

14. TRANSMISSION AND DIFFERENTIAL

14-1.	Description	14-2
14-2.	Flow of Drive Through Transmission.	14-3
14-3.	Transmission Gear Ratio.	14-5
14-4.	Dismounting.	14-5
14-5.	Disassembly	14-8
14-6.	Maintenance Services	14-11
14-7.	Important Steps in Installation.	14-14
14-8.	Maintenance Services (Differential).	14-20
14-9.	Important Steps in Installation (Differential)	14-21

14-1. Description

The transmission is full synchronized and provides four forward speeds and one reverse speed by means of two synchronizers and two shafts-input shaft and countershaft.

Gears on both shafts (input and counter) are always meshed. The low-speed synchronizer on the counter shaft is engaged either with the low driven gear or second driven gear. The high-speed synchronizer is engaged with either the third driven gear or top driven gear. The reverse idler gear is of clash-meshing type and is engaged with the low speed synchronizer sleeve on the countershaft and the reverse drive gear on the input shaft.

Transmission case is in two-piece construction, consisting of upper case and lower case.

The lower case has the three-fork-shifting mechanism built in it.

The upper case houses the reverse shaft.

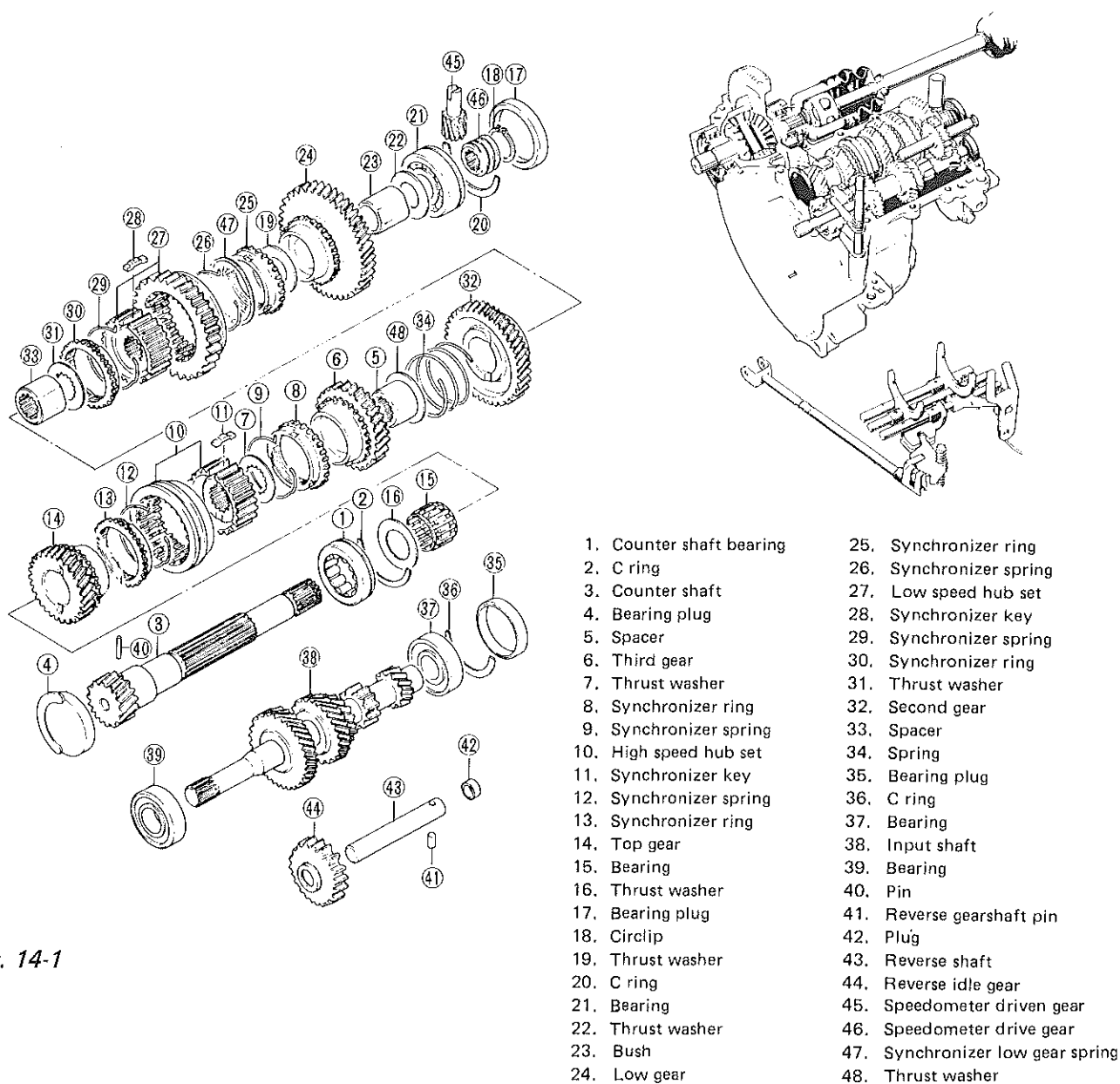


Fig. 14-1

14-2. Flow of Drive Through Transmission

How drive flows will be explained for each shift position:

Low speed drive

Low driven gear on the countershaft is free from this shaft and merely rotates around it, as driven from the low drive gear of the input shaft. Shifting the lever into "low" causes low-speed gear shifter fork to push low-speed synchronizer toward low driven gear and, through the dog teeth, mesh it with the gear, thus coupling the gear to the input shaft.

In this condition, the drive is transmitted through the low drive gear on the input shaft and low driven gear on the countershaft to the final gear of the differential.

Second speed drive

Shifting the lever into "second" causes the same low-speed gear shifter fork to push low-speed synchronizer to the other direction, that is, toward second driven gear and mesh it with this gear, thereby coupling the gear to the input shaft.

In this condition, the drive is transmitted through the second drive gear on the input shaft and second driven gear on the countershaft to the final gear of the differential.

Third speed drive

Shifting the lever into "third" actuates high-speed shifter fork to engage high-speed synchronizer with third driven gear on the countershaft. This gear, like low and second driven gears, is free on the shaft and merely spins as driven by third drive gear of input shaft when the gearshift lever is any other position.

In this condition, the drive is transmitted through the third drive gear on the input shaft and third driven gear on the countershaft to the final gear of the differential.

Top speed drive

Shifting the lever into top causes the high-speed shifter fork, which is also used for the third speed, to mesh the top gear with the high-speed synchronizer on the countershaft.

In this condition, the drive is transmitted through the top drive gear on the input shaft and top driven gear on the countershaft to the final gear of the differential.

Reverse drive

Shifting the lever into reverse causes the reverse gear shifter fork to mesh the reverse idle gear with the reverse gear on the input shaft and the low speed synchronizer sleeve on the countershaft.

In this condition, the drive is transmitted through the reverse gear on the input shaft, reverse idle gear and low-speed synchronizer on the countershaft to the final gear of the differential.

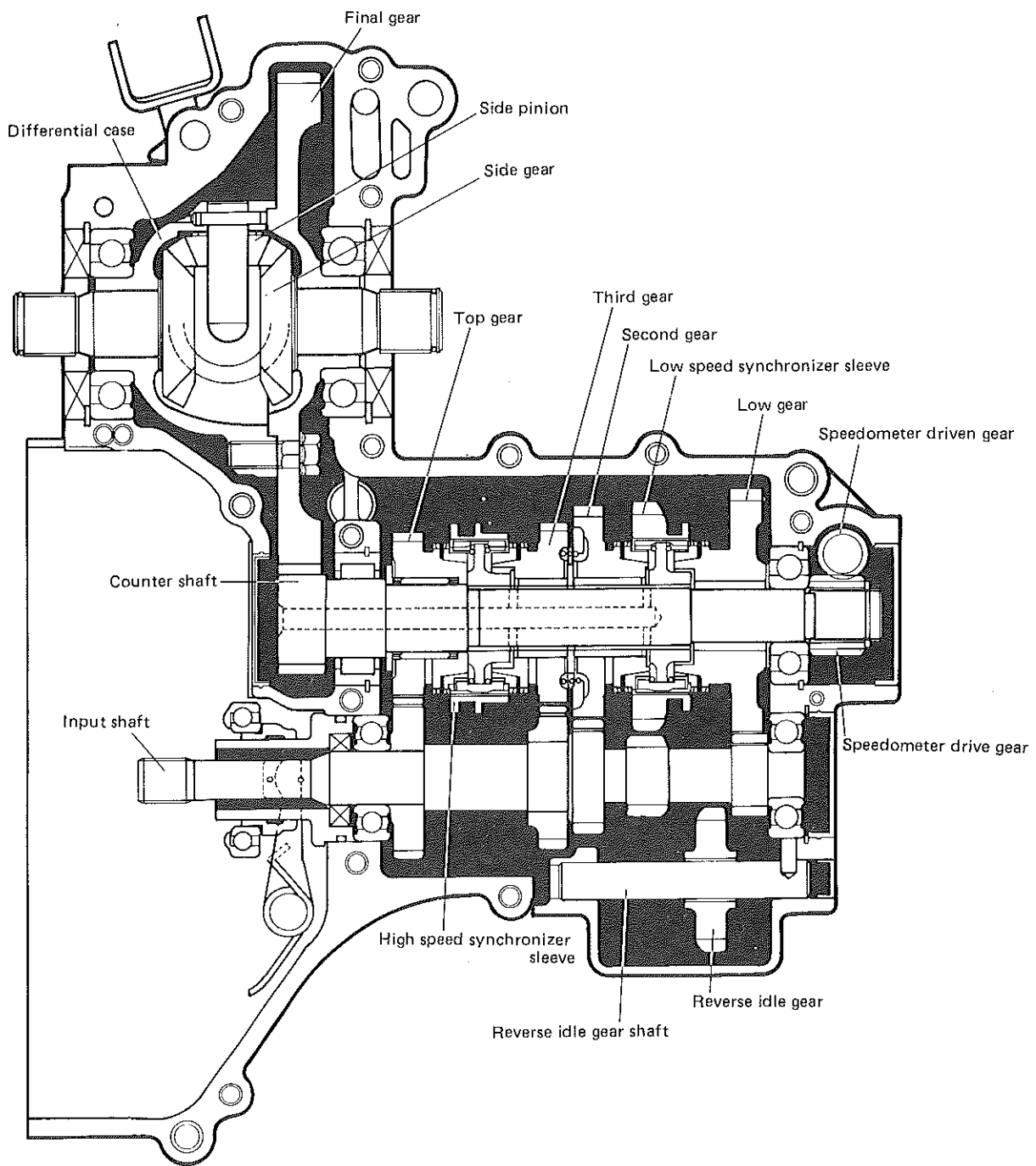


Fig. 14-2

14-3. Transmission Gear Ratio

		Gear ratio	Speed ratio
Final reduction ratio		87/20	4.350
Shift position	Low	43/12	3.583
	Second	39/18	2.166
	Third	32/24	1.333
	Top	27/30	0.900
	Reverse	37/22 x 22/11	3.363

14-4. Dismounting

When servicing the transmission or differential, the procedure is as follows (when the engine is not removed);

NOTE:

A transmission jack is required for this work. If no transmission jack is available, it is recommended to demount the transmission and differential together with the engine referring to the item on engine removal.

- 1) Disconnect the negative (—) and positive (+) lead wires from the battery terminals.
- 2) Remove the battery ass'y.
- 3) Jack up the front body.



Fig. 14-3

- 4) Support the body on safety stands.



Fig. 14-4

- 5) Remove the front grille.
- 6) Remove the front upper member.

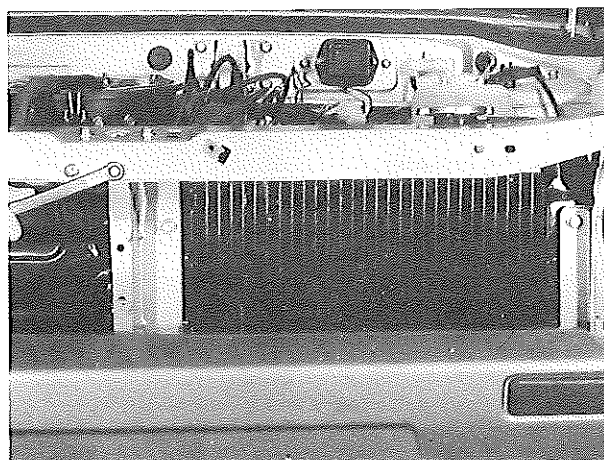


Fig. 14-5

- 7) Disconnect the lead wire from the radiator fan thermo switch, and remove the thermo switch on the radiator to empty its water.

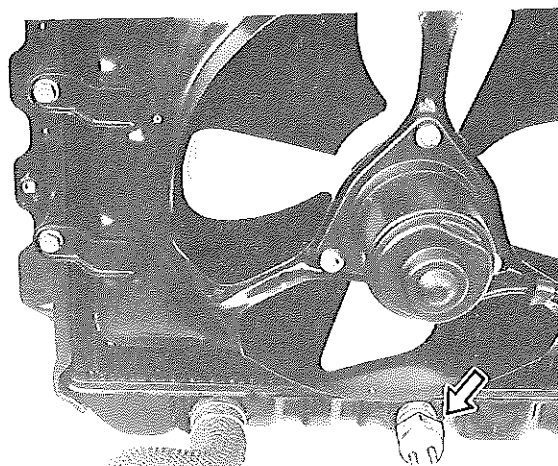


Fig. 14-6

- 8) Disconnect the radiator fan lead wire at the coupler.
- 9) Disconnect the radiator inlet and outlet hoses at the joint part, and then remove the radiator outlet pipe and radiator.

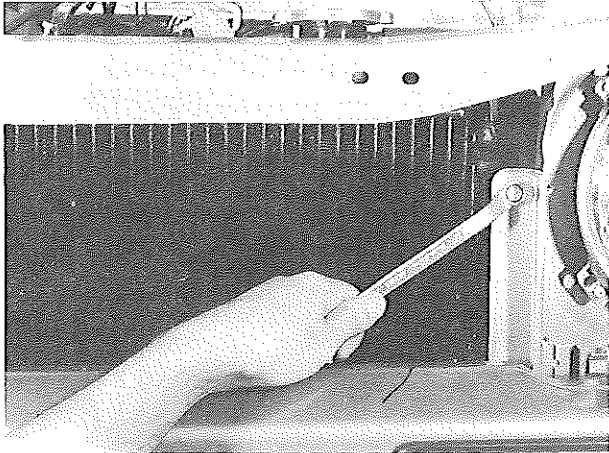


Fig. 14-7

- 10) Remove the starter motor.
- 11) Disconnect the back light switch lead wire at the coupler.
- 12) Disconnect the clutch cable from the clutch lever and adjusting part.

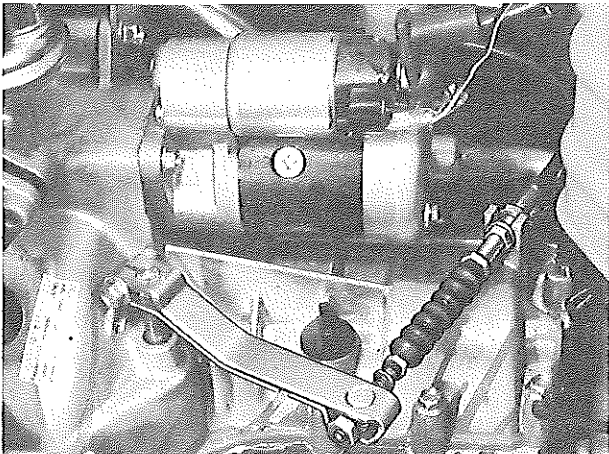


Fig. 14-8

- 13) Disconnect the speedometer cable from the transmission case.
- 14) Disconnect the fuel hose from the fuel filter outlet pipe.
- 15) Detach the gear shift control shaft at the joint of the transmission case side.

- 16) Detach the extension rod at the joint of the transmission case side.
- 17) Remove the clutch housing lower plate.
- 18) Remove the drain plug to drain out the oil in the transmission.

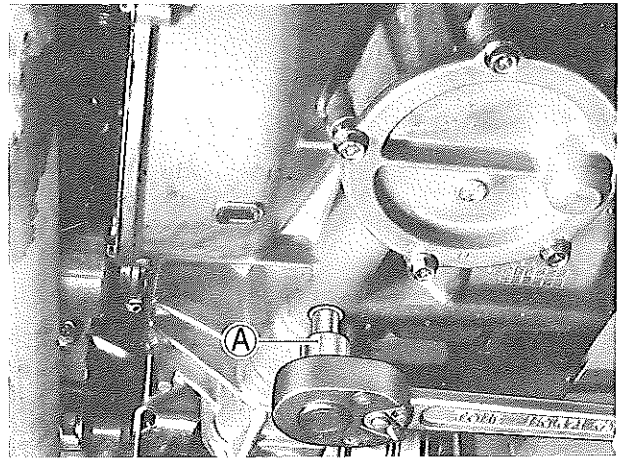


Fig. 14-9 Special tool (A) (09915-27810)

- 19) Detach the drive shafts (L & R) from the snap rings of the differential side gears.

NOTE:

At this stage, the two drive shaft cannot be removed from the each side gear.

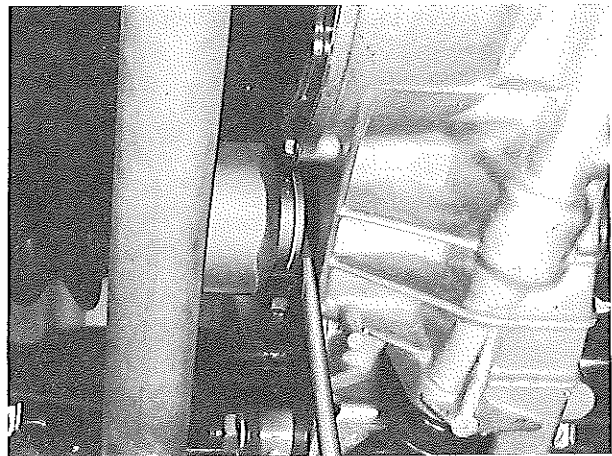


Fig. 14-10

- 20) Remove the left front wheel.

- 21) Detach the left tie rod end from the steering knuckle by using special tool (A) (09913-65210).

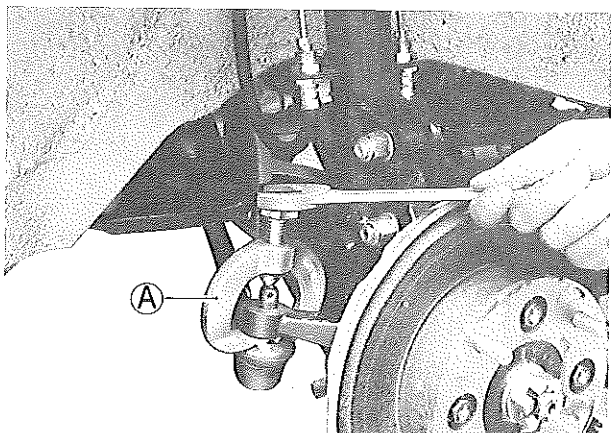


Fig. 14-11

- 22) Detach the front suspension left arm ball joint stud from the steering knuckle.

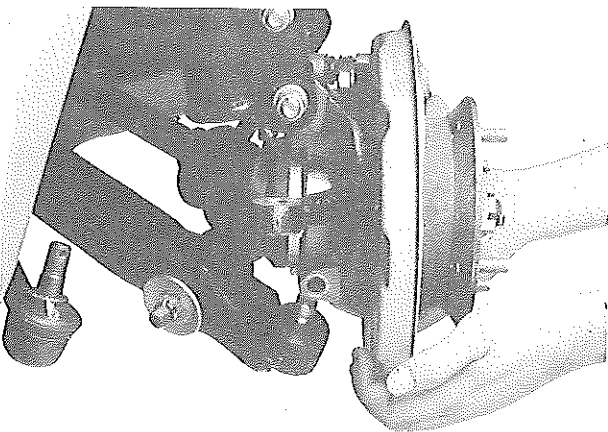


Fig. 14-12

- 23) Draw out the left drive shaft from the differential side gears.

NOTE:

At this time, be careful not to damage the brake flexible hose.

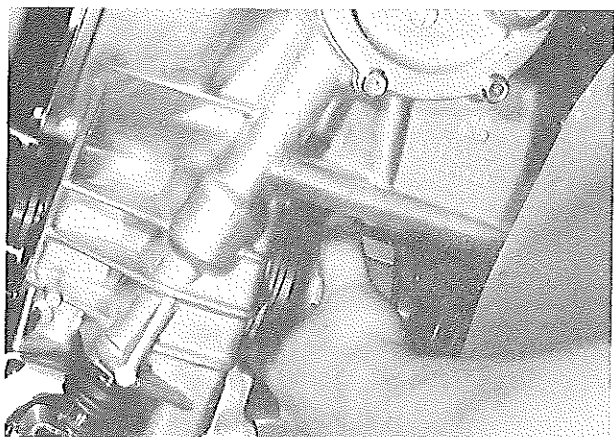


Fig. 14-13

- 24) Remove two torque rods and torque rod engine side bracket (center).
25) Remove the distributor gear case.

CAUTION:

Engine oil will come out of the distributor drive gear case when the distributor gear case is removed from the cylinder head. Never allow this oil to find its way onto the flywheel. Place a properly shaped pan to catch the oil.

- 26) Support the engine on a transmission jack.
27) Remove the engine rear mounting and bracket from the body and transmission case.
28) Remove the bolts and nuts fastening the engine and transmission case.

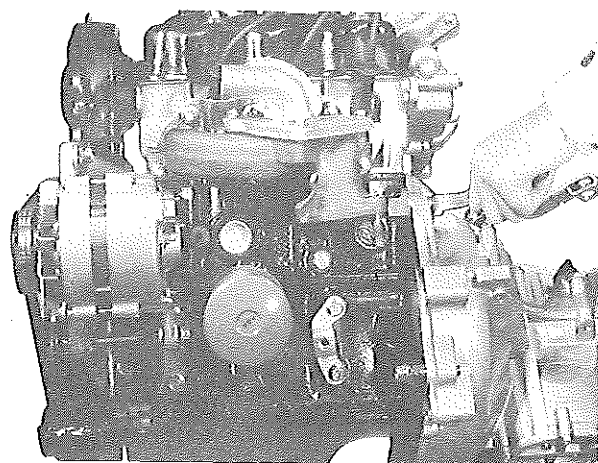


Fig. 14-14

CAUTION:

At this stage, make certain that no parts are connected to the transmission case.

- 29) Remove the engine left mounting and bracket.
30) Remove the transmission.

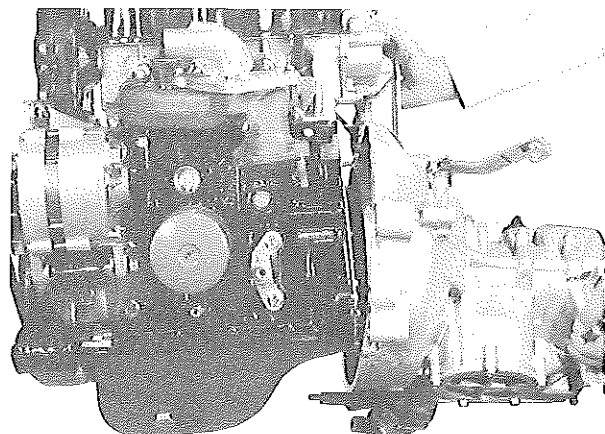


Fig. 14-15

14-5. Disassembly

Disassemble procedure for the transmission and differential is as follows.

Remove the back up light switch.

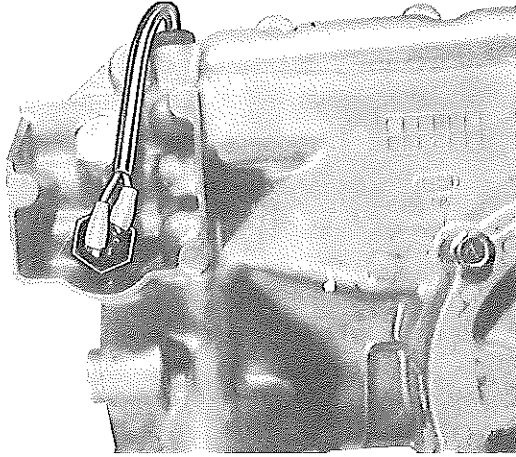


Fig. 14-16

Remove the clutch release bearing.

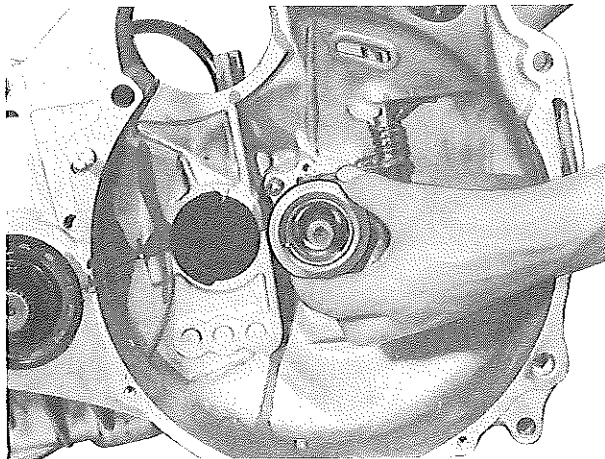


Fig. 14-17

Remove the clutch release shaft return spring from the release lever.

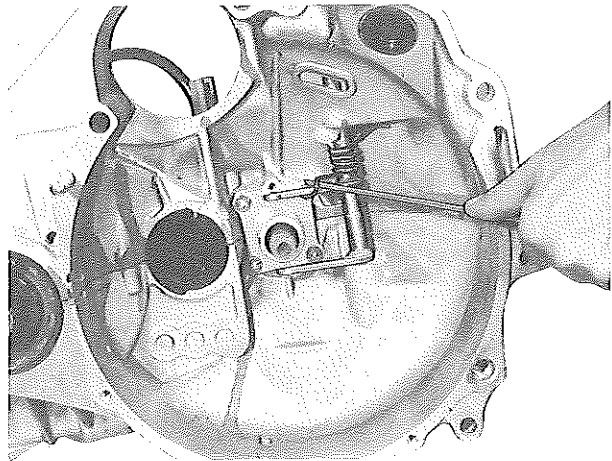


Fig. 14-18

Remove the clutch release bearing retainer. Inserting bolts in the upper and lower points of the retainer will facilitate removal.

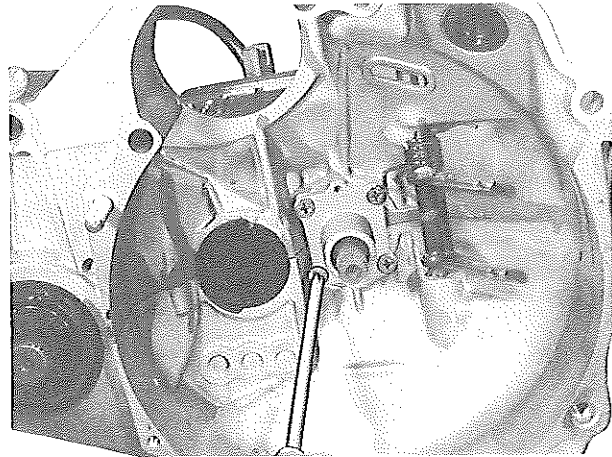


Fig. 14-19

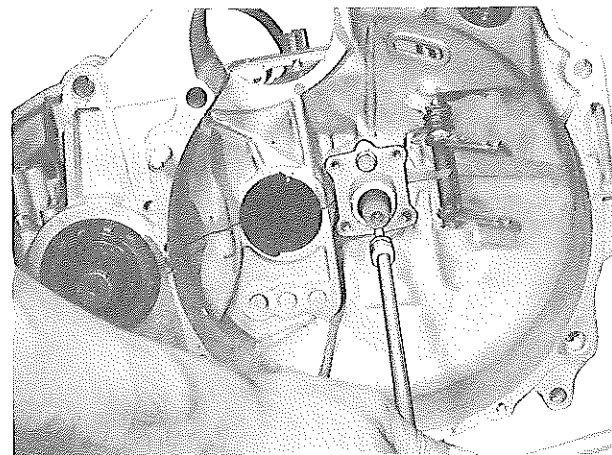


Fig. 14-20

Remove the bolts fastening the upper and lower cases.

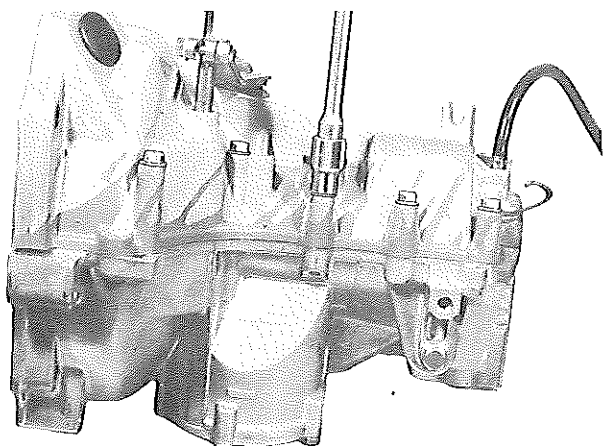


Fig. 14-21

Detach the lower and upper transmission cases.

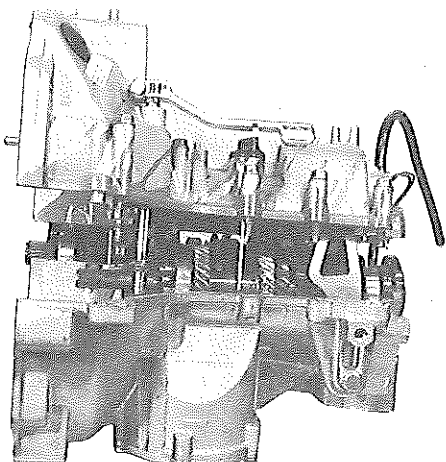


Fig. 14-22

When the upper case is removed, all parts should be left on the lower case.

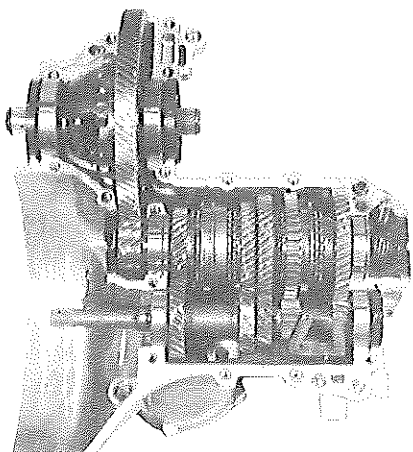


Fig. 14-23

Remove the input shaft from the lower case.

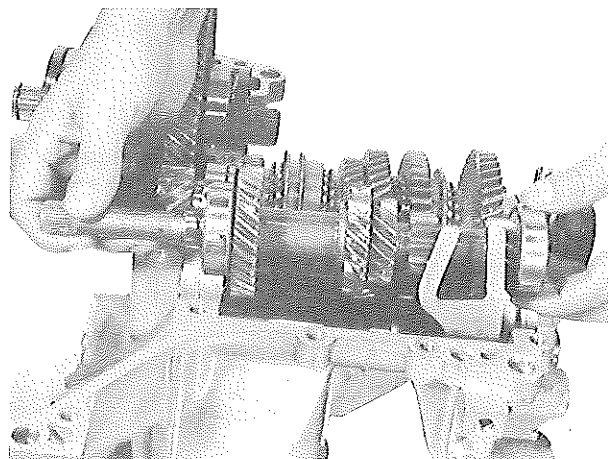


Fig. 14-24

Remove the counter shaft from the lower case.

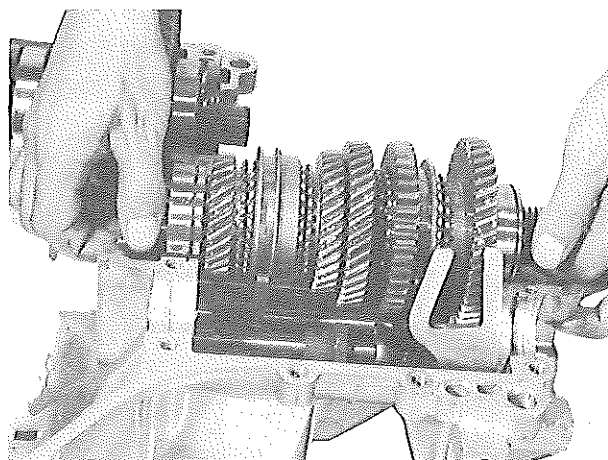


Fig. 14-25

Tap the spring pin out of the 3 shift fork shafts with special tool (A).

Special tool (A) (09922-85811)

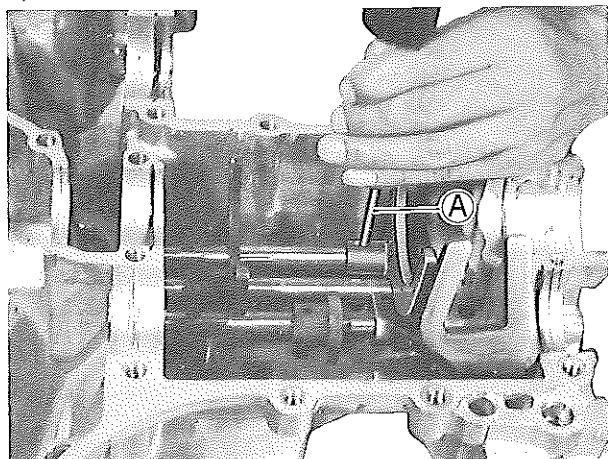


Fig. 14-26

Draw out the 3 shift fork shafts in the order of low speed gear shift fork shaft, high speed gear shift fork shaft and reverse gear shift fork shaft.

NOTES:

- The 2 shafts should be positioned at neutral when removing the shift fork shafts.
- Take care when drawing out the shafts so that the locating balls do not fall out.

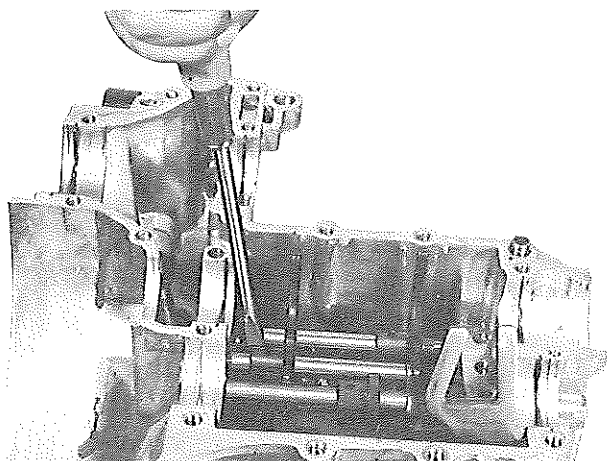


Fig. 14-27

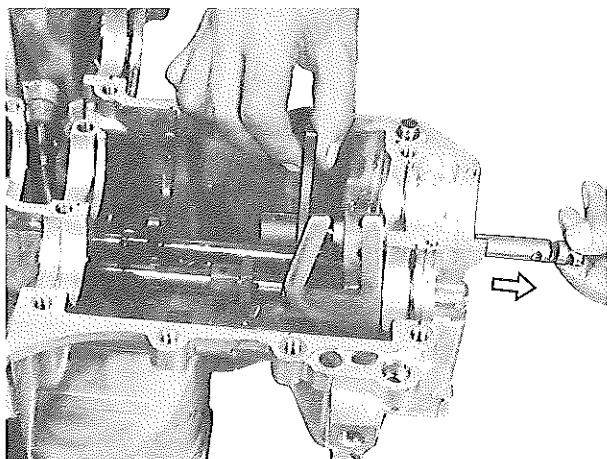


Fig. 14-28

After removing the circlip, draw out the speedometer drive gear.

Special tool (A) (09900-06107)

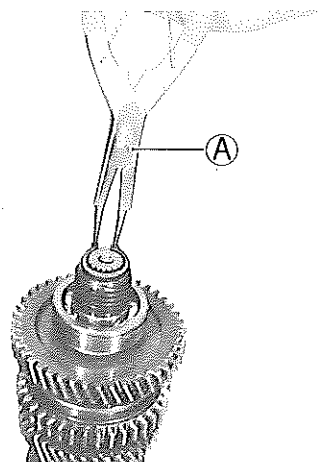


Fig. 14-29

Remove the bearing. After removing the bearing, all the parts on the counter shaft can be removed.

Special tool (B) (09913-61110)

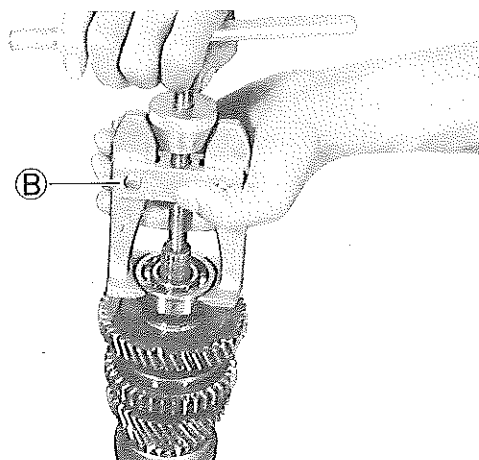


Fig. 14-30

14-6. Maintenance Services

Reverse gears and idle gear

Inspect the chamfered edges of gear teeth of the three gears-driving and driven gears (of input shaft and countershaft) and idle gear. If the edges are worn badly, replace the gears. Abnormal noise of gear slipping in reverse drive is often due to worn tooth edges of these gears.

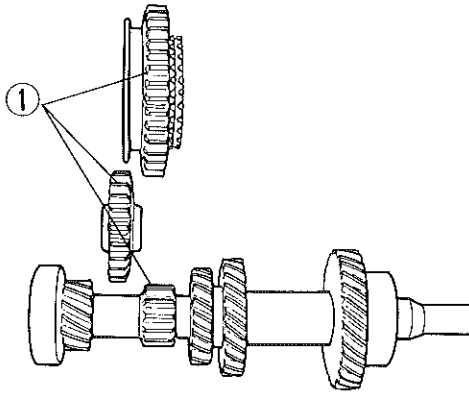


Fig. 14-31 ① Chamfered

Input shaft and its bearings

If any of the input shaft gears is found with chipped or broken teeth, replace the input shaft. Check each bearing by spinning its outer race by hand to "feel" the smoothness of rotation. Replace the bearing if noted to exhibit sticking, resistance or abnormal noise when spun or rotated by hand.

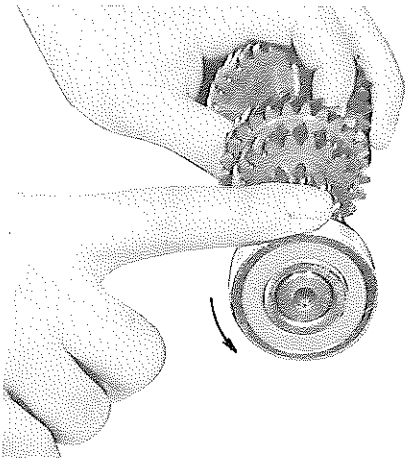


Fig. 14-32

Check the spline ② of the input shaft for wear and damage. Replace if defective.

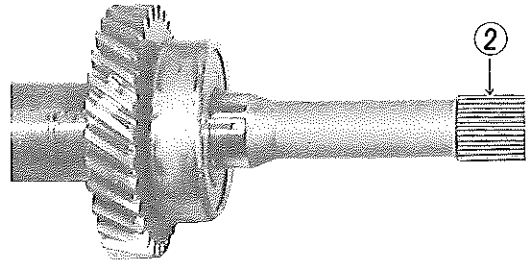


Fig. 14-33

Combination of gear and synchronizer ring

Fit the ring to the cone of the gear (top gear, or "third," "second" or "low" gear), and measure the clearance between the two at the peripheral teeth, as shown in Fig. 14-34. If the clearance has reached or exceeds the service limit, replacement the worn part.

Clearance between gear and ring	Standard	Service limit
	0.8~1.2 mm (0.03~0.05 in.)	0.5 mm (0.02 in.)

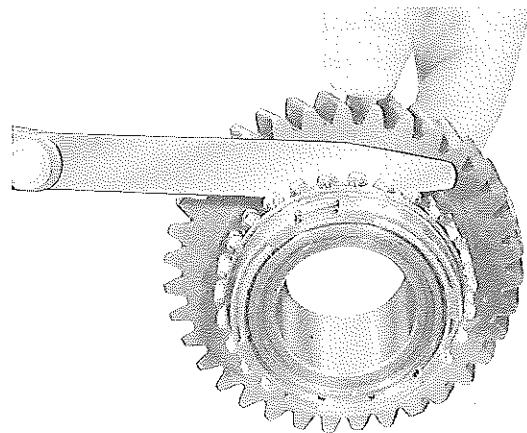


Fig. 14-34

Inspect the external cone (of the gear) and internal cone (of the ring) for abnormal wear. Be sure that the contact patterns on these surfaces indicate uniform full-face contact, and that the surfaces are free from any wavy wear. A badly worn member must be replaced.

Proper synchronizing action on gear shifting can be expected when the ring-to-gear clearance (Fig. 14-35) and the condition of cone surfaces, among other things, are satisfactory.

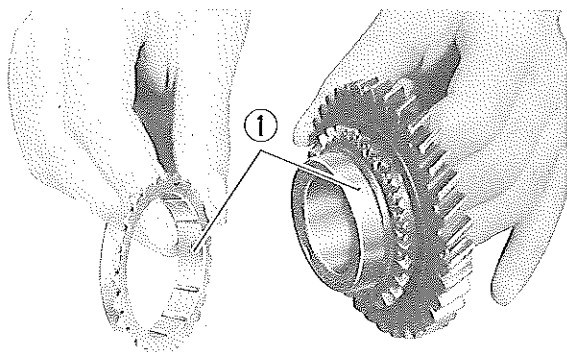


Fig. 14-35 ① Checking contacting surface.

Chamfered tooth ends of ring (external teeth) and sleeve (internal teeth)

Synchronizer ring and hub have three slots each, in which the keys are carried as backed by expanding springs, so that the hub and its two rings, one on each end, are capable of running together. Since the sleeve is engaged by its internal teeth with the hub, as if the two were splined together, the sleeve too runs with the hub and rings.

In meshing action, the sleeve is pushed (by the shifter fork) to one side, so that it slides axially on the hub, pushing the ring toward the cone surface of the gear. This push is transmitted by the three keys, which are lightly gripped by the sleeve.

By the friction between the gear cone and the ring cone (internal), the ring begins to rotate but is opposed by the hub because of the keys. In other words, the ring is at this time twisted, while the sleeve is advancing further to push the ring fully against the gear cone. Since the ring is unable to slide any further, the

sleeve lets go of the keys and rides over to the ring. At this moment, the initial contact between the chamfered ends of teeth of the ring and those of internal teeth of the sleeve occurs. This contact is such that the internal teeth of the sleeve align themselves to those of the ring. When the sleeve advances and slides into the ring, the ring will be rotating nearly with the speed of the gear, so that the sleeve is enabled smoothly to slide over into the clutch teeth of the gear.

The initial contactor mesh between sleeve and ring is determined by the widths of key and slot or, to say the same thing, the key clearance in the slot, and is prescribed to extend at least a third ($1/3$) of the chamfer.

With the synchronizer properly assembled on the shaft, push in and twist each synchronizer to see if the one-third mesh occurs or not; if not, it means that the overall wear (which is the sum of the wears of slots, keys and chamfered tooth ends) is excessive and, in such a case, the entire synchronizer assembly must be replaced.

Mesh of chamfered tooth ends of synchronizer ring and hub	Contact extending about $1/3$ of chamfered face from apex
-----------------------------------------------------------	-----------------------------------------------------------

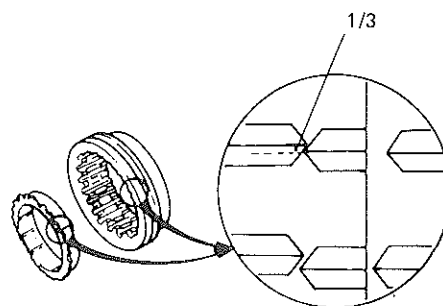


Fig. 14-36

Synchronizer rings

Inspect each synchronizer ring for key slot wear by measuring the width of each slot. If the width reading exceeds the limit, replace the ring.

Key slot width	Standard	Service limit
Low gear	7.8 mm (0.31 in.)	8.1 mm (0.32 in.)
Second, third, top gear	9.6 mm (0.38 in.)	9.9 mm (0.39 in.)

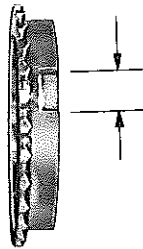


Fig. 14-37

Fork shaft locating springs & Gear shift arm spring.

Locating spring are used to arrest the three shifter fork shafts. If "gears slipping out of mesh" has been reported, check these springs for strength by measuring their free lengths, and replace them if their free lengths are less than the service limits.

Gear shift arm spring is used to arrest the shift lever when it is shifted into the reverse gear. Also replace it if its free length is less than the below specified service limit.

Spring free length	Standard	Service limit
	19.5 mm (0.767 in.)	17.0 mm (0.669 in.)

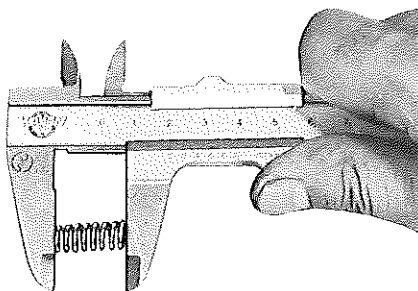


Fig. 14-38

Gear backlash

Check the backlash of gears with a fuse wire-element or dial gauge and replace if the backlash exceeds the specified service limit.

Gear backlash

Gear	Standard	Service limit
Low & Second	0.10~0.15 mm (0.0039~0.0059 in.)	0.30 mm (0.0118 in.)
Third & Top	0.15~0.20 mm (0.0059~0.0078 in.)	0.30 mm (0.0118 in.)
Reverse	0.15~0.30 mm (0.0059~0.0118 in.)	0.40 mm (0.0157 in.)

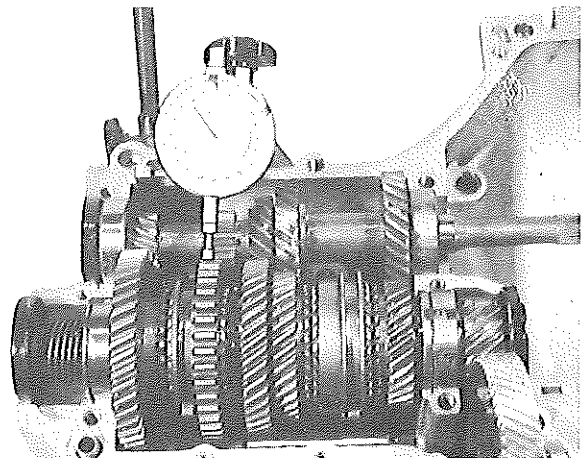


Fig. 14-39

Shifter fork shafts

Check the groove of the shifter fork shaft which comes in contact with the locating spring ball, for wear.



Fig. 14-40

14-7. Important Steps in Installation

NOTE:

Wash all parts and apply gear oil to sliding surfaces.

Synchronizer hub and synchronizer sleeve

When mounting the low-speed and high-speed synchronizer hubs on the countershaft, point the longer inner boss in the direction of the low gear side (opposite to the clutch).

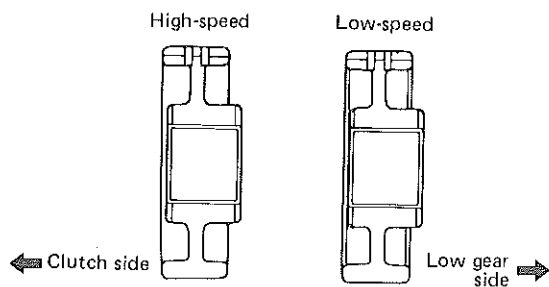


Fig. 14-41

When inserting the synchronizer sleeve in the synchronizer hub:

low-speed synchronizer sleeve:

point groove ① on the outer surface of the sleeve in the direction of the low gear side.

High-speed synchronizer sleeve:

point groove ② on the outer surface of the sleeve in the direction of the clutch side.

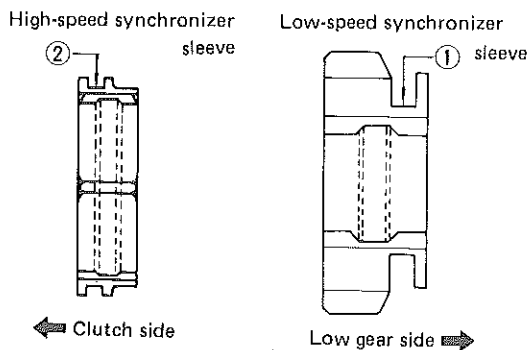


Fig. 14-42

Synchronizer ring spring

Do not forget to install spring ① between the synchronizer ring of low gear side and synchronizer hub.

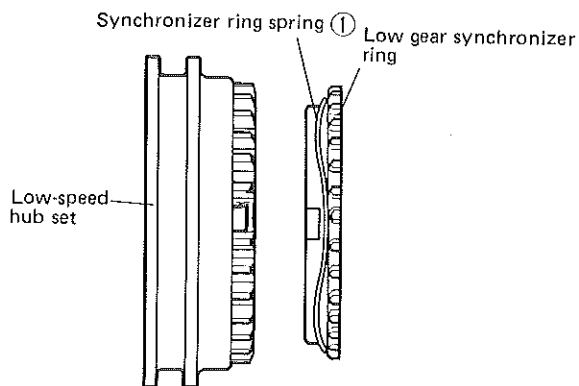


Fig. 14-43

Second and third gear spacer

When assembling the second and third gear spacer, make sure that oil hole of counter shaft and oil grooves of second and third gear spacer match accurately.

(Refer to Page 14-4)

Synchronizer spring

Do not deform or otherwise damage the synchronizer spring. To install the spring, insert one end of the spring in the spring setting hole ③ on the synchronizer hub, directing the 2 springs in opposition to each other so that the load is evenly applied to the synchronizer keys.

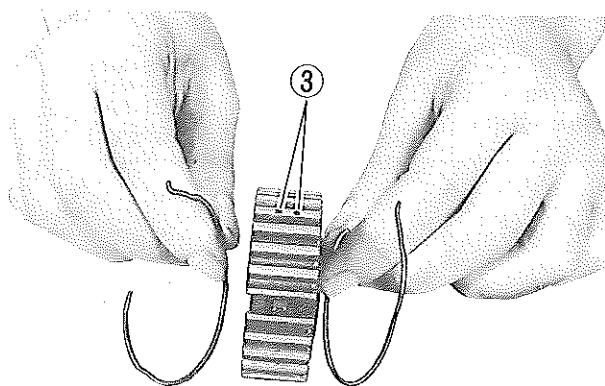


Fig. 14-44

After putting on each synchronizer, be sure that the three keys mounted on the hub fit snugly into the slots provided in the ring.

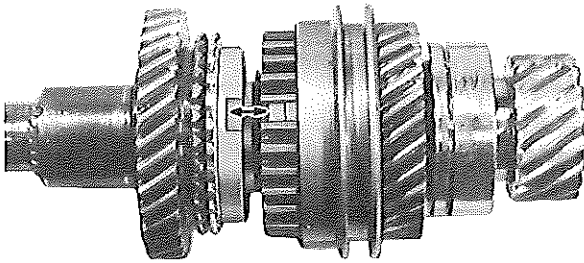


Fig. 14-45

2ND, 3RD driven gear spring

Do not forget to install spring ① between the 2nd and 3rd driven gears on the counter shaft. This prevents noise due to play.

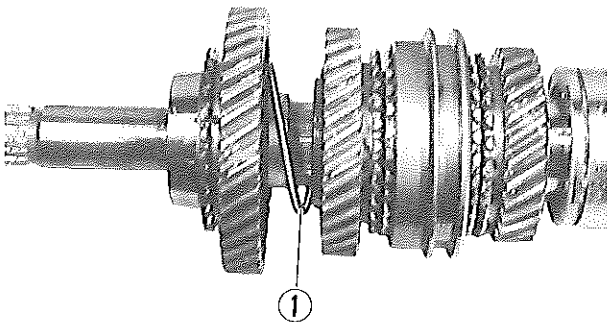


Fig. 14-46

Counter shaft bearing

To drive bearing into the counter shaft, use special tool ① (09913-80112).

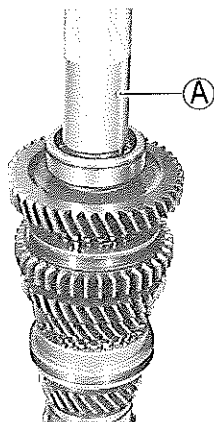


Fig. 14-47

Shifter forks and shafts

When mounting the shifter fork on the shifter shaft, refer to Fig. 14-48 for the direction of the shifter forks.

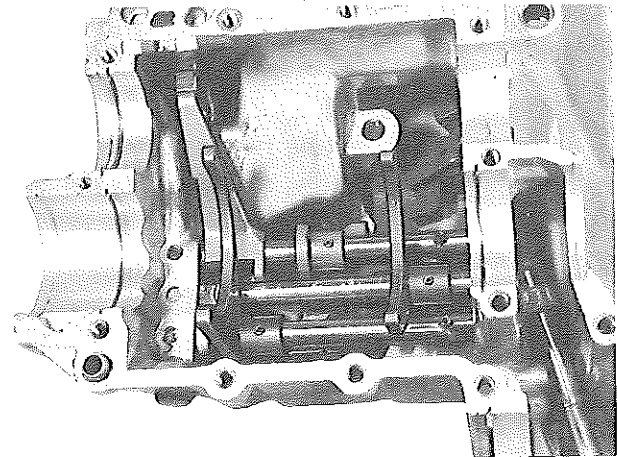


Fig. 14-48

These coil springs are for keeping the locating steel balls pushed down against the fork shafts (REVERSE, HIGH and LOW) for the purpose of arresting these shafts at respective operating positions.

CAUTION:

The locating steel balls and gear shift arm shaft steel ball used have an outside diameter of 7.9 mm ϕ (0.311 in. ϕ).

Install the shifter shaft in the order of reverse shaft ①, high-speed shaft ② and low-speed shaft ③, as shown in Fig. 14-49.

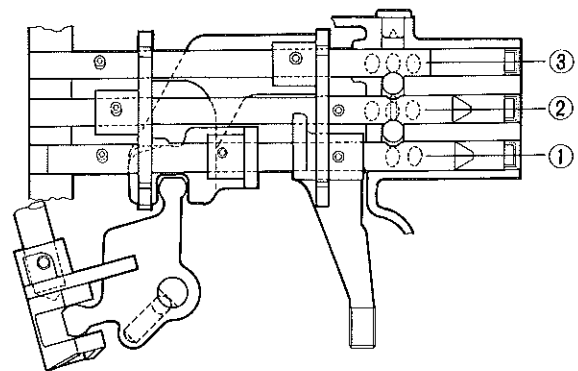


Fig. 14-49

Insert the interlock steel balls through hole ② next to the low-speed shifter fork shaft of the transmission case as illustrated below. Through this hole, insert one ball between each of the 2 adjacent shafts. Use inter lock steel balls with an outside diameter of 9.5 mm ϕ (0.374 in. ϕ).

NOTE:

Be sure to put in the pin for preventing two shafts from getting shifted at the same time. This pin ① goes into the hole provided in the high-speed shaft.

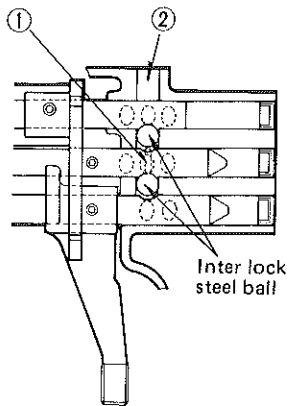


Fig. 14-50

Gear shifter shaft stopper pin

Drive the shifter shaft stopper pins (low-speed, high-speed and reverse) into the shifter shaft so that dimension \oplus is obtained, as illustrated in Fig. 14-52.

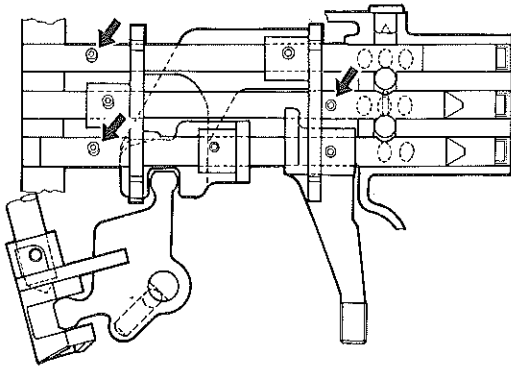
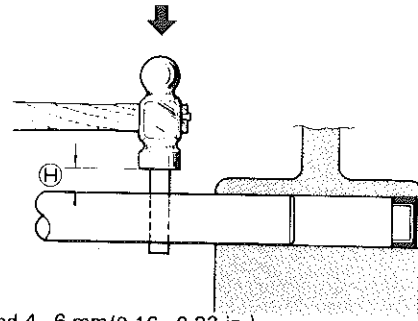


Fig. 14-51



H: Low-speed 4 - 6 mm (0.16 - 0.23 in.)

H: High-speed 0 mm (0 in.)

H: Reverse 4 - 6 mm (0.16 - 0.23 in.)

Fig. 14-52

Reverse gear shifter lever

When installing the reverse gear shifter lever, adjust dimension "D" as illustrated below to 5 mm (0.197 in.) with the gear shifter lever bolt ④. This is necessary to keep the clearance between the lever and second gear on the input shaft to more than 2 mm (0.078 in.) when shifting the gear into reverse.

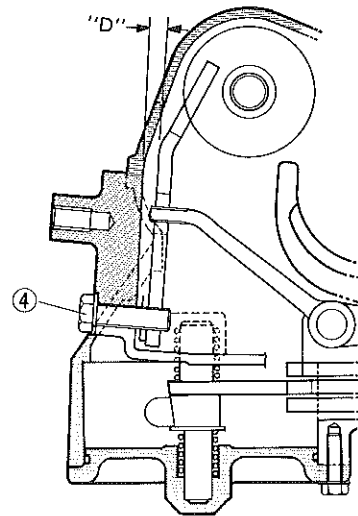


Fig. 14-53

Gear shifter fork shaft plugs

Before installing the gear shifter fork shaft plugs, apply SUZUKI BOND NO.4 (99000-31030) to the outer surface of the plugs.

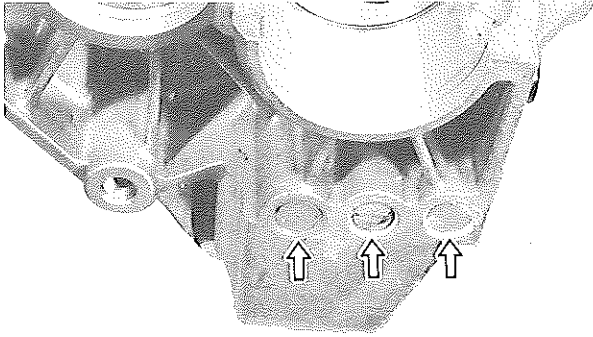


Fig. 14-54

Gear shifter interlock plug

Apply SUZUKI BOND NO.4 (99000-31030) to the gear shifter interlock plug and insert it into the transmission case.

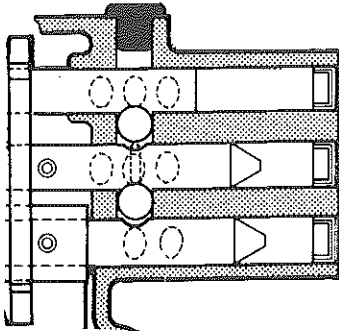


Fig. 14-55

C ring

Do not forget to fit the 2 "C" rings on counter shaft bearing and input shaft C ring in the transmission case.

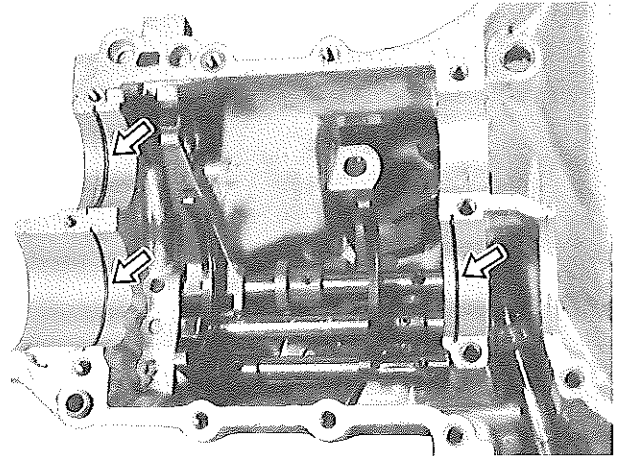


Fig. 14-56

Counter shaft

Install the countershaft in the lower case with the gears on the countershaft in neutral (shifter fork shafts must also be in neutral), fitting the shifter fork in the groove of the sleeve.

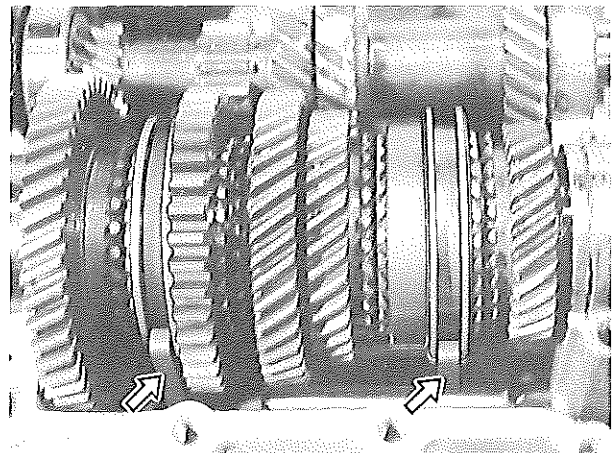


Fig. 14-57

Counter shaft bearing plug

Install the countershaft bearing plug, directing the rib ① (flange) of the plug outside the case, toward the joint of the upper and lower cases on the differential side.

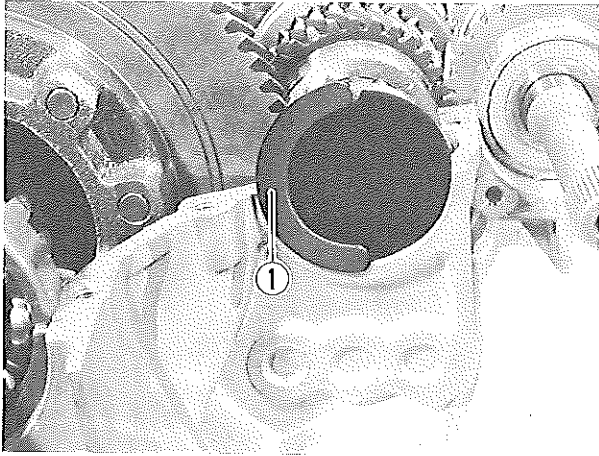


Fig. 14-58

Reverse gear shaft pin

Do not forget to install the reverse gear shaft pin. After installation, apply grease to the hole into which the pin has been inserted to prevent the pin from coming out when installing the gear. Do not install the reverse idle gear in the wrong direction.

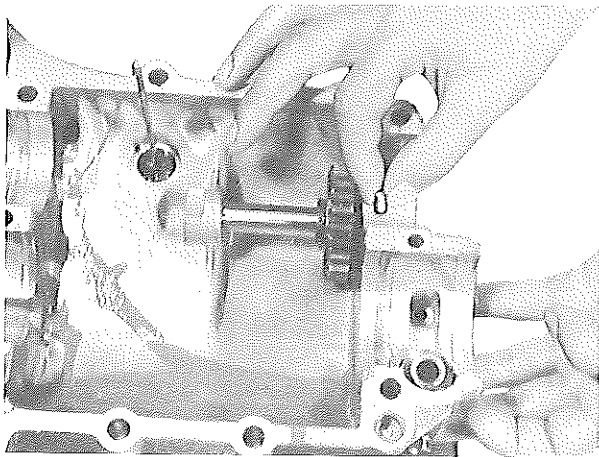


Fig. 14-59

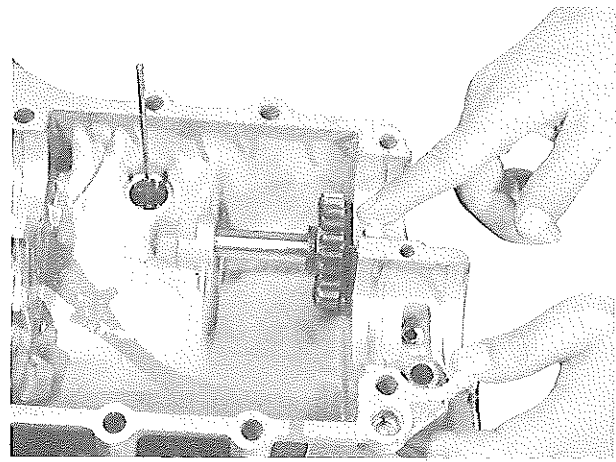


Fig. 14-60

Putting together upper and lower cases

Clean the joint faces, removing any foreign matters adhering to these faces, and then apply the liquid sealing compound (SUZUKI Bond No. 4, 99000-31030) to the joint faces, coating each face uniformly with the compound and, a few minutes after this application, match the two cases together.

Upper case

Move the idle gear to right and left so that the idle gear fits perfectly in the groove ② of the reverse idle gear shift arm. Fit the upper case on the lower case.

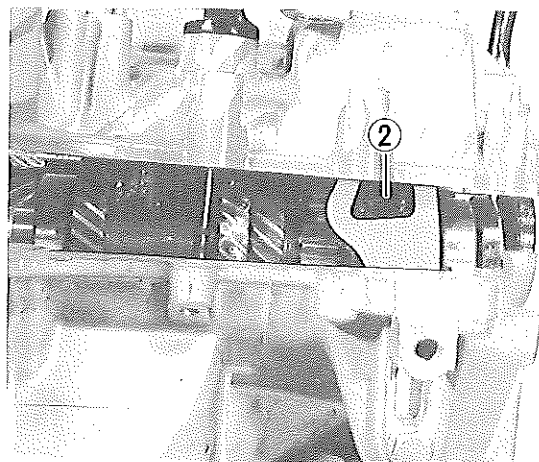


Fig. 14-61

CAUTION:

Do not forget to install the snap rings (right and left) on the differential side gear spline.

NOTES:

- Refer to the item on clutch (group 12) for clutch installation procedure.
- Refer to the next page when installing the differential gears.

Input shaft bearing retainer

Bear in mind the following points when installing the input shaft bearing retainer.

- Apply SUZUKI SUPER GREASE "A" (99000-25010) to the oil seal lip.
- Install "O" ring ③ in the groove of the retainer and then apply SUZUKI BOND(NO.4) (99000-31030) to a part of the retainer that is lined up with the joint of upper and lower transmission cases.
- Match the upper and lower transmission cases together without tightening the bolts and insert the retainer into the transmission case taking care not to damage "O" ring ③.

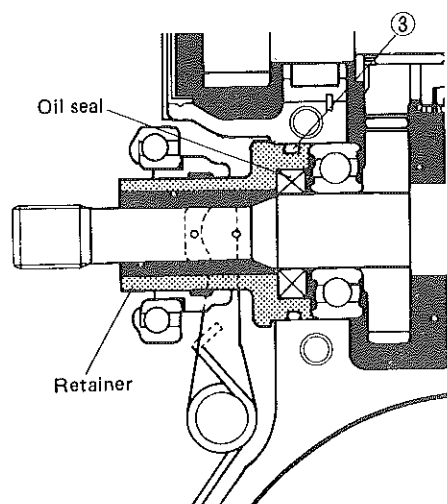


Fig. 14-62

Oil drain plug

Remove the oil drain plug and apply SUZUKI BOND NO.4 (99000-31030) to the screw part of the plug before reassembling.

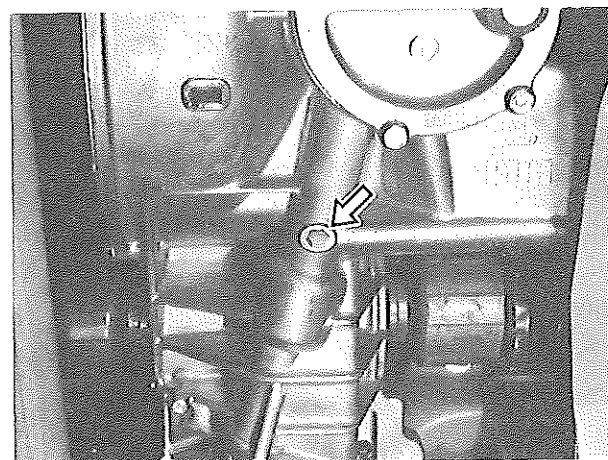


Fig. 14-63 Oil drain plug

Oil filler plug and level gauge

Check the oil level according to the following procedures.

- 1) Take out the oil level gauge from the transmission case and wipe off the oil.
- 2) Bring face (A) of the oil level gauge to contact face (B) of the transmission case and check the oil level indicated by the oil on the gauge.

The oil level must be somewhere between FULL level line and LOW level line on the gauge.

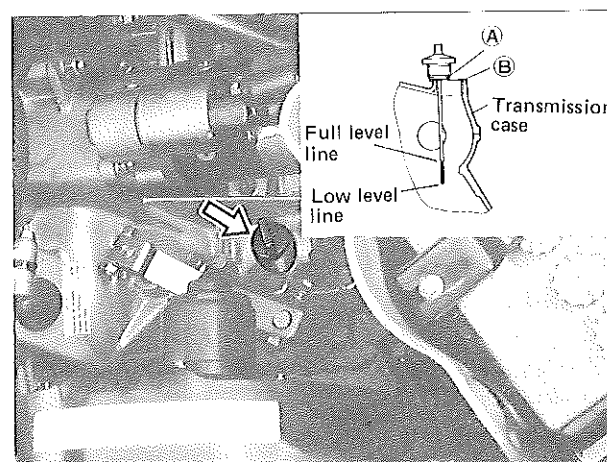


Fig. 14-64

Transmission oil

The oil capacity of the transmission and the oil specification are as follows:

Oil capacity	2.0 litres (4.2/3.5 US/Imp.pt.)
Oil specification	Gear oil, SAE #90

14-8. Maintenance Services (Differential)

Differential case bolts

Check the differential case bolts for looseness and retighten if loose.

Differential case bolt	80 - 100 N.m 8.0 - 10.0 kg-m (58.0 - 72.0 lb-ft)
------------------------	--------------------------------------------------------

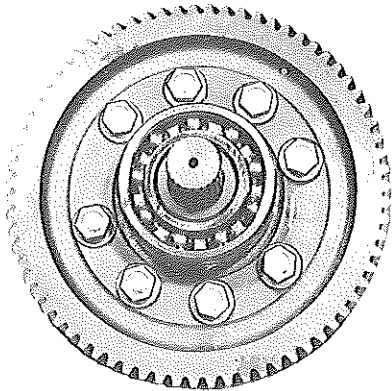


Fig. 14-65

Differential side pinion & gear

Measure the backlash of the side pinion and side gear. To measure backlash, insert a thin fuse between the pinion and gear and measure the thickness of the crushed fuse.

Side gear backlash specification	0.05 - 0.10 mm (0.002 - 0.004 in)
Side gear thrust play specification	0.15 - 0.40 mm (0.006 - 0.0157 in)

If the backlash exceeds the specified value, adjust it by varying the thickness of thrust washer

① at the back of the side gear (back of the toothed surface).

Available thrust washer sizes (thickness)	0.8, 1.0, & 1.2 mm (0.03, 0.04 & 0.05 in.)
-------------------------------------------	-----------------------------------------------

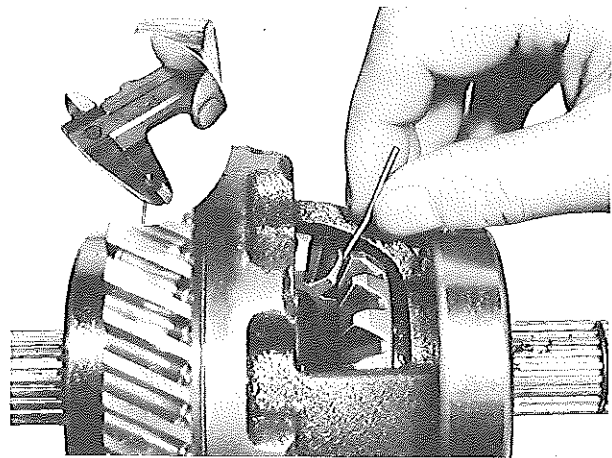


Fig. 14-66

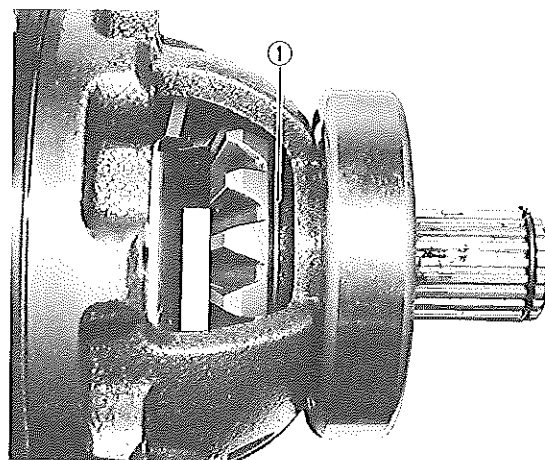


Fig. 14-67

Differential side bearing

Press-fit the differential side bearing with a hydraulic press using special tool ① (09913-75810).

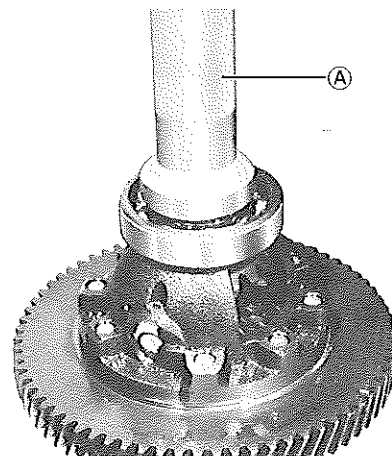


Fig. 14-68

14-9. Important Steps in Installation (Differential)

Differential Side bearings

Install the differential side bearings in the correct direction.

Direct the seal side ① of the bearing (iron plate side) inward (transmission oil side).

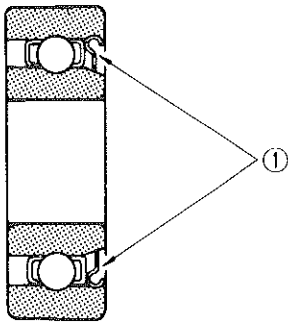


Fig. 14-69

Differential Side oil Seals

Apply grease to the lip of the differential side oil seal and install with spring ② of the oil seal positioned inside (transmission oil side).

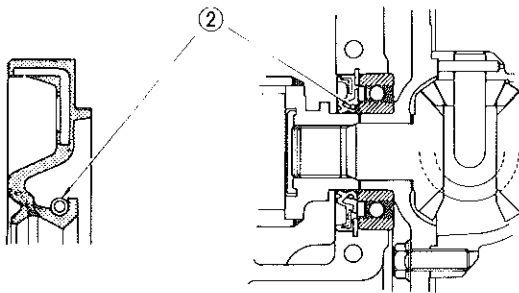


Fig. 14-70

Differential case bolts

Special bolts are used for the differential case because of the high torsional load. Never use bolts other than the specified ones.

Tightening torque

Differential case bolt	80 - 100 N.m 8.0 - 10.0 kg-m (58.0 - 72.0 lb-ft)
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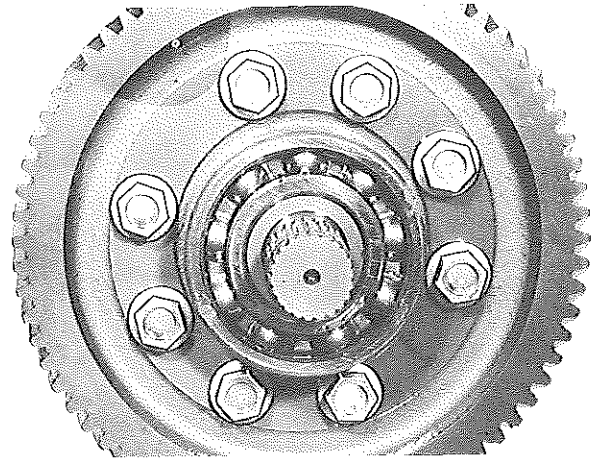


Fig. 14-71

