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| **Model Year:** 2013 | **Model:** RAV4 | **Prod Date Range:** [12/2012 - ] |
| **Title:** GF1A TRANSFER / 4WD / AWD: DYNAMIC TORQUE CONTROL AWD SYSTEM: FOUR WHEEL DRIVE CONTROL; 2013 MY RAV4 [12/2012 - ] | | |

# FOUR WHEEL DRIVE CONTROL

### 1. FUNCTION OF MAIN COMPONENTS

| COMPONENT | | FUNCTION |
|---|---|---|
| Transfer | | Drive force input into the differential is redirected 90 degrees and output to the propeller shaft by the transfer. |
| Electromagnetic Control Coupling (Transmission Coupling Assembly) | Electromagnetic Solenoid | Distributes drive torque in accordance with the amperage applied by the 4WD ECU assembly. |
| Throttle Position Sensor | | Detects the throttle valve position and outputs it to the ECM. |
| Crankshaft Position Sensor | | Detects the engine speed and outputs it to the ECM. |
| Speed Sensor | | Detects the wheel speed of each wheel. |
| Steering Sensor | | Detects the direction and angle of the steering wheel. |
| Park/Neutral Position Switch Assembly | | Detects the shift position of the transaxle and outputs it to the ECM. |
| Stop Light Switch Assembly | | Detects when the brake pedal is depressed. |
| Parking Brake Switch | | Detects when the parking brake is applied. |
| Differential Lock Switch | | Switches between Auto (Sport) and Lock modes. |
| Sport Mode Switch | | Turns the Sport mode on and off. |
| 4WD ECU Assembly | | • Controls the amperage applied to the electromagnetic control coupling solenoid based on signals provided by the ECUs, sensors and switches in order to optimally distribute drive torque in accordance with driving conditions.<br>• Turns AWD mode off when a parking brake on signal is received from the main body ECU.<br>• Turns AWD mode off when a shift position signal (P or N) is received from the ECM.<br>• Operates in cooperation with the skid control ECU to control the torque distribution between the front and rear wheels. |
| ECM | | Outputs signals such as the shift position signal, Sport mode signal, throttle position signal and engine speed signal to the 4WD ECU assembly via CAN communication. |
| Skid Control ECU | | • Outputs signals such as the vehicle speed signal and deceleration signal to the 4WD ECU assembly via CAN communication.<br>• Requests torque distribution between the front and rear wheels during cooperative control with AWD. |
| Center Airbag Sensor Assembly<br>• Yawrate and Deceleration Sensor | | Detects the vehicle's yaw rate, longitudinal and lateral acceleration and sends the detection signals. |
| Main Body ECU (Multiplex Network Body ECU) | | Outputs signals such as the parking brake signal to the 4WD ECU assembly via CAN communication. |
| Combination Meter | Differential Lock Indicator Light | Illuminates to inform the driver that AWD lock mode is engaged. |
| | Sport Mode | |

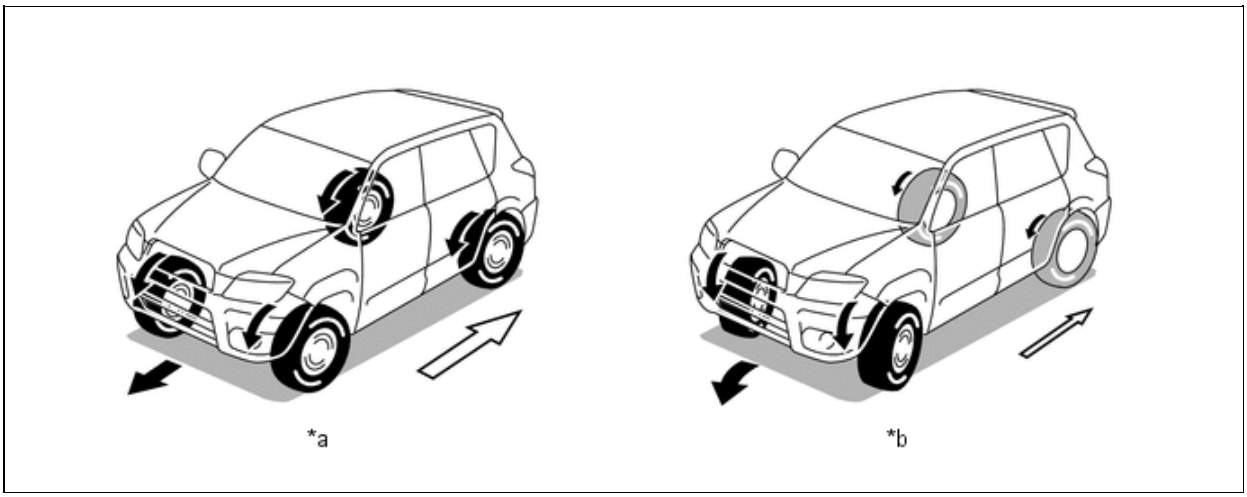
| | | |
|---|---|---|
| Assembly | Indicator Light | Illuminates to inform the driver that Sport mode is engaged. |
| | AWD Warning Light | Illuminates to warn the driver if a malfunction occurs in the AWD system. |

## 2. SYSTEM CONTROL

(a) Auto Mode

(1) Starting Off

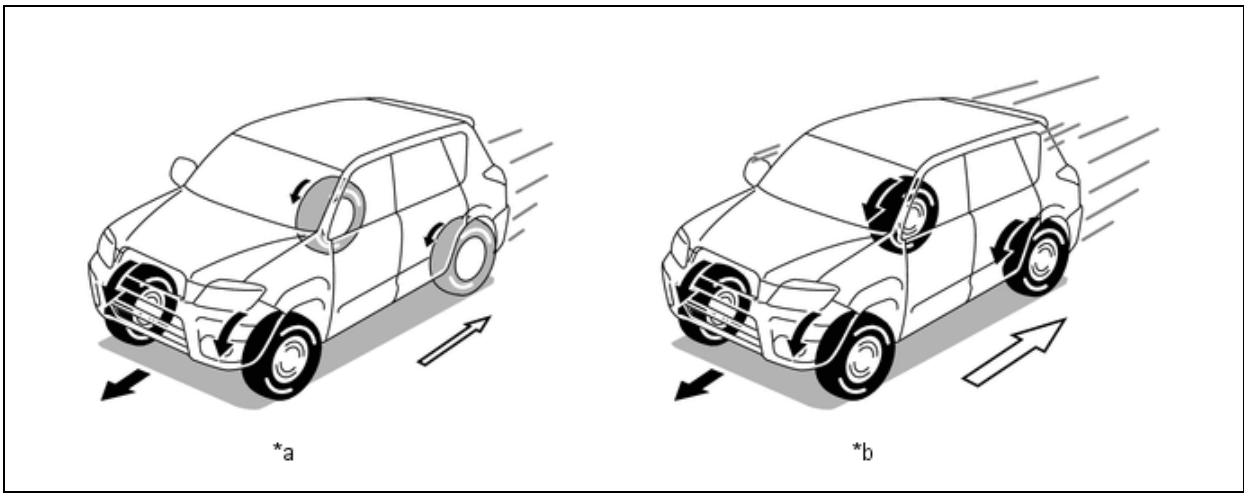
- The system ensures start-off performance by optimally distributing engine drive torque to the front and rear wheels.
- To prevent the tight corner braking phenomenon from occurring during low-speed cornering, the system reduces the amount of torque distributed to the rear wheels.




| *a | Straightline Driving | *b | Low-speed Cornering |
|---|---|---|---|
| ⇨ | Torque Distribution to Rear Wheels | - | - |

(2) Normal Driving

- During normal driving, when the system judges that the vehicle is traveling steadily, it reduces the amount of torque distribution to the rear wheels. This allows the vehicle to operate in conditions similar to front-wheel-drive, improving fuel economy.
- The system optimizes torque distribution to the rear wheels to ensure both excellent straightline acceleration performance and excellent driving stability while cornering.




| *a | Steady Driving | *b | Straightline Acceleration |
|---|---|---|---|
| | Torque Distribution to Rear Wheels | - | - |

| | | | |
|---|---|---|---|
| ⇨ | | | |

(b) Sport Mode

- Torque distribution to the rear wheels is optimized to ensure operability and stability during turning by judging the driver's driving operation and the vehicle's driving conditions in accordance with signals from each sensor.

(c) Lock Mode

- When the vehicle is being driven in gravel or sand and more traction is required, the driver can select Lock mode by operating the differential lock switch. Thus, this mode achieves optimal control in accordance with the driving conditions and transmits as much drive torque as possible to the rear wheels, in a mode that is similar to the locked AWD mode.

(d) Engine Output Control

- If there is a possibility that overdriving could damage the powertrain system, engine output may be restricted.

**3. FAIL-SAFE**

(a) When there is a possibility of causing damage to the drivetrain due to a malfunction in the AWD system or rough driving, the system illuminates or blinks the AWD warning light to inform the driver and stops AWD control.

| CONDITION | | AWD WARNING LIGHT |
|---|---|---|
| AWD system malfunction | | Illuminates |
| Rough driving in AWD mode | Pre-warning for stopping AWD control | Slowly Blinkis |
| | Stopping AWD control | Quickly Blinkis |

(1) When the 4WD ECU assembly judges that the vehicle has stabilized, it resumes AWD mode. If the AWD warning light blinks, take the following actions without turning the engine off:

- Decelerate the vehicle until the light goes out.
- Stop the vehicle and wait until the light goes out.

**4. DIAGNOSIS**

(a) Furthermore, the AWD warning light in the combination meter assembly illuminates to inform the driver.

(b) For details of the DTCs that are stored in 4WD ECU assembly memory, refer to the Repair Manual.