10) and whenever it becomes contaminated with dirt or water.

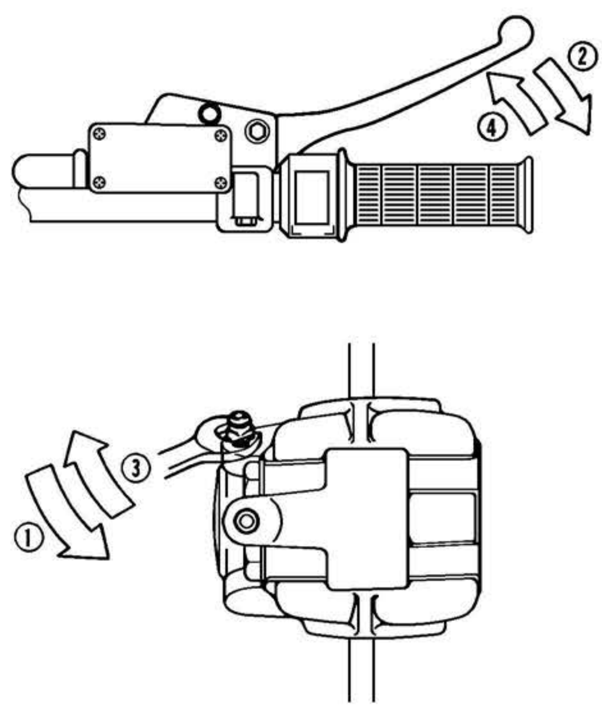
- Attach a clear plastic hose to the bleed valve on the caliper, and run the other end of the hose into a container.
- Remove the reservoir cap, and remove the rubber cap on the bleed valve.
- Open the bleed valve (counterclockwise to open), and pump the brake lever or pedal until all the fluid is drained from the line.




**A. Bleed Valve**

**Filling up the Brake Line**

J28




1. Open the bleed valve.
2. Apply the brake, keeping the brake applied.
3. Close the bleed valve.
4. Then quickly release the brake.

- For a dual disc brake, repeat the previous step one more time for the other side.

- Close the bleed valve(s), and fill the reservoir with fresh brake fluid.
- Open the bleed valve, apply the brake by the brake lever or pedal, close the valve with the brake held applied, and then quickly release the lever or pedal. Repeat this operation until the brake line is filled and fluid starts coming out of the plastic hose. Replenish the fluid in the reservoir as often as necessary to keep it from running completely out.
- Bleed the air from the lines (See the next paragraph).

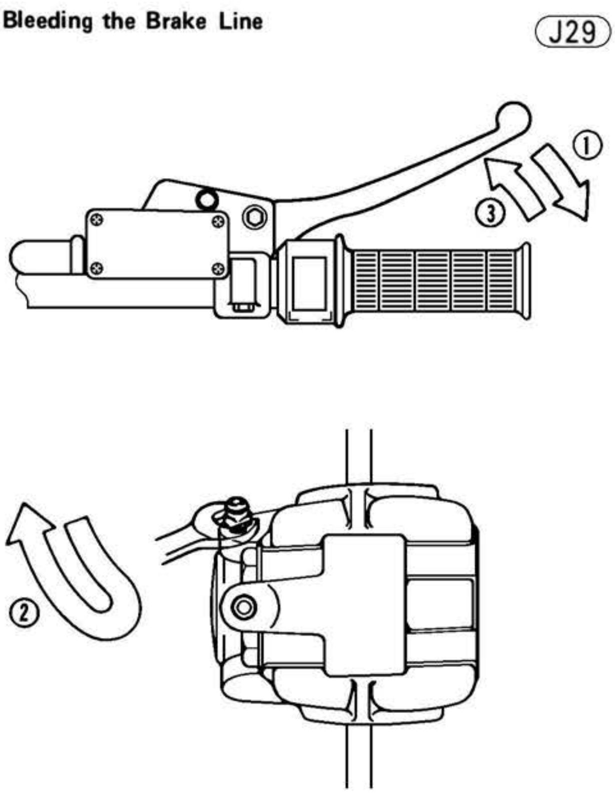
### *Bleeding the brake*

The brake fluid has a very low compression coefficient so that almost all the movement of the brake lever or pedal is transmitted directly to the caliper for braking action. Air, however, is easily compressed. When air enters the brake lines, brake lever or pedal movement will be partially used in compressing the air. This will make the lever or pedal feel spongy, and there will be a loss in braking power.

Bleed the air from the brake whenever brake lever or pedal action feels soft or spongy, after the brake fluid is changed, or whenever a brake line fitting has been loosened for any reason.

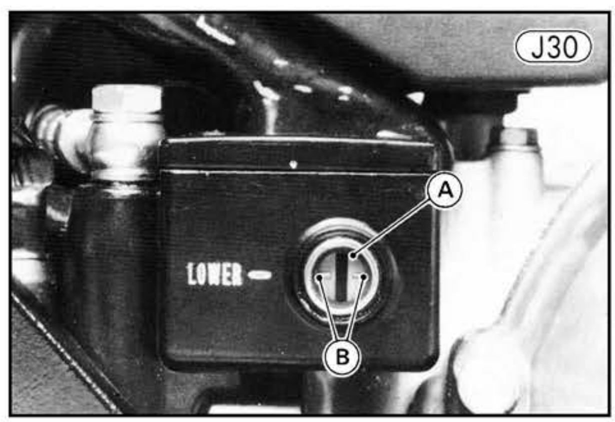
- Remove the reservoir cap, and check that there is plenty of fluid in the reservoir. The fluid level must be checked several times during the bleeding operation and replenished as necessary. If the fluid in the reservoir runs completely out any time during bleeding, the bleeding operation must be done over again from the beginning since air will have entered the line.

**Bleeding the Brake Line**




1. Hold the brake applied.
2. Quickly open and close the valve.
3. Release the brake.

- With the reservoir cap off, slowly pump the brake lever or pedal several times until no air bubbles can be seen riding up through the fluid from the holes at the bottom of the reservoir. This bleeds the air from the master cylinder end of the line.
- Install the reservoir cap, and connect a clear plastic hose to the bleed valve at the caliper, running the other end of the hose into a container. Pump the brake lever or pedal a few times until it becomes hard and then, holding the lever squeezed or the pedal pushed down, quickly open (turn counterclockwise) and close the bleed valve. Then release the lever or pedal. Repeat this operation until no more air can be seen coming out into the plastic hose. Check the fluid level in the reservoir every so often, replenishing it as necessary.
- For a dual disc brake, repeat the previous step one more time for the other side.
- After air bleeding is finished, tighten the bleed valve to 0.80 kg-m (69 in-lbs) of torque, and install the rubber cap.
- Check the brake fluid level through the inspection window in the reservoir. With the master cylinder held level, the fluid should be filled more than level line marked next to the window.




**A. Inspection Window** **B. Level Lines**

## Master Cylinder

### *Master cylinder parts wear*

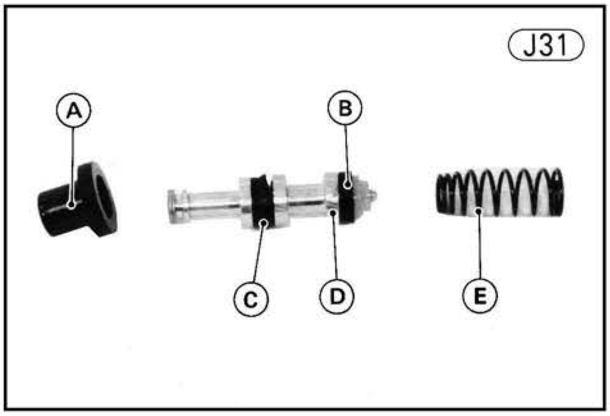
When master cylinder parts are worn or damaged, proper brake fluid pressure cannot be obtained in the line, and the brake will not hold.

If the small relief port becomes plugged, especially with a swollen or damaged primary cup, the brake pads will drag on the disc.

- Check that there are no scratches, rust or pitting on the inside of the master cylinder, and that it is not worn past the service limit.
- Check the piston for these same faults.

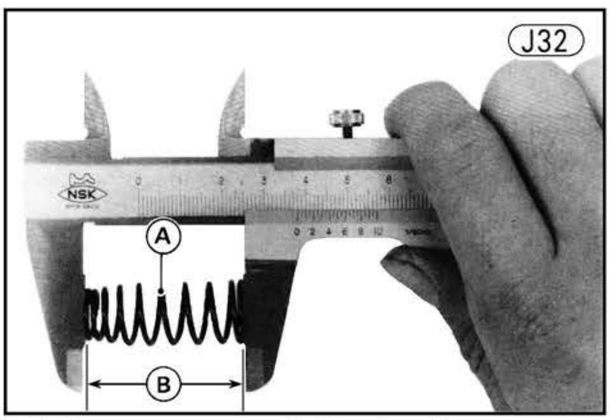
**NOTE:** The cups are part of the piston assembly. Replace the piston assembly if any one of the cups requires replacement.

- Inspect the primary and secondary cups. If a cup is worn, damaged, softened (rotted), or swollen, replace it. When inserting the cup into the cylinder, see that it is slightly larger than the cylinder (standard values given in Table J7). If fluid leakage is noted at the brake lever, the cups should be replaced.




**A. Dust Seal**
**B. Primary Cup**
**C. Secondary Cup**
**D. Piston**
**E. Spring**

•Check that the spring is not damaged and is not shorter than the service limit.




**A. Spring** **B. Free Length**

**Table J7 Master Cylinder Parts (Front and Rear)**

| Measurement | Service Limit |
|---|---|
| Cylinder Inside Diameter | 15.95 mm |
| Piston Outside Diameter | 15.80 mm |
| Primary Cup Diameter | 16.0 mm |
| Secondary Cup Diameter | 16.4 mm |
| Spring Free Length | 34.7 mm |

•Check the dust seal at the piston and diaphragm at the reservoir cap for tear or other damage. Replace them if they are damaged.
•Check the diaphragm under the master cylinder cap. If there is any tear or other damage, replace the diaphragm.

## Caliper

### *Caliper parts wear*

Inspect the pads for wear. For the front disc brake(s), check the thickness of the pad linings, and replace both pads as a set if the thickness of either pad is less than the service limit.

**Lining Thickness**

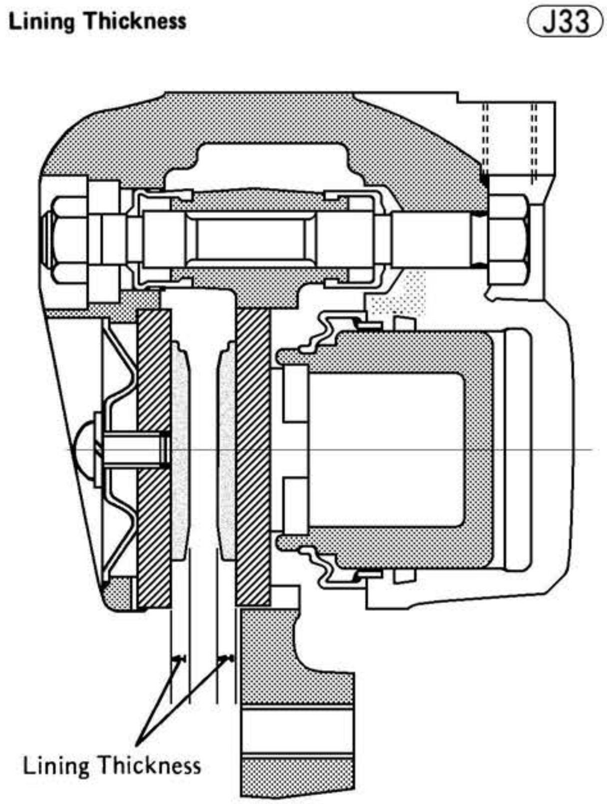
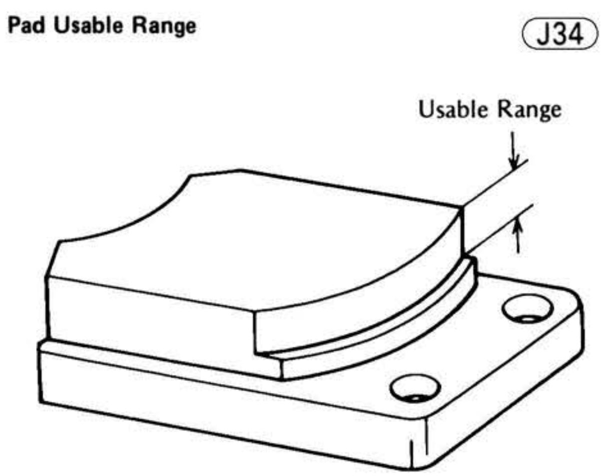



**Table J8 Lining Thickness**

| | |
|---|---|
| Service Limit | 1 mm |

For the rear disc brake, if either pad is worn down through the stepped portion, replace both pads as a set. If any grease or oil spills on the pads, wash it off with trichloroethylene or a high flash-point solvent. Do not use one which will leave an oily residue. If the oil cannot be thoroughly clean off, replace the pads.

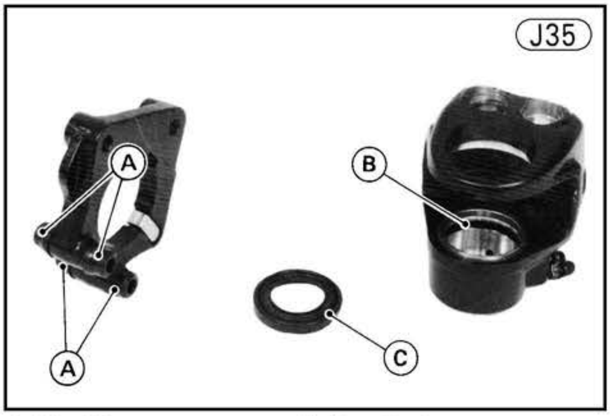
**Pad Usable Range**



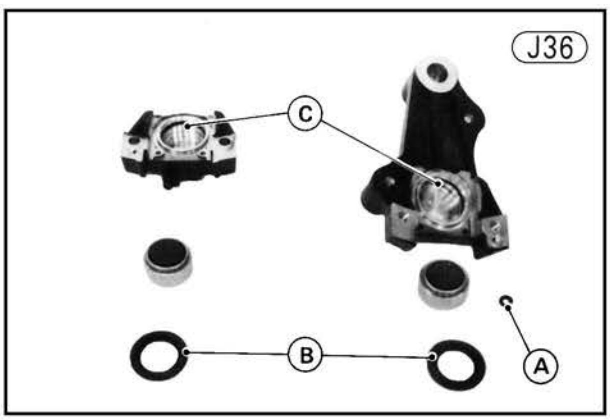

The fluid seal around the piston maintains the proper pad/disc clearance. If this seal is not satisfactory, pad wear will increase, and constant pad drag on the disc will raise brake and brake fluid temperature.

Replace the fluid seals under any of the following conditions: (a) fluid leakage around the pad; (b) brakes overheat; (c) there is a large difference in left and right pad wear; (d) the seal is stuck to the piston. If the fluid seal is replaced, replace the dust seal as well. Also, replace all seals every other time the pads are changed.

Check the dust seals, dust covers, and **O** rings, and replace any that are cracked, worn, swollen or otherwise damaged.




**A. Dust Covers** **C. Dust Seal**
**B. Fluid Seal**




**A. "O" Ring** **C. Fluid Seals**
**B. Dust Seals**

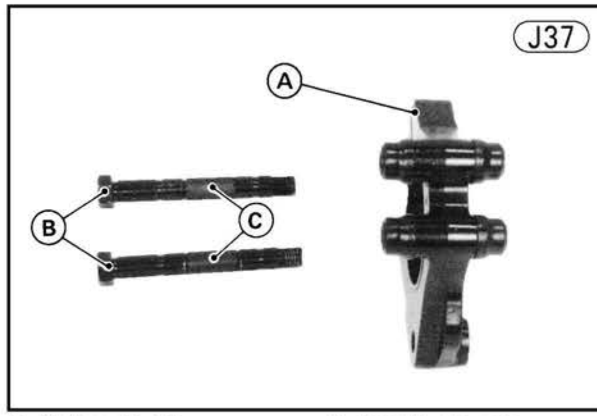
Measure the cylinder inside diameter and piston outside diameter.

Replace the cylinder and piston if they are worn out of tolerance, badly scored, or rusty.

**Table J9 Caliper Parts (Front and Rear)**

| Measurement | Service Limit |
|---|---|
| Cylinder Inside Diameter | 42.92 mm |
| Piston Outside Diameter | 42.75 mm |

For front calipers, caliper holder shafts must slide smoothly in the caliper holder. If the shafts do not slide smoothly, one pad will wear more than the other, pad wear will increase, and constant drag on the disc will raise brake and brake fluid temperature. Check to see if the caliper holder shafts are badly worn or show stepped wear, or the rubber friction boots are damaged. If the shafts or friction boots are damaged, replace the shafts, and caliper holder, and friction boots.




**A. Caliper Holder** **C. Friction Boots**
**B. Caliper Holder Shafts**

## Brake Hoses

### *Brake line damage*

The high pressure inside the brake line can cause fluid to leak or the hose to burst if the line is not properly maintained.

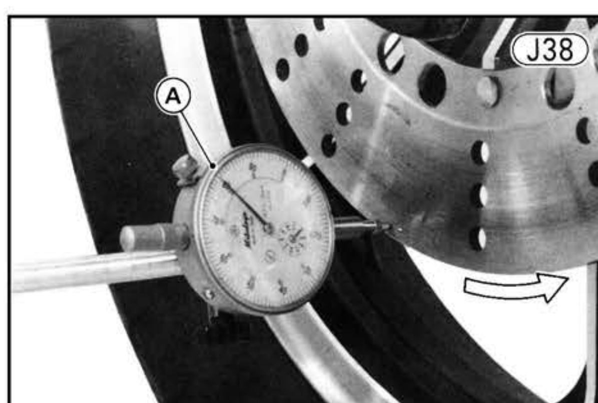
Bend and twist the rubber hose while examining it. Replace it if any cracks or bulges are noticed.

## Discs

### *Disc wear, warp*

Besides wearing down, the disc may warp. A warped disc will cause the brake pads to drag on the disc and will wear down both the pads and disc quickly. Dragging will also cause overheating and poor braking efficiency. Poor braking can also be caused by oil on the disc. Oil on the disc must be cleaned off with trichloroethylene or a high flash-point solvent. Do not use one which will leave an oily residue.

Jack up the motorcycle so that the front wheel is off the ground, and turn the handlebar fully to one side. Set up a dial gauge against the front disc as illustrated, and measure disc runout. Remove the jack, set the motorcycle up on its center stand, and then measure the rear disc runout. If runout exceeds the service limit, replace the disc.




**A. Dial Gauge**

**Table J10 Disc Runout (Front, Rear)**

| | |
|---|---|
| Service Limit | 0.3 mm |

Measure the thickness of each disc at the point where it has worn the most. Replace the disc if it has worn past the service limit.

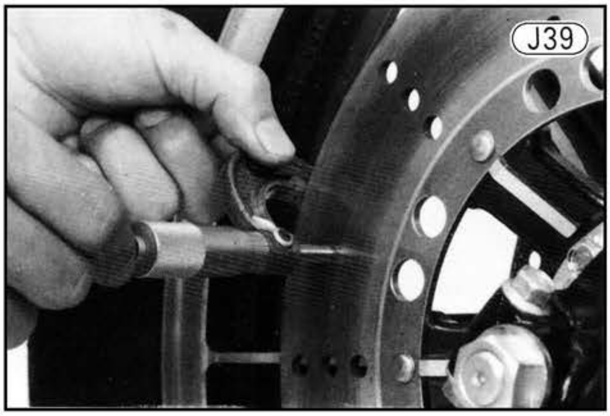



**Table J11 Disc Thickness**

| | Front | Rear |
|---|---|---|
| Service Limit | 4.0 mm | 6.0 mm |

## STEERING STEM

The steering stem itself does not wear, but it may become bent. If it becomes bent, the steering will be stiff, and the bearings may become damaged.

The steering stem will require periodic adjustment as it becomes loose due to bearing wear. Overtightening during adjustment, however, will make the steering stiff and cause accelerated bearing wear. Lack of proper lubrication will also bring about the same results.

From overtightening or from a heavy shock to the steering stem, the bearing race surfaces may become dented. Damaged bearing races will cause the handlebar to jerk or catch when turned.

### *Steering stem warp*

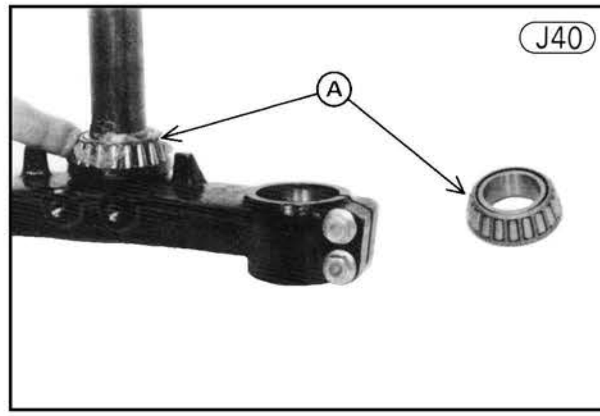
Examine the steering stem, and replace it if it is bent.

### *Bearing wear, damage*

Wipe the bearings clean of grease and dirt, and examine the races and rollers. If the rollers or races are worn, or if either race is dented, replace both races and all the rollers for that bearing as a set.

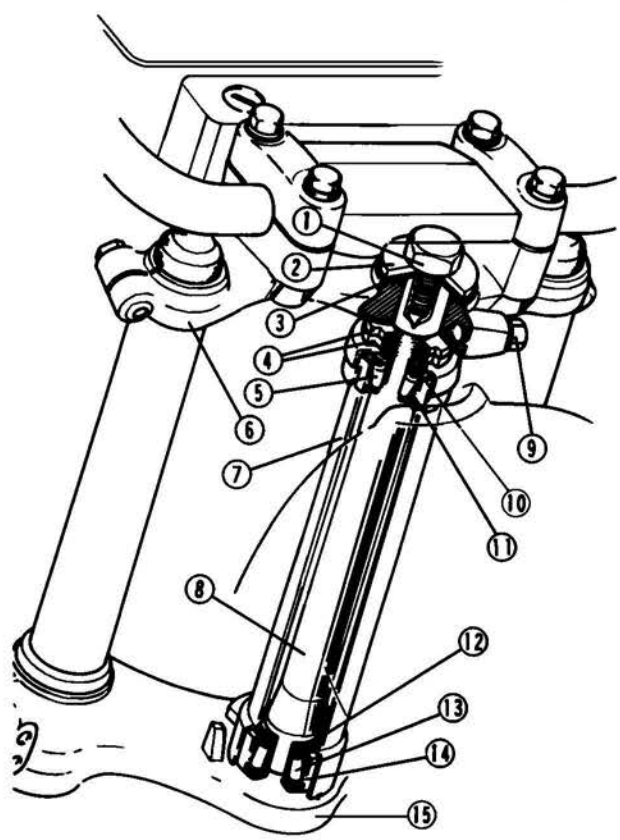
### *Bearing lubrication*

In accordance with the Periodic Maintenance Chart (Pg. 10), and whenever the steering stem is disassembled, the steering stem bearings should be relubricated. Wipe all the old grease off the races and balls. Wash them in a high flash-point solvent if necessary. Replace the bearing parts if they show wear or damage. Apply grease liberally to the upper and lower races, and stick the bearing balls in place with grease.




A. Grease the bearings.

**Steering** J41




1. Stem Head Bolt
2. Flat Washer
3. Wave Washer
4. Stem Locknuts
5. Tapered Roller Bearing
6. Stem Head
7. Frame Head Pipe
8. Steering Stem
9. Head Clamp Bolt
10. Upper Inner Race
11. Upper Outer Race
12. Lower Inner Race
13. Tapered Roller Bearing
14. Lower Outer Race
15. Stem Base

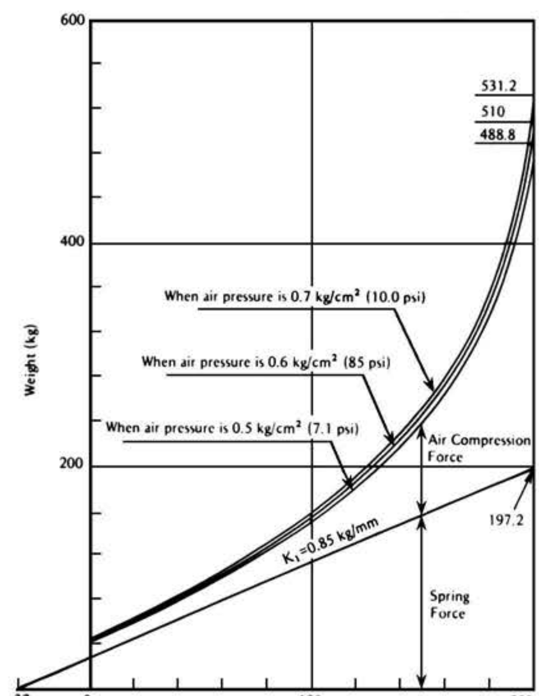
*Grease seal deterioration, damage*

Inspect the grease seal of the lower tapered roller bearing for any signs of deterioration or damage, and replace the bearing if necessary.

## FRONT FORK

The front fork legs of this model contain compressed air to obtain adjustable suspension. This type of the front fork is especially effective when the fork is compressed. It also has the advantage that any air pressure can be choosen (within the usable range) to suit various riding conditions.

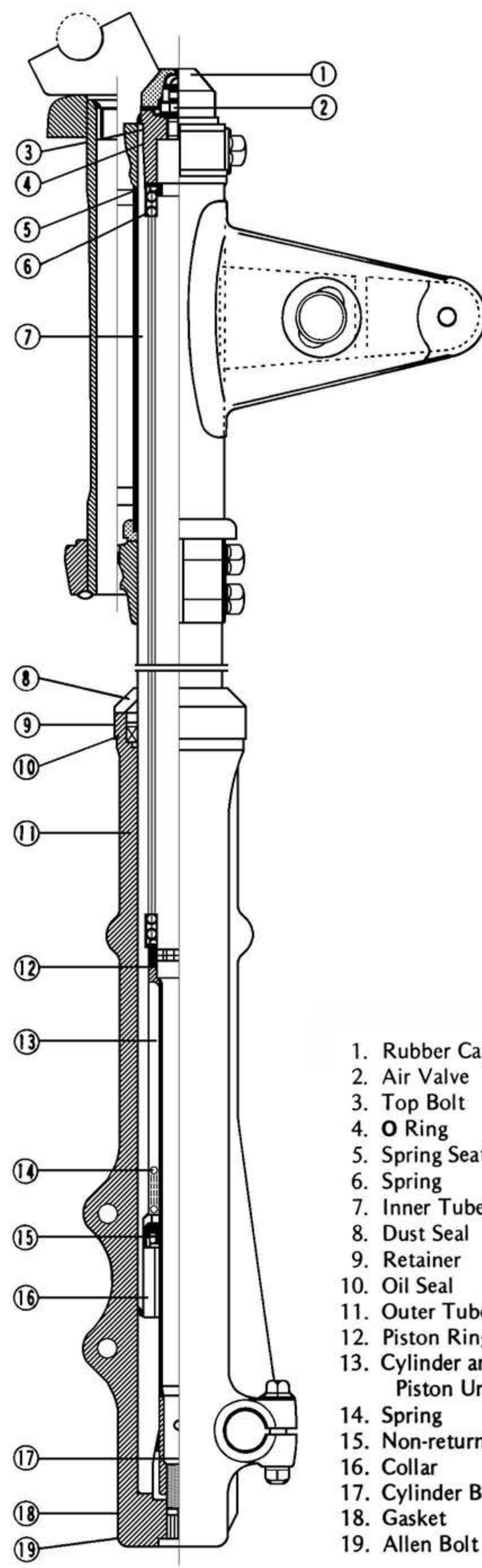
**Front Fork Load/Compression Stroke Relationship** (J42)




It accomplishes shock absorption through air compression in the inner tube, spring action, and the resistance to the flow of the oil forced into the cylinder by the movement.

**WARNING** **Do not remove the springs and rely on compressed air only. Correct springs must be used in this suspension system. Use without springs can lead to a condition causing accident and injury.**

**Front Fork** (J43)




1. Rubber Cap
2. Air Valve
3. Top Bolt
4. **O** Ring
5. Spring Seat
6. Spring
7. Inner Tube
8. Dust Seal
9. Retainer
10. Oil Seal
11. Outer Tube
12. Piston Ring
13. Cylinder and Piston Unit
14. Spring
15. Non-return Valve
16. Collar
17. Cylinder Base
18. Gasket
19. Allen Bolt

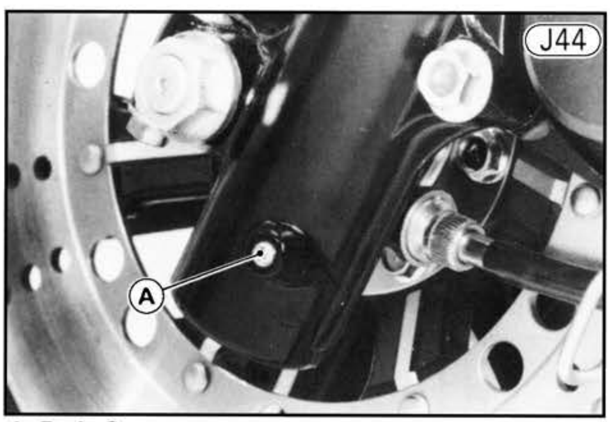
## Fork Oil

Either too much or too little oil in the fork legs will adversely affect shock damping. Too much oil or too heavy an oil makes the action too stiff; too little oil or too light an oil makes the action soft, decreases damping potential, and may cause noise during fork movement.

Contaminated or deteriorated oil will also affect shock damping and, in addition, will accelerate internal wear. The fork oil should be changed periodically (Pg. 10) or sooner if the oil appears dirty.

### *Fork oil change*

- Put a motorcycle up on its center stand.
- Raise the front wheel off the ground by using a jack at the specified location (See Fig. G2).
- Release air through the air valve at the top end of the front fork, and loosen the top bolt.
- Remove the front wheel (See Pg. 121).
- Remove the front fork (See Pg. 225).
- Remove the drain screw from the lower end of the outer tube.
- Pump out the oil by repeatedly compressing and extending the front fork.
- Wash the drain screw threads clean of oil, and blow them dry.
- Apply a liquid gasket to the thread of drain screw, and install the screw and gasket.
- Unscrew the top bolt, and remove the spring seat and spring from the inner tube, and pour in the type and amount of oil specified in Table J12.



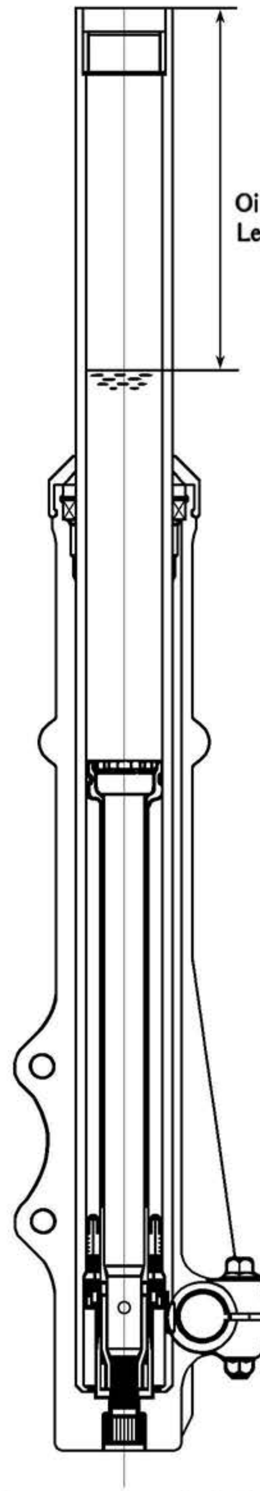

**A. Drain Screw**

**Table J12 Fork Oil**

| Filling fork oil capacity | | | |
|---|---|---|---|
| Type | When changing oil | After disassembly and completely dry | Oil level (mm) |
| SAE 10W 20 | about 360 cc | 391 cc | 155.5 ± 2 from top of inner tube with spring removed and fork completely compressed |

- Pump the fork by several times to expel the air from the upper and lower chambers.
- Check the oil level by compressing the fork completely. If the oil is above or below the specified level, remove or add oil and recheck the oil level.

**Fork Oil Level**




CAUTION **The operation of air front forks is especially dependent upon correct oil level. Higher level than specified may cause oil leakage and seal breakage. So be sure to maintain the specified level.**

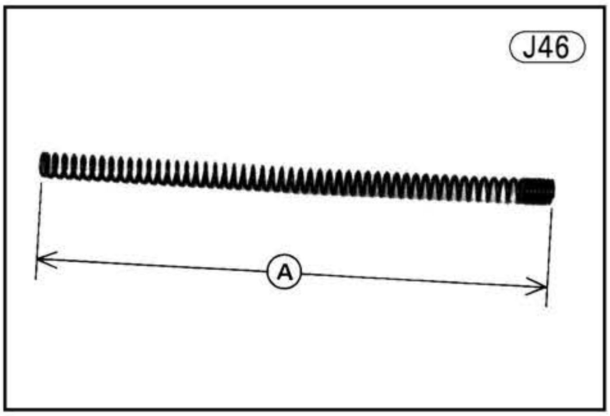
- Inspect the O ring on the top bolt, and replace it with a new one if it is damaged.
- Install the spring, spring seat, and top bolt, and tighten the top bolt to 2.3 kg-m (16.5 ft-lbs) of torque.
- Change the oil of the other fork leg in the same manner.
- Install the front fork (See Pg. 148).

- Install the front wheel (See Pg. 121).
- Adjust the front fork air pressure (See Pg. 26).

## Spring

### *Spring tension*

Since the spring becomes shorter as it weakens, check its free length to determine its condition. If the spring. of either fork leg is shorter than the service limit, it must be replaced. If the length of a replacement spring and that of the remaining spring vary greatly, the remaining spring should also be replaced in order to keep the fork legs balanced for motorcycle stability.




**A. Free Length**

**Table J13 Fork Spring Free Length**

| | |
|---|---|
| Service Limit | 580 mm |

## Inner Tube

A bent, dented, scored, or otherwise damaged inner tube will damage the oil seal, causing oil leakage. A badly bent inner tube may cause poor handling.

### *Inner tube damage*

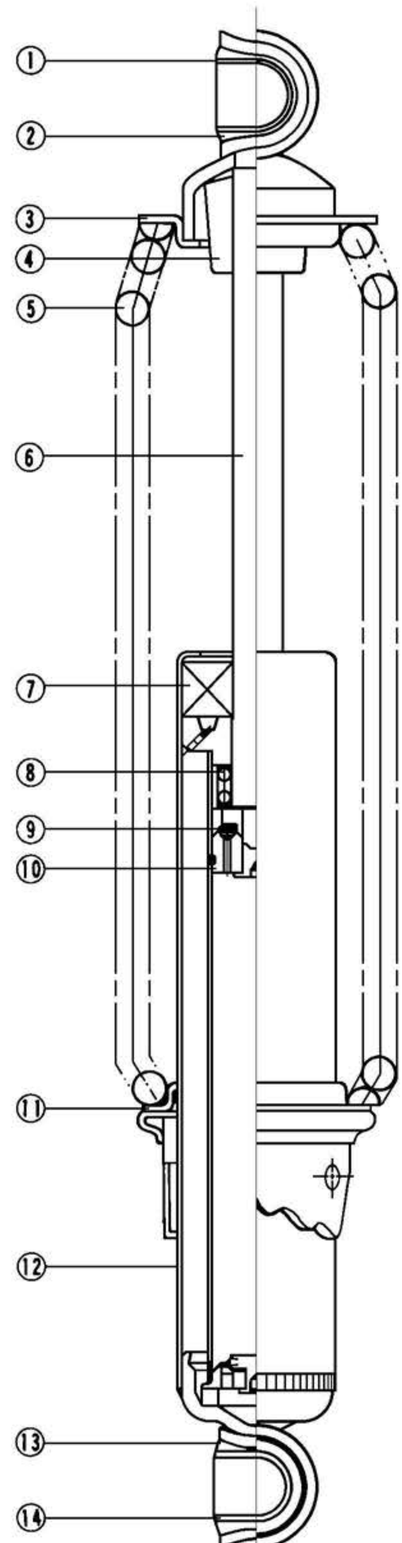
Visually inspect the inner tube, and repair any damage. If the damage is not repairable, replace the inner tube. Since damage to the inner tube damages the oil seal, replace the oil seal whenever the inner tube is repaired or replaced. Temporarily assemble the inner and outer tubes, and pump them back and forth manually to check for smooth operation.

**CAUTION** **If the inner tube is bent or badly creased, replace it. Excessive bending, followed by subsequent straightening, can weaken the inner tube.**

## REAR SHOCK ABSORBERS

Since the rear shock absorbers are sealed units which cannot be disassembled, only external checks of operation are necessary. With the shocks removed, compress each one and see that the compression stroke is smooth and that there is damping in addition to spring resistance

**Rear Shock Absorber** J47

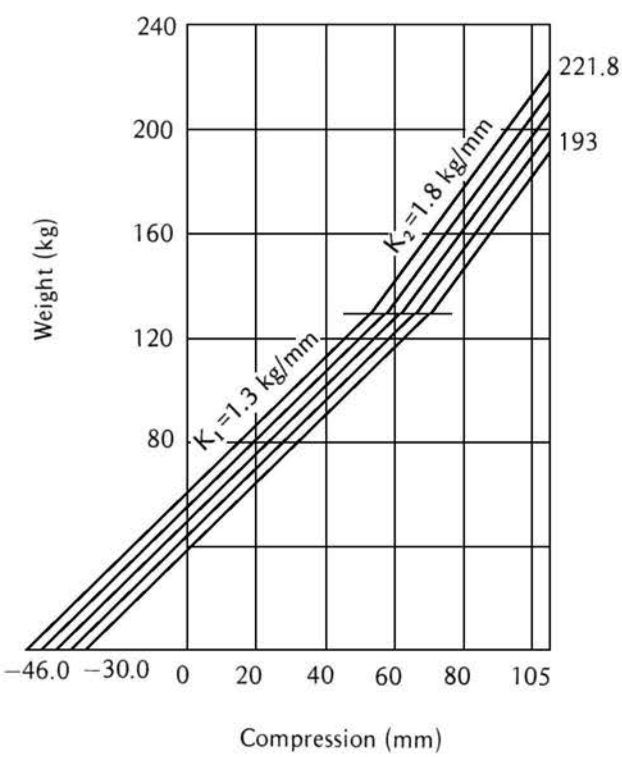



1. Collar
2. Rubber Damper
3. Spring Seat
4. Stopper Rubber
5. Outer Spring
6. Piston Rod
7. Oil Seal
8. Inner Spring
9. Check Valve
10. Piston
11. Spring Seat
12. Outer Shell
13. Rubber Damper
14. Collar

to compression. When the compressed shock rod is released, the spring should not suddenly snap out to full length. It should extend smoothly with notable damping. When the shock absorber is operated, there should be no oil leakage. If either shock absorber does not perform all of these operations satisfactorily, or if one unit feels weaker than the other, replace both shock absorbers as a set. If only one unit is replaced and the two are not balanced, motorcycle instability at high speeds may result.

Shock absorber spring force for the 5 different settings is shown in the graph.

**Rear Shock Absorber Spring Force** (J48)




### *Bushings*

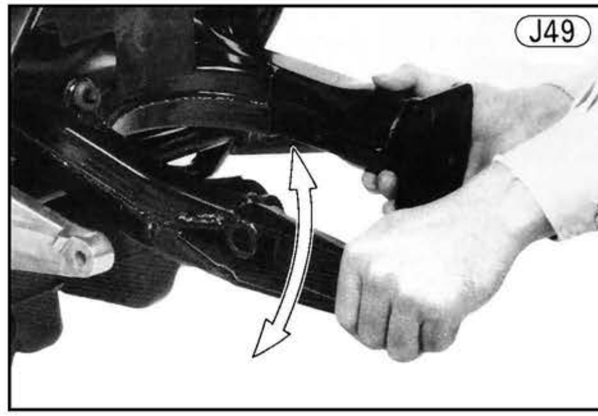
Check the rubber bushings, and replace any that are worn, cracked, hardened, or otherwise damaged.

## SWING ARM

The motorcycle has a tapered roller bearing on each side of the swing arm pivot. The tapered roller bearing is characterized by a high radial capacity and a thrust capacity. Also it allows the swing arm to pivot smoothly without any play.

### *Bearing inspection*

- Remove the rear wheel, both rear shock absorbers, and final gear case.
- Move the swing arm up and down to check for abnormal friction, and push and pull it from side to side to check for bearing play.

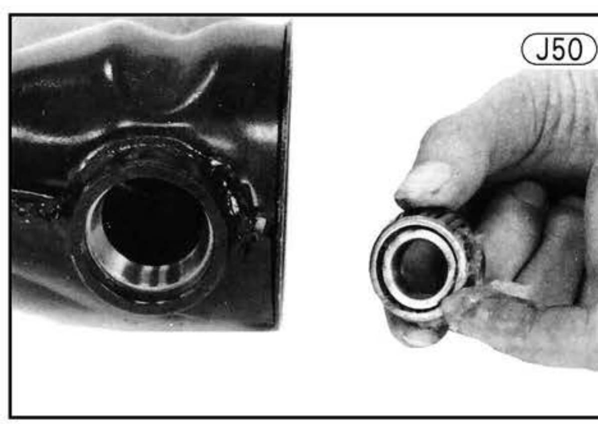



- If abnormal friction is felt, the bearings are damaged. Replace both left and right bearings and grease seals.
- The play developed during use may indicate bearing damage. In this case, remove the swing arm and inspect the bearings. Replace both left and right bearings if one of the bearings is damaged.

### *Swing arm lubrication*

Grease the swing arm pivot bearings with a molybdenum disulfide chassis assembly grease in accordance with the frequency given in the Periodic Maintenance Chart (Pg. 10).

- Remove the swing arm, and remove the grease seals from both sides of the pivot.
- Clean out the old grease from the bearings, and apply fresh grease to them.




- Install new grease seals, and install the swing arm.

# Maintenance—Electrical

## Table of Contents

## BATTERY

The battery supplies the current to the starter motor and serves as a back-up source of power to operate the electrical equipment whenever the engine is turning over too slowly for the alternator to supply sufficient power.

With proper care, the battery can be expected to last several years, but it may be completely ruined long before that if it is mistreated. Following a few simple rules will greatly extend the life of the battery.

1. **When the level of the electrolyte in the battery is low, add only distilled water to each cell, until the level is at the upper level line marked on the outside of the battery. Ordinary tap water is not a substitute for distilled water and will shorten the life of the battery.**
2. **Never add sulphuric acid solution to the battery. This will make the electrolyte solution too strong and will ruin the battery within a very short time.**
3. **Avoid quick-charging the battery. A quick-charge will damage the battery plates.**
4. **Never let a good battery stand for more than 30 days without giving it a supplemental charge, and never let a discharged battery stand without charging it. If a battery stands for any length of time, it slowly self-discharges. Once it is discharged, the plates sulphate (turn white), and the battery will no longer take a charge.**
5. **Keep the battery well charged during cold weather so that the electrolyte does not freeze and crack open the battery. The more discharged the battery becomes, the more easily it freezes.**
6. **Always keep the battery vent hose free of obstruction, and make sure it does not get pinched, crimped, or melted shut by contact with the hot muffler. If battery gases cannot escape through this hose, they will explode the battery.**
7. **DON'T INSTALL THE BATTERY BACKWARDS. The negative side is grounded.**

### Electrolyte

The electrolyte is dilute sulphuric acid. The standard specific gravity of the electrolyte is 1.280 at 20°C (68°F). The water in this solution changes to a gaseous mixture due to chemical action in the battery and escapes, which concentrates the acid in a charged battery. Consequently, when the level of the electrolyte becomes low, only distilled water should be added. If sulphuric acid is added, the solution will become too strong for proper chamical action and will damage the plates. Metal from the damaged plates collects in the bottom of the battery. This sediment will eventually cause an internal short circuit.

The specific gravity of the electrolyte is measured with a hydrometer and is the most accurate indication of the condition of the battery. When using the hydrometer, read the electrolyte level at the bottom of the meniscus (curved surface of the fluid). Fig. K2 shows the relationship between the specific gravity of the solution at 20°C (68°F) and the percentage of battery charge. Since specific gravity varies with temperature, and since the temperature of the solution being checked is likely to be other than 20°C (68°F); the formula given below should be used to compute the equivalent specific gravity for any temperature. When the temperature goes up, the specific gravity goes down, and vice versa.

oCelsius

$S_{20}=S_t + [0.0007\ (t\text{-}20)]$

oFahrenheit

$S_{68}=S_t + [0.0004\ (t\text{-}68)]$

$S_t$=specific gravity at the present temperature

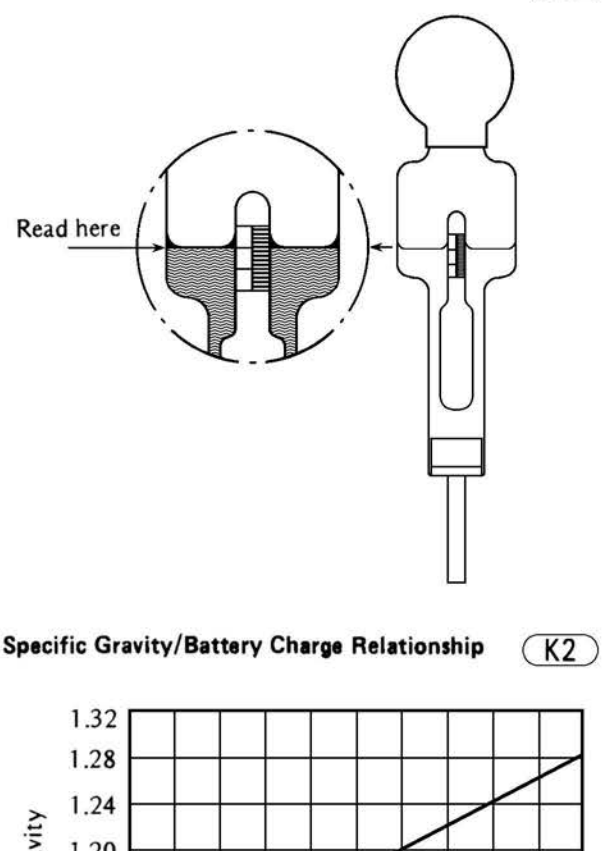
$S_{20}$=specific gravity at 20°C

$S_{68}$=specific gravity at 68°F

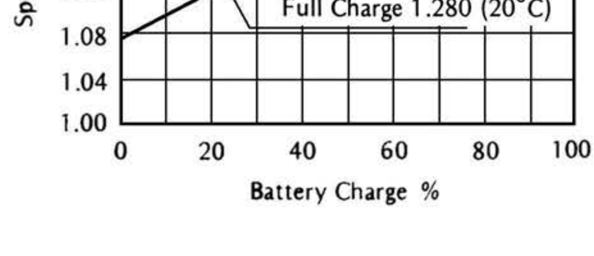
t=present temperature of solution

Generally speaking, a battery should be charged if a specific gravity reading shows it to be discharged to 50% or less of full charge.

**Hydrometer** (K1)




**Specific Gravity/Battery Charge Relationship** (K2)



### *Initial charge*

New batteries for Kawasaki motorcycles are dry charged and can be used directly after adding the electrolyte. However, the effect of the dry charge deteriorates somewhat during storage, especially if any air has entered the battery from imperfect sealing. Therefore, it is best to give the battery an initial charge before using it in order to ensure long battery life.

**WARNING** **Because the battery gives off an explosive gas mixture of hydrogen and oxygen, keep any sparks or open flame away from the battery during charging.**

- Pour a 1.280 (specific gravity at 20°C or 68°F) sulphuric acid solution into each cell of the battery up to the upper level line.
- Let the battery stand for 30 minutes, adding more acid if the level drops during this time.

**NOTES:** 1. If the temperature of the solution is over 30°C (85°F) cool the solution before pouring it into the battery.
2. After pouring the acid into the battery, start charging the battery within 12 hours.

- Leaving the caps off the cells, connect the battery to a charger, set the charging rate at 1/10 the battery capacity, and charge it for 10 hours. For example, if the battery is rated at 20AH, the charging rate would be 2 ampere. If a constant voltage charger is used, the voltage must be adjusted periodically to keep the current at a constant value.

**CAUTION** **If the temperature of the electrolyte rises above 45°C (115°F) during charging, reduce the charging rate to bring down the temperature, and increase the charging time proportionately.**

- After charging, check the electrolyte level in each cell. If the level has dropped, add distilled water to bring it back up to the upper level line.
- Check the results of charging by measuring the specific gravity of each cell and by measuring battery voltage. Battery voltage of a 12 volt battery directly after the completion of charging should be 15 to 16 volts.

### *Ordinary charge*

**WARNING** **Because the battery gives off an explosive gas mixture of hydrogen and oxygen, keep any sparks or open flame away from the battery during charging.**

- Clean off the battery using a solution of baking soda and water. Make especially sure that the terminals are clean.
- If the electrolyte level is low in any cell, fill to over the lower level line but not up to the upper level line since the level rises during charging. Figure the charging rate to be between 1/10 and 3/10 of battery capacity. For example, the maximum charging rate for a 20AH battery would be 3/10 x 20 which equals 6 amperes.

**CAUTION** **Charging the battery at a rate higher than specified above could ruin the battery. Charging at a higher 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.**

- Measure the specific gravity of the electrolyte, and use the graph, Fig. K 2, to determine the percentage of discharge. Multiply the capacity of the battery by the percentage of discharge to find the amount of discharge in ampere-hours. Use this figure in the formula below to compute charging time.

$$\text{Charging time (hours)} = \frac{\text{Amount of discharge (AH)}}{\text{charging current (A)}} \times 1.2 \sim 1.5$$

- Remove the caps from all the cells, and begin charging the battery at the rate just calculated. If a constant voltage charger is used, the voltage will have to be adjusted periodically to maintain charging current at a constant value.

**CAUTION** **If the temperature of the electrolyte rises above 45°C (115°F) during charging, reduce the charging rate to bring down the temperature, and increase charging time proportionately.**

- After charging, check the electrolyte level in each cell. If the level has dropped, add distilled water to bring it back up to the upper level line.
- Check charging results by measuring the specific gravity of each cell and by measuring battery voltage. Battery voltage of a 12 volt battery directly after the completion of charging should be 15 to 16 volts and the specific gravity of the electrolyte should be more than 1.250. If the voltage is lower than this, the battery is not completely charged or can no longer take a full charge. If the specific gravity of any one cell is lower than 1.250, there may be damage in the cell.

### *Test charging*

When the battery is suspected of being defective, first inspect the points noted in the Table below. The battery can be restored by charging it with the ordinary charge.

**Table K1 Battery Troubleshooting Guide**

| | Good Battery | Suspect Battery | Action |
|---|---|---|---|
| Plates | (+) chocolate color<br>(–) gray | white (sulphated); + plates broken or corroded | Replace |
| Sediment | none, or small amount | sediment up to plates, causing short | Replace |
| Voltage | above 12 volts | below 12 volts | Test charge |
| Electrolyte Level | above plates | below top of plates | Fill and test charge |
| Specific Gravity | above 1.200 in all cells; no two cells more than 0.020 different | below 1.100, or difference of more than 0.020 between two cells | Test charge |

If it will take a charge so that the voltage and specific gravity come up to normal, it may be considered good except in the following case:

★ If the voltage suddenly jumps to over 13 volts just after the start of charging, the plates are probably sulphated. A good battery will rise to 12 volts immediately and then gradually go up to 12.5 ~ 13 volts in about 30 to 60 minutes after charging is started.

★ If one cell produces no gas bubbles, or has a very low specific gravity, it is probably shorted.

★ If there does not appear to be enough sediment to short the plates, but one cell has a low specific gravity after the battery is fully charged, the trouble may be just that there is insufficient acid in that cell. In this instance only, sulphuric acid solution may be added to correct the specific gravity.

★ If a fully charged battery not in use 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.

## CHARGING SYSTEM

The charging system consists of an alternator and an integrated regulator/rectifier.

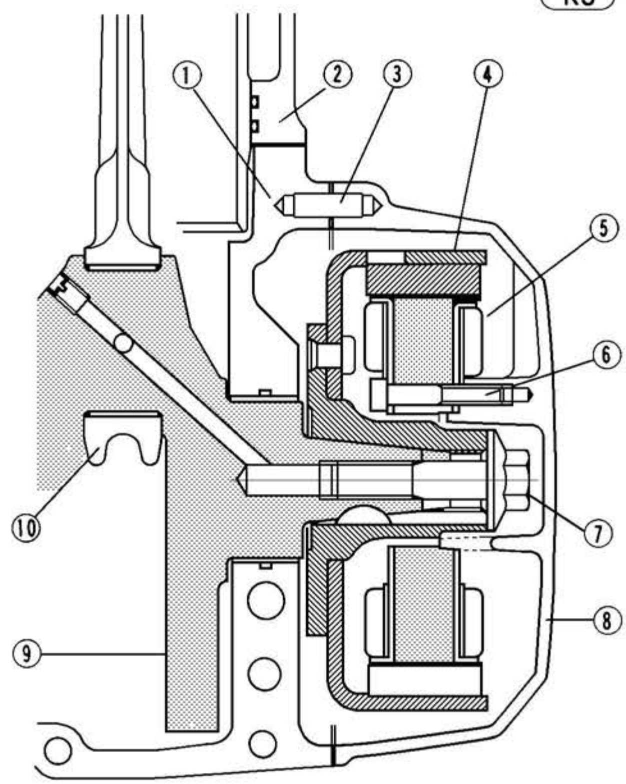
The alternator generates the current required by the electrical circuits. The generated current is a three phase alternating current (AC), which is changed to direct current (DC) and controlled by a solid-state regulator/rectifier to supply an even voltage to the circuit components.

### Alternator

The alternator is made of a rotor (4) and stator (5). The stator is mounted in the alternator cover (8), while the rotor is secured to the right end of the crankshaft (9) and rotates at engine rpm. Permanent magnets in the rotor supply the magnetic field for the stator so that no slip rings or brushes are necessary, making the alternator practically maintenance free.

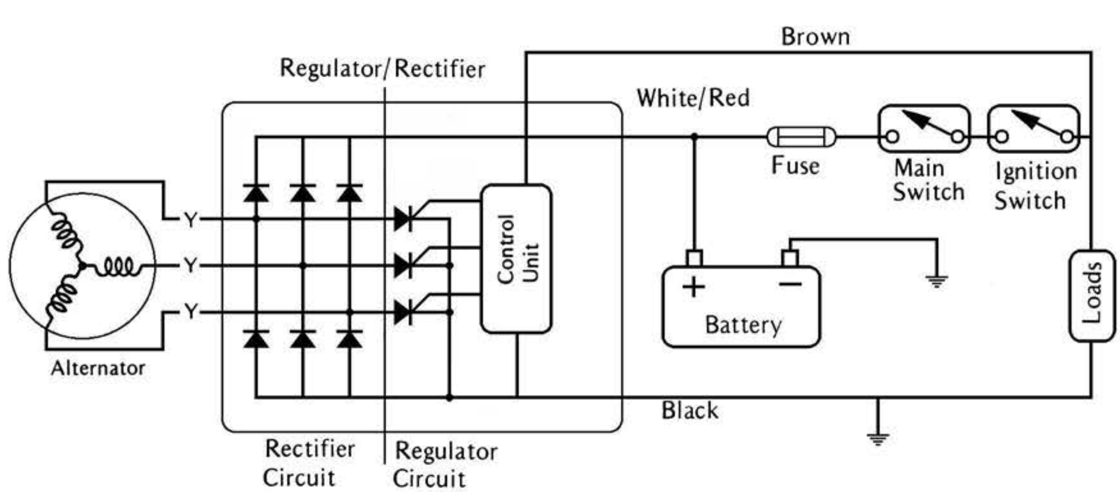
The stator consists of three sets of coils would on laminated steel cores. These coils are connected in a Y-connection to produce a three-phase alternating current. Since the voltages of these three-phases overlap, there is a continuous, even supply of current for the circuit components.

**Alternator Construction** (K3)




1. Crankcase
2. Cylinder Block
3. Knock Pin
4. Alternator Rotor
5. Alternator Stator
6. Mounting Bolt
7. Mounting Bolt
8. Alternator Cover
9. Crankshaft
10. Connecting Rod

**Charging System** (K4)



## Regulator/Rectifier

The regulator and rectifier are solid-state type, and integrated into one unit. Since it contains no contacts or other moving parts, it does not wear out and never needs to be adjusted. It is therefore manufactured as a sealed unit, and must be replaced as a unit should it become defective. The rectifier in the unit rectifies (changes to direct current, DC) the three-phase alternating current (AC) from the alternator. It contains six silicon diodes which are connected in a bridge circuit arrangement for efficient, full-wave rectification. The regulator in the unit keeps the battery + terminal voltage level to a maximum of the specified range. The control circuit in the diagram checks on the voltage level, and triggers the thyristors.

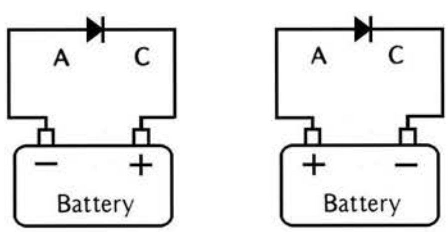
Though the actual regulator/rectifier circuit performs full-wave rectification and regulates each phase of the three-phase alternator output, a simplified single-phase circuit of half-wave rectification is explained here to aid the technician in troubleshooting and in understanding test procedures. Fig. K8 shows the basic circuit of the regulator/rectifier. The main components of the regulator/rectifier circuit are a thyristor (Th), or Silicon Controlled Rectifier (SCR) as it is also called, and a diode. The diode, thyristor (Th), and zener diode (ZD) function as follows:

1. Diode

A current of electrons can flow only form the cathode to the anode of the diode. However, a defective diode will either conduct in both directions (a short) or not conduct at all (an open circuit). If any of the diodes is shorted or open, the voltage from the regulator/rectifier will be below normal, and the battery may not be charged adequately.

**Diode Current Flow** (K5)

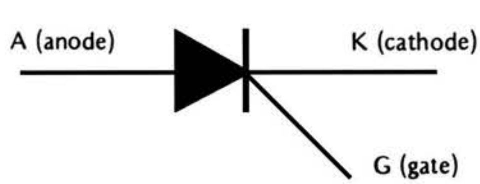
No current flows    Current flows




2. Thyristor

The current of electrons will flow from the cathode to the anode but will not flow in the reverse direction. The thyristor differs from a diode in two respects: (a) even though a voltage of the correct polarity (nagative to cathode) may be applied, the thyristor will not conduct until a signal is received at the gate input lead; (b) once started, it will not stop conducting (even if the gate lead signal voltage stops) until the anode to cathode voltage is removed or reversed.

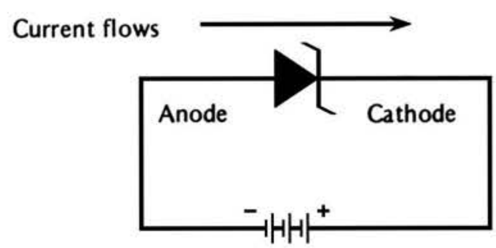
**Thyristor** (K6)




3. Zener diode

As in a normal diode, current will flow easily from the cathode to anode, and will not usually flow in the opposite direction. Unlike a normal diode, however, the zener diode will "break down", or conduct in the reverse direction, if enough voltage is applied in the reverse direction. When this voltage is lowered or removed, the diode will stop conducting and return to its normal state. The voltage at which the diode begins reverse conduction, is called the break down voltage, and is set at the desired level when the diode is manufactured. This property of the zener diode makes it very useful in voltage regulator circuits.

**Zener Diode** (K7)

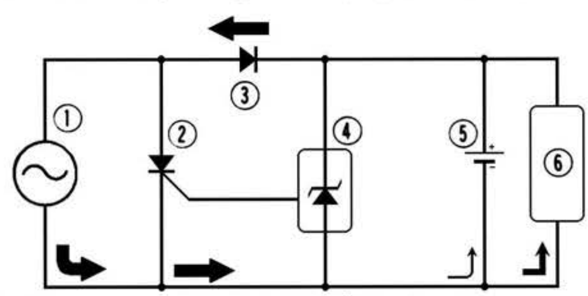



More than break down voltage

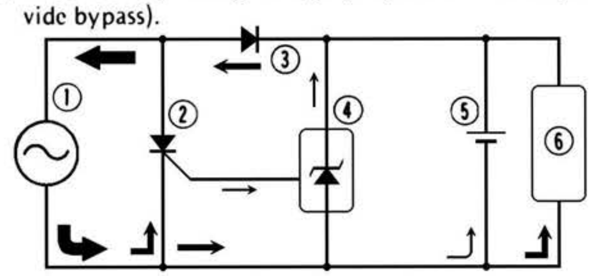
In the regulator/rectifier circuit, the diode is connected in series with the alternator to rectify the alternator output, and the thyristor is connected in parallel with the alternator. Detailed circuit operation is as follows:

**Basic Regulator/Rectifier Circuit** (K8)

1. When battery voltage is low (Thyristor is off).




2. When battery voltage is high (Thyristor is on to provide bypass).




1. Alternator
2. Thyristor
3. Diode
4. Control Unit
5. Battery
6. Load

When the battery voltage is lower than the specified value, the zener diode does not conduct and the control unit does not trigger the thyristor. At this time, the thyristor does not conduct, and all alternator output current flows through the battery and loads to supply adequate charging current.

When the battery voltage is equal to or higher than the predetermined voltage, the zener diode conducts and the control unit signals the thyristor to start conducting. Then, instead of current going through the battery and overcharging it, it flows through the thyristor and then directly back to the alternator.

There are a number of important precautions that are musts when servicing the charging system. Cautions that apply to the individual parts are listed below. Failure to observe these rules can result in serious system damage. Learn and observe all the rules below.

**CAUTION** **When handling the regulator/rectifier, observe the following to avoid damage to the regulator/rectifier:**

1. **Do not reverse the battery lead connections. This will burn out the zener diode.**
2. **For the regulator/rectifier to function properly, the battery must be charged to near capacity. If the battery is badly discharged, charge it before installing it in the motorcycle.**

**When handling the alternator rotor:**

3. **The alternator rotor should never be struck sharply, as with a hammer, or allowed to fall on a hard surface. Such a shock to the rotor can cause the magnets to lose their magnetism.**

## Charging System Inspection

### *Initial inspection:*

If there are any problem indications in the charging system, give the system a quick initial inspection or check before starting a series of time consuming tests, or worse yet, removing parts for repair or replacement. Such a check will often turn up the source of the trouble.

Make sure all connectors in the circuit are clean and tight. Examine wires for signs of burning, fraying, etc. Poor wires and bad connections will affect electrical system operation. Check the alternator rotor and regulator/rectifier for evidence of physical damage.

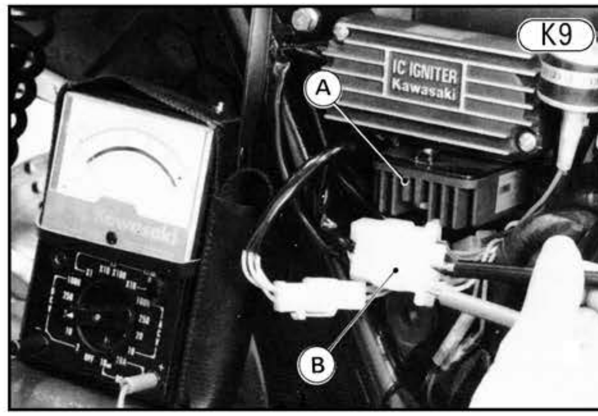
A worn out or badly sulphated battery will produce numerous problems that cannot be corrected until the battery is replaced. **ALWAYS CHECK BATTERY CONDITION BEFORE CONDEMNING OTHER PARTS OF THE SYSTEM. A FULLY CHARGED BATTERY IS A MUST FOR CONDUCTING ACCURATE CHARGING SYSTEM TESTS.**

Charging system malfunctions can be traced to either the battery, alternator, regulator/rectifier, or the wiring. Troubles may involve one item or in some cases all items. Never replace a defective part without determining what **CAUSED** the failure. If the failure was brought on by some other item or items, they too must be repaired or replaced, or the new replacement will soon fail again.

### *Operational inspection of charging system:*

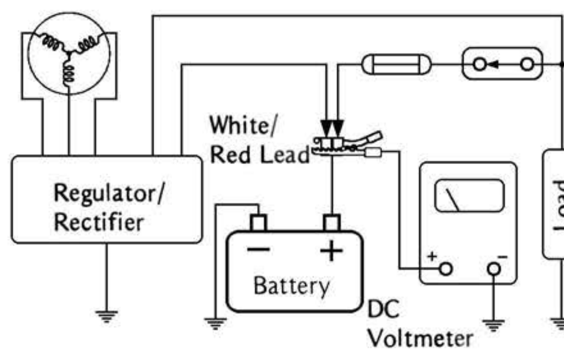
- Warm up the engine to obtain actual alternator operating conditions.
- Remove the right side cover, and pull out the 4-pin connector which connects the regulator/rectifier and the main wiring harness.
- Check that the ignition switch is turned off, and connect the multimeter as shown in Table K2 to test the regulator/rectifier output voltage at the 4-pin connector.

**CAUTION** **The white/red lead is connected directly to the battery positive (+) terminal even when the ignition switch is off, so take care not to short the meter probes or clips to the chassis ground.**




A. Regulator/Rectifier B. 4-pin Connector

**Regulator/Rectifier Output Voltage Measurement** (K10)




- Start the engine, and note the voltage readings at various engine speeds with the headlight turned on and then turned off. (To turn off the headlight of US model disconnect the black/yellow lead from the headlight unit in the headlight housing.) 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.
- Turn off the ignition switch to stop the engine, and disconnect the multimeter.

If the regulator/rectifier output voltage are kept between the values given in Table K2, 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/rectifier is defective or the alternator output is insufficient for the loads.

**Table K2 Regulator/Rectifier Output Voltage**

| Meter Range | Connections | Reading |
|---|---|---|
| 30V DC | Meter (+) → White/Red | Battery Voltage~15V |
| | Meter (–) → Black | |

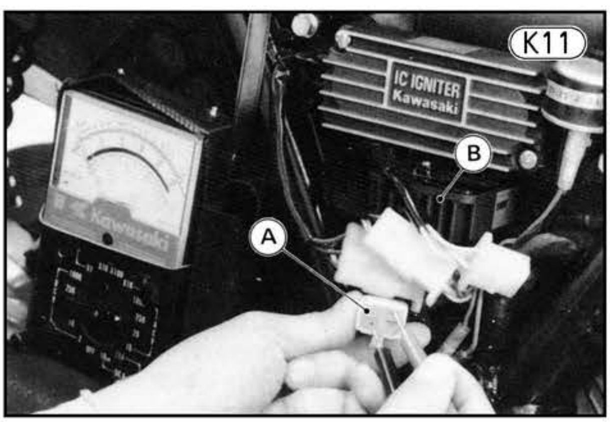
Check the alternator and regulator/rectifier to determine which part is defective.

### *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 aging, will result in low output.

•Remove the right side cover, remove the bolts (2), pull out the 4-pin connector which connects the regulator/rectifier and the alternator, and disconnect the 4-pin connector.

•Connect the multimeter as shown in Table K3 to check the alternator output voltage of each pair of the three alternator output leads with no electrical loads.




**A. 4-pin Connector**
**B. Regulator/Rectifier**

•Start the engine, run it at the rpm given in Table K3, and note the voltage reading.

**Table K3 Alternator Output Voltage**

| Meter Range | Connections | Reading @4,000 rpm |
|---|---|---|
| 250V AC | One Meter lead → One yellow lead The other meter lead → Another yellow lead (Total of 3 measurements) | about 50V |

If the output voltage shows the value in Table K3, the alternator operates properly and the regulator/rectifier is damaged. A much lower reading than that given in the table indicates that the alternator is defective. Check the starter coil resistance as follows:

•Stop the engine, set the multimeter to the x 1 Ω range, and measure for continuity between each pair of the three alternator output leads. If there is more resistance than shown in Table K4, or no meter reading (infinity) for any two leads, the stator has an open lead and must be replaced. Much less than this resistance means the stator is shorted, and must be replaced.

**Table K4 Stator Coil Resistance**

| Meter Range | Connections | Reading |
|---|---|---|
| x 1 Ω | One meter lead → One yellow lead | 0.50 ~ 0.76 Ω |
| | The other meter lead → Another yellow lead (Total of 3 measurements) | |

•Using the highest resistance range of the multimeter, measure the resistance between each of the yellow leads and chassis ground. Any meter reading less than infinity (∞) indicates a short, necessitating stator replacement.

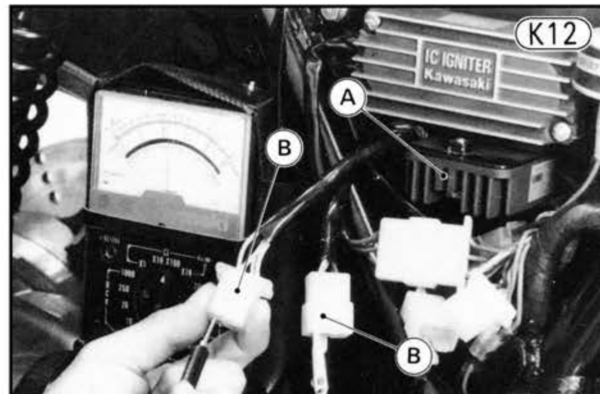
If the stator coils have normal resistance, but the voltage check showed the alternator to be defective; then the rotor magnets have probably weakened, and the rotor must be replaced.

## Regulator/Rectifier

### *Rectifier inspection*

•With the ignition switch turned off, remove the right side cover, and disconnect the 4-pin connectors (2) from the regulator/rectifier.

•Using the x 10 or x 100 Ω range, check the resistance in both directions between the white/red lead and each yellow lead (in the 4-pin connector which leads to the alternator), and between the black lead and each yellow lead. There is a total of 12 measurements. The resistance should be low in one direction and more than ten times as much in the other direction. If any two leads are low or high in both directions, the rectifier is defective and must be replaced.




**A. Regulator/Rectifier B. 4-pin Connector**

**NOTE:** The actual meter reading varies with the meter used and the individual rectifier, but, generally speaking, the lower reading should be from zero to the first 1/3 of the scale.

### *Regulator test*

To test the regulator out of circuit, use three 12V batteries and a test light made from a 12V 3~6W bulb in a socket with leads.

- Remove the regulator/rectifier from the frame.
- Using auxiliary leads, connect one of the yellow leads to the battery (+) terminal, and connect the test light between the black lead and the battery (–) terminal. At this time the bulb should not be lit.

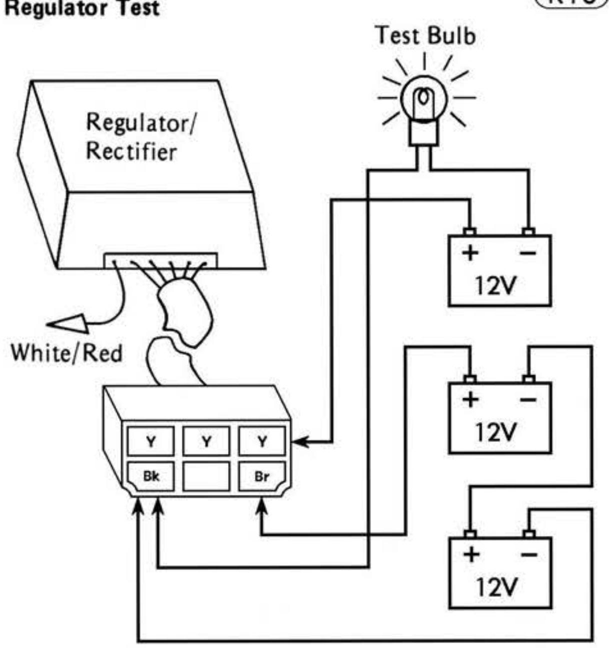
**CAUTION The test light works as an indicator and also as a current limiter to protect the regulator/rectifier from excessive current. Do not use an ammeter instead of a test light.**

- Connect the brown lead to the other battery (+) terminal and connect the black lead to the battery (–) terminal momentarily. At this time the bulb should not be lit.
- To apply 24V to the regulator/rectifier, connect two 12V batteries in series, and connect the brown lead to the battery (+) terminal and the black lead to the battery (–) terminal momentarily. The bulb should now light and stay on until the bulb circuit is opened.

**CAUTION Do not apply more than 24 volts. If more than 24 volts is applied, the regulator/rectifier may be damaged. Do not apply 24 V more than a few seconds. If 24 volts is applied for more than a few seconds, the regulator/rectifier may be damaged.**

- Repeat the above three steps for other two yellow leads (in the 4-pin connector which leads to the regulator/rectifier).
- Replace the regulator/rectifier if the bulb does not light as described above.

**Regulator Test** (K13)




**NOTE:** The above test is not foolproof. If the above checks show the regulator/rectifier is not damaged, but there is still trouble in the changing system, first carefully inspect the alternator, battery, wiring, and all connections. Replace the regulator/rectifier if all these other components turn out good.

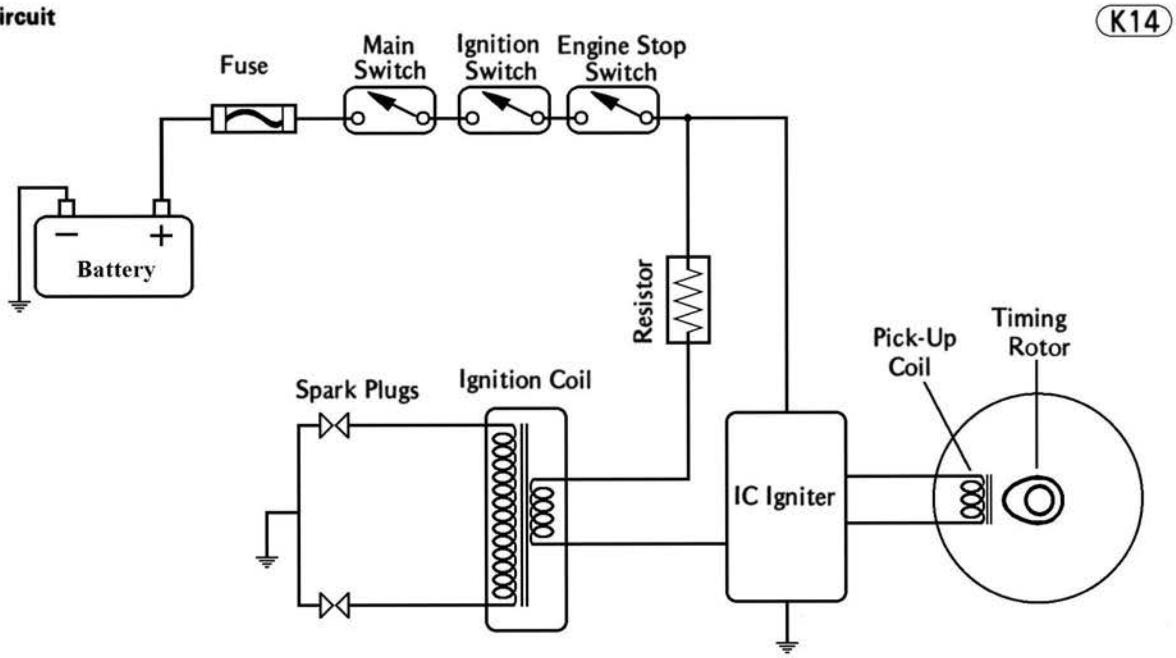
## IGNITION SYSTEM

The ignition system for this model is essentially a battery and coil ignition system where the battery supplies the current for the primary circuit in the ignition system. However, this ignition system is transistorized and controls the current for the primary circuit by use of a solid state electronic switching unit called a Darlington power transistor. The power transistors are triggered by pick-up coils, and there are no mechanical breaker points, so the only periodic maintenance needed is automatic timing advancer lubrication (Pg. 240). Since contact breaker heel wear (with resultant retarded ignition timing), and breaker point pitting or burning are eliminated, periodic inspection and adjustment of the ignition timing are not required.

The working electrical part of the ignition system consists of a battery, three pick-up coils, an IC igniter, three ignition coils, a resistor, and six spark plugs. To advance the ignition timing as engine rpm rises, an automatic centrifugal-type timing advancer is used. The resistor limits the amount of primary current flowing through the coil to a safe maximum to prevent overheating of the ignition coil primary winding whose electrical resistance is low to ensure a high performance spark. The ignition system comprises three parts; one part fires #1 and #6 cylinders, and the other parts #2 and #5 cylinders, and #3 and #4 cylinders. A schematic wiring diagram of one third the system is shown in Fig. K14. The other 2 parts of the system are identical. Each works as follows.

The pick-up coil assembly (a magnetic impulse generator) resembles the standard contact breaker assembly in most respects except that the three sets of breaker points have been eliminated. In their places is an iron timing rotor and three magnetic pick-up coils. Each pick-up coil assembly consists of a pair of permanent magnets and a pick-up coil on a mounting plate. The timing rotor which is attached to the timing advancer has one projection. As the projection on the timing rotor passes through the magnetic field created by the permanent magnets on the mounting plate, a magnetic field alternately builds up and collapses. Each time the projection passes a pick-up coil core an electric current is developed. Each voltage pulse is conducted to the IC igniter where it is amplified and switches the Darlington power transistor on and off to control the primary current.

**Ignition Circuit**

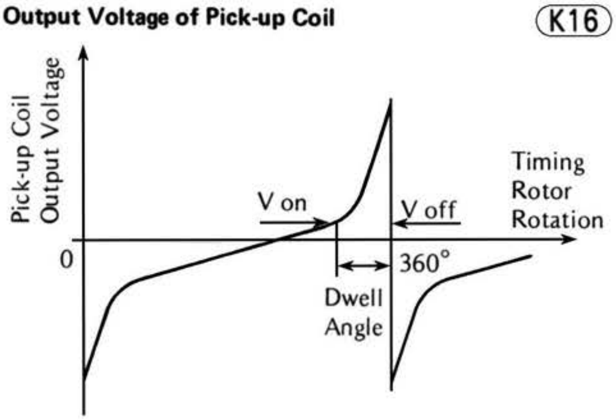




**A. IC Igniter**

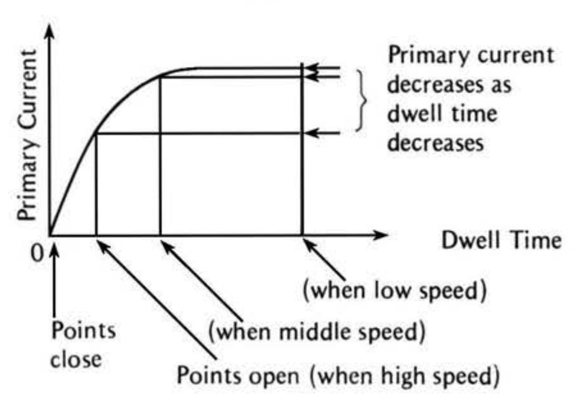
The IC igniter utilizes the voltage pulse sent from the pick-up coil as follows to obtain stable induced high tension voltage from low to high engine speeds. The output voltage of the pick-up coil alternates as shown in Fig. K16.

**Output Voltage of Pick-up Coil**




With rotation of the timing rotor the output voltage rises, and the power transistor conducts and permits primary current to flow when the pick-up coil output reaches the preset voltage (**V** on). When the output voltage drops to the other preset voltage (**V** off) after passing the voltage peak, the power transistor no longer conducts, stopping the current flow in the ignition coil primary winding and inducing a high tension voltage that jumps across the spark plug electrodes. In the case of a standard breaker point ignition system the dwell time (the time during which current can flow in the primary circuit) decreases as the engine speed increases. This results in less current flow through the ignition coil primary winding and decreased induced voltage at high rpm. Conversely the dwell time in this transistorized ignition system is kept relatively constant by virtue of the pick-up coil output voltage.

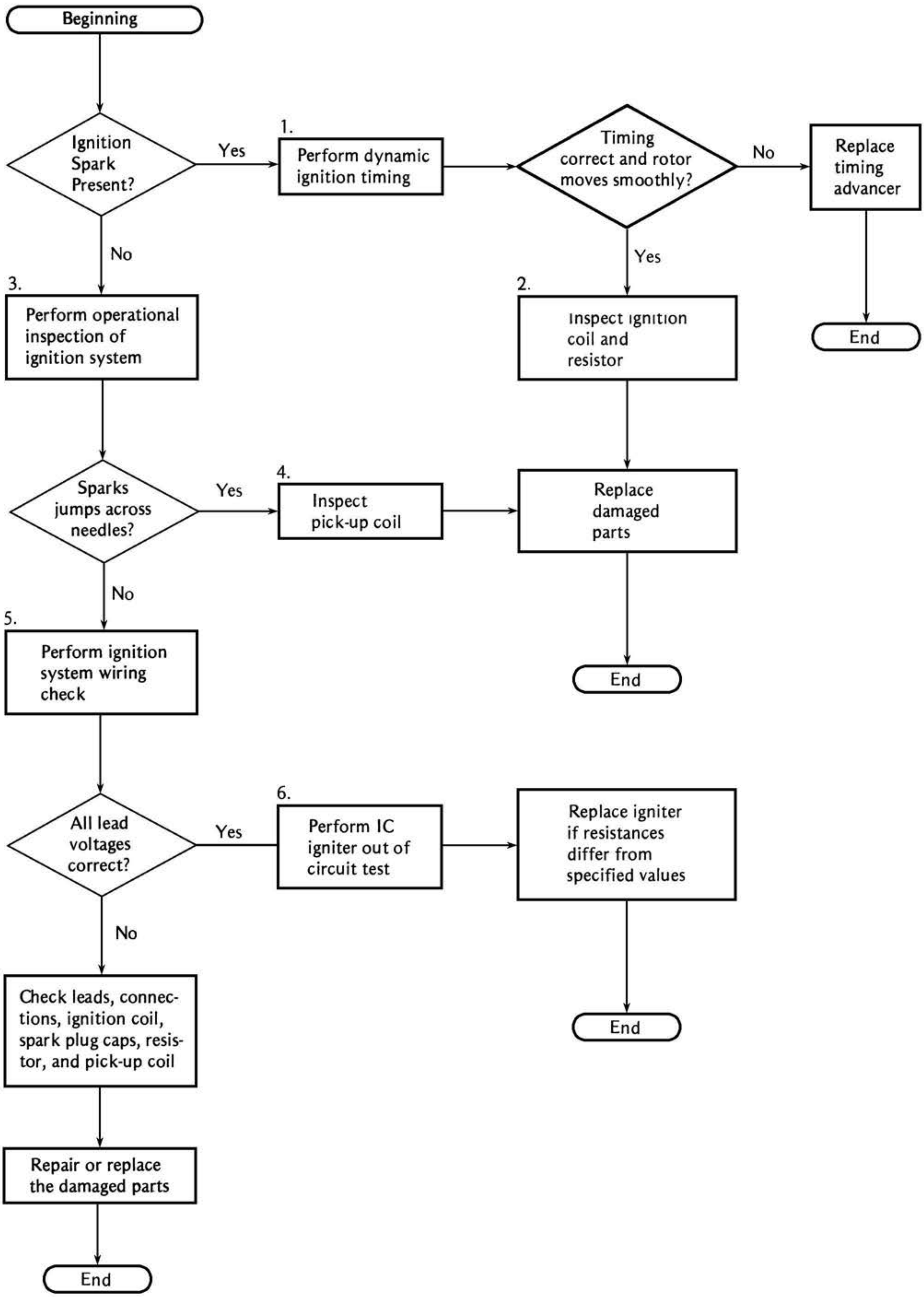
**Dwell Time and Primary Current (Breaker Point Timing System)**



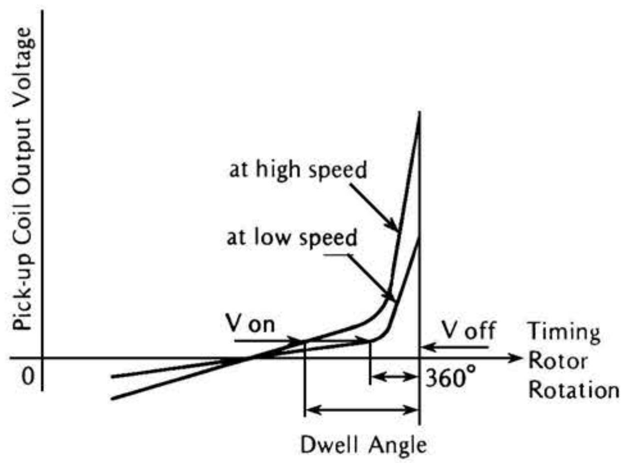

This is because the faster the engine runs, the higher the output voltage of the pick-up coil becomes and the sooner the **V** or voltage is reached. Therefore the dwell **angle** increases to keep the dwell **time** long enough at high engine rpm so that the induced high voltage does not decrease.

**Ignition System Troubleshooting Guide**

K18



**Pick-up Coil Output Voltage at Low and High Speeds** (K19)




### *Ignition system troubleshooting guide*

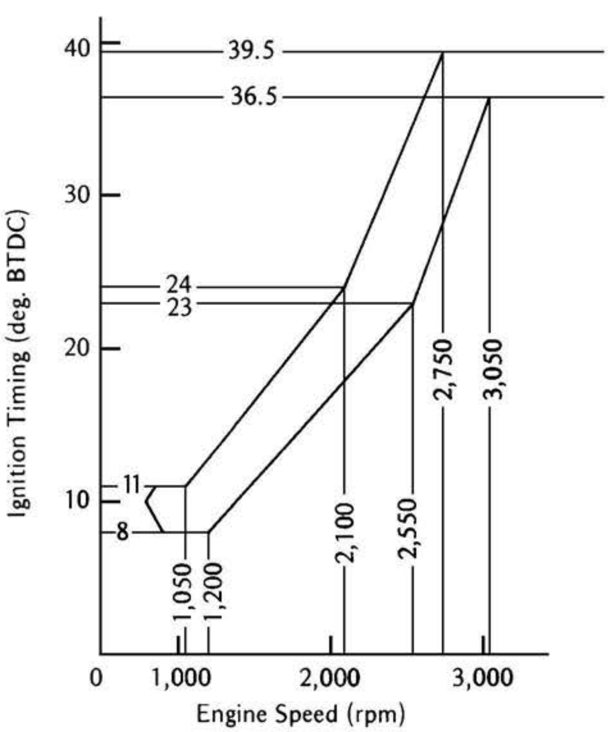
If trouble is suspected in the ignition system, check the system by the following procedure.

An example of troubleshooting is shown in Fig. K18. To use this chart, follow the arrows on the chart selecting a "yes" or "no" arrow at each diamond-shaped step until you reach the "end". Each test procedure is explained individually on the pages after the chart. This chart is for one third of the ignition circuit; use the same chart for each other third.

## Description of Each Testing Procedure

### 1. Dynamic Ignition Timing Test

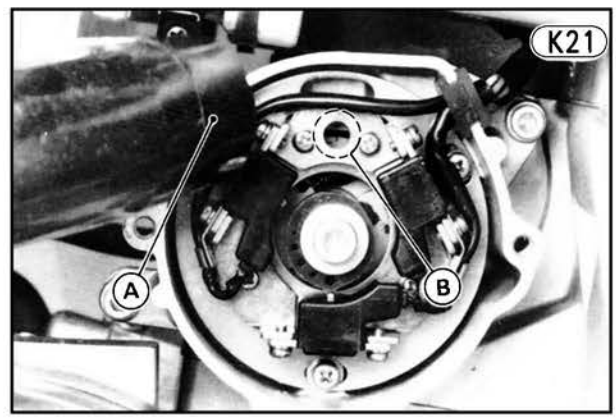
**Ignition Timing/Engine Speed Relationship** (K20)




Check the ignition timing with a strobe light for both low and high speed operation. Timing advance begins at 1,050 ~ 1,200 rpm and reaches the maximum advance at 2,750 ~ 3,050 rpm. As a result, the timing must be checked at idle (below 1,050 rpm) and then between 3,100 ~ 3,500 rpm when it is fully advanced.

**Check the timing as follows:**

- Connect a strobe light to the #1 or #6 spark plug lead in the manner prescribed by the manufacturer in order to check the ignition timing under operating conditions.
- Turn on the main switch, the ignition switch, and the engine stop switch. Start the engine, and direct the strobe light at the timing marks.
- Below 1,050 rpm, the "F" mark on the timing advancer must be aligned with the timing mark above the advancer for correct low rpm ignition timing (Fig. K22).




A. Strobe Light  B. Inspection Window

- Between 3,100 ~ 3,500 rpm, the timing mark on the housing must be between the advanced timing mark on the advancer (a pair of the vertical lines) for correct high rpm ignition timing (Fig. K22).

**Table K5 Timing Advancing**

| | Engine Speed |
|---|---|
| Advance Begins | 1,050~1,200 rpm |
| Full Advance | 2,750~3,050 rpm |

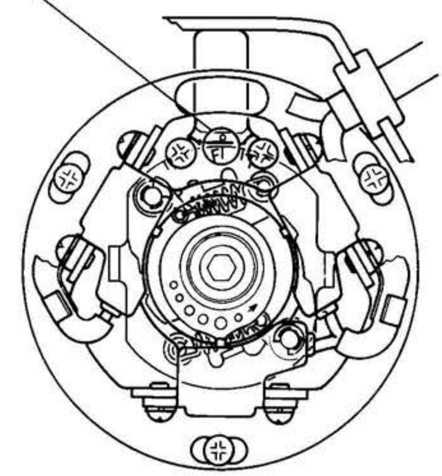
- If low speed ignition timing is not correct, loosen the mounting screws (3) of the pick-up coil assembly, and turn the stator plate to adjust the timing; clockwise rotation advances the timing and counterclockwise rotation retards it. Re-check the timing.
- If low speed ignition timing is correct but high speed ignition timing is not correct; check that the rotor on the timing advancer turns smoothly on the shaft by hand and that no parts are visibly damaged.

**Timing Marks**

(K22)

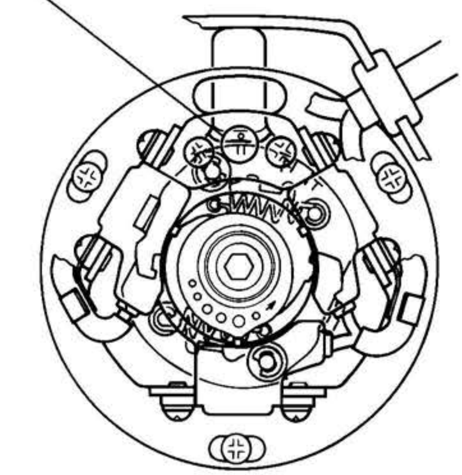
(a) Before Advance

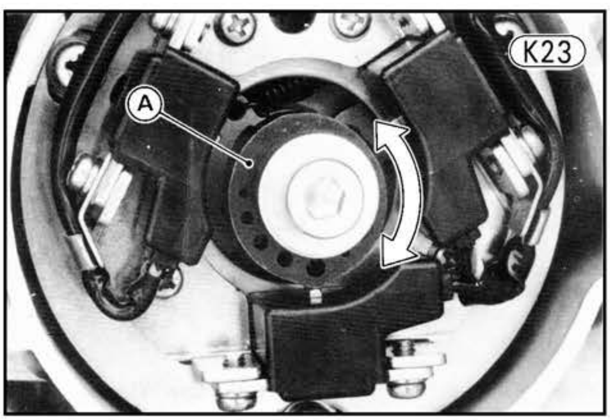
The "F" mark on the timing advancer is alined with the timing mark.



(b) Full Advance

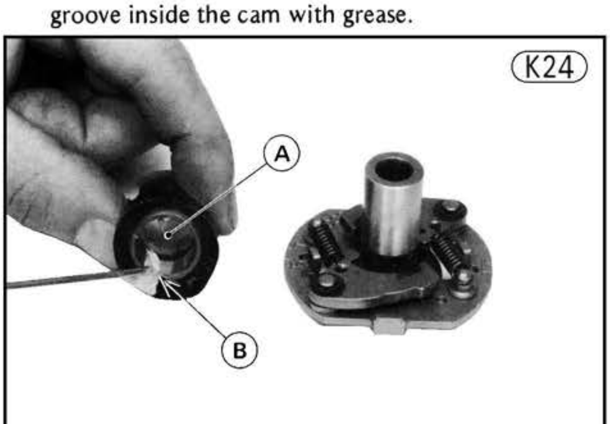
The timing mark on the housing must be between the advanced timing mark.






**A. Rotor**

- If the timing advancer binds on the shaft; remove the timing advancer, check and lubricate it and re-check the ignition timing.
  - ○Remove the timing advancer (Pg. 58).
  - ○Check that the rotor on the timing advancer turns smoothly on the shaft by hand and that no parts are visibly worn or damaged.
  - ○Wipe the advancer clean, apply oil to it, and fill the groove inside the cam with grease.




**A. Cam Body** **B. Grease**

  - ○Install the advancer (Pg. 58), and adjust and check the ignition timing with a strobe light for both low and high speed operation.
- A damaged timing advancer must be replaced with a new one. If advancer lubrication does not remedy the problem, replace the advancer with a new one.

**2. Ignition Coil, Resistor Inspection**

**To check the resistor:**

- Remove the fuel tank, and disconnect the resistor leads (yellow and pink).
- Measure for continuity between the resistor leads. If there is more or less resistance than shown in Table K6, replace the resistor.


**Table K6 Resistor Resistance**

| | |
|---|---|
| Meter Range | x 1 Ω |
| Connections | One meter lead → Yellow lead<br>The other meter lead → Pink lead |
| Reading | 1.5~1.9 Ω |

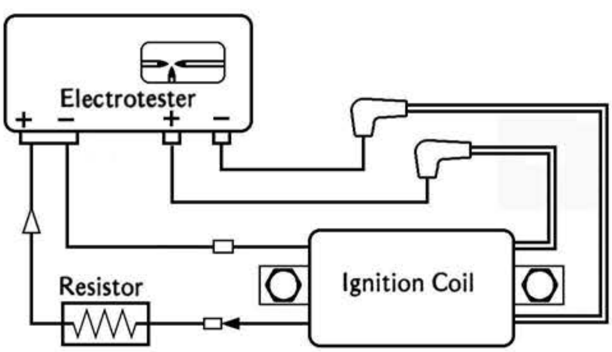
- Using the highest resistance range of the multimeter, measure the resistance between the resistor lead and chassis ground. Any meter reading less than infinity (∞) indicates a short, necessitating resistor replacement.

**To check the coil:**

The most accurate test for determining the condition of the ignition coil is made by measuring arcing distance with the Kawasaki Electrotester. Since a tester other than the Kawasaki Electrotester may produce a different arcing distance, the Kawasaki Electrotester is recommended for reliable results.

- Remove the ignition coil and the resistor.
- Connect the ignition coil with its resistor to the Kawasaki Electrotester as shown in the figure. Do not forget to connect the resistor in series with the ignition coil primary winding.

**Ignition Coil Test** (K26)




- Turn on the tester switches.

**WARNING** **To avoid extremely high voltage shocks, do not touch the coil or leads.**

- Gradually slide the arcing distance adjusting knob from left to right (small distance to large distance) carefully checking the arcing.
- Stop moving the knob at the point where the arcing begins to fluctuate, and note the knob position in mm. The reading should show the value in Table K7.

**Table K7 Arcing Distance***

| | |
|---|---|
| Standard | 7 mm or more |

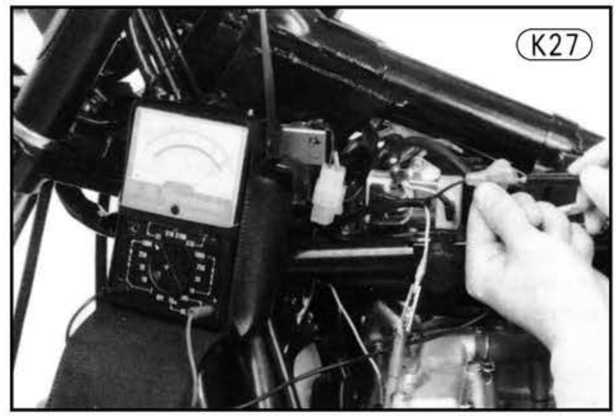
*1. Measure with the Kawasaki Electrotester.
2. Check the resistor before the measurement.

If the distance reading is less than the value shown in the table, the ignition coil or spark plug caps are defective. To determine which part is defective, measure the arcing distance again with the spark plug caps removed from the ignition coil. If the arcing distance is subnormal as before, the trouble is with the ignition coil itself. If the arcing distance is now normal, the trouble is with the spark plug caps.

If an Electrotester is not available, the coil can be checked for a broken or badly shorted winding with an ohmmeter. However, an ohmmeter cannot detect layer shorts and shorts resulting from insulation breakdown under high voltage.

**To measure the primary winding resistance:**

- Set the ohmmeter to the x 1 Ω range, and connect one ohmmeter lead to the pink lead and the other to the green, black, or blue lead from the ignition coils.




**To measure the secondary winding resistance:**

- Unscrew the spark plug caps from the spark plug leads.
- Set the ohmmeter to the x 1 kΩ range, and connect one ohmmeter lead to one of the spark plug leads and the other ohmmeter lead to the remaining spark plug lead.

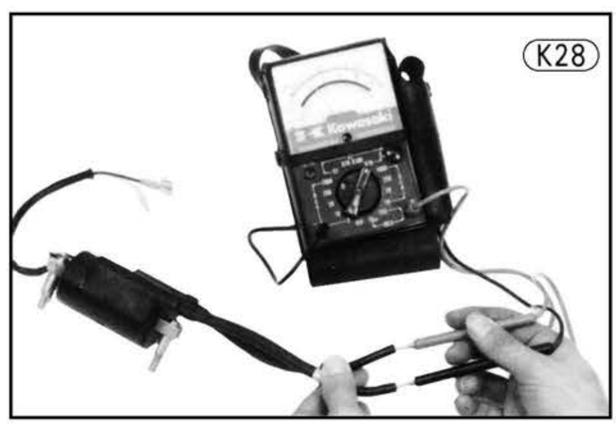



**Table K8 Ignition Coil Resistance**

| | Meter Range | Reading |
|---|---|---|
| Primary Winding | x 1 Ω | 1.2~1.9 Ω |
| Secondary Winding | x 1 kΩ | 12~18 kΩ |

If the coil does not produce an adequate spark, or if either the primary or secondary winding does not have the correct resistance, replace the ignition coil.

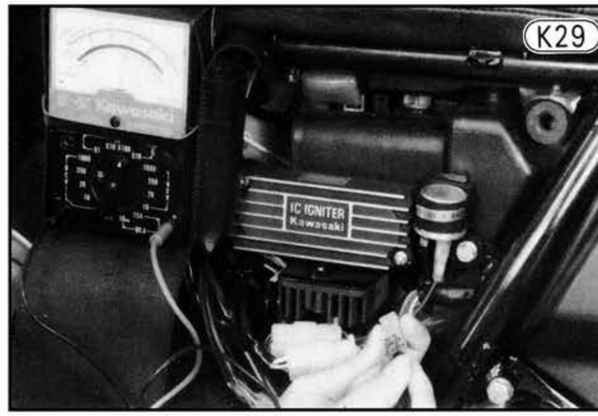
With the highest ohmmeter range, check for continuity between each ignition coil pink lead, and one spark plug lead and the coil core (two tests on each coil). If there is any reading, the coil is shorted and must be replaced. Also, replace the ignition coil if either spark plug lead shows visible damage.

**3. Operational Inspection of the Ignition System (without the pick-up coil)**

- Have a DC voltage source of 6~12 volts output such as a motorcycle battery.
- Pull off the right side cover, and disconnect the smaller 6-pin connector which connects the IC igniter and the pick-up coils.
- Remove the fuel tank, and pull the spark plug caps off the spark plugs.
- Connect the spark plug leads to the Electrotester in the same way as for measuring the arcing distance. For this test, the Electrotester need not be supplied with electric power.
- Slide the adjusting knob to set the arcing distance to 5~8 mm.
- In the smaller 6-pin connector from the IC igniter, connect the DC voltage source positive (+) lead to the black lead and the negative (–) lead to the blue lead for the #1 and #6 ignition coil [voltage source positive (+) lead to the yellow lead and the negative (–) lead to the red lead for the #2 and #5 ignition coil, and voltage source positive (+) lead to the light green lead and negative (–) lead to the green lead for #3 and #4 ignition coil].
- Turn the ignition switch to the ON position, and switch the DC voltage source on and off.
- As the DC voltage source is switched, sparks should jump across the needles in the Electrotester.

**4. Pick-up Coil Inspection**

- Connect the multimeter to the pick-up coil leads to measure the coil resistance as shown in the table.




- If there is more resistance than shown in the table, the coil has an open lead and must be replaced. Much less than this resistance means the coil is shorted, and must be replaced.
- Using the highest resistance range of the multimeter, measure the resistance between the pick-up coil leads and chassis ground. Any meter reading less than infinity (∞) indicates a short, necessitating replacement of the pick-up coil assembly.

**Operational Inspection of the Ignition System**

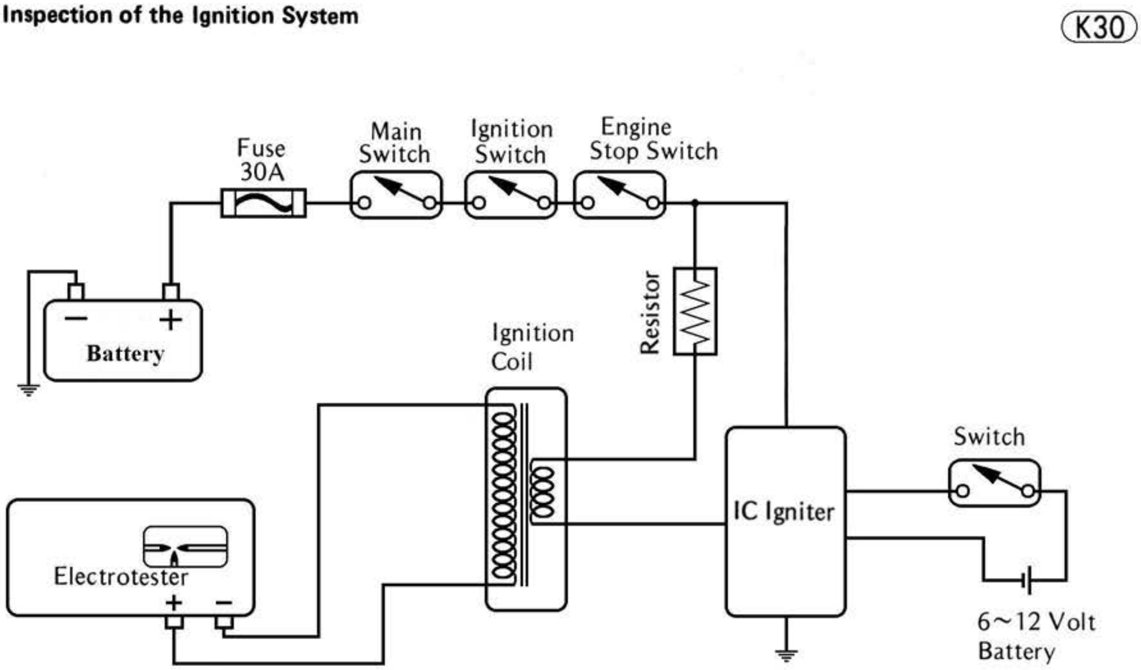
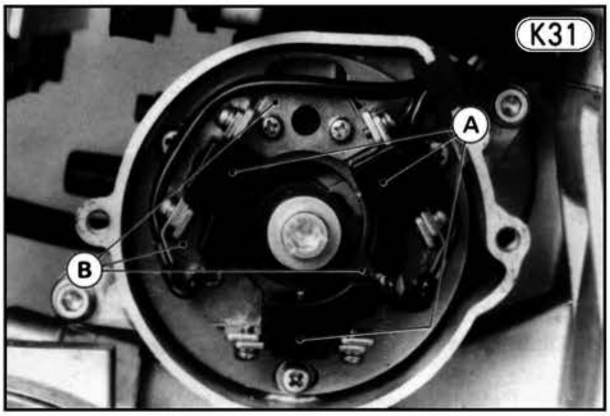



**Table K9 Pick-up Coil Resistance**

| Meter Range | Connections | Reading |
|---|---|---|
| x 100 Ω | One meter lead → Black (Yellow*, Light Green**) Lead<br>The other meter lead → Blue (Red*, Green**) Lead | 360~540 Ω |

*Leads for #2 and #5 pick-up coil **Leads for #3 and #4 pick-up coil

• Visually inspect the pick-up coil assembly. If the permanent magnets and coils are damaged, replace the pick-up coil assembly.




**A. Pick-up Coils** **B. Magnets**

**5. Ignition System Wiring Check**

• Reconnect all leads and connectors which were disconnected.

• Connect the multimeter to the IC igniter leads as shown in the Table K10, turn on the ignition switch, and note the meter readings. Measure the lead voltages with the engine stopped.

**6. IC Igniter out of Circuit Test**

• Turn off the ignition switch, and disconnect the IC igniter 6-pin connectors (2).

• Connect the multimeter as shown in the Table K11 to check the internal resistance of the igniter.

## ELECTRIC STARTER SYSTEM

### Starter Motor Circuit

The starter motor circuit includes the starter button (switch), starter lockout switch, starter relay, battery, and starter motor. The starter lockout switch mounted

**Table K10 Wiring Inspection**

| Meter Range | Connections* | Location | Reading |
|---|---|---|---|
| 20V DC | Meter (+) → Yellow/Red, Black, Green, Blue | At the larger 6-pin connector | Battery voltage |
| | Meter (+) → Black, Blue, Yellow, Red, Green, light Green | At the smaller 6-pin connector | 0.5~1.0 V |

*Connect the meter (–) lead to ground.

**Table K11 Igniter Resistance**

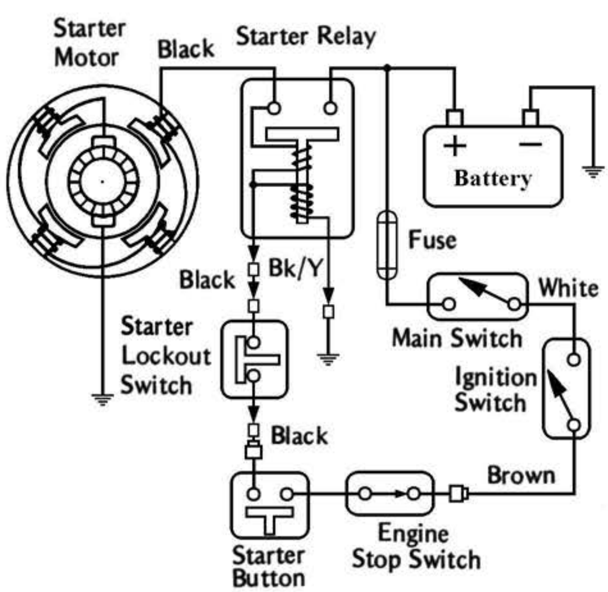
| Meter Range | Connections | Location | Reading* |
|---|---|---|---|
| x 1 kΩ | Meter (+) → Black/Yellow<br>Meter (–) → Black, Green, Blue | at larger 6-pin connector | ∞ |
| x 100 Ω | Meter (+) → Black, Green, Blue<br>Meter (–) → Black/Yellow | at larger 6-pin connector | 200~500 Ω |
| | Meter (+) → Yellow/Red<br>Meter (–) → Black/Yellow | at larger 6-pin connector | 200~600 Ω |
| | Meter (+) → Black/Yellow<br>Meter (–) → Yellow/Red | at larger 6-pin connector | 300~700 Ω |
| x 1 kΩ | Meter (+) → Blue<br>Meter (–) → Black | at smaller 6-pin connector | 25~45 kΩ |
| | Meter (+) → Red<br>Meter (–) → Yellow | | |
| | Meter (+) → Green<br>Meter (–) → Light/Green | | |
| | Meter (+) → Black<br>Meter (–) → Blue | at smaller 6-pin connector | 20~40 kΩ |
| | Meter (+) → Yellow<br>Meter (–) → Red | | |
| | Meter (+) → Light/Green<br>Meter (–) → Green | | |

* Measured with Kawasaki Hand Tester (57001-983).
A tester other than the Kawasaki Hand Tester may show slightly different readings.

on the clutch lever holder is designed to prevent starter motor operation unless the clutch is disengaged. When the ignition switch is on, the clutch lever is pulled (the starter lockout switch is on), and the starter button is pushed, a small amount of current flows through the switch and the relay coil. This current magnetizes the relay core, which then pulls the armature to it, closing the relay contacts. The closed contacts complete a circuit for the starter motor, and the motor turns. The reason for using a relay instead of using the switch to turn on the starter motor directly is that the starter motor requires much current – enough that relatively thick wire is necessary to carry the current to the starter motor. Because it is not practical to put a heavy switch on the handlebar and have large wires running to it, the starter switch is made to carry just the light relay coil current, and heavy contacts inside the relay carry the starter motor current.

**CAUTION** **Because of the large amount of current, never keep the starter button pushed any time that the starter motor will not turn over, or the current may burn out the starter motor windings.**

**Starter Motor Circuit**

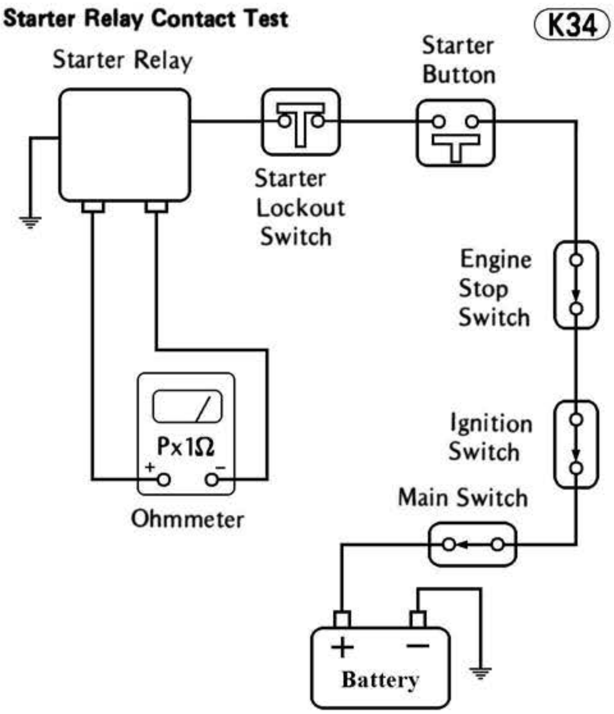



### *Starter relay test*

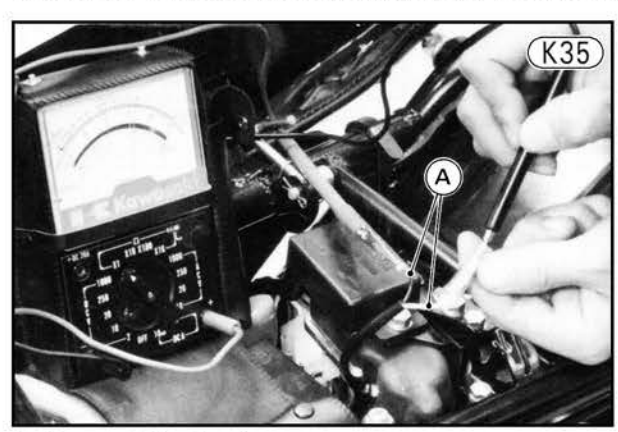
Remove the tool tray, disconnect both starter motor lead to the starter relay, and connect an ohmmeter set to the x 1 Ω range across the relay terminals. Pulling the clutch lever, push the starter button, and see if the meter reads zero ohms. If the relay makes a single clicking sound and the meter reads zero, the relay is good. If the relay clicks but the meter does not read zero, the relay is defective and must be replaced.


**A. Starter Relay**
**B. Disconnect the lead to the starter motor.**

**Starter Relay Contact Test**

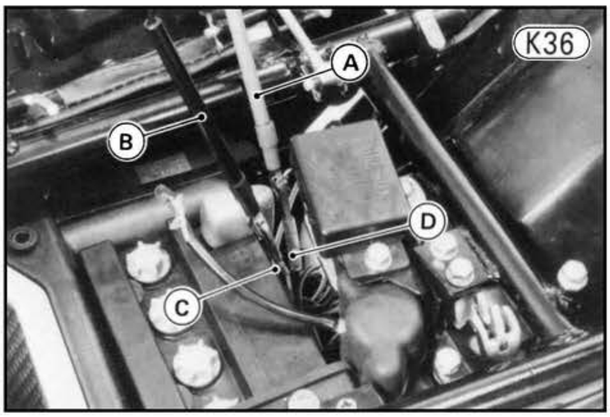



If the relay does not click at all, disconnect the other two leads (black and yellow/red) from the starter relay, and measure the resistance across them. There should be a few ohms resistance. If the resistance is infinity (no reading) or zero ohms, the relay is defective.




**A. Starter Relay Leads**

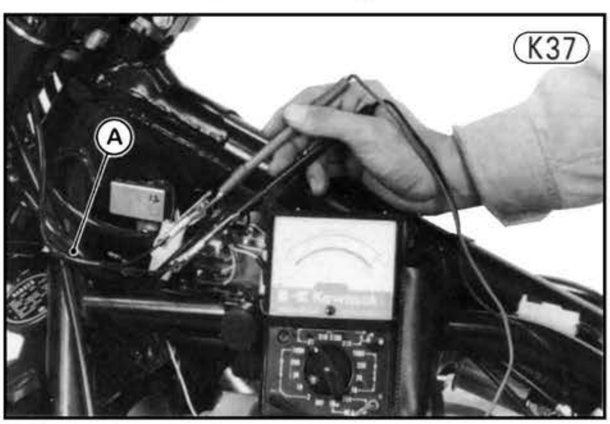
However, if there is a few ohms resistance, the relay may be good; check that there is actually voltage to the relay before deciding that the relay is defective. To check for the voltage, first turn the meter to 20V DC, connect the – meter lead to the yellow/red lead which was disconnected from the relay, and connect the + meter lead to the black lead. Pulling the clutch lever, push the starter button, and see if the meter reads battery voltage. If the meter does not, there is wiring, starter lockout switch, or starter switch trouble. If the meter reads battery voltage but the relay does not click, the relay is defective.




**A. Meter + Lead** **C. Yellow/Red Lead**
**B. Meter – Lead** **D. Black Lead**

### *Starter lockout switch test*

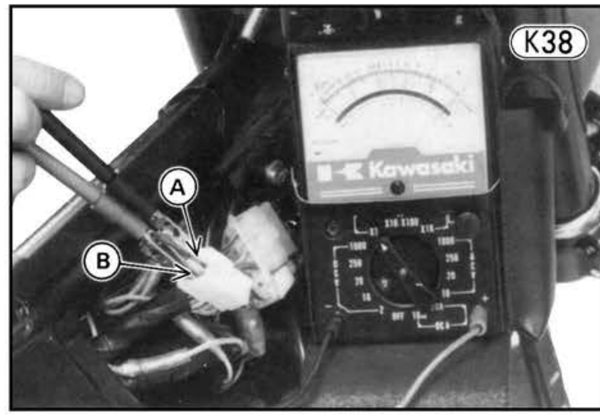
Remove the fuel tank (Pg. 46), and disconnect the two starter lockout switch black leads. Connect an ohmmeter set to the x 1 Ω range across the two black leads. Pull the clutch lever, and see if the meter reads zero ohms. If the meter does not, the starter lockout switch is defective and must be replaced.




**A. Starter Lockout Switch Leads**

### *Starter switch test*

Remove the fuel tank (Pg. 46), and disconnect the 3-pin connector from the right switch housing. Connect an ohmmeter set to the x 1 Ω range across the brown and the black leads. Push the starter button with the engine stop switch to "RUN", and see if the meter reads zero ohms. If the meter does not, the starter switch or engine stop switch is defective and the entire right switch housing assembly must be replaced.




**A. Black Lead** **B. Brown Lead**

### Starter Motor

The starter motor is installed in a constant-mesh arrangement to transmit starter motor rotation to the crankshaft. A clutch disengages the starter motor once the engine starts. (See the Starter Motor Clutch Paragraph, Pg. 247).

Fig. K42 shows starter motor construction. The field coils ⑤ are wound around four cores ⑦, forming the yoke ⑧, and the armature windings ⑥ are connected to the commutator ⑫ and receive their current through the brushes ⑪. If the brushes are not making good contact, no starter motor current will flow since the field coils and armature windings are connected in series, and the motor will not turn over. A short or open circuit in a coil or winding may also cause the motor to be inoperative. Particles from brush wear may be another cause of starter motor failure; these particles may get into the bearing at the rear of the motor, causing heat seizure.

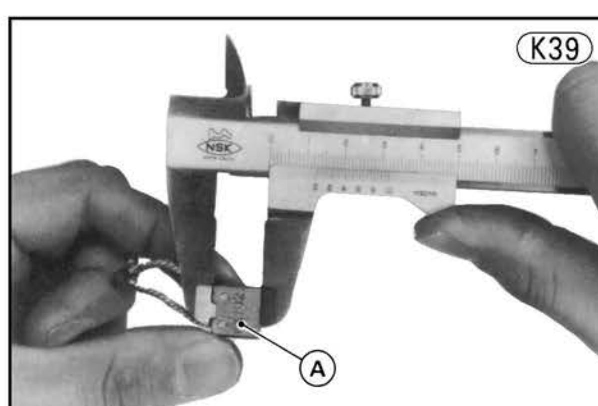
### *Carbon brushes*

Worn brushes or weak springs will cause poor brush contact.

Measure the length of the brushes, and replace both if either one is worn down to less than the service limit.

**Table K12 Starter Motor Brush Length**

| | |
|---|---|
| Service Limit | 6 mm |




**A. Brush**

### *Brush spring*

Spring tension should be 560~680 grams but a spring can be considered serviceable if it will snap the brush firmly into place.

### *Commutator*

A dirty or damaged commutator will result in poor brush contact and cause the brushes to wear down quickly. In addition, particles from brush wear accumulating between commutator segments may cause partial shorts.

Smooth the commutator surface if necessary with fine emery cloth, and clean out the grooves as illustrated. Determine as accurately as possible the depth of the grooves between commutator segments. Replace the armature with a new one if the groove depth is less than the service limit.

(K40)

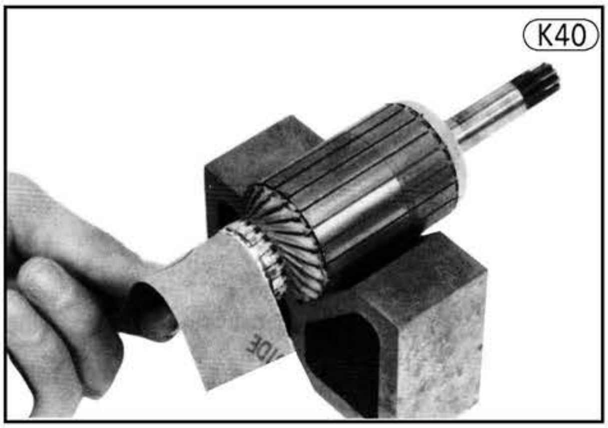
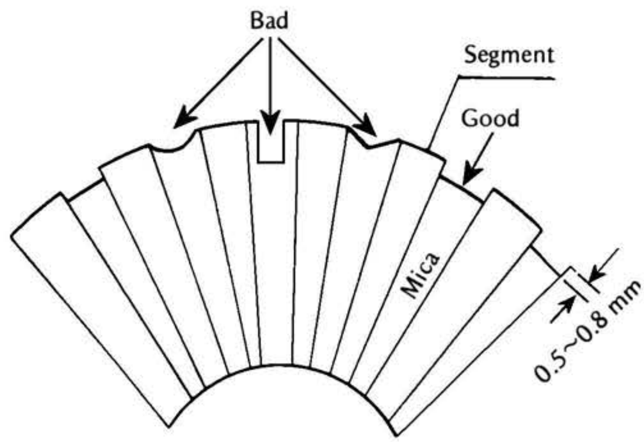


**Table K13 Commutator Groove Depth**

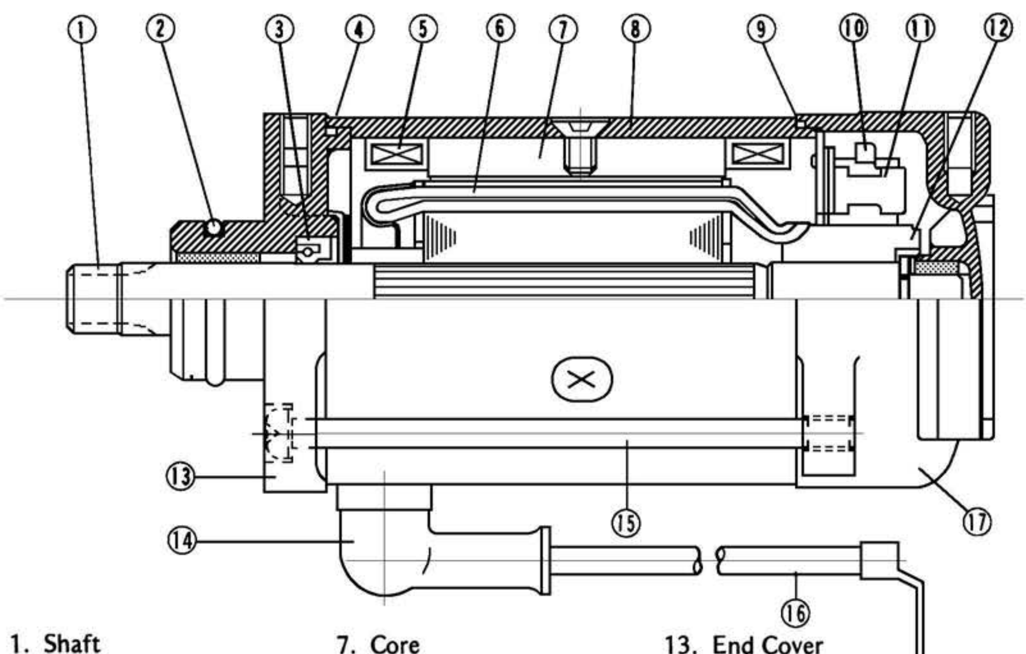
| | |
|---|---|
| Service Limit | 0.2 mm |

**Commutator** (K41)

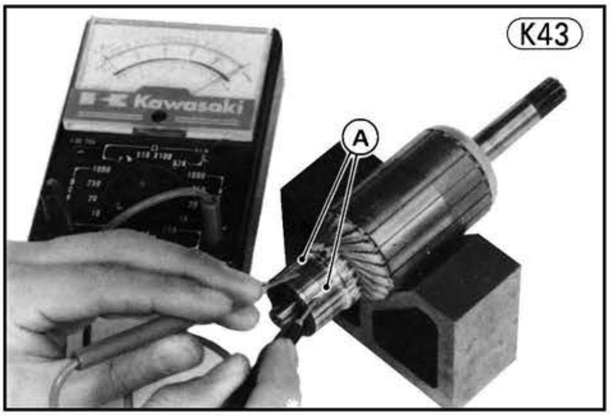



Using the x 1 Ω ohmmeter range, measure the resistance between any two commutator segments. If there is a high resistance or no reading between any two segments, a winding is open and the armature must be replaced.

**Starter Motor Construction** (K42)

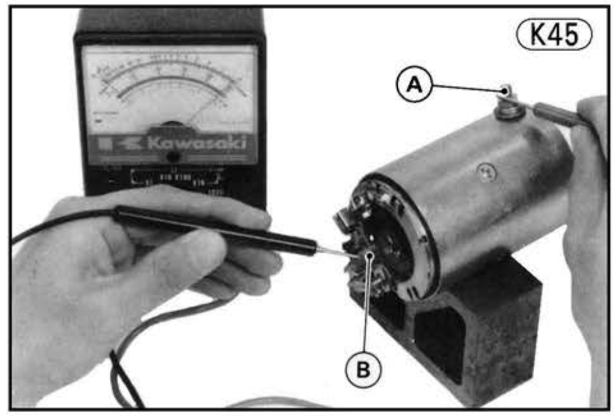



1. Shaft
2. **O** Ring
3. Grease Seal
4. **O** Ring
5. Field Coil
6. Armature Coil
7. Core
8. Yoke Assembly
9. **O** Ring
10. Spring
11. Brush
12. Commutator
13. End Cover
14. Cover
15. Screw
16. Lead
17. End Cover



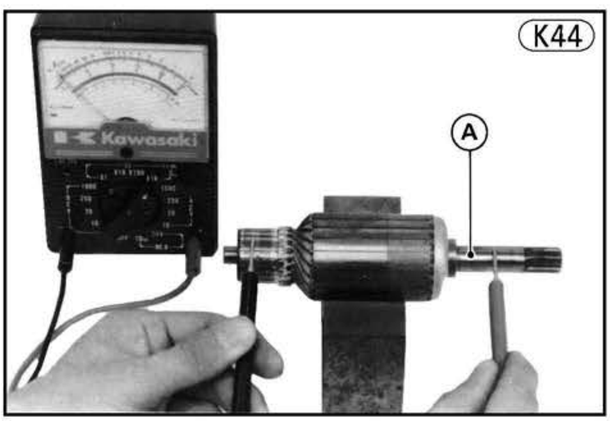

A. Segments

Using the highest ohmmeter range, measure the resistance between the commutator and the shaft. If there is any reading at all, the armature has a short and must be replaced.




A. Starter Motor Terminal B. + Side Carbon Brush

Using the highest ohmmeter range, measure the resistance between the + side carbon brush and the yoke (housing). If there is any meter reading, the coils are shorted to ground and the yoke assembly must be replaced.

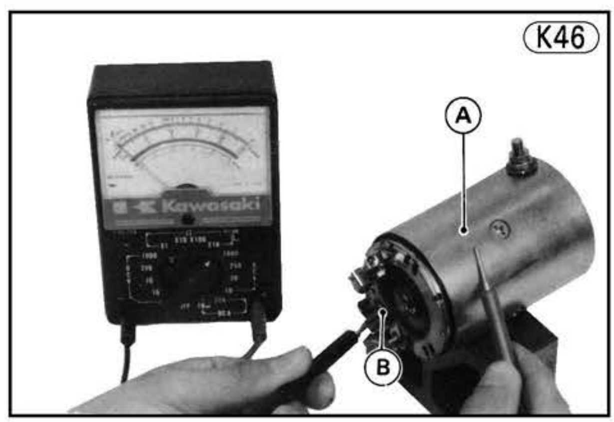



A. Shaft

Even if the foregoing checks show the armature to be good, it may be defective in some manner not readily detectable with an ohmmeter. If all other starter motor and starter motor circuit components check good, but the starter motor still does not turn over or only turns over weakly, replace the armature with a new one.

### *Field coils*

Using the x 1 Ω ohmmeter range, measure the resistance between the + side carbon brush and the starter motor terminal. If there is not close to zero ohms, the field coils have an open circuit and the yoke assembly must be replaced.




A. Yoke B. + Side Carbon Brush

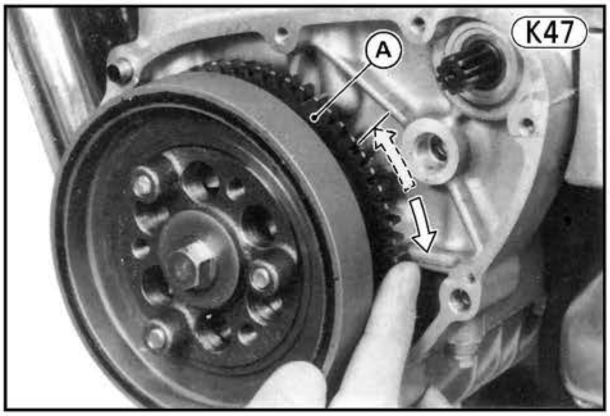
## Starter Motor Clutch

The motorcycle uses the roller-type one-way clutch for the starter clutch.

If the rollers or the starter clutch gear hub becomes damaged or worn, the rollers may lock in place so that the starter motor will not disengage when the engine starts. On the other hand, roller or gear hub damage could prevent the clutch from engaging properly, causing the starter motor to run freely without transmitting power.

### *Clutch inspection*

Remove the left engine cover and starter idle gear (Pg. 79), and turn the starter clutch gear by hand. The starter clutch gear should turn clockwise freely, but should not turn counterclockwise. If the clutch does not operate as it should or if it makes noise, disassemble the starter clutch (Pg. 80), examine each part visually, and replace any worn or damaged parts.



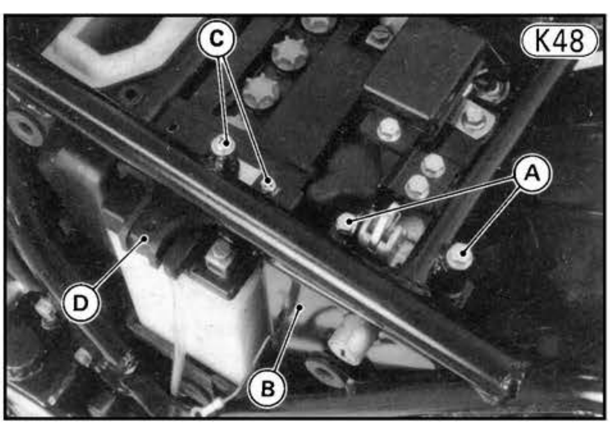

**A. Starter Clutch Gear**

## MAIN SWITCH

The main switch is connected in series with the ignition switch. This switch works as an anti-theft device. Namely, when the ignition switch is turned off, the ignition circuit is cut off and the engine cannot be started even if the ignition switch is turned on. This provides added safety when the motorcycle is parked.

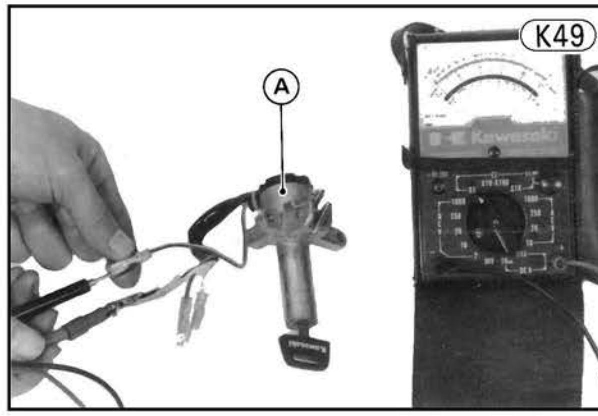
### *Testing the switch*

- Unlock the seat, and swing it open.
- Remove the screws (2) and flat washers (2), and remove the tool tray.
- Remove the leads from the battery – terminal and then the leads from the battery + terminal.
- Remove the screws (2), remove the battery holding plate, and pull out the battery.




**A. Bolts** **C. Screws**
**B. Cover** **D. Holding Plate**

- Remove the bolts (2), and remove the cover.
- Disconnect the leads (4) from the main switch, and check the switch connections. Use an ohmmeter to see that only the connections shown in the table have continuity (zero ohms). If the switch has an open or a short, replace the switch.




**A. Main Switch**

**Table K14 Main Switch Connections**

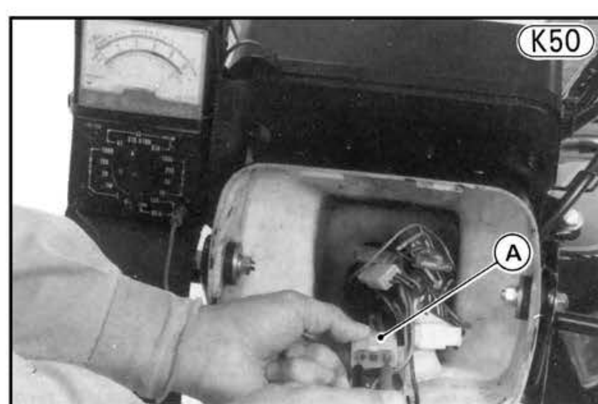
| Key Position | Lead Color: White/Black | Orange/Green | White | Red |
|---|---|---|---|---|
| Open | ● | ● | | |
| Off | ● | ● | | |
| On | ● | ● | ● | |
| Park | ● | ● | | ● |

## IGNITION SWITCH

The ignition switch works in combined with the main switch. The engine can be started only when the main switch is either on or in the park position, and then the ignition switch is turned on.

### *Testing the switch*

Table K15 shows the internal connections of the ignition switch for each switch position. To check the switch, remove the headlight unit, and disconnect the 6-pin connector from the ignition switch in the headlight housing. Use an ohmmeter to verify that all the connections listed in the table are making contact (zero ohms between those wires); and that no other wires are connected. If there are any opens or shorts in the switch, replace it with a new one.




**A. Ignition Switch 6-pin Connector**

**Table K15 Ignition Switch Connections**

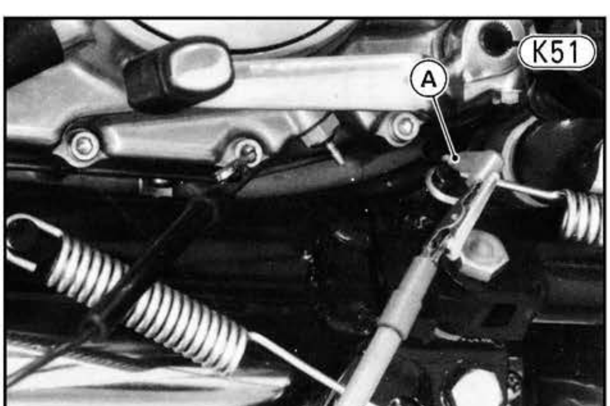
| Key Position | Lead Color: White | Brown | Blue | Red | Orange | Orange/Green |
|---|---|---|---|---|---|---|
| Off | | | | | | |
| On | ● | ● | ● | ● | ● | ● |
| Park | | | | | ● | ● |
| Lock | | | | | | |

## NEUTRAL SWITCH

A neutral indicator light is provided so that the rider can readily determine whether or not the transmission is in neutral. The neutral switch, installed in the external shift mechanism cover, consists of a spring loaded pin which contacts a projection on the shift drum pin holder when the transmission is in neutral. This completes the neutral indicator light circuit, which turns on the neutral indicator light.

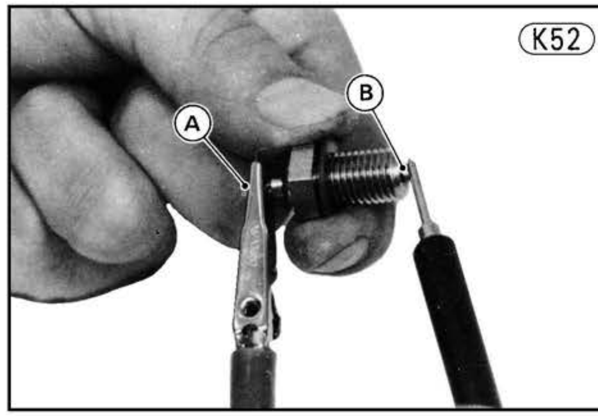
### *Switch inspection*

- Turn on the main switch and ignition switch. Watching the indicator light, shift the transmission into neutral and then shift the transmission into other positions. If the neutral indicator light goes on in neutral position and the light does not go on in other positions, the neutral switch is good.
- If the neutral indicator light does not go on in the neutral position or if it does go on in other positions, disconnect the neutral switch light green lead.
- To check for the voltage, first turn the meter to 20V DC, connect the + meter lead to the switch lead, and connect the – meter lead to chassis ground.
- Turn the ignition switch on, and see if the meter reads battery voltage. If the meter does not indicate battery voltage, the trouble is either defective wiring or a burned-out indicator bulb. If the voltmeter reads battery voltage, then the neutral switch may be defective.




**A. Switch Lead**

- To check the neutral switch, first remove the switch from the external shift mechanism cover, turn the meter to the x 1 Ω range, and measure the resistance between the switch terminal and the spring loaded pin. If the resistance is not close to zero ohms, the switch is defective, and must be replaced.




**A. Switch Terminal B. Spring Loaded Pin**

- If the resistance is close to zero ohms, measure the resistance between the switch terminal or spring loaded pin and the switch body. If there is any meter reading, the neutral switch is defective and must be replaced.

## HEADLIGHT

### Headlight Circuit and Reserve Lighting System

Fig. K53 and Fig. K54 are US, Canadian and European model wiring diagrams of the headlight circuit.

The US and Canadian models of this motorcycle contain a reserve lighting system in the headlight circuit. This system is a safety device that keeps the headlight on if one of the filaments burns out.

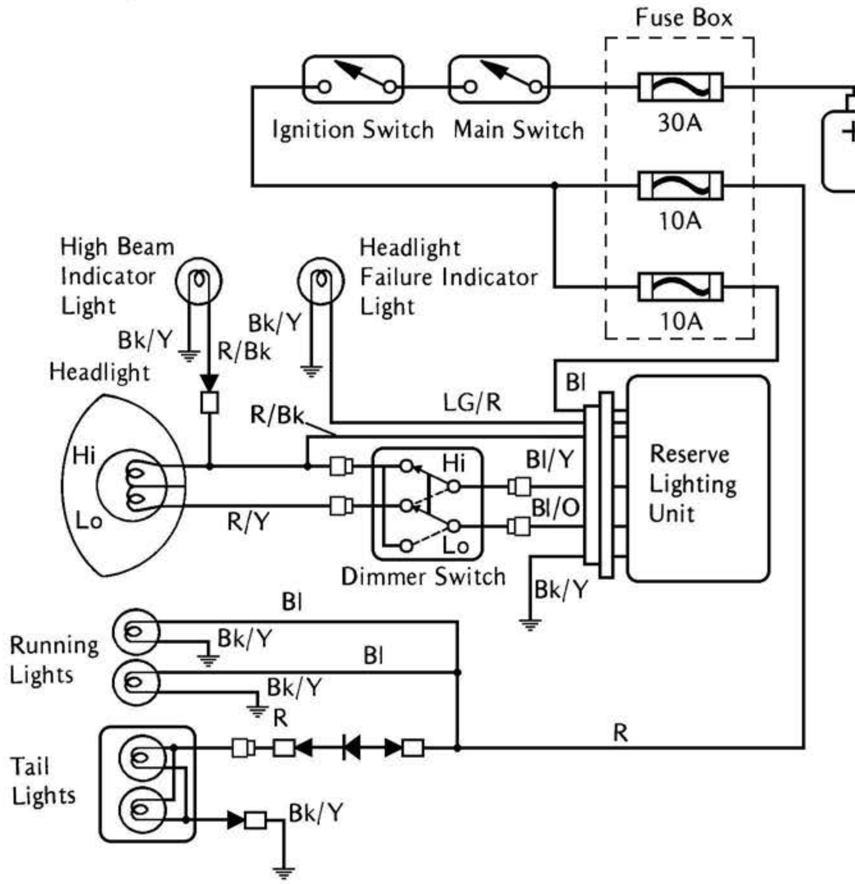
If either the high or low beam burns out, the reserve lighting system switches over to the remaining filament automatically, and lights the white headlight failure indicator light to show that the headlight bulb must be replaced. If the high beam filament burns out, the low beam is automatically turned on; if low beam burns out, the high beam is turned on but more dimly than normally.

**NOTE:** Current is always flowing slightly in the headlight failure indicator light when the main switch and ignition switch are "ON" position. So you may notice the indicator light glimmers unless the headlight filaments burn out.

In the US and Canadian model, there is no headlight switch, and when the main switch and ignition switch is turned on, the headlight circuit is completed, turning on the headlight, tail light, running position lights, and meter lights.

**Headlight Circuit (US, Canadian model)**

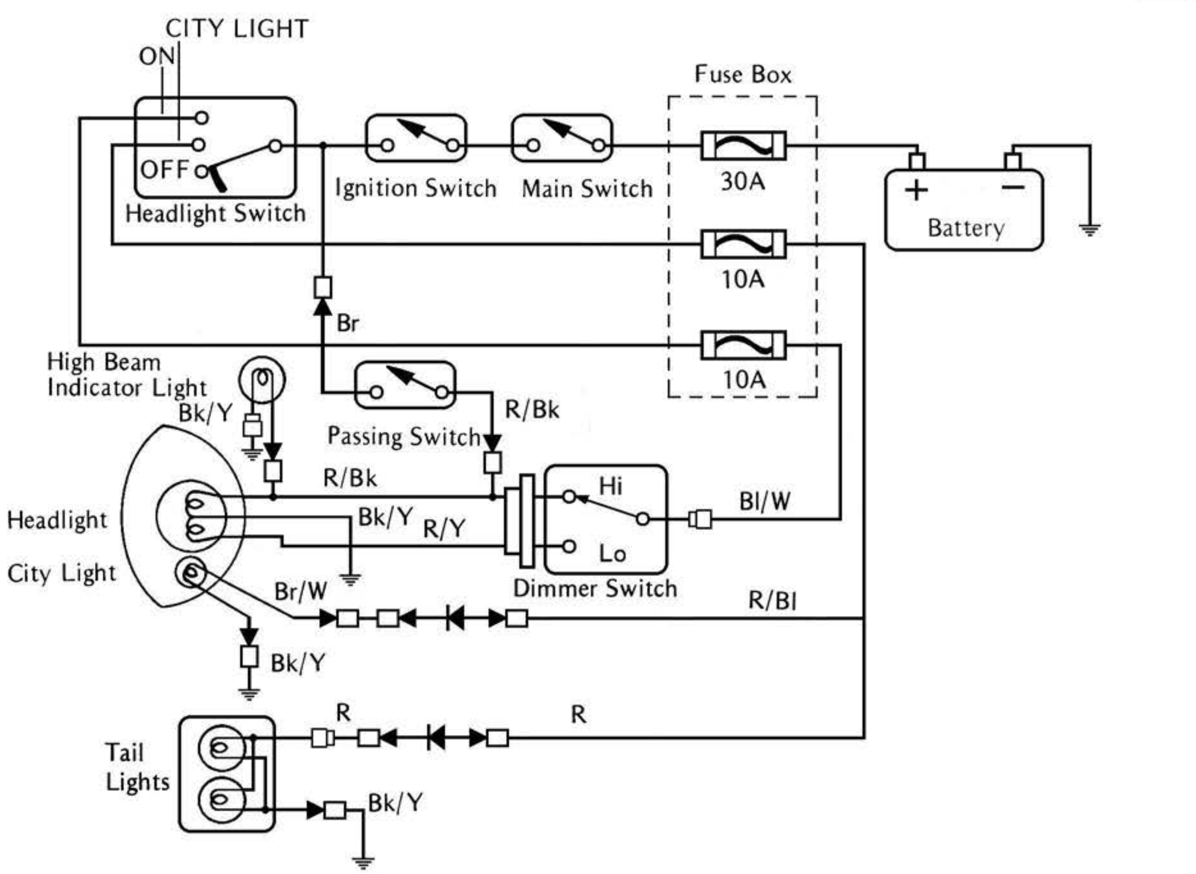
K53




| Color Code | |
|---|---|
| R | Red |
| Bk | Black |
| Y | Yellow |
| Br | Brown |
| W | White |
| Bl | Blue |
| O | Orange |
| LG | Light Green |

**Headlight Circuit (European model)**

K54



In the European model, the center city light position of the headlight switch turns on the small city light, tail light and meter lights for driving in the city after dark. When the switch is turned to the on position, the headlight comes on and city light stays on. High and low beam can be selected only when the headlight switch is in the on position.

There is also a passing and horn button (European model). This button is spring loaded and when the button is pushed to pass, the high beam light (but not the tail light) comes on as a passing signal to the driver of the vehicle ahead. The passing button will light the high beam light regardless of the headlight switch position, and the button will spring back and turn the light off as soon as it is released.

### *Checking the reserve lighting system*

- Remove the headlight unit.
- Disconnect the headlight socket and connect the three terminals of headlight bulb with corresponding leads using three suitable insulated wires.
- Turn on the headlight and set the dimmer switch to the low beam position.
- Disconnect the wire which is connected to the red/yellow lead to simulate a bad low beam filament. At this time the high beam should go on more dimly than normal, and the white headlight failure indicator should come on.
- Connect the red/yellow leads, and set the dimmer switch to the high beam position.
- Disconnect the wire which is connected to the red/black leads to simulate high beam failure. At this time the low beam should come on and the white indicator light should light.

### *Headlight, dimmer switch inspection*

Tables K16, K17, and K18 show the connections in the headlight switch, and the connections in the dimmer switch for both high and low beam.

- Remove the fuel tank, and disconnect the leads to the headlight switch or the leads to the dimmer switch.
- Use an ohmmeter to see that only the connections shown in the tables have continuity (zero ohms). If the switch has open or a short, it can be disassembled for repair. The contact surfaces may be cleaned, but no internal parts are available for replacement. If any parts are not repairable, the switch must be replaced as a unit.

**Table K16 Headlight Switch Connection (European Model)**

| | Brown/White | Brown | Blue |
|---|---|---|---|
| OFF | | | |
| • (City Light) | ● | ● | |
| ON | ● | ● | ● |

**Table K17 Dimmer Switch Connection (US and Canadian Models)**

| | Red/Black | Blue/Yellow | Red/Yellow | Blue |
|---|---|---|---|---|
| Hi | ● | ● | ● | ● |
| Lo | ● | ● | ● | ● |

**Check of Reserve Lighting System**

(K55)

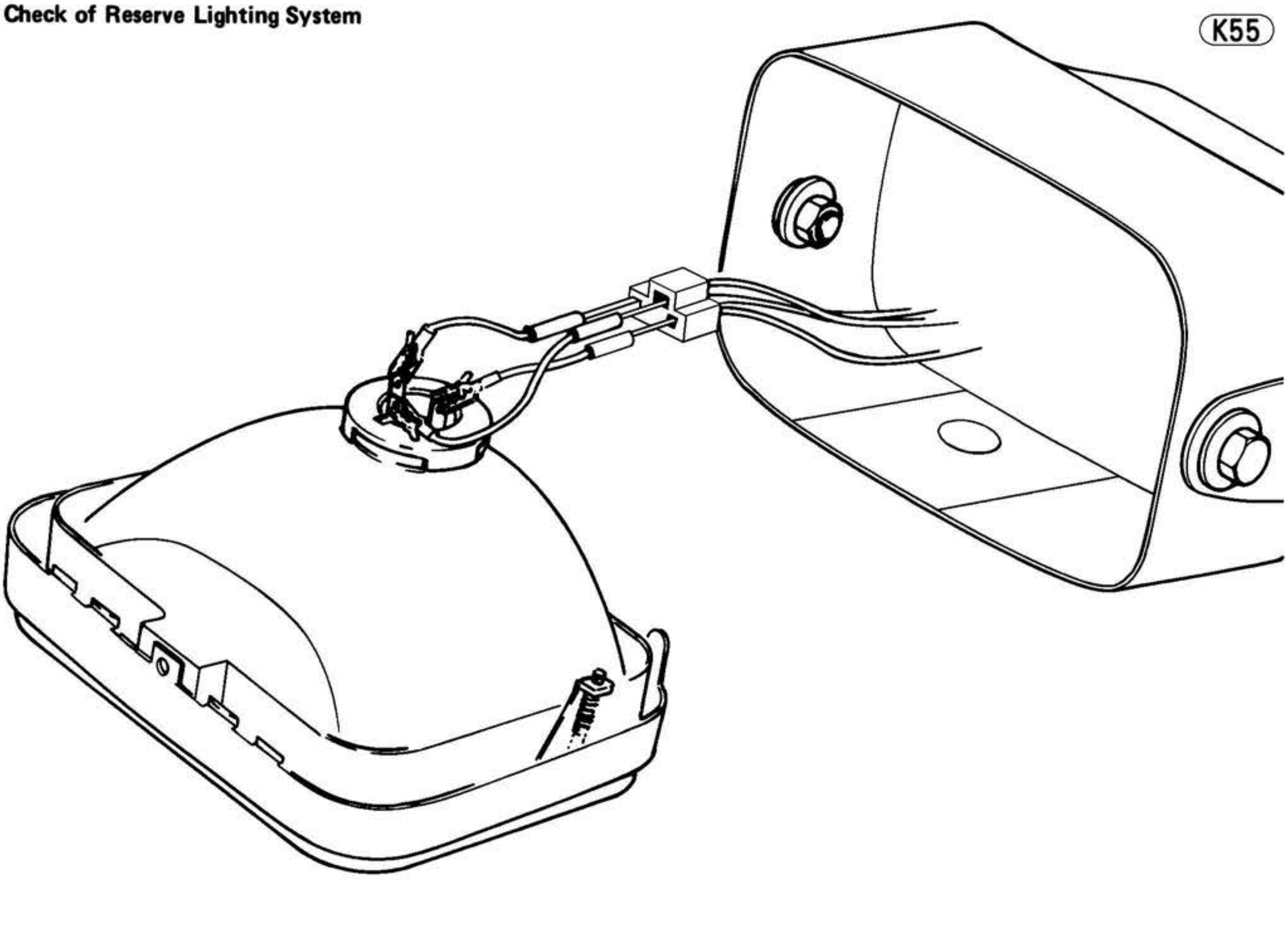
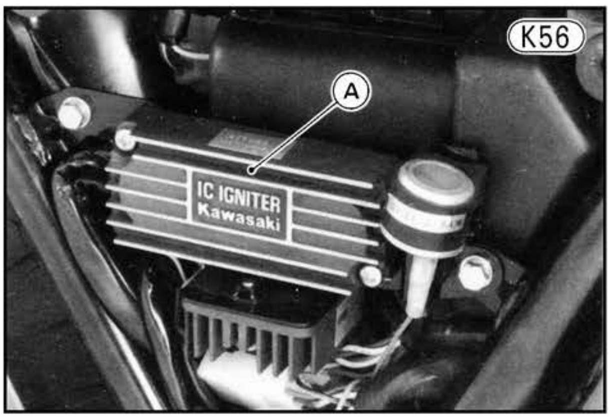


**Table K18 Dimmer Switch Connection (European Model)**

| | Red/Black | Blue/White | Red/Yellow |
|---|---|---|---|
| Hi | ● | ● | |
| Lo | | ● | ● |

### *Reserve lighting wiring inspection*

●Pull off the right side cover, remove the IC igniter and regulator/rectifier mounting bolts (2), and then pull out the 6-pin connector of the reserve lighting device.




**A. IC Igniter**

**NOTE:** The reserve lighting device is mounted beneath the battery tray.

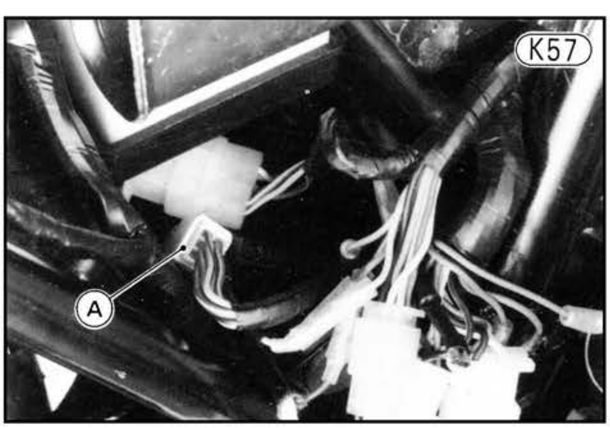
●Turn on the main switch and ignition switch to "ON" position.

●Check the voltage of each lead through the 6-pin connector by referring to the following procedure.

**NOTE:** Set a voltmeter to 20V DC range, and always ground the (–) probe of the voltmeter.

Trouble (a): When one filament is burned out, the other is not turned on.

○Examine the voltage of blue/orange lead by applying the (+) probe of voltmeter to the lead. When the meter reading is about 12 V, both filaments of the headlight are burned out or the black/yellow lead is broken. When the meter reading is less than about 12 V, advance to the next step.




**A. 6-pin Connector**

○Examine the voltage of the blue lead. If the meter reading is about 12 V, the reserve lighting device is defective. When the reading is 0 V, the main switch, ignition switch or wiring harness is broken.

Trouble (b): Both filaments for upper beam and lower beam are turned on at the same time.

○Examine the voltage of the blue/orange lead. When the meter reading is about 12 V, the reserve lighting device is defective. When the reading is 0 V, the dimmer switch is defective.

Trouble (c): The high beam is not dimmed when the low beam burns out and the high one is turned on automatically.

○Examine the voltage of the red/black lead. If the meter reading is about 12 V, the reserve lighting device is defective. If the reading is 0 V, the wiring harness is broken.

Trouble (d): The failure indicator light is not turned on when the headlight filament burns out.

○Examine the voltage of the light green/red lead. When the meter reading is about 12 V, the indicator light burns out or is not grounded. When the reading is 0 V, the reserve lighting device is defective.

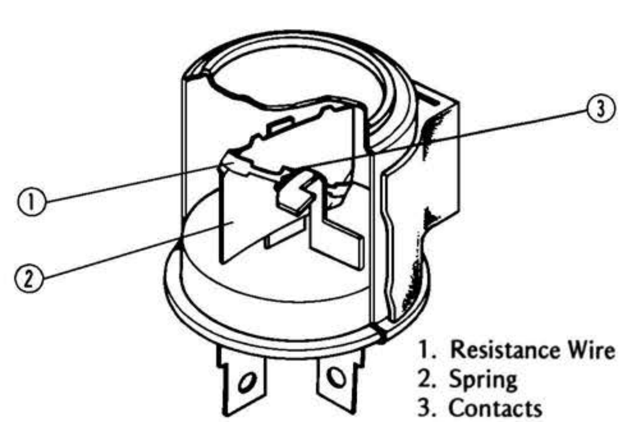
## TURN SIGNAL CIRCUIT AND AUTOMATIC CANCELLING SYSTEM

### Turn Signal Circuit

A wiring diagram of the turn signal circuit is shown in Fig. K59. When the ignition switch is on and the turn signal switch is turned to "R" or "L", a ground is provided for the circuit so current can flow. Current to the right or left turn signals flows through the closed contacts and through the resistance wire inside the turn signal relay, and the turn signals go on. The resistance wire quickly heats up, expands, and allows a spring to pull the contacts open. When the contacts have opened, the circuit is broken, the turn signals go off, and the resistance wire cools and contacts, closing the contacts so that the cycle can begin again. The indicator light for the turn signals indicates that they are working properly.

**Turn Signal Relay**

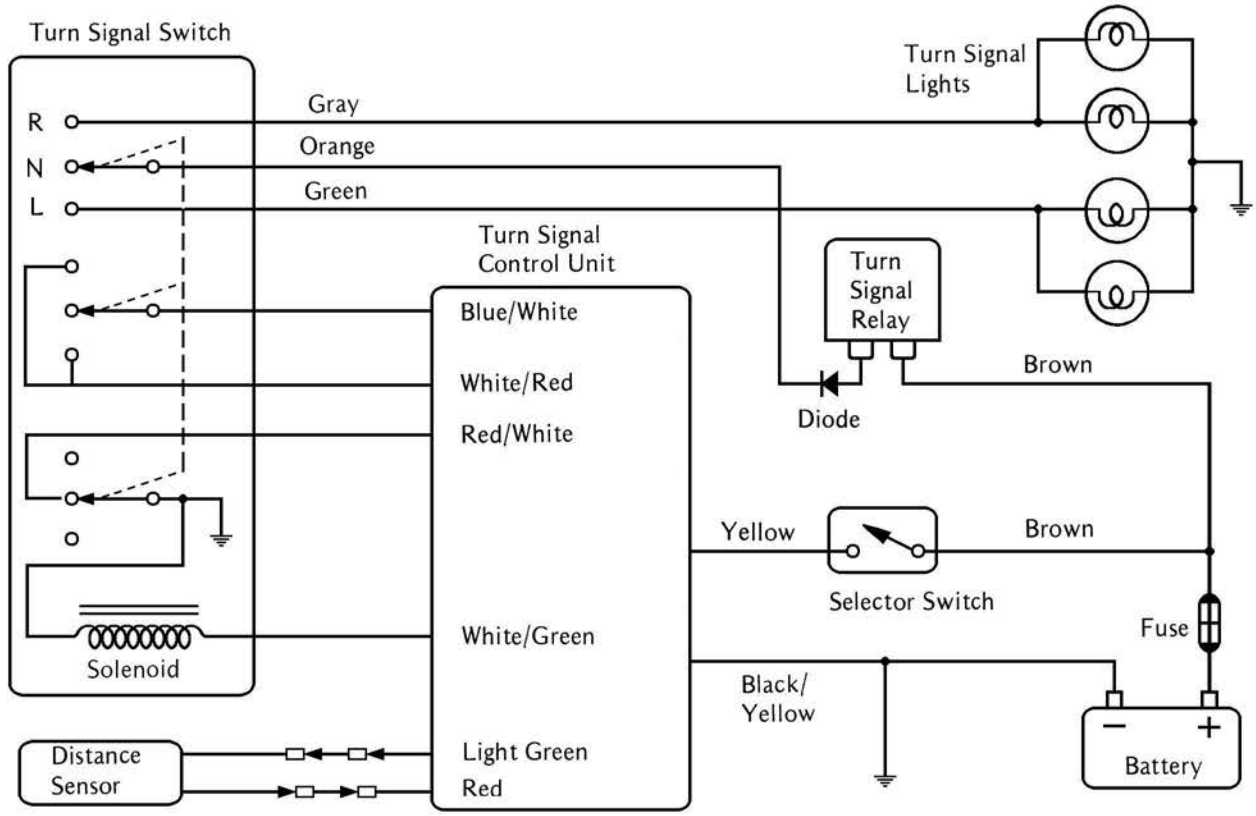
K58



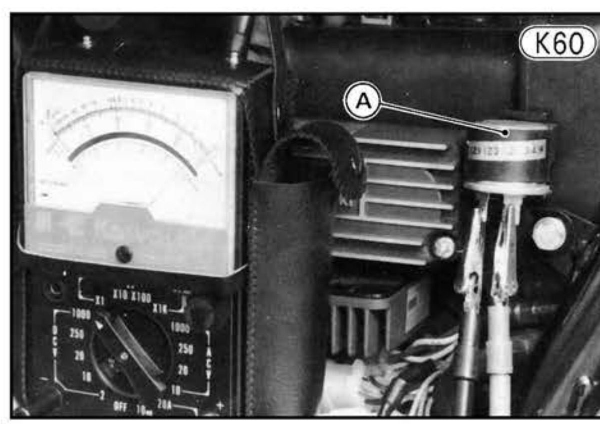

1. Resistance Wire
2. Spring
3. Contacts

**Turn Signal and Cancelling System**

(K59)




Since the turn signal relay is designed to operate correctly only when two turn signals (one front and one rear) and the turn signal indicator light are properly connected in the circuit, trouble may result from a burned out bulb, a bulb of incorrect wattage, loose wiring, as well as from a defect in the relay itself. In general, if the trouble with the circuit is common to both right and left turn signals, it is probably caused by a defective turn signal relay, although it may be due to a bad switch, wiring, or battery. If the trouble is with only one side – either right or left – then the relay is not at fault since the same relay is used for both sides.




**A. Turn Signal Relay**

### *Turn signal trouble*

(1)Neither right nor left turn signals come on at all:

- Check that battery voltage is normal.
- Remove the right side cover.
- Unplug the brown lead and relay diode from the relay, and use an ohmmeter to check that there is continuity (close to zero ohms) between the relay terminals. If there is no ohmmeter reading, or if there is several ohms resistance, replace the relay with a new one.
- Disconnect the relay diode from the orange lead. Setting an ohmmeter to the x 10 Ω or x 100 Ω range, check the resistance between both rectifier leads. The resistance should be low in one direction and more than ten times as much in the other direction.

**NOTE:** The actual meter reading varies with the meter used and with the individual rectifier, but, generally speaking the lower reading should be within the first third of the scale.

If the meter reads low or high in both directions, the rectifier is defective and must be replaced.


**A. Relay Diode**

- If the relay and the diode check good, turn the meter to the 20V DC range, connect the + meter lead to the brown lead that was disconnected from the relay, and connect the – meter lead to the orange lead. With the ignition switch on and with the hazard switch off, first switch the turn signal switch to the R and then to the L position. The meter should register battery voltage at either position. If it does not, the fuse, ignition switch, or wiring is at fault. If battery voltage is read on the meter but the turn signals still will not work when the relay is reconnected, then recheck all wiring connections.

(2) Both right or both left turn signals come on and stay on or flash too slowly:
- Check that battery voltage is not low.
- Check that all wiring connections are good.
- Check that the turn signal bulbs and indicator bulb are of the correct wattage.
- If all of the above check good, replace the relay.

(3) A single light on one side comes on and stays on:
- Either the light that does not come on is burned out or of incorrect wattage, or the wiring is broken or improperly connected.

(4) Neither light on one side comes on:
- Unless both lights for that side are burned out, the trouble is with the turn signal switch.

(5) Flashing rate is too fast:
- If this occurs on both the right and left sides, check that the battery is not being overcharged (indicating a defective regulator/rectifier). If the alternator and the battery voltage are normal, replace the turn signal relay.
- If this occurs on only one side, one or both of the turn signal bulbs are of too high a wattage.

### Automatic Turn Signal Cancelling System

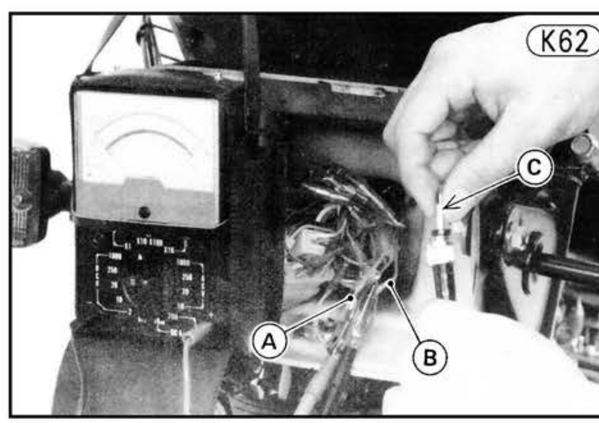
When the turn signal selector switch is in the on (automatic) position, a solenoid turns off the turn signal after it has been on for 4 seconds, plus the time that the motorcycle has traveled an additional 50 meters.

The cancelling system consists of the battery (power source), turn signal control unit, distance sensor, solenoid, and turn signal switch. When the turn signal switch is pushed to the left or right, the turn signals start flashing and the control unit starts counting off 4 seconds. At the end of this time, the control unit starts calculating distance travelled using pulses from the distance sensor at the rear of the speedometer. When the motorcycle has traveled 50 meters, the control unit operates the solenoid, which returns the turn signal switch to the off position.

If the turn signal cancelling system does not function properly, first check all the wiring connections carefully, and then inspect the distance sensor and turn signal switch/solenoid assembly. If all these are good, replace the turn signal control unit.

#### *Distance sensor inspection*

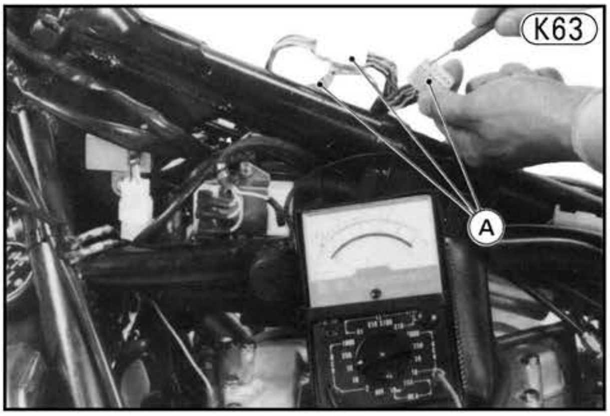
- Open the headlight housing, disconnect the red lead and light green lead from the sensor, and remove the speedometer cable lower end from the speedometer gear housing using pliers.
- Connect an ohmmeter across to the sensor leads, and check continuity as follows. Turning the speedometer inner cable slowly count how many times the sensor shows continuity. The ohmmeter should show continuity and then open four times per revolution. If it does not, replace the sensor.




**A. Light Green Lead**
**B. Red Lead**
**C. Turn the speedometer inner cable.**

#### *Turn signal and selector switch inspection*

First remove the fuel tank, and unplug the 9-pin, 6-pin, and 3-pin connectors from the left switch housing, check the turn signal switch and selector switch connections according to Table K19 and K20. If the switch has an open circuit or a short, it can be disassembled for repair. The contact surfaces may be cleaned, but no internal parts are available for replacement. If any parts are not repairable, the switch must be replaced as a unit.




**A. 9-pin, 6-pin, and 3-pin Connectors from the Left Switch Housing**

**Table K19 Selector Switch Connections***

| | | Lead Color | |
|---|---|---|---|
| | | Brown | Yellow |
| Switch Position | Off | | |
| | On | ● | ● |

*Check connections at the 3-pin and 6-pin connectors.

**Table K20 Turn Signal Switch Connections***

| | Gray | Orange | Green | Red/ White | Ground | White/ Red | Blue/ White |
|---|---|---|---|---|---|---|---|
| R | ● | ● | | | | ● | ● |
| N | | | | ● | ● | | |
| L | | ● | ● | | | ● | ● |

*Check connections at the 9-pin connectors.

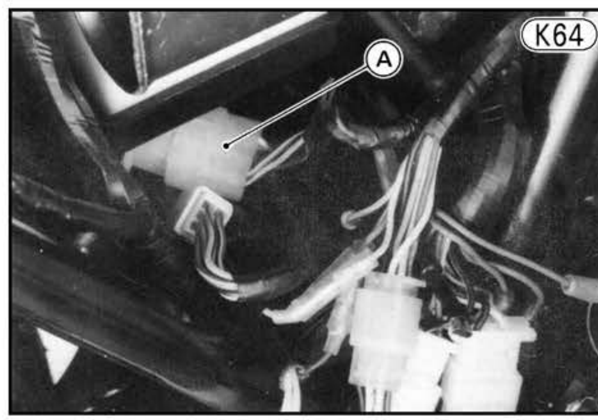
Next check that the solenoid operates properly when it receives a pulse from the control unit.

- Switch the turn signal switch to either side, connect a wire to the positive (+) side of the battery and touch it to the white/green lead in the 9-pin connector momentarily. At this time the solenoid should return the turn signal switch to the off position. If it does not do this for both right and left positions, replace the switch assembly.

**CAUTION** **Do not connect the battery lead to the white/green wire for more than a few seconds, as it could burn out the solenoid.**

### *Wiring inspection*

- Connect all the leads and connectors.
- Pull off the right side cover, remove the mounting bolts, and pull out the IC igniter and regulator/rectifier.
- Measure the voltage at the 6-pin connector from the turn signal control unit as shown in Table K21.




**A. 6-pin Connector**

- If any one of the meter readings shows an improper value, check the wiring and connections of the turn signal switch, distance sensor, and turn signal control unit. Replace the turn signal control unit if all of them turn out good.

**NOTE:** The turn signal control unit is located beneath the battery tray.

**Table K21 Wiring Inspection**

| Meter Range | Connections* | Ignition** Switch | Selector Switch Position | Turn Signal Switch Position | Reading |
|---|---|---|---|---|---|
| 20V DC | Meter (+) → Yellow, Blue/White | on | on | Any (R, L, Neu.) | Battery voltage |
| | | off | off | Any | 0 V |
| | Meter (+) → White/Red | on | on | R or L | Battery voltage |
| | | off | off | Neutral | 0 V |

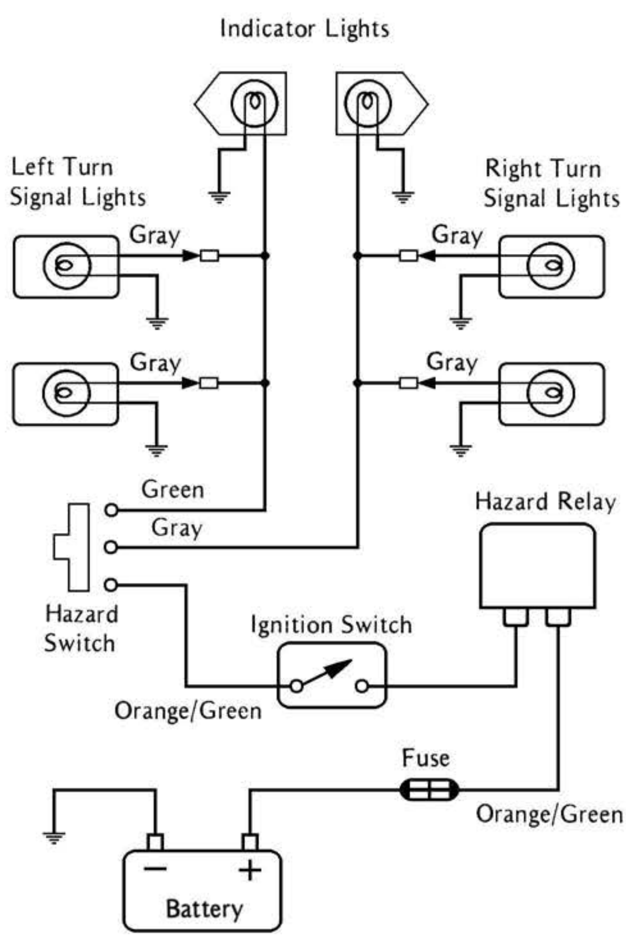
* Connect the meter negative (–) lead to ground.
** Turn the main switch to the on position.

## HAZARD WARNING CIRCUIT

A wiring diagram of the hazard warning circuit is shown in Fig. K65. When the ignition switch is in the On or Park position, and the hazard switch is turned on; a ground is provided for the circuit so current can flow. The current flows intermittently by the working of the hazard relay, then all the turn signals will flash on and off.

Since the hazard relay is designed to operate correctly only when all turn signals and the turn signal indicator light are properly connected in the circuit, trouble may result from a burned out bulb, a bulb of incorrect wattage, loose wiring, as well as from a defect in the relay itself.

**Hazard Warning Circuit** K65

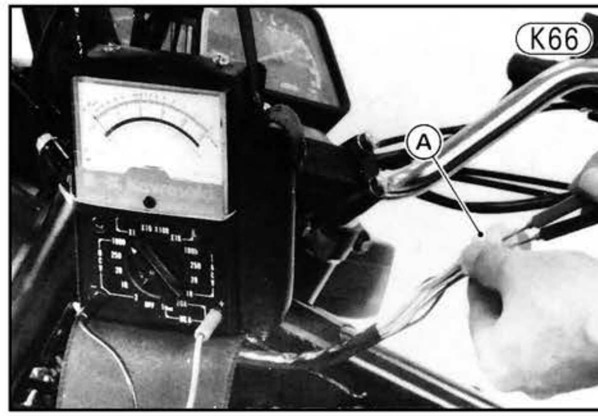



### *Testing the hazard warning circuit*

Before testing the hazard warning circuit, check the turn signal operation.

(1)Wiring Inspection:

- Remove the fuel tank, and disconnect the 6-pin connector from the left switch housing.
- Measure the voltage at the 6-pin connector as shown in Table K22.




**A. 6-pin Connector from the Left Switch Housing**

**Table K22 Hazard Warning Circuit Wiring Inspection**

| Meter | Connections | Ignition Switch | Reading |
|---|---|---|---|
| 20V DC | Meter (+) → Orange/Green<br>Meter (–) → Ground | On or Park Position | Battery Voltage |
| | | Off or Lock | 0 V |

- If any one of the meter readings shows an improper value, check the ignition switch (Pg. 248), connections and orange lead between the ignition switch and the 6-pin connector, and the hazard relay. If the meter reading shows the wiring good, check the hazard switch.

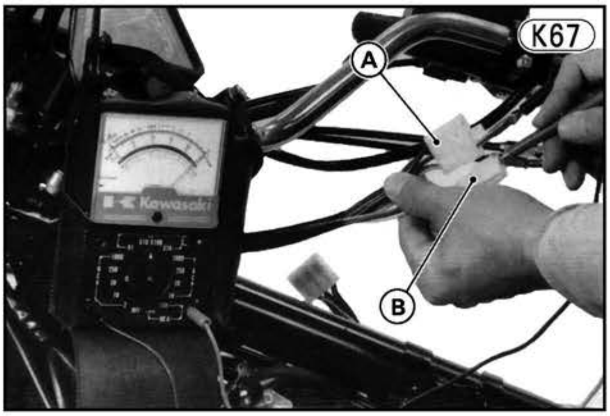
(2)Hazard Switch Inspection:

- Table K23 shows the internal connections of the hazard switch. To check the switch, disconnect the 3-pin and 6-pin connectors, and use an ohmmeter to verify that there is continuity between all the connections that are listed in the table. If the switch has an open circuit or short, the switch must be replaced.

**Table K23 Hazard Switch Connections**

| Color | Green | Orange/Green | Gray |
|---|---|---|---|
| Off | | | |
| On | ● | ● | ● |

* Check the switch connections at the 3-pin and 6-pin connectors from the left switch housing.




A. 6-pin Connector B. 3-pin Connector

(3)Hazard Relay Inspection:

- To gain access to the hazard relay, remove the tool tray, battery, and main switch cover.
- Disconnect the hazard relay leads and check the resistance between the relay terminals. There should be about 60Ω. If there is no ohmmeter reading, or if there is zero ohms resistance, replace the relay with a new one.


A. Hazard Relay

## TAIL/BRAKE LIGHT

The tail/brake light circuit is shown in Fig. K70 and K71.

This motorcycle contains two tail/brake lights which are connected in parallel for a safety device. When one filament burns out, the other one continues to work.

When the main switch and ignition switch are turned on, the brake light go on whenever the circuit is closed by either the front or rear brake light switch.

When the main switch is turned to "Park" position, the tail lights go on. For the US and Canadian models, the tail lights go on also when the main switch and ignition switch are turned on. For the European model, they go on when the main switch, ignition switch and headlight switch are turned on.

The same bulbs are used for both the brake and tail lights.

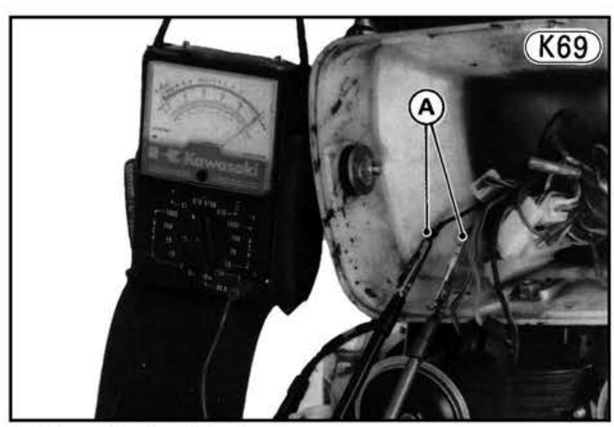
The front brake light switch is a pressure switch installed in the brake fluid line, and is operated by fluid pressure when the brake lever is pulled. The rear brake light switch is a plunger type switch actuated by a spring attached to the rear brake pedal. The front and rear brake light switches never require adjustment and so are not designed to be adjusted. They cannot be disassembled for repair and must be replaced when defective. Tail/brake light circuit inspection involves the tail/brake lights, the front brake light switch, rear brake light switch, and wiring.

### *Tail/brake light trouble*

If one or both of the two tail/brake lights does (do) not go on when the circuit is closed, the filament(s) is (are) probably burned out. However if the bulbs are good, check the fuses, wiring, main switch, ignition switch, battery, front brake light switch, rear brake light switch, and wiring.

### *Front brake light switch inspection*

- Disconnect the front brake light switch leads from the switch.
- Set an ohmmeter to the x 1 Ω range, connect the meter to the switch terminals, and determine whether or not there is continuity whenever the front brake lever is squeezed. If there is no continuity, replace the switch (See Pg. 127).



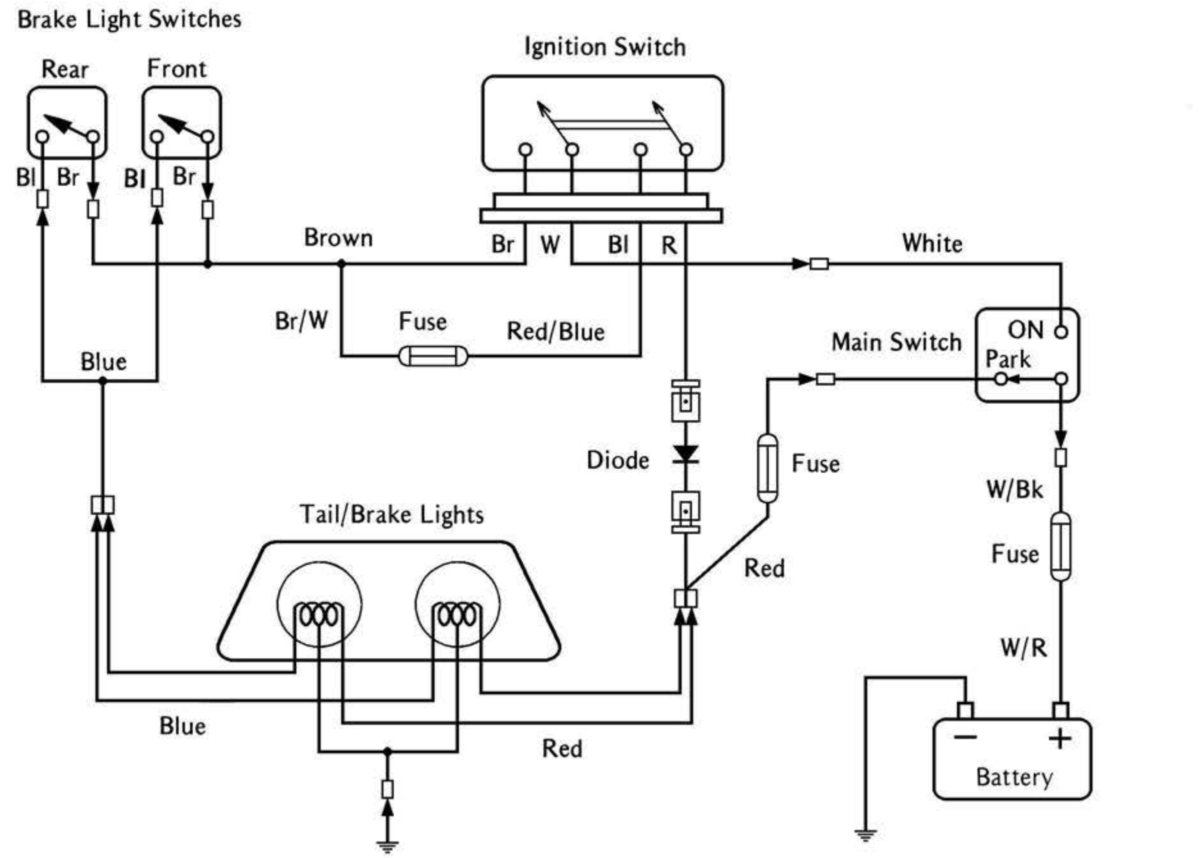

A. Front Brake Light Switch Leads

### *Rear brake light switch inspection*

- Disconnect the rear brake light switch leads in the right side cover.

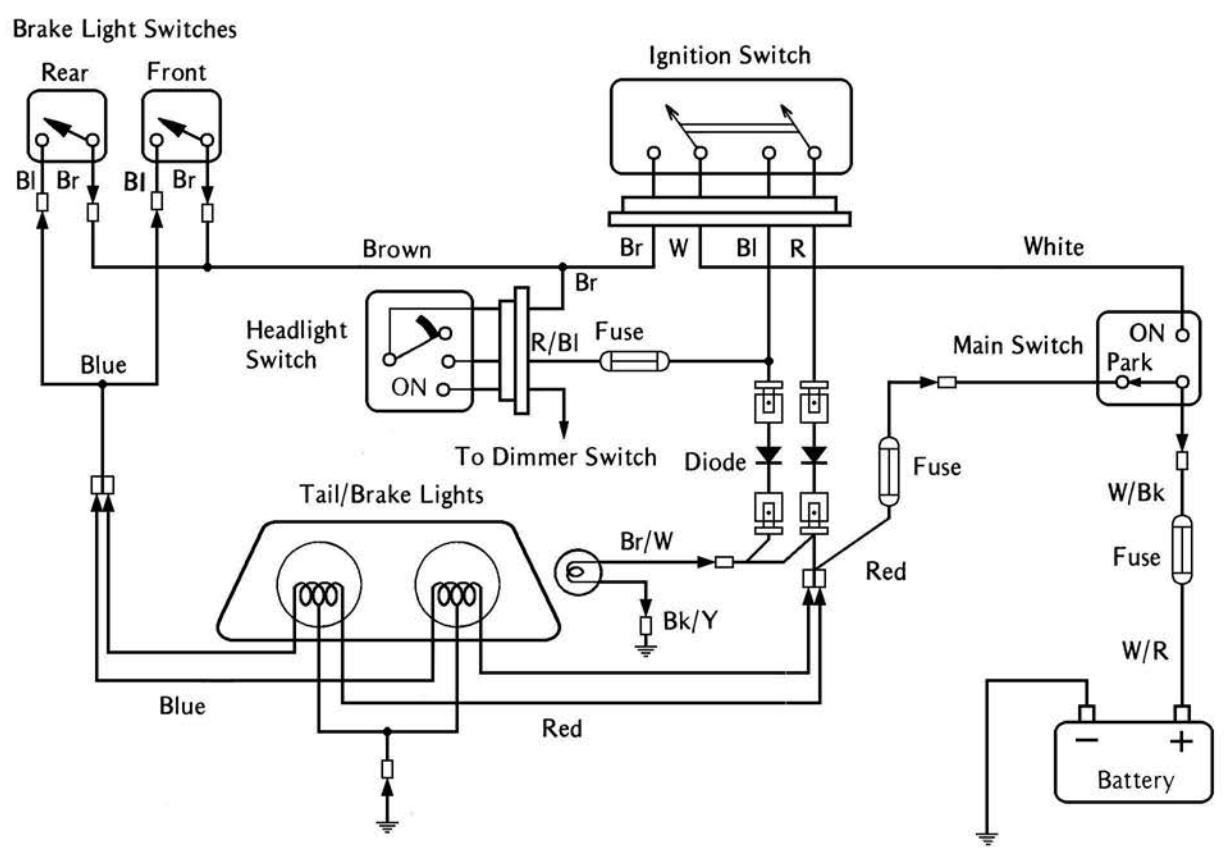
**Tail/Brake Light Circuit (US, Canadian Models)**

K70

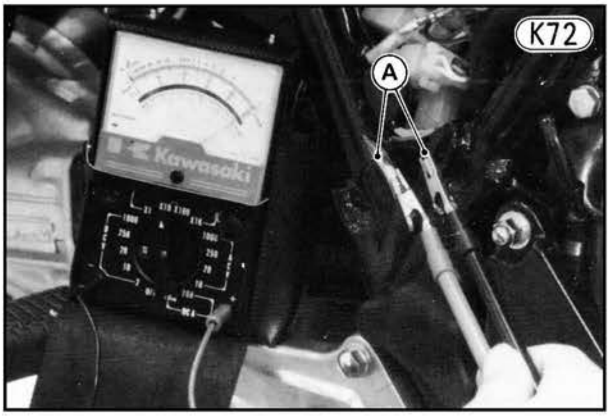



**Tail/Brake Light Circuit (European Model)**

K71



•Check the rear brake light switch in the same way that the front brake light switch was inspected. If there is no continuity whenever the rear brake pedal if depressed, replace the switch.

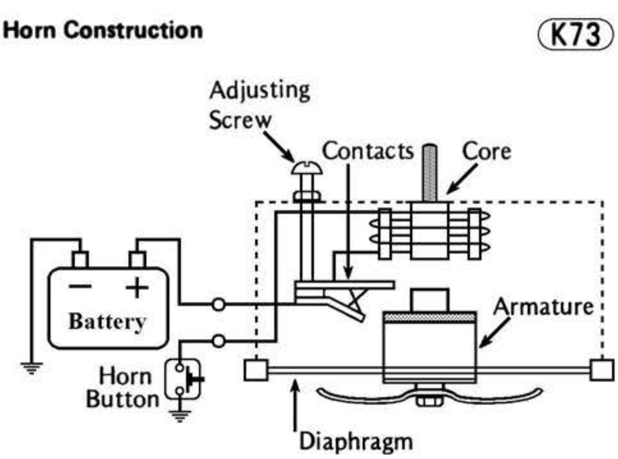



**A. Rear Brake Light Switch Leads**

## HORN

The horn circuit and construction are shown in Fig. K73. When the horn button is pressed (with the ignition switch on), the horn is grounded to complete the horn circuit. Current then flows through the horn contacts and horn coil, magnetizing the iron core. The magnetized iron core pulls on the armature and diaphragm assembly, the movement of which pushes open the contacts, interrupting the current flow. Since the core now loses its magnetism, the armature and diaphragm assembly springs back to its original position, closing the contacts. This cycle repeats until the horn button is released. Since each cycle takes only a fracture of a second, the diaphragm moves fast enough to produce sound.

**Horn Construction**



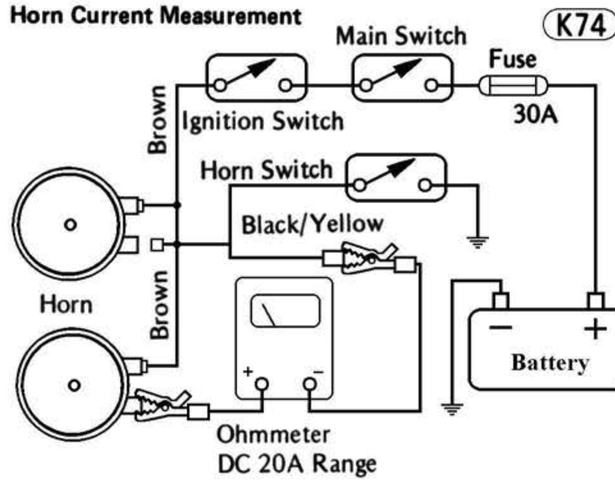

The horn contacts wear down after long use and may need to be adjusted from time to time. When satisfactory horn performance cannot be obtained by adjustment, check the horn and the rest of the horn circuit. If the horn adjustment alone cannot the trouble and the rest of the electrical system is functioning properly, the horn must be replaced. It cannot be disassembled.

### Adjustment

**NOTE:** Two horns are installed on this machine. Disconnect the horn you will not adjust so that you can determine the change of the horn sound during adjustment.

•Disconnect the black/white horn lead, and connect an ammeter in series to the horn circuit. The + ammeter lead goes to the horn terminal and the – ammeter lead to the black/white lead.

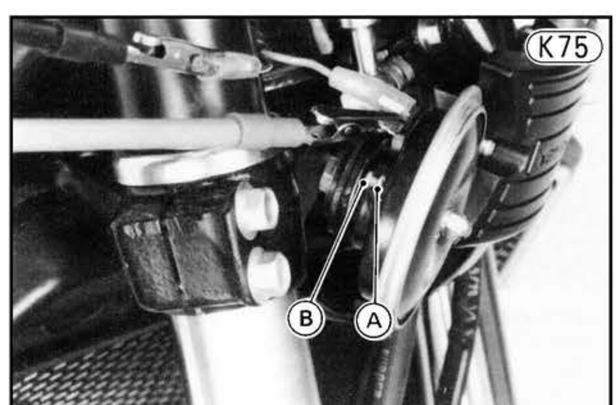
**Horn Current Measurement**




•Fully loosen the adjusting screw locknut.

•Turn on the ignition key, and keep the horn button pressed while turning the horn adjusting screw. Adjust for the best horn sound while keeping the current under 2.5 amperes.

**CAUTION** **Do not turn the adjusting screw in too far, since doing so will increase horn current with the possibility of burning out the horn coil.**



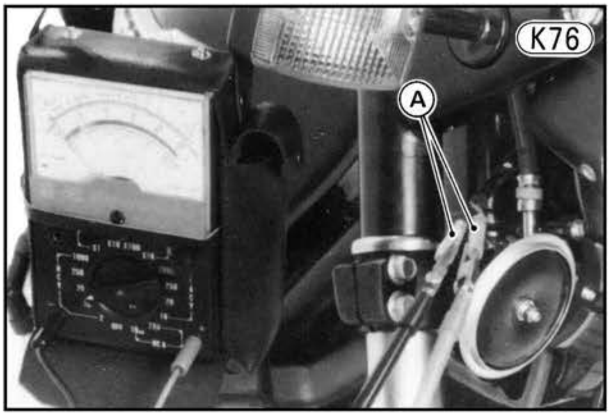

**A. Locknut** **B. Adjusting Screw**

•Tighten the adjusting screw locknut.

**NOTE:** The horn will not sound properly if it is mounted incorrectly or if any cable or other part is touching it.

### *Horn circuit check*

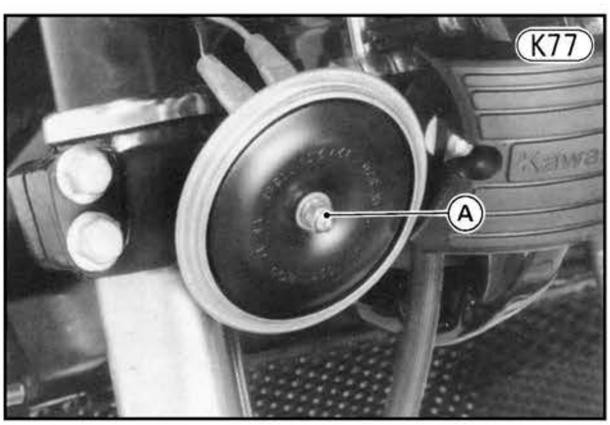
- Check that battery voltage is normal.
- Set the multimeter to the 20V DC range, and connect the meter to the leads that were disconnected from the horn. The + meter lead goes to the brown lead, and the – meter lead goes to the black/white lead.
- With the ignition switch on, press the horn button. The meter should registor battery voltage. If it does not, the fuse, ignition switch, main switch, horn button, or wiring is at fault.




**A. Horn Leads**

- If the meter does show battery voltage, indicating that the horntrouble lies within the horn itself, and adjustment fails to correct the trouble, replace the horn.

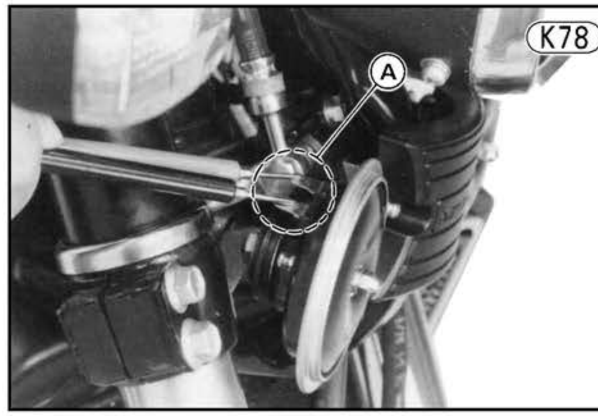
**CAUTION** **Do not loosen the armature mounting nut since doing so would alter the armature position such that the horn would probably have to be replaced.**




**A. Armature Mounting Nut**

### *Horn inspection*

- Disconnect the leads to the horn, and connect a multimeter set to the x 1 Ω range to the horn terminals to check for continuity (close to zero ohms). If the reading is several ohms or if there is no reading at all, replace the horn.

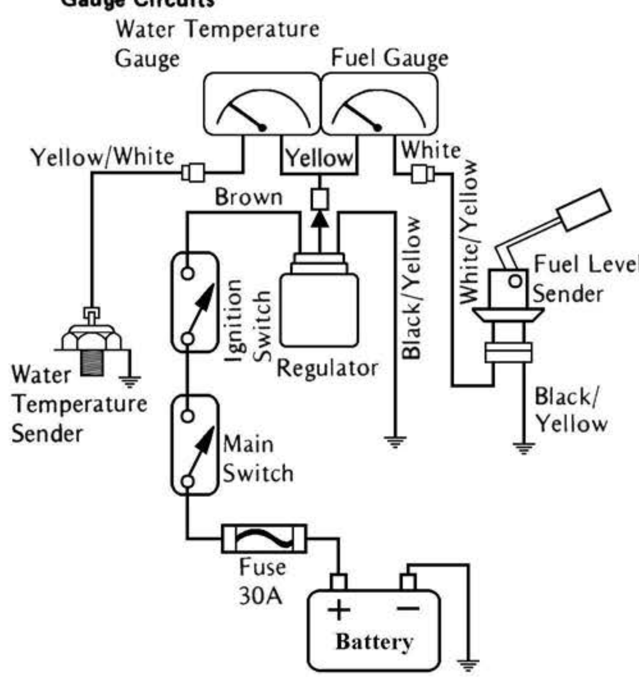



**A. Check the resistance across the horn terminals.**

## FUEL GAUGE, WATER TEMPERATURE GAUGE

Both the fuel and water temperature gauges are electrically operated. As shown in the diagram, two gauges are powered by the battery through the 7-volt voltage regulator. Each gauge is of the bimetal type, and the indicator needle swings according to the amount of current flowing through the gauge. The amount of current is controlled by the fuel level sender and the water temperature sender.

**Fuel Gauge and Water Temperature Gauge Circuits** (K79)

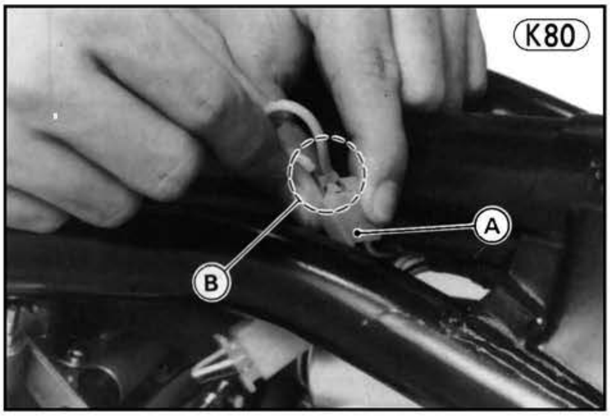



### Fuel Level Gauge

#### *Level gauge circuit check*

- Remove the fuel tank (Pg. 46).
- Disconnect the 2-pin connector to the sender, and turn on the ignition switch. At this time the gauge should read "E".
- Short-circuit together the black/yellow and white/yellow leads on the gauge side of the 2-pin connector. At this time the gauge should read "F".

**CAUTION** **Do not short-circuit the leads longer than necessary. When the needle swings to the "F" position, stop short-circuiting. Otherwise a good meter could be damaged.**




**A. 2-pin Connector**
**B. Open or short-circuit the leads to check the circuit.**

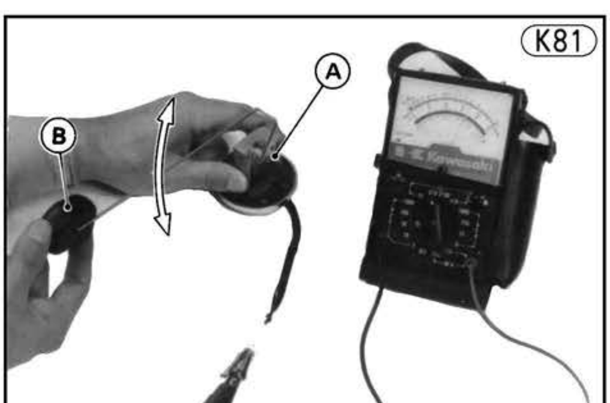
- If the above "E" and "F" readings are correct, the fuel level sender is bad. If these readings are not obtained, the trouble is with the fuel level gauge, voltage regulator, or wiring.

### *Fuel level sender check*

- Remove the fuel level sender, and check that the float moves up and down smoothly without binding. It should go down under its own weight from top to stop. If the float does not move smoothly, replace the sender.
- Measure the resistance of the fuel level sender with an ohmmeter. If the ohmmeter does not show the values in the table, or the reading does not vary smoothly as the fuel level changes, replace the sender.

**Table K24 Resistance of Fuel Level Sender**

| Tank (Float) | Resistance |
|---|---|
| Full (Highest position) | 0.5~5.5 Ω |
| Empty (Lowest position) | 102~118 Ω |

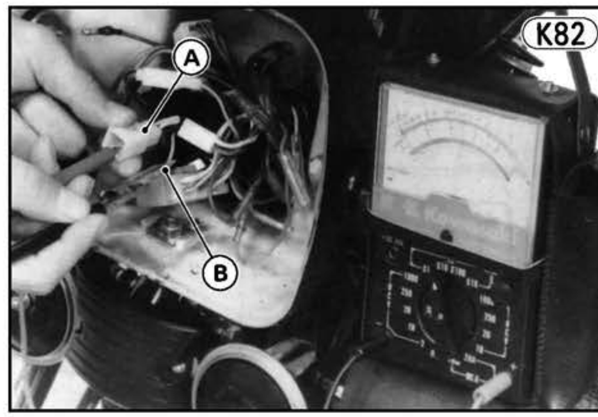



**A. Fuel Level Sender** **B. Float**

- Inspect the leads and connector. If they show any damage, replace the sender.

### *Level gauge check*

- Open the headlight housing.
- Disconnect the yellow lead and the 4-pin connector from the meter assembly.
- Check the resistance of the meter using an ohmmeter as shown in Table K25. If the resistance in this test is found to be less than the proper value, there is a short in the meter. No reading (∞) indicates an open circuit. In either case, replace the gauge meter.



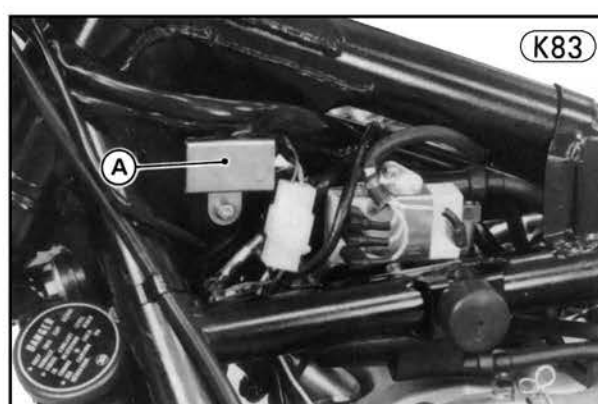

**A. 4-pin Connector** **B. Yellow Lead**

**Table K25 Gauge Resistance**

| Meter Range | x 10 Ω |
|---|---|
| Connections | One meter lead → Yellow lead<br>The other meter lead → White lead |
| Reading | 54~66 Ω |

### *Voltage regulator check*

- Remove the fuel tank, and disconnect the 3-pin connector from the voltage regulator.




**A. Voltage Regulator**

- Connect the 12 volt battery as shown in Fig. K84, and measure the regulator output voltage as shown in Table K26.

**Regulator Test** (K84)

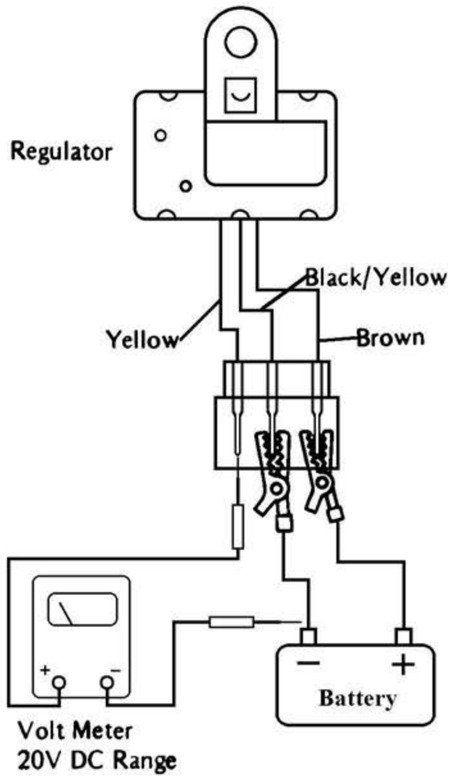


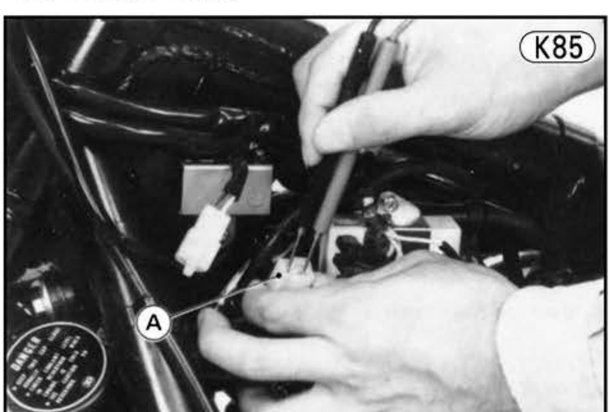

**Table K26 Regulator Test**

| Meter | Connections | Reading |
|---|---|---|
| 20V DC | Meter (+) → Yellow<br>Meter (–) → Black/Yellow | about 7 volts |

- If the reading in this test differs greatly from the value specified in the table, replace the regulator.

### *Level gauge wiring check*

- Disconnect the 3-pin connector from the voltage regulator.
- Connect a voltmeter to the 3-pin connector on the main wiring harness side as shown in the table, and turn on the ignition switch. If the voltmeter reading does not correspond to the table, the wiring is bad. Check the leads and connectors, and replace or repair any damaged wiring.




A. 3-pin Connector

**Table K27 Wiring Check**

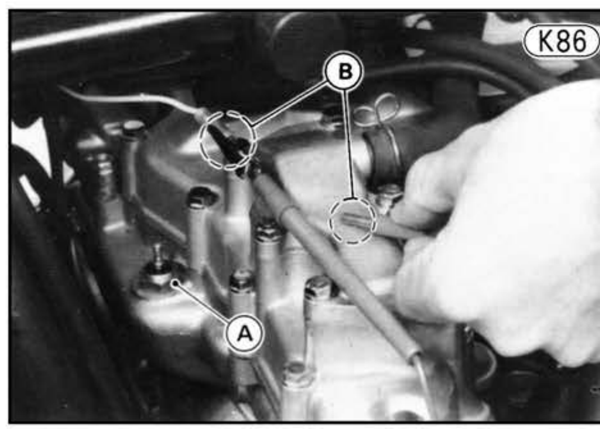
| Meter Range | Connections | Reading |
|---|---|---|
| 20V DC | Meter (+) → Brown Lead<br>Meter (–) → Black/Yellow Lead | Battery Voltage |

## Water Temperature Gauge

### *Temperature gauge circuit check*

- Disconnect the yellow/white lead from the water temperature sender, and turn on the ignition switch. At this time the gauge should read "C".
- Ground the sender lead to the engine. At this time the gauge should read "H".

**CAUTION** **Do not ground the lead longer than necessary. When the needle swings to the "H" position, stop grounding. Otherwise the good meter could be damaged.**




**A. Sender**
**B. Open or ground the lead to check the circuit.**

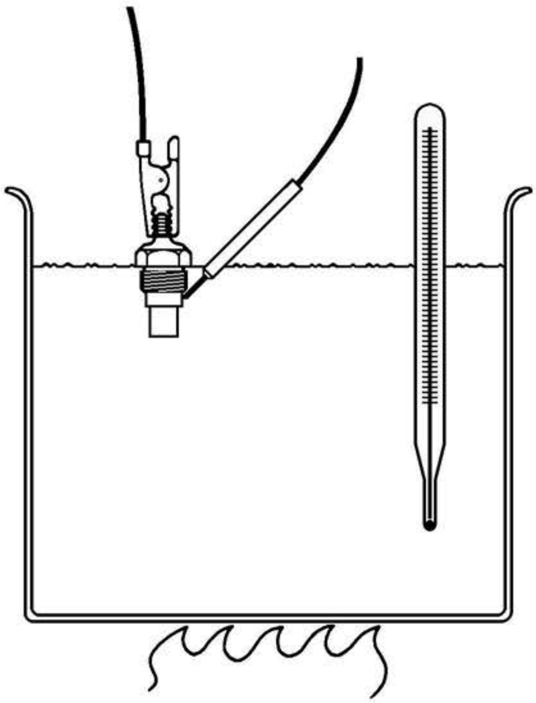
- If the above "E" and "F" readings are correct, the water temperature sender is bad. If these readings are not obtained, the trouble is with the water temperature gauge, voltage regulator, or wiring. See Pg. 261 for voltage regulator inspection, and Pg. 262 for wiring check.

### *Water temperature sender check*

- Remove the water temperature sender.
- Suspend the sender in a container of water so that the temperature – sensing projection and threaded portion are submerged. The switch must not touch the container sides or bottom.
- Suspend an accurate thermometer in the water. It must not touch the container, either.
- Place the container over a source of heat and gradually raise the temperature of the water while stirring the water gently.

**Water Temperature Sender Inspection**

(K87)



●Measure the internal resistance of the sender across the switch terminal and the body at the temperatures shown in Table K28. The internal resistance of the sender should change as shown in the table. If it does not, replace the switch.

**Table K28 Internal Resistance of Water Temperature Sender**

| Water Temperature | Resistance |
|---|---|
| 80°C (176°F) | 47~57 Ω |
| 100°C (212°F) | 26~30 Ω |

### *Water temperature gauge check*

●Open the headlight housing.

●Disconnect the yellow lead and the 4-pin connector from the meter assembly.

●Check the resistance of the meter using an ohmmeter as shown in Table K29. If the resistance in the test is found to be less than the proper value, there is a short in the meter. No reading (∞) indicates an open circuit. In either case, replace the gauge meter.


**A. 4-pin Connector** **B. Yellow Lead**

**Table K29 Gauge Resistance**

| Meter | Connections | Reading |
|---|---|---|
| x 10 Ω Range | One meter lead → Yellow lead<br>The other meter lead → Yellow/White lead | 54~66 Ω |

# Troubleshooting—Guide

## Engine Does Not Start; Starting Difficulty

**Starter motor not rotating**
- Clutch lever not pulled
- Starter motor broken
- Battery voltage low
- Relay not contacting or operating
- Starter button not contacting
- Wiring open or shorted
- Main switch trouble
- Ignition switch trouble
- Engine stop switch trouble
- Engine stop switch off
- Fuse blown
- Starter lockout switch trouble

**Starter motor rotating but engine doesn't turn over**
- Starter motor clutch broken
- Torsion damper bolt loosened

**Engine won't turn over**
- Valve seizure
- Valve lifter seizure
- Cylinder, piston seizure
- Crankshaft seizure
- Connecting rod small end seizure
- Connecting rod big end seizure
- Transmission gear or bearing seizure
- Camshaft seizure
- Primary chain broken

**No fuel flow**
- No fuel in tank
- Fuel tap turned off
- Tank cap air vent obstructed
- Solenoid fuel valve trouble
- Fuel tap clogged
- Solenoid fuel valve clogged
- Fuel line clogged
- Float valve clogged

**Engine flooded**
- Fuel level too high
- Solenoid fuel valve worn or broken
- 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.)

**No spark; spark weak**
- Main switch not on
- Ignition switch not on
- Engine stop switch turned off
- Battery voltage low
- Spark plug dirty, broken, or maladjusted
- Spark plug cap or high tension wiring trouble
- Spark plug cap not in good contact
- IC igniter broken
- Pick-up coil broken
- Ignition coil broken
- Ignition coil resistor open
- Ignition or engine stop switch shorted
- Wiring shorted or open

**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/land 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**
- Battery voltage low
- Spark plug dirty, broken, or maladjusted
- Spark plug cap or high tension wiring trouble
- Spark plug cap not in good contact
- Spark plug incorrect
- IC igniter broken
- Pick-up coil broken
- Ignition coil broken
- Ignition coil resistor open

**Fuel/air mixture incorrect**
- Pilot screw(s) maladjusted
- Pilot jet, or air passage clogged
- Air bleed pipe bleed holes clogged
- Air cleaner clogged, poorly sealed, or missing
- Air cleaner/carburetor poorly sealed
- Starter plunger stuck open
- Fuel level too high or too low
- Fuel tank air vent obstructed
- Solenoid fuel valve clogged or broken
- Carburetor holders loose
- Carburetors and carburetor holders not aligned correctly

**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/land 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)

**Backfiring when deceleration**
- Vacuum switch valve broken
- Air suction valve trouble
- Coasting enricher trouble

**Other**
- Timing not advancing (spring broken or stretched)
- Carburetors not synchronizing
- Carburetor vacuum pistons don't slide smoothly

Engine oil viscosity too high
Final gear case oil viscosity too high
Brakes dragging
Air suction valve trouble
Vacuum switch valve broken

## Poor Running or No Power at High Speed

**Firing incorrect**
Spark plug dirty, broken, or maladjusted
Spark plug cap or high tension wiring trouble
Spark plug cap not in good contact
Spark plug incorrect
IC igniter broken
Pick-up coil broken
Ignition coil broken
Ignition coil resistor open
Timing not advancing

**Fuel/air mixture incorrect**
Main jet clogged or wrong size
Jet needle or needle jet worn
Jet needle clip in wrong position
Fuel level too high or too low
Air bleed pipe bleed holes clogged
Air cleaner clogged, poorly sealed, or missing
Air cleaner/carburetor poorly sealed
Starter plunger stuck open
Water or foreign matter in fuel
Carburetor holders loose
Carburetors and carburetor holders not aligned correctly
Fuel tank air vent obstructed
Solenoid fuel valve clogged or broken
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/land 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

**Backfiring when deceleration**
Vacuum switch valve broken
Air suction valve trouble
Coasting enricher trouble

**Miscellaneous**
Butterfly valve won't fully open
Carburetor vacuum piston don't slide smoothly
Timing not advancing
Brakes dragging
Clutch slipping
Overheating
Engine oil level too high
Engine oil viscosity too high
Final gear case oil viscosity too high

## Overheating

**Firing incorrect**
Spark plug dirty, damaged, or maladjusted
Spark plug incorrect

**Fuel/air mixture incorrect**
Main jet clogged
Fuel level too low
Carburetor holders loose
Carburetors and carburetor holders not aligned correctly
Air cleaner poorly sealed, or missing
Air cleaner/carburetor poorly sealed

**Compression high**
Carbon built up in combustion chamber

**Engine load faulty**
Clutch slipping
Engine oil level too high
Engine oil viscosity too high
Brakes dragging

**Lubrication inadequate**
Engine oil level too low
Engine oil poor quality or incorrect

**Gauge incorrect**
Water temperature gauge broken
Water temperature sender broken
Voltage regulator broken

**Coolant incorrect**
Coolant level too low
Coolant deteriorated

**Cooling system component incorrect**
Radiator clogged
Thermostat trouble
Radiator cap trouble
Thermostatic fan switch trouble
Fan relay trouble
Fan motor broken
Fan blade damaged
Water pump not rotating
Water pump impeller damaged

## Over Cooling

**Gauge incorrect**
Water temperature gauge broken
Water temperature sender broken

**Cooling system component incorrect**
Thermostatic fan switch trouble
Thermostat trouble

## Clutch Operation Faulty

**Clutch slipping**
No clutch lever play
Friction plates worn or warped
Steel plates worn or warped
Clutch springs broken or weak
Clutch release maladjusted
Clutch inner cable catching
Clutch release mechanism trouble
Clutch hub or housing unevenly worn

**Clutch not disengaging properly**
Clutch lever play excessive
Clutch plates warped or too rough
Clutch spring tension uneven
Engine oil deteriorated
Engine oil of too high a viscosity
Engine oil level too high
Clutch housing frozen on drive shaft
Clutch release mechanism trouble
Loose clutch hub nut

## Gear Shifting Faulty

**Doesn't go into gear; shift pedal doesn't return**
Clutch not disengaging
Shift fork(s) bent or seized
Gear(s) stuck on the shaft
Shift drum positioning pin binding
Shift pedal return spring weak or broken
Shift lever broken
External shift mechanism pawl broken
Shift return spring pin loose
Pawl spring broken

**Jumps out of gear**
Shift fork(s) worn
Gear groove(s) worn
Gear dogs, dog holes, and/or dog recesses worn
Shift drum groove(s) worn
Shift drum positioning pin spring weak or broken
Shift fork pin(s) worn
Drive shaft, driven shaft, and/or gear splines worn

**Overshifts**
Shift drum positioning pin spring weak or broken
Pawl spring weak or broken

## Abnormal Engine Noise

**Knocking**
Carbon built up in combustion chamber
Fuel poor quality or incorrect
Spark plug incorrect

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

**Valve noise**
Valve clearance incorrect
Valve spring broken or weak
Camshaft bearings worn
Valve lifter worn

**Other noise**
Connecting rod small end clearance excessive
Connecting rod big end clearance excessive
Piston ring(s) worn, broken, or stuck
Piston seizure damage
Cylinder head gasket leaking
Exhaust pipe leaking at cylinder head connection
Crankshaft runout excessive
Engine mounting loose
Crankshaft bearings worn
Camshaft chain tensioner trouble
Camshaft chain, timing chain sprockets, guides worn
Loose alternator rotor
Air suction valve damaged
Vacuum switch valve damaged
Secondary shaft cam damper damaged

## Abnormal Drive Train Noise

**Clutch noise**
Clutch housing/friction plate clearance excessive
Wear or damaged clutch rubber damper(s)
Friction plate installed incorrectly

**Transmission noise**
Bearings worn
Transmission gears worn or chipped
Metal chips jammed in gear teeth
Engine oil insufficient
Driven shaft cam damper damaged
Secondary shaft cam damper damaged

**Drive line noise**
Bevel gear bearings worn
Bevel gears worn or chipped
Bevel gears maladjusted
Rear wheel coupling damaged
Insufficient lubricant

## Abnormal Frame Noise

**Front fork noise**
Oil insufficient or too thin
Spring weak or broken

**Rear shock absorber noise**
Shock absorber defective

**Disc brake noise**
Pad B loose
Pad A installed reversely
Pad surface glazed
Disc warped

**Other noise**
Brackets, nuts, bolts, etc. nor properly mounted or tightened

## Oil Pressure Indicator Light Goes On

Engine oil pump trouble
Engine oil screen clogged
Engine oil level too low
Engine oil viscosity too low
Camshaft bearings worn
Crankshaft bearings worn
Oil pressure switch trouble
Wiring trouble
Relief valve stuck open

## 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/carburetor poorly sealed
Air cleaner poorly sealed or missing

## Handling and/or Stability Unsatisfactory

**Handlebar hard to turn**

Steering stem locknut too tight
Bearing(s) damaged
Race(s) dented or worn
Steering stem lubrication inadequate
Steering stem bent
Tire air pressure too low

**Handlebar shakes or excessively vibrates**

Tire(s) worn
Swing arm bearing(s) worn
Rim(s) warped, or not balanced
Wheel bearing(s) worn
Handlebar clamps loose
Steering stem head bolt and/or clamp bolt loose

**Handlebar pulls to one side**

Frame bent
Wheel misalignment
Swing arm bent or twisted
Steering stem bent
Front fork bent
Right/left front fork oil level uneven
Right/left rear shock absorbers unbalanced

**Shock absorption unsatisfactory**

Too hard:
Front fork oil excessive
Front fork oil viscosity too high
Front fork air pressure too high
Tire air pressure too high
Shock absorber maladjusted
Front fork bent
Too soft:
Front fork oil insufficient and/or leaking
Front fork oil viscosity too low
Front fork air pressure too low
Front fork, rear shock absorber spring(s) weak
Rear shock absorber oil leaking

## Brakes Don't Hold

Air in the brake line
Pad or disc worn
Brake fluid leak
Disc warped
Contaminated pads
Brake fluid deteriorated
Primary or secondary cup damaged
Master cylinder scratched inside

## Battery Discharged

Battery faulty (e.g., plates sulphated, 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
Stator coil open or short
Wiring faulty

## Battery Overcharged

Regulator/Rectifier trouble
Battery trouble

**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. Electrical troubleshooting is not covered here due to its complexity. For electrical problems, refer to the appropriate heading in the Maintenance Section.

# Appendix

## Table of Contents



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## ADDITIONAL CONSIDERATIONS FOR RACING

This motorcycle has been manufactured for use in a reasonable and prudent manner and as a vehicle only. However, some may wish to subject this motorcycle to abnormal operation, such as would be experienced under racing conditions. KAWASAKI STRONGLY RECOMMENDS THAT ALL RIDERS RIDE SAFELY AND OBEY ALL LAWS AND REGULATIONS CONCERNING THEIR MOTORCYCLE AND ITS OPERATION.

Racing should be done under supervised conditions, and recognized sanctioning bodies should be contacted for further details. For those who desire to participate in competitive racing or related use, the following technical information may prove useful. However, please note the following important points.

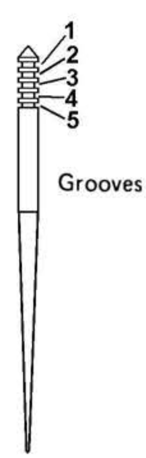
- You are entirely responsible for the use of your motorcycle under abnormal conditions such as racing, and Kawasaki shall not be liable for any damages which might arise from such use.
- Kawasaki's Limited Motorcycle Warranty and Limited Emission Control Systems Warranty specifically exclude motorcycles which are used in competitive or related uses. Please read the warranty carefully.
- Motorcycle racing is a very sophisticated sport, subject to many variables. The following information is theoretical only, and Kawasaki shall not be liable for any damages which might arise from alterations utilizing this information.
- When the motorcycle is operated on public roads, it **must** be in its original state in order to ensure safety and compliance with applicable emission regulations.

### Carburetors

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

A certain amount of adjustment can be made by changing the position of the needle. There are five grooves at the top of the needle. Changing the position of the clip to a groove closer to the bottom raises the needle, which makes the mixture richer at a given position of the throttle valve.

**Jet Needle** (M1)




**NOTE:** The last digit of the jet needle number (for example: "3" of 5P2-3 or 5P3-3) is not stamped on the needle, but is the number of the standard groove in which the clip is set. The groove numbers are counted from the top of the needle, 1 being the topmost groove, and 5 being the lowest groove.

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

### Spark Plugs

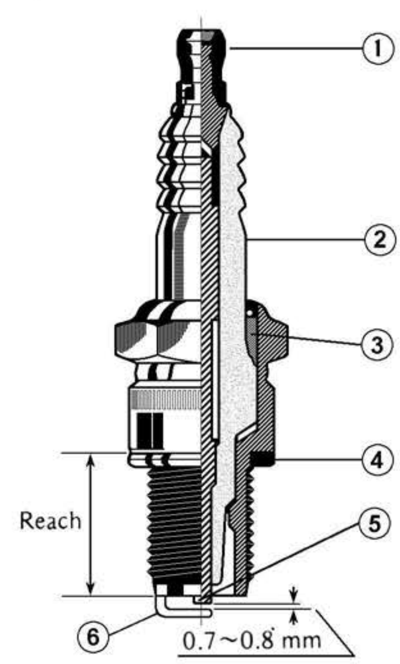
The spark plugs ignite the fuel/air mixture in the combustion chamber. To do this effectively and at the proper time, the correct spark plugs must be used, and the spark plugs must be kept clean and adjusted.

Test have shown the plugs listed in Table B1 on Pg. 12 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 spark plugs of a correct heat range are used should be determined by removing and inspecting the plugs.

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.

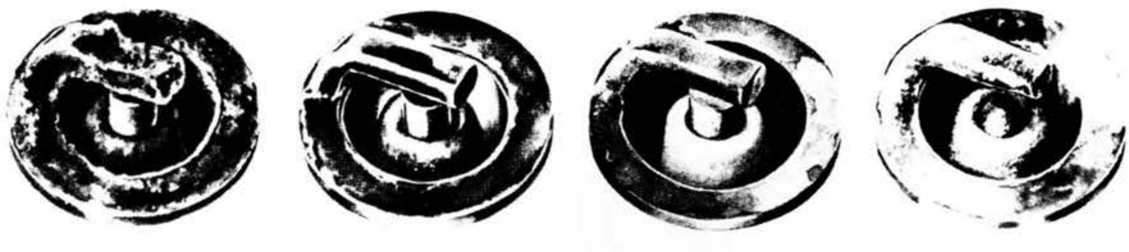
**Spark Plug** (M2)




1. Terminal
2. Insulator
3. Cement
4. Gasket
5. Center Electrode
6. Side Electrode

**Spark Plug Condition**

(M3)



Carbon Fouling Oil Fouling Normal Operation Overheating

The carbon on the electrodes conducts electricity, and can short the center electrode to ground by either coating the ceramic insulator or bridging 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 preignition and knocking, which may eventually burn a hole in the top of the piston.

**To inspect the spark plugs:**

Remove each 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.

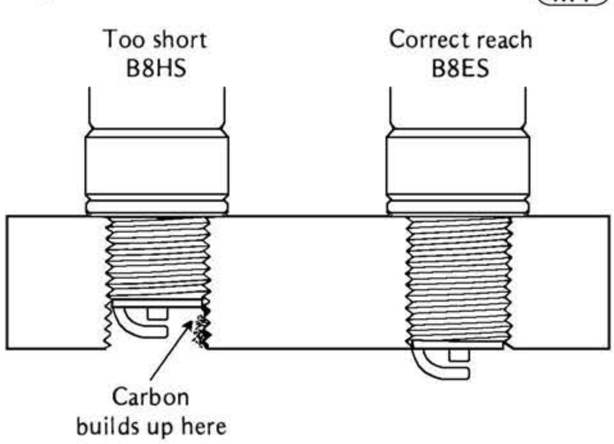
**CAUTION If the spark plugs are replaced with a type other than those mentioned below, make certain the replacement plugs have the same thread pitch and reach (length of threaded portion) as the standard plugs.**

**Table M1 Spark Plug Threads**

| | |
|---|---|
| Diameter | 14 mm |
| Pitch | 1.25 mm |
| Reach | 19.0 mm |

**Plug Reach**

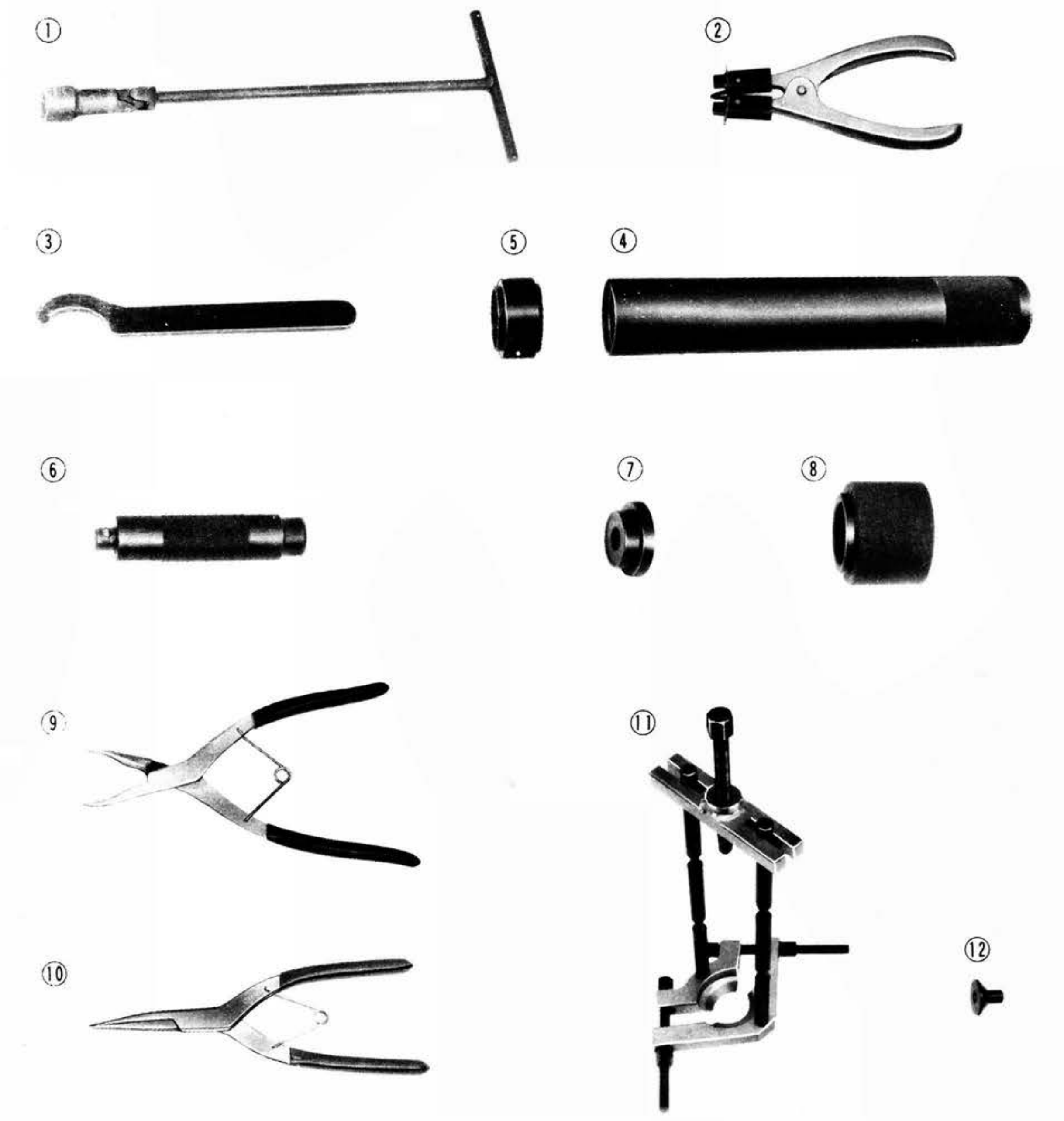
(M4)



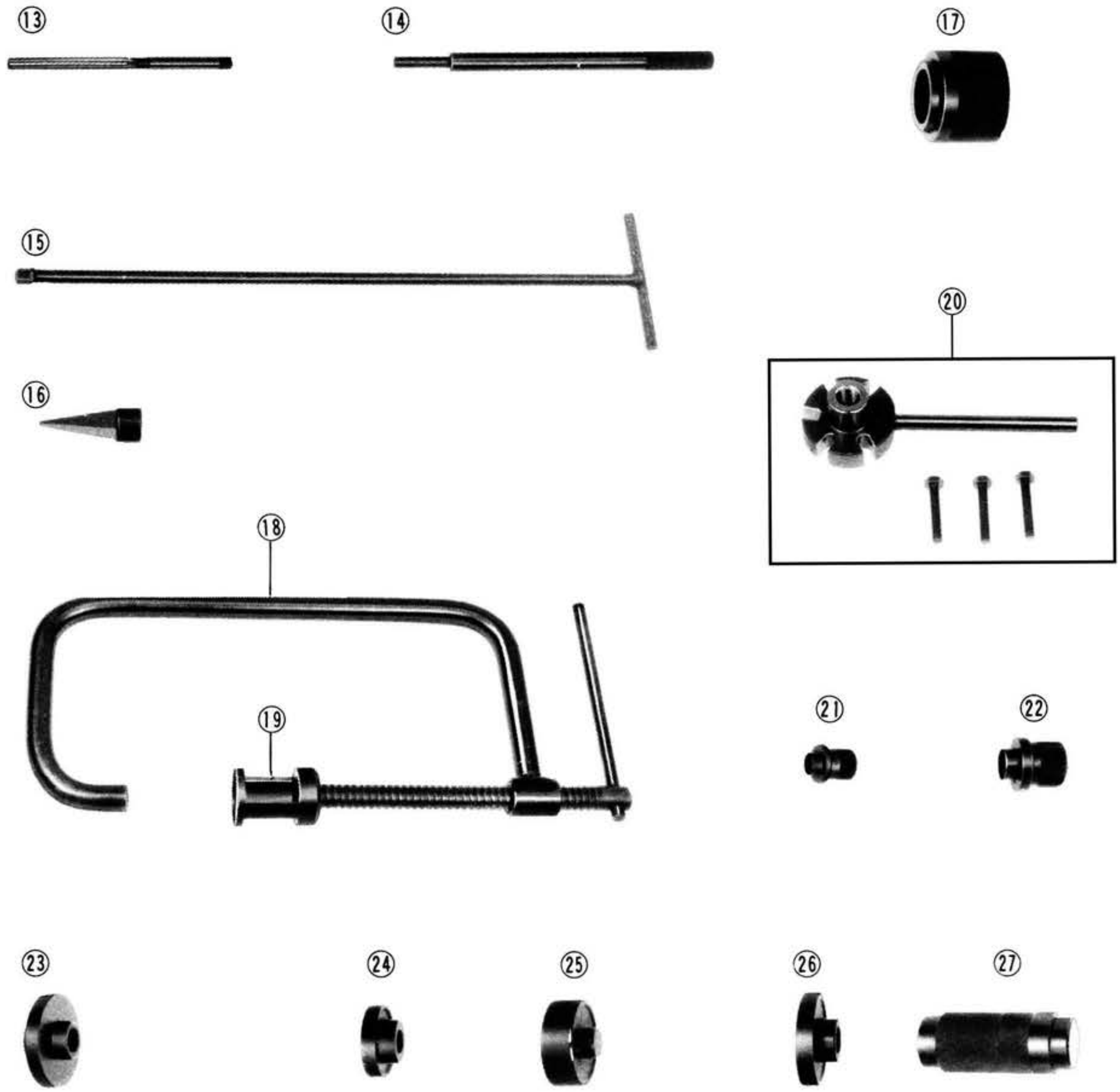

If the plug reach is too short, carbon will build up on the plug hole threads in the cylinder head, causing overheating and making it very difficult to insert the correct spark plug later.

If the reach is too long, carbon will build up on the exposed spark plug threads causing overheating, preignition, and possibly burning a hole in the piston top. In addition, it may be impossible to remove the plug without damaging the cylinder head.

## SPECIAL TOOLS




| REF. NO. | PART NO. | DESCRIPTION | Q'TY |
|---|---|---|---|
| 1 | 57001-110 | SPARK PLUG WRENCH | 1 |
| 2 | 57001-115 | PISTON RING PLIERS | 1 |
| 3 | 57001-134 | STEM NUT WRENCH | 1 |
| 4 | 57001-137 | STEM BEARING DRIVER | 1 |
| 5 | 57001-1074 | STEM BEARING DRIVER ADAPTER | 1 |
| 6 | 57001-139 | BEARING DRIVER HOLDER | 1 |
| 7 | 57001-140 | BEARING DRIVER | 1 |
| 8 | 57001-141 | FRONT FORK OIL SEAL DRIVER | 1 |
| 9 | 57001-143 | INSIDE CIRCLIP PLIERS | 1 |
| 10 | 57001-144 | OUTSIDE CIRCLIP PLIERS | 1 |
| 11 | 57001-158 | BEARING PULLER | 1 |
| 12 | 57001-317 | BEARING PULLER ADAPTER | 1 |




| REF. NO. | PART NO. | DESCRIPTION | Q'TY |
|---|---|---|---|
| 13 | 57001-162 | VALVE GUIDE REAMER | 1 |
| 14 | 57001-163 | VALVE GUIDE ARBOR | 1 |
| 15 | 57001-183 | FRONT FORK CYLINDER HOLDER HANDLE | 1 |
| 16 | 57001-1057 | FRONT FORK CYLINDER HOLDER ADAPTER | 1 |
| 17 | 57001-191 | FRONT FORK OIL SEAL DRIVER | 1 |
| 18 | 57001-241 | VALVE SPRING COMPRESSOR ASSY | 1 |
| 19 | 57001-243 | VALVE SPRING COMPRESSOR ADAPTER | 1 |
| 20 | 57001-259 | MAGNETO PULLER | 1 |
| 21 | 57001-261 | OIL SEAL GUIDE | 1 |
| 22 | 57001-264 | OIL SEAL GUIDE | 1 |
| 23 | 57001-296 | BEARING DRIVER | 1 |
| 24 | 57001-289 | BEARING DRIVER | 1 |
| 25 | 57001-290 | BEARING DRIVER | 1 |
| 26 | 57001-293 | OIL SEAL DRIVER | 1 |
| 27 | 57001-286 | BEARING DRIVER | 1 |

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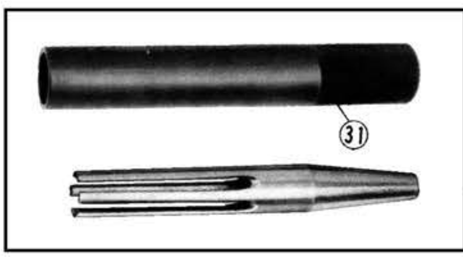


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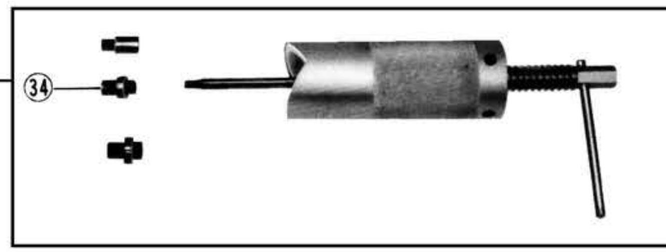


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| REF. NO. | PART NO. | DESCRIPTION | Q'TY |
|---|---|---|---|
| 28 | 57001-305 | CLUTCH HOLDER | 1 |
| 29 | 57001-308 | FLYWHEEL HOLDER | 1 |
| 30 | 57001-1109 | ADAPTER | 1 |
| 31 | 57001-382 | TRANSMISSION CIRCLIP DRIVER | 1 |
| 32 | 57001-380 | CIRCLIP DRIVER | 1 |
| 33 | 57001-910 | PISTON PIN PULLER ASSY | 1 |
| 34 | 57001-913 | PISTON PIN PULLER ADAPTER "B" | 1 |
| 35 | 57001-921 | PISTON RING COMPRESSOR | 6 |
| 36 | 57001-1016 | ROTOR PULLER | 1 |
| 37 | 57001-1030 | PISTON HOLDER | 4 sets |
| 38 | 57001-1036 | CARBURETOR AND CARBURETOR HOLDER ALIGNMENT JIG | 1 |
| 39 | 57001-1037 | HOLDER | 1 |

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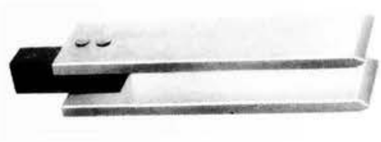

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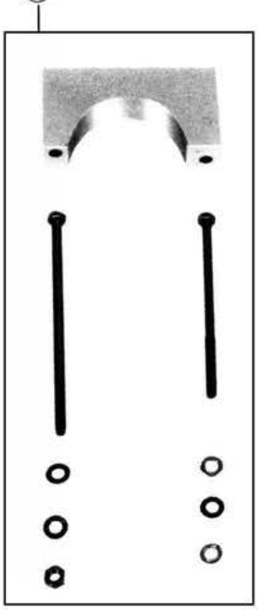

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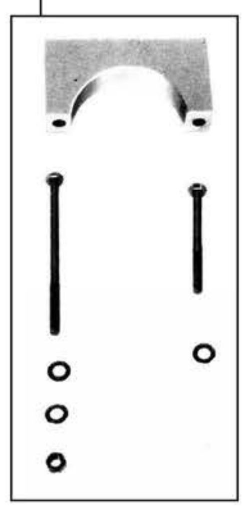

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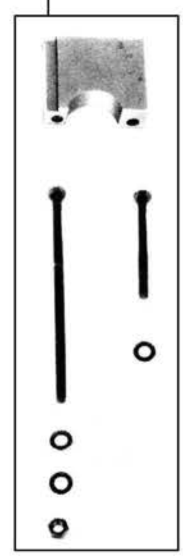

| REF. NO. | PART NO. | DESCRIPTION | Q'TY |
|---|---|---|---|
| 40 | 57001-1038 | PISTON BASE | 2 |
| 41 | 57001-1039 | CLUTCH HOUSING PUSHER | 1 |
| 42 | 57001-1040 | UNIVERSAL COUPLING HOLDER | 1 |
| 43 | 57001-1041 | CAM DAMPER COMPRESSOR "A" | 1 |
| 44 | 57001-1042 | CAM DAMPER COMPRESSOR "B" | 1 |
| 45 | 57001-1043 | BEVEL GEAR HOLDER | 1 |
| 46 | 57001-1044 | OUTPUT SHAFT COUPLING HOLDER | 1 |
| 47 | 57001-1045 | DRIVEN SHAFT HOLDER "A" | 1 |
| 48 | 57001-1046 | DRIVEN SHAFT HOLDER "B" | 1 |
| 49 | 57001-1047 | OUTPUT SHAFT HOLDER "A" | 1 |
| 50 | 57001-1048 | OUTPUT SHAFT HOLDER "B" | 1 |

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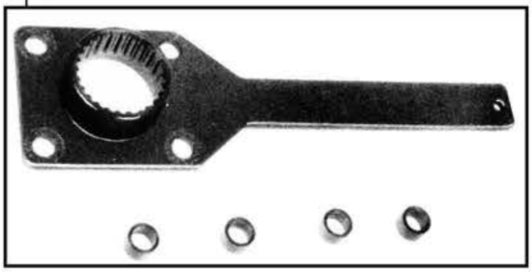

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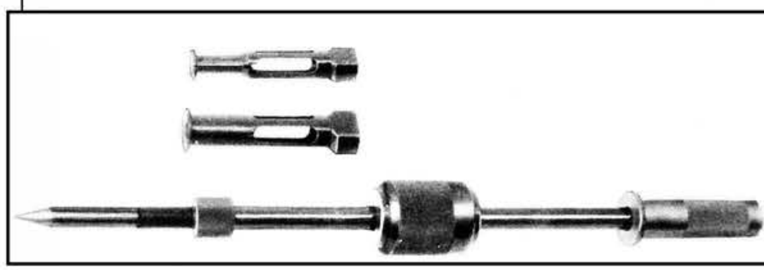

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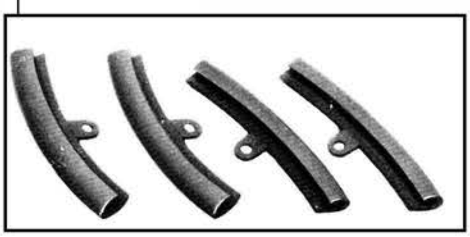

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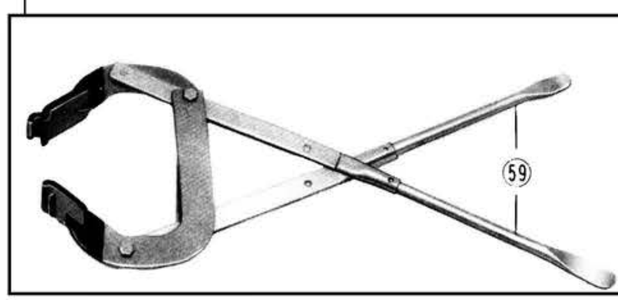


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| REF. NO. | PART NO. | DESCRIPTION | Q'TY |
|---|---|---|---|
| 51 | 57001-1050 | PINION JOINT HOLDER | 1 |
| 52 | 57001-1051 | RING NUT WRENCH | 1 |
| 53 | 57001-1052 | OIL SEAL REMOVER | 1 |
| 54 | 57001-1053 | DRIVER | 1 |
| 55 | 57001-1054 | DRIVER | 1 |
| 56 | 57001-1058 | OIL SEAL AND BEARING REMOVER ASSY | 1 |
| 57 | 57001-1063 | RIM PROTECTOR | 1 set |
| 58 | 57001-1072 | BEAD BREAKER ASSY | 1 |
| 59 | 57001-1073 | TIRE IRON | – |
| 60 | 57001-1075 | DRIVER PRESS SHAFT | 1 |
| 61 | 57001-1076 | BEARING DRIVER | 1 |
| 62 | 57001-1077 | BEARING DRIVER | 1 |

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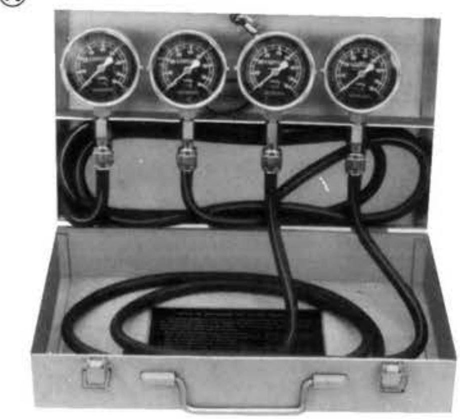

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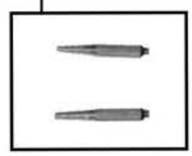

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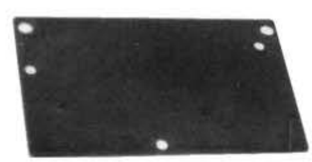
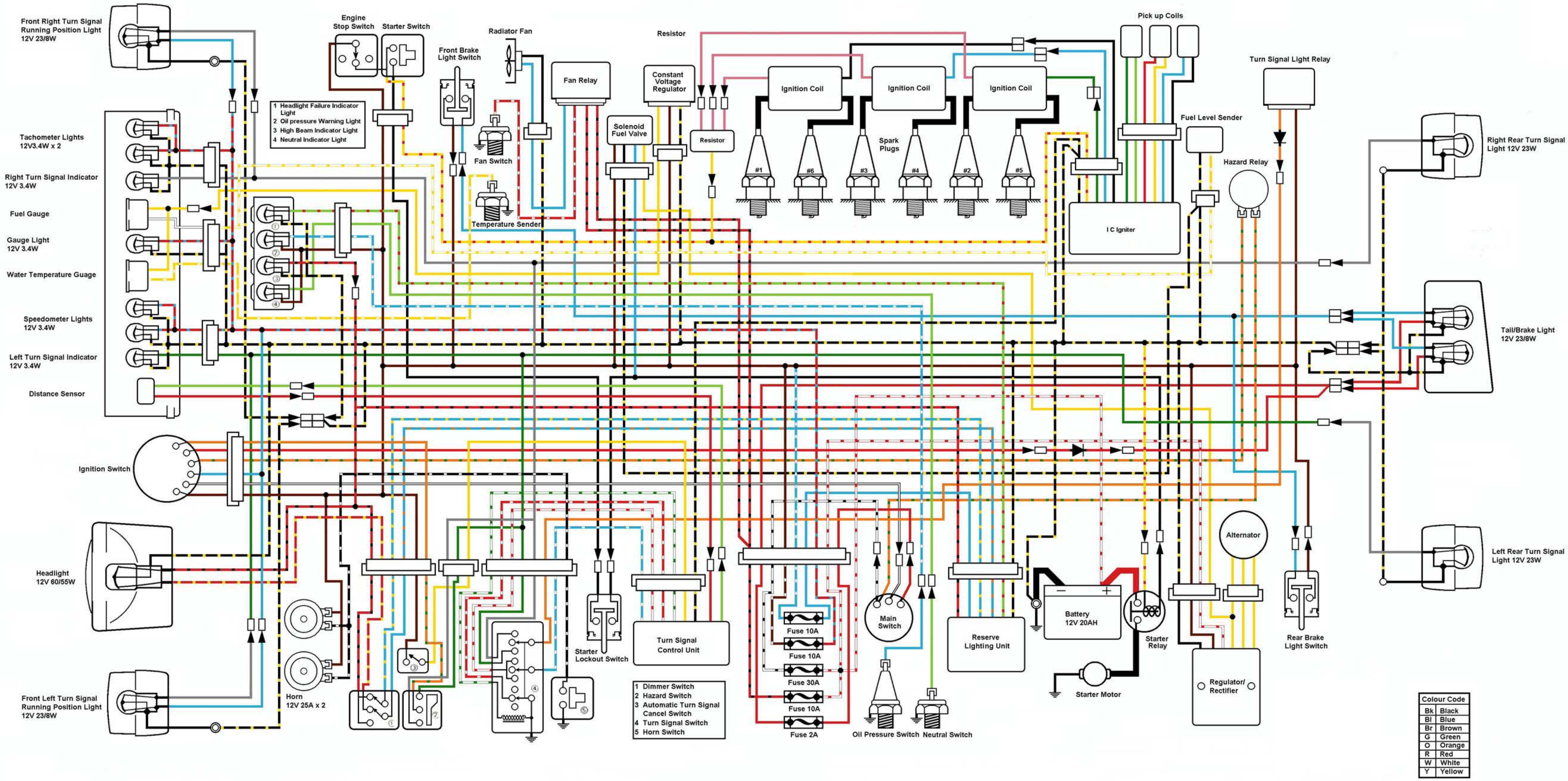


| REF. NO. | PART NO. | DESCRIPTION | Q'TY |
|---|---|---|---|
| 63 | 52005-1003 | AIR PRESSURE GAUGE | 1 |
| 64 | 57001-123 | COMPRESSION GAUGE ASSY | 1 |
| 65 | 57001-221 | COMPRESSION GAUGE | – |
| 66 | 57001-127 | VACUUM GAUGE SET | 2 sets |
| 67 | 57001-401 | VACUUM GAUGE ADAPTER | 3 sets (2 sets for US model) |
| 68 | 57001-226 | VACUUM GAUGE | – |
| 69 | 57001-164 | OIL PRESSURE GAUGE | 1 |
| 70 | 57001-1033 | OIL PRESSURE GAUGE ADAPTER | 1 |
| 71 | 57001-208 | FUEL LEVEL GAUGE | 1 |
| 72 | 57001-980 | ELECTROTESTER | 1 |
| 73 | 57001-983 | HAND TESTER | 1 |
| 74 | 57001-1034 | BALANCE ADJUSTER | 1 |
| 75 | 57001-1035 | VALVE LIFTER HOLDER | 1 |
| 76 | 57001-1049 | DIAL GAUGE HOLDER | 1 |

# KZ1300-A1 Wiring Diagram

(U.S., Canadian Model)






**LEFT HANDLEBAR SWITCH CONNECTIONS**

| Dimmer Switch | | | | | Hazard Switch | | | | Automatic Turn Signal Cancel Switch | | | Turn Signal Switch | | | | | | | | Horn Switch | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | R/Bk | Bl/Y | R/Y | Blue | | Green | O/G | Gray | | Br | Y | | Green | Orange | Gray | W/R | Bl/W | R/W | ⏚ | | Bk/W | ⏚ |
| HI | ○ | ○ | ○ | ○ | | | | | | | | R | | ○ | ○ | ○ | ○ | | | | | |
| LO | ○ | ○ | ○ | ○ | ON | ○ | ○ | ○ | ON | ○ | ○ | | | | | | | ○ | ○ | Push | ○ | ○ |
| | | | | | | | | | | | | L | ○ | ○ | | ○ | ○ | | | | | |

**IGNITION SWITCH CONNECTIONS**

| | Battery 1 | Ignition | Tail 1 | Tail 2 | Battery 2 | Tail3 |
|---|---|---|---|---|---|---|
| | White | Brown | Blue | Red | Orange | O/G |
| OFF | | | | | | |
| ON | ○ | ○ | ○ | ○ | ○ | ○ |
| PARK | | | | | ○ | ○ |

**MAIN SWITCH CONNECTIONS**

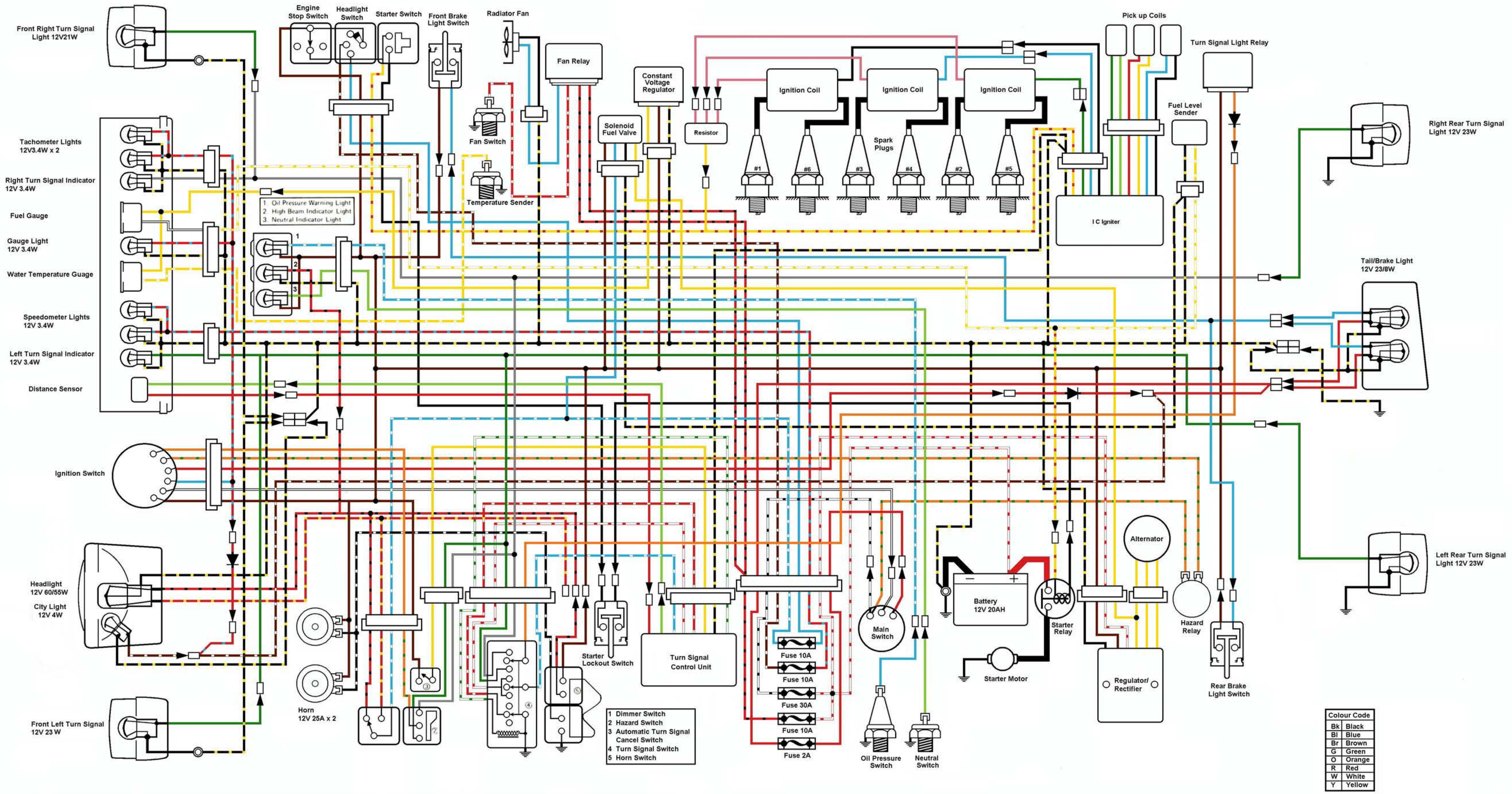
| | Battery | Ignition | Tail |
|---|---|---|---|
| | W/Bk | White | Red |
| OFF | | | |
| ON | ○ | ○ | |
| PARK | ○ | | ○ |

**RIGHT HANDLEBAR SWITCH CONNECTIONS**

| Engine Stop Switch | | | Starter Switch | | |
|---|---|---|---|---|---|
| | Y/R | Br | | Black | Y/R |
| OFF | | | | | |
| RUN | ○ | ○ | Push | ○ | ○ |
| OFF | | | | | |

# Z1300-A1 Wiring Diagram

## (European Model)




LEFT HANDLEBAR SWITCH CONNECTIONS

| Dimmer Switch | | | | Hazard Switch | | | | Automatic Turn Signal Cancel Switch | | | Turn Signal Switch | | | | | | | | Horn Switch | | | Passing Switch | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | R/Bk | Bl/Y | R/Y | | Green | O/G | Gray | | Br | Y | | Green | Orange | Gray | W/R | Bl/W | R/W | ⏚ | | Bk/W | ⏚ | | Brown | R/Bk |
| HI | ○ | ○ | | | | | | | | | R | | ○ | ○ | ○ | ○ | | | | | | | | |
| LO | | | | ON | ○ | ○ | ○ | ON | ○ | ○ | | | | | | | ○ | ○ | Push | ○ | ○ | Push | ○ | ○ |
| | | ○ | ○ | | | | | | | | L | ○ | ○ | | ○ | ○ | | | | | | | | |

IGNITION SWITCH CONNECTIONS

| | Battery 1 | Ignition | Tail 1 | Tail 2 | Battery 2 | Tail3 |
|---|---|---|---|---|---|---|
| | White | Brown | Blue | Red | Orange | O/G |
| OFF | | | | | | |
| ON | ○ | ○ | ○ | ○ | ○ | ○ |
| PARK | | | | | ○ | ○ |

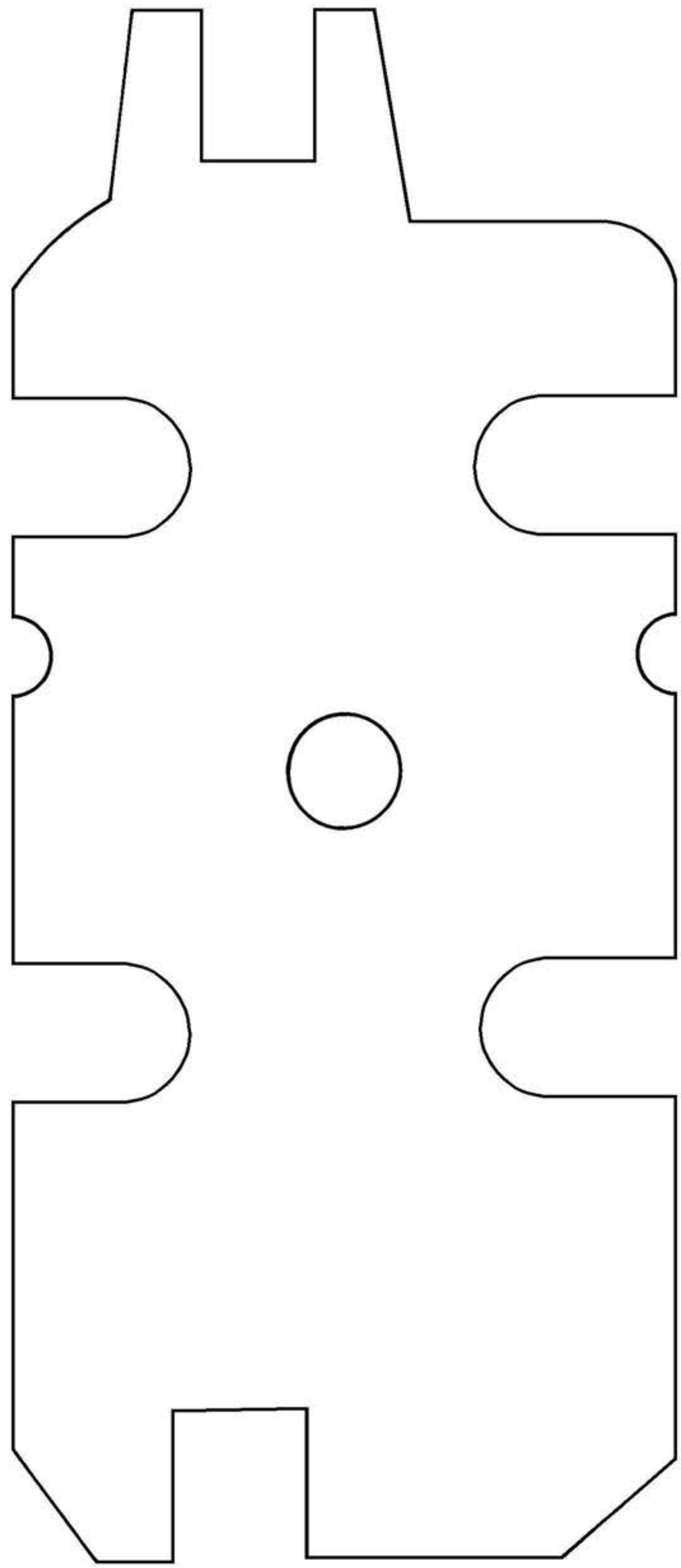
MAIN SWITCH CONNECTIONS

| | Battery | Ignition | Tail |
|---|---|---|---|
| | W/Bk | White | Red |
| OFF | | | |
| ON | ○ | ○ | |
| PARK | ○ | | ○ |

RIGHT HANDLEBAR SWITCH CONNECTIONS

| Engine Stop Switch | | | Headlight Switch | | | | Starter Switch | | |
|---|---|---|---|---|---|---|---|---|---|
| | Y/R | Br | | Br/W | Brown | Bl | | Black | Y/R |
| OFF | | | OFF | | | | | | |
| RUN | ○ | ○ | o | ○ | ○ | | Push | ○ | ○ |
| OFF | | | ON | ○ | ○ | ○ | | | |

## PATTERN FOR CYLINDER HEAD CHAIN TUNNEL COVER



# Supplement

This Supplement is designed to be used in conjunction with the front part of this Service Manual (up to Pg. 281). The maintenance and repair procedures described in this Supplement are only those that are unique to later year units since the first publication of this Service Manual. Complete and proper servicing of later year units therefore requires mechanics to read both this Supplement and the front part of this Service Manual.

This Supplement is divided into few sections. Each section is annually added to the preceding section, and explains procedures per one year unit that are unique to the latest year unit. Complete and proper servicing of later year units therefore requires mechanics to read (1) the section corresponding to the year unit they work at, (2) the previous section(s), and (3) the text in front of this Supplement.

**NOTE:** The maintenance and repair procedures for the variation model (KZ1300-B) are included in the "Supplement for 1980 Model". Unless otherwise noted, procedures for the 1980 KZ1300-B2 are same as for the standard 1980 KZ1300-A2.

## Table of Contents



N

# Supplement for 1980 Model

**NOTE:** The maintenance and repair procedures for the 1980 KZ1300-B2 are newly included in this section. Unless otherwise noted, procedures for the 1980 KZ1300-B2 are the same as those for the 1980 KZ1300-A2.

## Table of Contents

# Model Identification

**KZ1300-A2**


**KZ1300-B2**

## SPECIFICATIONS

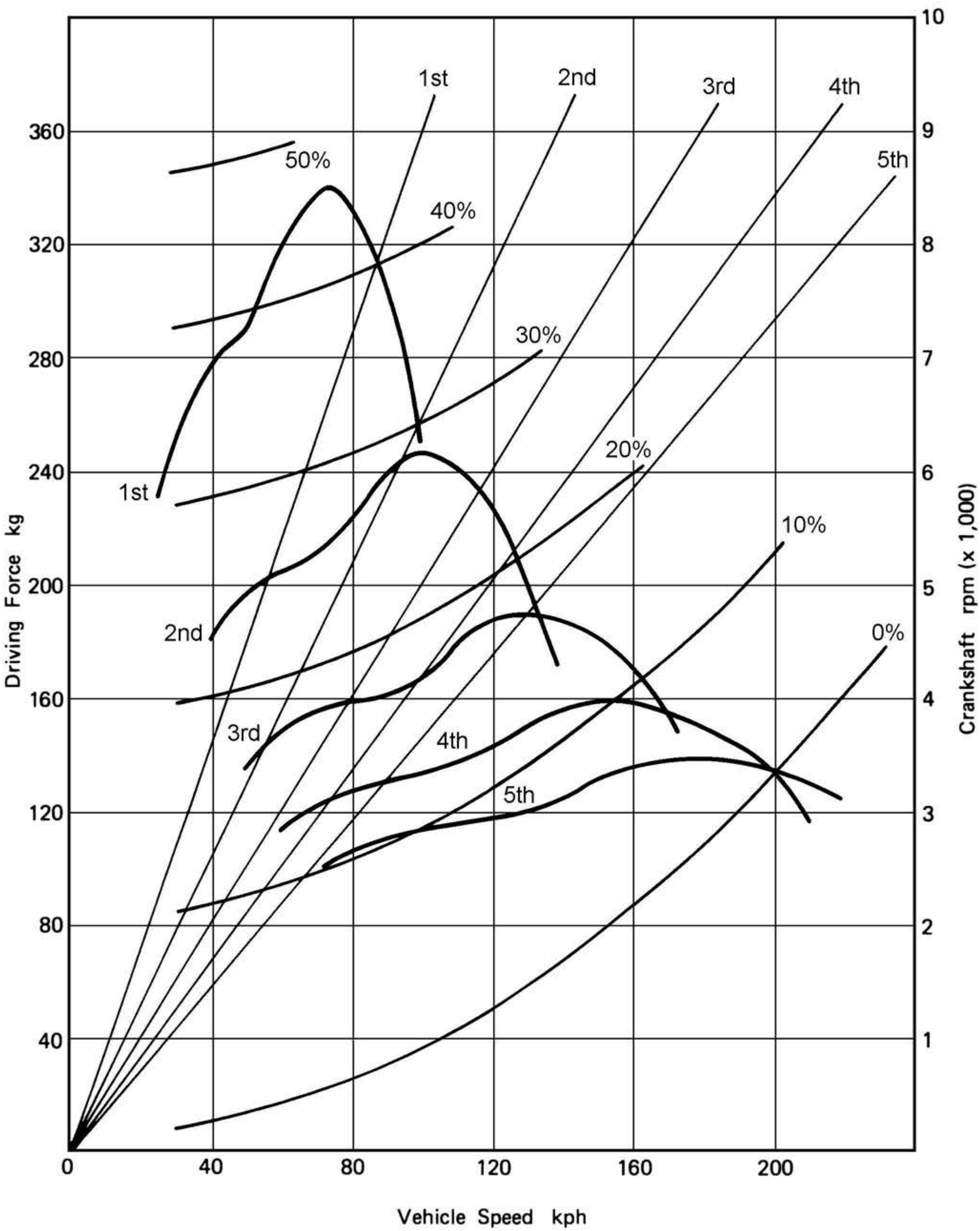
| | KZ1300-A2 | | KZ1300-B2 |
|---|---|---|---|
| **Dimensions** | | | |
| Overall length | 2,295 mm | ⒺⒶ 2,335 mm | 2,510 mm |
| Overall width | 905 mm | ⒺⒶ 840 mm | 870 mm |
| Overall height | 1,280 mm | ⒺⒶ 1,155 mm | 1,450 mm |
| Wheelbase | 1,580 mm | | * |
| Road clearance | 137 mm | | 140 mm |
| Dry weight | 297 kg | ⒺⒶ 296 kg | 335 kg |
| Fuel tank capacity | 27.0 ℓ | Ⓤ 21.4 ℓ | 27.0 ℓ |
| **Performance** | | | |
| Braking distance | 12 m from 50 kph | | * |
| Minimum turning radius | 2.8 m | | * |
| **Engine** | | | |
| Type | DOHC, 6 cylinder, 4 stroke, water-cooled | | * |
| Bore and stroke | 62.0 x 71.0 mm | | * |
| Displacement | 1,286 cc | | * |
| Compression ratio | 9.9 | | * |
| Maximum horsepower | 120 HP @8,000 rpm | | * |
| Maximum torque | 11.8 kg-m @6,500 rpm | | * |
| Valve timing | | | |
| Inlet — Open | 20° BTDC | | * |
| Close | 70° ABDC | | * |
| Duration | 270° | | * |
| Exhaust — Open | 70° BBDC | | * |
| Close | 30° ATDC | | * |
| Duration | 280° | | * |
| Carburetors | Mikuni BSW32 x 3 | | * |
| Lubrication system | Forced lubrication (Wet sump) | | * |
| Engine oil | SE class SAE 10W40, 10W50, 20W40, or 20W50 | | * |
| Engine oil capacity | 5.3 ℓ | | * |
| Coolant Capacity | 3.5 ℓ | | * |
| Starting system | Electric starter | | * |
| Ignition system | Battery and coil (transistorized ignition) | | * |
| Cylinder numbering method | Left to right, 1–2–3–4–5–6 | | * |
| Firing order | 1–5–3–6–2–4 | | * |
| Ignition timing | From 10° BTDC @850 rpm to 38° BTDC @2,900 rpm | | * |
| Spark plugs | NGK BP6ES or ND W20EP-U<br>ⒺⒸ NGK BPR6ES or ND W20EPR-U | | * |
| **Transmission** | | | |
| Type | 5-speed, constant mesh, return shift | | * |
| Clutch | Wet, multi disc | | * |
| Gear ratio: 1st | 2.29 (39/17) | | * |
| 2nd | 1.67 (35/21) | | * |
| 3rd | 1.28 (32/25) | | * |
| 4th | 1.07 (29/27) | | * |
| 5th | 0.93 (27/29) | | * |
| Primary reduction ratio | 1.84 (32/24 x 29/21) | | * |

| | | | KZ1300-A2 | KZ1300-B2 |
|---|---|---|---|---|
| Final reduction ratio | | | 2.65 (20/24 x 35/11) | * |
| Overall drive ratio | | | 4.55 (Top gear) | * |
| **Electrical Equipment** | | | | |
| Alternator | | | Kokusan GP9101 | * |
| Regulator/Rectifier | | | Shindengen SH232-12B | * |
| Ignition coils | | | Toyo Denso ZC005-TR12V | * |
| Igniter | | | Toyo Denso UNT1005K-1000 | * |
| Battery | | | Yuasa Y50-N18L-A (12V 20AH) | * |
| Starter | | | Mitsuba SM-226-K | * |
| Headlight type | | | Semi-sealed | * |
| Headlight | | | 12V 60/55W (Quartz Halogen Light) | * |
| City light | | | Ⓔ Ⓐ 12V 4W | – |
| Tail/Brake light | | | 12V 8/27W Ⓔ Ⓐ 12V 5/21W | 12V 8/27W |
| Meter lights | | | 12V 3.4W | * |
| Indicator lights | | | 12V 3.4W | * |
| Turn signal/running position lights | | | Ⓤ 12V 23/8W | * |
| Turn signal lights | | | 12V 23W Ⓔ Ⓐ 12V 21W | 12V 23W |
| Horns | | | 12V 2.5A | * |
| **Frame** | | | | |
| Type | | | Tubular, double cradle | * |
| Steering angle | | | 38° to either side | * |
| Castor | | | 28° | * |
| Trail | | | 100 mm | * |
| Tire size | Front | | 110/90V-18 4PR Ⓤ MN90-18 4PR | MN90-18 4PR |
| | Rear | | 130/90V-17 6PR Ⓤ MT90-17 6PR | MT90-17 6PR |
| Suspension | Front | | Telescopic fork (pneumatic) | * |
| | Rear | | Swing arm | * |
| Wheel travel | Front | | 200 mm | * |
| | Rear | | 116 mm | * |
| Front fork oil capacity (each fork) | | | 394 cc | * |
| Front fork oil type | | | SAE 10W20 | * |
| Final gear case oil | | Type | API GL-5 Hypoid Gear Oil<br>SAE 90 (above 5°C)<br>SAE 80 (below 5°C) | * |
| | | Capacity | 0.25 ℓ | * |
| **Brakes** | | | | |
| Type | Front and Rear | | Disc brake | * |
| Effective disc diameter | | Front | 260 mm | * |
| | | Rear | 250 mm | * |

Ⓐ : Australian model Ⓒ : Canadian model Ⓔ : European model Ⓤ : US model
* : Identical to KZ1300-A2

Specifications subject to change without notice, and may not apply to every country.

## RUNNING PERFORMANCE CURVES (KZ1300 B2)



## PERIODIC MAINTENANCE CHART (KZ1300-A2, B2)

The maintenance and adjustments must be done in accordance with this chart to keep the motorcycle in good running condition. **The initial maintenance is vitally important and must not be neglected.**

| OPERATION \ FREQUENCY | Whichever comes first → Every | ODOMETER READING* 800 km | 5,000 km | 10,000 km | 15,000 km | 20,000 km | 25,000 km | 30,000 km | See Page |
|---|---|---|---|---|---|---|---|---|---|
| Battery electrolyte level — check † | month | • | • | • | • | • | • | • | 230 |
| Brake, brake light switch adjustment — check † | | • | • | • | • | • | • | • | 27 |
| Brake wear — check † | | | • | • | • | • | • | • | 221 |
| Brake fluid level — check † | month | • | • | • | • | • | • | • | 221,295 |
| Brake fluid — change | year | | | • | | • | | • | 221,295 |
| Clutch — adjust | | • | • | • | • | • | • | • | 20 |
| Carburetors — adjust | | • | • | • | • | • | • | • | 18,290 |
| Throttle cables — adjust | | • | • | • | • | • | • | • | 14 |
| Steering play — check † | | • | • | • | • | • | • | • | 28 |
| Front fork — inspect/clean | | | • | • | • | • | • | • | 227 |
| Rear shock absorbers — inspect | | • | • | • | • | • | • | • | 228,295 |
| Nuts, Bolts, Fasteners — check and torque | | • | | • | | • | | • | 37～42 |
| Spark plugs — clean and gap † | | • | • | • | • | • | • | • | 12 |
| Valve clearance — check † | | • | • | • | • | • | • | • | 12 |
| Air suction valve — check † | | | • | • | • | • | • | • | 180 |
| Air cleaner element — clean | | | • | • | • | | • | | 164 |
| Air cleaner element — replace | 5 cleanings | | | • | | • | | • | 47,164 |
| Fuel system — clean | | • | • | • | • | • | • | • | 290 |
| Tire tread wear — check † | | | • | • | • | • | • | • | 213,295 |
| Engine oil — change | year | • | • | • | • | • | • | • | 290 |
| Oil filter — replace | | • | | • | | • | | • | 21,290 |
| General lubrication — perform | | | • | • | • | • | • | • | 32 |
| Front fork oil — change | | | | • | | • | | • | 226 |
| Timing advancer — lubricate | | | | • | | • | | • | 240 |
| Swing arm — lubricate | | | | • | | • | | • | 228 |
| Wheel bearings — grease | 2 years | | | | | • | | | 216,292 |
| Steering stem bearings — grease | 2 years | | | | | • | | | 224 |
| Final gear case oil level — check † | | | | • | | • | | • | 32 |
| Final gear case oil — change | | • | | | | | | • | 32 |
| Propeller shaft sliding joint — lubricate | | | | • | | | | • | 218 |
| Coolant — change | 2 years | | | | | | | • | 23,203 |
| Radiator hoses, connectings — check † | year | • | | • | | • | | • | 37～42 |

*For higher odometer readings, repeat at the frequency interval established here.
†Replace, add or adjust if necessary.

# Adjustment

## CARBURETORS (US model)

The adjustment procedures are the same as those for the 1979 KZ1300-A1 with the following exception. Refer to Pg. 18.

1. Each pilot screw is shielded with a plug, and idle mixture adjustment is not required.

## ENGINE OIL

The procedures are the same as those for the 1979 KZ1300-A1 with the following exception. Refer to Pgs. 21 ~ 22.

**Table N1 Engine Oil**

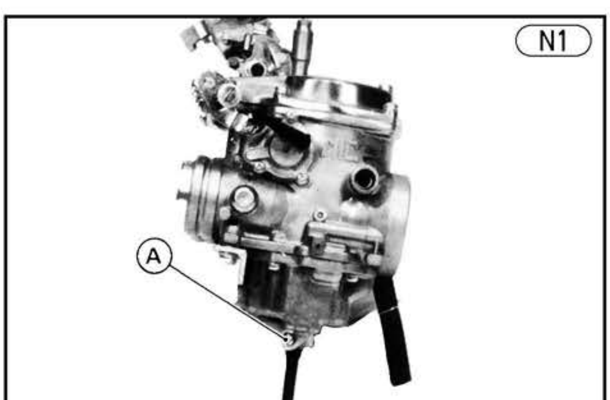
| Grade | Viscosity | Filling Engine Oil Capacity | |
|---|---|---|---|
| | | When filter is not changed | When filter is changed |
| SE Class | SAE 10W40 10W50 20W40 20W50 | 4.7 liters | 5.3 liters |

## FUEL SYSTEM

Accumulation of moisture in the fuel tank will restrict the flow of fuel, and cause the carburetors to malfunction. The fuel system should be cleaned out periodically (Pg. 289) in the following manner:

**WARNING** **1. Clean the fuel system in a well-ventilated area, and take ample care that there are no sparks or flame anywhere near the working area.**
**2. Never clean out the fuel system when the engine is still warm.**
**3. Wipe any fuel off the engine before starting it.**

- Turn the fuel tap lever to the "RES" position.
- Connect the suitable tubes to the fittings at the bottom of the carburetor float bowls.
- Run the other ends of the tubes into a suitable container.
- Turn out the drain screws a few turns to check if water has accumulated in the carburetors.




A. Drain Screw

- If any dirt or water comes out, clean the following parts in accordance with the procedures in the Maintenance Section.
  - Fuel Tank (Pg. 165)
  - Fuel Tap (Pg. 165)
  - Carburetors (Pg. 167)
- Turn the tap to the "ON" position.

## HEADLIGHT (KZ1300-B)

The headlight beam is adjustable both horizontally and vertically. If not properly adjusted horizontally, the beam will point to one side rather than straight ahead. If adjusted too low vertically, neither low nor high beam will illuminate the road far enough ahead. If adjusted too high vertically, the high beam will fail to illuminate the road close ahead, and the low beam will dazzle oncoming drivers. In most areas it is illegal to ride with improperly adjusted headlight.

### Horizontal Adjustment

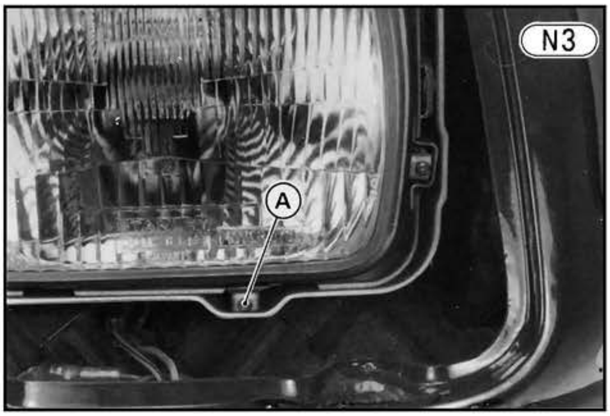
- Take off the headlight shield by removing the four mounting screws.
- Turn the adjusting screw at the left side of the headlight rim in or out until the beam points straight ahead. Turning the adjusting screw clockwise makes the headlight beam point to the left.


A. Adjusting Screw

- Install the headlight shield.

### Vertical Adjustment

- Take off the headlight shield by removing the four mounting screws.
- Turn the adjusting screw at the bottom of the headlight rim in or out until the proper angle is obtained. Turning the adjusting screw clockwise makes the headlight beam point lower.




A. Adjusting Screw

•Install the headlight shield.

**NOTE:** On high beam, the brightest point should be slightly below horizontal. Adjust the headlight to the proper angle according to the regulation that applies to its operation. Adjust with normal operational weight loaded on the motorcycle.

# Disassembly

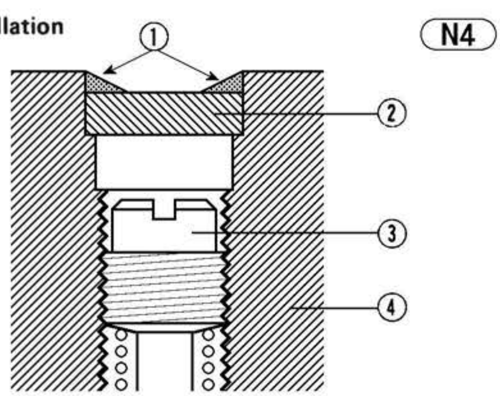
## CARBURETORS (US model)

### Carburetor Disassembly and Assembly (each carburetor):

The procedures are the same as those for the 1979 KZ1300-A1 with the following exceptions. Refer to Pgs. 50~53.

1. To remove the pilot screw, first punch and pry off the plug with an awl or other suitable tools. Turn in the pilot screw and count the number of turns until it seats fully but not tightly, and then remove it with its **O** ring and spring. This is to set the pilot screw to its original position when assembling.
2. Install the pilot screw as follows:
   - •Turn in the pilot screw fully but not tightly, and then back it out the same number of turns counted during disassembly.
   - •Install a new plug in the pilot screw hole, and apply a small amount of a bonding agent to the circumference of the plug to fix the plug.

**Plug Installation**




1. Apply a bonding agent.
2. Plug
3. Pilot Screw
4. Carburetor Body

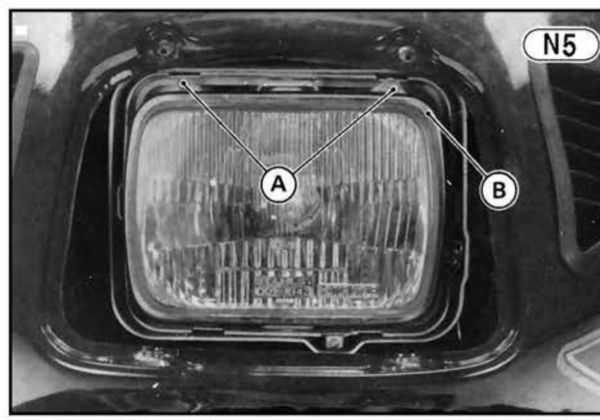
**CAUTION** **Do not apply too much bond on the plug to keep the pilot screw itself from being fixed.**

## FAIRING (KZ1300-B)

### Removal:

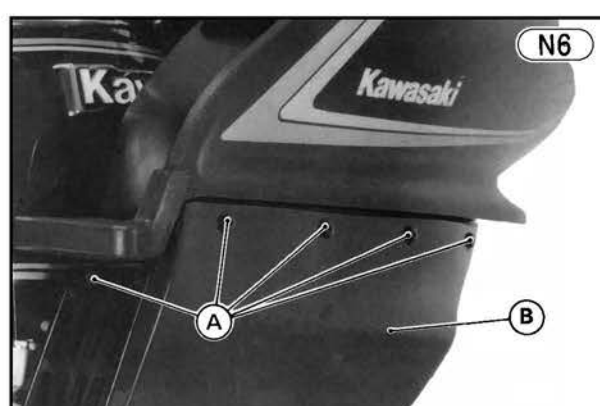
•Take off the headlight shield by removing the four mounting screws.

•Remove the two headlight unit mounting screws, pull the headlight bulb socket out of the headlight unit, and then take out the headlight unit and rim.




A. Headlight Mounting Screws B. Rim

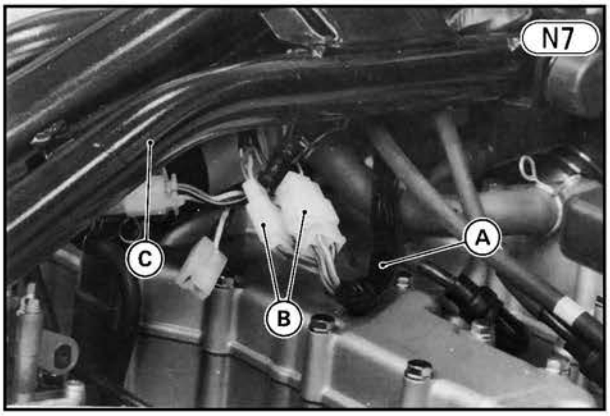
•Remove the right and left lower-fairing mounting screws (5) on each side, and take off the lower fairings.




A. Mounting Screws B. Lower Fairing

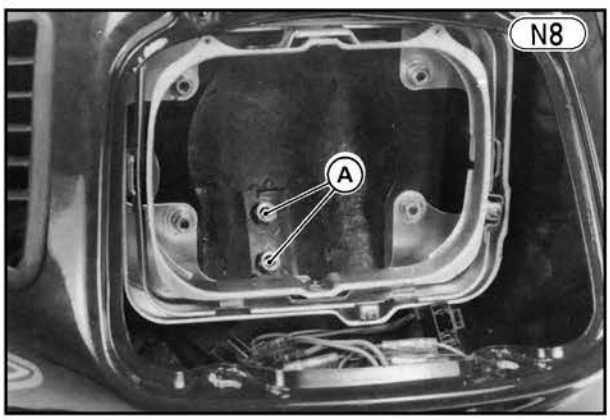
•Remove the fuel tank.

•Disconnect the two 3-pin connectors under the frame top pipe, and pull out the fairing harness so that it does not hinder upper-fairing removal.




**A. Fairing Harness**
**B. 3-pin Connectors**
**C. Frame Top Pipe**

●Disconnect the horn leads from the horn terminals.
●Remove the front upper-fairing mounting nuts.



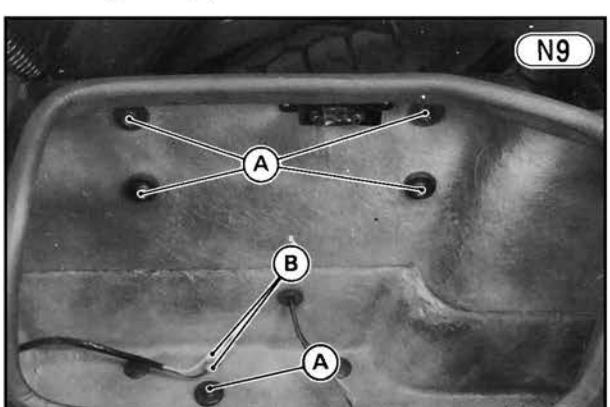

**A. Mounting Nuts**

●Remove the left and right upper-fairing mounting bolts.
●Take out the upper-fairing.

## SADDLEBAG AND TAIL TRUNK (KZ1300-B)

### Removal:

●Disconnect the rear turn signal leads in the saddlebag, and pull out the leads out of the saddlebag.
●Take off the saddlebag by removing the saddlebag mounting bolts (5).




**A. Mounting Bolts**
**B. Turn Signal Leads**

●Remove the tail trunk mounting bolts (4), and take off the tail trunk.

### Installation Note:

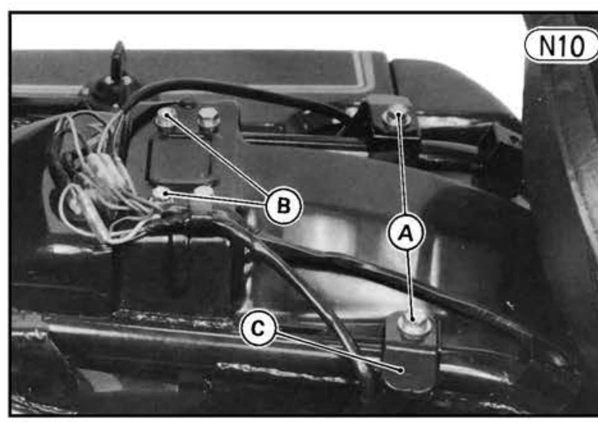
1. If the shock absorber is removed, install it with the piston rod facing downward.

## REAR WHEEL, REAR CALIPER (KZ1300-B)

Rear wheel installation notes and rear hub disassembly procedures are the same as those for the 1979 KZ1300-A1. Refer to Pg. 129.

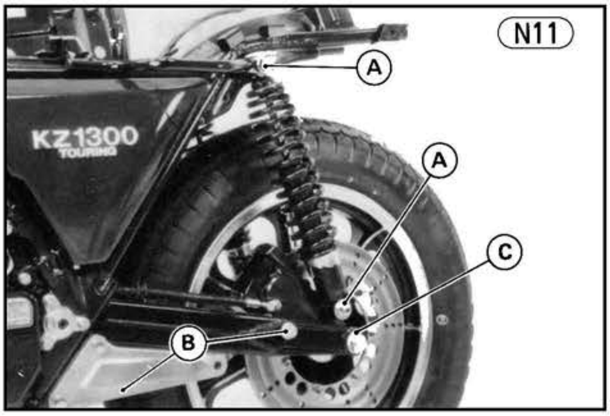
Remove the rear wheel and rear caliper as follows:

●Set the motorcycle up on its center stand.
●Unlock the seat, and swing it open.
●Remove the rear seat mounting bolts (4), and take it off.
●Disconnect the tail/brake and turn signal light leads on the rear fender.
●Remove the saddlebags and tail trunk stay mounting bolts.




**A. Stay Mounting Bolts**
**B. Rear Fender Mounting Bolts**
**C. Stay**

●Remove the rear fender mounting bolts (2), and take off the saddlebags and tail trunk with the rear fender.
●Remove both mufflers (Pg. 55).
●If the rear caliper is to be completely removed, drain the brake fluid from the line (Pg. 220), unscrew the banjo bolt, and free the brake hose from the caliper. If only the rear wheel is to be removed, these operations are not necessary.
●Unscrew the lower mounting nut of the left rear shock absorber, loosen its upper mounting nut, and pull the lower end of the shock absorber off the rear caliper stud.




**A. Nut** **B. Bolt** **C. Axle Nut**

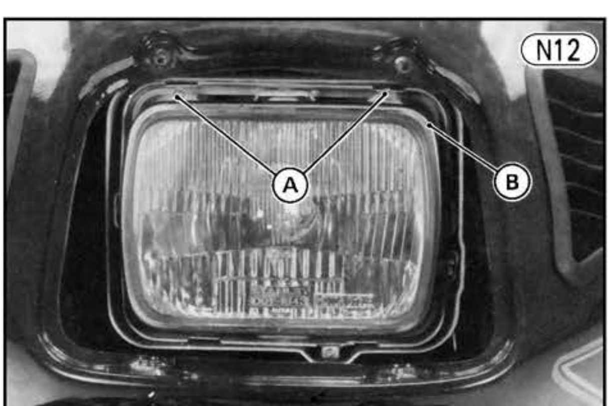
- Raise the rear wheel enough to pull out the axle, and remove the axle halfway.
- Rest the caliper on some kind of stand so that the brake hose is not damaged, and insert a wood wedge (7 ~ 8 mm thick) between the disc brake pads.
- Pull out the axle completely, and disengage the rear wheel coupling by sliding the wheel to the left. The wheel cap and collar may fall from the left and the right respectively.
- Take out the rear wheel from the left side of the motorcycle.

**CAUTION** **Do not lay the wheel on the ground with the disc facing down. This can damage or warp the disc. Place blocks under the wheel so that the disc does not touch the ground.**

## HEADLIGHT UNIT (KZ1300-B)

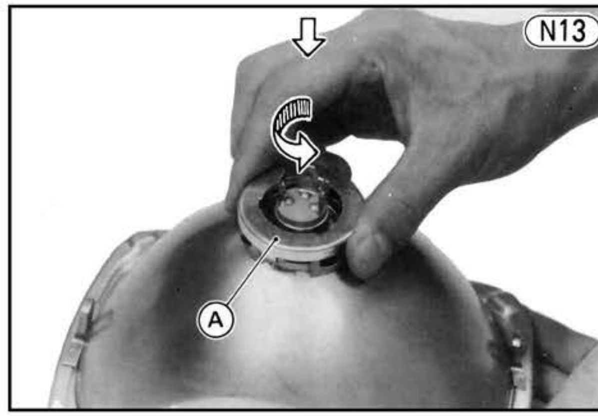
### Removal:

- Take off the headlight shield by removing the mounting screws (4).
- Remove the two headlight mounting screws ①, pull out the headlight bulb socket, and then take out the semi-sealed beam unit ③ and rim ②.




**A. Headlight Mounting Screws** **B. Rim**

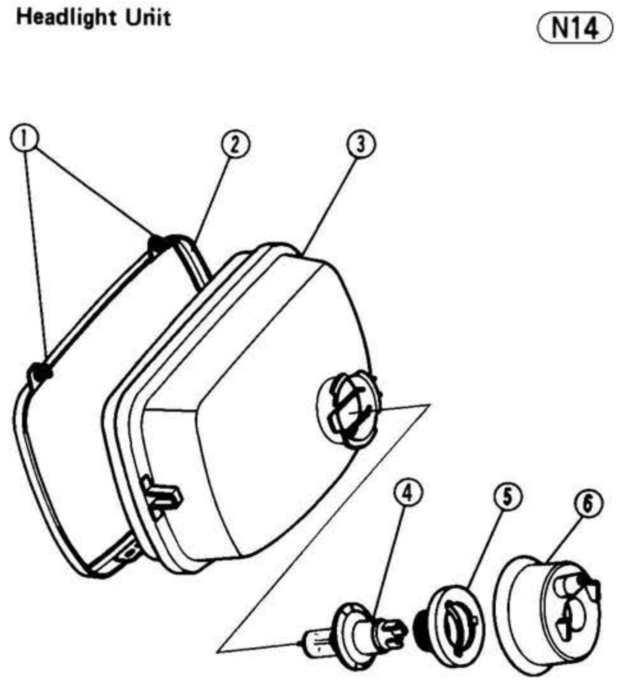
- Remove the rubber boot ⑥.
- Push the bulb stop ⑤ and turn it counterclockwise so that the bulb stop can be removed, and then remove the bulb ④.




**A. Bulb Stop**

**CAUTION** **When handling the quartz-halogen bulb, never touch the glass portion with bare hands. Always use a clean cloth. Oil contamination from hands or dirty rags can reduce bulb life or even cause the bulb to explode.**

**Headlight Unit**




1. Mounting Screws
2. Rim
3. Semi-sealed Beam Unit
4. Headlight Bulb
5. Bulb Stop
6. Rubber Boot

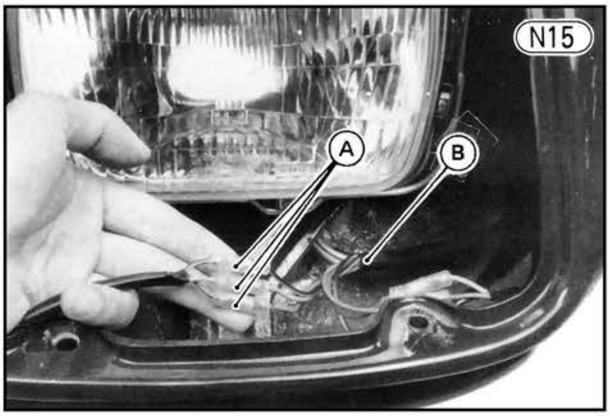
### Installation Notes:

1. The top of the semi-sealed beam unit and rubber boot is marked "TOP".
2. Adjust the headlight after installation (Pg. 290).

### TURN SIGNAL ASSEMBLY (KZ1300-B)

**Removal (front, either side):**

- Remove the headlight shield.
- Disconnect the turn signal/running position light leads (gray, blue, and black/yellow) in the fairing.




**A. Leads** **B. Fairing Harness**

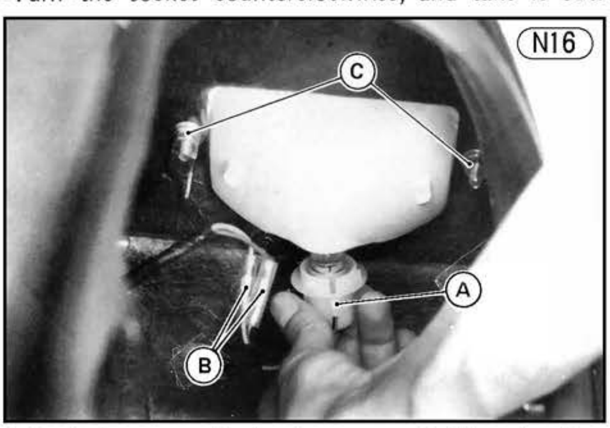
- Remove the turn signal mounting screws (4), and pull the front turn signal out of the fairing.

**Installation Note:**

1. Connect the gray lead of the left turn signal to the green lead of the fairing harness.

**Removal (rear, either side):**

- Unlock the saddlebag, and swing it open.
- Disconnect the rear turn signal leads (gray and black/yellow) in the saddlebag.
- Turn the socket counterclockwise, and take it out.




**A. Socket** **B. Leads** **C. Mounting Nuts**

- Remove the rear turn signal mounting nuts in the saddlebag, and pull off the turn signal body.

**Installation Note:**

1. Connect the gray lead of the left turn signal to the green lead of the wiring harness.

**Table N2 Carburetor Specifications**

| Type | Main Jet | Needle Jet | Jet Needle | Pilot Jet | Service Fuel Level |
|---|---|---|---|---|---|
| BSW32 | 110R, Ⓖ105R | Y-8 | 5P3-3, Ⓤ5P4 | 42.5 | 6.5 ~ 8.5 mm |

Ⓖ: West German Model Ⓤ: US Model

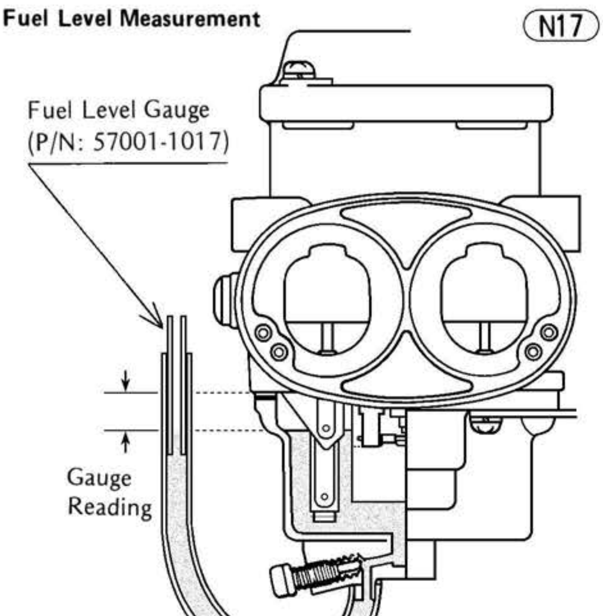
# Maintenance

### CARBURETORS

The maintenance procedures are the same as those for the 1979 KZ1300-A1 with the following exceptions. Refer to Pg. 167.

1. The table N2 shows the carburetor specifications for the 1980 KZ1300-A2, B2.
2. For US model, the jet needle has only one groove in which the jet needle clip is installed.
3. Use a different fuel level gauge to measure the service fuel level because the drain plug of the carburetors has been changed. To install the gauge (special tool), attach a suitable hose to the fitting at the bottom of the carburetor, and attach the gauge to the other end of the hose.

**Fuel Level Measurement**




### COOLING SYSTEM (US, Canadian models)

The procedures are the same as those for the 1979 KZ1300-A1 with the following exceptions. Refer to Pgs. 202 ~ 209.

**Table N3 Internal Resistance of Fan Switch**

| | Resistance change | Temperature |
|---|---|---|
| Raising temperature | From more than 1 mega Ω to less than 0.5 Ω | 107 ~ 113°C (225 ~ 235°F) |
| Lowering temperature | From less than 0.5 Ω to more than 1 mega Ω | above 104°C (219°F) |

## WHEELS (KZ1300-B)

The procedures are the same as those for the 1979 KZ1300-A1 with the following exceptions. Refer to Pgs. 212 ~ 217.

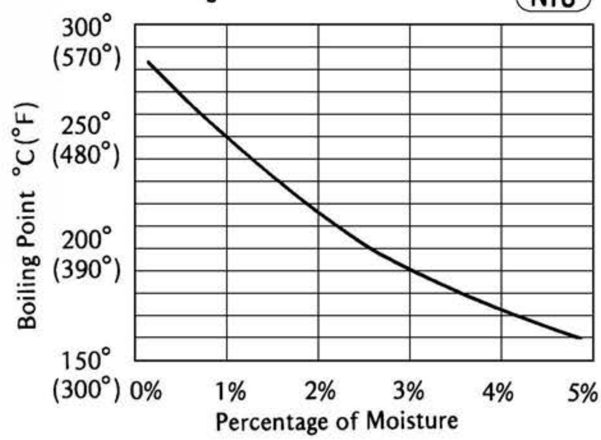
### Tires

1. The maximum recommended load, in addition to vehicle weight, is 170 kg including rider, passenger, baggage, and accessories.
2. Inflate the tires in accordance with the following table.

**Table N4 Tires, Air Pressure (measured when cold)**

| | Air Pressure | | Size | Make, Type |
|---|---|---|---|---|
| Front | 2.25 $kg/cm^2$ (32 psi) | | MN90-18 | Dunlop Gold Seal F8 Nylon Tubeless |
| Rear | Up to 97.5 kg load | 2.50 $kg/cm^2$ (36 psi) | MT90-17 | Dunlop Gold Seal K100M Nylon Tubeless |
| Rear | 97.5 ~ 170 kg load | 2.80 $kg/cm^2$ (40 psi) | MT90-17 | Dunlop Gold Seal K100M Nylon Tubeless |

**Brake Fluid Boiling Point** (N18)




## DISC BRAKES

The procedures are the same as those for the 1979 KZ1300-A1 with the following exceptions. Refer to Pgs. 219 ~ 224.

### Brake Fluid

1. The disc brake fluid reservoirs must be filled up to the level line with one of the recommended brake fluids. Fill both reservoirs over the lower level line (reservoir held horizontal). If none of the recommended brake fluids are available, use extra heavy-duty brake fluid only from a container marked D.O.T.4.

**Table N5 Recommended Disc Fluid**

| |
|---|
| Castrol Girling-Green |
| Castrol GT (LMA) |
| Castrol Disc Brake Fluid |
| Check Shock Premium Heavy Duty |

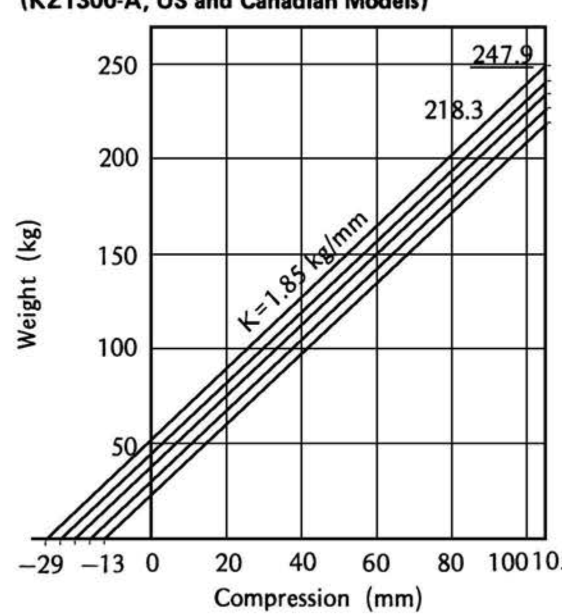
2. The graph of Fig. N18 shows how brake fluid contamination with moisture lowers the fluid boiling point. Although not shown in the graph, the boiling point also lowers as the fluid gets old, is contaminated with dirt, or if two dlfferent types of brake fluid are mixed.

## REAR SHOCK ABSORBERS

Refer to Pg. 227 ~ 228, noting the following.

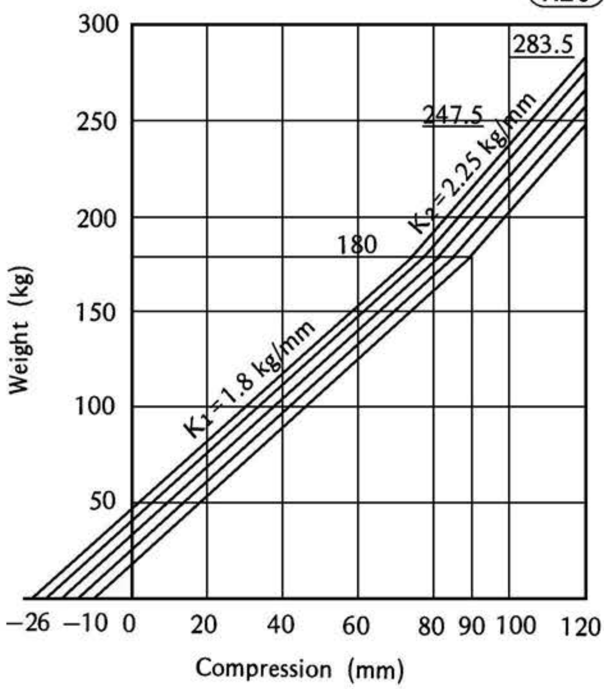
Shock absorber spring force for the 5 different setting is shown in the graph.

**Rear Shock Absorber Spring Force (KZ1300-A, US and Canadian Models)** (N19)



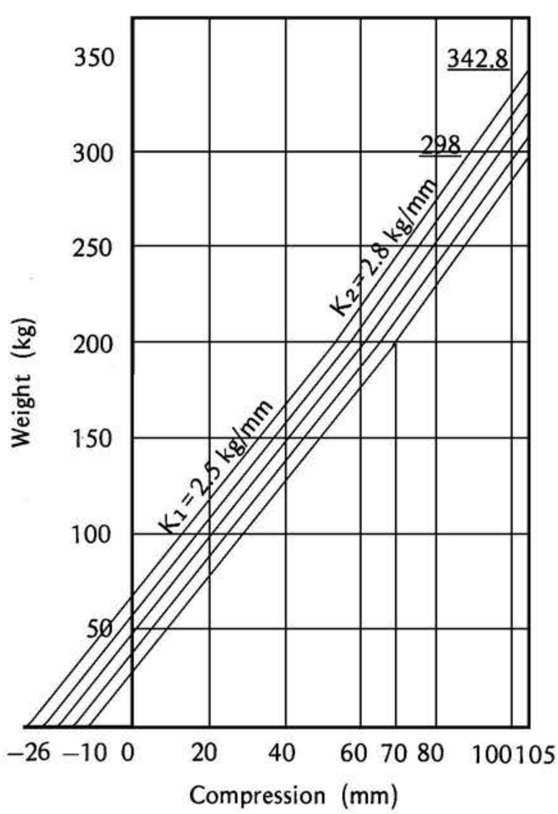
**Rear Shock Absorber Spring Force (KZ1300-A, except US and Canadian Models)**

(N20)




**Rear Shock Absorber Spring Force (KZ1300-B)**

(N21)



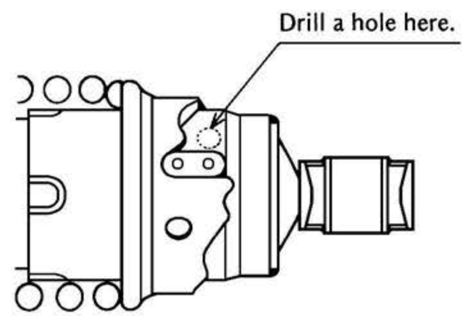

## Scrapping (KZ1300-B)

**WARNING**

1. **Since the rear shock absorber contains nitrogen gas, do not incinerate or disassemble the rear shock absorber.**
2. **Before a rear shock absorber is scrapped, open the hole at the point indicated in Fig. N22 to release the nitrogen gas completely. Wear safety glasses when drilling the hole, as the gas may blow out bits of drilled metal when hole opens.**

**Drilling Point**

(N22)



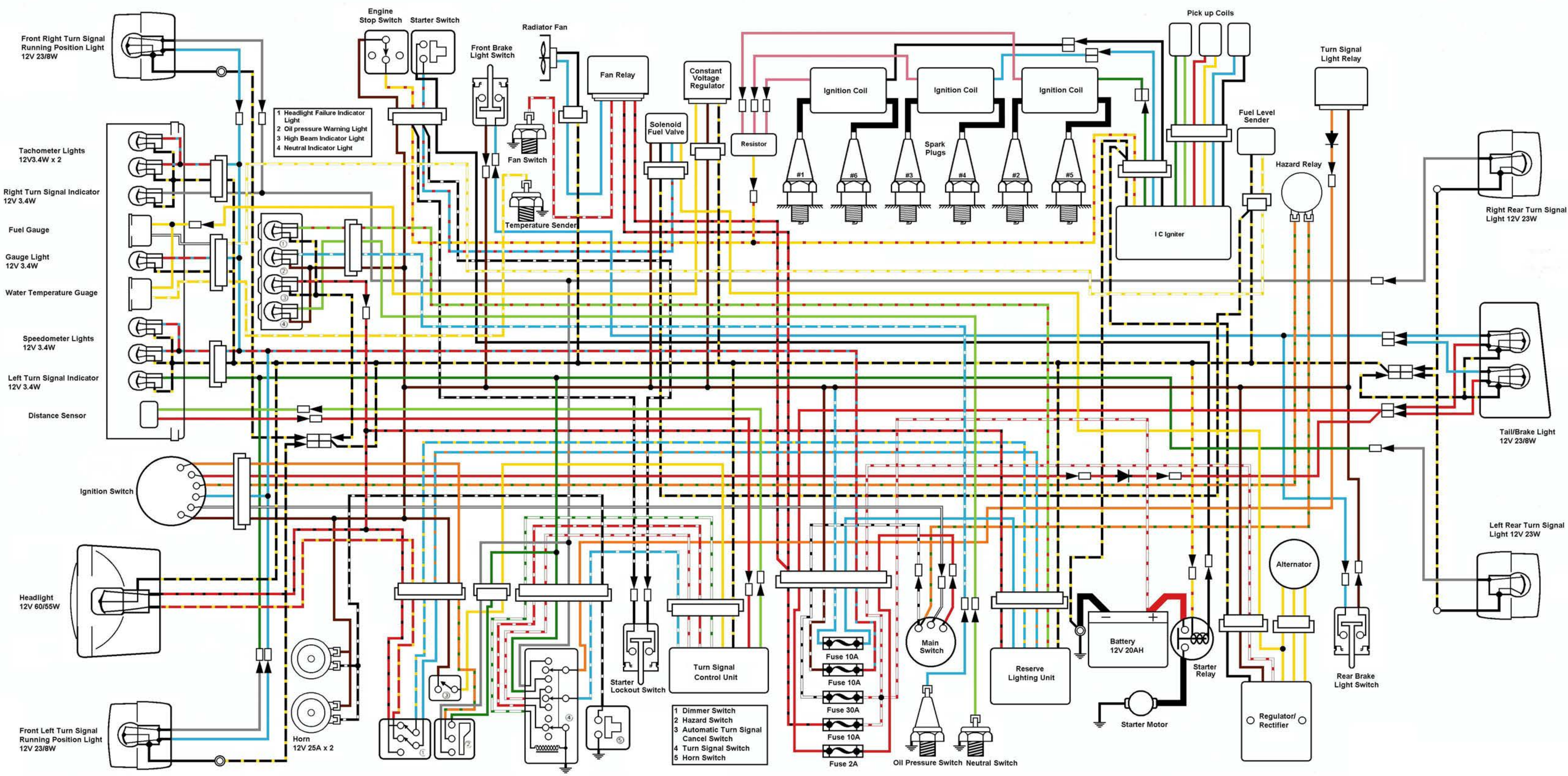

# Appendix

## SPECIAL TOOLS

Use the fuel level gauge (P/N: 57001-1017) to measure the service fuel level. Refer to Pg. 272 ~ 277 for other special tools.

# KZ1300-A2 Wiring Diagram

## (U.S., Canadian Model)




### LEFT HANDLEBAR SWITCH CONNECTIONS

| Dimmer Switch | | | | | Hazard Switch | | | | Automatic Turn Signal Cancel Switch | | | Turn Signal Switch | | | | | | | | Horn Switch | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | R/Bk | Bl/Y | R/Y | Blue | | Green | O/G | Gray | | Br | Y | | Green | Orange | Gray | W/R | Bl/W | R/W | ⏚ | | Bk/W | ⏚ |
| HI | ○— | —○ | ○— | —○ | | | | | | | | R | | ○— | —○ | ○— | —○ | | | | | |
| LO | ○ | ○— | —○ | ○ | ON | ○— | —○— | —○ | ON | ○— | —○ | | | | | | | ○— | —○ | Push | ○— | —○ |
| | | | | | | | | | | | | L | ○— | —○ | | ○— | —○ | | | | | |

### IGNITION SWITCH CONNECTIONS

| | Battery 1 | Ignition | Tail 1 | Tail 2 | Battery 2 | Tail3 |
|---|---|---|---|---|---|---|
| | White | Brown | Blue | Red | Orange | O/G |
| OFF | | | | | | |
| ON | ○— | —○ | ○— | —○ | ○— | —○ |
| PARK | | | | | ○— | —○ |

### MAIN SWITCH CONNECTIONS

| | Battery | Ignition | Tail |
|---|---|---|---|
| | W/Bk | White | Red |
| OFF | | | |
| ON | ○— | —○ | |
| PARK | ○— | —— | —○ |

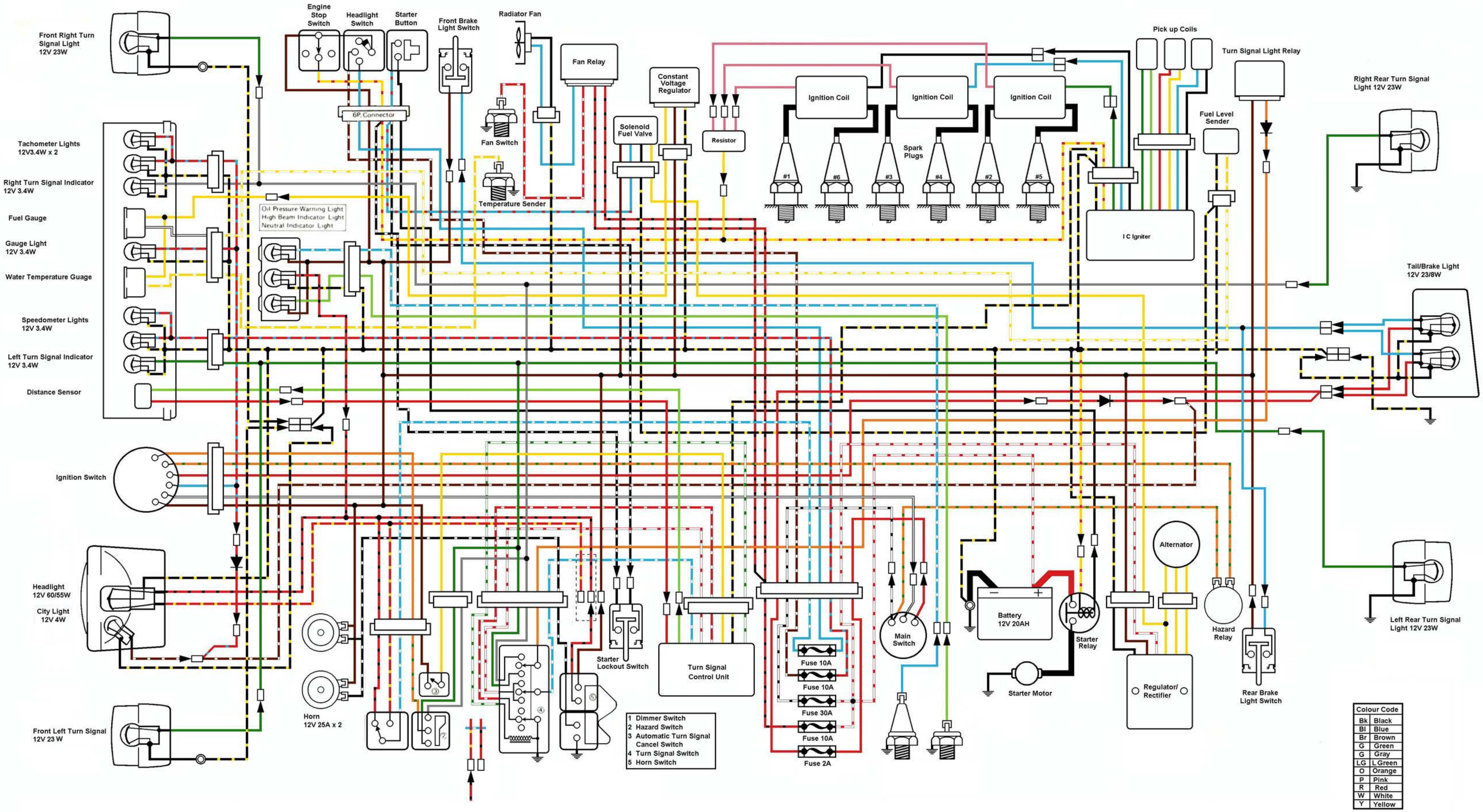
### RIGHT HANDLEBAR SWITCH CONNECTIONS

| Engine Stop Switch | | | Starter Switch | | |
|---|---|---|---|---|---|
| | Y/R | Br | | Black | Y/R |
| OFF | | | | | |
| RUN | ○— | —○ | Push | ○— | —○ |
| OFF | | | | | |

| Colour Code | |
|---|---|
| Bk | Black |
| Bl | Blue |
| Br | Brown |
| G | Green |
| G | Gray |
| LG | L Green |
| O | Orange |
| P | Pink |
| R | Red |
| W | White |
| Y | Yellow |

# Z1300-A2 Wiring Diagram

(European Model)




| Colour Code | |
|---|---|
| Bk | Black |
| Bl | Blue |
| Br | Brown |
| G | Green |
| G | Gray |
| LG | L Green |
| O | Orange |
| P | Pink |
| R | Red |
| W | White |
| Y | Yellow |

**LEFT HANDLEBAR SWITCH CONNECTIONS**

| Dimmer Switch | R/Bk | Bl/Y | R/Y |
|---|---|---|---|
| HI | O | O | |
| LO | | O | O |

| Hazard Switch | Green | O/G | Gray |
|---|---|---|---|
| ON | O | O | O |

| Automatic Turn Signal Cancel Switch | Br | Y |
|---|---|---|
| ON | O | O |

| Turn Signal Switch | Green | Orange | Gray | W/R | Bl/W | R/W | ⏚ |
|---|---|---|---|---|---|---|---|
| R | | O | O | O | O | | |
| | | | | | | O | O |
| L | O | O | | O | O | | |

| Horn Switch | Bk/W | ⏚ |
|---|---|---|
| Push | O | O |

| Passing Switch | Brown | R/Bk |
|---|---|---|
| Push | O | O |

**IGNITION SWITCH CONNECTIONS**

| | Battery 1 | Ignition | Tail 1 | Tail 2 | Battery 2 | Tail3 |
|---|---|---|---|---|---|---|
| | White | Brown | Blue | Red | Orange | O/G |
| OFF | | | | | | |
| ON | O | O | O | O | O | O |
| PARK | | | | | O | O |

**MAIN SWITCH CONNECTIONS**

| | Battery | Ignition | Tail |
|---|---|---|---|
| | W/Bk | White | Red |
| OFF | | | |
| ON | O | O | |
| PARK | O | | O |

**RIGHT HANDLEBAR SWITCH CONNECTIONS**

| Engine Stop Switch | Y/R | Br |
|---|---|---|
| OFF | | |
| RUN | O | O |
| OFF | | |

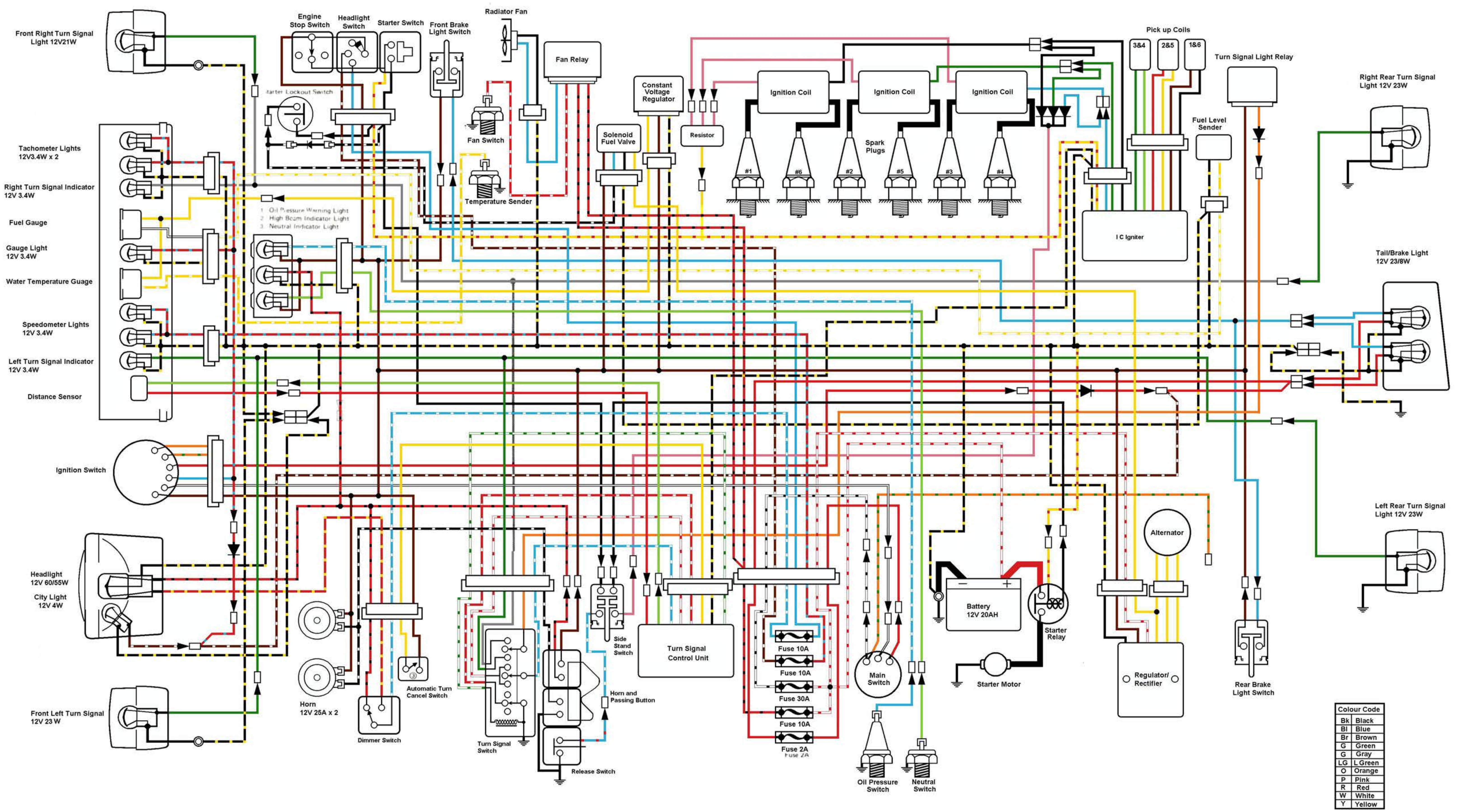
| Headlight Switch | Br/W | Brown | Bl |
|---|---|---|---|
| OFF | | | |
| O | O | O | |
| ON | O | O | O |

| Starter Switch | Black | Y/R |
|---|---|---|
| Push | O | O |

SUPPLEMENT -- 1980 MODEL

# Z1300-A2 Wiring Diagram

## (West German Model)




| Colour Code | |
|---|---|
| Bk | Black |
| Bl | Blue |
| Br | Brown |
| G | Green |
| G | Gray |
| LG | L Green |
| O | Orange |
| P | Pink |
| R | Red |
| W | White |
| Y | Yellow |

**LEFT HANDLEBAR SWITCH CONNECTIONS**

| Release Switch | | | Dimmer Switch | | | | Automatic Turn Signal Cancel Switch | | | Turn Signal Switch | | | | | | | Horn Switch | | | Passing Switch | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Bl/R | ⏚ | | R/Bk | Bl/W | R/Y | | | | | Green | Orange | Gray | W/R | Bl/W | R/W | ⏚ | | Bk/W | ⏚ | | Brown | R/Bk |
| Push | | | HI | ○ | ○ | | | Br | Y | R | | ○ | ○ | ○ | ○ | | | | | | | | |
| | ○ | ○ | LO | | ○ | ○ | ON | ○ | ○ | | | | | | | ○ | ○ | Push | ○ | ○ | Push | ○ | ○ |
| | | | | | | | | | | L | ○ | ○ | | ○ | ○ | | | | | | | | |

**IGNITION SWITCH CONNECTIONS**

| | Battery 1 | Ignition | Tail 1 | Tail 2 | Battery 2 | Tail3 |
|---|---|---|---|---|---|---|
| | White | Brown | Blue | Red | Orange | O/G |
| OFF | | | | | | |
| ON | ○ | ○ | ○ | ○ | ○ | ○ |
| PARK | | | | | ○ | ○ |

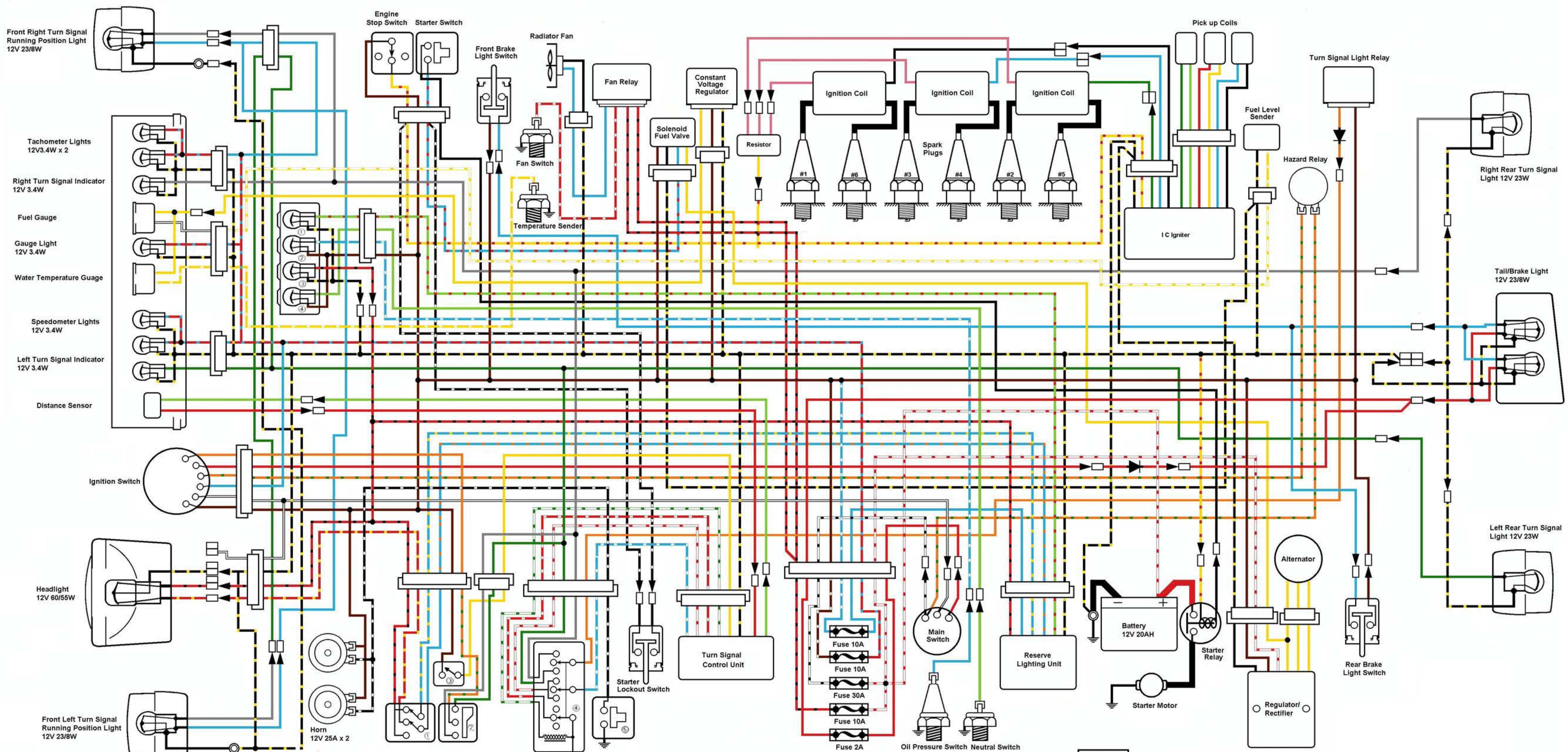
**MAIN SWITCH CONNECTIONS**

| | Battery | Ignition | Tail |
|---|---|---|---|
| | W/Bk | White | Red |
| OFF | | | |
| ON | ○ | ○ | |
| PARK | ○ | | ○ |

**RIGHT HANDLEBAR SWITCH CONNECTIONS**

| Engine Stop Switch | | | Headlight Switch | | | | Starter Switch | | |
|---|---|---|---|---|---|---|---|---|---|
| | Y/R | Br | | Br/W | Brown | Bl | | Black | Y/R |
| OFF | | | OFF | | | | | | |
| RUN | ○ | ○ | O | ○ | ○ | | Push | ○ | ○ |
| OFF | | | ON | ○ | ○ | ○ | | | |

# KZ1300-B2 Wiring Diagram




| Colour Code | |
|---|---|
| Bk | Black |
| Bl | Blue |
| Br | Brown |
| G | Green |
| G | Gray |
| LG | L Green |
| O | Orange |
| P | Pink |
| R | Red |
| W | White |
| Y | Yellow |

| | Indicator Lights |
|---|---|
| 1 | Headlight failure Indicator Light |
| 2 | Oil Pressure Warning Light |
| 3 | High Beam Indicatot Light |
| 4 | Neutral Indicator Light |

| | Switches |
|---|---|
| 1 | Dimmer Switch |
| 2 | Hazard Switch |
| 3 | Automatic Turn Signal Cancel Switch |
| 4 | Turn Signal Switch |
| 5 | Horn Button |

**LEFT HANDLEBAR SWITCH CONNECTIONS**

| Dimmer Switch | | | | | Hazard Switch | | | | Automatic Turn Signal Cancel Switch | | | Turn Signal Switch | | | | | | | | Horn Switch | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | R/Bk | Bl/Y | R/Y | Blue | | Green | O/G | Gray | | Br | Y | | Green | Orange | Gray | W/R | Bl/W | R/W | ⏚ | | Bk/W | ⏚ |
| HI | ○—○ | | ○—○ | | | | | | | | | R | | ○—○ | | ○—○ | | | | | | |
| LO | ○ | ○—○ | | ○ | ON | ○—○—○ | | | ON | ○—○ | | N | | | | | | ○—○ | | Push | ○—○ | |
| | | | | | | | | | | | | L | ○—○ | | | ○—○ | | | | | | |

**IGNITION SWITCH CONNECTIONS**

| | Battery 1 | Ignition | Tail 1 | Tail 2 | Battery 2 | Tail3 |
|---|---|---|---|---|---|---|
| | White | Brown | Blue | Red | Orange | O/G |
| OFF | | | | | | |
| ON | ○—○ | | ○—○ | | ○—○ | |
| PARK | | | | | ○—○ | |

**MAIN SWITCH CONNECTIONS**

| | Battery | Ignition | Tail |
|---|---|---|---|
| | W/Bk | White | Red |
| OFF | | | |
| ON | ○—○ | | |
| PARK | ○—— | —— | —○ |

**RIGHT HANDLEBAR SWITCH CONNECTIONS**

| Engine Stop Switch | | | Starter Switch | | |
|---|---|---|---|---|---|
| | Y/R | Br | | Black | Y/R |
| OFF | | | | | |
| RUN | ○—○ | | Push | ○—○ | |
| OFF | | | | | |

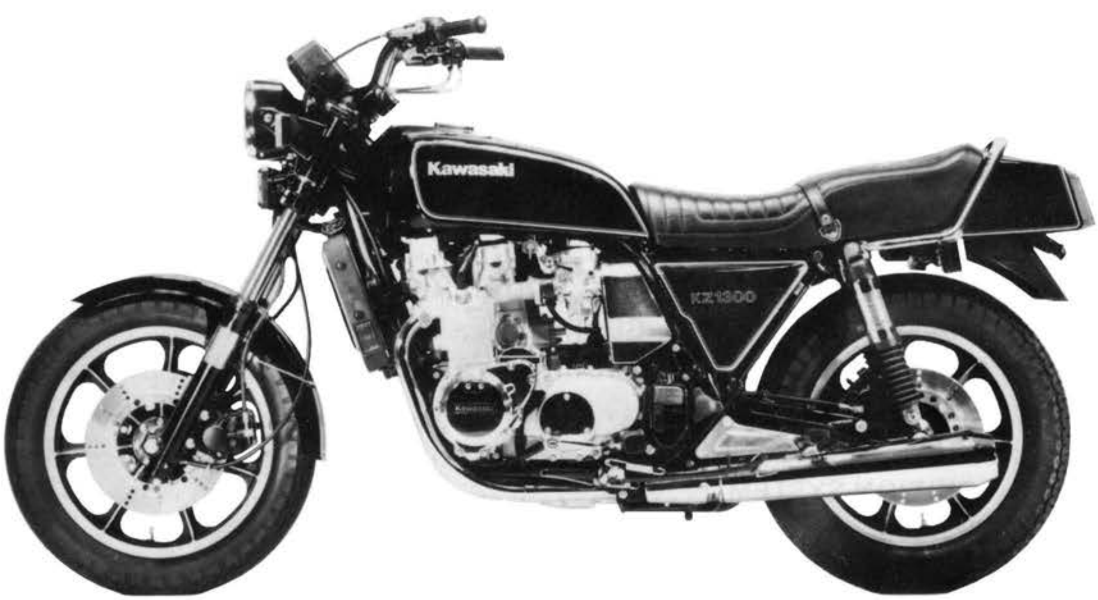
# Supplement for 1981 Model

## Table of Contents

# Model Identification

**KZ1300-A3 Right Side View**


**KZ1300-A3 Left Side View**



## SPECIFICATIONS

| | KZ1300-A3 |
|---|---|
| **Dimensions** | |
| Overall length | 2,295 mm Ⓔ Ⓐ 2,335 mm |
| Overall width | 905 mm Ⓔ Ⓐ 840 mm |
| Overall height | 1,280 mm Ⓔ Ⓐ 1,155 mm |
| Wheelbase | 1,580 mm |
| Road clearance | 150 mm |
| Dry weight | 297 kg Ⓔ Ⓐ 296 kg |
| Fuel tank capacity | 27.0 ℓ Ⓒ Ⓤ 20.5 ℓ |
| **Performance** | |
| Braking distance | 12 m from 50 kph |
| Minimum turning radius | 2.8 m |
| **Engine** | |
| Type | DOHC, 6 cylinder, 4 stroke, water-cooled |
| Bore and stroke | 62.0 x 71.0 mm |
| Displacement | 1,286 cc |
| Compression ratio | 9.9 |
| Maximum horsepower | 120 HP @8,000 rpm |
| Maximum torque | 11.8 kg-m @6,500 rpm |
| Valve timing | |
| Inlet Open | 20° BTDC |
| Close | 70° ABDC |
| Duration | 270° |
| Exhaust Open | 70° BBDC |
| Close | 30° ATDC |
| Duration | 280° |
| Carburetors | Mikuni BSW32 x 3 |
| Lubrication system | Forced lubrication (Wet sump) |
| Engine oil | SE class SAE 10W40, 10W50, 20W40, or 20W50 |
| Engine oil capacity | 6.2 ℓ |
| Coolant Capacity | 3.5 ℓ |
| Starting system | Electric starter |
| Ignition system | Battery and coil (transistorized ignition with electric advancer) |
| Cylinder numbering method | Left to right, 1–2–3–4–5–6 |
| Firing order | 1–5–3–6–2–4 |
| Ignition timing | From 10° BTDC @850 rpm to 33° BTDC @ 2,800 rpm |
| Spark plugs | NGK BP6ES or ND W20EP-U<br>Ⓔ Ⓒ NGK BPR6ES or ND W20EPR-U |
| **Transmission** | |
| Type | 5-speed, constant mesh, return shift |
| Clutch | Wet, multi disc |
| Gear ratio: 1st | 2.29 (39/17) |
| 2nd | 1.67 (35/21) |
| 3rd | 1.28 (32/25) |
| 4th | 1.07 (29/27) |
| 5th | 0.93 (27/29) |

| | | |
|---|---|---|
| | | **KZ1300-A3** |
| Primary reduction ratio | | 1.84 (32/24 x 29/21) |
| Final reduction ratio | | 2.65 (20/24 x 35/11) |
| Overall drive ratio | | 4.55 (Top gear) |
| **Electrical Equipment** | | |
| Alternator | | Kokusan GP9115 |
| Regulator/Rectifier | | Shindengen SH232-12B |
| Ignition coils | | Toyo Denso ZC005-TR12V |
| Igniter | | Mitsubishi J004T00571 |
| Battery | | Yuasa Y50-N18L-A (12V 20AH) |
| Starter | | Mitsuba SM-226-K |
| Headlight type | | Semi-sealed |
| Headlight | | 12V 60/55W (Quartz Halogen Light) |
| City light | | Ⓔ Ⓐ 12V 4W |
| Tail/Brake light | | 12V 8/27W Ⓔ Ⓐ 12V 5/21W |
| Meter lights | | 12V 3.4W |
| Indicator lights | | 12V 3.4W |
| Turn signal/running position lights | | Ⓤ 12V 23/8W |
| Turn signal lights | | 12V 23W Ⓔ Ⓐ 12V 21W |
| Horns | | 12V 2.5A x 2 |
| **Frame** | | |
| Type | | Tubular, double cradle |
| Steering angle | | 38° to either side |
| Castor | | 28° |
| Trail | | 100 mm |
| Tire size | Front | 110/90V-18 4PR Ⓤ MN90-18 4PR |
| | Rear | 130/90V-17 6PR Ⓤ MT90-17 6PR |
| Suspension | Front | Telescopic fork (pneumatic) |
| | Rear | Swing arm |
| Wheel travel | Front | 200 mm |
| | Rear | 115 mm |
| Front fork oil capacity (each fork) | | 394 cc |
| Front fork oil type | | SAE 10W20 |
| Final gear case oil | Type | API GL-5 Hypoid Gear Oil<br>SAE 90 (above 5°C)<br>SAE 80 (below 5°C) |
| | Capacity | 0.25 ℓ |
| **Brakes** | | |
| Type | Front and Rear | Disc brake |
| Effective disc diameter | Front | 260 mm |
| | Rear | 250 mm |

Ⓐ : Australian model Ⓒ : Canadian model Ⓔ : European model Ⓤ : US model

Specifications subject to change without notice, and may not apply to every country.

## PERIODIC MAINTENANCE CHART (KZ1300-A3)

The maintenance and adjustments must be done in accordance with this chart to keep the motorcycle in good running condition. **The initial maintenance is vitally important and must not be neglected.**

| FREQUENCY / OPERATION | Whichever comes first → ODOMETER READING* / ↓ Every | 800 km | 5,000 km | 10,000 km | 15,000 km | 20,000 km | 25,000 km | 30,000 km | See Page |
|---|---|---|---|---|---|---|---|---|---|
| Battery electrolyte level — check † | month | • | • | • | • | • | • | • | 230 |
| Brake, brake light switch adjustment — check † | | • | • | • | • | • | • | • | 27 |
| Brake wear — check † | | | • | • | • | • | • | • | 221 |
| Brake fluid level — check † | month | • | • | • | • | • | • | • | 221,295 |
| Brake fluid — change | year | | | • | | • | | • | 221,295 |
| Clutch — adjust | | • | • | • | • | • | • | • | 20 |
| Carburetors — adjust | | • | • | • | • | • | • | • | 18,290 |
| Throttle cables — adjust | | • | • | • | • | • | • | • | 14 |
| Steering play — check † | | • | • | • | • | • | • | • | 28 |
| Front fork — inspect/clean | | | • | • | • | • | • | • | 227,306 |
| Rear shock absorbers — inspect | | • | • | • | • | • | • | • | 228,306 |
| Nuts, Bolts, Fasteners — check and torque | | • | | • | | • | | • | 307 |
| Spark plugs — clean and gap † | | • | • | • | • | • | • | • | 12 |
| Valve clearance — check † | | • | • | • | • | • | • | • | 12 |
| Air suction valve — check † | | | • | • | • | • | • | • | 180 |
| Air cleaner element — clean | | | • | • | • | | • | | 164 |
| Air cleaner element — replace | 5 cleanings | | | • | | • | | • | 47,164 |
| Fuel system — clean | | • | • | • | • | • | • | • | 290 |
| Tire tread wear — check † | | | • | • | • | • | • | • | 213,295 |
| Engine oil — change | year | • | • | • | • | • | • | • | 306 |
| Oil filter — replace | | • | | • | | • | | • | 21,290 |
| General lubrication — perform | | | • | • | • | • | • | • | 32 |
| Front fork oil — change | | | | • | | • | | • | 226 |
| Swing arm — lubricate | | | | • | | • | | • | 228 |
| Wheel bearings — grease | 2 years | | | | | • | | | 216,292 |
| Steering stem bearings — grease | 2 years | | | | | • | | | 224 |
| Final gear case oil level — check † | | | | • | | • | | • | 32 |
| Final gear case oil — change | | • | | | | | | • | 32 |
| Propeller shaft sliding joint — lubricate | | | | • | | | | • | 218 |
| Coolant — change | 2 years | | | | | | | • | 23,203 |
| Radiator hoses, connectings — check † | year | • | | • | | • | | • | 37~42 |

* For higher odometer readings, repeat at the frequency interval established here.

† Replace, add or adjust if necessary.

# Adjustment

## ENGINE OIL

The procedures are the same as those for the 1979 KZ1300-A1 with the following exception. Refer to Pgs. 21~22.

**Table N6 Engine Oil**

| Grade | Viscosity | Filling Engine Oil Capacity | |
|---|---|---|---|
| | | When filter is not changed | When filter is changed |
| SE Class | SAE 10W40 10W50 20W40 20W50 | 5.6 liters | 6.2 liters |

## FRONT FORK

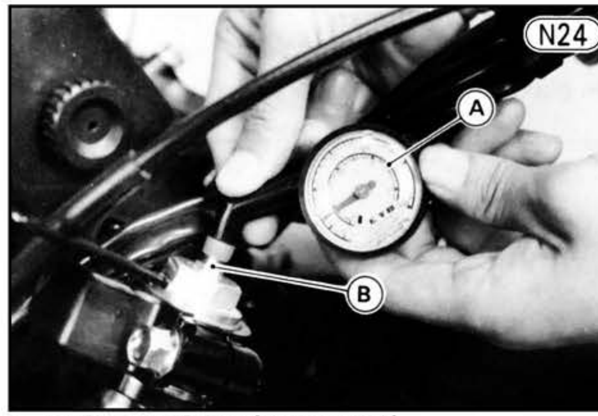
The front forks can be adjusted to any air pressure within the usable range to suit various riding and load conditions. They can be adjusted to lower air pressure for cruising on smooth roads, but should be adjusted to higher pressure for high speed riding, or riding on bad roads. Before making any adjustments, however, read the procedures in this section.

**To check the front forks:**

- Put the motorcycle up on its center stand.
- Raise the front wheel off the ground by using a jack at the specified location. All weight must be off the front wheel.


**A. Place the jack at this location.**

- Remove the air valve cap on the top of the left fork leg, and check the air pressure with the air pressure gauge (special tool).




**A. Air Pressure Gauge (52005-1003)**
**B. Air Valve**

**NOTES:** 1. Check the air pressure when the front forks are cold.
2. Do not use tire gauges for checking air pressure. They may not indicate the correct air pressure because of air leaks that occur when the gauge is applied to the valve.

- Inject air through the valve with a pump until the pressure gauge reads the specified value, but do not exceed 2.5 kg/cm² (35 psi).

**NOTE:** A normal tire pump can be used.

**Table N7 Front Fork Air Pressure**

| Standard | Usable Range |
|---|---|
| 0.60 kg/cm² (8.5 psi) | 0.50~0.70 kg/cm² (7.1~10 psi) |

**CAUTION** **Inject air little by little so that air pressure does not rise rapidly. Air pressure exceeding 2.5 kg/cm² (35 psi) may damage the oil seals.**

**WARNING** **1. Be sure to adjust the air pressure within the usable range. Front forks adjusted too low or too high adversely affect handling and stability and could lead to accident and injury.**
**2. Only air or nitrogen gas can be used. Never inject oxygen or any other kind of gas. Other gases could produce an explosion.**
**3. Do not incinerate the front fork.**

## REAR SHOCK ABSORBERS

The rear shock absorbers can be adjusted by changing the air pressure and damping force to suit various riding and loading conditions.

Before making any adjustments, however, read the following procedures.

### Air Pressure

The air pressure in the rear shock absorbers can be adjusted for difference road and loading conditions.

The Table N8 shows an example of air pressure adjustment. To obtain the stable handling or suitable riding condition, adjust the air pressure for different road and loading conditions if necessary. For instance, lower air pressure is for comfortable riding for an average-built rider of 68 kg (150 lbs) with no accessories. Ordinarily, the heavier the total load becomes, the higher the air pressure should be set.

**Table N8 Air Pressure Adjustment**

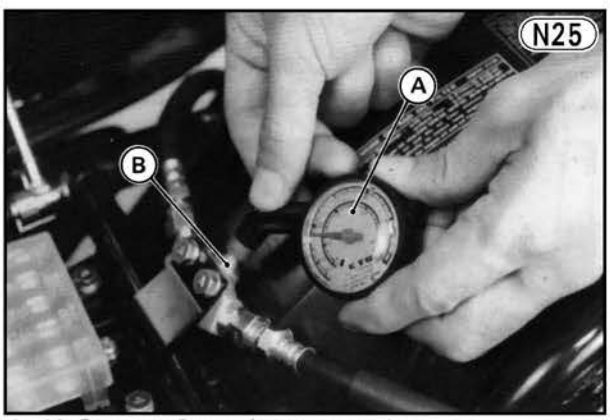
| Usable range $kg/cm^2$ (kPa, psi) | Setting | Load | Road |
|---|---|---|---|
| 1.0 (100, 14) ↕ 3.5 (350, 50) | Soft ↕ Hard | Light ↕ Heavy | Good ↕ Bad |

**To adjust the air pressure:**

**NOTE:** Check and adjust the air pressure when the rear shock absorbers are cold (room temperature).

- Put the motorcycle up on its center stand to raise the rear wheel off the ground.
- Unlock the seat, and swing it open to take off the air valve cap under the seat.
- Check the air pressure with the air pressure gauge (special tool).

**NOTE:** Do not use tire gauges for checking air pressure. They may not indicate the correct air pressure because of air leaks that occur when the gauge is applied to the valve.




**A. Air Pressure Gauge (52005-1003)**
**B. Air Valve**

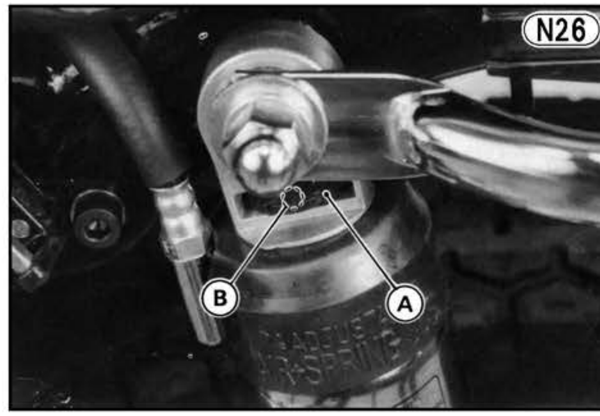
- To lower the air pressure, push the valve core in a twinkle. To raise the pressure, inject air through the valve with a tire pump. Change the air pressure within the range specified in the table N8 to suit various riding conditions.

**CAUTION** **Inject air little by little so that air pressure does not rise rapidly. Air pressure exceeding 5.0 $kg/cm^2$ (500 kPa, 70 psi) may damage the oil seal.**

**WARNING** **1. Be sure to adjust the air pressure within the usable range. Pressure too high or too low can produce a hazardous riding condition.**
**2. Only air or nitrogen gas can be used. Never inject oxygen or any kind of explosive gas.**
**3. Do not incinerate the rear shock absorbers.**

## Damping Force

The damper adjuster on each rear shock absorber has 4 positions so that the damping force can be adjusted for different road and loading conditions. The numbers on the adjuster show the setting position of the damper.




**A. Damper adjuster B. Number**

The Table N9 shows an example of damping force adjustment. To obtain the stable handling or suitable riding condition, adjust the damping force for different road and loading conditions if necessary. The damping force can be left soft for average riding. But it should be adjusted harder for high speed riding or riding with a passenger. If the damper setting feels too soft or too stiff, adjust it in accordance with the Table N9:

**Table N9 Damping Force Adjustment**

| Adjuster Position | Damping Force | Setting | Load | Road | Speed |
|---|---|---|---|---|---|
| 1 | ↓ | Soft ↓ | Light ↓ | Good ↓ | Low ↓ |
| 2 | | | | | |
| 3 | | | | | |
| 4 | Stronger | Hard | Heavy | Bad | High |

**To adjust the damping force:**

- Turn the adjusters to the desired position until you feel a click.
- Check to see that both adjuster are turned to the same relative position.

**WARNING** **If both damper adjuster are not adjusted equally, handling may be impaired and a hazardous condition may result.**

# Disassembly

## TORQUE AND LOCKING AGENT

The table below shows the tightening torque for the parts which are modified from the previous model. Thighten the other parts to the same torque listed on Pgs. 37~42.

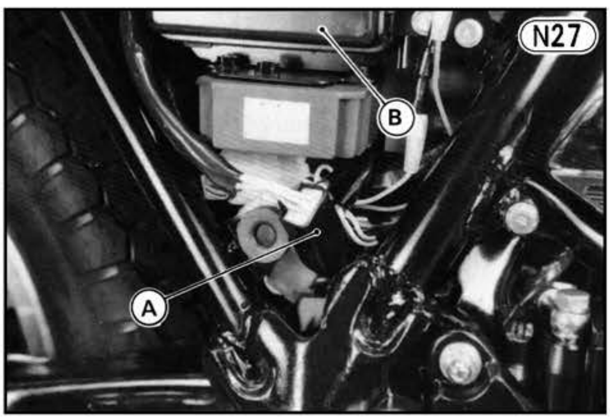
**ENGINE**

| Part | Q'ty | Metric (kg-m) | English (ft-lbs) | Remarks | See Pg. |
|---|---|---|---|---|---|
| Starter Motor Clutch Mounting Bolt $\phi$12 P1.25 | 1 | 15.0 | 108 | — | 309 |
| Baffle Plate Mounting Screw $\phi$6 P1.0 | 2 | — | — | ● | 310 |

## PICKUP ASSEMBLY

### Removal:

- Set the motorcycle up on its center stand and put an oil pan beneath the left engine cover.
- Remove the right side cover.
- Disconnect the 6-pin conector that joins the pickup coil leads to the IC igniter and free the leads from the motorcycle.




**A. 6-pin Connector B. IC Igniter**

- Unscrew the left engine cover Allen bolts (10) and remove the cover.
- Unscrew the pickup mounting screws (3) and remove the pickup assembly.

## AUTOMATIC TIMING ADVANCER HOUSING, AUTOMATIC TIMING ADVANCER

This 1981 model employs a newly-developed transistor ignition system, and the ignition timing is advanced by an electric circuit in the IC igniter (electric advance system). So there is no mechanical automatic timing advancer.

## STARTER MOTOR CLUTCH

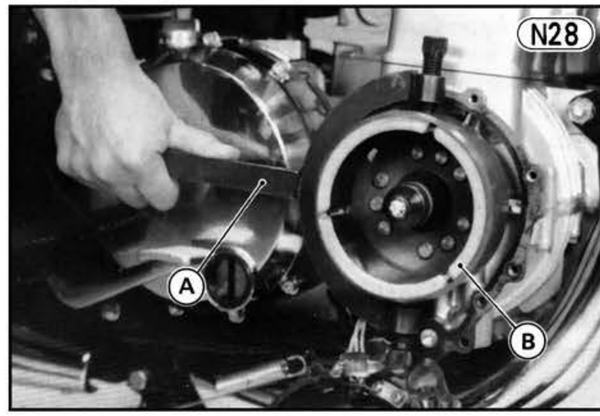
### Removal:

- Set the motorcycle up on its center stand and put an oil pan beneath the left engine cover.
- Unscrew the left engine cover Allen bolts (10) and remove the cover.
- Unscrew the alternator cover Allen bolts (8) and remove the cover.

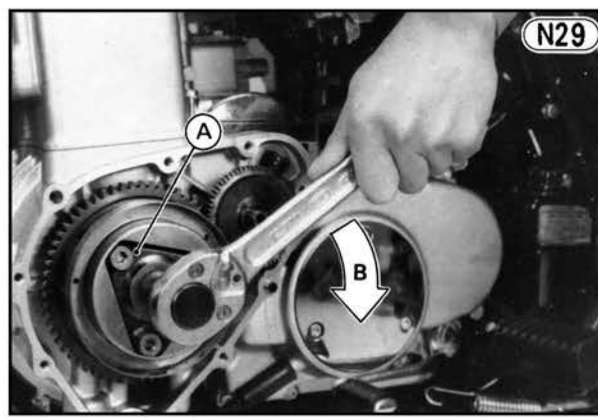
**NOTE:** The left engine and alternator covers need not be removed completely, so the leads may be left connected.

- Holding the alternator rotor with the flywheel holder (special tool), remove the starter motor clutch mounting bolt and washer.

**NOTE:** The bolt is a left hand thread and must be turned clockwise to loosen.




**A. Flywheel Holder (57001-308) B. Alternator Rotor**



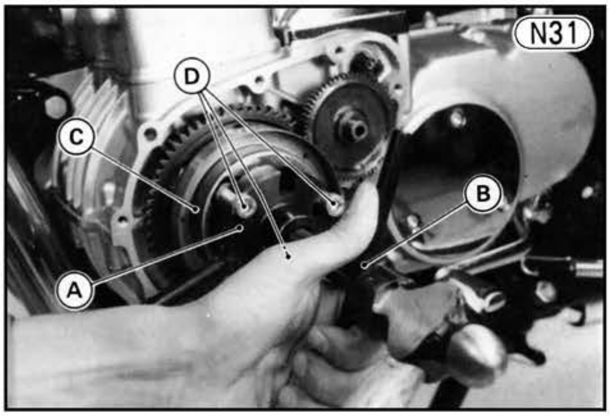

**A. Starter Motor Clutch**
**B. Turn Clockwise to Loosen**

- To pull out the starter motor clutch assembly, insert the rotor puller adapter (special tool) in the hole of the crankshaft.


**A. Rotor Puller Adapter (57001-1082)**

- Pull out the starter motor clutch assembly using the pullers (special tools), and three bolts (Diameter 8 mm x Pitch 1.25 mm). Be careful not to drop the reduction gear and/or starter clutch gear.

**NOTE:** Screw the bolts in tightly not to loosen when the starter motor clutch assembly is removed.



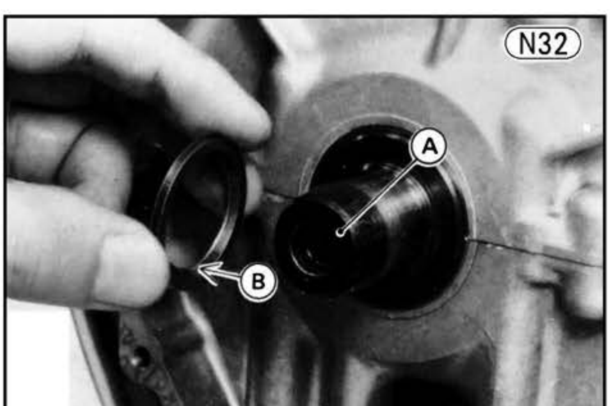

**A. Magneto Puller (57001-259)**
**B. Rotor Puller (57001-1016)**
**C. Starter Motor clutch Assembly**
**D. Bolts**

- Remove the knock pin on the crankshaft.
- Remove the starter clutch gear, washers(2), reduction gear, and its shaft.

### Installation:

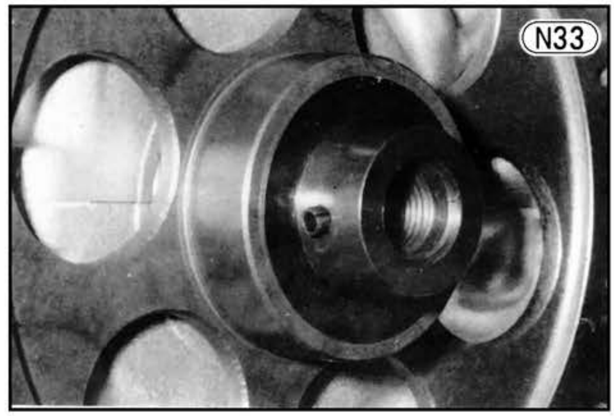
- Using a high flash-point solvent, celan off any oil or dirt that may be on the crankshaft taper and starter motor tapered hole.
- Install the thrust washer, starter clutch gear, thrust washer.

**NOTE:** Be sure to place the chamfered side of the inner thrust washer toward the inside so that the washer will fit on the crankshaft.




**A. Crankshaft** **B. Chamfer faces in**

- Put the knock pin in the crankshaft so that the opening of the pin faces toward the leftside or rightside of the engine.




- Install the starter motor clutch assembly.
- Install the washer and starter motor clutch assembly mounting bolt, and tighten the bolt to 15 kg-m of torque (108 ft-lbs) while holding the rotor steady with the flywheel holder (special tool).

**NOTES:** 1. Be sure to place the stepped side of the washer toward the inside.
2. After tighting the bolt to 15 kg-m (108 ft-lbs) of torque, loosen the bolt and re-tighten the bolt to the same torque.

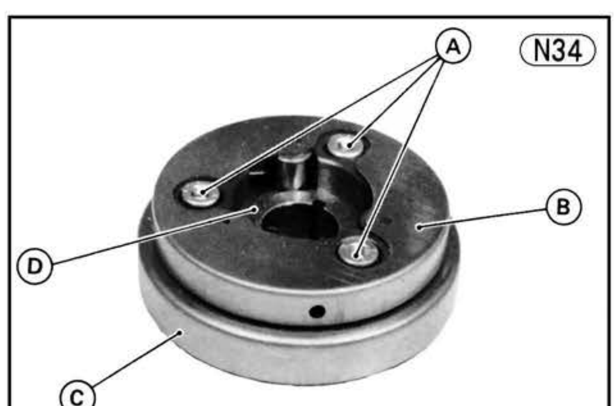
- Install the alternator and left engine covers.

**NOTE:** Check that the knock pins are in place.

- Check the engine oil level (Pg. 306) and add oil if insufficient.

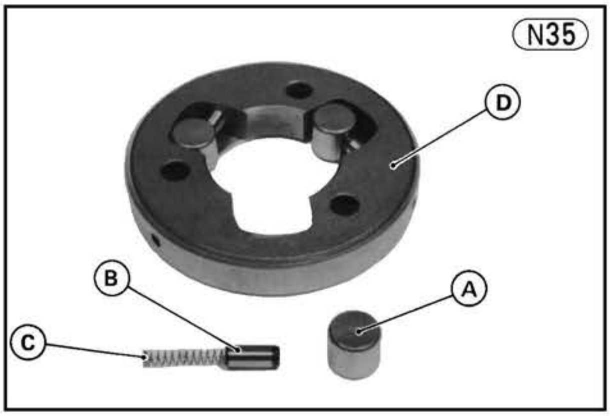
### Disassembly

- Remove the allen bolts (3) to separate the starter motor clutch and clutch hub.




**A. Allen bolt** **C. Timing Rotor**
**B. Starter Motor Clutch** **D. Clutch Hub**

- Remove the rollers, springs, spring caps (3ea) from the starter motor clutch.

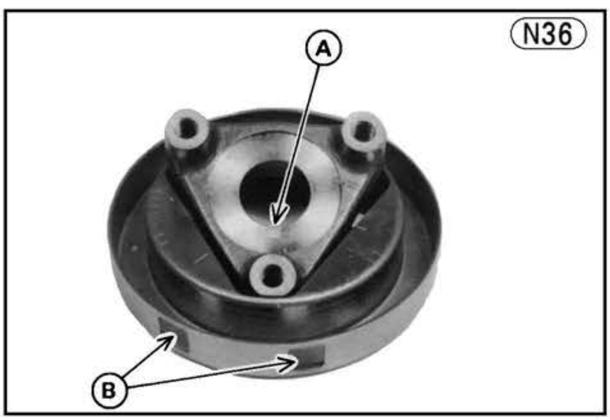



**A. Roller** **C. Spring**
**B. Spring Cap** **D. Starter Motor Clutch**

- Take the steel plate out of the timing rotor.

## Assembly Notes:

1. When installing the timing rotor, set the timing rotor so that the groove in the clutch hub positions between the holes of the timing rotor.




**A. Groove** **B. Holes**

2. Apply a molybdenum disulfide engine assembly grease to the underside of each Allen bolt head, and tighten them to 3.9 kg-m (28 ft-lbs) of torque.

## CLUTCH

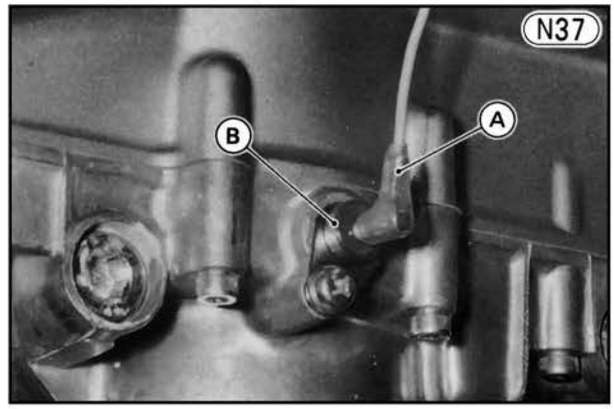
Refer to Pgs. 87~89, noting the following.

1. To increase oil quantity and for easier inspection, the oil level inspection window was enlarged with higher upper and lower marks. At the same time, a baffle plate was placed between the clutch and crankcase.
2. Apply a non-permanent locking agent to the thread of the baffle plate mounting screws (2).

## OIL LEVEL SENSOR

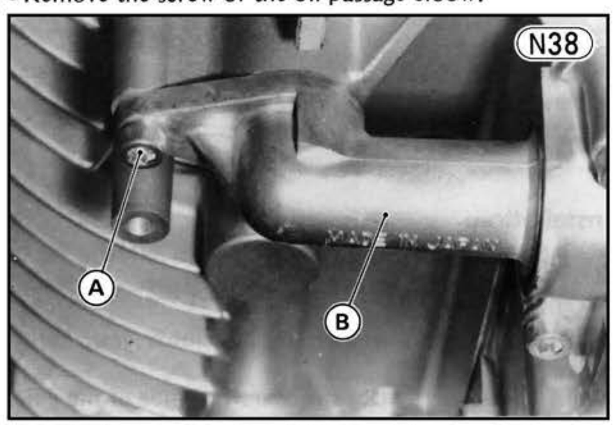
### Removal:

- Unscrew the engine drain plug, and drain the engine oil.
- Remove the mufflers and exhaust pipes (Pg. 55 and 56).
- Disconnect the oil level sensor lead (yellow) from the connector at the rear end of the oil pan.



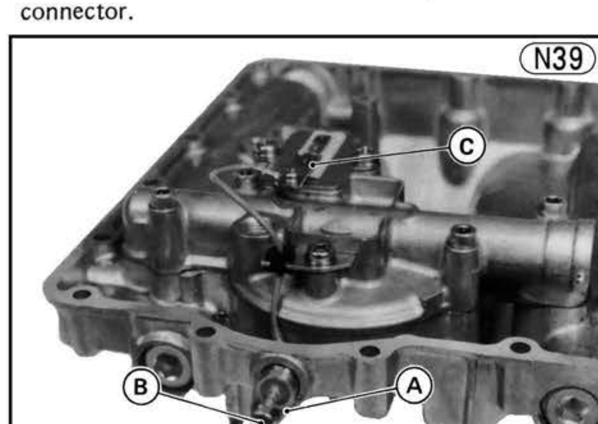

**A. Yellow Lead** **B. Connector**

- Remove the screw of the oil passage elbow.




**A. Allen Bolt** **B. Oil Passage Elbow**

- Unscrew the oil pan Allen bolts (17), and remove the oil pan and its gasket.
- Unscrew the connector holder screw, and remove the connector.



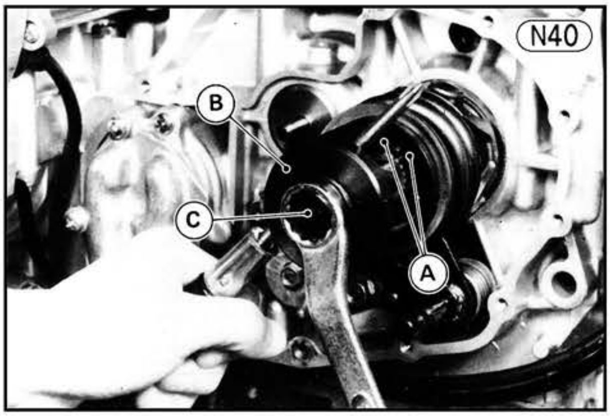

**A. Connector Holder** **B. Screw** **C. Oil Level Sensor**

- Unscrew the screws (2) and remove the oil level sensor.

## DRIVEN SHAFT CAM DAMPER

### Removal:

- •Disconnect the battery ground lead from the battery.
- •Remove the external shift mechanism cover (p. 82).
- •Using cam damper compressor bolt 57001-1150 and cam damper compressor "B" 57001-1042, remove the retainers (2) ①.




**A. Retainers**
**B. Cam Damper Compressor "B"**
**C. Cam Damper Compressor Bolt**

- •Remove the spring stop ②, damper spring ③, and damper cam ④.
- •Take out the circlip ⑤, shim(s) ⑥, washer ⑦, cam follower ⑧, and shim(s) ⑨.

### Installation Note:

1. Perform the shim adjustment when replacing any cam damper parts (p. 311).

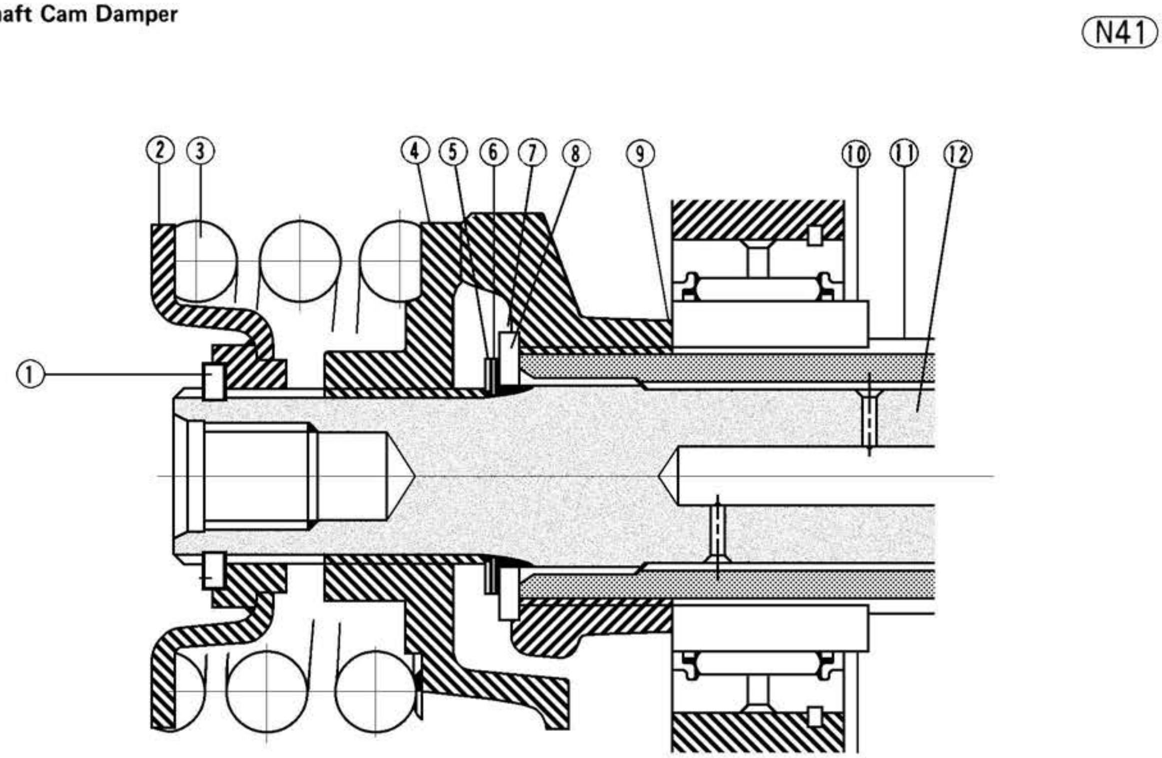
## SHIM ADJUSTMENT

The shim adjustment procedures are the same as those for the 1979 KZ1300-A1 with the following exception. Refer to p.p. 112 ~ 117.

### Cam Damper

The shim **C** adjustment is not necessary because of the modification of the cam damper parts. The shim **A** and **B** adjustment procedures are the same as those for the 1979 KZ1300-A1.

**Driven Shaft Cam Damper**



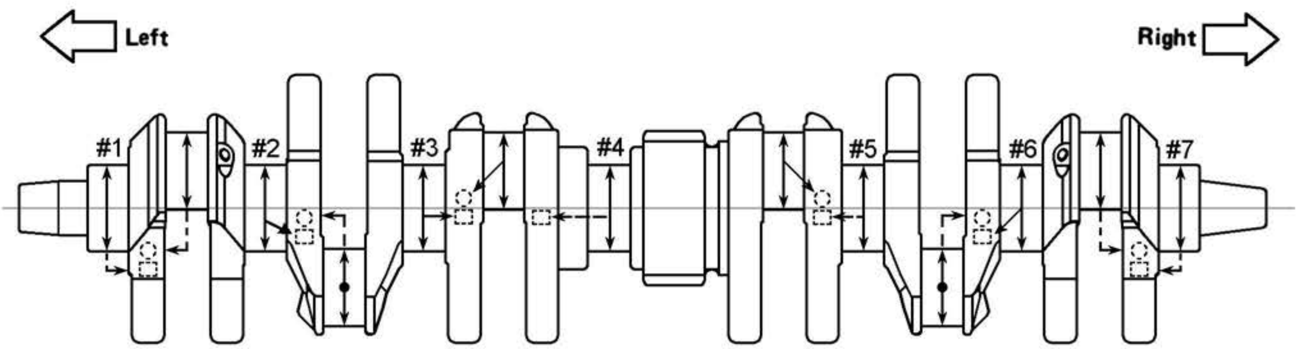

1. Retainer
2. Spring Stop
3. Damper Spring
4. Damper Cam
5. Circlip
6. Shim(s) B
7. Washer
8. Cam Follower
9. Shim(s) A
10. Inner Race
11. Outer Shaft
12. Inner Shaft

## CRANKSHAFT, PRIMARY CHAIN

Refer to p. 110, noting the following.

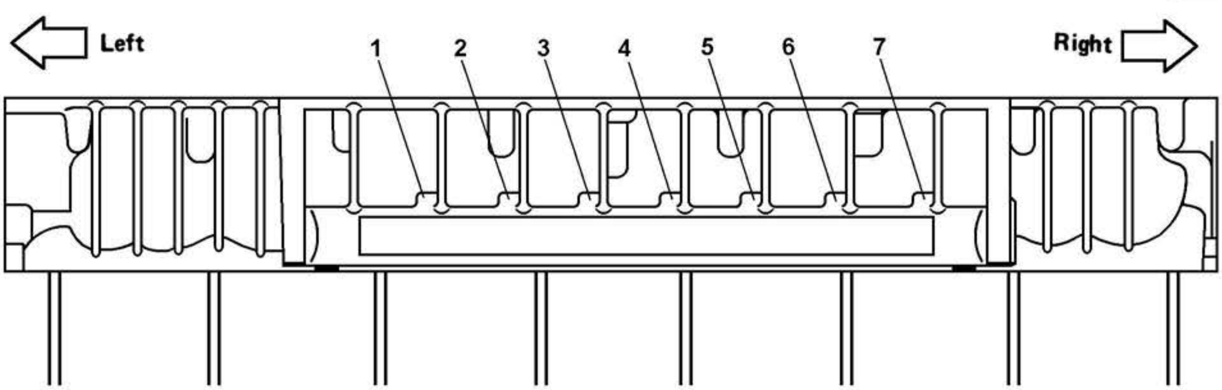
1. If a new crankshaft and/or crankcase are used, select the proper size of two bearing inserts (each one for upper and lower crankcase halves) in accordance with the combination of the marks on the upper crankcase half and crankshaft for each main bearing. If the crankcase only is replaced with a new one, first measure the diameter of the crankshaft main journals which wear on the bearing inserts, make a new mark on the crankshaft in accordance with Table N13 on p. 316, and then select the proper bearing inserts in accordance with the combination of the marks on the upper crankcase half and crankshaft.

**Location of Crankshaft Marks** (N42)




Location of Crankshaft Marks: Squares show areas where marks for main journal size are engraved. Circles show areas where marks for crankpin size are engraved.

**Location of Crankcase Marks** (N43)




Location of Crankcase Marks: Illustration shows upper crankcase half that is viewed from front and positioned upside down. Marks for main bearing bore size are engraved on areas called out by numbers 1 through 7. Each number shows main bearing number (Numbering method, left to right).

**Table N10 Bearing Insert Selection**

| Crankcase Marking | Crankshaft Marking | Proper Bearing Insert | | Remarks |
|---|---|---|---|---|
| | | Color | Part Number | |
| ○ | 1 | Brown | 92028-1105 | Grooved inserts for #1, #3, #5, and #7 bearings |
| | | | 92028-1108 | Non-grooved inserts for #2, #4, and #6 bearings |
| ○ | No Mark | Black | 92028-1104 | Grooved inserts for #1, #3, #5, and #7 bearings |
| | | | 92028-1107 | Non-grooved inserts for #2, #4, and #6 bearings |
| No Mark | 1 | Black | 92028-1104 | Grooved inserts for #1, #3, #5, and #7 bearings |
| | | | 92028-1107 | Non-grooved inserts for #2, #4, and #6 bearings |
| No Mark | No Mark | Blue | 92028-1103 | Grooved inserts for #1, #3, #5, and #7 bearings |
| | | | 92028-1106 | Non-grooved inserts for #2, #4, and #6 bearings |

## TRANSMISSION

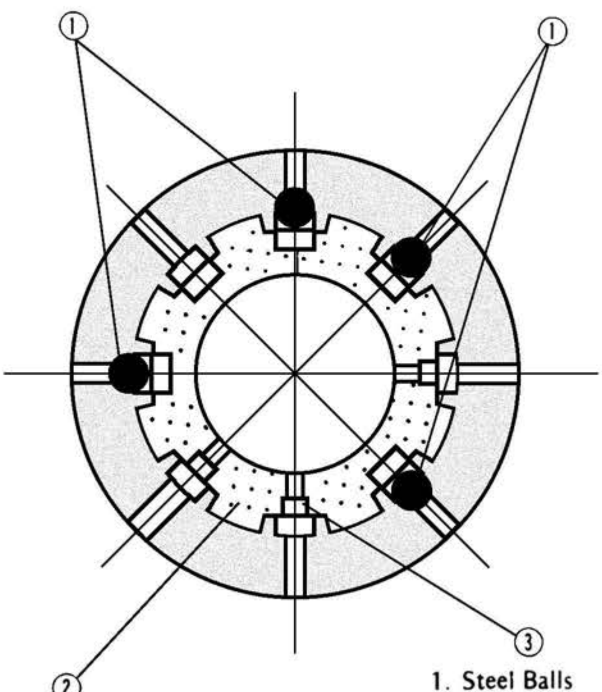
### Driven Shaft

### Disassembly and Assembly:

Refer to Pgs. 105~108, noting the following.

1. The 4th gear ⑰ has four steel balls assembled into it for nuetral positioning. To remove this gear with the balls, quickly spin the shaft in a vertical position while holding 3rd gear ③, and pull off the 4th gear upwards.
2. Do not use grease on the four balls during assembly; these balls must be able to move freely.

**Steel Balls Installation** N44




1. Steel Balls
2. Driven Shaft
3. 4th Gear

## FINAL GEAR CASE

Refer to p. 151, noting the following.

### Ring Gear Assembly Note:

1. It is not necessary to snake the bearing holder mounting screws (3).

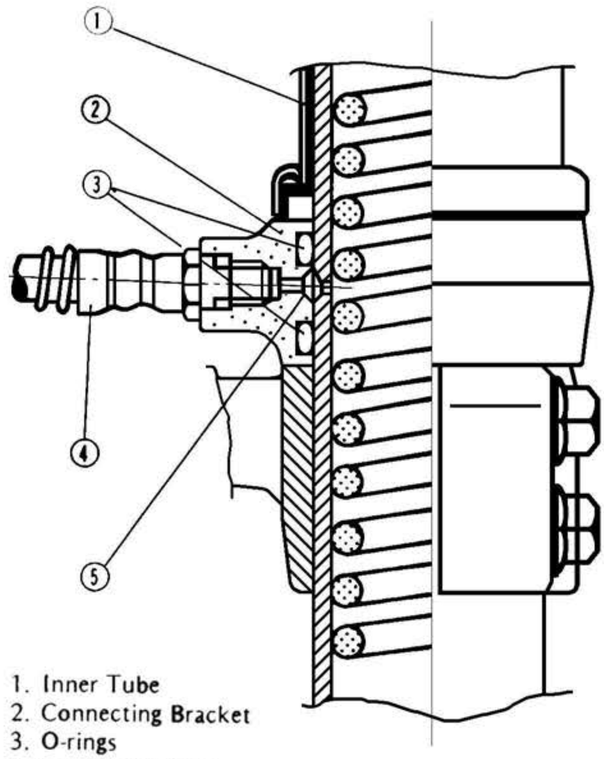
## FRONT FORK

The front fork for 1981 model has the connecting hose assembly to equalize the air pressure between left and right fork legs. Refer to Pgs. 148~150, noting the following.

**NOTES:** 1. Before working the fork leg down and out, release air through the air valve and remove the fork leg not to damage the o-rings.

2. After removal, be careful not to spill the oil from the hole of the inner tube.
3. When installing the connecting hose assembly, replace the o-rings with the new them and apply oil to the inside the connecting bracket.
4. Do not compress only one of the forks. If it does, the oil may flow through the connecting hose and the oil level may change.
5. After installation, inject air through the valve with a pump until the pressure gauge reads the specified value, but do not exceed 2.5 kg/cm² (35 psi. 250 kPa).

**Connecting Hose Assembly Construction** N45

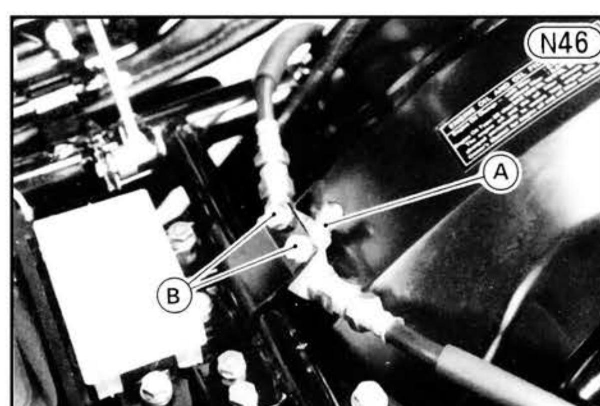



1. Inner Tube
2. Connecting Bracket
3. O-rings
4. Connecting Hose
5. Hole

## REAR SHOCK ABSORBERS

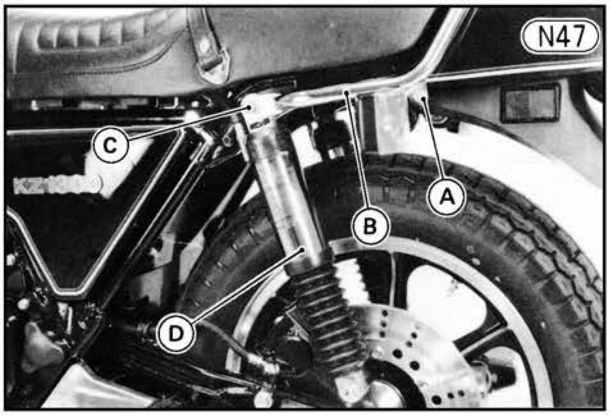
### Removal:

- Set the motorcycle up on its center stand, and swing open the seat.
- Remove the bolts, and take off the air valve.




**A. Air Valve** **B. Bolts**

- Remove the grab rail mounting bolts and lockwashers (2ea).




A. Mounting Bolt
B. Grab Rail
C. Cap Nut
D. Rear Shock Absorber

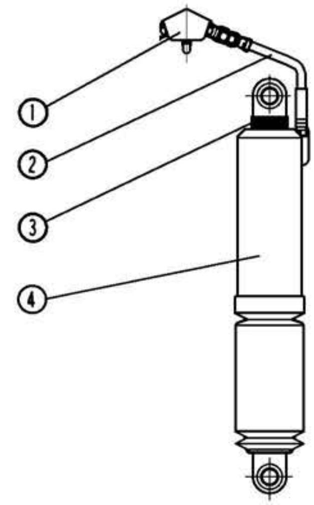
- Remove the cap nut, lockwasher, grab rail, and flat washer from the upper end of the rear shock absorber and remove the nut from the lower end.
- Take off the rear shock absorbers.

**CAUTION** **Place the rear shock absorbers so that the correct side of them is up shown below. If they are left upside down or other incorrect conditions, the oil in the rear shock absorber may flow through the connecting hoses and the oil level may change.**

## Installation Note:

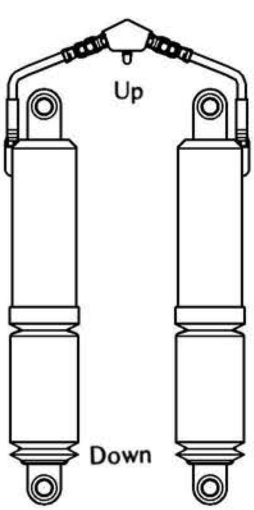
1. Tighten the mounting nut to 2.5 kg-m (18.0 ft-lbs) of torque.
2. Check to see that both damper adjuster are turned to the same relative position so that the same damping force is obtained.
3. Check the air pressure and adjust it if necessary (Pg. 306).

**Rear Shock Absorbers** (N48)

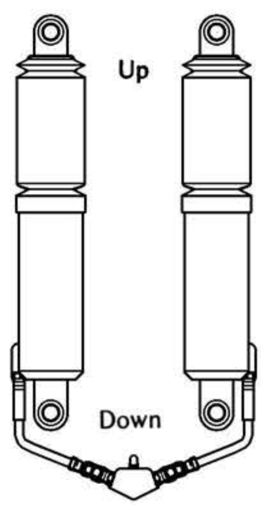



1. Air Valve
2. Connecting Hose
3. Damper Adjuster
4. Rear Shock Absorber

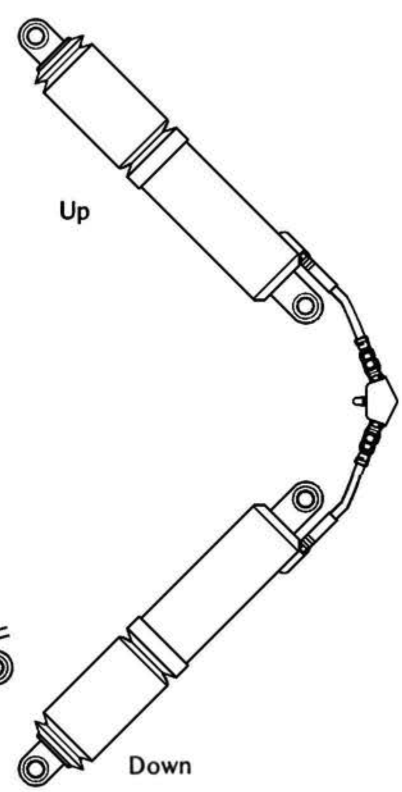
**Placing Method of Rear Shock Absorbers** (N49)

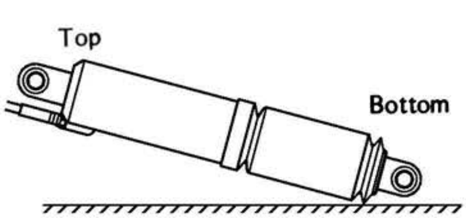



(A) GOOD: Correct side up

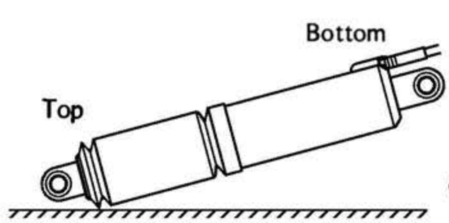



(C) BAD: Upside down




(B) GOOD: Top is higher




(D) BAD: Top is lower

(E) BAD: Oil flows

# Maintenance

## CYLINDER HEAD, VALVES

Valve seat cutters (special tools) are newly designed, and the repair procedures are changed a little. But, new seat cutters are available for the models before 1981 model. Refer to Pgs. 173–180, noting the following.

### Valve, Valve Guide, Valve Seat

Valve inspection, valve guide inspection and valve stem height inspection procedures are the same as those for the 1979 KZ1300-A1.

*Valve Seat Inspection*

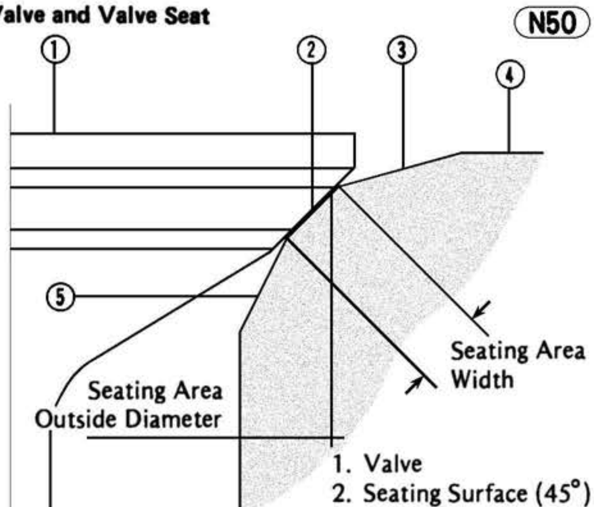
The valve must seat in the valve seat evenly around the circumference over the specified area. If the seating area is too wide, the seating pressure per unit of area is reduced, which may result in compression leakage and carbon accumulation on the seating surface. If the seating area is too narrow, heat transfer from the valve is reduced and the valve will overheat and warp. Uneven seating or seat damage will cause compression leakage.

- Remove the valve, and check to see if the valve and valve guide are in good condition before valve seat inspection.
- Apply machinist's dye to the valve seat, and then use a lapper to tap the valve lightly into place.
- Remove the valve, and note where the dye adheres to the valve seating surface. The distribution of the dye on the seating surface gives an indication of seat condition.
- If the distribution of the dye shows uneven seating or seat damage, or if the width or outside diameter of seating surface is out of the specified range, repair the valve seat.

**Table N11 Valve Seating Surface**

| | Inlet | Exhaust |
|---|---|---|
| Outside Diameter | 33.5 mm | 28.5 mm |
| Width | 0.5~1.0 mm | 0.5~1.0 mm |

**Valve and Valve Seat** (N50)




1. Valve
2. Seating Surface (45°)
3. Outer Surface (32°)
4. Valve Seat
5. Inner Surface (60°)

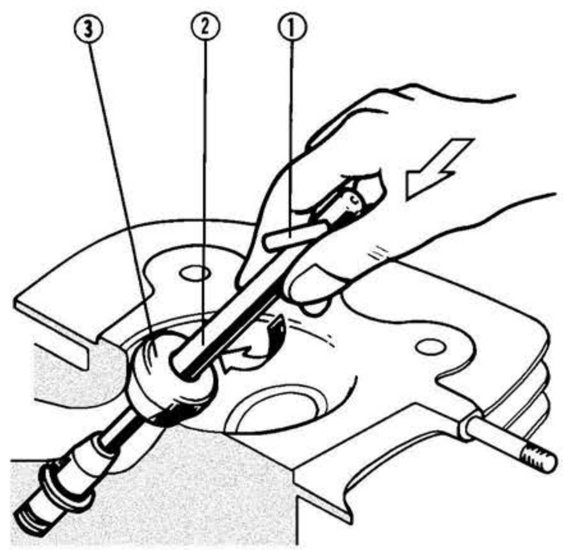
*Valve Seat Repair*

A valve seat which requires repair is cut with a set of valve seat cutters. Six seat cutters are required for complete repair; two 32°; two 45°; and two 60° seat cutters, one for the inlet and the other for the exhaust.

**NOTE:** When using the cutter, be sure to apply engine oil to the cutting part before grinding and also wipe off ground particles adhering to the cutter with washing oil.

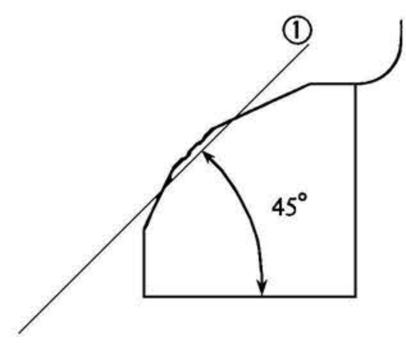
- First, cut the seating surface of the valve seat with the 45° seat cutter, cutter holder and bar (special tools). Cut only the amount necessary to make a good surface; overcutting will reduce the valve clearance, possibly making it no longer adjustable.

**Cutting Valve Seat** (N51)




1. Bar (57001-1128)
2. 7.0 mm Cutter Holder (57001-1126)
3. Seat Cutter

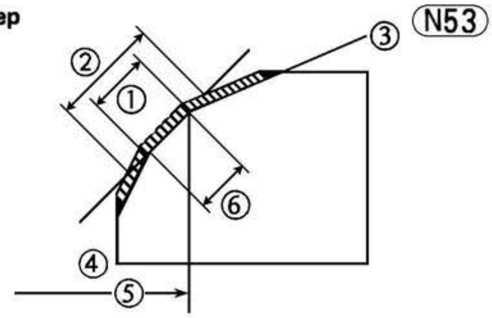
**First Step** (N52)




1. Cut Seating Surface with following cutters.
   Exhaust : #3 Seat Cutter (57001-1115)
   Inlet : #4 Seat Cutter (57001-1116)

- Next, cut the outermost surface with the outside cutter so that the valve seating surface will have the specified outside **diameter.**
- Then, cut the surface inside the seating surface with inside cutter so that the seating surface will have the specified **width.**

**Second Step**



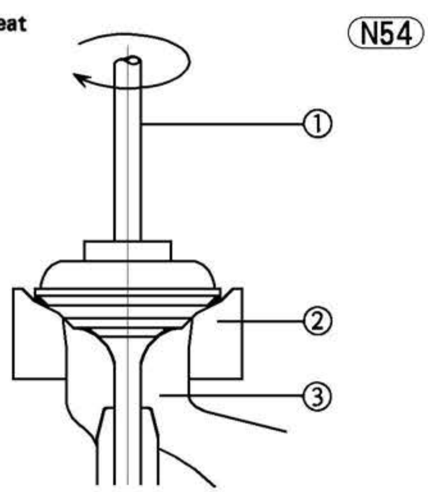

1. Original Seating Surface
2. New Seating Surface
3. Cut this surface to adjust outside diameter ⑤ of new seating surface with following cutters.
   Exhaust : #8 Outside Cutter (57001-1120)
   Inlet : #10 Outside Cutter (57001-1122)
4. Cut this surface to obtain correct width ⑥ with following cutters.
   Exhaust : #11 Inside Cutter (57001-1123)
   Inlet : #12 Inside Cutter (57001-1124)
5. Outside Diameter
6. Seating Area Width

After cutting, lap the valve to properly match the valve and valve seat surfaces. Start off with coarse lapping compound, and finish with fine compound.

●Apply compound to the valve seat, and tap the valve lightly into place while rotating it with a lapper, repeating this until a smooth, matched surface is obtained.

●When lapping is completed, check the valve installed height and adjust if necessary.

**Lapping Valve Seat**




1. Lapper
2. Valve Seat
3. Valve

## CYLINDER BLOCK, PISTONS

Refer to p.p. 182 – 186, noting the following.

### *Timing Advancer Drive Gear Inspection*

This inspection is not necessary becuase the timing gear is discontinued.

### *Cylinder Bearing Hole Wear*

To measure the bearing inside diameter for the timing advancer shaft is not necessary because the timing advancer shaft is discontinued.

## CRANKSHAFT, CONNECTING RODS, PRIMARY CHAIN

Refer to p.p. 186 – 190, noting the following.

### *Crankshaft bearing insert/journal wear*

●Split the crankcase, and clean off the mating surfaces of the crankcase halves.

●Cut strips of plastigauge to bearing insert width. Place a strip on each journal parallel to the crankshaft so the plastigauge will be compressed between the bearing insert and the crankshaft journal.

●Install the lower crankcase half without turning the crankshaft, and tighten the bolts in the correct sequence to the specified amount of torque (p. 101).

●Remove the lower crankcase half (making sure that the crankshaft does not turn at any time), and measure the plastigauge width to determine the bearing inset/journal wear. (See Fig. H70 on p. 188.)

★If any clearance exceeds the service limit, replace all bearing inserts (14) as follows.

**Table N12 Crankshaft Main Journal/Bearing Insert Clearance**

| Standard | Service Limit |
|---|---|
| 0.040 – 0.064 mm | 0.10 mm |

○Measure the diameter of the crankshaft main journals which wear on the bearing inserts. (See Fig. H71 on p. 189.)

☆If the measurement is less than the service limit, replace the crankshaft.

**Table N13 Crankshaft Main Journal Diameter**

| Marking | Standard | Service Limit |
|---|---|---|
| 1 | 39.992 – 40.000 mm | 39.96 mm |
| No Mark | 39.984 – 39.992 mm | |

☆If the measurement is 39.96 to 39.984 mm; install bearing inserts painted blue, and check the clearance between the crankshaft main journal and the bearing inserts using plastigauge. The clearance may exceed the standard slightly (Table N12), but it must not be less than the minimum in order to avoid bearing seizure.

☆If the measurement is 39.984 to 40.000 mm, check to see that the measurement is within the range which the mark on the crankshaft indicates. (See Table N13.) If it is not, make a new mark on the crankshaft in accordance with Table N13.

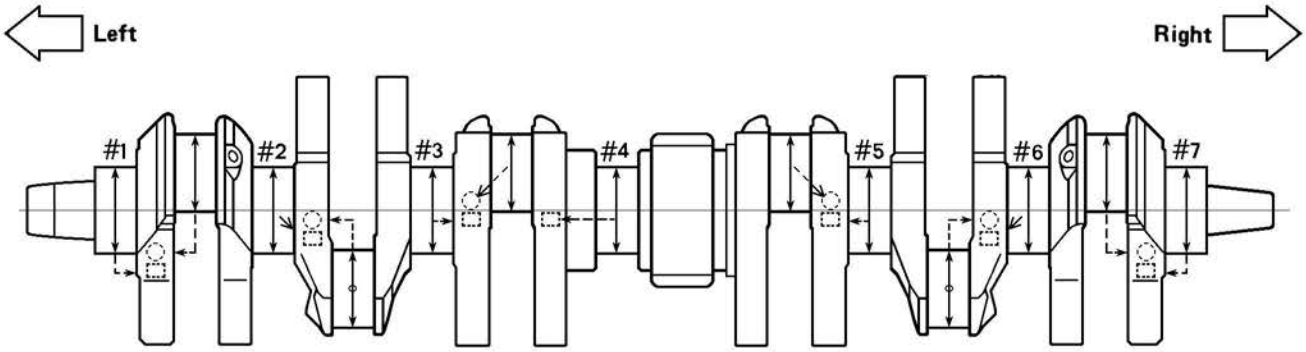
○For each main bearing, select the proper size of two bearing inserts (each one for upper and lower crankcase halves) in accordance with the combination of the marks on the upper crankcase half and crankshaft, following the Table N15. Bearing insert size (thickness) is identified by color which is painted on the side.

**Table N14 Crankshaft Main Bearing Insert Thickness and Marking Color**

| Color | Thickness |
|---|---|
| Brown | 1.485 – 1.489 mm |
| Black | 1.489 – 1.493 mm |
| Blue | 1.493 – 1.497 mm |

**Location of Crankshaft Marks**

N55



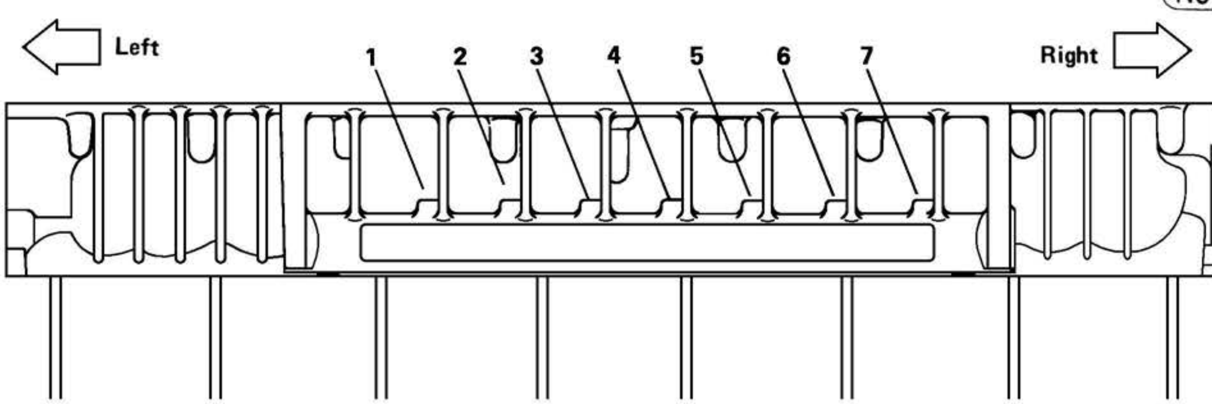

Location of Crankshaft Marks: Squares show areas where marks for main journal size are engraved. Circles show areas where marks for crankpin size are engraved.

**Table N15 Bearing Insert Selection**

| Crankcase Marking | Crankshaft Marking | Proper Bearing Insert | | Remarks |
|---|---|---|---|---|
| | | Color | Part Number | |
| ○ | 1 | Brown | 92028-1105 | Grooved inserts for #1, #3, #5, and #7 bearings |
| | | | 92028-1108 | Non-grooved inserts for #2, #4, and #6 bearings |
| ○ | No Mark | Black | 92028-1104 | Grooved inserts for #1, #3, #5, and #7 bearings |
| | | | 92028-1107 | Non-grooved inserts for #2, #4, and #6 bearings. |
| No Mark | 1 | Black | 92028-1104 | Grooved inserts for #1, #3, #5, and #7 bearings |
| | | | 92028-1107 | Non-grooved inserts for #2, #4, and #6 bearings |
| No Mark | No Mark | Blue | 92028-1103 | Grooved inserts for #1, #3, #5, and #7 bearings |
| | | | 92028-1106 | Non-grooved inserts for #2, #4, and #6 bearings |

**Location of Crankcase Marks**

N56




Location of Crankcase Marks: Illustration shows upper crankcase half that is viewed from front and positioned upside down. Marks for main bearing bore size are engraved on areas called out by numbers 1 through 7. Each number shows main bearing number (Numbering method, left to right).

**Table N16 Main Bearing Bore Diameter and Marking**

| Marking | Diameter |
|---|---|
| No Mark | 43.008 – 43.016 mm |
| ○ | 43.000 – 43.008 mm |

## TRANSMISSION, BEVEL GEARS

### Sprial Bevel Gears:

*External shift mechanism inspection*

Refer to p. 195, noting the following.

**Table N17 Positioning Pin Spring Free Length**

| | |
|---|---|
| Service Limit | 30.7 mm |

## OIL PRESSURE/LEVEL WARNING SYSTEM

### Introduction:

The oil pressure/level warning system has been newly installed to warn both decreased oil level and/or low oil pressure in the engine. This system includes the oil pressure/level warning light, oil pressure switch, oil level sensor, and oil level warning light switch.

The oil pressure/level warning light warns the low oil pressure and level in the engine. With the motorcycle held perpendicular to the ground, if the warning light comes on when the ignition switch is turned on and then goes off after engine starting off, both the oil pressure and oil level are normal. If the warning light goes on continuously after engine starting, it shows the low oil pressure or level, necessitating oil level and engine inspection. If the warning light comes on during riding, it shows the low oil pressure.

### Operation of Oil Pressure/Level Warning System:

The oil pressure/level warning system is shown in Fig. N57. The oil pressure switch is on when the engine is stopped (i.e. the oil pressure is low.), and is off when the engine is running (i.e. the oil pressure is correct.). The oil level sensor is on when the oil level in the engine is correct, and is off when the oil level is low. The control circuit in the oil level warning light switch commits the oil level sensor condition (i.e. on or off) to memory when the ignition switch is turned on, and also it controls the transistor.

If the oil level is low (i.e. the oil level sensor is off.) when the ignition switch is turned on, the transistor conducts by means of the control circuit. So the oil pressure/level warning light is on, and it is on continuously with no relation to the oil pressure switch condition until the correct oil level is obtained and the ignition switch is turned off.

If the oil level is correct (i.e. the oil level sensor is on.) when the ignition switch is turned on, the transistor does not conduct. So the warning light is on or off according to the oil pressure switch condition. Therefore, if the warning light is on after engine starting or comes on during riding, it shows that the oil pressure is low, and if the warning light is off engine starting, it shows that both the oil pressure and level are in good condition.

### Troubleshooting Guide:

If trouble suspected in this system, check the system by the following "Oil Pressure/Level Warning System Toubleshooting Guide" shown in Fig. N58. This toubleshooting guide is explained on the assumption that the ignition switch, engine stop switch, fuse, and battery are in good condition. To use this chart, follow the arrows on the chart selecting a "Yes" or "No" arrow at each diamond-shaped step until you reach the "End". Each test procedure is explained individually.

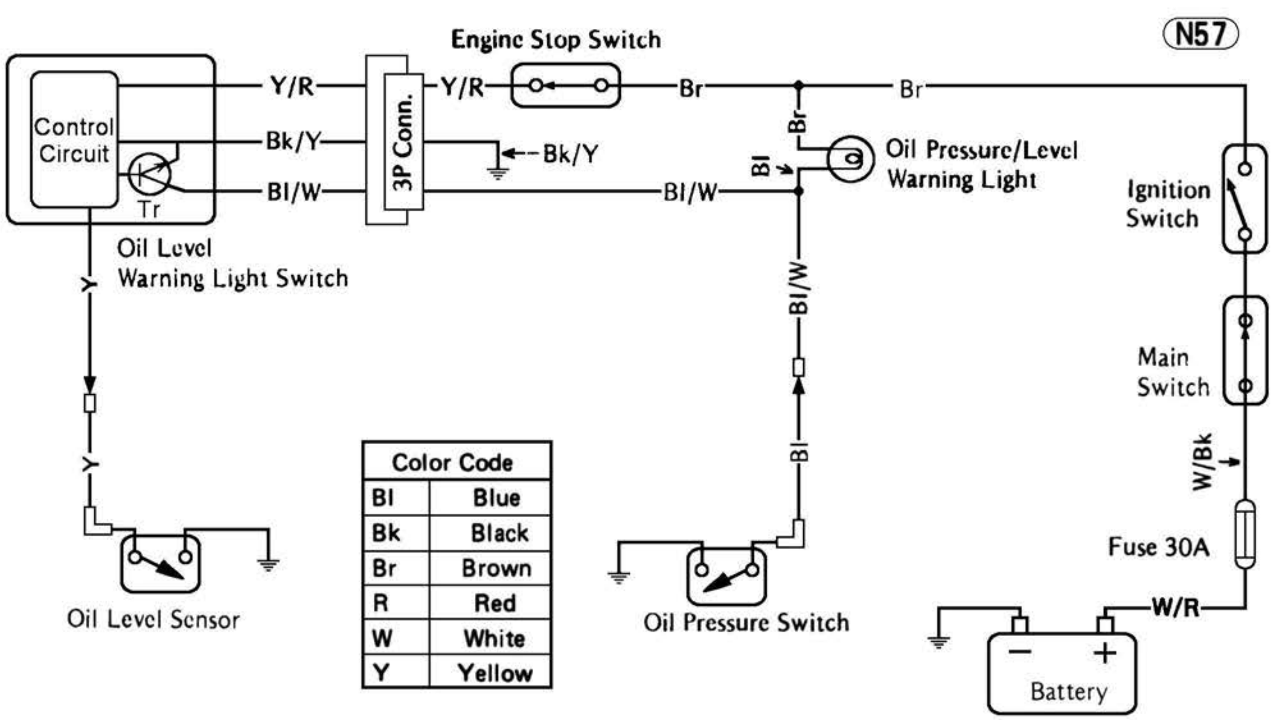
### Description of Each Test Procedure:

**1. Engine Oil Level Inspection**
Refer to p. 306.

**2. To Check the Voltage Applied to Oil Pressure Switch**
Refer to p. 200.

**3. Oil Pressure Switch Inspection**
Check the oil pressure switch with engine stopped referring to p. 200.

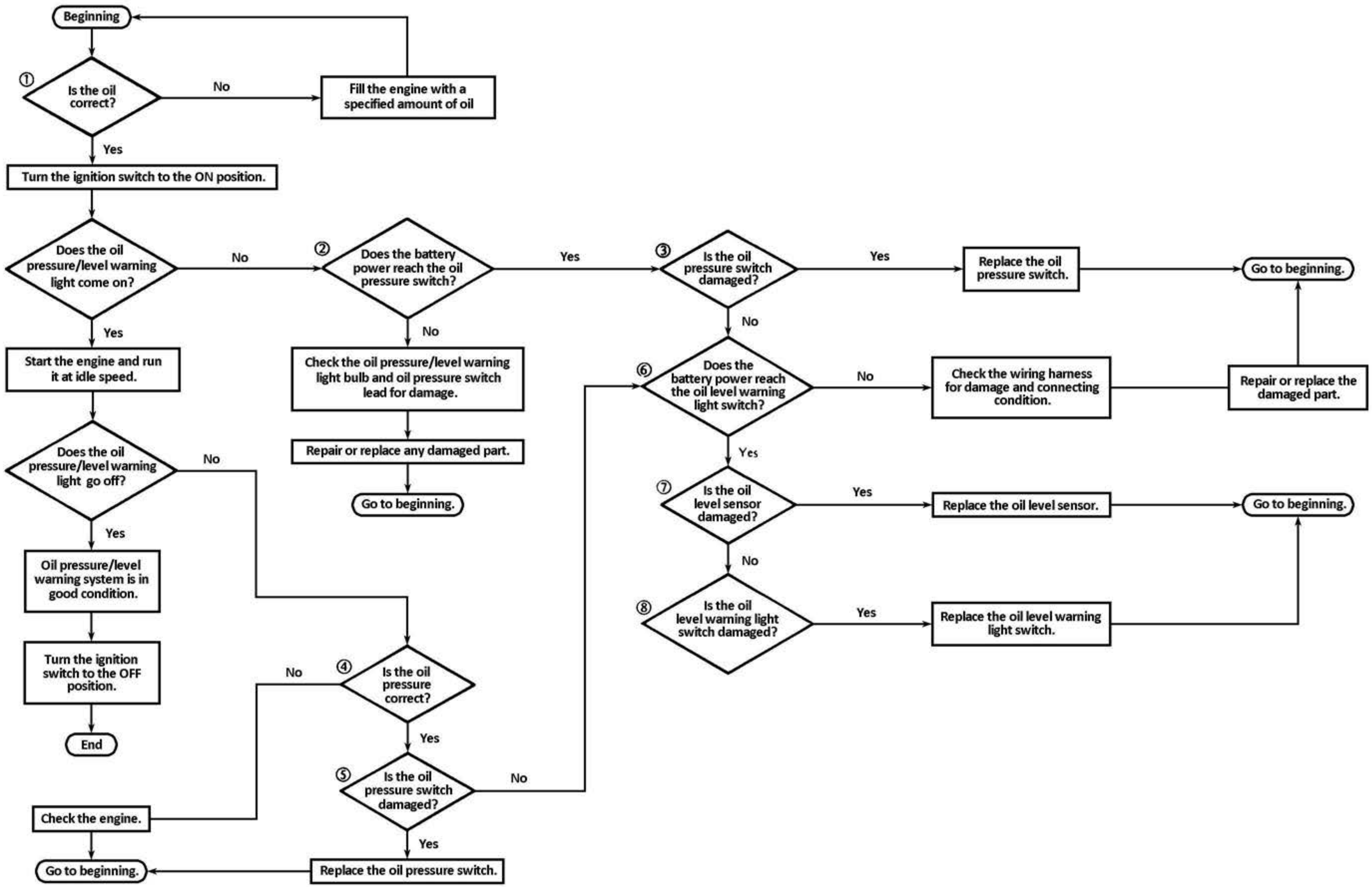
**Oil Pressure/Level Warning System**




| Color Code | |
|---|---|
| Bl | Blue |
| Bk | Black |
| Br | Brown |
| R | Red |
| W | White |
| Y | Yellow |

## Oil Pressure/Level Warning System Troubleshooting Guide






NOTE: Test proceedures 1 through 8 are explained individually.

**4. Engine Oil Pressure Measurement**
Refer to p. 200.

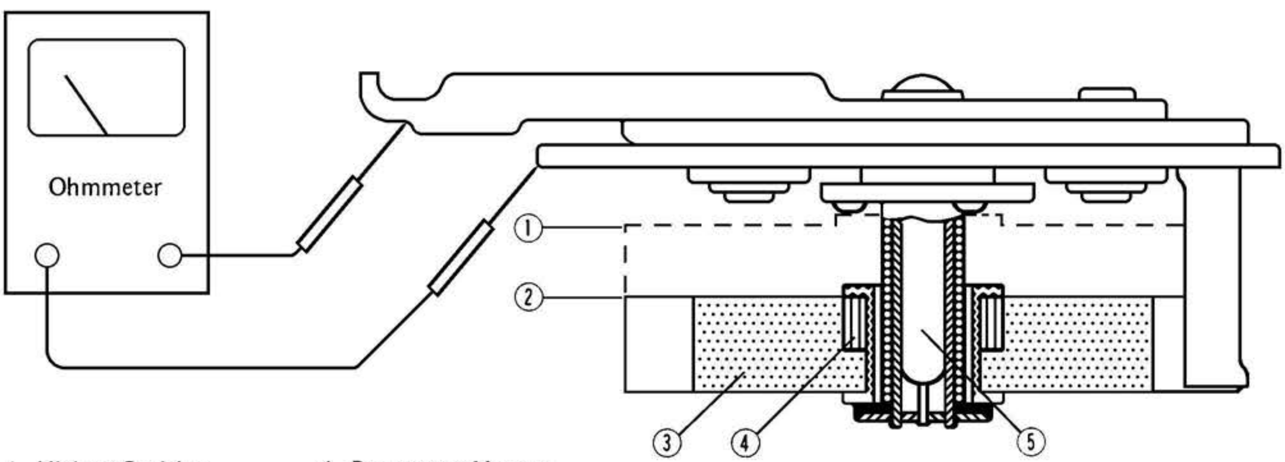
**5. Oil Pressure Switch Inspection**
Check the oil pressure switch with engine running at idle speed referring to p. 200.

**6. To Check the Voltage Applied to the Oil Level Warning Light Switch**
- Make sure that the ignition switch is off.
- Remove the right side cover.
- Disconnect the 3-pin connector from the oil level warning light switch beneath the regulator/rectifier.
- Connect the multimeter as shown in Table N18.
- Turn the ignition switch on, and measure the lead voltage.
- Turn the ignition switch off.
- Connect the 3-pin connector and install the right side cover.

**7. Oil Level Sensor Inspection**
Inspect the oil level sensor with either method mentioned below.
(a) Inspection with the oil level sensor installed
- Remove the right side cover.
- Disconnect the yellow lead beneath the regulator/rectifier which connects the oil level sensor to the oil level warning light switch.
- Connect the ohmmeter as shown in Table N19 to check the continuity of the oil level sensor.
- Connect the yellow lead and install the right side cover.

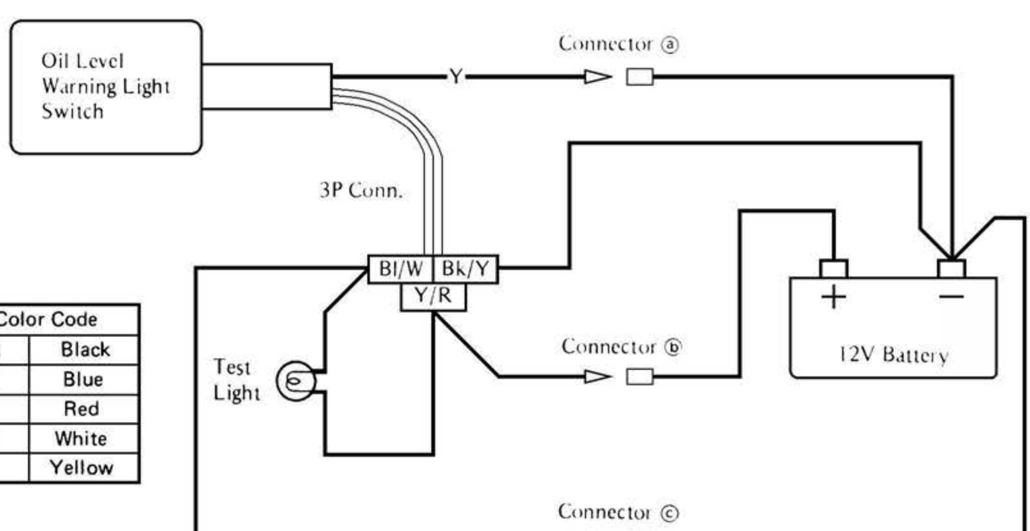
(b) Inspection with the oil level sensor removed
- Remove the oil level sensor in the oil pan.
- Connect the ohmmeter as shown in Fig. N59 to check the continuity of the oil level sensor.

**Oil Level Sensor Inspection** (N59)




1. Highest Position
2. Lowest Position
3. Float
4. Parmanent Magnet
5. Magnetic-reed Switch

**Oil Level Warning Light Switch Inspection** (N60)




| Color Code | |
|---|---|
| Bk | Black |
| Bl | Blue |
| R | Red |
| W | White |
| Y | Yellow |

**Table N18 Voltage Applied to Oil Level Warning Light Switch**

| | |
|---|---|
| Meter Range: | 25V DC |
| Lead Location: | Female, warning light switch connector with male connector disconnedted. |
| Connections: | Meter (+) → Yellow/Red or Blue/White<br>Meter (–) → Black/Yellow |
| Reading: | Vattery Voltage |

**Table N19 Oil Level Sensor Inspection**

| | |
|---|---|
| Meter Range: | x 1 Ω |
| Lead Location: | Female, level sensor lead with male lead disconnected. |
| Connections: | Meter (+) → Yellow<br>Meter (–) → Ground |
| Reading: | Under 0.5 Ω<br>(when the oil level correct.)<br>Infinity<br>(After draining out the oil completely.) |

**Table N20 Oil Level Sensor Inspection**

| Meter Range | Float Position | Reading |
|---|---|---|
| x 1 Ω | Highest | Under 0.5 Ω |
| | Lowest | Infinity |

**8. Oil Level Warning Light Switch Inspection**

- Remove the oil level warning light switch near the main switch.
- Prepare a 12V battery, test light made from about 12V3W bulb in a socket, and leads.
- Connect the battery and test light as shown in Fig. N58 to simulate the oil pressure/level warning system.
- Connect the connector ⓐ, and then connect the connector ⓑ.
- At this time, check to see that the test light comes on and off according to the condition of the connector ⓒ (i.e. on and off).
- Disconnect the connectors ⓐ, ⓑ, and ⓒ, and then connect the connector ⓑ.
- At this time, check to see that the test light comes on and it is on continuously with no relation to the condition of the connector ⓒ until the connector ⓑ is disconnected.
- If above two tests are normal, the oil level warning light switch is good.

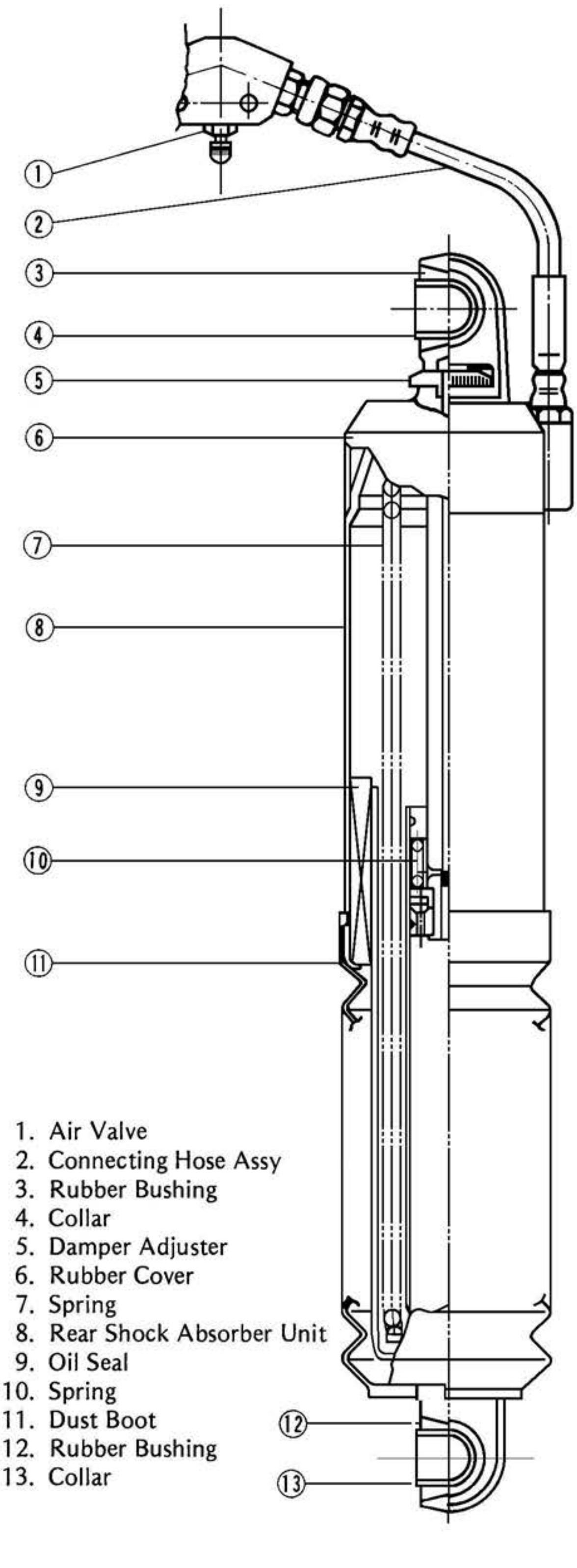
## FRONT FORK

The front fork for 1981 model has the connecting hose assembly to equalize the air pressure between the left and right fork legs. Change the fork oil refering to p.p. 226 and 313.

## REAR SHOCK ABOSRBER

Since the rear shock absorbers are sealed units which can not be disassembled, only external checks of rear shock absorbers are necessary. Replace the dust boot or connecting hose if it is cracked, torn, or otherwise damaged.

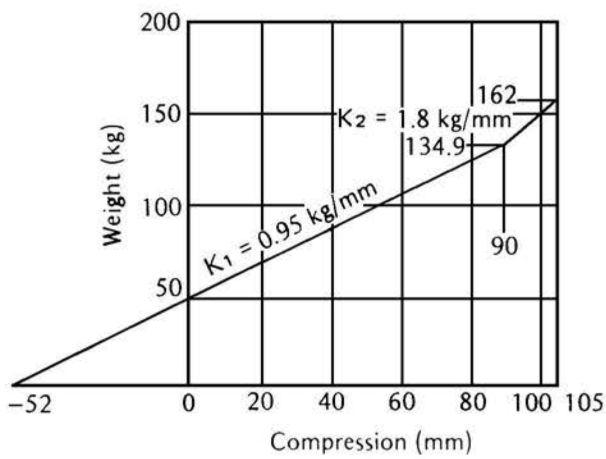
**Rear Shock Absorber** (N61)




1. Air Valve
2. Connecting Hose Assy
3. Rubber Bushing
4. Collar
5. Damper Adjuster
6. Rubber Cover
7. Spring
8. Rear Shock Absorber Unit
9. Oil Seal
10. Spring
11. Dust Boot
12. Rubber Bushing
13. Collar

The rear shock absorbers serve to damp shocks transmitted to the frame and rider from the rear wheel. For this purpose, they are connected between the frame and the rear end of the swing arm. Shock absorption is performed by the spring action, air compression in the unit and by the resistance to the flow of oil inside each unit. Shock absorption is further aided by the use of rubber bushings in both the upper and lower shock absorber mountings.

**Rear Shock Absorber Spring Force (per one unit)** (N62)




*Bushing inspection*

Check the rubber bushings, and replace any that are worn, cracked, hardened, or otherwise damaged.

## IGNITION SYSTEM

### Introduction:

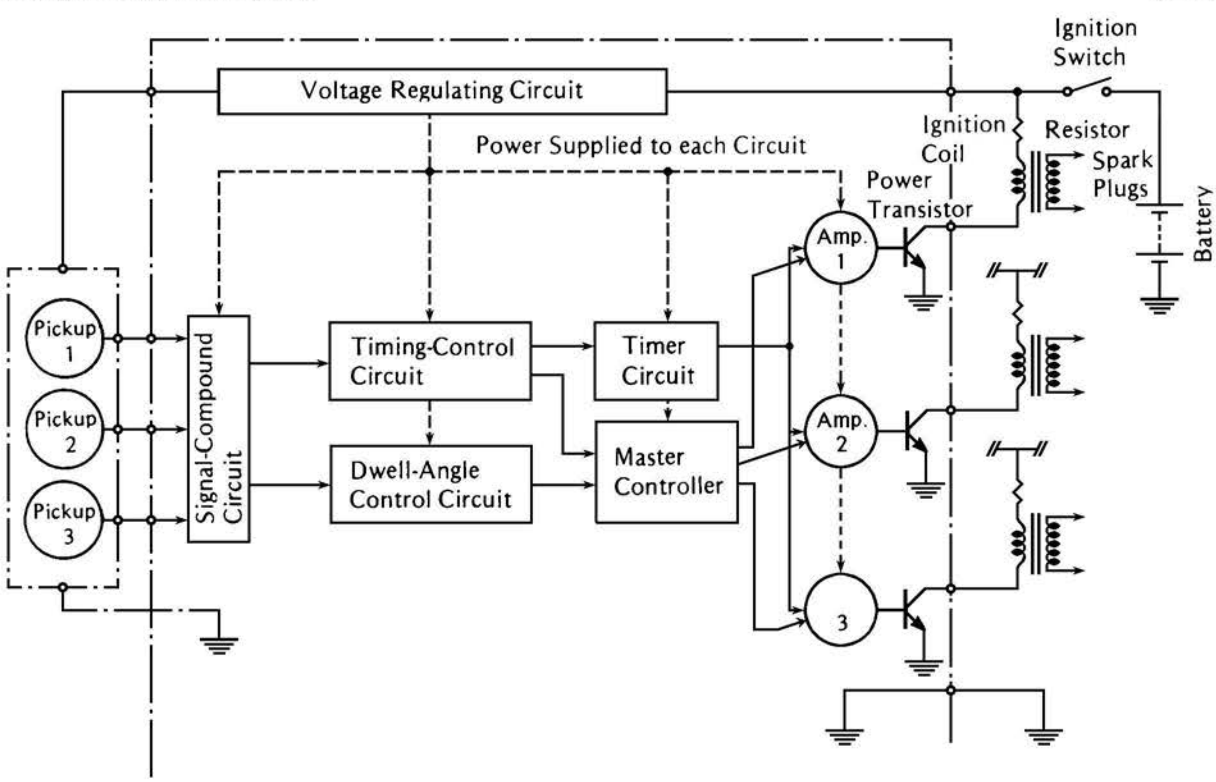
The 1981 model employs a newly-developed transistor ignition system. The new ignition system differs from the previous one in the following points: First, the ignition timing is advanced by an electric circuit in the IC igniter (electric advance system). Secondly, the Hall-effect element is used in the pickup system. Finally, the internal circuitry of the IC igniter cannot be separated into three independent parts. Since there are no moving mechanical parts to wear out, no periodic maintenance for the 1981 model ignition system is required. The working electrical part of the ignition system consists of a battery, three Hall-IC pickups, an IC igniter, a resistor, and three ignition coils.

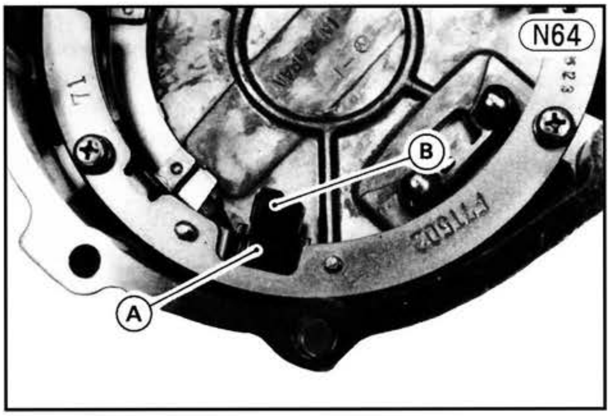
### Main Component Parts:

**Pickups:**

Three pickups are fastened inside the left engine cover, and equally spaced on a circle. One is for #1 and #6 cylinders, another for #2 and #5 cylinders, and the third for #3 and #4 cylinders. A Hall IC is employed in the pickup for its constant output voltage from low to high speed engine operation.

**Block Diagram of Ignition System** (N63)






**A. Hall IC** **B. Permanent Magnet**

The Hall IC is a magnetic-field detector into which a Hall-effect element (a semiconductor device capable of generating voltage when a magnetic field passes through it) and an amplifier for output voltage are integrated into one compact unit. The Hall-effect element consists of a wafer of semiconductor material. A direct current, called the control current, is applied to the element by means of ohmic contacts placed at the ends of the Hall element. This produces a flow of charge carriers lengthwise through the element. In the absence of a magnetic field, these charge carriers flow in a direct path between the two ends of the element, and no voltage appears at the two electrodes placed at the edge of the element.

When the Hall-effect element is subjected to a magnetic field, the charge carriers are deflected from their straight path and contact one of the two side electrodes, depending on the polarity of the applied magnetic field. A voltage difference now exists between the two side electrodes, and a current will pass between them. When the control current remains constant, the developed Hall voltage is a function of the **intensity** of the magnetic field. In this respect the Hall IC differs from an inductor type detector; output voltage of which is a function of the **time rate** of the magnetic field intensity.

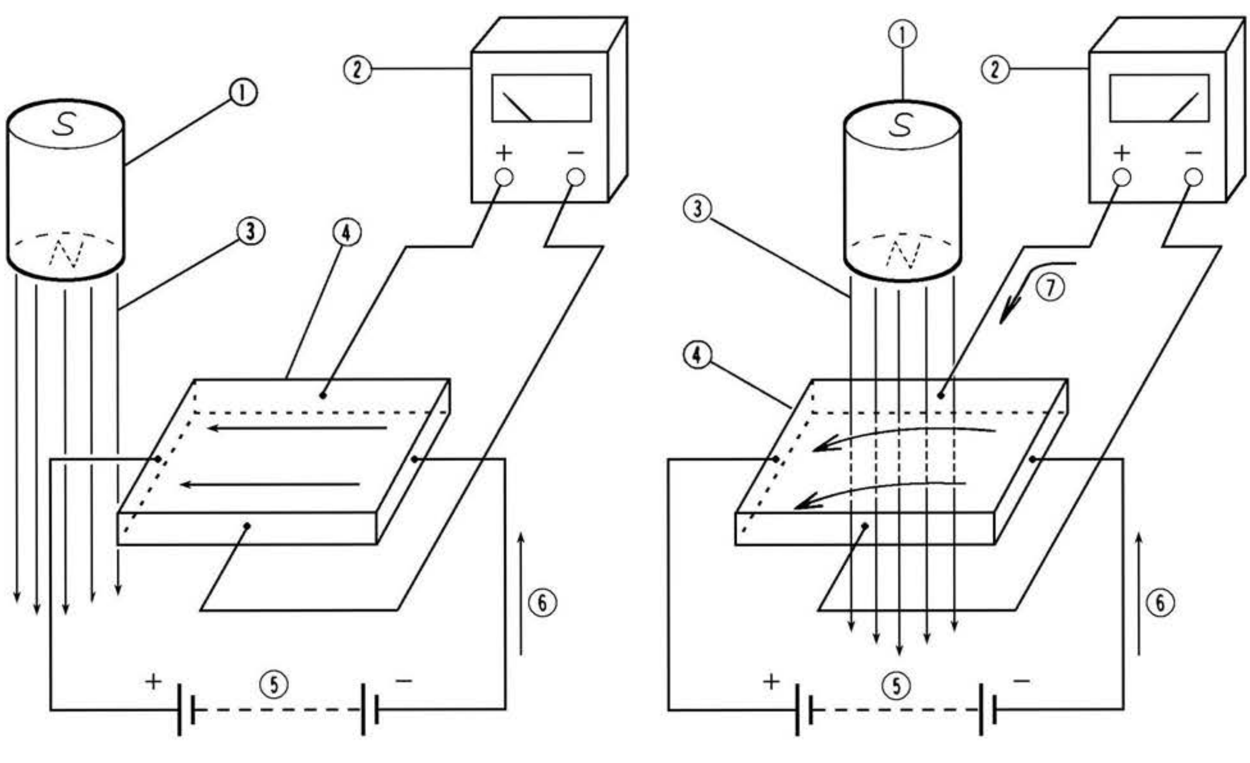
Each pickup consists of a permanent magnet and Hall IC (single unit) and a timing rotor (made of soft iron and used in common with the other two pickups). The magnet and Hall IC unit is fastened to the left engine cover.

**Hall Effect**

N65

A. Hall current will not flow when there is no magnetic field through the Hall-effect element.

B. Hall current will flow when the Hall-effect element is subject to a magnetic field.

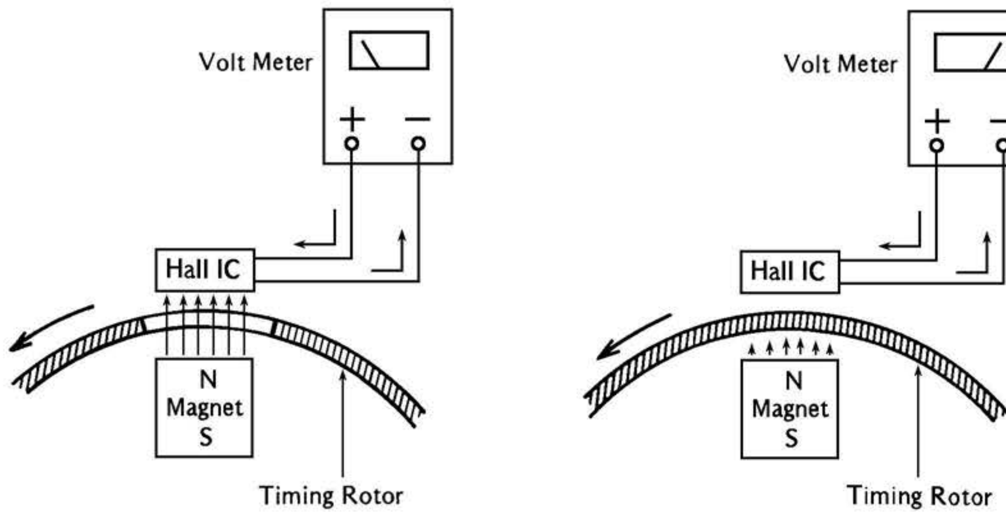



1. Magnet
2. Volt Meter
3. Magnetic Field
4. Hall-Effect Element
5. Battery
6. Control Current
7. Hall Current

The timing rotor is mounted on the crankshaft through the starter motor clutch by means of a positioning key. The rim part of the timing rotor has two holes 45 degrees apart from each other, and runs between the Hall IC and the permanent magnet. When the metal part of the rotor is between the Hall IC and the magnet, the magnetic field developed by the magnet is intercepted and the Hall IC does not send signals to the IC igniter. When a hole is between the Hall IC and the permanent magnet, the hole permits the magnetic field to reach the Hall IC and a signal is sent to the IC igniter. Thus, two pulses per one crankshaft revolution from each pickup are sent to the IC igniter. The polarity of these pulses are negative for shorter rise time.

**Pulse Generating Mechanism**

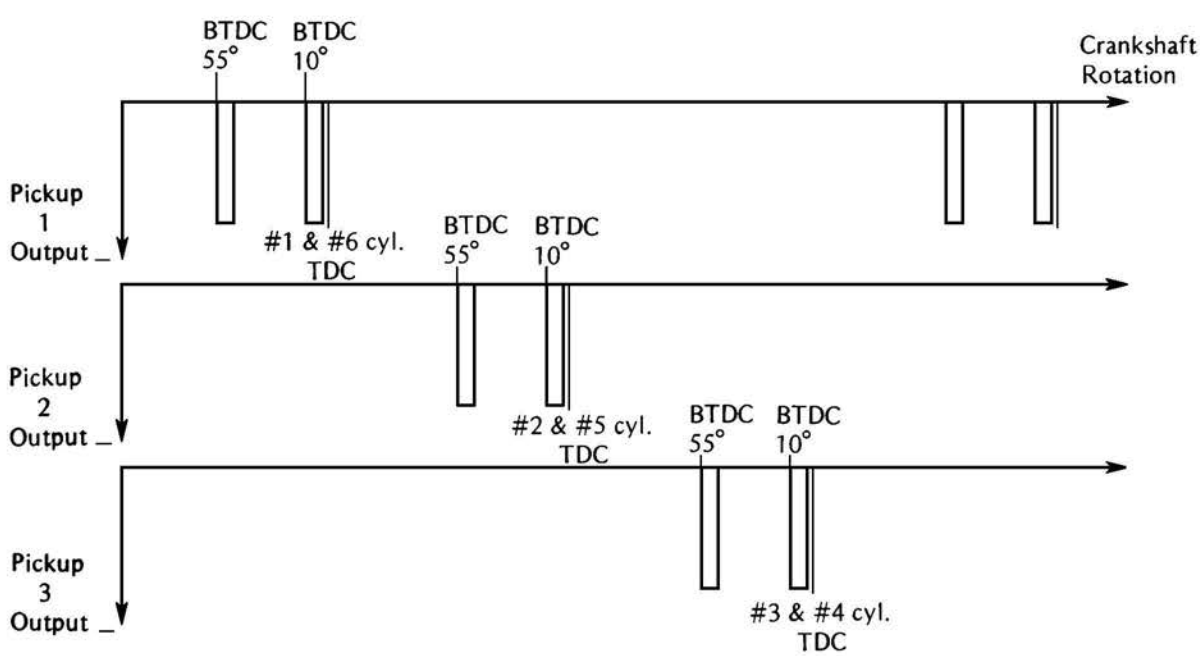
(N66)




1. Pulse is generated when opening is under Hall IC.
2. Pulse is not generated when metal part is under Hall IC.

**Outputs of Pickups**

(N67)

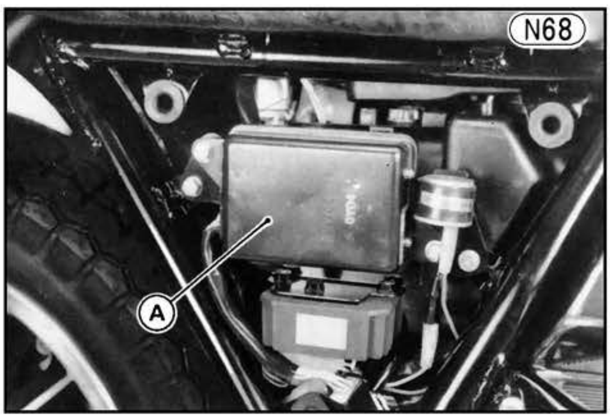


**Igniter:**

The IC igniter has the following functions as well as the functions explained in the introduction.

1. Time-controlled cutting off

If the ignition switch is left turned on but the engine is not running, the primary current may continue to flow through a certain ignition coil (depending on the crankshaft position). If this condition continues, the battery will be discharged, and the ignition coil and the power transistor will be damaged by overheating. To prevent such a problem, a timer circuit is provided to cut off the primary current automatically a few seconds after the engine stops. However, once the engine is cranked and the first signal from the pickup arrives at the igniter, the timer circuit returns to its original state to permit the primary current to flow.




**A. IC Igniter**

2. Dwell-angle control

The dwell angle is electronically controlled so that it increases as the engine speed increases. This is to save the electric power at low engine speed, and to produce a spark of sufficient strength at high engine speed.

3. Voltage regulating

A voltage regulating circuit is equipped in the circuitry. The voltage regulating circuit supplies an even voltage (6 volts) to the other circuits in the igniter despite variations in battery voltage. As a result, stable operation of the igniter is ensured. Moreover, the voltage regulating circuit protects the circuitry from surge currents in the power lines.

The internal circuits of the IC igniter of the 1979 and 1980 models consists of three separate parts. Each part works independently for each pair of cylinders. For the 1981 model IC igniter, the internal circuits other than the amplifier circuits are used in common for all cylinders. This makes the IC igniter more compact. The signal-compound circuit gathers up the pulses sent from the three pickups, and sends them to the timing-control and the dwell-angle control circuits. These circuits dictate the proper ignition timing and dwell angle to the master controller. The master controller distributes the control signals to the correct amplifier to ignite the cylinders.

## Safety Instructions:

There are a number of important precautions that must be observed when servicing the transistor ignition system. Failure to observe these precautions can result in serious system damage. Learn and observe all the rules listed below.

1. **Because of limited capacity of the voltage regulating circuit in the IC igniter, 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 IC igniter damage.**
2. **Do not install the battery backwards. The negative side is grounded. This is to prevent damage to the diodes.**

### *Ignition system troubleshooting guide*

If trouble is suspected in the ignition system, check the system by the following procedure.

An example of troubleshooting is shown in Fig. N70. To use this chart, follow the arrows on the chart selecting a "yes" or "no" arrow at each diamond-shaped step until you reach the "end". Each test procedure is explained individually.

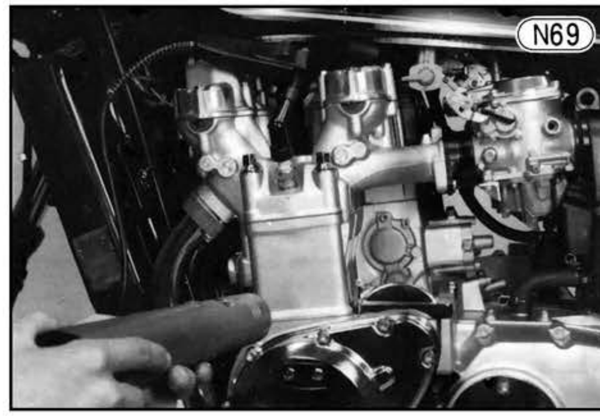
## Discription of Each Testing Procedure

**1. To Check the Ignition Spark**

•Connect the strobe light to each spark plug lead in the manner prescribed by the manufacturer.

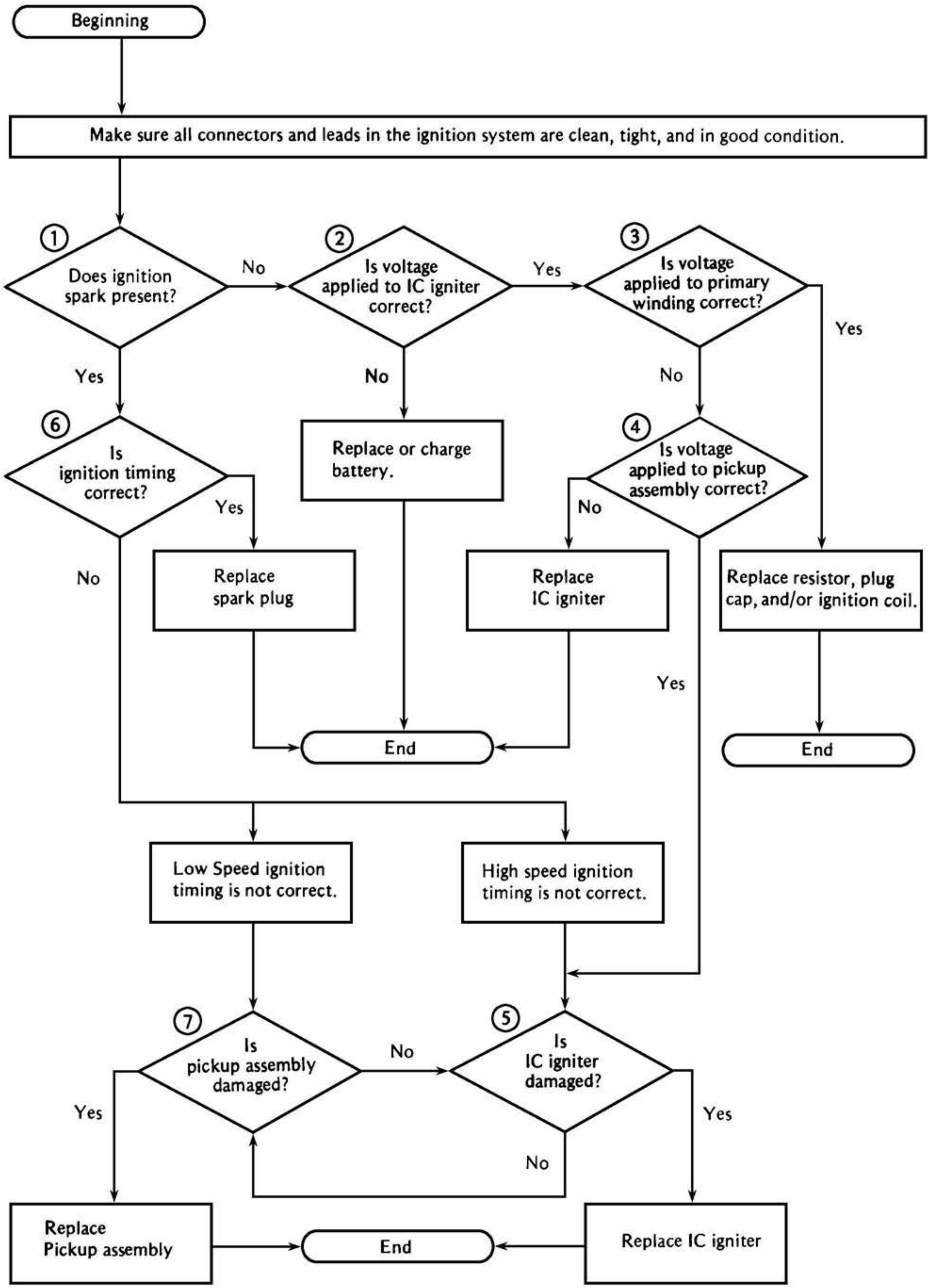
•Turn on the main switch, ignition switch, and engine stop switch.

★Push the starter button, and make sure that the strobe light goes on and off.



**Ignition System Troubleshooting Guide**

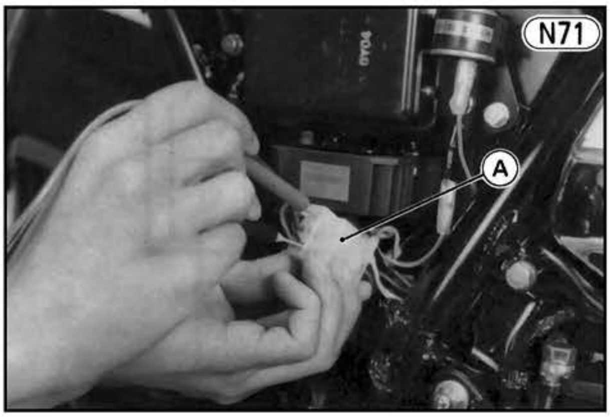
N70



**2. To Check the Voltage Applied to the IC Igniter**

- Remove the right side cover.
- Set the multimeter to the 25V DC range, and connect the meter (+) lead to the yellow/red lead and the meter (–) lead to the black/yellow lead from the IC igniter without disconnecting the IC igniter 6-pin connector.
- Turn on the main switch, ignition switch, and engine stop switch.

★Push the starter button, and make sure that the reading is more than 8 volts.




**A. 6-pin Connector**

**Table N21 Voltage Applied to IC Igniter**

| Meter Range | Connections | Reading |
|---|---|---|
| 25V DC | Meter (+) lead → Yellow/Red lead<br>Meter (–) lead → Black/Yellow lead | more than 8V |

**3. To check the Voltage Applied to Primary Winding**

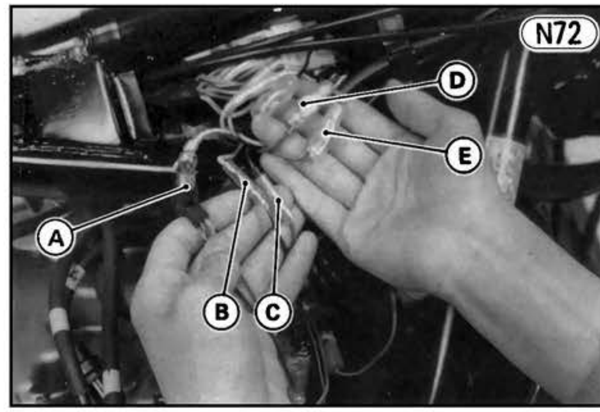
To check the voltage applied to primary winding, use a test light made from a 12V 3–4W bulb in a socket with leads.

- Remove the fuel tank.
- Disconnect the lead (black, green, or blue) to the ignition coil referring to Table N22.
- Disconnect the yellow lead to the resistor.
- Connect the test light between the lead (black, green, or blue) and yellow lead.
- Turn on the main switch, ignition switch, and engine stop switch.

★Push the starter button, and make sure that the test light goes on and off.

**Table N22 Ignition Coil Lead Color**

| #1 and #6 Cyl. | #2 and #5 Cyl. | #3 and #4 Cyl. |
|---|---|---|
| Black | Green | Blue |




**A. Test Light**
**B. Yellow Lead**
**C. Black Lead**
**D. Green Lead**
**E. Blue Lead**

**4. To Check the Voltage Applied to Pickup Assembly**

- Remove the right side cover.
- Set the multimeter to the 10V DC range, and connect the meter (+) lead to the white lead and the meter (--) lead to the gray lead from the IC igniter.
- Turn on the main switch, the ignition switch, and the engine stop switch.

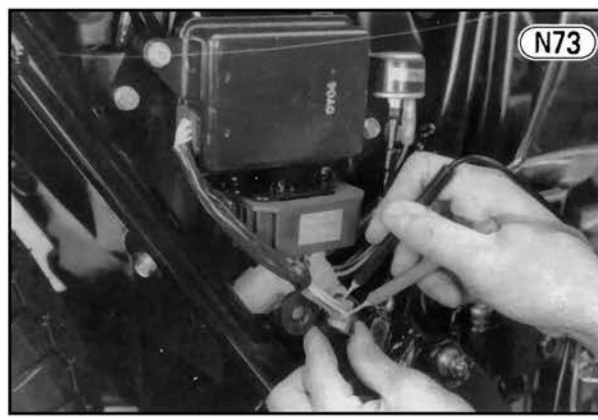



**Table N23 Voltage Applied to Pickup Assembly**

| Meter Range | Connections | Reading |
|---|---|---|
| 10V DC | Meter (+) lead → White lead<br>Meter (–) lead → Gray lead | 5.4–6.2V |

★Make sure that the voltage applied to pickup assembly is specified value shown in Table N23.

**5. IC Igniter Inspection**

The most accurate test for determining the condition of IC igniter is made by measuring the resistance with the Kawasaki Hand Tester (Special Tool: P/N. 57001-983). Since a tester other than the Kawasaki Hand Tester may produce a different resistance, the Kawasaki Hand Tester should be used for reliable results.

CAUTION **Use only the Kawasaki Hand Tester (Special Tool) for this test. If a megger or a meter with a large-capacity battery is used, the IC igniter will be damaged.**

- Remove the right side cover.
- Disconnect the two 6-pin connectors from the IC igniter.
- Connect the Kawasaki Hand Tester as shown in Table N24 to check the internal resistance of the IC igniter. The reading should show the value in Table N24.

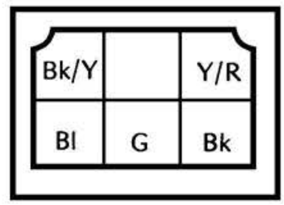
**6. Dynamic Ignition Timing Test**

Check the ignition timing with a strobe light for both low and high speed operation. Timing advance begins at about 1,400 rpm and reaches the maximum advance at about 2,800 rpm. As the result, the timing must be checked at idle (low speed operation) and then above 3,000 rpm (high speed operation) when it is fully advanced. The ignition timing/engine speed relationship is shown in Fig. N74.

**Table N24 IC Igniter Inspection Using a Kawasaki Hand Tester (Meter Range: x1kΩ)**

**(a) Male 6-pin Connector**

| Tester Negative (−) Lead Connection / Lead Color | Tester Positive (+) Lead Connection: Y/R | Bk/Y | Bk | G | Bl |
|---|---|---|---|---|---|
| Y/R | | A | B | B | B |
| Bk/Y | A | | B | B | B |
| Bk | ∞ | ∞ | | ∞ | ∞ |
| G | ∞ | ∞ | ∞ | | ∞ |
| Bl | ∞ | ∞ | ∞ | ∞ | |

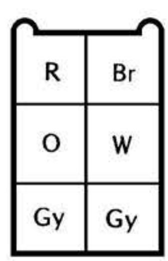



| Value (kΩ) | |
|---|---|
| A | 0.75–0.90 |
| B | 2.4–3.9 |
| C | 11–12 |
| D | 5.0–6.5 |
| E | 1.0–1.1 |
| ∞ | Infinity |
| 0 | Zero |

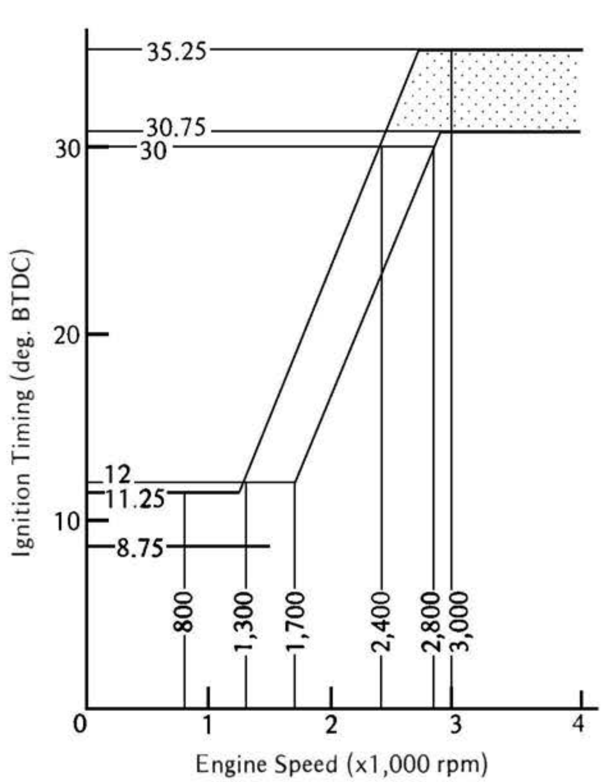
| Lead Color | |
|---|---|
| Bk | Black |
| Bl | Blue |
| Br | Brown |
| G | Green |
| Gy | Gray |
| O | Orange |
| R | Red |
| W | White |
| Y | Yellow |

**(b) Female 6-pin Connector**

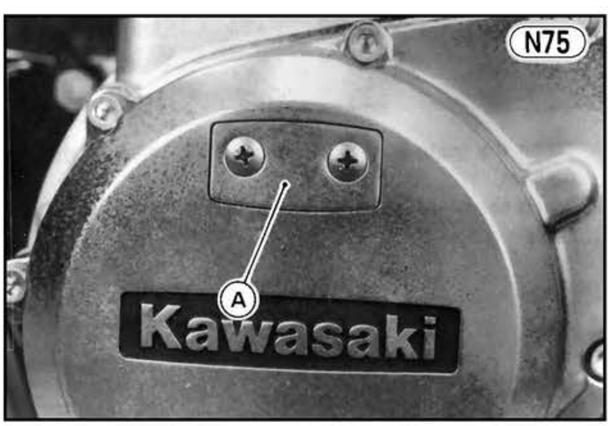
| Tester Negative (−) Lead Connection / Lead Color | Tester Positive (+) Lead Connection: Br | R | O | W | Gy | Gy |
|---|---|---|---|---|---|---|
| Br | | C | C | D | D | D |
| R | C | | C | D | D | D |
| O | C | C | | D | D | D |
| W | D | D | D | | E | E |
| Gy | D | D | D | E | | 0 |
| Gy | D | D | D | E | 0 | |



**Ignition Timing/Engine Speed Relationship** (N74)

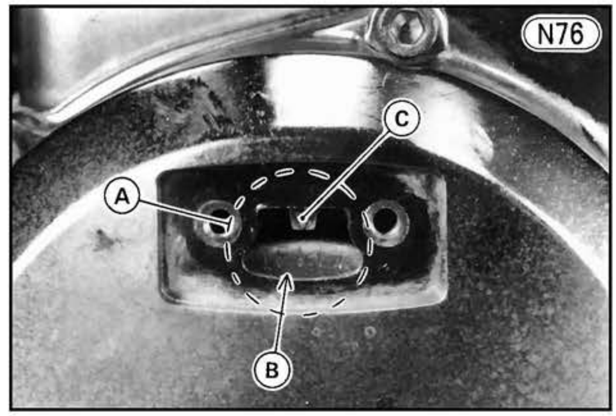



●Remove the inspection window cover.




A. Cover

●Connect a strobe light to the #1 or #6 spark plug lead in the manner prescribed by the manufacturer in order to check the ignition timing under operating conditions.
●Turn on the main switch, the ignition switch, and the engine stop switch. Start the engine, and direct the strobe light at the timing marks through the inspection window.
●At idle speed, the "F" mark on the timing rotor must be aligned with the timing mark on the left engine cover for correct low rpm ignition timing.

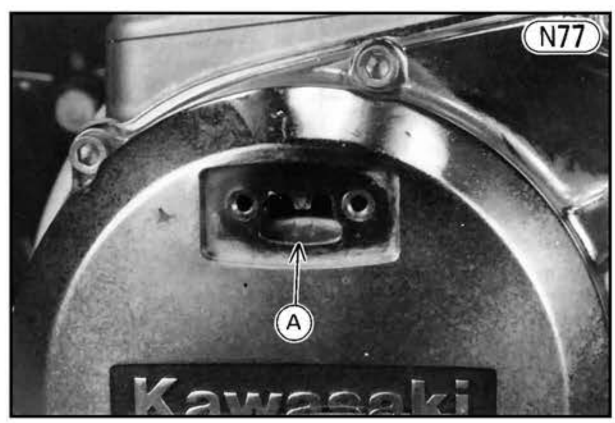



A. Inspection Window C. Timing Mark
B. "F" Mark

●Above 3,000 rpm, the timing mark on the left engine cover must be between the advanced timing mark on the timing rotor (a pair of the vertical lines) for correct high rpm ignition timing.

**Table N25 Timing Advancing**

| | Engine Speed |
|---|---|
| Advance Begins | About 1,400 rpm |
| Full Advance | About 2,800 rpm |




A. Timing Mark after Advanced

**7. Pickup Assembly Inspection**

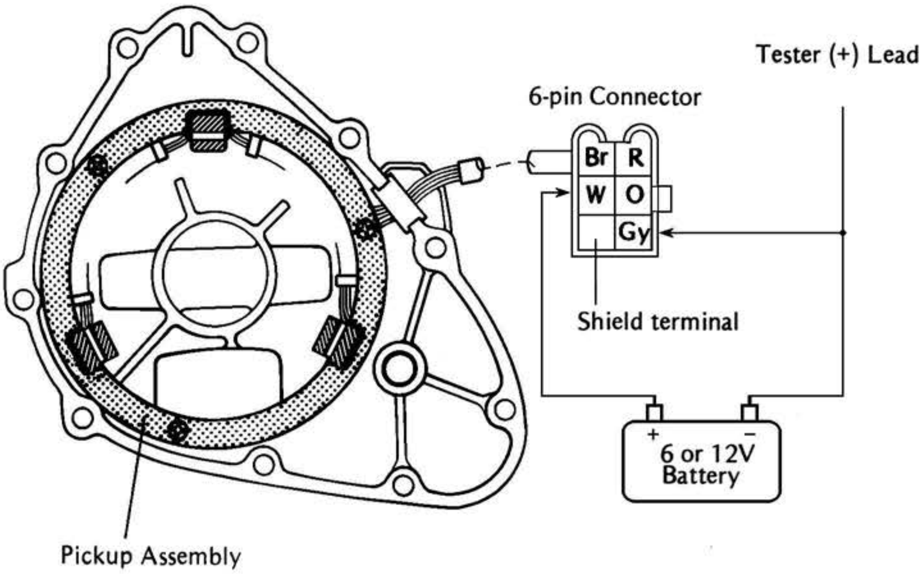
To test the pickup assembly, use a 6V or 12V battery with lead and thin plate made of soft iron.

**CAUTION** **Use only a the Kawasaki Hand Tester (Special Tool) for this test. If a megger or a meter with a large-capacity battery is used, the pickup assembly will be damaged.**

●Set a motorcycle on its center stand and put an oil pan beneath the left engine cover.
●Unscrew the left engine cover Allen bolts (10) and remove the cover.
●Remove the right side cover, and disconnect the 6-pin connector from the pickup assembly.
●Connect the battery (+) lead to the white lead and battery (−) lead to the gray lead from the pickup assembly as shown in Fig. N78.

**Pickup Assembly Inspection**

N78




| Lead Color | |
|---|---|
| Br | Brown |
| Gy | Gray |
| O | Orange |
| R | Red |
| W | White |

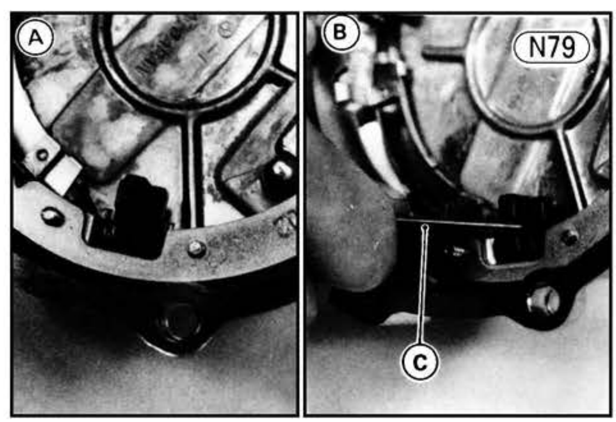
* : Connect the tester (–) lead to the Brown, Red, or Orange lead.

- See the Kawasaki Hand Tester to the x1kΩ range, and connect the Kawasaki Hand Tester as shown in Table N26. The reading should show the value in Table N26.

**Table N26 Pickup Assembly Resistance**

| | Tester (–) Lead | | |
|---|---|---|---|
| | Brown | Red | Orange |
| When the plate is not between the Hall IC and the magnet | About zero | About zero | About zero |
| When the plate is between the Hall IC and the magnet. | ∞ | ∞ | ∞ |

* : Connect the tester (+) lead to the battery (–) lead.

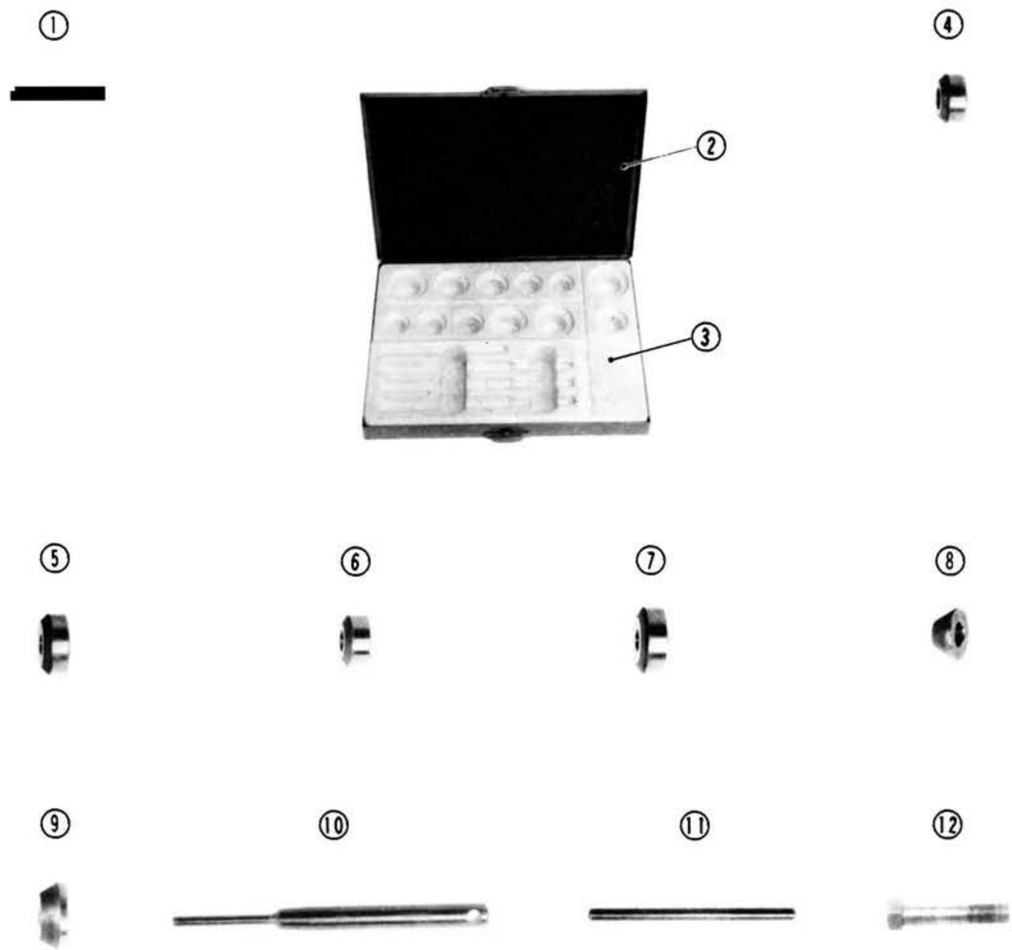



**A. When the plate is not between the Hall IC and the magnet.**
**B. When the plate is between the Hall IC and the magnet.**
**C. Plate**

# Appendix

## SPECIAL TOOLS

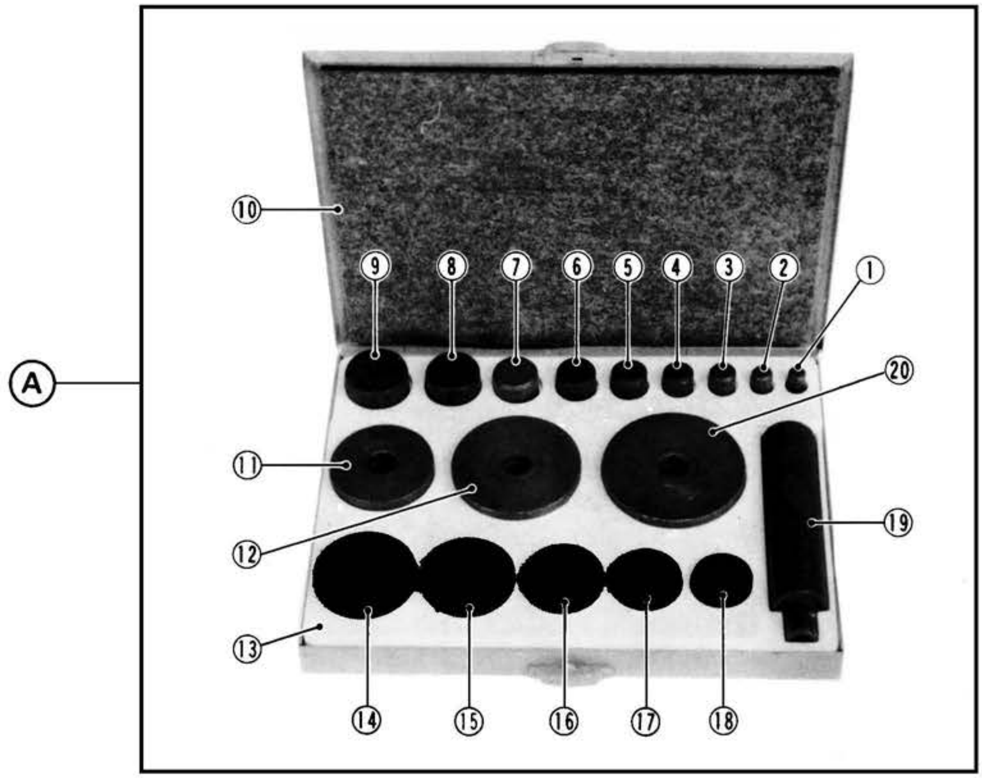
1. The following special tools are newly designed for this motorcycle, and are also available for the models before 1981 model except REF. NO. 12. Refer to Pgs. 296 and 272–277, noting the following.




| REF. NO. | PART NO. | DESCRIPTION | Q'TY |
|---|---|---|---|
| 1 | 57001-1082 | ROTOR PULLER ADAPTER | 1 |
| 2 | 57001-1111 | VALVE SEAT CUTTER CASE | 1 |
| 3 | 57001-1112 | SEPARATE CASE | 1 |
| 4 | 57001-1115 | SEAT CUTTER (#3) | 1 |
| 5 | 57001-1116 | SEAT CUTTER (#4) | 1 |
| 6 | 57001-1120 | OUTSIDE CUTTER (#8) | 1 |
| 7 | 57001-1122 | OUTSIDE CUTTER (#10) | 1 |
| 8 | 57001-1123 | INSIDE CUTTER (#11) | 1 |
| 9 | 57001-1124 | INSIDE CUTTER (#12) | 1 |
| 10 | 57001-1126 | CUTTER HOLDER | 1 |
| 11 | 57001-1128 | BAR | 1 |
| 12 | 57001-1150 | CAM DAMPER COMPRESSOR BOLT | 1 |

2. There are selections of inner and outer drivers to choose in the bearing driver set (Part No. 57001-1129), which can be used to press in the ball bearing on the engine and frame of all models. Also, this set can replace the older bearing drivers of the following part numbers.

| Part No | | | |
|---|---|---|---|
| | 57001-138 | 57001-284 | 57001-290 |
| | 57001-139 | 57001-286 | 57001-293 |
| | 57001-140 | 57001-287 | 57001-296 |
| | 57001-282 | 57001-288 | 57001-298 |
| | 57001-283 | 57001-289 | 57001-1053 |

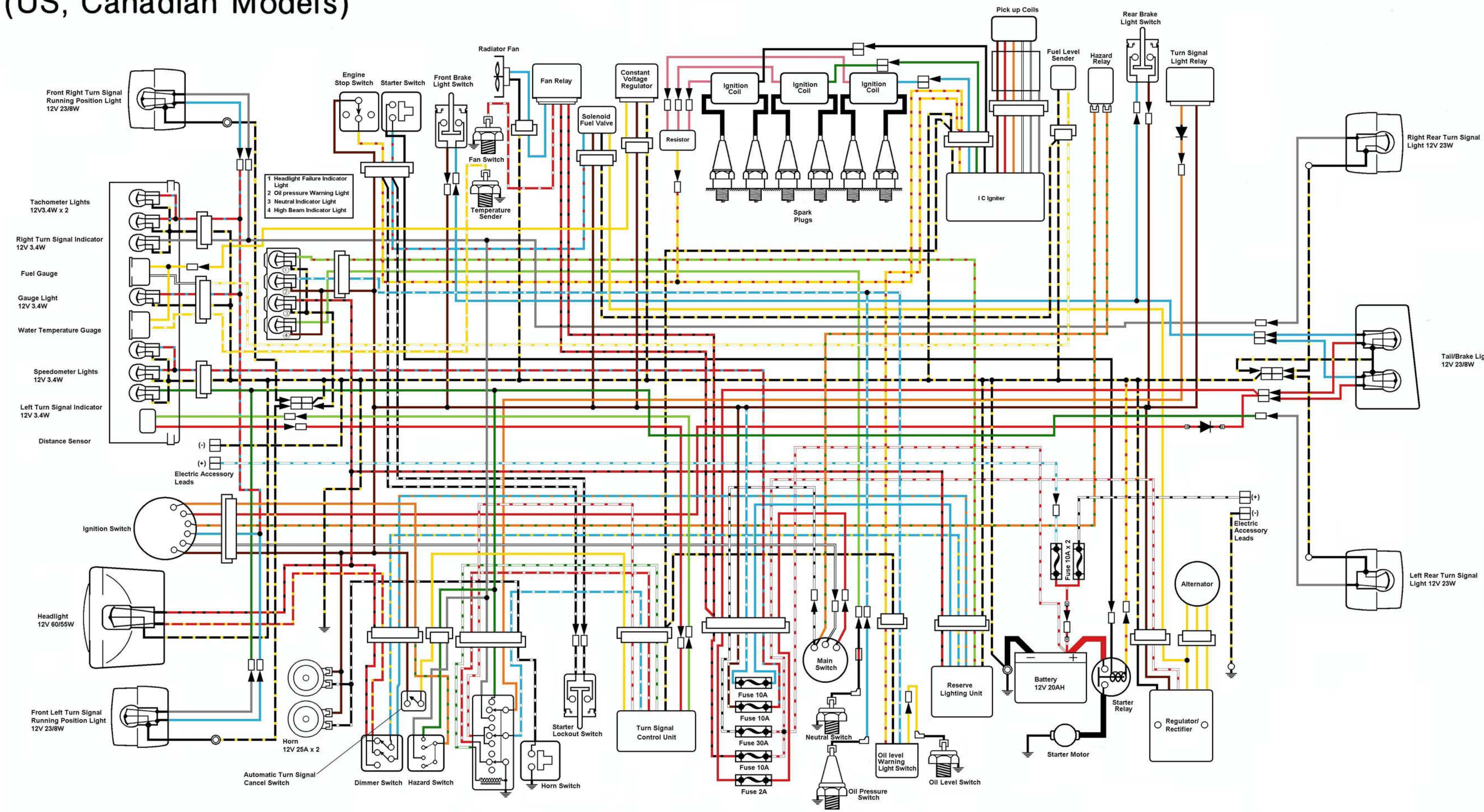



**A. Bearing Driver Set (57001-1129)**

| | Part No. | Part Name | | Part No. | Part Name |
|---|---|---|---|---|---|
| 1. | 57001-1133 | Inner Driver (φ10) | 11. | 57001-1147 | Outer Driver (φ52 x φ55) |
| 2. | 57001-1134 | Inner Driver (φ12) | 12. | 57001-1148 | Outer Driver (φ62 x φ68) |
| 3. | 57001-1135 | Inner Driver (φ15) | 13. | 57001-1131 | Separate Case |
| 4. | 57001-1136 | Inner Driver (φ17) | 14. | 57001-1146 | Outer Driver (φ46 x φ51) |
| 5. | 57001-1137 | Inner Driver (φ20) | 15. | 57001-1145 | Outer Driver (φ42 x φ47) |
| 6. | 57001-1138 | Inner Driver (φ22) | 16. | 57001-1144 | Outer Driver (φ37 x φ40) |
| 7. | 57001-1139 | Inner Driver (φ25) | 17. | 57001-1143 | Outer Driver (φ32 x φ35) |
| 8. | 57001-1140 | Inner Driver (φ30) | 18. | 57001-1142 | Outer Driver (φ28 x φ30) |
| 9. | 57001-1141 | Inner Driver (φ35) | 19. | 57001-1132 | Driver Holder |
| 10. | 57001-1130 | Bearing Driver Case | 20. | 57001-1149 | Outer Driver (φ72 x φ75) |

# KZ1300-A3 Wiring Diagram

## (US, Canadian Models)




| LEFT HANDLEBAR SWITCH CONNECTIONS | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dimmer Switch | | | | | Hazard Switch | | | | Automatic Turn Signal Cancel Switch | | | Turn Signal Switch | | | | | | | | Horn Switch | | |
| | R/Bk | Bl/Y | R/Y | Blue | | Green | O/G | Gray | | Br | Y | | Green | Orange | Gray | W/R | Bl/W | R/W | ⏚ | | Bk/W | ⏚ |
| HI | O | O | O | O | | | | | | | | R | | O | O | O | O | | | | | |
| LO | O | O | O | O | ON | O | O | O | ON | O | O | | | | | | | O | O | Push | O | O |
| | | | | | | | | | | | | L | O | O | | O | O | | | | | |

| IGNITION SWITCH CONNECTIONS | | | | | | |
|---|---|---|---|---|---|---|
| | Battery 1 | Ignition | Tail 1 | Tail 2 | Battery 2 | Tail3 |
| | White | Brown | Blue | Red | Orange | O/G |
| OFF | | | | | | |
| ON | O | O | O | O | O | O |
| PARK | | | | | O | O |

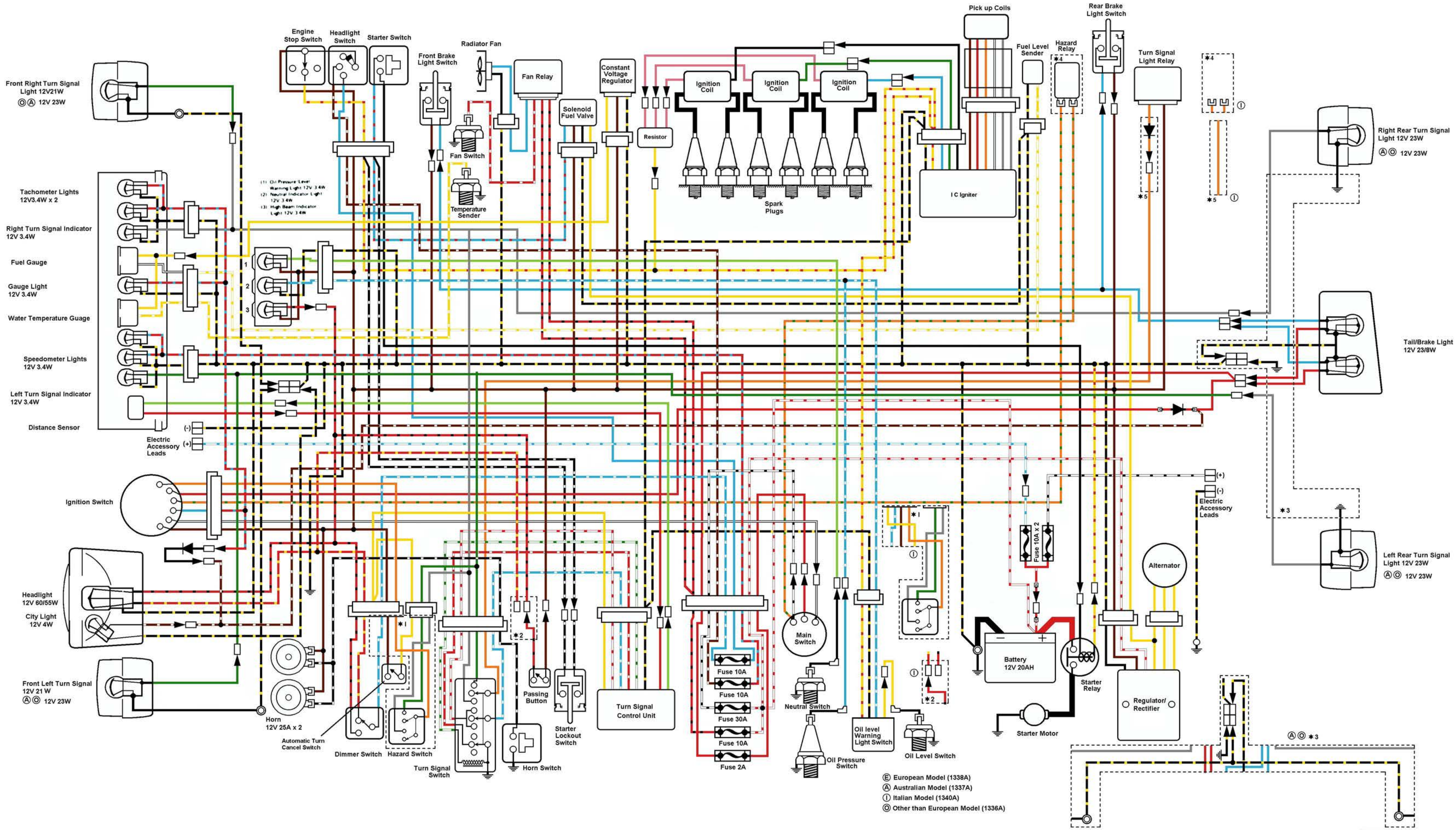
| MAIN SWITCH CONNECTIONS | | | |
|---|---|---|---|
| | Battery | Ignition | Tail |
| | W/Bk | White | Red |
| OFF | | | |
| ON | O | O | |
| PARK | O | | O |

| RIGHT HANDLEBAR SWITCH CONNECTIONS | | | | | |
|---|---|---|---|---|---|
| Engine Stop Switch | | | Starter Switch | | |
| | Y/R | Br | | Black | Y/R |
| OFF | | | | | |
| RUN | O | O | Push | O | O |
| OFF | | | | | |

| Colour Code | |
|---|---|
| Bk | Black |
| Bl | Blue |
| Br | Brown |
| G | Green |
| G | Gray |
| LG | L Green |
| O | Orange |
| P | Pink |
| R | Red |
| W | White |
| Y | Yellow |

# Z1300-A3 Wiring Diagram

(European Model, except W/German and U.K.models)




LEFT HANDLEBAR SWITCH CONNECTIONS

| Dimmer Switch | | | | Hazard Switch | | | | Automatic Turn Signal Cancel Switch | | | Turn Signal Switch | | | | | | | | Horn Switch | | | Passing Switch | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | R/Bk | Bl/Y | R/Y | | Green | O/G | Gray | | Br | Y | | Green | Orange | Gray | W/R | Bl/W | R/W | ⏚ | | Bk/W | ⏚ | | Brown | R/Bk |
| HI | ○ | ○ | | | | | | | | | R | | ○ | ○ | ○ | ○ | | | | | | | | |
| LO | | | | ON | ○ | ○ | ○ | ON | ○ | ○ | | | | | | | ○ | ○ | Push | ○ | ○ | Push | ○ | ○ |
| | | ○ | ○ | | | | | | | | L | ○ | ○ | | ○ | ○ | | | | | | | | |

IGNITION SWITCH CONNECTIONS

| | Battery 1 | Ignition | Tail 1 | Tail 2 | Battery 2 | Tail3 |
|---|---|---|---|---|---|---|
| | White | Brown | Blue | Red | Orange | O/G |
| OFF | | | | | | |
| ON | ○ | ○ | ○ | ○ | ○ | ○ |
| PARK | | | | | ○ | ○ |

RIGHT HANDLEBAR SWITCH CONNECTIONS

| Engine Stop Switch | | | Headlight Switch | | | | Starter Switch | | |
|---|---|---|---|---|---|---|---|---|---|
| | Y/R | Br | | Br/W | Brown | Bl | | Black | Y/R |
| OFF | | | OFF | | | | | | |
| RUN | ○ | ○ | O | ○ | ○ | | Push | ○ | ○ |
| OFF | | | ON | ○ | ○ | ○ | | | |

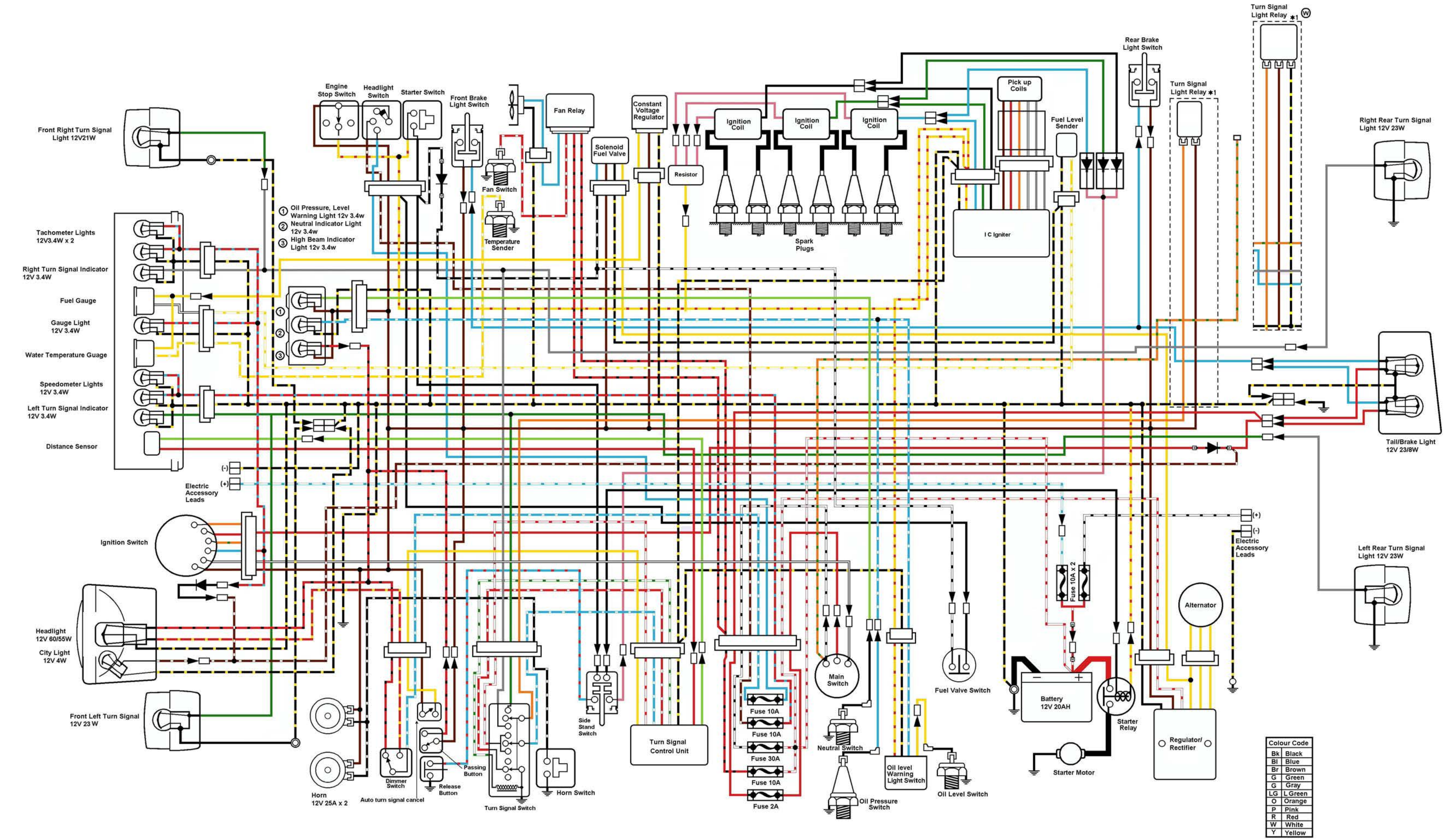
MAIN SWITCH CONNECTIONS

| | Battery | Ignition | Tail |
|---|---|---|---|
| | W/Bk | White | Red |
| OFF | | | |
| ON | ○ | ○ | |
| PARK | ○ | | ○ |

| Colour Code | |
|---|---|
| Bk | Black |
| Bl | Blue |
| Br | Brown |
| G | Green |
| G | Gray |
| LG | L Green |
| O | Orange |
| P | Pink |
| R | Red |
| W | White |
| Y | Yellow |

# Z1300-A3 Wiring Diagram

(West German, U.K.Models)




## LEFT HANDLEBAR SWITCH CONNECTIONS

Dimmer Switch

| | R/Bk | Bl/Y | R/Y |
|---|---|---|---|
| HI | ○ | ○ | |
| LO | | ○ | ○ |

Automatic Turn Signal Cancel Switch

| | Br | Y |
|---|---|---|
| ON | ○ | ○ |

Turn Signal Switch

| | Green | Orange | Gray | W/R | Bl/W | R/W | ⏚ |
|---|---|---|---|---|---|---|---|
| R | | ○ | ○ | ○ | ○ | | |
| | | | | | | ○ | ○ |
| L | ○ | ○ | | ○ | ○ | | |

Horn Switch

| | Bk/W | ⏚ |
|---|---|---|
| Push | ○ | ○ |

Passing Switch

| | Brown | R/Bk |
|---|---|---|
| Push | ○ | ○ |

Release Switch

| | Bl/R | ⏚ |
|---|---|---|
| Push | | |
| | ○ | ○ |

Starter Lockout Switch

| | Black | Black |
|---|---|---|
| ON | ○ | ○ |

## IGNITION SWITCH CONNECTIONS

| | Battery 1 | Ignition | Tail 1 | Tail 2 | Battery 2 | Tail3 |
|---|---|---|---|---|---|---|
| | White | Brown | Blue | Red | Orange | O/G |
| OFF | | | | | | |
| ON | ○ | ○ | ○ | ○ | ○ | ○ |
| PARK | | | | | ○ | ○ |

## MAIN SWITCH CONNECTIONS

| | Battery | Ignition | Tail |
|---|---|---|---|
| | W/Bk | White | Red |
| OFF | | | |
| ON | ○ | ○ | |
| PARK | ○ | | ○ |

## RIGHT HANDLEBAR SWITCH CONNECTIONS

Engine Stop Switch

| | Y/R | Br |
|---|---|---|
| OFF | | |
| RUN | ○ | ○ |
| OFF | | |

Headlight Switch

| | Br/W | Brown | Bl |
|---|---|---|---|
| OFF | | | |
| O | ○ | ○ | |
| ON | ○ | ○ | ○ |

Starter Switch

| | Black | Y/R |
|---|---|---|
| Push | ○ | ○ |

# Supplement for 1982 Model

## Table of Contents

# Model Identification

**KZ1300-A4 Right Side View**


**KZ1300-A4 Left Side View**

# Specifications

## Specifications

| Items | KZ1300-A4 |
|---|---|
| **Dimensions:** | |
| Overall length | 2,295 mm, E A 2,335 mm |
| Overall width | 905 mm, E A 840 mm |
| Overall height | 1,280 mm, E A 1,155 mm |
| Wheelbase | 1,580 mm |
| Road clearance | 150 mm |
| Seat height | 820 mm |
| Dry weight | 297 kg, U C 299.5 kg, E A 296 kg |
| Fuel tank capacity | 27.0 L, U C 20.5 L |
| **Performance:** | |
| Braking distance | 12 m from 50 km/h |
| Minimum turning radius | 2.8 m |
| **Engine:** | |
| Type | 4-stroke, DOHC, 6-cylinder |
| Cooling system | Water-cooled |
| Bore x stroke | 62.0 x 71.0 mm |
| Displacement | 1,286 mL |
| Compression ratio | 9.9 |
| Maximum horsepower | 120 HP @8,000 r/min (rpm)<br>G S 99 HP @8,000 r/min (rpm) |
| Maximum torque | 116 N-m (11.8 kg-m) @6,500 r/min (rpm)<br>G S 102 N-m (10.4 kg-m) @6,000 r/min (rpm) |
| Valve timing: | |
| Inlet Open | 20° BTDC |
| Close | 70° ABDC |
| Duration | 270° |
| Exhaust Open | 70° BBDC |
| Close | 30° ATDC |
| Duration | 280° |
| Carburetion system | Carburetors, Mikuni BSW32 x 3 |
| Lubrication system | Forced lubrecation (Wet sump) |
| Engine oil: Grade | SE class |
| Viscosity | SAE 10W40, 10W50, 20W40, or 20W50 |
| Capacity | 6.2 L |
| Coolant capacity | 3.5 L |
| Starting system | Electric starter |
| Ignition system | Battery and coil (Transistorized) |
| Timing advance | Electronic advance |
| Ignition timing | From 10° BTDC 850 r/min (rpm)<br>to 33° BTDC @2,800 r/min (rpm)<br>U From 10° BTDC @900 r/min (rpm)<br>to 33° BTDC @2,800 r/min (rpm) |
| Spark plug | NGK BP6ES or ND W20EP-U<br>E C NGK BPR6ES or ND W20EPR-U |

(Continued on next page.)

**Specifications for 1982 KZ1300A (Cont.):**

| Items | KZ1300-A4 |
|---|---|
| **Drive Train:** | |
| Primary reduction system: | |
| Type | Chain drive |
| Reduction ratio | 1.841 (32/24 x 29/21) |
| Clutch type | Wet multi disc |
| Transmission: Type | 5-speed, constant mesh, return shift |
| Gear ratios 1st | 2.294 (39/17) |
| 2nd | 1.666 (35/21) |
| 3rd | 1.280 (32/25) |
| 4th | 1.074 (29/27) |
| 5th | 0.931 (27/29) |
| Final drive system: Type | Shaft drive |
| Reduction ratio | 2.651 (20/24 x 35/11) |
| Overall drive ratio | 4.545 @top gear |
| Final gear case oil: Type | API GL-5 Hypoid gear oil |
| Viscosity | SAE 90 (above 5°C), SAE 80 (below 5°C) |
| Capacity | 0.25 L |
| **Frame:** | |
| Type | Tubular, double cradle |
| Castor (rake angle) | 28° |
| Trail | 100 mm |
| Front tire: Type | Tubeless |
| Size | 110/90V-18 4PR, Ⓤ Ⓒ MN90-18 4PR |
| Rear tire: Type | Tubeless |
| Size | 130/90V-17 6PR, Ⓤ Ⓒ MT90-17 6PR |
| Front suspention: Type | Telescopic fork (pneumatic) |
| Wheel travel | 200 mm |
| Rear suspension: Type | Swing arm |
| Wheel travel | 115 mm |
| Brake type: Front | Dual disc brake |
| Rear | Single disc brake |
| **Electrical Equipment:** | |
| Alternator: Type | Three-phase AC |
| Rated output | 23.5 amp. @8,000 r/min (rpm), 14 V<br>Ⓤ Ⓒ 40.9 amp. @8,000 r/min (rpm), 14 V |
| Voltage regulator | Short-circuit type |
| Battery | 12 V 20 AH |
| Headlight: Type | Semi-sealed, quartz-halogen |
| Bulb | 12 V 60/55W |
| Tail/brake lights | 12 V 8/27 W x 2, Ⓔ Ⓐ 12 V 5/21 W x 2 |

Ⓐ : Australian Model, Ⓒ : Canadian Model, Ⓔ : European Model,
Ⓖ : West German Model Ⓢ : Swedish Model, Ⓤ : U.S. Model

Specifications subject to change without notice, and may not apply to every country.

## Periodic Maintenance Chart

The maintenance and adjustments must be done in accordance with this chart to keep the motorcycle in good running condition. **The initial maintenance is vitally important and must not be neglected.**

| OPERATION \ FREQUENCY | Whichever comes first → Every | ODOMETER READING * 800 km | 5,000 km | 10,000 km | 15,000 km | 20,000 km | 25,000 km | 30,000 km | See Page |
|---|---|---|---|---|---|---|---|---|---|
| Engine oil — change | year | • | • | • | • | • | • | • | 306 |
| Oil filter — replace | | • | | • | | • | | • | 306 |
| Coolant — change | 2 years | | | | | | | • | 23 |
| Radiator hoses, connections — Check † | year | • | | • | | • | | • | — |
| Final gear case oil level— check † | | | | • | | • | | • | 31 |
| Final gear case oil — change | | • | | | | | | • | 31 |
| Propeller shaft joint — lubricate | | | | • | | | | • | 353 |
| Fuel system — clean | | | | • | | • | | • | 290 |
| Fuel hose — replace | 4 years | | | | | | | | — |
| Spark plug — clean and gap † | | • | • | • | • | • | • | • | 12 |
| Valve clearance — check † | | • | • | • | • | • | • | • | 341 |
| Air suction valve — check † (US Model) | | | • | • | • | • | • | • | 180 |
| Air cleaner element — clean | | | • | | • | | • | | 164 |
| Air cleaner element — replace | 5 cleanings | | | • | | • | | • | 164 |
| Throttle grip play — check † | | • | • | • | • | • | • | • | 14 |
| Idle speed — check † | | • | • | • | • | • | • | • | 343 |
| Carburetor synchronization — check † | | • | • | • | • | • | • | • | 343 |
| Clutch — adjust | | • | • | • | • | • | • | • | 20 |
| Brake lining wear — check † | | | • | • | • | • | • | • | 221 |
| Brake fluid level — check † | month | • | • | • | • | • | • | • | 295 |
| Brake fluid — change | year | | | • | | • | | • | 295 |
| Brake hose — replace | 4 years | | | | | | | | — |
| Master cylinder cup and dust seal — replace | 2 years | | | | | | | | — |
| Caliper piston seal and dust seal — replace | 2 years | | | | | | | | — |
| Brake play — check † | | • | • | • | • | • | • | • | 27 |
| Brake light switch — check † | | • | • | • | • | • | • | • | 27 |
| Steering play — check † | | • | • | • | • | • | • | • | 28 |
| Steering stem bearing — lubricate | 2 years | | | | | • | | | 224 |
| Front fork oil — change | | | | • | | • | | • | 321 |
| Front fork oil seal — clean | | | • | • | • | • | • | • | 321 |
| Tire wear — check † | | | • | • | • | • | • | • | 212 |
| Wheel bearing — lubricate | 2 years | | | | | • | | | 216 |
| Speedometer gear — lubricate | 2 years | | | | | • | | | 34 |
| Swing arm pivot — lubricate | | | | • | | | | • | 228 |
| Battery electrolyte level — check † | month | • | • | • | • | • | • | • | 230 |
| General lubrication — perform | | | • | • | • | • | • | • | 32 |
| Nut, bolt, fastener tightness — check † | | • | | • | | • | | • | 343 |

* : For higher odometer readings, repeat at the frequency interval established here.
† : Replace, add, adjust, or torque if necessary.

# Adjustment

## Valve Clearance

Valve and valve seat wear decreases valve clearance, upsetting valve timing. If valve clearance is not adjusted, the wear will eventually cause the valves to remain partly open, which lowers performance, burns the valves and valve seats, and may cause serious engine damage.

Valve clearance for each valve should be checked and adjusted in accordance with the Periodic Maintenance Chart (p. 340) and any time that clearance may have been affected by disassembly.

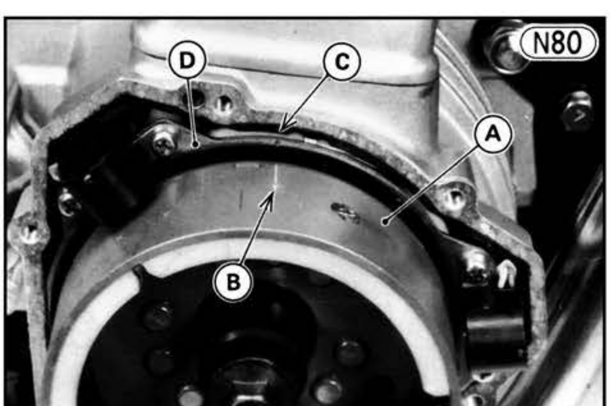
Be careful to adjust within the specified clearance. Adjusting to a larger value will disturb valve timing and cause engine noise.

**"NOTE"**

○*Valve clearance must be checked when the engine is cold (room or atmospheric temperature).*

### *Valve Clearance Inspection*

- Remove the fuel tank (p. 46).
- Disconnect the battery ground (–) lead.
- Remove the spark plugs.
- Remove the vacuum switch valve (US model) (p. 48).
- Remove the two lower ignition coils (p. 49).
- Remove the cylinder head cover (p. 65).
- Remove the alternator cover (p. 85). The cover need not be removed completely from the crankcase, so the alternator leads may be left connected.
- Using a wrench on the alternator rotor bolt, turn the crankshaft clockwise so that the "T" mark on the rotor is aligned with the line mark in the upper part of the pickup coil base plate.



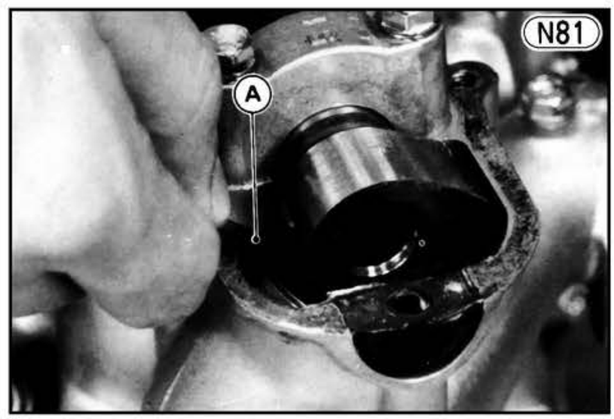

**A. Alternator Rotor**
**B. "T" Mark**
**C. Line Mark**
**D. Pickup Coil Base Plate**

- Check that the timing mark on the exhaust camshaft sprocket is aligned with the cylinder head cover mating surface on the front side of the exhaust camshaft. If it is not, turn the crankshaft another turn until the "T" mark is aligned with the line mark again.

**"NOTE"**

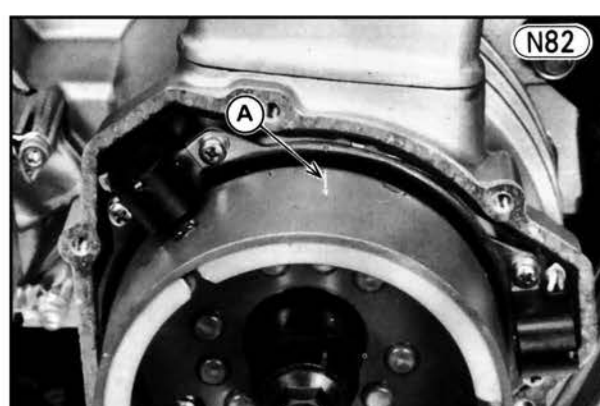
○***At this position, the #1 (extreme left) piston is at top dead center (TDC) at the end of its compression stroke.***

- At this ctankshaft (0°) position, measure the clearance between the cam and the shim of the #1 inlet and exhaust valves. See Table N27.




**A. Thickness Gauge**

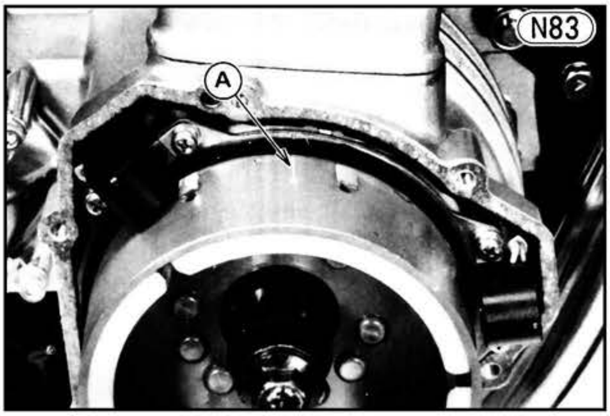
- Next turn the crankshaft 1/3 turn (120°) Clockwise and align the "1" mark on the rotor with the line mark.




**A. "1" Mark**

- At this crankshaft (120°) position, measure the valve clearance of the #4 and #5 inlet and #6 exhaust valves.

•Repeat the preceding step, and measure the remaining valve clearances. Turn the crankshaft 1/3 turn (120°) at a time, and match the "2", "T", or "1" mark on the rotor with the line mark. Measure the valve clearances specified in the table at each crankshaft position.




**A. "2" Mark**

•Install the removed parts.

### *Valve Clearance Adjustment*

If the valve clearance is incorrect, replace the present shim with a new shim to obtain the proper clearance.

**"NOTE"**

○*If there is no clearance between the shim and cam, select a shim which is several sizes smaller and then remeasure the gap once it is installed.*

•Cut out a cover from a rubber plate using the pattern on p. 281, and stuff it in the camshaft chain tunnel so that no parts will fall into the crankcase. (See fig. B10 on p.14.)

•Turn the crankshaft so that the cam points away from the lifter. Position the notch in the lifter so it points toward the opposite camshaft. This will allow the shim to be lifted and removed later.


**A. Notch**

**Table N27 Valve Clearance Measurement Procedure**

| Crankshaft position degree (turns) | Rotor mark aligned with the line mark | Appropriate Valves | | Valve Clearance mm | |
|---|---|---|---|---|---|
| | | Inlet | Exhaust | Inlet | Exhaust |
| 0° (0) | "T" | #1 | #1 | | |
| 120° (1/3) | "1" | #4 and #5 | #6 | | |
| 240° (2/3) | "2" | | #2 and #3 | 0.05 – 0.15 | 0.15 – 0.25 |
| 360° (3/3) | "T" | #6 | | | |
| 480° (4/3) | "1" | #2 and #3 | | | |
| 600° (5/3) | "2" | | #4 and #5 | | |

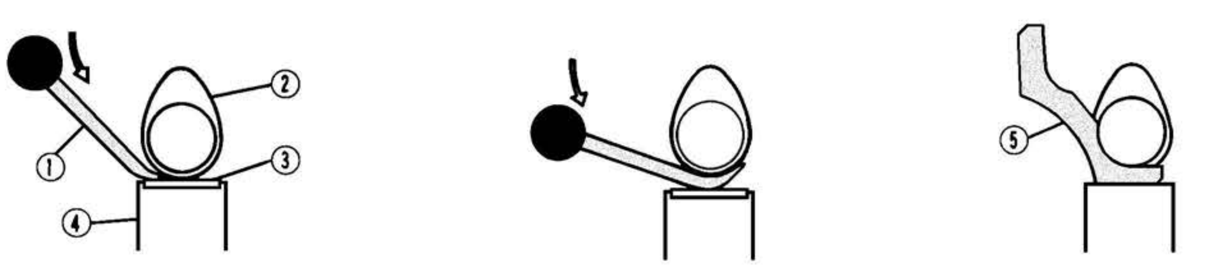
**Shim Removal**

(N85)

Step 1: Insert the lever between the cam and shim.

Step 2: Push the lever in and pry it down.

Step 3: Insert the holder and remove the lever.




1. Lever 2. Cam 3. Shim 4. Valve Lifter 5. Holder

- Insert the lever included in valve lifter holder set 57001-1153 between the cam and shim. (See step 1 in fig. N85.)
- Push the lever in and pry it down so that the valve lifter is forced away from the camshaft. (See step 2 in fig. N85.)
- Insert the small end of the holder included in the valve lifer holder set between the camshaft and valve lifter rim, and remove the lever. (See step 3 in fig. N85.)
- Remove the shim carefully so that it dose not pop out of the valve lifter top.
- Check the present shim thickness (shim size) which is printed on the shim surface. Refer to valve adjustment Charts (Table B3 and 4 on pp. 15-16), and select the shim which will bring the valve clearance within the specified limits. Shims are available in sizes from 2.00 to 3.20 mm, in increments of 0.05mm.
- Insert the new shim on the valve lifter with the numbered side facing downwards so the number won't be polished off by the action of the cam.

**CAUTION**

○**Do not put shim stock under the shim. This may cause the shim to pop out at high rpm, causing extensive engine damage.**
○**Do not grind the shim. This may cause it to fracture, causing extensive engine damage.**

**"NOTE"**

○*If the smallest shim dose not sufficiently increase clearance, the valve seat is probably worn. In this case, (a) repair the valve seat (p. 315), (b) grind down the valve stem slightly (p. 175), (c) then recheck the clearance.*

- Reinsert the lever to release the valve lifter, and remove the holder.
- Make sure that the valve clearance is correct. If it is not, readjust it.
- Remove the rubber plate.
- Install the removed parts.

## Carburetors

### *Idling Adjustment*

Refer to p. 290, noting the following.

1. Adjust the idle speed to 850 – 950 r/min (rpm) for U.S. model, and adjust the idle speed to 800 – 900 r/min (rpm) for other models.

### *Carburetor Synchronization*

Refer to pp. 18 – 19, noting the following.

1. Use new vacuum gauge 57001 – 1152 to synchronize the carburetors.

# Disassembly

## Torque and Locking Agent

Refer to pp. 37 – 42, noting the following.

### ENGINE

| Part | Q'ty | Torque | | | Remarks | See Pg. |
|---|---|---|---|---|---|---|
| | | N-m | kg-m | ft-lb | | |
| Alternator rotor bolt $\phi$12 P1.25 | 1 | 125 | 13.0 | 94 | – | 347 |
| Alternator stator Allen bolts $\phi$6 P1.0 | 3 | 9.8 | 1.0 | 87 in-lb | • | 347 |
| Baffle plate mounting screws $\phi$6 P1.0 | 2 | – | – | – | • | 310 |
| *Crankshaft torsion damper bolt $\phi$12 P1.25 | 1 | 125 | 13.0 | 94 | – | 347 |
| **Sub-alternator rotor bolt $\phi$12 P1.25 | 1 | 125 | 13.0 | 94 | – | 346 |
| **Sub-alternator stator Allen bolt $\phi$5 P0.8 | 1 | 7.8 | 0.80 | 69 in-lb | • | 345 |

* : Other than U.S. and Canadian models
** : U.S. and Canadian models

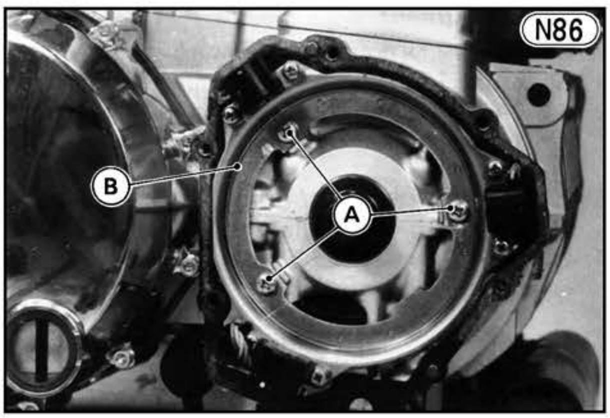
## Pickup Coil Assembly

*Removal*

**"NOTE"**

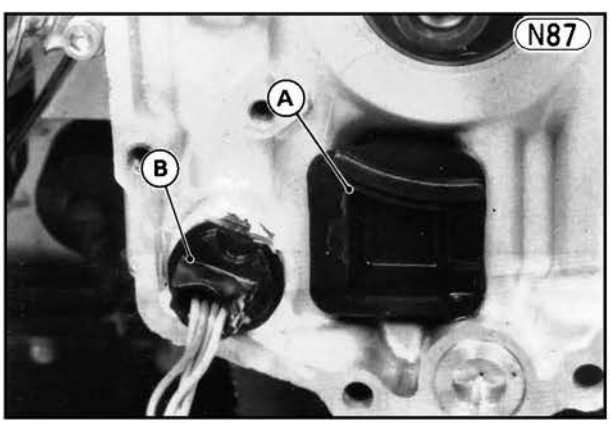
○*To keep the loss of engine oil to a minimum, set the motorcycle on its side stand.*

•Put an oil pan beneath the alternator cover.
•Remove the alternator cover (p. 85). The cover need not be removed completely, so the alternator leads may be left connected.
•Remove the alternator rotor (p. 347).
•Remove the pickup coil mounting screws (3), and remove the pickup coil assembly.



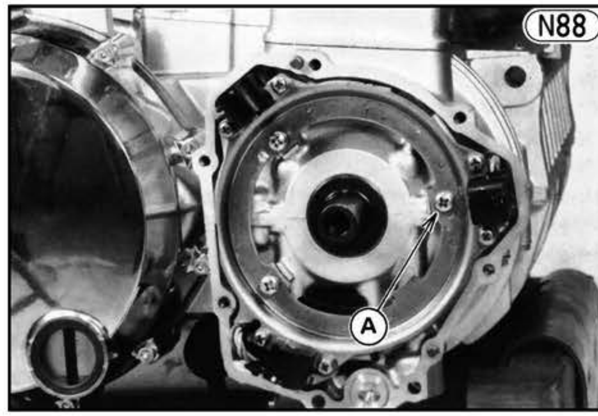
**A. Mounting Screws B. Pickup Coil Assembly**

*Installation Points*
•Check that the baffle is properly fitted on the crankcase.



**A. Baffle B. Grommet**

•Properly install the pickup coil leads grommet so that the notched side of it faces toward the pickup coil mounting screw hole.
•When installing the pickup coil assembly, first tighten the mounting screw at the front side of the pickup coil assembly, and then tighten the other mounting screws.



**A. First tighten this screw.**

•Tightening torque for the alternator rotor bolt is 125 N-m (13.0 kg-m, 94 ft-lb). After torquing the bolt, loosen it and tighten it to the specified torque again.
•Check the engine oil level, and add oil as necessary (p. 306).

## Camshafts

Refer to pp. 66 – 69, noting the following.
1. To position the #1 and #6 pistons at top dead center (TDC), turn the crankshaft until the "T" mark on the rotor is aligned with the line mark in the upper part of the pickup coil base plate. (See fig. N80 on p. 341.)

## Left Engine Cover (U.S. and Canadian Models)

*Removal*
•Set the motorcycle up on its center stand.
•Remove the exhaust pipes and mufflers (pp. 55 – 56).
•Unscrew the Allen bolts (2), and remove the sub-alternator lead clamps (2) on the oil pan.
•Remove the left side cover, and disconnect the 3 –pin connector which connects the sub-regulator/rectifier and sub-alternator.
•Unscrew the bolt, and pull the reserve tank and its cover toward the left of the motorcycle. (See fig. B35 on p. 23.)
•Put an oil pan beneath the left engine cover.
•Remove the left engine cover Allen bolts (10), and free the left engine cover from the motorcycle.

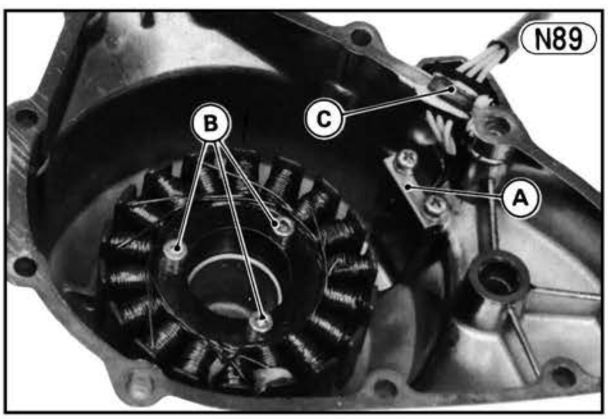
*Installation Points*
•Apply a liquid gasket around the circumference of the lead grommet before setting it in the notch of the left engine cover.
•Check that the knock pins (2) are in place on the crankcase.

- Clamp the sub-alternator lead with the starter motor lead by installing the clamps (2) on the oil pan, and connect the 3-pin connector.
- See the radiator, mufflers, and exhaust pipes insullation notes (pp. 55 – 56).
- Check the engine oil level, and add oil as necessary (p. 306).

## Sub – Alternator Stator (U.S. and Canadian Models)

### *Removal*

- Remove the left engine cover (p. 344).
- Remove the screws (2) and holding plate of sub-alternator lead.




**A. Holding Plate** **C. Grommet**
**B. Allen Bolts**

- Unscrew the Allen bolts (3) and remove the stator.

### *Installation Points*

- Apply a liquid gasket around the circumference of the lead grommet before setting it in the notch of the left engine cover.
- Apply a non-permanent locking agent to the threads of the stator mounting Allen bolts, and tighten it to 7.8 N-m (0.8 kg-m, 69 in-lb) of torque.

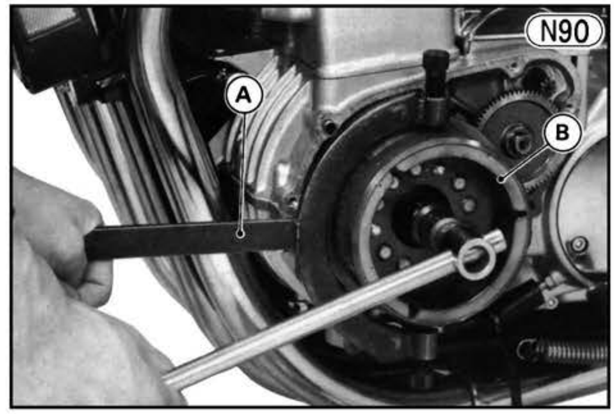
## Sub-Alternator Stater Motor Clutch (U.S. and Canadian Models)

### *Removal*

- Removal the left engine cover (p. 344). The cover need not be removed completely, so the leads may be left connected.
- Using rotor holder 57001-308, remove the rotor bolt.

**"NOTE"**

○*The bolt is a left hand thread and must be turned clockwise to loosen.*

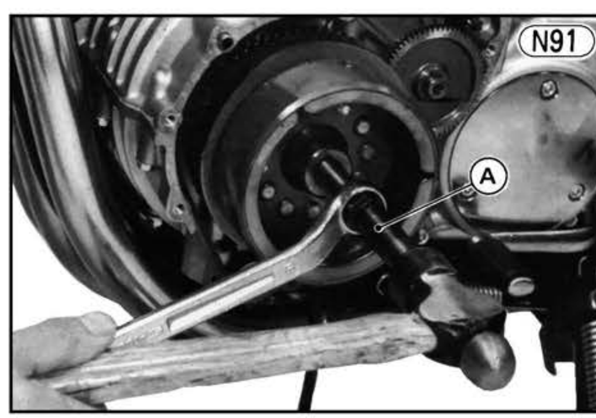



**A. Rotor Holder** **B. Sub-Alternator Rotor**

- Using rotor puller 57001-1099, remove the alternator rotor, torsion damper, and starter motor clutch assembly from the crankshaft. There is a thrust washer between the starter clutch gear hub and sub-alternator rotor.

**CAUTION**

○**If the rotor is difficult to remove and a hammer is used, turn the bar with hand tapping the head of the puller shaft with a hammer. Do not attempt to strike the alternator rotor itself. Striking the bar or the rotor can cause the bending or the magnets to lose thier magnetism.**

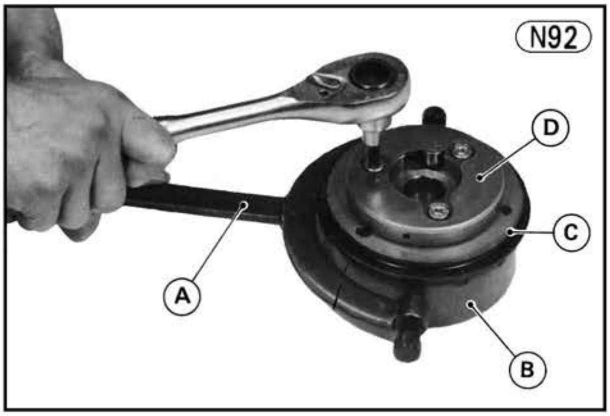



**A. Rotor Puller**

- Remove the starter clutch gear, washer, reduction gear, and its shaft.

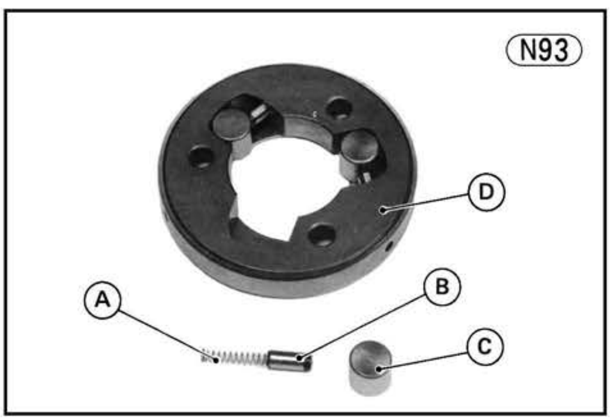
### *Disassembly*

- Holding the rotor steady with rotor holder 57001-308, remove the Allen bolts and washers (3ea) to separate the rotor, torsion damper, and starter motor clutch.




**A. Holder** **C. Torsion Damper**
**B. Rotor** **D. Starter Motor Clutch**

- Remove the rollers, springs, and spring caps (3ea) from the stater motor clutch.




**A. Spring** **C. Roller**
**B. Spring Cap** **D. Starter Motor Clutch**

*Assembly Points*
- Apply a molybdenum disulfide engine assembly grease to the under side of each Allen bolt head.
- Tighten the stater motor clutch Allen bolts (3) to 38 N-m (3.9 kg-m, 28 ft-lb) of torque.

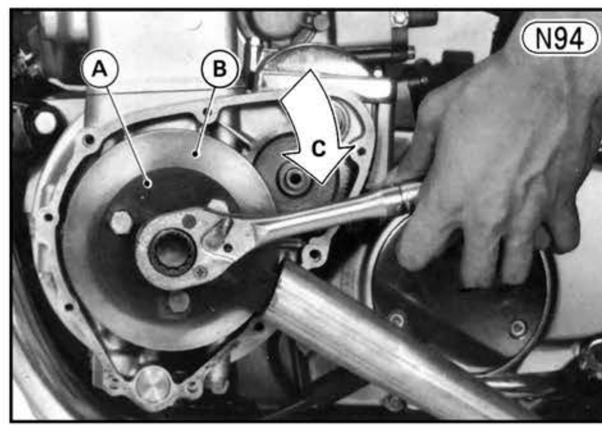
*Installation Points*
- Apply a molybdenum disulfide engine assembly grease to the reduction gear shaft.
- Be sure that the washer between the starter clutch gear and crankshaft is placed with the chamfered side facing toward the crankshaft. (See fig. E124 on p. 80.).
- Using a high flash-point solvent, clean off any oil or dirt that may be on the crankshaft taper and rotor tapered hole.
- Torque the rotor bolt to 125 N-m (13.0 kg-m, 94 ft-lb). After tightening the bolt to the specified torque, loosen the bolt and re-tighten the bolt to the same torque.
- Check the engine oil level, and add oil as necessary (p. 306).

## Torsion Damper, Starter Motor Clutch (Other than U.S. and Canadian Models)

*Removal*
- Set the motorcycle up on its center stand and put an oil pan beneath the left engine cover.
- Unscrew the left engine cover Allen bolts (10) and remove the cover.
- Holding a torsion damper with holder 57001-1156 and three bolts (8 mm diameter x 1.25 mm pitch x 10 – 15 mm length), remove the torsion damper mounting bolt and washer.

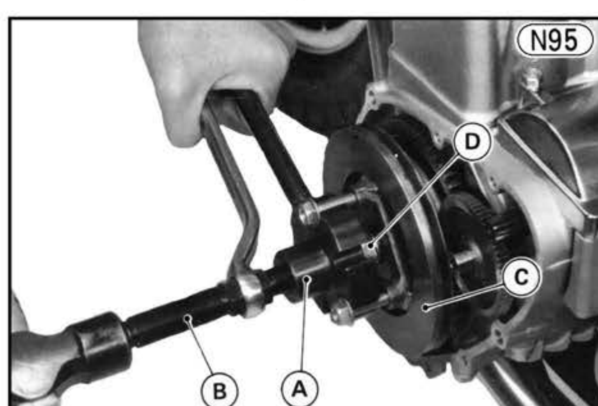
"NOTE"

○*The bolt is a left hand thread and must be turned clockwise to loosen.*




**A. Holder** **C. Turn clockwise to loosen.**
**B. Torsion Damper**

- Pull out the torsion damper and starter motor clutch assembly using pullers 57001-259 and 1099. Before installing the pullers, screw bolt 92001-1425 into the crankshaft hole. Be careful not to drop the reduction gear and/or starter clutch gear.

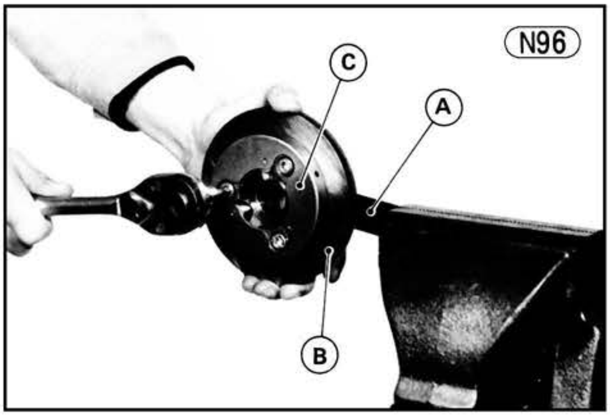



**A. Magneto Puller** **C. Torsion Damper**
**B. Rotor Puller** **D. Bolt**

- Remove the starter clutch gear, washers (2), reduction gear, and its shaft.

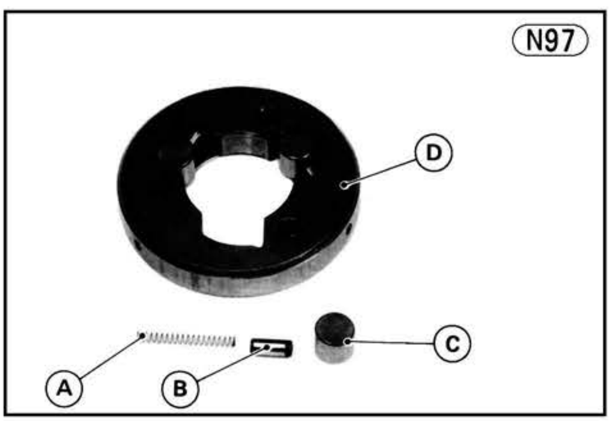
### *Disassembly*

- Holding the torsion damper with holder 57001-1156 and three bolts (8 mm dia. x 1.25 mm pitch x 10 – 15 mm length), remove the Allen bolts (3) to separate the damper and starter motor clutch.




A. Holder C. Starter Motor Clutch
B. Torsion Damper

- Remove the steel plate from the damper.
- Remove the rollers, springs, and spring cap (3 ea) from the starter motor clutch.




A. Spring C. Roller
B. Spring Cap D. Starter Motor Clutch

### *Assembly Points*

- Apply a molybdenum disulfide engine assembly grease to the underside of each Allen bolt head.
- Tighten the Allen bolts (3) to 38N-m (3.9 kg-m, 28 ft-lb) of torque.

### *Installation Points*

- Apply a molybdenum disulfide engine assembly grease to the reduction gear shaft.
- Be sure to place the chamfered side of the inner thrust washer toward the inside so that the washer will fit on the crankshaft. (See fig. E124 on p. 80.)
- Using a high flash-point solvent, clean off any oil or dirt that may be on the crankshaft taper and torsion damper tapered hole.
- Torque the torsion damper bolt to 125 N-m (13.0 kg-m, 94 ft-lb).
- Check the engine oil level (p. 306) and add oil if insufficient.

## Alternator Stator

Refer to p. 86, noting the following.

1. Tighten the alternator stator mounting Allen bolts (3) to 9.8 N-m (1.0 kg-m, 87 in-lb) of torque.

## Alternator Rotor

Refer to p. 86, noting the following.

1. To remove the alternator rotor, use rotor puller 57001-1099.
2. Tighten the alternator rotor bolt to 125 N-m (13.0 kg-m, 94 ft-lb) of torque. After tightening the bolt to the specified torque, loosen the bolt and re-tighten the bolt to the same torque.

## Clutch

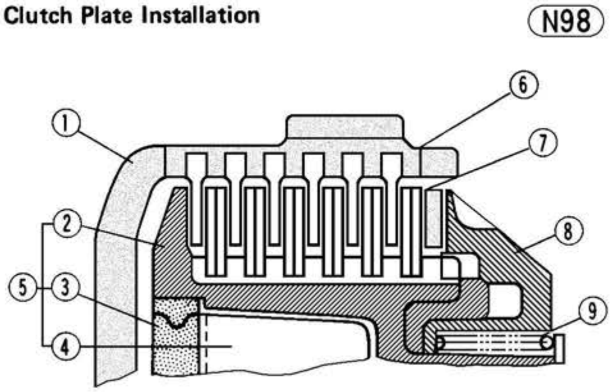
Refer to p. 310, noting the following.

1. The installing order and number of the clutch friction plates and steel plates are changed. Install the friction plates (7) and steel plates (12) starting with a friction plate, and then install the two steel plates. Repeat this procedures, and finally install the friction plate.

**"NOTE"**

○*First, install the six friction plates fitting the tangs of the plate in the grooves Ⓐ in the clutch housing. And then, install the last one fitting the tangs of the plate in the grooves Ⓑ in the housing (See fig. E159 on p.89).*

**Clutch Plate Installation**




1. Clutch Housing
2. Outer Hub
3. Inner Hub
4. Rubber Damper
5. Clutch Hub Assembly
6. Friction Plate
7. Steel Plate
8. Spring Plate
9. Clutch Spring

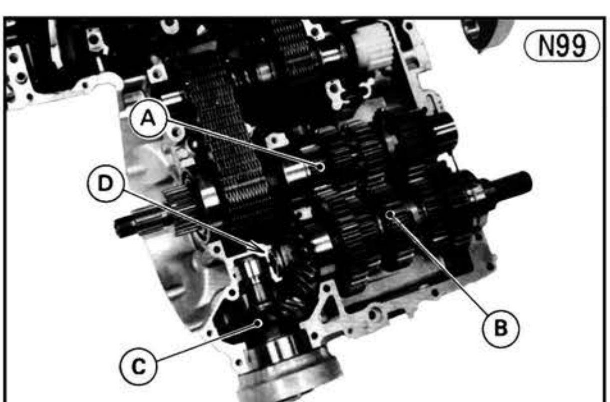
## Transmission

### *Removal*

**"NOTE"**

○*When the drive shaft is to be disassembled, remove the clutch while the engine is in the frame (p. 347). When the driven shaft is to be disassembled, remove the driven shaft cam damper while the engine is in the frame (p. 311).*

- Remove the engine (p. 96).
- Split the crankcase (p. 98).
- Take out the drive shaft, driven shaft, and output shaft assemblies. The washer and shim(s) may fall off the end of the driven shaft.



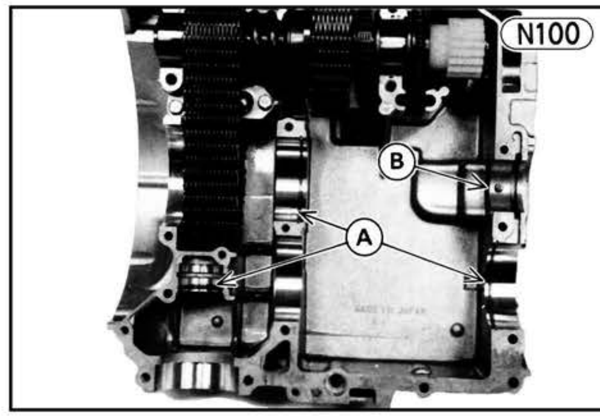

**A. Drive Shaft Assembly** **C. Output Shaft Assembly**
**B. Driven Shaft Assembly** **D. Washer**

### *Installation*

- Check to see that the following parts are in place on the upper crankcase half: drive shaft set pin and set ring, driven shaft set ring, output shaft set ring.

**"NOTE"**

○*If the drive shaft standard set ring (P/N: 14013-1004) cannot be put into the crankcase groove, use a thin set ring (P/N: 14013-013) instead of the standard set ring.*




**A. Set Rings** **B. Set Pin**

- Install the drive shaft pushing the secondary chain driven sprocket toward the transmission gear, and fit the secondary chain on the sprocket. Check that the set pin goes into the hole in the needle bearing outer race, and that the set ring fits into the groove in the ball bearing, and that there are no gap between the driven sprocket and the drive shaft ball bearing.
- Install the driven shaft and output shaft assemblies on the upper crankcase half while engaging the bevel gears. Check that the driven shaft set ring fits into the groove in the driven shaft needle bearing, and that the output shaft set ring stops the output shaft needle bearing from coming out.
- Install the shims outside of the washer. Put the thinner one inside and the thicker one outside.

**"NOTE"**

○*For adjustment of the shim between the washer and crankcase, refer to p. 350.*

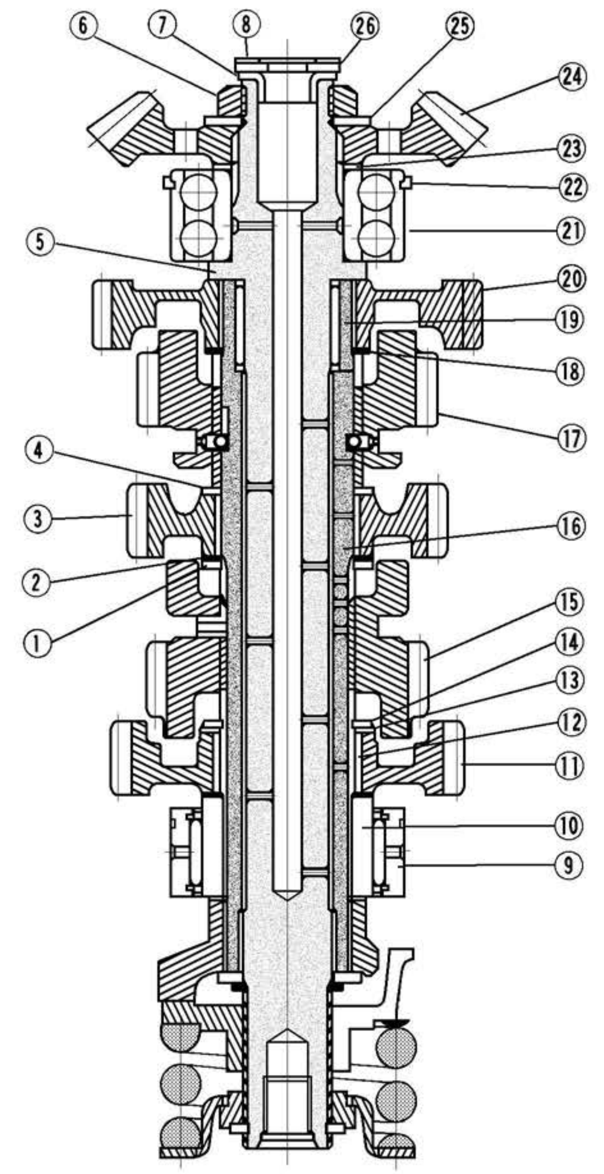
- Assemble the crankcase halves (p. 99).
- Install the engine (p. 98).

**Drive Shaft:**

Refer to pp. 102 – 105, noting the following.

1. The secondary chain driven sprocket ⑩ and collar⑨ are made into one piece, and the needle bearings (2) ⑳ between the drive shaft and secondary chain driven sprocket ⑩ are discontinued. (See fig. F25 on p.103.)

**Driven Shaft** (N101)



1. Circlip
2. Splined Washer
3. 3rd Gear
4. Washer
5. Inner Shaft
6. Nut
7. Collar
8. Shim(s)
9. Needle Bearing
10. Needle Bearing Inner Race
11. 2nd Gear
12. Bushing
13. Splined Washer
14. Circlip
15. 5th Gear
16. Outer Shaft
17. 4th Gear
18. Washer
19. Needle Bearing
20. 1st Gear
21. Ball Bearing
22. Set Ring
23. Shim(s)
24. Bevel Gear
25. Washer
26. Washer

## Driven Shaft:

Refer to p. 313, noting the following.

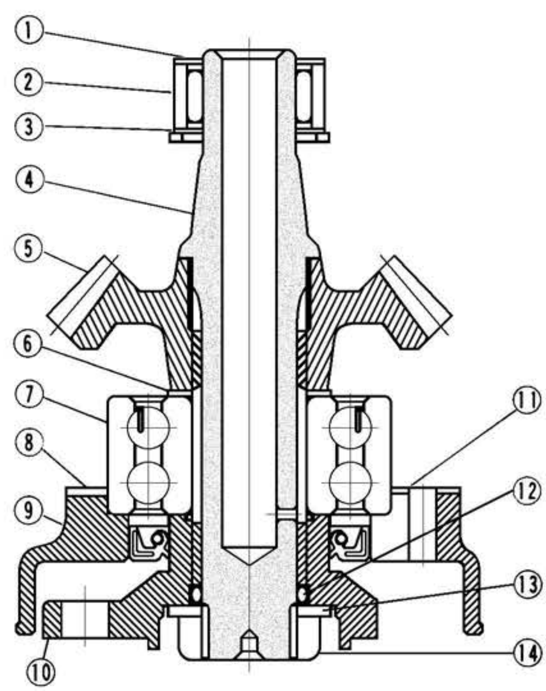
1. The needle thrust bearing is discontinued, and the collar ⑦ and washer ㉖ are newly installed on this position in replacement of the bearing. The collar is pressed into inner shaft ⑤. To remove the collar, turn out the nut ⑥. When installing the collar, be careful not to damage the surface of the collar.
2. Adjust the clearance between the washer ㉖ and the crankcase when replacing the inner shaft parts and/or washer (p. 350).

## Output Shaft:

Refer to p. 108, noting the following.

1. The washer is installed on each side of the needle bearing ②.
2. The bevel gear ⑤ is divide from the output shaft ④, and the shaft and bevel gear become into two parts accordingly.
3. The washer ⑬ can be installed with either side facing out.

**Output Shaft** (N102)



1. Washer
2. Needle Bearing
3. Washer
4. Output Shaft
5. Bevel Gear
6. Shim(s)
7. Ball Bearing
8. Gasket
9. Bearing Cap
10. Output Shaft Coupling
11. Oil Seal
12. O-ring
13. Washer
14. Nut

## Shim Adjustment (Engine)

Refer to p. 311, noting the following.

### Washer/Crankcase Clearance:

The needle thrust bearing is discontinued, and the collar and washer are newly installed on this position in replacement of the bearing. (See fig. N101 on p. 349.) The washer/crankcase clearance adjustment procedures are the same as those for the needle thrust bearing/crankcase clearance adjustment. Refer to p. 115.

**"NOTE"**

○*Insert thinner shims on the washer side.*

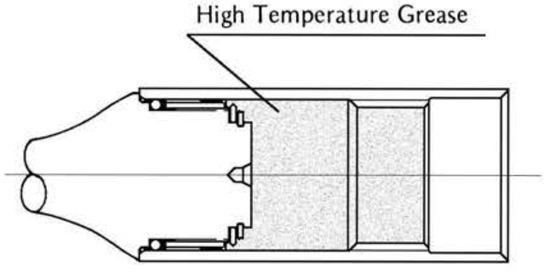
## Final Gear Case

### Final Gear Case Removal and Installation:

Refer to p. 151, noting the following.

1. The propeller shaft joint is changed. Pack the properller shaft joint with 20 mL (16 grams) of high temperature grease.

**Propeller Shaft Joint Lubrication** (N103)




### Ring Gear Disassembly and Assembly:

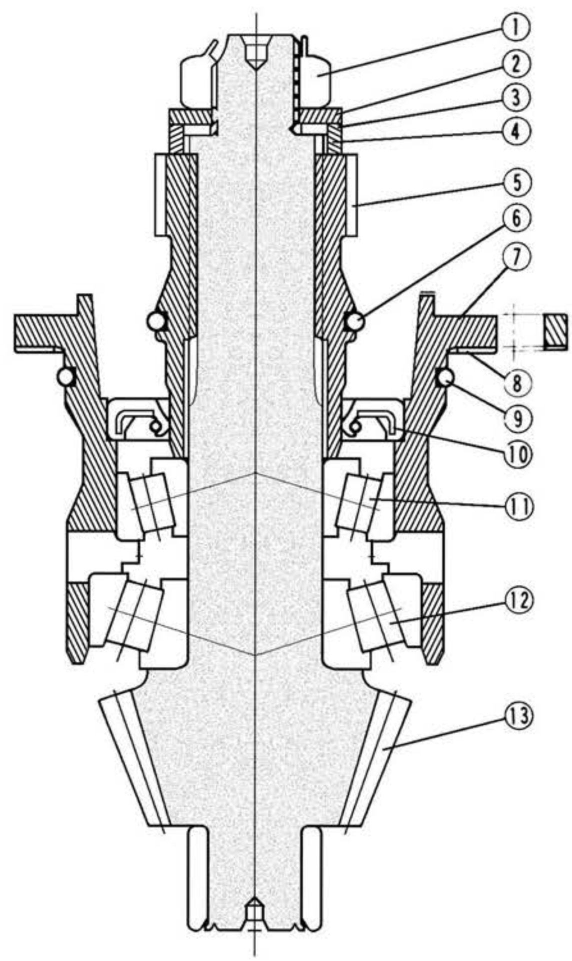
Refer to pp. 151 – 153, noting the following.

1. Use pinion joint holder 57001-1165 to secure the pinion shaft in replacement of pinion joint holder 57001-1050, and loosen or tighten the ring nut ①.
2. It is not necessary to snake the bearing holder mounting screws ⑨, and it is required to apply a non-permanent locking agent to the screw threads.

### Pinion Gear Disassembly:

- Pull the pinion gear assembly from the final gear case with 6 mm dia. x 1 mm pitch jacking bolts and remove the shim(s) ⑧. (See fig. G106 on p. 153.)
- Pry open the staking of the pinion gear nut ① with a small chisel. Secure the pinion gear assembly in a vise using pinion joint holder 57001-1165, and then loosen the nut. (See fig. G108 on p. 154.)
- Remove the washer ②, shim(s) ③, and collar ④, and pull out the pinion shaft joint ⑤ and O-ring ⑥.
- Remove the grease seal ⑩ from the bearing housing ⑦.
- Remove the inner race of the tapered roller bearing ⑪.
- Using the suitable puller, remove the outer races of the tapered roller bearings ⑪, ⑫ from the bearing housing. (See fig. G109 on p. 154.)
- Using puller 57001-158, pull the inner race of the tapered roller bearing ⑫ from the pinion gear ⑬. (See fig. G110 on p. 154.)

**Pinion Gear Assembly** (N104)




1. Pinion Gear Nut
2. Washer
3. Shim(s)
4. Collar
5. Pinion Shaft Joint
6. O-Ring
7. Bearing Housing
8. Shim(s)
9. O-Ring
10. Grease Seal
11. Tapered Roller Bearing
12. Tapered Roller Bearing
13. Pinion Gear

## Pinion Gear Assembly Point:

- The pinion gear and ring gear are lapped as a set in the factory to get the best tooth contact. They must be replaced as a set.
- Check and adjust the preload of the tapered roller bearings(p. 351).
- If the pinion gear ⑬, tapered roller bearing ⑫, or bearing housing ⑦ was replaced, be sure to check and adjust the backlash and tooth contact of the bevel gears (p. 351).
- Use suitable bearing drivers to press in the tapered roller bearings and oil seal. Press the oil seal until it stops at the stepped portion of the hole.
- Discard the used pinion gear nut, and install a new nut when re-assembling.
- Use pinion gear holder 57001-1165 to tighten the pinion gear nut.
- Tightening torque for the pinion gear nut is 120 N-m (12.0 kg-m, 87 ft-lb).
- After preloading the bearings (p. 351), stake the pinion gear nut to prevent loosening. (See fig. G111 on p. 154.)

## Final Gear Case Disassembly and Assembly:

The disassembly and assembly procedures for the 1982 KZ1300-A4 are the same as those for the 1979 KZ1300-A1. Refer to pp. 155 – 156.

## Shim Adjustment (Chassis)

## Preload of Taper Roller Bearings:

Refer to pp. 156 – 157, noting the following.

**CAUTION**

○**Always select the shims so that the end of the collar and shims are flush within 1.5 mm. If it is not done, the tapered roller bearings may be damaged by the huge pressure when the pinion gear nut is tightened.**

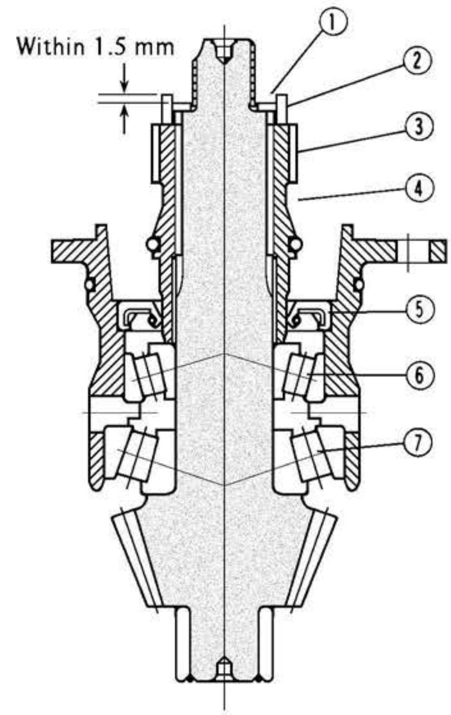
1. Use pinion gear holder 57001-1165 to turn the pinion shaft in replacement of pinion gear holder 57001-1050.

## Backlash and Tooth Contact of Bevel Gears:

Refer to pp. 157 – 160, noting the following.

1. Use pinion gear holder 57001-1165 to turn the pinion shaft in replacement of pinion gear holder 57001-1050.

**Pinion Shaft Joint** (N105)




1. Shim(s)
2. Collar
3. Pinion Shaft Joint
4. Pinion Shaft
5. Bearing Housing
6. Tapered Roller Bearing
7. Tapered Roller Bearing

# Maintenance

## Carburetors (U.S. Model)

### High Altitude Performance Adjustment:

High altitude performance adjustment is not required for the U.S. model.

## Clutch

Refer to pp. 192 – 194, noting the following.

1. The number of the steel plates is changed from eight to twelve and the friction plate from nine to seven.
2. The installation sequence of the steel and friction plates is changed. Refer to p. 347.
3. The clutch spring tension and friction plate thickness are changed.

**Table N28 Clutch Spring Tension**

| Length | Service Limit |
|---|---|
| 23.5 mm | 25.6 kg |

**Table N29 Friction Plate Thickness**

| | |
|---|---|
| Service Limit: | 3.10 mm |

## Transmission, Bevel Gears

Refer to p. 316, noting the following.

*Gear/Shaft Wear*

In addition to Table H70, measure the diameter of the drive shaft at the 50 mm, 75 mm, and 150 mm apart from the right end in fig. H96, and replace the drive shaft if it wears past the service limit.

**Table N30 Drive Shaft Wear**

| Location | Service Limit |
|---|---|
| At the 50 and 75 mm apart from the right end | 24.93 mm |
| At the 150 mm apart from the right end | 24.95 mm |

Measure the inside diameter of the secondary chain driven sprocket, and replace it if it wears past the service limit.

**Table N31 Secondary Chain Driven Sprocket Wear**

| | |
|---|---|
| Service Limit: | 25.04 mm |

*Shaft Bearing, Bushing Wear, Damage*

1. In Table H71 on p. 197, to measure the diameter of the drive shaft at location D and E is not necessary because the needle bearings between the secondary chain driven sprocket and drive shaft are discontinued.
2. The output shaft and bevel gear become into two part, and output shaft wear service limit is changed as follows (See fig. H98 on p. 198).

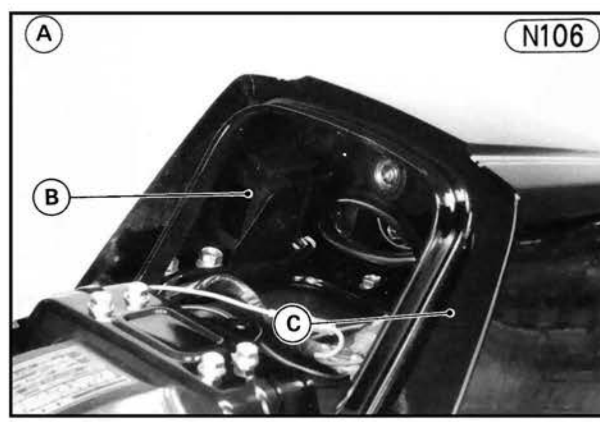
**Table N32 Output Shaft Wear**

| | |
|---|---|
| Service Limit: | 19.99 mm |

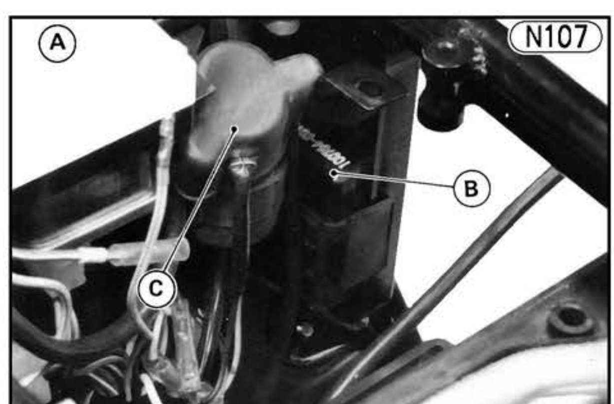
## Oil Pressure/Level Warning System

Refer to p. 318, noting the following.

1. The oil level warning light switch is installed inside the seat cover (U.S. and Canadian models) or near the starter relay (other than U.S. and Canadian models).




A. U.S. and Canadian Models
B. Oil Level Warning Light Switch
C. Seat Cover




A. Other than U.S. and Canadian Models
B. Oil Level Warning Light Switch
C. Starter Relay

## Propeller Shaft, Final Gear Case

Refer to pp. 217 – 219, noting the following.

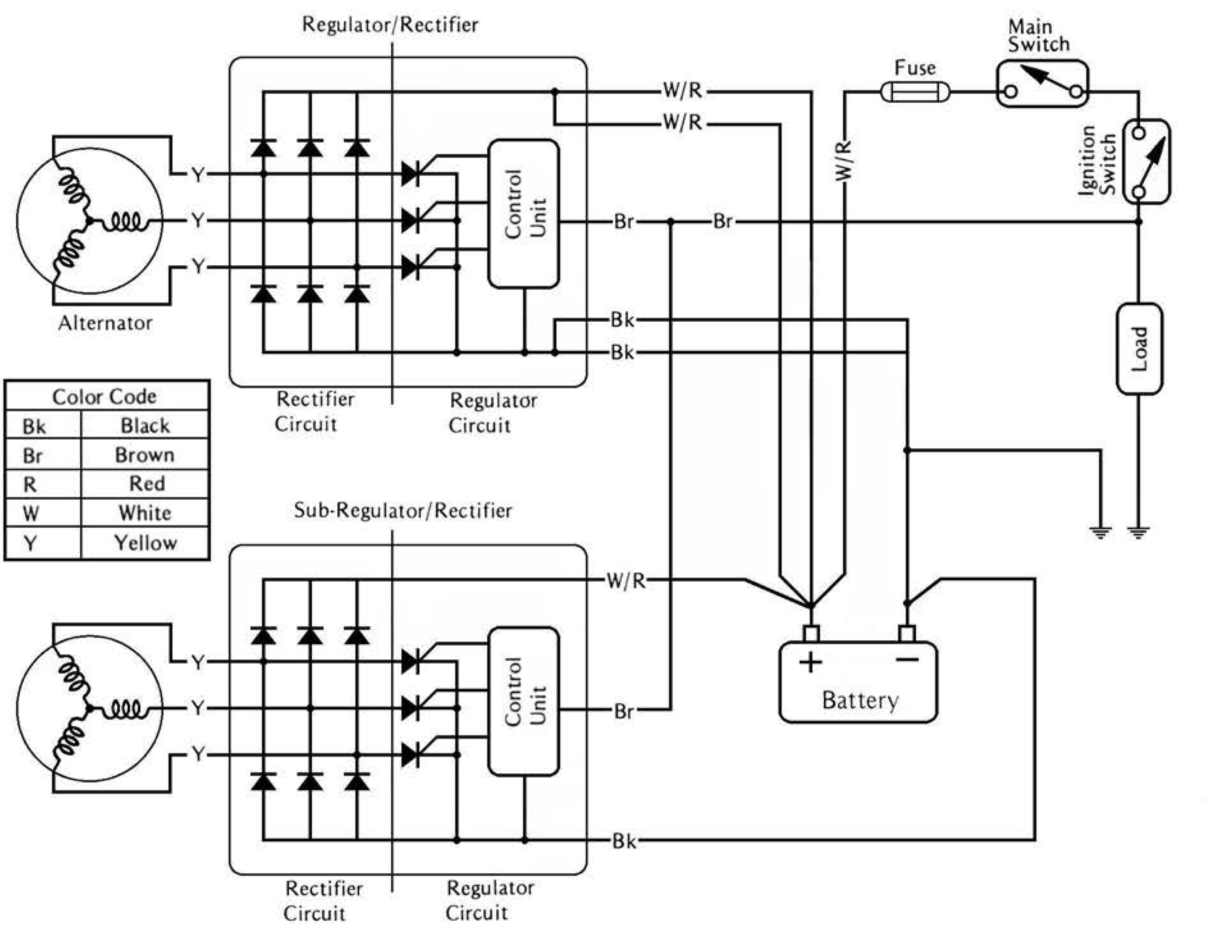
### *Propeller Shaft Joint Lubrication*

The propeller shaft joint is changed. Wipe off all the old grease, washing it in a high flash-point solvent if necessary. Pack the propeller shaft joint with 20 mL (16 grams) of high temperature grease. (See fig. N103 on p. 350.)

## Charging System

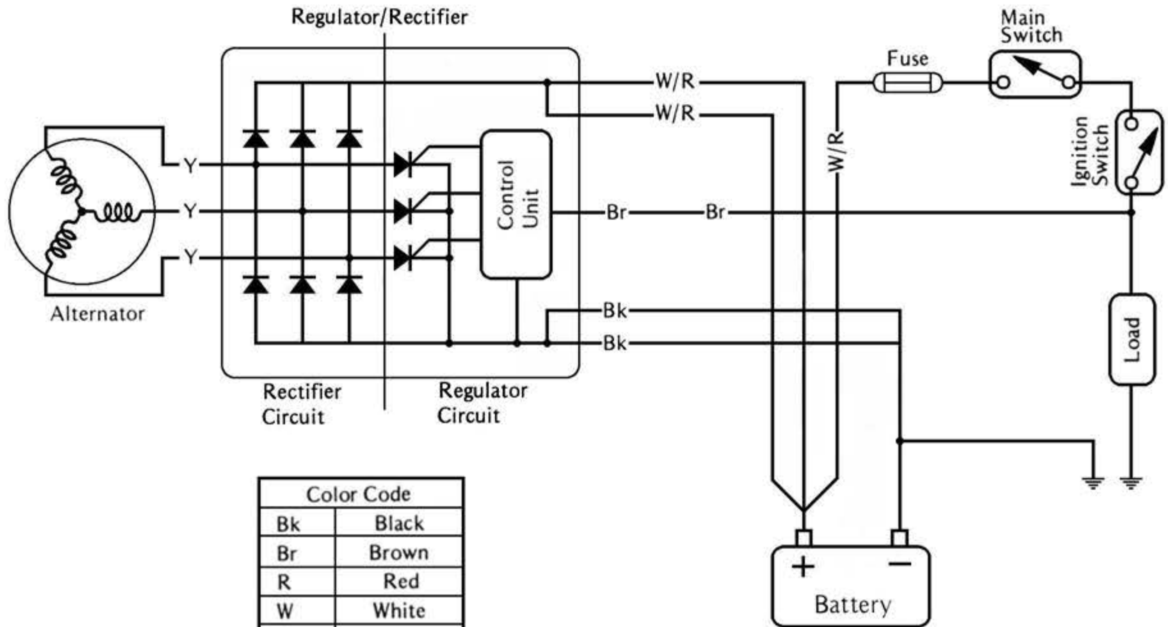
The schematic wiring diagrams for the 1982 model are shown in fig. N108 and 109. The alternator for the 1982 model is changed to get more generating output, and new regulator/rectifier is adopted for new alternator. For the U.S. and Canadian models, moreover, the sub-alternator is installed on the left side of the crankshaft to get more generating output. Also, the sub-regulator/rectifier is installed behind the left side cover for the sub-alternator. The constructions and operations of the sub-alternator and sub-regulator/rectifier are the same as those for the alternator and regulator/rectifier. Refer to pp. 232 – 234 with the following exceptions.

**Charging System (U.S. and Canadian Models)** (N108)




| Color Code | |
|---|---|
| Bk | Black |
| Br | Brown |
| R | Red |
| W | White |
| Y | Yellow |

**Charging System (Other than U.S. and Canadian Models)** (N109)




| Color Code | |
|---|---|
| Bk | Black |
| Br | Brown |
| R | Red |
| W | White |
| Y | Yellow |

1. The number of the white/red and black leads from the regulator/rectifier is changed from each one to each two because the alternator generating output is increased. For this reason, the connector which connects the regulator/rectifier and main wiring harness is changed from 4-pin connector to 6-pin connector. Check the regulator/rectifier at this connector.
2. For U.S. and Canadian models, check the sub-regulator/rectifier. This test procedures and meter reading are the same as those for the regulator/rectifier. There are 4-pin connector which connects the sub-regulator/rectifier to wiring harness and 3-pin connector which connects the sub-regulator/rectifier to the sub-alternator.
3. The output voltage and stator coil resistance for the alternator are shown in Table N33 and 34.
4. The output voltage and stator coil resistance for the sub-alternator on U.S. and Canadian models are shown in Table N35 and 36.

**Table N33 Alternator Output Voltage**

| Meter Range | Connections | Reading |
|---|---|---|
| 250 V AC | One meter lead → One yellow lead<br>The other meter lead → Another yellow lead<br>(Total of 3 measurements) | about 50 V @4,000 rpm |

**Table N34 Starter Coil Resistance**

| Meter Range | Connections | Reading |
|---|---|---|
| x 1 Ω | One meter lead → One yellow lead<br>The other meter lead → Another yellow lead<br>(Total of 3 measurements) | 0.48 – 0.72 Ω |

**Table N35 Sub-Alternator Output Voltage**

| Meter Range | Connections | Reading |
|---|---|---|
| 250 V AC | One meter lead → One yellow lead<br>The other meter lead → Another yellow lead<br>(Total 3 of measurements) | about 50V @4,000 rpm |

**Table N36 Stator Coil Resistance**

| Meter Range | Connections | Reading |
|---|---|---|
| x 1 Ω | One meter lead → One yellow lead<br>The other meter lead → Another yellow lead<br>(Total 3 of measurement) | 0.4 – 0.6 Ω |

## Ignition System

### Introduction:

The 1982 model employs a transistorized ignition system with no mechanical contact breaker. This system is essentially a battery and coil ignition system where the battery supplies the current for the primary circuit in the ignition system. The current for the primary circuit is controlled by use of an electronic switch called a power transistor. Moreover, the ignition timing is advanced not by a centrifugal advance mechanism but by an electronic circuit in the IC igniter: the electronic advance system. Since there are no moving mechanical parts to wear out, no maintenance is required. The working electrical part of ignition system consists of a battery, three pickup coils, an IC igniter, three resistors, and three ignition coils. The schematic wiring diagram of ignition system is shown in fig. N111.

### Main Component Parts:

**Pickup Coil Assembly:**

Three pickups are fastened onto the crankcase inside the alternator cover so that they will be close to the alternator rotor, and equally spaced on a circle. One is for #1 and #6 cylinders, another for the #2 and #5 cylinders, and the third for #3 and #4 cylinders. The pick-up coil is a magnetic signal generator which consists of a permanent magnet and coil. Two timing projections are positioned on the outside of the alternator rotor, and 45 degrees apart from each other.

Every time the timing projection passes under the pickup coil core, a signal is generated and sent to the IC igniter. The outputs of pickup coil is shown in fig. N110.

**IC Igniter:**

The IC igniter is located inside the right side cover and has the following functions.

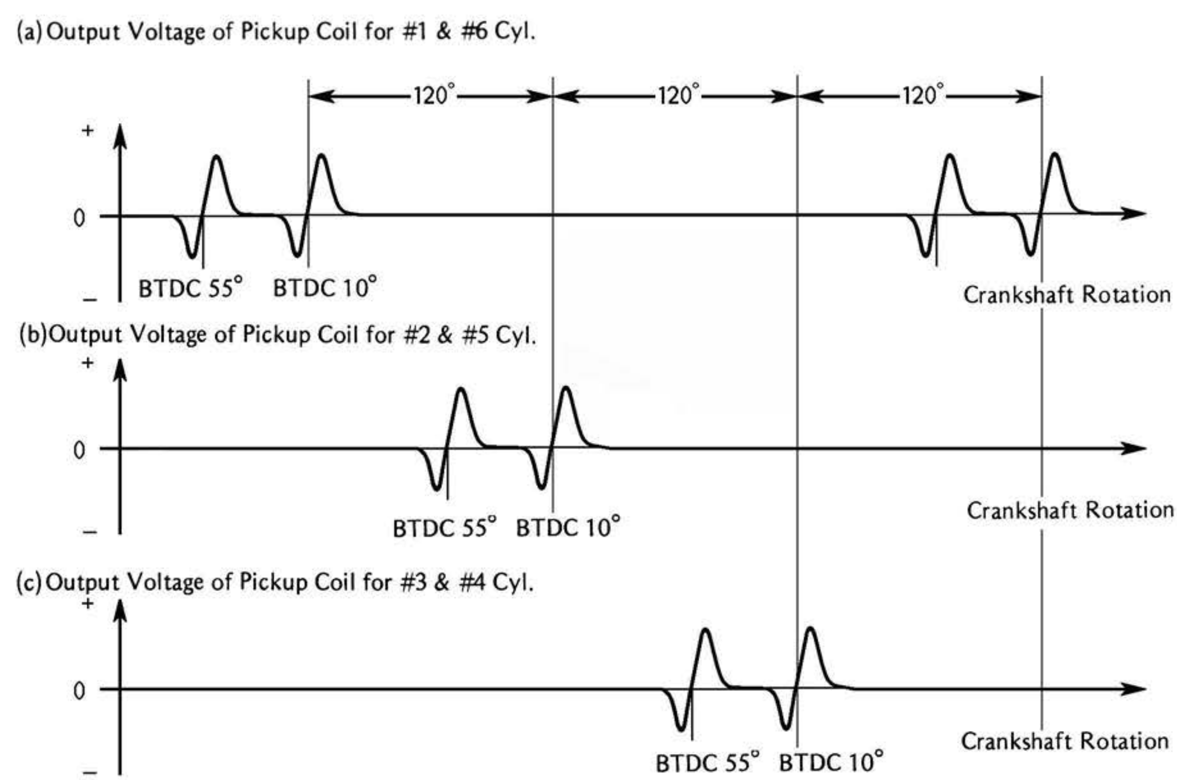
*(1) Electronic ignition timing advance*

The timing control circuit is provided in the IC igniter, and the ignition timing is controlled electronically so that it advances as the engine speed rises.

*(2) Time-controlled cutting off*

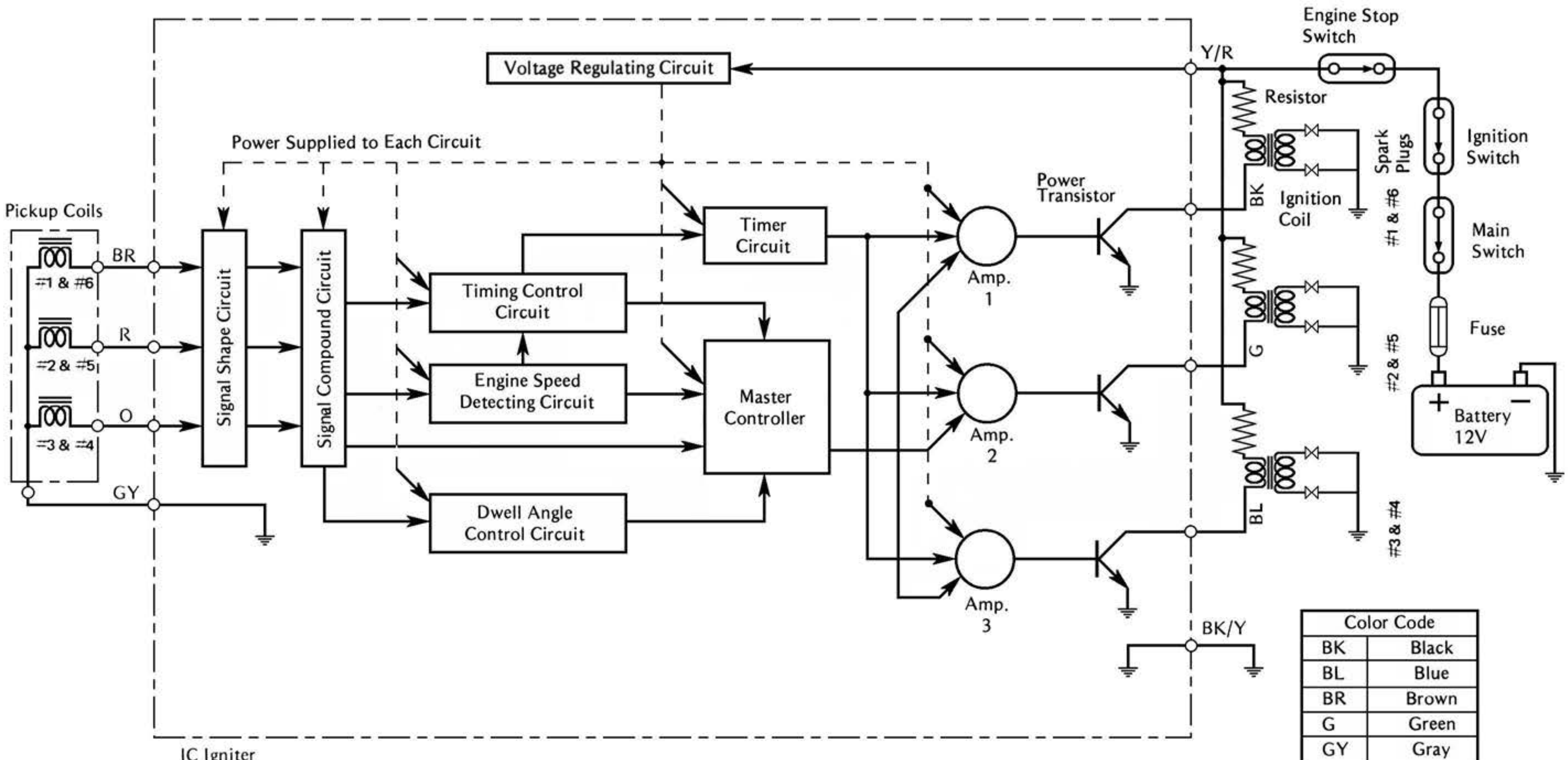
If the ignition switch is left turned on but the engine is not running, the primary current may continue to flow through a certain ignition coil (depending on the crankshaft position). If this condition continues, the battery will be discharged, and the ignition coil and the power transistor will be damaged by overheating. To prevent such a problem, a timer circuit is provided to cut off the primary current automatically a few seconds after the engine stops. However, once the engine is cranked and the first signal from the pickup arrives at the igniter, the timer circuit returns to its original state to permit the primary current to flow.

**Output of Pickup Coil** (N110)



## Schematic Wiring Diagram of Ignition System

N111




| Color Code | |
|---|---|
| BK | Black |
| BL | Blue |
| BR | Brown |
| G | Green |
| GY | Gray |
| O | Orange |
| R | Red |
| Y | Yellow |

*(3) Dwell-angle control*

The dwell angle is electronically controlled by the dwell angle control circuit so that it increases as the engine speed increases. This is to save the electric power at low engine speed, and to produce a spark of sufficient strength at high engine speed.

*(4) Voltage regulating*

A voltage regulating circuit is equipped in the circuitry. The voltage regulating circuit supplies an even voltage (6 volts) to the other circuits in the igniter despite variations in battery voltage. As a result, stable operation of the igniter is ensured. Moreover, the voltage regulating circuit protects the circuitry from surge currents in the power lines.

## Safety Instruction:

There are a number of important precautions that must be observed when servicing the transistorized ignition system. Failure to observe these precautions can result in serious system damage. Learn and observe all the rules listed below.

**(1) Because of limited capacity of the voltage regulating circuit in the IC igniter, 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 IC igniter damage.**

**(2) Do not install the battery backwards. The negative side is grounded. This is to prevent damage to the diodes.**

## Non-Scheduled Maintenance:

### Troubleahooting Guide:

If trouble is suspected in the ignition system, check the system by the following "Ignition System Troubleshooting Guide" shown in fig. N114. To use this chart, follow the arrows on the chart selecting a "YES" or "NO" arrow at each diamond-shaped step until you reach the "END". Each test procedure is explained individually.

### Discription of Each Testing Procedure:

*(1) To check the ignition spark*

•Connect the strobe light to each spark plug lead in the manner prescribed by the manufacturer.

•Turn on the main switch, ignition switch, and engine stop switch.

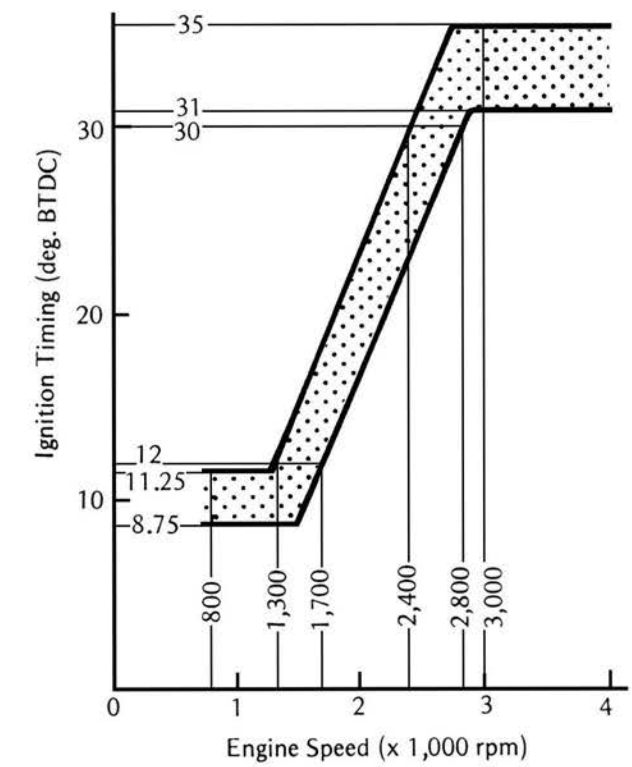
•Push the starter button with the clutch lever pulled in.

★Make sure that the strobe light gose on and off continuously.

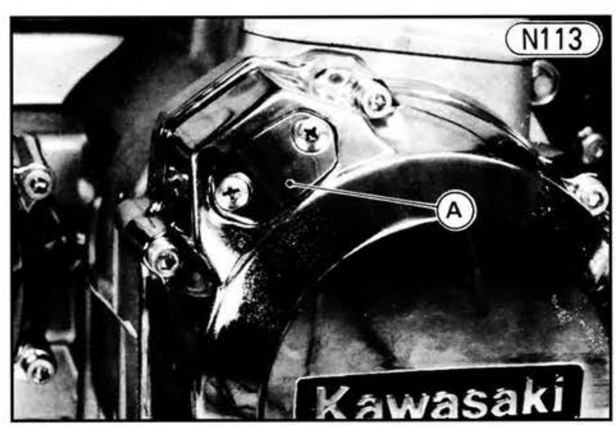
*(2) To check the dynamic ignition timing*

Check the ignition timing with a strobe light for both low and high speed operations. Timinig advance begins at about 1,400 rpm and reaches the maximum advance at about 2,800 rpm. As the result, the timing must be checked at idle (low speed operation) and then above 3,000 rpm (high speed operation) when it is fully advanced. The ignition timing/engine speed relationship is shown in fig. N112.

**Ignition Timing/Engine Speed Relationship** (N112)




•Remove the inspection window cover on the alternator cover at the right side of the engine.




**A. Inspection Window Cover**

•Connect a strobe light to the #1 or #6 spark plug lead in the manner prescribed by the manufacturer in order to check the ignition timing under operating conditions.

•Turn on the main switch, the ignition switch, and the engine stop switch. Start the engine, and direct the strobe light at the timing marks through the inspection window.

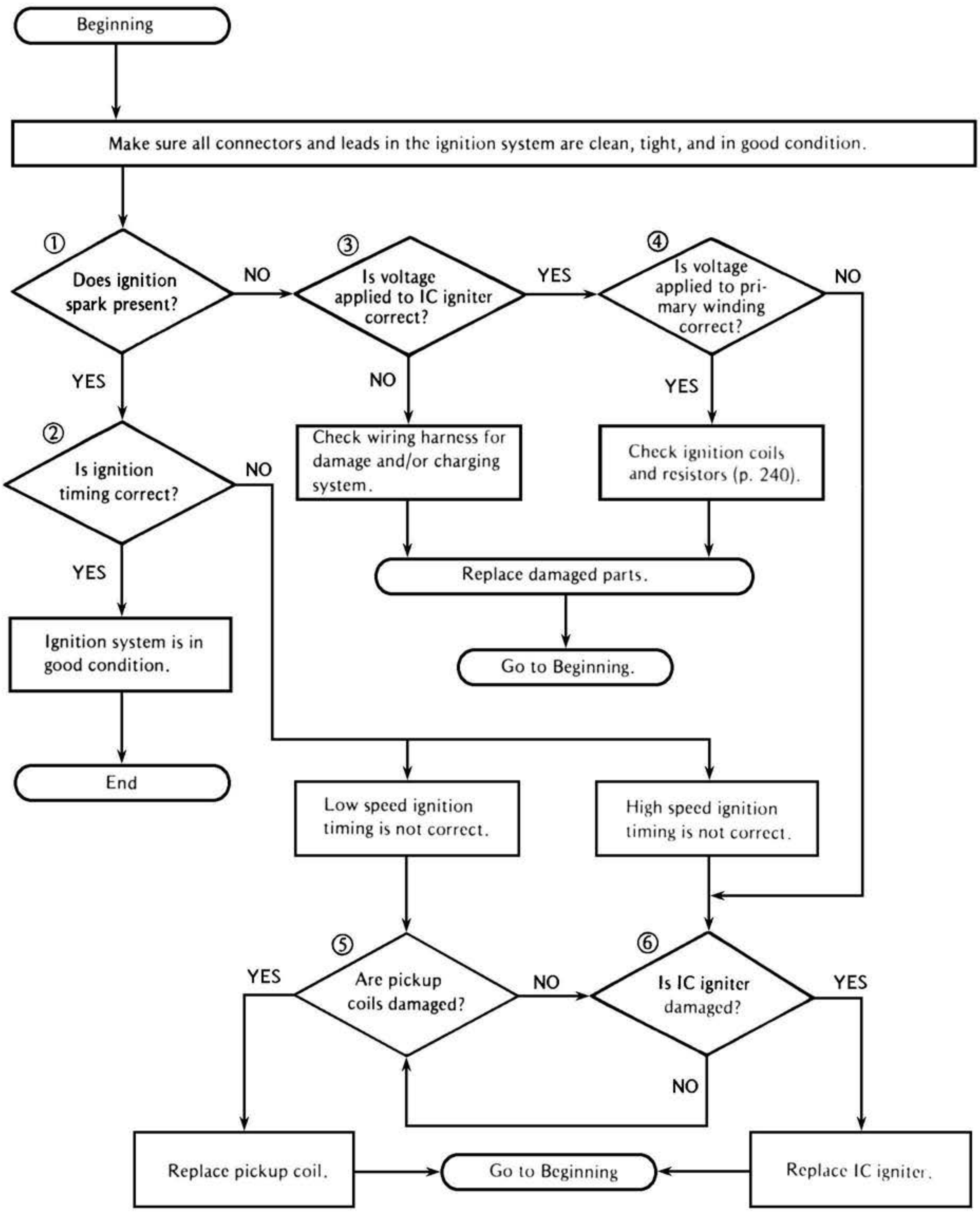
•At idle speed, the "F" mark on the alternator rotor must be aligned with the timing mark on the alternator cover for correct low speed ignition timing.

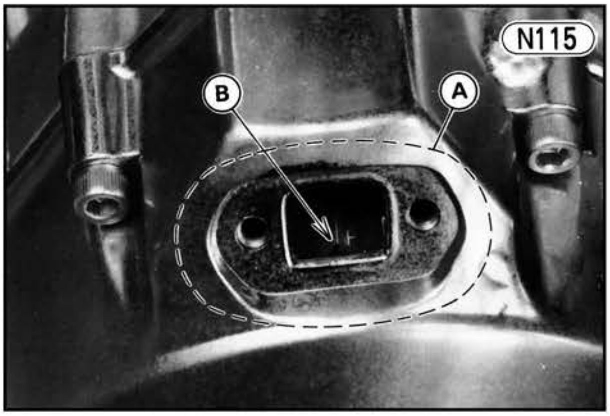
N114

*Ignition System Troubleshooting Guide*

**"NOTE"**

○This troubleshooting guide is explained on the assumption that the ignition switch, main switch, engine stop switch, fuse, battery, spark plugs, and spark plug caps are in good condition.

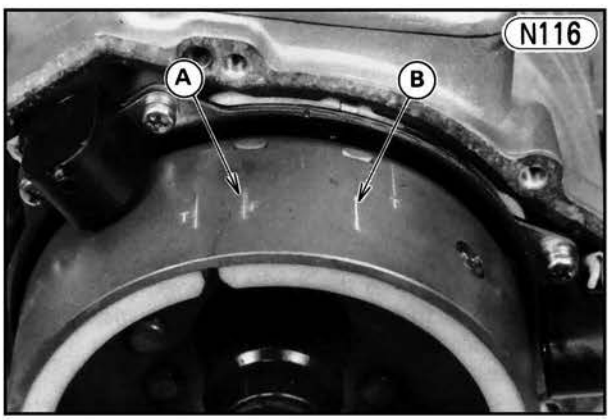





**A. Inspection Window** **B. Timing Mark**

**"NOTE"**

○*In fig. N116, the alternator cover is removed for explanation. In actual procedure, the alternator cover removal is not necessary.*




**A. "F" Mark** **B. Advanced Timing Mark**

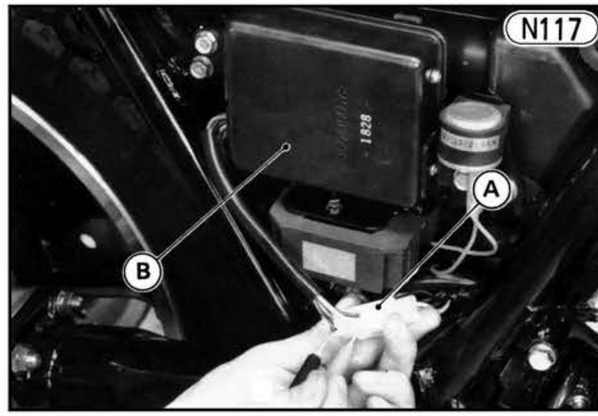
●Above 3,000 rpm, the timing mark on the alternator cover must be aligned with the advanced timing mark on the alternator rotor for correct high speed ignition timing.

*(3) To check the voltage applied to the IC igniter*

●Remove the right side cover.
●Set the multimeter to the 25V DC range, and connect the meter (+) lead to the yellow/red lead and the meter (–) lead to the black/yellow lead from the IC igniter without disconnecting the IC igniter 6-pin connector.
●Turn on the main switch, ignition switch, and engine stop switch.
●Push the starter button with the clutch lever pulled in.
★Make sure that the reading is within the specified value shown in Table N37.

**Table N37 Voltage Applied to IC Igniter**

| Meter Range | Lead Location | Connections | Reading |
|---|---|---|---|
| 25 V DC | 6-pin IC igniter connector inside the right side cover. | Meter (+) → Yellow/red lead<br>Meter (–) → Black/yellow lead | 8 – 16 volts |




**A. 6-Pin Connector** **B. IC Igniter**

*(4) To check the voltage applied to ignition coil primary winding*

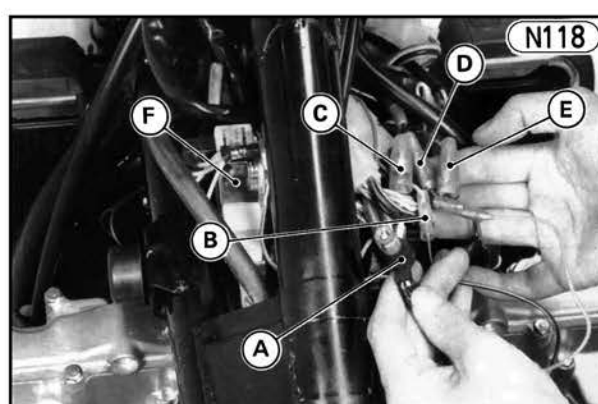
To check the voltage applied to primary winding, use a test light made from a 12V 3 – 4W bulb in a socket with leads.

●Remove the fuel tank.
●Disconnect the lead (black, green, or blue) to the ignition coil referring to Table N38.

**Table N38 Ignition Coil Lead Color**

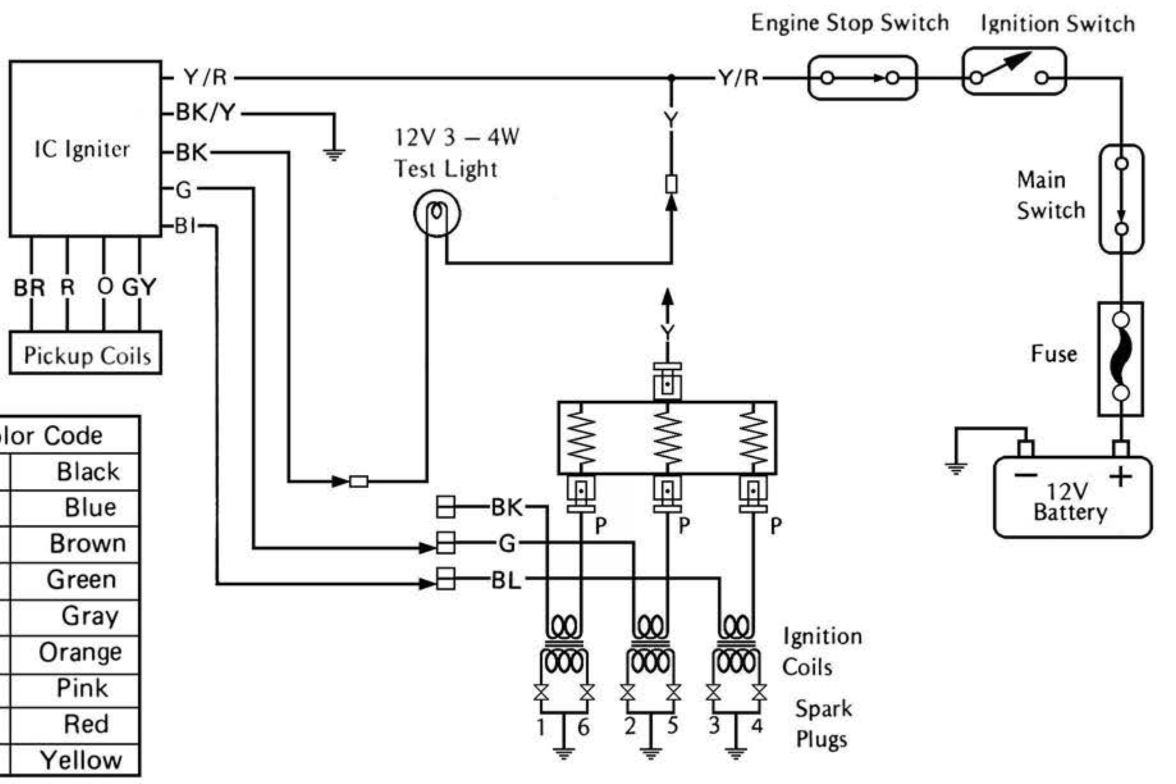
| #1 and #6 Cyl. | #2 and #5 Cyl. | #3 and #4 Cyl. |
|---|---|---|
| Black | Green | Blue |

●Disconnect the yellow lead to the resistor.
●Connect the test light between the lead (black, green or blue) and yellow lead as shown in fig. N118 or N119.
●Turn on the main switch, ignition switch, and engine stop switch.
●Push the starter button with the clutch lever pulled in.
★Make sure that the test light goes on and off continuously.




**A. Test Light** **D. Green Lead**
**B. Yellow Lead** **E. Blue Lead**
**C. Black Lead** **F. Resistor**

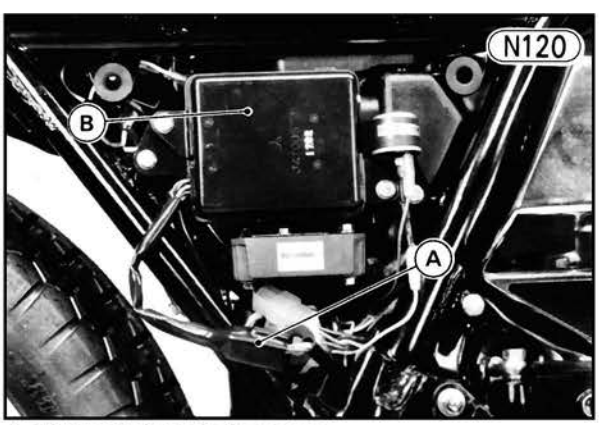
**Inspection of the Voltage Applied to the Ignition Coil Primary Winding**




| Color Code | |
|---|---|
| BK | Black |
| BL | Blue |
| BR | Brown |
| G | Green |
| GY | Gray |
| O | Orange |
| P | Pink |
| R | Red |
| Y | Yellow |

*(5) Pickup coil inspection*

- Remove the right side cover, and disconnect the 4-pin connector which connects the pickup coils with the IC igniter.




**A. Pickup Coil 4-pin Connector**
**B. IC Igniter**

- Set the ohmmeter to the x 100 Ω range, and connect the ohmmeter to the pickup coil leads to measure the coil resistance as shown in Table N39.

★The reading should show the value in Table N39.

- Using the highest resistance range of the ohmmeter, measure the resistance between each pickup coil lead and chassis ground.

★Any meter reading less than infinity (∞) indicates a short, necessitating replacement of the pickup coil assembly.

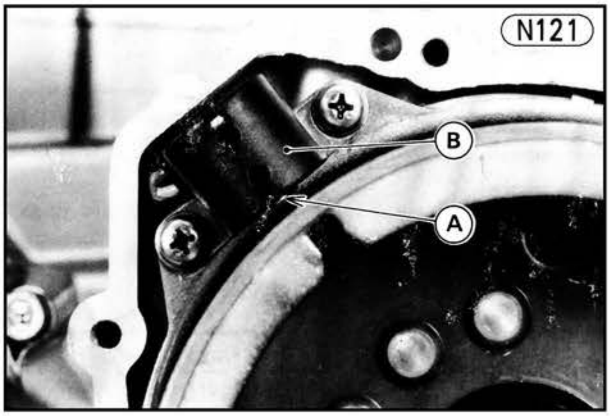
- Visually inspect the pickup coil assembly.

★If the permanent magnets and coils are damaged, replace the pickup coil assembly.

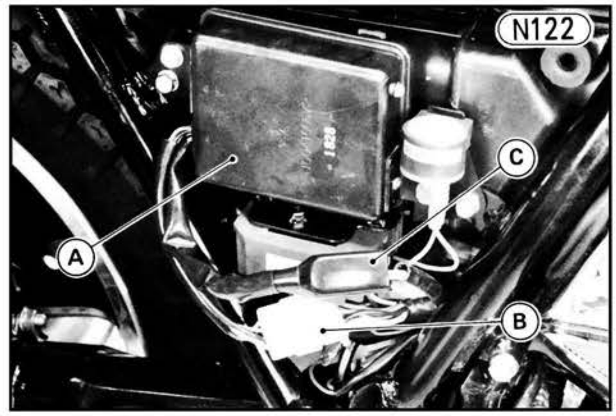
**Table N39 Pickup Coil Resistance**

| Meter Range | Lead Location | | Connections | Reading* |
|---|---|---|---|---|
| x 100 Ω | Female, 4-pin pickup coil connector inside the right side cover | For #1 & #6 pickup coil | One meter lead → Brown lead<br>The other meter lead → Gray lead | 160 – 240 Ω |
| | | For #2 & #5 pickup coil | One meter lead → Red lead<br>The other meter lead → Gray lead | |
| | | For #3 & #4 pickup coil | One meter lead → Orange lead<br>The other meter lead → Gray lead | |

*Measured when the coil is cold (room or atmospheric temperature).




**A. Magnet** **B. Pickup Coil**




**A. IC Igniter** **C. 4-pin Connector**
**B. 6-pin Connector**

*(6) IC igniter inspection*

The most accurate test for determining the condition of IC igniter is made by measuring the resistance with the Kawasaki Hand Tester (Special Tool: P/N 57001-983). Since a tester other than the Kawasaki Hand Tester may produce a different resistance, the Kawasaki Hand Tester should be used for reliable results.

**CAUTION**

**○Use only the Kawasaki Hand Tester (special tool) for this test. If a megger or a meter with a large-capacity battery is used, the IC igniter will be damaged.**

●Remove the right side cover.
●Disconnect the 6-pin and 4-pin connectors to the IC igniter.
●Connect the Kawasaki Hand Tester as shown in Table N40 to check the internal resistance of the IC igniter.
★The reading should show the value in Table N40.

## Hazard Warning Circuit (Other than U.S. and Canadian Models)

For the model other than U.S. and Canadian models, the hazard warning circuit is discontinued.

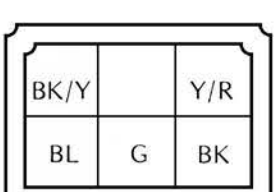
**Table N40 IC Igniter Inspection Using a Kawasaki Hand Tester (Meter Range: x 1 kΩ)**

**(a) Male 6-pin Connector**

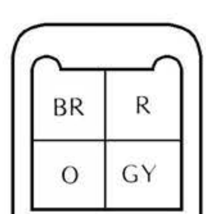
| | | Tester Positive (+) Lead Connection | | | | |
|---|---|---|---|---|---|---|
| | Lead Color | Y/R | BK/Y | BK | G | BL |
| Tester Negative (−) Lead Connection | Y/R | | A | B | B | B |
| | BK/Y | A | | C | C | C |
| | BK | ∞ | ∞ | | ∞ | ∞ |
| | G | ∞ | ∞ | ∞ | | ∞ |
| | BL | ∞ | ∞ | ∞ | ∞ | |

**(b) Male 4-pin Connector**

| | | Tester Positive (+) Lead Connection | | | |
|---|---|---|---|---|---|
| | Lead Color | BR | R | O | GY |
| Tester Negative (−) Lead Connection | BR | | ∞ | ∞ | D |
| | R | ∞ | | ∞ | D |
| | O | ∞ | ∞ | | D |
| | GY | ∞ | ∞ | ∞ | |




| Value (kΩ) | |
|---|---|
| A | 0.6 – 1.0 |
| B | 2.2 – 3.7 |
| C | 1.8 – 3.0 |
| D | 280 – 420 |
| ∞ | Infinity |




| Color Code | |
|---|---|
| BK | Black |
| BL | Blue |
| BR | Brown |
| G | Green |
| GY | Gray |
| O | Orange |
| R | Red |
| Y | Yellow |

# Appendix

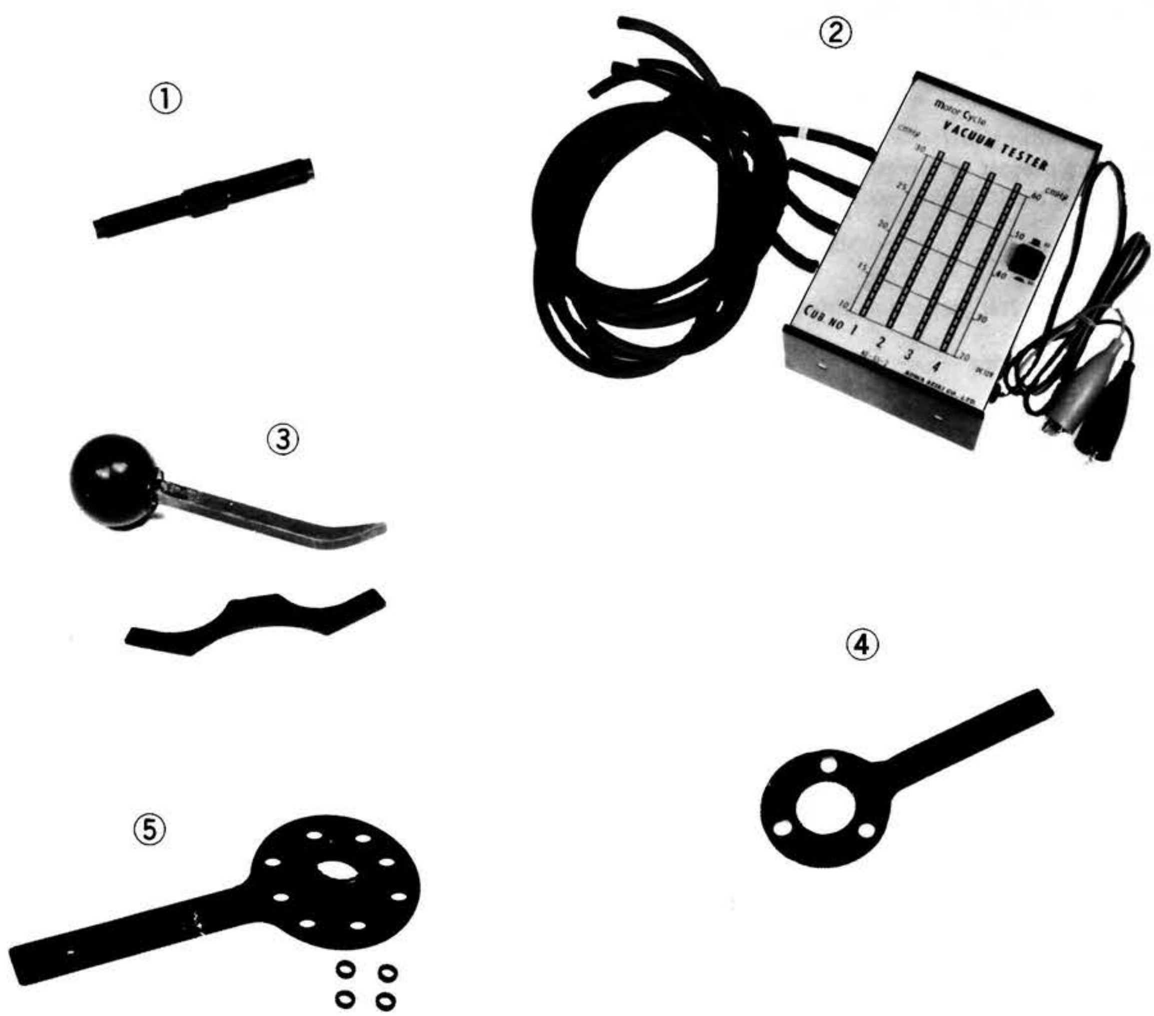
## Special Tools

Refer to pp. 331 – 332, noting the following.

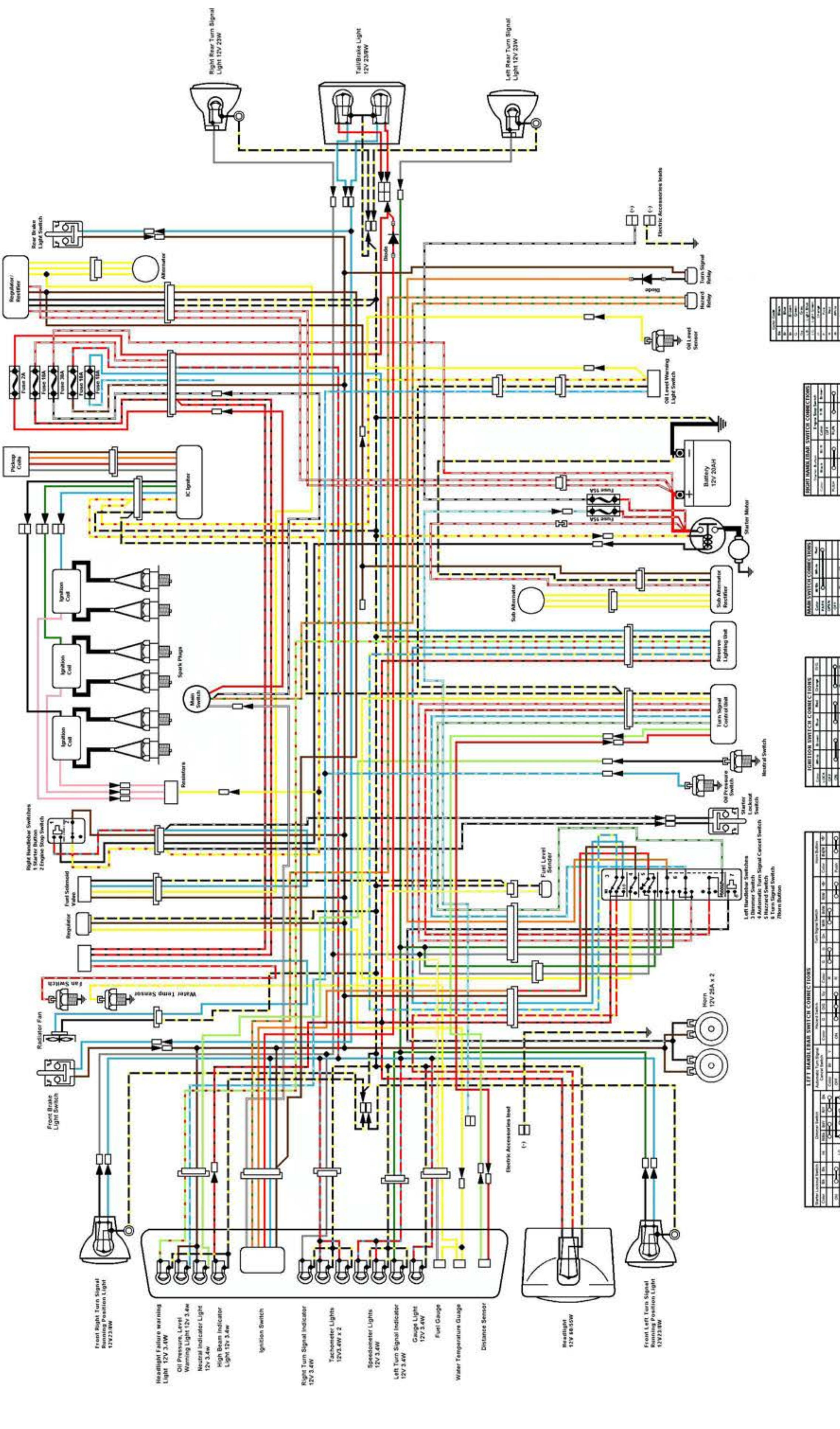
## Wiring Diagrams

The wiring diagrams for the 1982 model are shown on pp. 363 – 364.

| Ref. No. | New Part No. | Tool Name | Q'ty | Old Part No. |
|---|---|---|---|---|
| 1 | 57001-1099 | Rotor Puller | 1 | 57001-1016 & 1109 |
| 2 | 57001-1152 | Vacuum Gauge | 1 | 57001-127 & 226 |
| 3 | 57001-1153 | Valve Lifter Holder Set | 1 | 57001-1035 |
| 4 | 57001-1156 | Holder | 1 | ———— |
| 5 | 57001-1165 | Pinion Joint Holder | 1 | 57001-1050 |

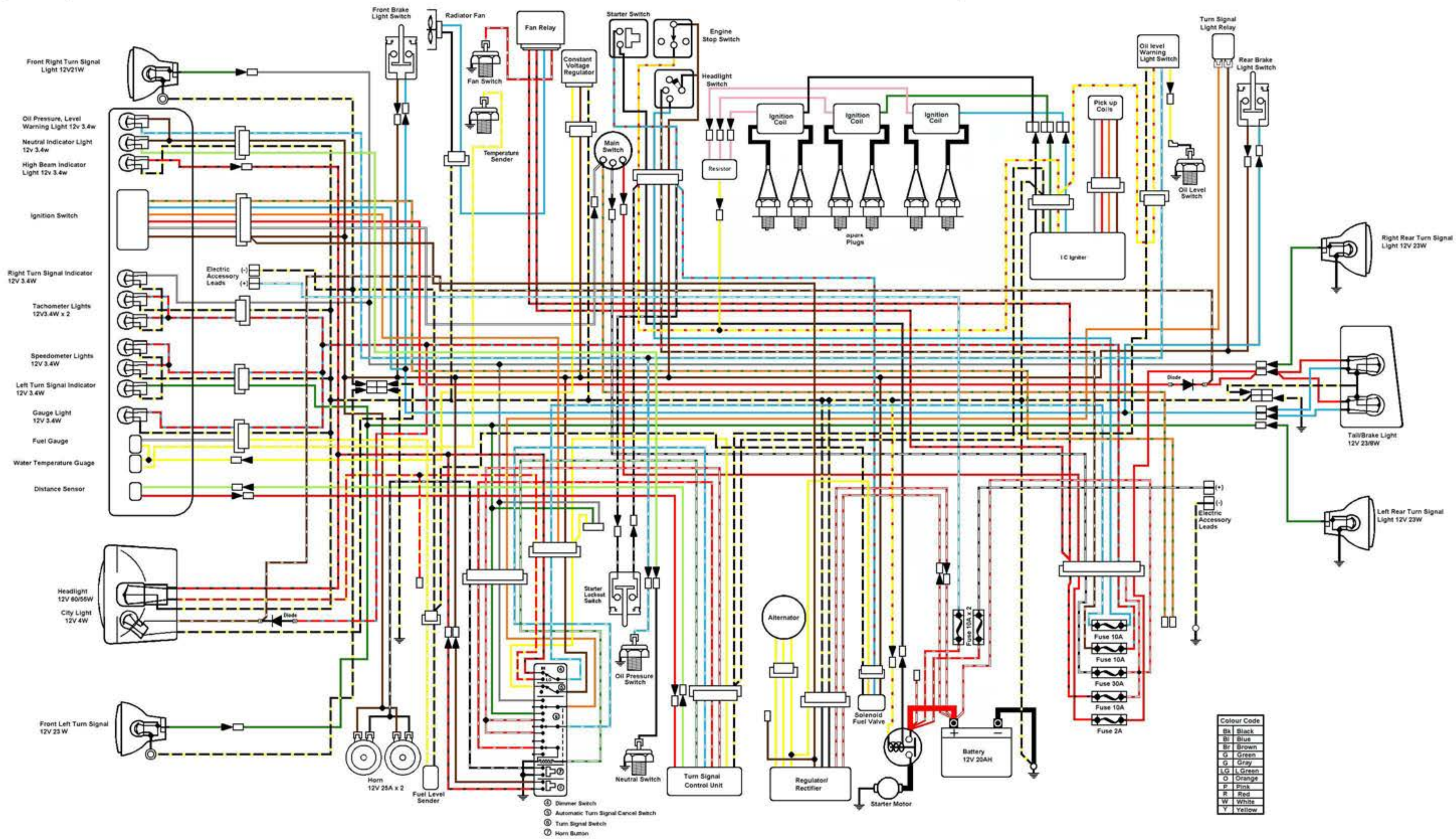


# KZ1300-A4 Wiring Diagram
(U.S. and Canadian Models)



# KZ1300-A4 Wiring Diagram

(Except U.S., Canadian, U.K., West German, Swiss, and Sweedish Models)




**LEFT HANDLEBAR SWITCH CONNECTIONS**

| Dimmer Switch | R/Bk | Bl/Y | R/Y | Automatic Turn Signal Cancel Switch | Br | Y | Turn Signal Switch | Green | Orange | Gray | W/R | Bl/W | R/W | ⏚ | Horn Switch | Bk/W | ⏚ | Passing Switch | Brown | R/Bk | Release Switch | Bl/R | ⏚ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HI | O | O | | | | | R | | O | O | O | O | | | | | | | | | Push | | |
| LO | | | | ON | O | O | | | | | | | O | O | Push | O | O | Push | O | O | | O | O |
| | | O | O | | | | L | O | O | | O | O | | | | | | | | | | | |

**IGNITION SWITCH CONNECTIONS**

| | Battery 1 | Ignition | Tail 1 | Tail 2 | Battery 2 | Tail3 |
|---|---|---|---|---|---|---|
| | White | Brown | Blue | Red | Orange | O/G |
| OFF | | | | | | |
| ON | O | O | O | O | O | O |
| PARK | | | | | O | O |

**RIGHT HANDLEBAR SWITCH CONNECTIONS**

| Engine Stop Switch | Y/R | Br | Headlight Switch | Br/W | Brown | Bl | Starter Switch | Black | Y/R |
|---|---|---|---|---|---|---|---|---|---|
| OFF | | | OFF | | | | | | |
| RUN | O | O | o | O | O | | Push | O | O |
| OFF | | | ON | O | O | O | | | |

**MAIN SWITCH CONNECTIONS**

| | Battery | Ignition | Tail |
|---|---|---|---|
| | W/Bk | White | Red |
| OFF | | | |
| ON | O | O | |
| PARK | O | | O |

# Index