

## GROUP 42C

# WIRELESS CONTROL MODULE (WCM)

## CONTENTS

<b>GENERAL INFORMATION</b> .....	<b>42C-2</b>	TIRE PRESSURE MONITORING SYSTEM (TPMS) FUNCTION .....	42C-9
<b>SYSTEM OPERATION</b> .....	<b>42C-5</b>	WARNINGS/ALARMS.....	42C-11
KEYLESS ENTRY FUNCTION.....	42C-5		
IMMOBILIZER FUNCTION.....	42C-9	<b>CONFIGURATION FUNCTION</b> .....	<b>42C-13</b>

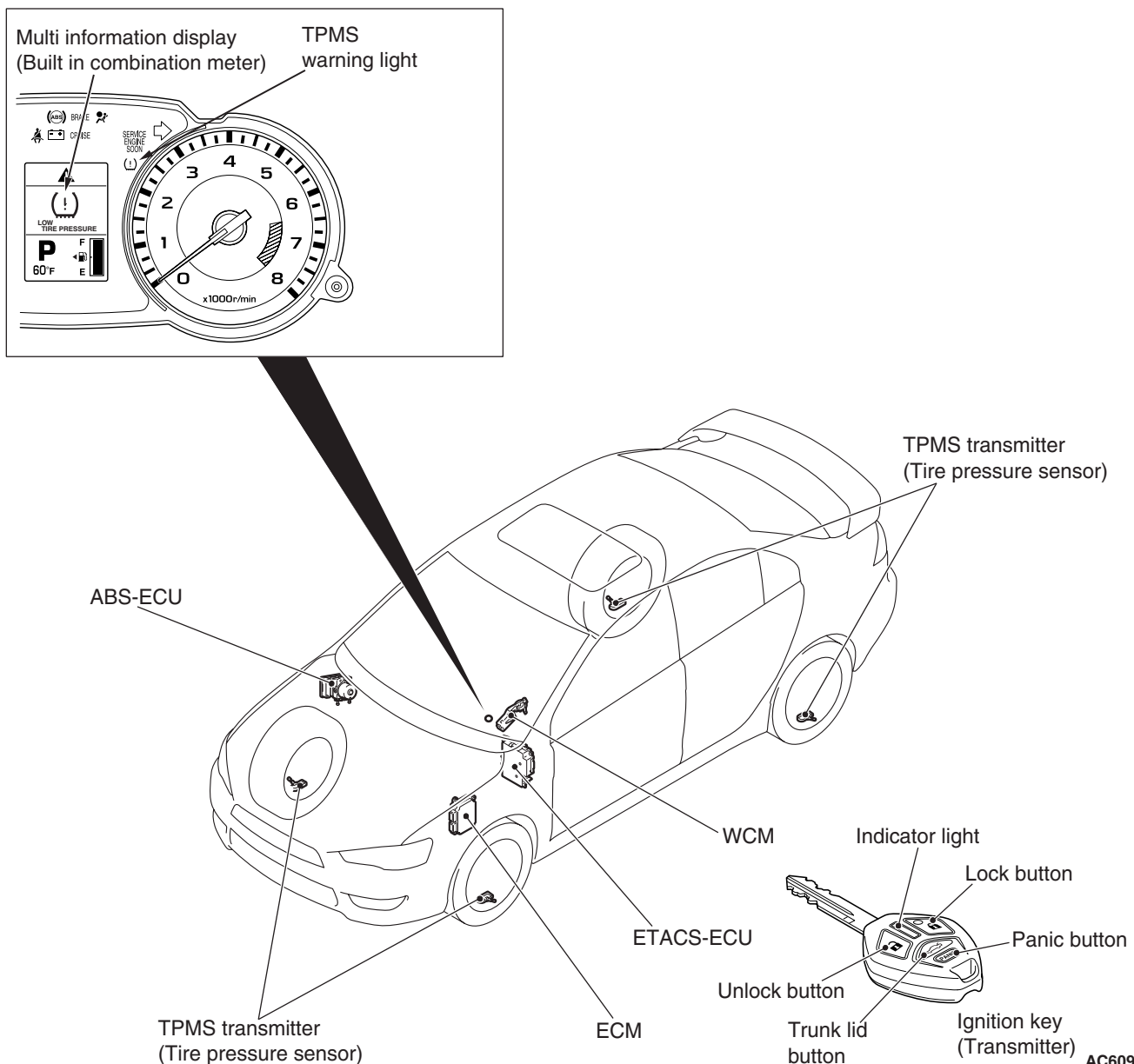
## GENERAL INFORMATION

M2422000100075

The wireless control module (WCM) is a system that integrates the keyless entry function, immobilizer function, and the TPMS function, and it has the following features:

- The ignition key (transmitter) incorporates a lock/unlock/trunk lid button and a panic button. The ignition key also incorporates an indicator light that enables the driver to check if the signal is transmitted correctly or if the battery in the key is discharged. (Refer to P.42C-5.)
- The ignition key incorporates the immobilizer function that inhibits starting the engine by using an unauthorized key.
- The incorporated TPMS function monitors the air pressure of all the tires (except spare tire).
- Each vehicle is provided with two ignition keys (transmitter), and up to eight ignition keys can be registered.
- Settings of the keyless entry function can be adjusted using a customization function (Refer to P.42C-13).

## CONSTRUCTION DIAGRAM



AC609302AC

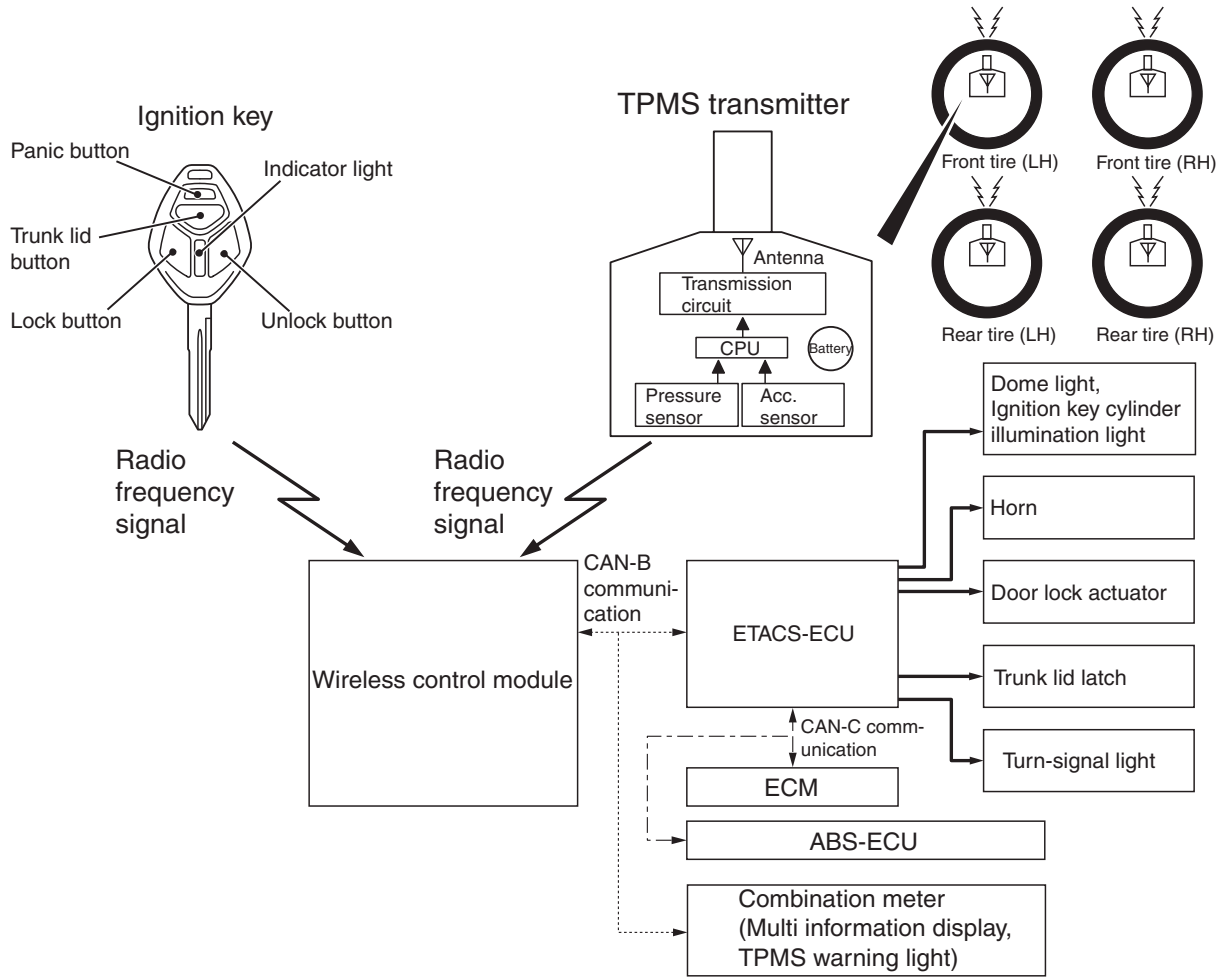
**Main components and functions**

Parts name	Functional description
WCM	Controls the keyless entry functions, TPMS functions and starting of the engine by using the following communications. <ul style="list-style-type: none"> <li>• Communications with ETACS-ECU, ECM, ABS-ECU &lt;vehicles for ABS&gt; and combination meter via CAN</li> <li>• Wireless communication with the ignition key (transmitter)</li> <li>• Wireless communication with the TPMS transmitter</li> </ul>
Ignition key (transmitter)	The ignition key (transmitter) also sends signals to WCM when the lock/unlock/trunk lid button and the panic button on it are operated.
Combination meter (Multi information display, TPMS warning light)	Communicates with WCM via CAN. Send ignition switch status. Receives the warning request or warning information about TPMS from WCM, activates * the TPMS warning light. Warning symbol and message is additionally displayed on the multi information display.
ETACS-ECU	Communicates with WCM via CAN send ignition switch status. Receives the door lock/unlock request from WCM, outputs the lock/unlock signal and flashes the turn signal light, dome light and horn to inform the driver that the doors are locked/unlocked.
ABS-ECU	Communicates with WCM via CAN. Sends the vehicle speed data <Vehicles with ABS>.
ECM	Communication with WCM via CAN. Send atmospheric pressure data. Sends the vehicle speed data <Vehicles without ABS>.
TPMS transmitter	Measure tire pressure directly, then send radio frequency signal to WCM.

**NOTE:**

- \*: Illuminates for tire pressure warning.
- \*: Flashes for about 1 minute and then continuously illuminated for TPMS malfunction warning.

System configuration



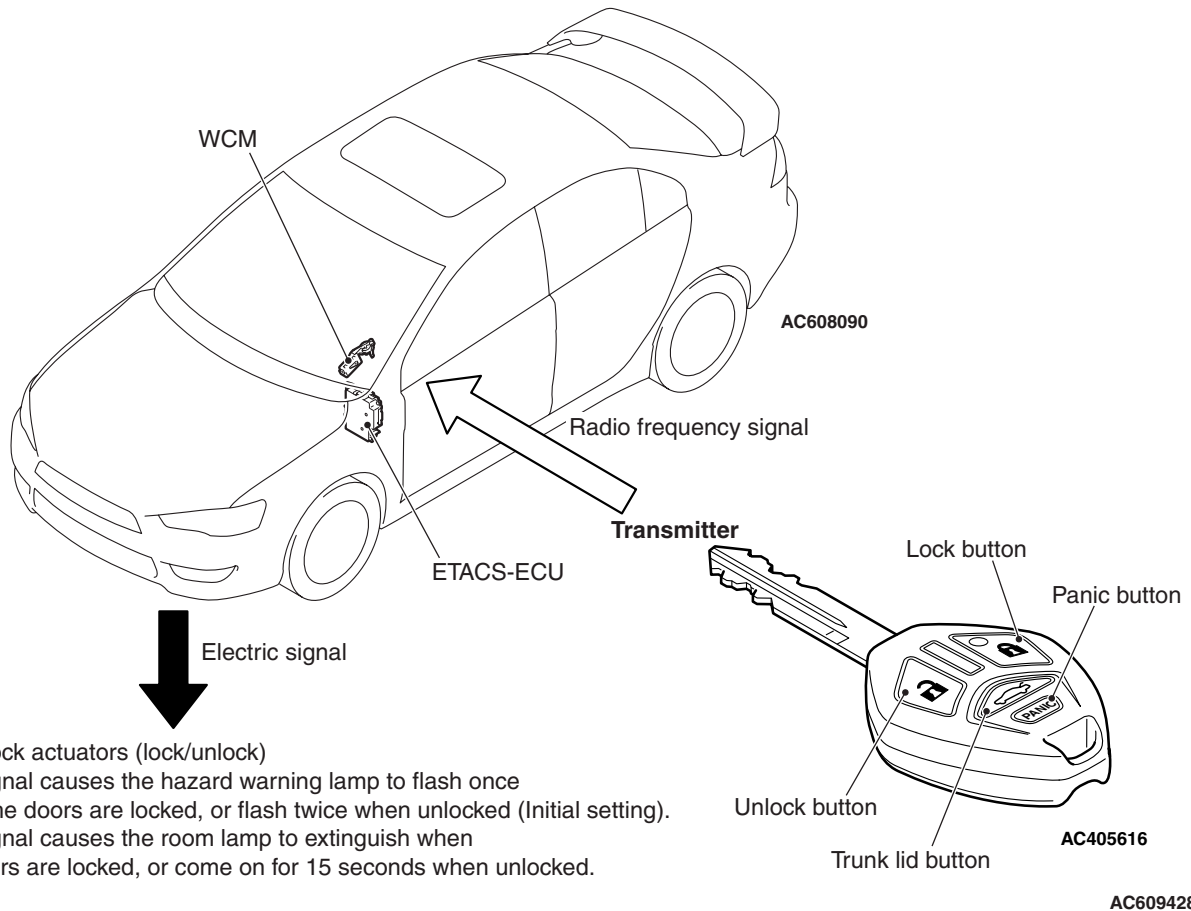
AC609283AB

*NOTE: In case of replacement of WCM, all keyless ID, key ID and tire pressure sensor ID should be re-registered using scan tool MB991958 (M.U.T.-III sub-assembly).*

## SYSTEM OPERATION

### KEYLESS ENTRY FUNCTION

M2422000400076



- Door lock actuators (lock/unlock)
- The signal causes the hazard warning lamp to flash once when the doors are locked, or flash twice when unlocked (Initial setting).
- The signal causes the room lamp to extinguish when the doors are locked, or come on for 15 seconds when unlocked.

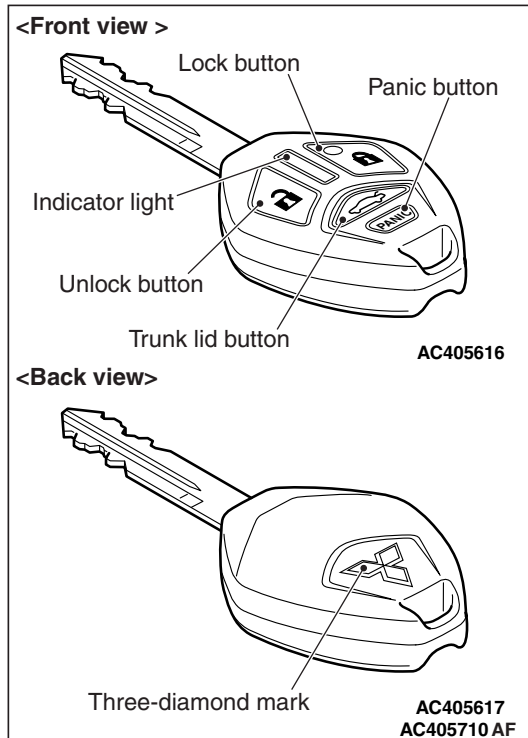
This keyless entry function has the following features: A keyless entry system enables locking and unlocking of all doors, the trunk lid from 12m (39.4 feet) away from the vehicle. The following features are also available.

- A four-knob type transmitter with lock, unlock, trunk lid and panic buttons.
- The WCM incorporates a receiver and a receiving antenna.

- Up to eight encrypted codes can be registered using scan tool MB991958 (M.U.T.-III sub-assembly).
- Answerback functions  
*NOTE: The answerback function can be changed using a customization function (Refer to P.42C-13).*
- Keyless entry timer lock  
*NOTE: Timer of the keyless entry timer lock can be changed using a customization function (Refer to P.42C-13).*

**DESCRIPTION OF CONSTRUCTION AND OPERATION**

**TRANSMITTER**

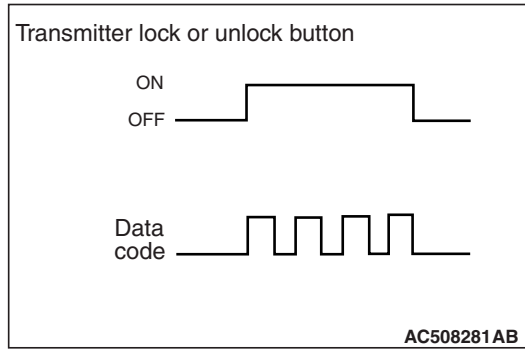


- The transmitter is integrated into the master key. The four-knob button is adopted, and the specific encrypted code is transmitted as radio wave signal.
- An indicator light, which illuminates when signals are sent, is added on the key grip. This indicator light informs you of the signal transmission status and warns you of flat battery.
- A signal transmission circuit (printed circuit) and a battery are housed in one case. The case is housed in the key grip, thus improving resistance to water ingress.
- A coin type battery, CR1620 is used in the transmitter.
- The functions of the immobilizer system are integrated (Refer to P.42C-9).
- Using a customization feature, the transmitter button operation can be changed (Refer to P.42B-27).
- The transmitter button operation allows the system to operate as follows:

**KEYLESS ENTRY SYSTEM OPERATION TABLE (DEFAULT)**

OPERATION OF TRANSMITTER		OPERATION OF KEYLESS ENTRY SYSTEM	
Lock button	Press once	Lock all doors	
Unlock button	Press once	Unlock the driver's door	
	Press twice	Unlock all doors	
Trunk lid button	Press twice (press once, and then press again within 5 seconds)	Open the trunk lid	
Panic alarm system	Panic button	Press once (press and hold for 1 second).	Starts the panic alarm (headlights flash and horn honks for three minutes)
	Lock button, unlock button, trunk lid button or panic button	Press again	Stops the panic alarm in progress

## ENCRYPTED CODE



Four data codes are transmitted when a switch is operated once. The encrypted code for user identification is a combination of 0 and 1, and more than 1 million different combinations are available. To prevent theft by copying signal codes, the data code includes a rolling code with the encrypted code. The rolling code changes each time a signal is sent.

## RECEIVER

The receiver is incorporated into WCM together with the receiving antenna. The receiver compares the signal the antenna received from the transmitter with the encrypted code registered in it, and when they coincide, outputs a signal from WCM. By connecting scan tool MB991958 (M.U.T.-III sub-assembly) to the data link connector, encrypted codes of up to eight transmitters can be registered.

*NOTE: IA transmitter can be added without using the scan tool. <USA only>*

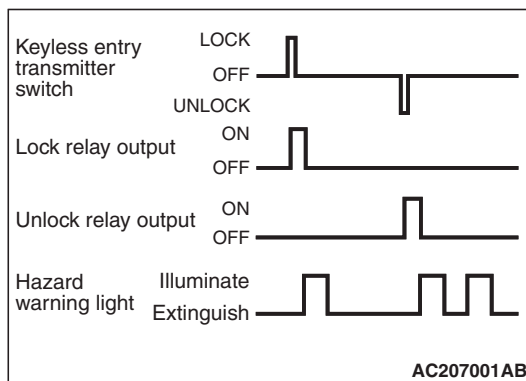
## FUNCTION FOR CONFIRMING WCM (RECEIVER) OUTPUT AND OPERATION

When the ETACS-ECU receives a command from WCM, the ETACS-ECU outputs LOCK/UNLOCK signal and informs the driver of the keyless entry system operation by flashing the light and blowing horn (Answerback). The initial setting at factory for the answerback function is as following table. Using a customization feature, the answerback function can be changed (Refer to P.42C-13).

### FUNCTION TABLE FOR CONFIRMING KEYLESS ENTRY OPERATION (DEFAULT)

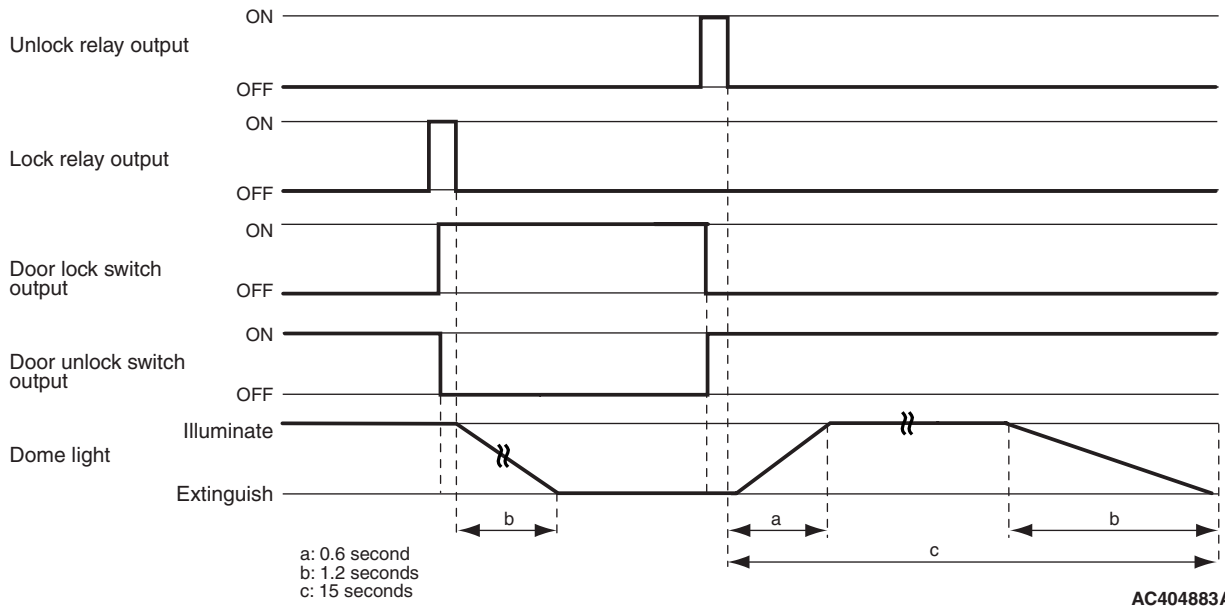
ITEM	OPERATION	
	DOORS LOCKED	DOORS UNLOCKED
ETACS-ECU (WCM)	Sends lock signal	Sends unlock signal
Dome light	Flashes once	Illuminates for 15 seconds
Turn-signal lights (RH and LH)	Flashes once	Flashes twice
Horn	Sounds once if doors are already locked	—

## KEYLESS ENTRY HAZARD LIGHT ANSWERBACK FUNCTION



The hazard answerback function that allows checking the lock/unlock state of the door easily even in the daytime is installed. When the LOCK signal from the transmitter is input to ETACS-ECU, all doors are locked and the hazard warning light flashes once. When UNLOCK signal is input, all doors are unlocked and the hazard warning light flashes twice.

**KEYLESS ENTRY DOME LIGHT  
ANSWERBACK FUNCTION**



When LOCK signal from the transmitter is input to the ETACS-ECU via WCM, all doors are locked and the dome light will extinguish\*. When UNLOCK signal is input, all doors are unlocked and the dome light illuminates for 15 seconds. The dome light fades in, keeps on, and fades out in 15 seconds after the door unlock relay is operated.

*NOTE: \*: If doors are locked with the transmitter when the dome light is ON while doors are opened, the dome light is switched off in 1.2 seconds. In addition, if doors are locked with the transmitter when the dome light is OFF, the dome light does not work.*

**KEYLESS ENTRY HORN ANSWERBACK FUNCTION**

When WCM receives the LOCK signal from the transmitter and send LOCK signal to ETACS-ECU, all doors are locked and the horn sounds. If the driver's door cannot be locked even when the keyless entry transmitter is operated, the horn does not sound.

**KEYLESS ENTRY TIMER LOCK TIME**

When none of the doors is opened within 30 seconds after the doors are unlocked by the keyless entry system, ETACS-ECU automatically outputs the door lock signal to lock the doors. This function prevents the doors from being unlocked unexpectedly by operation errors. Using a customization function, the timer lock time can be changed (Refer to P.42C-13).

**OPERATION INHIBITION CONDITIONS**

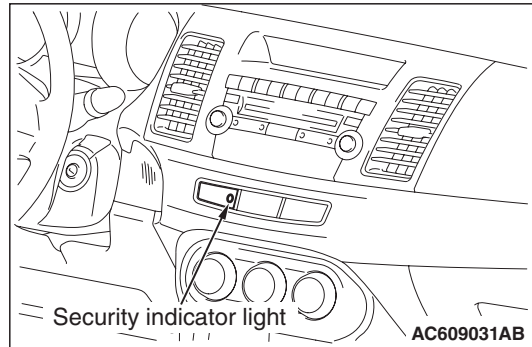
The operation of the system is inhibited when:

- The ignition key is in the ignition switch.

**SECURITY ALARM**

The security alarm function is based on the door lock operation by the keyless entry system. The function warns when the doors are opened by any operation other than the keyless entry system. Using a customization function, the security alarm can be enabled/disabled (Refer to GROUP 54A, Security alarm P.54A-37). This customization function is described in the owner's manual.

**SECURITY INDICATOR LIGHT**



The security indicator light has been installed on the center panel of the instrument panel.

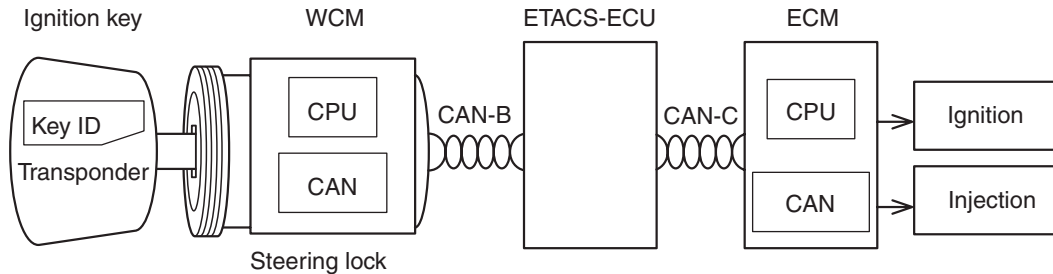


## IMMOBILIZER FUNCTION

M2422000500062

The immobilizer function prevents the engine from starting and immobilizes the vehicle if a key other than the key registered for that vehicle is used in an attempt to start the engine after forced entry.

## CONSTRUCTION DIAGRAM



AC507888AE

## OPERATION

1. With the ignition key turned ON, the transponder (a small transmitter) integrated in the ignition key transmits its own ID code (key ID) to WCM via radio wave.
2. According to the sent key ID, WCM controls the ECM only when the sent ID code agrees with the pre-registered one.
3. Since the power to the transponder incorporated in the ignition key is supplied from the WCM, the ignition key can be used even when its battery is discharged. Two ignition keys are provided, and up to eight ignition keys can be registered to one vehicle as needed. More than one trillion of ID code combinations can be registered. This feature prevents code copying, resulting in higher security of the system.

**NOTE:** In case of replacement of WCM, or loss or addition of the ignition key, all key ID codes should be re-registered using scan tool. (A key can be added without using the scan tool. <USA only>)

## TIRE PRESSURE MONITORING SYSTEM (TPMS) FUNCTION

M2422000800018

When the tire pressure becomes under the specified value, the TPMS function warns the driver of that state by illuminating the TPMS warning light.

## OPERATION

- The signals from the TPMS transmitter are received by the WCM.
  - WCM processes input signals from each TPMS transmitter as well as vehicle speed signals from the ABS-ECU if equipped. It receives the atmospheric pressure signal from ECM, and when the atmospheric pressure is low (such as at high altitude), it calibrates the tire pressure received from TPMS transmitter and makes a judgment of warning. When the road tire pressure is low, it sends a warning signal causing the TPMS warning light to be illuminated. When the TPMS has problems, it sends a warning signal causing the TPMS warning light to be flashed\*.
- NOTE:** \*: Change to continuous illumination after flashing for about 1 minute.
- For 3 seconds after the ignition switch is turned to the "ON" position, WCM illuminates the TPMS warning light to check any breaks in the TPMS warning light circuit.

- By connecting the scan tool to the data link connector, data stored in WCM (data of tire pressure and TPMS transmitter ID, the alarm status and warning history, etc.) can be displayed and TPMS transmitter ID can be registered.

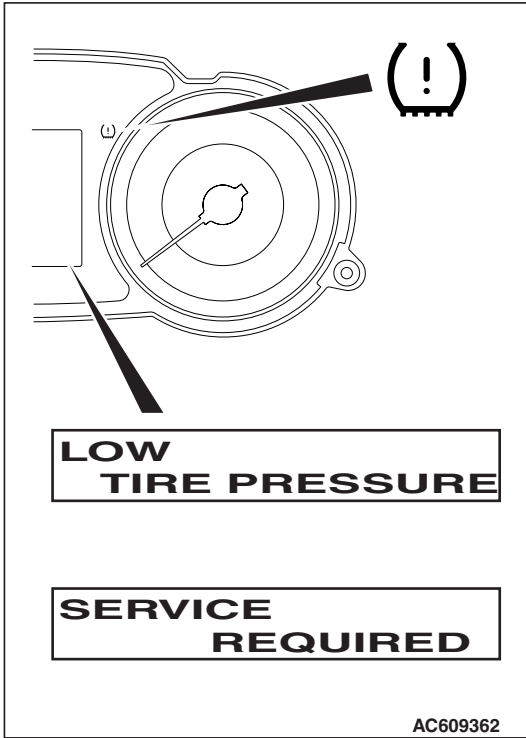
*NOTE: If the TPMS transmitter is replaced, register the ID codes of all the TPMS transmitters again using the M.U.T.-III.*

**TPMS WARNING LIGHT**

The TPMS warning light on the combination meter illuminates or flashes\* to alert the driver by request from WCM. When the tire pressure warning or the fault warning is activated, a warning symbol and a message are displayed on the multi information display.

**WARNING DISPLAY PATTERN OF TPMS WARNING LIGHT AND MULTI INFORMATION DISPLAY**

Circumstance	Warning light	Multi information display
For 3 seconds after the ignition switch is turned to the "ON" position (warning light circuit self-check)	Illuminates	No indication
TPMS problems	Flashes*	Symbol and "SERVICE REQUIRED" is displayed
Low tire pressure	Illuminates	Symbol and "LOW TIRE PRESSURE" is displayed



**TIRE PRESSURE THRESHOLD VALUES**

Item	Tire pressure kPa (psi)
Standard pressure at cold (reference)	220 (32)
Alarm ON pressure	174 (25.2) or less
Alarm OFF pressure	189 (27.4) or more

**TPMS TRANSMITTER (TIRE PRESSURE SENSOR)**

The TPMS transmitter combines the valve and tire pressure sensor in a single unit. The TPMS transmitters are mounted inside the tires. The TPMS transmitter measures tire pressure directly with its tire pressure sensor and sends radio frequency signals to WCM. The TPMS transmitter includes acceleration sensor that senses tire rotation, and change tire pressure sampling and data transmission timing when vehicle is running.

*NOTE: Use only genuine wheels. The use of non-genuine wheels may cause the improper installation of the TPMS transmitters, possibly resulting in air leakage and damage to the TPMS transmitter.*

**TIRE PRESSURE SAMPLING TIMING**

Vehicle status	Sampling timing
At vehicle moving	once every 5 seconds
At vehicle stationary	once every 1 minute

NOTE: Vehicle moving = vehicle speed: approximately 25 km/h (15 mph) or more

**DATA TRANSMISSION TIMING**

Vehicle status	Transmission timing
At vehicle moving	once every 1 minute *
At vehicle stationary	once every 13 hours


If a sampled pressure varies by  $\pm 10$  kPa (1.5psi) from the last transmitted pressure value, an additional transmission will occur.


NOTE: \*: Once every 15 seconds for first 30 transmission after vehicle starts moving.

**WARNINGS/ALARMS**

M2422000900015

If the TPMS fails or the tire pressure is low, the WCM warns the driver of that state by the TPMS warning light and the multi information display in the combination meter.

Display contents	Item	State	Warning operations		Warning cancellation conditions (Cancels warning operations when one of the conditions met)
			TPMS warning light	Multi information display	
	TPMS warning light bulb open circuit check	The ignition switch is turned from "LOCK" (OFF) to "ON."	Illuminates for 3 seconds.	–	3 seconds have passed after the TPMS warning light is lit.
	Tire pressure alarm	The received tire pressure value is under the alarm ON threshold value.	Illuminates.	Symbol and "LOW TIRE PRESSURE" is displayed.	The received tire pressure value is over the alarm OFF threshold value.

Display contents	Item		State	Warning operations		Warning cancellation conditions (Cancels warning operations when one of the conditions met)
				TPMS warning light	Multi information display	
	TPMS failure warning	ID not stored	The TPMS transmitter ID is not registered in the WCM.	Flashes *	Symbol and "SERVICE REQUIRED" is displayed.	ID is registered normally.
		Defective EEPROM	Abnormality of data in the EEPROM of the WCM is detected.			Data in the EEPROM of the WCM is checked to be normal.
		Problem in signal reception	The signals from TPMS transmitters cannot be received while driving for about 20 minutes.			The signal from the TPMS transmitter that was warned is received.
		Defective sensor	The sensor failure signal is received from the TPMS transmitter.			A normal signal is received from the TPMS transmitter that was warned.
		The battery voltage of the TPMS transmitter is low.	The reception problem warning is activated because of the low battery voltage of the TPMS transmitter.			The signal of normal battery voltage is received from the TPMS transmitter that was warned.
		Vehicle speed input problem	The vehicle speed is not input.			The vehicle speed is input.
		Abnormal vehicle speed value	The vehicle speed value is abnormal.			The normal vehicle speed value is received.

NOTE: \*: Change to continuous illumination after flashing for about 1 minute.

## CONFIGURATION FUNCTION

M2422000600070

Using the scan tool, the following functions can be programmed. The programmed information is held even when the battery is disconnected.

Adjustment item (scan tool MB991958 display)	Adjustment item	Adjusting contents (scan tool MB991958 display)	Adjusting contents
Hazard answer back	Adjustment of the number of keyless hazard warning light answer back flashes	Lock:1, Unlock:2	LOCK: Flashes once, UNLOCK: Flashes twice (default)
		Lock:1, Unlock:0	LOCK: Flashes once, UNLOCK: No flash
		Lock:0, Unlock:2	LOCK: No flash, UNLOCK: Flash twice
		Lock:2, Unlock:1	LOCK: Flash twice, UNLOCK: Flash once
		Lock:2, Unlock:0	LOCK: Flash twice, UNLOCK: No flash
		Lock:0, Unlock:1	LOCK: No flash, UNLOCK: Flash once
		Lock:0, Unlock:0	No function
Dome light delay timer with door	Adjustment of interior light delay shutdown time	0sec	0 second (no delay shutdown time) (default <Vehicles without central door locking system>)
		7.5sec	7.5 seconds
		15sec	15 seconds
		30sec	30 seconds (default <Vehicles with central door locking system>)
		60sec	60 seconds
		120sec	120 seconds
		180sec	180 seconds
Door unlock mode	Door lock system <Vehicles with central door locking system>	All doors unlock	All the doors are unlocked when the driver's side door is unlocked.
		Dr door unlock	Only the driver's side door is unlocked when the driver's side door is unlocked. (default)
Auto door unlock by P position	Auto door unlock by P position function <Vehicles with central door locking system>	Disable	No function (default)
		Always enabled	Always with function
Duration of horn chirp	Horn sounding time during horn answer back	Short	0.01 second (default)
		Long	0.02 second
Horn chirp by keyless	Horn chirp by keyless entry system	Not sound horn	No horn answerback function
		Lock any time	The horn sounds when the lock button of keyless entry transmitter is pressed once.
		W lock any time	The horn sounds when the lock button of keyless entry transmitter is pressed twice. (default)

<b>Adjustment item (scan tool MB991958 display)</b>	<b>Adjustment item</b>	<b>Adjusting contents (scan tool MB991958 display)</b>	<b>Adjusting contents</b>
Timer lock timer	Timer lock period adjustment	30sec	30 seconds (default)
		60sec	60 seconds
		120sec	120 seconds
		180sec	180 seconds
Panic alarm switch	With/without panic alarm function	Disable	No function
		Enable	With function (default)