

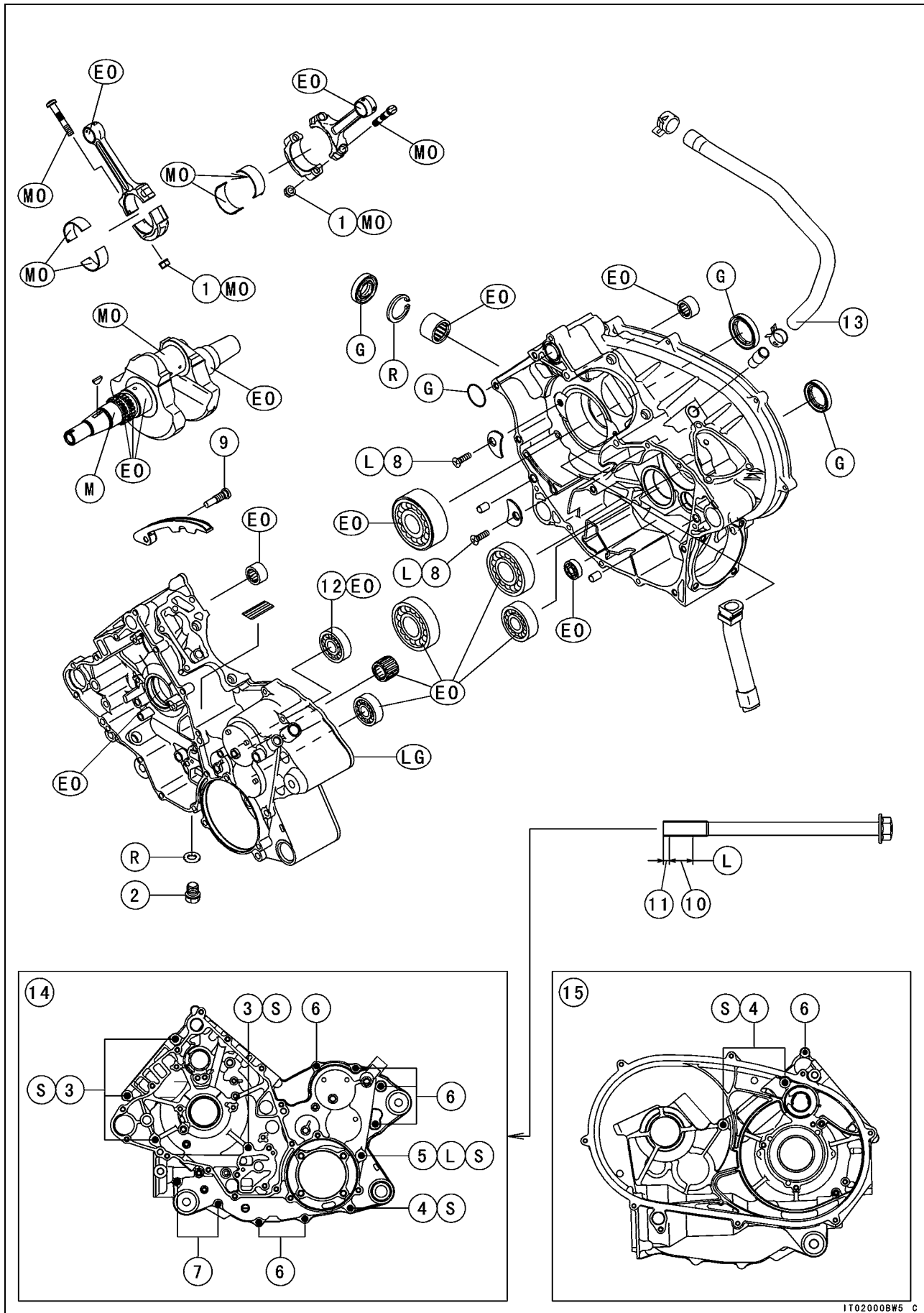
Crankshaft/Transmission

Table of Contents

Exploded View	9-2
Specifications	9-6
Special Tools and Sealant	9-8
Crankcase	9-9
Crankcase Disassembly	9-9
Crankcase Assembly	9-9
Crankshaft/Connection Rod	9-13
Crankshaft Removal	9-13
Crankshaft Installation	9-13
Connecting Rod Removal	9-13
Connecting Rod Installation	9-13
Crankshaft/Connecting Rod Cleaning	9-14
Connecting Rod Bend Inspection	9-14
Connecting Rod Twist Inspection	9-14
Connecting Rod Big End Side Clearance Inspection	9-15
Connecting Rod Big End Bearing/Crankpin Wear Inspection	9-15
Crankshaft Runout Inspection	9-17
Crankshaft Main Bearing/Journal Wear Inspection	9-17
Transmission	9-18
Shift Lever Removal	9-18
Shift Lever Installation	9-19
Transmission Removal	9-23
Transmission Installation	9-24
Shift Fork Bending Inspection	9-26
Shift Fork/Gear and Shifter Groove Wear Inspection	9-26
Transmission and Shift Mechanism Inspection	9-27
Ball Bearing, Needle Bearing, and Oil Seal	9-29
Ball and Needle Bearing Replacement	9-29
Ball and Needle Bearing Wear Inspection	9-29
Oil Seal Inspection	9-29

9-2 CRANKSHAFT/TRANSMISSION

Exploded View



CRANKSHAFT/TRANSMISSION 9-3

Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Connecting Rod Big End Cap Nuts	34.3	3.5	25	MO
2	Engine Oil Drain Plug	20	2.0	14	
3	Crankcase Bolts (M8), L = 75 mm (2.95 in.)	20	2.0	14	S
4	Crankcase Bolts (M8), L = 110 mm (4.33 in.)	20	2.0	14	S
5	Crankcase Bolt (M8), L = 110 mm (4.33 in.)	20	2.0	14	S, L (1)
6	Crankcase Bolts (M6), L = 40 mm (1.57 in.)	9.8	1.0	87 in·lb	
7	Crankcase Bolts (M6), L = 65 mm (2.56 in.)	9.8	1.0	87 in·lb	
8	Bearing Position Plate Screws	4.9	0.50	43 in·lb	L
9	Rear Cylinder Camshaft Chain Guide Bolt	20	2.0	14	

10. About 12 mm (0.47 in.)

11. Do not apply a non-permanent locking agent to this area (2 ~ 3 mm, 0.08 ~ 0.12 in.)

12. Face the seal of the bearing to the left side (outward).

13. White Mark: Align the white mark with the crankcase mark.

14. Left Crankcase

15. Right Crankcase

EO: Apply engine oil.

G: Apply grease.

L: Apply a non-permanent locking agent.

LG: Apply liquid gasket (Kawasaki Bond: 92104-1063 or Three Bond 1216).

M: Apply molybdenum disulfide grease.

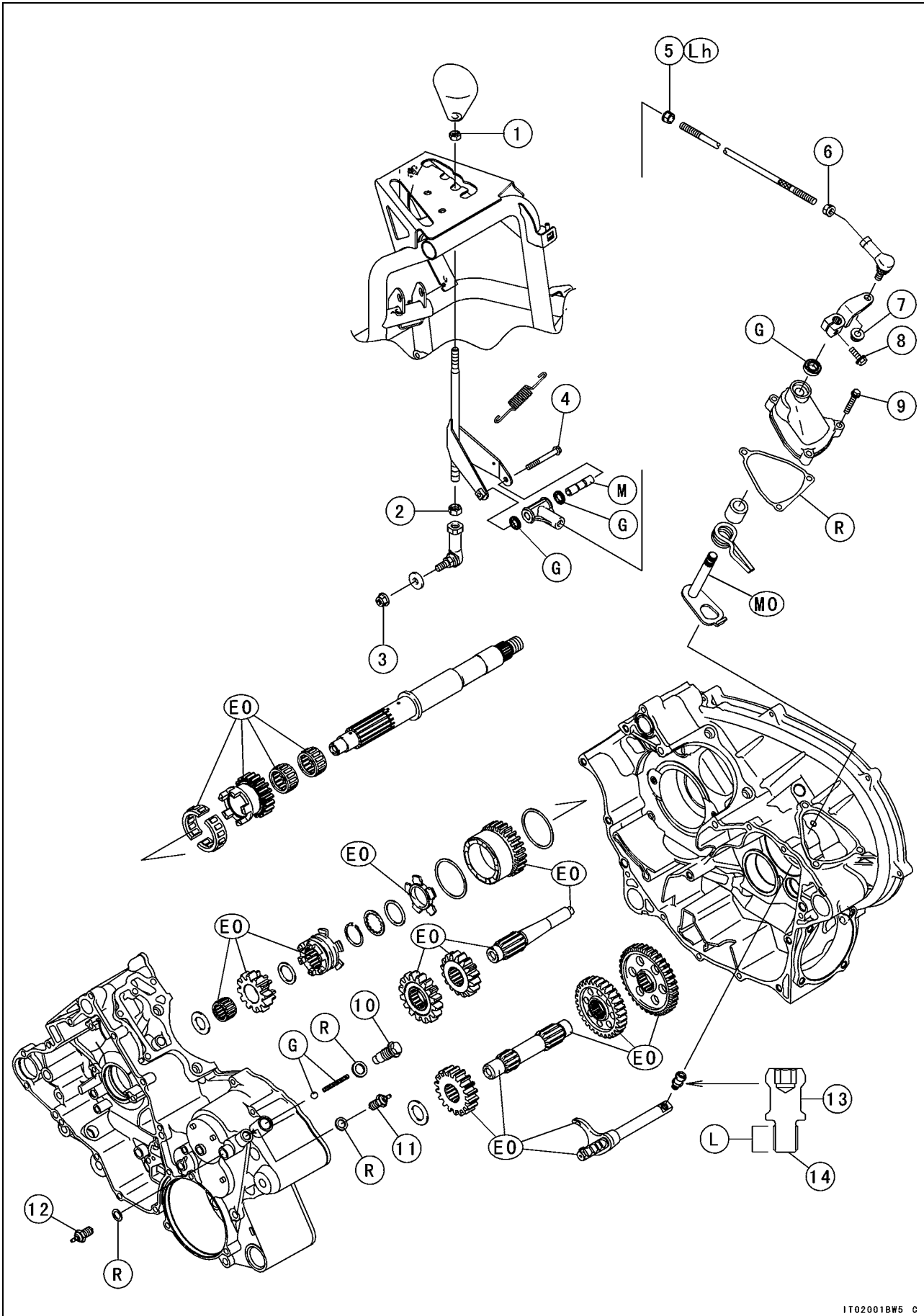
MO: Apply molybdenum disulfide oil solution (mixture of the engine oil and molybdenum disulfide grease in a weight ratio 10:1).

R: Replacement Parts

S: Follow the specific tightening sequence.

9-4 CRANKSHAFT/TRANSMISSION

Exploded View



CRANKSHAFT/TRANSMISSION 9-5

Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Grip Hold Nut	9.8	1.0	87 in·lb	
2	Tie-rod End Locknut	19.6	2.0	14	
3	Shift Lever Assembly Nut	19.6	2.0	14	
4	Tie-rod End Bolt	9.8	1.0	87 in·lb	
5	Tie-rod End Front Locknut	9.8	1.0	87 in·lb	Lh
6	Tie-rod End Rear Locknut	9.8	1.0	87 in·lb	
7	Tie-rod End Nut	19.6	2.0	14	
8	Shift Shaft Lever Bolt	13.5	1.4	10	
9	Shift Shaft Cover Bolts	8.8	0.90	78 in·lb	
10	Shift Shaft Positioning Bolt	25	2.5	18	
11	Neutral Position Switch	15	1.5	11	
12	Reverse Position Switch	15	1.5	11	
13	Shift Shaft Spring Bolt	25	2.5	18	L

14. Do not apply a non-permanent locking agent to this end.

EO: Apply engine oil.

G: Apply grease.

L: Apply a non-permanent locking agent.

Lh: Left-hand Threads

M: Apply molybdenum disulfide grease.

MO: Apply molybdenum disulfide oil solution (mixture of the engine oil and molybdenum disulfide grease in a weight ratio 10:1).

R: Replacement Parts

9-6 CRANKSHAFT/TRANSMISSION

Specifications

Item	Standard	Service Limit																					
Crankshaft, Connecting Rods																							
Connecting Rod Bend	---	TIR 0.2/100 mm (0.008/3.94 in.)																					
Connecting Rod Twist	---	TIR 0.2/100 mm (0.008/3.94 in.)																					
Connecting Rod Big End Side Clearance	0.16 ~ 0.46 mm (0.0063 ~ 0.0181 in.)	0.7 mm (0.028 in.)																					
Connecting Rod Big End Bearing Insert/Crankpin Clearance	0.028 ~ 0.052 mm (0.0011 ~ 0.0020 in.)	0.09 mm (0.0035 in.)																					
Crankpin Diameter:	39.984 ~ 40.000 mm (1.5742 ~ 1.5748 in.)	39.97 mm (1.5736 in.)																					
Marking:																							
None	39.984 ~ 39.992 mm (1.5742 ~ 1.57449 in.)	---																					
○	39.993 ~ 40.000 mm (1.57452 ~ 1.5748 in.)	---																					
Connecting Rod Big End Inside Diameter:	43.000 ~ 43.016 mm (1.6929 ~ 1.6939 in.)	---																					
Marking:																							
None	43.000 ~ 43.008 mm (1.6929 ~ 1.69322 in.)	---																					
○	43.009 ~ 43.016 mm (1.69326 ~ 1.6935 in.)	---																					
Connecting Rod Big End Bearing Insert Thickness:																							
Brown	1.482 ~ 1.486 mm (0.05835 ~ 0.05850 in.)	---																					
Yellow	1.486 ~ 1.490 mm (0.05850 ~ 0.05866 in.)	---																					
Green	1.490 ~ 1.494 mm (0.05866 ~ 0.05882 in.)	---																					
Connecting Rod Big End Bearing Insert Selection:																							
<table border="1"> <thead> <tr> <th rowspan="2">Con-rod Big End Bore Diameter Marking</th> <th rowspan="2">Crankpin Diameter Marking</th> <th colspan="2">Bearing Insert</th> </tr> <tr> <th>Size Color</th> <th>Part Number</th> </tr> </thead> <tbody> <tr> <td>None</td> <td>○</td> <td>Brown</td> <td>92028-1963</td> </tr> <tr> <td>None</td> <td>None</td> <td rowspan="2">Yellow</td> <td rowspan="2">92028-1962</td> </tr> <tr> <td>○</td> <td>○</td> </tr> <tr> <td>○</td> <td>None</td> <td>Green</td> <td>92028-1961</td> </tr> </tbody> </table>				Con-rod Big End Bore Diameter Marking	Crankpin Diameter Marking	Bearing Insert		Size Color	Part Number	None	○	Brown	92028-1963	None	None	Yellow	92028-1962	○	○	○	None	Green	92028-1961
Con-rod Big End Bore Diameter Marking	Crankpin Diameter Marking	Bearing Insert																					
		Size Color	Part Number																				
None	○	Brown	92028-1963																				
None	None	Yellow	92028-1962																				
○	○																						
○	None	Green	92028-1961																				
Crankshaft Runout	TIR 0.04 mm (0.0016 in.) or less	TIR 0.10 mm (0.0039 in.)																					
Crankshaft Main Journal Diameter	41.984 ~ 42.000 mm (1.6529 ~ 1.6535 in.)	41.96 mm (1.652 in.)																					
Crankshaft Main Bearing Bore Diameter	42.025 ~ 42.041 mm (1.6545 ~ 1.6552 in.)	42.07 mm (1.6563 in.)																					

CRANKSHAFT/TRANSMISSION 9-7

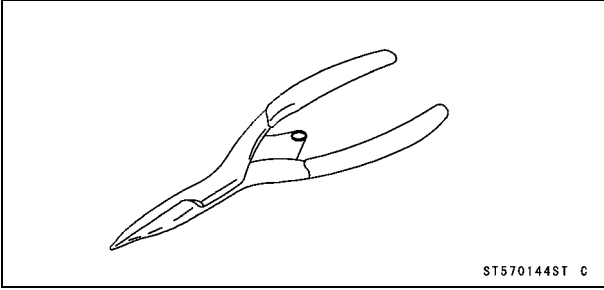
Specifications

Item	Standard	Service Limit
Transmission		
Shift fork Ear Thickness	5.9 ~ 6.0 mm (0.2323 ~ 0.2362 in.)	5.8 mm (0.2283 in.)
Shift Groove Width	6.05 ~ 6.15 mm (0.2382 ~ 0.2421 in.)	6.25 mm (0.2461 in.)

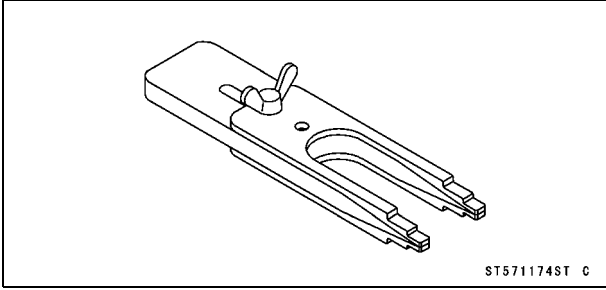
9-8 CRANKSHAFT/TRANSMISSION

Special Tools and Sealant

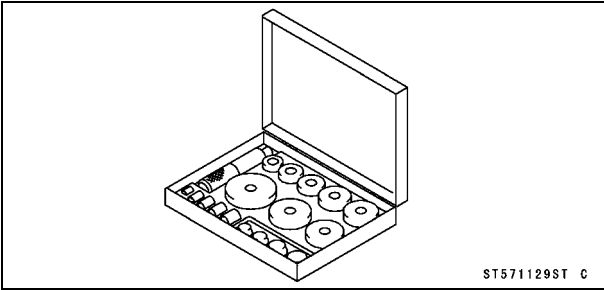
Outside Circlip Pliers:
57001-144



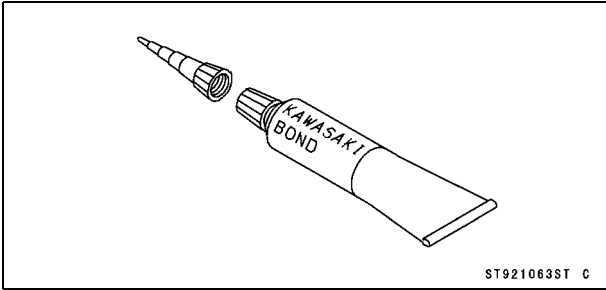
Crankshaft Jig:
57001-1174



Bearing Driver Set:
57001-1129



Kawasaki Bond (Liquid Gasket - Gray):
92104-1063



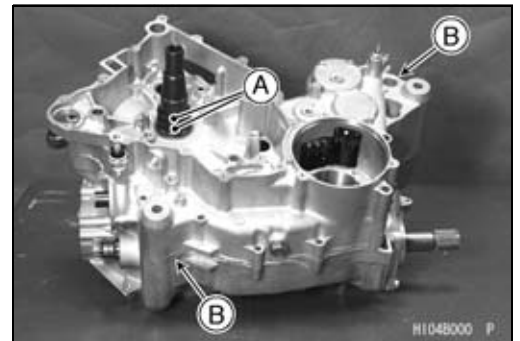
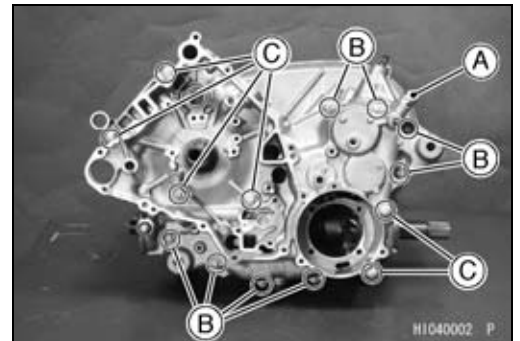
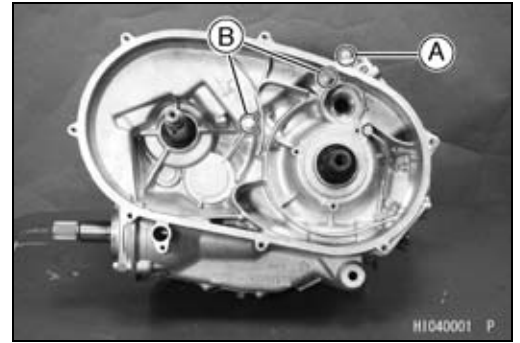
Crankcase

Crankcase Disassembly

- Remove:
 - Engine (see Engine Removal in the Engine Removal/Installation chapter)
 - Starter Motor (see Starter Motor Removal in the Electrical System chapter)
 - Oil Filter
 - Cylinder Blocks and Pistons (see Cylinder and Piston Removal in the Engine Top End chapter)
 - Intermediate Shaft and Chains (see Camshaft Chain Removal in the Engine Top End chapter)
 - Right Crankcase Bolt (M6) [A]
 - Right Crankcase Bolts (M8) [B]

- Remove:
 - Shift Shaft Positioning Bolt [A], Washer, Spring, and Steel Ball
 - Left Crankcase Bolts (M6) [B]
 - Left Crankcase Bolts (M8) [C]

- Wrap the teeth on the sprockets [A] by taping for protecting the bushing in the crankcase.
- Using the pry points [B], split the crankcase halves.
- Lift off the left crankcase half.



Crankcase Assembly

CAUTION

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

NOTE

- Be certain that all parts are cleaned thoroughly before assembly.
- Blow through all oil passages with compressed air to clear any blockage in the crankcase halves and crankshaft.

▲ WARNING

Clean the engine parts in a well-ventilated area, and take care that there are no sparks or flame anywhere near the working area; this includes any appliance with a pilot light. Do not use gasoline or low-flash point solvents to clean parts. A fire or explosion could result.

9-10 CRANKSHAFT/TRANSMISSION

Crankcase

- Press and insert the new ball bearings until they are bottomed.

Special Tool - Bearing Driver Set: 57001-1129

[A] Ball Bearing

[B] Ball Bearing (sealed side towards crankcase)

- Press and insert the new needle bearings so that the bearing surfaces are flush with the end of the hole.

[C] Needle Bearing

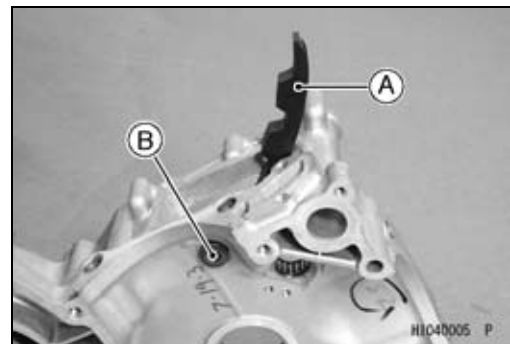
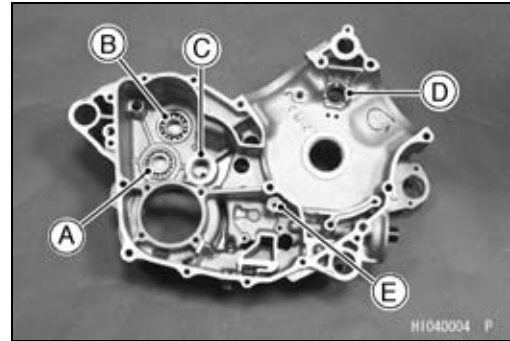
[D] Needle Bearing (Insert it from outside.)

- Apply engine oil to the bearings.
- Install:
 - Oil Pressure Relief Valve [E] (see Oil Pressure Relief Valve Installation in the Engine Lubrication System chapter)

- Install:
 - Rear Cylinder Camshaft Chain Guide [A]

- Tighten:

Torque - Rear Cylinder Camshaft Chain Guide Bolt [B]: 20 N·m (2.0 kgf·m, 14 ft·lb)



- Press and insert the new ball bearings [A] until they are bottomed.

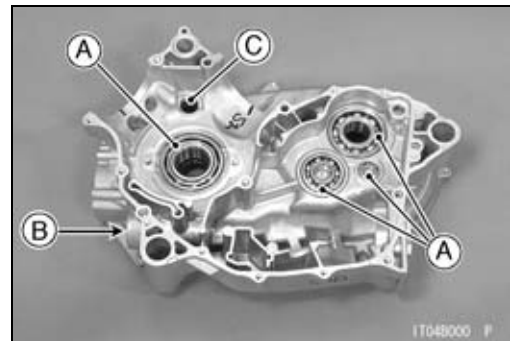
Special Tool - Bearing Driver Set: 57001-1129

- Press and insert the new needle bearings so that the bearing surfaces are flush with the end of the hole.

[B] Needle Bearing

[C] Needle Bearing (Insert it from outside.)

- Apply engine oil to the bearings.



- Install the ball bearing [A] so that the stepped side faces outside [B].

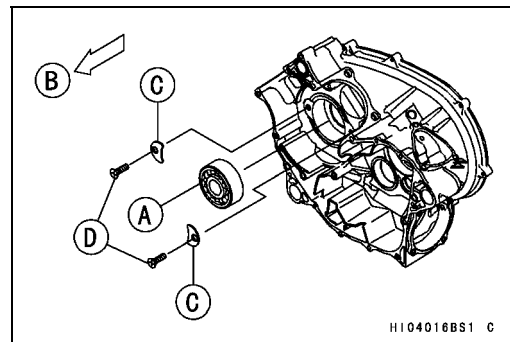
- Install:

Plates [C]

- Apply a non-permanent locking agent to the bearing position plate screws [D].

- Tighten:

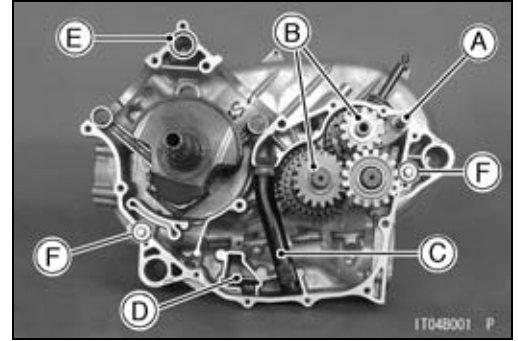
Torque - Bearing Position Plate Screws: 4.9 N·m (0.50 kgf·m, 43 in·lb)



Crankcase

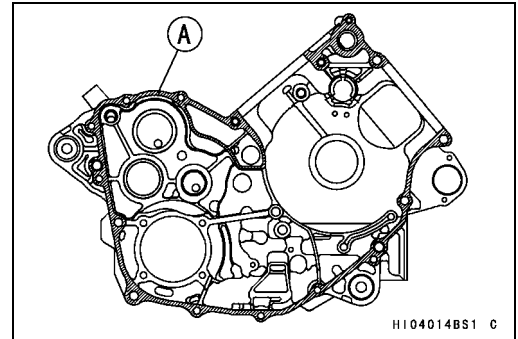
- Be sure the following parts are in place in the right crankcase half.

Crankshaft
 Transmission Shafts and Shift Rod [A]
 Spacers [B]
 Oil Tube [C]
 Oil Screen [D]
 O-ring [E] (Apply Grease)
 Dowel Pins [F]



- Apply liquid gasket [A] to mating surface of the left crankcase half.

**Sealant - Kawasaki Bond: 92104-1063 or
 Three Bond 1216**



- Apply a non-permanent locking agent to the area [C] (12 mm, 0.47 in.) except for the tip [D] (2 ~ 3 mm, 0.08 ~ 0.12 in.).

Left Crankcase Bolt (M8) [3]

- Tighten the right and left crankcase bolts (M8) following the tightening sequence [1 ~ 8].

Torque - Crankcase Bolts (M8): 20 N·m (2.0 kgf·m, 14 ft·lb)

[1, 2, 5, 6] L = 75 mm (2.95 in.)

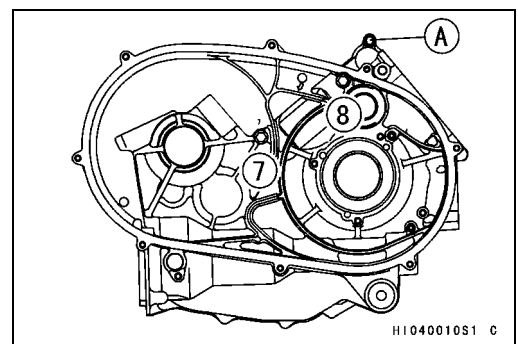
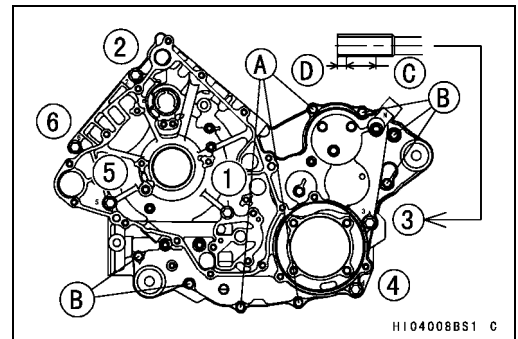
[3, 4, 7, 8] L = 110 mm (4.33 in.)

- Tighten:

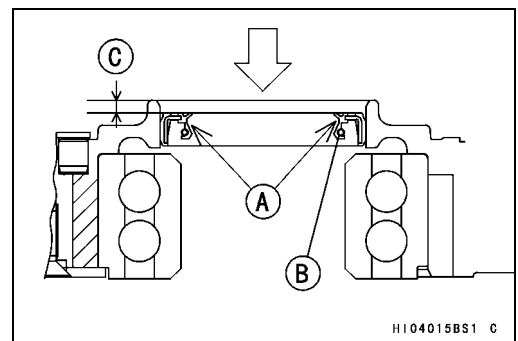
Torque - Crankcase Bolts (M6): 9.8 N·m (1.0 kgf·m, 87 in·lb)

[A] L = 40 mm (1.57 in.)

[B] L = 65 mm (2.56 in.)



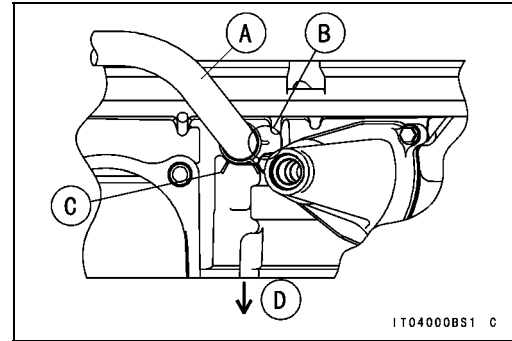
- Grease the lip [A] of the oil seal [B] and press the seal 3 mm (0.12 in.) [C] inwards from the end of the boss.



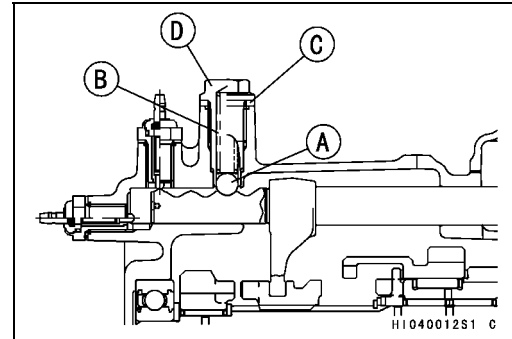
9-12 CRANKSHAFT/TRANSMISSION

Crankcase

- Install the breather tube [A] on the crankcase fitting.
- Align the white line on the tube with the mark [B] on the crankcase.
- Face the open end of the clamp [C] towards the left side [D] as shown.



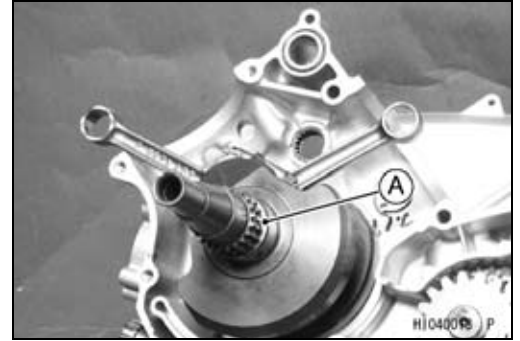
- Apply grease to the steel ball [A] and spring [B].
- Install:
 - Steel Ball
 - Spring
 - Washer [C]
 - Shift Shaft Positioning Bolt [D]
- Tighten:
 - Torque - Shift Shaft Positioning Bolt: 25 N·m (2.5 kgf·m, 18 ft·lb)**
- Check:
 - Crankshaft and driven shaft turn freely.
- ★ If any of the shafts do not turn freely, split the crankcase to locate the problem.



Crankshaft/Connection Rod

Crankshaft Removal

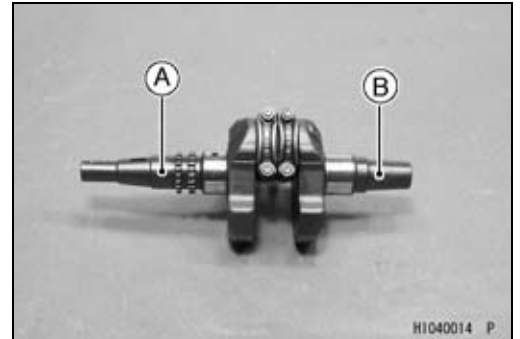
- Split the crankcase (see Crankcase Disassembly).
- Remove the crankshaft [A] from the crankcase using a press.



Crankshaft Installation

- The left shaft [A] of the crankshaft is longer than the right shaft [B].
- Apply engine oil to the both main journals.
- Insert the right crankshaft tapered end (the shorter end) into the right crankcase using a press and two crankshaft jigs.

Special Tools - Crankshaft Jig: 57001-1174 × 2



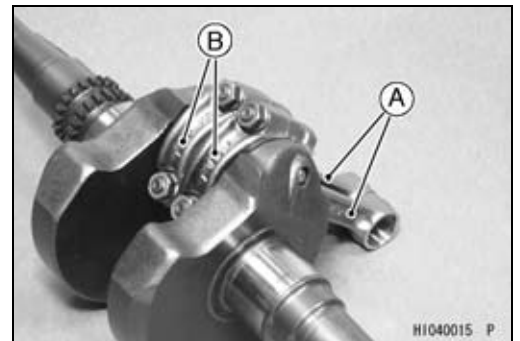
Connecting Rod Removal

- Remove the crankshaft (see Crankshaft Removal).
- Remove the connecting rods [A] from the crankshaft.

NOTE

○Mark and record the locations of the connecting rods and their big end caps [B] so that they can be installed in their original positions.

- Remove the connecting rod big end nuts, and take off the rod and cap with the bearing inserts.

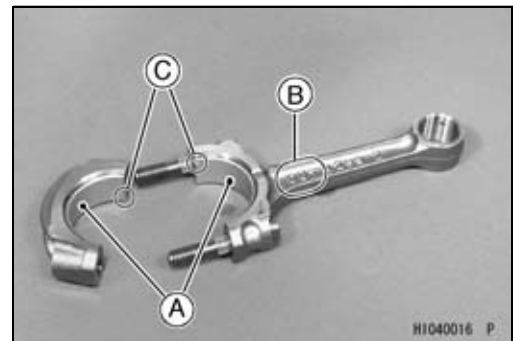


Connecting Rod Installation

CAUTION

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

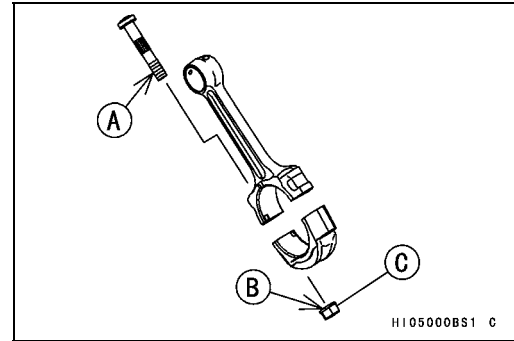
- Apply molybdenum disulfide oil:
Inner Surface [A] of Bearing Inserts
- Face the "OUT" marks [B] of both connecting rods towards the outsides of the crankshaft.
- Fit the connecting rod cap so that the grooves [C] of the cap and connecting rod are on the same side.



9-14 CRANKSHAFT/TRANSMISSION

Crankshaft/Connection Rod

- Apply molybdenum disulfide oil:
Threads [A] of Connecting Rod Big End Cap Bolts
Seating Surface [B] of Connecting Rod Big End Cap Nuts [C]
- Tighten:
Torque - Connecting Rod Big End Cap Nuts: 34.3 N·m (3.5 kgf·m, 25 ft·lb)

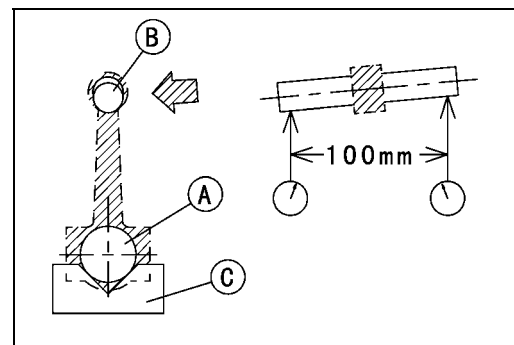


Crankshaft/Connecting Rod Cleaning

- After removing the connecting rods from the crankshaft, clean them with a high flash-point solvent.
- Blow the crankshaft oil passages with compressed air to remove any foreign particles or residue that may have accumulated in the passages.

Connecting Rod Bend Inspection

- Remove the connecting rod big end bearing inserts, and reinstall the connecting rod big end cap.
 - Select an arbor [A] of the same diameter as the connecting rod big end, and insert the arbor through the connecting rod big end.
 - Select an arbor of the same diameter as the piston pin and at least 100 mm (3.94 in.) long, and insert the arbor [B] through the connecting rod small end.
 - On a surface plate, set the big-end arbor on a V block [C].
 - With the connecting rod held vertically, use a height gauge to measure the difference in the height of the arbor above the surface plate over a 100 mm (3.94 in.) length to determine the amount of connecting rod bend.
- ★ If connecting rod bend exceeds the service limit, the connecting rod must be replaced.



Connecting Rod Bend

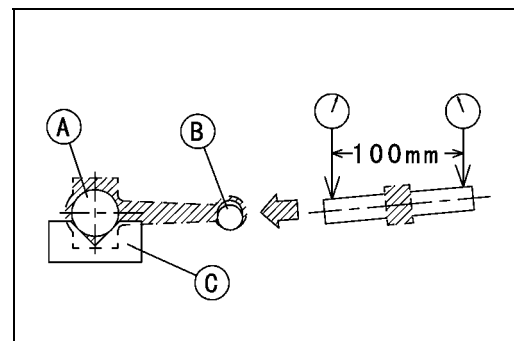
Service Limit: TIR 0.2/100 mm (0.008/3.94 in.)

Connecting Rod Twist Inspection

- With the big-end arbor [A] still on the V block [C], hold the connecting rod horizontally and measure the amount that the arbor [B] varies from being parallel with the surface plate over a 100 mm (3.94 in.) length of the arbor to determine the amount of connecting rod twist.
- ★ If connecting rod twist exceeds the service limit, the connecting rod must be replaced.

Connecting Rod Twist

Service Limit: TIR 0.2/100 mm (0.008/3.94 in.)



Crankshaft/Connection Rod

Connecting Rod Big End Side Clearance Inspection

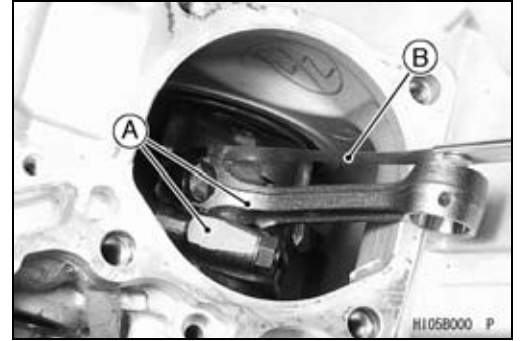
- Measure the side clearance of the connecting rod big end [A].
- Insert a thickness gauge [B] between the big end and either crank web to determine clearance.

Connecting Rod Big End Side Clearance

Standard: 0.16 ~ 0.46 mm (0.0063 ~ 0.0181 in.)

Service Limit: 0.7 mm (0.028 in.)

- ★ If the clearance exceeds the service limit, replace the connecting rod with new one and then check clearance again. If clearance is too large after connecting rod replacement, the crankshaft also must be replaced.



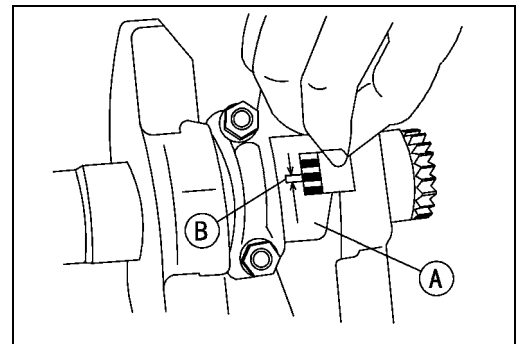
Connecting Rod Big End Bearing/Crankpin Wear Inspection

- Measure the bearing insert/crankpin [A] clearance with plastigage [B].
- Tighten the big end cap nuts to the specified torque.

Torque - Connecting Rod Big End Cap Nuts: 34.3 N·m (3.5 kgf·m, 25 ft·lb)

NOTE

- Do not move the connecting rod and crankshaft during clearance measurement.

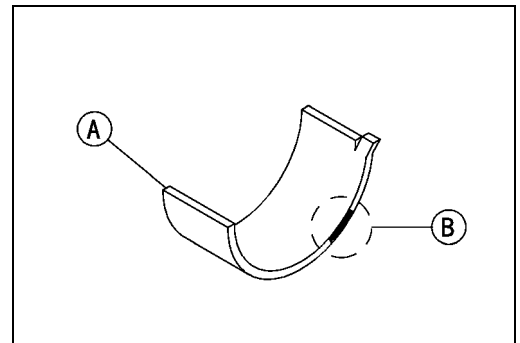


Connecting Rod Big End Bearing Insert/Crankpin Clearance

Standard: 0.028 ~ 0.052 mm (0.0011 ~ 0.0020 in.)

Service Limit: 0.09 mm (0.0035 in.)

- ★ If the clearance is within the standard, no bearing insert replacement is required.
- ★ If the clearance is between 0.052 mm (0.0020 in.) and the service limit 0.09 mm (0.0035 in.), replace the bearing inserts [A] with inserts painted green [B]. Check insert/crankpin clearance with plastigage. The clearance may exceed the standard slightly, but it must not be less than the minimum in order to avoid bearing seizure.
- ★ If the clearance exceeds the service limit, measure the diameter of the crankpin.



Crankpin Diameter

Standard: 39.984 ~ 40.000 mm (1.5742 ~ 1.5748 in.)

Service Limit: 39.97 mm (1.5736 in.)

- ★ If the crankpin has worn past the service limit, replace the crankshaft with a new one.

9-16 CRANKSHAFT/TRANSMISSION

Crankshaft/Connection Rod

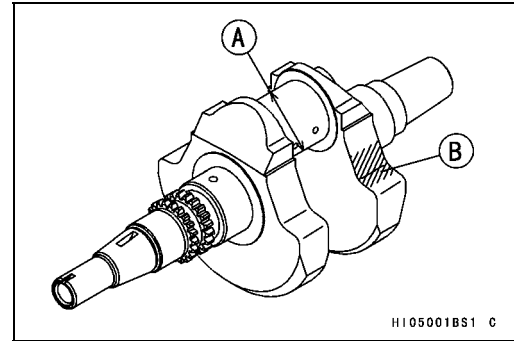
★ If the measured crankpin diameter [A] is not less than the service limit, but does not coincide with the original diameter marking on the crankshaft, make a new mark on it.

Crankpin Diameter Marks

None: 39.984 ~ 39.992 mm (1.5742 ~ 1.57449 in.)

○: 39.993 ~ 40.000 mm (1.57452 ~ 1.5748 in.)

Crankpin Diameter Mark [B]: “○” mark or no mark



- Measure the connection rod big end inside diameter, and mark each connecting rod big end in accordance with the inside diameter.
- Tighten the big end nuts to the specified torque.

Torque - Connecting Rod Big End Cap Nuts: 34.3 N·m (3.5 kgf·m, 25 ft·lb)

NOTE

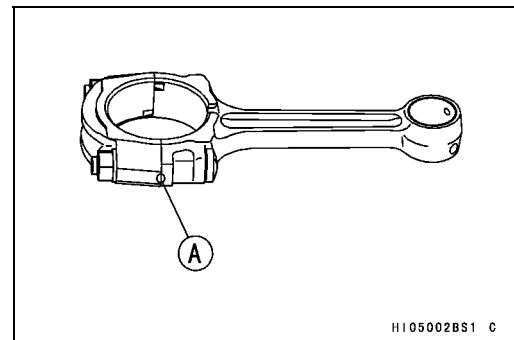
○ The mark already on the big end should almost coincide with the measurement because of little wear.

Connecting Rod Big End Inside Diameter Marks

None: 43.000 ~ 43.008 mm (1.6929 ~ 1.69322 in.)

○: 43.009 ~ 43.016 mm (1.69326 ~ 1.6935 in.)

Diameter Mark [A]: “○” or no mark

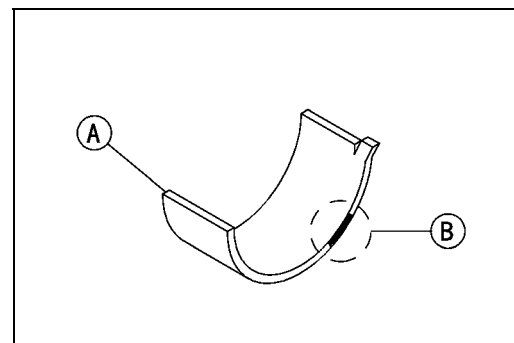


- Select the proper bearing insert [A] in accordance with the combination of the connecting rod and crankshaft coding. Size Color [B]

Big End Bearing Insert Selection

Con-rod Big End Bore Diameter Mark	Crankpin Diameter Mark	Bearing Insert	
		Size Color	Part Number
None	○	Brown	92028-1963
None	None	Yellow	92028-1962
○	○		
○	None	Green	92028-1961

- Install the new inserts in the connecting rod and check insert/crankpin clearance with the plastigage.



Crankshaft/Connection Rod

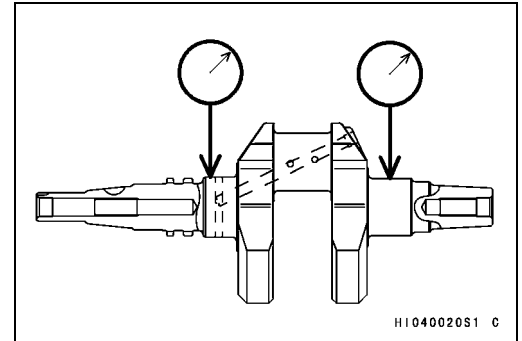
Crankshaft Runout Inspection

- Measure the crankshaft runout.
- ★ If the measurement exceeds the service limit, replace the crankshaft.

Crankshaft Runout

Standard: TIR 0.04 mm (0.0016 in.) or less

Service Limit: TIR 0.10 mm (0.0039 in.)



Crankshaft Main Bearing/Journal Wear Inspection

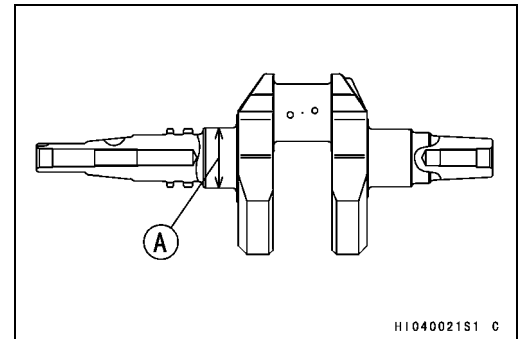
- Measure the diameter [A] of the crankshaft main journal.

Crankshaft Main Journal Diameter

Standard: 41.984 ~ 42.000 mm (1.6529 ~ 1.6535 in.)

Service Limit: 41.96 mm (1.652 in.)

- ★ If any journal has worn past the service limit, replace the crankshaft with a new one.



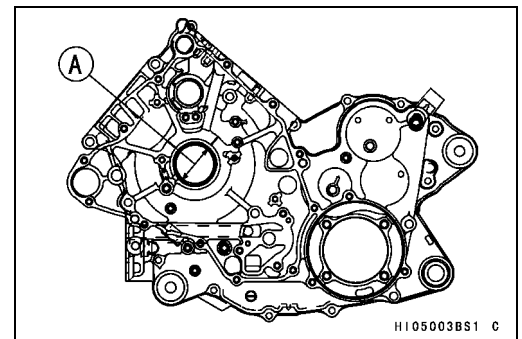
- Measure the main bearing bore diameter [A] in the crankcase halves.

Crankcase Main Bearing Bore Diameter

Standard: 42.025 ~ 42.041 mm (1.6545 ~ 1.6552 in.)

Service Limit: 42.07 mm (1.6563 in.)

- ★ If there is any signs of seizure, damage, or excessive wear, replace the crankcase halves as a set.

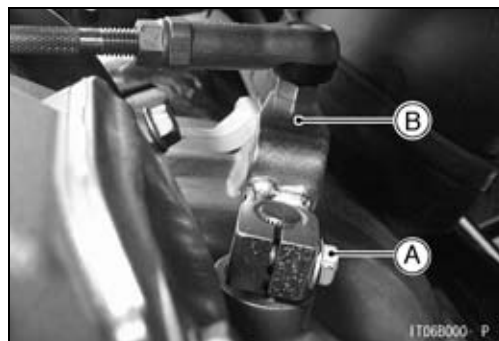


9-18 CRANKSHAFT/TRANSMISSION

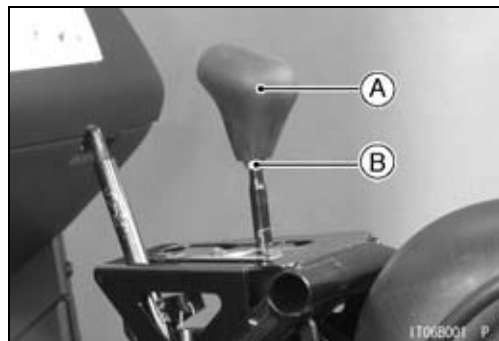
Transmission

Shift Lever Removal

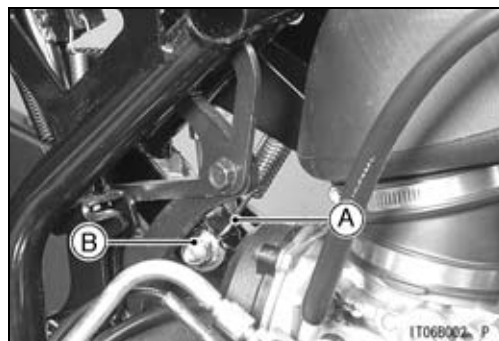
- Set the shift lever in the neutral position.
- Remove:
 - Seat Lower Cover (see Seat Lower Cover Removal in the Frame chapter)
 - Shift Shaft Lever Bolt [A]
- Remove the shift shaft lever [B] from the shift shaft.



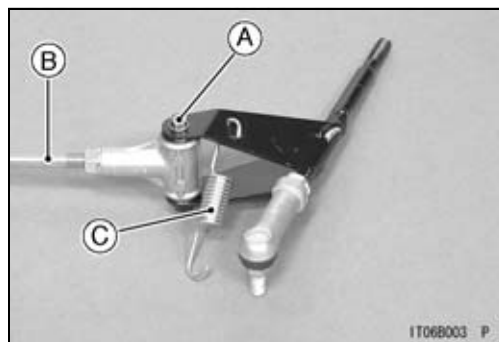
- Remove:
 - Grip [A]
 - Grip Hold Nut [B]



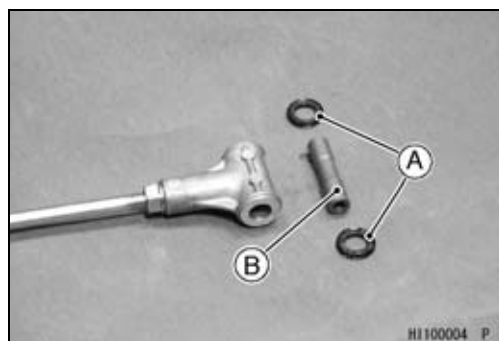
- Remove:
 - Spring [A]
 - Shift Lever Assembly Nut [B]



- Remove:
 - Tie-rod End Bolt [A]
 - Tie-rod [B]
 - Spring [C]



- Remove:
 - Oil Seals [A]
 - Collar [B]

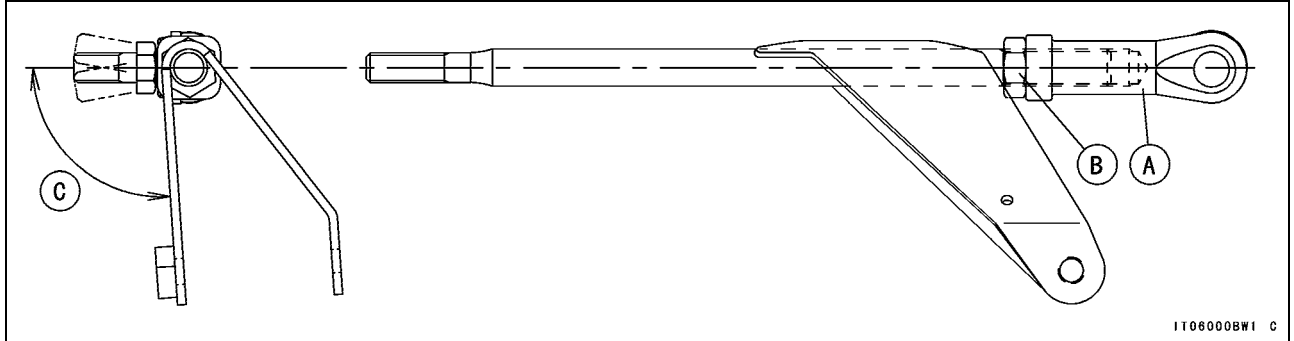


Transmission

Shift Lever Installation

- Twist the tie-rod end [A] and tie-rod end locknut [B] to bottom of the screw and then turn back the tie-rod end to dimension with $94^\circ \pm 10^\circ$ [C] as shown in the figure.
- Tighten the locknut against the tie-rod end:

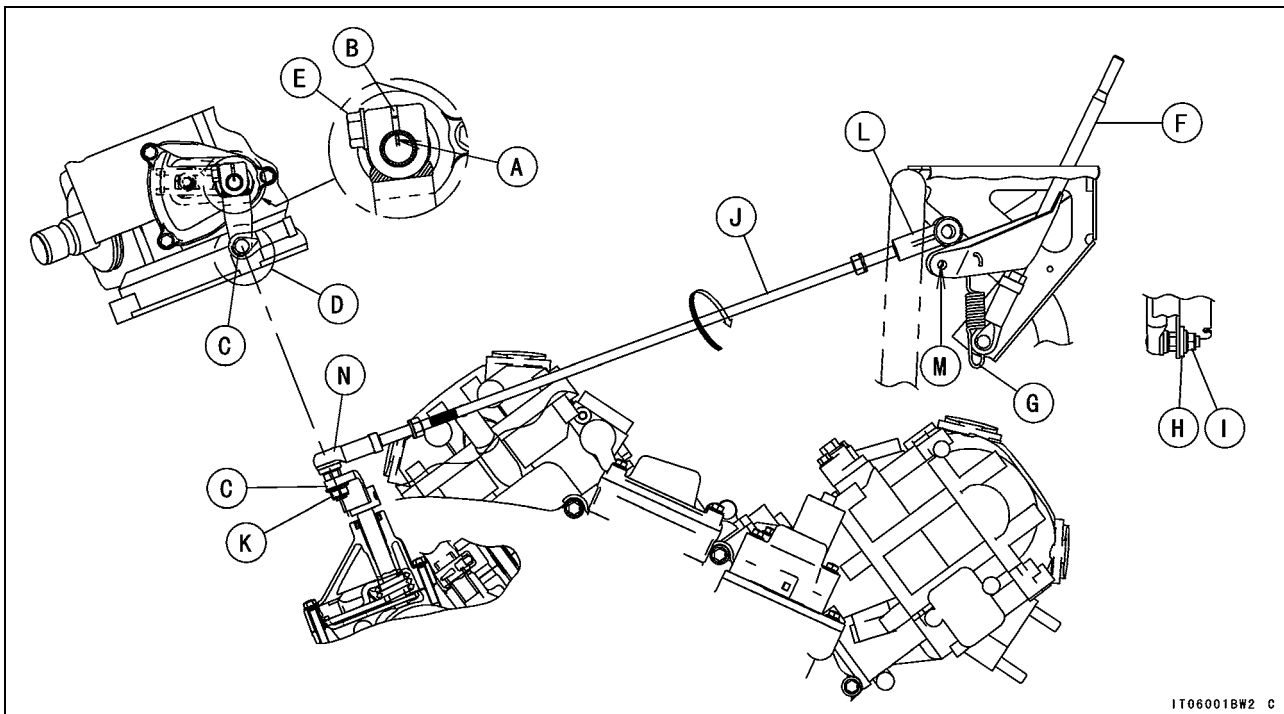
Torque - Tie-rod End Locknut: 19.6 N·m (2.0 kgf·m, 14 ft·lb)



9-20 CRANKSHAFT/TRANSMISSION

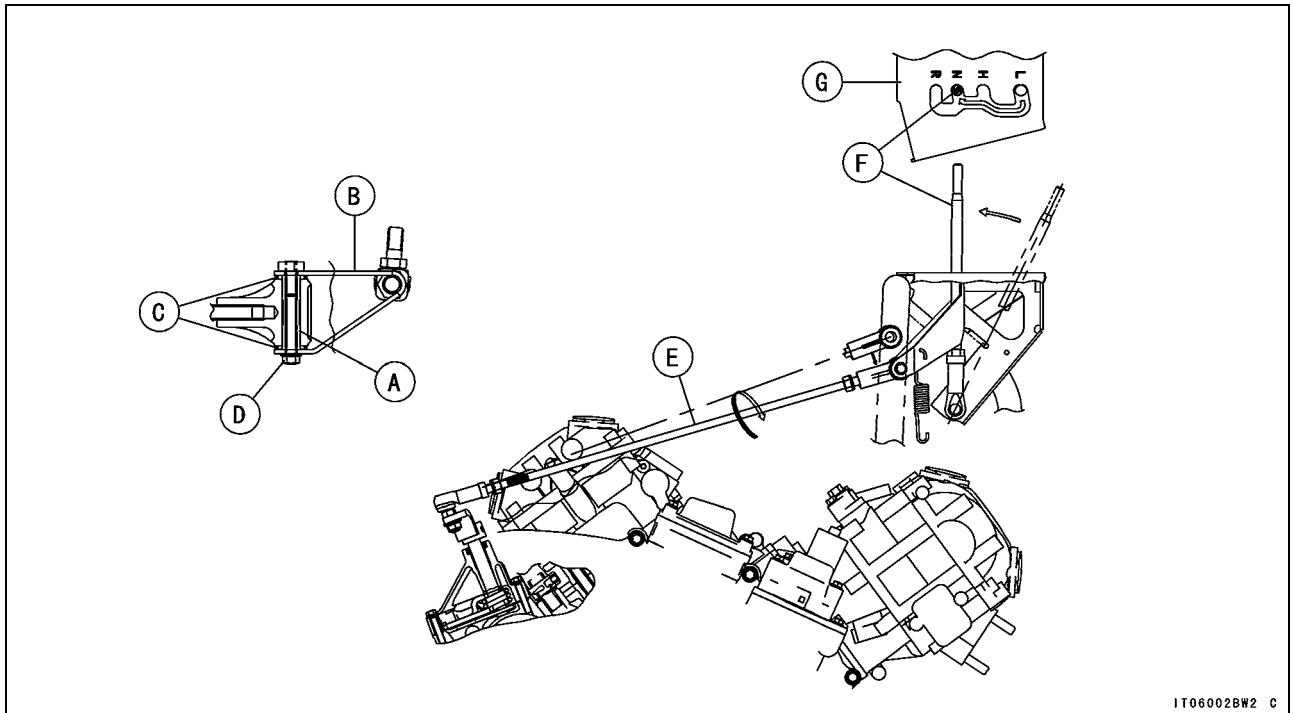
Transmission

- Align the mark [A] on the shaft end with the slit [B] of the shift shaft lever.
- Position the shift shaft lever end [C] on the boss-center [D] of the crankcase as shown in the figure.
- Tighten:
 - Torque - Shift Shaft Lever Bolt [E]: 13.5 N·m (1.4 kgf·m, 10 ft·lb)**
- Install:
 - Shift Lever Assembly [F]
 - Spring [G] (to Shift Lever Assembly)
 - Washer [H]
 - Shift Lever Assembly Nut [I]
- Tighten:
 - Torque - Shift Lever Assembly Nut: 19.6 N·m (2.0 kgf·m, 14 ft·lb)**
- Install:
 - Tie-rod [J]
- Tighten:
 - Torque - Tie-rod End Nut [K]: 19.6 N·m (2.0 kgf·m, 14 ft·lb)**
- Turn the tie-rod until the upper tie-rod end [L] will be adjusted to hole [M] of the shift lever assembly as shown in the figure.
- The connection length of the upper and lower tie-rod end [N] should be equal.



Transmission

- Apply molybdenum disulfide grease to the collar [A].
- Install the following parts to the shift lever assembly [B].
 - Oil Seals [C]
 - Tie-rod End Bolt [D]
- Tighten:
 - Torque - Tie-rod End Bolt: 9.8 N·m (1.0 kgf·m, 87 in·lb)**
- Turn the tie-rod [E] and align the lever [F] with neutral position of the guide [G] as shown in the figure.



9-22 CRANKSHAFT/TRANSMISSION

Transmission

- Tighten the tie-rod end rear locknut [A] so that the thread length is 6 mm (0.24 in.) [B].

Torque - Tie-rod End Rear Locknut: 9.8 N·m (1.0 kgf·m, 87 in·lb)

- Holding the rear tie-rod end [C], and tighten the front locknut [D] so that the thread length is 6 mm (0.24 in.) [B].

Torque - Tie-rod End Front Locknut: 9.8 N·m (1.0 kgf·m, 87 in·lb)

NOTE

- *The front locknut has left-hand threads.*
- *The thread length [B] of the front and rear are almost same.*
- *Do not lean the tie-rod rear end after tightening the front locknut.*

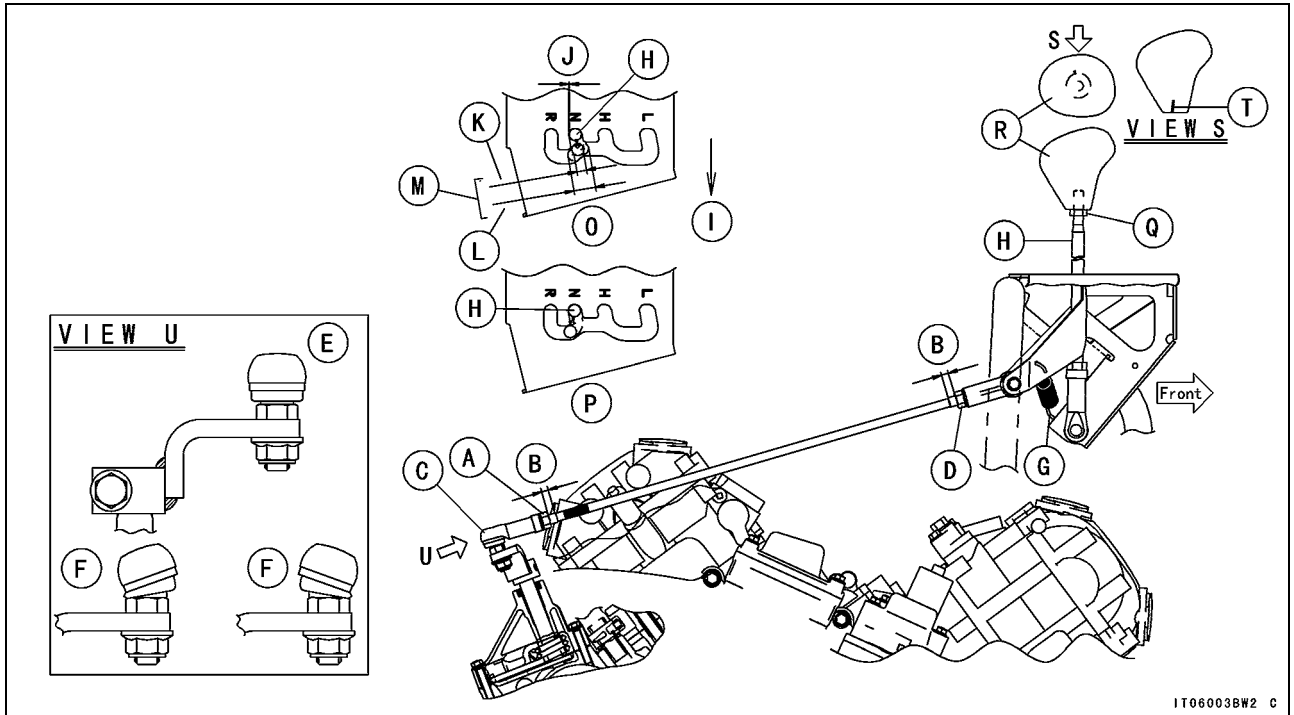
Right [E]

Wrong [F]

- Install the lower end of the spring [G] to the bracket.
- Confirm the lever [H] does not scrub the ditch of guide excessively, when the lever leaned to right side [I].
 - Clearance [J] = 0 mm (0 in.)
 - 8 mm (0.31 in.) [K]
 - 18 mm (0.71 in.) [L]Lighting Range [M] of Neutral Indicator Light
- If the excessive friction [N] occurs to the lever and the ditch of guide, readjust the thread length of the tie-rod.
 - Good [O]
 - Readjustment [P]
- Tighten the grip hold nut [Q] lightly by finger until it is stopped.
- Twist the grip [R] to bottom of the screw and then turn back in accordance with the direction of figure.
- In view of [S], the mark [T] becomes the position of figure.
- Hold the grip and tighten the grip hold nut.

Torque - Grip Hold Nut: 9.8 N·m (1.0 kgf·m, 87 in·lb)

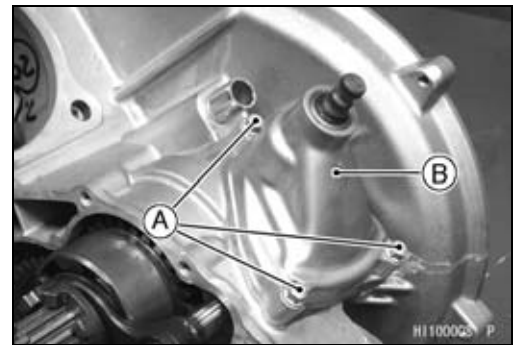
Transmission



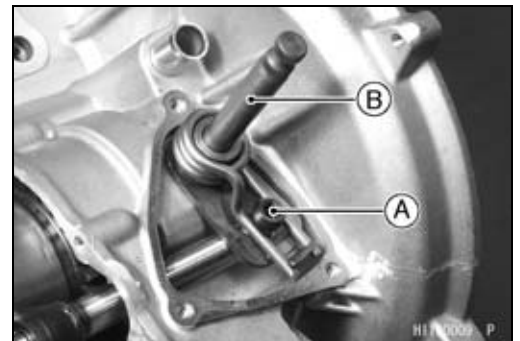
1T06003BW2 C

Transmission Removal

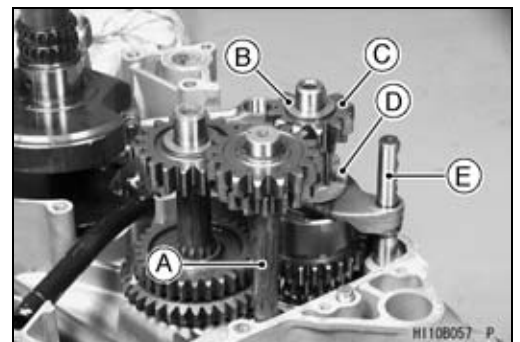
- Split the crankcase (see Crankcase Disassembly).
- Remove:
 - Shift Shaft Cover Bolts [A]
 - Shift Shaft Cover [B]



- Remove:
 - Shift Shaft Spring Bolt [A]
 - Shift Shaft [B]



- Remove:
 - Reverse Idle Shaft [A]
 - Spacer [B]
 - Reverse Drive Gear [C], Needle Bearing, and Spacer
 - Shifter [D]
 - Shift Rod [E]



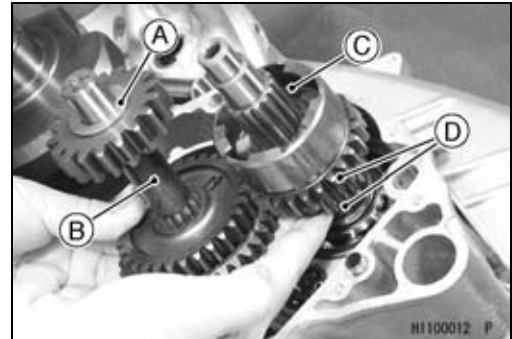
9-24 CRANKSHAFT/TRANSMISSION

Transmission

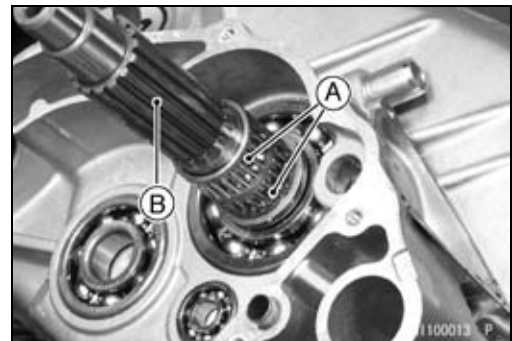
- Remove:
Circlip [A]
Special Tool - Outside Circlip Pliers: 57001-144



- Remove:
Spacer [A]
Idle Gear Assembly [B]
Washers and Spacer [C]
Low and High Gears [D]

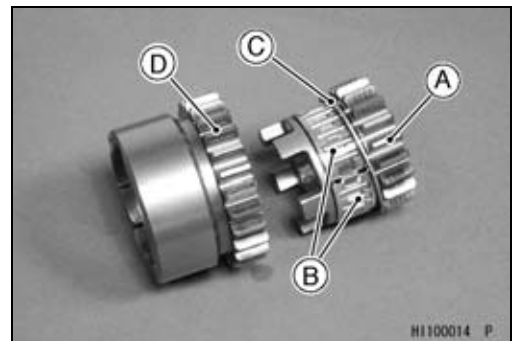


- Remove:
Needle Bearings [A]
- Remove the driven shaft [B] from the crankcase using a press.



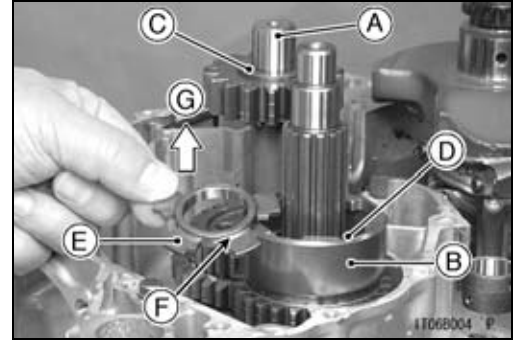
Transmission Installation

- Insert the driven shaft in the crankcase until it is bottomed using a press.
- Apply engine oil to the needle bearings and install them.
- Install the following parts on the low gear [A].
Needle Bearings [B]
Spacer [C] (P/No. 92026-1599, 48.2 × 54.3 × 1.0)
High Gear [D]

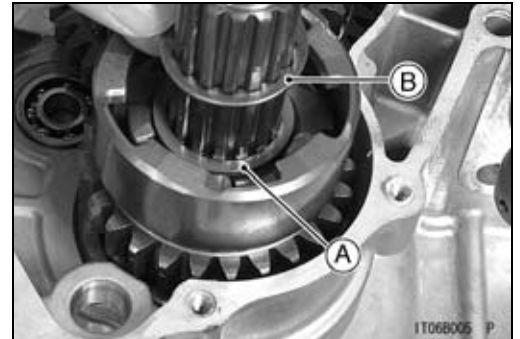


Transmission

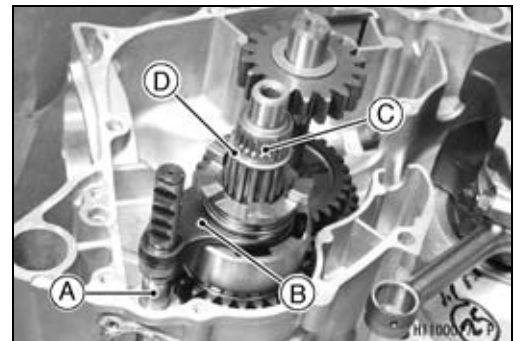
- Apply engine oil to the journal of the idle shaft [A].
- Install:
 - Idle Shaft with Gear Assembly [B]
 - Spacer [C]
 - Spacer [D] (P/No. 92026-1599, 48.2 × 54.3 × 1.0)
- Apply engine oil to the inner surface of the spacer [E].
- Install the spacer [E] so that the rounded side [F] faces outward [G].



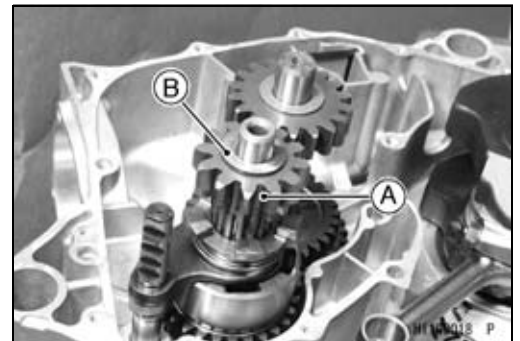
- Install:
 - Spacer [A]
 - Toothed Washer [B]
 - Circlip
- Special Tool - Outside Circlip Pliers: 57001-144**



- Apply engine oil:
 - Shift Rod [A] and Shift Fork Ear [B]
 - Needle Bearing [C]
- Install:
 - Shift Rod with Shift Fork
 - Spacer [D]
 - Needle Bearing



- Install:
 - Reverse Drive Gear [A]
 - Spacer [B]



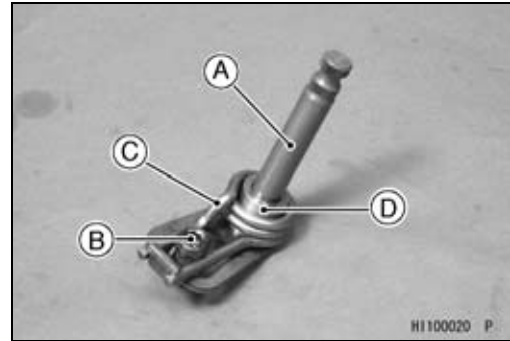
- Install:
 - Reverse Idle Shaft [A]



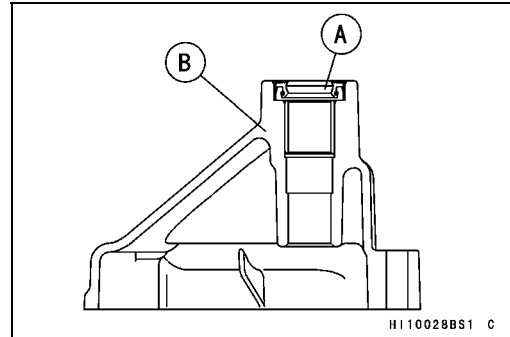
9-26 CRANKSHAFT/TRANSMISSION

Transmission

- Apply molybdenum disulfide oil to the shift shaft [A].
- Install:
 - Shift Shaft Spring Bolt [B]
 - Spring [C]
 - Guide [D]
- Apply a non-permanent locking agent:
 - Shift Shaft Spring Bolt
- Tighten:
 - Torque - Shift Shaft Spring Bolt: 25 N·m (2.5 kgf·m, 18 ft·lb)**



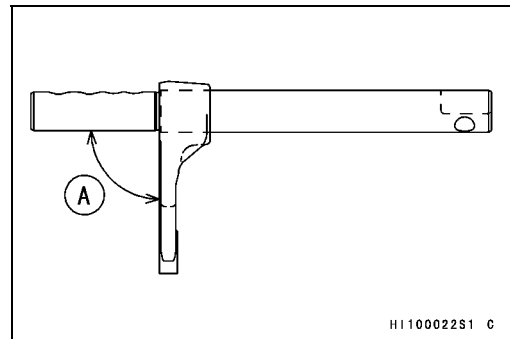
- When an oil seal [A] is installed in the shift shaft cover [B], press and insert the oil seal so that its surface is flush with the end of the hole.



- Install:
 - Shift Shaft Cover
- Tighten:
 - Torque - Shift Shaft Cover Bolts: 8.8 N·m (0.90 kgf·m, 78 in·lb)**

Shift Fork Bending Inspection

- Visually inspect the shift fork.
- ★ If the fork is bent, replace the shift rod with a new one. A bent fork could cause difficulty in shifting, or allow the transmission to jump out of gear when under power.
 - [A] 90°



Shift Fork/Gear and Shifter Groove Wear Inspection

- Measure the thickness of the shift fork ears [A], and measure the width [B] of the shifter groove.
- ★ If the thickness of a shift fork ear is less than the service limit, the shift rod must be replaced.

Shift Fork Ear Thickness

Standard: 5.9 ~ 6.0 mm (0.2323 ~ 0.2362 in.)

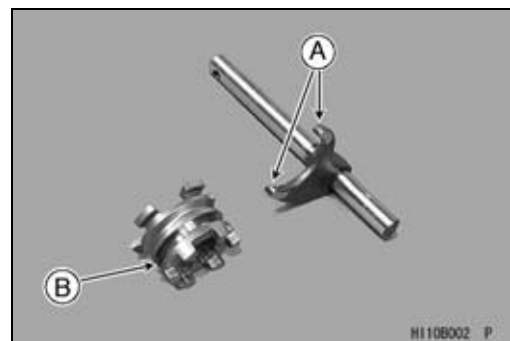
Service Limit: 5.8 mm (0.2283 in.)

- ★ If the groove is worn over the service limit, the shifter must be replaced.

Shifter Groove Width

Standard: 6.05 ~ 6.15 mm (0.2382 ~ 0.2421 in.)

Service Limit: 6.25 mm (0.2461 in.)



Transmission

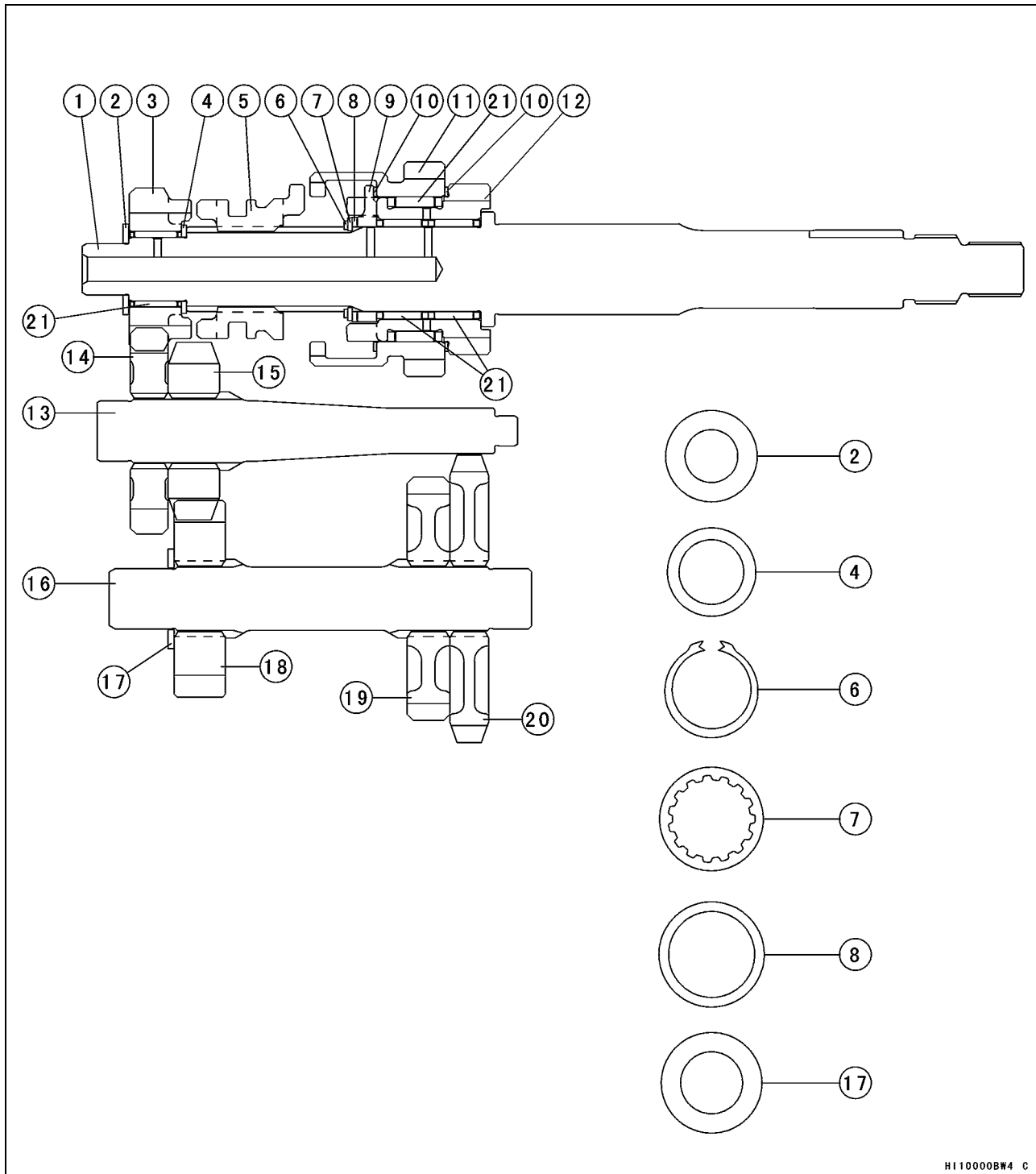
Transmission and Shift Mechanism Inspection

- Visually inspect:
 - Gears
 - Dogs of Gear and Shifter
- ★ If they are damaged or worn excessively, replace them.



9-28 CRANKSHAFT/TRANSMISSION

Transmission



HI1000BW4 C

- | | |
|--------------------------------|--------------------------------------|
| 1. Driven Shaft | 12. Drive Low Gear (20T) |
| 2. Spacer (17.3 × 30 × 2.0) | 13. Reverse Idle Shaft |
| 3. Reverse Gear (12T) | 14. Reverse Driven Gear (16T) |
| 4. Spacer (21.2 × 29 × 1.6) | 15. Reverse Driven Output Gear (16T) |
| 5. Shifter | 16. Idle Shaft |
| 6. Circlip | 17. Spacer (20.3 × 33 × 2.0) |
| 7. Toothed Washer T = 1.5 | 18. Driven Output Gear (18T) |
| 8. Spacer (28.2 × 34.5 × 1.6) | 19. Driven Hi Gear (30T) |
| 9. Spacer (Hi and Low) | 20. Driven Low Gear (36T) |
| 10. Spacer (48.2 × 54.3 × 1.0) | 21. Needle Bearing |
| 11. Drive Hi Gear (26T) | |

Ball Bearing, Needle Bearing, and Oil Seal

Ball and Needle Bearing Replacement

CAUTION
Do not remove the ball or needle bearings unless it is necessary. Removal may damage them.

- Using a press or puller, remove the ball bearing and/or three needle bearings.

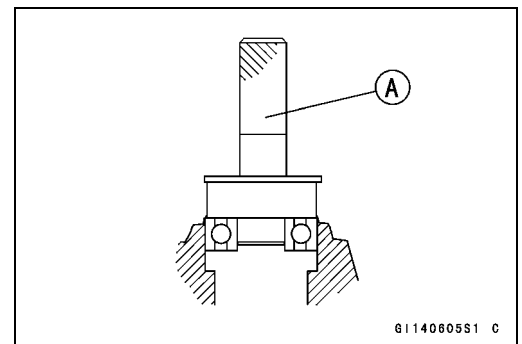
NOTE

○ *In the absence of the above mentioned tools, satisfactory results may be obtained by heating the case to approximately 93°C (200°F) max., and tapping the bearing in or out.*

CAUTION
Do not heat the case with a torch. This will warp the case. Soak the case in oil and heat the oil.

- Using a press and the bearing driver set [A], install the new ball bearing until it stops at the bottom of its housing.
- Three new needle bearings must be pressed into the crankcase so that the end is flush with the end of the hole.

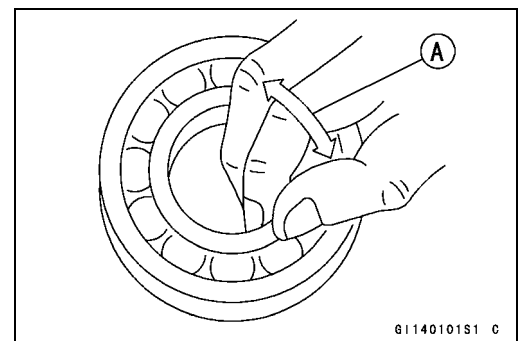
Special Tool - Bearing Driver Set: 57001-1129



Ball and Needle Bearing Wear Inspection

CAUTION
Do not remove the bearings for inspection. Removal may damage them.

- Check the ball bearings.
 - Since the ball bearings are made to extremely close tolerances, the wear must be judged by feel rather than measurement. Clean each bearing in a high-flash point solvent, dry it (do not spin the bearing while it is dry), and oil it with engine oil.
 - Spin [A] the bearing by hand to check its condition.
 - ★ If the bearing is noisy, does not spin smoothly, or has any rough spots, replace it.
- Check the needle bearings.
 - The rollers in a needle bearing normally wear very little, and wear is difficult to measure. Instead of measuring, inspect the bearing for abrasion, color change, or other damage.
 - ★ If there is any doubt as to the condition of a needle bearing, replace it.



Oil Seal Inspection

- Inspect the oil seals.
 - ★ Replace it if the lips are misshapen, discolored (indicating that the rubber has deteriorated), hardened or otherwise damaged.

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