

## WD-2

## Transfer System

## Transfer Case Assembly

## Description

Items	Part time	Full time
Type	EST(Electric shift transfer)	TOD(Torque On Demand)
FRT axle connection	FRRD(NAS only)	No FRRD
		(Full time connection)
Weight (Kg), Length(mm)	35, 351	37.3, 351
Gear ratio (HIGH)	1:01	
Gear ratio (LOW)	2.48 : 1	
FRT driving type	Chain	
Lubricant	ATF DEXRON III or equivalent	ATF MOBILE LT or equivalent
Lub. Quantity (L)	1.5-1.7	

## EST

EST(Electric Shift Transfer) is selective electric 4 wheel drive system.

The mode switch consists of the 3 modes ; 2High, 4High, 4Low.

When the vehicle speed is 0mi/h(standing) and the shift lever is in neutral position, it can switch 4High to 4Low.

When selects 4Low mode, it has better driving power (torque ratio-2.481:1) in case not exceeds 40kph(25mi/h).

## TOD

TOD(Torque On Demand) is electronic 4 wheel drive system.

The mode switch consists of the 3 modes ; Auto, 4High-Lock, 4Low.

In Auto mode TCCU receives load condition, driver's will, and ABS/ESP signal, etc and controls the front/rear driving power in the range of 0:100 to 50:50.

When the vehicle speed is 0mi/h(standing) and the shift lever is in neutral position, it can switch 4High-Lock to 4Low.

When selects 4Low mode, it has better driving power (torque ratio-2.481:1) in case not exceeds 40kph(25mi/h).

## Operation

## EST

1. TCCU receives the mode switch signal and activates the shift motor.

The shift cam linked to the shift motor moves the lock-up fork(2High↔4High) or reduction fork(4High↔4Low).

TCCU controls the motor by receiving MPS(Motor Position Sensor) signal inside the shift motor.

Driving chain delivers the power to the front propellar shaft.

2. TCCU receives the mode switch signal(2High→4High) and activates the shift motor.

The shift cam linked to the shift motor moves the lock-up fork(2High↔4High).

Before moving the fork TCCU magnetizes the EMC coil,

TCCU synchronizes the lock-up hub(Front) with EMC housing(Rear) for better shifting.

3. TCCU receives the mode switch signal(4High→4Low) and activates the shift motor.

The shift cam linked to the shift motor moves the reduction fork(4High→4Low).

The reduction hub connected to the reduction fork moves the planetary gear to change the torque ratio(2.481:1) for better driving force.

# Transfer Case Assembly

## WD-3

### TOD

In Auto mode TCCU activates the magnetic clutch by magnetizing the EMC coil and variates the ratio of front/rear driving power by 0:100~50:50 related to the EMC duty.

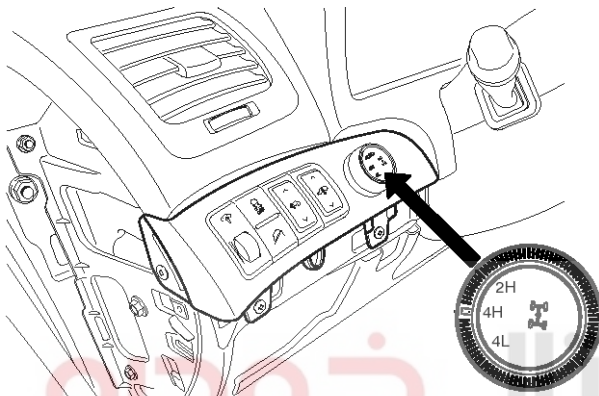
In 4High-Lock mode TCCU fix the ratio of 50:50.

In 4Low mode the torque ratio is 2.481:1.

### Operating Elements

#### EST

1. Mode switch (2High↔4High↔4Low)



- a. Drivers toggle the mode switch to select the 4WD mode(2High, 4High, 4Low)
- b. It can switch 2High↔4High-Lock under the vehicle speed of 80kph(50mph) but mode switching of 2High↔4Low, 4High↔4Low is possible under 3kph(standing) and neutral position of shift lever.

2. Motor Position Sensor (MPS)

MPS is magnetic field sensor and places inside the shift motor.

The MPS and round magnetic in TCCU are as an assembly and the angle is calibrated so should not be disassembled in any case.

Because the angle never be calibrated once the shift motor and TCCU are disassembled.

3. Shift motor

The shift motor switches the 4WD mode(2High↔4High↔4Low) by receiving TCCU signal.

The internal circuit consists of two N-channel and two P-channel of MOSFET.

TCCU moves the shift motor by controlling these FET.

\* The metal-oxide-semiconductor field-effect transistor (MOSFET) is a device used to amplify or switch electronic signals.

It is by far the most common field-effect transistor in both digital and analog circuits.

4. Electronic Magnet Clutch(EMC) coil

The EMC coil synchronizes the lock-up hub with the EMC housing for shifting 4High to 4Low while driving.

EMC is activated before the shift motor moves the lock-up fork and stops after completing shifting 4High.

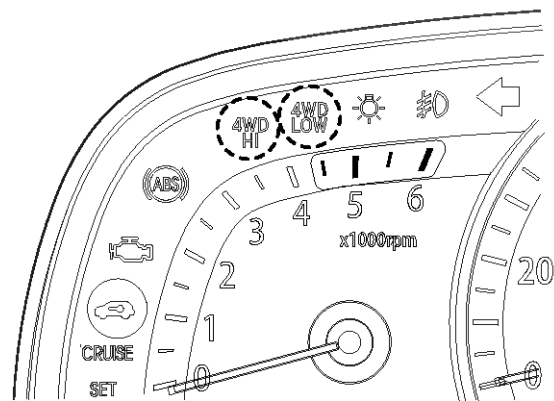
EMC is activated about 6 seconds. TCCU sends 12V of duty 100%.

5. Indicator and Warning lamp

The indicator lamp for 4WD mode(4High,4Low) is in the cluster. But there is no indicator lamp for 2High.

When the 4WD system fails, the 4WD warning lamp(yellow) is on center in the cluster.

The cluster controls 4WD related lamps by receiving TCCU signal via CAN.



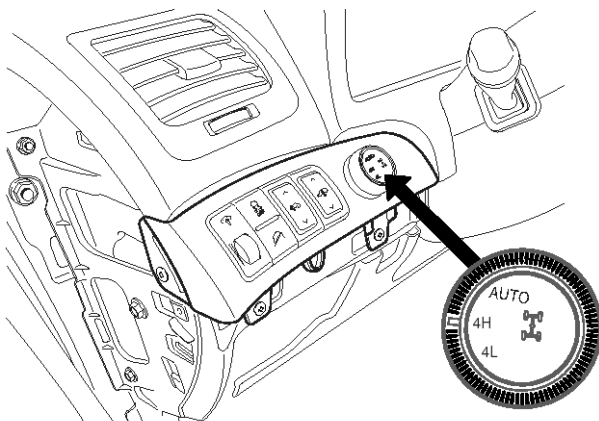
SHMAT9032L

## WD-4

## Transfer System

## TOD

## 1. Mode switch (Auto↔4High↔4Low)



SHMAT9033L

- a. Drivers toggle the mode switch to select the 4WD mode(Auto, 4High, 4Low)
- b. It can switch Auto↔4High-Lock under the vehicle speed of 80kph(50mph) but mode switching of Auto↔4Low, 4High-Lock↔4Low is possible under 3kph(standing) and neutral position of shift lever.

## 2. Motor Position Sensor (MPS)

MPS is magnetic field sensor and places inside the shift motor.

The MPS and round magnetic in TCCU are as an assembly and the angle is calibrated so should not be disassembled in any case.

Because the angle never be calibrated once the shift motor and TCCU are disassembled.

## 3. Shift motor

The shift motor switches the 4WD mode(2High↔4High↔4Low) by receiving TCCU signal.

The internal circuit consists of two N-channel and two P-channel of MOSFET.

TCCU moves the shift motor by controlling these FET.

\*The metal-oxide-semiconductor field-effect transistor (MOSFET) is a device used to amplify or switch electronic signals.

It is by far the most common field-effect transistor in both digital and analog circuits.

## 4. Electronic Magnet Clutch(EMC) coil

The driving force deviates by EMC duty.

TCCU controls EMC duty by receiving the related sensor signals via CAN.

EMC duty is normally 200Hz, 12V at duty 100%, and 0V at duty 0%.

\* While ABS/ESP control is activated, EMC duty control is limited.

## 5. Indicator and Warning lamp

The indicator lamp for 4WD mode(4High-Lock,4Low) is in the cluster. But there is no indicator lamp for Auto.

When the 4WD system fails, the 4WD warning lamp(yellow) is on center in the cluster.

The cluster controls 4WD related lamps by receiving TCCU signal via CAN.

# Transfer Case Assembly

## WD-5

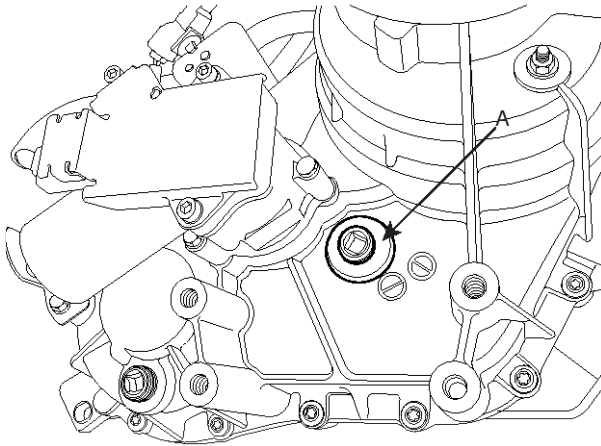
### Service Adjustment Procedure

#### Fluid level inspection

1. Clean the fluid level plug and the surface near.
2. Remove the fluid level plug (A).

#### NOTICE

When the oil is warm, check or drain the oil.



SHMAT9034L

3. Check that the fluid flows out of the fluid level hole. If not, add fluid as required.
4. When the fluid dribbles out of the fluid level hole, install the fluid level plug.

#### Tightening torque:

20~30 Nm(2.0~3.0 kgf.m, 14.5~21.7 lb-ft)

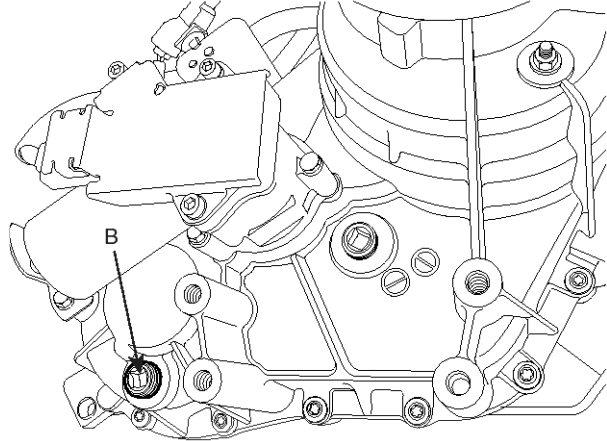
### Fluid replacement

1. Clean the fluid level plug and the surface near.
2. Drain the fluid by removing the drain plug (B).

#### NOTICE

When the oil is warm, check or drain the oil.

Remove the fluid level plug to help drain the fluid.



SHMAT9035L

3. Install the drain plug.

#### Tightening torque:

20~30 Nm(2.0~3.0 kgf.m, 14.5~21.7 lb-ft)

4. Add fluid until the fluid flows out of the fluid level hole.
5. When the fluid dribbles out of the fluid level hole, install the fluid level plug.

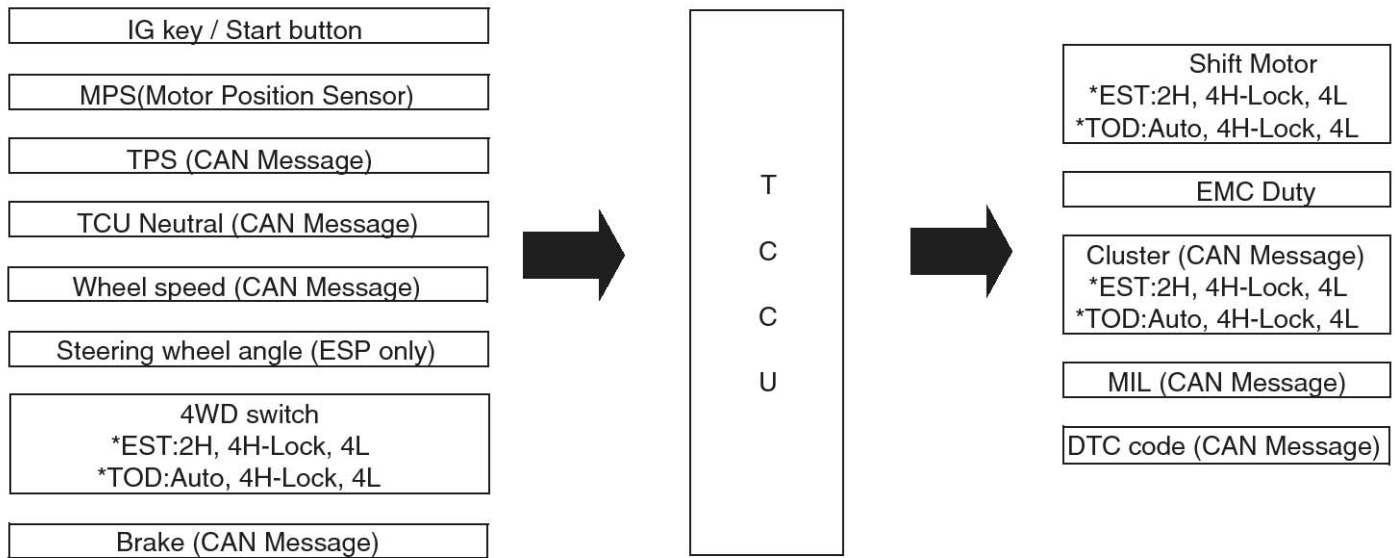
#### Tightening torque:

20~30 Nm(2.0~3.0 kgf.m, 14.5~21.7 lb-ft)

## WD-6

## Transfer System

## TCCU In/Out signal



SHMAT9036L

## TCCU terminal



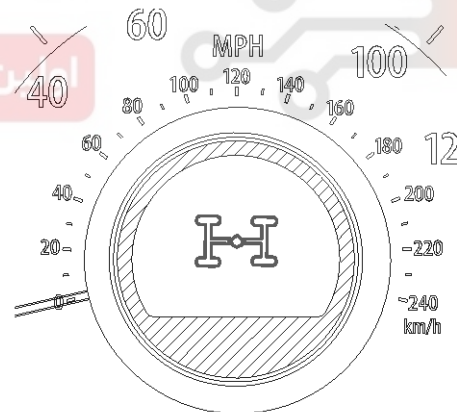
SHMAT9037L

No.	Description
1	Power
2	EMC (+)
3	-
4	CAN High
5	Mode select switch
6	Ground
7	EMC (-)
8	-
9	CAN Low
10	ON/START

## Troubleshooting

## Warning lamp control

- The warning lamp is yellow center in the cluster.
- TCCU communicates the cluster via CAN.



SHMAT9038L

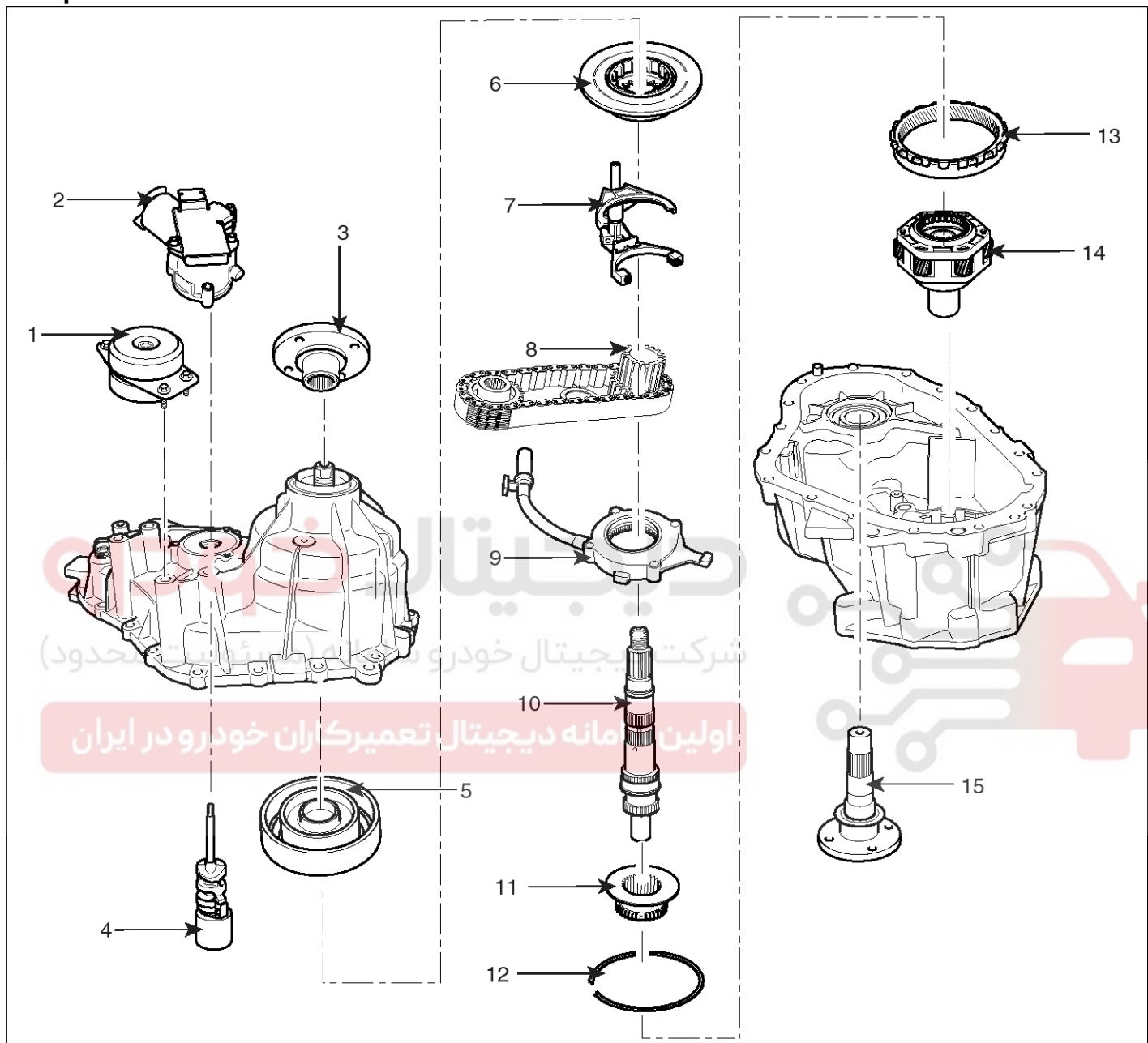


# Transfer Case Assembly

WD-7

## Transfer Assembly

### Components



SHMAT9001L

1. Dynamic damper
2. TCCU and assembly
3. Rear flange
4. Shift shaft assembly
5. Clutch housing
6. Lockup clutch
7. Lockup fork
8. Chian

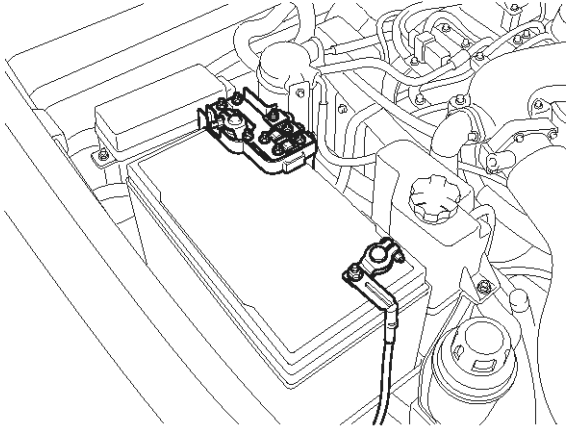
9. Oil filter
10. Main shaft
11. Reduction hub
12. Snap ring
13. Ring gear
14. Carrier assembly
15. Front output shaft assembly

## WD-8

## Transfer System

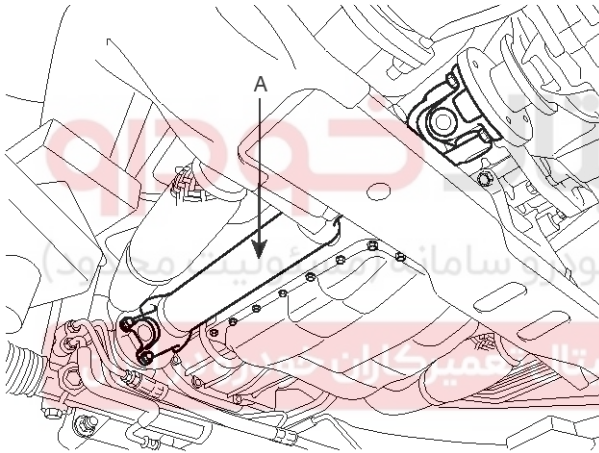
### Removal

1. Disconnect the battery (-) terminal.



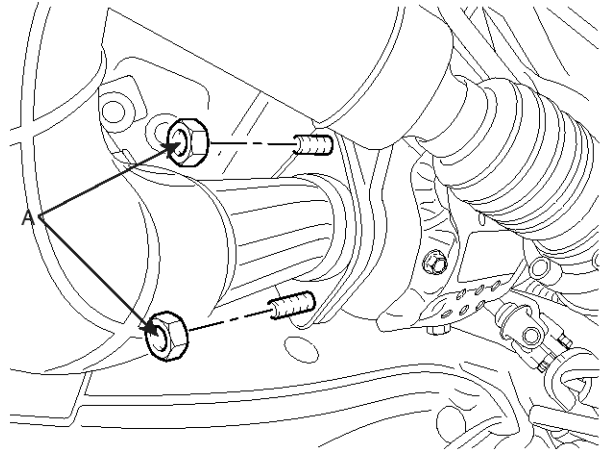
SHMAT8001D

2. Remove the front propeller shaft(A). (4WD)

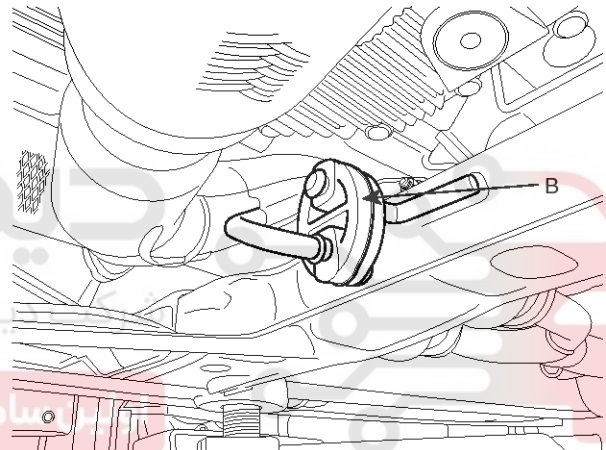


SBLAT6007L

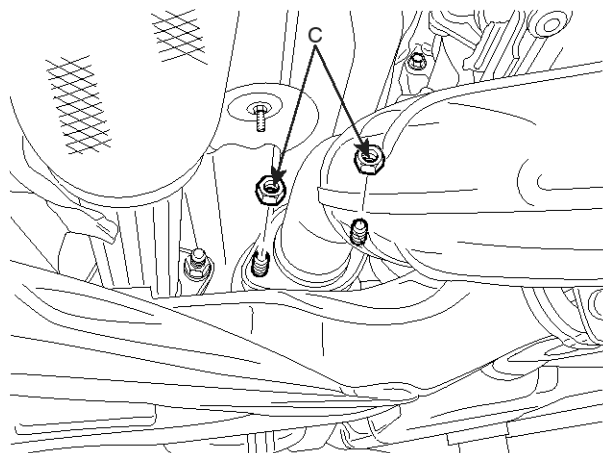
3. Remove the front muffler(A) or muffler hanger rubber(B), by removing rear muffler(C).



SHMAT8002L



SHMAT8003L

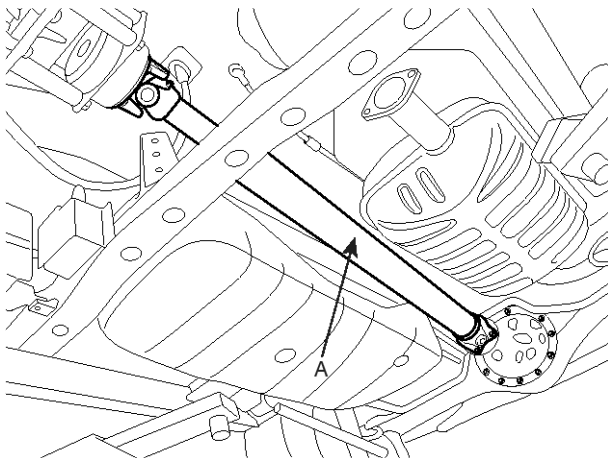


SHMAT8004L

# Transfer Case Assembly

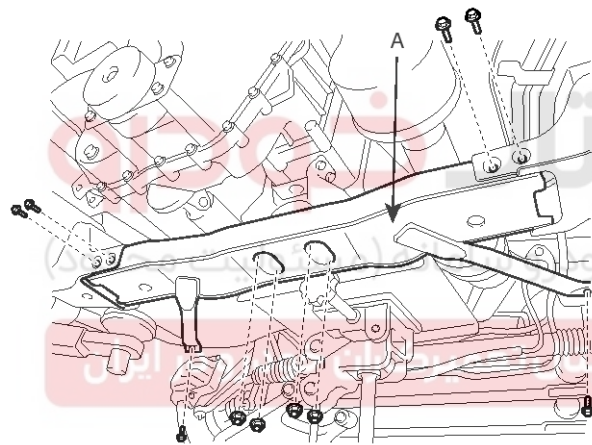
## WD-9

4. Remove the rear propeller shaft(A).



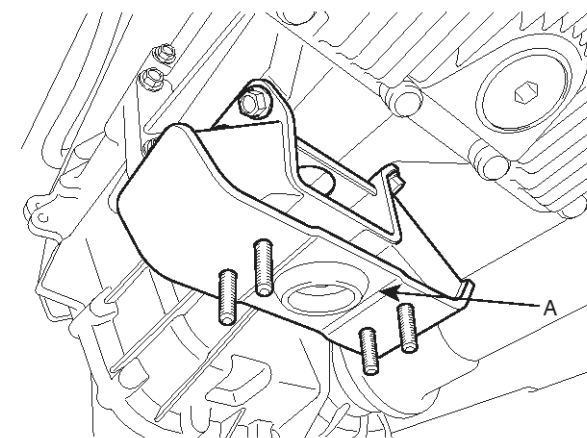
SBLAT6009L

5. Support the transmission assembly with a jack  
6. Remove the cross member(A).



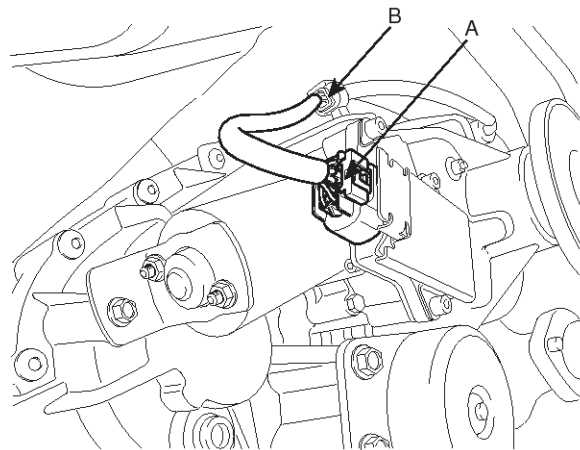
SHMAT8002D

7. Remove the insulator support bracket(A).



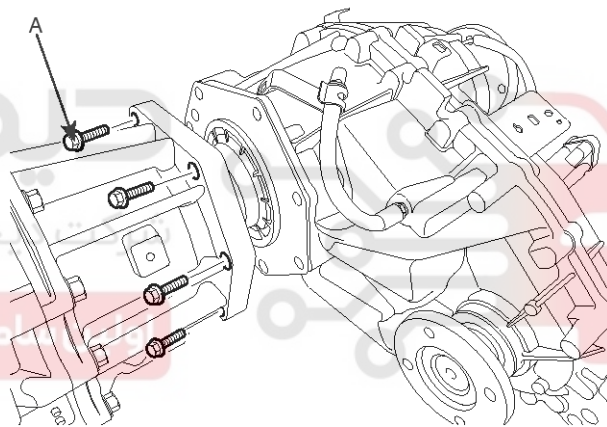
SHMAT8020L

8. Disconnect the 4WD ECU connector(A) or EMC connector(B).

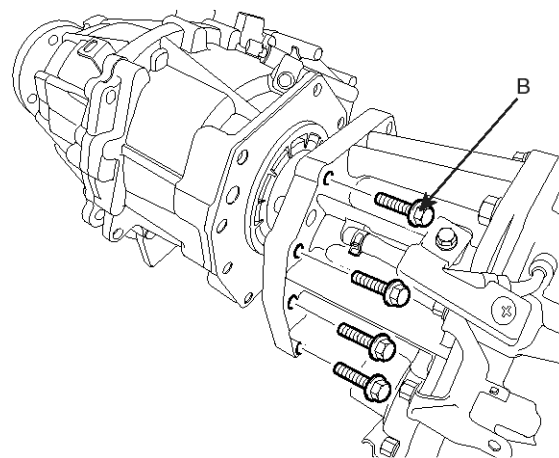


SHMAT8005D

9. Remove the mounting bolts(A,B-4ea) and the transfer assembly.



SHMAT8112L



SHMAT8113L



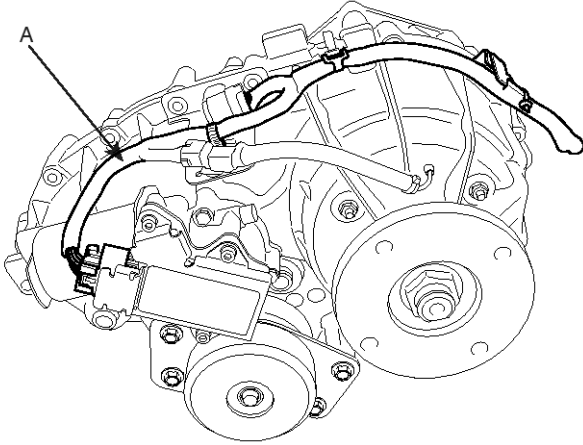
## WD-10

## Transfer System

10. Remove the transfer assembly by lowering the supporting jack.

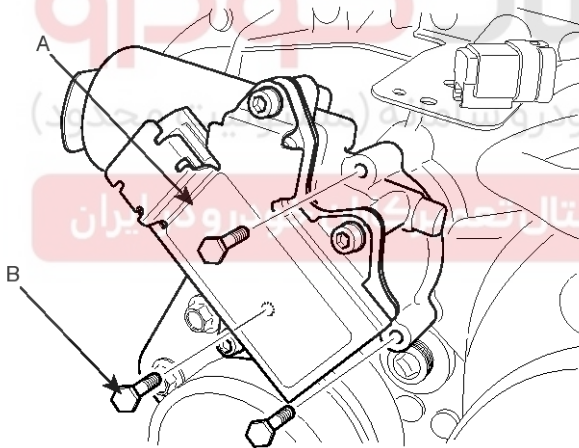
### Disassembly

1. Disconnecting the connectors, remove the wiring assembly (A).



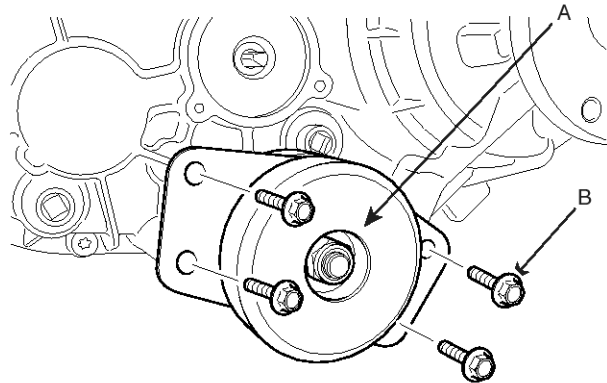
SHMAT9002L

2. Remove the TCCU and motor assembly (A) by removing bolts (B-3ea).



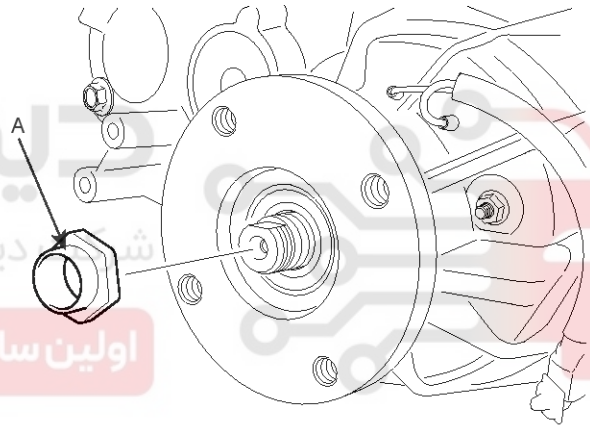
SHMAT9003L

3. Remove the dynamic damper (A) by removing bolts (B-4ea).



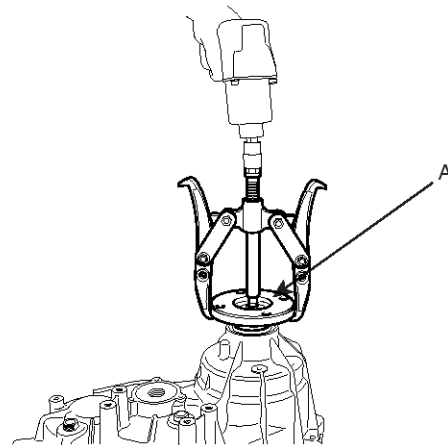
SHMAT9004L

4. Remove the flange nut (A).



SHMAT9005L

5. Remove the rear flange (A) by using a puller.

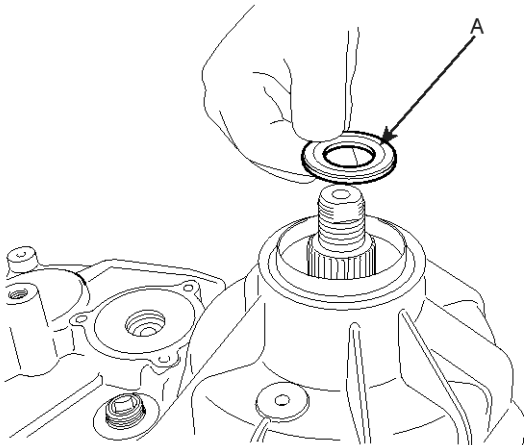


SHMAT9006L

# Transfer Case Assembly

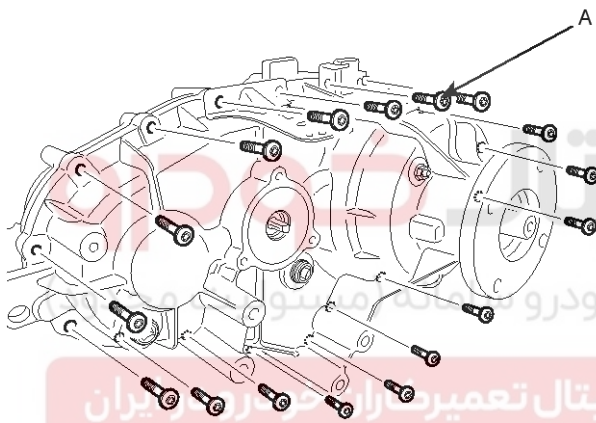
## WD-11

6. Remove the washer (A).



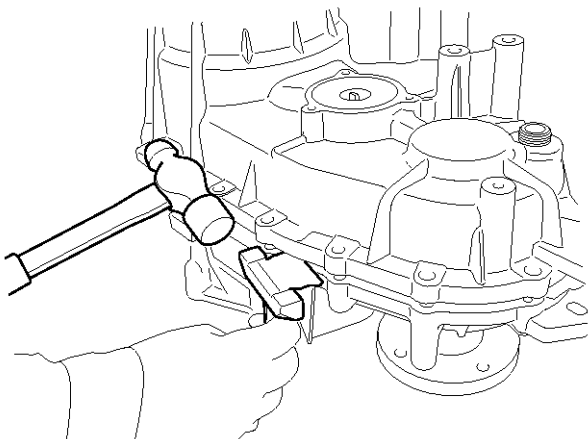
SHMAT9007L

7. Remove the transfer cover bolts (A-17ea).



SHMAT9008L

8. Using the special tool (09215-3C000), separate the transfer cover and case in two parts.

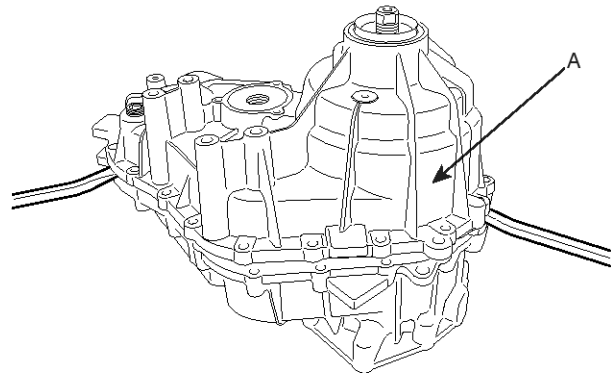


SHMAT9009L

9. Remove the transfer cover (A).

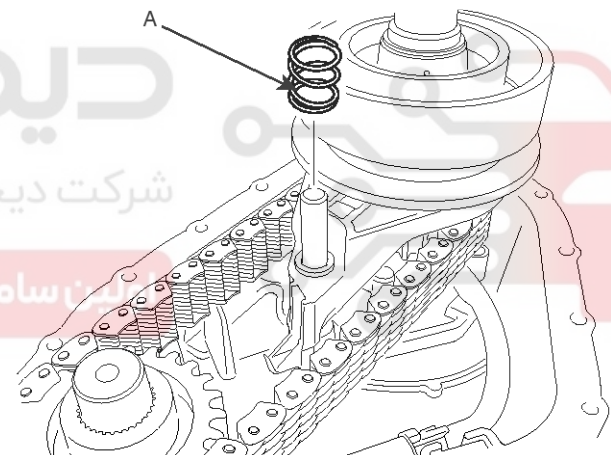
### ⚠ CAUTION

Do not shake the transfer cover not to damage to the inner parts.



SHMAT9010L

10. Remove the return spring (A).

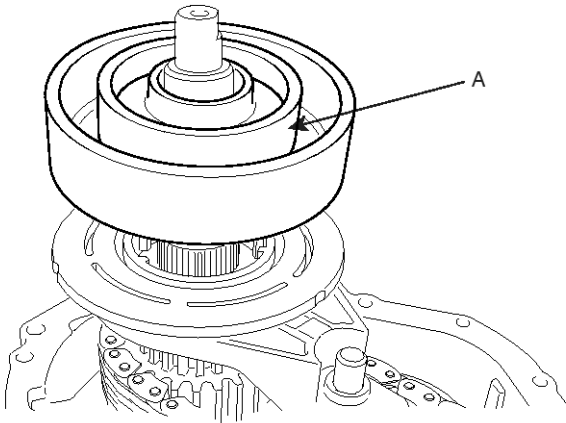


SHMAT9011L

## WD-12

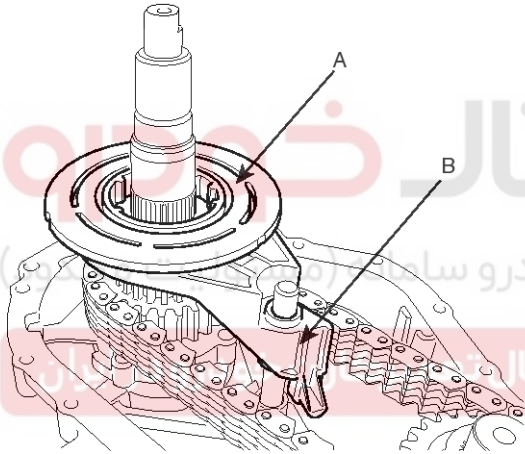
## Transfer System

11. Remove the clutch housing (A).



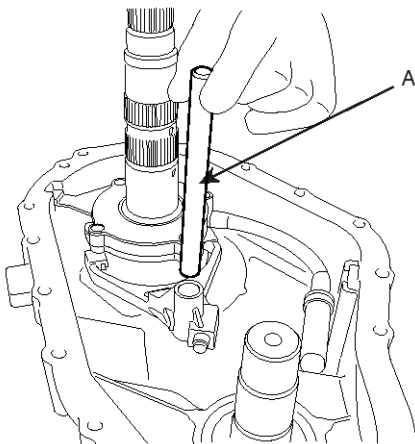
SHMAT9012L

12. Remove the lockup clutch (A) with the lockup fork (B).



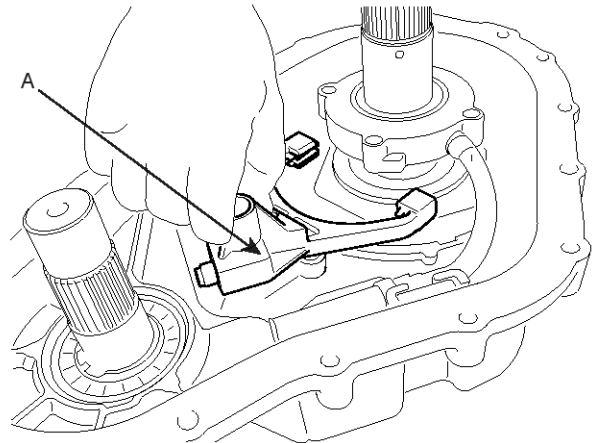
SHMAT9013L

13. Remove the fork rail (A).



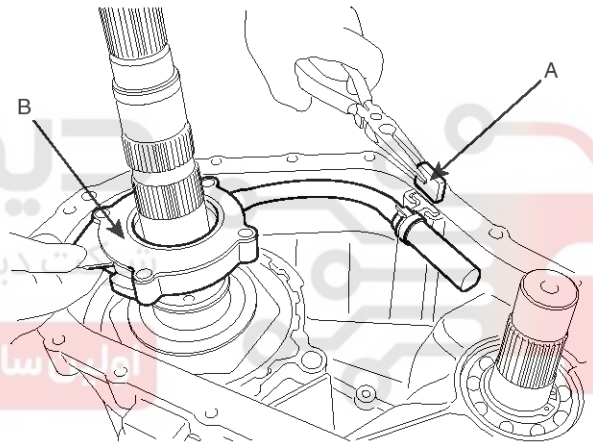
SHMAT9014L

14. Remove the reduction fork (A).



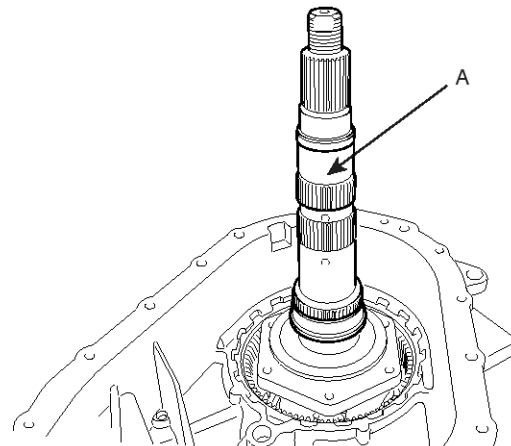
SHMAT9015L

15. Remove the oil filter (B) by removing the magnetic (A).



SHMAT9016L

16. Remove the main shaft (A).

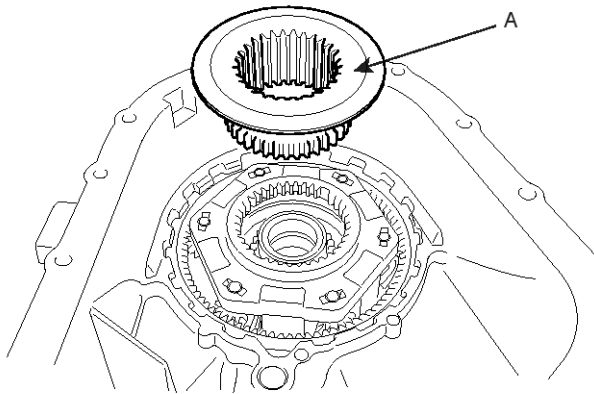


SHMAT9017L

# Transfer Case Assembly

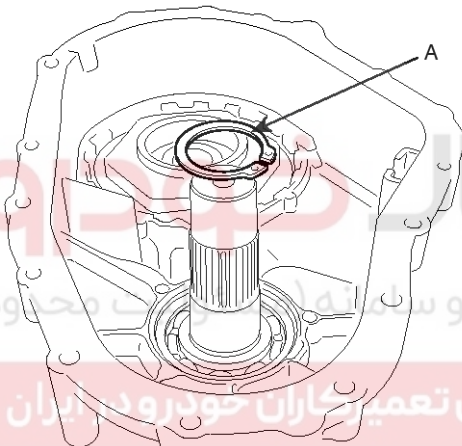
## WD-13

17. Remove the reduction hub (A).



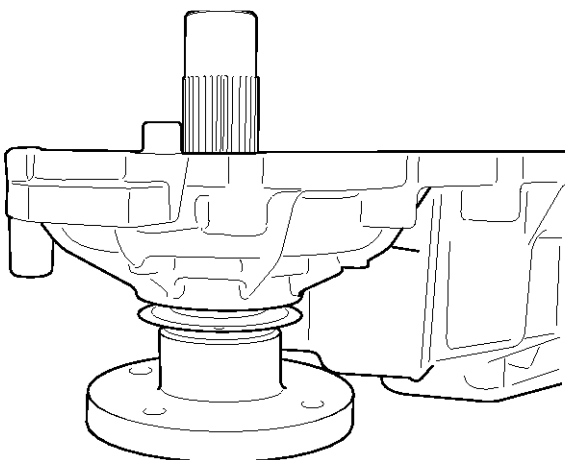
SHMAT9018L

18. Remove the snap ring (A).



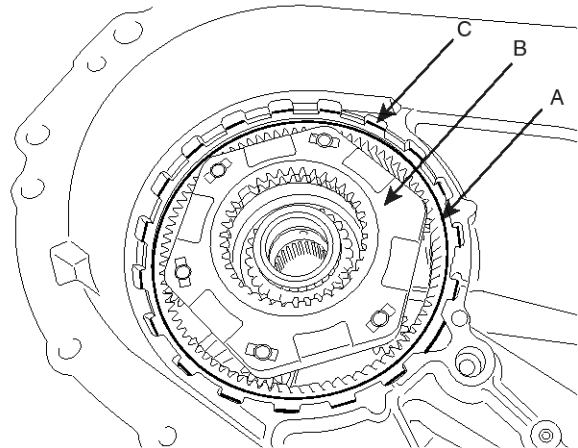
SHMAT9019L

19. Remove the front output shaft assembly outward from the case.



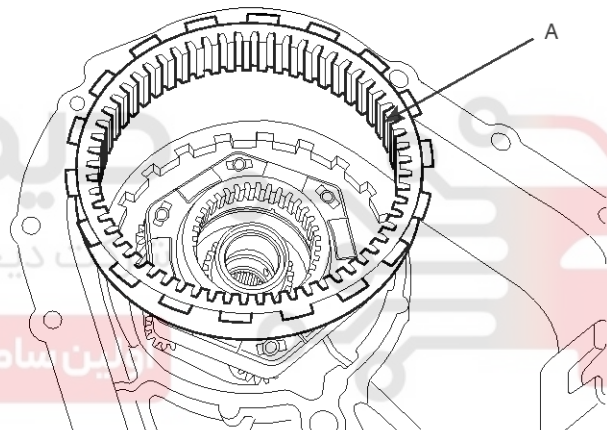
SHMAT9020L

20. Remove the snap ring (A) between the carrier (B) and ring gear (C).



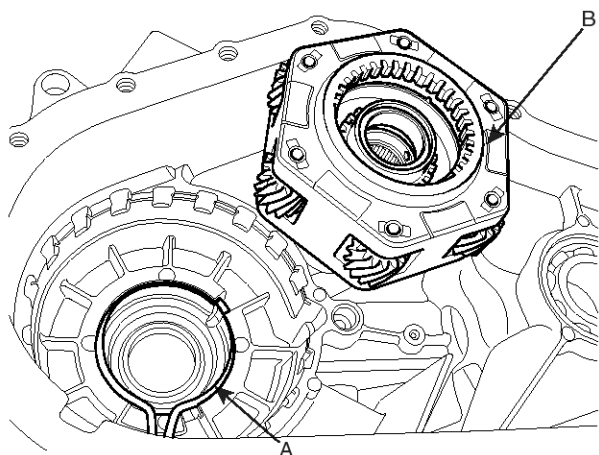
SHMAT9021L

21. Remove the ring gear (A).



SHMAT9022L

22. Widen two ends of the snap ring (A) and remove the carrier assembly (B).

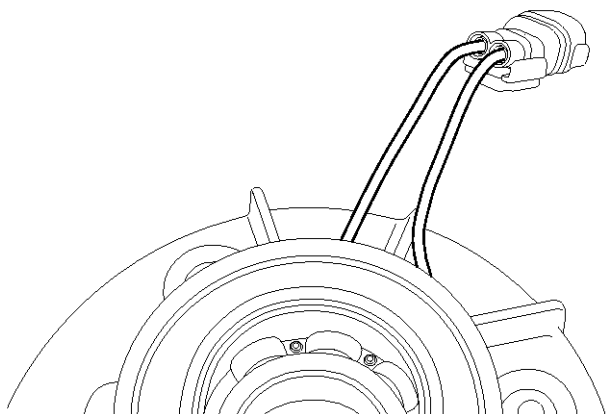


SHMAT9026L

## WD-14

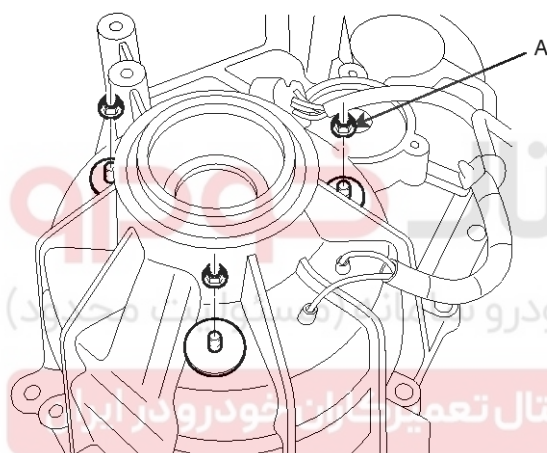
## Transfer System

23. Pull each wire from the connector housing.



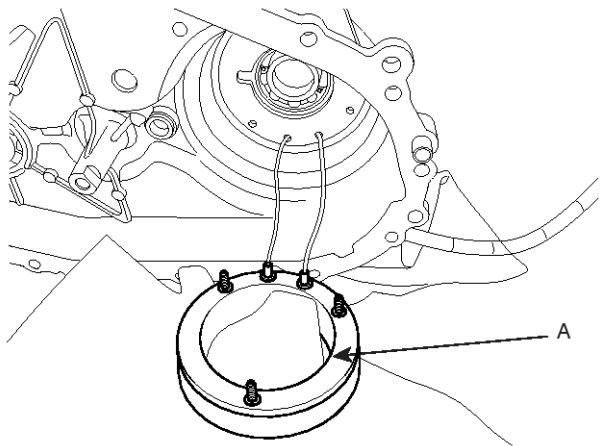
SHMAT9023L

24. Remove the clutch coil nuts (A-3ea).



SHMAT9024L

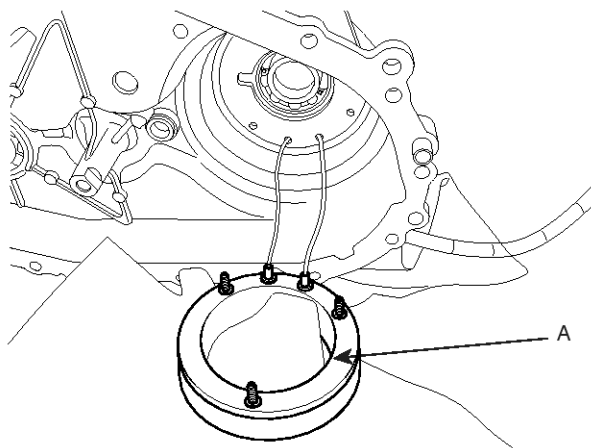
25. Remove the clutch coil (A).



SHMAT9025L

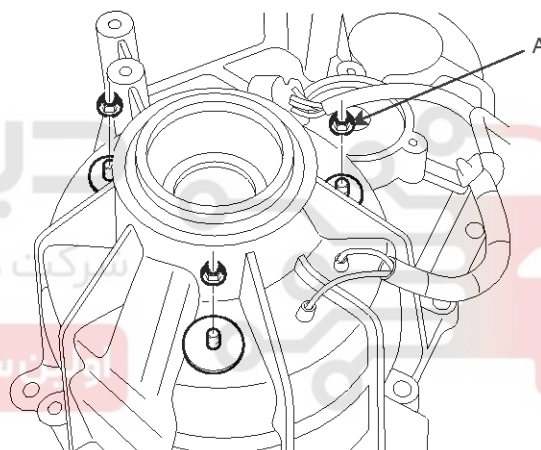
## Reassembly

1. Install the clutch coil (A).



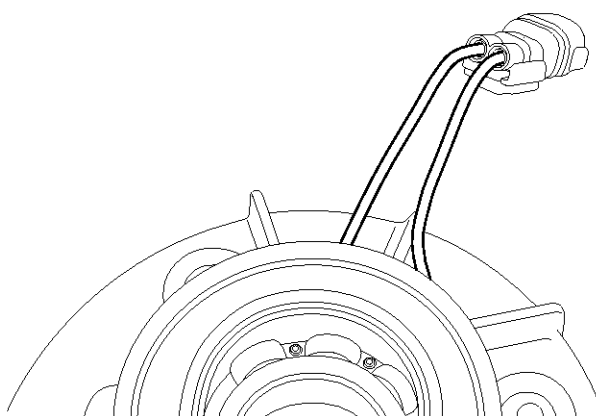
SHMAT9025L

2. Install the clutch coil nuts (A-3ea).



SHMAT9024L

3. Insert each wire to the connector housing.



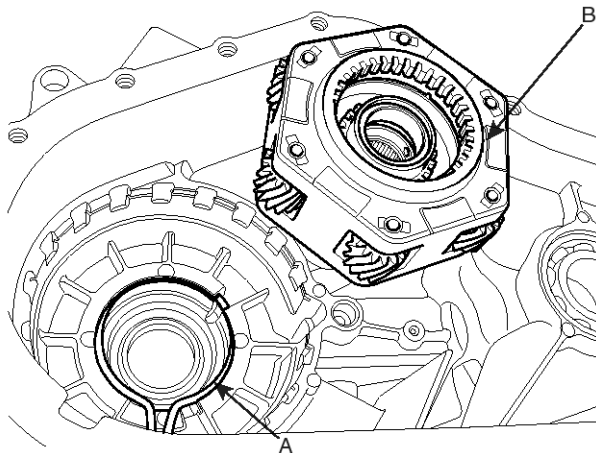
SHMAT9023L



# Transfer Case Assembly

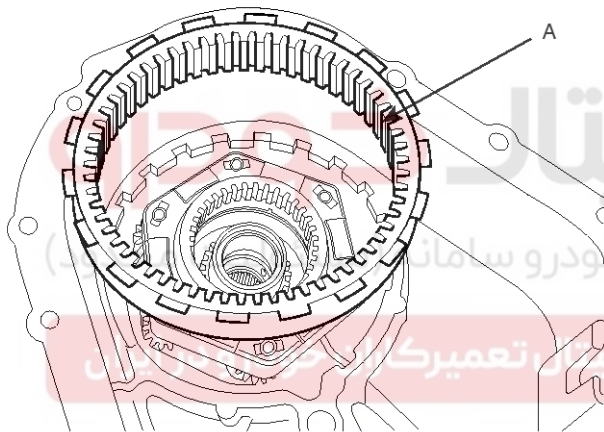
## WD-15

4. Widen two ends of the snap ring (A) and install the carrier assembly (B).



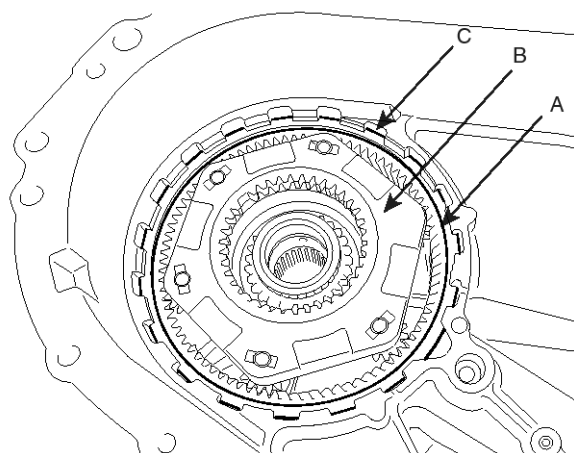
SHMAT9026L

5. Install the ring gear (A).



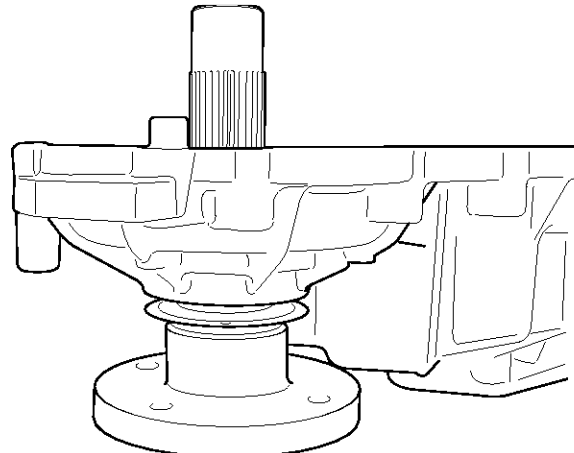
SHMAT9022L

6. Install the snap ring (A) between the carrier (B) and ring gear (C).



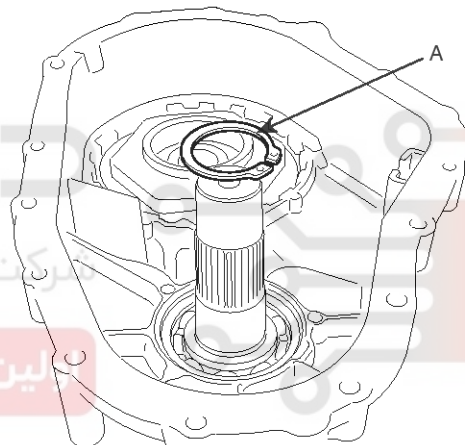
SHMAT9021L

7. Install the front output shaft assembly outward from the case.



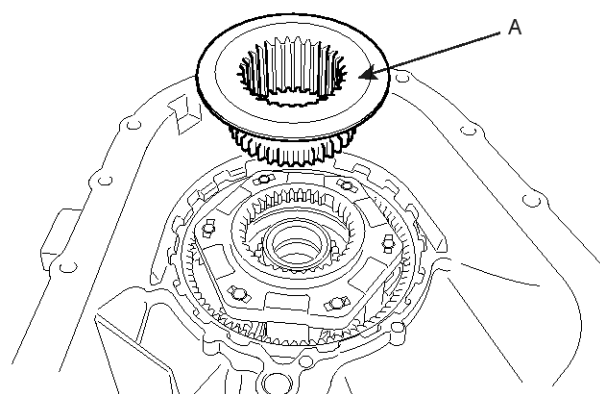
SHMAT9020L

8. Install the snap ring (A).



SHMAT9019L

9. Install the reduction hub (A).

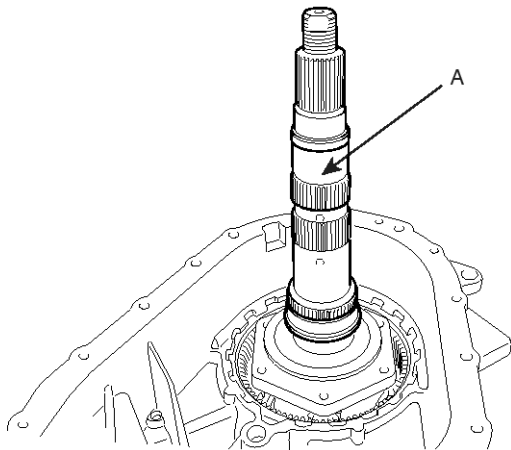


SHMAT9018L

## WD-16

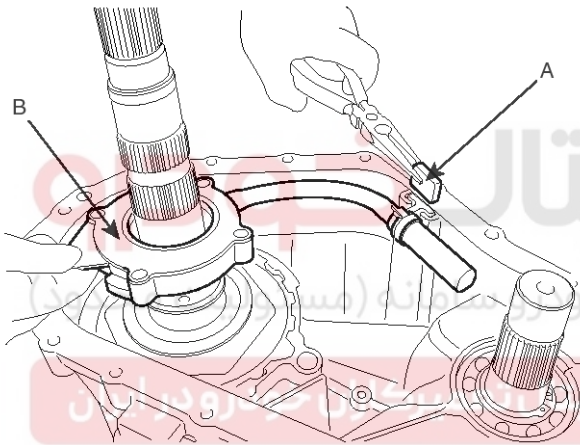
## Transfer System

10. Install the main shaft (A).



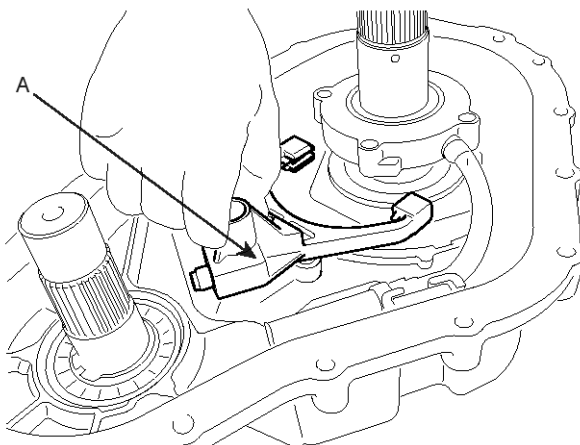
SHMAT9017L

11. Install the oil filter (B) and the magnetic (A).



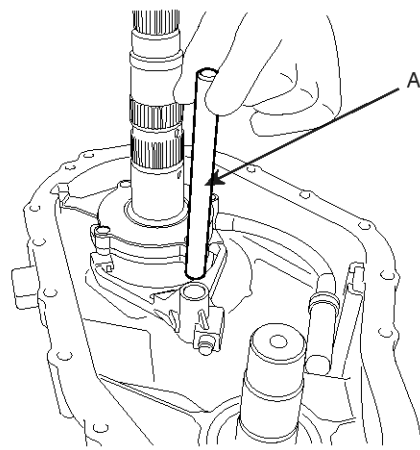
SHMAT9016L

12. Install the reduction fork.



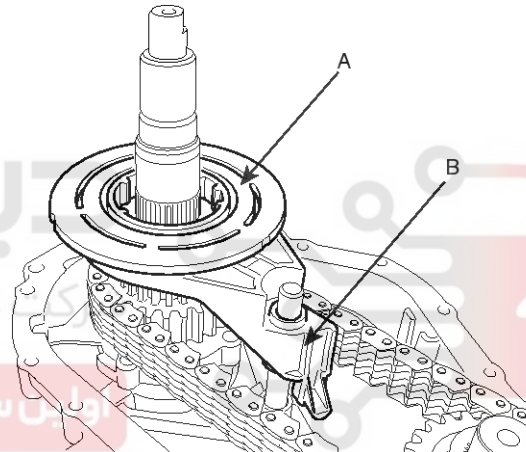
SHMAT9015L

13. Install the fork rail (A).



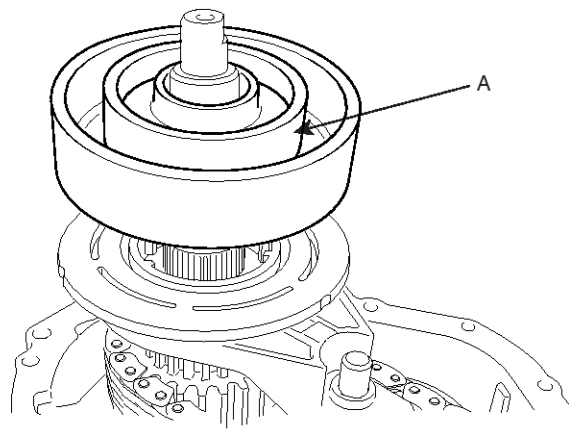
SHMAT9014L

14. Install the lockup clutch (A) with the lockup fork (B).



SHMAT9013L

15. Install the clutch housing (A).

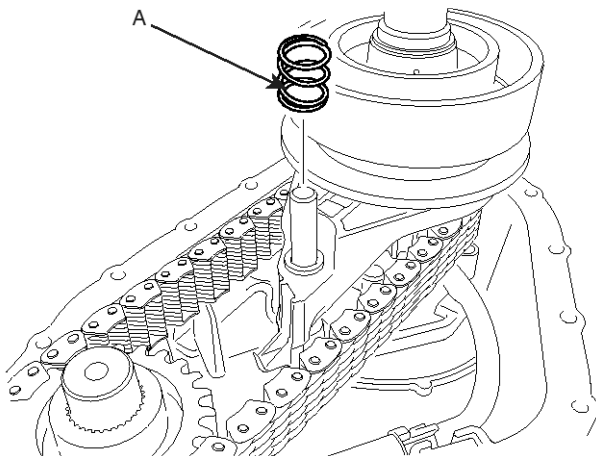


SHMAT9012L

# Transfer Case Assembly

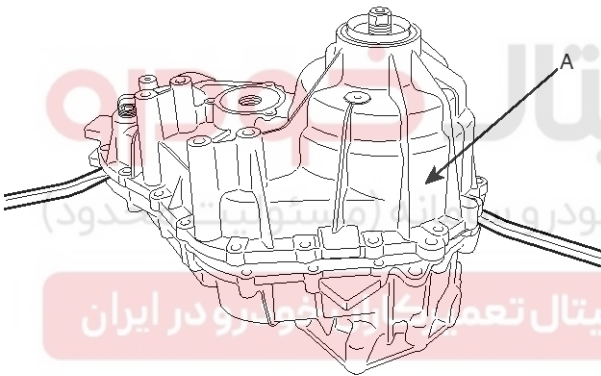
WD-17

16. Install the return spring (A).



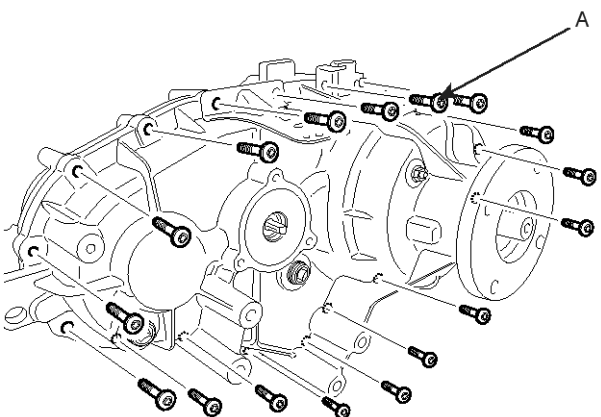
SHMAT9011L

17. Grease the contact surface of the cover and install the transfer cover (A).



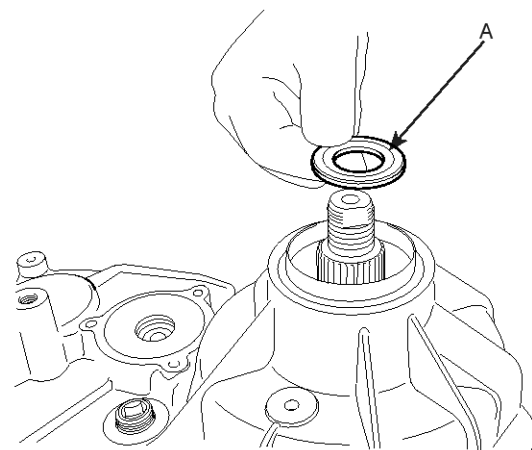
SHMAT9010L

18. Install the transfer cover bolts (A-17ea).



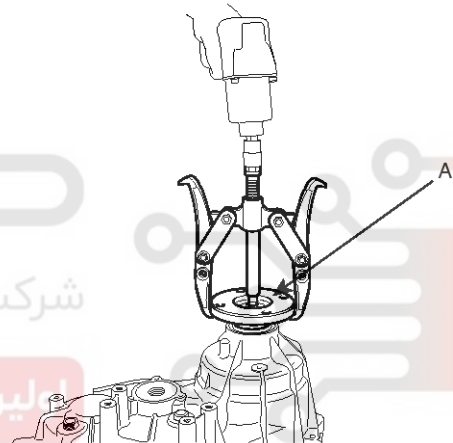
SHMAT9008L

19. Install the washer (A).



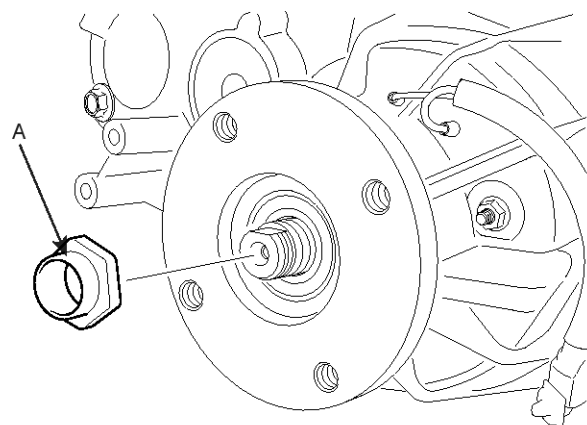
SHMAT9007L

20. Install the rear flange (A) by using press.



SHMAT9006L

21. Install the flange nut (A).

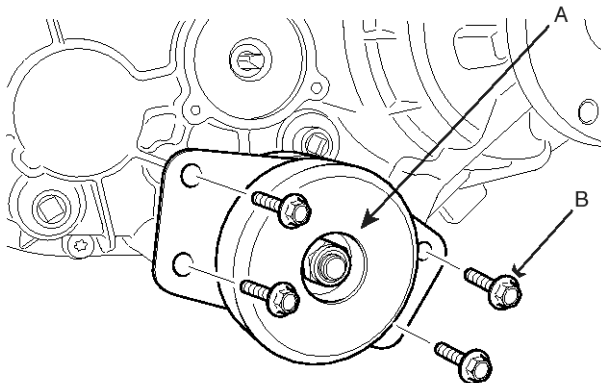


SHMAT9005L

## WD-18

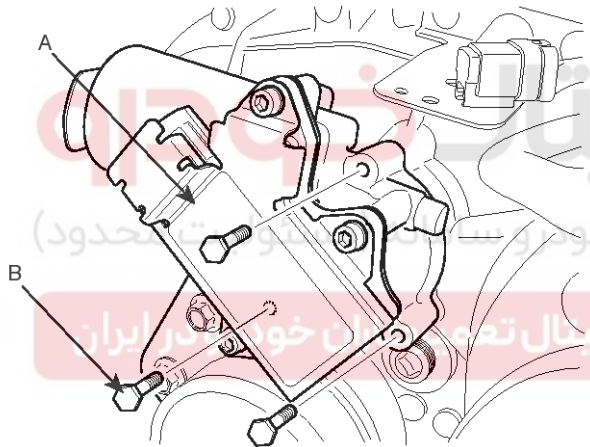
## Transfer System

22. Install the dynamic damper (A) by installing bolts (B-4ea).



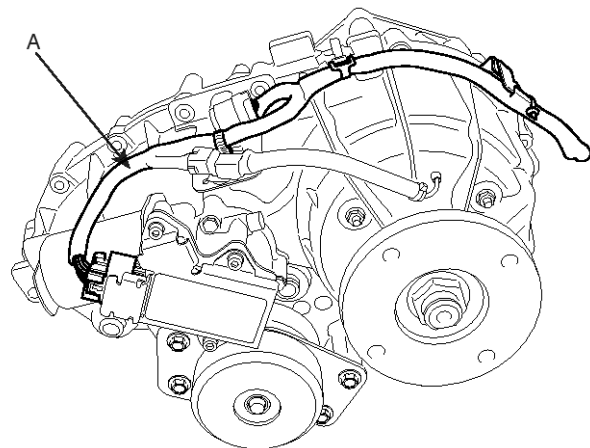
SHMAT9004L

23. Install the TCCU and motor assembly (A) by installing bolts (B-3ea).



SHMAT9003L

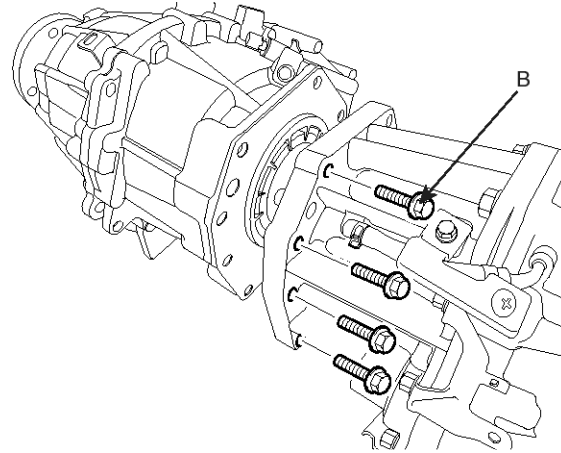
24. Connecting the connectors, install the wiring assembly (A).



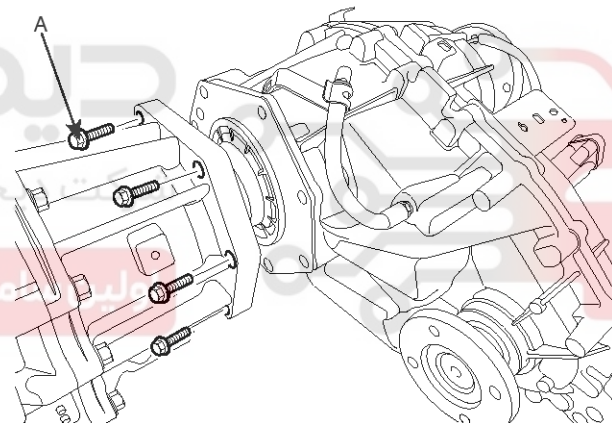
SHMAT9002L

## Installation

1. Lowering the vehicle or lifting up a jack, install the transfer assembly.
2. Install the mounting bolts (A, B-4ea) and the transfer assembly.



SHMAT8113L



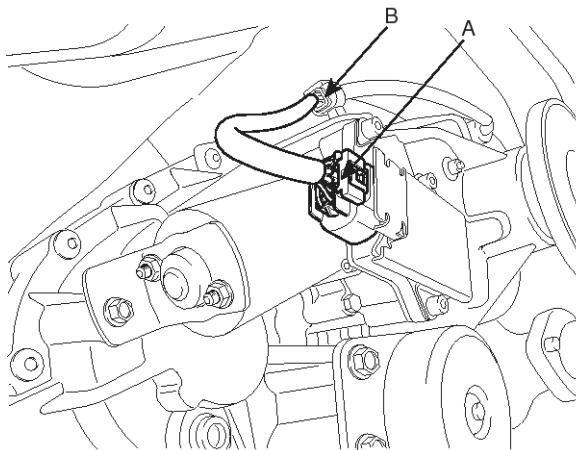
SHMAT8112L



# Transfer Case Assembly

## WD-19

3. Connect the 4WD ECU connector(A) or EMC connector(B).

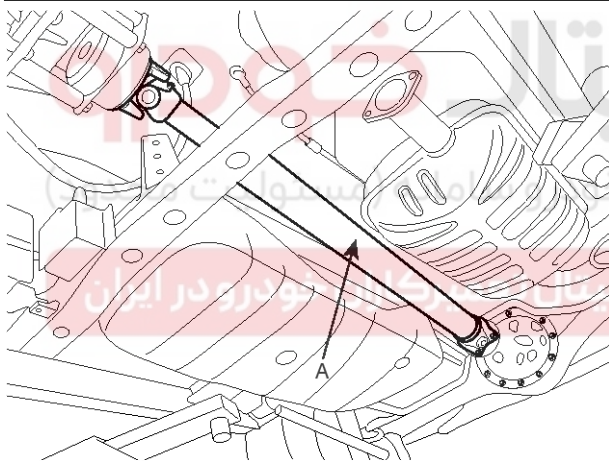


SHMAT8005D

4. Install the rear propeller shaft(A).

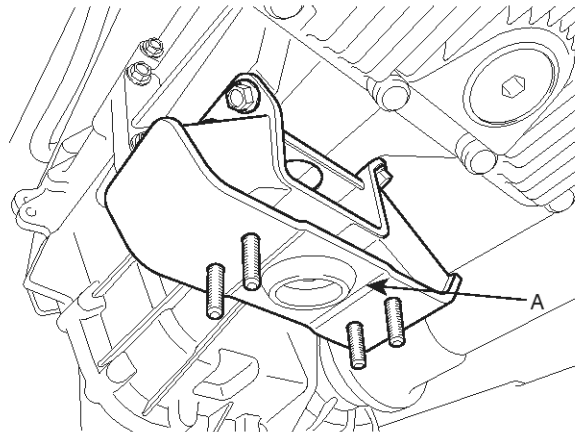
### Tightening torque :

58.83~68.64Nm(6~7kgf.m, 43.39~50.63lb-ft)



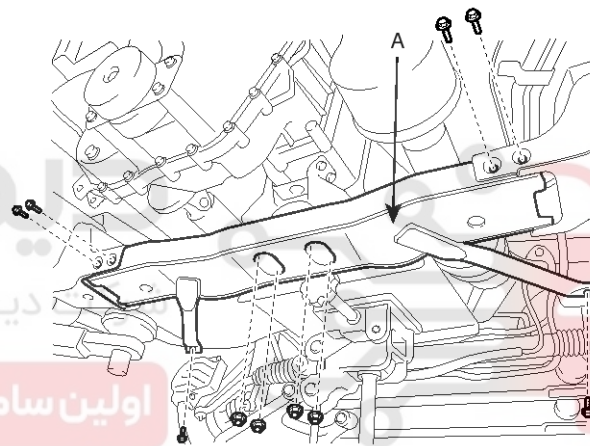
SBLAT6009L

5. Install the insulator support bracket(A).



SHMAT8020L

6. Install the cross member(A).

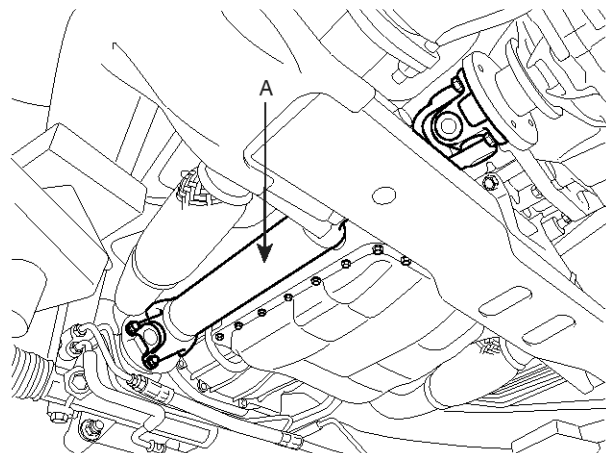


SHMAT8002D

7. Install the front propeller shaft(A). (4WD)

### Tightening torque :

58.83~68.64Nm(6~7kgf.m, 43.39~50.63lb-ft)



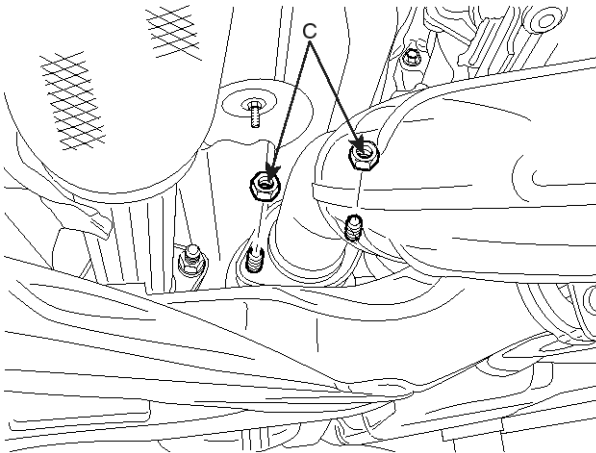
SBLAT6007L



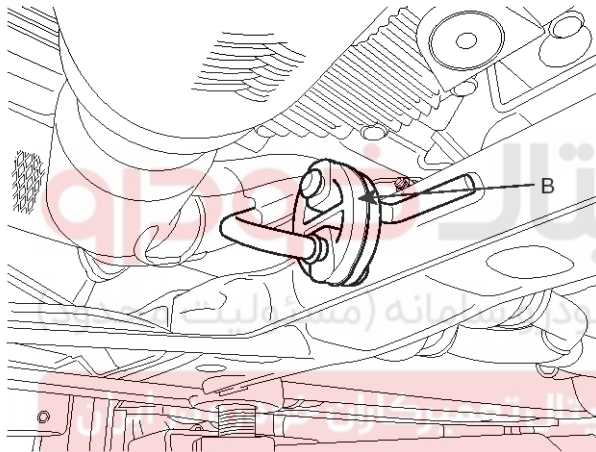
## WD-20

## Transfer System

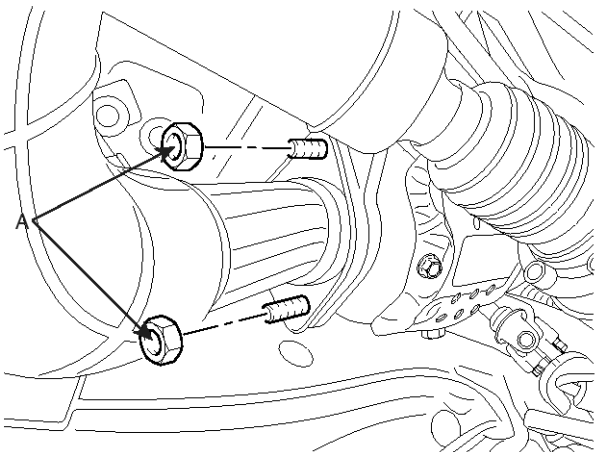
8. Install the front muffler(A) or muffler hanger rubber(B), by removing rear muffler(C).



SHMAT8004L

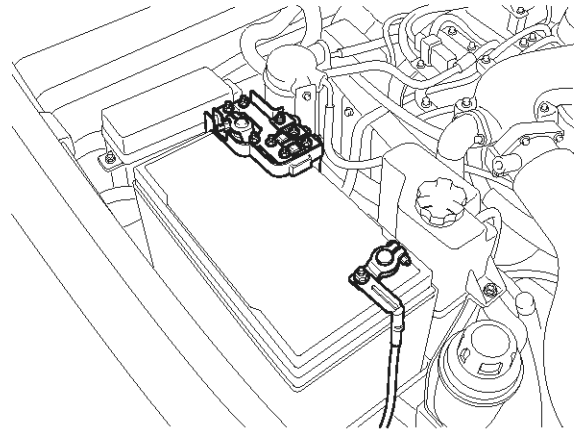


SHMAT8003L



SHMAT8002L

9. Install the battery (-) terminal.



SHMAT8001D