3. Function of Main Component

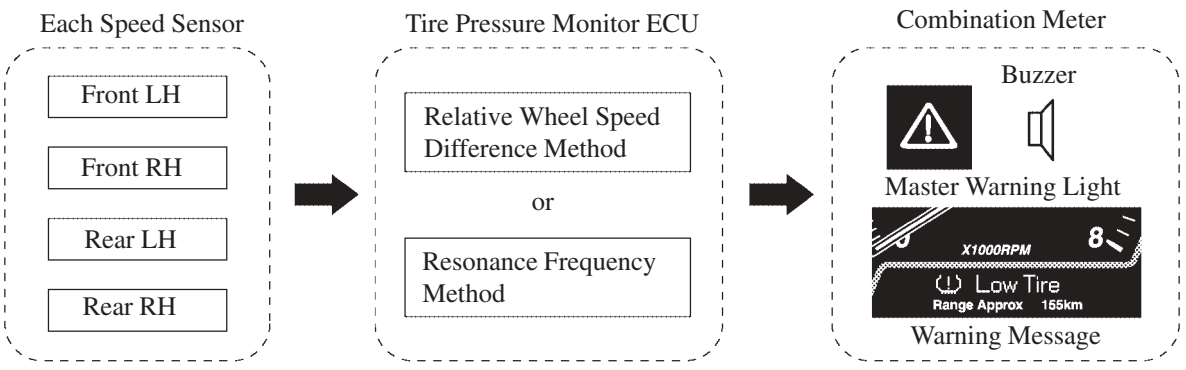
Component		Outline
Tire Pressure Warning Reset Switch		Starts the system initialization mode.
Stop Light Switch		Detects that the brake pedal has been depressed.
Speed Sensor (4)		Detects the wheel speed of the each wheel.
Ambient Temp. Sensor (for A/C)		Detects the ambient temperature to use as correction data for determining low tire inflation pressure.
Combination Meter	Multi-information Display	Displays a warning message to inform the driver of the system condition in accordance with the signal from the tire pressure monitor ECU.
	Master Warning Light	Turns on to warn the driver in accordance with the signal from the tire pressure monitor ECU.
	Buzzer	Sounds once to warn the driver in accordance with the signal from the tire pressure monitor ECU.
Engine ECU		Transmits the signal from the ambient temperature sensor to the tire pressure monitor ECU.
Gateway ECU		Transmits the request signal from the tire pressure monitor ECU to the combination meter.
Brake Actuator	Skid Control ECU ● Tire Pressure Monitor ECU	● Calculates and monitors tire inflation pressures based on signals from the speed sensors. ● When the tire pressure monitor ECU detects a drop in the tire inflation pressure, a system malfunction, or the initialization mode, it outputs the respective signal to the combination meter. ● When the ON signal of the stop light switch is input, the tire pressure monitor ECU disables the calculation of the tire inflation pressure.

4. System Operation

General

The tire pressure monitor ECU detects any changes from the initialized tire inflation pressure.

- It uses two detection methods: a relative wheel speed difference method and a resonance frequency method. If either method detects a drop in the tire inflation pressure, the tire pressure monitor ECU outputs a warning signal to the combination meter in order to warn the driver.
- Most of the components of this system belong to the brake control system. Therefore, this system does not have a dedicated diagnosis function.



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System Initialization Mode

The tire pressure monitor ECU detects any changes in the tire inflation pressure. Therefore, it must initialize and store it in its memory the tire inflation pressure if the tires or wheels have been replaced, or the tires have been rotated.

Service Tip

The tire pressure monitor ECU can be initialized as follows:
1) Check and adjust tire inflation pressure for all tires to the specified value.

Tire Size	Cold Tire Inflation Pressure
225/55R17	240 kPa (2.4 kgf/cm^2, 35 psi)
245/45R18	230 kPa (2.3 kgf/cm^2, 33 psi)

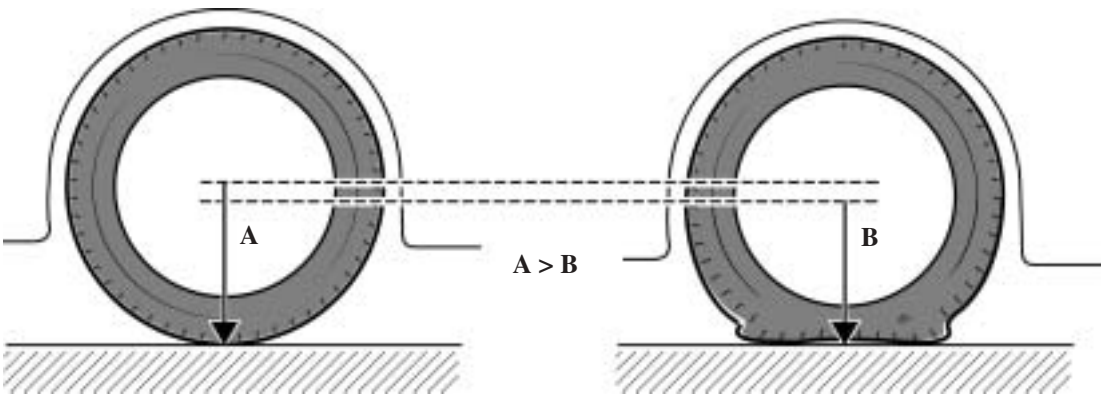
2) Turn ON the ignition switch. If the low tire pressure warning message in the multi-information display "Low tire" were appearing, push the tire pressure warning reset switch for a few seconds and make sure the warning message goes off.
3) Press and hold the tire pressure warning reset switch until "Pressure Initial" appears in the multi-information display.
4) Release the switch.
5) Initialization completed after driving at the vehicle speed of 30 km/h (19 mph) or over for more than on hour.

For details, see the LEXUS LS430 Repair Manual Supplement (Pub. No. RM1049E).

Relative Wheel Speed Difference Method (Rolling Radius Difference Method)

The relative wheel speed difference method utilizes the changes in the actual radius of the tires that result from a drop in the tire inflation pressure.

- When the tire inflation pressure drops, the actual radius of the tire decreases. As a result, the wheel speed increases.
- The tire pressure monitor ECU compares each speed of four wheels, and detects a drop in the tire inflation pressure from their difference.



Normal Tire Inflation Pressure **Low Tire Inflation Pressure**

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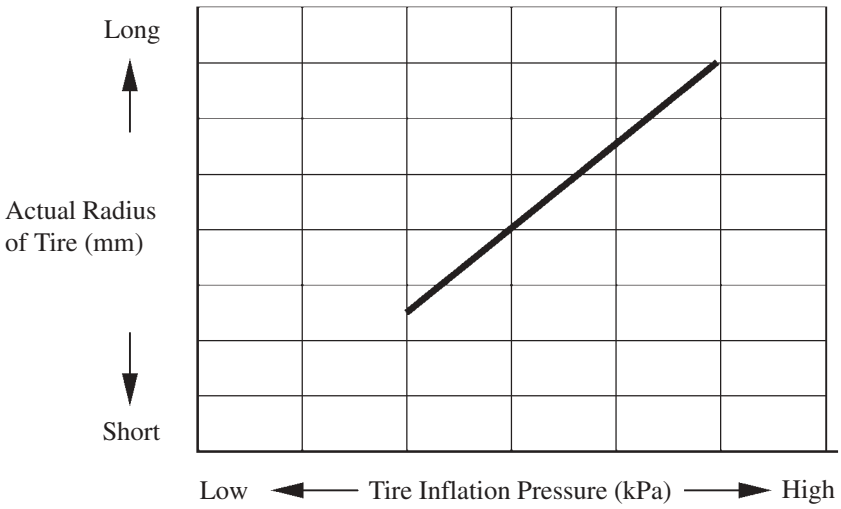

Relationship between Tire Inflation Pressure and Actual Tire Radius

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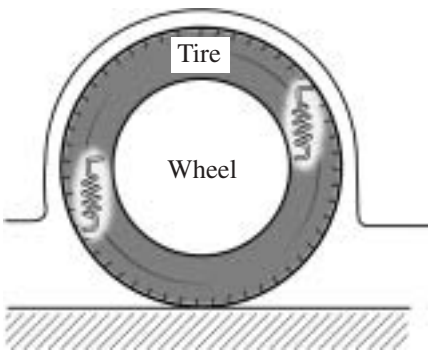
Resonance Frequency Method

The resonance frequency method utilizes the changes in the tire torsional spring constant that result from a drop in the tire inflation pressure.

- When the tire inflation pressure drops, the tire torsional spring constant decreases. As a result, the resonance frequency decreases.
- The tire pressure monitor ECU calculates the resonance frequency of the tires based on the wheel speeds at certain time intervals.
- The tire pressure monitor ECU detects a drop in the tire inflation pressure based on the changes in the resonance frequency.



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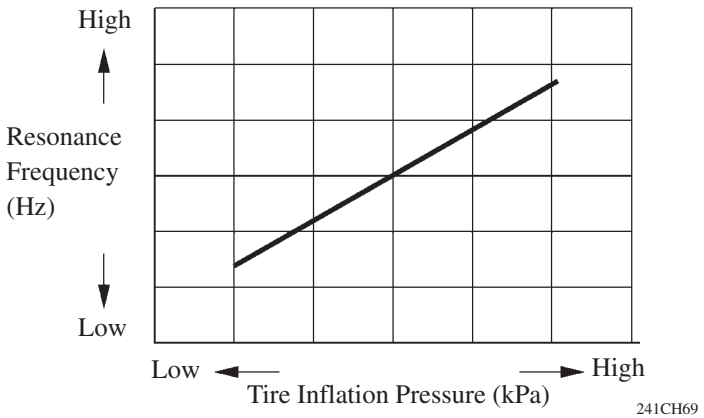
Conceptual Image of Tire Vibration



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Relationship between Tire Inflation Pressure and Resonance Frequency

Warning Message

This system has three warning messages: Low Tire, Check System, and Pressure Initial, which are output under the following conditions.

Priority No.	Condition	Warning Message
1	System malfunction (speed sensor, stop light switch, and tire pressure monitor ECU)	Check System
2	Tire pressure warning reset switch is turned ON.	Pressure Initial
3	System initialization mode being accepted	
4	System initialization mode being requested	
5	Low tire pressure detected	Low Tire

Fail-safe

If a malfunction occurs in a speed sensor or the tire pressure monitor ECU, the fail-safe function disables the system operation.

5. Precaution for Tire Pressure Warning System Operation

In the following cases, the tire pressure warning system may not operate properly.

- A compact spare tire, snow tire, or tire chains are used.
- The tire inflation pressure is excessively higher than specified, or tire inflation pressure suddenly drops due to bursting or other causes.
- The vehicle is driven on a slippery road surface such as rough or frozen roads.
- The vehicle speed is less than 30 km/h (19 mph) or more than 100 km/h (62 mph), and the driving duration is less 5 minutes.
- The tires differ in tread pattern or manufacturer.
- The tires are not the specified size.
- The degree of the tread wear is very different among the installed tires.
- Repaid acceleration/ deceleration or sharp turns is continued.
- Towing a trailer.
- The loading is over the limit or unbalanced.
- Initialization was not performed correctly after replacing or rotating tires or wheels.
- The out side temperature is below 0°C (32°F) or above 40°C (104°F).