
POWER TRAIN

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CLUTCH

<EVOLUTION-IV>

A clutch with a pull-type diaphragm spring is utilized to enhance the disengagement characteristics and lighten the pedal action during high-speed operation.

Specifications

Drive system	4WD
Engine	4G63 DOHC-T/C
Control system	Hydraulic
Clutch disc type	Dry; single
Clutch disc size (mm)	230 × 150
Clutch cover type	Diaphragm spring (pull-type)
Clutch cover load setting (N {kgf})	7,845 {800}
Release cylinder size (mm)	20.6
Flexible flywheel	No

<EVOLUTION-V>

The EVOLUTION-V's clutch is basically the same as the EVOLUTION-IV's clutch. In light of the engine's higher torque, however, the clutch cover set load has been increased.

Specifications

Item	EVOLUTION-IV	EVOLUTION-V
Clutch cover load setting (N {kgf})	7,845 {800}	8,826 {900}

MANUAL TRANSMISSION

The W5M51 transmission has been newly adopted.

Specifications

Model		W5M51 (Normal type)		W5M51 (With super cross gear)	
Engine		4G63 DOHC-T/C			
Type	Forward	5-speed, constant mesh			
	Reverse	One-speed, constant mesh			
Gear ratios (numbers of teeth)	1st	2.785 (39/14)			
	2nd	1.960 (39/20)			
	3rd	1.407 (38/27)		1.444 (39/27)	
	4th	1.031 (33/32)		1.096 (34/31)	
	5th	0.761 (32/42)		0.825 (33/40)	
	Reverse	3.416 (41/12)			
Final reduction ratio (numbers of teeth)		4.529 (77/17)		4.875 (78/16) or 4.529 (77/17)	
Transfer	Reduction ratio (numbers of teeth)	1/3.312 (16/53)			
	Limited-slip differential	VCU			
Reverse synchromesh		Yes			
Speedometer gear ratio		29/36	30/36	29/36	30/36
Front limited-slip differential		Helical-gear type			

TRANSMISSION CONTROL

The transmission control mechanism is basically the same as that of the previous model. However, the gear shift lever has a shorter stroke.

PROPELLER SHAFTS

<EVOLUTION-IV>

The propeller shafts are basically the same as those of EVOLUTION-III. However, the specifications of the rear propeller shaft have been revised as shown below.

Specifications

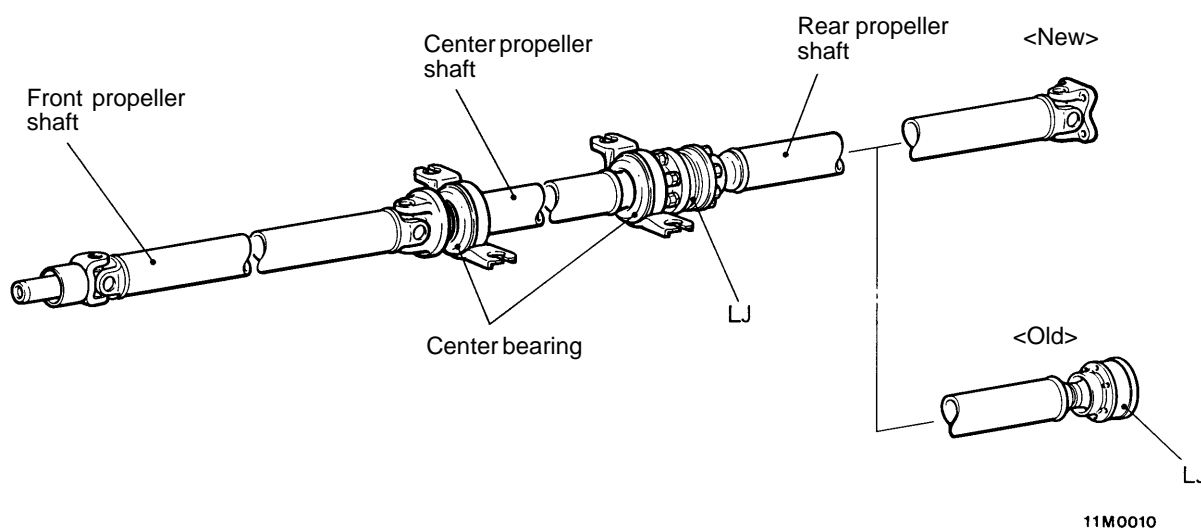
Item		RS	GSR	EVOLUTION-III
Type		Three-joint; multi-part		
Length × diameter mm	Front	676.5 × 65		
	Center	505 × 65		
	Rear	666.5 × 65 (684.5 × 65)	684.5 × 65	666.5 × 65

NOTE:

- (1) The length of each propeller shaft is given as the distance between the centers of the joints.
- (2) Figures in parentheses apply to vehicles fitted with the AYC system.

<EVOLUTION-V RS>

The joint between the rear propeller shaft and the rear differential has been changed from a Löbro joint (LJ) to a Cardan universal joint.

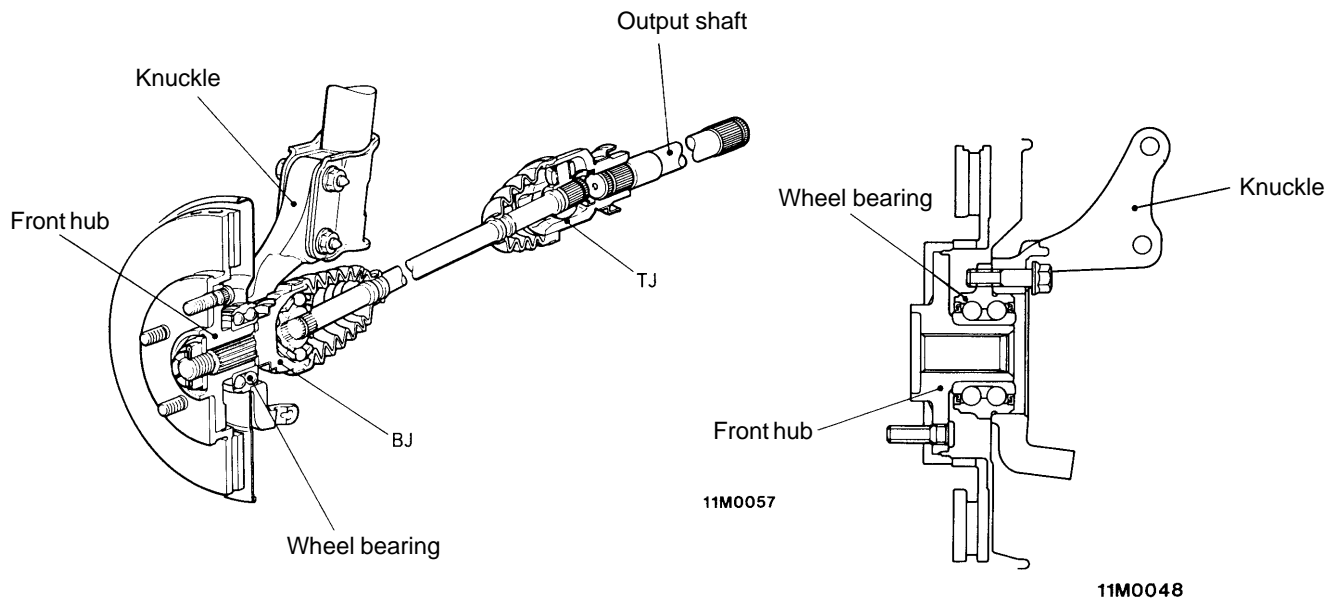


FRONT AXLE

To match the high-performance engine, the front axle has been revised as follows:

- Unit ball bearings are used for the wheel bearings to enhance rigidity.
- For easier maintenance, the wheel bearings are bolted onto the knuckles.
- In light of the engine's higher output, the number of hub bolts has been increased from four to five.

Configuration

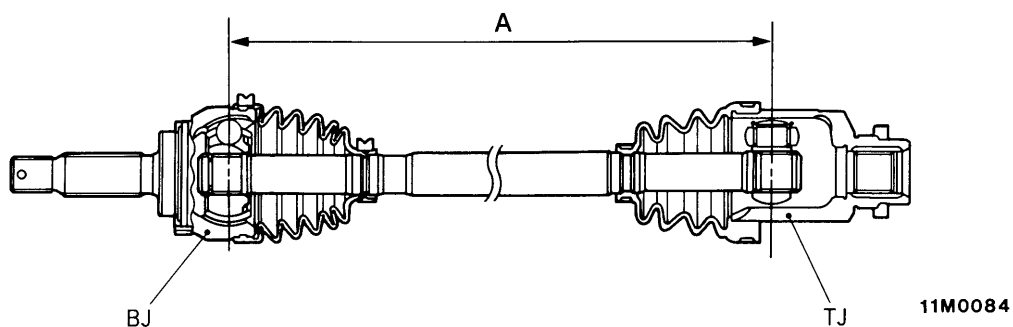


<EVOLUTION-V>

DRIVE SHAFTS

In accordance with the wider tread, the joint-to-joint distances (see dimension “A” in the drawing) have been increased as shown in the following table.

Item		EVOLUTION-IV	EVOLUTION-V
Joint-to-joint distance (mm)	Right-hand side	418	442
	Left-hand side	348	365

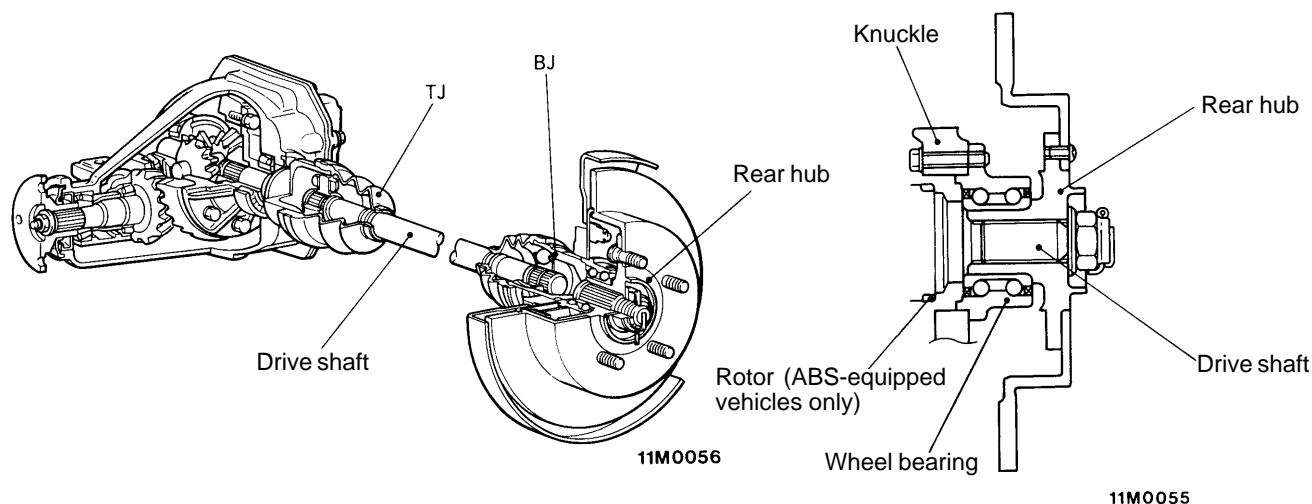


REAR AXLE

To match the high-performance engine, the rear axle has been revised as follows:

- For easier maintenance, the wheel bearings are bolted onto the knuckles.
- In light of the engine's higher output, the number of hub bolts has been increased from four to five.
- On ABS-equipped vehicles, wheel speed sensor rotors are fitted on the drive shafts and wheel speed sensors are fitted on the knuckles.

Configuration



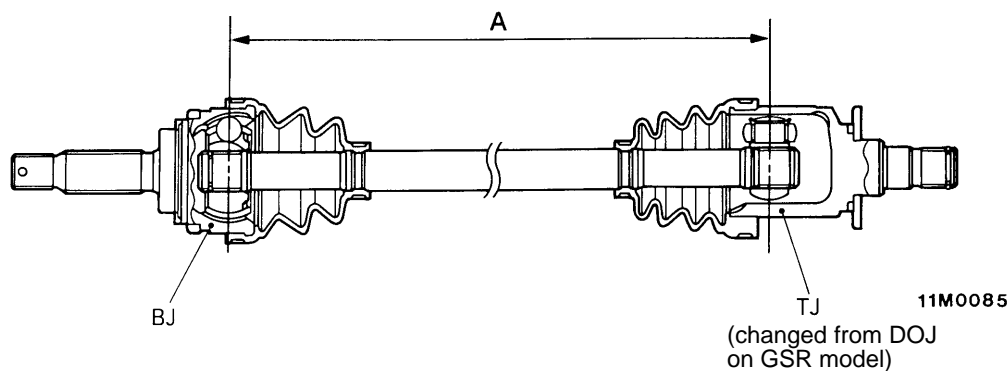
<EVOLUTION-V>

DRIVE SHAFTS

- (1) In accordance with the wider tread, the joint-to-joint distances (see dimension “A” in the drawing) have been increased as shown in the following table.

Item		EVOLUTION-IV		EVOLUTION-V	
		Without AYC system	With AYC system	Without AYC system	With AYC system
Joint-to-joint distance (mm)	Right-hand side	560	435	578	453
	Left-hand side	480	425	498	443

- (2) On the GSR model, the joints closer to the differential have been changed from the double-offset type (DOJ) to the tripod type (TJ). (On the RS model, tripod joints were already used.)



DIFFERENTIAL

Vehicles without the AYC system are fitted with a mechanical LSD. The LSD is basically the same as that of the EVOLUTION-III.

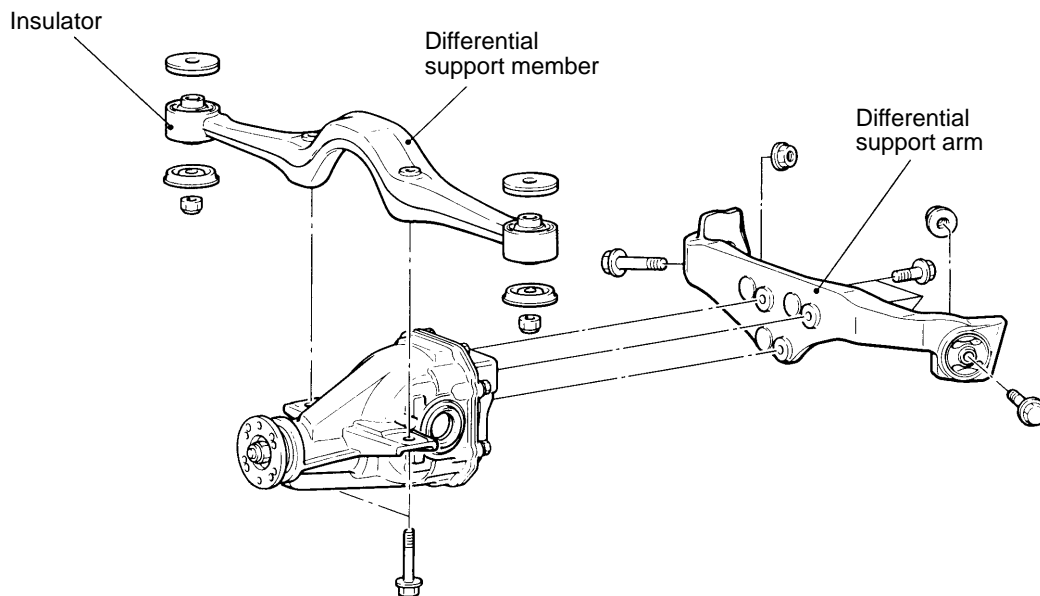
NOTE

For details of the LSD fitted on vehicles with the AYC system, refer to page 2-14.

Specifications

Item		Mechanical LSD
Reduction gear type		Hypoid gears
Reduction ratio		3.312
Differential gear (type × quantity)	Side gear	Straight bevel gear × 2
	Pinion gear	Straight bevel gear × 4
Number of teeth	Drive gear	53
	Drive pinion	16
	Side gear	16
	Pinion gear	10
Bearing (outside diameter × inside diameter) (mm)	Side	72 × 35
	Front	62 × 25
	Rear	72 × 35

<EVOLUTION-IV>

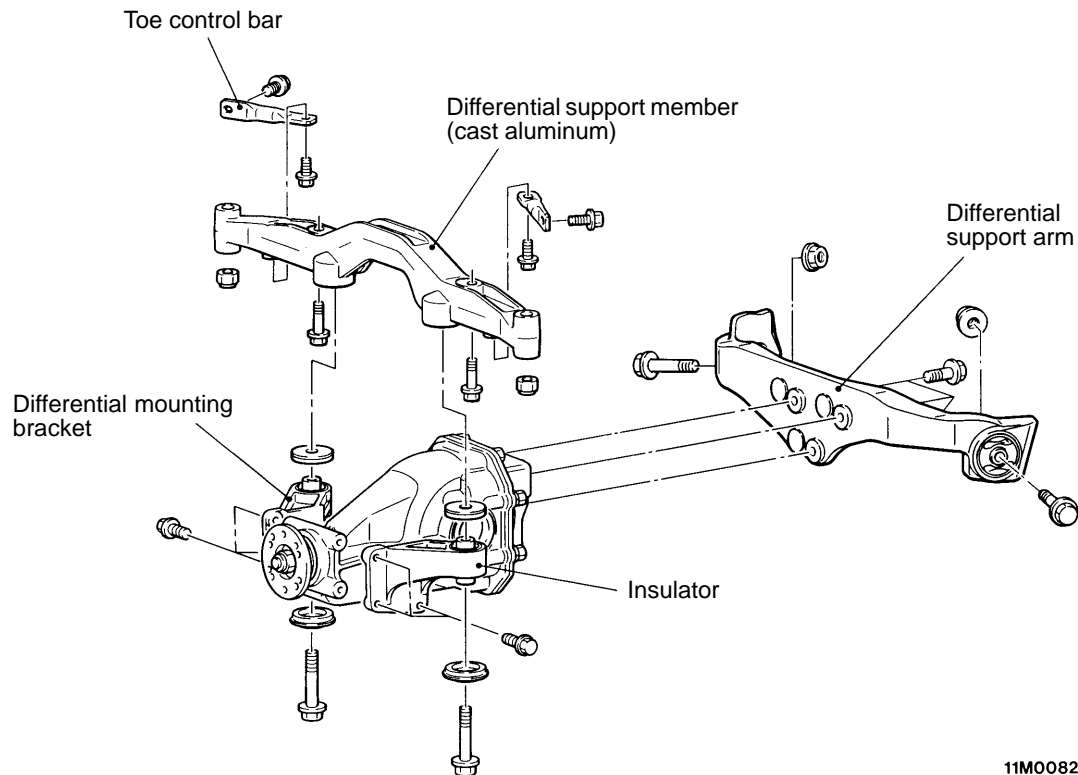


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<EVOLUTION-V RS>

- The differential's reduction gear ratio has been revised from 3.312 to 3.307.
- The differential support member is joined to the body without insulators, yielding a stiff joint that enhances the body's torsional rigidity. Also, the differential support member is made from cast aluminum for lightness.

<EVOLUTION-V>



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AYC SYSTEM

The active yaw control (AYC) system is available with the EVOLUTION-IV <standard on GSR; optional on RS>. The system actively controls the difference in driving force between the left and right rear wheels, thereby adjusting the vehicle's yaw moment such that all four tires perform to their maximum potential. As a result, safety is enhanced for all drivers.

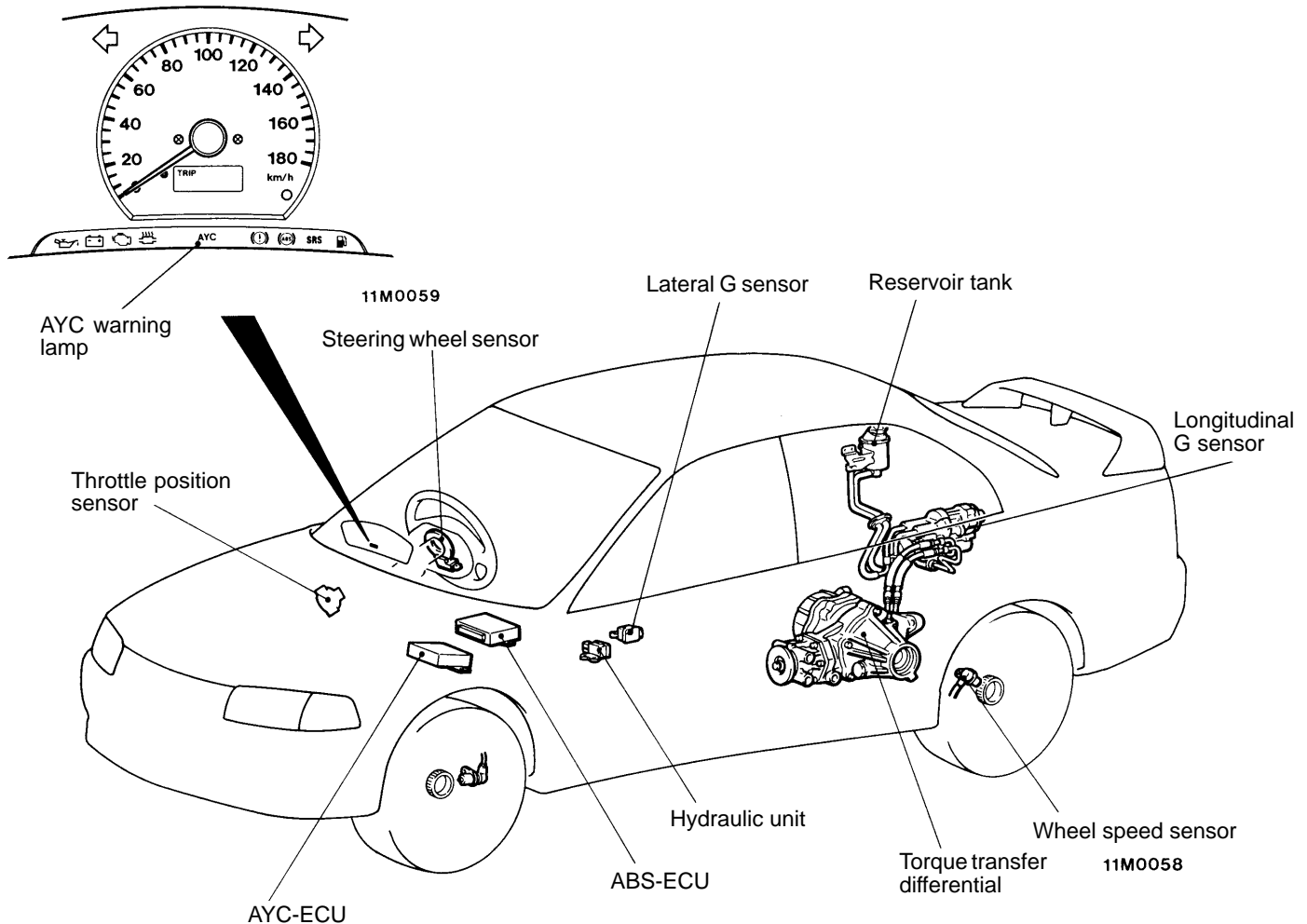
[World-Leading Technology]

The AYC system incorporates a torque transfer differential. Newly developed by Mitsubishi Motors, this device allows torque to be transferred between the left and right wheels as required.

[Maximized Safety]

- (1) Even when the vehicle is driven near the edge of its performance envelope, the AYC system ensures that it responds faithfully and naturally to the driver's steering and accelerator inputs. Thus, controllability is optimized at all times.
- (2) By suppressing sudden changes in vehicle behavior during acceleration and deceleration, the AYC system provides superior stability.

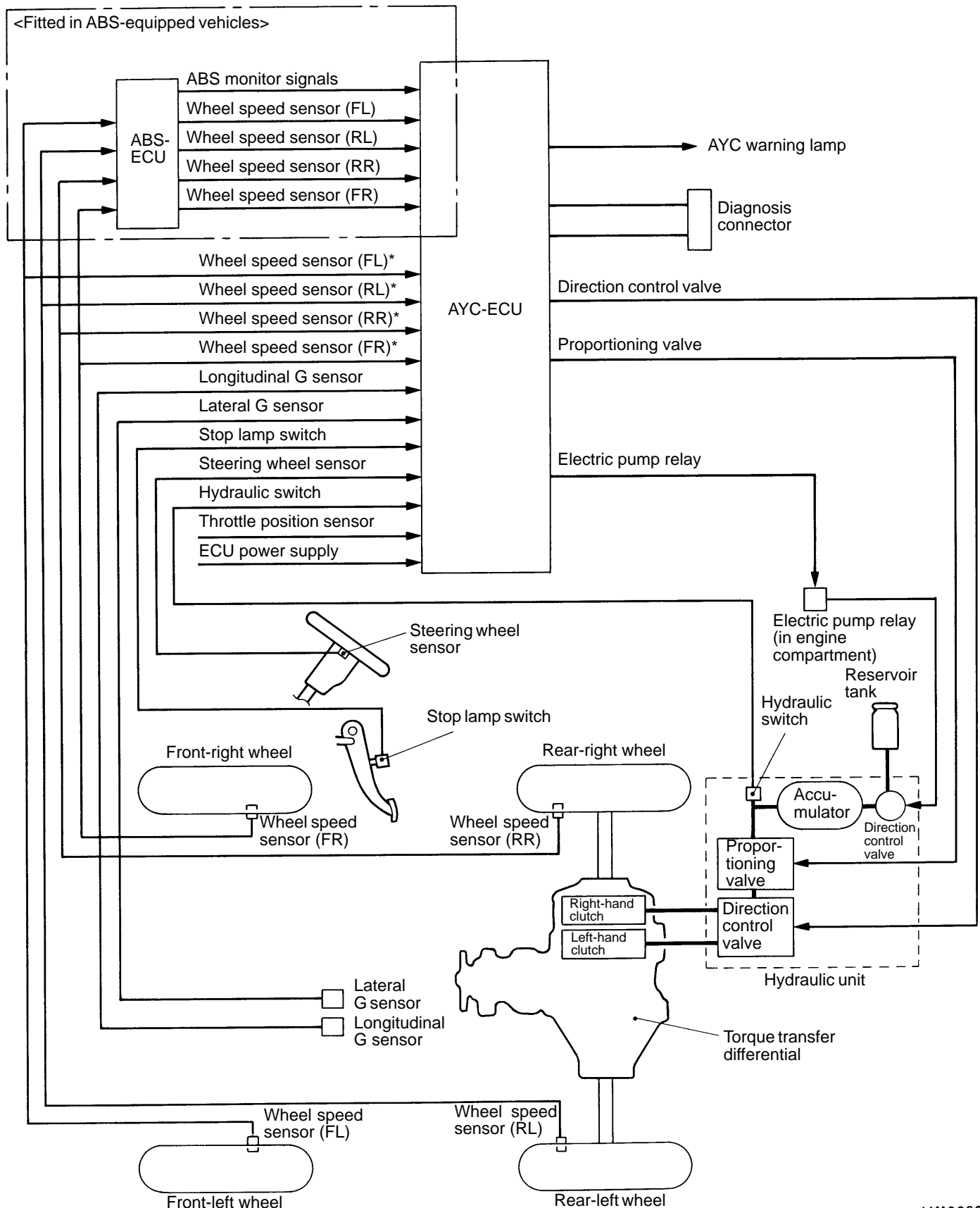
System Configuration



Major Components

Component		Function	Reference page
AYC-ECU		Calculates direction and magnitude of required torque transfers in accordance with data from sensors and switches, and controls hydraulic unit accordingly	2-20
		Controls diagnosis and fail-safe functions	2-22
ABS-ECU		Monitors ABS operating status	—
Throttle position sensor		Informs AYC-ECU when engine is idling	2-16
		Provides AYC-ECU with data on throttle valve opening	
AYC warning lamp		Illuminates in event of system failure (also illuminates for 1.5 seconds when ignition switch is turned to ON position)	2-22
Stop lamp switch		Provides AYC-ECU with data to enable evaluation of brake operating status	—
Longitudinal G sensor		Provides AYC-ECU with data on vehicle's rate of longitudinal acceleration	2-16
Lateral G sensor		Provides AYC-ECU with data on vehicle's rate of lateral acceleration	2-16
Steering wheel sensor		Provides AYC-ECU with data on steering wheel angle	2-16
		Informs AYC-ECU when steering wheel is in straight-ahead position	
Wheel speed sensor (one on each wheel)		Provides AYC-ECU with data on wheel speed	2-16
Hydraulic unit	Hydraulic switch	Provides AYC-ECU with data on accumulator pressure	2-17
	Electric pump	Produces hydraulic pressure for clutch actuation	
	Direction control valve	Determines whether hydraulic pressure is supplied to left-hand clutch or right-hand clutch	
	Proportioning valve	Controls supply of hydraulic pressure to clutches	
Electric pump relay		Supplies power to electric pump	—
Torque transfer differential		Apports torque to driven wheels	2-14

AYC System Configuration



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NOTE

*: Vehicles without ABS

■ ACTIVE YAW MOMENT CONTROL

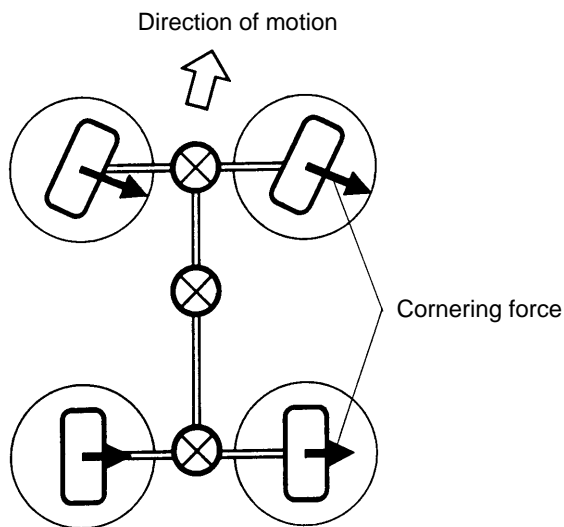
PURPOSE OF ACTIVE YAW MOMENT CONTROL

Active control of the vehicle's yaw moment enables all four tires to perform to their maximum potential, resulting in enhanced cornering performance and safety under a wide range of operating conditions.

CORNERING MODEL WITH YAW MOMENT ADDED

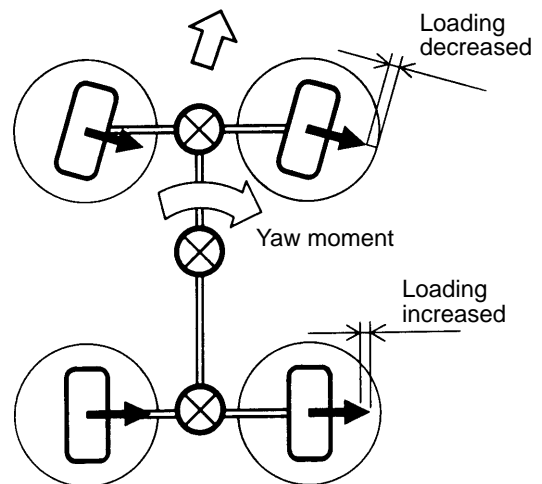
The addition of a yaw moment (created by causing a difference in driving force or braking force between the left and right tires) causes the vehicle to turn inward. The front-wheel cornering force caused by the steering wheel angle thus becomes smaller than that of a conventional vehicle, so cornering on any given radius becomes possible with a smaller steering wheel angle. The loading applied to the front tires decreases, and the loading applied to the rear tires increases accordingly.

<Conventional vehicle>



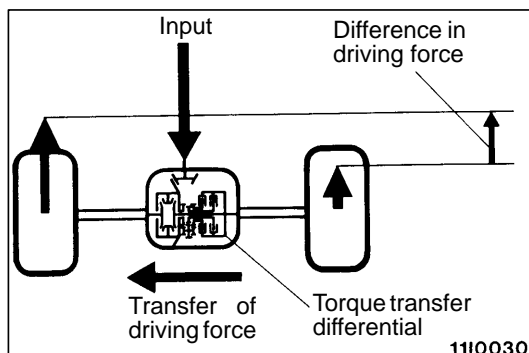
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<Vehicle with yaw moment added>



Cornering on given radius is possible with smaller steering wheel angle.

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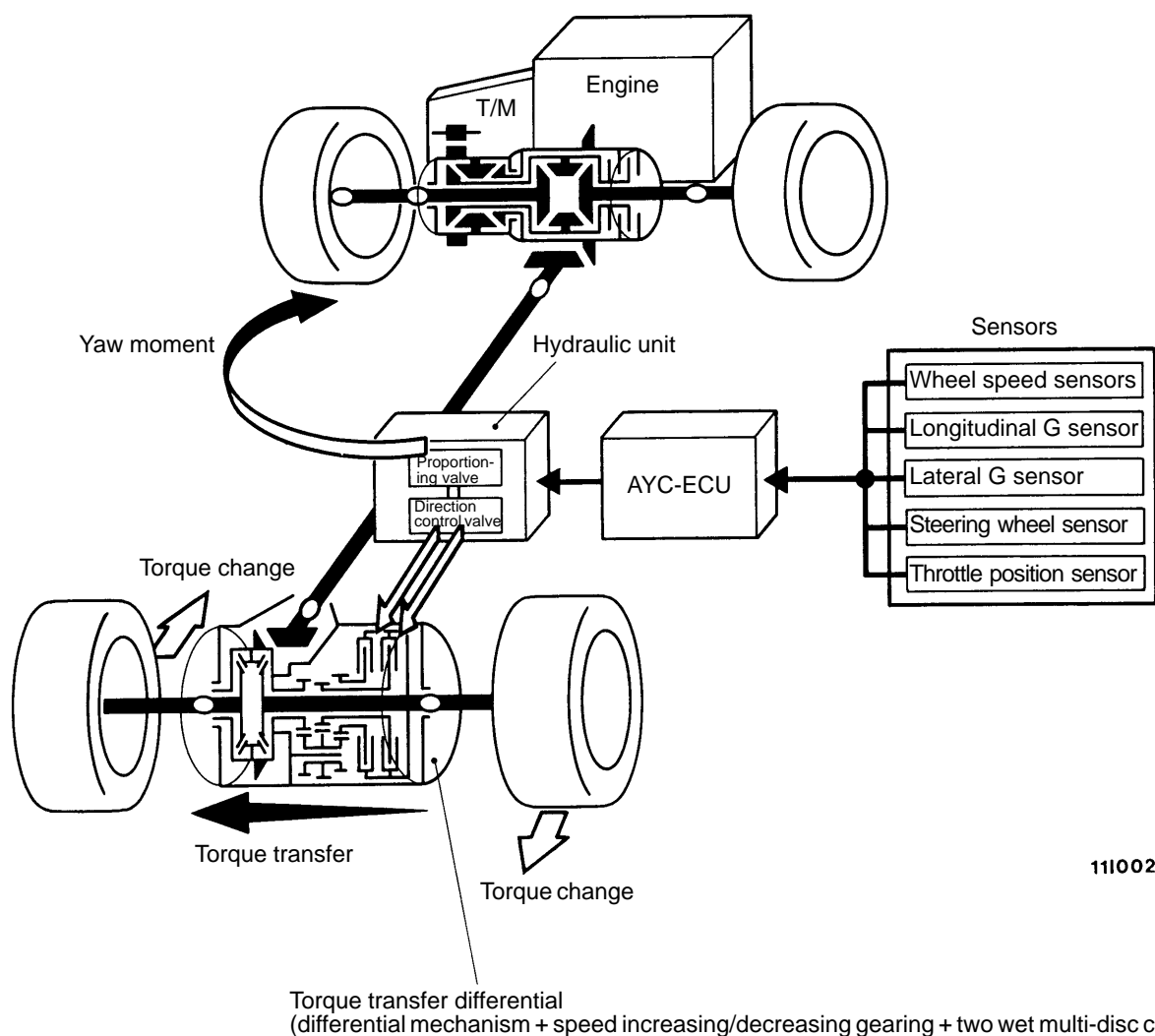
YAW MOMENT CREATION METHOD

The AYC system creates a yaw moment by using the torque transfer differential to control the difference in driving force between the left and right wheels.

■ STRUCTURE AND OPERATION

SYSTEM CONFIGURATION

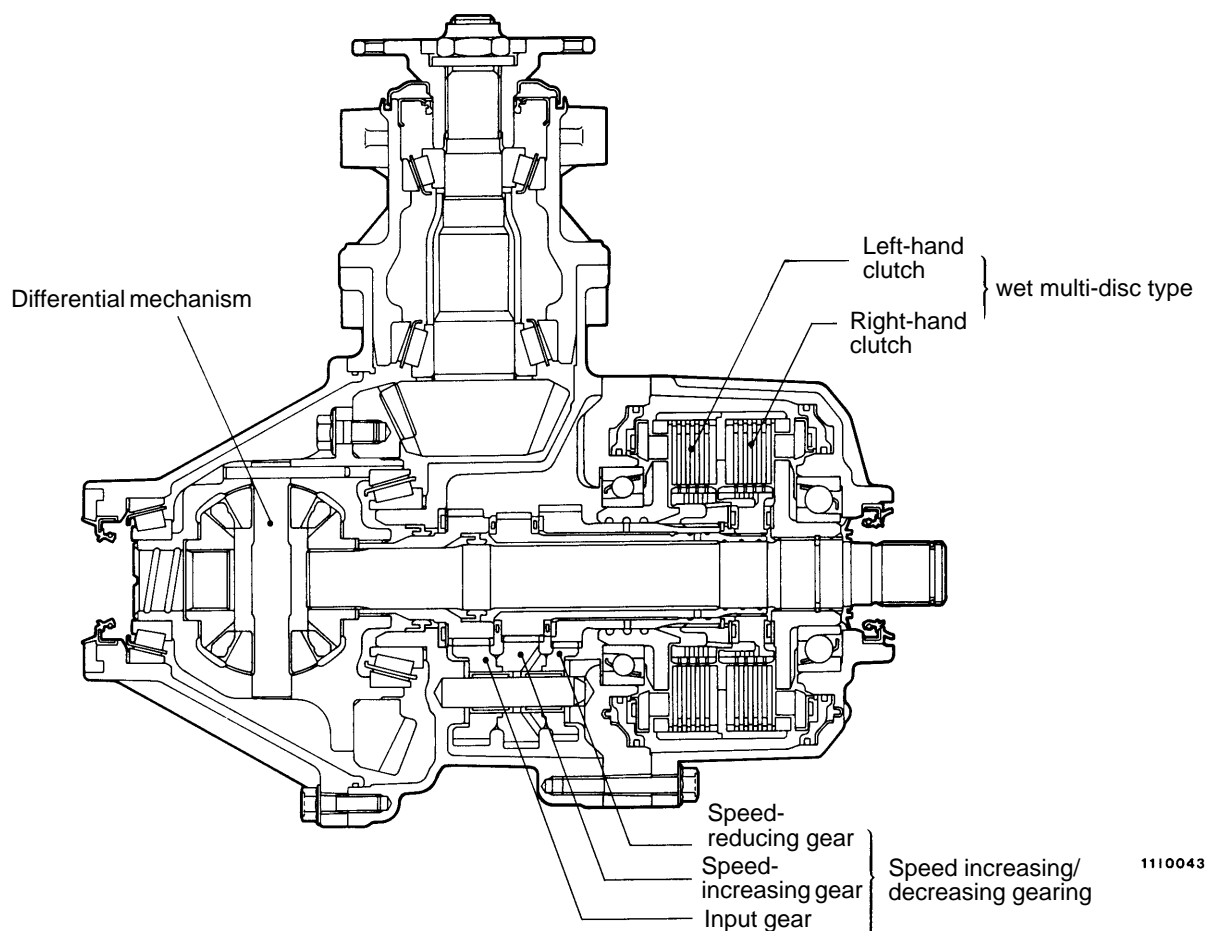
The AYC system's main components are the torque transfer differential (this is a rear differential that incorporates a torque transfer mechanism), the hydraulic unit, and the AYC-ECU that controls them. The hydraulic unit incorporates an electric pump, a direction control valve, and a proportioning valve. It supplies hydraulic pressure to the torque transfer differential. The AYC-ECU monitors driver inputs and road conditions in accordance with data from various sensors and determines the optimum magnitude and direction of torque transfers accordingly.



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TORQUE TRANSFER DIFFERENTIAL

The torque transfer differential consists of a differential mechanism, speed increasing/decreasing gearing, and two wet multi-disc clutches. The differential mechanism is lubricated by hypoid gear oil, and the speed increasing/decreasing gearing and clutches (these constitute the torque transfer section) are lubricated by AYC fluid.



[Differential Mechanism]

During cornering maneuvers, the differential mechanism allows the vehicle's inside and outside wheels to turn at different speeds.

[Speed Increasing/Decreasing Gearing]

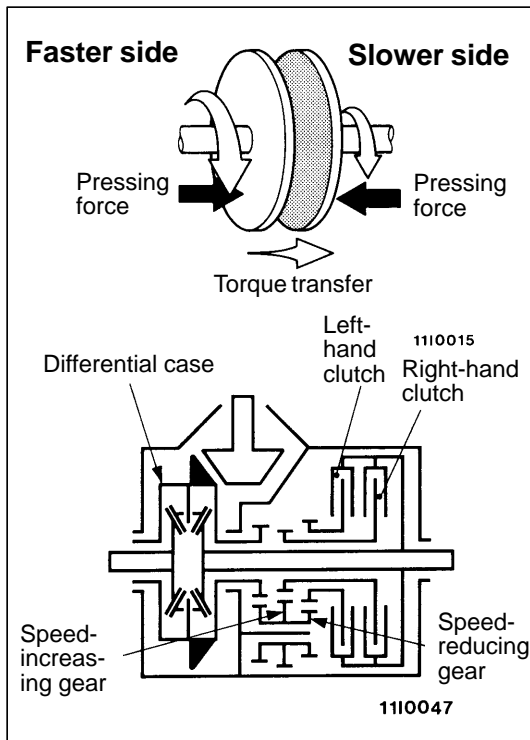
The speed increasing/decreasing gearing increases or decreases the speeds of the left- and right-hand wet multi-disc clutches relative to the speed of the right wheel.

[Wet Multi-Disc Clutches]

The wet multi-disc clutches transfer torque from the faster wheel to the slower wheel. When the left-hand clutch operates, the speed-reducing gear causes a torque transfer from the right wheel to the left wheel. When the right-hand clutch operates, the speed-increasing gear causes a torque transfer from the left wheel to the right wheel.

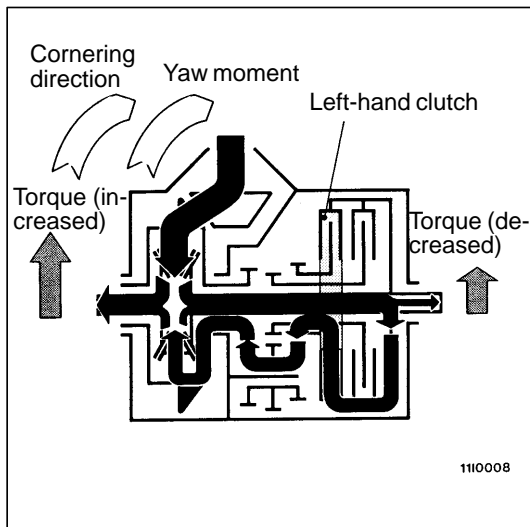
[Comparison of Torque Transfer Differential and LSD]

Device	Torque transfer differential	LSD
Components	Differential mechanism + speed increasing/decreasing gearing + two wet multi-disc clutches	Differential mechanism + one wet multi-disc clutch or viscous coupling unit
Function	Permits transfer of torque in either direction and thus enables control of yaw moment.	Transfers torque from inside wheel (during cornering maneuver) or spinning wheel to wheel on opposite side.



Principle of Operation in Torque Transfer Differential

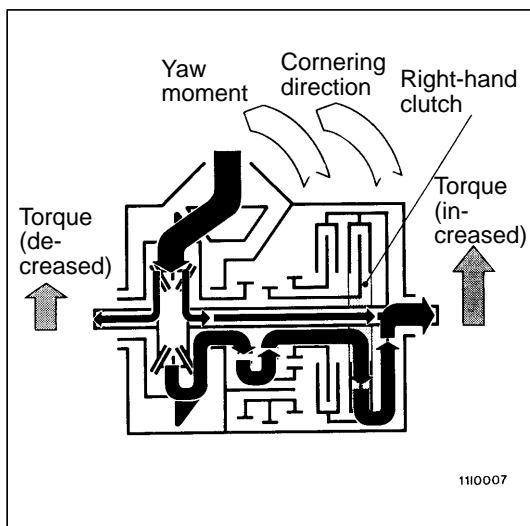
When two clutch plates with different rotational speeds are pressed against each other, torque is transferred from the faster disc to the slower disc. The amount of torque transferred is proportional to the force with which the discs are pressed together. In the torque transfer differential, these properties are utilized to allow torque to be transferred as required. The speed increasing/reducing gearing is permanently meshed. Relative to the input speed of the differential case, the left-hand clutch, which is meshed with the speed-reducing gear, turns more slowly and the right-hand clutch, which is meshed with the speed-increasing gear, turns more quickly. The housing of the left- and right-hand clutches is linked to the rear-right drive shaft, so activation of the left- or right-hand clutches permits torque to be transferred toward either side.



Flow of Torque

(1) With Left-Hand Clutch Activated

When the left-hand clutch is activated to increase the torque applied to the left wheel, some of the torque applied to the right wheel is directed back to the differential case and thence to the left wheel. Thus, a rightward yaw moment is applied to the vehicle.



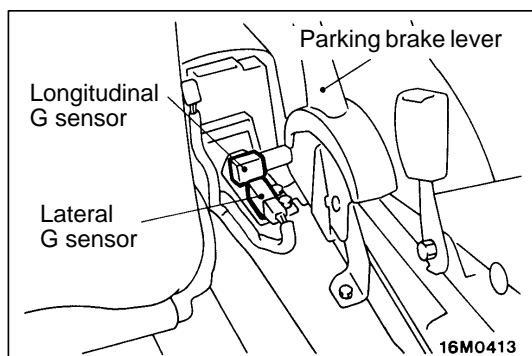
(2) With Right-Hand Clutch Activated

When the right-hand clutch is activated to increase the torque applied to the right wheel, additional torque is directed toward the right wheel from the differential case. Thus, a leftward yaw moment is applied to the vehicle.

SENSORS

Wheel Speed Sensors

The wheel speed sensors are the same as those used with ABSs. On an ABS-equipped vehicle, signals from the wheel speed sensors are transmitted to the AYC-ECU after being processed by the ABS-ECU.

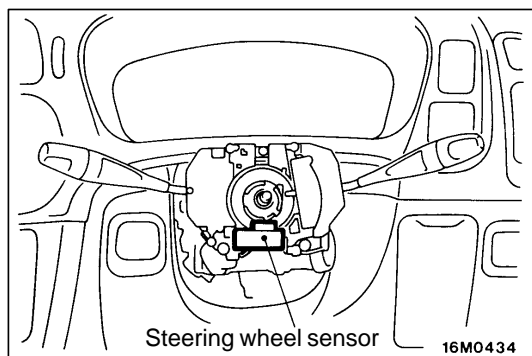


Longitudinal G Sensor

The longitudinal G sensor is the same as that used with the ABSs of earlier models. On an ABS-equipped vehicle, the sensor is shared by the AYC system and ABS.

Lateral G Sensor

The lateral G sensor is the same as the longitudinal G sensor. It is mounted at 90° to the longitudinal G sensor to enable sensing of lateral acceleration.



Steering Wheel Sensor

The steering wheel sensor senses the degree of steering wheel rotation and detects when the steering wheel is centered. It is incorporated into the column switch on the steering column.

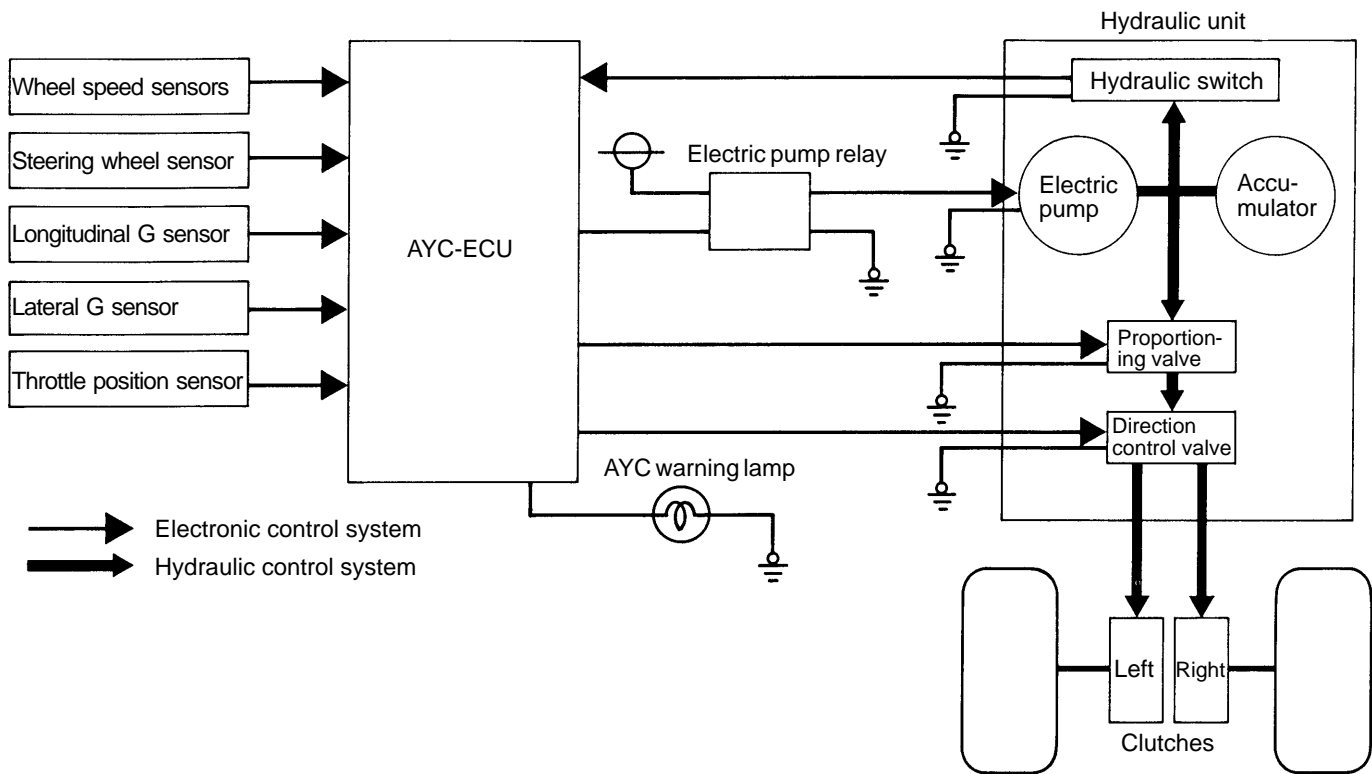
Throttle Position Sensor

The throttle position sensor is used by the AYC system and for engine control purposes.

HYDRAULIC UNIT

The hydraulic unit consists of an accumulator section (this contains an electric pump, a hydraulic switch, and an accumulator) and a pressure control section (this contains a proportioning valve and a direction control valve).

In the accumulator section, the pump is activated intermittently to maintain the required level of control pressure in the accumulator. In the pressure control section, signals from the AYC-ECU cause the proportioning valve and direction control valve to supply pressure to the clutches in the torque transfer differential.

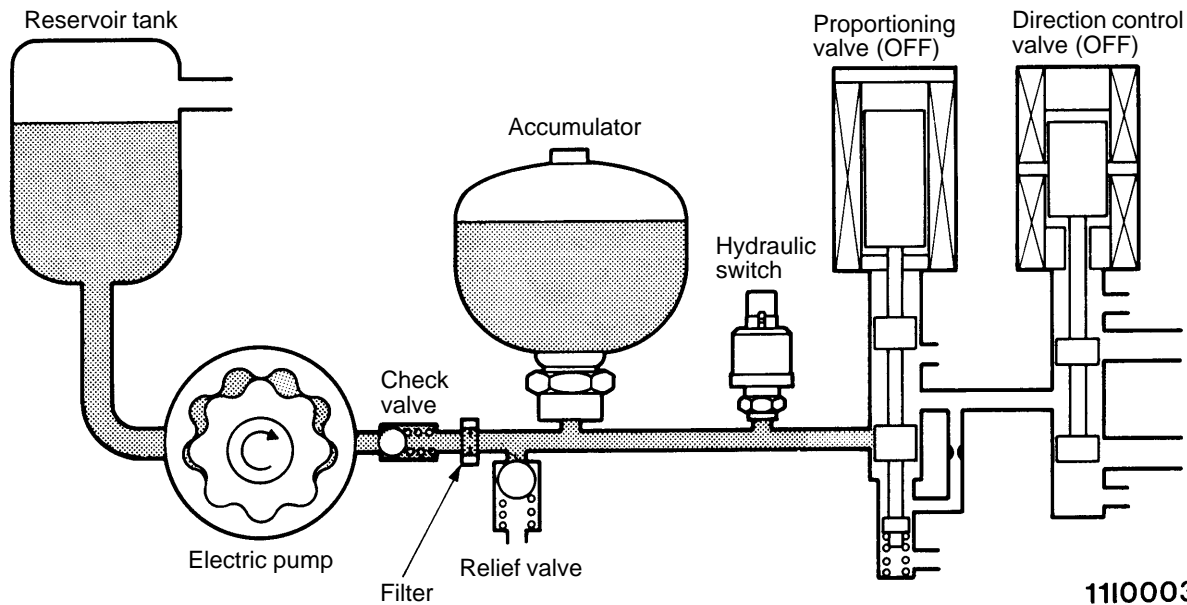


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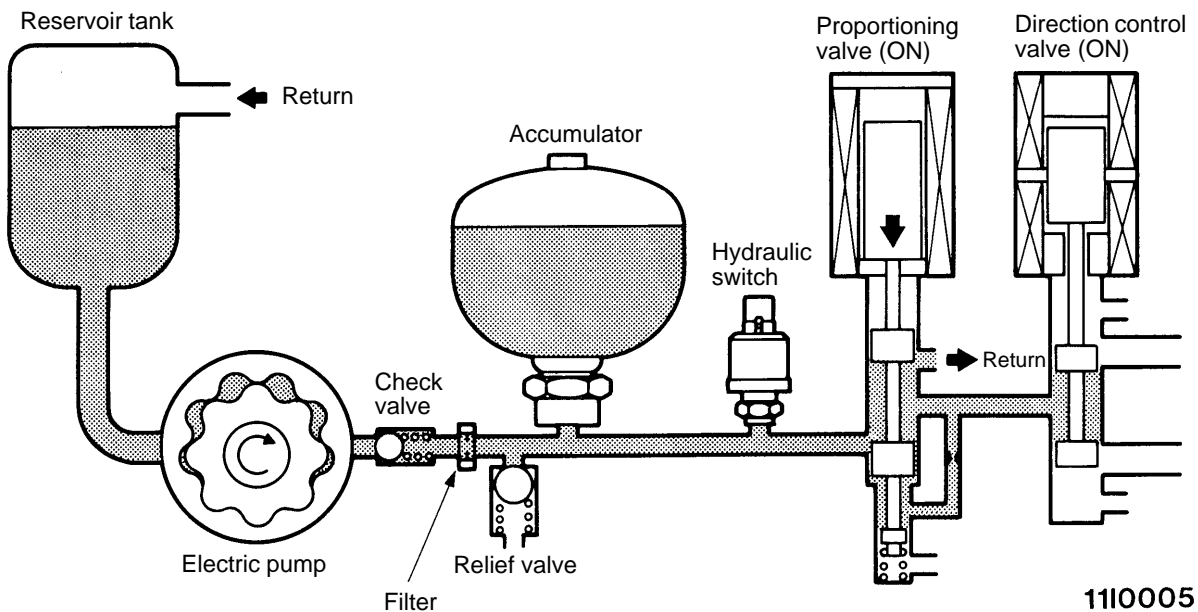
Item	Specification
Electric pump	Trochoid type
Hydraulic fluid	ATF-SPII
Proportioning valve	Current control type (direct-acting, electromagnetic, proportional pressure control valve)
Direction control valve	Voltage control type (spring-centered 4-port, 2-solenoid, 3-position valve)

[Operation]**(1) Proportioning Valve and Direction Control Valve OFF**

The proportioning valve and direction control valve are both closed, so no hydraulic pressure is supplied to the differential.

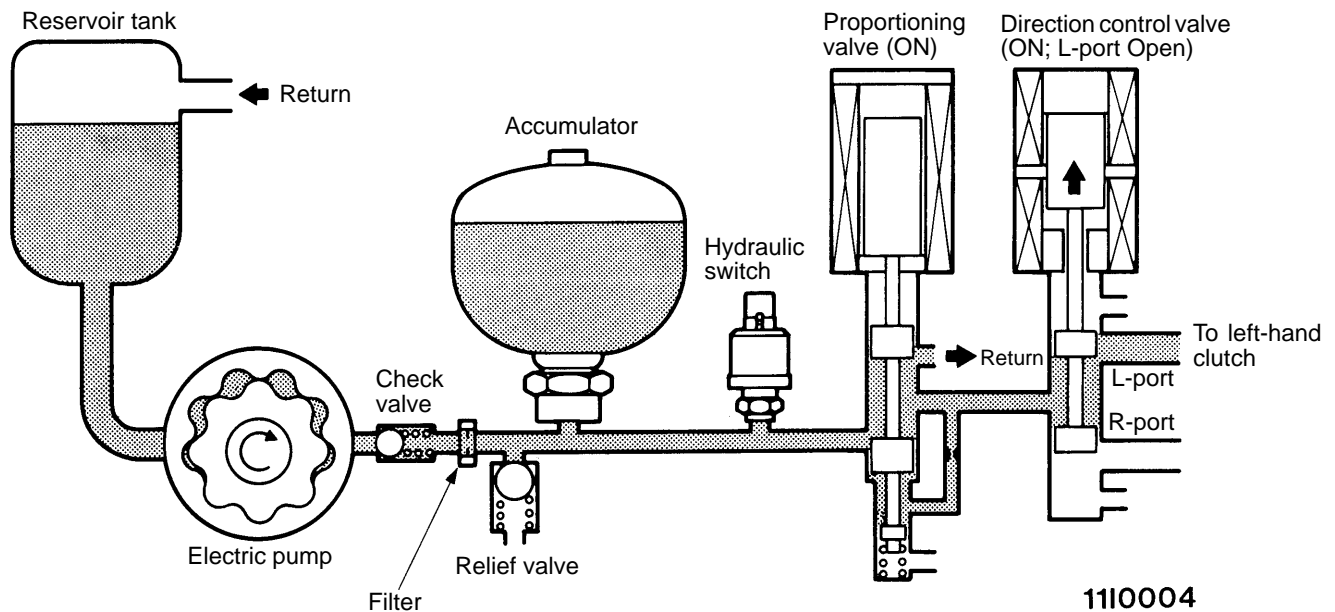
**(2) Proportioning Valve ON and Direction Control Valve OFF**

The proportioning valve is opened as required to regulate the control pressure.

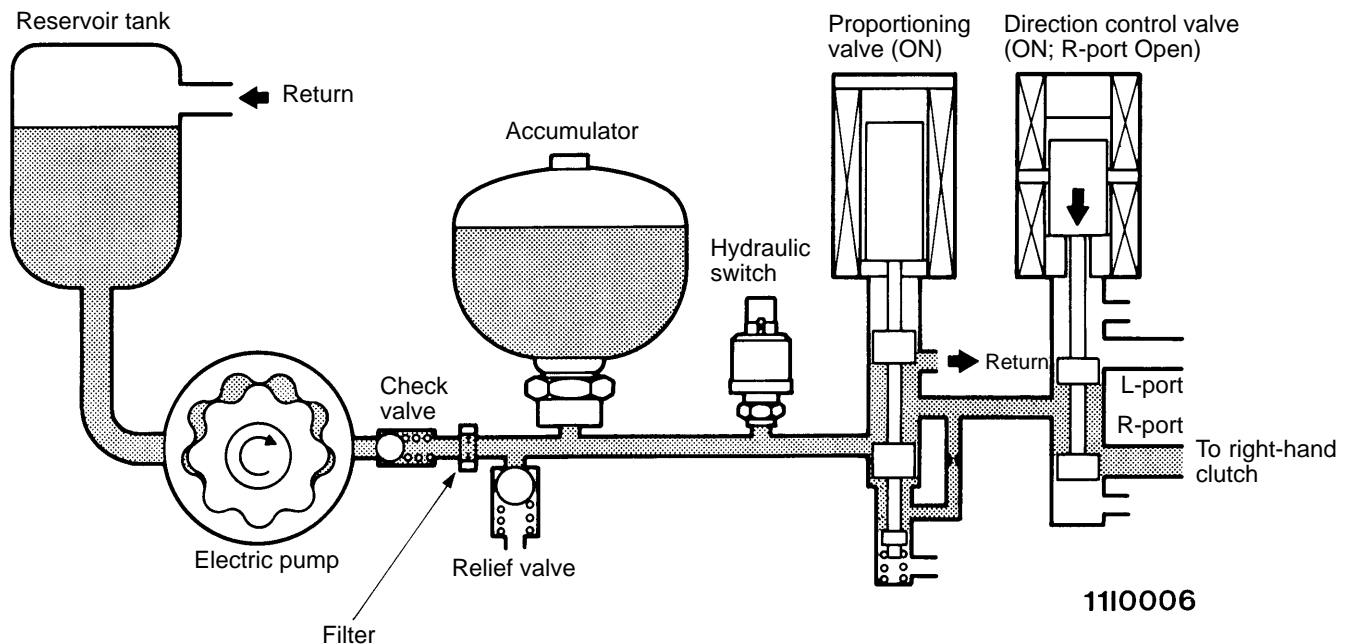


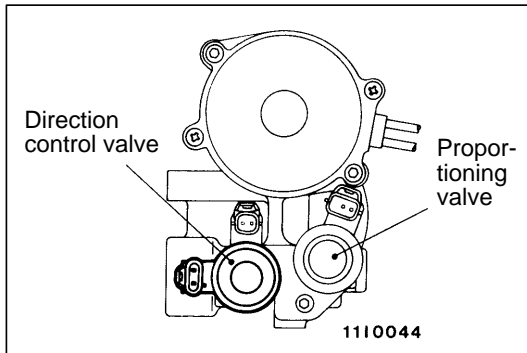
(3) Proportioning Valve ON and Direction Control Valve ON (L-Port Open)

Opening of the direction control valve's L-port allows the regulated hydraulic pressure to reach the left-hand clutch from the proportioning valve.

**(4) Proportioning Valve ON and Direction Control Valve ON (R-Port Open)**

Opening of the direction control valve's R-port allows the regulated hydraulic pressure to reach the right-hand clutch from the proportioning valve.



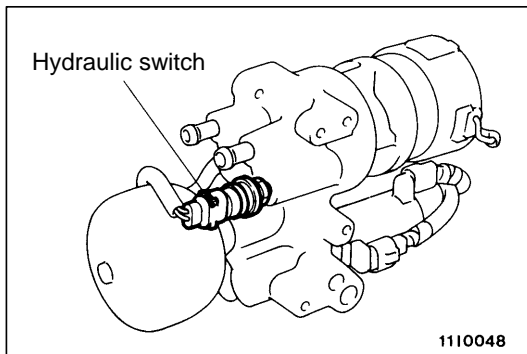


Proportioning Valve

The proportioning valve adjusts the control pressure in accordance with signals from the AYC-ECU.

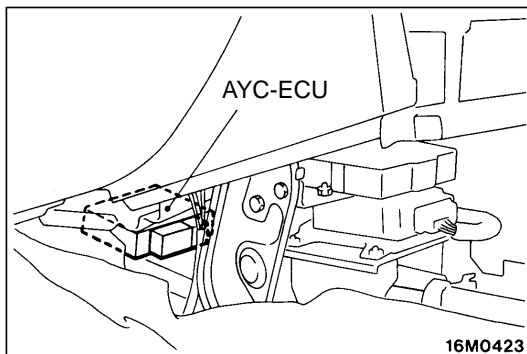
Direction Control Valve

The direction control valve directs the control pressure to the left- and right-hand clutches in accordance with signals from the AYC-ECU.



Hydraulic Switch

The hydraulic switch issues signals to the AYC-ECU in accordance with the accumulator pressure. The AYC-ECU activates the electric pump in accordance with these signals.



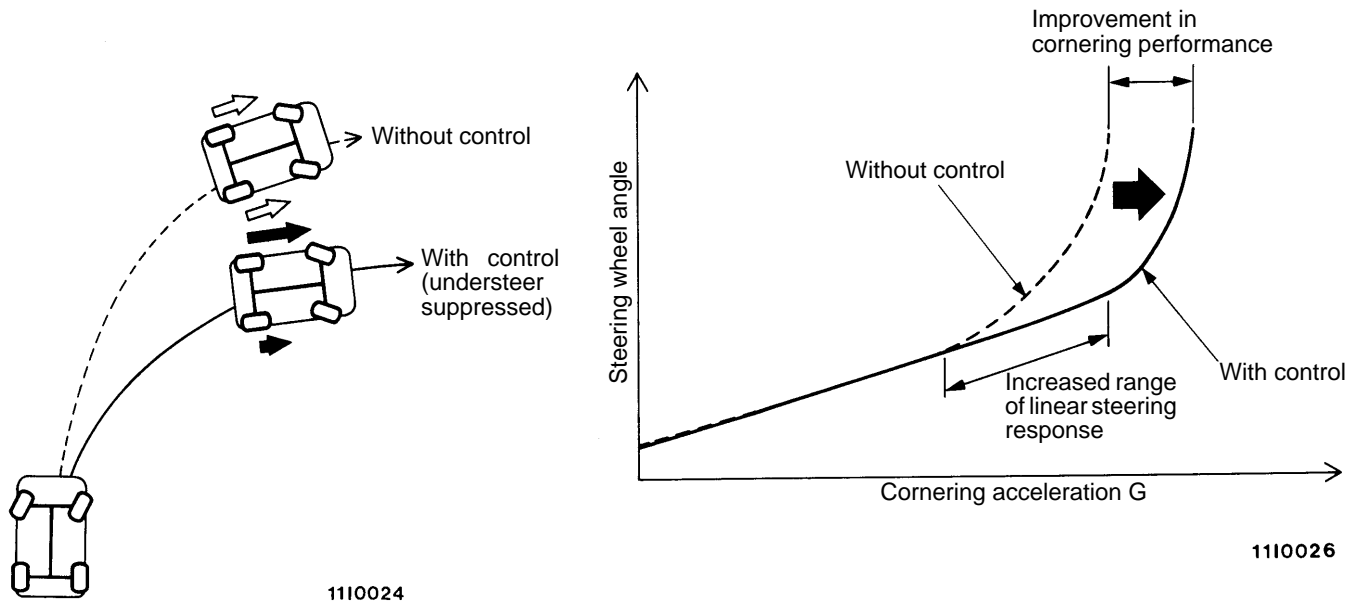
AYC-ECU

The AYC-ECU evaluates the driving, vehicle, and road conditions using signals from various sensors and controls the hydraulic unit accordingly. Further, the AYC-ECU has a diagnosis function. When it identifies a fault using this function, it terminates the system's operation and illuminates the AYC warning lamp.

Benefits of Control

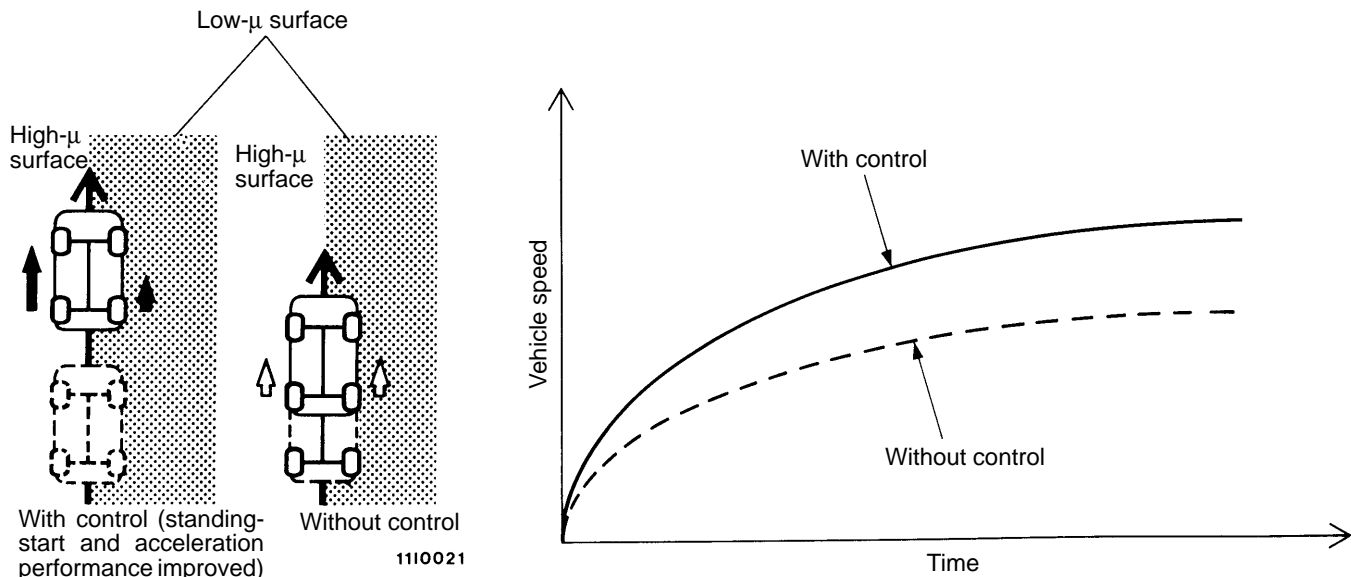
(1) Control During Simultaneous Acceleration and Cornering and When Steering Wheel Angle is Increased

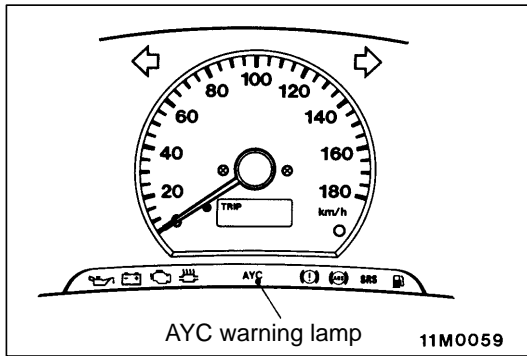
Understeer tends to occur when a vehicle accelerates and corners simultaneously and when its steering wheel angle is increased. Therefore, the AYC system creates a yaw moment in the cornering direction by transferring torque to the outside wheel. As a result, the front wheels' cornering force load diminishes (in other words, the front wheels' lateral slip force decreases) such that understeer is suppressed. The overall benefits are linear response to steering inputs with higher levels of cornering acceleration G and accordingly enhanced controllability during cornering maneuvers.



(2) Control on Poor Road Surfaces

When the vehicle makes a standing start with its left and right wheels on surfaces with significantly different friction (μ) levels or is driven on a rough surface, the AYC system transfers torque to the wheel on the higher-friction side, thereby suppressing wheelspin on the lower-friction side. Effectively, the system functions as an LSD, thus enabling smooth acceleration and enhanced running performance on poor roads.





AYC Warning Lamp Control

The AYC warning lamp is illuminated at the following times:

- (1) For approximately 1.5 seconds when the ignition switch is turned to the ON position (to enable the user to check whether the bulb has blown);
- (2) In the event of a fault in the AYC system (the lamp stays illuminated until the ignition switch is turned to the OFF position).

Diagnosis Functions

To facilitate inspection of the AYC system, the AYC-ECU has the following functions:

- Diagnosis code output
- Service data output
- Actuator test

All of these functions can be utilized using a MUT-II.

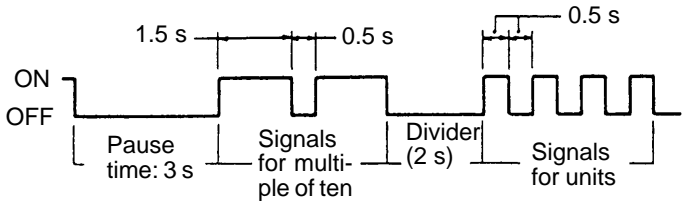
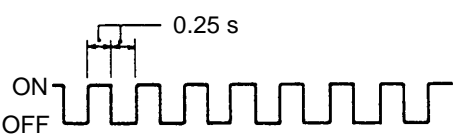
Diagnosis Codes

There are 23 diagnosis items. Diagnosis results are stored in a volatile memory. When the ignition switch is turned to the OFF position, a backup battery ensures that the memory's contents are retained. (The memory's contents are lost if the battery is disconnected.) Diagnosis codes can be read using a MUT-II or the AYC warning lamp. (The AYC warning lamp indicates codes by flashing.)

(1) Diagnosis Items

Code No.	Diagnosis item	Warning lamp: ○: ON —: OFF	Meaning
12	Power supply voltage (bulb power supply)	—	Open/short circuit or voltage drop in power-supply-voltage-related circuitry
21	Wheel speed sensor (front-right)	○	Open/short circuit in circuitry related to wheel speed sensor (front-right)
22	Wheel speed sensor (front-left)	○	Open/short circuit in circuitry related to wheel speed sensor (front-left)
23	Wheel speed sensor (rear-right)	○	Open/short circuit in circuitry related to wheel speed sensor (rear-right)
24	Wheel speed sensor (rear-left)	○	Open/short circuit in circuitry related to wheel speed sensor (rear-left)
25	Wheel speed sensor	—	Wheels of different diameters fitted
26	Wheel speed sensor	○	Fault in wheel speed sensor(s)
31	Steering wheel sensor	○	Open circuit in circuitry related to steering wheel sensor
32	Steering wheel sensor	○	Short circuit in circuitry related to steering wheel sensor
33	Steering wheel sensor	○	Steering wheel sensor stuck in H position
34	Steering wheel sensor	○	Short circuit in circuitry related to steering wheel sensor
41	Throttle position sensor	○	Open/short circuit in circuitry related to throttle position sensor
51	Longitudinal G sensor	○	Open/short circuit in circuitry related to longitudinal G sensor
52	Longitudinal G sensor	○	Longitudinal G sensor jammed
56	Lateral G sensor	○	Open/short circuit in circuitry related to lateral G sensor
61	Stop lamp switch	○	Open circuit in circuitry related to stop lamp switch
65	ABS	○	Open circuit in ABS output line; fault in ABS
71	Proportioning valve	○	Open/short circuit in circuitry related to proportioning valve
72	Direction control valve (right)	○	Open/short circuit in circuitry related to direction control valve (right)
73	Direction control valve (left)	○	Open/short circuit in circuitry related to direction control valve (left)
81	Electric pump relay	○	Open/short circuit in circuitry related to electric pump relay
82	Hydraulic switch	○	Open circuit in circuitry related to hydraulic pressure switch; pressure leak; fault in electric pump; fusible link of motor blown
83	Hydraulic switch	○	Open circuit in circuitry related to hydraulic pressure switch; electric pump relay contacts fused together

Indication of Diagnosis Codes Using AYC Warning Lamp

Example: Indication of diagnosis code No. 24	Normal flashing
 <p>1.5 s</p> <p>0.5 s</p> <p>0.5 s</p> <p>ON</p> <p>OFF</p> <p>Pause time: 3 s</p> <p>Signals for multiple of ten</p> <p>Divider (2 s)</p> <p>Signals for units</p> <p>14N0173</p>	 <p>0.25 s</p> <p>ON</p> <p>OFF</p> <p>14N0174</p>

(2) Deletion of Diagnosis Codes from Memory

NOTE

- (1) It is not possible to delete diagnosis codes using a MUT-II unless the AYC-ECU is functioning normally.
- (2) The only way to check whether the memory contents have been deleted is to try displaying them again.
- (3) Commands can still be received from the MUT-II after the memory contents have been deleted. To confirm diagnosis codes, operate the MUT-II again.

<With MUT-II>

Delete the memory contents in accordance with messages displayed on the MUT-II. For details, refer to the MUT-II Reference Manual or Operating Instructions.

<Without MUT-II>

Delete the memory contents by disconnecting the battery for 10 seconds or longer. (The memory contents are cleared if the supply of backup power to the AYC-ECU is interrupted for 10 seconds or longer.)

Service Data Output

Service data output items are shown in the following table.

Item No.	Service data item	Unit
01	Wheel speed sensor (front-right)	km/h (indicated in increments of 1 km/h)
02	Wheel speed sensor (front-left)	km/h (indicated in increments of 1 km/h)
03	Wheel speed sensor (rear-right)	km/h (indicated in increments of 1 km/h)
04	Wheel speed sensor (rear-left)	km/h (indicated in increments of 1 km/h)
05	Wheel speed sensor (front-right) (0.2 km/h)	km/h (indicated in increments of 0.2 km/h)
06	Wheel speed sensor (front-left) (0.2 km/h)	km/h (indicated in increments of 0.2 km/h)
07	Wheel speed sensor (rear-right) (0.2 km/h)	km/h (indicated in increments of 0.2 km/h)
08	Wheel speed sensor (rear-left) (0.2 km/h)	km/h (indicated in increments of 0.2 km/h)
10	Vehicle speed	km/h
11	Battery voltage	V
15	Throttle position sensor	mV
19	G sensor (longitudinal)	V
20	G sensor (lateral)	V
22	Steering wheel angle	deg
23	Steering wheel angular velocity	deg/s
45	Idle switch	ON/OFF
46	Steering wheel sensor – STN terminal	ON/OFF
47	Steering wheel sensor – ST1 terminal	ON/OFF
48	Steering wheel sensor – ST2 terminal	ON/OFF
50	Stop lamp switch	ON/OFF
56	Pressure switch	High/Low
59	ABS monitor	ON/OFF

Actuator Tests

- (1) An actuator test can be performed only when the following conditions are all satisfied:
- The speed indicated by each wheel speed sensor is 20 km/h or lower.
 - No system fault is detected.
 - The steering wheel angle is within 30° of the steering wheel's center position.
- (2) Forced activation is cancelled if any of the following conditions exists:
- The speed indicated by any wheel speed sensor is higher than 20 km/h.
 - A system fault is detected.
 - The forced activation time elapses.
 - The MUT-II is disconnected.
 - The MUT-II's clear key is pressed.

Item No.	Meaning	Activation	Activation time	Remarks
10	Air bleed	Current supplied to proportioning valve in accordance with steering wheel angle; direction control valve activated	5 min.	Check that air does not emerge from bleeder plug on torque transfer differential.
11	Fluid volume check	Direction control valve activated leftward and rightward 20 times	Until end of operation	Check fluid level in reservoir tank
12	Electric pump operation check	Electric pump activated for 5 seconds	Until end of operation	Check pump operation by listening to pump's operating sound.
13	Clutch operation check (left-hand)	Direction control valve activated; maximum hydraulic pressure supplied to left-hand clutch	1 min.	With wheels raised, check operation from speed difference between rear wheels.
14	Clutch operation check (right-hand)	Direction control valve activated; maximum hydraulic pressure supplied to right-hand clutch	1 min.	With wheels raised, check operation from speed difference between rear wheels.
15	Control OFF	Electric pump relay turned OFF; AYC system deactivated	—	During on-road operation, check difference in behavior with AYC system switched ON and OFF.