

TIRE AND WHEEL SYSTEM

PRECAUTION

1. REMOVAL AND INSTALLATION OF THE TIRE PRESSURE WARNING VALVE SUB-ASSEMBLY

- (a) When installing a tire, make sure that the tire pressure warning valve sub-assembly does not interfere with the tire bead in order to prevent damage to the tire pressure warning valve sub-assembly.
- (b) After completing the operation, remove the valve core to rapidly release the air in the tire and check that the warning light comes on. If the warning light does not come on, the system may be defective.
- (c) If there is air leakage, tighten the nut to a torque of 4.0 N*m (41 kgf*cm, 35 in.*lbf) and push the valve core 2 or 3 times to remove any dirt attached to the valve core. If air continues to leak, replace the grommet, washer, and nut.
- (d) When installing the tire pressure warning valve sub-assembly, check whether the rim, grommet, washer, and nut are clean. Use a manufacturer-specified cap.
- (e) When putting air into the tire, first install the tire pressure valve straight onto the stem of the tire pressure warning valve sub-assembly.

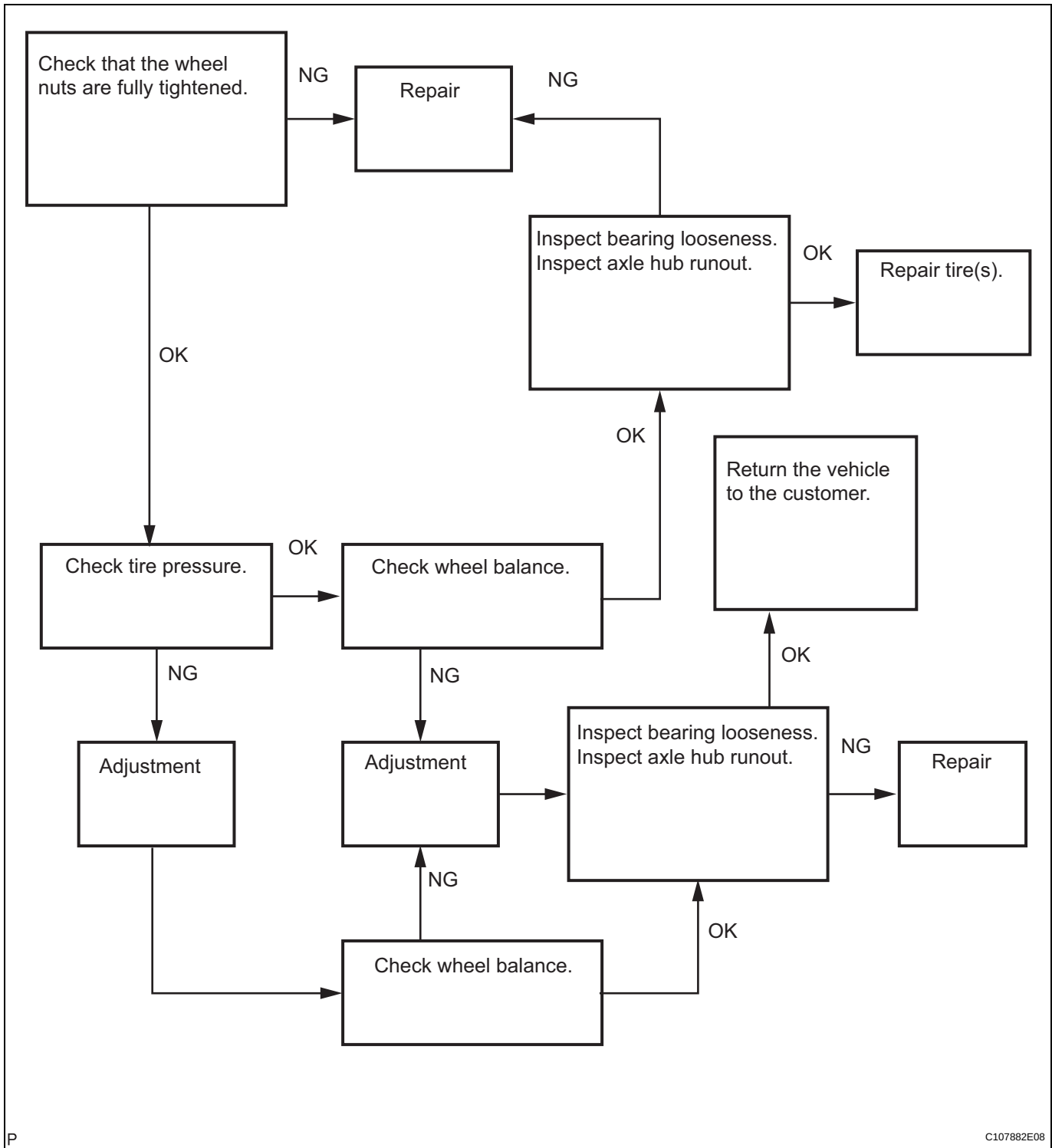
2. TIRE AND WHEEL REPLACEMENT

- (a) If replacing a tire, be sure to check the grommet of the tire valve for damage. If the grommet is damaged, replace the grommet, washer, and nut.
- (b) If tires and wheels are replaced, register the transmitter ID (See page [TW-15](#)).

HOW TO PROCEED WITH TROUBLESHOOTING

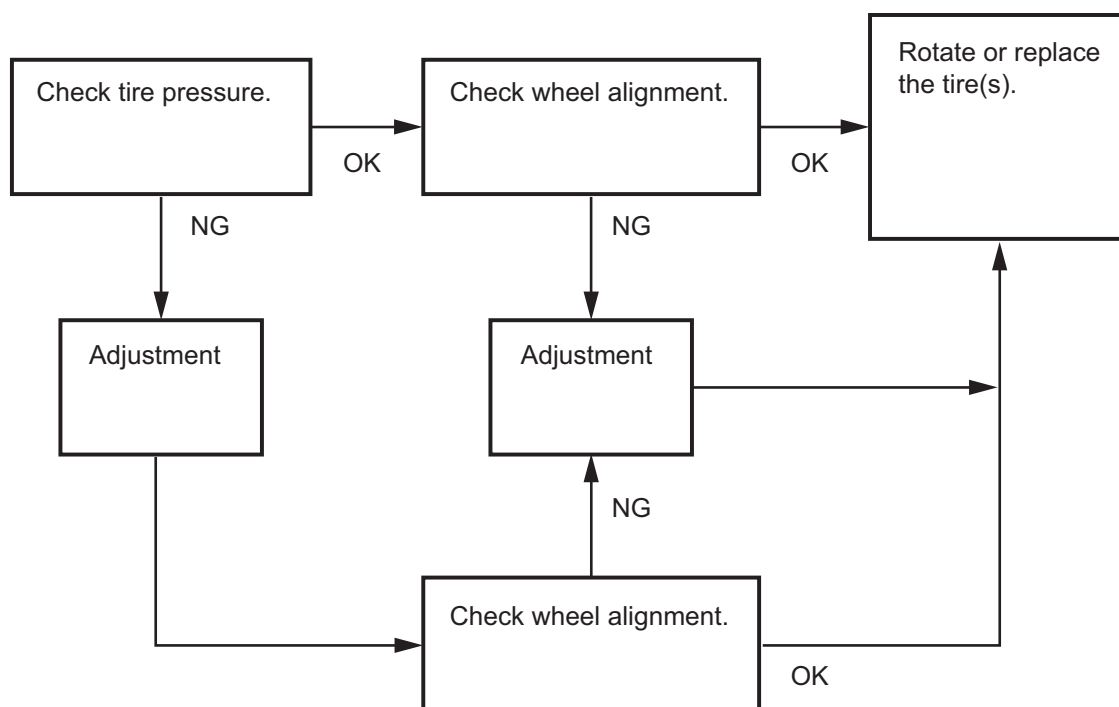
1. DIAGNOSIS OF TIRE VIBRATION

(a) Inspection procedure



2. DIAGNOSIS OF IRREGULAR TIRE WEAR

(a) Inspection procedure



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INSPECTION

1. INSPECT TIRE

- (a) Check the tires for wear and proper inflation pressure.

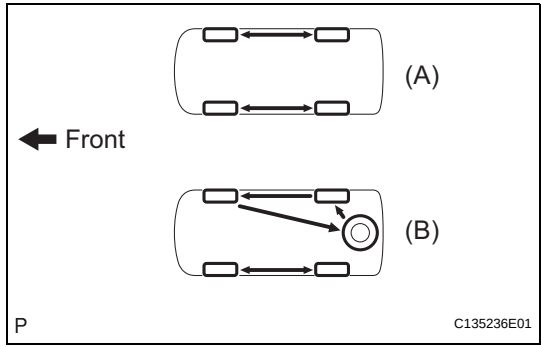
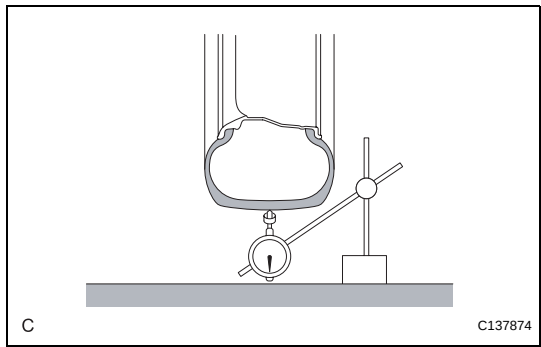
Cold tire inflation pressure

Tire size	Front kPa (kgf*cm ² , psi)	Rear kPa (kgf*cm ² , psi)
P215/55R17 93V	210 (2.1, 31)	210 (2.1, 31)

When driving under the above vehicle conditions at sustained high speeds above 160 km/h (100 mph), in countries where such speeds are permitted by law, inflate the front and rear tires to 240 kPa (2.4 kgf*cm², 35 psi) provided that it does not exceed the maximum cold tire inflation pressure molded on the tire sidewall.

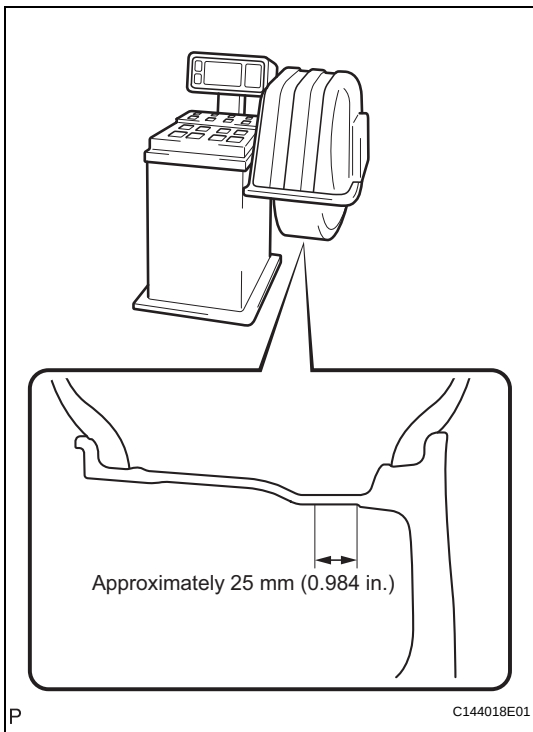
- (b) Using a dial indicator, check the runout of the tires.

Tire runout:
1.4 mm (0.055 in.) or less



2. ROTATE TIRES

- (a) Rotate the tires as shown in illustration (A). If the vehicle is equipped with a grand spare tire, rotate the tires as shown in illustration (B).



3. INSPECT WHEEL BALANCE

- (a) Check and adjust the off-the-car balance.

Imbalance after adjustment:

8.0 g (0.018 lb.) or less.

NOTICE:

- Remove dirt, oil, and water from the surface where the balance weight is to be adhered with a cleaning detergent.
- Do not touch the sticking surface of the tape.
- Adhere the sticking type balance weight to the flat position shown in the illustration.
- Push the balance weight securely with a finger to adhere it to the indicated position.
- Do not reuse balance weights.
- Use the LEXUS genuine adhesive type balance weights.

HINT:

- The inner side balance weight should be installed by clipping it to the rim.
- If necessary, check and adjust the on-the-car balance.

4. INSPECT FRONT AXLE HUB BEARING LOOSENESS

HINT:

(See page [AH-5](#))

5. INSPECT REAR AXLE HUB BEARING LOOSENESS

HINT:

(See page [AH-14](#))

6. INSPECT FRONT AXLE HUB RUNOUT

HINT:

(See page [AH-5](#))

7. INSPECT REAR AXLE HUB RUNOUT

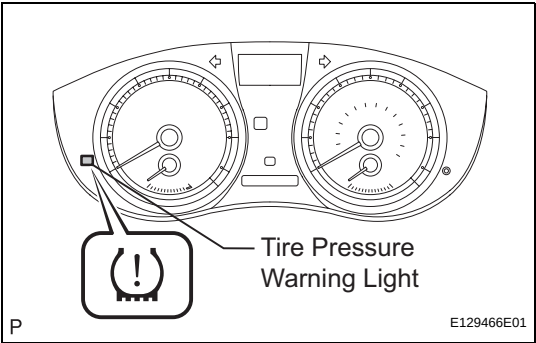
HINT:

(See page [AH-14](#))

TIRE PRESSURE WARNING SYSTEM

PRECAUTION

NOTICE:
Some systems need to be initialized after reconnecting the negative (-) battery terminal (See page [IN-33](#)).



Cold tire inflation pressure

Tire size	Front kPa (kgf/cm ² , psi)	Rear kPa (kgf/cm ² , psi)
P215/55R17 93V	210 (2.1, 30)	210 (2.1, 30)

1. TIRE PRESSURE WARNING SYSTEM PRECAUTION

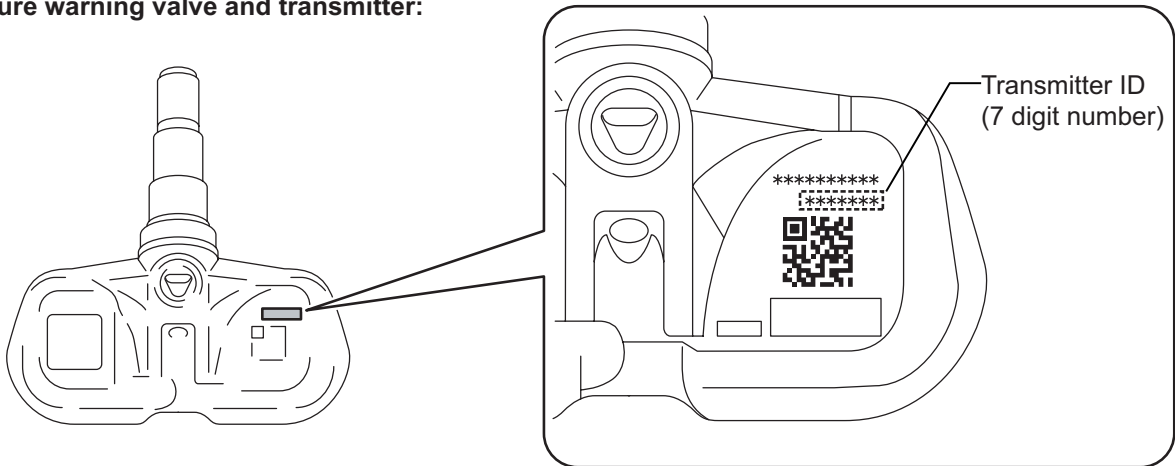
- (a) When the tire pressure warning light comes on, immediately check the tire pressure of the tire and adjust it to the specified value. (The tire pressure warning light will blink (come on after blinking for 1 minute) if there is an open in the tire pressure warning light circuit.)

NOTICE:
Make sure to adjust the tire pressure for the full-size spare tire because this system monitors tire pressure for all the tires including the spare tire.

- (b) When the tire pressure warning light blinks (comes on after blinking for 1 minute), there is a malfunction in the system. Check for DTCs.
- (c) It is necessary to register the transmitter ID in the tire pressure warning ECU after replacing the tire pressure warning valve and transmitter and/or tire pressure warning ECU (See page [TW-15](#)).
- (d) When replacing the tire pressure warning ECU;
- (1) Using the DATA LIST, read the transmitter IDs registered in the ECU and make a note of them before removing the tire pressure warning ECU.
 - (2) Register the transmitter IDs after installing a new tire pressure warning ECU.

- (e) When replacing the tire pressure warning valve and transmitter;
- (1) Take a note of the 7 digit number (transmitter ID) written on the new tire pressure warning valve and transmitter when replacing it. Register the transmitter IDs in the tire pressure warning ECU after replacing the tire pressure warning valve and transmitter and installing the tires and wheels on the vehicle.

Tire pressure warning valve and transmitter:



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NOTICE:

The transmitter ID is written on the tire pressure warning valve and transmitter. It will be unable to be read after installing the tire pressure warning valve and transmitter on the tire and wheel. Therefore, take a note of the transmitter ID before installing the tire pressure warning valve and transmitter.

- (f) When replacing the tire pressure warning ECU and the tire pressure warning valves and transmitters; It is necessary to perform the initialization (See page [TW-18](#)) after the registration (See page [TW-15](#)).
- (g) Precautions about the tire pressure;
- The tire pressures decrease naturally.
 - In winter, tire pressure may decrease due to low ambient temperatures (tire pressure decreases by approximately 10 kPa (0.2 kgf/cm², 1.45 psi) for every 10°C (50°F) drop in the ambient temperature). Therefore, the tire pressure warning is more likely to operate if the tire pressures are not adjusted appropriately. If the daily temperature variation is large, pressurize the tires high so that the tire pressures are suitable under cold conditions. Incorrect tire pressure warning operation becomes less likely.

2. IN CASE OF TIRE AND WHEEL REPLACEMENT

- (a) When tires and wheels are replaced, always ensure that each transmitter ID is correctly registered.

3. IN CASE OF REPLACEMENT OF TIRE PRESSURE WARNING ECU, TIRE PRESSURE WARNING VALVE AND TRANSMITTER, OR TIRE(S) WITH DIFFERENT TIRE PRESSURE

- (a) Initialize the tire pressure warning system after any of the following is performed:
- Replacing the tire pressure warning ECU or the tire pressure warning valve and transmitter
 - Installing tire(s) which require different tire pressure

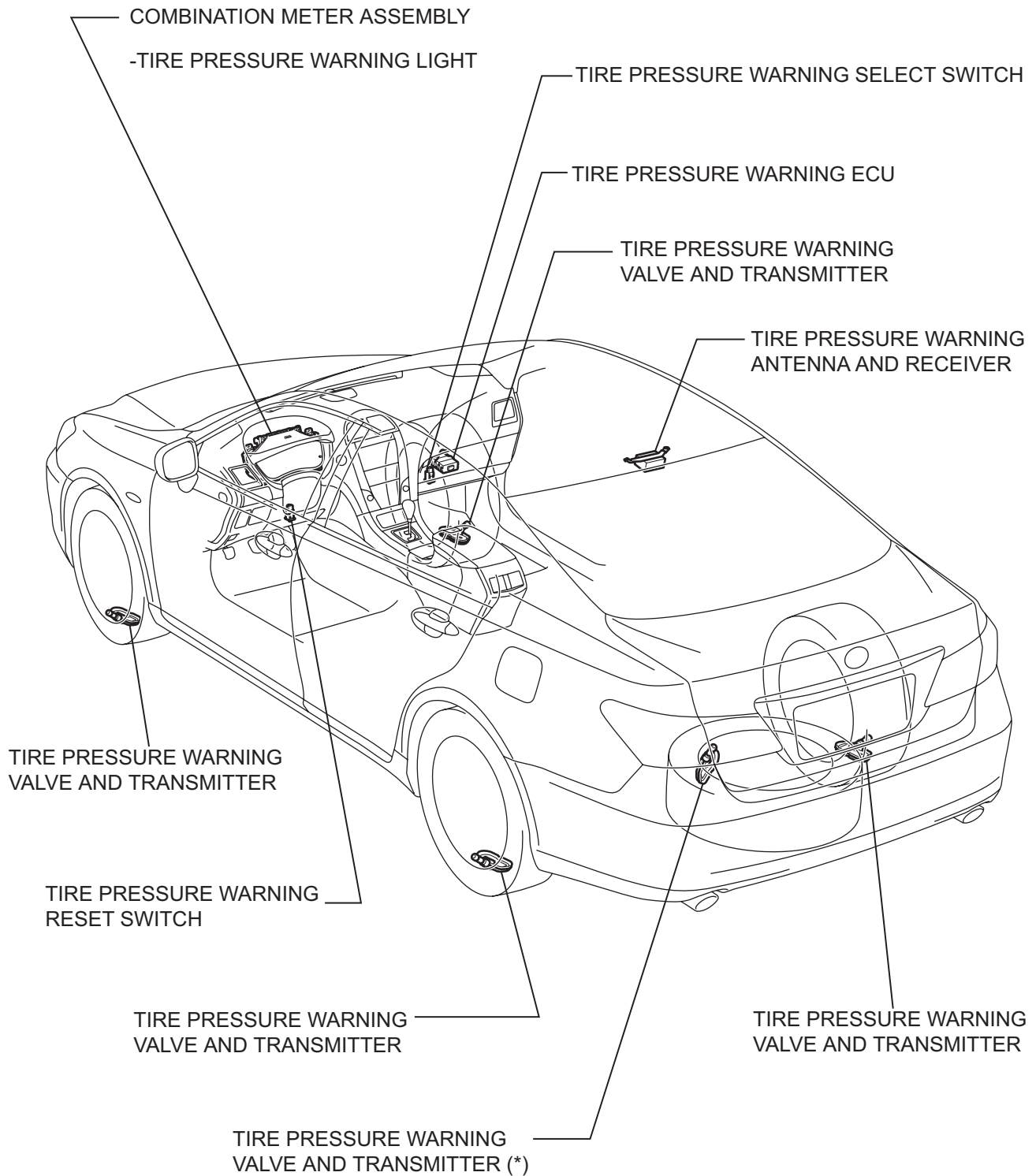
HINT:

The tire pressure warning system will not operate properly if it is not initialized (See page [TW-18](#)).

4. FAIL-SAFE FUNCTION

- (a) When a system malfunction occurs in the tire pressure warning system, the tire pressure warning light blinks (comes on after blinking for 1 minute) and informs the driver of the system failure.
- (b) The result of this diagnosis is stored in the tire pressure warning ECU.

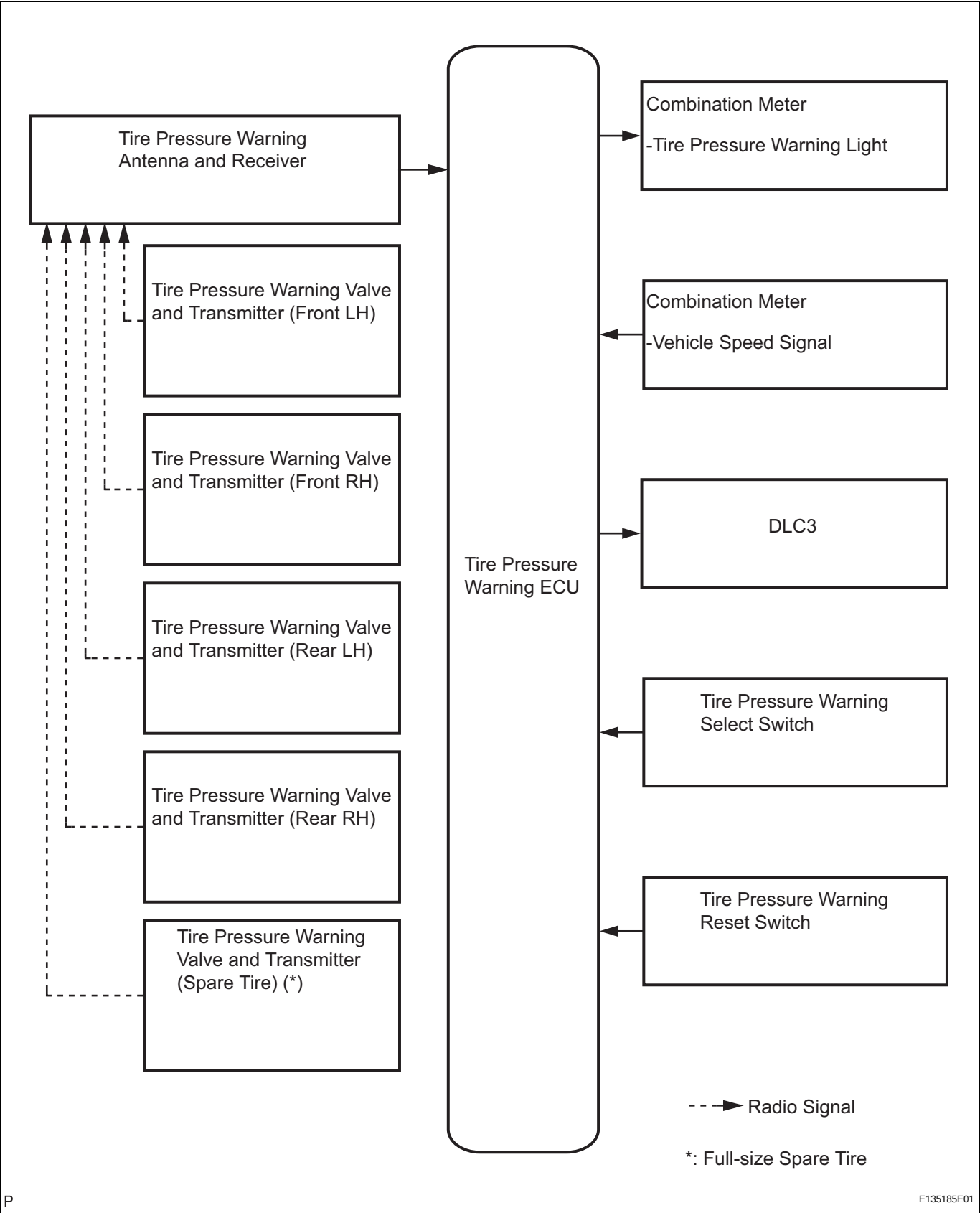
PARTS LOCATION



*: FULL-SIZE SPARE TIRE

TW

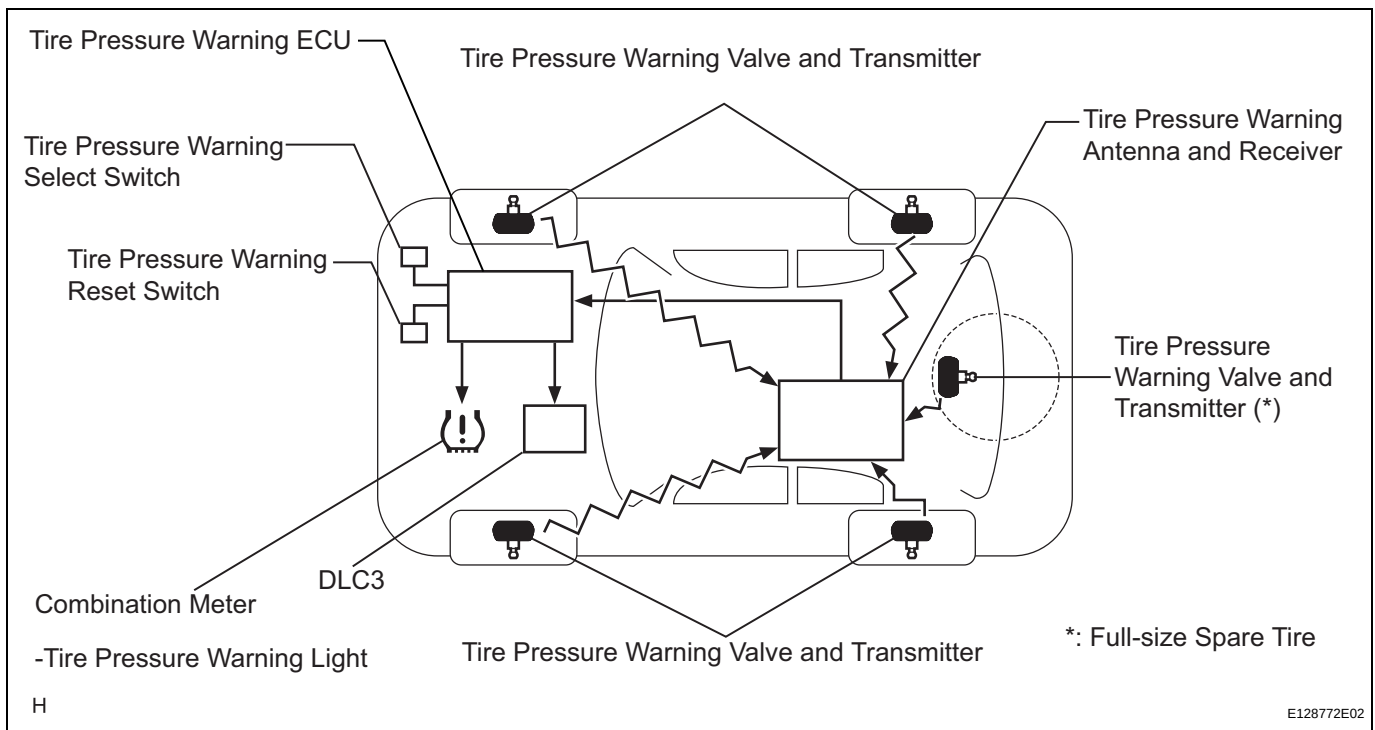
SYSTEM DIAGRAM



SYSTEM DESCRIPTION

1. DESCRIPTION OF SYSTEM

- (a) A tire pressure warning valve and transmitter is equipped with a tire pressure sensor and a transmitter and is installed in a tire wheel assembly. The sensor measures the tire pressure. The measured value and transmitter ID are transmitted to the tire pressure warning antenna and receiver on the body as radio waves and then sent to the tire pressure warning ECU from the tire pressure warning antenna and receiver. If the transmitter ID has already been registered, the ECU compares the measured air pressure value with the standard value. When the value is less than the standard value registered in the tire pressure warning ECU, the warning light on the combination meter comes on.
- For the differences in the air pressure settings by the type of tires, a tire pressure warning reset switch has been adopted.



2. WHEN TIRE PRESSURE WARNING LIGHT IS LIT

- (a) When the tire pressure warning light does not go off, or when it comes on during driving, check tire pressure. If the tire pressure warning light comes on within several hours after adjusting the tire pressure, the tire may have a slow air leak.
- (b) Under the following conditions, the system may not function properly.
- Facilities or devices that use similar radio frequencies are located in the vicinity of the vehicle.

- A radio device of similar frequency is used in the vehicle.
 - A large amount of snow or ice is stuck to the vehicle, especially onto the wheels and around the wheel houses.
 - The battery of the sensor has been depleted.
 - The tires without tire pressure warning valve and transmitter are used.
 - Tire chains are used.
 - When the full-size spare tire is not within the receivable range of the electric wave, a signal may not be received because the full-size spare tire is fixed. Accordingly, the system may not function properly. If there is a possibility that the tire pressure warning system does not receive a signal from the full-size spare tire, rotate the tire 90°.
 - If any wheels other than the specified ones are used, the system may not function properly because interference may prevent the radio waves from being correctly transmitted from the tire pressure sensor.
 - Depending on the tire type, the system may not function properly even though the specified wheels are used.
- (c) The average usage life of the grommet of the tire pressure warning valve and transmitter is approximately 5 years, at which time it must be replaced.
Re-tighten the valve nut if the valve is leaking air, although it is less than 5 years old and there is no problem with grommets.
- (d) After removing and installing the ECU or a sensor, check for a diagnostic trouble code and verify that it is a normal code.

3. FUNCTION OF COMPONENTS

Components	Function
Tire pressure warning valve and transmitter	Combined as a single unit with a disc wheel air valve, it measures tire pressure and temperature and transmits an ID number for measurement value and identification. Built-in the battery.
Tire pressure warning antenna and receiver	Receives and transmits a necessary signal from the transmitter to the tire pressure warning ECU.
Tire pressure warning ECU	Receives the signal from the receiver and identifies it as vehicle's own signal. If the measured value is equal to or lower than the specified value, it transmits a signal so that the air pressure warning light on the combination meter comes on.
Tire pressure warning light	Located in the combination meter, it informs the driver of lowered tire air pressure and system failure.
Tire pressure warning reset switch	Enters the initialization mode for tire or wheel replacement.
Tire pressure warning select switch	When 2 sets of ID are registered in the tire pressure warning ECU, either of the sets can be selected by changing the switch between "MAIN" and "2nd".

4. TIRE PRESSURE WARNING RESET SWITCH

- By operating the tire pressure warning reset switch, the tire pressure warning ECU can be set to issue a warning at an inflation pressure that corresponds to the type of tires.
Therefore, the dealer must set the warning threshold to the proper value in order to comply with the local regulations.
- Operate the tire pressure warning reset switch only after the inflation pressures of all tires (including the full-size spare tire) have been adjusted on the vehicle.
- To initialize the system, press and hold the tire pressure warning reset switch for 3 seconds or longer with the engine switch on (IG). After the initialization process has started, the warning light blinks 3 times (1 second on, 1 second off).
- During initialization, the tire pressure warning valve and transmitter measures the inflation pressure of the tires, and registers the signals that are transmitted into the tire pressure warning ECU at a frequency of once per minute. The initialization process is completed when signals from the all tires (including the full-size spare tire) have been received.

5. TIRE PRESSURE WARNING SELECT SWITCH

- This switch is installed at the base of the instrument panel on the front passenger seat side.
- The control ECU can be used to register two sets of the tire select switch. Consequently, there is no need to log the ID again each time a tire is changed.
- Make sure ID registration is performed by your car dealer.

HOW TO PROCEED WITH TROUBLESHOOTING

- HINT:
- Use the following procedures to troubleshoot the tire pressure warning system
 - *: Use the intelligent tester.

1

VEHICLE BROUGHT TO WORKSHOP

NEXT

2

CUSTOMER PROBLEM ANALYSIS

NEXT

3

CHECK TIRE PRESSURE WARNING LIGHT AND INDICATOR CONDITION

- (a) Turn the engine switch on (IG).
- (b) Record the condition of the tire pressure warning light on the combination meter assembly.
- (c) Refer to the "TIRE PRESSURE WARNING LIGHT AND INDICATOR CHART" section of the DIAGNOSIS SYSTEM for checking the condition of the tire pressure warning light (See page [TW-25](#)).

NEXT

4

DTC CHECK AND CLEAR*

Result	
Result	Proceed to
DTC is output	A
DTC is not output	B

A

Go to step 5

B

Go to step 6

5

DTC CHART

NEXT

Go to step 8

6 PROBLEM SYMPTOM CONFIRMATION**Result**

Result	Proceed to
Symptom does not occur	A
Symptom occurs	B

A

Go to step 7

B

Go to step 8

7 SYMPTOM SIMULATION**NEXT**

Go to step 6

8 PROBLEM SYMPTOMS TABLE**NEXT****9** CIRCUIT INSPECTION***NEXT****10** REPAIR**NEXT****11** CONFIRMATION TEST

- (a) Check for a DTC (See page [TW-29](#)).
- (b) Perform initialization (See page [TW-18](#)).
- (c) Confirm that the initialization has been completed.

NEXT

End

REGISTRATION

1. DESCRIPTION OF CODE REGISTRATION

It is necessary to register the transmitter ID in the tire pressure warning ECU when replacing the tire pressure warning valve and transmitter and/or tire pressure warning ECU.

(a) Before registration

(1) In case of tire pressure warning ECU replacement.

- Read the registered transmitter IDs that are stored in the old ECU using the intelligent tester and note them down.
- If reading stored transmitter IDs is impossible due to malfunctions of components such as the tire pressure warning antenna and receiver, remove the tires from the wheels and check the IDs located on the tire pressure warning valves and transmitters (See page [TW-6](#)).

(2) In case of tire pressure warning valve and transmitter replacement.

- When replacing the tire pressure warning valves and transmitters, note down the IDs written on the tire pressure warning valves and transmitters.

2. REGISTER TRANSMITTER ID

(a) Connect the intelligent tester to DLC3 (Procedure "A").

(b) Turn the engine switch on (IG) (Procedure "B").

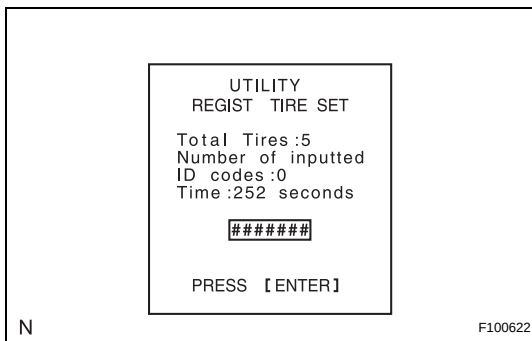
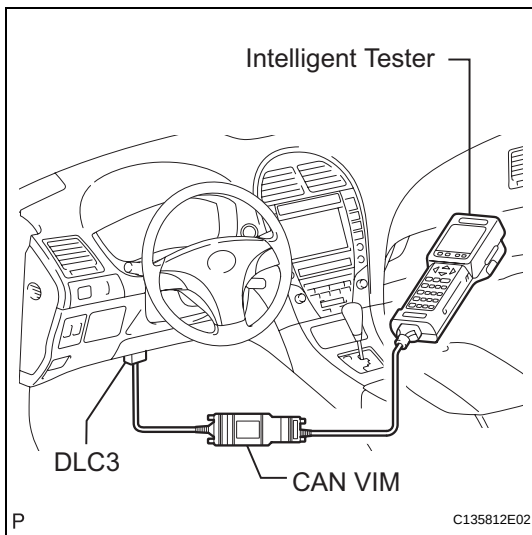
(c) Select the REGIST TIRE following the intelligent tester screen (UTILITY - REGIST TIRE) (Procedure "C").

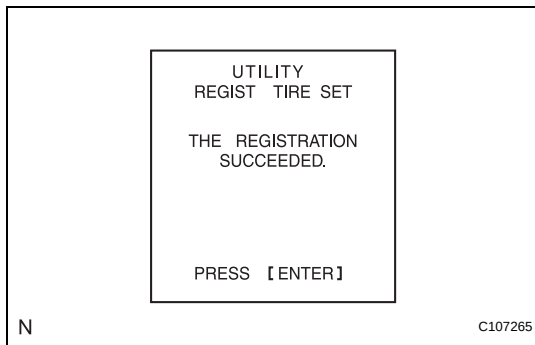
(d) Select the registration mode "MAIN" (Procedure "D").

HINT:

- Check that tire pressure warning select switch is "MAIN".
- When registering second set, select the registration mode "2nd" after changing tire pressure warning select switch to "2nd".

(e) Input the IDs (ID1 to ID4 or ID5) using the intelligent tester and transmit them to the tire pressure warning ECU (Procedure "E").



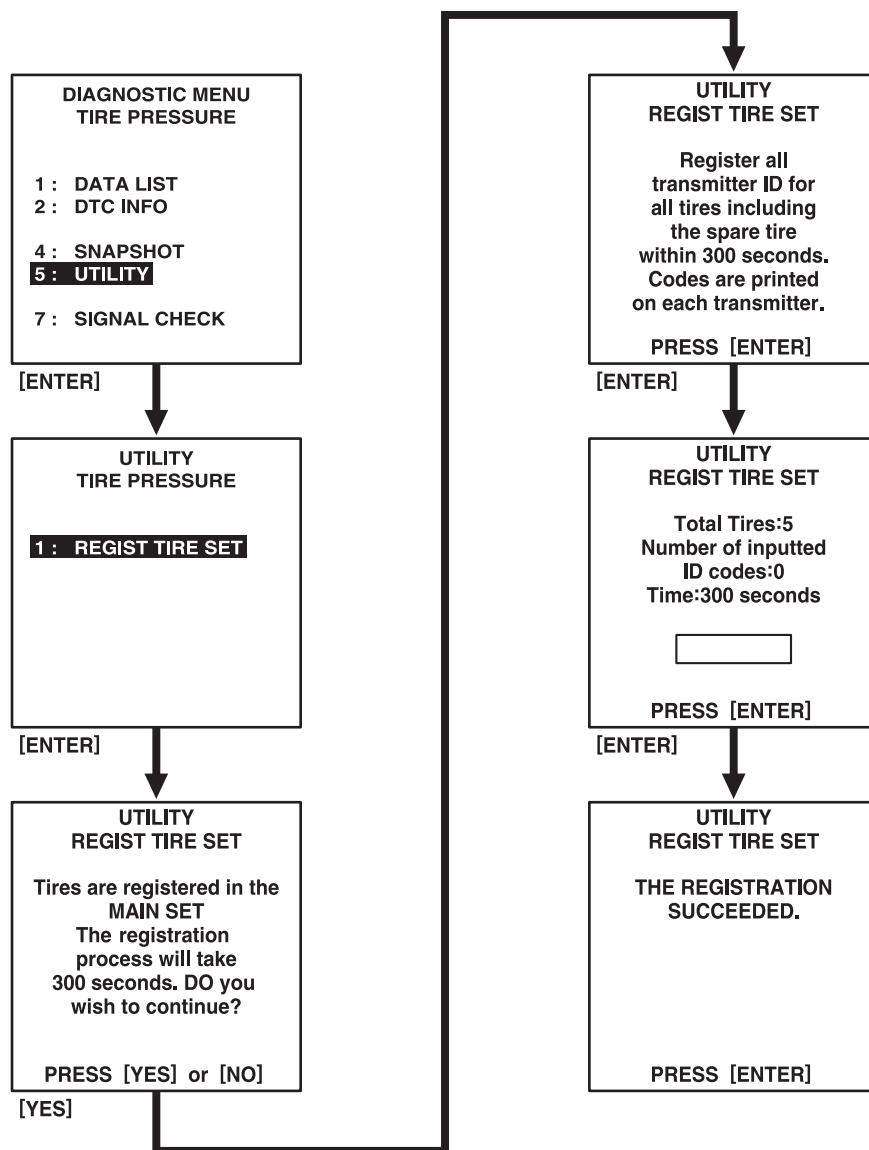


- (f) Set the ID transmission condition to "ID Registration is complete" (Procedure "F").

HINT:

- The previously registered IDs will be deleted from the memory when the registration is completed.
- If the procedures "C" to "E" are not completed within 5 min. , the mode will return to the normal operation mode.
- When the system is in initialization mode after the tire pressure warning reset switch has been operated, the registration is disabled until the initialization process is canceled or completed.

Registration Procedure



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3. CONFIRMATION OF TRANSMITTER ID REGISTRATION

- Connect the intelligent tester to DLC3 (engine switch is off).
- Turn the engine switch on (IG).
- Select "TIREPRESS" by following the prompts displayed on the intelligent tester.

- (d) Confirm that the data of tire pressure of all tires (including the full-size spare tire) are displayed on the intelligent tester screen.

NOTICE:

- It may take up to 1 minute or more to update the tire pressure data.
- If the IDs have not been registered, some of DTC C2171/71 is set in the tire pressure warning ECU after 51 minutes or more.

INITIALIZATION

1. DESCRIPTION OF INITIALIZATION

(a) Perform initialization in the following cases:

- Before delivery of a new vehicle.
- After replacement of the tire pressure ECU.*
- After replacement of the tire pressure warning valve and transmitter.
- Specified tire pressure changes depending on the size or type of the tire.

*: Perform initialization after the transmitter ID registration is completed (See page [TW-15](#)).

(b) Before initialization

- (1) Set the air pressure of all wheels, including the full-size spare tire, to the specified value.

Cold tire inflation pressure

Tire size	Front kPa (kgf/cm ² , psi)	Rear kPa (kgf/cm ² , psi)
P215/55R17 93V	210 (2.1, 30)	210 (2.1, 30)

NOTICE:

Perform the tire pressure adjustment after the vehicle has sufficiently cooled down. If the vehicle is not sufficiently cooled down, increase the air pressure by 20 to 30 kPa (0.2 to 0.3 kgf/cm², 2.9 to 4.3 psi) above the specified value.

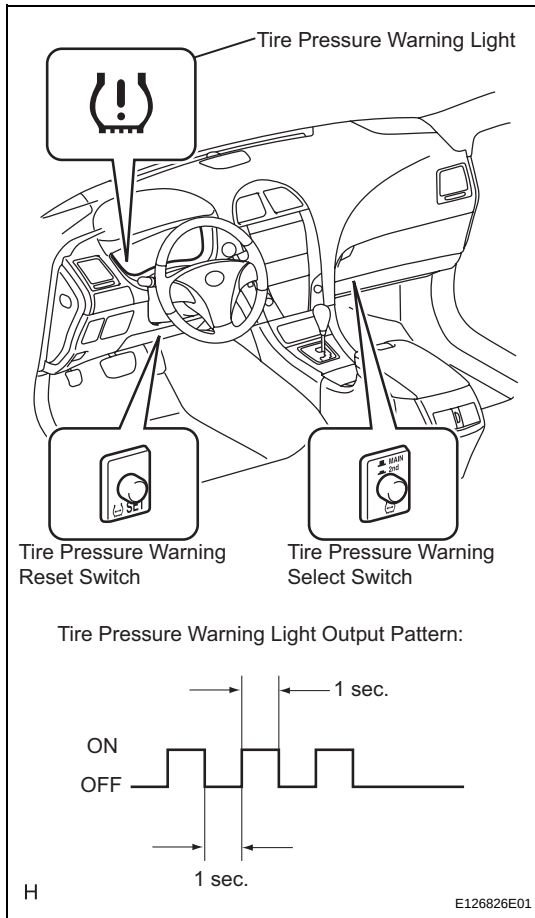
2. INITIALIZATION PROCEDURE

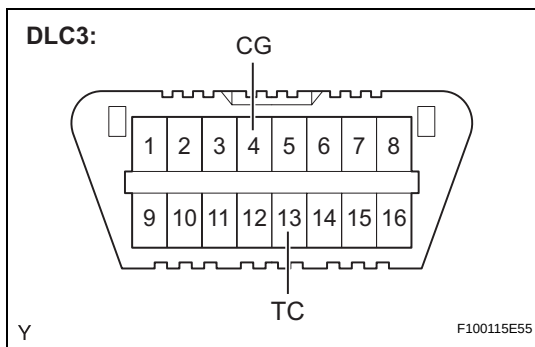
(a) Keep the tire pressure warning reset switch pressed for 3 seconds or more with the engine switch on (IG).

(b) Check that the tire pressure warning light blinks 3 times (1 second ON, 1 second OFF).

HINT:

Initialization will be completed if signals are received from all the wheels.





- (c) Wait for 2 or 3 minutes with the engine switch on (IG).

NOTICE:

- The initialization is normally completed within 2 to 3 minutes.
- If the initialization has not been completed successfully, DTC C2177/77 is set approximately 20 minutes.
- The initialization can be terminated by making a short circuit between terminals TC and CG of the DLC3 connector.

- (d) Confirm that the initialization has been completed using the intelligent tester.

- (1) Change the mode to test mode using intelligent tester and check that tire pressure warning light blinks at 0.125 second intervals.

HINT:

Tire pressure warning light will not blink until the system initialization is complete.

NOTICE:

The following operations can be used instead of above procedure

1. Turn the engine switch from off to on (IG).
2. Monitor the tire pressure values of all the wheels using the intelligent tester.
3. If the tire pressure values cannot be displayed on the intelligent tester screen, the initialization has failed.
4. It takes 2 to 3 minutes to display the tire pressure data.

HINT:

- In winter, as the tire pressure may decrease depending on the ambient temperature, increase the tire pressure by 20 to 30 kPa (0.2 to 0.3 kgf/cm², 2.9 to 4.3 psi) above the specified value after confirming that the initialization has been completed.

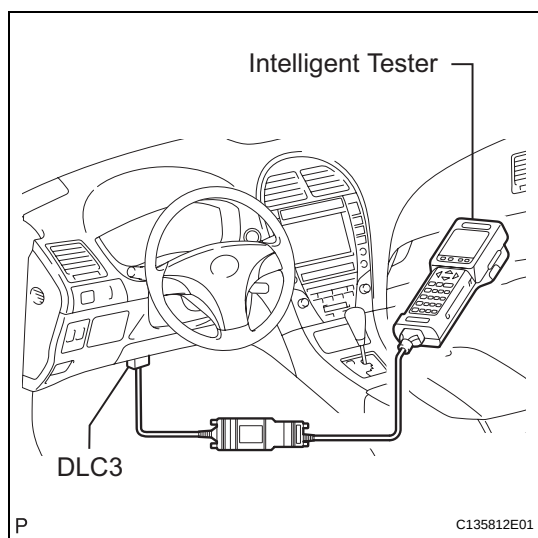
TEST MODE PROCEDURE

1. ENTER TEST MODE

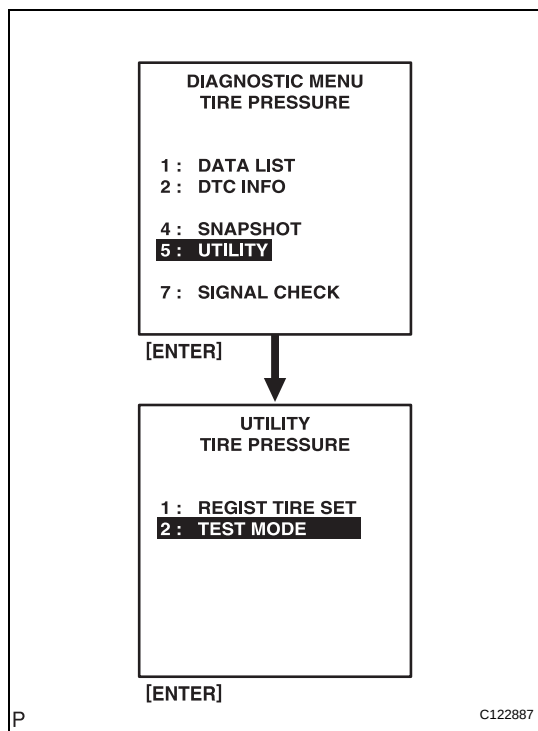
HINT:

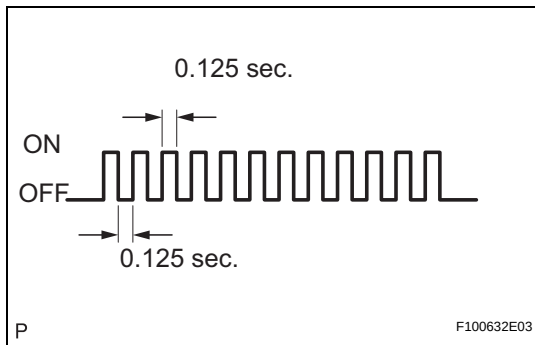
- Operation of the tire pressure warning reset switch can be checked in TEST MODE.
- During TEST MODE, the system is not initialized by pushing the tire pressure warning reset switch. The circuit of the tire pressure warning reset switch can be inspected during this mode.

- Make sure that the engine switch is off.
- Connect the intelligent tester to DLC3.
- Turn the engine switch on (IG).
- Check that the tire pressure warning light comes on for 3 seconds and then goes off.



- Select the TEST MODE on the intelligent tester.





- (f) Confirm that the tire pressure warning light in the combination meter blinks at 0.125 second intervals.

2. PERFORM SIGNAL CHECK

HINT:

- When entering signal check mode, the tire pressure warning ECU sets all the signal check DTCs first. After completing signal check for each inspection item, the DTCs for systems that are determined to be normal by the tire pressure warning ECU will be erased.

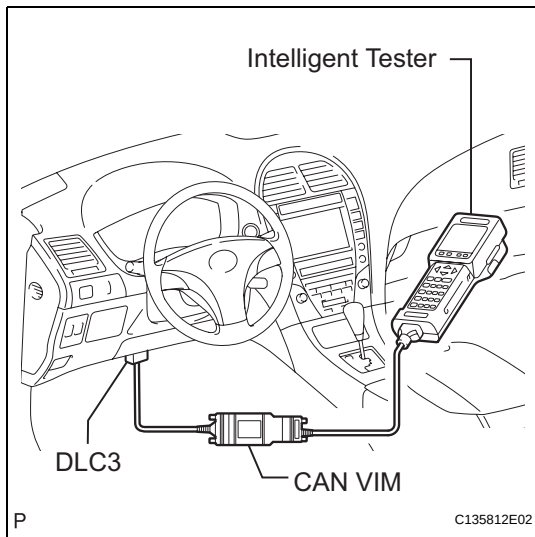
The DTCs for other inspection items may not be erased when only a certain signal is inspected.

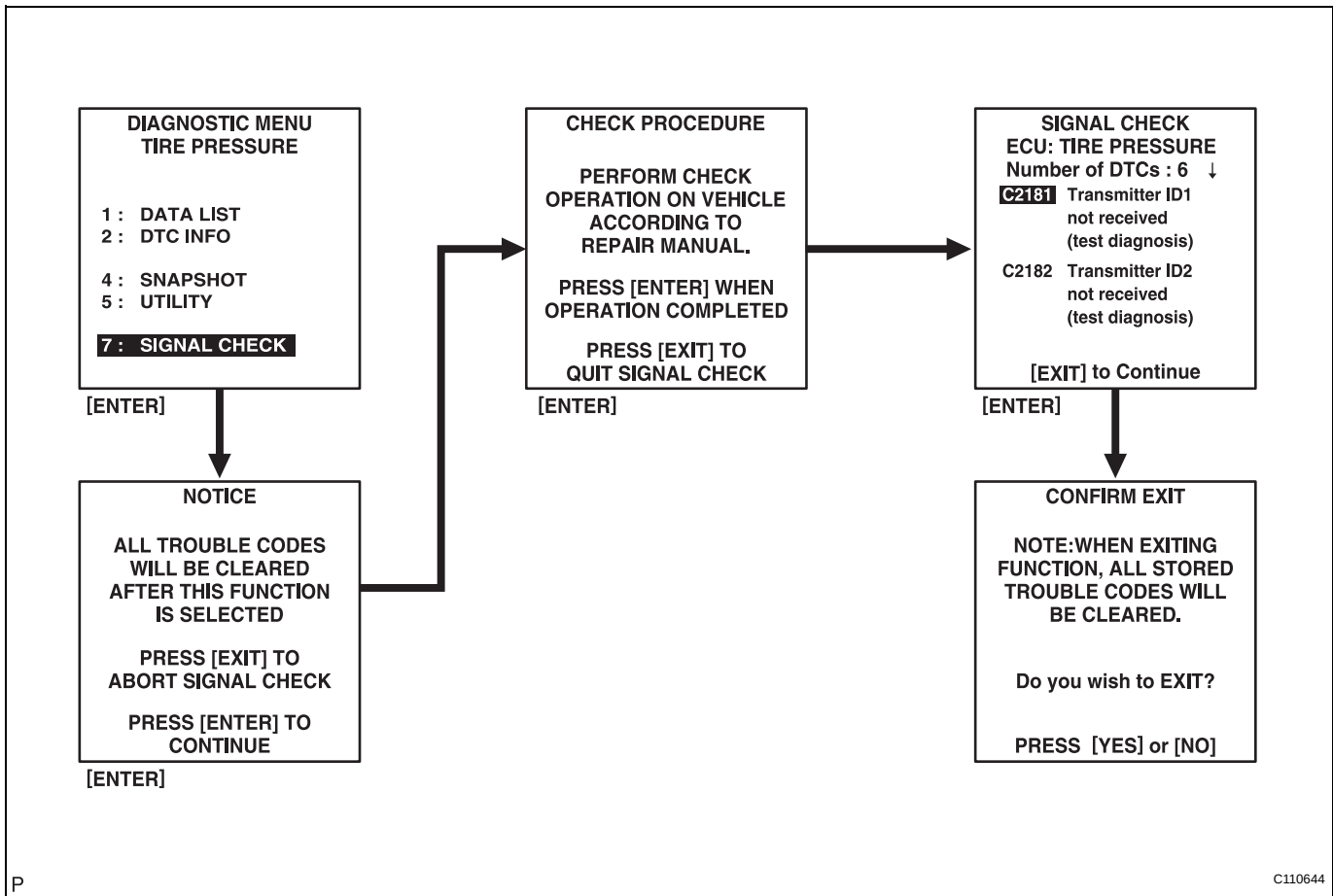
- When signal check returns to normal mode, all the signal check DTCs will be erased.

- Make sure that the engine switch is off.
- Connect the intelligent tester to DLC3.
- Turn the engine switch on (IG).
- Select the SIGNAL CHECK on the intelligent tester.

HINT:

Every time the test mode DTC erasure conditions are satisfied, the tire pressure warning light comes on for 1 second. Then, the tire pressure warning light blinks at 0.125 second intervals.





- (e) Drive the vehicle at 12 mph (20 km/h) or more for 10 seconds or more. To check the vehicle speed signal (C2191/91).
- (f) Loosen the valve core and rapidly reduce the pressure (at least 40 kPa (0.41 kg/cm², 5.8 psi) within 30 seconds or more). To check the transmitter data (C2181/81 to C2185/85).
HINT:
The transmitter ID can be transmitted by rapidly reducing the tire pressure.
- (g) Turn the select switch from off (main) to on (second) and then to off (main) to check the select switch signal (C2192/92).
- (h) Check that the tire pressure warning system test mode DTCs are erased.

Test Mode DTC	Test Signal	Test mode DTC Clear Condition
C2181/81 to C2185/85	Transmitter Data	Receive data from the transmitter which has a registered ID in the tire pressure warning ECU
C2191/91	Vehicle Speed Signal	Vehicle speed of 12 mph (20 km/h) or more is detected for 3 seconds or more
C2192/92	Tire Pressure Warning Select Switch	Change the mode by pressing the tire pressure warning select switch in the following order: MAIN→2nd→MAIN

- (i) Check the tire pressure warning reset switch.
(1) Press the tire pressure warning reset switch.

(2) Check the tire pressure warning indicator light.

Test Signal	Normal Condition
Tire Pressure Warning Reset Switch	- Switch ON: TPWS indicator comes on - Switch OFF: TPWS indicator blinks

(j) Result

HINT:

After the signal check is completed, check for a signal check DTC to confirm the system status.

Condition	Procedure
SIGNAL CHECK DTC is output	Repair the faulty part and enter SIGNAL CHECK again
SIGNAL CHECK DTCs are cleared	No problem

(k) End of SIGNAL CHECK

After completing the test mode (SIGNAL CHECK), turn the engine switch off and disconnect the tester.

DTC of SIGNAL CHECK (TEST DIAGNOSIS) function:

If a trouble code is displayed during the test mode DTC check, check the circuit listed for that code. For details of each code, refer to the relevant page listed under respective "DTC No." in the chart.

DTC No.	Detection Item	Trouble Area
C2181/81 (TW-40)	Transmitter ID1 not received	- Tire pressure warning valve and transmitter - Tire pressure warning antenna and receiver - Wire harness or connector - Tire pressure warning ECU
C2182/82 (TW-40)	Transmitter ID2 not received	- Tire pressure warning valve and transmitter - Tire pressure warning antenna and receiver - Wire harness or connector - Tire pressure warning ECU
C2183/83 (TW-40)	Transmitter ID3 not received	- Tire pressure warning valve and transmitter - Tire pressure warning antenna and receiver - Wire harness or connector - Tire pressure warning ECU
C2184/84 (TW-40)	Transmitter ID4 not received	- Tire pressure warning valve and transmitter - Tire pressure warning antenna and receiver - Wire harness or connector - Tire pressure warning ECU
C2185/85 (TW-40)	Transmitter ID5 not received	- Tire pressure warning valve and transmitter - Tire pressure warning antenna and receiver - Wire harness or connector - Tire pressure warning ECU
C2191/91 (TW-63)	Vehicle speed signal error	- Vehicle speed sensor - Combination meter assembly - Wire harness or connector - Tire pressure warning ECU
C2192/92 (TW-65)	Tire pressure warning select switch malfunctions	- Tire pressure warning select switch - Tire pressure warning ECU - Wire harness or connector