Manual Transmission (T060S6)

General

SPECIFICATION

Type		Specification	
Model		T060S6	
Torque		60 kgf.m	
Gear ratio	1st gear	6.701	
	2nd gear	3.712	
	3rd gear	2.084	
	4th gear	1.351	
	5th gear	1.814	
	6th gear	0.732	
	Reverse gear	5.863	
Gear oil		API GL-4, 75W85	
Oil quantity		5.5 liter(Without PTO), 5.9 liter(With PTO)	
Gear range		Endplay(mm)	Backlash(mm)
	1st gear	0.14~0.42	0.084~0.209
	2nd gear	0.17~0.34	0.067~0.187
	3rd gear	0.14~0.37	0.11~0.238
	4th gear	0.17~0.39	0.094~0.21
	5th gear	-	0.079~0.199
	6th gear	0.11~0.33	0.068~0.212
	Reverse gear(reverse idler~main shaft idler)	0.39~0.61	0.096~0.265
	Reverse gear(counter shaft idler~reverse idler)	0.2~0.35	0.096~0.303

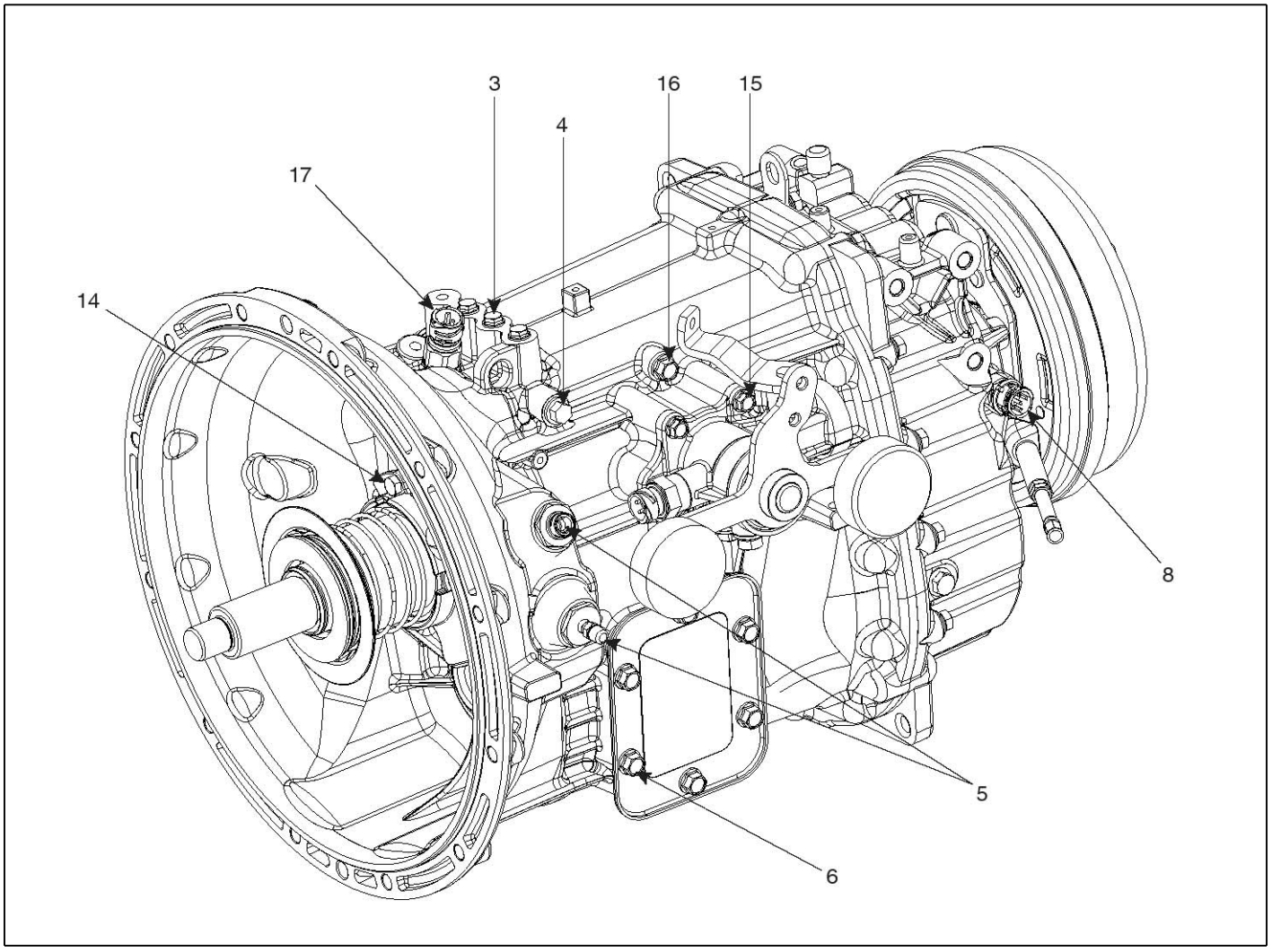
TIGHTENING TORQUE

The capscrew, plug, and nut should be tightened to the specified torque to prevent oil leakage and loosening of components. Those parts should be also tightened to the specified torque to maintain a good transmission's performance for a long time. In addition, always apply the sealant to the areas indicated.

⚠CAUTION

Comply with the specified torque when assembling.

WITHOUT PTO



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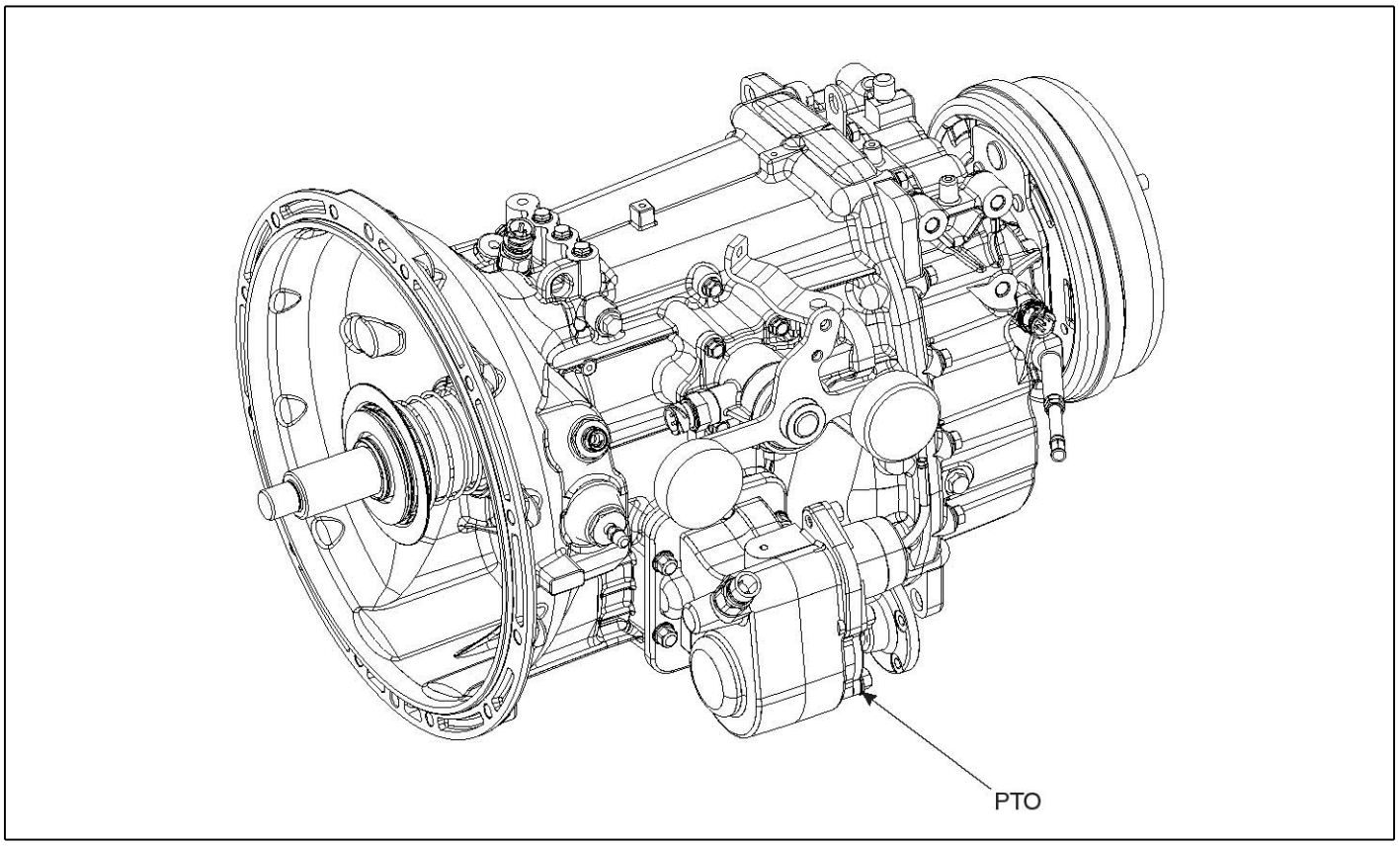
WITH PTO



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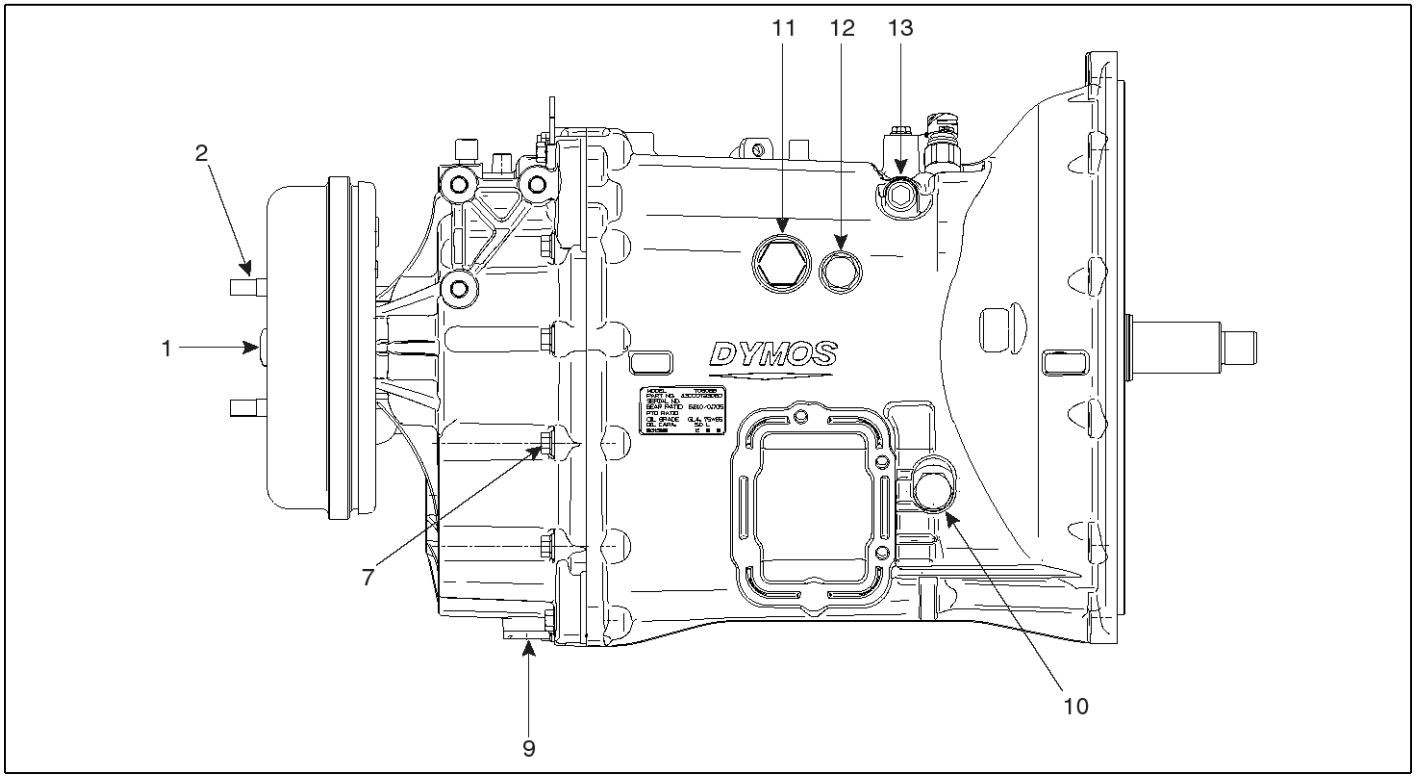

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No.	Name	Tightening torque kgf.m (Nm, lb.ft)	Sealant
1	Output shaft bolt	24~28 (235.3~274.6, 173.6~202.5)	
2	Parking brake bolt	5.4~6.2 (53~60.8, 39.1~44.8)	
3	Flange bolt	2.6~3 (25.5~29.4, 18.8~21.7)	
4	Screw plug	3.5~4.1 (34.3~40.2, 25.3~29.7)	Loctite 5060
5	CSC connection	7.2~8.4 (70.6~82.4, 52.1~60.8)	
6	PTO cover bolt	4.5~5.2 (44.1~51, 32.5~37.6)	Loctite 5060
7	Housing assembling bolt	5.4~6.2 (53~60.8, 39.1~44.8)	Loctite 5060
8	Speedometer sensor	4.6~5.4 (45.1~53, 33.3~39.1)	
9	Oil drain plug	7.2~8.4 (70.6~82.4, 52.1~60.8)	
10	Oil filler plug	7.2~8.4 (70.6~82.4, 52.1~60.8)	Loctite 5060
11	Control support bolt	5.4~6.2 (53~60.8, 39.1~44.8)	
12	4th/5th fork pin bolt	5.4~6.2 (53~60.8, 39.1~44.8)	
13	Screw plug	3.5~4.1 (34.3~40.2, 25.3~29.7)	Loctite 5060
14	CSC mounting bolt	2.1~2.5 (20.6~24.5, 15.2~18.1)	
15	Control assembly mounting bolt	2.1~2.5 (20.6~24.5, 15.2~18.1)	Loctite 5060
16	Guide pin seal bolt	3.5~4.1 (34.3~40.2, 25.3~29.7)	
17	Back lamp switch	4.6~5.4 (45.1~53, 33.3~39.1)	

GENERAL SAFETY INFORMATION

PRECAUTIONS WHEN ASSEMBLING AND DISASSEMBLING

⚠CAUTION

When assembling the transmission, apply the same transmission lubricant oil to gear bearings, needle bearings, non-sealed bearings and all other parts under friction conditions.

Apply the same transmission lubricant oil in order to prevent damage to transmission parts during initial gears movement.

CLEANING AND HANDLING

Immerse them into a solvent bath (kerosene, for instance) to completely clean the parts. Wash them by moving every part slowly up and down until all the old lubricant and foreign material have been dissolved.

⚠CAUTION

A special care must be taken to avoid skin rasher, fire hazard and vapor inhalation when using solvents.

NON-SEALED BEARINGS

Immerse the bearings in clean solvent. Move them slowly up and down to remove the deposits. Dry the bearings with moisture free compressed air. In this way, dry all the bearings after cleaning them.

⚠CAUTION

Never drive the air jet directly to bearing not to rotate it in high speed. That can cause damage to the bearing.

SYNCHRONIZER ASSEMBLY

A special care should be taken when handling the synchronizer assemblies. Either drops or bumps when disassembling or assembling may lock them.

HOUSING

Clean thoroughly the inside and outside of cases, covers, etc. Clean cast parts in mild alkaline solution container (a 7% soluble degreasing oil solution is recommended). Keep the parts in the solution container until they become completely clean. The parts cleaned in alkaline solutions should be rinsed with clean water to remove any alkaline trace after cleaning process.

Do not drop or bump.

INSPECTION

A thorough and careful inspection of every part may extend the life of transmission.

The replacement of parts showing either wear or damage may avoid future foreseen failures.

GEARS, SHAFTS, AND SYNCHRONIZER ASSEMBLIES

Check the parts whenever magna-flux is available.

Check carefully gear teeth for wear, pitting, chipping and cracks. Replace with a new one if any damage is found when checking.

Check shafts for warping and excessive wear or damaged splines.

CASE AND COVER

Make sure that cases and covers are completely clean and that mounting surfaces and bearing bores are free from chips or burrs.

Check carefully individual parts for cracks or excessive wear. And check them for any other condition that may cause oil leak or a future failure.

NEEDLE BEARING

Check carefully every needle roller for wear, pitting or cracked areas to determine whether they are suitable for reuse or should be replaced. After inspection, dip the needle bearings in an oil container and then wrap them in a lint free cloth or paper, so as to protect them until they are to be reassembled.

OIL SEALS AND SNAP RINGS

Replace with a new one if damages to any oil seal and snap ring are found during maintenance. The replacement of oil seal and snap ring in time can prevent damage to the parts of transmission beforehand.

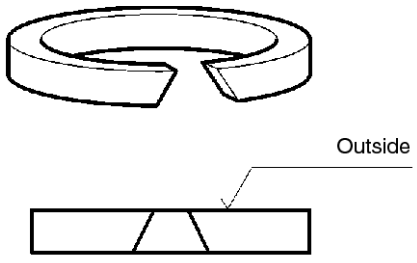
An oil leakage through a worn seal may result in failures of other more expensive components of the transmission.

The sealing elements should be handled carefully, particularly during assembly.

Cuts, scratches or rolled up seal lips decrease the sealing efficiency.

⚠CAUTION

The snap rings should be assembled in the proper position due to the angle of their opening ends. Make the side with shorter opening face outwards to facilitate the installation with pliers.



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PARTS REPLACEMENT

Use only genuine parts when replacing parts. The use of genuine parts can extend the life of transmission.

INSPECTION

Transmission Oil Check

Frequent replacement of transmission oil can prevent bearings damage, rings wear. The small metalic particles may be accumulated and cause damage to various parts when the transmission oil is used for a long time without changing it. The transmission oil will be changed by the chemical action due to rapid change of oil temperature when the transmission is also used.

Recommended Oil :
● SAE 75W85 API GL4

Oil Maintenance Intervals

1. When driving on highway
   - Replace the transmission oil after driving initial 100,000 km.
   - Check the transmission oil for level and leak every 50,000 kim.
   - Replace the transmission oil every 150,000 kim.
2. When driving on general roads
   - Replace the transmission oil after driving initial 100,000 km.
   - Check the transmission oil for level and leak every 50,000 kim.
   - Replace the transmission oil every 150,000 kim.

Transmission Oil Drain

Drain the transmission oil when it is warm. Drain the transmission oil after removing the magnetic drain plug. Clean the drain plug before refilling with the recommended transmission oil.

Refilling Transmission

Appropriate oil level

Inappropriate oil level

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Clean the case around transmission oil filler plug and add transmission oil to the proper level after removing the oil filler plug.

The amount to refill transmission oil differs according to the gradient of the transmission. Therefore stop the vehicle on a flat road surface and refill the transmission oil.

Do not add the transmission oil above the proper level because the oil can leak through the front bearing cover, control cover or shift lever housing.

Transmission oil amount :
- 5.5 L (Without PTO)
- 5.9 L (With PTO)

NOTICE

The amount to refill may differ according to the gradient of engine or transmission. Always add the transmission oil to the proper level.

Oil Level Check

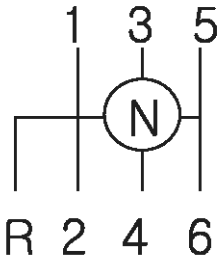
Clean the transmission oil filler plug when checking the oil level and add it to the proper level.

CAUTION

Do not mix oils of different types and brands, as they might cause damage to the transmission parts.

Gear Shift Lever Pattern

It has six forward speeds and one reverse speed and the gear shift lever pattern is illustrated below.



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NOTICE

Notes while driving

- *Always use the clutch while shifting the gears. Otherwise there may cause damage to the synchronizer assembly.*
- *Use the proper shift gear when driving away from a stop depending on the vehicle's load and road conditions.*
- *Never slam or jerk the gear shift lever to complete gear engagement.*
- *Never take the vehicle out of gear and coast down a hill.*

Precautions For Seized Taper Roller Bearing (Pocket beearing)

CAUTION

Warm up for more than several minutes when replacing the transmission oil or disassembling and reassembling the transmission.

1. There is a possibility that the pocket bearing may be damaged initially if the transmission is a brand new product.
2. Care must be taken not to depress the accelerator pedal with 1,200 rpm or higher for more than two minutes with the shift lever neutral until the driving distance covered right after reassembling the transmission is within 100~200 kim. Because the pocket bearing may be damaged.
3. Depress the clutch pedal and hold it if you want to accelerate 1,200 rpm or higher with the shift lever neutral.
4. There is little possibility that the transmission may be damaged when the driving distance covered is above 100~200 kim.

Description

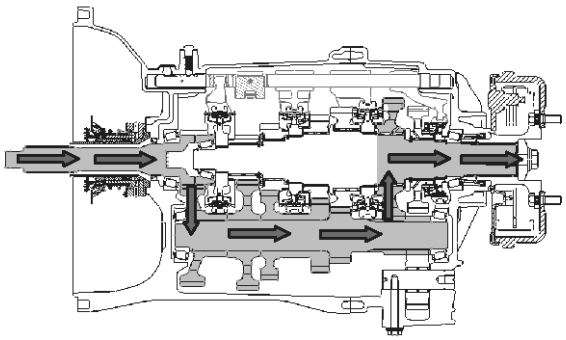
The transmission should transmit the output and torque of engine to the drive line of vehicle sufficiently. It is very helpful if you know the torque power flow when repairing the transmission.

1st Speed Gear, 2nd Speed Gear, 3rd Speed Gear, 4th Speed gear, 6th Speed gear

1. The torque from the engine is transmitted to the pinion drive of transmission.
2. The torque is transmitted from the pinion drive to the countershaft through the drive gear. In this manner, the pinion drive is always driven together with the countershaft.
3. The torque is transmitted to all the mainshaft gears assembled to the bearing in the countershaft.

   These gears rotates freely unless one of gears is shifted.
4. After the torque is transmitted from the mainshaft gear to the clutch's serrations of the synchronizer assembly when the gear is shifted, it is transmitted to the synchronizer hub and driven with the mainshaft. The torque is transmitted from the mainshaft to the drive line through the output yoke.

1st speed gear



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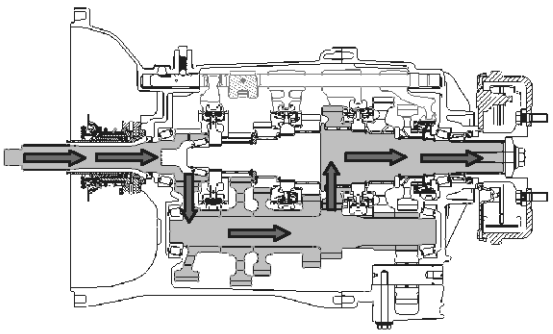
2nd speed gear



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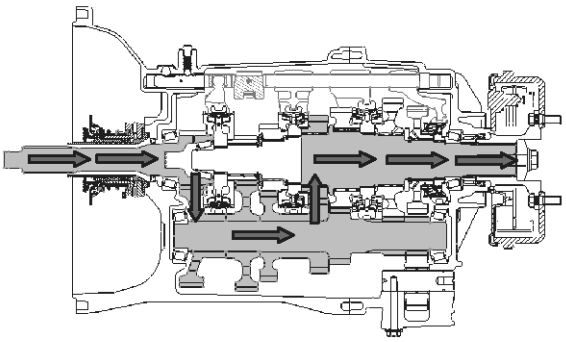
3rd speed gear



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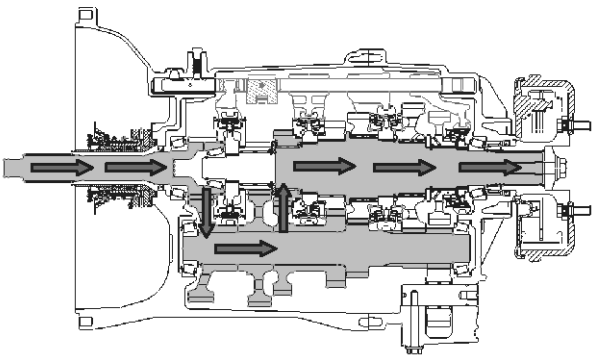
4th speed gear



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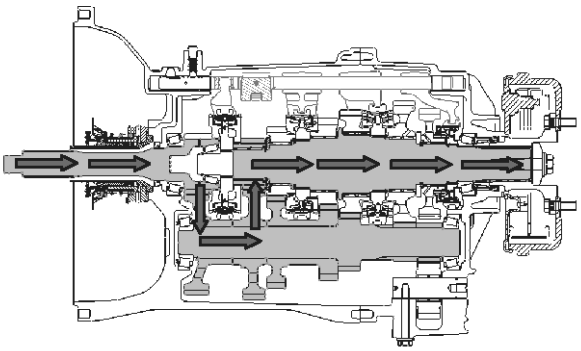
6th speed gear



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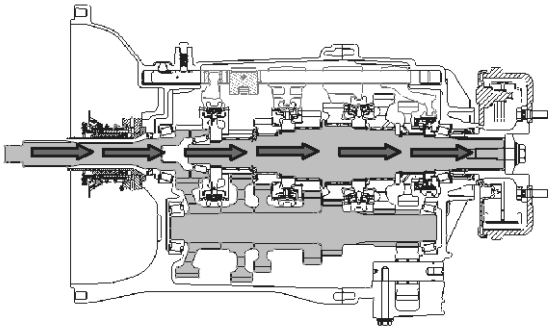
5th Speed Gear

The 5th speed gear is called by direct speed gear. The torque occurs in the drive pinion and is directly transmitted to the mainshaft although the countershaft moves.

The torque is directly connected to the mainshaft and transmitted to the pinion drive clutch serrations linked to the 5th speed gear synchronizer hub.

The noise is very little since the direct connections are made from one shaft to other one without any other gear load in 5th speed gear.

5th speed gear



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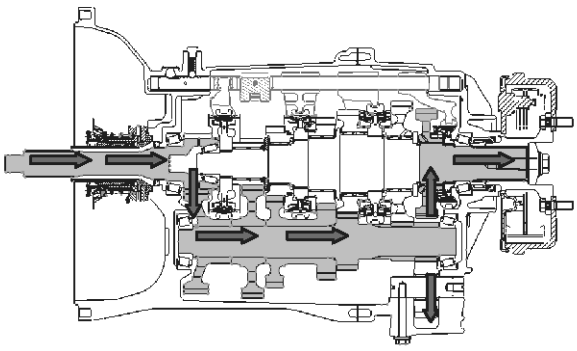
Reverse Speed Gear

When the reverse speed gear is shifted into, the torque is transmitted from the countershaft to the reverse idler gear and changes the rotation direction. The torque is transmitted from the reverse idler gear to the mainshaft reverse speed gear.

Reverse speed gear



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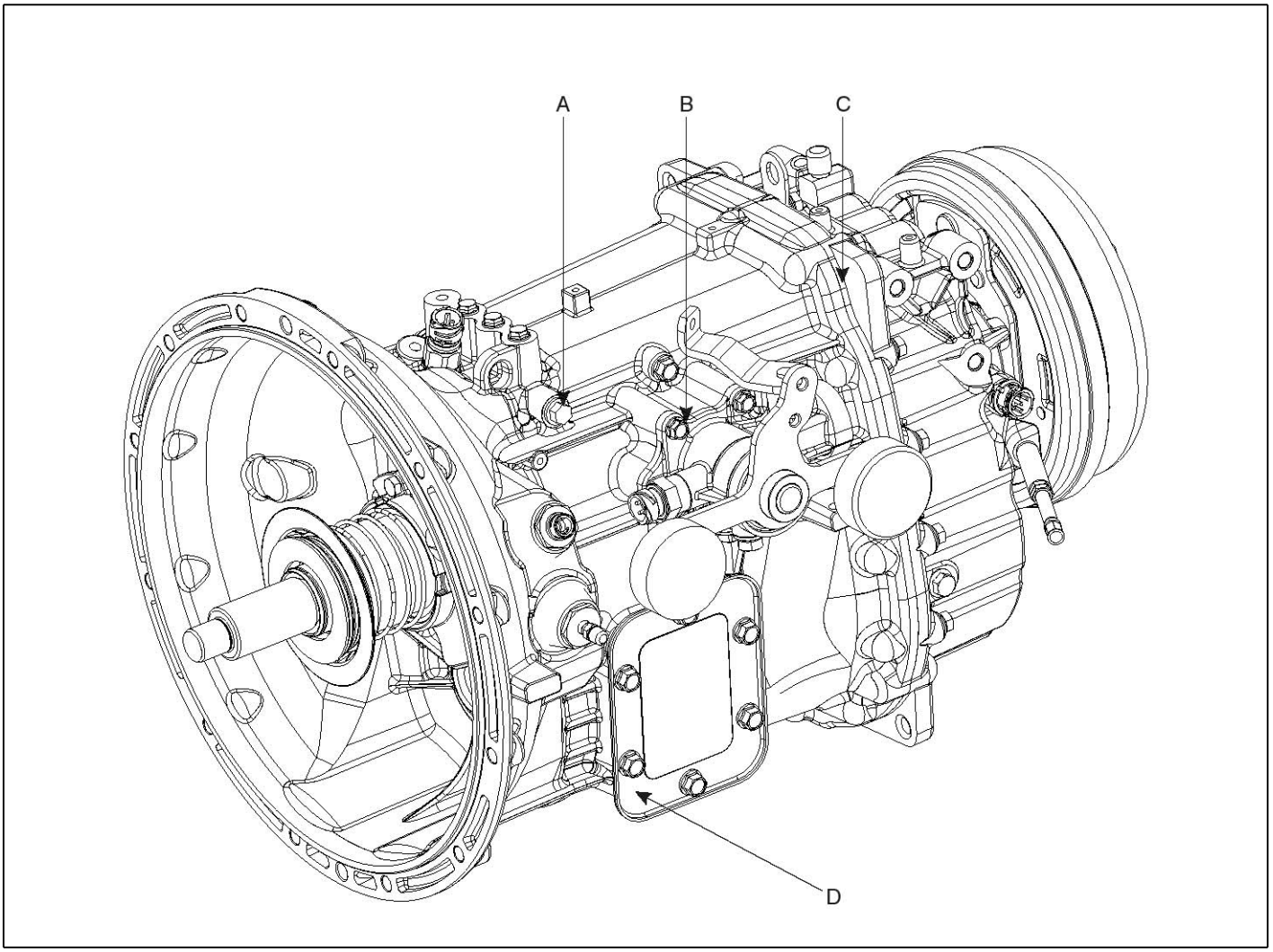
Applying Sealant

The sealant should be applied to the proper positions for the correct reassembly and the prevention of leak.



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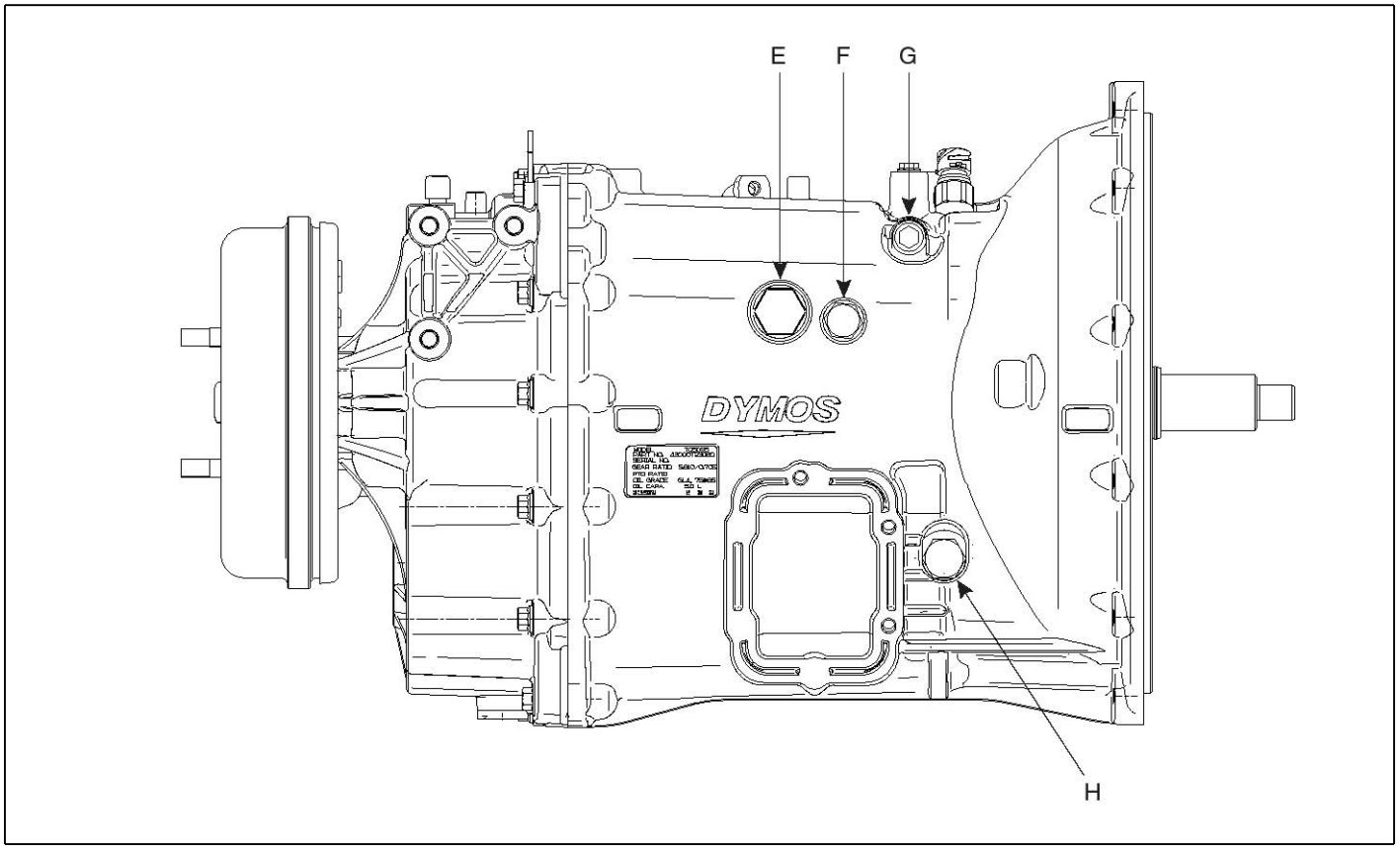
A : Apply Loctite 5060 to the screw plug.

B : Apply Loctite 5060 to the housing mounting surface.

C : Apply Loctite 5060 to the front and rear housing mounting surface.

D : Apply Loctite 5060 to the PTO cover mounting surface.



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E : Apply Loctite 5060 to the control support bolt.

F : Apply Loctite 5060 to the 4th/5th speed gear fork pin bolt.

G : Apply Loctite 5060 to the screw plug.

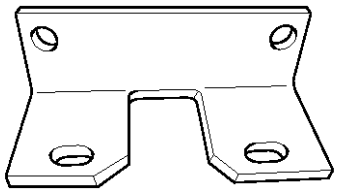
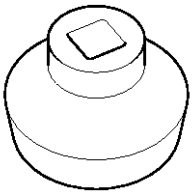
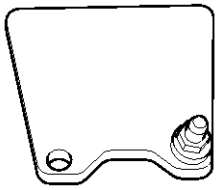
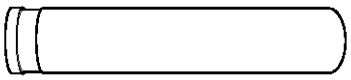
H : Apply Loctite 5060 to the filler plug.

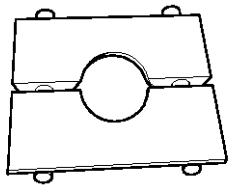
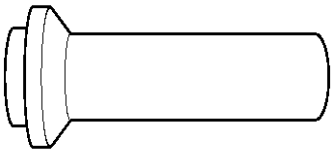
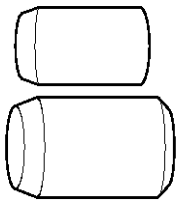
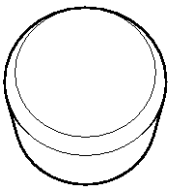
TROUBLESHOOTING AND TEST

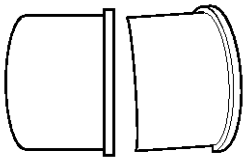
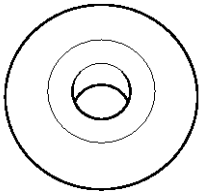
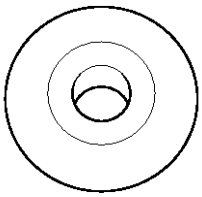
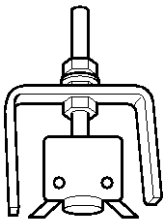
Problem	Probable cause	Remedy
Transmission noise when in neutral	Incorrect idle speed adjustment	Adjust idle speed
	Improper or damaged clutch disc	Replace disc
	Loose or damaged engine or transmission mounting	Replace and/or tighten mounting
	Worn or damaged yoke	Replace yoke
	Warped or unbalanced drive shaft	Repair or replace drive shaft
	Low lubricant level	Fill with recommended oil to the proper level
	Contaminated lubricant	Drain and clean transmission and refill with r-ecommended oil
	Worn or damaged gears and/or bearings	Replace damaged parts
	Misalignment due to loose tightening capscrews	Retighten capscrews
Transmission noise from shi-fted gears	Improper or damaged clutch disc	Replace disc
	Low lubricant level	Fill with recommended oil to the proper level
	Worn or damaged flywheel bushing or bearing	Replace damaged parts
	Vibration from other vehicle components (drive shaft, mounts, yoke)	Verify and repair as per vehicle's manual
	Misalignment between engine and transmission	Realign
	Worn or damaged gears and/or bearings	Replace damaged parts
	Warped main shaft or countershaft	Replace warped shaft
Hard shifting	Malfunction of clutch (not releasing)	Check and adjust clutch drive system
	Wrong adjustment of clutch pedal	Adjust pedal stroke
	Worn or damaged flywheel bushing or bearing	Replace damaged parts
	Improper, contaminated lubricant	Drain, clean,and refill with recommended oil
	Low lubricant level	Fill with recommended oil to the proper level
	Worn or damaged gear shift lever components	Replace damaged parts
	Worn or damaged synchronizer rings	Replace rings
	Excessively worn or damaged synchronizer assemblies (keys, sleeve or hub)	Replace synchronizer assemblies
	Improper adjustment of synchronizer assemblies sleeve or hub	Readjust synchronizer assemblies
	Worn or damaged shift system components (yokes, nylon pads, bars, shift blocks)	Replace damaged parts
	Improper end play of main shaft or countershaft	Adjust end play

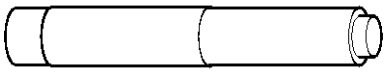
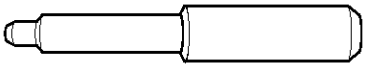
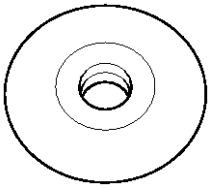
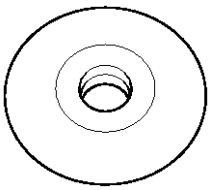
Problem	Probable cause	Remedy
Gear shift rubbing	Malfunction of clutch (not releasing)	Check and adjust clutch drive system
	Wrong adjustment of clutch pedal stroke	Adjust pedal stroke
	Malfunction of clutch drive system	Check and adjust system
	Worn or damaged flywheel bushing or bearing	Replace damaged parts
	Incorrect idle speed adjustment	Adjust idle speed
	Worn or damaged synchronizer rings	Replace rings
	Worn or damaged gear clutching teeth	Replace gear
	Worn shift yokes nylon pads	Replace nylon pads
Transmission slips out of gear	Misalignment between engine and transmission	Realign
	Incomplete gear shifting	Shift gear properly
	Excessive vibration on gear shift lever (due to loose or damaged engine or transmission mountings)	Replace and/or tighten mountings
	Gear shift lever console out of position, forcing the lever	Adjust console
	Worn or damaged synchronizer assemblies	Replace synchronizer assemblies
	Excessive axial clearance on main shaft gears	Adjust clearance
	Worn or damaged clutching gear teeth	Replace gear
	Worn or damaged shift system (gear shifting lever housing, yokes, bars, etc.)	Replace damaged parts
Oil leak proper level	Excessive oil level	Correct to proper level
	Clogged breather	Check and unclog breather
	Worn or damaged oil seals	Replace damaged seals
	Housing capscrews not properly tightened or lack of sealant	Reassemble with proper sealant and tighten to the specified torque
	Cracked housing or covers	Replace or repair damaged parts
	Warped or damaged mounting surfaces of housings and covers	Replace or repair damaged parts
Defective bearings	Low lubricant level	Fill with recommended oil to the proper level
	Contaminated or not recommended lubricant	Drain and clean transmission and refill with recommended oil
	Improper assembly of transmission components	Reassemble transmission instructions on this manual
	Improper end play of main shaft or countershaft	Adjust end play
	Bearings were not lubricated prior to assembly	Replace/reassemble damaged parts
Double shifting	Double gear shifting interlock system is assembled improperly	Reassemble system

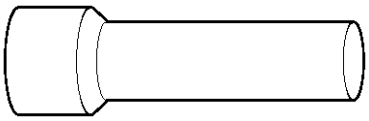
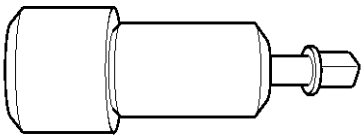
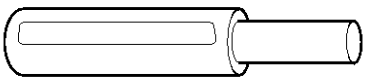
SERVICE SPECIAL TOOL

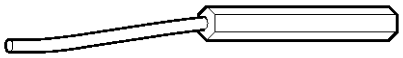
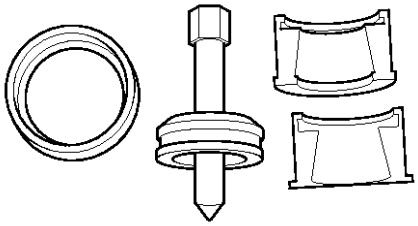
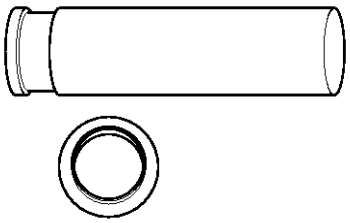
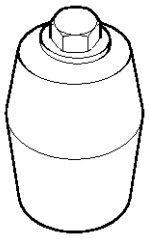
Tool no.	Shape	Use
4405/1	 SUDMT9013D	Install the output yoke to output flange.
4405/2	 SUDMT9014D	Socket plug
4405/3	 SUDMT9015D	Base for dial indicator
4405/4	 SUDMT9016D	Installation of pinion drive bearing cone

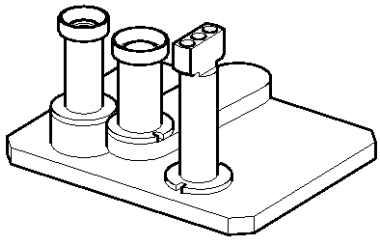
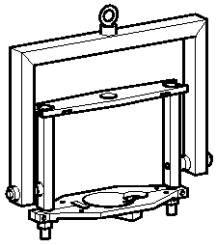
Tool no.	Shape	Use
4405/5	 SUDMT9017D	Pinion drive bearing puller
4405/6	 SUDMT9018D	Installation of rear oil seal
4405/7	 SUDMT9019D	Installation of bearing puller
4405/8	 SUDMT9020D	When reassembling countershaft bearing cone

Tool no.	Shape	Use
4405/9	 SUDMT9021D	Mainshaft pilot bearing puller
4405/10	 SUDMT9022D	When reassembling mainshaft rear bearing cap
4405/11	 SUDMT9022D	When reassembling countershaft bearing cap
4405/12	 SUDMT9023D	Countershaft bearing cap puller

Tool no.	Shape	Use
4405/13	 SUDMT9024D	Reassembly of shift rail plug
4405/14	 SUDMT9025D	Reassembly of rear case plug
4405/15	 SUDMT9026D	When reassembling front case bearing cap
4405/16	 SUDMT9026D	When reassembling front case oil seal

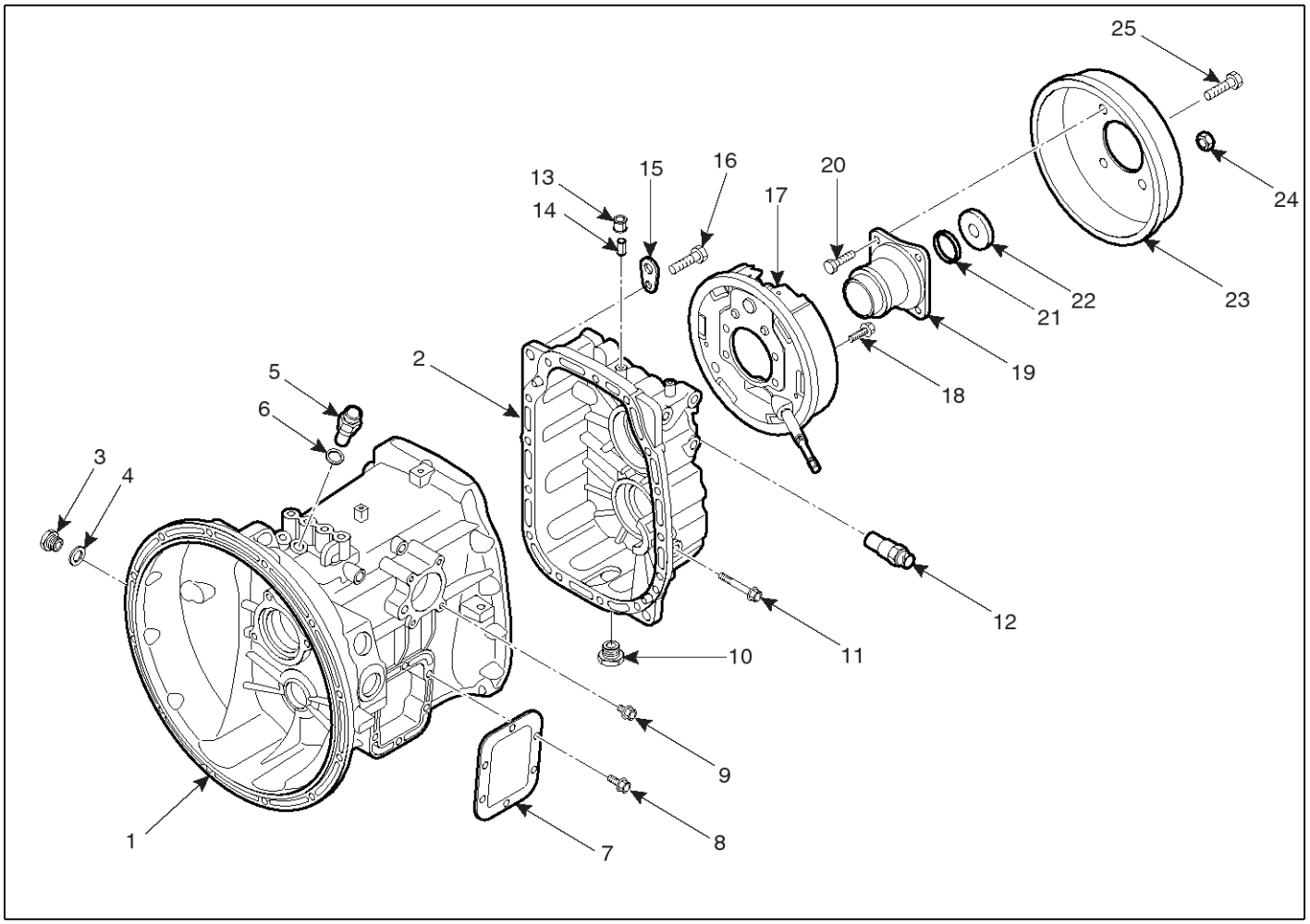
Tool no.	Shape	Use
4405/17	 SUDMT9027D	When reassembling mainshaft front bearing cone
4405/18	 SUDMT9028D	When reassembling the oil seal of control case
4405/19	 SUDMT9029D	Mainshaft rear bearing cone puller
4405/20	 SUDMT9030D	Spring pin pusher

Tool no.	Shape	Use
4405/21	 SUDMT9031D	Spring pin extractor
4405/22	 SUDMT9032D	Bearing puller
4405/23	 SUDMT9033D	When installing input shaft seal
4405/24	 SUDMT9034D	When reassembling mainshaft pilot bearing

Tool no.	Shape	Use
4405/25	 SUDMT9035D	Jig for reassembling gear train and rail assembly
4405/26	 SUDMT9036D	* Jig for rotating gear train and front housing * To rotate gear train and front housing to 180˚ for reassembling rear housing * Equipment and tool : Hoist, nut spanner for reassembling

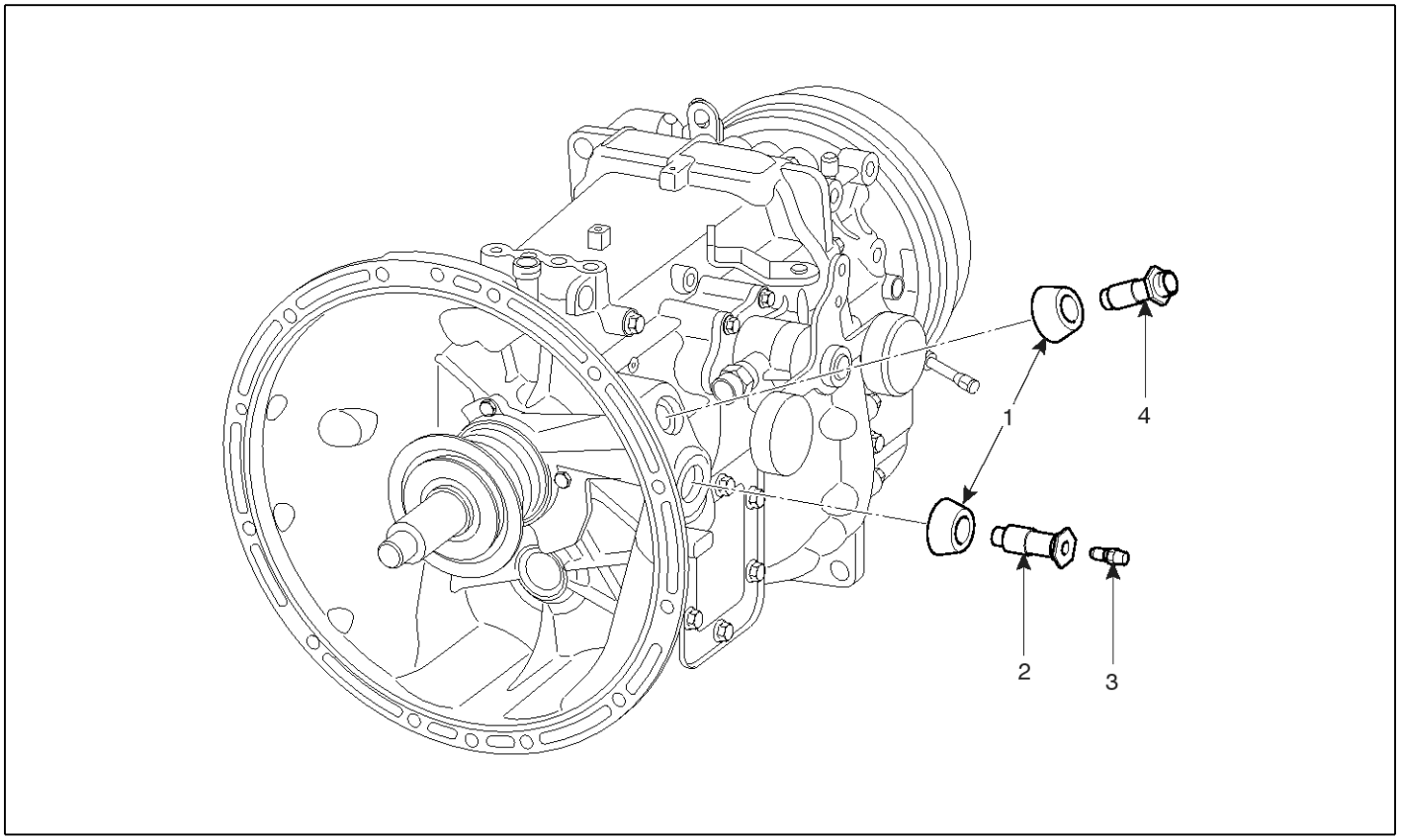
Manual Transmission

COMPONENTS



SUDMT9038D

1. Front housing
2. Rear housing
3. Filler plug
4. Gasket
5. Reverse speed light switch
6. Washer
7. PTO cover
8. Bolt
9. Screw plug
10. Drain plug
11. Reverse idler bolt
12. Speedometer sensor
13. Air breather cap
14. Air breather sleeve
15. Mounting bracket
16. Bolt
17. Parking brake
18. Parking brake mounting bolt
19. Output flange
20. Bolt
21. O-ring
22. Output nut
23. Drum
24. Dust plug
25. Bolt

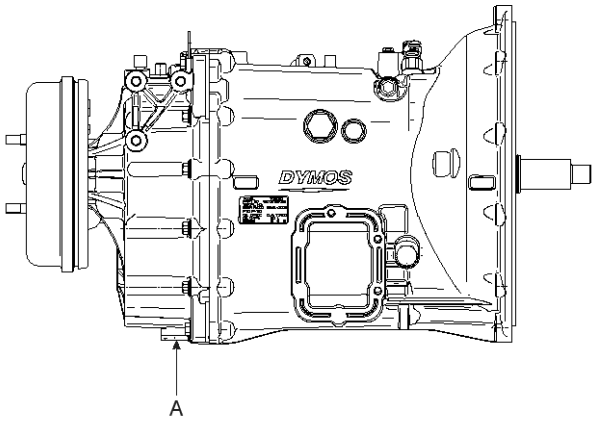


SUDMT1012L

1. CSC(concentric slave cylinder) unit
2. Connector
3. Bleed valve
4. Pressure adapter

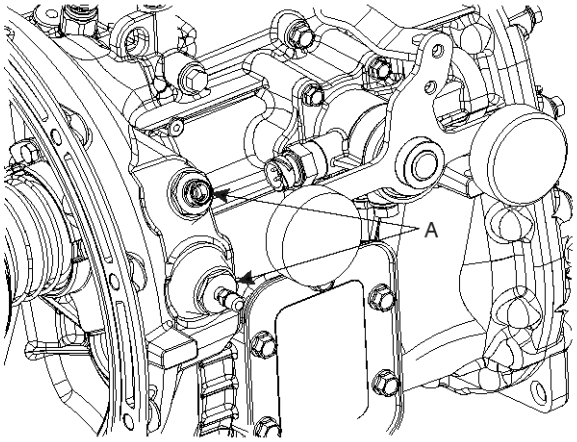
REMOVAL

1. Remove the drain plug (A) and drain oil.



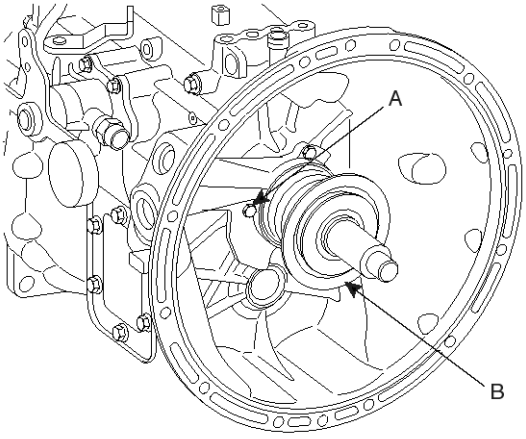
SUDMT9040D

2. Remove the CSC (concentric slave cylinder) connector (A).



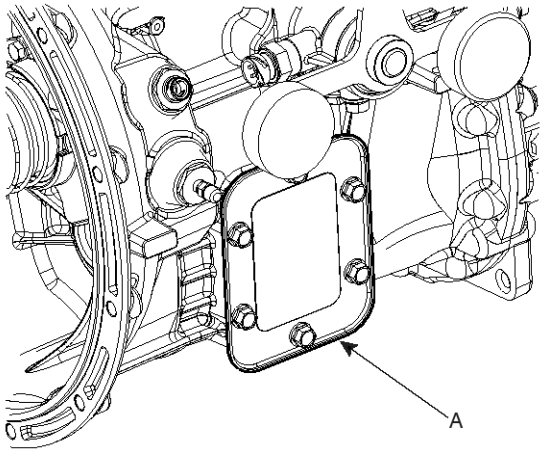
SUDMT9041D

3. Remove the mounting bolt (A) of the CSC and then remove the CSC unit (B).



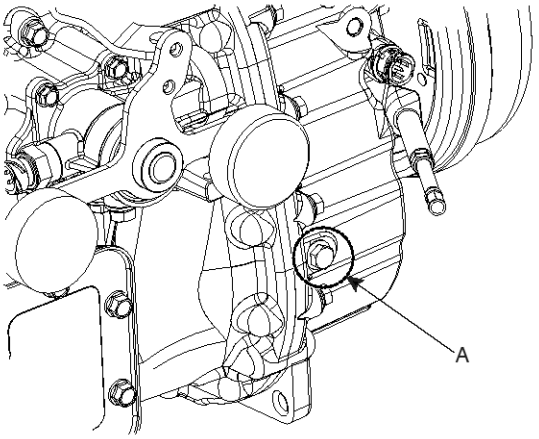
SUDMT9042D

4. Remove the PTO cover(A).



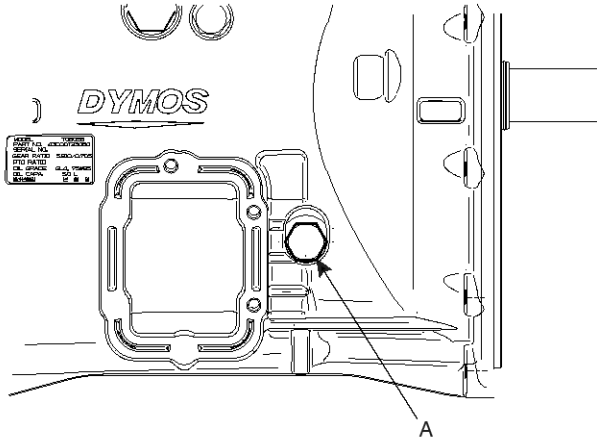
SUDMT9043D

5. Remove the reverse idler mounting bolt (A).



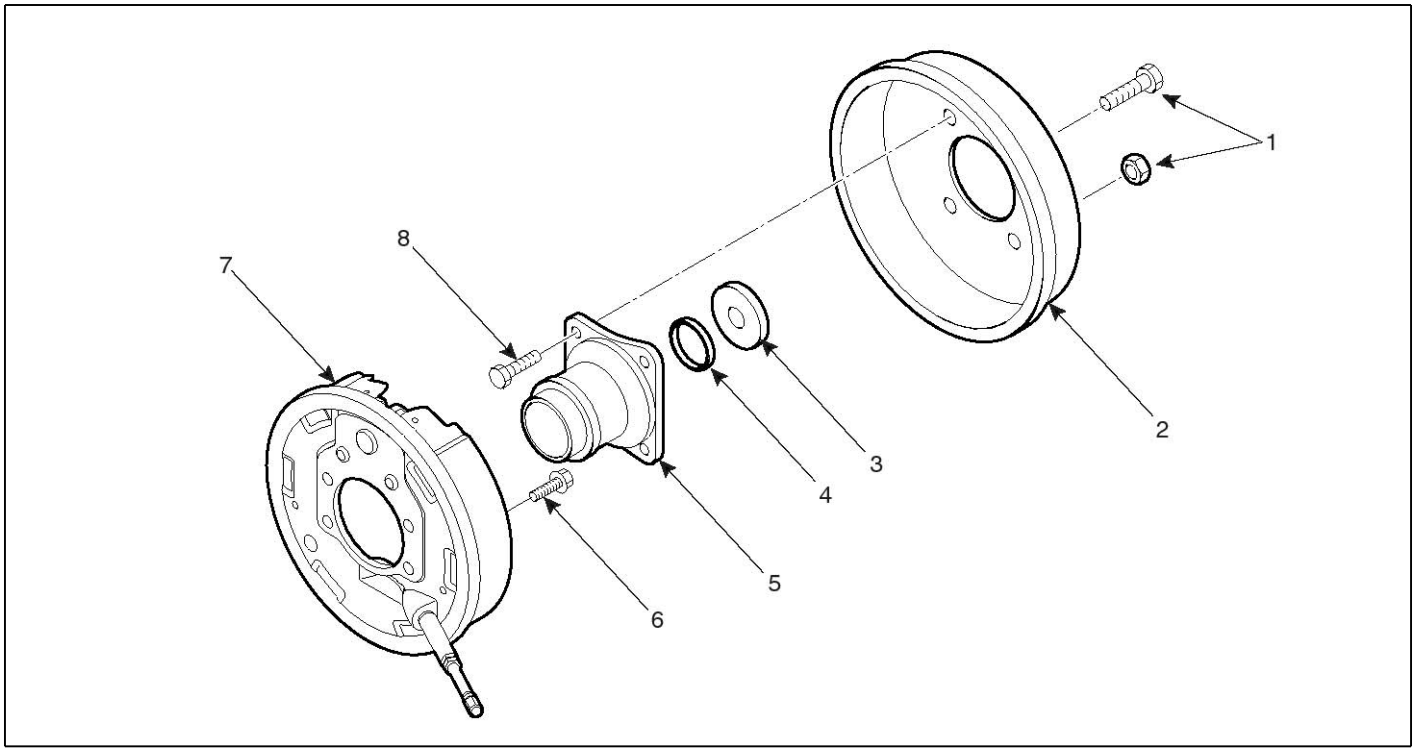
SUDMT9044D

6. Remove the filler plug (A). (Assemble it finally after filling oil.)



SUDMT9045D

7. Remove the parking brake and drum in the following sequence.

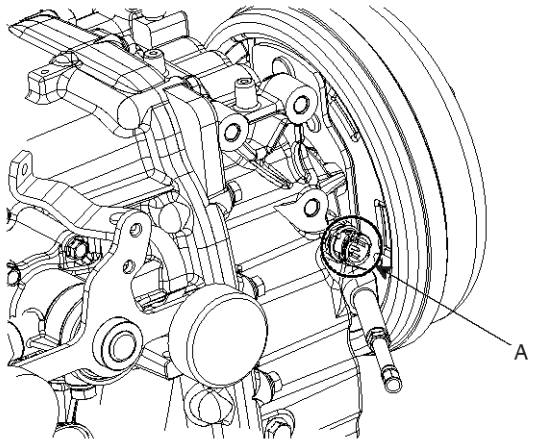


SUDMT9046D

Removal procedure

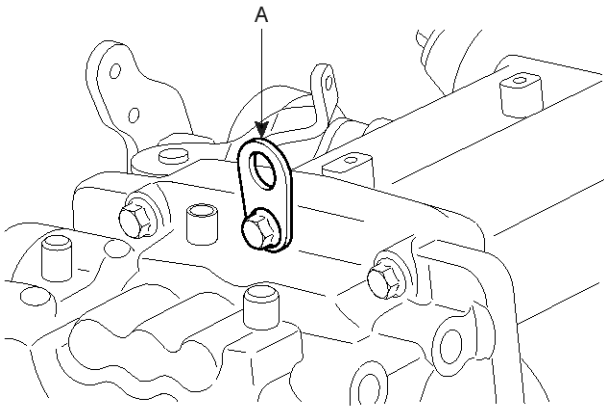
1) Bolt, dust plug (remove if necessary)
2) Drum
3) Output nut
4) O-ring
5) Output flange
6) Parking brake mounting bolt
7) Parking brake
8) Bolt

8. Remove the speedometer sensor (A).



SUDMT9047D

9. Remove the mounting bracket and case assembling bolt (A). (Remove the air breather if necessary.)



SUDMT1013L

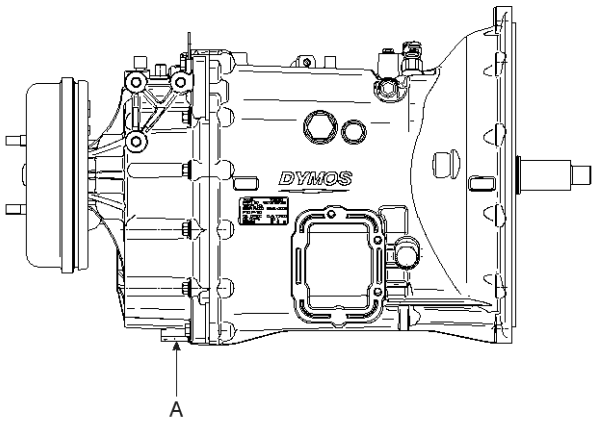
INSTALLATION

The installation is in the reverse order of removal.

SERVICE POINTS

1. Install the drain plug (A).

Tightening torque : 7.2 ~ 8.4 kgf.m (70.6~82.4 Nm, 52.1~60.8 lb.ft)

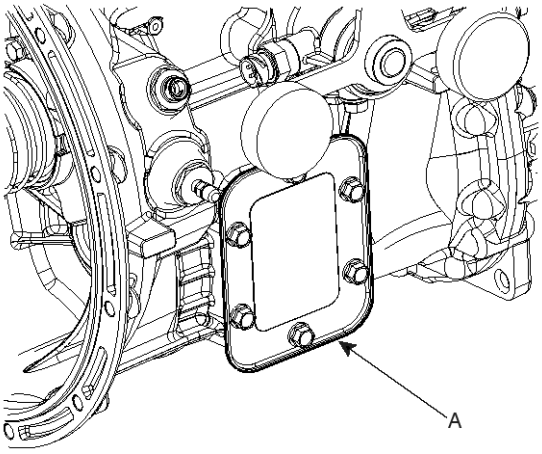


SUDMT9049D

2. Install the PTO cover (A).

Tightening torque : 4.5 ~ 5.2 kgf.m (44.1~51 Nm, 32.5~37.6 lb.ft)

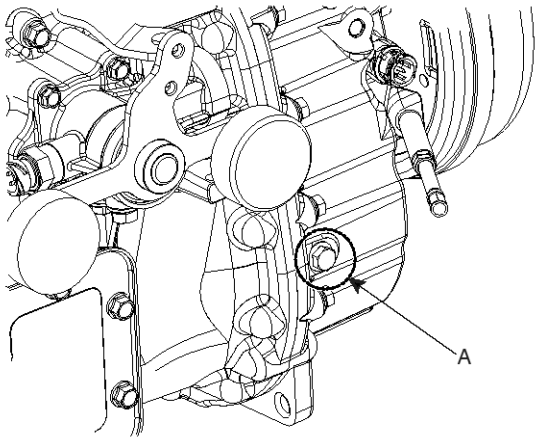
- Apply Loctite 5060 to the mounting surface of PTO cover.



SUDMT9050D

3. Install the reverse idler mounting bolt (A).

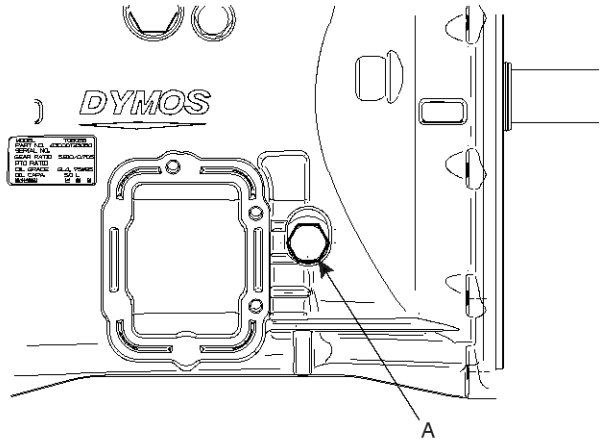
Tightening torque : 5.4 ~ 6.2 kgf.m (53~60.8 Nm, 39.1~44.8 lb.ft)



SUDMT9051D

4. Install the filler plug (A).

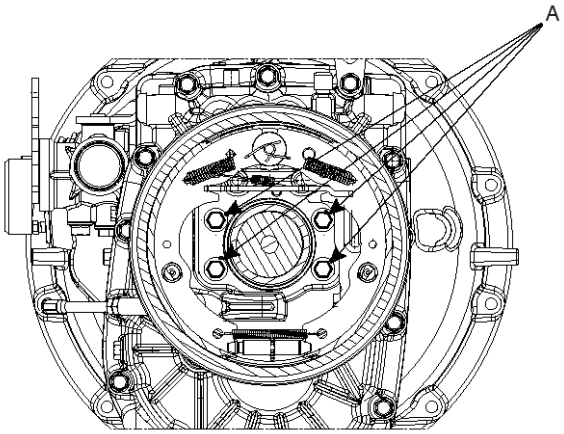
Tightening torque : 5.4 ~ 6.2 kgf.m (53~60.8 Nm, 39.1~44.8 lb.ft)



SUDMT9052D

5. Install the parking brake mounting bolt (A).

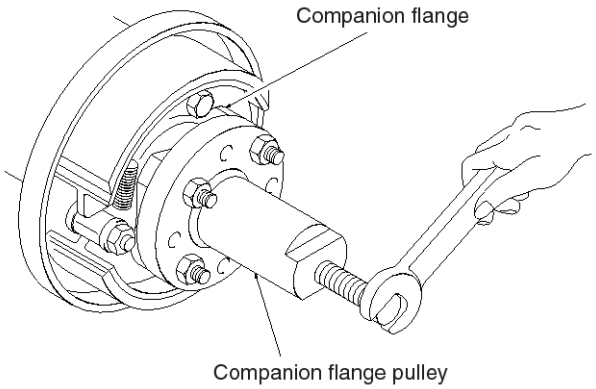
Tightening torque : 5.4 ~ 6.2 kgf.m (53~60.8 Nm, 39.1~44.8 lb.ft)



SUDMT9053D

6. Install the output flange nut and bolt.

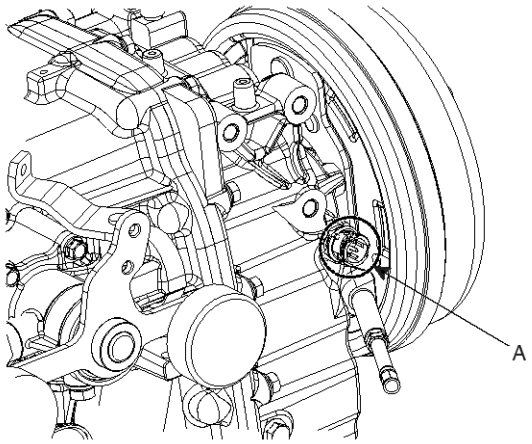
Tightening torque : 24 ~ 28 kgf.m (235.3~274.3 Nm, 173.6~202.5 lb.ft)



SUDMTA9009L

7. Install the speedometer sensor (A).

Tightening torque : 3.5 ~ 4.1 kgf.m (34.3~40.2 Nm, 25.3~29.7 lb.ft)

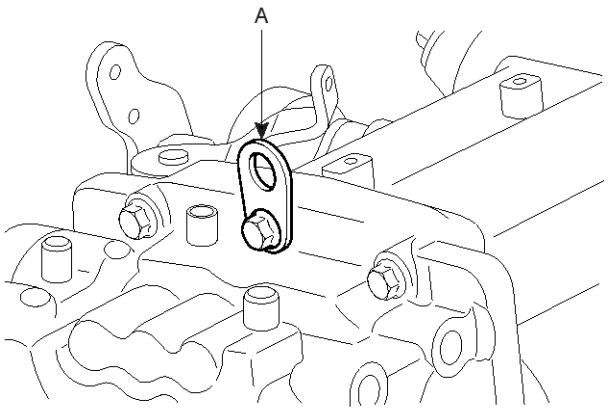


SUDMT9055D

8. Install the mounting bracket and case assembling bolt (A).

Tightening torque : 5.4 ~ 6.2 kgf.m (53~60.8 Nm, 39.1~44.8 lb.ft)

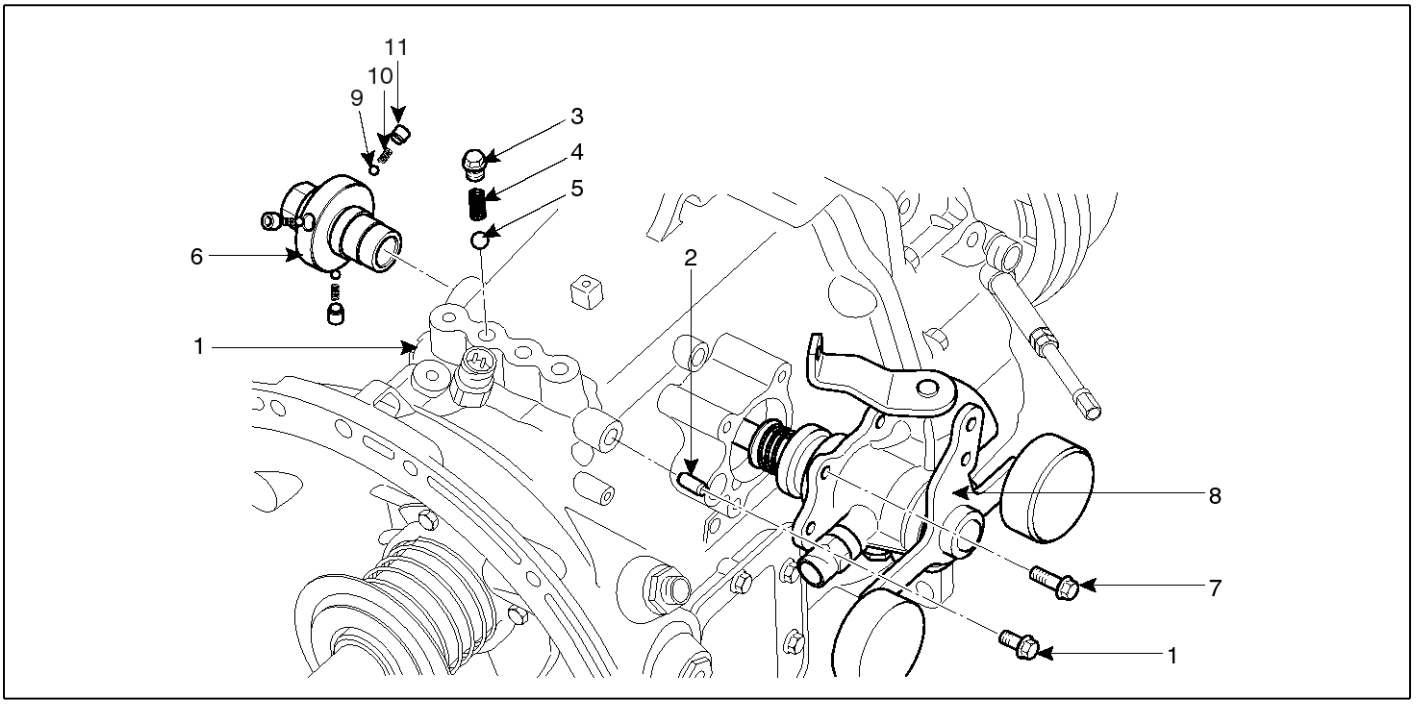
- Apply Loctite 5060 to the mounting surface of the front and rear housing.



SUDMT1013L

Gear Shift Upper

COMPONENTS



SUDMT1014L

REMOVAL PROCEDURE

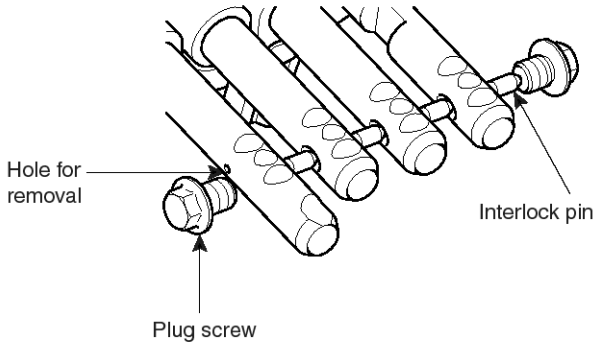
1. Plug screw
2. Interlock pin
3. Bolt
4. Poppet spring
5. Ball
6. Support bolt assembly
7. Bolt
8. Upper gear shift
9. Reverse poppet ball
10. Reverse poppet spring
11. Reverse poppet bolt

ASSEMBLY PROCEDURE

The assembly procedure is in the reverse order of disassembly.

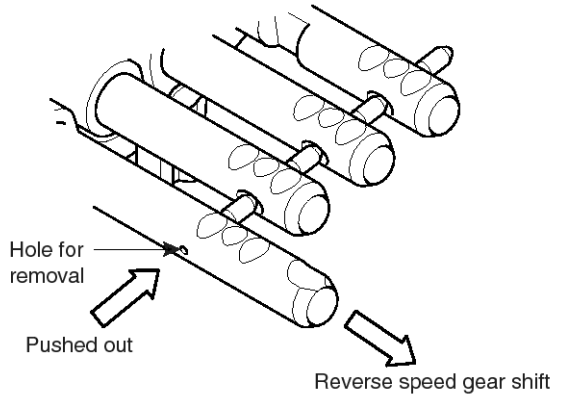
SERVICE PROCEDURE

1. Removal of interlock pin
   1) There is a hole (Ø3) for removing the interlock pin in the 1st and reverse shift rail.



SUDMT1015L

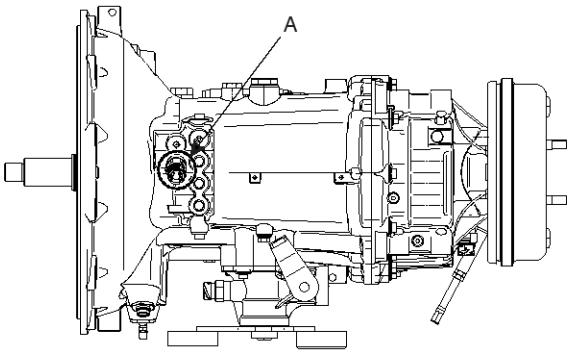
   2) If the 1st and reverse shift rail is shifted into the reverse gear, the hole for removing the interlock pin meets the hole of interlock pin on other shift rail and the hole on plug screw.
   3) Push the interlock pin out and remove it by using a wire or the like through the hole for mounting the plug screw.



SUDMT1016L

2. When installing it, apply sealant to the mounting surface of case or the thread part of bolt and tighten it to the specified torque.
3. Install the reverse speed light switch (A).

Tightening torque : 3.5 ~ 4.1 kgf.m (34.3~40.2 Nm, 25.3~29.7 lb.ft)

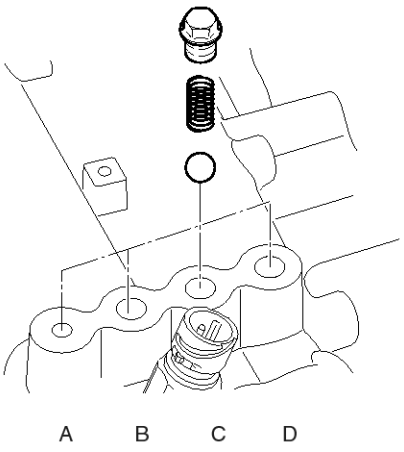


SUDMT9060D

4. Install four poppet balls, four poppet springs, and four bolts.

Tightening torque : 2.6 ~ 3 kgf.m (25.5~29.4 Nm, 18.8~21.7 lb.ft)

A : Reverse gear
B : 1st gear/2nd gear
C : 3rd gear/4th gear
D : 5th gear/6th gear

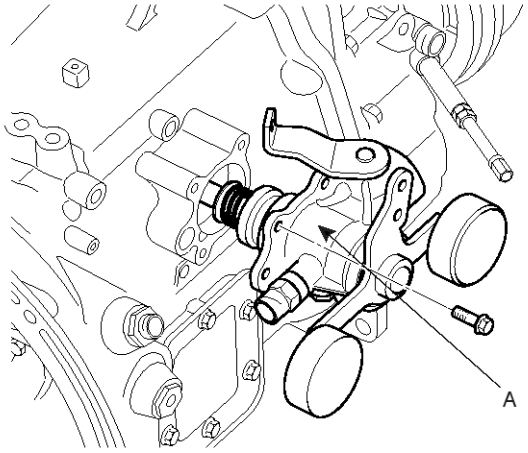


SUDMT1017L

5. When installing the gear shift upper assembly (A), incline downward and insert it. And install the gear shift upper assembly (A) with it lifted up.

   Apply sealant to the assembling surface.

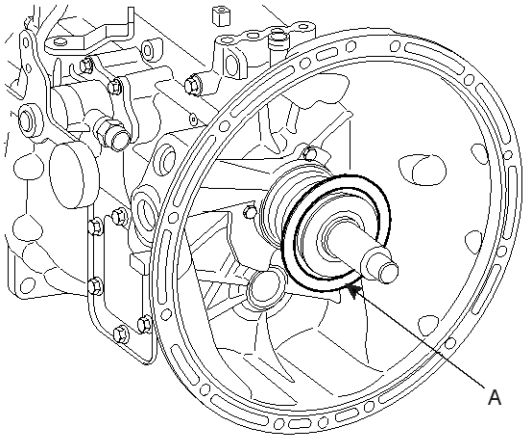
Tightening torque : 2.1 ~ 2.5 kgf.m (20.6~24.5 Nm, 15.2~18.1 lb.ft)



SUDMT9062D

6. Install the concentric slave cylinder (CSC) unit (A).

Tightening torque : 2.1 ~ 2.5 kgf.m (20.6~24.5 Nm, 15.2~18.1 lb.ft)

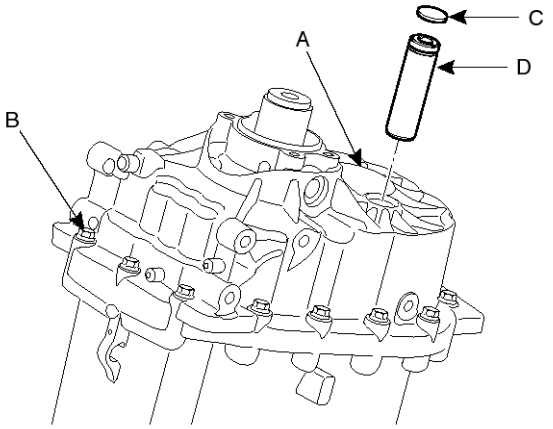


SUDMT9063D

Transmission Assembly

DISASSEMBLY

1. Remove the reverse idler shaft(D) from the rear cover (A). Remove the O-ring (C) from the shaft. And remove 14 bolts (B).

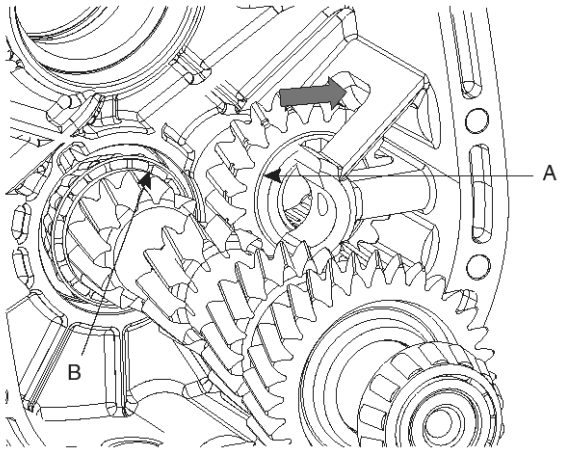


SUDMT1018L

⚠CAUTION

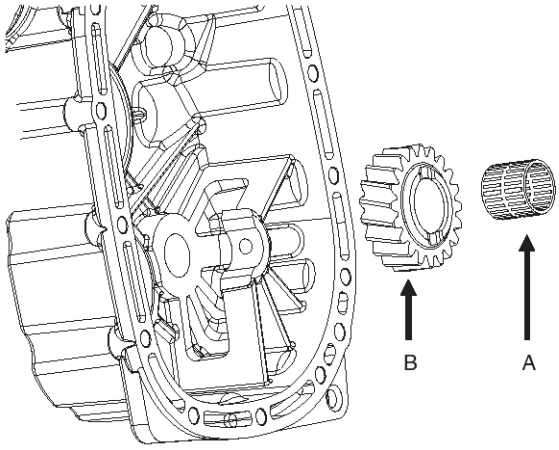
Before removing the rear cover from the transmission, push the reverse idler gear (A) and the reverse idler needle bearing out in the arrow direction through the cover hole of the arrow area and then remove it.

Otherwise, the rear cover will not be disassembled with interference in the counter shaft taper bearing (B).



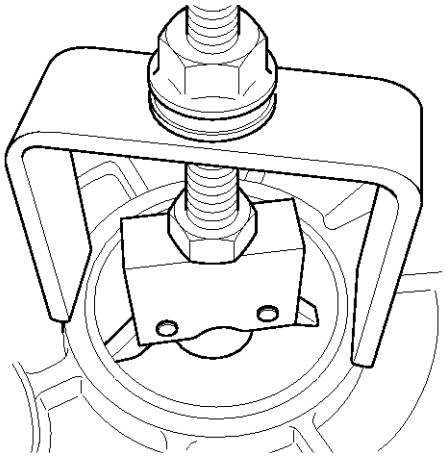
SUDMT9065D

2. Remove the bearing (A) and the idle gear (B) from the rear cover.



SUDMT9066D

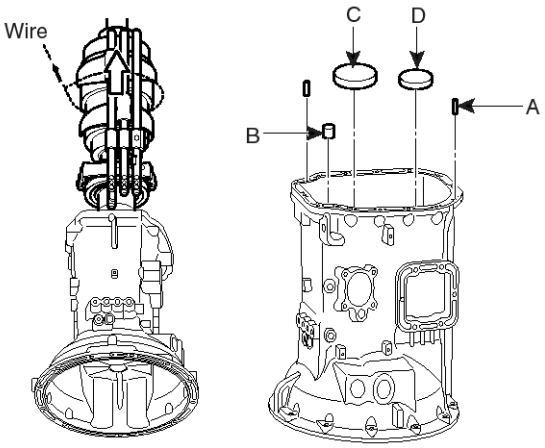
3. Using the special tool (4405/12), remove the mainshaft rear bearing cup and the oil seal by hitting it carefully from the outside to the inside of the case.



SUDMT9067D

4. Using the special tool (4405/12), remove the countershaft rear bearing cup by hitting it carefully from the outside to the inside of the case.

5. Remove the rail subassembly (R, 1st/2nd, 3rd/4th, 5th/6th), the mainshaft subassembly, and the countershaft subassembly by tying them up with a wire as a whole from the front case.

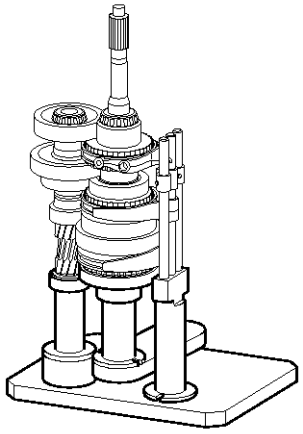


SUDMTA9017L

6. Remove the dowel pin (A) and the shift rail bush (B) from the front case.
7. Using the special tool (4405/12), remove the bearing cup (C,D).

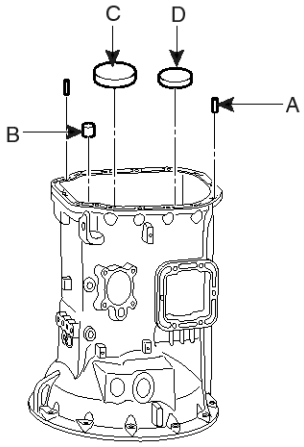
INSTALLATION

1. Assemble the mainshaft subassembly and the countershaft subassembly on the assembling jig (4405/25) and then assemble each rail subassembly (R, 1st/2nd, 3rd/4th, 5th/6th).



SUDMT9069D

2. Put the inner surface of the front case properly in position so that it faces up. Clean the bearing cup and the housing carefully prior to installation.
3. Using the special tool(4405/10,11), install the mainshaft and the countershaft bearing cup (C,D) by pressing them with a special tool until they settle properly against its housing.

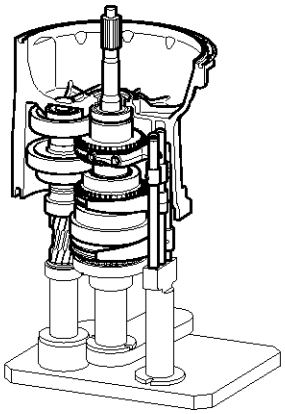


SUDMT9070D

4. Install the dowel pin (A) and shift rail bush (B) to the front case.

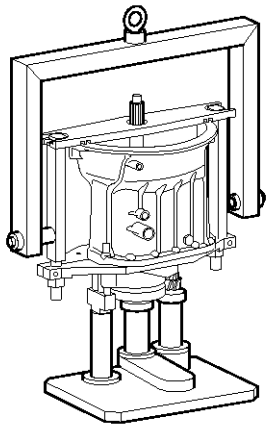
⚠CAUTION
When installing the bush, assemble the opening part and the groove for bleeding air each other to have the direction of 180˚.

5. Install the front cover. Be careful to install that there is no interference between the rail subassembly and the assembling hole.



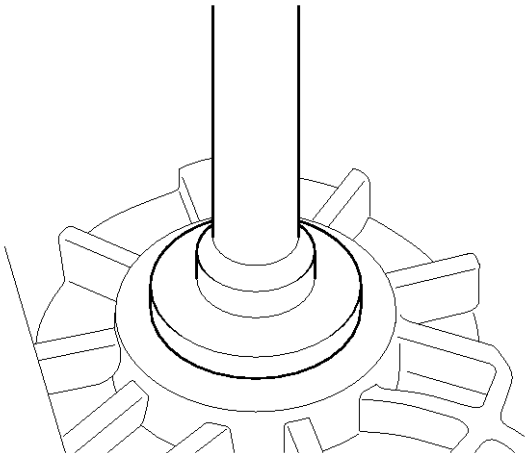
SUDMT9071D

6. Assemble the jig (4405/26) to the front case.



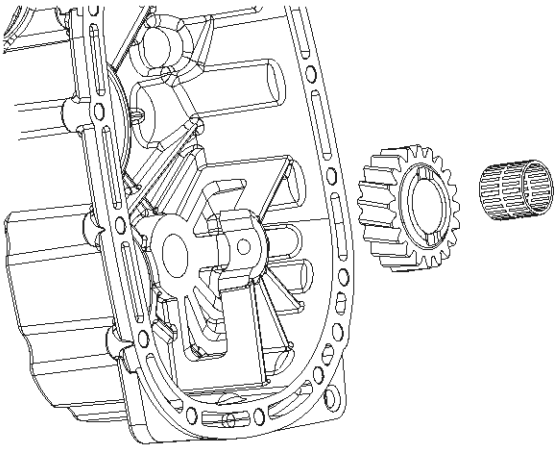
SUDMT9072D

7. Put the crane to the hole of the upper of the jig (4405/26) and rotate the front and the power train subassembly and then move to the place where the lower surface of front case can be secured.
8. Put the inner surface of the rear case properly in position so that it faces up. Clean the bearing cup and the housing carefully prior to installation.
9. Install with the proper shims and install the mainshaft, the countershaft, the rear bearing, and shims by pressing them with the special tool(4405/11) until they settle properly against its housing.



SUDMT9076D

10. Install the bearing and the idle gear to the rear cover.

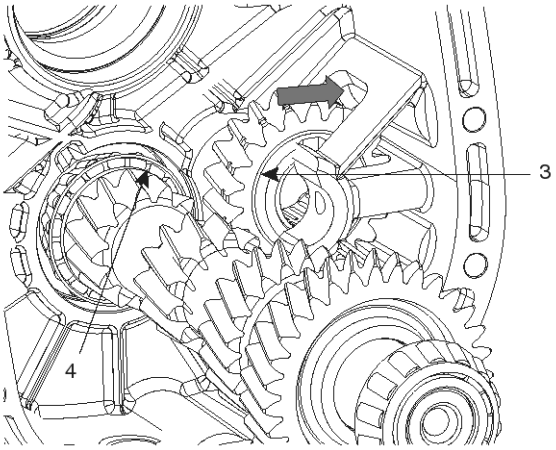


SUDMT1019L

⚠CAUTION

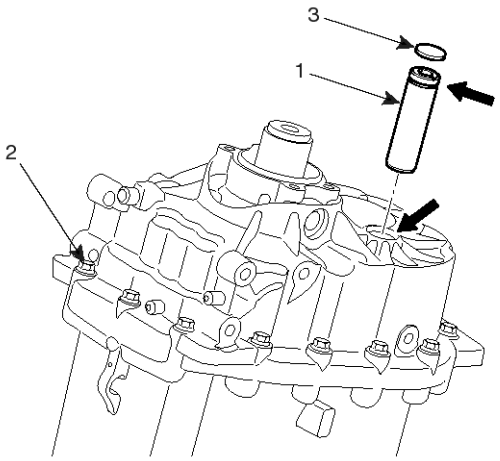
Before assembling the rear cover, push out the reverse idler gear (3) and the reverse idler needle bearing in the arrow direction and then assemble it.

Otherwise, the rear cover will not be assembled with interference in the counter shaft taper bearing (4).



SUDMT9078D

11. Install the O-ring (3) to the groove of shaft. (Before assembling, immerse it in the transmission oil and then assemble it.)



SUDMT9079D

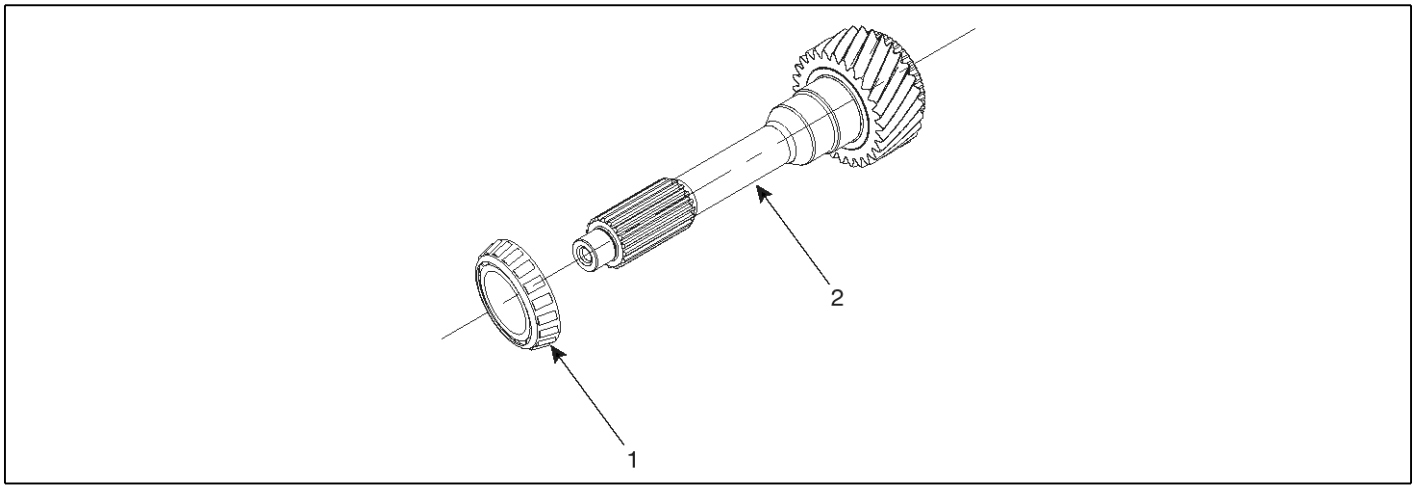
12. Align the idler gear and bearing of the rear cover inside (arrow direction) to face to the middle of shaft and install the reverse idler shaft (1). Install the bolt (2).

⚠CAUTION

- **Apply sealant to the direction area uniformly prior to assembling the shaft.**
- **The oil seal removed should be replaced with a new one.**

Pinion Drive

COMPONENTS

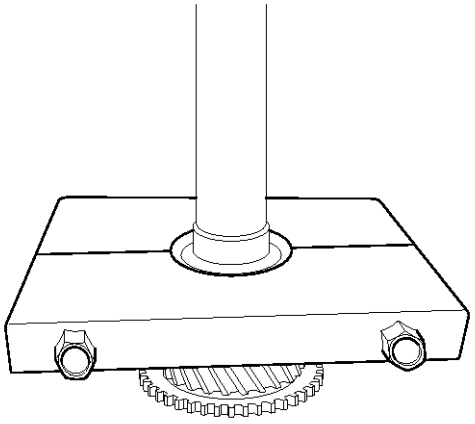


SUDMT9080D

1. Taper roller bearing
2. Pinion drive

DISASSEMBLY

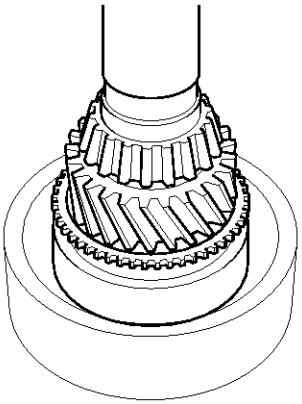
1. Remove the taper roller bearing (1) from the pinion drive (2). Using the special tool (4405/05), apply pressure to the pinion drive.



SUDMT9081D

ASSEMBLY

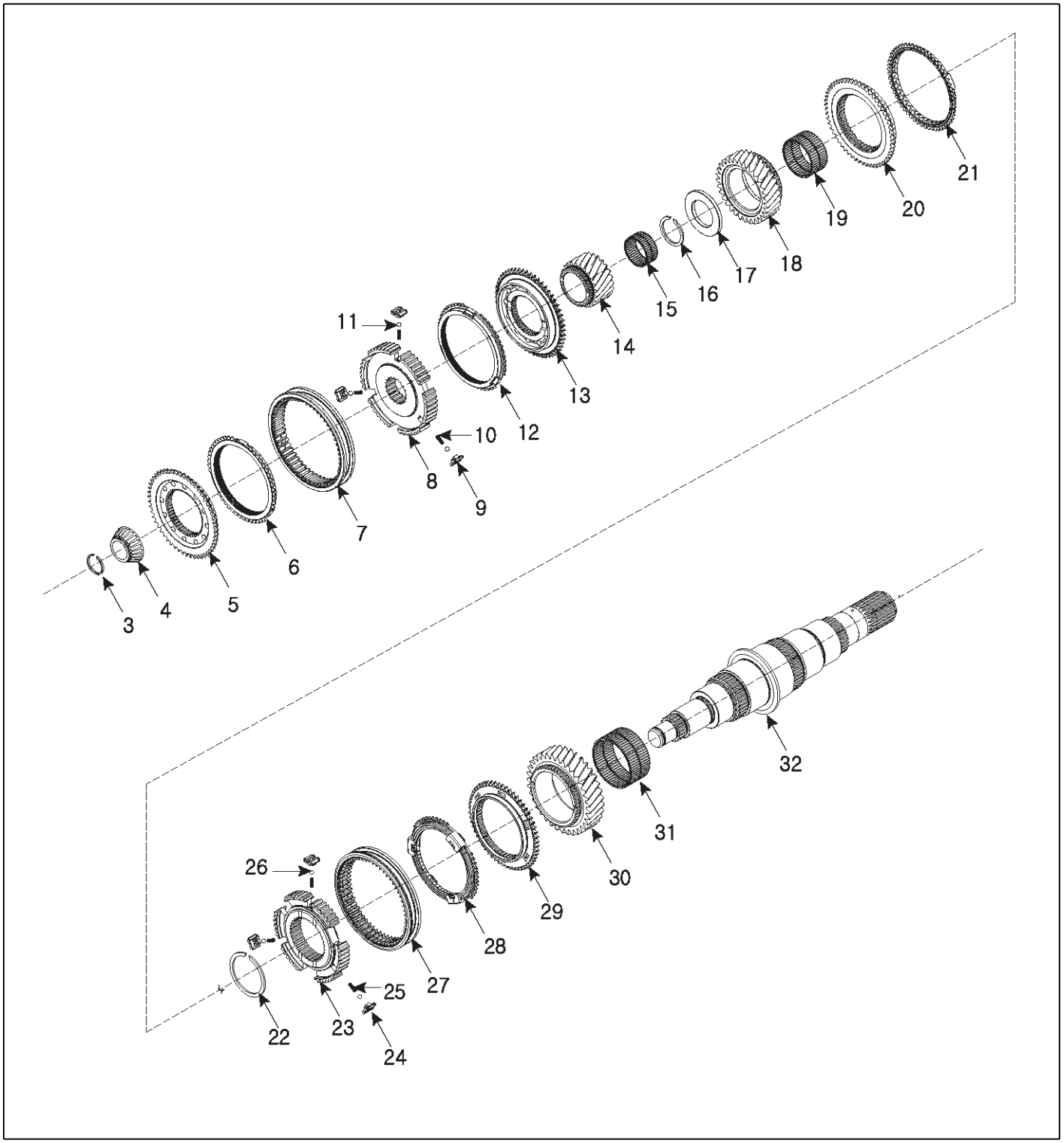
1. Using the tube shaped tool (4405/04), install the bearing to the pinion drive completely by applying pressure to the taper roller bearing (1).



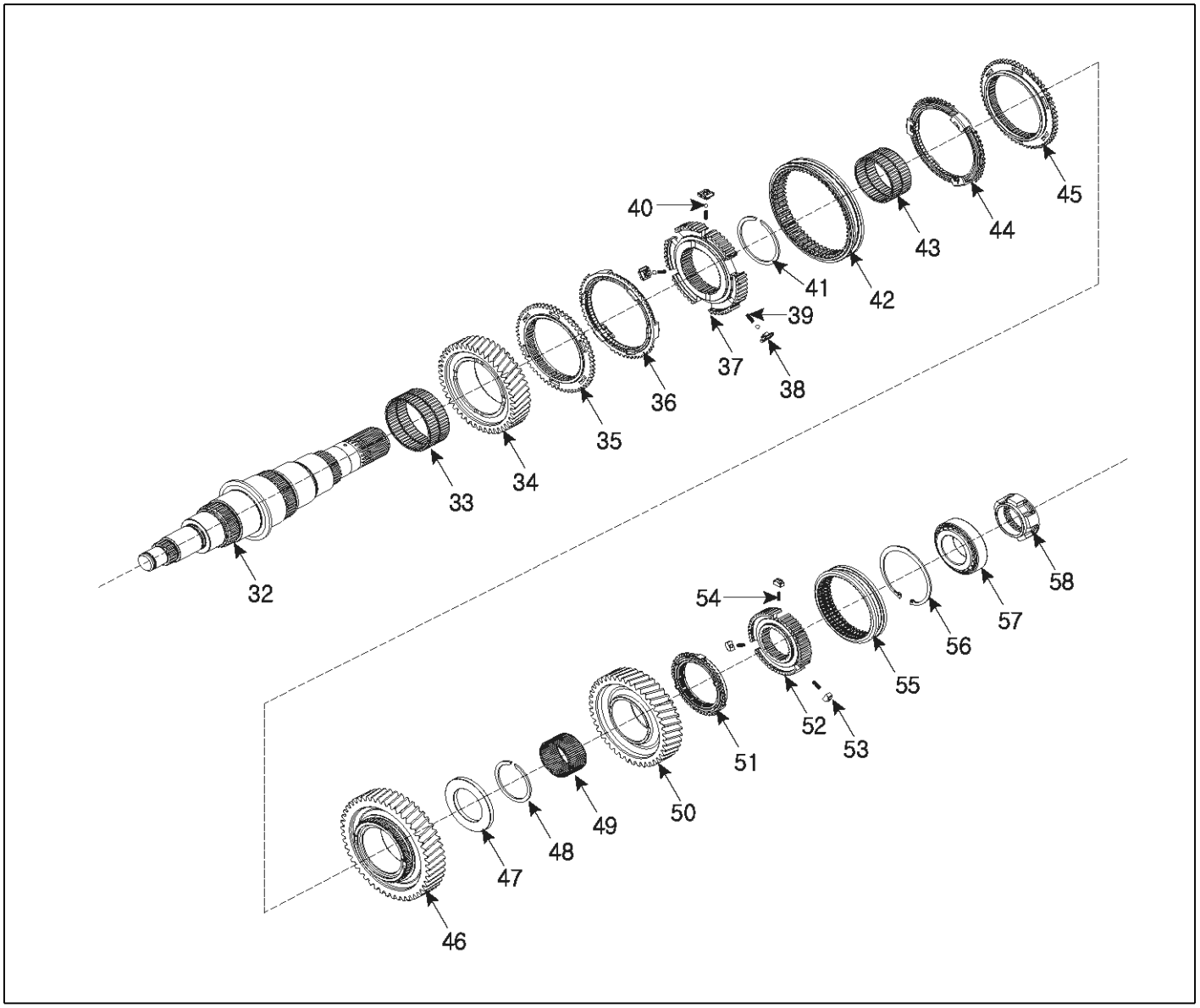
SUDMT9082D

MainShaft

COMPONENTS



SUDMT1020L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SUDMT1021L

3	Snap ring	31	3rd speed needle bearing
4	Pilot bearing	32	Mainshaft
5	5th speed gear clutch	33	2nd speed needle bearing
6	5th speed synchronizer ring	34	Mainshaft 2nd speed gear
7	5th/6th speed sleeve	35	2nd speed gear clutch
8	5th/6th hub	36	2nd speed synchronizer assembly
9	Strut	37	1st/2nd hub
10	Synchronizer spring	38	Strut
11	Ball	39	Synchronizer spring
12	6th speed synchronizer ring	40	Ball
13	6th speed gear clutch	41	Snap ring
14	Mainshaft 6th speed gear	42	1st/2nd sleeve
15	6th speed needle bearing	43	1st needle bearing
16	Snap ring	44	1st speed synchronizer assembly
17	Thrust washer	45	1st speed speed gear clutch
18	Mainshaft 4th speed gear	46	Mainshaft 1st speed gear
19	4th speed needle bearing	47	Thrust washer
20	4th speed gear clutch	48	Snap ring
21	4th speed synchronizer assembly	49	Reverse speed needle bearing
22	Snap ring	50	Reverse speed gear assembly
23	3rd/4th hub	51	Reverse speed synchronizer assembly
24	Strut	52	Reverse speed hub
25	Synchronizer spring	53	Strut
26	Ball	54	Synchronizer spring
27	3rd/4th speed sleeve	55	Reverse speed sleeve
28	3rd speed synchronizer assembly	56	Sleeve snap ring
29	3rd speed gear clutch	57	Taper roller bearing
30	Mainshaft 3rd speed gear	58	Impulse spacer

DISASSEMBLY

1. Remove the impulse spacer (58) from the end part of the mainshaft (32).
2. Secure the main shaft (32) in a vice to the vertical position with the end part of the front faced upward.
3. Remove the snap ring (3) from the front end surface of the shaft.
4. Using the special tool (puller 4405/22, or 4405/08), remove the pilot bearing (4).
5. Remove the 5th speed gear clutch (5).
6. Remove the 5th speed synchronizer ring (6).
7. Remove 5th/6th speed sleeve (7), strut (9), ball (11), spring (10), and hub (8) in sequence.

   WARNING
   Prevent the components from bouncing with a cloth since the strut and the ball are compressed with the spring.
8. Remove the 6th speed synchronizer ring (12).
9. Remove the 6th speed gear clutch (13).
10. Remove the mainshaft 6th speed gear (14).
11. Remove the 6th speed needle bearing(15).
12. Remove the snap ring (16).
13. Remove the thrust washer (17).
14. Remove the mainshaft 4th speed gear (18).
15. Remove 4th speed needle bearing (19).
16. Remove 4th speed gear clutch (20).
17. Remove the snap ring (22).
18. Remove the 4th speed synchronizer assembly (21).
19. Remove the 3rd/4th speed sleeve (27), strut (24), ball (26), spring (25), and hub (23) in sequence.

    WARNING
    Prevent the components from bouncing with a cloth since the strut and the ball are compressed with the spring.
20. Remove the 3rd speed synchronizer assembly (28).
21. Remove the 3rd speed gear clutch (29).
22. Remove the mainshaft 3rd speed gear (30).
23. Remove the 3rd speed needle bearing (31).
24. Rotate the mainshaft (32). At this time, secure it to the vertical position to face the rear end part of the mainshaft (32) upward.
25. Using the special tool (puller, 4405/19), remove the taper roller bearing (57).
26. Remove the reverse speed snap ring (56).
27. Remove the reverse speed sleeve (55), strut (53), spring (54), and hub (52) in sequence.

    WARNING
    Prevent the components from bouncing with a cloth since the strut and the ball are compressed with the spring.
28. Remove the reverse speed synchronizer assembly (51).
29. Remove the reverse speed gear assembly (50).
30. Remove the reverse speed needle bearing (49).
31. Remove the snap ring (48).
32. Remove the thrust washer (47).
33. Remove the mainshaft 1st speed gear (46).
34. Remove the 1st speed needle bearing (43).
35. Remove the 1st speed gear clutch (45).
36. Remove the 1st speed synchronizer assembly (44).
37. Remove the snap ring(41).
38. Remove the 1st/2nd speed sleeve (42), strut (38), spring (39), and hub (37) in sequence.

    WARNING
    Prevent the components from bouncing with a cloth since the strut and the ball are compressed with the spring.
39. Remove the 2nd synchronizer assembly (36).
40. Remove the 2nd gear clutch (35).
41. Remove the main shaft 2nd gear (34).
42. Remove the 2nd needle bearing(33).

Reassembly

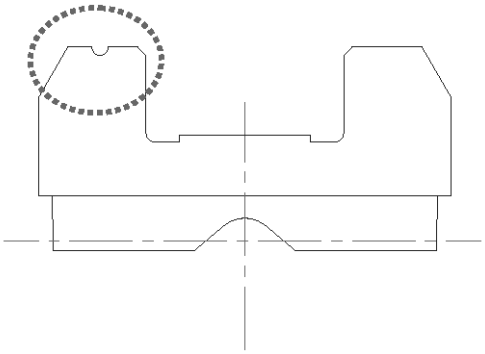
1. Face the rear end part of the mainshaft (32) upward and secure it in a vice to the vertical position.
2. Apply transmission oil to the 2nd speed needle bearing (33) and install the mainshaft (32).
3. Install the mainshaft 2nd speed gear (34).
4. Install the 2nd speed gear clutch (35).
5. Apply transmission oil to the friction surface of the 1st speed synchronizer assembly (36) and install it.
6. Heat 1st/2nd speed hub (37) to 130℃~150℃ for maximum 15 minutes and press it on the mainshaft (32) with a press.

   WARNING
   When handling the hub heated, always wear protective gloves.

   NOTICE
   The 2nd speed end play should be 0.17~0.34 mm.

7. Install the 1st/2nd speed sleeve (42), spring (39), strut (38), and ball (40) in sequence.

⚠CAUTION
Pay attention to the assembling direction of the 1st/2nd speed sleeve. Assemble the identification groove to face to the 1st speed side as shown in the below illustration.



SUDMT1022L

8. Install the snap ring (41). At this time, the snap ring end play should be 0~0.07 mm.
9. Apply transmission oil to the 1st speed needle bearing (43) and install it.

   Apply transmission oil to the friction surface of the 1st speed synchronizer ring (44) and install it.
10. Install the 1st speed gear clutch (45).
11. Install the mainshaft 1st speed gear (46).
12. Install the thrust washer (47).
13. Install the snap ring (48). At this time, the snap ring end play should be 0~0.07 mm.

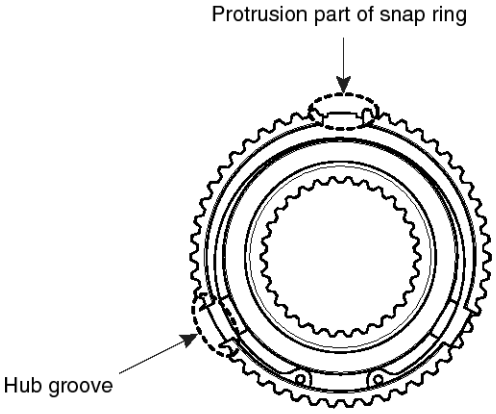
NOTICE
The 1st speed end play should be 0.14~0.42 mm.

14. Apply transmission oil to the reverse speed needle bearing (49) and install it.
15. Install the mainshaft reverse speed gear (50).
16. Apply transmission oil to the friction surface of the reverse speed synchronizer ring (51) and install it.
17. Heat reverse speed hub (52) to 130℃~150℃ for maximum 15 minutes and press it on the mainshaft (32) with a press.

WARNING
When handling the hub heated, always wear protective gloves.

NOTICE
The reverse speed end play should be 0.14~0.37 mm.

18. Install the reverse speed sleeve (55), spring (54) and strut (53) in sequence.
19. Install the snap ring (56) to the reverse speed hub (52) correctly like as below picture.



SUDMT1023L

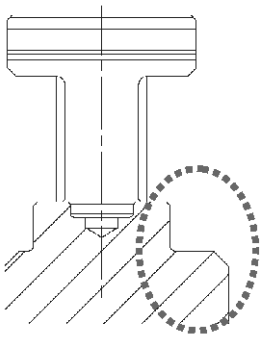
20. Using the tube shaped tool (4405/17), install the bearing to the shaft completely by applying pressure to the taper roller bearing (57). At this time, locate the tube shaped tool inside bearing. Do not support the tube shaped tool in the bearing cage.

NOTICE
The reverse speed end play should be 0.39~0.61 mm.

21. Install the impulse spacer (58).
22. Secure the mainshaft (32) in a vice to the vertical position with the end part of the front faced upward.
23. Apply transmission oil to the 3rd speed needle bearing (31) and install it.
24. Install the mainshaft 3rd speed gear (30).
25. Install the 3rd speed gear clutch (29).
26. Apply transmission oil to the 3rd speed synchronizer assembly (28) and install it.
27. Heat 3rd/4th speed hub (23) to 130℃~150℃ for maximum 15 minutes and press it on the mainshaft (32) with a press.

WARNING
When handling the hub heated, always wear protective gloves.

⚠CAUTION
Pay attention to the assembling direction of the 3rd/4th speed hub. Assemble the higher speed to face to the 3rd speed side as shown in the below illustration.

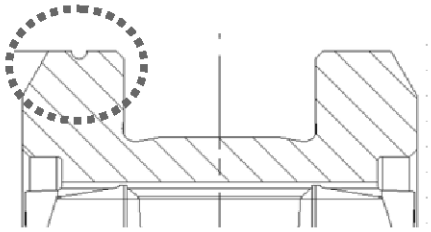


<3rd/4th sleeve>

SUDMT1024L

28. Install the 3rd/4th speed sleeve (27), spring (25), strut (24), and ball (26) in sequence.

⚠CAUTION
Pay attention to the assembling direction of the 3rd/4th speed sleeve. Assemble the identification groove to face to the 4th speed side as shown in the below illustration.



<3rd/4th sleeve>

SUDMT1025L

29. Apply transmission oil to the 4th speed synchronizer assembly (21) and install it.
30. Install the snap ring (22). At this time, the snap ring end play should be 0~0.07 mm.

NOTICE
The 3rd speed end play should be 0.14~0.37 mm.

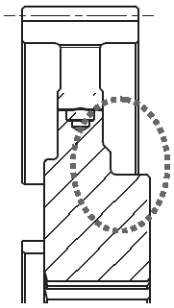
31. Install the 4th speed gear clutch (20).
32. Apply transmission oil to the 4th needle bearing (19) and install it.
33. Install the mainshaft 4th speed gear (18) and install it. And install the thrust washer (17).
34. Install the snap ring (16). At this time, the snap ring end play should be 0~0.07 mm.

NOTICE
The 4th speed end play should be 0.17~0.39 mm.

35. Apply transmission oil to the 6th speed needle bearing (19) and install it.
36. Install the mainshaft 6th speed gear (14) and install it. And install the 6th speed gear clutch (13).
37. Apply transmission oil to the 6th speed synchronizer ring (12) and install it.
38. Heat the 5th/6th speed hub (8) to 130℃~150℃ for maximum 15 minutes and press it on the mainshaft (32) with a press.

WARNING
When handling the hub heated, always wear protective gloves.

⚠CAUTION
Pay attention to the assembling direction of the 5th/6th speed hub. Assemble the higher speed to face to the 6th speed side as shown in the below illustration.



<5th/6th hub>

SUDMT1026L

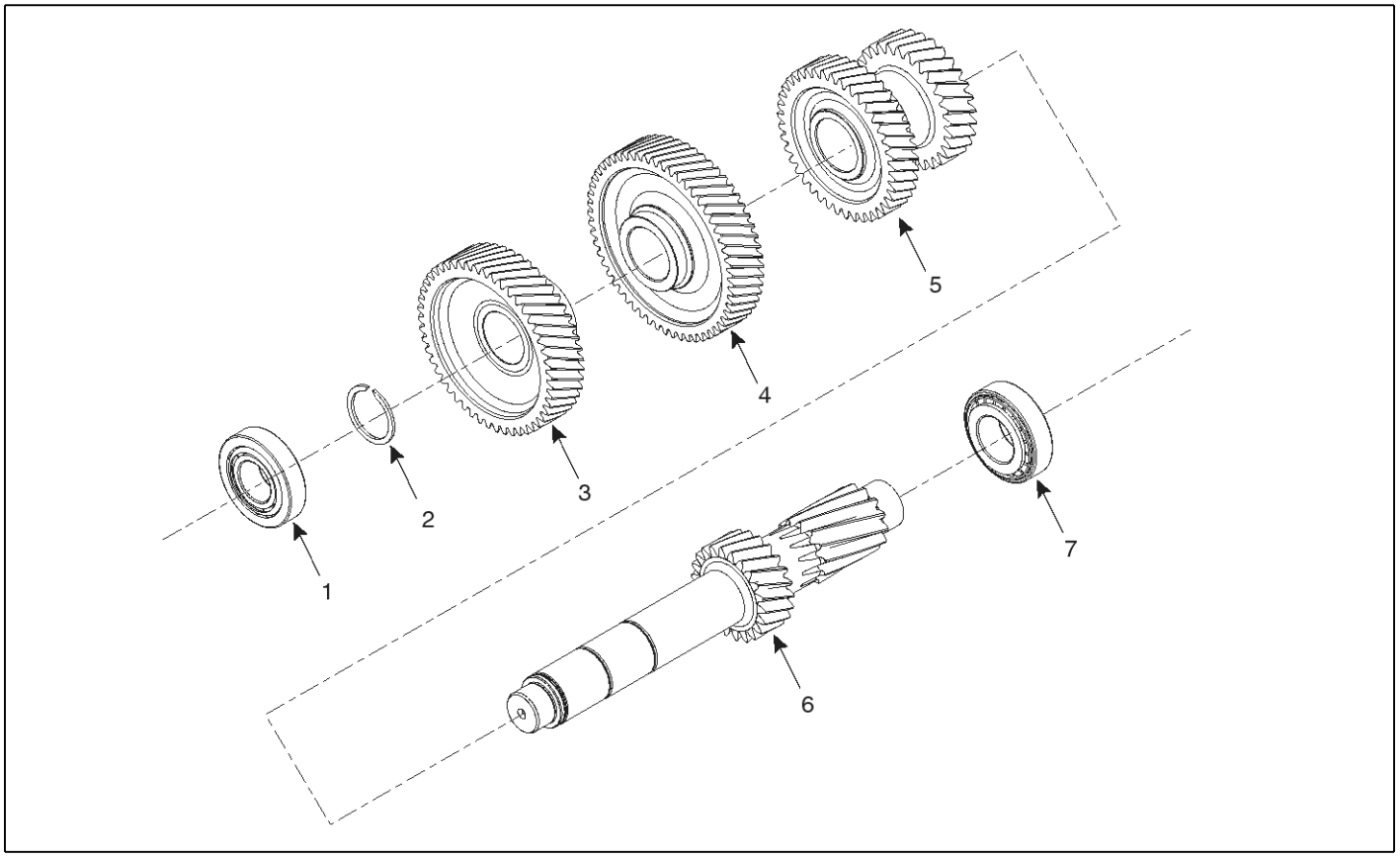
39. Install the 5th/6th speed sleeve (7), spring (10), strut (9), and ball (11) in sequence.
40. Apply transmission oil to the 5th speed synchronizer ring (6) and install it. And install the 5th speed gear clutch (5).
41. Using the tube shaped tool (4405/17), install the pilot bearing (4) to the shaft completely by applying pressure to the taper roller bearing (57).
42. Install the snap ring (3). At this time, the snap ring end play should be 0~0.07 mm.

NOTICE
The 6th speed end play should be 0.11~0.33 mm.

43. Install the impulse spacer (58).

CounterShaft

COMPONENTS



SUDMT1027L

1. Taper roller bearing
2. Snap ring
3. Countershaft constant gear
4. Countershaft 6th speed gear
5. Countershaft 3rd/4th speed gear
6. Countershaft
7. Taper roller bearing

DISASSEMBLY

1. Face the front end part of the countershaft (6) upward and secure it in a vice to the vertical position. Using the special tool (puller, 4405/7), remove the taper roller bearing (1).

   WARNING
   Place the countershaft to the soft support stand and prevent it from rolling.
2. Remove the snap ring (2).
3. Remove the countershaft constant gear (3) by applying pressure to the countershaft (6).
4. Remove the countershaft 6th speed gear (4) by applying pressure to the countershaft (6).
5. Remove the countershaft 3rd/4th speed gear (5) by applying pressure to the countershaft (6).
6. Face the rear end part of the countershaft (6) upward and secure it in a vice to the vertical position. Using the special tool (puller, 4405/7), remove the taper roller bearing (7).
7. Use the hydraulic jack suitable for removing the helical gear at a time since very high accuracy is required. The force necessary to remove each helical gear is 255kgf(2,500 N).
8. While removing, there can cause damage to each taper roller bearing inner ring. Therefore, use a new taper roller bearing to perform an exact inspection.

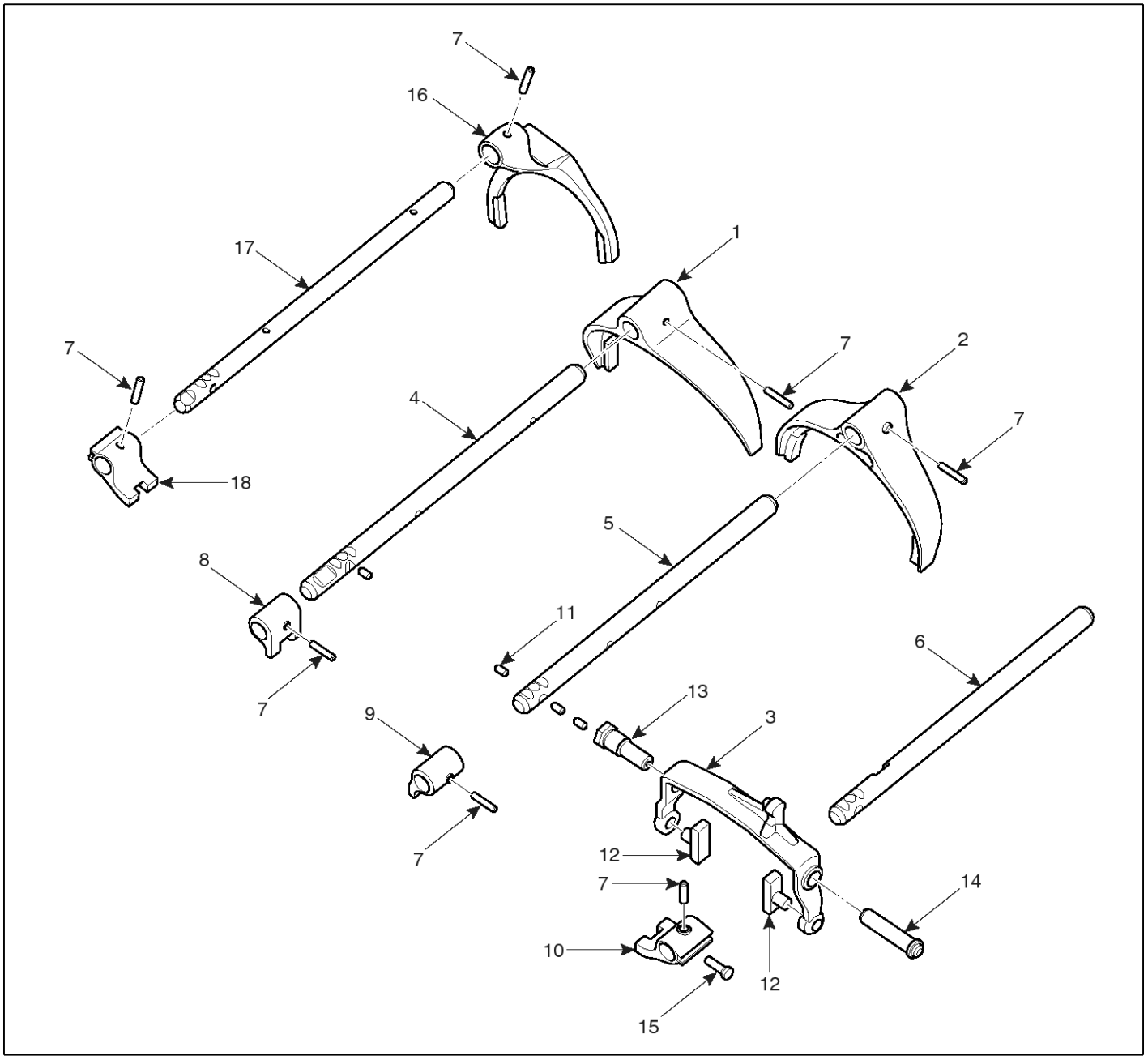
ASSEMBLY

1. Clean the helical gear (3,4,5) bore and countershaft (6).
2. Heat the helical gear to 160˚C for maximum an hour.

   WARNING
   When the helical gear heated, always wear protective gloves.
3. Face the front end part of the countershaft (6) upward and rest the lower part of the reverse speed in a vice. And secure it to the vertical position.
4. Using the tube shaped tool, install the countershaft 3rd/4th speed gear (5) by applying pressure downward to the boss part of the 4th speed gear.
5. Using the tube shaped tool, install the countershaft 6th speed gear (4) by applying pressure downward to the boss part of the 6th speed gear.
6. Using the tube shaped tool, install the countershaft constant gear (3) by applying pressure downward to the boss part of the constant gear.
7. Install the snap ring (2).
8. Using the tube shaped tool, install the taper roller bearing (1) by applying pressure downward.
9. Face the rear end part of the countershaft (6) upward and rest the lower part of the constant gear in a vice. And secure it to the vertical position. Using the tube shaped tool (4405/08), face the small surface of the taper roller bearing (7) cone upward and apply pressure until the bearing is seated to the shaft.

Shift Rail And Shift Fork

COMPONENTS

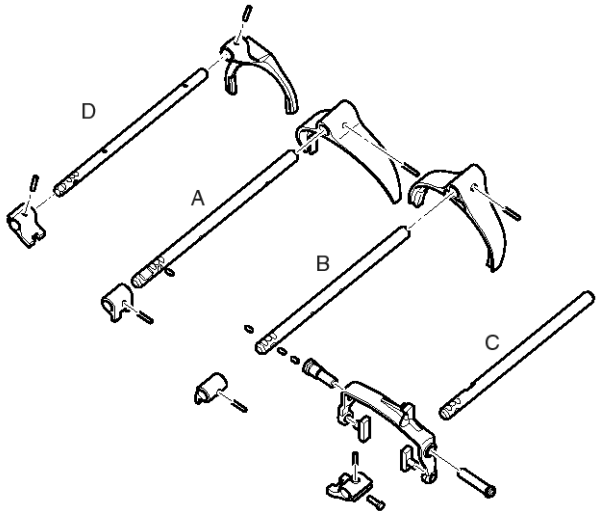


SUDMT1028L

1	1st/2nd speed fork	10	5th/6th speed jaw
2	3th/4th speed fork	11	Interlock pin
3	5th/6th speed fork	12	Pad
4	1st/2nd speed rail	13	5th/6th speed fork mounting bolt
5	3th/4th speed rail	14	5th/6th speed fork mounting pin
6	5th/6th speed rail	15	5th/6th speed jaw guide bolt
7	Spring pin	16	Reverse speed shift fork
8	1st/2nd speed jaw	17	Reverse speed shift rail
9	3th/4th speed jaw	18	Reverse speed shift jaw

DISASSEMBLY

1. The rail subassembly of the 1st/2nd, 3rd/ 4th, 5th/6th, reverse speed is separated from the transmission main section, the fork and jaw of each speed except for 5th/6th speed fork are separated by removing the spring pin.



SUDMT1029L

A : 1st and 2nd speed rail subassembly

B : 3rd and 4th speed rail subassembly

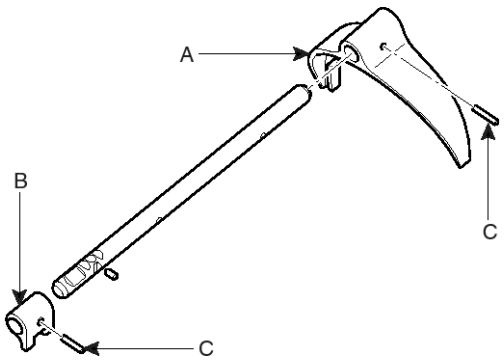
C : 5th and 6th speed rail subassembly

D : Reverse speed rail subassembly

2. Remove the spring pin (C) of the fork (A) and jaw (B) of each speed except for 5th/6th speed fork.

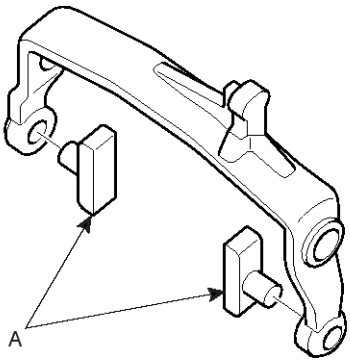
NOTICE

Use the pin punch of diameter 5 mm.



SUDMT9093D

3. Remove the jaw of each speed.
4. Remove the fork of each speed.
5. Remove the pad (A) at both ends of 5th/6th speed fork.



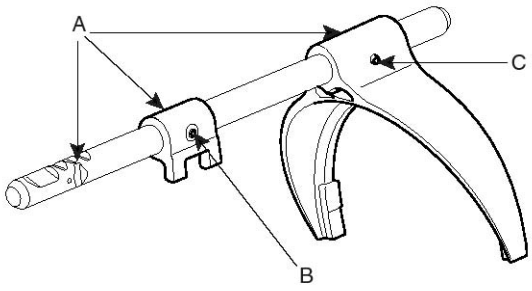
SUDMT9094D

ASSEMBLY

1. Locate the jaw and fork of 1st/2nd, 3rd/ 4th, 5th/6th, reverse speed to the corresponding rail, check for the mounting position related to the groove in the front of rail.
2. Align the spring pin hole (B) at the jaw with the hole (A) of rail and install a new spring pin.
3. Align the spring pin hole (C) at the fork with the hole of rail and install a new spring pin.

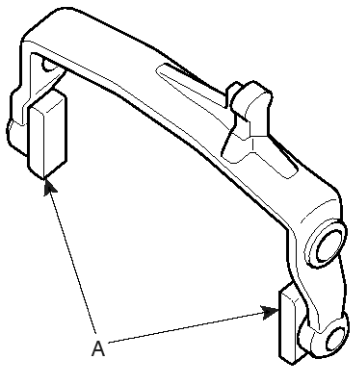
NOTICE

Use the pin punch of diameter 5 mm.



SUDMT9095D

4. Install the pad (A) at both ends of 5th/6th speed fork.



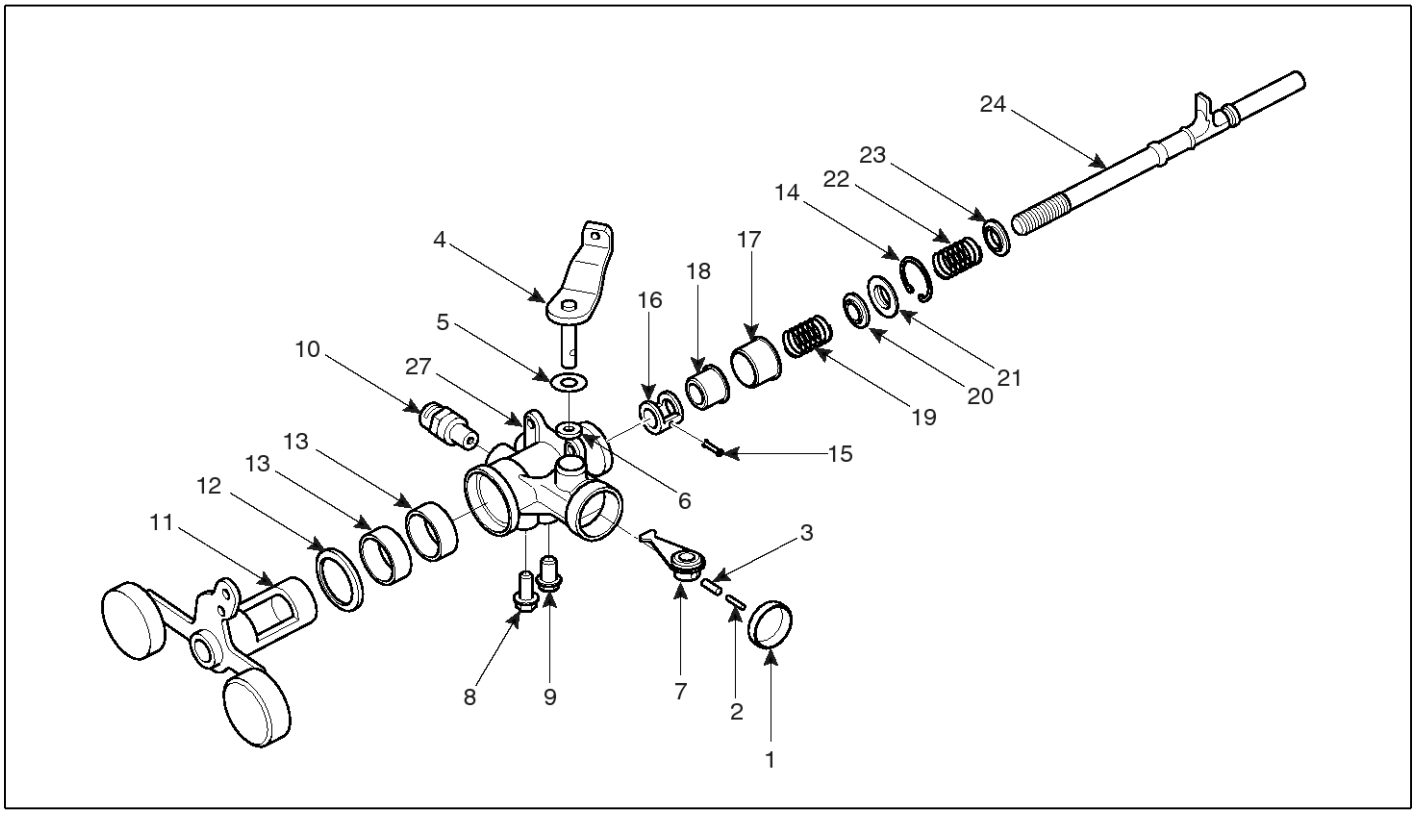
SUDMT9096D

5. The components not mentioned above are assembled in the transmission main section.

Manual Transmission Control System

Gear Shifter Lever

COMPONENTS



SUDMT1030L

⚠CAUTION

- **Install the plug (1) with a new one when replacing it.**
- **Do not remove the bush (13) except for replacing it.**
- **Assemble the select lever (B) and shift lever by rotating not to cause damage to the lip of the oil seal.**
- **When installing the kinds of bolt, apply sealant and tighten them to the specified torque.**

DISASSEMBLY SEQUENCE

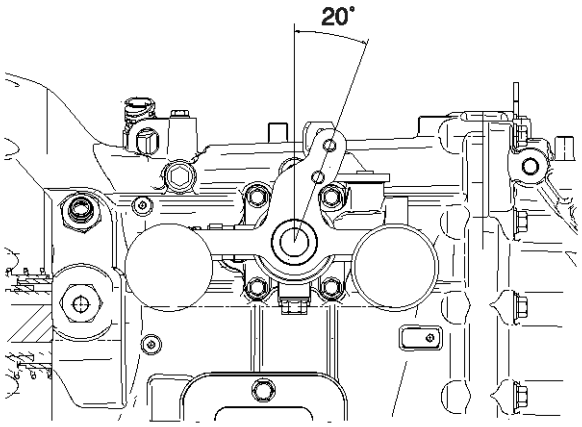
1. Plug
2. Spring pin
3. Spring pin
4. Select lever (B)
5. Plain washer
6. Oil seal
7. Select lever (A)
8. Set bolt
9. Poppet ball assembly
10. Interlock switch
11. Shift lever
12. Oil seal
13. Bush
14. Retainer ring
15. Spring pin
16. Select lug
17. Retainer (A)
18. Retainer (B)
19. Return spring
20. Spacer
21. Retainer
22. Return spring
23. Retainer
24. Torsion shaft

ASSEMBLY SEQUENCE

Assembly is in the reverse order of disassembly.

SERVICE PROCEDURE

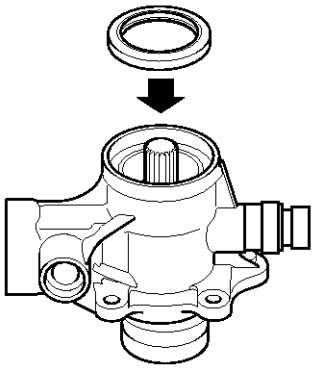
1. Assembly of Torsion Shaft
   1) When assembling the inner spline of shift lever and the outer spline of torsion shaft, assemble them to the angle of 20° between the center line of shift lever hole and the center line of torsion shaft lever.



SUDMT9098D

2. Assembly of Oil Seal of Shift Lever

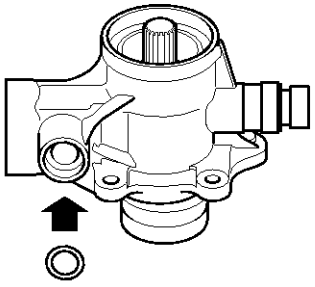
   Apply grease to the lip of oil seal and press-fit it evenly as shown in the illustration.



SUDMT9099D

3. Assembly of Oil Seal of Select Lever

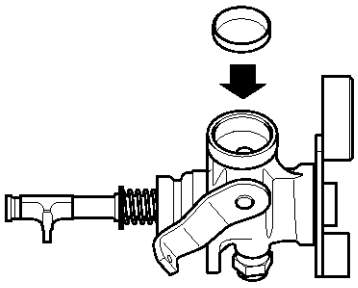
   Apply grease to the lip of oil seal and press-fit it evenly as shown in the illustration.



SUDMT9100D

4. Assembly of Dust Plug of Select Lever

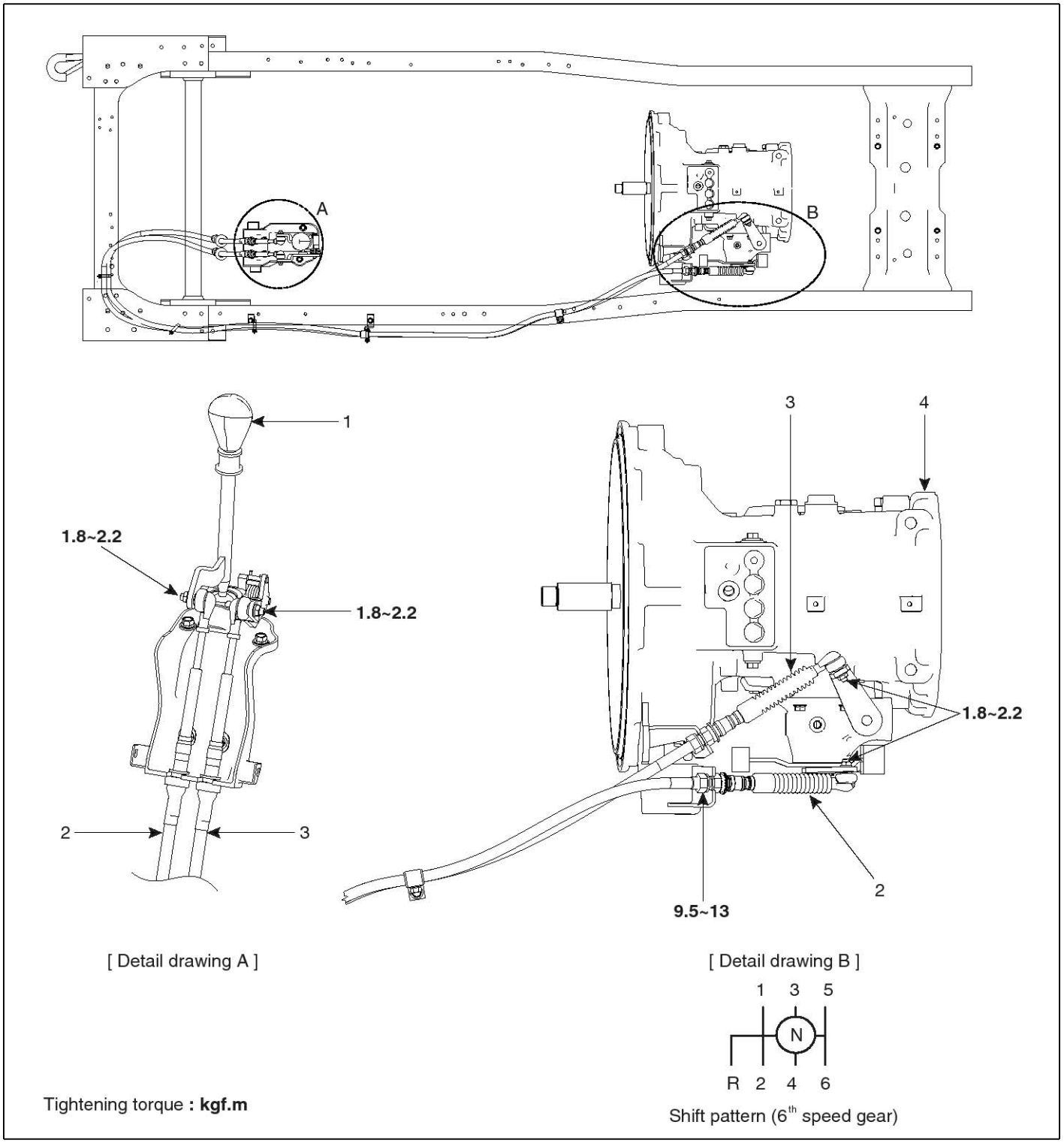
   Apply Loctite 648 or 962 around the periphery surface of dust plug and press-fit it evenly as shown in the illustration.



SUDMT9101D

Shift Cable And Select Cable Assembly

COMPONENTS

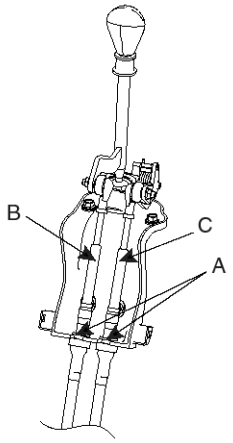


SUDMT1031L

1. Transmission knob
2. Shift cable assembly
3. Select cable assembly
4. Transmission assembly

REMOVAL

1. Remove the center console.
2. Disconnect the clip (A) and then disconnect the shift cable (B) and select cable (C) from the shift lever.



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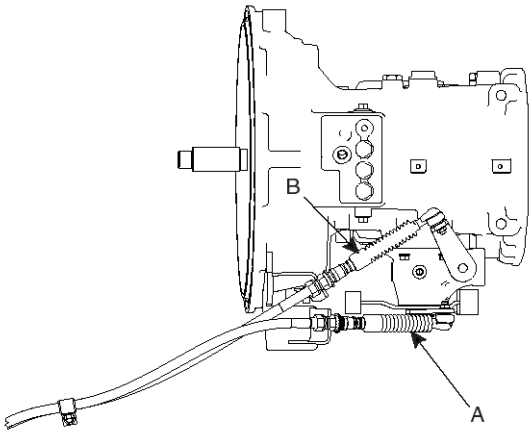
3. Remove the shift cable (A) and select cable (B) in the transmission side.



SUDMT9105D

4. Disconnect the middle strap.

INSTALLATION

1. Installation is the reverse order of removal.

⚠CAUTION

1. Make sure the shift and select lever is in the Neutral position and install it.

2. Regarding tightening torque value, see page components.