

■ TIRE PRESSURE WARNING SYSTEM

1. Description

- The tire pressure warning system has been adopted on all models.
- While the vehicle is in motion, this system monitors the fluctuations in the wheel speed signals that are output by the speed sensor for the brake control system. It informs the driver if it detects a low tire pressure.

2. Detection Method

General

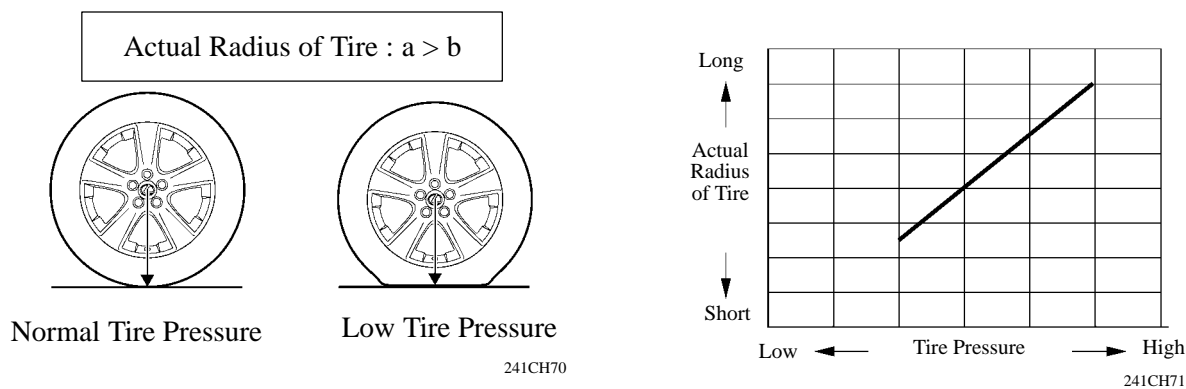
This system uses two methods: a resonance frequency method that determines a low tire pressure from all four wheels, and a relative wheel speed difference method that determines a low tire pressure according to the condition of each wheel.

On the ABS models, the tire pressure is detected by the relative wheel speed difference method. On the VSC models, the tire pressure is detected by the resonance frequency method and the relative wheel speed difference method.

When the system determines a low tire pressure through one of these methods, the system informs the driver of it by turning ON the low tire pressure warning light in the combination meter.

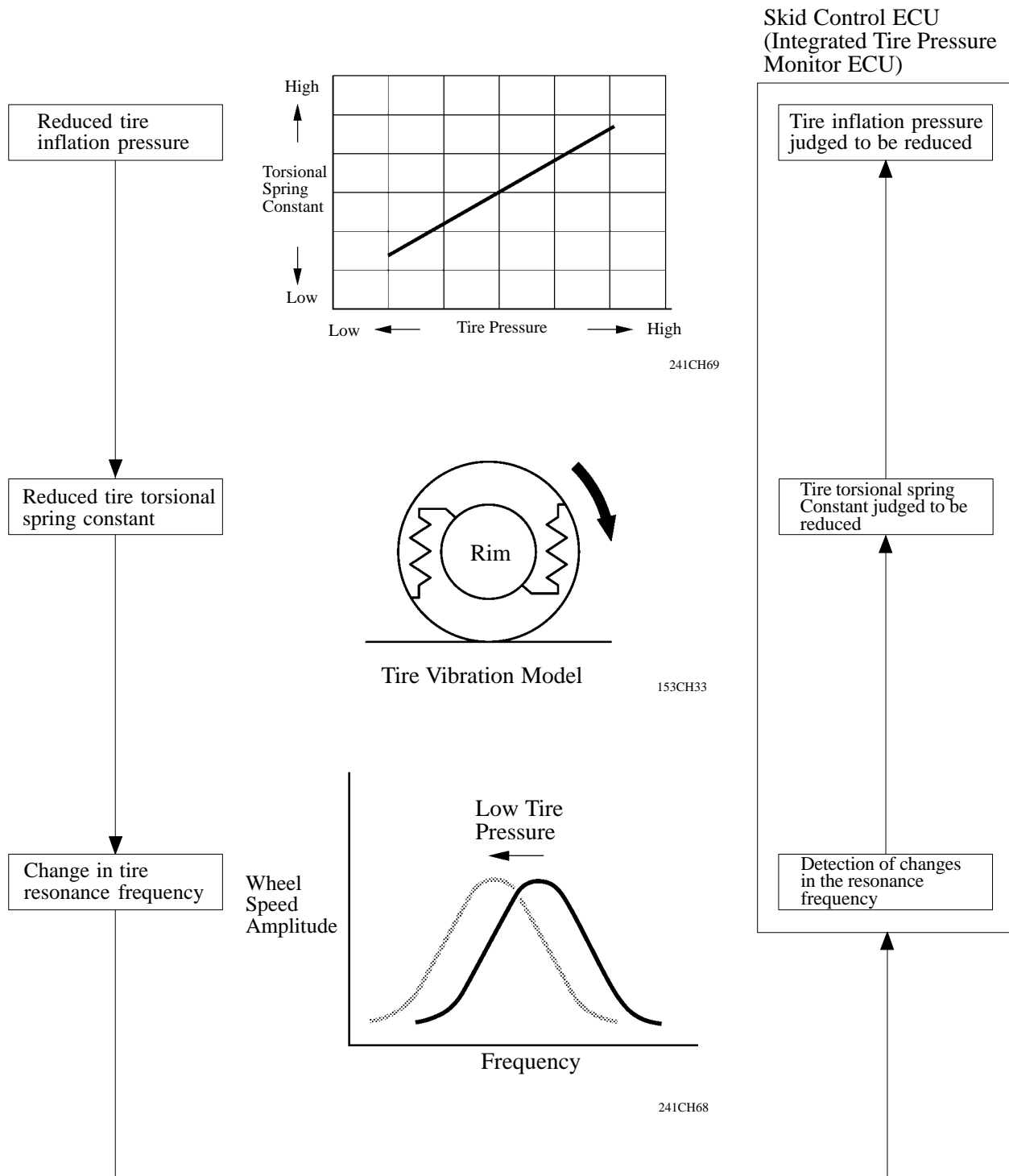
Relative Wheel Speed Difference Method

The relative wheel speed method utilizes the changes in the wheel speeds that occur when the actual radius of a tire decreases due to a low tire pressure. Based on the wheel speed signals that are output by the speed sensors, the system calculates the four-wheel average wheel speed within a prescribed length of time and the average wheel speed of each wheel. Then, the system determines the presence of a low tire pressure based on the relative difference between the speed of each wheel and the average speed of the four wheels.



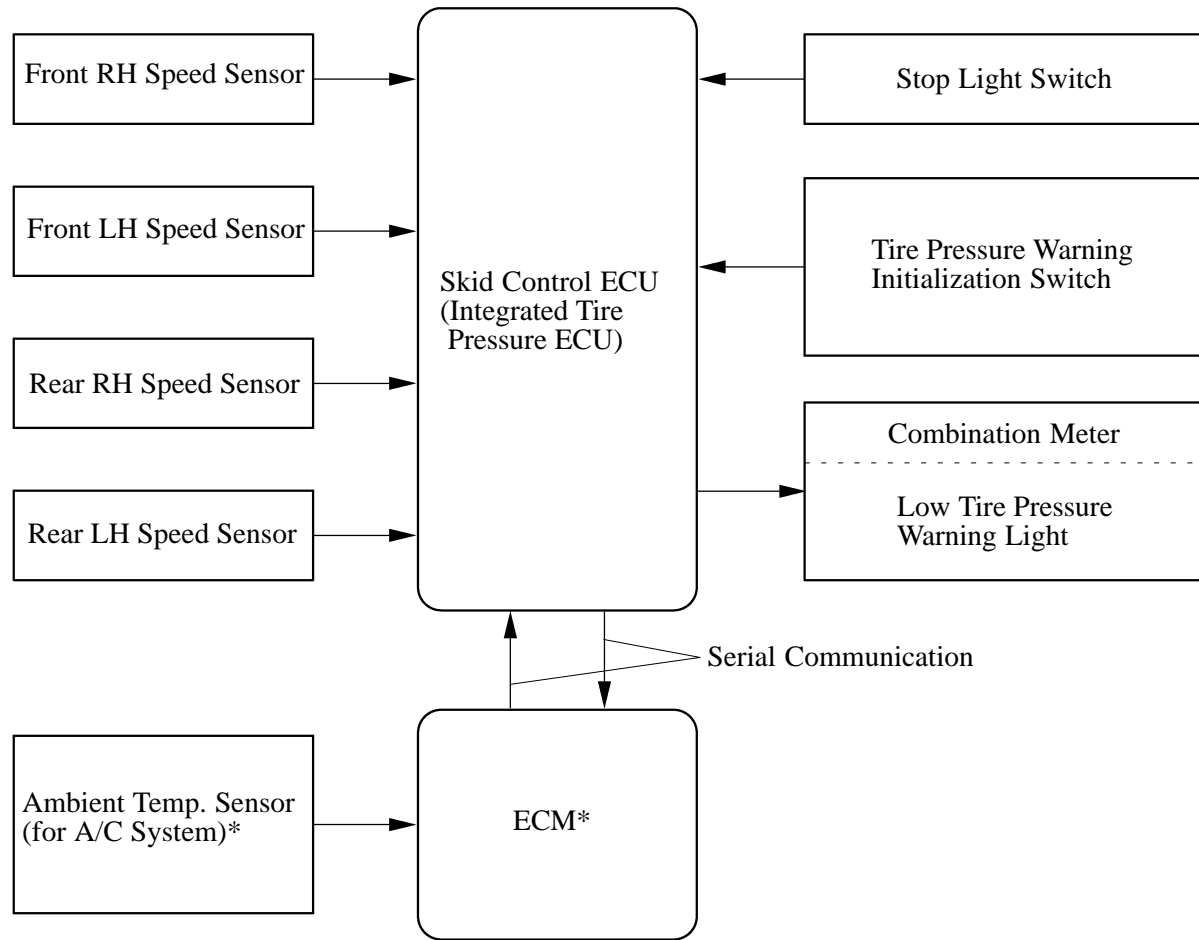
Resonance Frequency Method

The tire's torsional spring constant changes due to the change in tire inflation pressure. Based on the wheel speed signal that is detected while the vehicle is in motion, the changes in the tire's resonance frequency are estimated as the changes in the spring constant, thus detecting as the changes in the tire inflation pressure.



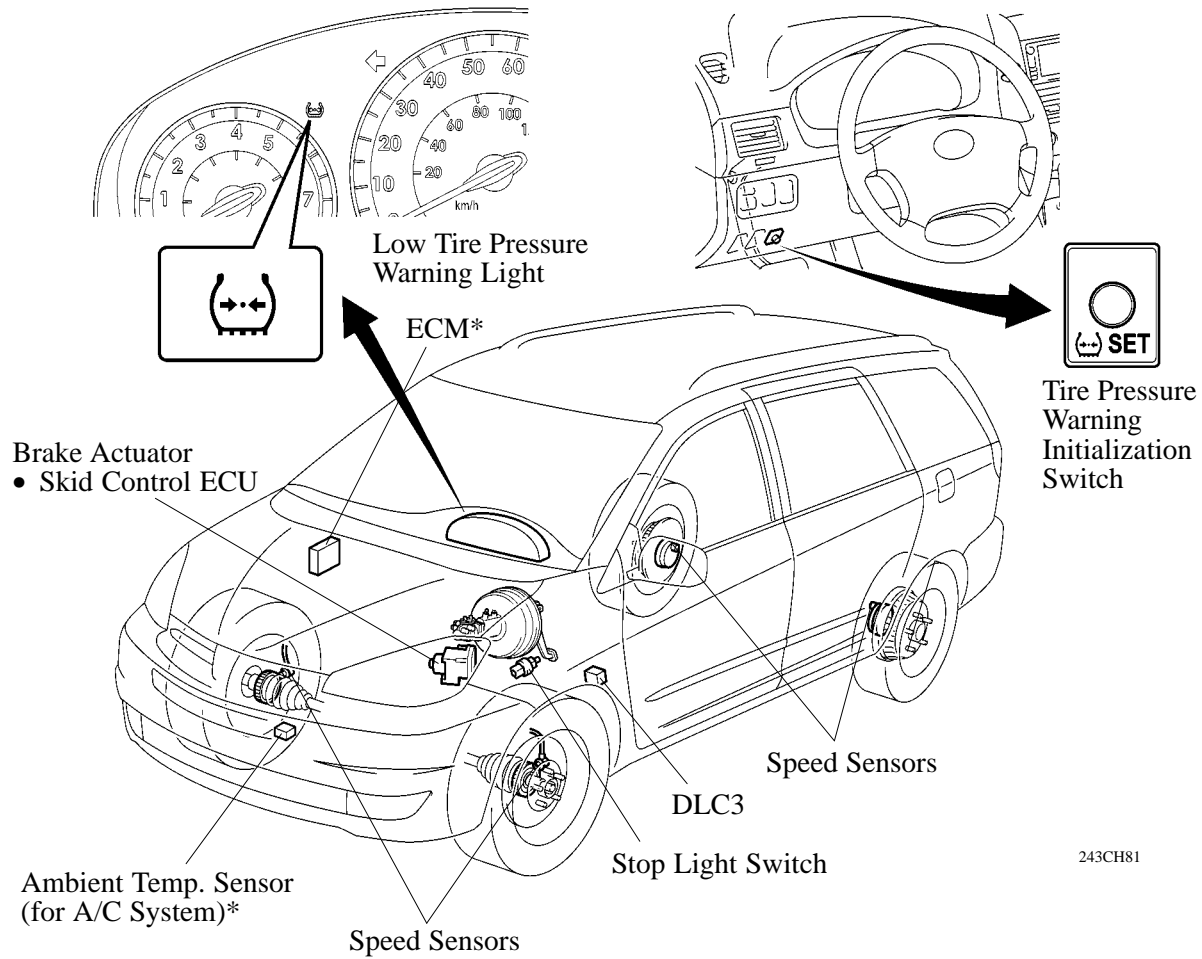
3. Construction and Operation

System Diagram



*: Only for VSC Models

Layout of Main Components



*: Only for VSC Models

Function of Main Components

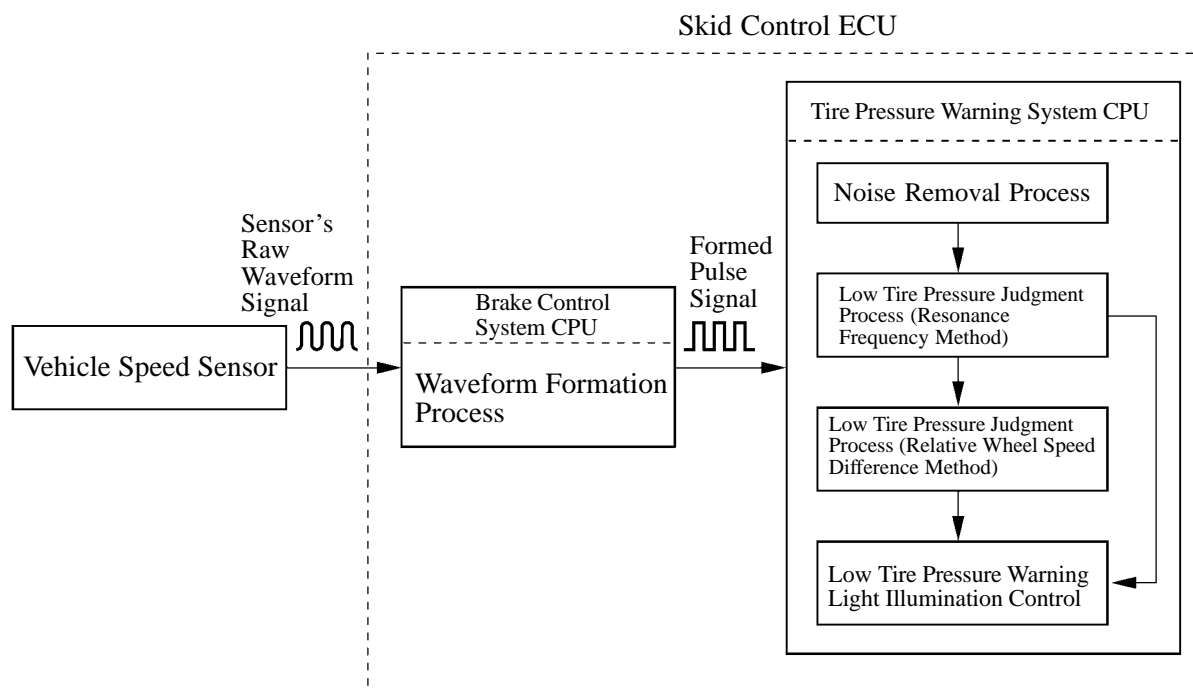
Components	Function
Skid Control ECU (Integrated Tire Pressure Monitor ECU)	<ul style="list-style-type: none"> The tire pressure monitor ECU, which is integrated with the skid control ECU, detects a low pressure in the tires based on the signals from the speed sensors. When a low tire pressure is detected, this ECU turns ON the low tire pressure warning light.
Speed Sensor	Detects the wheel speed of each wheels.
Low Tire Pressure Warning Light	The warning light turns ON in accordance with the illumination signal from the tire pressure monitor ECU in order to inform the driver of the low tire pressure.
Tire Pressure Warning Initialization Switch	This switch starts the system initialization mode after a tire has been replaced.
Stop Light Switch	This switch detects that the brake pedal has been depressed and transmits a signal to the tire pressure monitor ECU. At this time, the tire pressure monitor ECU prohibits the low tire pressure judgment operation.
Ambient Temp. Sensor (For A/C System)*	The signals from this sensor are used as correction data for determining a low tire pressure.

*: Only for VSC Models

Low Tire Pressure Detection

1) General

- This system uses two methods: a resonance frequency method that determines a low tire pressure from all four wheels, and a relative wheel speed difference system that determines a low tire pressure according to the condition of each wheel. The tire pressure monitor ECU uses the pulses that are formed by the brake control system CPU to make these determinations.
- In addition to resonance frequencies, the pulses that are detected from the speed sensors also contain noise, which must be removed by the tire pressure monitor ECU.
- This system uses both the resonance frequency method and the relative wheel speed difference method to determine a low tire pressure. If either method determines the presence of a low tire pressure, this system informs the driver of it by turning ON the low tire pressure warning light in the combination meter.



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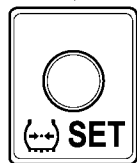
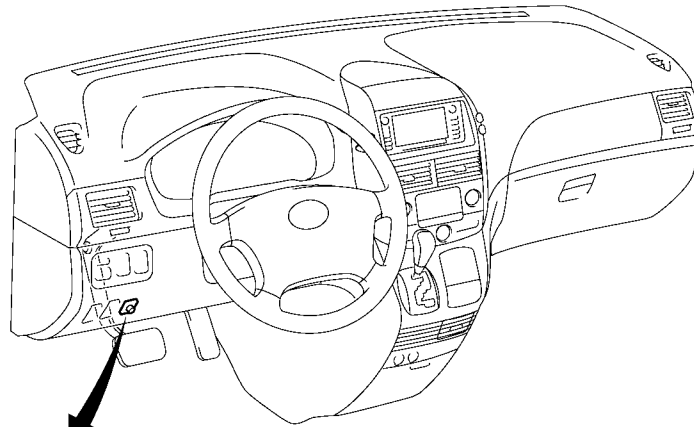
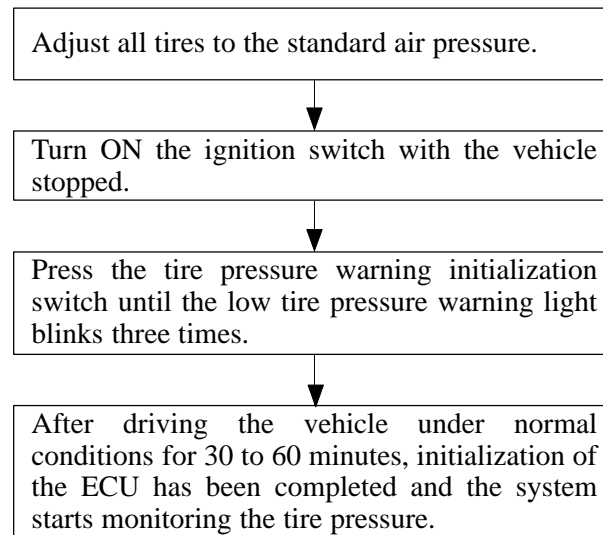
2) Situations in Which a Low Tire Pressure Cannot Be Detected

The system may not operate properly under the following conditions:

- The vehicle uses non-standard size tires or tires made by other manufacturers.
- The vehicle uses tires of different sizes or manufacturers.
- Some of the tires are worn differently.
- The vehicle uses snow tires, compact spare tires, or snow chains.
- The vehicle is being driven below 19 mph (30 km/h).
- The vehicle is being driven on a slippery or rough surface.

System Initialization Mode

- To enable this system to detect a low tire pressure, the normal tire pressure of the tires on the disc wheels that the vehicle currently uses is stored in memory in the tire pressure monitor ECU. Therefore, if a tire or disc wheel is replaced, the ECU must be initialized. To do this, press the tire pressure warning initialization switch that is located below the driver side of the instrument panel, which transfers the system to the system initialization mode and initializes the ECU.
- The tire pressure monitor ECU can be initialized as follows:



Tire Pressure Warning
Initialization Switch

Low Tire Pressure Warning Light

The output operations of the low tire pressure warning light are listed below.

Condition	Outline	Priority of Warning Light
Ignition switch turned ON	ON for 3 sec	2
Low tire pressure detected	ON	6
System initialization mode being accepted	Blinks 3 times (at 0.5 Hz cycle)	4
System malfunction, part 1* ¹	Blinks (1 Hz cycle)	3
System malfunction, part 2* ²	ON	1
System initialization mode being requested* ³	Blinks (2 Hz cycle)	5

*1: Malfunction of speed sensor, stop light switch and tire pressure monitor ECU.

*2: The tire pressure warning light circuit is open or shorted as a result of the adoption of the active circuit.

*3: Add bullets for the 3 conditions

- New vehicle from factory
- New tire pressure warning system ECU installed
- Failure to initialize during driving

Diagnosis

- When the skid control ECU detects a malfunction, the skid control ECU makes a diagnosis and memorizes the failed section. Furthermore, the low tire pressure warning light in the combination meter illuminates or blinks to inform the driver.
- The DTC can be read by connecting the SST (09843-18040) between the Tc and CG terminals DLC3, and observing the blinking of the low tire pressure warning light or connecting a hand-held tester.

For details, refer to the 2004 Sienna Repair Manual (Pub. No. RM1025U).

► DTC Chart ◀

DTC No.		Detection Item
2-digit	5-digit	
11	C2106	Stop light switch signal malfunction
13	—	ABS malfunction

Fail-Safe

In the event of the malfunction in the each sensor circuits or tire pressure monitor ECU, prohibits the tire pressure warning system.