

WORKSHOP MANUAL

N-SERIES

MANUAL TRANSMISSION AND CLUTCH

MBP SERIES

SECTION 7

ISUZU

ISUZU



International Service & Parts
Tokyo, Japan

NOTICE

Before using this Workshop Manual to assist you in performing vehicle service and maintenance operations, it is recommended that you carefully read and thoroughly understand the information contained in Section 0A under the headings "GENERAL REPAIR INSTRUCTIONS" and "HOW TO USE THIS MANUAL".

**All material contained in this Manual is based on the latest product information available at the time of publication.
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Applicable Model : NPR70, NQR70

This manual is applicable to 1998 year model and later vehicles.

THIS MANUAL INCLUDES THE FOLLOWING SECTIONS:

SECTION NO.	CONTENTS
00	Service Information
7B	Manual Transmission
7C	Clutch

SECTION 00

GENERAL INFORMATION

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TROUBLESHOOTING

MANUAL TRANSMISSION

PROBLEM	POSSIBLE CAUSE	CORRECTION
Abnormal Noise	<ul style="list-style-type: none"> • Insufficient or improper lubricant • Flywheel pilot bearing worn or broken • Bearing(s) worn or broken (Top gear shaft, main shaft, counter shaft, and reverse idler gear) • Gear tooth contact surfaces worn or scuffed (Top gear, main shaft, counter shaft, and reverse idler gear) • Spline worn (main shaft, synchronizer clutch hub) • Floating gear on main shaft or bearing thrust face seized • Transmission misalignment • Lack of backlash between mating gears, or improper shimming of P.T.O UNITS • Vibration in power train (Engine, propeller shafts, joint angle, rear axle, differential, transfer) 	<ul style="list-style-type: none"> • Replenish or replace lubricant • Replace flywheel pilot bearing • Replace bearing(s) • Replace gear(s) • Replace worn parts • Replace gear(s) • Realign transmission • Replace gear(s) • Check and correct
Hard Shifting	<ul style="list-style-type: none"> • Insufficient or improper lubricant • Clutch improperly adjusted • Hard operating of change lever caused insufficient grease • Change lever sliding portions worn • Control cable worn • Shift linkage improperly adjusted • Shift shaft and/or bearing worn • Power assister and/or air line malfunctioning • Shift rod and/or quadrant box sliding face worn • Shift arm and synchronizer sleeve groove worn • Synchronizer parts worn • Thrust washer, collar, and/or gear thrust faces worn (main shaft and counter shaft thrust play) 	<ul style="list-style-type: none"> • Replenish or replace lubricant • Readjust clutch linkage • Regrease • Repair or replace applicable parts and regrease • Replace control cable • Readjust shift linkage • Replace worn parts • Correct or replace • Replace worn parts • Replace worn parts • Replace worn parts • Replace worn parts

TROUBLESHOOTING (CONT.)

MANUAL TRANSMISSION

PROBLEM	POSSIBLE CAUSE	CORRECTION
Walking or Jumping Out of Gear	<ul style="list-style-type: none"> • Shift linkage improperly adjusted • Change lever sliding portion worn and excessive play • Detent ball worn • Detent spring weakened or broken • Shift rod and/or quadrant box sliding faces worn • Shift arm and synchronizer sleeve groove worn • Thrust washer, collar, and/or gear thrust faces worn (Main shaft, counter shaft thrust play) • Bearing worn or broken (Main shaft, counter shaft, and individual gears) • Main shaft splines and synchronizer clutch hub splines worn • Synchronizer parts worn or broken 	<ul style="list-style-type: none"> • Readjust shift linkage • Replace worn parts • Replace detent ball • Replace detent spring • Replace worn parts • Replace worn parts • Replace worn parts • Replace bearing(s) • Replace main shaft and synchronizer clutch hub • Replace worn or broken parts
Oil Leakage	<ul style="list-style-type: none"> • Oil level too high • Improper lubricant • Drain plug and/or filler plug loose • Defective or improperly installed gasket(s) • Air breather not installed, air breather clogged • Oil seal worn or scratched 	<ul style="list-style-type: none"> • Drain oil to correct level • Replace lubricant • Tighten plug and replenish lubricant • Replace gasket(s) • Install air breather, replace air breather • Replace oil seal

TROUBLESHOOTING (CONT.)

CLUTCH

PROBLEM	POSSIBLE CAUSE	CORRECTION
Clutch Slippage	<ul style="list-style-type: none"> • No free pedal • Clutch pedal assembly binding or sticking • Driven plate facing worn or burned • Oil or grease on facing • Clutch pressure springs weakened or broken • Pressure plate or flywheel warped • Master cylinder or slave cylinder malfunctioning • Binding or sticking of clutch disc hub 	<ul style="list-style-type: none"> • Adjust free pedal • Repair or replace faulty parts, and check linkage for proper adjustment • Replace facing or driven plate assembly • Replace driven plate assembly and repair oil leak • Replace pressure plate assembly • Replace defective parts, check transmission, clutch, and engine alignment • Correct or replace • Lubricate splines with high temperature grease (if dry), replace driven plate if splined hub are worn
Clutch Dragging	<ul style="list-style-type: none"> • Fluid leakage • Air in hydraulic line • Master cylinder or slave cylinder malfunctioning • Release lever improperly adjusted • Driven plate warped • Loose rivet in facings • Clutch spline worn • Driven plate sticking on splines • Clutch pressure springs weakened • Clutch pressure plate warped • Release bearing worn or damaged • Misalignment of transmission 	<ul style="list-style-type: none"> • Correct • Bleed • Correct or replace • Adjust slave cylinder • Replace driven plate assembly, also check flywheel for deep heat cracks • Replace driven plate assembly, check for damage flywheel and pressure plate, replace as necessary • Replace worn parts • Lubricate with grease or correct • Replace pressure plate assembly • Replace pressure plate assembly, also check flywheel surface for wear • Replace release bearing • Check engine mounts, wear on flywheel housing, and bolt torque

TROUBLESHOOTING (CONT.)

CLUTCH

PROBLEM	POSSIBLE CAUSE	CORRECTION
Clutch Chatter	<ul style="list-style-type: none"> • Grease or oil on facings • Driven plate facing warped • Surface of facing hardened • Rivets on driven plate loosened • Damper springs in clutch disc weakened or broken • Pressure spring weakened • Pressure plate or flywheel warped • Pilot bearing worn or broken • Flywheel warpage or discoloration • Engine mounts loose or damaged 	<ul style="list-style-type: none"> • Replace driven plate assembly and repair oil leak • Replace driven plate assembly • Replace driven plate assembly • Replace driven plate assembly • Replace driven plate assembly • Replace pressure plate assembly • Correct or replace • Replace and lubricate pilot bearing • Replace or resurface flywheel • Tighten engine mount bolts to specifications
Clutch Noisy	<ul style="list-style-type: none"> • Driven plate cracked • Damper springs weakened or broken • Head of rivets exposed • Release bearing worn or damaged • Release bearing poorly lubricated or damaged • Loose flywheel or clutch cover bolts • Pilot bearing worn or broken 	<ul style="list-style-type: none"> • Replace driven plate • Replace driven plate • Replace driven plate • Replace release bearing • Lubricate or replace • Tighten bolts to specifications • Replace pilot bearing

MAIN DATA AND SPECIFICATIONS

MANUAL TRANSMISSION

Type	Over drive 6 speed
Gear mesh type	1st and reverse: Constant mesh 2nd to 6th: Inertia lock (blocking ring) type synchromesh
Gear type	1st and reverse: Spur gear Others: Helical gear
Lubrication oil capacity Liters (US gal / Imp. gal)	Approx. 5.3 (1.40 / 1.17) (6 speed, without P.T.O.) Approx. 6.1 (1.61 / 1.34) (6 speed, with P.T.O.)

The oil capacity in the list above are for reference only.
The level must always be checked with the level indicator.

GEAR RATIO

T/M-Model	Type	1st	2nd	3rd	4th	5th	6th	Reverse
MBP6P	6-speed O.D.	6.378	3.627	2.339	1.452	1.000	0.787	6.595
MBP6Q		6.378	3.469	1.963	1.357	1.000	0.787	6.595

POWER TAKE OFF

Allowable Maximum Torque N·m (kg·m / lb·ft)	245 (25 / 181) /at output shaft 1,500RPM
Gear Ratio (to Engine)	0.776
Distance Plate Thickness mm (in)	3.93 (0.156)
Revolution Direction	Clockwise (Viewed from rear)

SIZE mm (in)		325 (13)
Set Force	N (kg / lb)	9,512 (970 / 2,139)
Pressure Plate		
Type		Coil spring-strap drive
No. of pressure spring		12
Driven Plate		
Type		Dry single plate with damper spring
No. of torsion spring		12
Facing		
Inside dia. × Outside dia.	mm (in)	210 × 325 (8.27 × 12.80)
Thickness	mm (in)	4.0 × 2 (0.157 × 0.08)
Master Cylinder Inside Diameter		
Without Booster	mm (in)	19.050 – 19.102 (0.7500 – 0.7520)
With Booster	mm (in)	20.640 – 20.692 (0.8126 – 0.8146)
Slave Cylinder		
Inside Diameter	mm (in)	25.400 – 25.452 (1.0000 – 1.0020)
Clutch Booster		
Diaphragm Diameter	mm (in)	130 (5.118)
Clutch pedal stroke	mm (in)	159 – 169 (6.260 – 6.654)
Clutch pedal free play	mm (in)	15 – 25 (0.591 – 0.984)
Clutch pedal Height	mm (in)	45 – 65 (1.77 – 2.56)

SERVICE STANDARD

MANUAL TRANSMISSION

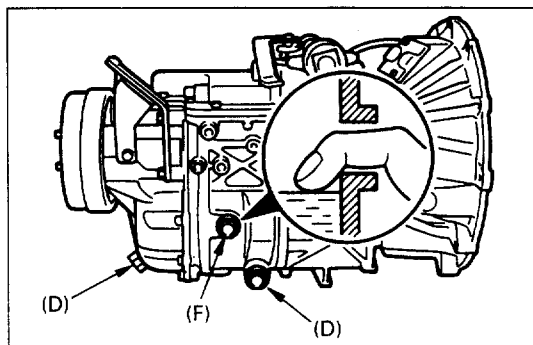
ITEMS		SERVICE STANDARD	SERVICE LIMIT
Clutch Hub and insert			
Clutch Hub and Insert Clearance	mm (in)	0.1 – 0.4 (0.004 – 0.016)	0.5 (0.020)
Insert Spring			
Spring Free Length	mm (in)		
	2nd & 3rd	19.9 (0.784)	—
	4th & 5th	19.9 (0.784)	—
	6th	18.7 (0.736)	—
Blocking Ring and Synchronizer			
Blocking ring and Synchronizer Clearance	mm (in)	2.0 (0.079)	0
Synchronizer (Dual Cone Type)			
Dog Teeth and Synchronizer Clearance	mm (in)	1.1 (0.043)	0
Shift Arm			
Shift Arm Thickness	mm (in)	11.0 (0.433)	10.0 (0.394)
Detent Spring			
Detent Spring Free Length	mm (in)	28.0 (1.102)	26.0 (1.024)
Select Cable and Shift Cable Fitting Length			
Gear Shift Lever Side			
Shift Cable / Select Cable	mm (in)	283 ± 15 (11.1 ± 0.6)	—
Transmission side			
Shift Cable / Select Cable	mm (in)	283 ± 15 (11.1 ± 0.6)	—

CLUTCH

ITEMS		SERVICE STANDARD	SERVICE LIMIT
Master Cylinder			
Master Cylinder Body and Piston Clearance	mm (in)	0.03 – 0.11 (0.0018 – 0.0043)	0.12 (0.0047)
Slave Cylinder			
Slave Cylinder Body and Piston Clearance	mm (in)	0.02 – 0.10 (0.0008 – 0.0039)	0.15 (0.0059)
Pressure Plate			
Pressure Plate Warpage	mm (in)	0.05 (0.0020) or less	0.30 (0.0118)
Clutch Set Force	mm (in)	9,512 (970 / 2,139)	—
Diaphragm Spring Finger Height	mm (in)	61.8 – 63.8 (2.433 – 2.512)	—
Driven Plate			
Depression of Rivet Head from Surface	mm (in)	—	0.2 (0.008)
Driven Plate Warpage	mm (in)	less than 0.7 (0.028)	1.0 (0.039)
Driven Plate Wear in Splines	mm (in)	1.8 – 2.4 (0.071 – 0.094)	—

SERVICING

TRANSMISSION OIL LEVEL



1. Remove the filler plug.

2. Check the oil level.

- Add lubricant to within 0 to 10 mm (0 to 0.4 in) of bottom edge of the filler hole if necessary.



CAUTION

Use **ENGINE OIL (SAE 5W-30)** for transmission .

3. Install the filler plug (F).

Filler Plug Torque	N·m (kg·m / lb·ft)
49 (5.0 / 36)	



TRANSMISSION OIL CHANGE

1. Remove the drain plug (D) from the transmission case and drain the oil.

2. Install the drain plug (D).

Drain Plug Torque	N·m (kg·m / lb·ft)
69 (7.0 / 51)	



3. Remove the filler plug (F).

4. Fill the transmission case from the filler plug hole with new oil of specified grade.

Oil Capacity	Litres (US-qt / Imp-qt)
6-Speed with PTO	6.1 (1.61 / 1.34)
6-Speed without PTO	6.1 (1.61 / 1.34)

CAUTION

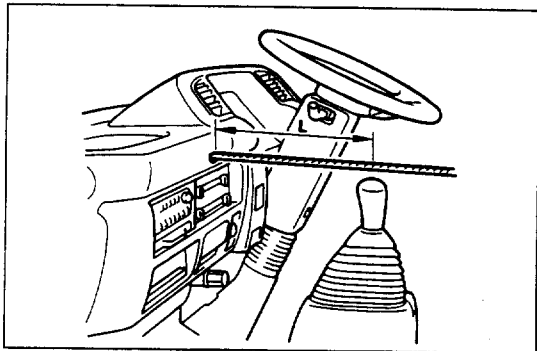


Use **ENGINE OIL (SAE 5W-30)** for transmission.



5. Install filler plug (F).

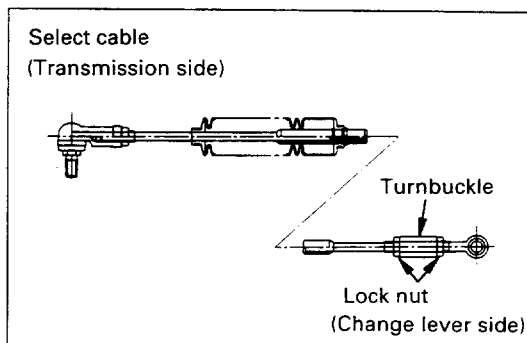
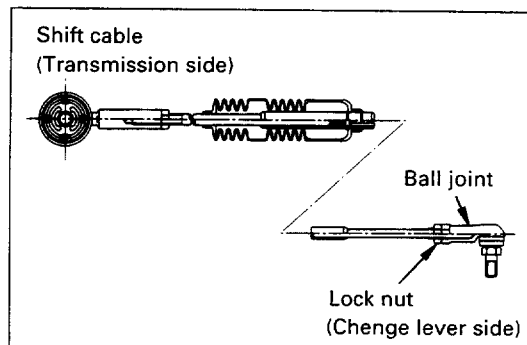
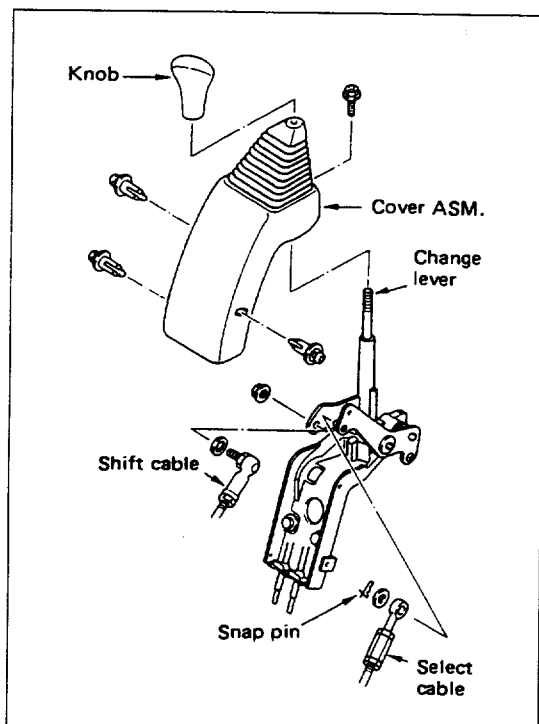
Filler Plug Torque	N·m (kg·m / lb·ft)
69 (7.0 / 51)	



GEAR CONTROL CABLE ADJUSTMENT

1. Set the change lever in the neutral position, then confirm if the dimension between the center of the change lever play and the instrument center cluster is within the reference value.

Change Lever Position	mm (in)
Wide Cab	283 ± 15 (11.1 \pm 0.6)



2. If the dimension is out of the reference adjust as required.

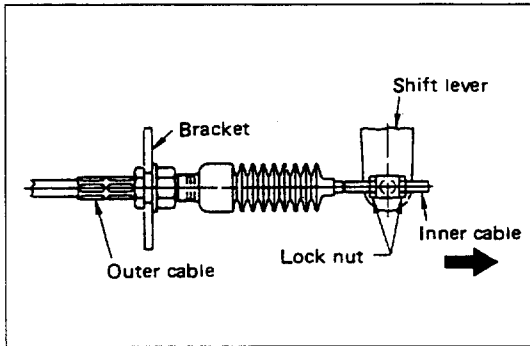
- 1) Remove the change lever knob.
- 2) Remove the cover assembly.
- 3) Disconnect the shift cable from the change lever.
- 4) Set the transmission in the neutral position.
- 5) Loosen the lock nut of the shift cable ball joint and the select cable turnbuckle, then turn the ball joint and turnbuckle as necessary for hole and pin.
- 6) Tighten the lock nuts and install the shift cable to the change lever.



Lock nut torque	N·m (kg·m / lb·in)
	6 (0.6 / 52)

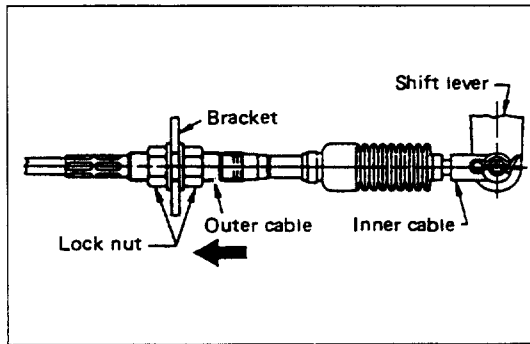
- 7) Install the cover assembly and the change lever knob.

POWER TAKE OFF CONTROL CABLE ADJUSTMENT



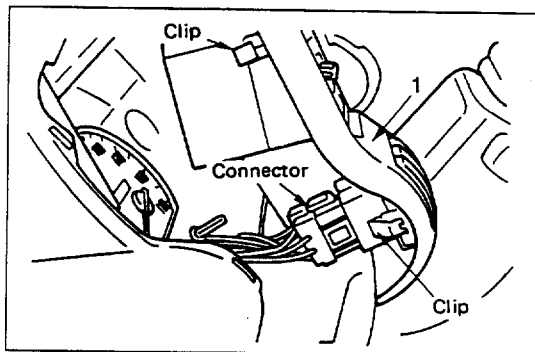
Inner Cable Adjustment Type

1. Loosen the lock nuts.
2. Set the PTO shift lever in the OFF position. Be sure to confirm the PTO control lever is in the OFF position (PTO indicator light turned off).
3. Remove slack from the inner cable by pulling the inner cable in the direction of the arrow.
4. Tighten the lock nuts.



Outer Cable Adjustment Type

1. Loosen the lock nuts.
2. Set the PTO shift lever in the OFF position. Be sure to confirm the PTO control lever is in the OFF position (PTO indicator light turned off).
3. Connect the inner cable to the PTO shift lever.
4. Remove slack from the inner cable by pulling the outer cable in the direction of the arrow.
5. Tighten the lock nuts.

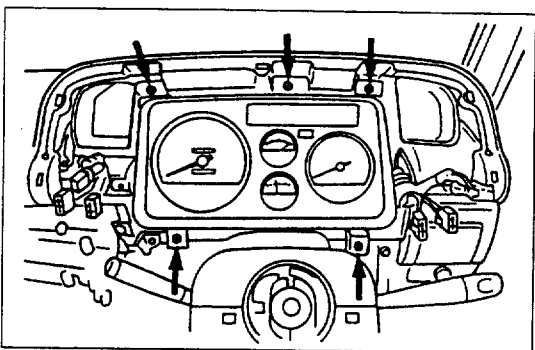


CLUTCH PEDAL TRAVEL AND FREE PLAY ADJUSTMENT

Clutch Pedal Height and Stroke

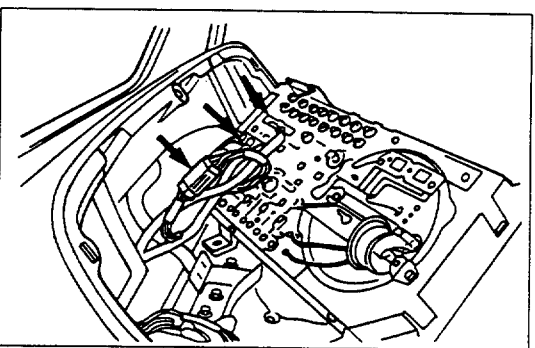
1. Remove the meter cluster.

- Pull out the meter cluster and disconnect the harness connectors.

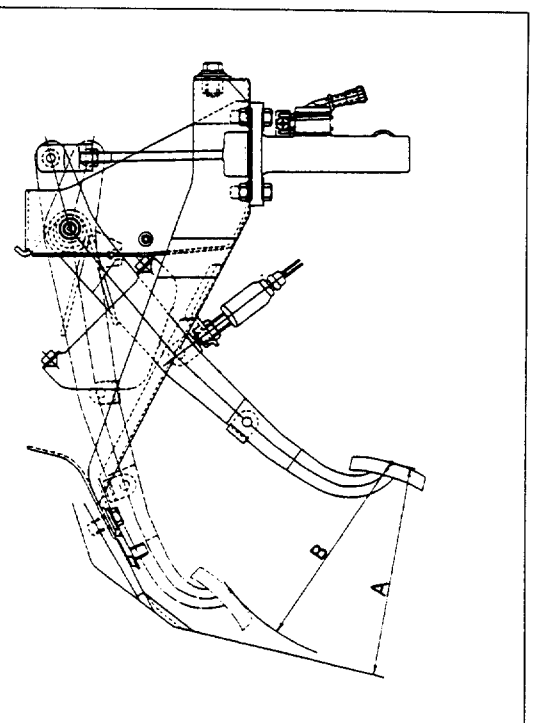


2. Remove the meter assembly.

- Remove the 5 fixing screws.



- Disconnect the harness connectors.



3. Loosen the lock nut of the clutch booster plunger or clutch master cylinder push rod.

4. Adjust the pedal height by turning plunger or push rod.

Clutch Pedal Height and Stroke mm (in)

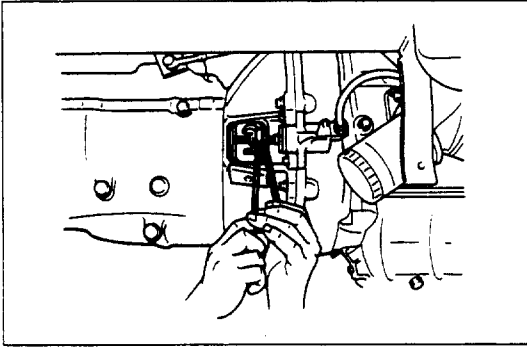
Height(A)	160 - 170 (6.299 - 6.693)
Stroke(B)	159 - 169 (6.260 - 6.654)

5. Tighten the lock nut.

Lock Nut Torque N·m (kg·m / lb·ft)

Plunger	20 (2.0 / 14)
Push Rod	13 (1.3 / 10)

6. Install the meter assembly and meter cluster.



Clutch Pedal Free Play

Slave Cylinder

1. Remove the slave cylinder return spring.
2. Loosen the lock nut of the push rod.
3. Turn the adjust nut until it reaches the shift fork.
4. Back off the adjust nut 1.5 turns (shift fork free play approximately 2 mm).
5. Tighten the lock nut.



Lock Nut Torque	N·m (kg·m / lb·ft)
19 (1.9 / 14)	

6. Install the return spring.

Clutch Switch or Stopper Bolt

After completion of clutch pedal height adjustment, adjust the clutch switch or stopper bolt clearance.

1. Loosen the lock nut of clutch switch or stopper bolt.
2. Adjust the clutch switch or stopper bolt clearance by turning clutch switch or stopper bolt.

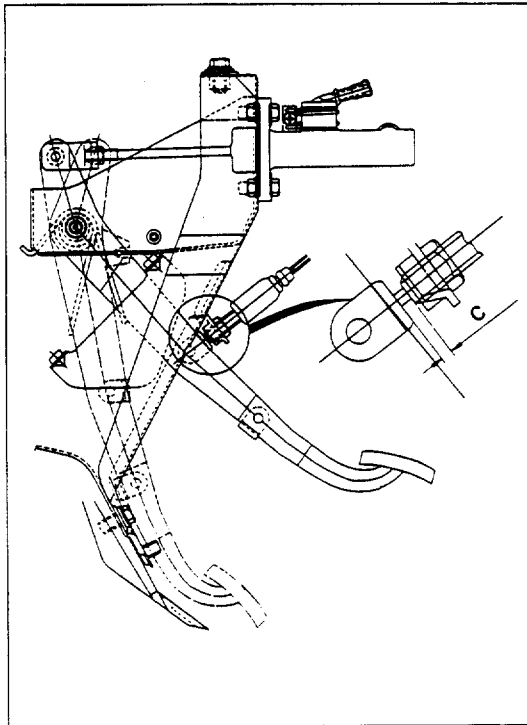
Clutch Switch or Stopper Bolt Clearance(C)	mm (in)
0.5 - 1.0 (0.02 - 0.04)	

Clutch Pedal Free Play	mm (in)
15 - 25 (0.59 - 0.98)	



3. Tighten the lock nut.

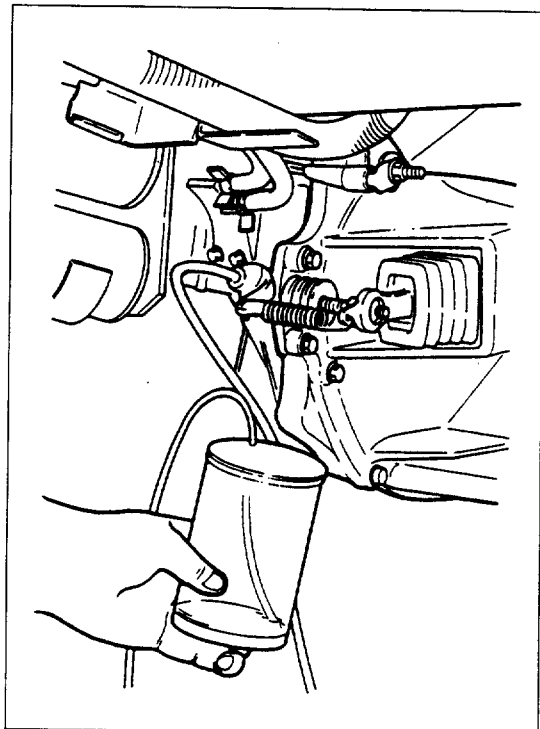
Lock Nut Torque	N·m(kg·m / lb·ft)
19 (1.9 / 14)	



CLUTCH HYDRAULIC CIRCUITS BLEEDING

If air enters the clutch circuit, it will causes clutch dragging. Therefore, bleeding operation should be performed if the clutch fluid reservoir has been emptied due to failure to mal-replenishment or if the hydraulic circuit has been disassembled. Bleeding operation calls for cooperative action of two men.

1. Check the level of clutch fluid in the reservoir and replenish if necessary.
 2. Remove the rubber cap from the bleeder screw and wipe clean the bleeder screw.
Connect a vinyl tube to the bleeder screw and insert the other end of the vinyl tube into a transparent container.
 3. Pump the clutch pedal repeatedly and hold it depressed.
 4. Loosen the bleeder screw on the clutch slave cylinder to release clutch fluid with air bubbles into the container and tighten the bleeder screw immediately.
 5. Release the clutch pedal carefully. Repeat the above operation until air bubbles disappear from the clutch fluid being pumped out into the container. During the bleeding operation, keep the clutch fluid reservoir filled to the specified level.
- Reinstall the rubber cap.



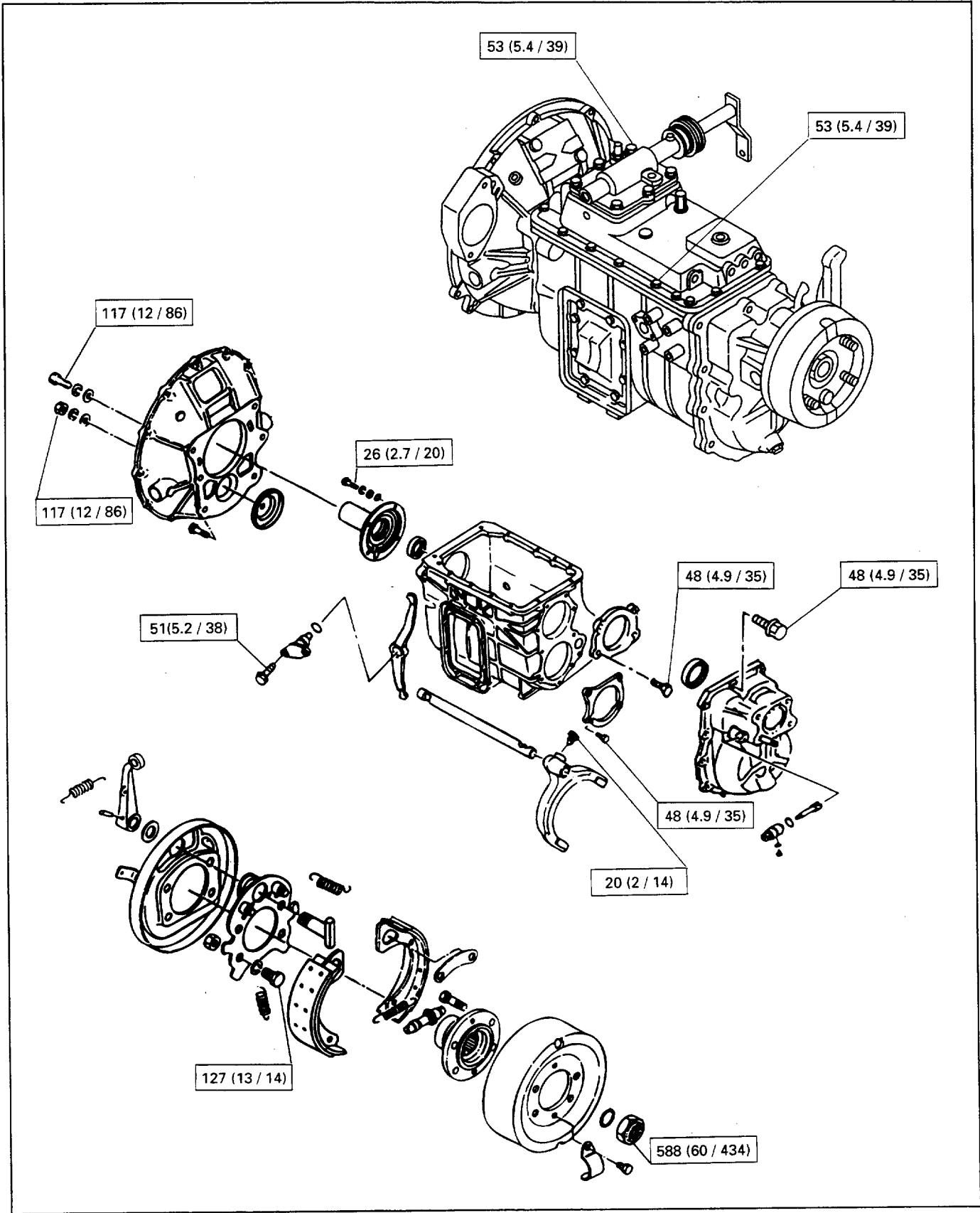
CAUTION

Do not let clutch fluid remain on a painted surface. Wash it off immediately.

FIXING TORQUE

MANUAL TRANSMISSION

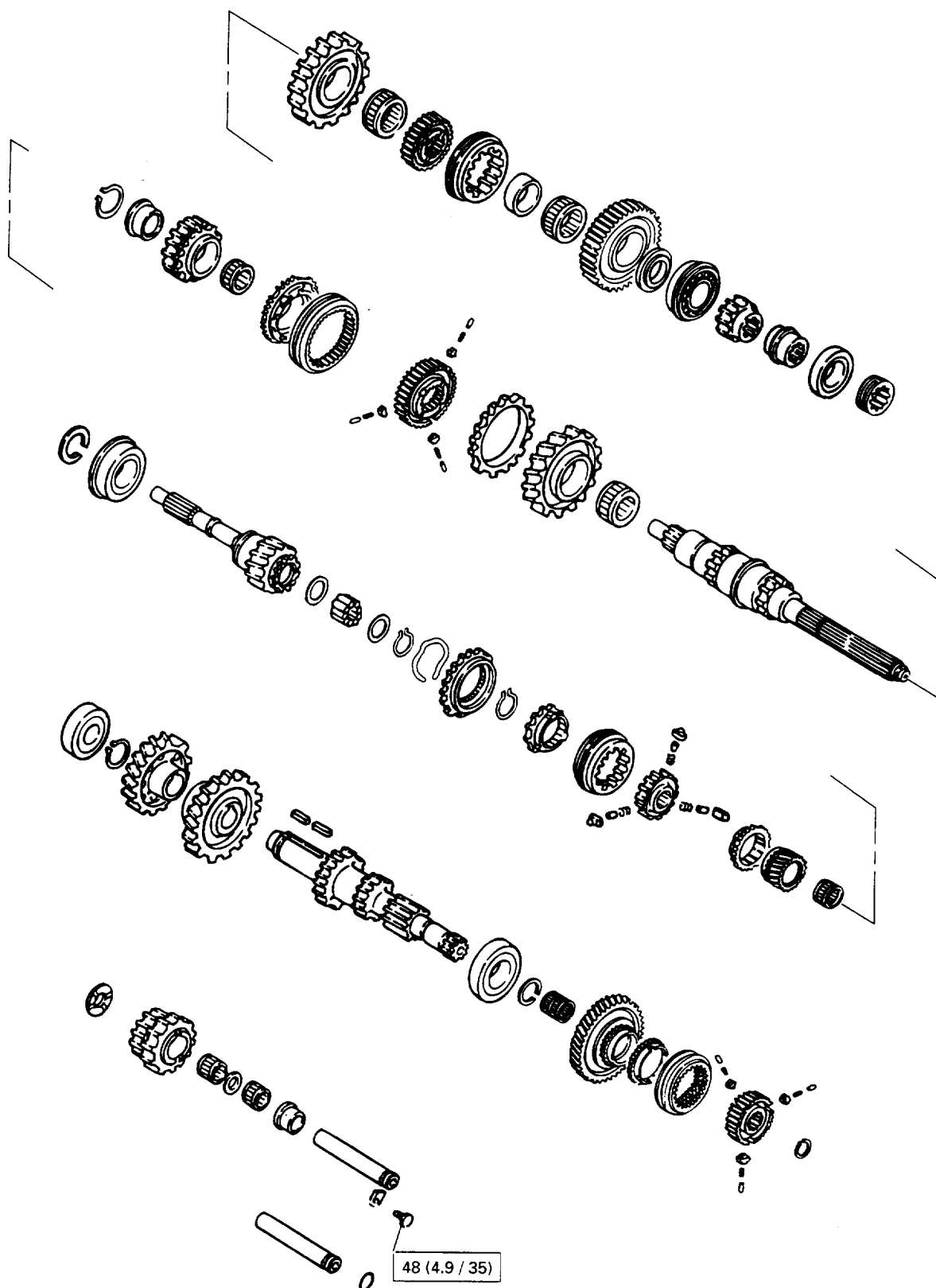
N·m (kg·m / lb·ft)



FIXING TORQUE (CONT.)

MANUAL TRANSMISSION

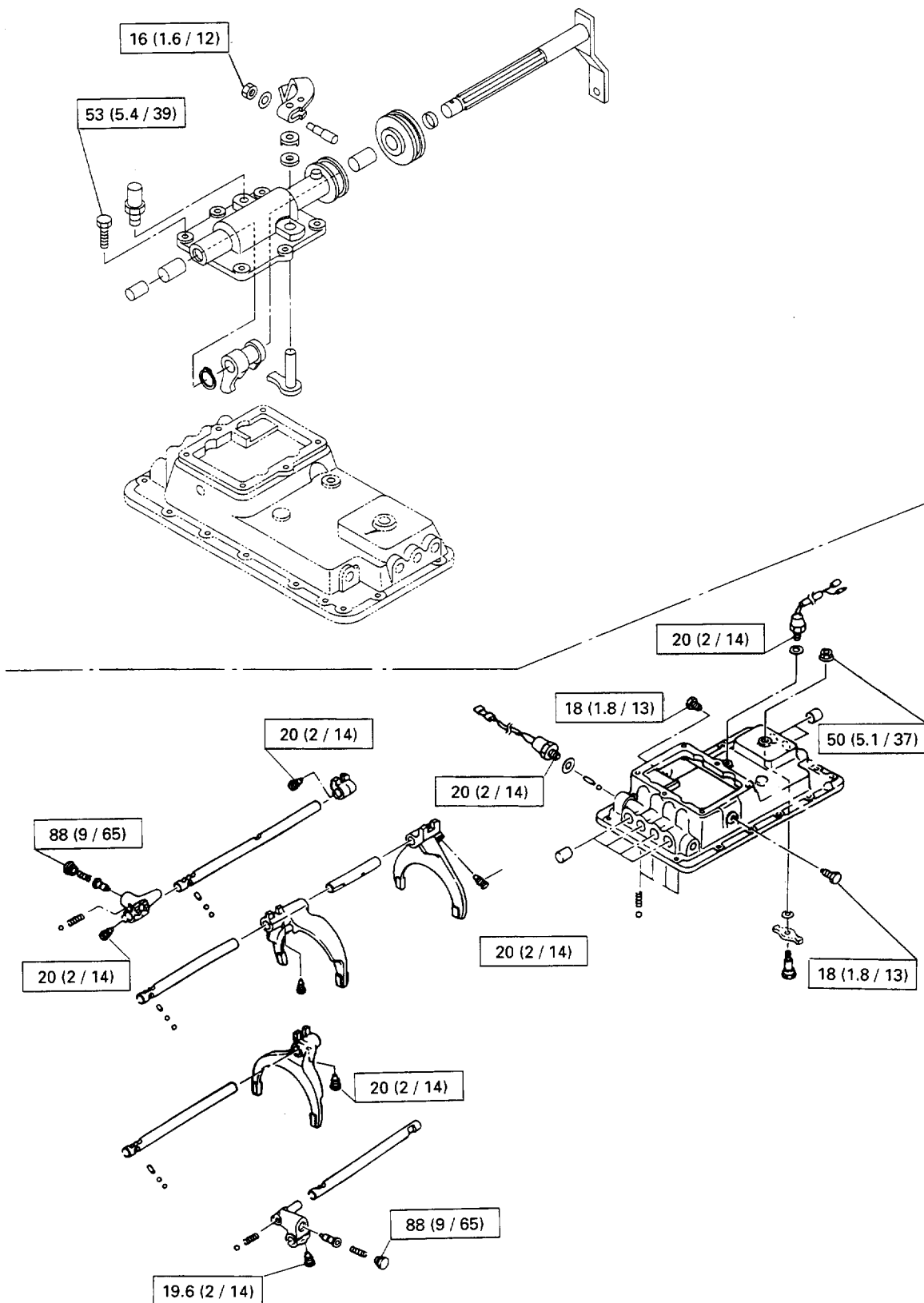
N·m (kg·m / lb·ft)



FIXING TORQUE (CONT.)

MANUAL TRANSMISSION

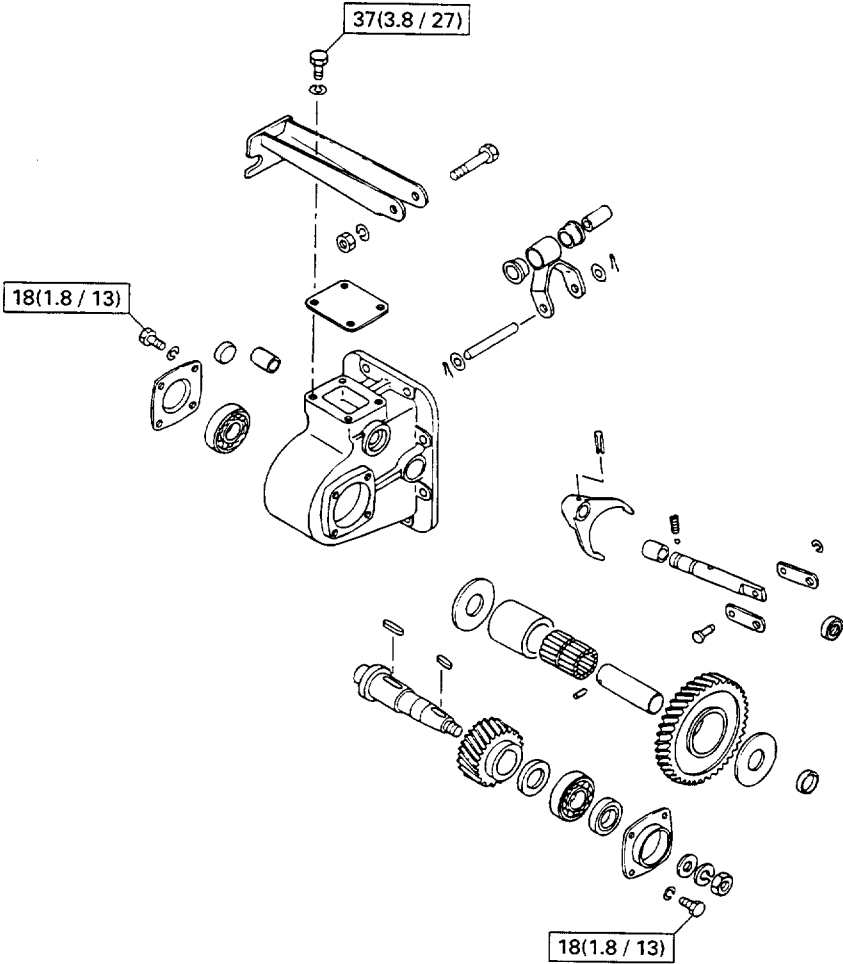
N·m (kg·m / lb·ft)



FIXING TORQUE (CONT.)

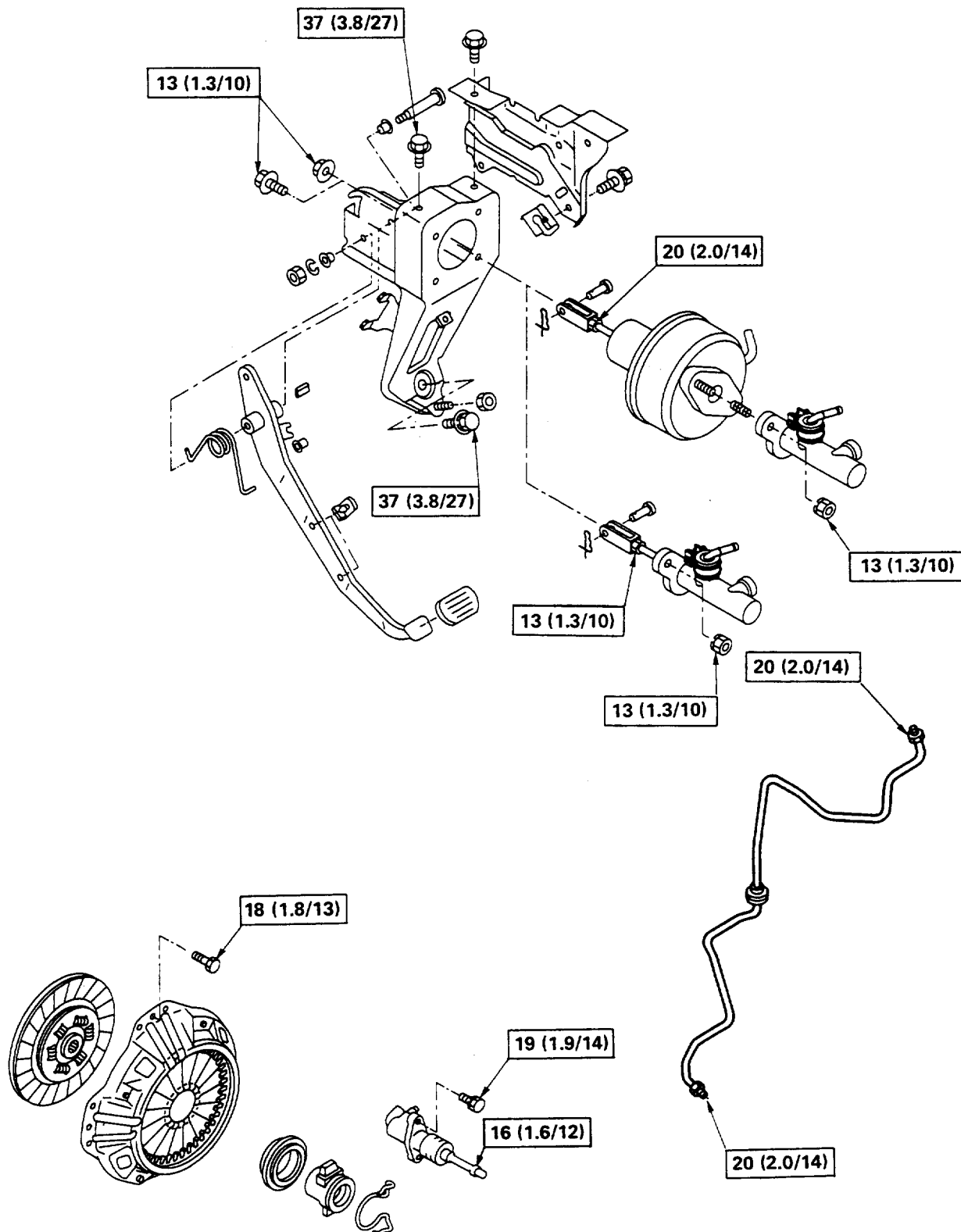
SIDE POWER TAKE-OFF

N·m (kg·m / lb·ft)



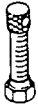
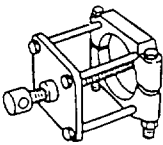

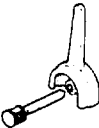
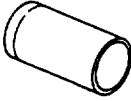
FIXING TORQUE (CONT.)**CLUTCH**

N·m (kg·m / lb·ft)



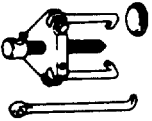


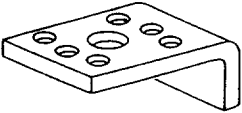
SPECIAL TOOL

MANUAL TRANSMISSION

ILLUSTRATION	PART NUMBER	PART NAME	REMARKS
	9-8521-0091-0	Gear bushing Remover	For speedometer gear
	9-8521-0169-0	Bearing Remover	For main/counter shaft rear
	9-8521-0095-0	Gear shaft Remover	For idle gear shaft
	9-8521-0168-0	Bearing Remover	For counter shaft front
	9-8522-0040-0	Setting tool	For bearing

SPECIAL TOOL (CONT.)

CLUTCH

ILLUSTRATION	PART NUMBER	PART NAME	REMARKS
	9-8521-0148-0	Bearing puller	
	1-8525-3008-0	Pilot Aligner	
	9-8523-1733-0	Handle	For clutch booster
	5-8840-2056-0	Support Plate	For clutch booster

SECTION 7

MANUAL TRANSMISSION AND CLUTCH

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SECTION 7B

MANUAL TRANSMISSION (MBP)

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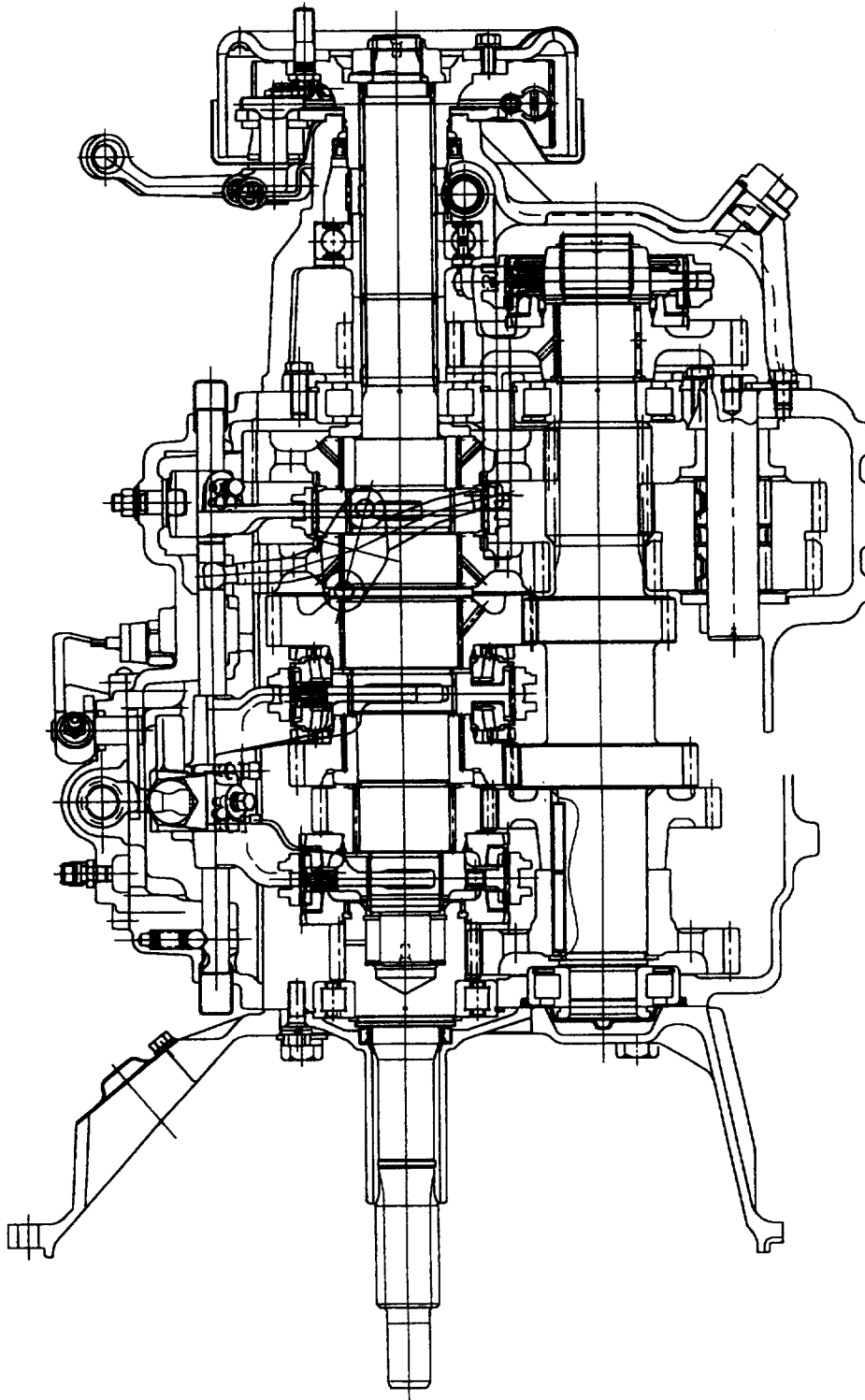
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GENERAL DESCRIPTION

Manual Transmission



The 6-speed transmissions have constant mesh first and reverse gears and the remaining gears are synchronized. Shifting is done with a remote shift control and two cables operating a shift quadrant mounted on the top of the transmission.

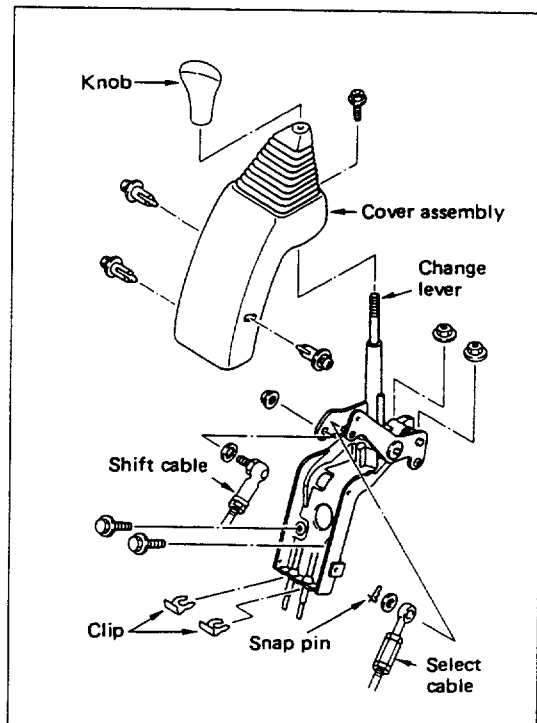
Both transmissions are equipped to drive a power take off unit. An identification plate is mounted on the side of the transmission.

ON-VEHICLE SERVICE

CHANGE LEVER ASSEMBLY REPLACEMENT



Removal Steps



1. **Change Lever Knob**
2. **Cover Assembly**
 - Remove the fixing screw and three clips.
3. **Shift Cable and Select Cable**
 - Disconnect the cables from the change lever.
 - Remove the clips and disconnect the cables from bracket.
4. **Change Lever Assembly**



Installation Steps

1. **Change Lever Assembly**
2. **Shift Cable and Select Cable**



When connecting the shift cable and the select cable to the change lever, adjust the cable.

Refer to "GEAR CONTROL CABLE ADJUSTMENT" given previously in section 00.

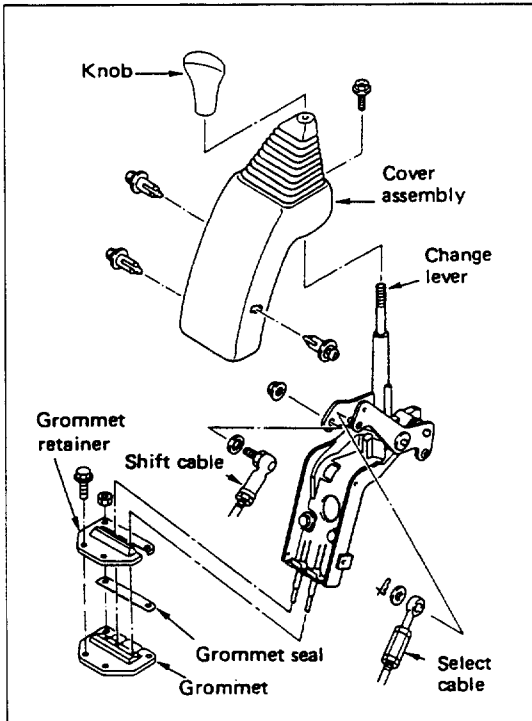


Lock nut torque	N·m (kg·m / lb·ft)
	21 (2.1 / 15.2)

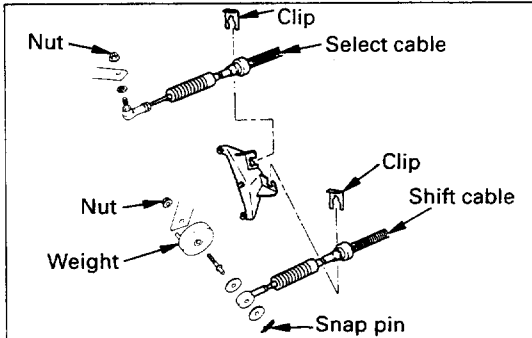
3. **Cover Assembly**
4. **Change Lever Knob**

GEAR CONTROL CABLE REPLACEMENT

↔ Removal Steps



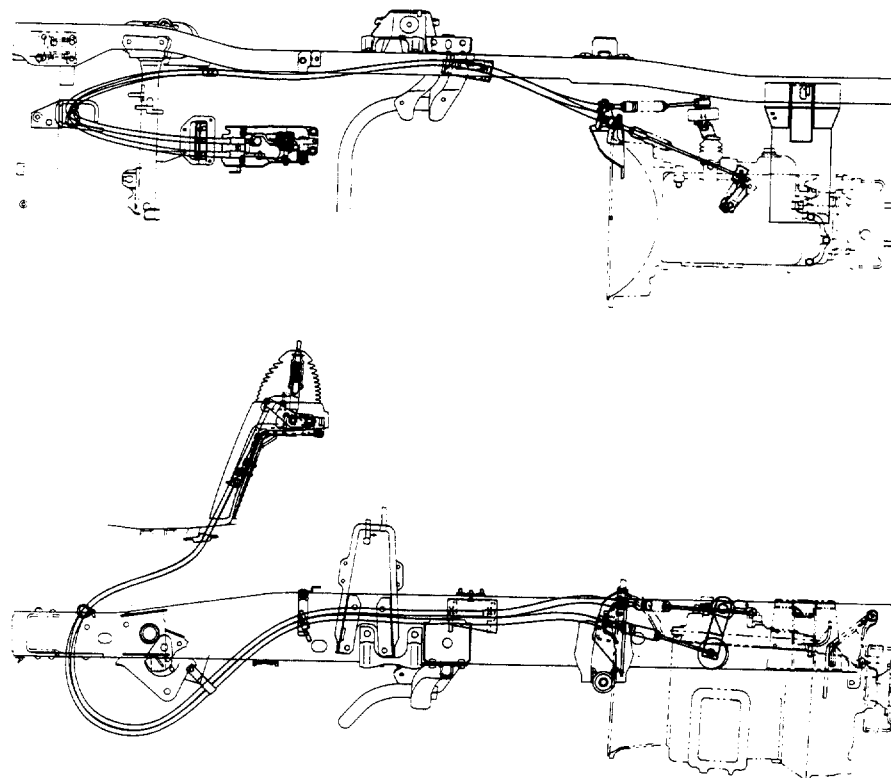
1. Change Lever Knob
2. Cover Assembly
3. Shift Cable and Select Cable
 - 1) Disconnect the shift and select cables from change lever.
 - 2) Remove the clips and disconnect the cables from change lever bracket.
 - 3) Remove the grommet retainer, grommet seal and grommet.
 - 4) Raise vehicle and support with suitable safety stands.
 - 5) Tilt the cab.
 - 6) Disconnect the shift cable and the select cable on the transmission side.
 - 7) Remove the c-clips and disconnect the shift cable and the select cable from the bracket.
 - 8) Remove the clips that fix the cables to the frames.
 - 9) Remove the shift and select cable assemblies.



🔍 Inspection and Repair

Check the cables for any deformation, damage or rust, and also check the sliding portion for any abnormal condition.

When there is any abnormal condition found, replace it with a new one.



Installation Steps

1. Shift Cable and Select Cable

- 1) Install temporarily that the shift cable and the select cable.



CAUTION:

Never bend the cables to radius less than 450 mm (18 in) unless it is necessary to do so for wiring purposes. And never bend the cables to radius less than 180 mm (7 in) even during wiring.

Install the cables carefully without unnecessary twisting the cable boots.

- 2) Fasten the cables with clips to the brackets on the transmission side.
- 3) Fasten the cables with clips to the change lever bracket.
- 4) Fasten the cables with clips to the frames. At this time, take care that the select cable comes above the shift cable.

- 5) Connect the shift cable and the select cable to the transmission.



Select Cable Nut Torque	N·m (kg·m / lb·ft)
<hr/>	
21 (2.1 / 15)	
<hr/>	



Shift Weight Fixing Nut Torque	N·m (kg·m / lb·ft)
<hr/>	
103 (10.5 / 76)	
<hr/>	

- 6) Install the grommet, grommet seal and grommet retainer.



Fixing Bolt & Nut Torque	N·m (kg·m / lb·ft)
<hr/>	
11 (1.1 / 8)	
<hr/>	



- 7) When connecting the shift cable and the select cable to the change lever, adjust the cables.
Refer to "GEAR CONTROL CABLE ADJUSTMENT" given previously in section 00.

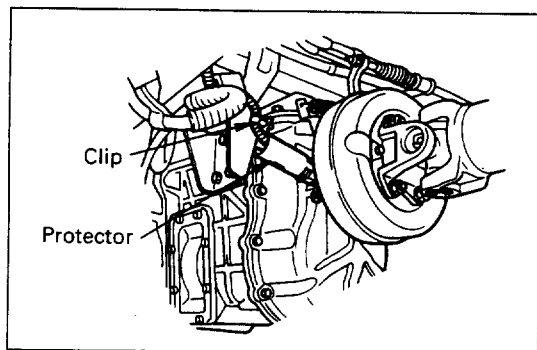
2. Cover Assembly

3. Change Lever Knob

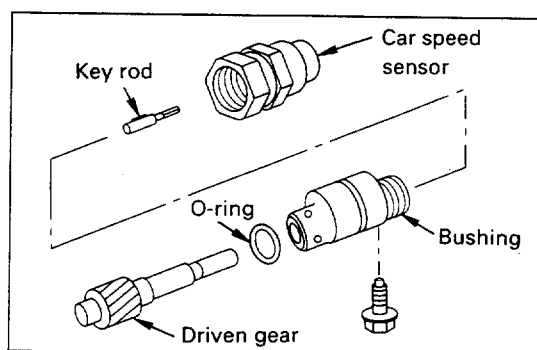
CAR SPEED SENSOR DRIVEN GEAR REPLACEMENT



Removal Steps



1. Protector
2. Wiring Connector



3. Car Speed Sensor with Key Rod
4. Car Speed Sensor Driven Gear Assembly
 - Remove the fixing bolt.
 - Remove the driven gear assembly.



Installation Steps

1. Car Speed Sensor Driven Gear Assembly



Fixing Bolt Torque	N·m (kg·m / lb·in)
	8 (0.8 / 69)

2. Car Speed Sensor with Key Rod

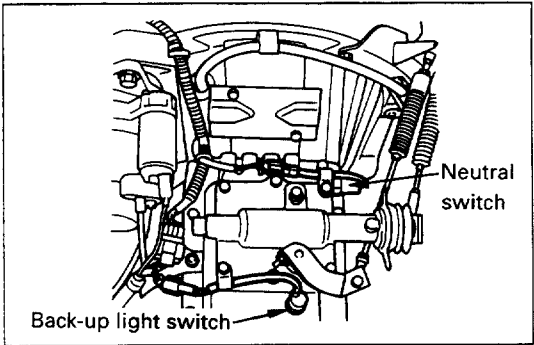


Fixing Bolt Torque	N·m (kg·m / lb·ft)
	25 (2.5 / 18)

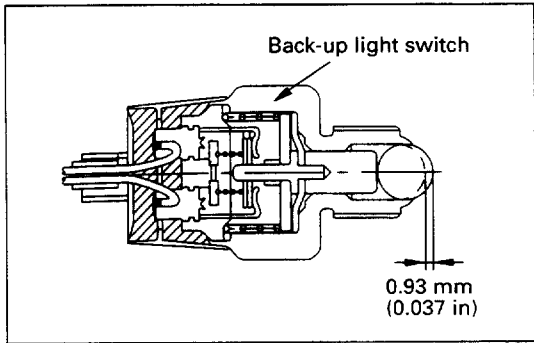
3. Wiring Connector
4. Protector

BACK-UP LIGHT SWITCH AND NEUTRAL SWITCH REPLACEMENT

↔ Removal Steps



- 1. Wiring Connector
- 2. Switch

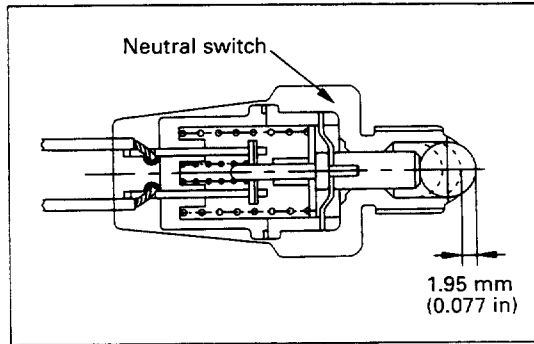


👁 Inspection and Repair

- When there is continuity between the terminals in the condition as it is, and when the continuity between the terminals is turned off by pressing the ball of the switch, the switch is normal.



Switch Operating Stroke	mm (in)
Back-up light Switch	0.93 (0.037)
Neutral Switch	1.95 (0.077)



↔ Installation Steps

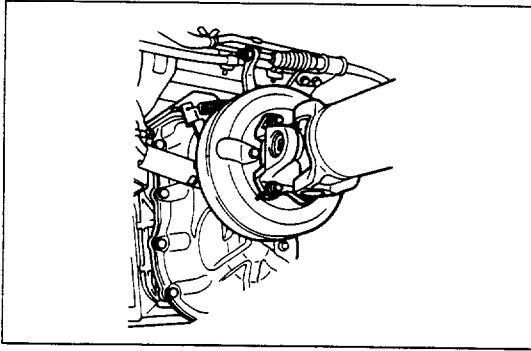
- 1. Switch



Switch Torque	N·m (kg·m / lb·ft)
	20 (2.0 / 14)

- 2. Wiring Connector

TRANSMISSION ASSEMBLY REPLACEMENT



Removal Steps

- Block the vehicle so it cannot move.
- Disconnect the ground cable from the battery negative(-) post.
- Raise vehicle and support with suitable safety stands.

1. Propeller Shaft

- Reference mark the flange yoke to the parking brake drum.
- Disconnect the propeller shaft at flange yoke.
- Put aside propeller shaft and tie it to the frame so it does not interfere with servicing work.

2. Wiring Connector

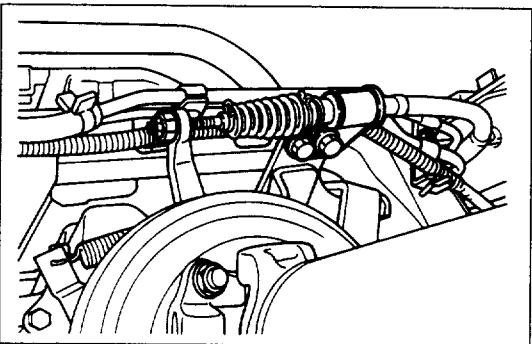
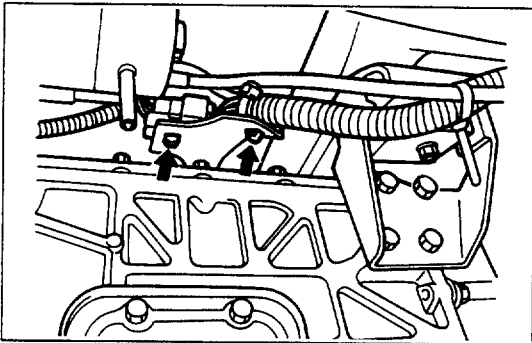
- Disconnect the wiring connector from the vehicle speed sensor, the neutral switch and the back-up light switch.

3. Harness Connector

- Remove the clip from the bracket.

NOTE:

Take care not to damage the clip.

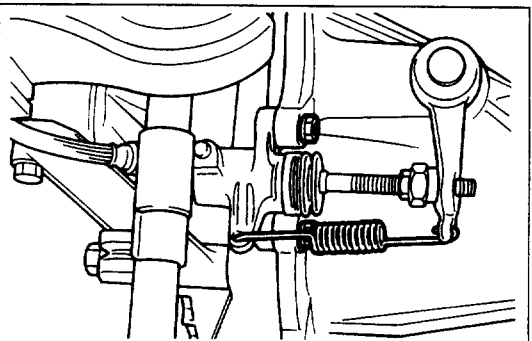


4. Parking Brake Cable

- Remove the lock nut from the parking brake cable.
- Remove the parking brake cable with the bracket.

5. Shift Cable and Select Cable

- Disconnect the shift cable and select cable on the transmission side.

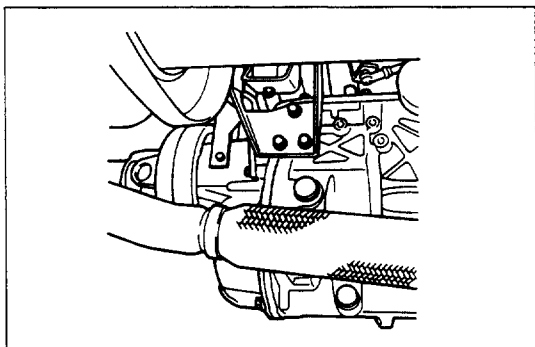


6. Clutch Slave Cylinder

- Remove the slave cylinder assembly with flexible hose attached and then tie it to the frame so that it does not interfere with servicing works.

7. Starter Motor Assembly

- Remove the starter motor assembly then tie it to the frame so that it does not interfere with servicing works.



8. Exhaust Pipe

9. Mounting Bracket Bolts

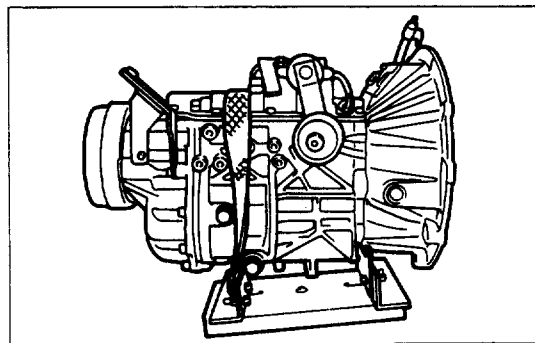
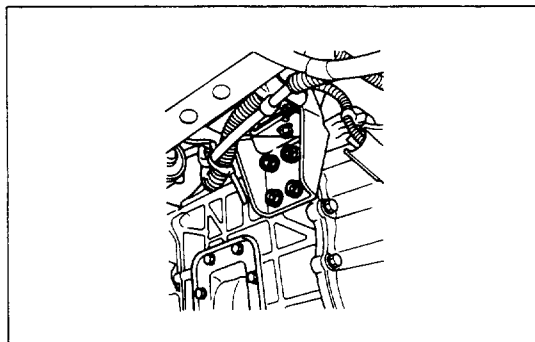
- Support the transmission with mission jack.



CAUTION:

To prevent the falling of the transmission, tie it securely to the mission jack with a chain or belt.

Do not allow transmission to hang unsupported from clutch. Damage to the clutch assembly will result.



10. Transmission Assembly

- Remove the nuts of the transmission mounting bracket on the crossmember side.
- Engine and transmission angle may need to be adjusted for removal.
- Hold the rear section of the engine by the jack or hoist.

CAUTION:

When lifting the engine by the jack, use wood blocks to prevent any possible damage to the oil pan.

- Remove transmission fastening bolts.
- Put on the transmission assembly rearward.



Installation Steps

1. Transmission Assembly

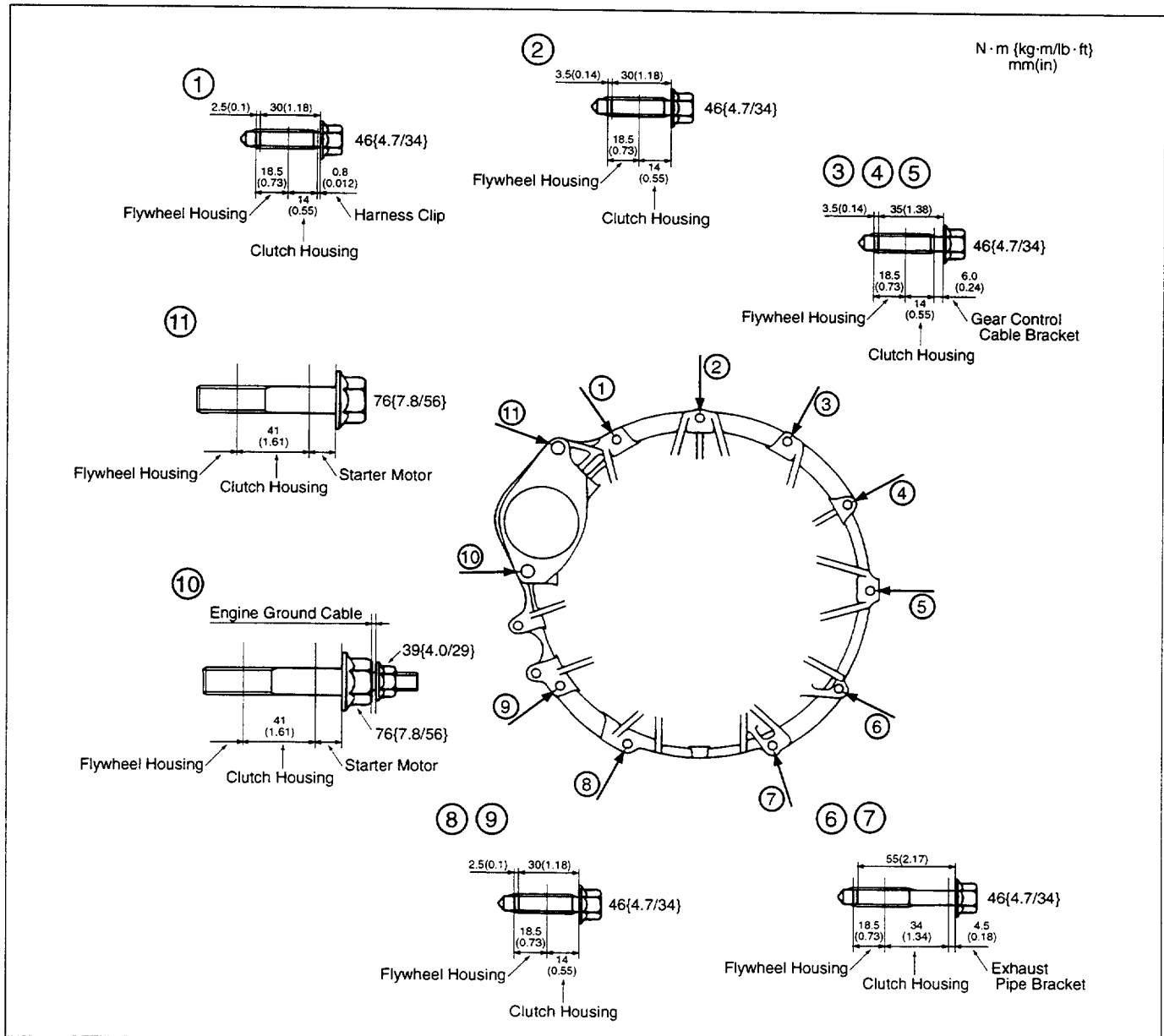
- Support the transmission with mission jack.



CAUTION:

To prevent the falling of the transmission, tie it securely to the mission jack with a chain or belt.

- Shift the transmission into high gear.
- Align the with the engine slope.
- Turn the output parking brake drum to aid clutch spline engagement.
- Install the clutch housing to flywheel housing fixing bolts.
- Clutch housing to flyheel housing bolts to figure.



2. Mounting Bracket Bolts

Mounting bracket bolts Torque	N·m (kg·m / lb·ft)
97 (9.9 / 72)	

3. Exhaust Pipe

- Install the exhaust pipe to bracket.



Exhaust pipe bracket bolts Torque	N·m (kg·m / lb·ft)
97 (9.9 / 72)	

4. Starter Motor Assembly

- Starter motor to flywheel housing bolts to figure.

5. Clutch Sleeve Cylinder

Clutch sleeve cylinder bolts Torque	N·m (kg·m / lb·ft)
16 (1.6 / 12)	

6. Shift Cable and Select Cable**7. Wiring Connector****8. Harness Connector****9. Parking Brake Cable****10. Propeller Shaft**

- Line up reference mark.



Propeller shaft nuts Torque	N·m (kg·m / lb·ft)
103 (10.5 / 76)	

- Connect the battery negative cable and remove the wheel blocks.
- Remove the safety stands.

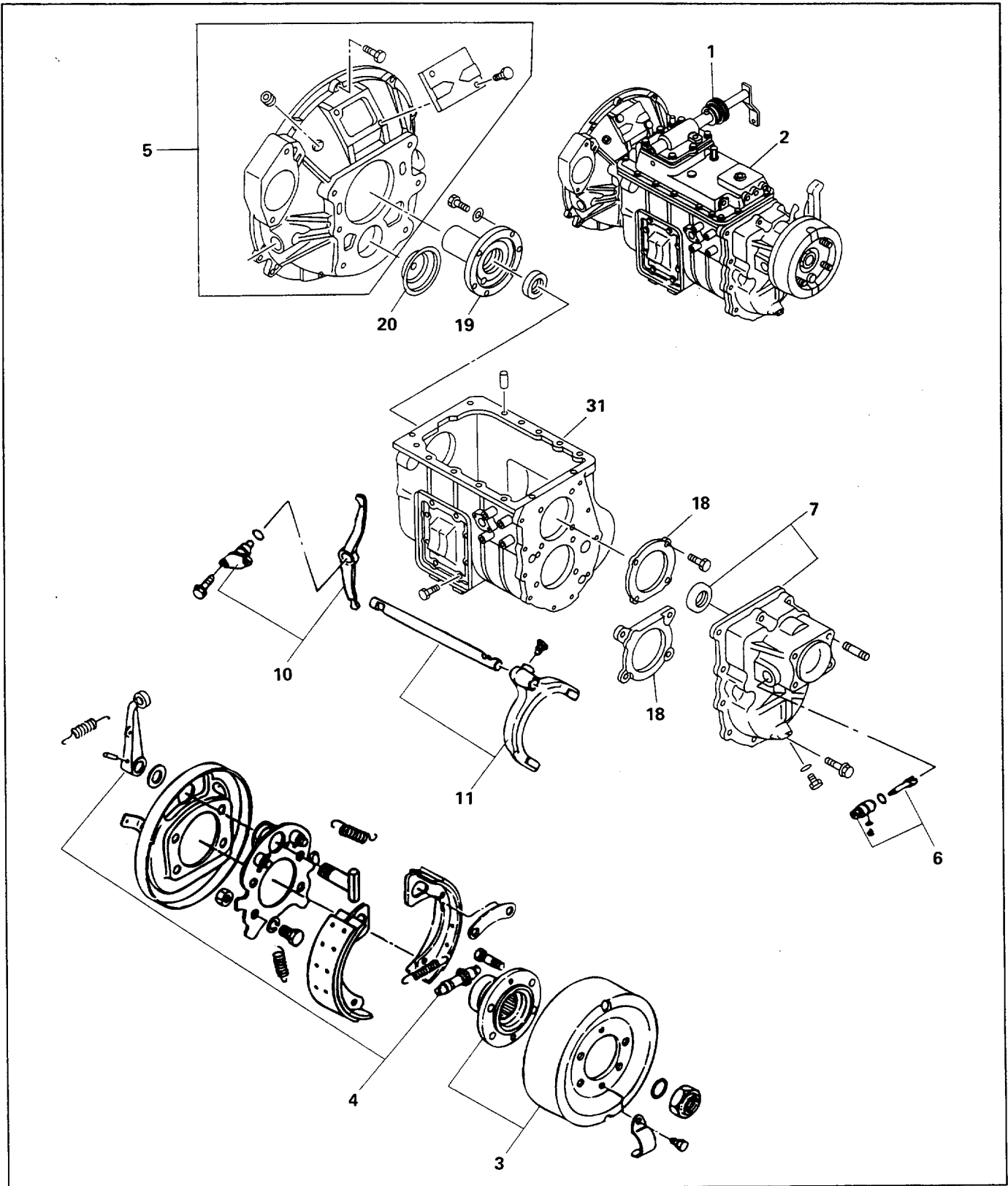
MEMO

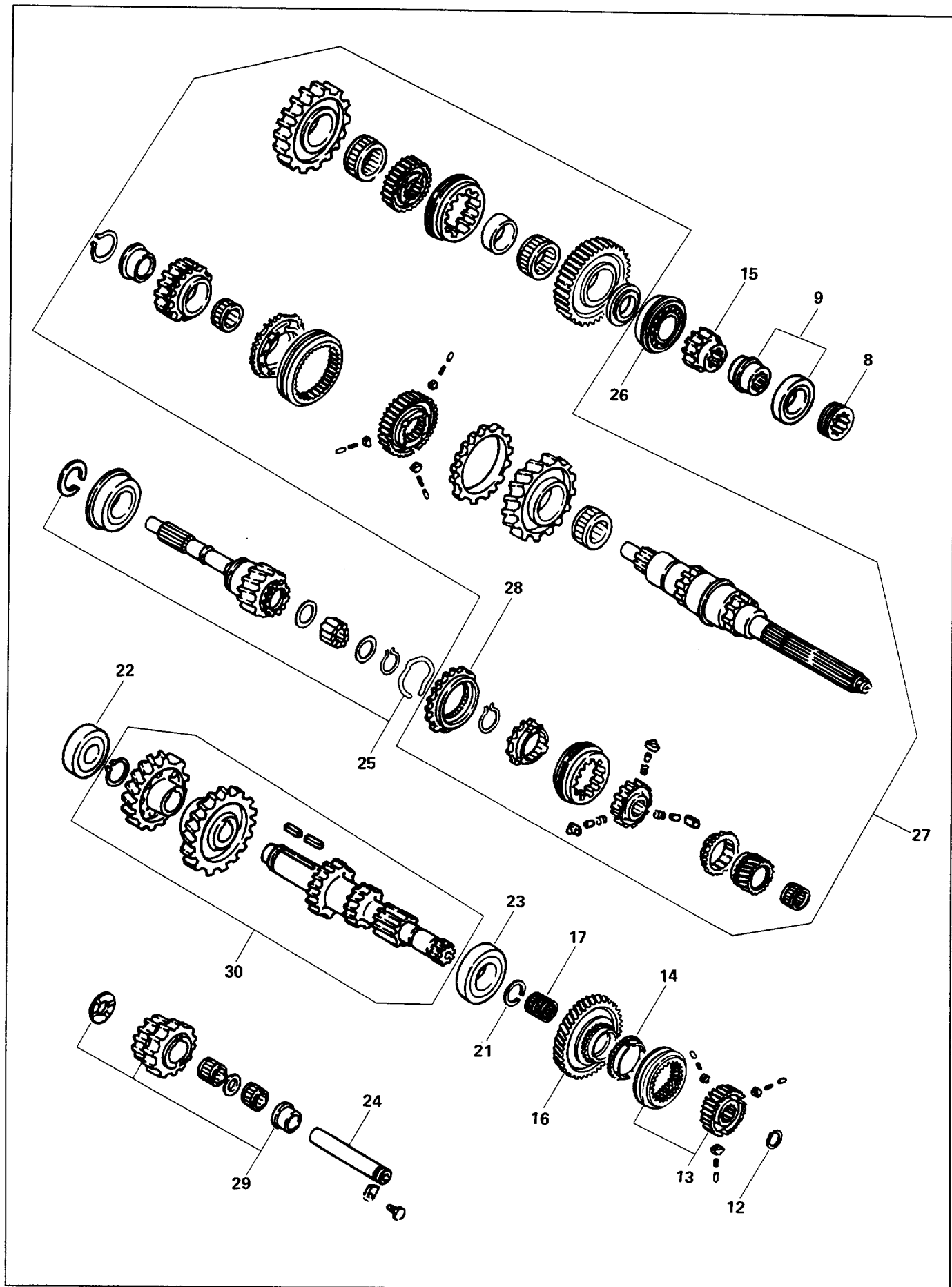
Handwriting practice lines consisting of 20 horizontal dashed lines.

UNIT REPAIR

MAJOR COMPONENTS

DISASSEMBLY





Disassembly Steps

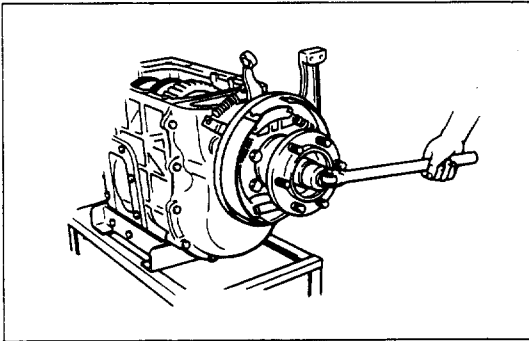
1. Upper quadrant box assembly
2. Lower quadrant box assembly
3. Parking brake drum and flange
4. Parking brake assembly
5. Clutch housing assembly
6. Speedometer driven gear assembly
7. Rear cover
8. Speedometer drive gear
9. Main shaft rear bearing and distance piece (for 6 speed)
10. 6th relay lever and spindle
11. 6th shift arm and rod
12. Snap ring; 6th synchronizer
13. 6th synchronizer assembly
14. 6th blocking ring
15. 6th main shaft gear
16. 6th counter shaft gear
17. Needle roller bearing; 6th counter gear
18. Bearing retainer
19. Front cover assembly
20. Counter shaft front bearing cover
21. Snap ring; counter shaft rear bearing
22. Counter shaft front bearing
23. Counter shaft rear bearing
24. Reverse idle gear shaft
25. Top gear shaft assembly
26. Main shaft rear bearing
27. Main shaft assembly
28. Synchronizer clutch gear
29. Reverse idle gear, thrust collar and washer
30. Counter shaft assembly
31. Transmission case



Disassembly Steps

1. Upper Quadrant Box Assembly
2. Lower Quadrant Box Assembly
3. Parking Brake Drum and Flange

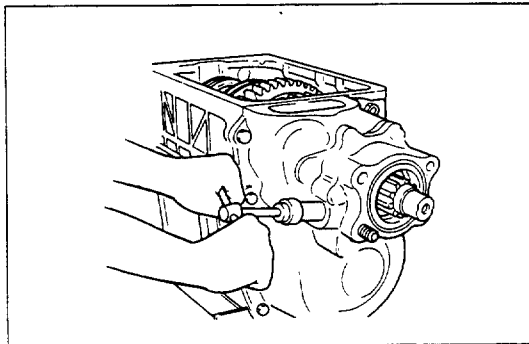
Engage two gear sets or wedge a piece of hard between the gears and case to prevent turning of main shaft.

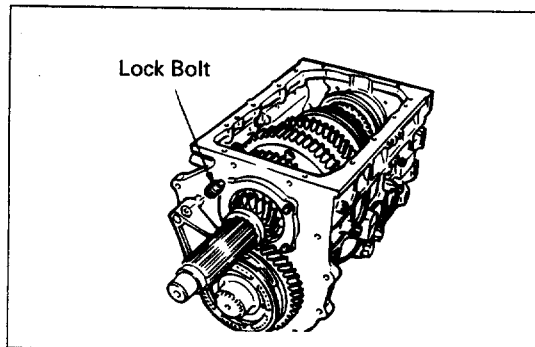


4. Parking Brake Assembly
5. Clutch Housing Assembly
6. Speedometer Driven Gear Assembly

Disassemble these parts if necessary.

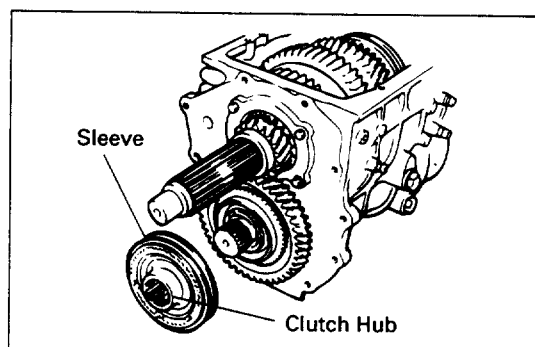
Remover: 9-8521-0091-0





7. Rear Cover
8. Speedometer Drive Gear
9. Main Shaft Rear Bearing and Distance Piece
10. 6th Relay Lever and Spindle
11. 6th Shift Arm and Rod

Remove the lock bolt, then pull out the 6th shift arm and rod.

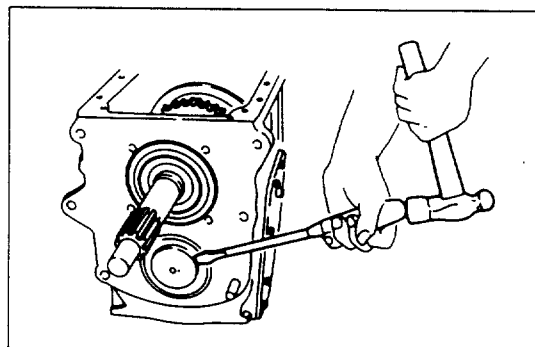


12. Snap Ring; 6th Synchronizer
13. 6th Synchronizer Assembly

Clutch hub must be removed with sleeve.

NOTE:

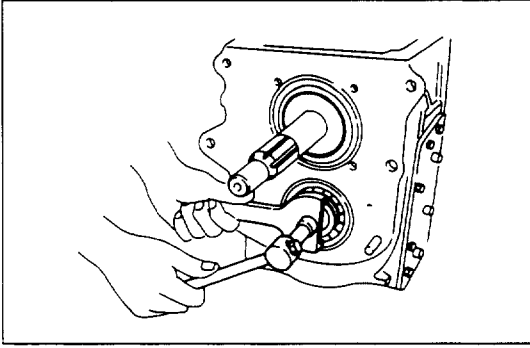
Be careful not to lose plungers and springs.



14. 6th Blocking Ring
15. 6th Main Shaft Gear
16. 6th Counter Shaft Gear
17. Needle Roller Bearing; 6th Counter Shaft Gear
18. Bearing Retainer
19. Front Cover Assembly
20. Counter Shaft Front Bearing Cover

Tap the side of seal cover as shown.

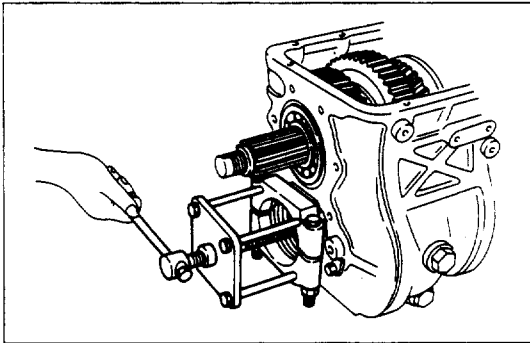
21. Snap Ring; Counter Shaft Rear Bearing



22. Counter Shaft Front Bearing

Remove the counter shaft front bearing using a special tool.

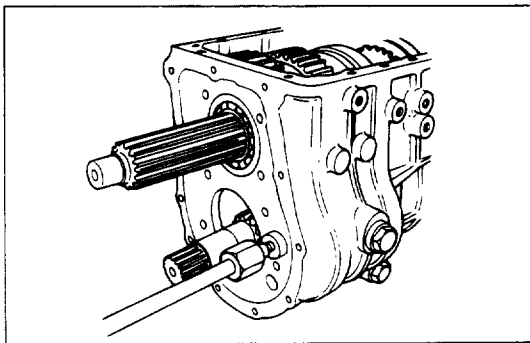
Remover: 9-8521-0168-0



23. Counter Shaft Rear Bearing

Remove the counter shaft rear bearing using a special tool.

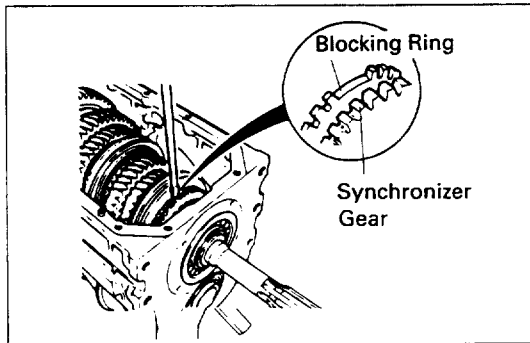
Remover: 9-8521-0169-0



24. Reverse Idle Gear Shaft

Before removing, remove the set screw.

Remover: 9-8521-0095-0



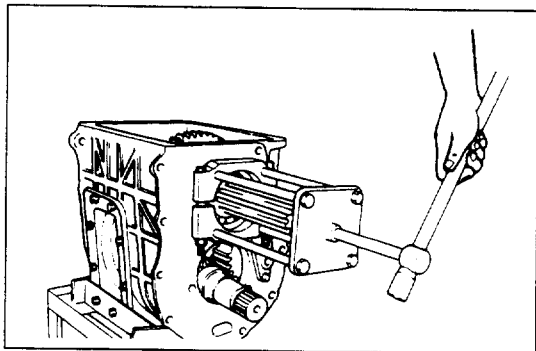
25. Top Gear Shaft Assembly

- Insert "-" screwdriver between top gear and synchronizer gear, disconnect synchronizer from retaining clip of top gear.
- Remove the top gear shaft assembly.



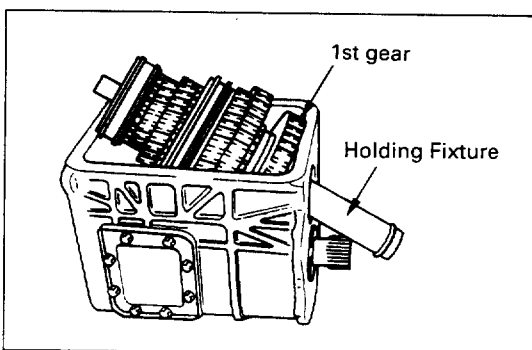
NOTE:

Be careful not to damage to the synchronizer blocking ring.

**26. Main Shaft Rear Bearing**

Remove the main shaft rear bearing using a special tool.

Remover: 9-8521-0169-0

**27. Main Shaft Assembly**

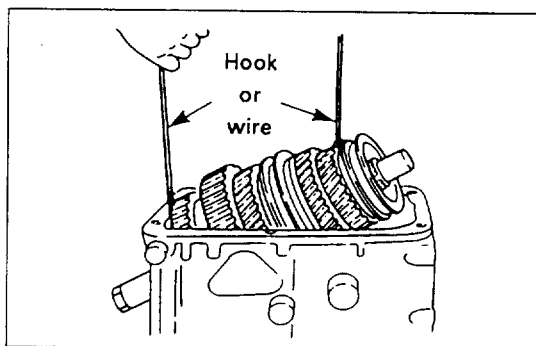
1. Use a flange nut to attach a Holding fixture to the rear of the main shaft.

This will prevent the reverse gear, and the thrust washer from falling free during the disassembly procedure.

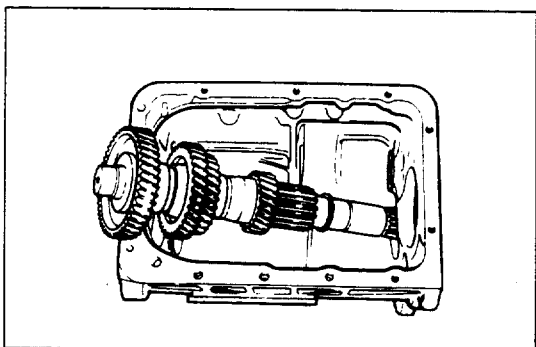
Holding Fixture Dimensions (Reference) mm (in.)

Length	Inside Dia.	Thickness
210 (8.27)	46 - 48 (1.81 - 1.89)	3 - 5 (0.12 - 0.20)

2. Remove the main shaft assembly from the case using a suitable hook or wire.

**28. Synchronizer Clutch Gear****29. Reverse Idle Gear, Thrust Collar and Washer****30. Counter Shaft Assembly**

- Remove the counter shaft assembly from the case using a suitable hook or wire.

**31. Transmission Case**

INSPECTION AND REPAIR

Make necessary correction or parts replacement if wear, damage or any other abnormal conditions are found through inspection.

- Bearing
- Gear
- Synchronizer clutch gear
- Flange
- Top gear shaft
- Reverse idle gear shaft

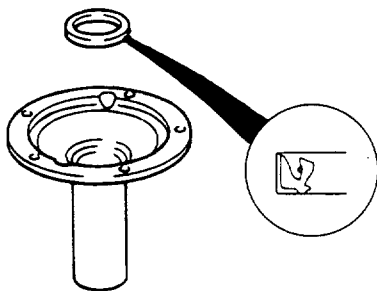


Visual Check

Inspect all disassembled parts for wear, damage or other abnormal conditions.

Inspect the following parts paying particular attention to the points shown in the illustrations.

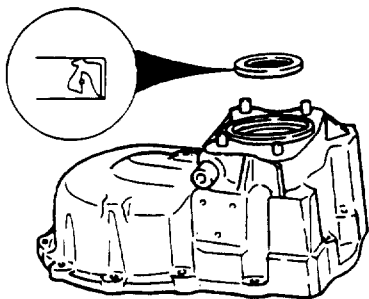
Front

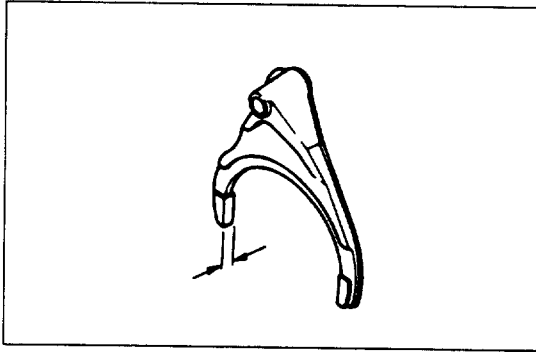


Front and Rear Cover Oil Seal Replacement

1. Note direction of oil seal installation.
2. Apply engine oil to outer circumference of oil seal.
3. Apply grease to the lip of oil seal
4. Insert oil seal until it is properly seated in position.

Rear



**6th Shift Arm**

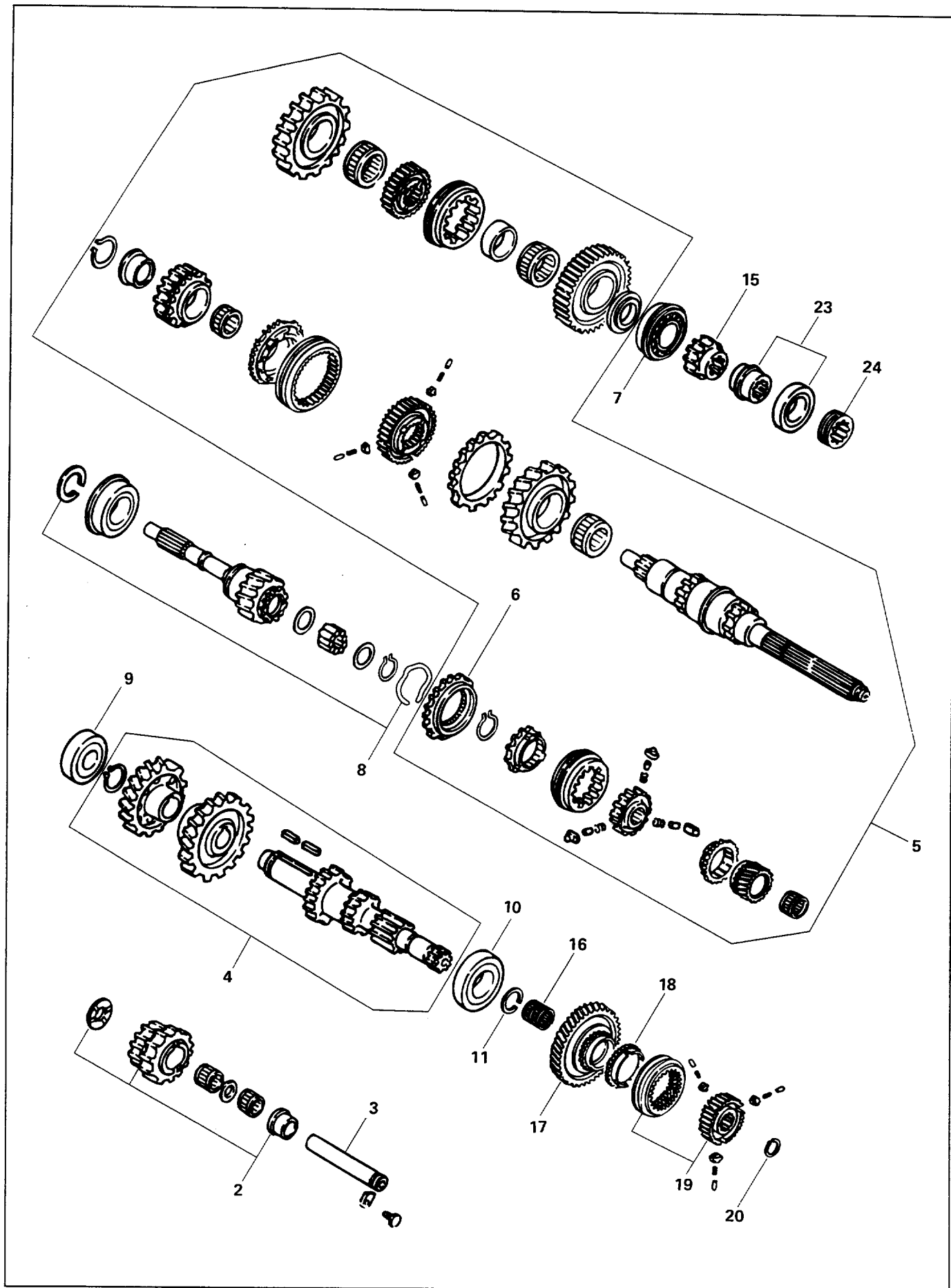
Measure the 6th shift arm thickness.



Shift Arm Thickness mm (in)

Standard	Limit
11.0 (0.433)	10.0 (0.394)

If the measured value exceeds the specified limit, the shift arm should be replaced.



Reassembly Steps

1. Transmission case
2. Reverse idle gear, thrust collar and washer
3. Reverse idle gear shaft
4. Counter shaft assembly
5. Main shaft assembly
6. Synchronizer clutch gear
7. Main shaft rear bearing
8. Top gear shaft assembly
9. Counter shaft front bearing
10. Counter shaft rear bearing
11. Snap ring; counter shaft rear bearing
12. Bearing retainer
13. Counter shaft front bearing cover
14. Front cover assembly
15. 6th main shaft gear
16. Needle roller bearing; 6th counter gear
17. 6th counter shaft gear
18. 6th blocking ring
19. 6th synchronizer assembly
20. Snap ring; 6th synchronizer
21. 6th shift arm and rod
22. 6th relay lever and spindle
23. Main shaft rear bearing and distance piece (for 6 speed)
24. Speedometer drive gear
25. Rear cover
26. Speedometer driven gear assembly
27. Clutch housing assembly
28. Parking brake assembly
29. Parking brake drum and flange
30. Lower quadrant box assembly
31. Upper quadrant box assembly



Reassembly Steps

Preparation



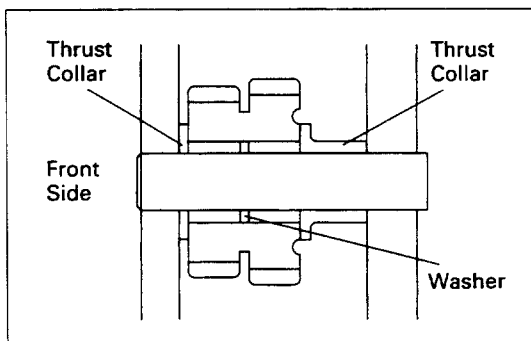
1. Clean each parts before reassembly
2. Be sure to use anew O-ring and oil seal.
3. Remove liquid gasket from each fitting surface.

1. Transmission Case

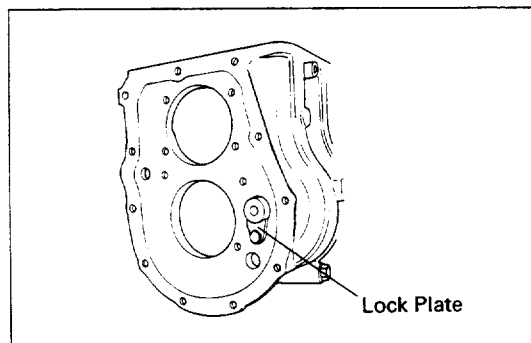
2. Reverse Idle Gear, Thrust Collar and Washer

3. Reverse Idle Gear Shaft

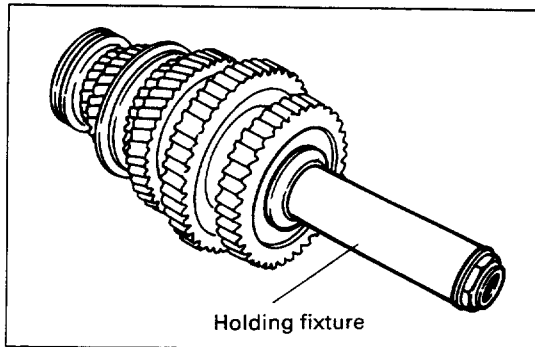
- Apply grease to needle roller bearing.
- Reassemble each parts as figure.



- Align cutting groove of reverse idle gear shaft and lock plate installation position.
- Install the reverse idle gear shaft by tapping lightly.



Lock Plate	Bolt Torque	N·m (kg·m / lb·ft)
		48 (4.9 / 35)



4. Counter Shaft Assembly

NOTE:

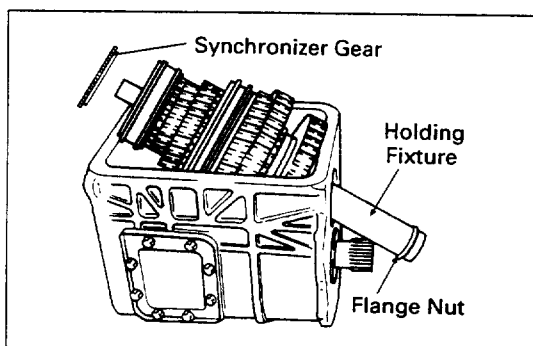
The counter shaft assembly is very heavy. Always support the counter shaft assembly with a hoist and wire.

5. Main Shaft Assembly

6. Synchronizer Clutch Gear



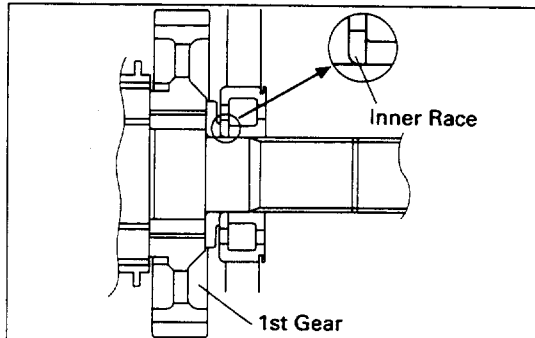
- Check that the gear and washer are installed to the correct position.
- Install the holding fixture to the main shaft, then semi tighten the used flange nut.



- Set the synchronizer clutch gear.
- Remove the main shaft assembly from the case using a suitable hook or wire.

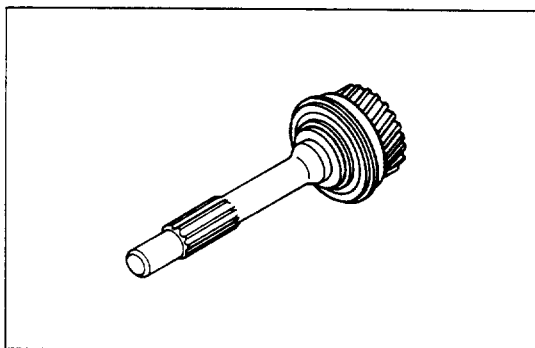
NOTE:

The main shaft assembly is very heavy. If it falls, it can cause serious injury to service personnel. Place supports beneath the main shaft assembly to prevent it from falling.



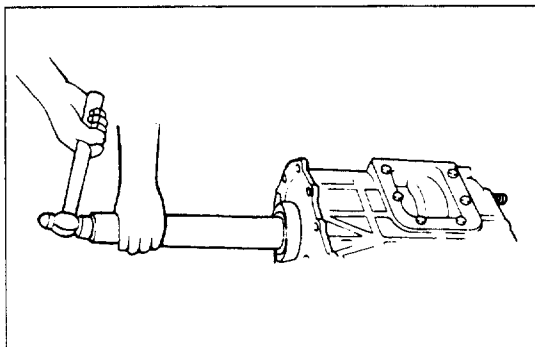
7. Main Shaft Rear Bearing

- Apply engine oil to the bearing.
- Install the bearing to the main shaft. Chamfered side of inner race must be facing the thrust washer.
- Install snap ring to the groove of outer race.



8. Top Gear Shaft Assembly

- Apply grease to the pilot bearing.
- Install top gear shaft.
- Check that the synchronizer clutch gear is fitted into the main shaft retaining clip correctly.
- Check that the top gear shaft turns smoothly.



9. Counter Shaft Front Bearing

10. Counter Shaft Rear Bearing

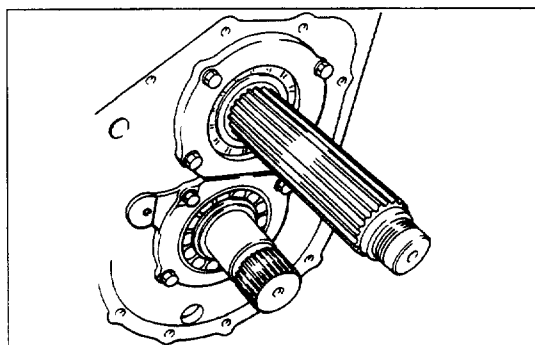
11. Snap Ring; Counter Shaft Rear Bearing



Installer: 9-8522-0040-0



1. Turn the transmission case upside down.
2. Use a hammer and the bearing installer to install the bearing to the transmission case.
3. Return the transmission case to its upright position.



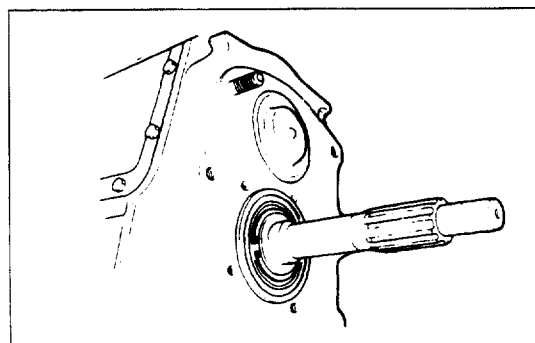
12. Bearing Retainer



Tighten bearing retainer bolts evenly.

Bearing Retainer Bolt Torque N·m (kg·m / lb·ft)

48 (4.9 / 35)

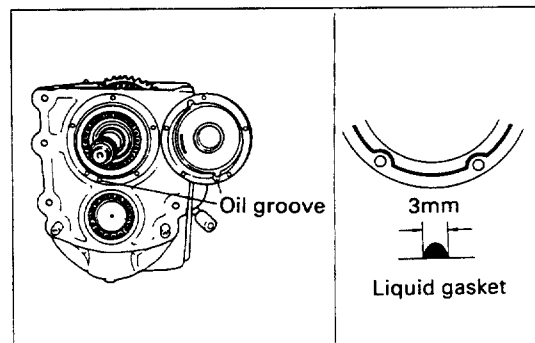


13. Counter Shaft Front Bearing Cover

Use a plastic hammer to lightly drive the front bearing cover into position in the transmission case.

NOTE:

Take care not to damage bearing cover outside rubber.



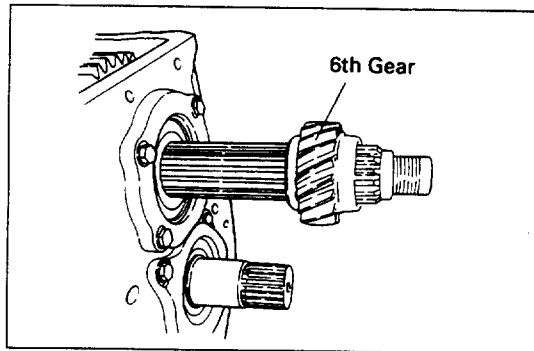
14. Front Cover Assembly



1. When installing the front cover, be careful not to damage the oil seal lip.
2. Apply grease to the oil seal lip.
3. Align the main housing oil holes and the front cover oil grooves.
4. Apply recommended liquid gasket (LOCTITE FMD-127 or equivalent) to the front cover fitting surface.

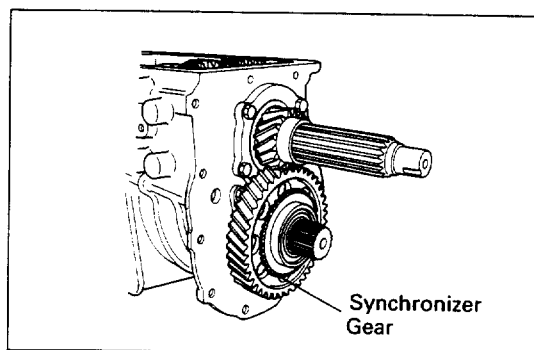
Front Cover Bolt Torque N·m (kg·m / lb·ft)

26 (2.7 / 20)



15. 6th Main Shaft Gear

Install the 6th main gear as figure.



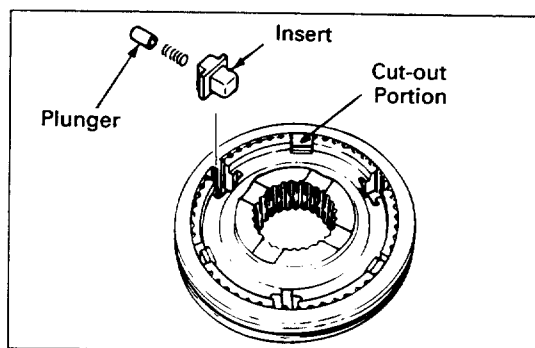
16. Needle Roller Bearing; 6th Counter Gear

17. 6th Counter Shaft Gear



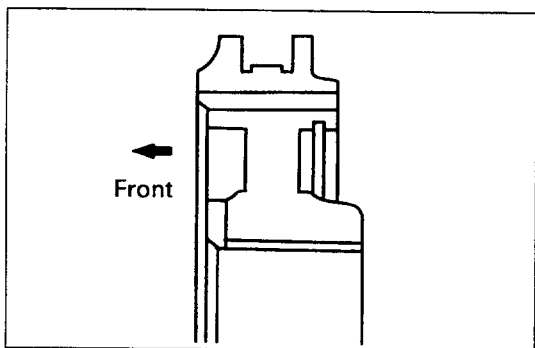
18. 6th Blocking Ring

- Apply grease to needle roller bearing.
- Install needle roller bearing and 6th counter shaft gear. Synchronizer clutch gear side of the 6th counter shaft gear must be facing rear of the transmission case.



19. 6th Synchronizer Assembly

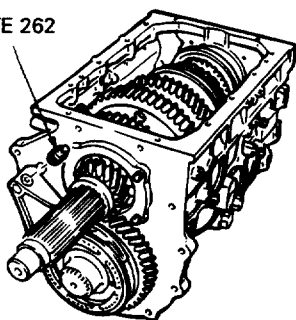
- Install snap ring to the sleeve.
- Install insert, spring and plunger to the clutch hub.
- Align cut-out portion of sleeve spline and clutch hub groove (except plunger installing position).
- Install the sleeve to the clutch hub with pressing plunger.



- The clutch hub oil grooves must be facing the front of the transmission case.

20. Snap Ring; 6th Synchronizer

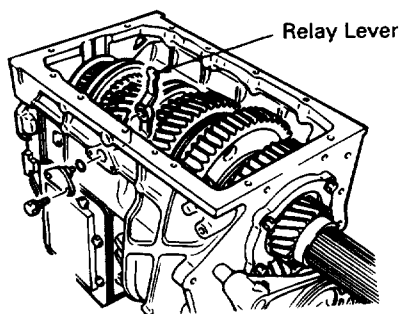
LOCTITE 262

**21. 6th Shift Arm and Rod**

- Apply liquid gasket (LOCTITE 262 or equivalent) to threaded portion of the bolt.
- Tighten lock bolt to the specified torque.



Lock Bolt Torque	N·m (kg·m / lb·ft)
20 (2.0 / 14)	

**22. 6th Relay Lever and Spindle**

- Install O-ring to the spindle.
- Align the relay lever to the groove of shift arm rod.
- Install the spindle to the specified torque.

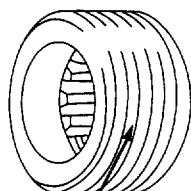


Spindle Bolt Torque	N·m (kg·m / lb·ft)
51 (5.2 / 38)	

NOTE:

Be careful not to damage to O-ring.

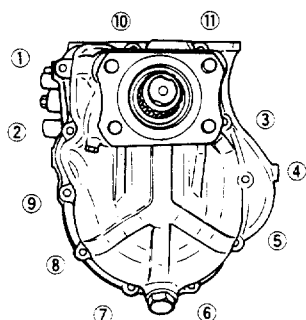
Front Side



Apply grease

23. Main Shaft Rear Bearing and Distance Piece**24. Speedometer Drive Gear**

- Apply grease to gear teeth surface.
- Install the speedometer drive gear. The spline cutting portion of the speedometer drive gear must be facing front of the transmission case.

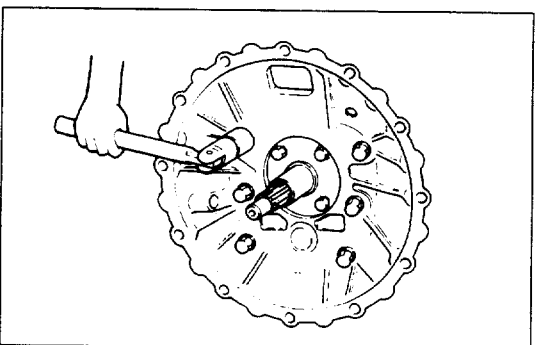
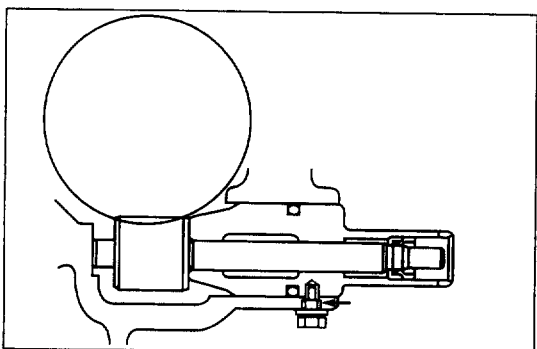
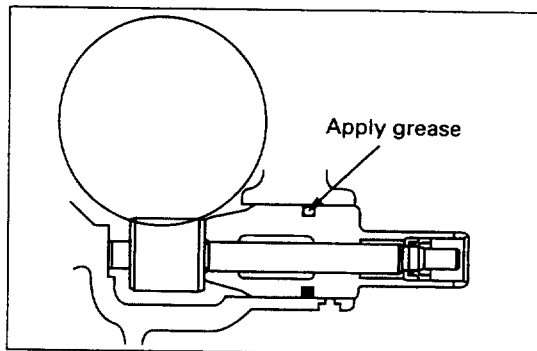
**25. Rear Cover**

- Apply grease to the oil seal lip.
- Apply liquid gasket (LOCTITE FMD-127 or equivalent) to the fitting surface of the rear cover.
- Tighten rear cover bolts in the sequence show in the figure.



Rear Cover Bolt Torque	N·m (kg·m / lb·ft)
48 (4.9 / 35)	





26. Speedometer Driven Gear Assembly



1. Apply grease to O-ring, then install it to the bushing.
2. Insert the bushing to the rear cover, then adjust it for 0.1 – 0.3mm (0.004 – 0.012 in.) clearance between the speedometer drive gear and driven gear.
3. Apply screw hole mark to the bushing from screw hole of the rear cover, then remove the bushing.
4. Make a screw hole to screw hole mark applied at step No.3.



Screw Hole Size mm(in)

Diameter	Depth
4.5 (0.177)	3.5 – 4.0 (0.138 – 0.157)

5. Install the bushing to the rear cover, then align screw holes.
6. tighten the set screw.

27. Clutch Housing Assembly



Clutch Housing Bolt Torque N·m (kg·m / lb·ft)

118 (12 / 87)

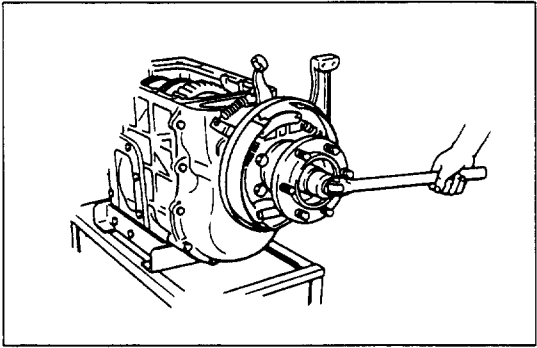
28. Parking Brake Assembly



Parking Brake Bolt (or Nut) Torque N·m (kg·m / lb·ft)

127 (13 / 94)

Refer to Sec.5C "Parking Brake" for parking brake adjustment.



29. Parking Brake Drum and Flange



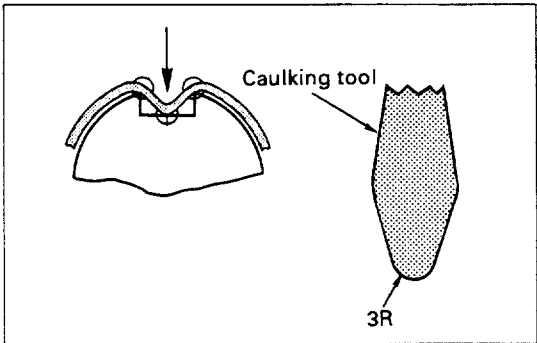
- Apply grease to O-ring, and install it to the groove of the flange.
- Tighten new flange nut to the specified torque.



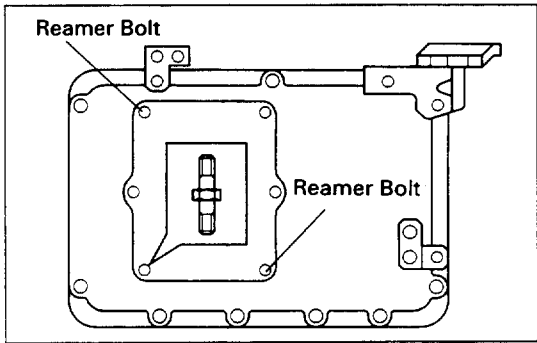
Flange Nut Torque	N·m (kg·m / lb·ft)
588 (60 / 434)	

NOTE:

Be sure to use a new flange nut.



- After tightening, caulk the flange nut against slot in main shaft. When caulking, the nut flange and the groove of the main shaft or/and must touch at both shoulders and the bottom of the grove even if small crack occurs on the caulking flange of nut.



30. Lower Quadrant Box Assembly

31. Upper Quadrant Box Assembly



- Apply liquid gasket (LOCTITE FMD-127 or equivalent) to lower and upper quadrant box fitting surface.
- At first fix a reamer bolt with mark (Δ), then fix other bolts.
- Tighten bolts to the specified torque.



Quadrant Box Bolt Torque	N·m (kg·m / lb·ft)
53 (5.4 / 39)	

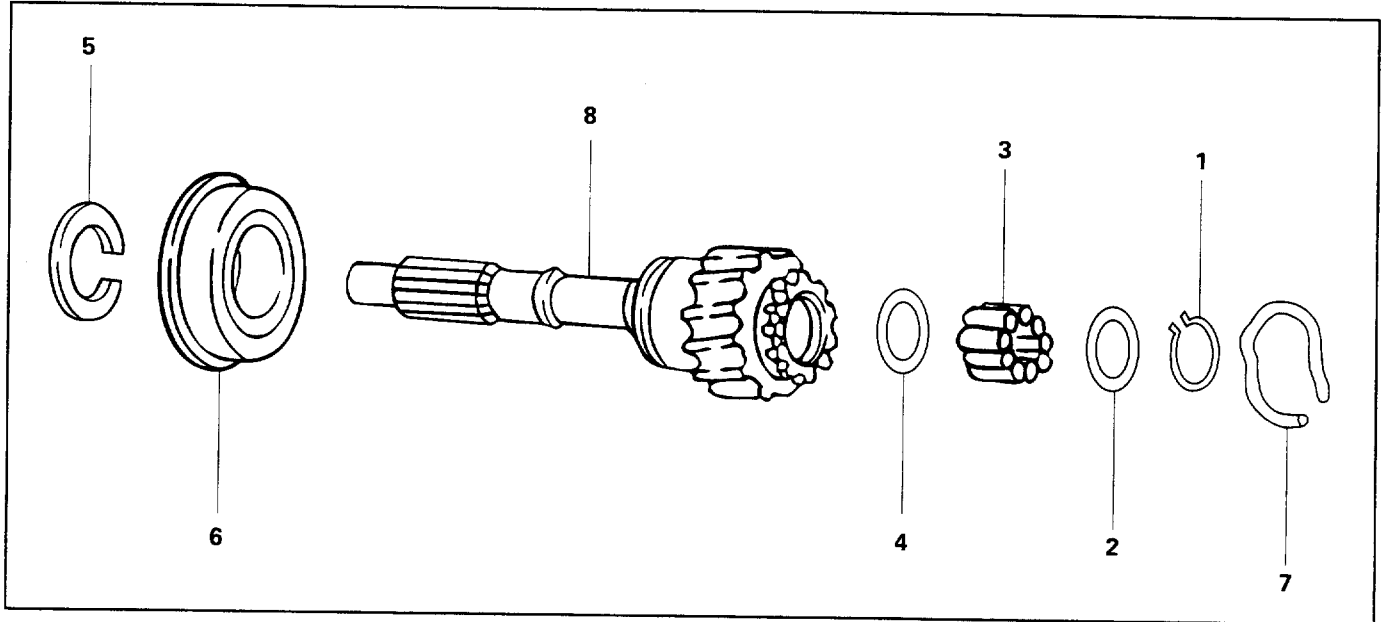
After reassembling the transmission, refill the case with the new specified transmission oil.



Lubricating Oil Capacity (Reference)	Liters (US gal / Imp. gal)
With P.T.O	6.1 (1.61 / 1.34)
Without P.T.O	5.3 (1.40 / 1.17)

TOP GEAR SHAFT ASSEMBLY

DISASSEMBLY



Disassembly Steps

- | | |
|------------------|---------------------------|
| 1. Snap ring | 5. Snap ring |
| 2. Thrust washer | 6. Top gear shaft bearing |
| 3. Pilot bearing | 7. Retaining clip |
| 4. Thrust washer | 8. Top gear shaft |

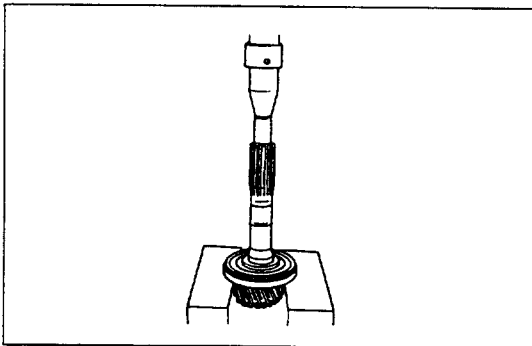


Disassembly Steps

1. Snap Ring
2. Thrust Washer
3. Pilot Bearing
4. Thrust Washer
5. Snap Ring
6. Top Gear Shaft Bearing



Use a bench press to remove the top gear shaft bearing.



7. Retaining clip
8. Top Gear Shaft

INSPECTION AND REPAIR

Make necessary correction or parts replacement if wear, damage or any other abnormal conditions are found through inspection.

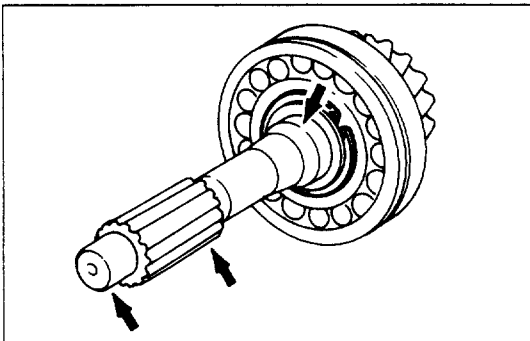
- Top gear shaft
- Top gear shaft bearing
- Pilot bearing
- Snap ring
- Retaining clip
- Thrust washer



Visual Check

Visually check each of the parts.

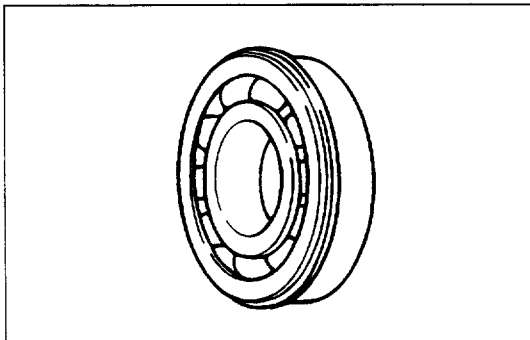
Check the bearing fittings, the faces, the splines, and the gears for excessive wear and damage.



Top Gear Shaft

Visually check the oil seal lip sealing face and the spline for excessive wear and distortion.

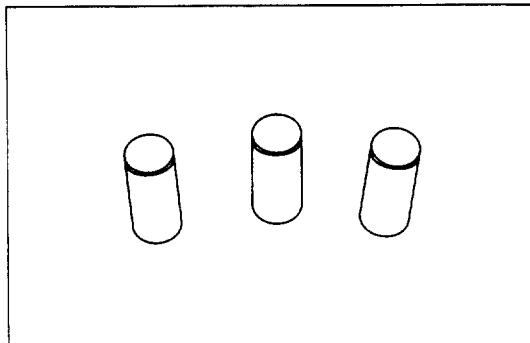
If there is excessive wear or distortion, the oil seal lip sealing face and the spline should be replaced.



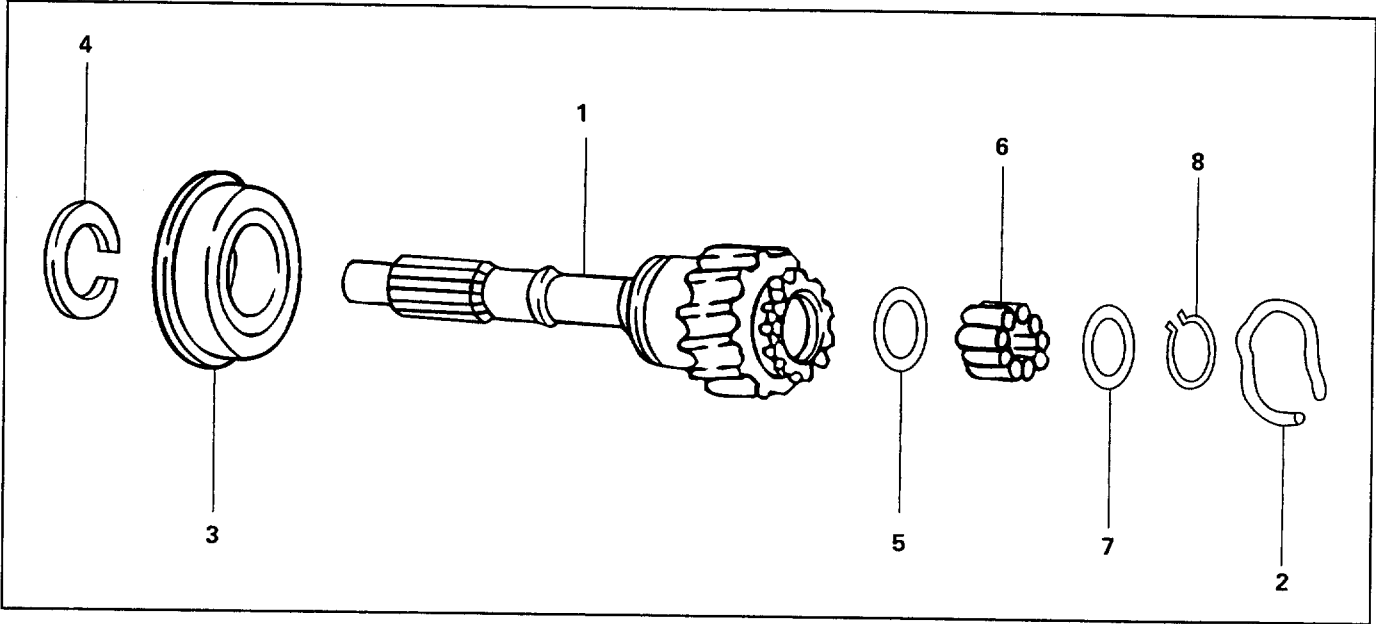
Bearings

Visually check the balls and rollers for worn contact surfaces and abrasion.

If there is wear and abrasion, the bearings should be replaced.



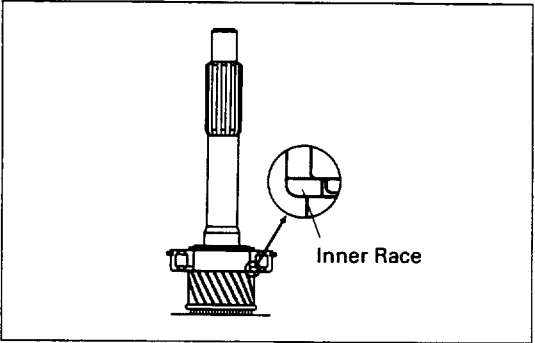
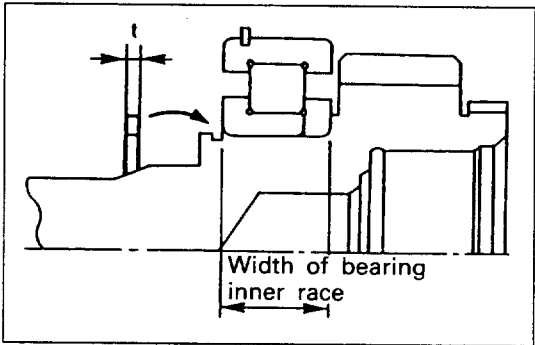
REASSEMBLY



Reassembly Steps

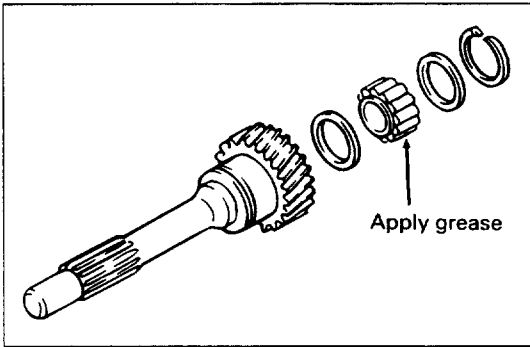
1. Top gear shaft
2. Retaining clip
3. Top gear shaft bearing
4. Snap ring
5. Thrust washer
6. Pilot bearing
7. Thrust washer
8. Snap ring

Reassembly Steps



- Top Gear Shaft
- Retaining Clip
- Top Gear Shaft Bearing
 - If the bearing is to be replaced with a new one, measure the bearing inner race width to determine the correct snap ring thickness.
 - Attach a suitable bar and use a bench press.

Bearing Inner Race, Snap Ring, Thickness and Color		mm (in.)
Width of Bearing Inner Race	Snap Ring Thickness (t)	Color
21.85 - 21.89 (0.8602 - 0.8618)	2.64 (0.1039)	Green
21.89 - 21.93 (0.8618 - 0.8634)	2.60 (0.1024)	Blue
21.93 - 21.97 (0.8634 - 0.8650)	2.56 (0.1008)	Yellow
21.97 - 22.00 (0.8650 - 0.8661)	2.53 (0.0996)	White



5. Thrust Washer

6. Pilot Bearing

Apply multi-purpose type grease to the bearing.

7. Thrust Washer

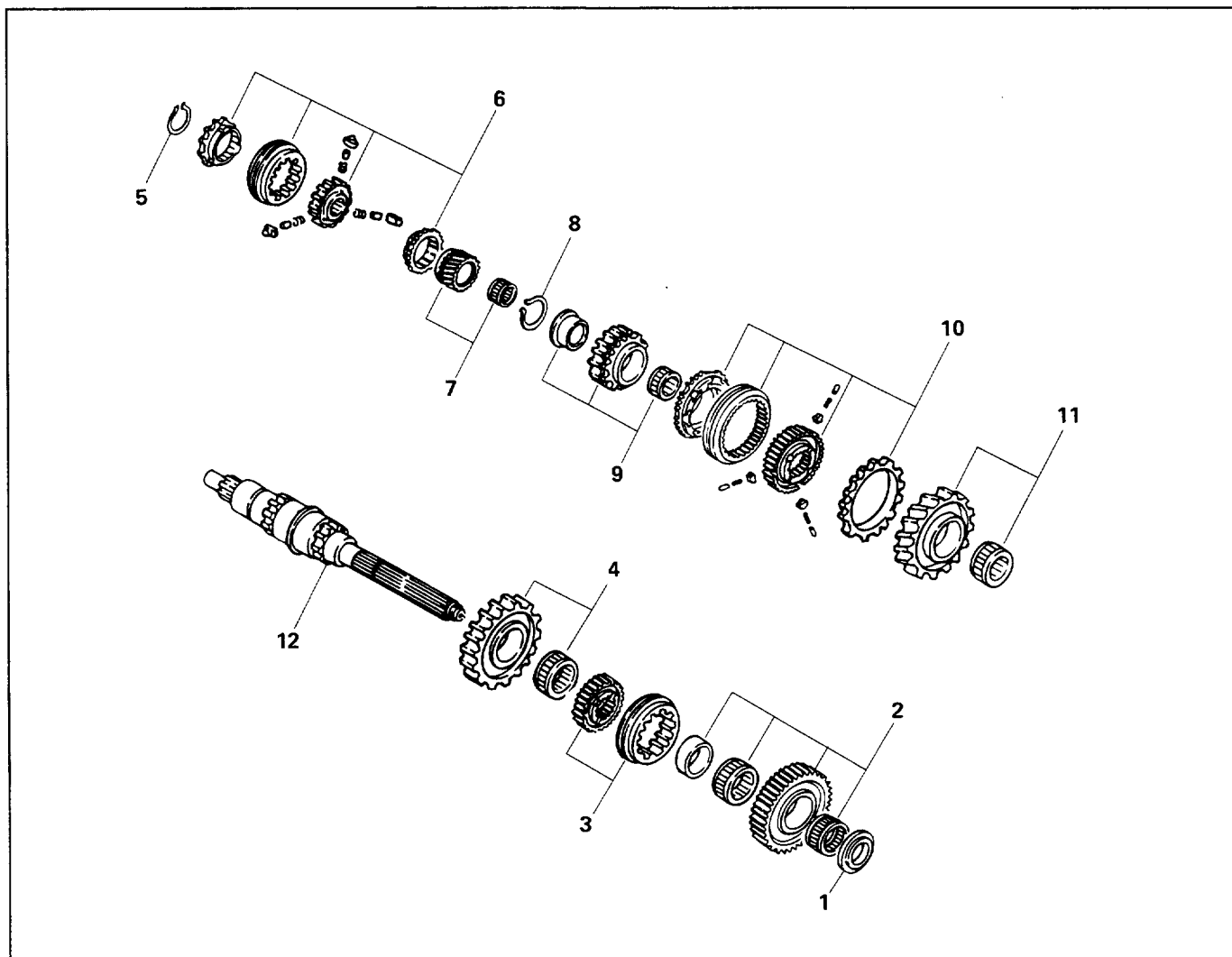
8. Snap Ring

MEMO

Lined area for writing the memo.

MAIN SHAFT ASSEMBLY

DISASSEMBLY



Disassembly Steps

1. Thrust washer
2. 1st gear, needle roller bearing and collar
3. 1st - reverse sleeve and clutch hub
4. Reverse gear and needle roller bearing
5. Snap ring
6. 4th - 5th synchronizer assembly
7. 4th gear and needle roller bearing
8. Snap ring
9. Collar, 3rd gear and needle roller bearing
10. 2nd - 3rd synchronizer assembly
11. 2nd gear and needle roller bearing
12. Main shaft



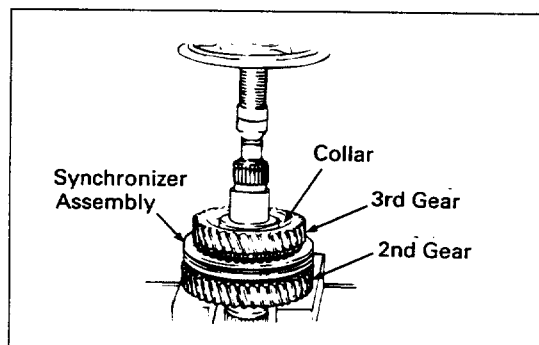
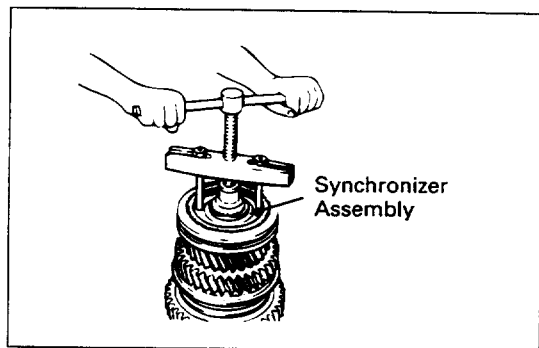
Disassembly Steps

NOTE:

The main shaft assembly is very heavy. If it falls, it can cause serious injury to service personnel.

Place supports beneath the main shaft assembly to prevent it from falling.

1. Thrust Washer
2. 1st Gear, Needle Roller Bearing and Collar
3. 1st – Reverse Sleeve and Clutch Hub
4. Reverse Gear and Needle Roller Bearing
5. Snap Ring
6. 4th – 5th Synchronizer Assembly
 - Remove the 4th – 5th synchronizer assembly from the main shaft assembly using a adequate puller.
 - Remove the sleeve from the clutch hub. Be careful not to lose plunger, spring and block after removal of the sleeve.



7. 4th Gear and Needle Roller Bearing
8. Snap Ring
9. Collar, 3rd Gear and Needle Roller Bearing
10. 2nd – 3rd Synchronizer Assembly
11. 2nd Gear and Needle Roller Bearing

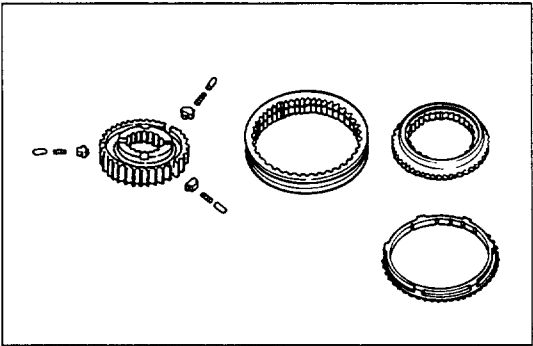


Use a bench press to remove each parts.

12. Main Shaft

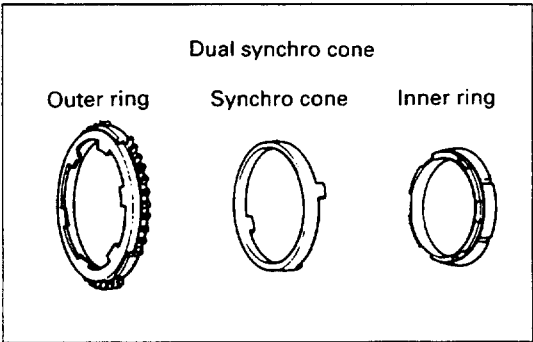
INSPECTION AND REPAIR

Make necessary correction or parts replacement if wear, damage or any other abnormal conditions are found through inspection.

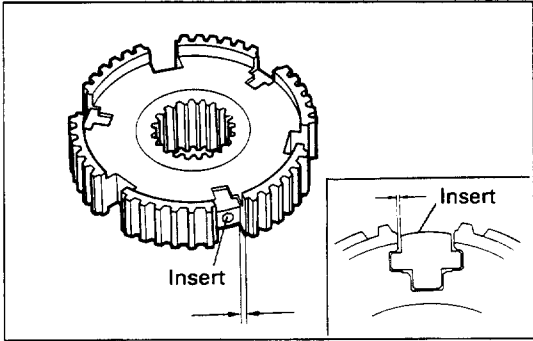


Visual Check

Inspect all disassembled parts for wear, damage or other abnormal conditions.
Inspect the following parts paying particular attention to the points shown in the illustrations.



Dual Synchronizer Assembly (2nd and 3rd)



Clutch Hub

Visually check for worn clutch hub inside and outside splines and sliding sleeves.
If wear is discovered during inspection, the clutch hub should be replaced.
Measure the clearance between the insert and the clutch hub.



Insert and Clutch Hub Clearance		mm (in.)
Standard	Limit	
0.1 - 0.4 (0.004 - 0.016)	0.5 (0.020)	

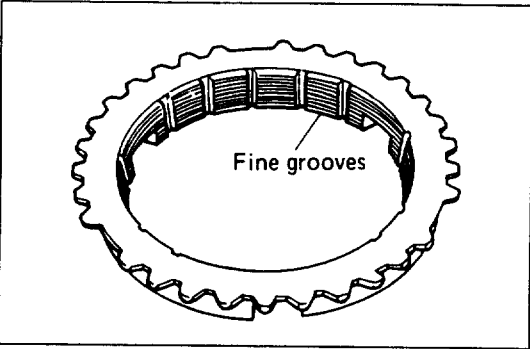
Insert Spring

Only the insert springs for the 6th synchronizer are different in free length from the 2nd – 3rd and 4th – 5th synchronizer, so be careful to assemble correctly.



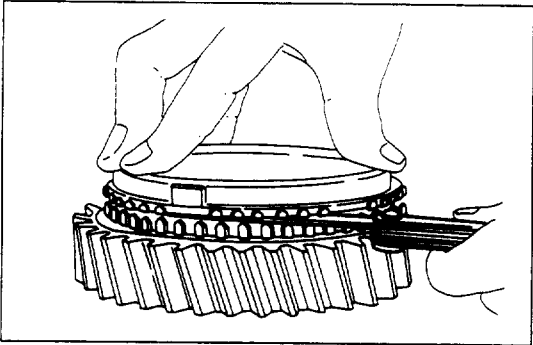
Spring Free Length		mm (in.)
2nd – 3rd and 4th – 5th	6th	
19.0 (0.748)	18.7 (0.736)	

For identification, the 6th synchronizer insert springs are painted white.



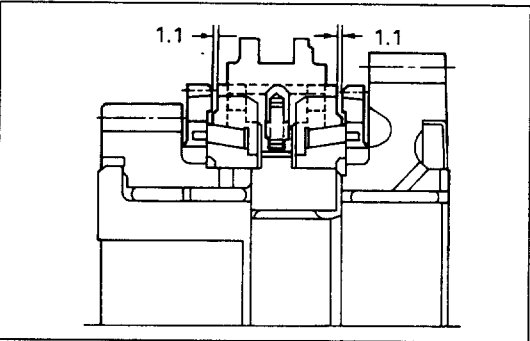
Blocking Ring

Visually check for worn blocking ring inside fine grooves.



Measure the clearance between the synchronizer cone and the blocking ring.

Blocking Ring and Synchronizer Clearance mm (in.)	
Standard	Limit
2.0 (0.079)	0



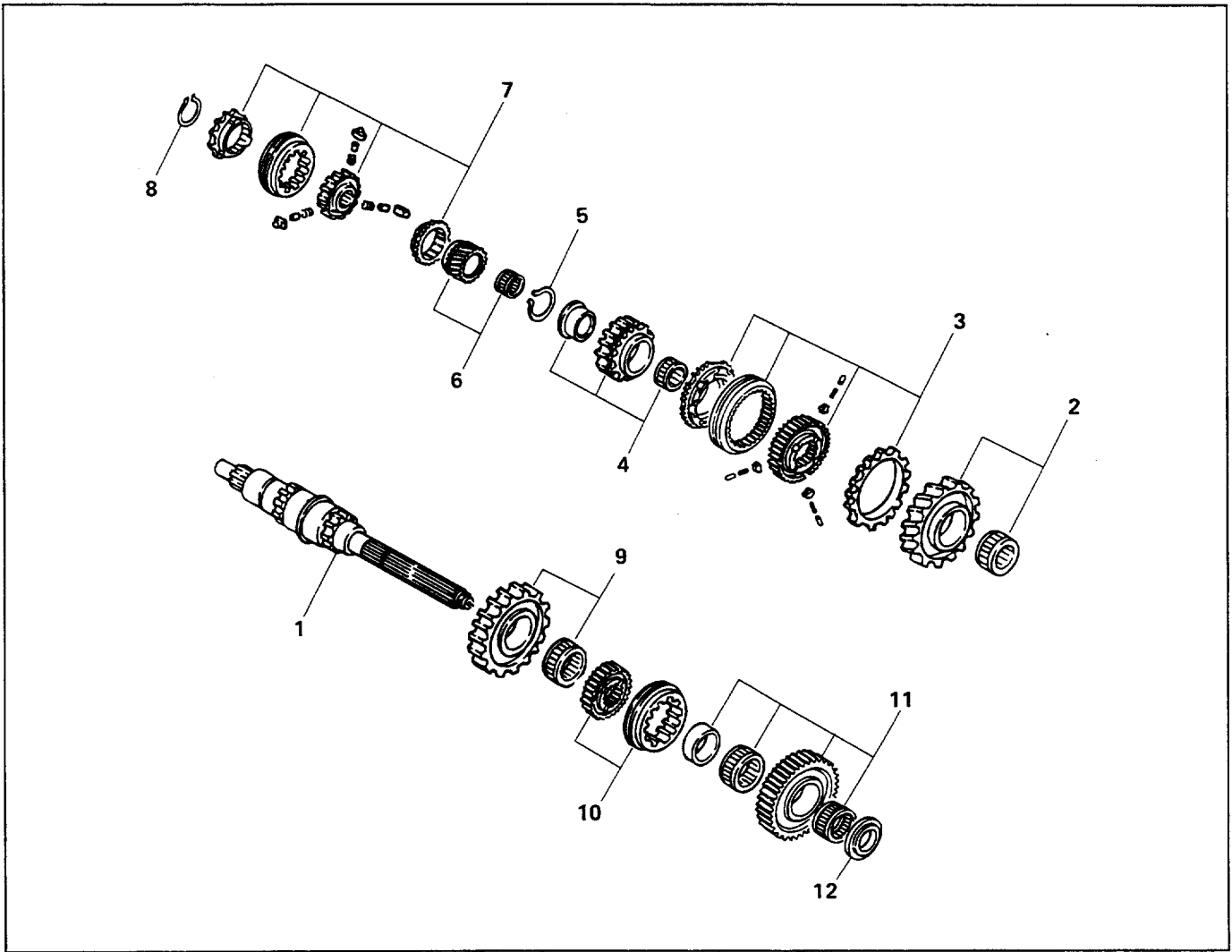
2nd – 3rd Synchronizer (Dual Cone Type)

Measure the clearance between the synchronizer cone and synchronizer gear teeth.

If the measured valve exceeds the specified limit, the synchronizer assembly must be replaced.

Gear Teeth and Synchronizer Cone Clearance mm (in.)	
Standard	Limit
1.1 (0.043)	0

REASSEMBLY



Reassembly Steps

1. Main shaft
2. 2nd gear and needle roller bearing
3. 2nd - 3rd synchronizer assembly
4. Collar, 3rd gear and needle roller bearing
5. Snap ring
6. 4th gear and needle roller bearing
7. 4th - 5th synchronizer assembly
8. Snap ring
9. Reverse gear and needle roller bearing
10. 1st - reverse sleeve and clutch hub
11. 1st gear, needle roller bearing and collar
12. Thrust washer

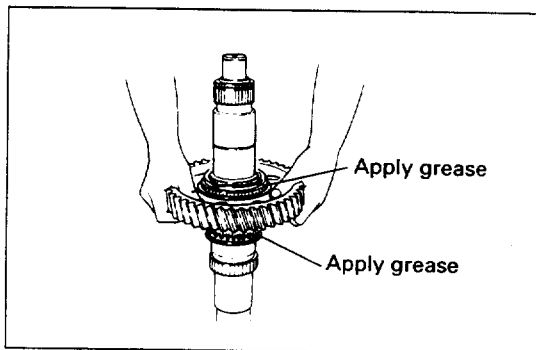


Reassembly Steps

NOTE:

The main shaft assembly is very heavy. If it falls, it can cause serious injury to service personnel.

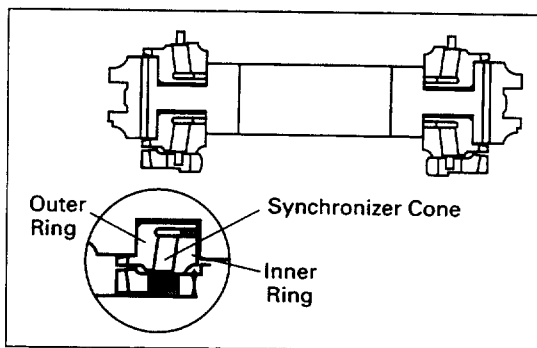
Place supports beneath the main shaft assembly to prevent it from falling.



1. Main Shaft

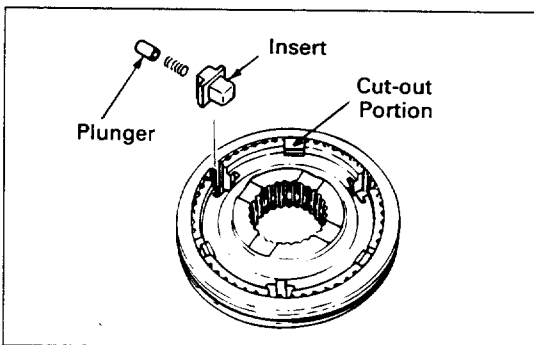
2. 2nd Gear and Needle Roller Bearing

1. Secure main shaft with a vise and supporter. The top gear shaft side must be facing upward.
2. Lubricate the main shaft with transmission oil.
3. Apply grease to needle roller bearing
4. Install the needle roller bearing and 2nd gear. The synchronizer gear teeth side of the 2nd gear must be facing upward.



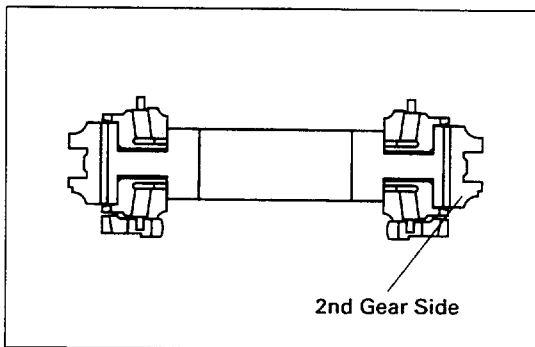
3. 2nd - 3rd Synchronizer Assembly

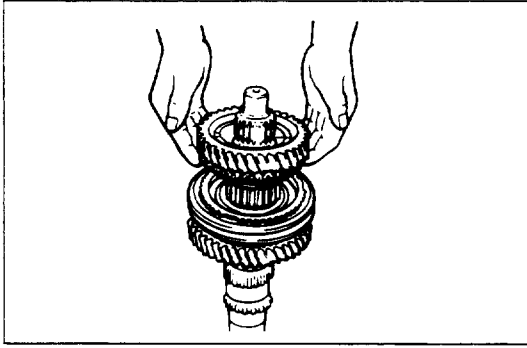
1. Align synchronizer gear holes of the 2nd gear and synchronizer cone claws (4 portion).
2. Align outer ring claw and inner ring groove (6 portion).
3. Fit the outer ring to correct position by turning the 2nd gear.
4. Reassemble the synchronizer of 3rd gear side in a same procedure.
5. Install insert, spring and plunger to the clutch hub.
6. Align cut-out portion of sleeve spline and clutch hub groove (except plunger installing position).
7. Install the sleeve to the clutch hub with pressing plunger.
8. Note the direction as figure.



NOTE:

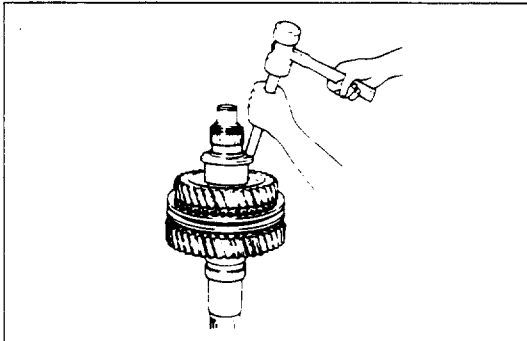
If the synchronizer cone claw and outer ring claw are not fit to holes or grooves, the synchronizer assembly cannot be reassemble to the correct position.



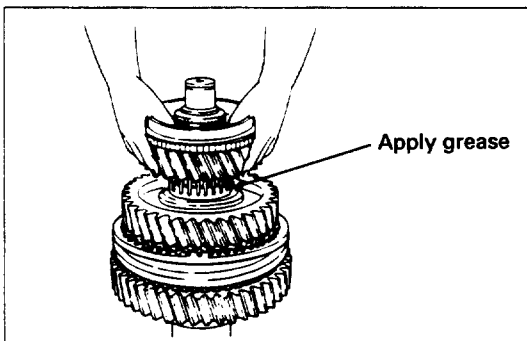


4. Collar, 3rd Gear and Needle Roller Bearing

1. Apply grease to needle roller bearing.
2. Apply grease to 3rd gear thrust surface.
3. Install needle roller bearing and 3rd gear to the main shaft. The synchronizer gear side of the 3rd gear must be facing downward.



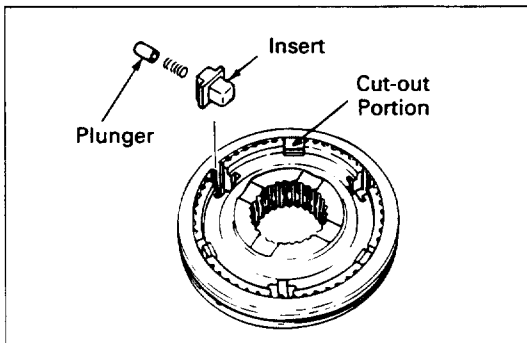
4. Install the collar to the main shaft by tapping with a brass bar.
5. Check that the 2nd and 3rd gear turn smoothly.



5. Snap Ring

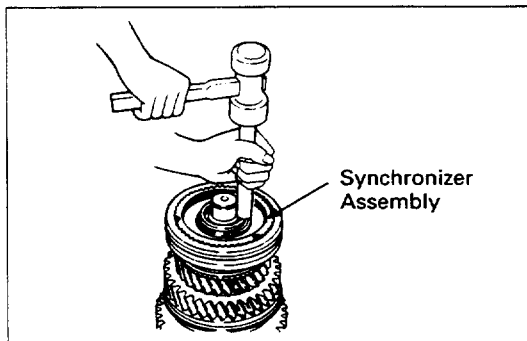
6. 4th Gear and Needle Roller Bearing

1. Apply grease to needle roller bearing.
2. Apply grease to 4th gear thrust surface.
3. Install needle roller bearing and 4th gear to the main shaft. The synchronizer gear side of the 4th gear must be facing upward.

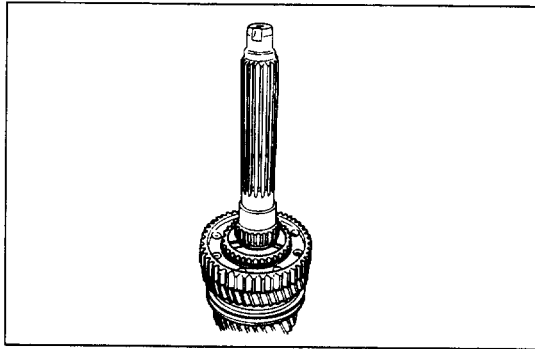


7. 4th - 5th Synchronizer Assembly

1. Align cut-out portion of sleeve spline and clutch hub groove (except plunger installing position).
2. Install the sleeve to the clutch hub with pressing plunger.



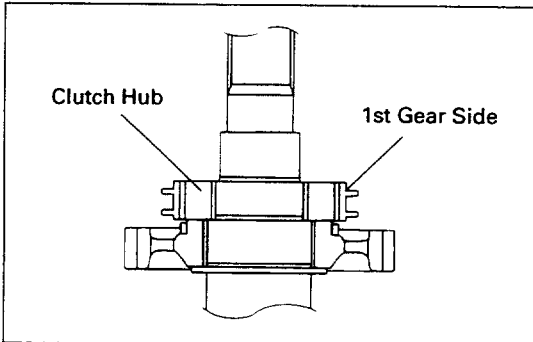
3. Fit the blocking ring to the correct position by turning the 4th gear.
4. Install the synchronizer assembly to the main shaft by tapping with a brass bar.
5. The clutch hub oil grooves must be facing 4th gear side.



8. Snap Ring

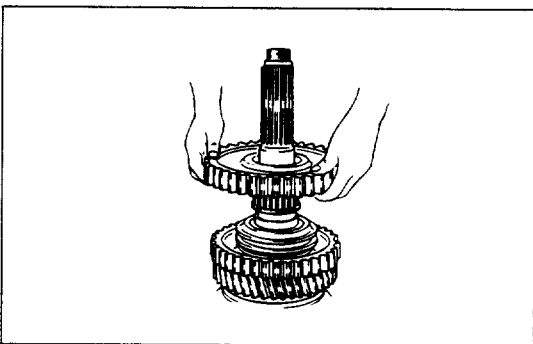
9. Reverse Gear and Needle Roller Bearing

1. Remove the main shaft assembly from a vise
2. Apply grease to needle roller bearing.
3. Apply grease to reverse gear thrust surface.
4. Install needle roller bearing and reverse gear to the main shaft. The synchronizer gear side of the reverse gear must be facing upward.



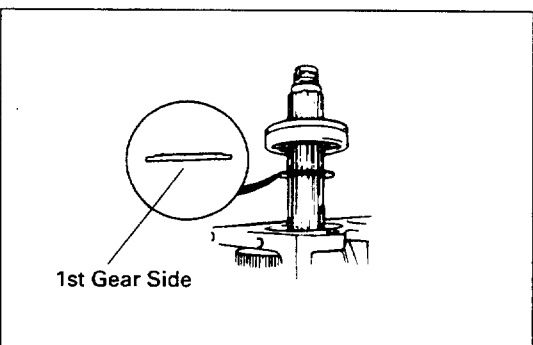
10. 1st – Reverse Sleeve and Clutch Hub

1. Install the clutch hub to the main shaft assembly.
2. Install the sleeve to the main shaft assembly
3. Note the direction of the sleeve as figure.



11. 1st Gear, Needle Roller Bearing and Collar

1. Install the collar to the main shaft assembly.
2. Apply grease to needle roller bearing.
3. Install needle roller bearing to the collar.
4. Apply grease to 1st gear thrust surface.
5. Install the 1st gear to the main shaft. The synchronizer gear side of the 1st gear must be facing downward.



12. Thrust Washer

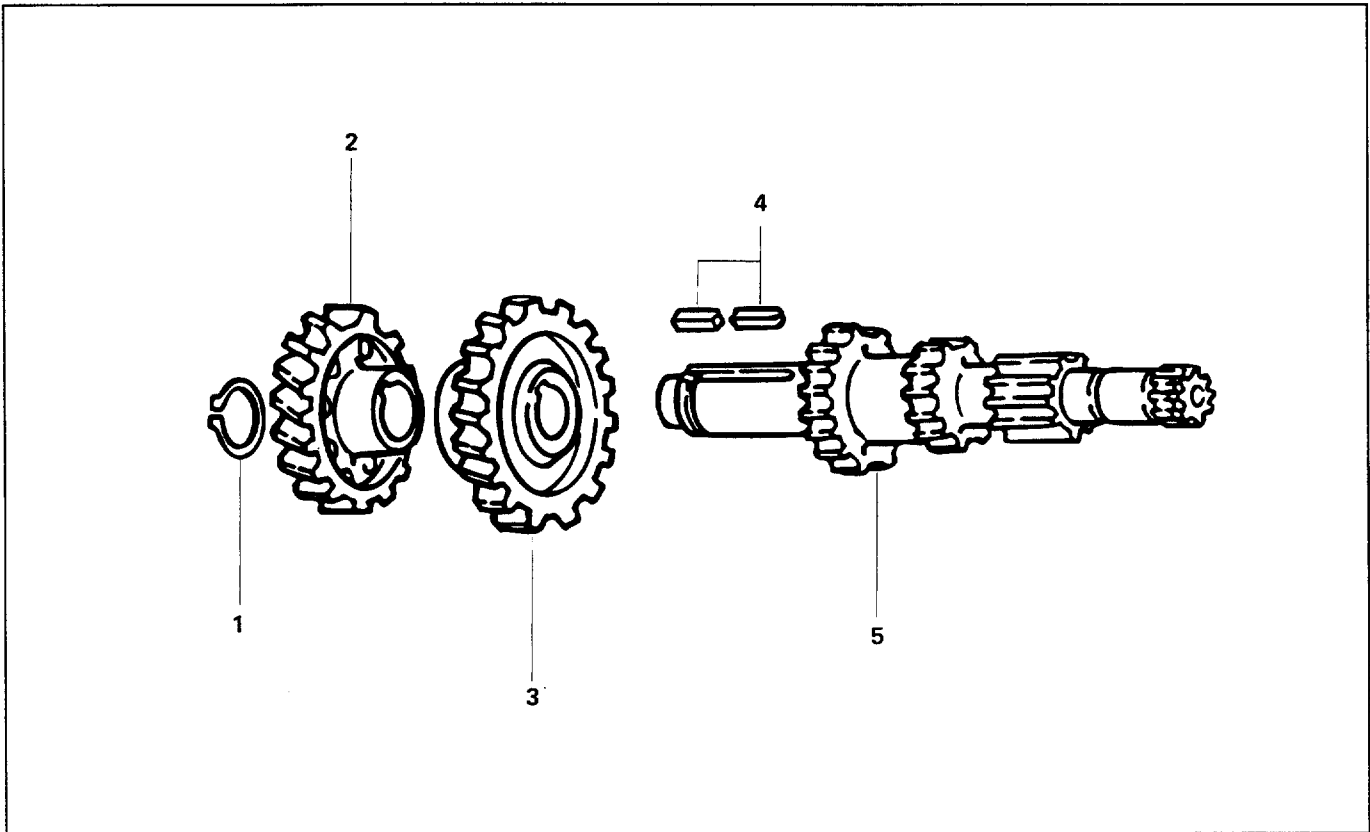
1. Apply grease to the thrust washer, and install to the main shaft assembly.
2. Thrust washer flat surface must be facing 1st gear side.



Install the holding fixture to the main shaft, then semi tighten the used flange nut.

COUNTER SHAFT ASSEMBLY

DISASSEMBLY



Disassembly Steps

1. Snap ring
2. Counter drive gear
3. 4th gear
4. Key
5. Counter shaft



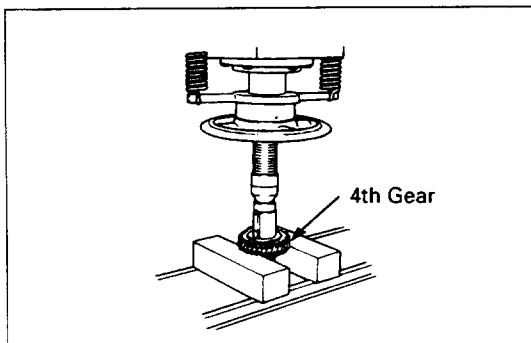
Disassembly Steps

1. Snap Ring
2. Counter Drive Gear
3. 4th Gear

Use a bench press to remove the counter drive gear, 4th gear and key from counter shaft assembly.

NOTE:

Be careful not to damage to the counter shaft



4. Key
5. Counter Shaft

INSPECTION AND REPAIR

Make necessary correction or parts replacement if wear, damage or any other abnormal conditions are found through inspection.

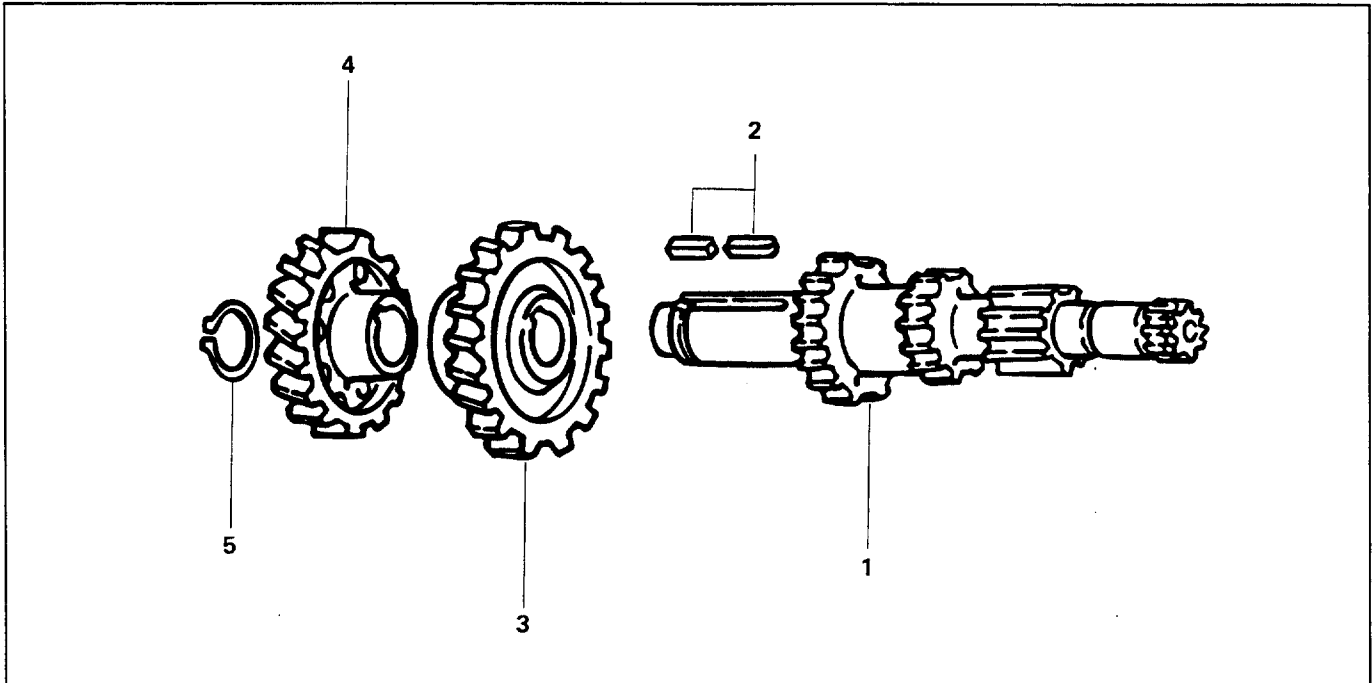
- Gears
- Counter shaft



Visual Check

Inspect all disassembled parts for wear, damage or other abnormal conditions.

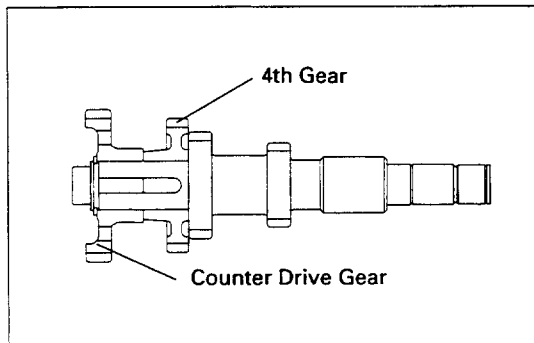
REASSEMBLY



Reassembly Steps

1. Counter shaft
2. Key
3. 4th gear
4. Counter drive gear
5. Snap ring

Reassembly Steps



1. Counter Shaft
2. Key
3. 4th Gear
4. Counter Drive Gear



1. Lubricate the counter shaft spindle with gear oil.
2. Use a bench press to set each gear and key to install the counter shaft.
3. Note the direction of each gears installation as figure.

5. Snap Ring

Install the snap ring to the snap ring groove of the counter shaft firmly.

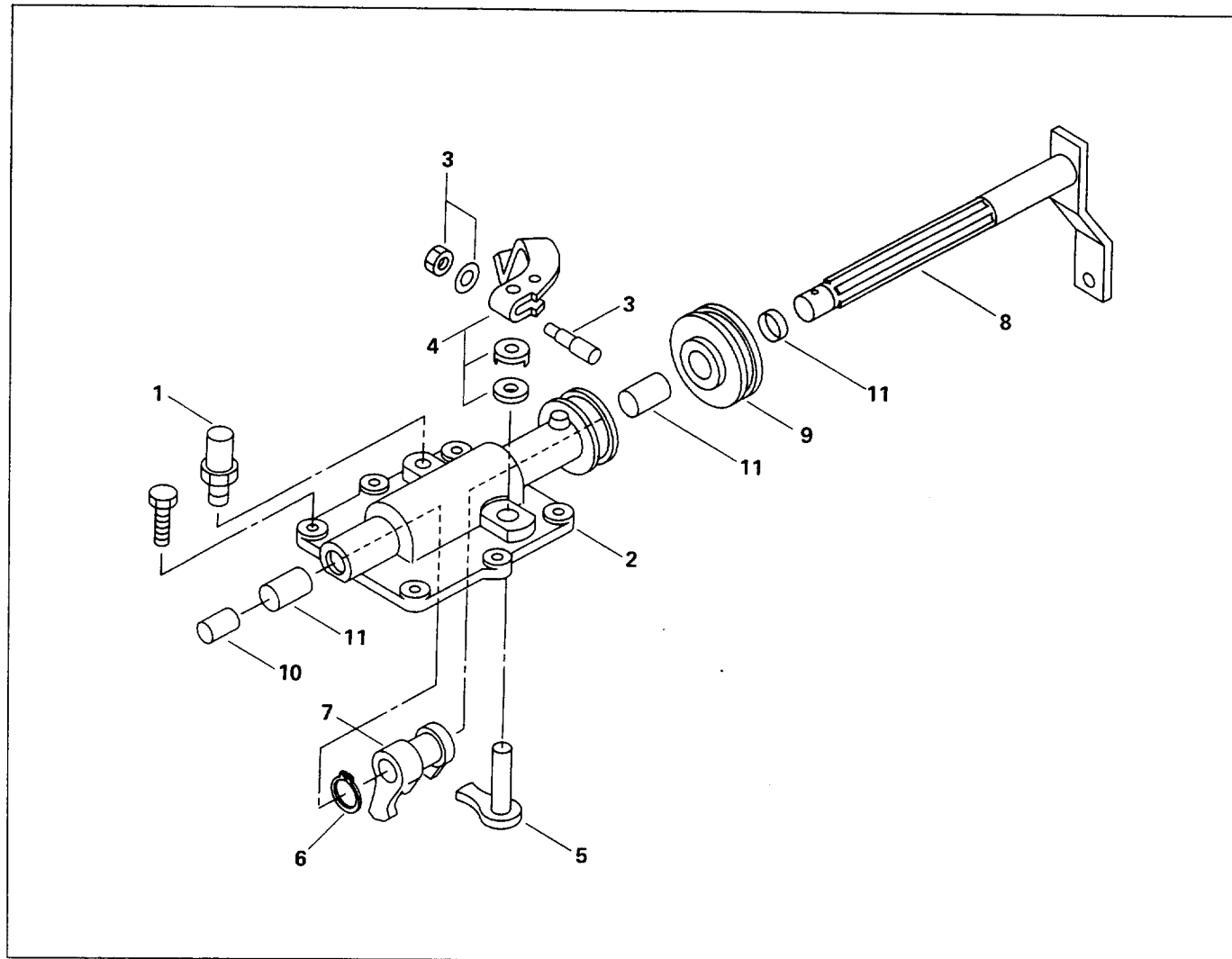
NOTE:

The counter shaft assembly is very heavy.

Always support the counter shaft assembly with a hoist and wire.

UPPER QUADRANT BOX

DISASSEMBLY



Disassembly Steps

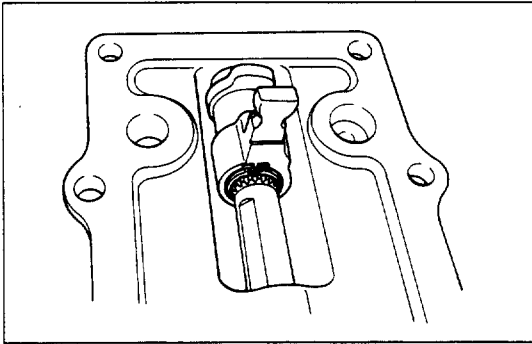
- | | |
|--------------------------|--------------------------|
| 1. Air breather | 7. Internal shift lever |
| 2. Upper quadrant box | 8. Shift shaft |
| 3. Key bolt | 9. Boot |
| 4. External select lever | 10. Cap |
| 5. Internal select lever | 11. Oil seal and Bushing |
| 6. Snap ring | |



Disassembly Steps

1. Air Breather
2. Upper Quadrant Box
3. Key Bolt
4. External Select Lever
5. Internal Select Lever
6. Snap Ring
7. Internal Shift Lever
8. Shift Shaft

Remove the snap ring from snap ring groove on the shift shaft, then pull out the shift shaft.



9. Boot
10. Cap
11. Oil Seal and Bushing

INSPECTION AND REPAIR

Make necessary correction or parts replacement if wear, damage or any other abnormal conditions are found through inspection.

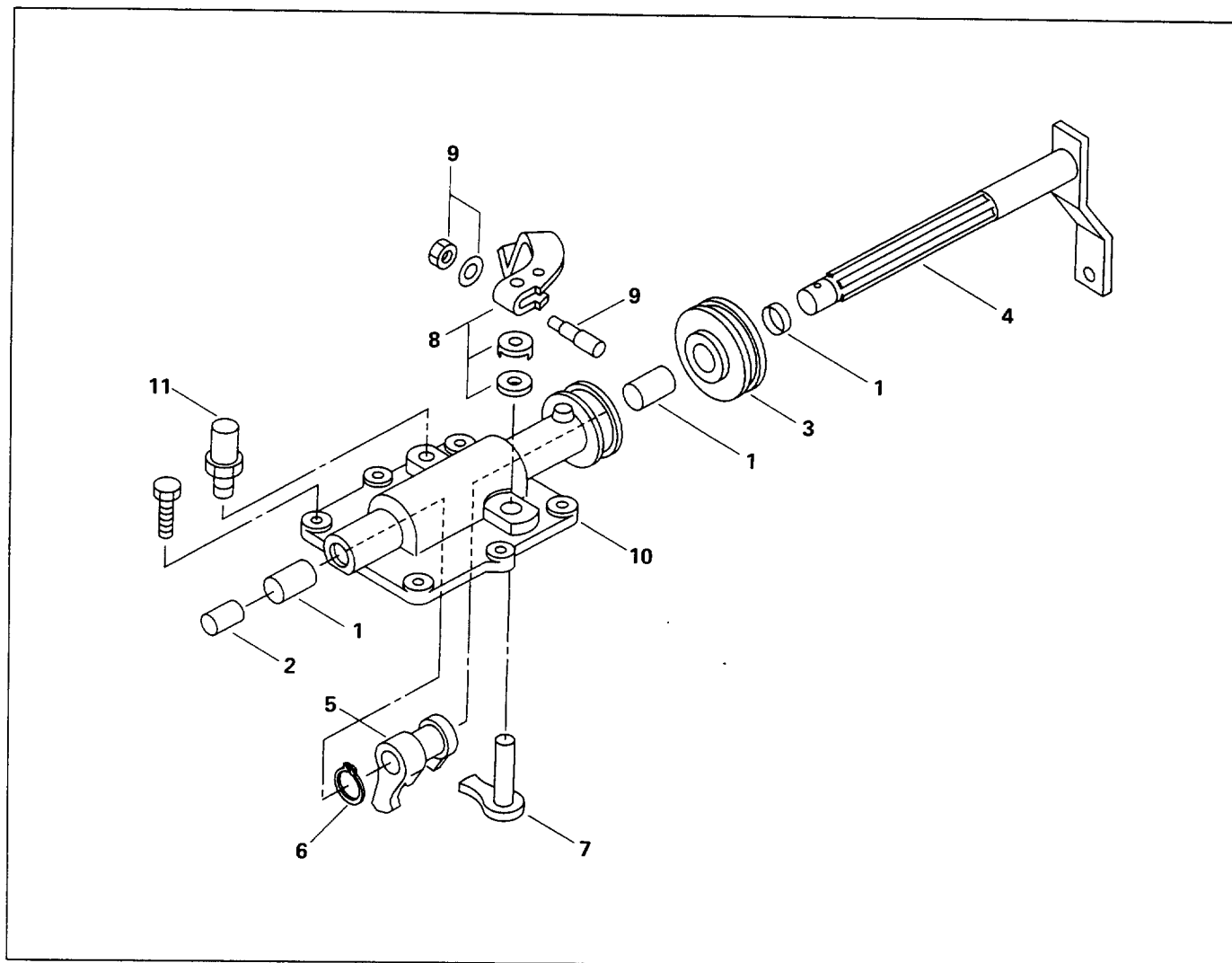
- Link rod ball joint
- Bushing
- Shift shaft
- Boot
- Oil seal
- Air Breather



Visual Check

Inspect the following parts for wear, damage or other abnormal conditions.

REASSEMBLY

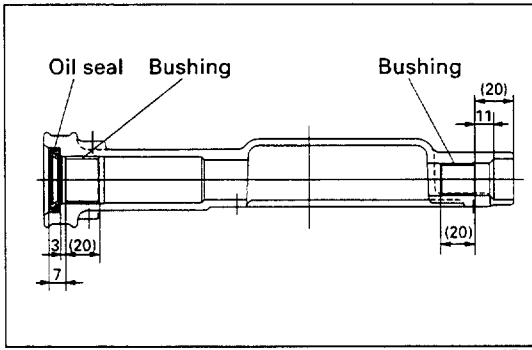


Reassembly Steps

- | | |
|-------------------------|--------------------------|
| 1. Oil seal and Bushing | 7. Internal select lever |
| 2. Cap | 8. External select lever |
| 3. Boot | 9. Key bolt |
| 4. Shift shaft | 10. Upper quadrant box |
| 5. Internal shift lever | 11. Air breather |
| 6. Snap ring | |



Reassembly Steps



1. Oil Seal and Bushing



- Apply engine oil to the oil seal outer circumference.



- Apply multi-purpose type grease to the oil seal lip.



Use a suitable bar to drive the bushing and install it specified depth as shown in the illustration.

NOTE:

Be sure to use a new oil seal.

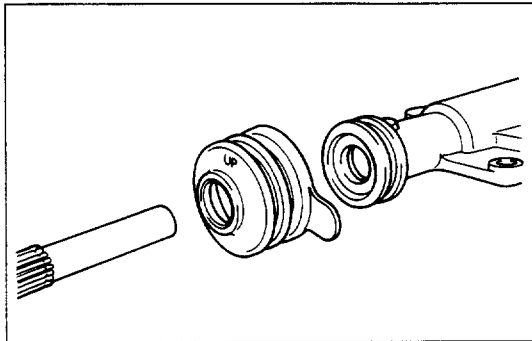
Be careful not to bend the bushing.

2. Cap

3. Boot



Install the boot to the upper quadrant box. The "UP" mark of the boot must be facing upward.



4. Shift Shaft

5. Internal Shift Lever

6. Snap Ring



- 1) Apply engine oil to the shift shaft sliding portion.

- 2) Install the shift shaft to the upper quadrant box.

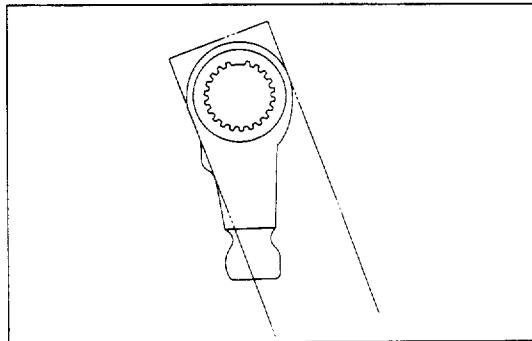


- 3) Align the shift shaft spline and internal shift lever spline, install the internal shift lever to the shift shaft.

- 4) Install the snap ring to the shift shaft snap ring groove.

NOTE:

Be careful not to damage the oil seal.



7. Internal Select Lever

8. External Select Lever

9. Key Bolt



- 1) Apply engine oil to the internal select lever sliding portion.
- 2) Install the internal select lever to the upper quadrant box.
- 3) Install the washer to the internal select lever.
- 4) Install the key bolt to the external select lever.



Key Bolt Nut Torque	N·m (kg·m / lb·ft)
16 (1.6 / 12)	

10. Upper Quadrant Box

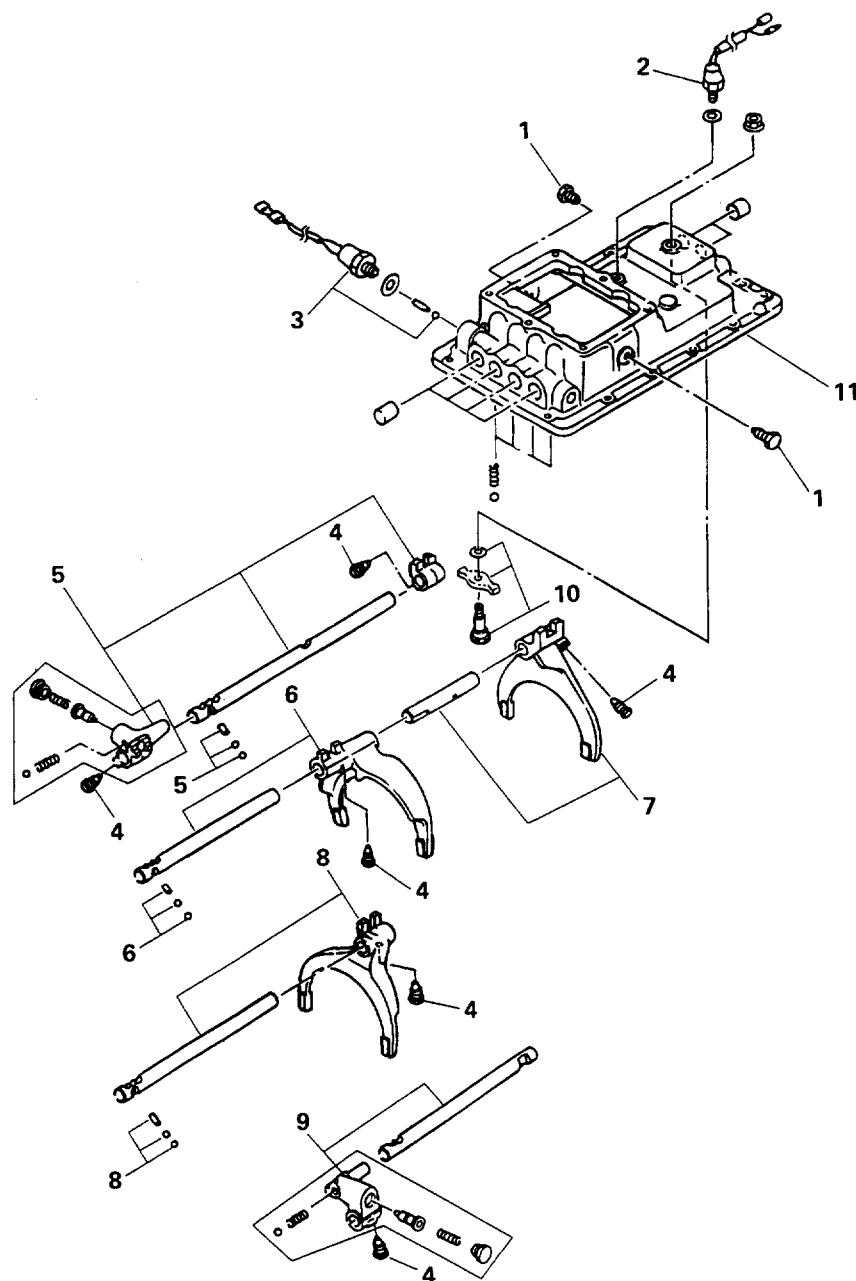


11. Air Breather

- Apply LOCTITE 242 or equivalent to the air breather threaded portion.
- Install the air breather to the upper quadrant box.

LOWER QUADRANT BOX

DISASSEMBLY

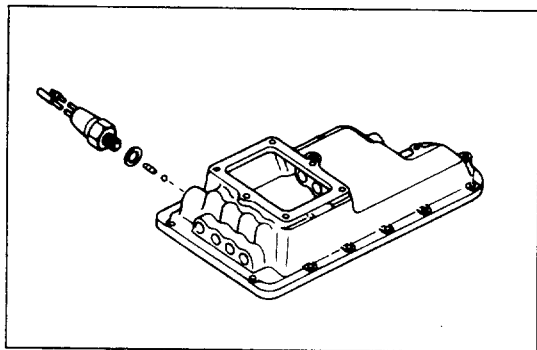


Disassembly Steps

1. Set bolt
2. Back up light switch
3. Neutral switch, pin and interlock ball
4. Lock bolt
5. 1st - reverse shift rod and shift block
6. 2nd - 3rd shift rod and shift arm
7. 1st - reverse shift rod and shift arm
8. 4th - 5th shift rod and shift arm
9. 6th shift rod and shift block
10. 1st - reverse shift lever and spindle
11. Lower quadrant box



Disassembly Steps

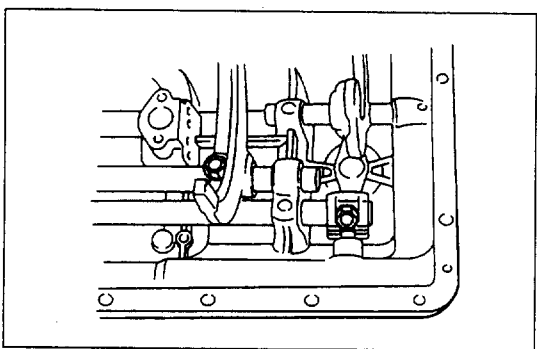


1. Set Bolt
2. Back Up Light Switch
3. Neutral Switch, Pin and Interlock Ball

- After remove the switch, remove a neutral switch pin and a ball from the hole.

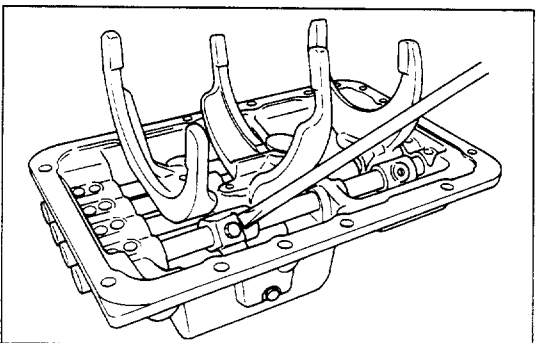
NOTE:

Be careful not to lose the interlock ball and pin.



4. Lock Bolt

Place the shift rod to the neutral position, and remove each lock bolts.

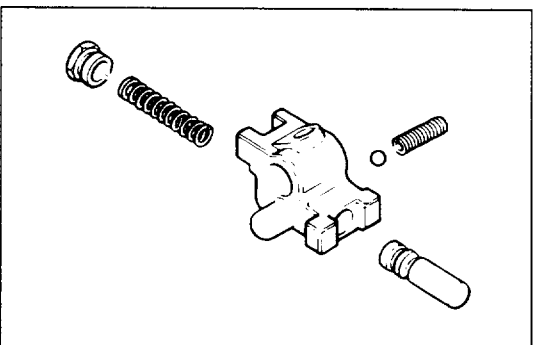


5. 1st - Reverse Shift Rod and Interlock Ball

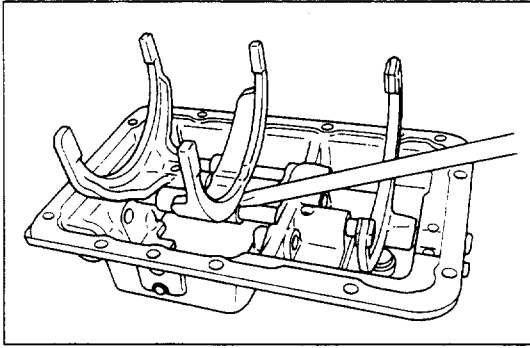
- Temporarily tighten only the upper quadrant box side shift block to the regular position.
- Drive out the rod together with cap. When removing parts, exercise care so as not to permit detent ball to snap out of position.
- The interlock pin is loosely fitted in the shift rod which is installed in position between the interlock balls. Do not lose the pin after removal of the rod.

NOTE:

Be careful not to damage the shift rod and quadrant box inner surface.

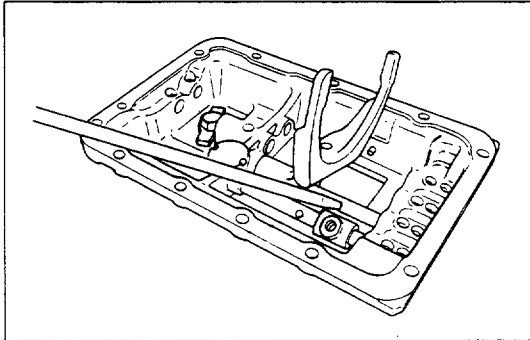


- Disassemble the shift block assembly. Remove the cap from the shift block and draw out the return spring and sleeve. A locking ball and locking spring will jump out when the sleeve is pulled out, so be careful not to lose them.



6. 2nd – 3rd Shift Rod and Shift Arm

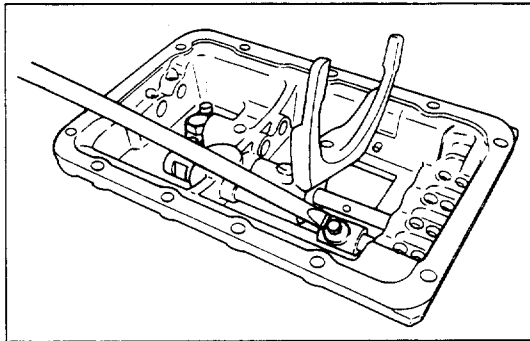
- Refer to disassembly step for No.5.



7. 1st – Reverse Shift Rod and Shift Arm

8. 4th – 5th Shift Rod and Shift Arm

- Refer to disassembly step for No.5.

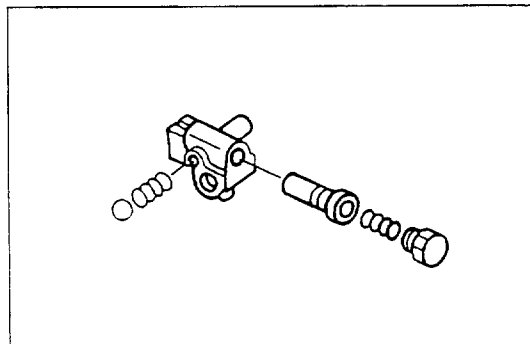


9. 6th Shift Rod and Shift Block

- Temporarily tighten the shift block to the regular position.
- Drive out the rod together with cap. When removing parts, exercise care so as not to permit detent ball to snap out of position.
- The interlock pin is loosely fitted in the shift rod which is installed in position between the interlock balls. Do not lose the pin after removal of the rod.

NOTE:

Be careful not to damage the shift rod and quadrant box inner surface.



- Disassemble the shift block assembly. Remove the cap from the shift block and draw out the return spring and sleeve. A locking ball and locking spring will jump out when the sleeve is pulled out, so be careful not to lose them.

10. 1st – Reverse Shift Lever and Spindle

11. Lower Quadrant Box

INSPECTION AND REPAIR

Make necessary correction or parts replacement if wear, damage or any other abnormal conditions are found through inspection.



Visual Check

- Inspect all disassembled parts for wear, damage or other abnormal conditions.
- Inspect the following parts paying particular attention to the points shown in the illustrations.

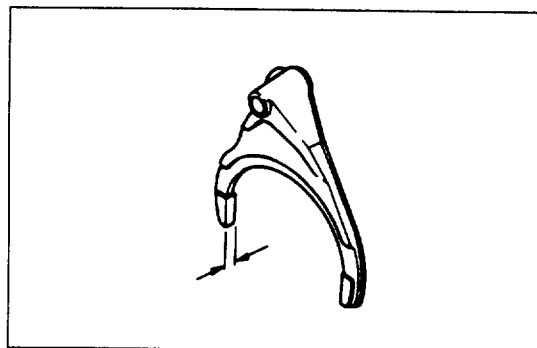
Shift Arm

Measure each shift arm thickness.



Shift Arm Thickness		mm (in)
Standard	Limit	
11.0 (0.433)	10.0 (0.394)	

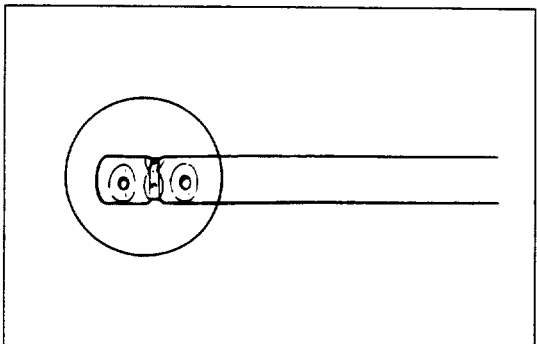
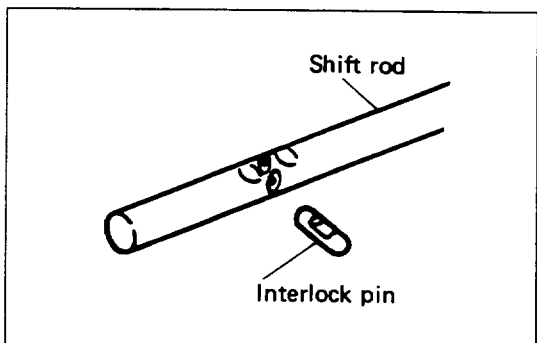
If the measured value exceeds the specified limit, the shift arm should be replaced.



Shift Rod and Interlock Pin Assembly

Check the shift rods for excessively worn detent grooves.

If the detent groove wear is excessive, the shift rod should be replaced.



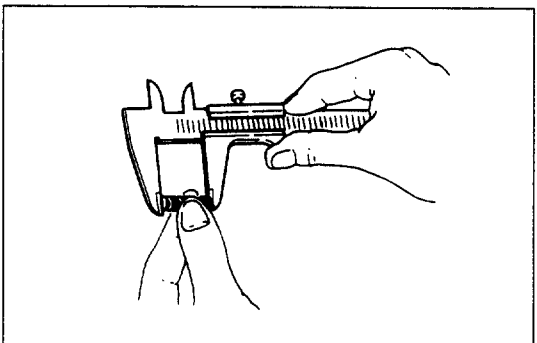
Detent Spring

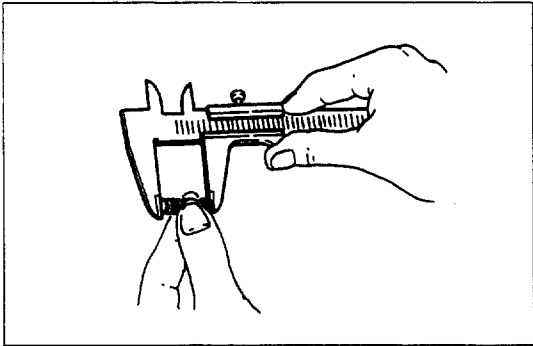
Measure the detent spring.



Detent Spring Free Length (Reference)		mm (in)
Standard	Limit	
28.0 (1.102)	26.0 (1.024)	

If the measured value exceeds the specified limit, detent spring should be replaced.





Shift Block Assembly

Measure sleeve return spring and lock ball spring.

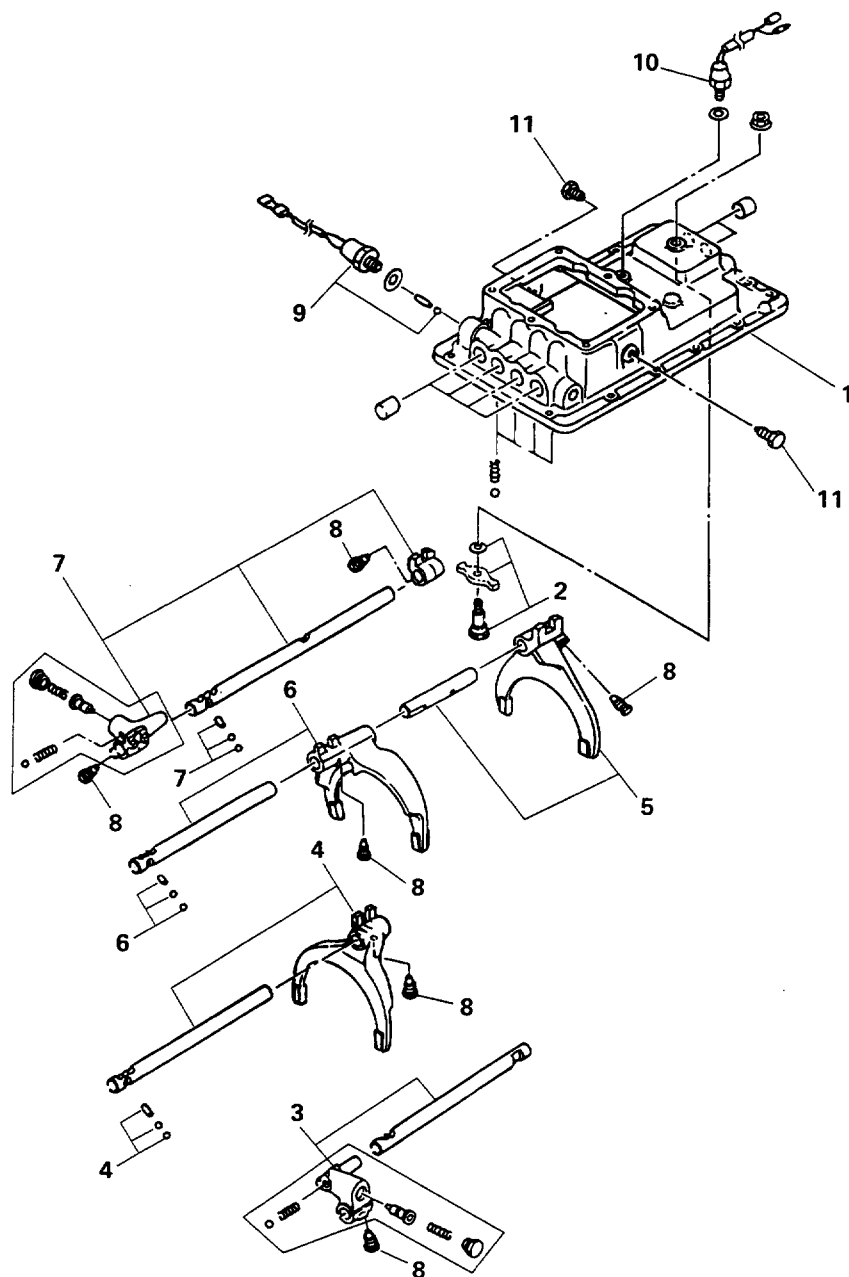


Sleeve Return Spring Free Length (Reference)		mm (in.)
1st – Reverse	6th	
61.5 (2.421)	61.5 (2.421)	



Lock Ball Spring (Reference)		mm (in.)
1st – Reverse	6th	
35 (1.378)	33 (1.299)	

REASSEMBLY



Reassembly Steps

- | | |
|------------------------------------------|--------------------------------------------|
| 1. Lower quadrant box | 6. 2nd - 3rd shift rod and shift arm |
| 2. 1st - reverse spindle and shift lever | 7. 1st - reverse shift rod and shift block |
| 3. 6th shift rod and shift block | 8. Lock bolt |
| 4. 4th - 5th shift rod and shift arm | 9. Neutral switch, pin and interlock ball |
| 5. 1st - reverse shift rod and shift arm | 10. Back up light switch |
| | 11. Set bolt |



Reassembly Steps

Preparation



Clean each parts, and apply gear oil to sliding surface.

1. Lower Quadrant Box

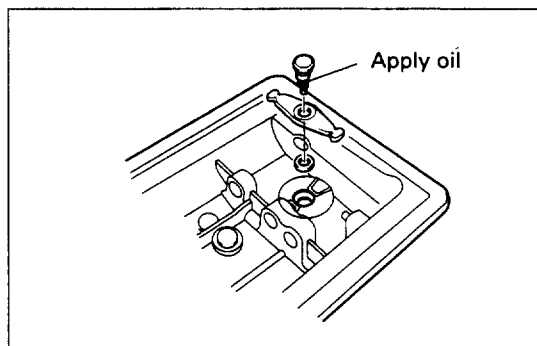


2. 1st – Reverse Spindle and Shift Lever

- Apply engine oil to the spindle.
- Install the spindle and shift lever to the lower quadrant box.



Spindle Nut Torque	N·m (kg·m / lb·ft)
50 (5.1 / 37)	



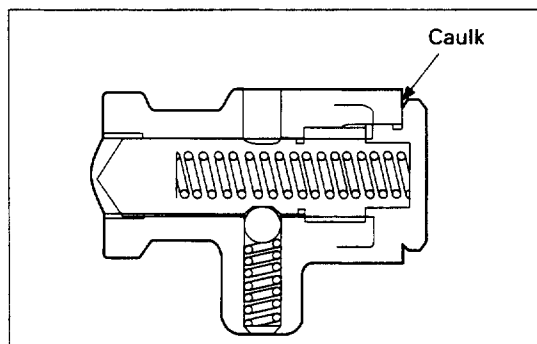
3. 6th Shift Rod and Shift Block



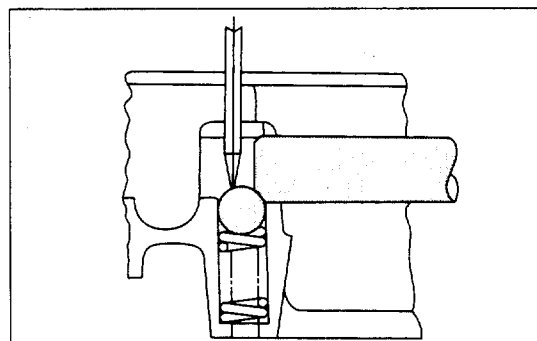
- Insert the lock ball spring and ball to the shift block.
- Apply engine oil and install the sleeve.
- Tighten cap to the specified torque, then caulk 1 portion.



Cap Torque	N·m (kg·m / lb·ft)
88 (9 / 65)	



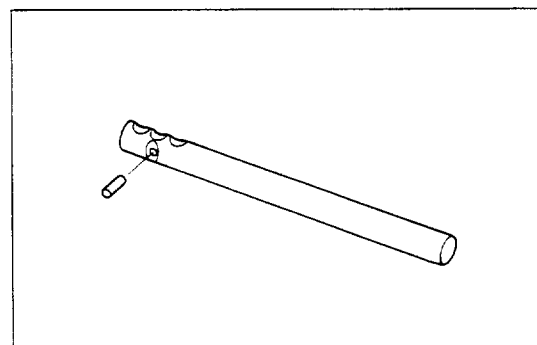
- Apply engine oil to rod.
- Insert detent spring and ball to the shift box.
- Install shift rod and arm in proper direction of installation, then set the rod in neutral position.
- Semi tighten the lock bolt to the shift block.

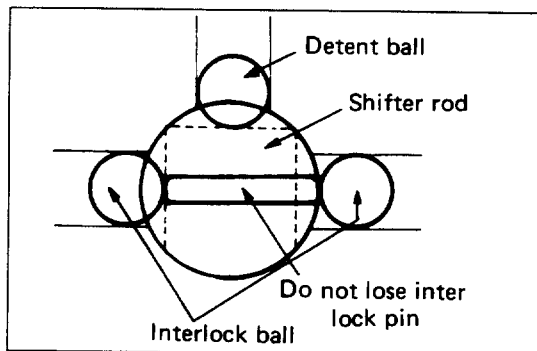


4. 4th – 5th Shift Rod and Shift Arm

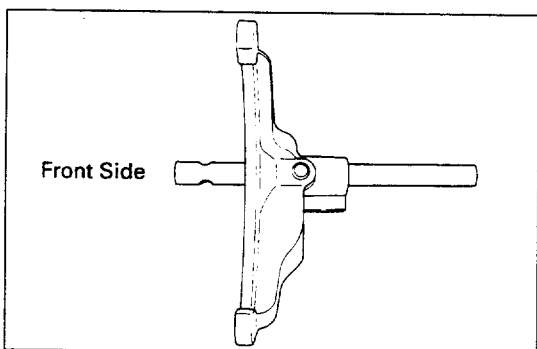


- Apply engine oil to rod, and insert the inter lock pin.

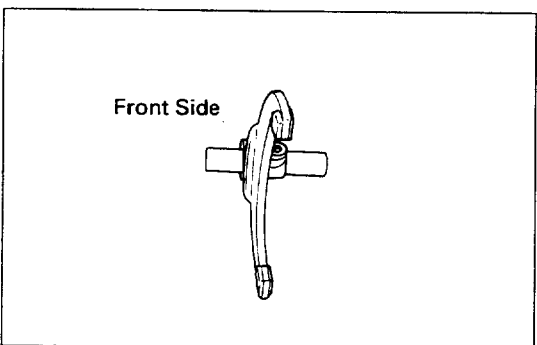




- The interlock pin is fitted in the shift rod which is installed in position between the lock balls. When installing rod, exercise care to prevent the pin from being mislocated.

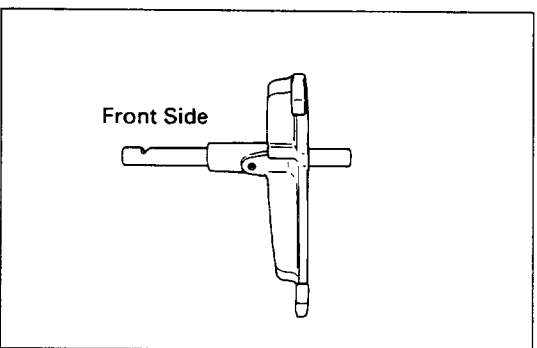


- Install shift rod and arm in proper direction of installation, then set rod in neutral position.



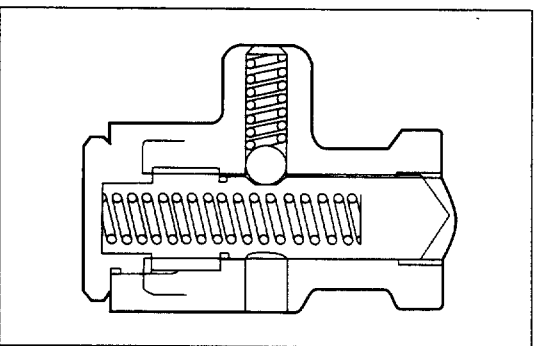
5. 1st – Reverse Shift Rod and Shift Arm

- Refer to reassembly procedure No.4.
- Note the direction of shift arm installation as figure.



6. 2nd – 3rd Shift Rod and Shift Arm

- Refer to reassembly procedure No.4.
- Note the direction of shift arm installation as figure.

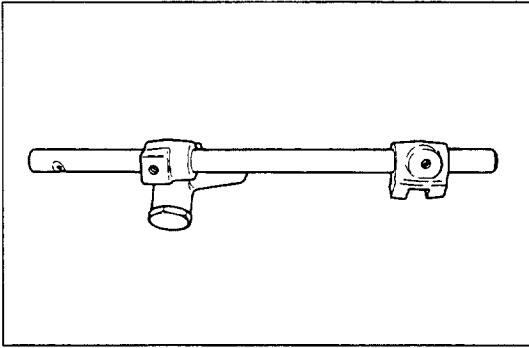


7. 1st – Reverse Shift Rod and Shift Block

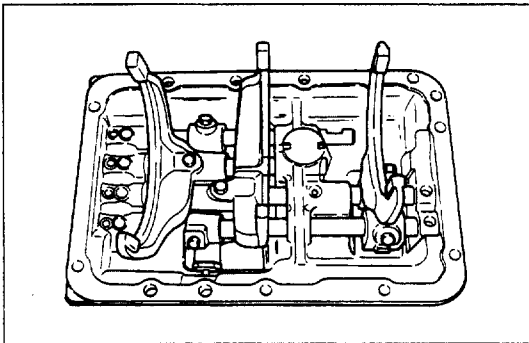
- Insert the lock ball spring and ball to the shift block.
- Apply engine oil and install the sleeve.
- Apply liquid gasket (LOCTITE 242 or equivalent) to threaded portion of the cap.

Cap Torque	N·m (kg·m / lb·ft)
	88 (9 / 65)

- Refer to reassembly procedure No.4.



- Note the direction of shift block installation as figure.

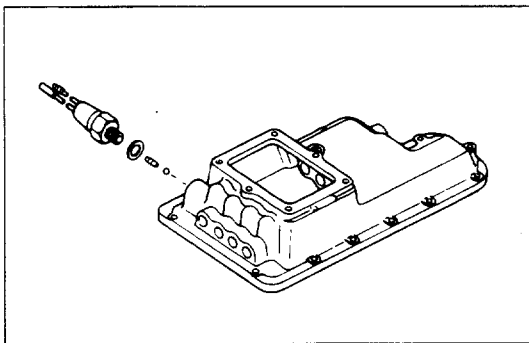


8. Lock Bolt

- Apply liquid gasket (LOCTITE 262 or equivalent) to threaded portion of the bolt.
- Tighten lock bolts to the specified torque.



Lock Bolt Torque	N·m (kg·m / lb·ft)
20 (2.0 / 14)	



9. Neutral Switch, Pin and Interlock Ball

Insert interlock ball and pin to the switch hole, and tighten neutral switch to the specified torque.

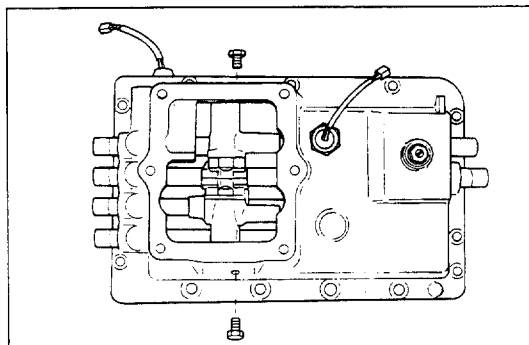
Neutral Switch Torque	N·m (kg·m / lb·ft)
20 (2.0 / 14)	

10. Back Up Light Switch

Tighten back up light switch to the specified torque.



Back Up light Switch Torque	N·m (kg·m / lb·ft)
20 (2.0 / 14)	



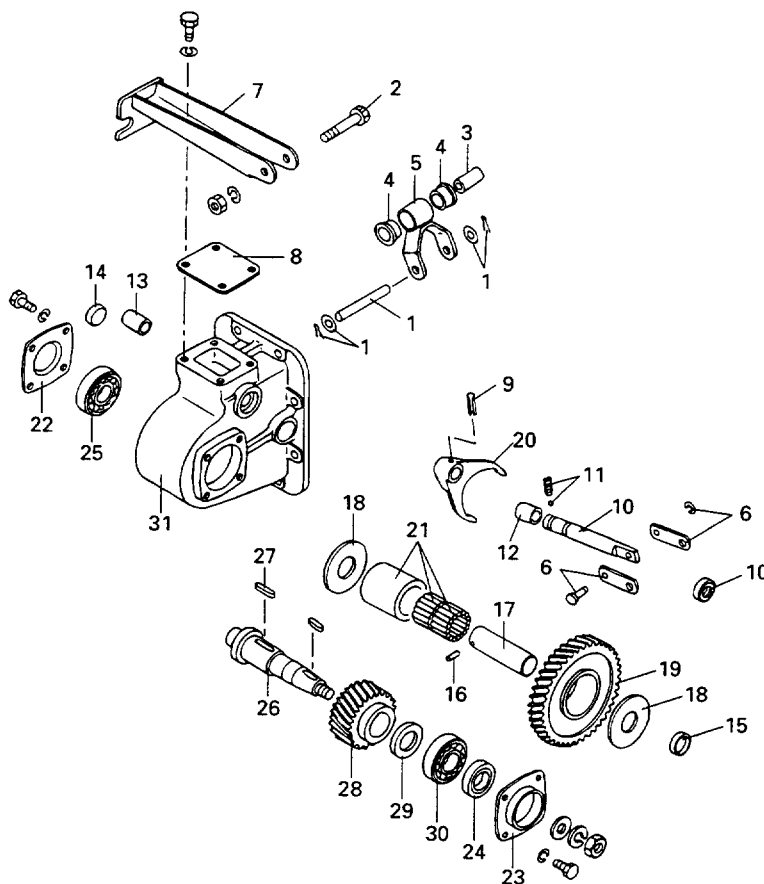
11. Set Bolt

Apply liquid gasket (LOCTITE 242 or equivalent) to threaded portion of the set bolt.



Set Bolt Torque	N·m (kg·m / lb·ft)
18 (1.8 / 13)	

SIDE POWER TAKE-OFF DISASSEMBLY



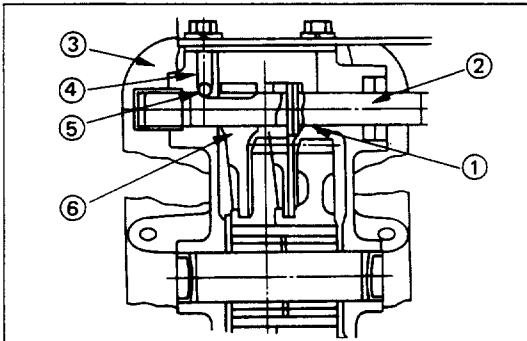
Disassembly Steps

1. Cotter pin, washer and pin
2. Bolt, washer and nut
3. Distance collar
4. Bushing
5. Control lever
6. Snap ring, plate and pin
7. Control lever bracket
8. Upper cover
9. Spring pin
10. Shift rod and oil seal
11. Spring and ball
12. Shift rod stopper
13. Cover
14. Plug
15. Plug
16. Spring pin
17. Idler gear shaft
18. Thrust washer
19. Idler gear
20. Shift arm
21. Needle roller bearing
22. Front cover
23. Rear cover
24. Oil seal
25. Front bearing
26. Output shaft
27. Key
28. Output gear
29. Distance collar
30. Rear bearing
31. Gear case



Disassembly Steps

1. Cotter Pin, Washer and Pin
2. Bolt, Washer and Nut
3. Distance collar
4. Bushing
5. Control Lever
6. Snap Ring, Plate and Pin
7. Control Lever Bracket
8. Upper Cover and Gasket
9. Spring pin
10. Shift Rod and Oil Seal
11. Spring and Ball

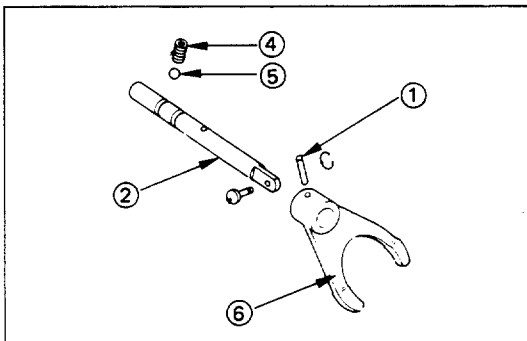


1. Use a hammer and a drift punch to drive out the spring pin ①.
Drive the pin in a downward direction.
2. Remove the shift rod ② or the shift rod and O-ring from the rear side of the gear case ③.

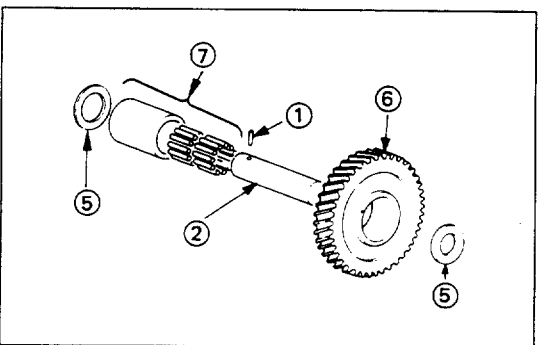
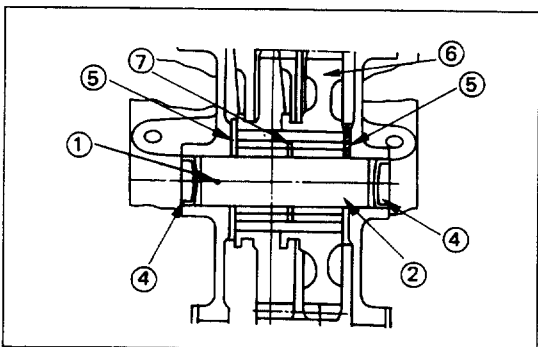
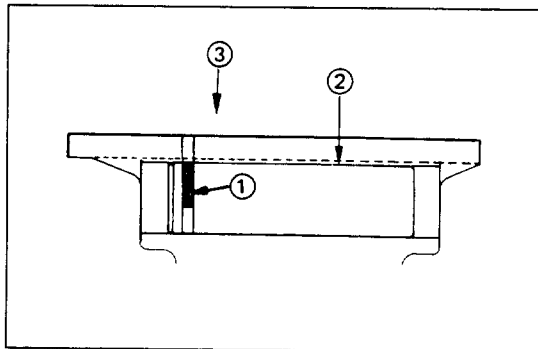
NOTE:

Take care not to misplace the spring ④ and the ball ⑤ or the straight pin and ball.

Leave the shift arm in the gear case. Remove it after removing the idler gear.



12. Shift Rod Stopper
13. Cover
14. Plug
15. Plug
16. Spring Pin
17. Idler Gear Shaft
18. Thrust Washer
19. Idler Gear
20. Shift Arm



21. Needle Roller Bearing

1. Drive the spring pin ① into the idler gear shaft ② from the gear case opening side ③.
2. Use a hammer and brass bar to drive out the plugs ④ along with the idler gear shaft ②.
3. Remove the idler gear shaft ② from the gear case.
4. Use a hammer and a drift punch to drive the spring pin from the idler gear shaft.
5. Remove the thrust washer ⑤, the idler gear ⑥, and the needle bearing ⑦ from the gear case opening side.

NOTE:

Take care not to allow the needle bearings to fall from the bearing case.

22. Front Cover and Gasket

23. Rear Cover and Gasket

24. Oil Seal

25. Front Bearing

26. Output Shaft

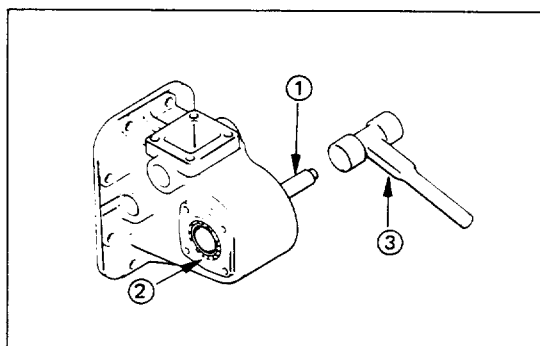
27. Key

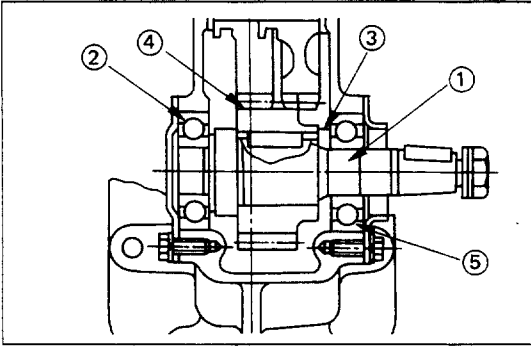
28. Output Gear

29. Distance Collar

30. Rear Bearing

1. Use a hammer and a brass bar to drive out the output shaft ① and the front bearing ②.
Drive the shaft towards the front of the gear case.





2. Use a bench press and a bearing remover to remove the front bearing from the output shaft.
3. Remove the keys from the output shaft.
4. Remove the distance collar ③ and the output gear ④ from the gear case opening side.
5. Use a hammer and a bearing remover to drive out the rear bearing ⑤ towards the rear of the gear case.

31. Gear Case

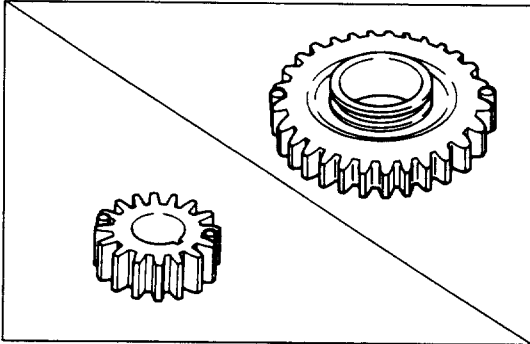
INSPECTION AND REPAIR

Make the necessary adjustments, repairs, and part replacements if excessive wear or damage is discovered during inspection.



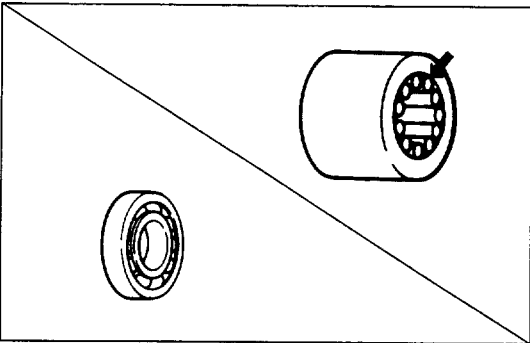
Visual Check

Visually inspect the following parts for excessive wear and damage.



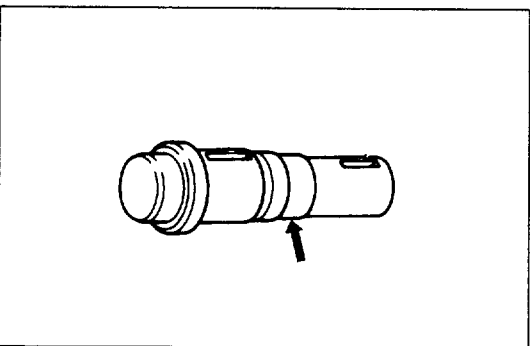
Idler Gear and Output Gear

Check the gear surfaces.



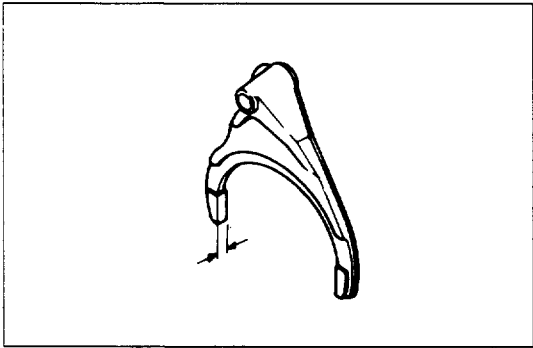
Needle Roller Bearings and Other Bearings

Check the bearing roller surfaces.



Output Shaft

Check the oil seal seating surfaces.



Shift Arm Thickness

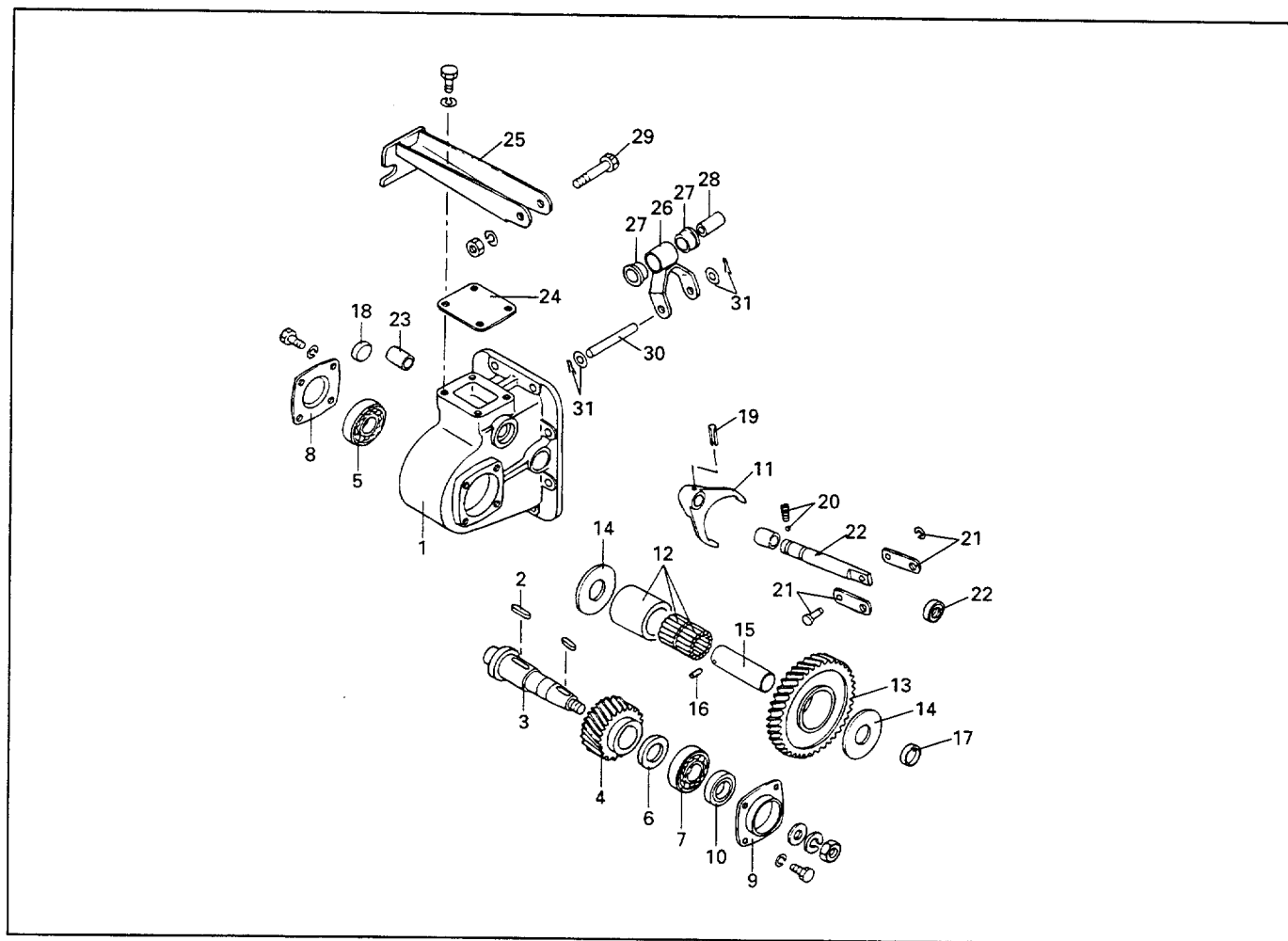
Use a vernier caliper to measure the shift arm thickness.



Shift Arm Thickness		mm (in)
Standard	Limit	
7.0 (0.276)	6.0 (0.236)	

If the measured value is less than the specified limit, the shift arm must be replaced.

REASSEMBLY



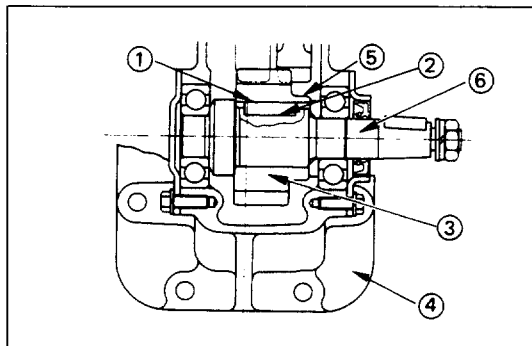
Reassembly Steps

- | | |
|---------------------------|----------------------------------|
| 1. Gear case | 17. Plug |
| 2. Key | 18. Plug |
| 3. Output shaft | 19. Spring pin |
| 4. Output gear | 20. Spring and ball |
| 5. Front bearing | 21. Snap ring, plate and pin |
| 6. Distance collar | 22. Shift rod and oil seal |
| 7. Rear bearing | 23. Cover |
| 8. Front cover | 24. Upper cover |
| 9. Rear cover | 25. Control lever bracket |
| 10. Oil seal | 26. Control lever |
| 11. Shift arm | 27. Bushing |
| 12. Needle roller bearing | 28. Distance collar |
| 13. Idler gear | 29. Bolt, spring washer, and nut |
| 14. Thrust washer | 30. Pin |
| 15. Idler gear shaft | 31. Cotter pin and washer |
| 16. Spring pin | |

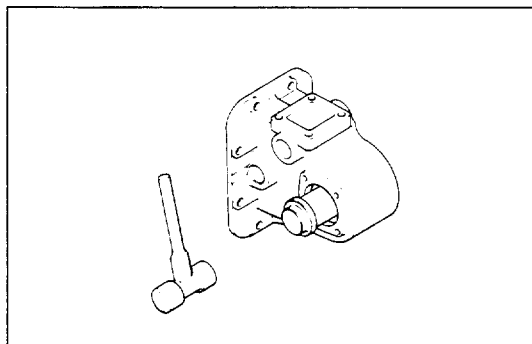


Reassembly Steps

1. Gear Case
2. Key
3. Output Shaft
4. Output Gear



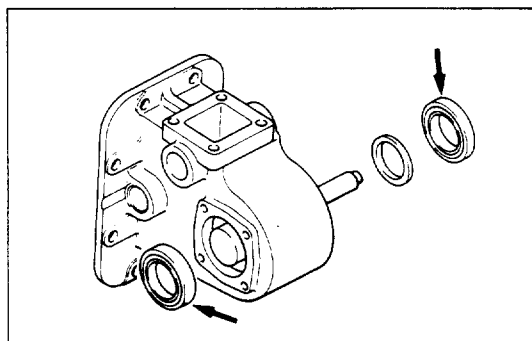
1. Use a copper hammer to drive the key ① into the output shaft key groove ②.
2. Install the output gear ③ to the gear case ④ from the gear case opening side.
The gear boss ⑤ must be facing the rear of the gear case.
3. Align the output gear key groove with the output shaft key.
4. Use a copper hammer to drive the output shaft ⑥ into the output gear from the front side of the gear case.



5. Front Bearing



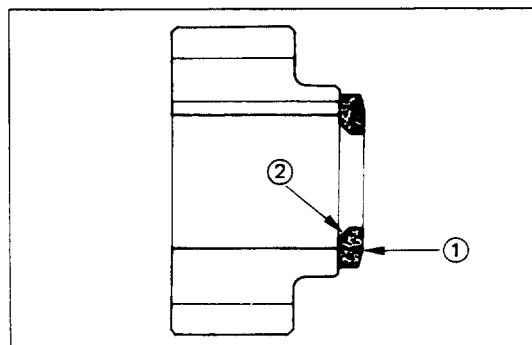
1. Apply gear oil to the bearing outer circumference.
2. Use a hammer and a bearing installer to drive the bearing into the gear case.

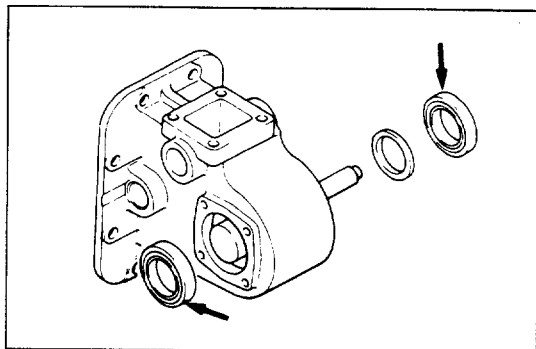


6. Distance Collar



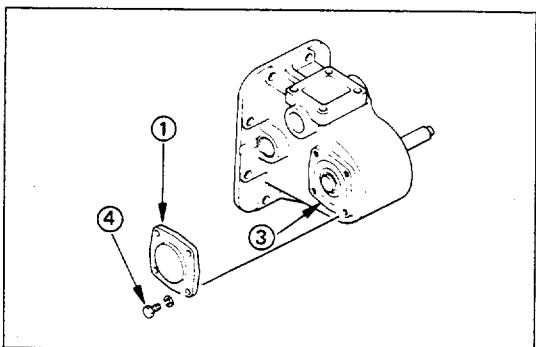
- Install the distance collar ① to the output shaft.
- The distance collar inside chamfer ② must be facing the front side of the gear case.





7. Rear Bearing

1. Apply gear oil to the bearing outer circumference.
2. Use a hammer and a bearing installer to drive the bearing into the gear case.



8. Front Cover and Gasket

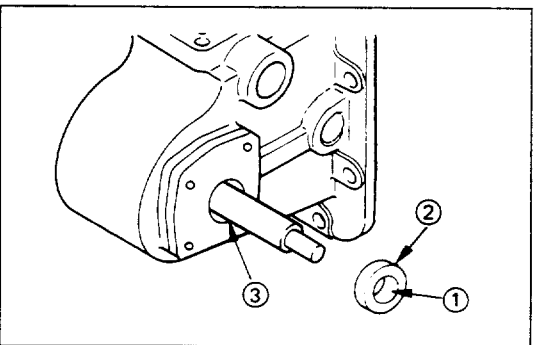
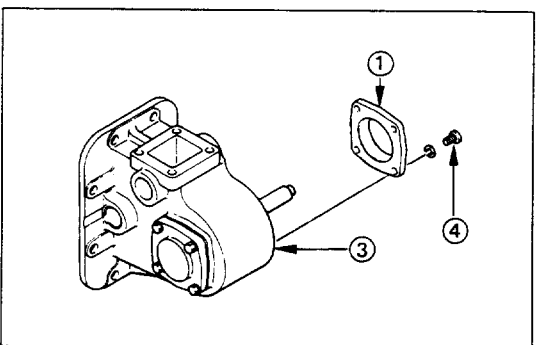
9. Rear Cover and Gasket

1. Apply liquid gasket LOCTITE (FMD-127 or equivalent) to each of the covers ①.
2. Install the covers to the front and rear of the gear case ③.
3. Tighten the cover bolts ④ to the specified torque.



Bolts Torque N·m (kg·m / lb·ft)

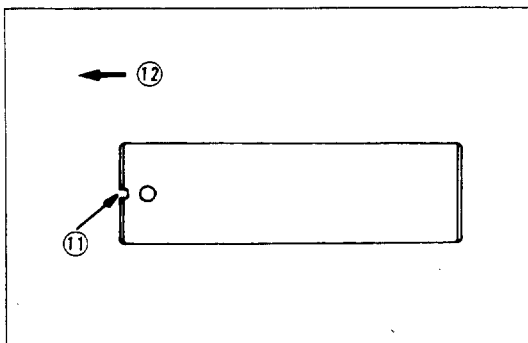
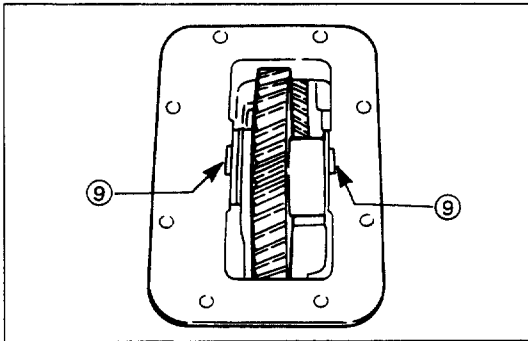
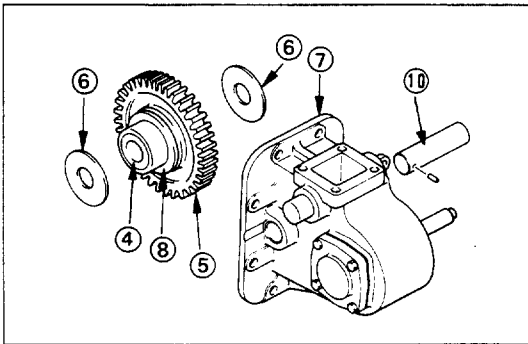
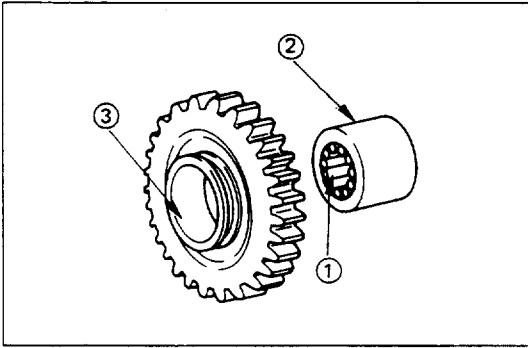
18 (1.8 / 13)



10. Oil Seal

1. Apply chassis grease to the oil seal lip ①.
2. Apply gear oil to the oil seal outer circumference ②.
3. Install the oil seal to the cover ③ from the rear side.





- 11. Shift Arm
- 12. Needle Roller Bearing
- 13. Idler Gear
- 14. Thrust Washer
- 15. Idler Gear Shaft
- 16. Spring Pin



1. Apply chassis grease to the needle roller bearings ①.

2. Install the needle roller bearings ① to the bearing case ②.



3. Apply gear oil to the idler gear inside surface ③.

4. Install the shift arm to the gear box.



5. Install the needle roller bearing ④ along with the idler gear ⑤ and the thrust washers ⑥ to the gear case ⑦ from the gear case open side.

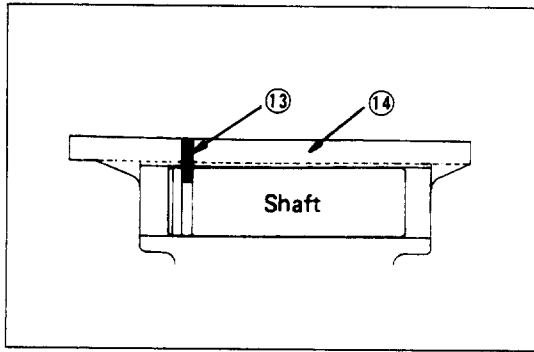
Be sure that the shift arm is inserted to the idler gear shaft arm groove ⑧.

The thrust washer projections ⑨ must be facing outward.

6. Install the idler gear shaft ⑩ to the needle roller bearing.

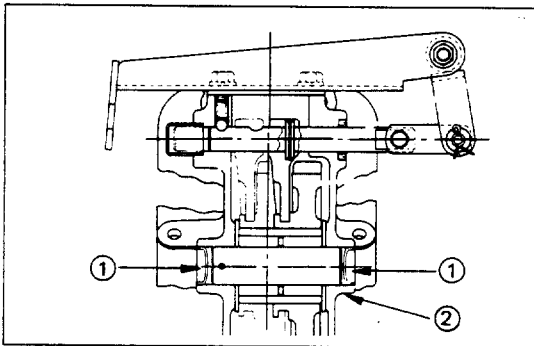


The idler gear shaft groove ⑪ must be facing the front ⑫.



7. Use a screwdriver to align the idler gear shaft spring hole with the gear case spring hole.
8. Use a hammer to drive the spring pin (13) into position.

The spring pin must be perfectly flush with the gear case end (14).

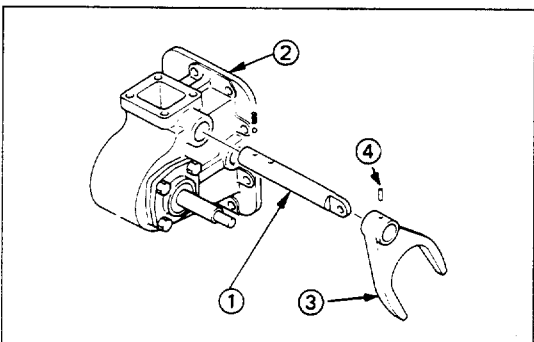


17. Plug

18. Plug



1. Apply liquid gasket (LOCTITE FMD-127 or equivalent) to the outer circumference of each of the plugs.
2. Use the installer and a hammer to drive each plug into the gear case.

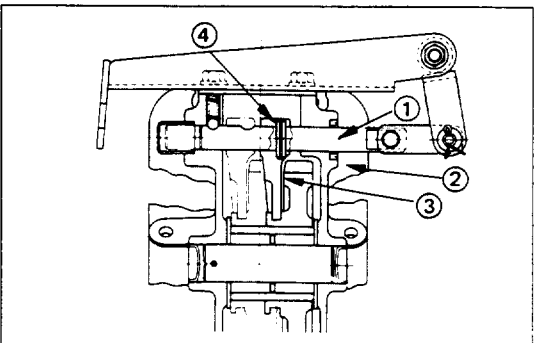


20. Spring Pin

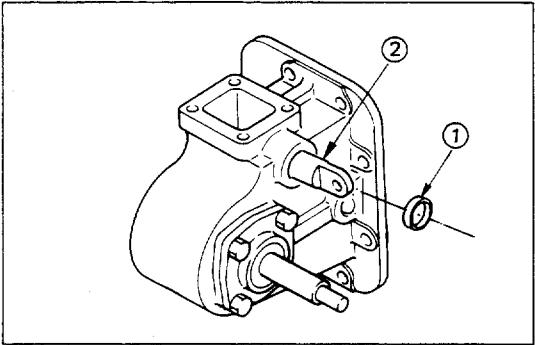
21. Straight Pin and Ball



1. Install the shift rod (1) to the gear case (2) and the shift arm hole (3) from the rear side of the gear case.
2. Align the shift arm pin (4) hole with the shift rod pin hole.
3. Use a hammer and a drift punch to drive the spring pin into the shift arm and shift pin holes.
4. Install the straight pin and ball to the gear case from the gear case upper side.



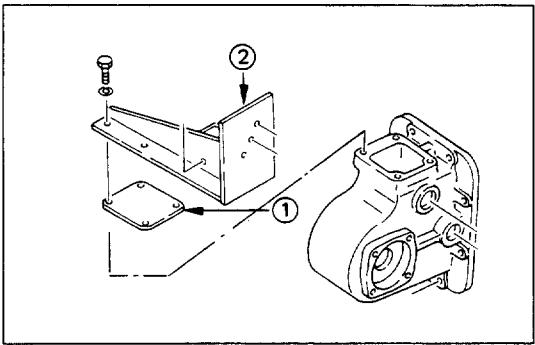
- 19. Spring Pin
- 20. Spring Pin
- 21. Snap Ring, Plate and Pin



22. Cover



- 1. Apply liquid gasket to the cover outer circumference ①.
- 2. Use the installer and a hammer to install the cover to the gear case from the front side.



23. Shift Rod and O-ring



24. Upper Cover Plate and Gasket

25. Control Lever Bracket



- 1. Apply liquid gasket (LOCTITE FMD-127 or equivalent) to the upper cover ① .
- 2. install the upper cover ① to the control level bracket ②.
- 3. Tighten the control lever bracket ③ along with the upper cover ① to the specified torque.

Bolts Torque	N-m (kg-m / lb-ft)
37 (3.8 / 27)	

- 26. Control Lever
- 27. Bushing
- 28. Distance Collar
- 29. Bolt
- 30. Pin
- 31. Cotter Pin and Washer

SECTION 7C

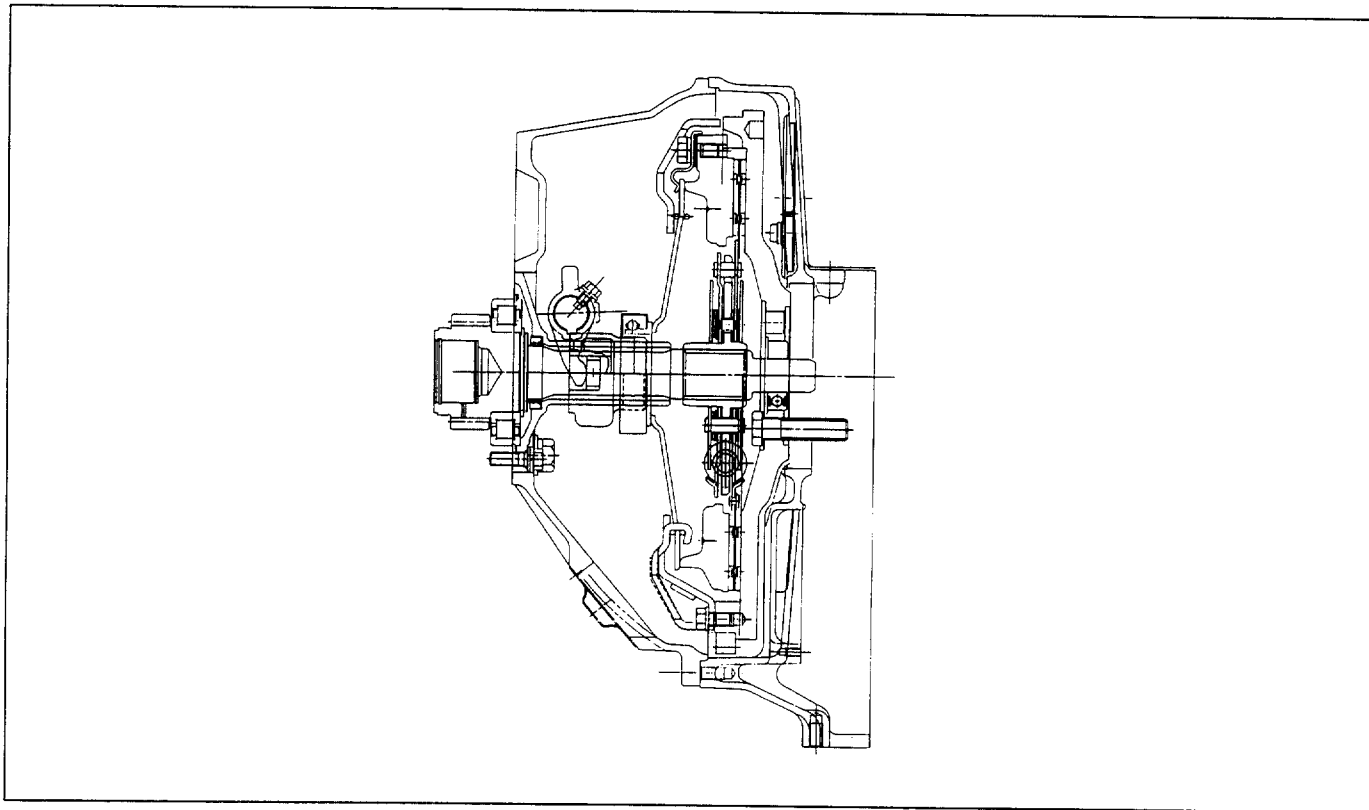
CLUTCH

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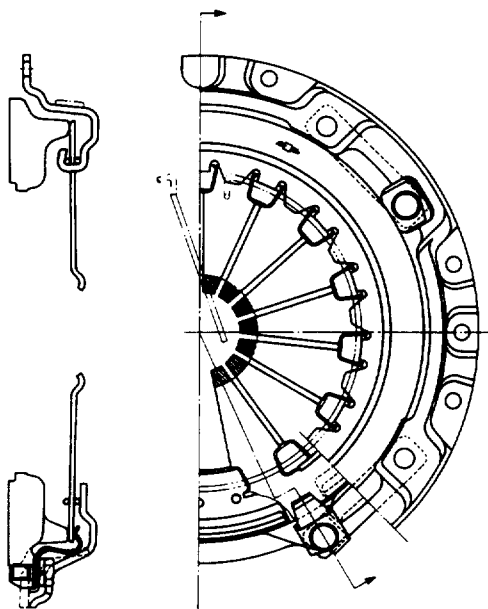
GENERAL DESCRIPTION

CLUTCH ASSEMBLY

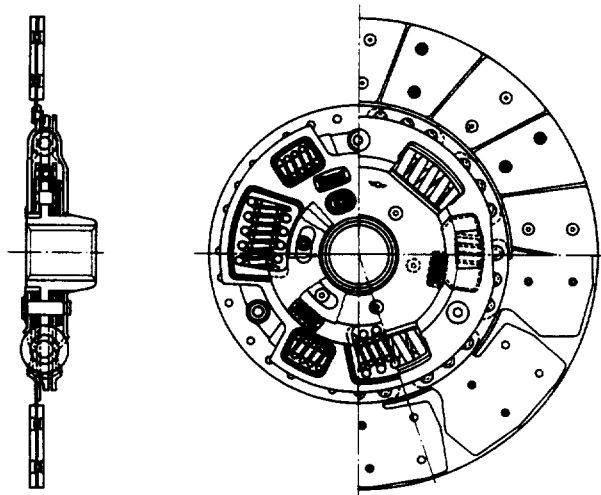


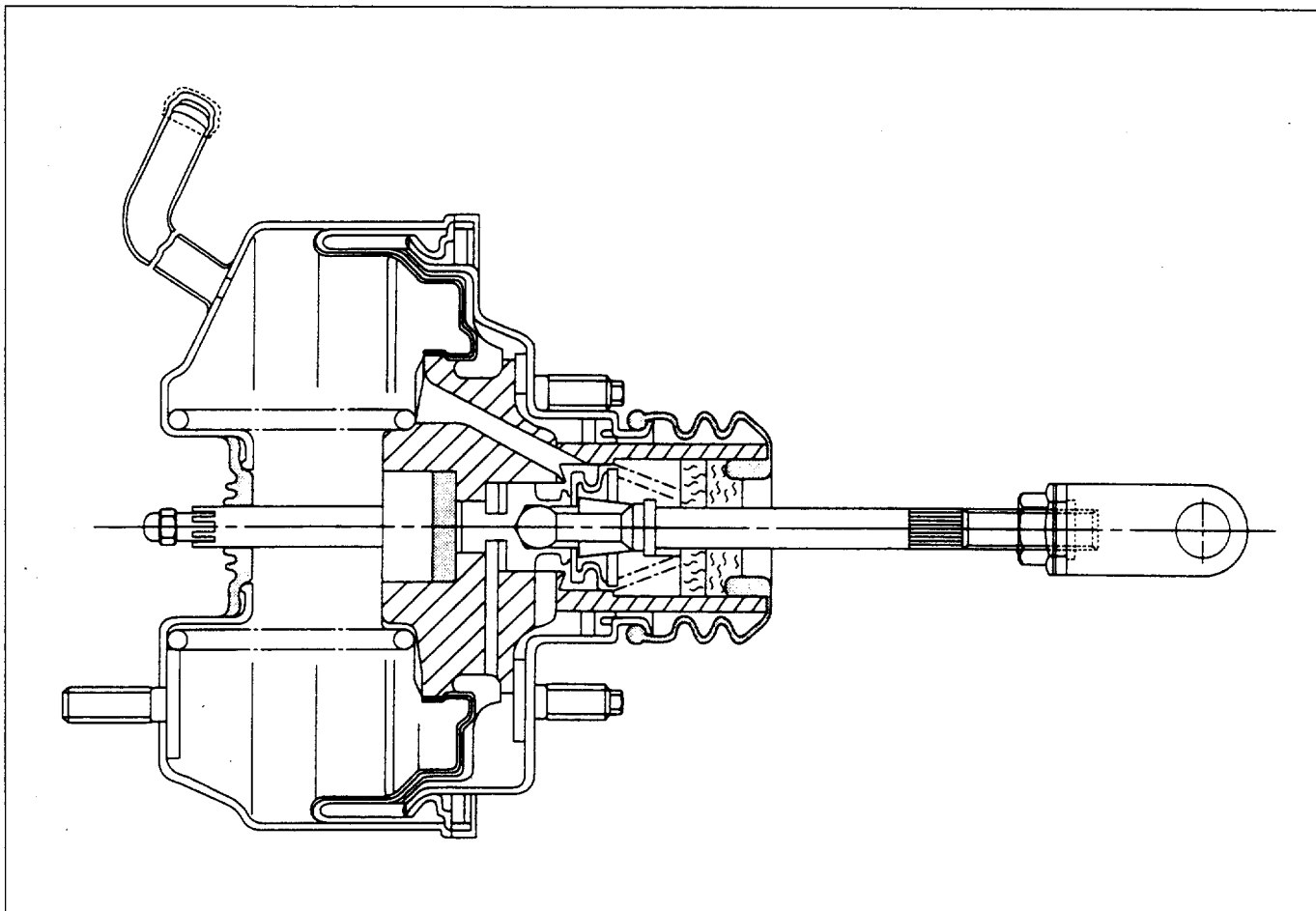
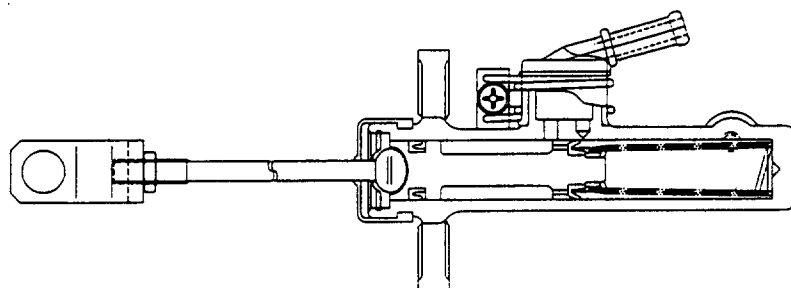
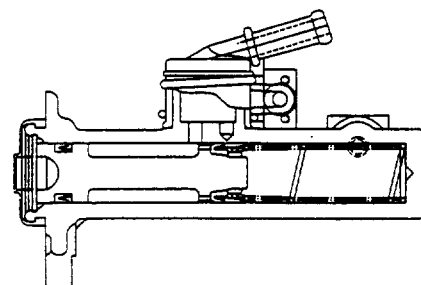
PRESSURE PLATE ASSEMBLY AND DRIVEN PLATE

Pressure plate assembly

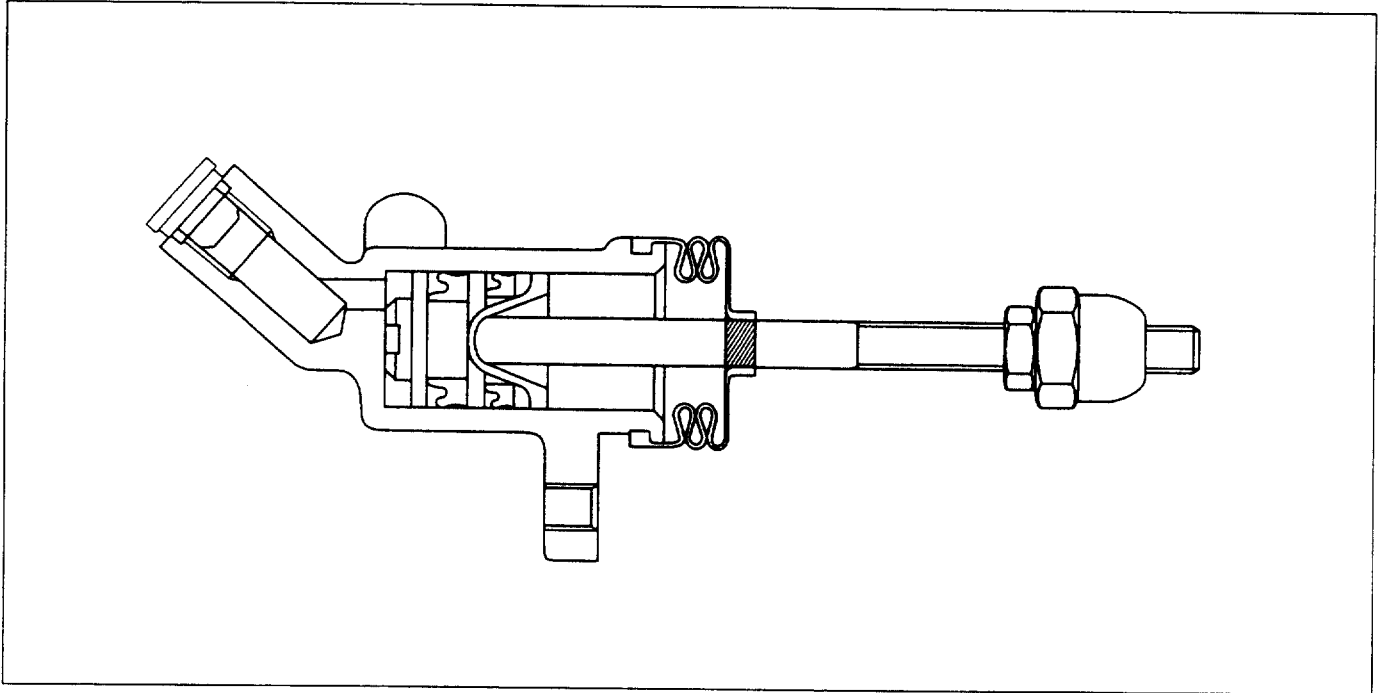


Driven plate assembly



CLUTCH BOOSTER**MASTER CYLINDER****Booster less****With Booster**

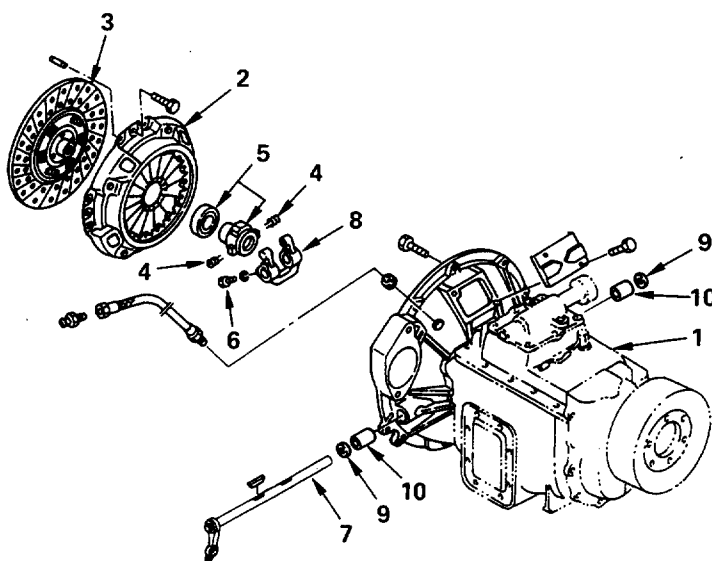
SLAVE CYLINDER



ON-VEHICLE SERVICE

CLUTCH ASSEMBLY

REMOVAL



Removal Steps

1. Transmission assembly
2. Pressure plate assembly
3. Driven plate assembly
4. Return spring
5. Shift block and release bearing
6. Set bolt
7. Shift shaft and key
8. Shift fork
9. Dust seal
10. Needle bearing



Removal Step

- Raise vehicle and support with suitable safety stands.



CAUTION

Do not clutch fluid remain on a painted surface.

Wash it off immediately.

1. Transmission Assembly

Refer to "SECTION 7B ON-VEHICLE SERVICE: TRANSMISSION ASSEMBLY REPLACEMENT" in this manual.

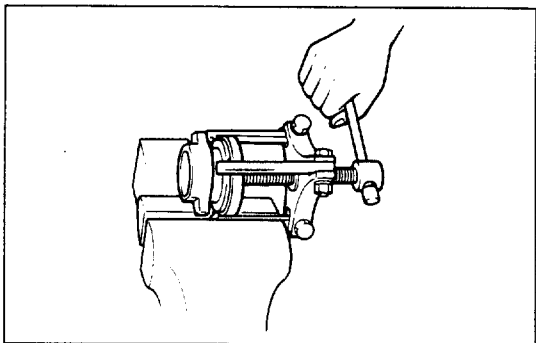
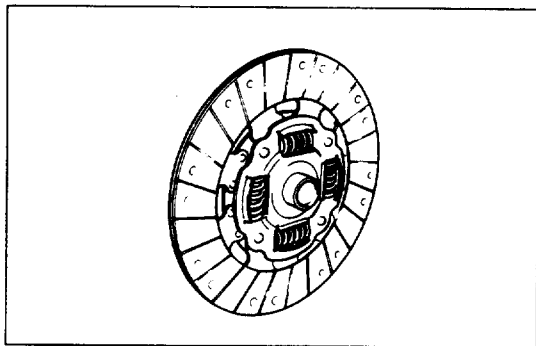
2. Pressure Plate Assembly

3. Driven Plate Assembly



- Use the pilot aligner to prevent the driven plate assembly from falling free.
Pilot aligner: 1-85253-008-0
- Mark the flywheel and pressure plate lug for alignment when installing.

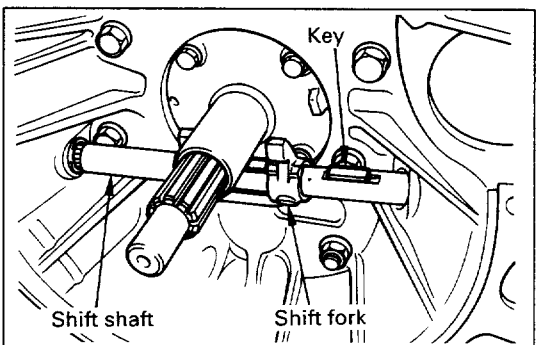
4. Return Spring



5. Shift Block and Release Bearing

- Use the bearing puller to release bearing from the shift block.
Bearing puller: 9-85210-148-0

6. Set Bolt



7. Shift Shaft and Key

8. Shift Fork

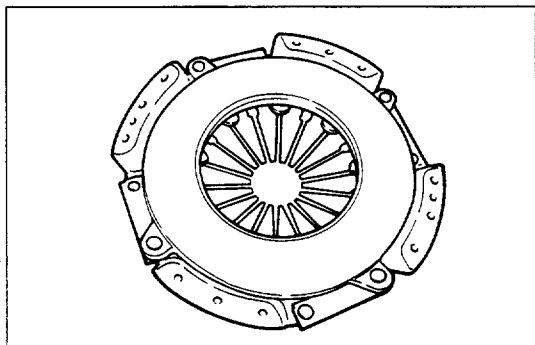
- Remove shift shaft by tapping. Install a round bar from the end of the shaft.

9. Dust Seal

10. Needle Bearing

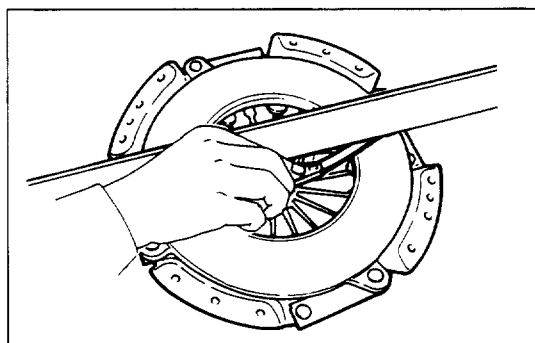
INSPECTION AND REPAIR

Make the necessary adjustments, repairs, and part replacement if excessive wear or damage is discovered during inspection.



Pressure Plate Assembly

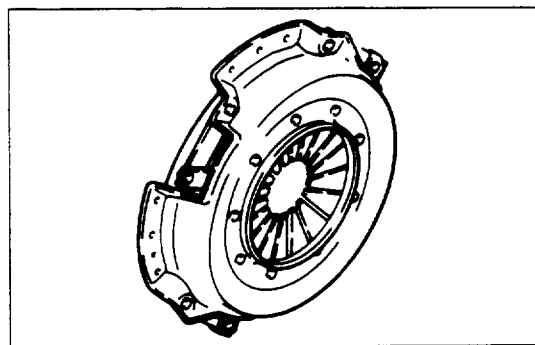
- Visually inspect the pressure plate friction surface for excessive wear and heat cracks. If excessive wear or deep heat cracks are present, the pressure plate must be replaced.



Pressure Plate Warpage

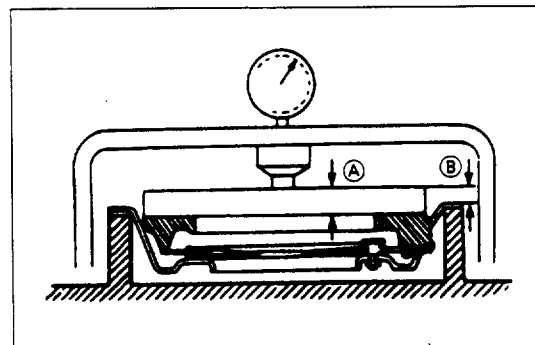
- Use a straight edge and a feeler gauge to measure the pressure plate friction surface flatness in four directions.
- If any of the measured values exceed the specified limit, the pressure plate assembly must be replaced.

Pressure Plate Warpage	mm (in)
Limit	
0.3 (0.0118)	



Clutch Cover

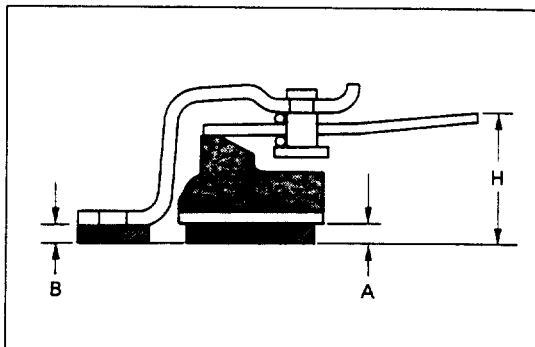
- Visually inspect the entire clutch cover for excessive wear, cracking, and other damage.
- The Pressure plate assembly must be replaced if any of these conditions are present.



Clutch Set Force

- Invert the pressure plate.
- Place a metal sheet with "A" thickness of 9.2 mm (0.362 in) on the pressure plate.
- Compress the pressure plate assembly until the distance "B" becomes 19 mm (0.748 in).
- Note the pressure plate gauge reading.

Clutch Set Force	N (kg / lb)
Standard	
9,512 (970 / 2,139)	

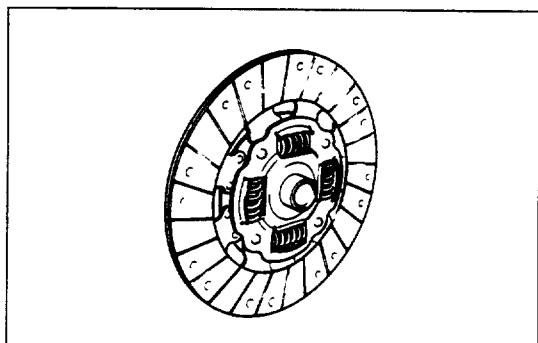


Diaphragm Spring Finger Height

- 1) Place a metal sheet with "A" thickness of 9.2 mm (0.362 in) under the pressure plate.
- 2) Compress the pressure plate assembly until the distance "B" becomes 19 mm (0.748 in). There are two ways to do this.
 - a. Use a bench press to press down on the pressure plate assembly from the top.
 - b. Tighten the pressure plate assembly fixing bolts.
- 3) Measure the spring finger height "H" from base to spring tip.

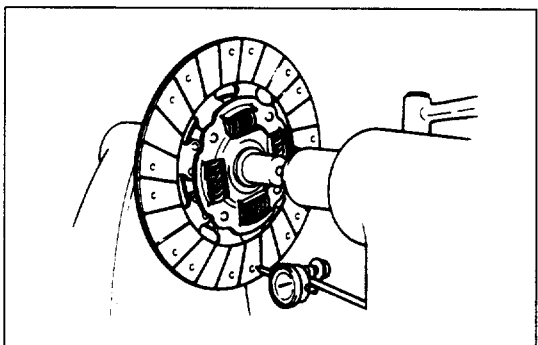


Spring Finger Height	mm (in)
Standard	
61.8 – 63.8 (2.433 – 2.512)	



Driven Plate Assembly

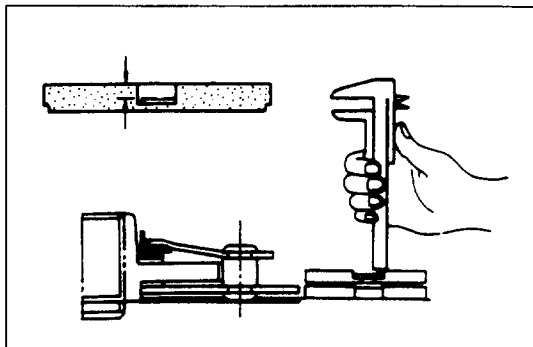
- Visually inspect the torsion spring for looseness, breakage, and weakening.
If any of these conditions are discovered, the driven plate assembly must be replaced.
- Visually inspect the facing surfaces for cracking and excessive scorching.
Visually inspect the facing surfaces for the presence of oil or grease.
If any of these conditions are discovered, the facing must be cleaned or the driven plate assembly replaced.
- Check that the driven plate moves smoothly on the transmission top gear shaft spline.
Minor ridges on the top gear shaft spline may be removed with an oil stone.



Driven Plate Warpage

- Insert the pilot aligner into the driven plate spline hub.
The pilot aligner must be held perfectly horizontal.
Pilot Aligner: 1-8525-3008-0
- Set a dial indicator to the driven plate outside circumference.
- Slowly turn the driven plate.
Read the dial indicator as you turn the driven plate.
If the measured value exceeds the specified limit, the driven plate assembly.

Driven Plate Warpage		mm (in)
Standard	Limit	
0.7 (0.028)	1.0 (0.039)	

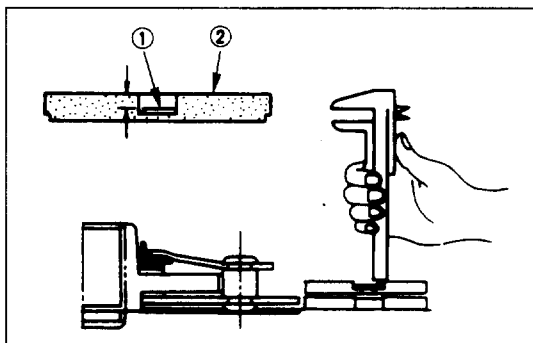


Driven Plate Splined Hub Spline Wear



- Clean the driven plate splined hub.
 - Install the driven plate to the transmission top gear shaft spline.
 - Set a surface gauge to the driven plate outside circumference.
 - Slowly turn the driven plate. Measure the spline rotation play as you turn the driven plate.
- If the measured value exceeds the specified limit, the driven plate assembly must be replaced.

Driven Plate Splined Hub Spline Wear	mm (in)
Standard	
1.8 - 2.4 (0.071 - 0.094)	

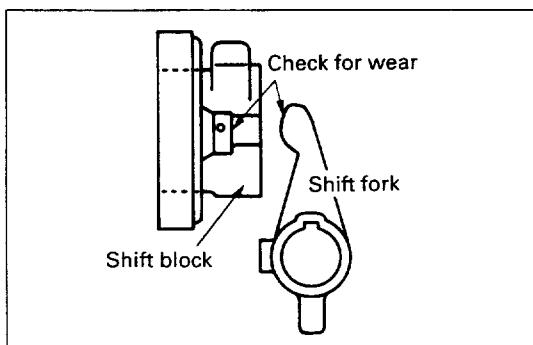


Driven Plate Rivet Head Depression



- Use the depth gauge or a straight edge with steel rule to measure the rivet head depression from the facing surface.
- Be sure to measure the rivet head depression on both sides of the driven plate.
- If the measured value is less than the specified limit, the driven plate must be replaced.

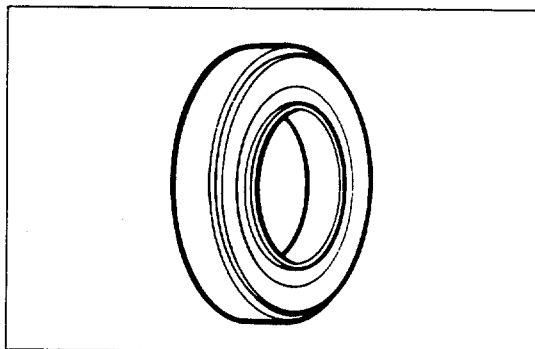
Rivet Head Depression	mm (in)
Standard	Limit
1.8 - 2.4 (0.070 - 0.094)	0.6 (0.024)



Shift Block and Shift Fork Wear

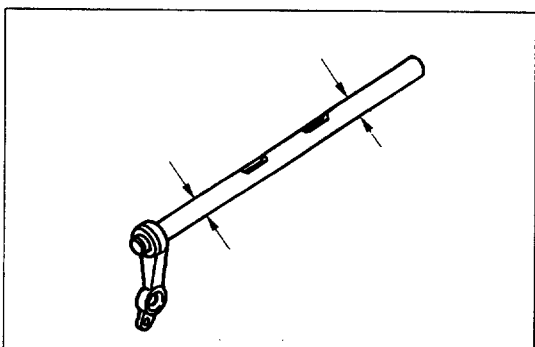


- Check the surface of the shift block for wear or damage.
- Check the surface of the shift fork for wear or damage.

**Clutch Shaft Wear**

- Clutch shaft diameters as shown in figure. If the diameter is less than 24.5mm(0.964in), replace the clutch shaft and needle bearing.

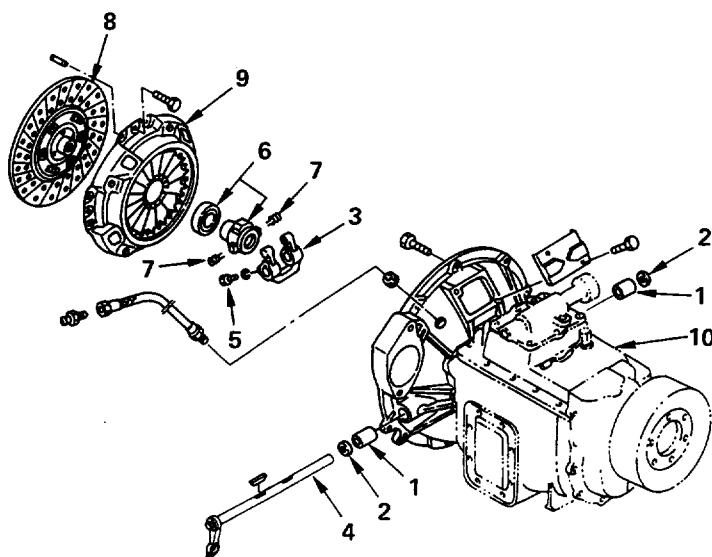
Clutch Shaft Wear		mm (in)
Standard	Limit	
25.0 (0.984)	24.5 (0.964)	

**Release Bearing**

- Visually inspect the release bearing for looseness, breakage, and weakening.

If any of these conditions are discovered, the release bearing must be replaced.

INSTALLATION



Installation Steps

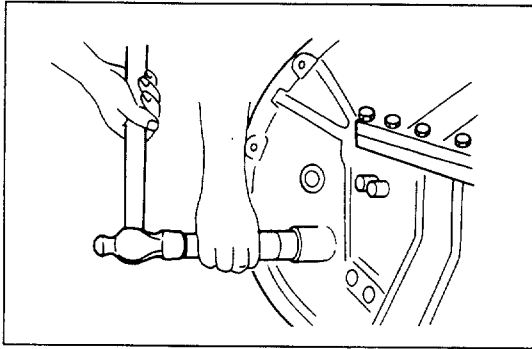
1. Needle bearing
2. Dust seal
3. Shift fork
4. Shift shaft and Key
5. Set bolt
6. Shift block and release bearing
7. Return spring
8. Driven plate assembly
9. Pressure plate assembly
10. Transmission assembly



Installation Step

1. Needle Bearing

- Use a 31.5mm (1.24inch) diameter bar to drive the needle bearing from the marked side of the bearing and install it specified depth as shows in illustration.



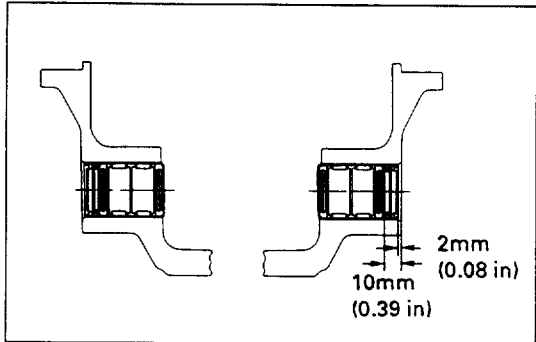
2. Dust Seal



- Before installing the new bearing, apply grease to the bearing surfaces and the clearance area between the bearing and the dust seal.

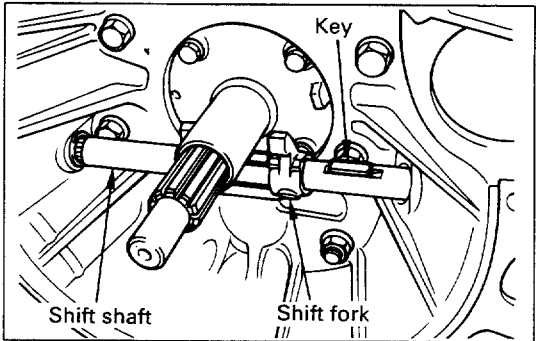
3. Shift Fork

4. Shift Shaft and Key



5. Set Bolt

- Install the clutch shaft to the clutch housing.
- Key and shift fork onto the clutch shaft assembly.
- Tighten the set bolt.

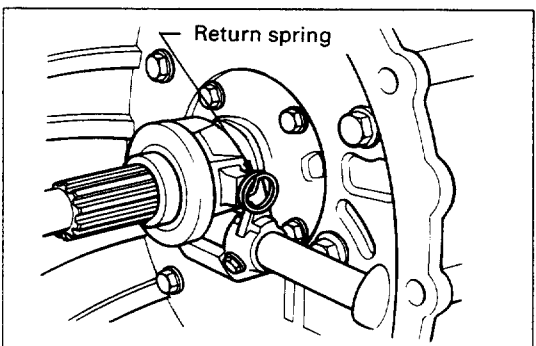


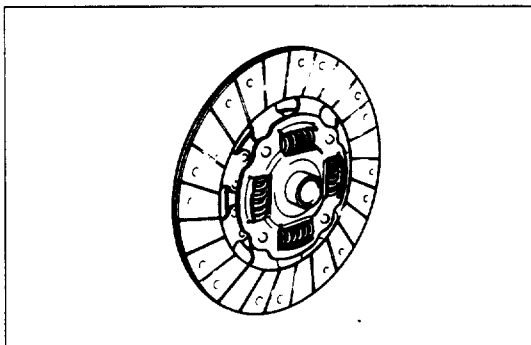
Set Bolt Torque	N-m (kg-m / lb-in)
	13 (1.3 / 113)

6. Shift Block and Release Bearing

7. Return Spring

- Apply the MoS² contained type grease to shift fork and shift block surfaces.
- Install the return spring.

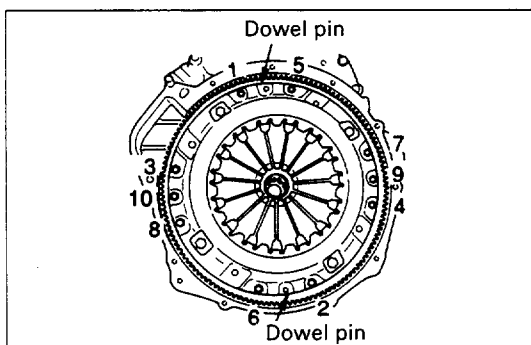




8. Driven Plate Assembly

- Attach driven plate to flywheel by clutch pilot aligner.

Pilot aligner: 1-85253-008-0



9. Pressure Plate Assembly

- Install the pressure plate assembly to the flywheel.
If the pressure plate was replaced to new parts, be sure to remove the ring which is installed to the diaphragm spring.
- Tighten the pressure plate bolt, in the sequence shown figure.



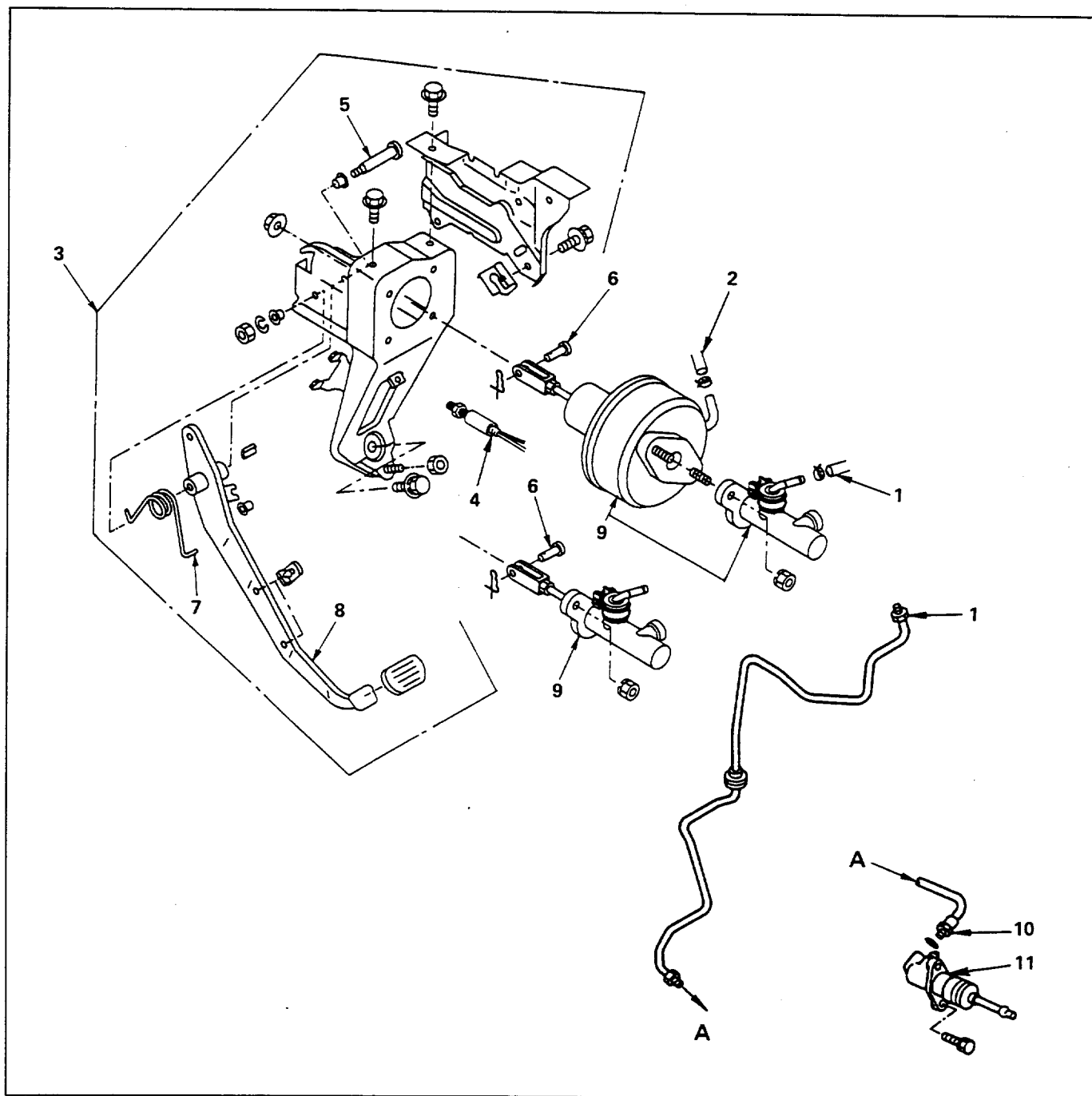
Pressure Plate Bolt Torque	N·m (kg·m / lb·ft)
40 (4.1 / 30)	

- Remove the pilot aligner.

10. Transmission Assembly

Refer to "SECTION 7B ON-VEHICLE SERVICE: TRANSMISSION ASSEMBLY REPLACEMENT" in this manual.

CLUTCH CONTROL REMOVAL



Removal Steps

1. Clutch pipe and hose
2. Vacuum hose
3. Clutch pedal and bracket assembly
4. Clutch switch or stopper bolt
5. Shaft
6. Clevis pin
7. Return spring
8. Clutch pedal
9. Clutch booster with master cylinder or master cylinder
10. Flexible hose
11. Slave cylinder

Preparation

1. Remove Meter Cluster

- Pull out the meter cluster and disconnect the harness connectors.

2. Meter Assembly

- Remove the 5 fixing screws, then remove the meter assembly and disconnect the harness connector.



Removal Steps

- Drain the clutch fluid from the clutch hydraulic line.



CAUTION

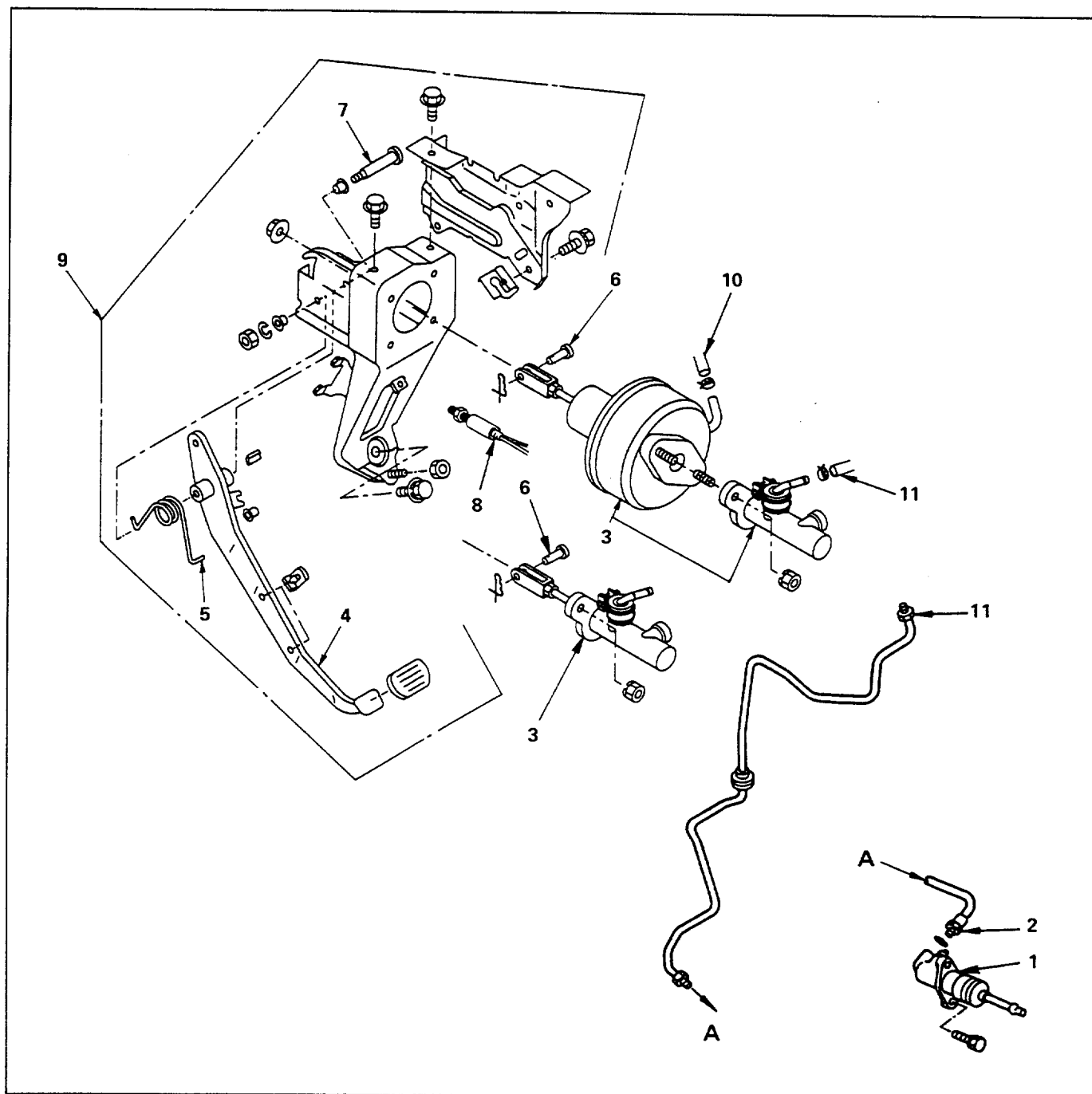
Do not let clutch fluid remain on a painted surface.
Wash it off immediately.

1. Clutch Pipe and Hose
2. Vacuum Hose
3. Clutch Pedal and Bracket Assembly
4. Clutch Switch or Stopper Bolt
5. Shaft
6. Clevis Pin
7. Return Spring
8. Clutch Pedal
9. Clutch Booster with Master Cylinder or Master Cylinder
10. Flexible Hose
11. Slave Cylinder

INSPECTION AND REPAIR

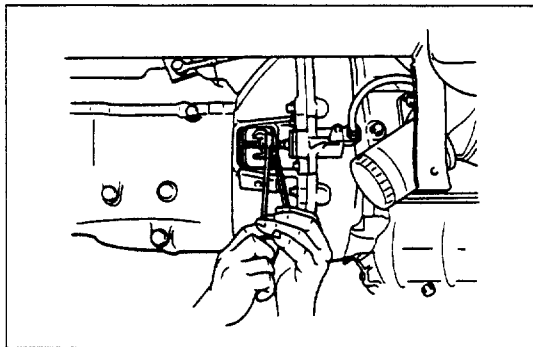
Make the necessary adjustment, repairs, and part replacement if excessive wear or damage is discovered during inspection.

INSTALLATION



Installation Steps

1. Slave cylinder
2. Flexible hose
3. Clutch booster with master cylinder or master cylinder
4. Clutch pedal
5. Return spring
6. Clevis pin
7. Shaft
8. Clutch switch or stopper bolt
9. Clutch pedal and bracket assembly
10. Vacuum hose
11. Clutch pipe and hose



Installation Steps

1. Slave Cylinder



Slave Cylinder Bolt Torque	N·m (kg·m / lb·ft)
16 (1.6 / 12)	

- Perform slave cylinder adjustment before installation of the return spring.
- 1) Loosen the lock nut of the push rod.
 - 2) Turn the adjust but until it reaches the shift fork.
 - 3) Back off the adjust nut 1.5 turns. (shift fork free play approximately 2 mm).
 - 4) Tighten the lock nut.



Push Rod Lock Nut Torque	N·m (kg·m / lb·ft)
19 (1.9 / 14)	

2. Flexible Hose

3. Clutch Booster with Master Cylinder or Master Cylinder

- Install the clutch booster with master cylinder assembly or the master cylinder assembly to the clutch pedal bracket.



Fixing Nuts Torque	N·m (kg·m / lb·in)
13 (1.3 / 113)	

4. Clutch Pedal

5. Return Spring

6. Clevis Pin

7. Shaft

8. Clutch Switch or Stopper Bolt

9. Clutch Pedal and Bracket Assembly



Clutch Bracket Bolts Torque	N·m (kg·m / lb·ft)
37 (3.8 / 27)	

- Perform the clutch pedal adjustment after installation of clutch control.

Clutch Pedal Height and Stroke

- 1) Loosen the lock nut of the clutch booster operating rod or the master cylinder push rod.
- 2) Adjust the pedal height by turning operating rod or push rod.

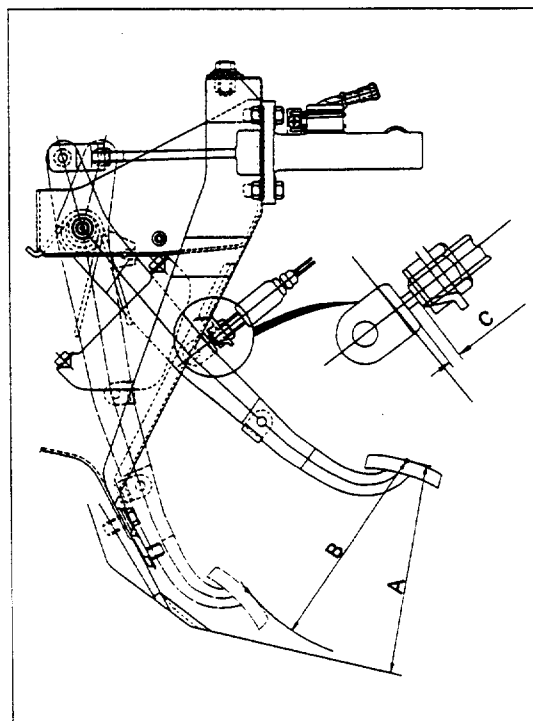


Clutch Pedal Height and Stroke	mm (in)
Height(A) : 160 - 170 (6.30 - 6.69)	
Stroke(B) : 159 - 169 (6.26 - 6.65)	

- 3) Tighten the lock nut.



Lock Nut Torque	N·m (kg·m / lb·ft)
With Booster : 20 (2.0 / 14)	
Booster Less : 13 (1.3 / 9.4)	



- 4) Install the meter assembly and meter cluster.

Clutch Pedal Free Play

Clutch Switch or Stopper Bolt

After completion of clutch pedal height and slave cylinder adjustment, adjust the clutch switch or stopper bolt clearance.

- 1) Loosen the lock nut of clutch switch or stopper bolt.
- 2) Adjust the clutch switch or stopper bolt clearance by turning clutch switch or stopper bolt.

Clutch Switch or Stopper Bolt Clearance

Clearance(C)	mm (in)
0.5 - 1.0 (0.02 - 0.04)	

Clutch Pedal Free Play	mm (in)
15 - 25 (0.59 - 0.98)	

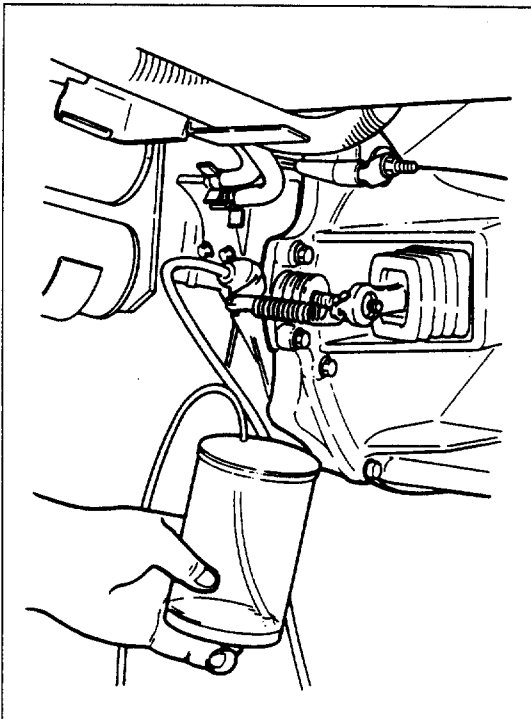
- 3) Tighten the lock nut.

Lock Nut Torque	N-m (kg-m / lb-ft)
19 (1.9 / 14)	

10. Vacuum Hose

11. Clutch Pipe and Hose

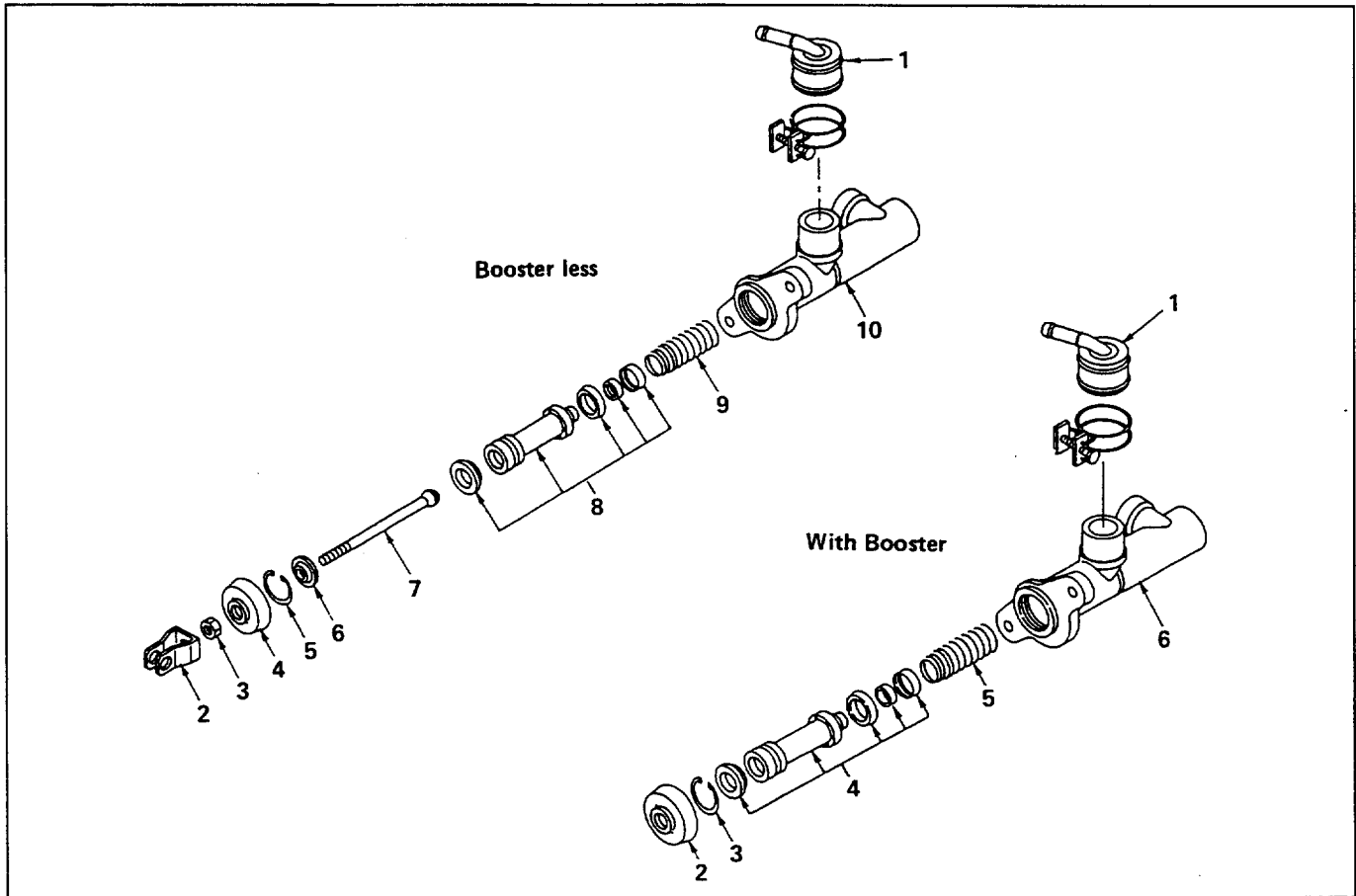
- Perform the clutch hydraulic circuit bleeding after installation of the clutch control.
Bleeding operation calls for cooperative action of two men.
- 1) Check the level of clutch fluid in the reservoir and replenish if necessary.
- 2) Remove the rubber cap from the bleeder screw and wipe clean the bleeder screw.
Connect a vinyl tube to the bleeder screw and insert the other end of the vinyl tube into a transparent container.
- 3) Pump the clutch pedal repeatedly and hold it depressed.
- 4) Loosen the bleeder screw on the clutch slave cylinder to release clutch fluid with air bubbles into the container and tighten the bleeder screw immediately.
- 5) Release the clutch pedal carefully. Repeat the above operation until air bubbles disappear from the clutch fluid being pumped out into the container. During the bleeding operation, keep the clutch fluid reservoir filled to the specified level.
Reinstall the rubber cap.



UNIT REPAIR

MASTER CYLINDER

DISASSEMBLY



Removal Steps

Booster Less

1. Pipe joint
2. Clevis yoke
3. Lock nut
4. Dust cover
5. snap ring
6. Stopper
7. Push rod
8. Piston assembly
9. Return spring
10. Cylinder body

With Booster

1. Pipe joint
2. Dust cover
3. Snap ring
4. Piston assembly
5. Return spring
6. Cylinder body



Disassembly Steps

Booster Less

1. Pipe Joint
2. Clevis Yoke

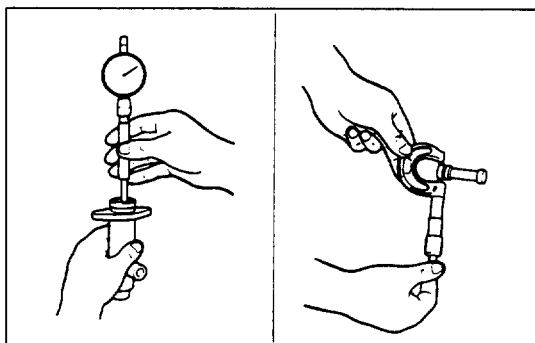
3. Lock Nut
4. Dust Cover
5. Snap Ring
 - Press down the piston with your finger to prevent it from jumping out.
6. Stopper
7. Push Rod
8. Piston Assembly
9. Return Spring
10. Cylinder Body

With Booster

1. Pipe Joint
2. Dust Cover
3. Snap Ring
 - Press down the piston with your finger to prevent it from jumping out.
4. Piston Assembly
5. Return Spring
6. Cylinder Body

INSPECTION AND REPAIR

Make the necessary adjustments, repairs, and parts replacements if excessive wear or damage is discovered during inspection.

**Cylinder Body**

- Wash clean the cylinder body in brake fluid.
- Check the fluid return port for restrictions and clean it if necessary.
- Measure the cylinder inside diameter.



Master Cylinder Inside Diameter mm (in)

Standard

With Booster : \varnothing 20.640 - 20.692 (0.8126 - 0.8146)

Booster Less : \varnothing 19.050 - 19.102 (0.7500 - 0.7520)

Clearance between Cylinder Bore
and Piston Clearance mm (in)

Standard

Limit

0.03 - 0.11 (0.0012 - 0.0043)

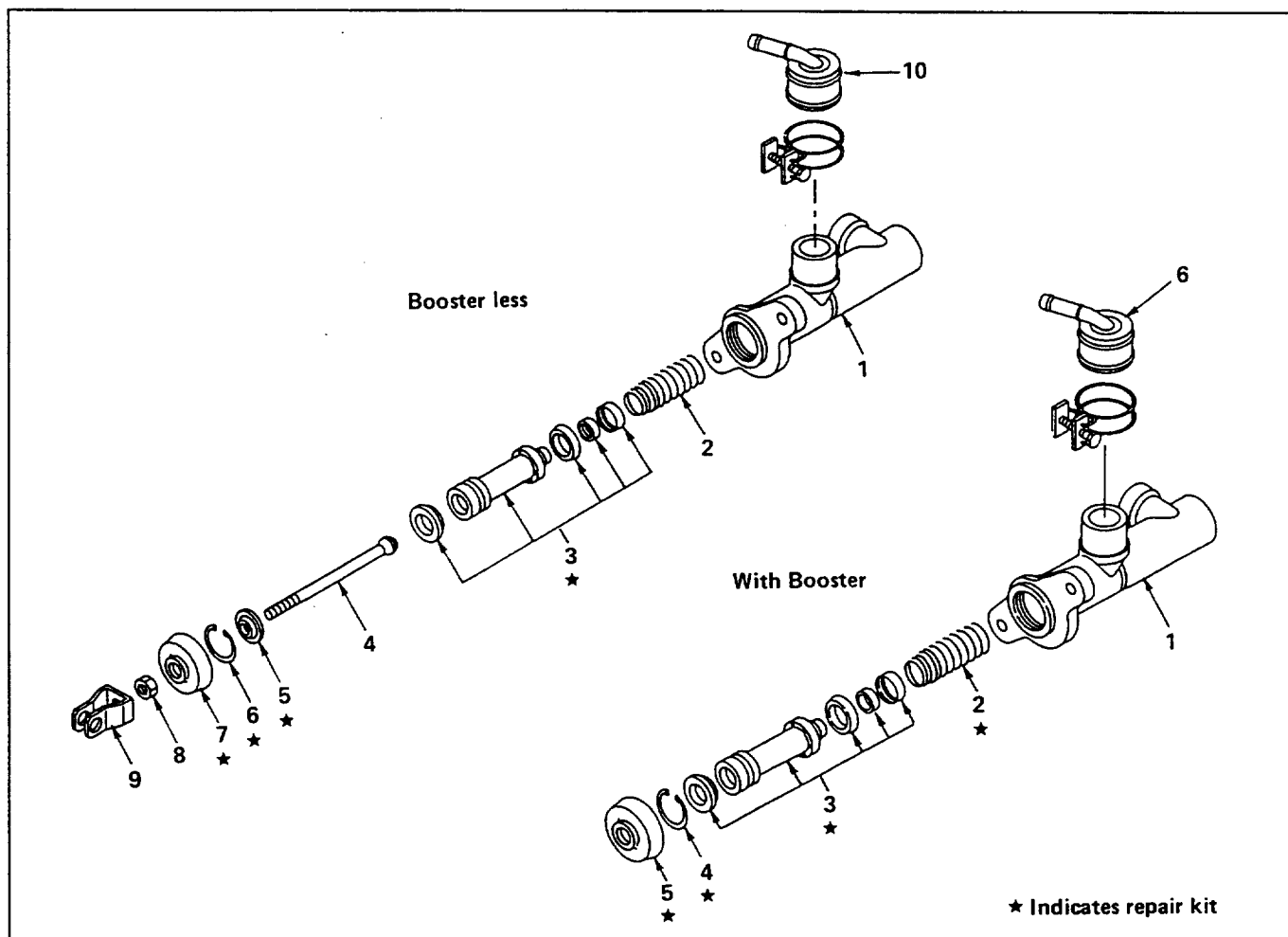
0.12 (0.0047)

- If excessive wear or any abnormal conditions are present, the master cylinder assembly must be replaced with new one.

**CAUTION**

If the master cylinder has been disassembled, the repair kit must be replaced with new one.

REASSEMBLY



Reassembly Step

Booster Less

1. Cylinder body
2. Return spring
3. Piston assembly
4. Push rod
5. Stopper
6. Snap ring
7. Dust cover
8. Lock nut
9. Clevis yoke
10. Pipe joint

With Booster

1. Cylinder body
2. Return spring
3. Piston assembly
4. Snap ring
5. Dust cover
6. Pipe joint

**Reassembly Step****Booster Less****1. Cylinder Body**

- Immerse the cylinder body in clean brake fluid.

2. Return Spring

- Install the return spring to the piston assembly.

3. Piston Assembly

- Before installing, apply a thin coat of rubber grease to the piston.

**CAUTION**

Use care to prevent damaging the lip of the piston cup.

4. Push Rod**5. Stopper****6. Snap Ring****7. Dust Cover****8. Lock Nut**

Lock Nut Torque	N·m (kg·m / lb·in)
13 (1.3 / 113)	

9. Clevis Yoke**10. Pipe Joint**

Pipe Joint Torque	N·m (kg·m / lb·in)
5 (0.5 / 43)	

With Booster**1. Cylinder Body**

- Immerse the cylinder body in clean brake fluid.

2. Return Spring

- Install the return spring to the piston assembly.

3. Piston Assembly

- Before installing, apply a thin coat of rubber grease to the piston.

**CAUTION**

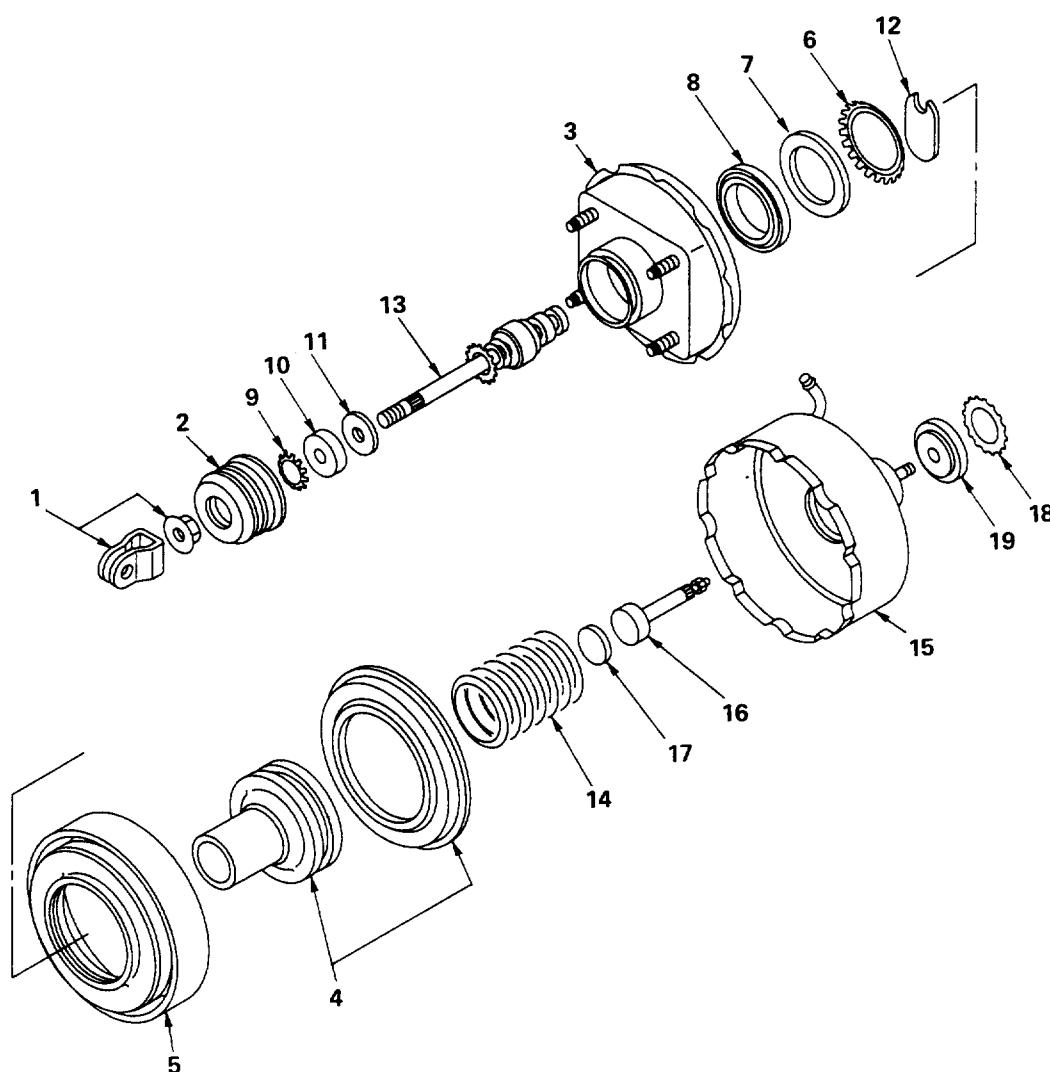
Use care to prevent damaging the lip of the piston cup.

4. Snap Ring**5. Dust Cover****6. Pipe Joint**

Pipe Joint Torque	N·m (kg·m / lb·in)
5 (0.5 / 43)	

CLUTCH BOOSTER

DISASSEMBLY



Disassembly Steps

- | | |
|-----------------------------|----------------------------|
| 1. Clevis yoke | 11. Filter |
| 2. Boot | 12. Stopper key |
| 3. Rear shell | 13. Valve plunger assembly |
| 4. Diaphragm plate assembly | 14. Return spring |
| 5. Diaphragm | 15. Front shell |
| 6. Bearing retainer | 16. Push rod |
| 7. Bearing | 17. Reaction disc |
| 8. Seal | 18. Retainer |
| 9. Silencer retainer | 19. Push rod seal |
| 10. Silencer | |



Disassembly Steps

1. Clevis Yoke
2. Boot
3. Rear Shell

- Apply setting marks to the front shell and rear shell.
- Install the support plate to the front shell.
- Install the handle to the rear shell.

Support Plate : 5-8840-2058-0

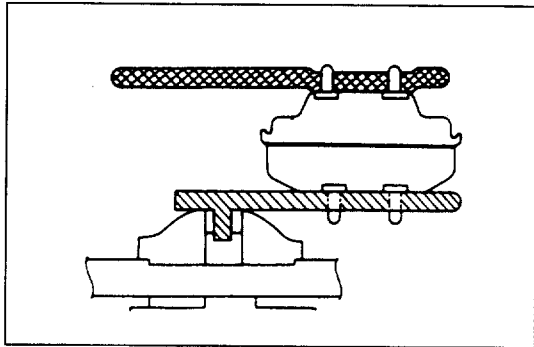
Handle : 9-8523-1733-0



NOTE

Note that the diaphragm spring pops out of position as the rear shell is removal.

4. Diaphragm Plate Assembly
5. Diaphragm
6. Bearing Retainer
7. Bearing
8. Seal
9. Silencer Retainer
10. Silencer
11. Filter
12. Stopper Key
13. Valve Plunger Assembly
14. Return Spring
15. Front Shell
16. Push Rod
17. Reaction Disc
18. Retainer
19. Push Rod Seal



INSPECTION AND REPAIR

Make the necessary adjustments, repairs, and parts replacements if excessive wear or damage is discovered during inspection.



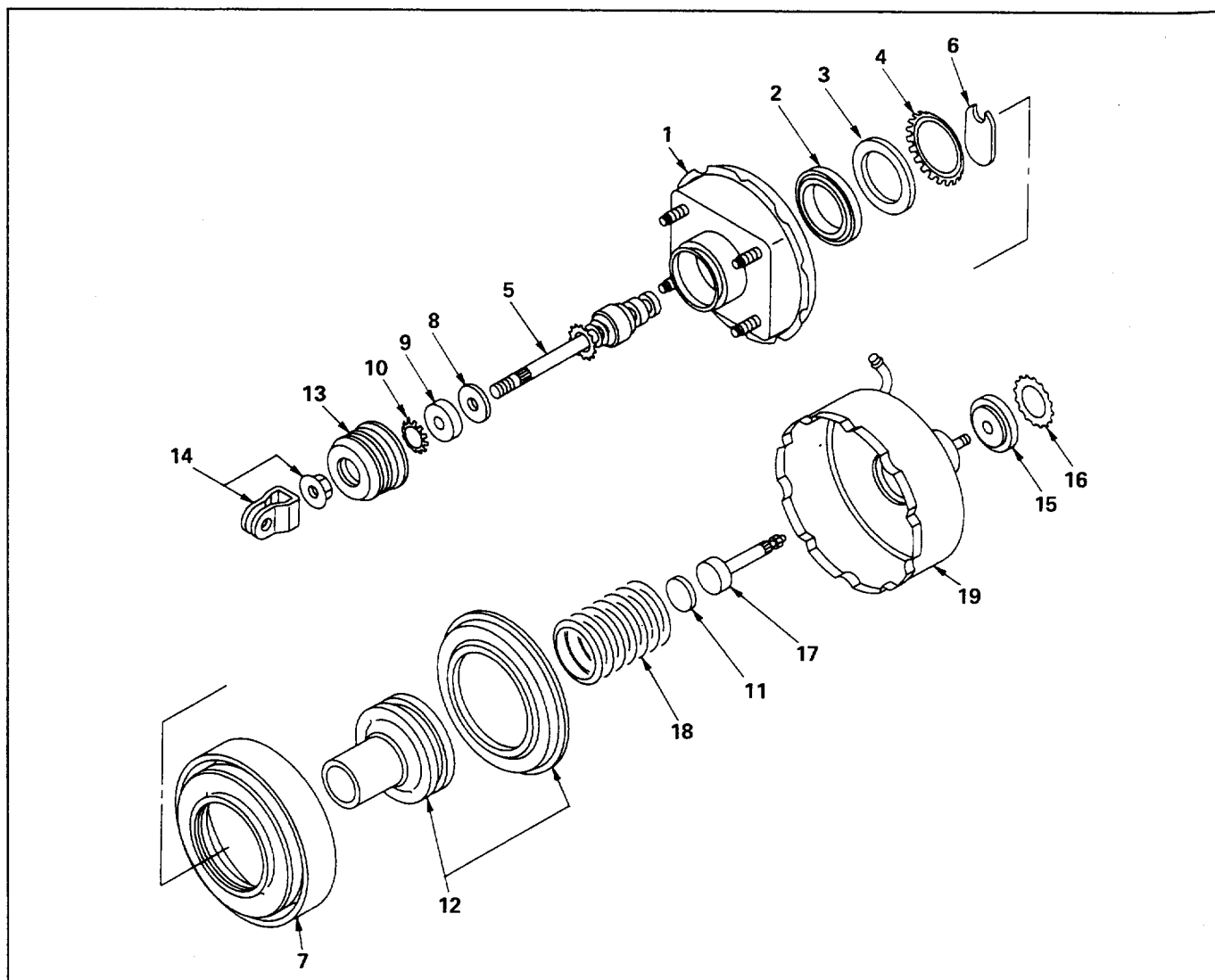
CAUTION:

If the clutch booster has been disassembled, the repair kit must be replaced with new one.

NOTE:

Before inspection, wash metal parts in metal cleaner, and wash rubber or resin parts in alcohol.

REASSEMBLY



Reassembly Step

- | | |
|---------------------------|------------------------------|
| 1. Rear shell | 11. Reaction disc |
| 2. Seal | 12. Diaphragm plate assembly |
| 3. Bearing | 13. Boot |
| 4. Bearing retainer | 14. Clevis yoke |
| 5. Valve plunger assembly | 15. Push rod seal |
| 6. Stopper key | 16. Retainer |
| 7. Diaphragm | 17. Push rod |
| 8. Filter | 18. Return spring |
| 9. Silencer | 19. Front shell |
| 10. Silencer retainer | |



Reassembly Steps

1. Rear Shell



- Apply silicone grease to the portions of the rear shell in contact with the seal and lip.

2. Seal

3. Bearing

4. Bearing Retainer

5. Valve Plunger Assembly



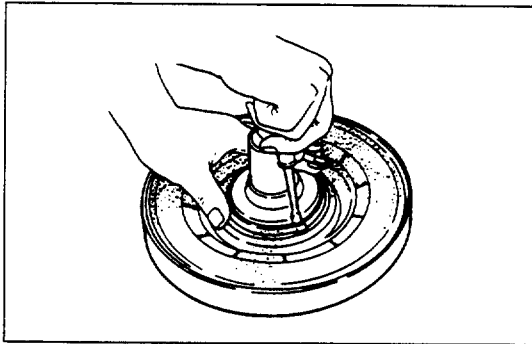
- Apply silicone grease to the valve body outside surfaces and the plunger sliding surfaces.

6. Stopper Key

7. Diaphragm



- Apply silicone grease to the outside and inside surfaces of the diaphragm in contact with the rear shell and front shell.



8. Filter

9. Silencer

10. Silencer Retainer

11. Reaction Disc



- Apply silicone grease to the reaction disc surfaces.

12. Diaphragm Plate Assembly



- Apply silicone grease to the outside and inside surfaces of the diaphragm plate.

13. Boot

14. Clevis Yoke

15. Push Rod Seal

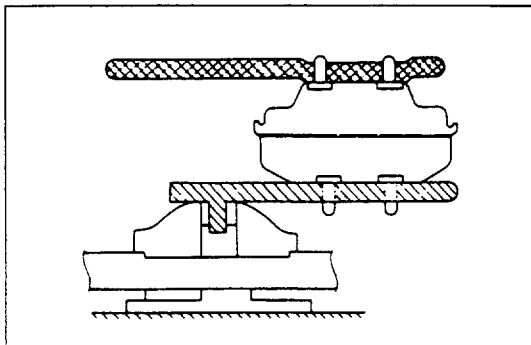
16. Retainer

17. Push Rod



- Apply silicone grease to the push rod sliding surfaces.

18. Return Spring



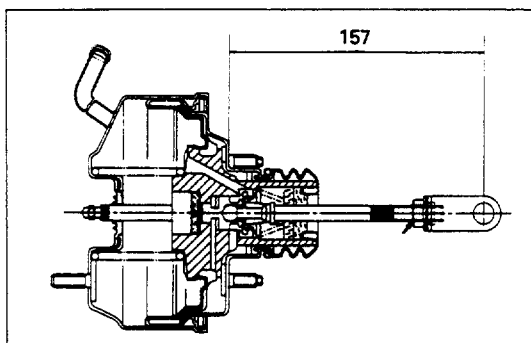
19. Front Shell



- Apply silicone grease to the sliding surfaces of the front shell with the push rod.
- Install the support plate and handle.
- Rotate handle to align the setting mark.

Support Plate : 5-8840-2056-0

Handle : 5-8523-1733-0



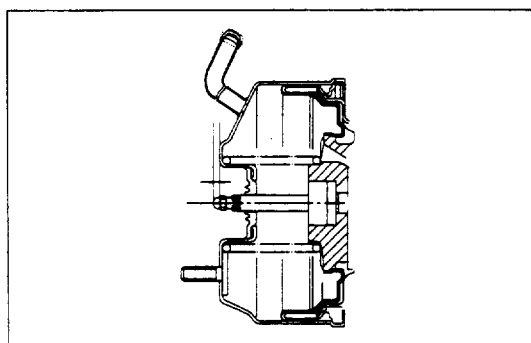
- Measure the push rod distance between pin center of clevis and rear shell.

If the distance is not equal to the specification, it must be adjusted.

Distance between Pin Center and Rear Shell	mm (in)
157	(6.18)



Lock Nut Torque	N·m (kg·m / lb·ft)
20	(2.0 / 14)



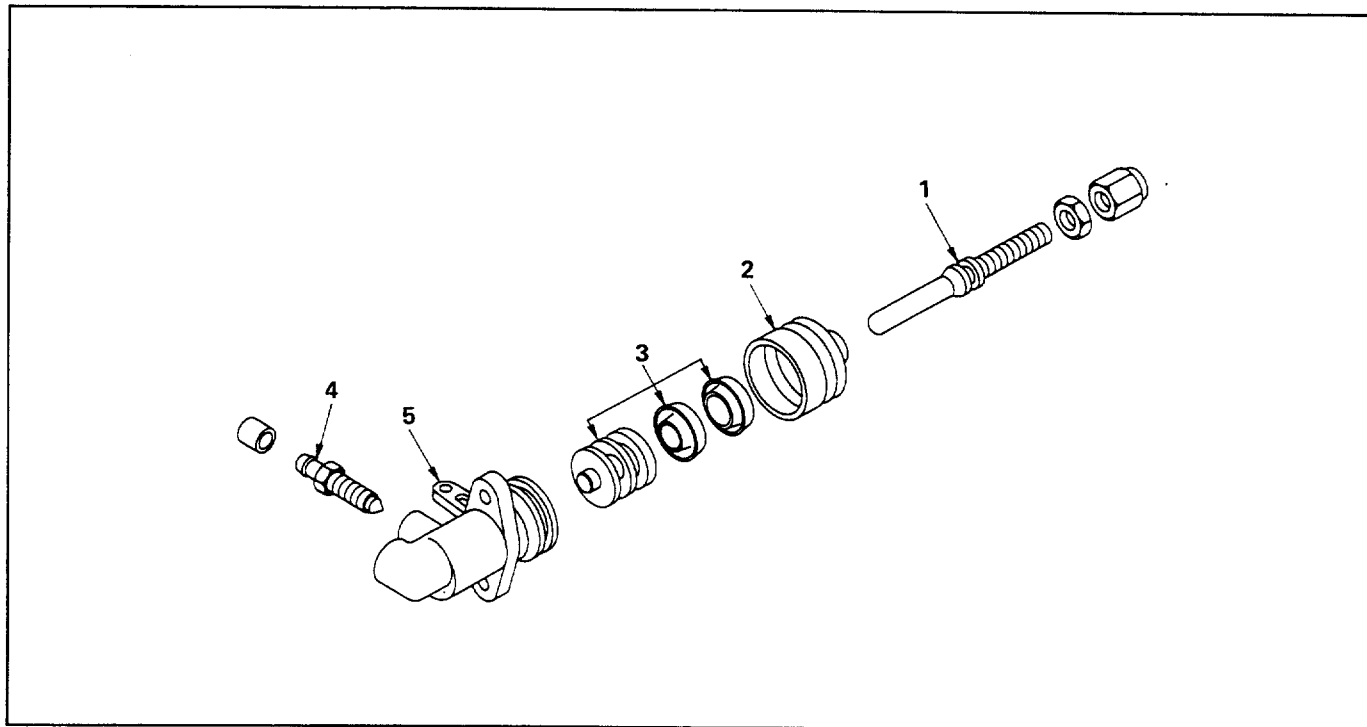
- Apply 66.66 kPa (500 mmHg) of negative pressure to the clutch booster.

- Measure the push rod distance between end of push rod and rear shell flange face.

If the distance is not equal to the specification, it must be adjusted.

Distance between Push Rod End and Rear Shell	mm (in)
3.75 - 4.00	(0.148 - 0.157)

SLAVE CYLINDER DISASSEMBLY



Disassembly Steps

1. Push rod
2. Boot
3. Piston assembly
4. Bleeder screw
5. Cylinder body

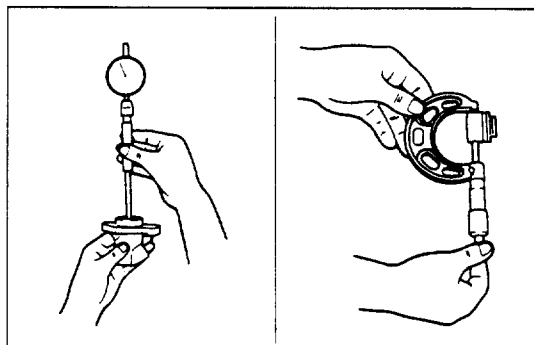


Disassembly Steps

1. Push Rod
2. Boot
3. Piston Assembly
4. Bleeder Screw
5. Cylinder Body

INSPECTION AND REPAIR

Make the necessary adjustments, repairs, and parts replacements if excessive wear or damage is discovered during inspection.



Cylinder Body



- Wash clean the cylinder body in brake fluid.



- Measure the cylinder inside diameter.

Master Cylinder Inside Diameter mm (in)

Standard

ø 25.400 – 25.452 (1.0000 – 1.0020)

Clearance between Cylinder Bore
and Piston Clearance mm (in)

Standard

Limit

0.02 – 0.10 (0.0008 – 0.0039)

0.11 (0.0043)

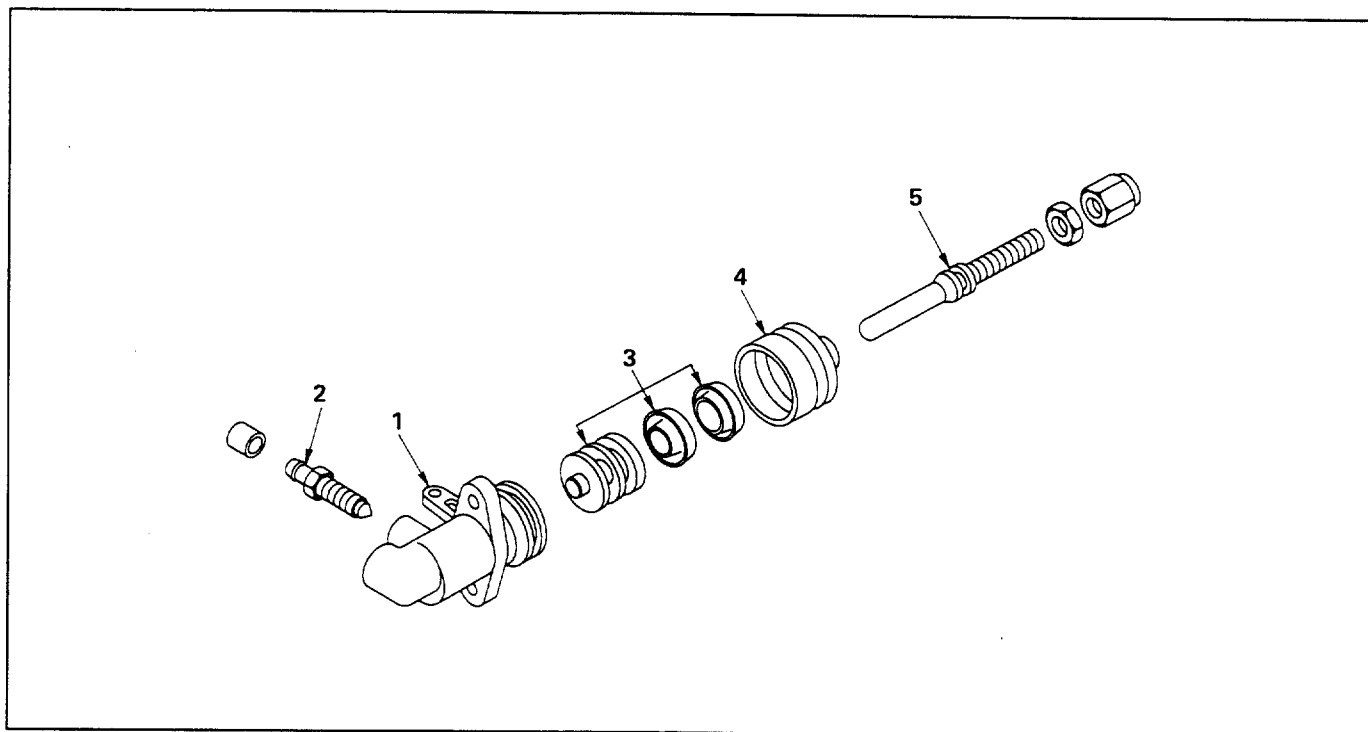
- If excessive wear or any abnormal conditions are present, the master cylinder assembly must be replaced with new one.



CAUTION

If the master cylinder has been disassembled, the repair kit must be replaced with new one.

REASSEMBLY



Reassembly Steps

- | | |
|--------------------|-------------|
| 1. Cylinder body | 4. Boot |
| 2. Bleeder screw | 5. Push rod |
| 3. Piston assembly | |



Reassembly Step

1. Cylinder Body
2. Bleeder Screw
3. Piston Assembly



- Before installing, apply a thin coat of rubber grease to the piston.



CAUTION:

Use care to prevent damaging the lip of the piston cup.

4. Boot
5. Push Rod

LGMBP-WE-881

You are requested to order this manual using the manual number that is shown above.

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