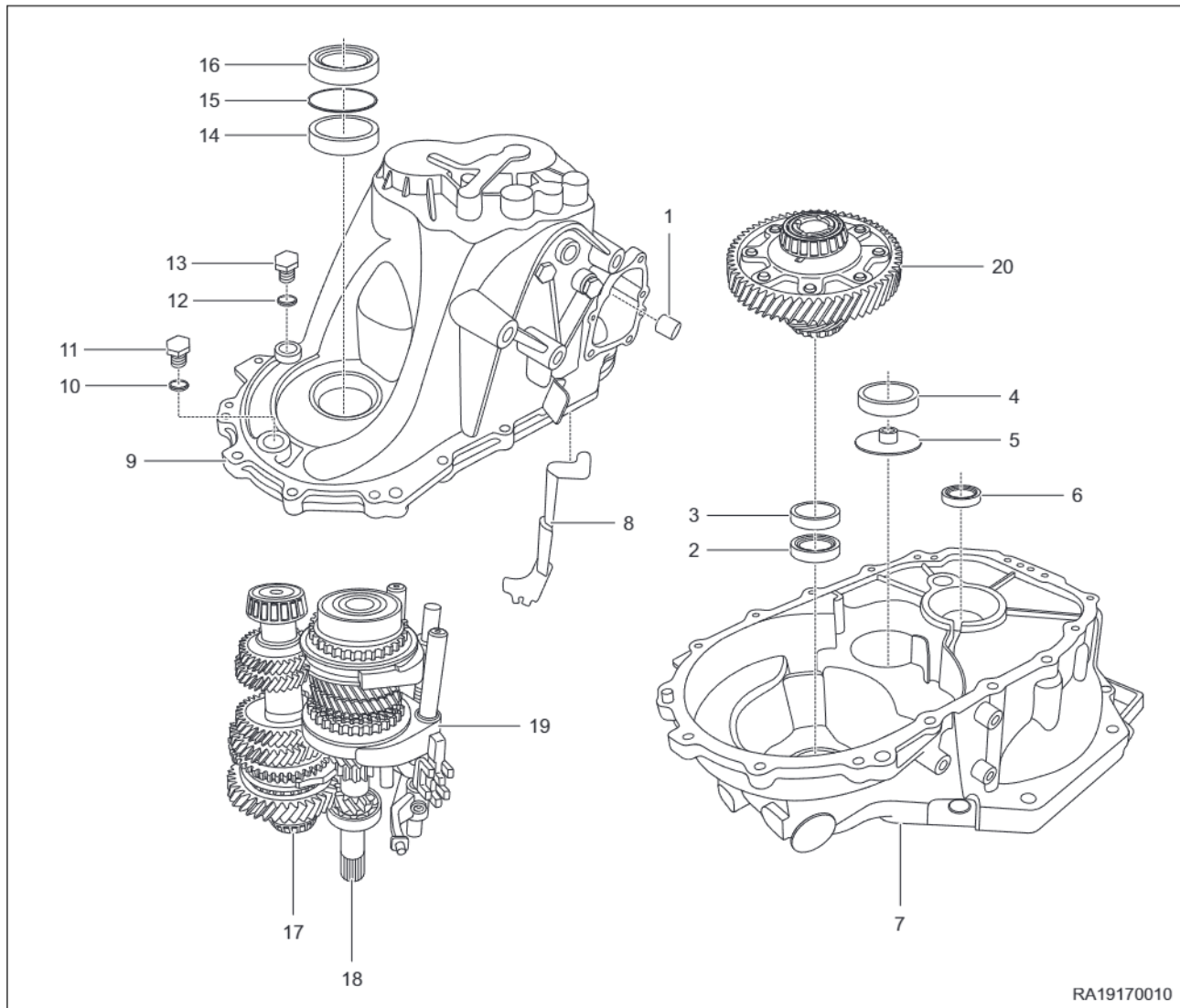

QR515MHA TRANSMISSION

GENERAL INFORMATION	17-3	Gear Shift Mechanism	17-34
Description	17-3	Disassembly	17-34
Operation	17-6	Assembly	17-35
Specifications	17-6	Shift Fork	17-36
Daily Maintenance	17-7	Disassembly	17-36
Tools	17-8	Inspection	17-38
DIAGNOSIS & TESTING	17-10	Assembly	17-38
Problem Symptoms Table	17-10	Input Shaft	17-39
On-vehicle Inspection	17-11	Disassembly	17-39
ON-VEHICLE SERVICE	17-12	Inspection	17-43
Transmission Oil	17-12	Assembly	17-44
Replacement	17-12	Output Shaft	17-49
Differential Oil Seal	17-14	Disassembly	17-49
Removal	17-14	Inspection	17-52
Installation	17-14	Assembly	17-53
Select and Shift Cable	17-16	Transmission External Accessory	17-58
Removal	17-16	Removal	17-58
Installation	17-18	Installation	17-59
Gear Shift Control Mechanism	17-19	Transmission Case	17-61
Removal	17-19	Disassembly	17-61
Inspection	17-20	Assembly	17-64
Installation	17-20		
Transmission Assembly	17-21		
Removal	17-21		
Disassembly	17-24		
Assembly	17-29		
Installation	17-33		

GENERAL INFORMATION

Description

Transmission

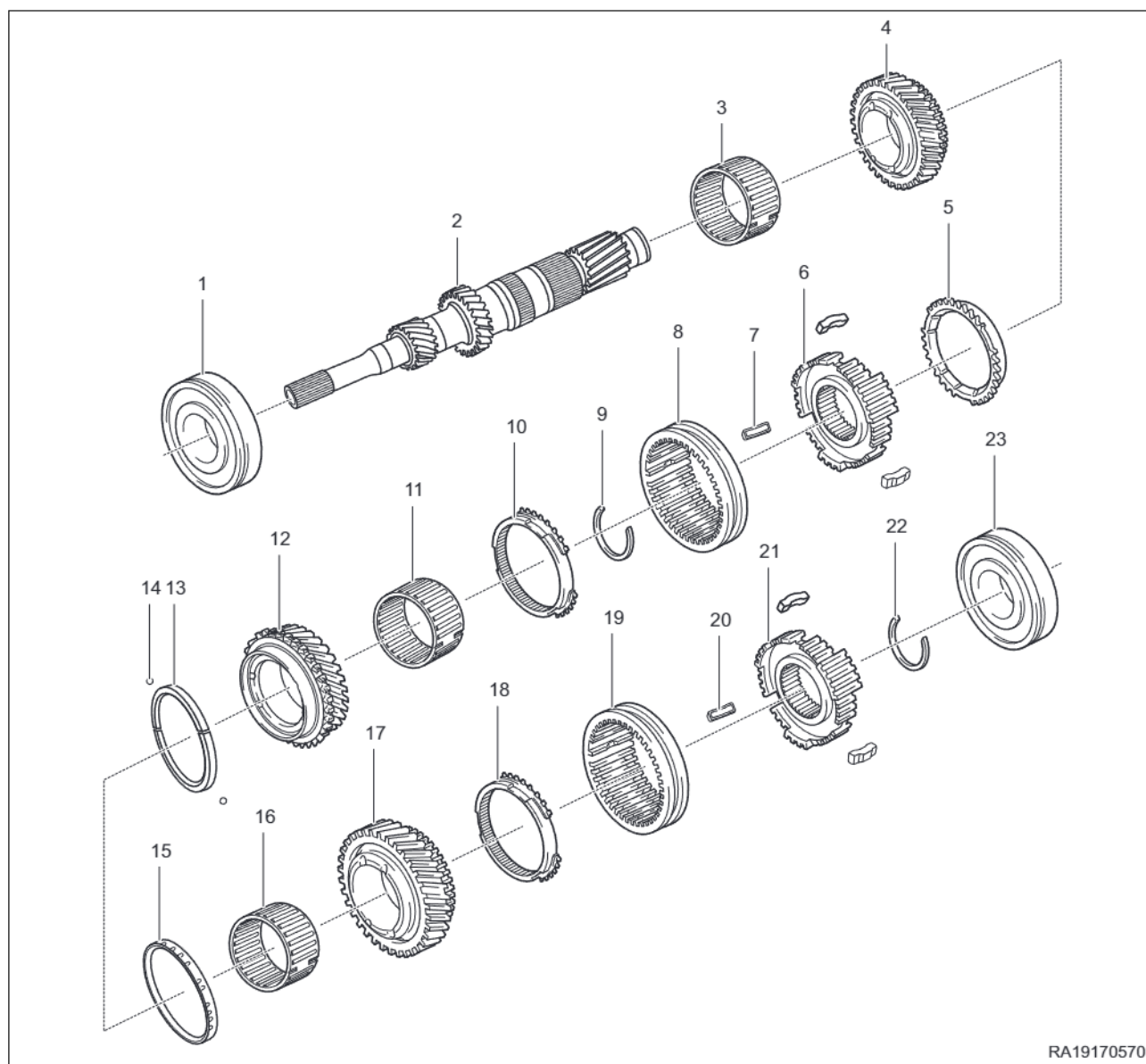


17

RA19170010

1 - Linear Bearing	2 - Differential Oil Seal
3 - Differential Bearing Outer Race	4 - Output Shaft Front Bearing Outer Race
5 - Oil Guide	6 - Input Shaft Oil Seal
7 - Clutch Case Groove	8 - Oil Deflector
9 - Transmission Case	10 - Washer
11 - Retaining Plug	12 - Washer
13 - Drain Plug	14 - Differential Bearing Outer Race
15 - Adjusting Washer	16 - Differential Oil Seal
17 - Output Shaft Assembly	18 - Input Shaft Assembly
19 - Shift Fork Assembly	20 - Differential

Input Shaft

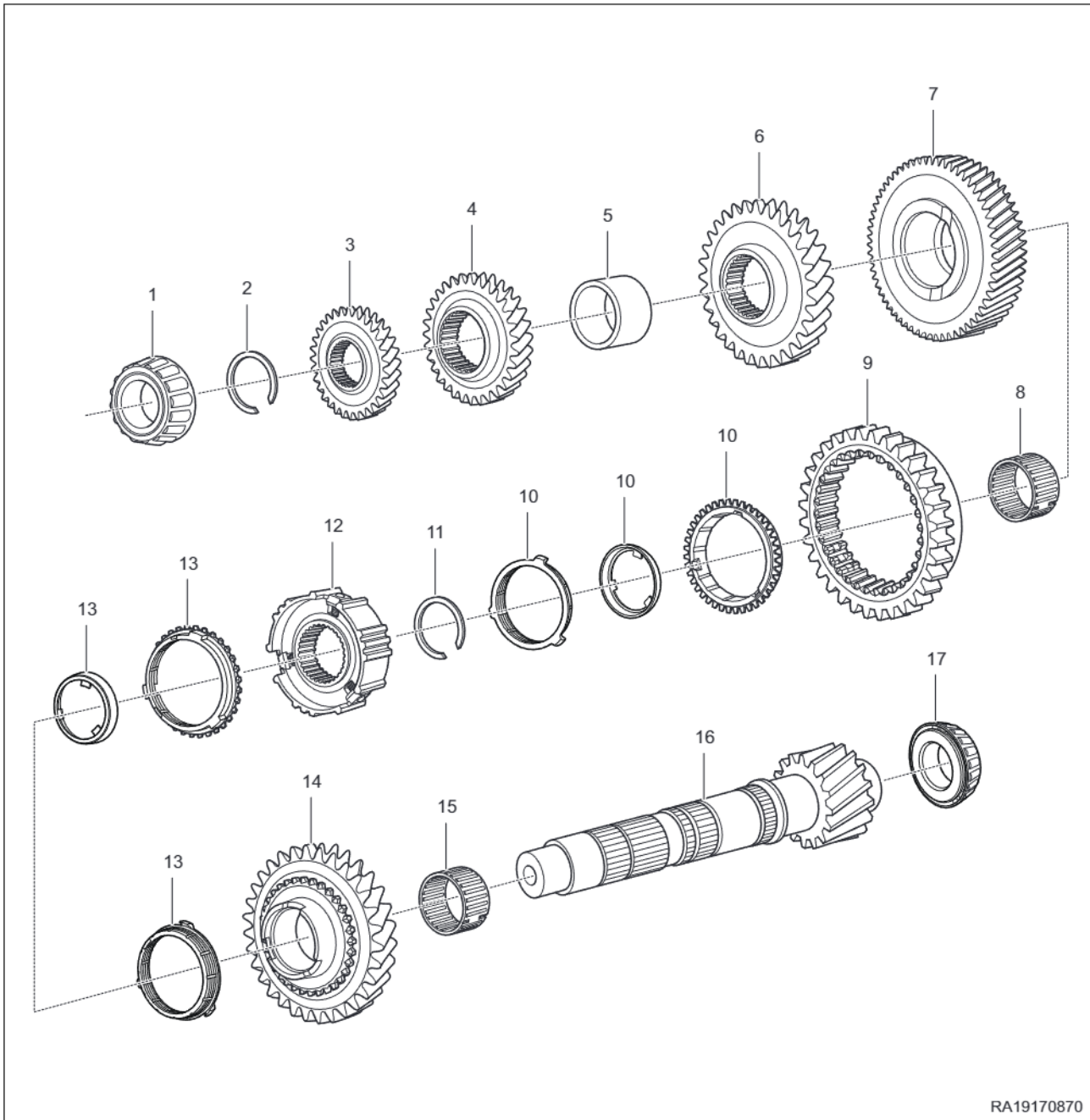


17

RA19170570

1 - Input Shaft Front Bearing	2 - Input Shaft
3 - 3rd Needle Roller Bearing	4 - 3rd Drive Gear Assembly
5 - 3rd Synchronizer Ring	6 - 3rd-4th Synchronizer Gear Hub
7 - Guide Block	8 - 3rd-4th Synchronizer Outer Race
9 - Snap Ring	10 - 4th Synchronizer Ring
11 - 4th Needle Roller Bearing	12 - 4th Drive Gear Assembly
13 - Gear Baffle Plate	14 - Ball
15 - Gear Baffle Plate Spring Clamp	16 - 5th Needle Roller Bearing
17 - 5th Drive Gear	18 - 5th Synchronizer Ring
19 - 5th Synchronizer Outer Race	20 - Guide Block
21 - 5th Synchronizer Gear Hub	22 - Snap Ring
23 - Input Shaft Rear Bearing	

Output Shaft



RA19170870

17

1 - Output Shaft Rear Bearing	2 - Snap Ring
3 - 5th Driven Gear	4 - 4th Driven Gear
5 - Gear Shaft Bushing	6 - 3rd Driven Gear
7 - 2nd Driven Gear	8 - 2nd Needle Roller Bearing
9 - 1st-2nd Synchronizer Outer Race	10 - Synchronizer Ring Set
11 - Snap Ring	12 - 1st-2nd Synchronizer Gear Hub
13 - Synchronizer Ring Set	14 - 1st Driven Gear
15 - 1st Needle Roller Bearing	16 - Output Shaft
17 - Output Shaft Front Bearing	



Operation

The transmission operates five forward gears and one reverse gear by three sets of synchronizers and two shafts (input shaft and output shaft). All the forward gears use the conventional engagement, and the reverse gear uses a sliding idler gear device. 1st-2nd gear synchronizer is installed on the output shaft and 3rd-4th and 5th gear synchronizers are installed on the input shaft. The transmission will engage with its corresponding gear hub separately when it is shifted to each different gear position, thus realizing the transmission of power. The drive gear of final drive, which is on the output shaft, rotates the driven gear of final drive and differential assembly, thus the propeller shaft is driven to turn the wheels.

Specifications

Torque Specifications

Description	Torque (N·m)
Reverse Shift Fork Fixing Bolt	25 ± 2
Transmission Case Fixing Bolt	25 ± 2
Clutch Case Fixing Bolt	25 ± 2
Reverse Gear Fixing Bolt	38 ± 2.5
Gear Shift Control Mechanism Fixing Bolt	20 ± 3
Select and Shift Cable Boot Fixing Nut	7 ± 1.5
Select and Shift Cable Locating Nut	7 ± 1.5
Coupling Bolt Between Gear Shift Mechanism and Transmission Case	25 ± 2
Gear Shift Mechanism Locating Bolt	32 ± 2.5
Clutch Line Bracket Fixing Bolt	25 ± 2
Shift Shaft Locating Bolt	20 ± 2
Back-up Light Switch	25 ± 2
Starter Wire Harness Bracket Fixing Bolt	25 ± 2
Oxygen Sensor Connector Bracket Fixing Bolt	20 ± 3
Ground Wire Fixing Bolt	20 ± 3
Drain/Retaining Plug	44 ± 3
Select and Shift Cable Mounting Bracket Fixing Bolt	25 ± 3
Transmission Fixing Bolt	45 ± 5
Fixing Bolt Between Front and Lower Side of Engine and Transmission	45 ± 5
Fixing Bolt Between Engine Rear Side and Transmission	45 ± 5

Transmission Gear Ratio Table

Gear Ratio \ Type		QR515MHA
Gear		
1st		3.545
2nd		2.050
3rd		1.423
4th		1.065
5th		0.865
Reverse		3.364
Final Drive		3.550

Daily Maintenance

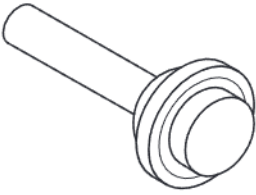
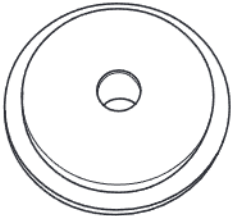
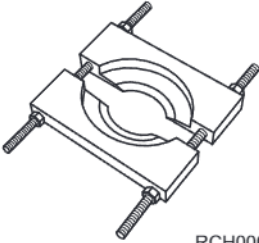
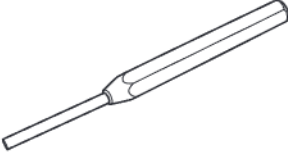
For transmission, generally it is not necessary to perform special maintenance, and the most normal maintenance is to change the gear oil. Transmission of QR515MHA series must use the gear lubricant of GL-4 75W-90 grade or above. If improper lubricant is used, the transmission will be seriously damaged. Never replace the transmission lubricant with engine lubricant. Also, please note that the lubricant has a strict requirement for filling amount.

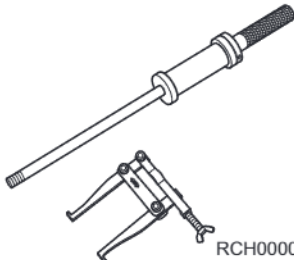
Filling method:

Park the vehicle on the service platform or lifter levelly without removing the transmission. Prepare a container to recover the used lubricant. Remove the transmission drain plug, and then drain the used transmission oil. Replace the washer with a new one after draining the transmission oil and tighten the drain plug. Loosen the transmission retaining plug and fill QR515MHA transmission lubricant with a special filling device until the oil flows out from the retaining plug, then tighten the retaining plug.

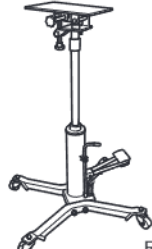
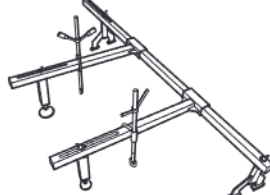
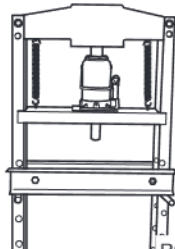
Tools

Special Tools

Input Shaft Oil Seal Installer	 RCH0000008
Differential Oil Seal Installer	 RCH0000009
Installation Joint	 RCH0000010
Bearing Remover	 RCH0000011
Punch	 RCH0000015

Puller	 RCH0000059
--------	--

General Tools

Transmission Carrier	 RCH0000005
Engine Equalizer	 RCH0000026
Hydraulic Press	 RCH0000012

DIAGNOSIS & TESTING

Problem Symptoms Table

HINT:

Use the table below to help determine the cause of problem symptoms. Check each suspected area in sequence. Repair or replace the faulty components, or adjust them as necessary.

Symptom	Suspected Area	See page
Noise	Oil level (too low)	17-11
	Oil wrong grade	17-11
	Gears (worn or damaged)	-
	Bearing (worn or damaged)	-
	Gear thrust position and clearance improper	-
Oil leakage	Drain plug	-
	Drain plug gasket	-
	Differential oil seal	17-14
	Joint surface damaged and not reamed in time	-
Hard shifting or impossible to shift	Oil level (too low)	17-11
	Gears (worn or damaged)	-
	Synchronizer ring (worn or damaged)	-
	Shift key spring (worn or damaged)	-
Jumps out of gear	Detent ball spring	-
	Shift fork (worn)	17-36
	Gears (worn or damaged)	-
	Bearing (worn or damaged)	-
Bearing irregular damaged	Lubricant contains any metal impurities	-
	Insufficient lubrication or lubricant not complying with the regulations	-
	Use irregular bearing	-
Release fork makes a "click" sound when clutch pedal is depressed	Insufficient lubrication at joint surface of release fork and hydraulic sub cylinder or joint surface of release fork and ball joint housing.	-
No gear change	Shift drive train (loose)	-
	Driver swing arm (loose)	-

CAUTION

- To guarantee the service quality of transmission, perform operations carefully and keep each component of transmission clean.
- Select appropriate or special tools.
- The transmission can achieve a good operation condition only when strictly performing service according to the technical requirements of assembly or adjustment.

On-vehicle Inspection

Transmission Oil

1. Check the transmission oil level.
 - a. Raise the vehicle with a lifter.

WARNING

- Be sure to wear the necessary safety equipment to prevent accidents.
- Check if the safety lock of lifter is locked when performing the vehicle lift repair and check.

- b. Remove the transmission filler plug and gasket.
- c. Check if the oil level is at the opening of retaining plug.

Transmission oil type: GL-4

Viscosity: 75W-90

Standard capacity: 2.3 L

CAUTION

- An excessively large or small amount of oil may affect proper functioning of transmission.
- After filling oil, run the vehicle, and then check the oil level.

ON-VEHICLE SERVICE

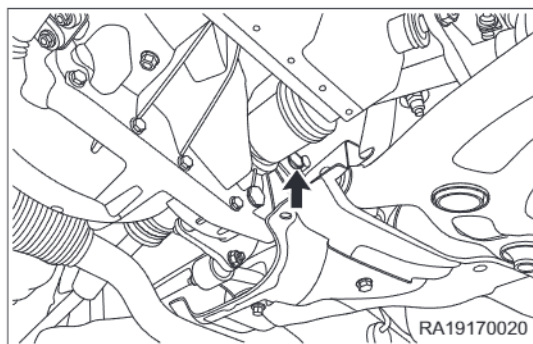
Transmission Oil

Replacement

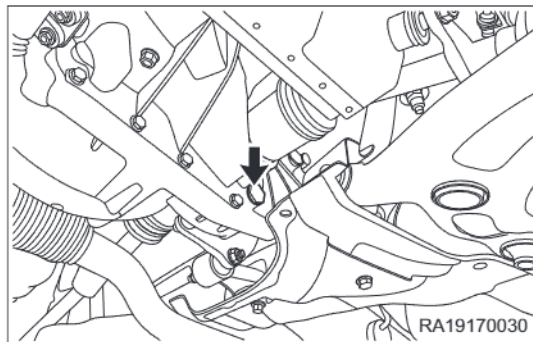
CAUTION

- Replace the transmission oil only when the engine stops and the transmission cools down.
- Before installation, replace the drain/retaining plug washer with a new one.

1. Turn off all the electrical equipment and ignition switch.
2. Raise the vehicle to the proper height.
3. Place a recovering container under the transmission drain hole.
4. Using a wrench, loosen the transmission filler plug (arrow).



5. Using a wrench, remove the transmission drain plug (arrow). Replace the drain plug gasket and tighten the drain plug after draining the transmission oil. (Tightening torque: $44 \pm 3 \text{ N}\cdot\text{m}$)



17

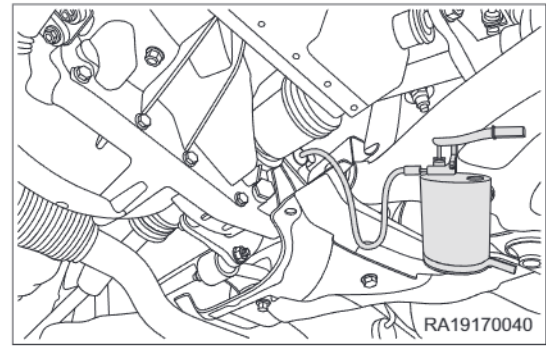
6. Fill transmission oil.

CAUTION

- Only use transmission oil approved by Chery Automobile Co., Ltd.

- a. Make sure that the transmission drain plug has been tightened in place.

- b. Using a filling tool, fill transmission oil to the transmission filler until it overflows.



- c. Replace the filler plug gasket and tighten the filler plug after filling.
(Tightening torque: $44 \pm 3 \text{ N}\cdot\text{m}$)

Transmission Oil Type

Model	1.5 L MT
Transmission Oil Type	API GL-4, 75W-90
Filling Capacity	2.3 L

Differential Oil Seal

Removal

HINT:

- Use the same procedures for the right side and left side.
- The procedures listed below are for the left side.

1. Raise the vehicle with a lifter.

WARNING

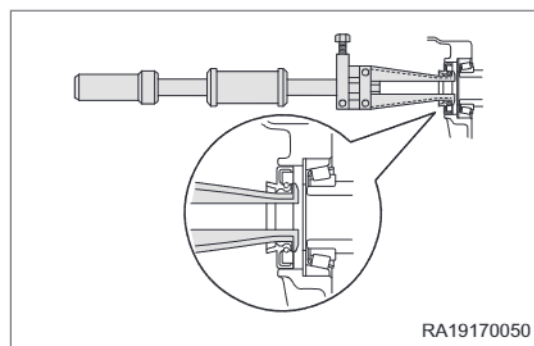
- Make sure to wear necessary safety equipment to prevent accidents.
- Check if the safety lock of lifter is locked when performing the vehicle lift repair and check.

2. Drain transmission oil.
 - a. Remove the retaining plug and gasket.
 - b. Remove the drain plug and gasket, and drain the transmission oil.

ENVIRONMENTAL PROTECTION

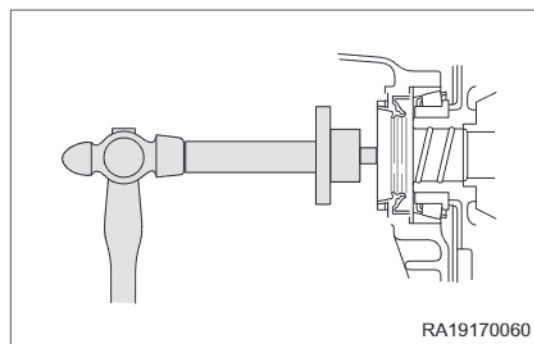
- The drained transmission oil should be collected with a recovering tool.

- c. Install the new gasket and drain plug.
(Tightening torque: 44 ± 3 N·m)
3. Remove the front left wheel ([See page 23-10](#)).
 4. Remove the left drive shaft ([See page 19-5](#)).
 5. Pull the oil seal with a puller.



Installation

1. Apply an appropriate amount of transmission oil to the lip of new oil seal.
2. Using a special tool and a hammer, tap in the oil seal.



 CAUTION

- DO NOT damage the oil seal during installation.

3. Fill transmission oil.

Other procedures are in the reverse order of removal.

Select and Shift Cable

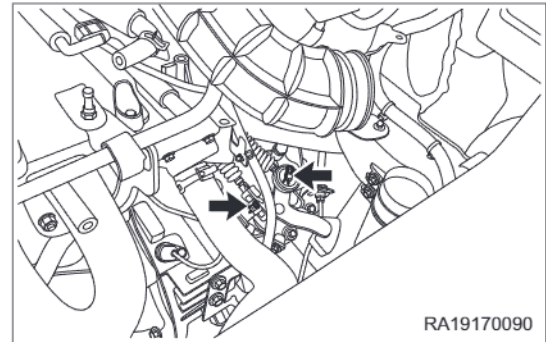
Removal

1. Place the vehicle on a lifter, and support the vehicle with the lifter.

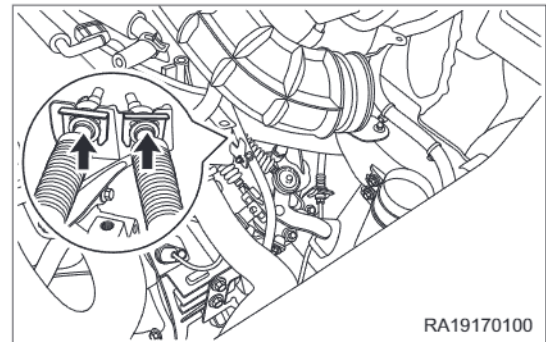
WARNING

- Be sure to wear the necessary safety equipment to prevent accidents.
- Check if the safety lock of lifter is locked when performing the vehicle lift repair and check.

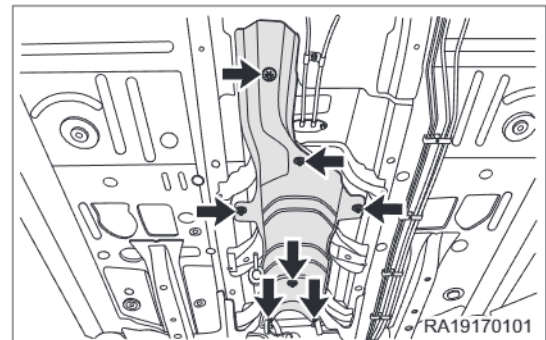
2. Turn off all the electrical equipment and ignition switch.
3. Open the engine hood.
4. Disconnect the negative battery cable.
5. Remove the battery ([See page 16-7](#)).
6. Remove the air filter ([See page 10-10](#)).
7. Remove the cotter pins (arrow) connecting select and shift cable with transmission gear shift mechanism.



8. Remove the flexible shaft clamps (arrow) from the select and shift cable.

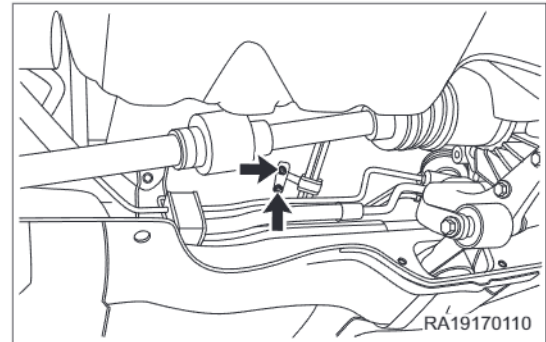


9. Remove the auxiliary fascia console assembly ([See page 43-10](#)).
10. Remove the front muffler assembly ([See page 11-13](#)).
11. Remove the heat insulator.
 - a. Remove 7 locks (arrow) from the heat insulator, and remove the heat insulator.

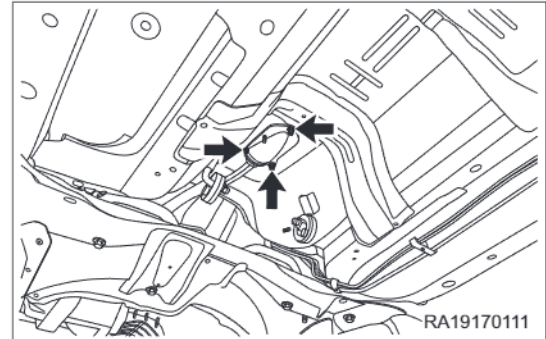


12. Remove the select and shift cable.

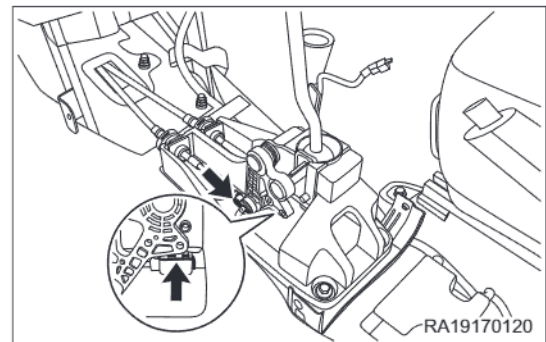
- a. Remove the locating nuts (arrow) from the select and shift cable.
(Tightening torque: $7 \pm 1.5 \text{ N}\cdot\text{m}$)



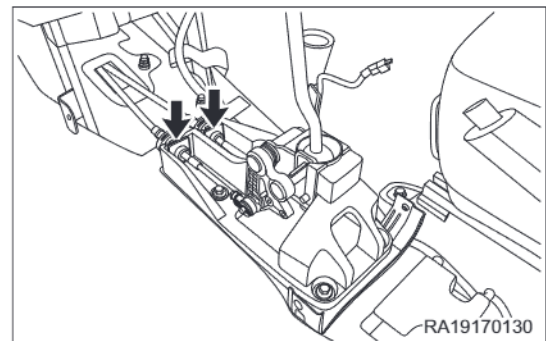
- b. Remove the fixing nuts (arrow) from the select and shift cable boot.
(Tightening torque: $7 \pm 1.5 \text{ N}\cdot\text{m}$)



- c. Remove the clamp and cotter pin (arrow) connecting select and shift cable with gear shift control mechanism.



- d. Remove the flexible shaft clamps (arrow) connecting select and shift cable with gear shift control mechanism.



- e. Remove the select and shift cable.

Installation

Installation is in the reverse order of removal.

CAUTION

- DO NOT install the select and shift cable in reverse position during installation.

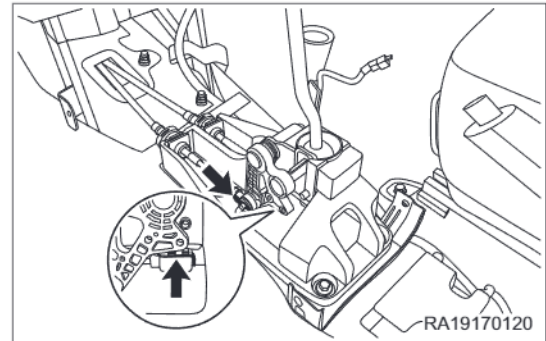
Gear Shift Control Mechanism

Removal

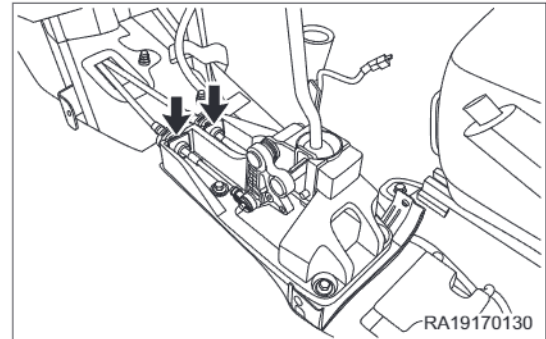
CAUTION

- Wear protective gloves when removing or installing the shift lever, and be careful to prevent the fingers from being injured.

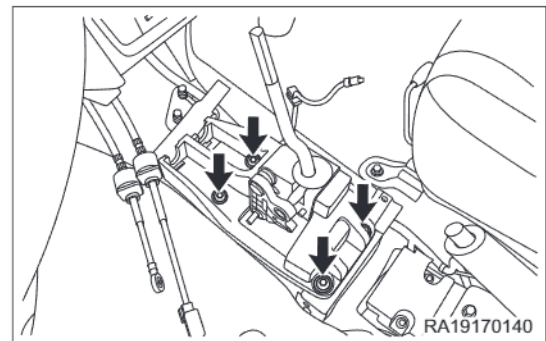
1. Turn off all the electrical equipment and ignition switch.
2. Remove the auxiliary fascia console assembly ([See page 43-10](#)).
3. Remove the gear shift control mechanism.
 - a. Remove the clamp and cotter pin connecting select and shift cable with gear shift control mechanism.



- b. Remove the flexible shaft clamps (arrow) connecting select and shift cable with gear shift control mechanism.



- c. Remove the fixing bolts (arrow) from the gear shift control mechanism, and remove the gear shift control mechanism.
(Tightening torque: $20 \pm 3 \text{ N}\cdot\text{m}$)



Inspection

1. Visually check if the gear shift control mechanism is deformed. If it is deformed or damaged, replace it.
2. Check if the shift lever ball is stuck. If it is stuck, apply grease or replace it.

Installation

Installation is in the reverse order of removal.

Transmission Assembly

Removal

WARNING

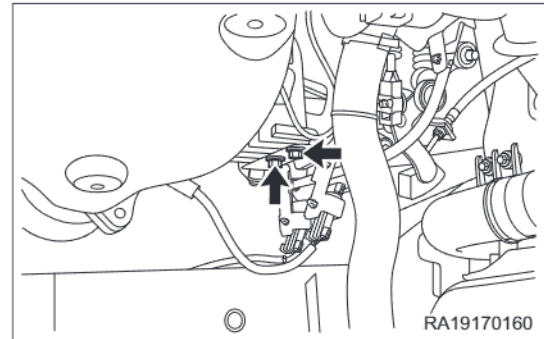
- Be sure to wear the necessary safety equipment to prevent accidents.
- Check if the safety lock of lifter is locked when performing the vehicle lift repair and check.

1. Turn off all the electrical equipment and ignition switch.
2. Disconnect the negative battery cable.
3. Remove the air filter ([See page 10-10](#)).
4. Remove the battery ([See page 16-7](#)).
5. Remove the battery tray ([See page 16-8](#)).
6. Drain transmission oil.

ENVIRONMENTAL PROTECTION

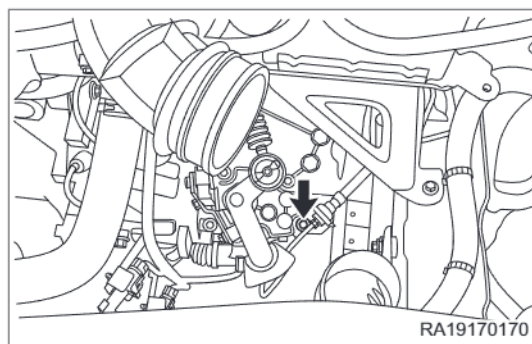
- The drained transmission oil should be collected with a recovering tool.

7. Remove the front wheel ([See page 23-10](#)).
8. Remove the drive shaft assembly ([See page 19-5](#)).
9. Use an engine equalizer to hang the engine.
10. Remove the oxygen sensor connector bracket.
 - a. Remove the fixing bolts (arrow) from the oxygen sensor connector bracket, and remove the oxygen sensor connector bracket.
(Tightening torque: $20 \pm 3 \text{ N}\cdot\text{m}$)



11. Remove the clutch line bracket.

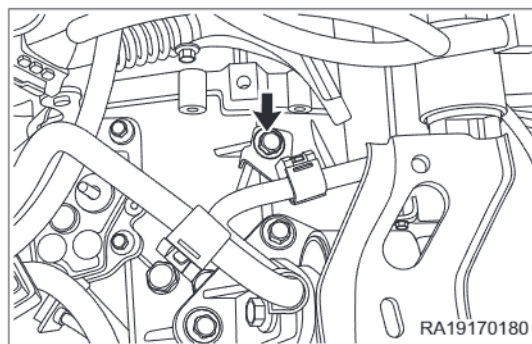
- a. Remove the fixing bolt (arrow) from the clutch line bracket.
(Tightening torque: 25 ± 2 N·m)



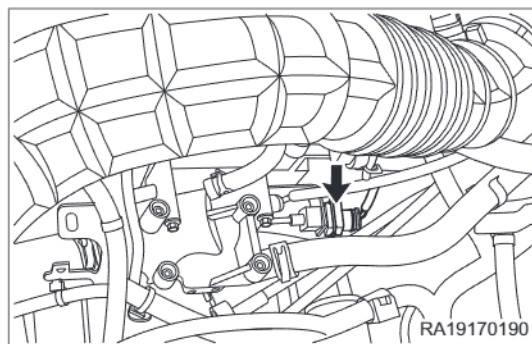
12. Remove the clamp and cotter pin connecting select and shift cable with gear shift control mechanism.

13. Remove the starter wire harness bracket.

- a. Remove the fixing bolt (arrow) from the starter wire harness bracket, and remove the starter wire harness bracket.
(Tightening torque: 25 ± 2 N·m)



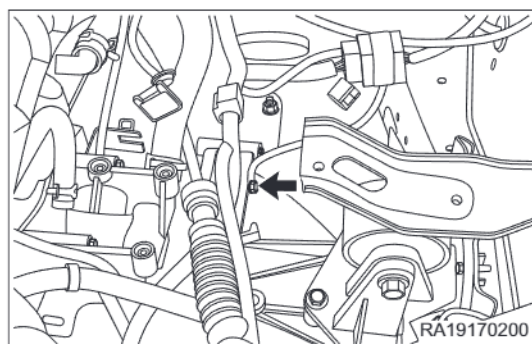
14. Disconnect the crankshaft position sensor connector (arrow).



15. Remove the starter ([See page 15-8](#)).

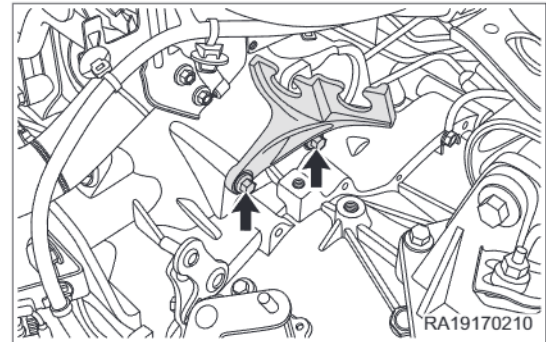
16. Remove the transmission ground wire.

- a. Remove the ground wire fixing bolt (arrow) and ground wire from the transmission.
(Tightening torque: 20 ± 3 N·m)

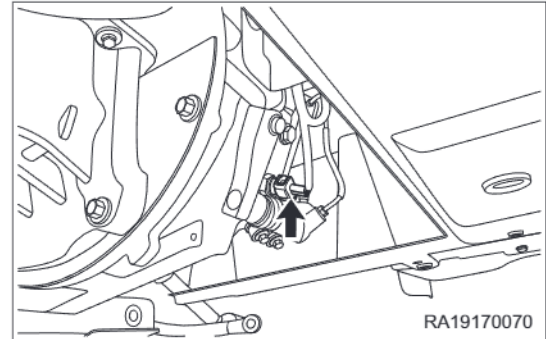


17. Remove the select and shift cable mounting bracket.

- a. Remove the fixing bolts from the select and shift cable mounting bracket, and remove the select and shift cable mounting bracket.
(Tightening torque: $25 \pm 3 \text{ N}\cdot\text{m}$)



18. Disconnect the back-up light switch connector (arrow).



19. Remove the clutch release cylinder from the transmission (See page 18-12).

20. Remove the left mounting assembly (See page 07-59).

21. Remove the rear mounting assembly (See page 07-58).

22. Remove the front lower deflector (See page 46-20).

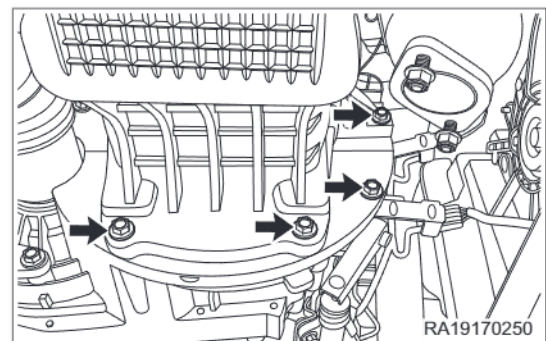
23. Remove the transmission assembly.

- a. Remove the transmission fixing bolts (arrow) from the transmission side.
(Tightening torque: $45 \pm 5 \text{ N}\cdot\text{m}$)

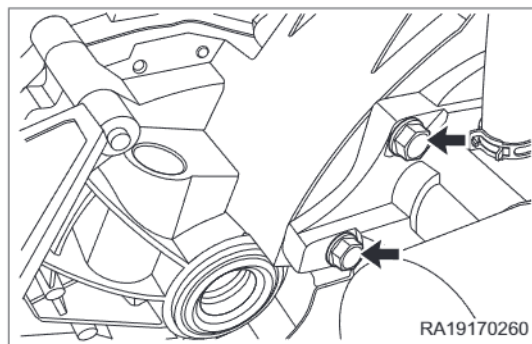


- b. Support the transmission assembly with a transmission carrier.

- c. Remove the fixing bolts (arrow) between the front and lower side of engine and the transmission.
(Tightening torque: $45 \pm 5 \text{ N}\cdot\text{m}$)

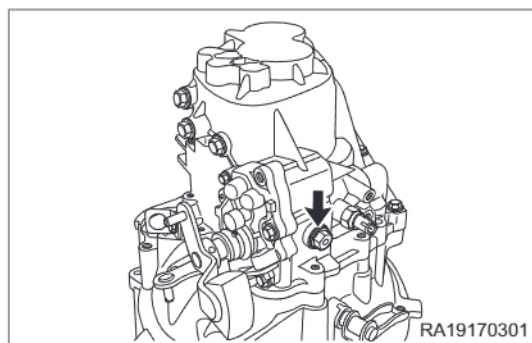


- d. Remove the fixing bolts (arrow) between engine rear side and transmission.
(Tightening torque: $45 \pm 5 \text{ N}\cdot\text{m}$)

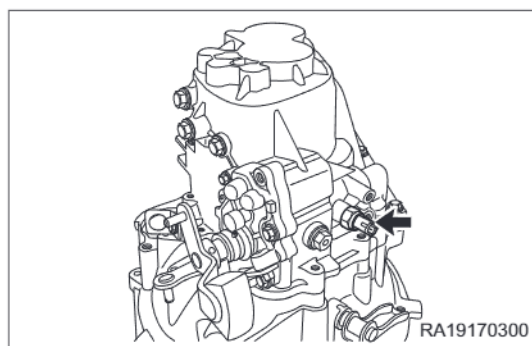


Disassembly

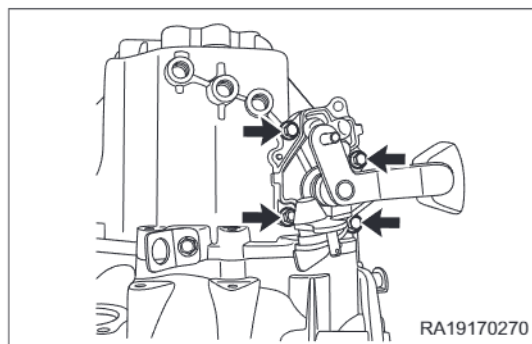
1. Remove the locating bolt of gear shift mechanism.
 - a. Remove the locating bolt (arrow) of gear shift mechanism from the transmission assembly.



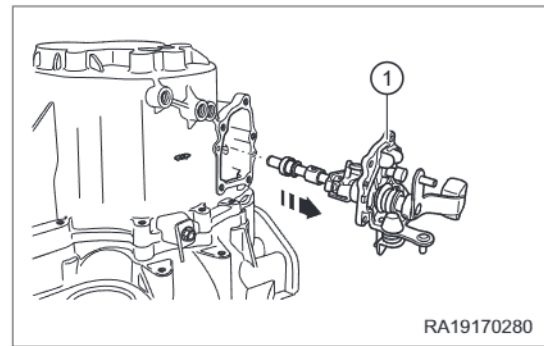
2. Remove the back-up light switch.
 - a. Remove the back-up light switch (arrow) from the transmission assembly.



3. Remove the gear shift mechanism.
 - a. Remove the gear shift mechanism fixing bolts (arrow).



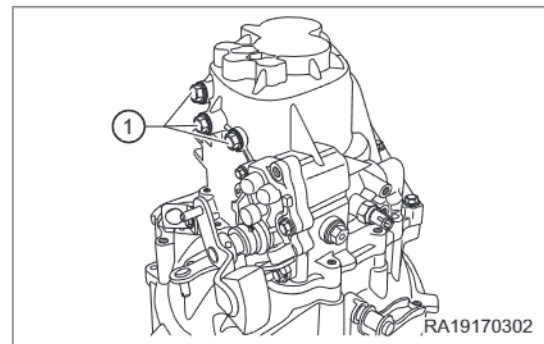
- b. Remove the gear shift mechanism (1) in the direction of the arrow.



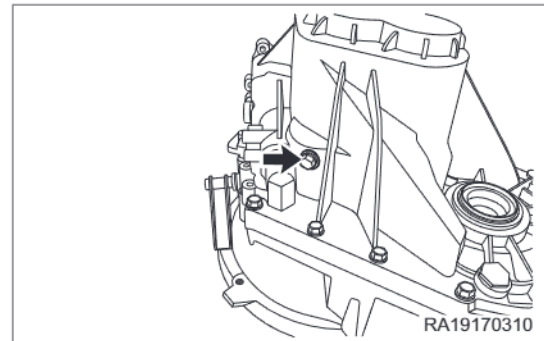
HINT:

It is difficult to remove the gear shift mechanism because of the seal gum, so tap the protrusion on the side of gear shift mechanism case with a rubber hammer.

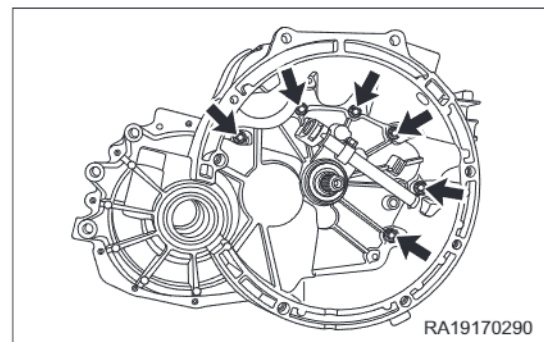
4. Remove the shift shaft locating bolt.
- a. Remove the shift shaft locating bolts (1) from the transmission assembly.



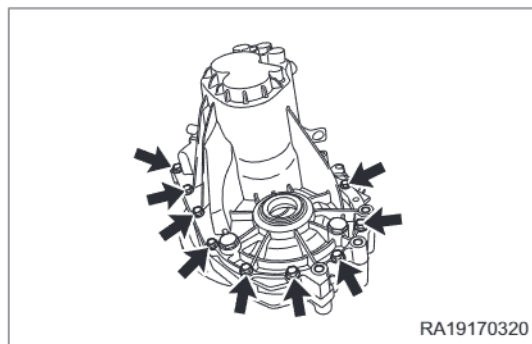
5. Remove the reverse idler gear shaft locating bolt.
- a. Remove the reverse idler gear shaft locating bolt (arrow) from the transmission assembly.



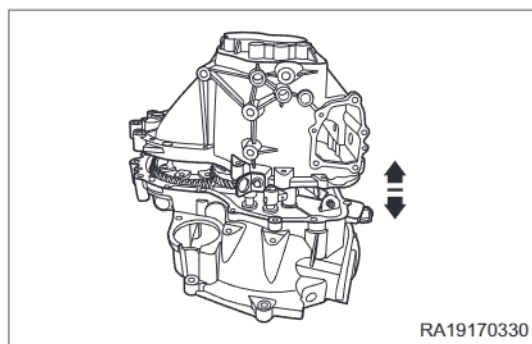
6. Remove the transmission case.
- a. Remove the clutch case fixing bolts (arrow) from the transmission assembly.



- b. Remove the transmission case fixing bolts (arrow) from the transmission assembly.



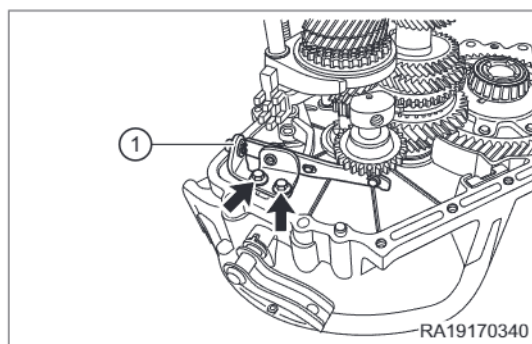
- c. Separate the transmission case and clutch case, and remove the transmission case.



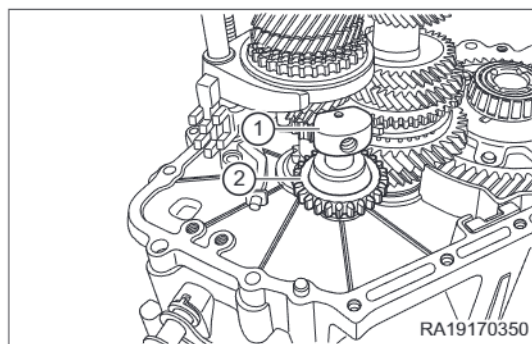
HINT:

It is difficult to separate the transmission case and clutch case because of the seal gum, so tap the protrusion on the transmission case side with a rubber hammer or equivalent for easy removal.

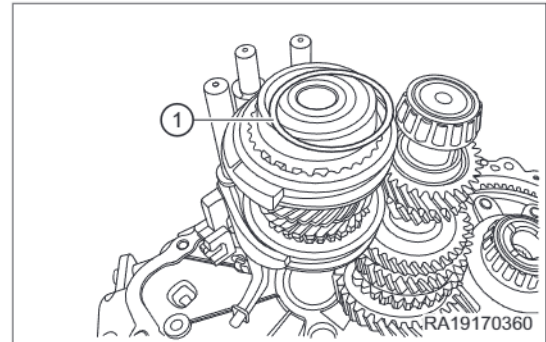
7. Remove the reverse gear fork.
 - a. Remove the fixing bolts (arrow) from the reverse gear fork, and remove the reverse gear fork (1).



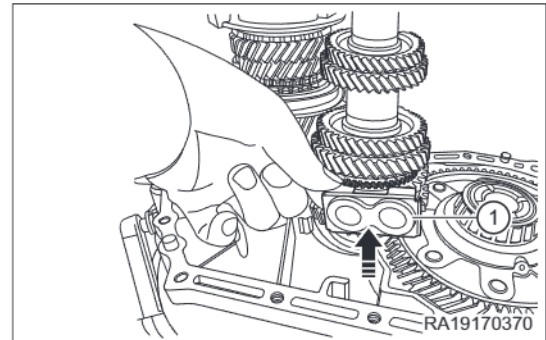
8. Remove the reverse gear shaft and reverse gear.
 - a. Remove the reverse gear shaft (1) and reverse gear (2) together from the clutch case.



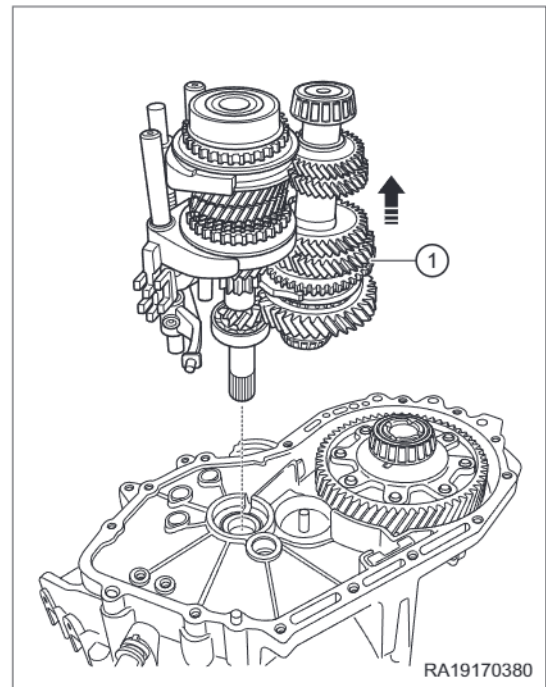
9. Remove the input shaft rear washer.
 - a. Remove the input shaft rear washer (1) from the input shaft.



10. Remove the magnet.
 - a. Remove the magnet (1) from the clutch case.



11. Remove the input shaft, output shaft and fork mechanism.
 - a. Remove the input shaft, output shaft and fork mechanism (1) together from the clutch case.



HINT:

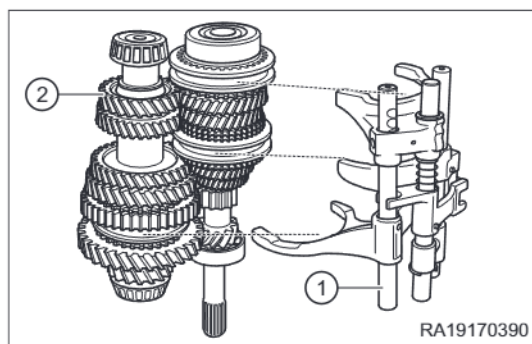
Gently jiggle them during removal.

CAUTION

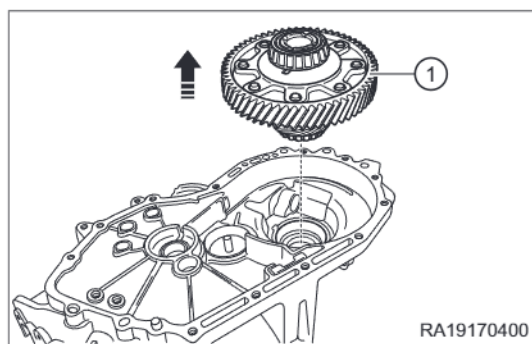
- Prevent the input shaft spline from damaging the input shaft front oil seal during removal.
- Prevent the interference between output shaft bearing cage and differential big ring gear and avoid damaging the bearing cage during removal.

12. Remove the shift fork assembly.

- Remove the shift fork assembly (1) from the input shaft and output shaft (2).


13. Remove the differential assembly.

- Remove the differential assembly (1) from the clutch case.



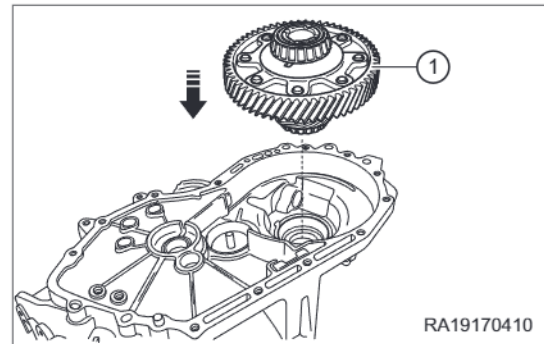
Assembly

CAUTION

- Before assembling the components, wash them clean.
- Remove the seal gum residues from the case.
- Make sure the joint surface of case is free of oil, and uniformly apply seal gum.
- Make sure the joint surface of case and shift assembly is free of oil, and uniformly apply seal gum.
- Tighten the bolts to the specified torque.

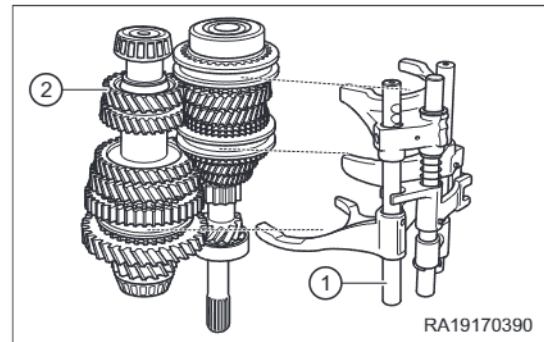
1. Install the differential assembly.

- a. Apply transmission oil to the each slide part of differential, and install the differential (1) to the clutch case in the direction of arrow.

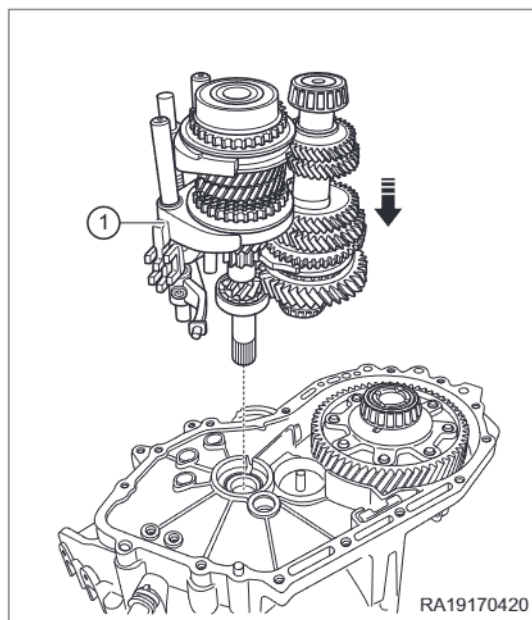


2. Install the shift fork assembly.

- a. Install the shift fork assembly (1) to the input shaft and output shaft (2).



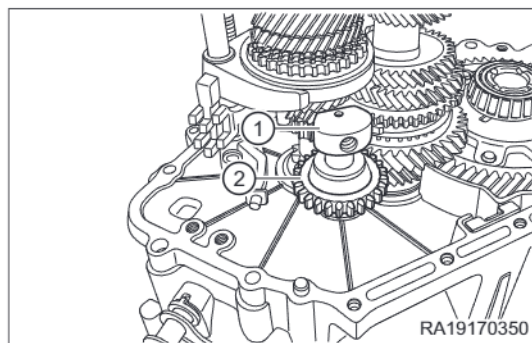
3. Install the input shaft, output shaft and fork mechanism.
 - a. Apply transmission oil to the each slide part of input shaft and output shaft, and install the input shaft, output shaft and fork mechanism (1) together to the clutch case in the direction of arrow.



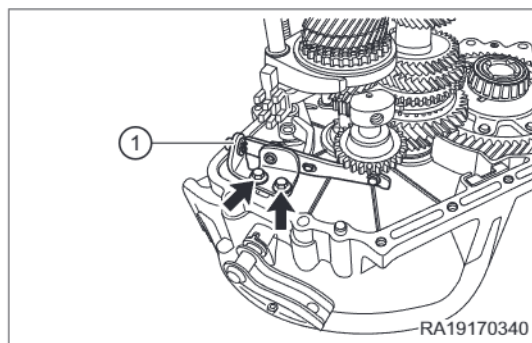
CAUTION

- Prevent the input shaft spline from damaging the input shaft front oil seal during installation.

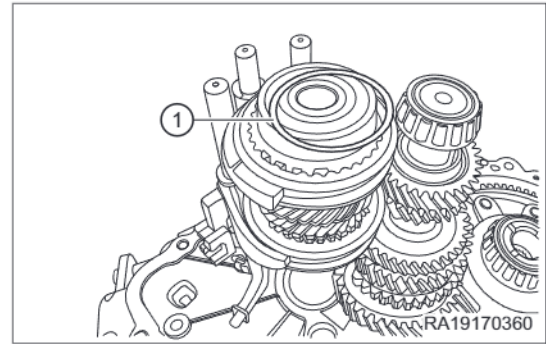
4. Install the reverse idler gear and reverse gear.
 - a. Apply transmission oil to the each slide part of reverse gear and reverse gear shaft, and install the reverse idler gear (1) and reverse gear (2) together to the clutch case.



5. Install the reverse gear fork.
 - a. Install the reverse gear fork (1) to the clutch case, and tighten the reverse gear fork fixing bolts (arrow). (Tightening torque: 25 ± 2 N·m)



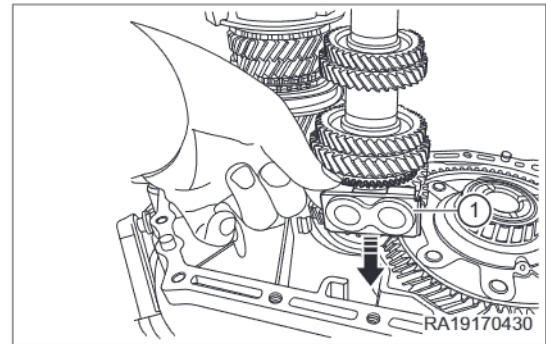
6. Install the input shaft rear washer.
 - a. Apply an appropriate amount of transmission oil, and put the input shaft rear washer (1) onto the input shaft rear bearing.



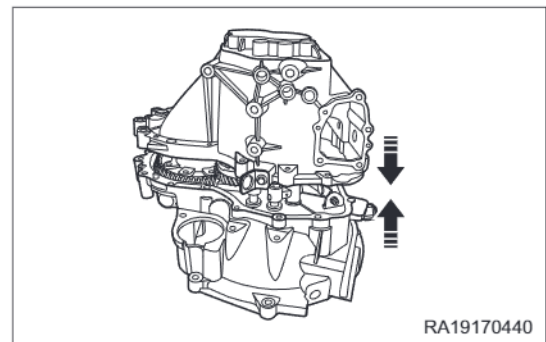
CAUTION

- Evenly put the input shaft rear washer onto the input shaft rear bearing without the washer edge out of the input shaft rear bearing.

7. Install the magnet.
 - a. Install the magnet (1) to the clutch case in the direction of arrow.



8. Install the transmission case.
 - a. Install the transmission case to the clutch case.

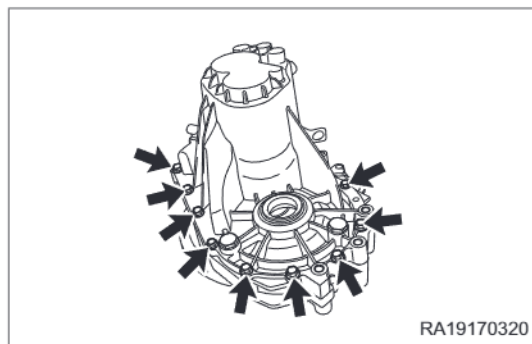


17

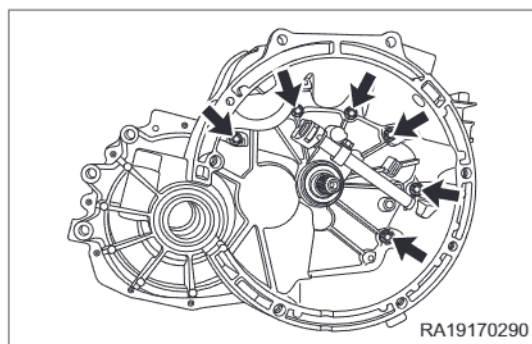
CAUTION

- Remove the seal gum residues from the case.
- Make sure the joint surface of case is free of oil, and uniformly apply seal gum.

- b. Install the transmission case fixing bolts (arrow) and tighten them.
(Tightening torque: 25 ± 2 N·m)

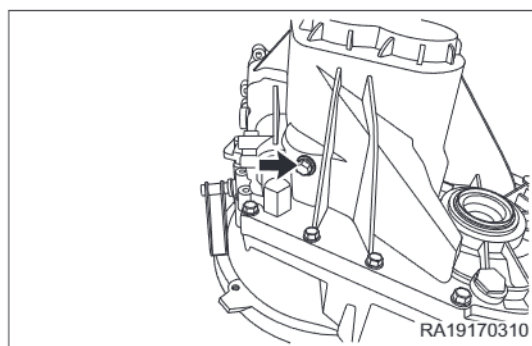


- c. Install the clutch case fixing bolts (arrow) and tighten them.
(Tightening torque: 25 ± 2 N·m)



9. Install the reverse gear fixing bolt.

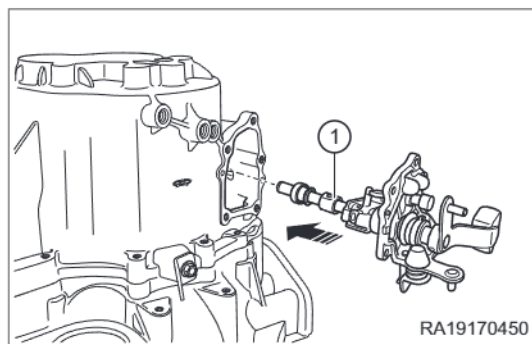
- a. Install the reverse gear fixing bolt (arrow) to the transmission case.
(Tightening torque: 38 ± 2.5 N·m)



17

10. Install the gear shift mechanism.

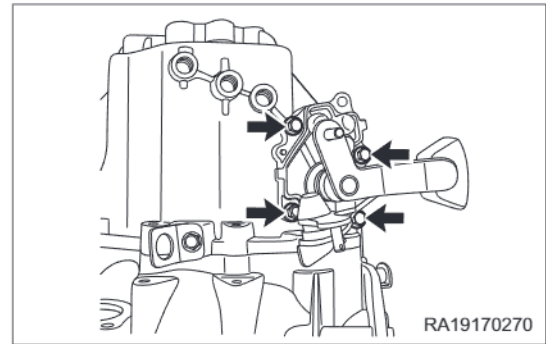
- a. Install the gear shift mechanism (1) to the transmission case.



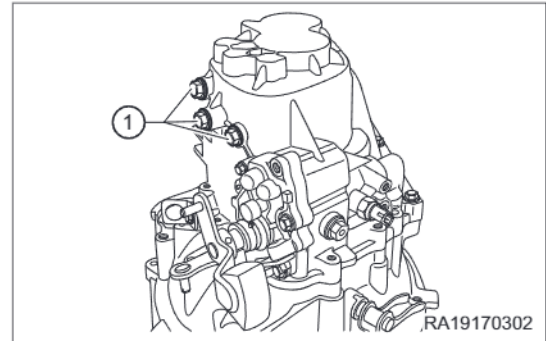
CAUTION

- Clean the engagement portion of shifter case and transmission case, and apply seal gum evenly.

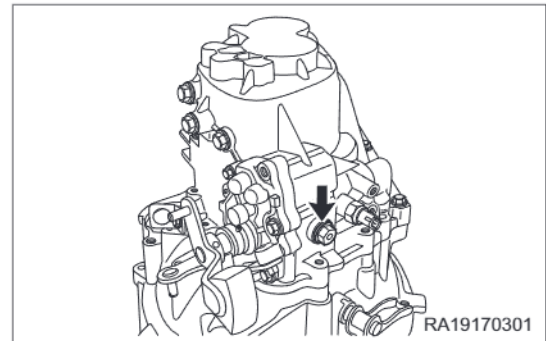
- b. Install the coupling bolts (arrow) between gear shift mechanism and transmission case.
(Tightening torque: 25 ± 2 N·m)



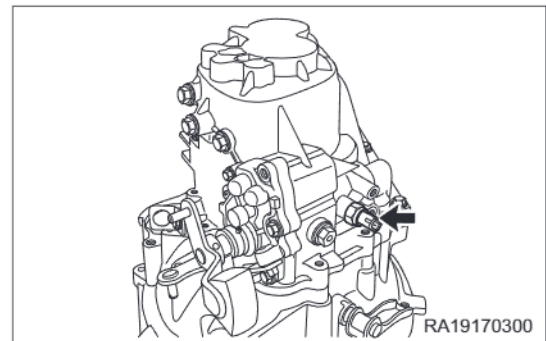
11. Install the shift shaft locating bolts (1).
(Tightening torque: 20 ± 2 N·m)



12. Install the locating bolt (arrow) of gear shift mechanism.
(Tightening torque: 32 ± 2.5 N·m)



13. Install the back-up light switch (arrow).
(Tightening torque: 25 ± 2 N·m)



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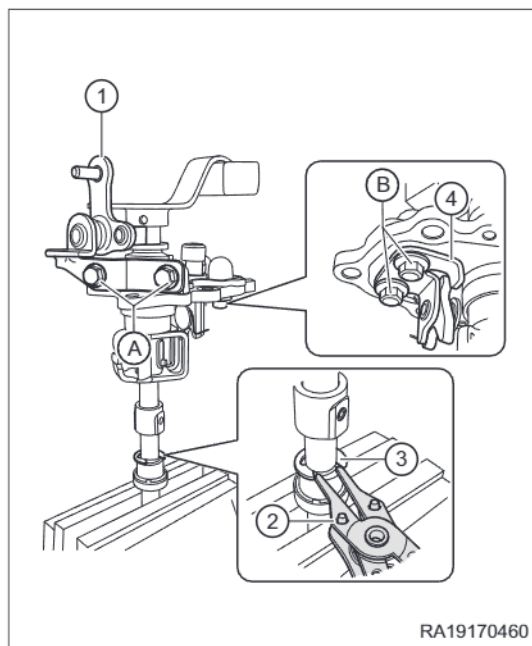
Installation

Installation is in the reverse order of removal.

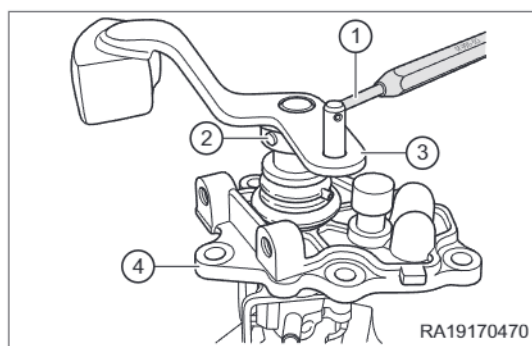
Gear Shift Mechanism

Disassembly

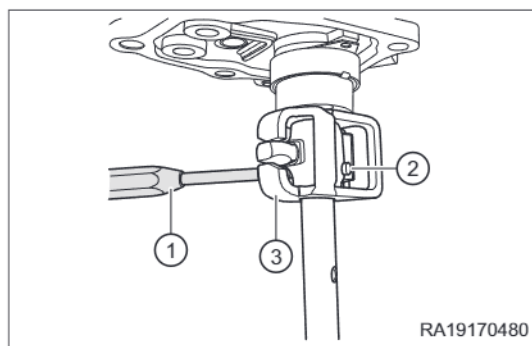
1. Loosen the shift arm bracket bolts (A).
2. Remove the shift arm bracket (1).
3. Using the snap spring calipers (2), remove the snap ring (3).
4. Loosen the fixing bolts (B) of reverse gear lock mechanism.
5. Remove the reverse gear lock mechanism (4).



6. Tap out the dowel pin (2) with a punch (1).
7. Remove the shift arm (3) and plate (4).



8. Tap out the dowel pin (2) with a punch (1).
9. Remove the shift finger (3).



Assembly

Assembly is in the reverse order of disassembly.

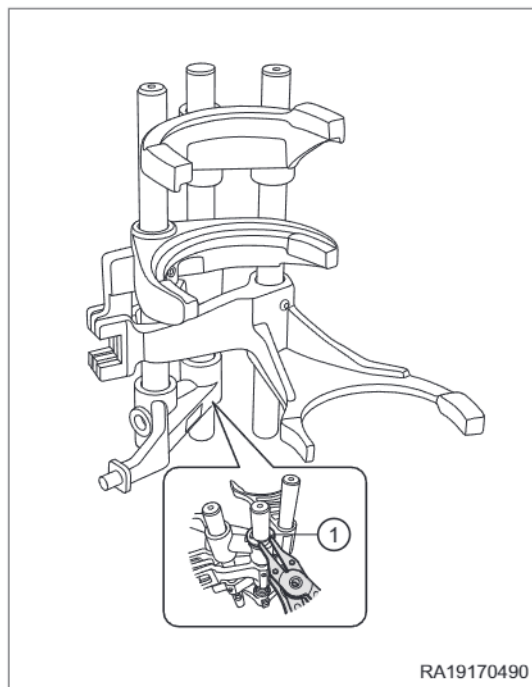
CAUTION

- Tighten the bolts to the specified torque.
- Replace the damaged dowel pins.

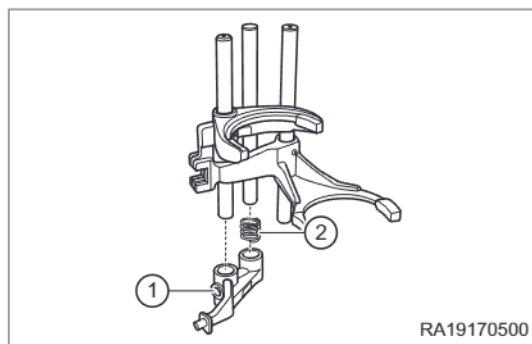
Shift Fork

Disassembly

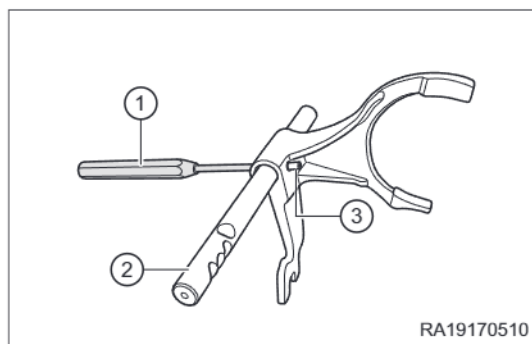
1. Remove the reverse gear fork.
 - a. Using the snap spring calipers, remove the snap ring (1).



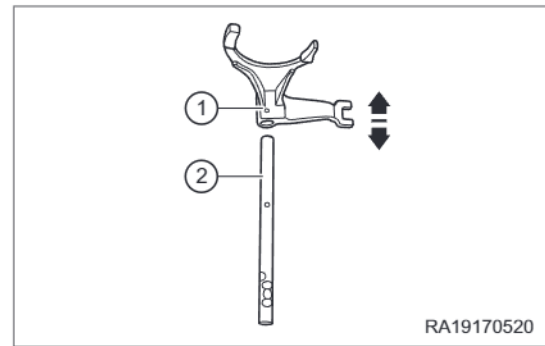
- b. Remove the reverse gear fork (1) and return spring (2).



2. Remove the 3rd-4th gear shift fork.
 - a. Using a punch (1), tap out the dowel pin (3) from the 3rd-4th gear shift shaft (2).

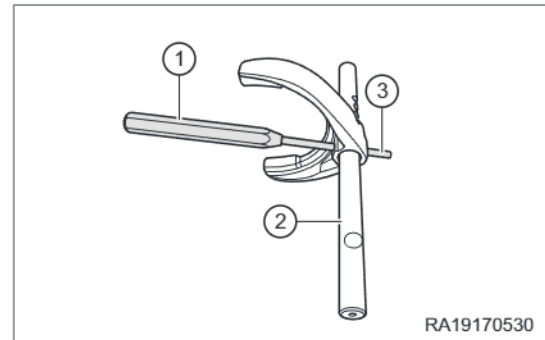


- b. Separate the 3rd-4th gear shift fork (1) from the shift shaft (2).

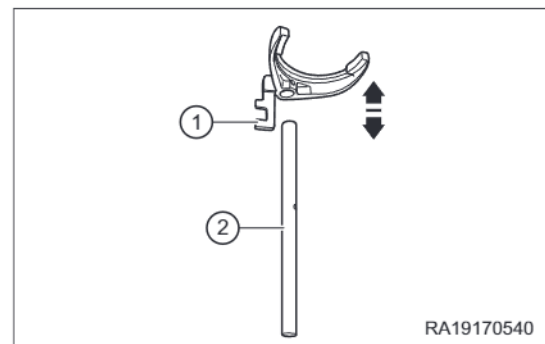


3. Remove the 1st-2nd gear shift fork.

- a. Using a punch (1), tap out the dowel pin (3) from the shift shaft (2).

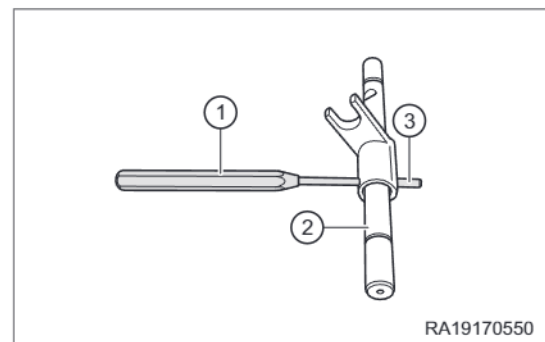


- b. Separate the 1st-2nd gear shift fork (1) from the shift shaft (2).

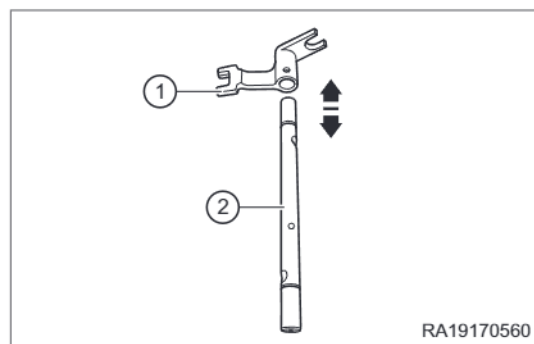


4. Remove the fork.

- a. Using a punch (1), tap out the dowel pin (3) from the shift shaft (2).



- b. Separate the fork (1) from the shift shaft (2).



Inspection

1. Check the shift shaft for excessive wear or damage. If damaged, replace it.
2. Check the release fork for excessive wear or damage. If damaged, replace it.

Assembly

Assembly is in the reverse order of disassembly.

CAUTION

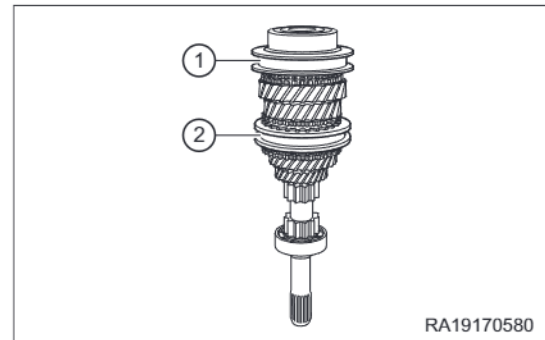
- When installing the dowel pin, if there is excessive wear or damage, replace it with a new one.

Input Shaft

Disassembly

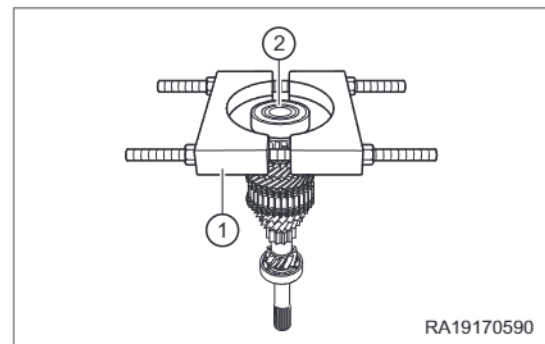
1. Remove the input shaft ([See page 17-21](#)).
2. Remove the 5th synchronizer outer race and 3rd-4th synchronizer outer race.

- a. Remove the 5th synchronizer outer race (1) and 3rd-4th synchronizer outer race (2) from the input shaft.

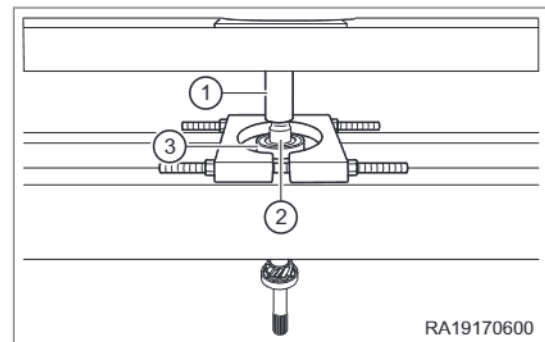


3. Remove the input shaft rear bearing.

- a. Using a special tool (1), secure the input shaft rear bearing (2).

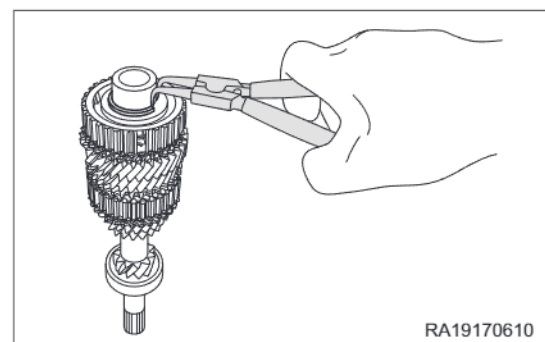


- b. Using a hydraulic press (1), press out the input shaft (2) and remove the input shaft rear bearing (3).

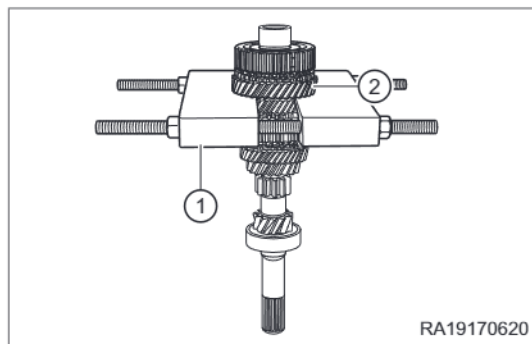


4. Remove the 5th drive gear and 5th synchronizer gear hub.

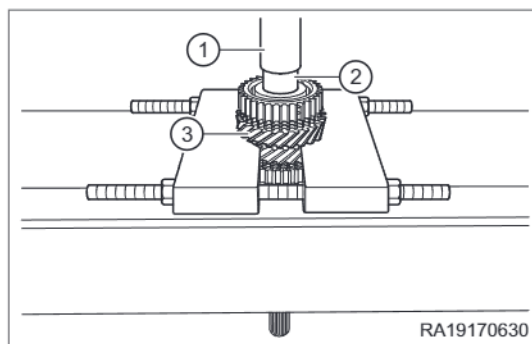
- a. Using the snap spring calipers, remove the rear snap ring.



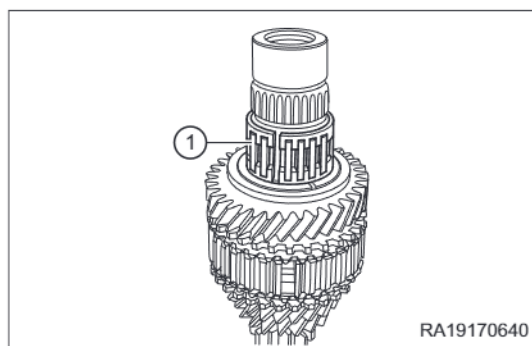
- b. Using a special tool (1), secure the 5th drive gear (2).



- c. Using a hydraulic press (1), press out the input shaft (2), and remove the 5th drive gear and 5th synchronizer gear hub (3).

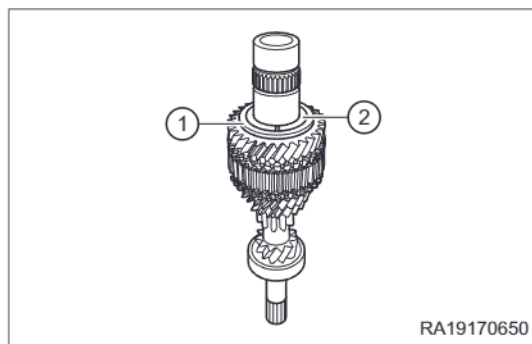


5. Remove the 5th gear needle roller bearing.
- a. Remove the 5th gear needle roller bearing (1) from the input shaft.



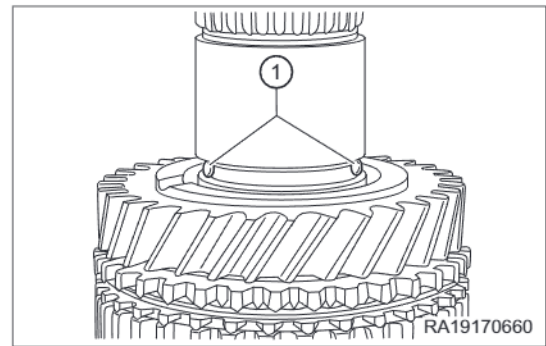
17

6. Remove the gear baffle plate and gear baffle plate spring clamp.
- a. Remove the gear baffle plate (2) and gear baffle plate spring clamp (1) from the input shaft.

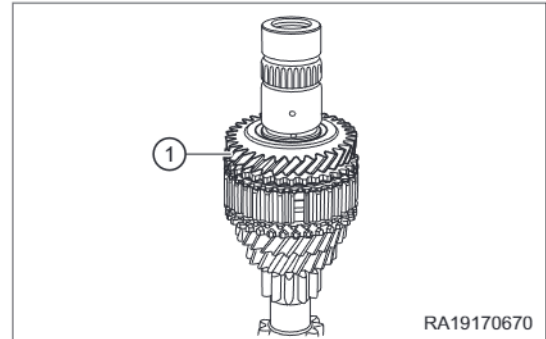


7. Remove the 4th drive gear.

- a. Using a magnetic rod, remove the balls (1) from the input shaft.

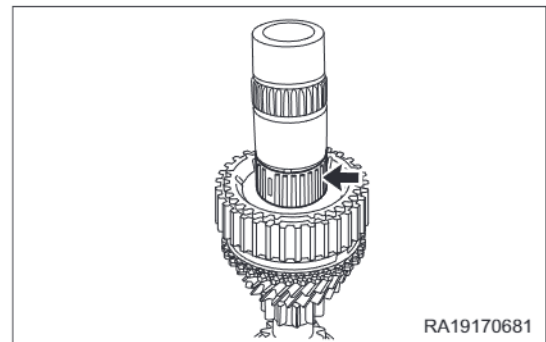


- b. Remove the 4th drive gear (1) from the input shaft.



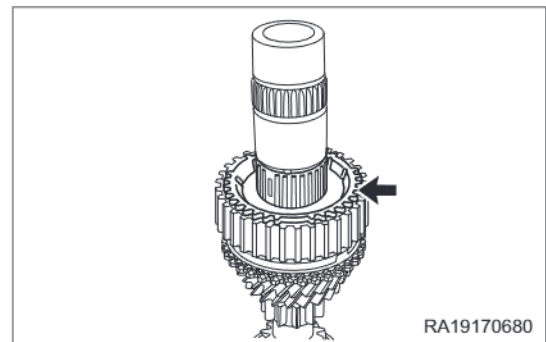
8. Remove the 4th gear needle roller bearing.

- a. Remove the 4th gear needle roller bearing (arrow) from the input shaft.

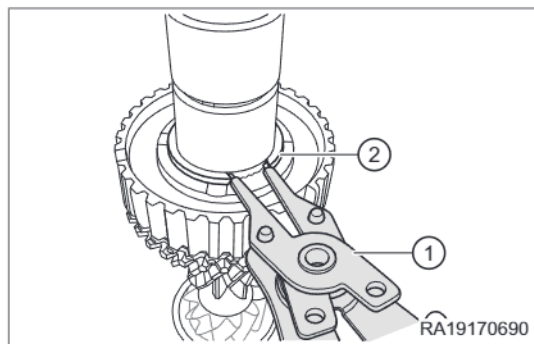


9. Remove the 3rd drive gear and 3rd-4th synchronizer gear hub.

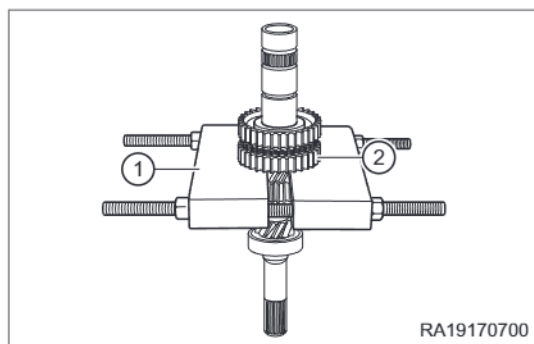
- a. Remove the synchronizer ring (arrow) from the 3rd-4th synchronizer gear hub.



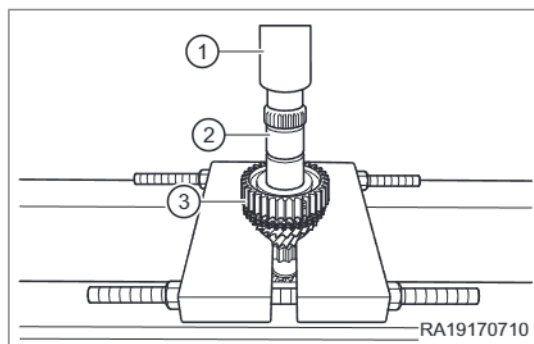
- b. Using the snap spring calipers (1), remove the snap ring (2).



- c. Using a special tool (1), secure the 3rd drive gear (2).

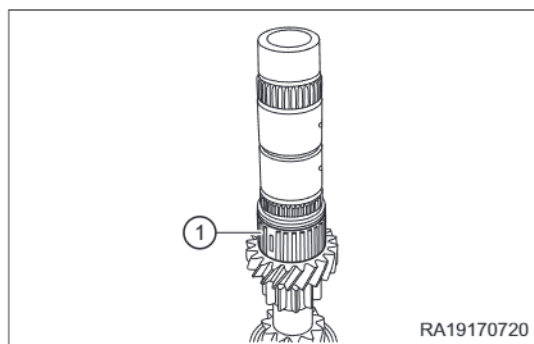


- d. Using a hydraulic press (1), press out the input shaft (2), and remove the 3rd drive gear and 3rd-4th synchronizer gear hub (3).



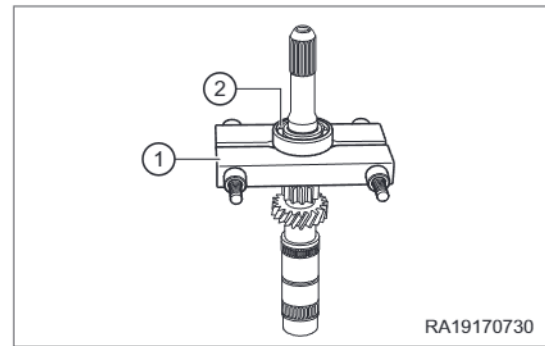
17 10. Remove the 3rd gear needle roller bearing.

- a. Remove the 3rd gear needle roller bearing (1) from the input shaft.

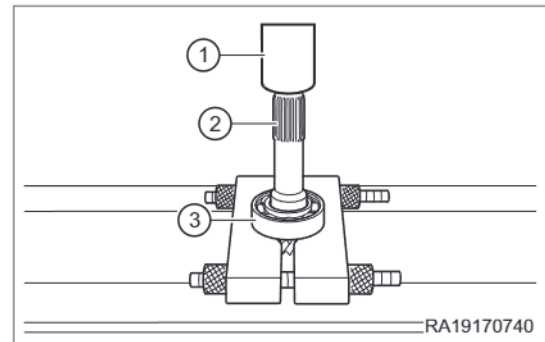


11. Remove the input shaft front bearing.

- a. Using a special tool (1), secure the input shaft front bearing (2).



- b. Using a hydraulic press (1), press out the input shaft (2) and remove the input shaft front bearing (3).



Inspection

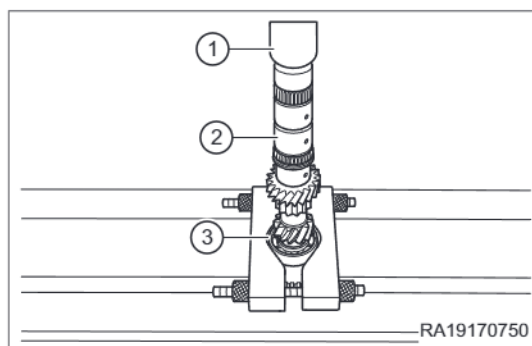
1. Check the outer surface of input shaft and needle roller bearing for excessive wear or damage. If excessively worn or damaged, replace them.
2. Check the input shaft spline for excessive wear or damage. If excessively worn or damaged, replace it.
3. Check the synchronizer ring for damage. If damaged, replace it.
4. Check the synchronizer gear shaft bushing for damage. If damaged, replace it.

CAUTION

- If the synchronizer gear shaft bushing or synchronizer gear hub needs to be replaced, replace them as a set.

Assembly

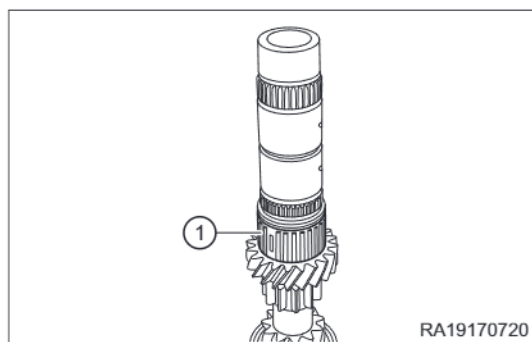
1. Install the input shaft front bearing.
 - a. Using a hydraulic press (1), press the input shaft (2) into the input shaft front bearing (3).



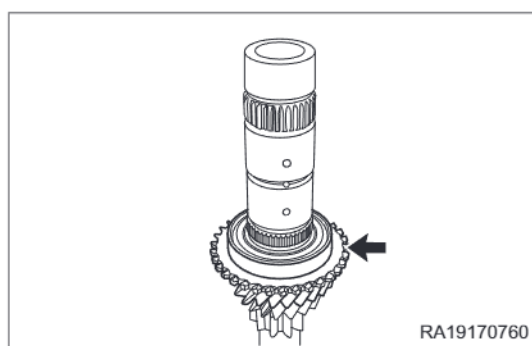
CAUTION

- When pressing the input shaft front bearing, make sure that the pressure is applied to the bearing inner race as the bearing may be damaged due to uneven force.

2. Install the 3rd gear needle roller bearing.
 - a. Apply transmission oil to the needle roller bearing (1), and install it to the input shaft.

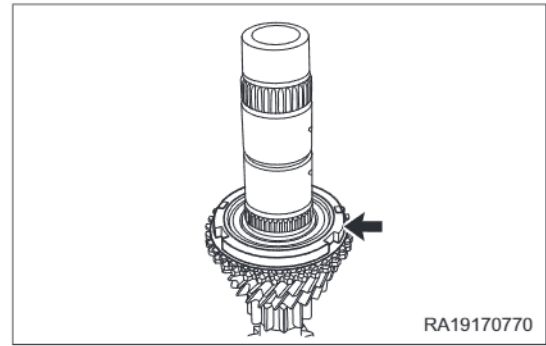


3. Install the 3rd drive gear.
 - a. Apply transmission oil to the 3rd drive gear (arrow), and install it to the input shaft.

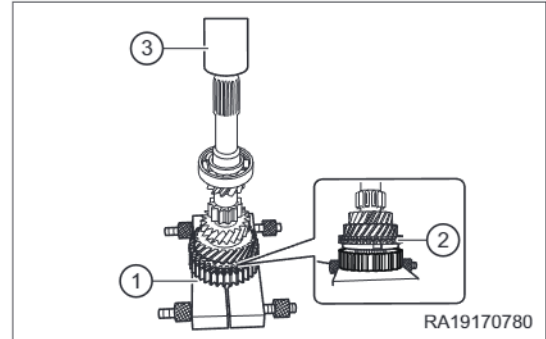


4. Install the 3rd synchronizer ring.

- a. Apply transmission oil to the 3rd synchronizer ring (arrow), and install it to the input shaft.



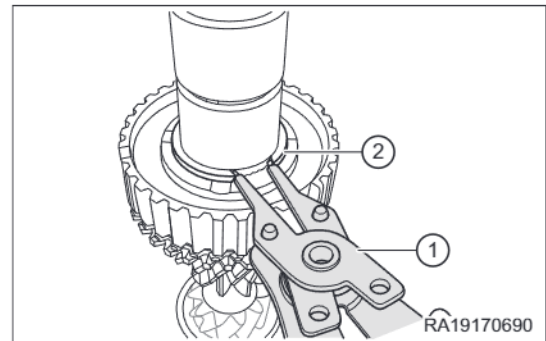
5. Install the 3rd-4th synchronizer gear hub.
 - a. Using a hydraulic press (3), press the 3rd-4th synchronizer gear hub (1) into the input shaft.



CAUTION

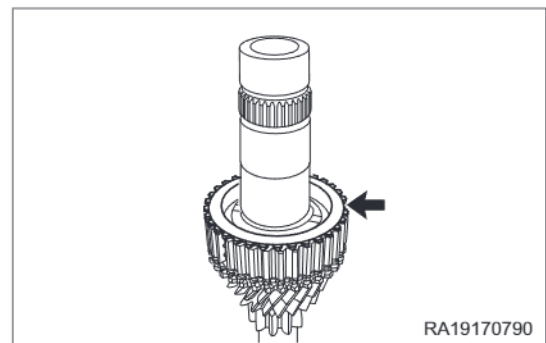
- When pressing the synchronizer gear hub, prevent the 3rd drive gear (2) from disengaging.

- b. Using the snap spring calipers (1), install the front snap ring (2) to the input shaft.

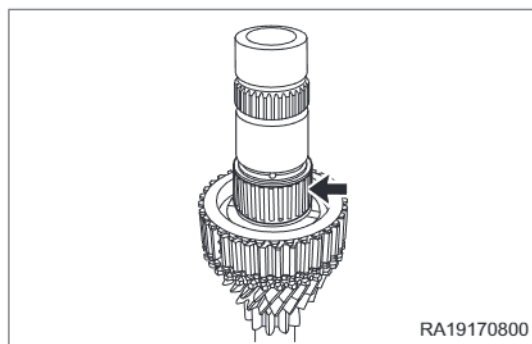


17

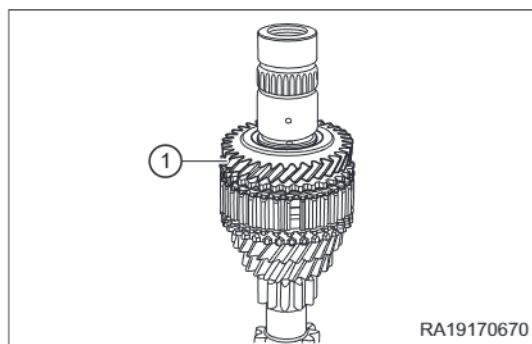
6. Install the 4th synchronizer ring.
 - a. Apply transmission oil to the 4th synchronizer ring (arrow), and install it to the input shaft.



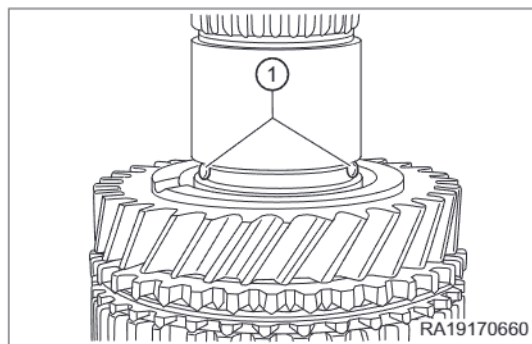
7. Install the 4th gear needle roller bearing.
 - a. Apply transmission oil to the 4th gear needle roller bearing (arrow), and install it to the input shaft.



8. Install the 4th drive gear.
 - a. Apply transmission oil to the 4th drive gear (1), and install it to the input shaft.



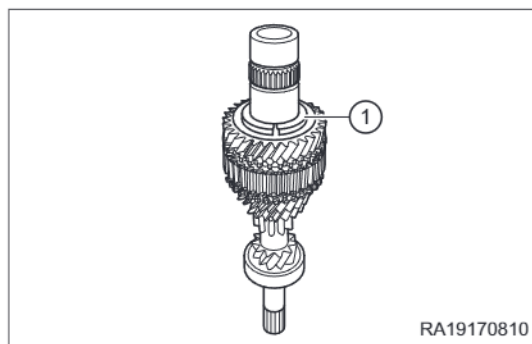
9. Install the ball.
 - a. Apply transmission oil to the balls (arrow), and install them to the input shaft.



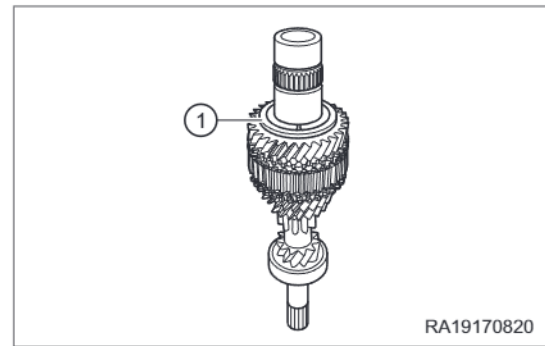
10. Install the gear baffle plate.
 - a. Apply transmission oil to the gear baffle plate (1), and install it to the input shaft.

HINT:

When installing the gear baffle plate, be careful to install the locating ball of input shaft in place correctly.

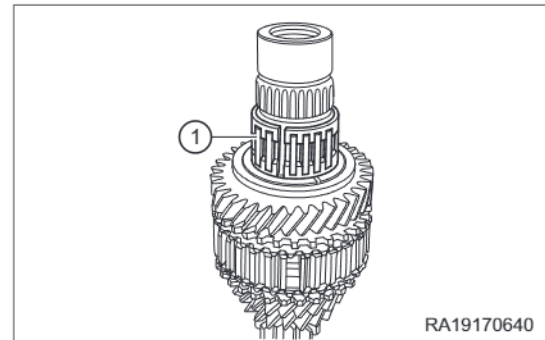


- b. Install the gear baffle plate spring clamp (1).



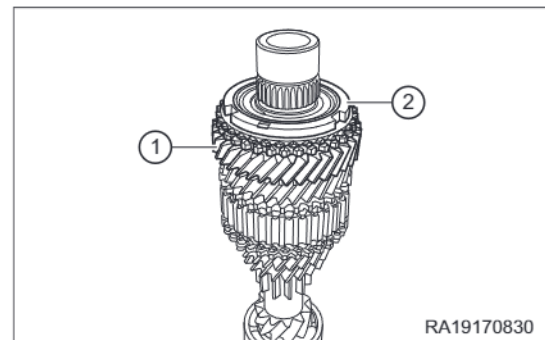
11. Install the 5th gear needle roller bearing.

- a. Apply transmission oil to the 5th gear needle roller bearing (1), and install it to the input shaft.



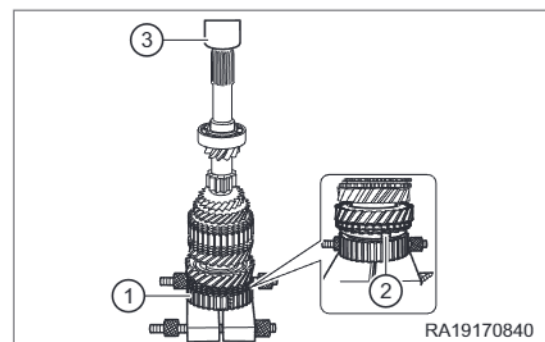
12. Install the 5th drive gear and 5th synchronizer ring.

- a. Apply transmission oil to the 5th drive gear (1) and 5th synchronizer ring (2), and install them to the input shaft.



13. Install the 5th synchronizer gear hub.

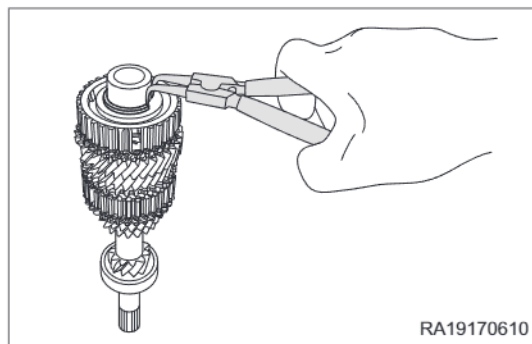
- a. Using a hydraulic press (3), press the 5th drive gear (2) and 5th synchronizer gear hub (1) together into the input shaft.



CAUTION

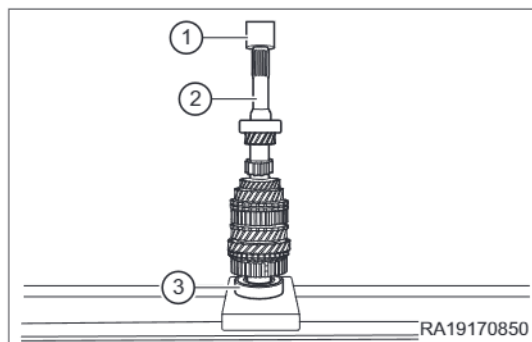
- When pressing the synchronizer gear hub, prevent the 5th drive gear (2) from disengaging.

- b. Using the snap spring calipers, install the rear snap ring.



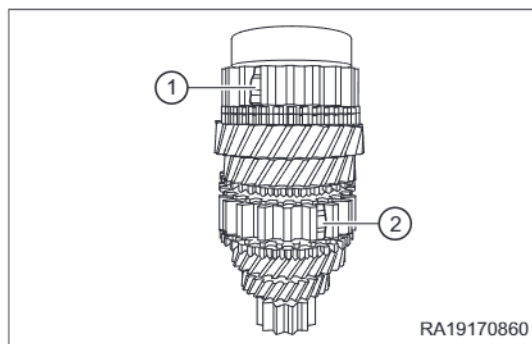
14. Install the input shaft rear bearing.

- a. Using a hydraulic press (1), press the input shaft (2) into the input shaft rear bearing (3).

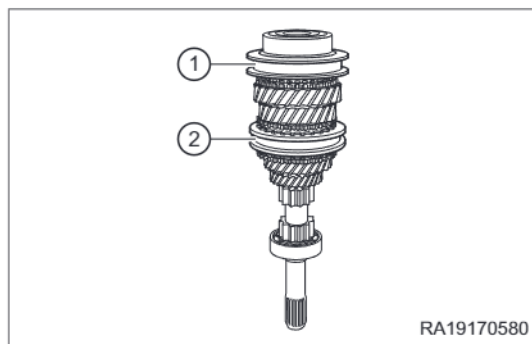


15. Install the 5th synchronizer outer race and 3rd-4th synchronizer outer race.

- a. Apply transmission oil to the 5th synchronizer guide block (1) and 3rd-4th synchronizer guide block (2), and install them to the synchronizer gear hub.



- b. Apply transmission oil to the 5th synchronizer outer race (1) and 3rd-4th synchronizer outer race (2), and install them to the input shaft.



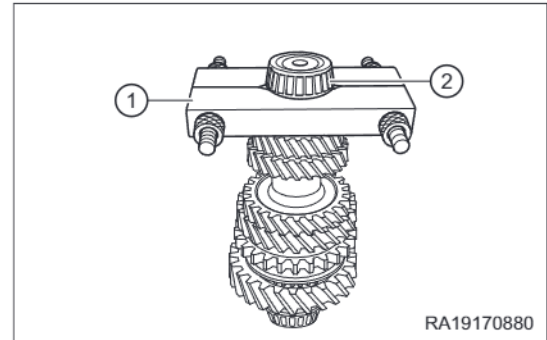
CAUTION

- Check the gears on the input shaft for smooth rotation after installation.
- Check the fitting of input shaft gears for looseness or sticking.

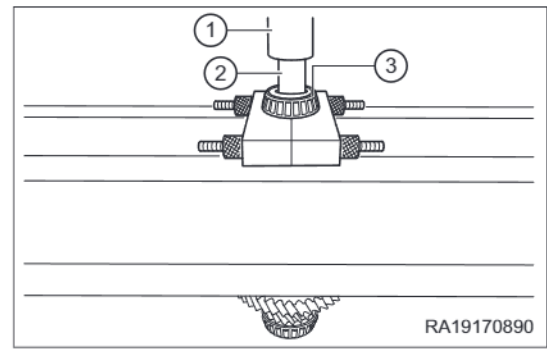
Output Shaft

Disassembly

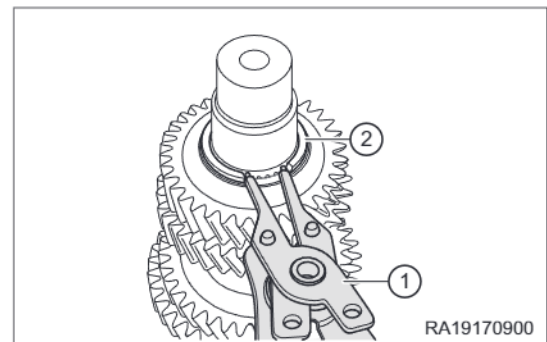
1. Remove the output shaft (See page 17-21).
2. Remove the output shaft rear bearing.
 - a. Using a special tool (1), secure the output shaft rear bearing (2).



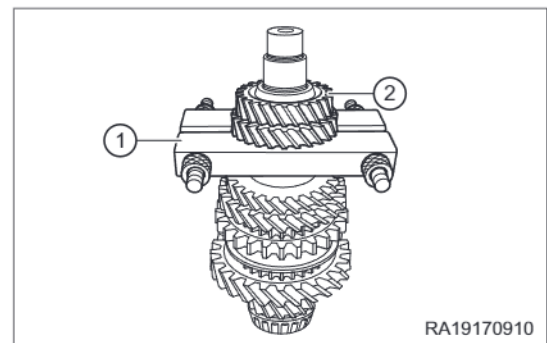
- b. Using a hydraulic press (1), press out the output shaft (2) and remove the output shaft rear bearing (3).



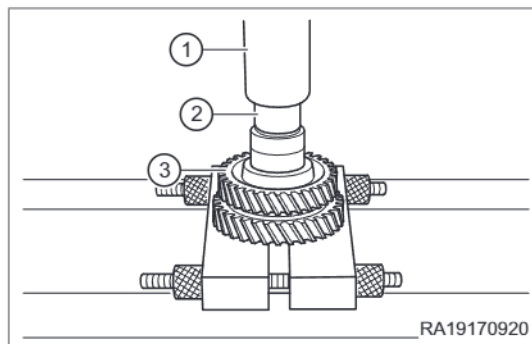
3. Remove the 4th and 5th driven gears.
 - a. Using the snap spring calipers (1), remove the snap ring (2).



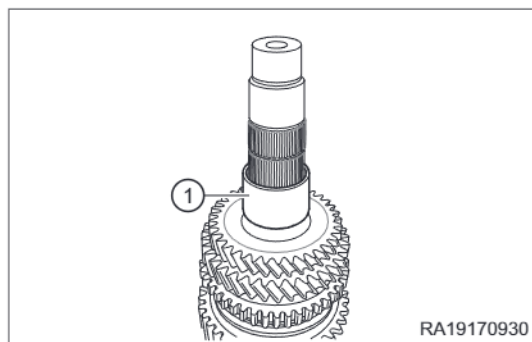
- b. Using a special tool (1), secure the 4th and 5th driven gears (2).



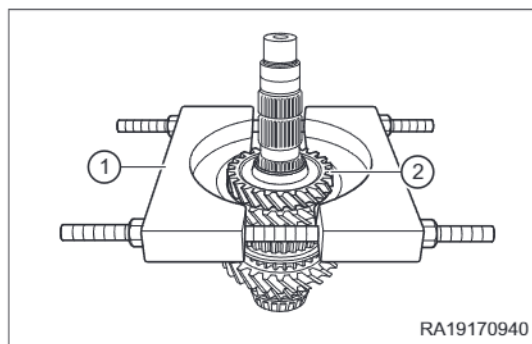
- c. Using a hydraulic press (1), press out the output shaft (2), and remove the 4th and 5th driven gears (3).



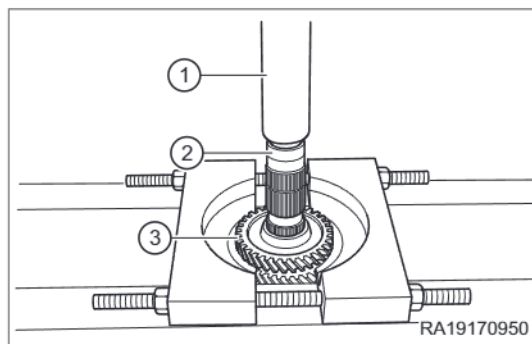
4. Remove the gear shaft bushing.
a. Remove the gear shaft bushing (1) from the output shaft.



5. Remove the 2nd-3rd driven gear.
a. Using a special tool (1), secure the 2nd driven gear (2).

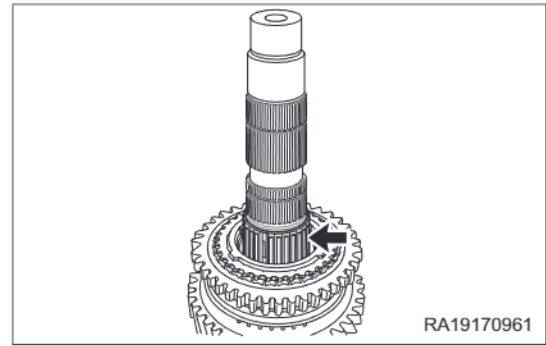


- b. Using a hydraulic press (1), press out the output shaft (2), and remove the 2nd-3rd driven gear (3).



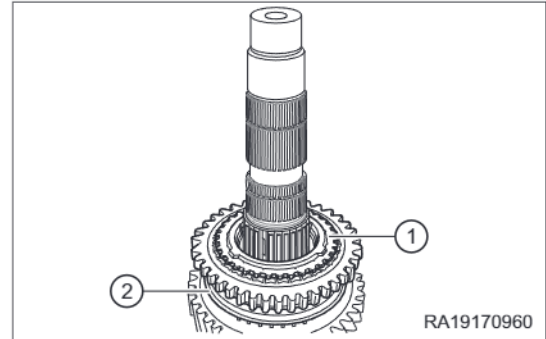
6. Remove the 2nd gear needle roller bearing.

- a. Remove the 2nd gear needle roller bearing (arrow) from the output shaft.

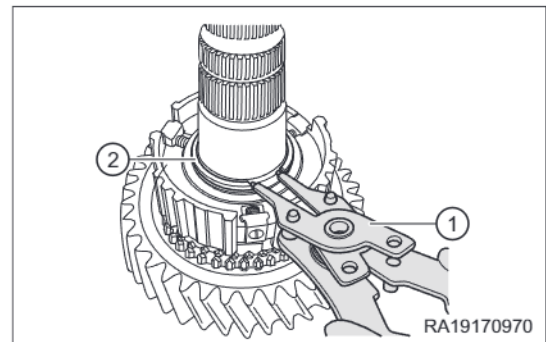


7. Remove the 1st driven gear and 1st-2nd synchronizer gear hub.

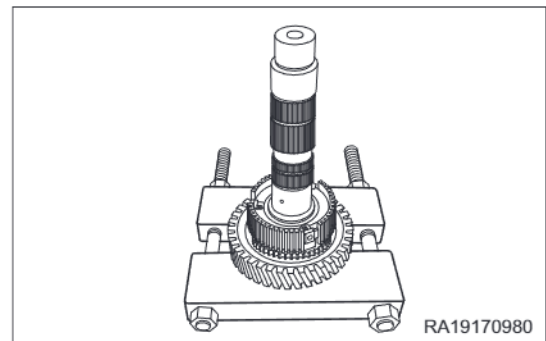
- a. Remove the 1st-2nd synchronizer ring set (2).
b. Remove the 1st-2nd synchronizer outer race (1).



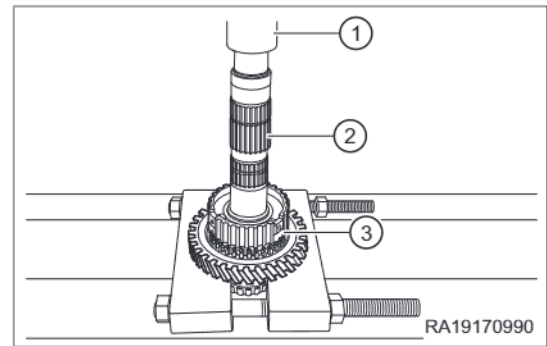
- c. Using the snap spring calipers (1), remove the snap ring (2).



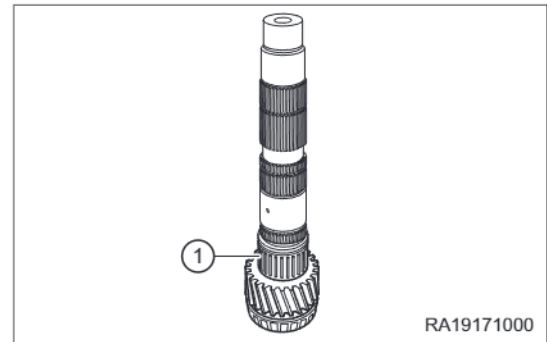
- d. Secure the special tool to the 1st driven gear.



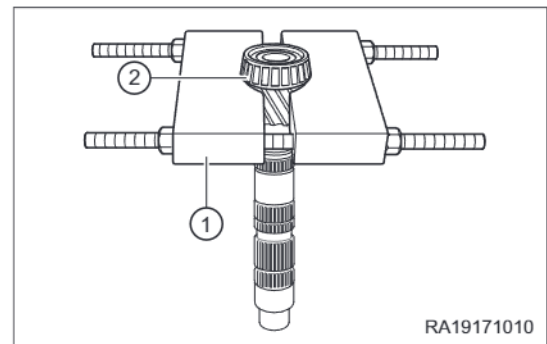
- e. Using a hydraulic press (1), press out the output shaft (2), and remove the 1st driven gear and 1st-2nd synchronizer (3).



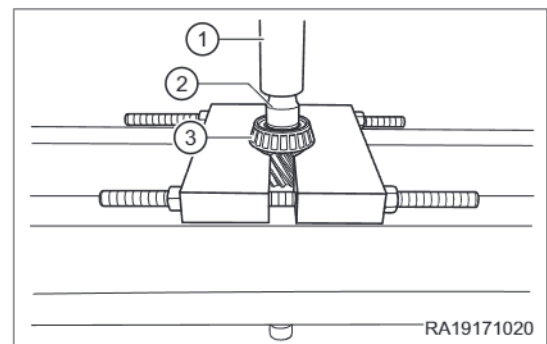
8. Remove the 1st gear needle roller bearing.
 - a. Remove the 1st gear needle roller bearing (1).



9. Remove the output shaft front bearing.
 - a. Using a special tool (1), secure the output shaft front bearing (2).



- b. Using a hydraulic press (1), press out the output shaft (2) and remove the front bearing (3).



Inspection

1. Check the surface of output shaft and needle roller bearing for excessive wear or damage. If excessively worn or damaged, replace them.
2. Check the output shaft spline for excessive wear or damage. If excessively worn or damaged, replace it.
3. Check the synchronizer ring set for damage. If damaged, replace it.

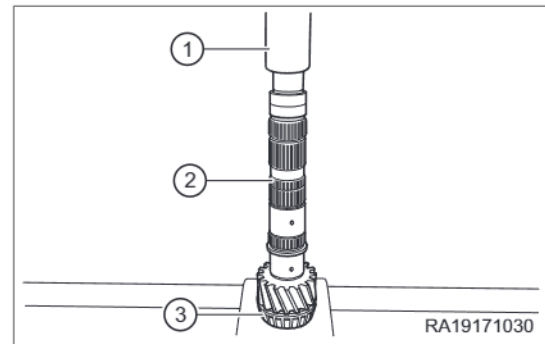
4. Check the synchronizer gear shaft bushing for damage. If damaged, replace it.

CAUTION

- If the synchronizer gear shaft bushing or synchronizer gear hub needs to be replaced, replace them as a set.

Assembly

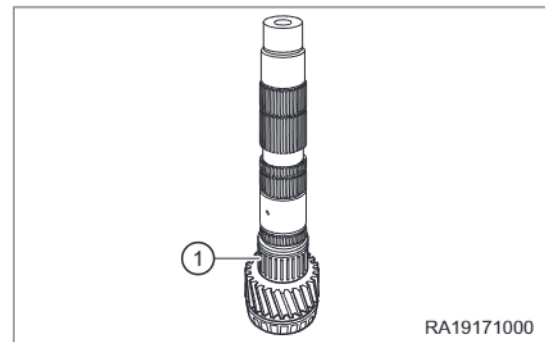
1. Install the output shaft front bearing.
 - a. Using a hydraulic press (1), press the output shaft front bearing (3) into the output shaft (2).



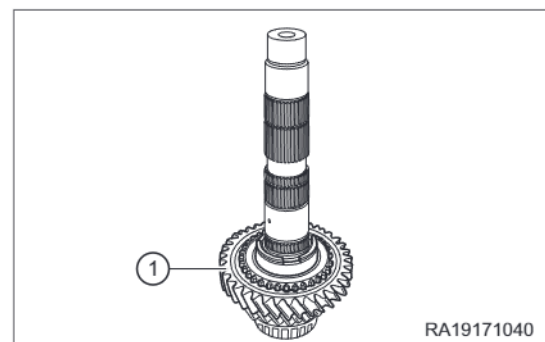
CAUTION

- When pressing the output shaft front bearing, make sure that the pressure is applied to the bearing inner race as the bearing may be damaged due to uneven force.

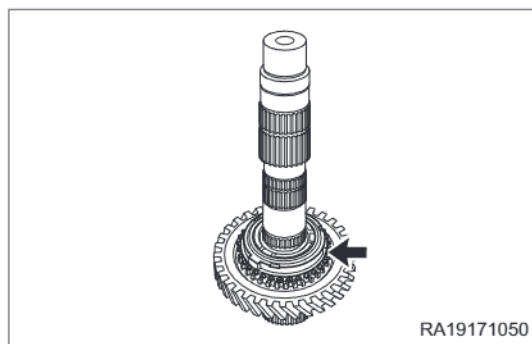
2. Install the 1st gear needle roller bearing.
 - a. Apply transmission oil to the 1st gear needle roller bearing (1), and install it to the output shaft.



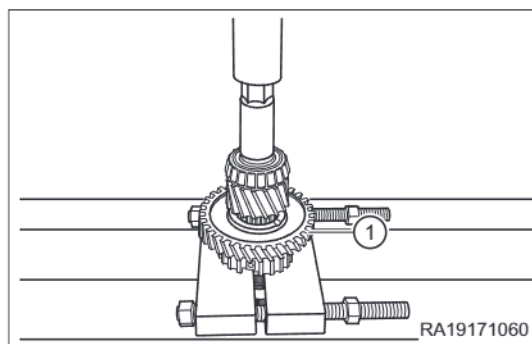
3. Install the 1st driven gear.
 - a. Apply transmission oil to the 1st driven gear (1), and install it to the output shaft.



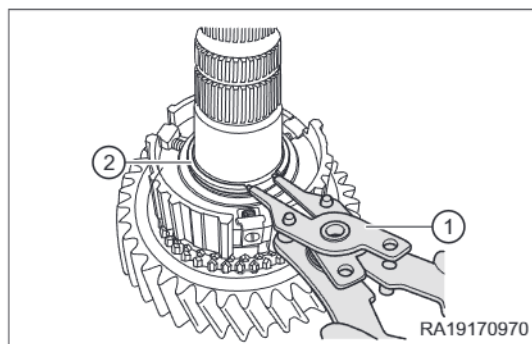
4. Install the 1st synchronizer ring set.
 - a. Apply transmission oil to the 1st synchronizer ring set (arrow), and install it to the output shaft.



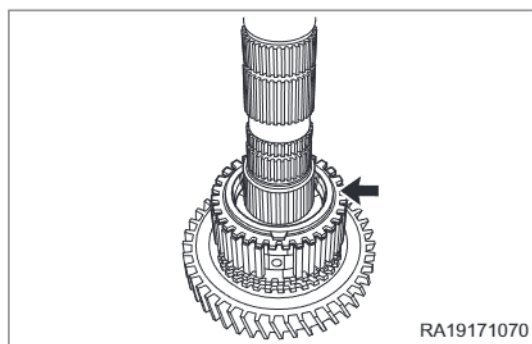
5. Install the 1st-2nd synchronizer gear hub and 1st driven gear.
 - a. Place the 1st-2nd synchronizer gear hub in place (1), and then press the 1st-2nd synchronizer gear hub (1) into the output shaft with a hydraulic press.



- b. Using the snap spring calipers (1), install the snap ring (2).

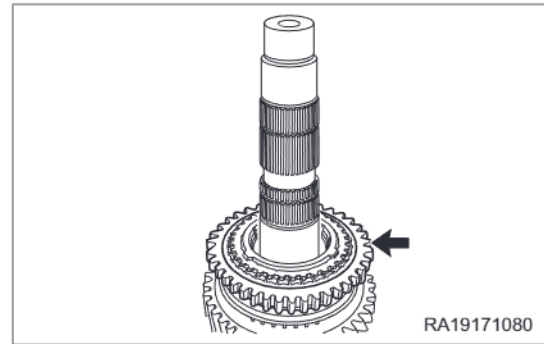


6. Install the synchronizer ring set.
 - a. Apply transmission oil to the synchronizer ring set (arrow), and install it to the output shaft.

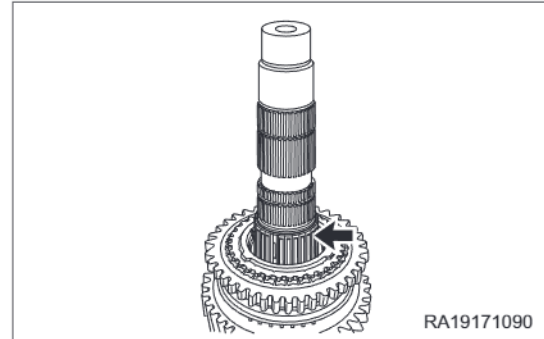


7. Install the synchronizer outer race.

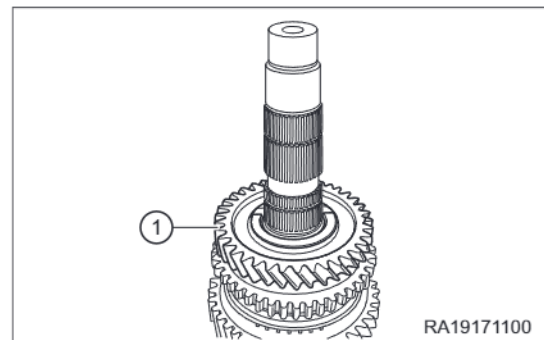
- a. Apply transmission oil to the synchronizer outer race (arrow), and install it to the output shaft.



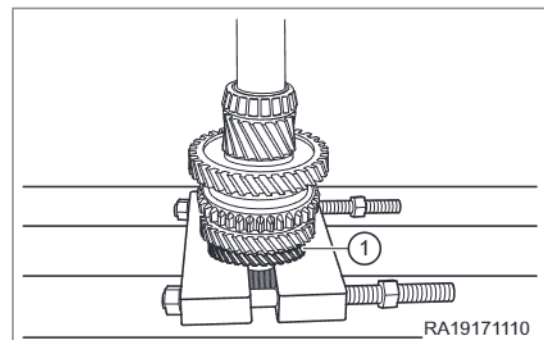
8. Install the 2nd gear needle roller bearing.
 - a. Apply transmission oil to the 2nd gear needle roller bearing (arrow), and install it to the output shaft.



9. Install the 2nd driven gear.
 - a. Apply transmission oil to the 2nd driven gear (1), and install it to the output shaft.

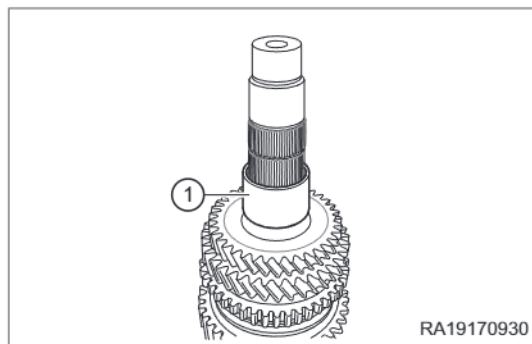


10. Install the 3rd driven gear.
 - a. Using a hydraulic press, press the 3rd driven gear (1) into the output shaft.



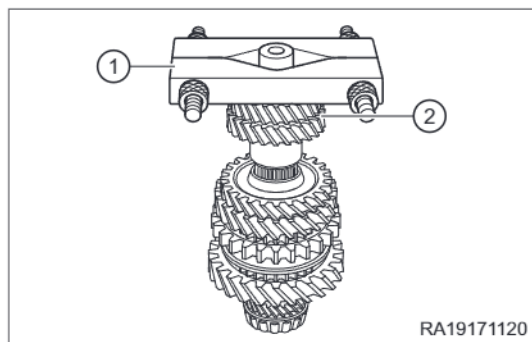
11. Install the gear shaft bushing.

- a. Apply transmission oil to the gear shaft bushing (1), and install it to the output shaft.

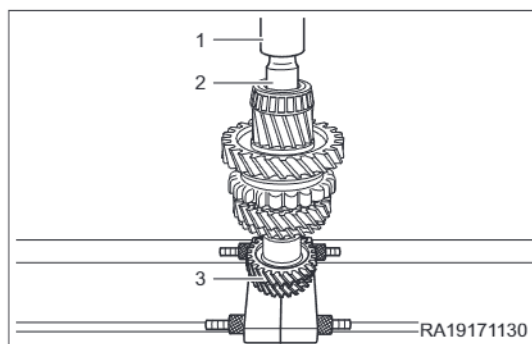


12. Install the 4th and 5th driven gears.

- a. Using a special tool (1), secure the 4th and 5th driven gears (2).

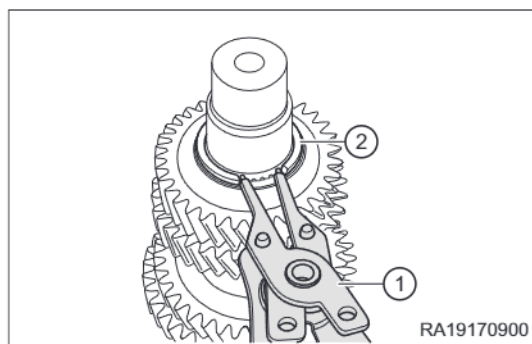


- b. Using a hydraulic press (1), press the 4th and 5th driven gears (3) into the output shaft (2).



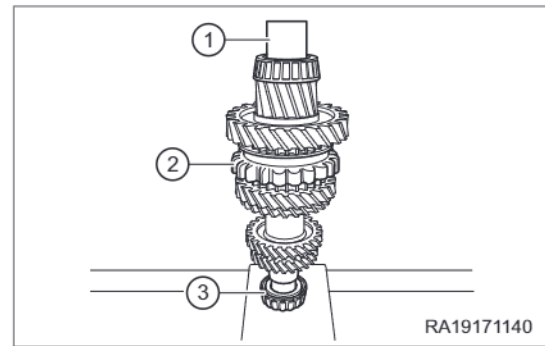
17

- c. Using the snap spring calipers (1), install the snap ring (2).



13. Install the output shaft rear bearing.

- a. Using a hydraulic press (1), press the output shaft rear bearing (3) into the output shaft (2).

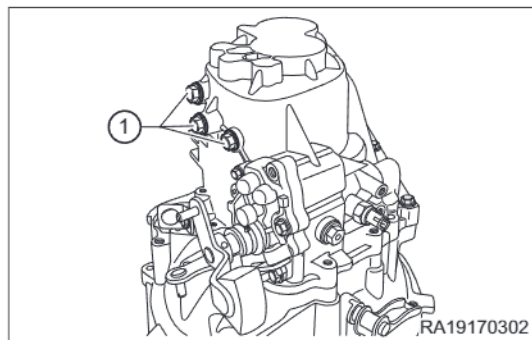
**CAUTION**

- Check the gears on the output shaft for smooth rotation after installation.
- Check the fitting of input shaft gears for looseness or sticking.

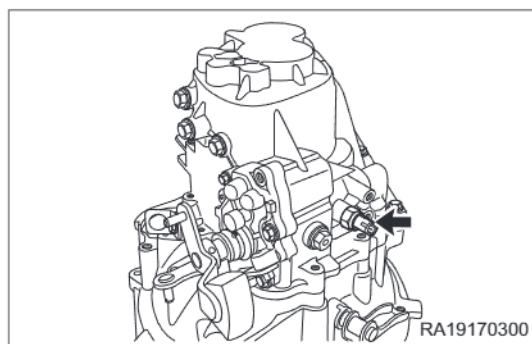
Transmission External Accessory

Removal

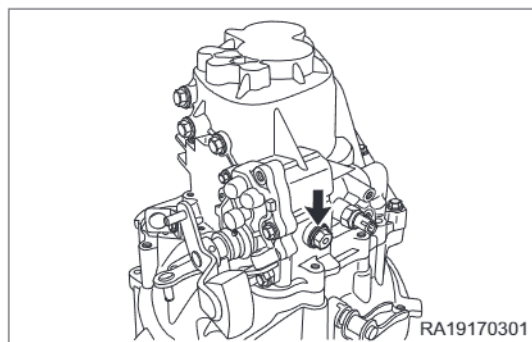
1. Shift the transmission to the neutral position.
2. Remove the shift shaft locating bolt.
 - a. Remove the shift shaft locating bolts (1) from the transmission case.



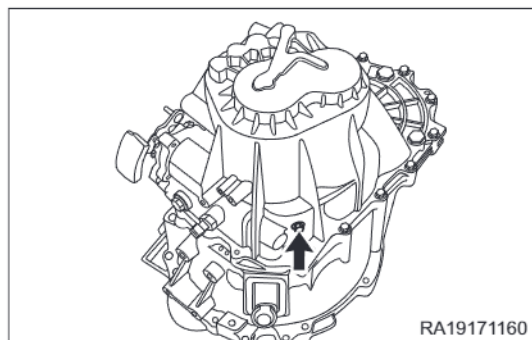
3. Remove the back-up light switch.
 - a. Remove the back-up light switch (arrow) from the transmission case.



4. Remove the locating bolt of gear shift mechanism.
 - a. Remove the locating bolt (arrow) of gear shift mechanism from the transmission case.

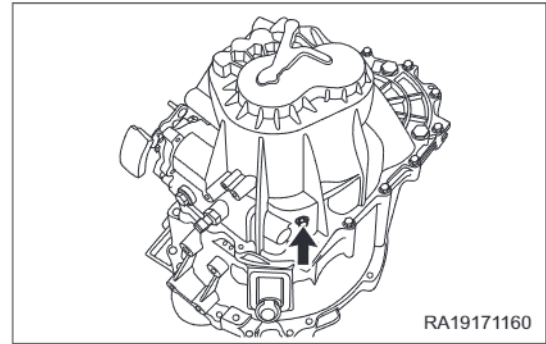


5. Remove the reverse idler gear shaft locating bolt.
 - a. Remove the reverse idler gear shaft locating bolt (arrow) from the transmission case.



Installation

1. Install the reverse idler gear shaft locating bolt.
 - a. Install the reverse idler gear shaft locating bolt (arrow) to the transmission case.
(Tightening torque: $38 \pm 2.5 \text{ N}\cdot\text{m}$)

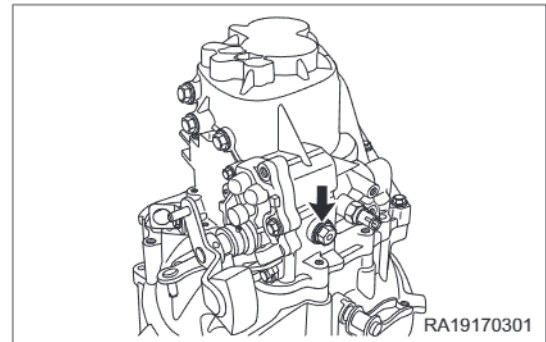


2. Install the locating bolt of gear shift mechanism.

HINT:

Before installation, apply thread locker to the threads.

- a. Install the locating bolt (arrow) of gear shift mechanism to the transmission case.
(Tightening torque: $32 \pm 2.5 \text{ N}\cdot\text{m}$)

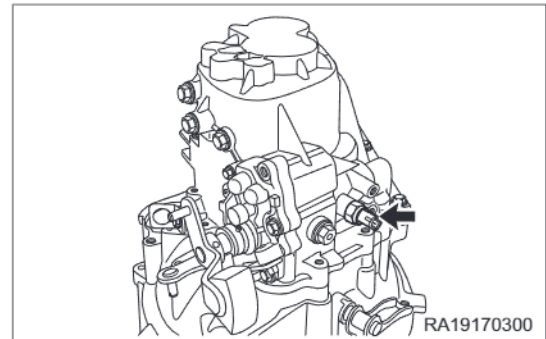


3. Install the back-up light switch.

HINT:

Before installation, apply thread locker to the threads.

- a. Install the back-up light switch (arrow) to the transmission case.
(Tightening torque: $25 \pm 2 \text{ N}\cdot\text{m}$)

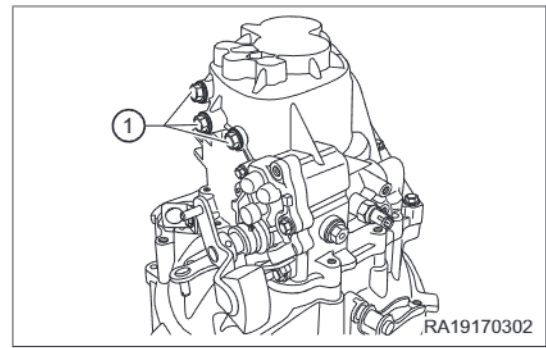


4. Install the shift shaft locating bolt.

HINT:

Before installation, apply thread locker to the threads.

- a. Install the shift shaft locating bolts (1) to the transmission case.
(Tightening torque: 20 ± 2 N·m)



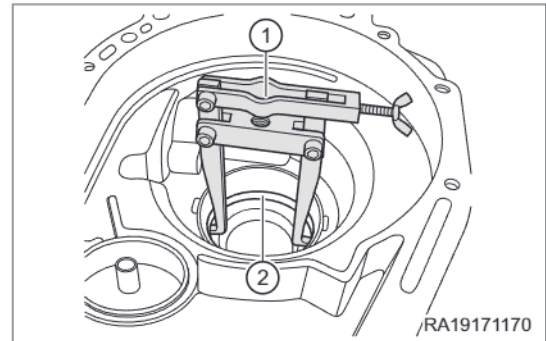
Transmission Case

Disassembly

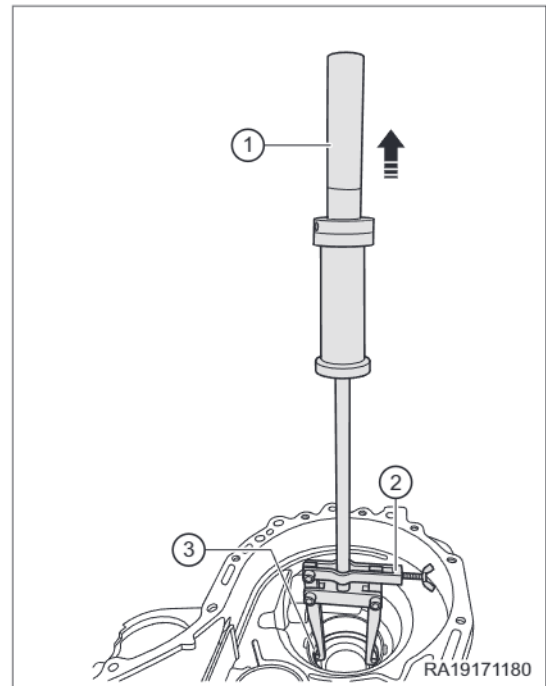
CAUTION

- Use the same removal procedures for the differential bearing out race of transmission case and clutch case and the oil seal.
- The oil seal cannot be reused. After removal, it must be replaced.

1. Remove the differential bearing outer race.
 - a. Secure the bearing outer race puller joint (1) to the bearing outer race (2).

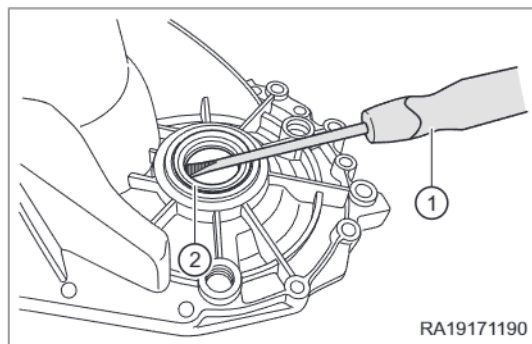


- b. Install the puller (1) to the bearing outer race remover (2), and pull out bearing outer race (3) with the puller.



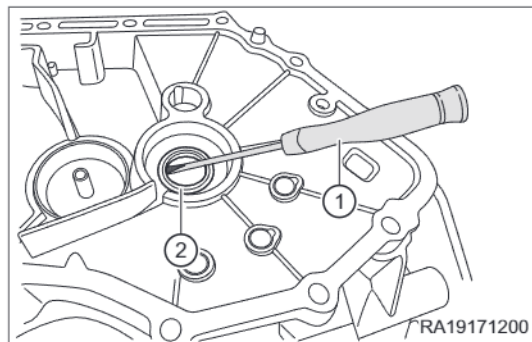
2. Remove the drive shaft oil seal.

- a. Using a flat tip screwdriver (1), pry out the drive shaft oil seal (2).



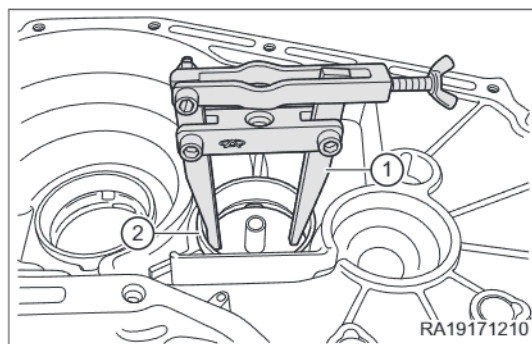
3. Remove the input shaft oil seal.

- a. Using a flat tip screwdriver (1), pry out the input shaft oil seal (2).

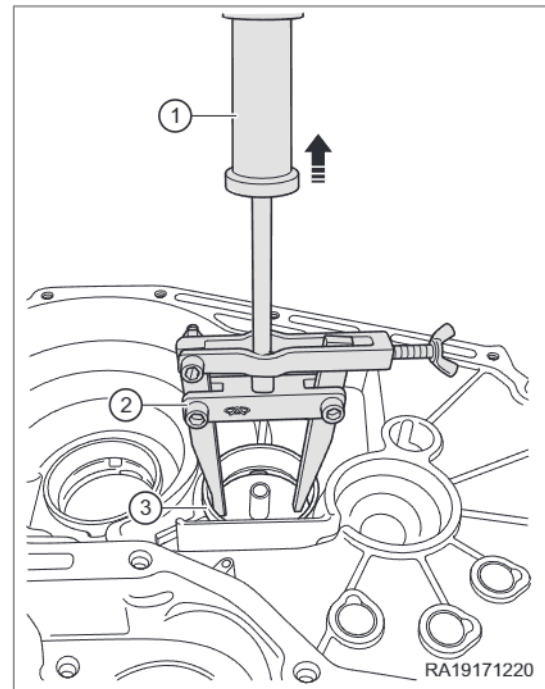


4. Remove the output shaft bearing outer race.

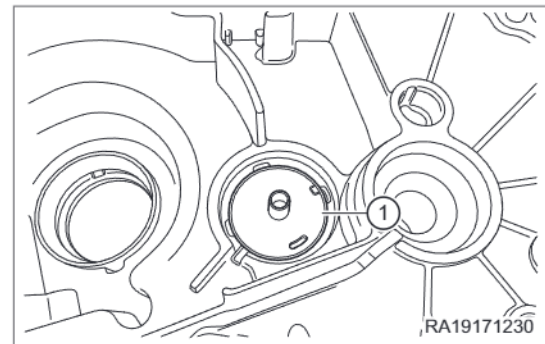
- a. Secure the bearing outer race puller joint (1) of output shaft end to the output shaft bearing outer race (2).



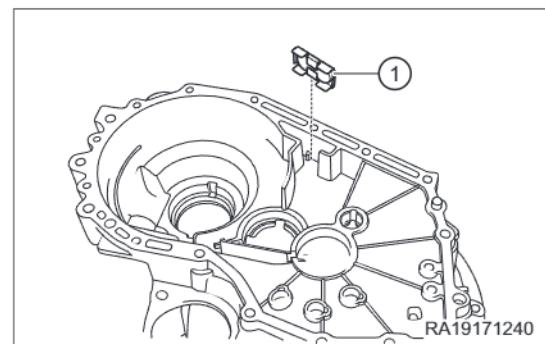
- b. Install the puller (1) to bearing outer race remover (2).
- c. Using the puller, pull out the output shaft bearing outer race (3).



- 5. Remove the oil guide.
 - a. Remove the oil guide (1) from the clutch case.

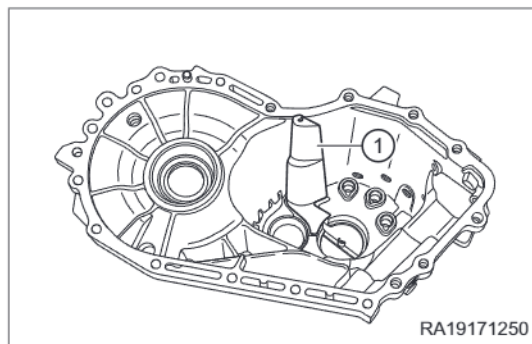


- 6. Remove the magnet.
 - a. Remove the magnet (1) from the clutch case.



- 7. Remove the oil deflector.

- a. Remove the oil deflector (1) from the transmission case.



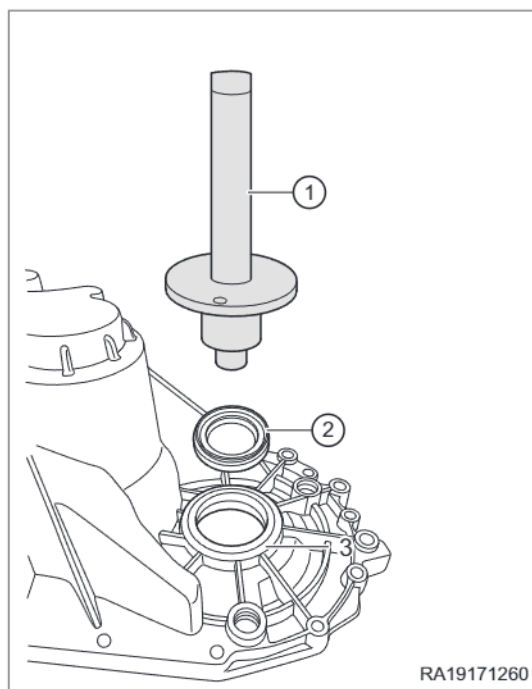
Assembly

1. Install the drive shaft oil seal.

CAUTION

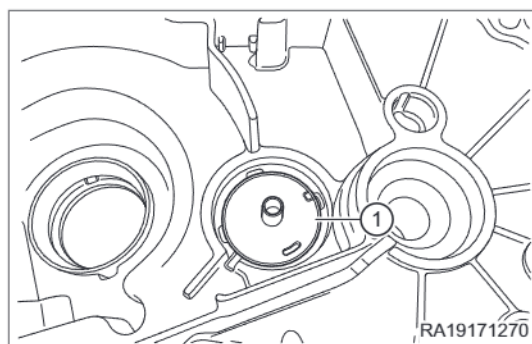
- Apply a proper amount of transmission oil to the lip when installing the oil seal.

- a. Using a drive shaft oil seal installer (1), install the drive shaft oil seal (2) to the transmission case (3).



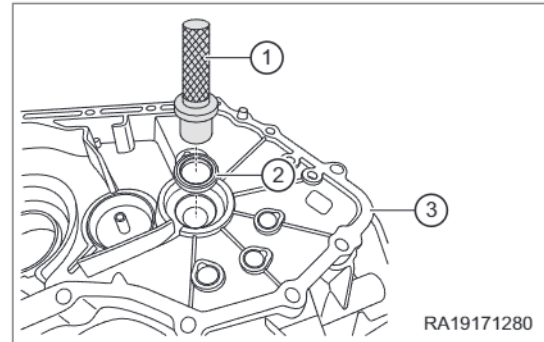
2. Install the oil guide.

- a. Install the oil guide (1) to the clutch case.



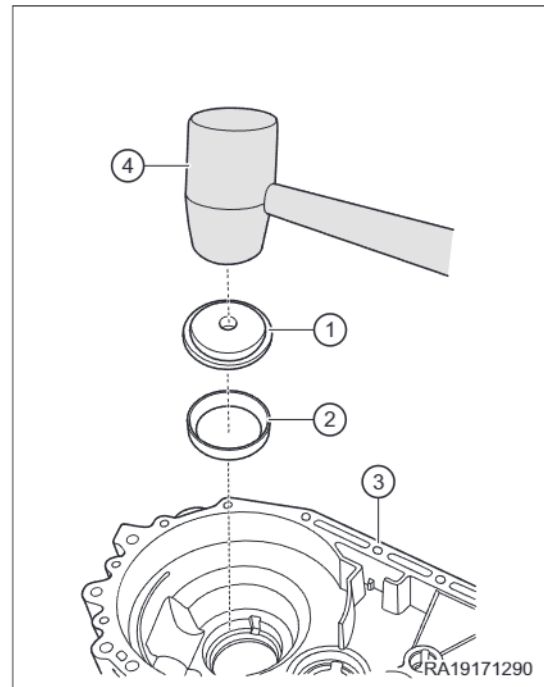
3. Install the input shaft oil seal.

- a. Using a input shaft oil seal installer (1), install the input shaft oil seal (2) to the clutch case (3).



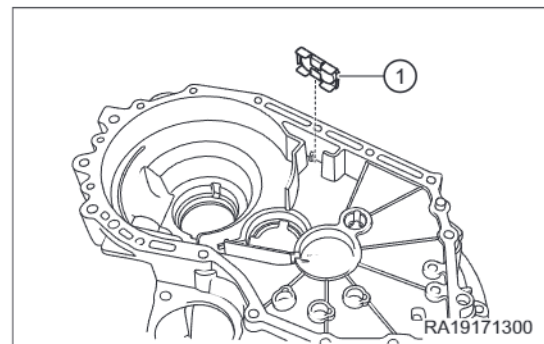
4. Install the differential bearing outer race.

- a. Install the joint (1) to the bearing outer race (2), and install the bearing outer race (2) to the case (3) with a rubber hammer (4).



5. Install the magnet.

- a. Install the magnet (1) to the clutch case.



6. Install the oil deflector.

- a. Install the oil deflector (1) to the transmission case.

