

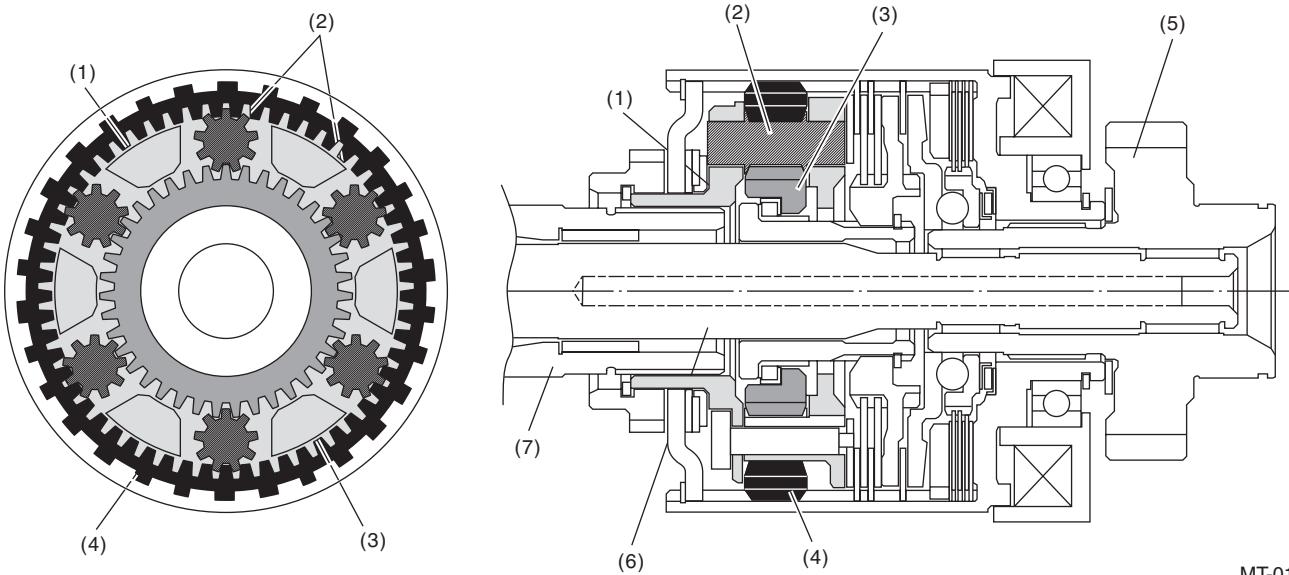
# **MANUAL TRANSMISSION AND DIFFERENTIAL (6MT)**

## 1. Driver's Control Center Differential System (From '06MY)

### A: GENERAL

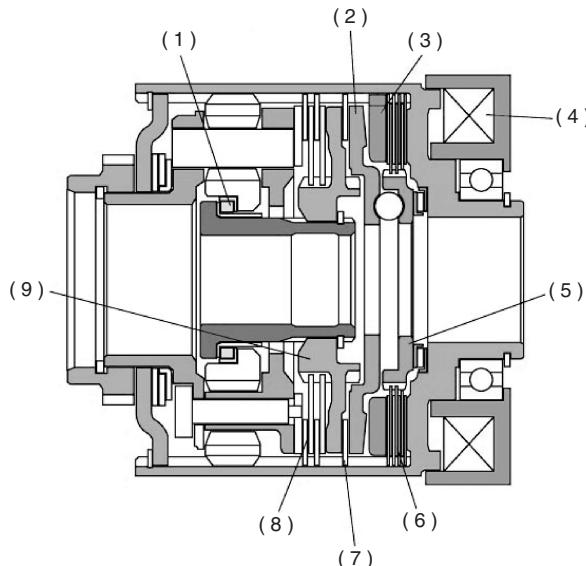
The Driver's Control Center Differential (DCCD) system consists of the sensors and switches such as steering angle sensor, yaw rate and lateral G sensor, or stop light switch, the planetary gear type center differential (with built-in the LSD clutch), and the DCCD control module.

The center differential of single pinion gear type planetary unit distributes the engine torque to the front wheels and rear wheels at the torque ratio of 41:59.



- |                   |                         |
|-------------------|-------------------------|
| (1) Carrier       | (5) Transfer drive gear |
| (2) Pinion gears  | (6) Drive pinion shaft  |
| (3) Sun gear      | (7) Driven shaft        |
| (4) Internal gear |                         |

- The controllability of the vehicle with accelerator operation has been improved more, because the timing of the differential restriction of LSD and the acceleration of the vehicle synchronizes almost completely by combining the torque sensing type mechanical LSD mechanism with the conventional electromagnetic clutch LSD mechanism.



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|--|-------------------------|
| (1) Torque cam                         | (5) Pilot clutch hub    |
| (2) Intermediate clutch pressure plate | (6) Pilot clutch        |
| (3) Armature                           | (7) Intermediate clutch |
| (4) Coil                               | (8) Main clutch         |
|  | (9) Main clutch hub     |

- With the yaw rate and lateral G sensor and the newly adopted steering angle sensor, the traveling line which the driver aims at is detected, and the differential restriction force in response to the behavior of the vehicle is adjusted. This makes it possible to reduce the understeer or oversteer tendency, and to actualize vehicle behavior that the driver intends it to be.
- In manual mode, the engagement power of electromagnetic clutch LSD can be adjusted with the DCCD control dial within the range of free to lock. However, even when the engagement power of electromagnetic clutch LSD is in the free condition, the differential restriction with mechanical LSD is done.
- When a malfunction occurs in the system, the fail-safe control may be performed that releases the electromagnetic clutch LSD so as to maintain safe conditions. At this time, the Subaru Select Monitor can be used for the system diagnosis.

## B: OPERATION

The DCCD system has the following 2 modes: "MANUAL MODE" and "AUTO MODE". In MANUAL MODE, as the operation amount of DCCD control dial (driver's will) is prioritized, the control that increases/decreases the engagement power of electromagnetic clutch LSD is performed. In AUTO MODE, the control that automatically adjusts the engagement power of electromagnetic clutch LSD corresponding to the input signals of steering angle sensor or yaw rate and lateral G sensor is performed.

### Control of DCCD control module

Center differential input torque sensing engagement power	Increases or decreases the engagement power of electromagnetic clutch LSD corresponding to the center differential input torque.
ABS operation signal input	Decreases the engagement power of electromagnetic clutch LSD when the ABS operation signal is input from ABSCM&H/U to DCCD CM.
Brake switch signal input	Decreases the engagement power of electromagnetic clutch LSD when the brake switch signal is input to DCCD CM.
Parking brake signal input	Releases the electromagnetic clutch LSD when the parking brake signal to DCCD CM is input.
Tight cornering	Decreases the engagement power of electromagnetic clutch LSD by judging the vehicle condition from the steering angle sensor signal so as to prevent the tight cornering symptom.
Slip	Calculates the slip amount of each wheel based on the wheel sensor signal, and then corrects the engagement power of electromagnetic clutch LSD corresponding to the slip amount of wheel.
Cornering	Optimally controls the engagement power of electromagnetic clutch LSD by judging the vehicle cornering condition based on the signals of the steering angle sensor and the yaw rate and lateral G sensor so as to manage both drivability and stability of the vehicle during cornering.
DCCD control dial	Decreases or increases the engagement power of electromagnetic clutch LSD with the operation amount of the DCCD control dial of the driver.
Fail-safe	DCCD CM indicates the malfunction to the driver by blinking the light on the bottom of DCCD indicator when some malfunctions of system have been detected. When there is a serious malfunction in the DCCD coil, DCCD CM turns the DCCD coil OFF and releases the electromagnetic clutch LSD completely. If the malfunction is not a serious malfunction, such as the malfunctions of some sensors, DCCD CM performs the control that maintains the system operation as much as possible.
Rear differential oil temperature	When the rear differential oil temperature rises excessively [approximately 150°C (302°F)] for some reasons such as repetitive hard driving, the rear differential oil temperature switch turns OFF and the rear differential oil temperature warning light of the combination meter illuminates. At the same time, DCCD CM performs the control that releases the engagement power of electromagnetic clutch LSD. (If the oil temperature drops, the system returns to the normal control automatically.)