

GROUP 35B

FOUR-WHEEL ANTI-LOCK BRAKE SYSTEM (4ABS)

CONTENTS

GENERAL DESCRIPTION.....	35B-2	BRAKE MODULATOR (ABS-ECU) ..	35B-9
SENSORS	35B-6	SYSTEM OPERATION	35B-10
ACTUATORS.....	35B-8		

GENERAL DESCRIPTION

M2351000100186

Top components such as Brembo™ brakes, EBD and sports ABS improve braking power and braking stability.

SPORTS ABS

- 4-wheel independent control optimizes the brake force to each wheel to achieve a balance of improved braking force and braking stability.
- A steering angular velocity sensor was added to monitor the steering angle status. Braking force is altered in response to the steering status to improve the quality of steering when braking in corners.
- The steering angular velocity sensor, lateral G-sensor and longitudinal G-sensor accurately monitor driving conditions and optimize ABS control to match the specific driving conditions.

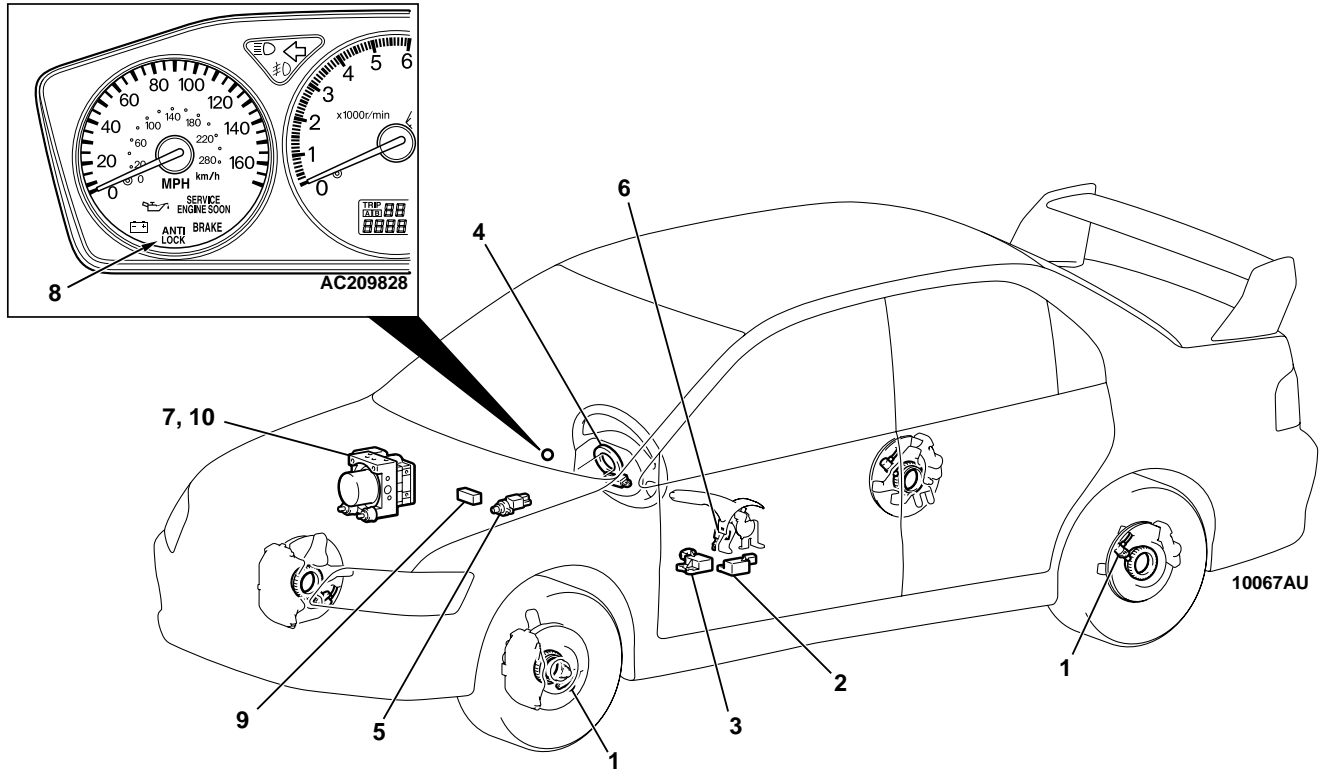
EBD (Electronic Brake-force Distribution system)

- Rear brake power is electronically controlled to optimize performance in accordance with road and load conditions and to ensure optimal distribution of braking force between the front and rear brakes.
- Rear brake fluid pressure control employs a brake modulator hydraulic unit solenoid valve that made it possible to eliminate the pressure control valves (proportioning valves).
- Effective use of rear wheel brake force reduces temperature build-up in the front brakes under hard braking conditions.
- Independent control of the left and right rear brakes when braking during cornering achieves a balance of improved vehicle stability and braking force.

SPECIFICATIONS

ITEM		LANCER EVOLUTION		LANCER	
ABS control method		4-sensor, 4-channel		4-sensor, 4-channel	
No. of ABS rotor teeth		Front	43	43	
		Rear	43	43	
ABS sensor	Type	Magnet coil type		Magnet coil type	
	Gap between sensor and rotor mm (in)	Front	0.85 (0.033) <Non-adjustable type>	0.85 (0.033) <Non-adjustable type>	
		Rear	0.60 (0.023) <Non-adjustable type>	0.89 (0.035) <Non-adjustable type>	

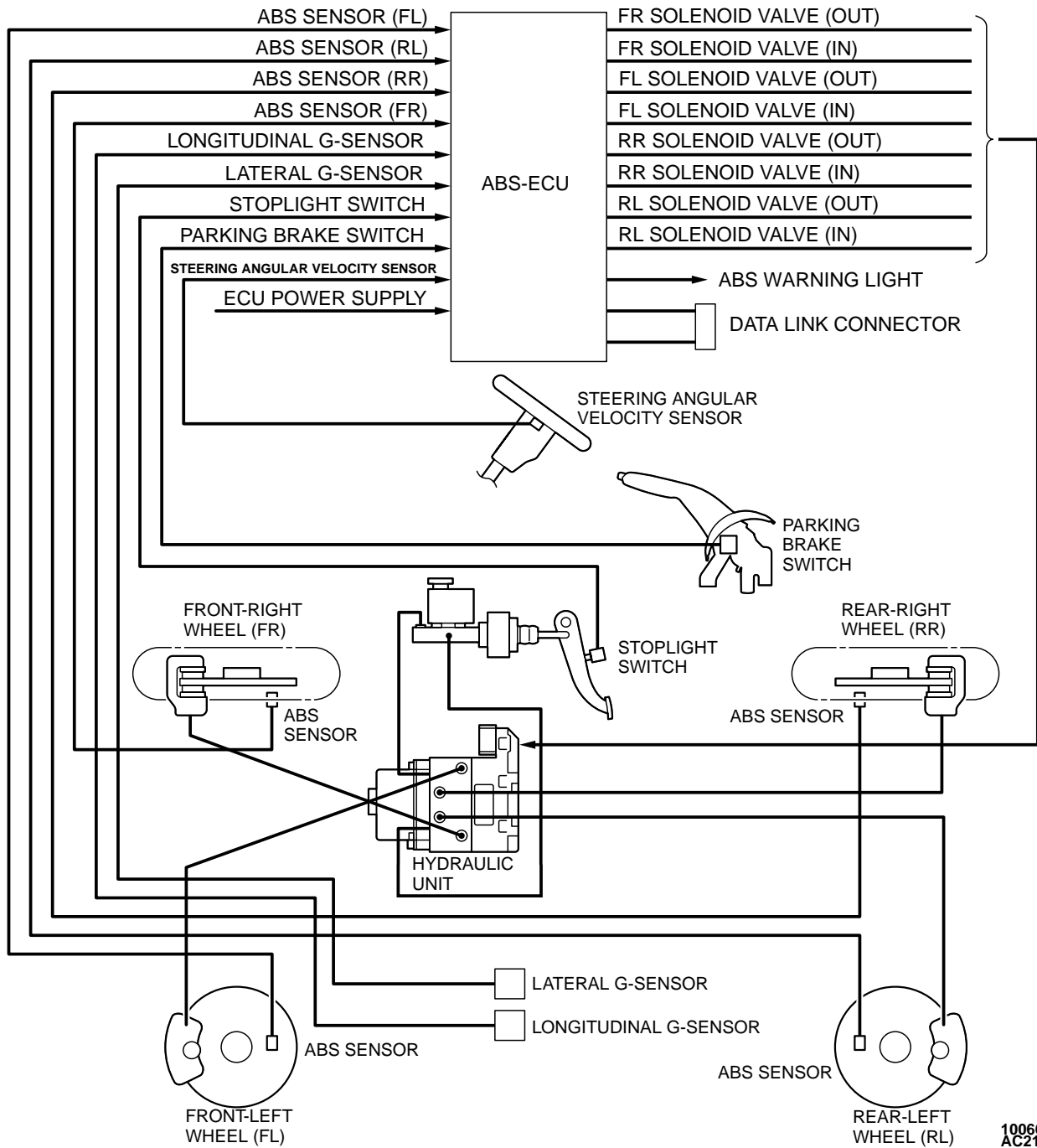
CONSTRUCTION DIAGRAM



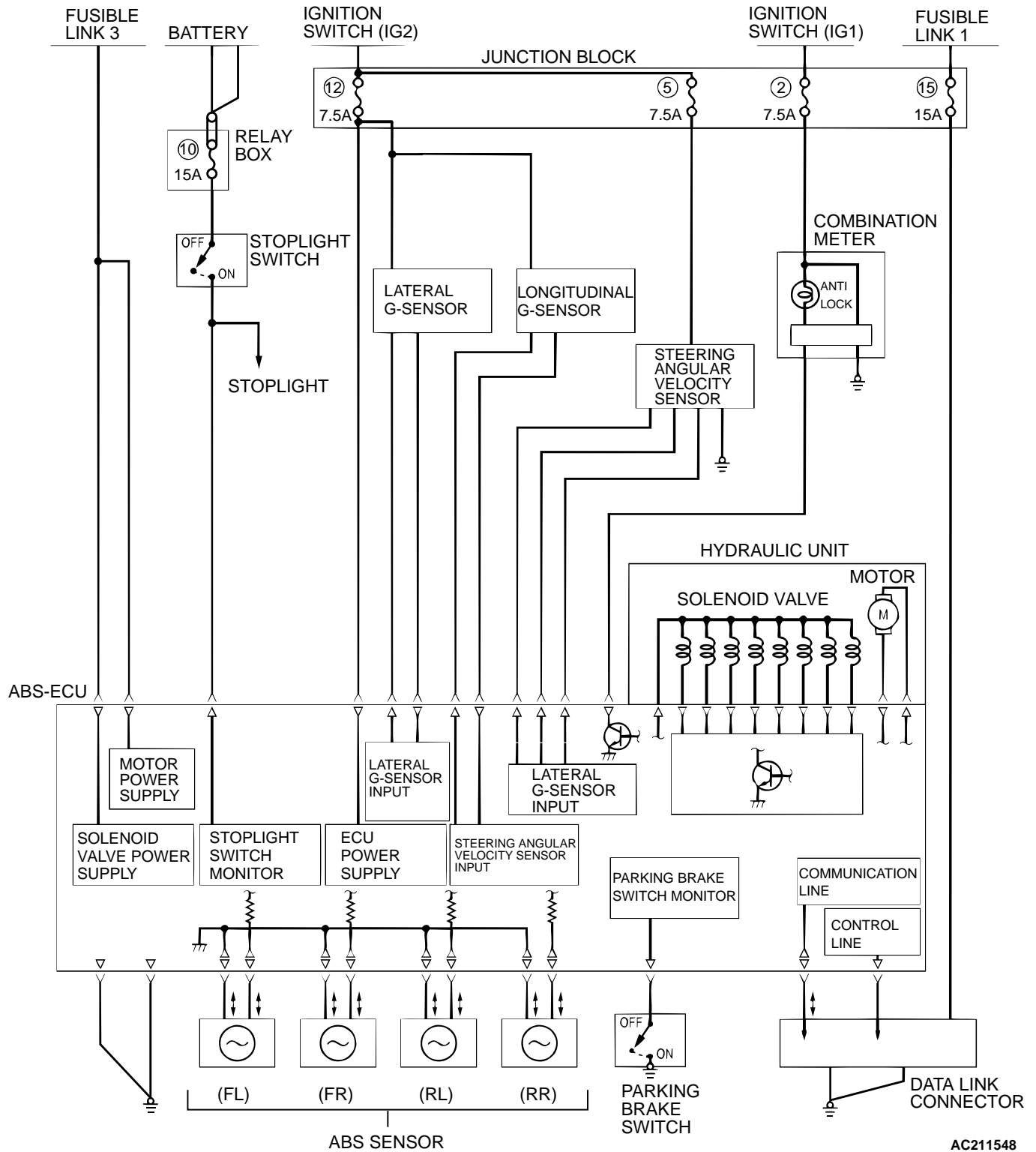
AC211546AB

NAME OF PART		NO.	OUTLINE OF FUNCTION
Sensor	ABS sensor	1	Sends alternating current signals at frequencies which are proportional to the rotation speeds of each wheel to the ABS-ECU.
	Lateral G-sensor	2	Sends data on vehicle's rate of lateral acceleration to the ABS-ECU.
	Longitudinal G-sensor	3	Sends data on vehicle's rate of longitudinal acceleration to the ABS-ECU.
	Steering angular velocity sensor	4	Sends data on steering wheel angle to the ABS-ECU. Indicates the ABS-ECU when steering wheel is in straight-ahead position.
	Stoplight switch	5	Sends a signal to the ABS-ECU to indicate whether the brake pedal is depressed or not.
	Parking brake switch	6	Sends a signal to the ABS-ECU to indicate whether the parking brake lever is pulled or not.
Actuator	Hydraulic unit	7	Drives the solenoid valves according to signals from the ABS-ECU in order to control the brake hydraulic pressure for each wheel.
	ABS warning light	8	Illuminates in response to signals from the ABS-ECU when a problem develops in the system.
Data link connector		9	Outputs the diagnostic trouble codes and allows communication with the scan tool.
Brake modulator (ABS-ECU)		10	Controls actuators (described above) based on the signals coming from each sensor. Controls the self-diagnosis and fail-safe functions. Controls the diagnostic function (scan tool compatible).

SYSTEM CONFIGURATION DIAGRAM



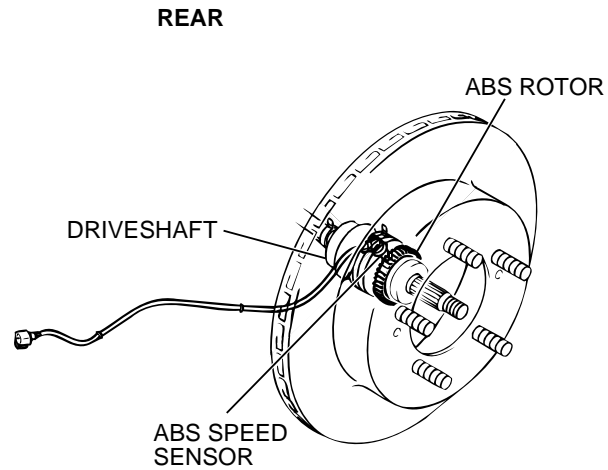
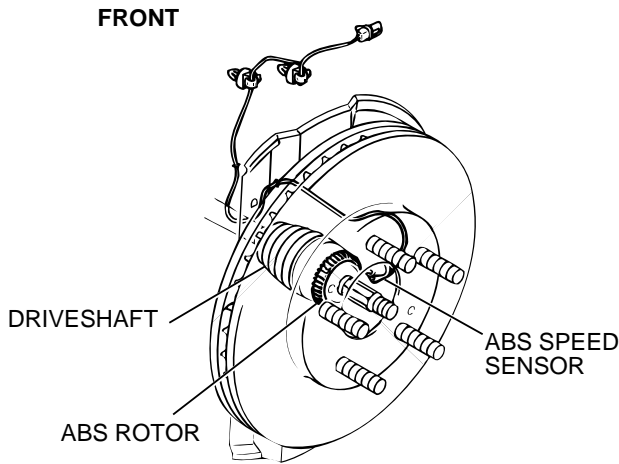
ABS ELECTRICAL CIRCUIT DIAGRAM



SENSORS

M2351001000137

ABS SENSOR

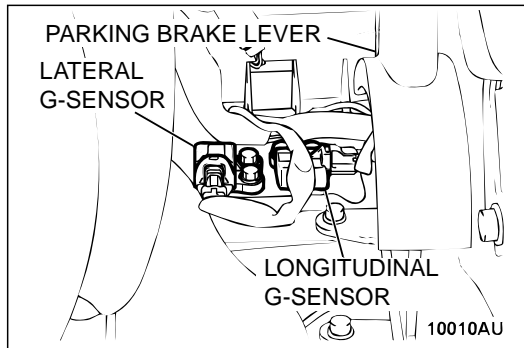


AC211549AB

The ABS sensors consist of fixed ABS speed sensors and the ABS rotors that rotate at the same speed as the wheels, that output alternating current signals at frequencies which are proportional to the wheel speed.

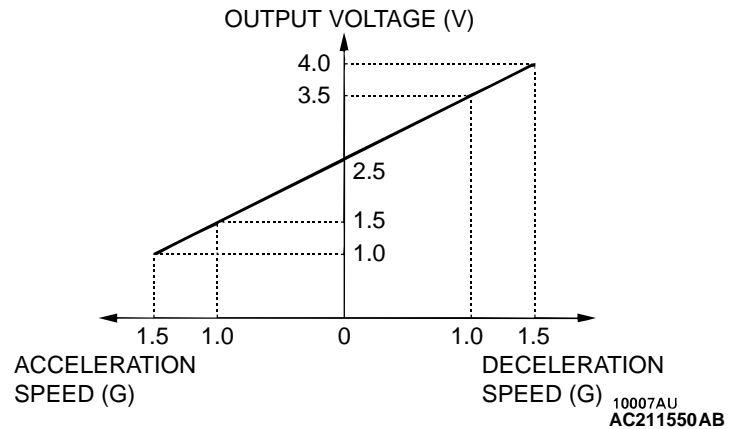
- The ABS rotors (43 teeth) are installed to the drive shafts, and the ABS speed sensors are installed to knuckles.
- The gap between the ABS rotors and the ABS speed sensors are non-adjustable at both the front and rear to improve serviceability.

LATERAL G-SENSOR/LONGITUDINAL G-SENSOR

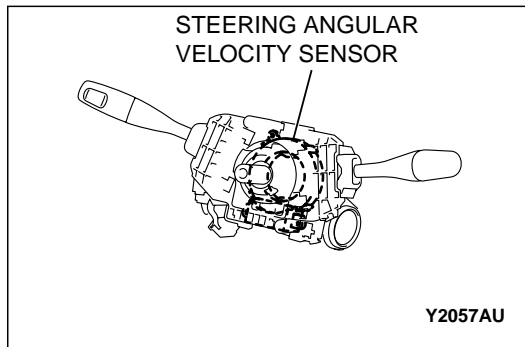


The longitudinal G-sensor detects the acceleration in the lateral direction of the vehicle, and are basically the same as those used conventionally. The lateral G-sensor is used for detecting the acceleration along the sides of the vehicle by changing the installing direction by 90 degree angle. The same sensor as the longitudinal G-sensor is used.

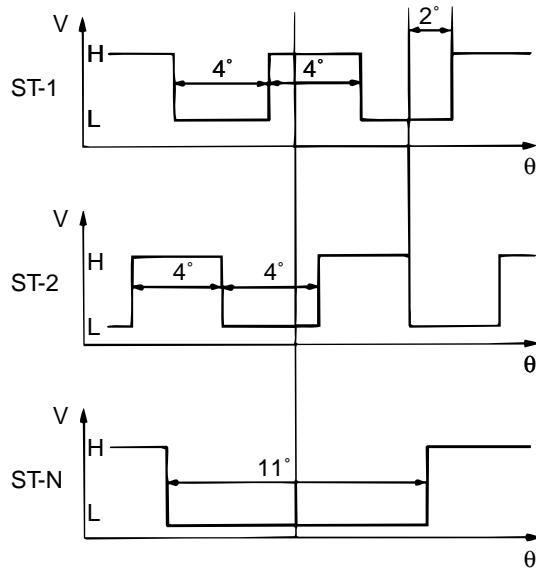
G-SENSOR OUTPUT CHARACTERISTICS



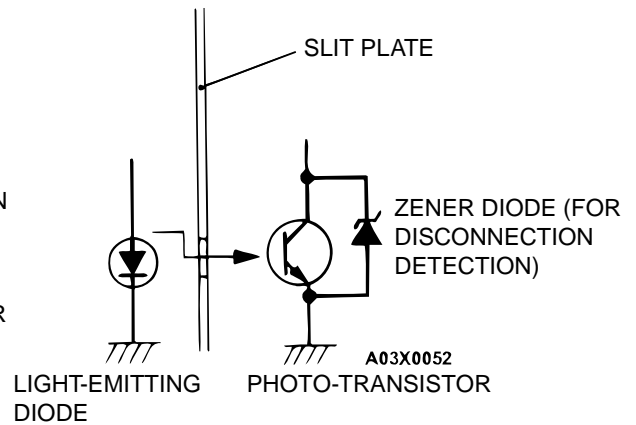
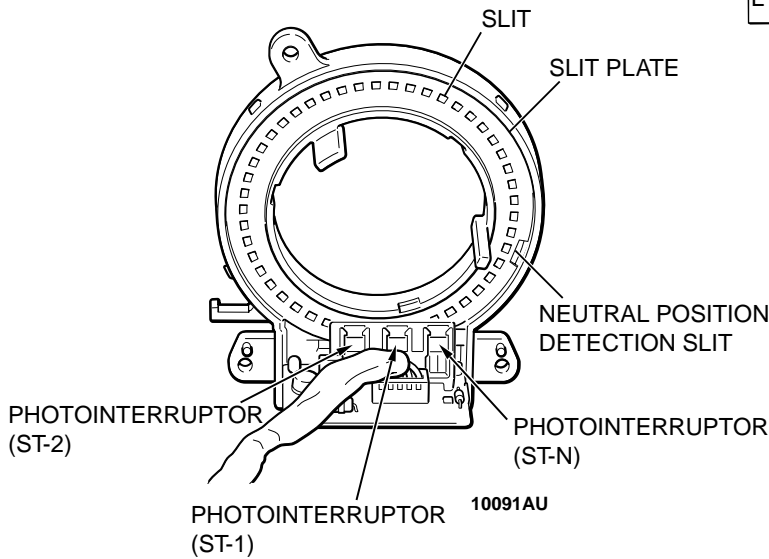
STEERING ANGULAR VELOCITY SENSOR



OUTPUT WAVEFORM OF EACH PHOTOINTERRUPTOR



03X0053



AC211551AB

The steering angular velocity sensor is installed at the steering column, and is used to output steer angles to the ABS-ECU as signals. It is composed of the slit plate which rotates according to the movements of the steering wheel and a three-set photointerruptor. The slit plate and photointerruptors have a sealed integrated structure to prevent the invasion of foreign particles as well as misoperations by external light. To detect malfunctions of the sensor output circuit, it is equipped with a zener diode for detecting disconnections parallel to the photo-transistor. The

ABS-ECU calculates the steering angle by reading the signals of the steering angular velocity sensor after every certain period of time and calculating the total of the ST-1 signal and ST-2 signal. The steering angle is obtained by taking the neutral position (ST-N output is L center) as 0 degree angle, and if there are changes, the steering angle is added with 2 degree angle for right and -2 degree angle for left. The output of the photointerruptor becomes L (low) when light passes through and H (high) when obstructed.

STOPLIGHT SWITCH

This switch turns on when the brake pedal is depressed, and turns off when the brake pedal is released. The ABS-ECU detects whether the stoplight switch is on or off by means of fluctuations in voltage (ON: system voltage; OFF: Approximately 0 V). This data is used for ABS control.

PARKING BRAKE SWITCH

This switch turns on when the parking brake lever is pulled, and turns off when the parking brake lever is released. The ABS-ECU detects whether the parking brake switch is on or off by means of fluctuations in voltage (ON: less than 1 volt; OFF: system voltage). This data is used for ABS control.

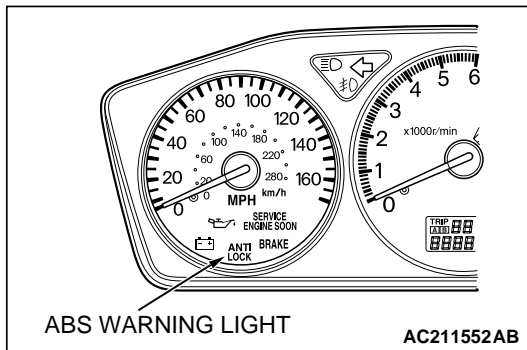
ACTUATORS

M2351002000099

ABS WARNING LIGHT

The ABS-ECU controls the power transistor in ABS-ECU to turn on and causes the ABS warning light to illuminate in the following cases:

- During initial check when the ignition switch is at the "ON" position (for approximately three seconds)
- When a problem develops in the ABS/EBD system
- Poor ABS-ECU connector connection

**HYDRAULIC UNIT**

The hydraulic unit is basically the same as that of the LANCER.

BRAKE MODULATOR (ABS-ECU)

M2351003000144

The ABS-ECU is basically the same as that of the LANCER except the followings:

DIAGNOSTIC FUNCTIONS

DIAGNOSTIC TROUBLE CODE OUTPUT

DTC	ITEM
11	Open circuit or short-circuit in ABS sensor (FR)
12	Open circuit or short-circuit in ABS sensor (FL)
13	Open circuit or short-circuit in ABS sensor (RR)
14	Open circuit or short-circuit in ABS sensor (RL)
16	Abnormal drop or rise in ABS-ECU power supply voltage
21	ABS sensor (FR) system
22	ABS sensor (FL) system
23	ABS sensor (RR) system
24	ABS sensor (RL) system
32	Longitudinal G-sensor system
41	Solenoid valve (FR) system
42	Solenoid valve (FL) system
43	Solenoid valve (RR) system
44	Solenoid valve (RL) system
51	Valve relay ON problem
52	Valve relay OFF problem
53	Motor relay OFF problem
54	Motor relay ON problem
55	Motor system
63	ABS-ECU abnormality
71	Lateral G-sensor system
81	Steering angular velocity sensor (ST-1) system
82	Steering angular velocity sensor (ST-2) system
83	Steering angular velocity sensor (ST-N) system

SERVICE DATA OUTPUT

SCAN TOOL DISPLAY	ITEM NO.	CHECK ITEM	DISPLAY TEXT OR UNIT
FR SNSR	11	Front-right ABS sensor	km/h or mph
FL SNSR	12	Front-left ABS sensor	
RR SNSR	13	Rear-right ABS sensor	
RL SNSR	14	Rear-left ABS sensor	
BATT. VOLTAGE	21	ABS-ECU power supply voltage	V
	29	Parking brake switch	ON/OFF
	32	Longitudinal G-sensor	V
STOPLIGHT SW	36	Stoplight switch	ON/OFF
	37	Steering angular velocity sensor straight ahead position memory	ON/OFF
	71	Lateral G-sensor	V
	74	Steering angular velocity sensor (ST-N)	OFF/ON
	75	Steering angular velocity sensor (ST-1)	
	76	Steering angular velocity sensor (ST-2)	
	86	Steering angle	° or OFF (when the steering angle is straight ahead position)

ACTUATOR TEST

NO.	ITEM	PARTS TO BE ACTIVATED
01	Solenoid valve for front-left wheel	Solenoid valves and pump motors in the hydraulic unit (simple inspection mode)
02	Solenoid valve for front-right wheel	
03	Solenoid valve for rear-left wheel	
04	Solenoid valve for rear-right wheel	

SYSTEM OPERATION

In terms of operation, the system is basically the same as that of the LANCER.