

# 12. TRANSMISSION

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## SERVICE INFORMATION

### GENERAL

- The crankcase must be separated to service the transmission.
- The gearshift cam plate can be serviced with the engine installed in the frame (Section 9).

### SPECIFICATIONS

Unit: mm (in)

ITEM			STANDARD	SERVICE LIMIT	
Transmission	Gear I.D.	M5	20.000 – 20.021 (0.7874 – 0.7882)	20.08 (0.791)	
		M6	23.000 – 23.021 (0.9055 – 0.9063)	23.07 (0.908)	
		C1	23.000 – 23.021 (0.9055 – 0.9063)	23.07 (0.908)	
		C2	25.020 – 25.041 (0.9850 – 0.9859)	25.09 (0.988)	
		C3	25.000 – 25.021 (0.9843 – 0.9851)	25.07 (0.987)	
		C4	22.000 – 22.021 (0.8661 – 0.8670)	22.07 (0.869)	
	Gear bushing	M6	O.D.	22.959 – 22.980 (0.9039 – 0.9047)	22.92 (0.902)
			C1	I.D.	18.000 – 18.018 (0.7087 – 0.7094)
		C2	O.D.	22.959 – 22.980 (0.9039 – 0.9047)	22.90 (0.902)
			I.D.	22.000 – 22.021 (0.8661 – 0.8670)	22.10 (0.870)
		C3	O.D.	24.979 – 25.000 (0.9834 – 0.9843)	24.90 (0.980)
			O.D.	24.959 – 24.980 (0.9826 – 0.9835)	24.90 (0.980)
	Mainshaft O.D.	M5	19.959 – 19.980 (0.7858 – 0.7866)	19.91 (0.784)	
		Clutch outer guide	19.959 – 19.980 (0.7858 – 0.7866)	19.91 (0.784)	
	Countershaft O.D.	Starter idle gear	14.966 – 14.984 (0.5892 – 0.5899)	14.91 (0.587)	
		C1	17.966 – 17.984 (0.7073 – 0.7080)	17.91 (0.705)	
		C2, C4	21.959 – 21.980 (0.8645 – 0.8654)	21.91 (0.863)	
	Shift drum O.D. at right crankcase bearing portion			19.959 – 19.980 (0.7858 – 0.7866)	19.90 (0.783)
	Gear-to-bushing clearance		M6, C1, C2, C3	0.020 – 0.062 (0.0008 – 0.0022)	0.10 (0.004)
	Gear-to-shaft clearance		M5, C4	0.020 – 0.062 (0.0008 – 0.0022)	0.15 (0.006)
Bushing-to-shaft clearance		C1	0.016 – 0.052 (0.0006 – 0.0020)	0.10 (0.004)	
		C2	0.020 – 0.062 (0.0008 – 0.0022)	0.10 (0.004)	
Shift fork, Shaft	Shift fork	I.D.	13.000 – 13.021 (0.5118 – 0.5126)	13.05 (0.514)	
		Operation area thickness	R, L	4.93 – 5.00 (0.194 – 0.197)	4.50 (0.177)
			C	4.90 – 5.00 (0.193 – 0.197)	4.50 (0.177)
	Shift fork shaft O.D.			12.966 – 12.984 (0.5105 – 0.5112)	12.90 (0.508)

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## **TRANSMISSION**

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### **TROUBLESHOOTING**

#### **Hard to shift**

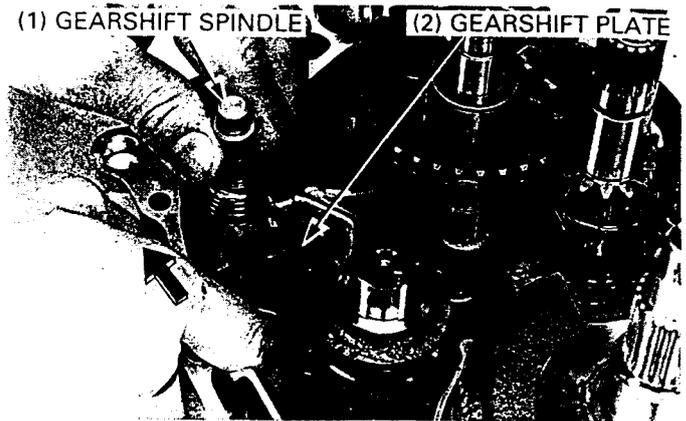
- Improper clutch adjustment; too much free play
- Shift forks bent
- Shift shaft bent
- Shift drum cam groove damaged

#### **Transmission jumps out of gear**

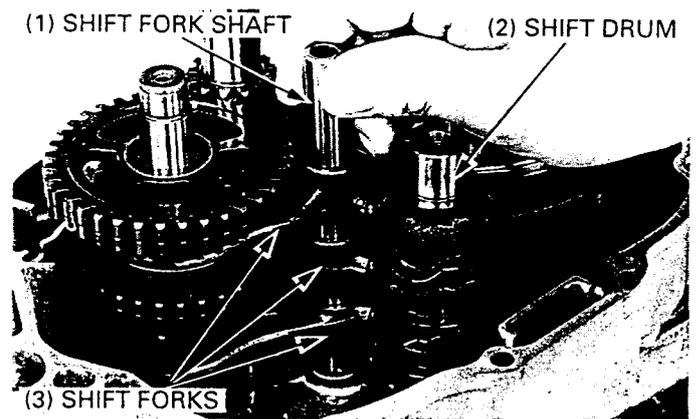
- Gear dogs worn
- Shift shaft bent
- Shift drum stopper broken
- Shift forks bent

## TRANSMISSION REMOVAL/ DISASSEMBLY

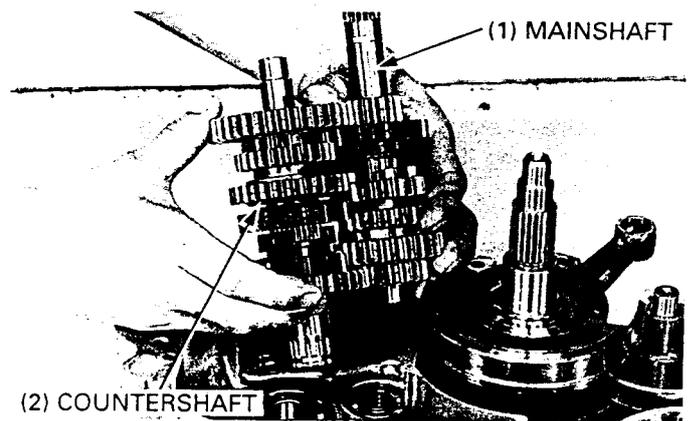
Separate the crankcase (Section 11).  
Pull the gearshift plate toward the spindle and remove the gearshift spindle.



Remove the shift fork shaft.  
Remove the shift drum and shift forks.

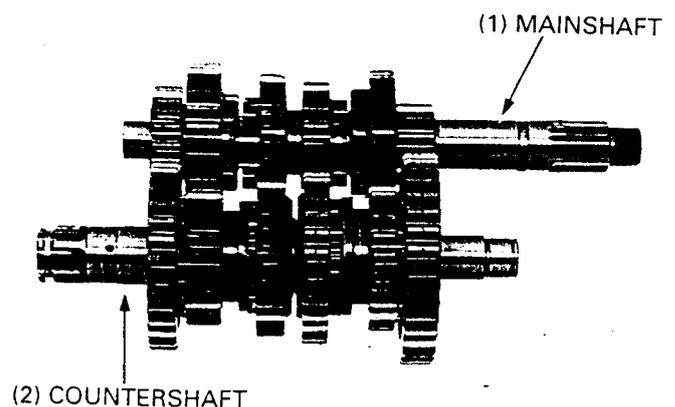


Remove the mainshaft and countershaft as an assembly.



## TRANSMISSION INSPECTION

Disassemble the mainshaft and countershaft.  
Inspect each gear for wear or damage and replace if necessary. Check the gear teeth and engagement dogs for wear or damage. Check the mainshaft and countershaft splines and sliding surfaces for wear or damage.

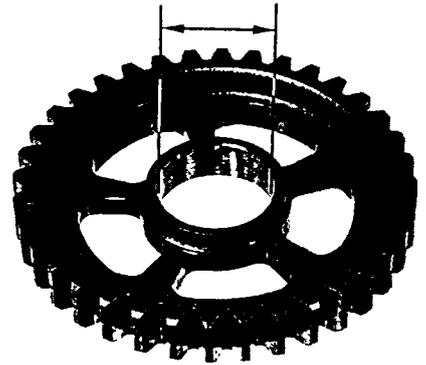


## TRANSMISSION

Measure the I.D. of each spinning gear.

### SERVICE LIMITS:

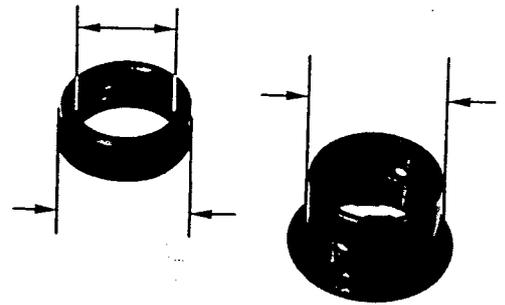
- M5: 20.08 mm (0.791 in)
- M6: 23.07 mm (0.908 in)
- C1: 23.07 mm (0.908 in)
- C2: 25.09 mm (0.988 in)
- C3: 25.07 mm (0.987 in)
- C4: 22.07 mm (0.869 in)



Measure the I.D. and O.D. of the gear bushings.

### SERVICE LIMITS:

- I.D.: C1: 18.08 mm (0.712 in)
- C2: 22.10 mm (0.870 in)
- O.D.: M6: 22.92 mm (0.902 in)
- C1: 22.90 mm (0.902 in)
- C2: 24.90 mm (0.980 in)
- C3: 24.90 mm (0.980 in)



Calculate the clearances between the gears and bushings.

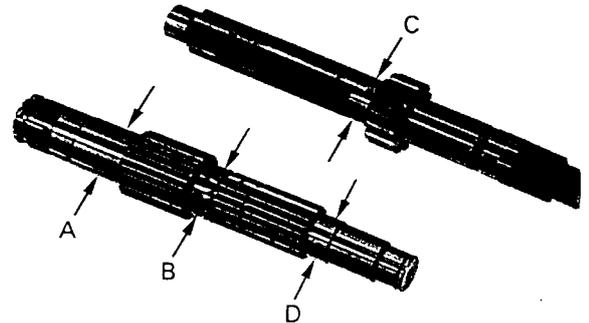
### SERVICE LIMITS:

- M6, C1, C2, C3: 0.10 mm (0.004 in)

Measure the O.D. of the mainshaft and countershaft in the locations shown.

### SERVICE LIMITS:

- A: C2 bushing: 21.91 mm (0.863 in)
- B: C4 gear: 21.91 mm (0.863 in)
- C: M5 gear: 19.91 mm (0.784 in)
- D: C1 bushing: 17.91 mm (0.705 in)



Calculate the clearance between the shaft and gears or bushings.

### SERVICE LIMITS:

- M5 gear: 0.15 mm (0.006 in)
- C4 gear: 0.15 mm (0.006 in)
- C1 bushing: 0.10 mm (0.004 in)
- C2 bushing: 0.10 mm (0.004 in)

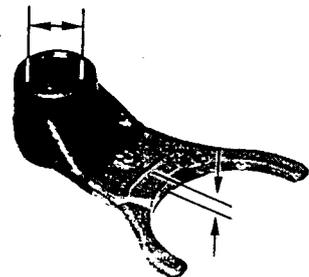
Inspect the shift forks and replace any shift fork if it is bent or damaged.

Measure the I.D. of the shift fork.

SERVICE LIMIT: 13.05 mm (0.514 in)

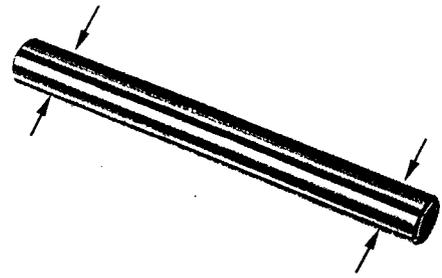
Measure the thickness of the shift fork contact area.

SERVICE LIMIT: 4.50 mm (0.177 in)



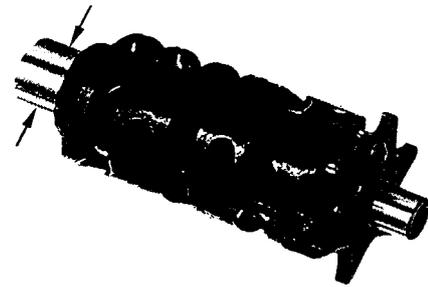
Inspect the shift fork shaft and replace the shift fork shaft if it is bent or damaged.  
Measure the O.D. of the shift fork.

**SERVICE LIMIT: 12.90 mm (0.508 in)**



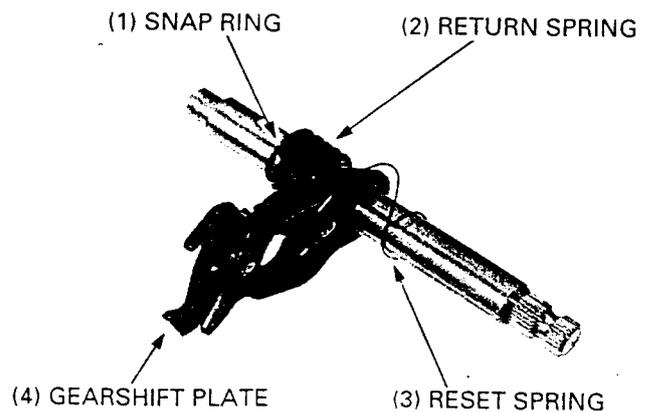
Inspect the shift drum grooves and replace the drum if they are damaged or worn.  
Measure the O.D. of the shift drum right crankcase bearing surface.

**SERVICE LIMIT: 19.90 mm (0.783 in)**



**GEARSHIFT SPINDLE INSPECTION**

Remove the snap ring and spring.  
Inspect the gearshift spindle and gearshift plate claw wear or damage.  
Replace if it's worn and damaged.  
Inspect the return spring and replace if it's damaged.  
Inspect the reset spring and replace if it's damaged.

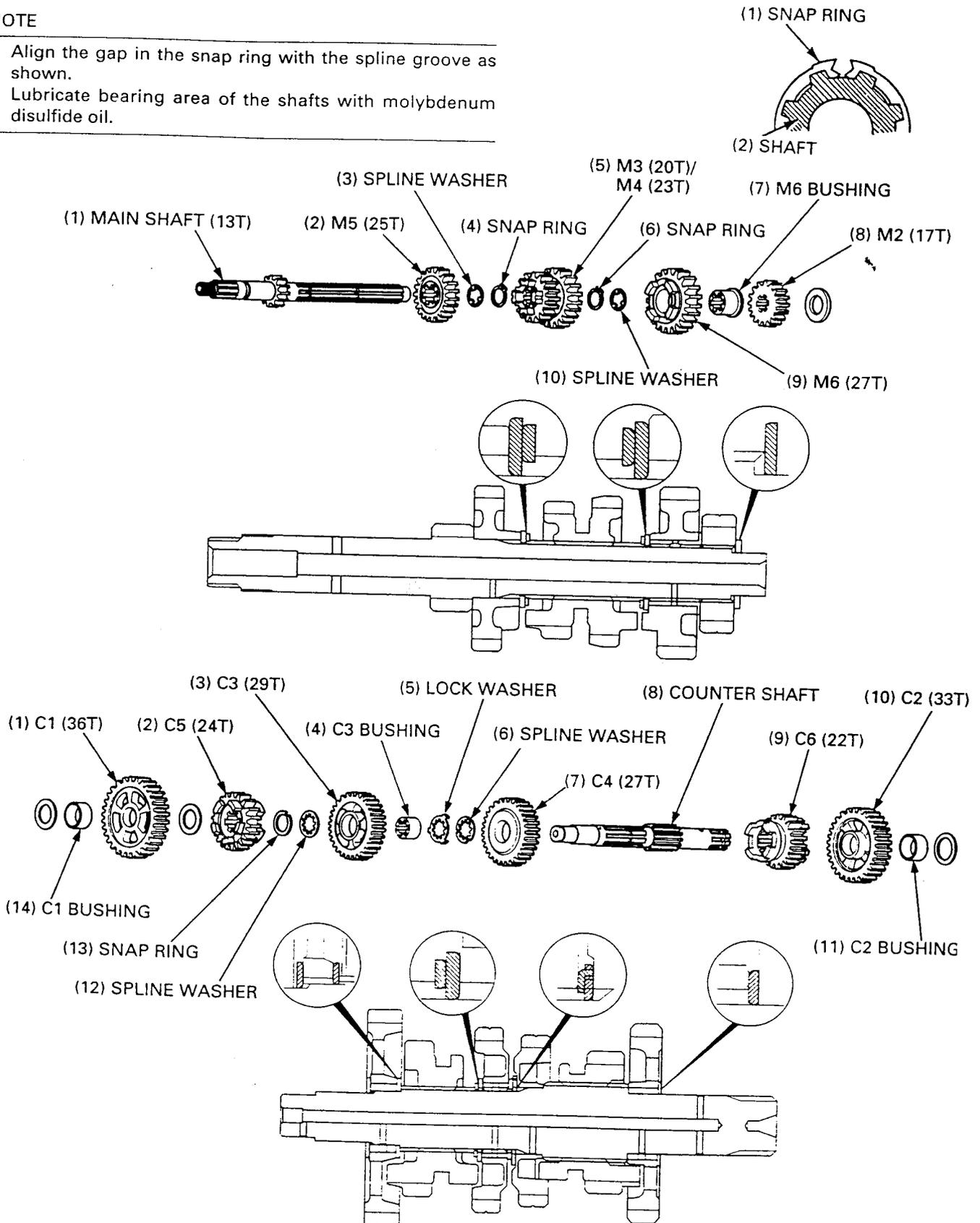


## TRANSMISSION

# TRANSMISSION ASSEMBLY/ INSTALLATION

### NOTE

- Align the gap in the snap ring with the spline groove as shown.
- Lubricate bearing area of the shafts with molybdenum disulfide oil.



## TRANSMISSION

Apply engine oil to the following:

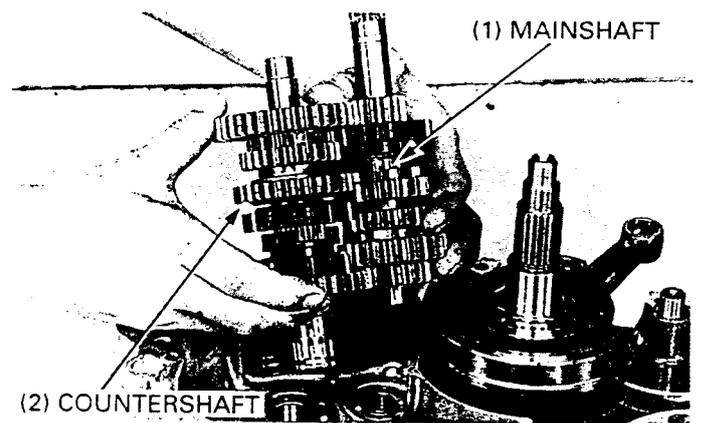
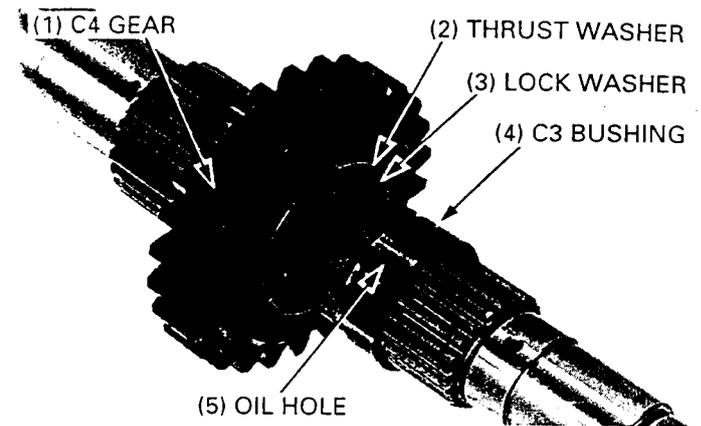
- All gear teeth
- Mainshaft bearing
- Countershaft bearing
- Shift drum bearing

Apply molybdenum disulfide oil to the shift fork grooves of the M3/4, C5, C6 gear.

Assemble the transmission.

### NOTE

- Align the cut-outs of the C4 gear splined washer with the tabs of the C4 gear thrust washer lock plate.
- Install the C3 gear bushing with its oil hole aligning with the hole in the countershaft.
- Install the M6 gear bushing with its oil hole aligning with the hole in the mainshaft.

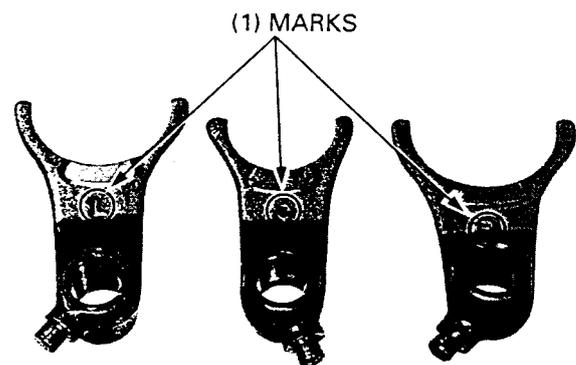


Install the mainshaft and countershaft into the left crankcase as an assembly.

### NOTE

- Be careful not to turn over the countershaft oil seal lip in the left crankcase when installing the countershaft.

Each shift fork has an identification mark; "R" (Right), "C" (Center) or "L" (Left).



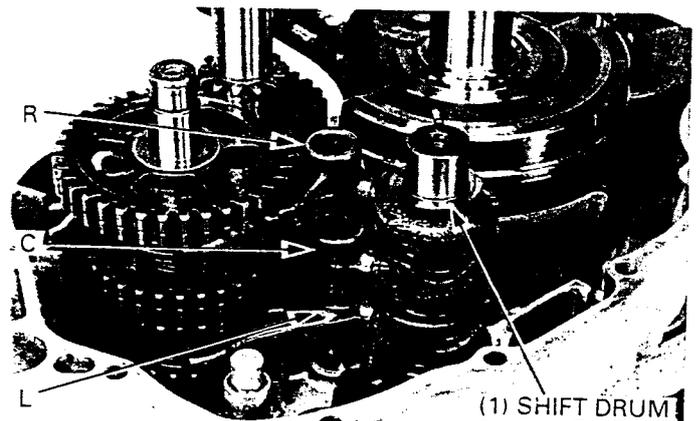
Apply engine oil to the following:

- Shift drum guide groove
- Shift fork claws
- Shift fork guide pin
- Shift fork I.D.
- Shift fork shaft

Install the following:

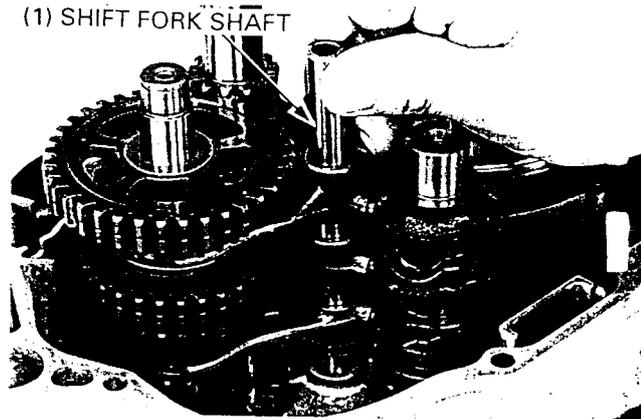
- Shift drum
- Shift forks

Install the shift forks in the correct position with their marks facing up.



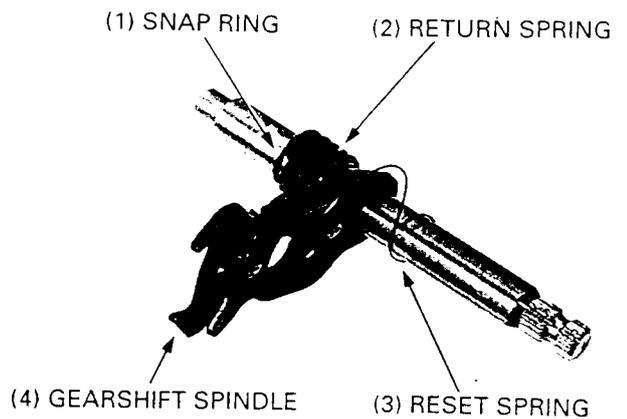
## TRANSMISSION

Install the shift fork shaft.



Install the following onto the gearshift spindle:

- Return spring
- Snap ring
- Reset spring

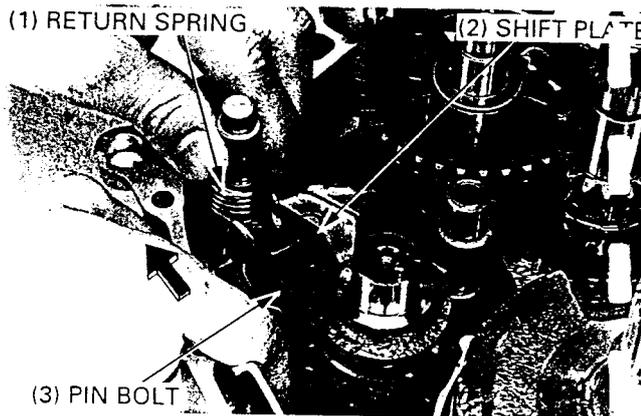


Align the return spring with the pin bolt and install the shift spindle while pulling the shift plate toward the spindle.

### NOTE

- Be careful not to turn over the spindle oil seal lip in the left crankcase when installing shift spindle.

Install the right crankcase (page 11-11).  
Install the shift cam and stopper arm (page 9-17).  
Install the gearshift pedal and check the transmission for smooth shifting.



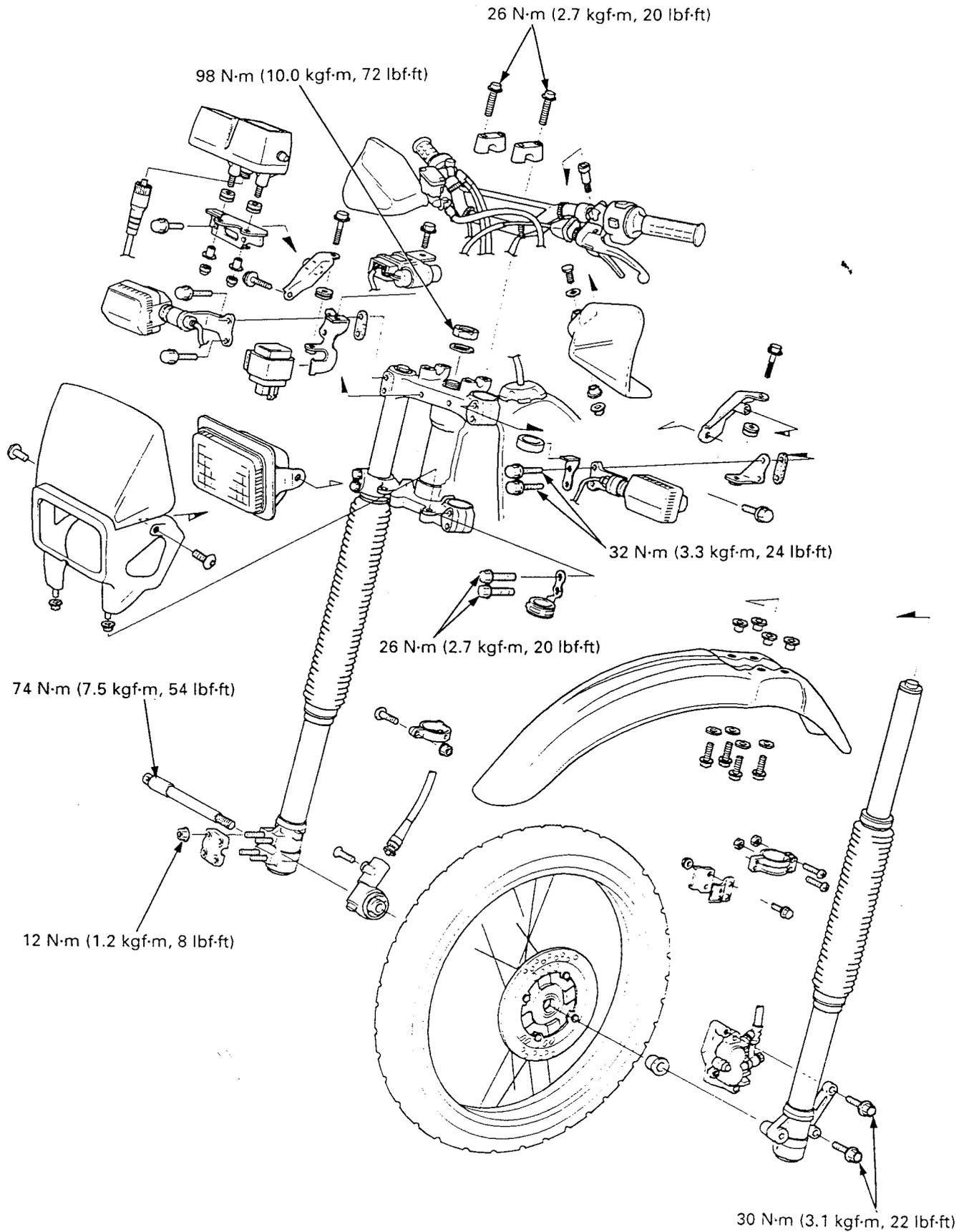
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MEMO





# FRONT WHEEL/SUSPENSION/STEERING



# 13. FRONT WHEEL/SUSPENSION/STEERING

SERVICE INFORMATION	13-1	FORK	13-7
TROUBLESHOOTING	13-2	SPEEDOMETER	13-19
FRONT WHEEL	13-3	STEERING	13-20

## SERVICE INFORMATION

### GENERAL

- Keep grease off of brake pads and disc.

#### ▲ WARNING

- *A contaminated brake disc or pad reduce stopping power. Discard contaminated pads and clean a contaminated disc with a high quality brake degreasing agent.*

- This section covers maintenance of the front wheel, fork and steering stem.
- A box or work stand is required to support the motorcycle.
- Refer to section 15 for brake system information.

### SPECIFICATIONS

ITEM		STANDARD	SERVICE LIMIT
Cold tire pressure	(ED, DK types)	100 kPa (1.0 kgf/cm <sup>2</sup> , 15 psi)	—
	(U type)	150 kPa (1.50 kgf/cm <sup>2</sup> , 22 psi)	—
Axle runout		—	0.2 (0.01)
Wheel rim runout	Radial	—	2.0 (0.08)
	Axial	—	2.0 (0.08)
Wheel rim-to-hub distance		20.25 (0.797)	—
Fork spring free length		442.5 (17.42)	438.1 (17.25)
Fork tube runout		—	2.0 (0.08)
Recommended fork oil		Fork fluid (SS8)	—
Fork oil level		82 (3.2)	77 – 108 (3.0 – 4.2)
Fork oil capacity		477 cm <sup>3</sup> (16.13 US oz, 16.79 Imp oz)	—

### TORQUE VALUES

Handlebar holder bolt	26 N·m (2.7 kgf·m, 20 lbf·ft)	
Steering stem nut	98 N·m (10.0 kgf·m, 72 lbf·ft)	
Steering top thread	5 N·m (0.5 kgf·m, 3.6 lbf·ft)	
Top bridge pinch bolt	32 N·m (3.3 kgf·m, 24 lbf·ft)	
Bottom bridge pinch bolt	26 N·m (2.7 kgf·m, 20 lbf·ft)	
Front axle	74 N·m (7.5 kgf·m, 54 lbf·ft)	
Front axle holder nut	12 N·m (1.2 kgf·m, 9 lbf·ft)	U-nut.
Front brake caliper bracket bolt	30 N·m (3.1 kgf·m, 22 lbf·ft)	Apply a locking agent to the threads.
Front brake disc plate bolt	20 N·m (2.0 kgf·m, 14 lbf·ft)	ALOC bolt; Replace with a new one.
Master cylinder holder bolt	9 N·m (0.9 kgf·m, 6.5 lbf·ft)	
Spoke nipple	3.8 N·m (0.38 kgf·m, 2.7 lbf·ft)	
Rim lock	15 N·m (1.5 kgf·m, 11 lbf·ft)	

## FRONT WHEEL/SUSPENSION/STEERING

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### TOOLS

#### Special

Fork damper holder	07PMB – KZ40101
Fork seal driver	07947 – KA50100
Fork seal driver attachment	07947 – KF00100
Oil seal remover	07948 – 4630100
Steering stem driver	07946 – 4300101
Steering stem socket	07916 – KA50100

#### Common

Attachment, 32 x 35 mm	07746 – 0010100
Attachment, 42 x 47 mm	07746 – 0010300
Bearing remover head, 15 mm	07746 – 0050400
Bearing remover shaft	07746 – 0050100
Driver	07749 – 0010000
Nipple wrench	07701 – 0020300
Pilot, 15 mm	07746 – 0040300

## TROUBLESHOOTING

#### Hard steering

- Steering stem nut too tight
- Faulty steering stem bearings
- Insufficient air in front tire

#### Steers to one side or does not track straight

- Bent front forks
- Bent front axle
- Wheel installed incorrectly

#### Front wheel wobbling

- Distorted rim
- Worn front bearings
- Loose or broken spokes
- Faulty tire
- Axle not tightened properly

#### Soft suspension

- Weak fork springs
- Insufficient fluid in front forks

#### Hard suspension

- Incorrect fluid weight in front forks
- Fork tube bent

#### Front suspension noise

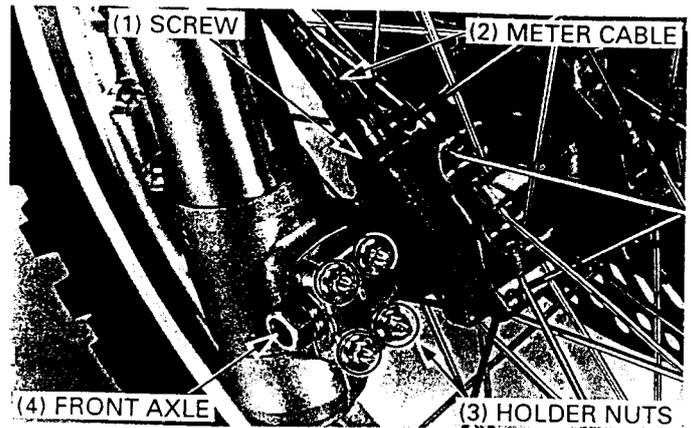
- Slider binding
- Insufficient fluid in forks
- Loose front fork fasteners

## FRONT WHEEL

### REMOVAL

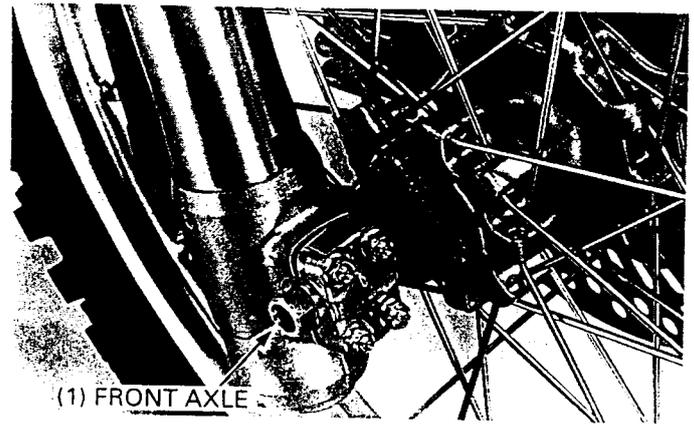
Remove the screw and disconnect the speedometer cable from the speedometer gearbox.  
Loosen the front axle holder nuts.  
Loosen the front axle.

Raise the front wheel off the ground by placing a box or work stand under the engine.  
Remove the front axle and front wheel.



### NOTE

- Do not depress the brake lever after the front wheel is removed. The caliper piston will move out and make reassembly difficult.

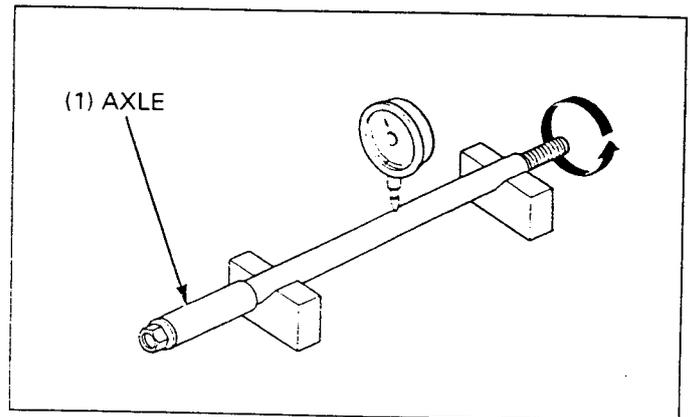


### INSPECTION

#### Axle

Set the axle in V blocks and measure the runout.  
The actual runout is 1/2 of the total indicator reading.

**SERVICE LIMIT: 0.2 mm (0.01 in)**

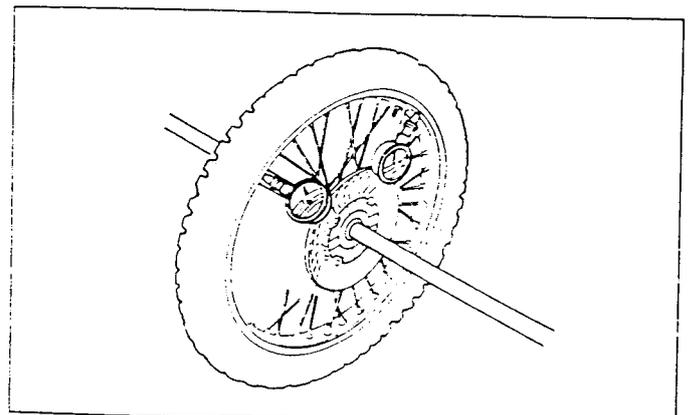


#### Wheel

Check the rim runout by placing the wheel on a turning stand.  
Spin the wheel by hand, and read the runout using a dial indicator.  
Actual runout is 1/2 of the total indicator reading.

**SERVICE LIMITS: Radial: 2.0 mm (0.08 in)**  
**Axial: 2.0 mm (0.08 in)**

Check the spokes and tighten any that are loose.



## FRONT WHEEL/SUSPENSION/STEERING

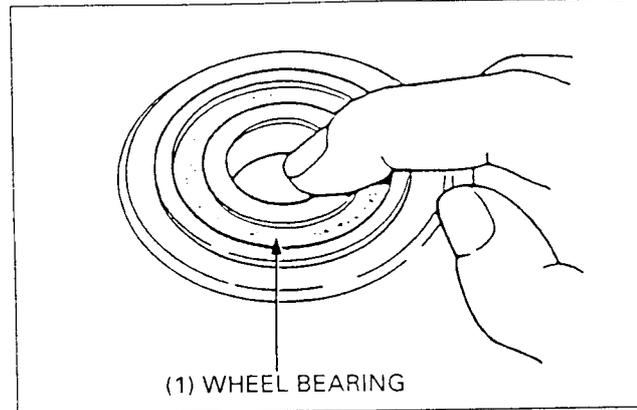
### Wheel bearing

Turn the inner race of each bearing with your finger. The bearing should turn smoothly and quietly. Also check that the bearing outer race fits tightly in the hub.

Remove and discard the bearings if the races do not turn smoothly, quietly or if they fit loosely in the hub.

### NOTE

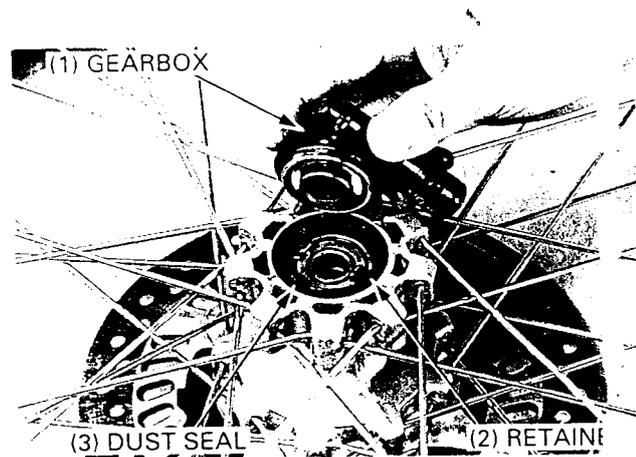
- Replace the wheel bearings in pairs.



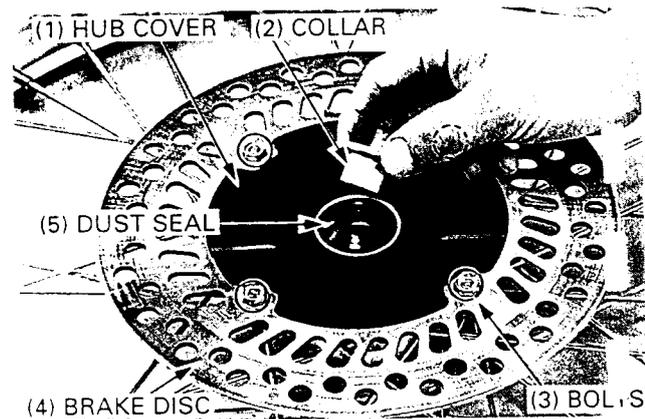
### DISASSEMBLY

Remove the following:

- Speedometer gearbox
- Right dust seal
- Speedometer gear retainer



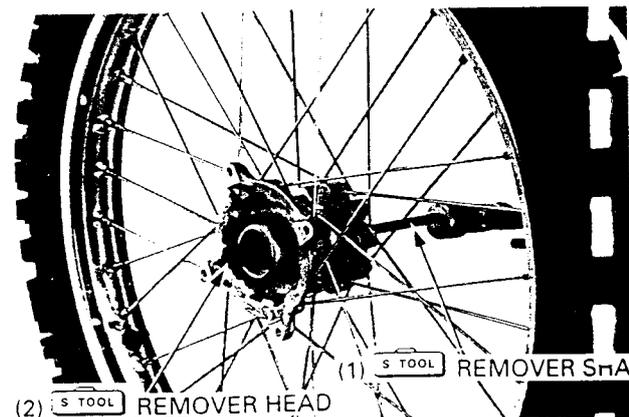
- Left wheel collar
- Front brake disc bolt
- Front brake disc
- Hub cover
- Left dust seal



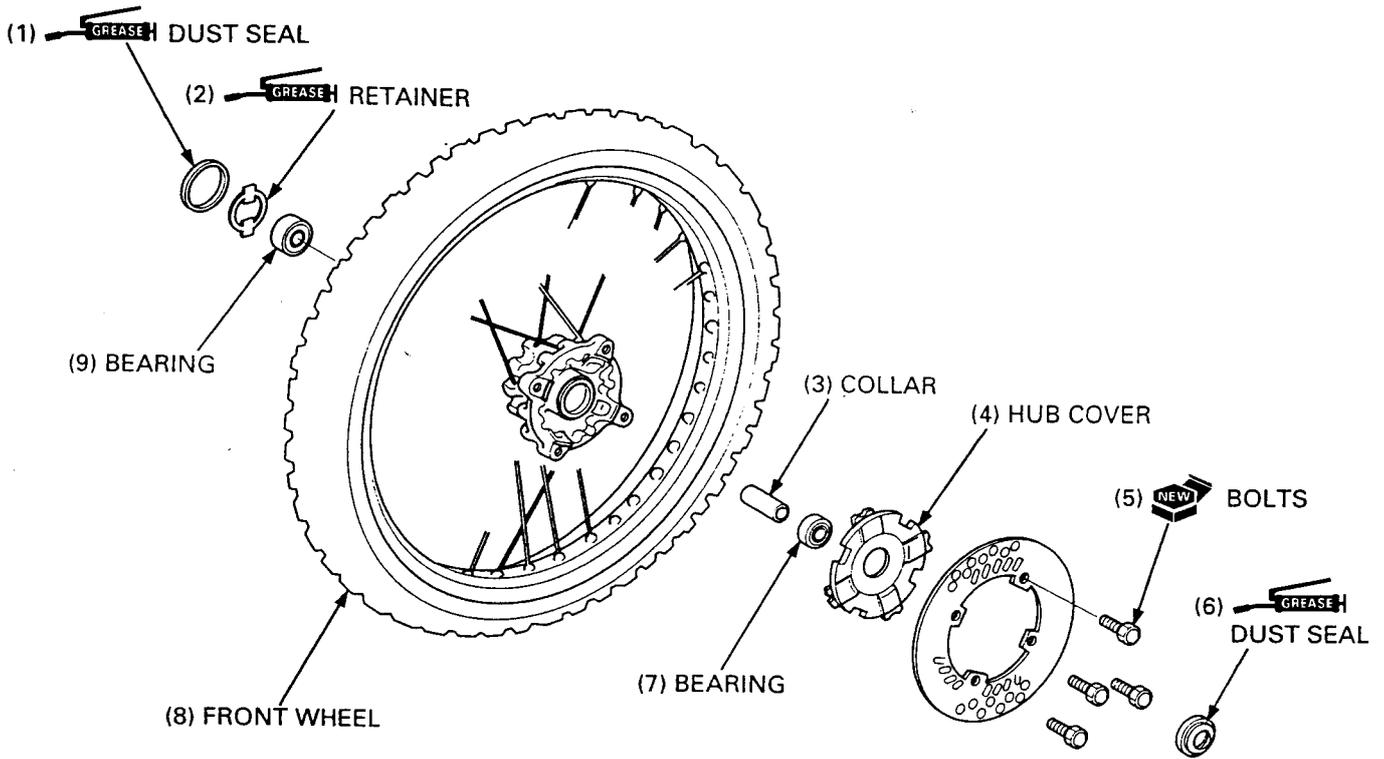
Remove the bearing and distance collar.

### TOOL:

- Bearing remover head, 15 mm 07746 - 0050400
- Bearing remover shaft 07746 - 0050100



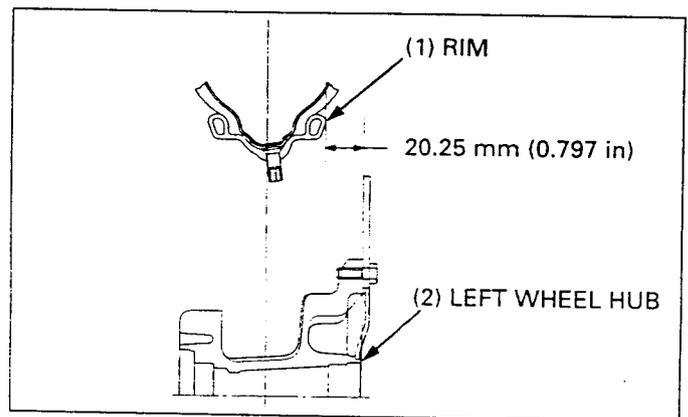
ASSEMBLY



Place the rim on a work bench.

Clean the spoke and nipple threads.  
Adjust the hub position to set the distance from the hub left end surface to the side of rims as shown.

**WHEEL RIM-TO-HUB STANDARD DISTANCE:**  
20.25 mm (0.797 in)



Torque the spokes in 2 or 3 progressive steps.

**TOOL:**  
Nipple wrench 07701 - 0020300

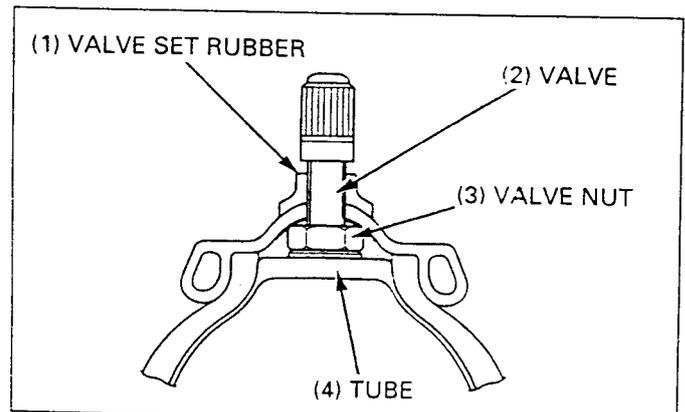
**TORQUE: 3.8 N-m (0.38 kgf-m, 2.7 lbf-ft)**

Install the valve nut to the valve.  
Install the valve to the wheel rim with the valve setting rubber.

Install and tighten the rim lock nut.

**TORQUE: 15 N-m (1.5 kgf-m, 11 lbf-ft)**

Pack all bearing cavities with grease.



## FRONT WHEEL/SUSPENSION/STEERING

Drive the new right wheel bearing into the hub using the special tools as shown.

Install the distance collar.

Drive the new left wheel bearing into the hub using the special tools as shown.

### TOOL:

Attachment, 32 x 35 mm	07746 - 0010100
Driver	07749 - 0010000
Pilot, 15 mm	07746 - 0040300

### NOTE

- Install the bearing with the seal side facing out.

Apply grease to the tripmeter gear retainer. Install the tripmeter gear retainer into the wheel hub, align the tangs with the slots.

Apply grease to the left dust seal lip. Install the left dust seal and hub cover. Install the front brake disc.

### NOTE

- Install the brake disc with the "⇐DRIVE" mark facing out.

Install and tighten the new brake disc bolts.

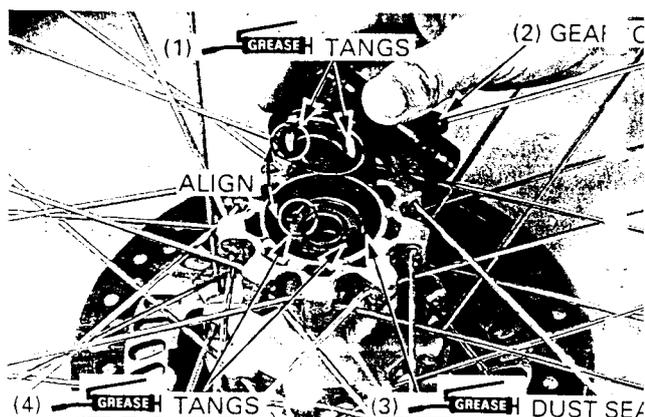
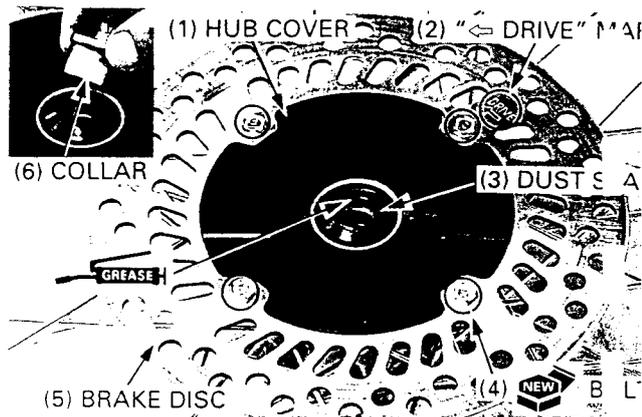
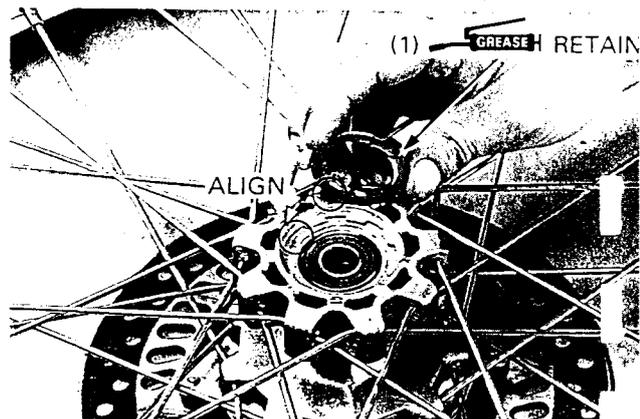
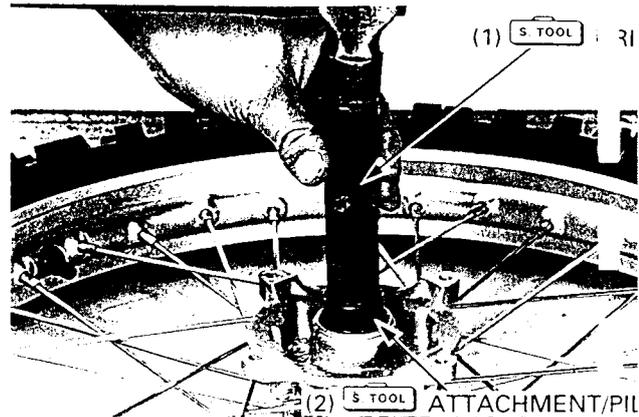
**TORQUE:** 20 N·m (2.0 kgf·m, 14 lbf·ft)

Install the left wheel collar.

Apply grease to the right dust seal lip and install the front wheel.

Apply grease to the speedometer gearbox tangs and retainer tangs.

Install the speedometer gearbox into the wheel hub, aligning the gearbox tangs and retainer tangs.



## FRONT WHEEL SUSPENSION/STEERING

### INSTALLATION

Install the front wheel.

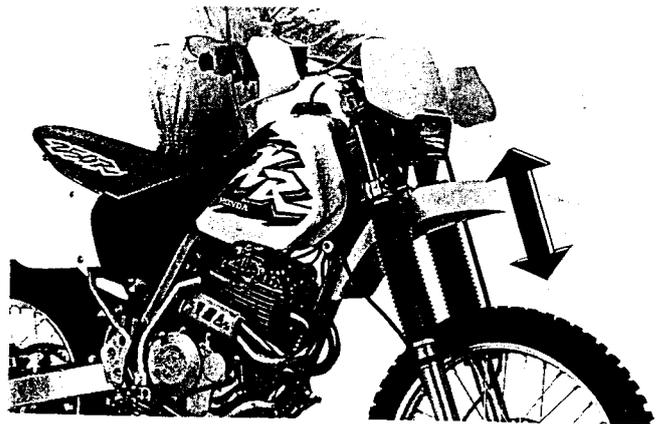
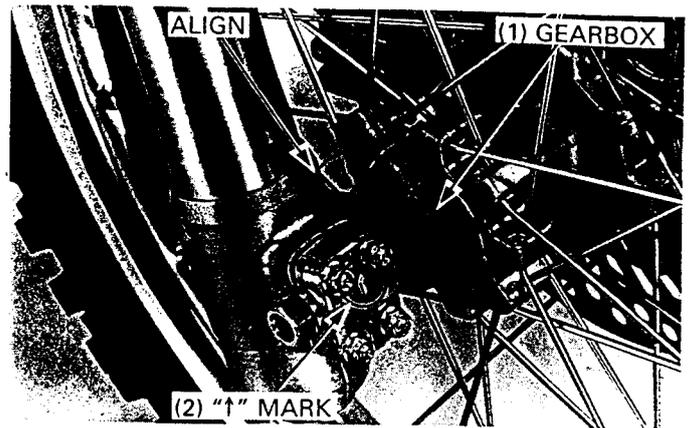
#### NOTE

- If you removed the axle holder, install it with the "↑" mark facing upwards.

Install the front axle.  
Align the speedometer gearbox with the tang on the right fork leg as shown.  
Tighten the axle to the specified torque.

**TORQUE: 74 N·m (7.5 kgf·m, 54 lbf·ft)**

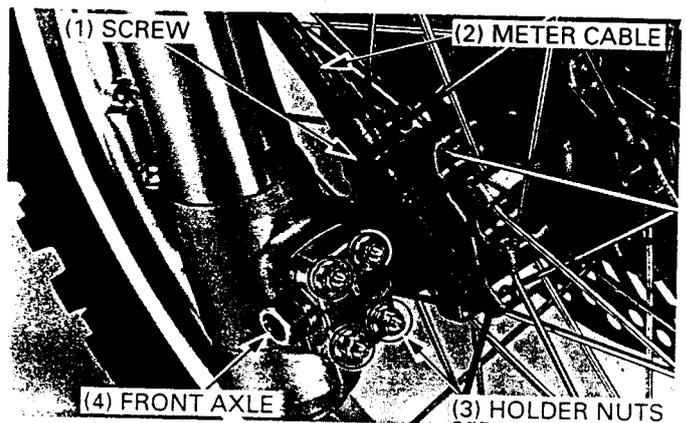
With the front brake applied, pump the front forks up and down several times to seat the axle and check front brake operation.



Tighten the axle holder nuts: the upper nuts first, then the lower nuts.

**TORQUE: 12 N·m (1.2 kgf·m, 9 lbf·ft)**

Connect the speedometer cable to the gearbox.

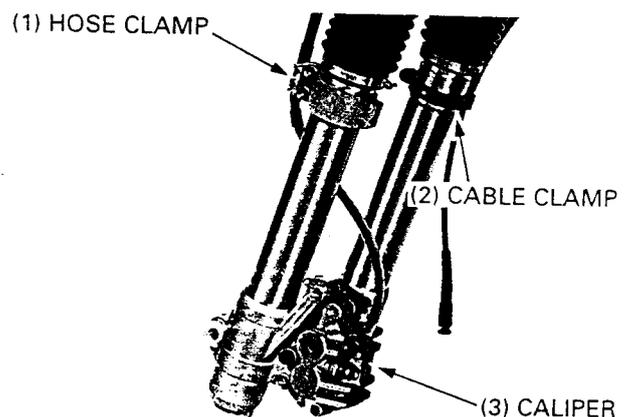


### FORK

#### REMOVAL

Remove the following:

- Headlight case (page 16-11)
- Front wheel (page 13-3)
- Brake hose clamp (left side)
- Front brake caliper (page 15-7)
- Speedometer cable clamp (right side)



## FRONT WHEEL/SUSPENSION/STEERING

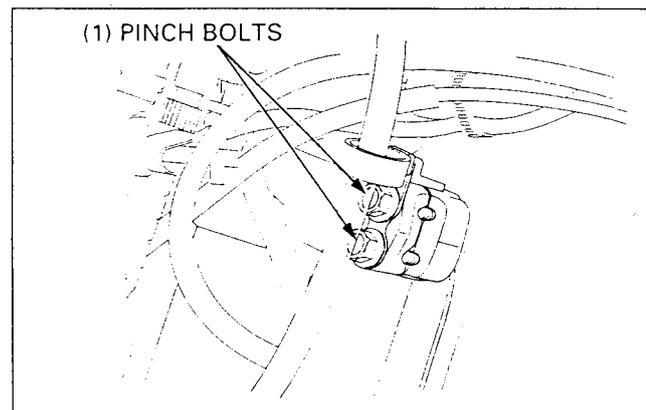
### NOTE

- Do not hang the brake caliper by the brake hose.
- It is not necessary to disconnect the brake hose.

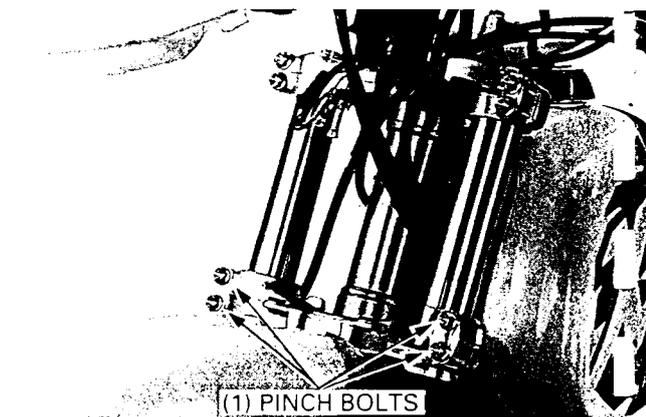
Loosen the top bridge pinch bolts.

### NOTE

- If the fork legs will be disassembled, loosen the fork caps, lower socket bolts and upper fork boot screws before loosening the fork pinch bolts.



Loosen the bottom bridge pinch bolts.  
Remove the fork.



## DISASSEMBLY

Loosen the lower fork boot screw.  
Remove the fork boot and fork boot guide.

