

6-SPEED M/T

**3192-02/3193-01/3194-02/3195-01/3196-06/3710-01/
3710-03/9210-02/**

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دیجیتال خودرو

شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

اولین سامانه دیجیتال تعمیرکاران خودرو در ایران



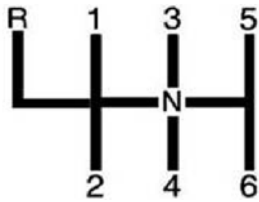
6-SPEED M/T**0000-00****GENERAL INFORMATION****1. SPECIFICATIONS**

Item		Specifications		Remarks
		D16DTF	G16DF	
Total length		393.1 mm	385.1 mm	-
Distance between shafts / Differential deflection		189 mm / 66.44 mm		-
Gear ratio	1st	3.538	3.769	-
	2nd	1.913	2.080	-
	3rd	1.152	1.387	-
	4th	0.829	1.079	-
	5th	0.689	0.927	-
	6th	0.587	0.791	-
	Reverse	3.000	3.077	-
Types of synchronizer ring for transmission	1st	T: Triple type		-
	2nd	T: Triple type		-
	3rd	S: Single type (carbon)		-
	4th	S: Single type		-
	5th	S: Single type		-
	6th	S: Single type		-
	Reverse	D: Double type		-

Modification basis	
Application basis	
Affected VIN	

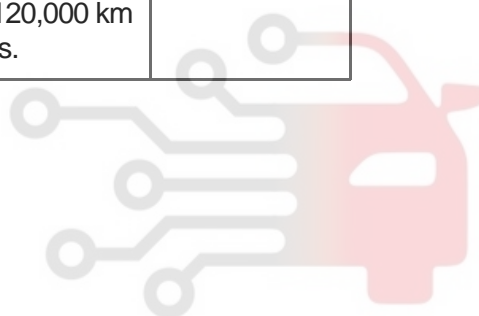
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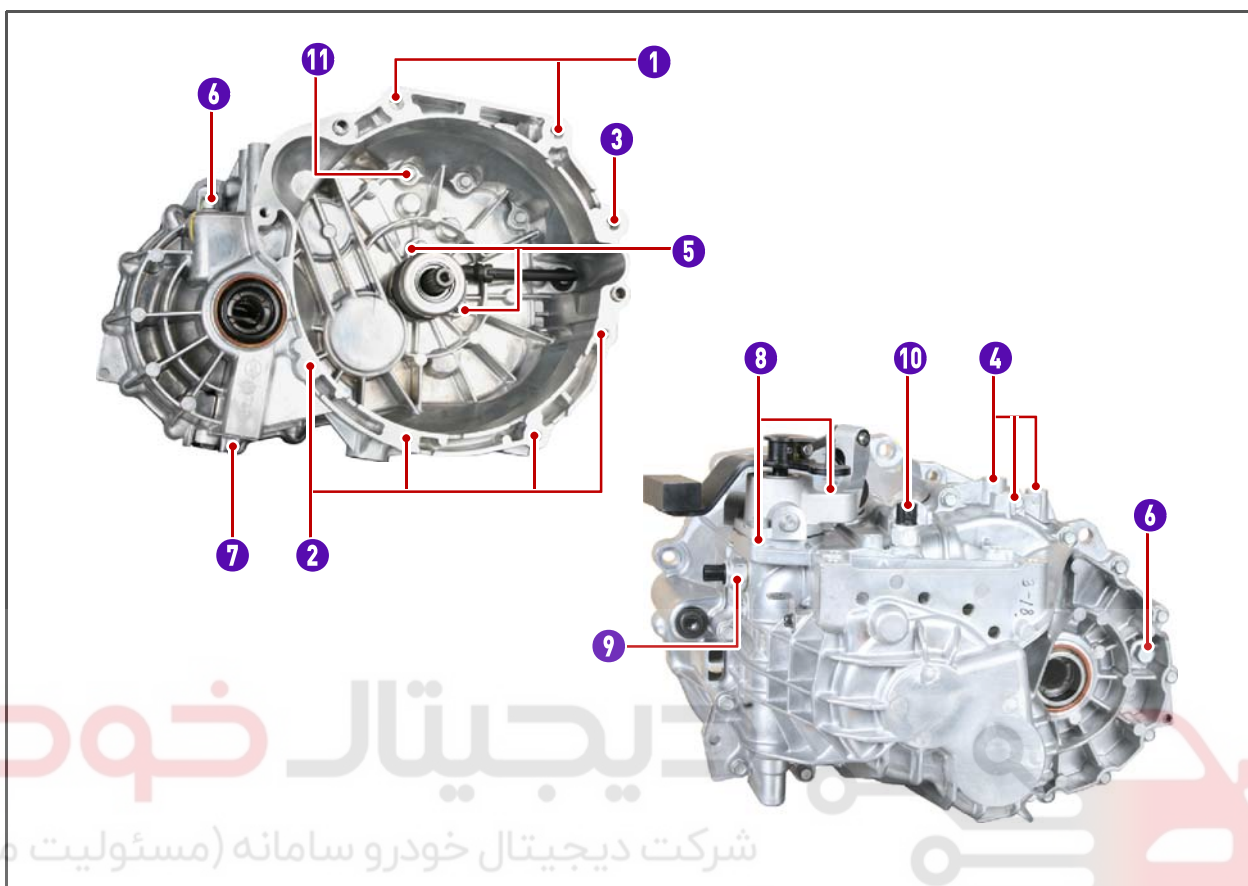
Item		Specifications	Remarks
Shifting	Type	Remote control (Cable type)	-
	Shifting pattern		Reverse: Reverse ring pull type
Transmission fluid	Fluid specification	SAE 70W	-
	Oil volume	1.9 ℓ	-
	Service interval	Check and add at every 60,000 km of driving or 3 years. Change is not required under normal driving conditions, but change at every 120,000 km under severe conditions.	-

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2. TIGHTENING TORQUE



Components	Tightening torque	Quantity
1. M/T upper mounting bolt (17 mm)	85 to 100 Nm	2
2. M/T lower mounting bolt (14 mm)	59 ± 3 Nm	4
3. M/T front mounting bolt (14 mm)	54 Nm + 20°	1
4. TGS shift cable bracket mounting bolt (12 mm)	17.7 to 21.6 Nm	3
5. Concentric slave cylinder mounting bolt (10 mm)	9.8 to 15.7 Nm	2
6. Oil filler plug (17 mm)	58.8 to 78.4 Nm	2
7. Oil drain plug (24 mm)	58.8 to 78.4 Nm	1
8. Control shaft assembly mounting bolt (12 mm)	26.5 to 33.4 Nm	2
9. Neutral switch (24 mm)	39.2 to 58.8 Nm	1
10. Backup lamp switch (24 mm)	39.2 to 58.8 Nm	1
11. Transmission case mounting bolt (12 mm)	19.6 to 26.46 Nm	19

Modification basis	
Application basis	
Affected VIN	

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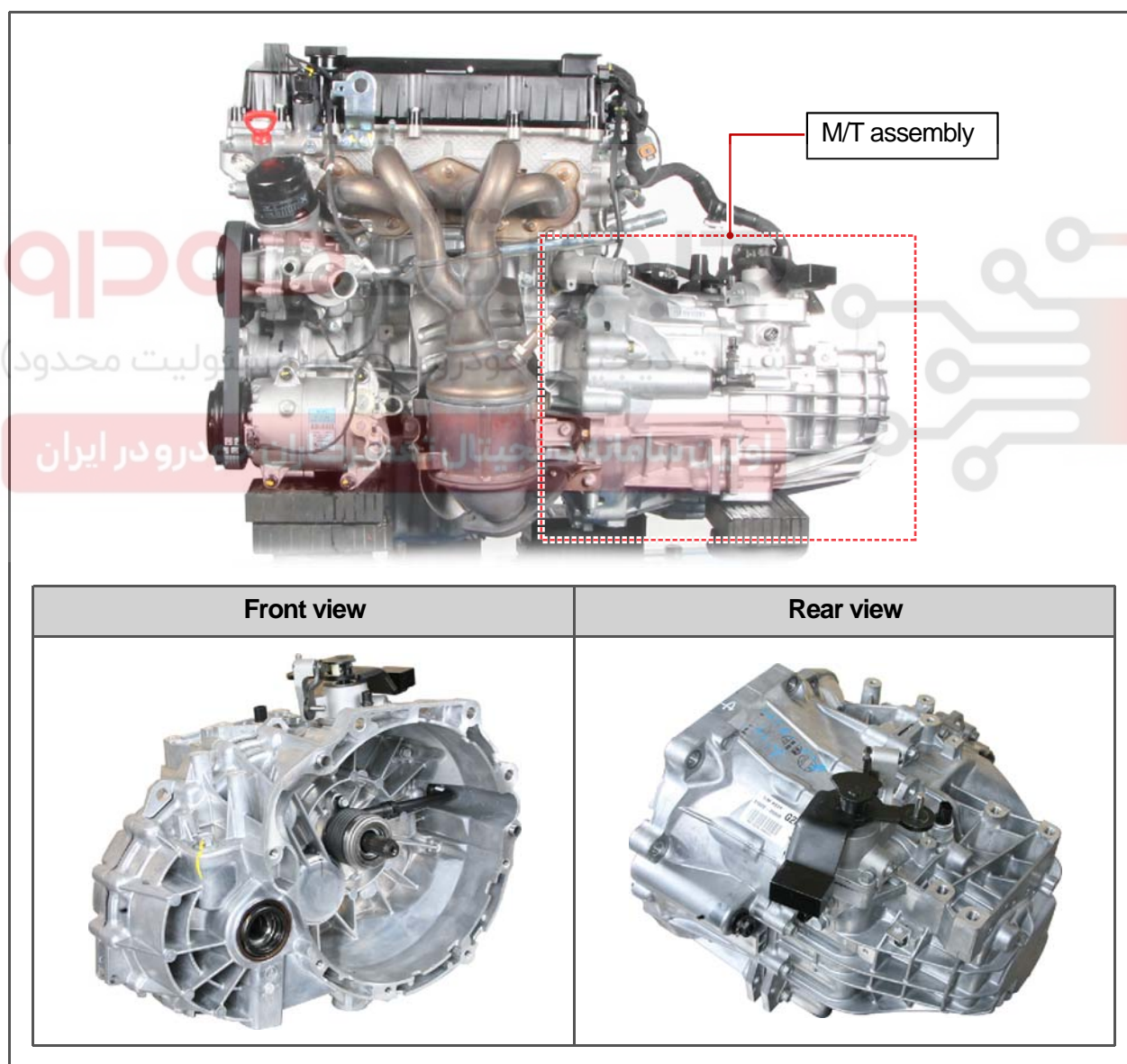
OVERVIEW AND OPERATING PROCESS

1. OVERVIEW

This vehicle is equipped with T028S6 manual transmission which is integrated with axle for front-engine front wheel drive (FF) use. This type of transmission is called a transaxle.

The driving force for the 1st to 6th gears is provided by the ring gear and transmitted through the input shaft and output shaft (output shaft pinion gear). When the reverse gear is engaged, the direction of rotation is changed by the input shaft and output shaft and the driving force is provided by the reverse gear idler shaft (reverse pinion gear) and ring gear.

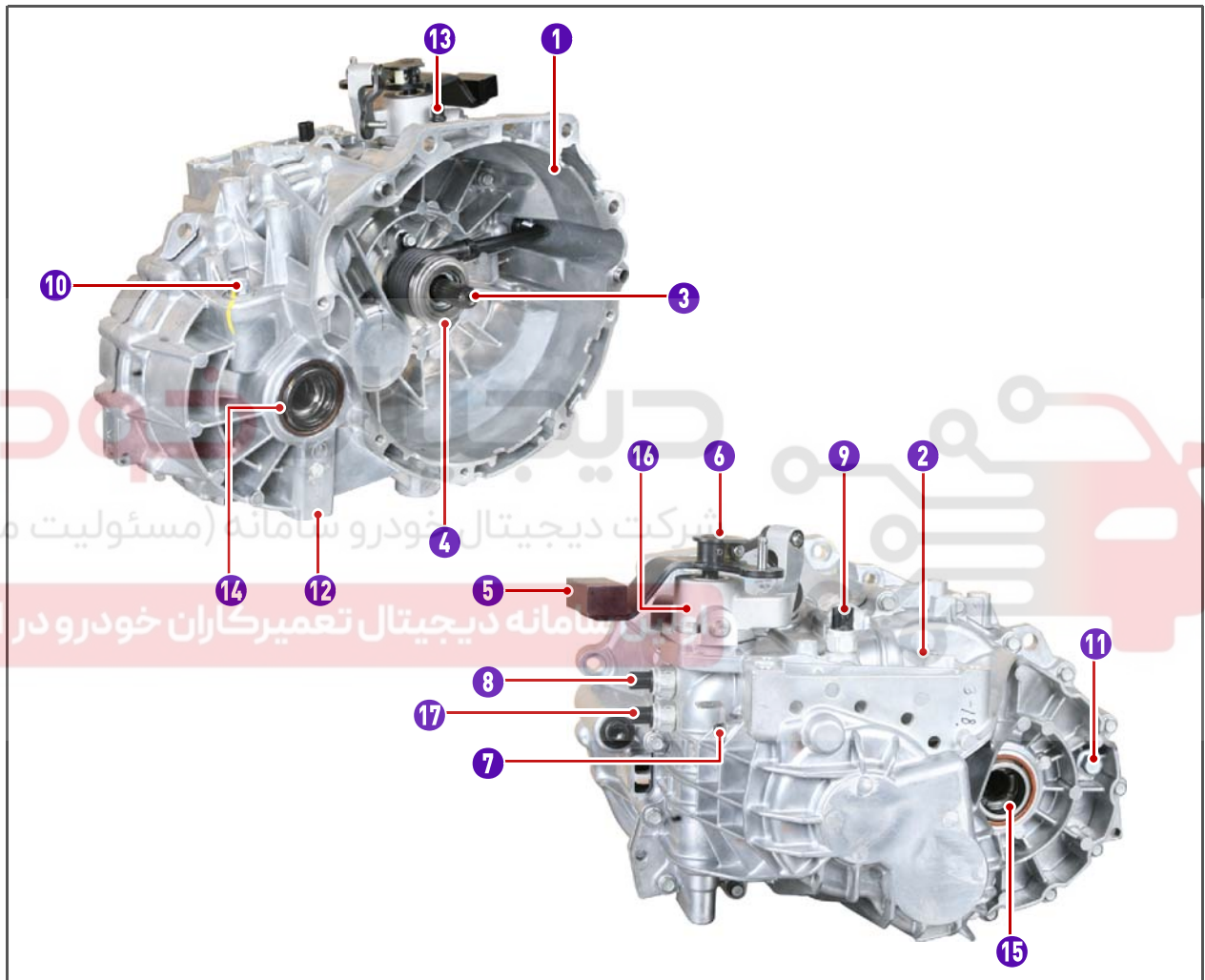
T028S6 manual transmission consists of an input shaft, an output shaft, and a reverse gear idler shaft. With the combination of 6-speed forward gears and a reverse gear, the transmission optimizes engine torque and gear ratio for improved driveability.



1) Features

- Consists of a input shaft and a output shaft
- Drives the clutch with a concentric slave cylinder (CSC).
- Shifting the transmission gears is performed through the remote control cable.
- When engaging reverse gear, the reverse gear ring on the shift lever should be pulled (pull type).

(1) Part name



- | | |
|------------------------------|------------------------------|
| 1. Clutch housing | 10.Oil filler plug (RH) |
| 2. Transmission case | 11.Oil filler plug (LH) |
| 3. Input shaft | 12.Oil drain plug |
| 4. Concentric slave cylinder | 13.Air breather |
| 5. Shift lever | 14.Oil seal (RH) |
| 6. Selector lever | 15.Oil seal (LH) |
| 7. Wiring bracket | 16.Control housing |
| 8. Neutral switch | 17.Neutral switch (ISG only) |
| 9. Backup Lamp Switch | |



Modification basis	
Application basis	
Affected VIN	

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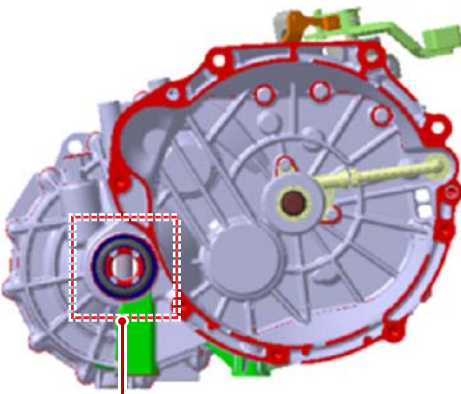
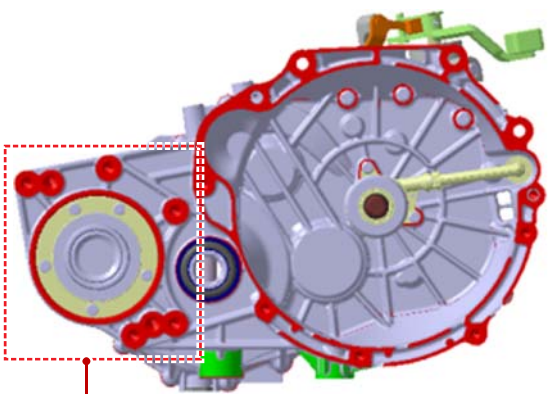
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(2) Characteristics by specification

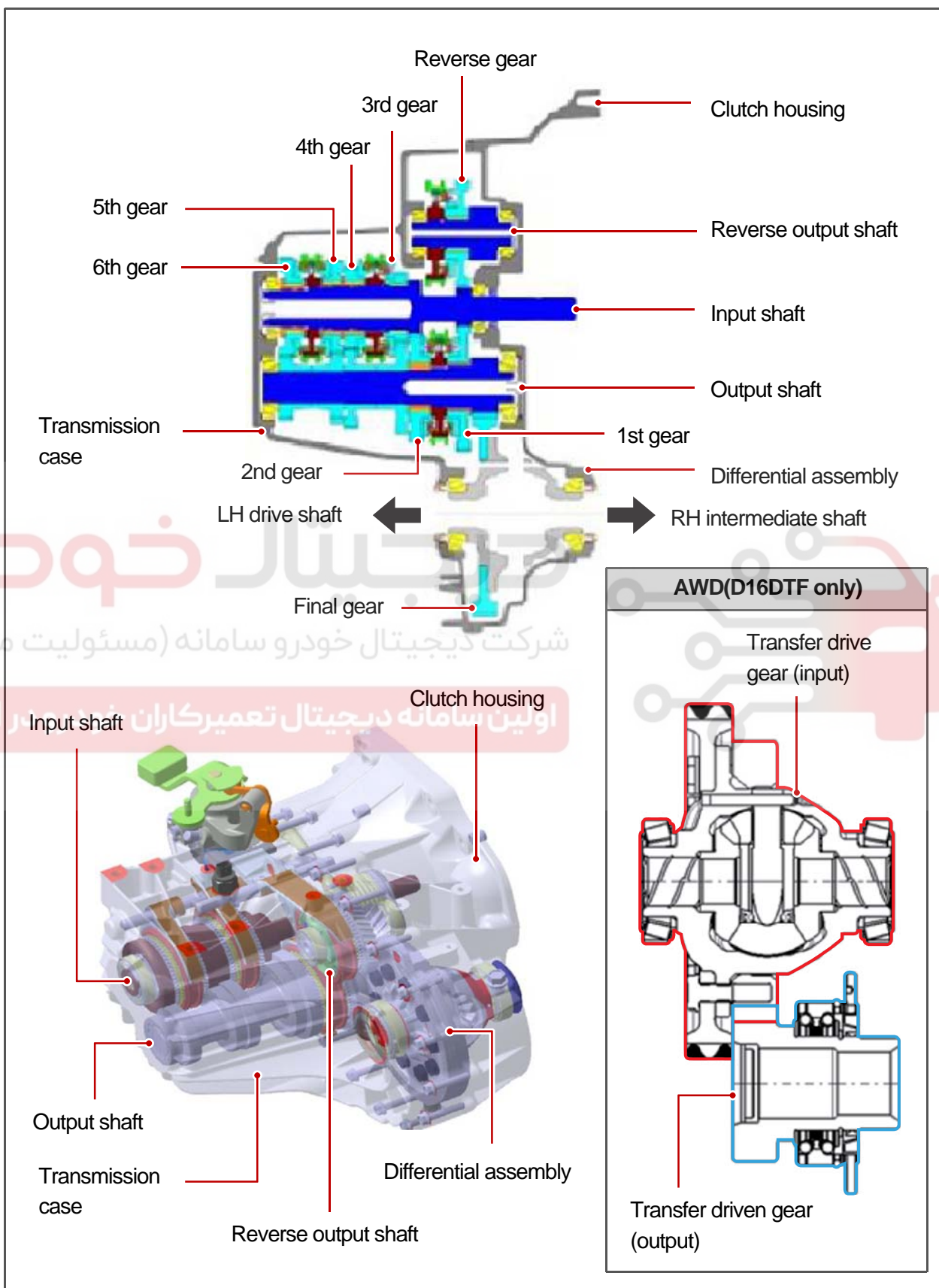
Since the diesel engine uses the thicker DMF (Dual Mass Flywheel) than SMF (Single Mass Flywheel) for the gasoline engine, the clutch housing for the manual transmission with the diesel engine is longer.

Gasoline	Diesel
 <p>Unit: mm</p>	 <p>Unit: mm</p>

The manual transmission with the AWD model is equipped directly with the intermediate shaft and PTU respectively and PTU attachment exists separately. Therefore, it has another separate power transmission shaft through the offset gear, compared to the manual transmission with 2WD model.

2WD	AWD(D16DTF only)
 <p>Intermediate shaft attachment</p>	 <p>PTU attachment</p>

3) Internal Structure



Modification basis	
Application basis	
Affected VIN	

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4) Gear Ratio

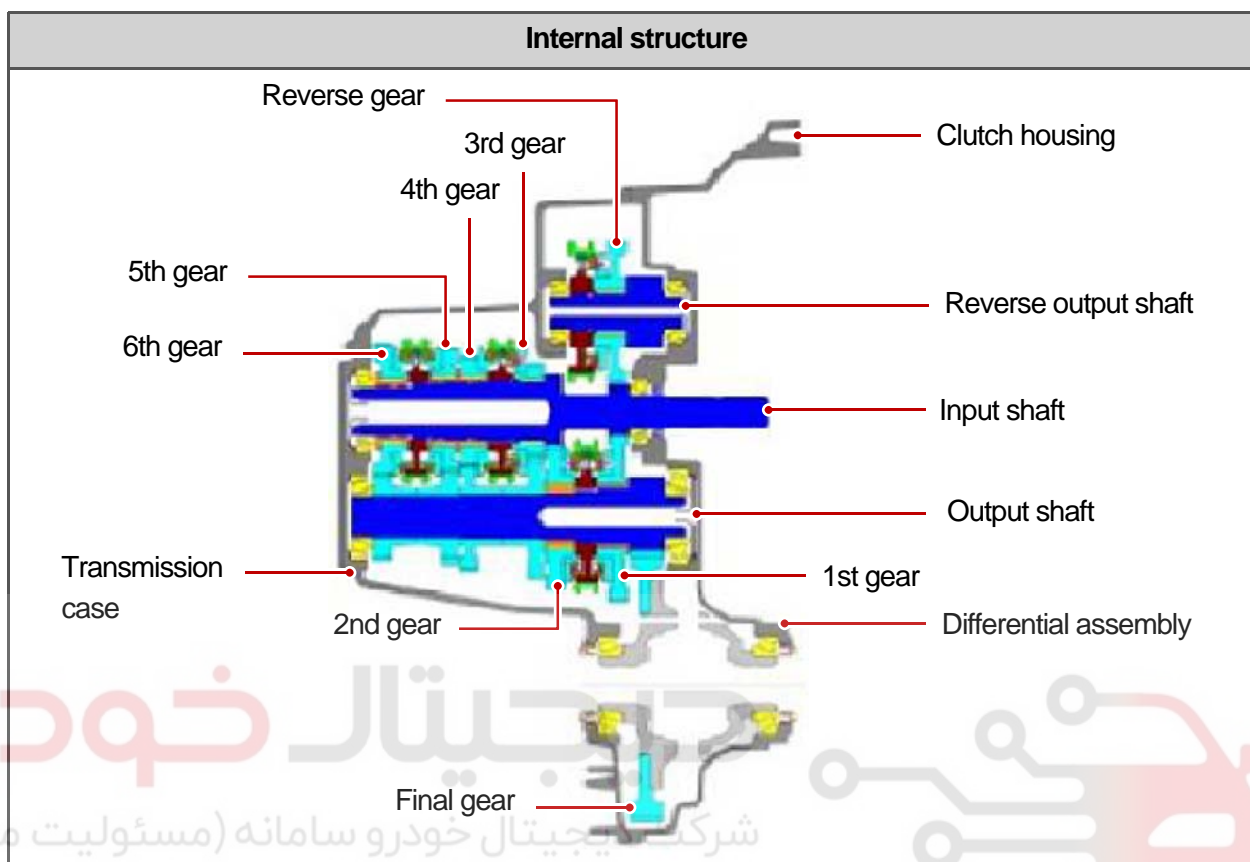
► G16DF

Gear	Speed gear			Differential drive gear			Total gear ratio
	Number of teeth		Gear ratio	Number of teeth		Gear ratio	
	Input	Output		Input	Output		
1st	13	49	3.769	14	57	4.071	15.346
2nd	25	52	2.080				8.469
3rd	31	43	1.387				5.647
4th	38	41	1.079				4.393
5th	41	38	0.927				3.774
6th	43	34	0.791				3.219
Reverse	13	40	3.077	11	57	5.182	15.944
	IDLE : 49(1st)						

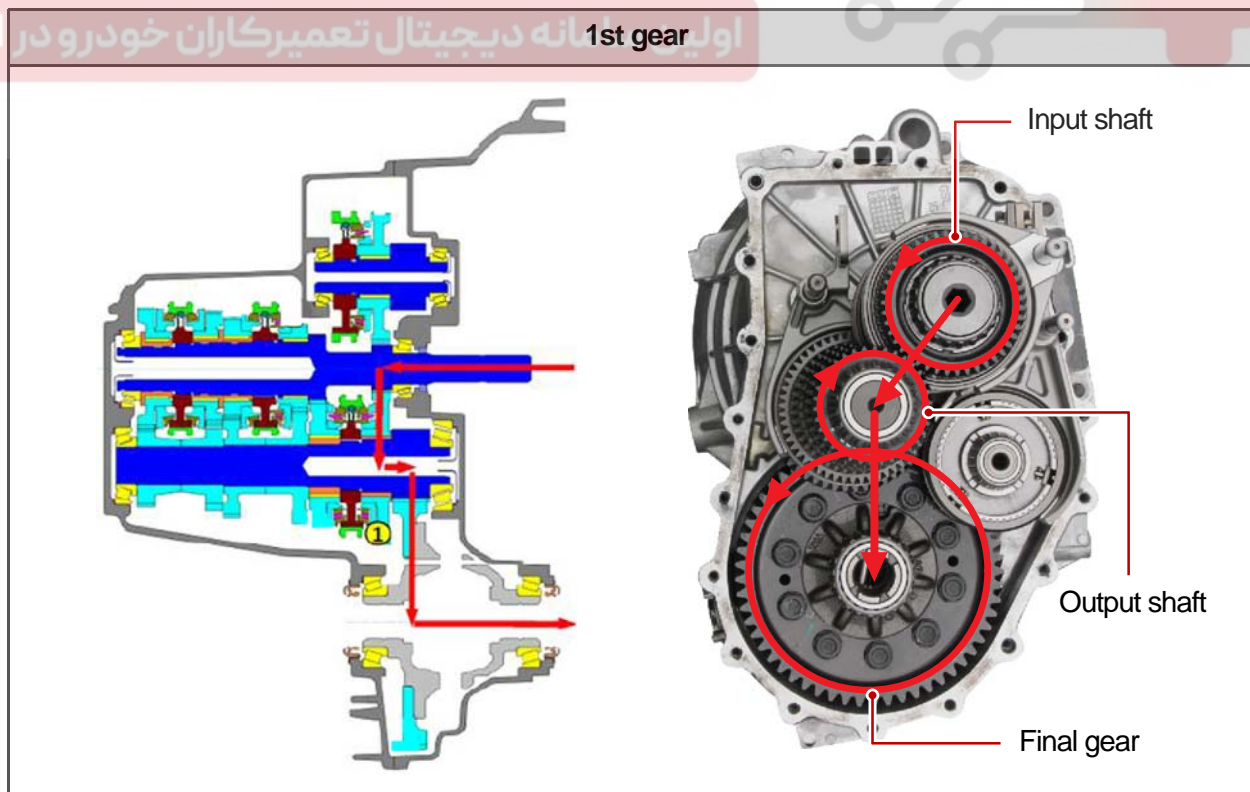
► D16DTF

Gear	Speed gear			Differential drive gear			Total gear ratio
	Number of teeth		Gear ratio	Number of teeth		Gear ratio	
	Input	Output		Input	Output		
1st	13	46	3.538	14	55	3.929	13.903 : 1
2nd	23	44	1.913				7.516 : 1
3rd	33	38	1.152				4.524 : 1
4th	41	34	0.829				3.258 : 1
5th	45	31	0.689				2.707 : 1
6th	46	27	0.587				2.306 : 1
Reverse	13	39	3.000	12	55	4.583	13.749 : 1
	IDLE : 46(1st)						

2. POWER FLOWS



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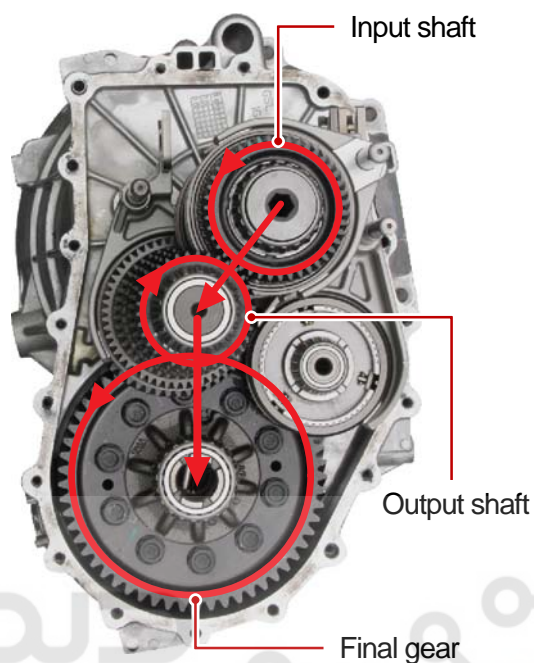
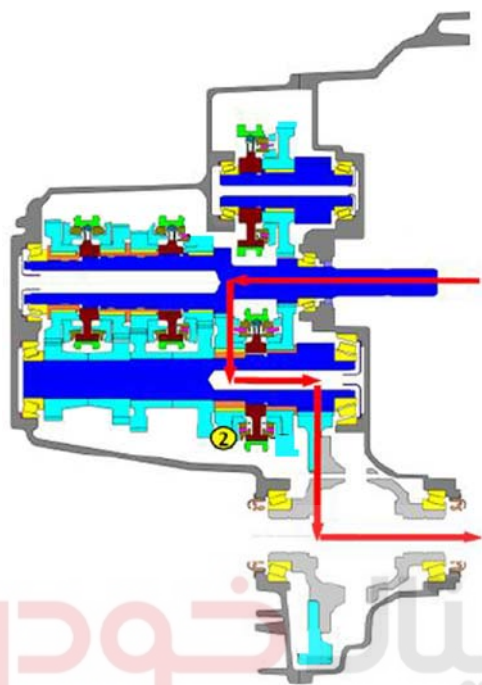


Modification basis	
Application basis	
Affected VIN	

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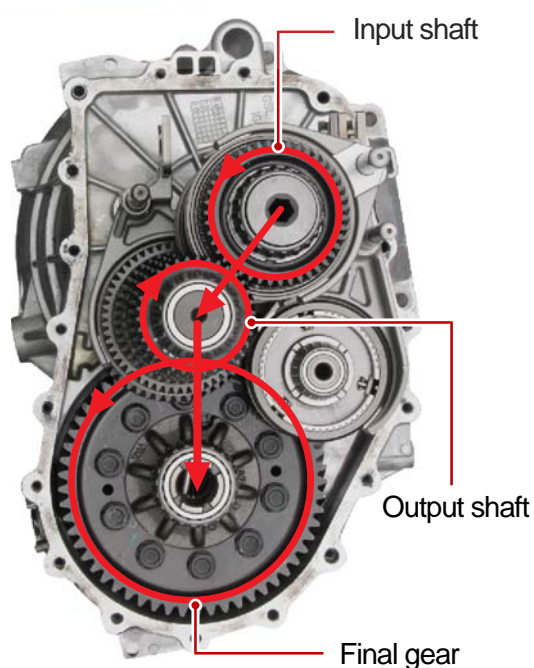
2nd gear



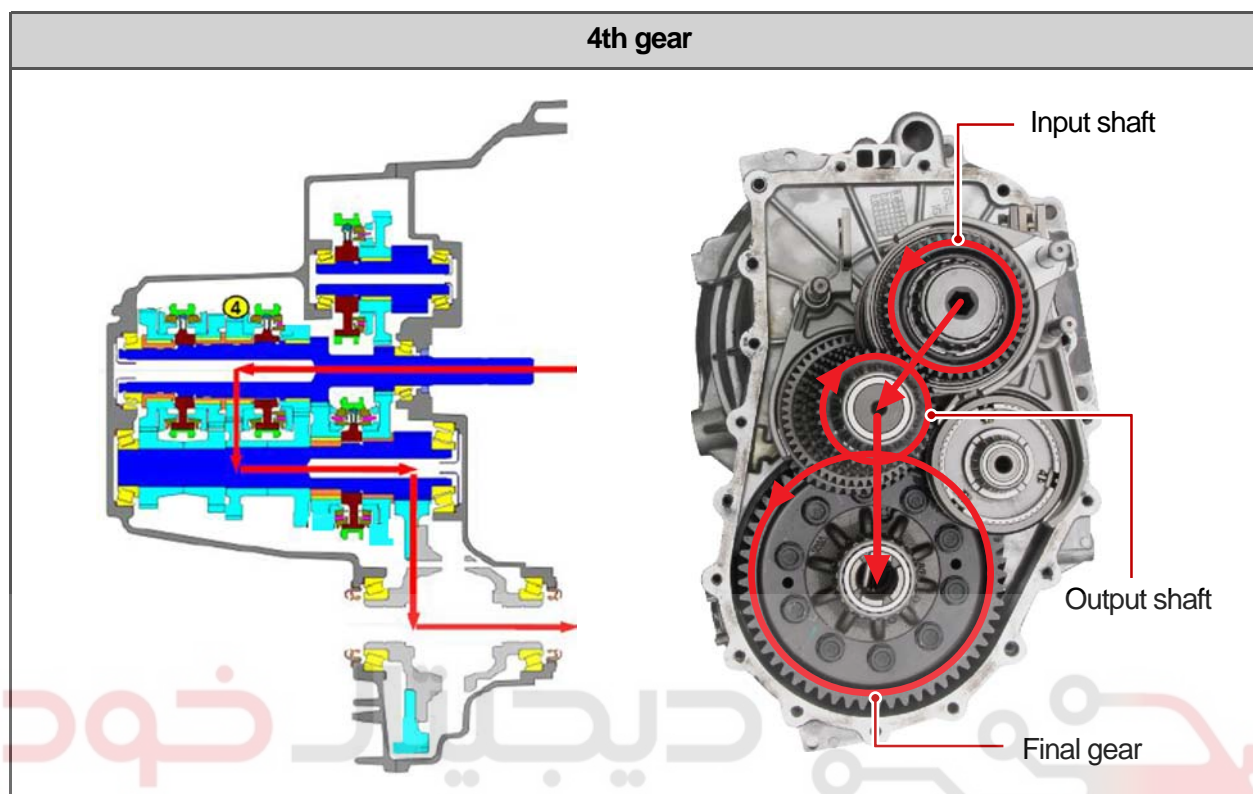
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3rd gear

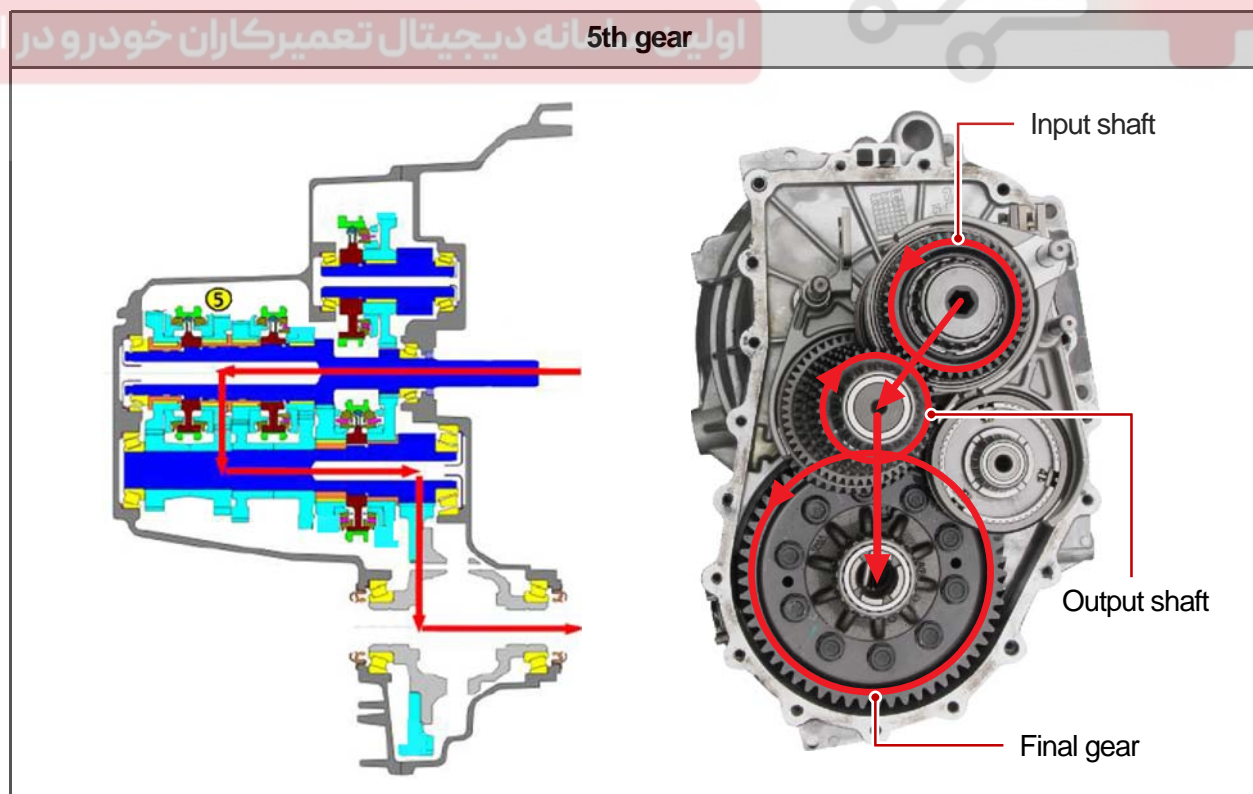


Modification basis	
Application basis	
Affected VIN	



شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

اولیه دیجیتال تعمیرکاران خودرو در ایران

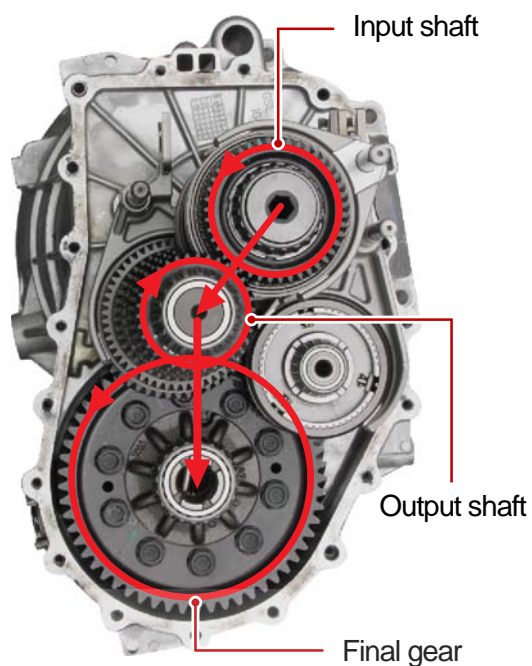


Modification basis	
Application basis	
Affected VIN	

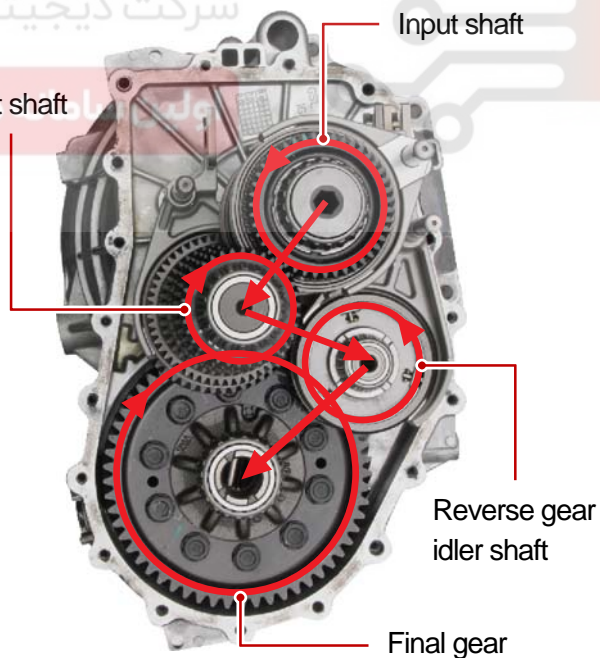
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6th gear



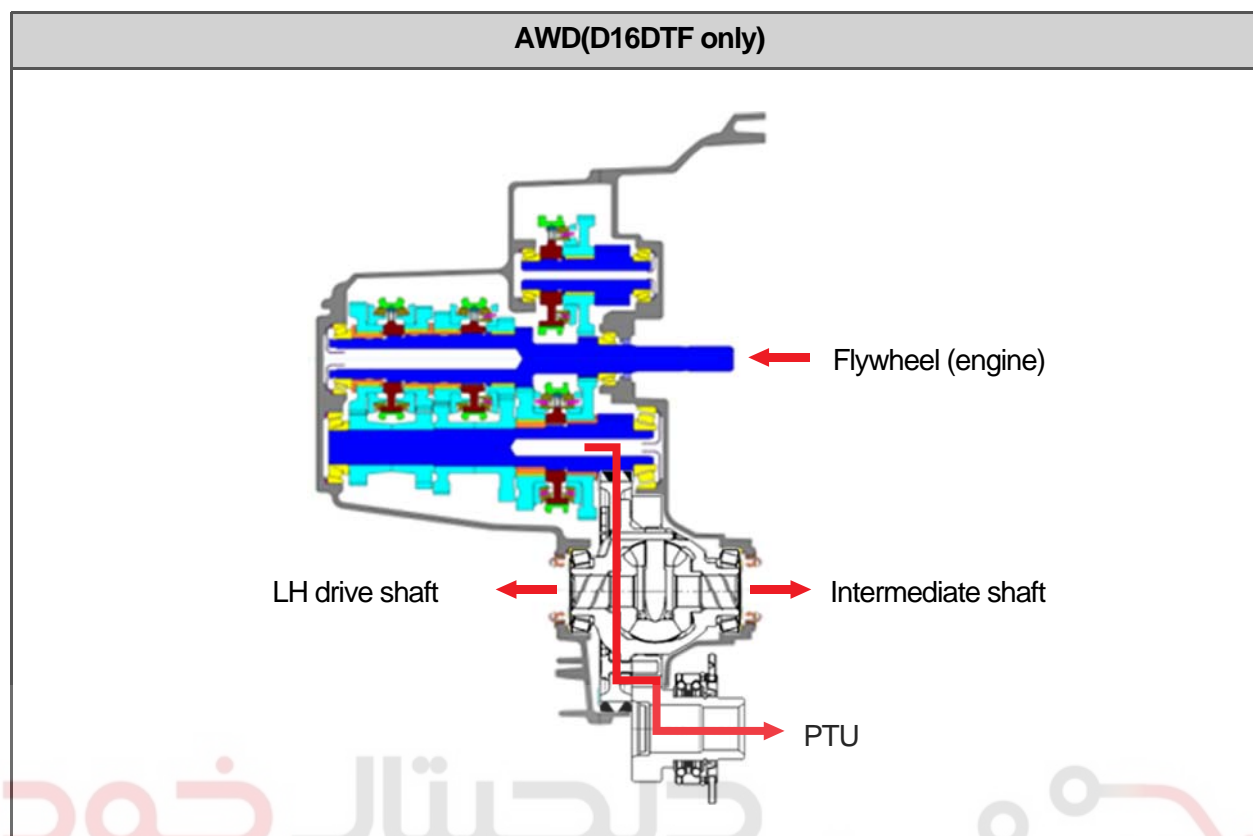
Reverse



► Reverse gear - power flow

1st gear input shaft → 1st gear output shaft → Reverse speed gear → Reverse shaft → Differential gear

Modification basis	
Application basis	
Affected VIN	



دیجیتال خودرو

شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

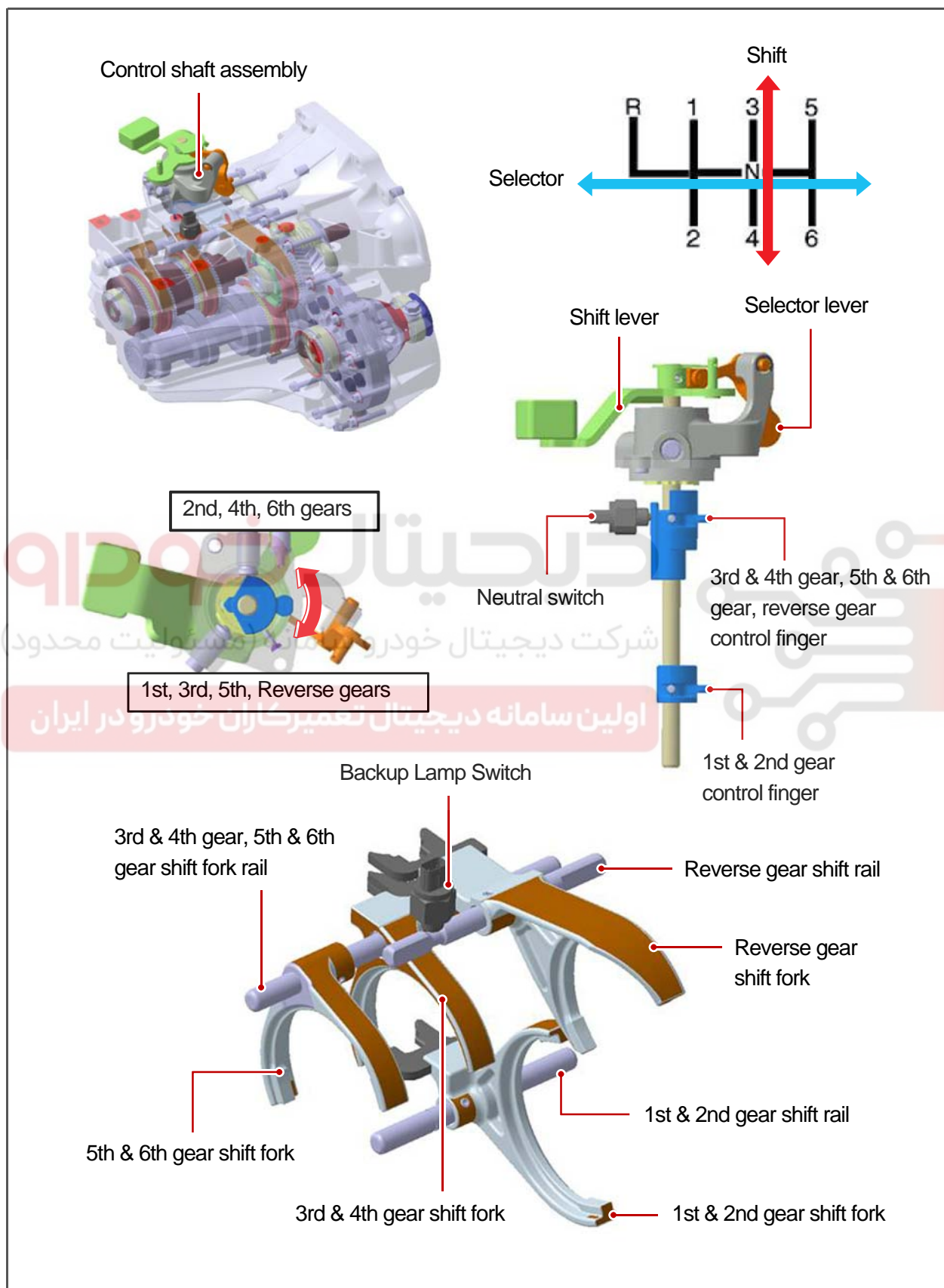
اولین سامانه دیجیتال تعمیرکاران خودرو در ایران

Modification basis	
Application basis	
Affected VIN	

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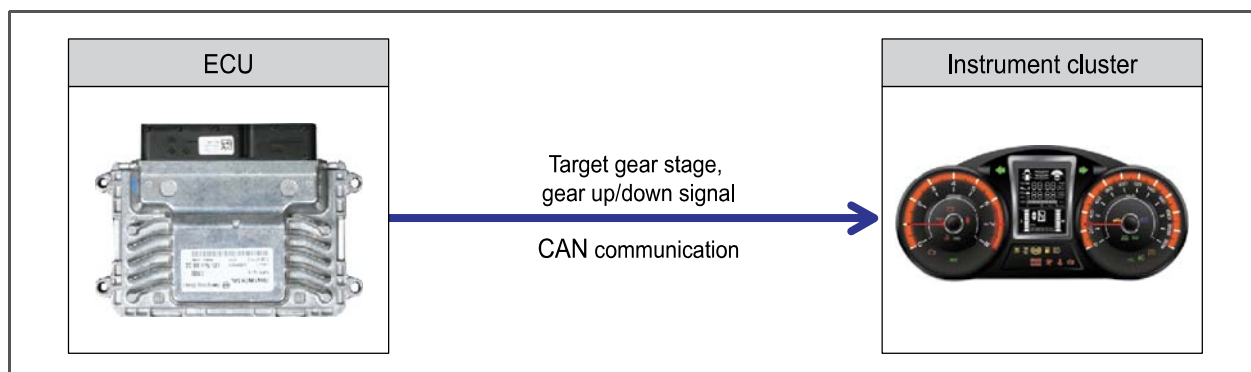
3. SHIFTING MECHANISM



Modification basis	
Application basis	
Affected VIN	

4. GEAR SHIFT INDICATOR

The gear shift indicator (GSI) is a function designed to encourage fuel-efficient driving by indicating to the driver the optimized points at which to shift gears. To achieve this, the ECU calculates the information such as engine rpm and vehicle speed and sends the signal to the instrument panel via CAN communication.



GSI display

This indicates the most appropriate timing for shifting to the 3rd gear (target) when the vehicle is driven in 1st to 2nd gear.

This indicates the most appropriate timing for shifting to the 3rd gear (target) when the vehicle is driven in 4th to 6th gear.

NOTE

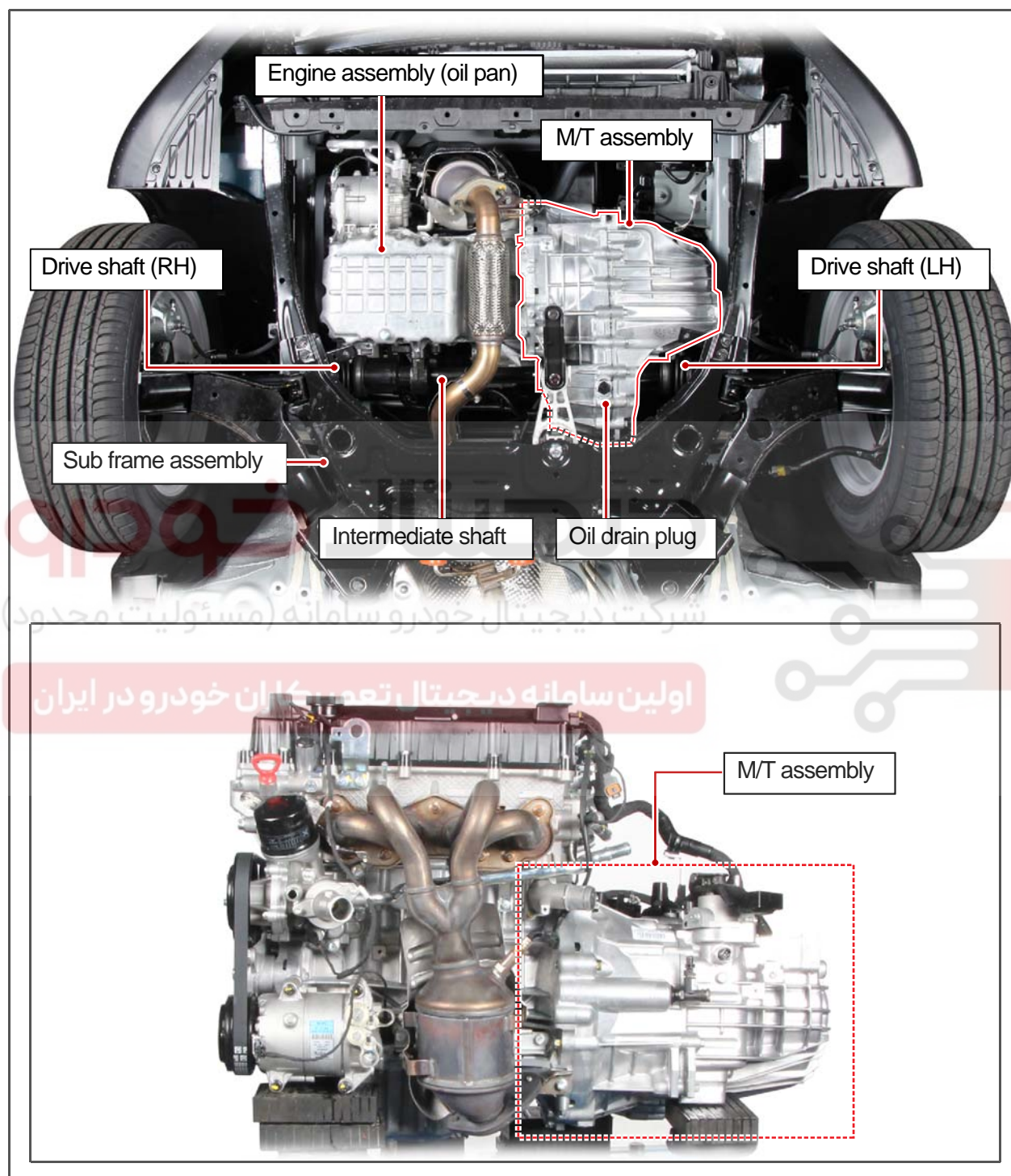
When the reverse gear is engaged, the selection is displayed on the LCD of the instrument cluster.

Modification basis	
Application basis	
Affected VIN	

CONFIGURATION AND FUNCTIONS

S.G.N.
3190-01

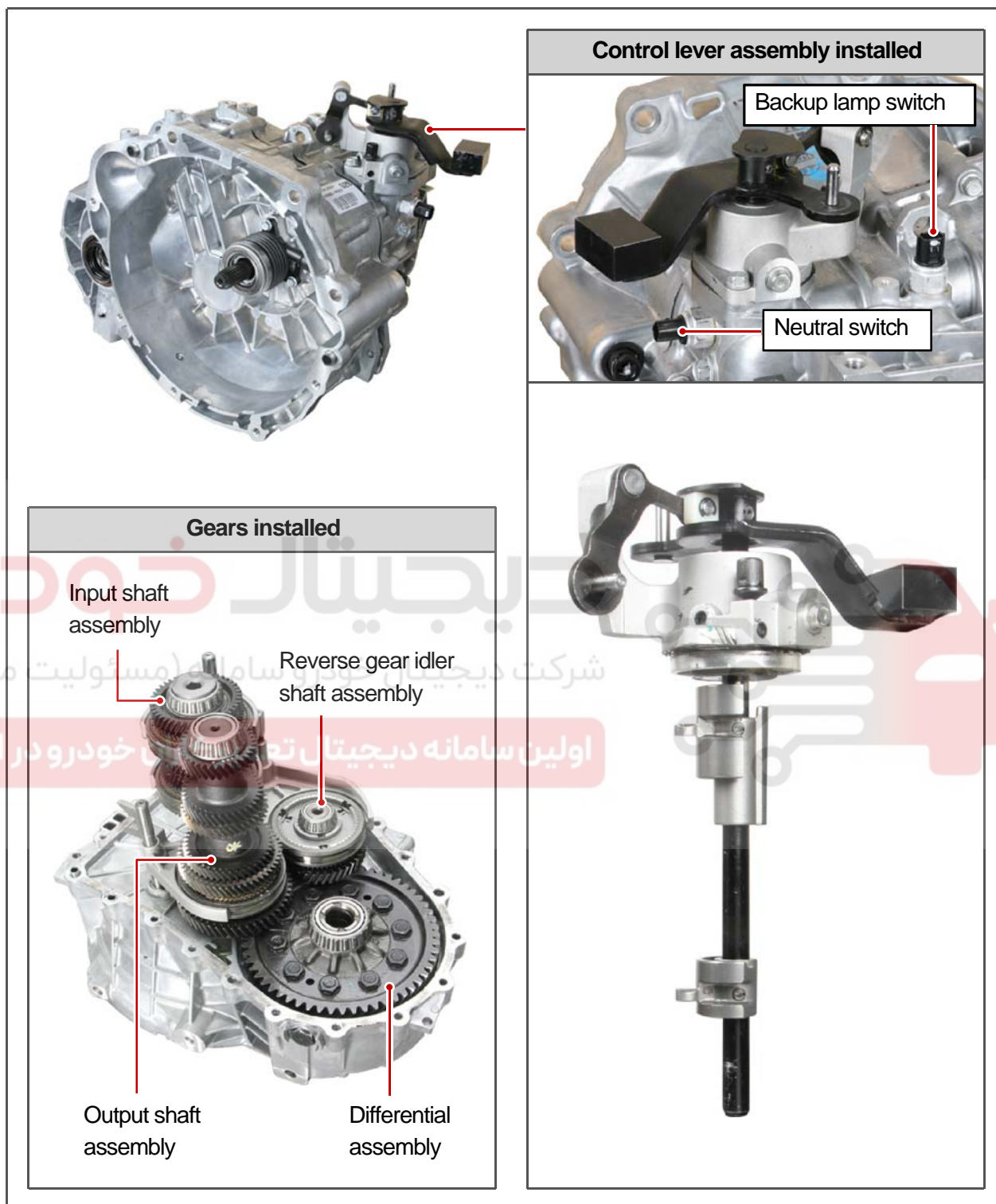
MOUNTING LOCATION



Modification basis	
Application basis	
Affected VIN	

S.G.N.

3190-01 COMPONENTS



Modification basis	
Application basis	
Affected VIN	

6-SPEED M/T

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AISIN 6
SPEED6-SPEED
M/T

CLUTCH

PROPELLER

DRIVE
SHAFT

AWD

SUSPENSION

BRAKE
SYSTEM

ESP

ABS

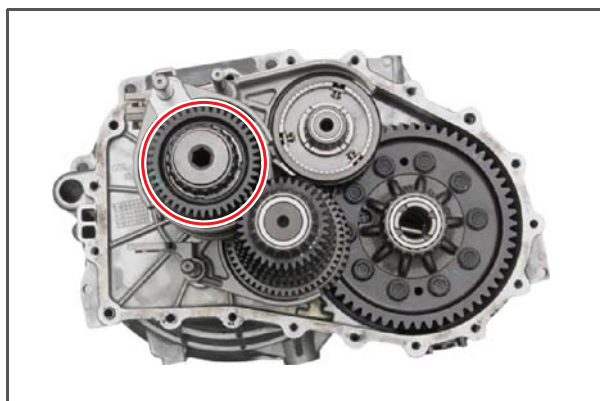
ELECTRIC
POWERWHEEL
AND TIRE

TPMS

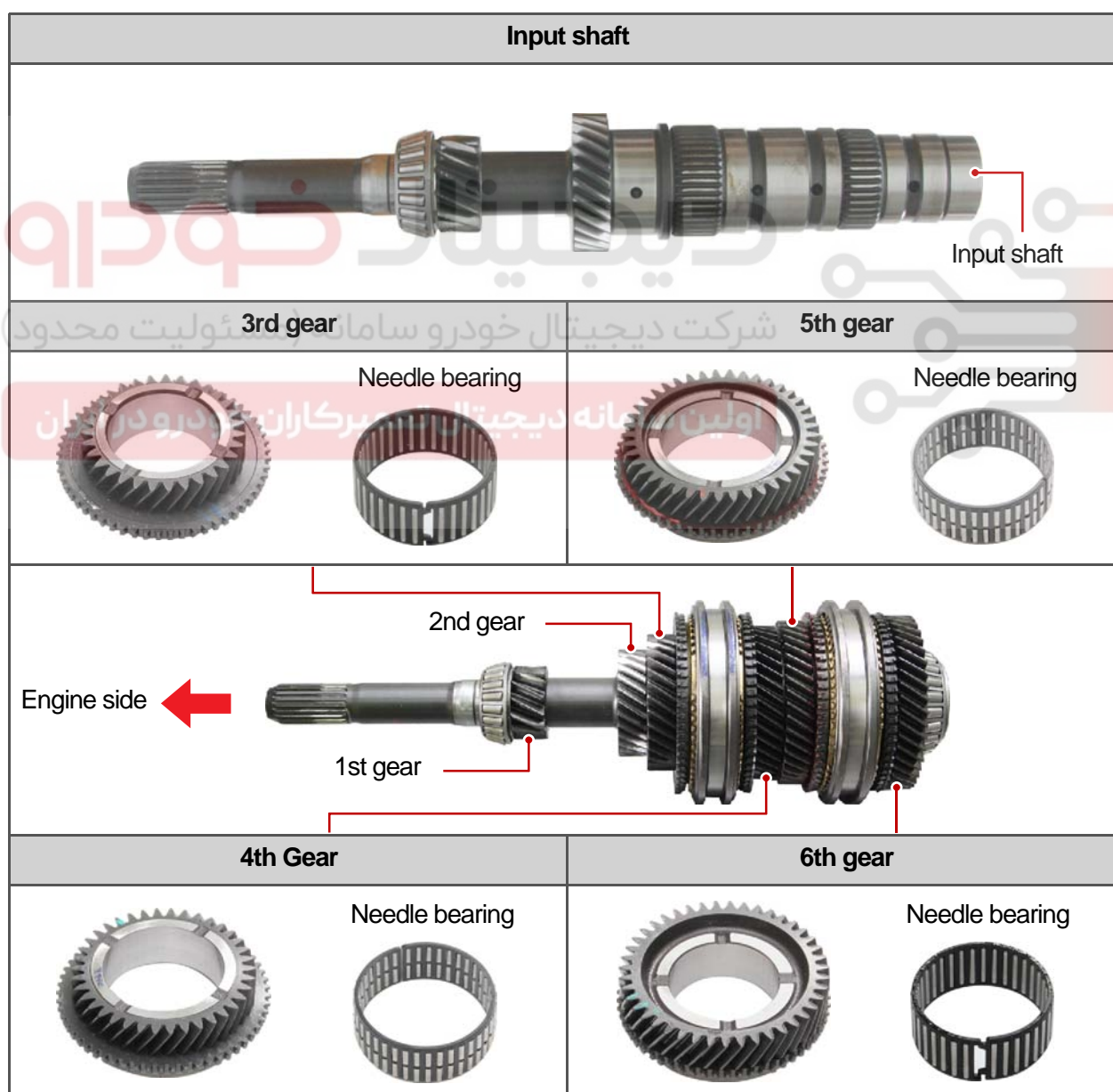
SUB
FRAME

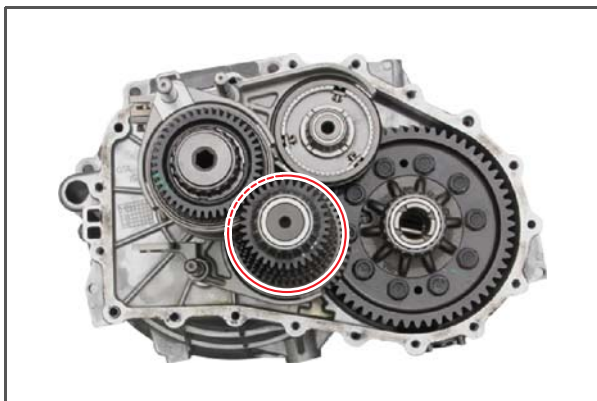
1) Gear Assembly

(1) Input shaft assembly



The input shaft assembly consists of 1st to 6th gears, 3rd, 4th, 5th, 6th gear synchronizer ring assembly, synchronizer hub, needle bearing, and shaft. Each gear meshes with the gears of the output shaft assembly. All gears are helical gear type.



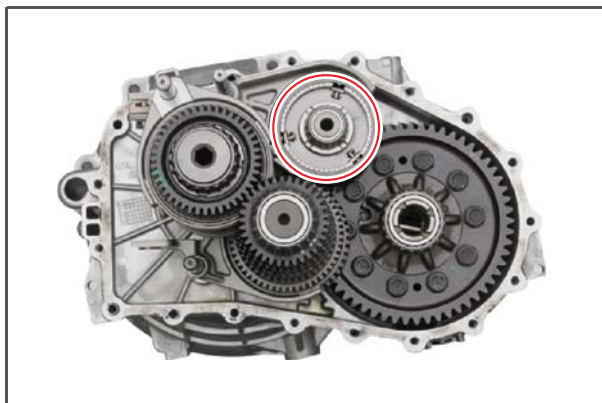
(2) Output shaft assembly

The output shaft assembly consists of 1st to 6th gears, 1st, 2nd gear synchronizer ring assembly, synchronizer hub, needle bearing, and shaft. Each gear meshes with the gears of the input shaft assembly and the reverse gear. The gear on the shaft meshes with the differential drive gear. All gears are helical gear type.

Output shaft			
Output shaft Pinion gear		Output shaft (1st to 6th gear)	
1st gear		3rd gear	5th gear
Needle bearing			
2nd gear		4th Gear	6th gear
Needle bearing			

Modification basis	
Application basis	
Affected VIN	

(3) Reverse gear idler shaft assembly



The reverse gear idler shaft assembly consists of the reverse gear, synchronizer ring assembly, synchronizer hub, needle bearing, and shaft. The gear on the reverse gear idler shaft meshes with the 1st gear of the output shaft assembly and differential gear.

Reverse gear idler shaft

Reverse gear idler
shaft pinion gear



Reverse gear
idler shaft

Engine side ←



Reverse gear

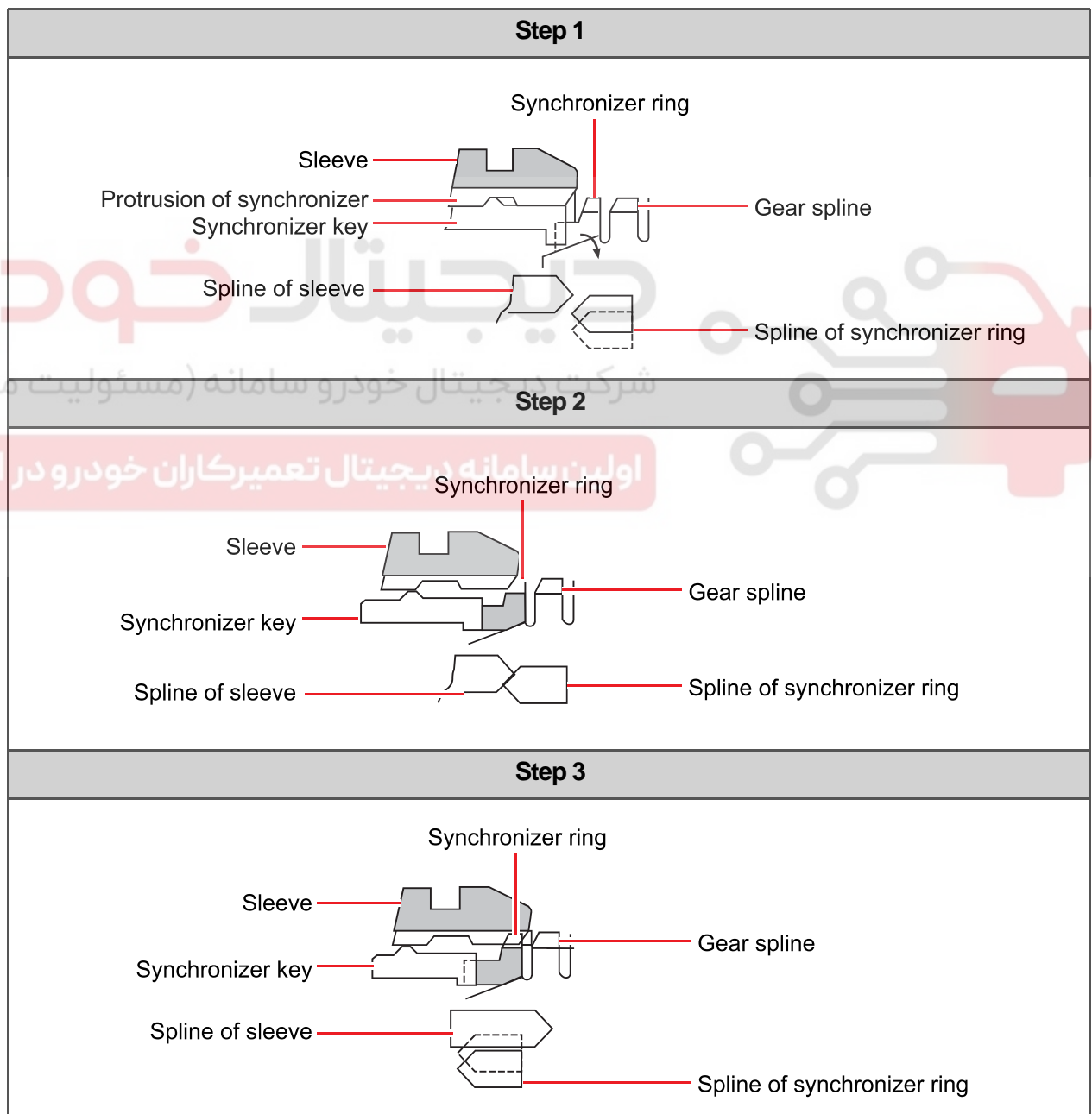
Needle bearing



2) Synchronizer

(1) Mechanism

When the shift lever is shifted, the sleeve is moved by the shift fork. At this time, the protrusion of the synchronizer key is seated on the inner groove of the sleeve (connected to the clutch hub). This movement pushes the synchronizer key to the synchronizer ring side. This leads to the start of synchronization. When the sleeve moves further the force which is applied to the sleeve overcomes the spring tension of the synchronizer spring and makes the sleeve to be displaced. And then the chamfered surface of the sleeve comes in contact with that of the synchronizer ring. This ensures that the gears mesh easily because of the synchronization of the sleeve revolution with the drive gear revolution, resulting in power transmission to the output shaft.



Modification basis	
Application basis	
Affected VIN	

(2) Synchronizer ring

The gears of the T028S6 manual transmission have the following types of synchronizer rings: (a) Triple-cone for the 1st and 2nd gears; (b) Double-cone for the reverse gear; (c) Single-cone for the 3rd, 4th, 5th, and, 6th gears.

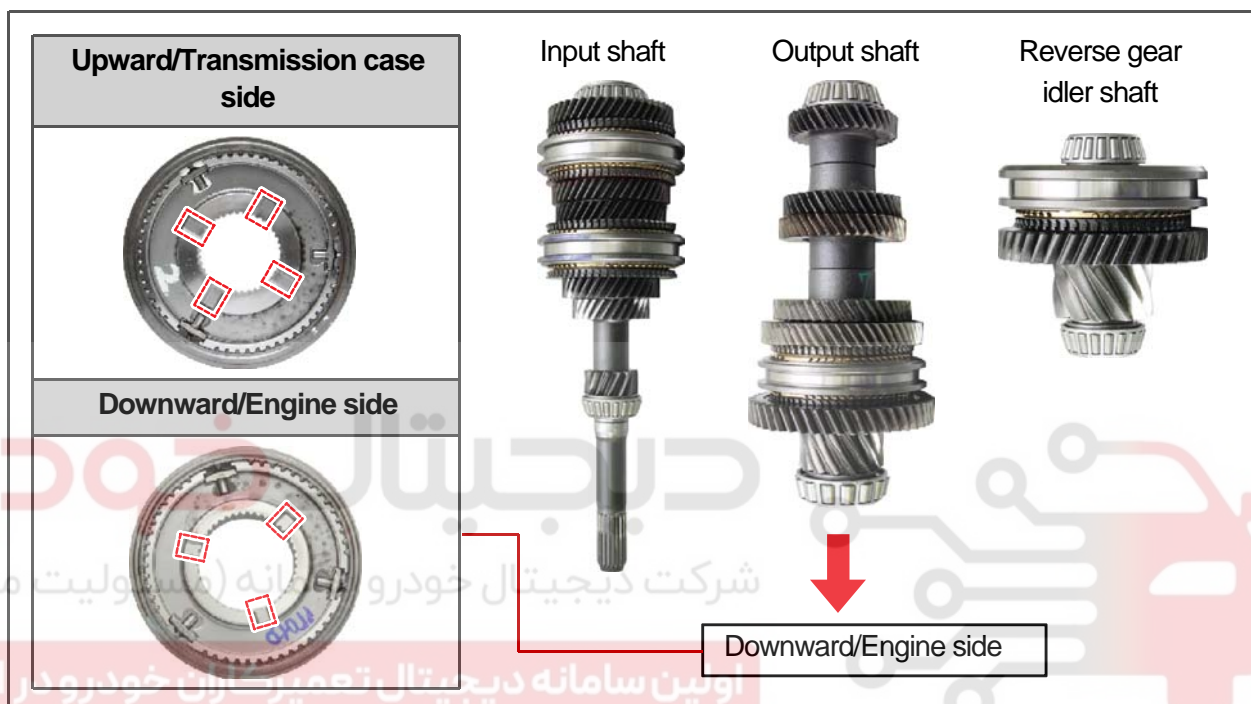
Synchronizer rings for each speed gear			
1st gear Triple-cone			
2nd gear Triple-cone			
3rd gear Single-cone (Carbon)		4th gear Single-cone	
5th gear Single-cone		6th gear Single-cone	
Reverse gear Double-cone			

(3) Synchronizer hub and sleeve

There are total 4 sets of synchronizer hub and sleeve. The reverse gear uses only one of the 4 sets. Since each hub and sleeve have different installation directions, always make sure that they are facing the right direction when assembling.

► Hub

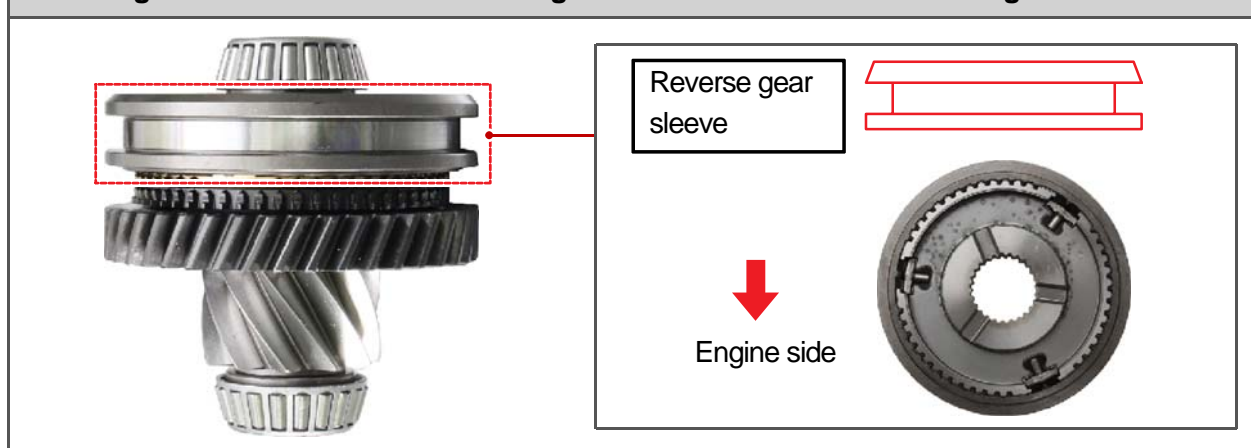
All hubs should be installed with its 3 oil grooves facing the downward (engine side).



► Sleeve

The 1st & 2nd gear sleeve should be installed with its deep grooves facing upward, and the rear gear sleeve with its chamfered side facing upward. The 3rd & 4th gear and 5th & 6th gear sleeves are non-directional.

Reverse gear idler shaft: The sleeve facing transmission case has a bevel angle.



Modification basis	
Application basis	
Affected VIN	

Output shaft: The 3rd & 4th gear and 5th & 6th gear sleeves are non-directional.



5th & 6th gear
sleeve



Engine side



3rd & 4th gear
sleeve



Engine side



Output shaft: The sleeve groove to 2nd gear is deeper than the groove to 1st gear.



1st & 2nd gear
sleeve



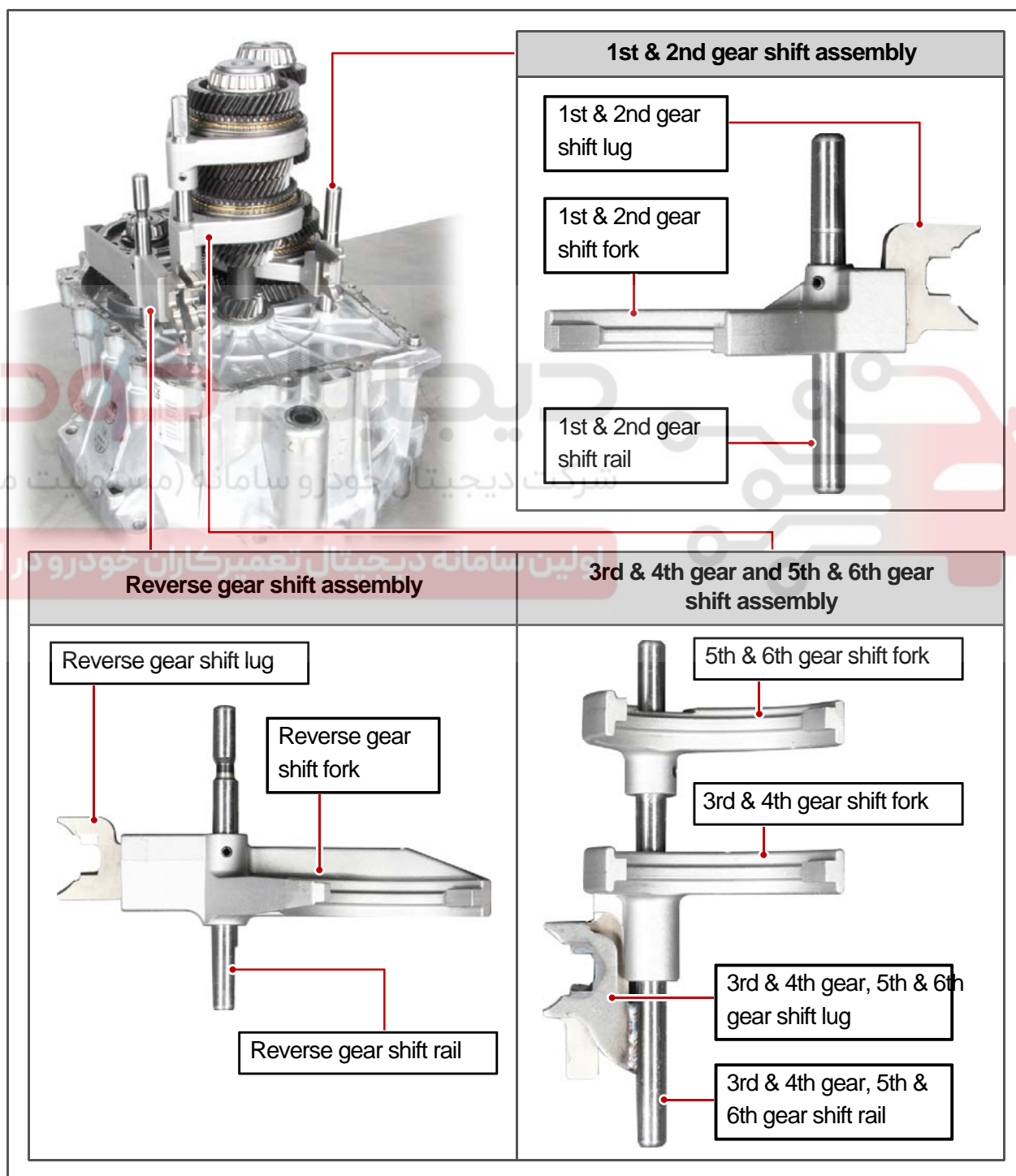
Engine side



3) Shift Fork, Shift Lug, Shift Rail

The total number of shift forks used in this system is the same with that of the synchronizer hubs (4). The 1st & 2nd gear shift fork is installed to a shift rail, and the 3rd & 4th gear and 5th & 6th gear shift forks are installed to another shift rail, and the reverse gear shift fork is installed to the reverse gear shift rail.

The 3rd & 4th gear shift fork is fitted to the rail so that it can slide on the rail. The other shift forks for 1st & 2nd gear, 5th & 6th gear, and reverse gear are fixed to the shift rails with retaining pins.



Modification basis	
Application basis	
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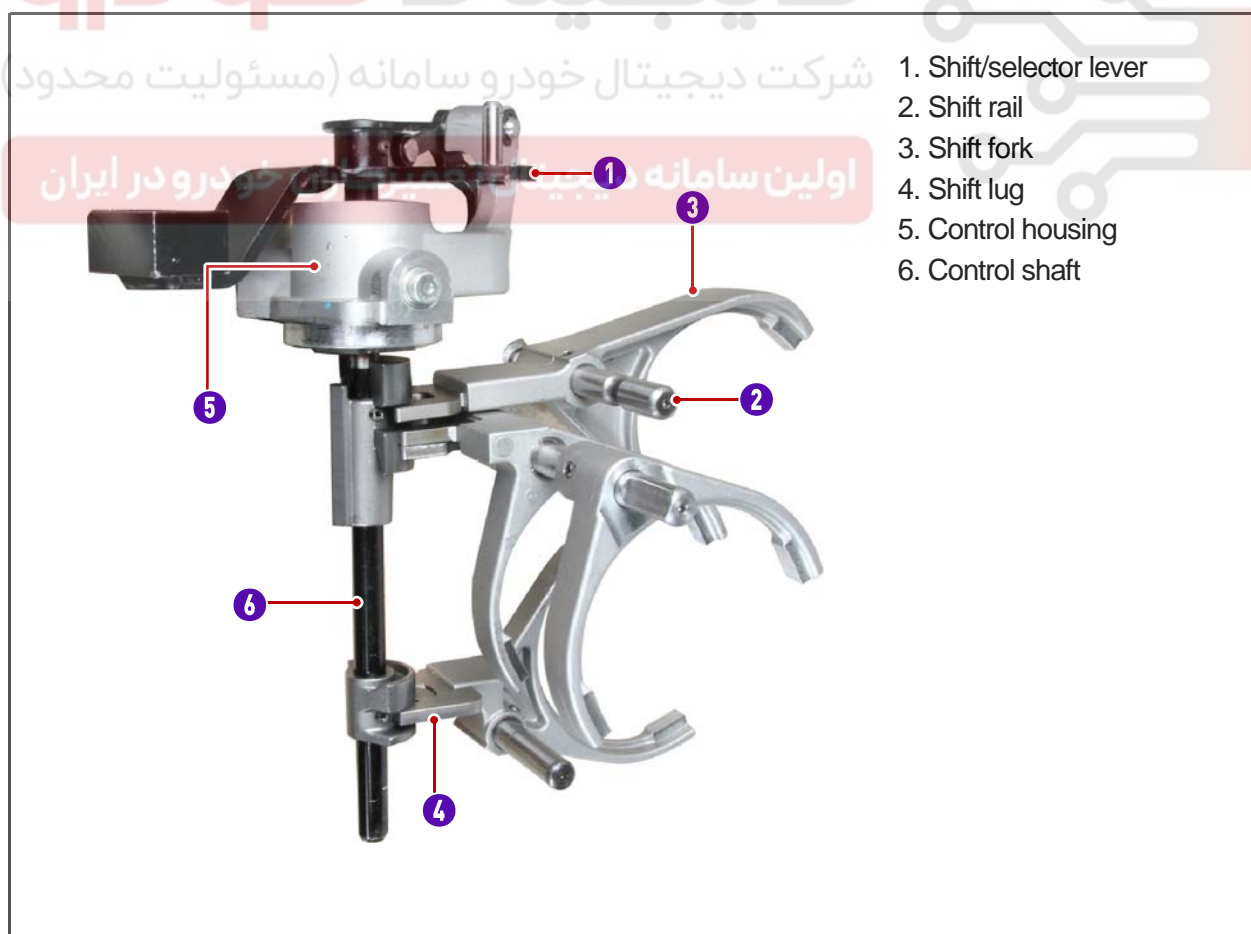
4) Control Lever



The control lever is used for shifting gears and is an essential element of a manual transmission. It consists of a selector lever and a shift lever. The neutral switch is fitted on this lever when installing the transmission case.

The cover and the rail can often be separated from each other when installing or removing the control lever. If so, assemble them together before performing any work.

► Shift mechanism assembly and control lever



1. Shift/selector lever
2. Shift rail
3. Shift fork
4. Shift lug
5. Control housing
6. Control shaft

Modification basis	
Application basis	
Affected VIN	

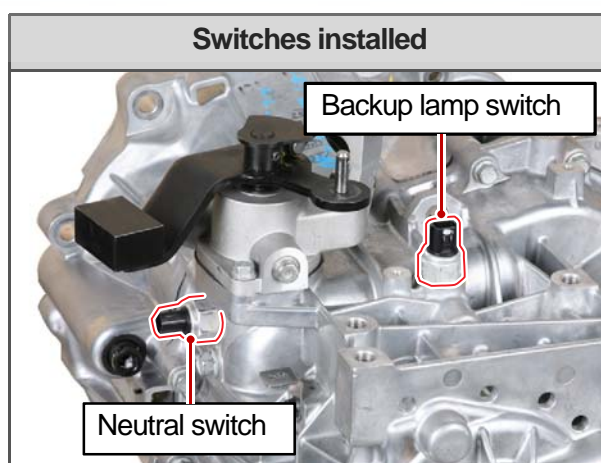
5) Neutral Switch and Backup Lamp Switch

(1) Features of neutral switch

The neutral switch, used in a vehicle with a manual transmission, determines whether the gears are in the neutral position or not, and sends the gear position signal to the engine ECU.

This switch offers the following features:

- To help the cold engine start smoothly by increasing the engine rpm when shifting gears: The engine ECU increases the engine RPM by 100 to 200 rpm based on the received signals from the neutral switch and data such as vehicle speed, clutch operating condition and engine coolant temperature. The neutral signal is used for the Hill Start Assist (HSA) function of the ESP.
- The clutch switch and the neutral switch determine the shifting point and increase the engine RPM (100 to 200 rpm) for smooth starting off of the vehicle (at below 3 km/h). Operating conditions are as follows:
 1. The vehicle is stopped (vehicle speed below 3 km/h)
 2. The clutch pedal is depressed (detected by clutch switch)
 3. The shift lever is in position other than neutral position (detected by neutral switch)
 4. Starting off with the clutch pedal released (detected by clutch switch)
 5. The RPM increases according to the temperature of the engine coolant as shown below (detected by engine coolant temperature sensor):
 - -20°C to 20°C : increased by about 100 rpm
 - 20°C to 60°C : increased by about 100 to 170 rpm
 - About 80°C (normal engine coolant temperature): increased by approx. 200 rpm
 6. If the vehicle speed exceeds 3 km/h after the shifting has been carried out smoothly, the engine rpm returns to the normal operating range.

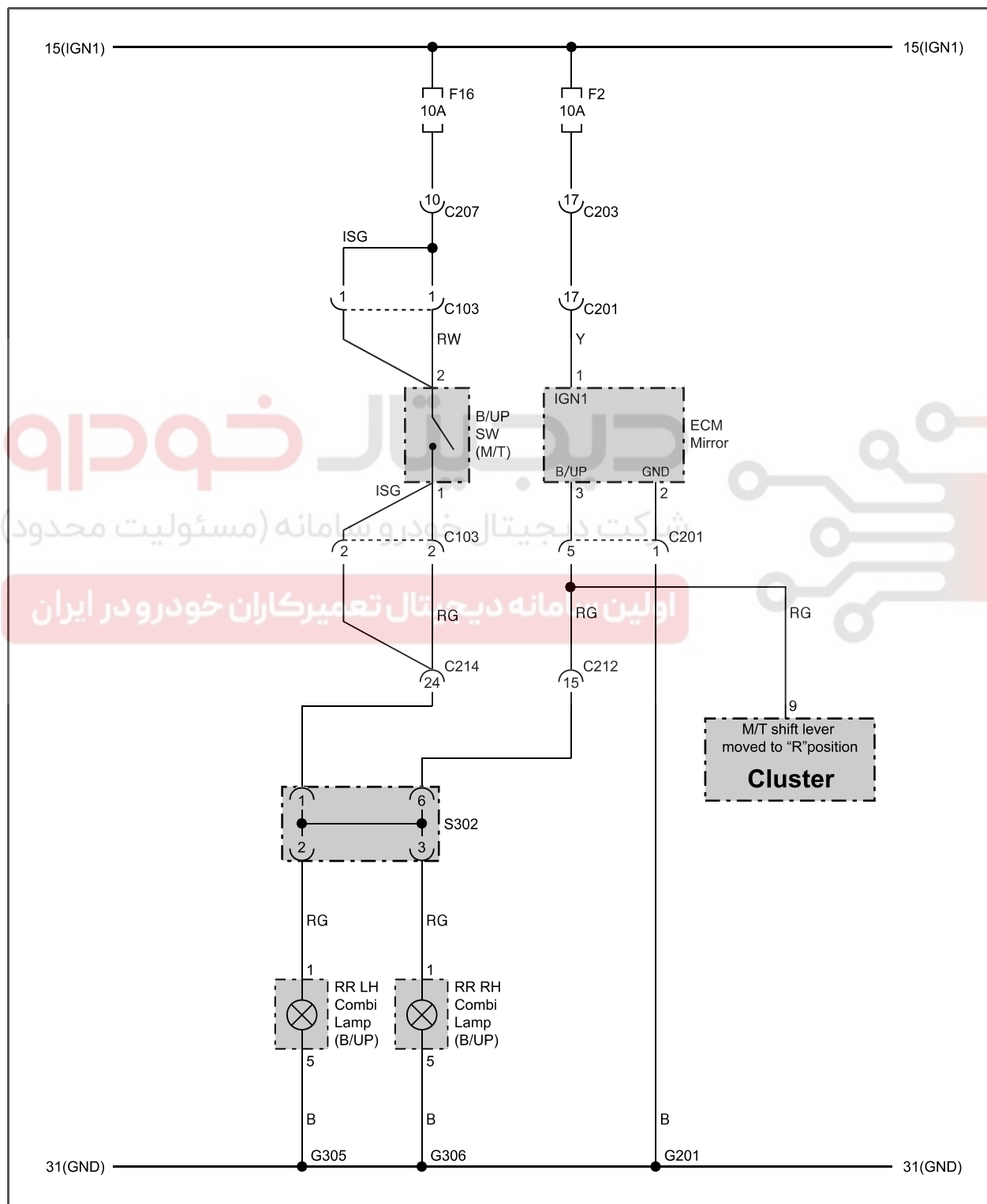


Modification basis	
Application basis	
Affected VIN	

(2) Features of backup lamp switch

When the gear selector lever is shifted to Reverse, the backup lamp switch sends the reverse signal to turn on the backup lamp and the reverse gear indicator on the instrument cluster.

► Circuit diagram



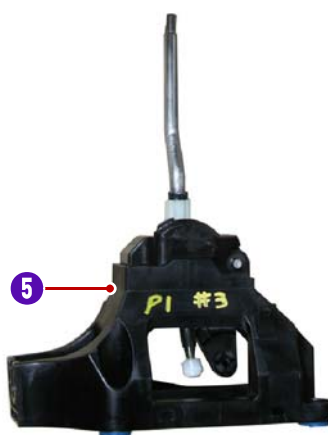
Modification basis	
Application basis	
Affected VIN	

S.G.N.

3710-01 SHIFT LEVER ASSEMBLY

The shift lever (gear selector lever) is installed in front of the center console and connected to the shift cable. When the shift lever is shifted to a certain point, the control lever connected to the shift cable drives the gears in the transmission to select the corresponding gear.

The reverse gear is engaged by pulling the reverse ring.

Shift lever installed**Components**

1. Knob
2. Return spring
3. Reverse pull lever
4. Boot
5. Shift lever assembly

Modification basis	
Application basis	
Affected VIN	

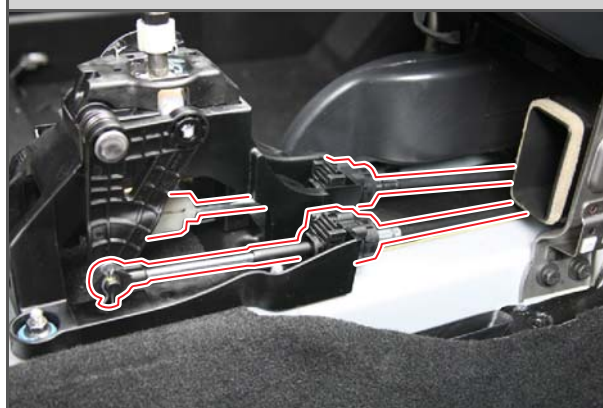
6-SPEED M/T

TIVOLI 2015.06

S.G.N.

3710-03 SHIFT CABLE ASSEMBLY

The shift cable consists of a shift cable and selector cable and connects the shift lever with the control lever. This cable is used to control the shift lever or selector lever according to the shift lever operation.

Shift cable assembly**Shift cable assembly installed****Shift lever side****Transmission side**

Modification basis	
Application basis	
Affected VIN	

REMOVAL AND INSTALLATION

S.G.N.

0000-00 TROUBLESHOOTING

Symptom	Cause	Action
Can not shift (control lever moves)	Control lever assembly broken or damaged.	Replace control lever and housing assembly.
	Damaged offset lever, shift fork, selector place or selector arm.	Remove extension, adapter or case cover. Check or replace damaged parts.
Hard shift or control lever will not move into gear	Clutch not releasing.	Adjust or replace clutch.
	Improper or low transmission oil.	Add or replace with specified oil.
	Shift or shift rail binding.	Remove extension, adapter or case cover. Check or replace damaged parts.
	Binding of sliding synchronizers or gears.	Remove extension, adapter or case cover. Check synchronizers and gears and replace damaged parts.
	If reverse only, faulty backup switch.	Check or replace backup switch.
	Worn or damaged flywheel pilot bushing.	Replace pilot bushing.
Gears crash when shifting	Engine idle speed too high.	Adjust idle speed to specified speed.
	Damaged or faulty clutch.	Adjust or replace clutch.
	Pilot bearing between input shaft and output shaft binding.	Replace or check roller bearings.
	Damaged synchronizer.	Check or replace synchronizer parts.
	Bell housing misaligned.	Align bell housing and bore.
	Damaged gear(s).	Check or replace gear(s).
	Worn or damaged flywheel pilot bushing.	Replace pilot bushing.
Transmission jumps out	Loosened transmission or flywheel housing bolts, improper alignment.	Tighten bolts to specified value. Realign if necessary.
	Synchronizer damaged or excessively worn.	Check or replace synchronizer parts.
	Blocking ring damaged, worn index slots or friction surfaces worn or damaged.	Check or replace blocking ring.
	Excessive countershaft end play.	Check worn or damaged parts. Adjust shim thickness using roller bearings if necessary.
	Worn or damaged fork due to loosened shaft, rail or shifting fork.	Check for wear or damaged. Replace worn or damaged parts.
Transmission locked in one gear	Fork or offset lever loose on shaft or rail.	Replace extension, adapter or case cover. Check or replace loose parts on shaft or rail. Replace roll pin(s).
	Worn or damaged forks, offset lever, shaft or rail.	Remove extension, adapter or case cover. Check for wear or damaged. Replace damaged parts.
	Worn or damaged synchronizer.	Check worn or damaged synchronizer parts and replace if necessary.
	Worn or damaged gears.	Check worn or damaged gears and replace if necessary.

Modification basis	
Application basis	
Affected VIN	

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Symptom	Cause	Action
Transmission noise	Improper or low transmission oil.	Add or drain and replace with proper oil.
	Loose bolts or other attaching parts.	Tighten as specified.
	Improper flywheel housing to engine crankshaft alignment.	Realign correctly.
	Noisy transmission bearing.	Check bearings, bearing rollers and parts for wear or damage. Replace if necessary.
	Noisy gears.	Check for worn or damaged gears (including speedometer gear). Replace if necessary.
Transmission leakage	Leakage from transmission.	Clean all exposed surfaces, then check for leaks.
	Vent or breather clogged.	Clean or replace vent or breather.
	Too much oil.	Check oil level.
	Loose bolts at sealing faces.	Tighten as specified.
	Improperly applied sealant.	Clean leaking surfaces. Reapply sealant.
	Worn or damaged oil seal.	Replace oil seal.

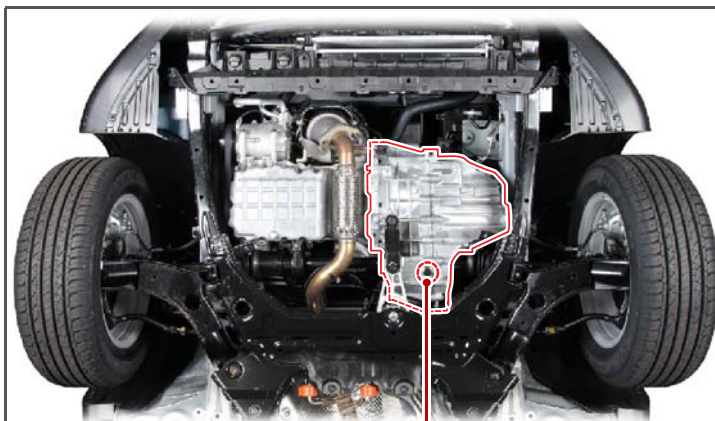
دیجیتال خودرو

شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

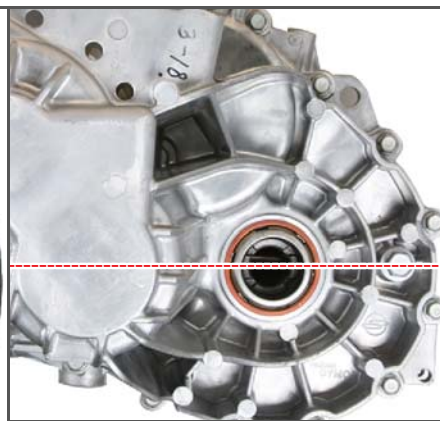
اولین سامانه دیجیتال تعمیرکاران خودرو در ایران



S.G.N.

9210-02 FLUID CHECK AND CHANGE

Oil drain plug



The transmission fluid level check plug is mounted on the back side of the M/T. The oil level is normal if the oil reaches the thread area of the plug.

1) Oil Check and Add

Stop the vehicle on a level surface, and check the transmission fluid level 5 minutes after shutting off the engine.

**WARNING**

Do not check the transmission fluid level immediately after switching off the engine. Otherwise, hot oil can cause burns.

1. Remove the oil filler plug and check the transmission fluid level.

**NOTE**

The fluid level should be around the bottom of the transmission fluid level check plug thread.
(transmission fluid volume: 1.9 L)

2. If needed, add the transmission fluid to the proper level through the oil filler plug.
(Specified oil: SAE 70W)
3. After adding (or changing) the oil, tighten the filler plug to the specified torque and check for oil leaks.

**CAUTION**

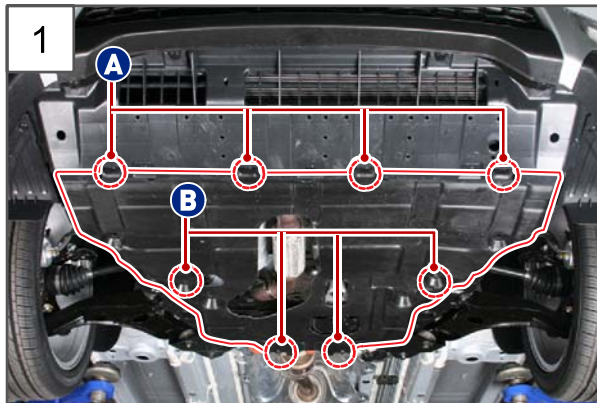
- The manual transmission fluid is a essential element for mechanical durability of the transmission. Check the fluid level at the specific interval and replace if needed.
(Check and add at every 60,000km of driving or 3 years)
(Normal driving conditions: Change is not required, Under severe conditions: Change at every 120,000 km)
- The oil replacement should be done at the qualified and authorized service station.

Modification basis	
Application basis	
Affected VIN	

6-SPEED M/T

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2) Transmission Fluid Change



⚠ CAUTION

Stop the vehicle on a level surface, and change the transmission fluid 5 minutes after shutting off the engine.

1. Remove the 4 retaining pins (A) and 4 mounting bolts (B, 12 mm) to remove the under cover.

Tightening torque 13.7 to 17.6 Nm



2. Put an oil container under the drain plug.

⚠ WARNING

Do not carry out this work immediately after switching off the engine. Otherwise, hot oil can cause burns.



3. Remove the drain plug (24 mm) and drain the fluid completely. After that, tighten the drain plug to the specified torque.

⚠ CAUTION

Make sure that no transmission fluid contacts to other objects.

Tightening torque 58.8 to 78.4 Nm



4. Remove the filler plug (17 mm) to add the fluid and then tighten the filler plug to the specified torque.

Tightening torque 58.8 to 78.4 Nm

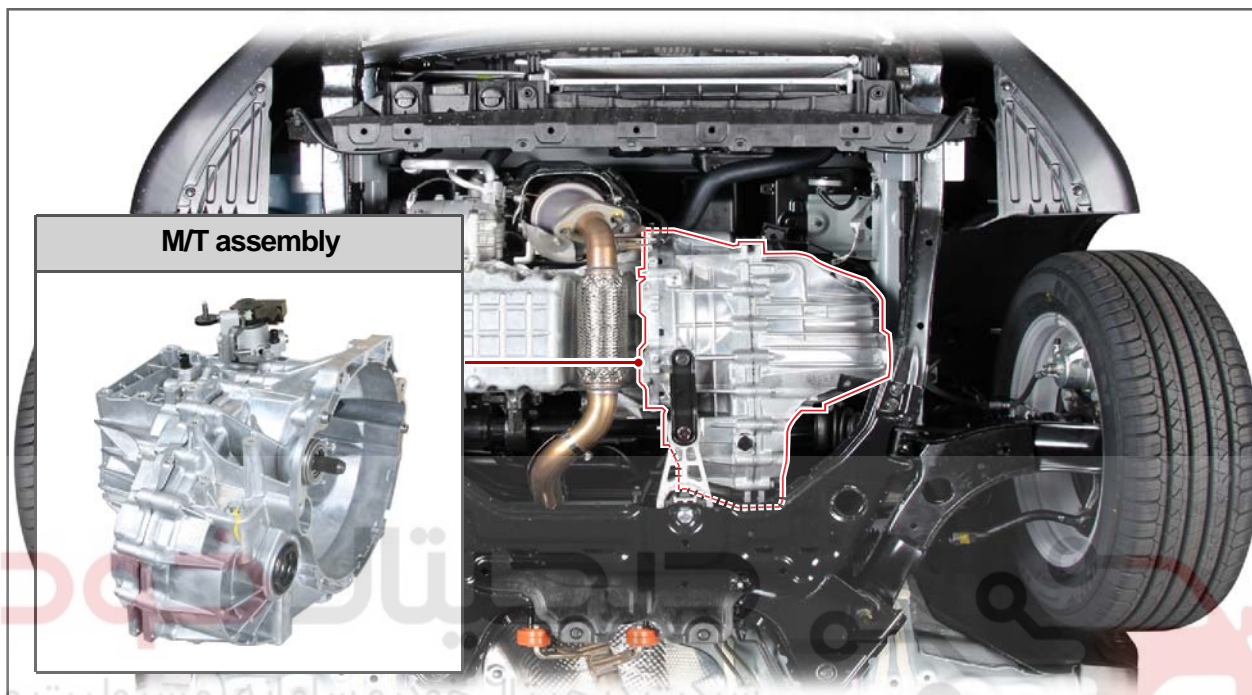
Specified oil (Oil volume)	SAE 70W (1.9ℓ)
---------------------------------------	-------------------

5. Check for oil leaks after changing or adding the transmission fluid.

S.G.N.

3190-01 M/T ASSEMBLY (G16DF)**Preceding work**

- Disconnect the battery negative cable.
- Remove the front/rear under covers.
- Drain the transmission fluid.



1. Remove the front drive shafts (LH/RH).

**NOTE**

See "FRONT DRIVE SHAFT" in "REMOVAL AND INSTALLATION" under "DRIVE SHAFT AND AXLE SYSTEM".



2. Remove the intermediate shaft.

**NOTE**

See "FRONT DRIVE SHAFT" in "REMOVAL AND INSTALLATION" under "DRIVE SHAFT AND AXLE SYSTEM".

Modification basis	
Application basis	
Affected VIN	

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3. Remove the front exhaust muffler.



NOTE

Refer to "FRONT EXHAUST MUFFLER" under "REMOVAL AND INSTALLATION" subsection of "EXHAUST SYSTEM" section in "ENGINE" chapter.

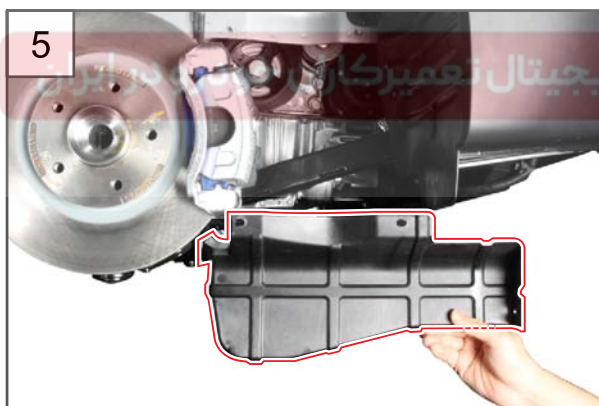


CAUTION

Perform the work after the muffler cools down in order to getting burn



4. Unscrew the 2 side cover mounting bolts (10 mm) on each side and 1 plastic nut (12 mm) on each side.



5. Remove the RH/LH side covers.



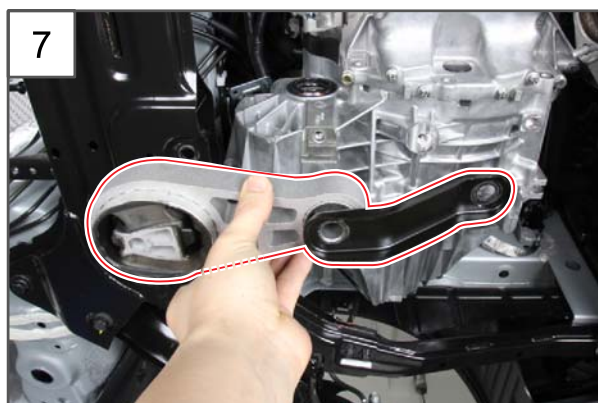
6. Unscrew the 3 mounting bolts (17 mm) for the rear engine mounting insulator to remove the rear engine mounting insulator.

Tightening torque 68.6 ~ 88.2Nm



CAUTION

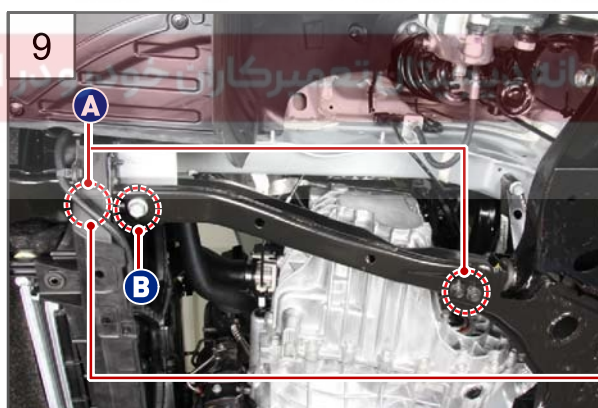
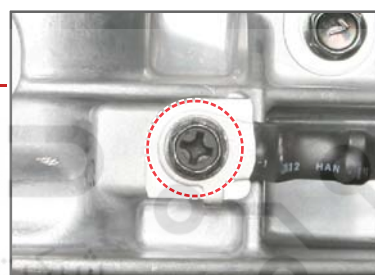
Please note that the bolts have different shapes.



7. Remove the rear engine mounting insulator.

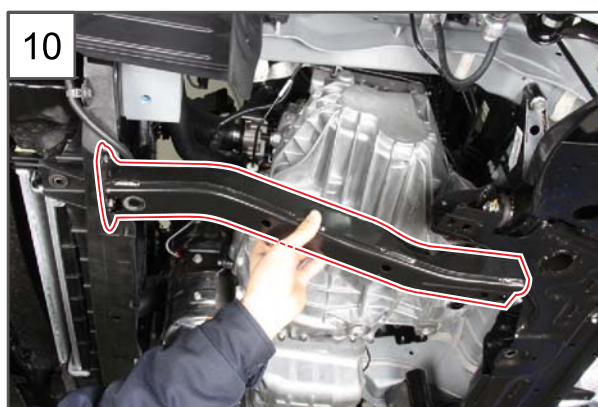
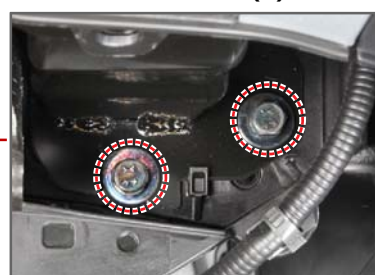


8. Unscrew the mounting bolt (10 mm) for the manual transmission ground wiring.



9. Unscrew the 4 impact beam mounting bolts (A, 12 mm) on each side and 1 mounting bolt (B, 17 mm) on each side.

Tightening torque (A) 29.4 ~ 34.3Nm
(B) 88.2 ~ 107.8Nm

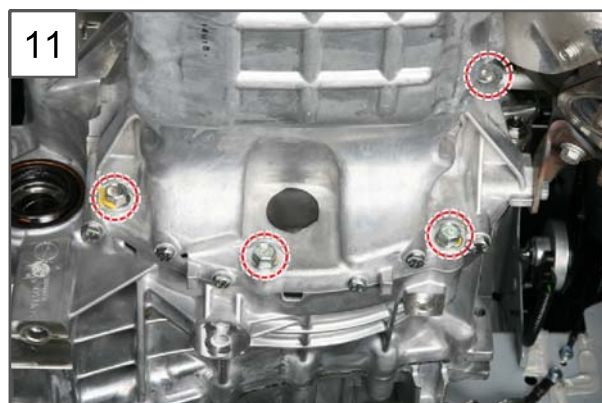


10. Remove the LH/RH impact beams.

Modification basis	
Application basis	
Affected VIN	

6-SPEED M/T

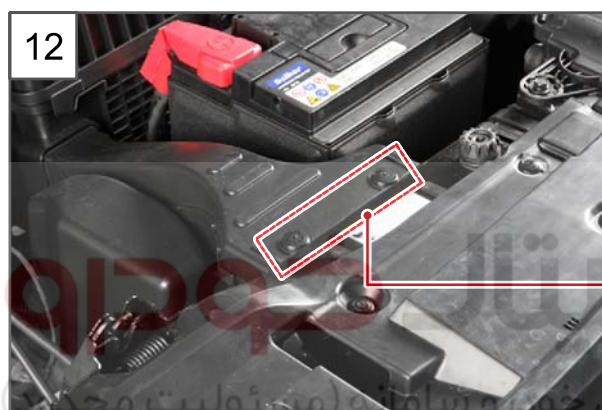
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11

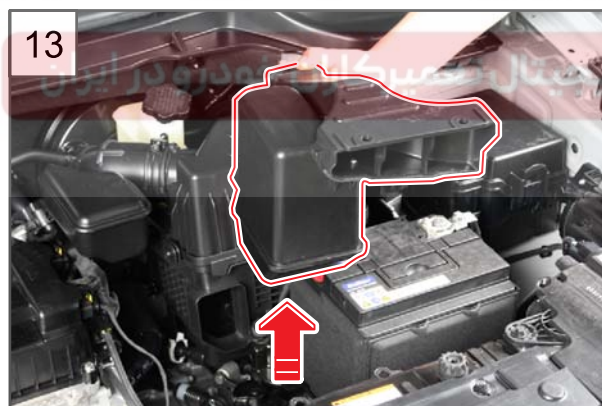
11. Unscrew the 4 lower manual transmission mounting bolts (14 mm).

Tightening torque 56 ~ 62Nm



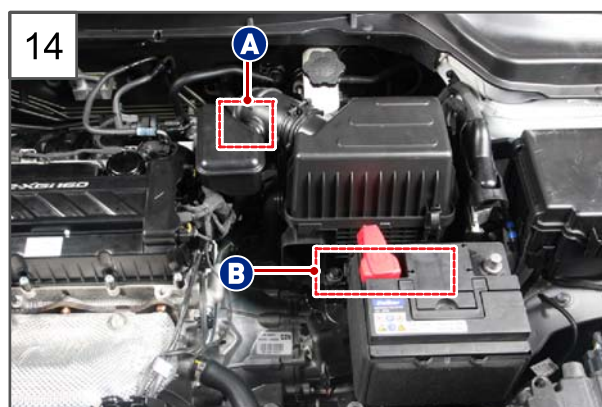
12

12. Remove the 2 mounting screw rivets for the snorkel assembly from the upper part of the vehicle



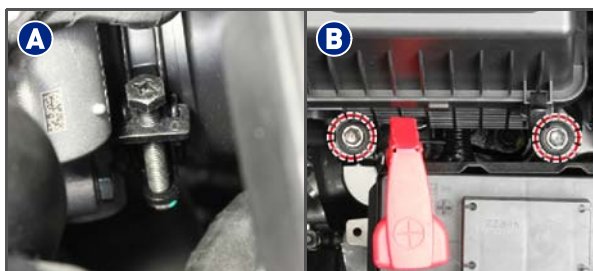
13

13. Remove the snorkel assembly.



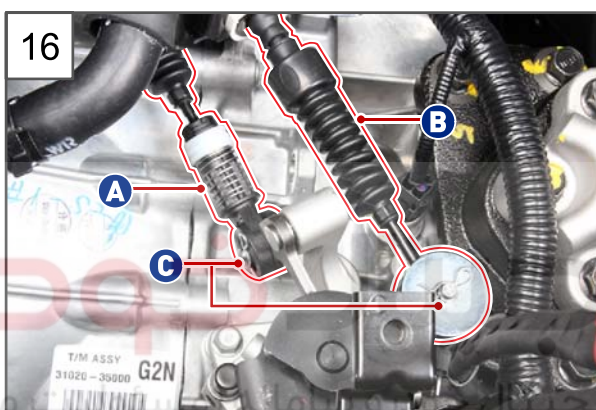
14

14. Unscrew the intake hose clamp bolt (A, 10 mm) and the 2 mounting bolts (B, 12 mm) for the air cleaner housing.





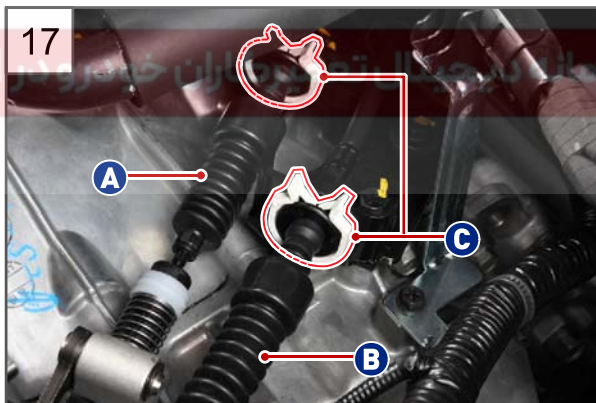


15. Remove the air cleaner housing with the intake hose.

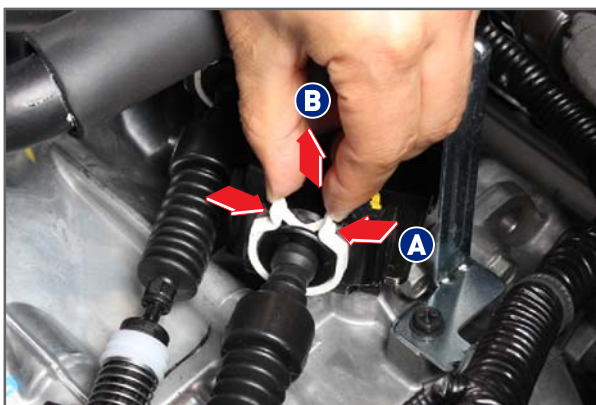


16. Remove the twist pins (C) for the selector cable (A) and shift cable (B) and remove the selector cable washer.

Twist pin	Washer
	



17. Detach the retaining clips (C) for the selector cable (A) and shift cable (B) from the mounting bracket on the transmission.



NOTE

When detaching the clips, press on the protrusions of the clip in the direction of the arrow (A) and pull up in the direction of the arrow (B).

Modification basis	
Application basis	
Affected VIN	

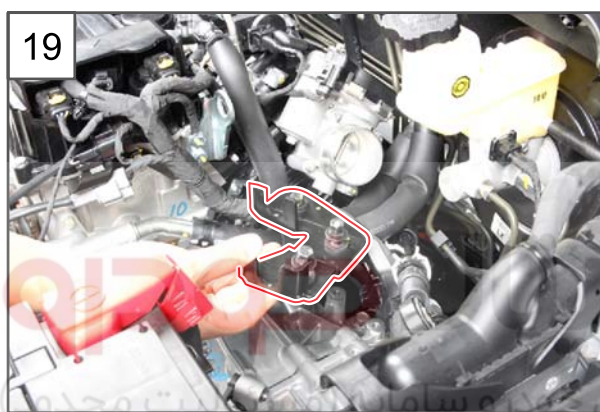
6-SPEED M/T

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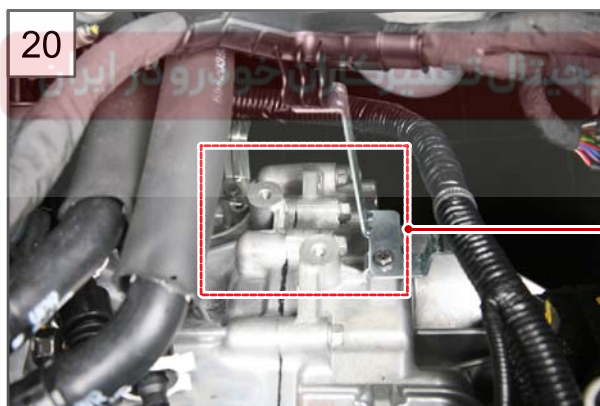


18. Unscrew 3 mounting bolts (12 mm) for the selector cable and shift cable.

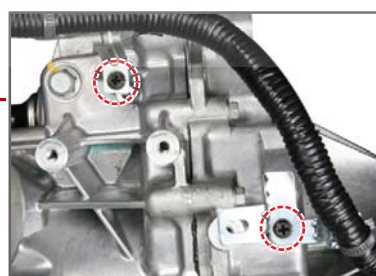
Tightening torque 17.7 ~ 21.6Nm



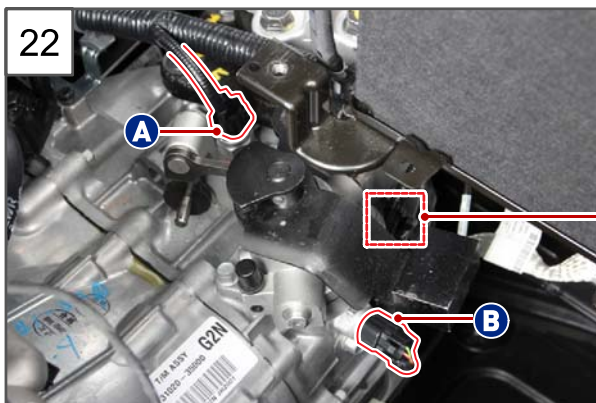
19. Remove the transmission cable mounting bracket.



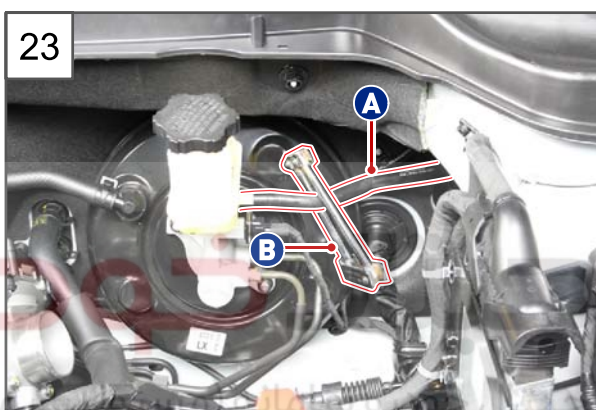
20. Unscrew the 2 mounting bolts (10 mm) for the battery cable mounting bracket.



21. Fix the battery cable mounting bracket, shift cable, and selector cable to the vehicle body to prevent interference when removing the M/T.



22. Disconnect the connectors for the back up lamp (A) and neutral switch (B) and remove the retaining clamp for the neutral switch wiring.



23. Fit a hydraulic shut-off clamp (B) on the clutch oil feed hose (A) to cut off the oil supply.



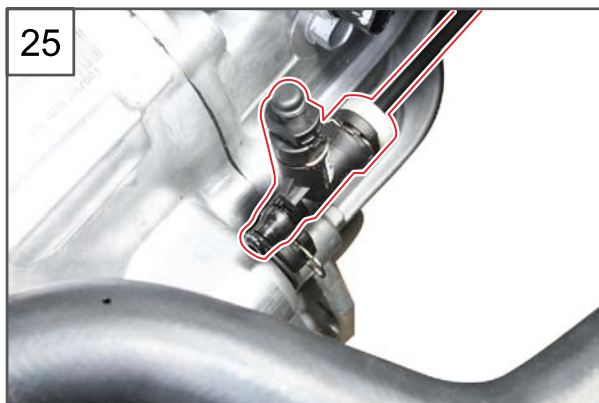
24. Detach the air Breather mounting pin.



⚠ CAUTION

The pin cannot be removed completely because of the retaining part. Do not try to remove the pin by applying excessive force. Just separate it.

Modification basis	
Application basis	
Affected VIN	

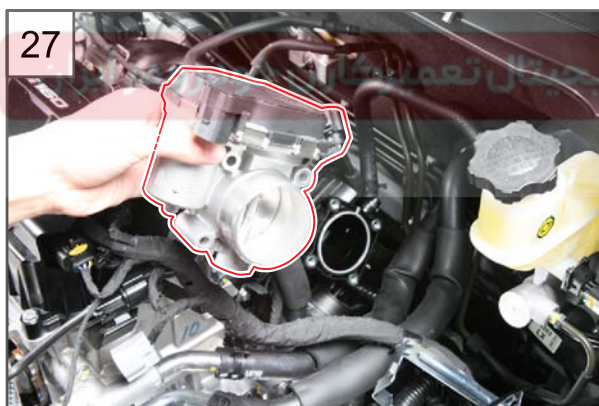


25.Remove the air breather and oil pipe.



26.Unscrew the 4 mounting bolts (10 mm) for the electronic throttle body.

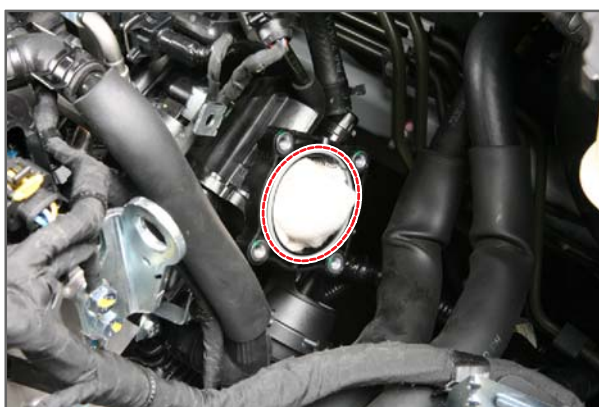
Tightening torque $10 \pm 1.0\text{Nm}$



27.Remove the electronic throttle body.

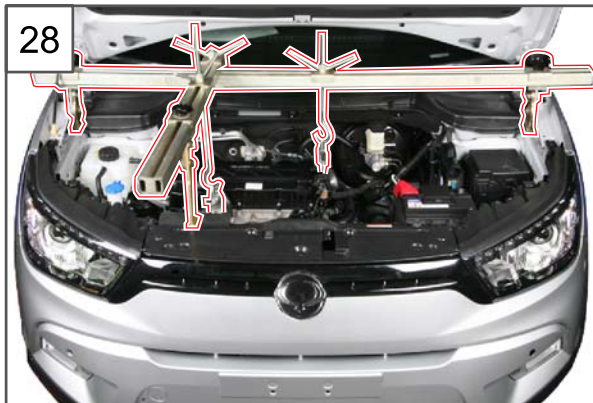
NOTE

This is to prevent the heater hose from being torn by the interference with the engine with transmission in the process of removal of transmission using the engine hanger.



CAUTION

Cover the inlet with a clean cloth or gloves, so that foreign matter does not enter into the intake manifold.

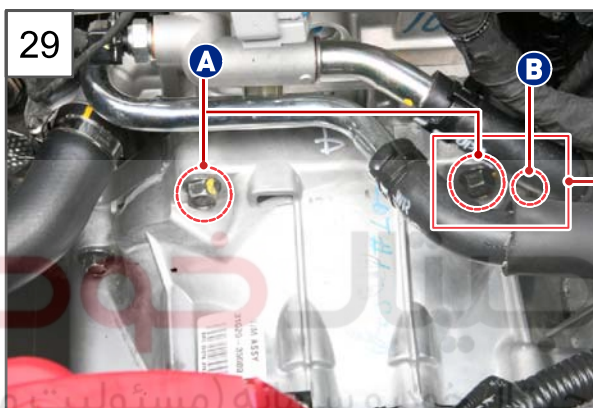


28. Install the engine support hanger.



NOTE

Refer to "INSTALLING THE ENGINE SUPPORT HANGER" under "SPECIAL SERVICE TOOLS" subsection of "ENGINE GENERAL" section in "ENGINE" chapter.



29. Unscrew the 2 M/T upper mounting bolts (A, 17 mm) and the start motor upper mounting bolt (B, 14 mm).

Tightening torque A : 85 ~ 100Nm

B : 45 ± 5Nm



30. Loosen the mounting nut (17 mm) for the engine mount bracket slightly.

Tightening torque 68.6 ~ 88.2Nm



NOTE

This is for preventing an excessive force from being applied to the engine mount when tilting the engine and manual transmission.



31. Unscrew the 3 mounting bolts (17 mm) for the transmission mount.

Tightening torque 85 ~ 100Nm



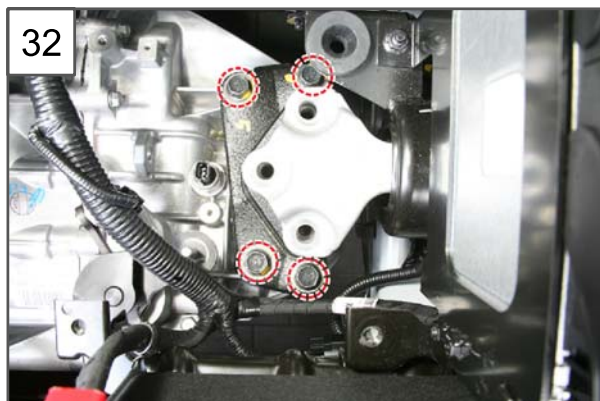
CAUTION

When you unscrew the transmission mount mounting bolt, adjust the engine hanger properly so that the engine and transmission assembly does not sag.

Modification basis	
Application basis	
Affected VIN	

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32. Unscrew the 4 mounting bolts (17 mm) for the transmission mount bracket.

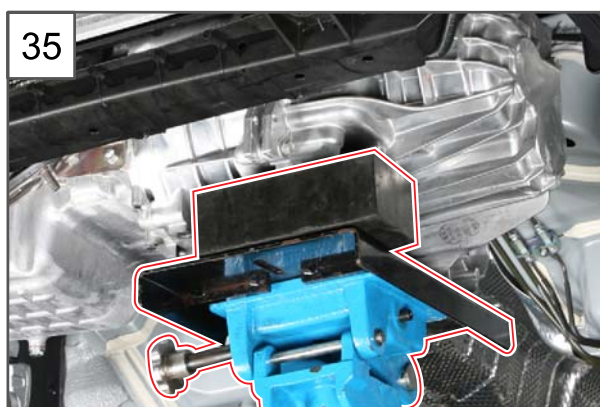
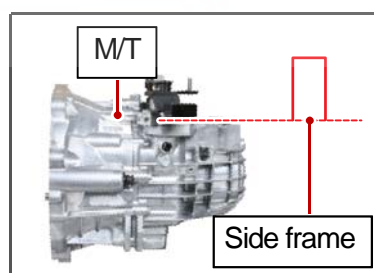
Tightening torque 85 ~ 100Nm



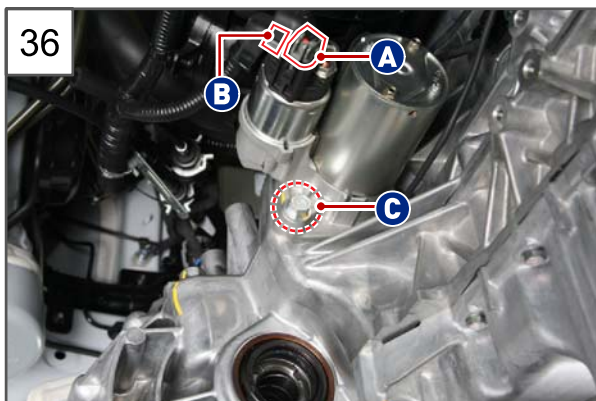
33. Remove the transmission mount bracket.



34. Adjust the engine hanger and tilt the engine and transmission assembly to locate the transmission under the side frame.



35. Place the transmission jack under the manual transmission securely.



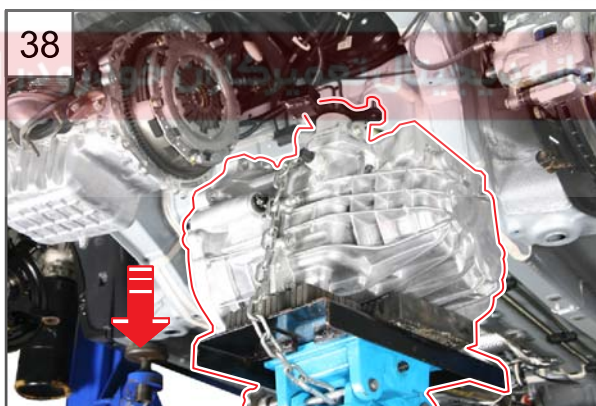
36. Disconnect the ST terminal connector (A) of the starter motor and remove the B+ terminal mounting nut (B, 12 mm) and the mounting bolt (C, 14 mm) located under the starter motor to remove the starter motor.

Tightening torque (B) 10 ~ 12Nm
(C) 45 ± 5Nm



37. Unscrew the mounting bolt (14 mm) at the front side of the M/T.

Tightening torque 54Nm + 20°



38. Lower the jack slowly to remove the transmission from the vehicle.

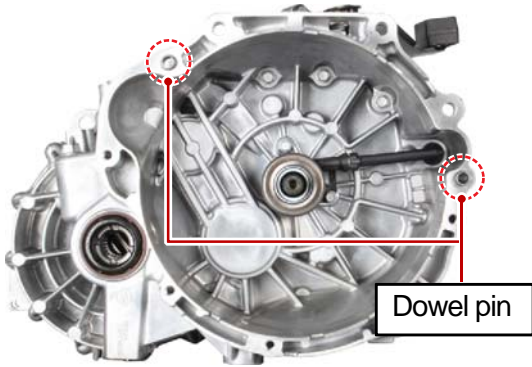
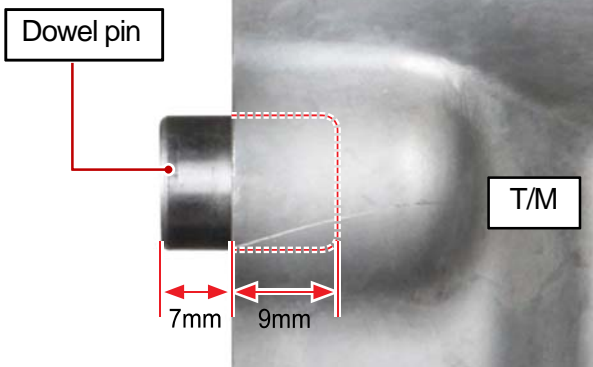
CAUTION

Lower the transmission jack slowly, ensuring that there is no interference.



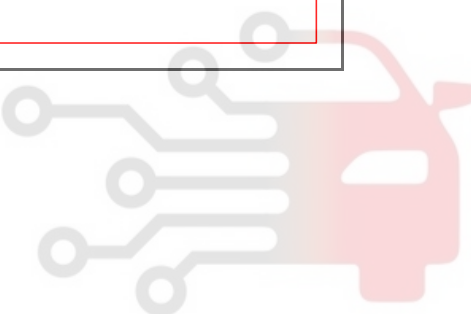
39. Install in the reverse order of removal.

Modification basis	
Application basis	
Affected VIN	

Cautions for installation	
Position of dowel pin	Installation of dowel pin
	
<p>⚠ CAUTION</p> <p>Since the dowel pin may move out of its position when removing the manual transmission, check the installation of the dowel pin when fitting the transmission.</p>	

شرکت دیجیتال خودرو (مسئولیت محدود)

اولین سامانه دیجیتال تعمیرکاران خودرو در ایران

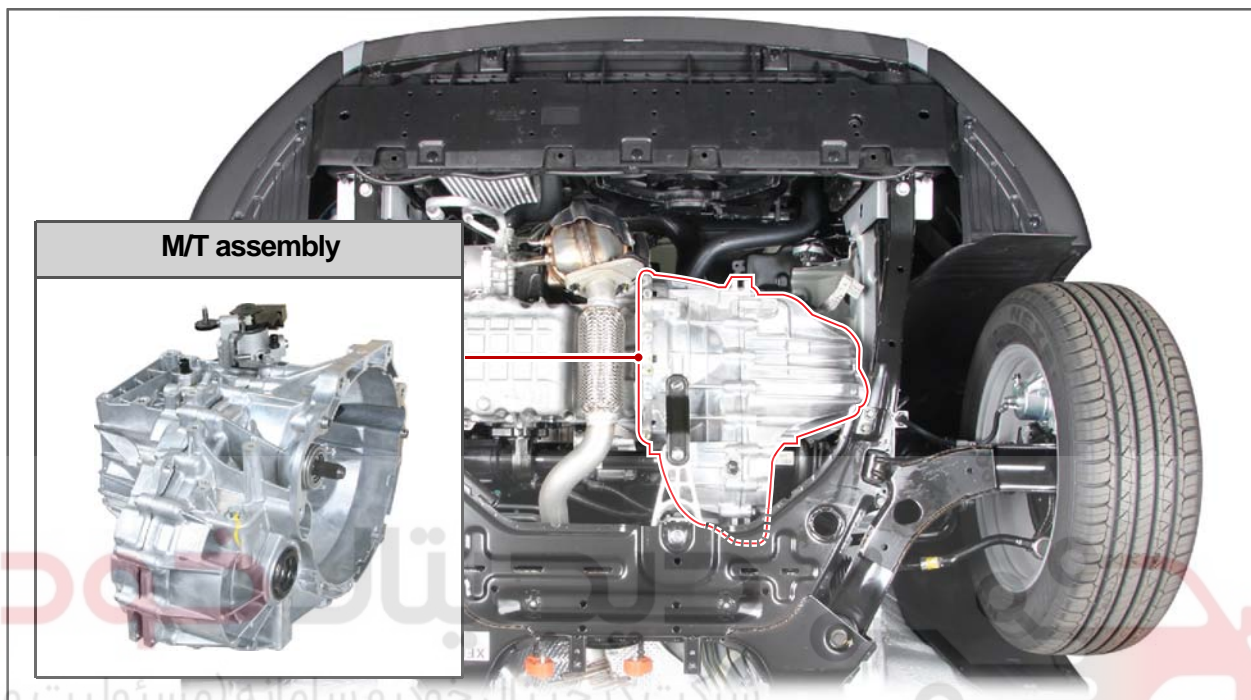


Modification basis	
Application basis	
Affected VIN	

S.G.N.

3190-01 M/T ASSEMBLY (D16DTF)**Preceding work**

- Disconnect the battery negative cable.
- Remove the front/rear under covers.
- Drain the transmission fluid.



1. Remove the front drive shafts (LH/RH).

**NOTE**

See "FRONT DRIVE SHAFT" in "REMOVAL AND INSTALLATION" under "DRIVE SHAFT AND AXLE SYSTEM".



2. Remove the intermediate shaft.

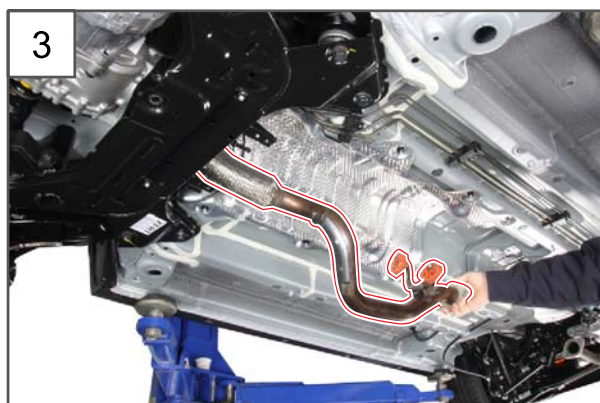
**NOTE**

See "FRONT DRIVE SHAFT" in "REMOVAL AND INSTALLATION" under "DRIVE SHAFT AND AXLE SYSTEM".

Modification basis	
Application basis	
Affected VIN	

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3. Remove the front exhaust muffler.



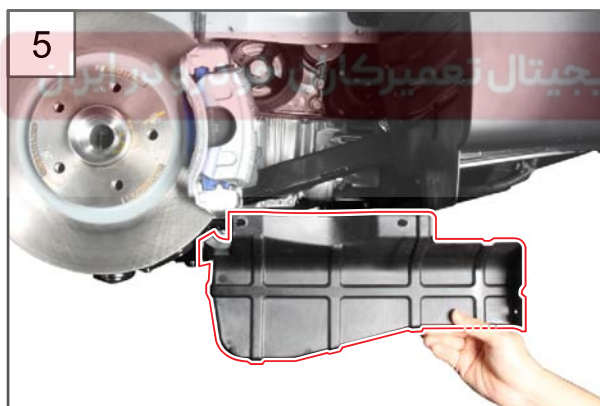
NOTE

Refer to "FRONT EXHAUST MUFFLER" under "REMOVAL AND INSTALLATION" subsection of "EXHAUST SYSTEM" section in "ENGINE" chapter.

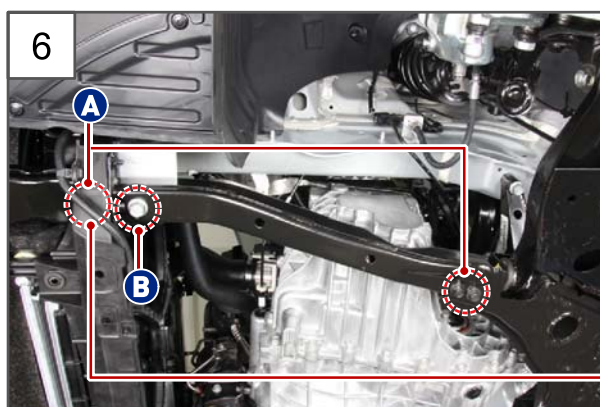


CAUTION

Perform the work after the muffler cools down in order to getting burn.



5. Remove the RH/LH side covers.



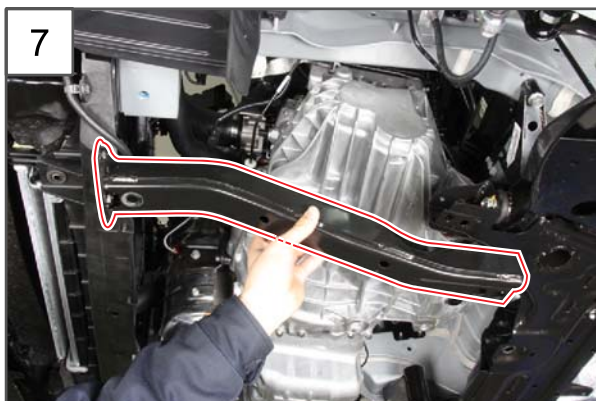
6. Unscrew the 4 impact beam mounting bolts (A, 12 mm) on each side and 1 mounting bolt (B, 17 mm) on each side.

Tightening torque

(A) 29.4 ~ 34.3Nm

(B) 88.2 ~ 107.8Nm

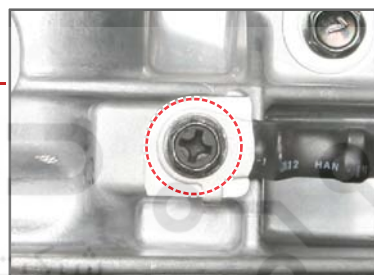




7. Remove the LH/RH impact beams.



8. Unscrew the mounting bolt (10 mm) for the manual transmission ground wiring.



9. Unscrew the 3 lower manual transmission mounting bolts (14 mm).

Tightening torque 56 ~ 62Nm



10. Unscrew 3 bracket mounting bolts No. 4 (12 mm) on bottom of the CDPF.

Tightening torque 68.6 ~ 88.2Nm

⚠ CAUTION

Please not that the black bolt is to be fitted to the engine side.

Modification basis	
Application basis	
Affected VIN	

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11. Remove the bracket No. 4 to the engine with CDPF.



12. Unscrew the mounting bolt (14 mm) at the bottom of the M/T.

Tightening torque 56 ~ 62Nm



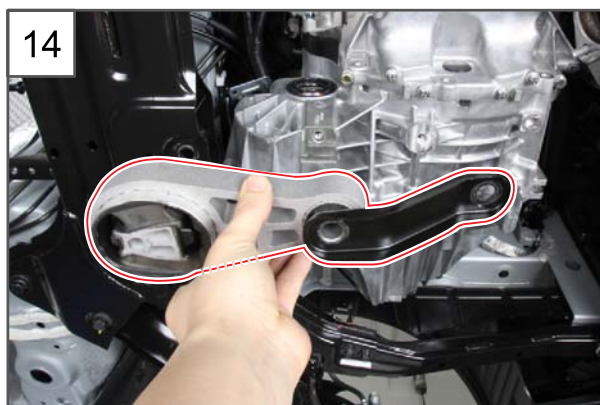
13. Unscrew the 3 mounting bolts (17 mm) for the rear engine mounting insulator to remove the rear engine mounting insulator.

Tightening torque 68.6 ~ 88.2Nm



CAUTION

Please note that the bolts have different shapes.



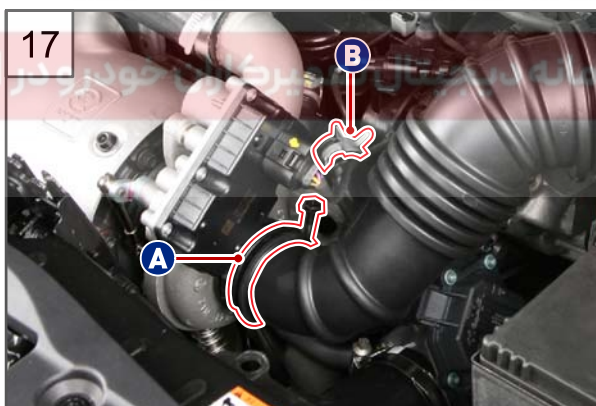
14. Remove the rear engine mounting insulator.



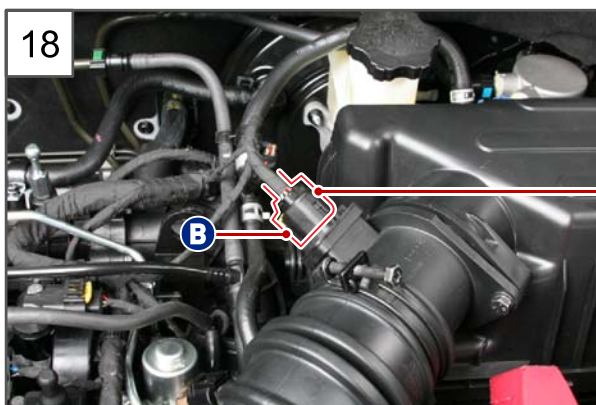
15. Remove the 2 screw rivets securing the snorkel assembly.



16. Remove the snorkel assembly.



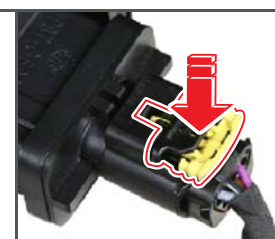
17. Remove the retaining clamp (A) for the hose between the air cleaner and turbocharger and the oil separator hose clamp (B).



18. Disconnect the HFM sensor connector.

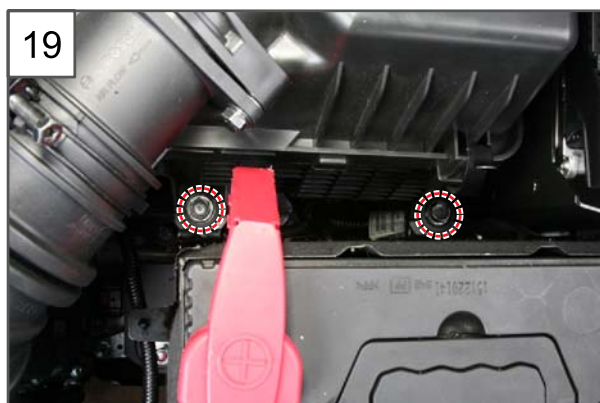


Pull the locking part of the HFM sensor connector in the direction of the arrow.



Press the locking part to disconnect the connector.

Modification basis	
Application basis	
Affected VIN	



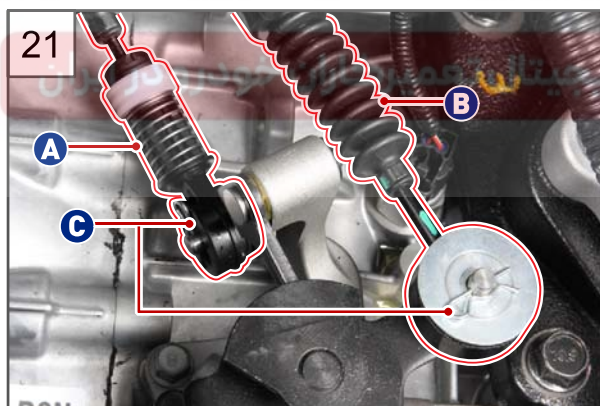
19. Unscrew 2 mounting bolts (12 mm) for the air cleaner housing.





20. Remove the air cleaner housing assembly together with the hose between the air cleaner and turbocharger.

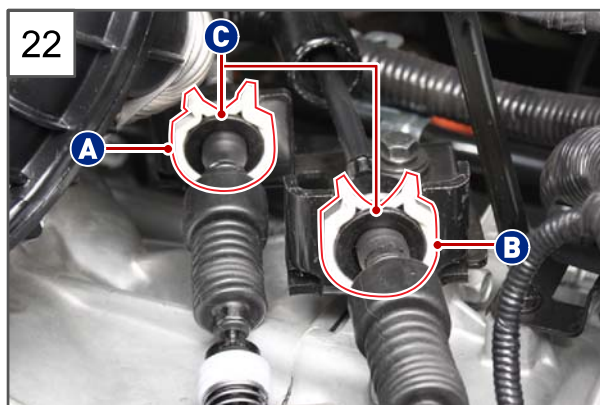
CAUTION

Cover the turbocharger inlet with a cap or cloth so that any foreign material does not enter the turbocharger after disconnecting the hose.



21. Remove the twist pins (C) from the selector cable (A) and shift cable (B) and remove the washer for the selector cable.

Twist pin	Washer
	

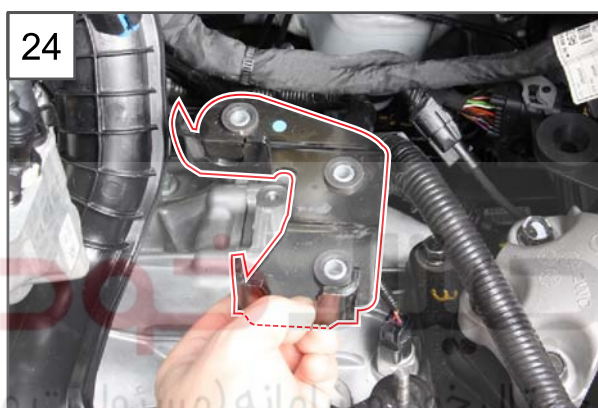


22. Detach the retaining clips (C) for the selector cable (A) and shift cable (B) from the mounting bracket on the transmission.

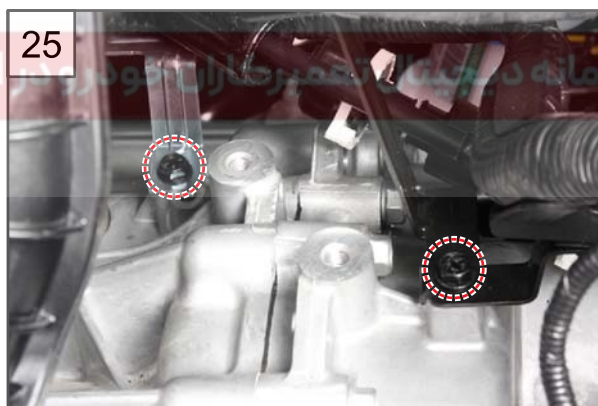


23. Unscrew 3 mounting bolts (12 mm) for the selector cable and shift cable.

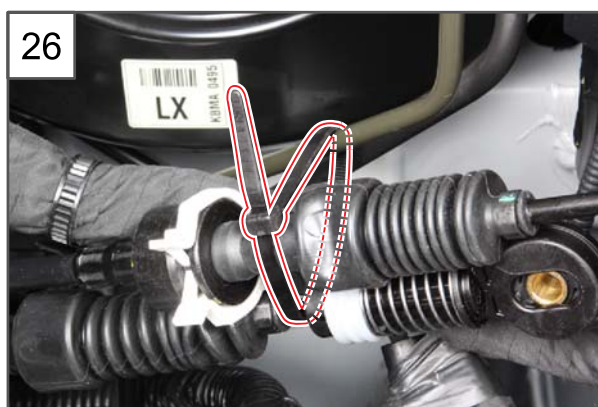
Tightening torque 17.7 ~ 21.6Nm



24. Remove the transmission cable mounting bracket.



25. Unscrew the 2 mounting bolts (10 mm) for the battery cable mounting bracket.

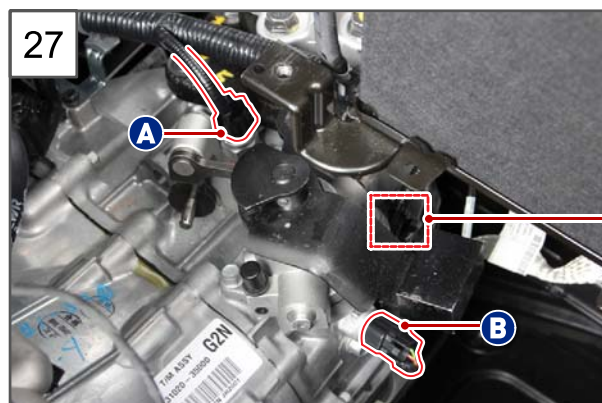


26. Fix the battery cable, shift cable, and selector cable to the vehicle body to prevent interference when removing the M/T.

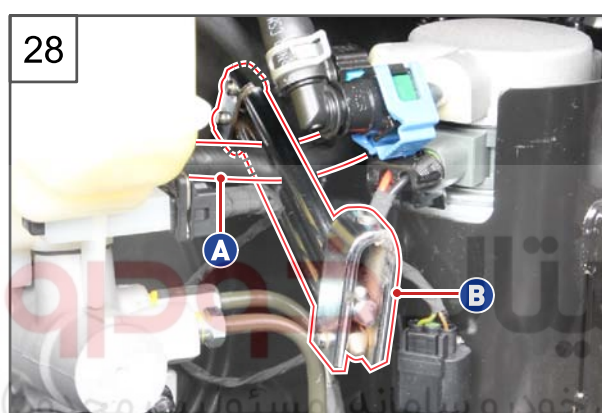
Modification basis	
Application basis	
Affected VIN	

6-SPEED M/T

TIVOLI 2015.06



27. Disconnect the connectors for the back up lamp (A) and neutral switch (B) and remove the retaining clamp for the neutral switch wiring.



28. Fit a hydraulic shut-off clamp (B) on the clutch oil feed hose (A) to cut off the oil supply.

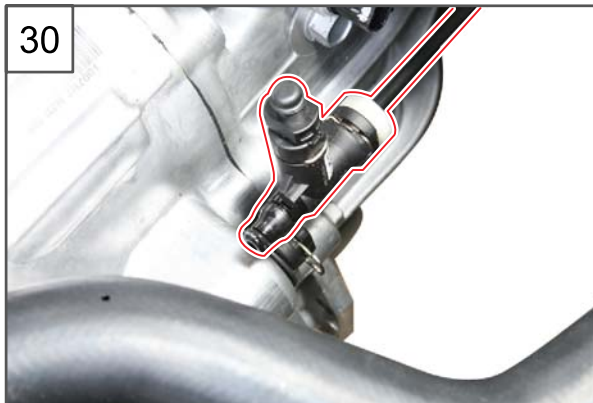


29. Detach the air breather mounting pin.

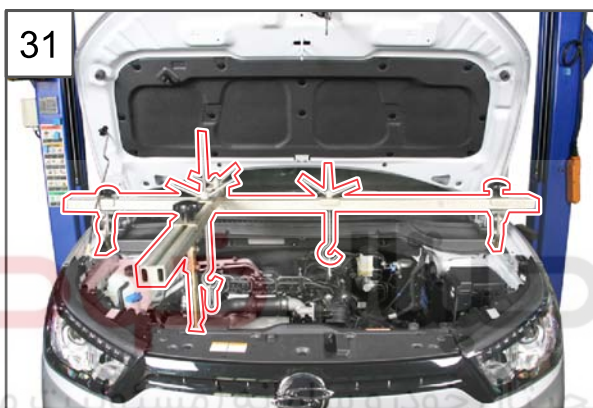


⚠ CAUTION

The pin cannot be removed completely because of the retaining part. Do not try to remove the pin by applying excessive force. Just separate it.



30. Remove the air bleeder and oil pipe.

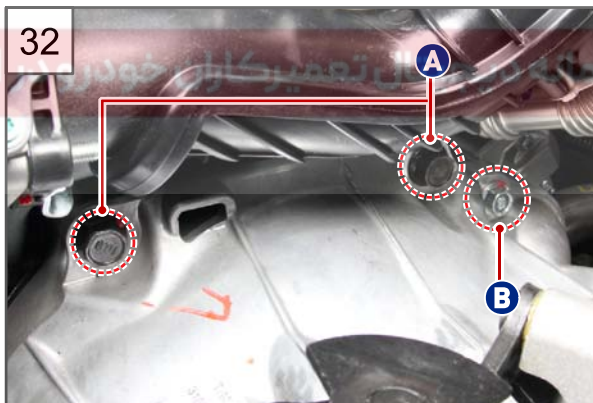


31. Install the engine support hanger.



NOTE

Refer to "INSTALLING THE ENGINE SUPPORT HANGER" under "SPECIAL SERVICE TOOLS" subsection of "ENGINE GENERAL" section in "G16DF ENGINE" chapter.



32. Unscrew the 2 M/T upper mounting bolts (A, 17 mm) and the start motor upper mounting bolt (B, 14 mm).

Tightening torque (A) 85 ~ 100Nm
(B) 45 ± 5Nm



33. Unscrew the RH engine mount bracket mounting nut (17 mm) slightly.

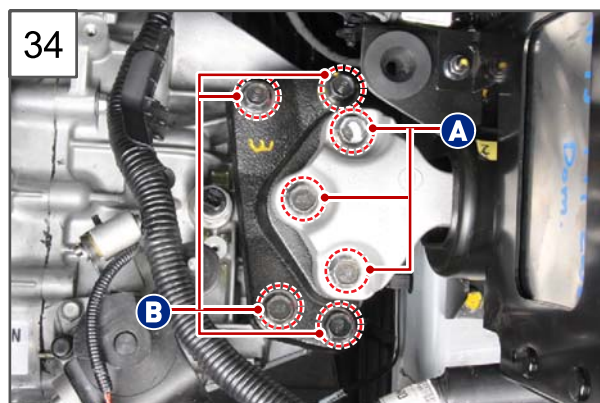
Tightening torque 68.6~ 88.2Nm



NOTE

This is for preventing an excessive force from being applied to the engine mount when tilting the engine and manual transmission.

Modification basis	
Application basis	
Affected VIN	

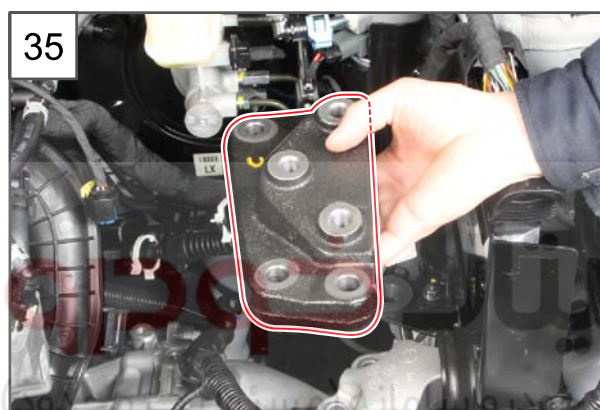


34. Unscrew the 3 transmission mount mounting bolts (A, 17 mm) and 4 transmission mount bracket mounting bolts (B, 17 mm).

Tightening torque (A),(B) 85 ~ 100Nm

CAUTION

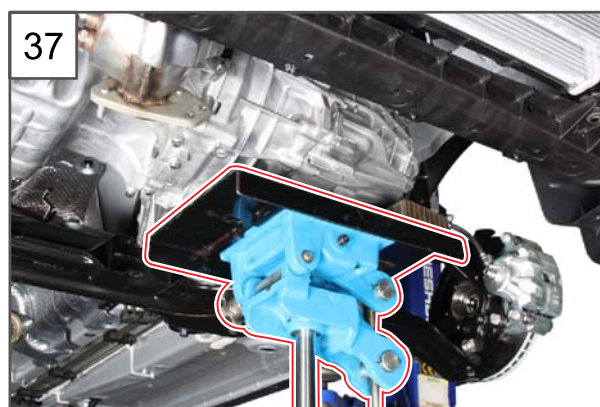
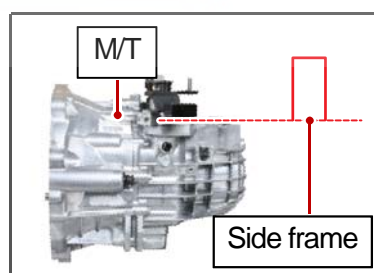
When you unscrew the transmission mount mounting bolt, adjust the engine hanger properly so that the engine and transmission assembly does not sag.



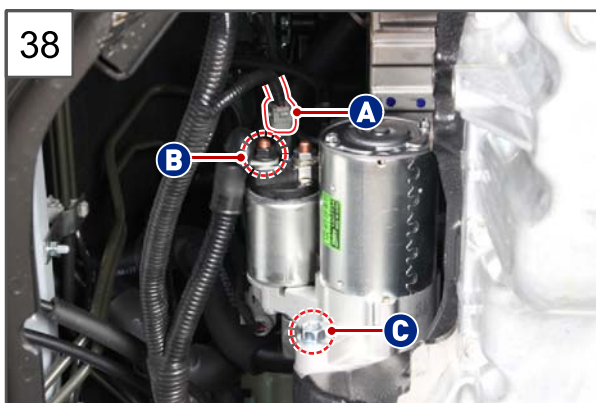
35. Remove the transmission mount bracket.



36. Adjust the engine hanger and tilt the engine and transmission assembly to locate the transmission under the side frame.



37. Place the transmission jack under the manual transmission securely.



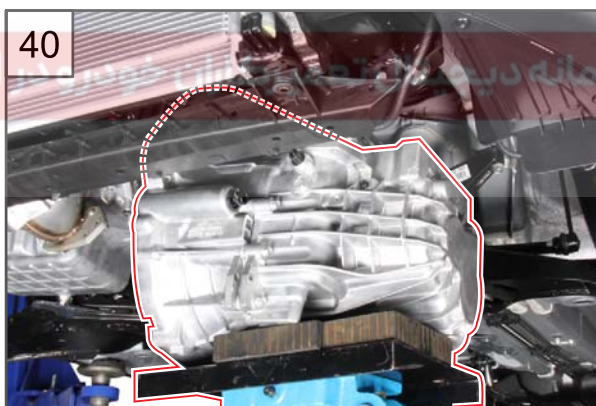
38. Disconnect the ST terminal connector (A) of the start motor and remove the B+ terminal mounting nut (B, 12 mm) and the mounting bolt (C, 14 mm) located under the start motor to remove the start motor.

Tightening torque (B) 10 ~ 12Nm
(C) 45 ± 5Nm



39. Unscrew the mounting bolt (14 mm) at the front side of the M/T.

Tightening torque 54Nm + 20°



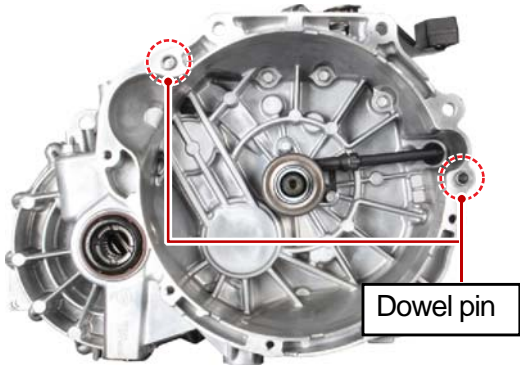
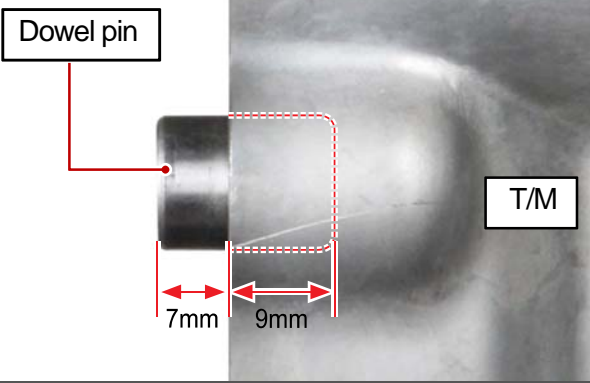
40. Lower the transmission jack slowly to remove the manual transmission.

CAUTION
Lower the transmission jack slowly while paying attention to interference.



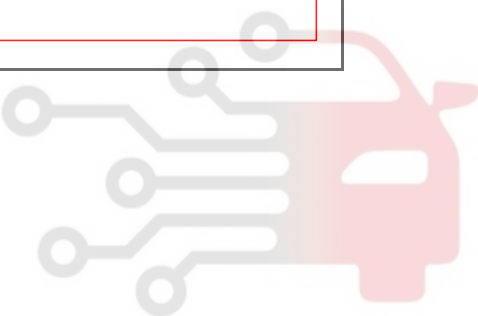
41. Install in the reverse order of removal.

Modification basis	
Application basis	
Affected VIN	

Cautions for installation	
Position of dowel pin	Installation of dowel pin
	
<p>⚠ CAUTION</p> <p>Since the dowel pin may move out of its position when removing the manual transmission, check the installation of the dowel pin when fitting the transmission.</p>	

شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

اولین سامانه دیجیتال تعمیرکاران خودرو در ایران

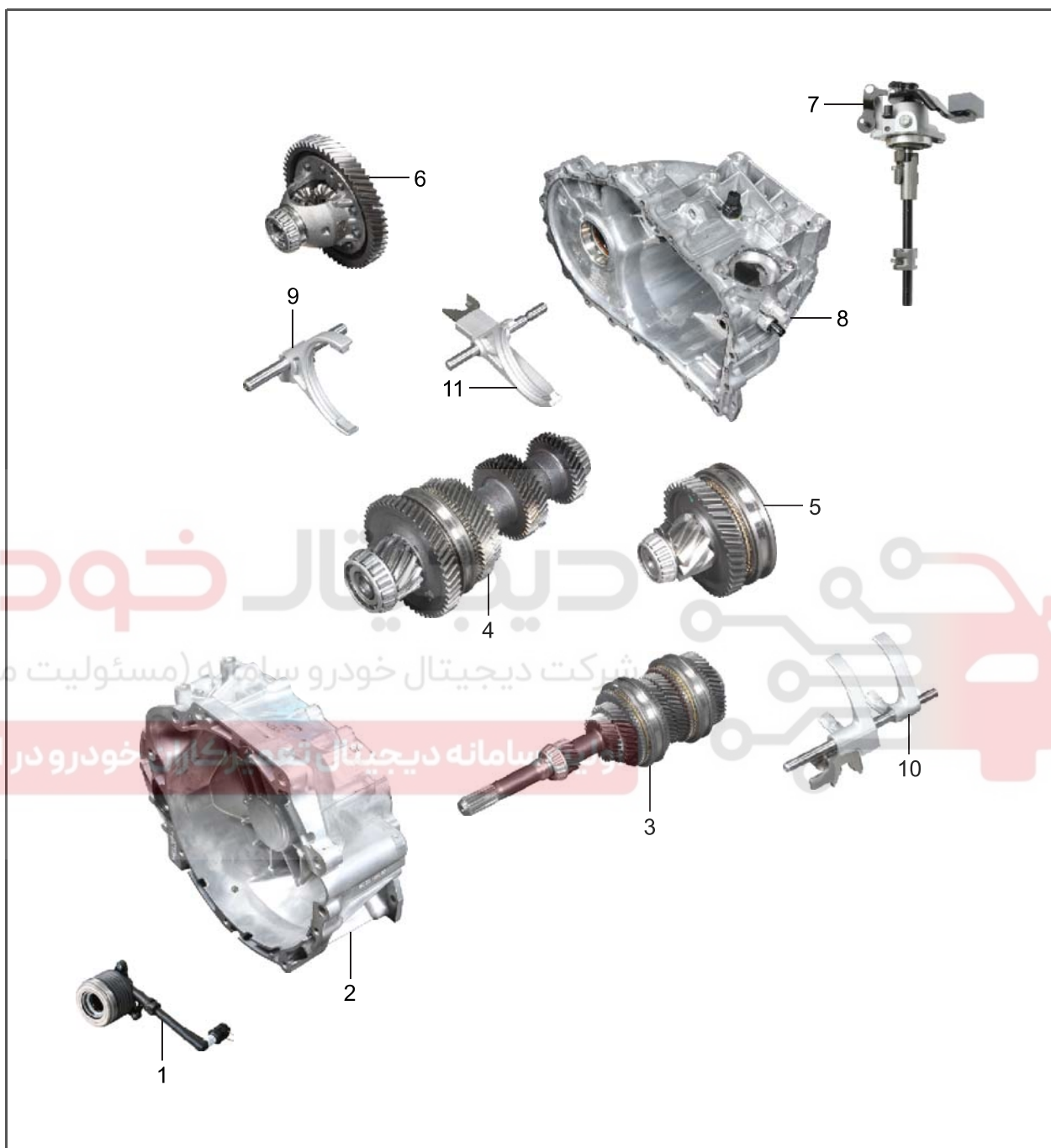


Modification basis	
Application basis	
Affected VIN	

S.G.N.

3190-01

DISASSEMBLING AND ASSEMBLING OF M/T ASSEMBLY



1. Concentric slave cylinder assembly
2. Clutch housing assembly
3. Input shaft assembly
4. Output shaft assembly
5. Reverse idler gear assembly
6. Differential carrier assembly

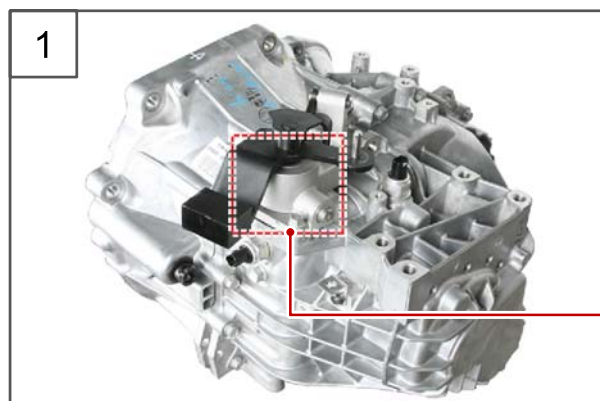
7. Control shaft assembly
8. Transmission housing assembly
9. 1st & 2nd gear shift fork assembly
10. 3rd & 4th, 5th & 6th gear shift fork assembly
11. Reverse gear shift fork assembly

Modification basis	
Application basis	
Affected VIN	

6-SPEED M/T

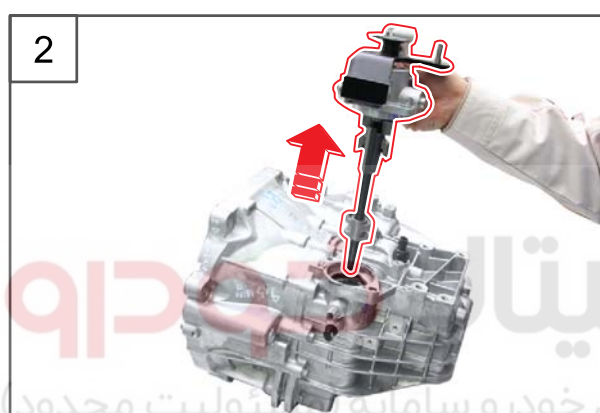
TIVOLI 2015.06

1) Disassembling



1. Put the control shaft assembly in neutral state and unscrew the 2 mounting bolts (12 mm).

Tightening torque 26.5 to 33.4 Nm

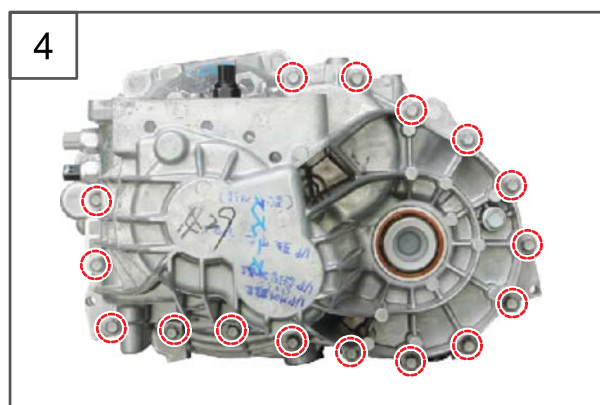


2. Remove the control shaft assembly from the transmission.



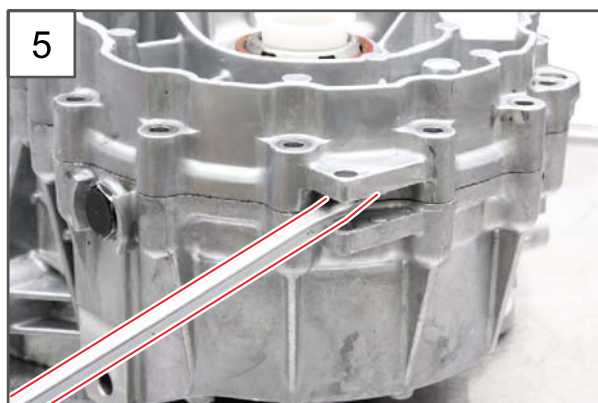
3. Unscrew the 3 mounting bolts (12 mm) of the clutch housing.

Tightening torque 19.6 to 26.46 Nm

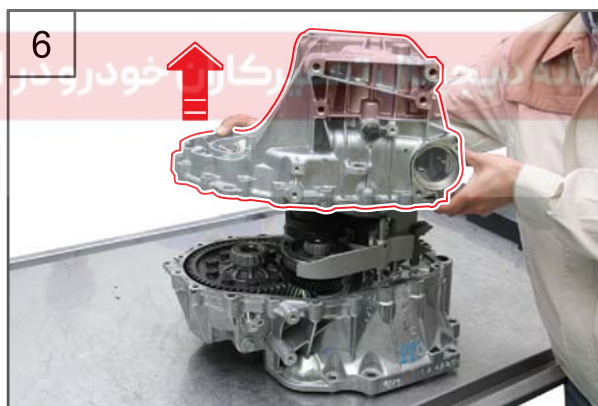


4. Unscrew the 16 mounting bolts (12 mm) for the transmission case.

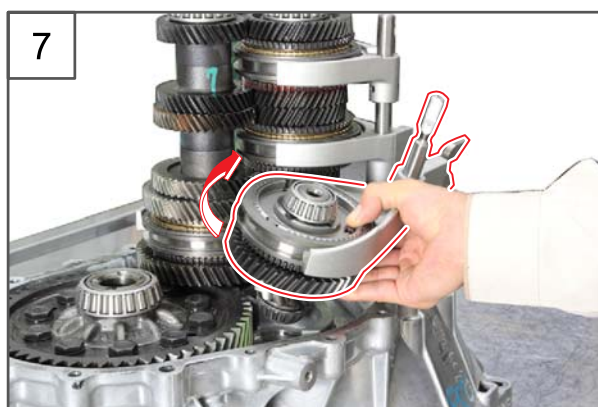
Tightening torque 19.6 to 26.46 Nm



5. Pry off the transmission case using a screwdriver.



6. Remove the transmission case.

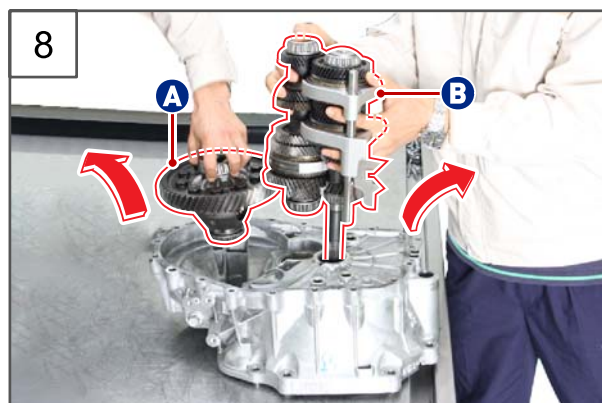


7. Pull the reverse gear idler shaft and reverse gear shift fork with rail toward yourself.

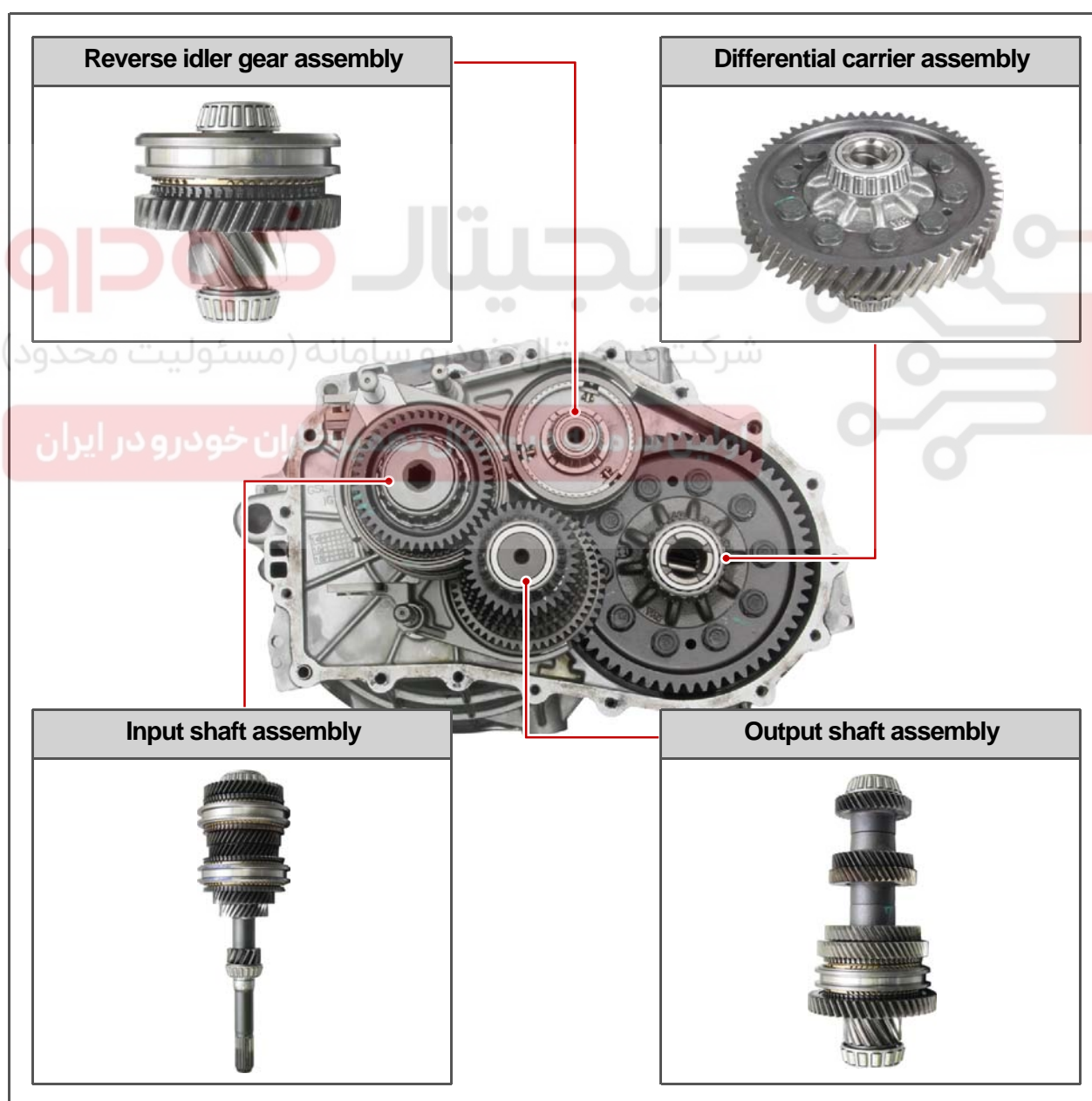
Modification basis	
Application basis	
Affected VIN	

6-SPEED M/T

TIVOLI 2015.06



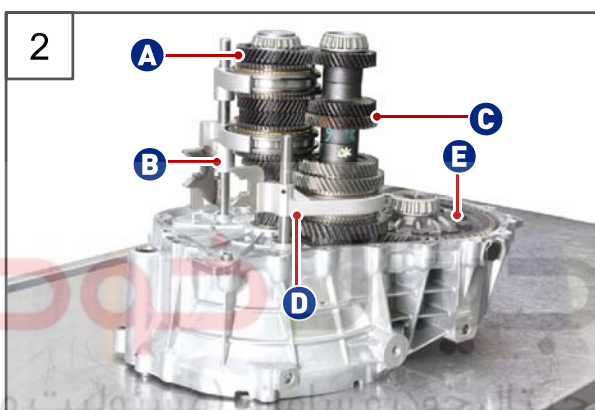
8. Remove the differential assembly (A), input and output shafts (B), and shift fork with rail by pulling them up at the same time. This requires two person.



2) Assembling



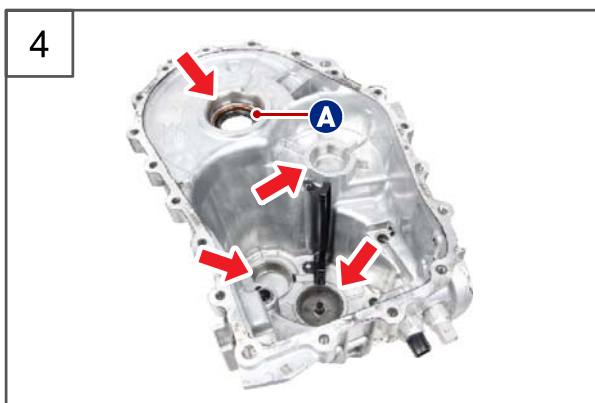
1. Fit the 3 bearing outer races and the spacer (A) of the reverse idler gear shaft to the clutch housing with a special tool.



2. Assemble the input shaft (A) with 3rd & 4th gear, 5th & 6th gear shift rail (B), output shaft (C) with 1st & 2nd gear shift rail (D), and differential carrier assembly (E) to the clutch housing at the same time.



3. Install the reverse gear idler shaft (A) and reverse gear shift rail (B) to the clutch housing.



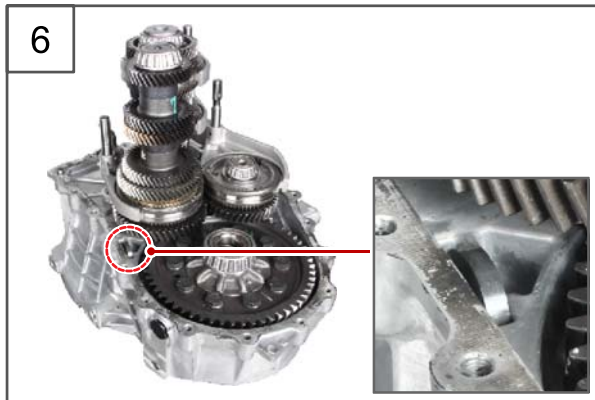
4. Select correct spacers for each shaft (A) and fit them to the transmission housing.
5. Fit the bearing outer races for each shaft with a special tool.



NOTE

When disassembling and assembling the gears for each shaft, select the correct spacer by referring to "How to select spacer" of "DISASSEMBLING AND ASSEMBLING OF SHIFT RAIL".

Modification basis	
Application basis	
Affected VIN	



6. The magnet (A) should be mounted to its original place when installing the shaft assemblies to the clutch housing.

CAUTION

Be careful not to lose the magnet, because it plays an important role, such as capturing the fine steel particles.

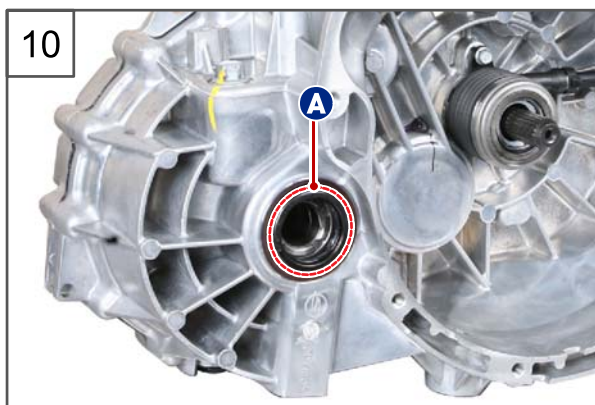


7. Remove any liquid gasket residue on the clutch housing completely and apply new liquid gasket (LOCITE 5060).
8. Remove any liquid gasket residue on the transmission housing completely and mount the transmission housing to the clutch housing so that it is positioned correctly.



9. Unscrew the 19 housing mounting bolts (12 mm).

Tightening torque 19.6 to 26.46 Nm



10. Fit the intermediate shaft oil seal (A) with a special tool.



11. Fit the drive shaft oil seal (A) with a special tool.



12. Remove any liquid gasket residue on the transmission housing (on the control shaft assembly side) completely. Apply new liquid gasket (LOCTITE 5060) on the housing and mount the control shaft assembly.



NOTE

When a bolt is not tightened to the specified torque, apply Loctite to the threads of the bolt.

اولین سامانه دیجیتال تعمیرکاران خودرو در ایران

Modification basis	
Application basis	
Affected VIN	

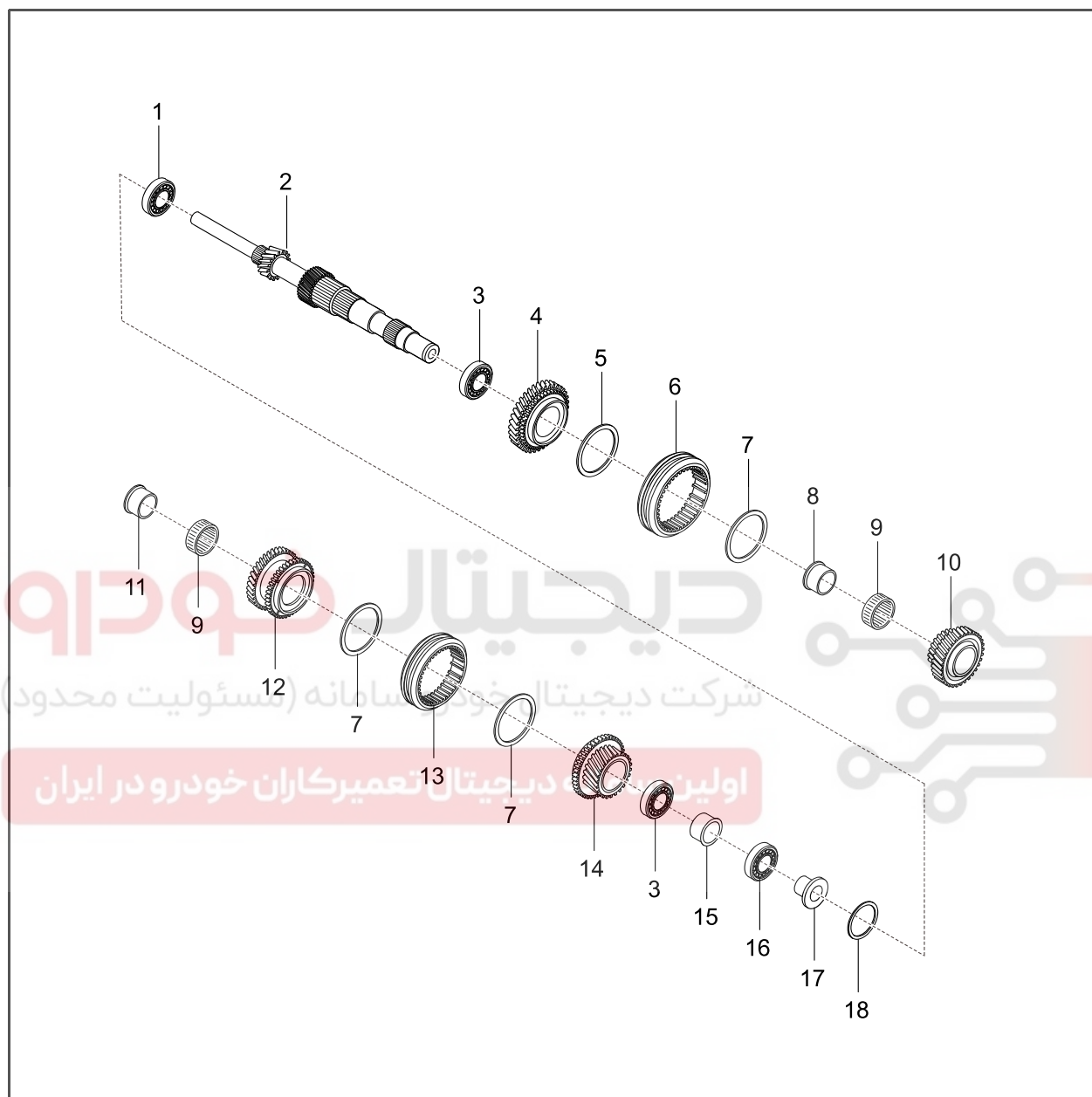
6-SPEED M/T

TIVOLI 2015.06

S.G.N.

3192-02

DISASSEMBLING AND ASSEMBLING OF INPUT SHAFT ASSEMBLY



- | | |
|--|-----------------------------------|
| 1. Taper roller bearing | 10.4th gear |
| 2. Input shaft | 11.5th gear sleeve |
| 3. Needle bearing (3rd, 6th gears) | 12.5th gear |
| 4. 3rd gear | 13.5th & 6th gear hub with sleeve |
| 5. 3rd gear synchronizer ring | 14.6th gear |
| 6. 3rd & 4th gear hub with sleeve | 15.6th gear sleeve |
| 7. Synchronizer ring (4th, 5th, 6th gears) | 16. Taper roller bearing |
| 8. 4th gear sleeve | 17. Locking bolt |
| 9. Needle bearing (4th, 5th gears) | 18. Input shaft bearing spacer |

Modification basis	
Application basis	
Affected VIN	

1) Disassembling



1. Fit an input shaft holding tool between the table top vise jaws and install the input shaft assembly to the tool.



2. Unscrew the hexagon mounting bolt (14 mm) on the input shaft.

Tightening torque 205.8 to 215.6 Nm



3. Remove the gear mounting bolt.



4. Put the input shaft assembly on a press.

Modification basis	
Application basis	
Affected VIN	

02-70

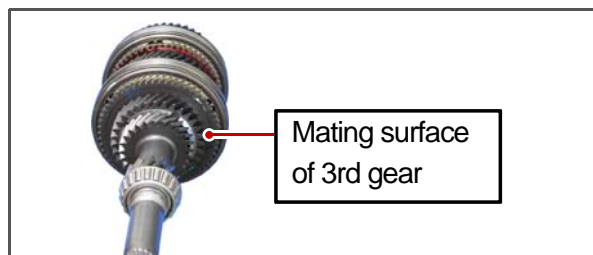
3192-02

T I V O L I

5



5. Fit jigs to the press, underneath the 3rd gear of the input shaft assembly.



6

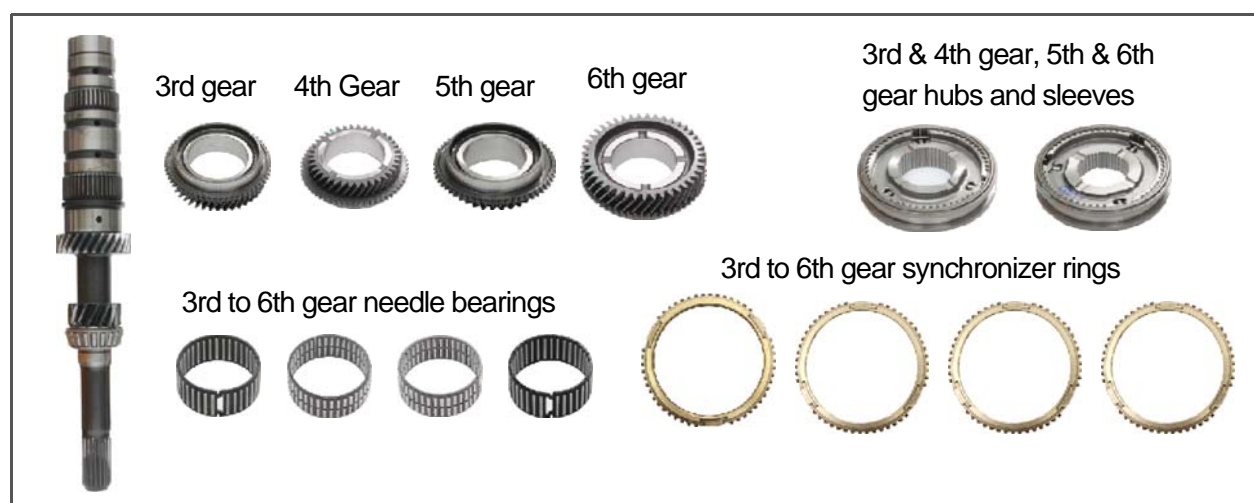


6. Select a proper tool and put it on top of the input shaft and press down on the shaft with the press.

7



7. Remove the input shaft.

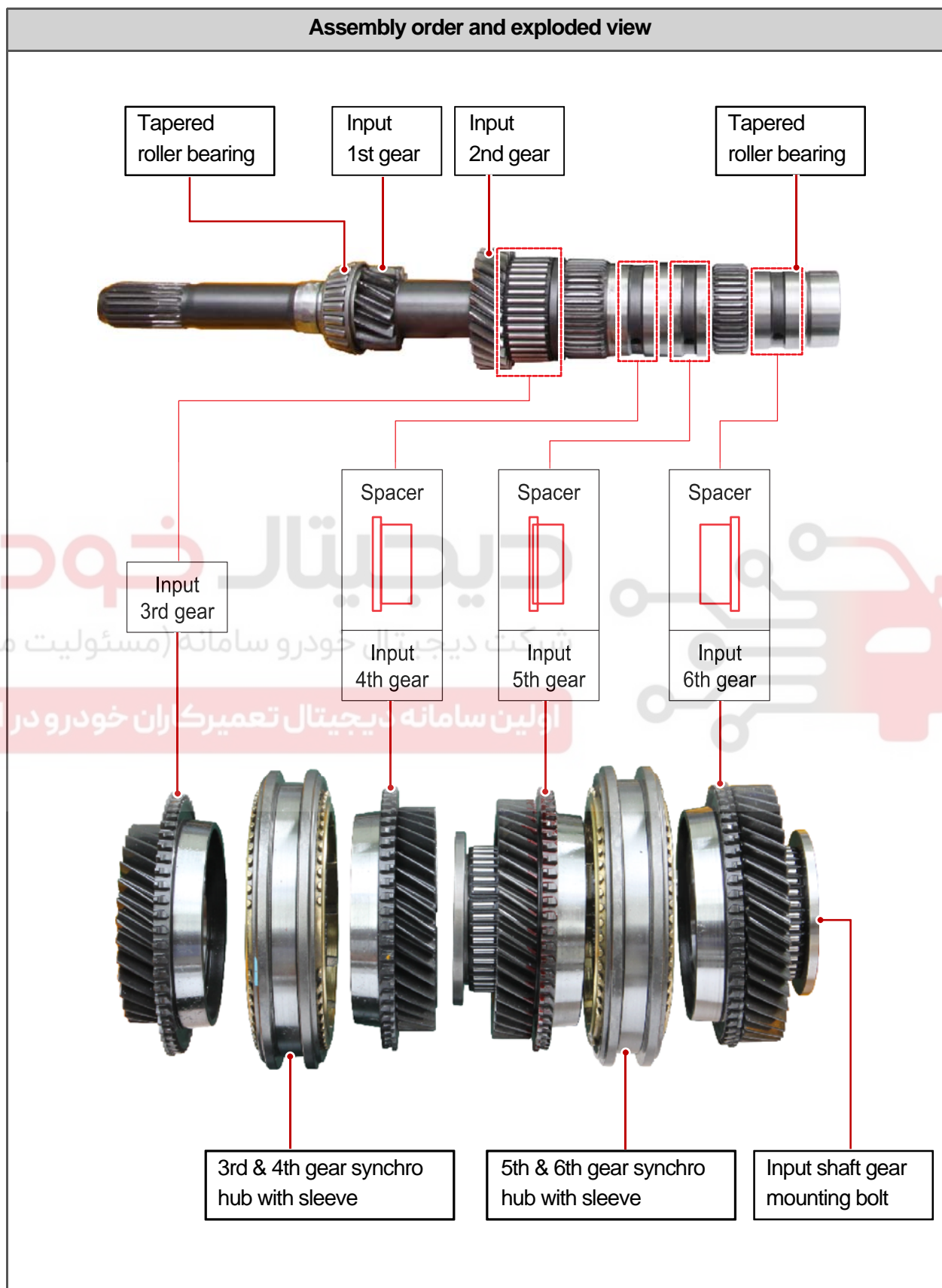


6-SPEED M/T

TIVOLI 2015.06

Modification basis	
Application basis	
Affected VIN	

2) Precautions for Assembling



Modification basis	
Application basis	
Affected VIN	

6-SPEED M/T

TIVOLI 2015.06

Precautions



- Installation directions

- Clean the components thoroughly before assembling.
- Assemble by aligning the oil hole of the needle bearing spacer with the oil hole of the input shaft.
- Pay close attention to the installation directions of the gears and hubs.
- The 4th, 5th, and 6th gear synchronizer rings are non-directional.
- The 3rd & 4th gear and 5th & 6th gear synchronizer sleeves are non-directional.

Hub with sleeve

3rd & 4th gear hub with sleeve



Engine side



To 4th gear



To 3rd gear

5th & 6th gear hub with sleeve







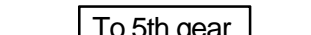
Engine side



To 6th gear



To 5h gear

Needle bearing		
3rd gear 	4th gear 	
5th gear 	6th gear 	
Needle bearing spacer		
4th gear 	5th gear 	6th gear 
Needle bearing spacer installation direction		
To 4th gear 	To 5th gear 	To 6th gear 
To 3rd gear 	To 4th gear 	To 5th gear 

Modification basis	
Application basis	
Affected VIN	

6-SPEED M/T

TIVOLI 2015.06

3) Assembling



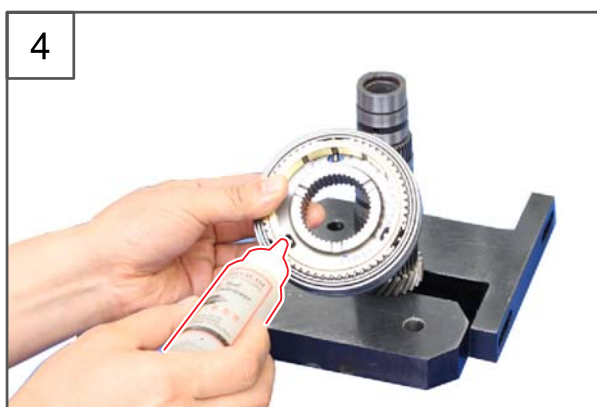
1. Fit jigs to the press, underneath the 2nd gear.



2. Install the 3rd gear needle bearing.



3. Apply oil to the 3rd gear needle bearing.



4. Fit the 3rd gear synchronizer ring to the 3rd & 4th gear synchronizer hub and apply oil to it.



5. Fit the 3rd gear to the 3rd & 4th gear synchronizer hub and turn the gear to the right and left to make sure that the gear turns smoothly.



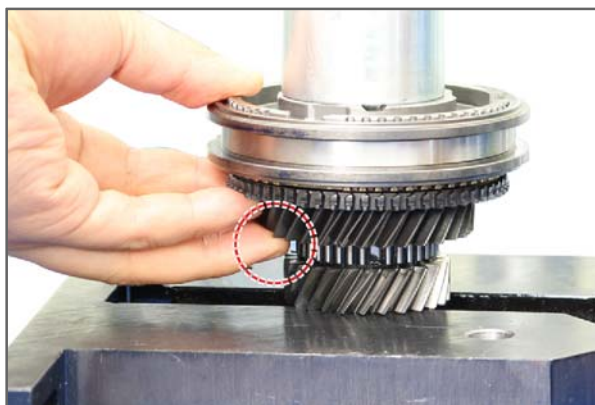
6. Fit the 3rd gear with synchronizer hub to the input shaft.



7. Place a proper tool on the 3rd & 4th gear synchronizer hub.

CAUTION

Hold the 3rd gear so that it does not move down, as the synchronizer ring may fall and become damaged.



WARNING

Pay close attention to pinch risk between the 3rd gear and 2nd gear.

Modification basis	
Application basis	
Affected VIN	



8. Apply pressure with the press to completely install the 3rd & 4th gear synchronizer hub.



9. Fit the 4th gear needle bearing spacer to the input shaft with the oil holes placed in a straight line.



10. Place a proper tool on the 4th gear needle bearing spacer and apply pressure with the press to completely install the 4th gear needle bearing spacer.



11. Make sure that the oil hole of the input shaft and the oil hole of the 4th gear needle bearing spacer are aligned.



12. Apply oil to the 4th gear synchronizer ring.



13. Install the 4th gear synchronizer ring to the 3rd & 4th gear synchronizer hub.



14. Fit the 4th gear needle bearing to the input shaft.



15. Apply oil to the 4th gear needle bearing.

Modification basis	
Application basis	
Affected VIN	

6-SPEED M/T

TIVOLI 2015.06



16. Fit the 4th gear to the input shaft.



17. Turn the 4th gear to the right and left to verify that it is installed completely.



18. Fit the 5th gear needle bearing spacer to the input shaft with the oil holes placed in a straight line.



19. Place a proper tool on the 5th gear needle bearing spacer and apply pressure with the press to completely install the 5th gear needle bearing spacer.

20



20. Make sure that the oil hole of the input shaft and the oil hole of the 5th gear needle bearing spacer are aligned.

21



21. Install the 5th gear needle bearing.

22



22. Apply oil to the 5th gear needle bearing.

23



23. Fit the 5th and 6th gear synchronizer rings to the 5th & 6th gear synchronizer hub and apply oil to it.

Modification basis	
Application basis	
Affected VIN	

6-SPEED M/T

TIVOLI 2015.06

24



24. Fit the 5th gear to the 5th & 6th gear synchronizer hub and turn the gear to the right and left to make sure that the gear turns smoothly.

25



25. Fit the 5th gear with the 5th & 6th gear synchronizer hub to the input shaft.

26



26. Hold the 5th gear and 5th gear synchronizer ring so that they cannot fall down.

**WARNING**

Pay close attention to pinch risk between the 4th gear and 5th gear.

27



27. Apply pressure with the press to completely install the 5th gear with the 5th & 6th gear synchronizer hub.

Modification basis	
Application basis	
Affected VIN	



28. Apply oil to the 6th gear synchronizer ring.



29. Fit the 6th gear to the input shaft.



NOTE

Align the oil groove of the 6th gear (B) with the oil hole of the input shaft (A) to align the oil hole of the 6th gear needle bearing spacer.

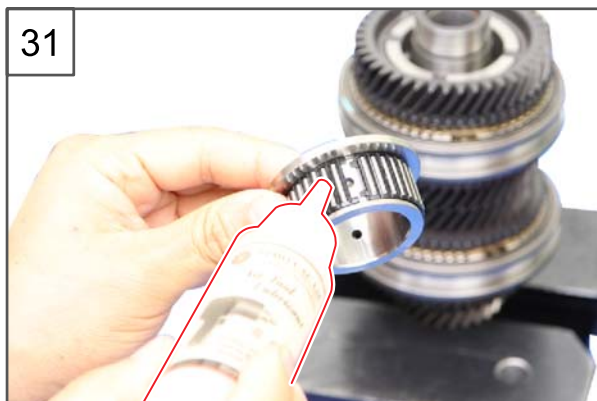


30. Fit the 6th gear needle bearing to the 6th gear needle bearing spacer.

Modification basis	
Application basis	
Affected VIN	

6-SPEED M/T

TIVOLI 2015.06



31. Apply oil to the 6th gear needle bearing.



32. Fit the 6th gear needle bearing spacer to the input shaft so that the oil hole of the needle bearing spacer and the oil groove of the 6th gear installed to the input shaft are aligned.



NOTE

Align the oil hole of the 6th gear needle bearing spacer with the oil groove of the 6th gear.



33. Place a proper tool on the 6th gear needle bearing spacer and apply pressure with the press to completely install the 6th gear needle bearing spacer.



34. Fit the bearing to the input shaft.



35. Put a proper tool on top of the bearing and press on the bearing with the press to install it completely.



36. Check the operating conditions of each gear and synchronizer sleeve.



37. Fit an input shaft holding tool between the table top vise jaws and install the input shaft assembly to the tool. Then screw in the hexagon mounting bolt (14 mm) for the input shaft gear.



38. Tighten the hexagon mounting bolt (14 mm) for the input shaft gear using a proper tool.

Tightening torque 205.8 to 215.6 Nm

Modification basis	
Application basis	
Affected VIN	

39



39. Check the operating conditions of each gear.

دیجیتال خودرو

شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

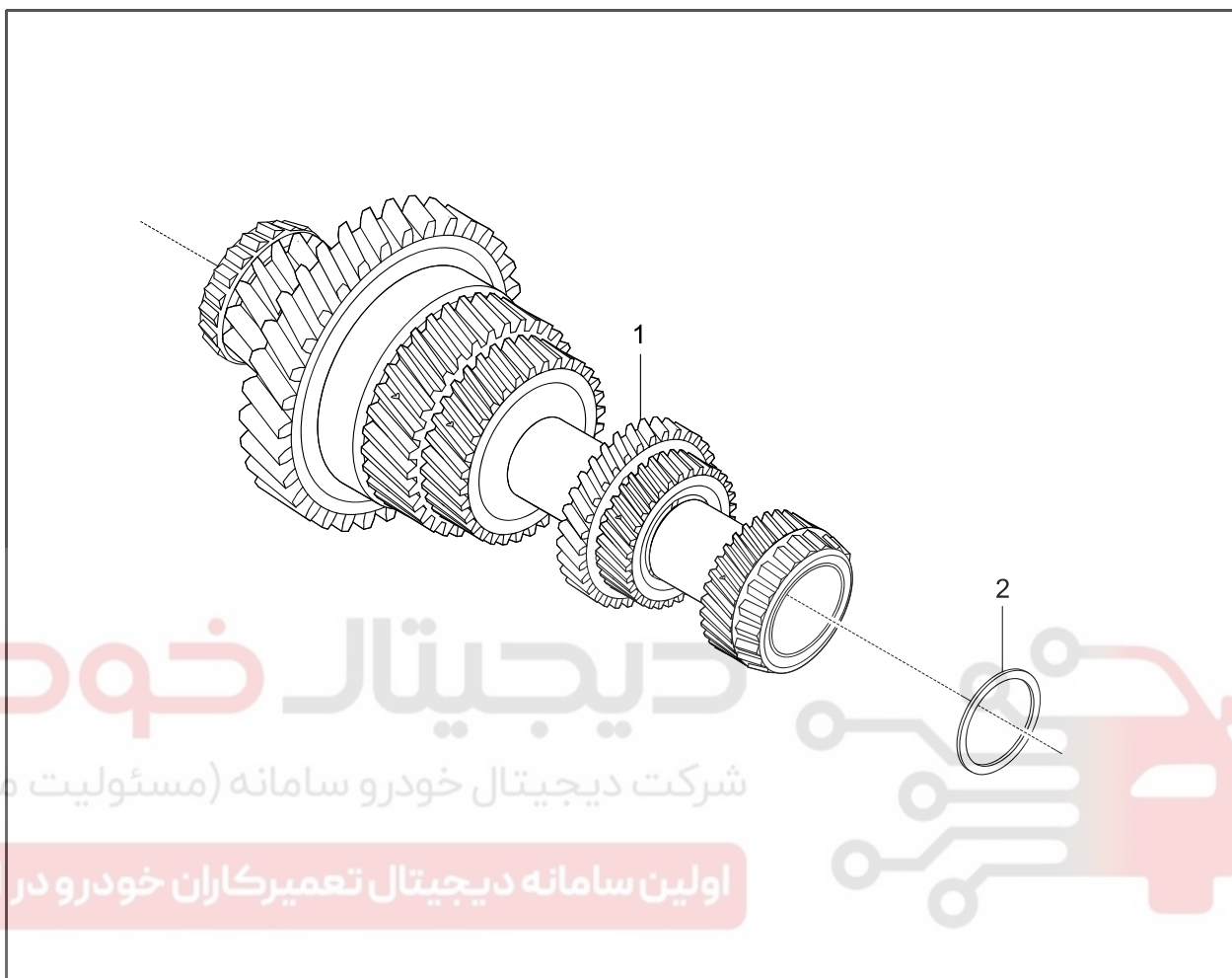
اولین سامانه دیجیتال تعمیرکاران خودرو در ایران



S.G.N.

3194-02

DISASSEMBLING AND ASSEMBLING OF OUTPUT SHAFT ASSEMBLY



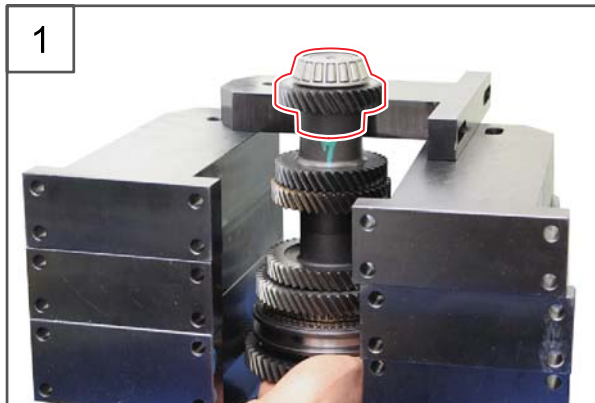
1. Output shaft assembly
2. Output shaft bearing spacer

Modification basis	
Application basis	
Affected VIN	

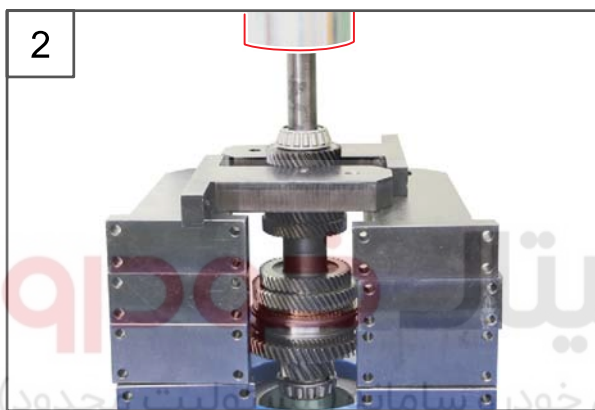
6-SPEED M/T

TIVOLI 2015.06

1) Disassembling



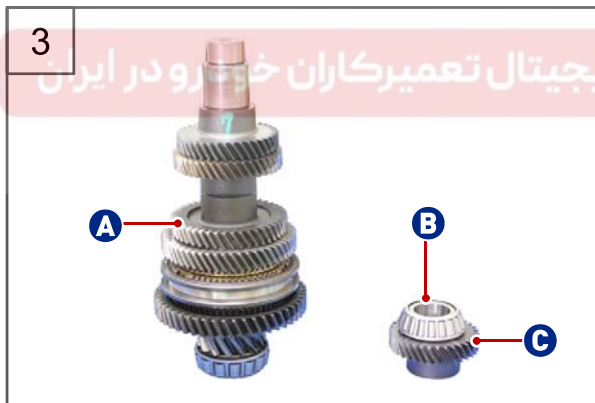
1. Fit jigs to the press, underneath the 6th gear.



2. Place a proper tool on the output shaft and apply pressure with the press.

CAUTION

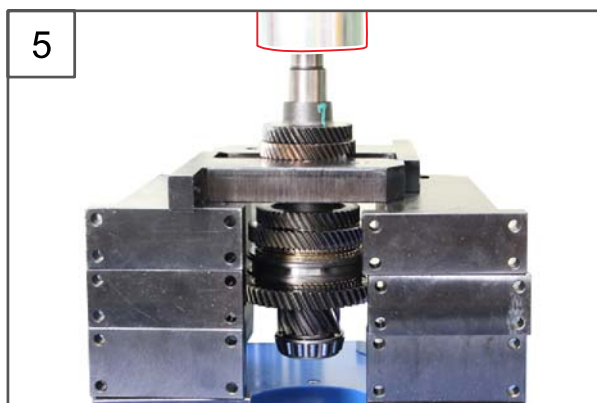
Use a special tool which is smaller than the bearing bore size, so that the tool is not inserted into the bearing when applying pressure with the press.



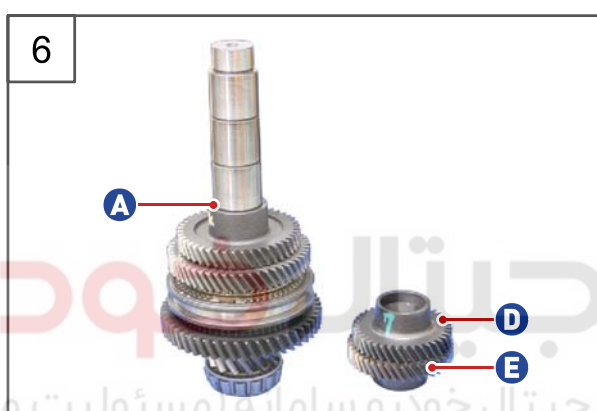
3. Remove the bearing (B) and the 6th gear (C) from the output shaft (A).



4. Fit jigs to the press, underneath the 4th gear.



5. Apply pressure to the output shaft with the press.



6. Remove the 4th gear (D) and the 5th gear (E) from the output shaft (A).

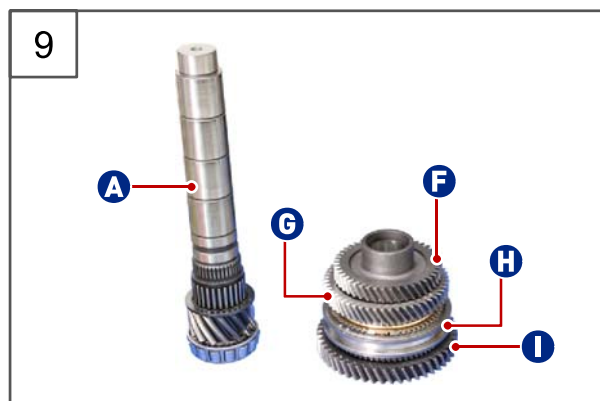


7. Fit jigs to the press, underneath the 1st gear.



8. Apply pressure to the output shaft with the press.

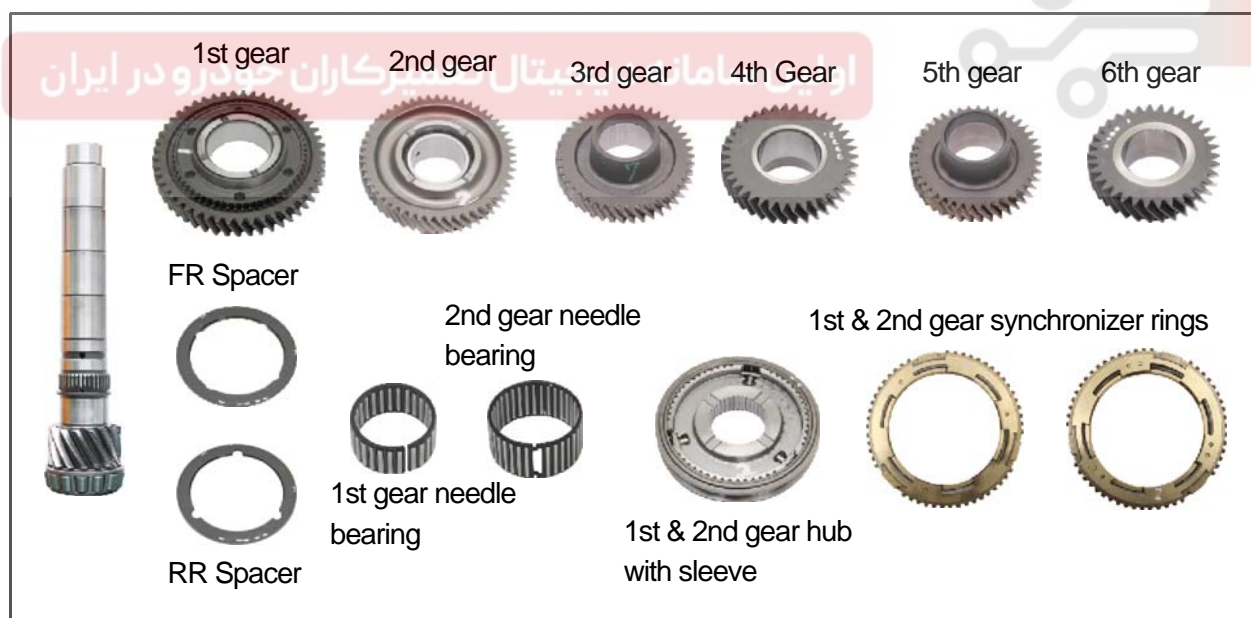
Modification basis	
Application basis	
Affected VIN	



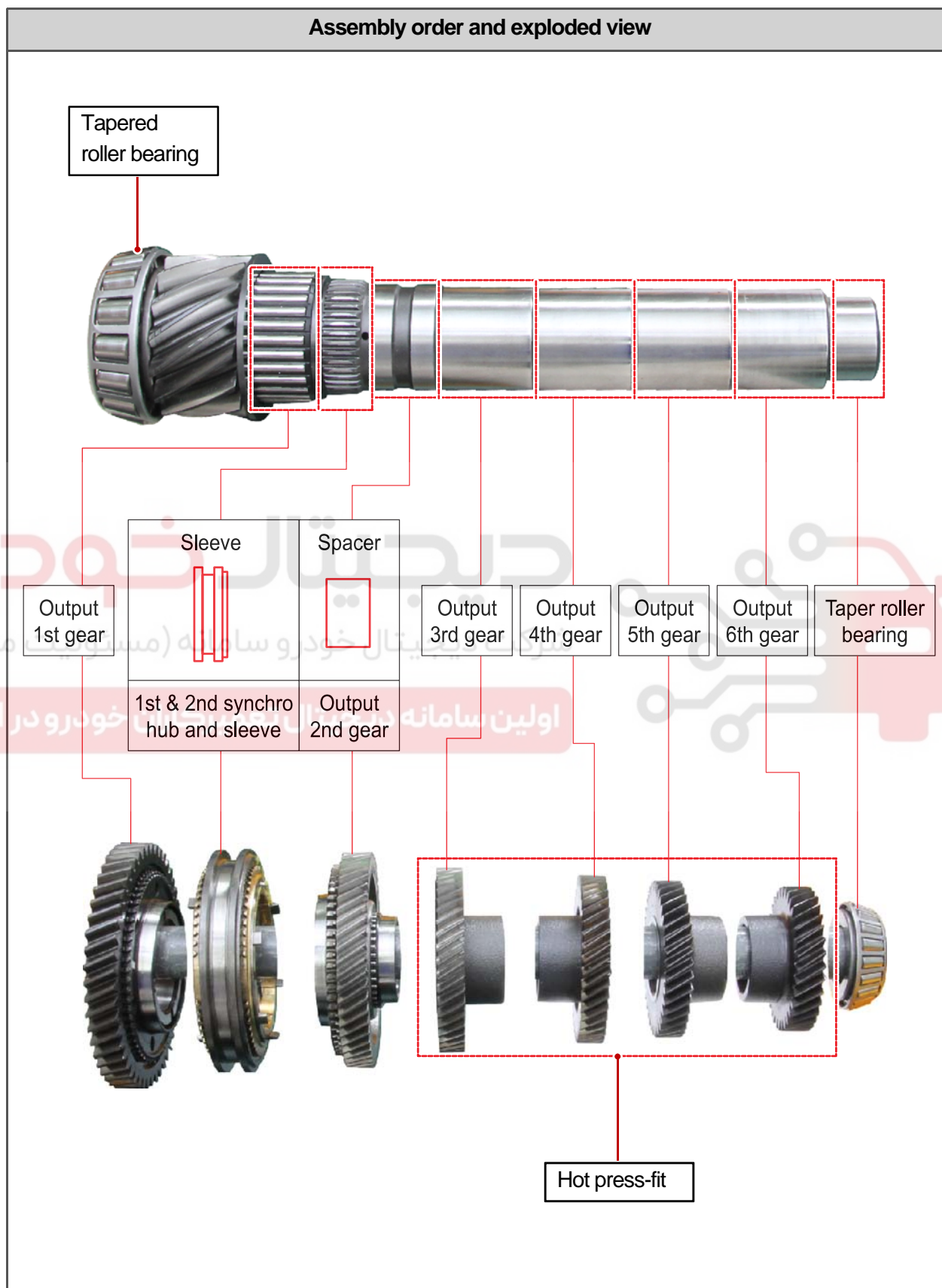
9. Remove the 3rd gear (F), 2nd gear (G), 2nd gear needle bearing, 2nd gear synchronizer ring, 1st & 2nd gear hub, 1st gear synchronizer ring (H), 1st gear (I) from the output shaft (A).



10. Remove the 1st gear needle bearing from the output shaft.



2) Precautions for Assembling



Modification basis	
Application basis	
Affected VIN	

6-SPEED M/T

TIVOLI 2015.06

Precautions



- Clean the components thoroughly before assembling.
- Assemble by aligning the oil hole of the needle bearing spacer with the oil hole of the output shaft.
- Pay close attention to the installation directions of the gears, synchronizer rings, sleeves, and hubs.

- Installation directions

Hub with sleeve

To 2nd gear



To 1st gear

To 2nd gear



To 1st gear



Synchronizer ring

To 1st gear



To 2nd gear



3) Assembling



1. Place the output shaft on the press, and the FR spacer to the shaft as the right picture.

WARNING

As the bearing may be damaged, take care to ensure that the bearing does not hit the ground.



2. Assemble the synchronizer ring and fit the RR spacer to the hub to the 1st gear side.



3. Apply oil to the 1st & 2nd gear synchronizer hub.



4. Fit the 1st gear to the 1st & 2nd gear synchronizer hub.

Modification basis	
Application basis	
Affected VIN	



5. Turn the gear to the right and left to make sure that the gear turns smoothly.



6. Fit the 1st gear with the 1st & 2nd gear synchronizer hub to the output shaft.

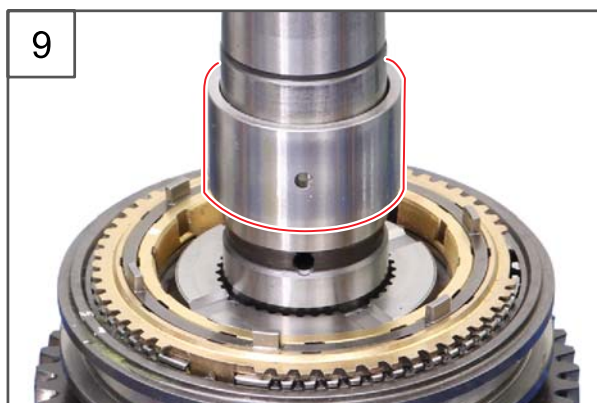


7. Apply pressure with the press to completely install the 1st & 2nd gear synchronizer hub.



8. Fit the 2nd gear needle bearing spacer to the output shaft.

Modification basis	
Application basis	
Affected VIN	



9. Align the oil hole of the 2nd gear needle bearing spacer with the oil hole of the output shaft.



10. Fit a proper tool to the output shaft and apply pressure with the press to completely install the 2nd gear needle bearing spacer.



11. Make sure that the oil holes are aligned.



12. Fit the 2nd gear needle bearing to the output shaft.

Modification basis	
Application basis	
Affected VIN	

13



13. Apply oil to the 2nd gear needle bearing.

14



14. Fit the 2nd gear to the output shaft.

15



15. Fit the 2nd gear by turning it to the right and left so that the grooves of the synchronizer ring and the 2nd gear match each other.

16



16. Turn the 2nd gear to the right and left to verify that it is installed completely.

17



17.Heat the 3rd gear and 4th gear.
(120 to 150°C)

CAUTION

Make sure to heat up the gears using the hot press-fit method to prevent scratches to the output shaft and inner surfaces of the gears and damage to the bearing.

18



18.Fit the 3rd gear to the output shaft.

NOTE

Complete the fitting before the gears cool down.

19



19.Fit a proper tool to the output shaft and apply pressure with the press to completely install the 3rd gear.

20



20.Fit the 4th gear to the output shaft.

Modification basis	
Application basis	
Affected VIN	

6-SPEED M/T

TIVOLI 2015.06

21



21. Fit the 4th gear completely by applying pressure with the press.

22



22. Heat the 5th gear and 6th gear.
(120 to 150°C)

CAUTION

Make sure to heat up the gears using the hot press-fit method to prevent scratches to the output shaft and inner surfaces of the gears and damage to the bearing.

23



23. Fit the 5th gear to the output shaft.

NOTE

Complete the fitting before the gears cool down.

CAUTION

Do not fit the 5th gear with the 6th gear at the same time. Too much heat transferred to the output shaft can deform the shaft.

24



24. Fit a proper tool to the output shaft and apply pressure with the press to completely install the 5th gear.

25



25. Fit the 6th gear to the output shaft.

26



26. Fit a proper tool to the output shaft and apply pressure with the press to completely install the 6th gear.

27



27. Fit the bearing to the output shaft.

28



28. Put a proper tool on top of the bearing and press on the bearing with the press to install it completely.

Modification basis	
Application basis	
Affected VIN	

6-SPEED M/T

TIVOLI 2015.06

29



29. Check the operating conditions of each gear.

دیجیتال خودرو

شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

اولین سامانه دیجیتال تعمیرکاران خودرو در ایران

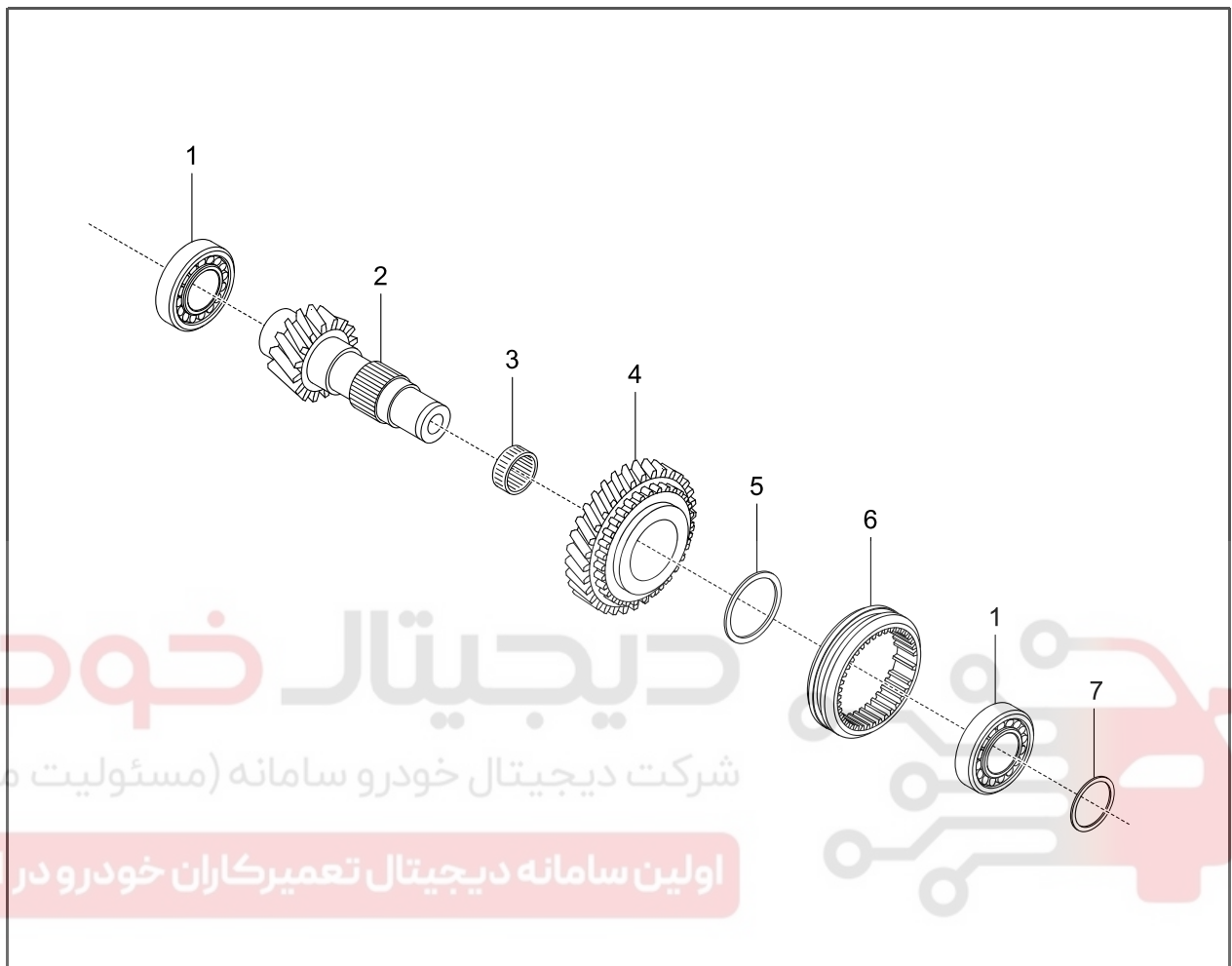


Modification basis	
Application basis	
Affected VIN	

S.G.N.

3194-02

DISASSEMBLING AND ASSEMBLING OF REVERSE GEAR IDLER SHAFT ASSEMBLY



1. Taper roller bearing
2. Reverse gear idler shaft
3. Needle bearing (reverse gear)
4. Reverse gear
5. Synchronizer ring (reverse gear)
6. Synchronizer hub with sleeve (reverse gear)
7. Reverse gear idler shaft bearing spacer

Modification basis	
Application basis	
Affected VIN	

6-SPEED M/T

TIVOLI 2015.06

1) Disassembling



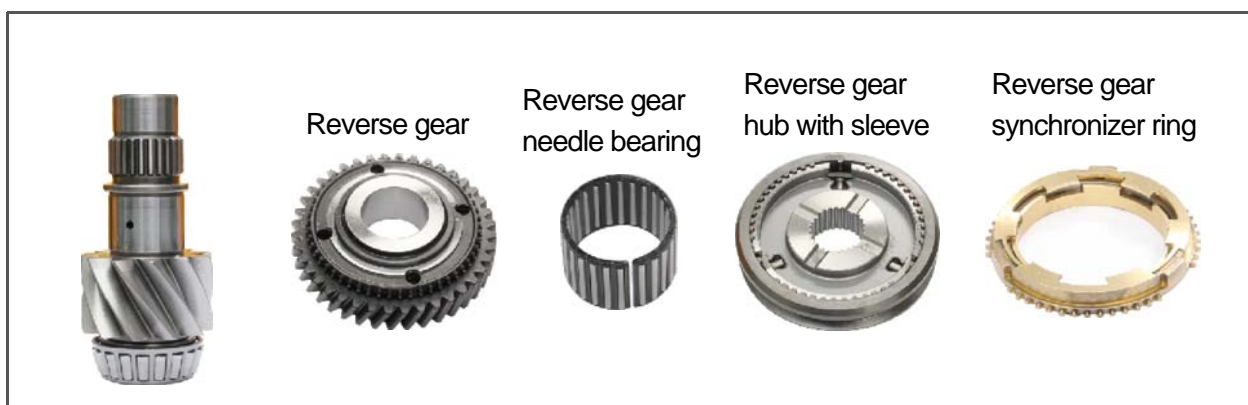
1. Fit jigs to the press, underneath the reverse gear.



2. Select a proper tool and put it on top of the reverse gear idler shaft and press down on the shaft with the press.



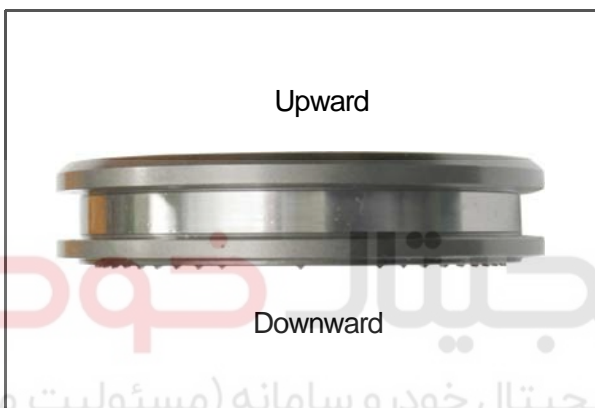
3. Remove the reverse gear idler shaft.



2) Precautions for Assembling

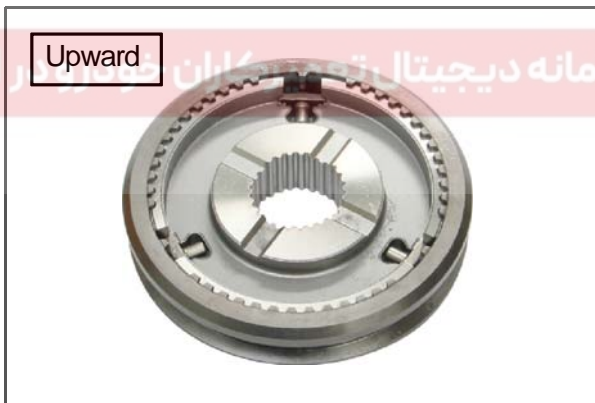


- Clean the components thoroughly before assembling.
- Assemble with the reverse gear idler shaft facing the front side.
- Pay close attention to the installation directions of the synchronizer hub and sleeve.

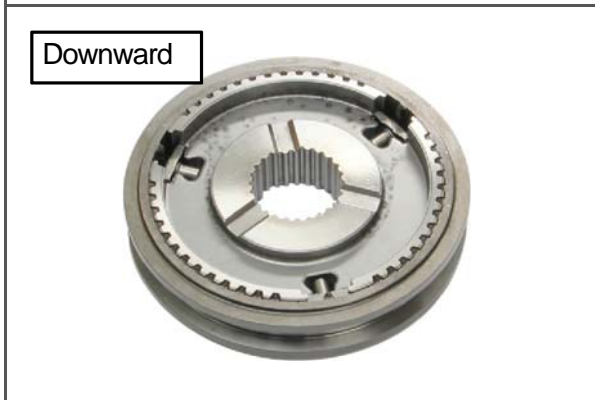


► Installation directions

- Sleeve
Install the sleeve with its chamfered side facing upward.



- Hub
The hub should be installed with its 4 oil grooves facing the upward and its 3 oil grooves facing downward.



Modification basis	
Application basis	
Affected VIN	

3) Assembling



1. Put the reverse gear idler shaft on the press.

WARNING

As the bearing may be damaged, take care to ensure that the bearing does not hit the ground.



2. Fit the reverse gear needle bearing and apply oil to the reverse gear needle bearing.



3. Fit the reverse gear synchronizer ring to the reverse gear hub and apply oil to it.



4. Fit the reverse gear to the reverse gear hub and fit them to the reverse gear idler shaft.



5. Place a proper tool on the reverse gear synchronizer hub.

CAUTION

Hold the reverse gear so that it does not move down, as the synchronizer ring may fall and become damaged.

WARNING

Pay close attention to pinch risk between the reverse gear and differential gear.



6. Apply pressure with the press to completely install the reverse gear with the reverse gear synchronizer hub.



7. Turn the reverse gear to the right and left to make sure that the gear turns smoothly.



8. Check the operating conditions of sleeve.

Modification basis	
Application basis	
Affected VIN	

02-104 3194-02

T I V O L I

9



9. Fit the bearing to the reverse gear idler shaft.

10



10. Fit the bearing completely by applying pressure with the press.

11



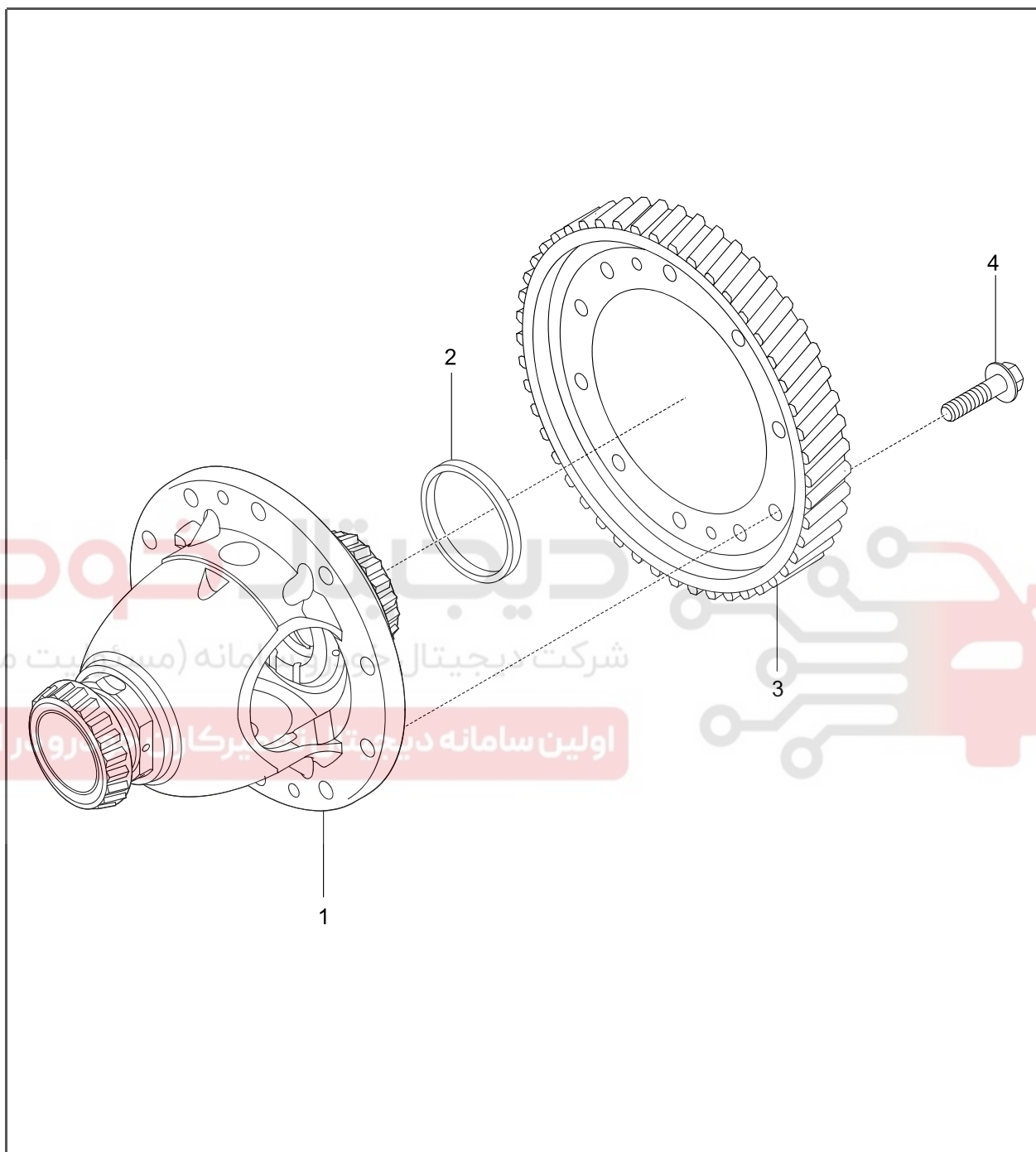
11. Check the operating conditions of gear and sleeve.

Modification basis	
Application basis	
Affected VIN	

S.G.N.

3196-06

DISASSEMBLING AND ASSEMBLING OF DIFFERENTIAL ASSEMBLY



1. Differential sub assembly
2. Differential bearing spacer
3. Differential drive gear
4. Differential drive gear mounting bolt

Modification basis	
Application basis	
Affected VIN	

6-SPEED M/T

TIVOLI 2015.06

1



1. Unscrew the 10 differential drive gear mounting bolts (19 mm) on the differential carrier.

Tightening torque 142.1 to 151.9 Nm

2



2. Tap on the differential drive gear using a rubber hammer.

CAUTION

Tapping on the bearing on the floor can damage the bearing. Make sure to hold the differential carrier by hand.

3

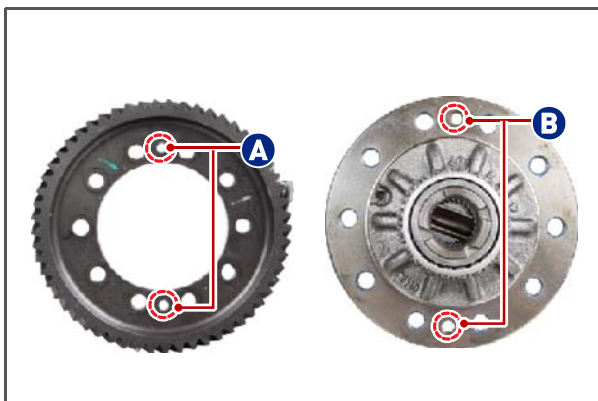


3. Separate the differential drive gear from the differential carrier.

4



4. Assemble in the reverse order of disassembly. Make sure to clean the removed components and apply oil before installing.



- a. Fit the differential drive gear to the differential carrier.

CAUTION

The holes of the differential carrier (A) and the holes of the differential drive gear (B) should be aligned.



- b. Tighten the differential drive gear mounting bolts on the differential carrier in the sequence shown in the picture in 2 or 3 steps.

Tightening torque 142.1 to 151.9 Nm



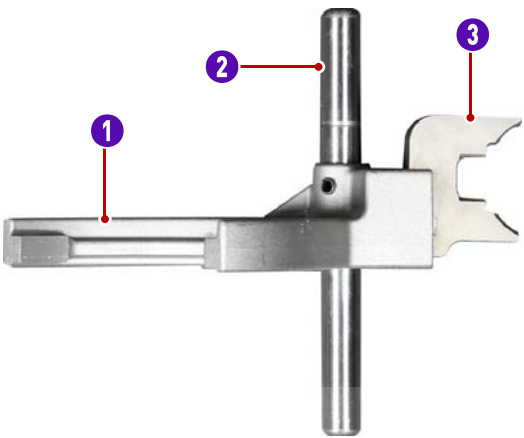
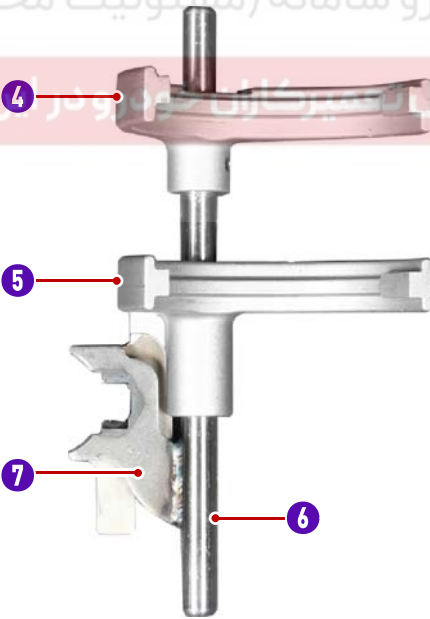
- c. Check the operating condition of the differential carrier.

Modification basis	
Application basis	
Affected VIN	

S.G.N.

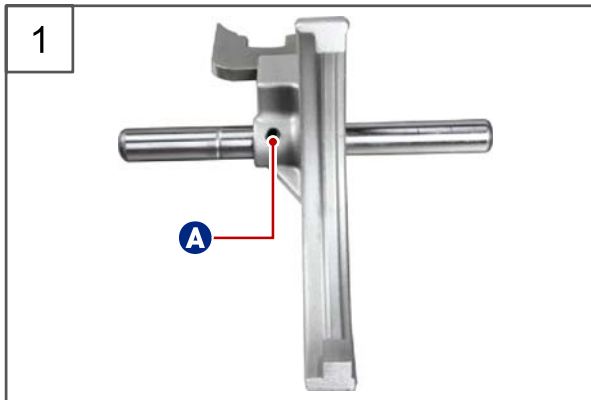
3196-06

DISASSEMBLING AND ASSEMBLING OF SHIFT RAIL

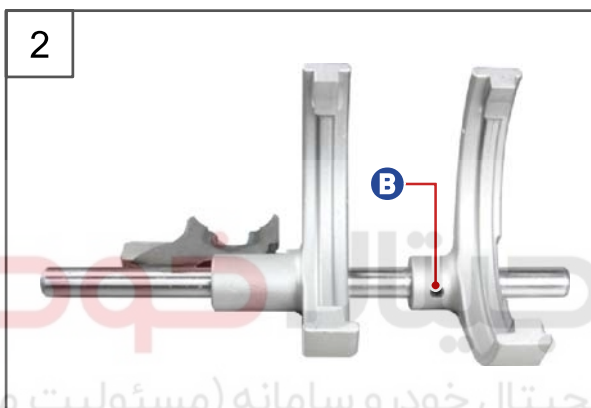
	<p>1st & 2nd gear shift assembly</p> 
<p>3rd & 4th gear and 5th & 6th gear shift assembly</p> 	<p>Reverse gear shift assembly</p> 
<ol style="list-style-type: none"> 1. 1st & 2nd gear shift fork 2. 1st & 2nd gear shift rail 3. 1st & 2nd gear shift lug 4. 5th & 6th gear shift fork 5. 3rd & 4th gear shift fork 	<ol style="list-style-type: none"> 6. 3rd & 4th gear and 5th & 6th gear shift rail 7. 3rd & 4th gear and 5th & 6th gear shift lug 8. Reverse gear shift fork 9. Reverse gear shift rail 10. Reverse gear shift lug

Modification basis	
Application basis	
Affected VIN	

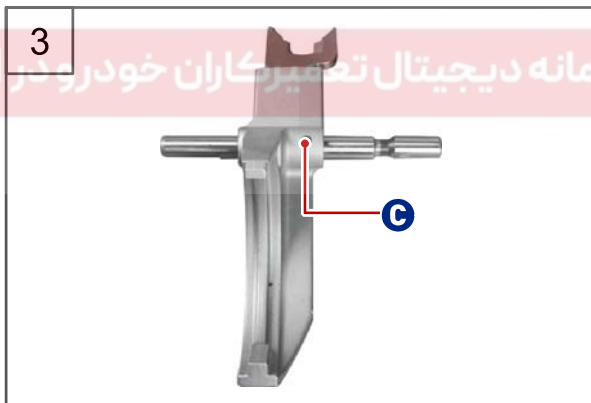
1) Disassembling



1. Remove the spring pin (A) for the 1st & 2nd gear shift fork with a punch from the 1st & 2nd gear shift rail mounted to the output shaft. And then remove the shift fork and shift lug from the shift rail.



2. Remove the spring pin (B) for the 5th & 6th gear shift fork with a punch from the 3rd & 4th gear and 5th & 6th gear shift rail mounted to the input shaft. And then remove the 5th & 6th gear shift fork, shift lug, and 3rd & 4th gear shift fork from the shift rail.



3. Remove the spring pin (C) for the reverse gear shift fork with a punch from the reverse gear shift rail mounted to the reverse gear idler shaft. And then remove the shift fork and shift lug from the shift rail.

4. Assemble in the reverse order of disassembly.



CAUTION

The split of the spring pin should face the shaft of the shift rail.
Make sure to install the removed pin to the original position and not to mix up.

Modification basis	
Application basis	
Affected VIN	

2) How To Select Spacer



Put the assembled clutch housing assembly on the surface plate, and measure the following values with a height gauge to select the proper spacer for the transaxle.



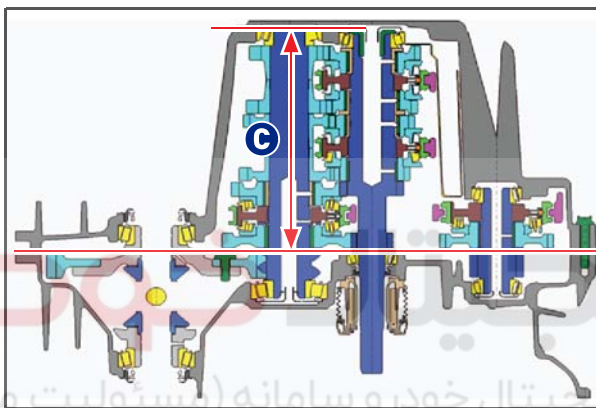
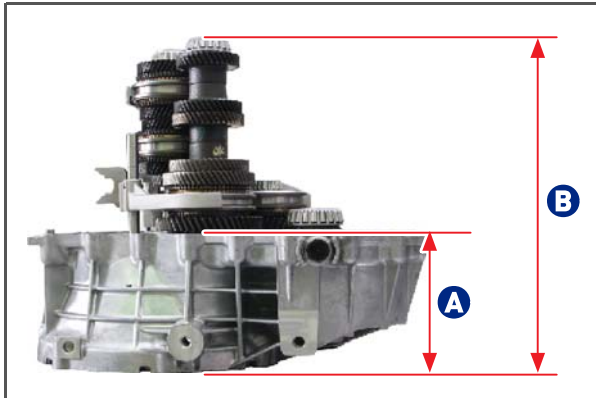
1. Measure the height at 3 points on the mating surface of the clutch housing and the transmission housing and calculate the average value (A). Set this value as a reference.



2. Measure the mounting height of the shaft assembly at 3 points and calculate the average value (B).



3. Measure the height difference (C) between the mating surface of the transmission housing and the shaft bearing outer race groove with a gauge.



4. *Use below formula to select a proper spacer:

Average value (B) - Average value (A) = H

Height (C) - H = Thickness of spacer (H")

Install the spacer which meets the calculated thickness of spacer (H").

شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

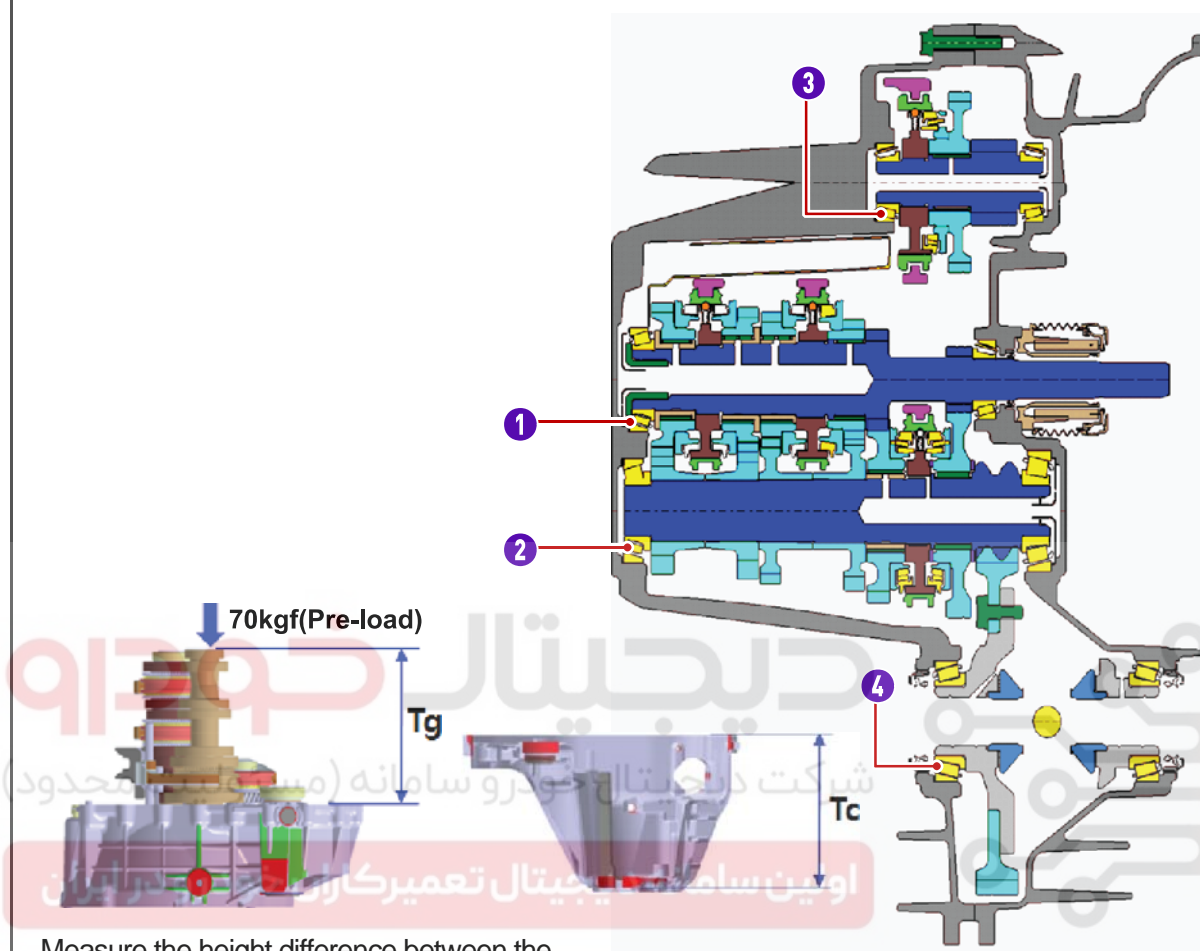
اولین سامانه دیجیتال تعمیرکاران خودرو در ایران

Modification basis	
Application basis	
Affected VIN	

6-SPEED M/T

TIVOLI 2015.06

How to select spacer



Measure the height difference between the clutch housing and the shaft with the shaft installed on the clutch housing. And measure the gap of the transmission case. Then select the spacer that meets the end play of the shaft to assemble it.

- 1) Average value of ①: 0 to 0.05T
 - 2) Average value of ②: 0.05T to 0.10T
 - 3) Average value of ③: 0 to 0.05T
 - 4) Average value of ④: 0.15T to 0.20T
- * Thickness of spacer = $T_c - T_g - \text{"Average value"}$

Modification basis	
Application basis	
Affected VIN	

3) Input Shaft Spacer (16 variants)



Part No.	Thickness (mm)	Symbol
43201T33070	0.70	70
43201T33073	0.73	73
43201T33076	0.76	76
43201T33079	0.79	79
43201T33082	0.82	82
43201T33085	0.85	85
43201T33088	0.88	88
43201T33091	0.91	91
43201T33094	0.94	94
43201T33097	0.97	97
43201T33100	1.00	100
43201T33103	1.03	103
43201T33106	1.06	106
43201T33109	1.09	109
43201T33112	1.12	112
43201T33115	1.15	115

AISIN 6
SPEED6-SPEED
M/T

CLUTCH

PROPELLER

DRIVE
SHAFT

AWD

SUSPENSION

BRAKE
SYSTEM

ESP

ABS

ELECTRIC
POWERWHEEL
AND TIRE

TPMS

SUB
FRAME

Modification basis	
Application basis	
Affected VIN	

6-SPEED M/T

TIVOLI 2015.06

4) Output Shaft Spacer (17 variants)

Measuring output shaft height



Part No.	Thickness (mm)	Symbol
43202T33072	0.72	72
43202T33075	0.75	75
43202T33078	0.78	78
43202T33081	0.81	81
43202T33084	0.84	84
43202T33087	0.87	87
43202T33090	0.90	90
43202T33093	0.93	93
43202T33096	0.96	96
43202T33099	0.99	99
43202T33102	1.02	102
43202T33105	1.05	105
43202T33108	1.08	108
43202T33111	1.11	111
43202T33114	1.14	114
43202T33117	1.17	117
43202T33120	1.20	120

5) Reverse Gear Idler Shaft Spacer (16 variants)



Part No.	Thickness (mm)	Symbol
43204T33084	0.84	84
43204T33087	0.87	87
43204T33090	0.90	90
43204T33093	0.93	93
43204T33096	0.96	96
43204T33099	0.99	99
43204T33102	1.02	102
43204T33105	1.05	105
43204T33108	1.08	108
43204T33111	1.11	111
43204T33114	1.14	114
43204T33117	1.17	117
43204T33120	1.20	120
43204T33123	1.23	123
43204T33126	1.26	126
43204T33129	1.29	129

AISIN 6
SPEED6-SPEED
M/T

CLUTCH

PROPELLER

DRIVE
SHAFT

AWD

SUSPENSION

BRAKE
SYSTEM

ESP

ABS

ELECTRIC
POWERWHEEL
AND TIRE

TPMS

SUB
FRAME

Modification basis	
Application basis	
Affected VIN	

6-SPEED M/T

TIVOLI 2015.06

6) Differential Carrier Assembly Spacer (20 variants)

Measuring differential carrier assembly height



Part No.	Thickness (mm)	Symbol
43203T33071	0.71	71
43203T33074	0.74	74
43203T33077	0.77	77
43203T33080	0.80	80
43203T33083	0.83	83
43203T33086	0.86	86
43203T33089	0.89	89
43203T33092	0.92	92
43203T33095	0.95	95
43203T33098	0.98	98
43203T33101	1.01	101
43203T33104	1.04	104
43203T33107	1.07	107
43203T33110	1.10	110
43203T33113	1.13	113
43203T33116	1.16	116
43203T33119	1.19	119
43203T33122	1.22	122
43203T33125	1.25	125
43203T33128	1.28	128

S.G.N.

3710-01 SHIFT LEVER ASSEMBLY**Preceding work**

- Park the vehicle on the level ground and place the chocks against the tires.
- Disconnect the negative battery cable.



1. Remove the front console assembly.

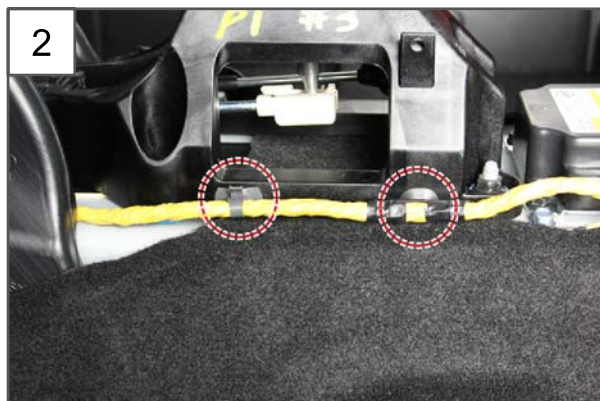
**NOTE**

Refer to "FRONT CONSOLE ASSEMBLY" under "REMOVAL AND INSTALLATION" subsection of "BODY INTERIOR" section in "BODY" chapter.

Modification basis	
Application basis	
Affected VIN	

6-SPEED M/T

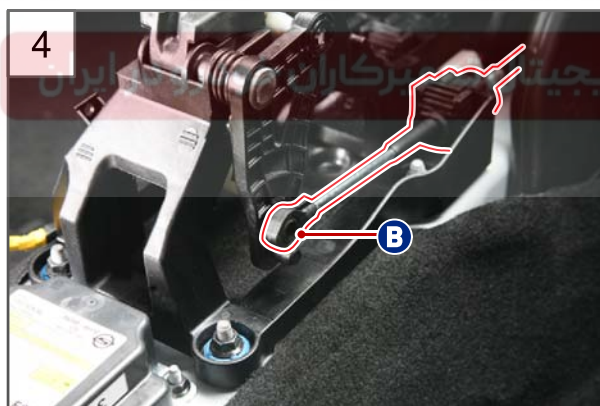
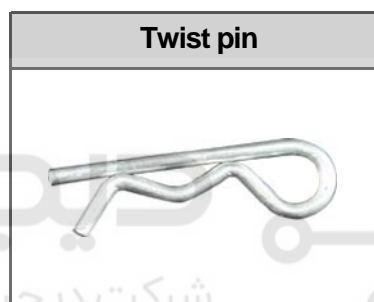
TIVOLI 2015.06



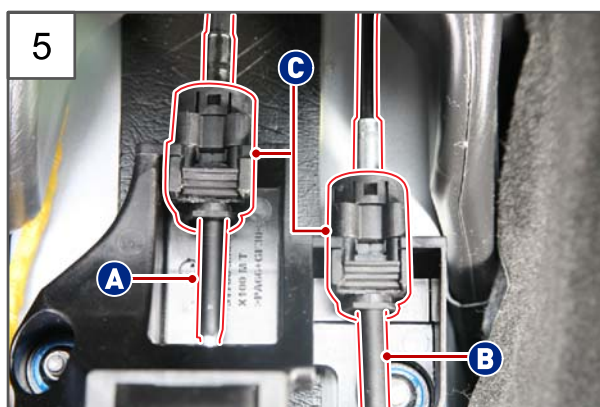
2. Remove the wiring retaining clamp from the shift lever assembly.



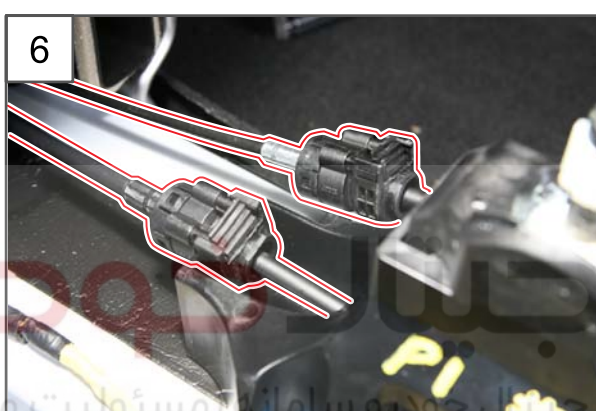
3. Remove the twist pin (A) for the selector cable from the shift lever assembly.



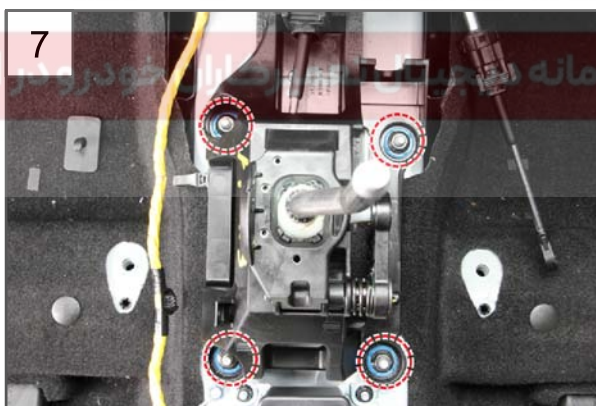
4. Remove the selector cable (B) from the shift lever assembly.



5. Detach the retaining clips (C) for the shift cable (A) and selector cable (B) from the shift lever assembly.



6. Free the selector cable and shift cable from their mounting positions.



7. Unscrew the 4 mounting nuts (12 mm) for the shift lever assembly.

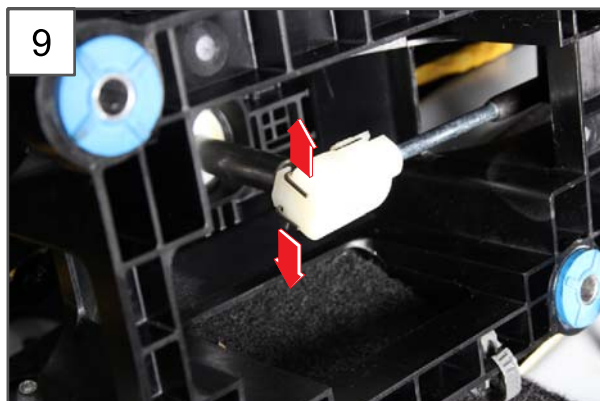


8. Free the shift lever assembly.

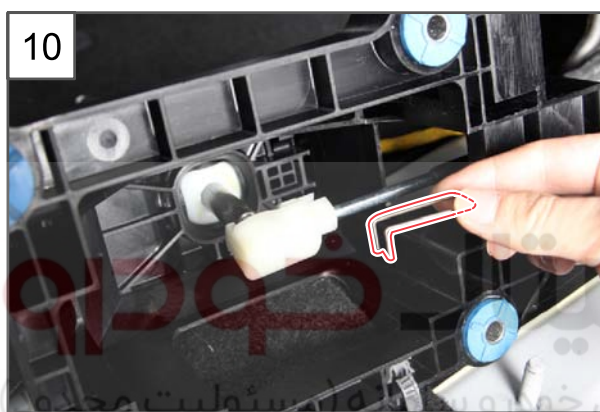
Modification basis	
Application basis	
Affected VIN	

6-SPEED M/T

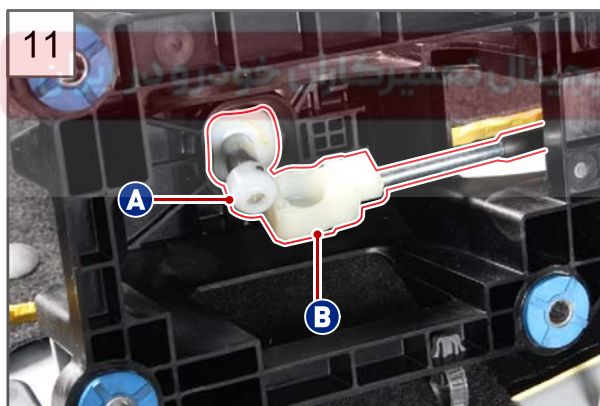
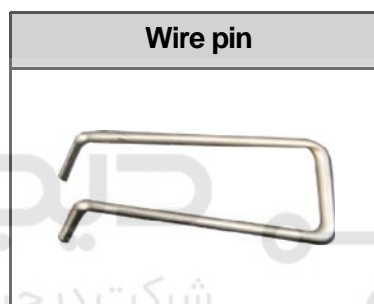
TIVOLI 2015.06



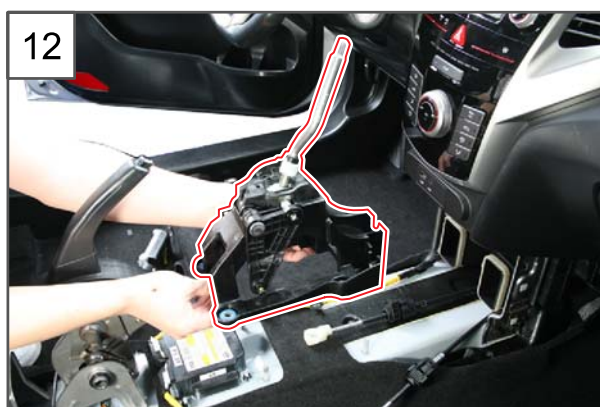
9. Spread the left and right sides of the retaining wire pin (A) for the selector cable.



10. Remove the retaining wire pin from the shift cable.



11. Separate the shift cable (B) and the shift lever ball (A).



12. Remove the shift lever assembly.

13. Install in the reverse order of removal.



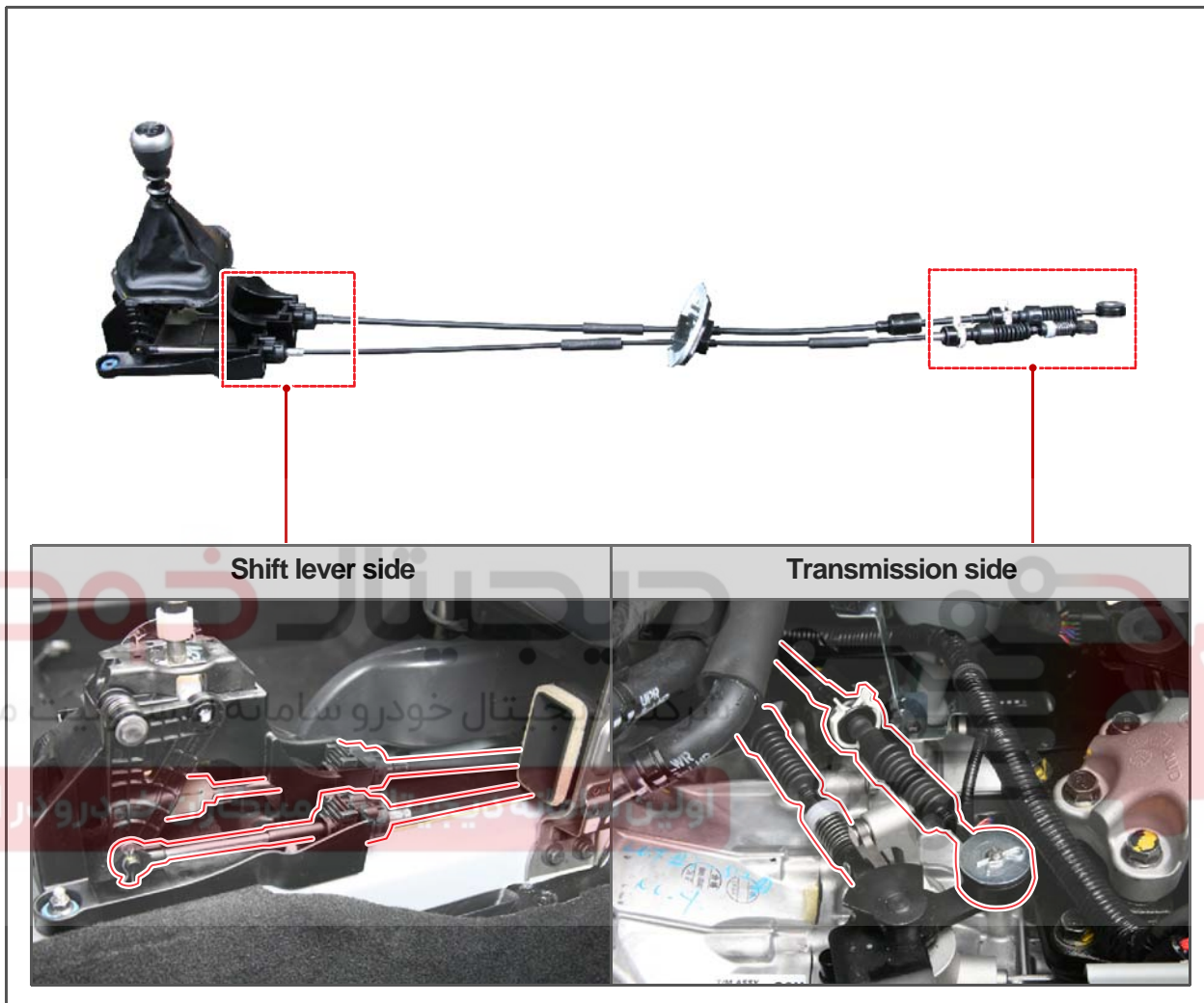
S.G.N.

3710-03

TRANSMISSION CABLE ASSEMBLY

Preceding work

- Park the vehicle on the level ground and place the chocks against the tires.
- Disconnect the negative battery cable.



1. Remove the front console assembly.

**NOTE**

Refer to "FRONT CONSOLE ASSEMBLY" under "REMOVAL AND INSTALLATION" subsection of "BODY INTERIOR" section in "BODY" chapter.

Modification basis	
Application basis	
Affected VIN	

6-SPEED M/T

TIVOLI 2015.06

AISIN 6
SPEED6-SPEED
M/T

CLUTCH

PROPELLER

DRIVE
SHAFT

AWD

SUSPENSION

BRAKE
SYSTEM

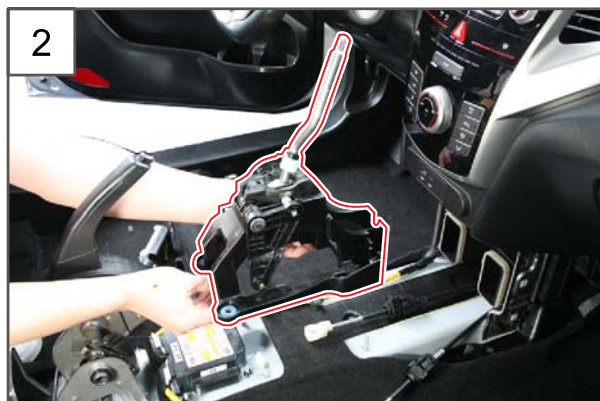
ESP

ABS

ELECTRIC
POWERWHEEL
AND TIRE

TPMS

SUB
FRAME



2. Remove the shift lever assembly.



NOTE

Refer to "SHIFT LEVER ASSEMBLY" under "REMOVAL AND INSTALLATION" subsection of "6-SPEED M/T" in "CHASSIS" chapter.



3. Remove the 2 mounting nuts (12 mm) securing the cable bracket on the instrument panel.

Tightening torque 17.64 ~ 21.56Nm

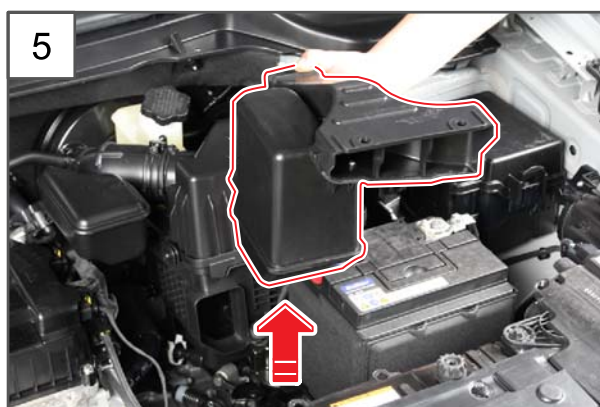


CAUTION

Tighten the bracket mounting nuts to the specified torque.



4. Remove the 2 screw rivets securing the snorkel assembly.

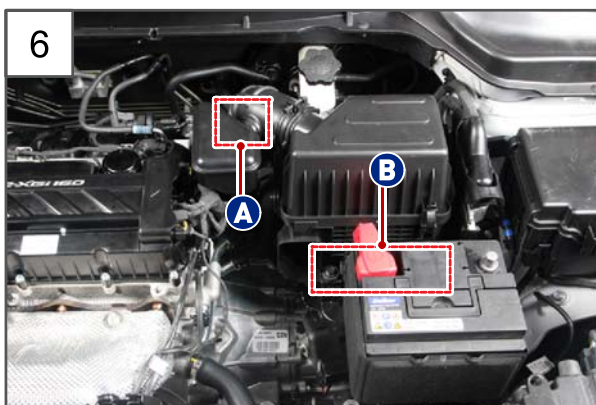


5. Remove the snorkel assembly.

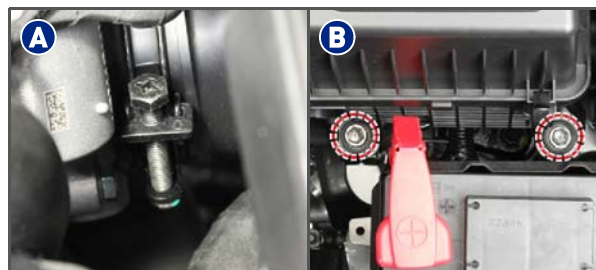
With D16DTF



► Gasoline engine

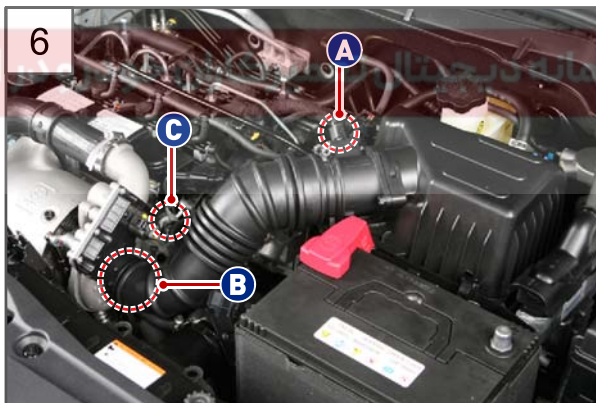


6. Unscrew the 2 bolts (12 mm) for the air cleaner housing mounting and the intake hose clamp bolt (10 mm).

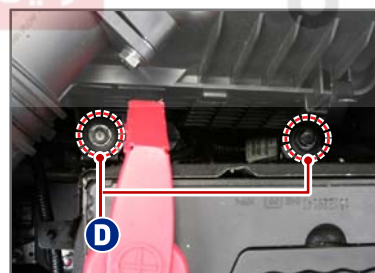


7. Remove the air cleaner housing with the intake hose.

► Diesel engine



6. Unhook the mounting clamps on the HFM sensor connector (A) and hose from the air cleaner to the turbocharger and the oil separator hose clamp (C) and then, unscrew the 2 air cleaner housing mounting bolts (D, 12 mm).



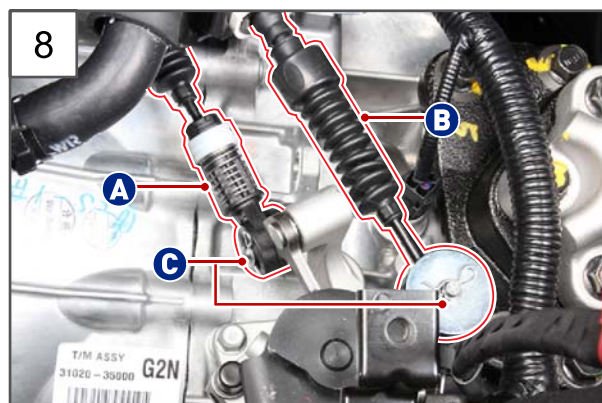
7. Unscrew the 2 air cleaner housing mounting bolts (12 mm) and remove the air cleaner housing assembly together with the hose between the air cleaner and turbocharger.

⚠ CAUTION



Cover the turbocharger inlet with a cap or cloth so that any foreign material does not enter the turbocharger after disconnecting the hose.

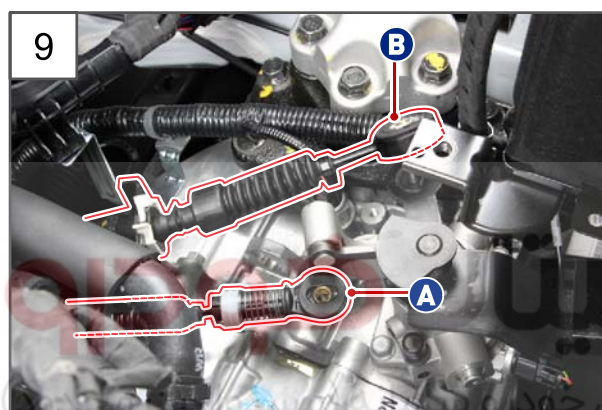
Modification basis	
Application basis	
Affected VIN	

► Applies to both gasoline and diesel engines

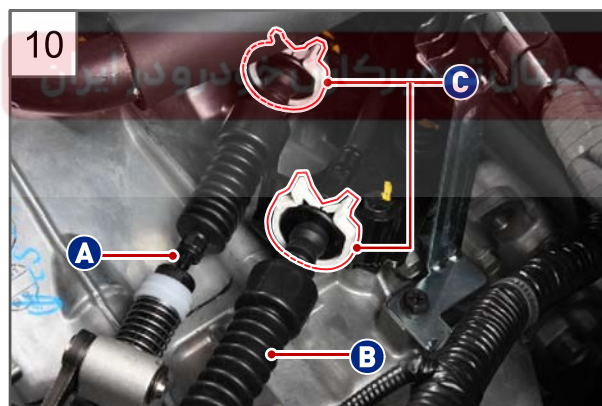


8. Remove the twist pins (C) for the selector cable (A) and shift cable (B) and remove the selector cable washer.

Twist pin	Washer
	



9. Disconnect the selector cable (A) and shift cable (B) from the control lever assembly.

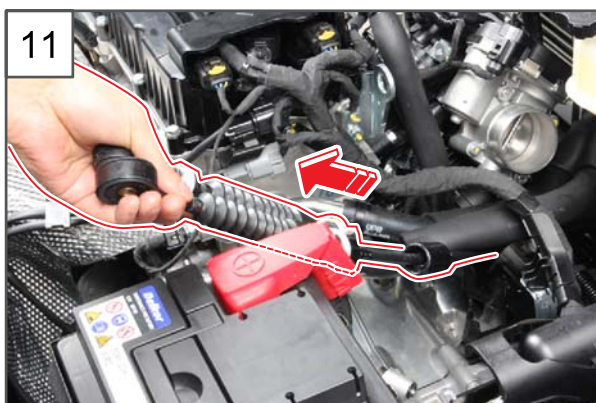


10. Detach the retaining clips (C) for the selector cable (A) and shift cable (B) from the mounting bracket on the transmission.



NOTE

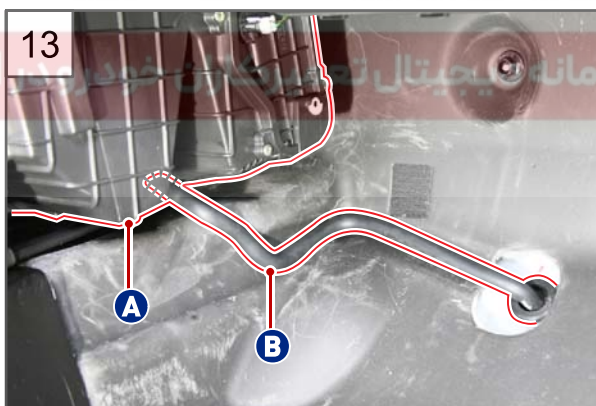
The cable can be disconnected easily from the mounting bracket by pulling the cable with the clip on the cable is pressed.



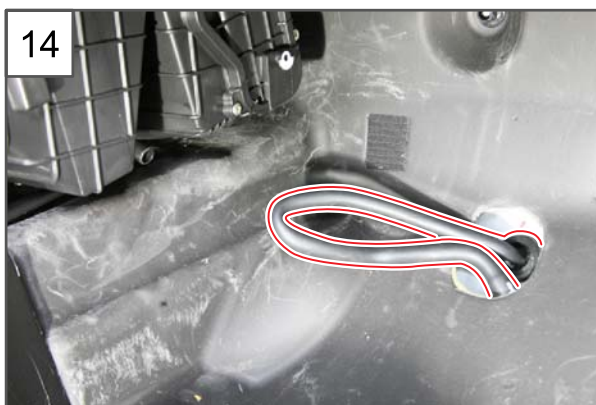
11. Pull out the transmission cable assembly from the engine compartment.



12. Bend some of the passenger carpet over.



13. Disconnect the A/C water drain hose (B) from the evaporator (A).



14. Bend the A/C water drain hose aside.

Modification basis	
Application basis	
Affected VIN	

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T I V O L I



15. Remove the shift cable assembly by pulling out the shift cable from the passenger side.

CAUTION

Do not fold, twist, or bend the shift cable excessively when removing the shift cable or shift lever.



16. Install in the reverse order of removal.



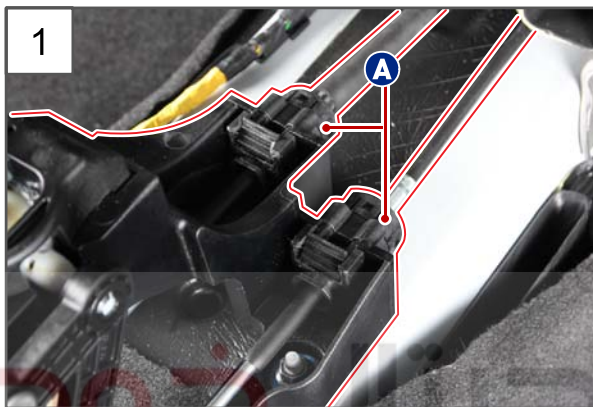
Modification basis	
Application basis	
Affected VIN	

1) Cautions When Installing

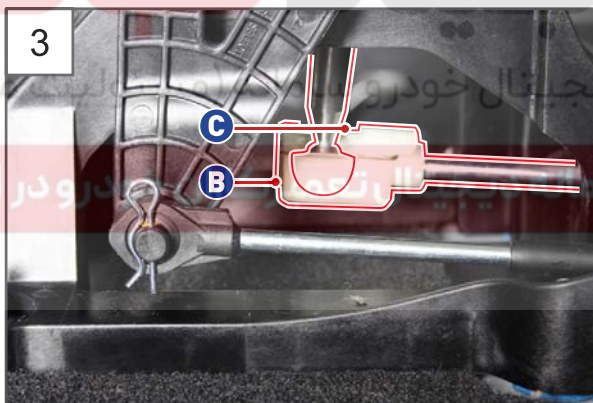


NOTE

- Install in the reverse order of removal. Observe the precautions stated in the below:
- The shift lever and selector lever should be in the neutral position.
- Tighten the mounting nut to the specified torque, and make sure that the ball joint of the selector rod and the mountings for the cable are secured firmly.
- Pay attention to the installation direction for the twist pin.



1. When connecting the shift cable and the selector cable to the bracket, make sure that the hook is engaged to the mounting bracket securely.
2. Make sure that the protruding parts at both sides of the cable (A) is inserted in the shift lever groove firmly when connecting the shift cable to the shift lever assembly.

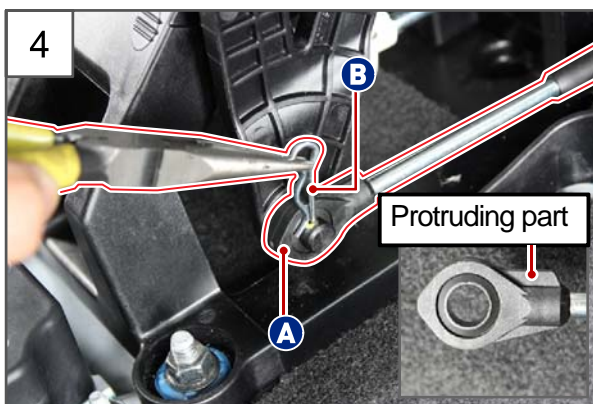


3. Fit the shift cable member (B) to the shift lever ball (C) securely.



NOTE

Fit the selector cable member to the selector lever rod securely.



4. Install the member (A) of the selector cable to the shift lever with the protruding part of the member facing upward. Insert the member from top to bottom so that the groove of the snap pin (B) is tight against the groove of the member.
5. Check the installation of each part.

Modification basis	
Application basis	
Affected VIN	

6-SPEED M/T

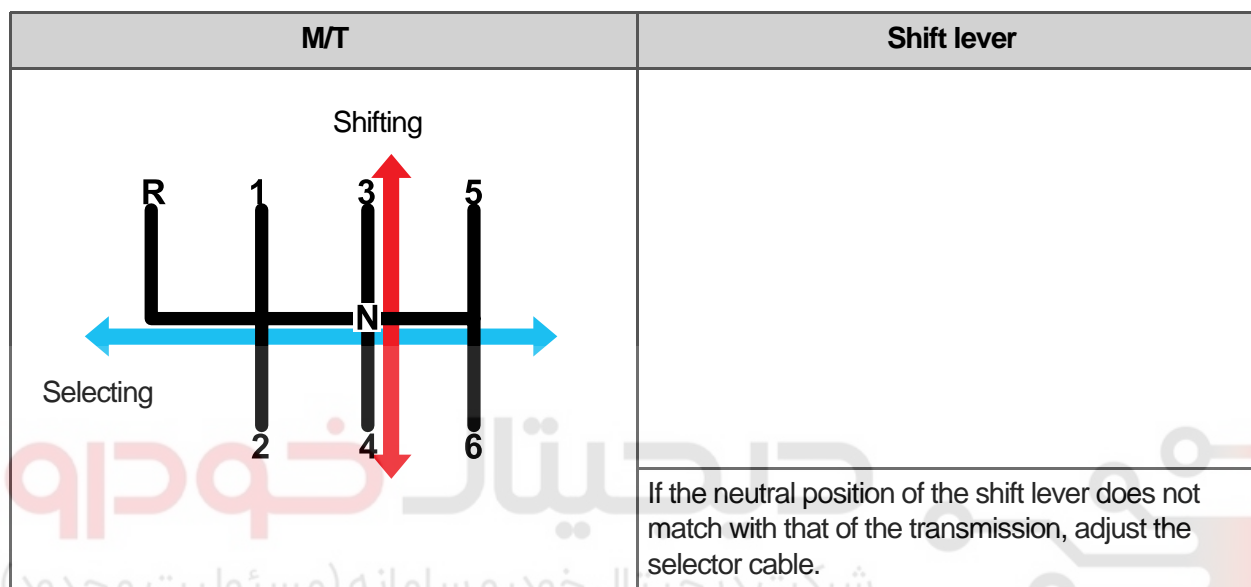
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2) How To Adjust

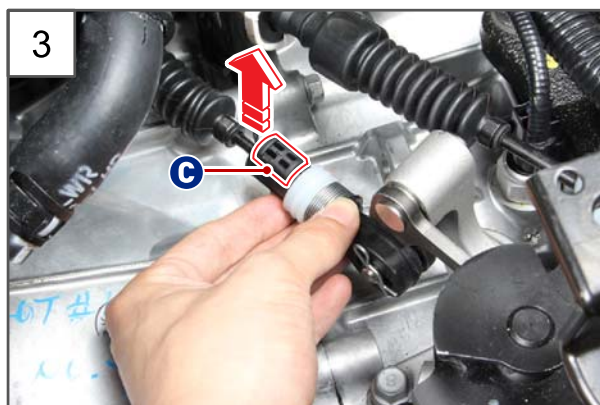
(1) Adjusting selector cable

If the shift lever is in a position other than the neutral position when the M/T is in neutral state (selector: moving the shift lever to the left and right), adjust the lever to the neutral position as shown below:

1. Adjusting the selector cable puts the selector lever to the N position.



2. Compress the selector member cable spring (B) connected to the selector rod ball (A) of the selector cable (1).



3. Adjust the cable length by pushing up the protruding part (C) of the selector cable located on the cable member.



CAUTION

To adjust the cable, the selector lever should be in the neutral position.



3. After adjusting the selector cable with the shift lever in N position, press on the protruding part of the member.
4. Make sure that the spring of the selector cable is expanded and check the shift lever operating conditions.

CAUTION

If the cable is not adjusted properly, the shift lever will not work properly. Therefore make sure to check the operating conditions.

Abnormal engagement feeling when shifting

Symptom: After replacing transmission or cables, there is an abnormal engagement feeling when shifting from N to R, N to 1st, 2nd to 3rd gears.

Possible Cause: 1. Twisted, bent, folded cable
2. Selector and shift cables out of position

Action: Work on the shift cable while paying attention not to bend, fold, or twist the cables, and making sure to check the correct positions of the shift and selector cables.

Modification basis	
Application basis	
Affected VIN	

6-SPEED M/T

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Memo

دیجیتال خودرو

شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

اولین سامانه دیجیتال تعمیرکاران خودرو در ایران

