

IMPORTANT

WARNING/CAUTION/NOTE

Please read this manual and follow its instructions carefully. To emphasize special information, the words **WARNING**, **CAUTION** and **NOTE** have special meanings. Pay special attention to the messages highlighted by these signal words.

WARNING:

Indicates a potential hazard that could result in death or injury.

CAUTION:

Indicates a potential hazard that could result in vehicle damage.

NOTE:

Indicates special information to make maintenance easier or instructions clearer.

WARNING:

This service manual is intended for authorized Suzuki dealers and qualified service mechanics only. Inexperienced mechanics or mechanics without the proper tools and equipment may not be able to properly perform the services described in this manual.

Improper repair may result in injury to the mechanic and may render the vehicle unsafe for the driver and passengers.

WARNING:

For vehicles equipped with a Supplemental Restraint Air Bag System:

- Service on and around the air bag system components or wiring must be performed only by an authorized SUZUKI dealer. Refer to “Air Bag System Components and Wiring Location View” under “General Description” in air bag system section in order to confirm whether you are performing service on or near the air bag system components or wiring. Please observe all WARNINGS and “Service Precautions” under “On-Vehicle Service” in air bag system section before performing service on or around the air bag system components or wiring. Failure to follow WARNINGS could result in unintentional activation of the system or could render the system inoperative. Either of these two conditions may result in severe injury.
- If the air bag system and another vehicle system both need repair, Suzuki recommends that the air bag system be repaired first, to help avoid unintended air bag system activation.
- Do not modify the steering wheel, instrument panel or any other air bag system component (on or around air bag system components or wiring). Modifications can adversely affect air bag system performance and lead to injury.
- If the vehicle will be exposed to temperatures over 93°C (200°F) (for example, during a paint baking process), remove the air bag system components (air bag (inflator) modules, SDM and/or seat belt with pretensioner) beforehand to avoid component damage or unintended activation.

FOREWORD

This manual provides information on the unit repair service procedures for the following units.

Applicable Units:

**Manual Transmission/Automatic Transmission/Transfer/Differentials (Front and Rear)
for SQ416/SQ420/SQ625**

When replacing parts or servicing by disassembling, it is recommended to use SUZUKI genuine parts, tools and service materials (lubricant, sealants, etc.) as specified in each description.

All information, illustrations and specifications contained in this literature are based on the latest product information available at the time of publication approval. And used as the main subject of description is the vehicle of standard specifications among others.

Therefore, note that illustrations may differ from the vehicle being actually serviced.

The right is reserved to make changes at any time without notice.

SUZUKI MOTOR CORPORATION

OVERSEAS SERVICE DEPARTMENT

TABLE OF CONTENTS

TRANSMISSION, CLUTCH AND DIFFERENTIAL	Mannual Transmission (Type 1)	7A
	Mannual Transmission (Type 2)	7A1
	Automatic Transmission	7B1
	Transfer	7D
	Differential (Front)	7E
	Differential (Rear)	7F

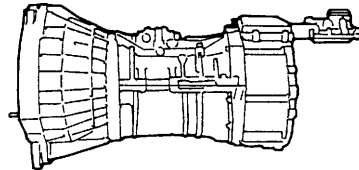
7A
7A1
7B1
7D
7E
7F

SECTION 7A

7A

MANUAL TRANSMISSION (TYPE 1)

TYPE 1 (For G16/J20 Engines)

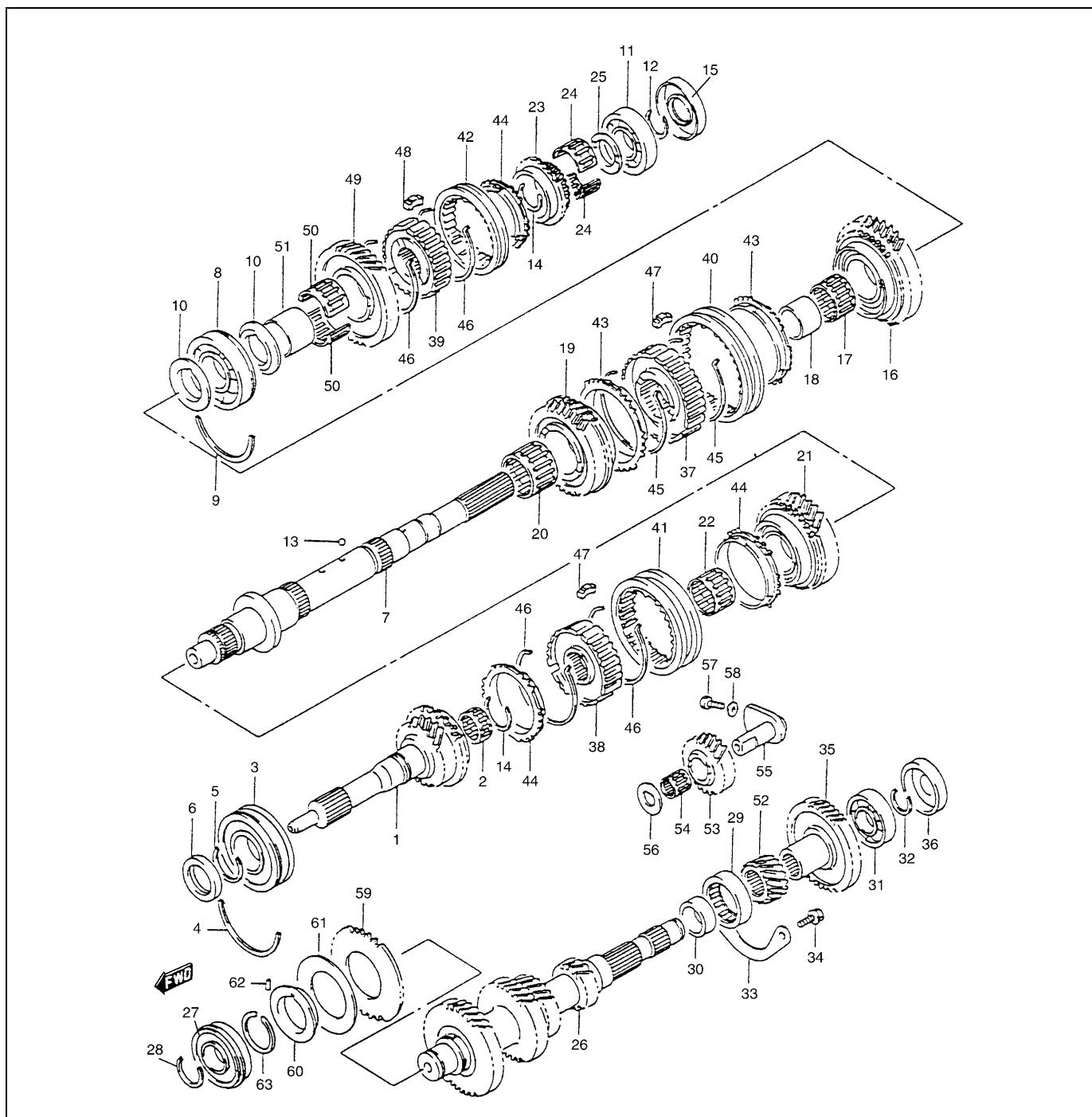


CONTENTS

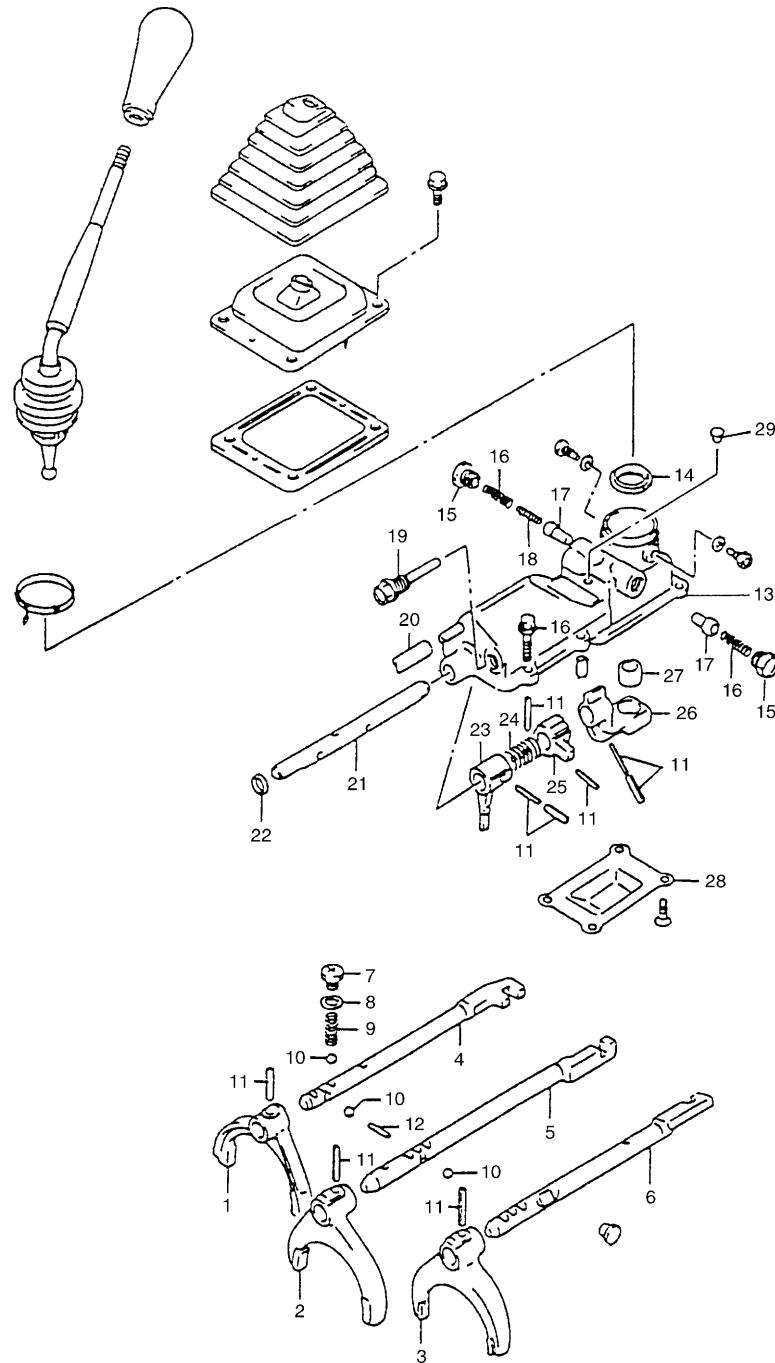
GENERAL DESCRIPTION	7A-2	UPPER CASE AND SHIFTER	7A-14
COMPONENTS	7A-2	REAR CASE	7A-14
UNIT DISASSEMBLY	7A-4	UNIT ASSEMBLY	7A-15
GEAR SHIFT LEVER CASE (4WD		GEAR SHIFT LEVER CASE (4WD	
MODEL)	7A-4	MODEL)	7A-15
GEAR SHIFT LEVER CASE (2WD		GEAR SHIFT LEVER CASE (2WD	
MODEL)	7A-5	MODEL)	7A-17
TRANSMISSION UNIT	7A-5	SUB ASSEMBLY	7A-19
SUB-ASSEMBLY	7A-8	MAIN SHAFT	7A-19
INPUT SHAFT	7A-8	COUNTER SHAFT	7A-22
MAIN SHAFT	7A-9	UPPER CASE AND SHIFTER	7A-24
UPPER CASE AND SHIFTER	7A-11	TRANSMISSION UNIT	7A-27
COMPONENT INSPECTION	7A-11	TIGHTENING TORQUE SPECIFICATION	7A-30
COUNTER SHAFT AND MAIN SHAFT		REQUIRED SERVICE MATERIAL	7A-30
INNER PARTS	7A-11	SPECIAL TOOL	7A-31
LOW AND REVERSE SCISSORS			
GEAR ASSEMBLIES (IF EQUIPPED) ...	7A-13		

GENERAL DESCRIPTION

COMPONENTS



1. Input shaft	14. Circlip	27. Front bearing	40. Low speed sleeve	53. Reverse idle gear
2. Needle bearing	15. Oil seal	28. Circlip	41. High speed sleeve	54. Needle bearing
3. Input shaft bearing	16. Low gear	29. Center bearing	42. Reverse sleeve	55. Idle gear shaft
4. C-ring	17. Needle bearing	30. Bush	43. Low speed ring	56. Thrust washer
5. Circlip	18. Low gear bush	31. Rear bearing	44. High speed ring	57. Bolt
6. Oil seal	19. 2nd gear	32. Circlip	45. Low speed spring	58. Washer
7. Main shaft	20. Needle bearing	33. Bearing plate	46. High speed spring	59. Friction gear
8. Main shaft bearing	21. 3rd gear	34. Bolt	47. Synchronizer key	60. Friction gear retainer
9. C-ring	22. Needle bearing	35. 5th gear	48. 5th synchronizer key	61. Friction gear spring
10. Bearing washer	23. 5th gear	36. Counter shaft plug	49. Reverse gear	62. Pin
11. Rear bearing	24. Needle bearing	37. Low speed hub	50. Needle bearing	63. Circlip
12. Circlip	25. 5th gear washer	38. High speed hub	51. Bush	
13. Ball	26. Counter shaft	39. Reverse hub	52. Reverse gear	



- | | | | |
|---------------------------------|---------------------------|-------------------------------------|-----------------------------------|
| 1. Lower gear shift fork | 9. Locating spring | 17. Select guide pin | 25. Reverse gear shift limit yoke |
| 2. High gear shift fork | 10. Locating ball | 18. Spring (inner) | 26. Gear shift arm |
| 3. 5th-reverse gear shift fork | 11. Spring pin | 19. Reverse gear shift limit bolt | 27. Gear control lever bush |
| 4. Low gear shift shaft | 12. Roller | 20. Breather hose | 28. Case plate |
| 5. High gear shift shaft | 13. Gear shift lever case | 21. Gear shift shaft | 29. Plug |
| 6. 5th-reverse gear shift shaft | 14. Case seat | 22. Case plug | |
| 7. Plug | 15. Bolt | 23. Gear shift lever | |
| 8. Gasket | 16. Spring | 24. Reverse gear shift limit spring | |

UNIT DISASSEMBLY

GEAR SHIFT LEVER CASE (4WD MODEL)

- 1) Remove 4 screws with screwdriver and remove case plate.
- 2) With case (1) supported with soft jawed vise, remove select return spring bolt (10) with wrench.

NOTE:

Use aluminum plates between vise and case to protect case (1) against damage.

- 3) Using spring pin remover, drive out double spring pin (2) for gear shift arm (9).

NOTE:

Double spring pin (2) can be driven out through the hole (14) after removing its plug (15). After removing the double spring pin (2), apply sealant to the plug (15) and install it.

“A” : Sealant 99000-31110

NOTE:

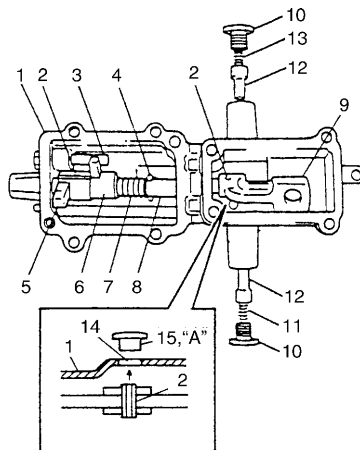
All spring pin (except double spring pin (2)) can be driven out only in such direction that it comes out toward the deeper side of the shift lever case (1).

- 4) Drive out spring pin (4) for reverse gear shift limit spring (7).
- 5) Drive out double spring pin (2) for gear shift lever (5).
- 6) Pull out gear shift shaft (8) a little and take out gear shift arm (9).

NOTE:

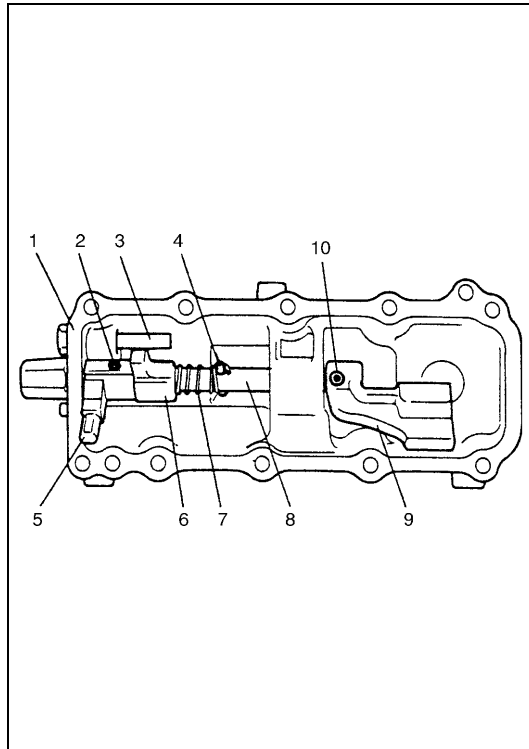
- **Case plug may come off during above work.**
- **If it is not possible to take out gear shift arm in above step 6, do it after following steps 7 and 8.**

- 7) Push gear shift shaft inward and drive out spring pin for reverse gear shift limit yoke (6).
- 8) Pull out gear shift shaft (8) from case (1).



- | |
|---|
| 3. Reverse gear shift limit bolt
11. Select return inner and outer spring (double coil spring)
12. Select guide pin
13. Select return outer spring |
|---|

GEAR SHIFT LEVER CASE (2WD MODEL)



- 1) Using spring pin remover, drive out double spring pin (10) for gear shift arm (9).
- 2) Drive out spring pin (4) for reverse gear shift limit spring (7).
- 3) Drive out double spring pin (2) for gear shift lever (5).
- 4) Pull out gear shift shaft (8) a little and take out gear shift arm (9).

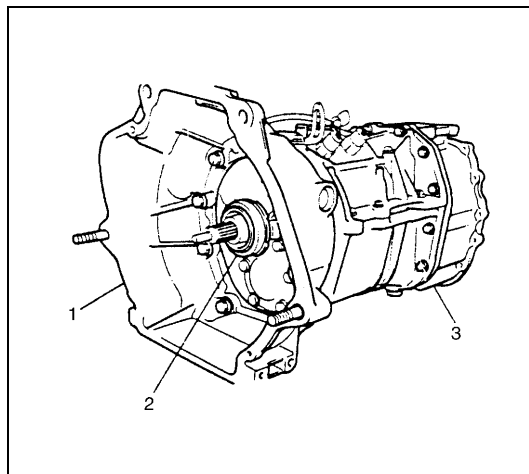
NOTE:

- Case plug may come off during above work.
- If it is not possible to take out gear shift arm (9) in above step 4, do it after following steps 5 and 6.

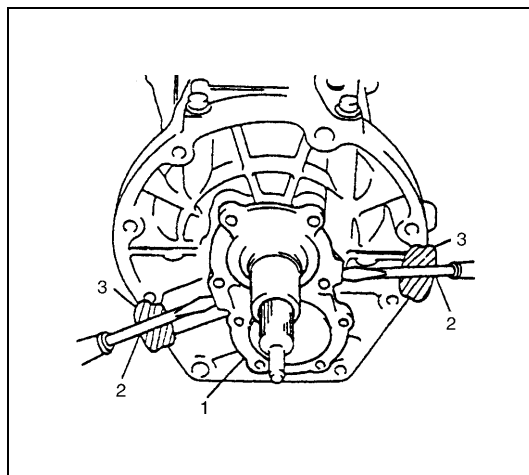
- 5) Push gear shift shaft (8) inward and drive out spring pin for reverse gear shift limit yoke (6).
- 6) Pull out gear shift shaft (8) from case (1).

3. Reverse gear shift limit bolt

TRANSMISSION UNIT



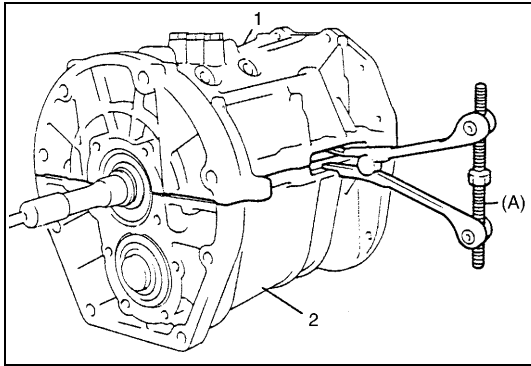
- 1) Remove 12 fastening bolts and separate rear case (3).
- 2) Remove clutch release bearing (2).
- 3) Remove 8 clutch housing bolts and then remove clutch housing (1).



- 4) Remove 8 bolts and pull out input shaft bearing retainer (1) by using large size screwdrivers (2) and clean cloth (3).

CAUTION:

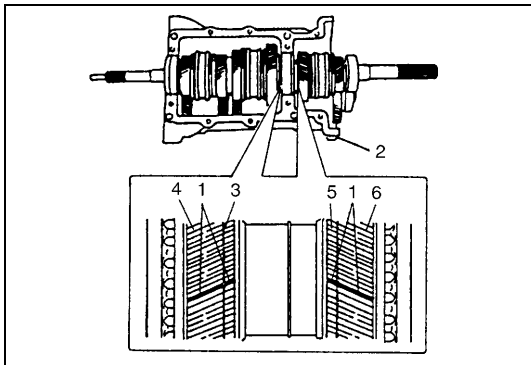
When pulling out, do not scratch the transmission case surface contacting with the clutch housing.



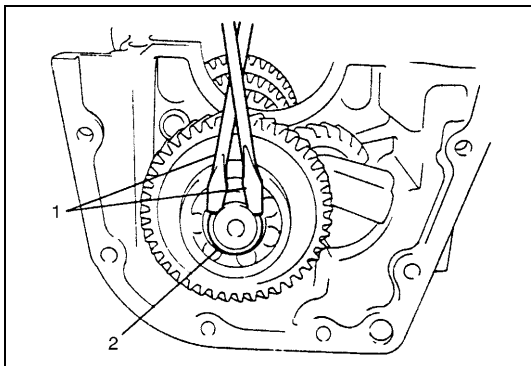
- 5) Remove 10 bolts and separate cases (1,2) by using special tool.

Special tool

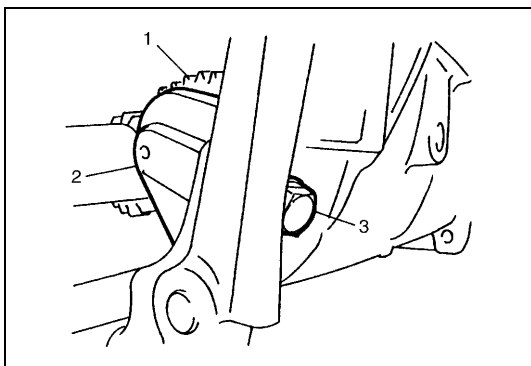
(A) : 09912-34510



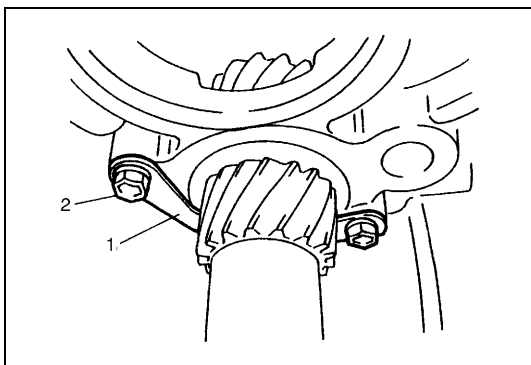
- 6) If equipped with scissors gears (3,5), put match mark (1) (paint) on teeth of low (4) and reverse (6) gear assembly as shown in the figure before taking out input and main shaft assembly from lower case (2).
- 7) Take out input and main shaft assembly.



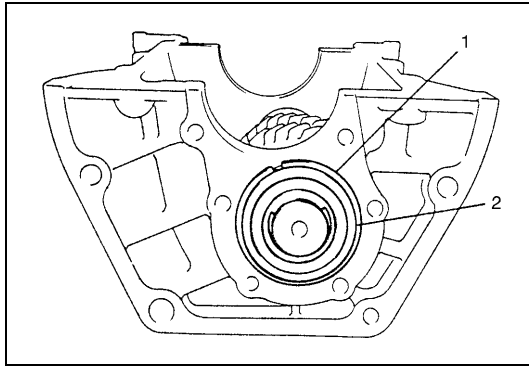
- 8) Remove bearing circlip (2) at the rear part of counter shaft by using screwdriver (1).



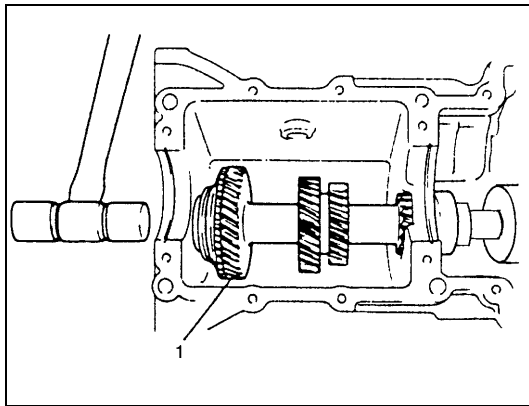
- 9) Remove bolt (3) for reverse idle gear shaft (2) and then remove idle gear (1) and shaft (2) as a set.



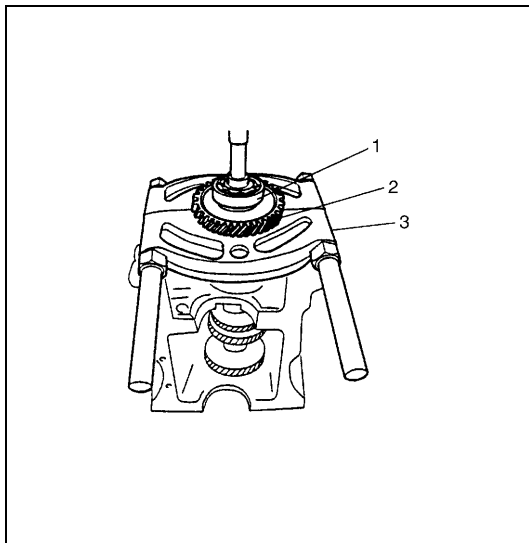
- 10) Remove center bearing plate (1) by removing its 2 bolts (2).



- 11) Remove outside circlip (1) of front bearing (2) on counter shaft.



- 12) Using plastic hammer, drive counter shaft (1) rearward.

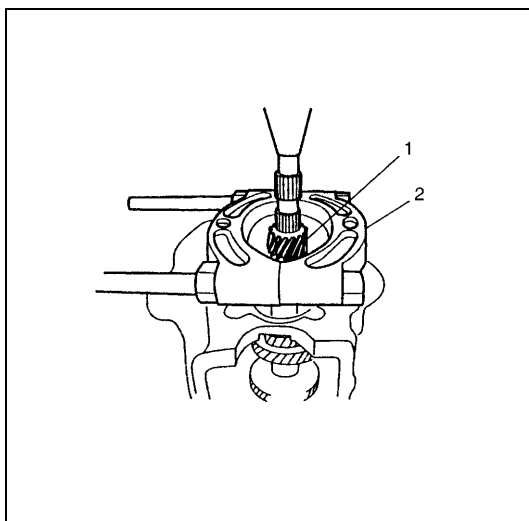


- 13) Pull out 5th gear (2) and rear bearing (1) with bearing puller (3) and press.

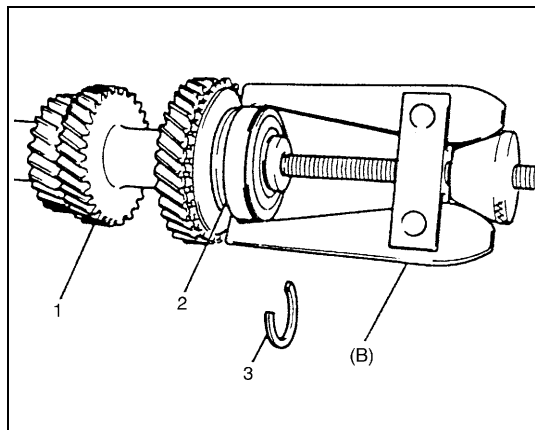
NOTE:

- Apply pressing force while adjusting position of front bearing so that it will fit in its original position (hole in lower case).
- Be sure to set flat face of puller (3) against 5th gear so as not to cause damage to teeth.

- 14) In the same manner as 12), drive counter shaft rearward again.



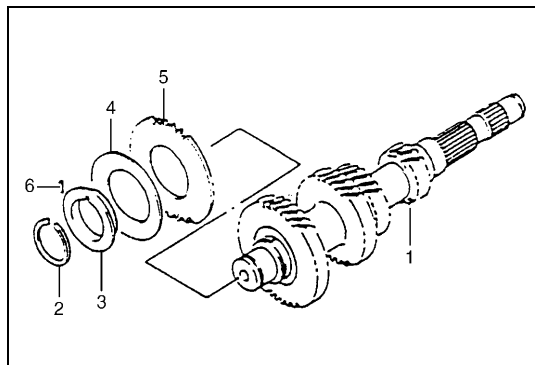
- 15) Pull out reverse gear (1) with bearing puller (2) and press.
 16) Pull out roller bearing by hand and then remove shaft from lower case.



- 17) Remove circlip (3) of counter shaft (1) front bearing (2) and pull out bearing (2) by using puller.

Special tool

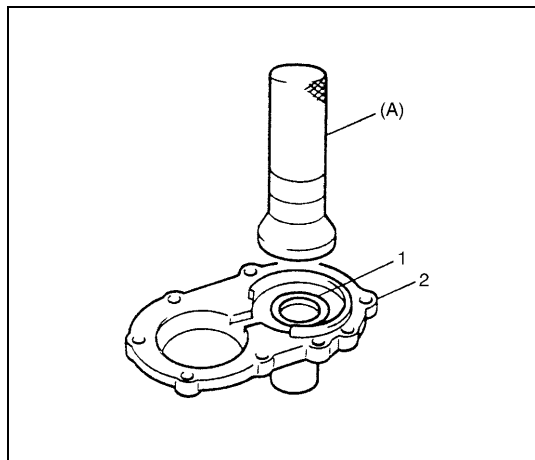
(B) : 09913-60910



- 18) Remove circlip (2), friction gear retainer (3), friction gear spring (4), friction gear (5) and pin (6) from counter shaft (1) in that order.

SUB-ASSEMBLY

INPUT SHAFT

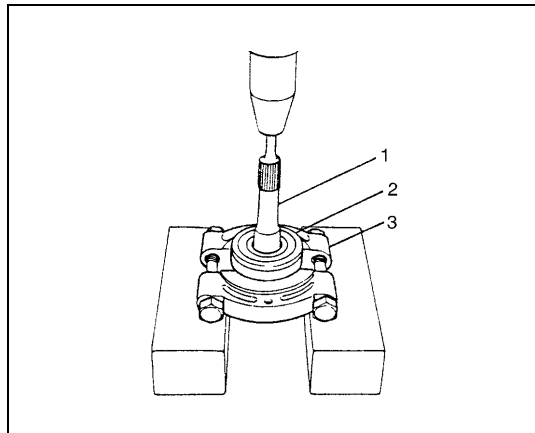


- 1) Take out oil seal (1) from input shaft oil seal retainer (2) and install new oil seal (1) with special tool and hammer up to case surface.

Unless oil seal (1) is leaky or its lip is excessively hardened, replacement is unnecessary.

Special tool

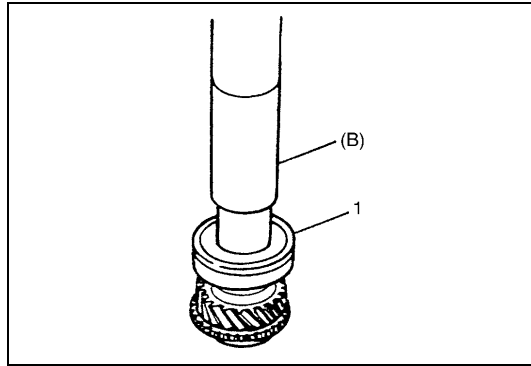
(A) : 09913-84510



- 2) Remove circlip of input shaft (1) and pull out bearing (2) with bearing puller (3) and press as necessary.

NOTE:

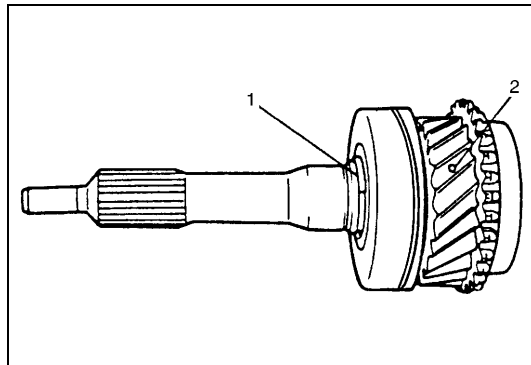
Sealed bearing must not be washed. Replace it with new one when required.



- 3) When installing bearing (1), bring it so that its groove for circlip is in the front and press-fit with special tool and press.

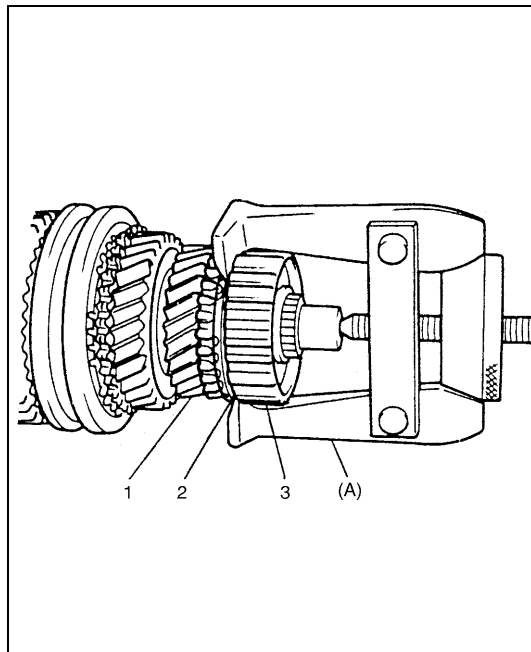
Special tool

(B) : 09925-18011



- 4) After fitting circlip (1), air-blow lubrication oil hole (2).

MAIN SHAFT



- 1) After removing needle bearing for input shaft at the front end of main shaft, pull out high speed sleeve from its hub (3) and remove 3 synchronizer keys.
- 2) Remove circlip in front of hub (3) and pull off hub (3) with special tool, then take out synchronizer springs.

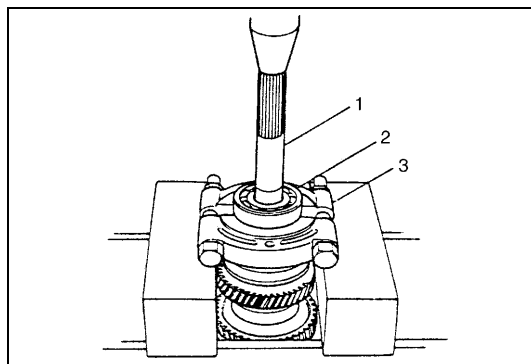
Special tool

(A) : 09913-61510

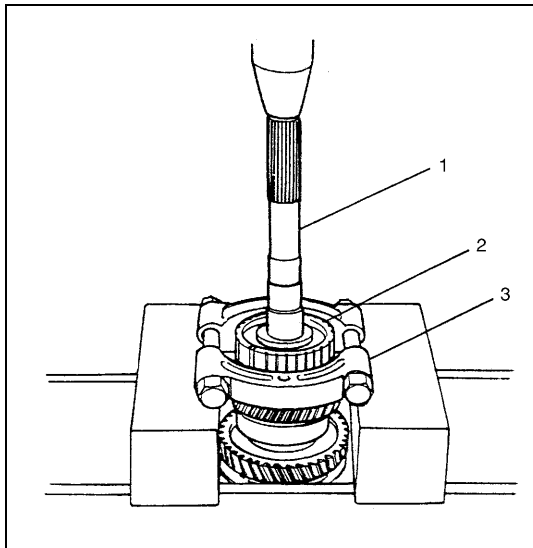
- 3) Remove 3rd synchronizer ring (2), 3rd gear (1) and needle bearing.

NOTE:

High speed sleeve-hub assembly, synchronizer ring (2) and 3rd gear (1) can be removed all at once by using puller and hydraulic press.



- 4) Remove circlip in the rear part of main shaft (1) and pull off rear bearing (2) with bearing puller (3) and press.
- 5) Remove thrust washer and steel ball and then remove 5th gear, synchronizer ring and needle bearing.

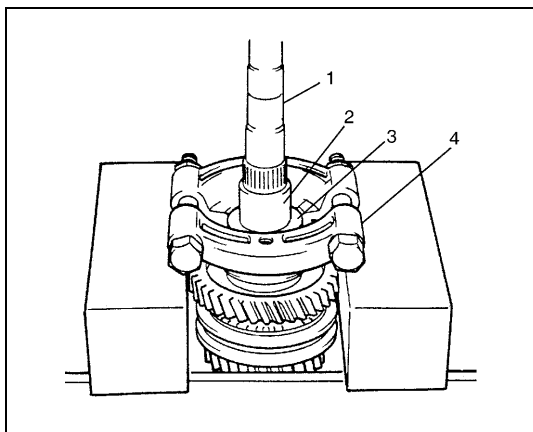


- 6) Pull out reverse sleeve from its hub (2) and remove 3 synchronizer keys.
- 7) Remove circlip and pull off reverse hub (2) from main shaft (1) with bearing puller (3) and press, then take out synchronizer springs.

NOTE:

It is also possible to remove reverse sleeve-hub as assembly and reverse gear all at once by using puller and press, after removing circlip.

- 8) Remove main shaft reverse gear and needle bearing by hand.



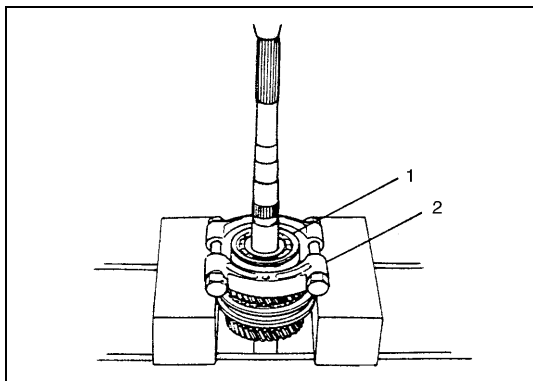
- 9) Using bearing puller (4) and press, remove reverse gear bush (2) and bearing washer (3) from main shaft (1).

NOTE:

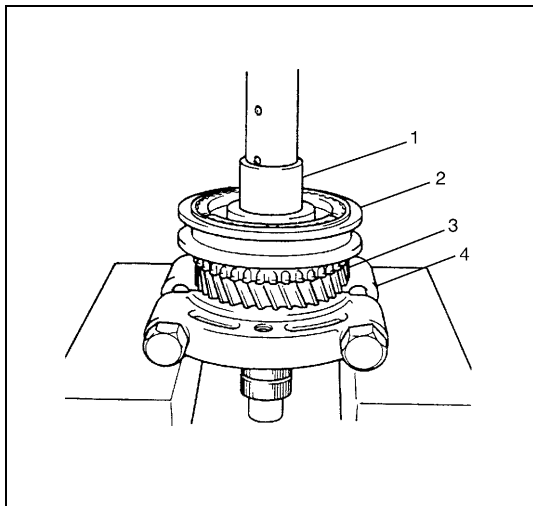
During above work, watch out for steel ball which will come out from inside of washer so as not to lose it.

CAUTION:

Do not attempt to pull out bearing, washer (3) and bush (2) all together at once. Steel ball would stop bearing and cause damage to it.



- 10) Pull off bearing (1) with bearing puller (2) and press.



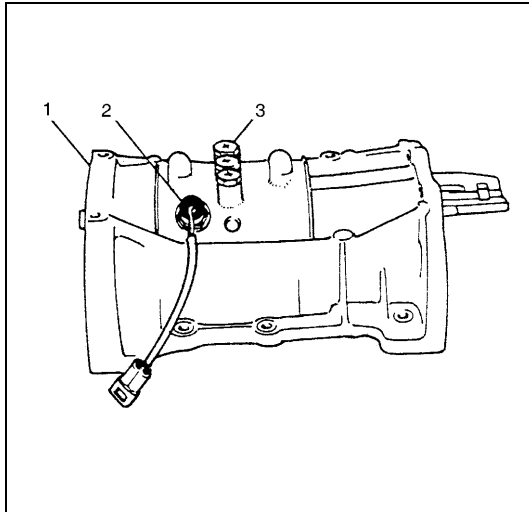
- 11) Remove the following in that order: bearing washer, steel ball, low gear, low synchronizer ring, needle bearing and low gear bush (1).
- 12) Using bearing puller (4) and press, pull out low speed sleeve and hub assembly (2), 2nd gear (3) and 2nd synchronizer ring all together.

NOTE:

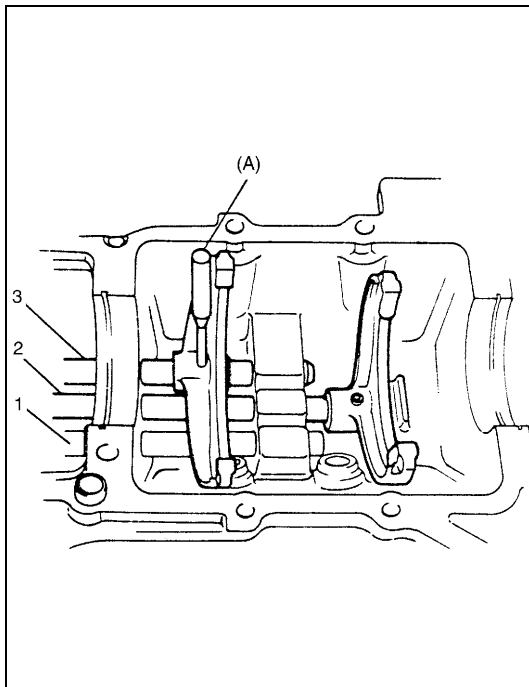
If bush can't be pulled out by hand at step 11, pull off sleeve and hub together by using press.

- 13) Remove sleeve from hub and then take off synchronizer keys and springs.

UPPER CASE AND SHIFTER



- 1) Remove back up light switch (2) and locating spring bolts (3) from upper case (1).
- 2) Take out locating springs and locating balls.



- 3) Remove 2 spring pins and pull out low speed gear shift shaft (3) and high speed gear shift shaft (2) in that order.
- 4) Pull out reverse gear shift shaft (1), then disconnect fork from shaft (1) by removing spring pin.

Special tool

(A) : 09922-85811

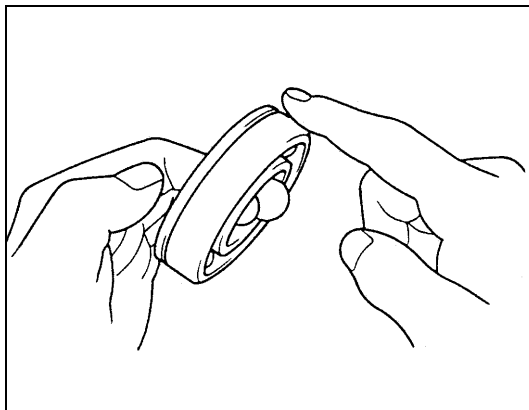
NOTE:

Make sure that remaining gear shift shafts are all neutral position when removing a gear shift shaft.

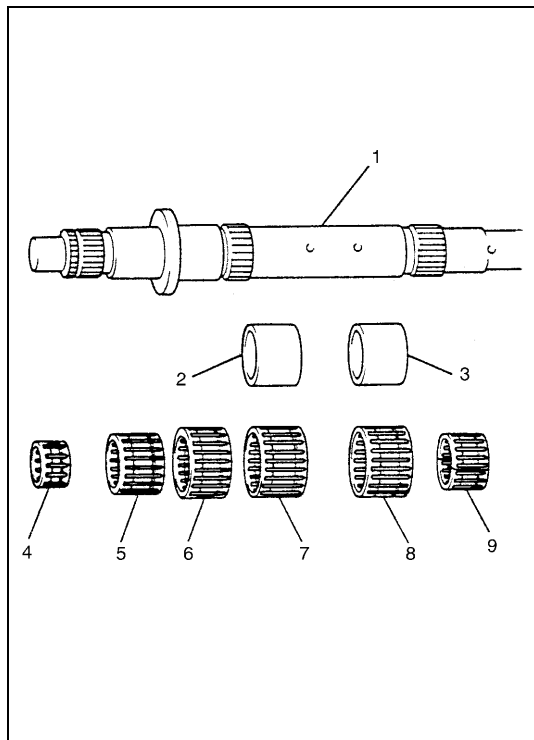
- 5) Take out rubber plug and 2 interlock balls from case.
- 6) Remove interlock pin from high speed gear shift shaft.

COMPONENT INSPECTION

COUNTER SHAFT AND MAIN SHAFT INNER PARTS



- Check tooth surface of gear and rotation of bearing and replace with new one if necessary. As long as no abnormal condition such as noise exists before removal, replacement is unnecessary.

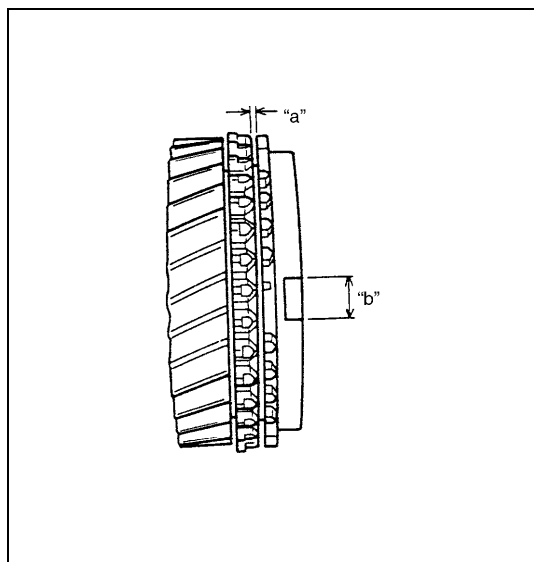


- Inspect needle bearings and needle contacting surfaces (rotating surfaces) and replace with new ones as required.

NOTE:

Should abnormal noise be heard before disassembly, it is necessary to carefully check needle contacting surface inside of each gear besides those parts shown in the figure.

- | | |
|----|--|
| 1. | Main shaft |
| 2. | Low gear bush - identical |
| 3. | Reverse gear bush - identical |
| 4. | Input shaft needle bearing |
| 5. | 3rd gear needle bearing |
| 6. | 2nd gear needle bearing - identical |
| 7. | Low gear needle bearing - identical |
| 8. | Reverse gear needle bearing (2 pieces) |
| 9. | 5th gear needle bearing (2 pieces) |



- Check clearance "a" between synchronizer ring and gear, key slot width "b" in synchronizer ring and each chamfered tooth of gear and synchronizer ring and replace with new one, if necessary. Also, check gear tooth.

Clearance "a" between synchronizer ring and gear :

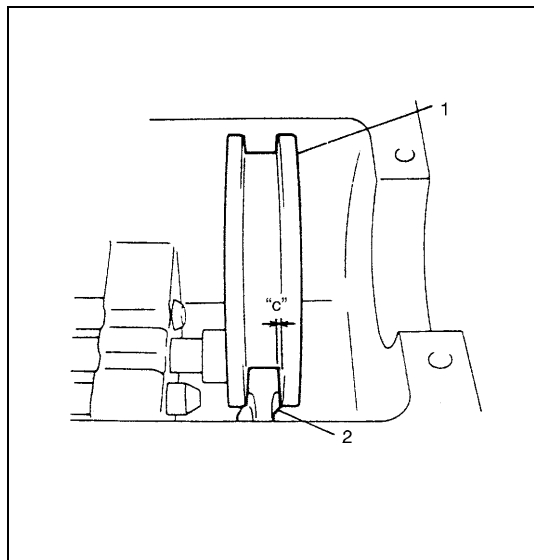
Standard : 1.0 – 1.4 mm (0.039 – 0.055 in.)

Service limit : 0.5 mm (0.019 in.)

Key slot width "b" :

Standard : 10.1 mm (0.397 in.)

Service limit : 10.4 mm (0.409 in.)



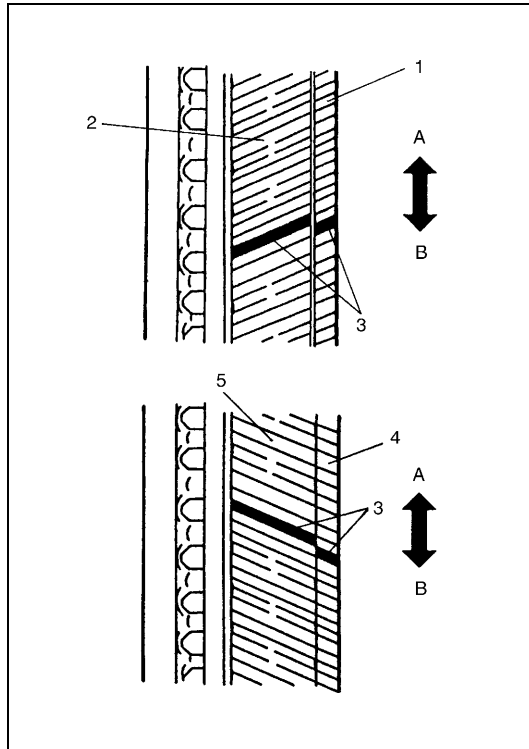
- Using feeler gauge, check clearance between sleeve (1) and shifter fork (2) and replace parts if necessary.

Clearance "c" between sleeve and shifter fork :

Maximum 1.0 mm (0.039 in.)

- Check chamfered part of each sleeve for damage and excessive wear, and replace as necessary.
- Check each synchronizer key and synchronizer spring and replace as necessary.
- Check splined portions and replace parts if excessive wear are found.

LOW AND REVERSE SCISSORS GEAR ASSEMBLIES (IF EQUIPPED)

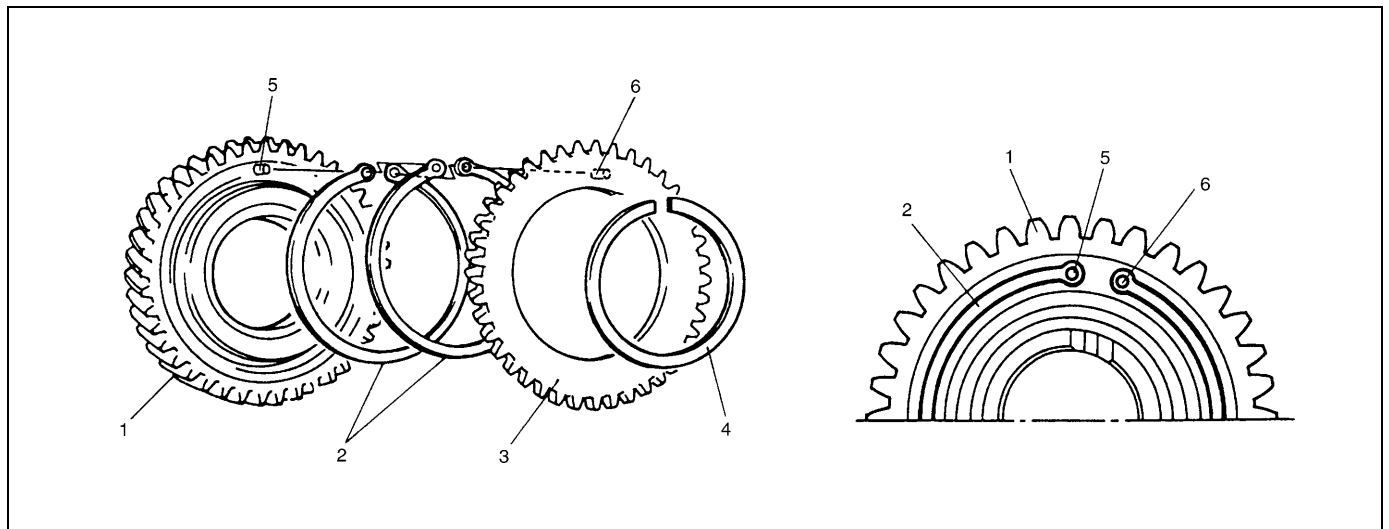


Check for the following items.

- Match mark (3) provided for reassembly should be almost at such position as shown in the figure.
- Try to turn scissors gear against main shaft low (and reverse) gear. It should feel light when turned in “A” direction but heavy when turned in “B” direction.
- Play of scissors gear against main shaft low (or reverse) gear in “A” – “B” direction should be about half of tooth width as shown in the figure.

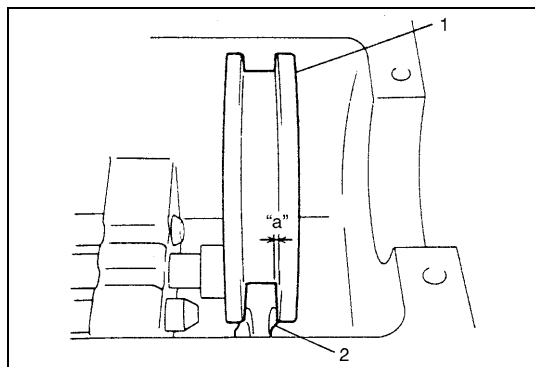
If any faulty condition is noted, remove snap ring, open up assembly unit and check that all components are installed at proper positions. If all components are positioned properly and yet faulty condition exists, replace the low (reverse) gear assembly.

- | | |
|----|-------------------------|
| 1. | Scissors low gear |
| 2. | Main shaft low gear |
| 4. | Scissors reverse gear |
| 5. | Main shaft reverse gear |



- | | |
|----|---------------------------------------|
| 1. | Main shaft (low or reverse) gear |
| 2. | Scissors (low or reverse) gear spring |
| 3. | Scissors (low or reverse) gear |
| 4. | Snap ring |
| 5. | Pin (Main gear side) |
| 6. | Pin (scissors gear side) |

UPPER CASE AND SHIFTER

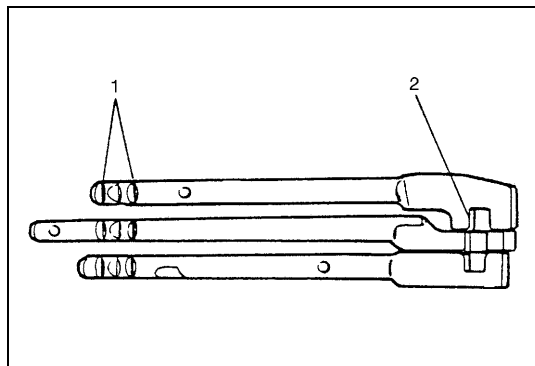


- Using feeler gauge, check clearance between fork (2) and sleeve (1) and replace those parts if it exceeds limit.

Clearance "a" between fork and sleeve :

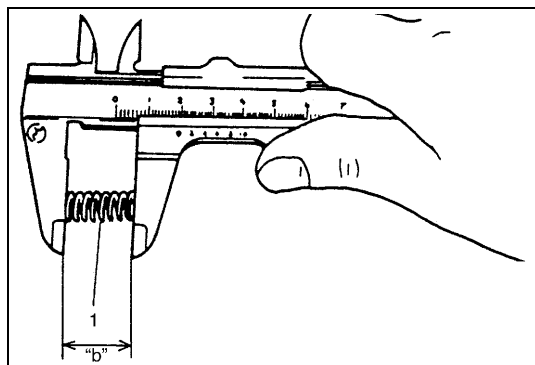
Service limit : 1.0 mm (0.039 in.)

- Insert each gear shift shaft into case and check that it moves smoothly. If it doesn't, correct by using oilstone, reamer or the like.



- Check gear shift shaft for excessive wear and correct or replace a necessary.

- | |
|--------------------|
| 1. Locating groove |
| 2. Yoke portion |



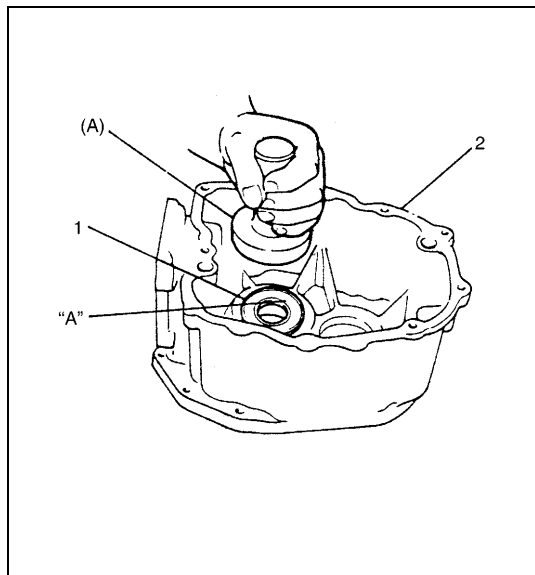
- Check free length of each locating spring (1) and replace if it is below service limit.

Locating spring free length "b" :

Standard : 27.0 mm (1.063 in.)

Service limit : 24.0 mm (0.945 in.)

REAR CASE



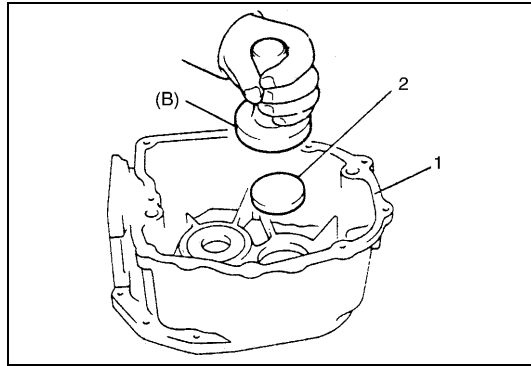
- If oil seal leaks and/or its lip is excessively hardened, replace it with new one and at the same time, check main shaft where oil seal contacts. If contacting surface is not smooth, correct or replace. Apply grease to oil seal lip portion.

Grease "A" : 99000-25010

Special tool

(A) : 09913-75510

- | |
|--------------|
| 1. Oil seal |
| 2. Rear case |



- If oil leakage exists at counter shaft end plug, replace it.

Special tool

(B) : 09913-75520

- | |
|---------------------------|
| 1. Rear case |
| 2. Counter shaft end plug |

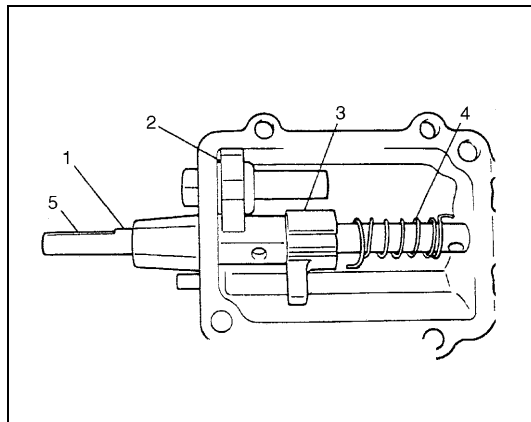
UNIT ASSEMBLY

GEAR SHIFT LEVER CASE (4WD MODEL)

- 1) Wash and inspect each part and replace if necessary. Also check items as described below and correct whatever necessary carefully by using reamer, oilstone and the like, wash it thoroughly and reassemble them.

Items to be checked are;

- Shift shaft should go into case smoothly.
- Shift lever, limit yoke and shift arm should go into shift shaft smoothly.



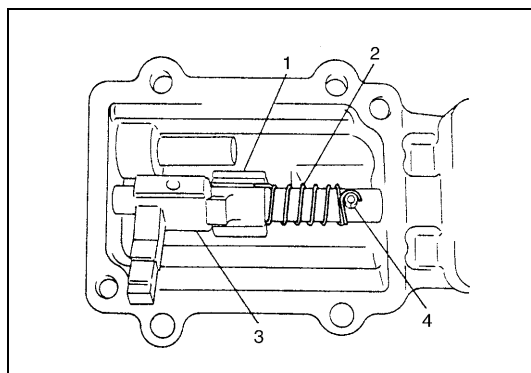
- 2) Insert shift shaft (1) as shown while making sure that inner parts are in proper direction.

NOTE:

- **Cut off portion (5) in shift shaft should face downward when shift shaft (1) is installed.**
- **Use care for installing direction of shift limit spring (4).**
- **Shift arm should be installed at the same time.**

- | |
|---------------------|
| 2. Shift lever |
| 3. Shift limit yoke |

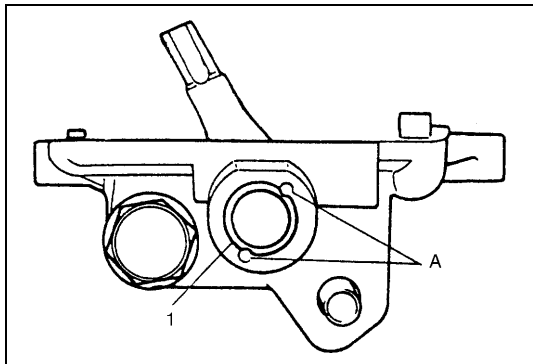
- 3) Drive in spring pin (single short) for reverse gear shift limit yoke.
- 4) Drive in spring pin (double) for shift lever.
- 5) Drive in spring pin (single long) for return spring.



- 6) Fit straight end of shift limit spring (2) into line groove in shift limit yoke (1) and with its other hooked end turned in its winding direction by about 90° from its free state, hook it on spring pin (4).

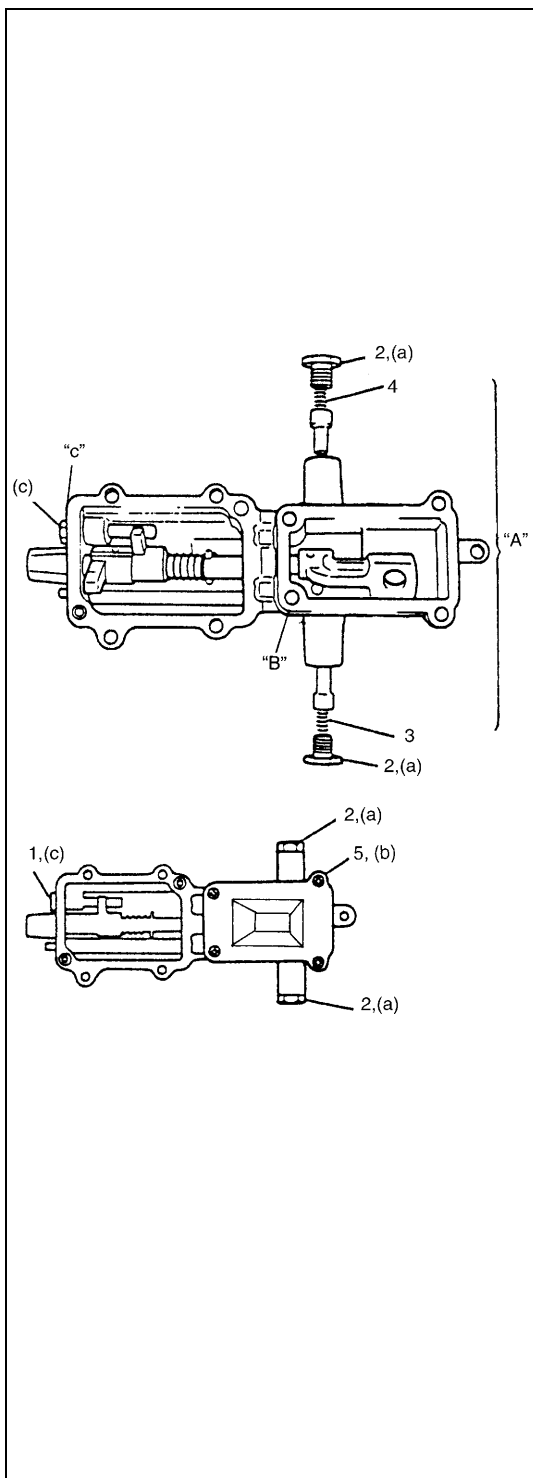
- | |
|----------------|
| 3. Shift lever |
|----------------|

- 7) Drive in spring pin for shift arm.



8) Press-fit case plug (1) into case.

A : Caulking



9) After applying grease "A", install select guide pins, select return springs and spring bolts (2) and torque them to specification.

"A" : Grease 99000-25010

Tightening torque

Select return spring bolt (a) : 35 N·m (3.5 kg-m, 25.5 lb-ft)

NOTE:

Double coil spring is required at 5th/Reverse select side.

10) Clean mating surfaces of both case plate and case, apply sealant "B" to case side evenly, mate them and fasten with screws (5).

"B" : Sealant 99000-31110

Tightening torque

**Shift lever case plate screws (b) :
9 N·m (0.9 kg-m, 6.5 lb-ft)**

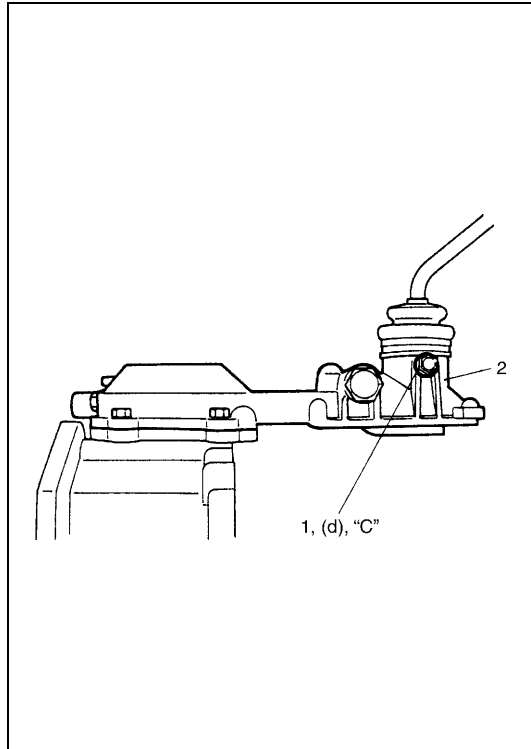
11) If reverse gear shift limit bolt (1) has been removed, apply thread lock cement "C" to bolt then install and torque it to specification.

"C" : Thread lock cement : 99000-32020

Tightening torque

**Reverse gear shift limit bolt (c) :
23 N·m (2.3 kg-m, 17.0 lb-ft)**

- | |
|--|
| 3. Inner and outer spring (Double coil spring) |
| 4. Outer spring |



- 12) Install gear shift lever case (2) to transmission without using sealant for functional check.
- 13) Install shift control lever and check to make sure that it shifts smoothly according to shift pattern.

NOTE:

- Apply thread lock cement “C” to control lever locating bolts (1) when replaced.
- Be sure to apply sealant to mating surface of gear shift lever for its final installation.

“C” : Cement 99000-32020

Tightening torque

Control lever locating bolt (d) :
17 N·m (1.7 kg-m, 12.5 lb-ft)

GEAR SHIFT LEVER CASE (2WD MODEL)

- 1) Wash and inspect each part and replace if necessary. Also check items as described below and correct whatever necessary carefully by using reamer, oilstone and the like, wash it thoroughly and reassemble them.

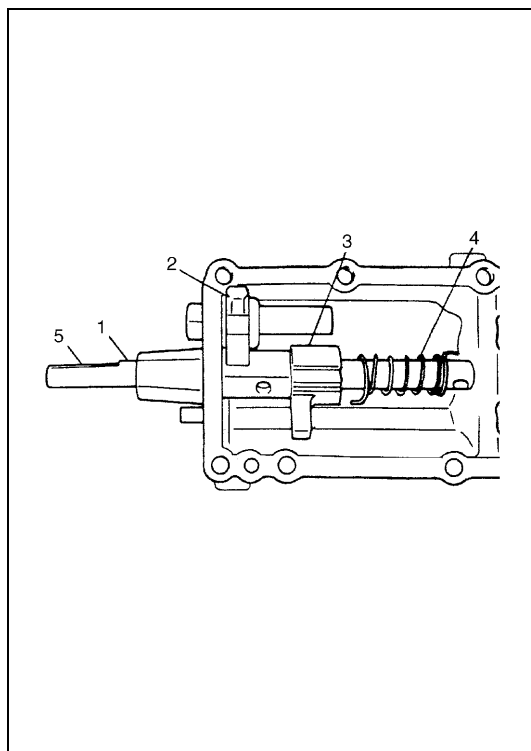
Items to be checked are;

- Shift shaft should go into case smoothly.
- Shift lever, limit yoke and shift arm should go into shift shaft smoothly.

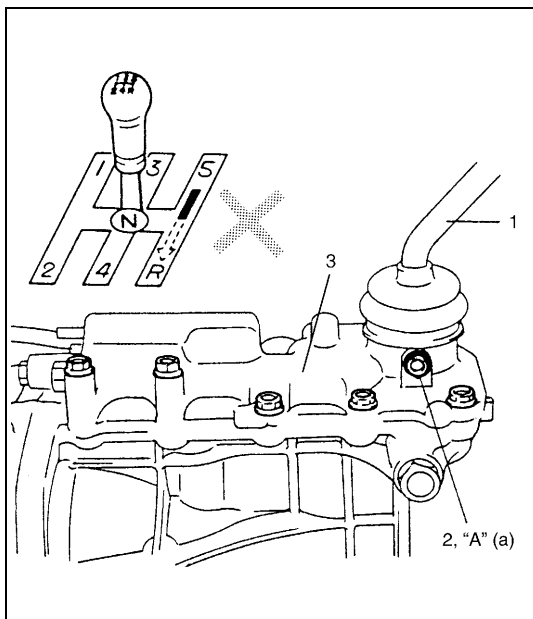
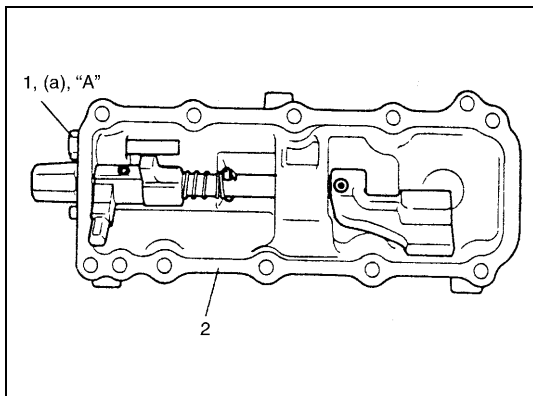
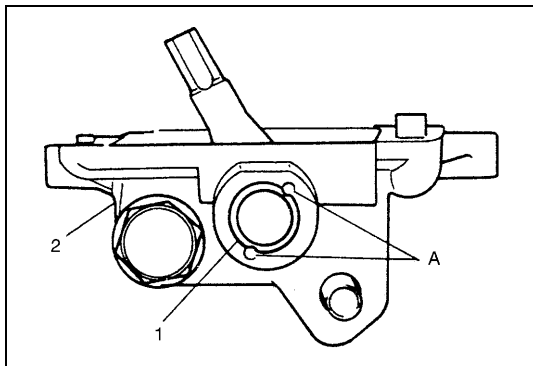
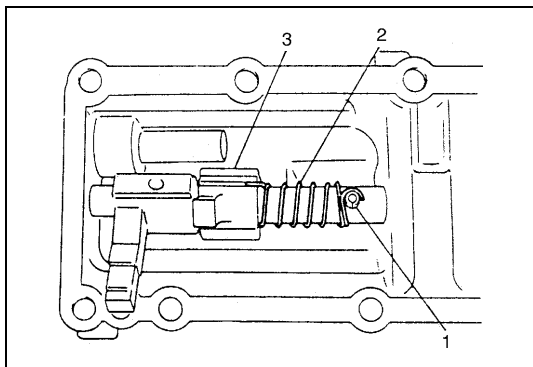
- 2) Insert shift shaft (1) as shown while making sure that inner parts are in proper direction.

NOTE:

- Cut off portion (5) in shift shaft should face downward when shift shaft (1) is installed.
- Use care for installing direction of shift limit spring (4).
- Shift arm should be installed at the same time.



- | |
|---------------------|
| 2. Shift lever |
| 3. Shift limit yoke |



- 3) Drive in spring pin (single short) for reverse gear shift limit yoke.
- 4) Drive in spring pin (double) for shift lever.
- 5) Drive in spring pin (single long) for return spring.
- 6) Fit straight end of shift limit spring (2) into line groove in shift limit yoke (3) and with its other hooked end turned in its winding direction by about 90° from its free state, hook it on spring pin (1).
- 7) Drive in spring pin for shift arm.

- 8) Press-fit case plug (1) into case (2) and caulk it with punch.

"A" : Caulking

- 9) If reverse gear shift limit bolt (1) has been removed, apply thread lock cement "A" to bolt then install and torque it to specification.

"A" : Cement 99000-32020

Tightening torque

Reverse gear shift limit bolt (a) :
23 N·m (2.3 kg-m, 17.0 lb-ft)

2. Gear shift lever case

- 10) Install gear shift lever case (3) to transmission without using sealant for functional check.
- 11) Install shift control lever (1) and check to make sure that it shifts smoothly according to shift pattern as shown in the figure.

NOTE:

- Apply thread lock cement "A" to control lever locating bolts (2) when replaced.
- Be sure to apply sealant to mating surface of gear shift lever case (3) for its final installation.

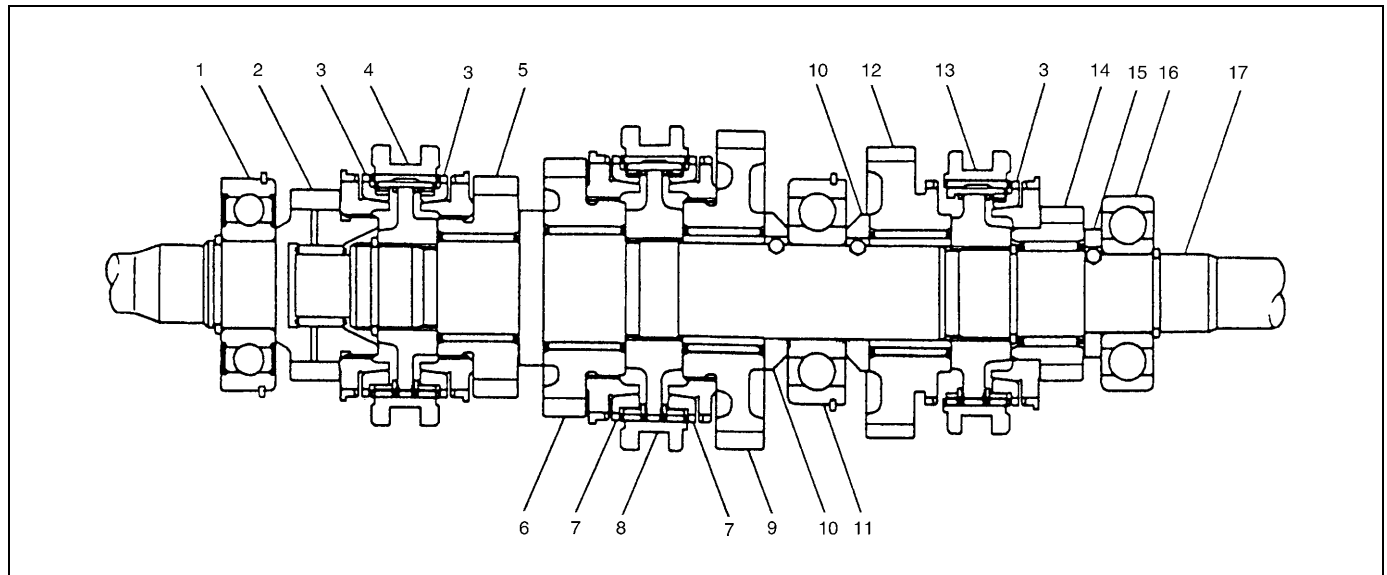
"A" : Cement 99000-32020

Tightening torque

Control lever locating bolt (a) :
17 N·m (1.7 kg-m, 12.5 lb-ft)

SUB ASSEMBLY

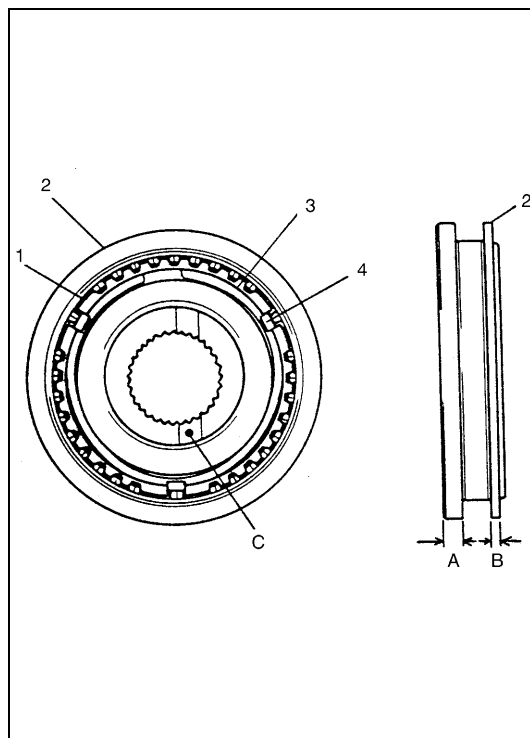
MAIN SHAFT



- | | | |
|--|---|--|
| 1. Input shaft bearing | 7. Synchronizer low speed ring | 13. Synchronizer reverse sleeve and hub assembly |
| 2. Input shaft | 8. Synchronizer low speed sleeve and hub assembly | 14. 5th gear |
| 3. Synchronizer high speed ring | 9. Low gear | 15. 5th gear washer |
| 4. Synchronizer high speed sleeve and hub assembly | 10. Bearing washer | 16. Rear bearing |
| 5. 3rd gear | 11. Main shaft bearing | 17. Main shaft |
| 6. 2nd gear | 12. Reverse gear | |

NOTE:

- Before installation, wash each part and apply specified gear oil to sliding faces of bearing and gear.
- Use new circlips on shaft for reinstallation. Don't reuse used circlips.



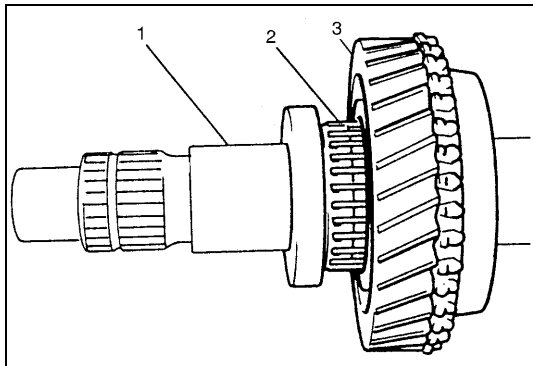
- 1) Fit sleeve to low speed hub (1), place 3 synchronizer keys (4) in it and set synchronizer spring (3).

Refer to the figure for proper installing direction of hub (1), sleeve (2) and springs (3). Synchronizer key (4) has no specific direction for installation.

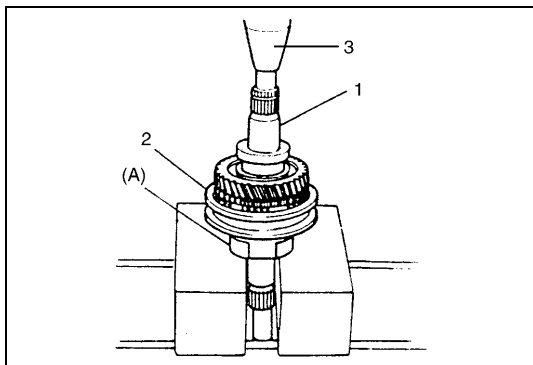
NOTE:

When installing each synchronizer spring, insert its hooked end to hub hole and put it toward right.

- | |
|------------------------------------|
| A : Thick (2nd and front side) |
| B : Thin (Low and rear side) |
| C : Punch mark (Low and rear side) |



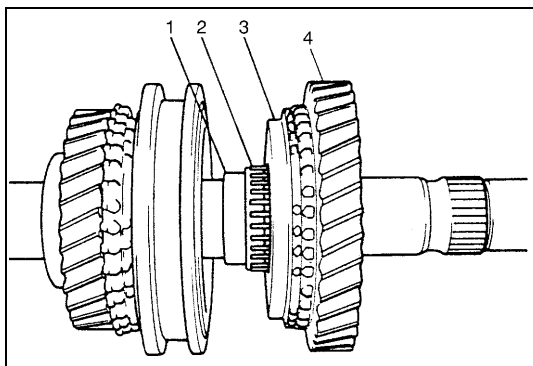
- 2) Install needle bearing (2), 2nd gear (3) and 2nd synchronizer ring to main shaft (1).



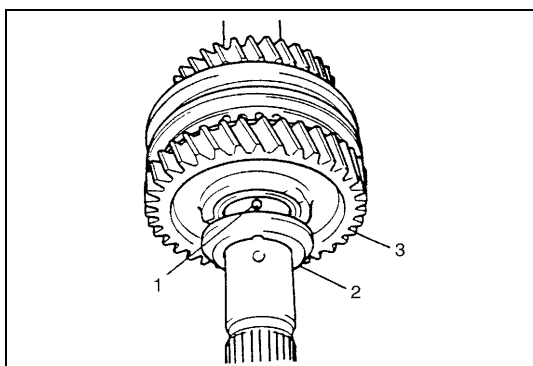
- 3) Press-fit low speed sleeve and hub assembly (2) onto main shaft (1) with press (3).

Special tool

(A) : 09927-08210

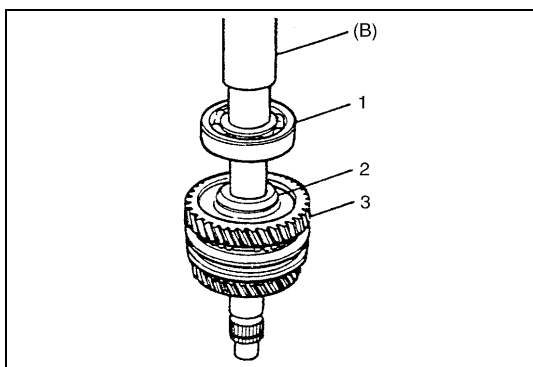


- 4) Insert low gear bush (1) and set synchronizer ring (3), needle bearing (2) and low gear (4).



- 5) Set steel ball (1) and washer (2).

3. Low gear



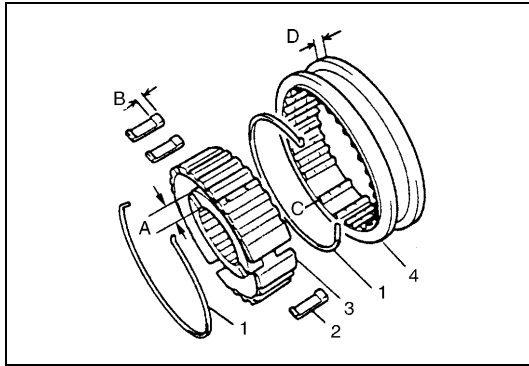
- 6) Using special tool and press, press-fit bearing (1).

Special tool

(B) : 09925-18011

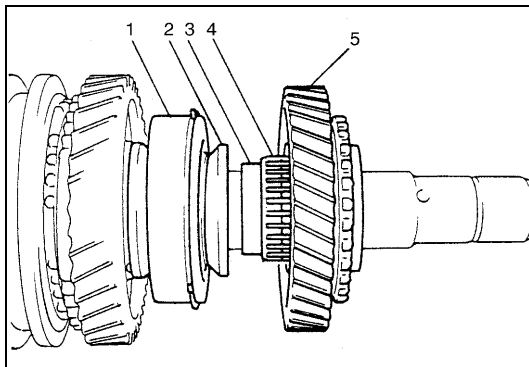
2. Washer

3. Low gear



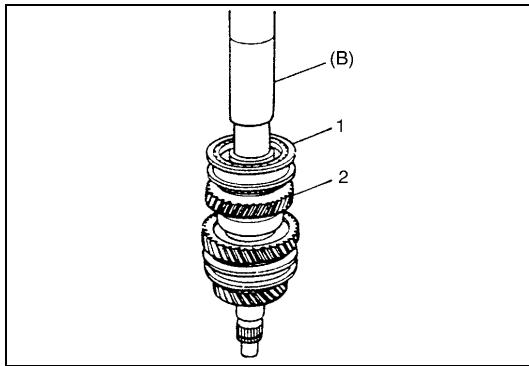
- 7) Fit sleeve (4) to reverse hub (3), place 3 synchronizer keys (2) in it and then set synchronizer springs (1). Refer to the figure for proper installing direction of hub (3), sleeve (4) and springs (1). Also, note that key (2) has specific installing direction.

A : Reverse side (thick)
B : 5th side (thick)
C : Key position
D : 5th side (thick)



- 8) Set steel ball and bearing washer (2) and insert reverse gear bush (3), needle bearing (4) and reverse gear (5).

1. Bearing

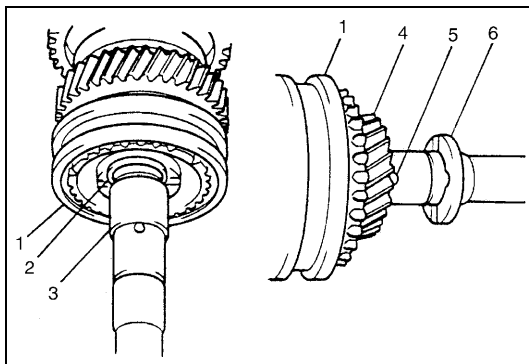


- 9) Press-fit reverse sleeve and hub assembly (1) with special tool and press.

Special tool

(B) : 09925-18011

2. Reverse gear

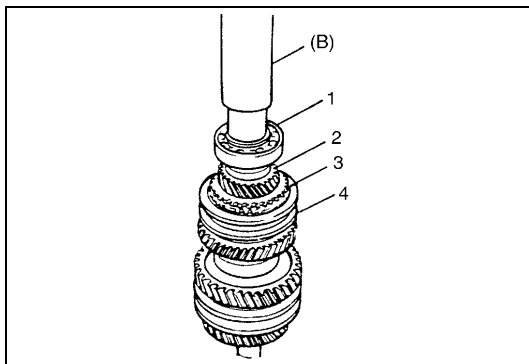


- 10) After setting large circlip (2), install 5th speed synchronizer ring, needle bearing, 5th gear (4), steel ball (5) and washer (6).

NOTE:

Washer should be installed with its oil slot side facing gear.

1. Sleeve and hub assembly
3. Bush



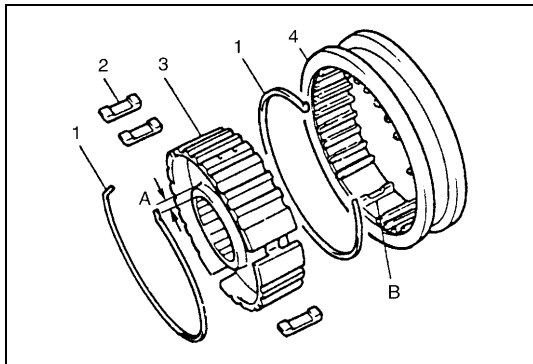
- 11) Press-fit bearing (1) with special tool and press.

Special tool

(B) : 09925-18011

2. 5th gear
3. Ring
4. Sleeve and hub assembly

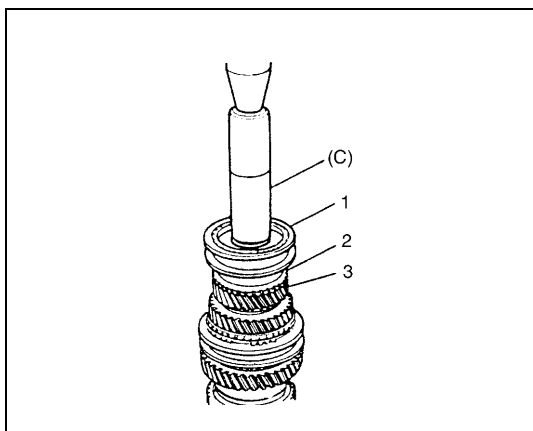
- 12) Fit small circlip.



- 13) Fit sleeve (4) to high speed hub (3), place 3 synchronizer keys (2) and set synchronizer springs (1) as shown in the figure.

Neither sleeve nor key has specific installing direction.

A : 4th side (thin)
B : Key position



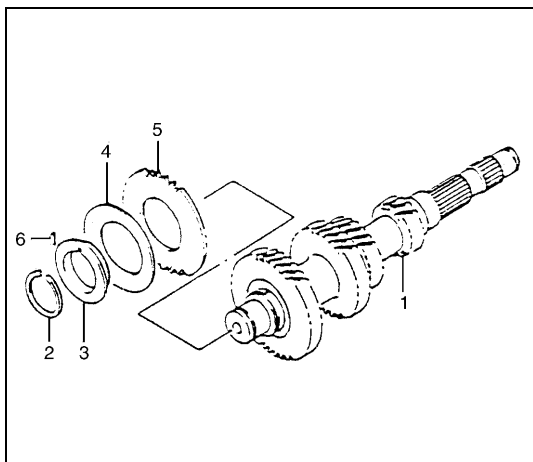
- 14) Install needle bearing, 3rd gear (3) and 3rd synchronizer ring (2). Then using special tool and press, press-fit high speed sleeve and hub assembly (1) onto shaft.

Special tool

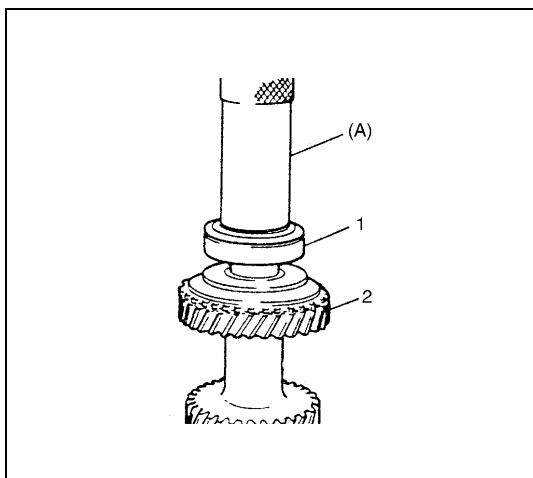
(C) : 09913-84510

- 15) Fit large circlip.
16) Install needle bearing.

COUNTER SHAFT



- 1) Install pin (6), friction gear (5), friction gear spring (4), friction gear retainer (3) and circlip (2) to counter shaft (1) in that order.

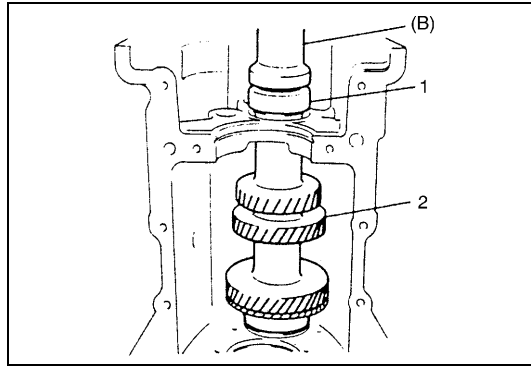


- 2) Press-fit front bearing (1) and fit circlip.

Special tool

(A) : 09913 -84510

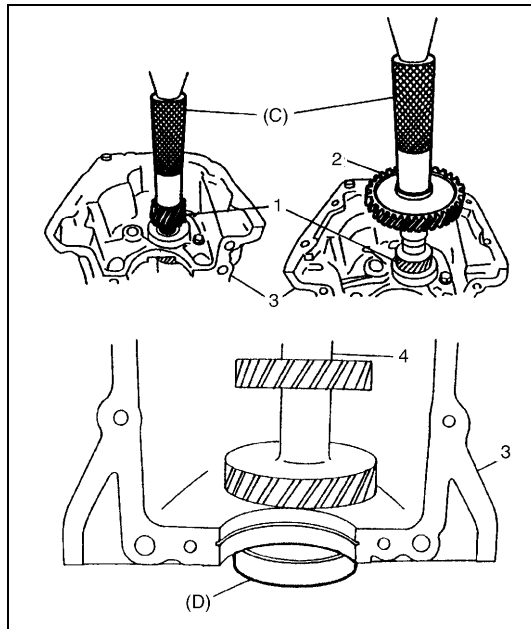
2. Counter shaft



- 3) With shaft inserted into case, install center bearing outer race (1) on it and then press-fit countershaft (2) by using special tool and hammer. Meanwhile case should be supported on wood blocks.

Special tool

(B) : 09951-16080



- 4) Press-fit reverse gear (1) and then 5th gear (2).

NOTE:

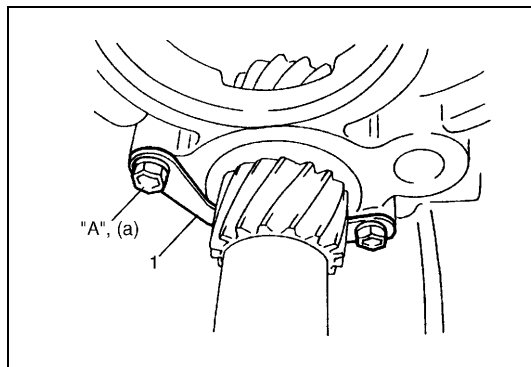
When press-fitting, hold counter shaft (4) as shown in the figure with its front end set on special tool.

Special tool

(C) : 09913-80112

(D) : 09944-66010

3. Lower case

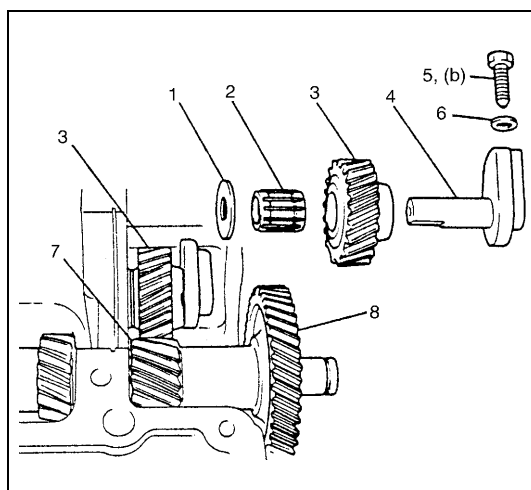


- 5) Install bearing plate (1) applying thread lock cement "A" to their thread part of bolts.

"A" : Cement 99000-32020

Tightening torque

Bearing plate bolt (a) :
6 N·m (0.6 kg-m, 4.0 lb-ft)



- 6) Install reverse idle gear (3) together with needle bearing (2) and thrust washer (1) on reverse idle gear shaft (4) and fix them with bolt (5) from outside of case.

NOTE:

Be sure to use aluminum washer for bolt.

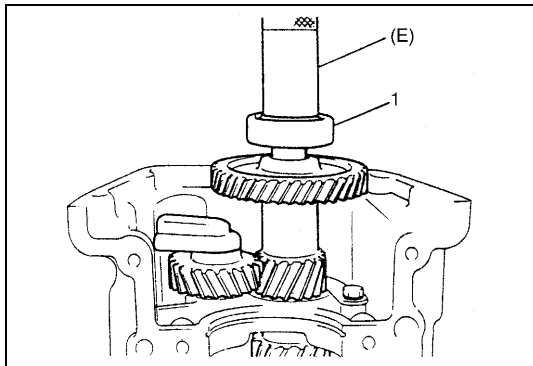
Tightening torque

Reverse idle gear shaft bolt (b) :
23 N·m (2.3 kg-m, 17.0 lb-ft)

6. Washer (aluminum)

7. Counter shaft reverse gear

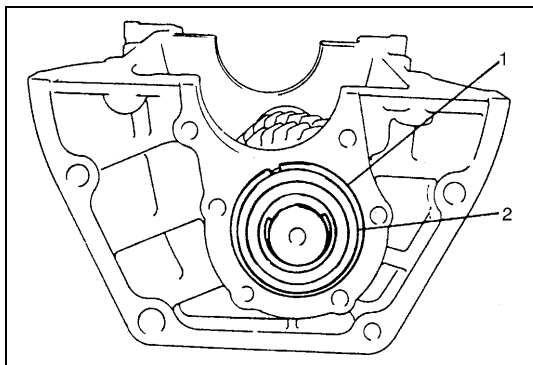
8. Counter shaft 5th gear



7) After press-fitting rear bearing (1) to counter shaft, make sure to fit circlip securely.

Special tool

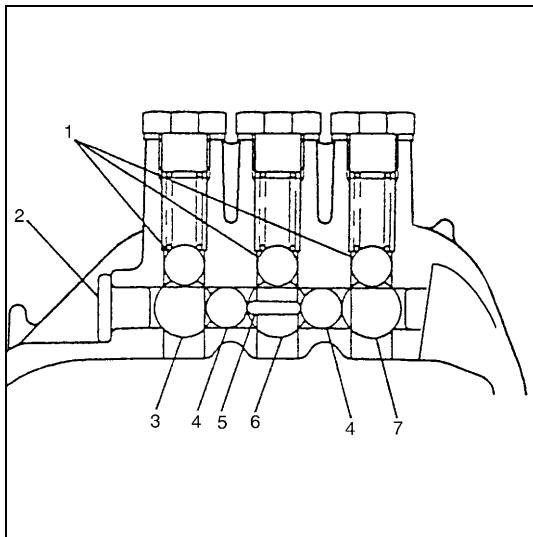
(E) : 09913-80112



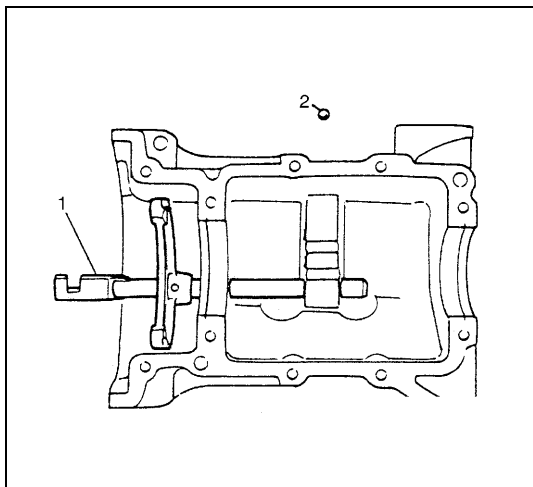
8) Fit circlip (1) around front bearing (2) and check to make sure that circlip just contacts with case surface.

UPPER CASE AND SHIFTER

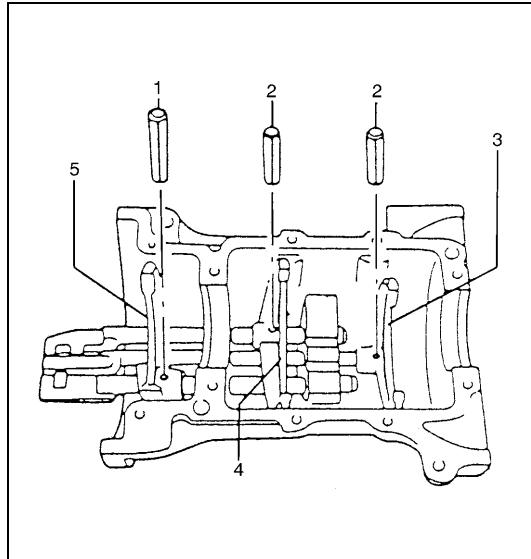
Interlock system is as shown in the figure.



1. Locating ball
2. Rubber plug
3. Reverse gear shift shaft
4. Interlock ball
5. Interlock pin
6. High speed gear shift shaft
7. Low speed gear shift shaft

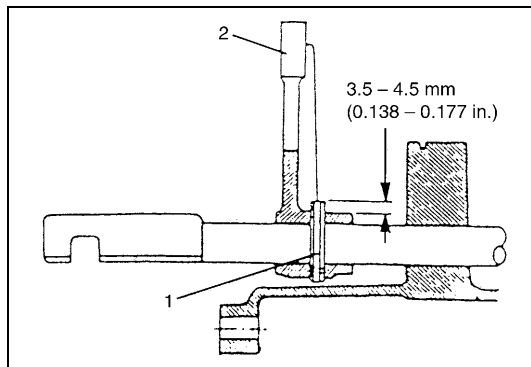


1) With fork installed to reverse gear shift shaft (1), install it into case and put in interlock ball (2).

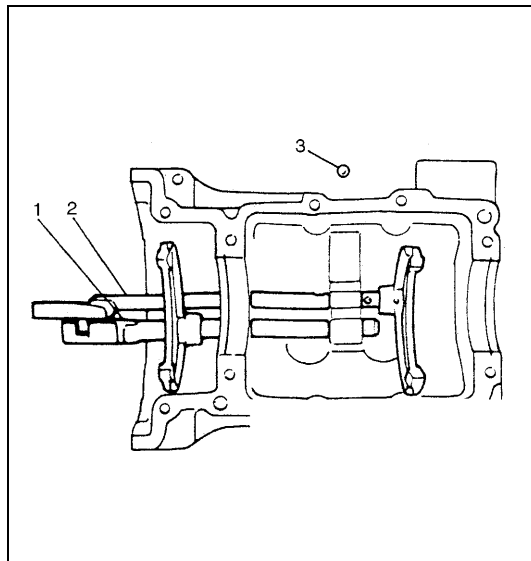
**NOTE:**

Reverse gear shift fork spring pin is different from other spring pins in length. It is longer than other spring pins.

- | | |
|----|---------------------------------------|
| 1. | Reverse gear shift fork spring pin |
| 2. | Low & High gear shift fork spring pin |
| 3. | High speed gear shift fork |
| 4. | Low speed gear shift fork |
| 5. | Reverse gear shift fork |

**NOTE:**

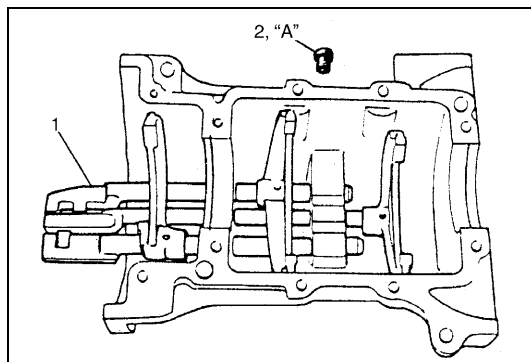
When pressing gear shift fork spring pin (1) into reverse gear shift fork (2), do not allow to go all the way in, but leave its end protruded as much as the length shown in the figure.



- 2) With interlock pin fit to high speed gear shift shaft (2), insert it into case and set fork with spring pin and then put in interlock ball (3).

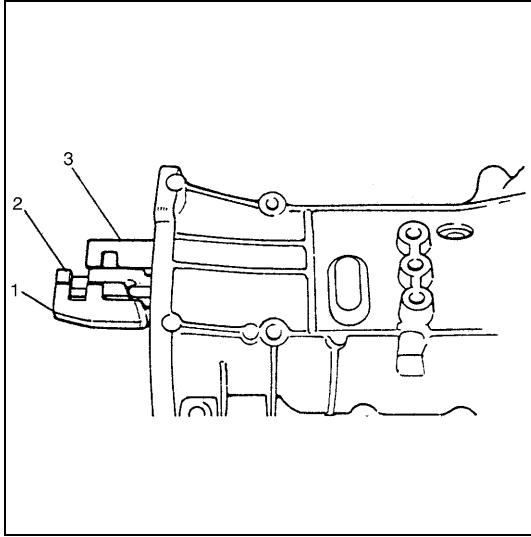
NOTE:

- Note that high speed gear shift shaft (2) can't be inserted unless reverse gear shift shaft (1) is placed at neutral position.
- When inserting high speed gear shift shaft (2), use care not to drop interlock pin.



- 3) With both reverse and high speed gear shift shafts placed at neutral position, insert low speed gear shift shaft (1) into case and fix fork with spring pin. Then apply sealant to rubber plug (2) and fit it in.

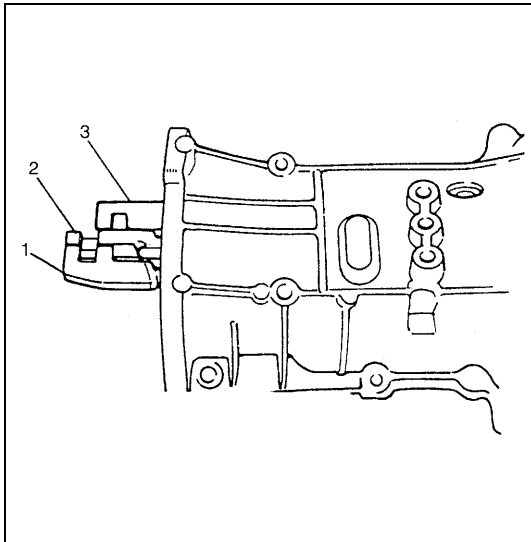
"A" : Sealant 99000-31110



4) Confirm that interlock system operates properly by checking the following.

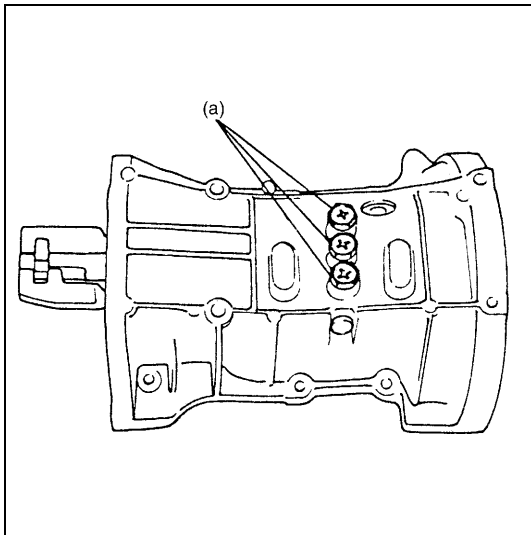
- When shifted to low position (or 2nd position), shifting of 3rd/4th speed or 5th/Rev speed is not available.

- | |
|--|
| 1. Low speed gear shift shaft (Low position) |
| 2. High speed gear shift shaft (Neutral) |
| 3. Reverse gear shift shaft (Neutral) |



- When shifted to reverse position (or 5th position), shifting of 1st/2nd speed or 3rd/4th speed is not available.

- | |
|--|
| 1. Low speed gear shift shaft (Neutral) |
| 2. High speed gear shift shaft (Neutral) |
| 3. Reverse gear shift shaft (Reverse position) |

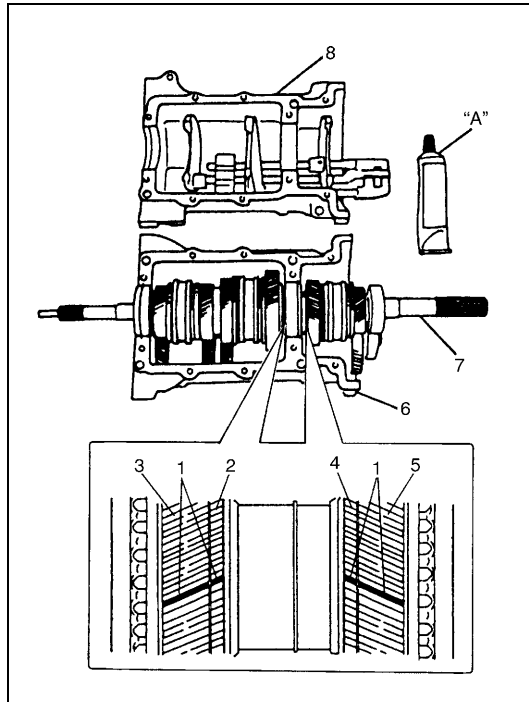


5) Install locating balls and locating springs and then set washers and bolts.

Tightening torque

Locating spring bolt (a) : 28 N·m (2.8 kg-m, 20.0 lb-ft)

TRANSMISSION UNIT



- 1) Put main shaft-input shaft assembly (7) into lower case (6), apply oil to component parts and check for proper engagement (smooth rotation) with counter shaft.

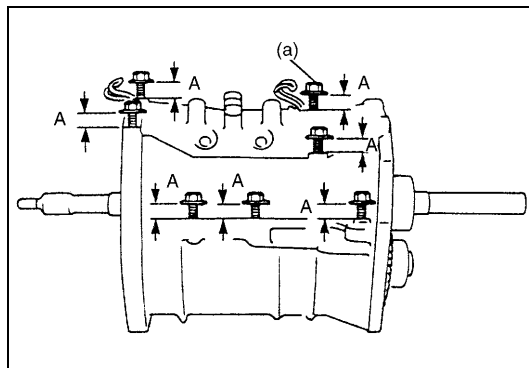
NOTE:

For vehicle equipped with scissors gears, align paint match marks (1) marked before disassembly as shown in figure when installing main shaft to lower case (6).

- 2) After cleaning mating surfaces of both cases, coat mating surface of upper case (8) with sealant evenly and put it over lower case (6). At this time, all gears and forks should be set to neutral position.

“A” : Sealant 99000-31150

- | |
|--|
| 2. Scissors low gear (if equipped) |
| 3. Main shaft low gear |
| 4. Scissors reverse gear (if equipped) |
| 5. Main shaft reverse gear |

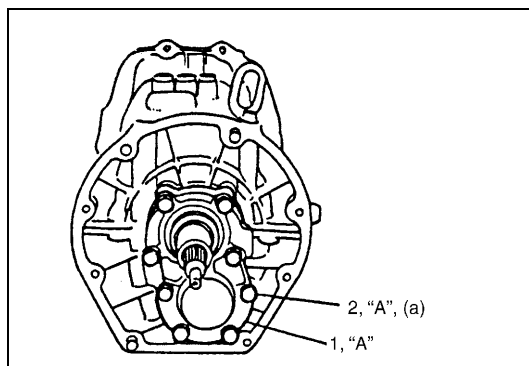


- 3) Place bolts at their positions and check to make sure that their height from case surface is the same before tightening them. Also, check clamp position and torque them to specification.

Tightening torque

Upper case bolt (a) : 23 N·m (2.3 kg-m, 17.0 lb-ft)

A : Bolt height before screw in

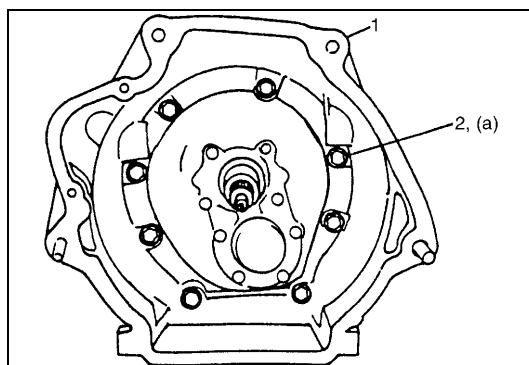


- 4) Apply sealant “A” to mating surface of input shaft bearing retainer (1) and its bolts (2), then install them.

“A” : Sealant 99000-31110

Tightening torque

Input shaft retainer bolt (a) : 23 N·m (2.3 kg-m, 17.0 lb-ft)

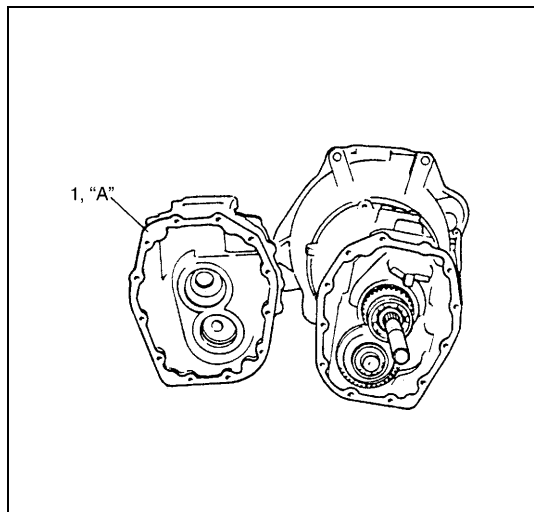


- 5) Install clutch housing (1) and torque its bolts (2) to specification.

Tightening torque

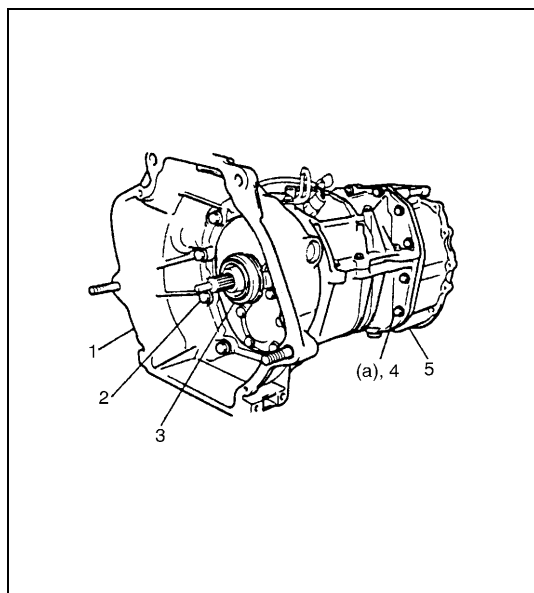
Clutch housing bolt (a) : 50 N·m (5.0 kg-m, 36.5 lb-ft)

- 6) Install release bearing



- 7) Clean mating surfaces of both cases, coat mating surface (1) of rear case with sealant evenly and mate it with transmission itself.

“A” : Sealant 99000-31110

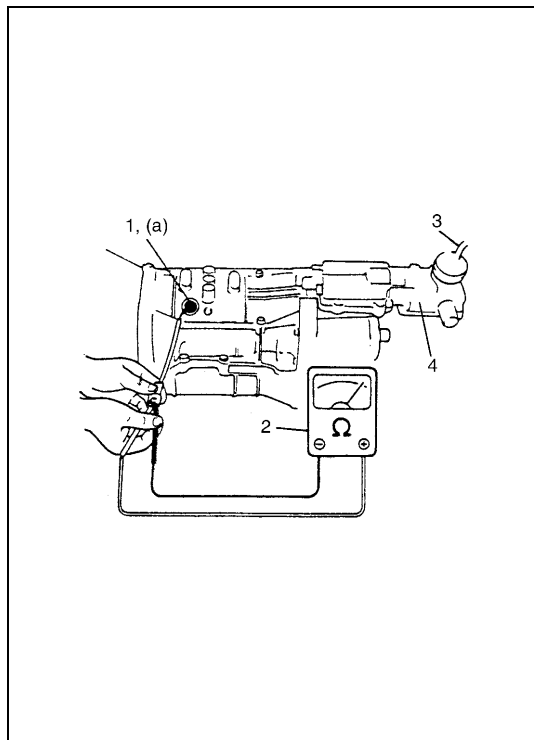


- 8) Install 12 rear case bolts and torque them to specification.

Tightening torque

Rear case bolt (a) : 23 N·m (2.3 kg-m, 17.0 lb-ft)

- | |
|---------------------------|
| 1. Clutch housing |
| 2. Bolt |
| 3. Clutch release bearing |
| 4. Bolt |
| 5. Rear case |



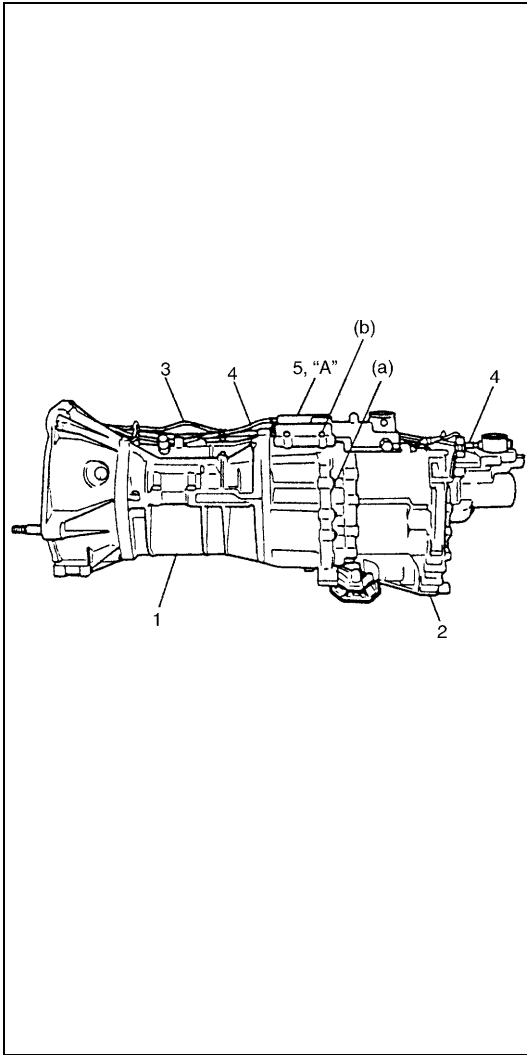
- 9) Install back up light switch (1).

Tightening torque

Back up light switch (a) : 20 N·m (2.0 kg-m, 14.5 lb-ft)

- 10) Install gear shift lever case (4) temporarily to confirm switch function by checking the following.
- Back up light switch (1) should conduct when gear shift control lever (3) is at reverse position.
- 11) After confirming switch function, remove gear shift lever case.

- | |
|-------------|
| 2. Ohmmeter |
|-------------|



- 12) Connect transfer assembly to transmission and tighten its fastening bolts to specified torque.

Tightening torque

Transfer to transmission bolt (a) :

23 N·m (2.3 kg-m, 17.0 lb-ft)

- 13) With sealant applied to mating surface of transmission gear shift lever case (5), put it onto transmission and transfer assembly, and torque bolts to specification.

“A” : Sealant 99000-31110

Tightening torque

Gear shift case bolt (b): 13 N·m (1.3 kg-m, 9.5 lb-ft)

- 14) Install breather hoses (4) for transmission and transfer and set clamps.
 15) Connect wiring harness (3) to each coupler of 4WD switch, 5th switch and back up light switch.
 16) Clamp wiring harness (3) and breather hoses (4) securely.

CAUTION:

Fill specified amount of gear oil to transmission and transfer after remounting transmission and transfer assembly to vehicle.

- | |
|---|
| 1. Transmission assembly
2. Transfer assembly (4WD model) / Extension case (2WD model) |
|---|

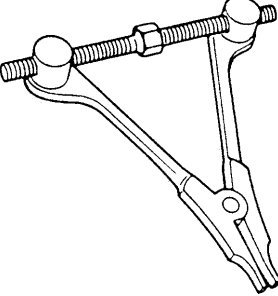
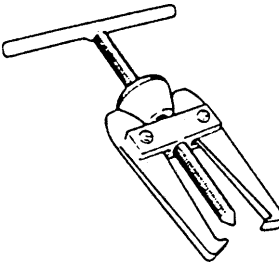
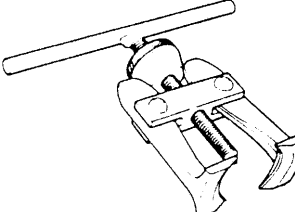
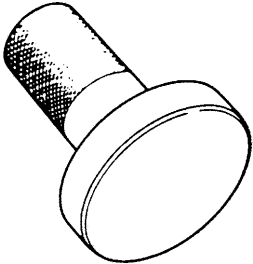
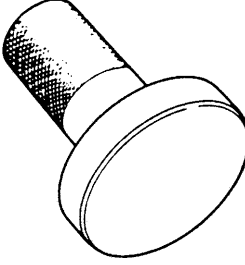
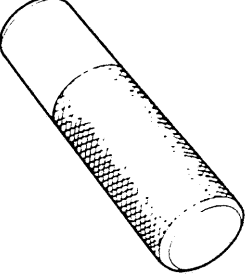
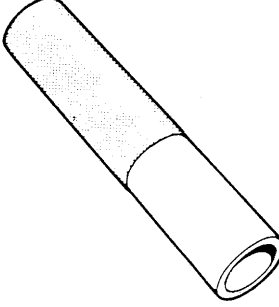
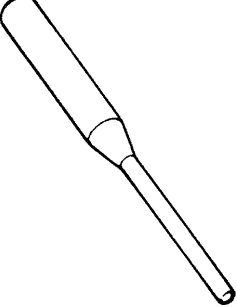
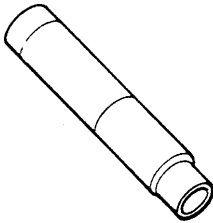
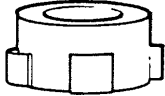
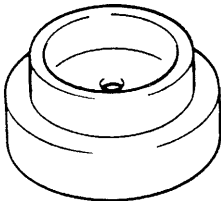
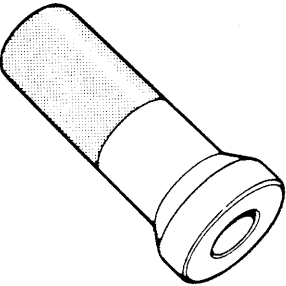
TIGHTENING TORQUE SPECIFICATION

Fastening part	Tightening torque		
	N•m	kg-m	lb-ft
Oil level/filler and drain plugs	23	2.3	17.0
Back up light and 4WD switches	20	2.0	14.5
Control lever locating bolts	17	1.7	12.5
Reverse gear shift limit bolt	23	2.3	17.0
Select return spring bolts	35	3.5	25.5
Shift lever case plate screws	9	0.9	6.5
Gear shift case bolts	13	1.3	9.5
Center bearing plate bolts	6	0.6	4.0
Reverse idle gear shaft bolt	23	2.3	17.0
Locating spring bolts	28	2.8	20.0
Upper case bolts	23	2.3	17.0
Input shaft retainer bolts	23	2.3	17.0
Clutch housing bolts	50	5.0	36.5
Rear case bolts	23	2.3	17.0
Transfer to transmission bolts	23	2.3	17.0

REQUIRED SERVICE MATERIAL

Material	Recommended SUZUKI product (Part number)	Use
Lithium grease	SUZUKI SUPER GREASE A (99000-25010)	• Oil seal lips • Select return system
Thread lock cement	THREAD LOCK CEMENT SUPER 1333B (99000-32020)	• Shift control lever locating bolts • Reverse gear shift limit bolt • Counter shaft bearing plate bolts
Sealant	SUZUKI BOND No. 1215 (99000-31110)	• Oil Drain and level/filler plugs • Mating surface of gear shift lever case • Rubber plug for interlock ball bore • Upper case mating surface • Mating surface of input shaft bearing retainer • Input shaft retainer bolts • Rear case mating surface

SPECIAL TOOL

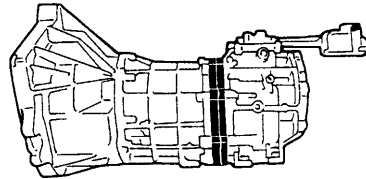
 09912-34510 Case separator	 09913-60910 Bearing/Gear puller	 09913-61510 Bearing puller	 09913-75510 (O.D. 70.5 mm) Bearing installer
 09913-75520 (O.D. 60.5 mm) Bearing installer	 09913-80112 Bearing installer	 09913-84510 Bearing installer	 09922-85811 Spring pin remover
 09925-18011 Bearing installer	 09927-08210 Shaft remover	 09944-66010 Wheel hub/knuckle oil seal installer	 09951-16080 Bearing installer

SECTION 7A1

7A1

MANUAL TRANSMISSION (TYPE 2)

TYPE 2 (For H25/RF Engines)

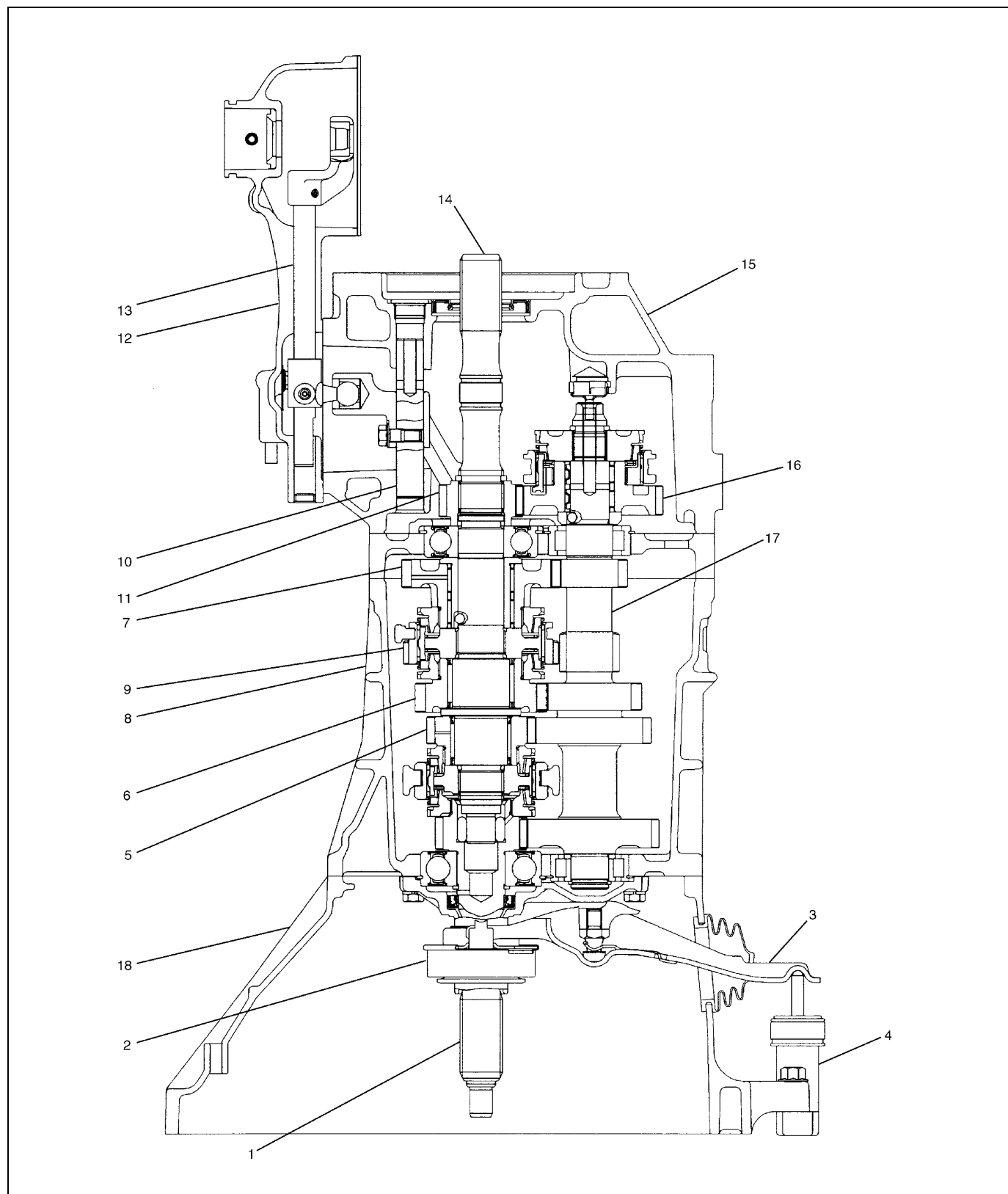


CONTENTS

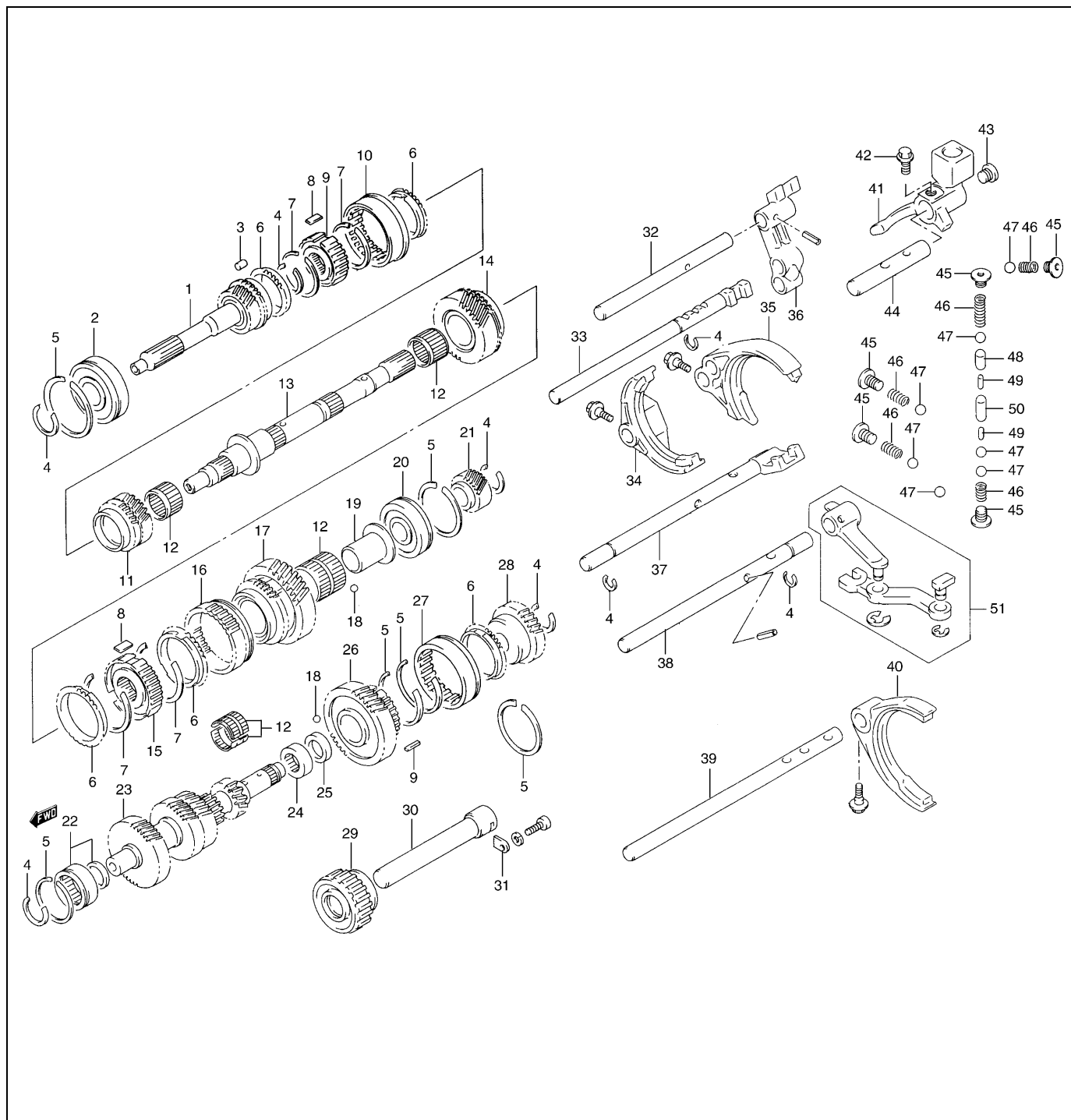
GENERAL DESCRIPTION	7A1-2	UNIT ASSEMBLY.....	7A1-22
COMPONENTS	7A1-2	GEAR SHIFT LEVER CASE	7A1-22
UNIT DISASSEMBLY.....	7A1-5	SUB-ASSEMBLY	7A1-23
GEAR SHIFT LEVER CASE	7A1-5	INPUT SHAFT ASSEMBLY	7A1-23
TRANSMISSION UNIT.....	7A1-5	MAIN SHAFT ASSEMBLY	7A1-24
SUB-ASSEMBLY	7A1-14	COUNTER SHAFT AND REVERSE	
INPUT SHAFT ASSEMBLY	7A1-14	IDLE GEAR.....	7A1-28
MAIN SHAFT ASSEMBLY	7A1-14	INPUT SHAFT BEARING RETAINER	
COUNTER SHAFT & REVERSE IDLE		AND OIL SEAL.....	7A1-29
GEAR	7A1-15	TRANSMISSION REAR CASE	7A1-29
INPUT SHAFT BEARING RETAINER		TRANSMISSION INTERMEDIATE	
AND OIL SEAL.....	7A1-16	CASE AND FRONT CASE (LOCATION	
TRANSMISSION REAR CASE	7A1-16	OF KNOCK AND PLUG).....	7A1-30
COMPONENTS INSPECTION	7A1-17	TRANSMISSION UNIT	7A1-31
SUB-ASSEMBLY	7A1-17	TIGHTENING TORQUE SPECIFICATION..	7A1-42
INPUT SHAFT ASSEMBLY	7A1-17	REQUIRED SERVICE MATERIAL.....	7A1-42
MAIN SHAFT ASSEMBLY	7A1-18	SPECIAL TOOL	7A1-43
COUNTER SHAFT AND REVERSE			
IDLE GEAR	7A1-20		

GENERAL DESCRIPTION

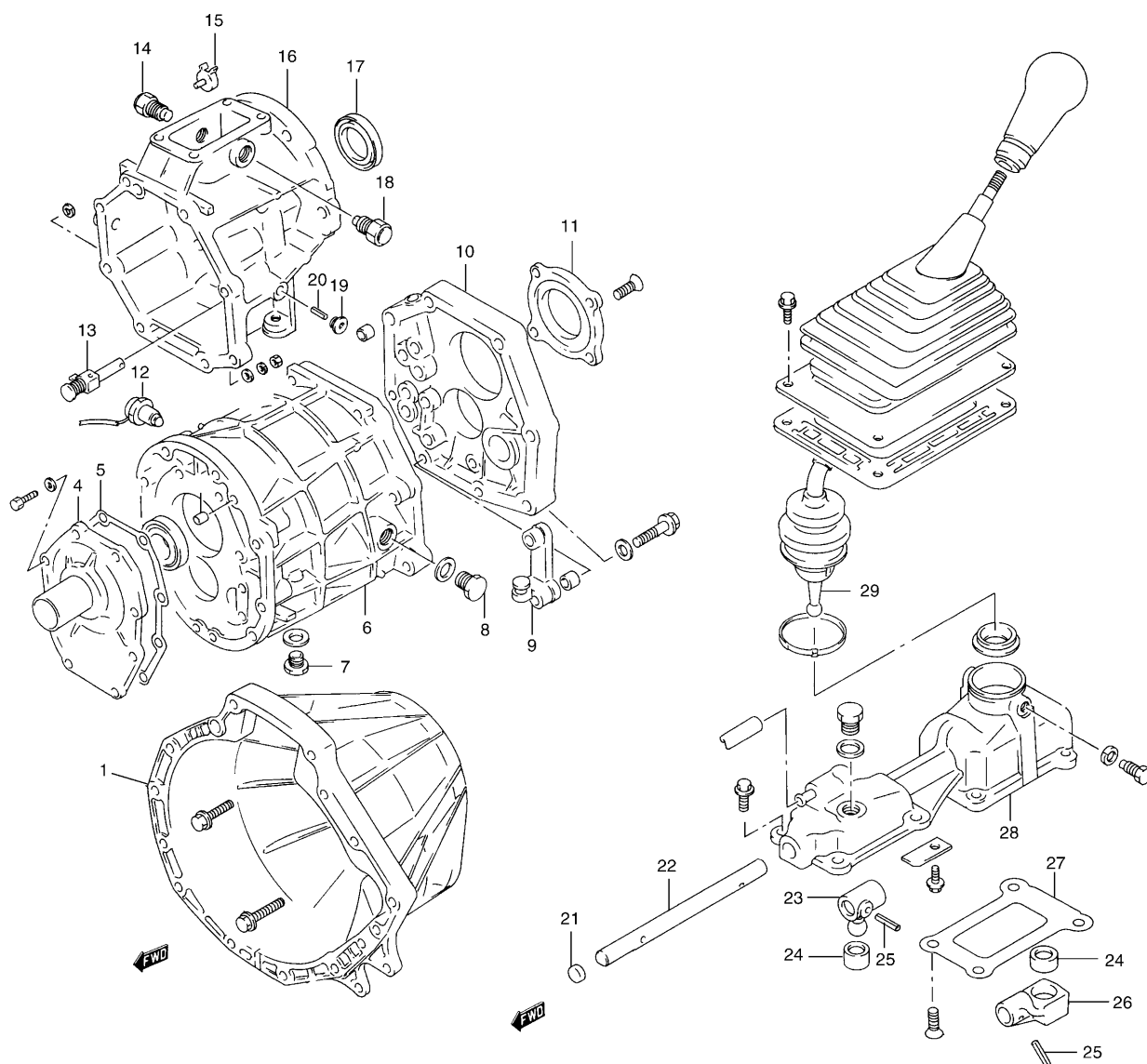
COMPONENTS



- | | | | |
|------------------------------|----------------------------|---------------------------|----------------------------|
| 1. Input shaft | 6. Main shaft 2nd gear | 11. Main shaft 5th gear | 16. Counter shaft 5th gear |
| 2. Clutch release bearing | 7. Main shaft low gear | 12. Gear shift lever case | 17. Counter shaft |
| 3. Clutch release fork | 8. Front case | 13. Gear shift shaft | 18. Clutch housing |
| 4. Clutch operating cylinder | 9. Main shaft reverse gear | 14. Main shaft | |
| 5. Main shaft 3rd gear | 10. Gear shift inner shaft | 15. Rear case | |



- | | | | |
|------------------------|--------------------------------------|----------------------------------|-----------------------------------|
| 1. Input shaft | 14. 2nd gear | 27. 5th sleeve | 40. 5th gear shift fork |
| 2. Input shaft bearing | 15. Low speed hub | 28. 5th speed synchronizer dog | 41. Gear shift shaft inner lever |
| 3. Input shaft roller | 16. Low speed sleeve | 29. Reverse idle gear | 42. Bolt |
| 4. Circlip | 17. Low gear | 30. Reverse gear shaft | 43. Plug |
| 5. C-ring | 18. Ball | 31. Reverse gear shift plate | 44. Gear shift inner shaft |
| 6. Synchronizer ring | 19. Needle bush | 32. 5th-reverse gear shift shaft | 45. Locating screw |
| 7. Synchronizer spring | 20. Main shaft bearing | 33. High gear shift shaft | 46. Locating spring |
| 8. Synchronizer key | 21. 5th gear | 34. High speed gear shift fork | 47. Locating ball |
| 9. High speed hub | 22. Counter shaft front bearing | 35. Low speed gear shift fork | 48. Locating roller No. 3 |
| 10. High speed sleeve | 23. Counter shaft | 36. Reverse gear shift yoke | 49. Locating roller No. 2 |
| 11. 3rd gear | 24. Counter shaft rear bearing | 37. Low gear shift shaft | 50. Locating roller No. 1 |
| 12. Needle bearing | 25. Thrust washer | 38. Reverse gear shift shaft | 51. Reverse gear shift link comp. |
| 13. Main shaft | 26. Counter shaft 5th gear (and hub) | 39. 5th shift shaft | |



- | | | | |
|---------------------------------|--------------------------------------|--------------------------------|------------------------------|
| 1. Clutch housing | 9. Reverse link stay | 17. Main shaft oil seal | 25. Spring pin |
| 2. Blank | 10. Transmission intermediate case | 18. Return spring reverse bolt | 26. Gear shift arm |
| 3. Blank | 11. Main/counter shaft bearing plate | 19. Interlock cam plug | 27. Case plate |
| 4. Input shaft bearing retainer | 12. Back-up light switch | 20. Interlock cam pin | 28. Gear shift lever case |
| 5. Gasket | 13. 5th-reverse interlock cam comp. | 21. Case plug | 29. Gear shift control lever |
| 6. Transmission front case | 14. Return spring low bolt | 22. Gear shift shaft | |
| 7. Oil drain plug | 15. Counter shaft gutter | 23. Gear shift lever | |
| 8. Oil filler/level plug | 16. Transmission rear case | 24. Bush | |

UNIT DISASSEMBLY

GEAR SHIFT LEVER CASE

- 1) Remove case plate.
- 2) With case supported with soft jawed vise, remove lever locating bolts (6).

NOTE:

Use aluminum plates between vise and case to protect case against damage.

- 3) Using special tool, drive spring pin (2) into gear shift arm (5) as far as the position shown in the figure.

CAUTION:

When driving spring pin (2), use care not to damage gear shift lever case (1).

Special tool

(A) : 09922-85811

- 4) Likewise, drive spring pin (2) into gear shift lever (3) as far as the position shown in the figure.

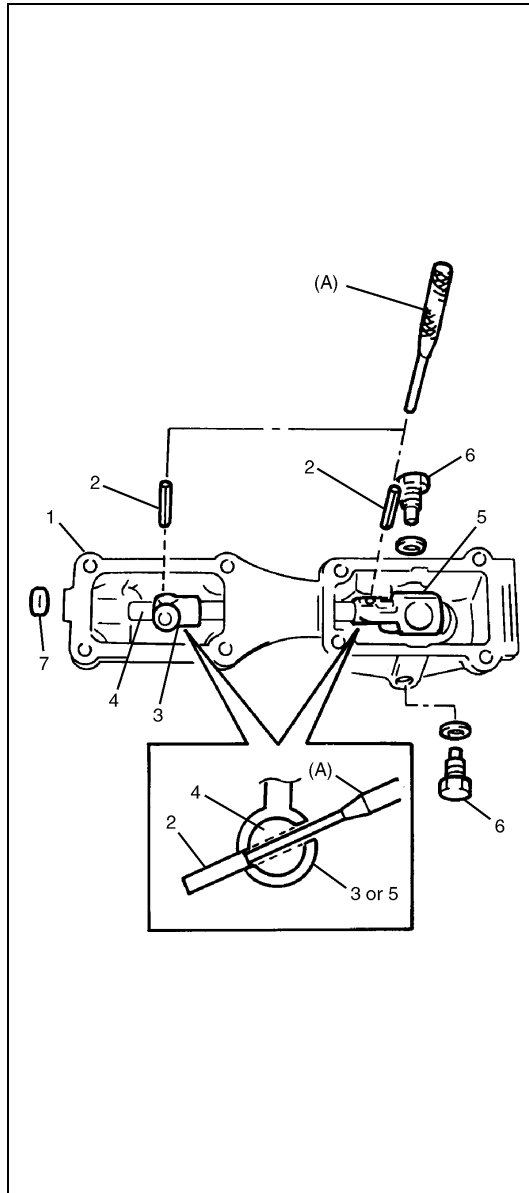
CAUTION:

When driving spring pin (2), use care not to damage gear shift lever case (1).

Special tool

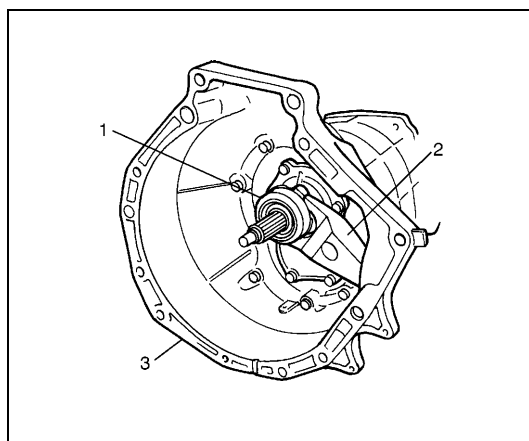
(A) : 09922-85811

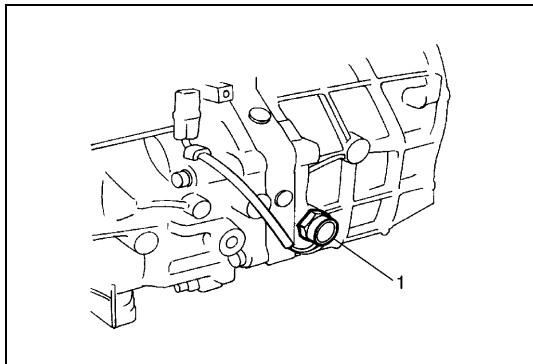
- 5) Remove case plug (7).
- 6) Pull out gear shift shaft (4) from gear shift lever case (1) and take out gear shift lever (3).



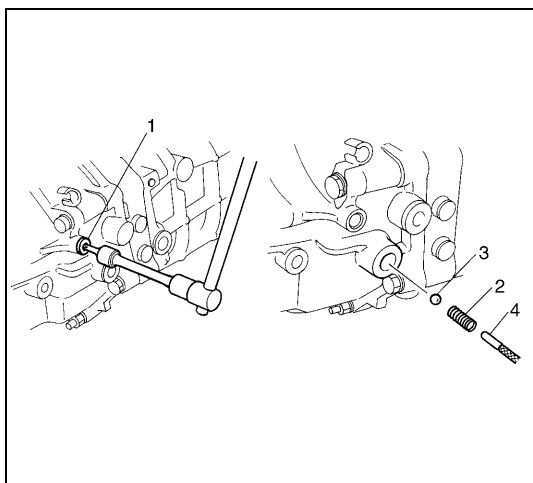
TRANSMISSION UNIT

- 1) Remove clutch release bearing (1), release fork (2) and clutch housing (3).



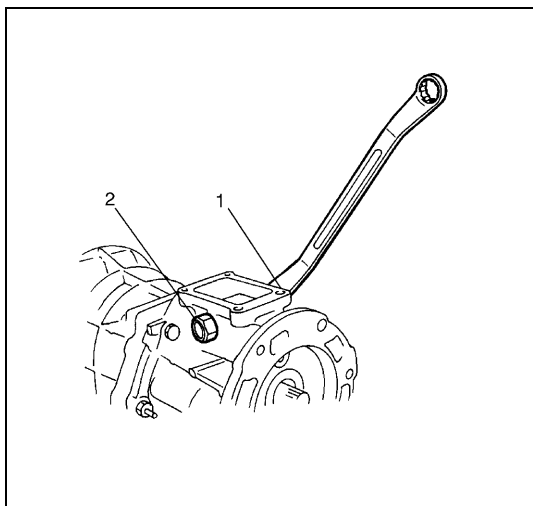


2) Remove back-up light switch (1).

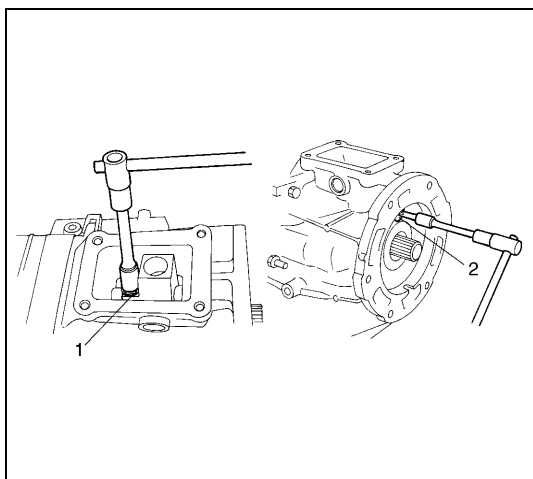


3) Remove locating screw (1), locating spring (2) and locating ball (3) as shown in the figure.

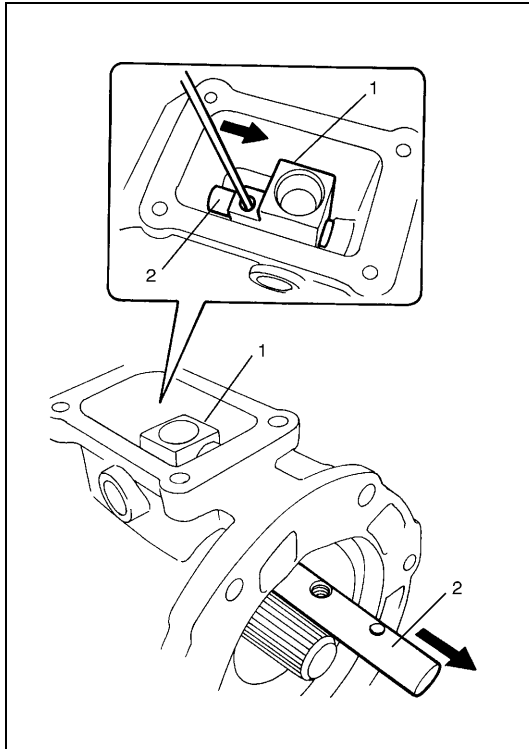
4. Magnet



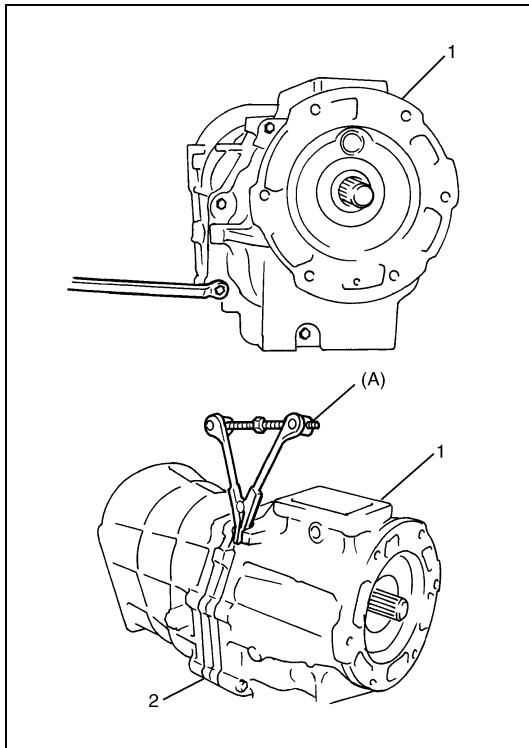
4) Remove return spring low bolt (1) and return spring reverse bolt (2).



5) Remove gear shift shaft inner bolt (1)/plug (2).



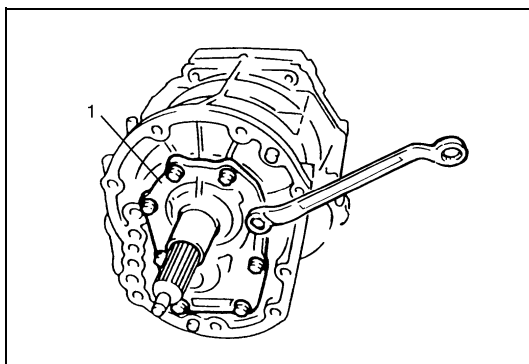
- 6) Using bolt hole, pull gear shift inner shaft (2) and then remove gear shift shaft inner lever (1).



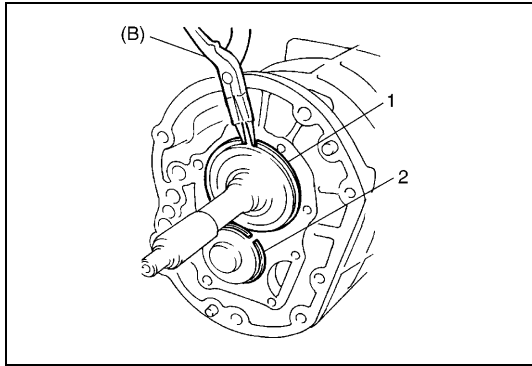
- 7) After removing transmission case bolts/nut, remove transmission rear case (1) from intermediate case (2).

Special tool

(A) : 09912-34510



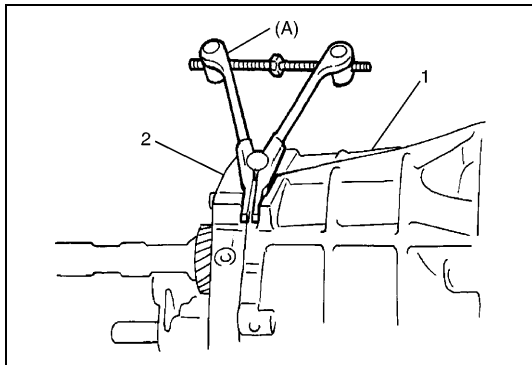
- 8) Remove input shaft bearing retainer (1) and gasket.



- 9) Remove C-ring (1) of input shaft bearing and C-ring (2) of counter shaft front bearing.

Special tool

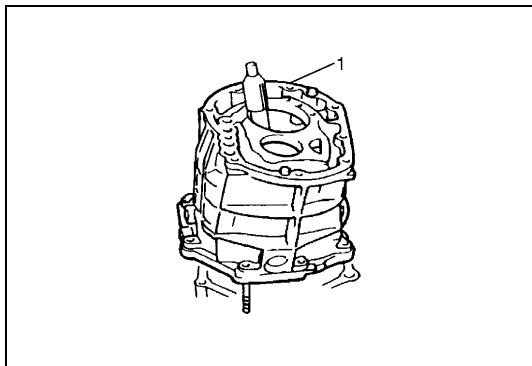
(B) : 09900-06107



- 10) Using special tool, separate transmission front case (1) and transmission intermediate case (2).

Special tool

(A) : 09912-34510

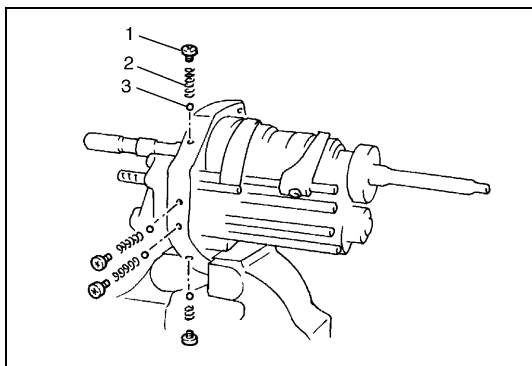


- 11) Set transmission on workbench and remove transmission front case (1).

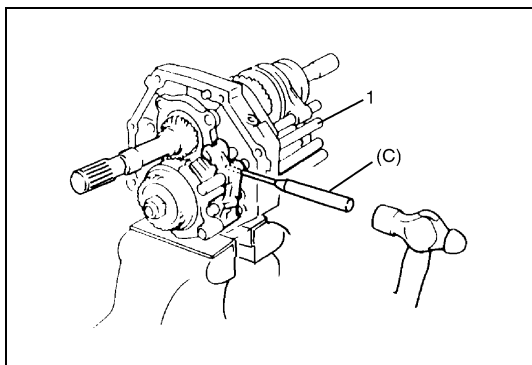
NOTE:

To remove transmission front case, tilt it as shown in the figure.

- 12) Set transmission intermediate case on vise securely.



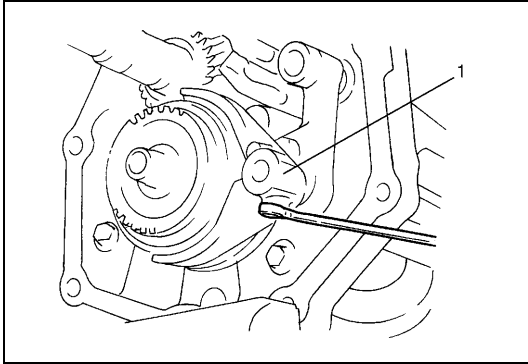
- 13) Remove locating screws (1), locating springs (2) and locating ball (3) as shown in the figure.



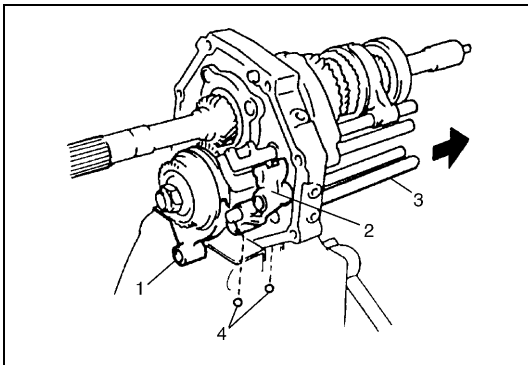
- 14) Using special tool, remove spring pin and then remove 5th-reverse gear shift shaft (1).

Special tool

(C) : 09922-85811



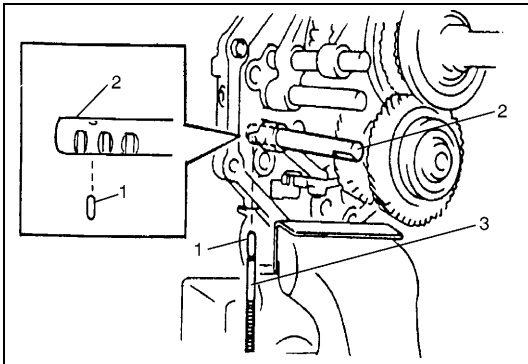
15) Remove bolt from 5th gear shift fork (1).



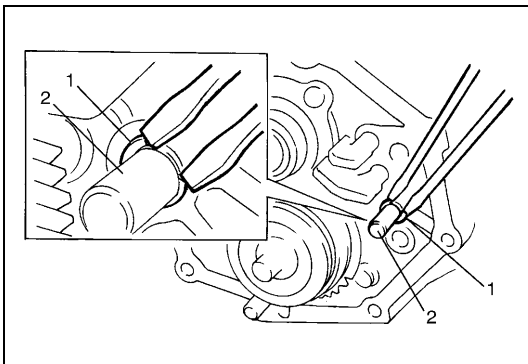
16) Remove 5th gear shift fork (1), 5th gear shift shaft (3) and reverse gear shift yoke (2).

NOTE:

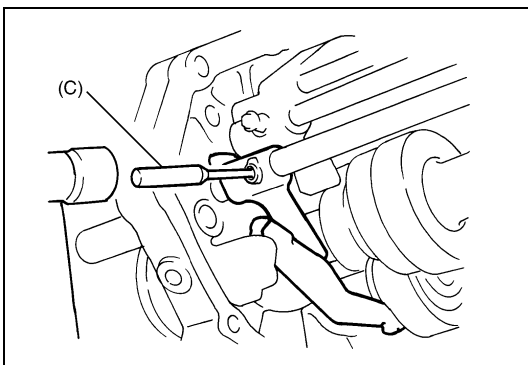
When pulling 5th gear shift shaft (3), place hand so as to catch balls (4) dropping from reverse gear shift yoke (2) and intermediate plate.



17) Remove locating roller No.2 (1) from reverse gear shift shaft (2) by using magnet (3).



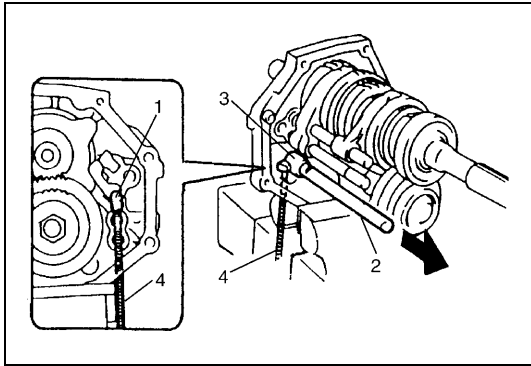
18) Remove circlip (1) from reverse gear shift shaft (2) as shown in the figure.



19) Remove spring pin from reverse gear shift link component.

Special tool

(C) : 09922-85811

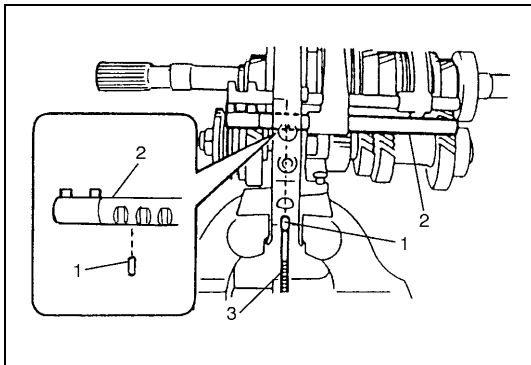


- 20) Remove reverse gear shift shaft (2), locating roller No. 1 (1), and reverse gear shift link component (3) by using magnet.

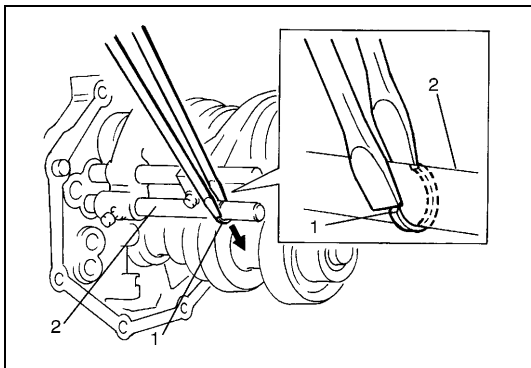
NOTE:

When pulling gear shaft (2), hold locating roller No. 1 (1) with magnet (4) to prevent it from falling.

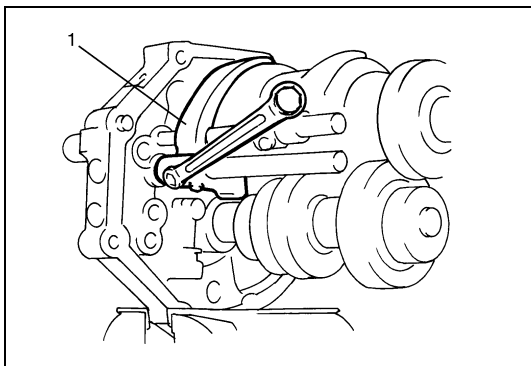
- 21) Disassemble reverse gear shift link component (3) by removing E-rings.



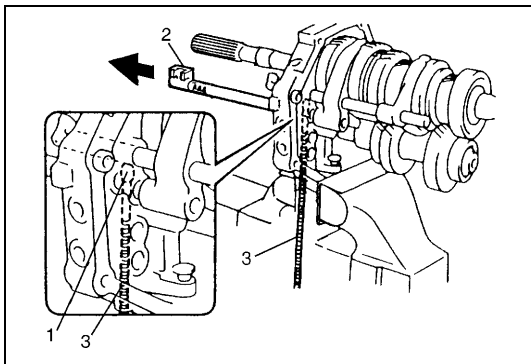
- 22) Remove locating roller No.2 (1) from low gear shift shaft (2) by using magnet (3).



- 23) Remove circlip (1) from low gear shift shaft (2) as shown in the figure.



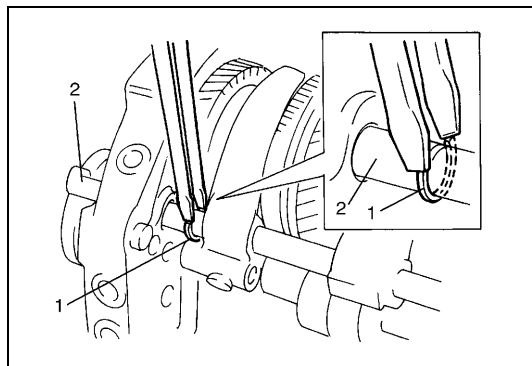
- 24) Remove bolt from low speed gear shift fork (1).



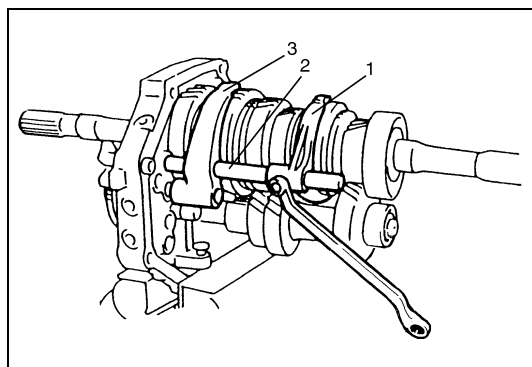
- 25) Remove low gear shift shaft (2) and locating roller No.1 (1) by using magnet (3).

NOTE:

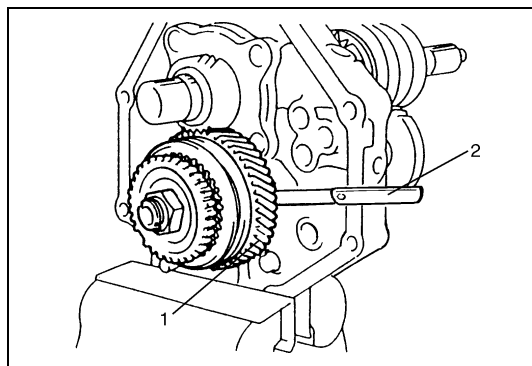
When pulling gear shaft (2), hold locating roller No.1 (1) with magnet (3) to prevent it from falling.



- 26) Remove circlip (1) from high gear shift shaft (2) as shown in the figure.

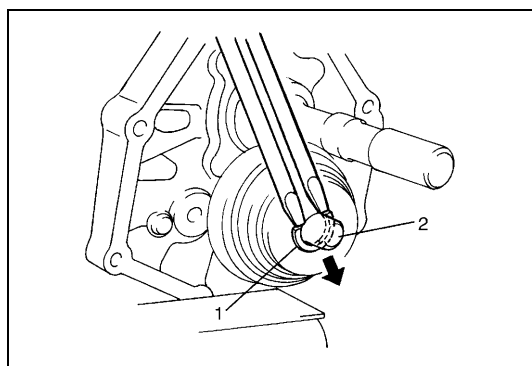


- 27) Remove bolt from high speed gear shift fork (1).
 28) Remove high gear shift shaft (2), high speed gear shift fork (1) and low speed gear shift fork (3).

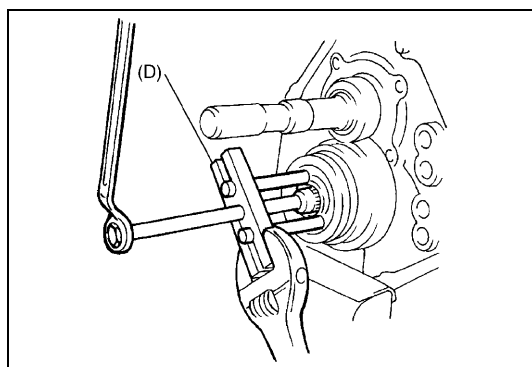


- 29) Check counter shaft 5th gear (1) thrust clearance by using thickness gauge (2).

Counter shaft 5th gear thrust clearance :
Standard : 0.10 – 0.30 mm (0.0040 – 0.0118 in.)



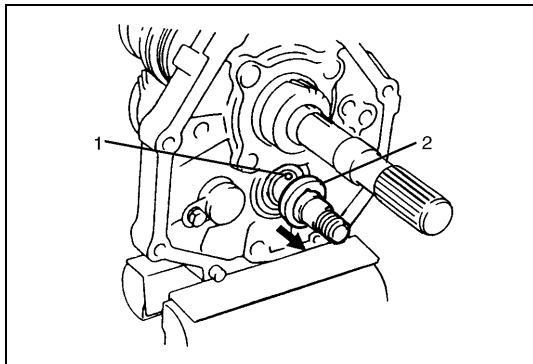
- 30) Remove circlip (1) from counter shaft (2) as shown in the figure.



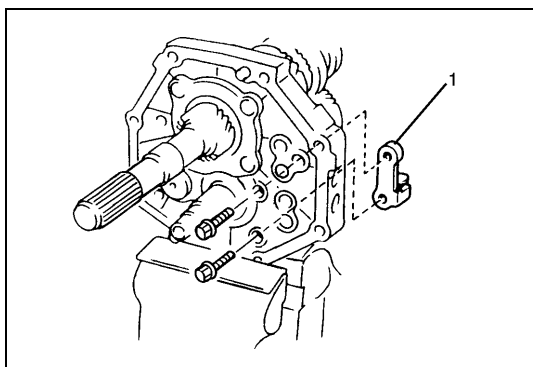
- 31) Remove 5th speed synchronizer dog by using special tool.

Special tool
(D) : 09941-84510

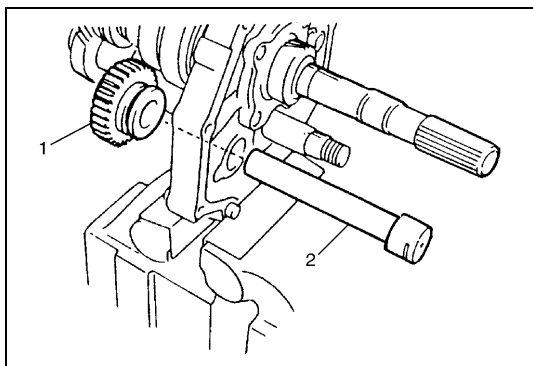
- 32) Remove synchronizer ring, needle bearing and counter shaft 5th gear.



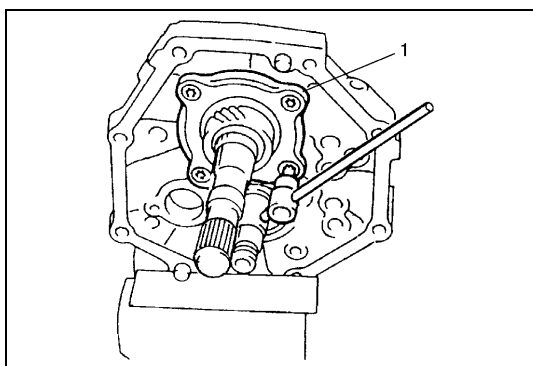
33) Remove thrust washer (2) and ball (1).



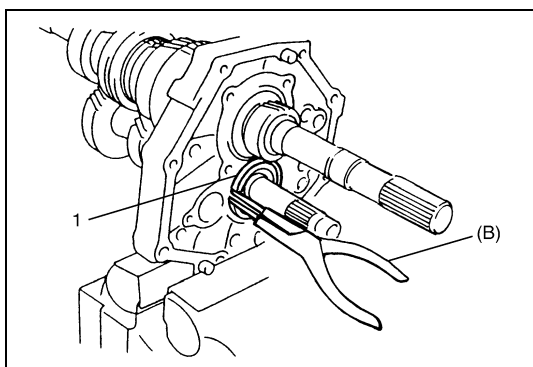
34) Remove reverse link stay (1) from intermediate case.



35) Remove reverse idle gear (1) and shaft (2).



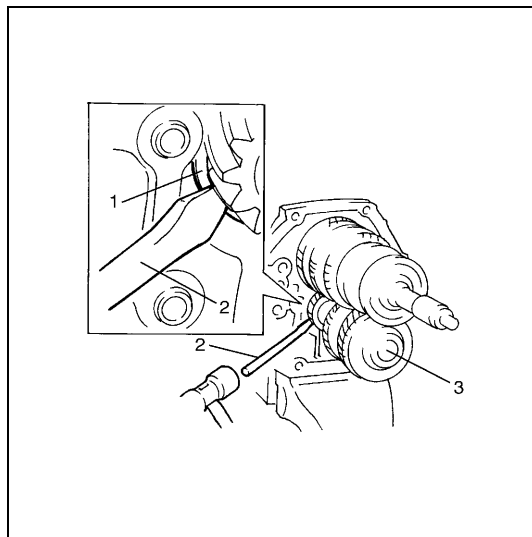
36) Remove main and counter shaft bearing plate (1).



37) Remove C-ring (1) of counter shaft rear bearing.

Special tool

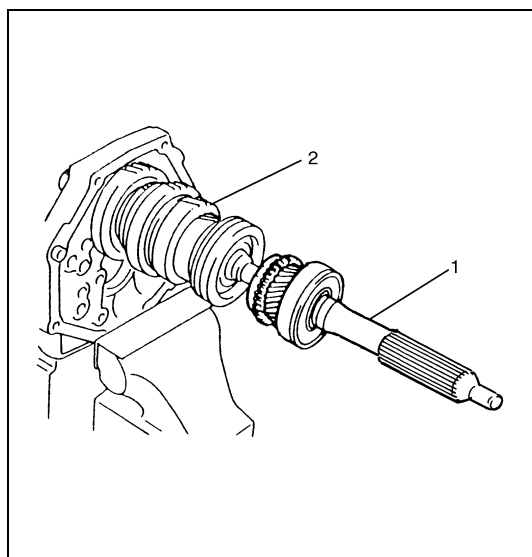
(B) : 09900-06107



- 38) Using rod (2) and hammer, remove counter shaft rear bearing (1) and counter shaft (3).

NOTE:

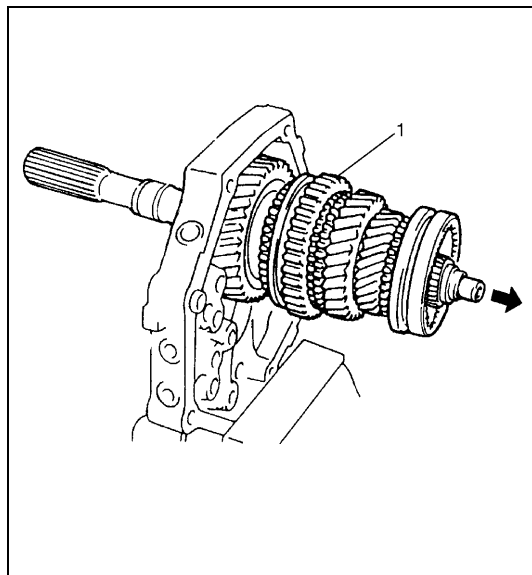
This removal requires 2 persons. One should hold counter shaft (3) and the other should remove bearing (1) by using rod (2) and hammer.



- 39) Remove input shaft assembly (1) with synchronizer ring from main shaft assembly (2).

NOTE:

When removing input shaft, be careful not to drop bearing roller.



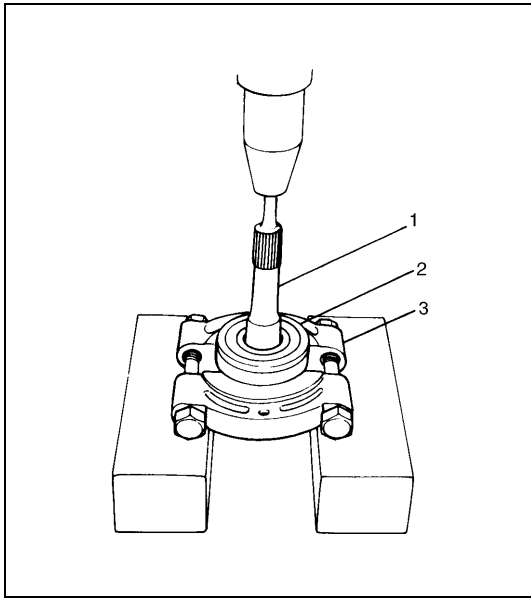
- 40) Remove C-ring of main shaft and pull out main shaft assembly (1).

NOTE:

If intermediate case is engaged with bearing firmly, tap front face of intermediate case with plastic hammer lightly as it will cause main shaft assembly to come off forward.

SUB-ASSEMBLY

INPUT SHAFT ASSEMBLY

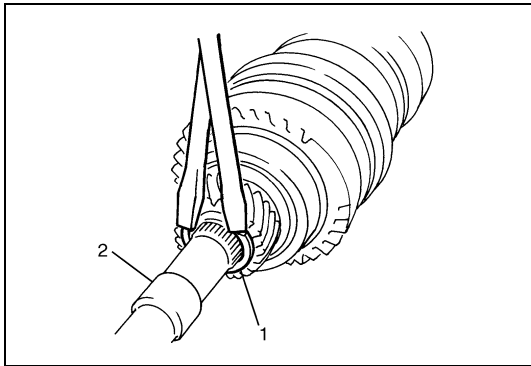


Remove circlip of input shaft (1) and pull out bearing (2) with puller (3) and press.

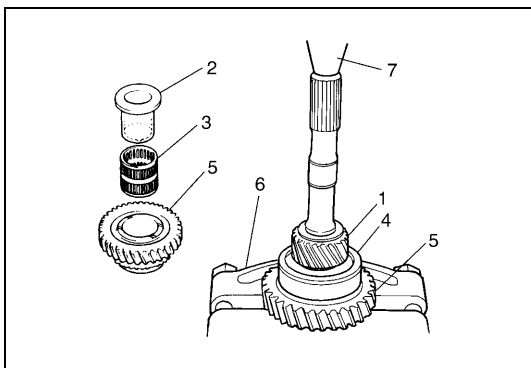
CAUTION:

Sealed bearing must not be washed. Replace it with new one when required.

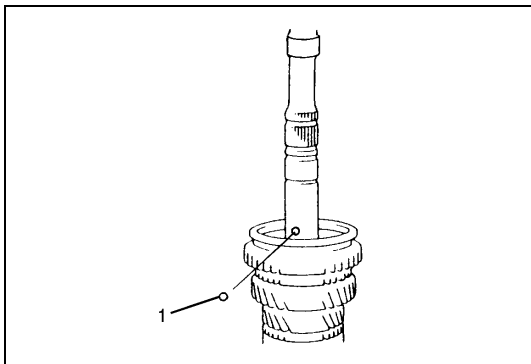
MAIN SHAFT ASSEMBLY



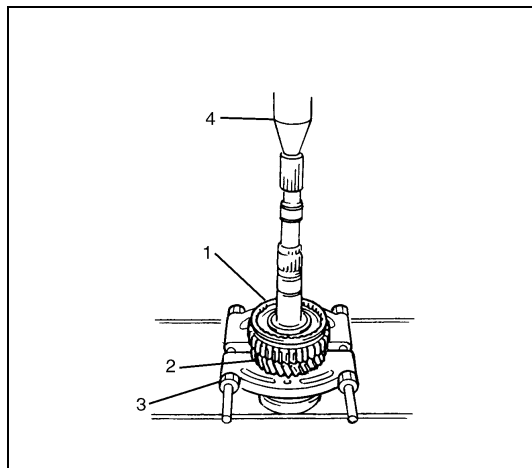
1) Remove circlip (1) from main shaft (2) as shown in the figure.



2) Pull out 5th gear (1), needle bush (2), needle bearing (3), main shaft bearing (4) and low gear (5) with puller (6) and press (7).

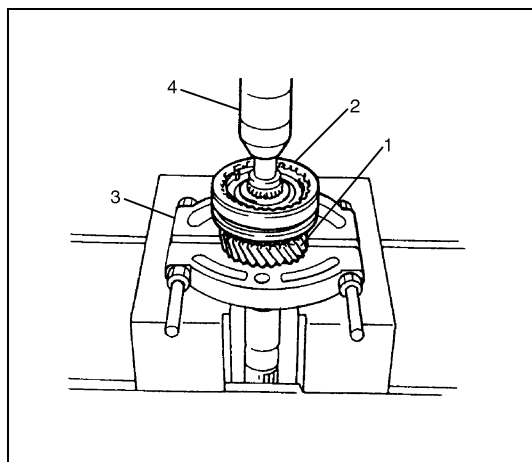


3) Remove synchronizer ring and ball (1).



- 4) Pull out low speed sleeve/hub assembly (1), needle bearing and 2nd gear (2) from main shaft.
- 5) Pull off synchronizer springs/keys and low speed sleeve from hub.

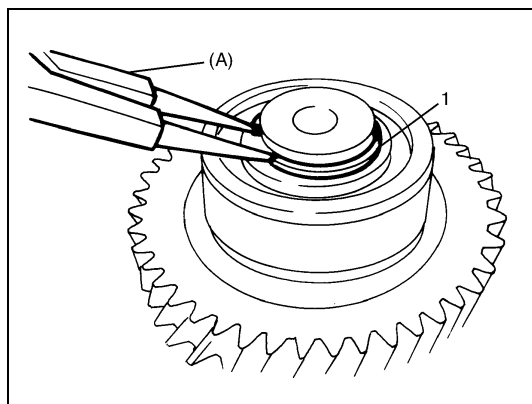
3. Puller
4. Press



- 6) Remove circlip from front part of main shaft and pull out 3rd gear (1), needle bearing, synchronizer ring and high speed sleeve/hub assembly (2).

3. Puller
4. Press

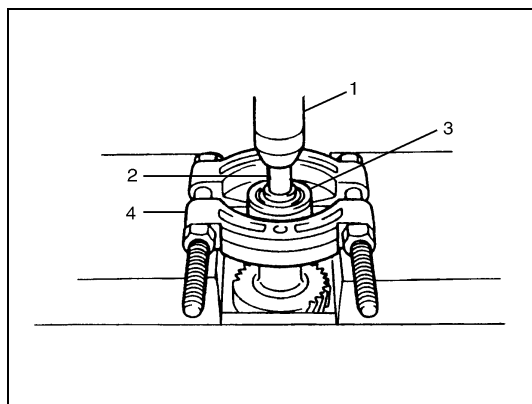
COUNTER SHAFT & REVERSE IDLE GEAR



- 1) Remove circlip (1) from counter shaft.

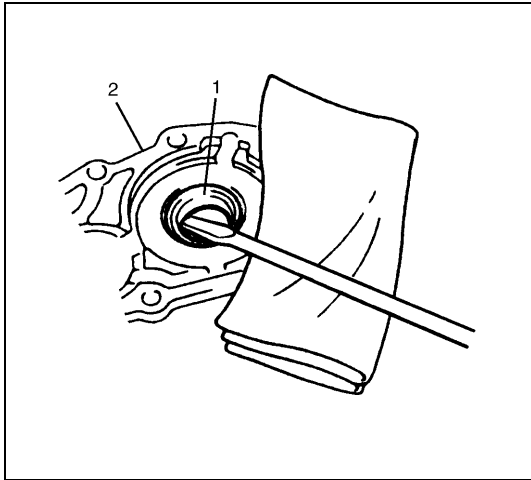
Special tool

(A) : 09900-06107



- 2) Pull out bearing (3) from counter shaft by using puller (4), press (1) and rod (diameter approx. 22 mm (0.87 in.)) (2).

INPUT SHAFT BEARING RETAINER AND OIL SEAL

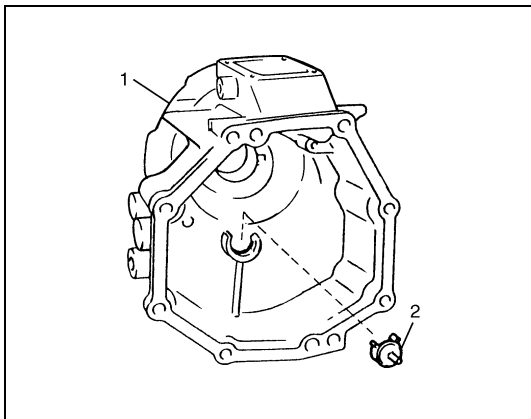


Remove oil seal (1) from bearing retainer (2) by using rod or the like as shown in the figure.

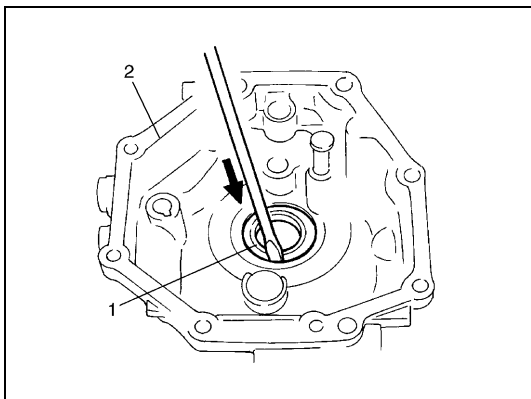
NOTE:

Unless oil seal is leaky or its lip is excessively hardened, replacement is not necessary.

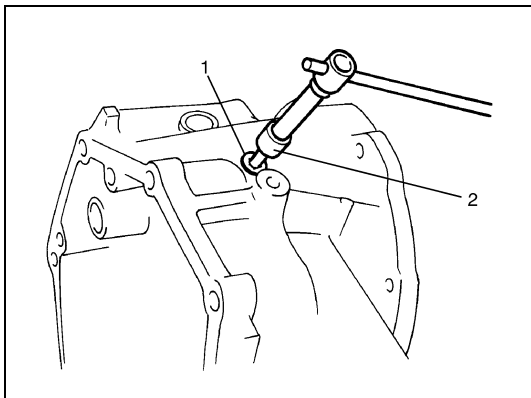
TRANSMISSION REAR CASE



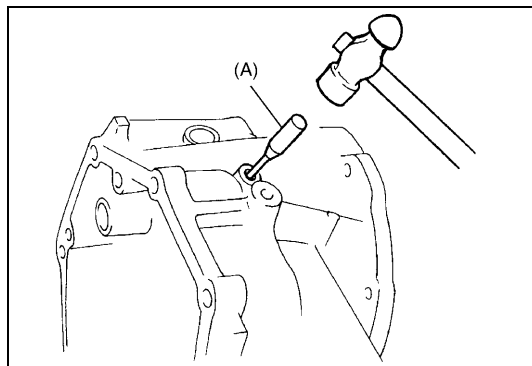
- 1) Remove counter shaft gutter (2) from transmission rear case (1).



- 2) Take out oil seal (1) from rear case (2).



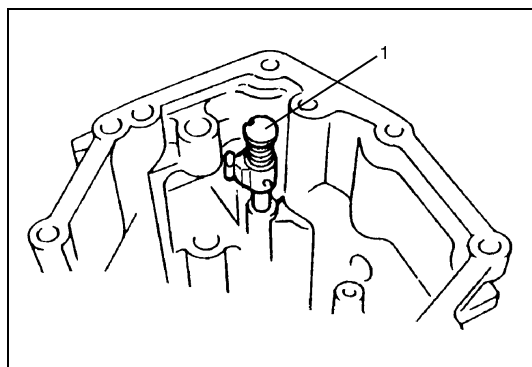
- 3) Remove interlock cam plug (1) by using torx® (2).



4) Remove pin by using special tool.

Special tool

(A) : 09922-85811

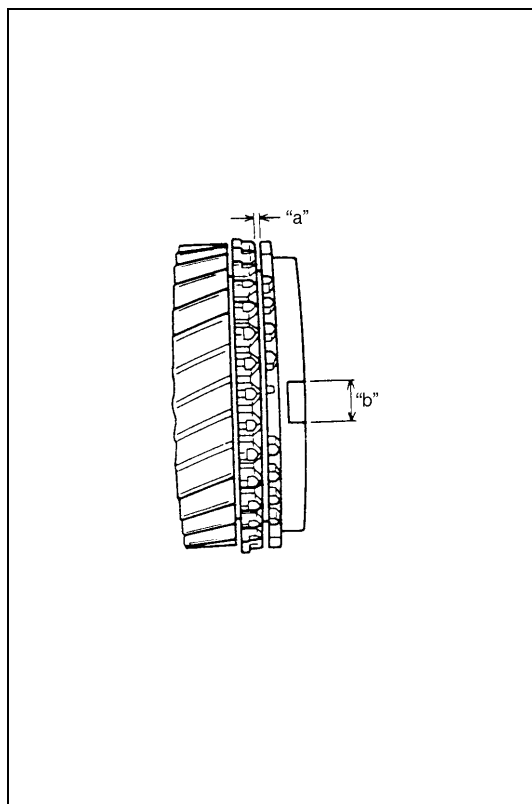


5) Pull out interlock cam component (1).

COMPONENTS INSPECTION

SUB-ASSEMBLY

INPUT SHAFT ASSEMBLY



Check clearance “a” between synchronizer ring and gear, key slot width “b” in synchronizer ring and each chamfered tooth of gear and synchronizer ring and replace with new one, if necessary. Also, check gear tooth.

Clearance “a” between synchronizer ring and gear (input shaft) :

Standard : 1.0 – 2.0 mm (0.039 – 0.078 in.)

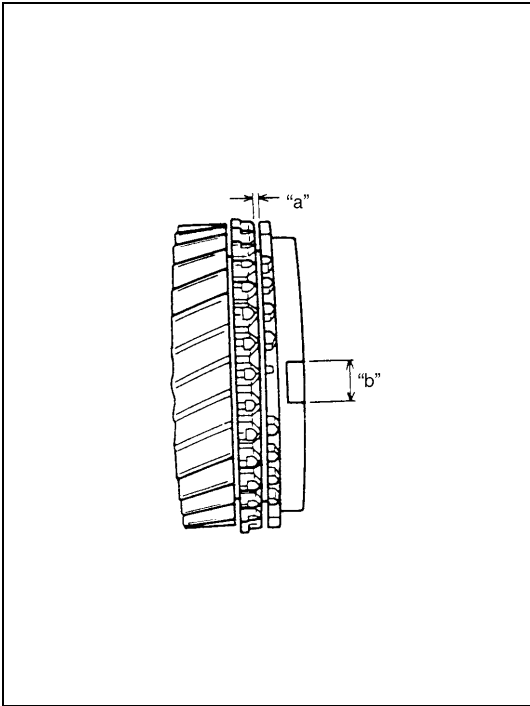
Service limit : 0.8 mm (0.032 in.)

Key slot width “b” (input shaft) :

Standard : 10.0 – 10.2 mm (0.394 – 0.401 in.)

Service limit : 10.45 mm (0.411 in.)

MAIN SHAFT ASSEMBLY



Check clearance “a” between synchronizer ring and gear, key slot width “b” in synchronizer ring and each chamfered tooth of gear and synchronizer ring and replace with new one, if necessary. Also, check gear tooth.

Clearance “a” between synchronizer ring and gear (Main shaft) :

Standard : 1.0 – 2.0 mm (0.039 – 0.078 in.)

Service limit : 0.8 mm (0.032 in.)

Key slot width “b” (Main shaft) :

1st, 2nd :

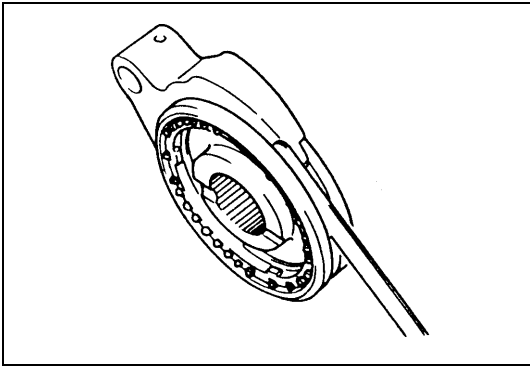
Standard : 12.2 – 12.4 mm (0.481 – 0.488 in.)

Service limit : 12.65 mm (0.498 in.)

3rd :

Standard : 10.0 – 10.2 mm (0.394 – 0.401 in.)

Service limit : 10.45 mm (0.411 in.)

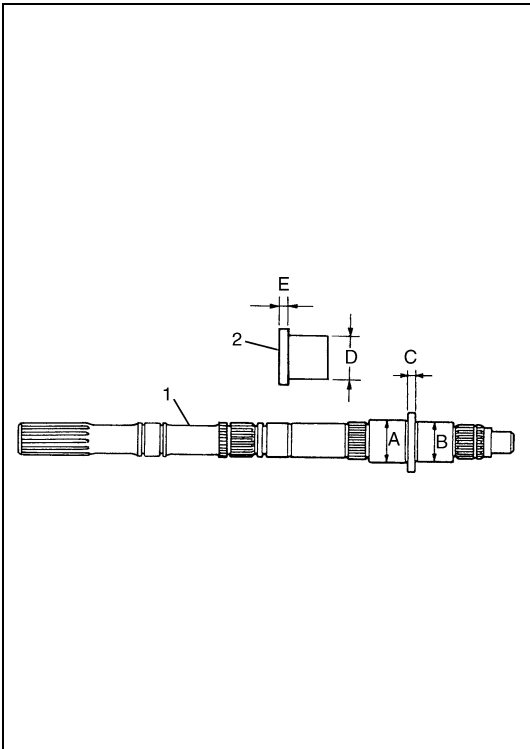


- Check clearance between fork and sleeve.
If clearance exceeds limit, replace fork and sleeve.

Clearance between fork and sleeve :

Standard : 0.15 – 0.35 mm (0.006 – 0.013 in.)

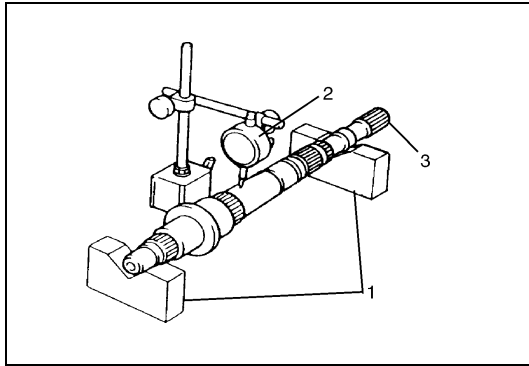
Limit : 1.0 mm (0.039 in.)



- Check diameter of main shaft (1)/needle bush (2) and thickness of main shaft (1)/needle bush (2) flanges as shown in the figure. If measured value is out of specification, replace them (or it).

Main shaft/needle bush specification (diameter and thickness) :

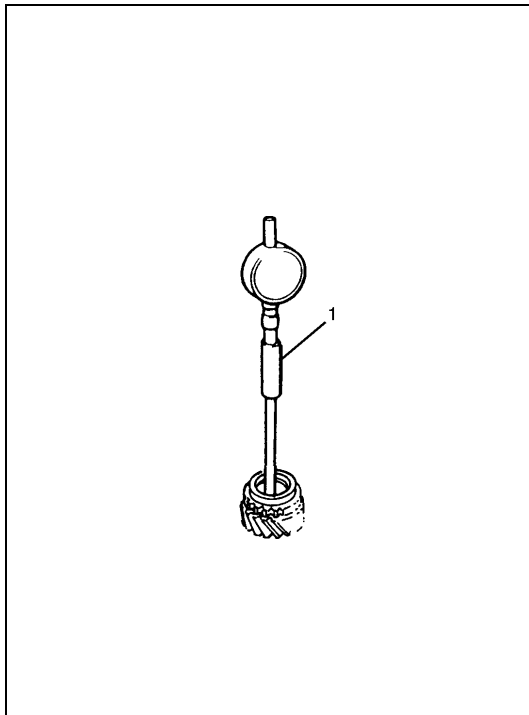
Measuring portion	Standard
A	37.984 – 38.000 mm (1.4955 – 1.4960 in.)
B	34.984 – 35.000 mm (1.3774 – 1.3779 in.)
C	4.80 – 5.20 mm (0.1840 – 0.2047 in.)
D	38.985 – 39.000 mm (1.5348 – 1.5354 in.)
E	3.955 – 4.195 mm (0.1558 – 0.1651 in.)



- Using “V” blocks (1) and dial gauge (2), check runout. If runout exceeds limit below, replace main shaft (3).

Main shaft runout :

limit : 0.06 mm (0.0023 in.)

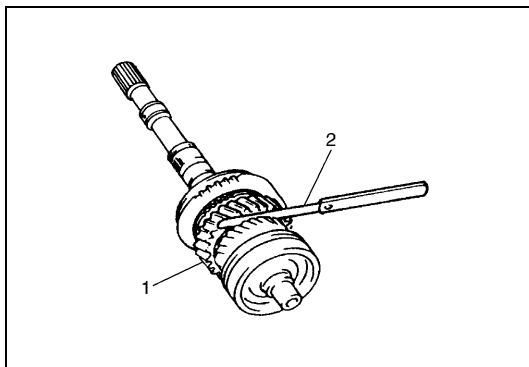


- Using cylinder gauge (1), check inside diameter of each gear. If its inside diameter exceeds specification, replace it.

Inside diameter of gear :

	Standard
1st gear	44.015 – 44.040 mm (1.7329 – 1.7338 in.)
2nd gear	
3rd gear	

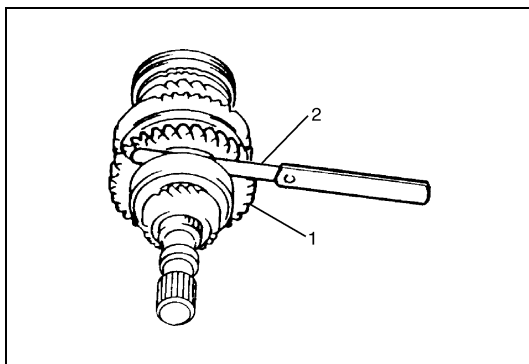
- Check chamfered part of each sleeve for damage and excessive wear, and replace as necessary.
- Check each synchronizer key and synchronizer spring and replace as necessary.
- Check splined portions and replace parts if excessive wear is found.



- Check 2nd gear (1) thrust clearance by using thickness gauge (2). If clearance is out of specification, repress-fit or replace defective part.

2nd gear thrust clearance :

Standard : 0.10 – 0.25 mm (0.004 – 0.009 in.)

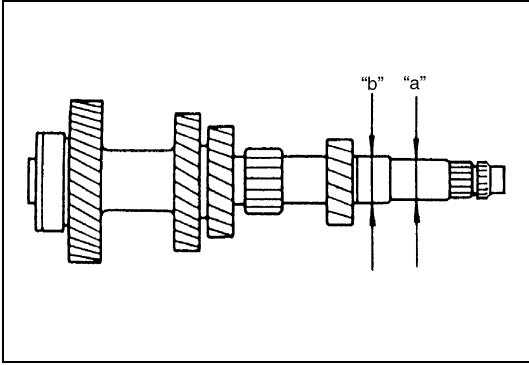


- Check low gear (1) thrust clearance by using thickness gauge (2). If clearance is out of specification, repress-fit or replace mainshaft bearing and 5th gear.

Low gear thrust clearance :

Standard : 0.10 – 0.25 mm (0.004 – 0.009 in.)

COUNTER SHAFT AND REVERSE IDLE GEAR

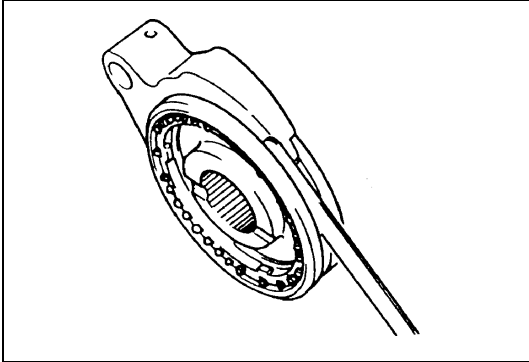


- Using micrometer, check diameter of counter shaft as shown in the figure. If measured value is out of specification, replace it.

Counter shaft diameter (standard) :

"a" : 25.986 – 26.00 mm (1.0231 – 1.0236 in.)

"b" : 30.957 – 30.972 mm (1.2188 – 1.2193 in.)

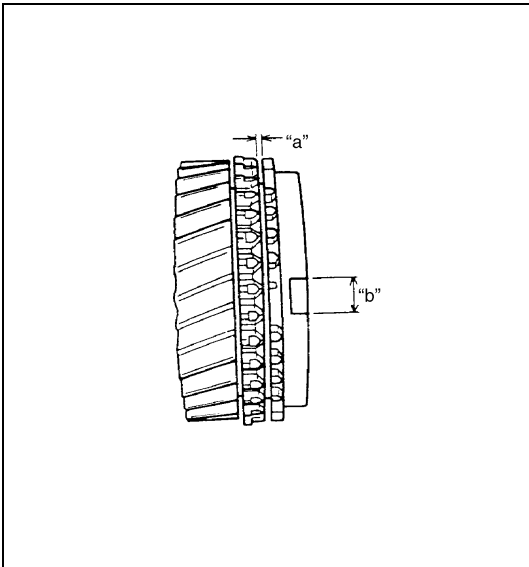


- Check clearance between fork and sleeve.
If clearance exceeds limit, replace fork and sleeve.

Clearance between fork and sleeve :

Standard : 0.15 – 0.35 mm (0.006 – 0.013 in.)

Limit : 1.0 mm (0.039 in.)



- Check clearance "a" between synchronizer ring and gear, key slot width "b" in synchronizer ring and each chamfered tooth of gear and synchronizer ring and replace with new one, if necessary. Also, check gear tooth.

Clearance "a" between synchronizer ring and gear (counter shaft) :

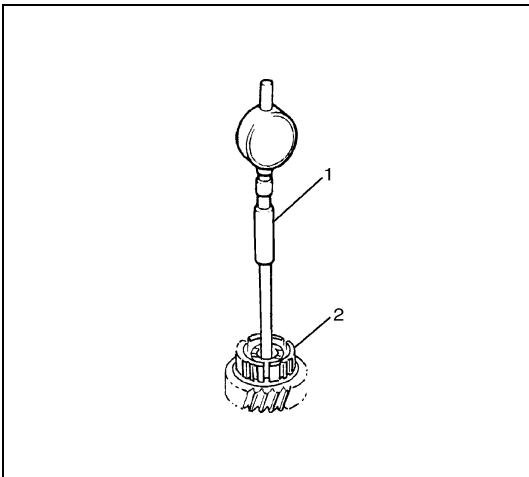
Standard : 1.0 – 2.0 mm (0.039 – 0.078 in.)

Service limit : 0.8 mm (0.032 in.)

Key slot width "b" (counter shaft) :

Standard : 10.0 – 10.2 mm (0.394 – 0.4015 in.)

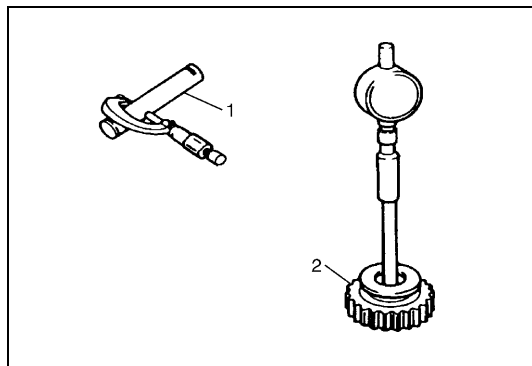
Service limit : 10.45 mm (0.411 in.)



- Using cylinder gauge (1), check inside diameter of counter shaft 5th gear (2). If measured value exceeds specification, replace gear.

Counter shaft 5th gear diameter :

Standard : 33.015 – 33.040 mm (1.2999 – 1.3007 in.)



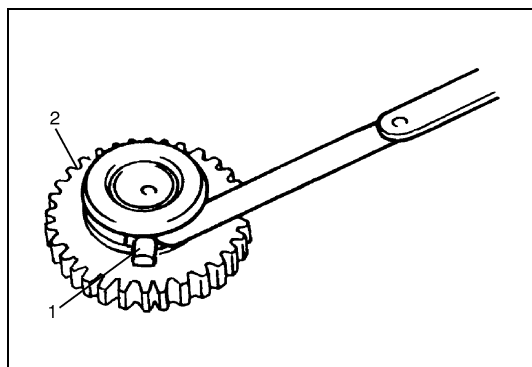
- Check oil clearance between reverse idle gear (2) and shaft (1) by measuring inside diameter of gear and diameter of shaft and calculate its clearance.

If clearance exceeds limit, replace gear and shaft.

Oil clearance between reverse idle gear and shaft

Standard : 0.040 – 0.082 mm (0.0016 – 0.0032 in.)

Limit : 0.13 mm (0.005 in.)



- Check clearance between reverse idle gear (2) and shoe (1) of reverse gear shift link.

If clearance exceeds limit, replace shoe.

Clearance between reverse idle gear and shoe

Standard : 0.05 mm – 0.28 mm (0.002 – 0.011 in.)

Limit : 0.5 mm (0.019 in.)

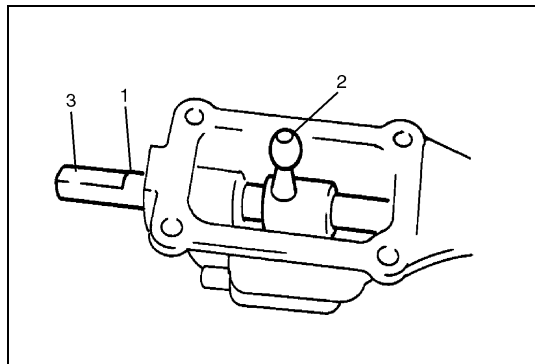
UNIT ASSEMBLY

GEAR SHIFT LEVER CASE

- 1) Wash and inspect each part and replace if necessary. Also check item as described below and correct whatever necessary carefully by using reamer, oilstone and the like, wash it thoroughly and reassemble it.

Item to be checked is;

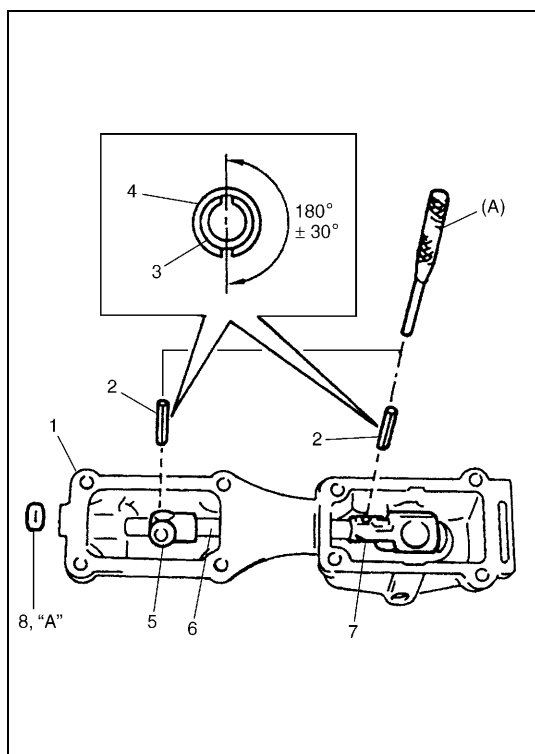
- Shift shaft should go into case smoothly.



- 2) Insert shift shaft (1) as shown in the figure while making sure that inner parts are in proper direction.

NOTE:

- Cut off portion (3) in shift shaft (1) should face downward when shift shaft (1) is installed.
- Shift lever (2) should be installed at the same time.



- 3) Drive in spring pins (2) for gear shift lever (5) and shift arm (7).

NOTE:

When driving in spring pins, position their slits $180^\circ \pm 30^\circ$ apart.

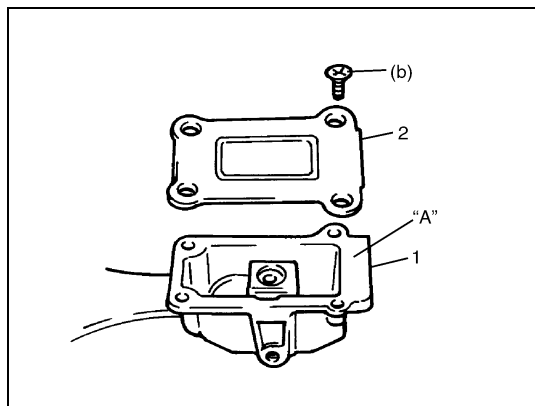
Special tool

(A) : 09925-78210

- 4) Apply sealant to new case plug (8) and drive it into lever case (1).

“A” : Sealant 99000-31110

- | | |
|----|------------------|
| 3. | Inner spring pin |
| 4. | Outer spring pin |
| 6. | Gear shift shaft |



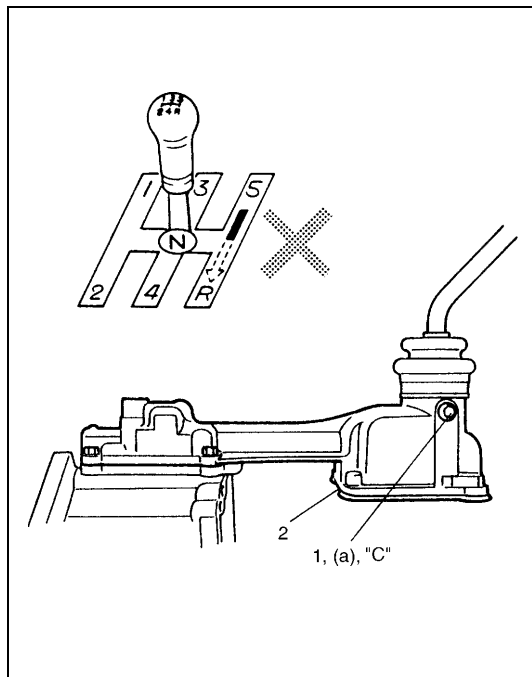
- 5) Clean mating surface of gear shift lever case (1) and case plate (2), and then apply sealant evenly to surface of gear shift lever case (1).

“A” : Sealant 99000-31110

- 6) Tighten screws to specified torque.

Tightening torque

Gear shift lever case plate screw (b) :
6 N·m (0.6 kg-m, 4.5 lb-ft)



- 7) Install gear shift lever case (2) to transmission without using sealant for functional check.
- 8) Install shift control lever and check to make sure that it shifts smoothly according to shift pattern as shown in the figure.

NOTE:

- Apply thread lock cement “C” to control lever locating bolts (1) when retightening.
- Be sure to apply sealant to mating surface of gear shift lever case (2) for its final installation.

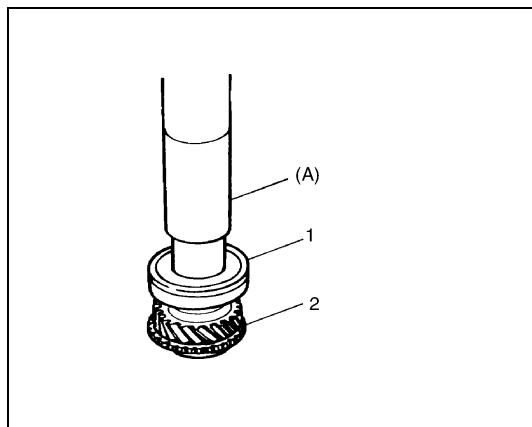
“C” : Cement 99000-32020

Tightening torque

Control lever locating bolt (a) :
17 N·m (1.7 kg-m, 12.5 lb-ft)

SUB-ASSEMBLY

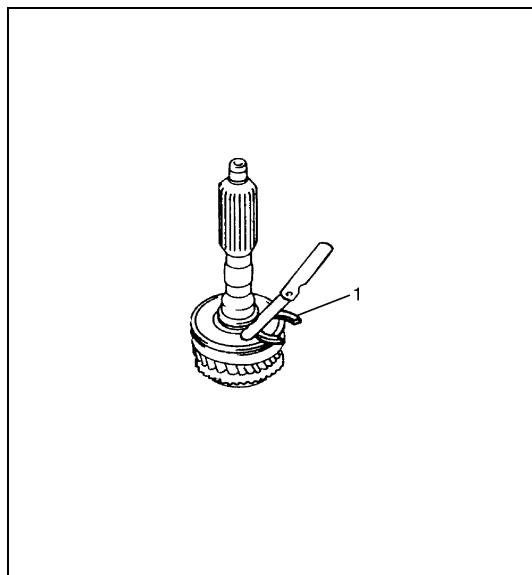
INPUT SHAFT ASSEMBLY



- 1) Bring bearing (1) so that its groove for circlip is in the front of input shaft (2) and press-fit with special tool and press.

Special tool

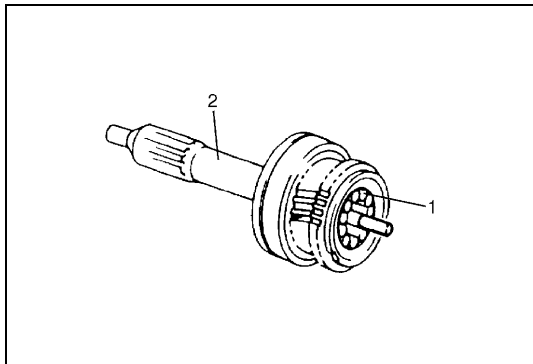
(A) : 09940-51710



- 2) Select circlip (1) that will make thrust clearance of bearing 0.1 mm (0.0039 in) or less and install it.

Circlip thickness specification :

ID mark	Circlip thickness
0	2.05 – 2.10 mm (0.0807 – 0.0826 in.)
1	2.10 – 2.15 (0.0827 – 0.0846 in.)
2	2.15 – 2.20 (0.0847 – 0.0866 in.)
3	2.20 – 2.25 (0.0867 – 0.0885 in.)
4	2.25 – 2.30 (0.0886 – 0.0905 in.)
5	2.30 – 2.35 (0.0906 – 0.0925 in.)



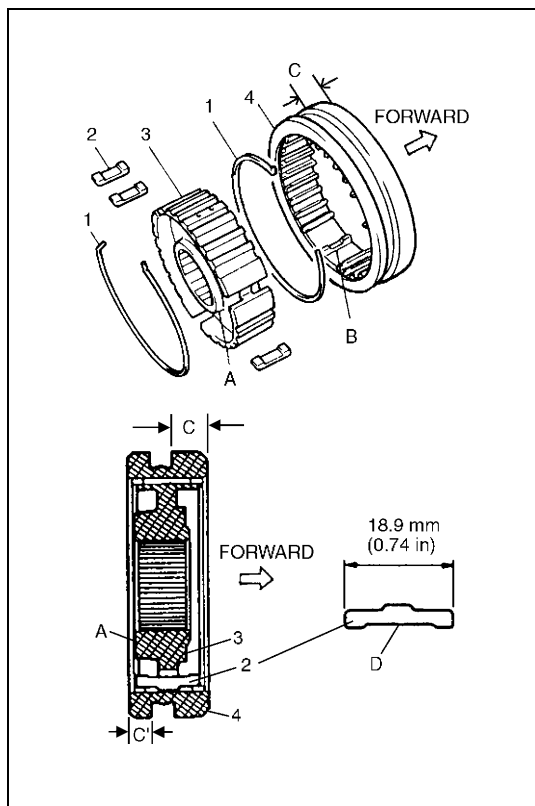
- 3) Apply grease to bearing roller (1) and install it to input shaft (2).

Grease : 99000-25010

MAIN SHAFT ASSEMBLY

NOTE:

- Before installation, wash each part and apply specified gear oil to sliding faces of bearing and gear.
- Use new circlips on shaft for installation. Don't reuse circlips.

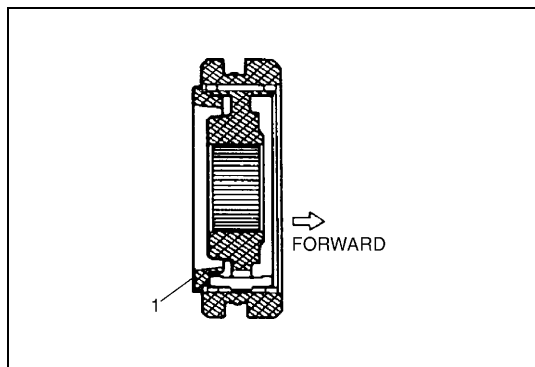


- 1) Assemble high speed synchronizer hub (3), sleeve (4), springs (1) and keys (2) according to the following procedure.
- Slide hub (3) in sleeve (4) so that wider flange side of sleeve (4) and boss side of hub (3) face opposite as shown in the figure, also aligning hub slots with key location teeth of sleeve (4).
 - Insert keys (2) in hub slots with depression side of keys face center of hub (3).
 - Install springs (1) to internal circle of key locations with spring end gaps apart at angles about 120 degrees each other, in order to apply spring tension equally to each key.

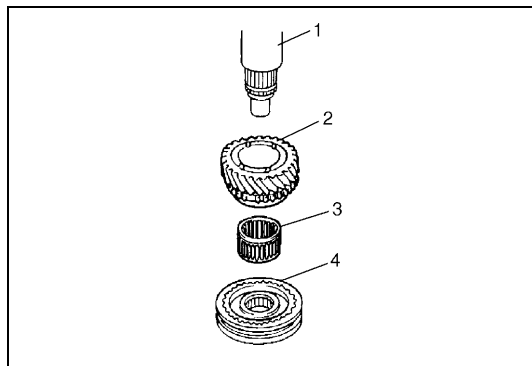
NOTE:

Do not mix high and low speed synchronizer keys as dimensions are different.

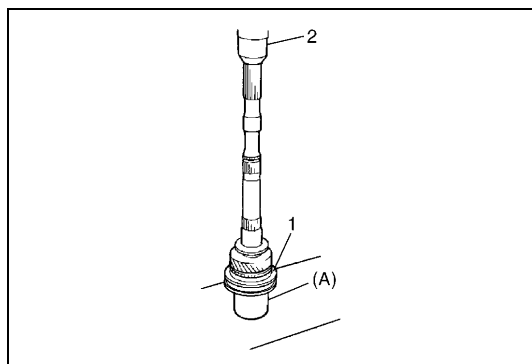
- | | |
|-----|---------------------|
| A : | Boss |
| B : | Key location teeth |
| C : | Wider flange (C>C') |
| D : | Depression of key |



- 2) Install synchronizer ring (1) by matching its key slots to keys as shown in the figure.



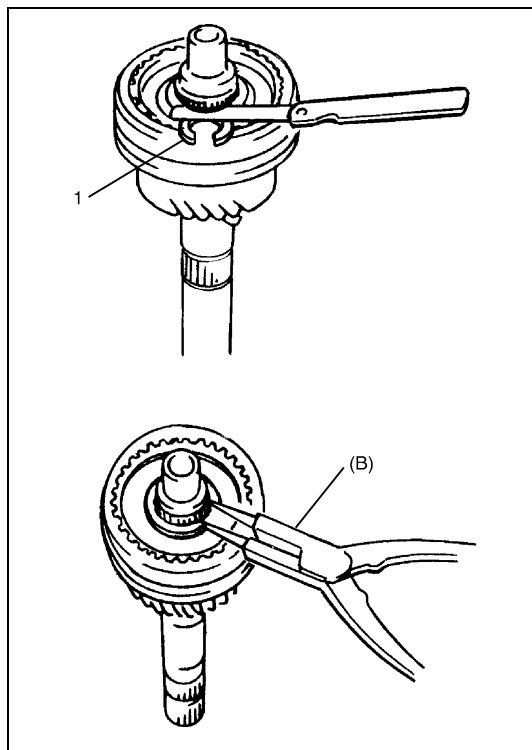
- 3) Insert 3rd gear, (2) needle bearing (3) and high speed sleeve/hub assembly (4) with synchronizer ring to main shaft (1).



- 4) Press-fit high speed sleeve/hub assembly (1) with special tool and press (2).

Special tool

(A) : 09940-53111



- 5) Select circlip (1) that will make thrust clearance of clutch hub 0.1 mm (0.0039 in) or less and install it.

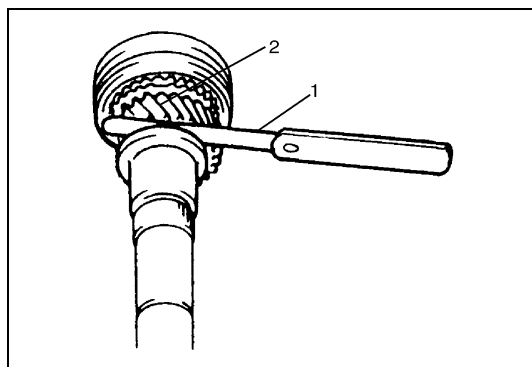
Circlip thickness specification :

ID mark	Circlip thickness
C - 1	1.75 - 1.80 mm (0.0689 - 0.0708 in.)
D	1.80 - 1.85 mm (0.0709 - 0.0728 in.)
D - 1	1.85 - 1.90 mm (0.0729 - 0.0748 in.)
E	1.90 - 1.95 mm (0.0749 - 0.0767 in.)
E - 1	1.95 - 2.00 mm (0.0768 - 0.0787 in.)
F	2.00 - 2.05 mm (0.0788 - 0.0807 in.)
F - 1	2.05 - 2.10 mm (0.0808 - 0.0826 in.)

Special tool

(B) : 09900-06107

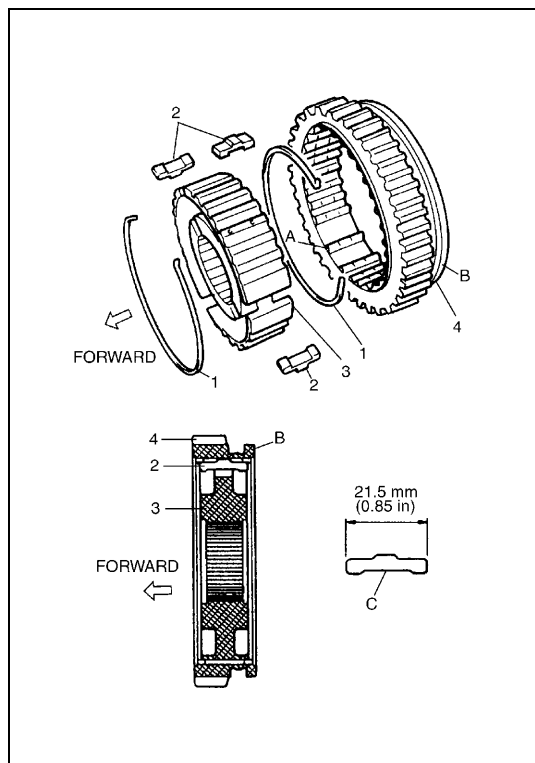
- 6) After installing circlip, check that 3rd gear turns lightly.



- 7) Check 3rd gear (2) thrust clearance by using thickness gauge (1). If clearance is out of specification, repress-fit or replace.

3rd gear thrust clearance :

Standard : 0.10 - 0.25 mm (0.004 - 0.009 in.)



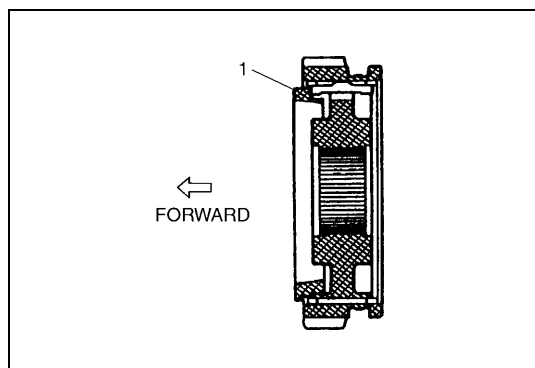
8) Assemble low speed synchronizer hub (3), sleeve (4), springs (1) and keys (2) according to the following procedure.

- Slide hub (3) in sleeve (4) with aligning hub slots with key location teeth of sleeve (4).
- Insert keys (2) in hub slots with depression side of keys (2) face center of hub (3).
- Install springs (1) to internal circle of key locations with spring end gaps apart at angles about 120 degrees each other, in order to apply spring tension equally to each key.

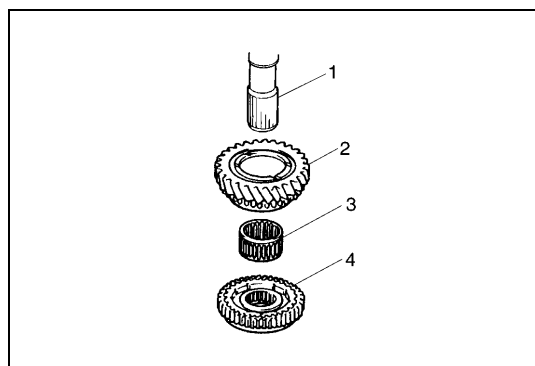
NOTE:

Before installing hub (3), sleeve (4), springs (1) and keys (2) assembly to main shaft, there is no specific installation direction on each component. However, when installing assembly to main shaft, gear side of sleeve (4) should face to forward direction as shown in the figure.

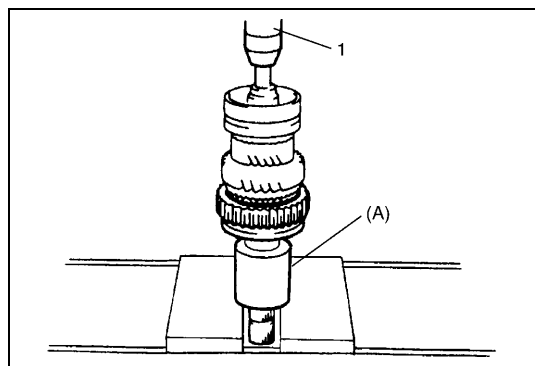
- | | |
|-----|--------------------|
| A : | Key location tooth |
| B : | Flange |
| C : | Depression of key |



9) Install synchronizer ring (1) by matching its key slots to keys as shown in the figure.



10) Insert 2nd gear (2), needle bearing (3) and low speed sleeve/hub assembly (4) with synchronizer ring to main shaft (1).

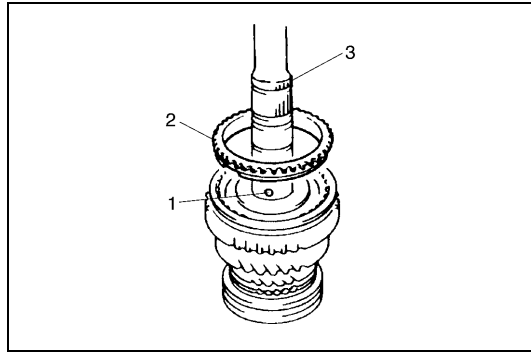


11) Press-fit low speed sleeve/hub assembly with special tool and press (1).

Special tool

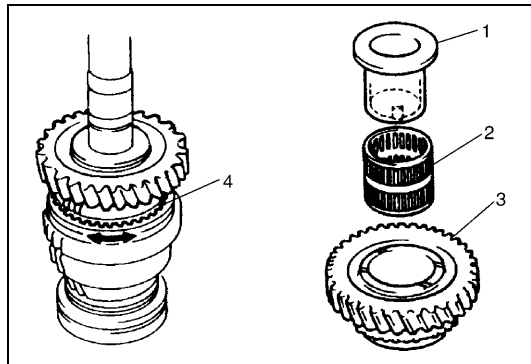
(A) : 09940-53111

12) Check 2nd gear thrust clearance, referring to "MAIN SHAFT ASSEMBLY" in this section.



13) Apply grease to ball (1) and set it to main shaft (3).

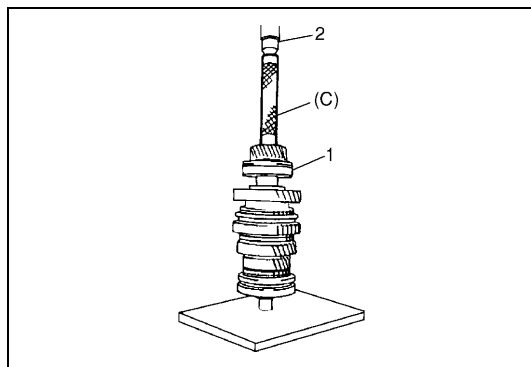
14) Install synchronizer ring (2).



15) Install needle bearing (2), low gear (3) and needle bush (1) to main shaft.

NOTE:

- Check the cut in needle bush and ball are engaged.
- After installation, check the synchronizer ring (4) moves in circumferential direction.



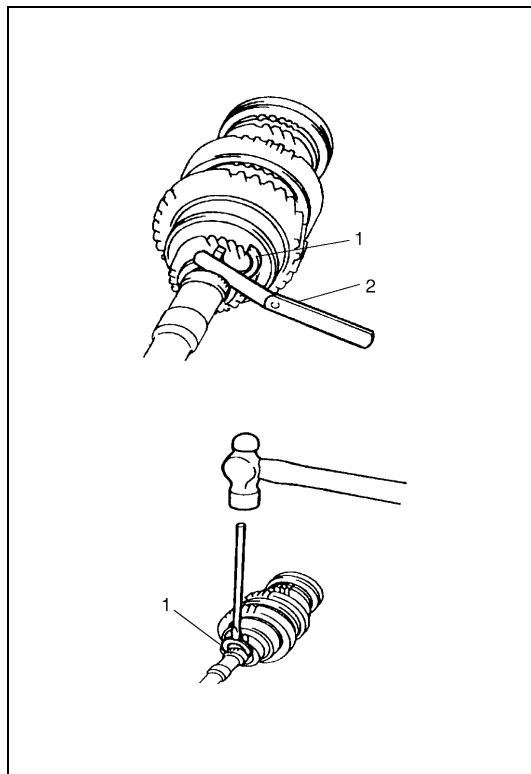
16) Press-fit main shaft bearing (1) and 5th gear with special tools and press (2).

NOTE:

Bring bearing so that its groove for circlip is in the rear.

Special tool

(C) : 09940-51710 or 09925-18011



17) Select circlip (1) that will make its thrust clearance 0.1 mm (0.0039 in.) or less and install it.

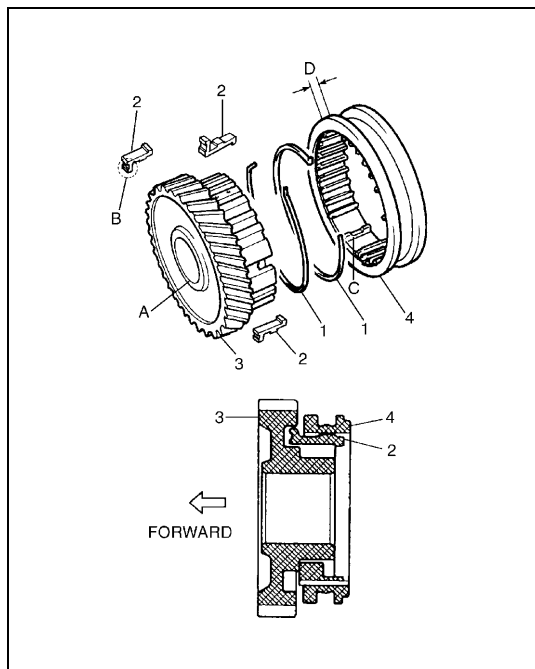
Circlip thickness specification :

ID mark	Circlip thickness
A	2.67 – 2.72 mm (0.1052 – 0.1070 in.)
B	2.73 – 2.78 mm (0.1075 – 0.1094 in.)
C	2.79 – 2.84 mm (0.1099 – 0.1118 in.)
D	2.85 – 2.90 mm (0.1123 – 0.1141 in.)
E	2.91 – 2.96 mm (0.1146 – 0.1165 in.)
F	2.97 – 3.02 mm (0.1170 – 0.1188 in.)
G	3.03 – 3.08 mm (0.1193 – 0.1212 in.)
H	3.09 – 3.14 mm (0.1217 – 0.1236 in.)
J	3.15 – 3.20 mm (0.1241 – 0.1259 in.)
K	3.21 – 3.26 mm (0.1264 – 0.1283 in.)
L	3.27 – 3.32 mm (0.1288 – 0.1307 in.)

2. Thickness gauge

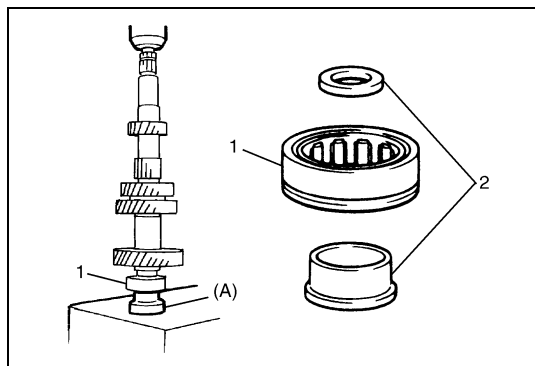
18) Check low gear clearance, referring to “MAIN SHAFT ASSEMBLY” in this section.

COUNTER SHAFT AND REVERSE IDLE GEAR



- 1) Fit sleeve (4) to counter shaft 5th gear (3), place 3 synchronizer keys (2) in it and then set synchronizer springs (1). Refer to the figure for proper installing direction of gear, sleeve and springs. Also, note that key has specific installing direction.

A : Reverse side (front)
 B : 5th side
 C : Key position
 D : 5th side (thick)



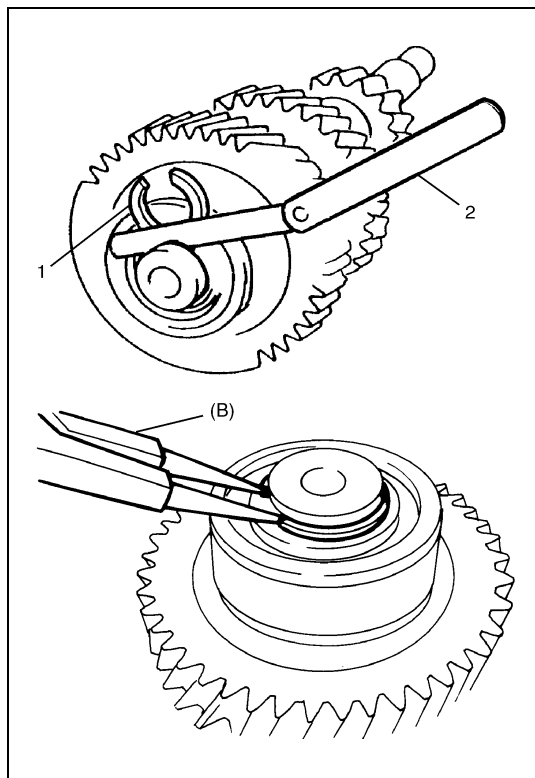
- 2) Set inner race (2) to counter shaft front bearing (1) and press-fit bearing with press and special tool.

NOTE:

When installing bearing, bring it so that its groove for circlip is in the front.

Special tool

(A) : 09940-54950



- 3) Select circlip that will make its thrust clearance 0.1 mm (0.0039 in.) or less and install it.

Circlip thickness specification :

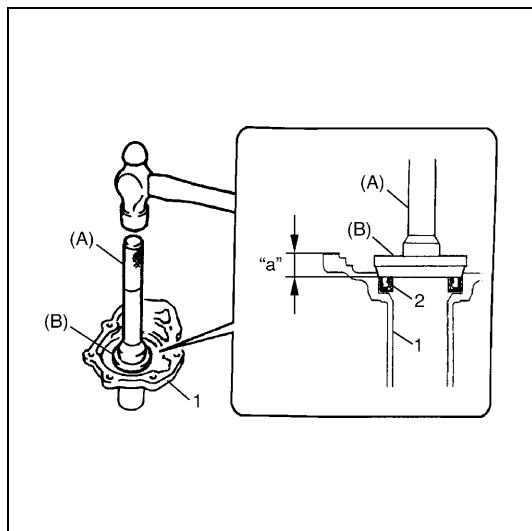
ID mark	Circlip thickness
1	2.05 – 2.10 mm (0.0807 – 0.0826 in.)
2	2.10 – 2.15 mm (0.0827 – 0.0846 in.)
3	2.15 – 2.20 mm (0.0847 – 0.0866 in.)
4	2.20 – 2.25 mm (0.0867 – 0.0885 in.)
5	2.25 – 2.30 mm (0.0886 – 0.0905 in.)
6	2.30 – 2.35 mm (0.0906 – 0.0925 in.)

Special tool

(B) : 09900-06107

1. Circlip
 2. Thickness gauge

INPUT SHAFT BEARING RETAINER AND OIL SEAL



Install new oil seal (2) to bearing retainer (1) by using special tool as shown in the figure.

Apply grease to oil seal lip.

Grease : 99000-25010

Special tool

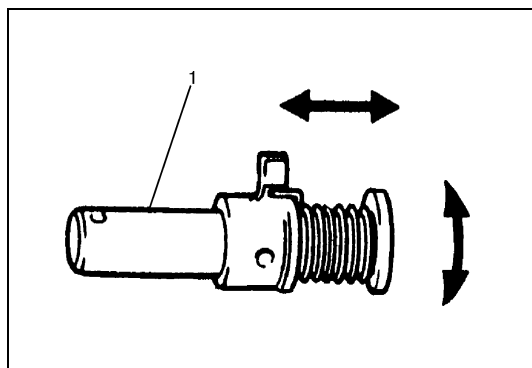
(A) : 09913-75821

(B) : 09924-84510-004

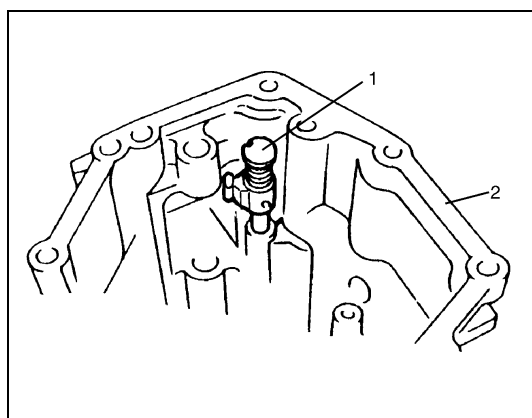
Oil seal installing position "a" :

12.2 – 13.2 mm (0.49 – 0.51 in.)

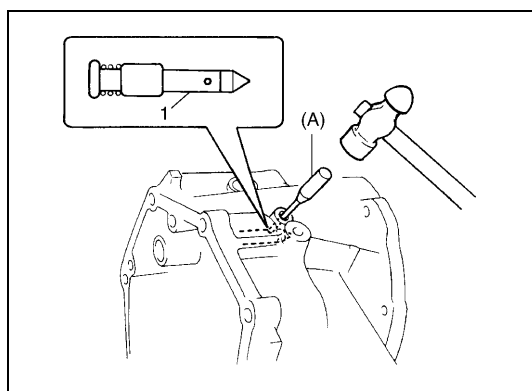
TRANSMISSION REAR CASE



- 1) Check that interlock cam component (1) moves smoothly in both turning direction and sliding direction.



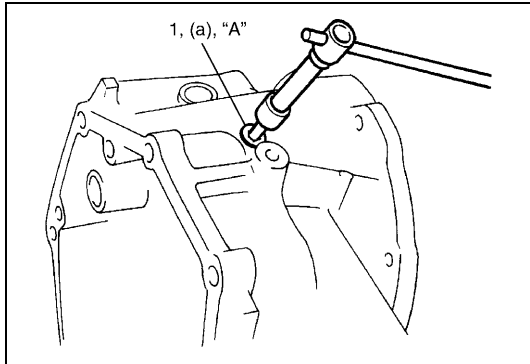
- 2) Insert interlock cam component (1) to rear case (2).



- 3) Set interlock cam component (1) as shown in the figure and drive pin by using special tool.

Special tool

(A) : 09922-85811

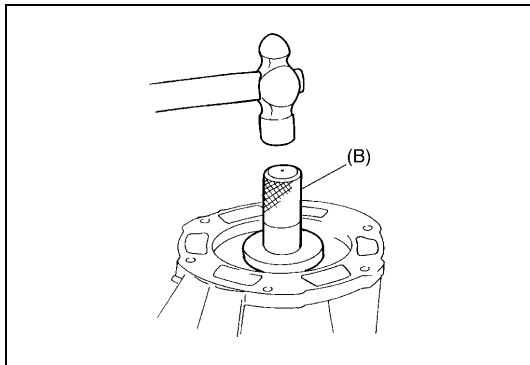


- 4) Apply thread lock cement to thread of interlock cam plug (1) and tighten it to specification.

“A” : Cement 99000-32020

Tightening torque

Interlock cam plug (a) : 19 N·m (1.9 kg·m, 14.0 lb·ft)

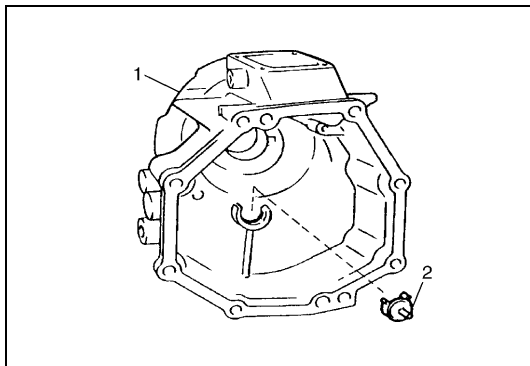


- 5) Install oil seal to rear case so that end surface of oil seal becomes flush with that case. Apply grease to oil seal lip.

Grease : 99000-25010

Special tool

(B) : 09913-77510

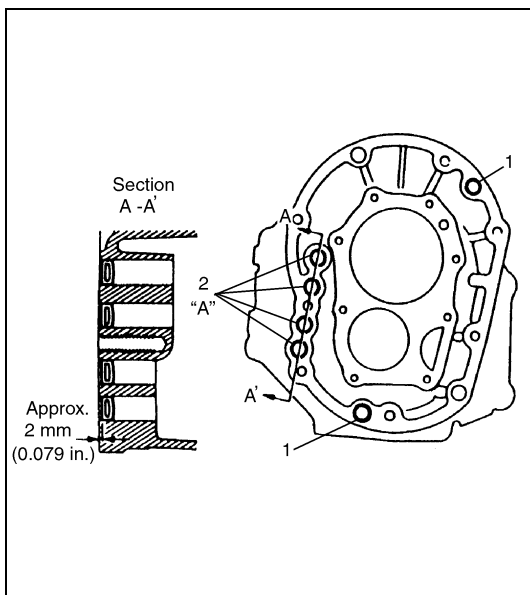


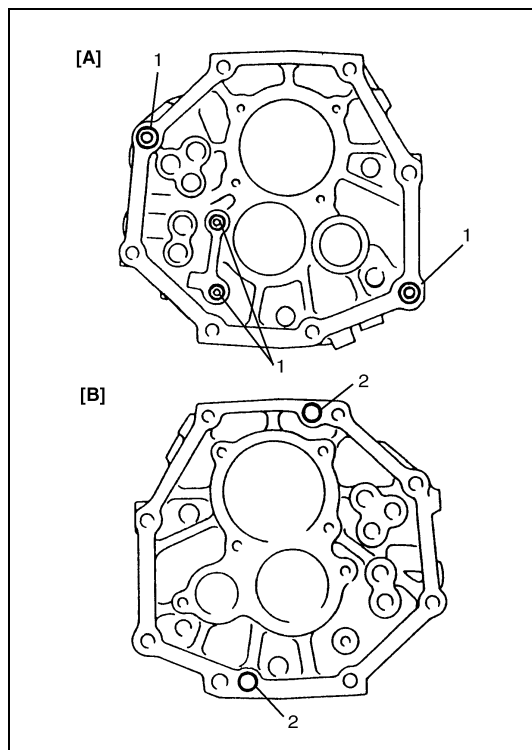
- 6) Install counter shaft gutter (2) to transmission rear case (1).

TRANSMISSION INTERMEDIATE CASE AND FRONT CASE (LOCATION OF KNOCK AND PLUG)

- Install knock pin (1) and plug (2) (sealant applied) to front case as shown.

“A” : Sealant 99000-31110





- Install knock pin (2)/ring pin (1) as shown in the figure.

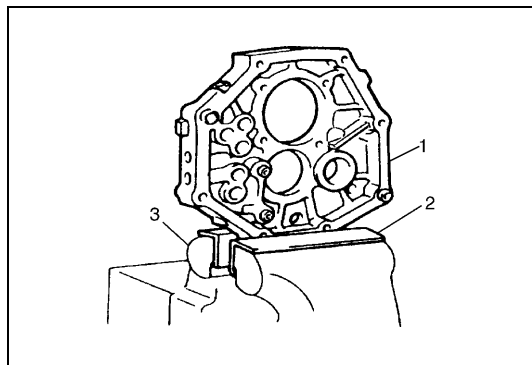
[A] : Front side

[B] : Rear side

TRANSMISSION UNIT

NOTE:

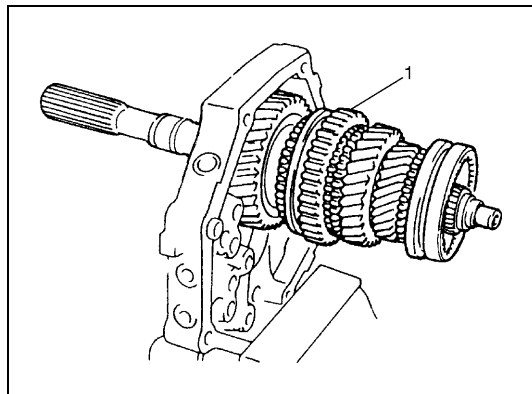
- Before installation, wash each part and apply specified gear oil to sliding faces of bearing and gear.
- Use new circlips on shaft for installation. Don't reuse circlips.



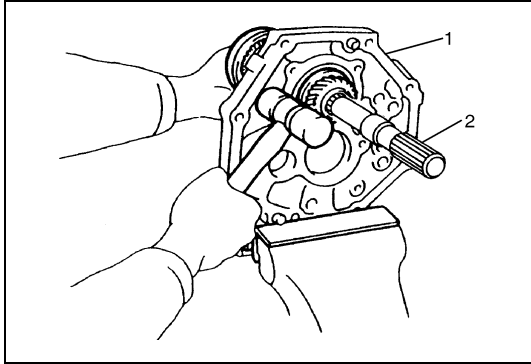
- 1) Set intermediate case (1) to vise (3).

Clean mating surfaces of intermediate case both sides, if intermediate case is reused.

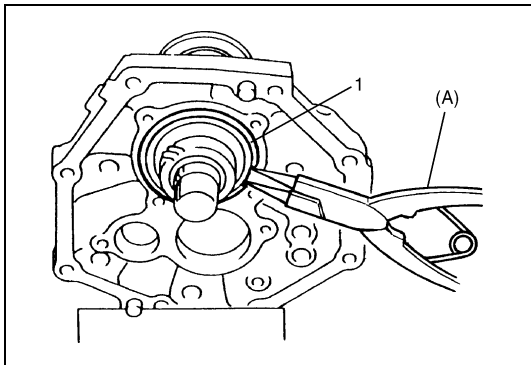
2. Aluminum plate



- 2) Install main shaft assembly (1) to intermediate case.

**NOTE:**

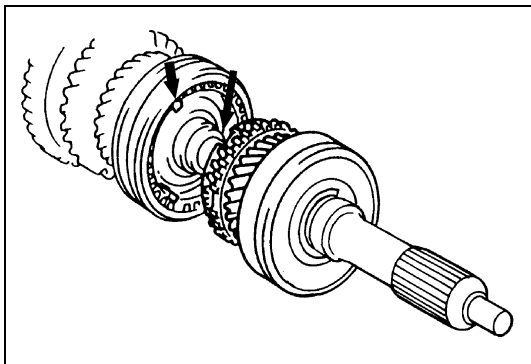
When fitting of intermediate case (1) and bearing is tight, tap rear face of intermediate case (1) with plastic hammer lightly as it will cause main shaft assembly (2) to install.



3) Fix with C-ring (1) by using special tool.

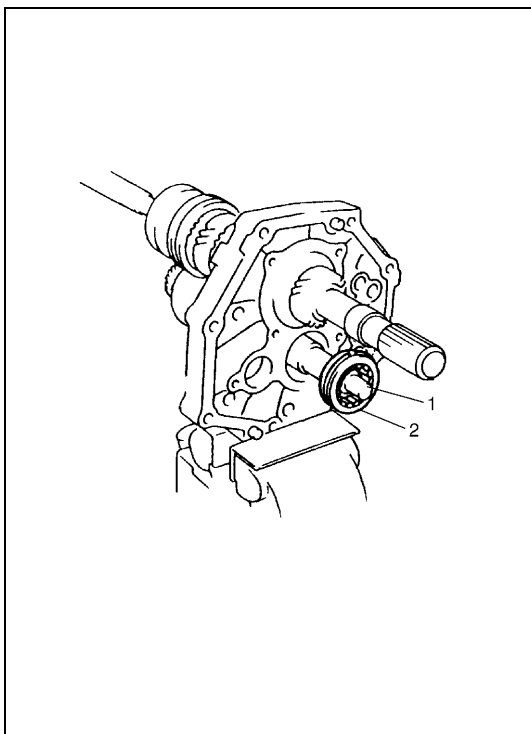
Special tool

(A) : 09900-06107



4) Align key slots of synchronizer ring and synchronizer keys and set input shaft assembly to main shaft assembly.
Check that input shaft assembly turns lightly.

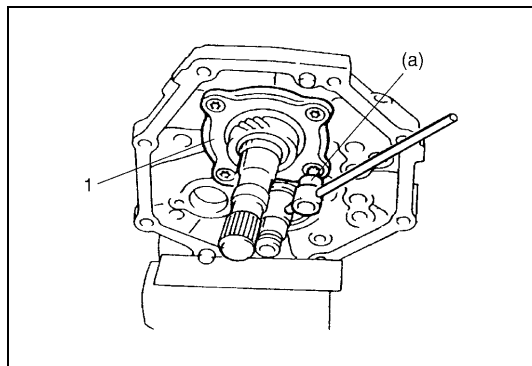
5) Fix with C-ring to counter shaft rear bearing.



6) Install counter shaft (1) and rear bearing (2) to intermediate case.

NOTE:

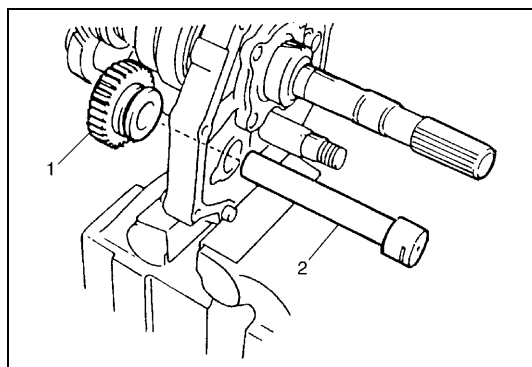
- When installing bearing, bring it so that its C-ring side is at rear side of intermediate case as shown in the figure.
- When fitting of intermediate case and bearing is tight, tap outer race of bearing lightly and evenly with plastic hammer.



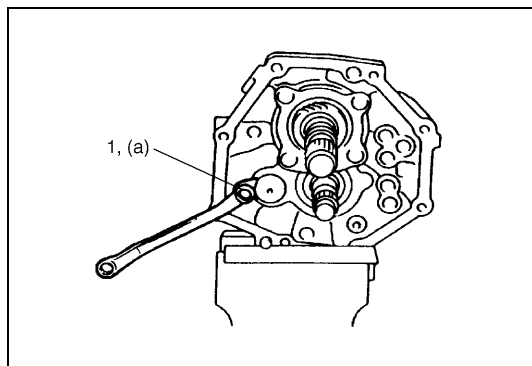
7) Install bearing plate (1).

Tightening torque

Bearing plate bolt (a) : 19 N·m (1.9 kg-m, 14.0 lb-ft)



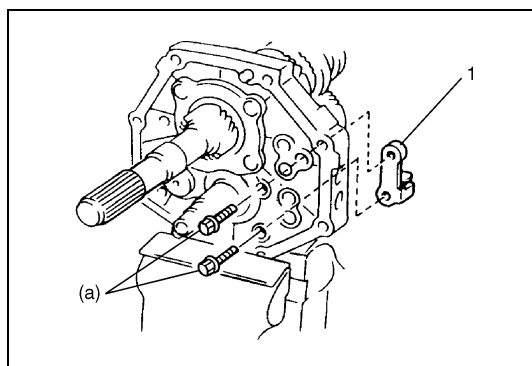
8) Install reverse idle gear (1) and shaft (2).



9) Tighten reverse gear shaft bolt (1) to specification.

Tightening torque

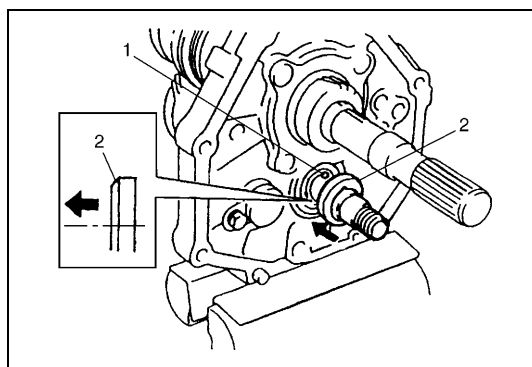
**Reverse gear shaft bolt (a) :
18 N·m (1.8 kg-m, 13.5 lb-ft)**



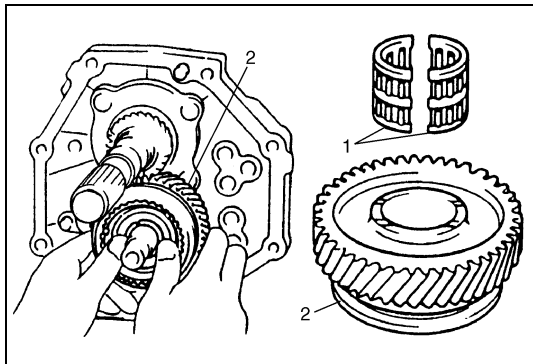
10) Install reverse link stay (1).

Tightening torque

**Reverse link stay bolt (a) :
19 N·m (1.9 kg-m, 14.0 lb-ft)**



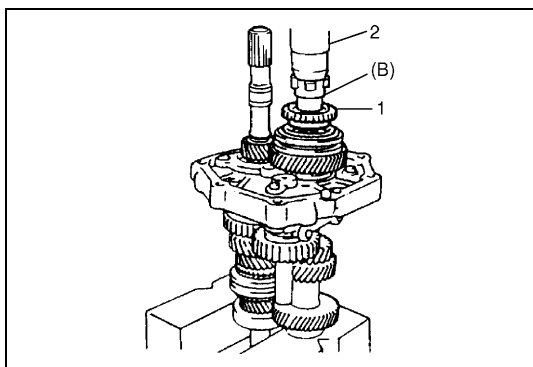
11) Set ball (1) and thrust washer (2) to counter shaft.



- 12) Install needle bearing (1), counter shaft 5th gear (2) and synchronizer ring.

NOTE:

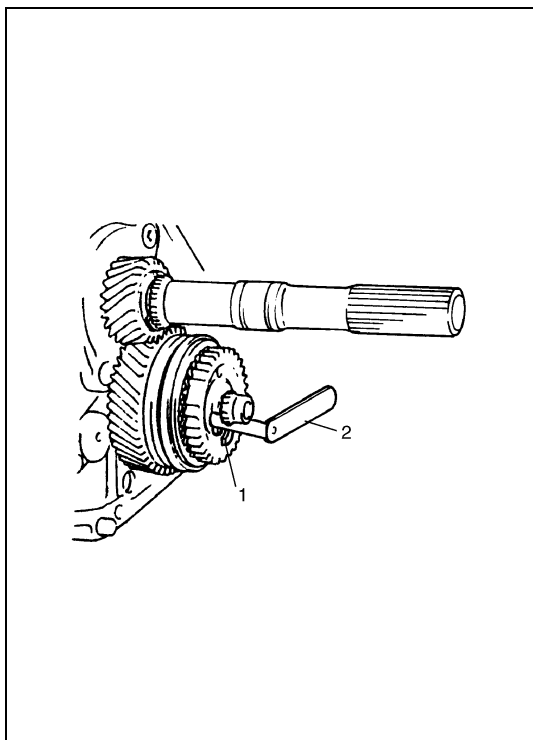
When setting synchronizer ring to sleeve of 5th gear, align synchronizer key slot to key.



- 13) Press-fit 5th speed synchronizer dog (1) to counter shaft with press (2) and special tool.

Special tool

(B) : 09927-08220

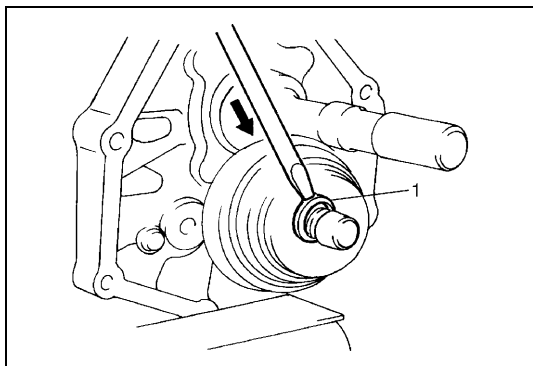


- 14) Select circlip (1) that will make clearance in circlip groove 0.1 mm (0.0039 in.) or less.

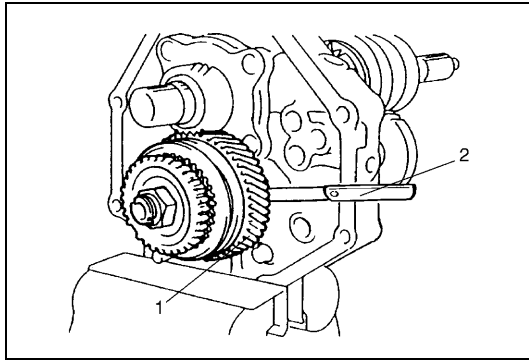
Circlip thickness specification :

ID mark	Circlip thickness
A	2.80 – 2.85 mm (0.1103 – 0.1122 in.)
B	2.85 – 2.90 mm (0.1122 – 0.1141 in.)
C	2.90 – 2.95 mm (0.1142 – 0.1161 in.)
D	2.95 – 3.00 mm (0.1162 – 0.1181 in.)
E	3.00 – 3.05 mm (0.1182 – 0.1200 in.)
F	3.05 – 3.10 mm (0.1201 – 0.1220 in.)
G	3.10 – 3.15 mm (0.1221 – 0.1240 in.)

2. Thickness gauge



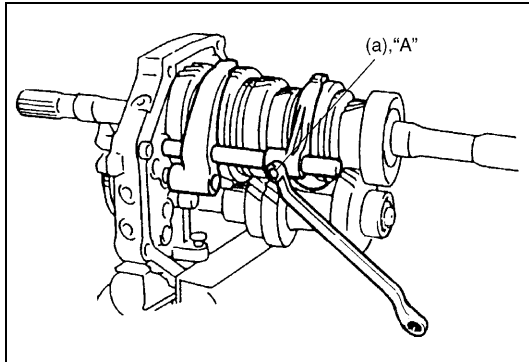
- 15) Fix with circlip (1) as shown in the figure and check that counter 5th gear turns lightly.



- 16) Check counter 5th gear (1) thrust clearance by using thickness gauge (2).

Counter 5th gear thrust clearance :

Standard : 0.1 – 0.3 mm (0.0040 – 0.0118 in.)



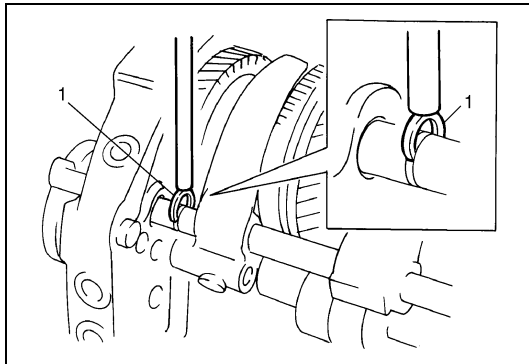
- 17) Install low speed gear shift fork, high speed gear shift fork and shaft.

- 18) Apply thread lock cement to thread of fork bolt and tighten bolt to specification.

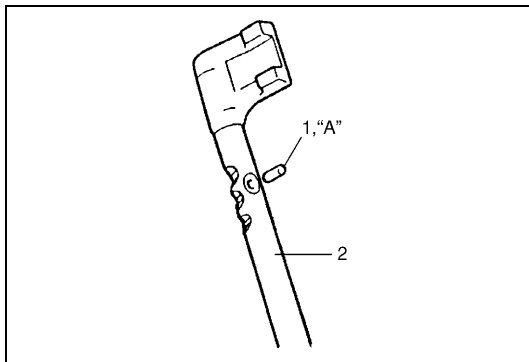
"A" : Cement 99000-32020

Tightening torque

Shift fork bolt (a) : 20 N·m (2.0 kg-m, 14.5 lb-ft)

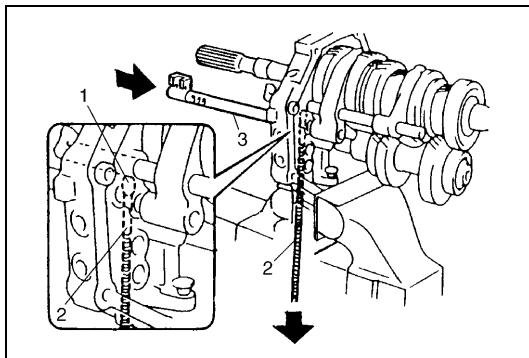


- 19) Fix new circlip (1) to high gear shift shaft by using lever or the like and hammer.

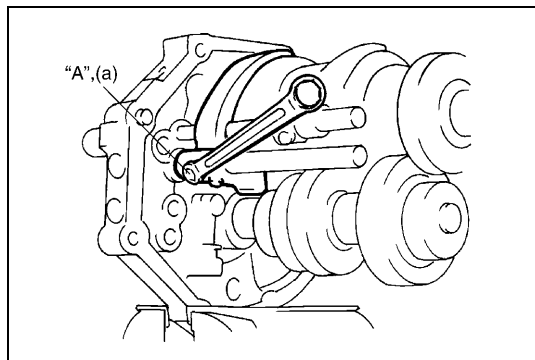


- 20) Apply grease "A" to locating roller No.2 (1) and install roller (1) to low gear shift shaft (2).

"A" : Grease 99000-25010



- 21) Supporting locating roller No. 3 (1) by magnet (2), insert low gear shift shaft (3) to intermediate case and low speed gear shift fork.

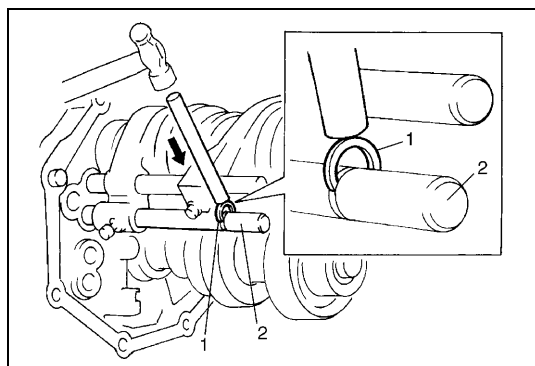


- 22) Apply thread lock cement "A" to thread of fork bolt and tighten bolt to specification.

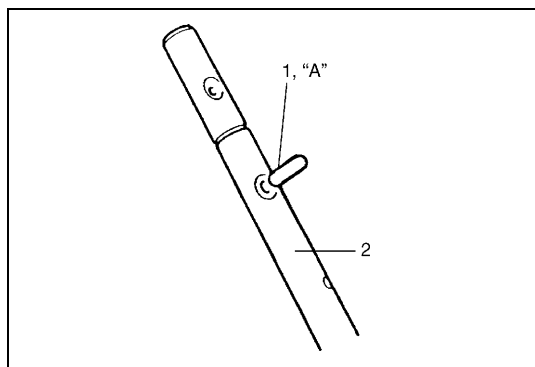
"A" : Cement 99000-32020

Tightening torque

Shift fork bolt (a) : 20 N·m (2.0 kg-m, 14.5 lb-ft)



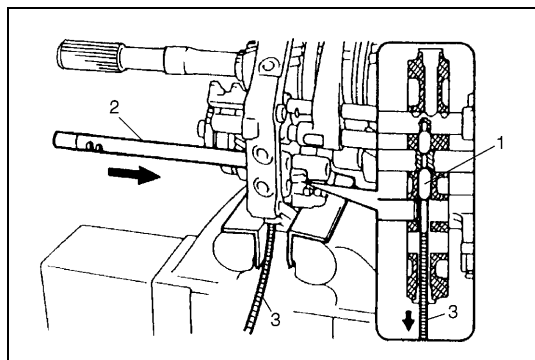
- 23) Fix with new circlip (1) to low gear shift shaft (2) by using lever or the like and hammer.



- 24) Apply grease to locating roller No.2 (1) and install roller (1) to reverse gear shift shaft (2).

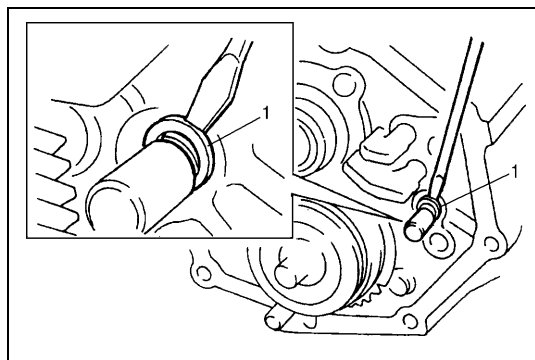
"A" : Grease 99000-25010

- 25) Assemble reverse gear shift link assembly.

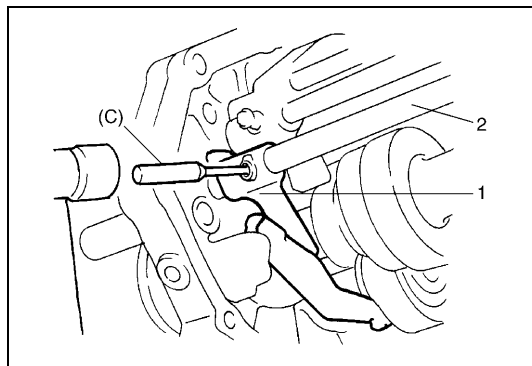


- 26) Insert reverse gear shift shaft (2) into reverse gear shift link assembly and intermediate case while holding locating roller No.1 (1) with magnet (3).

- 27) Supporting locating roller No.1 (1) with magnet (3), insert reverse gear shift shaft (2) into reverse gear shift link and intermediate case.



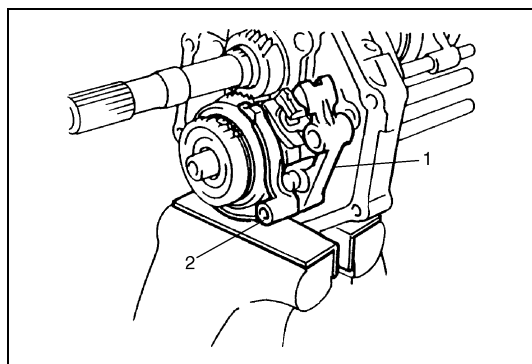
- 28) Fix with new circlip (1) to reverse gear shift shaft by using rod or the like and hammer.



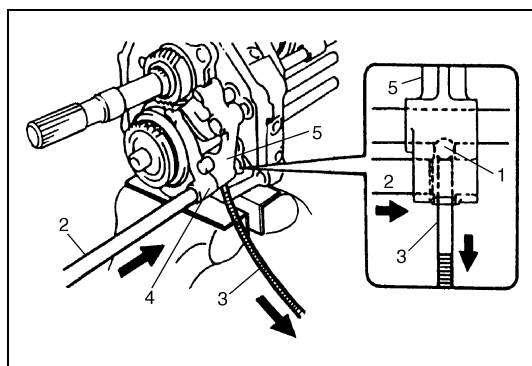
- 29) Drive pin into reverse gear shift link (1) and shaft (2) by using special tool.

Special tool

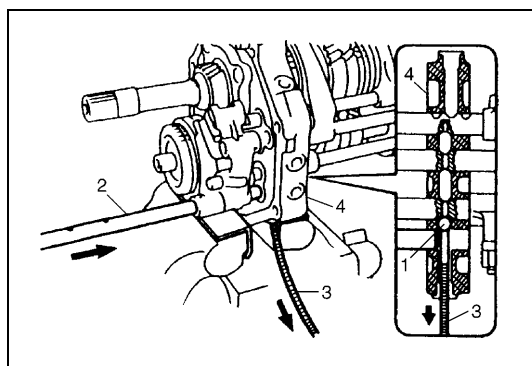
(C) : 09922-85811



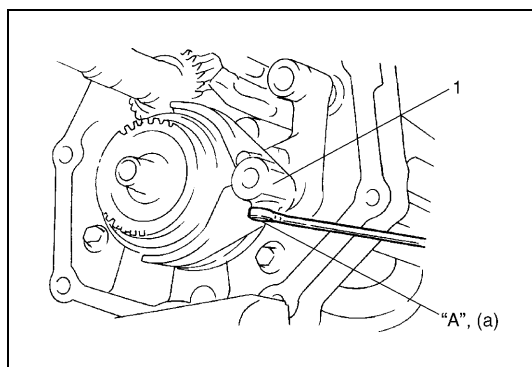
- 30) Install reverse gear shift yoke (1) and 5th gear shift fork (2) as shown in the figure.



- 31) Supporting ball (1) with magnet (3) as shown, in the figure insert 5th gear shift shaft (2) to 5th gear shift fork (4) and reverse gear shift yoke (5).



- 32) Supporting ball (1) with magnet (3) as shown in the figure, insert 5th gear shift shaft (2) into intermediate case (4).



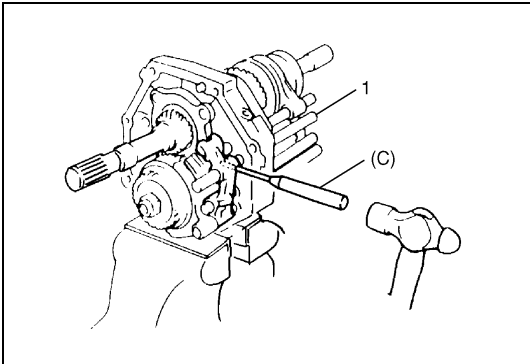
- 33) Apply thread lock cement "A" to thread of fork bolt and tighten bolt to specification.

"A" : Cement 99000-32020

Tightening torque

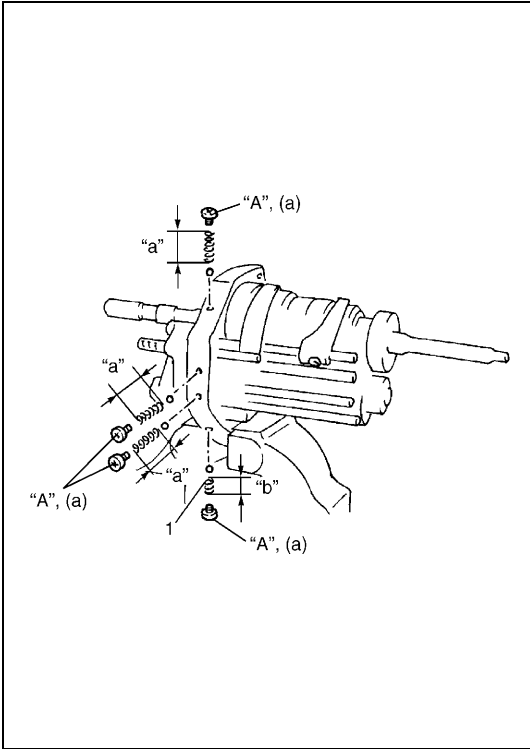
5th gear shift fork bolt (a) : 20 N·m (2.0 kg-m, 14.5 lb-ft)

1. 5th gear shift fork



34) Insert 5th-reverse gear shift shaft (1) to reverse gear shift yoke and drive pin into shaft and yoke.

Special tool
(C) : 09922-85811



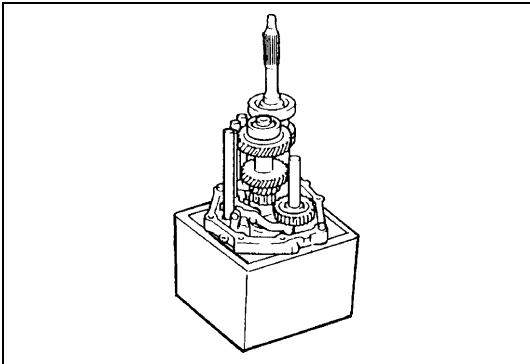
35) Install locating balls, locating springs and locating screw after checking free length of locating springs.

Free length of locating springs :

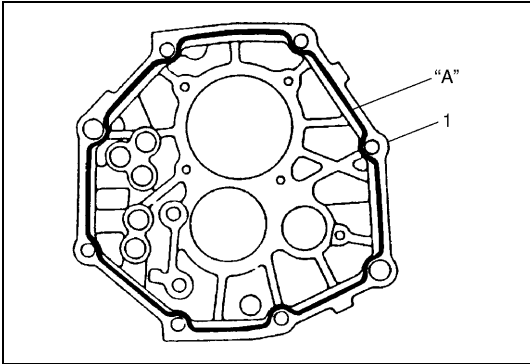
	Standard	Limit
“a”	31.0 mm (1.22 in.)	30.1 mm (1.19 in.)
“b”	20.2 mm (0.79 in.)	19.6 mm (0.77 in.)

NOTE:
For 5th gear locating spring, use shorter spring (1).
“A” : Cement 99000-32020

Tightening torque
Locating spring screw (a) : 19 N·m (1.9 kg-m, 14.0 lb-ft)

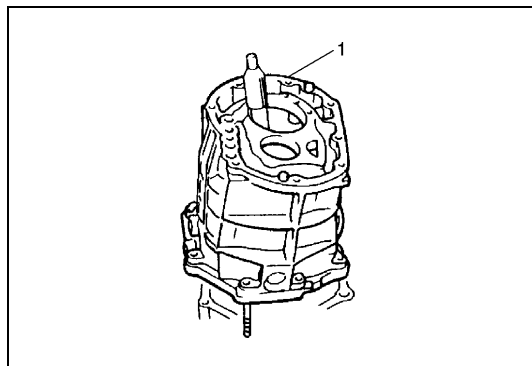


36) Place intermediate case assembly upright as shown in the figure by using workbench or the like.

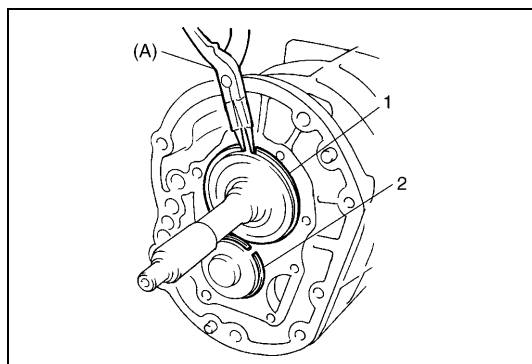


37) Apply sealant evenly to front case side of intermediate case (1) as shown.

“A” : Sealant 99000-31110



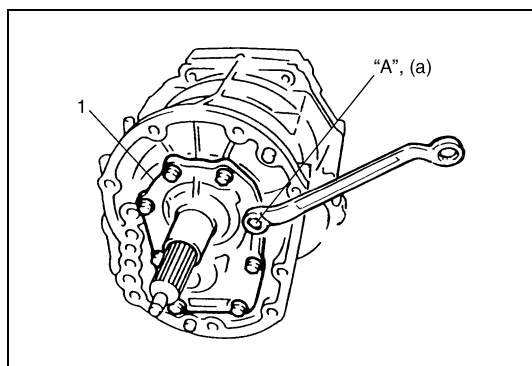
- 38) Clean mating surface of front case (1) and install it to intermediate case.



- 39) Fix C-rings (1, 2) to bearings as shown in the figure.

Special tool

(A) : 09900-06107

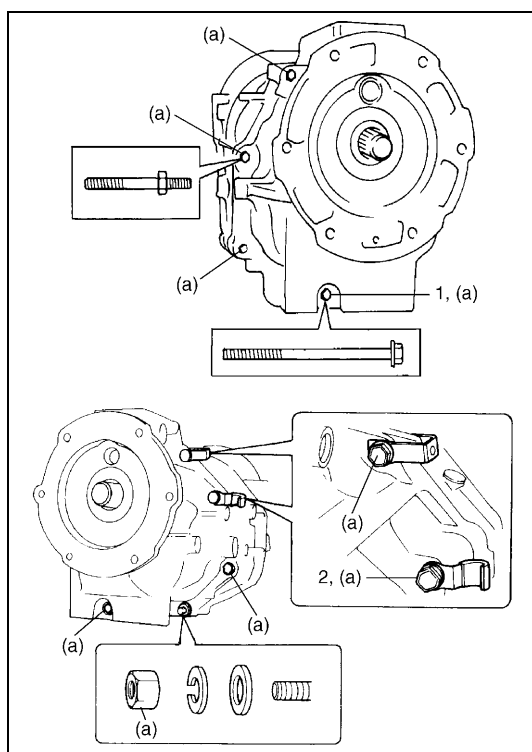


- 40) Apply cement "A" to input shaft bearing retainer bolt and install input shaft bearing retainer (1), new gasket and its bolts.

"A" : Cement 99000-32020

Tightening torque

Input shaft bearing retainer bolt (a) :
17 N·m (1.7 kg-m, 12.5 lb-ft)



- 41) Clean mating surface of rear case and apply sealant evenly to rear case side of intermediate case.

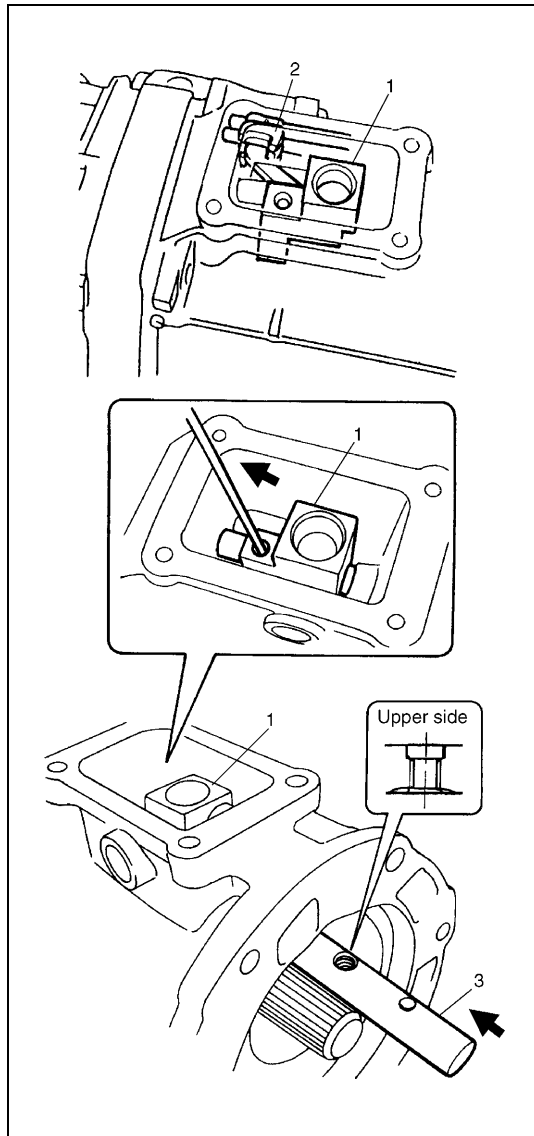
Sealant : 99000-31110

- 42) Install rear case to intermediate case.

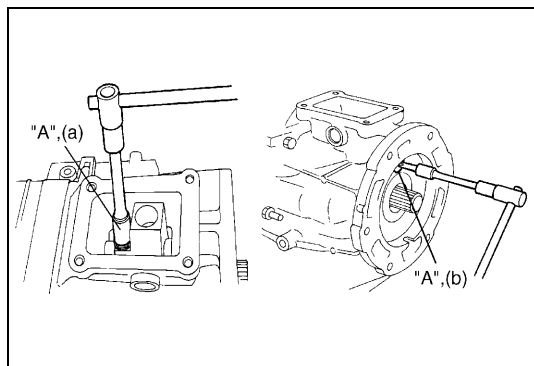
Tightening torque

Rear case to intermediate case bolt (a) :
35 N·m (3.5 kg-m, 25.5 lb-ft)

- | |
|-------------------|
| 1. Bolt (Longest) |
| 2. Bolt (Middle) |



- 43) With tip end of gear shift shaft inner lever (1) hooked on head of gear shift shaft (2), insert gear shift inner shaft (3) into gear shift shaft inner lever.



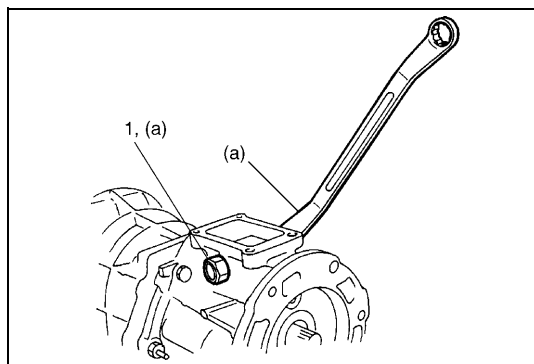
- 44) Apply cement "A" to inner gear shift shaft bolt/plug and tighten them to specification.

"A" : Cement : 66000-32020

Tightening torque

Gear shift shaft inner bolt (a) : 39 N·m (3.9kg-m, 28.5 lb-ft)

Gear shift shaft inner plug (b) : 19 N·m (1.9kg-m, 14.0 lb-ft)



- 45) Tighten return spring low bolt and return spring reverse bolt (Black color) (1).

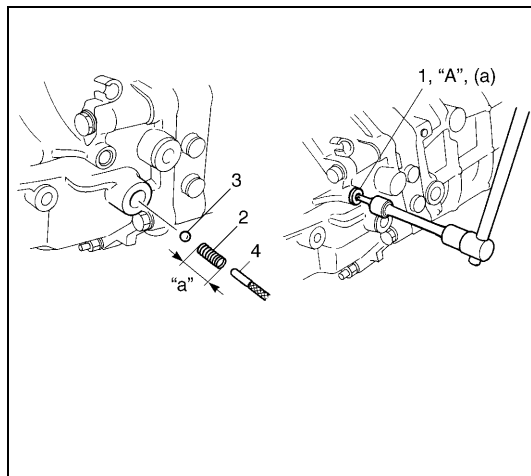
NOTE:

Install return spring reverse bolt (Black color) (1) to left side of case.

Tightening torque

Return spring reverse bolt (Black color) (a) :

28 N·m (2.8 kg-m, 20.5 lb-ft)



46) Apply cement "A" to locating screw (1) and install locating ball (3), locating spring (2) and screw to rear case.

Free length "a" of locating spring :

Standard : 22.1 mm (0.87 in.)

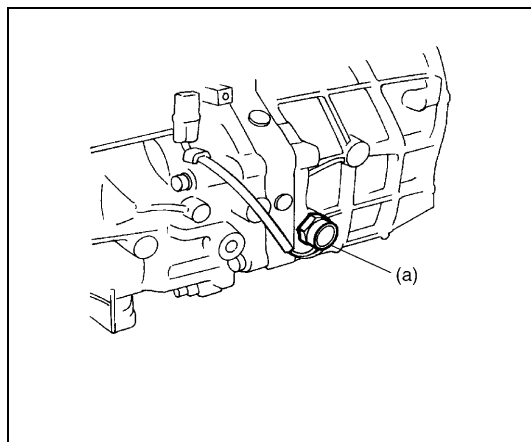
Limit : 21.4 mm (0.83 in.)

"A" : Cement 99000-32020

Tightening torque

Locating screw (a) : 19 N·m (1.9 kg-m, 14.0 lb-ft)

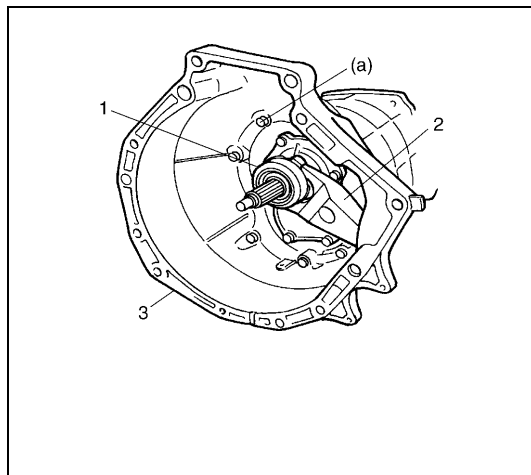
4. Magnet



47) Install back-up light switch and new gasket.

Tightening torque

Back-up light switch (a) : 45 N·m (4.5 kg-m, 32.5 lb-ft)



48) Install clutch housing (3) and torque its bolts to specification.

Tightening torque

Clutch housing bolt (a) : 50 N·m (5.0 kg-m, 36.5 lb-ft)

1. Release bearing
2. Release fork

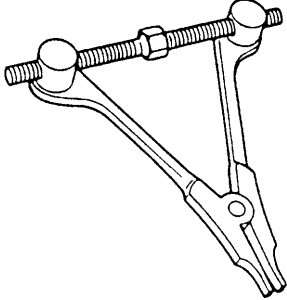
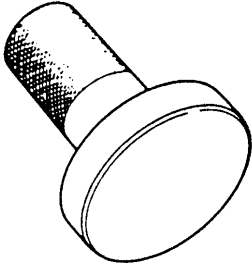
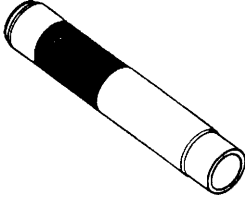
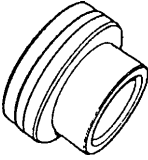
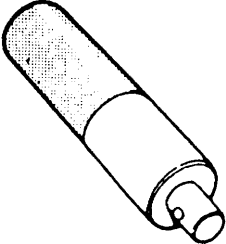
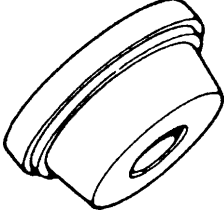
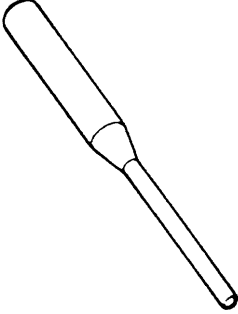
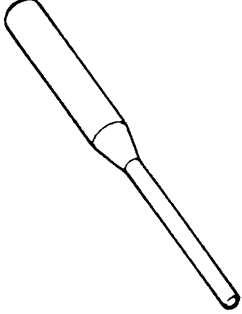
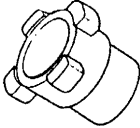
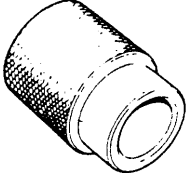
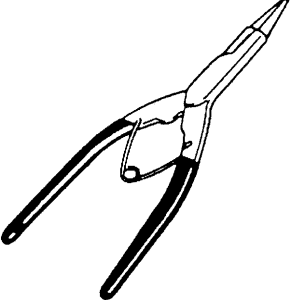
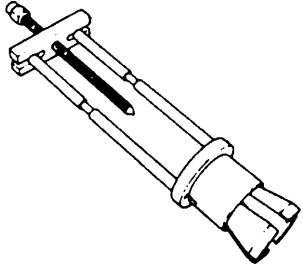
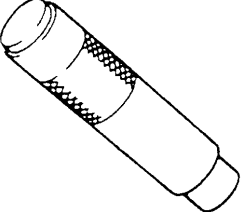
TIGHTENING TORQUE SPECIFICATION

Fastening part	Tightening torque		
	N•m	kg-m	lb-ft
Transfer oil filler/level and drain plugs	23	2.3	17.0
Transmission oil filler/level and drain plugs	38	3.8	27.5
Back-up light switch	45	4.5	32.5
Control lever locating bolts	17	1.7	12.5
Shift lever case plate screws	6	0.6	4.5
Gear shift lever case bolts	23	2.3	17.0
Interlock cam plug	19	1.9	14.0
Main & counter shaft bearing plate screws	19	1.9	14.0
Reverse gear shaft bolt	18	1.8	13.5
Reverse link stay	19	1.9	14.0
Shift fork bolts	20	2.0	14.5
Locating spring screws	19	1.9	14.0
Input shaft bearing retainer bolt	17	1.7	12.5
Transmission case bolts	35	3.5	25.5
Inner gear shift shaft bolt	39	3.9	28.5
Inner gear shift shaft plug	19	1.9	14.0
Return spring low/reverse bolts	28	2.8	20.5
Clutch housing bolts	50	5.0	36.5
Transmission to transfer bolts	50	5.0	36.5

REQUIRED SERVICE MATERIAL

Material	Recommended SUZUKI product (Part Number)	Use
Lithium grease	SUZUKI SUPER GREASE A (99000-25010)	- Oil seal lips - Select return system - Input shaft bearing roller - Locating rollers
Thread lock cement	THREAD LOCK CEMENT SUPER 1333B (99000-32020)	- Shift control lever locating screws - Gear shift fork bolts - Input shaft retainer bolts
Sealant	SUZUKI BOND No. 1215 (99000-31110)	- Oil drain and filler/level plugs - Mating surface of gear shift lever case - Mating surface of transmission cases - Front case plugs - Gear shift shaft plug

SPECIAL TOOL

 09912-34510 Case separator	 09913-75510 Bearing installer (O.D. 70.5 mm)	 09940-51710 Bearing installer	 09940-54950 Bearing installer attachment
 09913-75821 Installer attachment	 09924-84510-004 Bearing installer adapter (C)	 09925-78210 (6 mm) Spring pin remover	 09922-85811 (4.5 mm) Spring pin remover
 09927-08220 Shaft remover	 09940-53111 Bearing installer	 09900-06107 Snap ring pliers (opening type)	 09941-84510 Bearing inner remover
 09925-18011 Installer attachment			

SECTION 7B1

AUTOMATIC TRANSMISSION (4 A/T)

7B1

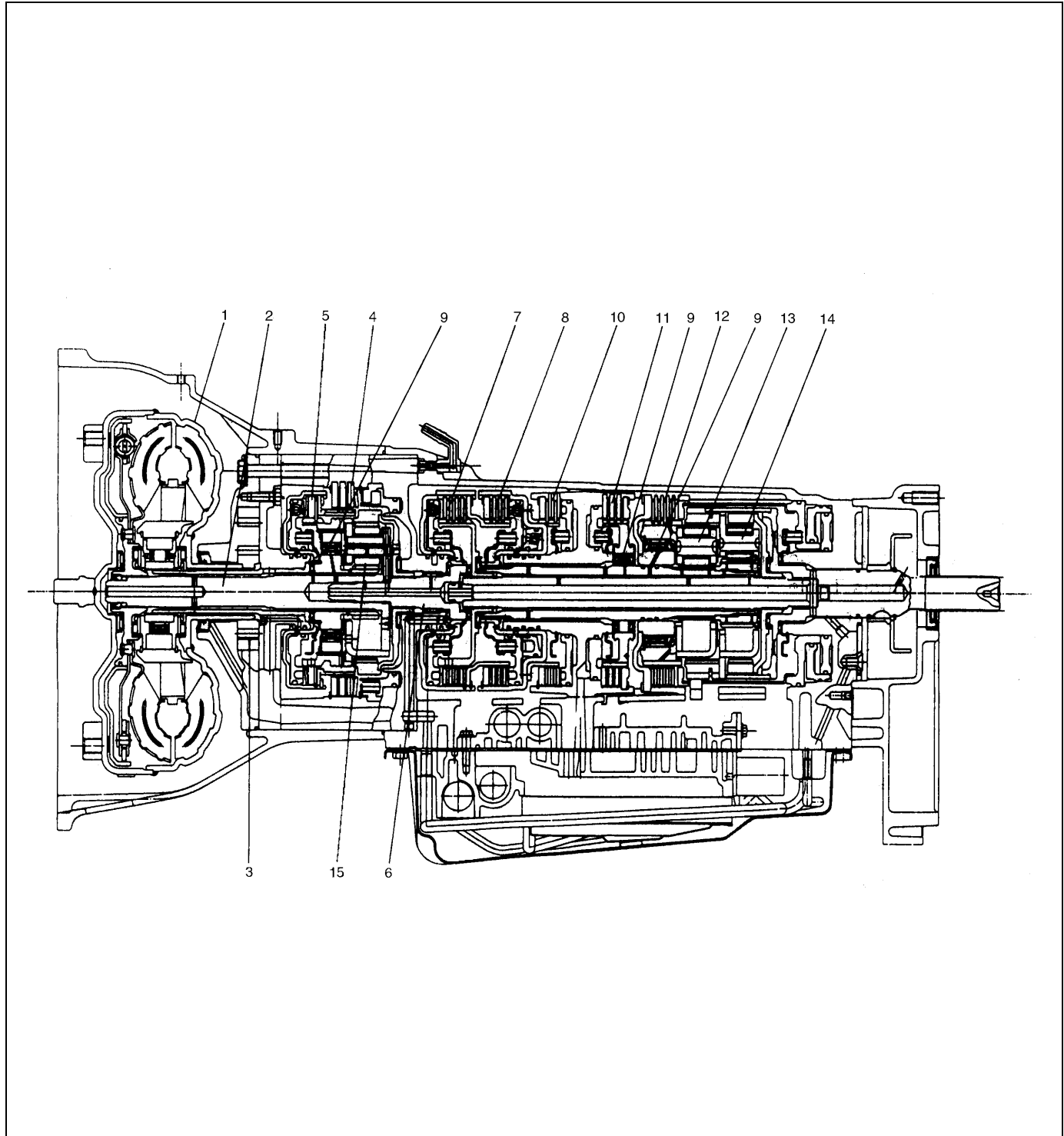
CONTENTS

GENERAL DESCRIPTION	7B1-2	OVERDRIVE (CASE SIDE)	7B1-17
TORQUE CONVERTER DIAGNOSIS	7B1-3	FORWARD CLUTCH	7B1-20
STATOR ASSEMBLY FREEWHEELS.....	7B1-3	DIRECT CLUTCH	7B1-24
STATOR ASSEMBLY REMAINS		CENTER SUPPORT	7B1-28
LOCKED UP	7B1-3	PLANETARY GEARS AND OUTPUT	
DO NOT REPLACE CONVERTER FOR		SHAFT	7B1-34
FOLLOWING CONDITIONS :	7B1-3	VALVE BODY ASSEMBLY	7B1-38
UNIT REPAIR	7B1-4	FRONT UPPER VALVE BODY.....	7B1-43
PRECAUTIONS	7B1-4	REAR UPPER VALVE BODY	7B1-47
PART INSPECTION AND CORRECTION		UNIT ASSEMBLY	7B1-54
TABLE	7B1-4	BEARING AND RACE INSTALLATION	
UNIT DISASSEMBLY	7B1-5	DIAGRAM	7B1-66
SUB-ASSEMBLY REPAIR	7B1-10	TIGHTENING TORQUE SPECIFICATION..	7B1-67
OIL PUMP	7B1-10	REQUIRED SERVICE MATERIAL.....	7B1-67
OVERDRIVE (PLANETARY		SPECIAL TOOL	7B1-68
GEAR SIDE).....	7B1-13		

GENERAL DESCRIPTION

When repairing automatic transmission, it is necessary to conduct the on-vehicle test to investigate where the cause of the trouble lies first.

Then whether overhaul should be done or not is determined. If the transmission is disassembled without such preliminary procedure, not only the cause of the trouble would be unknown, but also a secondary trouble may occur and often time would be wasted.



- | | | |
|--------------------------|-------------------------------|------------------------------|
| 1. Torque converter | 6. Forward clutch input shaft | 11. Second brake |
| 2. Overdrive input shaft | 7. Forward clutch | 12. Reverse brake |
| 3. Oil pump | 8. Direct clutch | 13. Front planetary gear |
| 4. Overdrive brake | 9. One-way clutch | 14. Rear planetary gear |
| 5. Overdrive clutch | 10. Second coast brake | 15. Overdrive planetary gear |

TORQUE CONVERTER DIAGNOSIS

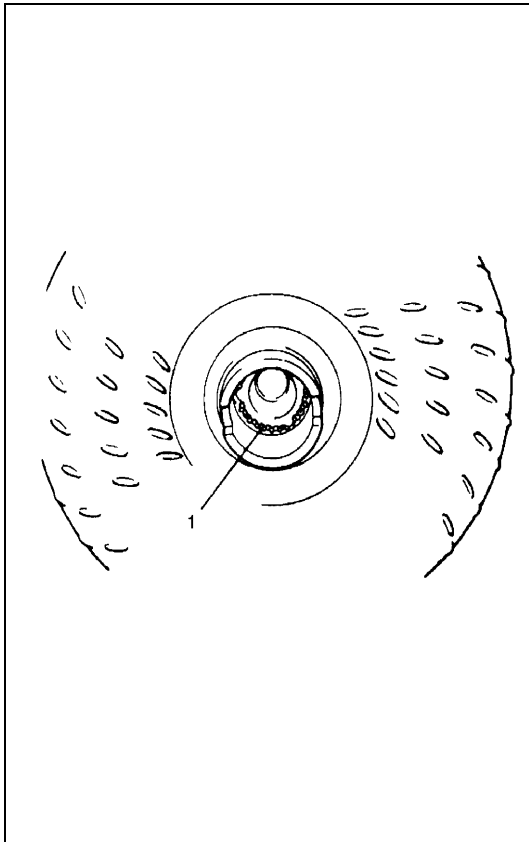
STATOR ASSEMBLY FREEWHEELS

If the stator roller clutch becomes ineffective, the stator assembly freewheels at all times in both directions. With this condition, the vehicle tends to have poor acceleration from a standstill. If poor acceleration problems are noted, what to be checked first are that the exhaust system is not blocked, the engine is running properly and the transmission is in 1st gear when starting out.

STATOR ASSEMBLY REMAINS LOCKED UP

If the stator assembly remains locked up at all times, the engine rpm and vehicle speed will tend to be limited or restricted at high speeds. The vehicle performance when accelerating from a standstill will be normal. Engine overheating may be noted. Visual examination of the converter may reveal a blue color from the overheating that will result.

Under above conditions, if the converter has been removed from the transmission, the stator roller clutch can be checked by inserting a finger into the splined inner race of the roller clutch and trying to turn the race in both directions. The inner race should turn freely clockwise, but be heavy to turn counterclockwise.



NOTE:

- **Converter placed with its flange upright does not fit for this inspection.**
- **For proper checking, position converter with its flange horizontal.**
- **Turn stator inner race clockwise as quickly as possible with finger, then turn reversely at the same speed and feel difference of inertia.**

1. Stator inner race (Should turn freely clockwise only)

DO NOT REPLACE CONVERTER FOR FOLLOWING CONDITIONS :

- 1) The fluid has an odor, is discolored, and there is no evidence of metal particles. There is no indication of existence of internal damage, or oil pump damage. Dump out as much fluid as possible from the converter and replace only the oil pump screen in the pan.
- 2) A small amount of wear (sometimes referred to as fretting wear) appears on the hub where the oil pump drive gear is located. A certain amount of such wear is normal for both the hub and oil pump gear. Neither the converter nor the oil pump assembly should be replaced.

UNIT REPAIR

PRECAUTIONS

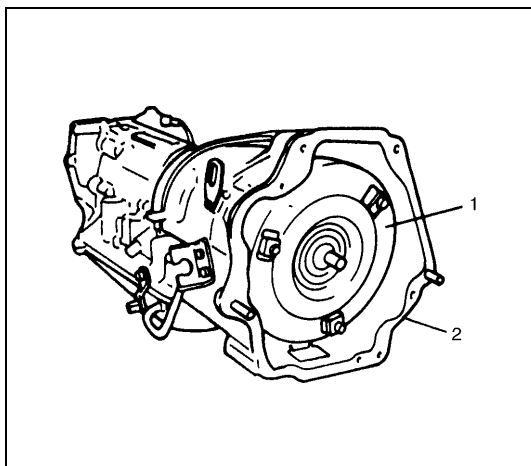
As the automatic transmission consists of high precision components, the following cautions should be strictly observed when handling its parts in disassembly and reassembly.

- Make sure to wash dirt off from the transmission so that no such dirt will enter the transmission during dismounting and remounting.
- Select a clean place free from dust and dirt for overhauling.
- Place a rubber mat on the work bench to protect parts from damage.
- Work gloves or shop cloth should not be used. (Use a nylon cloth or a paper towel.)
- When separating the case joint, do not pry with a screwdriver or such but tap with a plastic hammer lightly.
- Make sure to wash dirt off from the transmission so that no such dirt will enter the transmission during disassembly and reassembly.
- Wash the disassembled parts in ATF (Automatic Transmission Fluid) or kerosene (using care not to allow ATF or kerosene to get on your face, etc.) and confirm that each fluid passage is not clogged by blowing air into it. But use ATF to wash the disc, resin washers and rubber parts.
- Replace each gasket, oil seal and O-ring with a new one.
- Apply ATF to sliding or rotating parts before reassembly.
- A new disc should be soaked in ATF at least 2 hours before use.

PART INSPECTION AND CORRECTION TABLE

Part	Inspect for	Correction
Casted part, machined part	Small flaw, burr	Remove with oil stone.
	Deep or grooved flaw	Replace part.
	Clogged fluid passage	Clean with air or wire.
	Flaw on installing surface, residual gasket	Remove with oil stone or replace part.
	Crack	Replace part.
Bearing	Unsmooth rotation	Replace.
	Streak, pitting, flaw, crack	Replace.
Bushing, thrust washer	Flaw, burr, wear, burning	Replace.
Oil seal, gasket	Flawed or hardened seal ring	Replace.
	Worn seal ring on its periphery or side	Replace.
	Piston seal ring, oil seal, gasket, etc.	Replace.
Gear	Flaw, burr	Replace.
	Worn gear tooth	Replace.
Splined part	Burr, flaw, torsion	Correct with oil stone or replace.
Snap ring	Wear, flaw, distortion	Replace.
	No interference	Replace.
Thread	Burr	Replace.
	Damage	Replace.
Spring	Settling, sign of burning	Replace.
Clutch disc, brake disc	Wear, burning, distortion, damaged claw	Replace.
Clutch plate, brake plate	Wear, burning, distortion, damaged claw	Replace.
Sealing surface (where lip contacts)	Flaw, rough surface, stepped wear, foreign material	Replace.

UNIT DISASSEMBLY

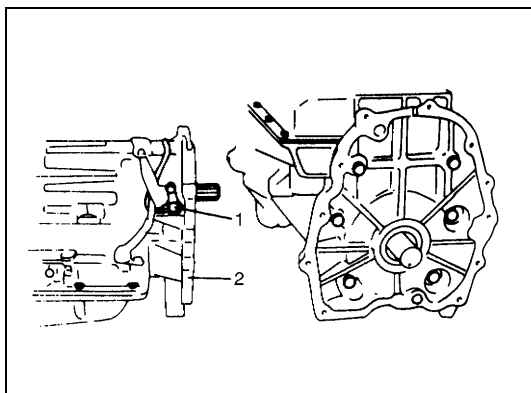


- 1) Extract torque converter. And remove oil filler tube and dipstick.

CAUTION:

Remove torque converter as much straight as possible. Leaning it may cause to damage oil seal lip.

- | |
|----------------------|
| 1. Torque converter |
| 2. Converter housing |

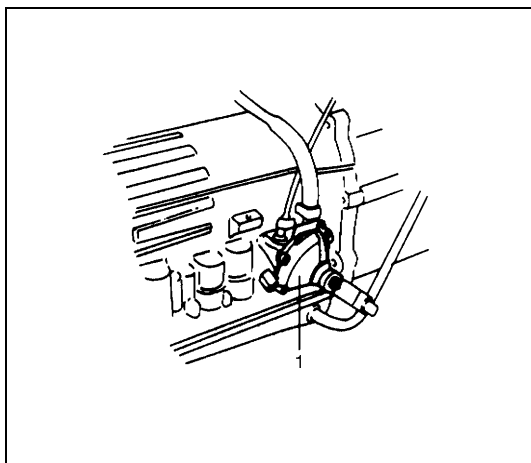


- 2) Remove speed sensor (1).
- 3) Remove 6 adapter case fixing bolts and then remove adapter case (2).

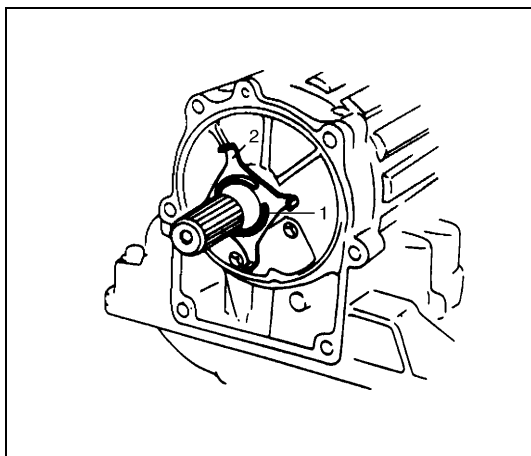
NOTE:

Use care not to cause damage to oil seal.

- 4) Remove gasket.



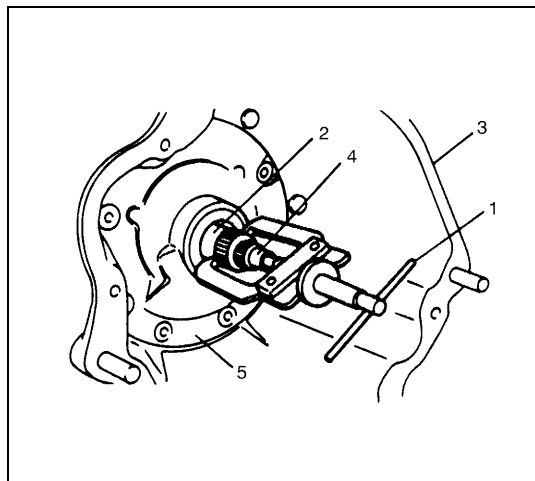
- 5) Remove shift switch (1).



- 6) Remove C-ring (1) and then remove speed sensor rotor (2).

NOTE:

Use care not to loose rotor stop key.



7) Remove oil pump (5) by using puller (1).

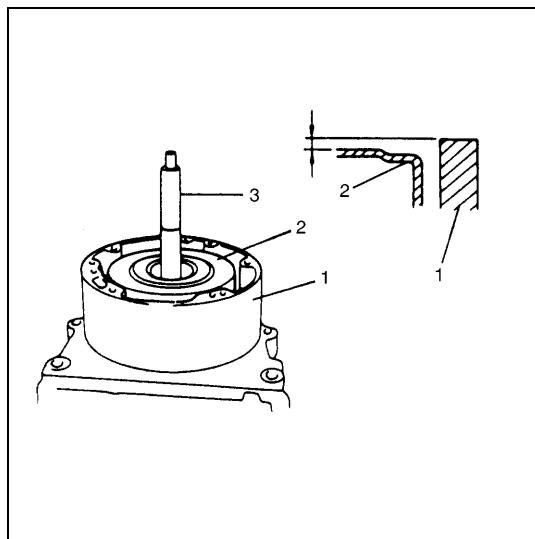
NOTE:

Use care not to cause damage to shaft bushing surface (2).

8) Remove bearing at the rear of oil pump (5).

9) Remove O-ring from oil pump (5).

10) Holding input shaft (4) by hand, remove converter housing (3).



11) Check dimensions of overdrive (O/D) case surface and clutch cylinder surface for reassembly.

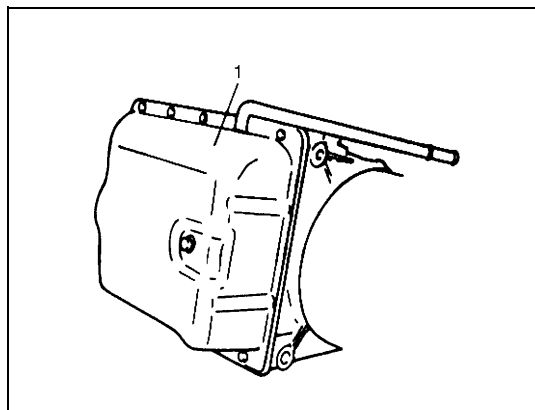
12) Remove overdrive (O/D) clutch assembly by holding input shaft (3).

13) Remove O/D case, bearing and bearing race.

NOTE:

Confirm direction of bearing and bearing race for reassembly.

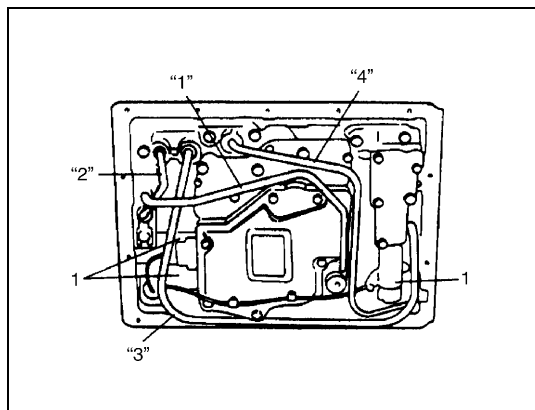
- | |
|--------------------|
| 1. Over drive case |
| 2. Clutch cylinder |



14) Remove oil pan (1).

NOTE:

- Hold oil pan with oil pan side down to prevent foreign material in oil pan from entering valve body.
- If iron powder is found, it is possible that bearing, gear or clutch plate is worn.

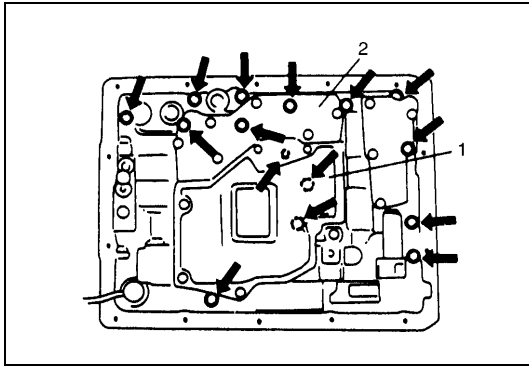


15) Remove oil tubes.

NOTE:

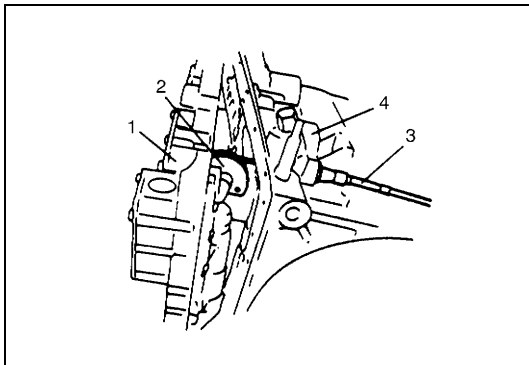
Refer to the figure for order of their removal.

16) Remove coupler from solenoid valve (1).



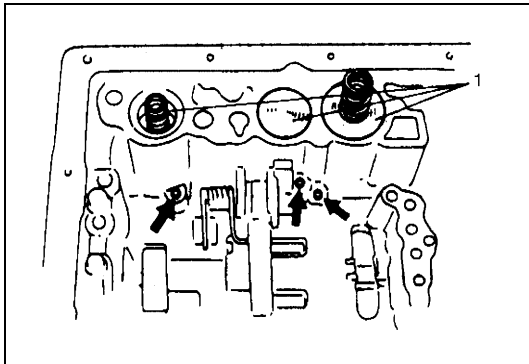
17) Remove oil strainer (1).

18) Remove valve body (2) mounting bolts as shown in the figure.



19) Lift valve body (1) and disconnect A/T throttle cable (2) from throttle cam. And remove valve body.

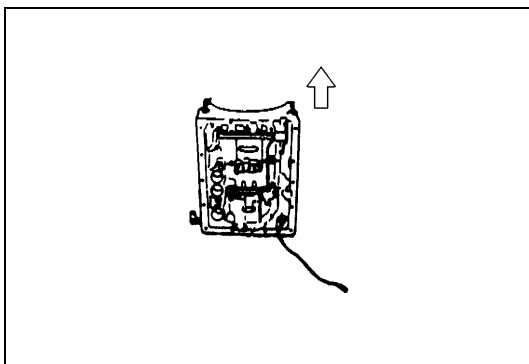
20) Disconnect throttle cable (3) from case (4).



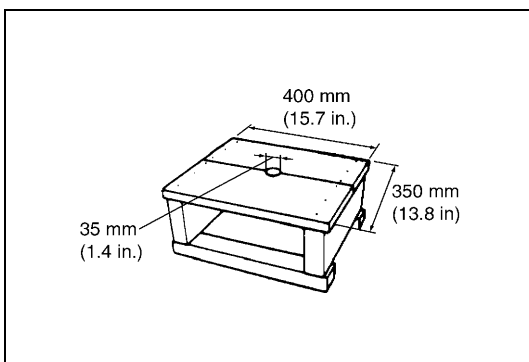
21) Remove accumulator pistons (1) by blowing air into holes indicated in the figure.

NOTE:

Hold accumulator piston (1) with shop cloth while blowing.

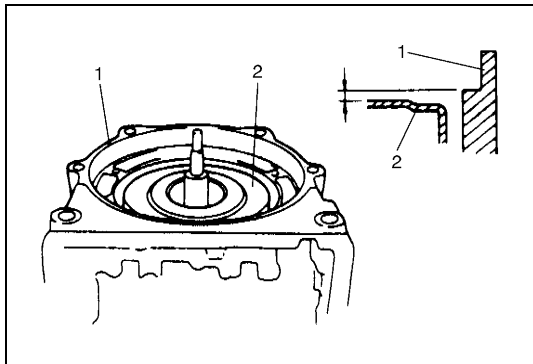


22) Place transmission upright as shown in the figure.



NOTE:

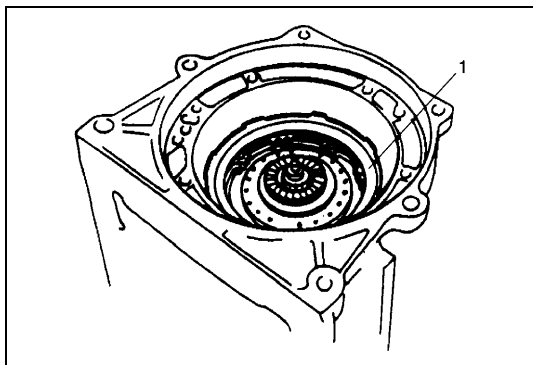
- To prevent transmission case from getting damaged, protect its contacting surface with stand by using shop cloth or the like.
- A stand of such size as shown in the figure will facilitate work.



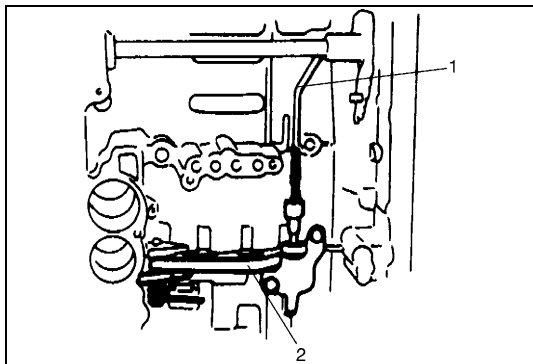
- 23) Check top surface level of forward clutch (2) against case (1) for reassembly.
- 24) Remove forward clutch.

NOTE:

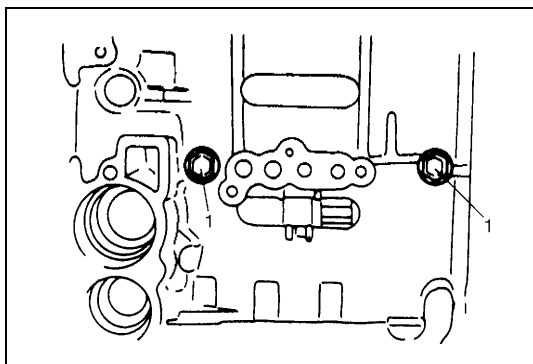
Confirm direction of bearing and bearing race for reassembly.



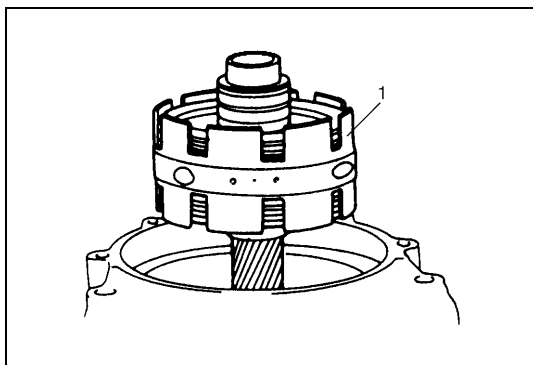
- 25) Remove direct clutch (1).



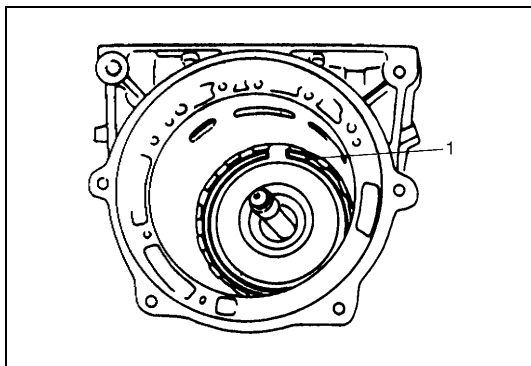
- 26) Remove parking rod (1) and parking pawl (2).



- 27) Remove 2 bolts (1) from valve body side to remove center support.



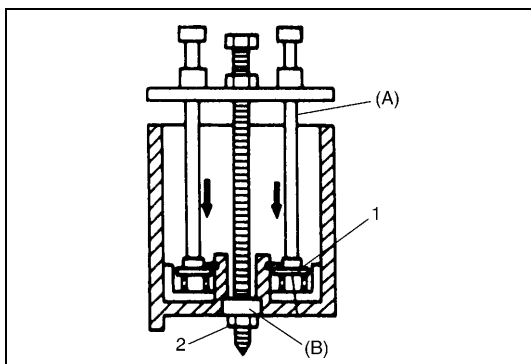
- 28) Remove center support assembly (1).



29) Remove retaining ring (1), planetary gear assembly and leaf spring.

NOTE:

- Use care not to cause damage to case when removing retaining ring.
- Confirm direction of bearing and bearing race for reassembly.



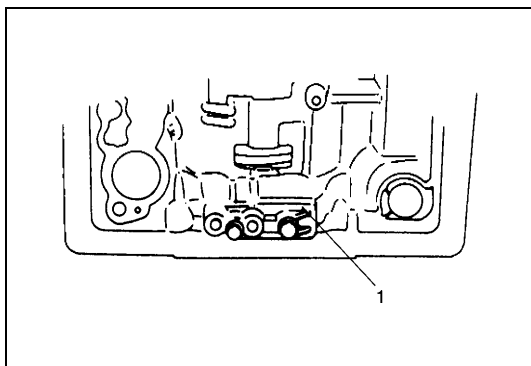
30) Remove reverse brake retainer (1).

Special tool

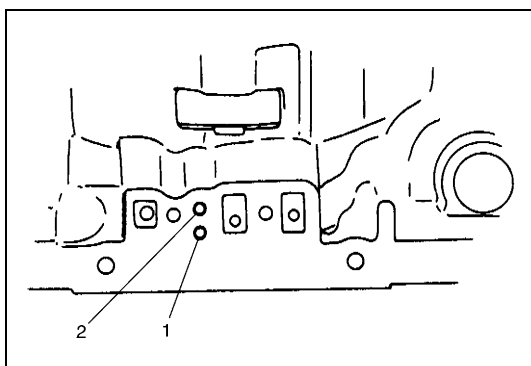
(A) : 09941-84510

(B) : 09926-98320

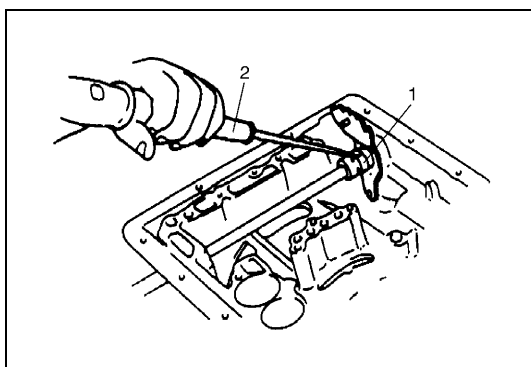
2. Nut M12 X 1.75



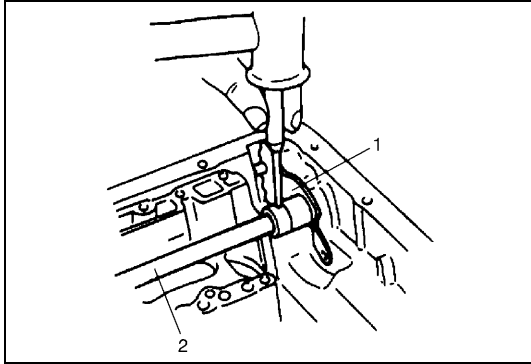
31) Remove brake applying cover (1).



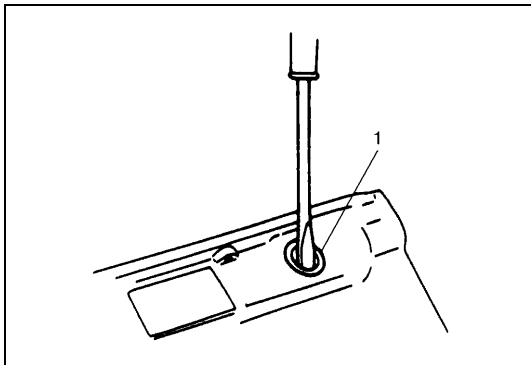
32) Remove rear action sleeve and reverse brake piston by blowing air into hole (1) with hole (2) closed.



33) Undo caulking of sleeve cover (1) by using moderate stick (2) and move sleeve cover.



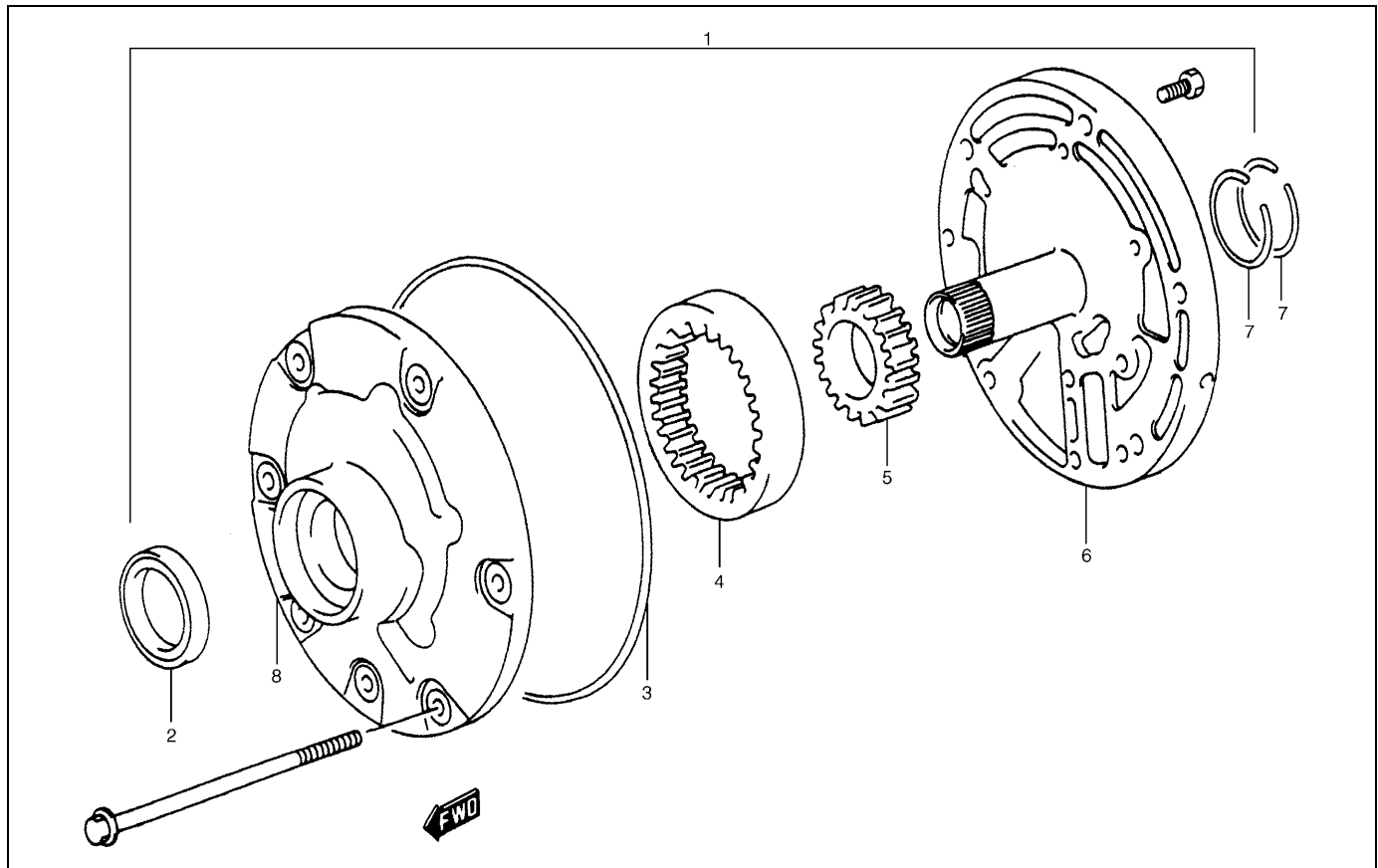
- 34) Using a punch, drive out manual shift lever pin, pull out manual shift shaft (2) and remove manual shift lever (1). Then remove sleeve cover from manual shift lever (1).



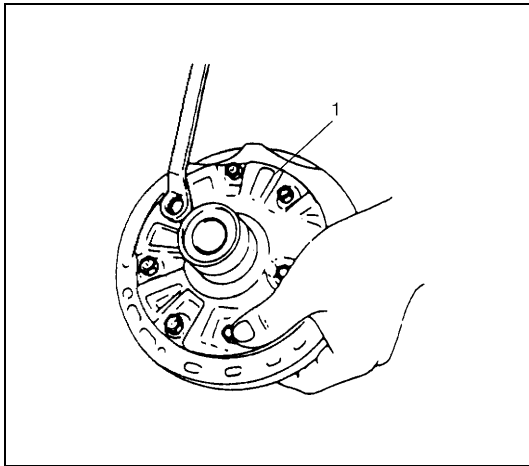
- 35) Remove oil seal (1) from both sides of transmission case.

SUB-ASSEMBLY REPAIR

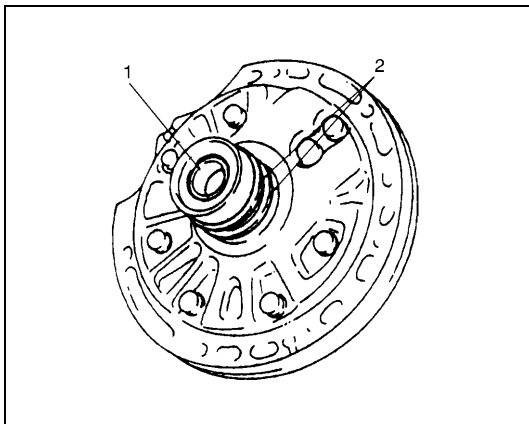
OIL PUMP



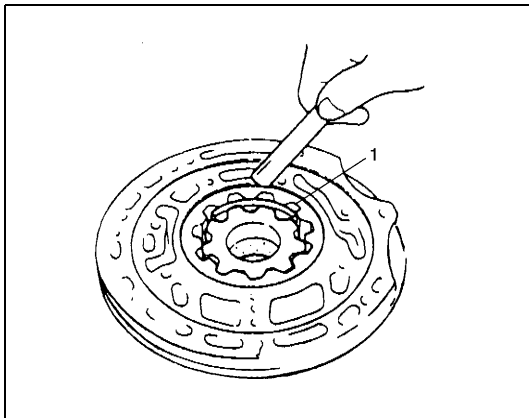
- | | | | |
|---------------------------|--------------------------|-------------------|------------------|
| 1. Oil pump assembly | 3. Oil pump cover O-ring | 5. Drive gear | 7. Seal ring |
| 2. Oil pump body oil seal | 4. Driven gear | 6. Oil pump cover | 8. Oil pump body |

DISASSEMBLY

- 1) Remove 6 bolts, oil pump cover (1), drive gear and driven gear in that order.
- 2) Remove oil pump cover O-ring.

INSPECTION

- Check seal ring (2) and bushing (1) for wear and damage.

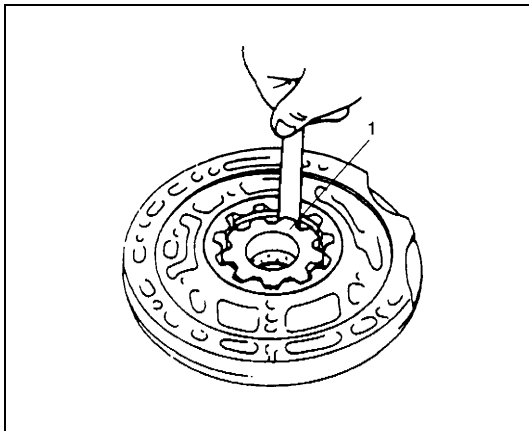


- Check clearance between outer gear (1) and body.

Clearance between outer gear and body :

Standard : 0.07 – 0.15 mm (0.0028 – 0.0059 in.)

Service limit : 0.30 mm (0.0118 in.)



- Check tip clearance between inner gear (1) and outer gear.

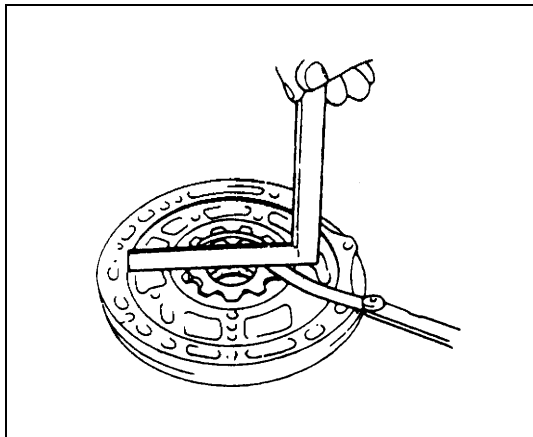
Tip clearance between inner gear and outer gear

Standard : 0.11 – 0.14 mm (0.0044 – 0.0055 in.)

Service limit : 0.30 mm (0.01181 in.)

NOTE:

Measure with torque converter installed.



- Check side clearance between inner gear/outer gear and pump body.

Side clearance between inner gear/outer gear and pump body :

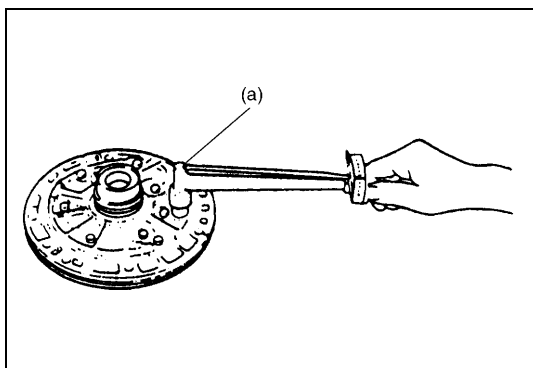
Standard : 0.02 – 0.05 mm (0.0008 – 0.0019 in.)

Service limit : 0.1 mm (0.0039 in.)

ASSEMBLY

Assemble each component by reversing removal procedure and noting following points.

- Before installing inner gear and outer gear to pump body, apply A/T fluid to them.
- When installing pump cover, use care so that its splined part will not cause damage to oil seal and use specified torque to tighten it to pump body.

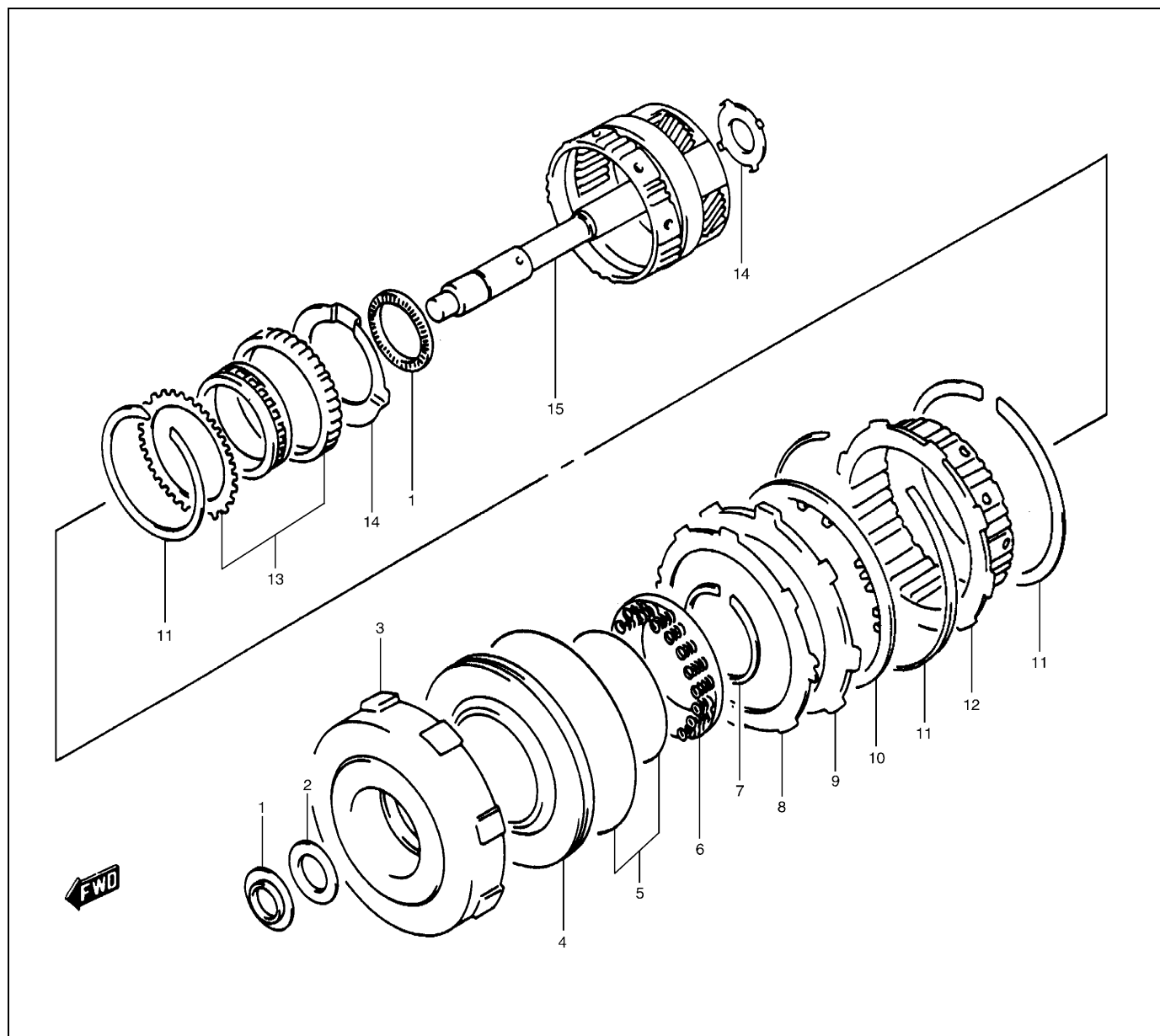


Tightening torque

Oil pump bolt (a) : 7.5 N·m (0.75 kg-m, 5.5 lb-ft)

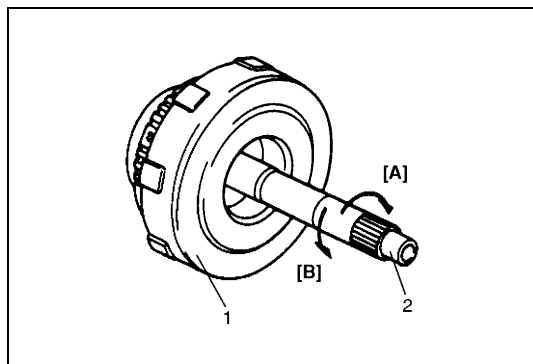
- When installing O-ring and oil seal, apply enough A/T fluid to them and fit them securely in groove.
- After installation, check that inner gear turns smoothly by making use of torque converter.
- When installing seal ring, it should not be opened more than necessary.
- Fit claws of seal ring securely.

OVERDRIVE (PLANETARY GEAR SIDE)



- | | | | |
|--------------------|-------------------------|-------------------------|------------------------|
| 1. Bearing | 5. O-ring | 9. Clutch backing plate | 13. One-way clutch |
| 2. Race | 6. Return spring | 10. Clutch disc | 14. Thrust washer |
| 3. Clutch cylinder | 7. Snap ring | 11. Retaining ring | 15. O/D planetary gear |
| 4. Clutch piston | 8. Cushion clutch plate | 12. Brake hub | |

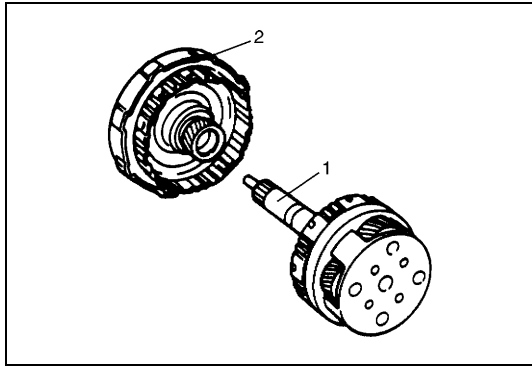
DISASSEMBLY



- 1) With overdrive (O/D) clutch cylinder (1) held stationary, turn O/D input shaft (2) clockwise to check that it turns smoothly and then counterclockwise to check that it locks.

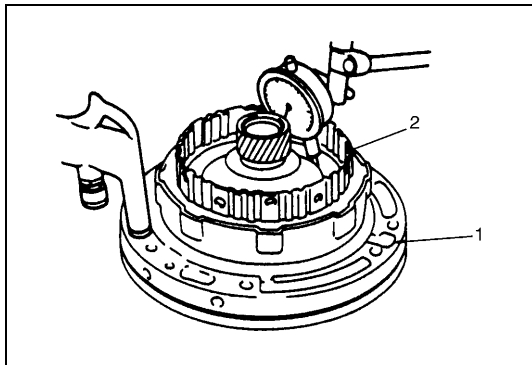
[A]: Rotates

[B]: Locks



2) Remove O/D planetary gear assembly (1).

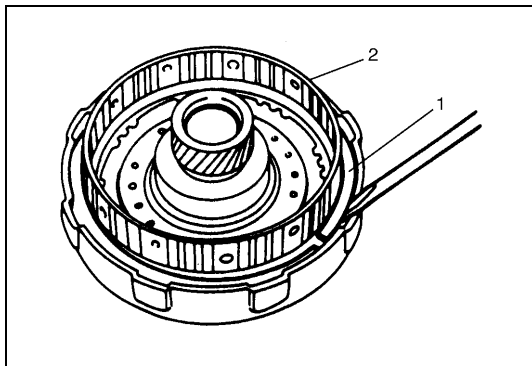
2. O/D clutch cylinder



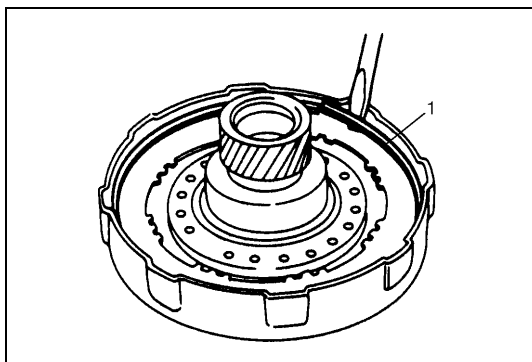
3) With O/D clutch assembly (2) installed to oil pump (1), apply 4 to 8 kg/cm² air pressure into fluid hole in oil pump and measure stroke of clutch piston. If it is not within standard range, replace cushion clutch plate or clutch disc.

Standard stroke of clutch piston:

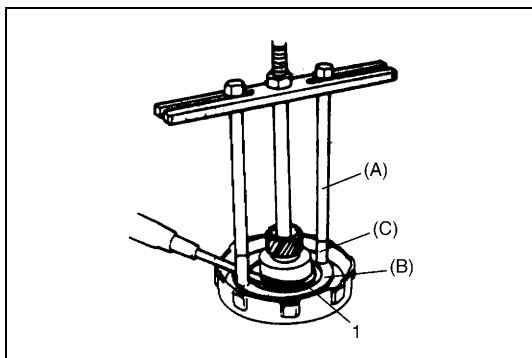
Standard : 1.47 – 2.28 mm (0.058 – 0.089 in.)



4) Remove retaining ring (1) and then remove brake hub (2).



5) Remove retaining clutch ring (1), cushion plate, backing plate and clutch disc in that order.



6) With clutch piston return spring compressed with special tools, remove clutch piston return spring.

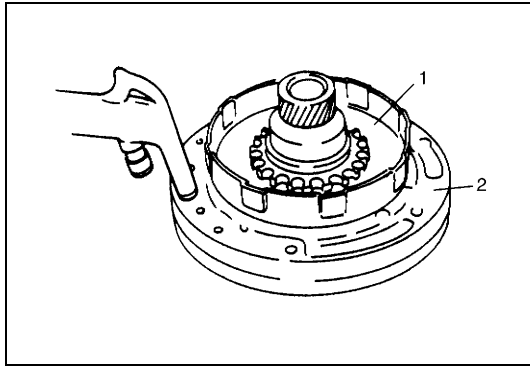
Special tool

(A) : 09918-48211

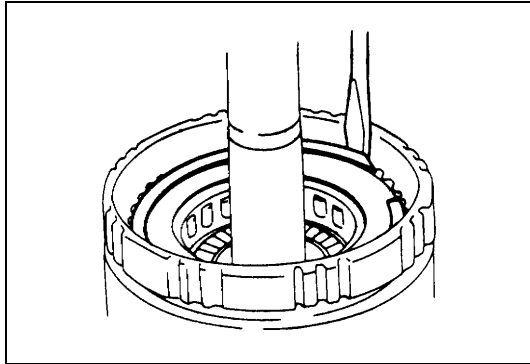
(B) : 09926-98320

(C) : 09918-48220

1. Snap ring



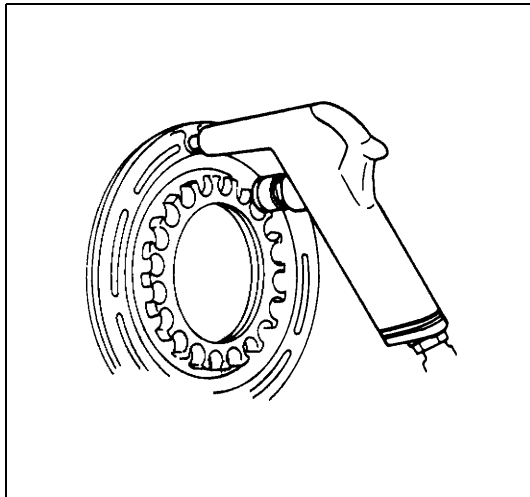
- 7) Install O/D clutch cylinder to oil pump (2). Apply compression air into fluid hole in oil pump (2) and remove clutch piston (1).
- 8) Remove piston inner O-ring and piston outer O-ring from clutch piston (1).



- 9) Remove retaining ring from O/D planetary gear and then remove one-way clutch, thrust planetary washer and thrust bearing.

INSPECTION

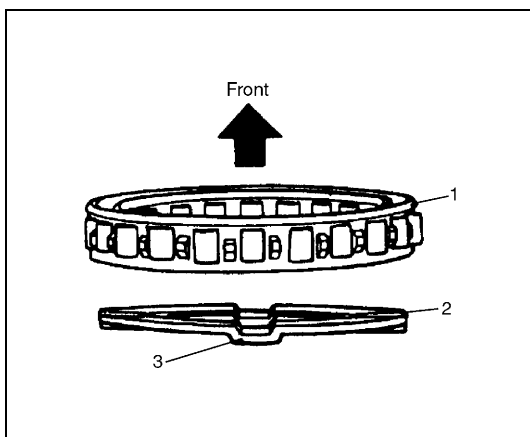
- Check that ball valve of clutch piston is not stuck.
- Check valve for leakage by applying low pressure air into ball valve hole.

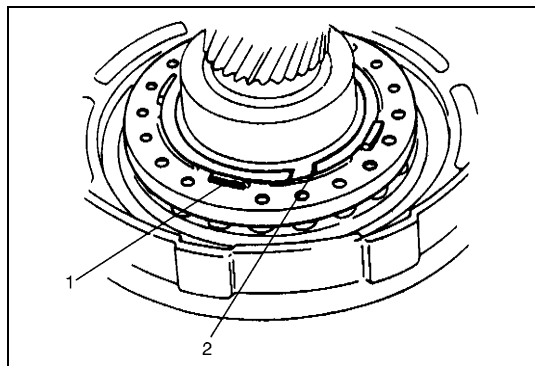


ASSEMBLY

Assemble each component by reversing removal procedure and noting the following points.

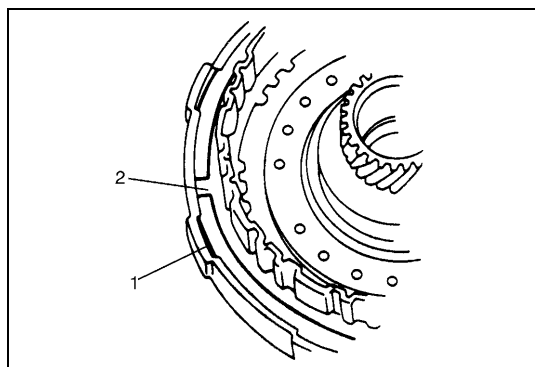
- When installing thrust washer (1), bring its oil groove (3) to the front.
- When installing one-way clutch to one-way clutch outer race, bring its flange (2) to the front.



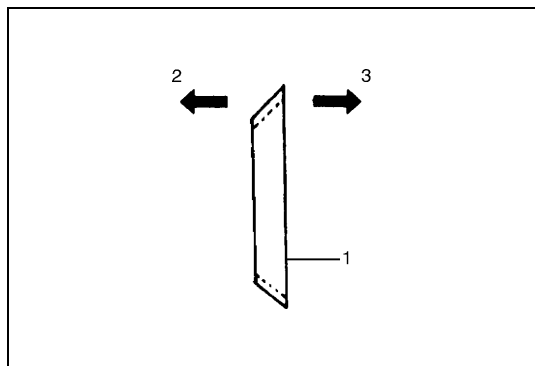


- Before installing piston inner O-ring and piston outer O-ring, apply A/T fluid to them.
- Install so that snap opening and projection (1) of clutch piston return spring will not match.

2. Slot



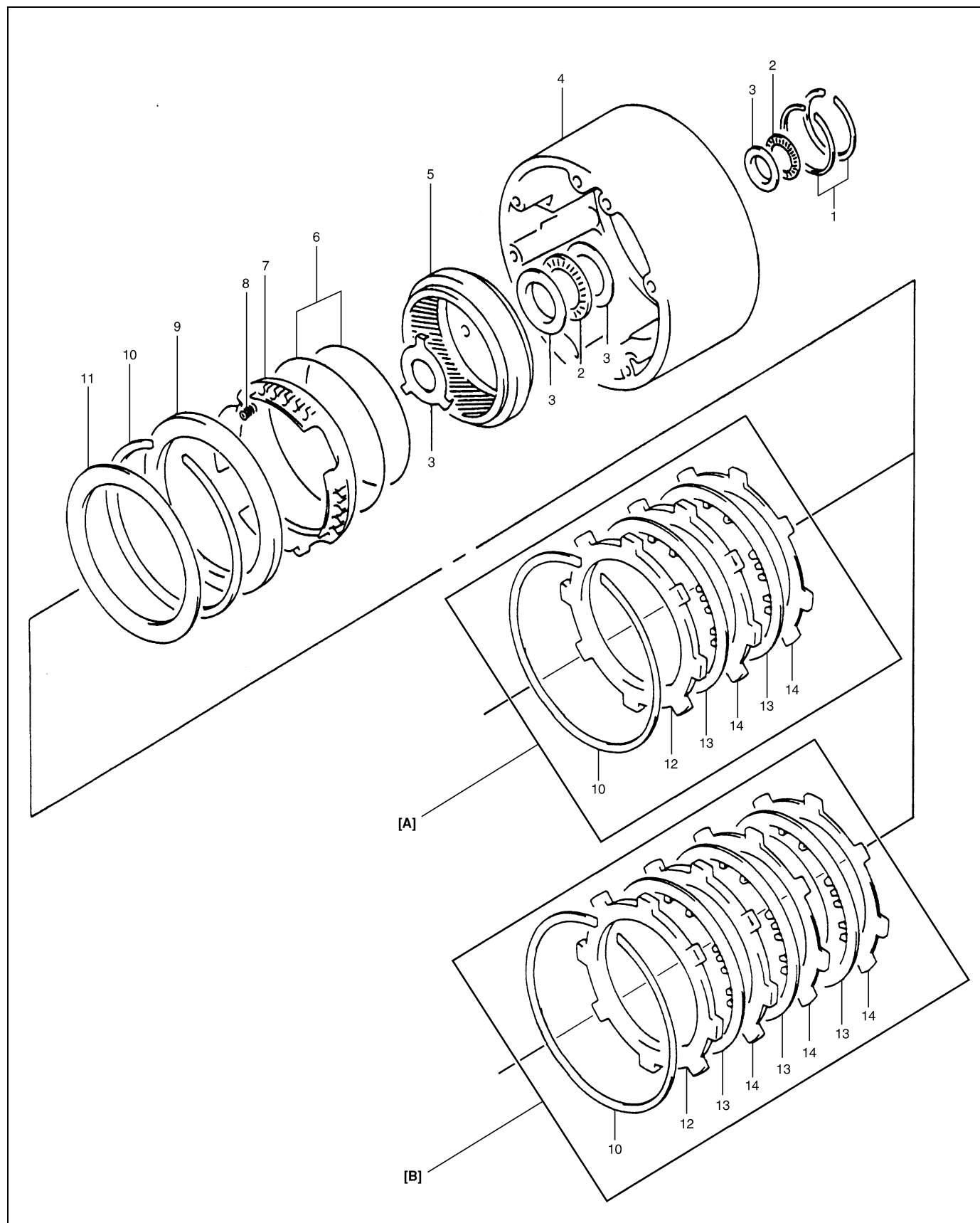
- Install retaining clutch ring and retaining brake hub so that their slots (2) will not match with dent (1) in O/D clutch cylinder.



- For installing cushion clutch plate (1), refer to the figure.

2. Clutch cylinder side
3. Brake hub side

OVERDRIVE (CASE SIDE)



[A]: [G16 and J20 engines]

[B]: [H25 engine]

1. Sealing

2. Bearing

3. Bearing race

4. O/D case

5. Planetary ring gear

6. O-ring

7. Brake piston

8. Return spring

9. Retainer

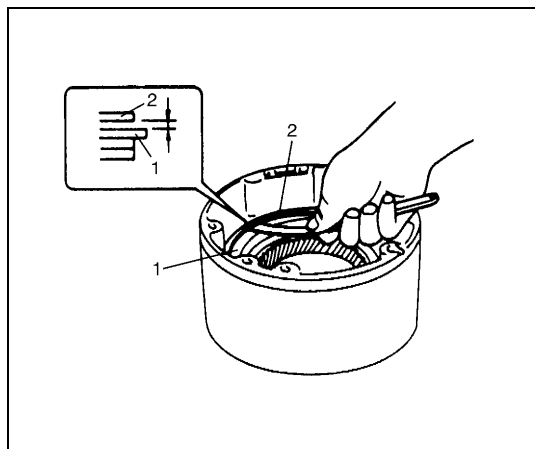
10. Retaining ring

11. Cushion plate

12. Brake backing plate

13. Brake disc

14. Brake plate

DISASSEMBLY

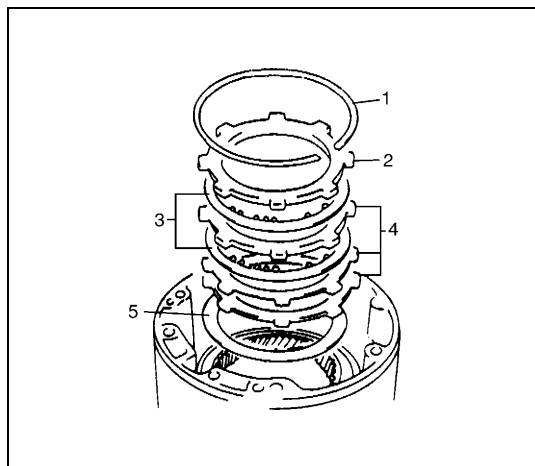
- 1) Measure clearance between retaining ring (1) and brake backing plate (2) with thickness gauge.

If it is not within standard range, replace brake disc or brake plate.

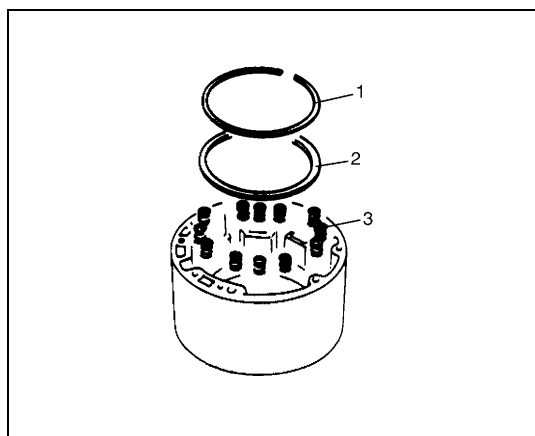
Clearance between retaining ring and brake backing plate**Standard :**

0.56 – 1.38 mm (0.022 – 0.054 in.) (G16 and J20 engines)

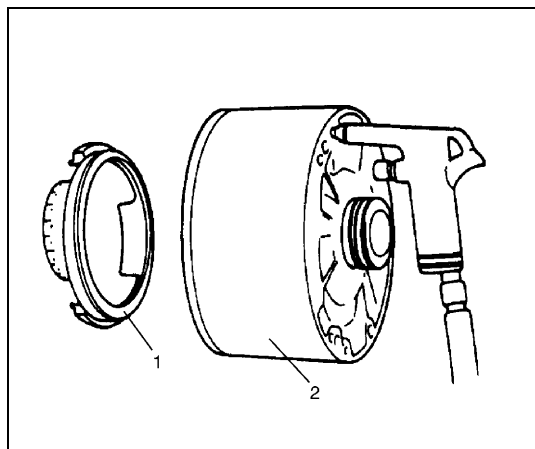
0.40 – 1.38 mm (0.016 – 0.054 in.) (H25 engine)



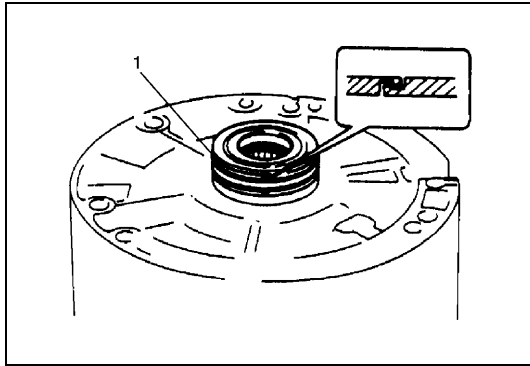
- 2) Remove retaining ring (1), brake backing plate (2), brake disc (3), brake plate (4), cushion brake plate (5) in that order. Then remove planetary ring gear, thrust bearing race and thrust rear bearing.



- 3) Remove retaining ring (1), retainer (2) and piston return spring (3).



- 4) Blow air into fluid hole in O/D case (2) and remove brake piston (1).
- 5) Remove brake piston inner ring and brake piston outer ring from brake piston.

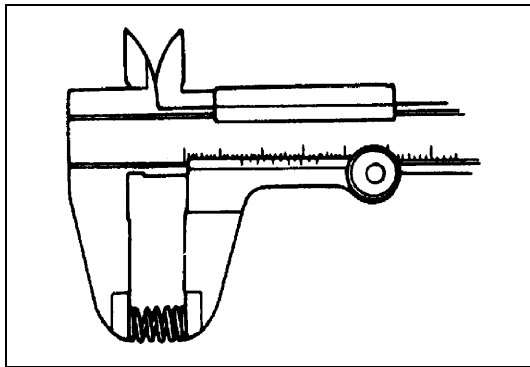


- 6) Unsnap seal ring (1).
- 7) Remove 2 seal rings (1).

NOTE:

Be careful not to open seal ring more than necessary.

INSPECTION



- Measure free length of piston return spring.

Standard free length of piston return spring :

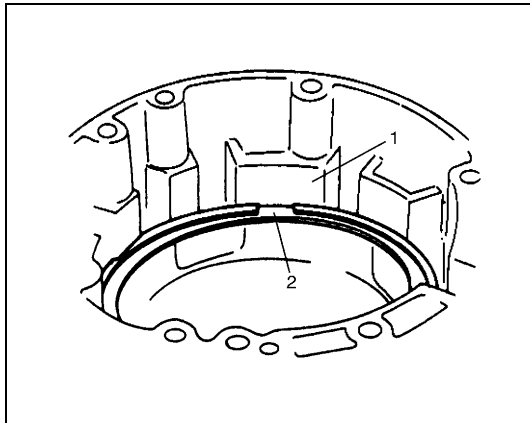
16.12 mm (0.635 in.) (J20 engine)

15.10 mm (0.594 in.) (G16 and H25 engines)

ASSEMBLY

Install each component by reversing removal procedure and noting the following points.

- When installing rear seal ring, use care not to open it too wide.
- Apply A/T fluid to O-ring, disc, etc. before installing them.
- Opening of retaining brake front ring (2) and projection (1) of O/D case should be matched.
- When installing each component, refer to the first figure of "OVER DRIVE (CASE SIDE)" in this section.

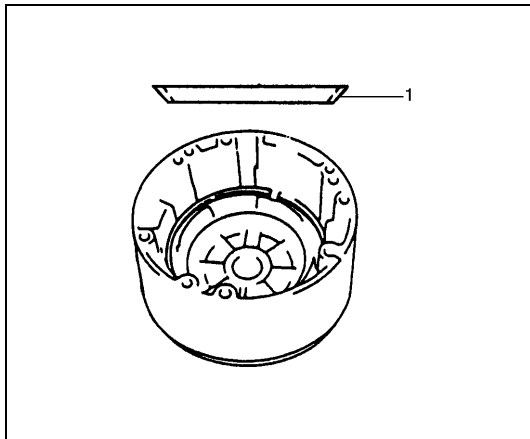


- Install cushion brake plate (1) so that it warps convexly.
- As a final step, measure clearance between retaining brake front ring and brake backing plate again.

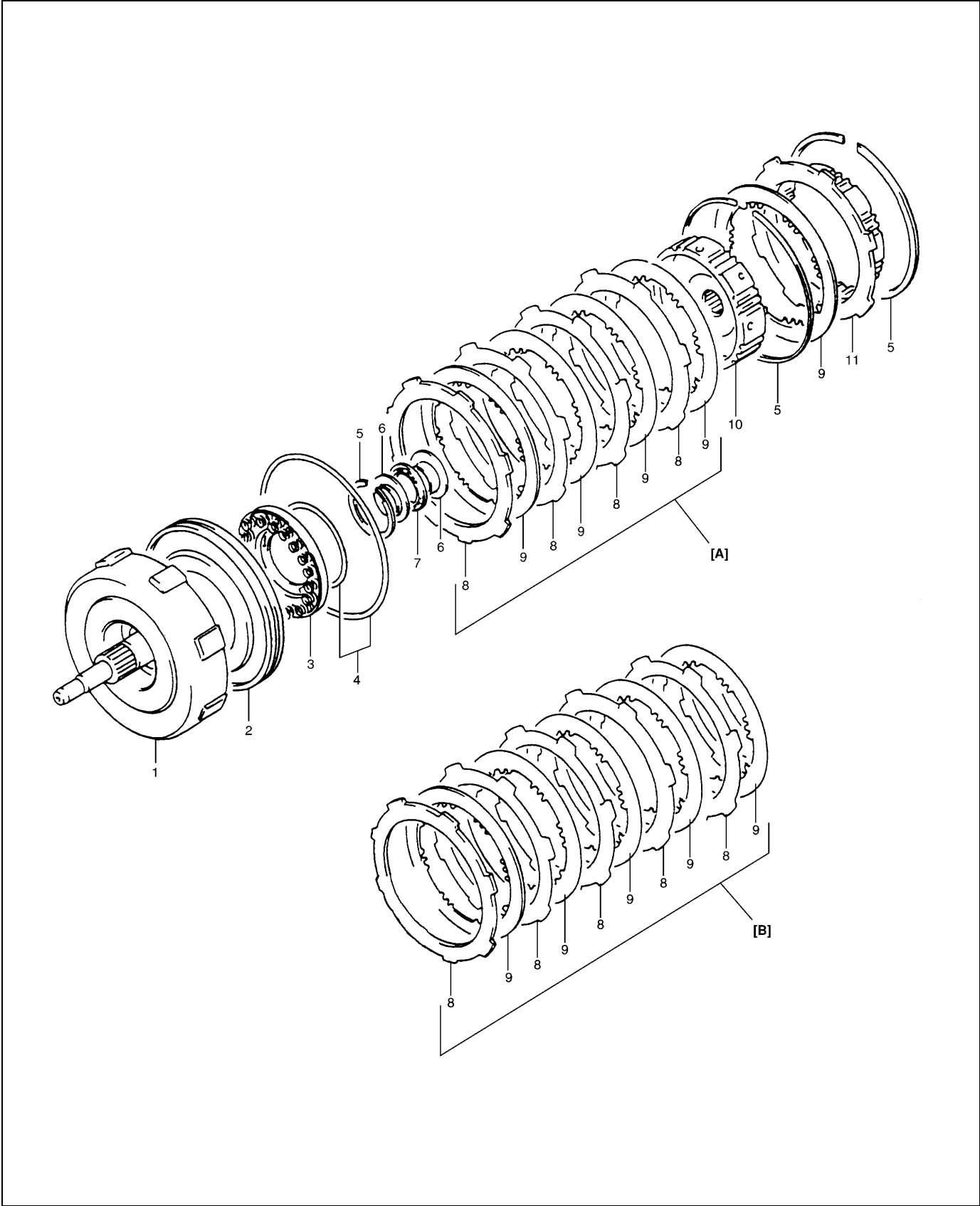
Standard clearance between retaining brake front ring and brake backing plate :

0.56 – 1.38 mm (0.022 – 0.054 in.) (G16 and J20 engines)

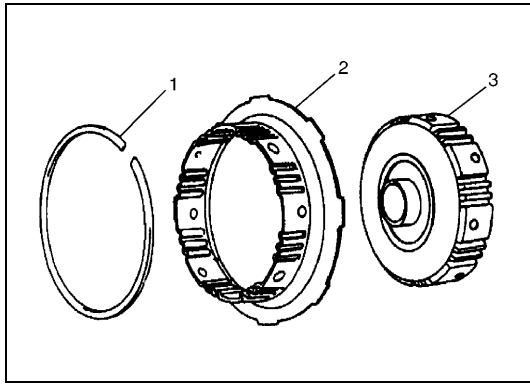
0.40 – 1.38 mm (0.016 – 0.054 in.) (H25 engine)



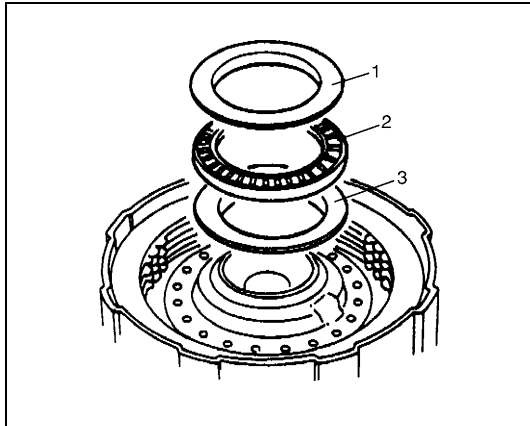
FORWARD CLUTCH



[A]: [J20 engine]	4. O-ring	9. Clutch disc
[B]: [G16 and H25 engines]	5. Retaining ring	10. Forward clutch hub
1. Input shaft	6. Bearing race	11. Direct clutch input hub
2. Piston	7. Bearing	
3. Return spring	8. Clutch plate	

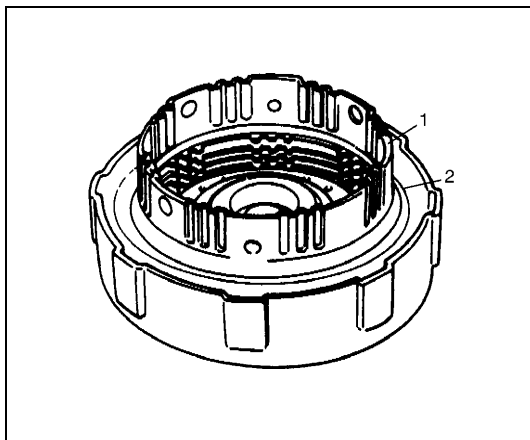
DISASSEMBLY

- 1) After removing retaining ring (1), remove direct clutch input hub (2) and forward clutch hub (3).

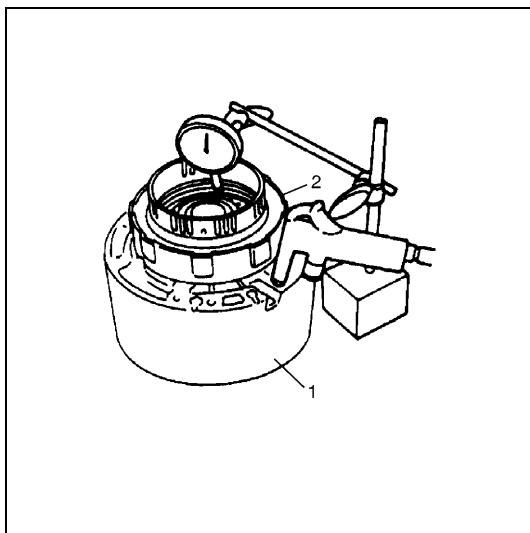


- 2) Remove bearing race and thrust bearing.

- | | |
|----|-------------------------------|
| 1. | Thrust bearing No. 2 |
| 2. | Thrust forward clutch bearing |
| 3. | Thrust rear race |

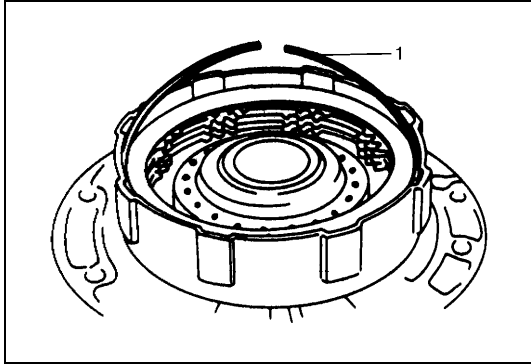


- 3) Install direct clutch input hub (1) and retaining ring (2).

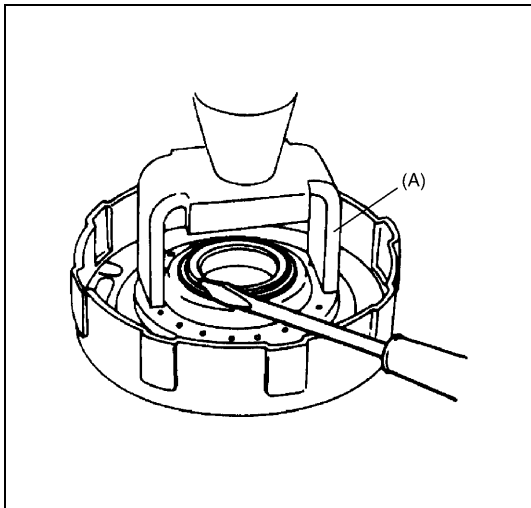


- 4) Install forward clutch (2) to O/D case (1). Apply 4 – 8 kg/cm² air pressure into fluid hole at the right of cut in O/D case and measure movement of forward clutch piston.
If measured value is not within standard range, use either 1.8 mm (0.071 in.) or 2.0 mm (0.079 in.) clutch disc to adjust it to standard value.

Standard forward clutch piston movement :
1.40 – 2.24 mm (0.056 – 0.088 in.)



- 5) Remove retaining ring (1) and then remove direct clutch input hub.
- 6) Remove retaining ring and then remove all clutch discs.



- 7) Using special tool and hydraulic press, compress forward clutch piston return spring and remove retaining return spring.

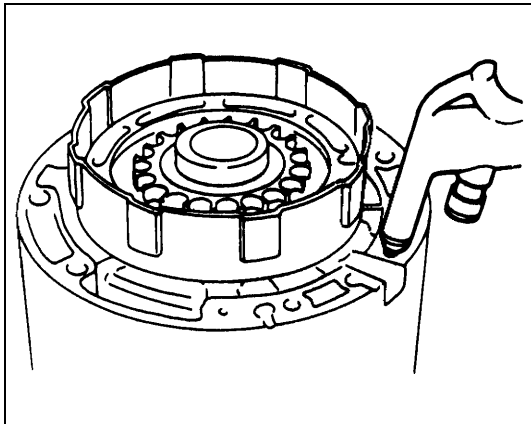
Special tool

(A) : 09926-98310

CAUTION:

Be careful when applying pressure, for overpressure will cause plate section of piston return spring to deform.

- 8) Remove forward clutch piston return spring.

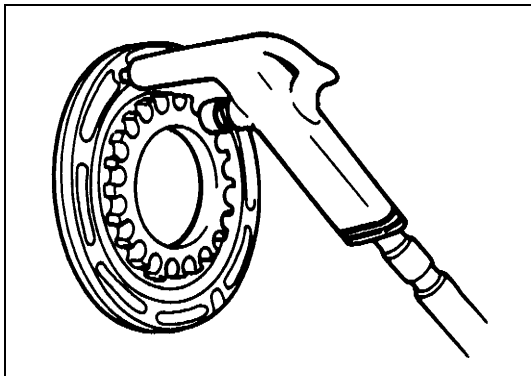


- 9) Install forward clutch to O/D case. Blow low pressure air into fluid hole at the right of cut in O/D case to remove forward clutch piston.

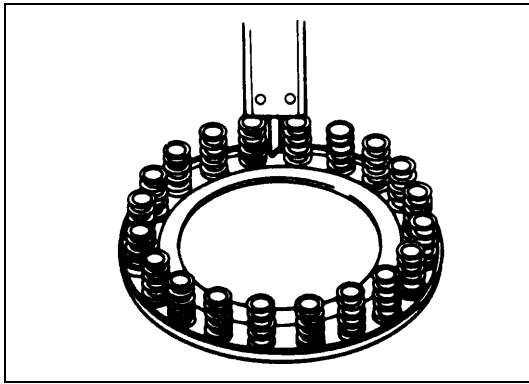
INSPECTION

Forward Clutch Piston

- Shake piston to check that ball is not stuck.
- Blow low pressure air to check ball section for leakage.



Forward Clutch Piston Return Spring

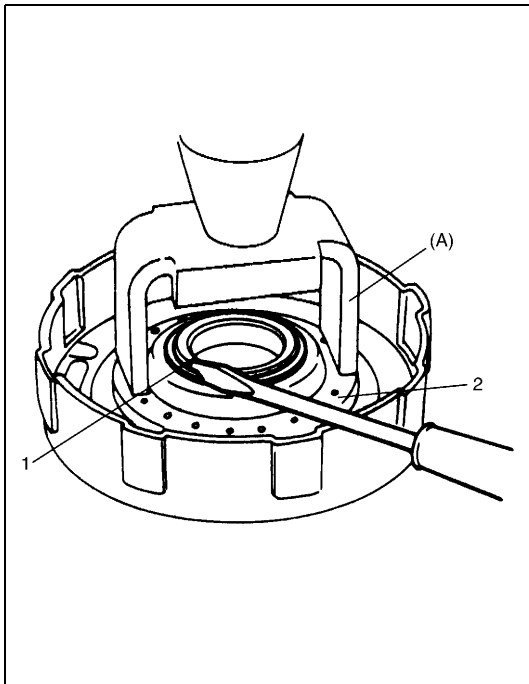


- Measure free length.

Standard free length of forward clutch piston return spring :

15.13 mm (0.596 in.)

INSTALLATION



- 1) Apply A/T fluid to forward input shaft O-rings, install forward clutch piston and piston return spring (2) to forward input shaft and then install return spring ring with special tool and hydraulic press.

Special tool

(A) : 09926-98310

NOTE:

- When installing return spring (2), be careful so that return spring (2) will not fall or tilt.
- Do not align opening in retaining ring (1) with lug of forward clutch piston return spring (2) at its retainer section.

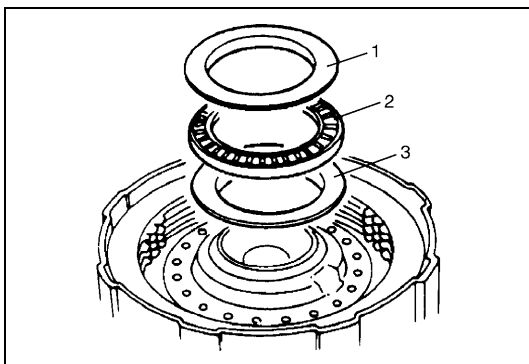
CAUTION:

Be careful when applying pressure, for overpressure will cause plate section of piston return spring to deform.

- 2) Install clutch discs from the thinnest one to thicker ones to piston side and then install retaining clutch ring.

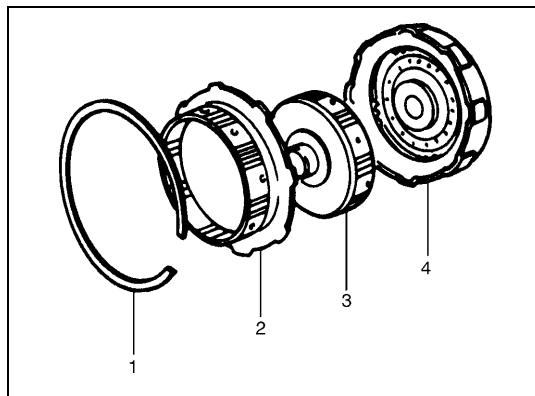
NOTE:

- Refer to the first figure of "FORWARD CLUTCH" in this section. When installing each component.
- Do not match opening in retaining clutch ring and dent in forward clutch input shaft.



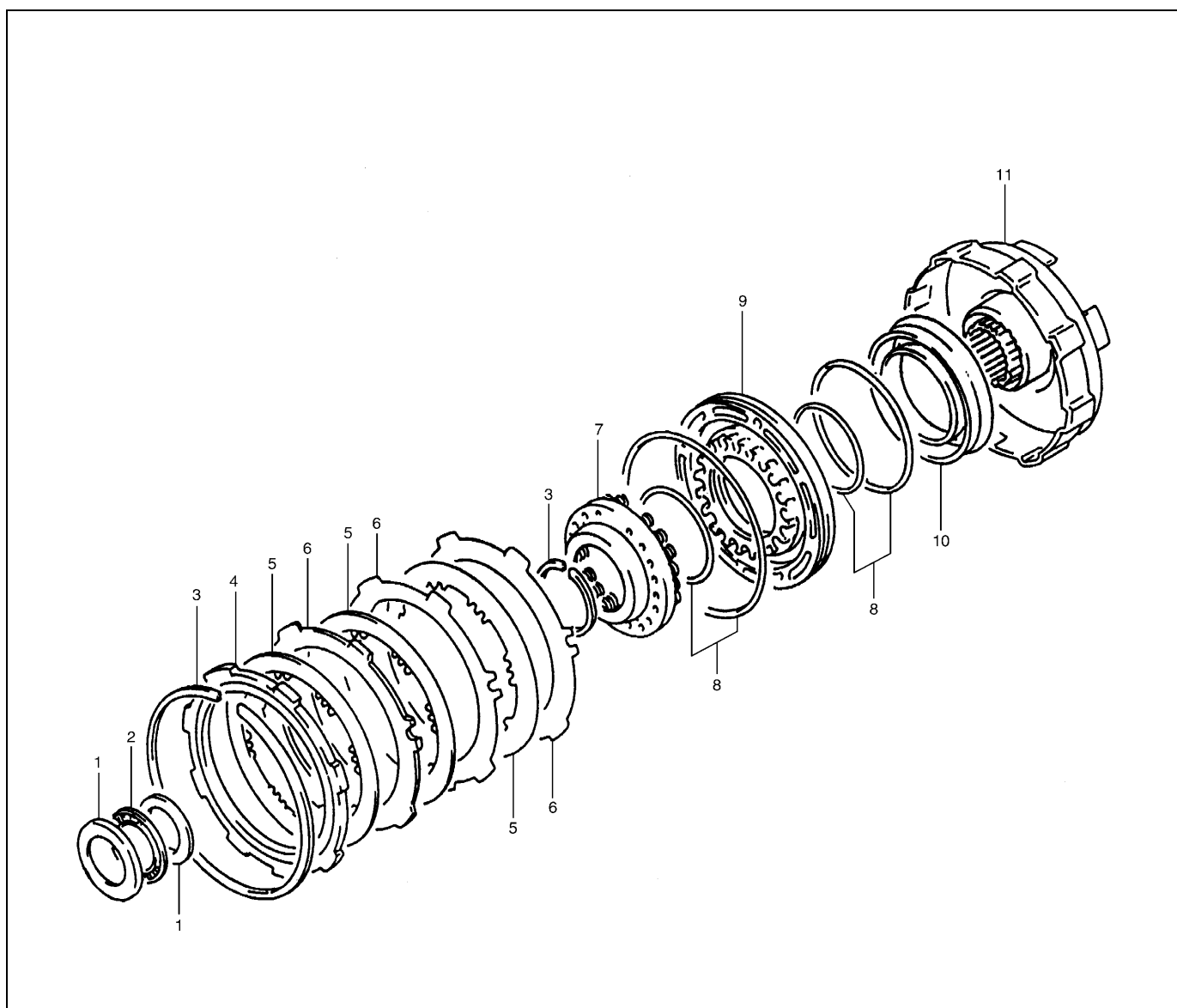
- 3) Install bearing races and thrust bearing.

- | |
|----------------------------------|
| 1. Thrust bearing No. 2 race |
| 2. Thrust forward clutch bearing |
| 3. Thrust rear race |

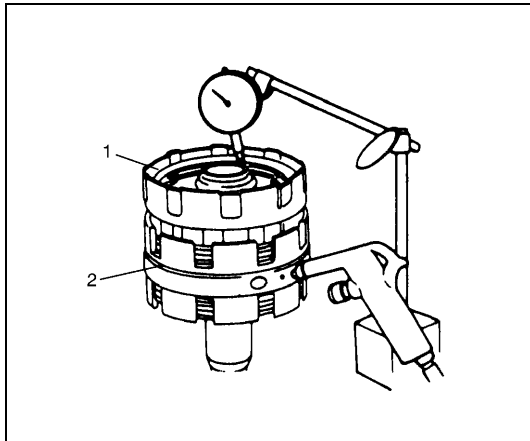


- 4) Install forward clutch hub (3), direct clutch hub (2) and retaining ring (1) to input shaft (4) in that order.

DIRECT CLUTCH



- | | | |
|-------------------------|------------------|--------------------------------|
| 1. Bearing race | 5. Clutch disc | 9. Direct clutch piston |
| 2. Bearing | 6. Clutch plate | 10. Direct clutch inner piston |
| 3. Retaining ring | 7. Return spring | 11. Direct clutch cylinder |
| 4. Clutch backing plate | 8. O-ring | |

DISASSEMBLY

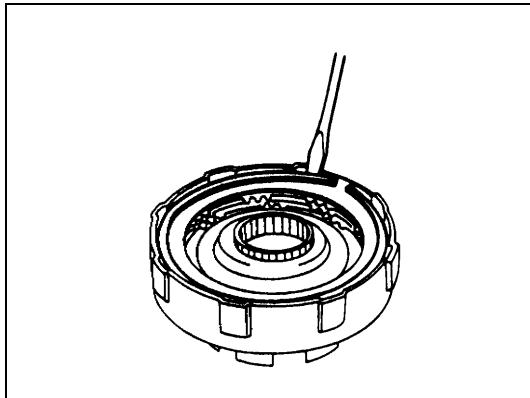
- 1) Install direct clutch assembly (1) to center support (2) and with 4 – 8 kg/cm² air pressure applied to second fluid hole from the left, measure stroke of direct clutch piston as shown in figure.

If it is not within standard range, use 3.55 mm, 3.75 mm or 4.0 mm (0.140 in., 0.147 in. or 0.157 in.) clutch backing plate to adjust it to standard stroke.

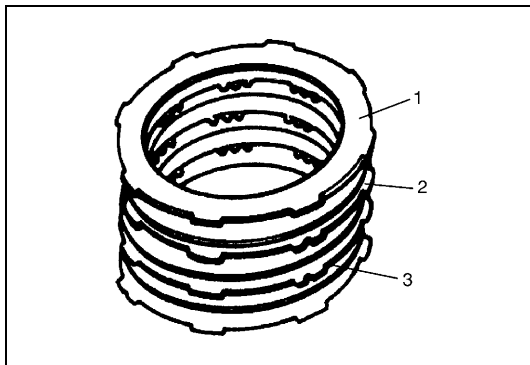
Standard direct clutch piston stroke :

1.06 – 2.14 mm (0.042 – 0.084 in.) (G16 and J20 engines)

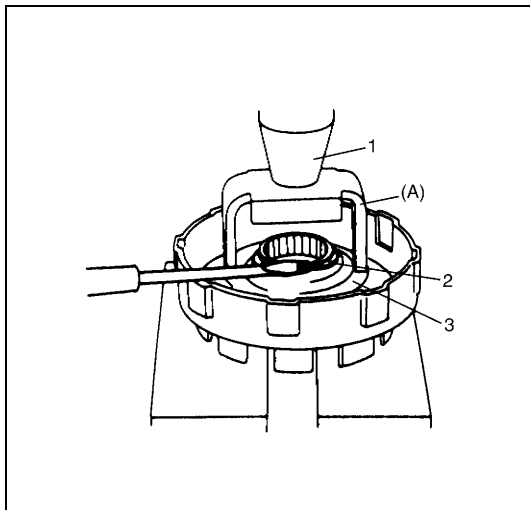
0.91 – 1.99 mm (0.036 – 0.078 in.) (H25 engine)



- 2) Remove direct clutch assembly from center support and then remove retaining ring.



- 3) Remove clutch backing plate (1) and then remove clutch disc (3) and clutch plate (2).



- 4) Using special tool and hydraulic press (1), compress direct clutch piston return spring (3) and remove retaining return spring ring (2).

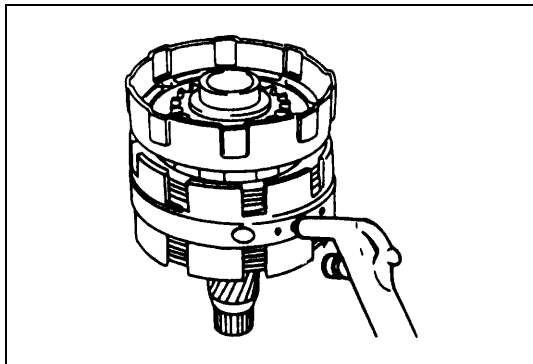
Special tool

(A) : 09926-98310

CAUTION:

Be careful when applying pressure, for overpressure will cause plate section of piston return spring to deform.

- 5) Remove direct clutch piston return spring.



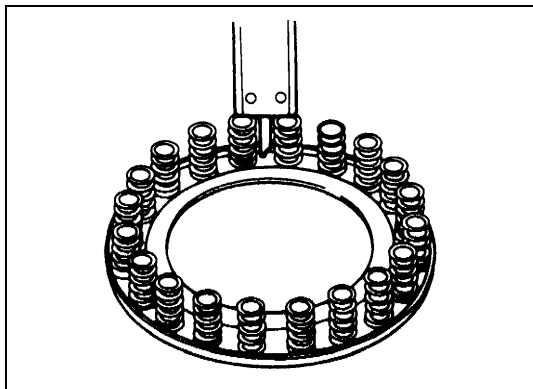
- 6) Install direct clutch cylinder to center support.
Remove direct clutch piston by blowing air into the second hole from the left as shown in the figure. Also, remove direct clutch inner piston by blowing air into hole at the extreme right. And then remove O-rings from pistons.

INSPECTION

Direct Clutch Piston Return Spring

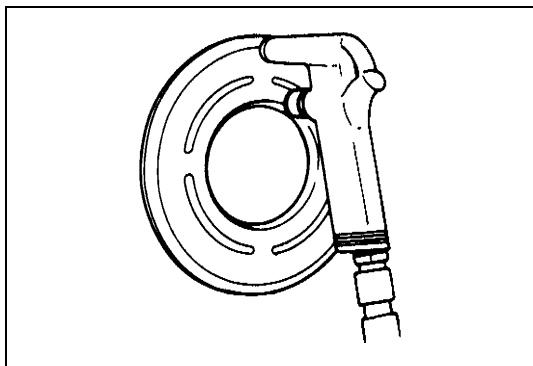
- Measure free length.

Standard free length of direct clutch piston return spring :
15.13 mm (0.595 in.)



Direct Clutch Piston

- Shake piston to check that ball is not stuck.
- Apply air pressure and check that there is no leakage.



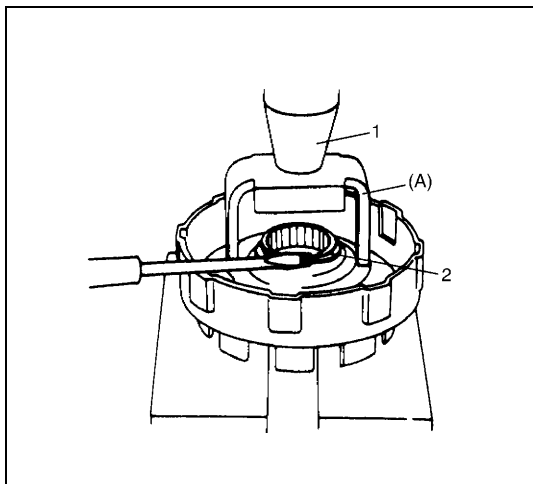
ASSEMBLY

Assemble each component by reversing disassembly procedure and noting the following points.

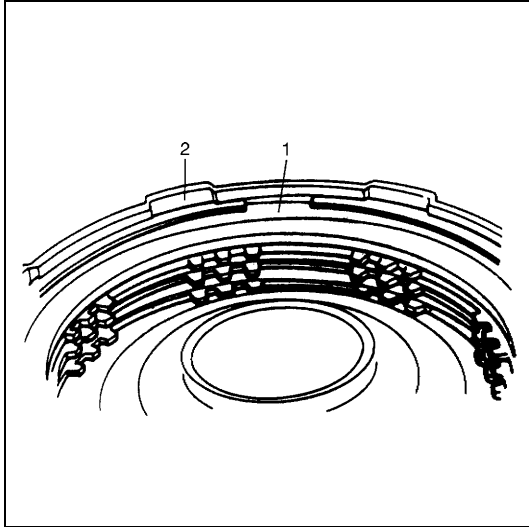
- Always use new O-ring and apply A/T fluid before installation.
- Do not align opening in retaining ring (2) with lug of direct clutch piston return spring at retainer.

Special tool

(A) : 09926-98310



1. Press

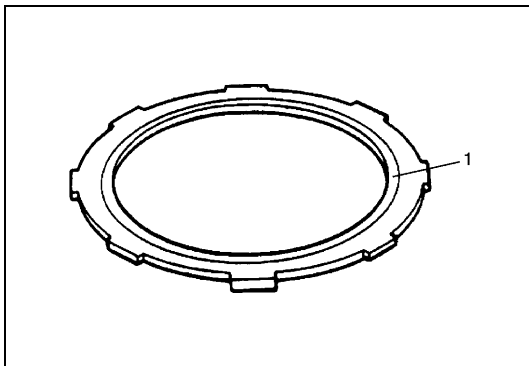


- Use care so that direct clutch piston return spring will not fall or tilt.

CAUTION:

Be careful when applying pressure, for overpressure will cause plate section of piston return spring to deform.

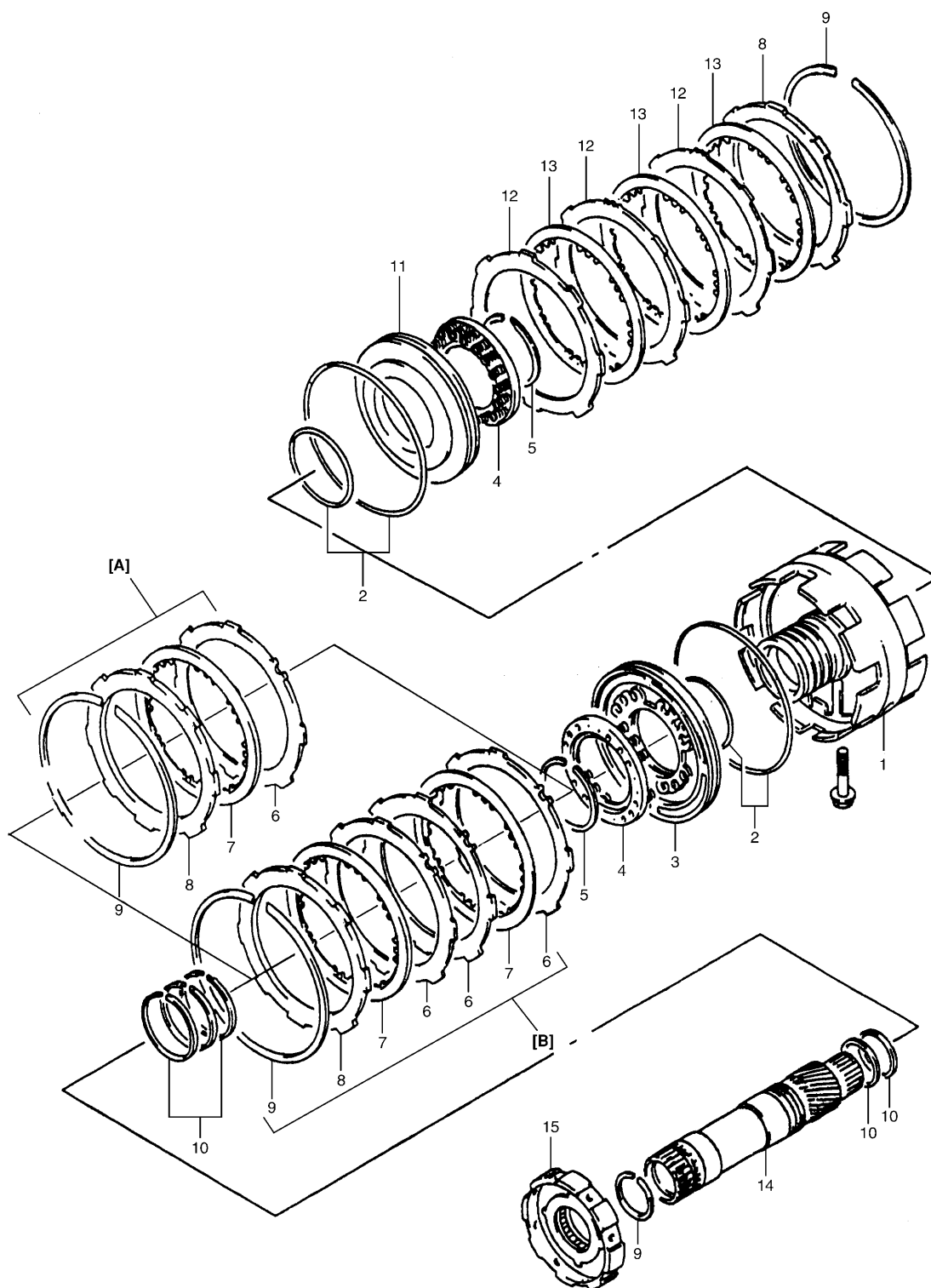
- Do not match opening (1) in retaining back plate ring with cutout (2) in direct clutch cylinder.



- Install clutch backing plate with its grooved side facing the front.

1. Groove

CENTER SUPPORT



[A]: [G16 and J20 engines]

[B]: [H25 engine]

1. Center support

2. O-ring

3. B1 brake (Second coast brake) piston

4. Piston return spring

5. Snap ring

6. B1 brake plate

7. B1 brake disc

8. Clutch backing plate

9. Retaining ring

10. Seal ring

11. B2 (Second brake) brake piston

12. B2 brake plate

13. B2 brake disc

14. Planetary sun gear

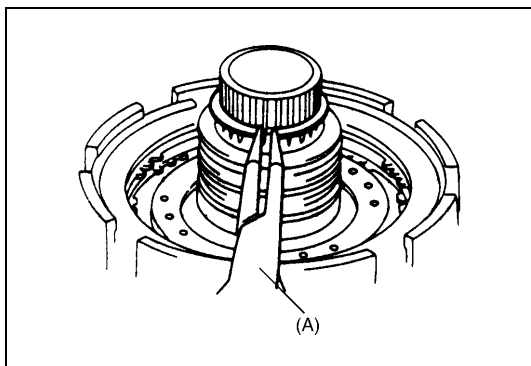
15. B2 brake hub assembly

DISASSEMBLY

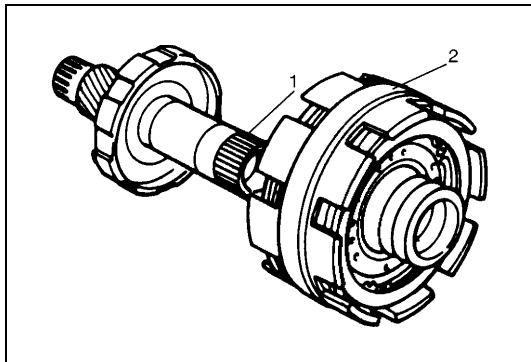
- 1) Remove retaining ring.

Special tool

(A) : 09920-76010



- 2) Pull out center support assembly (2) from planetary sun gear (1).

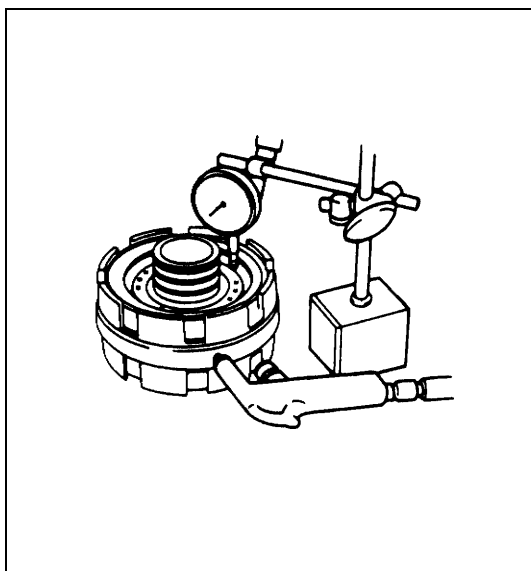


- 3) Apply 4 – 8 kg/cm² air pressure into fluid hole at the extreme left and measure movement of B1 brake (Second coast brake) piston.

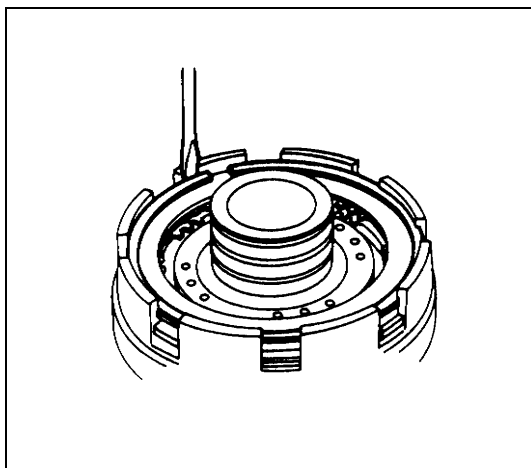
If measured value is not within standard range, replace B1 brake plate or B1 brake disc.

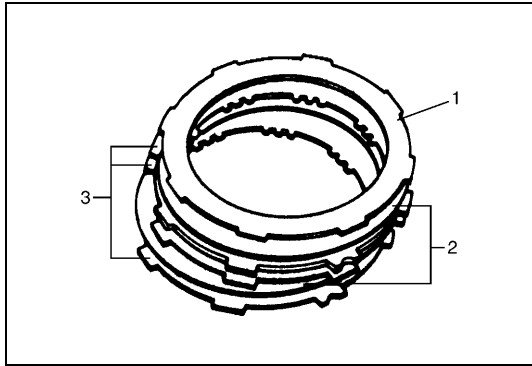
Standard B1 brake piston movement :

1.00 – 1.20 mm (0.039 – 0.047 in.)

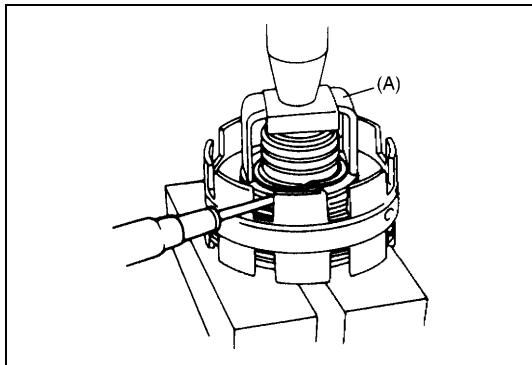


- 4) Remove retaining ring.





- 5) After removing clutch backing plate (1), remove B1 brake plates (3) and B1 brake discs (2).



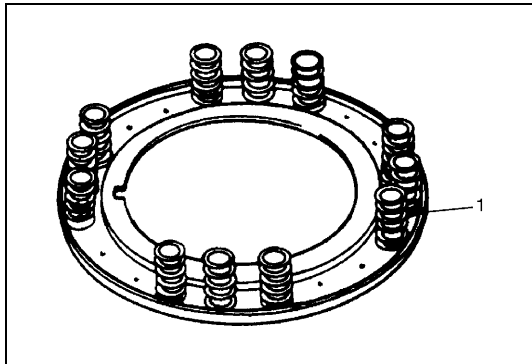
- 6) Using special tool and hydraulic press, compress piston return spring and remove snap ring.

CAUTION:

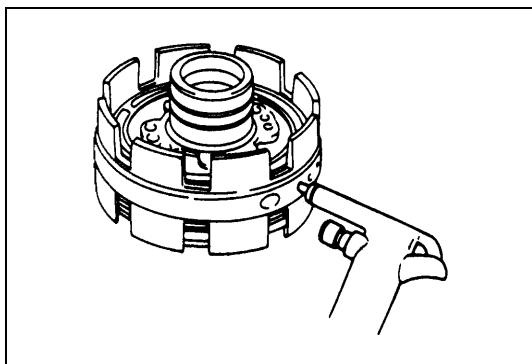
Be careful when applying pressure, for overpressure will cause plate section of piston return spring to deform.

Special tool

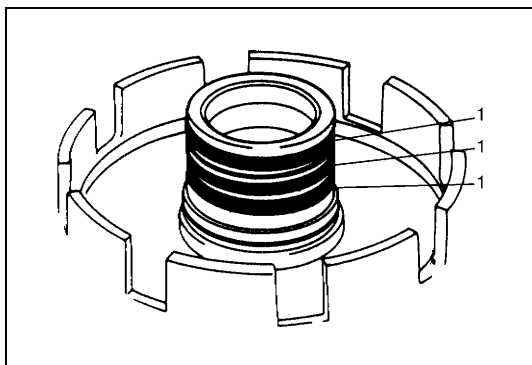
(A) : 09926-98310



- 7) Remove brake piston return spring (1).



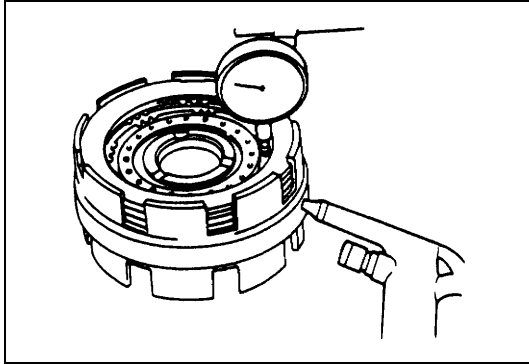
- 8) Blow air into fluid hole at the extreme left and remove B1 brake piston as shown in the figure. Then remove piston inner O-ring and piston outer O-ring from B1 brake piston.



- 9) Remove 3 seal rear rings (1).

NOTE:

Use care not to open ring more than necessary.

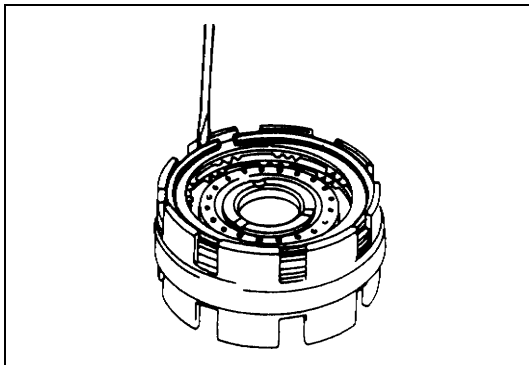


- 10) Apply 4 – 8 kg/cm² air pressure into the second hole from the left and measure stroke of B2 brake (Second brake) piston as shown in figure.

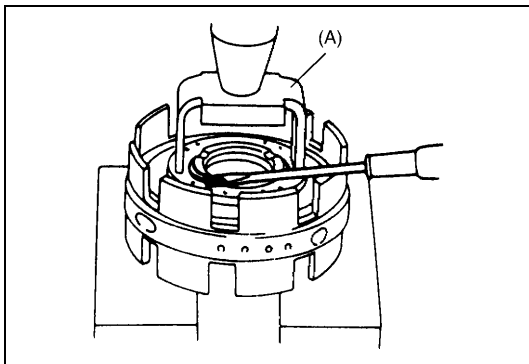
If measured value is not within standard range, replace B2 brake plate or B2 brake disc.

Standard B2 brake piston stroke :

1.01 – 2.25 mm (0.040 – 0.088 in.)



- 11) After removing retaining back plate ring, remove clutch backing plate, B2 brake plates and B2 brake discs.



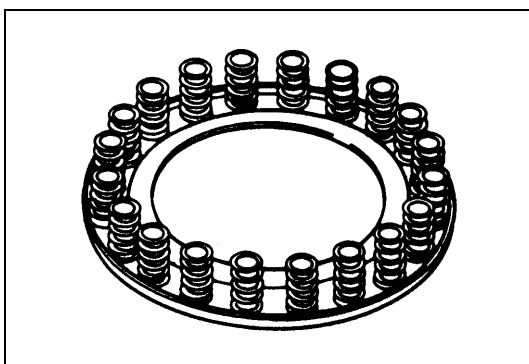
- 12) Using special tool and hydraulic press, compress brake piston return spring and remove snap B1 brake ring.

CAUTION:

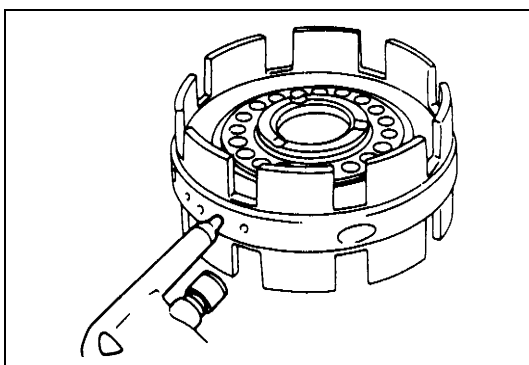
Be careful when applying pressure, for overpressure will cause plate section of piston return spring to deform.

Special tool

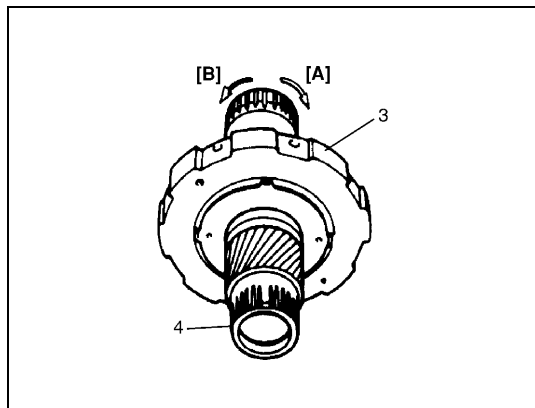
(A) : 09926-98310



- 13) Remove brake piston return spring.



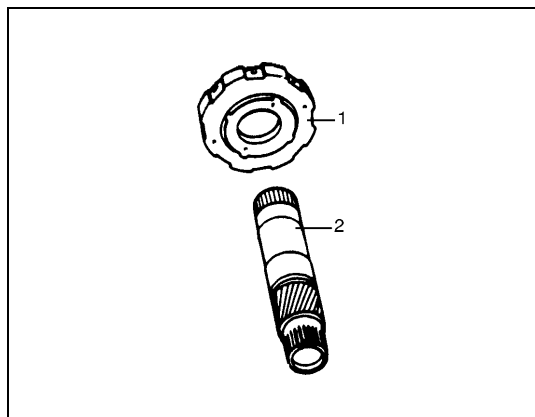
- 14) Blow air into the second air hole from the left and remove B2 brake piston. Then remove piston inner O-ring and piston outer O-ring from B2 brake piston.



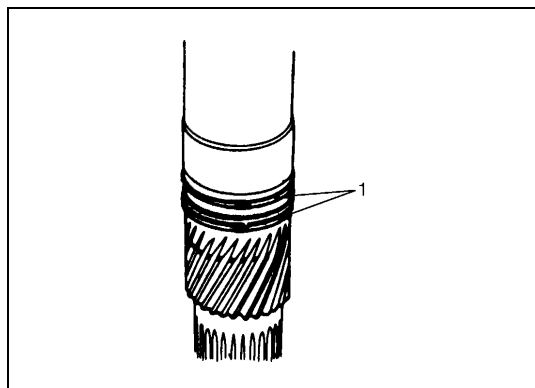
- 15) With B2 brake hub assembly (3) held stationary, turn planetary sun gear (4) clockwise to check that it locks and then counterclockwise to check that it turns smoothly.

[A]: Locks

[B]: Turns



- 16) Remove B2 brake hub assembly (1) from planetary sun gear (2).



- 17) Remove 2 sun gear seal rings (1) from planetary sun gear.

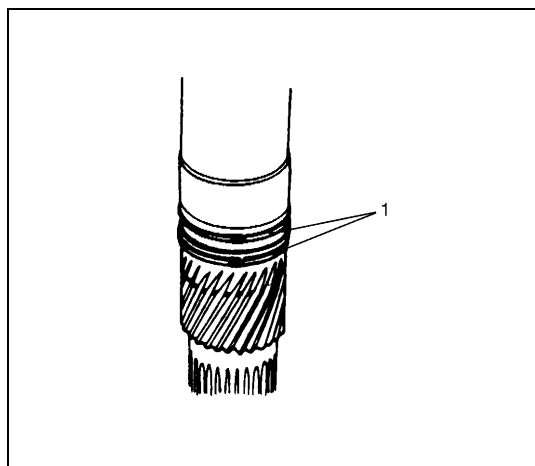
NOTE:

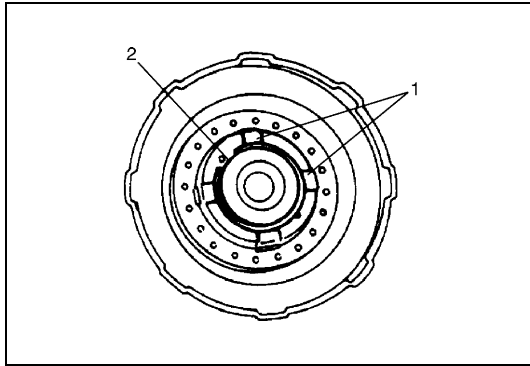
Use care not to open sun gear seal ring more than necessary.

ASSEMBLY

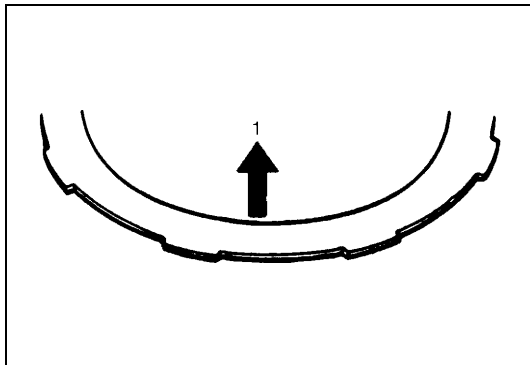
Assemble components by reversing disassembly procedure and noting the following points.

- Snap both ends of sun gear seal ring (1) securely.
- Do not open sun gear seal ring more than necessary.
- Always use new O-ring and apply A/T fluid before installation.
- When installing O-ring, make sure that it is not kinked or caught.
- Push in brake piston horizontally.
- When installing brake piston return spring, be careful so that spring will not fall or tilt.





- When installing snap ring, do not align lug (1) of retainer with opening in snap ring (2).



- When installing brake discs, brake plates and clutch backing plate, refer to the first figure of "CENTER SUPPORT" in this section.
- Install clutch backing plate with its chamfered side facing brake disc.

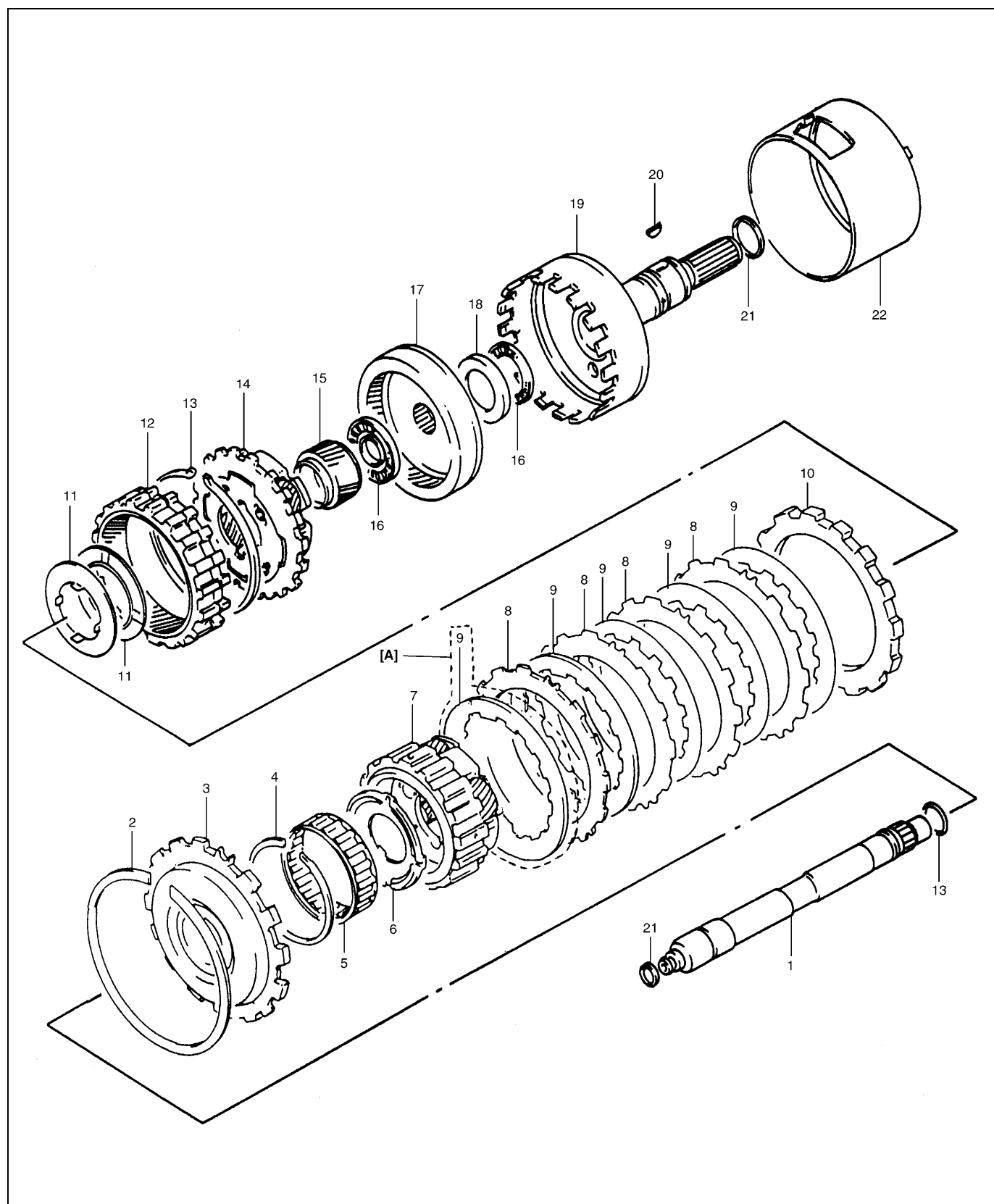
1. Clutch disc facing side

- After installing each retaining backing plate ring, measure movement of brake piston again.
If it is not within standard range, it is possible that ring is not installed properly. Then disassemble and reassemble again.

Standard movement of B1 brake piston :
1.00 – 1.20 mm (0.039 – 0.047 in.)

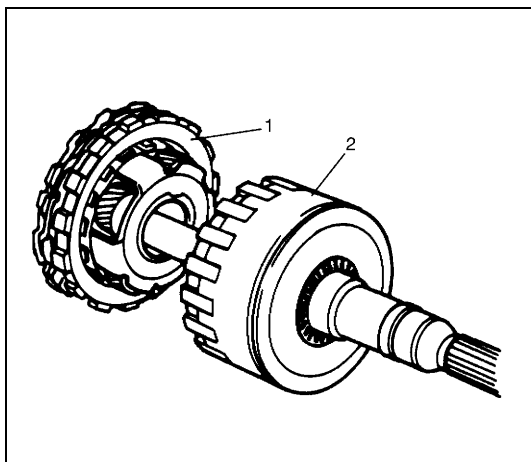
Standard movement of B2 brake piston :
1.01 – 2.25 mm (0.040 – 0.088 in.)

PLANETARY GEARS AND OUTPUT SHAFT

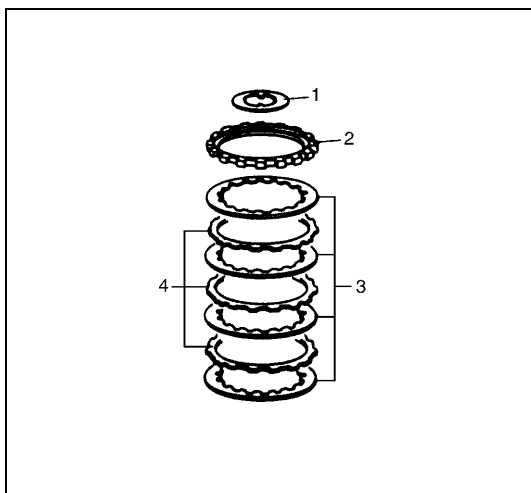


[A]: [G16 and H25 engines only]

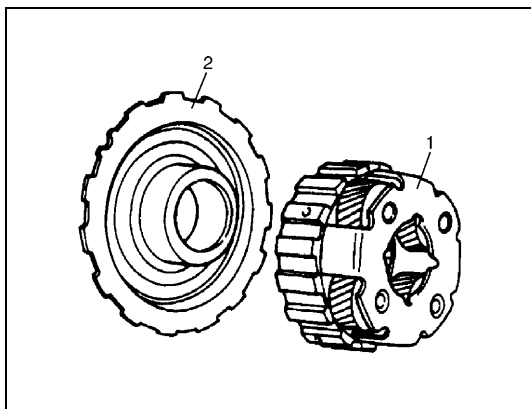
- | | | | |
|---------------------------------|---------------------------------|-------------------------------|---------------------------|
| 1. Inner shaft | 6. One-way clutch thrust washer | 12. Front planetary ring gear | 18. Bearing race |
| 2. Retaining ring | 7. Front planetary gear | 13. Retaining ring | 19. Output shaft assembly |
| 3. Reverse brake reaction plate | 8. Reverse brake plate | 14. Rear planetary gear | 20. Key |
| 4. Retaining ring | 9. Reverse brake disc | 15. Planetary sun gear | 21. Seal ring |
| 5. One-way clutch | 10. Reverse brake backing plate | 16. Bearing | 22. Brake applying tube |
| | 11. Washer | 17. Rear planetary ring gear | |

DISASSEMBLY

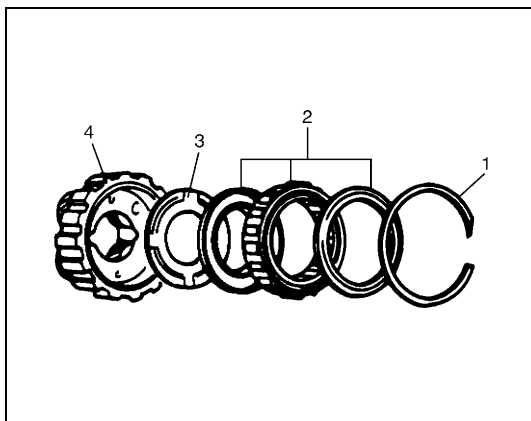
- 1) Remove front planetary gear assembly (1) from output shaft assembly (2).



- 2) Remove rear planetary thrust washer (1), reverse brake backing plate (2), reverse brake disc (3) and reverse brake plate (4) from front planetary gear assembly.

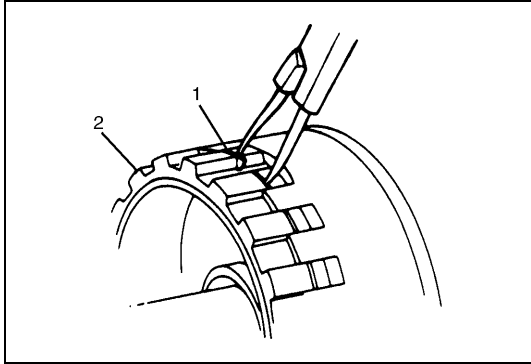


- 3) Remove reverse brake reaction plate (2) from front planetary gear (1).

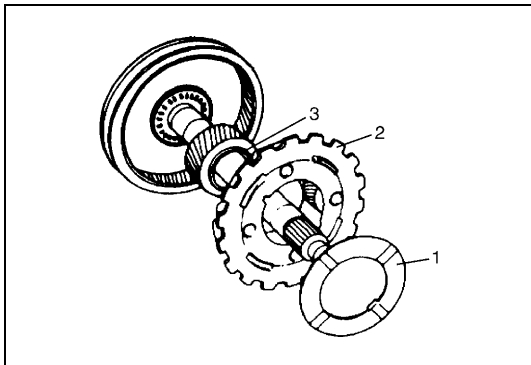


- 4) After removing retaining ring (1), remove one-way clutch (2) and one-way clutch rear thrust washer (3).

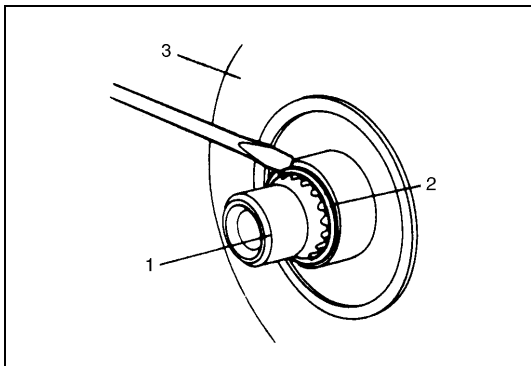
4. Front planetary gear



- 5) After removing retaining ring (1), remove front planetary ring gear (2), thrust bearing and rear planetary race.



- 6) Remove rear planetary thrust washer (1), rear planetary gear (2) and rear planetary sun gear (3).

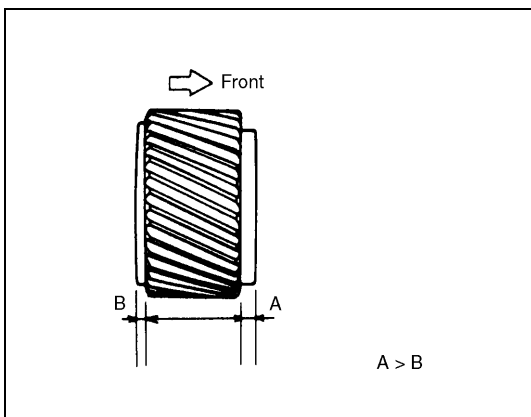


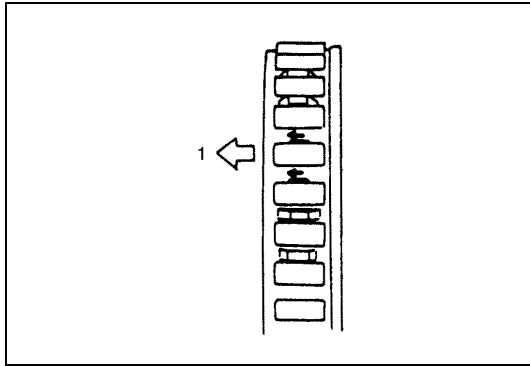
- 7) After removing retaining ring (2) from inner shaft (1), remove rear planetary ring gear (3) and thrust bearing assembly.

ASSEMBLY

Assemble components by reversing disassembly procedure and noting following points.

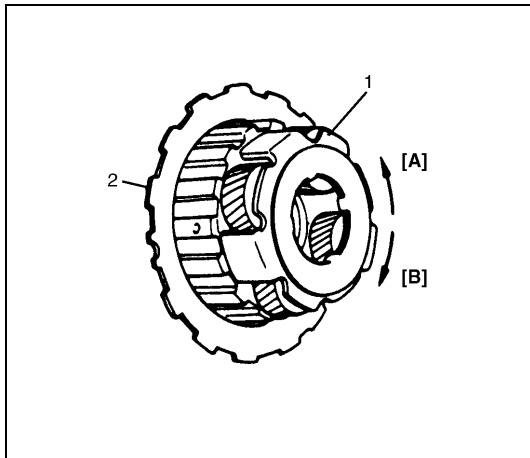
- Refer to the first figure of "PLANETARY GEARS AND OUTPUT SHAFT" when installing each component.
- Check seal sleeve ring for damage before installation and replace if damaged.
- Install planetary sun gear as shown in the figure.
- Fit retaining rings into groove securely.





- Install one-way clutch as shown in the figure.

1. Front planetary gear side

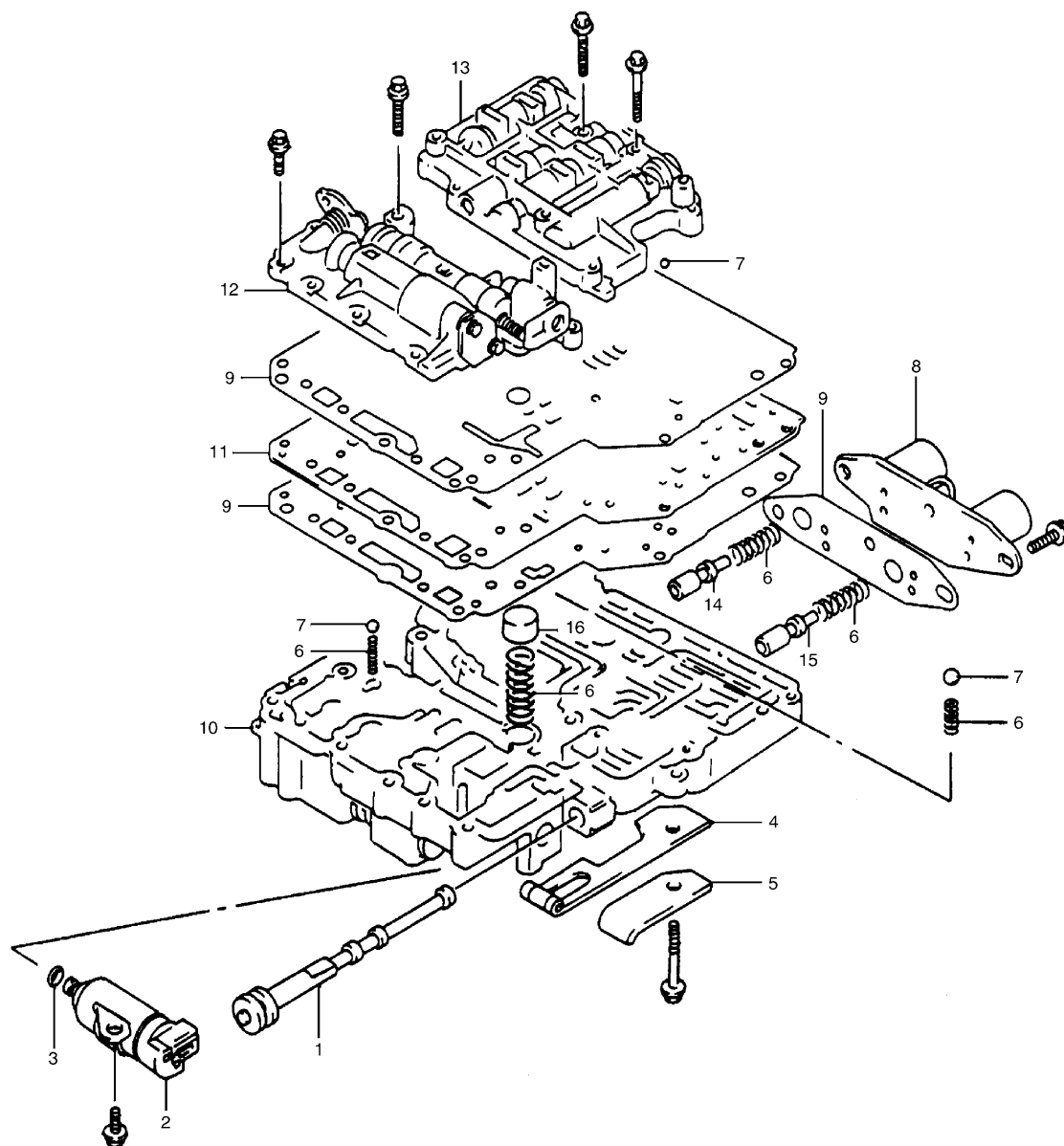


- Install reverse brake reaction plate (2) to front planetary gear (1). With reverse brake reaction plate (2) fixed stationary, turn front planetary gear (1) clockwise to check that it locks and then counterclockwise to check that it turns smoothly.

[A]: Rotates

[B]: Locks

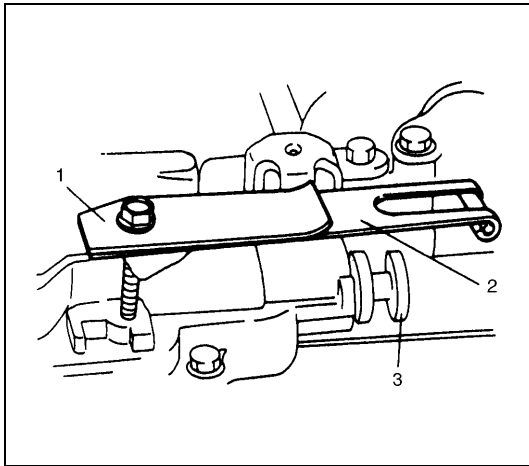
VALVE BODY ASSEMBLY



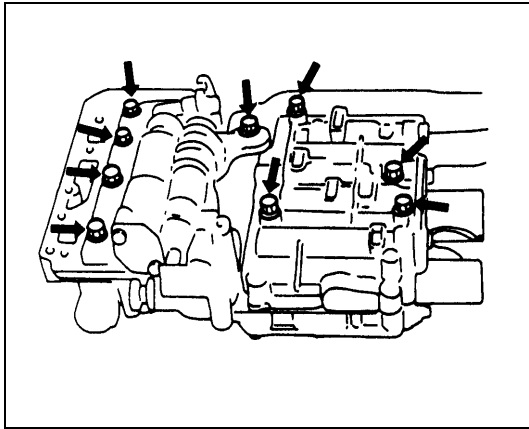
- | | | | |
|--|--|-------------------------------|--|
| 1. Manual valve | 5. Plate | 9. Gasket | 13. Rear upper valve body |
| 2. TCC solenoid valve
(Solenoid valve No.2) | 6. Spring | 10. Lower valve body assembly | 14. Intermediate coast modulator valve |
| 3. O-ring | 7. Ball | 11. Plate | 15. Low coast modulator valve |
| 4. Detent spring | 8. Shift solenoid valve A & B
(Solenoid valve No.1) | 12. Front upper valve body | 16. By-pass valve |

DISASSEMBLY

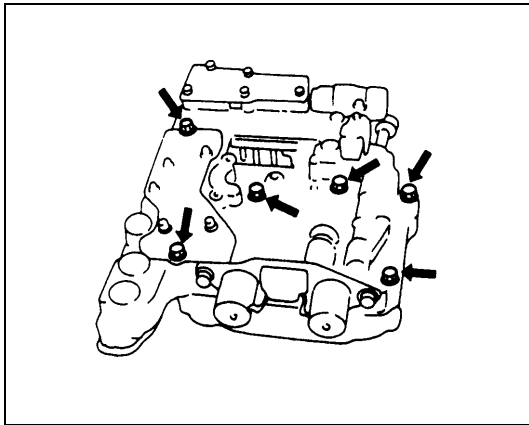
- 1) Remove detent spring (2), plate (1) and manual valve (3).



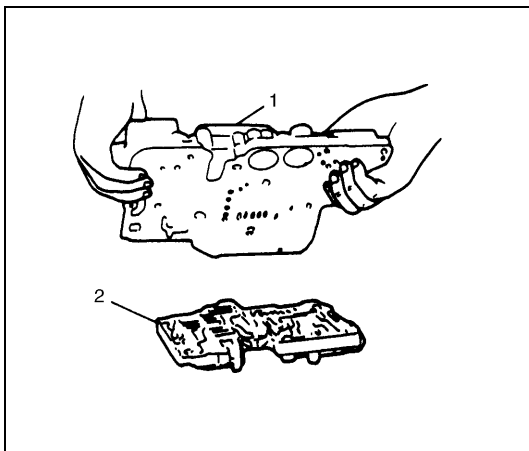
- 2) Remove bolts from upper valve body side.

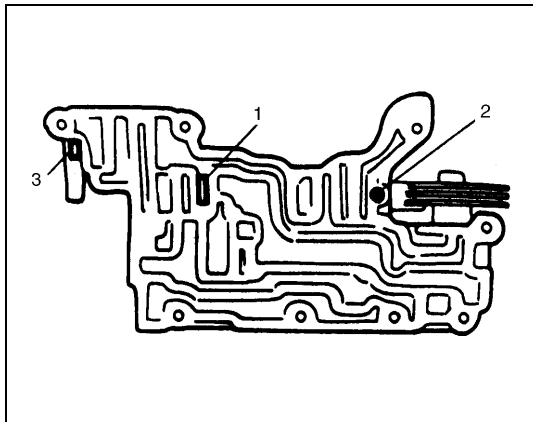


- 3) Remove bolts from lower valve body side.



- 4) Separate upper valve body (2) and lower valve body (1) while pressing separator plate and valve body gasket against lower valve body (1) to prevent balls, spring and others from coming out of valve body.

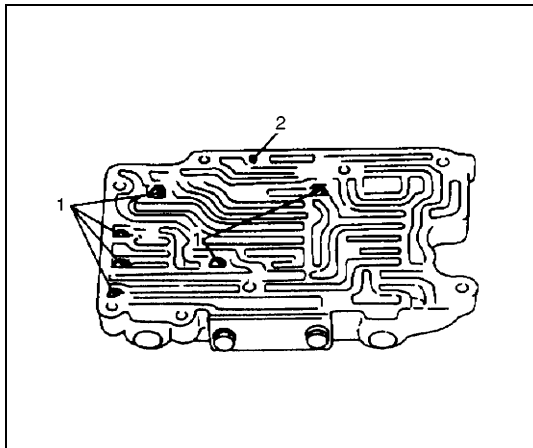




5) Confirm that there are valve, balls and plate as shown in the figures.

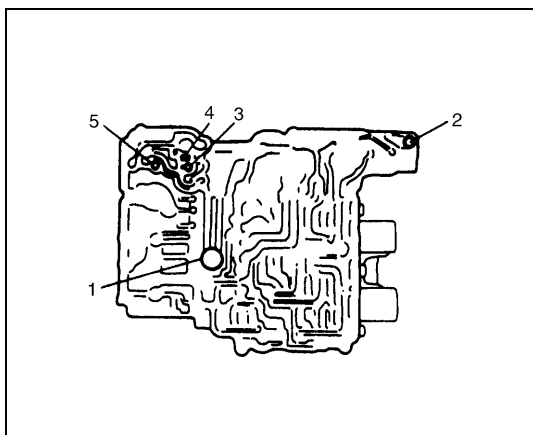
- Front upper valve body assembly.

- | |
|------------------------------|
| 1. Throttle valve keep plate |
| 2. Locating pin |
| 3. Cut back valve retainer |



- Rear upper valve body assembly.

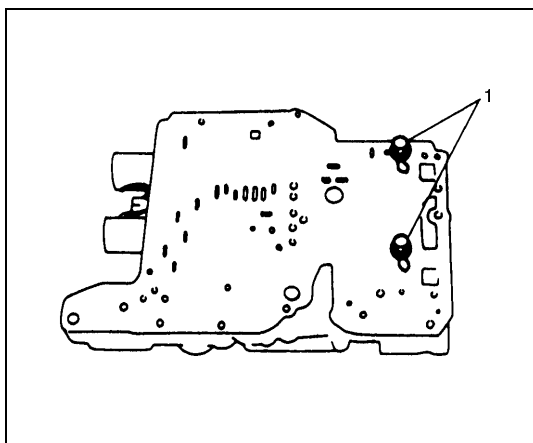
- | |
|--------------------|
| 1. Valve body ball |
| 2. Needle roller |



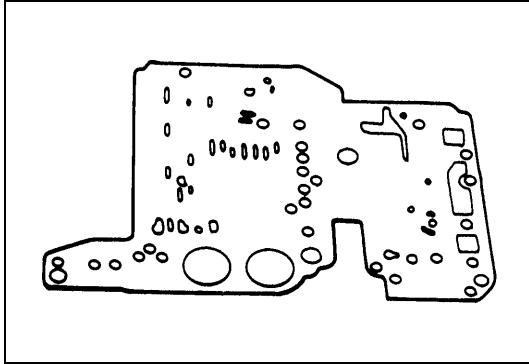
- Lower valve body assembly.

- | |
|--|
| 1. Bypass valve |
| 2. Valve body ball |
| 3. Check ball |
| 4. Primary regulator valve sleeve retainer |
| 5. Locating pin |

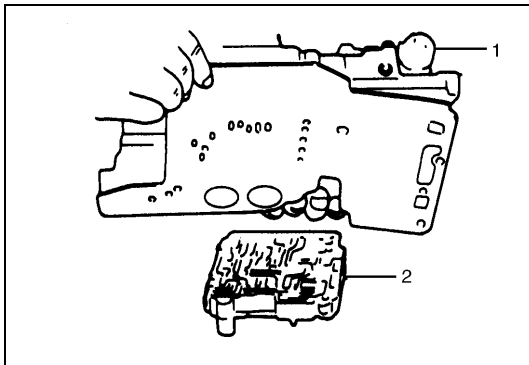
ASSEMBLY



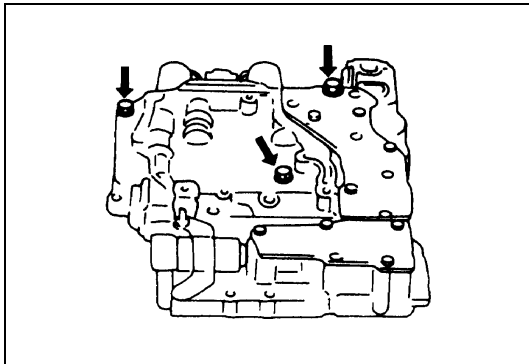
- 1) Place separator plate and new lower valve body gasket on lower valve body assembly and tighten installation section of front upper valve body assembly with 2 bolts (1) temporarily.



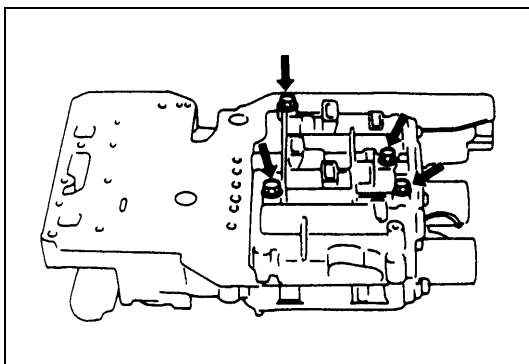
- 2) Place new upper valve body gasket on lower valve body assembly.



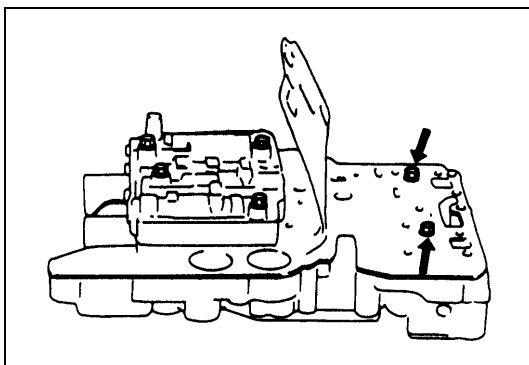
- 3) While holding upper valve body gasket and lower valve body (1) assembly together, install it on rear upper valve body assembly (2).



- 4) Tighten 3 bolts indicated in the figure temporarily.



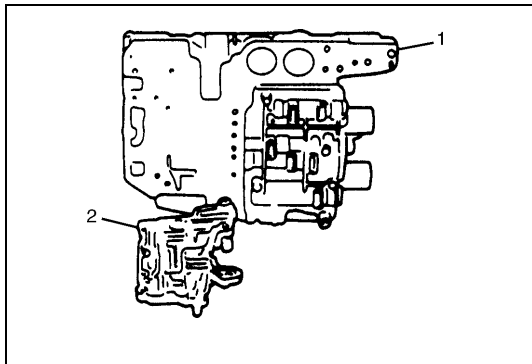
- 5) Turn over lower valve body assembly and tighten 4 bolts indicated in the figure temporarily



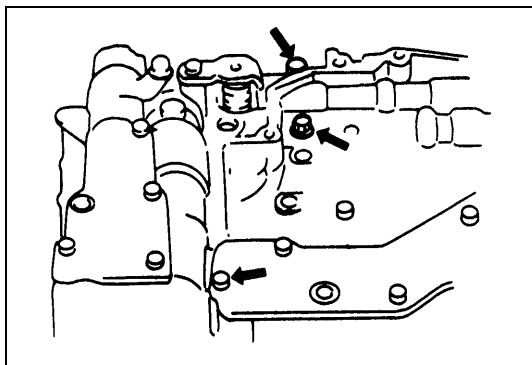
- 6) Remove 2 bolts tightened temporarily in Step 1).

NOTE:

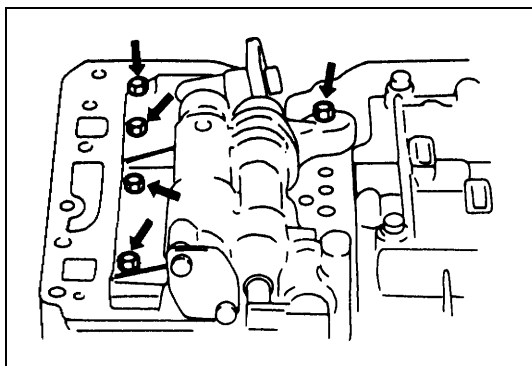
Be careful not to damage gasket.



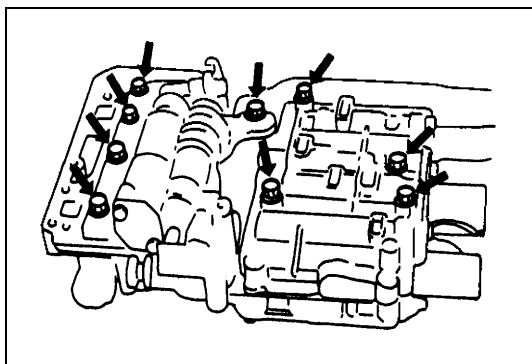
- 7) Install lower valve body assembly (1) on front upper valve body (2).



- 8) Tighten 3 bolts indicated in the figure temporarily.



- 9) Turn over control valve lower body and tighten 5 bolts indicated in the figure temporarily.



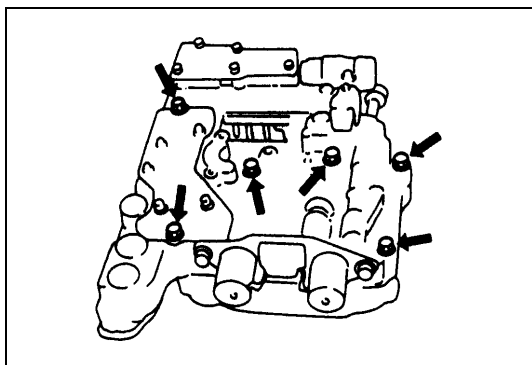
- 10) Tighten bolts on upper valve body side to specified torque.

Tightening torque

Upper valve body bolt : 5.5 N·m (0.55 kg-m, 4.0 lb-ft)

NOTE:

Tighten bolts by a certain amount of torque evenly and repeat it several times till specified torque is attained.



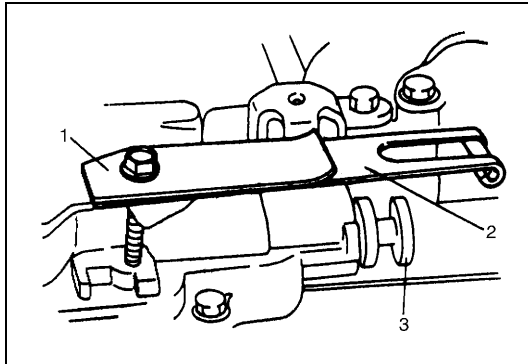
- 11) Tighten bolts on lower valve body inside to specified torque.

Tightening torque

Lower valve body bolt : 5.5 N·m (0.55 kg-m, 4.0 lb-ft)

NOTE:

Tighten bolts by a certain amount of torque evenly and repeat it several times till specified torque is attained.

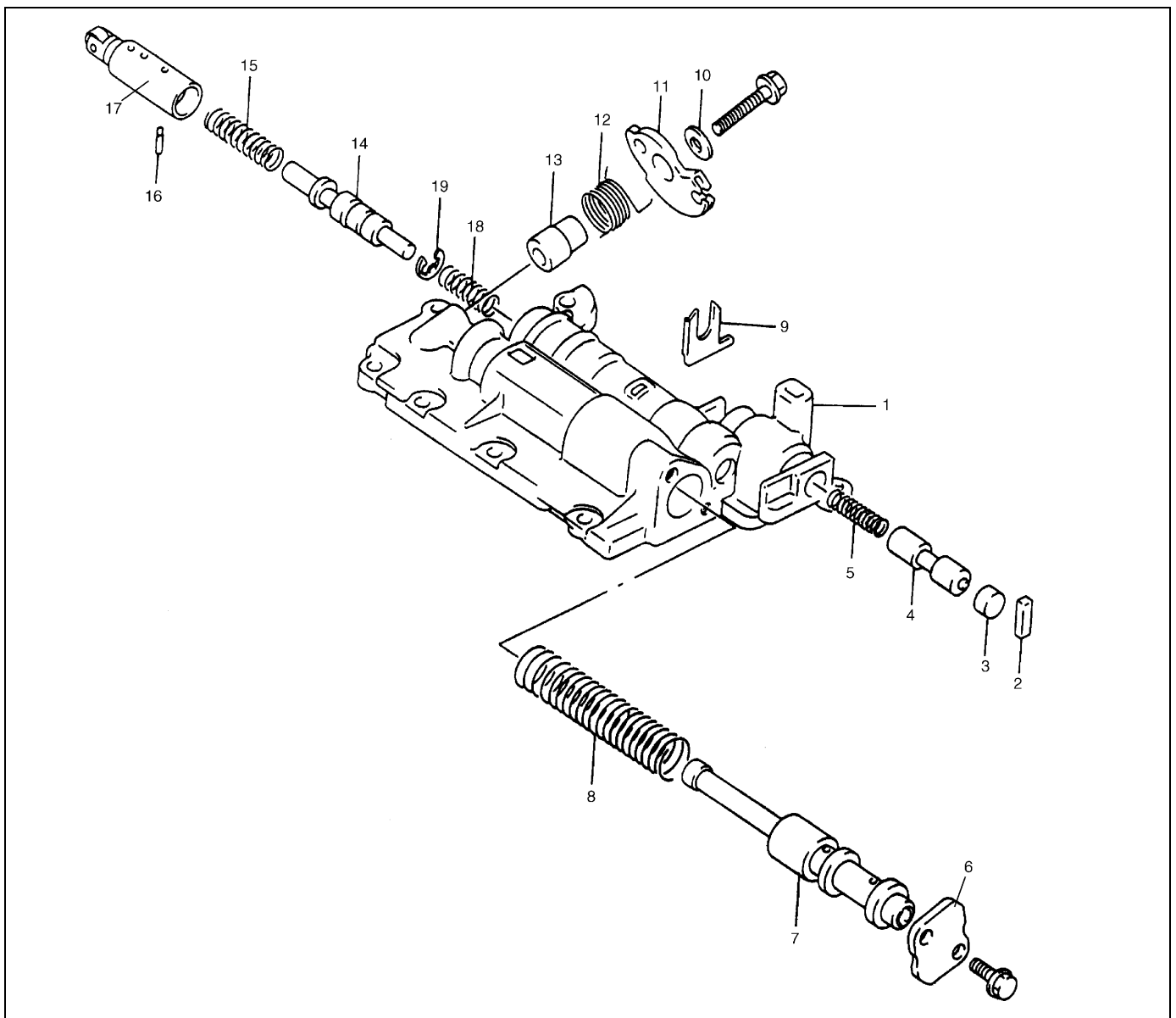


12) After installing manual valve (3), install detent spring (2) and plate (1) and tighten detent spring bolt to specified torque.

Tightening torque

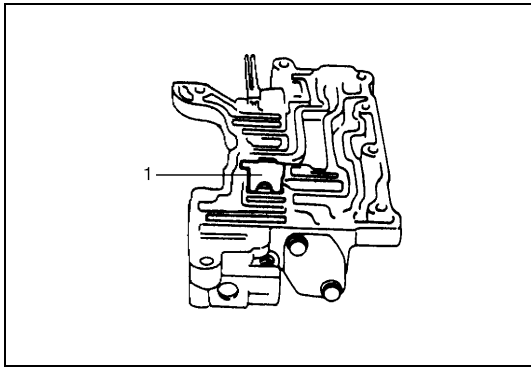
Detent spring bolt : 5.5 N·m (0.55 kg-m, 4.0 lb-ft)

FRONT UPPER VALVE BODY

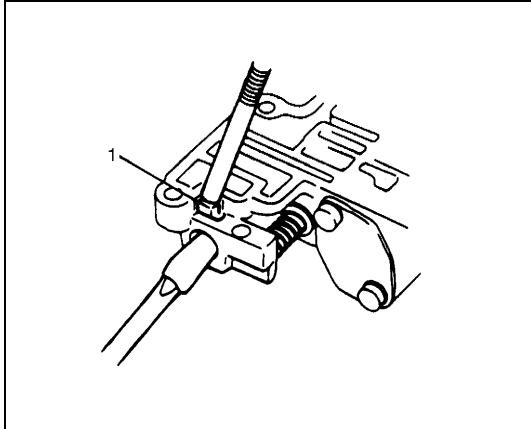


- | | | | |
|---------------------------|-------------------------------|-----------------------------------|--------------------------------------|
| 1. Front upper valve body | 6. Front valve end cover | 11. Throttle valve cam | 16. Locating pin |
| 2. Cut valve retainer | 7. Secondary regulator valve | 12. Cam return spring | 17. Down shift plug |
| 3. Cut back plug | 8. Secondary regulator spring | 13. Cam spacer | 18. Throttle valve secondary spring |
| 4. Cut back valve | 9. Throttle valve keep plate | 14. Throttle valve | 19. Throttle valve compensating ring |
| 5. Spring | 10. Washer | 15. Throttle valve primary spring | |

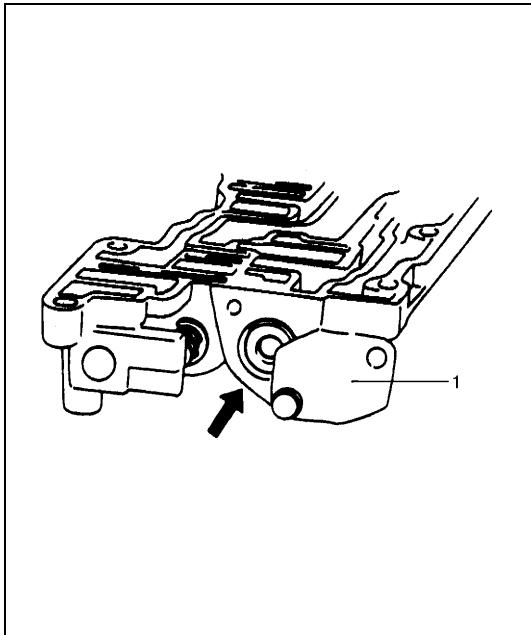
DISASSEMBLY



- 1) Remove throttle valve keep plate (1).



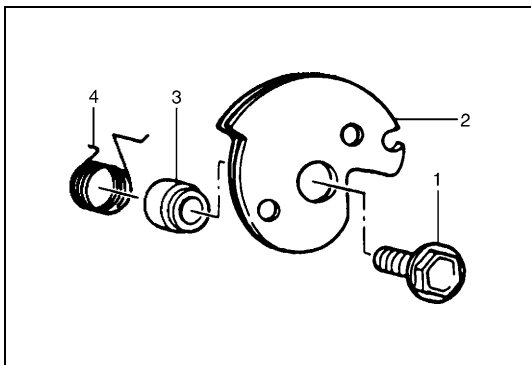
- 2) Using screwdriver with vinyl tape or the like wound around its tip, hold cut back valve plug and remove cut back retainer (1) with magnet. Then remove cut back plug, cut back valve and cut back valve spring.



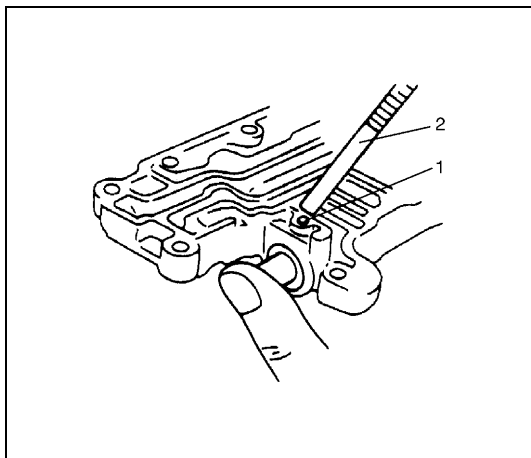
- 3) Remove one cover bolt on front valve end cover (1) and loosen the other to move cover as shown in figure. Remove secondary regulator valve sub assembly and secondary regulator valve spring. Then remove remaining loose cover bolt to remove front valve end cover (1).

WARNING:

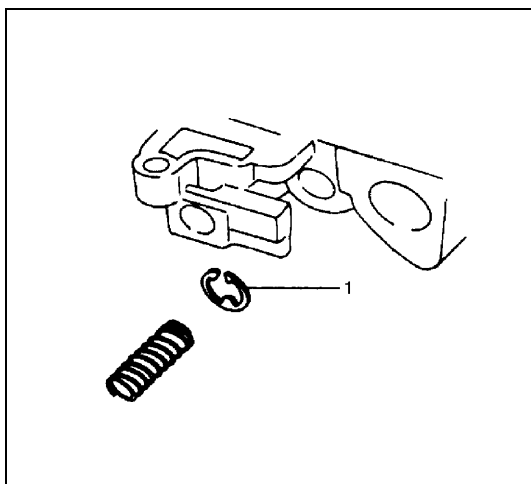
When moving cover, be sure to hold valve with finger to prevent secondary regulator valve sub assembly from jumping out.



- 4) Remove throttle cam bolt (1) and then remove throttle valve cam (2), throttle cam return spring (4) and cam spacer (3).



- 5) With throttle valve held as shown in the figure, remove locating pin (1) with magnet (2) and then remove throttle valve and throttle valve primary spring.



- 6) Remove throttle valve and then remove throttle valve secondary spring and throttle valve compensating ring(s) (1).

NOTE:

Write down how many throttle valve compensating rings (1) there were, for throttle pressure varies with number of them.

ASSEMBLY

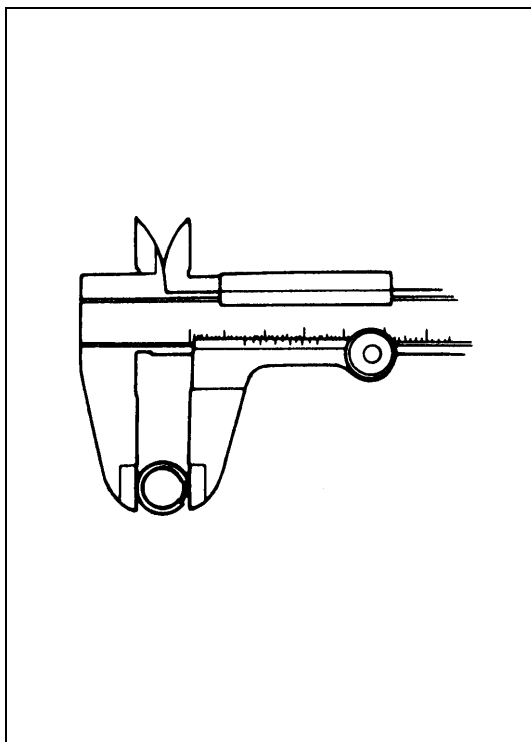
Assemble each component by reversing disassembly procedure and noting the following points.

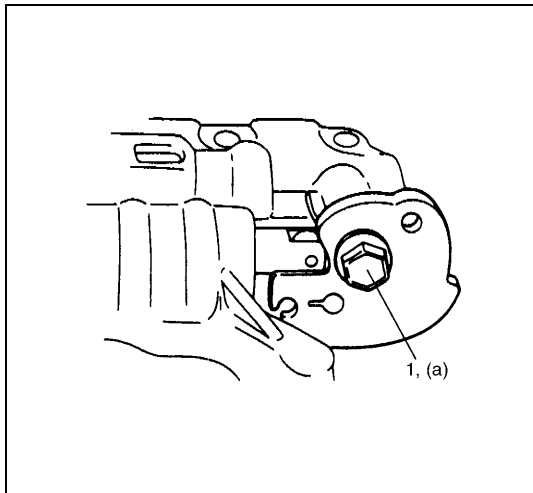
- Coil outer diameter and free length of each valve spring should be as listed below. Be sure to use each one of correct size.

Coil outer diameter and free length of each valve spring

Name of spring	Outer diameter	Free length
Secondary regulator valve spring	17.43 mm (0.681 in.)	71.27 mm (2.806 in.)
Cut back valve spring	6.85 mm (0.269 in.)	23.00 mm (0.905 in.)
Throttle valve secondary spring	7.16 mm (0.282 in.)	19.24 mm (0.757 in.)
Throttle valve primary spring	10.90 mm (0.429 in.)	39.55 mm (1.557 in.)

- Install as many throttle valve compensating rings as written down when disassembled.

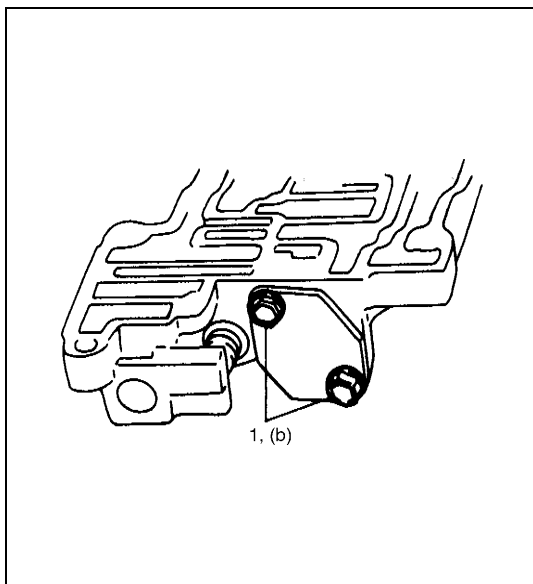




- Tighten throttle cam bolt (1) to specified torque.

Tightening torque

Throttle cam bolt (a) : 7.5 N·m (0.75 kg-m, 5.5 lb-ft)

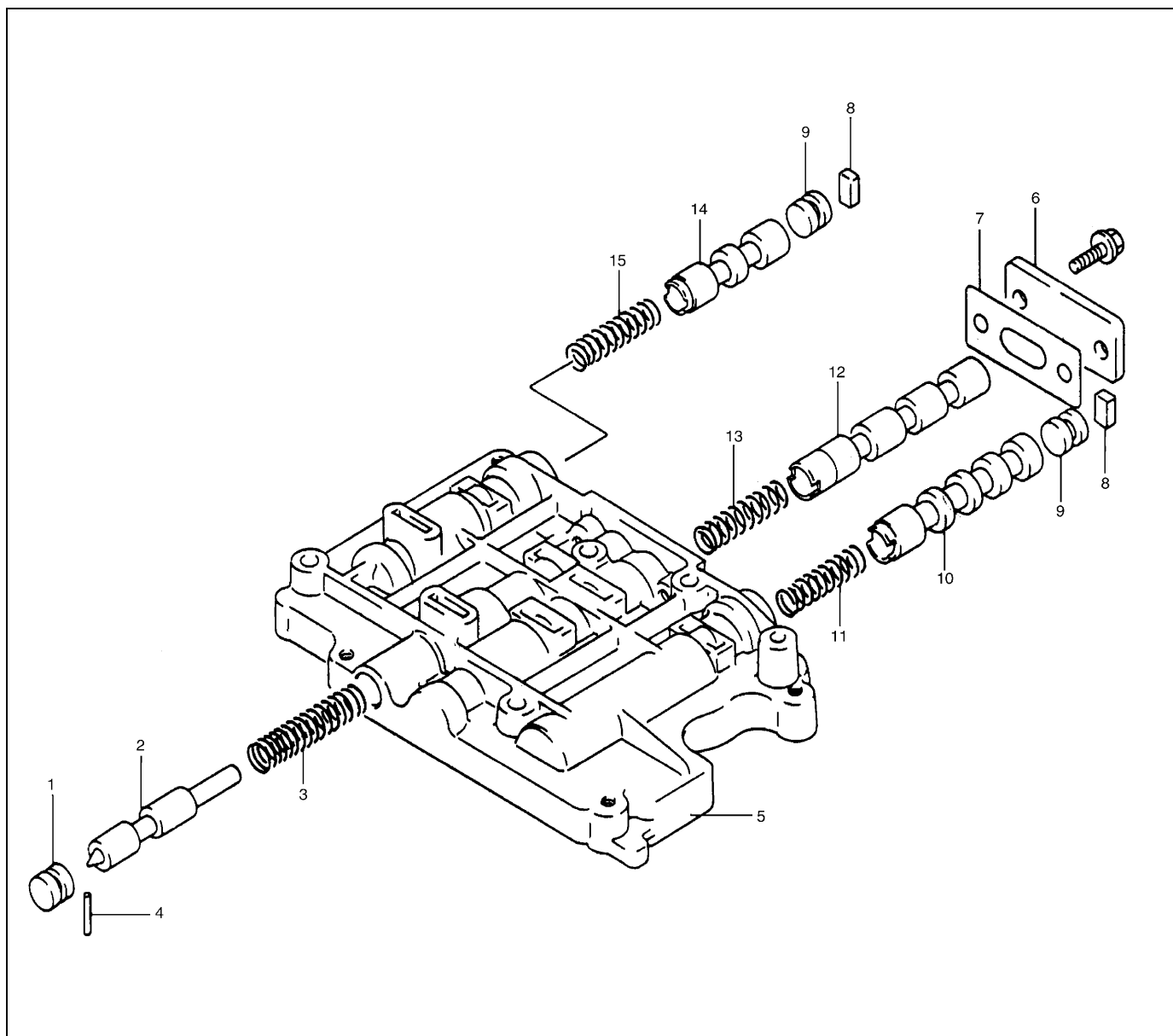


- Tighten pressure relief valve bolts (1) to specified torque.

Tightening torque

Pressure relief valve bolt (b) : 5.5 N·m (0.55 kg-m, 4.0 lb-ft)

REAR UPPER VALVE BODY

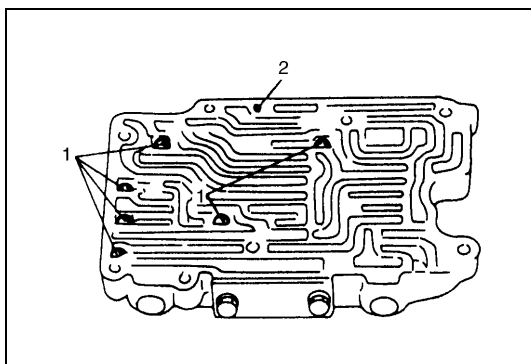


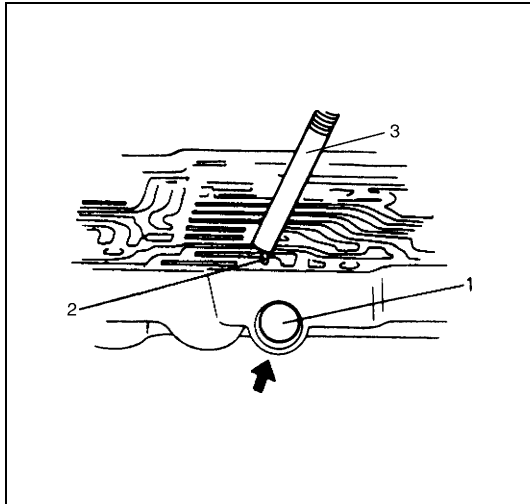
- | | | | |
|--|--------------------------|------------------------|------------------------|
| 1. 3 – 2 kickdown control valve plug | 5. Rear upper valve body | 9. Shift valve plug | 13. Shift valve spring |
| 2. Clutch sequence valve | 6. Plate | 10. 2 – 3 shift valve | 14. 3 – 4 shift valve |
| 3. Reverse brake sequence valve spring | 7. Gasket | 11. Shift valve spring | 15. Shift valve spring |
| 4. Needle roller | 8. Retainer | 12. 1 – 2 shift valve | |

DISASSEMBLY

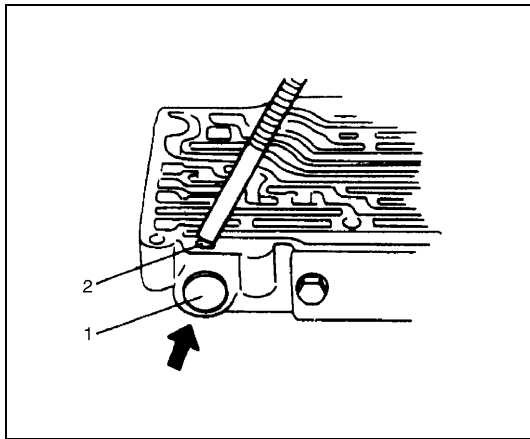
1) Take out 6 valve body balls (1).

2. Needle roller

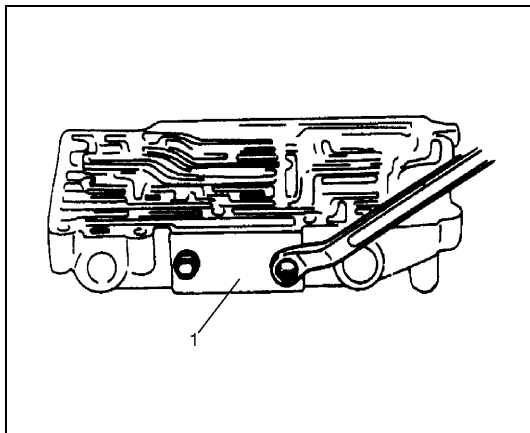




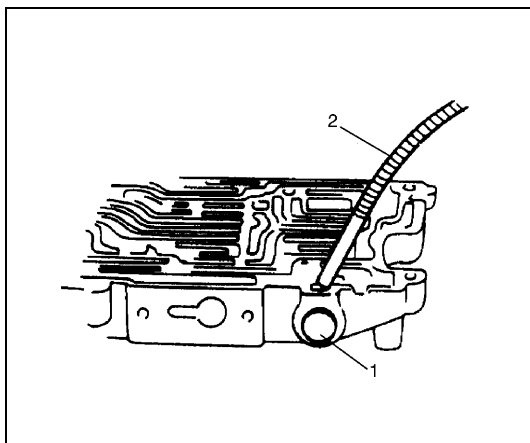
- 2) With 3 – 2 kickdown control valve plug (1) pressed with finger, take out needle roller (2) with magnet (3). Then remove 3-2 kickdown control valve plug (1), clutch sequence valve and reverse brake sequence valve spring.



- 3) With shift valve plug (1) pressed with finger, take out shift valve retainer (2) with magnet and then remove shift valve plug (1) and 3 – 4 shift valve spring.



- 4) Remove 2 plate bolts. Then remove rear upper valve body plate (1) and rear upper valve body gasket and take out 1 – 2 shift valve and shift valve spring.



- 5) With shift valve plug (1) pressed with finger, remove valve retainer with magnet (2) and then remove shift valve plug (1), 2 – 3 shift valve and shift valve spring.

ASSEMBLY

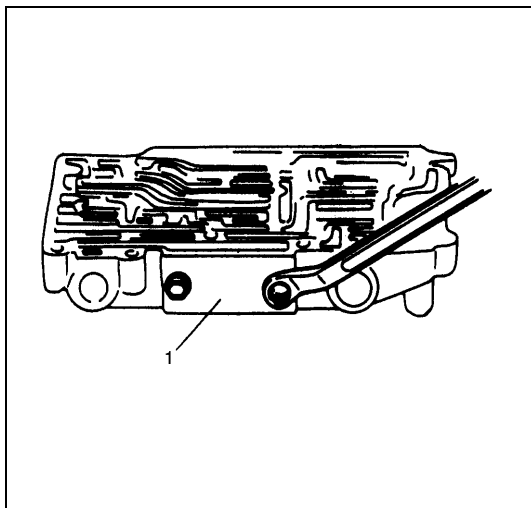
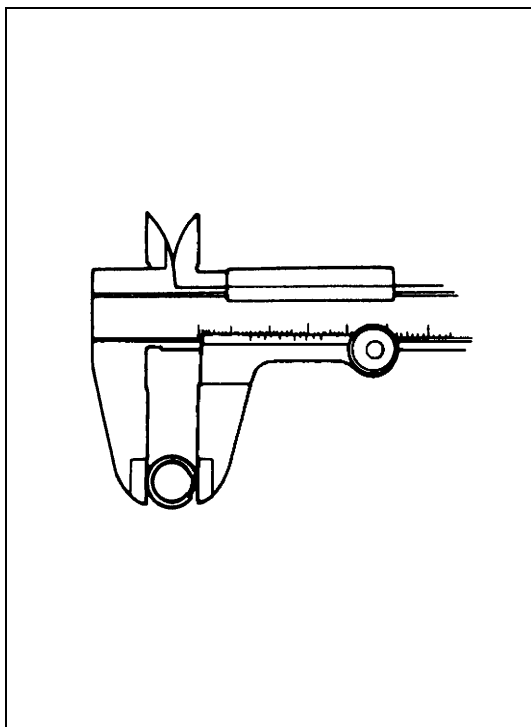
Assemble each component by reversing disassembly procedure and noting the following points.

- Coil outer diameter and free length of each valve spring should be as listed below. Be sure to use each one of correct size.

Coil outer diameter and free length of each valve spring

Name of spring	Outer diameter	Free length
Reverse brake sequence valve spring	9.10 mm (0.358 in.)	37.55 mm (1.478 in.)
1 – 2 shift valve spring	8.90 mm (0.350 in.)	29.15 mm (1.147 in.)
2 – 3 shift valve spring		
3 – 4 shift valve spring		

- Use new rear upper valve body gasket.

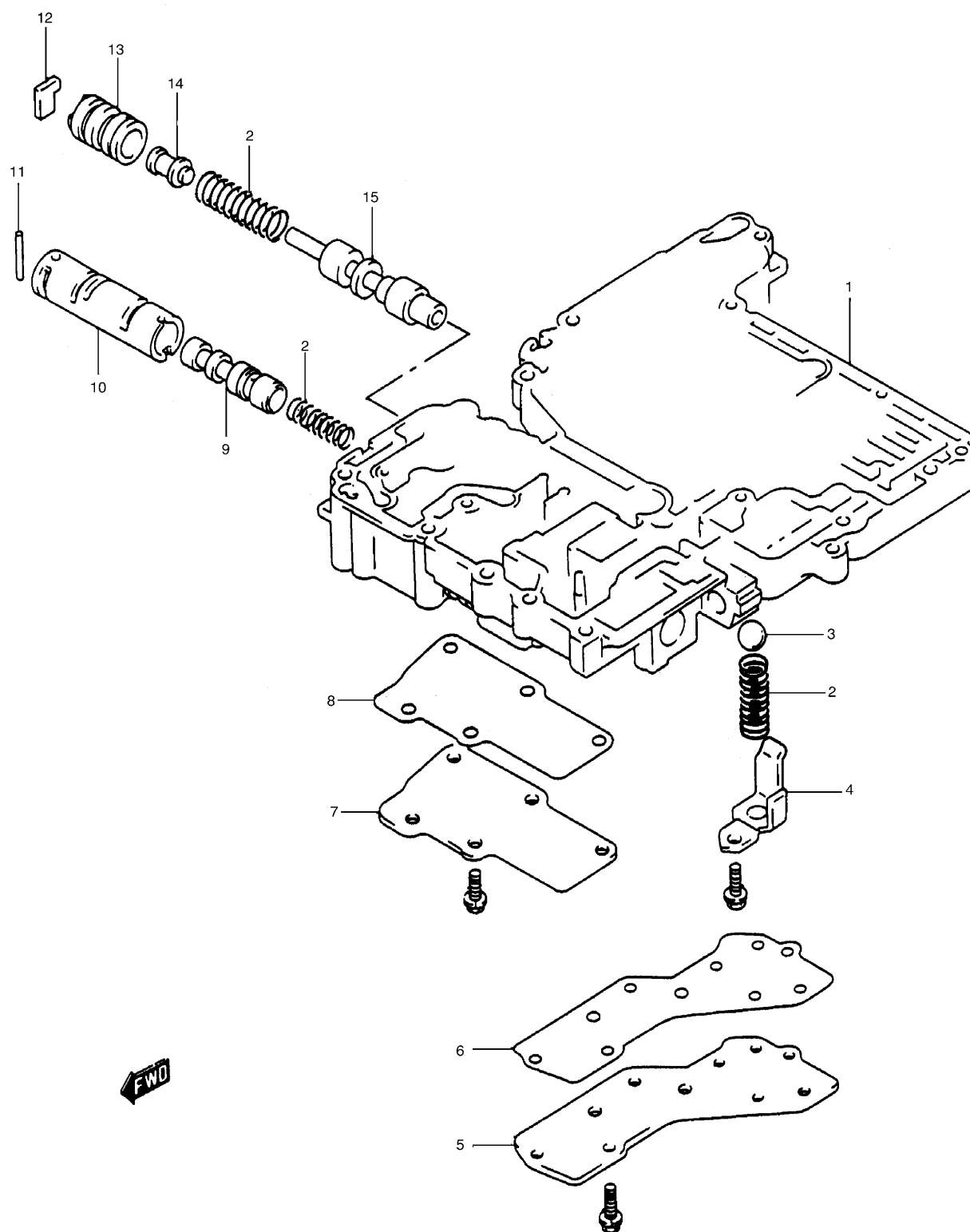


- Tighten rear upper valve body plate (1) bolt to specified torque.

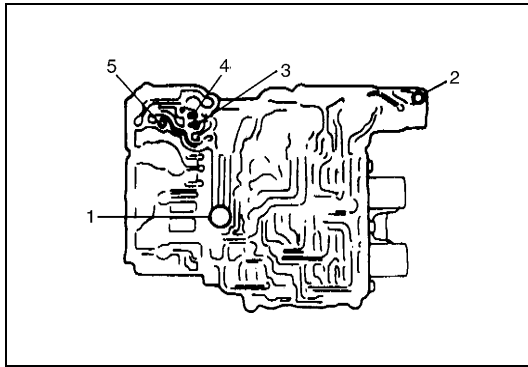
Tightening torque

Rear upper valve body plate bolt :
5.5 N·m (0.55 kg·m, 4.0 lb·ft)

LOWER VALVE BODY

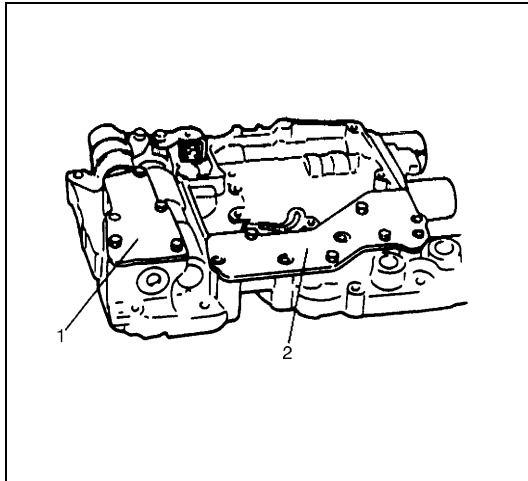


- | | | |
|-----------------------------------|---------------------------------------|-------------------------------------|
| 1. Lower valve body | 6. Lower valve body gasket | 11. Pin |
| 2. Spring | 7. TCC (Lock-up) control valve plate | 12. Retainer |
| 3. Pressure relief valve ball | 8. TCC (Lock-up) control valve gasket | 13. Primary regulator valve sleeve |
| 4. Pressure relief valve retainer | 9. TCC (Lock-up) control sleeve | 14. Primary regulator valve plunger |
| 5. Lower valve body plate | 10. TCC (Lock-up) control valve | 15. Primary regulator valve |

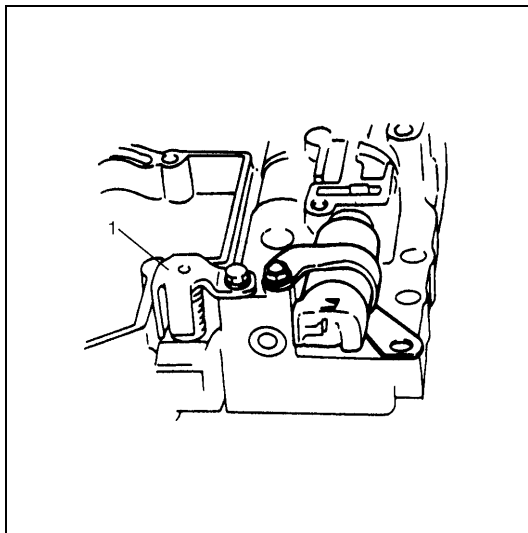
DISASSEMBLY

- 1) Remove bypass valve (1), bypass valve spring, check ball valve damping spring, valve body ball (2) and ball valve spring.

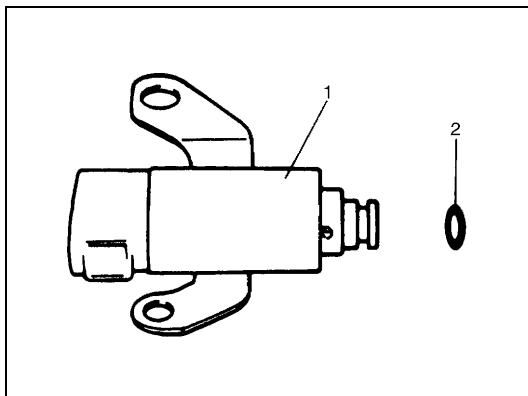
- | |
|--|
| 3. Check ball
4. Primary regulator valve sleeve retainer
5. Locating pin |
|--|



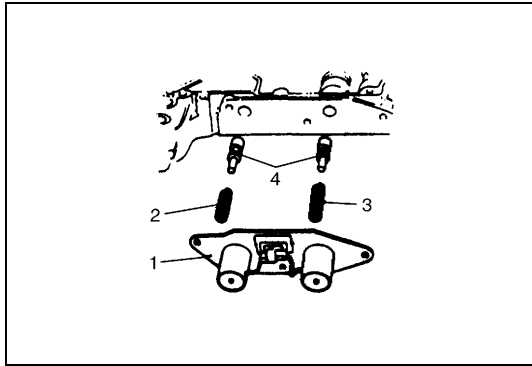
- 2) Remove lower valve body plate (1) and lower valve body plate gasket.
- 3) Remove TCC (lock-up) control valve plate (2) and TCC (lock-up) control valve gasket.



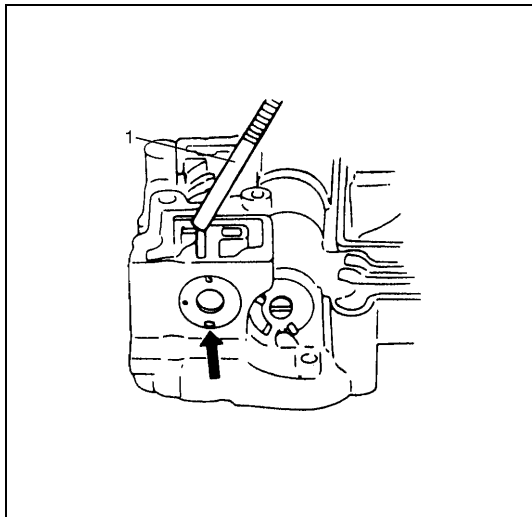
- 4) With pressure relief valve retainer (1) pressed with finger, remove pressure relief valve bolt and then remove pressure relief valve retainer (1), pressure relief valve spring and pressure relief valve ball.



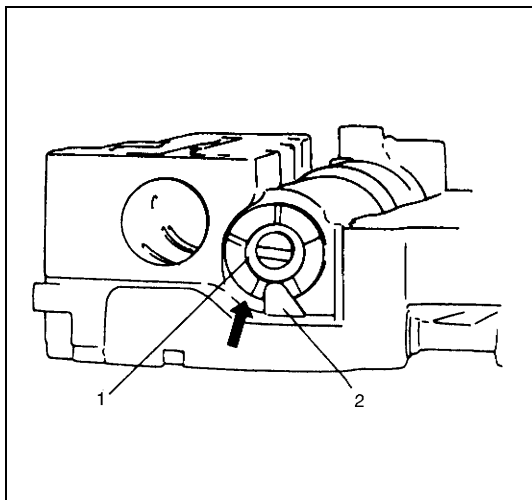
- 5) Remove TCC (lock-up) solenoid valve (1) and Then remove O-ring (2) from TCC solenoid valve (1).



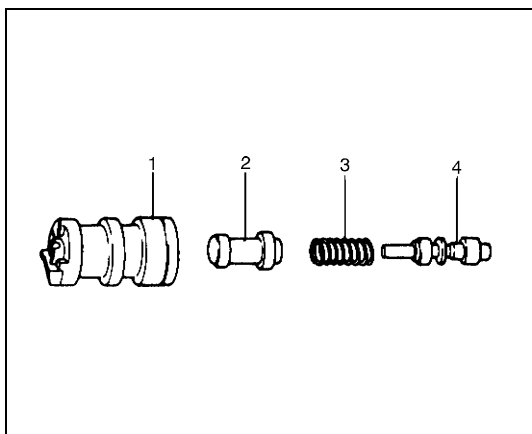
- 6) After removing shift solenoid valve (A & B) (1), remove solenoid valve gasket, low coast modulator valve spring (2), inter coast modulator valve spring (3) and 2 intermediate coast modulator valves (4).



- 7) Pressing TCC (lock-up) control sleeve with finger and using magnet (1), remove locating pin and then remove TCC (lock-up) control sleeve, TCC (lock-up) control valve and TCC (lock-up) control valve spring.

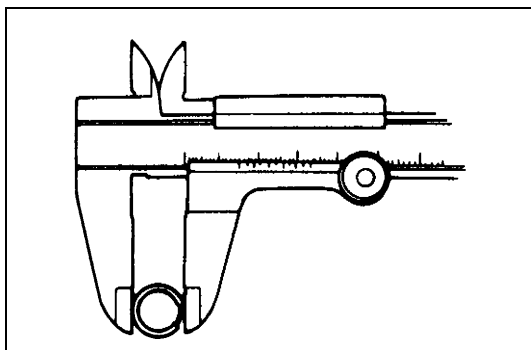


- 8) Check which step of primary regulator valve sleeve (1) (how many steps down from its tip) contacts primary regulator valve sleeve retainer (2).



- 9) Pressing primary regulator valve sleeve (1) with finger and using magnet, remove primary regulator valve sleeve retainer and then remove primary regulator valve sleeve (1), primary regulator valve plunger (2), primary regulator valve spring (3) and primary regulator valve (4).

ASSEMBLY



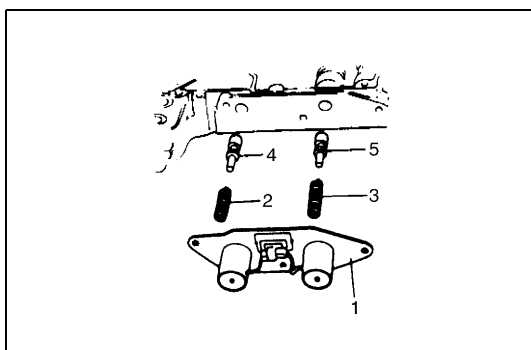
Assemble each component by reversing disassembly procedure and noting the following points.

- Coil outer diameter and free length of each valve spring should be as listed below. Be sure to use each one of correct size.

Coil outer diameter and free length of each valve spring :

Name of spring	Outer diameter	Free length
Pressure relief valve spring	13.14 mm (0.517 in.)	32.14 mm (1.265 in.)
TCC (Lock-up) control valve spring	11.40 mm (0.449 in.)	32.60 mm (1.283 in.)
Valve damping spring	4.95 mm (0.195 in.)	20.00 mm (0.787 in.)
Low coast modulator valve spring	10.00 mm (0.394 in.)	35.43 mm (1.395 in.)
Inter coast modulator valve spring	9.04 mm (0.356 in.) (G16 and J20 engines)	27.26 mm (1.073 in.) (G16 and J20 engines)
	10.00 mm (0.394 in.) (H25 engine)	25.60 mm (1.008 in.) (H25 engine)
Ball valve spring	13.14 mm (0.517 in.)	32.14 mm (1.265 in.)
Bypass valve spring	13.82 mm (0.544 in.)	28.90 mm (1.138 in.)
Primary regulator valve spring	13.62 mm (0.536 in.)	50.28 mm (1.980 in.)

- Install primary regulator valve sleeve so that its tip is positioned as it was before disassembly.
- Use new TCC (lock-up) control valve gasket, solenoid gasket and lower valve body plate gasket.

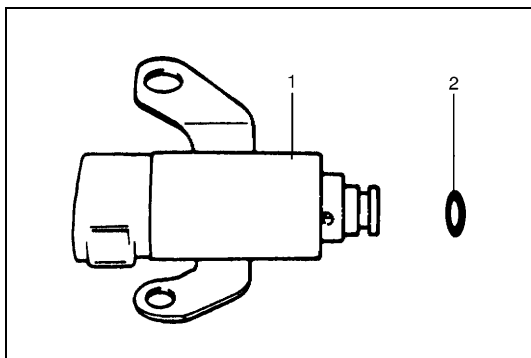


- Tighten shift solenoid valve bolt to specified torque.

Tightening torque

Shift solenoid valve bolt : 10 N·m (1.0 kg-m, 7.5 lb-ft)

1. Solenoid valve No. 1 (Shift solenoid valve)
2. Low coast modulator valve spring
3. Inter coast modulator valve spring
4. Intermediate coast modulator valve
5. Low coast modulator valve



- Tighten TCC (lock-up) solenoid valve bolt to specified torque.

Tightening torque

**TCC solenoid valve bolt :
5.5 N·m (0.55 kg-m, 4.0 lb-ft)**

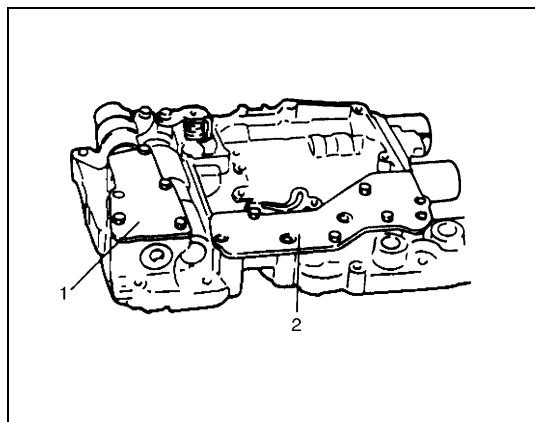
1. Solenoid valve No. 2 (TCC solenoid valve)
2. O-ring

- Tighten pressure relief valve bolt to specified torque.

Tightening torque

Pressure relief valve bolt :

5.5 N·m (0.55 kg-m, 4.0 lb-ft)



- Tighten lower valve body plate (1), TCC (lock-up) control valve plate (2) flange bolt to specified torque.

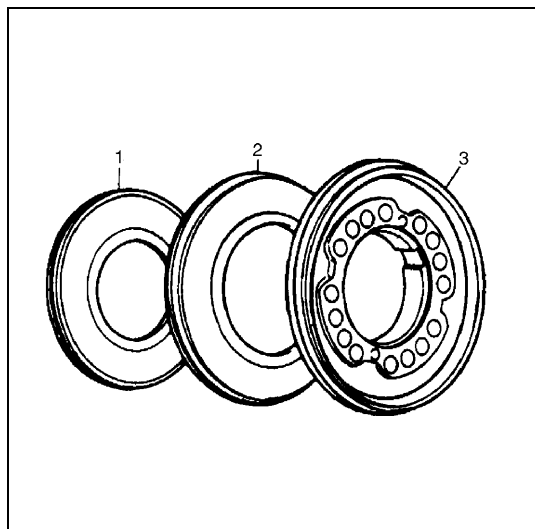
Tightening torque

Lower valve body and TCC control valve Plate bolts :

5.5 N·m (0.55 kg-m, 4.0 lb-ft)

UNIT ASSEMBLY

- 1) After applying A/T fluid to new O-rings, install them to reverse brake piston (3), reaction sleeve (2) and secondary reverse piston (1).



- 2) Install reverse brake piston assembly and brake piston return spring to transmission case, using care not to damage O-ring. Then install snap ring (1) with special tool.

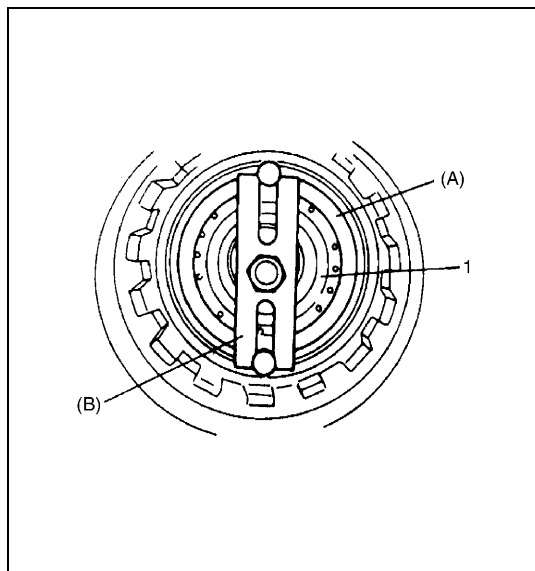
Special tool

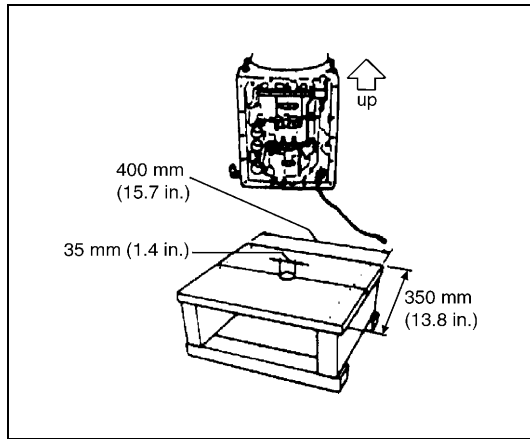
(A) : 09926-98320

(B) : 09941-84510

NOTE:

- Install so that opening in snap ring (1) will not align with any of 3 lugs of spring seat.
- Do not compress spring more than necessary and do not allow it fall or tilt.

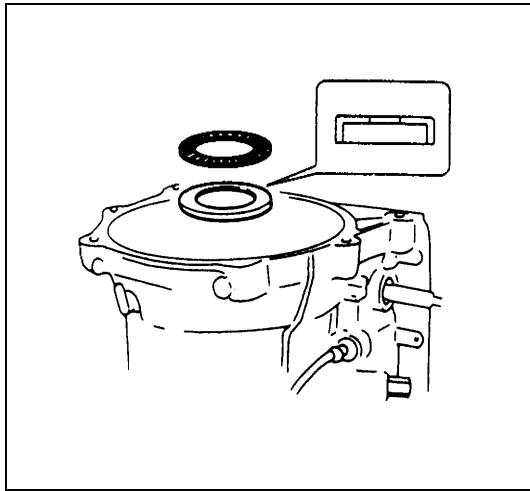




- 3) Prepare a stand as shown in the figure. It is necessary because work will be done with transmission case set upright from this step on.

NOTE:

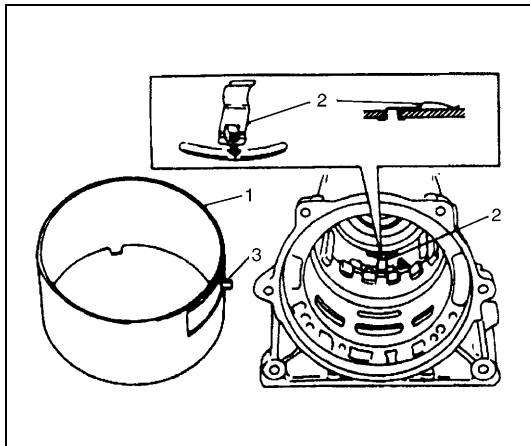
- To protect transmission case against damage, spread cloth on stand where case contacts.
- A stand of such size as shown in figure will facilitate work.



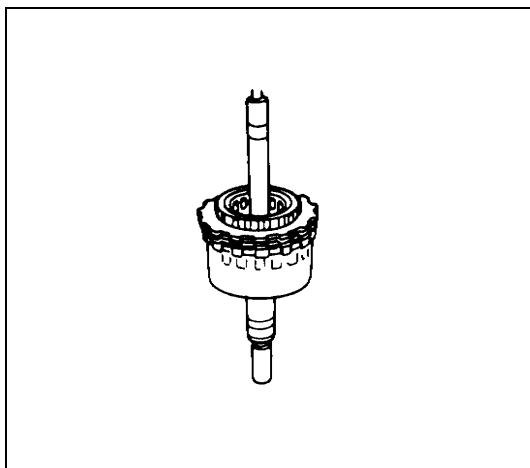
- 4) Install thrust output shaft bearing and thrust bearing output shaft race after lubricating them with grease.

NOTE:

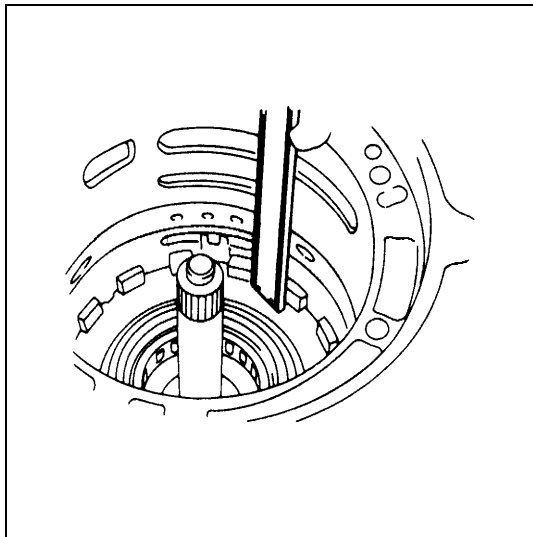
- Make sure that thrust bearing output shaft race is installed in proper direction.**



- 5) Install brake applying tube (1) so that its lug fits in a in transmission case. After installation, check that 4 lugs (3) along the underside of brake applying tube fit inside of reverse brake piston and leaf spring (2) is installed properly.



- 6) Remove reverse brake reaction plate of planetary gear assembly and align lugs of reverse brake plate, reverse brake disc and reverse brake packing plate. Install planetary gear assembly to transmission case so that aligned lugs fit in groove in transmission case.



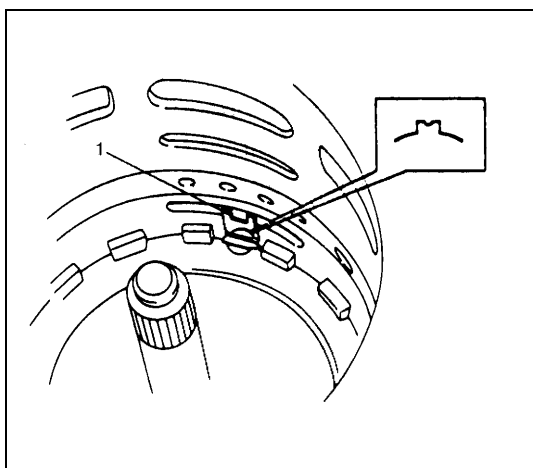
- 7) Measure clearance between reverse brake plate and lugs of transmission case.

If measured value is less than standard range, it is possible that something is installed improperly or dust or fluid is on reverse brake disc, etc. If it exceeds standard range, replace reverse brake disc, reverse brake plate or reverse brake backing plate.

Standard clearance between reverse brake plate and lugs of transmission case :

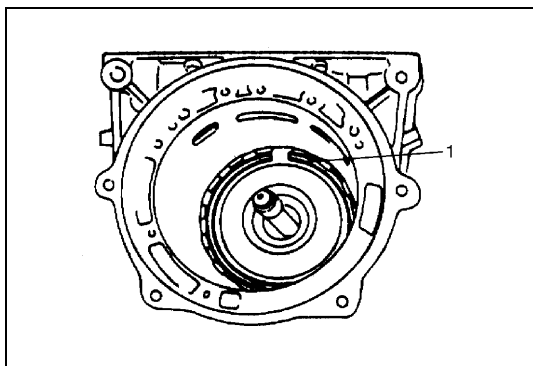
0.56 – 2.29 mm (0.022 – 0.090 in.) (G16 engine)

0.61 – 2.64 mm (0.024 – 0.103 in.) (J20 and H25 engines)

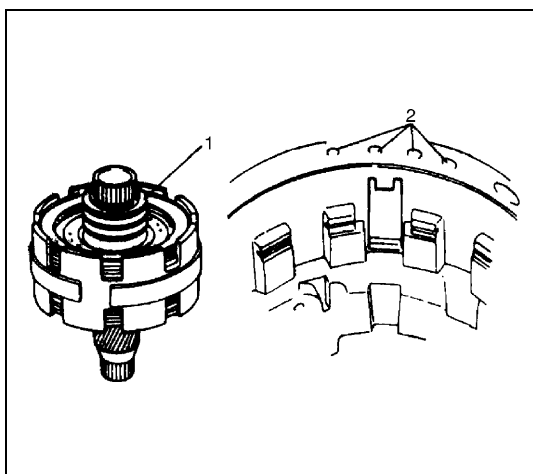


- 8) Install reverse brake reaction plate so that its lug with dent comes to the same position as leaf spring.

1. Relief spring



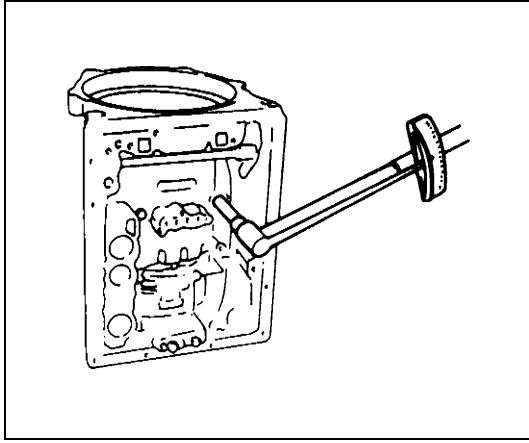
- 9) Using screwdriver with vinyl tape or the like wound at its tip, install retaining reaction plate ring (1). After installation, check that ring is in groove securely.



- 10) After confirming that lugs of all brake plates and brake discs are in grooves securely, hold retaining direct clutch ring (1) of planetary sun gear, install center support assembly by aligning fluid holes (2) in center support and transmission case.

NOTE:

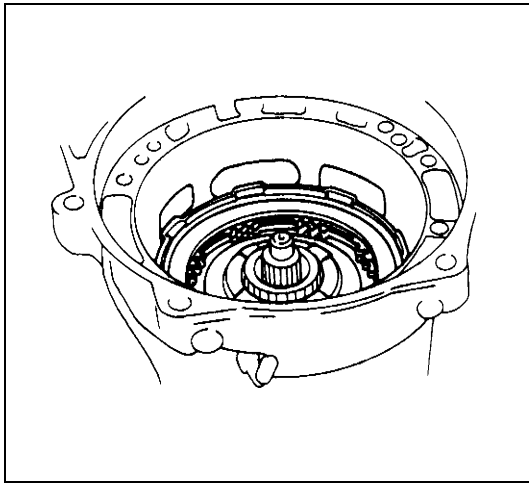
Unless retaining direct clutch ring of planetary sun gear is held, brake valve gets off center support and that will make it impossible to align fluid holes with bolt holes.



- 11) Tighten center support bolts by certain amount at a time till specified tightening torque is obtained.

Tightening torque

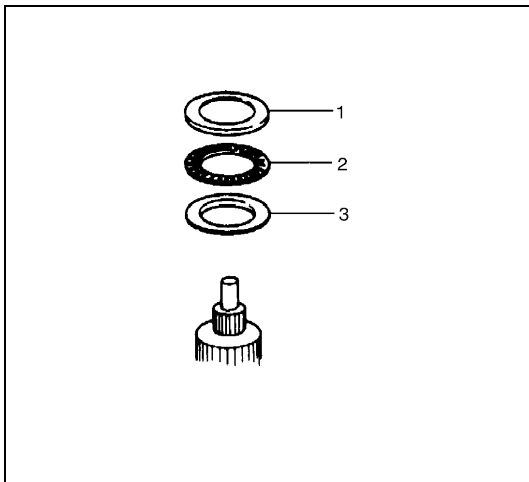
Center support bolt : 26 N·m (2.6 kg-m, 19.0 lb-ft)



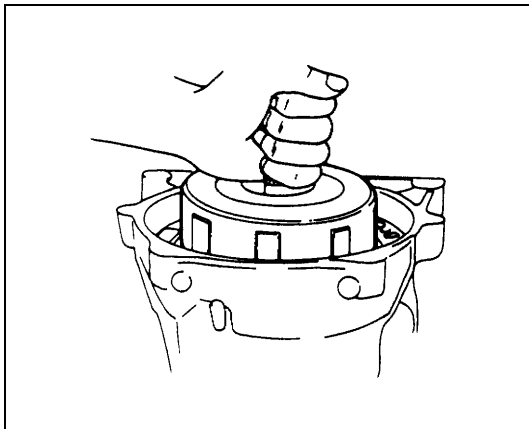
- 12) Install direct clutch assembly by aligning splines in direct clutch cylinder with planetary sun gear.

NOTE:

Ends of splines in direct clutch cylinder and planetary sun gear should come almost in match.



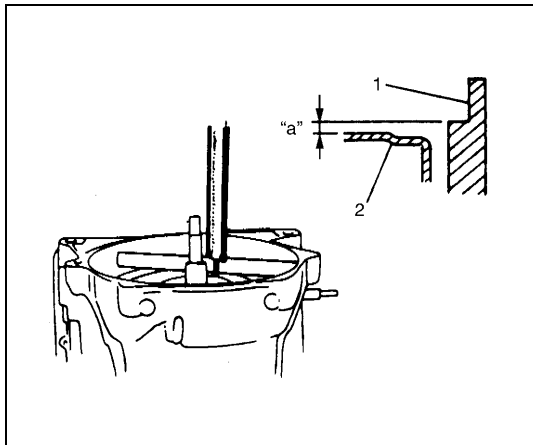
- 13) Apply grease to forward clutch rear No.1 race (1), thrust rear bearing (2), thrust bearing rear planetary ring race (3) and install thrust bearing planetary ring race (3) to direct clutch cylinder and forward clutch rear No.1 race and thrust bearing to forward clutch hub.



- 14) Install forward clutch assembly by putting all lugs of direct clutch disc hub together and matching them with groove cut in direct clutch input hub, and at the same time aligning splines in forward clutch hub with inner shaft.

NOTE:

Use care not to let forward clutch rear No.1 race and thrust bearing installed to forward clutch hub fall off.



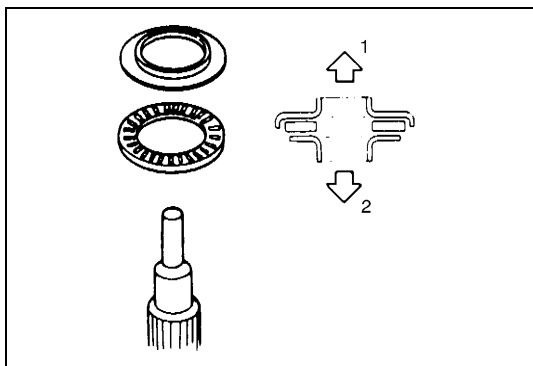
- 15) When clutch disc and plate have been replaced, check height difference between forward clutch input shaft and transmission case (1) by measuring as shown in the figure.

Standard height difference "a" :
About 2.0 mm (0.079 in.)

NOTE:

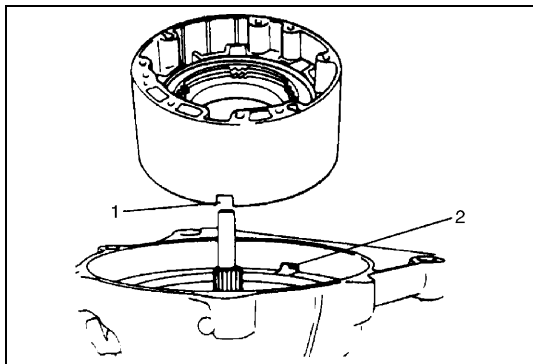
If measured value is less than standard value, remove forward clutch assembly and install it again.

2. Forward clutch



- 16) Apply grease to thrust forward clutch bearing and install it to forward clutch input shaft. Also apply grease to thrust rear race and install it to O/D case.

1. Planetary ring gear side
 2. Forward clutch side

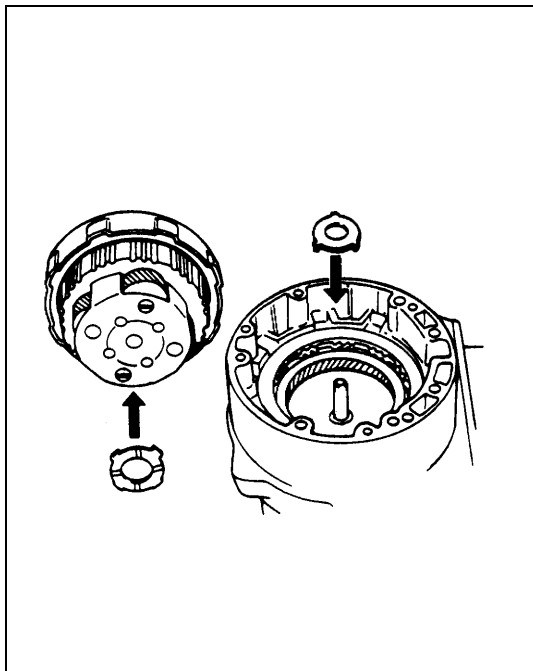


- 17) Install O/D case by aligning cutout in O/D case (1) and that in transmission case.

NOTE:

Use care not to drop thrust rear race installed to O/D case.

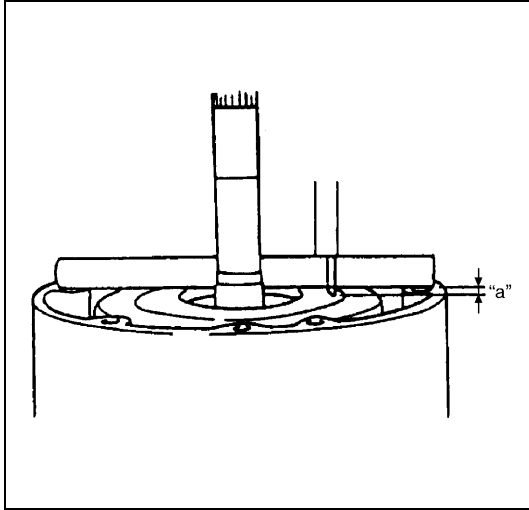
2. Cutout in automatic transmission



- 18) Apply grease to thrust planetary rear washer and install it to O/D planetary gear. Also apply grease to thrust planetary ring front race and install it to planetary ring gear and then install O/D input shaft assembly to O/D case.

NOTE:

- **Fit claws of thrust planetary rear washer and thrust planetary ring front race into holes securely.**
- **Use care not to drop thrust planetary rear washer installed to O/D planetary gear.**



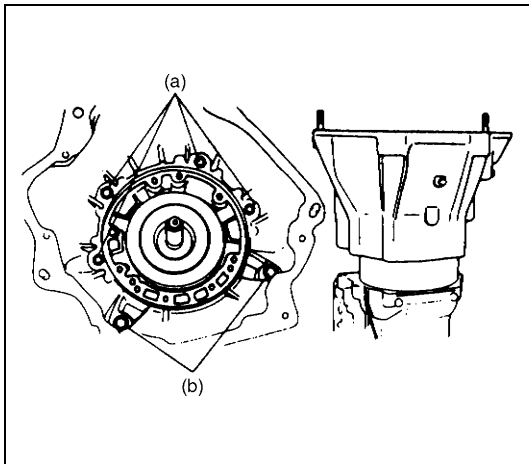
- 19) When clutch disc or plate has been replaced, check height difference between O/D case and O/D clutch cylinder by measuring it as shown in the figure.

Standard height difference "a" between O/D case and O/D clutch cylinder :

About 3.5 mm (0.138 in.)

NOTE:

Measure at the highest point along inner circumference of O/D clutch cylinder.



- 20) Apply A/T fluid to new housing O-ring and install it to O/D case. Then install converter housing and tighten housing bolt to specified torque.

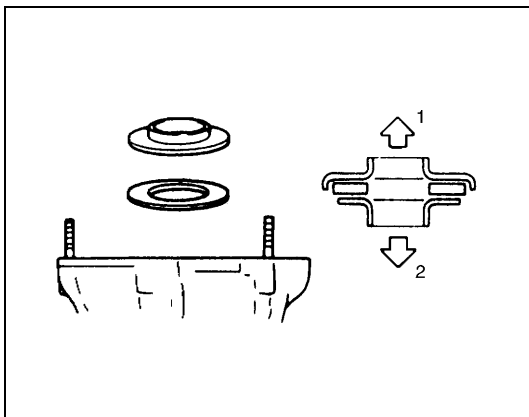
Tightening torque

Torque converter housing bolt (a) :

35 N·m (3.5 kg-m, 25.5 lb-ft)

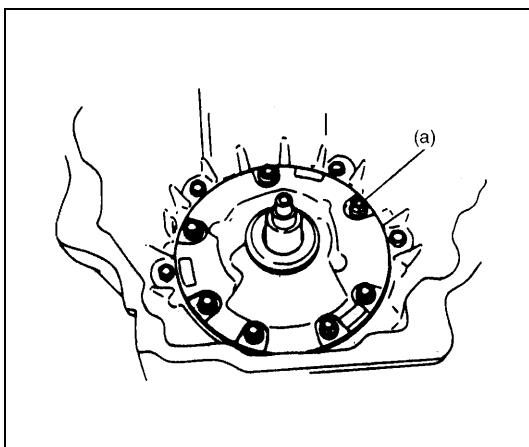
Torque converter housing bolt (b) :

58 N·m (5.8 kg-m, 42.0 lb-ft)



- 21) Apply grease to thrust front race and install it to O/D clutch cylinder.

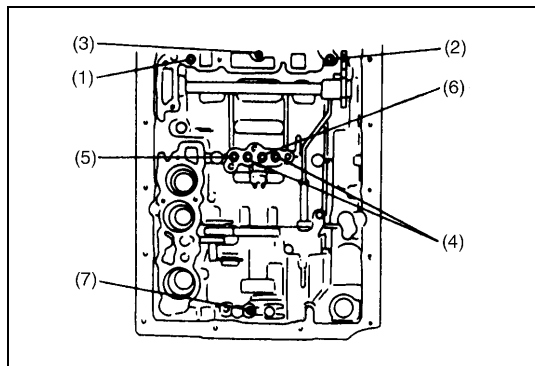
- | |
|------------------------------------|
| 1. Oil pump side |
| 2. Over drive clutch cylinder side |



- 22) Apply grease to front bearing assembly and install it to oil pump assembly. Also, apply A/T fluid to new oil pump cover O-ring and install it to oil pump assembly. Then install oil pump assembly aligning bolt holes in O/D case with those in transmission case oil pump assembly. Apply seal packing to oil pump assembly bolts and tighten them by certain amount of torque at each time one after another till specified torque is attained.

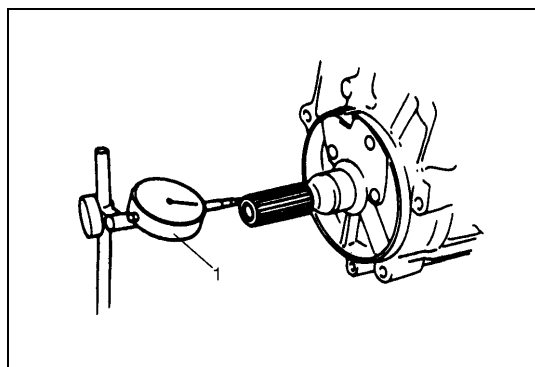
Tightening torque

Oil pump bolt (a) : 22 N·m (2.2 kg-m, 16.0 lb-ft)



23) Apply 2 – 4 kg/cm² air pressure into fluid holes in the figure as numbered and check operation sound of each part.

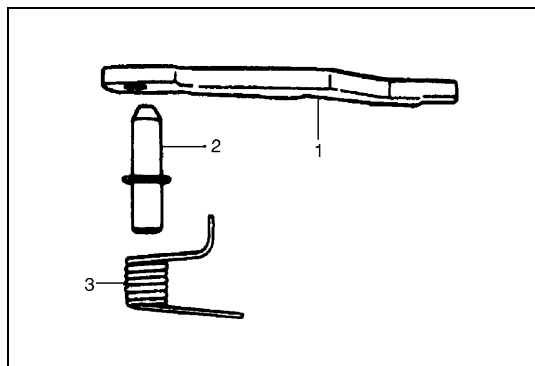
- (1) O/D clutch
- (2) O/D brake
- (3) Forward clutch
- (4) Direct clutch
- (5) B1 brake (Second coast brake)
- (6) B2 brake (Second brake)
- (7) Reverse brake



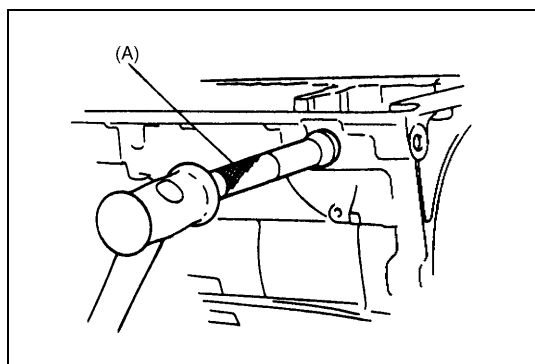
24) Take down transmission from stand and measure clearance in shaft direction by applying dial gauge (1) to output shaft as shown in the figure.

Standard clearance in shaft direction :
0.3 – 0.9 mm (0.012 – 0.035 in.)

25) Check that inner shaft runs smoothly.

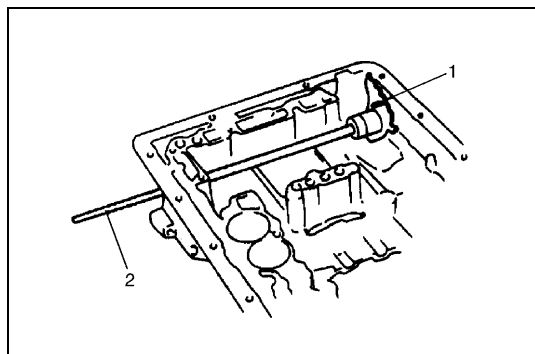


26) Install parking lock pawl (1), pawl pin (2) and pawl spring (3) to transmission case.

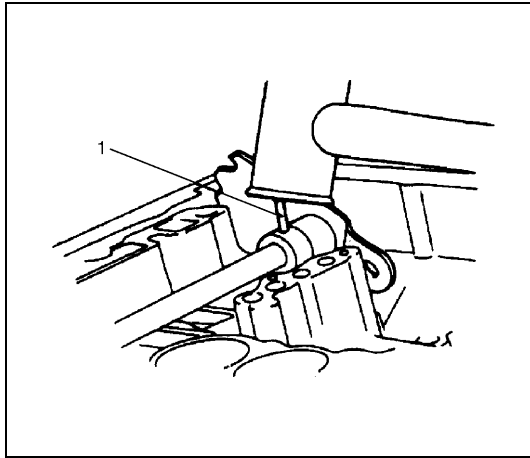


27) Apply grease to lip of new oil lip seal and drive in oil lip seal with special tool till it contacts transmission case.

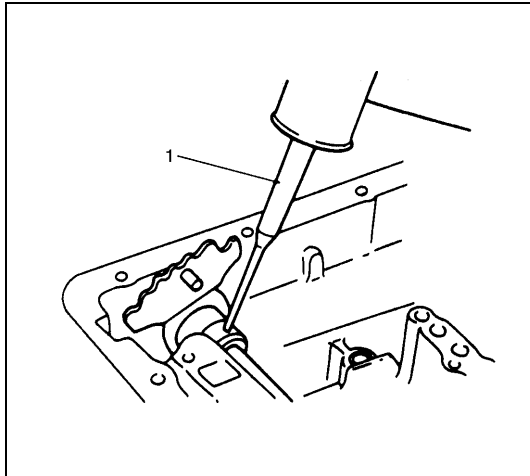
Special tool
(A) : 09943-88211



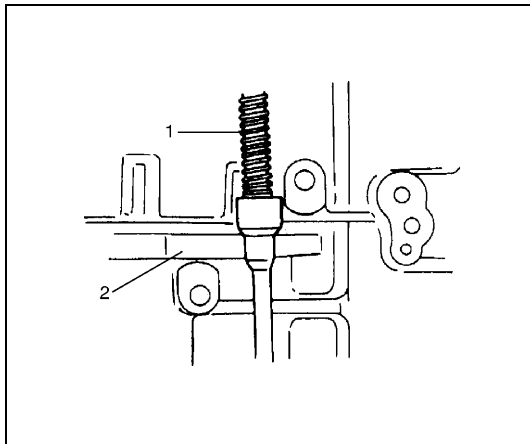
28) After installing new sleeve cover to manual shift lever (1), install manual shift shaft (2) and manual shift lever (1) to transmission case.



- 29) Align hole in manual shift shaft with that in manual shift lever and drive in new manual shift lever pin (1).



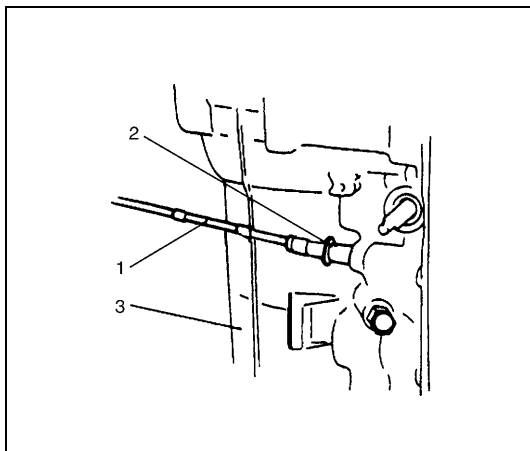
- 30) Align hole in sleeve cover with dent in manual shift lever and caulk securely with pin punch (1). Then check that manual shift shaft turns smoothly.



- 31) With parking lock rod (1) installed to manual shift lever, place parking lock rod (1) on parking lock pawl (2) as shown in the figure. Then install pawl bracket and tighten bracket screw to specified torque.

Tightening torque

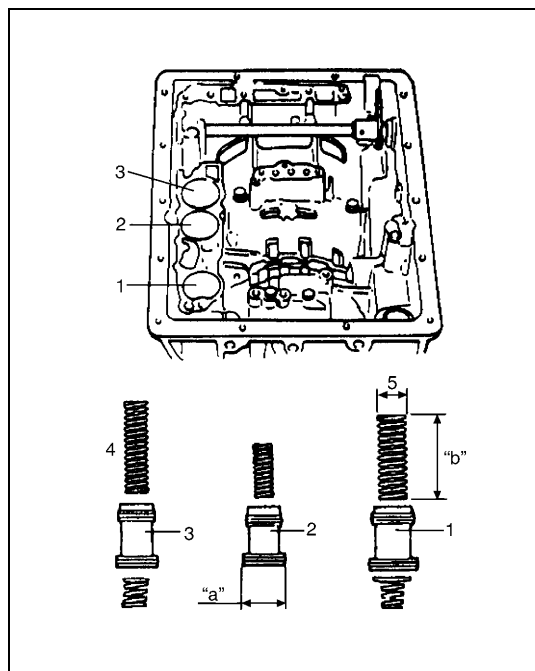
Pawl bracket screw : 7.5 N·m (0.75 kg-m, 5.5 lb-ft)



- 32) Apply A/T fluid to new throttle cable O-ring (2) and install it to throttle cable then connect throttle cable (1) to transmission case (3).

NOTE:

Do not turn transmission case toward position where throttle cable is connected so as to protect retainer of throttle cable.



33) Apply A/T fluid to new O-ring and spring and install them to accumulator piston and install accumulator piston to transmission case.

- 4. Upper spring
- 5. Coil outer diameter

Accumulator piston and spring specification (G16 engine) :

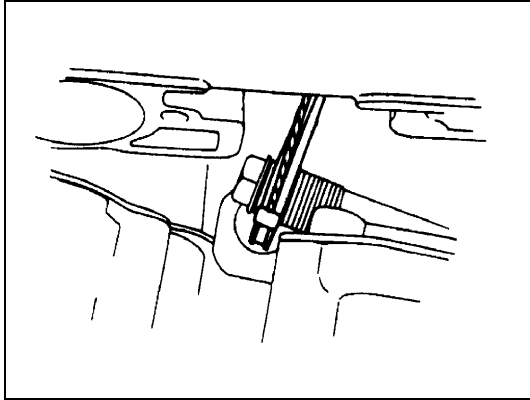
Used for	Piston outer diameter "a"	Spring free length "b"	
		Upper spring	Lower spring
Direct clutch accumulator (2)	31.80 – 31.85 mm (1.252 – 1.254 in.)	61.21 mm (2.410 in.)	–
		–	–
Forward clutch accumulator (1)	31.80 – 31.85 mm (1.252 – 1.254 in.)	64.68 mm (2.546 in.)	–
		–	–
Second brake accumulator (3)	34.80 – 34.85 mm (1.370 – 1.372 in.)	55.18 mm (2.172 in.)	35.13 mm (1.383 in.)
		–	–

Accumulator piston and spring specification (J20 engine) :

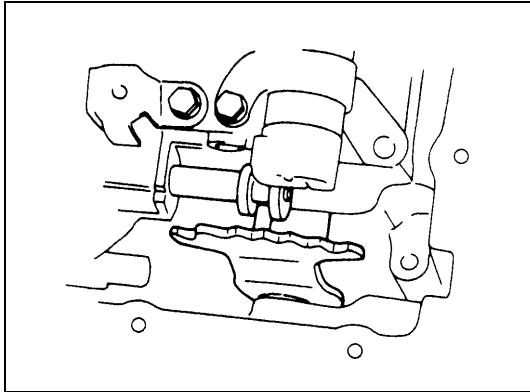
Used for	Piston outer diameter "a"	Spring free length "b"	
		Upper spring	Lower spring
Direct clutch accumulator (2)	31.80 – 31.85 mm (1.252 – 1.254 in.)	59.82 mm (2.355 in.)	–
		–	–
Forward clutch accumulator (1)	31.80 – 31.85 mm (1.252 – 1.254 in.)	64.68 mm (2.546 in.)	–
		–	–
Second brake accumulator (3)	34.80 – 34.85 mm (1.370 – 1.372 in.)	55.18 mm (2.172 in.)	35.13 mm (1.383 in.)
		–	–

Accumulator piston and spring specification (H25 engine) :

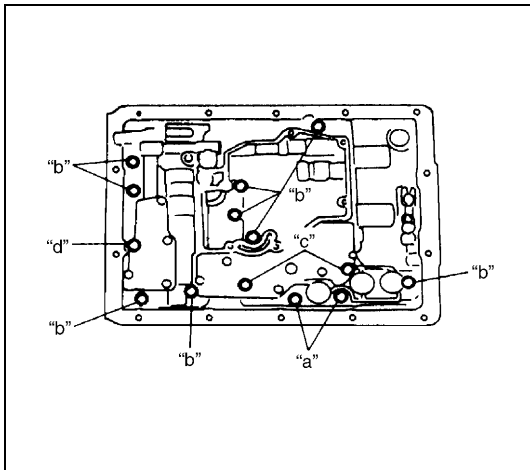
Used for	Piston outer diameter "a"	Spring free length "b"	
		Upper spring	Lower spring
Direct clutch accumulator (2)	31.80 – 31.85 mm (1.252 – 1.254 in.)	43.56 mm (1.715 in.)	30.80 mm (1.213 in.)
		–	–
Forward clutch accumulator (1)	31.80 – 31.85 mm (1.252 – 1.254 in.)	64.68 mm (2.546 in.)	–
		–	–
Second brake accumulator (3)	34.80 – 34.85 mm (1.370 – 1.372 in.)	58.80 mm (2.135 in.)	35.13 mm (1.383 in.)
		–	–



- 34) Lift valve body a little and install nipple of throttle cable to throttle valve cam.



- 35) After confirming that accumulator piston is pushed all the way down, match pin of manual shift lever with groove in manual valve.



- 36) Fix valve body by using bolts with each nominal length as shown in the figure and tightening to specified torque.

Tightening torque

Valve body bolt : 10 N·m (1.0 kg-m, 7.5 lb-ft)

Valve body bolt nominal length :

"a" : 25 mm (0.98 in.)

"b" : 30 mm (1.18 in.)

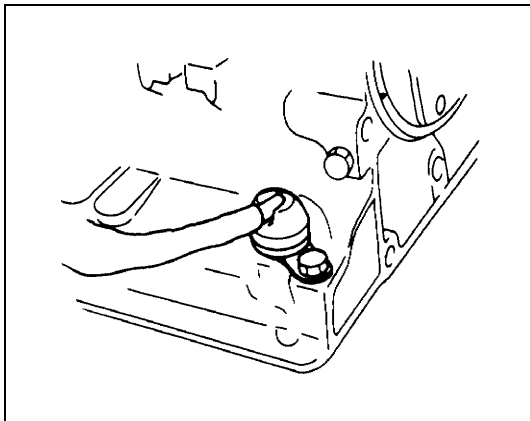
"c" : 47 mm (1.85 in.)

"d" : 60 mm (2.36 in.)

- 37) Install new gaskets, oil screen spacer and oil screen.

Tightening torque

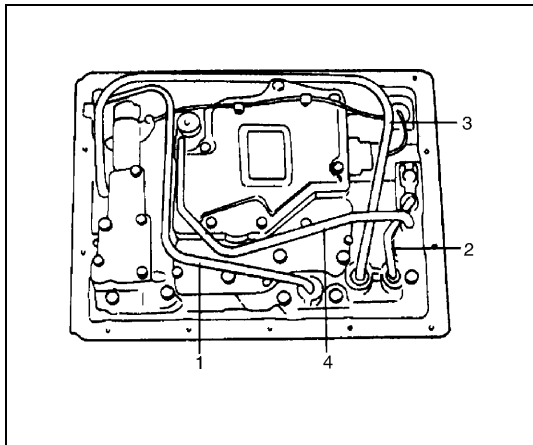
Oil screen bolt : 5.5 N·m (0.55 kg-m, 4.0 lb-ft)



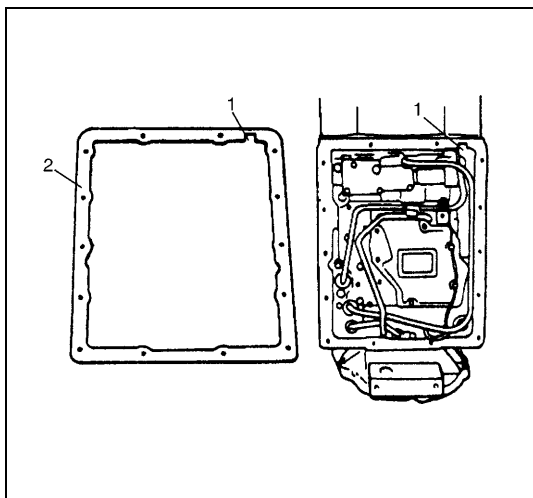
- 38) Lubricate new O-ring with A/T fluid and attach it to grommet of solenoid wire harness. Then connect solenoid wire harness to transmission case and fix it with solenoid wire harness clamp. Connect each connector to solenoid. And install new gasket and brake applying cover.

Tightening torque

Brake applying cover bolt : 10 N·m (1.0 kg-m, 7.5 lb-ft)



- 39) Using a plastic hammer, connect forward clutch applying tube (1), lube applying tube (2), reverse brake applying tube (3) and brake applying tube (4) in such order as shown in figure.



- 40) Install 2 oil pan magnets to transmission oil pan in such way that they do not interfere with oil tubes and install transmission oil pan with new oil pan gasket.

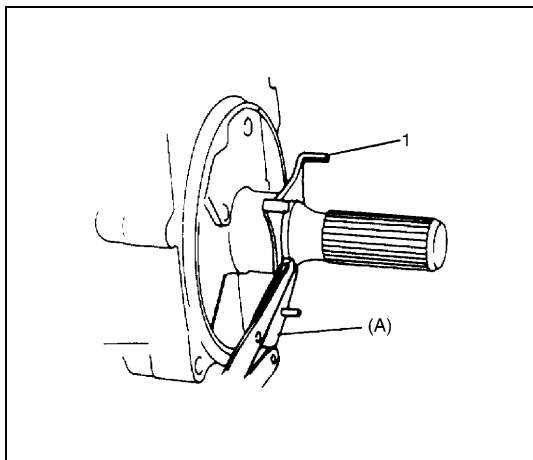
NOTE:

Align cutout in oil pan gasket with that in transmission case.

Tightening torque

Transmission oil pan bolt : 4.5 N·m (0.45 kg-m, 3.3 lb-ft)

- | |
|-------------------|
| 1. Cutout |
| 2. Oil pan gasket |

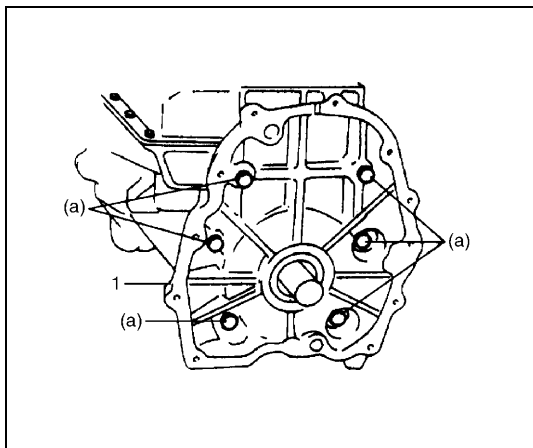


- 41) With wood rough key attached to output shaft, install sensor rotor by aligning its key groove with wood rough key and install C-ring by using special tool.

Special tool

(A) : 09920-76010

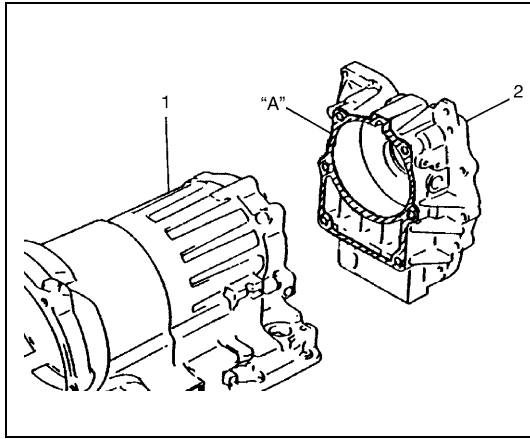
- | |
|-------------------|
| 1. Retaining ring |
|-------------------|



- 42) For G16 engine model, install adapter case (1) with new adapter gasket to transmission case and tighten adapter case bolts to specified torque.

Tightening torque

Adapter case bolt (a) : 35 N·m (3.5 kg-m, 25.5 lb-ft)

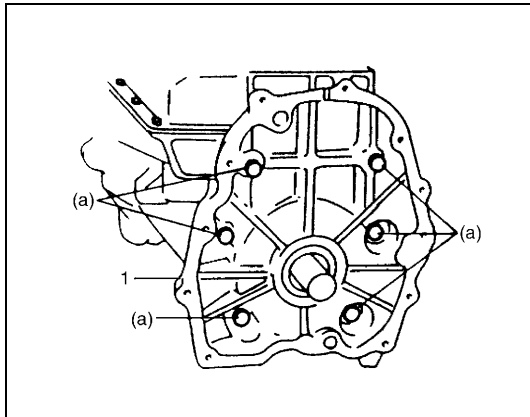


43) For J20 and H25 engines, perform the following procedures.

[J20 and H25 engines]

- a) Clean mating surface of transmission case (1) and adapter case (2) and apply sealant "A" to adapter case (2).

"A" sealant : 99000-31110

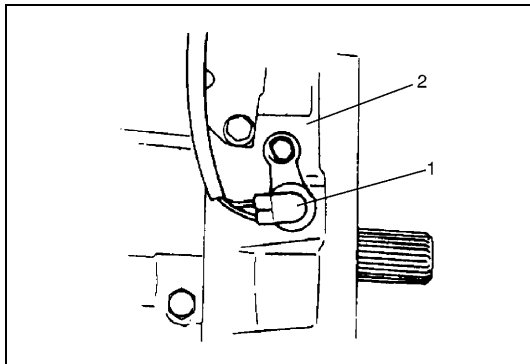


- b) Tighten adapter case bolts to specified torque.

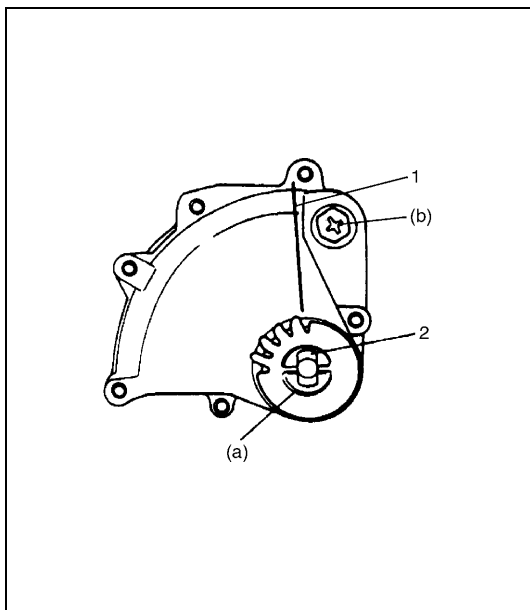
Tightening torque

Adapter case bolt (a) : 42 N·m (4.2 kg-m, 30 lb-ft)

1. Adapter case



- 44) Apply A/T fluid to new O-ring and install it to vehicle speed sensor (1) and then install vehicle speed sensor (1) to adapter case (2).



- 45) After turning manual shift shaft fully rearward, turn it back by 2 notches and set it to "N" range. Then install shift switch, lock washer and set nut and tighten set nut. After tightening it, bend claws of lock washer.

Tightening torque

Manual shift shaft set nut (a) :

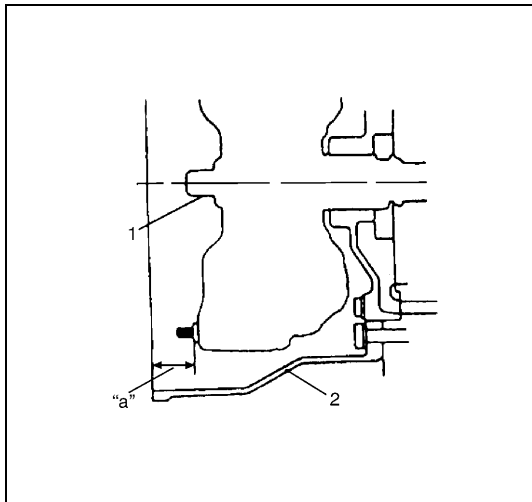
4 N·m (0.4 kg-m, 3.0 lb-ft)

- 46) With neutral reference line (1) and cut groove (2) in switch aligned, tighten lock bolt.

Tightening torque

Shift switch lock bolt (b) :

5.5 N·m (0.55 kg-m, 4.0 lb-ft)



- 47) Confirm that torque converter is fully fitted in transmission. Confirmation can be done by measuring dimension between end surface of housing case (2) and drive plate installation seat.

Standard dimension between end surface of case housing and drive plate installation seat "a" :

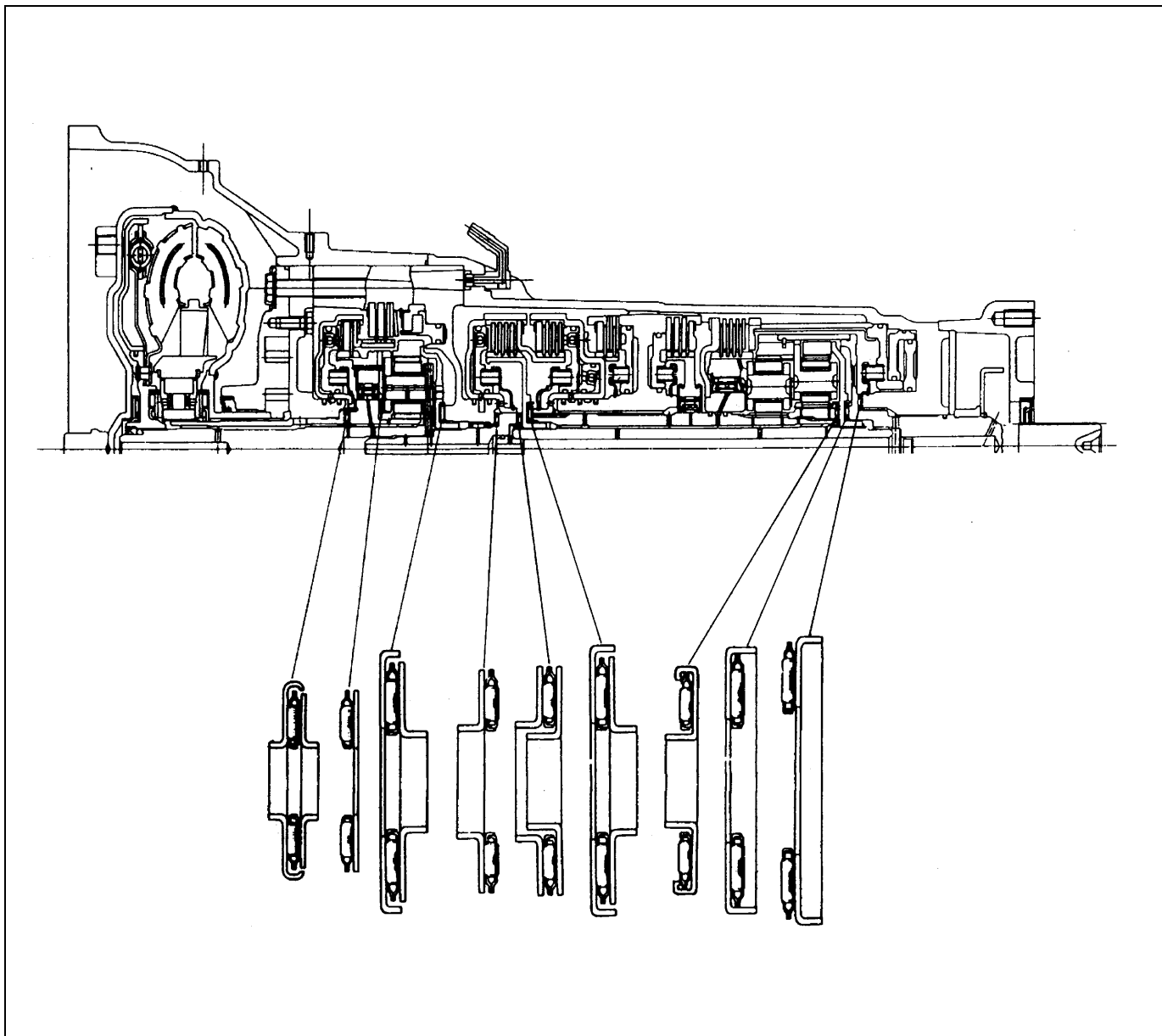
For G16 engine : 21.5 mm (0.85 in.)

For J20 engine : 17.3 mm (0.68 in.)

For H25 engine : 17.4 mm (0.69 in.)

- 48) Check that torque converter turns smoothly and apply grease to center piece (1) of torque converter.

BEARING AND RACE INSTALLATION DIAGRAM



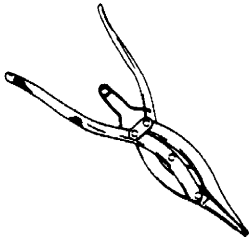
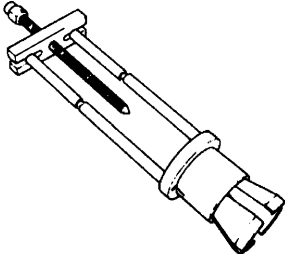
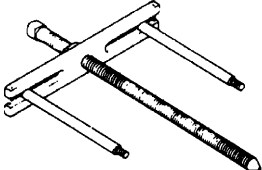
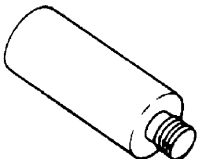
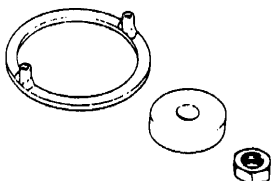
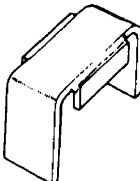
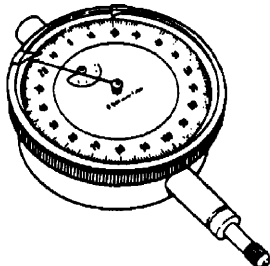
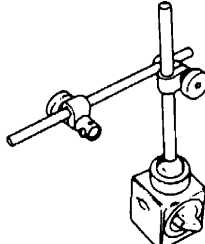
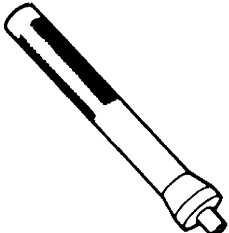
TIGHTENING TORQUE SPECIFICATION

Fastening part	Tightening torque		
	N•m	kg-m	lb-ft
Oil pump bolts	7.5	0.75	5.5
Upper/Lower valve body bolts	5.5	0.55	4.0
Detent spring bolt			
Throttle cam bolt	7.5	0.75	5.5
Pressure relief valve bolts	5.5	0.55	4.0
Rear upper valve body plate bolts			
Solenoid valve No.1 (Shift solenoid valve) bolts	10	1.0	7.5
Solenoid valve No.2 (TCC solenoid valve) bolts	5.5	0.55	4.0
Pressure relief valve bolt			
Lower valve body plate bolts			
TCC (Lock-up) control valve plates bolts			
Center support bolts	26	2.6	19.0
Torque converter housing bolts (a)	35	3.5	25.5
Torque converter housing bolts (b)	58	5.8	42.0
Parking lock pawl bracket screw	7.5	0.75	5.5
Valve body bolts	10	1.0	7.5
Oil screen bolts	5.5	0.55	4.0
Brake applying cover bolts	10	1.0	7.5
Oil pump assembly bolts	22	2.2	16.0
Oil pan bolts	4.5	0.45	3.3
Adapter case bolts (G16 engine)	35	3.5	25.5
Adapter case bolts (J20 and H25 engines)	42	4.2	30.0
Manual shift shaft set nut	4	0.4	3.0
Shift switch lock bolt	5.5	0.55	4.0
Oil pipe flare nuts	30	3.0	22.0
Oil filler tube bolt	23	2.3	17.0
Transfer to transmission bolts			
Drive plate bolts tightening torque	78	7.8	56.5

REQUIRED SERVICE MATERIAL

Material	Recommended SUZUKI product (Part Number)	Use
A/T fluid	Refer to Section 0B	- Automatic transmission - Parts lubrication when installing
Lithium grease	SUZUKI SUPER GREASE C (99000-25030)	- Retaining parts in place when assembling - Oil seal lips - Oil pump O-ring
	SUZUKI SUPER GREASE A (99000-25010)	Cable ends
Sealant	SUZUKI BOND No. 1215 (99000-31110)	Mating surface of transmission case

SPECIAL TOOL

			
09920-76010 Snap ring opener	09941-84510 Bearing inner race remover	09918-48211 Oil pump remover	09918-48220 Oil pump remover attachment (M8)
			
09926-98320 Spring compressor No. 1set	09926-98310 Clutch spring compressor	09900-20606 Dial gauge	09900-20701 Magnetic stand
			
09943-88211 Bearing installer			

SECTION 7D

TRANSFER (4WD)

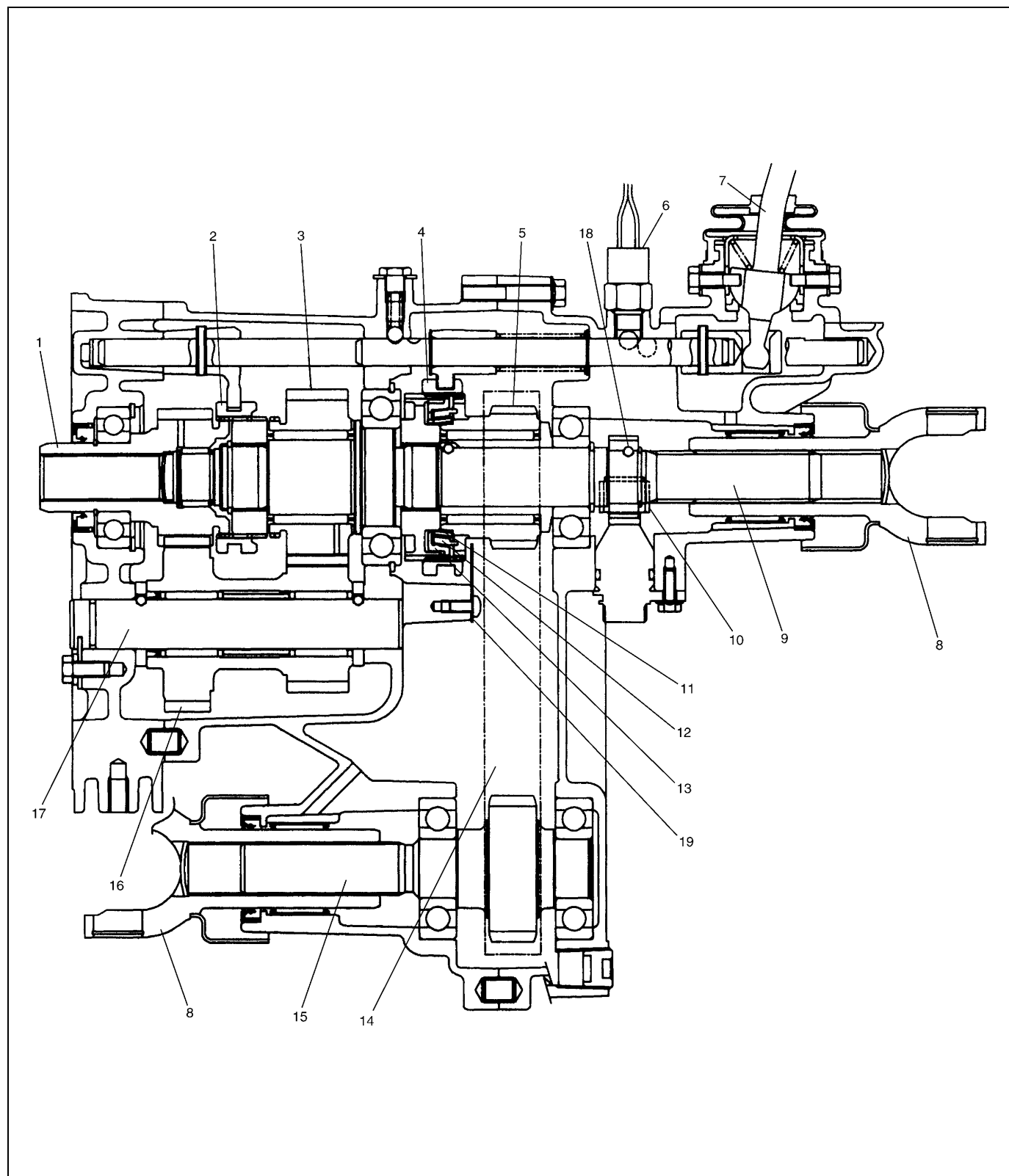
7D

CONTENTS

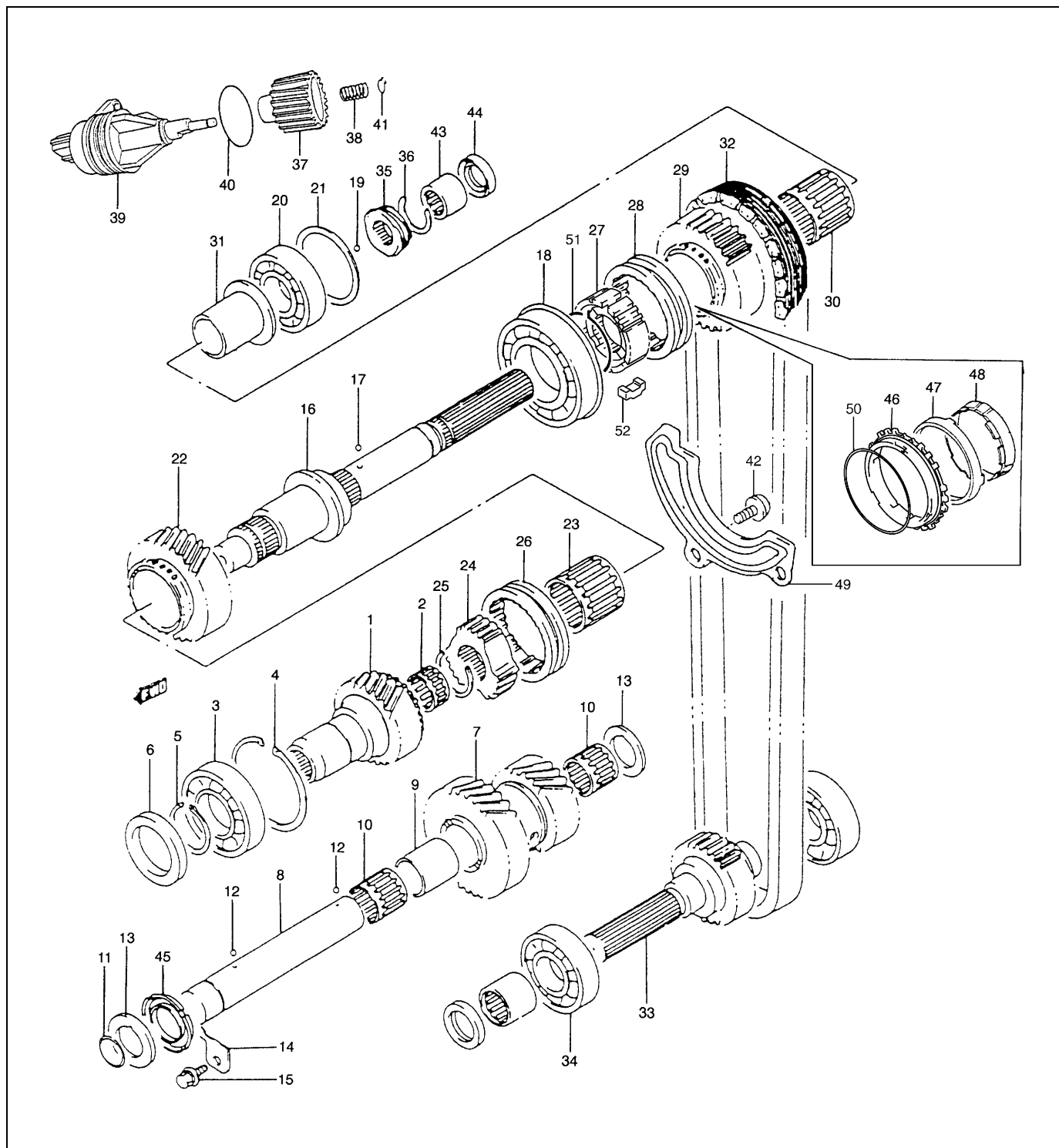
GENERAL DESCRIPTION	7D-2	ASSEMBLY	7D-11
COMPONENTS	7D-2	TIGHTENING TORQUE SPECIFICATION....	7D-23
UNIT REPAIR	7D-4	REQUIRED SERVICE MATERIAL.....	7D-23
DISASSEMBLY	7D-4	SPECIAL TOOL	7D-24
COMPONENT INSPECTION	7D-10		

GENERAL DESCRIPTION

COMPONENTS



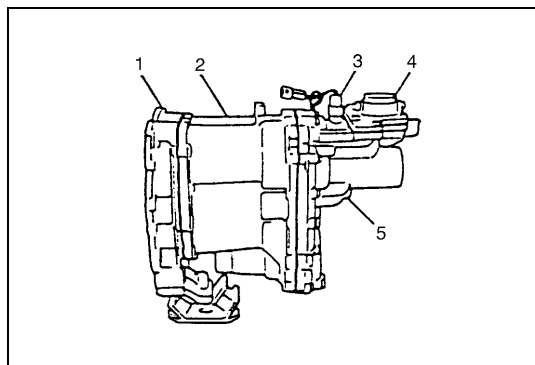
- | | | | |
|------------------------------|--------------------------------------|-----------------------------|----------------------------|
| 1. Transfer input gear | 6. 4WD switch | 11. Synchronizer inner ring | 16. Transfer counter gear |
| 2. Reduction shift sleeve | 7. Transfer gear shift control lever | 12. Center cone | 17. Transfer counter shaft |
| 3. Output low gear | 8. Sliding yoke | 13. Synchronizer outer ring | 18. Ball |
| 4. Front drive clutch sleeve | 9. Output rear shaft | 14. Drive chain | 19. Synchronizer plate |
| 5. Drive sprocket | 10. Speedometer driven gear | 15. Output front shaft | |



- | | | | |
|--------------------------|------------------------------|-------------------------------|--|
| 1. Input gear | 14. Plate | 27. Front drive clutch hub | 40. O-ring |
| 2. Needle bearing | 15. Bolt | 28. Front drive clutch sleeve | 41. Clip |
| 3. Input gear bearing | 16. Output rear shaft | 29. Drive sprocket | 42. Bolt |
| 4. Input bearing circlip | 17. Washer ball | 30. Needle bearing | 43. Needle bearing |
| 5. Input gear circlip | 18. Rear shaft No. 1 bearing | 31. Sprocket bush | 44. Oil seal |
| 6. Oil seal | 19. Washer ball | 32. Drive chain | 45. Friction ring |
| 7. Counter gear | 20. Rear shaft No. 2 bearing | 33. Output front shaft | 46. Synchronizer outer ring |
| 8. Counter shaft | 21. Adjusting shim | 34. Bearing | 47. Center cone |
| 9. Spacer | 22. Output low gear | 35. Speedometer drive gear | 48. Synchronizer inner ring |
| 10. Needle bearing | 23. Needle bearing | 36. Circlip | 49. Synchronizer plate |
| 11. O-ring | 24. Reduction clutch hub | 37. Speedometer driven gear | 50. Synchronizer spring (type without key) |
| 12. Washer ball | 25. Circlip | 38. Spring | 51. Synchronizer spring (type with key) |
| 13. Washer | 26. Reduction shift sleeve | 39. Speed sensor | 52. Synchronizer key (type with key) |

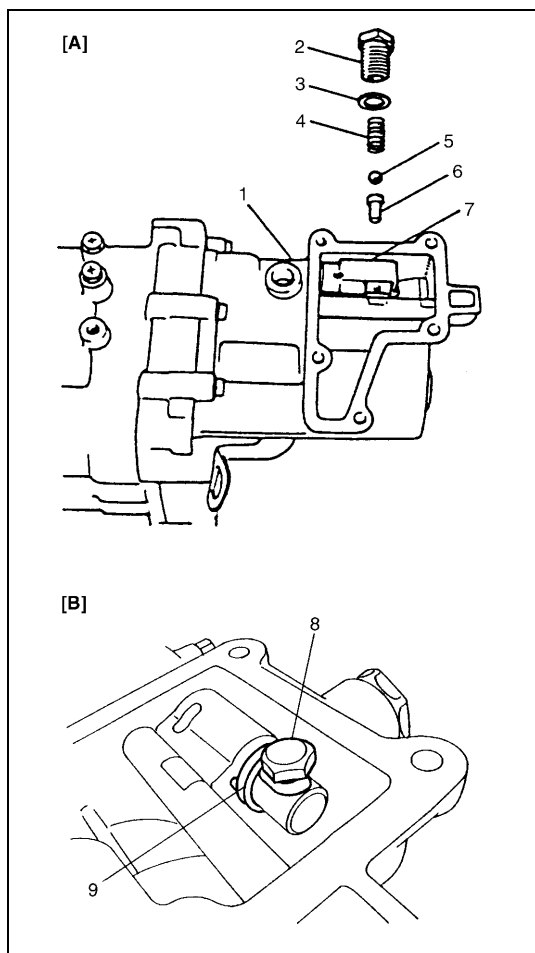
UNIT REPAIR

DISASSEMBLY



- 1) Remove 4WD switch (3) and take out steel ball.
- 2) Remove 5 bolts and then remove gear shift lever case (4).

- | |
|---|
| <ol style="list-style-type: none"> 1. Front case 2. Center case 5. Rear case |
|---|



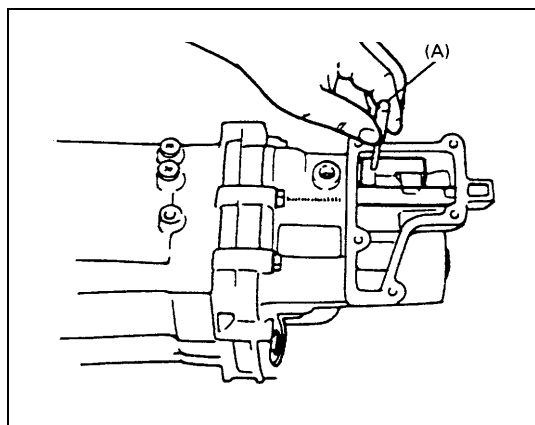
- 3) For transfer for A/T and TYPE 1 manual transmission, after removing bolt of select return system, take out spring (4), steel ball (5) and pin (6).

For transfer for TYPE 2 manual transmission, remove select return spring bolt (8) and then return spring (9).

[A]: For transfer for A/T and TYPE 1 manual transmission

[B]: For transfer for TYPE 2 manual transmission

- | |
|---|
| <ol style="list-style-type: none"> 1. Rear case 2. Select return spring bolt 3. Washer (aluminum) 7. Reduction shift yoke |
|---|



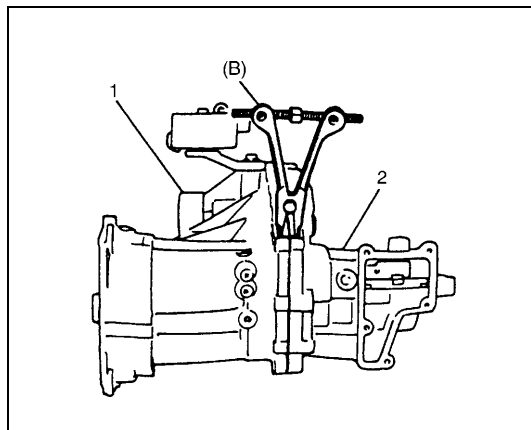
- 4) By hammering special tool, drive spring pin out of reduction shift yoke.

NOTE:

- Pin may drop into case when driven out. Therefore, take it out when case is disassembled.
- After spring pin is removed, yoke may be either taken out.

Special tool

(A) : 09922-85811



- 5) Remove 15 rear case bolts and then separate case by using special tool.

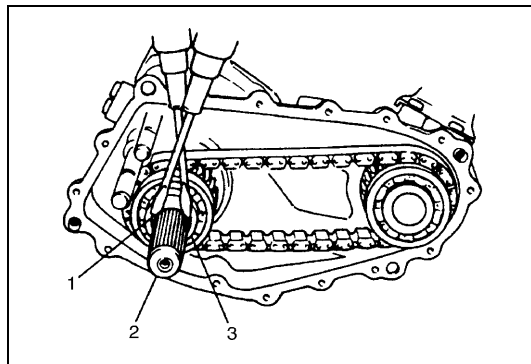
NOTE:

To separate case, use special tool at 4 points in turn and make opening wider evenly.

Special tool

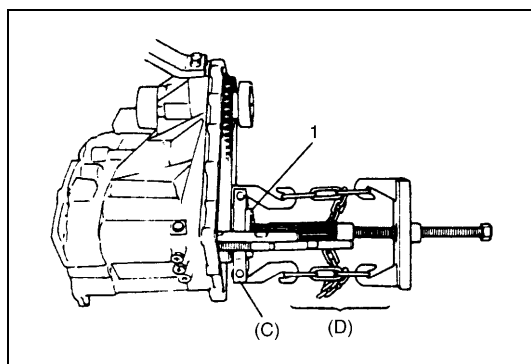
(B) : 09912-34510

- | |
|----------------|
| 1. Center case |
| 2. Rear case |



- 6) Remove circlip (1) by using screwdrivers and hammer, then pull out speedometer drive gear (3) and steel ball.

- | |
|----------------------|
| 2. Output rear shaft |
|----------------------|

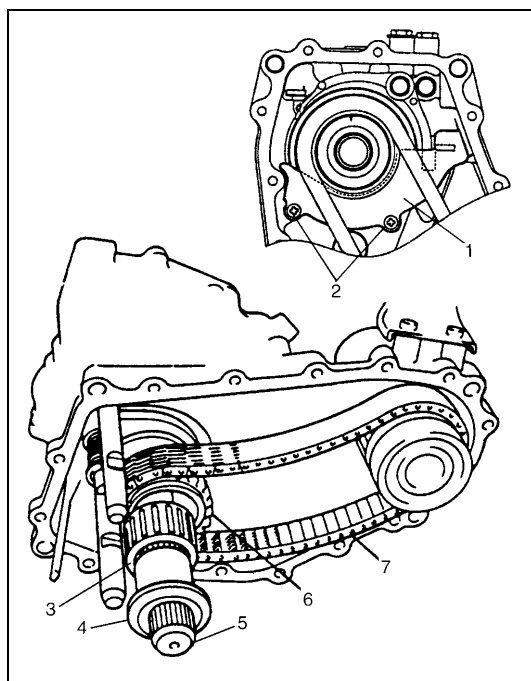


- 7) Remove circlip for bearing and pull out bearing No. 2 (1) by combination of special tools.

Special tool

(C) : 09921-57810

(D) : 09927-18411

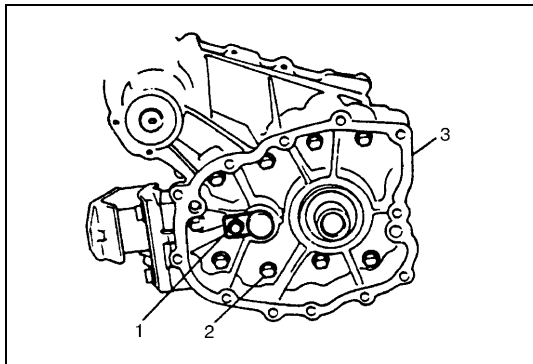


- 8) Remove synchronizer plate (1) screws (2) and pull out sprocket bush (4) and needle bearing (3) from output rear shaft (5).

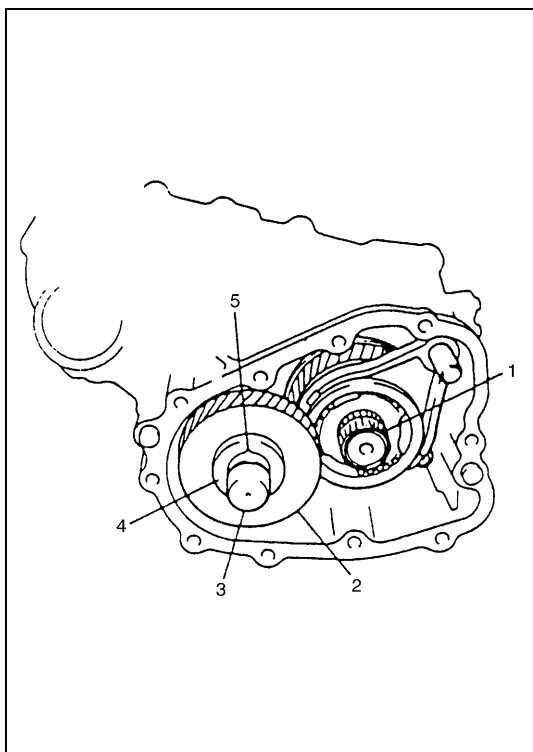
- 9) Remove sprocket (6) with drive chain (7) and synchronizer plate (1).

NOTE:

Watch out for steel ball which comes off from shaft when bush is pulled out so as not to lose it.



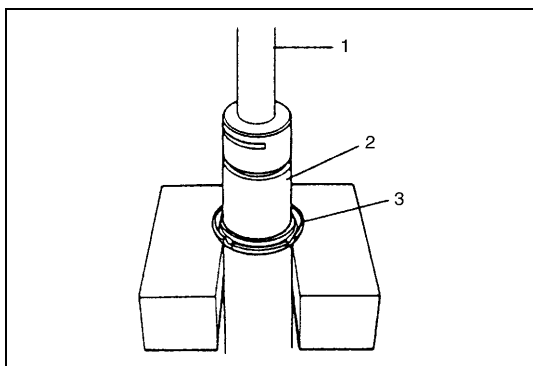
- 10) Remove counter shaft plate bolt (1) from front case (3), and counter shaft plate will come off.
- 11) Remove front case (3) by removing its 9 bolts (2).



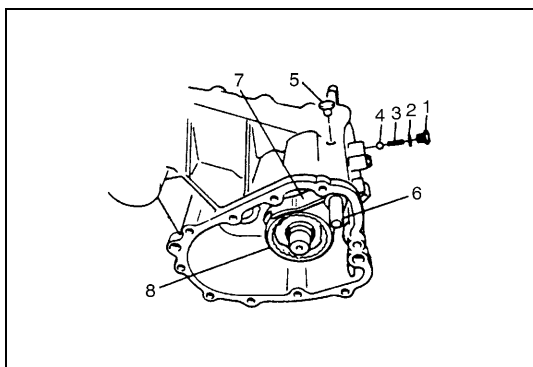
- 12) Remove input gear needle bearing (1). Remove counter gear (2) shaft (3) together with needle bearings, spacer, washers (4) and steel balls (5) from case.

NOTE:

- Watch out for steel balls which come out from between shaft and washers (front and rear) so as not to lose them.
- Check friction ring lip for damage and wear. Replace if necessary.
- Neither O-ring nor friction ring should be removed unless absolutely necessary. If removed, use new parts for reinstallation. Removed ones should not be reused.



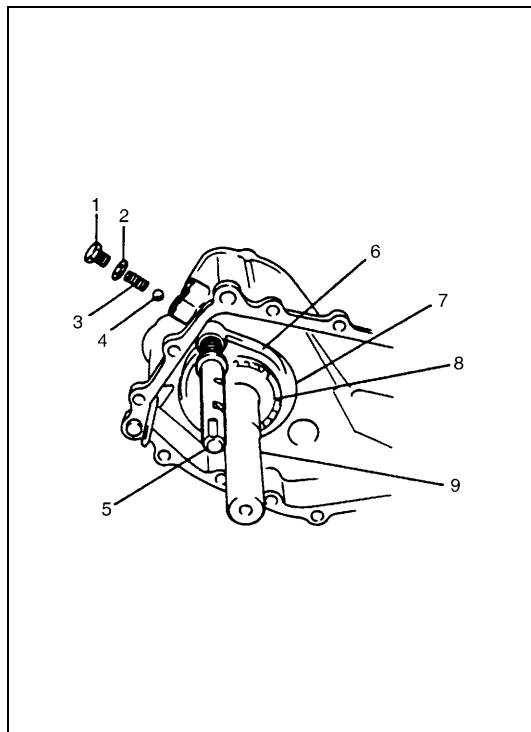
- 13) Remove O-ring from counter gear shaft (2) and then remove friction ring (3) from shaft, using a proper size rod (1) and press.



- 14) Remove locating spring bolt (1) with washer (2), spring (3) and ball (4) for reduction shift. Remove rubber plug (5) as well.
- 15) Pull out reduction shift shaft (6) together with fork (7) and sleeve (8).

NOTE:

For this removal, be sure to place front drive fork shaft at 4WD position.



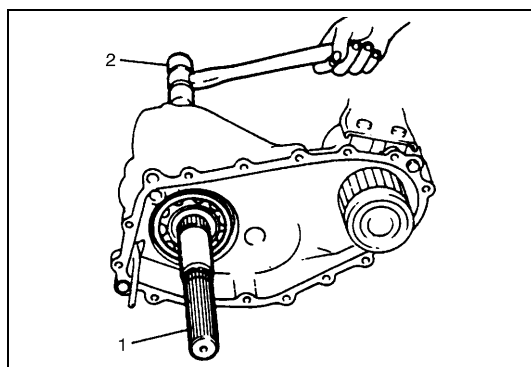
16) Remove locating spring bolt (1) with washer (2), spring (3) and ball (4) for front drive shift.

17) Pull out front drive shift fork (6) & shaft (5), sleeve (7) and hub (8) all together.

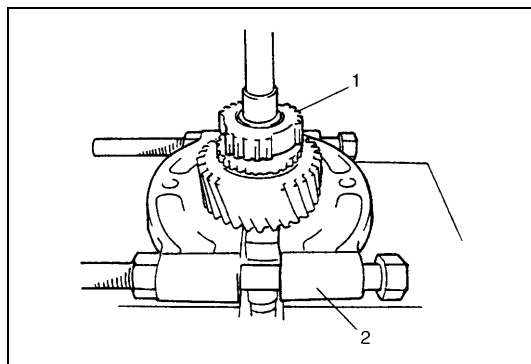
NOTE:

Watch out for interlock steel ball which comes out from between 2 shift shafts so as not to lose it. If it doesn't come out, remove rubber plug and take it out.

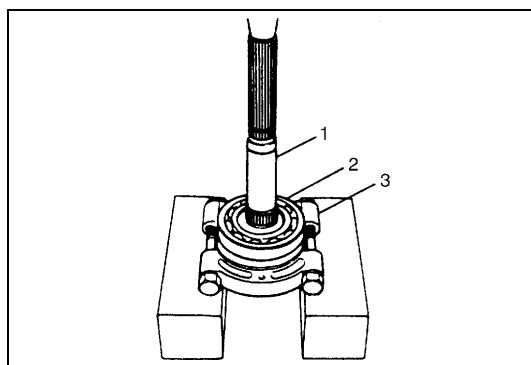
9. Output rear shaft



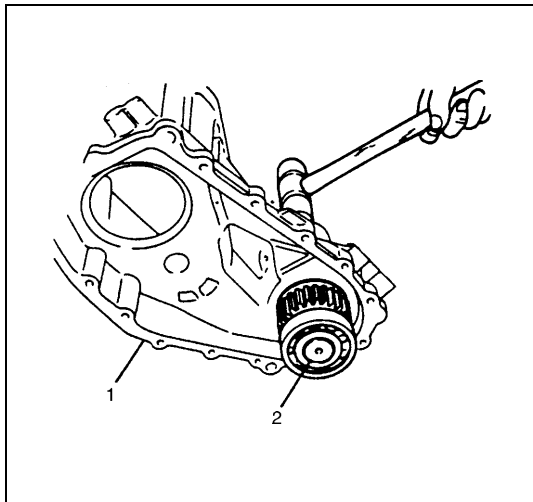
18) Using plastic hammer (2), drive out output rear shaft assembly (1) with bearing. Output low gear and reduction clutch hub also come off as they are installed to shaft.



19) Pull off circlip from output rear shaft and remove reduction clutch hub (1) by using puller (2) and press. Then pull out output low gear and needle bearing.



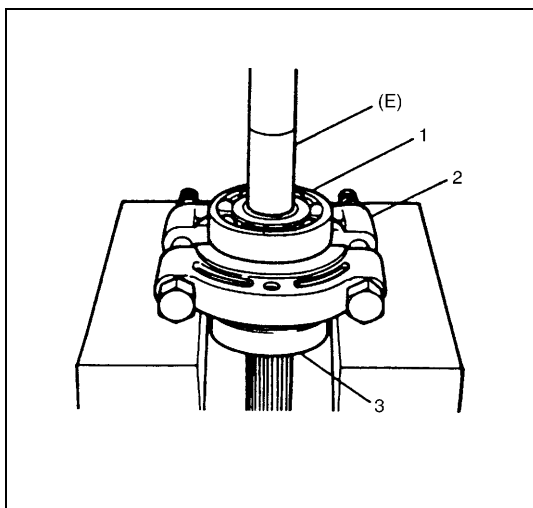
20) Using puller (3) and press, remove bearing No. 1 (2) from shaft (1).



- 21) Remove oil seal from center case (1).
- 22) Using plastic hammer, drive out output front shaft (2) together with bearings.

CAUTION:

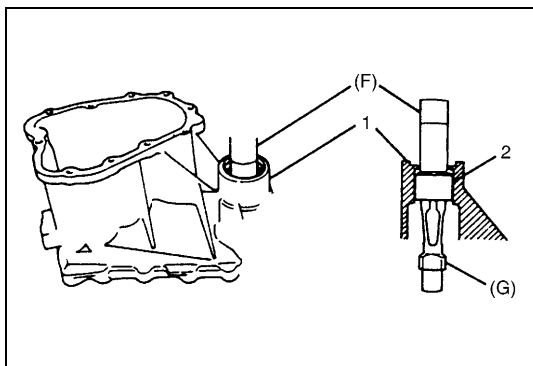
If oil seal remains in center case, be careful not to damage oil seal by hitting. Use drive punch for hammering.



- 23) Take off bearings (1, 3) from shaft by using press and puller (2). Removal of front side bearing requires special tool additionally as shown in the figure.

Special tool

(E) : 09925-98221

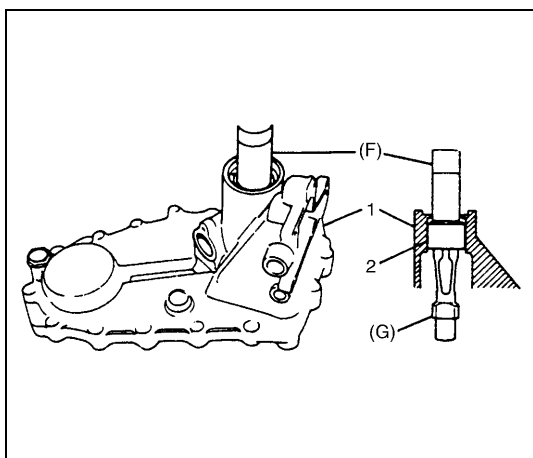


- 24) To remove needle bearing (2) from center case (1), combine special tools as shown in the figure and press them.

Special tool

(F) : 09913-84510

(G) : 09941-64511



- 25) Remove oil seal from rear case (1). And then, using same special tools and press as in step 24), remove needle bearing (2) from rear case.

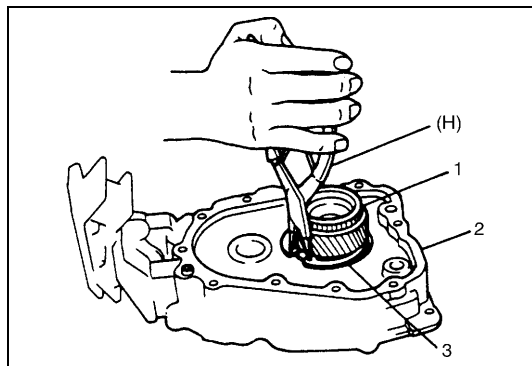
CAUTION:

Be careful not to damage oil seal, if it remains in rear case.

Special tool

(F) : 09913-84510

(G) : 09941-64511



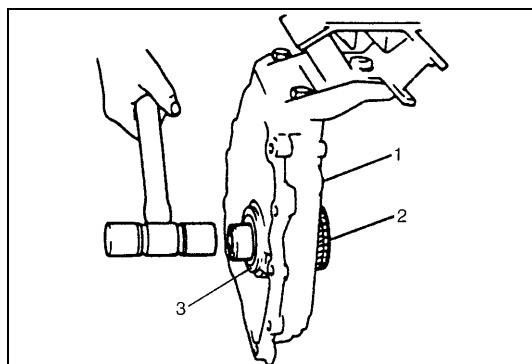
26) Using special tool, remove circlip (3) of input gear (1) from front case (2).

NOTE:

Be sure to use right tool to ensure proper work.

Special tool

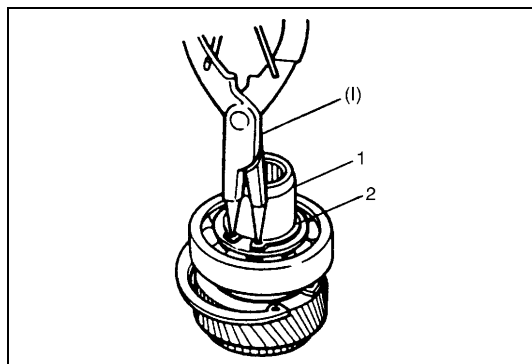
(H) : 09900-06108



27) Using plastic hammer, drive input gear (2) out of front case (1).

NOTE:

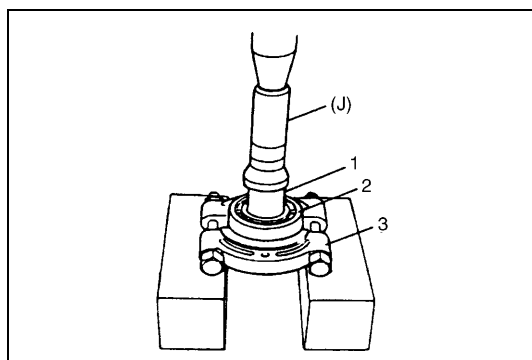
- **Be careful not to damage oil seal (3) by hitting.**
- **If removed, do not reuse oil seal.**



28) Remove circlip (2) of input gear (1) by using special tool.

Special tool

(I) : 09900-06107



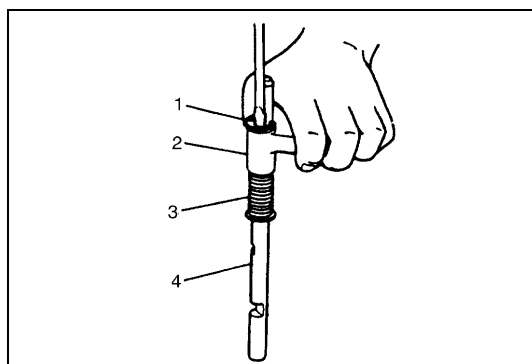
29) Remove bearing (2) from input gear (1) by using puller (3) and press.

NOTE:

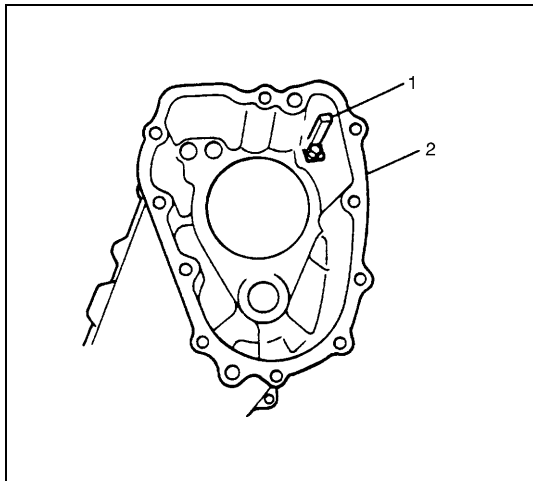
Use metal pad for this removal, or gear spline may get damaged.

Special tool

(J) : 09951-76010



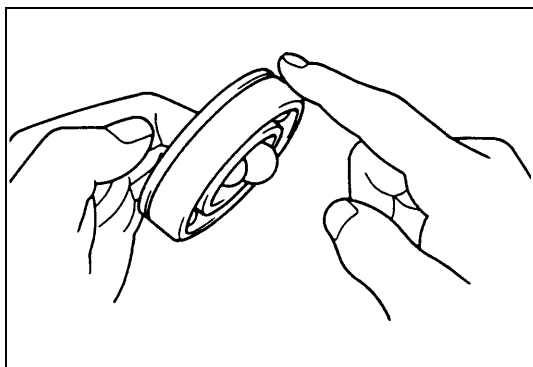
30) With spring (3) on front drive fork shaft (4) compressed, remove circlip (1) and then remove fork (2) and spring (3).



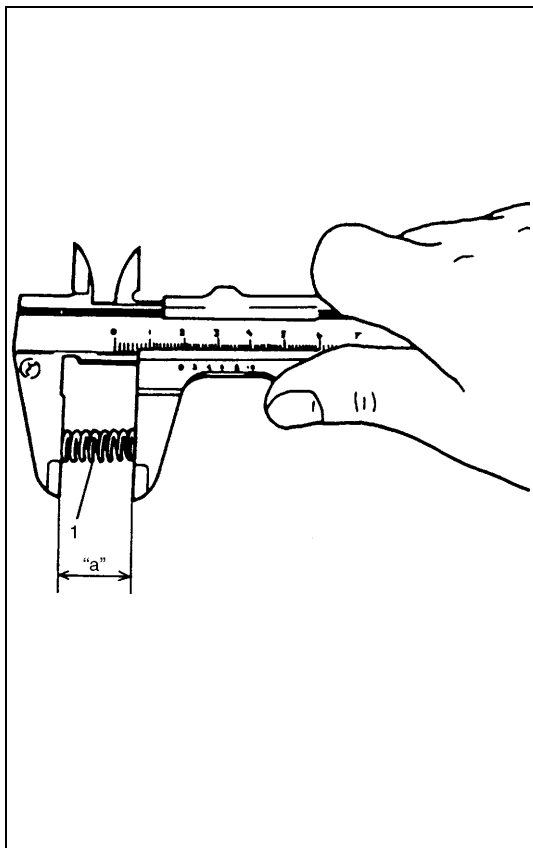
31) Remove center case gutter (1) with wrench.

2. Center case

COMPONENT INSPECTION



- Check each ball bearing for smooth rotation.
If found abnormal, replace.



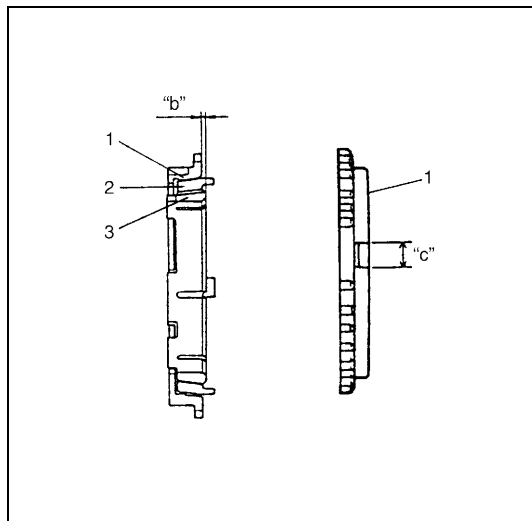
- Check each spring for distortion or breakage and change it with new one as necessary.
Especially for locating springs (1), measure each free length "a" and replace if it is below service limit.

Locating spring free length "a" :

Standard 19.5 mm (0.768 in.)

Service limit 18.0 mm (0.709 in.)

- Check needle bearing and bearing contacting surface for damage. Replace as required.
- Check gear tooth surface and shift mechanism in the same manner as with transmission.
Correct or replace as necessary.
- Check drive chain and sprockets for abnormal wear or damage. Replace as required.
- Check oil seal for leakage and its lip for excessive hardness.
If either is found, replace.
Also, check corresponding surface of shaft where oil seal lip contacts. Correct or replace as necessary.
- Check gear tooth surface of speedometer drive gear.
Replace if it is damaged.



- Put the synchronizer outer ring (1), inner ring (3) and the cone (2) together and then measure the step difference "b" between the outer ring (1) and the inner ring (3). And also check key slot or boss width "c" in synchronizer outer ring (1) and each chamfered tooth of gear and synchronizer ring and replace with new one, if necessary. Also, check gear tooth.

Difference "b" between the outer ring and the inner ring :

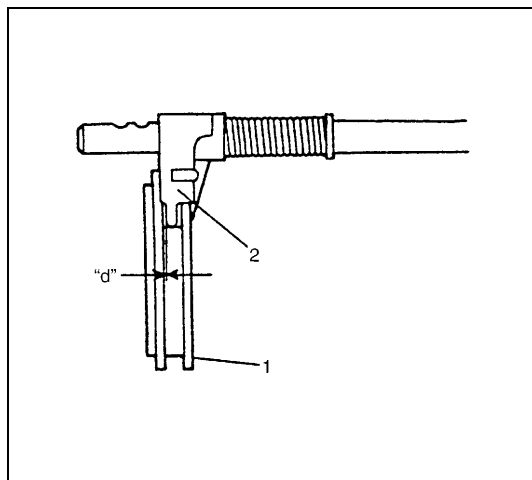
Standard : 1.0 – 1.4 mm (0.039 – 0.055 in.)

Service limit : 0.5 mm (0.019 in.)

Slot or Boss width "c" in synchronizer outer ring :

Standard : 10.1 mm (0.397 in.)

Service limit : 10.4 mm (0.409 in.)



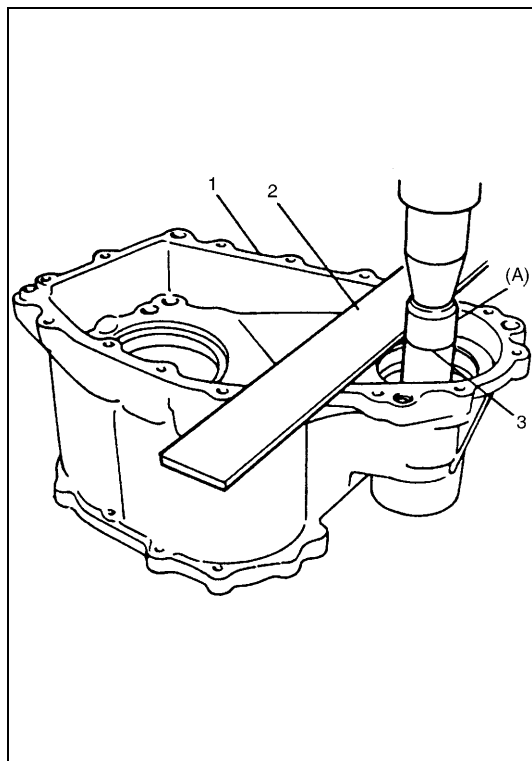
- Check chamfered part of each sleeve (1) for damage and excessive wear, and replace as necessary.
- Using feeler gauge, check clearance "d" between sleeve (1) and shift fork (2) and replace parts if necessary.

Clearance "d" between sleeve and shift fork :

Maximum 1.0 mm (0.039 in.)

- Check each synchronizer key and synchronizer spring and replace as necessary.
- Check splined portions and replace parts if excessive wear is found.

ASSEMBLY



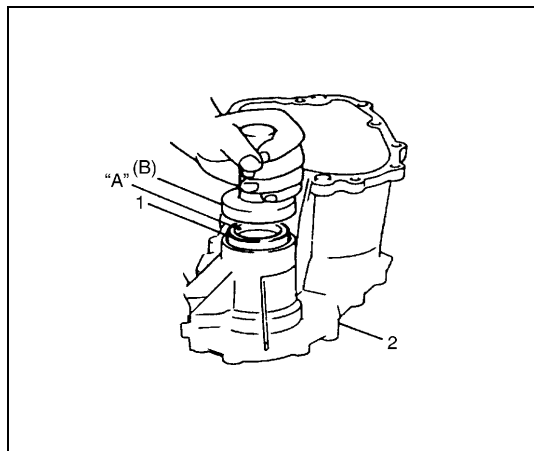
- Using press and special tool, press-fit needle bearing into center case (1). As shown in the figure, apply straightedge (2) to top surface of case and press-fit till limit line (3) of special tool aligns with bottom surface of straightedge (2) (i.e., case surface).

NOTE:

- Press-fitting needle bearing according to above procedure will set needle bearing 3 mm before it hits case bottom.**
- Once it is press-fit all way down to case bottom, removal would be very difficult if it becomes necessary.**

Special tool

(A) : 09951-76010

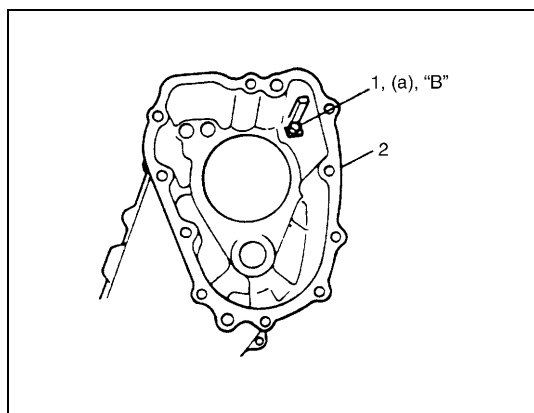


- 2) Using special tool and hammer, drive oil seal (1) into center case (2) until it becomes flush with case surface. Apply grease "A" to oil seal lip.

"A" : Grease 99000-25010

Special tool

(B) : 09913-75520



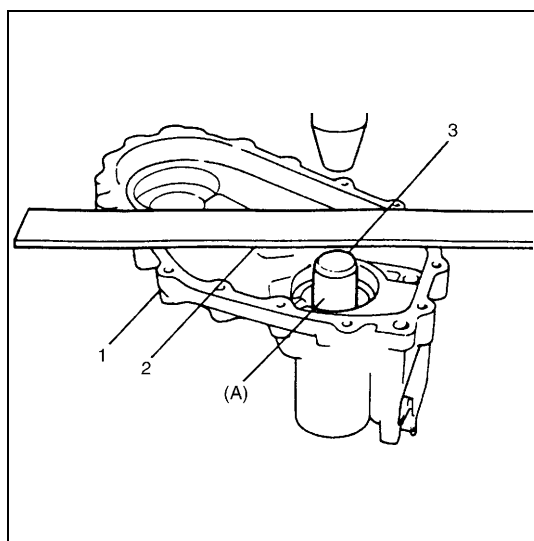
- 3) Install oil gutter and tighten bolt (1) applying thread lock cement "B".

Tightening torque

Center case gutter bolt (a) : 8 N·m (0.8 kg-m, 5.5 lb-ft)

"B" : Cement 99000-32020

2. Center case



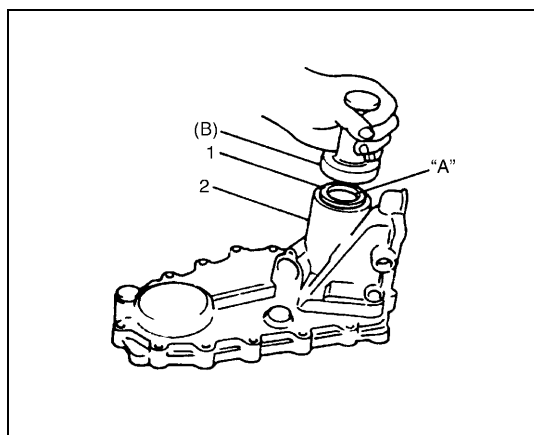
- 4) Using special tool and press, install needle bearing into rear case (1). As shown in the figure, apply straightedge (2) to case surface and press-fit till top of special tool (3) aligns with bottom surface of straightedge (i.e., case surface).

NOTE:

As with needle bearing in center case, above installation procedure will set needle bearing at a position 3 mm before it hits case bottom.

Special tool

(A) : 09951-76010

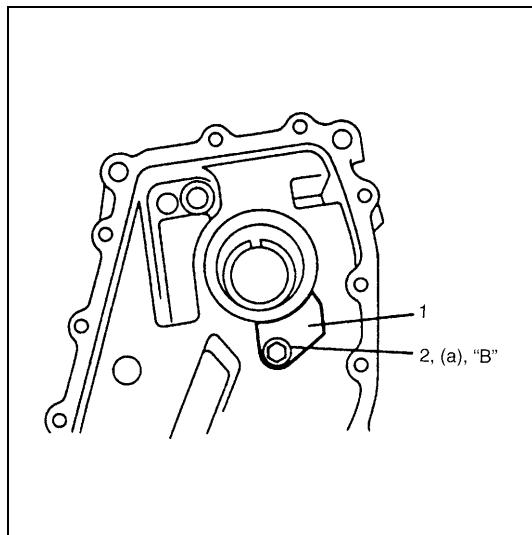


- 5) Using special tool and hammer, install oil seal (1) into rear case (2) until it becomes flush with case surface. Apply grease "A" to oil seal lip.

"A" : Grease 99000-25010

Special tool

(B) : 09913-75520



- 6) Install rear case plate (1) and bolt (2) applying thread lock cement "B".

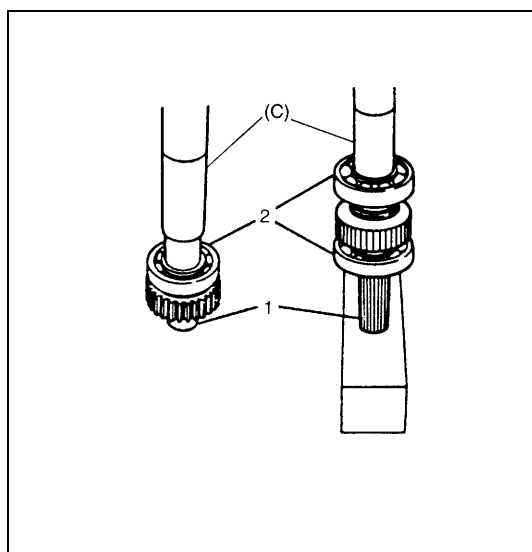
NOTE:

Removal of rear case plate is not required normally. However, if it is removed or replaced, install it with bolt applied with thread lock cement.

"B" : Cement 99000-32020

Tightening torque

Rear case plate bolt (a) : 8 N·m (0.8 kg-m, 5.5 lb-ft)

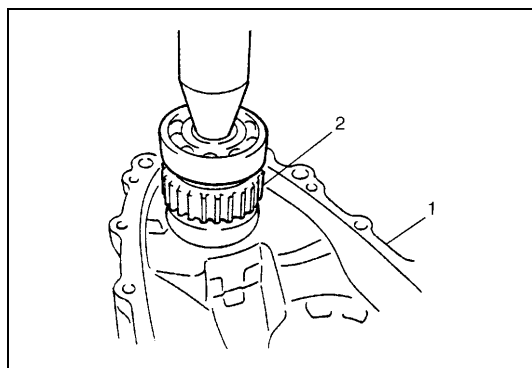


- 7) Using press and special tools, install bearings (2) to front shaft (1).

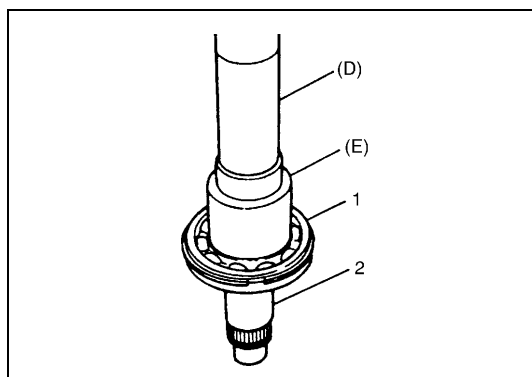
Bearings for both front and rear are identical.

Special tool

(C) : 09913-84510



- 8) Using press, drive output front shaft assembly (2) into center case (1).

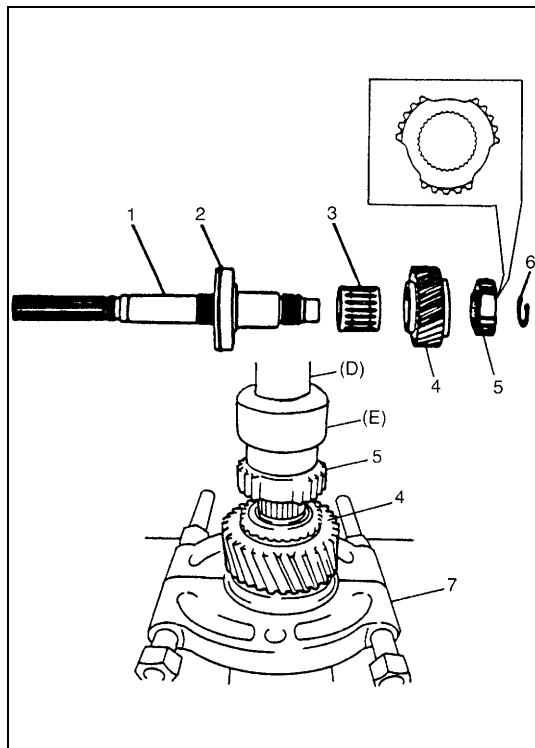


- 9) Using press and special tools, install bearing No. 1 (1) into output rear shaft (2). Place circlip portion of bearing on top as shown in figure.

Special tool

(D) : 09925-18011

(E) : 09940-53111



- 10) Install needle bearing (3) and output low gear (4) and then press-fit reduction clutch hub (5) onto output rear shaft (1) by using press and special tool and secure them with circlip (6). Hub has specific installing direction.

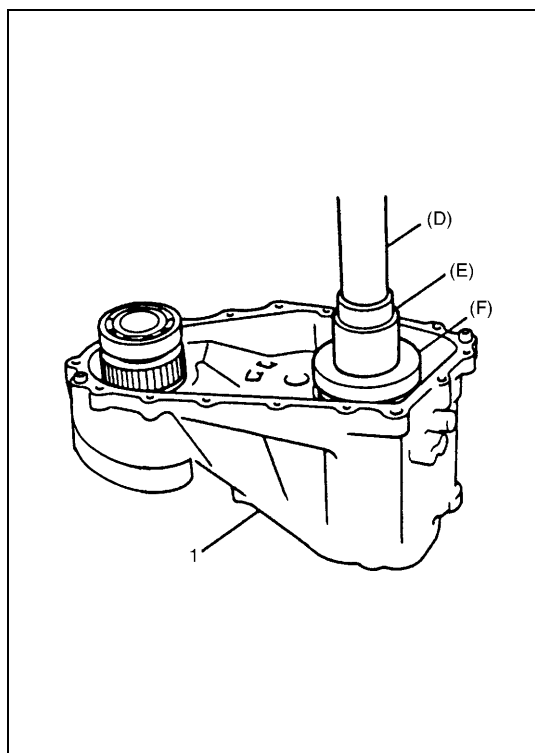
Special tool

(D) : 09925-18011

(E) : 09940-53111

2. Bearing No. 1

7. Puller



- 11) Combine special tools and press-fit output rear shaft assembly into center case (1).

NOTE:

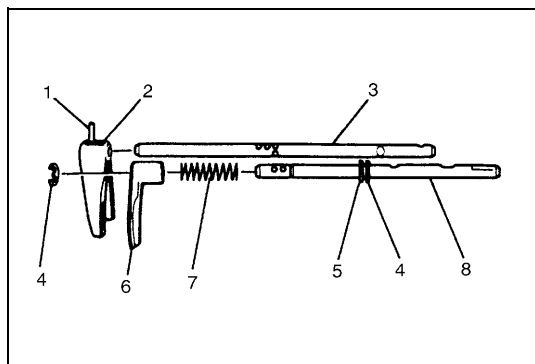
Use special tool (F) with its under-cut side faced down (toward bearing).

Special tool

(D) : 09925-18011

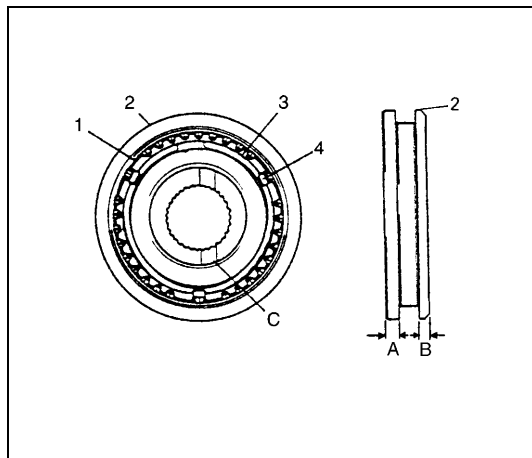
(E) : 09940-53111

(F) : 09951-26010



- 12) Install fork to corresponding shift shaft.

1. Spring pin
2. Reduction fork
3. Reduction shift shaft
4. Circlip
5. Washer
6. Front drive shift fork
7. Spring
8. Front drive shift shaft

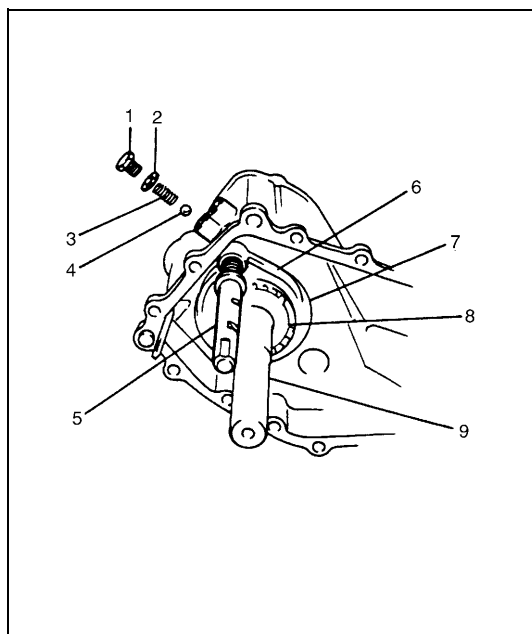


- 13) Fit sleeve to front drive clutch hub (1), place 3 synchronizer keys (4) (if equipped) in it and then set synchronizer springs (3) (if equipped). When installing, note that front drive clutch hub (1) and sleeve (2) have specific installing direction.

NOTE:

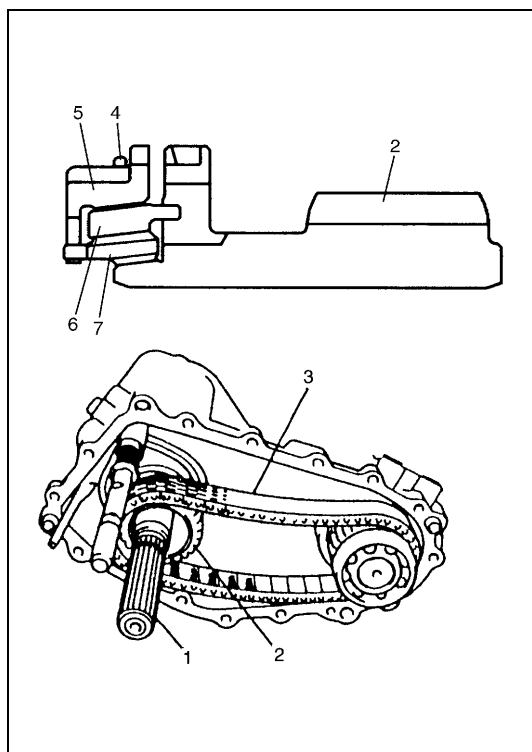
Make sure that bent end of synchronizer spring is inserted into hole (if equipped).

A: Thick (Front side)
B: Thin (Rear side)
C: Oil groove (Rear side)

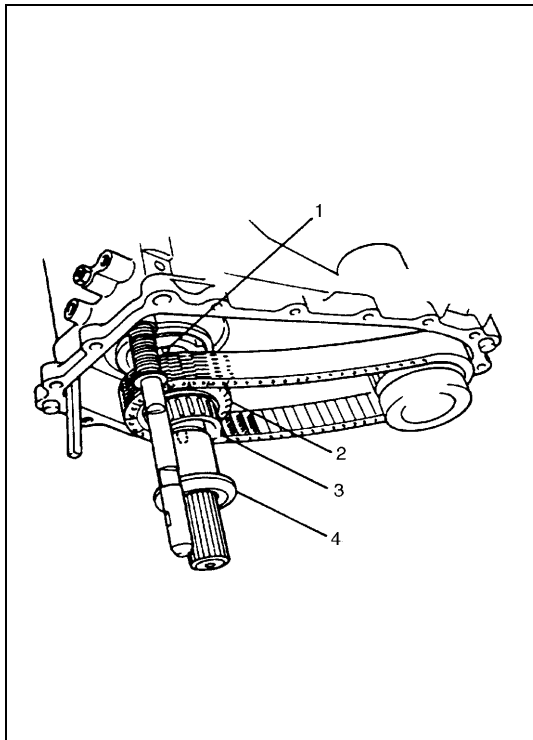


- 14) Install front drive fork shaft (5) assembly and sleeve (7) & hub (8) together into center case all at once. Then put locating ball (4) and spring (3) also into case and loosely install bolt (1).

2. Washer
6. Shift fork
9. Output rear shaft



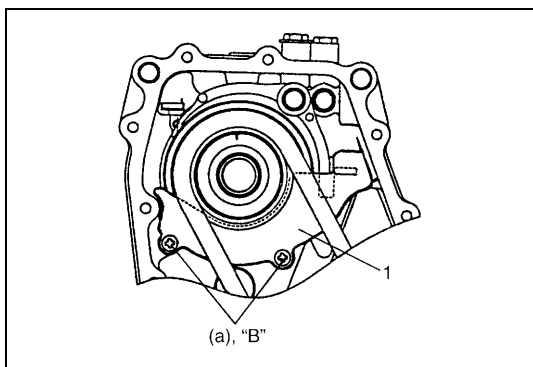
- 15) With the outer ring (5), spring (4) (if equipped), cone (6) and inner ring (7) put together and installed to sprocket gear (2) as shown in figure, install them together with chain (3) to output rear shaft (1).



- 16) Install needle bearing (3) and bush (4) to sprocket (2). Also install steel ball (1), using care not to drop it.

NOTE:

- Point mark on output rear shaft between positions of bearing No. 2 and speedometer drive gear indicates steel ball location in the front.
- Point mark on bush flange also means position where steel ball is met.

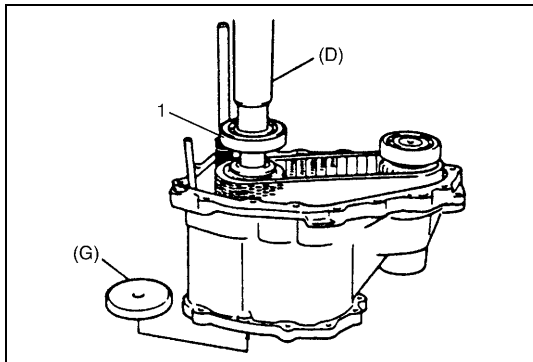


- 17) Install synchronizer plate (1).

Tightening torque

Synchronizer plate screw (a) : 10 N·m (1.0 kg-m, 7.5 lb-ft)

"B" : Cement 99000-32020

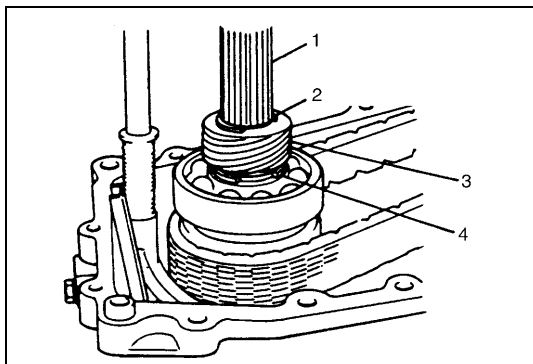


- 18) Using special tool, press-fit bearing No. 2 (1) into output rear shaft. It is necessary to place support base at lower end of shaft.

Special tool

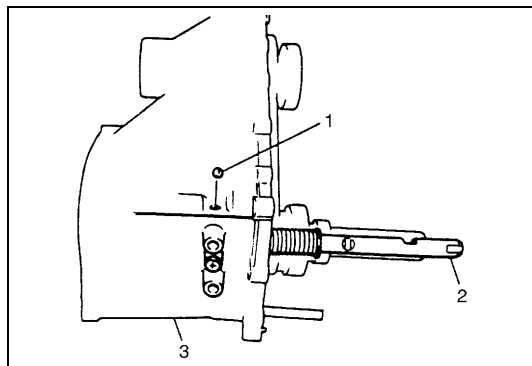
(D) : 09925-18011

(G) : 09926-68310



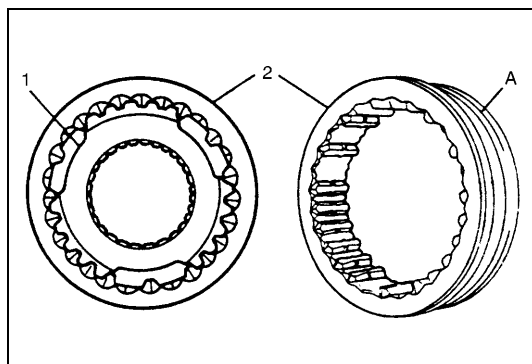
- 19) After installing large size circlip (4) install speedometer drive gear (3) and secure it with small size circlip (2).

1. Output rear shaft



20) Install interlock steel ball (1).

- | |
|----------------------------|
| 2. Front drive shift shaft |
| 3. Center case |

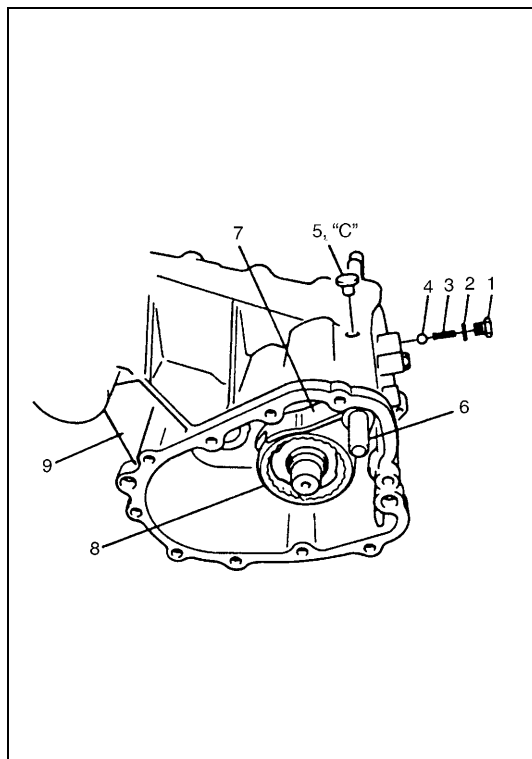


21) Fit sleeve (2) to reduction clutch hub (1).

NOTE:

- Circumferential groove mark (thicker rail side which works as shift stopper) should be inside (rear).
- Hub has no specific direction.

A: Groove (Inside – Rear)



22) Combine sleeve (8) & hub to reduction shift shaft (6) assembly and install them into center case (9). Then put locating ball (4) and spring (3) also into case and loosely install bolt (1).

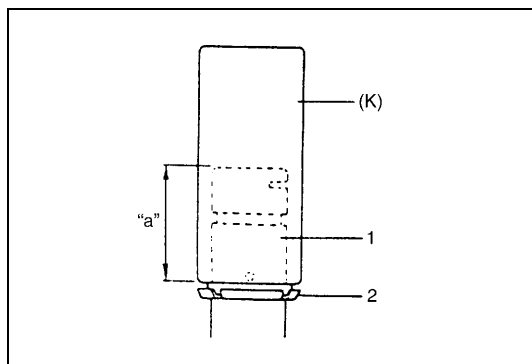
23) With sealant applied to rubber plug (5), insert it into hole in case.

NOTE:

When installing reduction shift shaft, front drive shift shaft must be placed at 4WD position.

“C” : Sealant 99000-31110

- | |
|---------------|
| 2. Washer |
| 7. Shift fork |

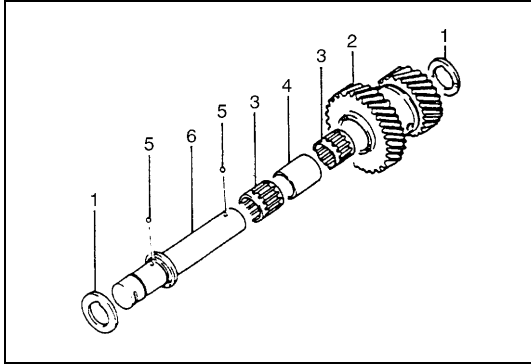


24) If friction ring (2) has been removed from counter shaft (1), press-fit new one onto shaft, using care so that it is installed in proper direction and position as shown in the figure.

Special tool

(K) : 09913-80112

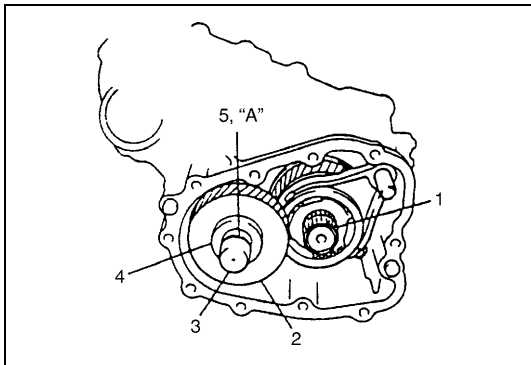
Installing position “a” :
39.5 mm (1.56 in.)



- 25) Install needle bearing (3) , spacer (4), counter gear (2), steel balls (5) and washers (1) onto shaft (6).

NOTE:

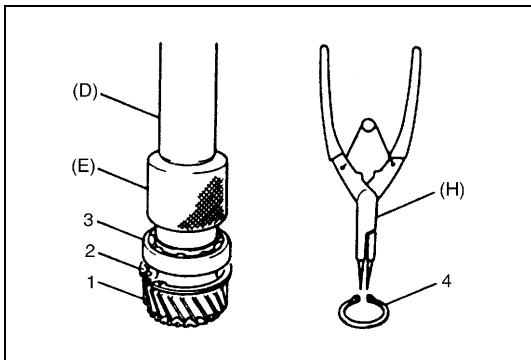
Washers must be installed with its oil slot side facing gear.



- 26) Install counter shaft assembly into case. If O-ring (5) has been removed, install new O-ring onto shaft (3) and apply grease "A".
Also, install low gear needle bearing (1).

“A” : Grease 99000-25010

2. Counter gear
4. Washer



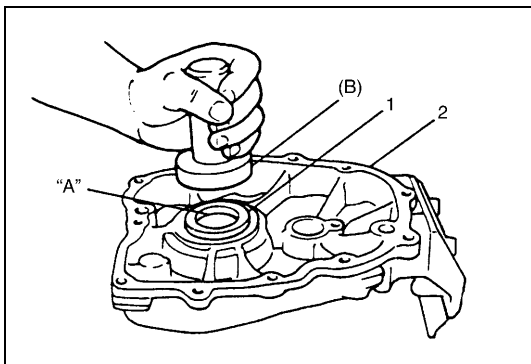
- 27) With circlip (2) placed on input gear (1), press-fit input gear bearing (3).
- 28) Fix bearing with circlip (4).

Special tool

(D) : 09925-18011

(E) : 09940-53111

(H) : 09900-06107

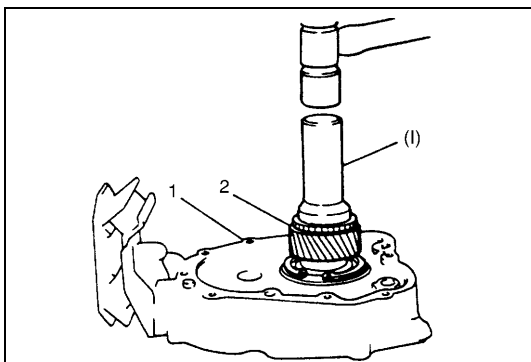


- 29) Install oil seal (1) to front case (2) so that end surface of oil seal becomes flush with that case. Apply grease "A" to oil seal lip.

“A” : Grease 99000-25010

Special tool

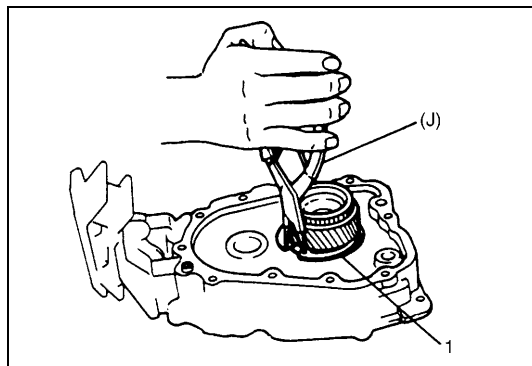
(B) : 09913-75520



- 30) Using special tool, drive input gear assembly (2) into front case (1).

Special tool

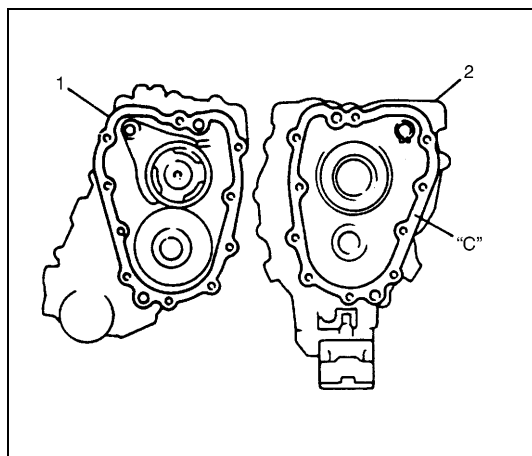
(I) : 09951-16080



31) Fix with circlip (1) by means of snap ring pliers.

Special tool

(J) : 09900-06108



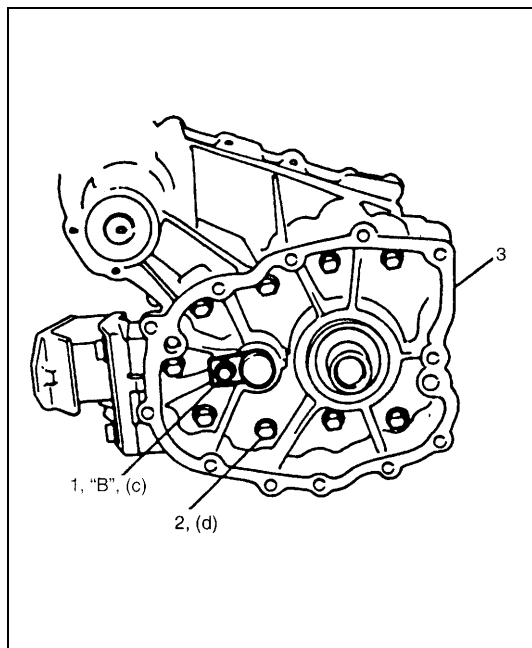
32) Oil to rotating parts and clean mating surfaces of center (1) case and front case (2).

33) Apply sealant "C" to mating surface of front case (2) evenly and put cases together.

NOTE:

- For smooth installation of front case, apply grease to counter shaft O-ring.
- When mating front case, make sure that input gear meshes with counter gear first.

"C" : Sealant 99000-31110



34) Torque 9 front case bolts (2) to specification.

35) Torque counter shaft plate fixing bolt (1) applied with thread lock cement to specification.

NOTE:

- After tightening bolts, check input gear and output rear shaft for smooth rotation by hand at low and high speed position.
- Also check front drive shift for proper operation.

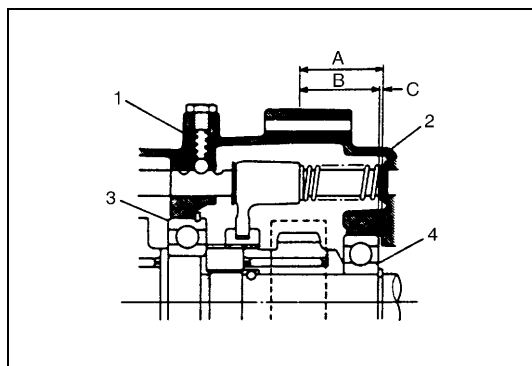
"B" : Cement 99000-32020

Tightening torque

Counter shaft plate bolt (c) : 23 N·m (2.3 kg-m, 17.0 lb-ft)

Front case bolt (d) : 23 N·m (2.3 kg-m, 17.0 lb-ft)

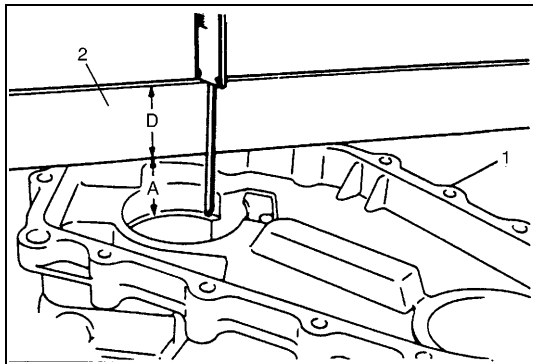
3. Front case



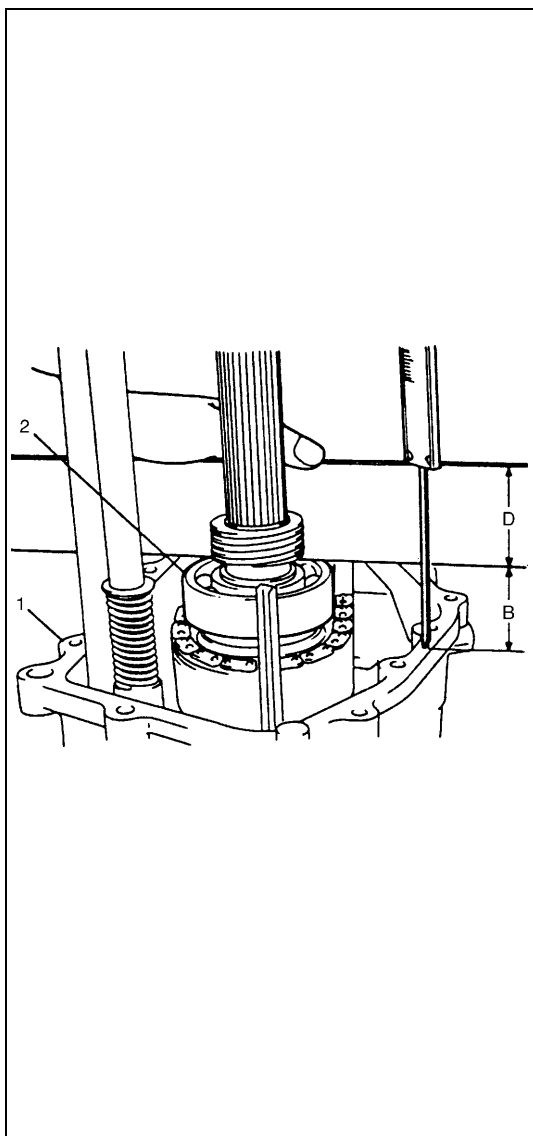
36) Before assembling rear case (2), shim adjustment is required. Follow steps described below.

1. Center case
3. Rear shaft bearing No. 1
4. Rear shaft bearing No. 2

$$A - B = C \text{ (Clearance)}$$



- a) Measure rear case (1) dimension “A” (from mating surface to bearing bore bottom) by using straightedge (2) and vernier caliper. Width of straightedge “D” plus “A” is obtained.



- b) Place straightedge on bearing No. 2 (2) securely and measure bearing height “B” (from center case (1) mating surface to No. 2 bearing top).

CAUTION:

Bridging straightedge between No. 2 bearing and output front shaft bearing brings misreading.

- c) Obtain clearance “C” in following calculation.

$$“C” = (“A” + “D”) - (“B” + “D”)$$

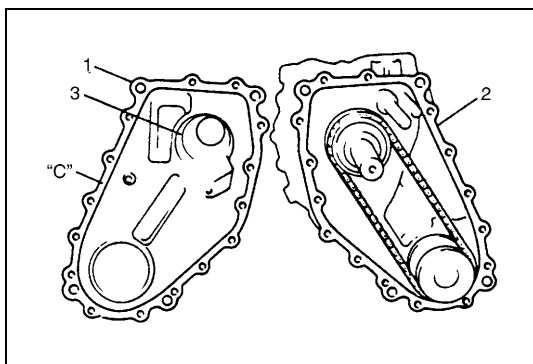
- d) Select a shim from among following available sizes and install it in bearing bore of rear case.

CAUTION:

Installing of over sized shim beyond specification in the following table may cause tight rotation of rear shaft and consequential bearing damage.

Shim specification :

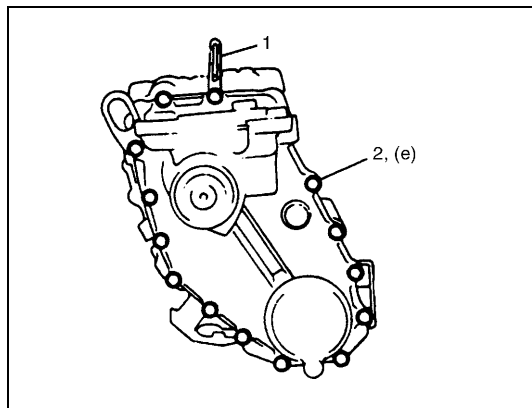
Clearance C	Shim size
0 – 0.13 mm (0 – 0.005 in)	NO NEED
0.13 – 0.23 mm (0.005 – 0.009 in)	0.1 mm (0.004 in)
0.23 – 0.33 mm (0.009 – 0.013 in)	0.2 mm (0.008 in)
0.33 – 0.43 mm (0.013 – 0.017 in)	0.3 mm (0.012 in)
0.43 – 0.53 mm (0.017 – 0.021 in)	0.4 mm (0.016 in)
0.53 – 0.58 mm (0.021 – 0.023 in)	0.5 mm (0.020 in)



- 37) Clean mating surfaces of both center (2) and rear (1) cases again, apply sealant to mating surface of rear case, and put them together.

“C” : Sealant 99000-31110

3. Install shim



38) Torque 15 rear case bolts (2) to specification.

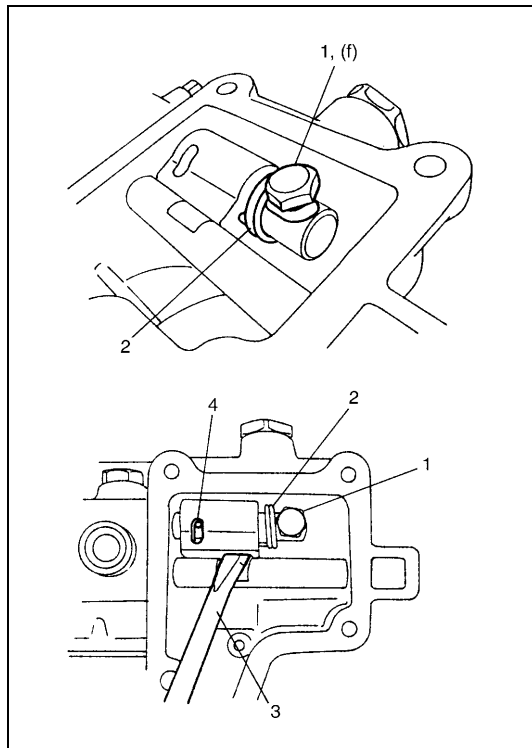
NOTE:

After tightening bolts, provisionally install universal joint flange into rear shaft and check to make sure smooth rotation of shaft.

Tightening torque

Rear case bolt (e) : 23 N·m (2.3 kg·m, 17.0 lb-ft)

1. Clamp



39) For transfer for TYPE 2 manual transmission, perform the following procedure.

- a) With reduction shift shaft shifted to high speed side, fit yoke to shaft and install return spring (2) as shown in the figure. Tighten bolt (1) to specified torque.

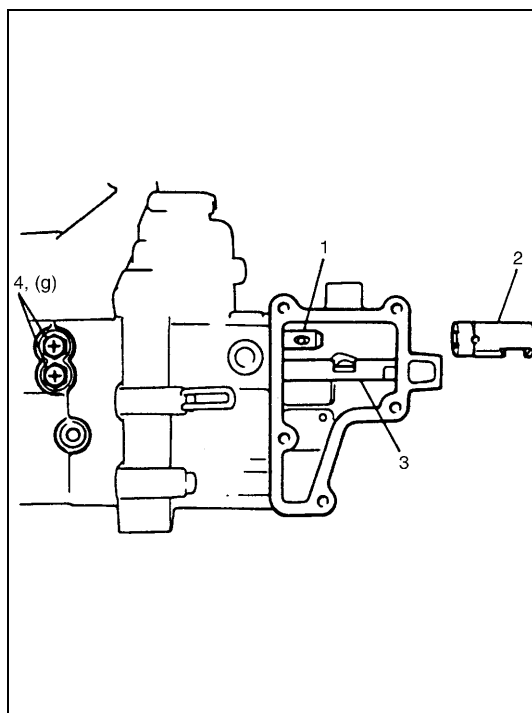
Tightening torque

Select return spring bolt (TYPE 2 M/T) (f) :

5.5 N·m (0.55 kg·m, 4.0 lb-ft)

- b) Fix reduction shift yoke with spring pin (4) while aligning shift yoke with shift shaft as shown in the figure.

3. Screwdriver



40) For transfer for A/T and TYPE 1 manual transmission, perform the following procedure.

- a) With reduction shift shaft (1) shifted to left (at high speed side) as shown in the figure, fit yoke (2) to shaft (1) and fix it with spring pin.

NOTE:

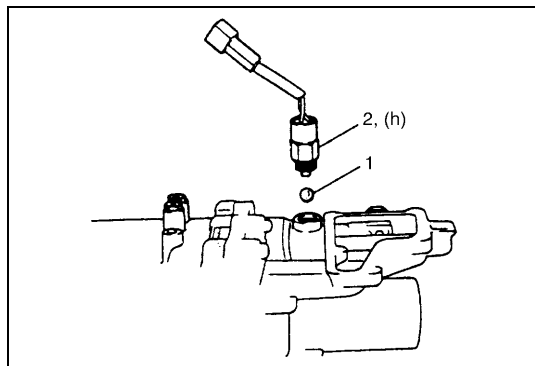
Be careful not to let spring pin fall off.

- b) Torque locating spring bolts (4) of shifters to specification.

Tightening torque

Locating spring bolt (g) : 26 N·m (2.6 kg·m, 19.0 lb-ft)

3. Front drive shift shaft

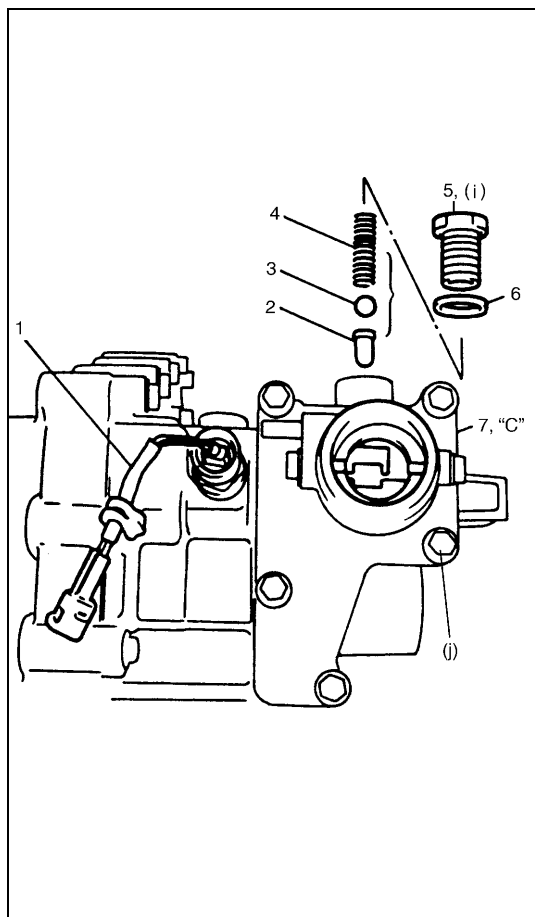


41) Install steel balls (1) and 4WD (2)/4WD-LOW switches.

Tightening torque

4WD switch (h) : 20 N·m (2.0 kg-m, 14.5 lb-ft)

4WD-Low switch : 20 N·m (2.0 kg-m, 14.5 lb-ft)



42) Fix lead of 4WD switch (1) with clamp.

43) Apply grease "A" to select return system parts and install them. Then torque select return spring bolt (5) to specification (For transfer with A/T or TYPE 1 manual transmission only).

"A" : Grease 99000-25010

Tightening torque

Select return spring bolt (A/T or TYPE 1 M/T) (i) :

35 N·m (3.5 kg-m, 25.5 lb-ft)

44) Clean mating surfaces of both gear shift lever case (7) and rear case, and with sealant "C" applied to mating surface of gear shift lever case, push both cases together.

"C" : Sealant 99000-31110

45) Torque gear shift lever case bolts to specification.

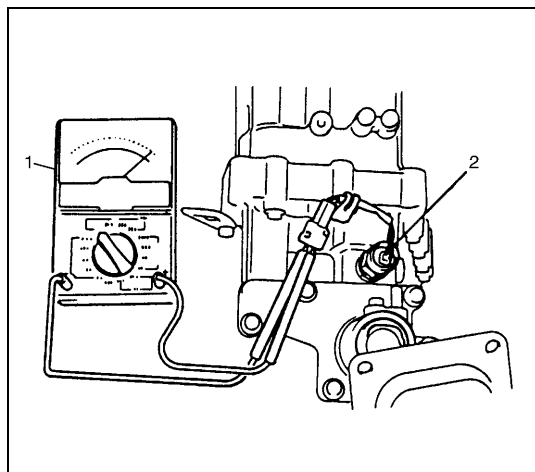
Tightening torque

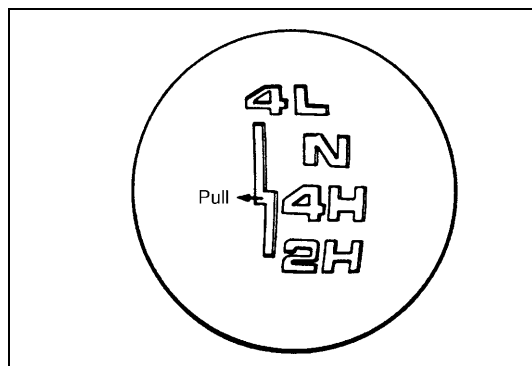
Gear shift lever case bolt (j) : 13 N·m (1.3 kg-m, 9.5 lb-ft)

- | | |
|----|----------------------|
| 2. | Select return pin |
| 3. | Ball |
| 4. | Select return spring |
| 6. | Washer |

46) Install gear shift control lever temporarily and check to make sure that it shifts to each shift position smoothly. Also check shaft for rotation.

47) Confirm 4WD switch (2) has turned ON at 4WD position (4H and 4L) by using ohmmeter (1).





- 48) Confirm 4WD LOW switch has turned ON at 4WD LOW and Neutral position.
- 49) Upon completion of above checks, remove shift control lever.

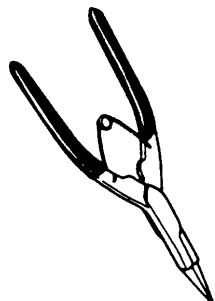
TIGHTENING TORQUE SPECIFICATION

Fastening part	Tightening torque		
	N•m	kg-m	lb-ft
Center case gutter bolt	8	0.8	5.5
Rear case plate bolt	8	0.8	5.5
Front case bolts	23	2.3	17.0
Counter shaft plate bolt	23	2.3	17.0
Rear case bolts	23	2.3	17.0
Locating spring bolts	26	2.6	19.0
4WD switch and 4WD- LOW switch	20	2.0	15.5
Select return spring bolt (For A/T and TYPE 1 M/T)	35	3.5	25.5
Select return spring bolt (For TYPE 2 M/T)	5.5	0.55	4.0
Gear shift lever case bolt	13	1.3	9.5
Control lever locating bolts	17	1.7	12.5
Synchronizer plate screws	10	1.0	7.5

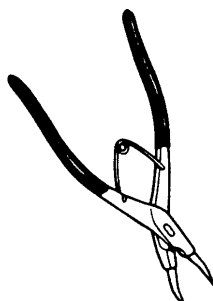
REQUIRED SERVICE MATERIAL

Material	Recommended SUZUKI product (Part Number)	Use
Lithium grease	SUZUKI SUPER GREASE A (99000-25010)	- Oil seal lips and O-rings. - Splines of propeller shaft. - Select return system. - Shift control lever.
Thread lock cement	THREAD LOCK CEMENT SUPER 1333B (99000-32020)	- Control lever locating bolts. - Center case gutter bolt. - Rear case plate bolt. - Countershaft plate bolt. - Synchronizer plate screws.
Sealant	SUZUKI BOND No. 1215 (99000-31110)	- Oil drain and level/filler plugs. - Rubber plug. - Mating surface of front case. - Mating surface of rear case. - Mating surface of gear shift lever case.

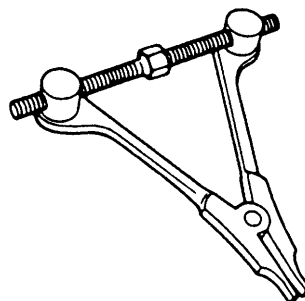
SPECIAL TOOL



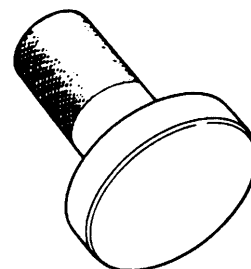
09900-06107
Snap ring plier
(Opening type)



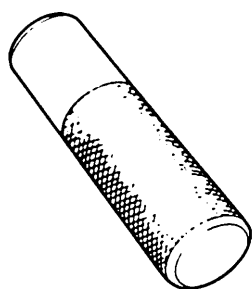
09900-06108
Snap ring plier
(Closing type)



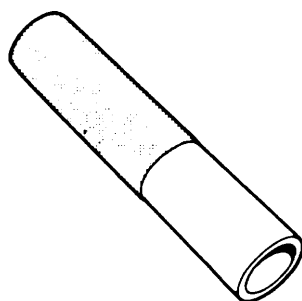
09912-34510
Separator



09913-75520
Bearing installer



09913-80112
Bearing installer



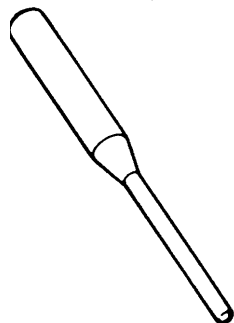
09913-84510
Bearing installer



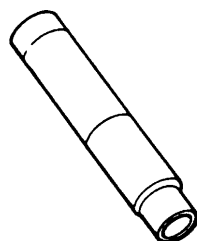
09921-57810
Bearing remover



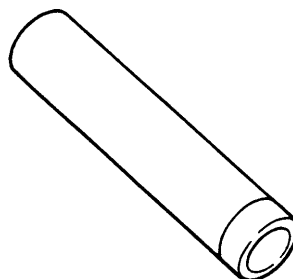
09927-18411
Universal puller



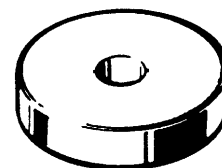
09922-85811
Spring pin remover



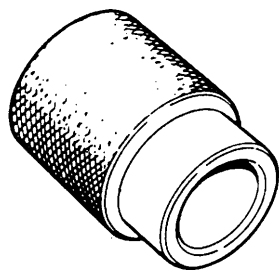
09925-18011
Bearing installer



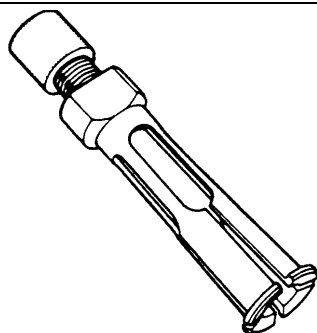
09925-98221
Bearing installer



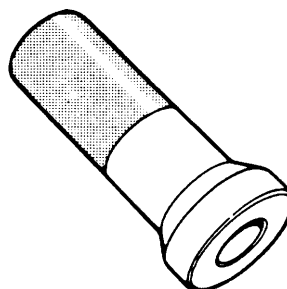
09926-68310
Bearing installer



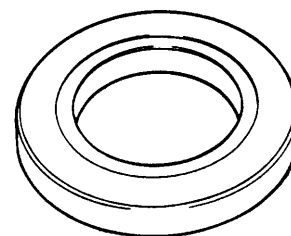
09940-53111
Bearing installer



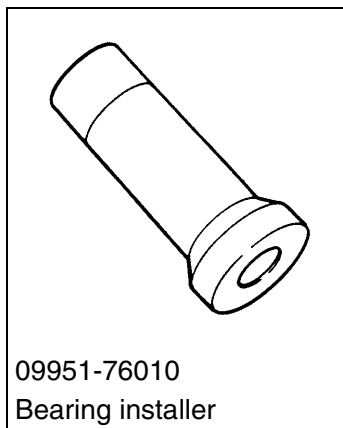
09941-64511
Bearing remover



09951-16080
Bearing installer



09951-26010
Bush remover plate



SECTION 7E

DIFFERENTIAL (FRONT)

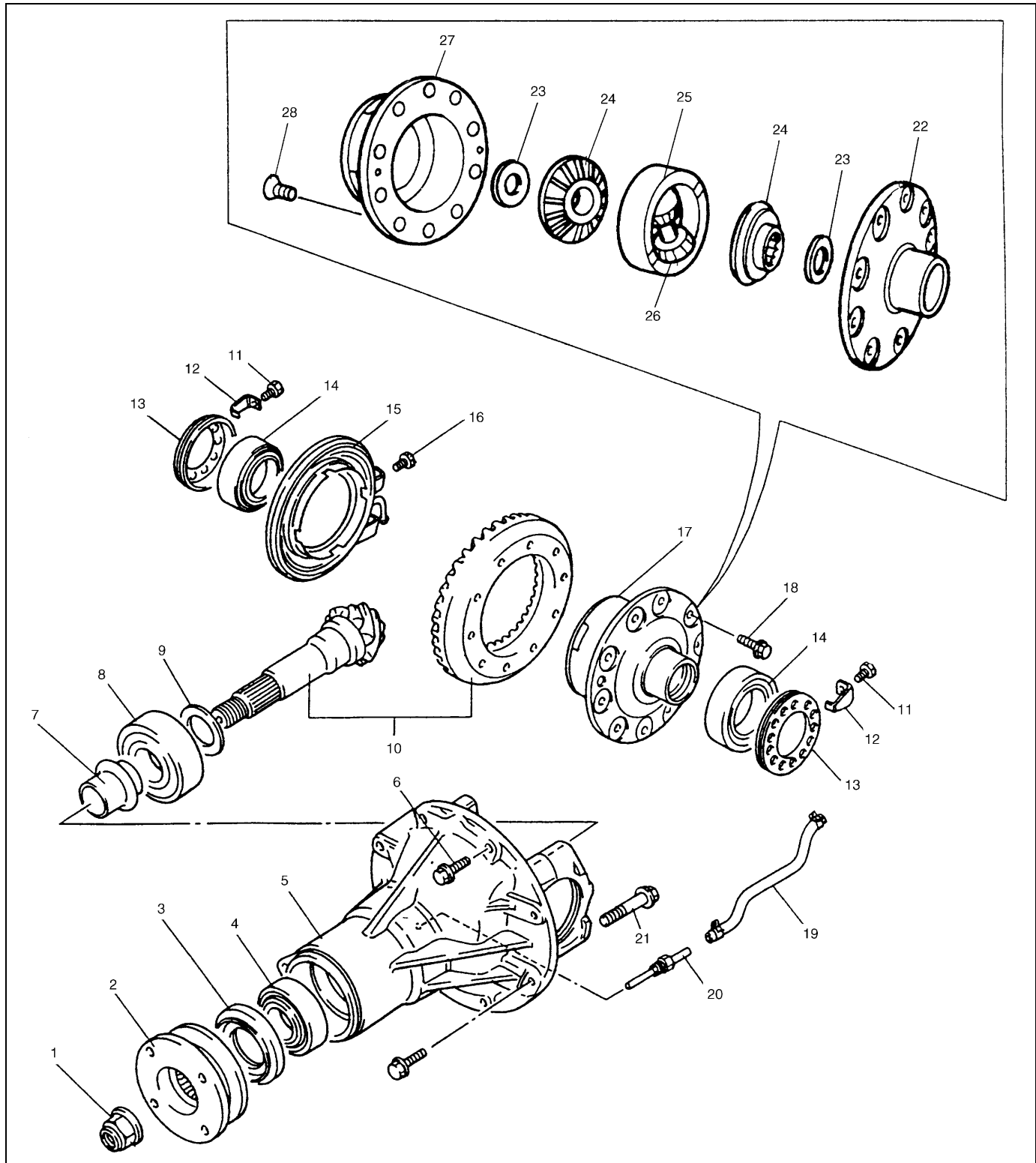
7E

CONTENTS

GENERAL DESCRIPTION	7E-2	DIFFERENTIAL CARRIER	7E-8
COMPONENT	7E-2	DIFFERENTIAL CASE	7E-8
UNIT REPAIR	7E-3	DRIVE BEVEL PINION	7E-10
DISASSEMBLY UNIT	7E-3	ASSEMBLY UNIT	7E-13
COMPONENTS INSPECTION.....	7E-6	TIGHTENING TORQUE SPECIFICATION....	7E-18
DIFFERENTIAL LEFT CASE	7E-6	REQUIRED SERVICE MATERIAL.....	7E-19
FREE AXLE HUB	7E-7	SPECIAL TOOL	7E-19
ACTUATOR.....	7E-7		
SUBASSEMBLY ADJUSTMENT AND			
REASSEMBLY	7E-8		

GENERAL DESCRIPTION

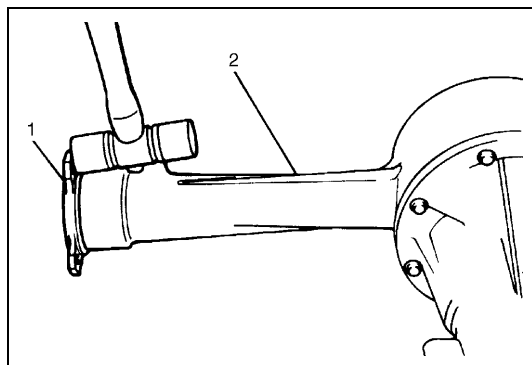
COMPONENT



- | | | | |
|---------------------------|-------------------------------|---------------------------------|-----------------------------|
| 1. Flange nut | 8. Front bearing | 15. Actuator | 22. Differential right case |
| 2. Universal joint flange | 9. Shim | 16. Bolt | 23. Thrust washer |
| 3. Oil seal | 10. Bevel pinion gear set | 17. Differential case assembly | 24. Differential gear |
| 4. Rear bearing | 11. Bolt | 18. Bevel gear bolt | 25. Free axle hub |
| 5. Carrier assembly | 12. Lock plate | 19. Differential inner air hose | 26. Differential pinion |
| 6. Bolt | 13. Bearing adjuster | 20. Air inlet union | 27. Differential left case |
| 7. Bevel pinion spacer | 14. Differential side bearing | 21. Bearing cap bolt | 28. Screw |

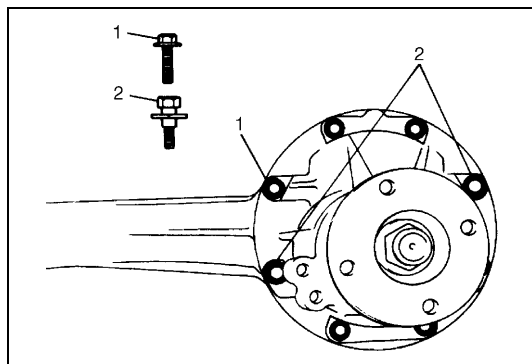
UNIT REPAIR

DISASSEMBLY UNIT



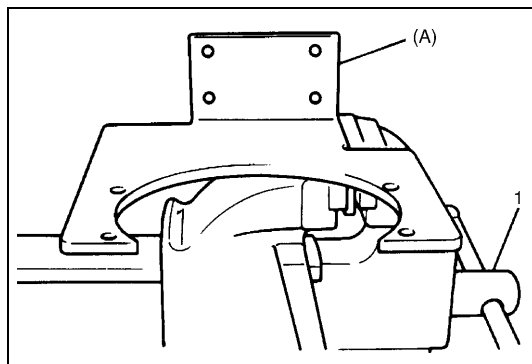
1) Remove front drive shaft (1) by using plastic hammer.

2. Differential housing



2) Remove 8 bolts for fastening differential carrier (2 of which are reamer bolts) and then take differential assembly out of housing.

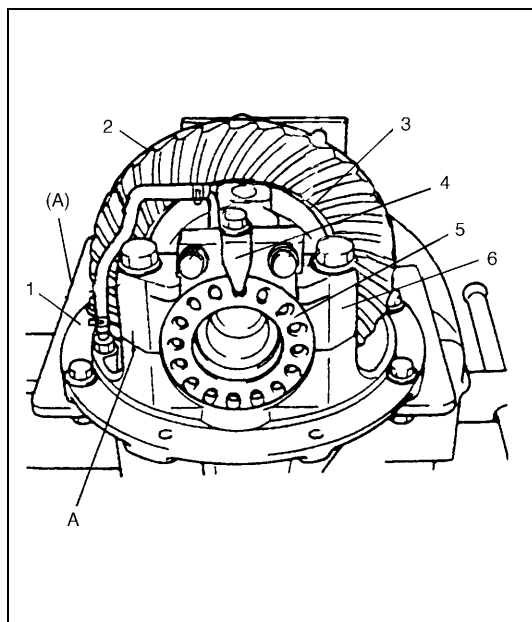
1. Bolt
2. Reamer bolt



3) Set special tool on vise (1) securely.

Special tool

(A) : 09944-76010



4) Using 4 bolt & nut sets, set differential assembly onto differential carrier holder and put identification marks on differential side bearing caps (6).

Remove differential inner hose and actuator bracket bolt.

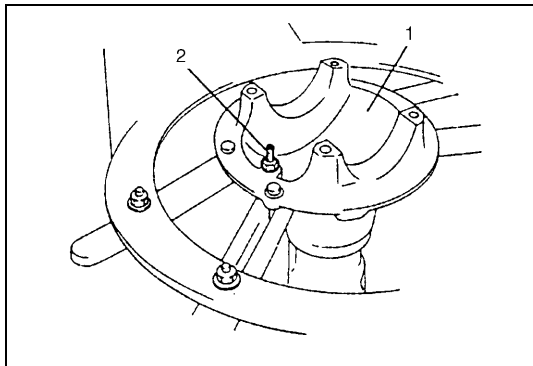
5) Take off differential side bearing lock plates (4) and differential side bearing caps (6) removing their bolts and then take out bearing adjusters (5), side bearing outer races and drive bevel gear with differential case (3).

6) Turn differential assembly together with special tool by 90 degrees and grip it with vise again.

Special tool

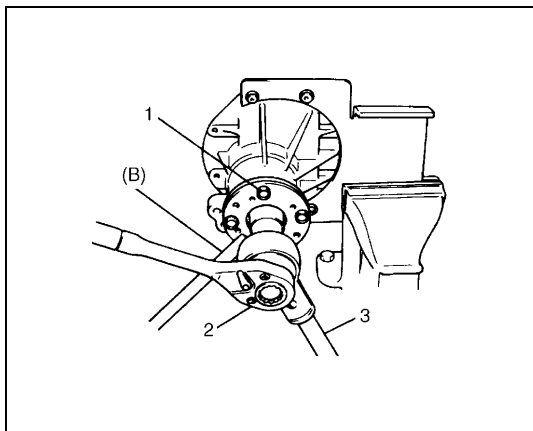
(A) : 09944-76010

1. Differential carrier
2. Drive bevel gear assembly
A: Identification mark



7) Remove air inlet union (2).

1. Differential carrier

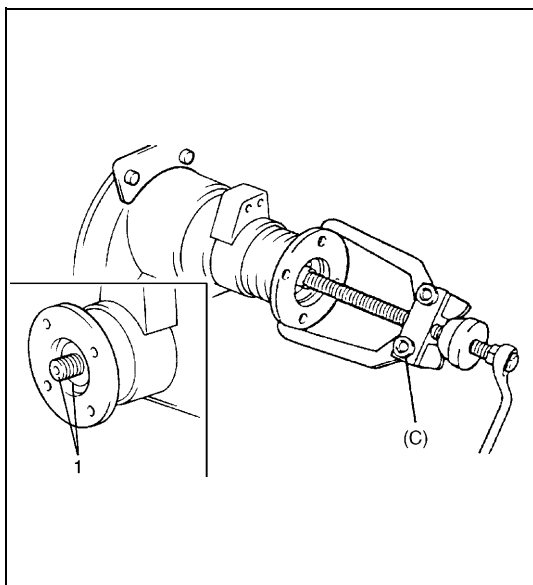


8) Hold universal joint flange with special tool and then remove flange nut by using power wrench.

Special tool

(B) : 09922-66020

- 1. Bolt and nut
- 2. Socket wrench
- 3. Power wrench (4 – 10 magnification)



9) Make mating marks (1) on drive bevel pinion and companion flange.

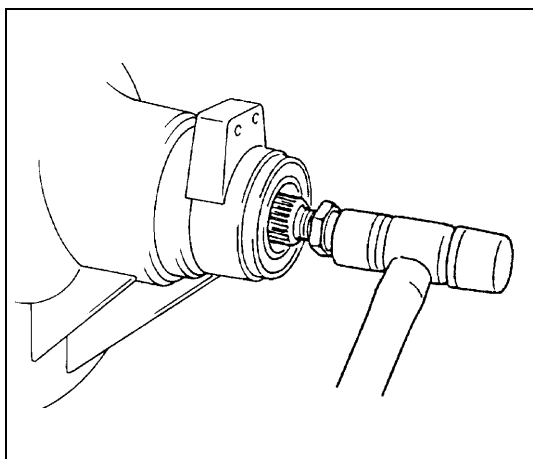
CAUTION:

Don't make mating mark on the coupling surface of the flange.

10) Remove companion flange from pinion. Use special tool if it is hard to remove.

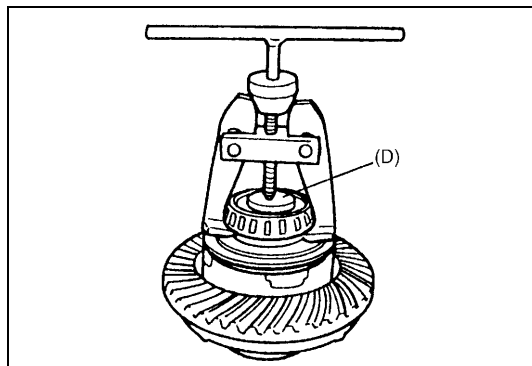
Special tool

(C) : 09913-65135



11) Remove bevel pinion with front bearing, and spacer from carrier.

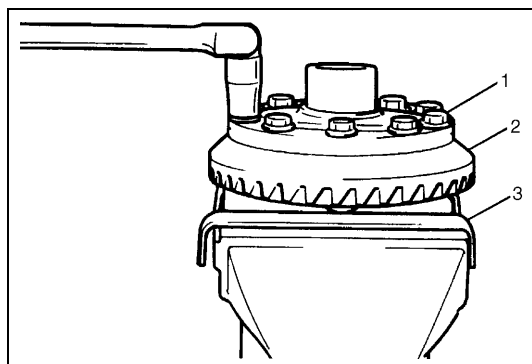
If it is hard to remove, screw an used nut into pinion and hammer on that nut with a plastic hammer but never directly on pinion.



12) Using special tools, pull out differential side bearings.

Special tool

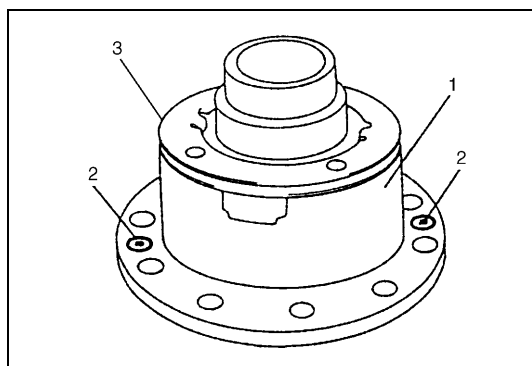
(D) : 09913-85230



13) With aluminum plates (3) placed on vise first, grip differential case with it and remove bevel gear (2) by removing its 10 bolts (1).

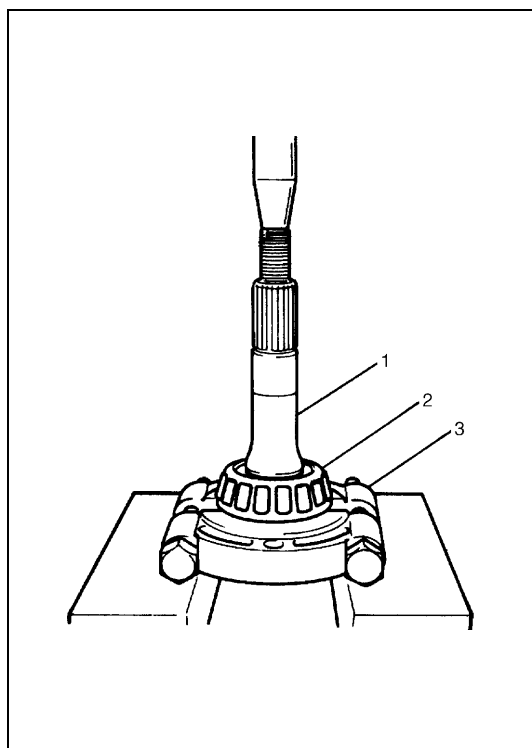
CAUTION:

**Use care not to hold axle lock clutch part with vise.
Be sure to hold differential left case.**



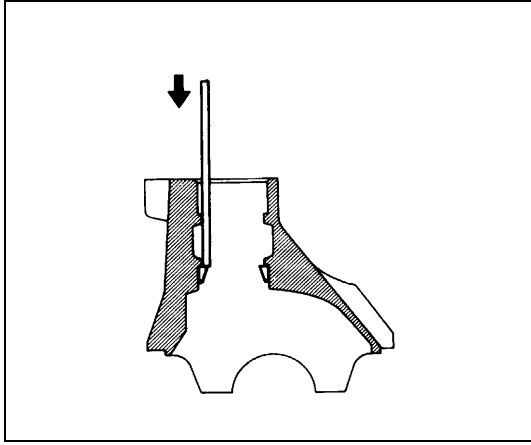
14) Separate differential case assembly by removing 2 screws (2) and take out free axle hub, side gears and shims from differential left case.

- 1. Differential left case
- 3. Axle lock clutch



15) Remove bevel pinion front bearing (2) by using bearing puller (3) and press.

- 1. Drive bevel pinion

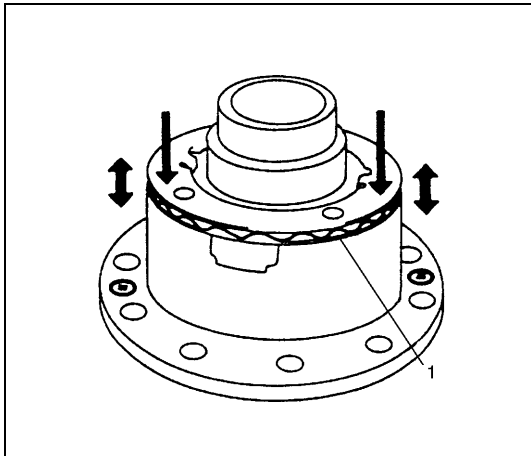


- 16) Drive out bevel pinion bearing outer races in differential carrier by hammering metal stick applied to them.

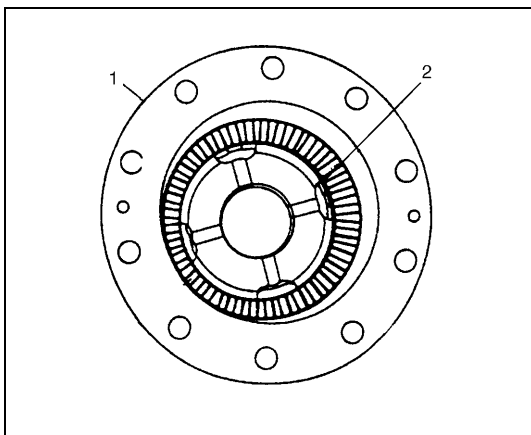
COMPONENTS INSPECTION

- Check companion flange for wear or damage.
- Check bearings for wear or discoloration.
- Check differential carrier for cracks.
- Check drive bevel pinion and bevel gear for wear or cracks.
- Check side gears, pinion gears and pinion shaft for wear or damage.
- Check side gear spline for wear or damage.

DIFFERENTIAL LEFT CASE



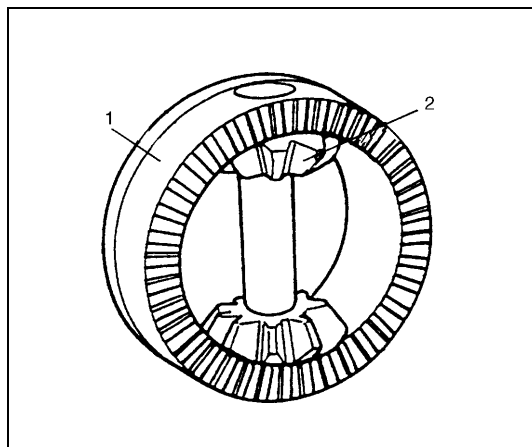
- Check clutch for smooth movement by pushing plate of axle lock clutch fitted to differential left case. Also, check return spring (1) for settling.



- Check teeth of axle lock clutch (2) fitted to differential right case for wear, damage and any other faulty condition.

1. Left case

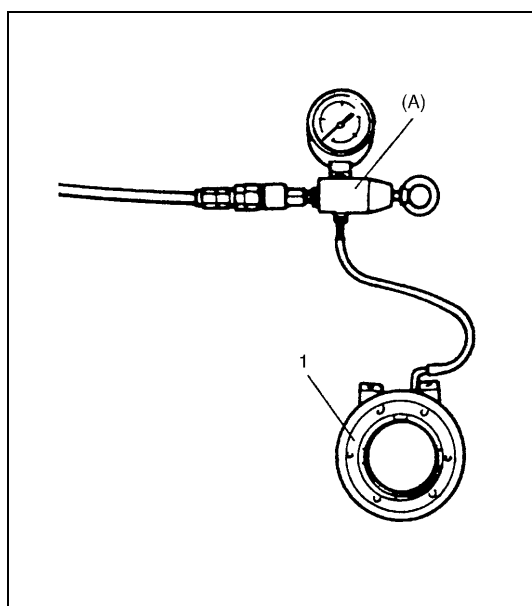
FREE AXLE HUB



Check teeth of free axle hub (1) for wear, damage and any other faulty condition.

2. Differential pinion

ACTUATOR



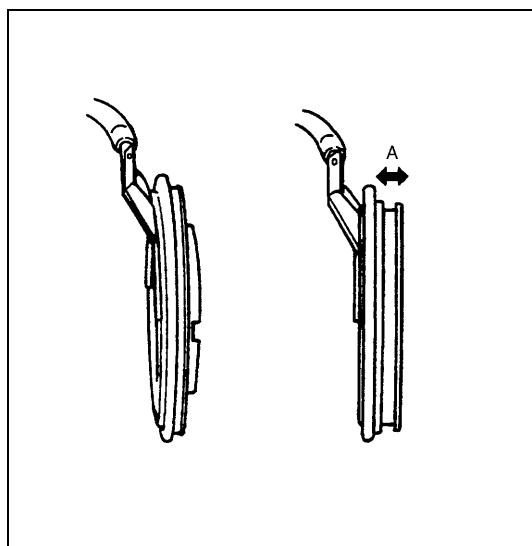
- 1) Connect special tool, air compressor, actuator (1) and hoses as shown in the figure.

NOTE:

Loosen adjusting screw of special tool before connecting hoses to special tool.

Special tool

(A) : 09918-18110



- 2) With pressure from compressor applied to special tool, adjust pressure to specified level by turning adjusting screw of special tool and check actuator for operation.

Also, check that there is no air leakage from actuator.

Specified pressure for actuator inspection:

38.0 kPa (0.38 kg/cm², 5.40 psi)

Actuator stroke :

3 mm (0.118 in.)

A: When pressure applied

SUBASSEMBLY ADJUSTMENT AND REASSEMBLY

Judging from faulty conditions noted before disassembly and what is found through visual check of bearing and gear tooth etc. after disassembly, prepare replacing parts and proceed to reassembly according to procedures as described below.

CAUTION:

- Bevel gear and pinion must be replaced as a set when either replacement becomes necessary.
- When replacing taper roller bearing, replace as inner race & outer race assembly.

DIFFERENTIAL CARRIER

For press-fitting bevel pinion bearing outer races, use special tools as shown in the figure.

CAUTION:

Perform press-fitting carefully so as not to tilt outer race.

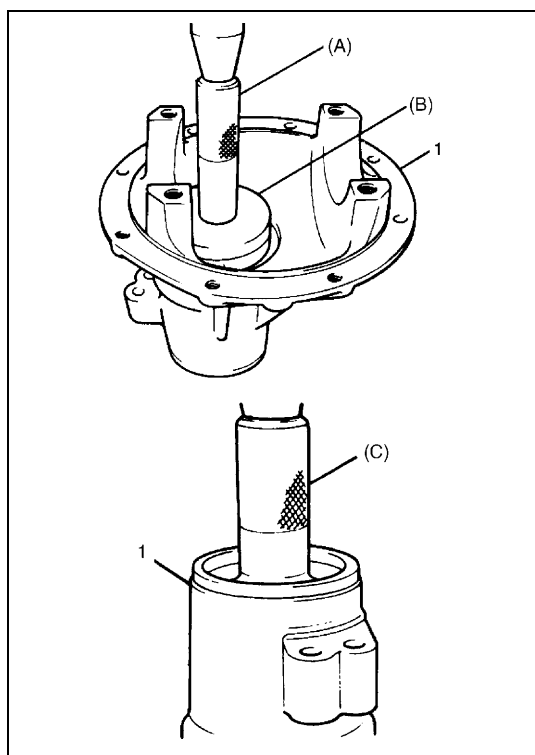
Special tool

(A) : 09924-74510

(B) : 09926-68310

(C) : 09913-75510

1. Differential carrier

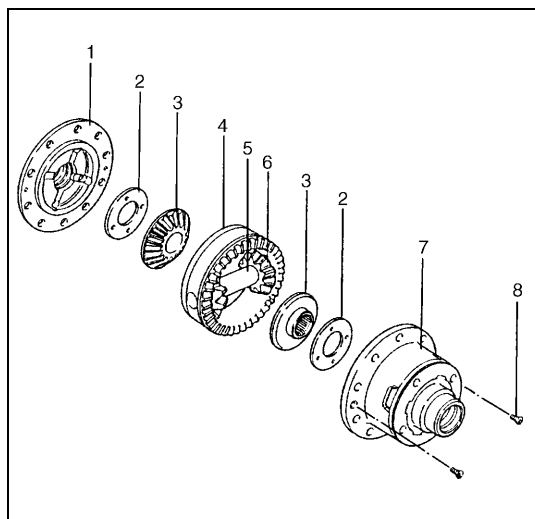


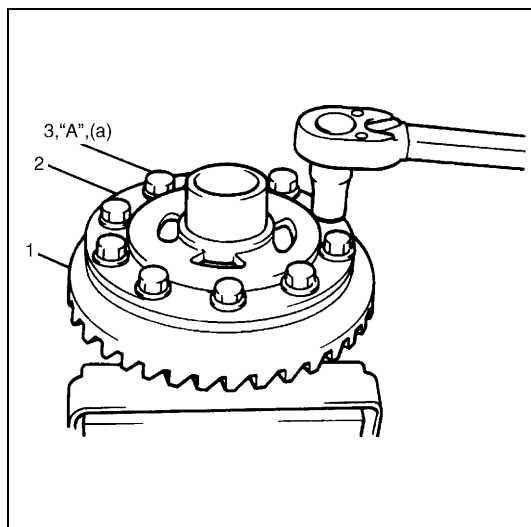
DIFFERENTIAL CASE

- 1) Install differential gears (3), free axle hub (4) and washers (2) to left case (7).
- 2) Install left case to right case (1) and tighten screws (8).

5. Differential pinion shaft

6. Differential pinion





- 3) Put bevel gear (1) on differential case (2) and fasten them with 10 bolts (3) by tightening them to specified torque.
Use thread lock cement "A" for 10 bolts (3).

CAUTION:

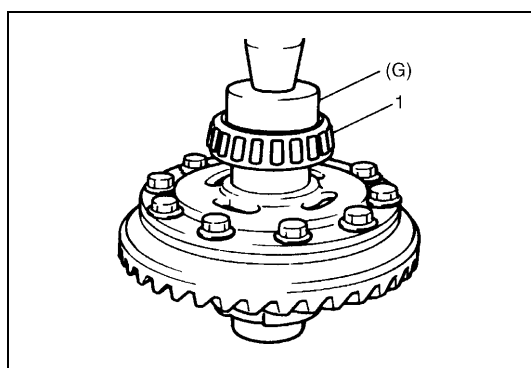
Use of any other bolts than that specified is prohibited.

"A" : Thread lock cement 99000-32020

Tightening torque

Drive bevel gear bolt (a) :

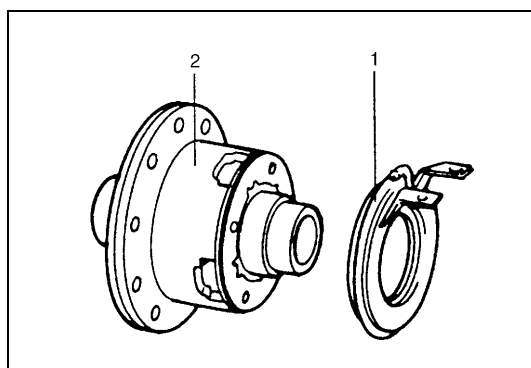
85 N·m (8.5 kg-m, 61.5 lb-ft)



- 4) Press-fit side bearing (1) with special tool and press.

Special tool

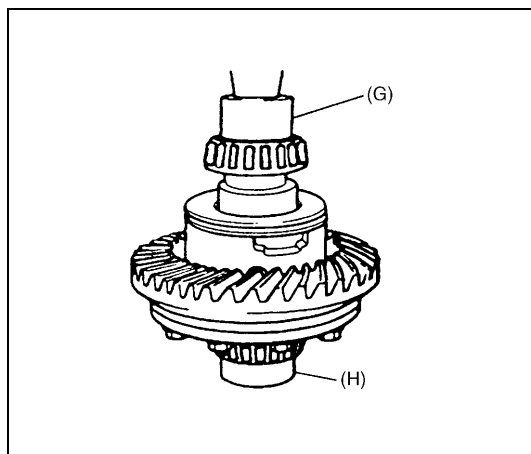
(G) : 09944-66020



- 5) Install actuator (1) to differential case (2).

NOTE:

Note that installing direction is as shown in figure.



- 6) Hold bearing press-fitted in step 7 with holder and press-fit side bearing on the other side.

NOTE:

Be sure to use bearing holder for the purpose of protecting lower bearing.

Special tool

(G) : 09944-66020

(H) : 09951-16060

DRIVE BEVEL PINION

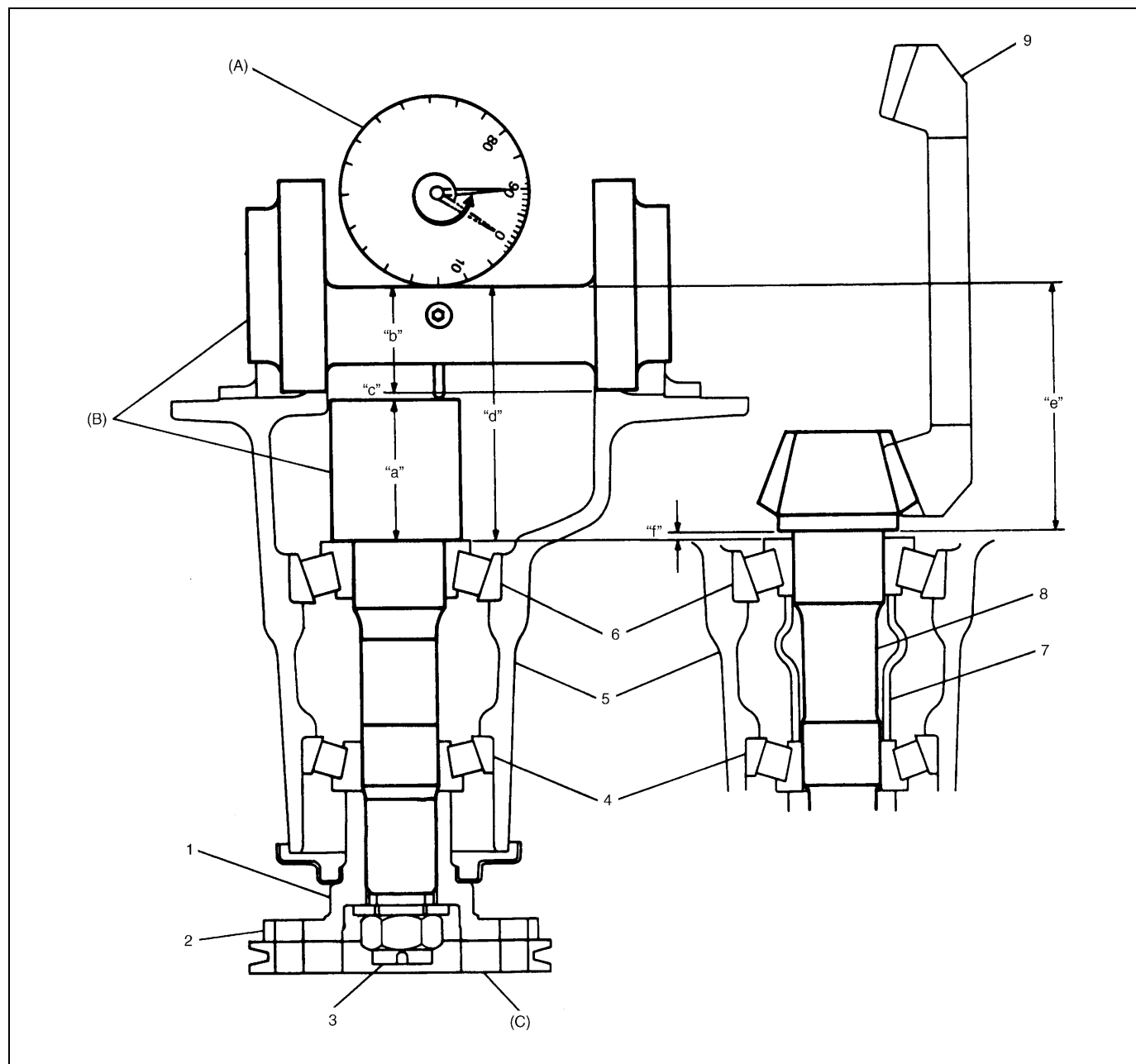
To engage bevel pinion and gear correctly, it is prerrequired to install bevel pinion to differential carrier properly by using adjusting shim as described on the following. Shown in the figure are relative positions of bevel pinion, differential carrier and mounting dummy.

Special tool

(A) : 09900-20606

(B) : 09926-78311

(C) : 09922-75222



1. Universal joint flange without groove (P/No. 27110 – 60A00)

2. No groove on flange periphery

3. Nut

4. Rear bearing

5. Differential carrier

6. Front bearing

7. Spacer

8. Bevel pinion

9. Bevel gear

"a": Pinion dummy height

"b": Axle dummy radius

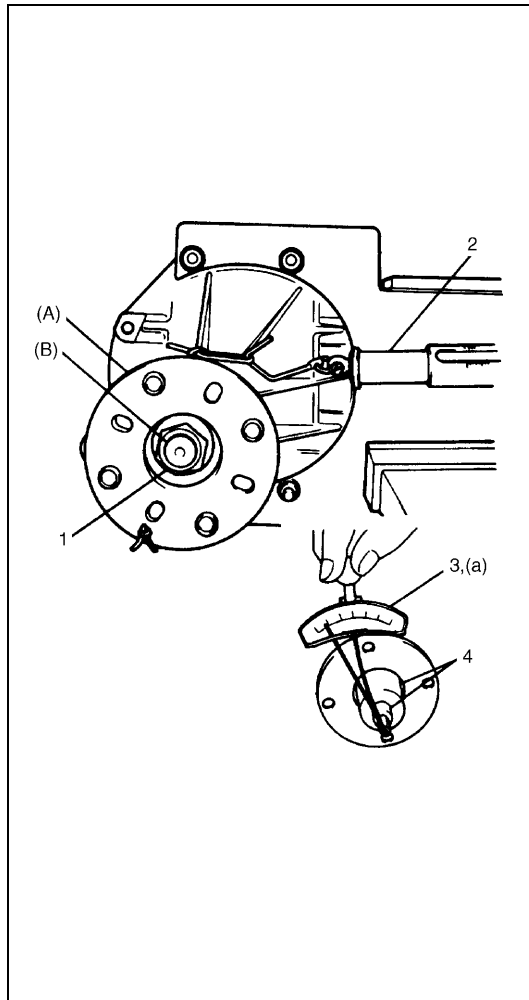
"a" + "b": Mounting dummy side 94.00 mm (3.70078 in.)

"c": Measured dimension

"d": Differential carrier mounting distance ("a" + "b" + "c")

"e": Bevel pinion mounting distance (Marked in shaft in mm)

"f": Shim size for mounting distance adjustment ("d" – "e")



- 1) Install bevel pinion dummy with bearings into differential carrier and tighten flange nut (1) so that specified bearing preload is obtained.

NOTE:

- This installation requires universal joint flange not equipped with groove on flange periphery.
- This installation requires no spacer or oil seal.
- Before taking measurement with spring balance (2) or torque wrench (3), check for rotation by hand and apply small amount of oil to bearings.

Special tool

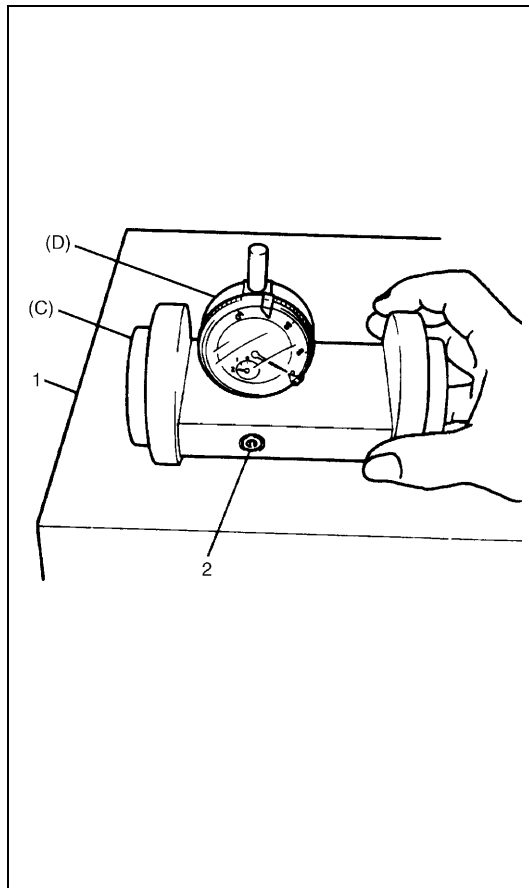
(A) : 09922-75222

(B) : 09926-78311

Pinion bearing preload (a) :
9.0 – 17.0 kg-cm (7.8 – 14.7 lb-in)

Spring measure reading :
1.8 – 3.4 kg (4.0 – 7.5 lb)

4. Socket with adapter



- 2) Set dial gauge to bevel pinion mounting dummy and make 0 (zero) adjustment on surface plate.

NOTE:

- When setting dial gauge to mounting dummy, tighten screw lightly. Be careful not to overtighten it, which will cause damage to dial gauge.
- With dial gauge set, turn dummy back and force by hand a couple of times and attain accurate 0 (zero) adjustment.
- It is desirable that short pointer indicates beyond 2 mm when long one is at 0 (zero).

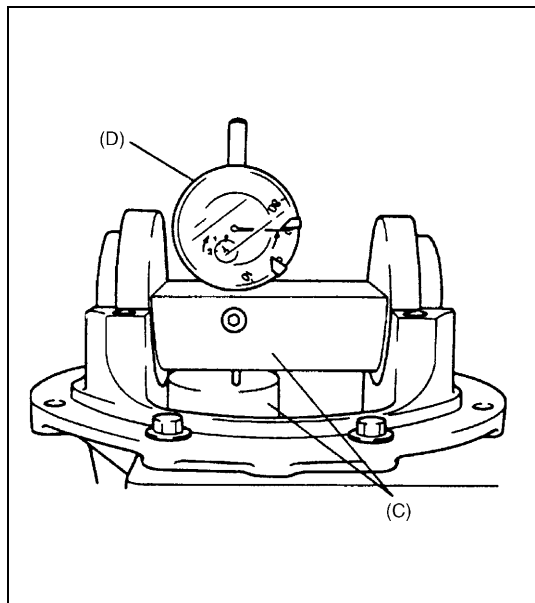
Special tool

(C) : 09926-78311

(D) : 09900-20606

1. Surface plate

2. Screw



- 3) Place zero-adjusted mounting dummy and dial gauge set on pinion dummy and take measurement between zero position and extended dial gauge measuring tip.

NOTE:

- Repeat turning back and force of dummy and measure distance as far as top surface of pinion dummy accurately.
- When dial gauge measuring tip extends from 0 (zero) position, pointer turns counterclockwise.
- Measured value may exceed 1 mm. Therefore, it is also necessary to know reading of short pointer.

Special tool

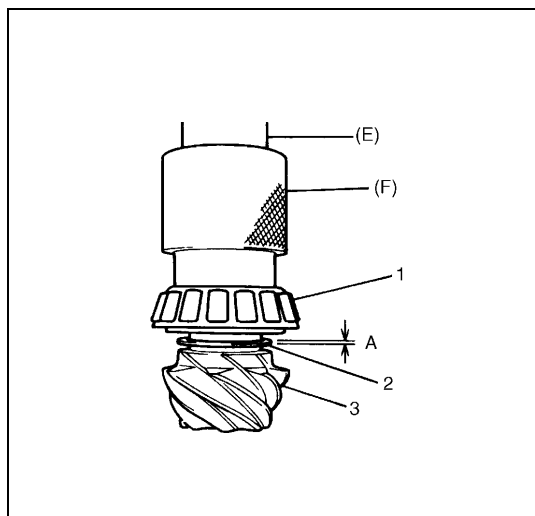
(C) : 09926-78311

(D) : 09900-20606

- 4) Obtain adjusting shim thickness by using measured value by dial gauge (which represents "c" in the first figure of "DRIVE BEVEL PINION" in this section) in the following equation.

Necessary shim thickness "f"	=	94	+	Dial gauge measured value "c"	-	Measurement printed on pinion "e"
------------------------------	---	----	---	-------------------------------	---	-----------------------------------

94 in above equation is "a" + "b" of mounting dummy (special tool) as shown in the first figure of "DRIVE BEVEL PINION" in this section.



- 5) Select adjusting shim(s) (2) closest to calculated value from among the following available sizes and put it in place and then press-fit front bearing (1).

Special tool

(E) : 09925-18011

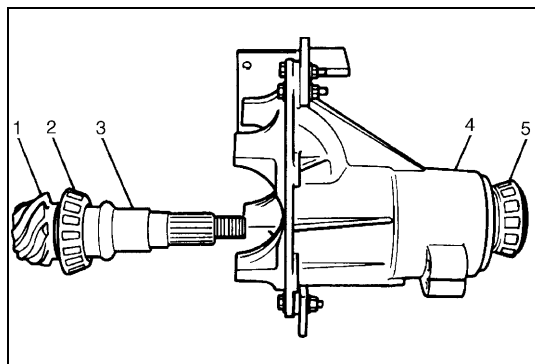
(F) : 09927-66010

Available shim thickness

1.12, 1.15, 1.18, 1.21, 1.24, 1.27, 1.30 and 0.3 mm

(0.044, 0.045, 0.046, 0.047, 0.048, 0.049, 0.050 and 0.012 in.)

3. Bevel pinion
A: Closest value to "f" (calculated)

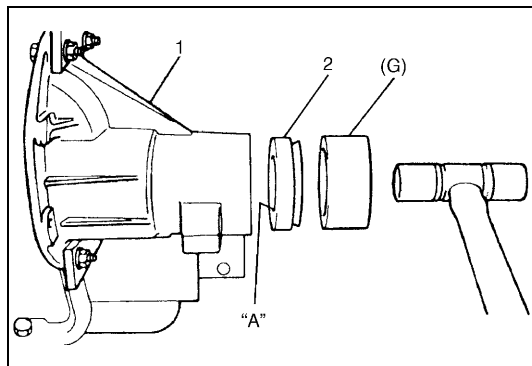


- 6) With new pinion spacer (3) inserted as shown in the figure, install rear bearing (5) to differential carrier (4).

NOTE:

- Make sure to use new spacer for reinstallation.
- Apply oil to bearings.

1. Bevel pinion
2. Front bearing

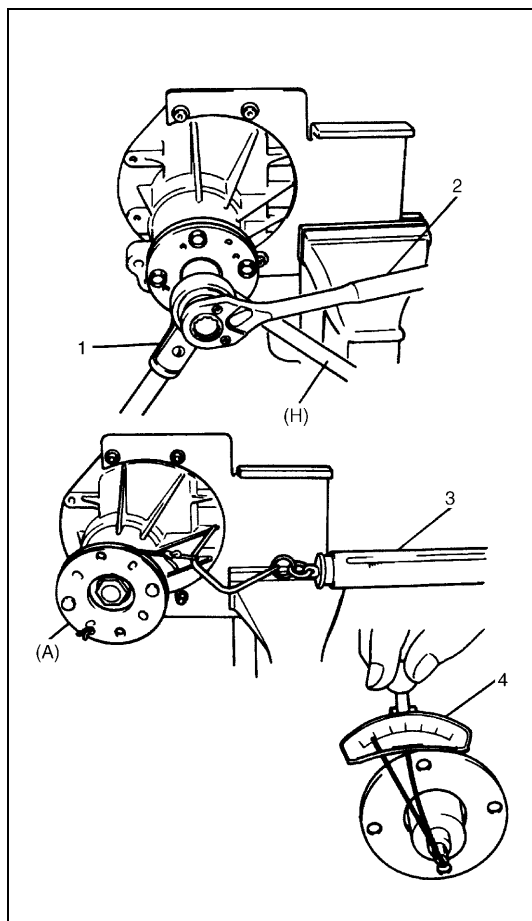


- 7) Using special tool and plastic hammer drive oil seal (2) into differential carrier (1) till it becomes flush with carrier end. Then apply grease "A" to oil seal lip.

Special tool

(G) : 09951-18210

"A" : Grease 99000-25010



- 8) While tightening flange nut gradually with flange holder (special tool) and power wrench (4 -10 magnification) (1), set preload of pinion to specification.

NOTE:

- Before taking measurement with spring balance (3) or torque wrench (4), check for smooth rotation by hand.
- Bearing preload can be measured roughly by pinion rotating angle which is due to arm weight of flange holder installed in flange. Refer to following page for further information.
- Be sure to tighten gradually and carefully till specified starting torque is obtained. Turning back overtightened flange nuts should be avoided.

Pinion bearing preload :

9.0 – 17.0 kg-cm (7.8 – 14.7 lb-in.)

Spring measure reading :

1.8 – 3.4 kg (4.0 - 7.5 lb)

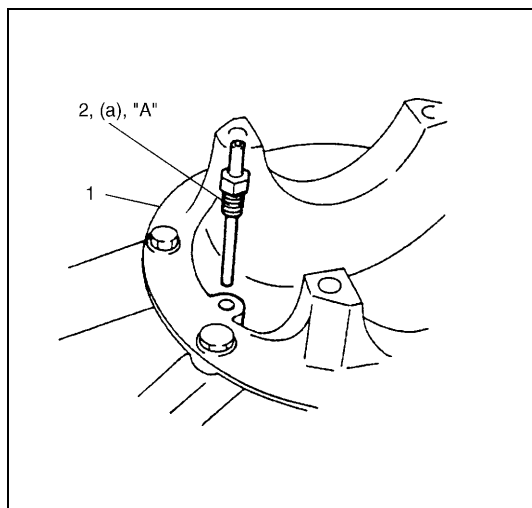
Special tool

(A) : 09922-75222

(H) : 09922-66020

2. Socket wrench

ASSEMBLY UNIT



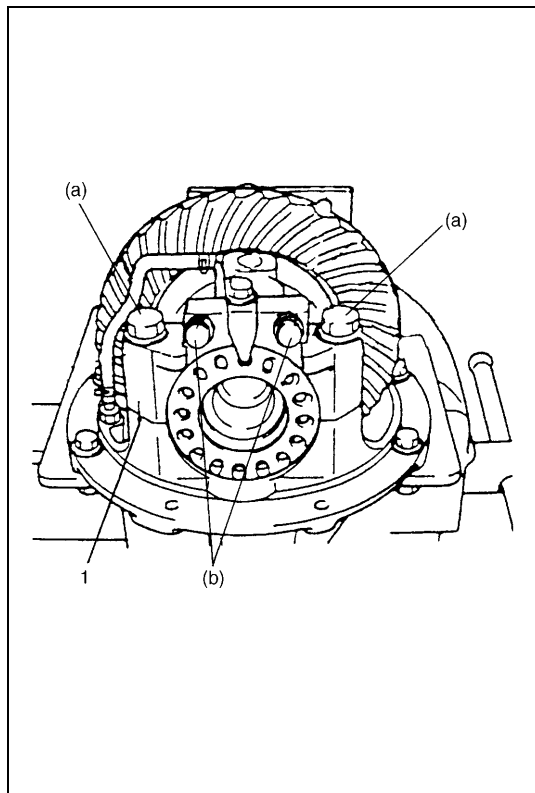
- 1) Apply sealant "A" to thread part of air inlet union (2) and install it to differential carrier (1). Tighten it to specified torque.

"A" : Sealant 99000-31110

Tightening torque

Air inlet union (a) : 13 N·m (1.3 kg-m, 9.5 lb-ft)

- 2) Place bearing outer races on their respective bearings. Used left and right outer races are not interchangeable and install case assembly in carrier.
- 3) Install side bearing adjusters on their respective carrier, making sure adjusters are threaded properly.



- 4) Align match marks (1) on cap and carrier. Screw in 2 side bearing cap bolts 2 or 3 turns and press down bearing cap by hand.

NOTE:

If bearing cap does not fit tightly on carrier, side bearing adjuster is not threaded properly. Reinstall adjuster.

- 5) Tighten cap bolts to provisional torque below.

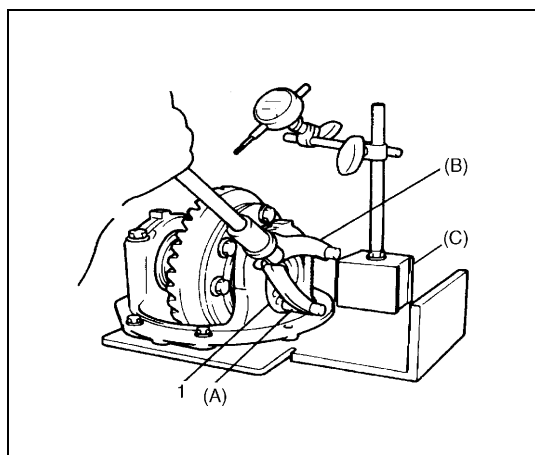
Tightening torque

Side bearing cap bolt (provisional torque) (a) :
15 N·m (1.5 kg-m, 11.0 lb-ft)

- 6) Install actuator bracket to bearing cap and tighten its bolts to specification.

Tightening torque

Actuator bracket bolt (b) :
12 N·m (1.2 kg-m, 8.5 lb-ft)

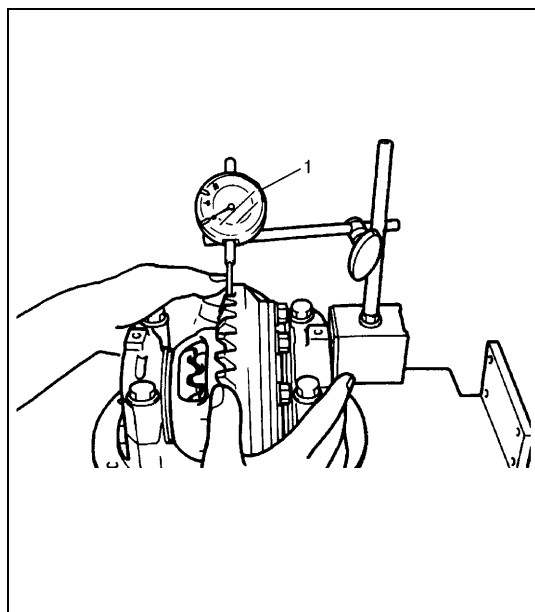


- 7) Tighten both bearing adjusters (1) so as to obtain specified gear backlash and at the same time, obtain preload of side bearing.

Special tool

(A) : 09930-40120 (Attachment)
(B) : 09930-40113 (Rotor holder)
(C) : 09900-20701

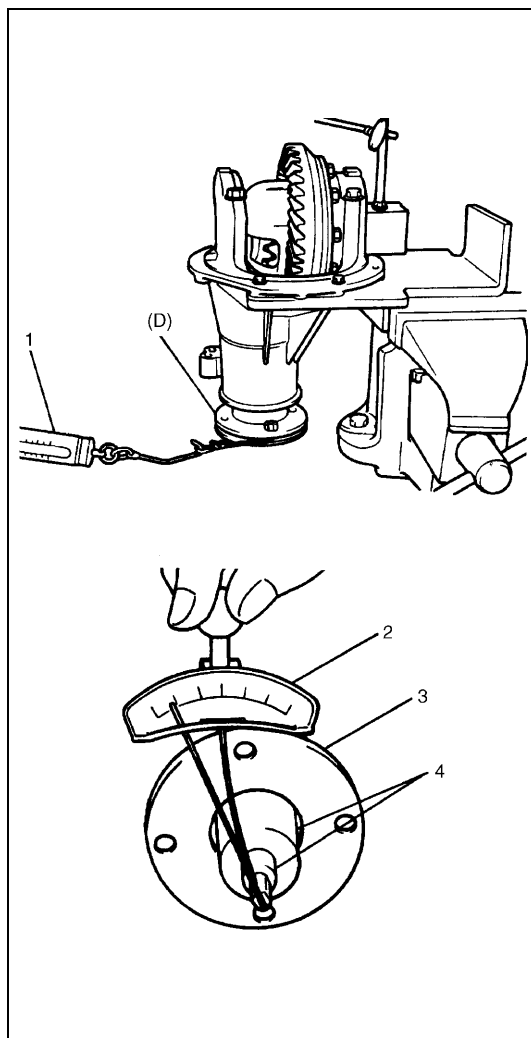
Bevel gear backlash :
0.13 – 0.18 mm (0.005 – 0.007 in.)



NOTE:

- Be sure to apply measuring tip of dial gauge (1) at right angles to convex side of tooth.
- Measure at least 4 points on drive bevel gear periphery.
- As a practical measure the following would be recommended to obtain specified backlash and side bearing preload at the same time.

- Obtain specified backlash by turning both adjusters inward lightly.
- Tighten both adjusters further by one notch at a time.



- 8) Measure preload of pinion with spring balance (1) or torque wrench (2) and check composite preload of pinion bearing and side bearing.

Special tool

(D) : 09922-75222

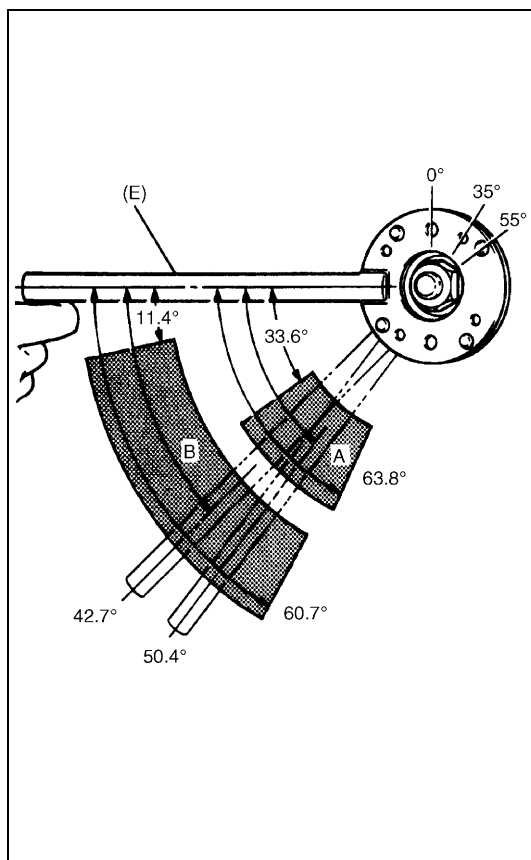
NOTE:

Standard preload is shown in the graph, which should be read as follows.

Example:

When preload of bevel pinion is 2.6 kg/5.73 lb, acceptable composite preload of both pinion bearings and side bearings should be between 2.8 and 3.2 kg/6.17 and 7.05 lb.

- | |
|---------------------------|
| 3. Universal joint flange |
| 4. Socket with adapter |



NOTE:

Bearing preload can be checked roughly by using flange holder as shown in the figure. In this measurement, holder arm itself will work as balance weight and torque will be replaced with angle. However, flange should be rotated very slowly with hand support so as not to allow over revolution due to inertia.

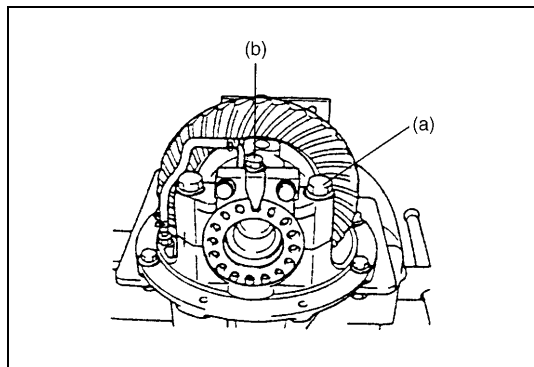
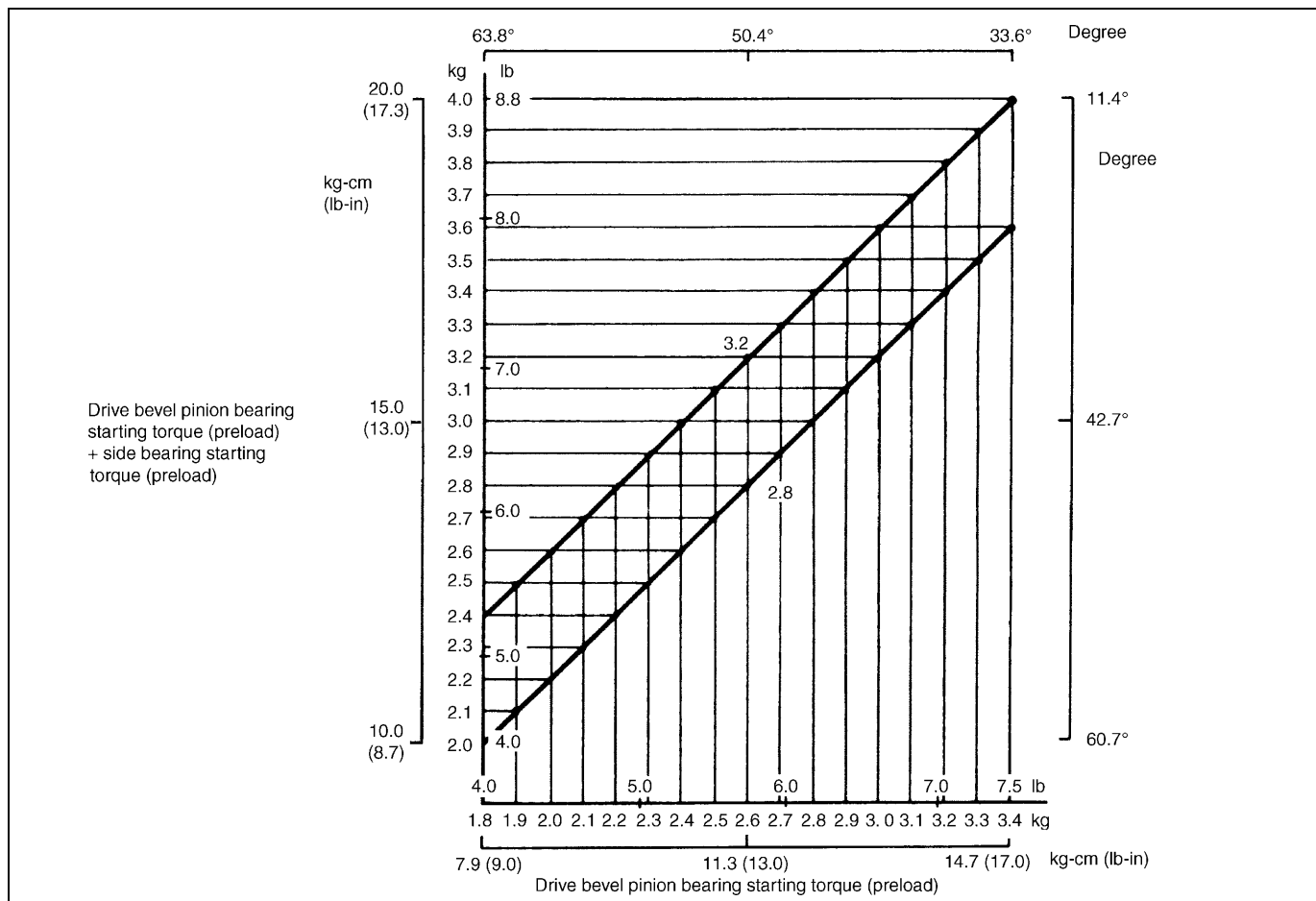
Special tool

(E) : 09922-66020

- | |
|---|
| "A": Pinion bearing starting torque range |
| "B": Pinion bearing plus side bearing starting torque range |

NOTE:

Repeat side bearing adjustment until gear backlash and composite bearing preload are compatible within specification, if fail to obtain specified measurements first.

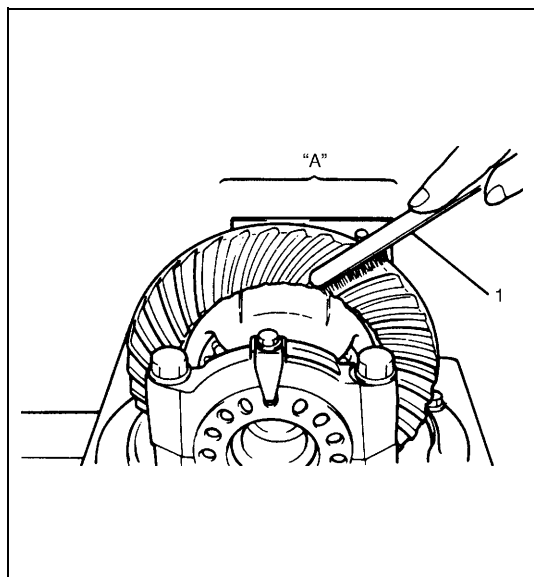


9) Torque bearing cap bolts to specification and install bearing lock plates.

Tightening torque

Bearing cap bolt (a) : 60 N·m (6.0 kg-m, 43.5 lb-ft)

Lock plate bolt (b) : 13 N·m (1.3 kg-m, 9.5 lb-ft)



10) As final step, check gear tooth contact as the follows.

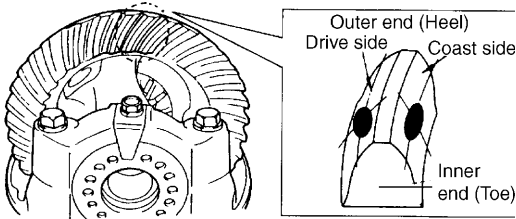
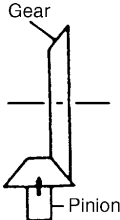
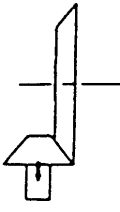
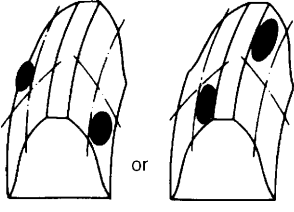
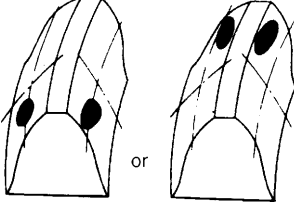
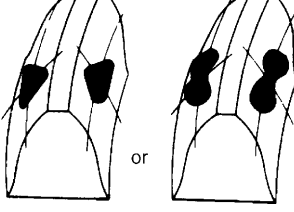
- After cleaning tooth surface of 10 bevel gears, paint them with gear marking compound evenly by using brush or sponge etc.
- Turn gear to bring its painted part in mesh with bevel pinion and turn it back and forth by hand to repeat their contact.
- Bring painted part up and check contact pattern, referring to the following table. If contact pattern is not normal, readjust or replace as necessary according to instruction in chart.

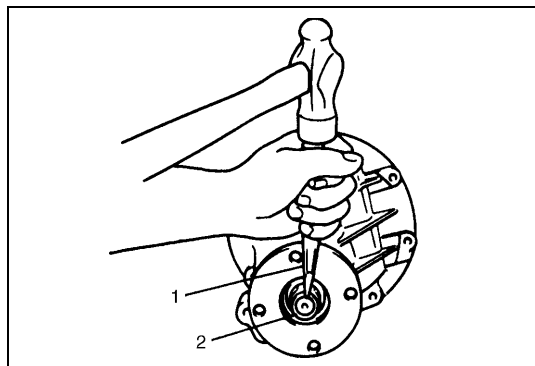
NOTE:

Be careful not to turn bevel gear more than one full revolution, for it will hinder accurate check.

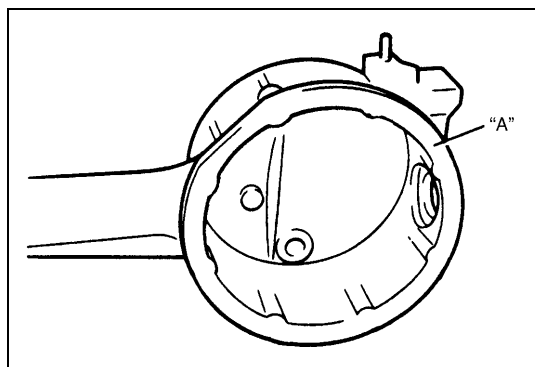
1. Brush

"A": Paint gear marking compound evenly

TOOTH CONTACT PATTERN	DIAGNOSIS AND REMEDY	
	NORMAL	
	HIGH CONTACT Pinion is positioned too far from the center of driver bevel gear. 1) Increase thickness of pinion height adjusting shim and position pinion closer to gear center. 2) Adjust drive bevel gear backlash to specification.	
	LOW CONTACT Pinion is positioned too close to the center of drive bevel gear. 1) Decrease thickness of pinion height adjusting shim and position pinion farther from gear center. 2) Adjust drive bevel gear backlash to specification.	
	If adjustment is impossible, replace differential carrier.	
	1) Check seating of bevel gear or differential case. (Check bevel gear for runout). 2) If adjustment is impossible, replace drive bevel gear & pinion set or differential carrier.	
	Replace drive bevel gear & pinion set or differential case.	

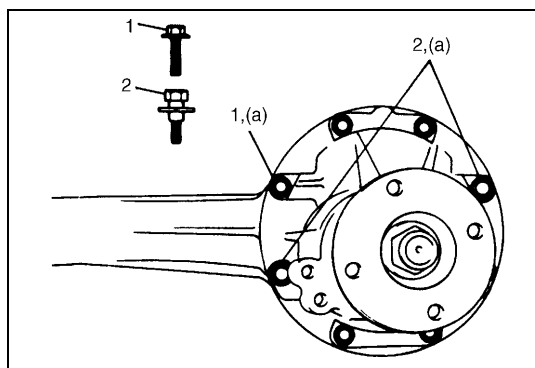


- 11) Upon completion of gear tooth contact check in step 9), caulk flange nut (2) with caulking tool (1) and hammer.



- 12) Clean mating surfaces of both housing and carrier and apply sealant "A" to housing side evenly.

"A" : Sealant 99000-31110



- 13) With differential assembly installed in housing, position it with 2 reamer bolts (2) and then install other 6 bolts (1).
14) Torque all bolts to specification.

Tightening torque

Differential carrier bolt (a) : 23 N·m (2.3 kg-m, 17.0 lb-ft)

- 15) Install front drive shaft.

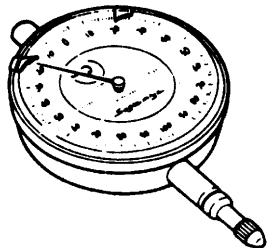
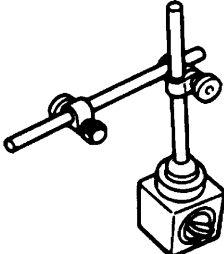
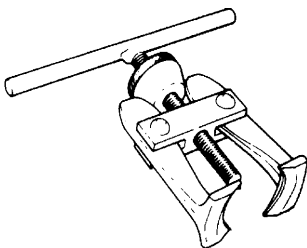
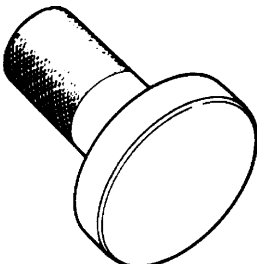
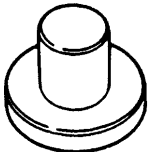
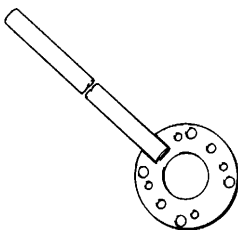
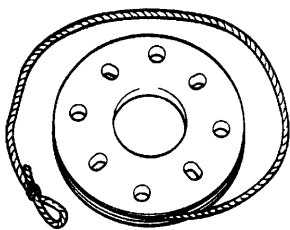
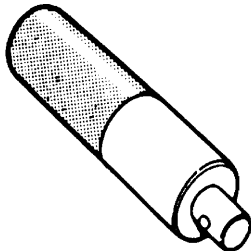
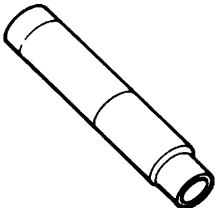
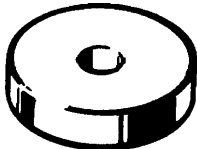
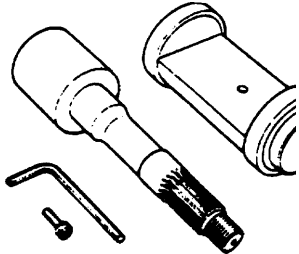
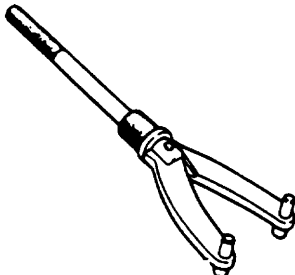
TIGHTENING TORQUE SPECIFICATION

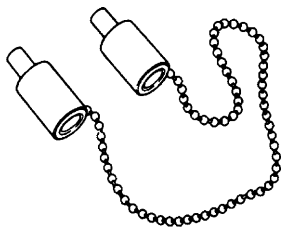
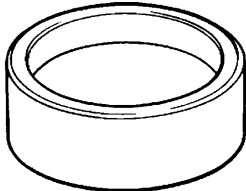
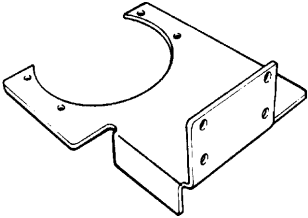
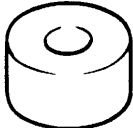
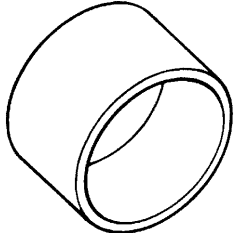
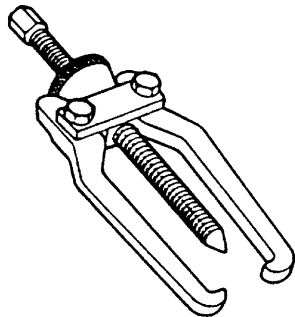
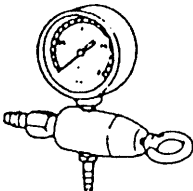
Fastening part	Tightening torque		
	N·m	kg-m	lb-ft
Air inlet union	13	1.3	9.5
Actuator bracket bolts	12	1.2	9.0
Bevel gear bolts	85	8.5	61.5
Bearing cap bolts	60	6.0	43.5
Lock plate bolts	13	1.3	9.5
Front differential carrier bolts	23	2.3	17.0

REQUIRED SERVICE MATERIAL

Material	Recommended SUZUKI product (Part Number)	Use
Thread lock cement	THREAD LOCK CEMENT SUPER 1333B (99000-32020)	Bevel gear bolts
Lithium grease	SUZUKI SUPER GREASE A (99000-25010)	Oil seal lips
Sealant	SUZUKI BOND NO. 1215 (99000-31110)	• Front differential drain and filler plug • Mating surface of differential housing • Air inlet union

SPECIAL TOOL

 09900-20606 Dial gauge	 09900-20701 Magnetic stand	 09913-61510 Bearing puller	 09913-75510 Bearing installer
 09913-85230 Bearing removing jig	 09922-66020 Flange holder	 09922-75222 Preload adjuster	 09924-74510 Installer attachment
 09925-18011 Bearing installer	 09926-68310 Bearing installer	 09926-78311 Bevel pinion mounting dummy	 09930-40113 Rotor holder

 09930-40120 Attachment	 09927-66010/J23082-01 Oil pump aligner	 09944-66020 Bearing installer	 09944-76010 Differential carrier holder
 09951-16060 Lower arm bush remover	 09951-18210 Oil seal remover & installer No. 2	 09913-65135 Bearing puller	 09918-18110 Air pressure regulator

SECTION 7F

DIFFERENTIAL (REAR)

7F

CONTENTS

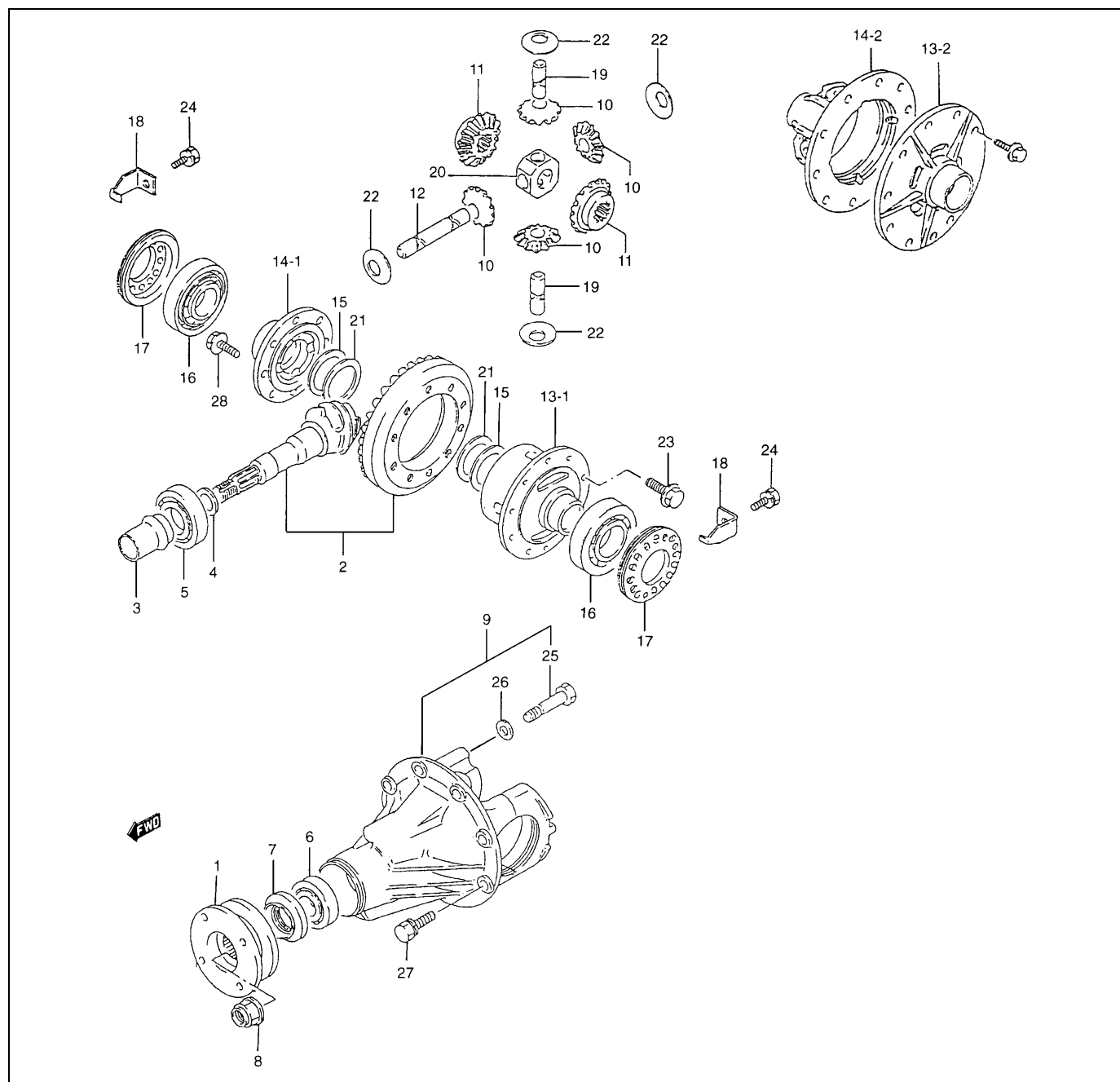
GENERAL DESCRIPTION	7F-2	DIFFERENTIAL SIDE BEARING	7F-9
UNIT REPAIR	7F-3	DRIVE BEVEL PINION	7F-10
DISASSEMBLING UNIT	7F-3	ASSEMBLING UNIT	7F-14
COMPONENT INSPECTION	7F-6	TIGHTENING TORQUE SPECIFICATION....	7F-18
SUB-ASSEMBLY ADJUSTMENT AND		REQUIRED SERVICE MATERIAL.....	7F-18
REASSEMBLY	7F-6	SPECIAL TOOL	7F-19
DIFFERENTIAL CARRIER.....	7F-6		
DIFFERENTIAL CASE	7F-6		

GENERAL DESCRIPTION

The differential assembly using a hypoid bevel pinion and gear is installed to the rear axle. It is set in the conventional type axle housing.

The reduction ratio and the differential case vary depending on transmission or engine type.

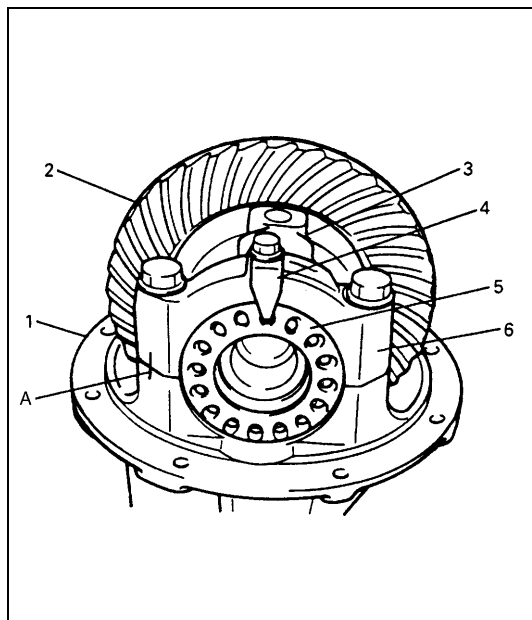
The differential assembly is decisive in that the drive power is concentrated there. Therefore, use of genuine parts and specified torque is compulsory. Further, because of sliding tooth meshing with high pressure between bevel pinion and gear, it is mandatory to lubricate them by hypoid gear oil.



- | | | | |
|---------------------------|--|-------------------------------|----------------------------|
| 1. Universal joint flange | 9. Differential carrier assembly | 15. Thrust washer | 23. Bevel gear bolt |
| 2. Bevel pinion gear set | 10. Differential pinion | 16. Differential side bearing | 24. Bolt |
| 3. Bevel pinion spacer | 11. Differential gear | 17. Bearing adjuster | 25. Bolt |
| 4. Shim | 12. Pinion shaft No.1 | 18. Lock plate | 26. Lock washer |
| 5. Rear bearing | 13-1. Differential left case (4 differential pinion type) | 19. Pinion shaft No.2 | 27. Bolt |
| 6. Front bearing | 13-2. Differential left case (2 differential pinion type) | 20. Pinion joint | 28. Differential case bolt |
| 7. Oil seal | 14-1. Differential right case (4 differential pinion type) | 21. Spring washer | |
| 8. Flange nut | 14-2. Differential right case (2 differential pinion type) | 22. Washer | |

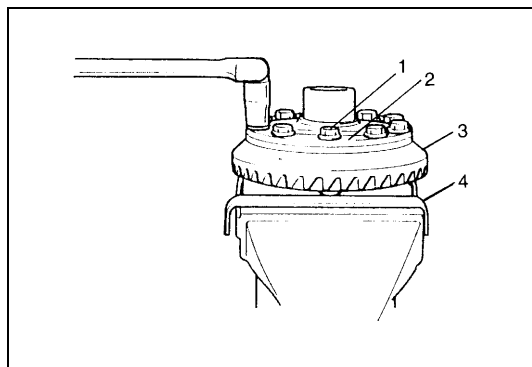
UNIT REPAIR

DISASSEMBLING UNIT

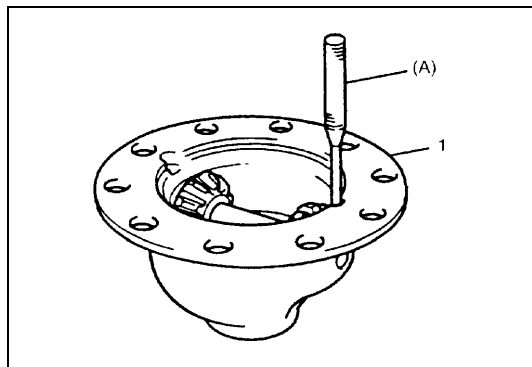


- 1) Hold differential assembly securely and put identification marks on differential side bearing caps (6).
- 2) Take off differential side bearing lock plates (4) and differential side bearing caps (6) by removing their bolts and then take out bearing adjusters (5), side bearing outer races and drive bevel gear with differential case.

- | | |
|----|---------------------------|
| 1. | Differential carrier |
| 2. | Drive bevel gear assembly |
| 3. | Differential case |
| A: | Identification mark |



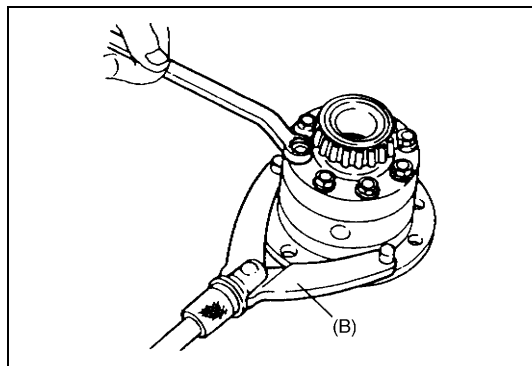
- 3) For 2 differential pinion type, remove differential side gear, pinion gear and pinion shaft.
 - a) With aluminum plates (4) placed on vise first, grip differential case with it and remove bevel gear (3) by removing its bolts (1).
 - b) Remove differential left case (2) from differential right case.



- c) Drive out spring pin with special tool and hammer and disassemble differential side gears, pinions, washers and shaft in differential case (1).

Special tool

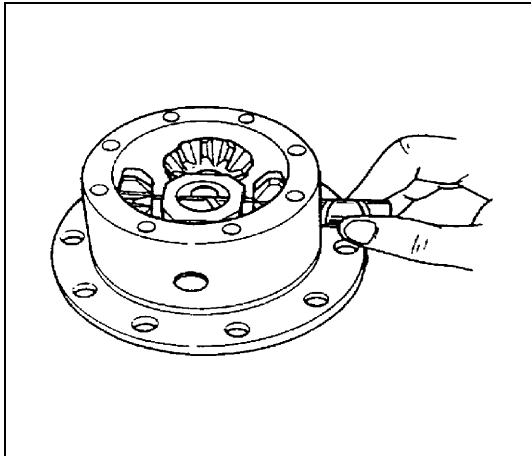
(A) : 09922-85811



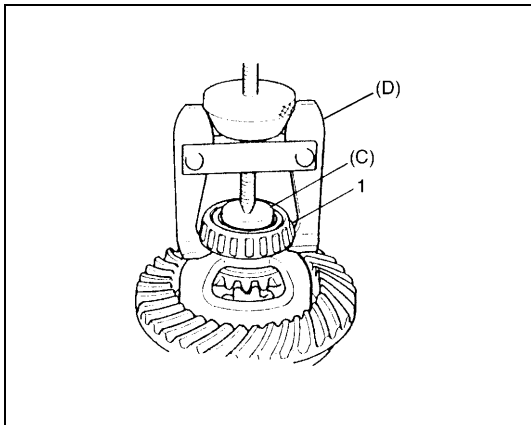
- 4) For 4 differential pinion type, remove drive bevel gear, pinion gear and pinion shaft.
 - a) Remove bevel gear by removing its bolts in the same manner as step a) of 2 differential pinion type (Step 3).
 - b) There are 8 bolts fastening two differential case halves together. Remove these bolts to sever right-hand case half from left-hand one, and take off right-hand one.

Special tool

(B) : 09930-40113



- c) Remove pinion shaft, side gears, washers, differential pinions, spring washers, thrust washers.

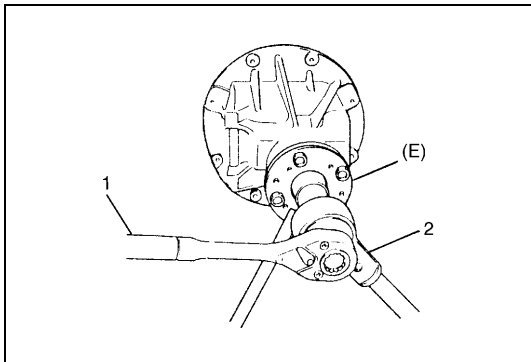


- 5) Using special tools, pull out differential side bearings (1).

Special tool

(C) : 09913-85230

(D) : 09913-61510



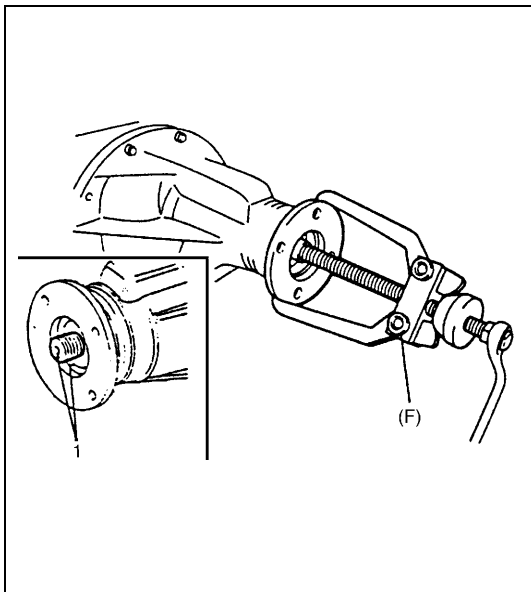
- 6) Remove bevel pinion assembly.

- a) Hold universal joint flange with special tool and then remove flange nut by using power wrench (4 - 10 magnification) (2).

Special tool

(E) : 09922-66020

1. Socket wrench



- b) Make mating marks (1) on drive bevel pinion and companion flange.

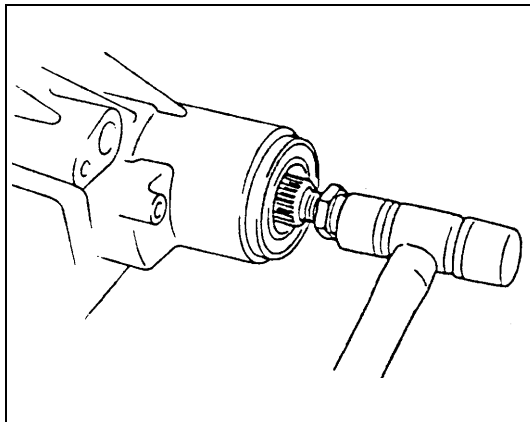
CAUTION:

Don't make mating mark on the coupling surface of the flange.

- c) Remove companion flange from pinion. Use special tool if it is hard to remove.

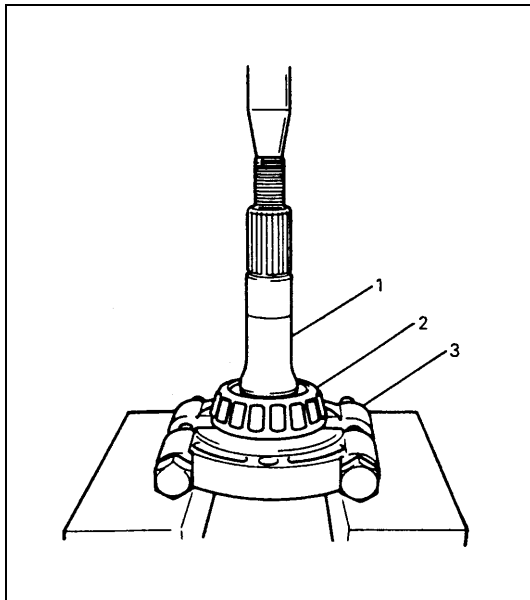
Special tool

(F) : 09913-65135



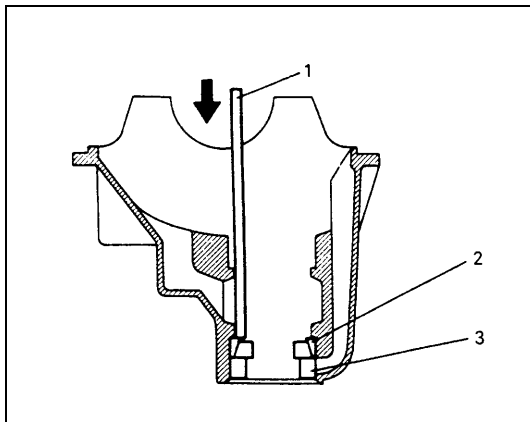
- d) Remove bevel pinion with rear bearing, shim and spacer from carrier.

If it is hard to remove, screw an used nut into pinion and hammer on that nut with a plastic hammer but never directly on pinion.

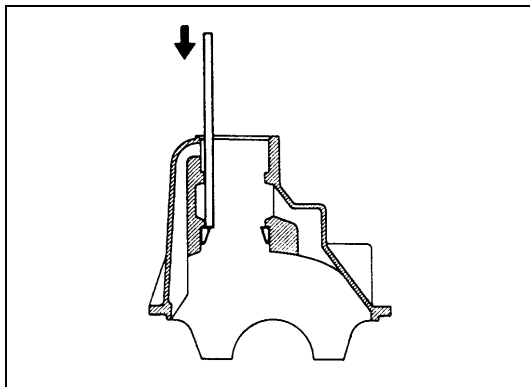


- e) Remove bevel pinion rear bearing (2) by using bearing puller (3) and press.

1. Drive bevel pinion



- 7) Using a hammer and brass bar (1), drive out front bearing outer race with bearing (2) and oil seal (3).



- 8) Drive out rear bearing outer race in the same way as in the step 7).

COMPONENT INSPECTION

- Check companion flange for wear or damage.
- Check bearings for wear or discoloration.
- Check differential carrier for cracks.
- Check drive bevel pinion and bevel gear for wear or cracks.
- Check side gears, pinion gears and pinion shaft for wear or damage.
- Check side gear spline for wear or damage.

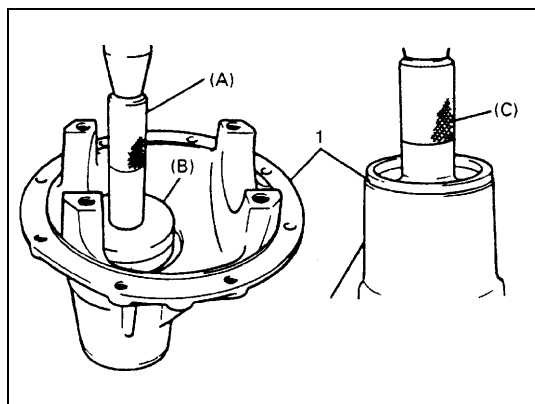
SUB-ASSEMBLY ADJUSTMENT AND REASSEMBLY

Judging from faulty conditions noted before disassembly and what is found through visual check of bearing and gear tooth etc. after disassembly, prepare replacing parts and proceed to reassembly according to procedures as described below.

CAUTION:

- **Bevel gear and pinion must be replaced as a set when either replacement becomes necessary.**
- **When replacing taper roller bearing, replace as inner race & outer race assembly.**

DIFFERENTIAL CARRIER



For press-fitting bevel pinion bearing outer races, use special tools as shown in the figure.

Special tool

(A) : 09924-74510

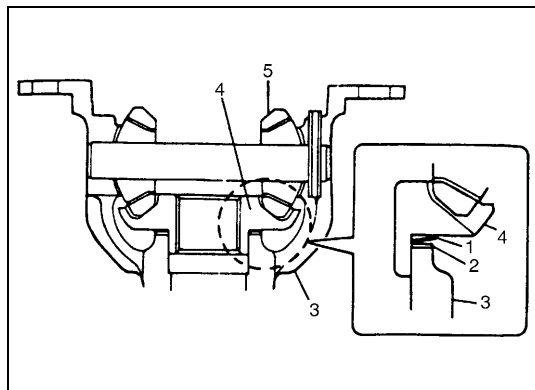
(B) : 09926-68310

(C) : 09913-75510

1. Differential carrier

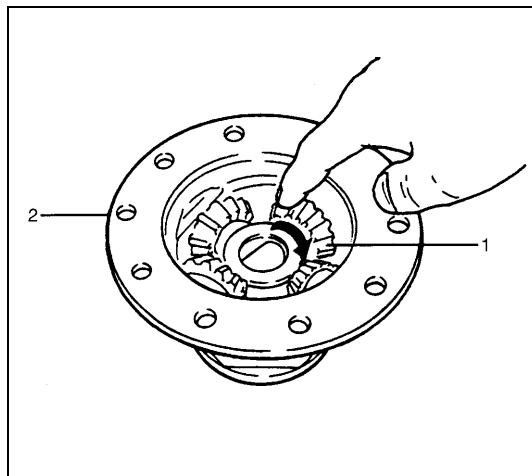
DIFFERENTIAL CASE

FOR 2 DIFFERENTIAL PINION TYPE



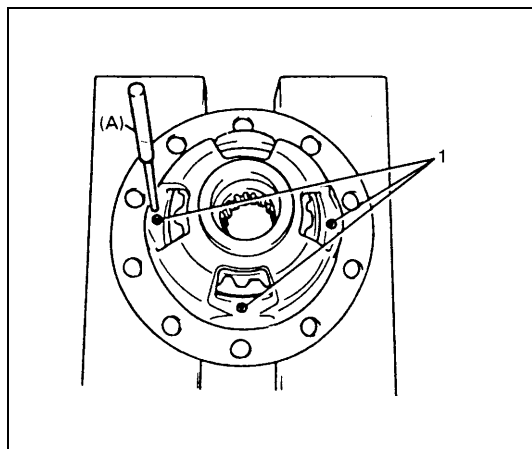
- 1) After applying differential oil to side gear (4), pinions (5), pinion shaft, thrust washer (2) and spring washer (1), install them in differential right case (3).

For correct installing direction of thrust washer (2) and spring washer (1), refer to the figure.



2) Check pinion gear (1) for smooth rotation.

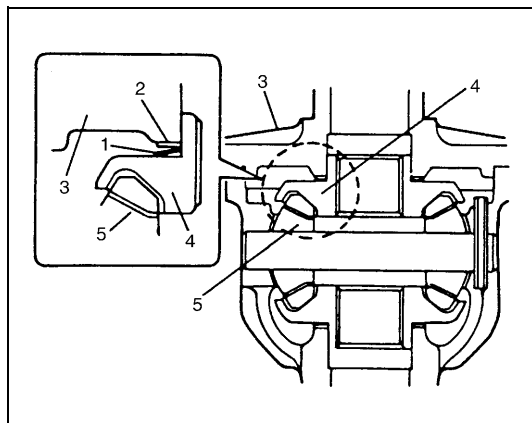
2. Differential right case



3) Align pinion shaft hole position with differential case and drive in 3 spring pins (1) till they are flush with end surface of case.

Special tool

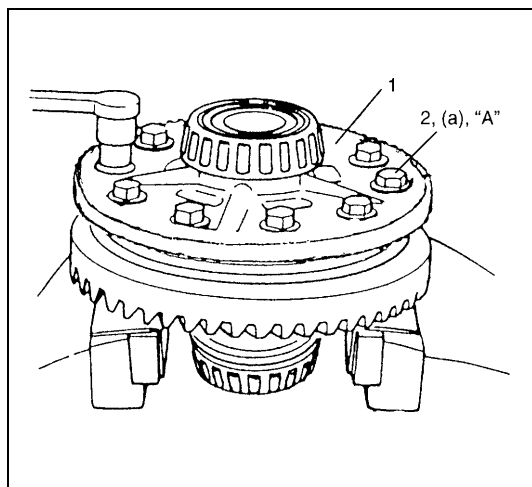
(A) : 09922-85811



4) In the same manner as described in Step 1), install thrust washer (2), spring washer (1) and side gear (4).

3. Differential left case

5. Pinion



5) Put bevel gear on differential case (1) and fasten them with bolts (2) by tightening them to specified torque.
Use thread lock cement for bolts (2).

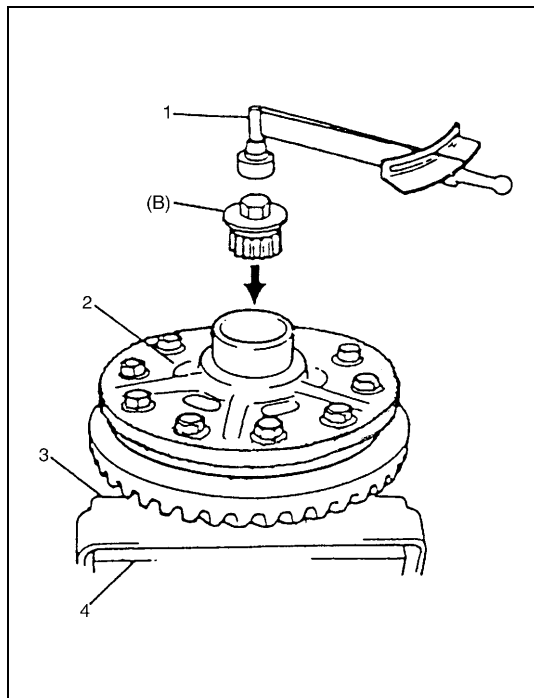
CAUTION:

Use of any other bolts than that specified is prohibited.

"A" : Cement 99000-32020

Tightening torque

Bevel gear bolt (a) : 85 N·m (8.5 kg-m, 61.5 lb-ft)



- 6) Install special tool to differential case assembly and check that preload is within specification below. If preload exceeds specified value, check if foreign matter is caught or gear is damaged.

Special tool

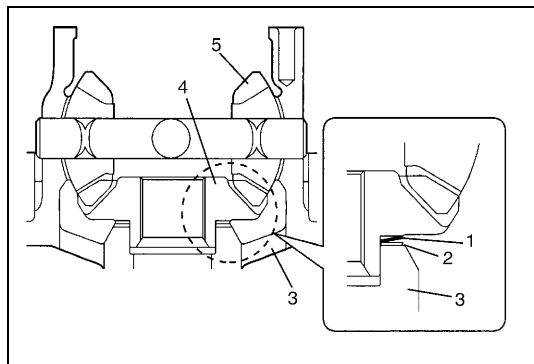
(B) : 09928-06010-002

Side gear preload :

Max. 2.5 N·m (0.25 kg-m, 1.8 lb-ft)

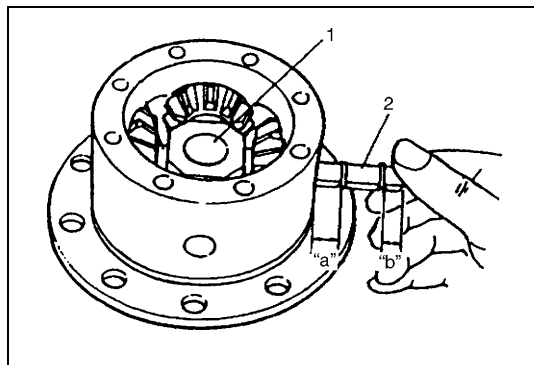
- | |
|-------------------------------|
| 1. Torque wrench |
| 2. Differential case assembly |
| 3. Aluminum plate |
| 4. Vise |

FOR 4 DIFFERENTIAL PINION TYPE



- 1) After applying differential oil to side gear (4), pinions (5), pinion shafts, washer, thrust washer (2) and spring washer (1), install them in differential left case (3).

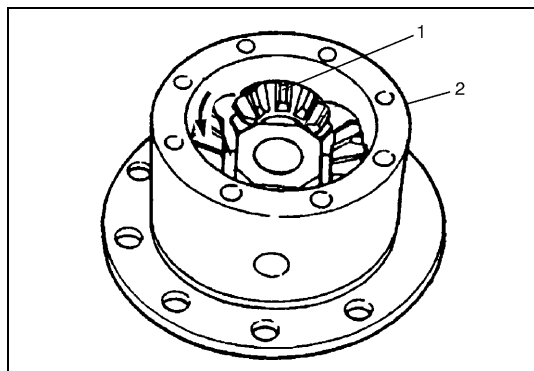
For correct installing direction of thrust washer (2) and spring washer (1), refer to the figure.



- 2) When installing pinion shaft No.2 (2) (shorter) into differential case and pinion, insert its "a" side into pinion joint (1).

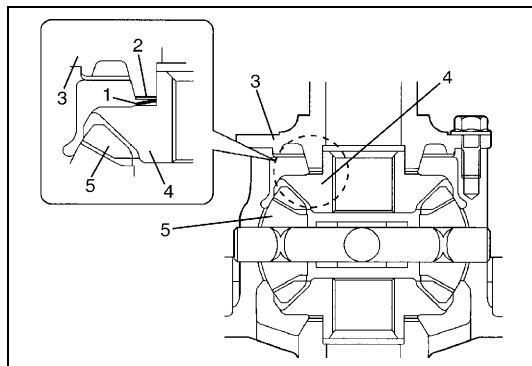
NOTE:

"a" is longer than "b". ("a" > "b")



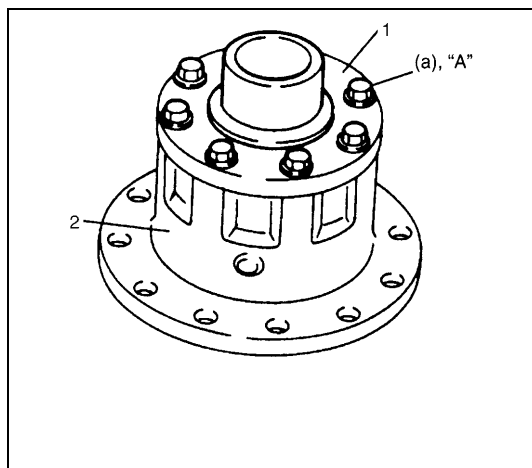
- 3) Check pinion gear (1) for smooth rotation.

- | |
|---------------------------|
| 2. Differential left case |
|---------------------------|



- 4) In the same manner as described in Step 1), install thrust washer (2), spring washer (1) and side gear (4).

3. Differential right case
5. Pinion



- 5) Install differential right case (1) and then tighten bolts to specified torque.

“A” : Cement 99000-32020

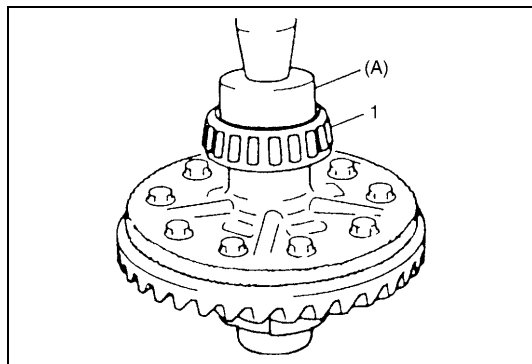
Tightening torque

Differential case bolt (a) :
41 N·m (4.1 kg-m, 30.0 lb-ft)

2. Differential left case

- 6) Install bevel gear in the same manner as step 5) of 2 differential pinion type.
7) Check preload in the same manner as step 6) of 2 differential pinion type.

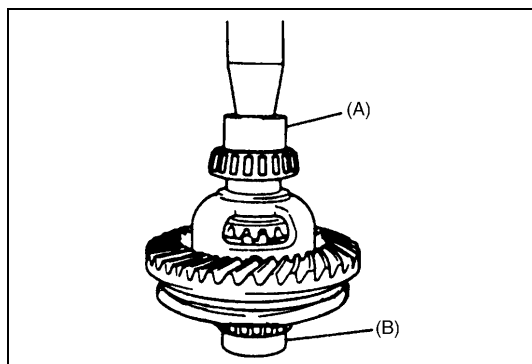
DIFFERENTIAL SIDE BEARING



- 1) Press-fit side bearing (1) with special tool and press.

Special tool

(A) : 09944-66020



- 2) Hold bearing press-fitted in Step 1) with holder and press-fit side bearing on the other side.

NOTE:

Be sure to use bearing holder for the purpose of protecting lower bearing.

Special tool

(A) : 09944-66020

(B) : 09951-16060

DRIVE BEVEL PINION

To engage bevel pinion and gear correctly, it is pre-required to install bevel pinion to differential carrier properly by using adjusting shim as described on the followings. Shown below is relative positions of bevel pinion, differential carrier and mounting dummy.

Special tool

(A) : 09900-20606

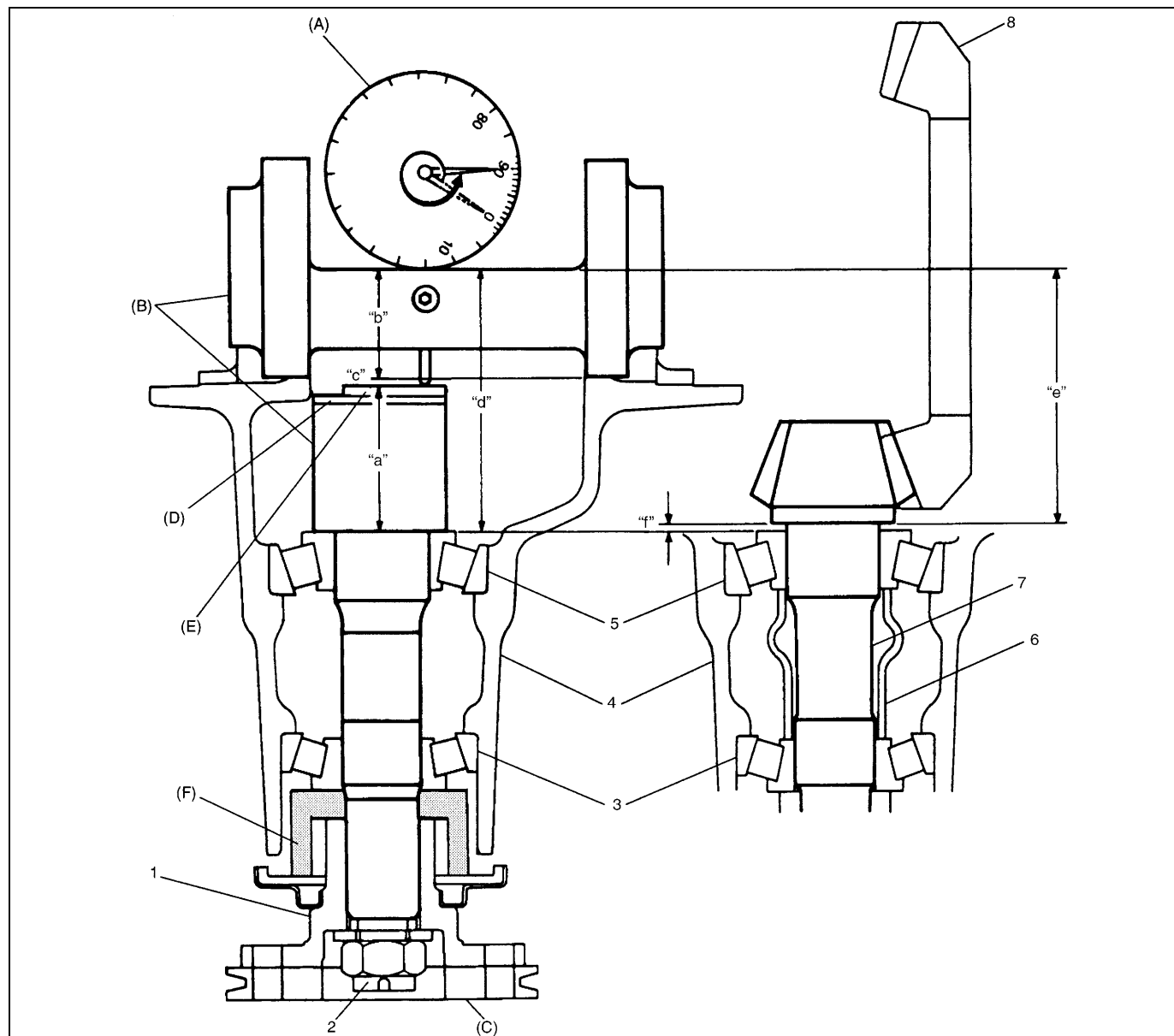
(B) : 09926-78311

(C) : 09922-75222

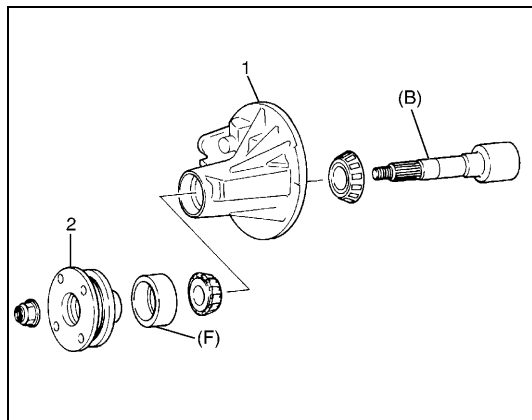
(D) : 09951-16070

(E) : 09922-77250 (4 differential pinion type)

(F) : 09951-46010 (4 differential pinion type)



- | | |
|---|--|
| 1. Universal Joint flange (P/No. 27110-60A00) | "a": Pinion dummy height + Attachment height |
| 2. Nut | "b": Axle dummy radius |
| 3. Front bearing | "a" + "b" Mounting dummy size 97.00 mm/3.81889 in. (2 differential pinion type) 102.00 mm/4.01575 in. (4 differential pinion type) |
| 4. Differential carrier | "c": Measured dimension |
| 5. Rear bearing | "d": Differential carrier mounting distance ("a" + "b" + "c") |
| 6. Spacer | "e": Bevel pinion mounting distance (Marked in shaft in mm) |
| 7. Bevel pinion | "f": Shim size for mounting distance adjustment ("d" - "e") |
| 8. Bevel gear | |



- 1) Install special tools with bearings and universal joint flange (2) to differential carrier (1).

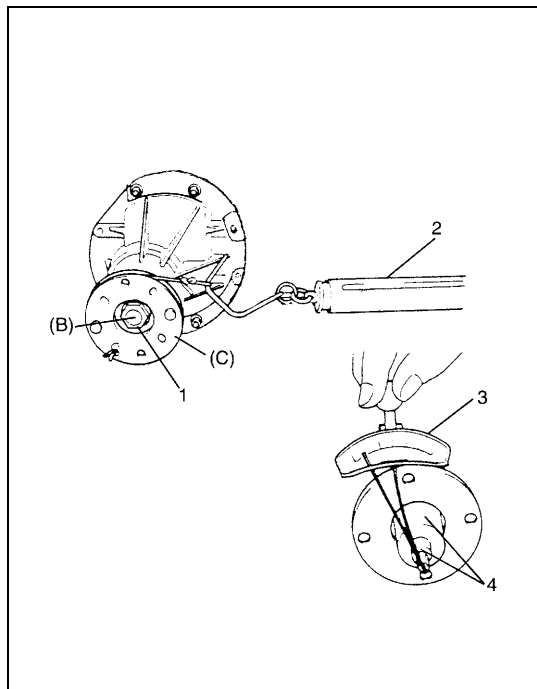
NOTE:

- This installation requires universal joint flange (2) not equipped with groove on flange periphery.
- This installation requires no spacer or oil seal.

Special tool

(B) : 09926-78311

(F) : 09951-46010 (4 differential pinion type)



- 2) Tighten flange nut (1) so that specified bearing preload is obtained.

NOTE:

Before taking measurement with spring balance (2) or torque wrench (3), check for rotation by hand and apply small amount of oil to bearings.

Special tool

(B) : 09926-78311

(C) : 09922-75222

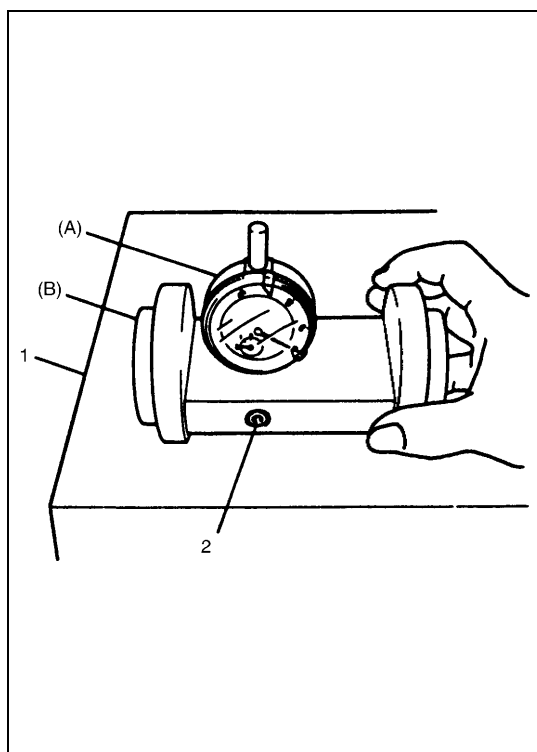
Pinion bearing preload :

9.0 – 17.0 kg-cm (7.8 – 14.7 lb-in.)

Spring measure reading with special tool :

1.8 – 3.4 kg (4.0 – 7.5 lb)

4. Socket with adapter



- 3) Set dial gauge to bevel pinion mounting dummy and make 0 (zero) adjustment on surface plate.

NOTE:

- When setting dial gauge to mounting dummy, tighten screw lightly. Be careful not to overtighten it, which will cause damage to dial gauge.
- With dial gauge set, turn dummy back and force by hand a couple of times and attain accurate 0 (zero) adjustment.
- It is desirable that short pointer indicates beyond 2 mm when long one is at 0 (zero).

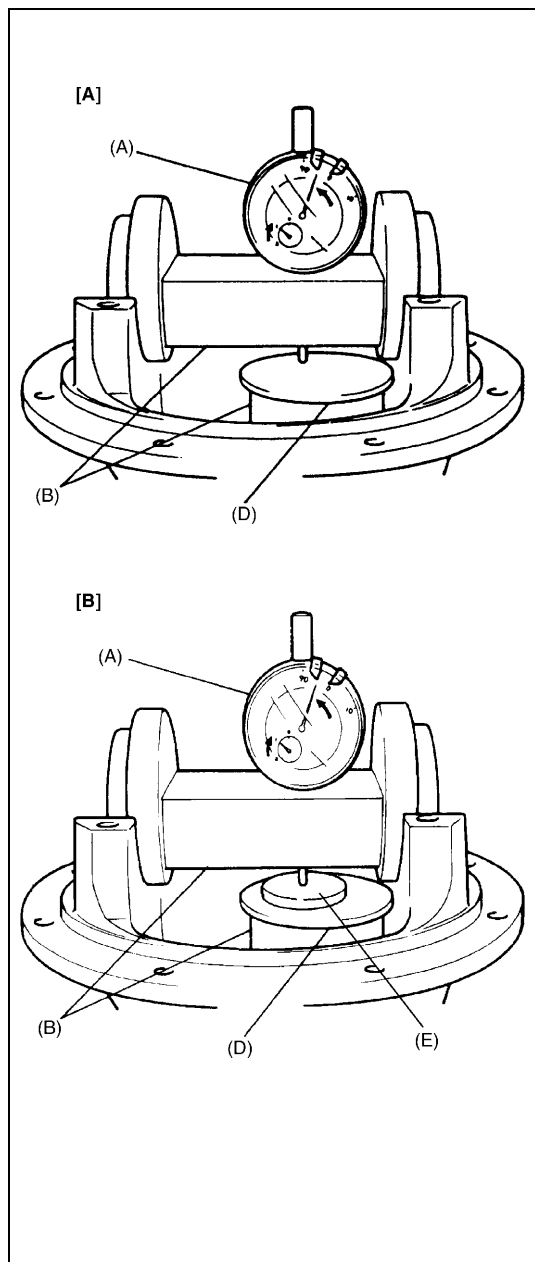
Special tool

(A) : 09900-20606

(B) : 09926-78311

1. Surface plate

2. Screw



- 4) Place zero-adjusted mounting dummy and dial gauge set on pinion dummy and take measurement between zero position and extended dial gauge measuring tip.

NOTE:

- Repeat turning back and force of dummy and measure distance as far as top surface of pinion dummy accurately.
- When dial gauge measuring tip extends from 0 (zero) position, pointer turns counterclockwise.
- Measured value may exceed 1 mm. Therefore, it is also necessary to know reading of short pointer.

Special tool

(A) : 09900-20606

(B) : 09926-78311

(D) : 09951-16070

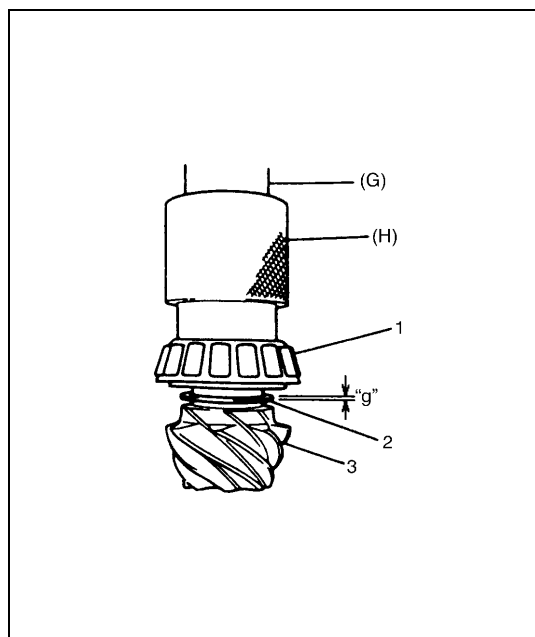
(E) : 09922-77250 (4 differential pinion type)

- 5) Obtain adjusting shim thickness by using measured value by dial gauge (which represents "c" in "Drive bevel pinion" in this section) in the following equation.
97 (2 differential pinion type) or 102 (4 differential pinion type) in above equation is "a" + "b" of mounting dummy (special tool) as shown in "Drive bevel pinion" in this section.

Necessary shim thickness "f"	=	97 (2 differential pinion type) or 102 (4 differential pinion type)	+	Dial gauge measured value "c"	-	Measurement printed on pinion "e"
---------------------------------	---	--	---	-------------------------------	---	-----------------------------------

[A] : 2 differential pinion type

[B] : 4 differential pinion type



- 6) Select adjusting shim(s) (2) closest to calculated value from among following available sizes and put it in place and then press-fit rear bearing (1).

Calculated value "g" :**Closest value to "f" (refer to Step 5).****Special tool**

(G) : 09925-18011

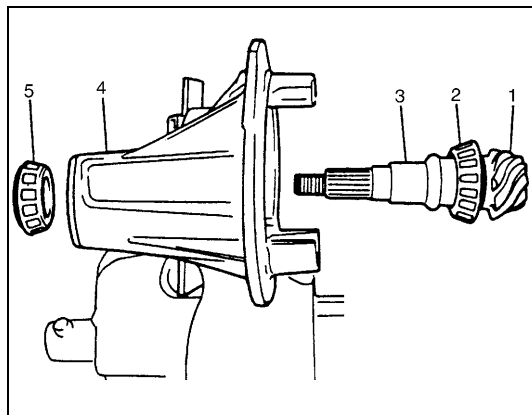
(H) : 09927-66010

Available shim thickness :

1.12, 1.15, 1.18, 1.21, 1.24, 1.27, 1.30 and 0.3 mm

(0.044, 0.045, 0.046, 0.047, 0.048, 0.049, 0.050 and 0.012 in.)

3. Bevel pinion

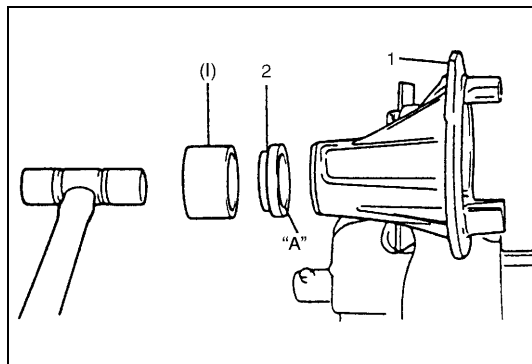


- 7) With new pinion spacer (3) inserted as shown in the figure, install front bearing (5) to differential carrier (4).

NOTE:

- Make sure to use new spacer for reinstallation.
- Apply oil to bearings.

- | |
|-----------------|
| 1. Bevel pinion |
| 2. Rear bearing |

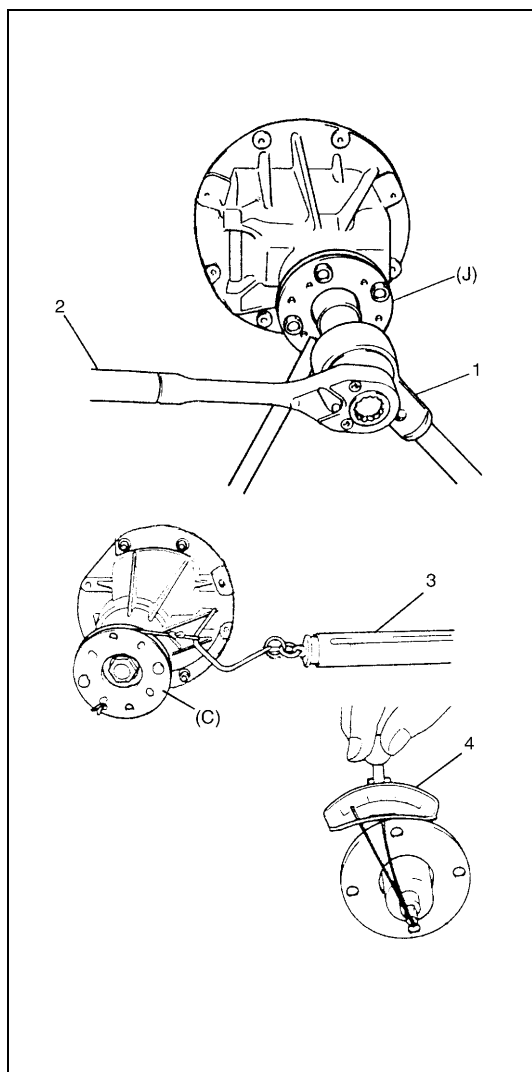


- 8) Using special tool and plastic hammer, drive oil seal (2) into differential carrier (1) till it becomes flush with carrier end. Then apply grease "A" to oil seal lip.

"A" : Grease 99000-25010

Special tool

(I) : 09951-18210



- 9) While tightening flange nut gradually with special tool and power wrench (4 - 10 magnification) (1), set preload of pinion to specification.

NOTE:

- Before taking measurement with spring balance (3) or torque wrench (4), check for smooth rotation by hand.
- Bearing preload can be measured roughly by pinion rotating angle which is due to arm weight of flange holder installed in flange.
- Be sure to tighten gradually and carefully till specified starting torque is obtained. Turning back overtightened flange nuts should be avoided.

Pinion bearing preload :

0.9 – 1.7 N·m (9.0 – 17.0 kg·cm, 7.8 – 14.7 lb-in.)

Spring measure reading with special tool :

18 – 34 N (1.8 – 3.4 kg, 4.0 – 7.5 lb)

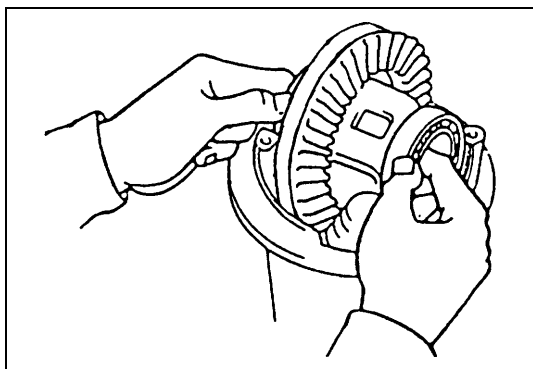
Special tool

(C) : 09922-75222

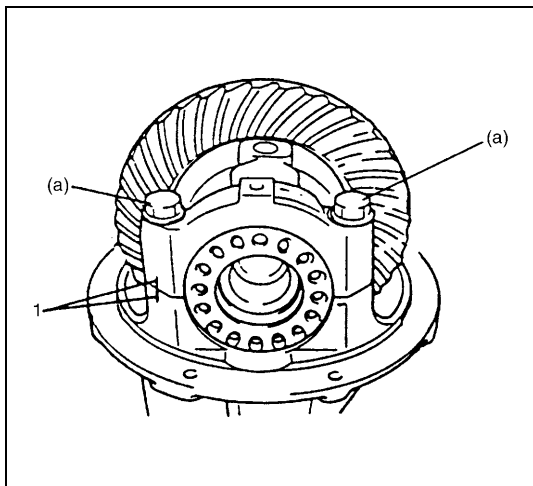
(J) : 09922-66020

- | |
|------------------|
| 2. Socket wrench |
|------------------|

ASSEMBLING UNIT



- 1) Place bearing outer races on their respective bearings.
Used left and right outer races are not interchangeable.
- 2) Install case assembly in carrier.
- 3) Install side bearing adjusters on their respective carrier, making sure adjuster are threaded properly.



- 4) Align match marks (1) on cap and carrier. Screw in 2 side bearing cap bolts 2 or 3 turns and press down bearing cap by hand.

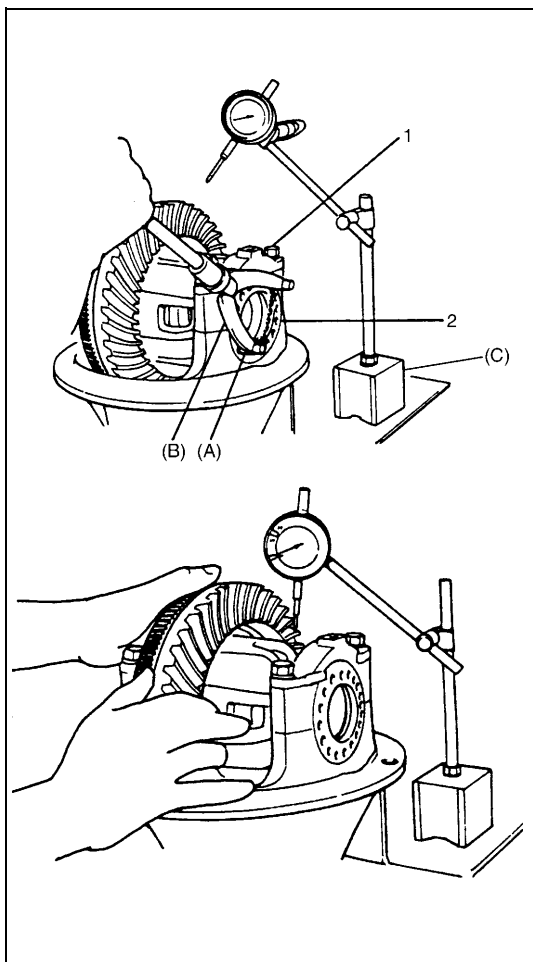
NOTE:

If bearing cap does not fit tightly on carrier, side bearing adjuster is not threaded properly. Reinstall adjuster.

- 5) Tighten cap bolts (provisional torque).

Tightening torque

Bearing Cap bolt (Provisional torque) (a) :
15 N·m (1.5 kg-m, 11.0 lb-ft)



- 6) Tighten both bearing adjusters (2) so as to obtain specified gear backlash and at the same time, obtain preload of side bearing.

NOTE:

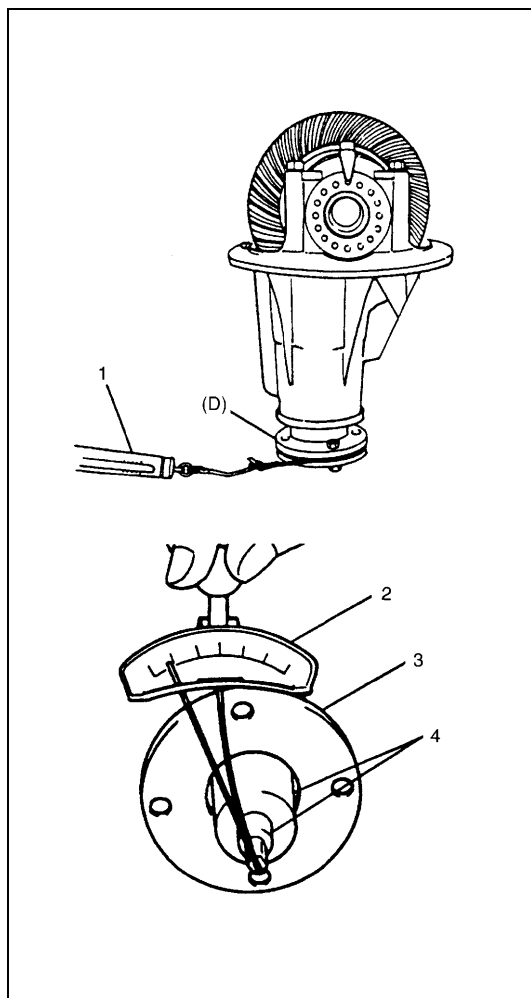
- Be sure to apply measuring tip of dial gauge at right angles to convex side of tooth.
- As a practical measure the following would be recommended to obtain specified backlash and side bearing preload at the same time.
 - Obtain specified backlash by turning both adjusters inward lightly.
 - Tighten both adjusters further by one notch at a time.
- Measure at least 4 points on drive bevel gear periphery.

Standard backlash :
0.13 – 0.18 mm (0.005 – 0.007 in.)

Special tool

- (A) : 09930-40120
(B) : 09930-40113
(C) : 09900-20701

1. Bearing cap bolt



- 7) Measure preload of pinion with spring balance (1) or torque wrench (2) and check composite preload of pinion bearing and side bearing.

NOTE:

- Standard preload is shown in the following graph, which should be read as follows.

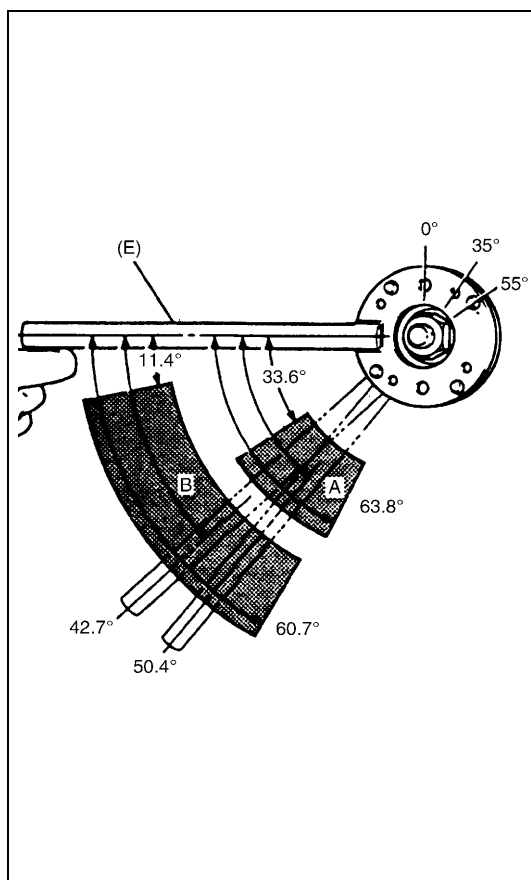
Example :

When preload of bevel pinion is 26 N (2.6 kg, 5.73 lb), acceptable composite preload of both pinion bearings and side bearings should be between 2.8 and 3.2 kg (6.17 and 7.05 lb).

Special tool

(D) : 09922-75222

- | |
|---------------------------|
| 3. Universal joint flange |
| 4. Socket with adapter |



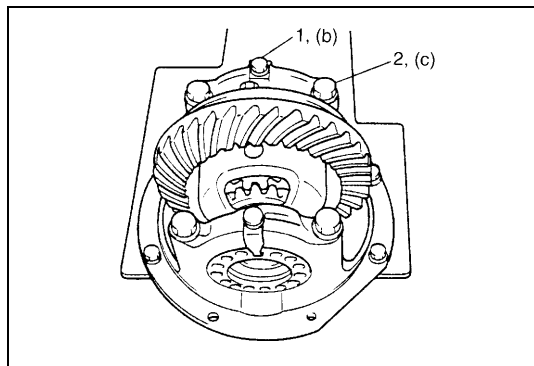
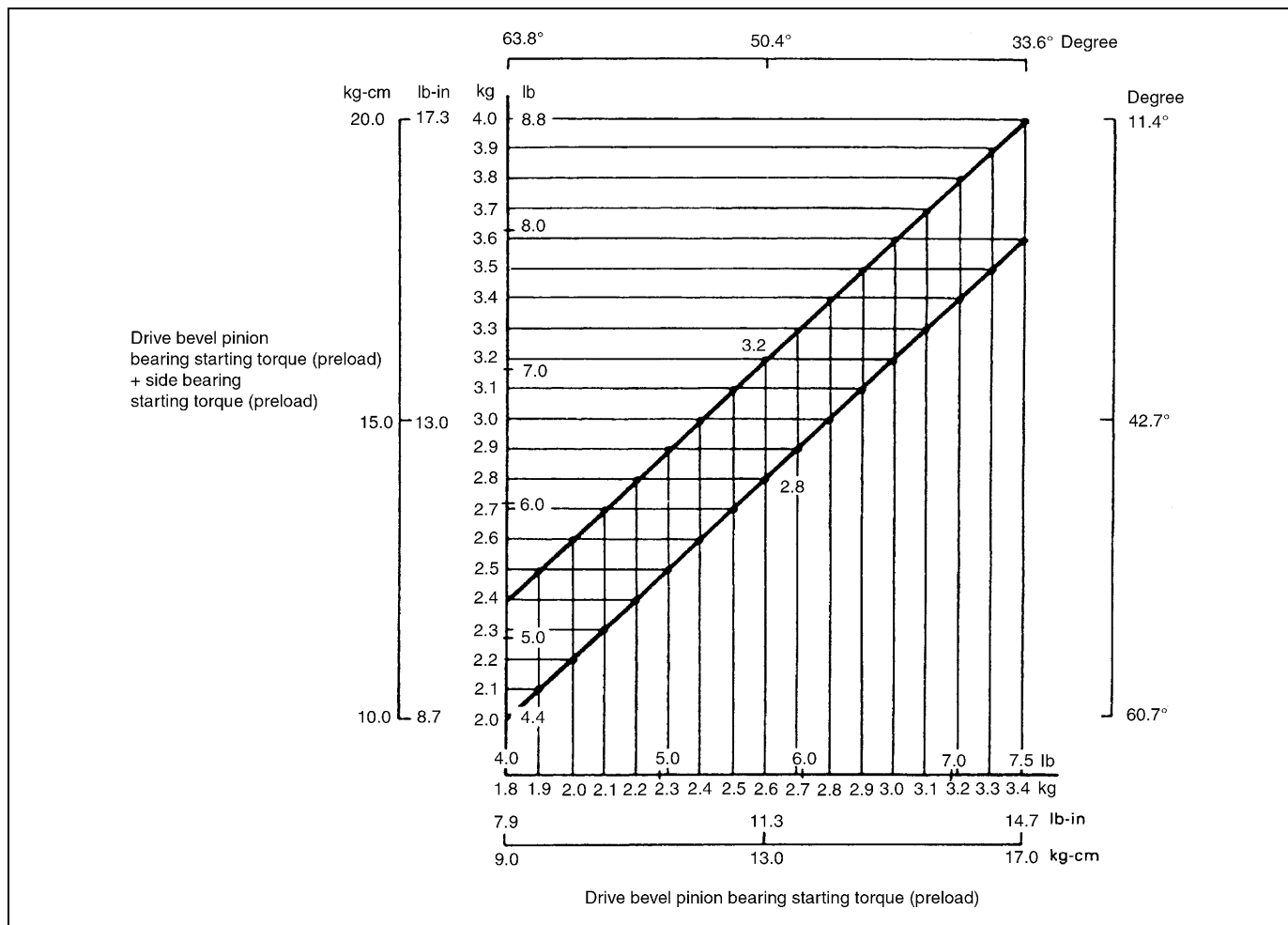
NOTE:

- Bearing preload can be checked roughly by using flange holder as shown in left figure. In this measurement, holder arm itself will work as balance weight and torque will be replaced with angle. However, flange should be rotated very slowly with hand support so as not to allow over revolution due to inertia.
- Repeat side bearing adjustment until gear backlash and composite bearing preload are compatible within specification, if failed to obtain specified measurements first.

Special tool

(E) : 09922-66020

- | |
|---|
| "A": Pinion bearing starting torque range |
| "B": Pinion bearing plus side bearing starting torque range |



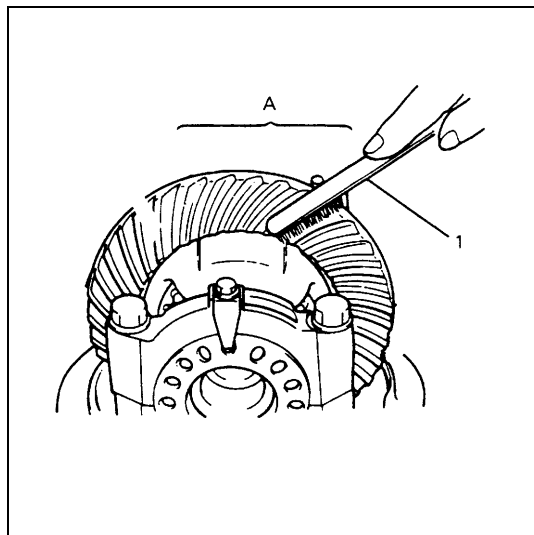
- 8) Torque bearing cap bolts (2) to specification and install bearing lock plates.

Tightening torque

Lock plate bolt (b) : 12 N·m (1.2 kg·m, 9.0 lb·ft)

Bearing cap bolt (c) : 85 N·m (8.5 kg·m, 61.5 lb·ft)

1. Lock plate bolt



- 9) As final step, check gear tooth contact as follows.

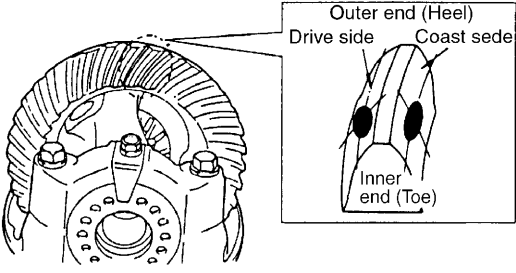
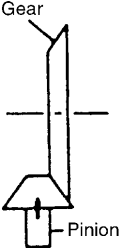
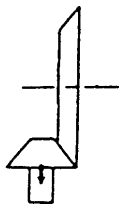
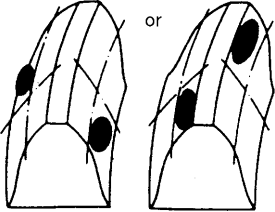
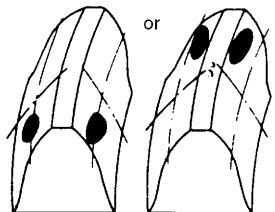
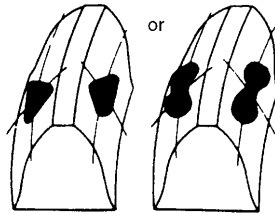
- After cleaning 10 bevel gear teeth, paint them with gear marking compound evenly by using brush or sponge etc.
- Turn gear to bring its painted part in mesh with bevel pinion and turn it back and forth by hand to repeat their contact.
- Bring painted part up and check contact pattern, referring to following chart. If contact pattern is not normal, readjust or replace as necessary according to instruction in chart.

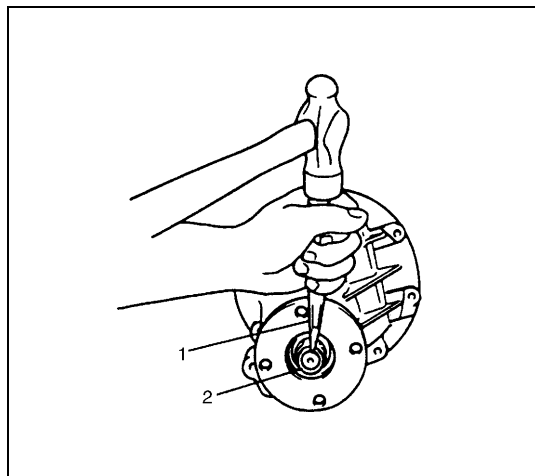
NOTE:

Be careful not to turn bevel gear more than one full revolution, for it will hinder accurate check.

1. Brush

"A": Paint gear marking compound evenly

TOOTH CONTACT PATTERN	DIAGNOSIS AND REMEDY	
	NORMAL	
	HIGH CONTACT Pinion is positioned too far from the center of drive bevel gear. 1) Increase thickness of pinion height adjusting shim and position pinion closer to gear center. 2) Adjust drive bevel gear backlash to specification.	
	LOW CONTACT Pinion is positioned too close to the center of drive bevel gear. 1) Decrease thickness of pinion height adjusting shim and position pinion farther from gear center. 2) Adjust drive bevel gear backlash to specification.	
	If adjustment is impossible, replace differential carrier.	
	1) Check seating of bevel gear or differential case. (Check bevel gear for runout). 2) If adjustment is impossible, replace drive bevel gear & pinion set or differential carrier.	
	Replace drive bevel gear & pinion set or differential case.	



- 10) Upon completion of gear tooth contact check in Step 8, caulk flange nut (2) with caulking tool (1) and hammer.

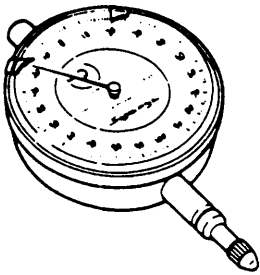
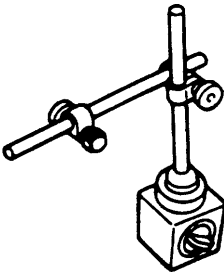
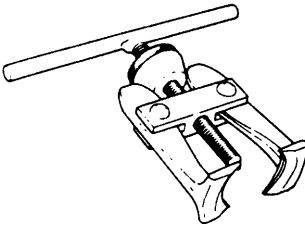
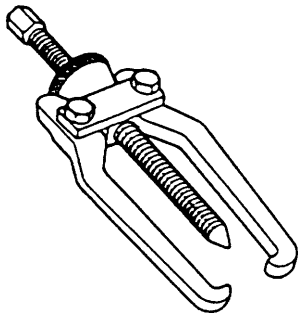
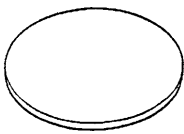
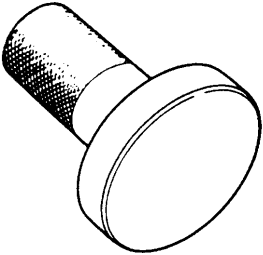
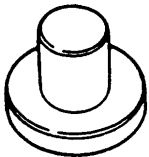
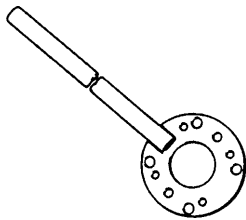
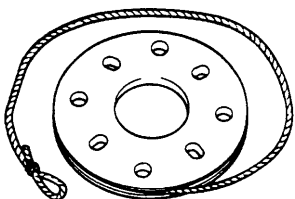
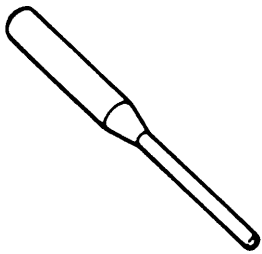
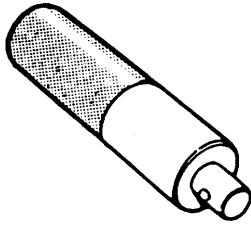
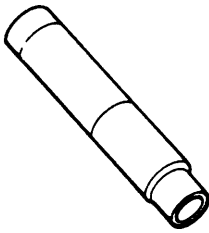
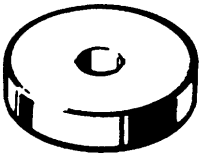
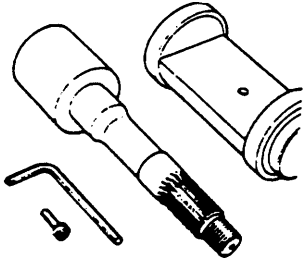
TIGHTENING TORQUE SPECIFICATION

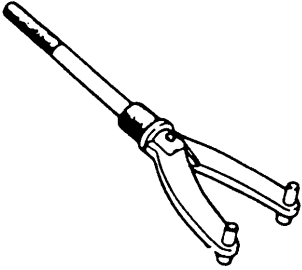
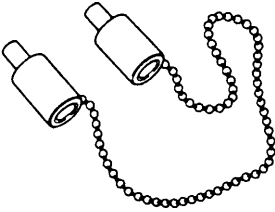
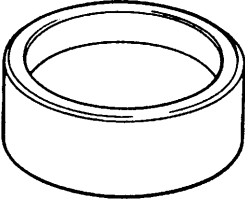
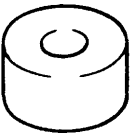
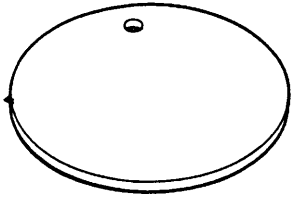
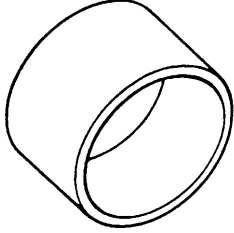
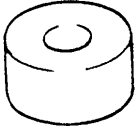
Fastening part	Tightening torque		
	N•m	kg-m	lb-ft
Bevel gear bolts	85	8.5	61.5
Bearing cap bolts	85	8.5	61.5
Lock plate bolts	12	1.2	9.0
Differential case bolts	41	4.1	30.0

REQUIRED SERVICE MATERIAL

Material	Recommended SUZUKI product (Part Number)	Use
Thread lock cement	THREAD LOCK CEMENT SUPER 1333B (99000-32020)	• Bevel gear bolts • Differential case bolts
Lithium grease	SUZUKI SUPER GREASE A (99000-25010)	Oil seal lips
Sealant	SUZUKI BOND NO. 1215 (99000-31110)	• Rear differential drain plug • Mating surface of differential housing • Mating surface of rear axle housing

SPECIAL TOOL

 09900-20606 Dial gauge	 09900-20701 Magnetic stand	 09913-61510 Bearing puller	 09913-65135 Bearing puller
 09922-77250 Attachment	 09913-75510 Bearing installer	 09913-85230 Bearing removing jig	 09922-66020 Flange holder
 09922-75222 Preload adjuster	 09922-85811 Spring pin remover	 09924-74510 Installer attachment	 09925-18011 Bearing installer
 09926-68310 Bearing installer	 09926-78311 Bevel pinion mounting dummy	 09927-66010/J-23082-01 Oil pump aligner	 09928-06010-002 Differential torque checking tool

 09930-40113 Rotor holder	 09930-40120 Attachment	 09944-66020 Bearing installer	 09951-16060 Lower arm bush remover
 09951-16070 Attachment	 09951-18210 Oil seal remover & installer No. 2	 09951-46010 Drive shaft oil seal installer	

Prepared by
SUZUKI MOTOR CORPORATION
Overseas Service Department

1st Ed. Jan, 1998
2nd Ed. May, 2000

Printed in Japan

Printing: May, 2000

213