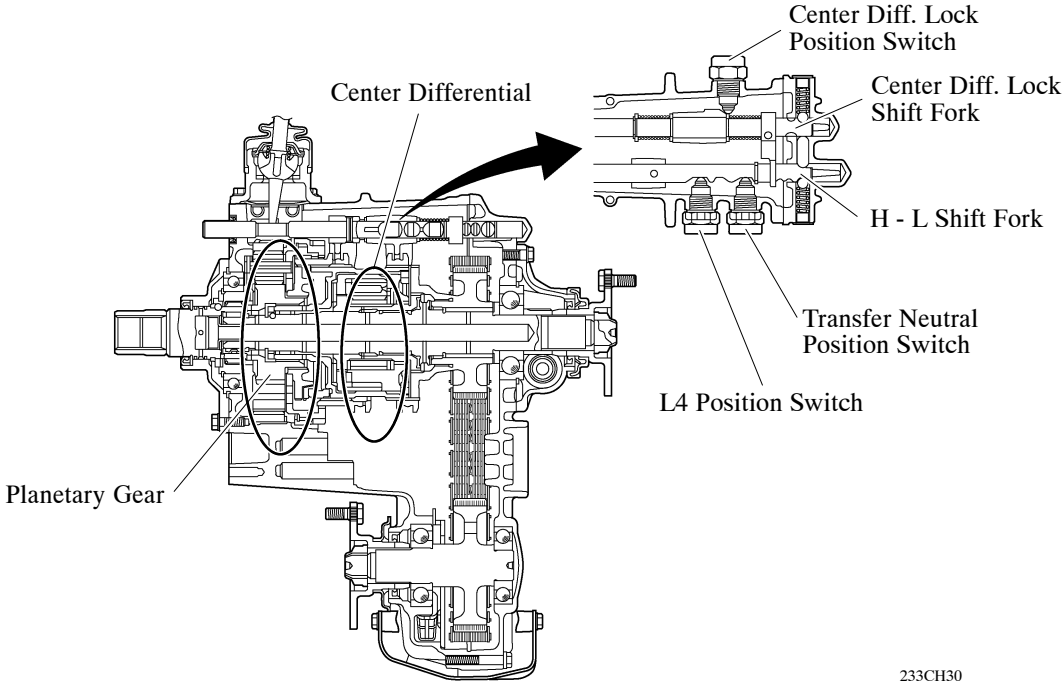
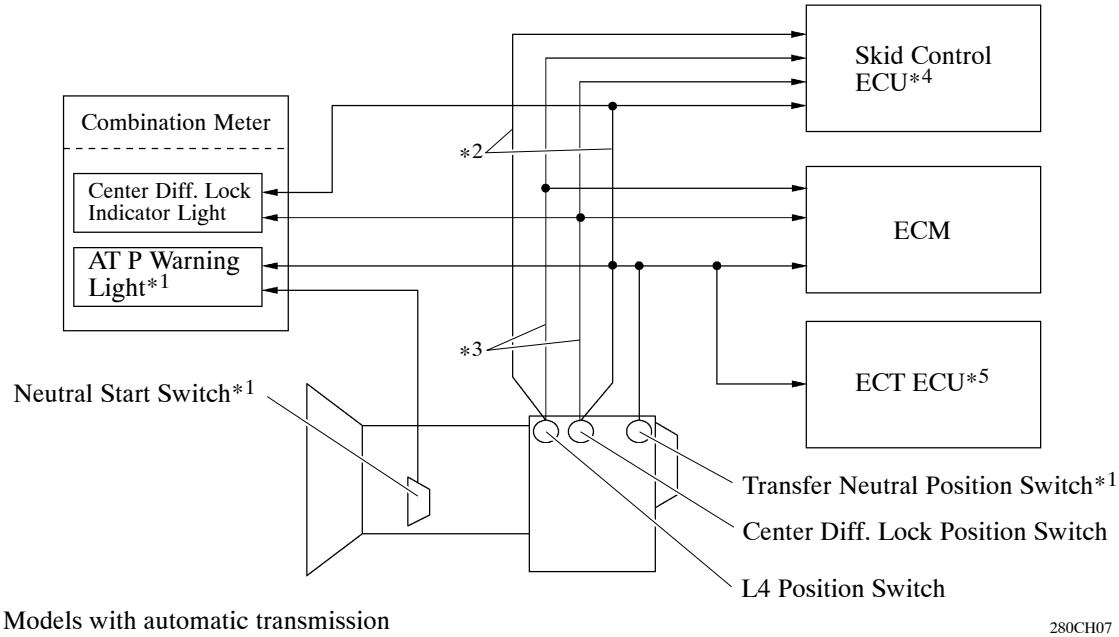
■CONSTRUCTION

1. General

- When the drive force is input via the transfer input shaft, the center differential unit of this transfer distributes the drive force to the front output shaft and the rear output shaft. Furthermore, the center differential effects the differential control of the front output shaft and the rear output shaft.
- When the driver manually operates the transfer shift lever to the L_L or H_L mode, the shift fork (which is linked to the transfer shift lever) slides to lock the center differential.
- Three switches are used to detect the modes that are changed by the operation of the transfer shift lever: a center differential lock position switch, a transfer neutral position switch, and an L4 position switch.



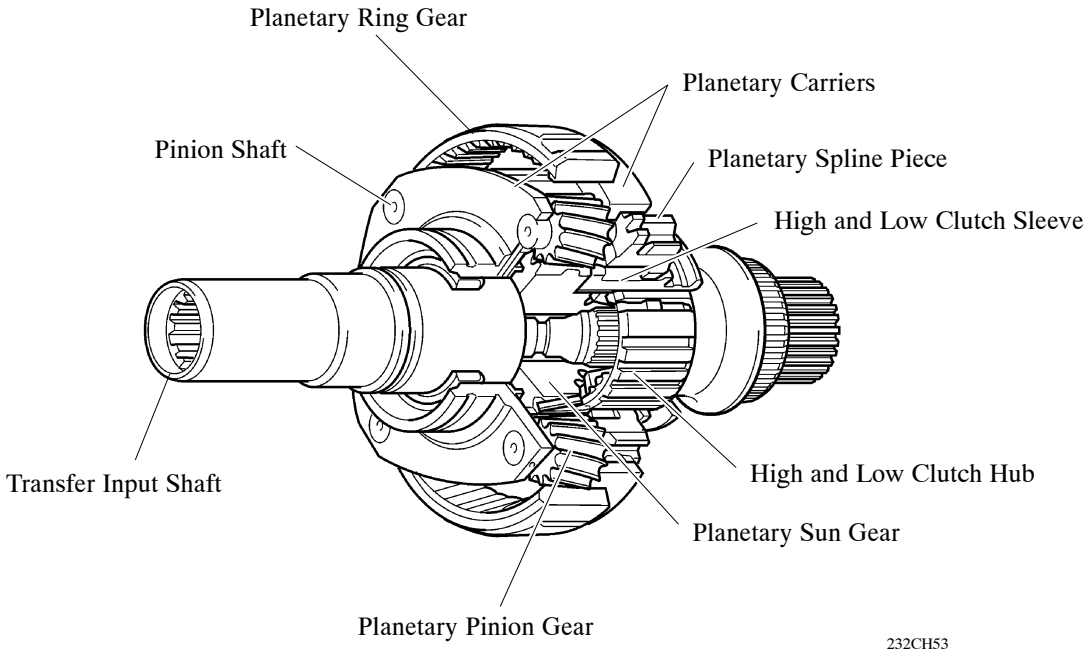
▶ System Diagram ◀



*1: Models with automatic transmission
*2: Models with 5L-E, 1KD-FTV or 2KD-FTV High Version engine
*3: Models with 2TR-FE or 1GR-FE engine *4: Models with brake control system
*5: Models with A340F automatic transmission

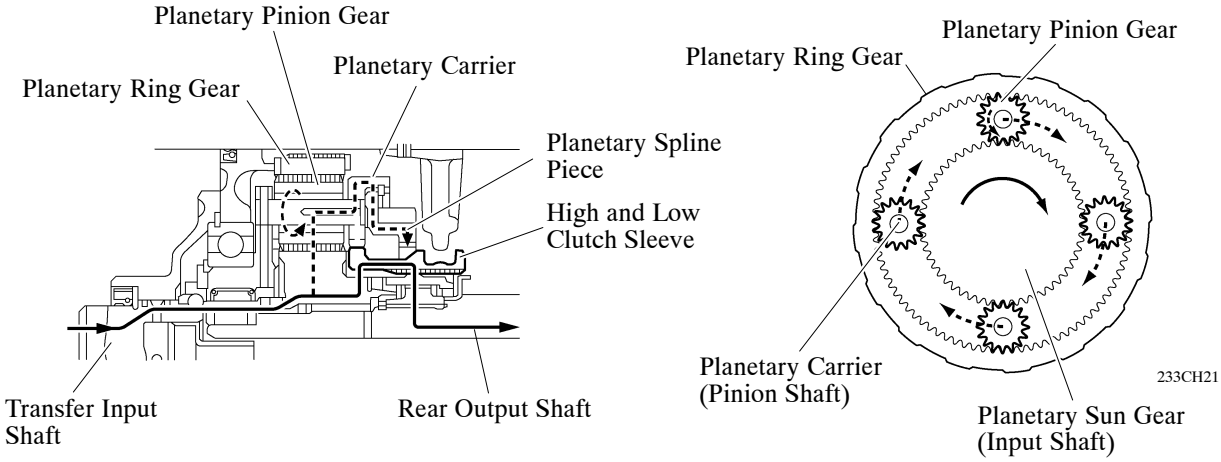
2. Planetary Gear

- The planetary sun gear integrates with the transfer input shaft.
- 4 planetary pinion gears are fitted to the planetary carrier. Each pinion gear shaft is fixed to the planetary carrier. A planetary spline piece is fitted to the rear of the planetary carrier, and the internal gear teeth of the planetary spline piece can be engaged with the external teeth of the high and low clutch sleeve. At the rear of the transfer input shaft, a high and low clutch sleeve is installed via the synchromesh mechanism on the output shaft.
- The planetary ring gear is fixed to the transfer case and the internal teeth are meshed with the planetary pinion gear.



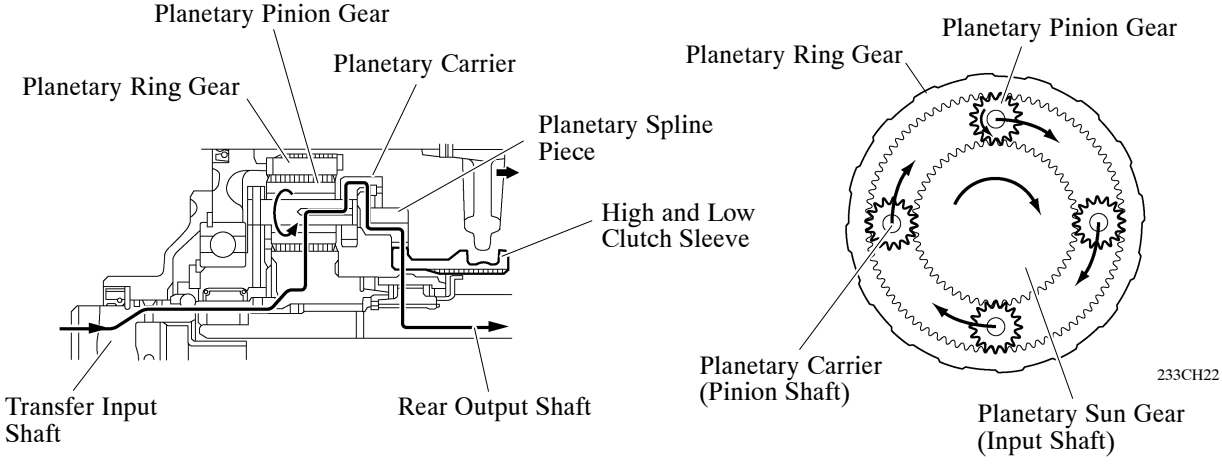
H_L/H Position

In the H_L/H position, the splines at the rear of the transfer input shaft mesh with the internal gear teeth of the high and low clutch sleeve.
Also, the high and low clutch sleeve is meshed to the rear output shaft via the high and low clutch hub. Thus, the rotation of the input shaft is transmitted to the high and low clutch sleeve, the high and low clutch hub, and to the rear output shaft.



L_L Position

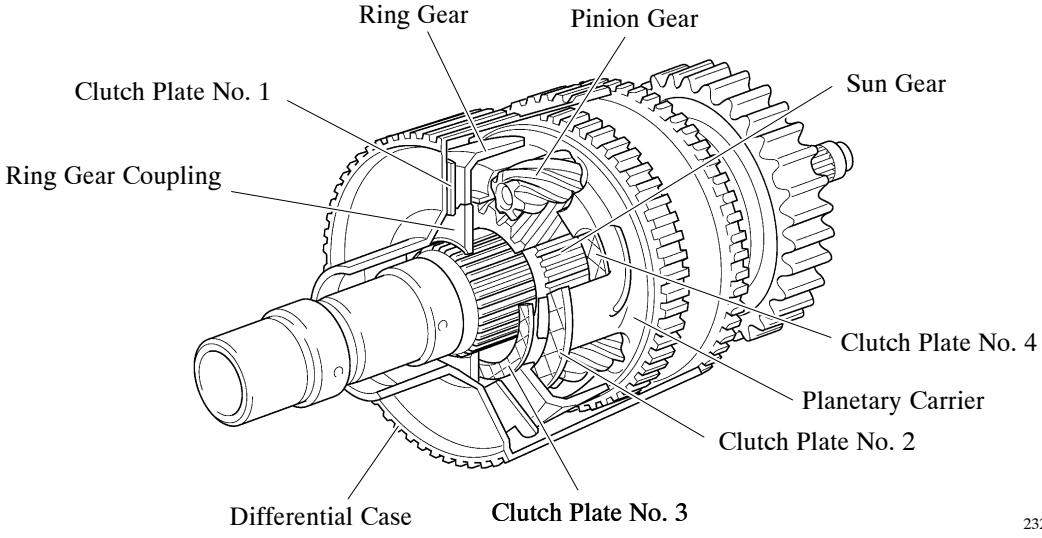
In the L_L position, the external teeth of the high and low clutch sleeve are meshed with the planetary spline piece.
Thus, the rotation of the input shaft is transmitted in a reduced form to the planetary sun gear, planetary pinion gear, planetary pinion gear shaft, planetary carrier, planetary spline piece, high and low clutch sleeve, high and low clutch hub, and rear output shaft.

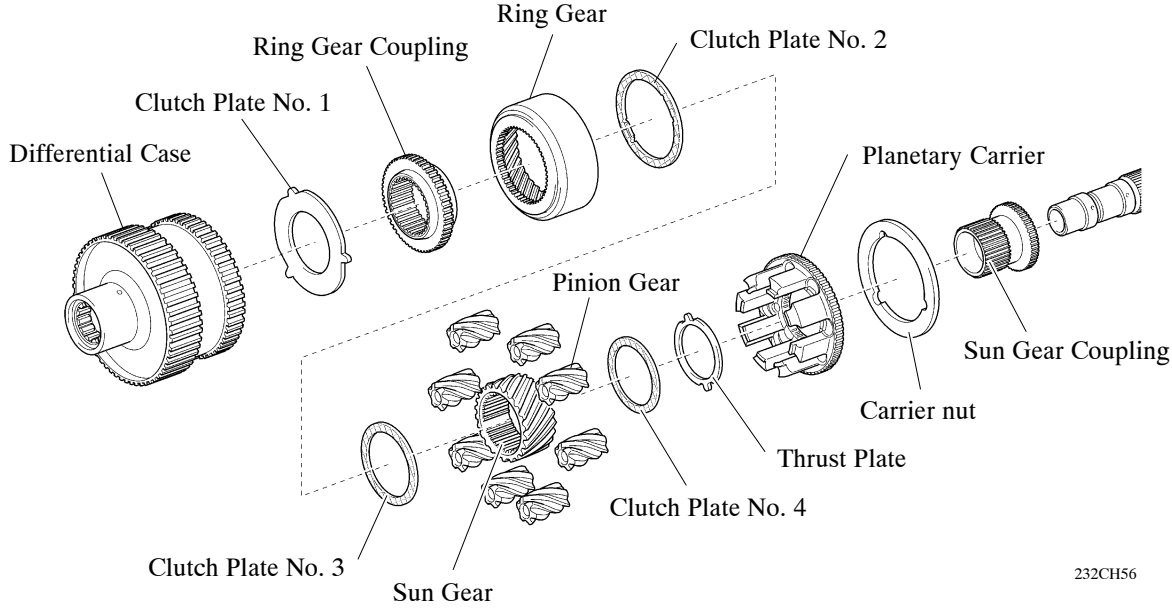


3. Center Differential (TORSEN LSD)

General

- The center differential uses a TORSEN LSD (Limited Slip Differential).
- The TORSEN LSD is a torque-sensing LSD. It generates a limited-differential torque in proportion to the drive torque, and instantly changes the front and rear torque distribution. As a result, this LSD ensures the proper stability during acceleration and high-speed driving.
- The torque distribution during straightline driving is 40/60 (front/rear), which is helpful for an appropriate steering response during the initial stage of a turn. During the acceleration stage of a turn, the torque distribution increases the rear wheels.
- This center differential consists of a differential case, a coupling, a ring gear, 8 pinion gears, a sun gear, and a planetary carrier.



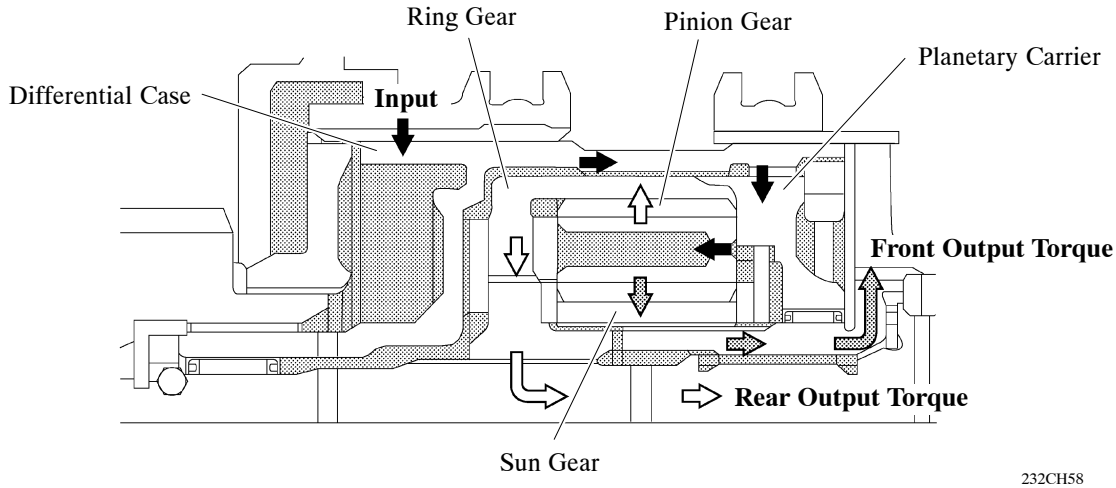


Service Tip

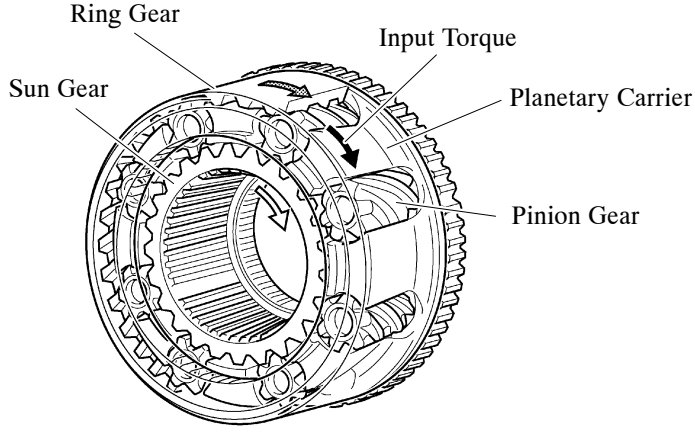
The TORSEN LSD cannot be disassembled, so it must be replaced as an assembly. For details, refer to the Fortuner/Hilux SW4 Repair Manual.

Normal Driving Operation

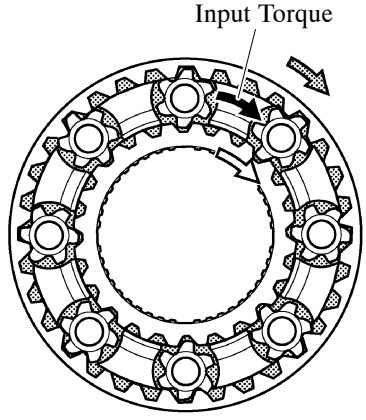
During normal driving (front wheel speed = rear wheel speed), the driving force that is input by the differential case is transmitted (Front: 40/Rear: 60) as shown below, without involving the LSD function.



232CH58

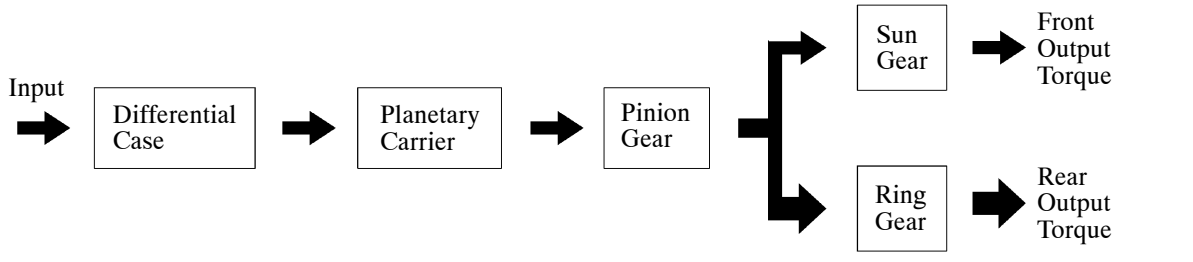


232CH126



232CH59

▶ Torque Transmission Path ◀



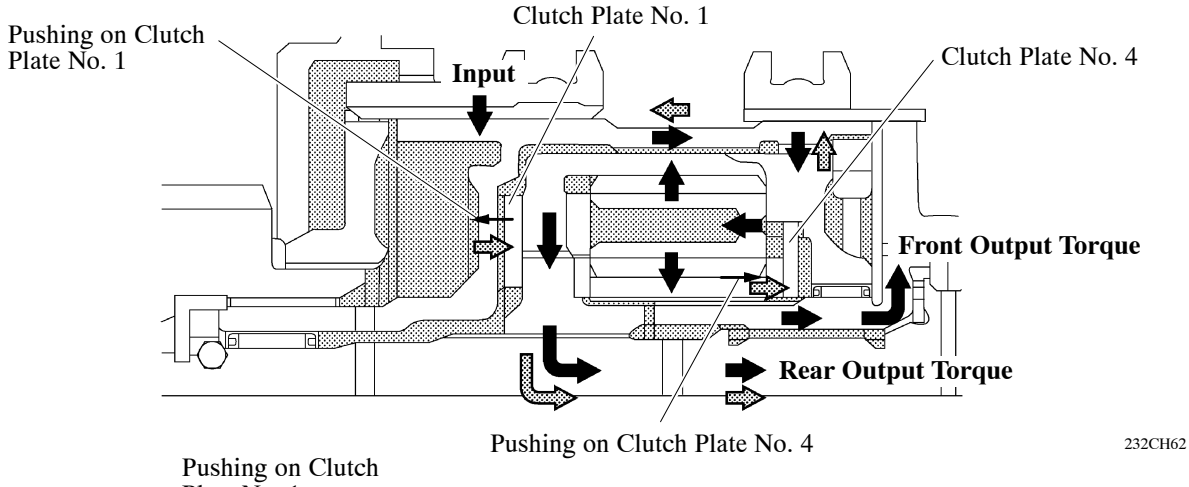
00MCH15Y

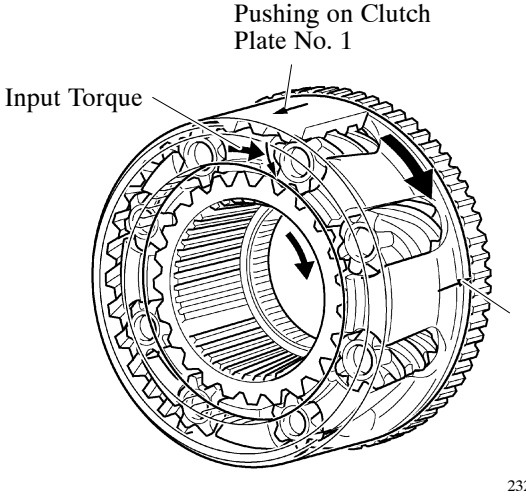
Front Wheel Skid Driving Operation

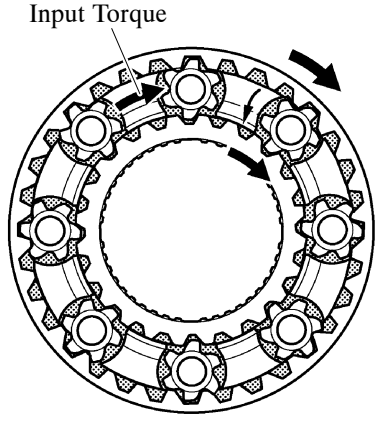
During front wheel skid driving (front wheel speed > rear wheel speed) when a rotational difference exists between the sun gear and the ring gear, the torque distribution of the driving force (torque) that is input by the differential case changes instantly before the torque is transmitted, as follows:

- The sun gear transmits torque to the planetary carrier while pushing on clutch plate No. 4. The planetary carrier transmits this torque to the ring gear from the differential case via clutch plate No. 1.
- The ring gear outputs torque while pushing on clutch plate No. 1.

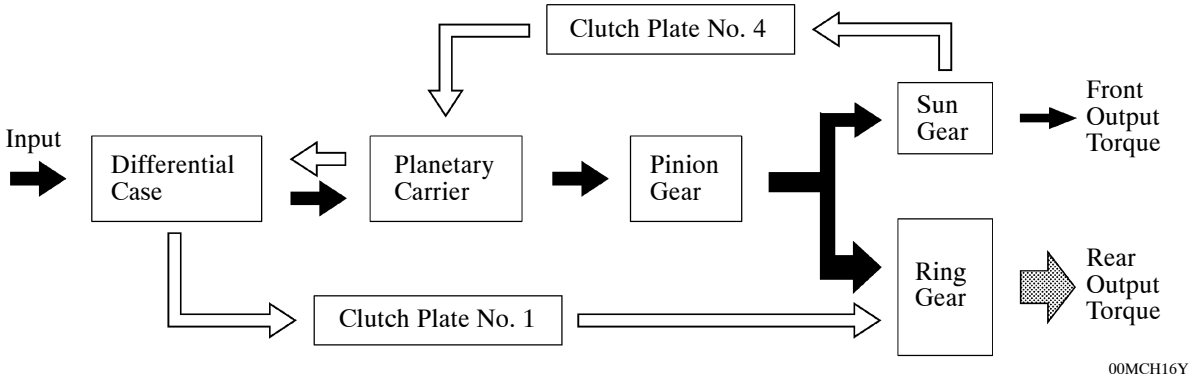
These LSD functions change the torque distribution.







▶ Torque Transmission Path ◀



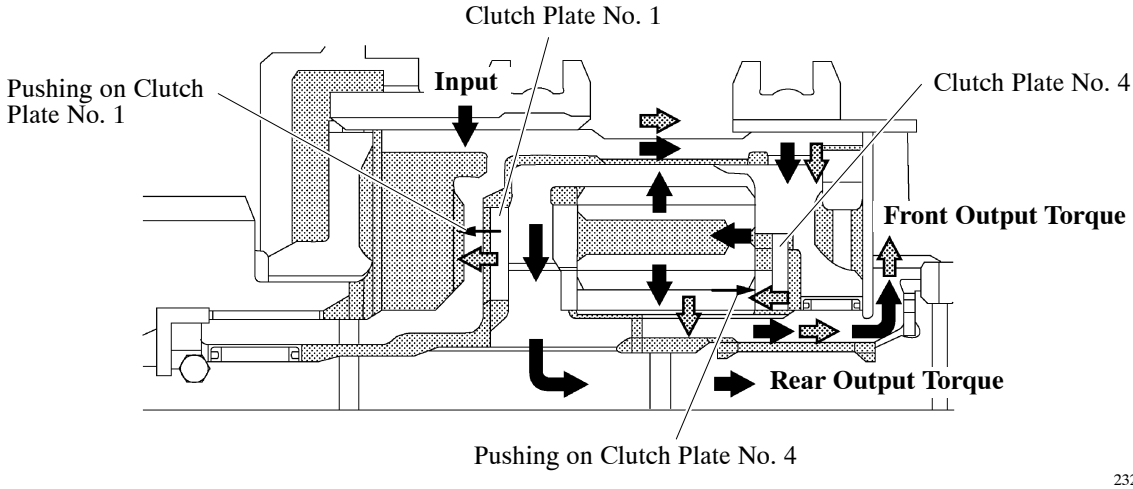
CH

Rear Wheel Skid Driving Operation

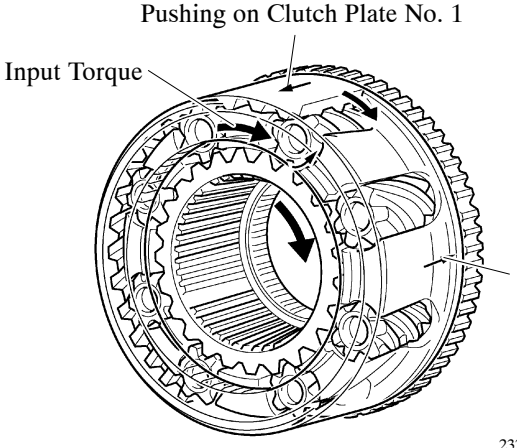
During rear wheel skid driving (front wheel speed < rear wheel speed), when a rotational difference exists between the sun gear and the ring gear, the torque distribution of the driving force (torque) that is input by the differential case changes instantly before the torque is transmitted, as follows:

- The ring gear transmits torque to the differential case while pushing clutch plate No. 1. The differential case transmits this torque from the planetary carrier to the sun gear via clutch plate No. 4.
- The sun gear outputs torque while pushing on clutch plate No. 4.

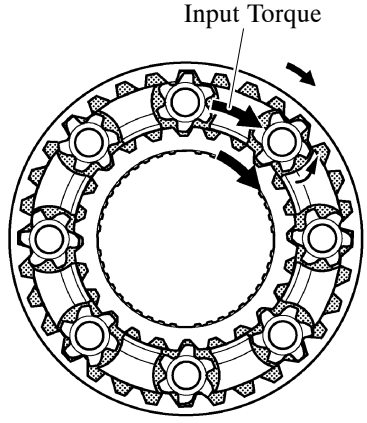
These LSD functions change the torque distribution.



232CH67

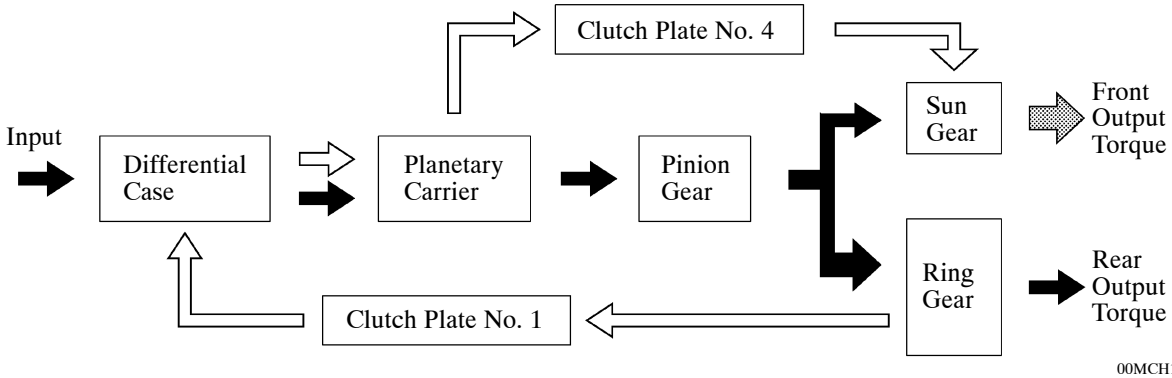


232CH65



232CH68

▶ Torque Transmission Path ◀



00MCH17Y