

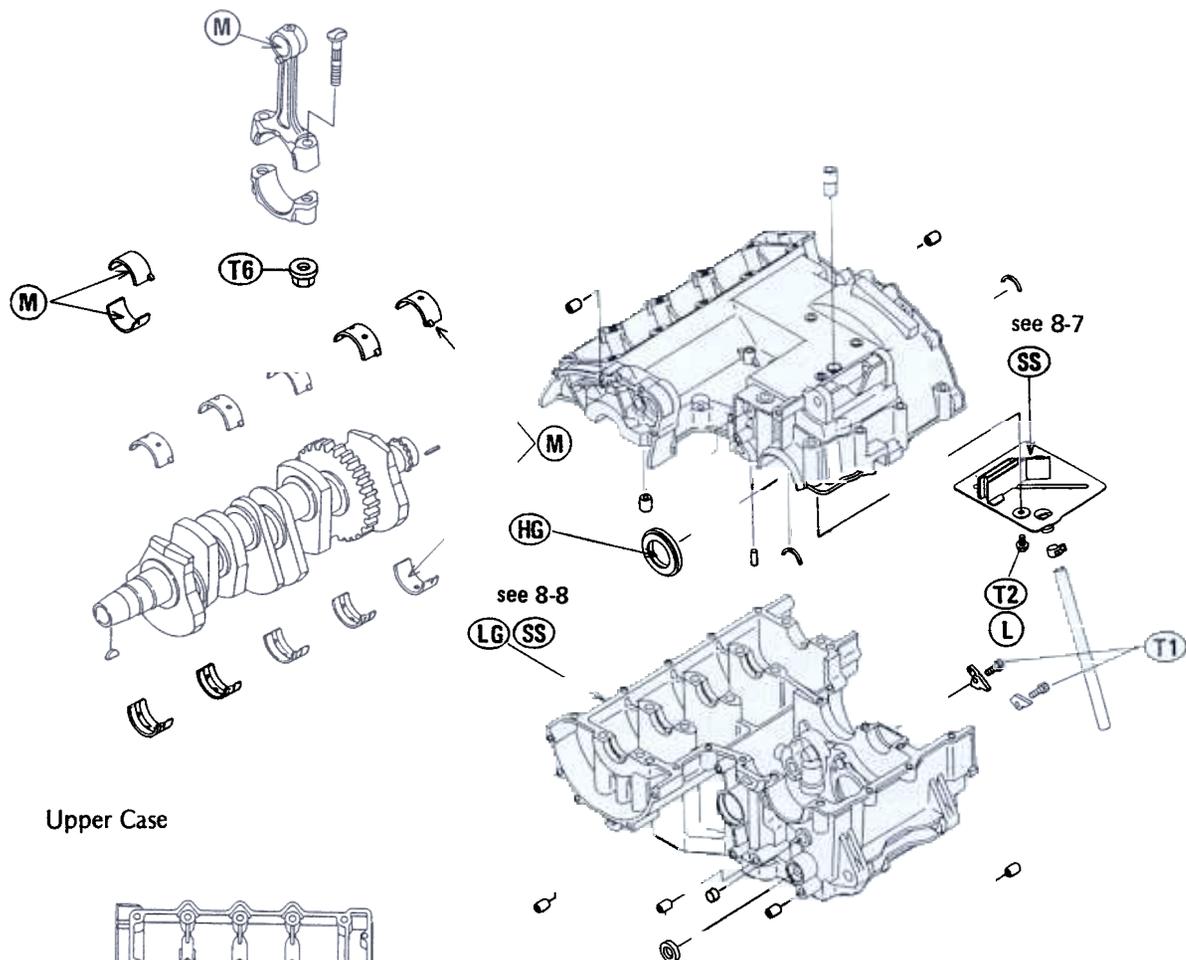
# Crankshaft / Transmission

## Table of Contents

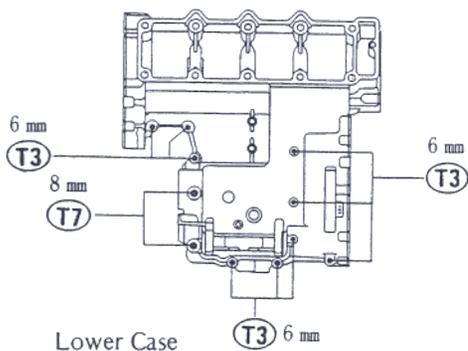
Exploded View .....	..8-2
Specifications .....	..8-4
Special Tools .....	..8-6
Sealant .....	..8-6
Crankcase .....	..8-7
Crankcase Splitting .....	..8-7
Crankcase Assembly .....	..8-7
Crankshaft/Connecting Rods .....	..8-9
Crankshaft Removal .....	..8-9
Crankshaft Installation .....	..8-9
Connecting Rod Removal .....	..8-10
Connecting Rod Installation .....	..8-10
Connecting Rod Big End Bearing Insert/Crankpin Wear .....	..8-10
Crankshaft Main Bearing/Journal Wear .....	..8-12
Crankshaft Side Clearance .....	..8-13
Transmission .....	..8-14
Shift Pedal Removal .....	..8-14
Shift Pedal Installation .....	..8-14
External Shift Mechanism Removal .....	..8-14
External Shift Mechanism Installation .....	..8-14
Transmission Shaft Removal .....	..8-14
Transmission Shaft Installation .....	..8-15
Transmission Disassembly .....	..8-15
Transmission Assembly .....	..8-15
Shift Drum and Fork Removal .....	..8-17
Shift Drum and Fork Installation .....	..8-17
Shift Drum Disassembly .....	..8-17
Shift Drum Assembly .....	..8-17

## 8-2 CRANKSHAFT / TRANSMISSION

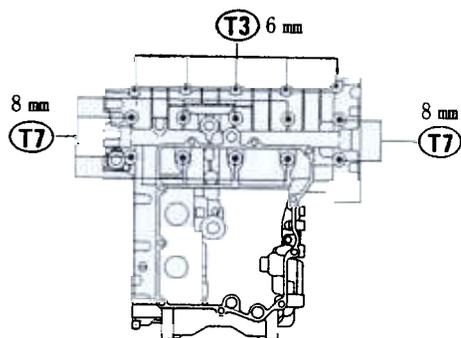
### Exploded View



Upper Case



Lower Case



**T1**: 8.8 N-m (0.9 kg-m, 78 in-lb)

**T2**: 9.8 N-m (1.0 kg-m, 7.0 ft-lb)

**T3**: 12 N-m (1.2 kg-m, 8.5 ft-lb)

**T4**: 15 N-m (1.5 kg-m, 11.0 ft-lb)

**T5**: 20 N-m (2.0 kg-m, 14.5 ft-lb)

**T6**: 25 N-m (2.6 kg-m, 19 ft-lb)

**T7**: 27 N-m (2.8 kg-m, 20 ft-lb)

**G** : Apply grease.

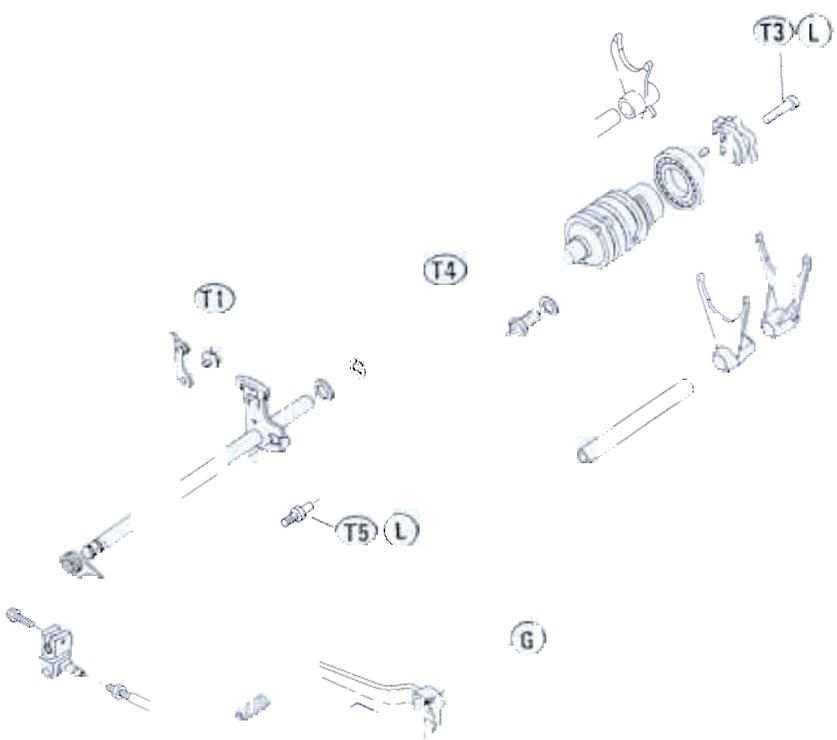
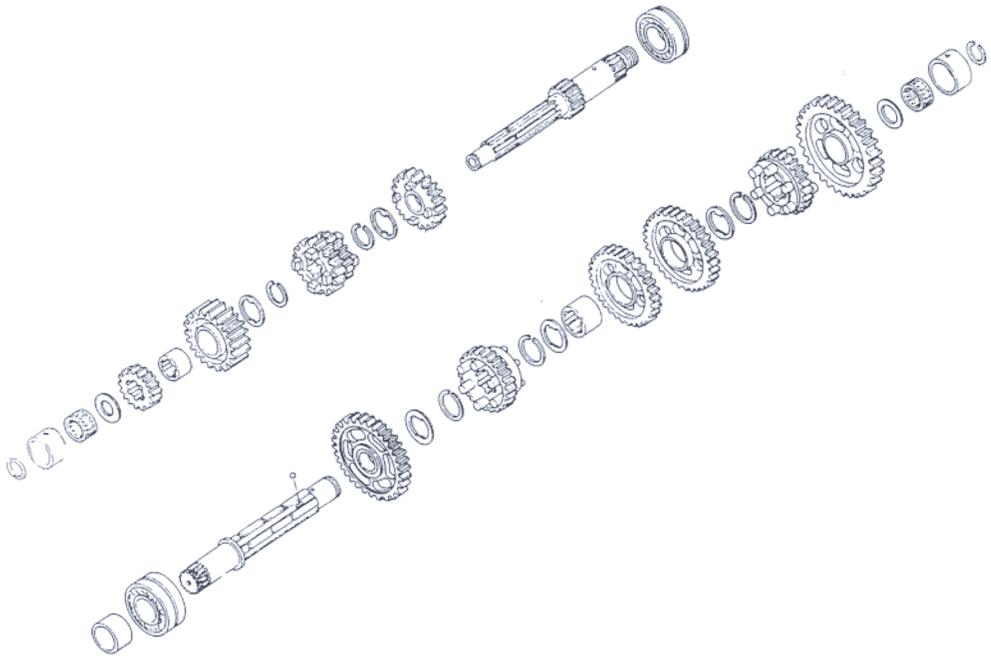
**H** : Apply high temperature grease.

**LG** : Apply liquid gasket – black (Kawasaki Bond: 92104-1003) to the mating surface of the right and left crankcase halves.

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

**SS** : Apply silicone sealant (Kawasaki Bond: 56019-120) to the gaskets and the threads.

**M** : Apply a thin coat of a molybdenum disulfide grease.



## 8-4 CRANKSHAFT / TRANSMISSION

### Specifications

Item	Standard	Service Limit
<b>Crankshaft, Connecting Rods:</b>		
Connecting rod big end side clearance	0.13 ~ 0.38 mm	0.60 mm
Connecting rod big end bearing insert/crankpin clearance	0.031 ~ 0.059 mm	0.10mm
Crankpin diameter:	29.984 ~ 30.000 mm	29.97 mm
Marking	None	---
	○	---
Connecting rod big end bore diameter:	33.000 ~ 33.016 mm	---
Marking	None	---
	○	---
Connecting rod big end bearing insert thickness:		
	Blue	---
	Black	---
	Brown	---

#### Connecting rod big end bearing insert selection:

Con-Rod Big End Bore Diameter Marking	Crankpin Diameter Marking	Bearing Insert	
		Size Color	Part Number
○	None	Blue	92028-1492
None	None	Black	92028-1493
○	○		
None	○	Brown	92028-1494

Crankshaft side clearance	0.05 ~ 0.20 mm	0.40 mm
Crankshaft runout	0.02 mm or less	0.05 mm TIR
Crankshaft main bearing insert, journal clearance	0.014 ~ 0.038 mm	0.08 mm
Crankshaft main journal diameter:	29.984 ~ 30.000 mm	29.96 mm
Marking	None	---
	1	---
Crankcase main bearing bore diameter:	33.000 ~ 33.016 mm	---
Marking	○	---
	None	---
Crankshaft main bearing insert thickness:		
	Brown	---
	Black	---
	Blue	---

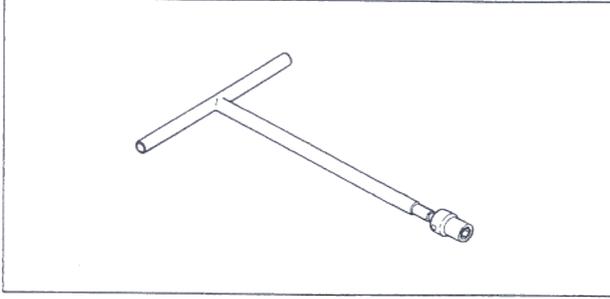
## CRANKSHAFT / TRANSMISSION 8-5

Item	Standard	Service Limit																															
Crankshaft main bearing insert selection:																																	
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2" style="width: 15%;">Crankcase Main Bearing Bore Diameter Mark</th> <th rowspan="2" style="width: 15%;">Crankshaft Main Journal Diameter Mark</th> <th colspan="3" style="text-align: center;">Bearing Insert*</th> </tr> <tr> <th style="width: 10%;">Size Color</th> <th style="width: 15%;">Part Number</th> <th style="width: 15%;">Journal Nos.</th> </tr> </thead> <tbody> <tr> <td rowspan="2" style="text-align: center;">○</td> <td rowspan="2" style="text-align: center;">1</td> <td rowspan="2" style="text-align: center;">Brown</td> <td style="text-align: center;">92028-1418</td> <td style="text-align: center;">5</td> </tr> <tr> <td style="text-align: center;">92028-1421</td> <td style="text-align: center;">1, 2, 3, 4</td> </tr> <tr> <td style="text-align: center;">○</td> <td style="text-align: center;">None</td> <td rowspan="2" style="text-align: center;">Black</td> <td style="text-align: center;">92028-1417</td> <td style="text-align: center;">5</td> </tr> <tr> <td style="text-align: center;">None</td> <td style="text-align: center;">1</td> <td style="text-align: center;">92028-1420</td> <td style="text-align: center;">1, 2, 3, 4</td> </tr> <tr> <td rowspan="2" style="text-align: center;">None</td> <td rowspan="2" style="text-align: center;">None</td> <td rowspan="2" style="text-align: center;">Blue</td> <td style="text-align: center;">92028-1416</td> <td style="text-align: center;">5</td> </tr> <tr> <td style="text-align: center;">92028-1419</td> <td style="text-align: center;">1, 2, 3, 4</td> </tr> </tbody> </table>			Crankcase Main Bearing Bore Diameter Mark	Crankshaft Main Journal Diameter Mark	Bearing Insert*			Size Color	Part Number	Journal Nos.	○	1	Brown	92028-1418	5	92028-1421	1, 2, 3, 4	○	None	Black	92028-1417	5	None	1	92028-1420	1, 2, 3, 4	None	None	Blue	92028-1416	5	92028-1419	1, 2, 3, 4
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			92028-1419	1, 2, 3, 4																													
*The bearing inserts for No. 5 has no oil groove.																																	
<b>Transmission:</b>																																	
Shift fork ear thickness	4.9 ~ 5.0 mm	4.8 mm																															
Gear shift fork groove width	5.05 ~ 5.15 mm	5.3 mm																															
Shift fork guide pin diameter	5.9 ~ 6.0 mm	5.8 mm																															
Shift drum groove width	6.05 ~ 6.20 mm	6.3 mm																															

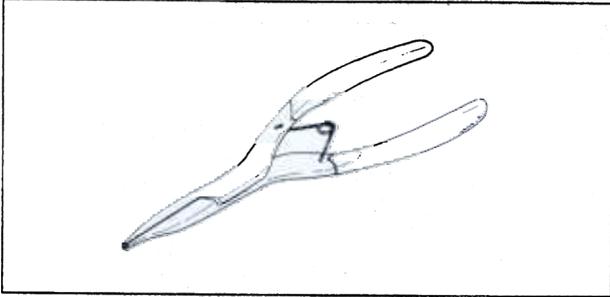
## 8-6 CRANKSHAFT / TRANSMISSION

### Special Tools

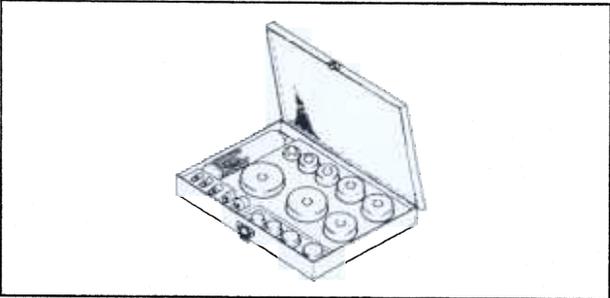
Socket Wrench, Hex 8: 57001-1268



Outside Circlip Pliers: 57001-144

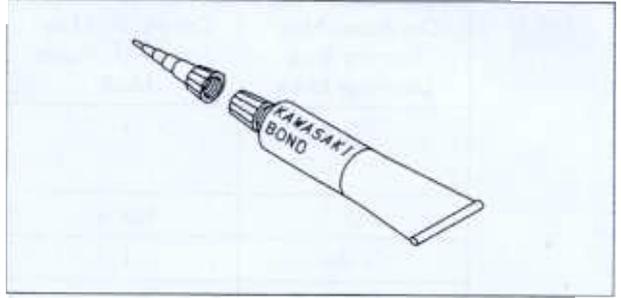


Bearing Driver Set: 57001-1129

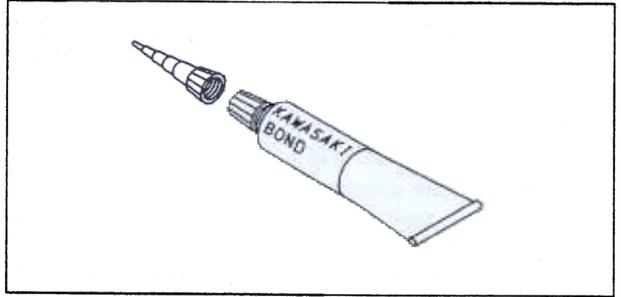


### Sealant

Kawasaki Bond (Silicone Sealant): 56019-120



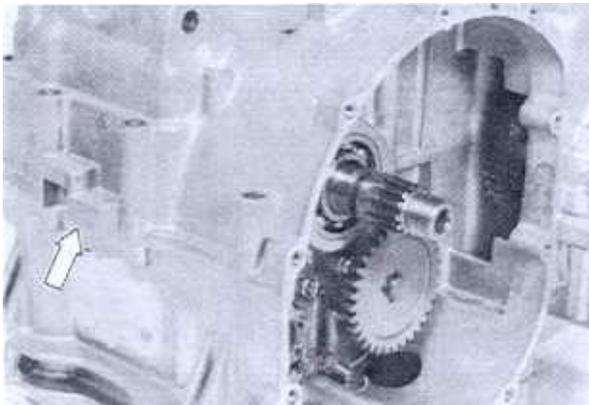
Kawasaki Bond (Liquid Gasket - Silver): 92104-002



**Crankcase**

**Crankcase Splitting**

- Remove the engine (see Engine Removal/Installation chapter).
- Set the engine on a clean surface and hold the engine steady while parts are being removed.
- Remove the following.
  - Cylinder Head (if the crankshaft is to be removed, see Engine Top End chapter)
  - Cylinder, Piston (if the crankshaft is to be removed, see Engine Top End chapter)
  - Starter Motor (see Electrical System chapter)
  - Crankcase Bolt (upper and lower)
- If necessary, remove the following.
  - Clutch (see Clutch chapter)
  - External Shift Mechanism (see this chapter)
  - Timing Rotor (see this chapter)
  - Oil Pump (see Engine Lubrication System chapter)
  - Alternator Rotor (see Electrical System chapter)
  - Water Pump (see Cooling System chapter)
  - Oil Filter Mounting Bolt
  - Oil Pan
  - Oil Pump Filter
  - Oil Pipe
- Gently tap the crankcase half with a plastic mallet, and separate the crankcase halves.



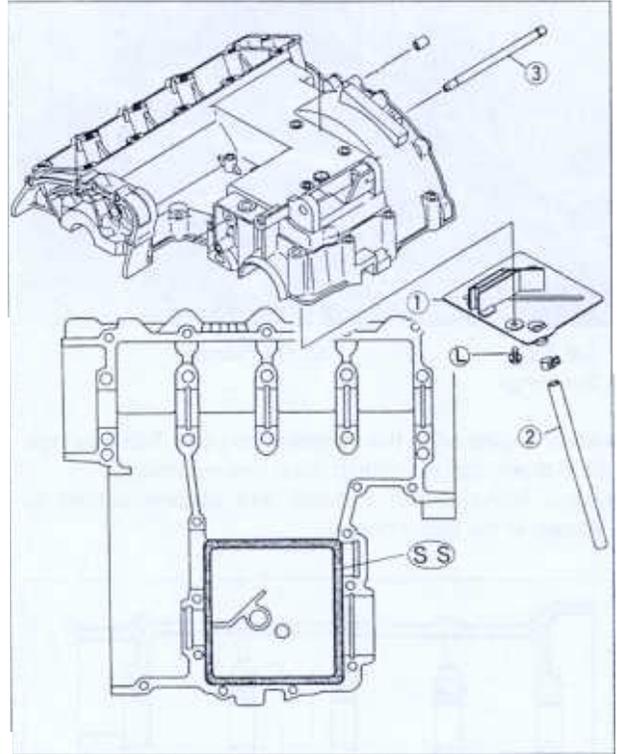
**Crankcase Assembly**

**CAUTION**

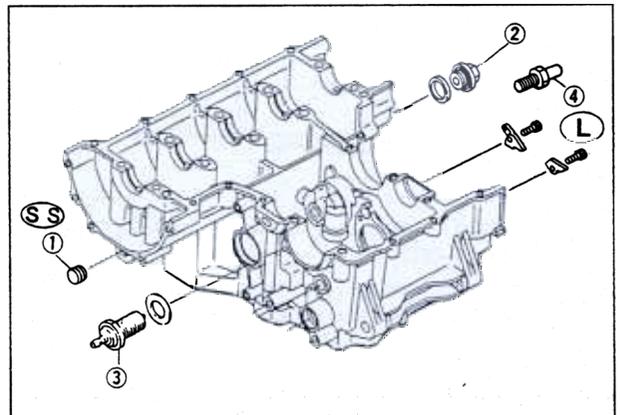
The upper and lower crankcase halves are machined at the factory in the assembled state, so the crankcase halves must be replaced as a set.

- With a high-flash point solvent, clean off the mating surfaces of the crankcase halves and wipe dry.
- Using compressed air, blow out the oil passages in the crankcase halves.
- Install the oil pipe.
- Apply silicone sealant to the breather plate mating surface on the upper crankcase and then install the breather plate.

- Apply a non-permanent locking agent to the plate mounting bolt (see Exploded View).



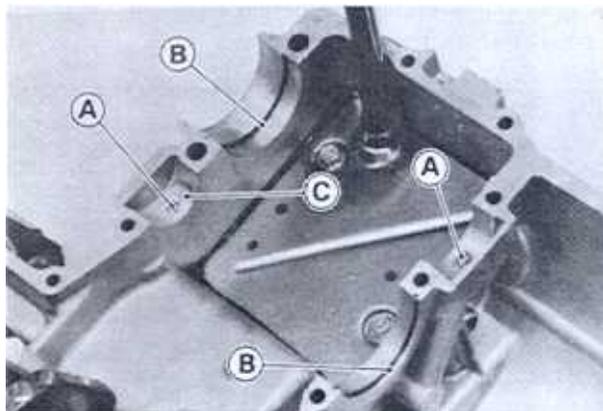
- SS: Apply silicone sealant
- L: Apply a non-permanent locking agent
- 1. Breather Plate
- 2. Oil Return Hose
- 3. Oil Pipe



- SS: Apply silicone sealant
- L: Apply a non-permanent locking agent
- 1. Left Oil Plug
- 2. Right Oil Plug
- 3. Neutral Switch
- 4. Return Spring Bolt

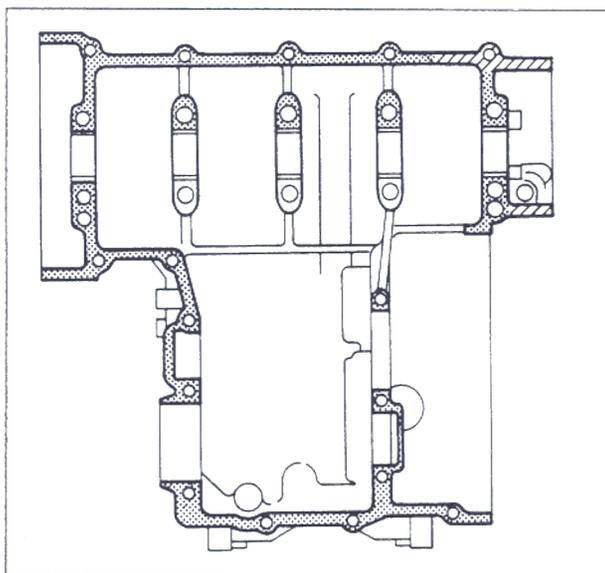
- Install the set pins and rings.

## 8-8 CRANKSHAFT / TRANSMISSION



A. Set Pin  
B. Set Rings  
C. Oil Passage

- Apply engine oil to the transmission gears, ball bearings, shift drum, and crankshaft main bearing inserts.
- Apply liquid gasket – black and silicone sealant as shown in the figure below.

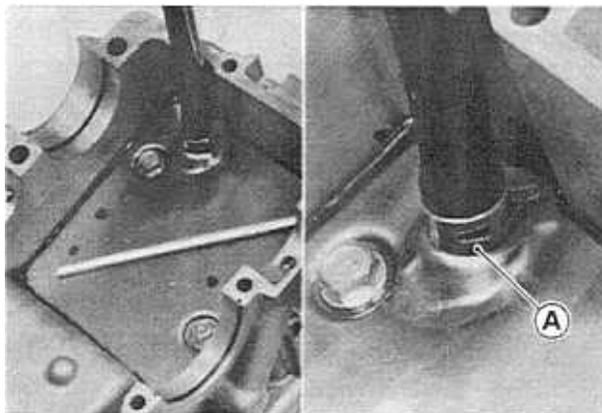


-  : Liquid Gasket – Silver (Kawasaki Bond: 92014-002)
-  : Silicone Sealant (Kawasaki Bond: 56019-120)  
Apply silicone sealant upon liquid gasket.

### CAUTION

If liquid gasket and silicone sealant adheres to any areas not indicated, the engine oil passages may be obstructed, causing engine seizure.

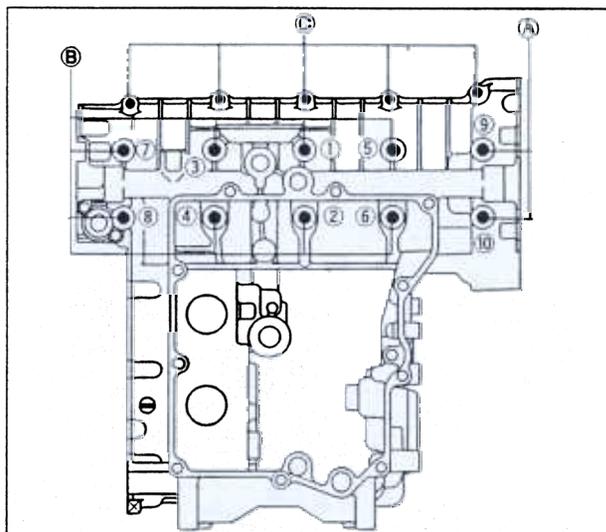
- Install the crankshaft, shift drum and transmission.
- Set the grip of clamp backward at the crankcase.



A. Oil Return Hose Clamp

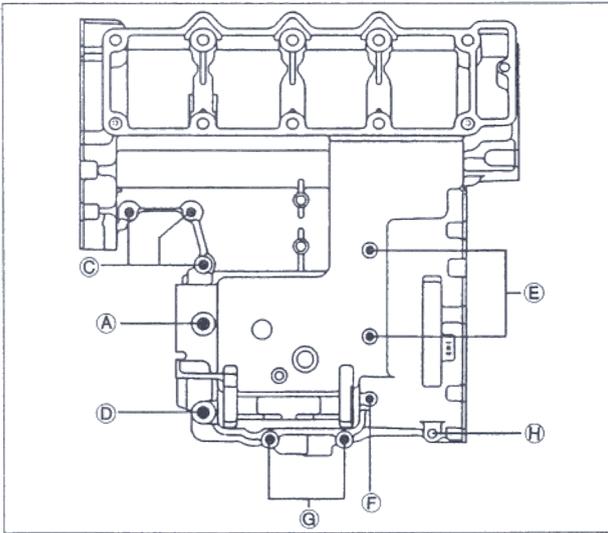
- Tighten the crankcase mounting bolts following the tightening sequence to the specified torque (see Exploded View).
- Following the tightening sequence, tighten the 8 mm bolts first to about one half of the specified torque, and finally to the specified torque.
- Tighten the 6 mm bolts to the specified torque.

### Lower Crankcase



A.  $\phi 8 \times L95$  mm  
B.  $\phi 8 \times L90$  mm  
C.  $\phi 6 \times L40$  mm

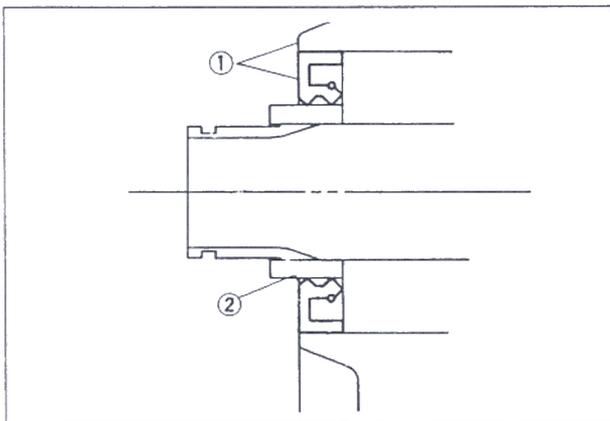
Upper Crankcase



D.  $\phi$  8 x L72 mm  
 E.  $\phi$  6 x L95 mm  
 F.  $\phi$  6 x L85 mm

G.  $\phi$  6 x L65 mm  
 H.  $\phi$  x L50 mm

- Apply high temperature grease to the output shaft oil seal lips and press the oil seal in the crankcase until the seal is even with the end of the hole.
- Install the collar.



1. Oil seal is even with end of hole.
2. Collar

- Check the following.
  - Shift drum is in the neutral position.
  - The #1 and 4 pistons are at TDC.
  - Drive shaft and output shaft turn freely.
  - Neutral finder operates properly (while spinning the output shaft, gears can be shifted from 1st to 2nd).

Crankshaft/Connecting Rods

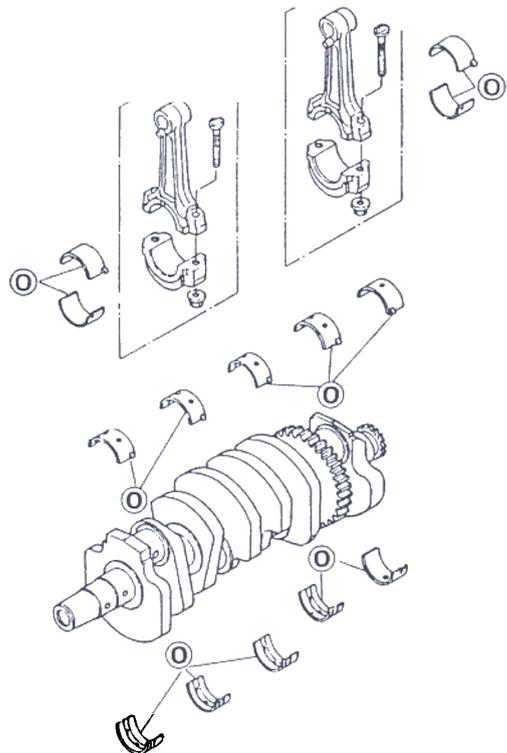
*Crankshaft Removal*

- Remove the engine.
- Remove the cylinder head, cylinder and pistons.
- Split the crankcase (see Crankcase Splitting).
- Take the crankshaft out of the upper crankcase.

*Crankshaft Installation*

**CAUTION**

If the crankshaft, bearing inserts, or crankcase halves are replaced with new ones, select the bearing inserts and check clearance with a plastigage before assembling engine to be sure the correct bearing inserts are installed.



O. Apply engine oil.

- Apply engine oil to the crankshaft main bearing inserts.

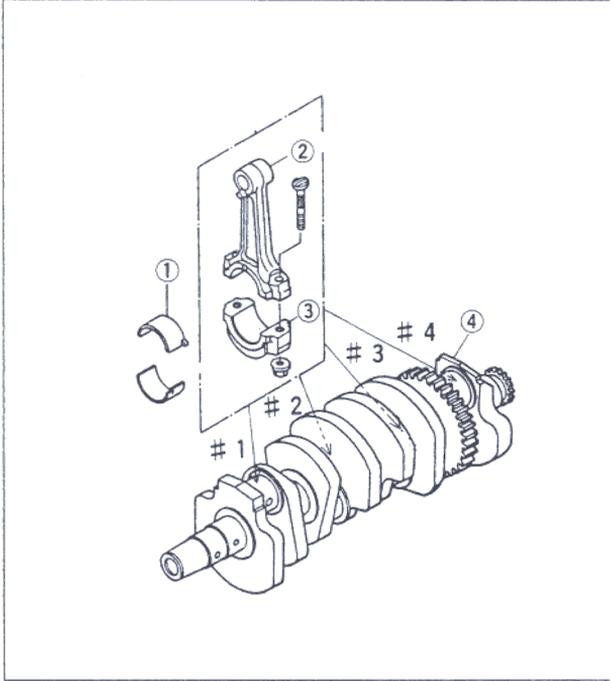
## 8-10 CRANKSHAFT / TRANSMISSION

### Connecting Rod Removal

- Remove the crankshaft.
- Remove the connecting rods from the crankshaft.

#### NOTE

- Mark and record the locations of the connecting rods and their big end caps so that they can be reassembled in their original positions.

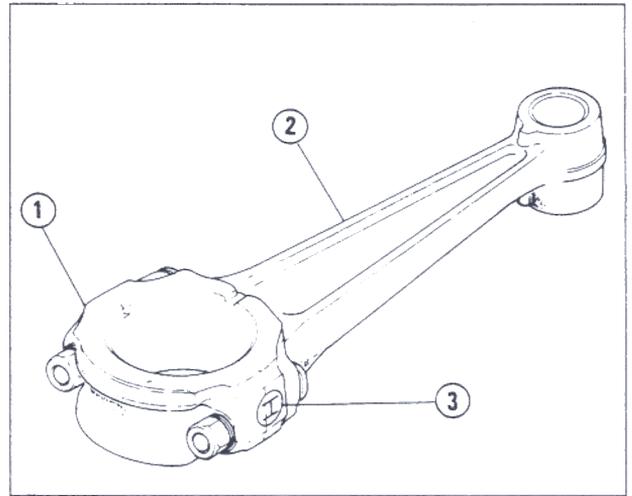


- 1. Main Bearing Inserts
- 2. Connecting Rod
- 3. Big End Cap
- 4. Crankshaft

### Connecting Rod Installation

#### CAUTION

To minimize vibration, a pair of connecting rods (left two rods or right two) should have the same weight mark.



- 1. Big End Cap
- 2. Connecting Rod
- 3. Weight Mark, Alphabet

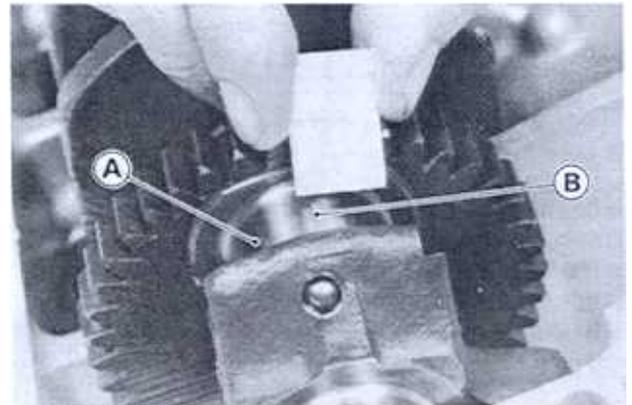
#### CAUTION

If the connecting rods, big end bearing inserts, or crankshaft are replaced with new ones, select the bearing insert and check clearance with a plastigage before assembling engine to be sure the correct bearing inserts are installed.

- Apply engine oil to the big end bearing inserts.
- Tighten the big end cap nuts to the specified torque (see Exploded View).

### Connecting Rod Big End Bearing Insert/Crankpin Wear

- Measure the bearing insert/crankpin clearance with a plastigage.



A. Crankpin

B. Plastigage

#### NOTE

- Tighten the big end cap nuts to the specified torque (see Exploded View).
- Do not move the connecting rod and crankshaft during clearance measurement.

**Connecting Rod Big End Bearing  
Insert/Crankpin Clearance**

Standard: 0.031 ~ 0.059 mm  
Service Limit: 0.10 mm

- ★ If clearance is within the standard, no bearing replacement is required.
- ★ If clearance is between 0.059 mm and the service limit (0.10 mm), replace the bearing inserts with inserts painted blue. Check insert/crankpin clearance with the plastigage. The clearance may exceed the standard slightly, but it must not be less than the minimum in order to avoid bearing seizure.
- ★ If clearance exceeds the service limit, measure the diameter of the crankpins.

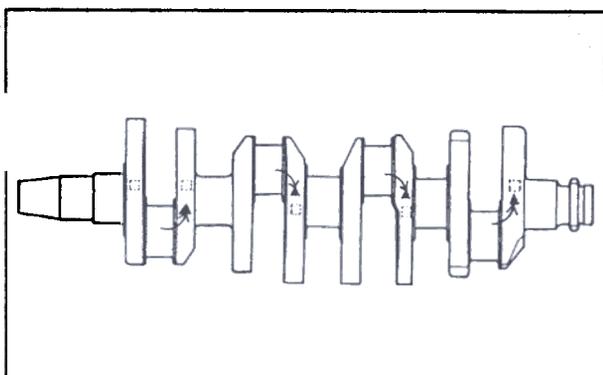
**Crankpin Diameter**

Standard: 29.984 ~ 30.000 mm  
Service Limit: 29.97 mm

- ★ If any crankpin has worn past the service limit, replace the crankshaft with a new one.
- ★ If the measured crankpin diameters are not less than the service limit, but do not coincide with the original diameter markings on the crankshaft, make new marks on it.

**Crankpin Diameter Marks**

None: 29.984 ~ 29.994 mm  
○: 29.995 ~ 30.000 mm



▲ Crankpin Diameter Marks, "○" mark or no mark

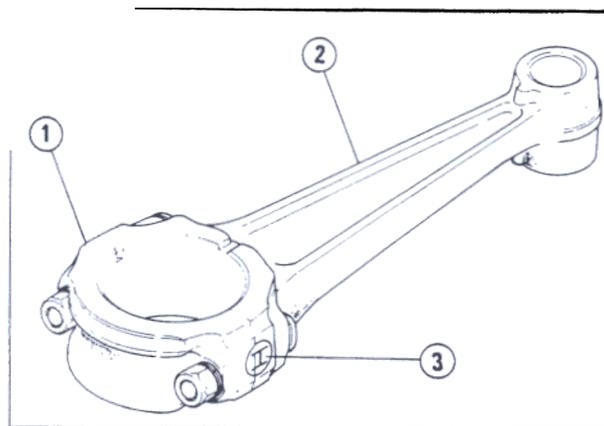
- Measure the connecting rod big end inside diameter, and mark each connecting rod big end in accordance with the inside diameter.

**NOTE**

- Tighten the nuts to the specified torque (see Exploded View).
- The mark already on the big end should almost coincide with the measurement.

**Connecting Rod Big End Inside Diameter Marks**

None: 33.000 ~ 33.008 mm  
○: 33.009 ~ 33.016 mm

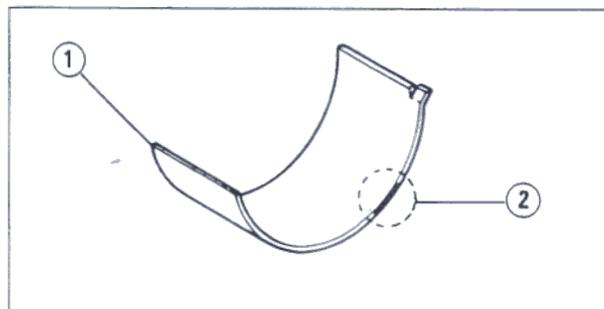


1. Big End Cap
2. Connecting Rod
3. Diameter Mark, "○" mark or no mark

- Select the proper bearing insert in accordance with the combination of the connecting rod and crankshaft coding.

**Big End Bearing Insert Selection**

Con-Rod Big End Bore Diameter Marking	Crankpin Diameter Mark	Bearing Insert	
		Size Color	Part Number
○	None	Blue	92028-1492
None	None	Black	92028-1493
○	○		
None	○	Brown	92028-1494



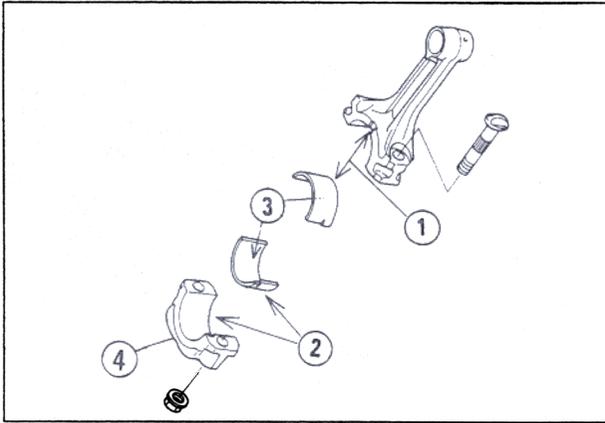
1. Bearing Insert
2. Color Size Mark

- Install the new inserts in the connecting rod and check insert/crankpin clearance with the plastigage.
- Apply molybdenum disulfide grease to the upper inner surface of the connecting rod big end (between the connecting rod big end and the bearing insert).

**CAUTION**

Do not apply molybdenum disulfide grease to the inner surface of the big end cap (between the big end cap and the bearing insert).

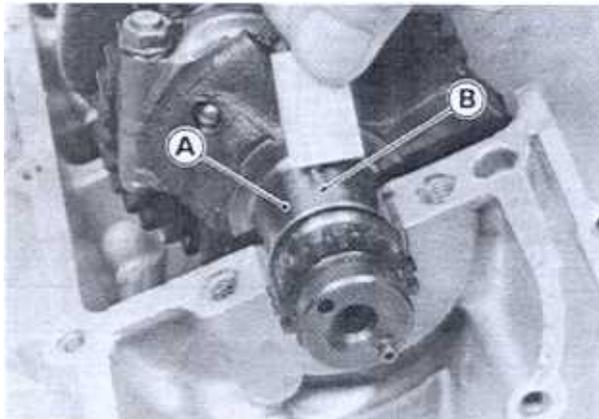
## 8-12 CRANKSHAFT / TRANSMISSION



1. Apply molybdenum disulfide grease. 3. Oil.
2. Do not apply grease. 4. Big End Cap

### Crankshaft Main Bearing/Journal Wear

- Measure the bearing insert/crankshaft main journal clearance with a plastigage.



A. Crankshaft Main Journal B. Plastigage

#### NOTE

- Tighten the crankcase bolts to the specified torque (see Exploded View).
- Do not turn the crankshaft during clearance measurement.
- Journal clearance less than 0.025 mm can not be measured by plastigage, however, using genuine parts maintains the minimum standard clearance.

### Crankshaft Main Bearing Insert/Journal Clearance

Standard: 0.014 ~ 0.038 mm  
Service Limit: 0.08 mm

- ★ If clearance is within the standard, no bearing replacement is required.
- ★ If clearance is between 0.038 mm and the service limit (0.08 mm), replace the bearing inserts with inserts painted blue. Check insert/journal clearance with the plastigage. The clearance may exceed the standard slightly, but it must not be less than the minimum in order to avoid bearing seizure.

- ★ If clearance exceeds the service limit, measure the diameter of the crankshaft main journal.

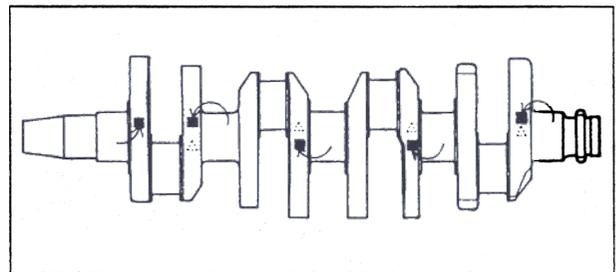
### Crankshaft Main Journal Diameter

Standard: 29.984 ~ 30.000 mm  
Service Limit: 29.96 mm

- ★ If any journal has worn past the service limit, replace the crankshaft with a new one.
- ★ If the measured journal diameters are not less than the service limit, but do not coincide with the original diameter markings on the crankshaft, make new marks on it.

### Crankshaft Main Journal Diameter Marks

None: 29.984 ~ 29.992 mm  
1: 29.993 ~ 30.000 mm



- Crankshaft Main Journal Diameter Marks, "1" mark or no mark

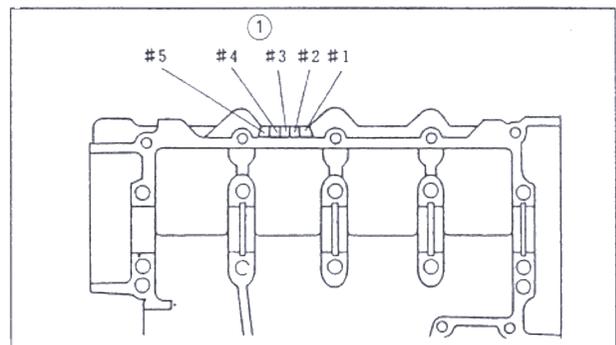
- Measure the main bearing bore diameter, and mark the upper crankcase half in accordance with the bore diameter.

#### NOTE

- Tighten the crankcase bolts to the specified torque (see Exploded View).
- The mark already on the upper crankcase half should almost coincide with the measurement.

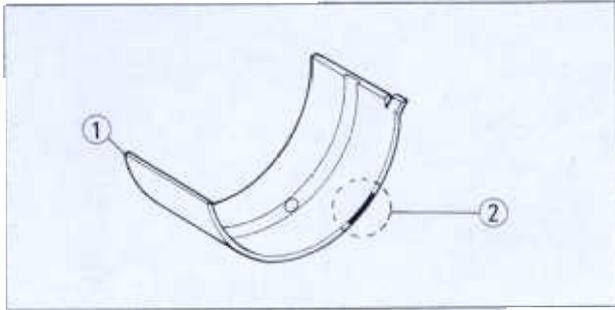
### Crankcase Main Bearing Bore Diameter Marks

○: 33.000 ~ 33.008 mm  
None: 33.009 ~ 33.016 mm



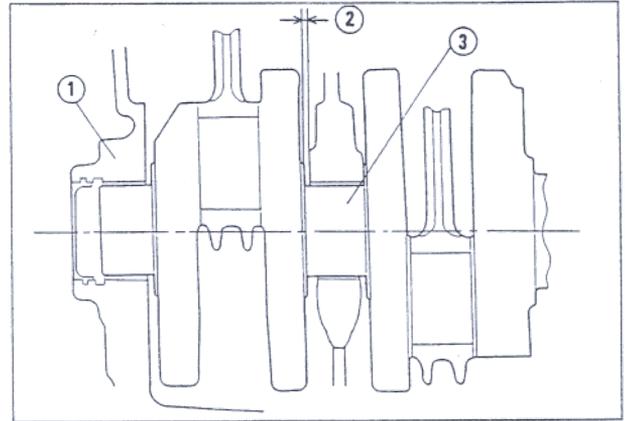
1. Crankcase Main Bearing Bore Diameter Marks, "○" mark or no mark

- Select the proper bearing insert in accordance with the combination of the crankcase and crankshaft coding.



1. Bearing Insert                      2. Size Color Mark

- Install the new inserts in the crankcase halves and check insert/journal clearance with plastigage.



1. Crankcase                                      3. No. 2 Journal  
2. Measure here.

**Crankshaft Side Clearance**

- Insert a thickness gauge between the crankcase and the crankweb at the No. 2 journal to determine clearance.
- ★ If the clearance exceeds the service limit, replace the crankcase halves as a set.

**Crankshaft Side Clearance**

Standard:            0.05 ~ 0.20 mm  
Service Limit:      0.40 mm

**Main Bearing Insert Selection**

Crankcase Main Bearing Bore Diameter Mark	Crankshaft Main Journal Diameter Mark	Crankshaft Bearing Insert*		
		Size Color	Part Number	Journal Nos.
○	1	Brown	92028-1418	5
			92028-1421	1, 2, 3, 4
○	None	Black	92028-1417	5
			92028-1420	1, 2, 3, 4
None	1	Blue	92028-1416	5
			92028-1419	1, 2, 3, 4

\*The bearing inserts for No. 5 has no oil groove.

## 8-14 CRANKSHAFT / TRANSMISSION

### Transmission

#### Shift Pedal Removal

- Remove the left lower fairing (see Frame chapter).
- Mark the position of the shift lever on the shift shaft so that it can be installed later in the same position.
- Remove the shift lever and shift pedal.

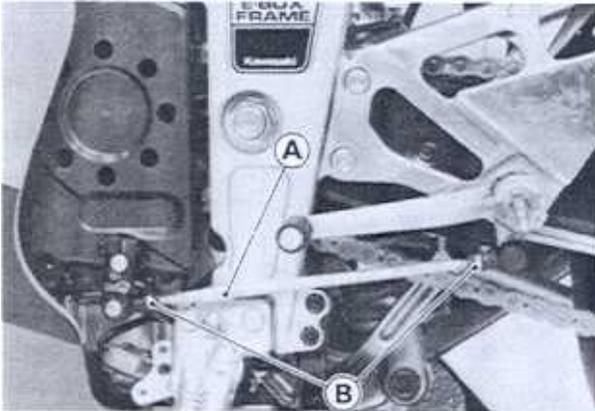
#### Shift Pedal Installation

- Apply grease to the shift pedal pivot.
- Tighten the shift pedal mounting bolt to the specified torque.
- ★ If necessary, adjust the pedal position from the standard position to suit you as follows.
- Loosen the front and rear rod locknuts.

#### NOTE

○ The locknut next to the knurled portion of the rod has left-hand threads.

- Turn the rod to adjust the pedal position.
- Tighten the locknuts securely.

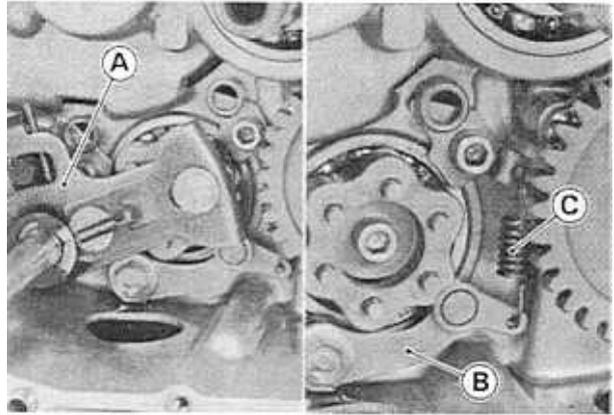


A. Rod

B. Locknut

#### External Shift Mechanism Removal

- Remove the following.
  - Engine Oil (see Engine Lubrication System chapter)
  - Clutch
  - Shift Pedal
- Pull out the shift mechanism arm with the shift shaft.
- Remove the shift drum set lever spring and then remove set lever.



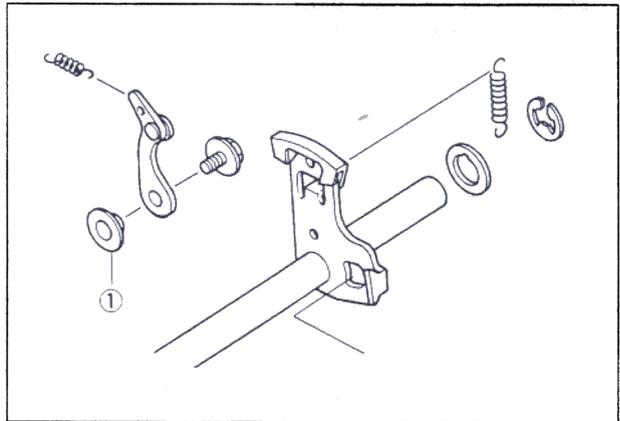
A. Shift Mechanism Arm

C. Set Lever Spring

B. Shift Drum Set Lever

#### External Shift Mechanism Installation

- Be careful of the direction of the shift drum set lever bolt collar.



1. Collar

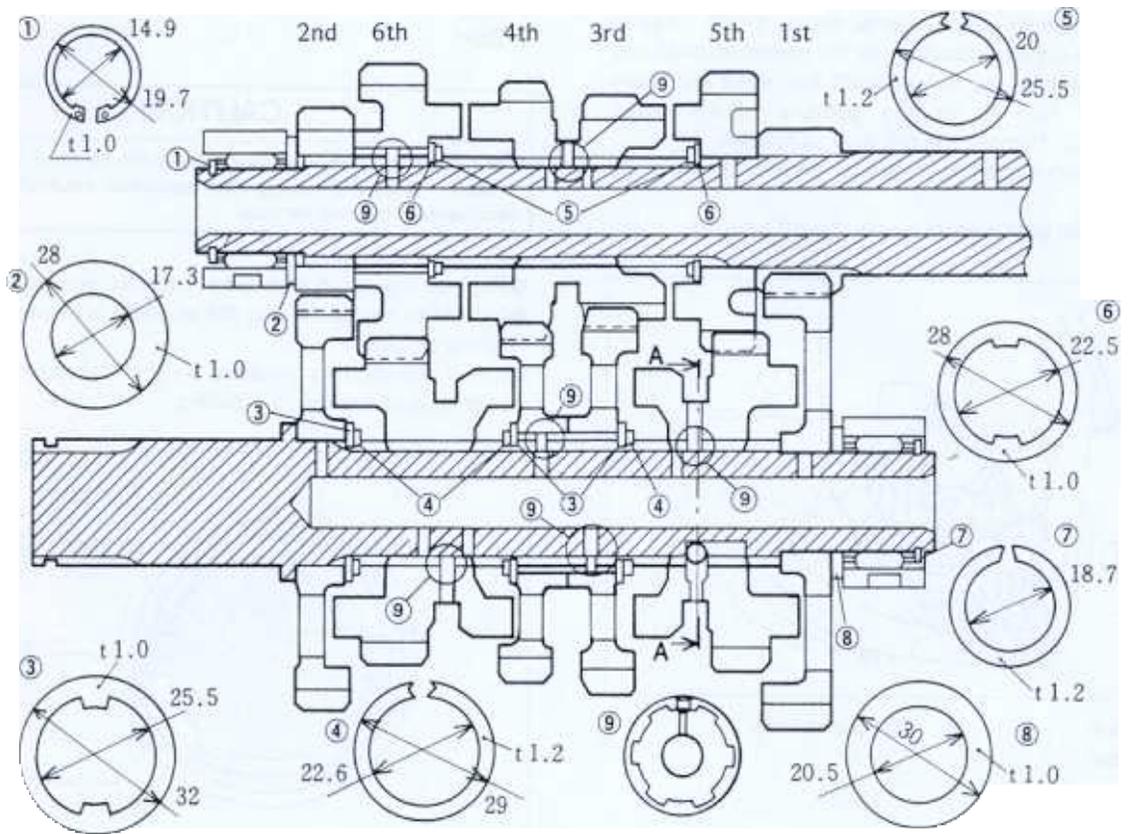
- Tighten the shift drum set lever bolt to the specified torque (see Exploded View).
- Install the shift drum set lever spring.

#### Transmission Shaft Removal

- Remove the clutch (see Clutch chapter).
- Remove the engine (see Engine Removal/Installation chapter).
- Split the crankcase (see this chapter).
- Remove the drive shaft and output shaft.



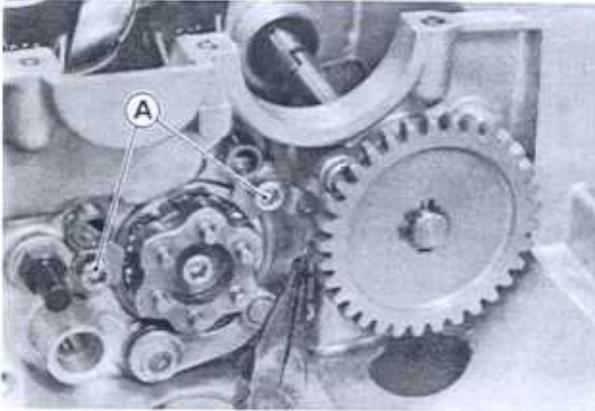
# 8-16 CRANKSHAFT / TRANSMISSION



## CRANKSHAFT / TRANSMISSION 8-17

### Shift Drum and Fork Removal

- Remove the following.
  - Lower Crankcase Half (see Crankcase Splitting)
  - External Shift Mechanism (see this chapter)
  - Shift Drum Bearing Retainer Bolt

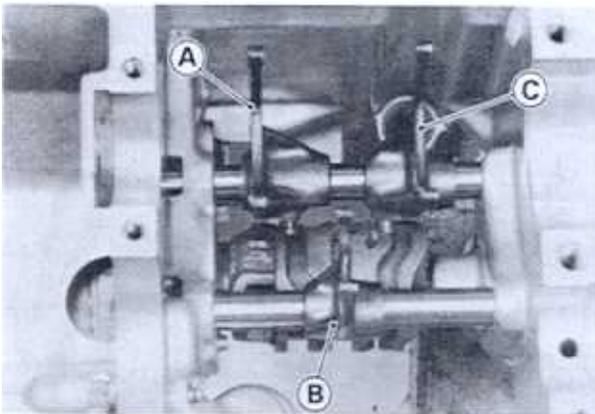


A. Shift Drum Bearing Retainer Bolt

- Pull out the shift rods and take off the shift forks.
- Pull out the shift drum.

### Shift Drum and Fork Installation

- There are three types of the shift forks. The smaller shift fork is for the drive shaft gear.
- Other two are for output shaft gears.
- Install the shift forks as shown, noting the rib position.



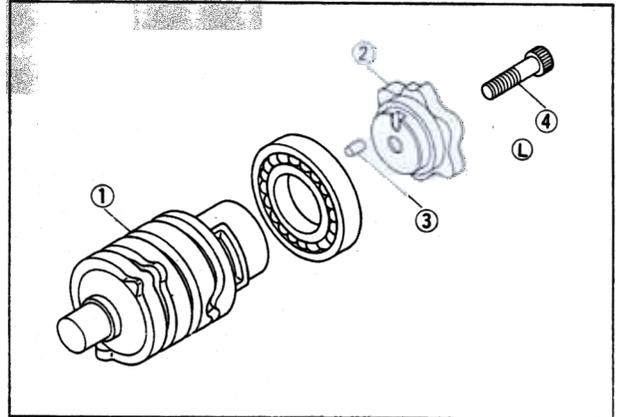
- A. Shift Fork (clutch side)  
B. Shift Fork (for drive shaft gear)  
C. Shift Fork (engine sprocket side)

### Shift Drum Disassembly

- Remove the shift drum (see this chapter).
- While holding the shift drum with a vise, remove the shift drum cam bolt.

### Shift Drum Assembly

- Align the hole of the shift drum cam with the dowel pin.



1. Shift Drum                      3. Dowel Pin  
2. Shift Drum Cam                4. Cam Mounting Bolt

- Tighten the following to the specified torque (see Exploded View).
  - Shift Drum Bearing Retainer Bolt
  - Shift Drum Cam Mounting Bolt
  - (Apply a non-permanent locking agent)