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Modification No.	Edition	Modification terms	Reviser	Modification date
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	01	Update 3.1 Refuel/check over Update 3.2 Oil level check Add 3.3 Gear selector cable adjustment Update 3.4 Parts disintegration diagram 3.5 Parts and components Update 2.4.2 Transmission interface layout Update 3.6 New tool number Update 4.2 Fault codes and measures Update 2.4.4 Layout of TCU plug pins Add P1763 and P1764 (start lock diagnosis) in 4.2 Fault codes and measures Update 3.6 New tool number Add 3.6.2.1 Half shaft assembly Update 3.6.2.2 Replace the differential oil seal Update 3.6.2.3 Replace the input shaft oil seal Improve 3.6.2.4 Replace the shift shaft oil seal Update 2.4.3 TCU wiring diagram and 2.4.1 TCU port Update 4.2 Fault codes and measures Add 4.3. Problem of Noises Add 4.4. Problem of jittering and crawling-free Update 4.2 Fault codes and measures Update 3.5 New oil pump number and differential oil seal number	Jiajun lu	2010-11-30

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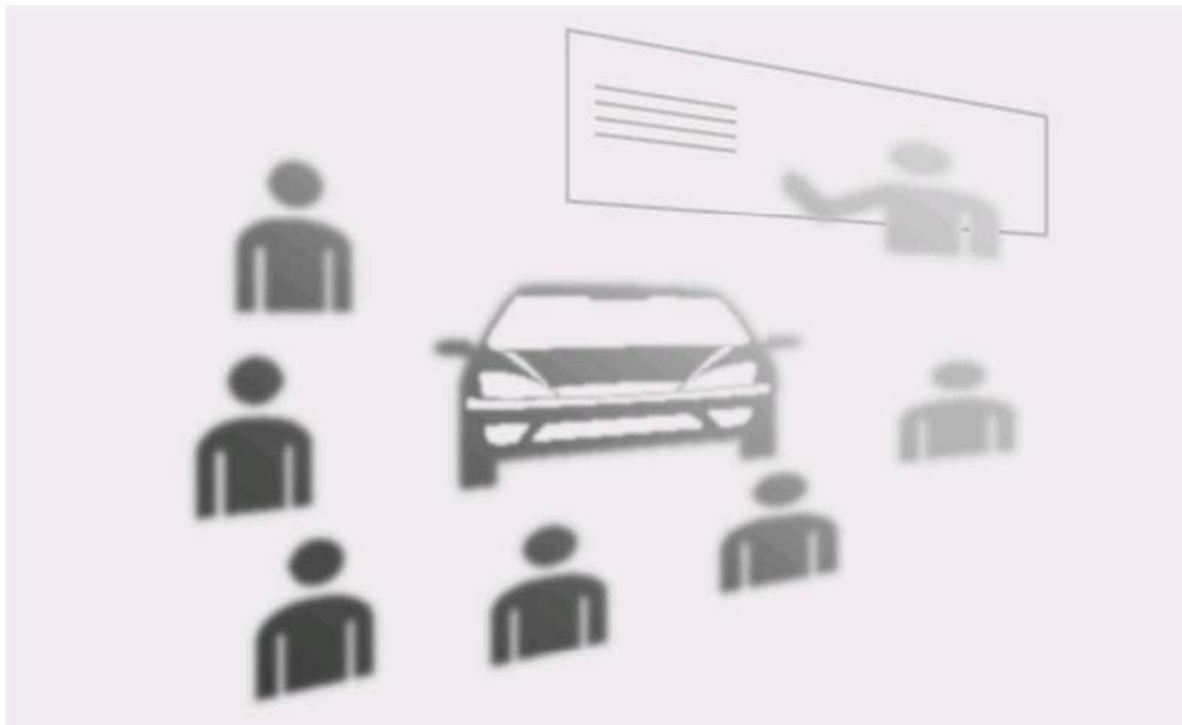
 <p style="font-size: small;">Gear up for the future</p>	<b>DOCUMENT</b>	<b>Number</b>	<b>D-ASS-208-03</b>
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	02	<p>Update 3.6.2.9 Replace the oil filter</p> <p>Update 3.6.2.6 Replace the oil pump</p> <p>Add a new number 483420 of the respirator in Section 3.5</p> <p>Update the clutch self-learning 2.5</p> <p>Add an oil pump label (vehicle safety warning) 3.5</p> <p>Replace the wording in 2.2 Service mileage</p>	Jiajun lu	2011-07-25
	03	<p>2.3 Oil specification: Use the oil of a new model</p> <p>2.4 Compressed natural gas, liquefied petroleum gas, etc</p> <p>2.6 Clutch self-learning value: updated the prerequisites</p> <p>3.5 List for after-sales parts: Updated material numbers of the new parts</p> <p>3.6 Replacement of special tools and accessories: comments More</p> <p>3.6.2.5 Replace the old drive end cover with a new one</p> <p>Add 4.2 Problem of noises in the breakdown maintenance guidance</p> <p>Add 4.3 Movement and start failure in the breakdown maintenance guidance</p> <p>4.4 Fault code and operation: Add the fault code P0605,P0604,P0603 and <b>P0604.</b></p>	Gu julin	2012-12-13

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# NANJING PUNCH

## Infinitely variable automatic transmission



# **PUNCH Powertrain Service Manual VT2 for Geely Girona**

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As far as we know the schematic diagrams, technical information, data and descriptive texts in this article have been checked and corrected before printed.

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**Service manual of  
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## 1. Overview

The continuous change of drive ratio for transmission can be realized by transmission. The transmission includes two opposite cone pulleys and V steel belt surrounding on the two wheels. The drive ratio of speed variator is transmitted to differential in the transmission through intermediate shaft.

This Manual has briefly introduced the transmission, including the design and functions of the transmission parts, and stated the power transmission and control devices respectively. In addition, this Manual has outlined the oil cooling system and external gear shift mechanism of the transmission.

Attention: The training materials of our company will only be used for training of PUNCH automatic transmission, and the vehicle repair and maintenance should be implemented according to the specifications and rules of the vehicle use manual.

It is hoped that you could make full use of the training materials for PUNCH automatic transmission technical training courses to obtain more theoretical and practical knowledge.

The stepless shift model of this transmission can make you drive more comfortably and have the vehicle performance improved.

The following advantages can be available if this automatic transmission is adopted:

- Under the condition of a constant speed, the engine speed is low;
- Improve the emission control/reduce the fuel consumption;
- Low NVH (noise, vibration and harshness);
- Smooth acceleration;
- Flexible driving is available on mountain roads;

The VT2 transmission adopts full electronic control, and its performance is far superior to the older generation of products.

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**1.1. Comparison between traditional automatic transmissions and stepless transmissions**

The following diagram shows the variogram for comparison of the transmission ratio between the manual or conventional automatic transmissions and stepless transmissions. The transmission ratio of the conventional automatic transmission (transmission gear) is a series of Fastening values.

When the transmission has its fast-speed gear engaged, the transmission ratio as shown in Diagram 1 will change according to the throttle opening along the heavy line or dotted line. However, when a stepless transmission is used, a transmission ratio variogram can be available as shown in Diagram 2, and the gear shift points of the two transmissions are both related to the throttle opening applied by the driver.

When the throttle opening becomes bigger, the engine speed will increase and the transmission has its faster-speed gear engaged; if a traditional transmission is adopted, the engine speed will be lowering significantly while the engine speed will not be lowering if a stepless transmission is adopted. The stepless transmission can have its faster-speed gear engaged by movement of the bevel pulley when the engine speed has not changed (see below). In addition, we also can choose other gear shift strategies, so that the stepless transmission could be accepted by new users more easily.

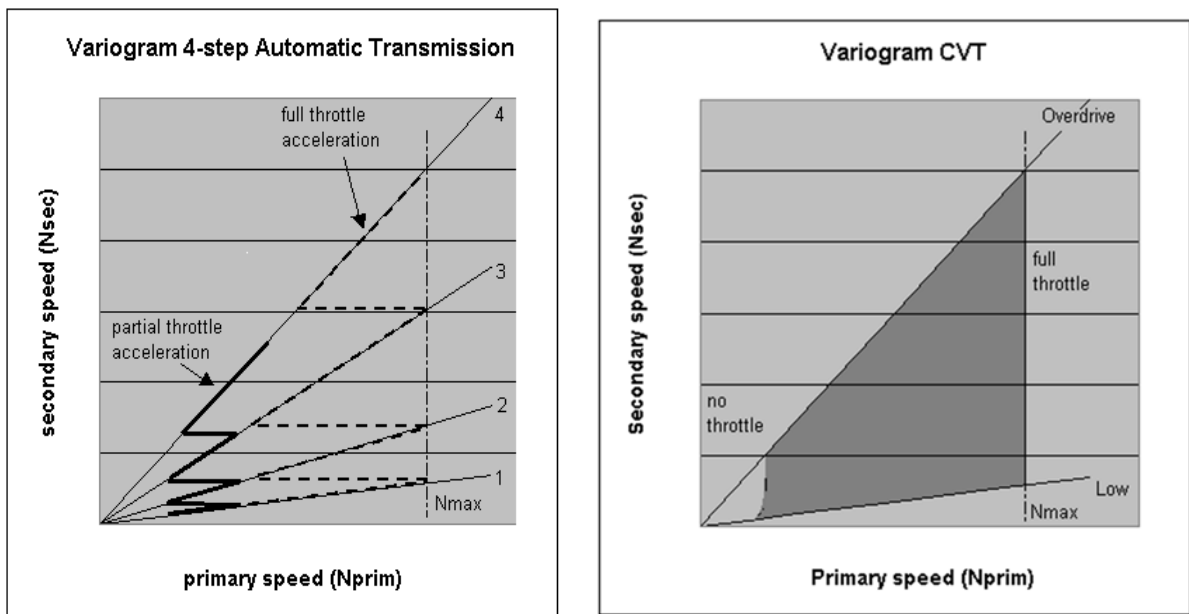
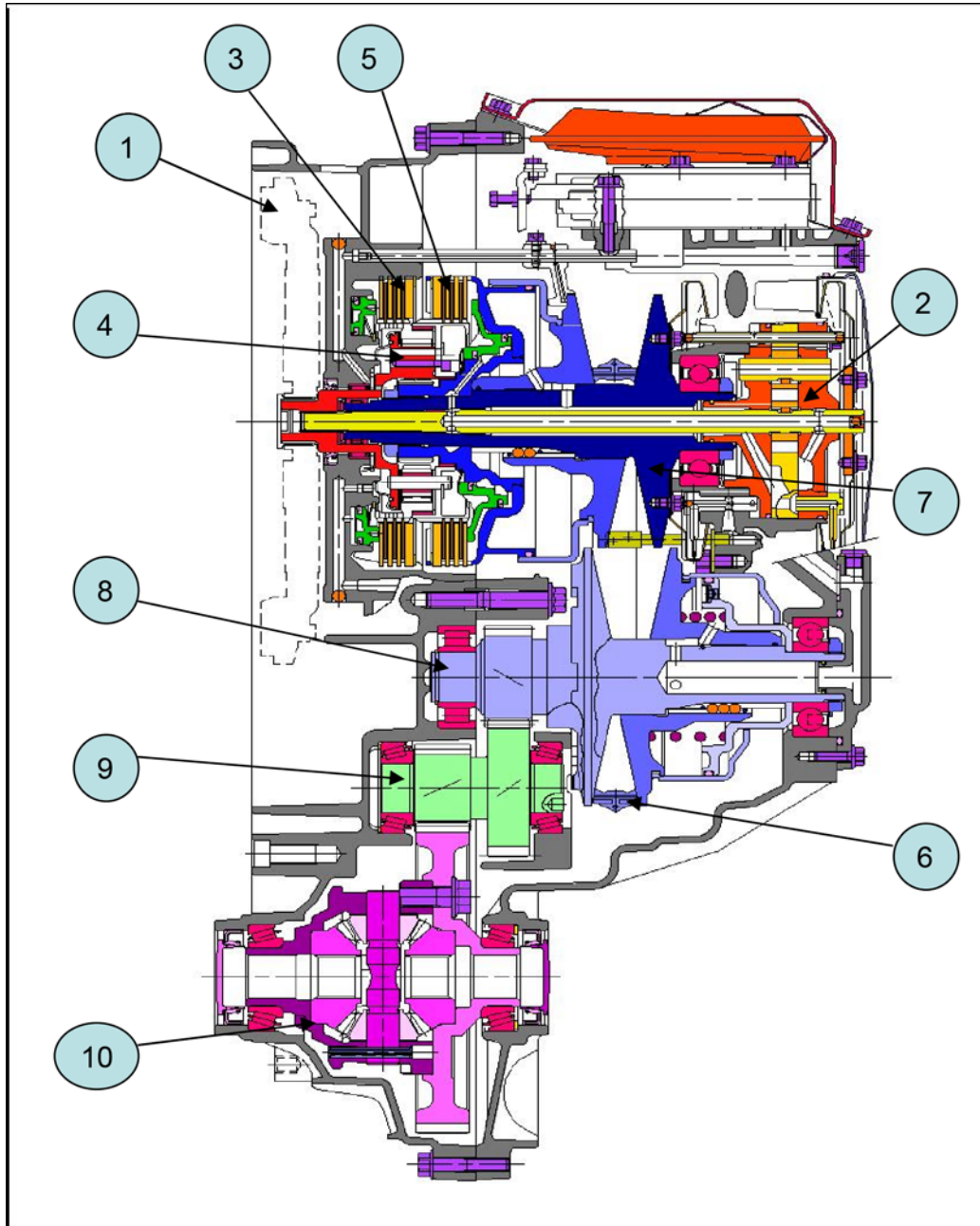


Figure2 Speed ratio variogram of 4-step automatic transmission (left) and stepless transmission (right)

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**1.2. Transmission section diagram**



- 1. Torsion damper/flywheel
- 2. Oil pump
- 3. Reverse clutch
- 4. Planetary mechanism
- 5. Forward clutch

- 6. Steel belt
- 7. Driving cone pulley
- 8. Driven bevel pulley
- 9. Intermediate shaft
- 10. Differential

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## 1.3. Basic principle of stepless transmissions

VT2 is composed of many components, which can be classified into three groups according to the corresponding functions.

### **Group 1** - Mechanical transmission device

This part is to provide mechanical and torque transmission.

### **Group 2** - Control system

It is a component related to the control system. According to the load conditions and driving requirements, the control system can ensure the power transmission and change the transmission ratio at the appropriate time.

### **Group 3** - External connection devices

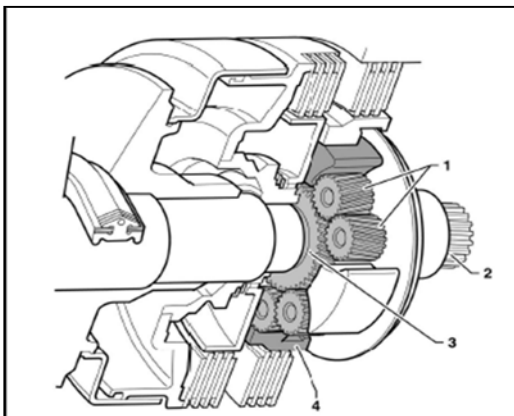
Some components externally connected to the transmission. Some of those components are located in the transmission or connected to the transmission, while others are components of the whole system, but they are distributed at other parts of the vehicle.

### **1.3.1. Group 1—Mechanical torque transmission**

#### **1.3.1.1 Planetary mechanism**

The planetary mechanism will make the transmission provide driving torque in front and back directions. The torque provided by engine will be transmitted to the transmission by input shaft in the planetary frame. The multiple disk clutch of engagement forward direction can make the planetary frame directly contact with the sun gear. By engagement, planetary frame and sun gear become one entire rotation, and engine torque can be directly transmitted to the main wheel. The planetary gear does not transmit any torque, therefore, there is no any loss in the planetary mechanism, and rotation direction of driving wheel will be the same to the rotation direction of engine. This is its drive mode.

In the reverse mode, when the reverse multi-plate clutch is engaged, the gear ring in the planetary mechanism will be kept static and the planet carrier will drive the three pairs of planetary gears to have the sun wheel rotate reversely. At this moment, the transmission ratio of the gears should be 1:1.1, and a tiny deceleration torque will be increased to compensate the friction loss of the planetary mechanism.



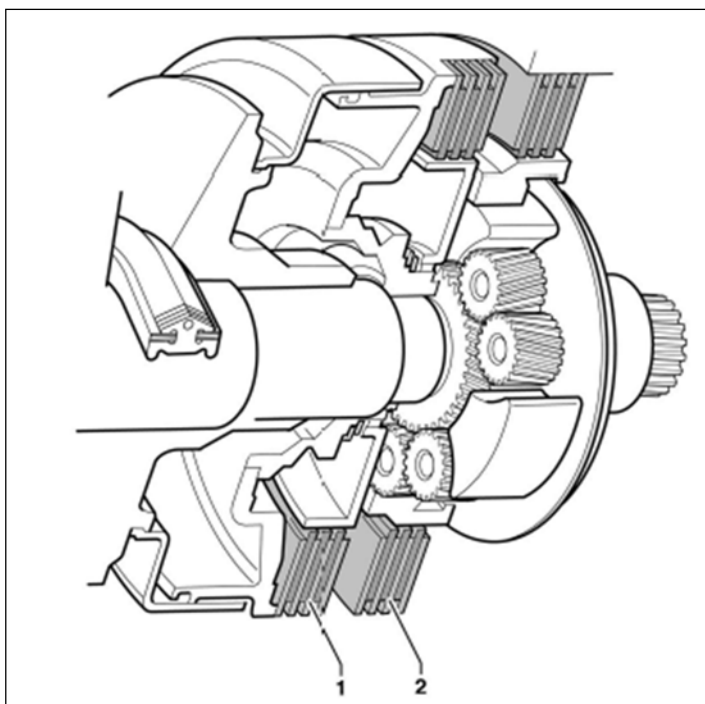
1. Planet wheel
2. Input shaft
3. Sun gear
4. Gear

Figure 4 Planetary mechanism

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### 1.3.1.2 Multi-plate clutch

It has two groups of multiple disc wet type clutches: one group is used for going forward, and the other is used for going back. Every group of clutch has three friction disks and 6 friction surfaces. The hydraulic system will control the clutch in order to ensure stable forward movement during throttle opening degree of the vehicles. When the gear engagement is driven, the engagement amount that controls the clutch can also park the vehicles. The cold oil can directly cool the clutch in order to prevent the friction surface from heating.



1. Forward clutch group
2. Back clutch group

Figure 5: Clutch in the planetary mechanism

### 1.3.1.3 Cone pulley and steel belt

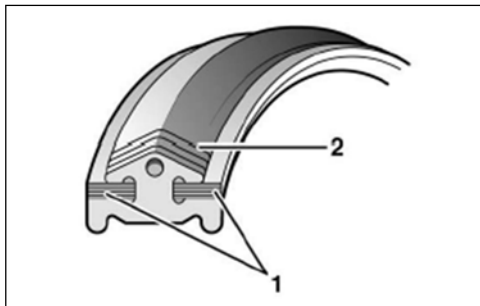
The main features of CVT are that one pair of “V” cone pulley is connected by one steel belt. The center distance should be 155 mm between the driving and driven gears. Every cone pulley will be divided into half: one half is fixed, and the other is slid along the shaft. The slop in half is 11°. The 24-mm-wide “Van Doorne” thrust driving belt is used to transfer the torque between gears (if a bigger torque value is required, you can use a 30-mm driving belt). Use a nozzle to lubricate and cool the driving belt by means of oil injection. In order to narrow the angle error of the driving belt in time of gear shift, have the two moving half gears placed at the diagonal line, and connect each moving half gear to the hydraulic cylinder/piston. The hydraulic mechanism is controlled by the control system, as shown in the section of “Hydraulic System”. The spherical spline can prevent the moving half gears rotating against their Fastening half gears.

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Because the sun gear is joined to the active cone wheel by the spline, the torque transmitted by planetary gear set can directly act on main cone pulley. The steel drive belt transmits the power to the driven cone pulley from active cone wheel, and the power will be transmitted to the intermediate gear shaft from driven cone pulley.

The torque and speed of the driven gear should be decided by the location of the driving belt. Design the size of the two runners so that a transmission ratio of 2.416:1—0.443:1 could be provided and the maximum transmission ratio is 5.45 times of the minimum ratio. Minimum fuel consumption will be achieved in time of overspeed transmission ratio.

The transmission steel belt has 450 steel sheets and 24 steel belts (12 at each side) Fastening together.



1. Steel belt
2. Steel disc

Figure 6: Drive belt

### 1.3.1.4 Intermediate shaft

The intermediate shaft (pinion shaft) make the helical gear set which are engaged together between driven cone pulley and differential reduce speed, which can ensure drive shaft can rotate in the correct direction. The speed can reduce between driven cone wheel and drive shaft improves the vehicle performance at a large extent. The intermediate shaft is fixed by two conical bearings situated in the clutch housing and independent bearing pedestal.



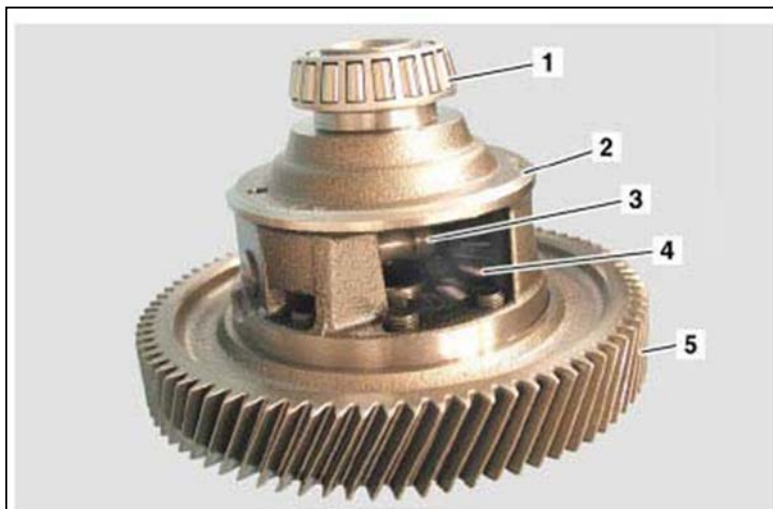
1. Transmission gear of driving cone pulley shaft
2. Differential crown gear
3. Drive pinion
4. Transmission intermediate gear
5. Driven bevel pulley shaft gear

Figure 7: Gear rings and intermediate gears

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### 1.3.1.5 Differential

As with manual transmission, the torque on the coronary gear is transmitted to the wheels through the differential, the coronary gear is Fastening in the differential casing by means of 8 bolts and the transmission shaft is Fastening in the differential by means of a traditional cage universal joint and a sealing gasket. The tapered bearing is used to fix the differential.



- 1. Differential bearing
- 2. Differential housing
- 3. Differential cross shaft
- 4. Differential planetary gear
- 5. Differential crown gear

Figure 8 Differential assembly

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### 1.3.1.6 Mechanical control

#### 1.3.1.6.1 Drive ratio change

The drive ratio grade of automatic transmission for traditional planetary mechanism is limited, the grade is usually grade 4, 5 or 6, but the transmission without grade is different. The drive ratio for transmission without grade is continuously variable. The low-speed gear (low drive ratio) makes the static vehicle more easily start, and the diameter of driving cone pulley is relative small, but the diameter of driven cone pulley is relative large. The drive belt is used for transmitting power and torque. If the high-speed ratio is selected by increasing the diameter of driving cone pulley and shortening the diameter of driven cone pulley, which can produce accelerated speed. Appropriate drive ratio can be ensured by control change scope.

The stepless transmission has two runners (driving and driven bevel pulleys); each bevel pulley is composed of two halves (with one fastening and the other movable by means of hydraulic control). The position of the driving belt on the runner can determine the transmission ratio. If the movable half gear comes close to the corresponding fastening half gear, then the driving belt will move peripherally. When the two half gears are separated, the circumference of this gear will become smaller, the driving and driven bevel pulleys will have their movable half gears located at their diagonal lines respectively, and at this moment, the driving belt on the driving bevel pulley will have its radius become smaller, while the driving belt on the driven bevel pulley will have its radius become bigger.

The low-speed ratio is required when starting the vehicle. The separation of driving cone pulley make the drive belt attach to it, which make the periphery movement of drive belt around closed driven cone pulley. When the speed is improved, it is necessary to increase drive ratio. The half pulley movement of driving cone pulley is gradually close to the relevant fixed half pulley, and circumference of wheel for the cone pulley increases, at the same time, the driven cone wheel is forced to separate, and the radius is reduced in order to produce higher drive ratio. When the driving cone pulley is closed and the driven pulley is separated, drive ratio of over drive is produced. The driving and driven bevel pulleys will rotate at the transmission ratio of about 1:2.5.

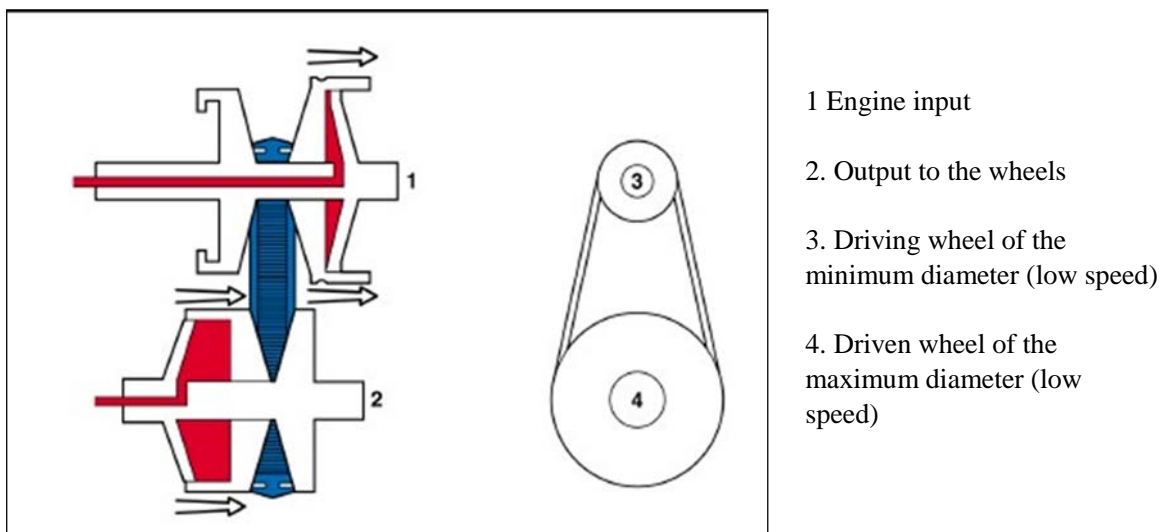
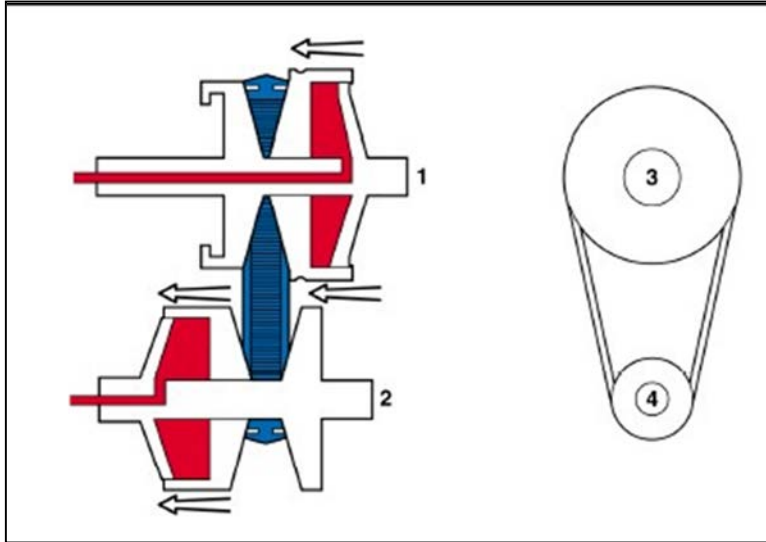


Figure 9 The runner position during low gear

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- 1 Engine input
- 2. Output to the wheels
- 3. Driving wheel of the minimum diameter (overspeed)
- 4. Driven wheel of the maximum diameter(overspeed)

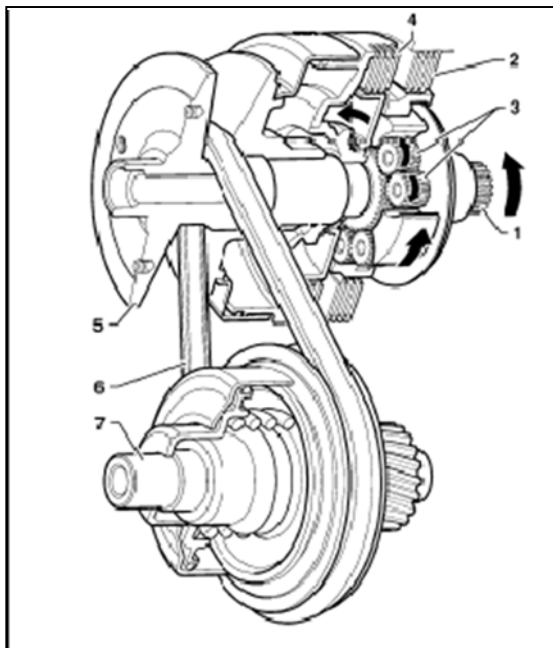
Figure 10 Belt wheel position during top grade (overspeed)

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### 1.3.1.6.2 The gearshift is kept at its neutral or parking position.

In this condition, back clutch (2) and forward clutch (4) are separated, which cannot make the wheel move.

- The transmission input shaft (1) speed is the same to the engine rotation speed.
- Back clutch (2) is separated.
- Forward clutch (4) is separated.
- The planet wheel (3) idles around the sun gear.
- The sun gear does not rotate, and driving wheel (5), driven wheel (7) and vehicles keep still.



1. Input shaft
2. Back clutch
3. Planetary gear
4. Forward clutch
5. Driving gear
6. Transmission steel belt
7. Driven bevel pulley

Figure 11 Transmission torque drive mechanism

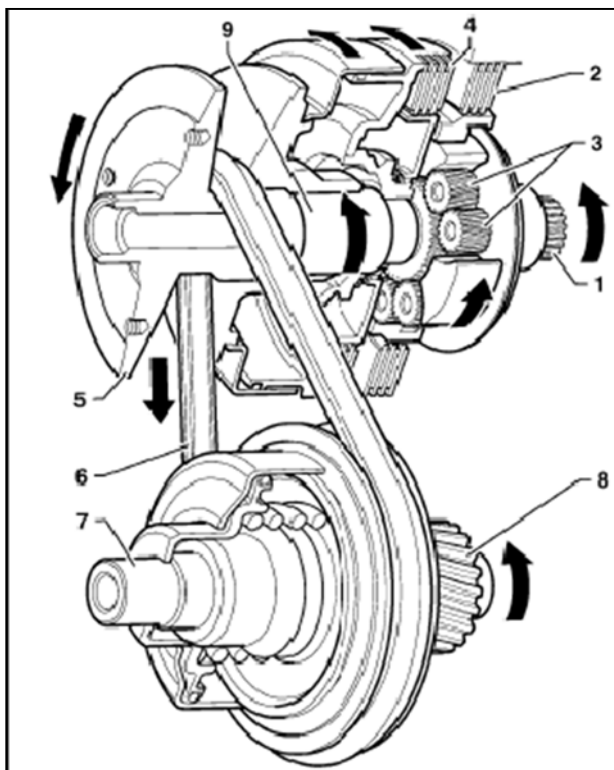
For all the automatic transmissions, the engine can start during park/neutral. During park, mechanical lock prevents the cars from moving forward and backward. In order to avoid damaging the transmission, use park when the vehicle does not move.

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1.3.1.6.3 Gear gearshift (drive)

In this state, the drive clutch (4) is engaged to have the wheels rotating.

- The transmission input shaft (1) speed is the same to the engine rotation speed.
- The reverse clutch (2) is separated.
- The forward clutch (4) is engaged.
- The planet wheel (3) of planetary mechanism, the sun gear and gear ring rotate together.
- The driving wheel (5) speed is the same to the engine rotation speed, and the direction is the forward gear direction.
- The driven wheel (7) direction is forward wheel direction, and its rotation speed depends on the drive ratio under the running state.



1. Input shaft
2. Reverse clutch
3. Planet wheel
4. Forward clutch
5. Driving bevel pulley
6. Driving steel belt
7. Driven bevel pulley
8. Driven bevel pulley
9. Input shaft

Figure 12 Transmission torque drive mechanism

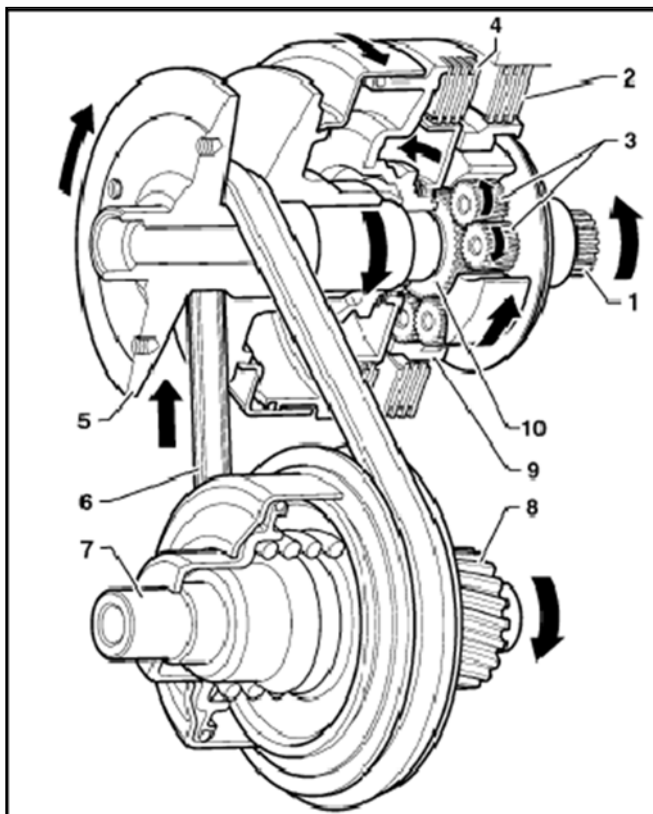
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1.3.1.6.4 Gear gearshift (reverse)

In this condition, backward clutch(2) engages, and gear ring(9) is locked in the transmission housing. The planet wheel(3) makes the rotation direction for sun gear(10), driving wheel(5), and driven wheel(7) is opposite to the transmission input shaft(1).

Now the reverse gear is selected.

- The transmission input shaft(1) speed is the same to the engine rotation speed.
- The reverse clutch(2) is engaged.
- Forward clutch (4) is separated.
- The gear ring(9) can be connected to the transmission housing by backward clutch(2).
  
- The planetary gear(3) which is directly transmitted by the transmission input shaft(1) makes its ring rotate around gear ring in order to drive reverse rotation of sun gear(10), belt wheel(5), and driven cone pulley(7).



1. Input shaft
2. Back clutch
3. Planet wheel
4. Forward clutch
5. Driving bevel pulley
6. Driving steel belt
7. Driven bevel pulley
8. Driven bevel pulley
9. Gear rings
10. Sun gear

Figure 13 Transmission torque drive mechanism

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### 1.3.2. Group 2—Control system

The control system functions as follows:

1. Have the clamping force of the steel belt tension and the engine torque matched to prevent slippage.
2. Control the drive and reverse clutches in time of driving.
3. Provide the best transmission ratio for driving.
4. Provide necessary lubricating and cooling oil for the transmission.

#### 1.3.2.1 Oil pump

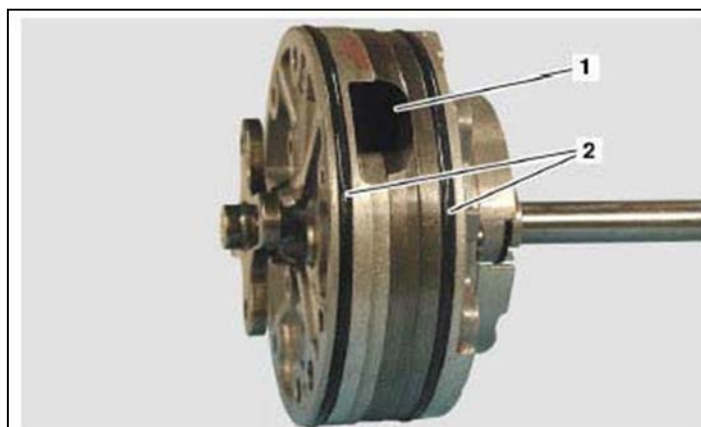
The oil pump in the transmission is an external gear pump, the engine drives the pump shaft and the oil pump shaft arrives inside the oil pump by means of the hollow driving bevel pulley shaft. The pump shaft coupled to the planetary gear rack with a spline can always be rotating at the engine speed, and the oil pump speed is about 10 cm<sup>3</sup> /round. The system pressure depends on the input torque, up to 40-50 bars.



1. Oil pump drive shaft
2. Oil pump assembly

Figure 14 Overall diagram for oil pump

The oil pressure is not only used for hydraulic control of the transmission, but also functions as a lubricant.



1. Oil pump inlet
2. Oil seal of the oil pump

Figure 15 Oil pump inlet

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### 1.3.2.2 Transmission control device

The transmission control device can minimize the tension between the driving belt and the runner and ensure non-slip performance, and at the same time also provide a different transmission ratio (calculated according to the input (driving) and output (driven) speed of the transmission) according to the target value given by the driving strategy. Within the service life, the performance recession of the control device will remain within a certain range, but does not significantly affect the vehicle comfort and the driving belt tension.

### 1.3.2.3 Tension control device

The tension control device can achieve the minimum tension as required when the driving belt does not slip, so that there should be minimal impact on the transmission efficiency of the transmission mechanism, thus to get the lowest fuel consumption.

In addition to the normal driving, the tension control device also takes into consideration of the special circumstances in time of the transmission maximum input and output torques, thus to protect the transmission to the greatest extent. The control device takes into consideration of the anti-skip brake system (ABS), tire lock (when there is no ABS equipped) and other driving force control systems (such as ESP and anti-skid control devices). In addition, this device also considers the special road surfaces and circumstances, such as passing through rutted roads, road shoulders, conversion of high and low adhesion coefficients, and tire slippage (for example, on the roads of a low adhesion coefficient).

The software can compare the torque transmission performance and expected input torque of the transmission. When the tension control device detects insufficient tension, the ECU will receive an instruction for reduction of the torque, and thus adjust the engine torque within an appropriate range. This function also can protect the transmission.

If a car has no electronic drive circuit system, the ECU will transmit the torque signal by means of a CAN bus, and if there is no CAN bus, the transmission control system (TCU) software itself will produce the torque signal by default.

### 1.3.2.4 Speed ratio control device

The transmission can balance the pressure on the driving and driven bevel pulleys by controlling the input and output pressure, so that the transmission ratio could be controlled. The transmission ratio can be calculated according to the speed sensor signal of the driving and driven bevel pulleys to change the output pressure and achieve the required transmission ratio. The minimum pressure can be determined by the method of tension. The physical model of the transmission can help to quickly adjust the pressure liquid level to the variable working point. The control software also considers the interference from other components of the transmission, so this software is developed to minimize the delay error and the target speed ratio error, etc. (in order to improve the fuel economy).

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In order to satisfy the requirements of the transmission in the limit state for mechanical performance and durability, we have formulated some driving strategies under the limit state. In addition to the vehicle speed limit, appropriate software can also be adopted to have the transmission ratio variation (set-point) kept within an allowable range. Moreover, software can also prevent the engine speed beyond a certain limit due to changes of the vehicle speed and throttle status (POS). In order to achieve such limiting conditions, the software would require that the engine torque could be reduced or a driving car should have its faster-speed gear engaged.

### 1.3.2.5 Transmission Control Unit (TCU)

The software to control the transmission is integrated in the TCU (transmission control unit). TCU is installed in the cab.

#### 1.3.2.5.1 TCU interface

See Section 2.4 of this manual for TCU and transmission interfaces, circuit diagrams and interface schematic diagrams.

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### 1.3.3. Group 3— External connection devices

#### 1.3.3.1 Oil cooler interface

In front of the transmission casing, there are two oil cooler pipe connectors. One oil cooler inlet is mounted beside the engine radiator to have the lubricant temperature kept below 120°C.

The oil in the gearbox flows out from the right side of the opening, which should be connected to the interface below the oil cooler.

The oil from the oil cooler flows into the gearbox from the left opening of the transmission, so the left interface of the transmission should be connected to the interface on the oil cooler.

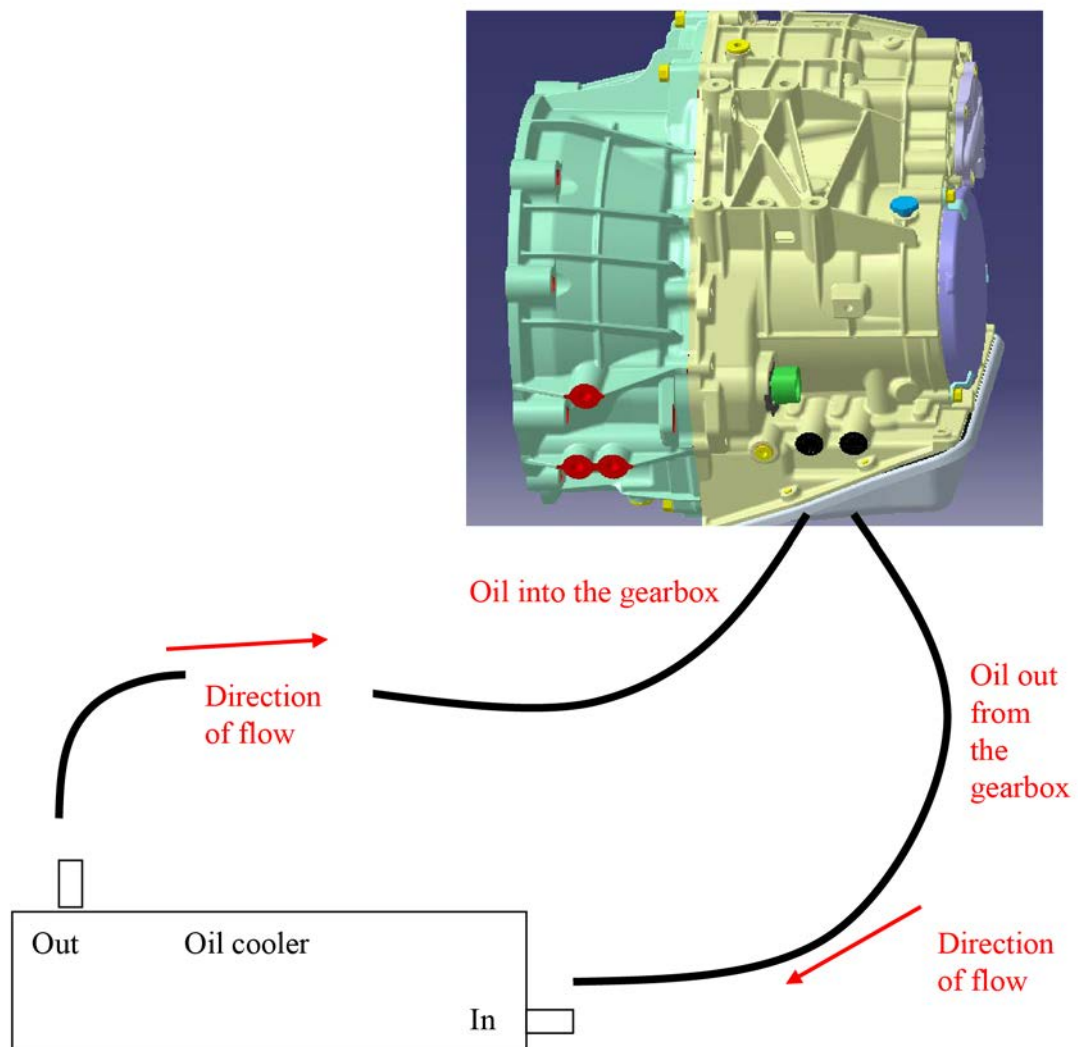


Figure 16 Oil cooler pipe connector

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### 1.3.3.2 Gearshift

The gear shift positions of the VT2 transmission may include the parking position (P), reverse gear position (R), neutral position (N), drive gear position (D) and sports pattern (S).

Users can customize the position of the gearshift. For the sake of safety, it is recommended that a shift locking device should be used for protection.

Geely has not used electronic shift locks controlled by the TCU, but a mechanical shift lock.

The stepless gearbox can also realize the manual mode, which requires that new pins should be added on the TCU to receive signals and that the engine should have its maximum calibrated in a certain scope. Moreover, all Geely CVTs have a manual mode.

### 1.3.3.3 Main connector

The main connector is located on the transmission casing, including 16 pins. The wiring harnesses are connected through circular connectors.



Figure 17 Wiring harnesses on the transmission

### 1.3.3.4 Torsion damper

Most traditional automatic transmissions use hydraulic torque converters to connect the engines and the input shafts, but this transmission then uses a torsional shock absorber, which is not part of the transmission. PUNCH strongly recommends using a torsional shock absorber also called as a dual mass flywheel (DMF).

Dual mass flywheel (DMF) currently used by Geely.

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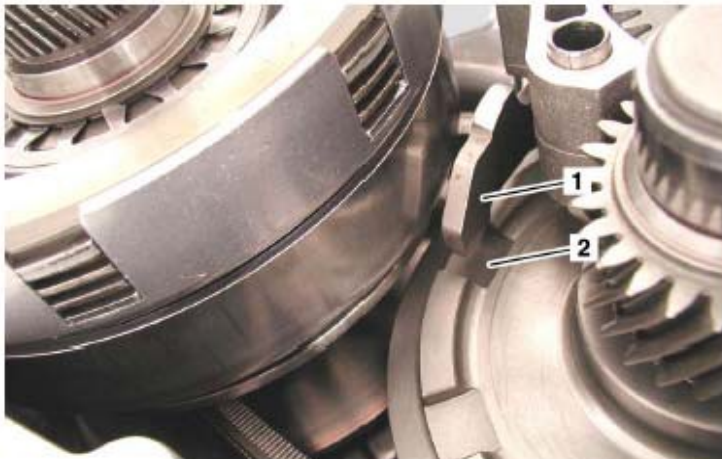
## 1.4. Driving strategy

### 1.4.1. State under special circumstances

Here follows the state of the vehicles equipped with stepless transmissions under special conditions.

#### 1.4.1.1 Functional characteristics of the parking and neutral gears

No matter what kind of transmissions, the engine can be started only if the transmission is in its parking and neutral status. The mechanical lock at the parking gear makes the car unable to move back and forth. The parking gear can only be used only when the vehicle is kept static to protect the transmission against damages. If the parking gear is accidentally applied due to carelessness when the vehicle is in its higher speed, the parking device can not work until the vehicle speed has reduced to about 5 km/h.



1. Parking locking pawl
2. Driven bevel pulley

Figure 18 Parking locking mechanism

When a vehicle is started, TCU will control the starter lock relay, which can then control and start the engine.

The car shift gears are controlled by the internal driving mode sensor and the driving mode sensor is directly connected to the gearshift.

You need to step down the brake pedal if you want to change the parking gear (P) or neutral gear (N) into the drive gear (D) or reverse gear (R). If you don't step on the brake pedal, the gear gearshift will continue to be locked in the starting position (see “gear shift lock”).

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## 1.4.1.2 D or R gear function

### 1.4.1.2.1 Normal operation

In time of driving, the operation on this transmission is completely different from that of the traditional automatic transmissions, so you should try to adapt yourself to it. For example: If you step on the accelerator pedal too hard, the engine speed will be obviously higher, but the vehicle speed will have no significant change. This function is quite normal for stepless transmissions, but if drivers do not understand this kind of transmissions, they may think that the transmissions have failed.

Some other conditions similar to traditional automatic transmissions may also be in existence.

### 1.4.1.2.2 Adaptive update

Either in the drive or reverse gear, the corresponding clutch should be calibrated again, so that it could achieve its best use effect within its service life. Here follow the specific contents for adaptive updates.

### 1.4.1.2.3 Crawling

According to the performance of automatic transmissions, when the gearshift is kept in its drive (D) or reverse gear (R), the car will start to move (on any flat road) if the driver releases the brake pedal. If the road slope is less than  $8^\circ$ , the car also can move; if the road slope is greater than  $8^\circ$ , the car will slightly move backward, which is true of such vehicles equipped with hydraulic torque transmissions; it will not move backward if the slope is not great enough. No matter how great the road slope is, the maximum car speed will be smaller than a threshold (for example, 8 kph). Especially in the downhill, the control system will make the clutch changed from disengagement into its “engagement” mode, so that the engine could be used for braking in time of sliding.

### 1.4.1.2.4 Idle stop (limited to the drive state)

The VT2 transmission can achieve idle stop. The idle stop can be achieved when the vehicle (battery status and air conditioner ON/OFF) and transmission sides (if the transmission durability is not affected) both have satisfied certain conditions. If all conditions are satisfied, the internal combustion engine will shut down in the static state. Only when the brake pedal is released, the engine is started again and the transmission starts to work quickly, the vehicle can move back and forth.

The idle stop function is particularly suitable for hybrid transmission devices, but for standard power transmission devices with no special starter or start motor, the transmission idle stop function is meaningless.

### 1.4.1.2.5 Acceleration and deceleration

During acceleration, the accelerated speed is mainly provided according to the requirement of the driver and the driving conditions, and at this moment, the engine speed will have its change trend corresponding to the initial speed, thus to achieve the best driving comfort.

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The clutch controller also provides some methods to compensate the differences (between different vehicles) due to clutch wear, and thus to ensure the driving comfort.

#### 1.4.1.2.6 Acceleration support

To achieve the best driving comfort, we should determine an optimal engine speed between the engine speed in time of the minimum traction and the engine speed when the vehicle is kept cruising at a constant speed (economical speed).

The transmission control system uses a joint control mode between the speed variator (speed ratio control) and the starting clutch to provide the functionality able to satisfy such requirements. As a result, when a vehicle is started, the control target focuses on controlling of the driving performance related to vehicle acceleration in time of a higher engine speed; when a vehicle is cruising or sliding, the control target is transferred to the fuel economy of the transmission system.

Only the PUNCH driving strategy can offer such joint control.

#### 1.4.1.2.7 Decelerate

If the driver steps on the accelerator pedal and the brake pedal at the same time, the engine speed will be limited within a certain range (similar to hydraulic torque transmissions). To this end, the transmission needs to cut off the torque jointly with the engine control system, so that the transmission could react quickly when the driver releases the brake pedal suddenly to control the clutch.

Long-term use will cause heat loss of the clutch and the transmission may also be damaged, so we use the monitoring functions to detect such dangerous situations. Activate the transmission internal diagnostic system and the clutch can be opened. At this time, if the driver always steps on the accelerator pedal, the engine will rev up to maximum.

And in other cases, the clutch controller can follow the top control target to ensure the original degree of safety and improve the driving comfort.

#### 1.4.1.2.8 Driving and braking

When the car slows down to stop, the clutch will separate again to prevent the engine from stopping and control the clutch pressure so that it could go down smoothly to separate the clutch gradually, so as not to cause any torque fluctuation. So the controller can provide different modes to have the clutch disengaged according to changes of the vehicle speed. The clutch pressure control device controls the power of the hydraulic control system according to the temperature of the transmission lubricant. After the clutch is disengaged, you can get ready to start as quickly as possible.

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In order to achieve the optimal driving comfort during the process of the vehicle braking and starting, the transmission software can work together with other transmission control devices to temporarily stop the torque and increase the idle speed.

#### 1.4.1.2.9 Clutch engagement/disengagement when driving

If the clutch is not used during driving, the variable speed controller will have no significant impact on the driving comfort, because there is nothing to do with the characteristics of the hydraulic system if the clutch is not applied. If the clutch is applied again in this case (low load, parking and low engine speed), the driving comfort may be worse when compared with such conditions the clutch is applied in the static state.

#### 1.4.1.3 **Fault default mode**

When the software detects any system error, the default rules should be followed; and this will be transmitted through the instrument cluster error display to the driver. The driver will take different default drive states in accordance with the seriousness of the errors. In some cases, the main relay will be enabled. All fault codes will appear on the OBD.

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## 2. General information

### 2.1. Vehicles hauling

Such vehicles equipped with VT2 transmissions can not be towed directly, because only when the engine is working can oil pressure be produced in the bevel pulley to have the driving belt start to work. Therefore, any vehicle can not be towed until its front wheels are lifted off the ground (suspended).

### 2.2. Maintenance cycle

In every **60,000 kilometers**' travel, the transmission gear oil and the **oil filter shall be** replaced. As a result, the transmission is equipped with a drain plug and a tank top filler plug. Carmakers can reduce the transmission maintenance cycle, so that it could be equivalent to the standard maintenance cycle of cars.

### 2.3. Lubricating oil specification

**MOBIL EZL799(A)**

or

**IDEMITSU CVTF-EX1**

**Such two kinds of oil can be mixed in the transmission, but is not recommended.**

The lubricating oil of other specifications will damage the transmission and such resulting damages shall be beyond the scope of the warranty.

The oil filling/inspection procedures are as shown in Section 3.1 of the service manual.  
The oil level inspection procedures are as shown in Section 3.2 of the service manual

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## **2.4 CNG (compressed natural gas), LPG (liquefied petroleum gas), etc**

Risks for modification of compressed natural gas:

- The vehicles will have different and unstable torque diagrams to result in:

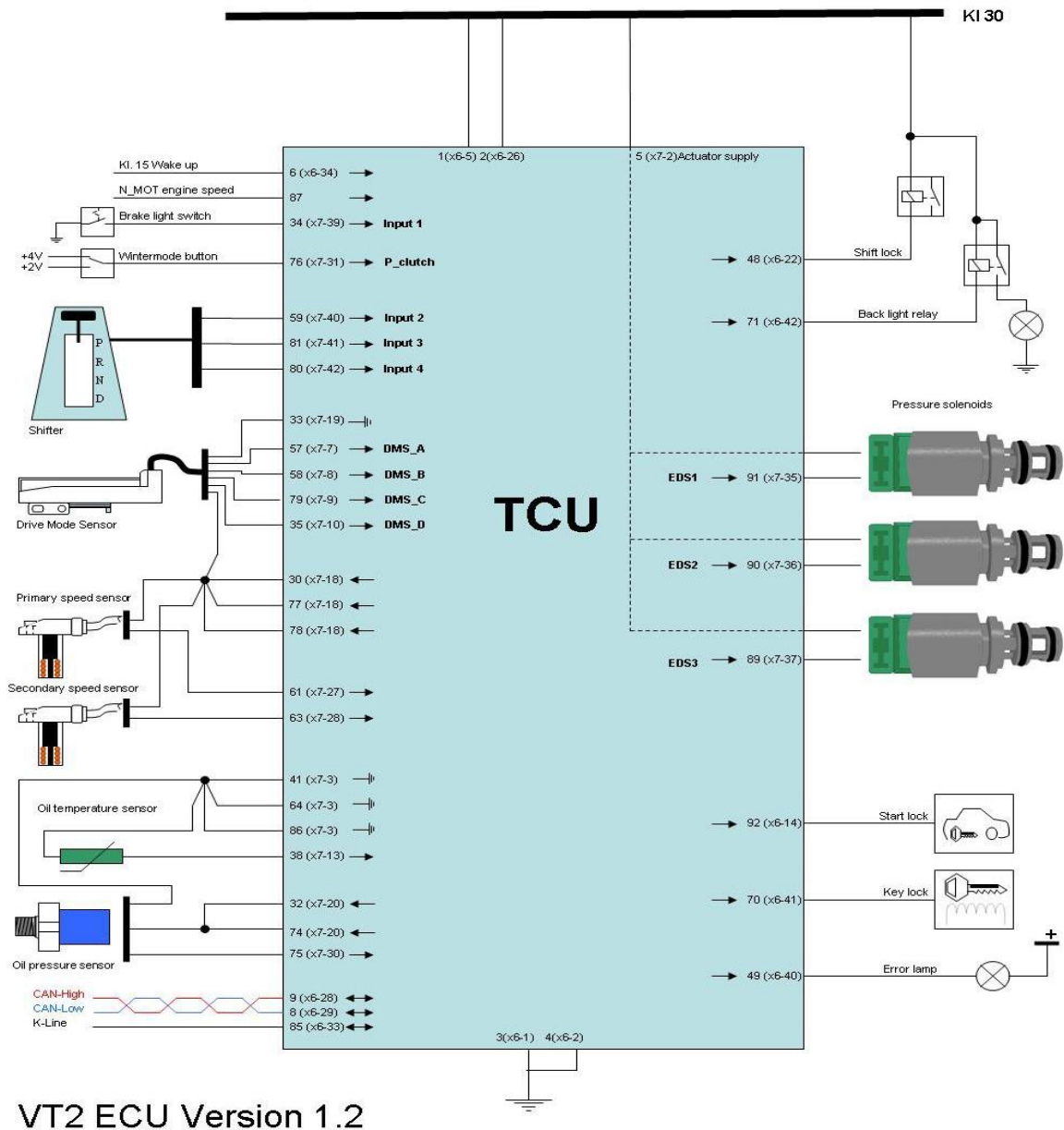
- Different performance
- Very bad driving reaction
- Production of fault codes
- Clutch play errors
- Self-learning errors
- Steel belt slippage

PUNCH does not allow any vehicle to use any other fuel system: such as CNC (compressed natural gas) and LPG (liquefied petroleum gas), etc; once other fuel system is used through modification, PUNCH will immediately stop the warranty for the transmission.

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## 2.5 TCU wiring diagram

### 2.5.1 TCU interface



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The transmission controller (TCU) and the transmission interfaces are as follows:

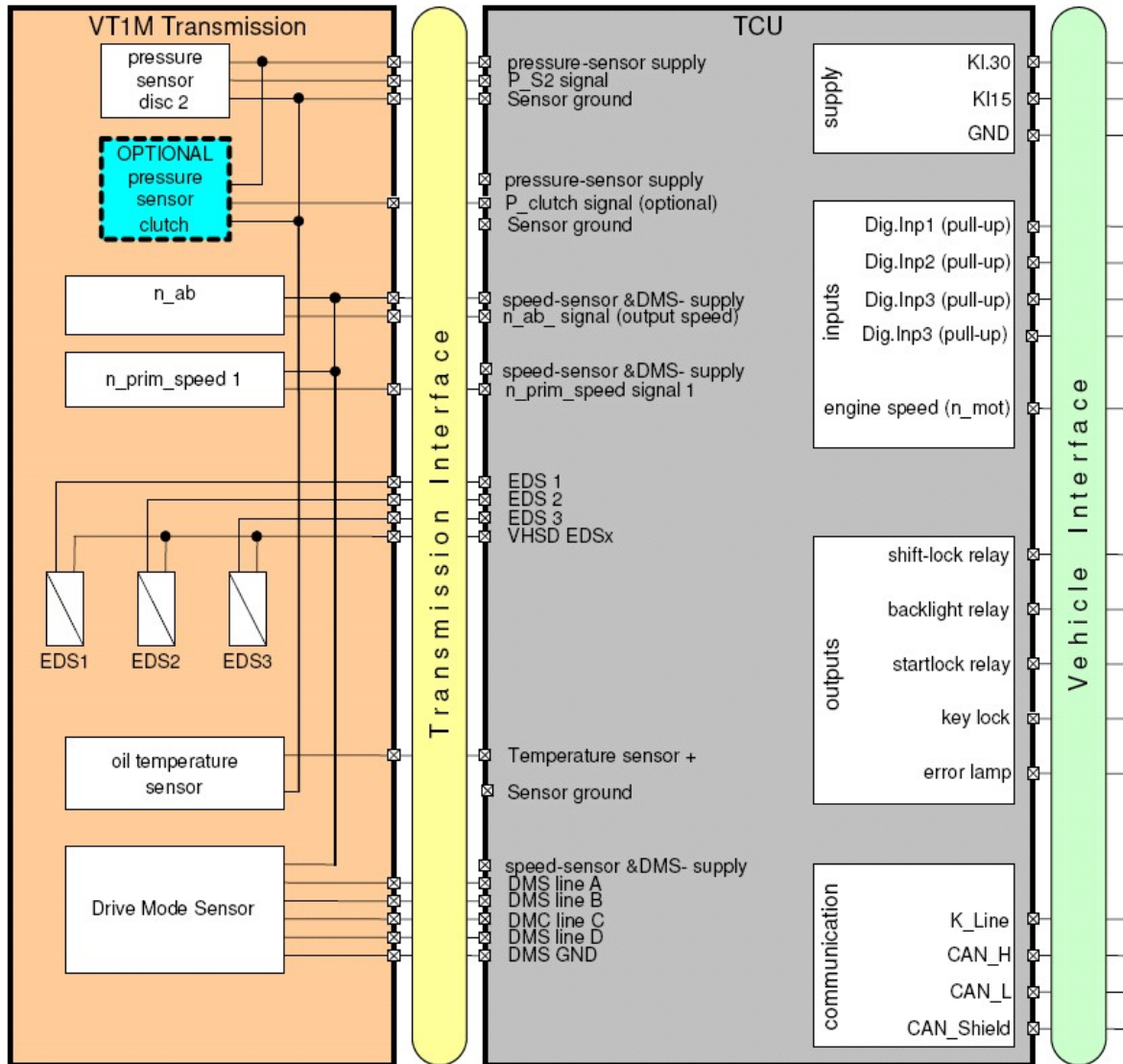


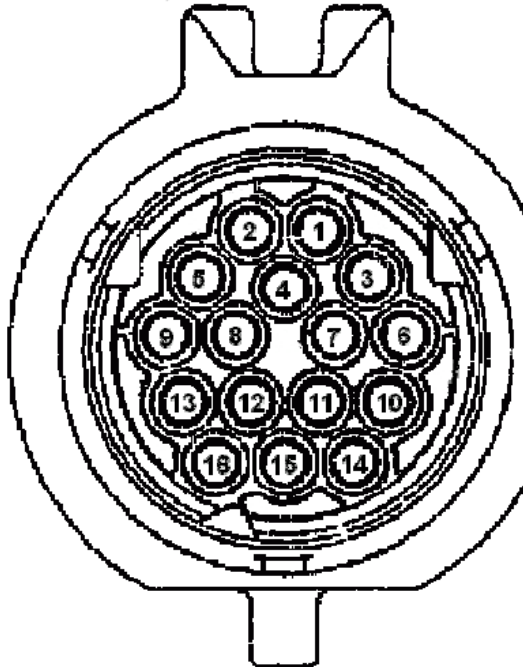
Figure 19 TCU and transmission interfaces

The communication signals between the TCU and the transmission will be transmitted by the connector through internal cables. The connector pins are shown as follows:

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**2.5.2. Pins of the transmission main connectors**

Connector Layout (transmission side)




Pin assignment

Pin	Signal	Pin	Signal
1	supply valves (VHS)	9	supply_8,4V
2	EDS_1	10	p_S2
3	EDS_2	11	n_ab
4	EDS_3	12	n_S1
5	oil temperature	13	DMS_A
6	DMS_GND	14	DMS_B
7	Sensor GND	15	DMS_C
8	supply 5V	16	DMS D

Figure 20 Transmission connector

Signal:

- DMS: Position sensor
- EDS\_1: Driving bevel pulley pressure regulator
- EDS\_2: Driven bevel pulley pressure regulator
- EDS\_3: Clutch pressure regulator
- P\_S2: Driven cone wheel pressure sensor
- N\_ab: Driven cone wheel speed sensor
- N\_S1 or N\_Prim: Active cone wheel speed sensor

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### 2.5.3 TCU circuit diagram

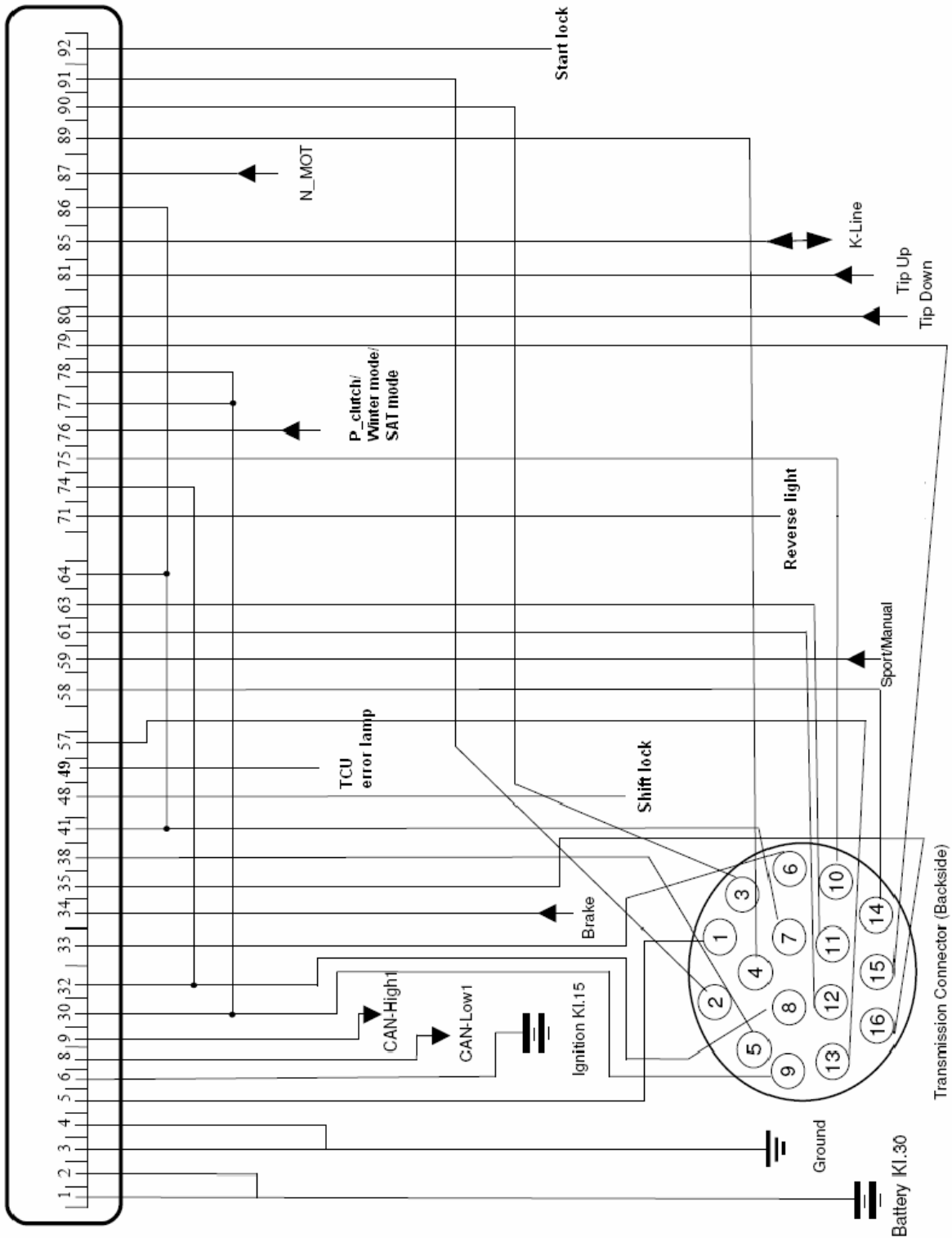




Figure 21 Interface between the TCU and the transmission (vehicle)

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**2.5.4 Layout of TCU pins**

VT2 – signal	Pins
Normally closed power supply Kl.30	1; 2
Ignition power supply Kl.15	6
Grounding Kl. 31	3; 4
VHSD1 (Actuator power supply)	5
Speed and position sensor power supply (8,4V)	30; 77; 78
Pressure sensor power supply (5V)	32; 74
GND Driving mode sensor	33
GND: Sensor grounding	41; 64; 86;
Transmission oil temperature	38
N-Prim (driving bevel pulley speed)	61
N-ab (driven bevel pulley speed)	63
N_MOT (Engine speed signal)	87
DMS-A (Driving mode sensor signals)	57
DMS_B (Driving mode sensor signals)	58
DMS-C (Driving mode sensor signals)	79
DMS_D (Driving mode sensor signals)	35
Brake signal	34
Manual mode signal	59
Gear up signal	81
Gear down signal	80
P_S2 (Driven cone wheel pressure )	75
Snow mode	76
Shifting lock (optional)	48
K-Line	85
CAN-high speed	9
CAN - low speed	8
Starter lock	92
EDS1 (Driven bevel pulley pressure regulator)	91
EDS2 (Driving bevel pulley pressure regulator)	90
EDS3 (Clutch pressure regulator)	89
Reverse lamp relay	71

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**2.5.5. Interface between the TCU and the transmission**

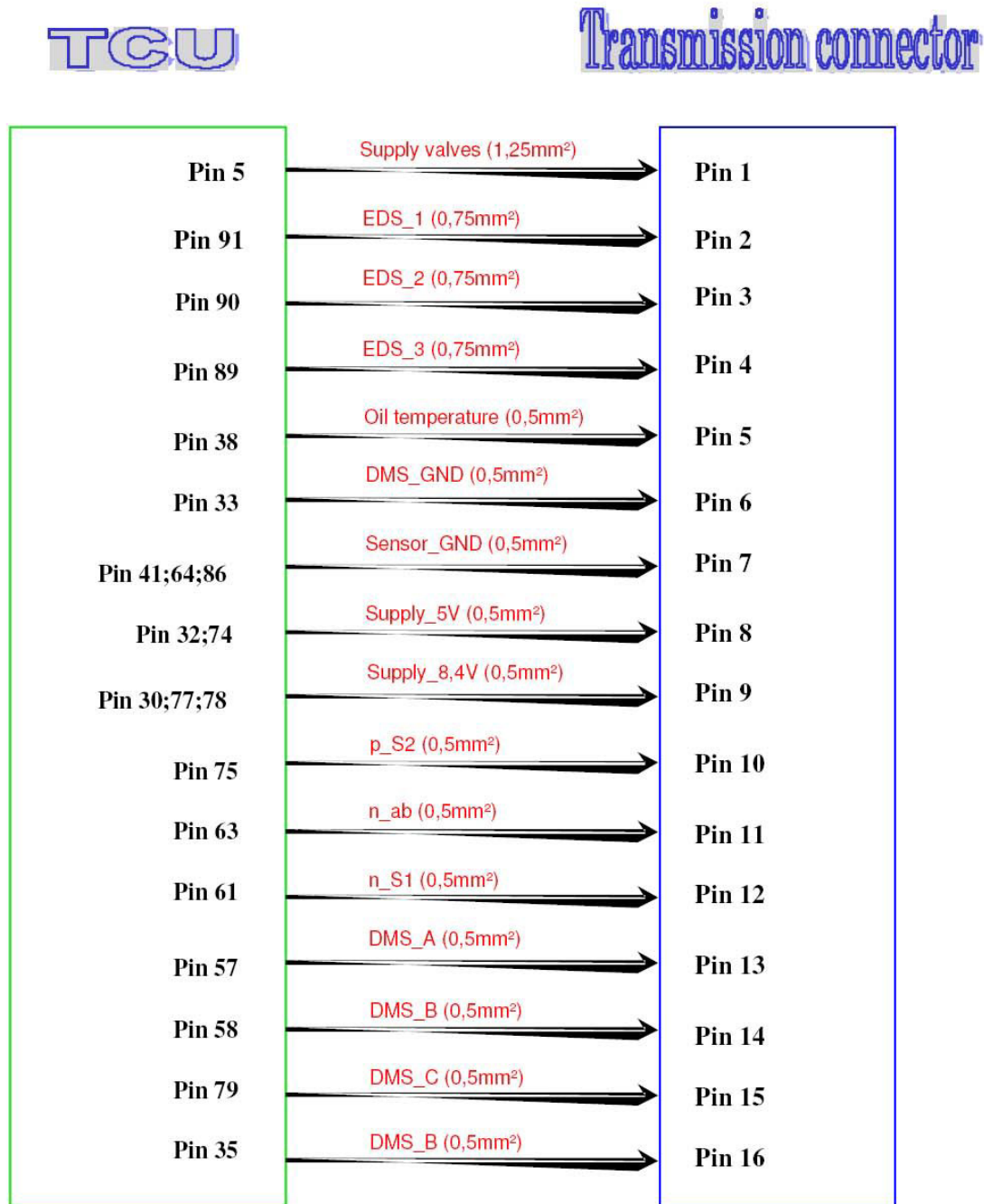



Figure 21 TCU and transmission

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## **2.6. Clutch self-learning**

### **2.6.1 Instructions**

**When:**

- 1. The TCU has refreshed the software or**
- 2. The transmission has been replaced or**
- 3. The TCU has been replaced,**

The clutch needs adaptive updating (self-learning) to compensate the tolerance in the process of production.

This function can be achieved by shifting in idle conditions.

Before the self-learning has completed, the TCU failure indicator will flash once every two seconds.

Once the initial self-learning has completed, the following self-learning in the whole life cycle can be completed automatically.

### **2.6.2 Necessary conditions:**

These conditions need to be done before self-learning:

- Stable torque and speed is needed when the engine is idling and the engine self-learning also needs to be completed in advance. For more information about self-learning of the engine, please read the documents provided by the ECU suppliers.

At P or N, the engine speed requirements are as follows: ECU target value + / - 200 rpm

At P or N, the engine torque requirements are as follows: ECU target value + / - 12 Nm

- The engine temperature should at least be 60 degrees.
- The transmission temperature should be between 20°C to 60°C.
- The air conditioner needs to be disabled.
- The TCU with no any self-learning value will always make the engine idling up to 1150 rpm.

**If the TCU already has had a self-learning value, but when:**

- 1. The TCU software has been updated or**
- 2. Replace transmission**

**Then the self-learning values in the TCU need to be reset with the self-learning conducted once again.**

**Such values can be reset through the PUNCH MLT software or the testing tools provided by the manufacturer.**


### **2.6.3 Process steps:**

When all the prerequisite conditions are satisfied, the following conditions must be implemented:

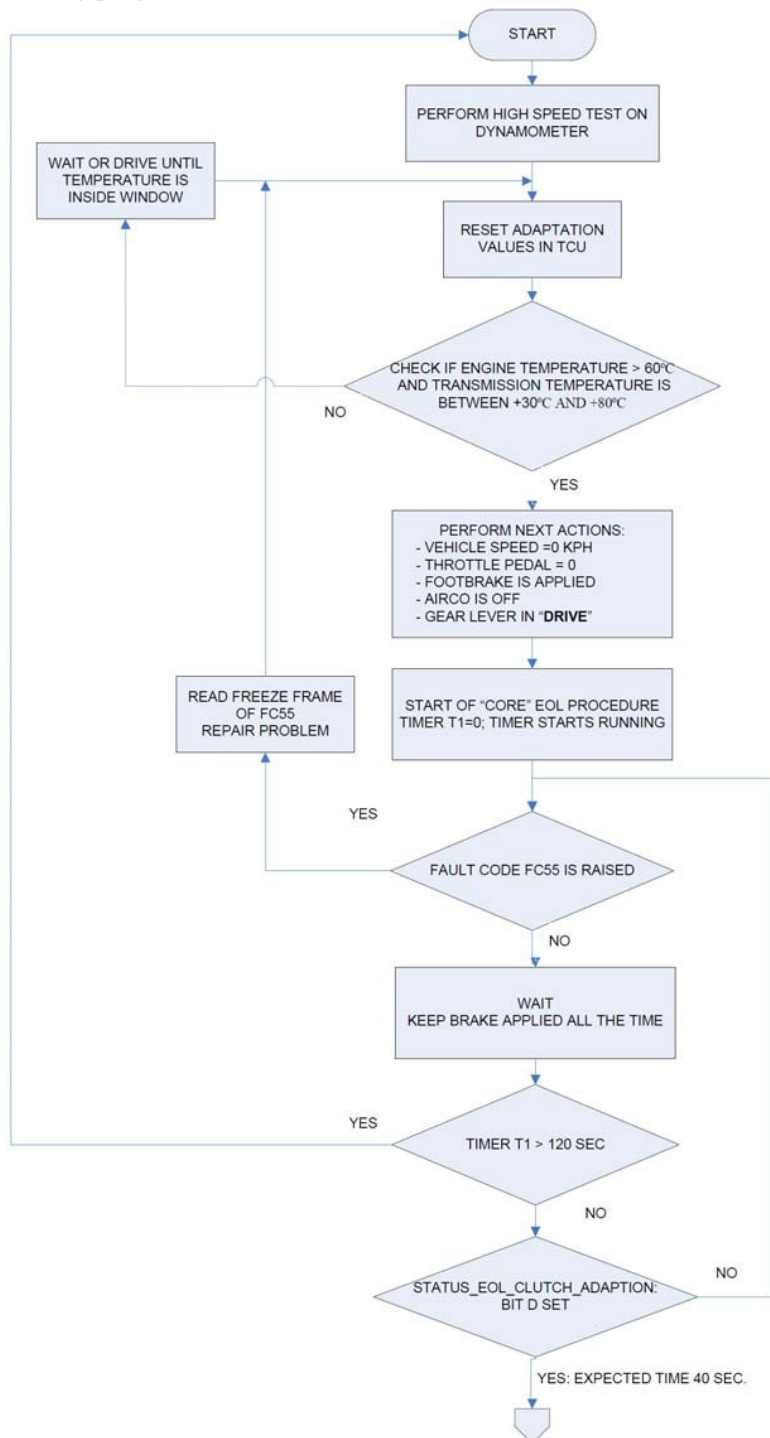
- Have the vehicle speed kept at 0 Kph
- Don't step on the accelerator pedal
- Step on the brake pedal at all time
- When the D gear is engaged


The offline car will have its self-learning application automatically started.

When there is any interference with the clutch self-learning value, the fault code FC51 (p0810) will be triggered and at the same time, the trouble light of the transmission will be activated.

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As long as the self-learning value of the clutch has not been fully completed, the fault code FC51 (P0810) will always be active and at the same time, the transmission trouble light will be flashing. When everything is smooth, it will take approximately 40 seconds to fully complete the gear self-learning value. If the gear self-learning value has not been completed within 120 seconds, then the self-learning program will certainly be terminated.



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After the gear self-learning value has been completed, the engine speed will quickly rise up to 1500 rpm in rather a short time just like a prompt signal, and then the following steps can be started.

**Note:**

For aftermarkets, the high-speed test subject to dynamometers can be ignored.

If all the conditions are satisfied, please check again.


Perform the following operations:

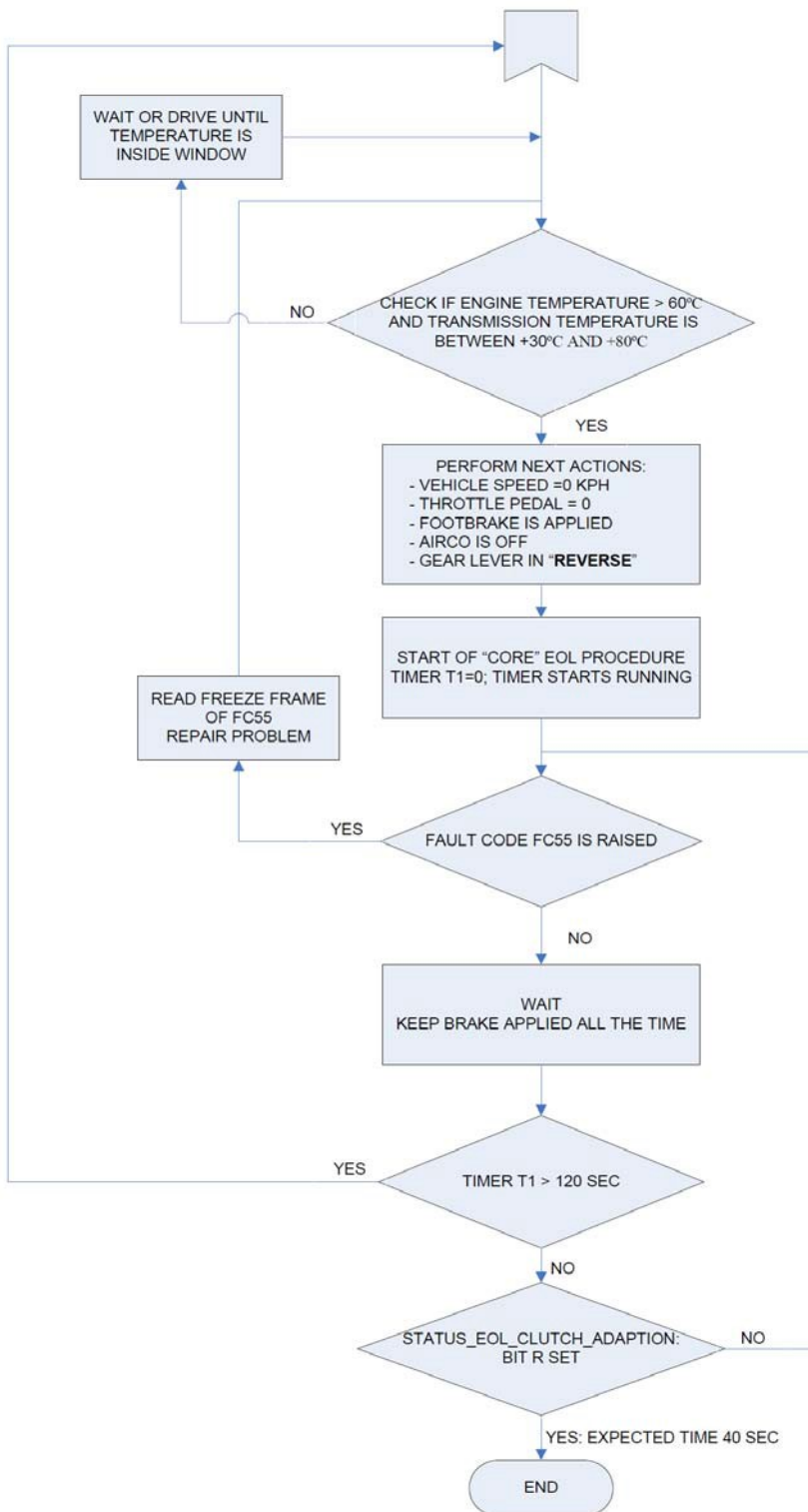
- Have the vehicle speed kept at 0 Kph
- Don't step on the accelerator pedal
- Step on the brake pedal at all time
- When the R gear is engaged, the offline car will have its self-learning application automatically started.

When there is any interference with the clutch self-learning value, the fault code FC51 (p0810) will be triggered and at the same time, the trouble light of the transmission will be activated.

As long as the self-learning value of the clutch has not been fully completed, the fault code FC51 (P0810) will always be active and at the same time, the transmission trouble light will be flashing.


When everything is smooth, it will take approximately 40 seconds to fully complete the gear self-learning value. If the gear self-learning value has not been completed within 120 seconds, then the self-learning program will certainly be terminated. After the self-learning value has been successfully completed, the engine speed will quickly rise up to 1500 rpm in rather a short time, then drop to its idling speed (850 rpm) and at the same time, the transmission trouble light will go out.

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**Note:**

- First complete the drive gear self-learning and then complete the reverse gear self-learning.
- Or first complete the reverse gear self-learning and then complete the drive gear self-learning.

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### 2.6.4 Fault diagnosis

In a certain extent, this fault diagnosis can solve the fault code FC51 (P0810).

The fault code FC51 (P0810) may occur due to six possible reasons, few of which are translated into FC51 (P0810) “Offline clutch self-learning unfinished” in the freeze frame.

Importance of “Offline clutch self-learning unfinished”	Failure types
<b>1</b>	Instable engine torque
<b>2</b>	The A/C is ON
<b>4</b>	Rather high pressure
<b>8</b>	The engine speed is too low.
<b>16</b>	The engine speed is too high.
<b>32</b>	Too many interruptions of emergency

Question	Possible cause	Actual operations
If the self-learning value is not set in 120 seconds, the inspection process will be terminated.	In the process of self-learning, the transmission oil temperature is below 20 degrees.	Have the transmission oil temperature rise up (when the engine is working) Start again according to the self-learning process
	In the process of self-learning, the transmission oil temperature is beyond 60 degrees.	Have the transmission oil temperature drop (when the engine is shut down) Start again according to the self-learning process
	The engine temperature is below 60 degrees.	Have the engine temperature rise up (when the engine is working) Start again according to the self-learning process
	In the process of self-learning, the brake pedal is released for a long time.	Start again according to the self-learning process and always step on the brake pedal in the process of self-learning.

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### 3. Use procedures

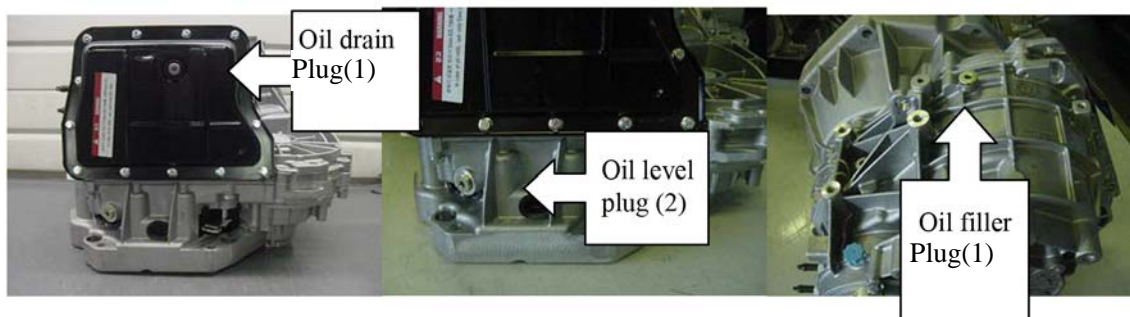
#### 3.1. Oil level check instructions


**In any case, if oil is drained from the transmission or the transmission is replaced, fill oil in accordance with such procedures.**

The transmission as a service part has no oil filled and needs to have about 4.3 liters of oil filled.

Check the oil level according to the following method after the oil has been filled:

- Start the engine and let it idling for at least 10 seconds (Note: It is normal to hear the sound of air circulation in the system when the engine is started.)
- Use the gearshift to switch to different gears (parking gear - reverse gear – neutral gear – drive gear) and stay for 5 seconds at each gear before it is switched to a next one.
- Shift to “D” (drive gear)
- Release the foot brake pedal.
- Accelerate more than 60 km/h (with the engine speed no higher than 2,500 rpm).
- Release the accelerator to stop slowly (all the noise from air circulation just when the engine is started will disappear).
- Make the oil heated up and drive carefully at least 5 minutes or wait until the transmission temperature has reached about 60°C.
- Park the car on a flat ground.
- Step on the foot brake pedal.
- Wait for 2 seconds.
- Shift to the “R” (neutral gear)
- Wait for 10 seconds.
- Shift to the “P” (parking gear).
- Engine idle
- Loosen the oil level plug.
- After it is confirmed that the oil level plug is loosened, at least there should be 0.2 liters of oil flowing out from the oil pipe. (Otherwise, it proves that the initial oil is insufficient) if the oil is less than 0.2 liters, fill 0.5 liters of oil again and then repeat the above process.
- Until there is oil dropping from the mouth of the oil level plug.
- Tighten the oil level plug and add a new gasket (18-24Nm) .
- Shut down the engine.



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### 3.2. Oil level check


If the initial oil reserve is enough, then the oil level should be kept at the right position (namely, the position of the oil level bolt)

The normal tolerance (like the residual oil of a new transmission and production line oil filling tolerance) should be the location of the oil level bolt, with the oil level of  $\pm 0.165L$ . If the oil level needs to be checked, the procedure should be as follows:

- Remove the oil filler bolt(3) at the top of the transmission.
  - Fill the transmission with accurate amount of oil (0.5 L).
  - Re-mount the oil filler plug (3) and tighten it subject to the torque (18 - 24 Nm)
  - Make the transmission heated up and drive carefully at least 5 minutes or wait until the oil temperature has reached about 60°C.
  - Park the car on a flat ground.
  - Step on the brake pedal.
  - Wait for 2 seconds.
  - Shift to the P gear.
  - **Have the engine kept idling.**
  - Remove the oil level checker bolt (2) when the engine is idling.
  - Drain the oil correctly (at least 0.335 L; up to 0.665 L)
- 
- At least 0.335 L ( $0.5_{ADDED\ OIL} - 0.165_{tolerances} = 0.335L$ ), the oil will flow out from the transmission, and if it is less than such amount of oil, **the original oil level is too low.**
  - Up to 0.665 L ( $0.5_{ADDED\ OIL} + 0.165_{tolerances} = 0.665 L$ ), the oil will flow out from the transmission, and if it is more than such amount of oil, **the original oil level is too high.**

All data is worked out at the accurate temperature of 60°C

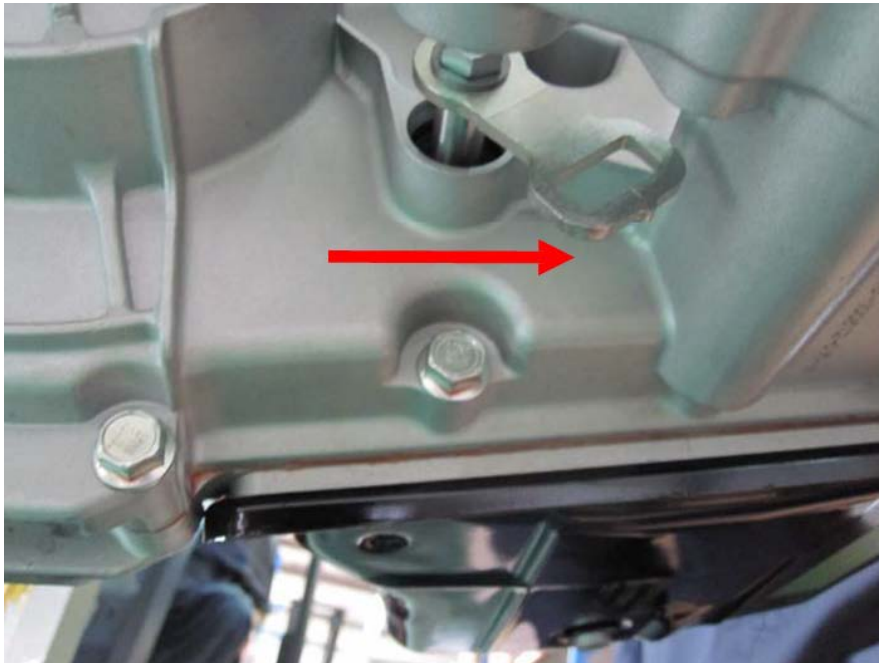
- Apply a gasket to the oil level bolt (2) and then tighten it (18-24 Nm)
- Engine flameout.

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### 3.3 Adjustment of the gear selector cable


This process describes how to connect the gearshift correctly, and if the instructions are not followed for operations, the transmission gears may become confused. No matter where the gearshift is located, the transmission gear will always be displayed on the dashboard. Good gear selector cable installation can have the same gear displayed on the instrument and the gearshift. (PRND)

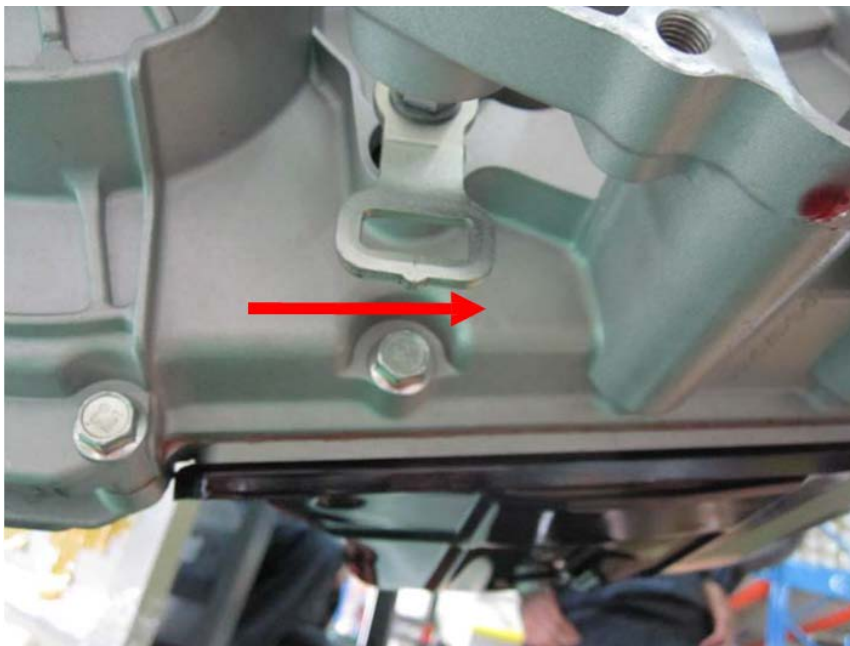
- First push the gearshift to the P gear.
- First make sure that the transmission is set at the P gear and that the gearshift should be located consistent with the figure below:



The gearshift is at the P gear.

- If the gearshift is not located at the P gear, push it by hand to this correct position.


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The gearshift is not at the P gear and the gearshift cables can't be installed.

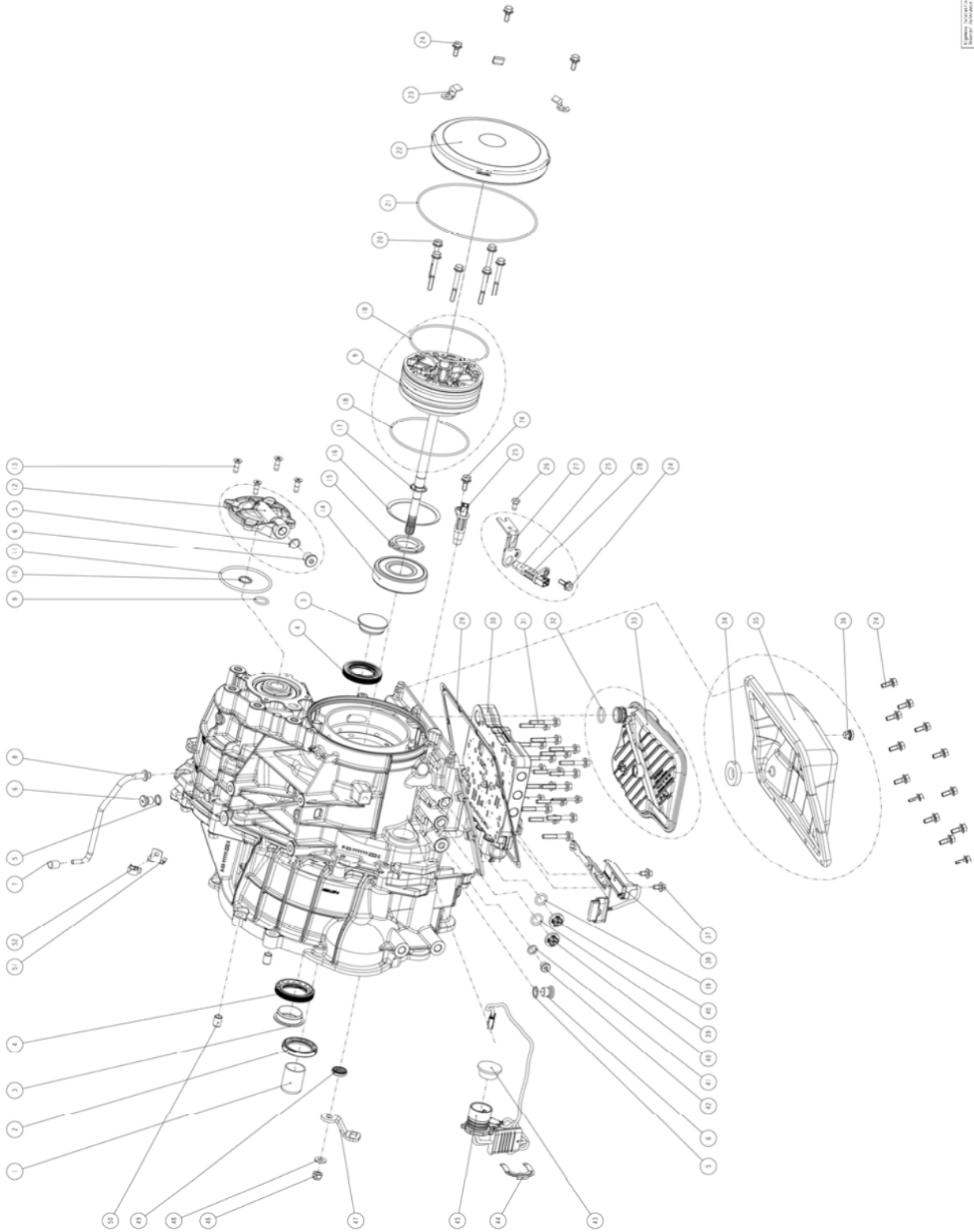
- The P gear can be identified by the instrument display.
- Simultaneously turn the front wheels of the car until they are locked, and now the transmission gear is at the P gear; at this moment, you can still screw the gearshift out of the P gear, but never do so.
- If there is a bracket to fix the cables, first connect the bracket with the cables.
- Use screws and nuts to connect the cable to the gearshift.
- Never bend the cable or gearshift in operation!!!


At this moment, the transmission has already been fastening together with the shifter, so the instrument can display the same location as that of the shifter. .

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3.4. Transmission disintegration diagram


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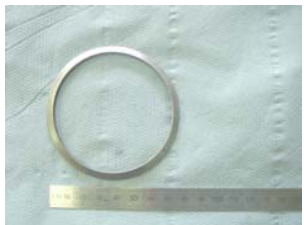



### 3.5 List of service parts and torque requirements


<b>482871</b> NO.4	Differential oil seal	
<b>481274</b> NO.2	Input shaft oil seal	
<b>482584</b> NO.50	Nut gaskets of selector tie rod	
<b>481329</b> NO.49	Nut of selector tie rod (14,5 +/-1,5 Nm)	
<b>482099</b> NO.51	Oil seal (gear selector shaft)	
<b>482465</b> NO.48	Selector tie rod	

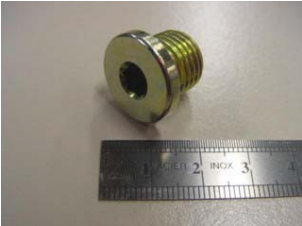





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481173 NO.24	Driving bevel pulley shaft end cover	
481189 NO.25	Buckle of driving bevel pulley shaft end cover	
481253 NO.23	O-shaped ring of driving bevel pulley shaft end cover 177.47 x 2.62	
481283  481986 NO.26	Bolts of driving bevel pulley shaft end M6x16 ( <b>adhesive free</b> ) Bolts of driving bevel pulley shaft end M6x16 ( <b>adhesive</b> ) (9,5 +/-2,5 Nm)	
481259 NO.20	O-shaped ring of the oil pump	
481284 NO.22	Oil pump bolts (10 +/-1 Nm)	







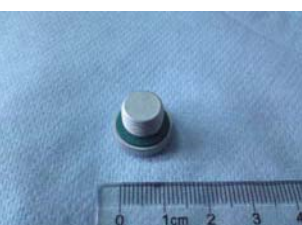
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481293 NO.17	Nuts of driving bevel pulley shaft (197,5 +/-17,5 Nm)	
481826 NO.19	Oil pump seal ring	
481856 NO.18	Conical spring washers	
482773	Oil pump (including O-shaped rings)	
483323 NO.21	<i>* See the note at the bottom of this page!</i>	
482294 NO.16	Ball bearing of driving bevel pulley shaft	
481247 NO.5	Gasket M14 of oil filler plugs	








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481248 NO.6	Oil filler plugs M14 (21 +/-3 Nm)	
481249 NO.43	Pressure screw plug spacer M10	
481250 NO.44	Pressure screw plug M10 (15 +/-2,25 Nm)	
483616 NO.14	Driven bevel pulley shaft end cover	
481254 NO.11	End cover O-shaped rings (small) of driven bevel pulley shaft (17.12 x 2.62)	
481255 NO.13	End cover O-shaped rings (large) of driven bevel pulley shaft (72.63 x 3.53)	








 <p style="font-size: small;">Gear up for the future</p>	DOCUMENT	Number	D-ASS-208-03
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481877 NO.12	End cover sealing ring of driven bevel pulley shaft	
482208 NO.15	End cover countersunk screws M6x20 of driven bevel pulley shaft (9,5 +/-0,95 Nm)	
482456 NO.35	Oil filter assembly (including the O-shaped ring)	
481283 NO.26	Oil sump bolts M6x16 (9 +/-1 Nm)	
482504 NO.31	Oil sump gaskets	
481870 NO.36	Oil sump magnet	
482442 NO.38	Oil drain bolt (11 +/-1 Nm)	






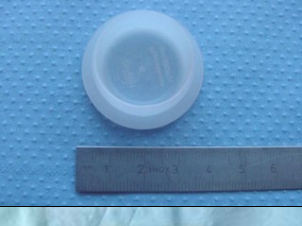

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482489 NO.37	Oil sump assembly	
482589 NO.32	Valve body assembly	
481311 NO.33	Valve body bolts (11 +/-1 Nm)	
483444 NO.40	Driving mode sensor	
481090 NO.39	Fastening screws for driving mode sensor (9,5 +/-0,95 Nm)	
482468 NO.29	Speed sensor bracket at the differential	
481289 NO.28	Fastening screws for speed sensor bracket at the differential (9,5 +/-0,95 Nm)	


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483516 NO.27	Speed sensor	
481283 NO.26	Retaining bolts of speed sensor (8,5 +/- 2 Nm)	
481258 NO.41	O-shaped ring of the oil cooler plug	
482121 NO.42	Oil cooler plug	
482235 NO.1	Input shaft rubber bumpers	
481296 NO.3	Differential oil seal cover	
482105 NO.46	Main connector buckles	

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482475 NO.47	Main connector and internal wiring harness	
483114 NO. 7	Ventilator tube assembly	
483420 NO. 8	Ventilator tube cap	
481456 NO. 9	Metal buckle	
482253 NO. 10	Plastic buckle	
482104 NO. 45	Main connector protection cover	
483270	TCU (EC-7)	

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483130	New transmission (excluding TCU)	
--------	-------------------------------------	--

**\*Prompt on the oil pump (vehicle safety warning) :**

Now there are two kinds of oil pumps in all: one is (482773) and the other is (483323).

The transmission number is higher than this number below:


18023999 ( forVT2)

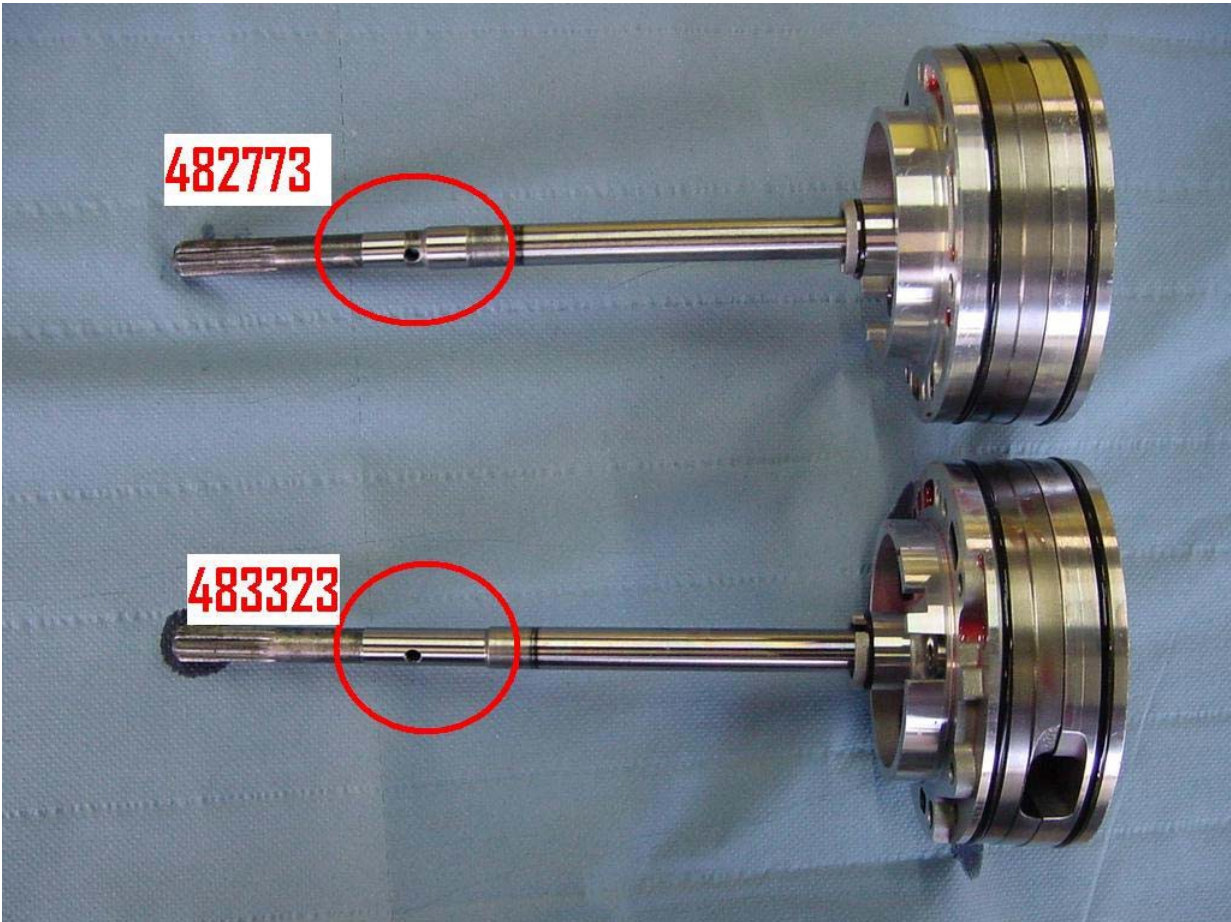
This oil pump (483323) is used.

**When the transmission number is lower than gearbox with its number just mentioned above, we must and can only use such oil pump with the part number of 482773 if it is replaced!**


**Otherwise, when the transmission number is lower than gearbox with its number just mentioned above, we must and can only use such oil pump with the part number of 483323 if it is replaced!**

If the transmission label is lost or difficult to distinguish, you can identify and differentiate which kind of oil pumps to be used as follows: Take out the oil pump, then compare it with the following figure, and you can clearly see which kind of oil pumps can be used:

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The oil pump (48332) will have a label introduction similar to a label, which can help technical personnel to distinguish and identify oil pumps.

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### **3.6 Special tools and replacement of service parts**

Note: The parts and tools in the figure are different from the actual ones.

#### **3.6.1. Special tools**



Bearing plug of driving bevel pulley shaft (drawing 480139)


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gear selector shaft oil seal punch (drawing 480125)



Bearing punch of driving bevel pulley shaft (drawing 480137 + 480126)


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Tool for removing of driving bevel pulley shaft (drawing 480136)



Input shaft oil seal punch (drawing 480130)


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Positioning sleeves of input shaft oil seal (drawing 480129)



Tool for removing gear selector shaft oil seal (drawing 480127)


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Locating pins of hydraulic control block (drawing 480142)



Differential oil seal punch (drawing 480143)


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Special tool for removing oil pump (drawing 480141)



Respirator pipe installer (drawing 480140)

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Half shaft installer (drawing 48154)


### **3.6.2. Introductions to replacement of service parts**

#### **3.6.2.1 Drive shaft installation**

In the process of half shaft installation, we strongly recommend using the special PUNCH tool (480145) to protect the differential oil seal.

If the half shaft has its oil seal damaged, oil leakage should be inevitable. If this tool is used, the risk of oil seal damages can be significantly reduced.

- Remove the protection cover:

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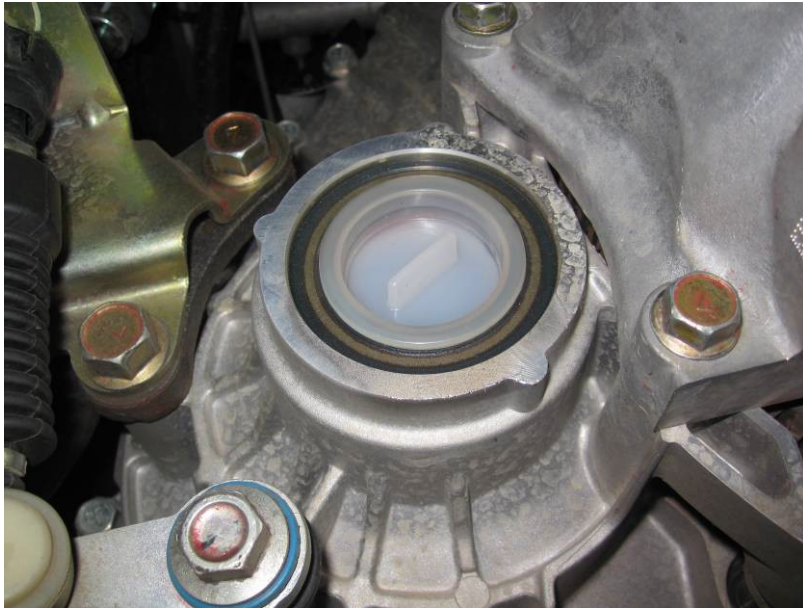



Figure 1-1 Differential oil seal protection cover

- Put the tool on the differential oil seal:



Figure 1-2 Installation by means of the special tool 480145

- Insert the half shaft into the transmission about 4cm:

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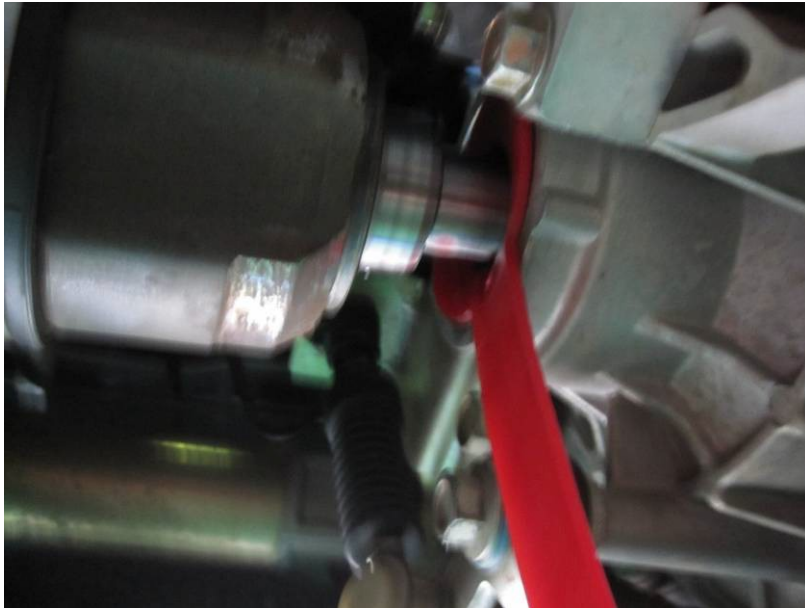


Figure 1-3 Insert it in about 4cm

- Stop right now and keep a distance of about 2cm between the half shaft and the tool:

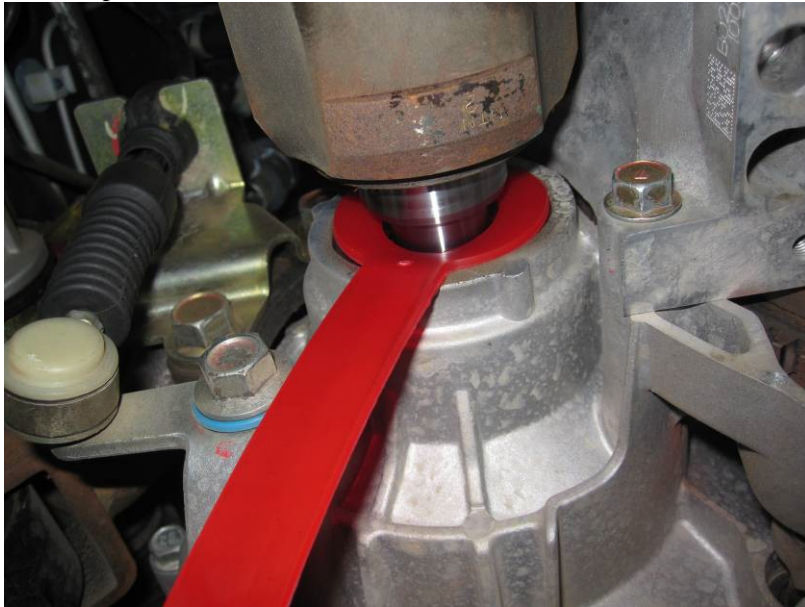



Figure 1-4 Installation position

- Remove the special tool 480145.

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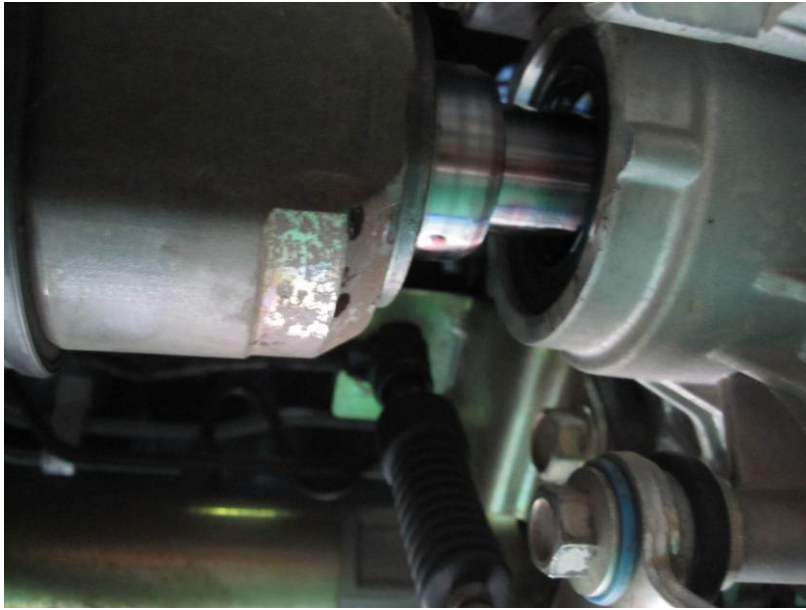


Figure 1-5 The tool has been removed.

- Insert the half shaft completely into the transmission:

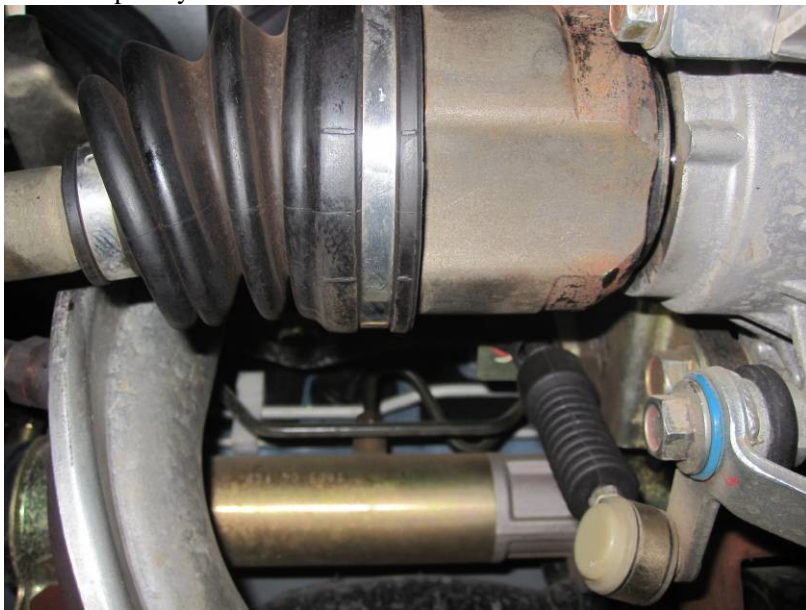



Figure 1-6 The half shaft has been installed.

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### 3.6.2.2 Replace the differential oil seal

**Fault descriptions:**

If any oil seal or half shaft is damaged or there is any oil leakage.

**Maintenance method:**

- Drain the oil in the transmission (See “How to replace the oil filter”)
- Remove the half shaft
- Use a big slotted screwdriver to pry out the oil seal. Take care not to put the slotted screwdriver too deep to protect the casing.(Figure 2-1)
- Throw away the removed oil seal.
- Put a new oil seal on the casing.(Figure 2-2)
- Put the special tool (480143) on the oil seal and use a rubber hammer to knock it into the casing. Be sure to install it in place.
- The depth should be 3 mm±0.3mm from the casing edge to the oil seal - installation of the half shaft
- Fill the transmission with oil again according to the instructions.(see 3.1)



Figure 2-1 Remove the oil seal.


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Figure 2-2 Use a special tool to install a new oil seal.

### **3.6.2.3 Replace the input shaft oil seal.**

**Fault descriptions:**

The input shaft has its oil seal damaged or there is oil leakage.

**Maintenance method:**

- Drain the oil in the transmission (See “How to replace the oil filter”).
- Remove the transmission from the car.
- Use a big slotted screwdriver to take out the oil seal from the casing (Figure 3-1). Pry it out along the hollow of the oil seal carefully or the input shaft of the transmission may be damaged.
- Take out this oil seal and throw it away.


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Figure 3-1 Remove the input shaft oil seal.

- Put the positioning sleeve (480129) of the oil seal on the input shaft.(Figure 3-2)
- Place a new oil seal on this positioning sleeve.(Figure 3-3)



Figure 3-2 Mount the special tool on the input shaft (480129).


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Figure3-3 Press the oil seal downward.

- Put the special tool (480130) on the input shaft.(Figure 3-4)
- Use a rubber hammer to knock the special tool in place.
- Remove the special tool and remount the transmission.
- Fill the transmission with oil again according to the instructions.(see 3.1)



Figure 3-4 Use a special tool to mount the oil seal (480130)

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### 3.6.2.4 Replace the gear selector shaft oil seal

**Fault descriptions:**


Leakage of the gear selector shaft oil seal

**Maintenance method:**

- Drain the oil in the transmission (See “How to replace the oil filter”).
- Remove the transmission from the car.
- Remove the gear selector tie rod.
- Place the special tool (480127) on the gear selector shaft.(Figure 4-1)
- Use a wrench to screw the special tool into the oil seal. Press the top of the wrench to screw the special tool into the oil seal.(Figure 4-2)
- Use an appropriate tool to turn the bolts on the special tool and pull the oil seal of the gear selector shaft out from the casing. (Figure 4-3)
- Throw away the oil seal.(Figure 4-4)



Figure 4-1 Place the special tool (480127) on the gear selector shaft.

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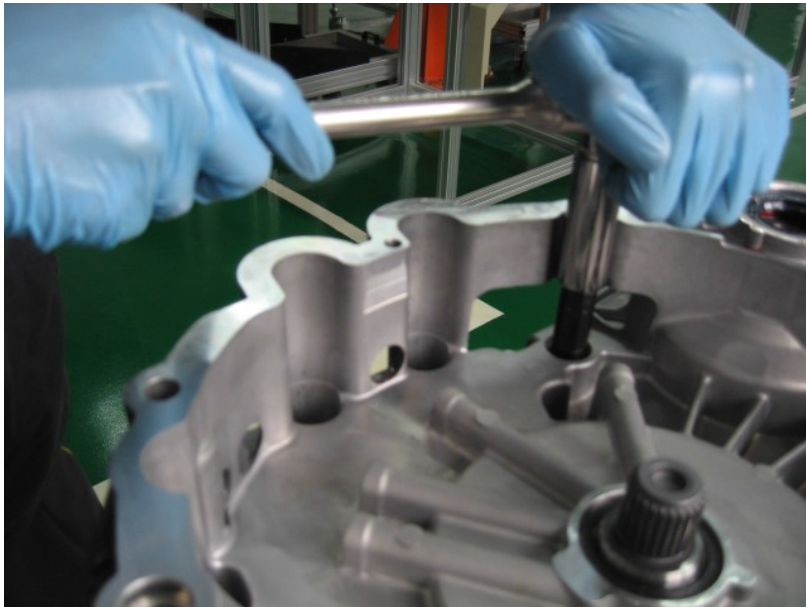


Figure 4-2 Press and turn the special tool.

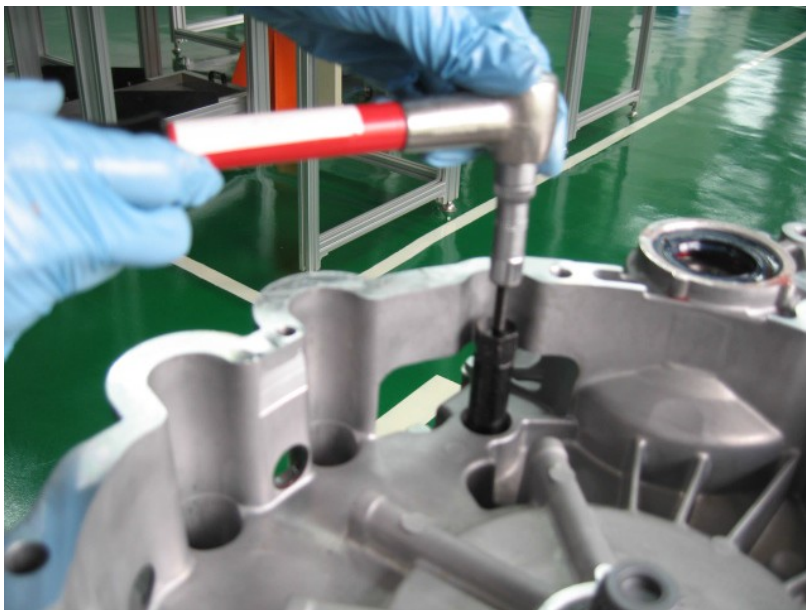


Figure 4-3 Turn the small bolts to pull out the oil seal.


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Figure 4-4 Remove the oil seal.

- Apply some vaseline or lubricating oil at the top of the punch (480125) (see the arrow in Figure 4-5).
- Take a new oil seal and have the special tool (480125) applied gently.(Figure 4-5)
- Put the tool (480125) and the oil seal on the gear selector shaft and use a hammer to knock it until installed in place (see Figures 4-6 and 4-7).
- Remove the tool (480125).



Figure 4-5 Slide the oil seal around the tool.


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Figure 4-6 Use a special tool (480125) to place the oil seal on the gear selector shaft.



Figure 4-7 Use a hammer to knock the tool (480125) until fully in place.

- Gently unscrew the tool, or it is likely to pull out the oil seal.
- Use a new gasket (482584) and nuts (481329) to install the gearshift.
- Apply the torque of  $14.5\text{Nm} \pm 1.5\text{Nm}$
- Remount the transmission.
- Fill oil again according to Section (3.1).

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**3.6.2.5. Replace the driving bevel pulley shaft end cover**

**Fault descriptions:**

The end cover of the driving bevel pulley shaft is suffering from oil leakage.

**Maintenance method:**

- Drain about one liter of oil from the transmission (See “Replacement of oil filters)
- It’s unnecessary to remove the transmission from the vehicle and it should be much easier for replacement if the engine and the transmission are lowered at the same time.
- Remove the three bolts and take down the buckle. Use a larger slotted screwdriver to remove the end cover and use a piece of cloth to pad underneath to prevent damages to the transmission casing.
- Use a larger slotted screwdriver to remove the end cover and use a piece of cloth to pad underneath to prevent damages to the transmission casing.(Figure 4-1)
- Remove the larger O-ring and the end cover and throw away.
- Mount a new O-ring.
- Replace a new end cover and tighten the bolts and buckles at the torque of 9.5N +/- 2.5 Nm.
- Fill 1 liter of oil again in the transmission.

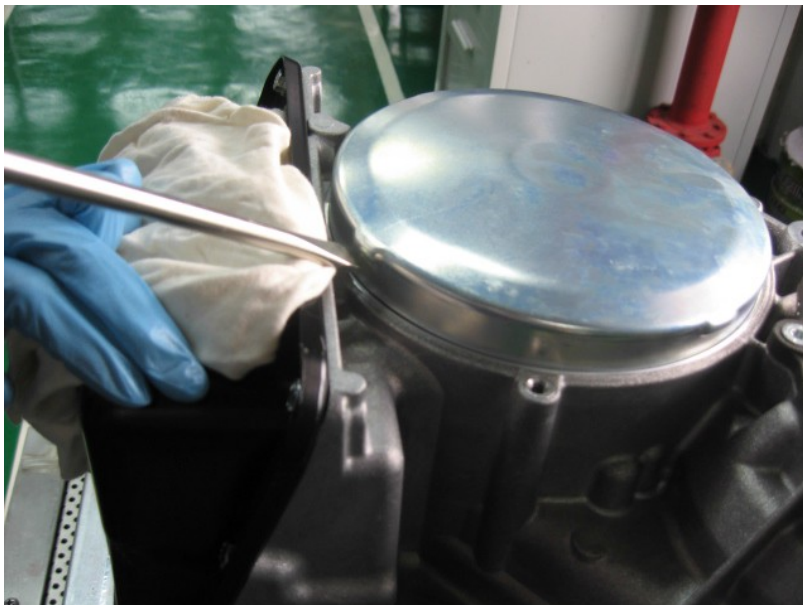

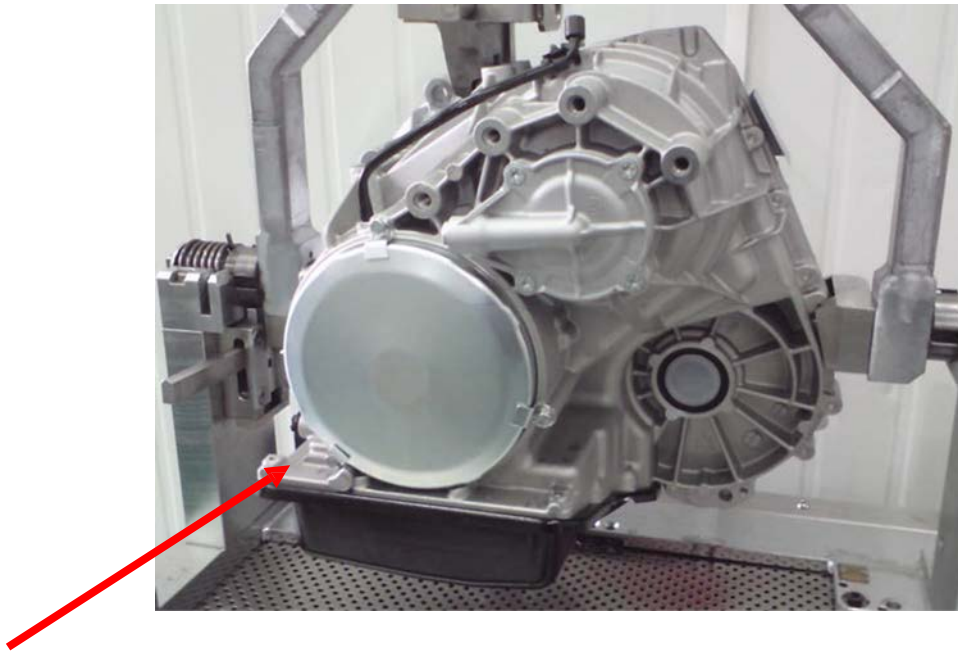



Figure 4-1 Remove the end cover of the driving bevel pulley shaft.

**If there is oil flowing out from the threaded hole at the left lower corner of the driving bevel pulley end cover, adhesive-coated bolts (481986) can be used to replace the original ones (481283) for troubleshooting.**

**If the oil is flowing out from the threaded hole, it’s unnecessary to replace the end cover of the driving bevel pulley.**

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### 3.6.2.6. Replace the oil pump

**Vehicle safety warning:** Please read the label prompts on the oil pump mentioned according to Section 3.5.

#### **Fault descriptions:**

If the transmission pressure is found too low or there is vibration during driving or any other abnormality appears, two important parts may fail: oil pump and hydraulic control block. Use the fault code to judge which one needs to be replaced. In most cases, it's impossible to accurately judge which one is faulty, so we can replace one after another to see whether the error is solved.

#### **Maintenance method:**

- Remove the end cover according to the order for replacement of the driving bevel pulley shaft end cover.
- Remove the six bolts on the oil pump and put the special tool on the oil pump shaft.(see Figure 6-1)
- Use a special tool (480141) to pull out the oil pump.(see Figure 6-2)
- Replace it with a new oil pump. It must be confirmed that two new O-rings are placed on the new oil pump. And take care not to pull out the tapered return spring and make sure that the end larger in diameter is kept toward the oil pump.(see Figure 6-3)
- Remount the 6 bolts and tighten at the torque of 10N +/- 1N.
- Remount the end cover according to the steps, but it's unnecessary to replace the O-rings and the end cover.

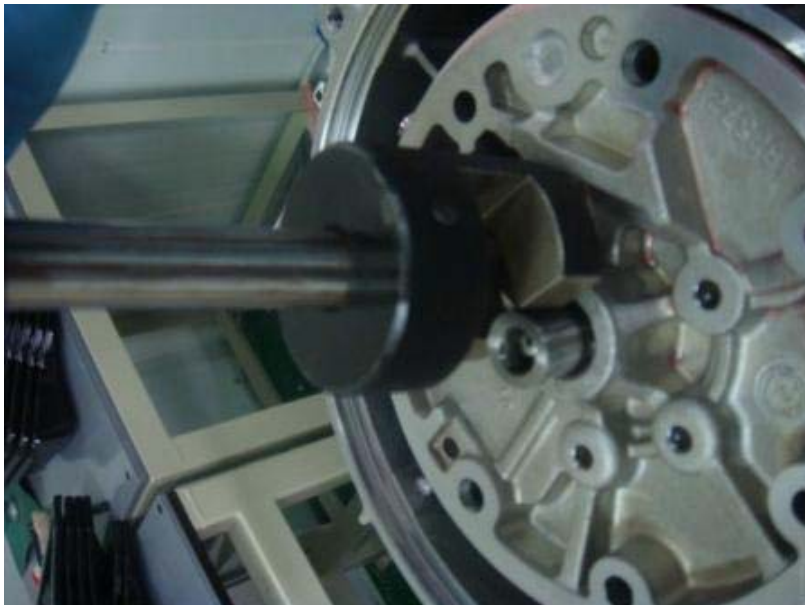


Figure 6-1 Remove the six bolts and install the special tool.


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Figure 6-2 Pull out the oil pump.

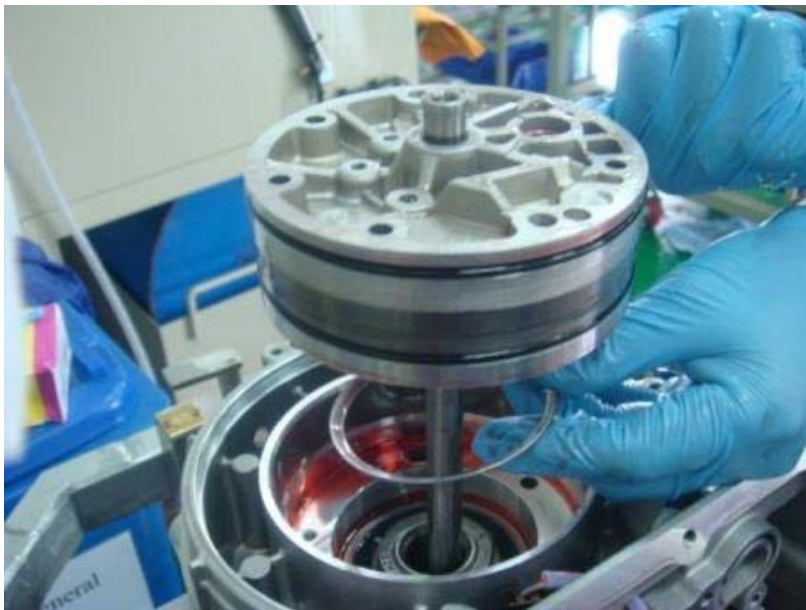



Figure 6-3 Conical spring washers

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### 3.6.2.7 Replace the ball bearing of driving bevel pulley shaft

#### Fault descriptions:

Replace the bearing of the driving bevel pulley if worn. The ball bearings of any worn driving bevel pulley will have much more noise varying with the engine speed. So if the D gear is replaced to its manual mode under a constant speed, the noise will increase suddenly, which indicates that the bearing may have been damaged. Because after it has been shifted to the manual mode, the vehicle speed is kept constant but the engine speed has increased.

#### Maintenance method:

- Remove the oil pump according to the steps.
- Pull out the conical return spring.
- Leave marks on the shaft and nuts.(see Figure 7-1)
- Use an air wrench of about  $\pm 300$  Nm to remove the nuts.
- Use a small slotted screwdriver to remove the dust cover on the bearing.(see Figure 7-2)
- Put a special plug on the shaft (480139) (see Figure 7-3)
- Assemble the bearing puller (480136) and use its foot to hook the bearing outer ring (see Figure 7-4)
- Tighten the bolts in the middle to pull out the bearing.(see Figure 7-5)
- Throw away the old bearing, clear the sealant on the driving bevel pulley shaft and the oil pump drive shaft, and clean the oil pump chamber (see Figure 6-6).
- Put the new bearing in place and use a special punch (480137 + 480126) to install it. Use a rubber hammer to knock the punch and take care to install in place.(see Figure 6-7)
- Use a pneumatic tool to fasten the nuts, until the mark on the shaft coincides with the one on the nut ( $\pm 5^\circ$ ).
- Remount the tapered return spring and take care to have the end larger in diameter toward the oil pump.
- Remount the oil pump into the transmission according to the steps.



Figure 7-1 Leave marks on the shaft and nuts



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Figure 7-2 Remove the dust cover on driving bevel pulley bearing



Figure 7-3 Put the special tool on the shaft (driving bevel pulley plug 480139)

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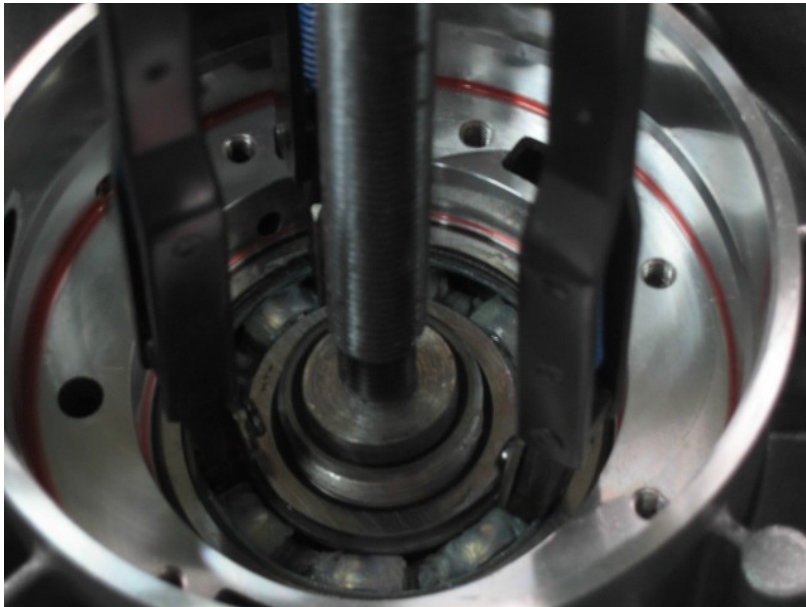


Figure 7-4 Assemble the bearing puller (480136)



Figure 7-5 Tighten the bolts in the middle to pull out the bearing



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Figure 7-6 Remove the bearing of the driving bevel pulley



Figure 7-7 Mount a new bearing

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### **3.6.2.8 Replace the driven bevel pulley shaft end cover**

**Fault descriptions:**

The driven bevel pulley shaft has its end cover damaged or suffering from oil leakage.

**Maintenance method:**

- It's unnecessary to remove the transmission from the vehicle and it should be much easier for operation if the engine and the transmission are lowered at the same time.
- Remove the four countersunk screws.
- Remove the two O-rings and one sealing ring on the end cover.
- If the end cover is damaged, replace it with a new one.
- Remount two O-rings and one sealing ring on the end cover.
- Clear the thread adhesive in the four screw holes on the casing.
- Tighten the four screws at the torque of 9.5N + / - 0.95 Nm.

### **3.6.2.9 Replace the oil sump**

**Fault descriptions:**

The oil sump is damaged or suffering from oil leakage.

**Maintenance method:**

- Remove the oil drain plug and drain the oil.(see Figure 9-1)
- Throw away the oil drain plug until there is no oil dripping.
- Remove all of the 13 bolts on the oil sump.(see Figure 9-2)
- Throw away the old oil sump and gasket.
- Take a new oil sump and gasket.
- Use a new gasket to install the oil sump, as shown in Figure 9-3, at the torque of 9.5N + / - 1 Nm.
- Fill the transmission with oil again according to the instructions.(see 3.1)



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Figure 9-1 Remove oil drain plug



Figure 9-2 Remove the oil sump

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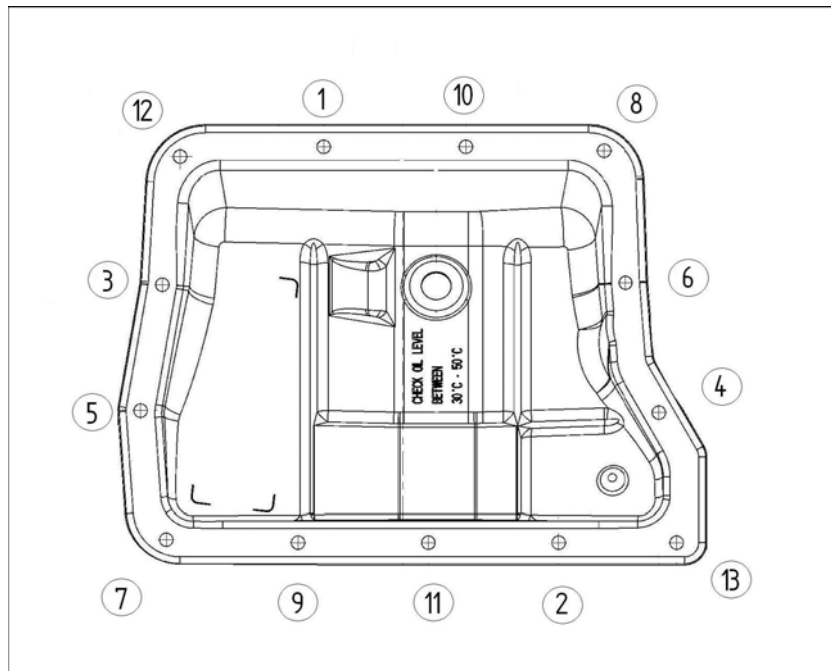


Figure 9-3 Order of bolts

### 3.6.2.10 Replace the oil filter

#### Fault descriptions:

Replace the oil filter at least once every 60,000 km, or shorter according to the standard of the manufacturer.

#### Maintenance method:

- Open the oil drain plug and drain the oil.(see Figure 9-1)
- Throw away the oil drain plug until there is no oil dripping.
- Take a new oil drain plug and tighten it at the torque of 11N + / - 1 Nm.
- Remove all of the 13 bolts on the oil sump.(see Figure 9-2)
- Throw away the oil sump gasket.
- Remove the oil filter gently and throw it away.
- Take a filter with an O-ring and use ESSO EZL799 (A) for lubrication.(see Figure 10-1)
- Gently press the filter in place (with the hole in the middle of the filter just matching the middle bolt on the hydraulic control block)(see Figure 10-2)
- Clean the magnet and oil sump.
- Install the new gasket and the oil sump in place and tighten the 3 bolts (see Figure 9-3) at the torque of 9.5N + / - 1 Nm.
- Fill oil again in accordance with the instructions.(see 3.1)



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Figure 10-1 Lubricate the O-ring



Figure 10-2 Install the filter in place

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### 3.6.2.11 Replace the driving mode sensor

#### **Fault descriptions:**

Driving mode sensor fault The fault code should display the driving mode sensor fault. Replace the driving mode sensor.

#### **Maintenance method:**

- Remove the oil filter according to the steps.
- Remove the two screws on the driving mode sensor.(see Figure 11-1)
- Carefully take down the driving mode sensor from the hydraulic control block, because the sensor is fixed together with the metal slider on the hydraulic control block by means of a small pin. Press the sensor downward to have the pin out of the slider.(see Figure 11-2)
- Use a small a slotted screwdriver to open the lock on the sensor connector and press the white buckle to separate the connector.(see Figure 11-3)
- Take a new sensor well connected and press the white buckle to lock it.
- Put the pin at the back of the sensor on the metal slider and install it in place.(see Figure 11-4)
- Move the sensor to have the bolt holes appearing.
- Use 9.5 Nm + / - 0.95 Nm to tighten the two screws.
- Install the oil filter according to the steps.

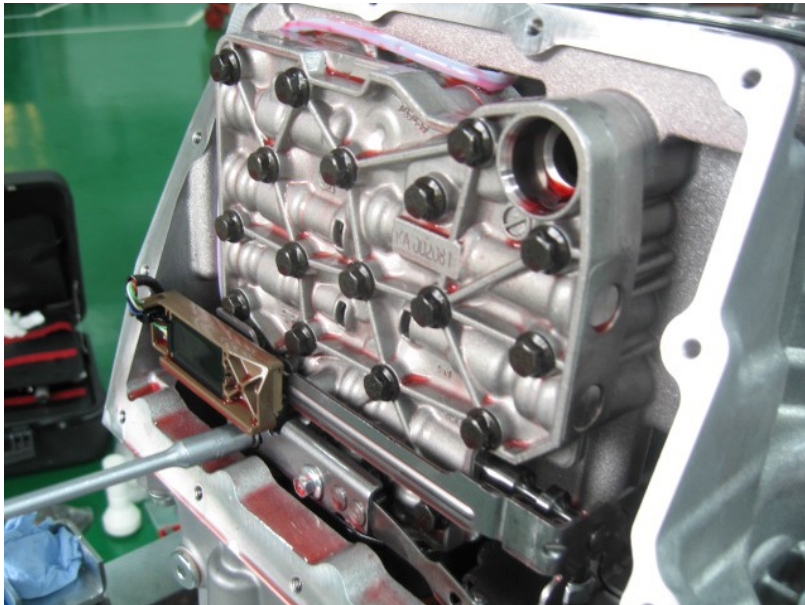


Figure 11-1 Remove the bolts of the driving mode sensor


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Figure 11-2 Press the sensor downward and pull it out.

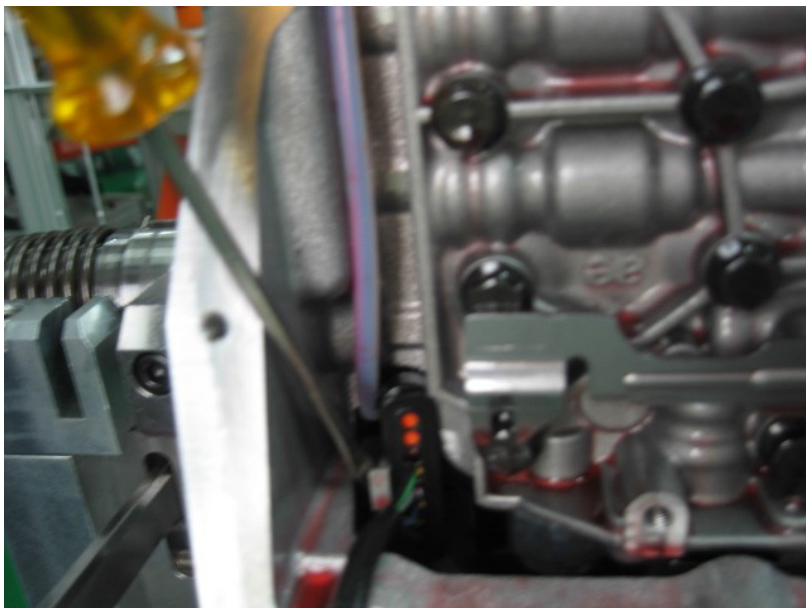


Figure 11-3 Remove the driving mode sensor.


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Figure 11-4 Mount the pin correctly on the metal slider.

### 3.6.2.12 Replace the hydraulic control block

#### **Fault descriptions:**

If the transmission pressure is found too low or there is vibration during driving or any other abnormality appears, two important parts may fail: oil pump and hydraulic control block. Use the fault code to judge which one needs to be replaced. In most cases, it's impossible to accurately judge which one is faulty, so we can replace one after another to see whether the error is solved.

#### **Maintenance method:**

- Remove the driving mode sensor according to the steps.
- As shown in Figure 12-1, remove the bolts according to the order of 20-19-18-17-16-15-14-13-12-11-10-9-8-7-6-5-4-3-2-1.
- Remove the hydraulic control block, separate the four connectors and take care to use a small slotted screwdriver to take down the connectors easily.(see Figure 12-2 and Figure 12-3)
- Take a new hydraulic control block and four connectors, and install the four connectors according to the length of the wire.
- Install the hydraulic control block in place and there is a pin at the back of the hydraulic control block, which should be correctly located.(see Figure 12-4)
- Make sure that the metal slider just matches the pin on the shifting cam. (Figure 12-5)
- Mount the middle bolts and tighten with your hands.
- Install the special tool (480142) in the bolt hole at the left top corner.(see Figure 12-6)
- Press the electric wire on the speed sensor of the driving bevel pulley at the left top corner of the hydraulic control block.(see Figure 11-6)
- Mount all the bolts of the hydraulic control block as shown in Figure 11-1 according to the order of 1-2-3-4-5-6-7-8-9-10-11-12-13-14-15-16-17-18-19-20 and tighten such bolts at the torque of 11N.
- Mount the driving mode sensor according to the order.


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Figure 12-1 Order of bolts

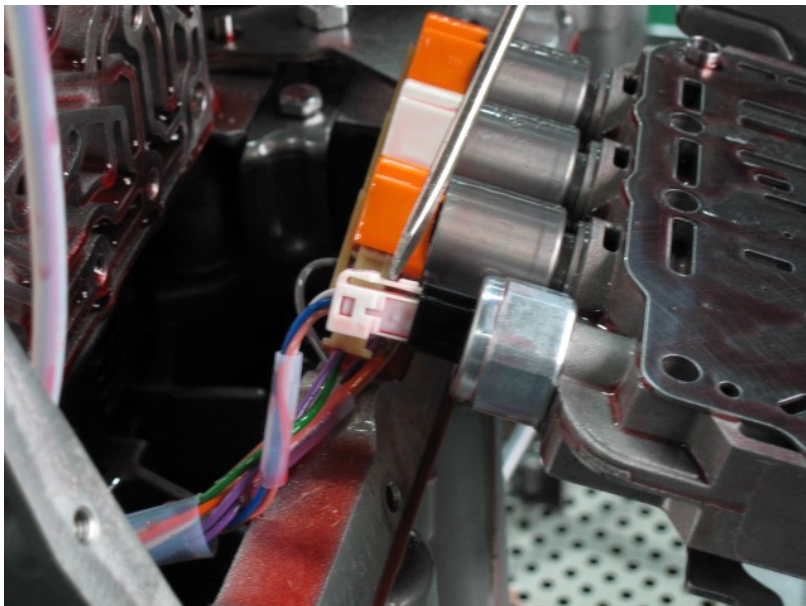



Figure 12-2 Use a small slotted screwdriver to remove the four connectors.

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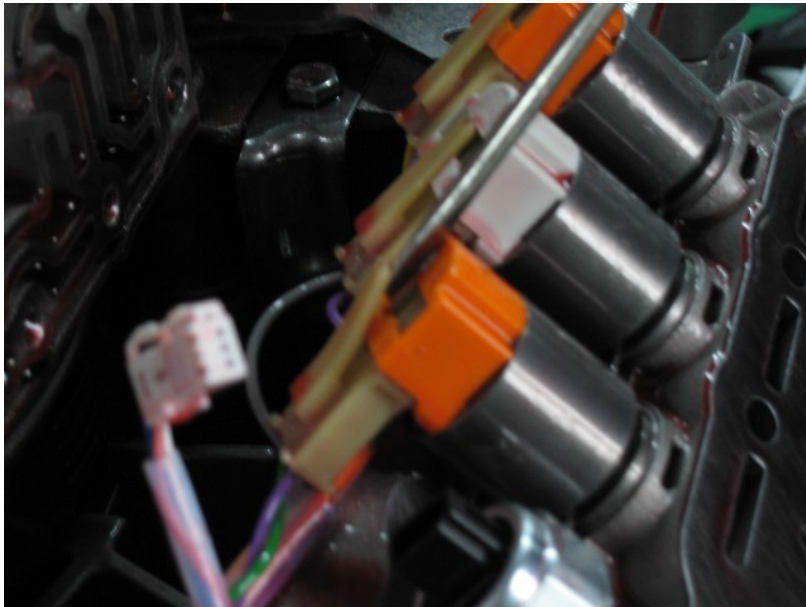


Figure 12-3 Use a small slotted screwdriver to remove the four connectors.

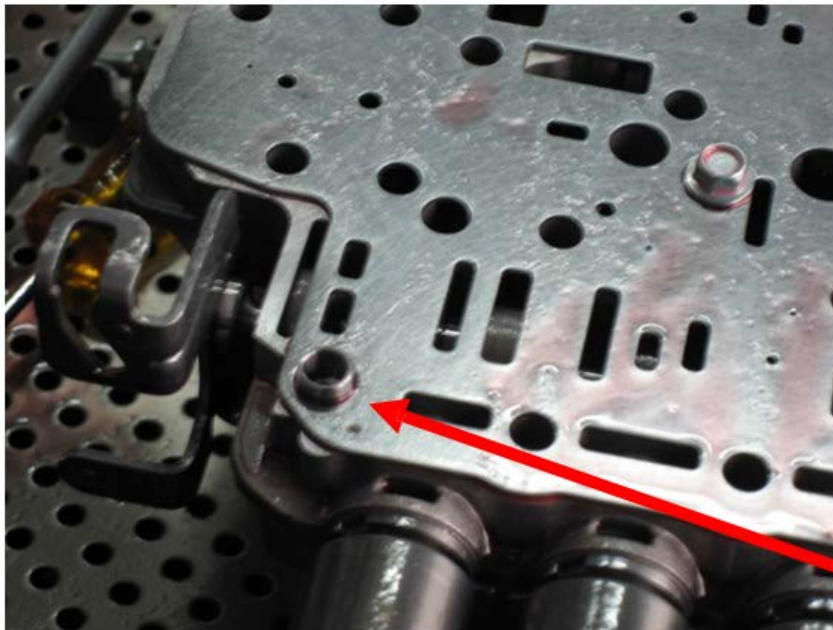


Figure 12-4 Locating pins at the back of the hydraulic control block



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Figure 12-5 The tie rod of the clutch control valve should be correctly located to the positioning pins on the shifting cam.



Figure 12-6 Use a special tool (480142) to fix the hydraulic control block.

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### **3.6.2.13 Replace the driven cone wheel speed sensor and support**

#### **Fault descriptions:**

Judge the fault of this component by means of the fault code.

#### **Maintenance method:**

- Remove the hydraulic control block according to the order.
- Loosen the sensor bracket bolts and throw them away.(see Figure 13-1)
- Pull the bracket out from the gear selector shaft. (see Figure 13-2)
- Use long nose pliers to remove the sensor and connectors.(see Figure 13-3)
- Loosen the bolts on the bracket and remove the speed sensor.
- Throw away the sensor or bracket.
- Take a new sensor or bracket and use bolts to fix them (at the torque of 8.5 Nm + / - 2 Nm).
- Connect the electric wires and have the bracket engaged around the gear selector shaft in place.
- Take a new bolt to fix the bracket at the torque of 9.5N + / - 0.95 Nm.
- Mount the hydraulic control block according to the order.

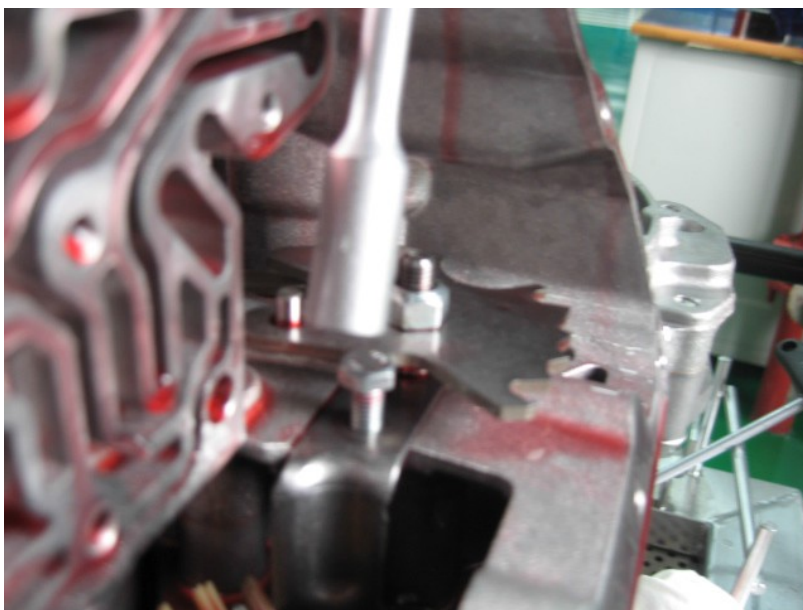



Figure 13-1 Remove the bolts on the speed sensor bracket.

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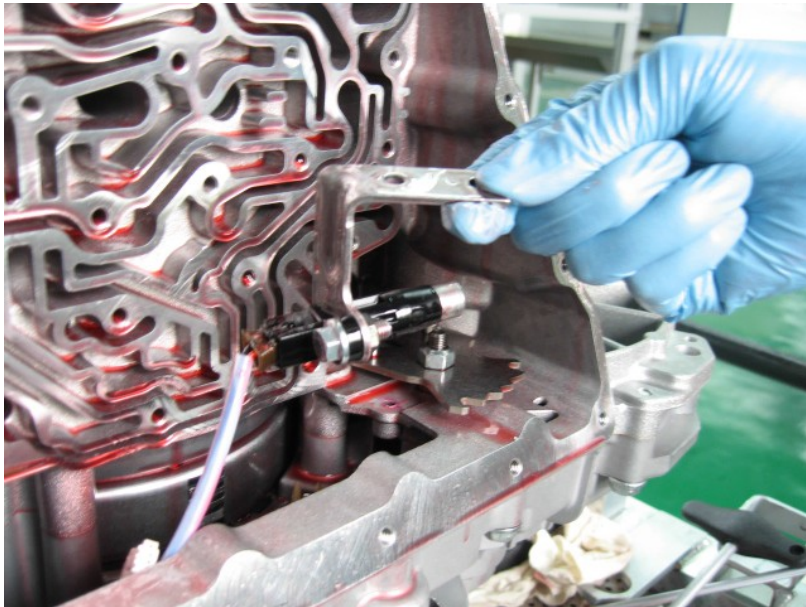


Figure 13-2 Speed sensor support

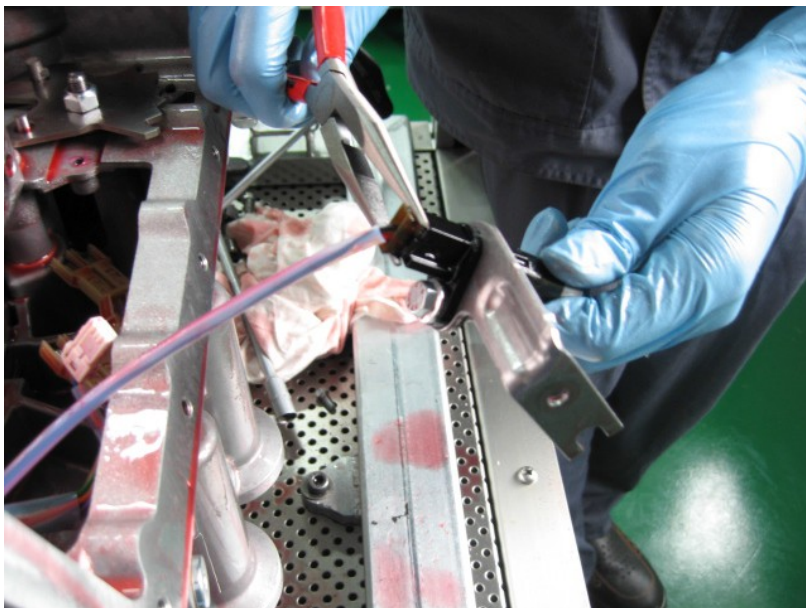



Figure 13-3 Use long nose pliers to separate the connector.

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### 3.6.2.14 Replace the active cone wheel speed sensor

#### Fault descriptions:

Judge the fault of this component by means of the fault code.

#### Maintenance method:

- Remove the bevel pulley end cover according to the order.
- Loosen the bolts and remove the sensor.(see Figure 14-1)
- Separate the electric wire and throw away the removed sensor.
- Take a new sensor and tighten the bolts at the torque of  $8.5N \pm 2 Nm$ .
- Connect the electric wire to the sensor.
- Mount the driving bevel pulley end cover according to the order.

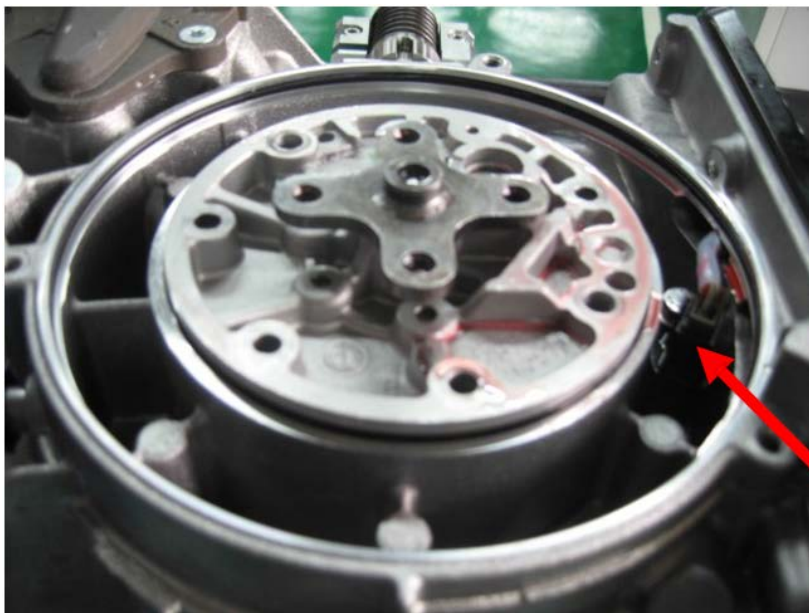


Figure 14-1 Active cone wheel speed sensor


### 3.6.2.15 Replace the main connector and internal wiring harness

#### Fault descriptions:

Judge the fault of this component by means of the fault code.

#### Maintenance method:

- Take out the hydraulic control block according to the order.
- Separate the two speed sensor connectors.
- Remove the cable on the car connected with the main connector.
- Remove the buckle on the main connector and press the main connector into the transmission.(see Figures 15-1,15-2)
- The driving mode sensor has its connector sandwiched on the casing, so remove the connector at first.(see Figure 15-3)

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- Remove the whole main connector from the transmission and throw it away.
- Take a new main connector and put it in the transmission.
- The main connector is connected to the casing through a spline, as shown in Figures 15-4 and 15-5.
- It is relatively easy to use long nose pliers of 45 degrees to press it upwards.
- Remount the buckle.
- Press the driving mode sensor connector on the casing.(see Figure 15-6)
- Connect the speed sensor to the connector.
- Mount the hydraulic control block in the transmission according to the steps.



Figure 15-1 Remove the buckle from the main connector.



Figure 15-2 Press the main connector into the transmission.


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Figure 15-3 Remove the driving mode sensor connector from the transmission.



Figure 15-4 Locating pin



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Figure 15-5 Locating pin



Figure 15-6 Press the driving mode sensor connector on the casing.

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### 3.6.2.16 Replace the breather pip

**Fault descriptions:**


If the breather pipe is damaged, the transmission may suffer from water invasion or dirty impurities.

**Maintenance method:**

- To facilitate replacement of the breather pipe, it is better to remove the air filter and battery top brackets.
- First remove the clamp to connect the breather pipe top and the transmission. .
- Use pliers to pull out the breather pipe (with the aluminum part at its bottom clamped).
- Put a new breather pipe (483114) in a special tool (480140), as shown in Figure 16-1, and at the same time, put some vaseline on the aluminum part.
- Put the tool on the transmission casing and at this time, the breather pipe is parallel to the transmission, as shown in Figure 16-2; use a plastic hammer to knock the top of the special tool until it has been completely installed in place.
- Mount the plastic buckle (482253) on the breather pipe.
- Force the pins on the plastic buckle into the metal buckle (481456).
- Force the metal buckle on the casing.
- Cover the breather pipe cap (483420).(see Figure 16-3)
- Install the air filter and battery.

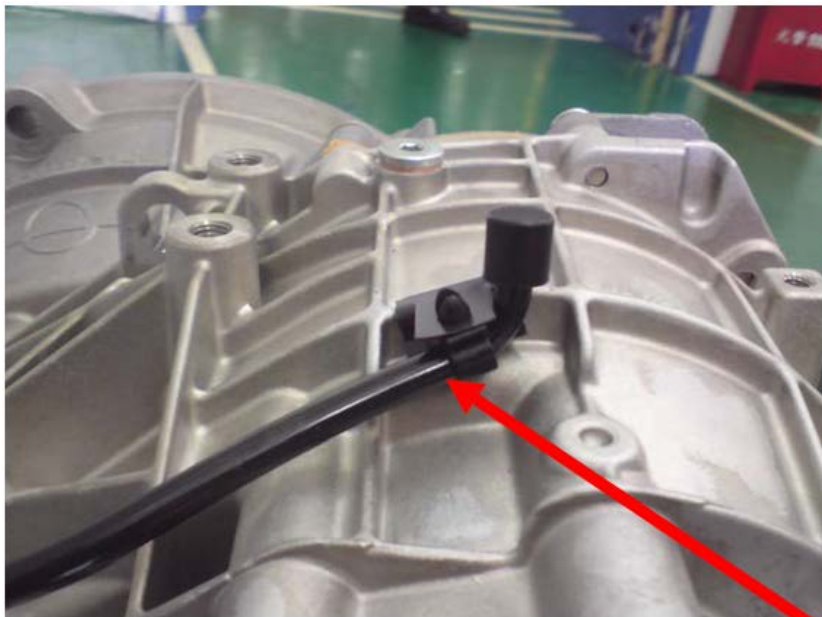


16-1 Put a new breather pipe in the tool.


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16-2 Install the breather pipe.



16-3 Install the buckle and cap.

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### 3.7 Checklist for electronic components

Checklist for transmission electronic components:

#### 1. Driving mode sensor

Check the internal resistance between different pins to judge whether the driving mode sensor is working normally,

- DMS\_GND = PIN 6
- DMS\_A = PIN 13
- DMS\_B = PIN 14
- DMS\_C = PIN 15
- DMS\_D = PIN 16
- DMS\_Supply= PIN 9

	DMS_Supply	DMS_A	DMS_B	DMS_C	DMS_D
DMS_Supply	X	17.2 MΩ	17.2 MΩ	17.2 MΩ	17.2 MΩ
DMS_A	17.2 MΩ	X	9 KΩ	9 KΩ	9 KΩ
DMS_B	17.2 MΩ	9 KΩ	X	9 KΩ	9 KΩ
DMS_C	17.2 MΩ	9 KΩ	9 KΩ	X	9 KΩ
DMS_D	17.2 MΩ	9 KΩ	9 KΩ	9 KΩ	X
DMS_GND		4.5 KΩ	4.5 KΩ	4.5 KΩ	4.5 KΩ

#### 2. Oil temperature sensor

Measure the internal resistance of the oil temperature sensor.

Measure the resistance between PIN 5 and PIN 7.


When the temperature is between 20°C and 40°C, the resistance should be 942-1121 Ohms.

#### 3. Speed sensor

This is a complex twin-wire component, so there is no any rather simple method to measure whether it works or not.

The resistance measured between PIN 9 and PIN 11 is about 24.3 MΩ.

The resistance measured between PIN 9 and PIN 12 is about 24.3 MΩ.

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Note: If the resistance is measured in this way, the speed sensor can not be ensured intact.

**4. Oil pressure sensor**

The resistance measured between PIN 7 and PIN 10 is about 44.3 K $\Omega$ .

**5. Clutch pressure regulator**

The resistance measured between PIN 1 and PIN 4 is about 5.2  $\Omega$ .

**6. Driving bevel pulley pressure regulator**

The resistance measured between PIN 1 and PIN 3 is about 5.2  $\Omega$ .


**7. Driven bevel pulley pressure regulator**

The pressure measured between PIN 1 and PIN 2 is about 5.2 Ohms.

**8. TCU**

Cannot be detected.


**Note: Different precision of the measuring instrument can have the resistance different.**

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## **4 FAQ**

### **4.1 Oil leakage**

Fault	Measures taken
The transmission oil sump gasket suffers from oil leakage.	Determine whether the oil sump bolts are firmly fixed.  Replace the oil sump gasket Replace the oil drain plug Replace the oil sump assembly
The transmission oil drain plug suffers from oil leakage.	Determine whether the screw plug is firmly fixed.  Replace the oil drain plug Replace the oil sump assembly
The driving bevel pulley has its end cover suffer from oil leakage.	Determine whether the sealing cover is firmly fixed.  Replace the O-ring Replace the driving bevel pulley end cover
The driven bevel pulley has its end cover suffer from oil leakage.	Determine whether the sealing cover is firmly fixed.  Replace the sealing cover O-ring Replace the driven bevel pulley shaft cover assembly
Oil leakage of the selector rod	Replace the sealing gasket of the selector rod
Oil leakage of the input rod	Replace the sealing gasket of the input shaft
Oil leakage of the differential oil seal	Replace oil seal
Oil leakage of the oil cooler pipe connector	Determine whether the pipes are firmly fixed. Replace the sealing ring of the oil cooler pipe connector Replace the pipeline.

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## 4.2 Noises

### 4.2.1 Noise of the driven wheel gears

**Descriptions of the noise:**

Such noise can be easily heard in time of slow acceleration and at the speed of 60-90 km/h.

When the accelerator pedal is released, the noise will be gradually reduced, while it will appear again in time of acceleration.

Such sound is similar to whistles, and the frequency will become higher with the increase of the vehicle speed. This is a normal sound from meshing of the CVT driven gears and pinions.

### 4.2.2 Reverse sound

**Descriptions of the noise:**

If the R gear is engaged when the vehicle is kept static, a lower siren can be heard.

When you release the brake and begin to accelerate, the voice will become louder like a whining sound.

This is a sound from normal working of the planetary gear in the transmission.

### 4.2.3 Gear sound in time of a low speed

**Descriptions of the noise:**

If the accelerator pedal is released when the vehicle speed is around 40 km/h, the vehicle will slow down and you can hear a sound of whistling.

The whistle frequency is much lower than 4.3.1 and the sound is hard to hear.

This is a sound from normal working of the intermediate shaft and differential in the transmission.

### 4.2.4 Noises of the driving bevel pulley bearings and internal bearings


**Noises of the driving bevel pulley bearings:**

**Descriptions of the noise:**

During driving at the D gear, the “buzzing” noise can be heard from the beginning of a low speed.

The frequency and volume of such noise will replace with the engine speed.

Such noise rises with the increase of the engine speed and **has nothing to do with the vehicle speed.**

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**Troubleshooting:**

1. Hold the accelerator, have the vehicle speed kept at about 60 km/h and then shift to its sports mode (S): At the moment, the engine speed will rise at about 500 rounds in 1 to 2 seconds. If the voice also rises at the same time (which means that the sound rises with the increase of the engine speed rather than with the vehicle speed), then it is more likely that the driving bevel pulley has its bearings damaged. Replace the bearings of the driving bevel pulley according to Section 3.6.2.7.

2. Hold the accelerator at the 4th-speed gear in the manual mode and have the vehicle speed kept at about 60 km/h.

Engage the 3rd-speed gear when the vehicle speed is kept at about 60 km/h. The engine speed will rise at about 800 rounds. If the voice also rises at the same time (which means that the sound rises with the increase of the engine speed rather than with the vehicle speed), then it is more likely that the driving bevel pulley has its bearings damaged.

Replace the bearings of the driving bevel pulley according to Section 3.6.2.7.

**Noises from the bearings in the transmission:**

**Descriptions of the noise:**


During driving at the D gear, the “buzzing” noise can be heard from the beginning of a low speed. .

**Troubleshooting:**

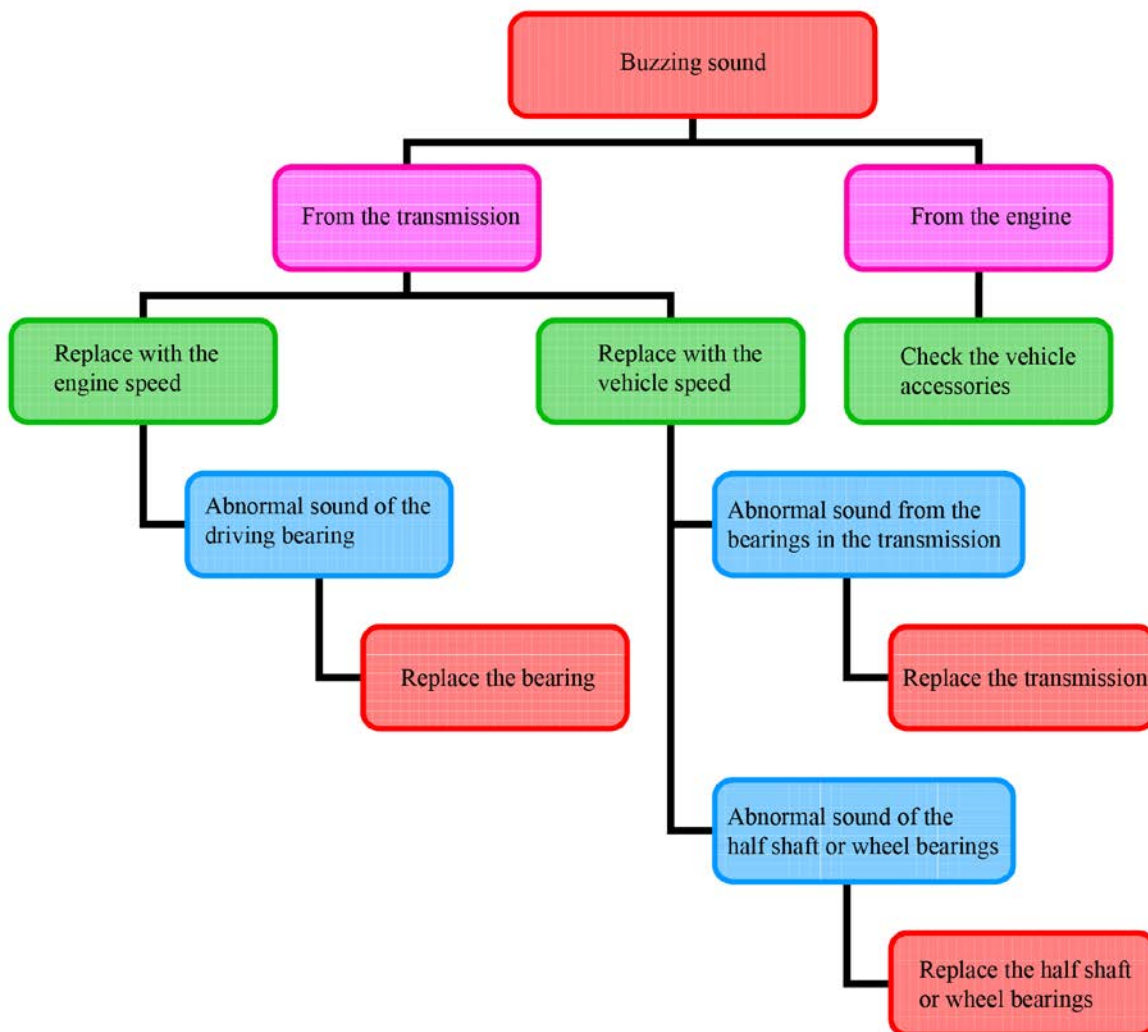
According to the test methods for the noise of the driving bevel pulley bearings, if the abnormal sound replaces with the vehicle speed rather than the engine speed, then it may come from the bearings in the transmission.

Such abnormal sound can not be repaired and the transmission assembly shall be replaced.

*Note: The noises are really hard to judge, so before you have decided to replace any transmission accessory or transmission assembly, make sure that the sound really comes from the transmission; if you cannot confirm the noise source, please check or replace such vehicle parts easy to be replaced.*

 <p style="font-size: small;">Gear up for the future</p>	DOCUMENT	Number	D-ASS-208-03
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Please check and confirm the noise sources as follows:



#### 4.2.5. Abnormal sound due to water invasion into the transmission or inferior oil

**Descriptions of the noise:**

Step on the brake to engage the D or R gear when the vehicle is kept static, as long as the brake is released, a “giggling” sound can be heard, and such abnormal sound can be heard when the vehicle starts to move.


The “squeaking” sound can be heard in time of acceleration from its crawling speed (10 km/h) to 40 km/h.

Only “giggling” sound but no “squeaking” sound can be heard just when the transmission suffers from water invasion.

Some vehicles may suffer from impacts in time of starting-up, which depends on the amount of water invasion or the degree of oil pollution.

**Troubleshooting:**

Remove the driving bevel pulley cover and the oil sump after draining the oil:

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If there is white foam in the driving wheel cover or oil sump, then it can be clearly identified that the transmission has been contaminated by water or oil or any other liquid.

Drain the oil as far as possible and throw away the oil filter.

Install a new oil filter and fill oil again according to Section 3.1.

Drive the vehicle away for about 5 minutes at different rates as far as possible.

Drain the oil and fill new oil again (repeat for 2-3 times until the abnormal sound has disappeared).

The “giggling” and “squeaking” sound will disappear at the same time.

You also can eliminate the “squeaking” sound by heating of the clutch in time of stalling: shift to the D gear, step on the brake and accelerate at the same time.

In time of heating, the fault code P2787 may appear (the clutch temperature is too high), which is just a kind of self-protection of the transmission against overheating of the clutch. This fault code will automatically disappear and you can repeat stalling for several times until the “abnormal” sound has diminished or disappeared.

If pollution is rather serious, you can't eliminate the abnormal sound or impact, and you can only replace the transmission.

#### 4.2.6 Noises at the N and P gears

1. The frequency and volume of such abnormal sound rises up with the engine speed.

Try to make sure whether the abnormal sound comes from the transmission or engine.


If the abnormal sound comes from the engine, please check the relevant spare parts of the engine.

If the abnormal sound comes from the transmission, it can only come from the oil pump.

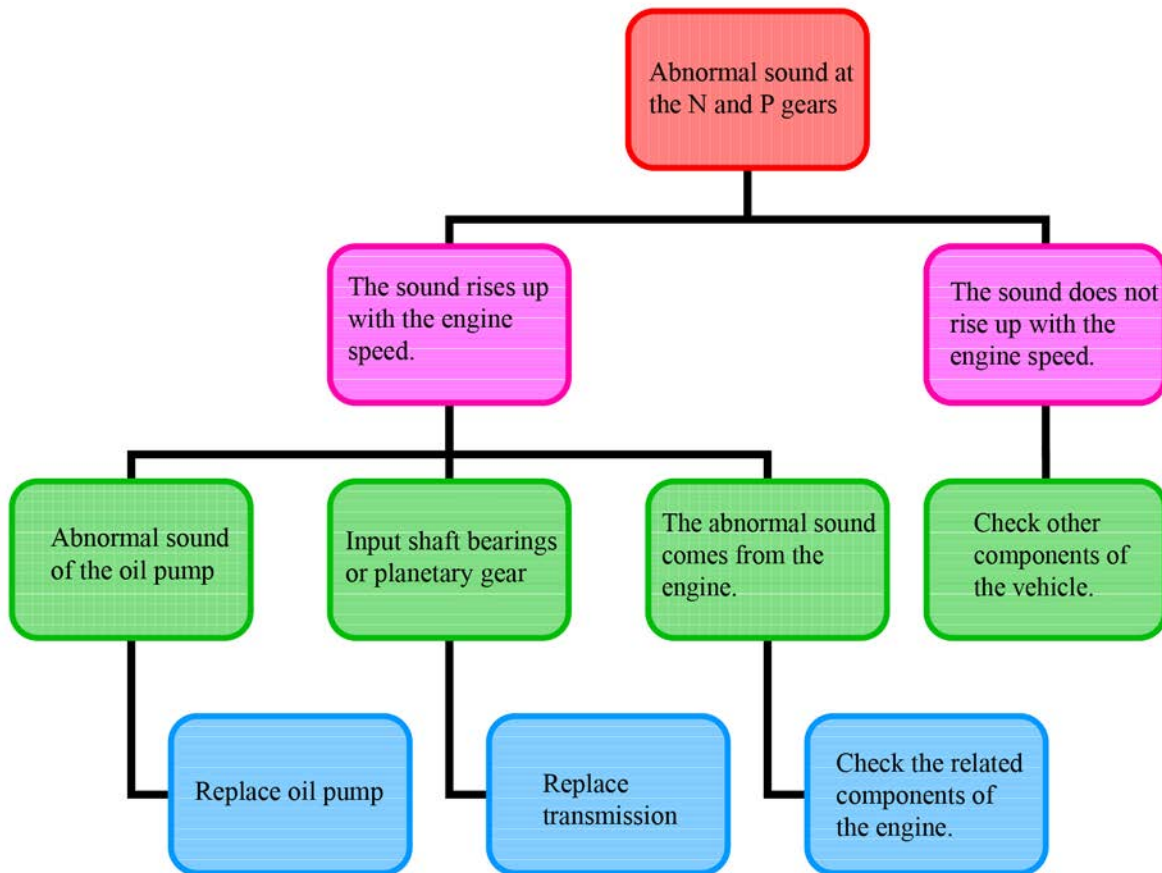
Replace the oil pump and confirm again whether the noise is eliminated.

If the abnormal sound is not eliminated after replacement of the oil pump, it is likely to come from the roller bearing of the input shaft or the planetary gear, and the transmission needs to be replaced.


2. If the frequency and volume of the abnormal sound does not rise up with the engine speed, then the sound should come from other components of the vehicle.

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Please check and confirm the noise sources as follows:



Note: The noises are really hard to judge, so before you have decided to replace any transmission accessory or transmission assembly, make sure that the sound really comes from the transmission; if you cannot confirm the noise source, please check or replace such vehicle parts easy to be replaced.

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## 4.3 Impact and no climbing

### 4.3.1 Impact

#### Problem descriptions:

In normal driving, some smaller vibration or impact can be sensed.

#### Troubleshooting:

Such error may result from many reasons:

1. Clutch self-learning unfinished: See Section 2.5 for details.
2. Transmission water invasion or oil contamination: See Section 4.2.5.
3. Driving wheel speed sensor: See Section 3.6.2.14 Methods for Replacement.
4. Hydraulic block error: See Section 3.6.2.12 Methods for Replacement and repeat the self-learning(Section 2.5).
5. Driven wheel speed sensor: See Section 3.6.2.13 Methods for Replacement.
6. If the error remains after all checks and relevant replacement have been completed in accordance with the order from 1 to 5, please contact PUNCH after-sales personnel.


### 4.3.2 Crawling failure

#### Problem descriptions:

Shift to the D gear and release the brake, but the vehicle does not move; in time of acceleration, the vehicle starts to move with impact or without impact when the engine speed has reached around 2000rpm.

#### Troubleshooting:

1. Check to see whether there is any activated fault code according to Section 4.4
2. If it appears in the cold state of the vehicle, please repeat the clutch self-learning according to Section 2.5.
3. Brake signal errors: If the brake signal has also been activated when the brake pedal is not stepped on (which can be seen from the diagnostic instrument or MLT), check the brake switch and the vehicle wiring harness.
4. Hydraulic block error: See Section 3.6.2.12 Methods for Replacement and repeat the self-learning(Section 2.5).
5. If the error remains after all checks and relevant replacement have been completed in accordance with the order from 1 to 4, please contact PUNCH after-sales personnel.

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#### 4.4 Fault code and measures taken

##### General descriptions:

**No matter when you read the DTC and fault code with a testing tool, the trouble light on the dashboard will flash.**

When you read the DTC and fault code by means of a detector, first check whether this fault code occurs occasionally and whether it does not occur in the final driving period (the detector should display “Wrong path of the FCM in the H memory, historical fault”), and if so, just delete the fault code and check whether such fault code will appear again. If it is not a historical fault but an existing fault (the detector should display “Wrong path of the FCM in the C memory, current fault”), solve the problem step by step in accordance with the following fault code.

**Always check whether the TCU is the latest version, if not, update it to the latest version of the software, and check the fault code again.**

**Note:** Whenever there is a fault code or the transmission has failed, you can first use the following three methods for troubleshooting:

1. Check the oil
2. Check the oil level
3. Repeat the clutch self-learning.

- It's unnecessary to complete all of the following procedures, and no further action is needed after the problem has been solved.

##### **P0604 RAM internal data check failure**

TCU measures taken:

Three pressure regulators have no power \*, and the fault indicator lights up.

Maintenance guidance:

1. Refresh the software by means of MLT or the tool provided by the car manufacturer.
2. Replace the TCU with a new one.

##### **P0605 ROM internal data checksum**

TCU measures taken:

Three pressure regulators have no power \*, and the fault indicator lights up.

Maintenance guidance:

1. Refresh the software by means of MLT or the tool provided by the car manufacturer.
2. Replace the TCU with a new one.

##### **P0602 ROM Internal encoding checksum**

TCU measures taken:

Three pressure regulators have no power \*, and the fault indicator lights up.

Maintenance guidance:

1. Refresh the software by means of MLT or the tool provided by the car manufacturer.
2. Replace the TCU with a new one.


##### **P0603 EEPROM fault (checksum)**

TCU measures taken:

Three pressure regulators have no power \*, and the fault indicator lights up.

Maintenance guidance:

1. Refresh the software by means of MLT or the tool provided by the car manufacturer.
2. Replace the TCU with a new one.

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**P0710 Oil temperature sensor fault**

TCU measures taken:

Malfunction indicator lamp is ON, transmission oil temperature set by the system

Maintenance guidance:

1. Use a detector to measure the oil temperature of the transmission; if appropriate signal data occurs, delete the fault code and check whether it occurs again.
2. Check the electric wires (open circuit, short circuit, grounding)
3. Measure the resistance between the two pins of the transmission main connector (at 20°C, the resistance should be between 980-1000 ohms) to determine whether the oil temperature sensor is damaged, and if it is damaged, jump to the next step and replace the main connector directly.
4. Use an intact TCU
5. Replace transmission

**P2765 Fault of the driving bevel pulley speed sensor**

TCU measures taken:

Three pressure regulators have no power \*, and the fault indicator lights up.

Maintenance guidance:

1. Use a detector to measure the oil temperature of the transmission; if appropriate signal data occurs, delete the fault code and check whether it occurs again.
2. Check the electric wires (short circuit, open circuit, grounding)
3. Use an intact TCU
4. Replace speed sensor

**P0720 Fault of the driven bevel pulley speed sensor**

TCU measures taken:

Three pressure regulators have no power \*, and the fault indicator lights up.

Maintenance guidance:

1. Use a detector to measure the oil temperature of the transmission; if appropriate signal data occurs, delete the fault code and check whether it occurs again.
2. Check the electric wires (open circuit, short circuit, grounding)
3. Use an intact TCU
4. Replace speed sensor


**P0840 Driven cone wheel pressure sensor**

TCU measures taken:

Three pressure regulators have no power \*, and the fault indicator lights up.

Maintenance guidance:

1. Use a detector to measure the actual oil pressure of the driven bevel pulley, and then compare it with the target value; if appropriate signal data occurs, delete the fault code and check whether it occurs again.
2. According to the value in the first step, check the circuit (grounding: 0 bar - actual pressure, short circuit: 60 bars, open circuit: 60 bars)
3. Use an intact TCU
4. Replace valve body

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**P0641 Fault of pressure sensor power supply**

TCU measures taken:

Three pressure regulators have no power \*, and the fault indicator lights up.

Maintenance guidance:

1. Use a detector to measure whether the input voltage is 5V, and if the data is correct, delete the fault code and check whether it appears again.
2. Measure the voltage between the power and ground cords of the pressure sensor based on the results of the first step.
3. Check the electric wires (short circuit, open circuit, grounding)
4. Use an intact TCU
5. Replace valve body assembly

**P0651 Driving mode sensor and speed sensor power failure**

TCU measures taken:

Three pressure regulators have no power \*, and the fault indicator lights up.

Maintenance guidance:

1. Use a detector to measure whether the input voltage is 8.4V, and if the data is correct, delete the fault code and check whether it appears again.
2. Measure the voltage between the power and ground cords of the pressure sensor based on the results of the first step.
3. Check the electric wires (short circuit, open circuit, grounding)
4. Use an intact TCU

**P0659 Pressure regulator short-circuit**

TCU measures taken:

Three pressure regulators have no power \*, and the fault indicator lights up.

Maintenance guidance:

Measure the HS voltage: Compare it with the battery voltage. If the same, check the electric circuit (to whether the battery positive pole is short to the VHS and the transmission interface) and repair the wire harness. If different, replace the TCU.

**P0658 Pressure regulator open circuit or grounded**

TCU measures taken:

Three pressure regulators have no power \*, and the fault indicator lights up.

Maintenance guidance:

Measure the HS voltage: Compare it with the battery voltage. If the battery voltage is normal and the top voltage is less than 3.4V, it indicates that some electric wire is grounded. If the battery voltage is normal and the top voltage is more than 3.4V, it indicates open circuit somewhere. In both of such cases, check the pin wires according to the specific circumstances, if the wire is found to be in good conditions, replace the TCU, and if the battery voltage is not normal, check the battery.


**P0702 TCU internal detection system failure (during ignition)**

TCU measures taken:

Three pressure regulators have no power \*, and the fault indicator lights up.

Maintenance guidance:

Replace TCU

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**P0962 EDS1 Driving bevel pulley pressure regulator grounding**

TCU measures taken:

Three pressure regulators have no power \*, and the fault indicator lights up.

Maintenance guidance:

1. Measure the resistance of the driving bevel pulley pressure regulator - It should be 5.05 ohms + - 6%.
2. Check the electric wires (grounding)
3. Replace the hydraulic control block

**P0963 EDS1 The driving bevel pulley has its pressure regulator shorted**

TCU measures taken:

Three pressure regulators have no power \*, and the fault indicator lights up.

Maintenance guidance:

1. Measure the resistance of the driving bevel pulley pressure regulator.
2. Check the electric wires (short circuit, open circuit, grounding)
3. Replace the hydraulic control block

**P0960 EDS1 The driving bevel pulley has its pressure regulator opened**

TCU measures taken:

Three pressure regulators have no power \*, and the fault indicator lights up.

Maintenance guidance:

1. Measure the resistance of the driving bevel pulley pressure regulator.
2. Check the electric wires (open)
3. Replace the hydraulic control block

**P0966 EDS2 Driven bevel pulley pressure regulator grounding**

TCU measures taken:

Three pressure regulators have no power \*, and the fault indicator lights up.

Maintenance guidance:

1. Measure the resistance of the driven bevel pulley pressure regulator.
2. Check the electric wires (grounding)
3. Replace the hydraulic control block

**P0967 EDS2 The driven bevel pulley has its pressure regulator shorted**

TCU measures taken:

Three pressure regulators have no power \*, and the fault indicator lights up.

Maintenance guidance:

1. Measure the resistance of the driven bevel pulley pressure regulator.
2. Check the electric wires (short circuit)
3. Replace the hydraulic control block


**P0964 EDS2 The driven bevel pulley has its pressure regulator opened**

TCU measures taken:

Three pressure regulators have no power \*, and the fault indicator lights up.

Maintenance guidance:

1. Measure the resistance of the driven bevel pulley pressure regulator.
2. Check the electric wires (open)
3. Replace the hydraulic control block

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**P0902 EDS3 Clutch pressure regulator grounding**

TCU measures taken:

Three pressure regulators have no power \*, and the fault indicator lights up.

Maintenance guidance:

1. Measure the resistance of the clutch pressure regulator.
2. Check the electric wires (grounding)
3. Replace the hydraulic control block

**P0903 EDS3 Clutch pressure regulator shorted**

TCU measures taken:

Three pressure regulators have no power \*, and the fault indicator lights up.

Maintenance guidance:

1. Measure the resistance of the clutch pressure regulator.
2. Check the electric wires (short circuit)
3. Replace the hydraulic control block

**P0900 EDS3 Clutch pressure regulator open-circuit**

TCU measures taken:

Three pressure regulators have no power \*, and the fault indicator lights up.

Maintenance guidance:

1. Measure the resistance of the clutch pressure regulator.
2. Check whether any electric wire (is open), and if so, you can replace either the transmission wire harness or the engine wire harness.
3. Replace the hydraulic control block

**P080A The offline self-learning is not completed.**

TCU measures taken:

Malfunction indicator lamp is ON

Maintenance guidance:

Complete the clutch self-learning according to Section 2.5 Process of the Clutch Self-learning.

**P1774 Offline clutch self-learning error**

TCU measures taken:

Malfunction indicator lamp is ON

Maintenance guidance:

The clutch self-learning value has not been completed. Please refer to 2.5.4 Fault Diagnosis.

**P1763 Starter lock grounded or open-circuit**

TCU measures taken:

Three pressure regulators have no power \*, and the fault indicator lights up.

Maintenance guidance:

1. Check the electric wires
2. Replace TCU


**P1764 Starter lock short-circuit**

TCU measures taken:

Three pressure regulators have no power \*, and the fault indicator lights up.

Maintenance guidance:

1. Check the electric wires
2. Replace TCU

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**P0930 Shift lock short-circuit**

TCU measures taken:

Three pressure regulators have no power \*, and the fault indicator lights up.

Maintenance guidance:

1. Check the circuit of the gear shift relay

**P0931 Shift lock open-circuit or grounded**

TCU measures taken:

Three pressure regulators have no power \*, and the fault indicator lights up.

Maintenance guidance:

1. Check the circuit of the gear shift relay

**P1768 Reversing light grounded**

TCU measures taken:

Three pressure regulators have no power \*, and the fault indicator lights up.

Maintenance guidance:

1. Check the electric wires
2. Replace TCU

**P1769 Reversing light short-circuit or open-circuit**

TCU measures taken:

Three pressure regulators have no power \*, and the fault indicator lights up.

Maintenance guidance:

1. Check the electric wires
2. Replace TCU

**P0868 Pressure preload adjustment failure**

TCU measures taken:

Three pressure regulators have no power \*, and the fault indicator lights up.

Maintenance guidance:

1. Check the oil level and oil type.
2. Replace the oil pump
3. Replace the hydraulic control block
4. Replace transmission


**P0811 Clutch slippage (forward or backward)**

TCU measures taken:

Malfunction indicator lamp is ON, and the clutch open

Maintenance guidance:

1. Use a detector to measure the clutch pressure, engine speed and driving bevel pulley speed, if the measured data is in an appropriate range, delete the fault code and check whether it appears again.
2. If the data is incorrect (for example, when the clutch pressure is 10 bars, there is great difference between the driving bevel pulley speed and the engine speed), go to the next step.
3. Check the oil level and oil type.
4. Replace the hydraulic control block
5. Replace transmission

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**P0730 Transmission ratio control failure**

TCU measures taken:

Three pressure regulators have no power \*, and the fault indicator lights up.

Maintenance guidance:

1. Use a detector to check the signal provided by the speed sensor, and check the input and feedback current of the driving bevel pulley pressure regulator.
2. Take corresponding measures according to the fault, check the speed sensor if it is faulty, or check the pressure sensor if it is faulty and so on.
3. Check the oil level and oil type as well.
4. Replace the speed sensor or hydraulic control block.
5. Replace the oil pump
6. Replace transmission

**P1765 The driven bevel pulley pressure is too low.**

TCU measures taken:

Three pressure regulators have no power \*, and the fault indicator lights up.

Maintenance guidance:

1. Measure the actual pressure during driving (like manual shifting, etc.) and compare it with the target value.
2. Check the oil level and oil type.
3. Complete appropriate clutch self-learning (when the clutch self-learning is not ideal, the fault code will not appear)
4. Check the engine to find out the factors to cause the torque loss: spark plugs, throttle, ternary catalysts,  
(Old engines may easily cause fault codes.)
5. Replace the hydraulic control block
6. Replace the oil pump
7. Replace transmission

**P1766 Driven cone wheel pressure is too high**

TCU measures taken:

Malfunction indicator lamp is ON

Maintenance guidance:

1. Measure the actual pressure during driving (like manual shifting, etc.) and compare it with the target value.
2. Check the oil level and oil type.
3. Replace the hydraulic control block
4. Replace the oil pump
5. Replace transmission

**P0701 When the two faults appear at the same time, it requires that the pressure regulator should have its power cut off.**

TCU measures taken:

Three pressure regulators have no power \*, and the fault indicator lights up.


Maintenance guidance:

Check other fault codes

**P0218 The transmission oil temperature is too high.**

TCU measures taken:

Malfunction indicator lamp is ON

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Maintenance guidance:

1. Check oil cooler
2. Try to let such fault occur again under normal driving conditions, if it does not appear, ask the customer in what kind of driving conditions such fault has ever occurred.
3. In the driving conditions of Step 2, you can measure the oil temperature of the transmission, use a detector to check whether the transmission oil temperature is greater than or equal to 120°C (it is abnormal if the fault code appears earlier than that of the filter time) and take measures to prevent the transmission overheating.

**P1767 The transmission has its oil temperature beyond the specified scope**

TCU measures taken:

Three pressure regulators have no power \*, and the fault indicator lights up.

Maintenance guidance:

1. Try to let such fault occur again under normal driving conditions, if it does not appear, ask the customer in what kind of driving conditions such fault has ever occurred. (Uphill riding or driving at a high speed)
2. Check oil cooler
3. Check the oil level
4. Replace valve body
5. Replace transmission

**P0219 The power system has its speed beyond the scope.**

TCU measures taken:

Three pressure regulators have no power \*, and the fault indicator lights up.

Maintenance guidance:

1. It should never appear in principle.
2. Check whether the engine speed is limited within 6,000 rpm.

**P2766 The driving bevel pulley has its speed inconsistent with the actual speed.**

TCU measures taken:

Three pressure regulators have no power \*, and the fault indicator lights up.

Maintenance guidance:


1. Use a detector to test whether other speed information is also lost (engine speed, output shaft speed and vehicle speed); if so, solve these problems first and then check whether the fault appears again.
2. Use a detector to test the speed signal of the driving bevel pulley, compare it with the engine speed when the clutch is engaged, and the difference should be less than 200 rpm. Complete such comparison from the low speed to the high speed of the engine (up to 6000 rpm).
3. Check the circuit
4. Use another TCU to determine whether the original TCU has failed.
5. Check the position, angle and wheels of the sensor. Check whether there is any object in front of the sensor (for example, steel belt fragments, etc.) - Note: This is a mechanical fault, and the fault code is different for electrical faults.
6. Replace the speed sensors of the driving bevel pulleys.
7. Replace the main wiring harness of the transmission.
8. Replace main wiring harness of the engine
9. Replace transmission

**P0721 The driven bevel pulley has its speed inconsistent with the actual speed.**

TCU measures taken:

Three pressure regulators have no power \*, and the fault indicator lights up.

Maintenance guidance:

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1. Use a detector to test whether other speed information is also lost (engine speed, output shaft speed and vehicle speed); if so, solve these problems first and then check whether the fault appears again.
2. Use manufacturer's instruments to check the vehicle speed based on driving bevel pulley speed sensor) and then compare it with actual speed of the vehicle (The difference should be less than 5kph).
3. Check the circuit
4. Use another TCU to determine whether the original TCU has failed.
5. Check the position, angle and wheels of the trigger. Check whether there is any object in front of the sensor (for example, steel belt fragments, etc.) - Note: This is a mechanical fault, and the fault code is different for electrical faults.
6. Replace the speed sensors of the driven and driving bevel pulleys.
7. Replace the main wiring harness of the transmission.
8. Replace wiring harness of the engine
9. Replace transmission assembly

#### **P0944 Insufficient clamping force (VSM)**

TCU measures taken:

Malfunction indicator lamp is ON, and the clutch open

Maintenance guidance:

At that time, the engine torque will become larger and the fault code will be activated. At this moment, the TCU requires a lower torque, but the ECU can't respond.

1. Check the ECU fault code.
2. Replace ECU
3. Check the oil level and oil type.
4. Complete appropriate clutch self-learning (when the clutch self-learning is not ideal, the fault code will not appear)
5. Check the engine to find out the factors to cause the torque loss: spark plugs, throttle, ternary catalysts,  
(Old engines may easily cause fault codes.)
6. Replace valve body
7. Replace the oil pump
8. Replace transmission assembly

#### **P0782 Winter driving mode fault**

TCU measures taken:

Malfunction indicator lamp is ON, and the winter mode set by the system is disabled.

Maintenance guidance:

The winter mode switching circuit has failed: grounded, short-circuit or open-circuit.

1. Check the circuit
2. Replace TCU

#### **P0783 Cruise control fault**

TCU measures taken:

Malfunction indicator lamp is ON, and the cruise control function set by the system is disabled..


Maintenance guidance:

There is no cruise control signal on the CAN bus or the ECU gives a wrong fault:

1. Check the circuit
2. Replace ECU
3. Replace TCU

#### **P0810 The offline adaptive updating has not yet been completed.**

TCU measures taken:

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Fault indicator lamp flashes

Maintenance guidance:

A new TCU is installed in the car or the software in the TCU is refreshed.

According to the process description in 2.5, repeat the adaptive update, and if the operation is correct, the fault indicator will go out and the fault code will be eliminated automatically after three driving cycles (three times of ignition).

**P1770 Engine speed is too low**

TCU measures taken:

None

Maintenance guidance:

1. Engine fault or idle control valve fault -Check the ECU fault code.

**P1762 The current value is fixed and unable to be changed.**

TCU measures taken:

Three pressure regulators have no power \*, and the fault indicator lights up.

Maintenance guidance:

1. Check such fault codes as P0962, P0963, P0960, P0966, P0967, P0964, P0902, P0903, P0900, P1763 and P1764 for troubleshooting. Then it is likely to have no fault code.

2. Use an intact TCU

**P0882 The battery or high-end voltage is too low.**

TCU measures taken:

Three pressure regulators have no power \*, and the fault indicator lights up.

Maintenance guidance:

1. When this fault occurs, there will be a record of the battery voltage (so you can judge whether the fault is caused by the battery or high-end voltage); if it is not a history record, directly check the next step.

2. Use a detector to test the high-end or the battery voltage – The temperature has great influence on the numerical value- Improve it in the software.

3. You need to distinguish the battery voltage and high-end voltage. If there is something wrong with the battery: Check the circuit from the battery to the TCU (fuse, main relay).

4. If there is something wrong with the battery: replace battery

5. If there is something wrong with the high-end voltage: Check the circuit from the transmission to the TCU.

6. Replace TCU

**P0883 The battery or high-end voltage is too high.**

TCU measures taken:

Three pressure regulators have no power \*, and the fault indicator lights up.

Maintenance guidance:

1. When this fault occurs, there will be a record of the battery voltage (so you can judge whether the fault is caused by the battery or high-end voltage); if it is not a history record, directly check the next step.


2. Use a detector to test the high-end or the battery voltage – The temperature has great influence on the numerical value

3. You need to distinguish the battery voltage and high-end voltage, if there is something wrong with the battery: Ask the customer whether any jump start has been made, and if there is something wrong with the battery: Check the circuit from the battery to the TCU (fuse, main relay).

4. If there is something wrong with the battery: Replace or check the battery or start the engine to charge it.

5. If there is something wrong with the high-end voltage: Check the circuit from the transmission to the TCU.

6. Replace TCU

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**P2787 The clutch temperature is too high.**

TCU measures taken:

Malfunction indicator lamp is ON, and the clutch open

Maintenance guidance:

1. Check to see how many times such fault has repeated, if only one or a few times, check the TCU internal data and ask the customer about the special driving environment at that time (for example, climbing during driving), and then you can delete the fault code.
2. Check the oil level and oil type.
3. Complete appropriate clutch self-learning (when the clutch self-learning is not ideal, the fault code will not appear)
4. The fault occurs only when the brake and accelerator are stepped down at the same time. Delete the fault code and see whether it appears again.
5. Replace TCU
6. The throttle is stuck; replace the throttle.

**P0727 The engine speed signal from the hardwire between the ECU and the TCU is inconsistent with the actual speed.**

TCU measures taken:

Malfunction indicator lamp is ON

Maintenance guidance:

1. Check the engine test report to see whether the engine has failed, and if so, repair the engine.
2. Check the circuit of the TCU input signal, which is a frequency signal (At 900rpm and 3000 rpm, the engine should give a signal of 30 Hz and 100 Hz respectively).
3. Replace it with an intact TCU.
4. Replace it with an intact engine speed sensor.

**P1761 Pressure regulator current fault**

TCU measures taken:

Three pressure regulators have no power \*, and the fault indicator lights up.

Maintenance guidance:

1. Use a detector to test the internal pressure drop of the pressure regulator and compare it with the regulated current of each pressure regulator.
2. Use a detector to test the current of the pressure regulator and compare it with the regulated current; if one is found different from the regulated current, check the circuit of this pressure regulator (The circuits in the transmission should also be checked).
3. Replace it with an intact TCU.
4. Replace valve body assembly
5. Replace the main wiring harness of the transmission.
6. Replace main wiring harness of the engine


**U0301 Vehicle configuration error (For example, the ECU from any other car is used).**

TCU measures taken:

Three pressure regulators have no power \*, and the fault indicator lights up.

Maintenance guidance:

1. Check whether the TCU hardware and software is combined correctly and effectively.
2. If it is the software newly refreshed by the EMS or TCU: The software on the new controller must be wrong (incompatibility between the transmission controller and the engine controller).

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**P0706 Single cable error of the driving mode sensor**

TCU measures taken:

Malfunction indicator lamp is ON, and the sensor position set by the system

Maintenance guidance:

1. Use a detector to check which cable is wrong and what's the problem, for example, the B cable is short-circuit, etc. (This fault indicates that one of the cables fails.)
2. Check the related electric wire between the transmission and the TCU.
3. Use an intact TCU
4. Replace the driving mode sensor
5. Replace the main wiring harness of the transmission.
6. Replace main wiring harness of the engine

**P0705 Multi-cable error of the driving mode sensor**

TCU measures taken:

Three pressure regulators have no power \*, and the fault indicator lights up.

Maintenance guidance:

1. Use a detector to check which cable is wrong and what's the problem, for example, the B cable is short-circuit, etc. (This fault indicates that one of the cables fails.)
2. Check the related electric wire between the transmission and the TCU.
3. Use an intact TCU
4. Replace the driving mode sensor
5. Replace the main wiring harness of the transmission.
6. Replace main wiring harness of the engine

**P0571 Brake signal failure**

TCU measures taken:

Malfunction indicator lamp is ON, no manual mode

Maintenance guidance:

1. Use a detector to check the status of the brake signal
2. Check the brake signal cable
3. Check/replace the brake switch
4. Replace it with an intact TCU.

**P0955 Manual shift-up/down signal failure**

TCU measures taken:

Malfunction indicator lamp is ON, no manual mode

Maintenance guidance:

1. Check the cable between the TCU and the shifter.
2. Use an intact TCU
3. Replace shifter


**U0415 ABS function fault**

TCU measures taken:

Malfunction indicator lamp is ON, no manual mode

Maintenance guidance:

Check ABS system

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**U0001 CAN bus fault**

TCU measures taken:

Malfunction indicator lamp is ON, while the emergency mode activated \*, and no manual mode. Increase the clamping force level 1 \* (highest) and the system will customize the locking and rotating conditions to activate the internal driving strategy; the system will customize the engine speed, the engine torque and the engine cooling water temperature, the brake signal is connected, the accelerator pedal has its numerical value fixed, and the system will customize the speed of the F/L, F/R, R/L and R/R wheels.

Maintenance guidance:

1. If this fault occurs in any other controller, it indicates that the wiring harness has failed (CAN high-speed and low-speed short-circuit): Check the wiring harness of the car.
2. If the fault is only stored in the TCU: Replace it with an intact TCU.

**U0121 CAN ABS communication fault**

TCU measures taken:

Increase the clamping force level 0\* and the system will customize the locking and rotating conditions and simultaneously the system will customize the speed of the F/L, F/R, R/L and R/R wheels.

Maintenance guidance:

Check the ABS controller and the CAN connecting controller in the ABS (Other controllers may also report this fault).

**U0100 ECU CAN communication fault**

TCU measures taken:

Malfunction indicator lamp is ON, while the emergency mode activated \*, and no manual mode. Increase the clamping force level 0 \* to activate the internal driving strategy; the system will customize the engine torque and the engine cooling water temperature, and the accelerator pedal has its numerical value fixed (stop data transmission on the CAN).

Maintenance guidance:

Check the engine controller and the CAN interface on the controller (Other controllers may also report this fault).

**U1012 Error of the engine speed signal on the CAN bus**

TCU measures taken:

The system will customize the engine speed.

Maintenance guidance:

Check MCU controller (Engine speed sensor and sensor wiring)

**U1013 CAN bus accelerator pedal signal is wrong**

TCU measures taken:

Malfunction indicator lamp is ON, and the accelerator pedal has its numerical value fixed.

Maintenance guidance:

Check EMS controller (Accelerator pedal sensor and sensor wires)


**U1014 Error of the engine torque signal on the CAN bus**

TCU measures taken:

Malfunction indicator lamp is ON, while the emergency mode activated \*, and no manual mode. Activate the internal driving strategy, and the system will customize the engine torque.

Maintenance guidance:

Check the EMS controller

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**U1016 Error of the F/L wheel speed signal on the CAN bus**

TCU measures taken:

Increase the clamping force level 0\* and the system will customize the locking and rotating conditions and the system will customize the speed of the F/L wheel.

Maintenance guidance:

*Check the ABS controller (wheel speed sensor and sensor wire)*

**U1017 Error of the F/R wheel speed signal on the CAN bus**

TCU measures taken:

Increase the clamping force level 0\* and the system will customize the locking and rotating conditions and the system will customize the speed of the F/R wheel.

Maintenance guidance:

*Check the ABS controller (wheel speed sensor and sensor wire)*

**U1018 Error of the R/L wheel speed signal on the CAN bus**

TCU measures taken:

Increase the clamping force level 0\* and the system will customize the locking and rotating conditions and the system will customize the speed of the R/L wheel.

Maintenance guidance:

*Check the ABS controller (wheel speed sensor and sensor wire)*

**U1019 Error of the R/R wheel speed signal on the CAN bus**

TCU measures taken:

Increase the clamping force level 0\* and the system will customize the locking and rotating conditions and the system will customize the speed of the R/R wheel.

Maintenance guidance:

*Check the ABS controller (wheel speed sensor and sensor wire)*

**Note:**

- **The three pressure regulators have no power supply\*:** When a fault code appears and the pressure regulator has no power supply, the clutch is open and the car can not move if any drive gear is engaged again; only when the engine is stopped with the key reset can the car start to move after the engine is started.

- **Increase the clamping force level 0\*:** The driven bevel pulley has its pressure fixed and such pressure is higher than that in normal circumstances but lower than the highest level.

- **Increase the clamping force level 1\*:** The driven bevel pulley has its pressure fixed at the highest level.

-**EDS1\*:** Driving bevel pulley pressure regulator

-**EDS2\*:** Driven bevel pulley pressure regulator


-**EDS3\*:** Clutch pressure regulator

- **Emergency mode \*:** also called as a “limp home” mode, which will be activated in case of any situation as follows:

- Any CAN cable off
- CAN ECU communication failure
- CAN engine torque signal error

All signals related to the engine and ABS will be replaced (with safety measures taken) :

- The throttle percentage is fixed.
- The engine map replaces the engine torque.
- The engine has its cooling temperature fixed.
- The wheel speed is replaced by the speed of the transmission output shaft.

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- The engine speed adopts the speed signal from the hardwire.
- The clutch is rather difficult to engage or disengage as if no data is calibrated in it.
- The engine has its highest speed limited to 3200 rpm.
- The top vehicle speed is limited to 98 km/h.
- The transmission will have gears shifted only in one driving strategy.

**The CVT can work only in the most basic conditions to provide enough driving performance for you to drive the car to a nearby service station.**

- 2 seconds later, the manual or sports gear can't be used any more, and the fault light will be kept on.

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