BODY & ACCESSORIES

09 SECTION

09–00 OUTLINE

BODY AND ACCESSORIES ABBREVIATIONS

DPE090000000T01

A/C	Air Conditioner
ACC	Accessories
ALC	Auto Level Control
ATX	Automatic Transaxle
BCM	Body Control Module
CAN	Controller Area Network
CM	Control Module
CPU	Central Processing Unit
DLC	Data Link Connector
DPF	Diesel Particulate Filter
DSC	Dynamic Stability Control
DTC	Diagnostic Trouble Code
GND	Ground
GPS	Global Positioning System
HDD	Hard Disk Drive
HI	High
IG	Ignition
INT	Intermittent
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LH	Left Hand
LO	Low
M	Motor
MTX	Manual Transaxle
OFF	Switch Off
ON	Switch On
PCM	Powertrain Control Module
PID	Parameter Identification
PSD	Power Sliding Door
PTC	Positive Temperature Coefficient

P/W CM	Power Window Control Module
RH	Right Hand
SW	Switch
TNS	Tail Number Side Lights
WDS	Worldwide Diagnostic System

BODY AND ACCESSORIES NEW FEATURES

DPE090000000T02

Improved marketability	• ~~Power sliding door (PSD) adopted~~ • Auto-open/close function adopted for all power windows • Power door lock system adopted • Advanced keyless entry & start system adopted • ~~Hard disc drive (HDD) built-in audio system adopted~~ • ~~Rear entertainment system (RES) adopted~~ • Hard-plastic liftgate adopted
Improved convenience	• Exterior open/close function adopted for power window • IG OFF timer function adopted for power outer mirror • Auto light system adopted • Auto wiper system adopted • ~~Car navigation system adopted~~ • ~~Back monitor system adopted~~
Improved safety	• Triple-H structure adopted
Improved security	• Immobilizer system adopted • Theft-deterrent system adopted
Improved visibility	• Discharge headlight adopted • Headlight auto leveling system adopted
Wiring harness simplification	• Controller area network (CAN) system adopted
System simplification	• Body control module adopted

09–10 BODY PANELS

BODY PANEL OUTLINE

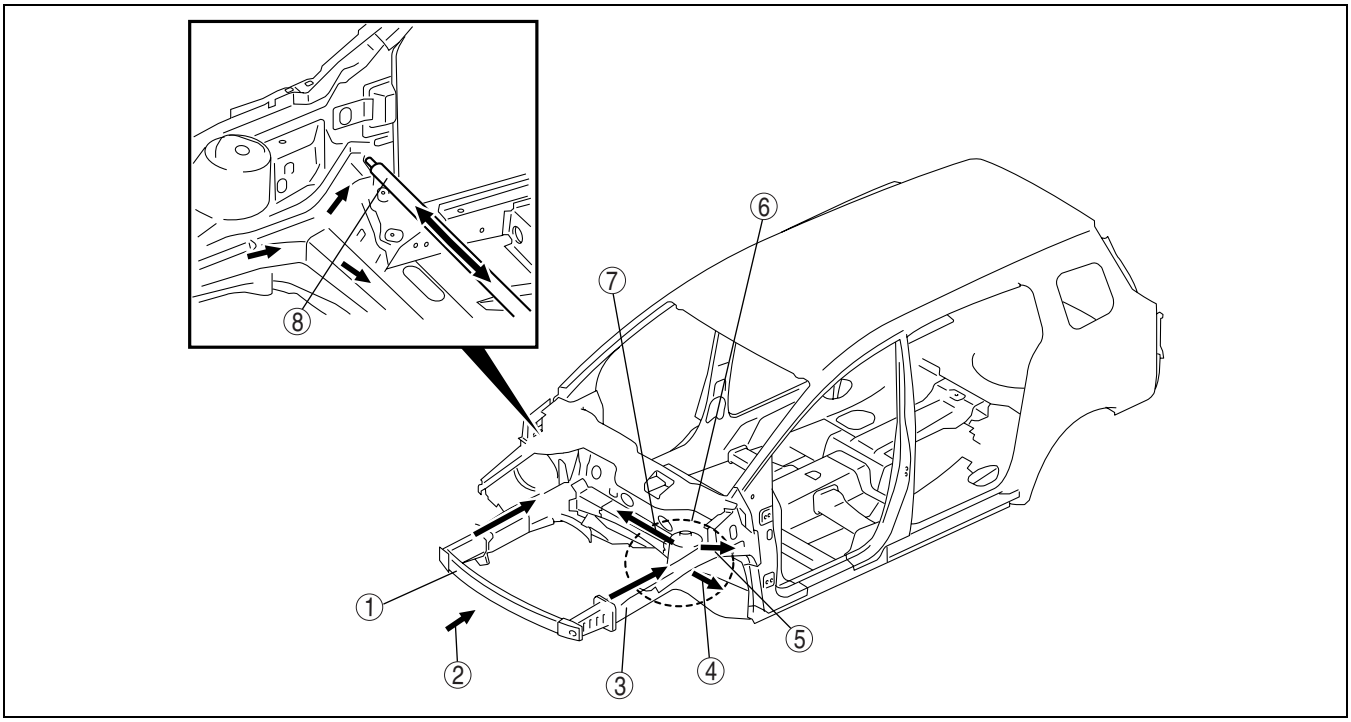
DPE091056100T01

- An H-shaped frame (triple-H structure) has been adopted.
- A highly rigid and safe body, "MAGMA" (Mazda Geometric Motion Absorption; Mazda's all-direction impact absorption body), has been adopted.

CABIN CONSTRUCTION

DPE091056100T03

- An impact dispersing three-fork structure that disperses a frontal impact into three directions has been adopted.
- A crossbeam that suppresses the hinge pillars from moving outward during a collision has been adopted, improving the cabin strength.

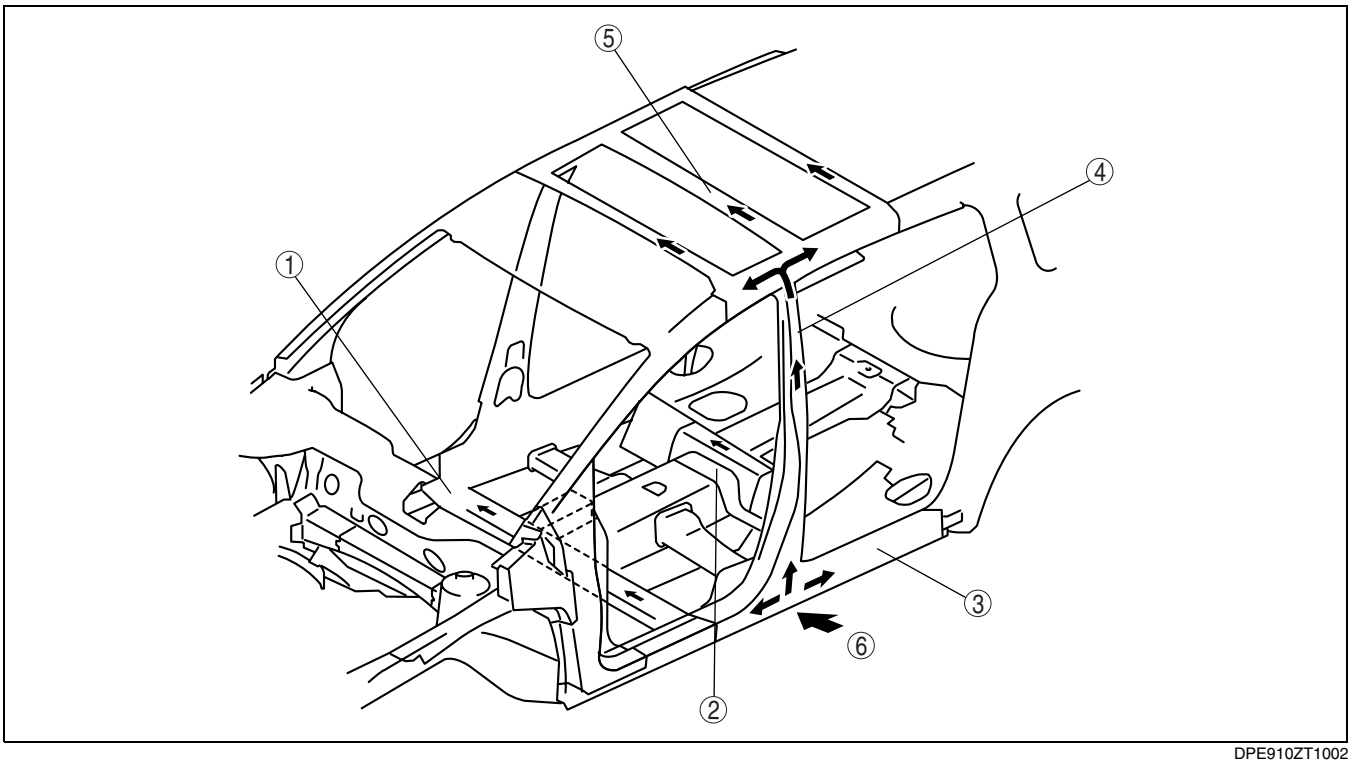


DPE910ZT1001

1	Front bumper reinforcement
2	Collision energy
3	Front side frame
4	To side sill
5	To hinge pillar
6	Impact dispersing three-fork structure
7	To dash lower clossmember
8	Clossbeam

- A distribution of reinforcement to the floor, side frames, and roof employing an H-shaped structure to reinforce each joint has been adopted. the combination of three points to each floor, side frames, and roof surface provide the strong triple H-shaped structure.

- Suppression of cabin torsion while driving, and steering performance has been improved.



DPE910ZT1002

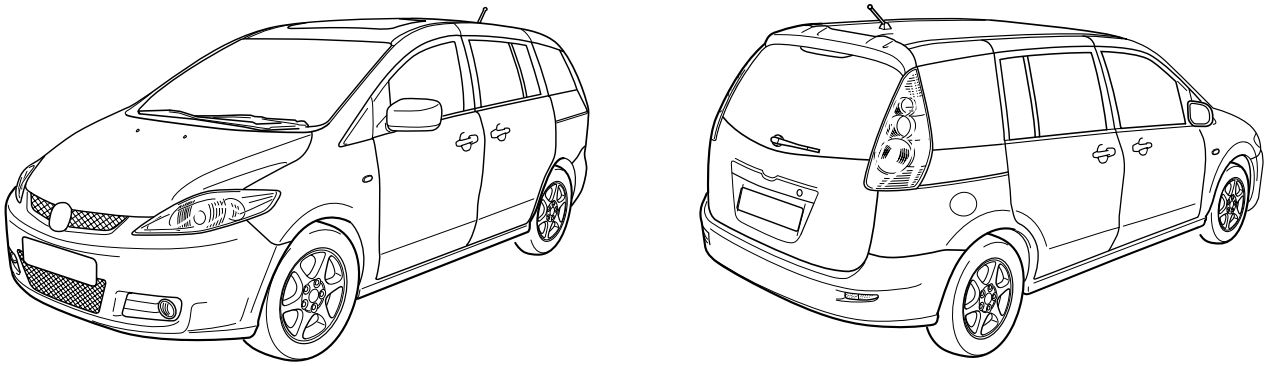
1	Crossmember No.2
2	Crossmember No.3
3	Side sill
4	B-pillar
5	Roof reinforcement
6	Collision energy

BUMPER CONSTRUCTION

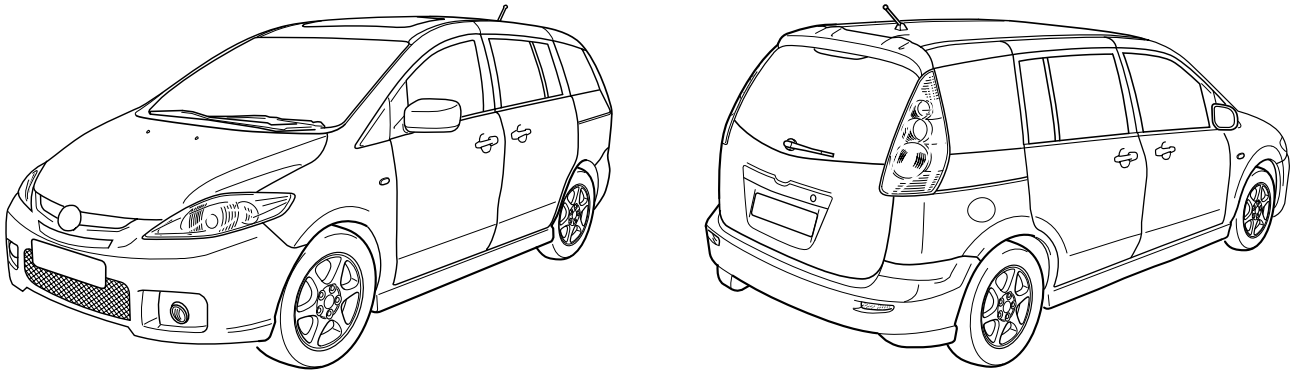
DPE091056100T04

- Standard or sport type bumper is available.

STANDARD TYPE



SPORT TYPE



DPE910ZT1003

09–11 DOORS AND LIFTGATE

DOORS AND LIFTGATE OUTLINE

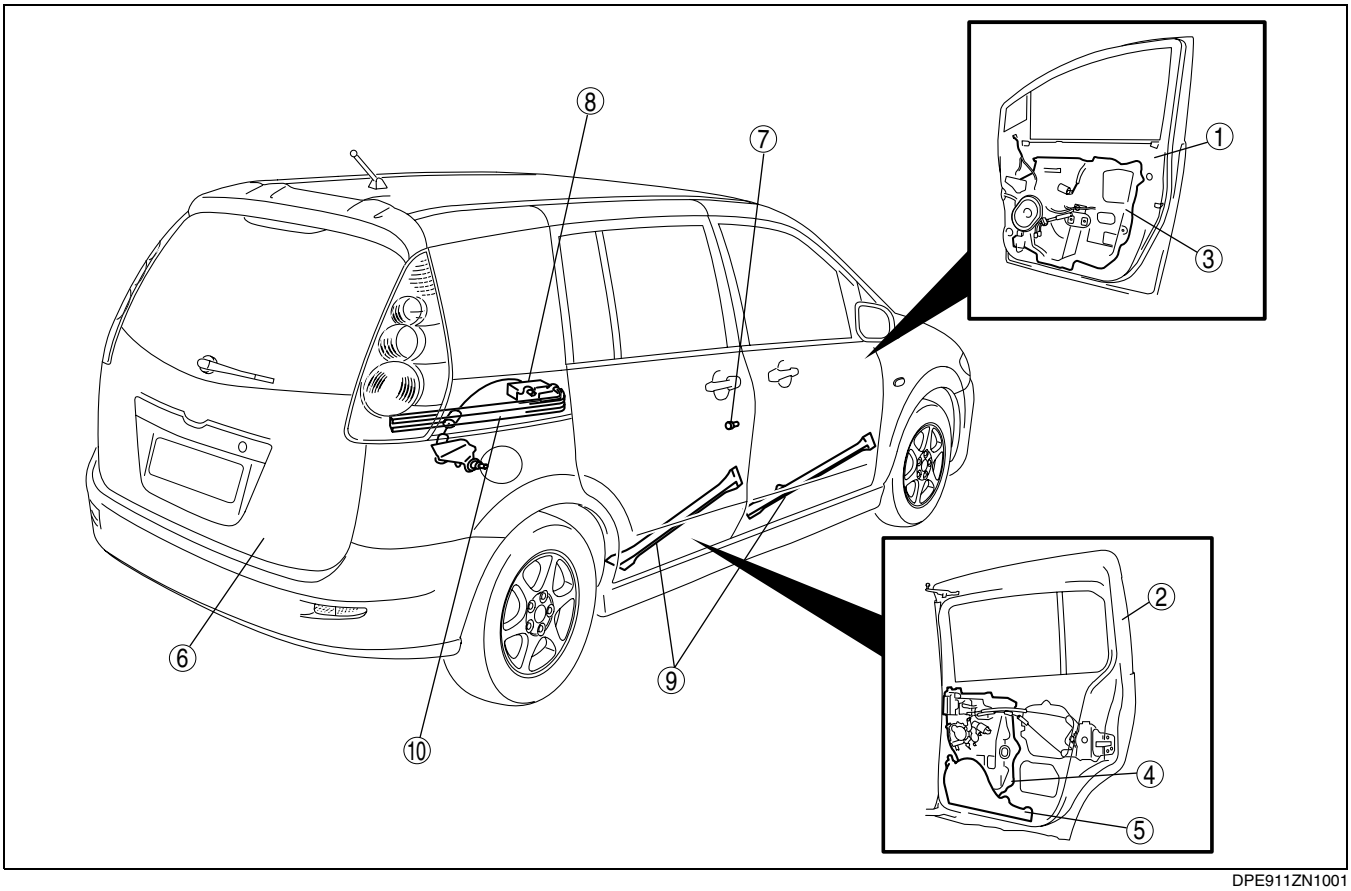
DPE091158010T01

Features

Improved marketability	• A power sliding door (PSD) system, which allows the sliding doors to open/close automatically, has been adopted for both LH and RH sliding doors. • An auto closure system that assists the sliding doors to close securely when they are ajar has been adopted. (vehicles with PSD) • A constant power supply wiring harness which supplies power while the sliding door is open has been adopted. • Door modules with integrated front door/sliding door internal parts have been adopted. • A light-weight hard plastic liftgate has been adopted to reduce opening/closing operation force.
Improved safety	• A rigid side impact bar has been adopted for each front door and sliding door. • A sliding door catcher pin has been adopted. • An open-lock function which keeps the sliding door open has been adopted.
Vehicle damage prevention	• A sliding door open cancel system has been adopted to the right side of the vehicle.

DOORS AND LIFTGATE STRUCTURAL VIEW

DPE091158010T02



DPE911ZN1001

1	Front door
2	Sliding door
3	Front door unit
4	Sliding door unit
5	Constant power supply wiring harness

6	Liftgate
7	Sliding door catcher pin
8	sliding door open stopper
9	Side impact bar
10	Center guide rail

SIDE IMPACT BAR FUNCTION

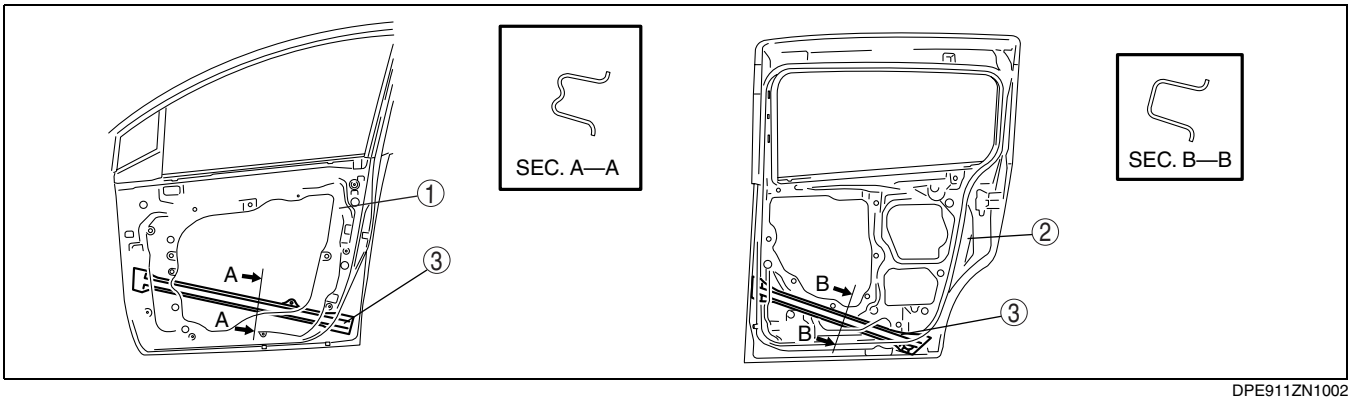
DPE091158010T03

- The side impact bar, located on the bottom part of the door, prevents the door from deforming inward by dispersing the impact to the floor in case of a side-impact collision.
- A corrugated side impact bar has been adopted to each front door, improving rigidity in case of a collision.

SIDE IMPACT BAR CONSTRUCTION/OPERATION

DPE091158010T04

- Installed to the inside of the door.



DPE911ZN1002

1	Front door

2	Sliding door

3	Side impact bar

SLIDING DOOR CATCHER PIN FUNCTION

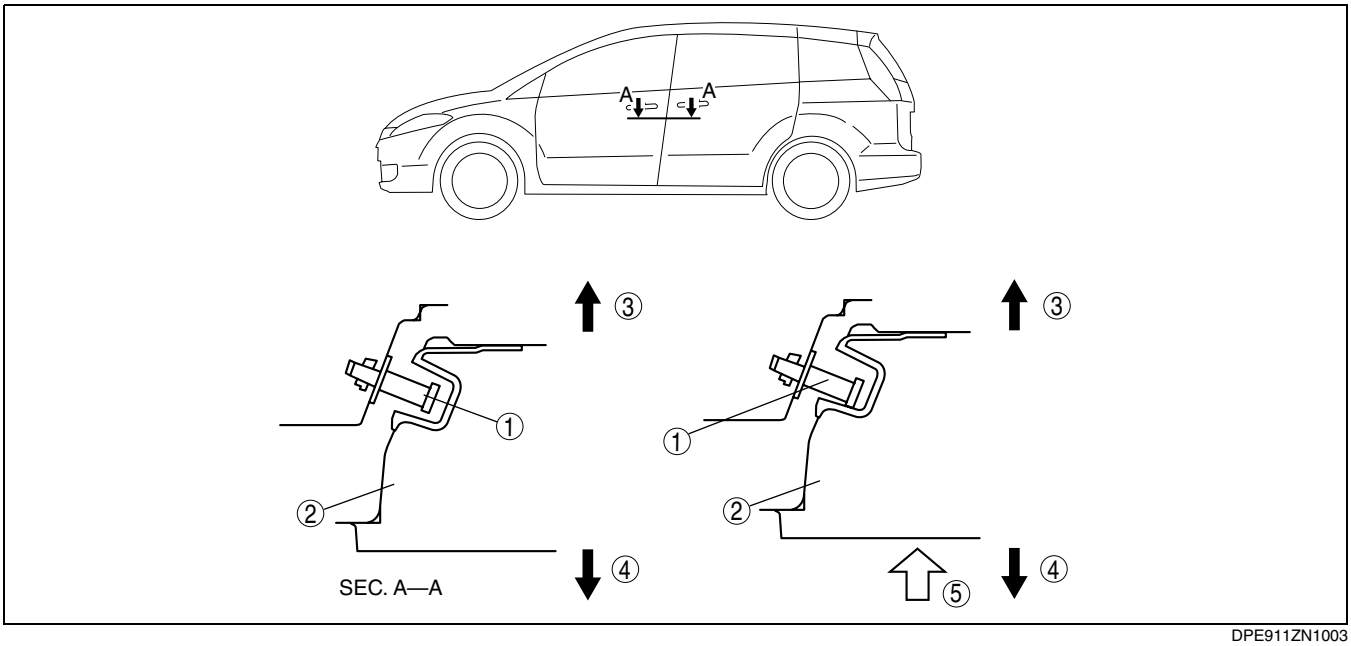
DPE091158010T05

- Prevents the sliding door from deforming inward toward the cabin during a side collision.

SLIDING DOOR CATCHER PIN CONSTRUCTION/OPERATION

DPE091158010T06

- Installed to the B-pillar.
- When the sliding door is fully closed, the sliding door catcher pin is inserted into the sliding door. If the vehicle is subjected to a side impact with the pin inserted, the sliding door contacts the sliding door catcher pin and is stopped.



DPE911ZN1003

1	Sliding door catcher pin
2	Sliding door
3	Inside of vehicle

4	Outside of vehicle
5	Collision energy

POWER SLIDING DOOR (PSD) SYSTEM OUTLINE

DPE091158010T22

- A power sliding door (PSD) system, which allows the sliding doors to open/close automatically, has been adopted for both LH and RH sliding doors.
- The sliding doors open/close automatically by the following switches and buttons:

Switch and button	Sliding door position		
	Fully closed	Partly open	Fully open
PSD front OPEN switch	Open	Open	Not operation
PSD front CLOSE switch	Not operation	Close	Close
Inner handle close direction (tilt forward)	Not operation	Close	Close
Inner handle open direction (tilt rearward)	Open	Open	Not operation
Outer handle	Open	Open	Close
Transmitter R or L button	Open	Open	Close

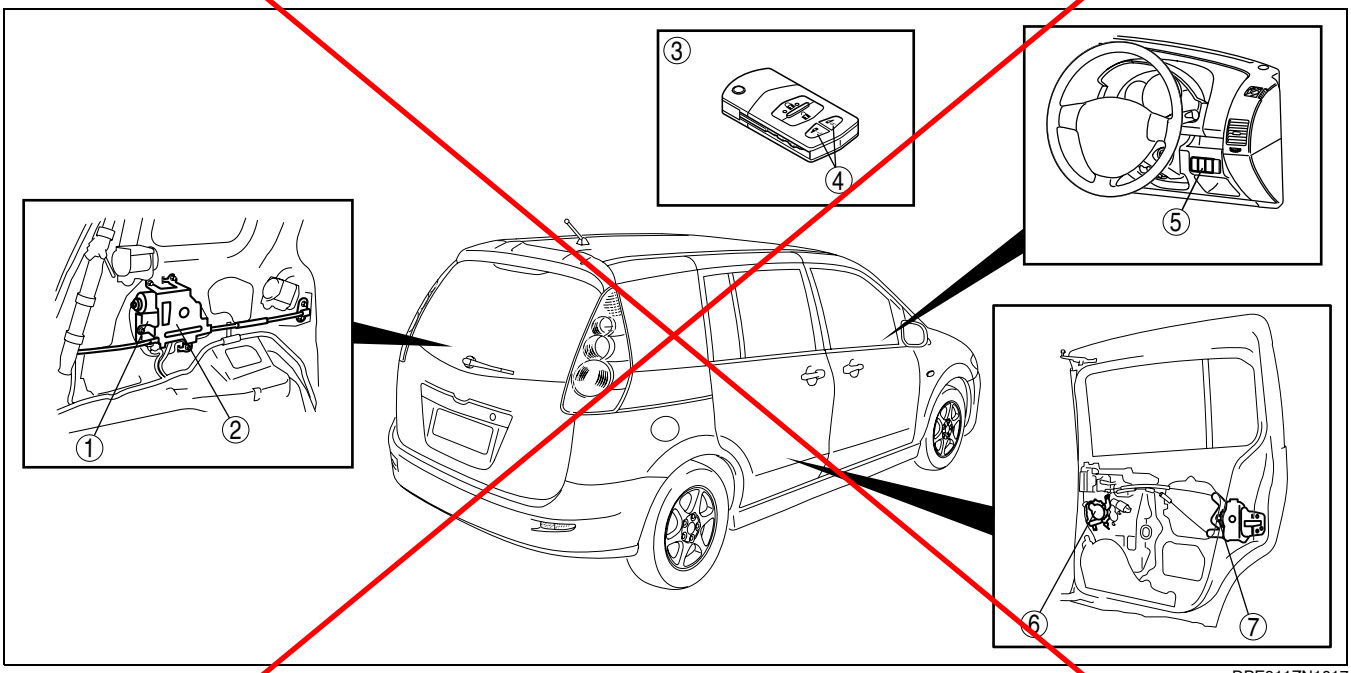
- When any of the following switches or buttons are pressed while the door is sliding, the door is stopped. (To stop a door, a switch or a button for the corresponding door should be pressed.)
  - PSD front OPEN/CLOSE switch
  - PSD OFF switch
  - Inner handle
  - Outer handle
  - Transmitter R or L button
- Using the PSD OFF switch, operation of the sliding doors can be switched between power and manual sliding.
- When each switch is operated, the buzzer sounds for 0.5 seconds to indicate that a sliding door is starting to

open/close.

- When a sliding door contacts an obstruction during opening/closing operation, the door reverses direction automatically to prevent jamming.
- When the sliding door comes to the position before the fully closed position during the close operation, the sliding speed is slowed to ensure safety.

POWER SLIDING DOOR (PSD) SYSTEM STRUCTURAL VIEW

DPE091158010T23



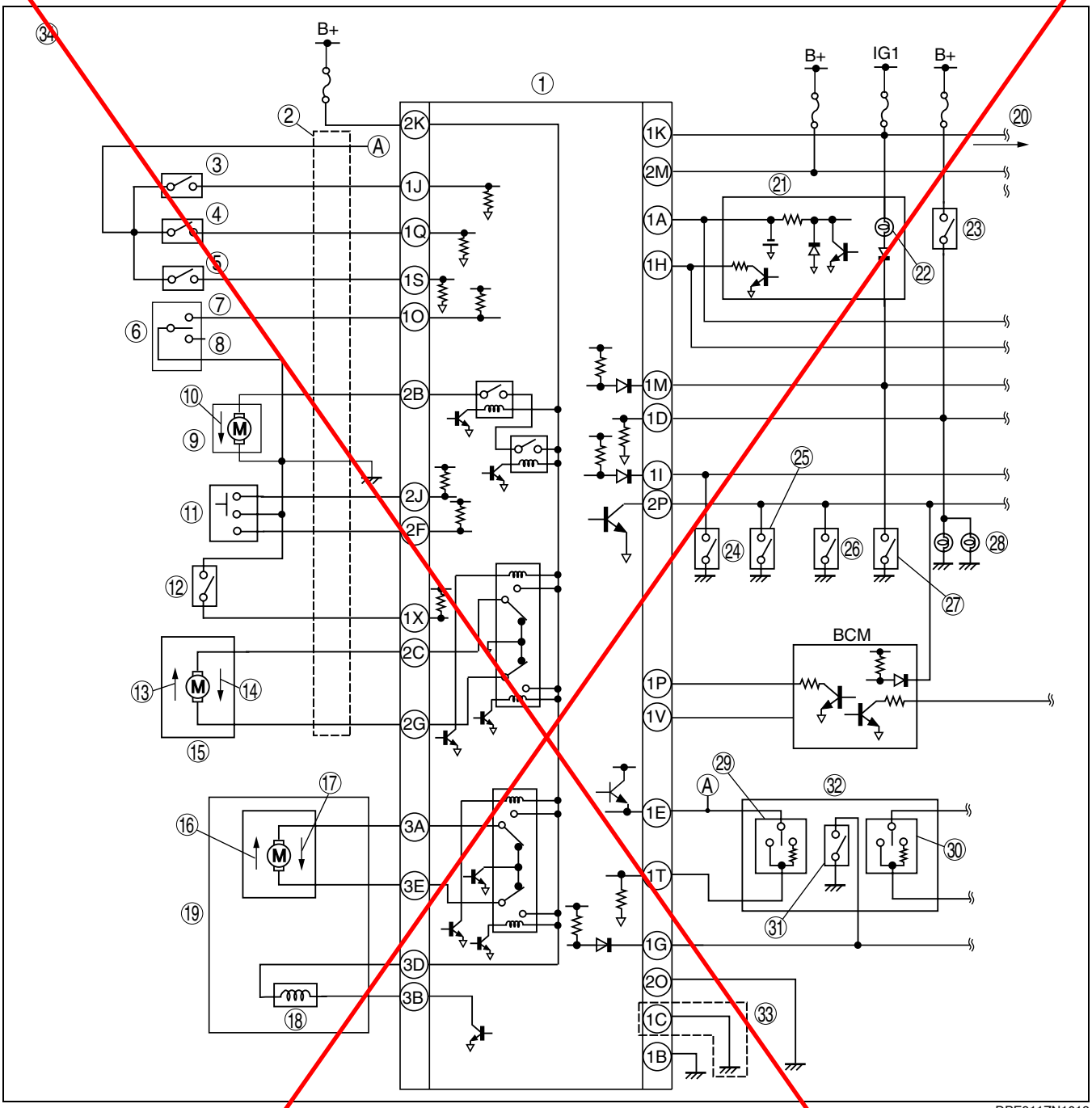
DPE911ZN1017

1	PSD control module
2	PSD drive unit
3	Vehicles with keyless entry system
4	PSD R/L button (transmitter)

5	PSD front switch
6	Latch release actuator
7	Auto closure motor

POWER SLIDING DOOR (PSD) SYSTEM SYSTEM WIRING DIAGRAM

DPE0911580107 24



DPE911ZN1018

1	PSD control module (LH)
2	Constant power supply wiring harness
3	Handle switch 1
4	Handle switch 2
5	Handle switch 3
6	Door lock link switch (LH)
7	Unlock
8	Lock
9	Latch release actuator (LH)
10	Release
11	Latch position switch (LH)
12	Ratchet switch (LH)
13	Open

14	Close
15	Auto closure motor (LH)
16	Close (RH: open)
17	Open (RH: close)
18	Electromagnetic brake
19	PSD drive unit (LH)
20	PSD control module (RH)
21	Instrument cluster
22	Brake system warning light
23	Brake switch
24	P position switch
25	Door switch (LR)
26	Door switch (RR)

27	Parking brake switch
28	Brake light
29	OPEN/CLOSE switch (LH)
30	OPEN/CLOSE switch (RH)
31	PSD OFF switch
32	PSD front switch
33	RH only
34	This figure shows LH of PSD system (same as RH)

POWER SLIDING DOOR (PSD) SYSTEM OPERATION

DPE091158010T25

Operation Outline

- The PSD system is controlled by the PSD control module.
- The sliding door is slid by the PSD drive unit.
- The sliding door latch and open lock are released by the latch release actuator.
- The PSD system slides the sliding door in the close direction and the auto closure system fully closes the sliding door.

Operation Conditions

- No PSD operations can be operated when the PSD OFF switch is on.
- When the key is inserted the steering lock, PSD start operation using the transmitter is not available.
- When the battery voltage drops during PSD operation, the operation continues.
- When the battery voltage increases to 18.0 V or higher during the PSD operation, the operation stops.
- If the sliding door is open (door switch on) and the vehicle speed is 3 km/h or more, the buzzer sounds continuously.
- When the vehicle speed falls from 40 km/h to 3 km/h {24.8 mph to 1.86 mph} within 2.0 seconds, PSD operation is inhibited for 3 seconds.
- If the child proof lever is in the lock position and sliding door fully closes, operation using the inner handles is disabled.
- If the following conditions are met, a power sliding door can be operated by operating each switch (PSD front OPEN/CLOSE switch or transmitter R/L button) or the handle (inner handle or outer handle).
- When the PSD start operation is performed without satisfying the conditions shown in the table, the buzzer sounds.
- When any of conditions 1. to 5. in the table is canceled during the PSD operation, the PSD operation is stopped forcibly.

Condition	Condition pattern			
1. PSD OFF switch	OFF	OFF	OFF	OFF
2. P position switch	OFF			
3. Parking brake switch		ON		
4. Brake switch			ON	
5. Vehicle speed 3 km/h {1.86 mph} or less	×	×	×	
6. Battery voltage between 10.5 V and 16 V	×	×	×	×
7. No door slide	×	×	×	×
PSD open operation	×	×	×	N/A
PSD close operation	×	×	×	×

PSD Operation Using Switches

Fully closed to fully open

- When the PSD front switch or the transmitter is operated to open a sliding door, the latch release actuator releases the latch and the PSD drive unit slides the door.

Partly open to fully open

- When the PSD front switch or the transmitter is operated to open a sliding door, the PSD drive unit slides the door.

Fully open to fully closed, partly open to fully closed (PSD front close switch only)

- When the PSD front switch or the transmitter is operated to close a sliding door, the PSD drive unit slides the door until the door is ajar. Then, the auto closure system operates to close the door fully.

Note

- If the transmitter R or L button is operated when the door is partly open, the sliding door slides in the open direction.

PSD Operation Via Handle Operation

Fully closed to fully open

- When a handle (inner handle is tilted rearward or outer handle is pulled) is operated, the latch release actuator releases the latch and the PSD drive unit slides the sliding door.

Partly open to fully open

- When a handle (inner handle is tilted rearward or outer handle is pulled) is operated, the PSD drive unit slides the sliding door.

Fully open to fully closed

- When a handle (inner handle is tilted forward or outer handle is pulled) is operated, the PSD drive unit slides the sliding door to the ajar position. Then the auto closure system operates to fully close the sliding door.

Note

- If an outer handle is operated with the sliding door half open, the sliding door slides in the open direction.

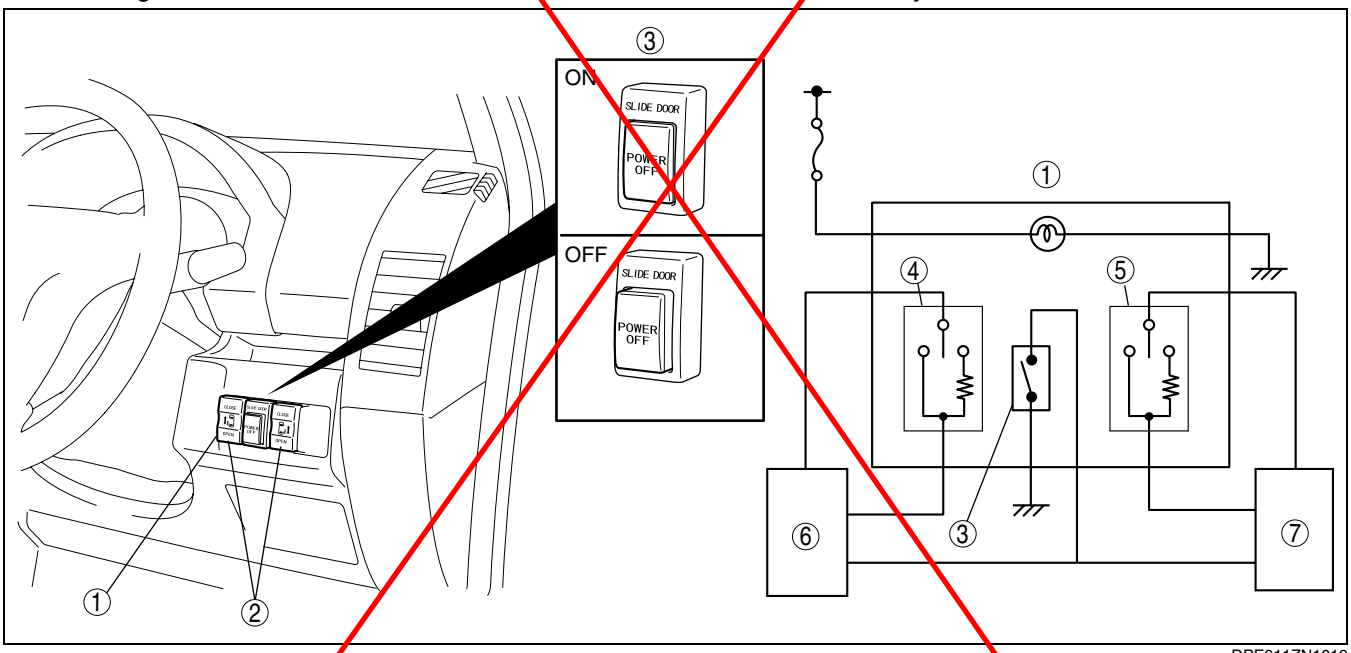
Auto Reverse Pinch Protection Function

- Foreign object obstruction is detected by the following:
  - PSD motor current change
  - PSD motor speed change
  - Sliding door speed change
- If an obstruction is detected, the buzzer sounds, then the sliding door is reversed.
- If obstruction is detected three times or more in a series, the PSD operation is stopped by the fail-safe function.

PSD FRONT SWITCH CONSTRUCTION/OPERATION

DPE091158010T26

- The PSD front switch is installed on the driver's side of the dashboard.
- The PSD front switch consists of the OPEN/CLOSE switch and PSD OFF switch.
- Pressing the PSD OFF switch turns the switch on and disables the PSD system.



DPE911ZN1019

1	PSD front switch
2	OPEN/CLOSE switch
3	PSD OFF switch
4	OPEN/CLOSE switch (LH)

5	OPEN/CLOSE switch (RH)
6	PSD control module (LH)
7	PSD control module (RH)

POWER SLIDING DOOR (PSD) DRIVE UNIT OUTLINE

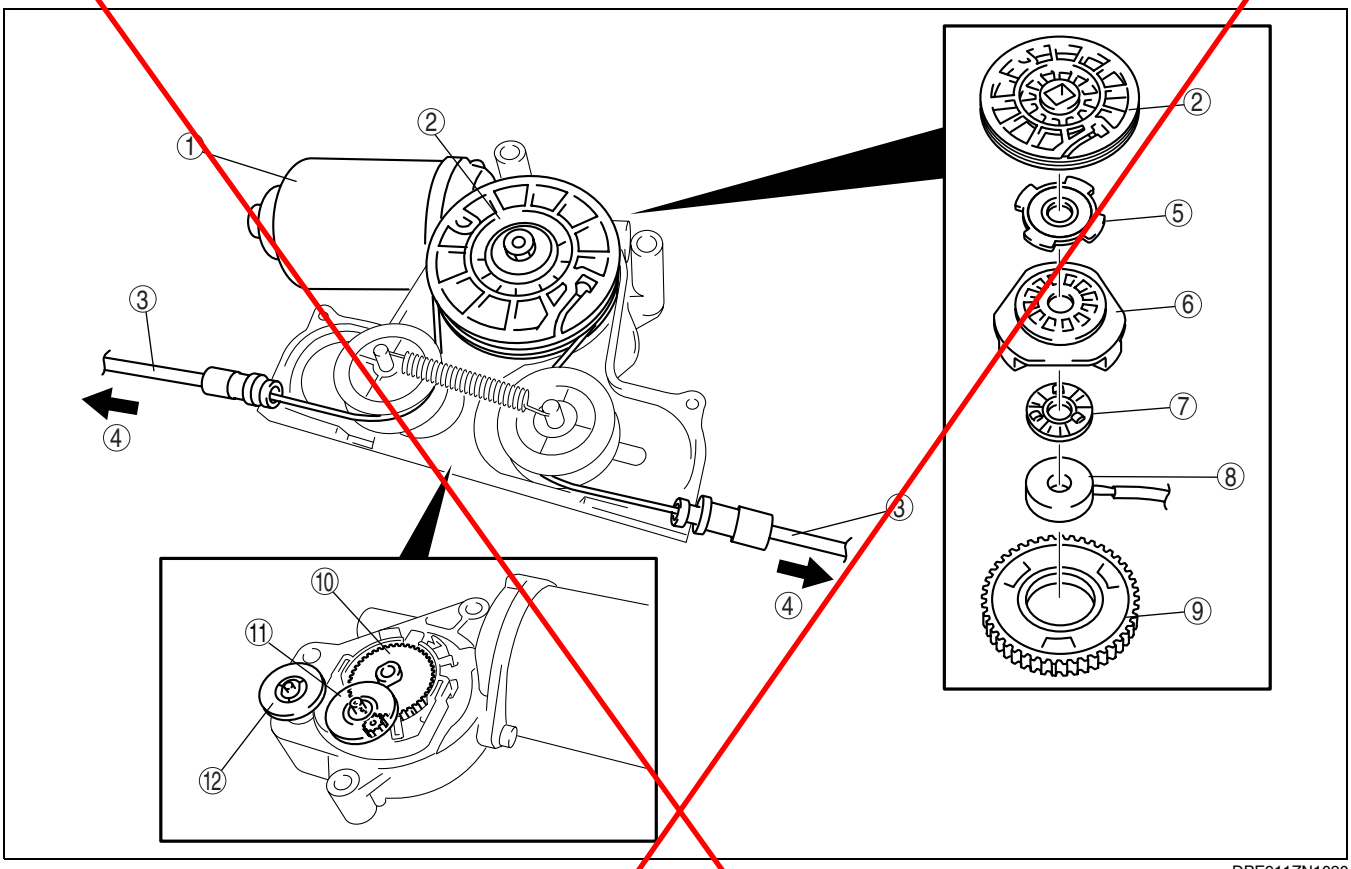
DPE091158010T27

- The PSD motor retracts the cable connected to the center roller. Due to this, the center roller is moved and the sliding door opens/closes.
- The PSD motor rotates normally/reversely according to the signal from the PSD control module. The sliding speed of the sliding door varies because the PSD motor is rotated based on the PSD control module voltage control.
- Outputs vehicle speed sensor signals to the PSD control module.

POWER SLIDING DOOR (PSD) DRIVE UNIT CONSTRUCTION/OPERATION

DPE091158010T28

Construction



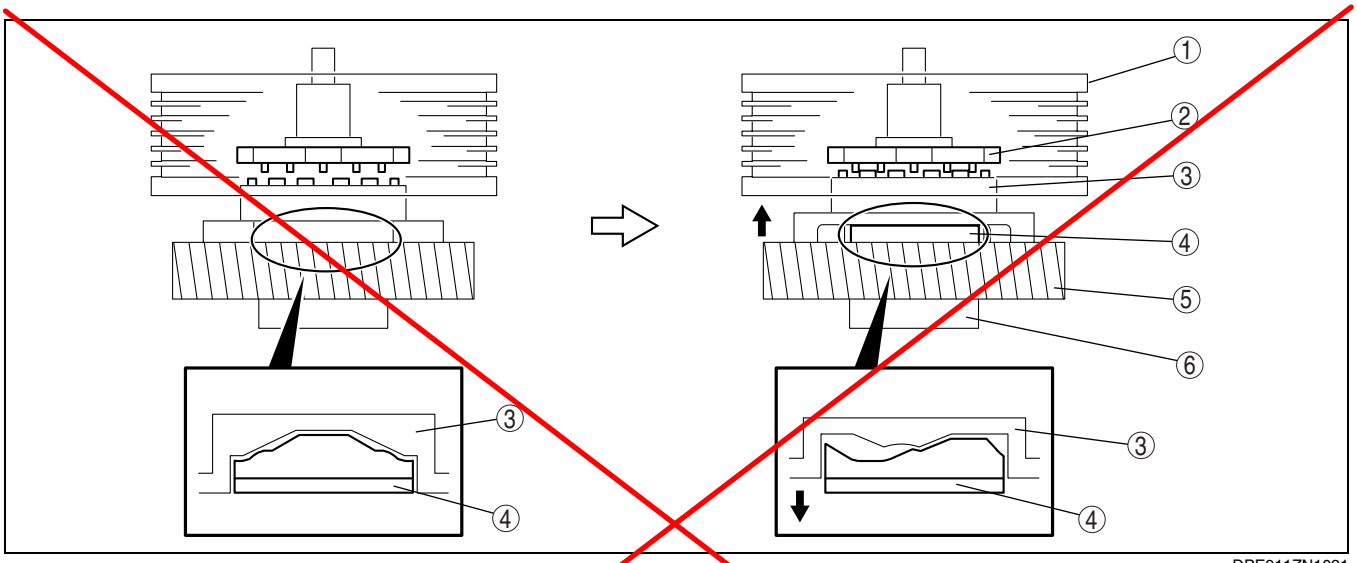
DPE911ZN1020

1	PSD motor
2	Pulley
3	Cable
4	Center roller
5	Pulley cam
6	Worm wheel cam

7	Clutch
8	Electromagnetic brake
9	Worm wheel
10	Speed sensor gear
11	Sliding door speed sensor
12	Motor speed sensor

Operation

- The PSD motor operates and the worm wheel rotates. Then, the magnet brake is turned on and the clutch cam is engaged to the worm wheel cam groove. Due to this, the clutch is lifted and the worm wheel cam is pressed to the pulley side, causing the worm wheel cam gear to engage with the pulley cam gear. Because the pulley cam is integrated with the pulley, the pulley rotates and retracts the cable.
- When the power sliding door operation is completed, an initialization operation (drive gear is reversed) is performed to release the clutch.
- If the PSD OFF switch is on (PSD disabled) during PSD operation, an initialization operation is not performed and the sliding door stops with the clutch engaged. To release the clutch, it is necessary to move a sliding door forward/rearward manually.
- If the PSD OFF switch is on (PSD disabled), the clutch cam is not engaged with the worm wheel cam. Therefore, only the pulley can be rotated manually to retract the cable.
- The speed sensor gear operates in conjunction with the sliding door speed sensor. Therefore, the sliding door speed sensor outputs signals to the PSD control module according to the pulley rotation (sliding door movement).



DPE911ZN1021

1	Pulley
2	Pulley cam
3	Worm wheel cam

4	Clutch
5	Worm wheel
6	Electromagnetic brake

POWER SLIDING DOOR (PSD) CONTROL MODULE FUNCTION

DPE091158010T29

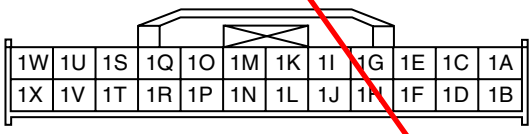
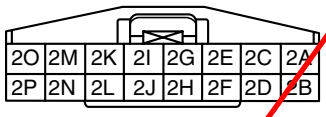
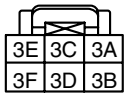
- The PSD control module controls the PSD system and the auto closure system based on input/output signals from each component in the PSD system.
- A fail-safe function, which sounds the buzzer to warn of abnormal input/output and inhibits operation when any abnormal input/output signals from the parts are detected during the PSD operation, has been adopted.
- The on-board diagnostic function that enables confirmation of abnormal input/output signals has been adopted.

POWER SLIDING DOOR (PSD) CONTROL MODULE CONSTRUCTION/OPERATION

DPE0911580101I30

Construction

Terminal layout and signals

Terminal		Signal
	1A	Vehicle speed input
	1B	GND
	1C	GND (RH only)
	1D	Brake switch
	1E	OPEN/CLOSE switch output
	1F	-
	1G	PSD OFF switch
	1H	Vehicle speed abnormal
	1I	P position switch
	1J	Handle switch 1
	1K	IG1
	1L	-
	1M	Parking brake switch
	1N	-
	1O	Door lock-link switch
	1P	Transmitter
	1Q	Handle switch 2
	1R	-
	1S	Handle switch 3
	1T	OPEN/CLOSE switch input
	1U	-
	1V	Door lock-link switch (unlock output)
	1W	-
	1X	Ratchet switch
	2A	-
	2B	Latch release actuator
	2C	Auto closure motor normal rotation
	2D	-
	2E	-
	2F	Half latch detection switch
	2G	Auto closure motor reverse rotation
	2H	-
	2I	-
	2J	Full latch detection switch
	2K	B+
	2L	-
	2M	B+
	2N	-
	2O	Ground
	2P	Door switch
	3A	LH:PSD motor normal rotation RH:PSD motor reverse rotation
	3B	Magnet brake
	3C	-
	3D	Magnet brake power supply
	3E	LH:PSD motor reverse rotation RH:PSD motor normal rotation

Operation

Sliding door speed/position detection method

- The speed and position of the sliding door are detected according to the calculation based on the two kinds of pulses sent from the speed sensor in the PSD drive unit.

Fail-safe function

- If any of the following failures are detected, the PSD operation is stopped and inhibited until a normal condition is detected.
- If the PSD is operated while any malfunctions shown in the table are detected or the PSD operation is stopped/disabled, the buzzer sounds continuously.
- The continuous buzzer sound caused by the fail-safe function can be stopped by switching the PSD OFF switch from off to on.

Input/output signal

Location (Module)	Location (Part)	Failure description
PSD drive unit	Speed sensor	Speed sensor pulse error
	PSD motor	Short in both ends of PSD motor, or PSD motor abnormal resistance value
	Brake	Brake FET malfunction, open circuit in brake, or short to ground
	Operation parts	Abnormal operation load
PSD control module	PSD motor relay	PSD motor relay malfunction
	PSD motor FET	PSD motor FET malfunction
	Latch release actuator relay	Latch release actuator relay 1 or 2 malfunction
	Brake	Brake FET malfunction, short in both ends of brake, or short to power supply
	PSD front switch	PSD front switch malfunction or short to ground
Vehicle speed input	Instrument cluster	Abnormal vehicle speed input
Auto closure	Auto closure motor	Short in both ends of auto closure motor
	Ratchet switch	Ratchet switch malfunction

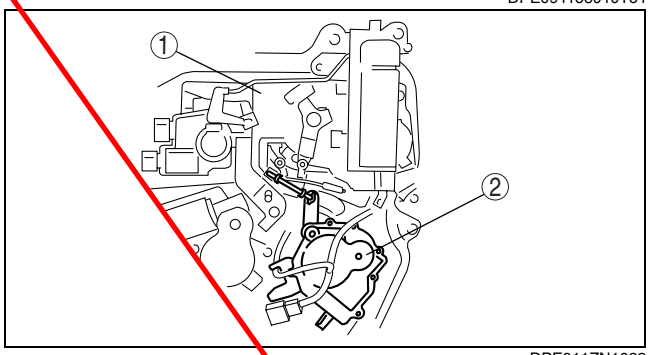
On-board Diagnostic Function

- The on-board diagnostic function has a “DTC output mode”.
- In the DTC output mode, abnormal input/output signals in the PSD system can be confirmed.
- The DTCs can be verified by flashing of the door ajar warning light. (NOTE: Interior lights, which are on/off according to door switch signals, also flash.)

LATCH RELEASE ACTUATOR CONSTRUCTION/OPERATION

- According to the signal from the PSD control module, the latch release actuator pulls the link connected to the sliding door latch. Due to this, the sliding door latch and open lock are released.

DPE091158010T31



DPE911ZN1022

1	Remote controller
2	Latch release actuator

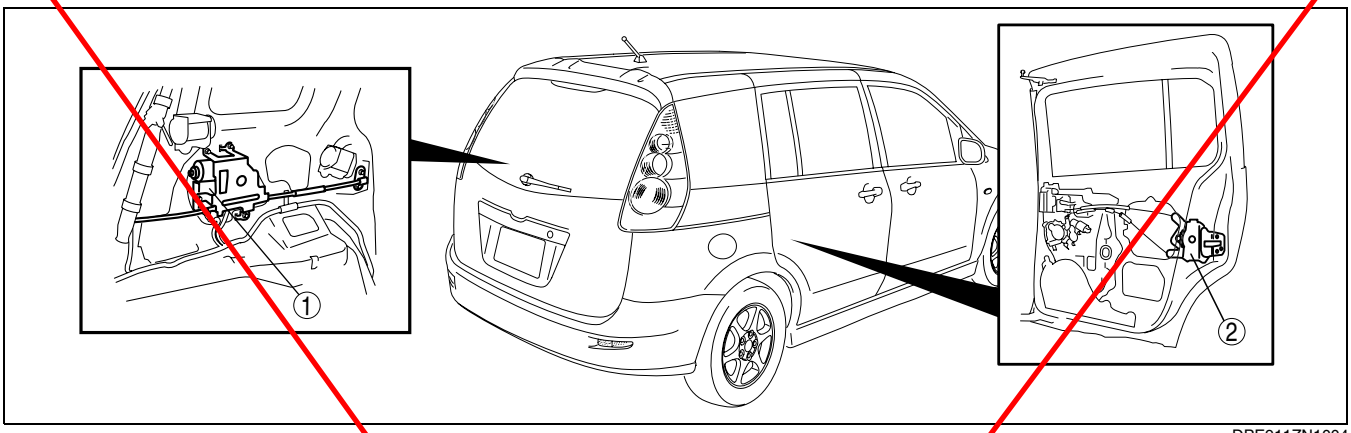
AUTO CLOSURE SYSTEM OUTLINE

DPE091158010T33

- A sliding door fully closes automatically from the ajar position.

AUTO CLOSURE SYSTEM STRUCTURAL VIEW

DPE091158010T34



DPE911ZN1004

1	PSD control module
2	Sliding door lock (auto closure motor, latch position switch)

AUTO CLOSURE CONTROL MODULE FUNCTION

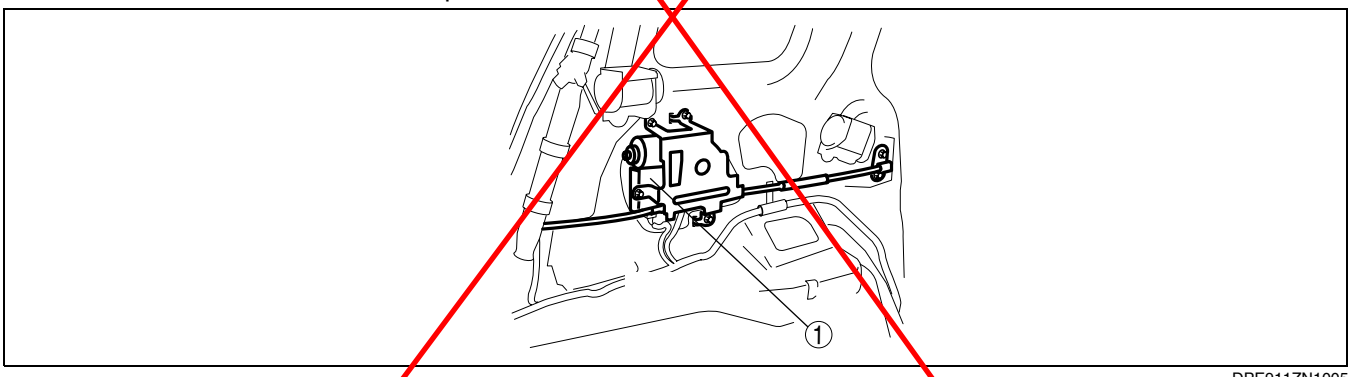
DPE091158010T35

- Fully closes the sliding door according to the latch position switch and ratchet switch signals.
- Equipped with a fail-safe function which corrects the operation in case of an auto closure system malfunction.

AUTO CLOSURE CONTROL MODULE CONSTRUCTION/OPERATION

DPE091158010T36

- Built into the PSD control module and installed to the inside of the trunk side trim.
- For auto closure control module operation, refer to AUTO CLOSURE MOTOR CONTROL FUNCTION.



DPE911ZN1005

1	PSD control module

AUTO CLOSURE MOTOR FUNCTION

DPE091158010T37

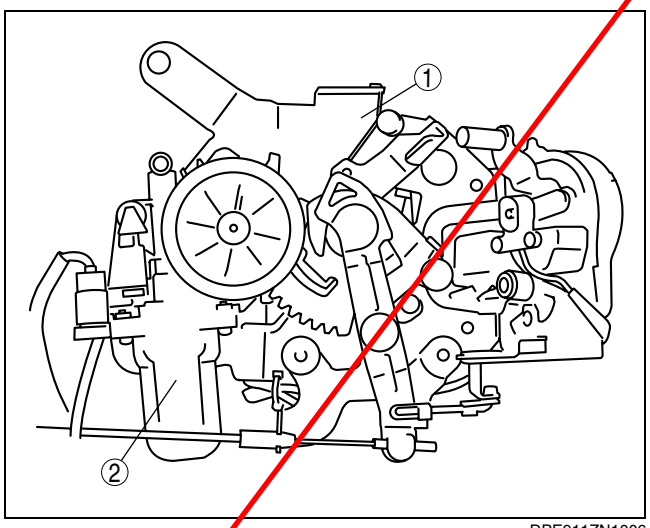
- Fully closes the sliding door by rotating the motor normally/reversely according to a signal from the PSD control module.

AUTO CLOSURE MOTOR CONSTRUCTION/OPERATION

DPE091158010T38

- Installed to the sliding door lock.

- For auto closure motor operation, refer to LOCK MECHANISM.



DPE911ZN1006

1	Sliding door lock
2	Auto closure motor

LATCH POSITION SWITCH FUNCTION

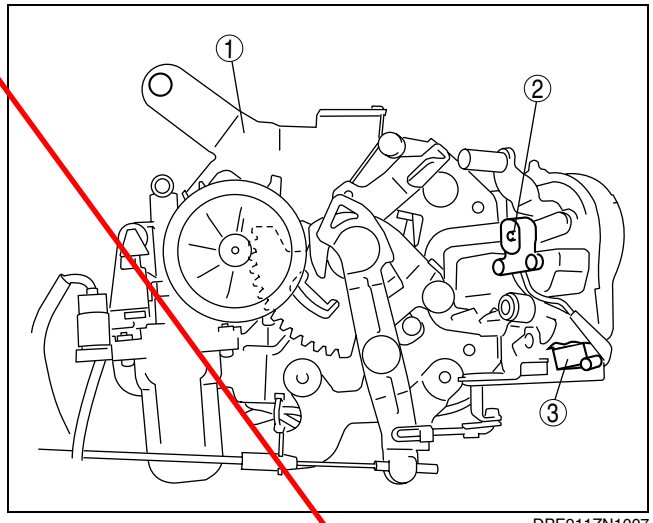
DPE091158010T39

- Detects the sliding door position based on the latch position switch and ratchet switch.

LATCH POSITION SWITCH CONSTRUCTION/OPERATION

DPE091158010T40

- Built into the sliding door lock.
- The latch position switch and ratchet switch are switched according to the sliding door lock latch position.



DPE911ZN1007

1	Sliding door lock
2	Latch position switch
3	Ratchet switch

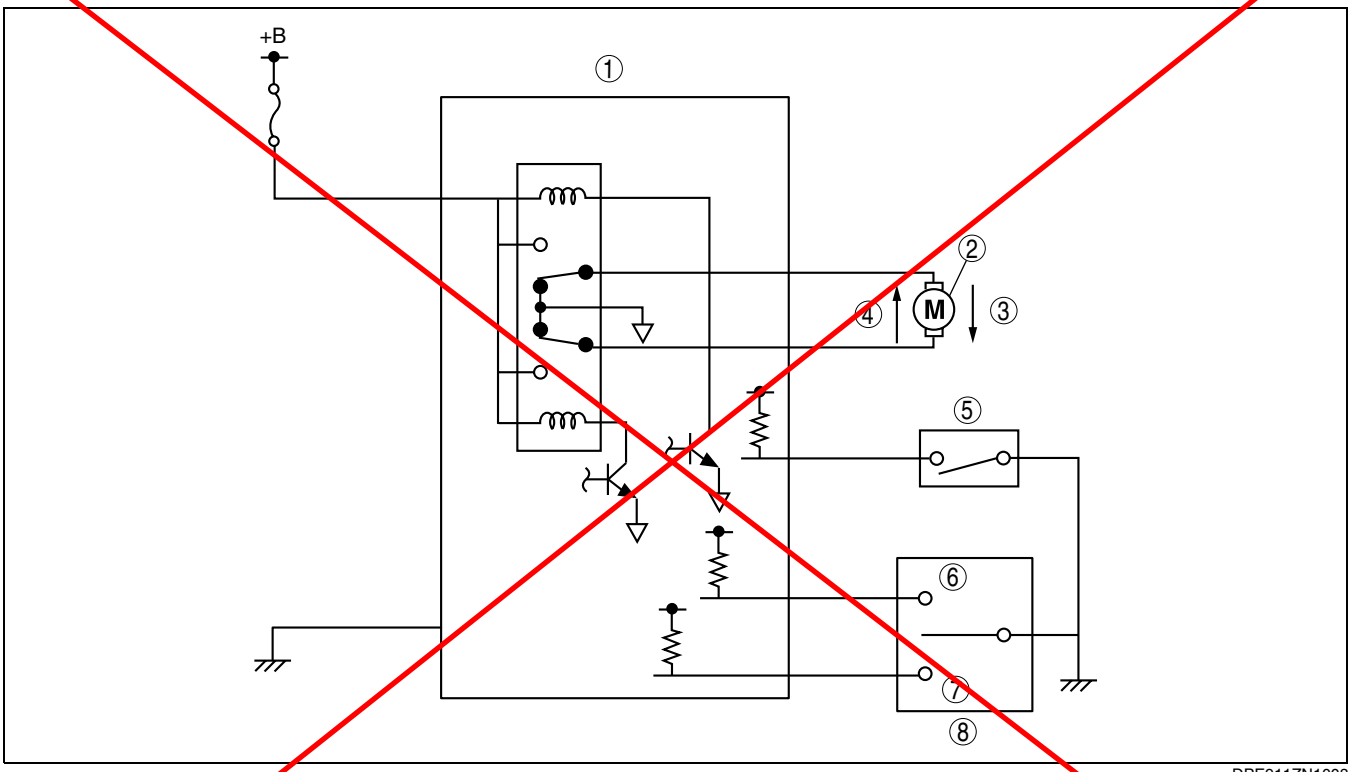
AUTO CLOSURE MOTOR CONTROL FUNCTION OUTLINE

DPE091158010T41

- The PSD control module operates the auto closure motor according to the signals from the latch position switch and ratchet switch (sliding door position), and fully close the sliding door from the ajar position.

AUTO CLOSURE MOTOR CONTROL FUNCTION SYSTEM WIRING DIAGRAM

DPE09115801OT42



DPE911ZN1008

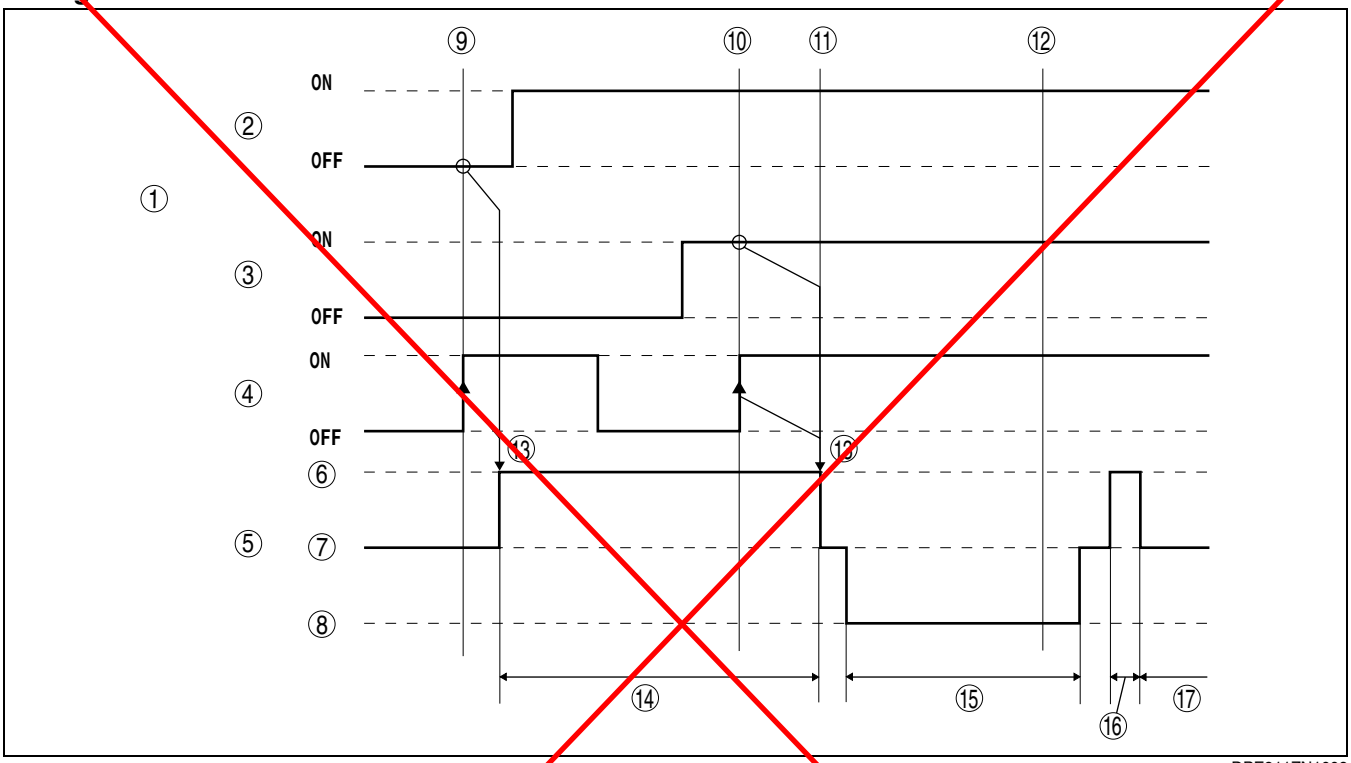
1	PSD control module
2	Auto closure motor
3	Normal rotation
4	Reverse rotation

5	Ratchet switch
6	Full latch
7	Half latch
8	Latch position switch

AUTO CLOSURE MOTOR CONTROL FUNCTION OPERATION

DPE091158010T43

Timing Chart

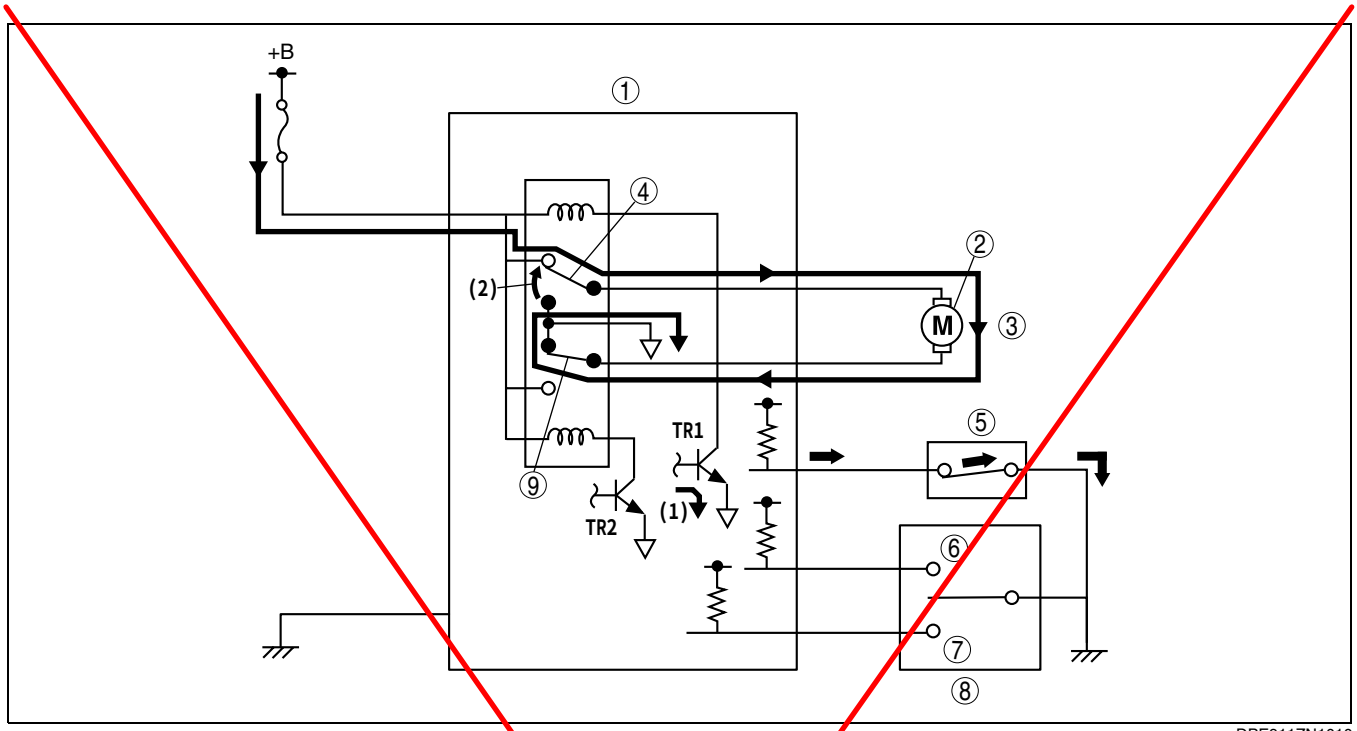


DPE911ZN1009

1	Latch position switch
2	Half latch switch
3	Full latch switch
4	Ratchet switch
5	Auto closure motor
6	Normal rotation
7	Stop
8	Reverse rotation
9	Half latch

10	Full latch
11	Overstroke
12	Initial position
13	Detection
14	Sliding door pull-in
15	Gear return to initial position
16	Slight reverse rotation
17	Operation completed

1. Closing
   - When the PSD control module detects that the ratchet switch has been turned from off to on and the latch position switch half latch switch is off, TR1 turns on and TR2 turns off (1). Due to this, relay A and B are switched (2) and the motor rotates normally.

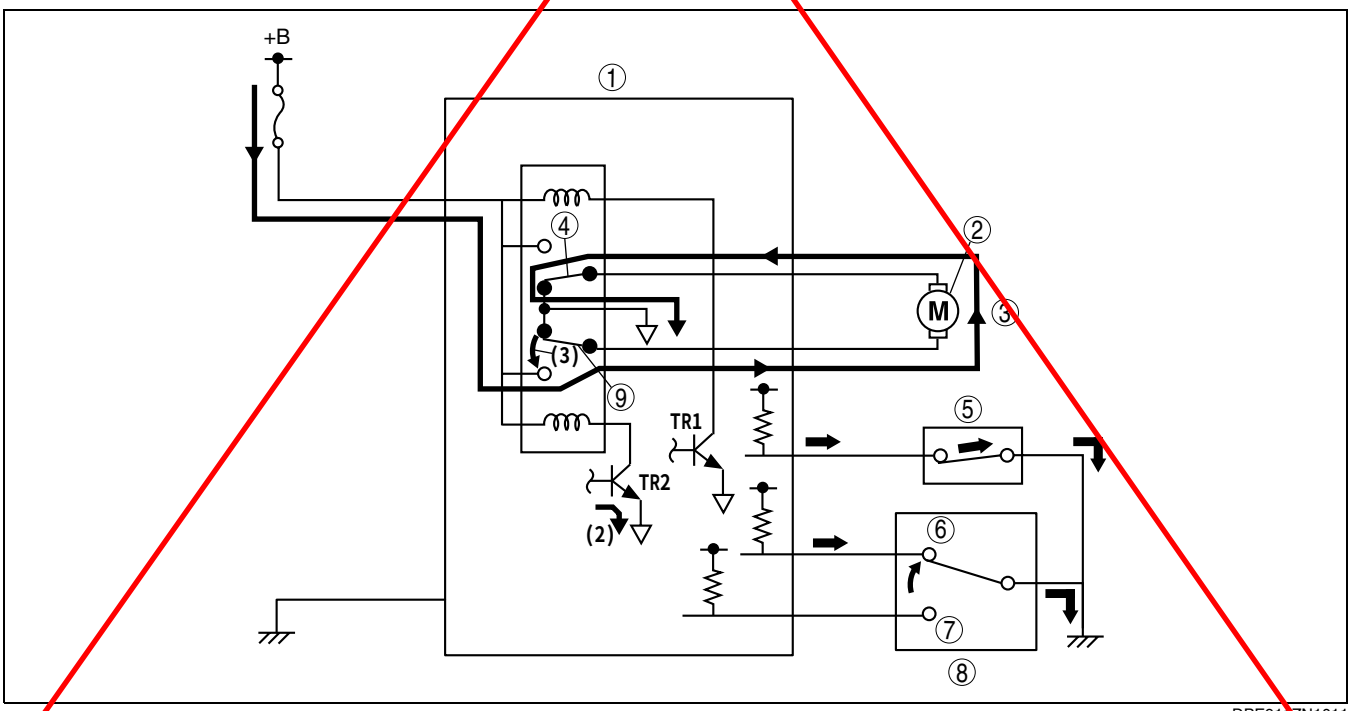


DPE911ZN1010

1	PSD control module
2	Auto closure motor
3	Normal rotation
4	Relay A
5	Ratchet switch

6	Full latch
7	Half latch
8	Latch position switch
9	Relay B

2. Initial position change
   - When the PSD control module detects that the latch position switch full latch switch is on and the ratchet switch has been turned from off to on, the closure motor is stopped and TR2 turns on and TR1 turns off after approx. 0.1 s. Due to this, relay A and B are switched (3) and the motor is switched from normal rotation to reverse rotation.



DPE911ZN1011

1	PSD control module
2	Auto closure motor

3	Reverse rotation
4	Relay A
5	Ratchet switch
6	Full latch
7	Half latch
8	Latch position switch
9	Relay B

3. Slight reverse rotation to operation completed
   - When the sector gear is moved to the lock position, the PSD control module rotates the motor reversely (normally) for approx. 0.1 s and completes the operation.

FAIL-SAFE FUNCTION OUTLINE

DPE091158010T44

- The PSD control module is equipped with a fail-safe function to prevent related parts damage.
- If the system operates incorrectly, the fail-safe function corrects the operation.

FAIL-SAFE FUNCTION OPERATION

DPE091158010T45

Lock Current Detection Function

- If the motor normal rotation stop condition cannot be detected from the latch position switch or ratchet switch during auto closure motor normal rotation, a motor lock is detected due to the motor operation current, and the motor is switched from normal rotation to reverse rotation.

Timer Function

- If the motor normal rotation stop condition cannot be detected from the latch position switch or ratchet switch and the lock current detection function also cannot be detected during auto closure motor normal rotation, the motor is switched from normal rotation to reverse rotation by the timer.
- If the lock current cannot be detected during auto closure motor reverse rotation, the motor is switched from reverse rotation to slight reverse rotation.

LOCK MECHANISM OUTLINE

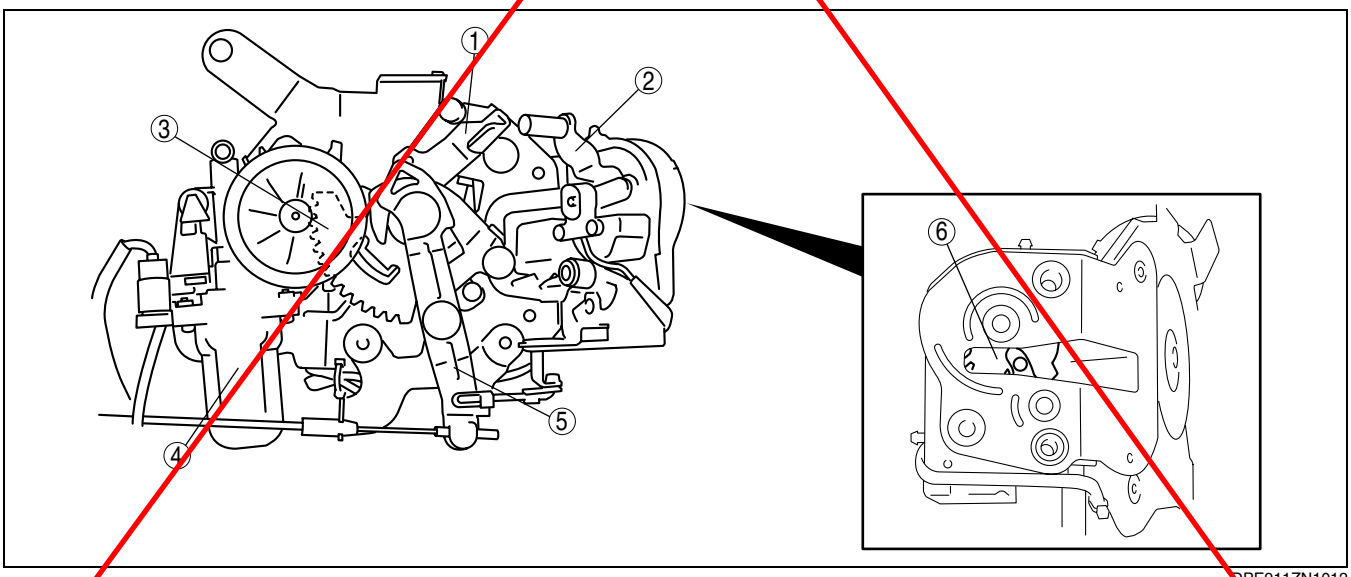
DPE091158010T46

- A sliding door is securely closed by pulling in the door lock striker with latch rotation.
- An easy closure cancellation mechanism has been adopted where the easy closure system operation stops when the sliding door handles are operated.

LOCK MECHANISM CONSTRUCTION/OPERATION

DPE091158010T47

Structural View



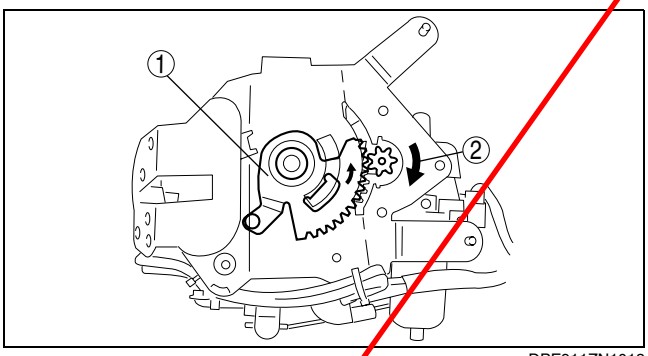
DPE911ZN1012

1	Lever A
2	Lever B
3	Sector gear

4	Auto closure motor
5	Cancel lever
6	Latch

Operation

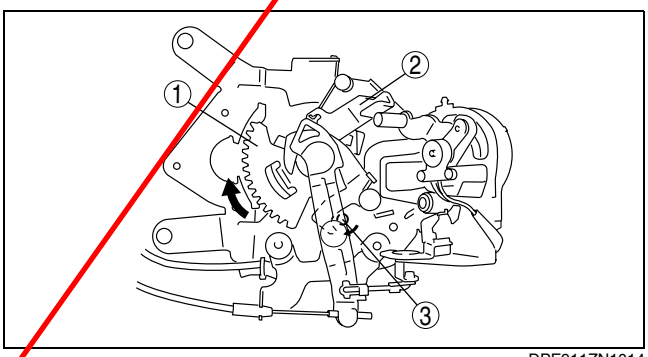
1. If the sliding door is in the ajar position, the auto closure motor rotates normally and rotates the sector gear.



DPE911ZN1013

1	Sector gear
2	Normal rotation

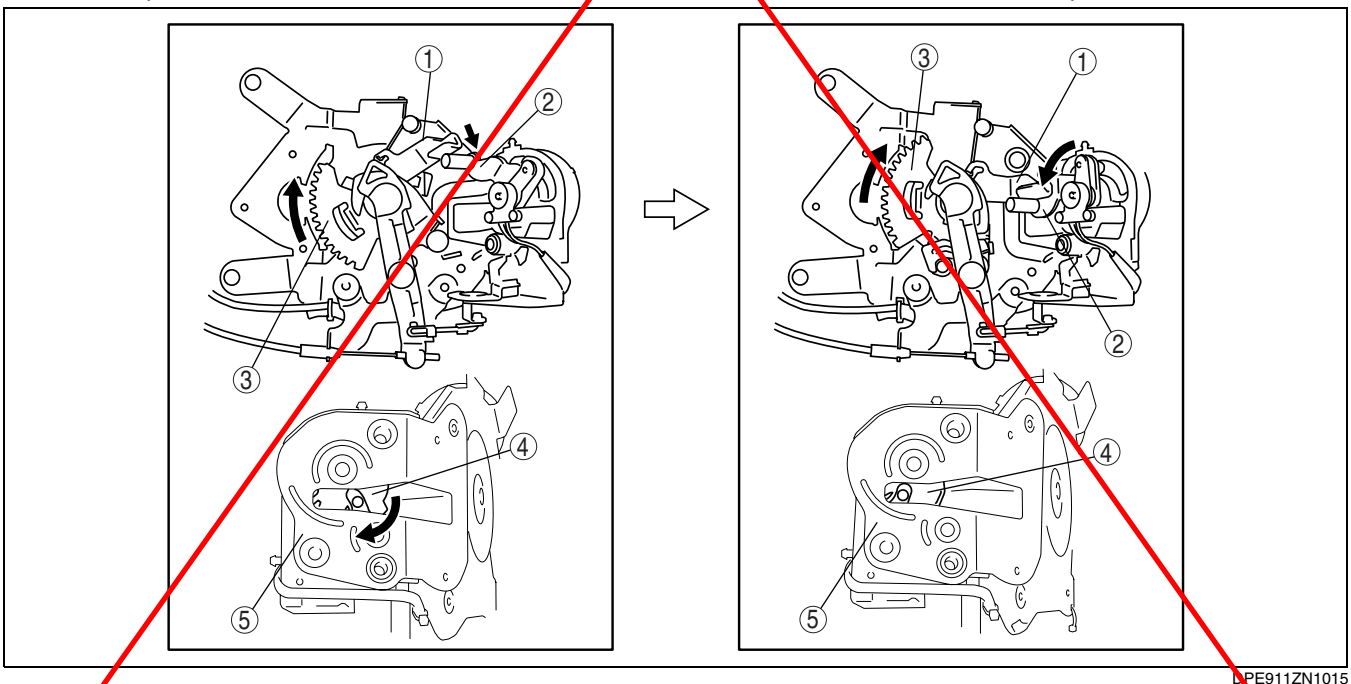
2. The sector gear knob press lever A and rotates it in the same direction as the sector gear rotation.



DPE911ZN1014

1	Sector gear
2	Lever A
3	Knob

3. Lever A presses lever B and rotates to the lock direction. At the same time, the latch is pulled to the lock side.



DPE911ZN1015

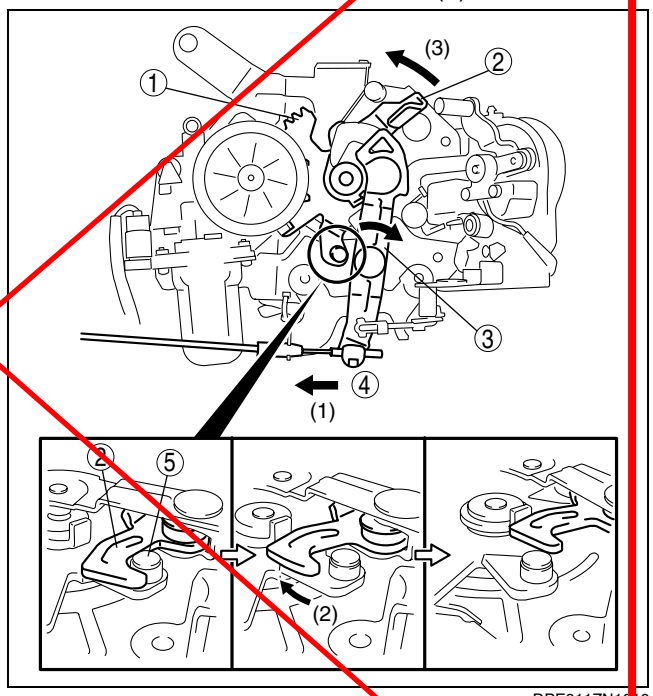
1	Lever A
2	Lever B
3	Sector gear

4	Latch
5	Sliding lock striker

4. If the motor normal rotation stop condition is detected, the motor is switched from normal rotation to reverse rotation.

Auto closure cancellation

1. If the outer handle or inner handle is operated while the auto closure system is operating, the cancel lever is pulled via the wire (1).
2. The cancel lever frees the sector gear knob from lever A (2).
3. The sector gear and lever A are separated and the power from the auto closure motor is cut (3).



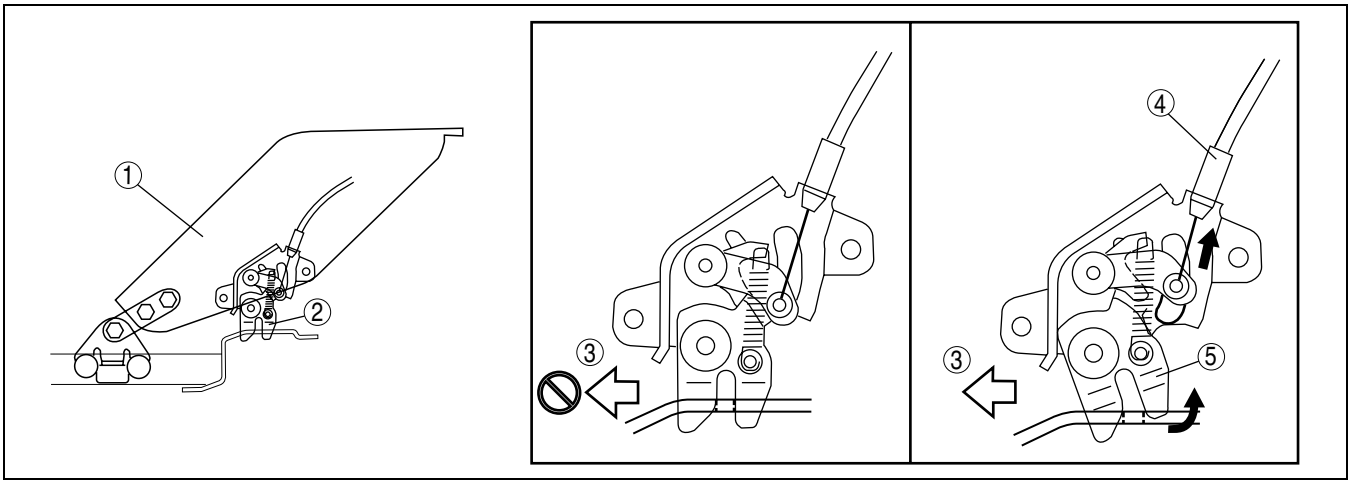
DPE911ZN1016

1	Sector gear
2	Lever A
3	Cancel lever
4	Wire
5	Knob

OPEN LOCK ACTUATOR CONSTRUCTION/OPERATION

DPE091158010T48

- When the sliding door is opened fully, the door is held at the fully open position so that it does not slide in the close direction.
- As the cable is linked with the outer and inner handles, the cable is pulled when either handle is operated. Due to this, the latch is released, and the sliding door moves.



DPE911ZN1023

1	Lower roller
2	Open lock actuator

3	Close slide
4	Cable
5	Latch

09–12 GLASS/WINDOWS/MIRRORS

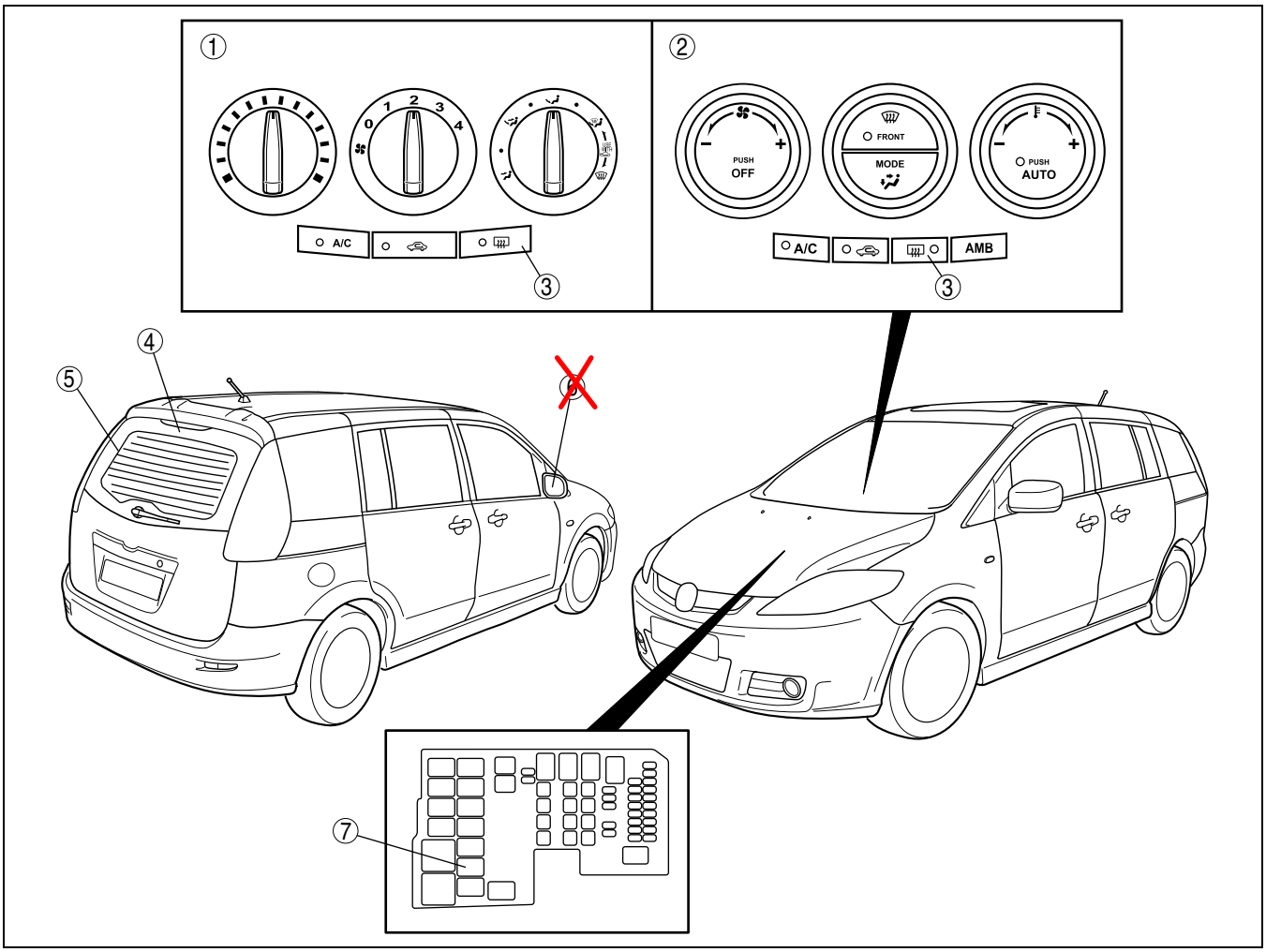
REAR WINDOW DEFROSTER SYSTEM OUTLINE

DPE091263000T03

Improved visibility	• Rear window defroster ~~and heated outer mirror~~ adopted

REAR WINDOW DEFROSTER SYSTEM STRUCTURAL VIEW

DPE091263000T02



DPE912ZT1104

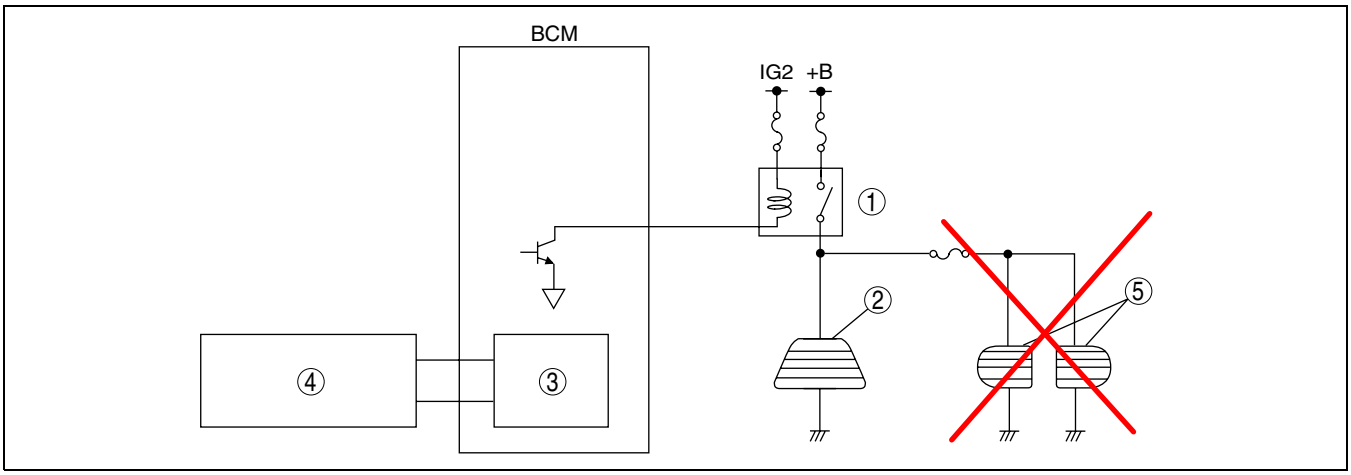
1	Climate control unit (Manual air conditioner)
2	Climate control unit (Full-auto air conditioner)
3	Rear window defroster switch
4	Rear window glass

5	Rear window defroster filament
6	Heated outer mirror
7	Rear window defroster relay

REAR WINDOW DEFROSTER SYSTEM CONSTRUCTION/OPERATION

DPE091263000T01

- Fogging is cleared from the rear window and outer mirror glass by heating of the filament.
- A signal is input to the BCM microcomputer when the rear defroster switch is turned on. The microcomputer turns the rear defroster relay on, causing the rear defroster and the heated outer mirror to operate.
- Approx. 10-15 min after the rear defroster switch is turned on, it is automatically turned off by the microcomputer timer control.



DPE912ZT1102

1	Rear window defroster relay
2	Rear window defroster filament
3	Microcomputer

4	Climate control unit
5	Heated outer mirror

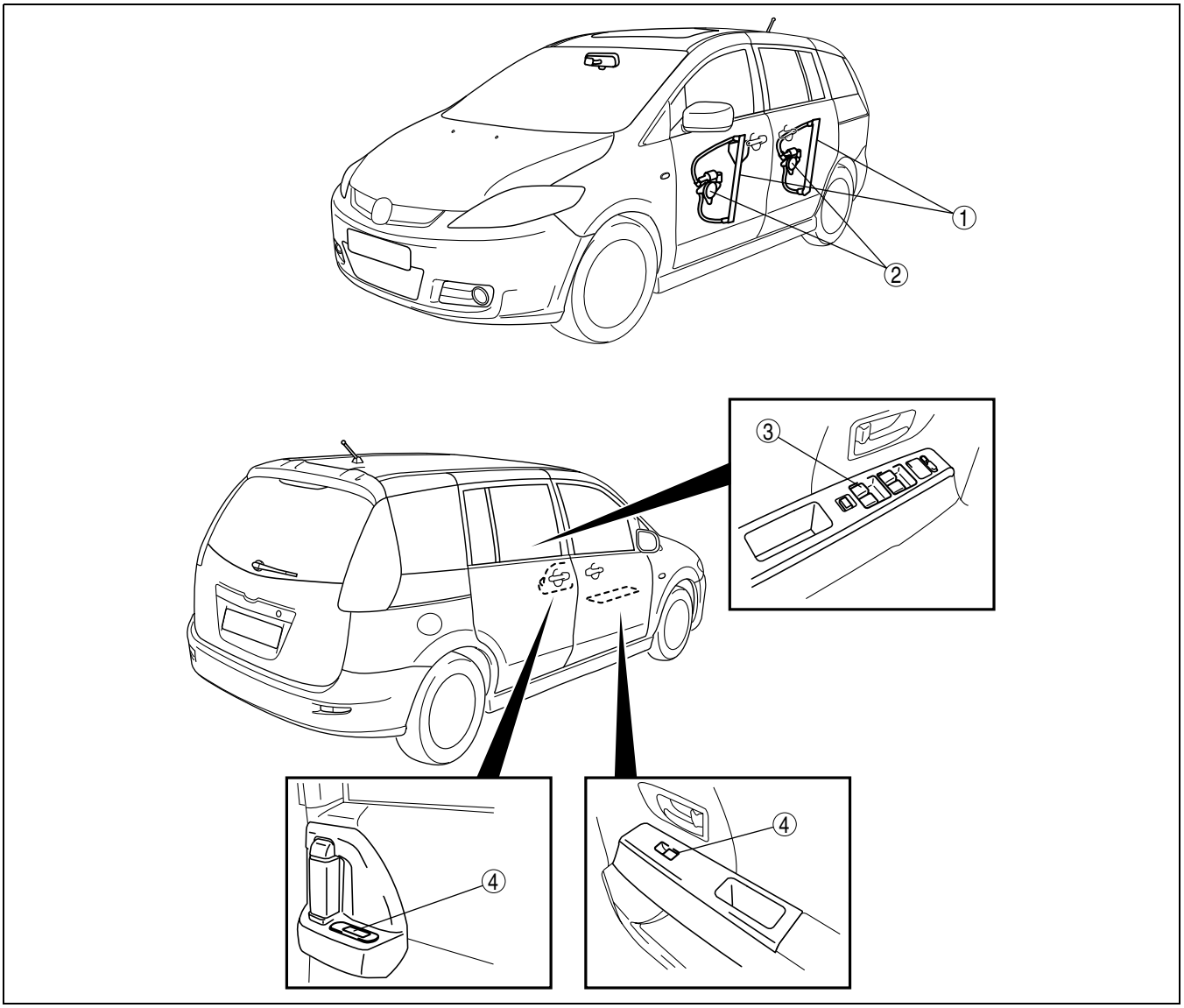
POWER WINDOW SYSTEM OUTLINE

DPE091258000T05

- The following functions have been adopted for all windows.
  - — Manual open/close function
  - — Auto-open/close function
  - — Auto reverse pinch protection function
  - — Two-step down function
  - — Ignition off timer function
  - — Fail-safe function
- A power-cut function that permits disabling the operation of all window switches from the driver's seat has been adopted.
- The P/W CM (power window control module) inside the power window switch, which detects the door glass movement distance and direction based on pulse signals of the power window motor, controls these functions.

POWER WINDOW SYSTEM STRUCTURAL VIEW

DPE091258000T02



DPE912ZT1105

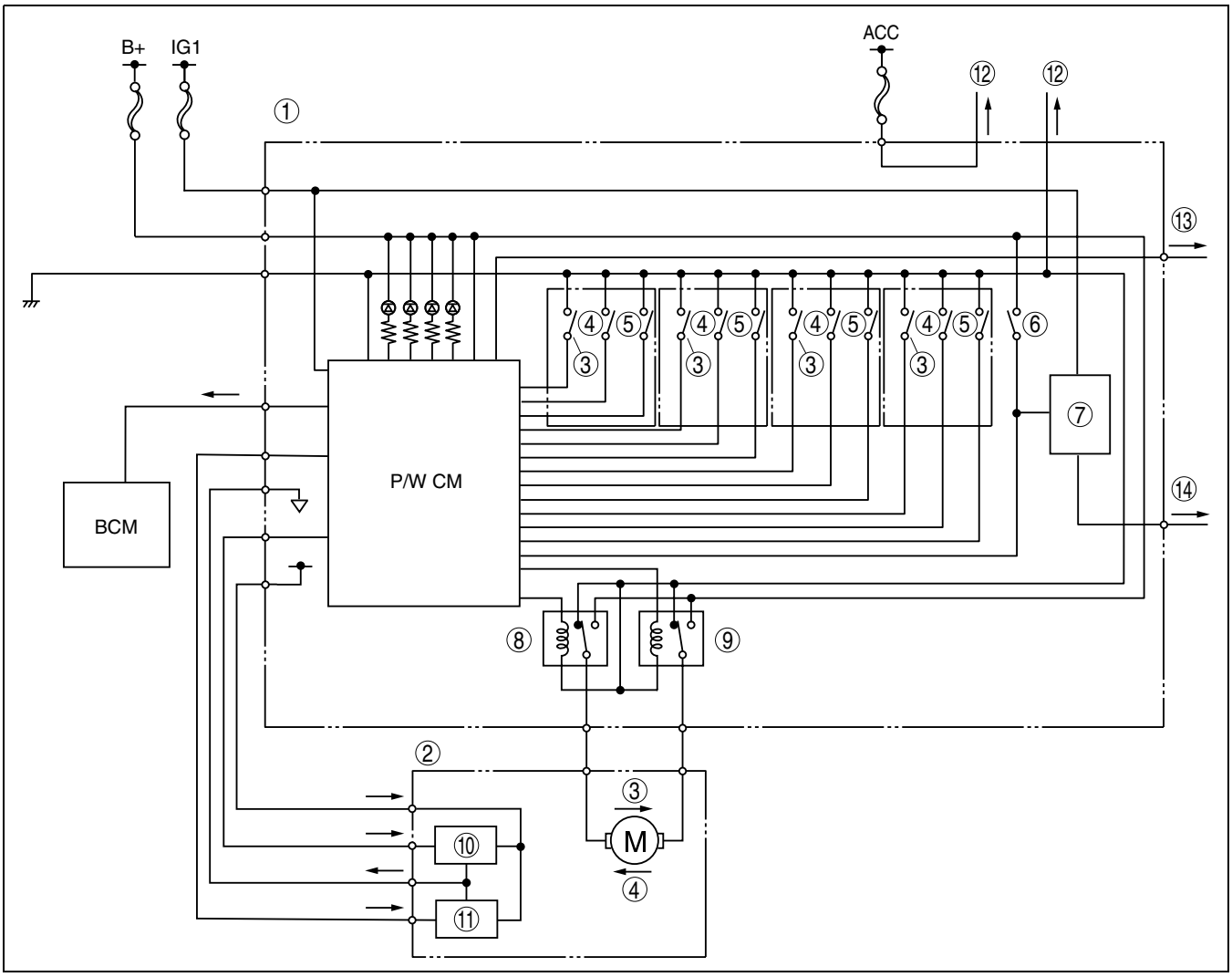
1	Power window regulator
2	Power window motor

3	Power window main switch
4	Power window subswitch

POWER WINDOW SYSTEM WIRING DIAGRAM

DPE091258000T07

Power Window Main Switch

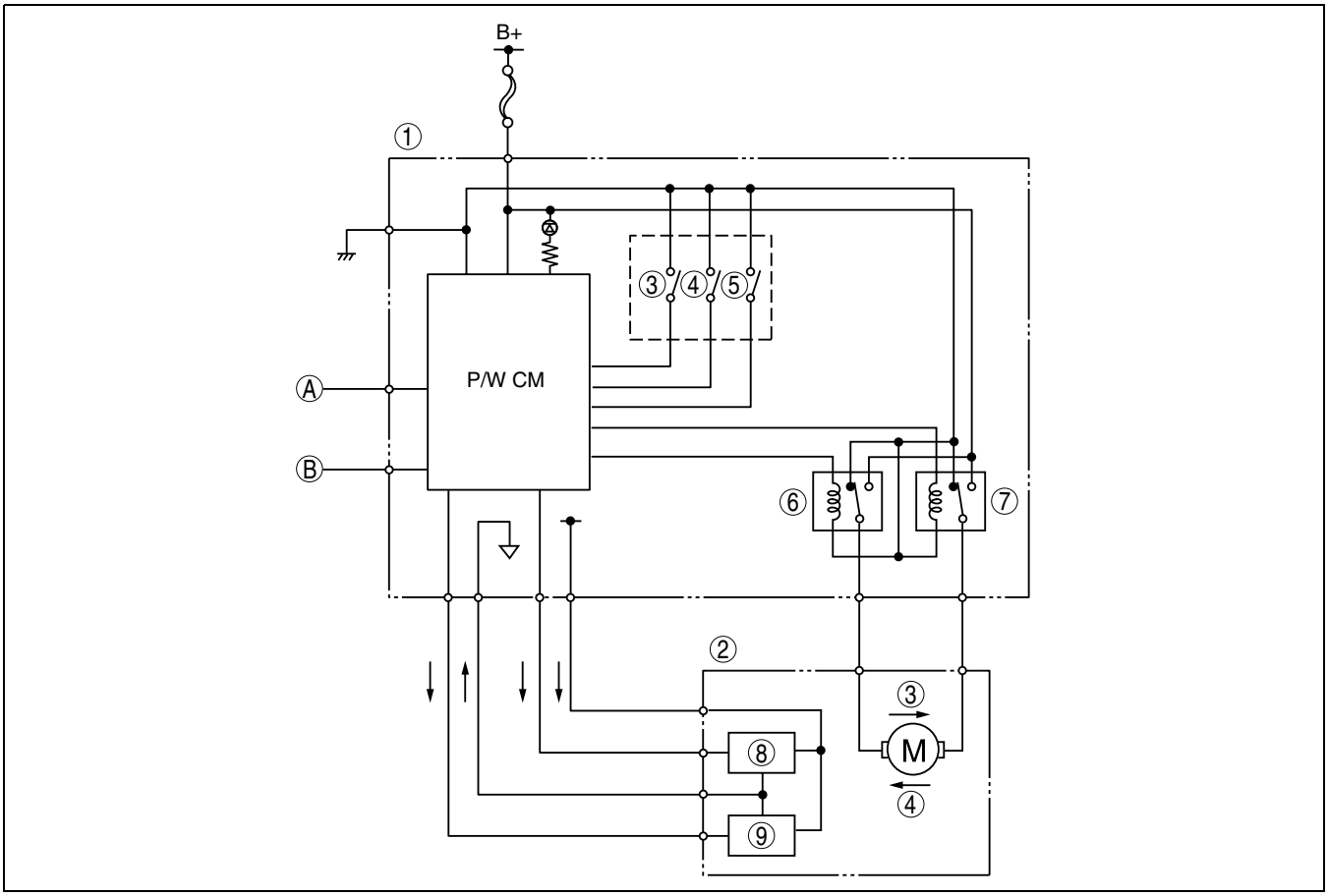


DPE912ZT1201

1	Power window main switch
2	Power window motor (driver's side)
3	Close
4	Open
5	Auto
6	Power-cut switch
7	Conjunction circuit

8	Close relay
9	Open relay
10	Hall effect switch 1
11	Hall effect switch 2
12	To power mirror switch
13	To power window subswitch A
14	To power window subswitch B

Power Window Subswitch



DPE912ZT1202

1	Power window subswitch
2	Power window motor
3	Close
4	Open
5	Auto

6	Close relay
7	Open relay
8	Hall effect switch 1
9	Hall effect switch 2

POWER WINDOW SYSTEM OPERATION

DPE091258000T06

Manual Open/Close

- The window opens/closes according to the down (push) or up (pull) operation of the power window main switches and the power window subswitches.

Auto-Open/Close

- The window automatically moves to a fully-opened or closed position when the power window main switches or the power window subswitches are operated to fully open/close positions, either down (push) or up (pull).

Auto Reverse Pinch Protection Function

- If any object is pinched in the window during auto-close operation, the window automatically opens **approx. 200 mm {7.9 in}**.

Two-step down function

- If a switch is lightly pushed (manual open operation) when the window is completely closed, the window lowers a set distance. (Initial setting is **approx. 30 mm {1.2 in}**.)
- If the manual open operation is performed with the two-step down function enabled, the window will always stop momentarily. (This is not a malfunction.)
- The set distance the window goes down can be changed. (Within a range of **approx. 20-100 mm {0.79-3.9 in}.**)
- The two-step down function can be disabled. (Initial setting is enabled)
- If the operation of the auto open/close, manual close or window obstruction is detected during two-step down function operation, these other operations are given priority.

- Does not function during IG OFF timer operation.

IG OFF Timer
- Allows operation of the driver's power window for **approx. 40 s** after the ignition switch has been turned from the ACC to the LOCK position.

Fail-safe
- The power window system is switched to fail-safe mode to prevent a malfunction when the P/W CM detects a malfunction in the pulse signal (Hall IC).

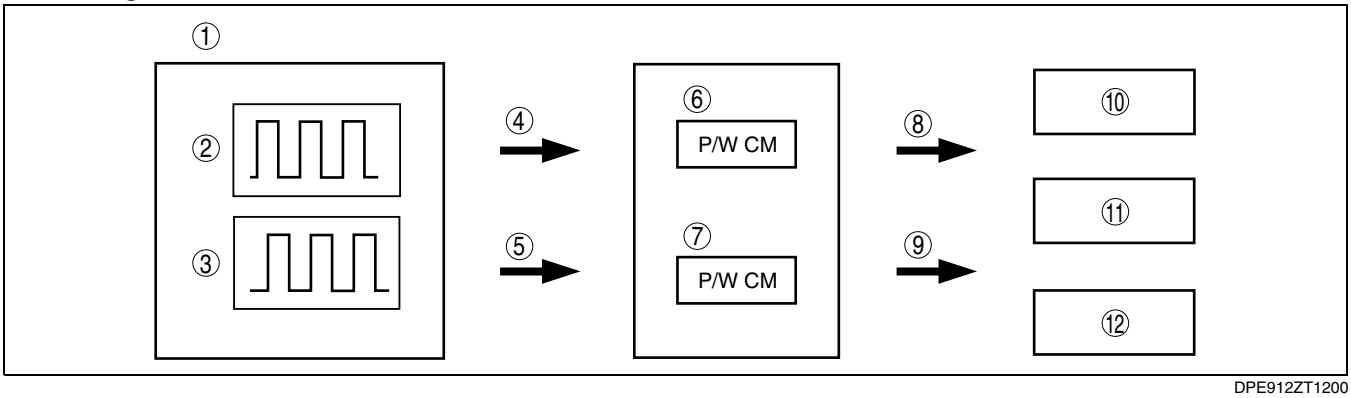
Malfunction condition	IG SW ON	IG SW OFF	Recovery condition
Pulse 1 (for pinching and door glass position detection) stopping malfunction • Pulse 2 pulse detected but pulse 1 not detected when opening or closing	Automatic operation is prohibited (Manual operation is possible) Operation of the power window main switches for each seat other than the driver's seat is inhibited	Auto and manual operation are prohibited	Pulse signals 1 and 2 detected normally during close operation, and redetection of fully-closed position return/non-return ranges
Pulse 2 (for door glass direction detection) stopping malfunction • Pulse 1 detected but pulse 2 is not detected during close or open operation			
Pulse signal malfunction detected (Inversion of input signals of or large phase deviation between pulses 1 and 2) • Difference detected between the direction detected by the signals of pulses 1 and 2, and the actual direction			
Non-return range downturn malfunction • The signal input from pulse 1 is higher than the position stored in the P/W main switch is detected during close operation			
Pulse 1 and 2 stopping malfunction • Pulse signals 1 and 2 not detected after open operation initiated from the fully closed position			

POWER WINDOW SWITCH CONSTRUCTION

DPE091266330T02

- Manual and auto-open/close can be performed for all windows by operation of the driver's seat switches.
- Manual and auto-open/close can be performed for each specific window by operation of the switches at the passenger's and rear seats.
- By locking the power cut switch, operation of the power window main switches for each seat and the power window subswitches is inhibited.
- A built-in P/W CM (power window control module) controls the power window system control based on the pulse signals from the power window motor.
- The position and movement direction of the window is stored at the time of vehicle delivery. Due to this, the initial position setting must be performed after performing any of the following procedures:
  - — Disconnecting the negative battery cable.
  - — Removing the power window system power supply fuse.
  - — Disconnecting the power window switch connector.

Block Diagram



DPE912ZT1200

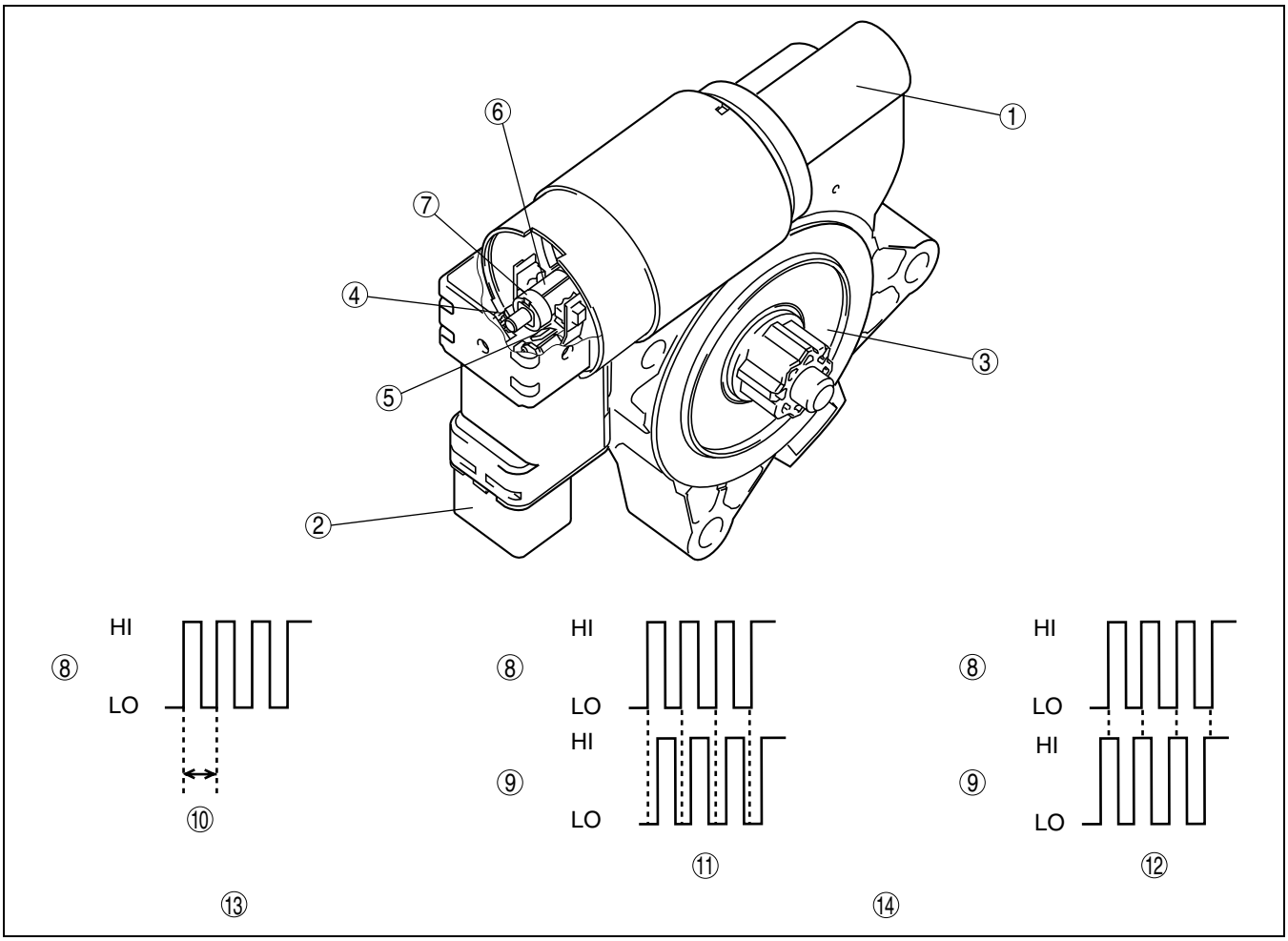
1	Power window motor	4	Window movement distance
2	Pulse 1 (Hall effect switch 1)	5	Window movement direction
3	Pulse 2 (Hall effect switch 2)	6	Power window main switch

7	Power window subswitch
8	Open
9	Close
10	Driver-side door glass
11	Passenger-side door glass
12	Rear door glass

POWER WINDOW MOTOR CONSTRUCTION

DPE091259560T01

- Consists of a motor, connector, and gear.
- Two Hall effect switches are located in the connector.
- The Hall effect switch utilizes magnets set on a rotating axis to detect the motor rotation, and outputs a synchronized pulse to the power window main switch.
- Hall effect switch 1 outputs one pulse cycle for each rotation of the power window motor axle and the power window main switch detects motor rotation speed from this.
- Hall effect switch 2 outputs pulse corresponding to motor rotation in the same manner as Hall effect switch 1. The high and low pulse points of Hall effect switches 1 and 2 are different during opening and closing because the phase difference shifts by 90°, allowing the power window main switch to detect the rotational direction of the power window motor.



B3E0912T008

1	Motor
2	Connector
3	Gear
4	Hall effect switch 1
5	Hall effect switch 2
6	Shaft
7	Magnet

8	Pulse (Hall effect switch 1)
9	Pulse (Hall effect switch 2)
10	One revolution of power window motor
11	Up
12	Down
13	Detection of window movement distance
14	Detection of window movement direction

EXTERIOR OPEN/CLOSE FUNCTION OUTLINE

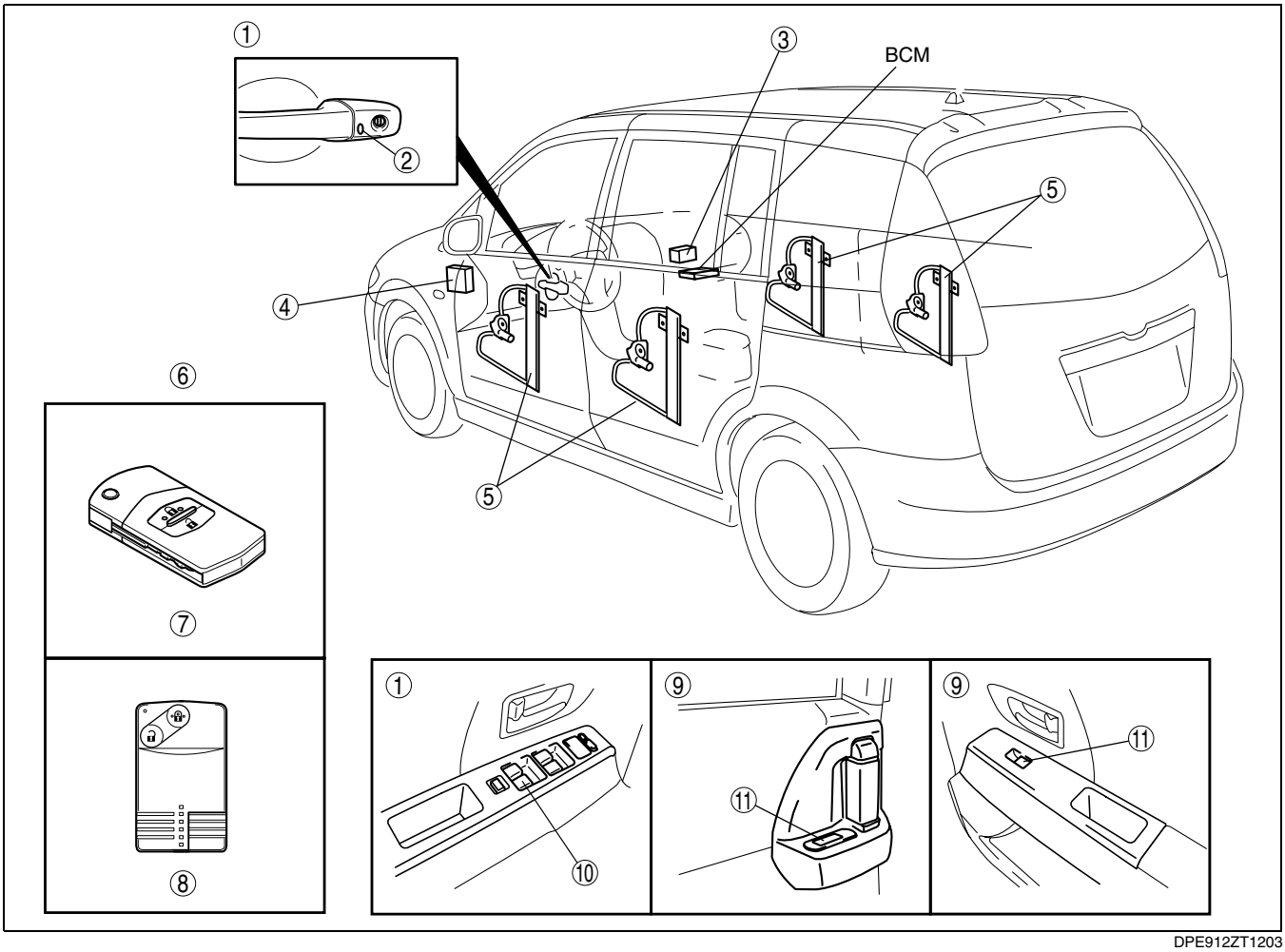
DPE091258000T08

- A exterior open/close function has been adopted so that the power window system can be operated from outside the vehicle.
- This function can operate in conjunction with the following:
  — Transmitter
  — Driver-side request switch (with advanced keyless system, close operation only)
- An auto reverse pinch protection function operates if the door glass is obstructed during close operation.

Operation item	Open operation (Automatic open)	Close operation (Manual close)
Transmitter	UNLOCK button operation (long press, approx. 1.5 s or more)	LOCK button operation (long press, approx. 1.5 s or more)
Request switch (With advanced keyless system)	—	Long press, approx. 1.5 s or more

EXTERIOR OPEN/CLOSE FUNCTION STRUCTURAL VIEW

DPE091258000T09



DPE912ZT1203

1	Driver's side
2	Request switch (*1)
3	Keyless receiver
4	Keyless control module (*1)
5	Power window regulator/motor
6	Transmitter

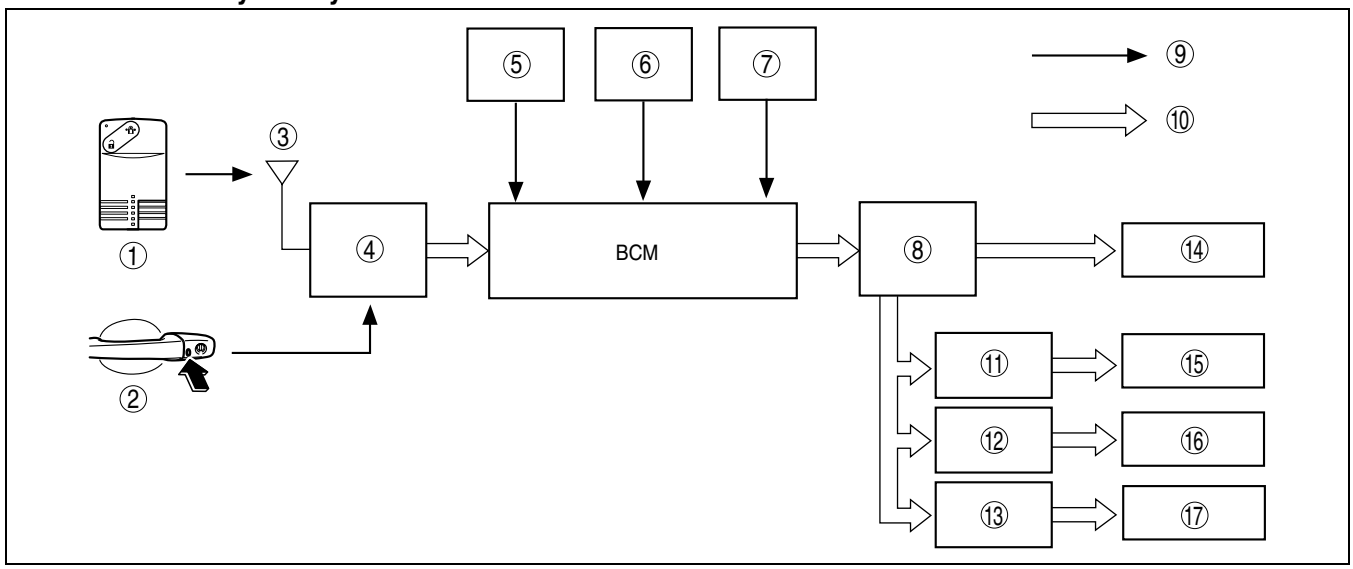
7	With keyless entry system
8	With advanced keyless system
9	Except driver's side
10	Power window main switch
11	Power window subswitch

*1 : With advanced keyless system

EXTERIOR OPEN/CLOSE FUNCTION BLOCK DIAGRAM

DPE091258000T10

With Advanced Keyless System

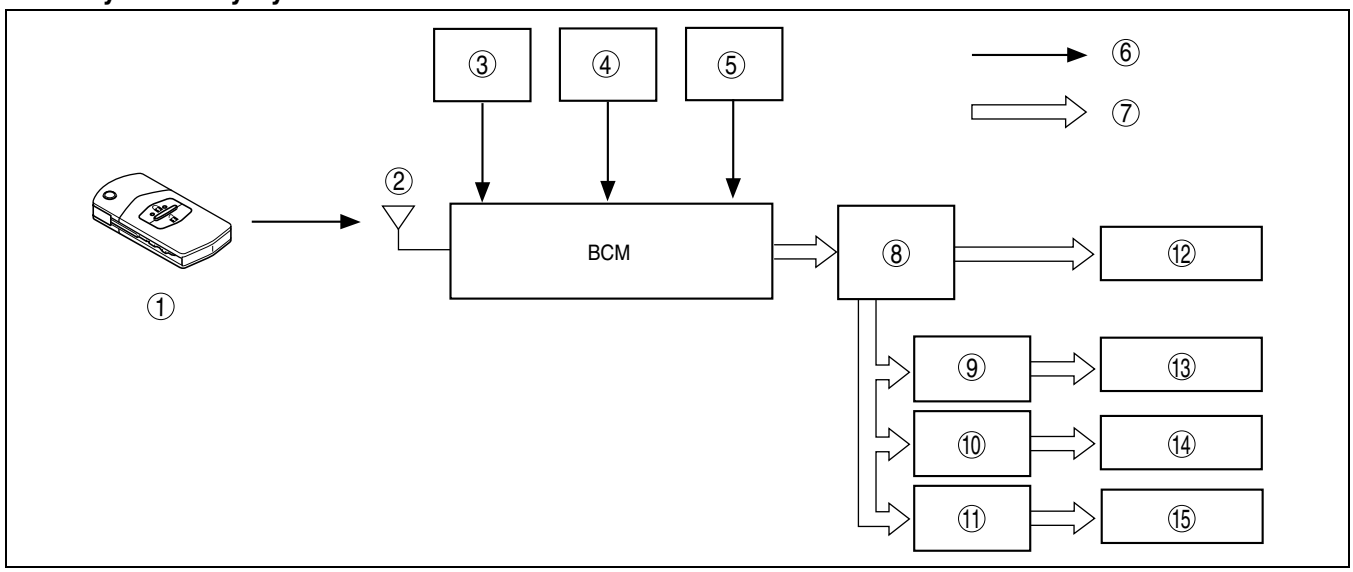


DPE912ZT1204

1	Transmitter
2	Request switch (driver's side)
3	Keyless receiver
4	Keyless control module
5	Door switch
6	Push switch / Keyless switch
7	Cargo compartment light switch
8	Power window main switch
9	Input signal

10	Control signal
11	Power window subswitch (RF)
12	Power window subswitch (LR)
13	Power window subswitch (RR)
14	Power window motor (LF)
15	Power window motor (RF)
16	Power window motor (LR)
17	Power window motor (RR)

With Keyless Entry System



DPE912ZT1205

1	Transmitter
2	Keyless receiver
3	Door switch
4	Keyless switch
5	Cargo compartment light switch
6	Input signal
7	Control signal

8	Power window main switch
9	Power window subswitch (RF)
10	Power window subswitch (LR)
11	Power window subswitch (RR)
12	Power window motor (LF)
13	Power window motor (RF)
14	Power window motor (LR)

15	Power window motor (RR)

EXTERIOR OPEN/CLOSE FUNCTION OPERATION

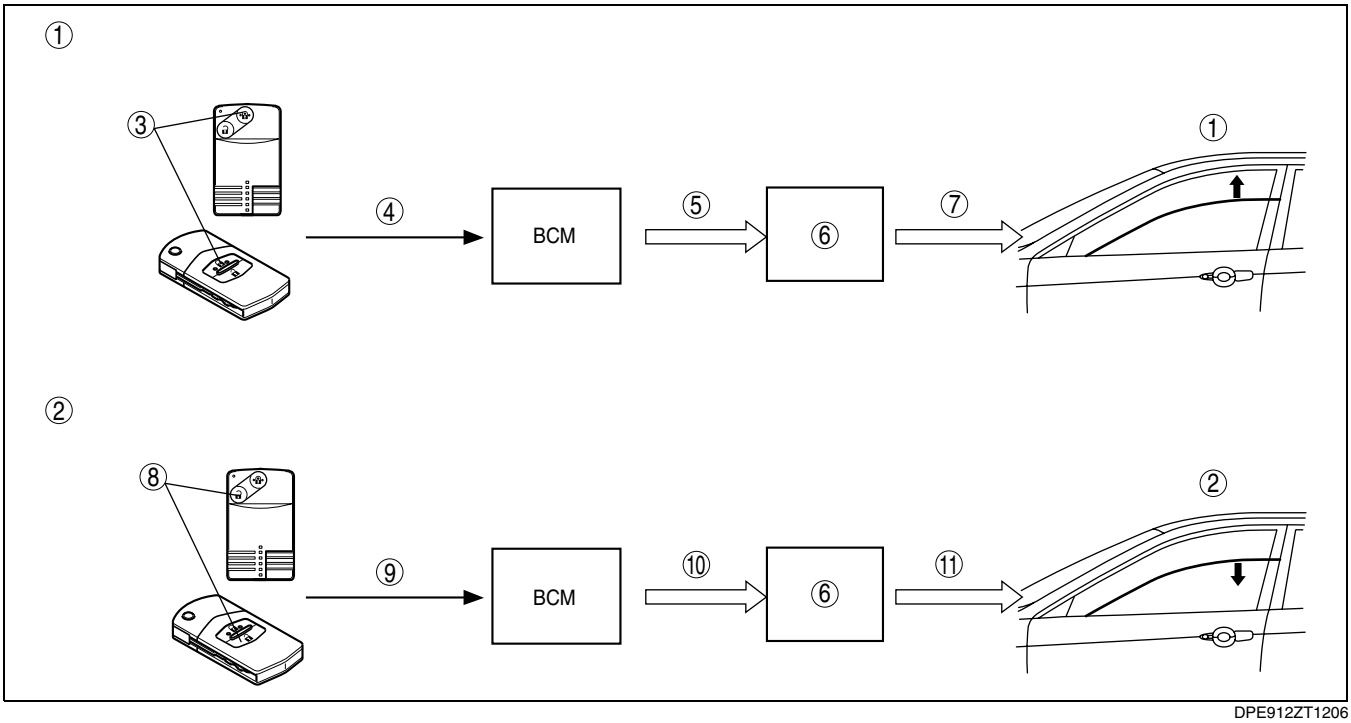
DPE091258000T11

- With the function, all door glass can open/close in conjunction with the UNLOCK/LOCK operation of the transmitter, and request switch (with advanced keyless system).
- One opening operation fully opens (automatic open) all door glass, and close operation operates only when the operation (manual close) is being performed.
- During IG OFF timer operation (power window system operates approx. 40 s after IG OFF), the power window switch operation has priority over the exterior open/close function.
- Auto reverse pinch protection operation has priority when the door glass is obstructed during close operation.
- The BCM sends the signal requiring the open/close operation to the power window control module (power window main switch) based on the signals input from the switches.
- The power window control module (power window main switch) sends open/close operation signal to the power window motor based on the required signal, and operates the door glass.

Open Function/Operation in Conjunction with Transmitter

- The door glass can be opened by holding the button in the UNLOCK position for approx. 1.5 s or more within the transmitter reception area.
- When the door glass is not fully open, operate and hold the transmitter UNLOCK position for approx. 1.5 s, and the door glass performs automatic open operation to fully open the door glass. During the automatic open operation, if the transmitter is operated again*1, it stops in that position.

*1 : The operation button can be either the LOCK/UNLOCK/PANIC button. Also, the holding time is not factored.



DPE912ZT1206

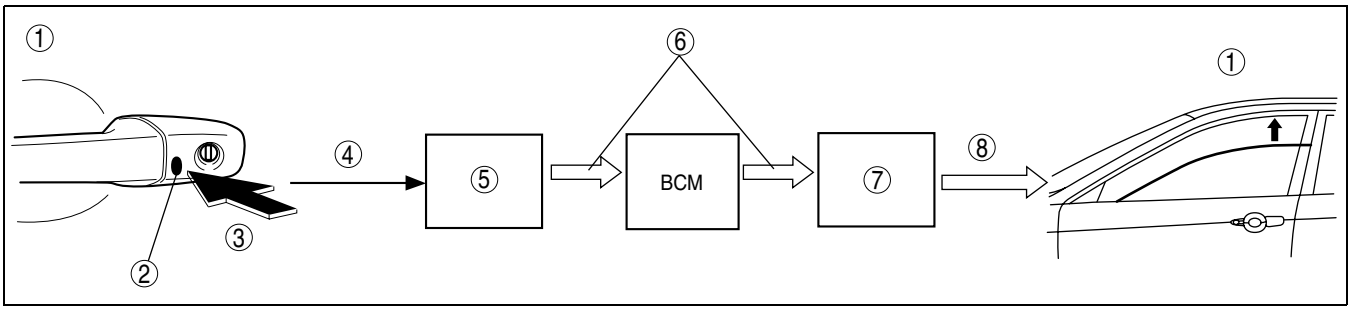
1	Close operation
2	Open operation
3	Close (lock button hold approx. 1.5 s)
4	Lock signal
5	Close request signal
6	Power window switch

7	Close operation signal
8	Open (unlock button hold approx. 1.5 s)
9	Unlock signal
10	Open request signal
11	Open operation signal

Close Function/Operation in Conjunction with Request Switch

- If the driver-side request switch is operated and held for approx. 1.5 s or more while the card key (transmitter) is within the reception area and the door glass is open, the door glass performs manual close operation. When the switch is released, the operation stops.
- During the operation, when the open/close function in conjunction with the key operation is performed, or the open/close function in conjunction with the transmitter is performed, these functions have priority over the

operation.



DPE912ZT1207

1	Close operation
2	Request switch (driver's side)
3	Close (lock, hold approx. 1.5 s)
4	Lock signal

5	Keyless control module
6	Close request signal
7	Power window switch
8	Close operation signal

Operation Prohibition/Stop Condition

- When the following conditions are met before the operation, the exterior open/close function does not operate. Also, if the conditions are met during the operation, the operation stops.
  - — Either door is open (when the door switch is ON)
  - — The key is inserted in the steering lock (when the keyless switch is ON)
  - — The push switch is pressed in or the start knob (ignition switch) is in a position other than the LOCK (with advanced keyless system)
  - — The transmitter is not in the reception area
  - — The card key (transmitter) is not in the reception area when the driver-side request switch is operated (with advanced keyless system)
  - — The transmitter is operated during the operation (LOCK, UNLOCK, PANIC operation)

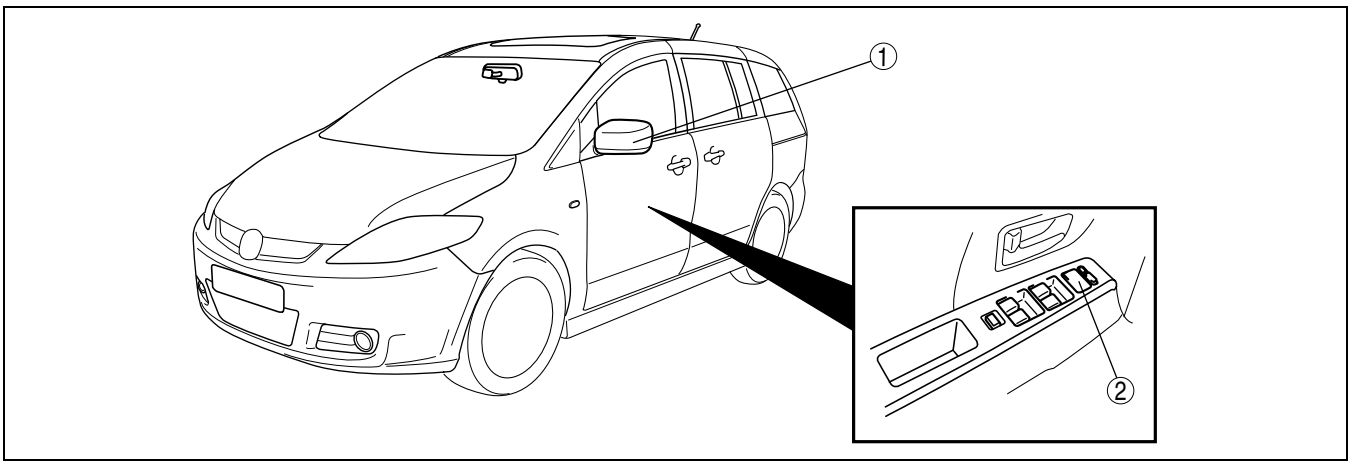
POWER OUTER MIRROR OUTLINE

DPE091269100T01

Improved convenience	• Power outer mirror (mirror glass adjusting function, and retract/return function) adopted • IG OFF timer function adopted for power outer mirror

POWER OUTER MIRROR STRUCTURAL VIEW

DPE091269100T02



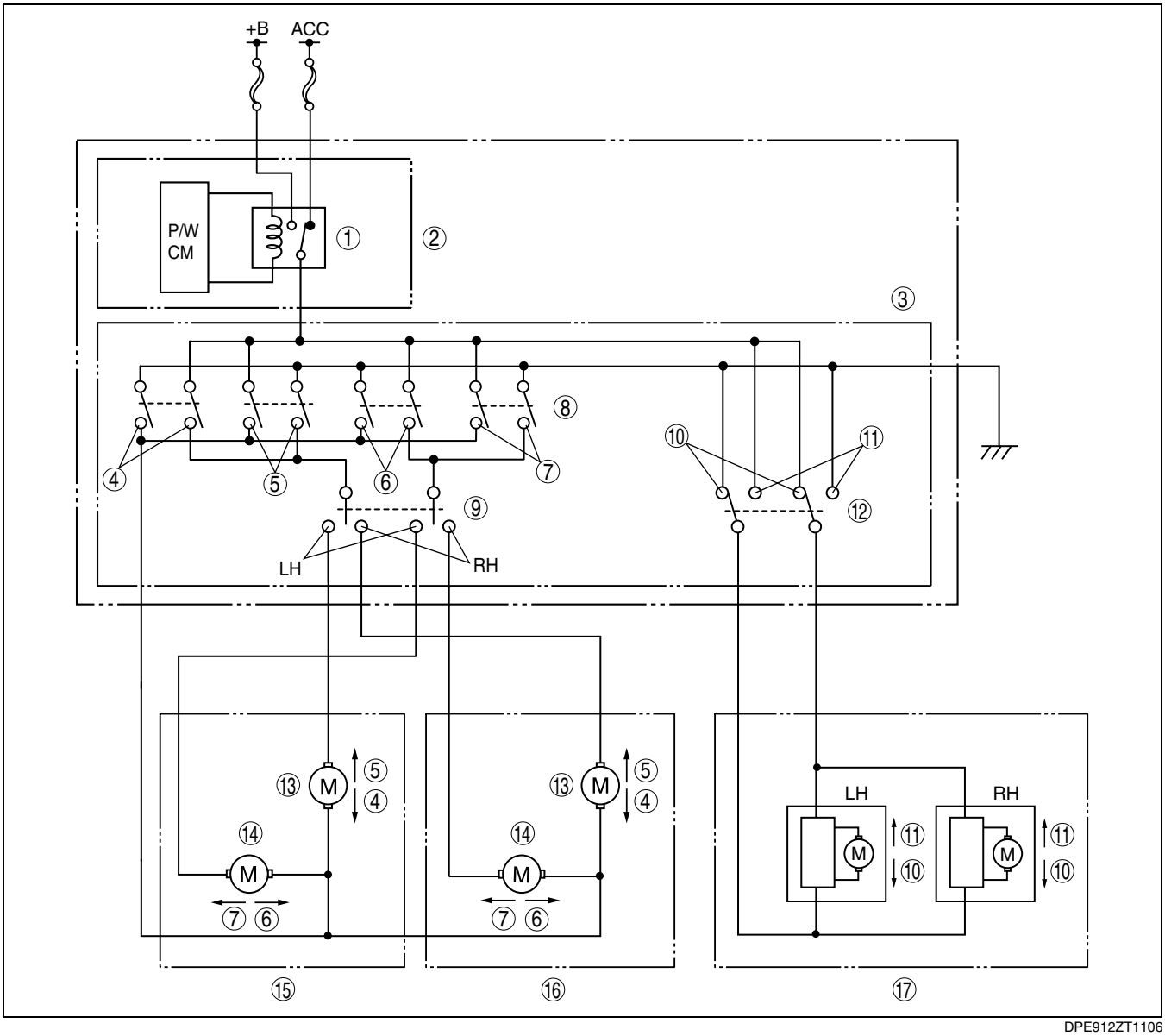
DPE912ZT1103

1	Power outer mirror

2	Power outer mirror switch

POWER OUTER MIRROR SYSTEM WIRING DIAGRAM

DPE091269100T03



DPE912ZT1106

1	IG OFF timer relay
2	Power window main switch
3	Power outer mirror switch
4	Up
5	Down
6	Left
7	Right
8	Mirror glass adjustment switch
9	Left/right selection switch

10	Return
11	Retract
12	Retractable mirror switch
13	Up/down adjustment motor
14	Left/right adjustment motor
15	Power outer mirror (LH)
16	Power outer mirror (RH)
17	Retract/return motor

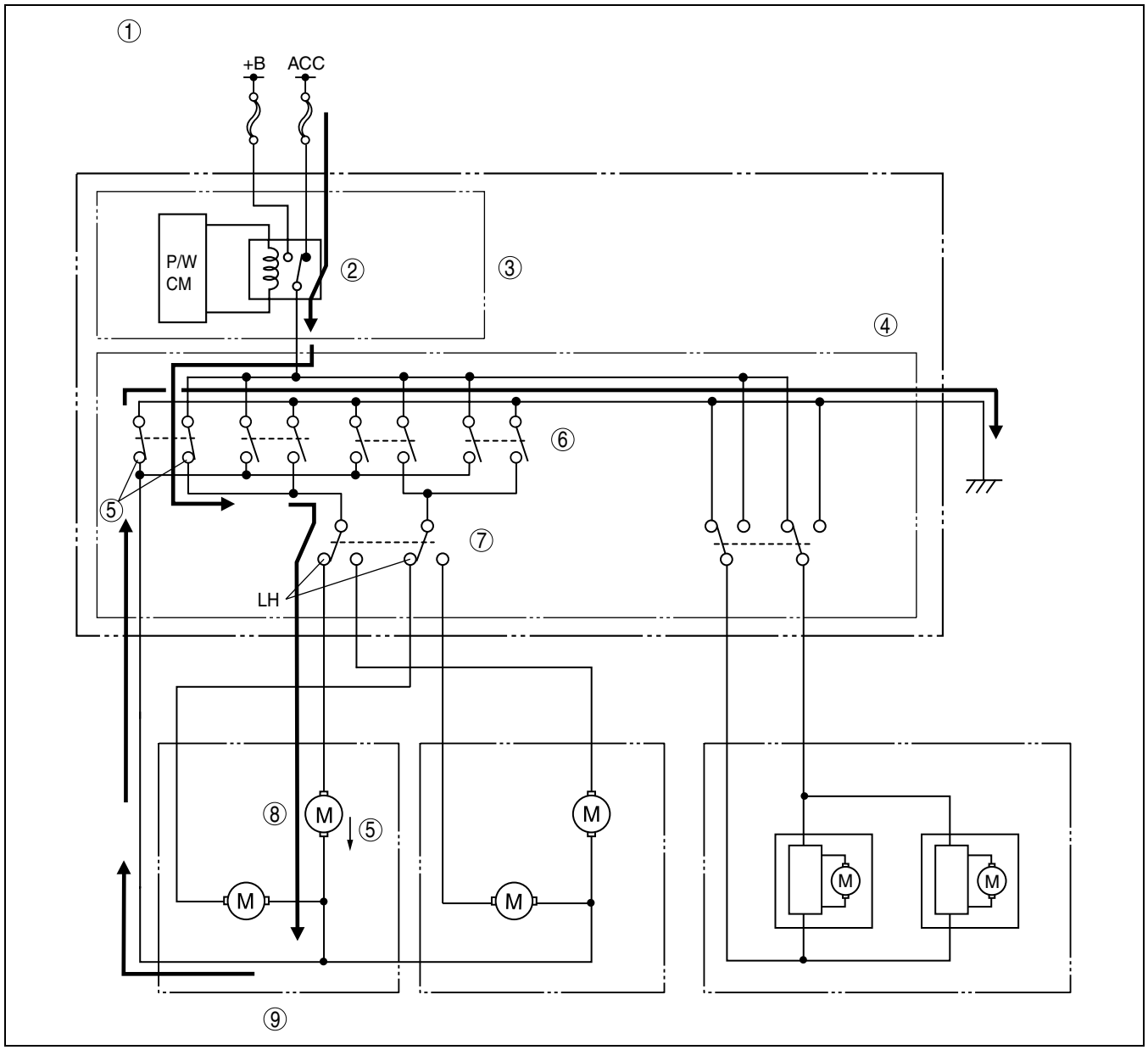
POWER OUTER MIRROR OPERATION

DPE091269100T04

Mirror Glass Adjustment

- The left/right selection switch establishes left or right side outer mirror circuit and current is supplied in either one of the four directions according to the position of the mirror glass adjustment switch. Due to this, the motor

rotates either up or down, left or right..



DPE912ZT1107

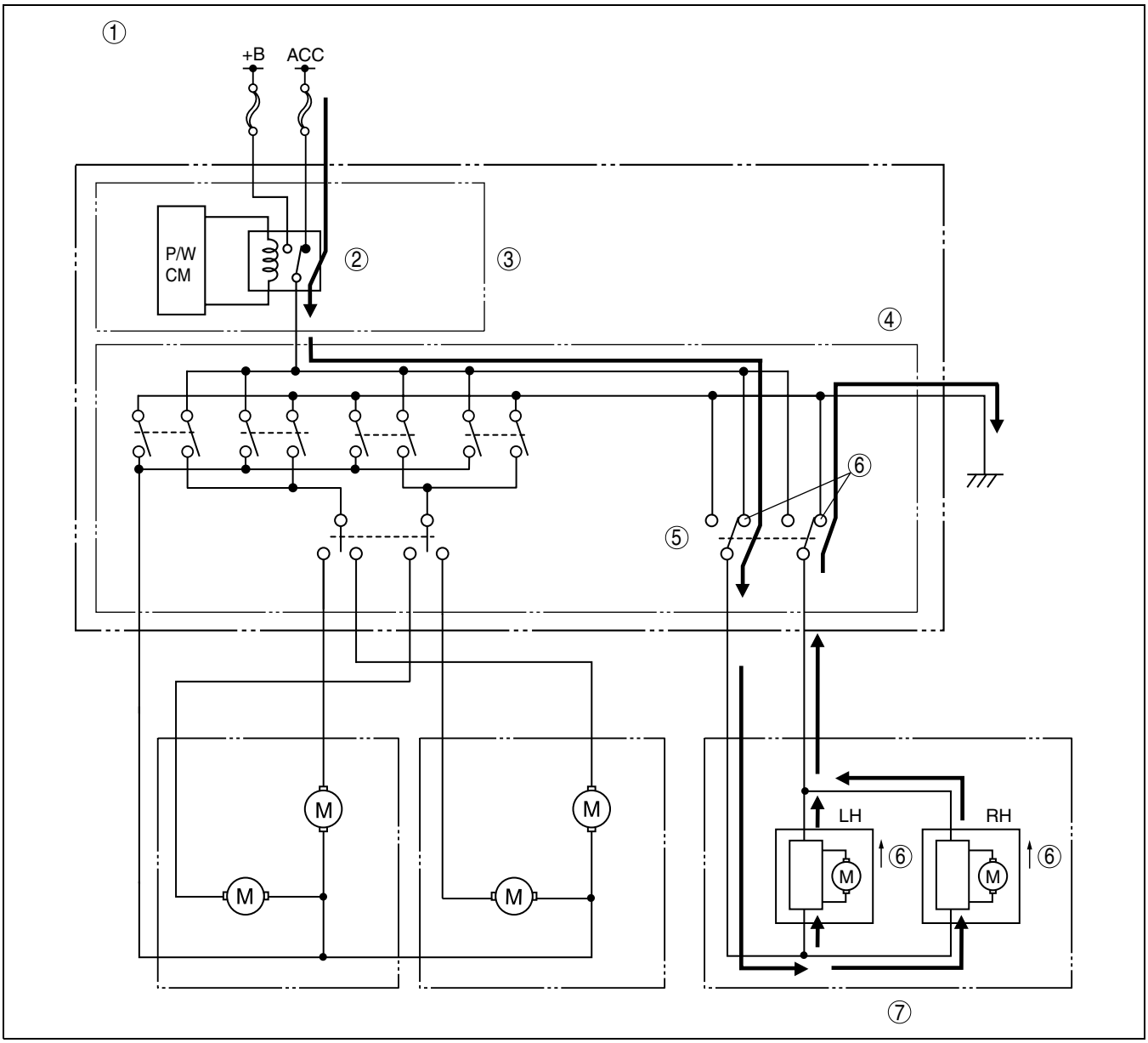
1	Left side outer mirror is moved upward
2	IG OFF timer relay
3	Power window main switch
4	Power outer mirror switch
5	Up

6	Mirror glass adjustment switch
7	Left/right selection switch
8	Up/down adjustment motor
9	Power outer mirror (LH)

Retract/Return

- When the retractable mirror switch is moved to the retract position, a circuit is established, and the retract/return motor rotates in the retracting direction.

- During return operation, the motor rotates in the opposite (returning) direction.



DPE912ZT1108

1	Outer mirror operated in retracting direction
2	IG OFF timer relay
3	Power window main switch
4	Power outer mirror switch

5	Up
6	Retract
7	Retract/return motor

IG OFF timer

- The power outer mirror can be operated for approx. 40 s after the ignition switch has been turned from the ON to the LOCK position.

09–13 SEATS

SEATS OUTLINE

DPE091357000T01

FEATURES

Improved marketability	• 2-row, 5-passenger model and a 3-row, 7-passenger model specifications have been adopted. • Lumbar support has been adopted for the driver-side seat. • Picnic table has been adopted on the front seat back. • Seat warmer has been adopted for the front seat. • Retractable KARAKURI storage box has been adopted under the seat bottom of the second-row seat (RH). • Retractable KARAKURI 7th seat has been adopted under the seat bottom of the second-row seat (LH). • Flip fold-down system which can be operated independently for RH and LH has been adopted for the second-row seat. • Large-sized armrest with a seat back function for the center seat has been adopted for the second-row seat.
Improved safety	• Built-in side air bag has been adopted for the front seat.

SEATS SPECIFICATION

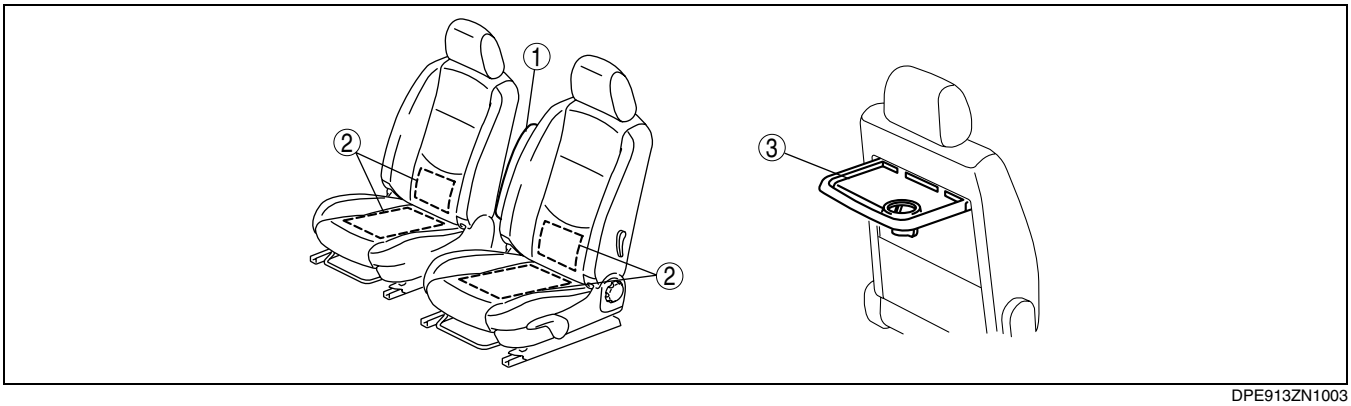
DPE091357000T02

Item	Function
Front seat	Recliner
	Slide
	Picnic table
	Cushion lifter (Driver-side seat only)
	Lumbar support (Driver-side seat only)
	Armrest (Driver-side seat only)
	Seat warmer unit
	Side air bag module
Second-row seat	Flip fold-down
	Slide
	Walk-in
	KARAKURI 7th seat
	Armrest (center seat back)
	KARAKURI storage box
Third-row seat (7-passenger model)	Easy fold-down (5:5)

SEATS STRUCTURAL VIEW

DPE091357000T03

Front Seat



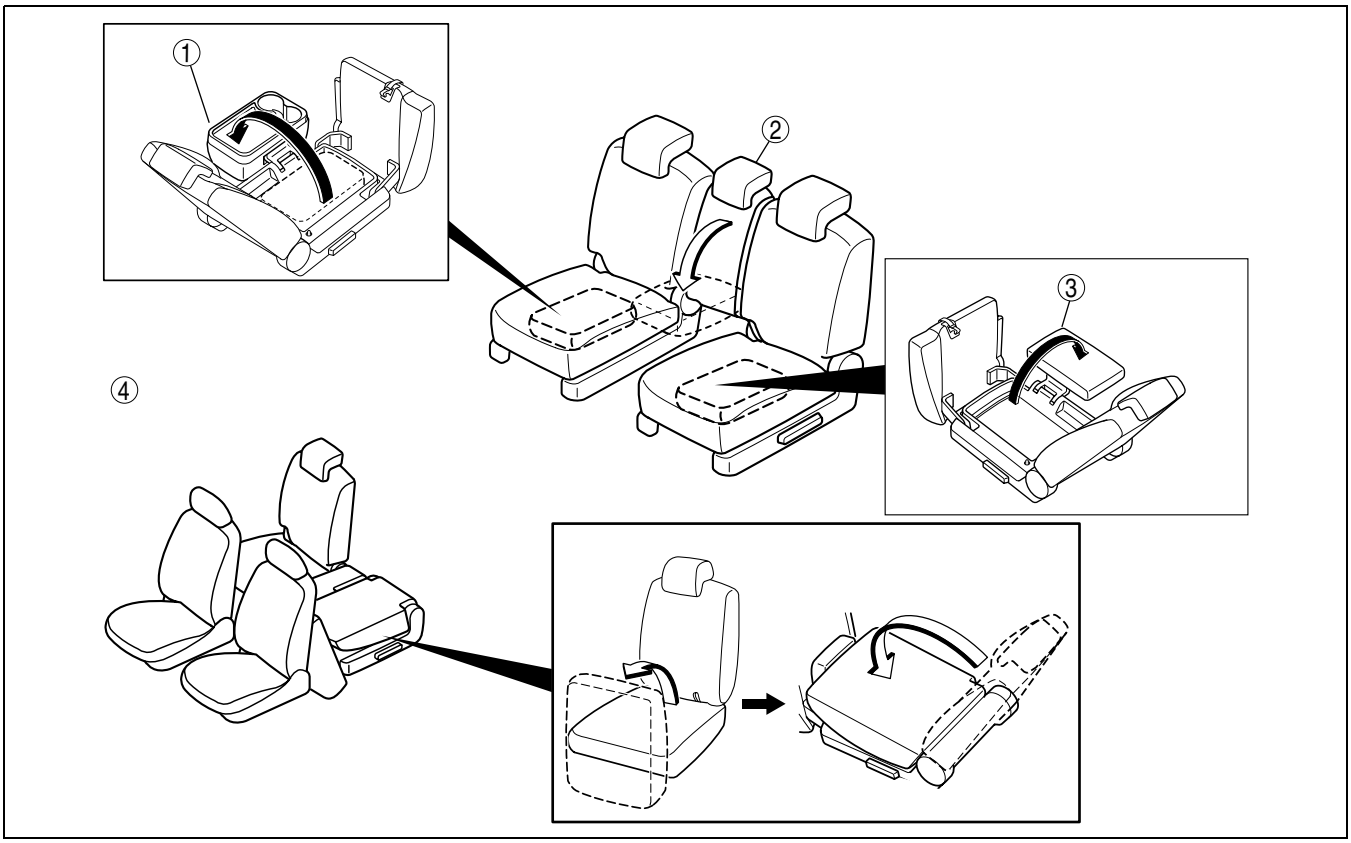
DPE913ZN1003

1	Armrest
2	Seat warmer unit

3	Picnic table

09

Second-Row Seat

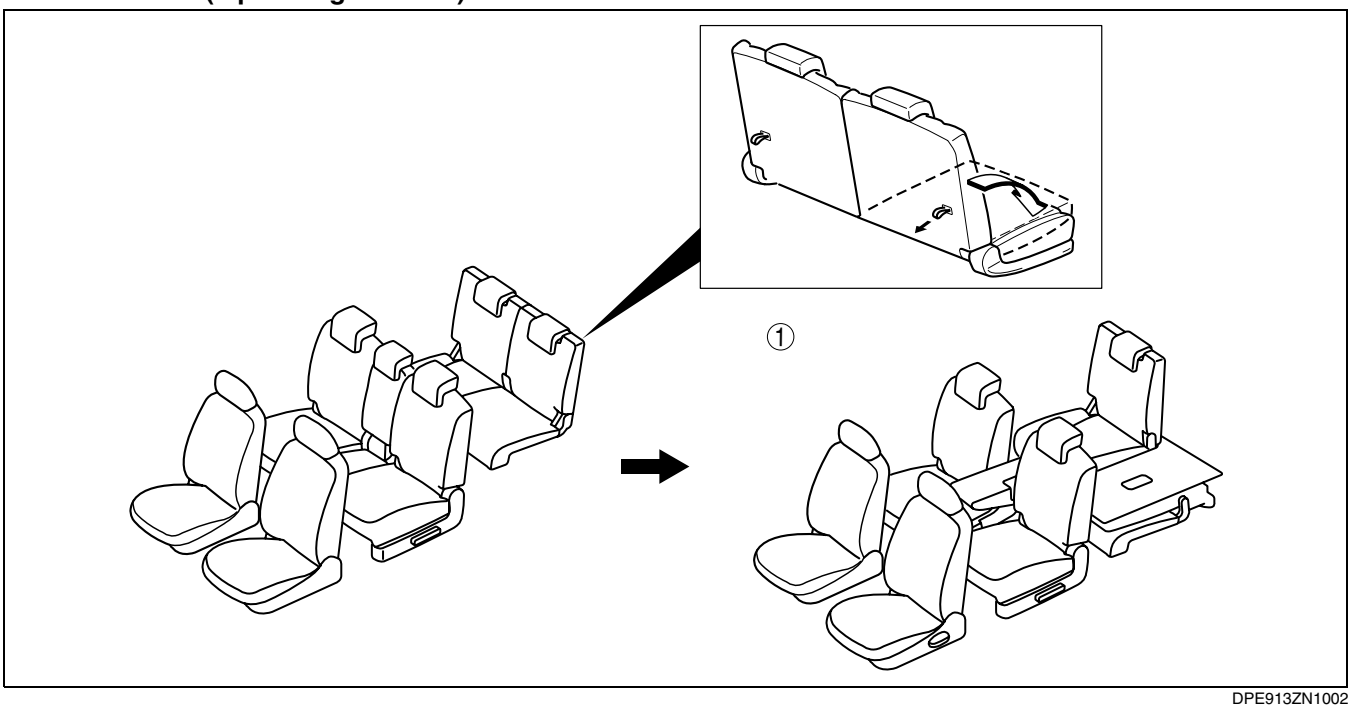


DPE913ZN1001

1	KARAKURI storage box
2	Armrest

3	KARAKURI 7th seat
4	Flip fold-down

Third-Row Seat (7-passenger model)



DPE913ZN1002

1	Easy fold-down

09–14A SECURITY AND LOCKS [ADVANCED KEYLESS AND START SYSTEM]

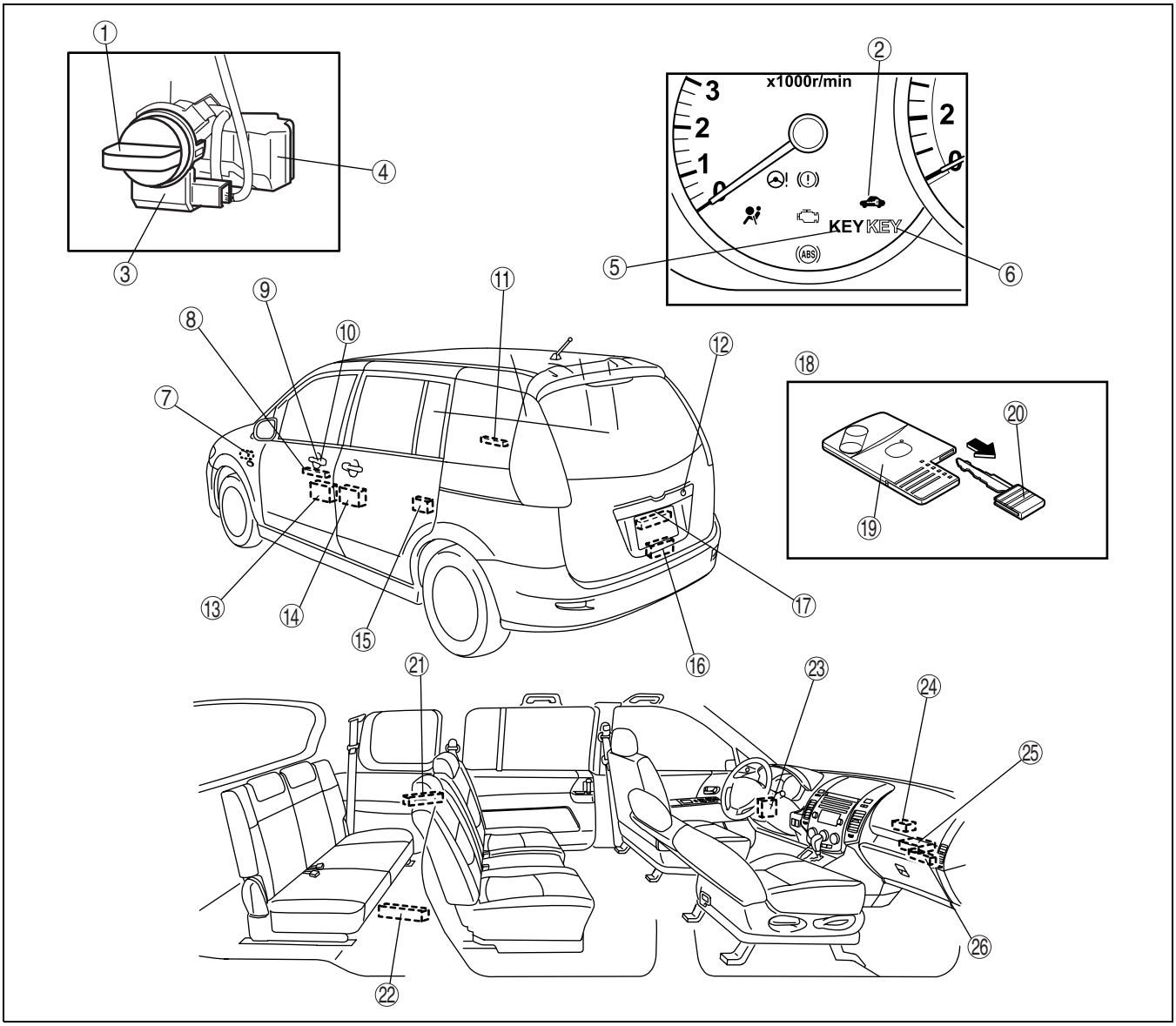
SECURITY AND LOCKS OUTLINE [ADVANCED KEYLESS SYSTEM]

DPE091400001T04

Improved marketability	• Power door lock system adopted • Advanced keyless entry and start system adopted
Improved serviceability	• Keyless control module that integrates the control of the keyless entry module and immobilizer system adopted
Improved security	• Theft-deterrent system adopted • Immobilizer system adopted

SECURITY AND LOCKS STRUCTURAL VIEW [ADVANCED KEYLESS SYSTEM]

DPE091400001T05



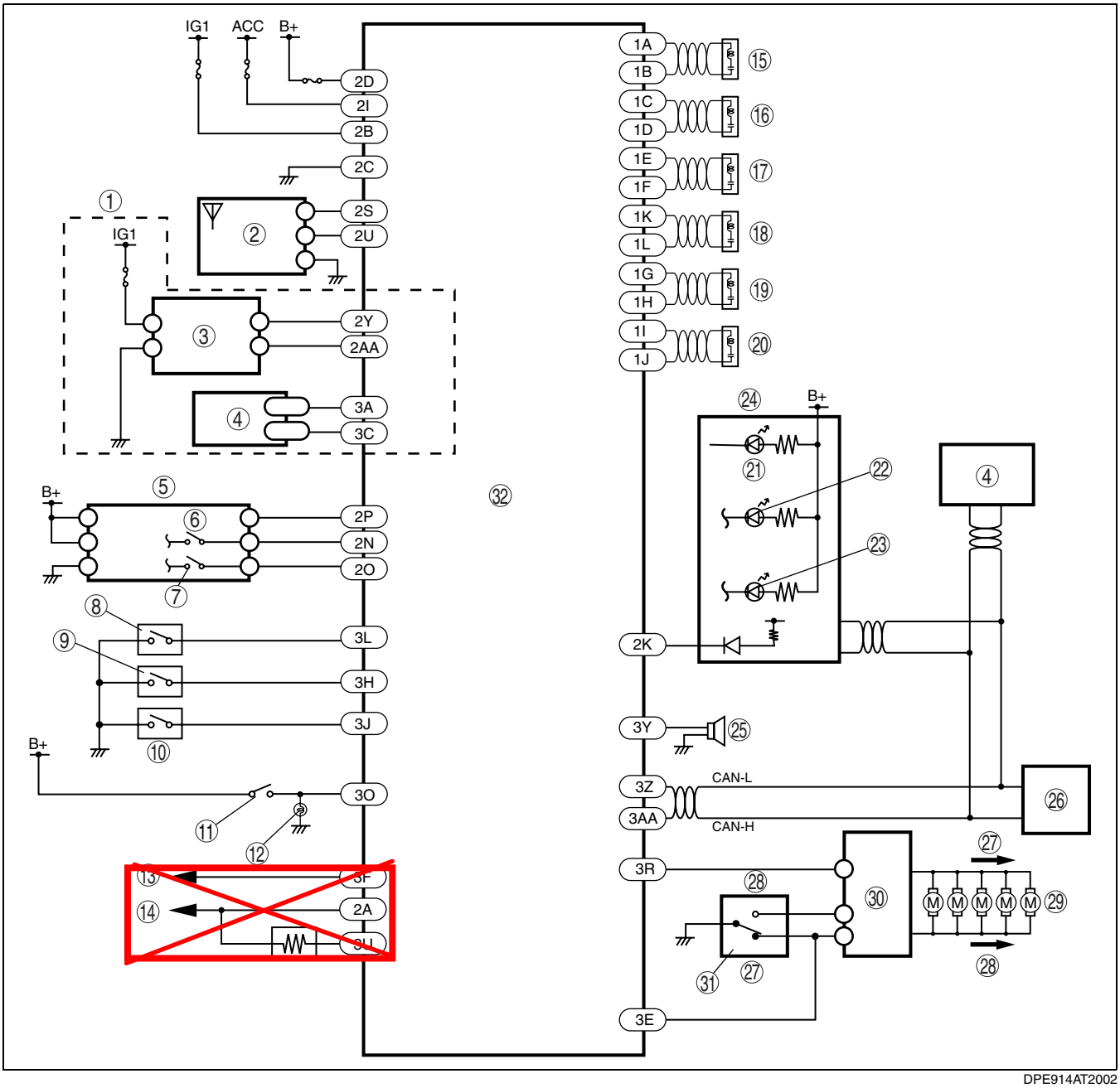
DPE914AT2001

1	Start knob (ignition switch)
2	Security light (with immobilizer system)
3	Coil (with immobilizer system)
4	Steering lock unit
5	Keyless warning light (red)
6	Keyless indicator light (green)
7	Keyless buzzer
8	Keyless antenna (driver side)
9	Request switch
10	Front door key cylinder
11	Keyless antenna (passenger side)
12	Request switch
13	Front door latch and lock actuator

14	Rear door lock actuator
15	Rear door latch
16	Liftgate latch and lock actuator
17	Keyless antenna (liftgate)
18	Card key
19	Transmitter
20	Auxiliary key
21	Keyless antenna (interior, RL)
22	Keyless antenna (interior, RR)
23	Keyless control module
24	Keyless receiver
25	BCM
26	Keyless antenna (interior, front)

SECURITY AND LOCKS SYSTEM WIRING DIAGRAM [ADVANCED KEYLESS SYSTEM]

DPE091400001T06



DPE914AT2002

1	With immobilizer system
2	Keyless receiver
3	Coil
4	PCM
5	Steering lock unit
6	Push switch
7	Key reminder switch
8	Request switch (liftgate)
9	Request switch (driver side)
10	Request switch (passenger side)
11	Brake light switch
12	Brake light
13	Selector lever
14	Key interlock solenoid
15	Keyless antenna (driver side)

16	Keyless antenna (passenger side)
17	Keyless antenna (liftgate)
18	Keyless antenna (interior, front)
19	Keyless antenna (interior, RR)
20	Keyless antenna (interior, RL)
21	Security light
22	Keyless indicator light (green)
23	Keyless warning light (red)
24	Instrument cluster
25	Keyless buzzer
26	DLC-2
27	LOCK
28	UNLOCK
29	Door lock actuator
30	BCM

31	Door lock-link switch
32	Keyless control module

POWER DOOR LOCK SYSTEM OUTLINE [ADVANCED KEYLESS SYSTEM]

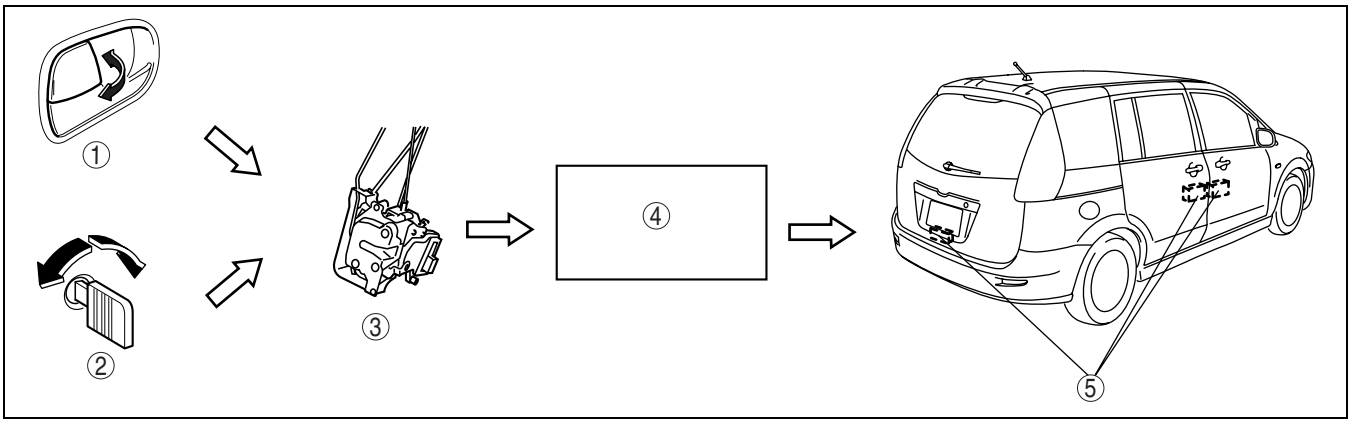
DPE091466000T01

- A door lock knob interlock function has been adopted where all doors and the liftgate are locked/unlocked when the driver's door is locked/unlocked with the driver's door lock knob.
- A door key interlock function has been adopted where all doors and the liftgate are locked/unlocked when the driver's door is locked/unlocked with the driver's door key cylinder.

POWER DOOR LOCK SYSTEM OPERATION [ADVANCED KEYLESS SYSTEM]

DPE091466000T02

- When the driver's door is locked/unlocked with the driver's door lock knob or key cylinder, the door lock-link switch in the door lock actuator is locked/unlocked via the rod.
- The BCM (body control module) activates each lock actuator to lock/unlock according to the lock/unlock signal from the door lock-link switch.



DPE914AT2003

1	Driver's door lock knob
2	Driver's door key cylinder
3	Door lock-link switch (in driver's door lock actuator)

4	BCM
5	Lock Actuator

KEYLESS ENTRY SYSTEM OUTLINE [ADVANCED KEYLESS SYSTEM]

DPE091469000T01

- An advanced keyless system has been adopted that enables the driver to start the engine or lock/unlock the doors without operating the key or transmitter (card key) by carrying the card key that has been programmed to the vehicle.
- The doors also can be locked/unlocked by operating the key (sub-key) or transmitter (card key).
- The answer-back function has been adopted where the hazard warning light flashes and a buzzer sounds to confirm that the doors are locked/unlocked. Also, the advanced keyless entry system indicates activation by a buzzer sound.
- A warning and guidance function has been adopted that promotes correction if the system is operated improperly, and uses the indicator light in the instrument cluster, a buzzer sound, and the keyless buzzer from the driver's side front fender panel.
- A customize function that switches the activation/deactivation of each function has been adopted.
- A rolling code type transmitter (card key) has been adopted to prevent theft by radiowave interception.
- To prevent improper operation while the vehicle is moving, the doors cannot be locked/unlocked by operating the transmitter (card key) or request switch if the start knob is not in the LOCK position.

KEYLESS ENTRY SYSTEM OPERATION [ADVANCED KEYLESS SYSTEM]

DPE091469000T02

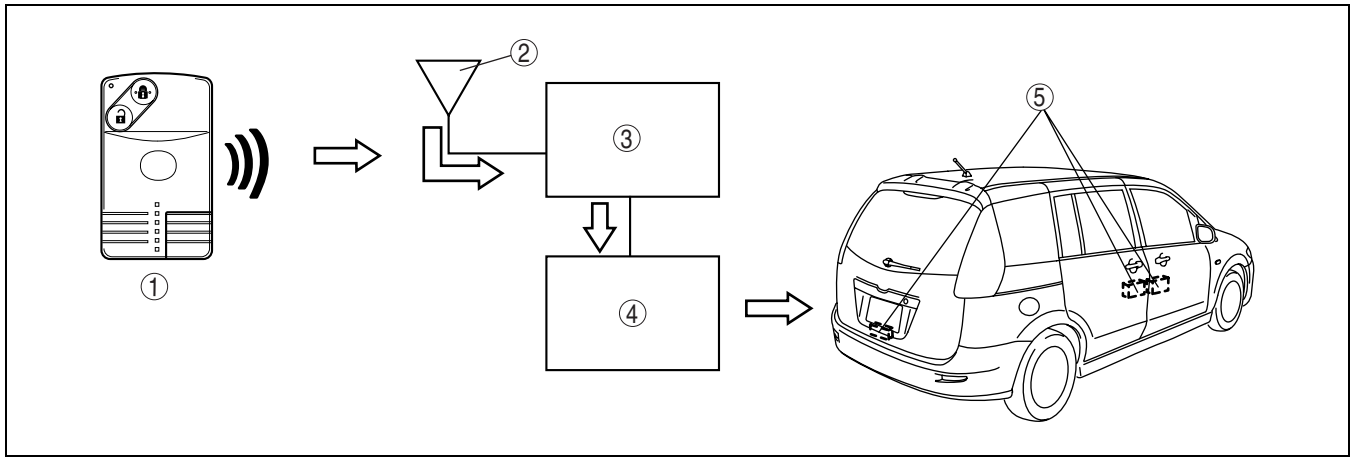
Normal Keyless Entry Function
Lock/unlock

Note

- If any of the following conditions are met, the doors cannot be locked by operating the transmitter (card key).
  - — The auxiliary key is inserted in the ignition key cylinder.
  - — The start knob is not in the LOCK position.
  - — The start knob is being pressed.

— Any door is open.
- If any of the following conditions are met, the doors cannot be unlocked by operating the transmitter (card key).
  — The auxiliary key is inserted in the ignition key cylinder.
  — The start knob is not in the LOCK position.
  — The start knob is being pressed.

1. When the transmitter (card key) is operated, the card key sends ID data and rolling code. They are received by the keyless receiver and sent to the keyless control module.
2. When the keyless control module receives a lock/unlock signal from the transmitter (card key) and verifies the ID, the signal is sent to the BCM and all lock actuators activate to lock/unlock.
3. The keyless control module operates the hazard warning light to flash via the BCM according to lock/unlock signal from the transmitter (card key). Also, the keyless control module operates the keyless buzzer at the same time.
   — When the LOCK button is pressed, the hazard warning light flashes once and keyless buzzer sounds once.
   — When the UNLOCK button is operated, the hazard warning light flashes twice and keyless buzzer sounds twice.



DPE914AT2004

1	Transmitter (card key)
2	Keyless receiver
3	Keyless control module

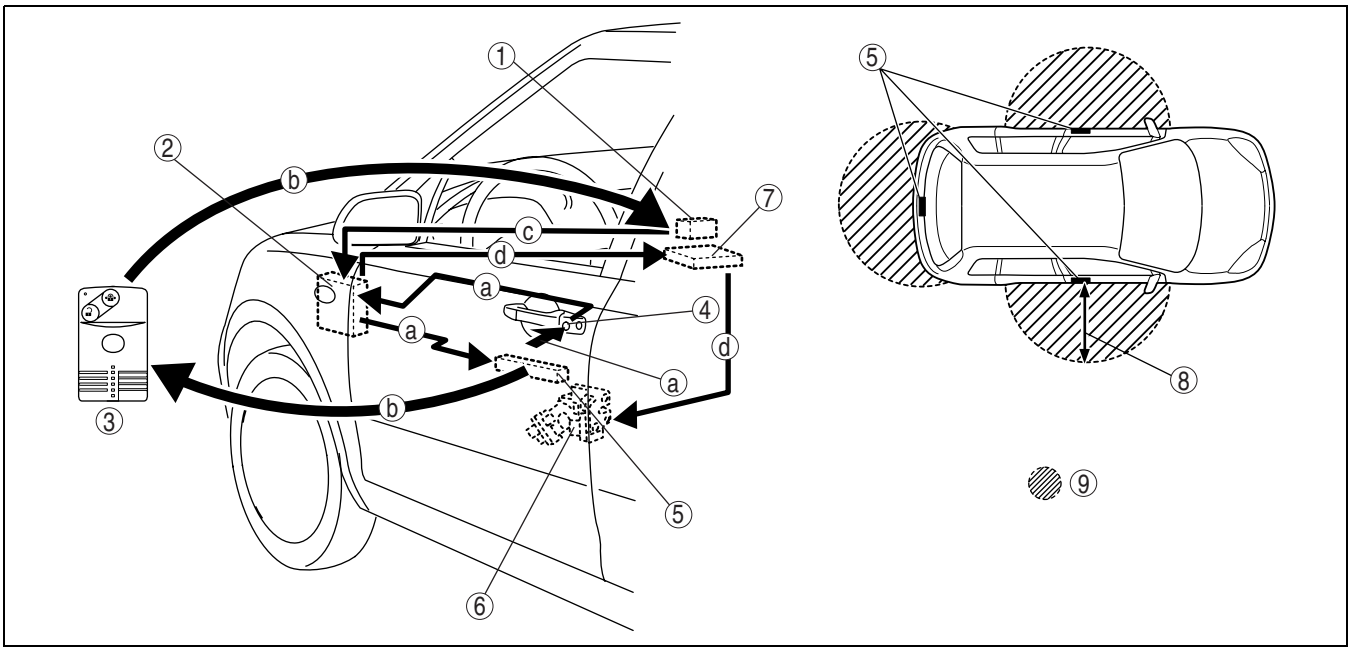
4	BCM
5	Lock Actuator

Advanced Keyless Entry Function
Lock/unlock

Note
- If any of the following conditions are not met, the doors cannot be locked by operating the request switch.
  — The card key is not inside the vehicle.
  — All doors and liftgate are closed.
  — The auxiliary key is not inserted in the ignition key cylinder.
  — The start knob is in the LOCK position and not being pressed.
  — The card key is within the reception range outside the vehicle.
- If any of the following conditions are not met, the doors cannot be unlocked by operating the request switch.
  — The auxiliary key is not inserted in the ignition key cylinder.
  — The start knob is in the LOCK position and not being pressed.
  — The card key is within the reception range outside the vehicle.

a. When the card key receives a request signal, the card key sends back an ID data.
b. When a request switch is pressed, the keyless control module sends a request signal. If an exterior request switch is pressed, a request signal is sent to the area around the door that the request switch is pressed, and if an interior request switch is pressed, the signal is sent to the whole cabin area (front and rear of the cabin).
c. The ID data is received at the keyless receiver, and sent to the keyless control module.
d. When the ID data is verified by the keyless control module and the card key is determined to be outside the vehicle, a signal is sent to the BCM and all the lock actuators are activated to lock/unlock.
e. The keyless control module operates the hazard warning light to flash via the BCM. Also, the keyless control module operates the keyless buzzer at the same time.

— When the doors are locked, the hazard warning light flashes once and keyless buzzer sounds once.
— When the doors are unlocked, the hazard warning light flashes twice and keyless buzzer sounds twice.



DPE914AT2005

1	Keyless receiver
2	Keyless control module
3	Transmitter (card key)
4	Request switch
5	Keyless antenna

6	Lock Actuator
7	BCM
8	Reception range (exterior)
9	Radius: Approx. 80 cm {2.6 ft}

Auto re-lock function

- The auto re-lock function that automatically locks the doors activates if any of the following operations are performed within approx. 30 s after the UNLOCK button of the card key is pressed, or after the request switch is pressed to unlock the doors.
  — A door or the liftgate is opened.
  — The auxiliary key is inserted in the ignition key cylinder.
  — The start knob is pressed.
  — The transmitter (card key) is operated. (If the UNLOCK button is pressed, the timer is reset.)
  — A request switch is operated.

Out-of-area (reception area) autolock function

- When all doors are closed and the driver is out of the reception area carrying the card key, the doors are automatically locked. (Initial setting is OFF.))

1. When all the following conditions are met and all doors are closed after any door or the liftgate is open, the keyless buzzer sounds and the function starts operation. (The doors are not locked at this time.))
   — The card key is not inside the vehicle.
   — The card key is within the reception area outside the vehicle.
   — The auxiliary key is not inserted in the ignition key cylinder.
   — The start knob is in the LOCK position, and not being pressed.
2. After the operation has started, the card key is monitored within the reception area by the keyless antenna. After about 2 s from where the card key has been determined to be out of the reception area, all lock actuators activate to lock. If approx. 30 s have passed since the operation started, the doors also locks regardless of whether the card key is within or out of the reception area.
3. The hazard warning light flashes once and keyless buzzer sounds once at the same time the door locks.

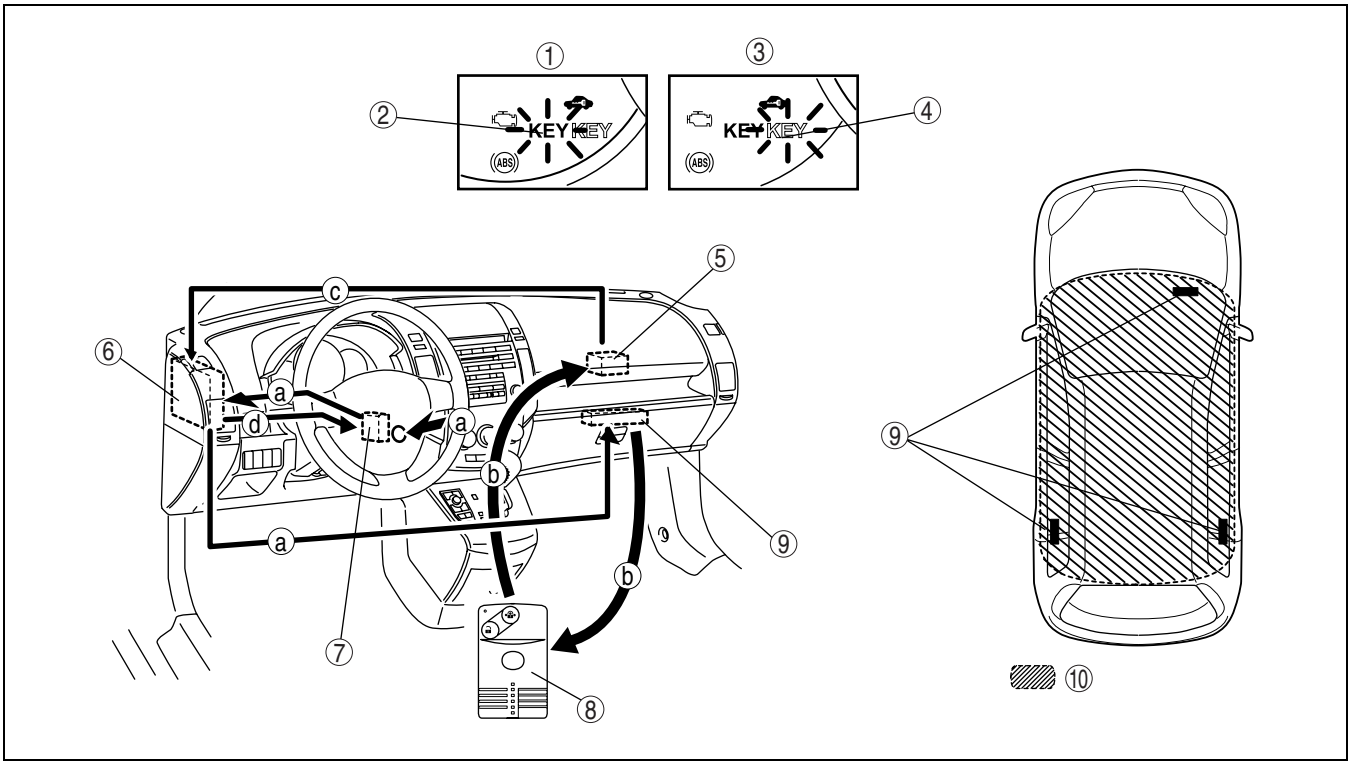
ADVANCED KEYLESS START FUNCTION OPERATION

DPE091469000T03

- The advanced start function activates to start the engine by operating the start knob, and not by inserting the key but by carrying the card key in the vehicle.

a. When the start knob is pressed, the keyless control module sends a request signal from the keyless antennas (Interior).
b. The card key receives the request signal, and sends back an ID data.

c. The ID data is received by the keyless receiver, and sent to the keyless control module.
d. When the ID data is verified by the keyless control module and the card key is determined to be inside the vehicle, the start knob of the steering lock unit is released. The keyless indicator light in the instrument cluster illuminates at the same time to indicate that the start knob is operable.
   — If the ID verification is not acceptable (for reasons such as an unprogrammed card key, or card key battery depletion), the start knob is not released and the keyless warning light (red) illuminates to indicate that the start knob is inoperable.
   — For vehicles with the immobilizer system, ID verification is performed when the start knob is turned to the ON position, and if the verification is acceptable, permission is given to start the engine.
e. Turn the start knob to the START position to start the engine.



DPE914AT2006

1	ID verification NG
2	Keyless warning light (red) (flash)
3	ID verification OK
4	Keyless indicator light (green) (illuminated)
5	Keyless receiver

6	Keyless control module
7	Steering lock unit
8	Transmitter (card key)
9	Keyless antenna
10	Reception range (interior)

WARNING/GUIDANCE FUNCTION OPERATION

DPE091469000T04

- If the system is operated improperly, it warns the driver using the indicator light in the instrument cluster, buzzer sound, and keyless buzzer in the driver's side front fender panel.
- The operation condition of the actuator is indicated by the indicator light and buzzer sound to guide user's operation.

Item		Operation condition	Keyless buzzer (outside the vehicle)	Instrument cluster		
				Buzzer (Interior)	Keyless warning light (red)	Keyless indicator light (green)
Warning	Start knob not in LOCK warning	Driver's door is open with start knob in ACC position	–	Sounds (approx. 6 s)	–	–
	Card key out of vehicle warning*1	Card key cannot be detected inside vehicle with driver's door open and start knob not in LOCK position	–	Sounds 3 times*2	Flashes*4	–
		Card key cannot be detected inside vehicle with all doors closed and start knob not in LOCK position	Sounds 3 times	—	Flashes*4	–
		Card key cannot be detected inside vehicle with start knob not in LOCK position and under any condition other than above	–	—	Flashes*4	–
	Door lock inoperable warning	Request switch is pressed from outside vehicle with proper card key inside vehicle and another card key carried	Sounds 3 times	–	–	–
		Request switch is pressed with card key is carried and a door open or start knob not in LOCK position	Sounds 3 times	–	–	–
	Battery voltage low indication	Card key battery voltage depleted	–	–	–	Flashes (Approx. 30 s after IG ON)
Guidance	Start knob operable guidance	Start knob is operable (lock released) when it is pressed	–	–	–	On (Max. 3 s)
	Start knob inoperable guidance	Start knob is inoperable (locked) when it is pressed	–	–	Flashes	–
	Lock/unlock answer back	Doors are locked/unlocked with normal/advanced keyless entry function	Locked: Once Unlocked: Twice	–	–	–

*1 : If the start knob is turned to the LOCK position with the card key out of the vehicle, the start knob is inoperable(the engine cannot be restarted). For vehicles with the immobilizer system, the engine cannot be restarted by turning the start knob from the ACC position to the START position even though the start knob has not been turned to the LOCK position.
*2 : When the ignition switch is off (except for LOCK position), "Start knob not in LOCK warning" (continuous buzzer sound) overrides.
*3 : Initial setting is OFF.
*4 : Stops flashing and goes out if the card key is detected inside the vehicle.

CUSTOMIZE FUNCTION OUTLINE

DPE091469000T05

- The settings of the following functions, and warning and guidance functions for the advanced keyless entry system can be turned ON/OFF optionally.
- The WDS or equivalent is necessary for settings. Refer to the Workshop Manual for the detailed setting procedure.

Function name	WDS or equivalent display	Initial setting
Auto lock function (Out-of-area type)	Auto Lock	OFF
Keyless buzzer answer back	Answer Back Buzzer	OFF
Battery voltage low indication	Low Battery Warning	ON

ON-BOARD DIAGNOSYS SYSTEM OUTLINE [ADVANCED KEYLESS SYSTEM]

DPE091469000T06

Special Features

- The keyless entry system has an on-board diagnostic function to facilitate system diagnosis.
- The on-board diagnostic function consists of the following functions: a malfunction detection function, which detects overall malfunctions in the keyless entry system-related parts; a memory function, which stores detected DTCs; a display function, which indicates system malfunctions by DTC display; and a PID/data monitoring function, which reads out specific input/output signals.
- Using the WDS or equivalent, DTCs can be read out and deleted, and the PID/data monitoring function can be activated.

ON-BOARD DIAGNOSYS SYSTEM PID DATA/MONITOR FUNCTION OPERATION [ADVANCED KEYLESS SYSTEM]

DPE091469000T07

On-board Diagnostic Function

Malfunction detection function

- Detects overall malfunctions in the keyless entry system-related parts.

Display function

- If any malfunction is detected, the keyless warning light (red) in the instrument cluster illuminates to inform the driver of a system malfunction.

Memory function

- Stores malfunctions in the keyless entry system-related parts detected by the malfunction detection function, and the stored malfunction contents are not cleared even if the ignition switch is turned to the LOCK position or the negative battery cable is disconnected.

DTC table

DTC WDS or equivalent display	System malfunction location
B1342	Keyless control module internal malfunction
B1134	Unprogrammed card key
B2477	Configuration error
B1317	Keyless control module power supply voltage increases.
B1318	Keyless control module power supply voltage decreases
B2170	Push switch (Steering lock unit)
B1126	Steering lock unit internal malfunction
U0236	Steering lock unit communication system
B1093	Steering lock unit communication error
U0214	Keyless receiver
B1133	Keyless antenna (Driver's door)
B1132	Keyless antenna (Front passenger door)
B1127	Keyless antenna (Interior, RR)
B1128	Keyless antenna (Interior, RL)
B1131	Keyless antenna (Liftgate)
B1129	Keyless antenna (Interior, Front)
U0323	Communication error to instrument cluster
U0100	Communication error to PCM
U0073	Control module communication error
U2023	Error signal from CAN related module
B1681*	No detected communication with the coil antenna.
B2103*	Coil malfunction
B1213*	Only one key ID number is programmed.

* : With immobilizer system

PID/data monitor function

- The PID/data monitor function is used for optionally selecting input/output signal monitor items preset in the keyless control module and reading them out in real-time.
- Use the WDS or equivalent to read the PID/data monitor.

PID/data monitor table

PID name (definition)	Data contents	Unit/ Operation	Terminal
DTC_CNT	Number of continuous DTCs	–	–
RPM	Engine speed	RPM	3Z, 3AA
VSS	Vehicle speed	KPH	3Z, 3AA
VPWR	Supply voltage	V	2D
NUMCARD	Number of programmed card keys	–	–
NUMKEY*	Number of programmed key ID numbers	–	–
DRSW_D	Door switch (Driver's door)	OPEN/ CLOSE	3R
DRSW_ALL	Door switch (All doors and liftgate)	OPEN/ CLOSE	3R
BOO	Brake pedal position (Brake switch)	On/Off	3O
REQ_SW_D	Request switch (Driver's door)	On/Off	3H
REQ_SW_P	Request switch (Passenger door)	On/Off	3J
REQ_SW_BK	Request switch (Liftgate)	On/Off	3L
LOCK_SW_D	Door lock-link switch	On/Off	3E
IMMOBI	Immobilizer system equipped or not	On*/Off	–
TR/LG_SW	Liftgate latch switch	OPEN/ CLOSE	3R
IG_KEY_IN	Key reminder switch	Key-In/Key-Out	2O
IG_SW_ST	Ignition switch (Push switch)	Pushed/Not Pushed	2N
BUZZER	Keyless buzzer	On/Off	3Y
PWR_IG1	Power supply (IG1)	On/Off	2B
PWR_ACC	Power supply (ACC)	On/Off	2I

* : Vehicles with immobilizer system

Simulation Function

- The simulation function is used for optionally selecting simulation items of output parts preset in the keyless control module, and to operate them regardless of control.

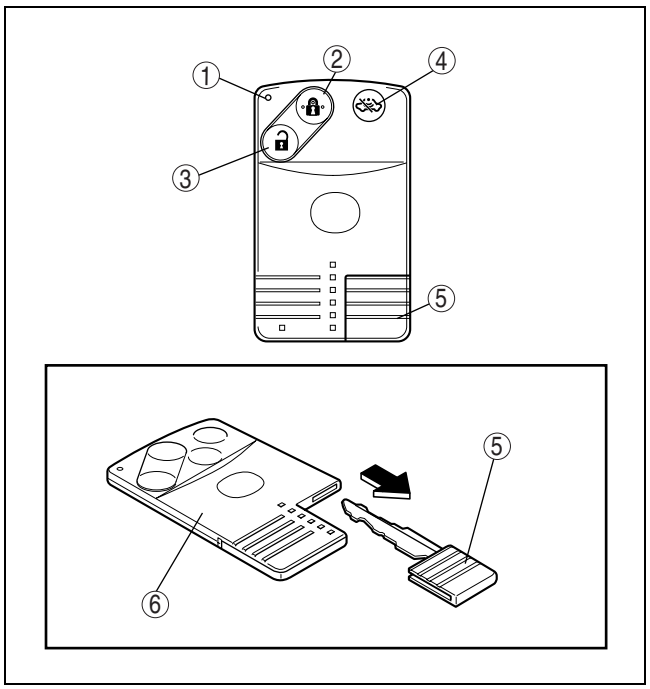
ACTIVE COMMAND MODE TABLE [ADVANCED KEYLESS SYSTEM]

Command name	Output part name	Unit/ Operation	Terminal
BZR_OUT	Keyless buzzer	On/Off	3Y
BZR_INN	Interior buzzer (Instrument cluster)	On/Off	3Z, 3AA
LNP_RED	Keyless warning light (red)	On/Off	3Z, 3AA
LNP_GREEN	Keyless indicator light (green)	On/Off	3Z, 3AA
DR_LOCK	All doors Lock/Off	Lock/Off	2R
DR_UNLOCK	All doors Unlock/Off	Unlock/Off	2R
SUPERLOCK	All doors Lock/Off	Lock/Off	2R

CARD KEY (TRANSMITTER) CONSTRUCTION/OPERATION

DPE091469000T08

- A card-type transmitter that is thin and convenient to carry has been adopted.
- A maximum of six transmitters can be programmed for one vehicle.
- A built-in operation indicator light illuminates according to LOCK/UNLOCK button operation and request signal from the vehicle.
- In case the transmitter is inoperable due to battery depletion, the doors can be locked/unlocked and the engine can be started using the auxiliary key.
- A transponder is built into the auxiliary key for vehicles with the immobilizer system.



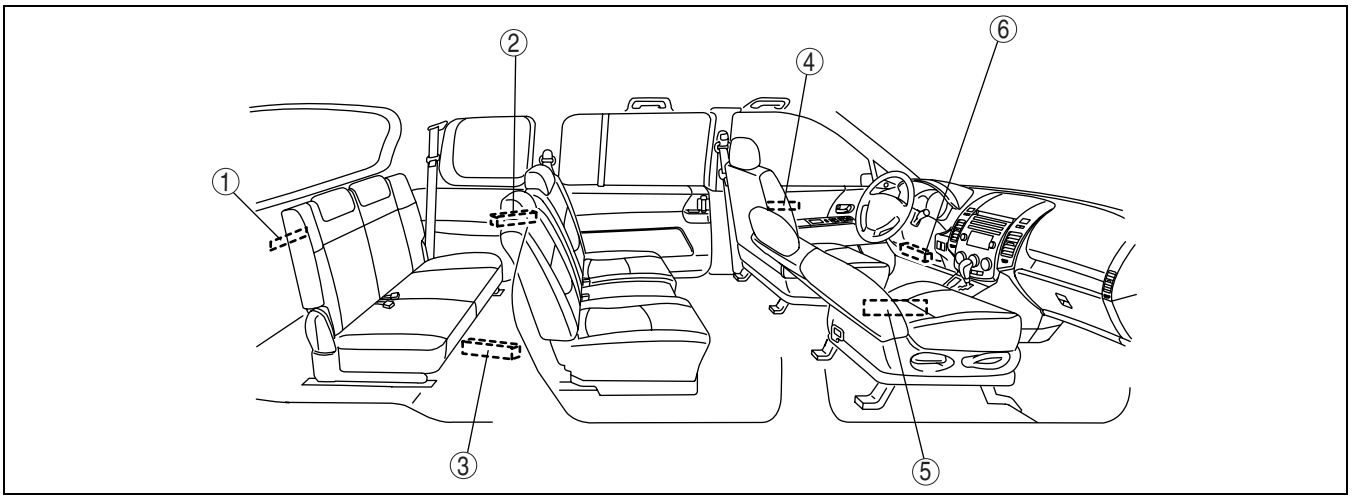
DPE914AT2007

1	Indicator light
2	Lock button
3	Unlock button
4	Intruder sensor cut-off button (with theft-deterrent system)
5	Auxiliary key
6	Transmitter

KEYLESS ANTENNA CONSTRUCTION/OPERATION

DPE091469000T09

- Consists of the antennas for request signal output (6 locations).
- Operated by the keyless control module, the keyless antennas send request signals to produce the reception areas inside and outside the vehicle.
- The keyless antennas built-into the front doors can output signals to both inside or outside the vehicle, and change the level of the radiowave (output to inside or outside the vehicle) according to operation conditions.
- The keyless control module locates the card key by determining the antenna which is receiving the signal the strongest.



DPE914AT2008

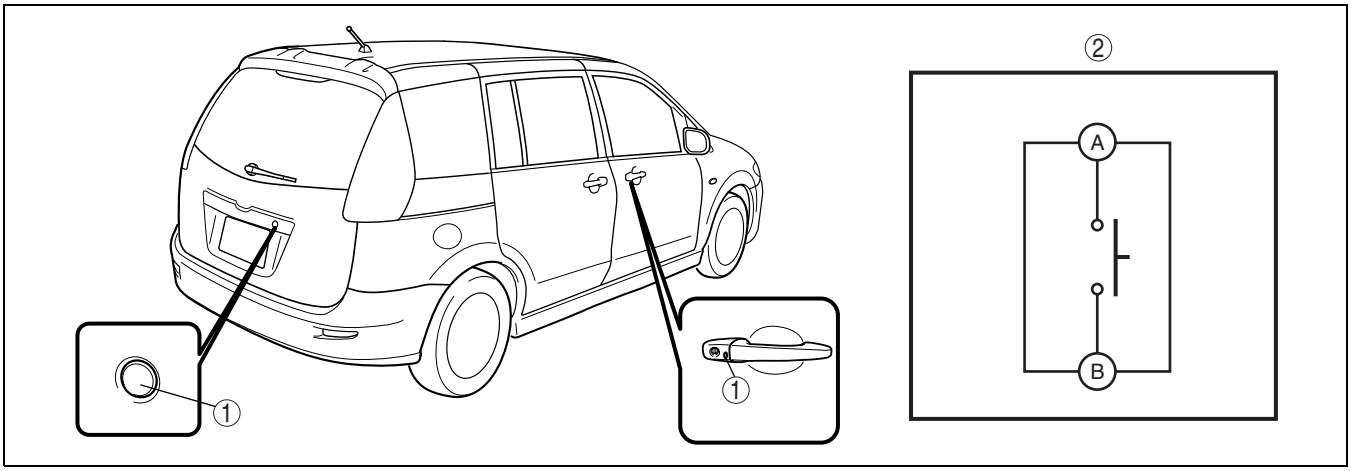
1	Keyless antenna (exterior, liftgate)
2	Keyless antenna (interior, RR)
3	Keyless antenna (interior, RL)

4	Keyless antenna (exterior, driver side)
5	Keyless antenna (exterior, passenger side)
6	Keyless antenna (interior, front)

REQUEST SWITCH CONSTRUCTION

DPE091469000T10

- Installed on the front doors and liftgate.



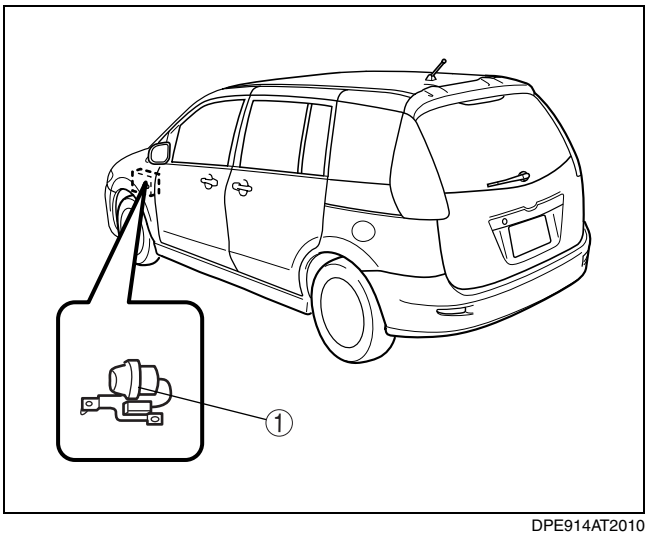
DPE914AT2009

1	Request switch
2	Internal circuit diagram

KEYLESS BUZZER CONSTRUCTION

DPE091469000T11

- Installed on the driver's door.



DPE914AT2010

1	Keyless buzzer

ON-BOARD DIAGNOSYS SYSTEM OUTLINE (POWER DOOR LOCK SYSTEM)

DPE091466000T03

- An on-board diagnostic system that allows override operation of the power door lock system related parts has been adopted.

ON-BOARD DIAGNOSYS SYSTEM OPERATION (POWER DOOR LOCK SYSTEM)

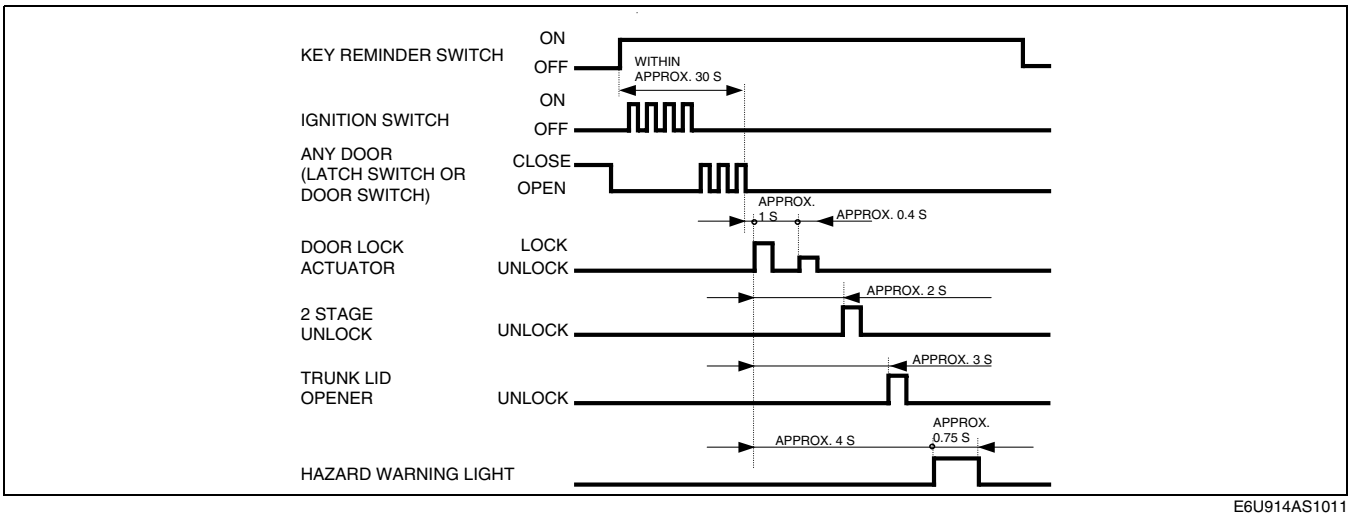
DPE091466000T04

- The override operation mode can by activated by operating the ignition key and opening/closing the doors (latch switch or door switch).

Override Operation

- Inspection for any malfunction is possible by performing an override operation of the lock actuator and hazard

warning light.



E6U914AS1011

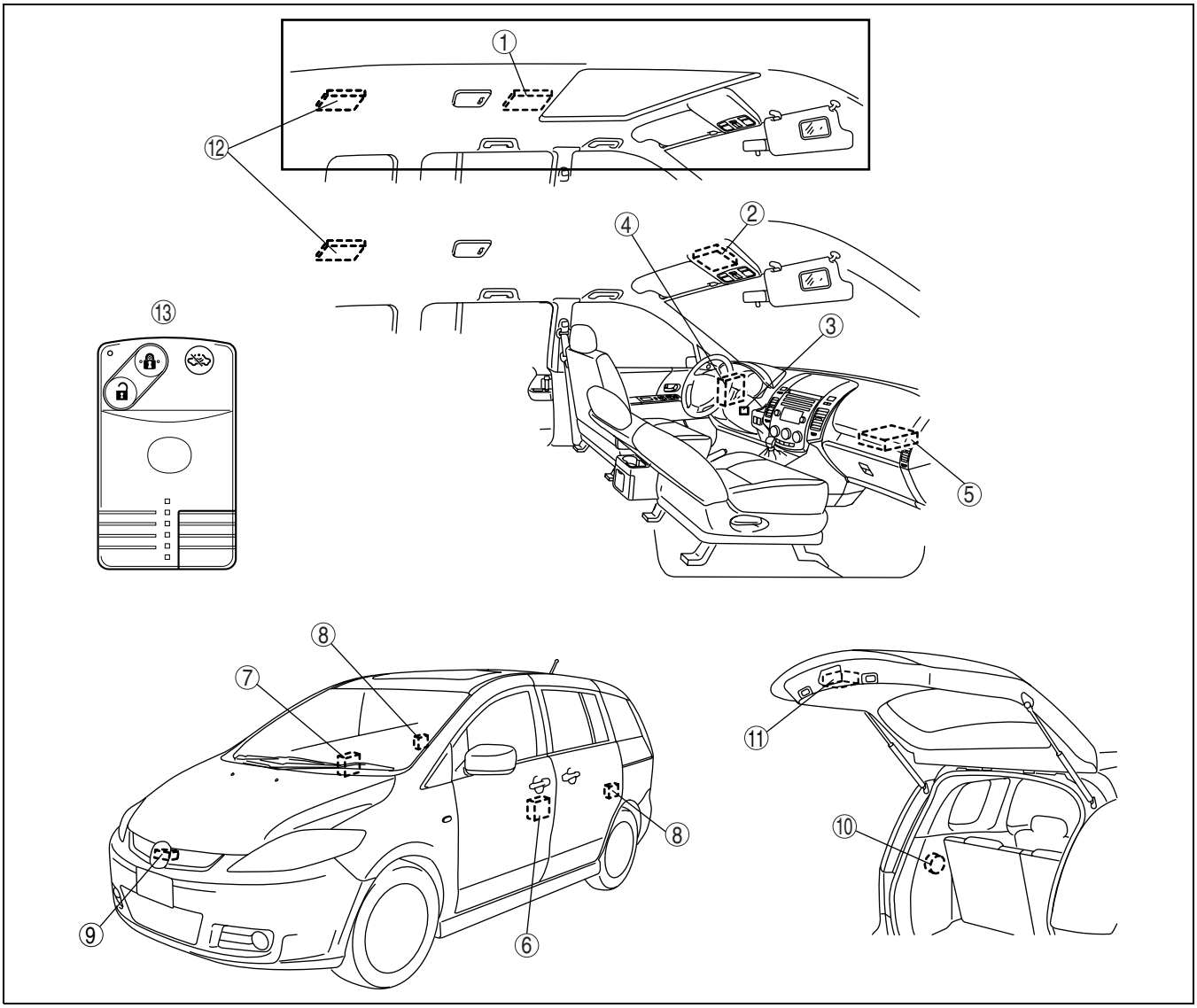
THEFT-DETERRENT SYSTEM OUTLINE

DPE091450000T01

- The theft-deterrent system includes sound and light alarms that activate when the bonnet, the liftgate, or a door is opened by means other than the transmitter. The turn lights flash and the theft-deterrent siren sound.
- When the transmitter unlock button is pressed, the alarms stop.
- An intruder sensor has been installed in the forward part of the roof (Vehicles without sunroof), in the center part of the roof (Vehicles with sunroof) or in the rear of the roof. The intruder sensor senses movement in the vehicle based on radio waves, and sends an alert signal to the BCM.
- A theft-deterrent siren has been installed on the rear, left side of the trunk compartment. The theft-deterrent siren includes an internal back-up power supply so that if power from the battery is cut by any means, the siren will still sound.
- An intruder sensor cut-off button is provided on the transmitter. If the intruder sensor cut-off button is pressed while the theft-deterrent system is pre-armed, intruder sensor radio wave output is cut, and movement detection is stopped.

THEFT-DETERRENT SYSTEM STRUCTURAL VIEW

DPE091450000T02



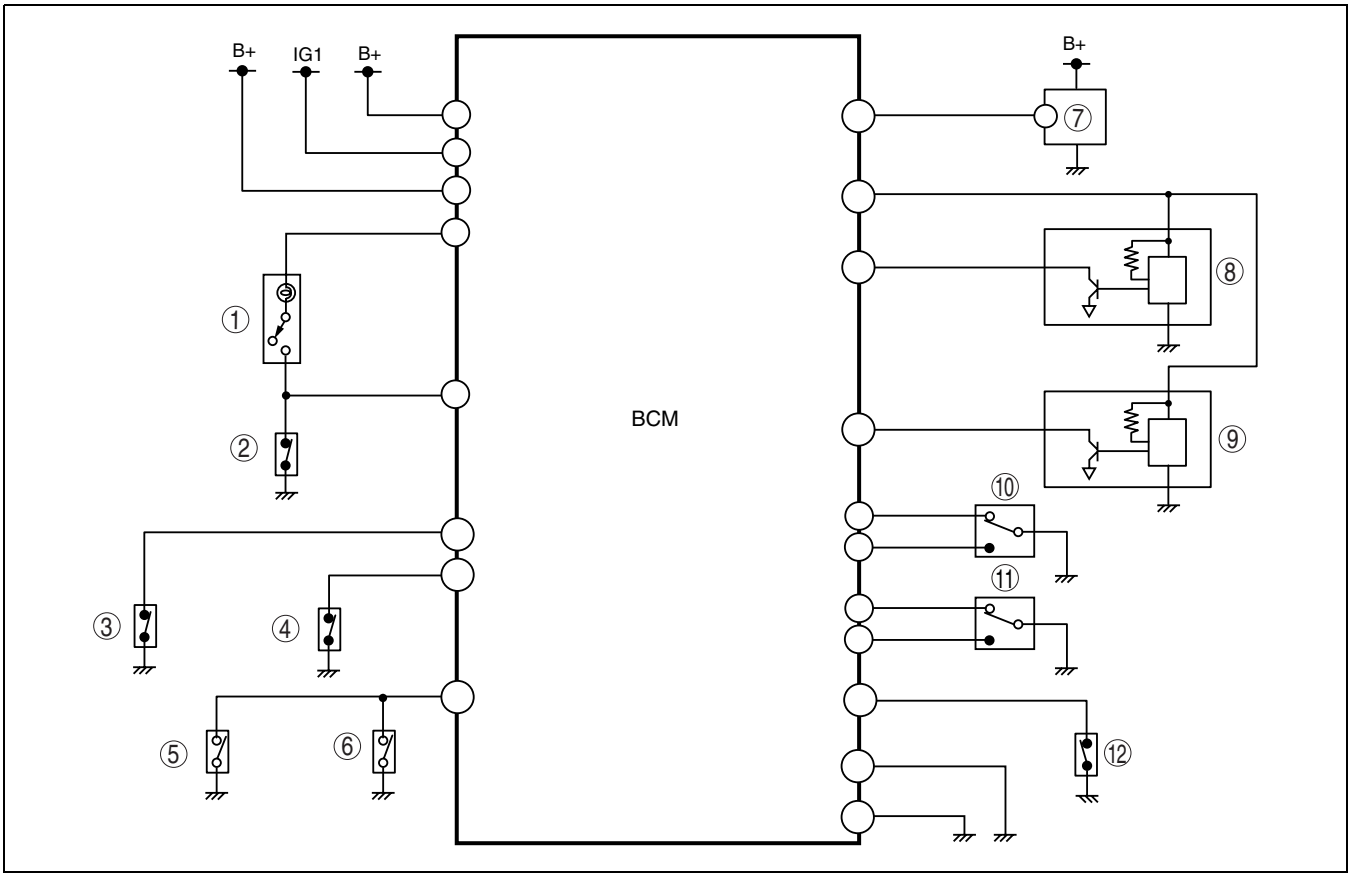
DPE914AT2011

1	Front intruder sensor (Vehicles with sunroof)
2	Front intruder sensor (Vehicles without sunroof)
3	Key reminder switch
4	Keyless control module
5	BCM
6	Front door latch and lock actuator (Driver's side) • Front door latch switch • Door lock-link siwtch • Door key cylinder switch

7	Front door latch and lock actuator (Passenger's side) • Front door latch switch
8	Rear door switch
9	Bonnet latch switch
10	Theft-deterrent siren
11	Liftgate latch and lock actuator • Liftgate latch switch
12	Rear intruder sensor
13	Transmitter

THEFT-DETERRENT SYSTEM WIRING DIAGRAM

DPE091450000T03



DPE914AT2013

1	Cargo compartment light switch
2	Liftgate latch switch
3	Front door latch switch (LH)
4	Front door latch switch (RH)
5	Door switch (LH)
6	Door switch (RH)

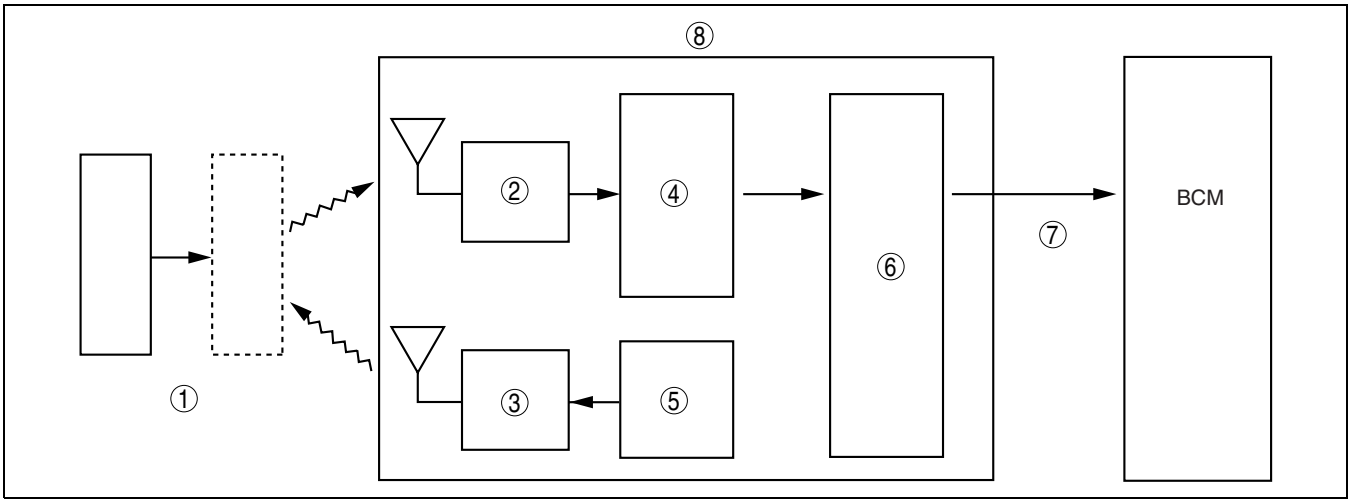
7	Theft-deterrent siren
8	Intruder sensor (front)
9	Intruder sensor (rear)
10	Door lock-link switch
11	Door key cylinder switch (driver side)
12	Bonnet switch

INTRUDER SENSOR CONSTRUCTION/OPERATION

DPE091450000T04

Operation

1. When the theft-deterrent system is armed, the intruder sensor outputs a 2.45 GHz radio wave in the passenger compartment. The intruder sensor detects phase differences in radio waves (reflected waves) that are output and bounced off a target object.
2. When a phase difference in reflected waves occurs due to movement in the vehicle (intruder), the CPU calculates the level of phase difference.
3. If the level of phase difference is more than specified, the intruder sensor sends a detection signal to the BCM.



DPE914AT2012

1	Target object
2	Receiver
3	Transmitter
4	Phase detection area

5	Oscillator
6	CPU
7	Detection signal output
8	Intruder sensor

IMMOBILIZER SYSTEM OUTLINE [ADVANCED KEYLESS SYSTEM]

DPE091467000T10

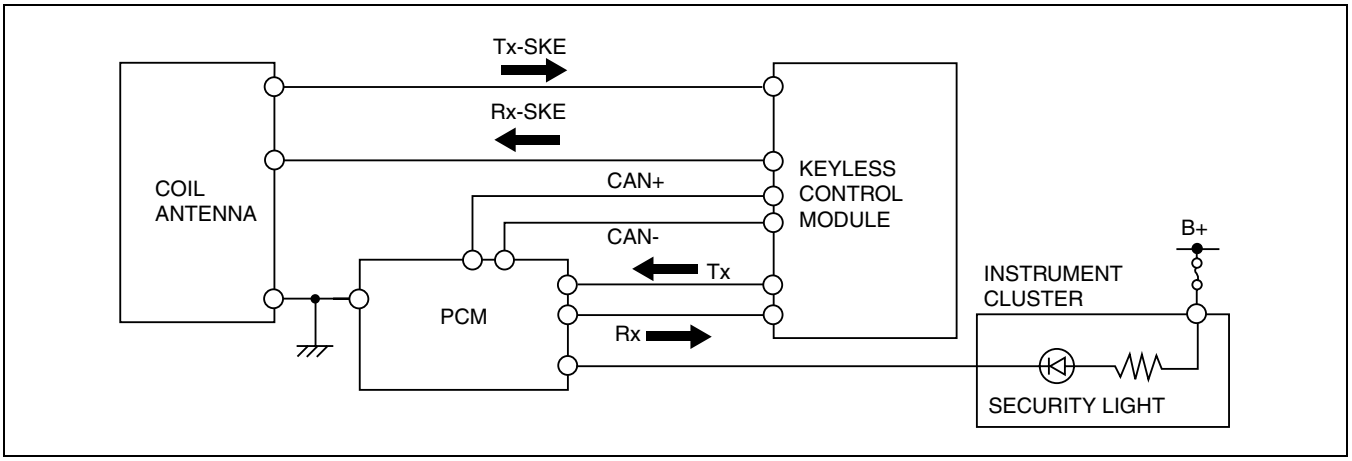
Note
- The construction and operation of the auxiliary key is described. Refer to “ADVANCED KEYLESS START FUNCTION OPERATION” for engine start with the card key. (See 09–14A–6 ADVANCED KEYLESS START FUNCTION OPERATION.)

Special Features
- The immobilizer system is a vehicle theft prevention device that only allows keys that have previously been programmed to the vehicle to start the engine. It functions to prevent theft by means such as a forged key or hotwiring.
- Consists of the key (with built-in transponder), coil antenna, PCM, and keyless control module.
- The immobilizer system activates automatically when the start knob is turned to the LOCK or ACC position. (The security light in the instrument cluster flashes while the immobilizer system is activated.)
- When the start knob is pressed (push switch ON) and turned to the ON position with a previously programmed auxiliary key, the immobilizer system deactivation operation begins automatically. The engine is allowed to start only after the deactivation operation is completed successfully. (The security light illuminates for 3 s and then goes out when the immobilizer system has been deactivated.)
- The immobilizer system cannot be disabled.
- Due to immobilizer system characteristics, the engine cannot be started unless two or more keys are programmed. Therefore, when resetting the immobilizer system (PCM replacement, Keyless control module replacement, or Replacement of all programmed keys), two or more keys usable with the immobilizer system must be readied before starting the operation.
- A maximum of eight keys can be programmed to one vehicle. The PID/data monitor function can be used to verify the number of keys programmed to the vehicle.
- If there is a system malfunction or the immobilizer system is not properly deactivated due to deactivation operation failure, the malfunction location can be verified by the flashing pattern of the security light in the instrument cluster, or using the malfunction diagnosis function of the on-board diagnostic system.

Caution
- **If any of the following items are touching or near the key head, signal communication between the key and vehicle is negatively affected, resulting in the engine not starting or a key programming error. Do not perform procedures if any of the following items are touching or near the key head.**
  - **— Any metallic object**
  - **— Spare keys or keys for other vehicles equipped with an immobilizer system**
  - **— Any electronic device, or any credit or other cards with magnetic strips**

IMMOBILIZER SYSTEM BLOCK DIAGRAM [ADVANCED KEYLESS SYSTEM]

DPE091467000T11



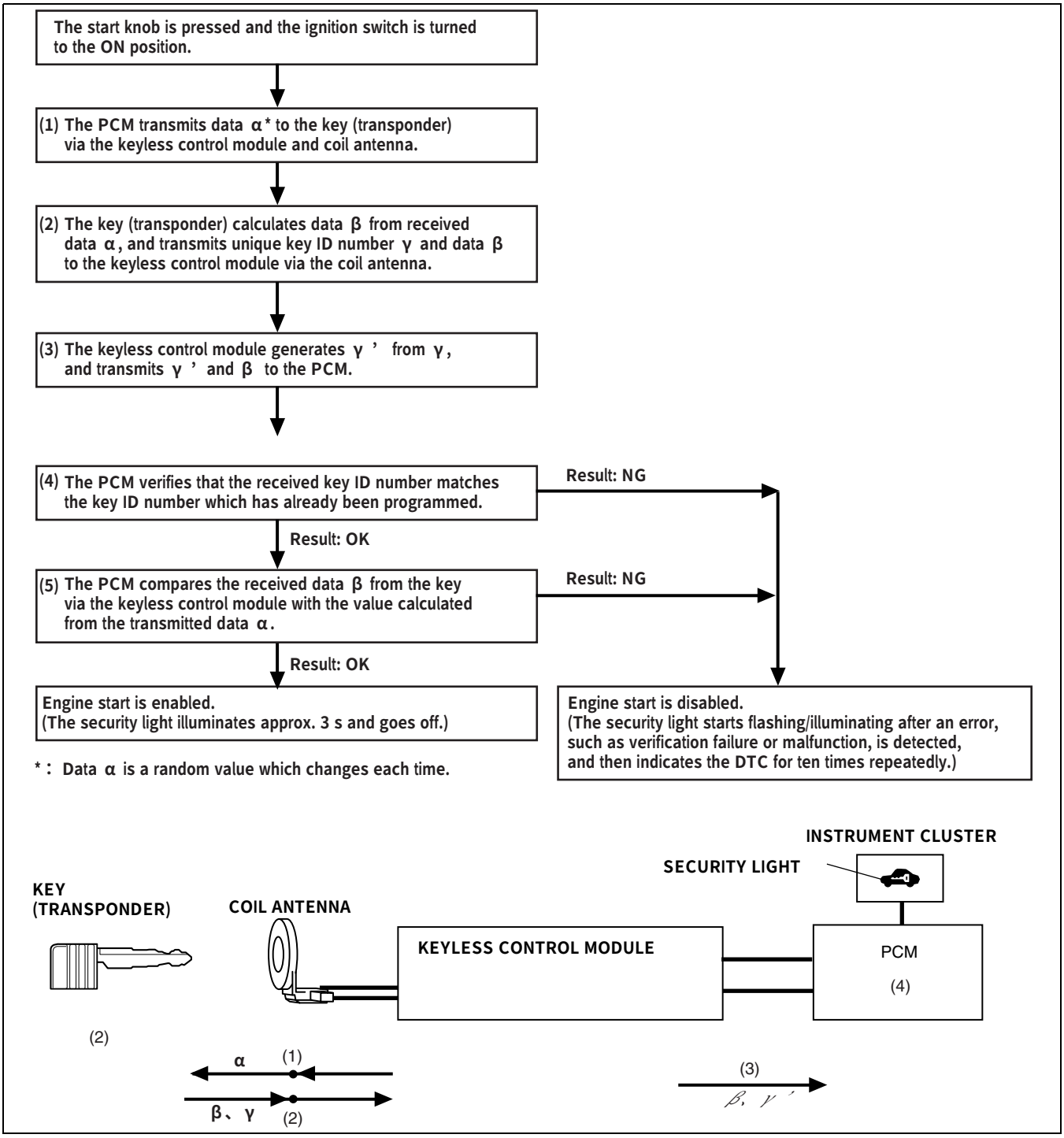
E6U914AS1018

IMMOBILIZER SYSTEM CONSTRUCTION/OPERATION [ADVANCED KEYLESS SYSTEM]

DPE091467000T12

- Keys contain a unique ID number that is previously programmed to the keyless control module and PCM. Due to this, if immobilizer system component parts are replaced (such as key addition/clearing or replacement of the keyless control module or PCM), it is necessary to reset the system.

Key ID Number Verification Procedure



E6U914AS1015

Immobilizer System Setting

- Some immobilizer system settings can be performed only using the WDS or equivalent. When using the WDS or equivalent, first, security access must be requested. Obtain security access permission according to the WDS or equivalent screen and then perform system procedures.

WDS or equivalent setting items	Contents
Programming an additional ignition key	Allows key ID number programming.
Ignition key ID number clearing	Clears all programmed key ID numbers and programs new key ID numbers.
Customer spare key programming enable	"Additional ignition key programming" is enabled. **Note** • This is the default setting on new vehicles.

WDS or equivalent setting items	Contents
Customer spare key programming disable	"Additional ignition key programming" is disabled. **Note** • When only the WDS or equivalent must be used to program key ID numbers, making a forged key by using two keys that can start the engine is prevented. This function is for use by rental car agencies or other companies with vehicle fleets.

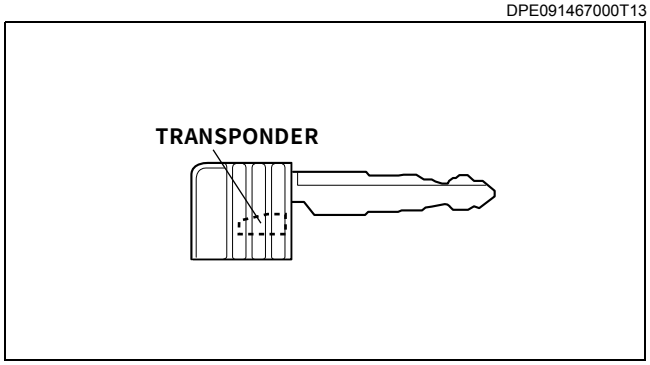
- When immobilizer system component parts (key, PCM, coil antenna, and keyless control module) are replaced, the system must be reset as described below. Refer to the Workshop Manual for the detailed setting procedure.

Component part	Setting
Key addition	Key ID number of added key must be programmed. Key ID number programming can be performed according to the following methods: • Method for programming additional keys using two keys that can start the engine • Method using the WDS or equivalent
Key clearing	The programmed key ID number can only be cleared using the WDS or equivalent. When clearing key ID numbers using the WDS or equivalent, all the programmed key ID numbers are cleared.
PCM replacement	• The key ID numbers for all keys that were being used must be programmed using the WDS or equivalent. Two or more keys must be programmed.
Keyless control module replacement	• Card key and steering lock unit must be programmed. • The key ID numbers for all keys that were being used must be programmed using the WDS or equivalent. Two or more keys must be programmed.
Steering lock unit replacement (including key replacement)	• Steering lock unit must be programmed. • The key ID number must be programmed using the WDS or equivalent. Two or more keys must be programmed.
Coil antenna replacement	Immobilizer system resetting is not necessary.

AUXILIARY KEY CONSTRUCTION

- Keys for use with the immobilizer system have an electronic communication device (transponder) built into the key head that retains specific electronic codes (key ID number).

DPE091467000T13

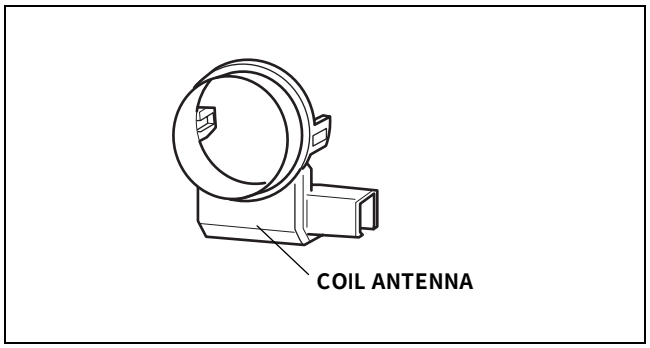


E6U914AS1016

COIL ANTENNA CONSTRUCTION [ADVANCED KEYLESS SYSTEM]

- Installed on the steering lock.
- Forms a magnetic field near the steering lock and receives the key signal.
- Demodulates the received key signal and outputs the signal to the keyless control module.

DPE091467000T14



E6U914AS1017

SECURITY LIGHT CONSTRUCTION/OPERATION [ADVANCED KEYLESS SYSTEM]

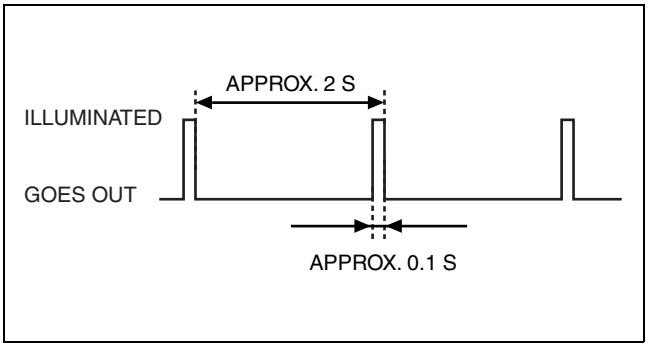
DPE091467000T15

Construction

- Allows visual confirmation of immobilizer system operation.
- If any malfunction is detected in the immobilizer system, the malfunction location can be verified by the security light illumination/flashing pattern.

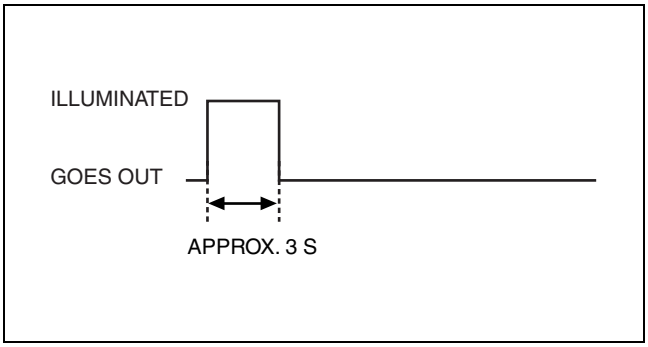
Caution
- **Always use the WDS or equivalent to verify DTCs even if the security light indicates a DTC. If the security light itself has a malfunction, a DTC may not be indicated properly.**

Operation
- When the immobilizer system is operating, the security light flashes repeatedly 0.1 s every approx. 2 s.



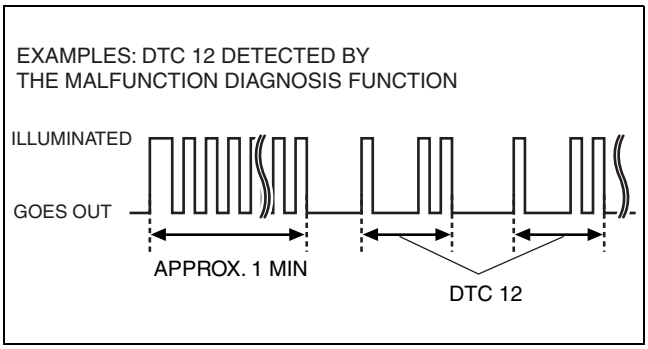
C3U0914S011

- When the immobilizer system is deactivated normally, the security light illuminates for approx. 3 s and then goes out when the start knob is turned to the ON position.
- If the immobilizer system is not deactivated normally (malfunction detected by the malfunction diagnosis function), the security light indicates a DTC. When the start knob is turned to the ON position, the security light flashes or illuminates for 1 min in the following pattern:
  — DTC 15 or lower: Flashes
  — DTC 21: On



C3U0914S012

Note
- The security light indicates the DTC 10 times.
- If multiple DTCs that can be confirmed with the security light are detected, only the DTC with the lowest number of those detected will be indicated by the security light.



C3U0914S013

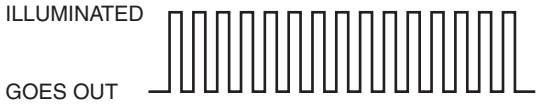
ON-BOARD DIAGNOSYS SYSTEM OUTLINE [IMMOBILIZER SYSTEM (ADVANCED KEYLESS SYSTEM)]
DPE091467000T16
- The immobilizer system is provided with a malfunction diagnosis function.
- Malfunction diagnosis of the immobilizer system occurs automatically when the start knob is turned from the LOCK (ACC) to the ON (START) position.
- If the results of the malfunction diagnosis show a malfunction in the immobilizer system, the security light indicates a DTC. At the same time, DTCs are stored in the PCM and keyless control module. The stored DTCs can be verified using the WDS or equivalent.

Caution
- **Always use the WDS or equivalent to verify DTCs even if the security light indicates a DTC. If the security light itself has a malfunction, it is possible that a DTC may not be indicated properly. There are certain DTCs which can only be verified using the WDS or equivalent, not the security light.**

Note
- If two or more malfunctions are detected as a result of malfunction diagnosis, only the DTC with the lowest number of those detected will be indicated by the security light. The PCM and keyless control module store multiple DTCs at the same time.
- If two or more immobilizer system DTCs are verified, first repair the part of the DTC indicated by the security light. After completely repairing one location, turn the ignition switch from the LOCK to the ON position and perform immobilizer system malfunction diagnosis.

DTC table

Note
- In the approx. 1 min after detecting a malfunction and before indicating the DTC, the security light illuminates or flashes in the following patterns:

Security light flashing pattern (Before indicating a DTC)	DTC
	11, 12, 13, 14, 15
	21

DTC					Detection condition
Security light flashing pattern		Keyless warning light	WDS or equivalent display		
			Keyless control module	PCM	
11		Off	–	B1681	No communication detected between keyless control module and PCM
		On	B1681	B1681	No communication detected between coil antenna and keyless control module
12		On	B2103	B2103	Coil antenna malfunction
13		Off	–	B1600 B2431	Key ID number cannot be read
14		Off	–	B1602	Key ID number cannot be read
15		Off	–	B1601	Unprogrammed key ID number detected
		On	B1342	B1601	Keyless control module malfunction
21		On	B1213	B1213	Only one key ID number is programmed to the PCM
–	–	On	B1213	–	Only one key ID number is programmed to the keyless control module
–	–	On	U0073	–	CAN malfunction
–	–	Off	U0323 U0100 U2023	–	CAN malfunction

ON-BOARD DIAGNOSYS SYSTEM PID DATA/MONITOR FUNCTION OPERATION [IMMOBILIZER SYSTEM (ADVANCED KEYLESS SYSTEM)]

DPE091467000T17

- The following item can be verified
  — Number of keys programmed to the vehicle.

- Use the WDS or equivalent to read the PID/data monitor.

Note
- The engine cannot be started unless two or more keys are programmed to the vehicle.
- A maximum of eight keys can be programmed for one vehicle.

PID/DATA Monitor Table

PID name (definition)	Detection condition
NUMKEYS (Number of key ID numbers programmed to the keyless control module)	Number of programmed key ID numbers: 0–8

09–14B SECURITY AND LOCKS [KEYLESS ENTRY SYSTEM]

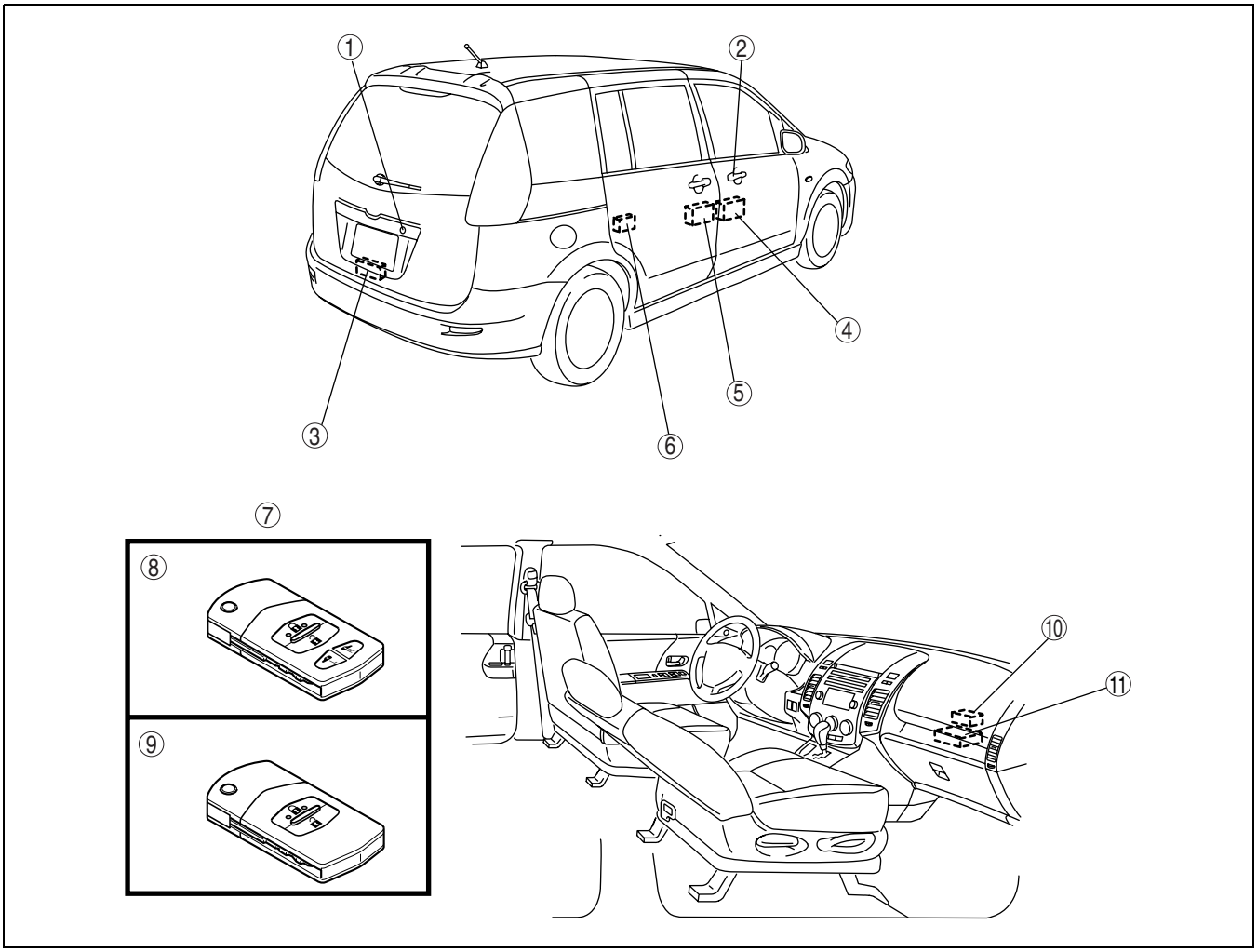
SECURITY AND LOCKS OUTLINE [KEYLESS ENTRY SYSTEM]

DPE091400001T07

Improved marketability	• Power door lock system adopted • Keyless entry system adopted • Retractable key type transmitter adopted
Improved security	• Theft-deterrent system adopted (See 09–14A–13 THEFT-DETERRENT SYSTEM OUTLINE) • Immobilizer system adopted

SECURITY AND LOCKS STRUCTURAL VIEW [KEYLESS ENTRY SYSTEM]

DPE091400001T08



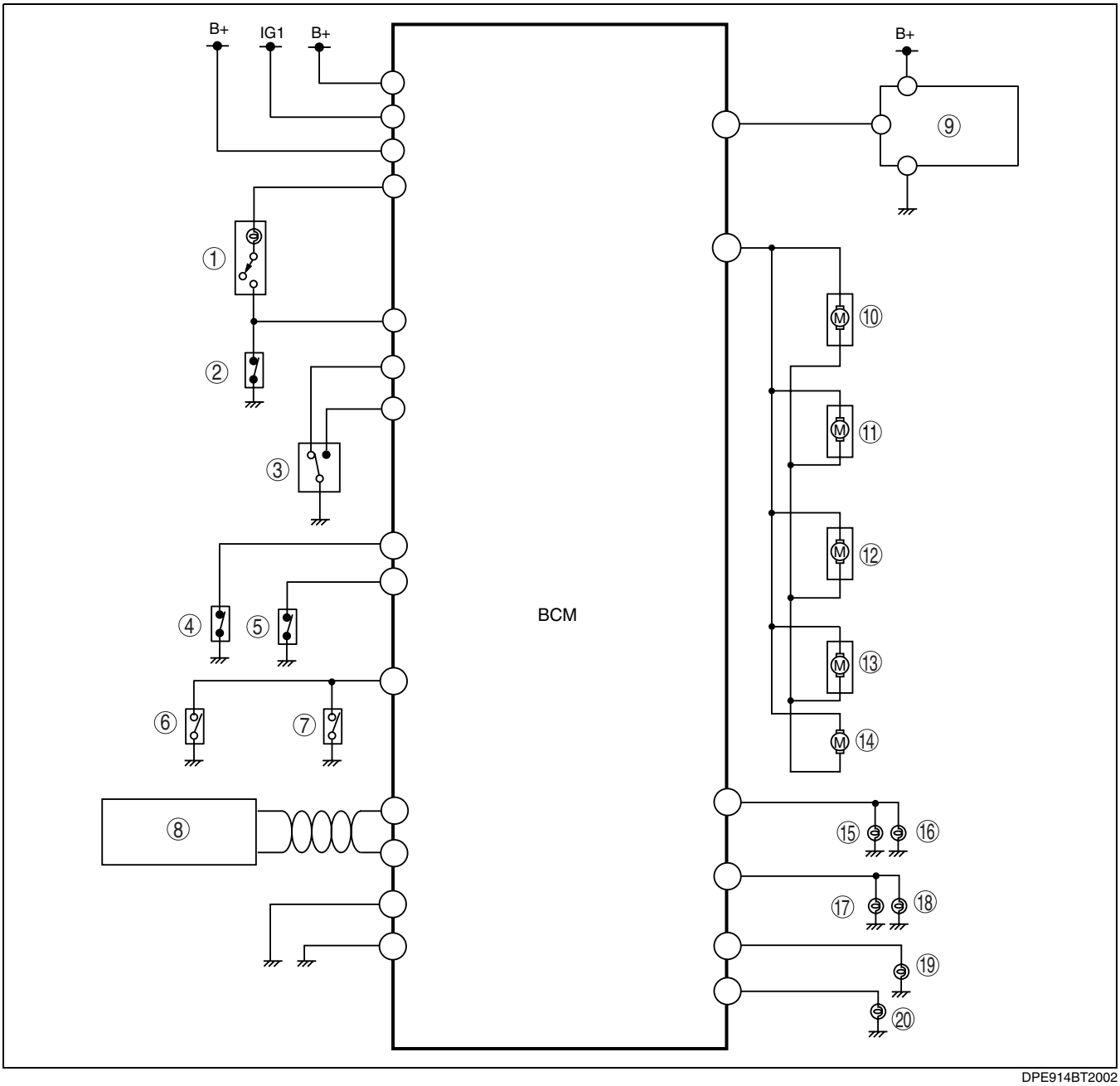
DPE914BT2001

1	Liftgate key cylinder
2	Front door key cylinder
3	Liftgate latch and lock actuator
4	Front door latch and lock actuator
5	Rear door lock actuator
6	Rear door latch

7	Transmitter
8	With PSD
9	Without PSD
10	Keyless receiver
11	BCM

SECURITY AND LOCKS SYSTEM WIRING DIAGRAM [KEYLESS ENTRY SYSTEM]

DPE091400001T09



DPE914BT2002

1	Cargo compartment light
2	Liftgate latch switch
3	Door lock-link switch
4	Front door latch switch (LH)
5	Front door latch switch (RH)
6	Door switch (LH)
7	Door switch (RH)
8	CAN related parts
9	Keyless receiver
10	Front door lock actuator (driver side)

11	Front door lock actuator (passenger side)
12	Sliding door lock actuator (LH)
13	Sliding door lock actuator (RH)
14	Liftgate lock actuator
15	Front turn light (LH)
16	Front side turn light (LH)
17	Front turn light (RH)
18	Front side turn light (RH)
19	Rear turn light (LH)
20	Rear turn light (RH)

POWER DOOR LOCK SYSTEM AND KEYLESS ENTRY SYSTEM OUTLINE [KEYLESS ENTRY SYSTEM]

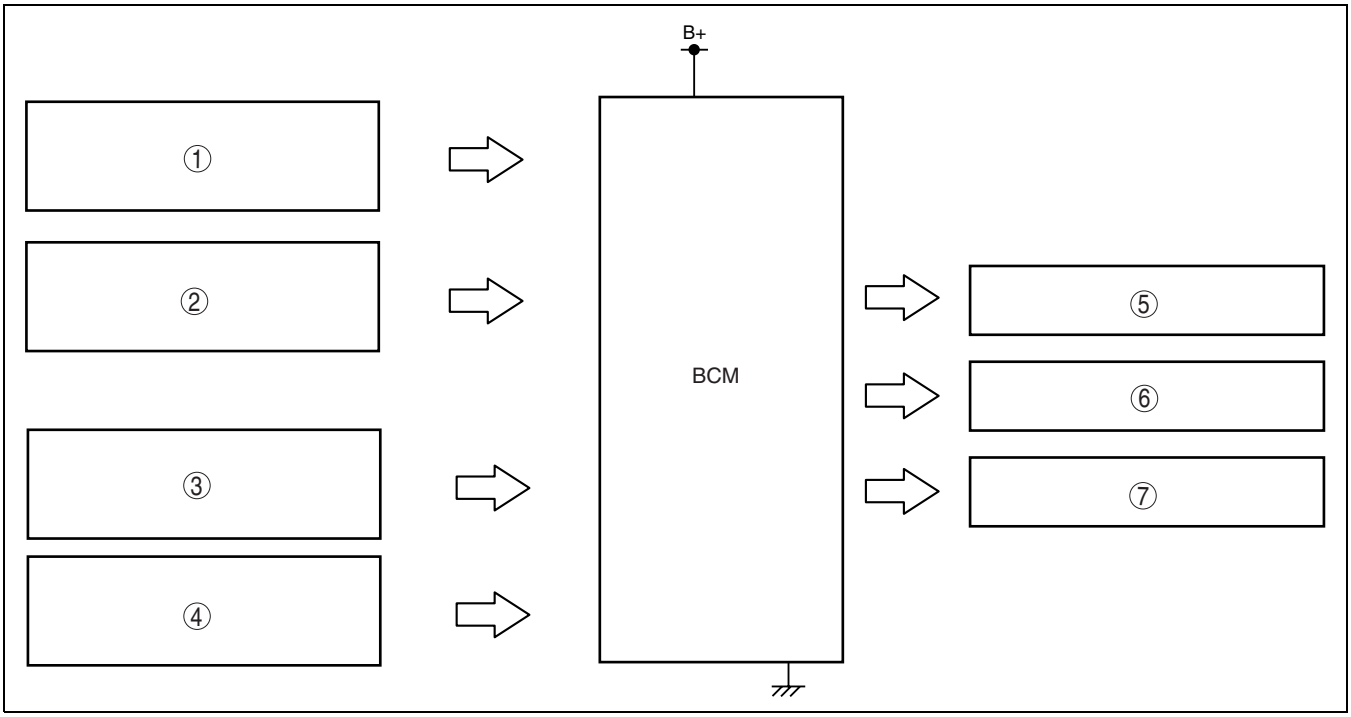
DPE091466000T05

- A retractable key type transmitter has been adopted.

POWER DOOR LOCK SYSTEM CONSTRUCTION/OPERATION [KEYLESS ENTRY SYSTEM]

DPE091466000T08

- Consists of the following parts;
  - — BCM
  - — Front door lock actuator
  - — Sliding door lock actuator
  - — Liftgate lock actuator
  - — Door lock-link switch (built into the driver-side front door lock actuator)
  - — Door key cylinder switch (built into the driver-side front door lock actuator)
- Unlocking/locking of all doors and liftgate is performed by operation of the door key cylinder (door key cylinder switch) and driver-side door knob (door lock-link switch).
- When unlocking using the door key cylinder, operating one time will unlock the driver-side door and operating a second time will unlock the passenger-side door.
- When any door is open, locking operation using the door key cylinder or the driver-side door lock knob is cancelled and the doors are unlocked. (Lock cancel function)



DPE914BT2003

1	• Front door latch switch (door open or closed) • Rear door switch (door open or closed)
2	Liftgate latch switch (liftgate open or closed)
3	Door lock-link switch (lock or unlock)

4	Door key cylinder switch (lock or unlock)
5	Front door lock actuator
6	Sliding door lock actuator
7	Liftgate lock actuator

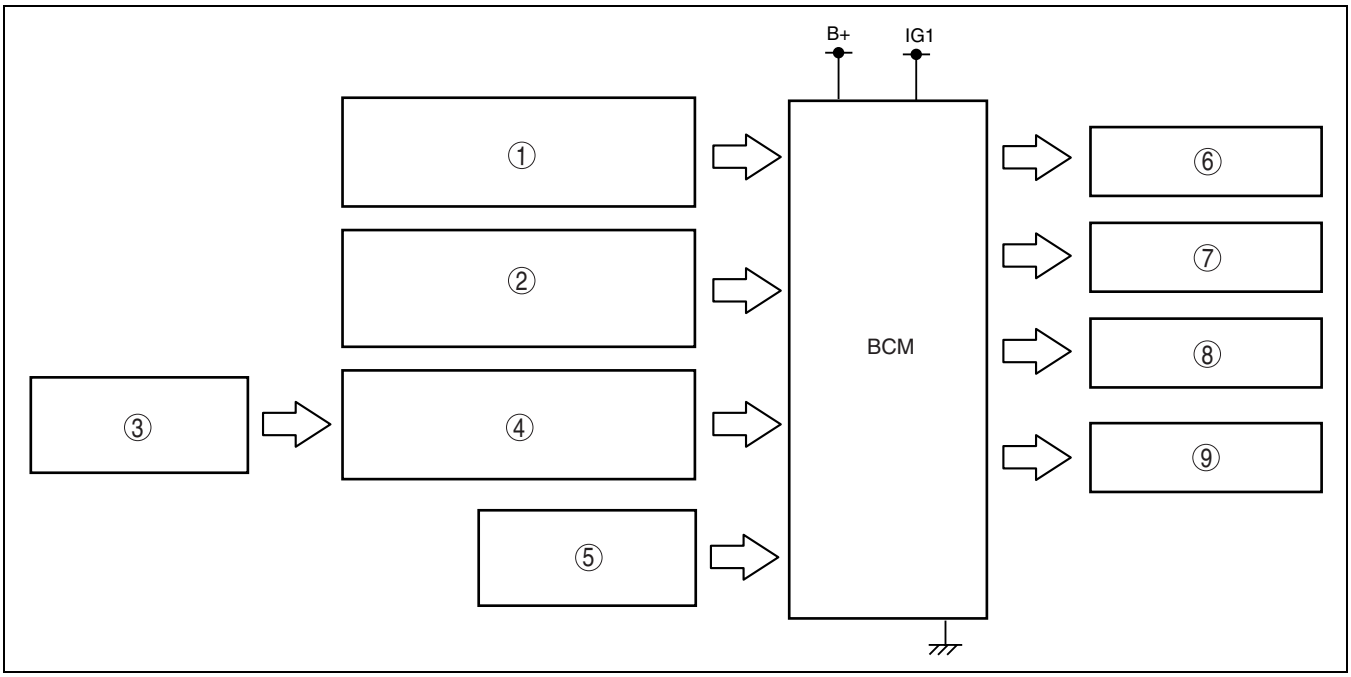
KEYLESS ENTRY SYSTEM CONSTRUCTION/OPERATION [KEYLESS ENTRY SYSTEM]

DPE091466000T09

- Consists of the following parts;
  - — BCM
  - — Keyless receiver
  - — Transmitter
  - — Front door lock actuator
  - — Sliding door lock actuator
  - — Liftgate lock actuator
- The following operations can be performed using the transmitter when away from the vehicle (approx. 2.5 m {8.2 ft}):
  - — Lock all doors (by pressing the LOCK button.)
  - — Unlock all doors (by pressing the UNLOCK button.)
- When the transmitter LOCK button is pressed two times within 5 s, the horn sounds once to indicate that all doors are locked.
- An auto-locking device has been adopted that automatically locks the doors if any of the following operations are not performed within 30 s of pressing the transmitter UNLOCK button:
  - — Any door is opened.

— The door is locked/unlocked using the door key cylinder.
— The door is locked/unlocked using the driver-side door lock knob.
— The key is inserted the steering lock.

- In order to prevent accidental operation when driving, pushing any transmitter button will have no affect when the ignition switch is at the ON position.
- In response to transmitter operation (lock/unlock), the hazard warning light flashes to enable visual verification of operation.
  — When the transmitter LOCK button is pushed, the hazard warning light flashes once.
  — When the transmitter UNLOCK button is pushed, the hazard warning light flashes twice.



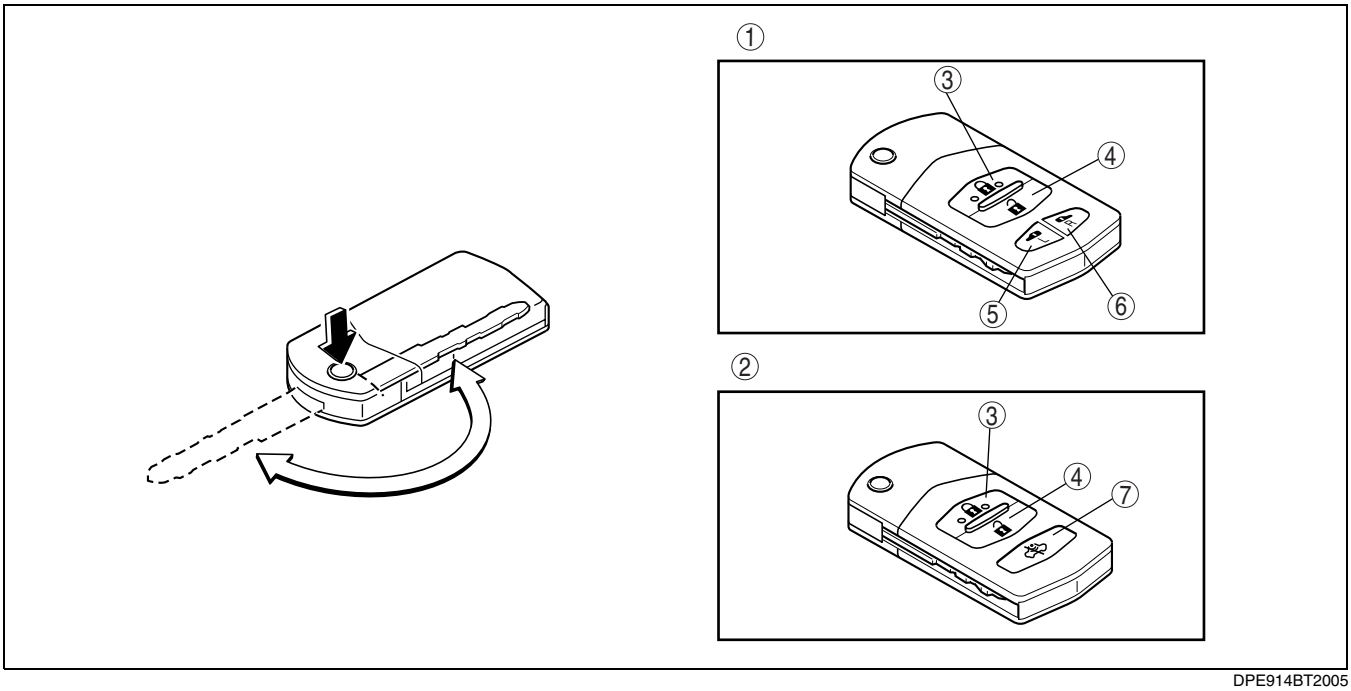
DPE914BT2004

1	• Front door latch switch (door open or closed) • Rear door switch (door open or closed)
2	Liftgate latch switch (liftgate open or closed)
3	Transmitter (lock or unlock)
4	Keyless control module (lock or unlock)

5	Key reminder switch
6	Front door lock actuator
7	Sliding door lock actuator
8	Liftgate lock actuator
9	Hazard warning light

TRANSMITTER (RETRACTABLE KEY TYPE) STRUCTURAL VIEW

DPE091466000T10



DPE914BT2005

1	With PSD
2	Without PSD
3	Lock button
4	Unlock button

5	Sliding door button (RH)
6	Sliding door button (LH)
7	Intruder sensor cut-off button (with theft-deterrent system)

ON-BOARD DIAGNOSTIC SYSTEM OUTLINE (POWER DOOR LOCK SYSTEM)

DPE091466000T11

- An on-board diagnostic system that allows override operation of the power door lock system related parts has been adopted.

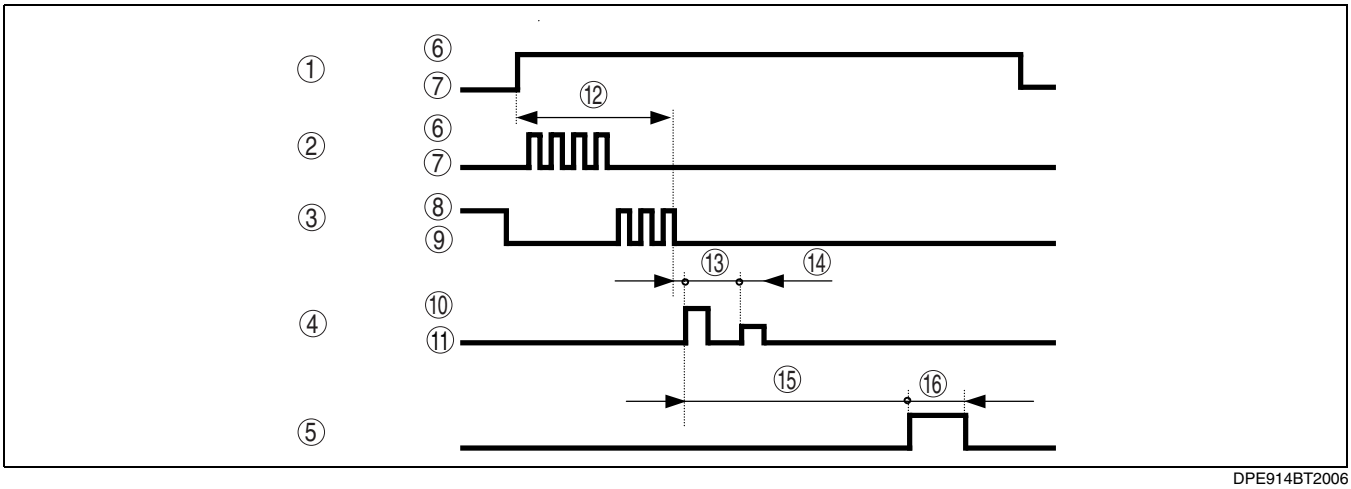
ON-BOARD DIAGNOSTIC SYSTEM OPERATION (POWER DOOR LOCK SYSTEM)

DPE091466000T12

- The override operation mode can by activated by operating the ignition key and opening/closing the doors (latch switch or door switch).

Override Operation

- Inspection for any malfunction is possible by performing an override operation of the lock actuator and hazard warning light.



DPE914BT2006

1	Key reminder switch
2	Ignition switch

3	Any door (latch switch or door switch)
4	Door lock actuator

5	Hazard warning light
6	ON
7	OFF
8	Close
9	Open
10	Lock
11	Unlock
12	Within approx. 30 s
13	Approx. 1 s
14	Approx. 0.4 s
15	Approx. 4 s
16	Approx. 0.75 s

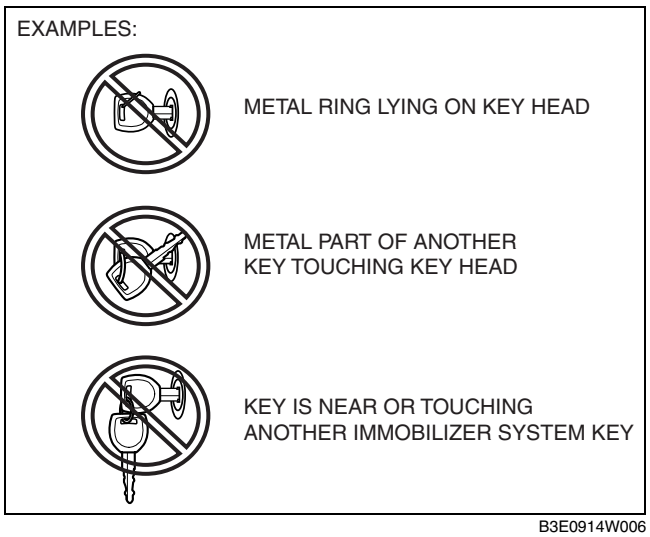
IMMOBILIZER SYSTEM OUTLINE [KEYLESS ENTRY SYSTEM]

DPE091467000T18

- The immobilizer system is a vehicle theft prevention device that only allows keys that have previously been registered to the vehicle to start the engine. Therefore, it functions to prevent theft by means such as a forged key or electrical 'hotwiring'.
- Consists of the key (with built-in transponder), coil antenna, PCM, instrument cluster and security light (in the instrument cluster).
- The immobilizer system operates automatically when the ignition switch is turned to the LOCK or ACC position. (The security light illuminates when the immobilizer system is in operation)
- When the ignition switch is turned from the LOCK (or ACC position) to the ON (or START position) with a previously registered key, the release operation begins automatically. The engine is allowed to start only after this operation is successful. (The security light illuminates for **3 s** and then goes out when the immobilizer system has been released.)
- The immobilizer system cannot be deactivated.
- Due to immobilizer system characteristics, the engine cannot be started unless two or more keys are registered. Moreover, when performing “Instrument cluster replacement”, “PCM replacement”, or “Replacement of all the keys”, two or more keys usable with the immobilizer system must be readied.
- A maximum of eight keys can be registered for one vehicle. The PID/data monitor function can be used to verify the number of keys registered for a single vehicle.
- If there is a system malfunction or the immobilizer system is not properly released due to release operation failure, the malfunction location can be verified using the malfunction diagnosis function of the on-board diagnostic system.

Caution

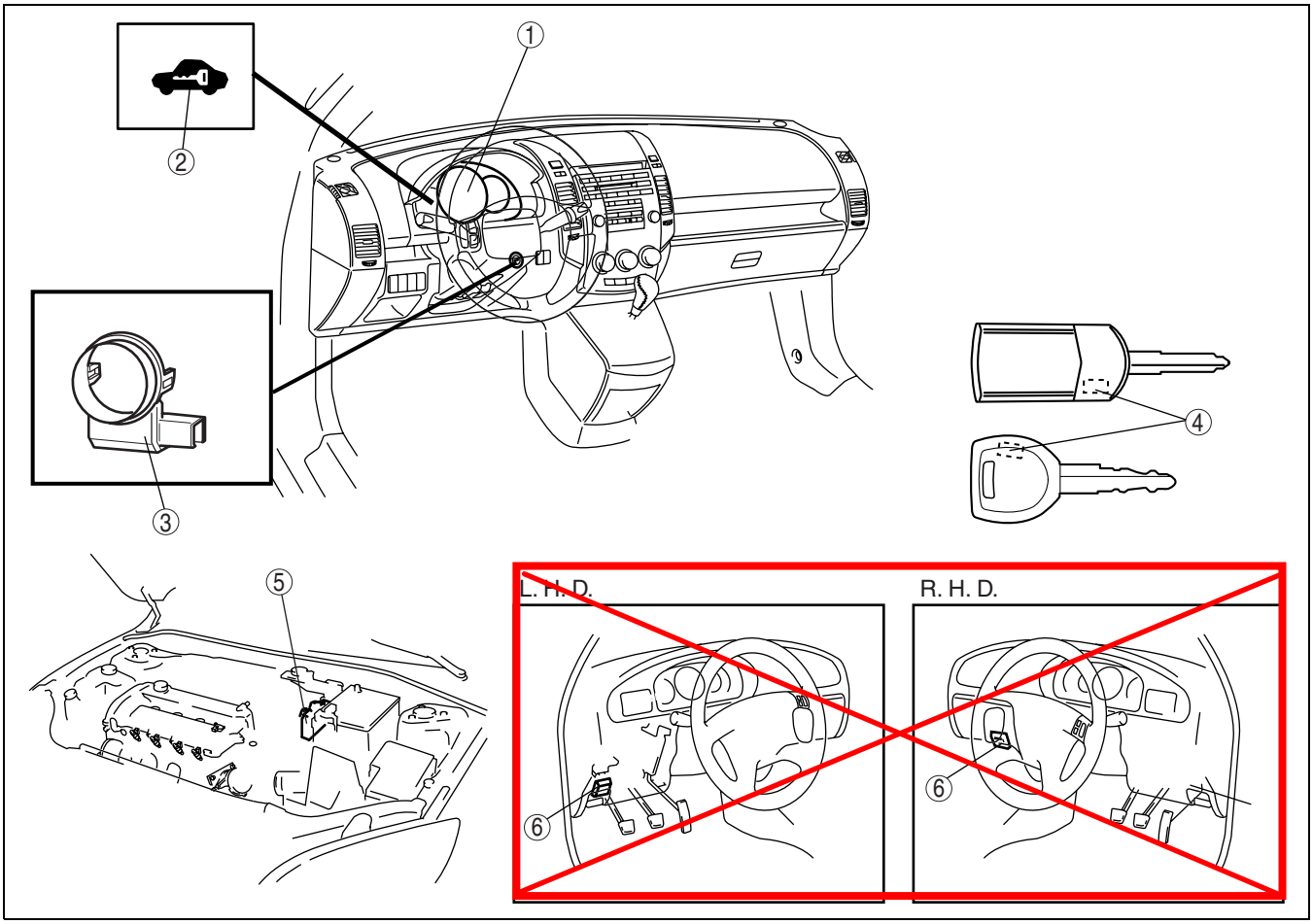
- **If any of the following items are touching or near the key head, signal communication between the key and vehicle is negatively affected, resulting in the engine not starting or a key registration error. Do not perform procedures if any of the following items are touching or near the key head.**
  - **— Any metallic object**
  - **— Spare keys or keys for other vehicles equipped with an immobilizer system**
  - **— Any electronic device, or any credit or other cards with magnetic strips**



B3E0914W006

IMMOBILIZER SYSTEM STRUCTURAL VIEW [KEYLESS ENTRY SYSTEM]

DPE091467000T19



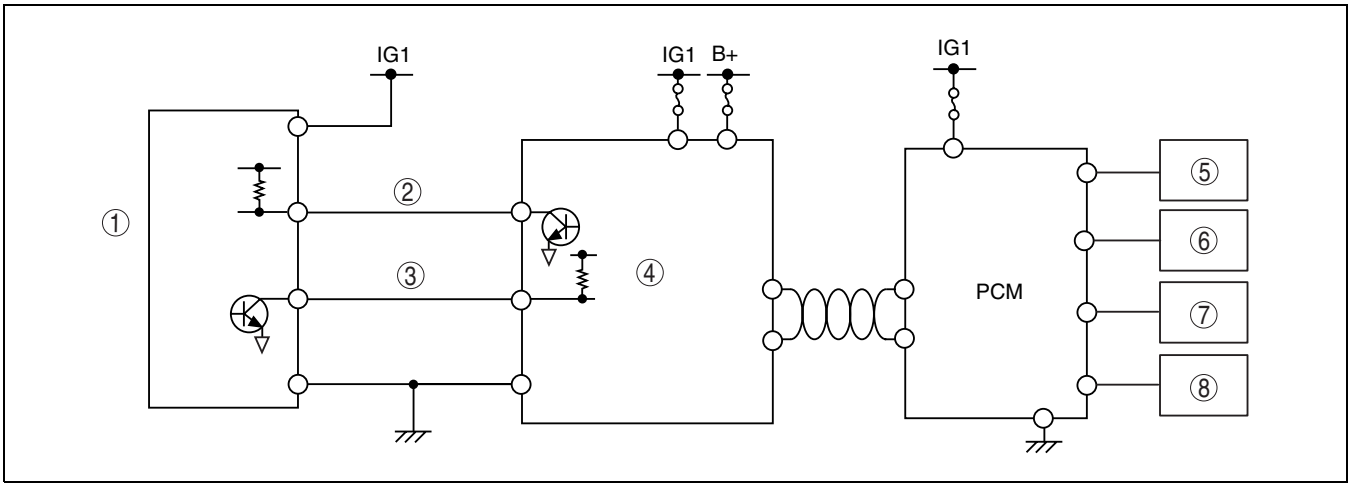
DPE914BT2007

1	Instrument cluster
2	Security light
3	Coil antenna

4	Key (transponder)
5	PCM (L8, LF)
6	PCM (MZR-CD (RF Turbo))

IMMOBILIZER SYSTEM WIRING DIAGRAM [KEYLESS ENTRY SYSTEM]

DPE091467000T20



B3E0914T003

1	Coil antenna
2	Tx line
3	Rx line

4	Instrument cluster
5	Fuel injector
6	Fuel pump relay

7	Ignition coil
8	Starter relay

IMMOBILIZER SYSTEM CONSTRUCTION/OPERATION [KEYLESS ENTRY SYSTEM]

DPE091467000T21

- When a key is inserted into the key cylinder, the key ID number of the key and the key ID number registered in the PCM are compared. If the comparison is successful, permission is given to start the engine. For PCM control, see Section 01, CONTROL SYSTEM.
- Keys contain a unique ID number that is previously registered in the instrument cluster. Due to this, if immobilizer system component parts are replaced (such as key addition/clearing and instrument cluster replacement), it is necessary to reset the system.

Immobilizer System Release Operation

The ignition switch is turned from the LOCK (ACC) to the ON (START) position. (Security light illuminates.)

↓

(1) The instrument cluster sends data A* to the key (transponder) via the coil.

↓

(2) The key (transponder) calculates data B from received data A and sends its specific key ID number and data B to the instrument cluster via the coil.

↓

(3) The instrument cluster verifies consistency between the received key ID number and the previously registered key ID numbers.

- UNSATISFACTORY RESULT → Engine starting is not permitted. (After detecting the error (such as non-verification or malfunction), the security light illuminates or flashes continuously for approx. 1 min, and then a DTC is repeatedly displayed 10 times.)
- SATISFACTORY RESULT ↓

(4) The instrument cluster makes a calculation using received data B and compares it with sent data A.

- UNSATISFACTORY RESULT → Engine starting is not permitted. (After detecting the error (such as non-verification or malfunction), the security light illuminates or flashes continuously for approx. 1 min, and then a DTC is repeatedly displayed 10 times.)
- SATISFACTORY RESULT ↓

(5) The instrument cluster requests data for verification from the PCM.

↓

(6) The PCM sends data C* to the instrument cluster.

↓

(7) The instrument cluster calculates data D from received data C and sends it to the PCM.

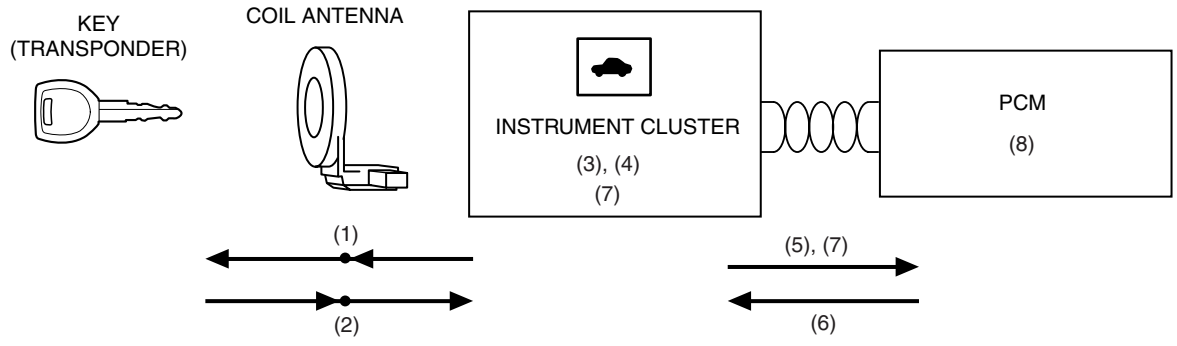
↓

(8) The PCM makes a calculation using received data D and compares it with sent data C.

- UNSATISFACTORY RESULT → Engine starting is not permitted. (After detecting the error (such as non-verification or malfunction), the security light illuminates or flashes continuously for approx. 1 min, and then a DTC is repeatedly displayed 10 times.)
- SATISFACTORY RESULT ↓

Engine starting is permitted. (The security light goes out after approx. 3 s.)

*: Data A and C are different random values each time.



B3E0914T005

Immobilizer System Setting

- The immobilizer system can be set so that only the WDS or equivalent must be used to perform system procedures. When using the WDS or equivalent, first security access must be requested. Obtain security access permission according the WDS or equivalent screen and then perform system procedures.

WDS or equivalent setting items	Contents
Programming an additional ignition key	Allows key ID number registratiyon.
Ignition key ID number clearing	Clearing and registration of key ID numbers.
Parameter reset	Initialization of either of the following: • PCM • Instrument cluster
Customer spare key programming enable	"Method for adding other keys using two keys that can start the engine" is enabled. **Note** • This is the default setting on new vehicles.
Customer spare key programming disable	"Method for adding other keys using two keys that can start the engine" is disabled. **Note** • When only the WDS or equivalent must be used to register key ID numbers, making a forged key by using two keys that can start the engine is prevented. This function is for use by rental car or other companies with vehicle fleets.

- When immobilizer system component parts (key, Instrument cluster, PCM, and coil antenna) are replaced, the system must be reset as described below. For setting method details, see Mazda5 Workshop Manual.

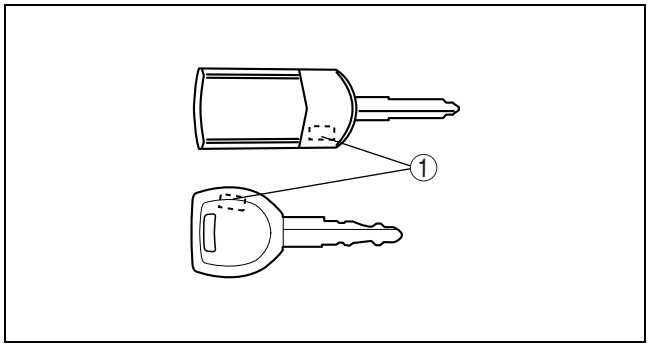
Component part	Setting
Key addition	Key ID number of added key must be registered. Key ID number registration is performed according to the following methods: • Method for registering other keys using two keys that can start the engine • Method using the WDS or equivalent
Key clearing	The registered key ID number can only be cleared using the WDS or equivalent. When clearing a key ID number using the WDS or equivalent, all key ID numbers are cleared.
PCM replacement	• Parameter reset must be performed. • The key ID numbers for all keys that were being used must be registered in the WDS or equivalent. Two or more keys must be registered.
Instrument cluster replacement	• Parameter reset must be performed. • The key ID numbers for all keys that were being used must be registered in the WDS or equivalent. Two or more keys must be registered.
Coil antenna replacement	Resetting of the immobilizer system does not need to be performed.

KEY CONSTRUCTION

DPE091467000T22

- Keys for use with the immobilizer system have an electronic communication device (transponder) built into the key head that retains specific electronic codes (key ID number).

1	Transponder



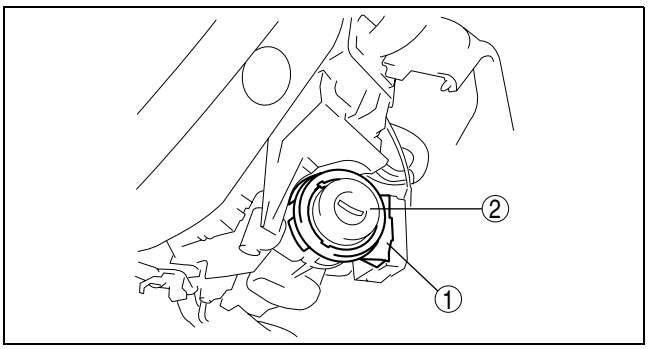
DPE914BT2008

COIL ANTENNA CONSTRUCTION [KEYLESS ENTRY SYSTEM]

DPE091467000T23

- Installed on the steering lock.
- Forms a magnetic field near the steering lock and receives the key signal.
- The received key signal is demodulated and input to the instrument cluster.

1	Coil antenna
2	Steering lock



B3E0914T006

SECURITY LIGHT CONSTRUCTION/OPERATION [KEYLESS ENTRY SYSTEM]

DPE091467000T24

Construction

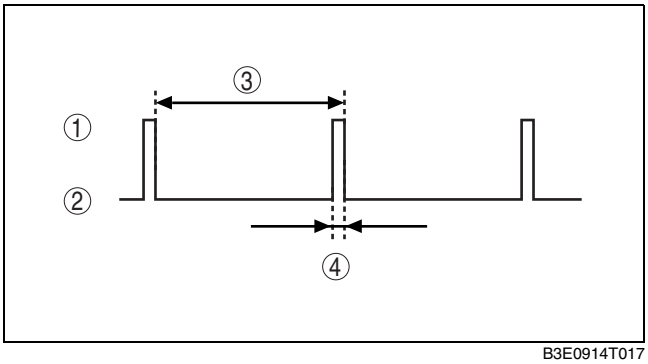
- Allows visual confirmation of immobilizer system operation.
- If any malfunction is detected in the immobilizer system, the malfunction location can be verified by the security light flashing pattern.

Note

- If there is security light system malfunction, DTCs may not be properly displayed. Always use the WDS or equivalent to verify DTCs.

Operation

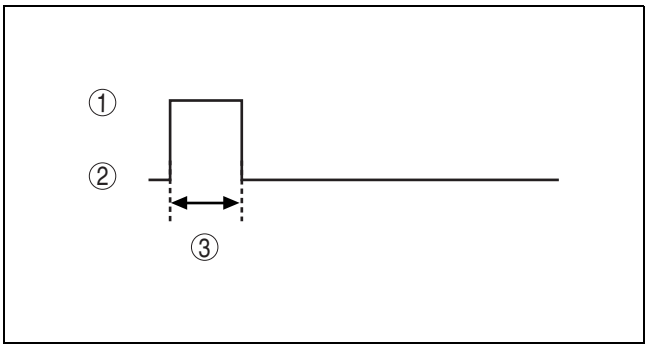
- When the immobilizer system is operating, the security light flashes repeatedly **0.1 s every 2 s**.



B3E0914T017

1	Illuminated
2	Goes out
3	Approx. 2 s
4	Approx. 0.1 s

- When the immobilizer system is released normally, the security light illuminates **for 3 s** and then goes off when the ignition switch is turned to the ON position.

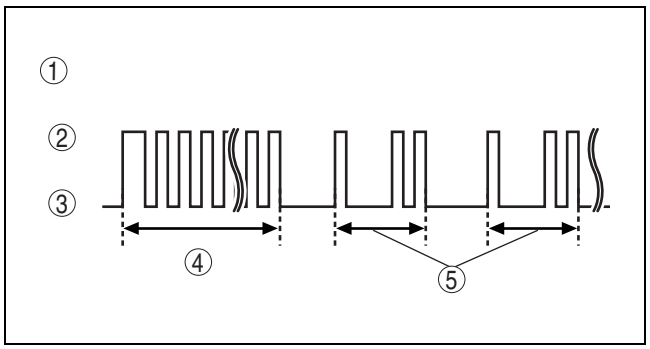


B3E0914T016

1	Illuminated
2	Goes out
3	Approx. 3 s

- If the immobilizer system is not released normally (malfunction detected by the malfunction diagnosis function), the security light displays a DTC. If this occurs, the security light flashes or illuminates **for 1 min** and then displays the DTC when the ignition switch is turned to the ON position.
  — DTC 16 and lower: Flashes

— DTC 21 and higher: Illuminated



B3E0914T018

1	Examples: DTC 12 detected by the malfunction diagnosis function
2	Illuminated
3	Goes out
4	Approx. 1 min
5	DTC 12

Note
- The security light flashes to display the DTC **10 times**.
- If multiple DTCs that can be confirmed with the security light are detected, only the DTC with the lowest number of those detected will be displayed by the security light.

ON-BOARD DIAGNOSTIC SYSTEM OUTLINE [IMMOBILIZER SYSTEM (KEYLESS ENTRY SYSTEM)]

DPE091467000T25

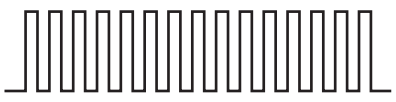
- The immobilizer system is provided with a malfunction diagnosis function.
- Malfunction diagnosis of the immobilizer system occurs automatically when the ignition switch is turned from the LOCK (ACC) to the ON (START) position.
- If the results of the malfunction diagnosis show a malfunction in the immobilizer system, the security light displays a DTC. At the same time, DTCs are stored in the PCM and instrument cluster. The stored DTCs can be verified using the WDS or equivalent.

Caution
- **Always use the WDS or equivalent to verify DTCs even if the security light display a DTC. If the security light itself has a malfunction, it is possible that a DTC may not be properly displayed. There are certain DTCs which can only be verified using the WDS or equivalent, not the security light.**
- **DTCs for the immobilizer system that are stored in the instrument cluster and PCM are cleared when the ignition switch is turned from the ON to the LOCK (ACC) position.**

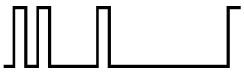
Note
- If two or more malfunctions are detected as a result of malfunction diagnosis, only the DTC with the lowest number of those detected will be displayed by the security light. However, multiple DTCs are stored at the same time.
- If two or more immobilizer system DTCs are verified, first repair the part indicated by the security light displayed DTC. After completely repairing one location, turn the ignition switch from the LOCK to the ON position and perform immobilizer system malfunction diagnosis.

DTC Table

Note
- In the approx. 1 min after detecting a malfunction and before displaying the DTC, the security light will illuminate or flash the following patterns:

Security light flashing pattern (Before displaying DTC)	DTC
ILLUMINATED  GOES OUT	11, 12, 13, 14, 15, 16

Security light flashing pattern (Before displaying DTC)	DTC
ILLUMINATED  GOES OUT	21, 22, 23

DTC				Detection condition
Security light flashing pattern		WDS or equivalent display*		
		Instrument cluster	PCM	
11		B1681	P1260	No detected communication with the coil
12		B2103	P1260	• Coil antenna malfunction • The PCM determined a malfunction in the coil antenna even though it is normal.
13		B1600	P1260	The key ID number data cannot be read.
		B2431	P1260	Key ID number registration error
14		B1602	P1260	The instrument cluster cannot read key ID number data normally.
15		B1601	P1260	The instrument cluster has detected unregistered key ID number.
16		U2510	P1260	Communication error between the instrument cluster and the PCM (no response)
		U1147	P1260	Communication error between the instrument cluster and the PCM (mismatched conditions)
21		B1213	P1260	Only one key ID number is registered.
22		B2141	P1260	Communication error between the instrument cluster and the PCM (data transfer error)
23		B2139	P1260	ID number data in the PCM and the instrument cluster do not match.
Not illuminated		B1342	-	Instrument cluster malfunction

ON-BOARD DIAGNOSTIC SYSTEM PID/DATA MONITOR FUNCTION [IMMOBILIZER SYSTEM (KEYLESS ENTRY SYSTEM)]

DPE091467000T26

- The following items can be verified:
  — Number of key ID numbers registered with the vehicle
- Use the WDS or equivalent to read the PID/data monitor.

PID/Data Monitor Table

PID name (definition)	Detected condition
NUMKEYS (Number of key ID numbers registered with the vehicle)	Number of key ID numbers registered: 0—8

09–15 SUNROOF

SLIDING SUNROOF OUTLINE

DPE091569800T01

Improved comfort	• Electric sunroof with tilt function adopted • Deflector adopted to reduce wind-blast noise
Improved serviceability	• Pulse sensor (hall effect switch) adopted for system control to simplify system • Sunroof motor with built-in control module adopted

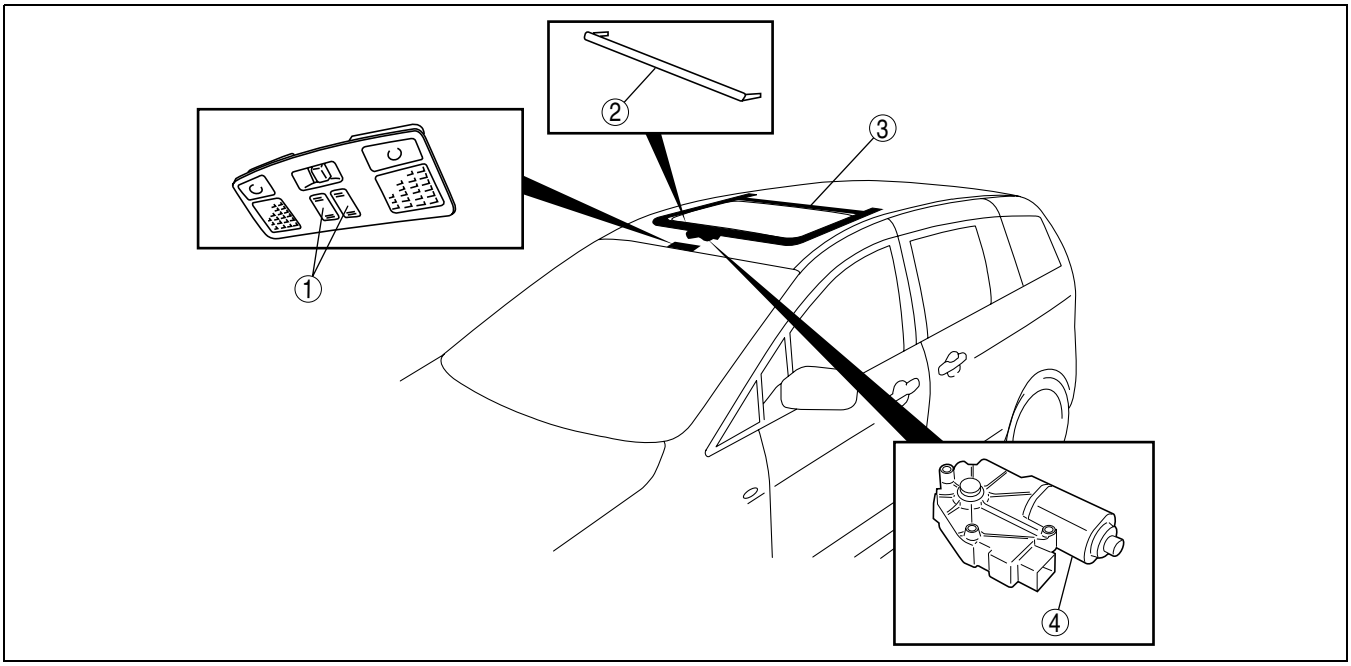
SUNROOF SPECIFICATION

DPE091569800T02

Item	Specification
Slide system	Outer slide
Opening measurement (mm {in})	202 × 722 {7.95 × 28.4}
Tilt-up amount (mm {in})	22—28 {0.9—1.1}
Opening/closing time (s)	Slide: 2.5—5.5, Tilt: 0.9 or less

SLIDING SUNROOF STRUCTURAL VIEW

DPE091569800T03

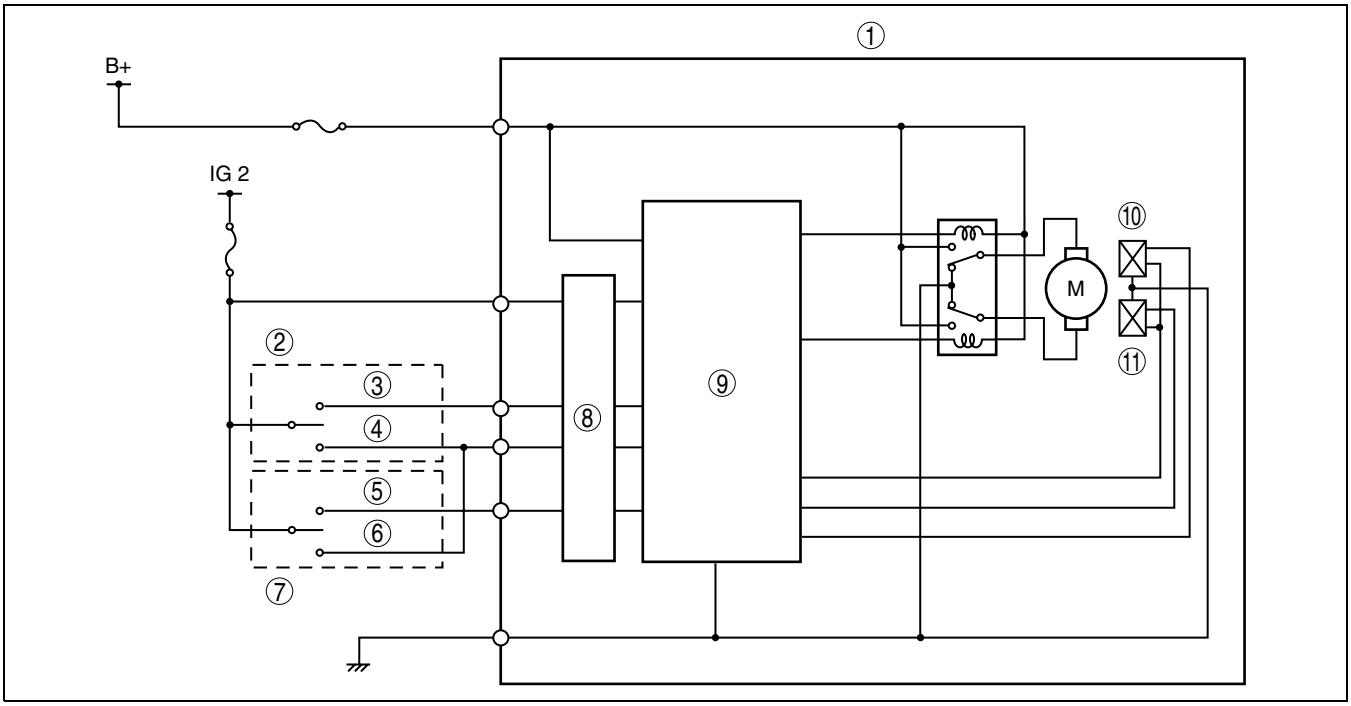


DPE915ZT1100

1	Sunroof switch
2	Deflector
3	Sunroof unit
4	Sunroof motor

SLIDING SUNROOF SYSTEM WIRING DIAGRAM

DPE091569800T04



DPE915ZT1102

1	Sunroof motor
2	Slide switch
3	Open
4	Close
5	Up
6	Down
7	Tilt switch
8	Input sensor
9	Control module
10	Hall effect switch 2
11	Hall effect switch 1

SLIDING SUNROOF OPERATION

DPE091569800T06

- The glass panel opens/closes using tilting and sliding operations.
- When the ignition switch is at the ON position, the sunroof operates by use of the sunroof switch.
- If the ignition switch is turned to the LOCK or ACC position while the sunroof is operating, it will stop.
- One-touch operation of the SLIDE open or the TILT up switch provides auto-operation.
- If any switch is operated during auto-operation, the sunroof stops.
- If any malfunction is detected during sunroof operation, the fail-safe function operates to ensure safety.

Item	Specification	Cancel condition
Continuous energization observation function (switch stuck-on observation function)	If the switch is continuously on for longer than the set time (60 s), operation is stopped.	The switch is turned off, then on
Continuous operation observation function	If the period of accumulated energization due to continuous opening/closing is longer than the set time (120 s), operation is stopped. (If set time is reached while closing, sunroof returns to fully open position.)	20 s after operation is stopped
Relay observation function	If the motor power supply is on continuously due to stuck breaker points in a relay on one side or similar malfunction, the other relay is turned on, cutting off energization to the motor. (Even if the ignition switch is turned to the LOCK or ACC position, the coil is energized.)	Relay is no longer stuck

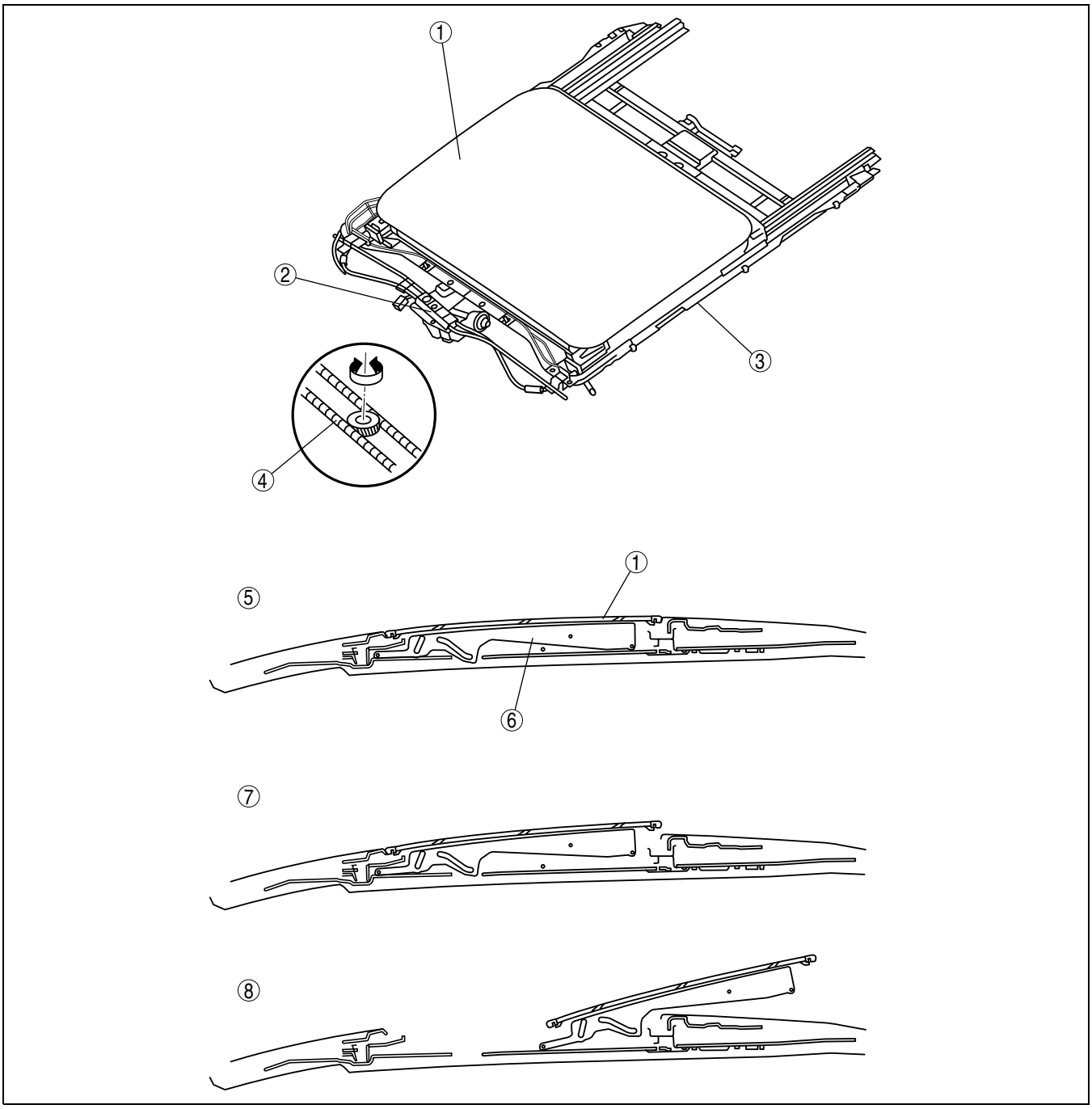
Item	Specification	Cancel condition
Pinching detection function	If the pulse variation of hall effect switch 1 is not longer than the set time (400 ms), operation is stopped (pinching detected).	Pinching is resolved, and the switch is turned off, then on
Static load detection function	If pinching is detected while the glass panel is sliding, sliding operation is stopped. Set load: 343 N {35 kgf, 77 lbf} or more	Pinching is resolved, and the switch is turned off, then on
Hall effect switch malfunction	If an abnormal hall effect switch pulse is detected, the system enters safe mode. • Abnormality while operating: Operation stopped • Abnormal condition when the switch is operated: Glass panel operates for 400 ms in the direction of sunroof switch operation and stops.	Hall effect switch pulse is detected to be normal (Complete normal recovery is achieved only after completion of initial position setting.)

SUNROOF UNIT CONSTRUCTION/OPERATION

DPE091569850T01

- Consists of a glass panel, frame and sunroof motor.
- The drive cables inside the frame are engaged with the sunroof motor drive gear so that when the motor rotates the drive cables also move.

- The guides are fixed to the glass panel so that the panel is moved by the drive cables sliding the guides..



DPE915ZT1101

1	Glass panel
2	Sunroof motor
3	Frame
4	Drive cable

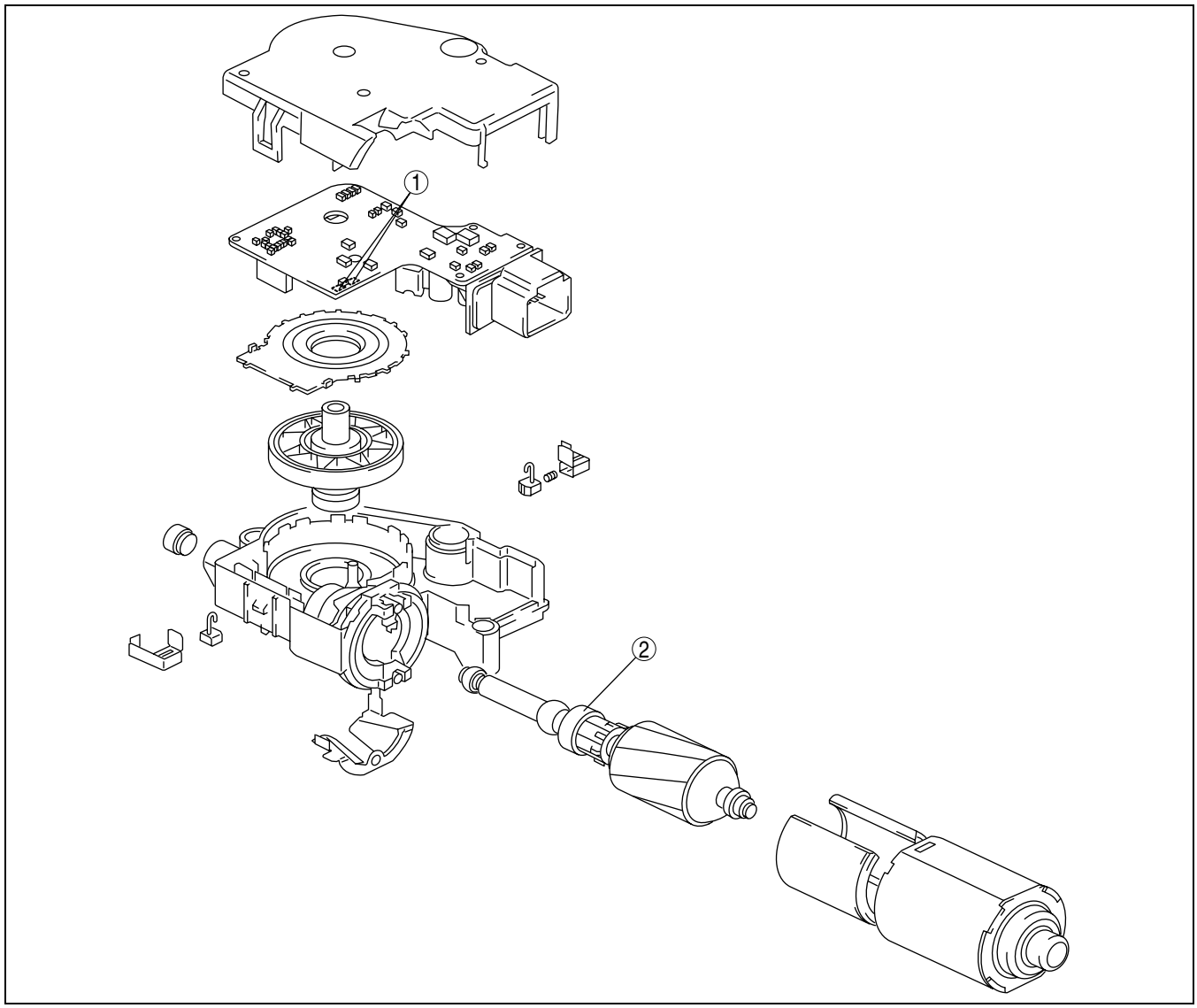
5	Fully closed
6	Guide
7	Tilt up
8	Fully open

SUNROOF MOTOR CONSTRUCTION

DPE091569873T02

- The motor consists of gear and control parts.
- A magnetic wheel is provided on the motor shaft.
- Two hall effect switches are provided in the control part.
- The control module detects the rotation direction, speed and amount based on pulse signals from the two hall

effect switches, and controls the position and static load of the glass panel accordingly.



BHE0915T104

1	Hall effect switch 1, 2
2	Magnetic wheel

09–16 EXTERIOR TRIM

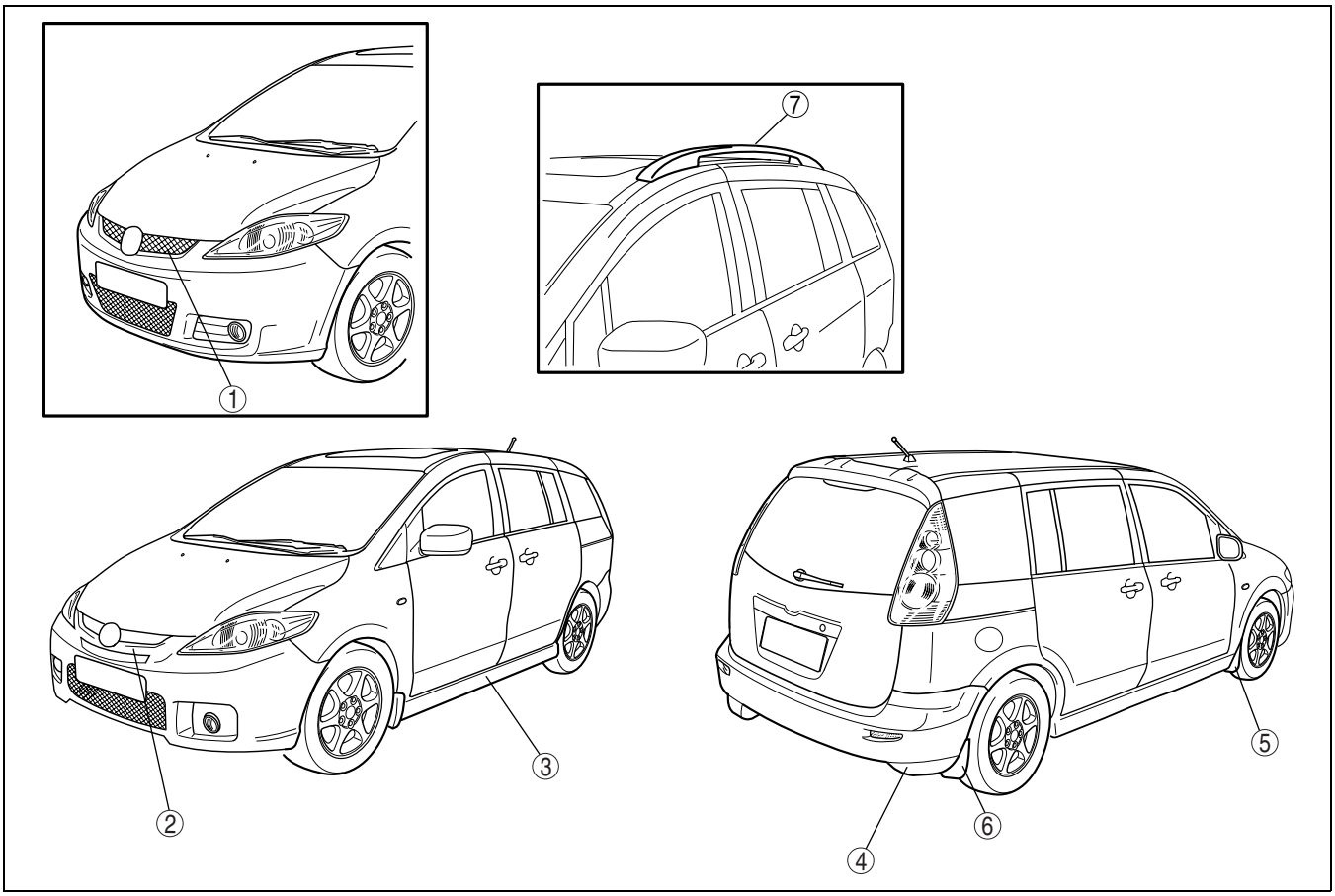
EXTERIOR TRIM OUTLINE

DPE091600000T01

- Rear airdam skirt has been adopted.
- Front and rear flaps have been adopted.
- Standard and Sports type radiator grilles are available.
- Sidestep molding has been adopted for the Sports type.
- Roof rail have been adopted.

EXTERIOR TRIM STRUCTURAL VIEW

DPE091600000T02



DPE916ZT1000

1	Radiator grille (Standard type)
2	Radiator grille (Sports type)
3	Side step molding
4	Rear airdam skirt
5	Front flap
6	Rear flap
7	Roof rail

09–17 INTERIOR TRIM

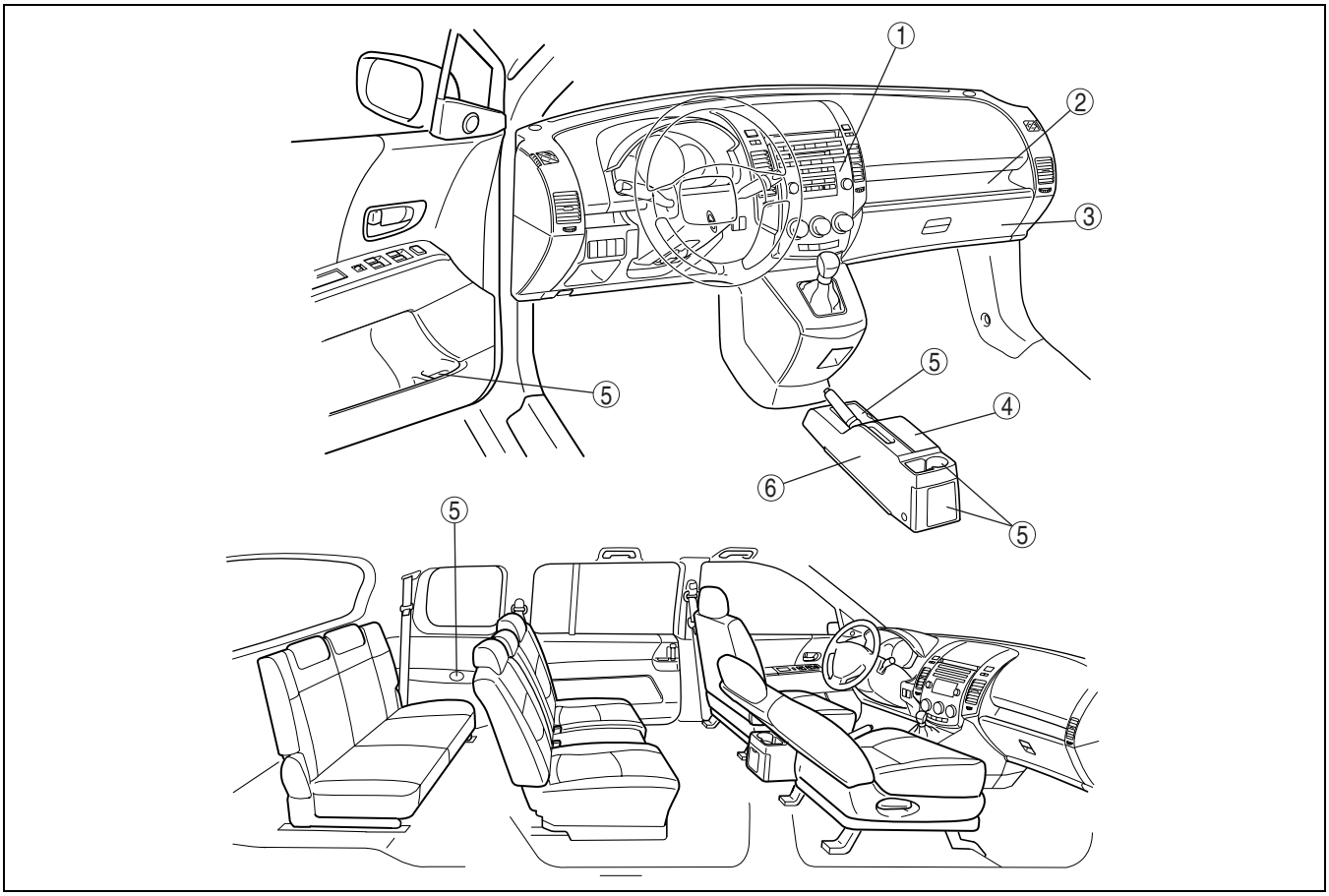
INTERIOR TRIM OUTLINE

DPE091755000T01

- The center panel module with integrated audio and climate control units, is located at the center of the dashboard panel. This improves functionality and gives a unified appearance.
- Various storage spaces have been added.

INTERIOR TRIM STRUCTURAL VIEW

DPE091755000T02



DPE917ZT1000

1	Center panel module
2	Tray
3	Glove compartment

4	Storage compartment
5	Cup holder
6	Console

09–18 LIGHTING SYSTEMS

LIGHTING SYSTEMS OUTLINE

DPE091800000T01

- Built-in front turn and parking lights have been adopted for headlights.
- Projector type headlights (low-beam) have been adopted.
- Front fog lights have been adopted. (Located in front bumper)
- Stepped reflectors have been adopted for rear combination lights.
- LEDs have been adopted for the high-mount brake light.
- Ignition key illumination that illuminates the ignition key slot has been adopted.
- Interior light control system with variable illumination period and illumination level controlled by the BCM has been adopted.
- A headlight auto leveling system, which responds to the vehicle attitude and automatically adjusts the optical axis of the headlights, has been adopted.

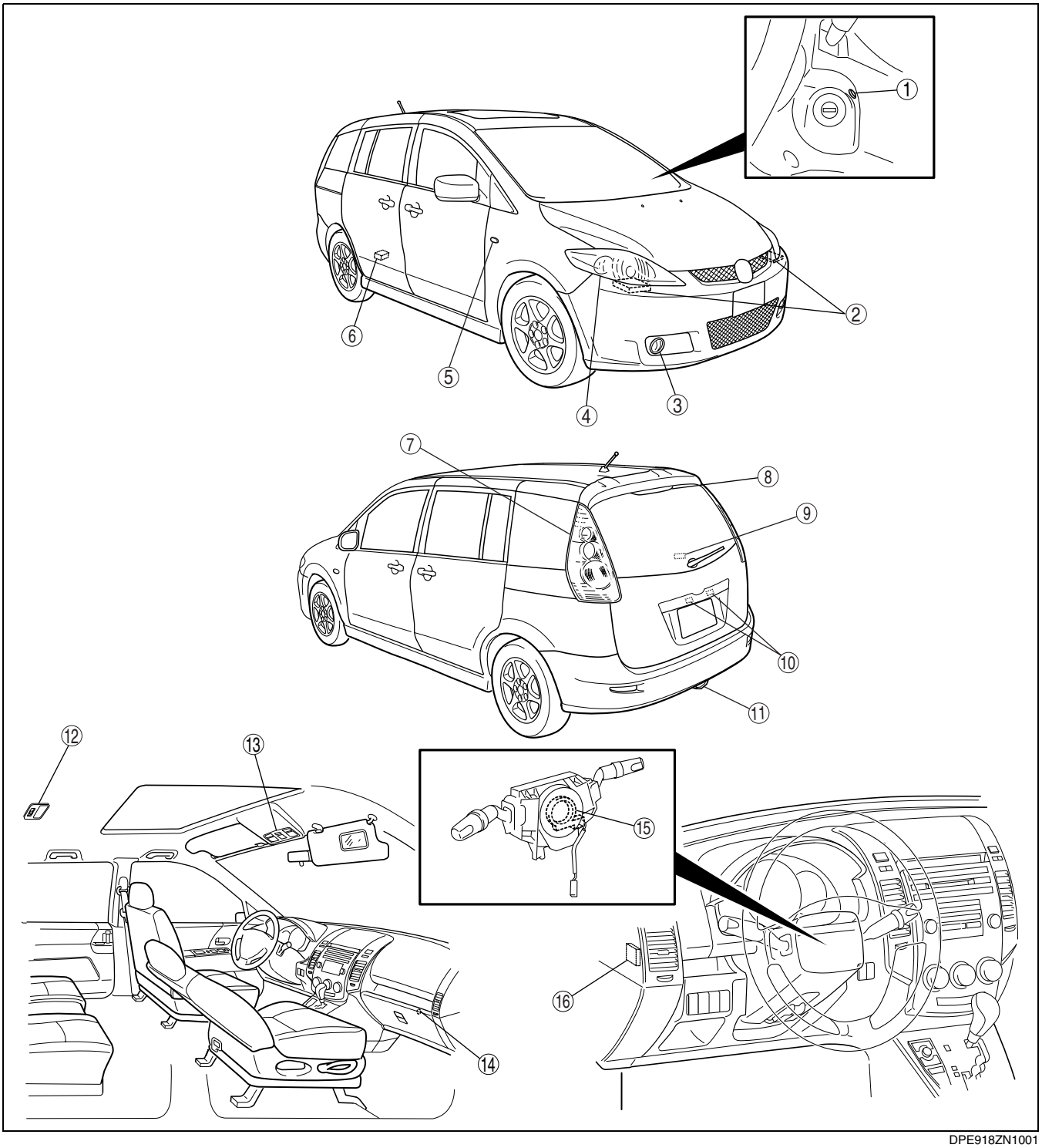
LIGHTING SYSTEMS SPECIFICATION

DPE091800000T02

Item		Specifications (W) × number
Exterior light bulb capacity	Headlight bulb (high-beam)	60 × 2
	Discharge headlight bulb (low-beam)	35 × 2
	Halogen headlight bulb (low-beam)	55 × 2
	Front turn light bulb	21 × 2
	Parking light bulb	5 × 2
	Front fog light bulb	55 × 2
	Front side turn light bulb	5 × 2
	Brake light/taillight bulb	21/5 × 2
	Rear turn light bulb	21 × 2
	Back-up light bulb	18 × 2
	Rear fog light bulb	21 × 1
	License plate light bulb	5 × 2
	High-mount brake light bulb (LED)	2.4
Interior light bulb capacity	Map light bulb	5 × 2
	Interior light bulb	10 × 1
	Cargo compartment light bulb	8 × 1
	Glove compartment light bulb	1.7 × 1
	Ignition key illumination bulb	1.4 × 1

LIGHTING SYSTEMS STRUCTURAL VIEW

DPE091800000T03



DPE918ZN1001

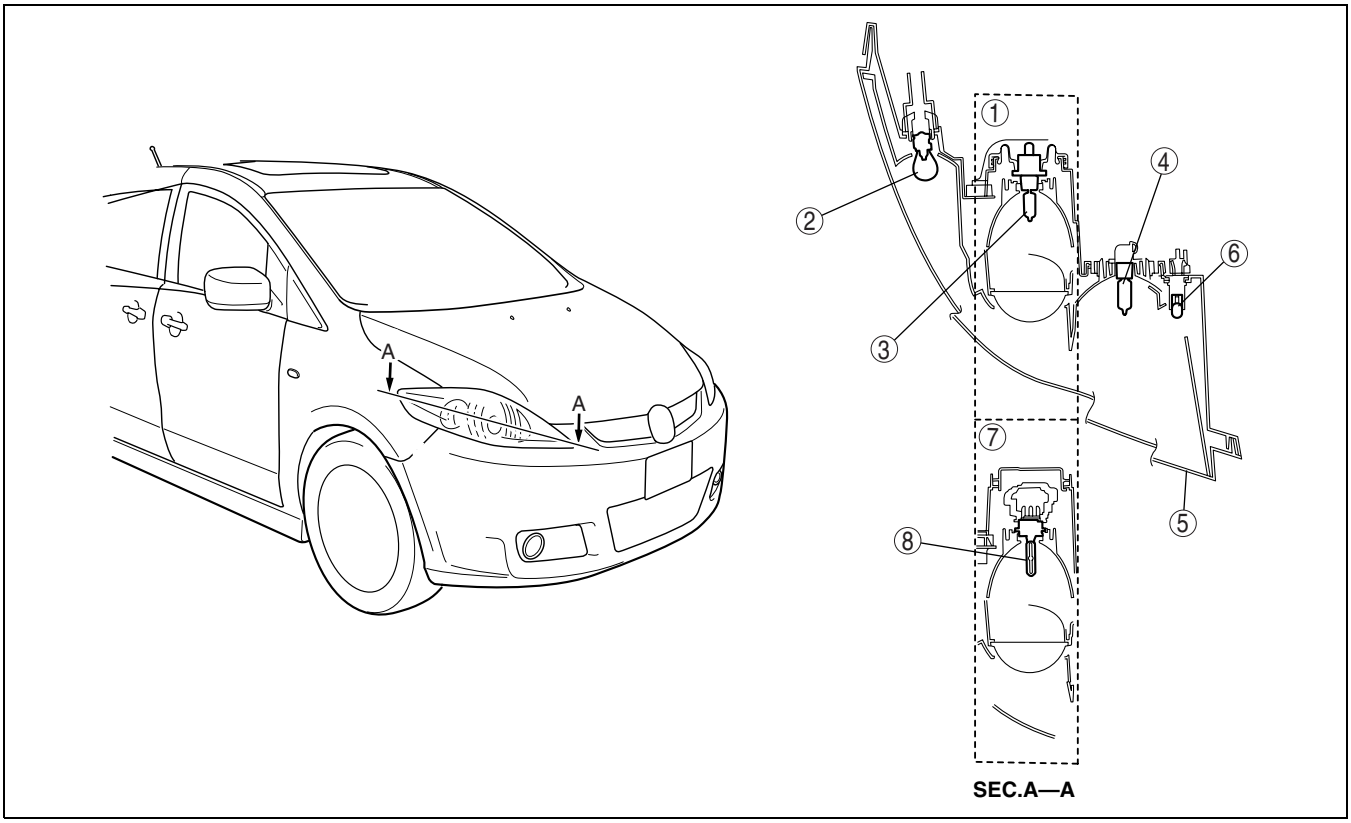
1	Ignition key Illumination
2	Discharge headlight control module
3	Front fog light
4	Front combination light
5	Front side turn light
6	Auto leveling sensor
7	Rear combination light
8	High-mount brake light

9	Cargo compartment light
10	License plate light
11	Rear fog light
12	Map light
13	Interior light
14	Glove compartment light
15	Steering angle sensor
16	Auto leveling control module

FRONT COMBINATION LIGHT CONSTRUCTION

DPE091851060T01

- A headlight with built-in front turn light and parking light has been adopted for design improvement.
- Projector type headlights have been adopted, and these have been incorporated, along with the front turn light and the parking light, into a single unit to reduce size.
- Discharge headlights, with a wide illumination area and projection of white light with a hue similar to sunlight, have been adopted.



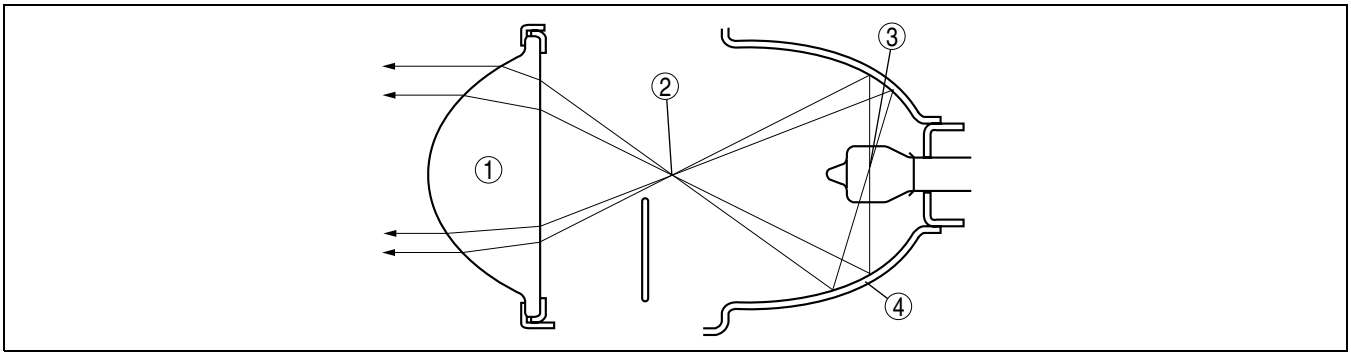
DPE918ZN1002

1	Halogen type
2	Front turn light bulb
3	Headlight bulb (LO)
4	Headlight bulb (HI)

5	Front combination light
6	Parking light bulb
7	Headlight bulb (HI)
8	Discharge headlight bulb (LO)

Projector-type Headlight

- Light emitted from the first focal point is projected off the reflector, gathered at the second focal point, and output through the convex lens.



BHE0918T129

1	Convex lens
2	Second focal position

3	First focal position
4	Reflector

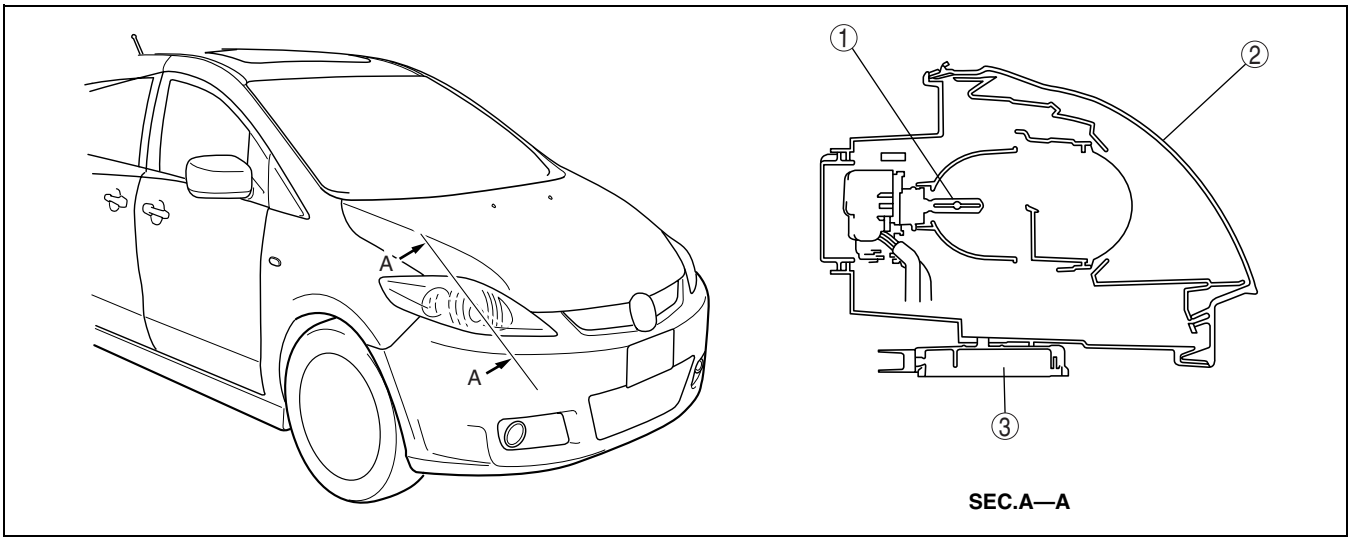
DISCHARGE HEADLIGHT OUTLINE

DPE091851030T06

- Compared with the current model, the illumination area is wider. Moreover, due to projection of white light with a hue similar to sunlight, night visibility while driving has been improved.
- The gas discharge bulb is efficient with low power consumption and high luminosity.

DISCHARGE HEADLIGHT STRUCTURAL VIEW

DPE091851030T07



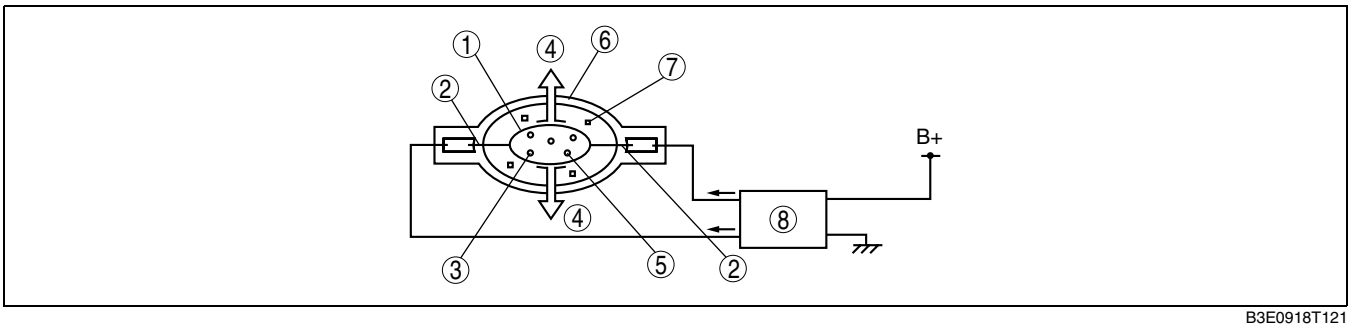
DPE918ZN1003

1	Discharge headlight bulb
2	Headlight
3	Discharge headlight control module

DISCHARGE HEADLIGHT OPERATION

DPE091851030T08

1. A high voltage pulse (alternating current approx. **25,000 V**) travelling from the discharge headlight control module is applied between both discharge headlight bulb terminals, energizing the xenon gas in the bulb.
2. Due to the energizing of the xenon gas, the temperature of the discharge headlight bulb interior increases, vaporizing the mercury and discharging an arc.
3. Due to the mercury and discharging of the arc, the temperature of the discharge headlight bulb interior increases further, metallic iodide is vaporized and separated, and metallic atoms are discharged, producing light.



B3E0918T121

1	Metallic atoms
2	Terminal
3	Metallic iodide
4	Light
5	Mercury
6	Discharge headlight bulb
7	Xenon gas
8	Discharge headlight control module

DISCHARGE HEADLIGHT CONTROL MODULE FUNCTION

DPE091851030T09

- Controls the amount of electrical current while the discharge headlights are on to maintain optimum brightness together with lighting stability.
- The failure detection functions are as follows:
  — Abnormal input detection function

— Abnormal output detection function

Abnormal Input Detection Function
- If the discharge headlight control module input voltage (**9—16 V**) fails to maintain operational voltage (except for the drop in voltage immediately after the headlights are turned on), the discharge headlight control module turns off the headlights for protection and to prevent partial operation.
- The discharge headlight control module turns the headlights back on at resumption of normal operational voltage.

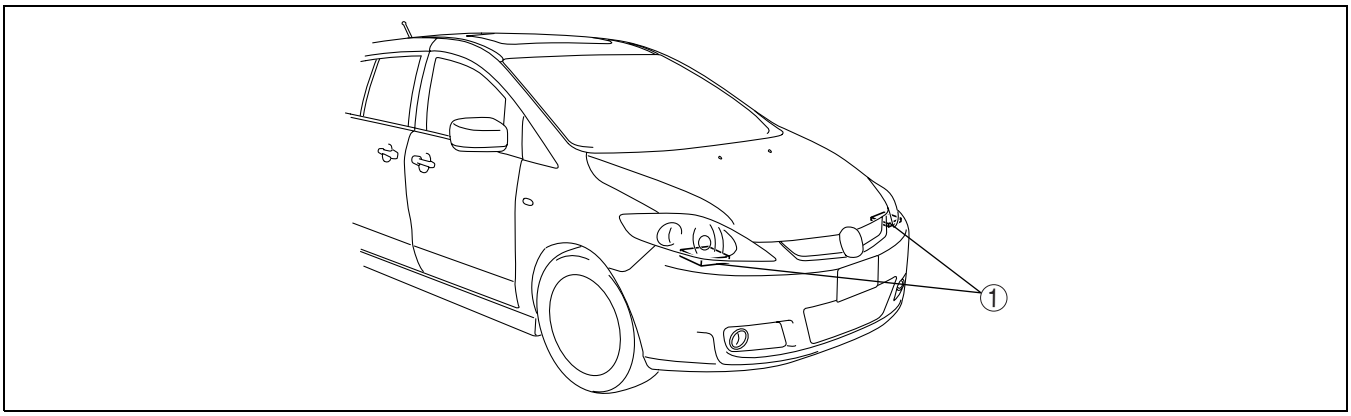
Abnormal Output Detection Function
- If there is an abnormality in the output system (detects an open or GND short circuit in harness), the discharge headlight control module turns off the headlights for protection and to prevent partial operation errors.
- If the discharge headlight control module turns off the headlights due to an abnormality in the output system, the discharge headlight control module will maintain them in the off condition until the light switch is turned again from off to on.

DISCHARGE HEADLIGHT CONTROL MODULE CONSTRUCTION/OPERATION

DPE091851030T10

Warning
- **Incorrect servicing of the discharge headlights could result in electrical shock. Before servicing the discharge headlights, always refer to the discharge headlight service warnings. (See PREMACY Workshop Manual.)**

- Built into the headlight and installed on the headlight lower side.



DPE918ZN1004

1	Discharge headlight control module

- Switches the direct current from the battery to alternating current (**25,000 V**) and optimally controls the current supply output to the bulb.

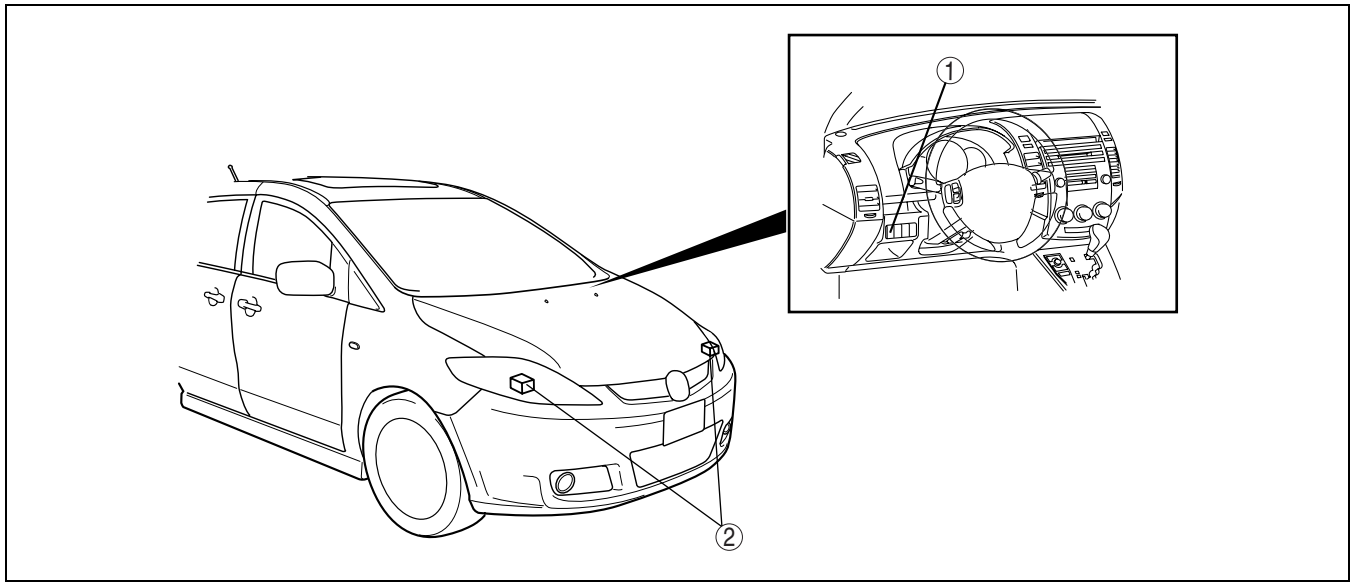
HEADLIGHT LEVELING SYSTEM OUTLINE

DPE091851032T01

- Allows adjustment of the headlight optical axis (changes due to varying cargo and passenger conditions) from the vehicle interior, in order to prevent blinding of oncoming vehicles.
- Paired with discharge headlights which can easily blind oncoming vehicles.
- The headlight optical axis can be freely adjusted by setting the headlight leveling switch between 0-3 ("0" is the maximum upward angle, "3" is the maximum downward angle).

HEADLIGHT LEVELING SYSTEM STRUCTURAL VIEW

DPE091851032T02

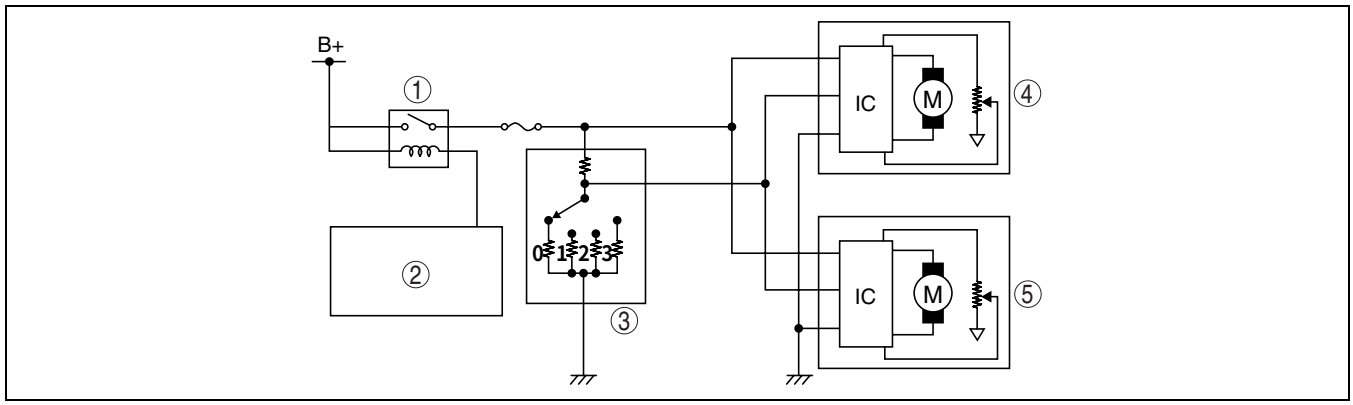


DPE918ZN1005

1	Headlight leveling switch
2	Headlight leveling actuator

HEADLIGHT LEVELING SYSTEM WIRING DIAGRAM

DPE091851032T03



DPE918ZN1006

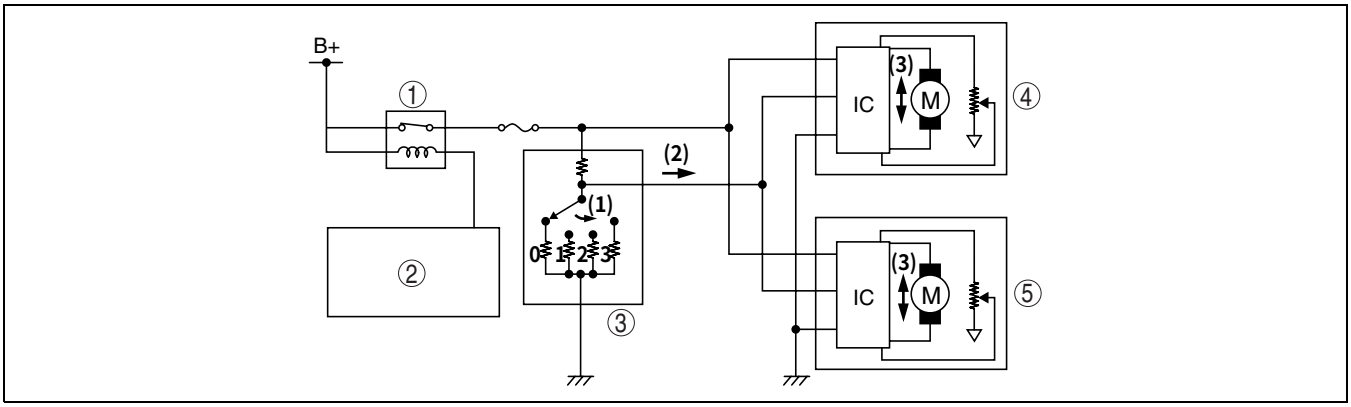
1	Headlight relay
2	Light switch
3	Headlight leveling switch

4	Headlight leveling actuator (LH)
5	Headlight leveling actuator (RH)

HEADLIGHT LEVELING SYSTEM OPERATION

DPE091851032T04

1. Switch the headlight leveling switch position.
2. The headlight level switch position signal is output to the headlight leveling actuator.
3. The motor inside the headlight leveling actuator operates, moving the headlight reflector angle upward or downward, and the headlight beam is adjusted accordingly.



DPE918ZN1007

1	Headlight relay
2	Light switch
3	Headlight leveling switch

4	Headlight leveling actuator (LH)
5	Headlight leveling actuator (RH)

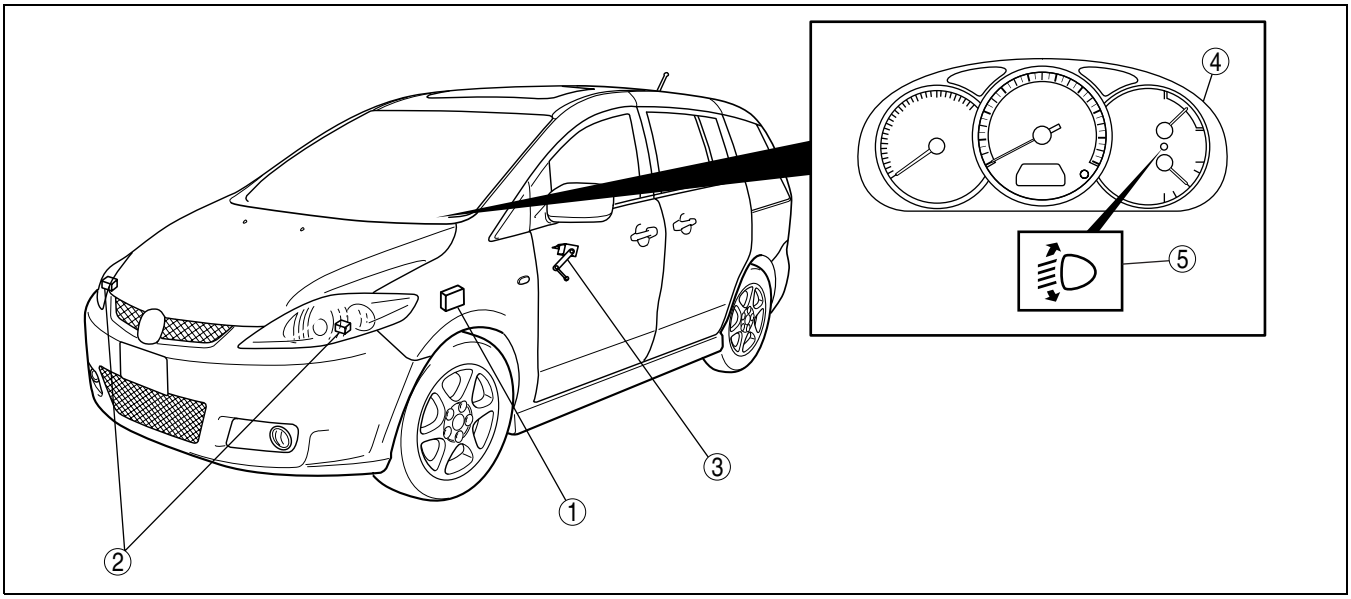
HEADLIGHT AUTO LEVELING SYSTEM OUTLINE

DPE091851031T01

- The optical axis of the headlights adjusts automatically at fixed angles to improve visibility and prevent blinding from oncoming traffic when the vehicle is under varying cargo and passenger weight conditions.

HEADLIGHT AUTO LEVELING SYSTEM STRUCTURAL VIEW

DPE091851031T02



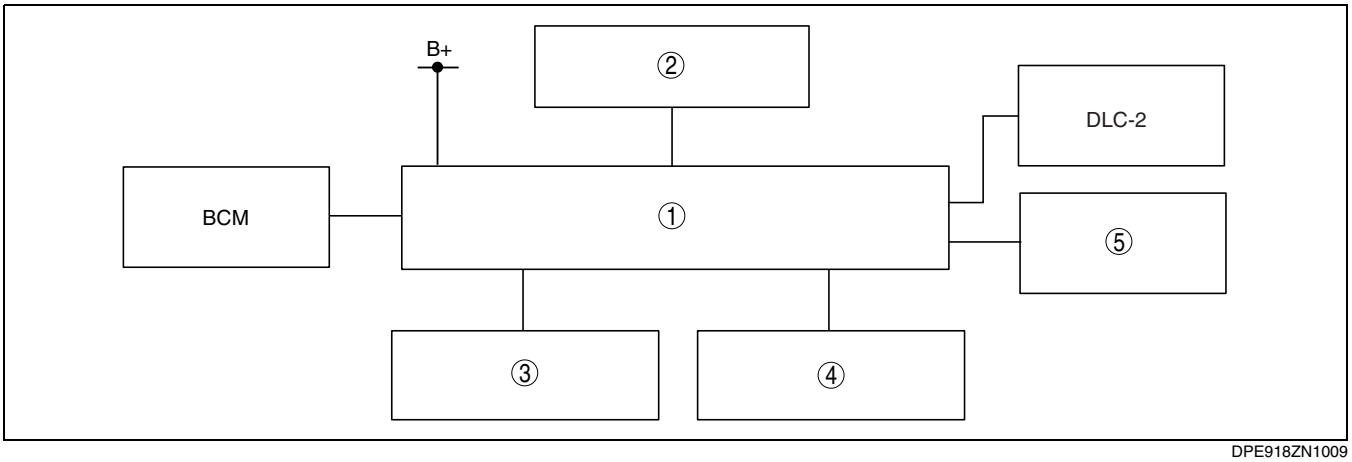
DPE918ZN1008

1	Auto leveling control module
2	Headlight leveling actuator
3	Auto leveling sensor

4	Instrument cluster
5	Auto leveling warning light

HEADLIGHT AUTO LEVELING SYSTEM DIAGRAM

DPE091851031T03



DPE918ZN1009

1	Auto leveling control module
2	Auto leveling sensor
3	Headlight leveling actuator (LH)

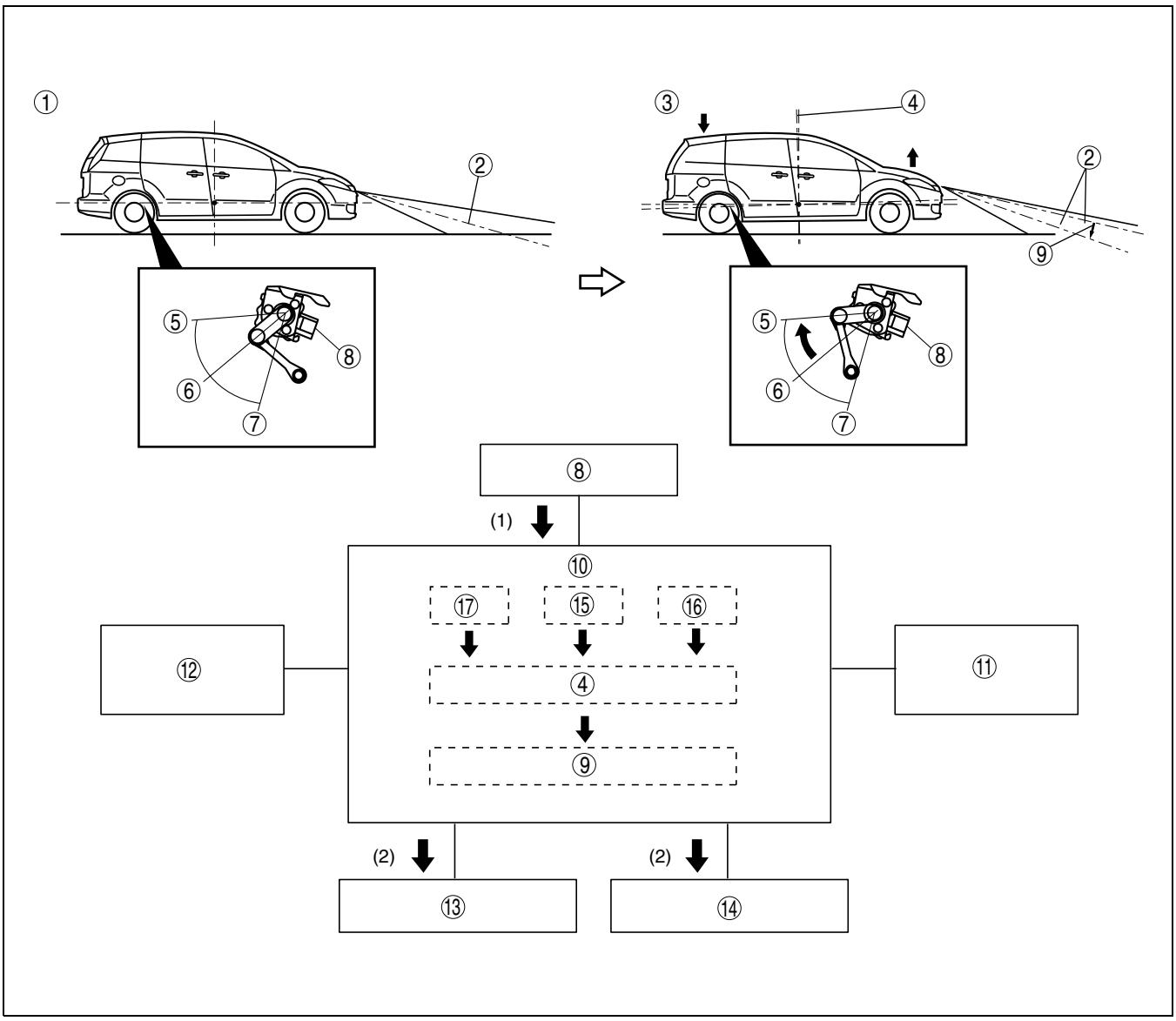
4	Headlight leveling actuator (RH)
5	Instrument cluster

HEADLIGHT AUTO LEVELING SYSTEM OPERATION

DPE091851031T04

Varying Passenger and Cargo Conditions Operation

1. According to the fluctuation of the suspension, the auto leveling sensor installed in the rear of the vehicle send a signal to the auto leveling control module.
2. When the signal input from the auto leveling sensor is detected, the auto leveling control module verifies the vehicle attitude, then calculates the amount of optical axis adjustment.When the headlights are on, the auto leveling control module compares the actual and optimal positions of the reflector and outputs a control signal to the headlight leveling actuator.



DPE918ZN1010

1	Zero setting
2	Optical axis
3	Large passenger or cargo weight
4	Vehicle attitude
5	Low
6	Zero reference
7	High
8	Auto leveling sensor
9	Optical axis adjustment amount

10	Auto leveling control module
11	Instrument cluster (Vehicle speed signal)
12	BCM (Headlight on signal)
13	Headlight leveling actuator (LH)
14	Headlight leveling actuator (RH)
15	Voltage signals
16	Vehicle speed signal
17	Headlight on signal

Operation When Driving

1. If the auto leveling control module detects the vehicle is moving at a constant vehicle speed of **8 km/h or more** for **4 s** while the headlights are on, the average value of the vehicle attitude during the period is calculated and the optical axis is adjusted.

AUTO LEVELING CONTROL MODULE FUNCTION

DPE091851031T05

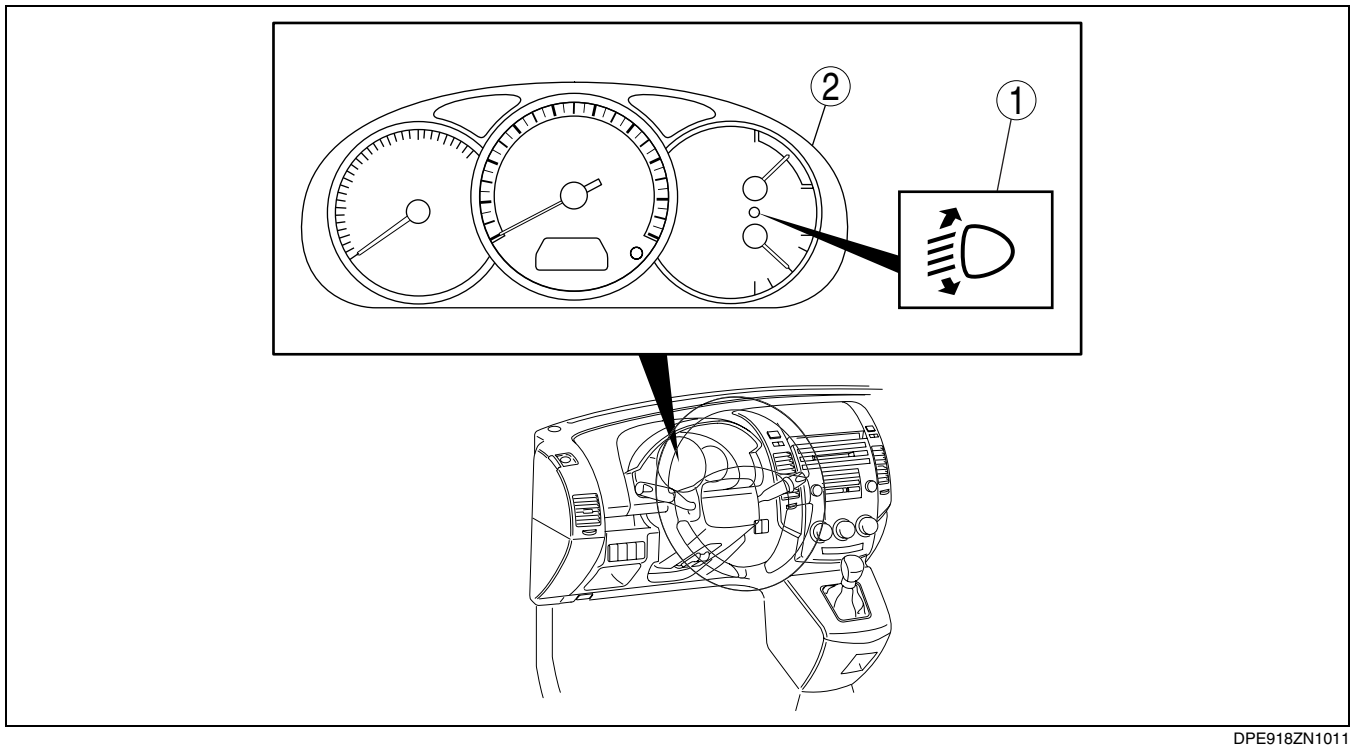
- In order to prevent blinding from oncoming traffic and to improve visibility, the auto leveling control module automatically controls the optical axis direction for optimal illumination based on signals input from the BCM and the auto leveling sensor.
- If an error signal from the auto leveling sensor or excessive power supply voltage is detected, the auto leveling warning light is illuminated to warn the driver of a malfunction.

Fail-safe Function

- The fail-safe function operates when the auto leveling control module detects a malfunction. It also warns the driver of a malfunction by illuminating the indicator light as shown in the fail-safe function table.
- The fail-safe function controls each part as shown on the fail-safe function table.

Note

- When the ignition switch is turned to the ON position, the auto leveling control module checks the auto leveling warning light bulb and illuminates the bulb for **3 s** to indicate that there is no malfunction.



DPE918ZN1011

1	Auto leveling warning light
2	Instrument cluster

Fail-safe Function Table

Item	Test condition		Fail-safe function	Indicator light	Cancel condition
Auto leveling sensor	Signal error	Auto leveling sensor signal voltage of **0.49 V or less**, or **4.43 V or more** detected **3 times** within **38.4 ms**	Returns headlights to the initial set position if they are pointing higher than initial set position. Fixes them in position where the malfunction is determined if pointing lower than the initial set position.	Illuminated*1	Continuous normal operation for **1 s** or ignition switch is turned off and then to the ON position again.
Auto leveling control module	Malfunction detected by auto leveling control module		Resets microcomputer in auto leveling control module.	Illuminated	Ignition switch is turned off and then to the ON position again.
Battery voltage	Excessive power supply voltage	Battery voltage of **10 V or less**, or **16 V or more** detected	Fixes headlights in position where excessive power supply voltage was determined.	Not illuminated	When battery voltage between **10-16 V** is detected, or the ignition switch is turned off and then to the ON position again.

Item	Test condition	Fail-safe function	Indicator light	Cancel condition
Headlight leveling actuator	Headlight leveling actuator is shorted to ground, or short circuited	Stopped at optical axis position when malfunction was detected.	Illuminated	Normal status continues for **1 s or more**.

*1 : Indicator light illuminates only when either malfunction condition is detected two consecutive times.

AUTO LEVELING CONTROL MODULE INITIALIZATION OUTLINE

DPE091851031T07

- The auto leveling control module records the vehicle height while there are no occupants based on the signal voltage sent from the auto leveling sensor to the auto leveling control module when the vehicle is unoccupied.
- Perform initialization after performing any of the following procedures:
  - — Front combination light replacement
  - — Auto leveling control module replacement
  - — Auto leveling sensor removal/installation
  - — Instrument cluster replacement
  - — BCM replacement
  - — Suspension replacement or work that effects vehicle height

AUTO LEVELING CONTROL MODULE CONSTRUCTION/OPERATION

DPE091851031T06

- The auto leveling control module is located inside of the driver's side dashboard.
- The auto leveling control module verifies changes in vehicle speed and attitude based on signal inputted from the BCM and the auto leveling sensor. The control module then calculates the optimal direction for the optical axis.
- Based on the calculation of the optical axis adjustment amount, the auto leveling control module controls the headlight leveling actuator.

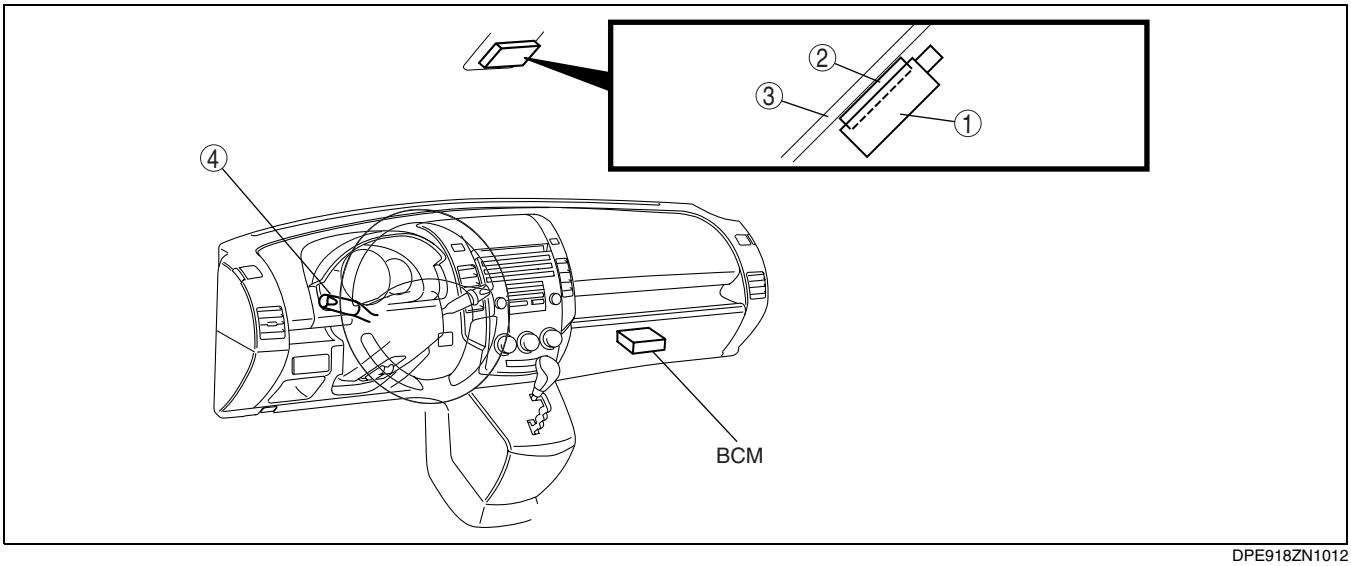
AUTO LIGHT SYSTEM OUTLINE

DPE091866500T01

- An auto light system that automatically and optimally illuminates and turns off the headlights in any situation according to the level of light above and in front of the vehicle has been adopted.

AUTO LIGHT SYSTEM STRUCTURAL VIEW

DPE091866500T02



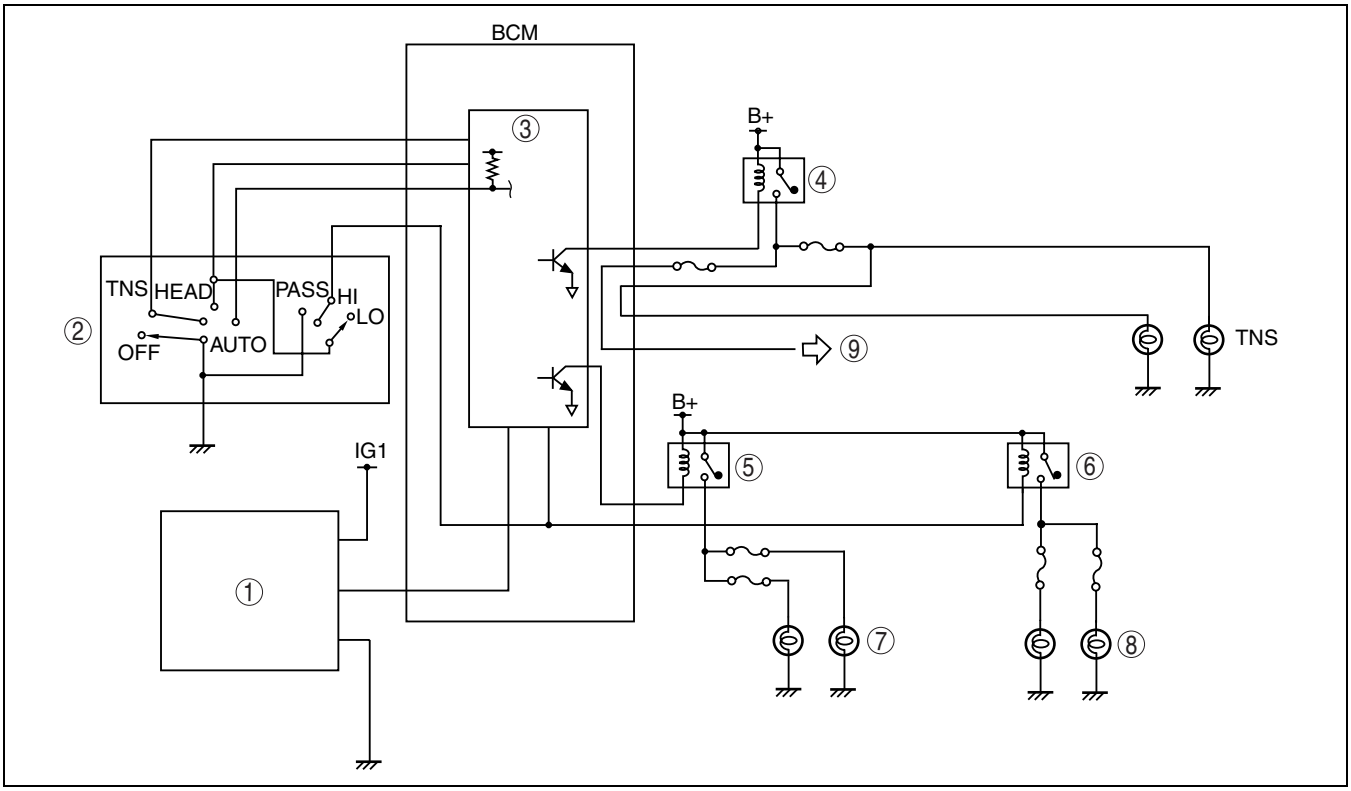
DPE918ZN1012

1	Auto-light sensor
2	Lens sensor

3	Windshield
4	Light switch

AUTO LIGHT SYSTEM WIRING DIAGRAM

DPE091866500T03



DPE918ZN1013

1	Auto light sensor
2	Light switch
3	Microcomputer
4	TNS relay
5	Headlight LO relay

6	Headlight HI relay
7	Headlight (low-beam)
8	Headlight (high-beam)
9	To illumination light

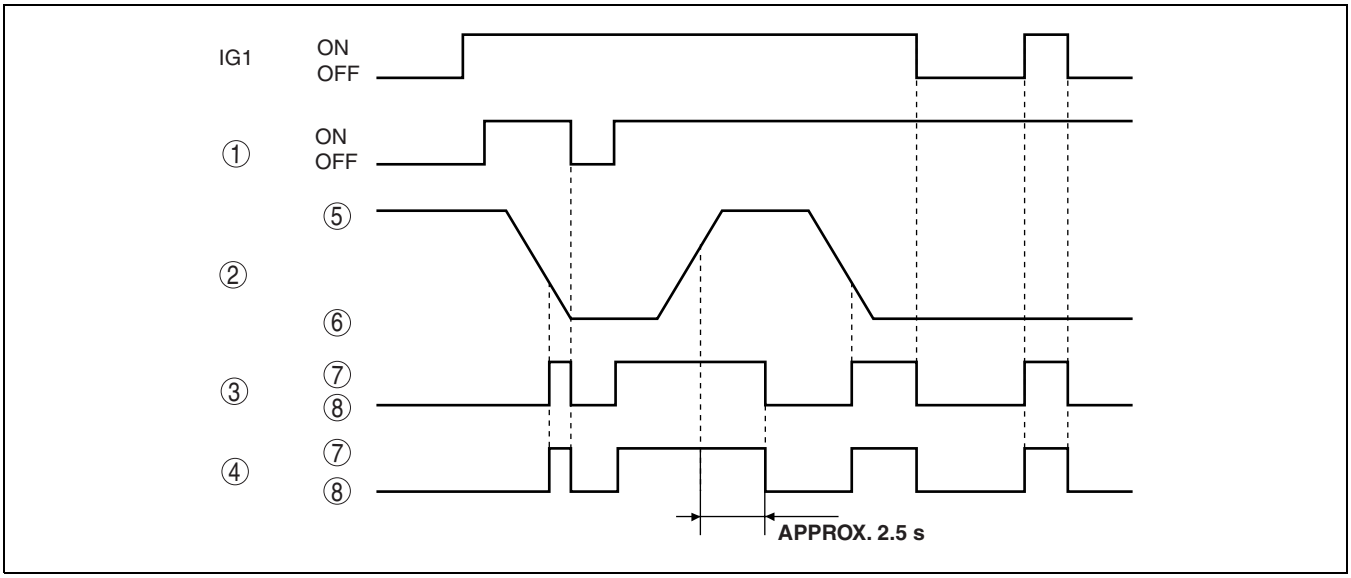
AUTO LIGHT SYSTEM OPERATION

DPE091866500T04

Note
- The illumination intensity which operates the auto light system is approximate and a reference. It varies depending on conditions in the surrounding area (Weather, reflection off buildings).

Operation
Illumination condition
- When the ignition switch is turned to the ON position and the light switch is in the AUTO position, the headlight and tail number side lights (TNS) illuminate under the following condition:
  — The forward and upward illumination level sensors detect **approx. 2000 lux or less**.

Lights off condition
- When the light switch is in the AUTO position, the headlights and TNS turn off under the following conditions:
  — The forward and upward illumination level sensors detect **approx. 4000 lux or more for approx. 2.5 s**.
  — The ignition switch is off.
  — The light switch is in the OFF position.



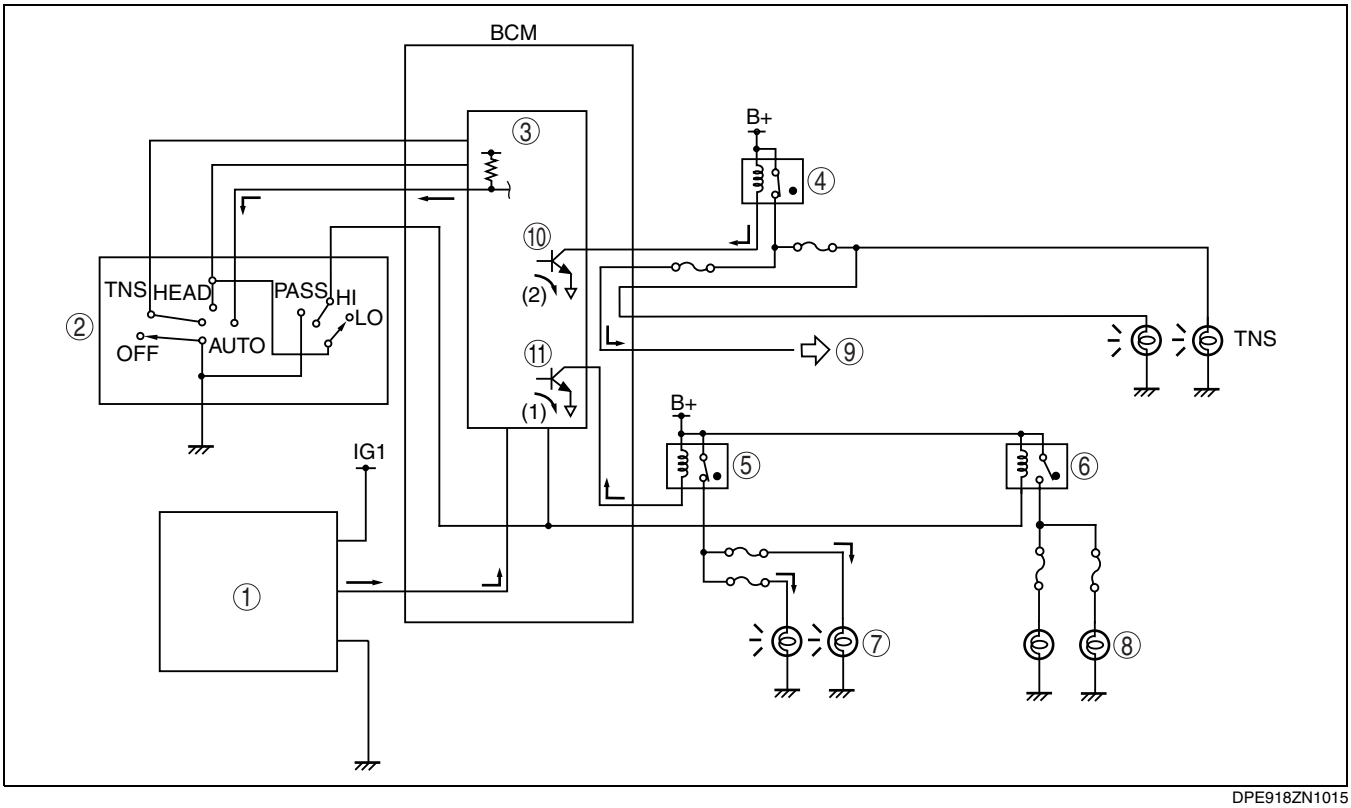
B3E0918T003

1	Light switch (AUTO position)
2	Illumination level
3	Headlight
4	TNS and illumination lights

5	Bright
6	Dark
7	Illuminated
8	Not illuminated

Illumination operation

1. When the light switch is in the AUTO position the illumination sensors in the auto light sensor (installed in the windshield) detect the illumination level above and in front of the vehicle.
2. If the upward or forward illumination sensors detect **approx. 2000 lux or less** in front of and above the vehicle, a headlight illumination control signal is sent to the BCM.
3. The microcomputer in the BCM receives the control signal and sends currents (1) and (2) to transistors A and B respectively, causing the transistors to turn on.
4. When transistors A and B turn on, the headlight LO and TNS relays also turn on. At the same time, the headlights (low-beam) and TNS illuminate.



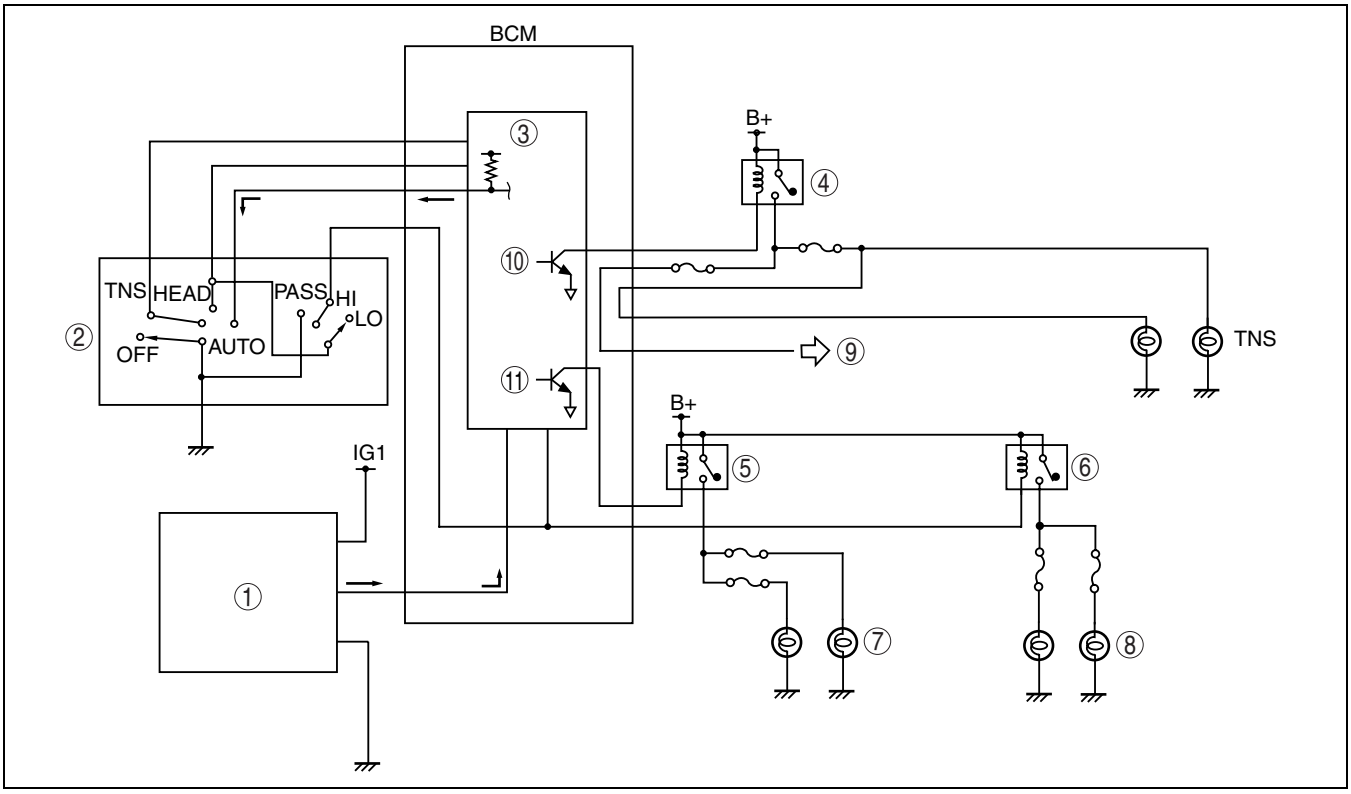
DPE918ZN1015

1	Auto light sensor
2	Light switch
3	Microcomputer
4	TNS relay
5	Headlight LO relay
6	Headlight HI relay

7	Headlight (low-beam)
8	Headlight (high-beam)
9	To illumination light
10	Transistor B
11	Transistor A

Lights off operation

1. When the light switch is in the AUTO position the illumination level sensors in the auto light sensor (installed in the windshield) detect the illumination level above and in front of the vehicle.
2. If the upward and forward illumination level sensor detect **approx. 4000 lux or more for 2.5 s** in front of and above the vehicle, a headlight off control signal is sent to the BCM.
3. The microcomputer in the BCM receives the control signal and turns off the currents to transistors A and B, causing the headlight (low-beam) and TNS relays to also turn off.
4. When the headlight LO and TNS relays turn off, the headlights (low-beam) and TNS also turn off.



DPE918ZN1016

1	Auto light sensor
2	Light switch
3	Microcomputer
4	TNS relay
5	Headlight LO relay
6	Headlight HI relay

7	Headlight (low-beam)
8	Headlight (high-beam)
9	To illumination light
10	Transistor B
11	Transistor A

09

AUTO LIGHT SENSOR FUNCTION

DPE091866500T05

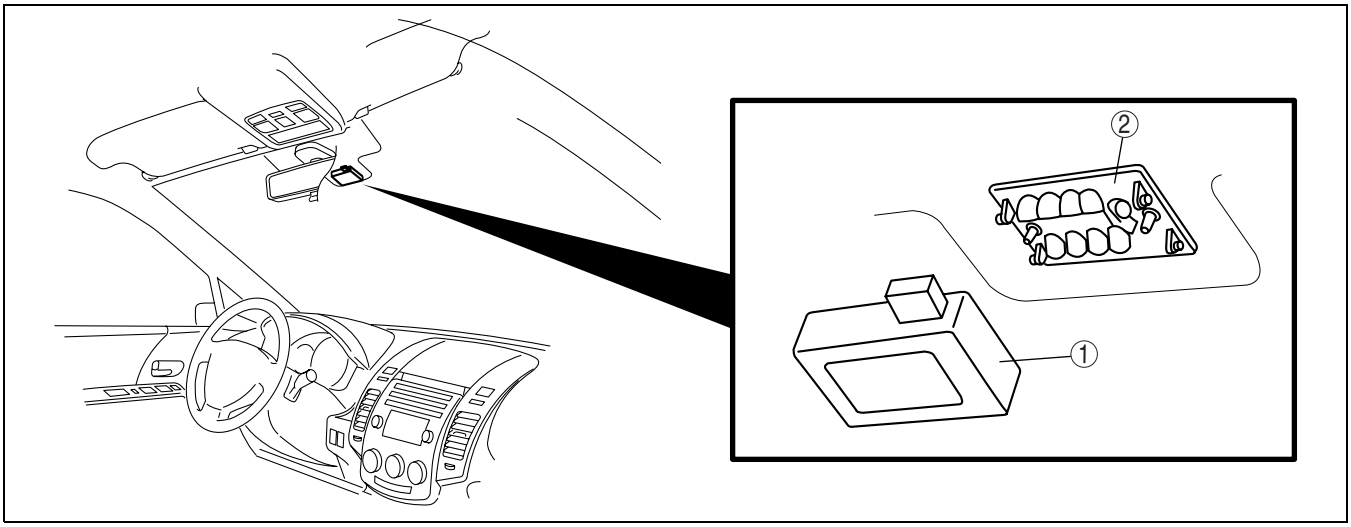
- The auto light sensor contains upward and forward illumination sensors which detect the level of illumination above and in front of the vehicle respectively.
- If the forward illumination level sensor detects a bright level of illumination in front of the vehicle and the upward illumination level sensor detects a dark level when the headlights are on, the microcomputer in the auto light sensor prepares for turning off the lights. If both illumination level sensors detect that is necessary to turn off the headlights, they are turned off with optimal timing.
- If the forward illumination level sensor detects a dark level of illumination in front of the vehicle and the upward illumination level sensor detects a bright level when the headlights are off, the microcomputer in the auto light

sensor prepares for turning on the lights If both illumination level sensors detect that is necessary to turn on the headlights, they are turned on with optimal timing.

AUTO LIGHT SENSOR OPERATION

DPE091866500T06

- Installed on the underside of the rearview mirror (windshield center) and integrated with the rain sensor as a single unit.



DPE918ZN1017

1	Auto-light sensor	2	Lens sensor

- The upward and forward illumination level sensors which detect the level of illumination above and in front of the vehicle respectively are built-in.

Function Description
Illumination level adjustment function

- The illumination level sensitivity can be switched between two levels using the WDS or equivalent.

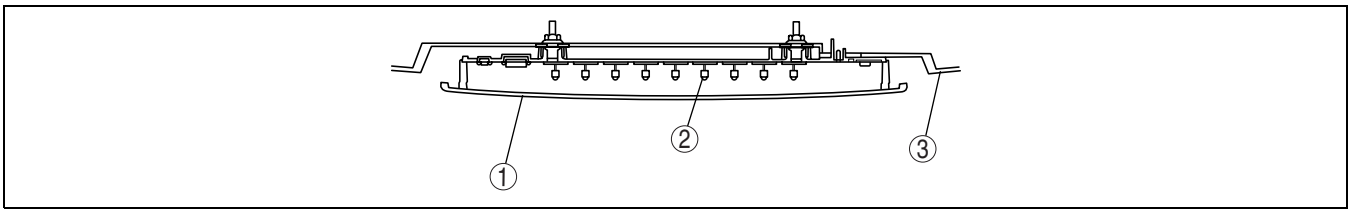
On-board diagnostic function

- If the voltage input to the auto-light sensor is not within the operational voltage (**approx. 9—16 V**), the BCM is informed of the malfunction and a BCM DTC is detected.

HIGH-MOUNT BRAKE LIGHT CONSTRUCTION

DPE091851580T01

- Installed to the liftgate with nuts.
- Using LED has resulted in reduced energy consumption.



DPE918ZN1018

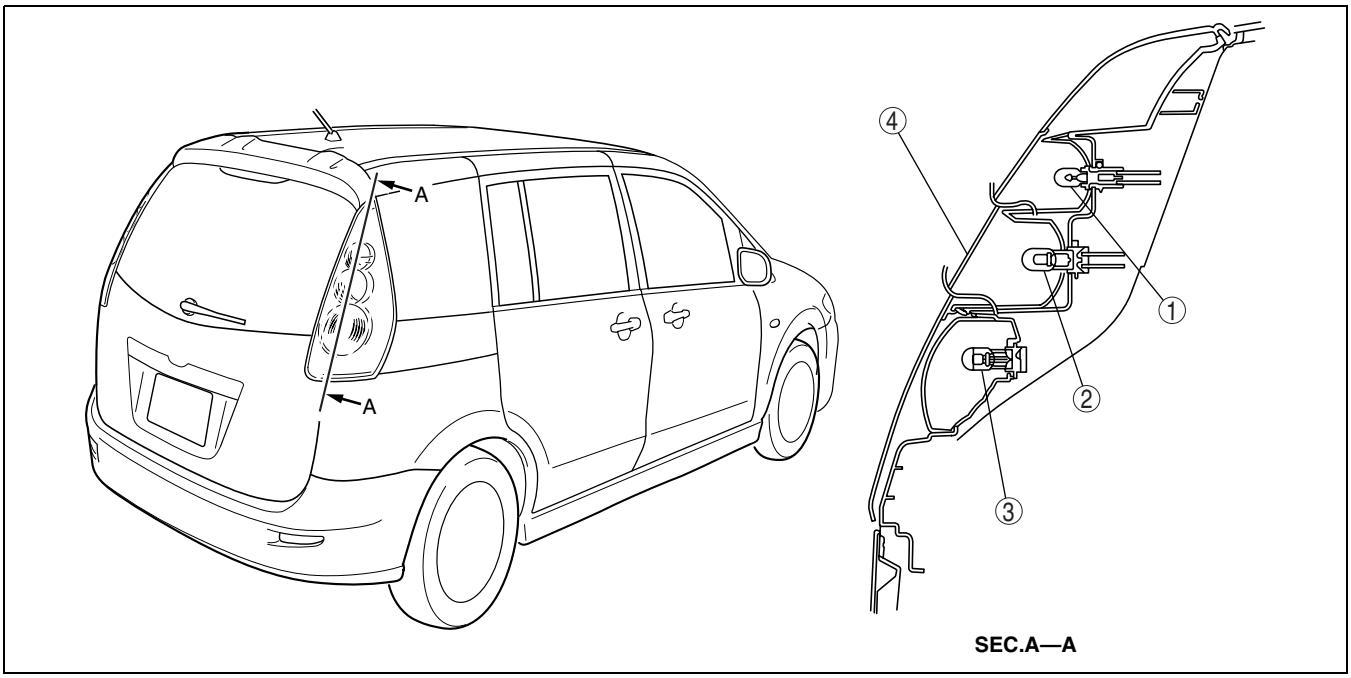
1	High-mount brake light	3	Liftgate
2	High-mount brake light bulb		

REAR COMBINATION LIGHT CONSTRUCTION

DPE091851150T01

- A step reflector that diffuses and reflects the light of the rear combination light bulbs, has been adopted. A flat, uncut lens has been adopted to control illumination distribution.

- A round reflector for the rear combination lights has been adopted to improve design.



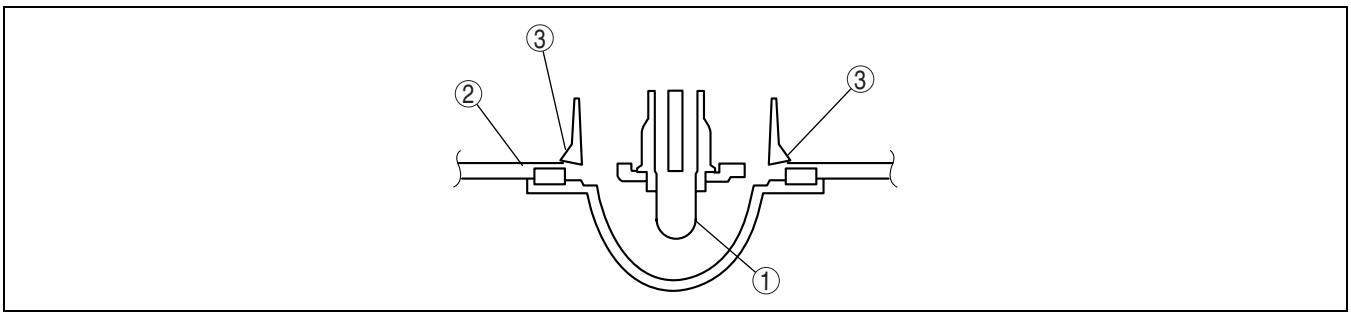
DPE918ZN1019

1	Back-up light bulb	3	Brake light/ Taillight bulb
2	Rear turn light bulb	4	Rear combination light

LICENSE PLATE LIGHT CONSTRUCTION

DPE091851270T01

- Installed to the liftgate with the connecting tabs



DPE918ZN1020

1	License plate light bulb	3	Tab
2	Liftgate		

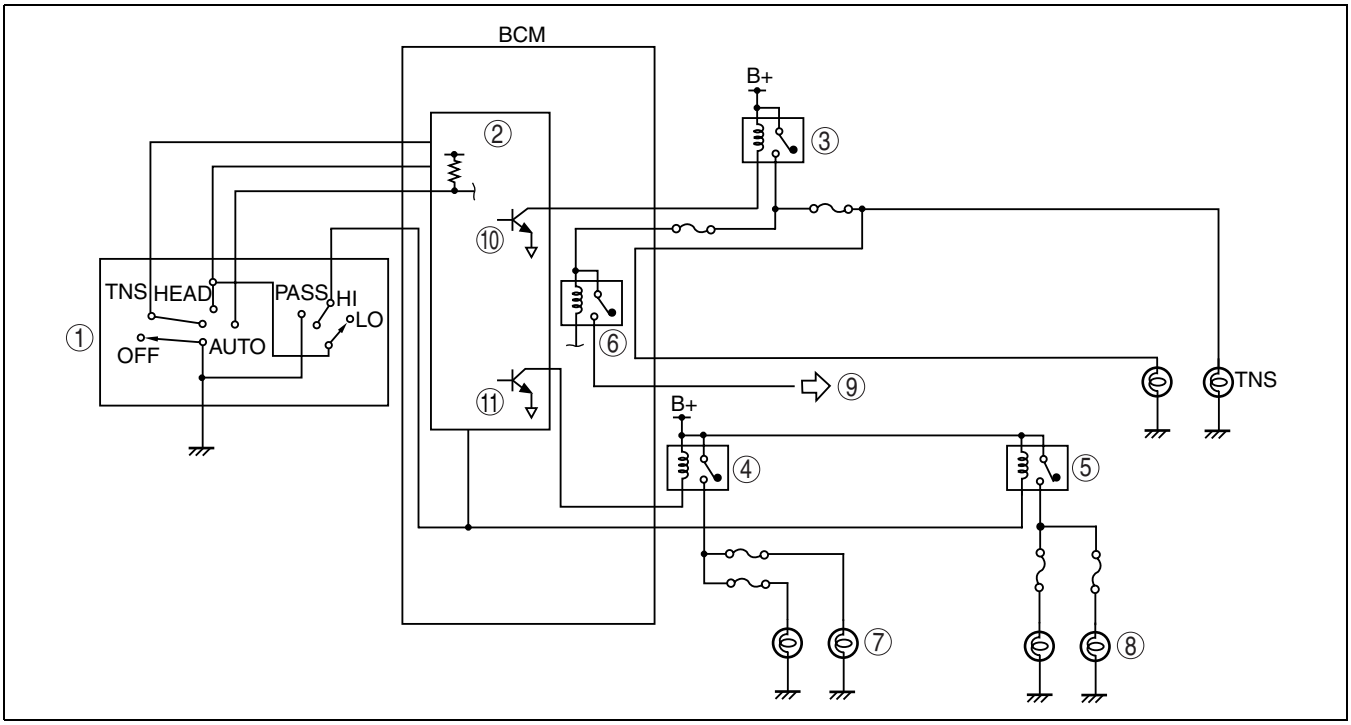
RUNNING LIGHT SYSTEM OUTLINE

DPE091800200T01

- The running light system automatically operates the low-beam headlights when the ignition switch is turned to the ON position.

RUNNING LIGHT SYSTEM WIRING DIAGRAM

DPE091800200T02



DPE918ZN1025

1	Light switch
2	Microcomputer
3	TNS relay
4	Headlight LO relay
5	Headlight HI relay
6	Runinglight relay

7	Headlight (low-beam)
8	Headlight (high-beam)
9	To illumination light
10	Transistor B
11	Transistor A

RUNNING LIGHT SYSTEM OPERATION

DPE091800200T03

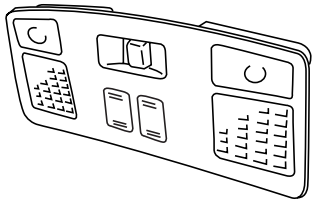
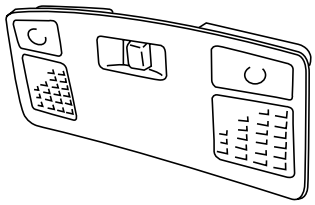
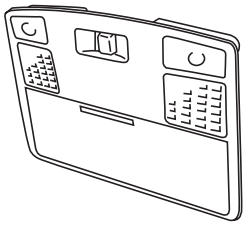
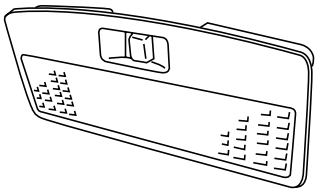
Operation condition (Input signal)			Operation condition of illumination (Output signal)			
Ignition switch	**Headlight switch**	**Flash-to-pass switch**	**Low-beam headlight**	**High-beam headlight**	**TNS**	**Illumination light**
ON	OFF	OFF	ON	OFF	ON	OFF
	TNS		OFF	OFF	ON	ON
	Headlight: LOW		ON	OFF	ON	ON
	Headlight: HIGH		ON	ON	ON	ON
	OFF	ON	ON	ON	ON	OFF

INTERIOR LIGHTING SYSTEM CONSTRUCTION

DPE091851311T01

- The map and interior lights settings are controlled by the interior light control system.

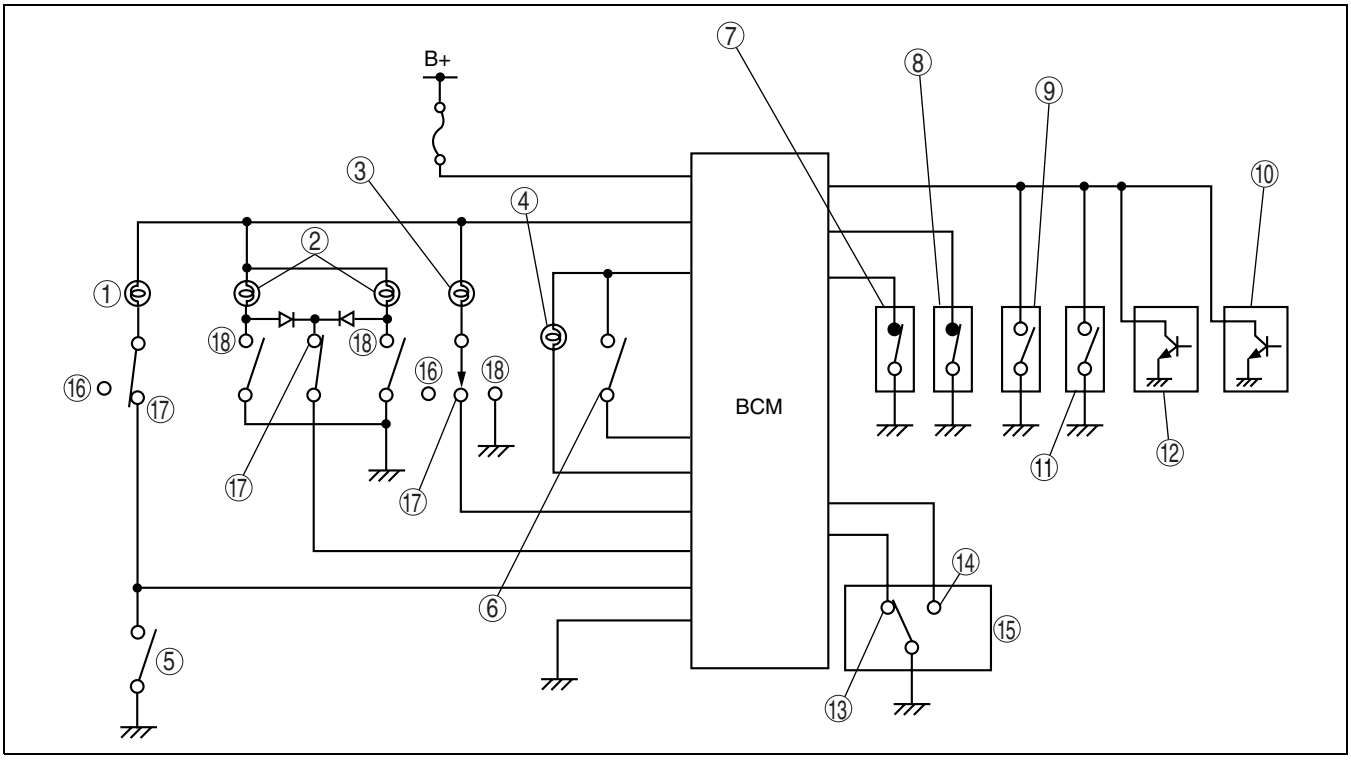
×: Equipped

Type		Installation position	Interior light control system	Roof
Map light		Front	×	Sunroof
				Normal roof
				
Interior light		Rear		Both

ROOM LIGHT CONTROL SYSTEM FUNCTION

DPE091851311T02

- The BCM changes the illumination condition and illumination level of the map light (Door position), and the interior light (Door position) according to whether the doors are opened or closed.



DPE918ZN1021

1	Cargo compartment light
2	Map light
3	Interior light
4	Ignition key illumination
5	liftgate latch switch
6	Key reminder switch
7	Front door latch switch (RH)
8	Front door latch switch (LH)
9	Rear door latch switch (LH)

10	Power sliding door control unit (RH)
11	Rear door latch switch (RH)
12	Power sliding door control unit (LH)
13	Lock
14	Unlock
15	Door lock-link switch
16	OFF
17	DOOR
18	ON

ROOM LIGHT CONTROL SYSTEM OPERATION

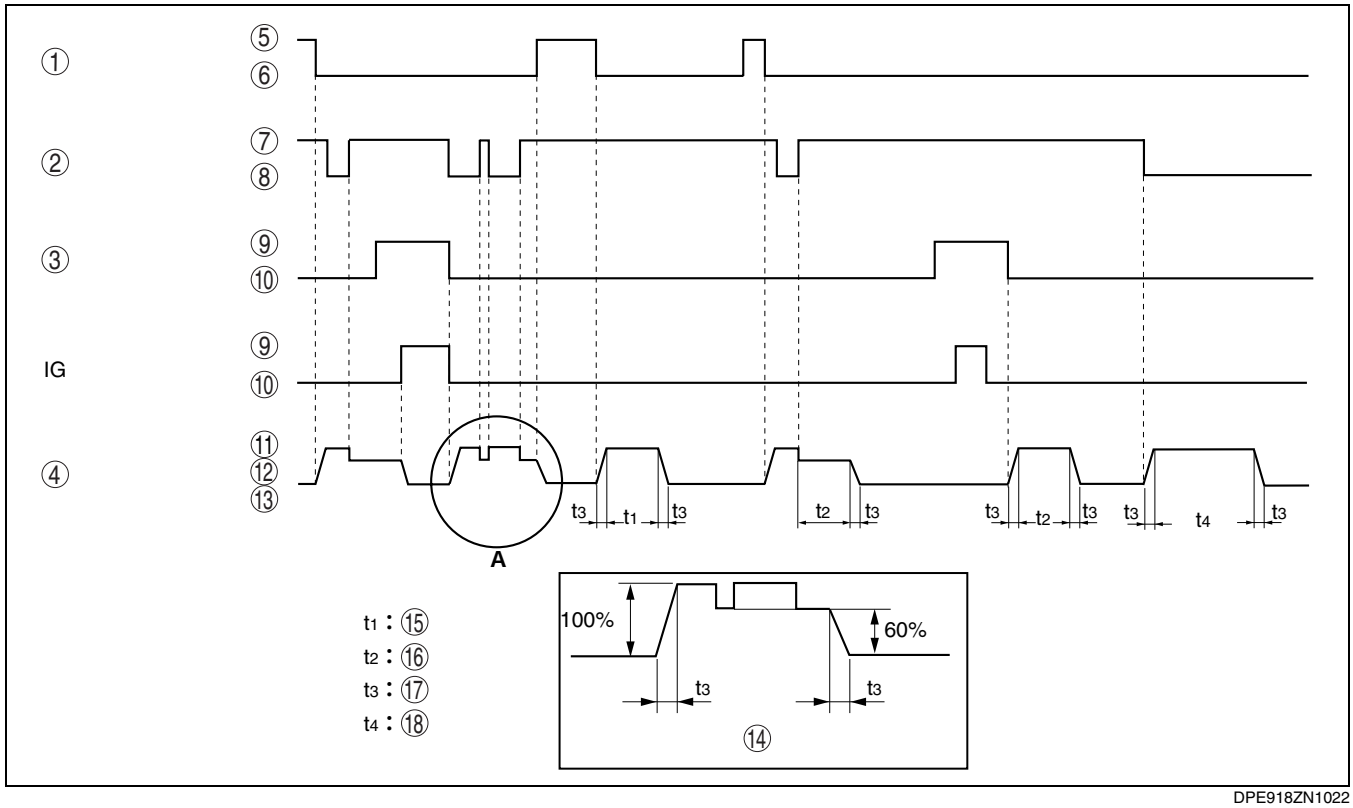
DPE091851311T03

Conditions before operation (Conditions which must be satisfied)	Operation condition	Interior light		Cancel condition (When any condition satisfied)
		Illumination time	Brightness	
• Turn the ignition switch to the LOCK or ACC position. • All doors are closed. (All door latch switches on, door switches off)	Any door open. (Any door latch switch off, door switch on)	Approx.30 min	100 %	• All doors are closed except liftgate. (All door latch switches on, door switches off) • After illumination time.*1
• Key extracted from steering lock. (Key reminder switch is off.) • All doors are closed. (All door latch switches on, door switches off) • Driver's door lock knob is locked. (Door lock-link switch is in lock position.)	Driver's door lock knob is unlocked. (Door lock-link switch is in unlock position.)	Approx.30 s	100 %	• Turn the ignition switch to the ON position. • Any door open. (Any door latch switch off, door switch on) • Driver's door lock knob is locked. (Door lock-link switch is in lock position.) • After illumination time.*1

Conditions before operation (Conditions which must be satisfied)	Operation condition	Interior light		Cancel condition (When any condition satisfied)
		Illumination time	Brightness	
• Key inserted into steering lock. (Key reminder switch is on.) • All doors are closed. (All door latch switches on, door switches off)	Key extracted from steering lock. (Key reminder switch is off.)	Approx.15 s	100 %	• Turn the ignition switch to the ON position. • Any door open. (Any door latch switch off, door switch on) • Driver's door lock knob is locked. (Door lock-link switch is in lock position.) • After illumination time.*1
• Turn the ignition switch to the LOCK or ACC position. • Any door is open. (Any door latch switch off, door switches on) • Driver's door lock knob is unlocked. (Door lock-link switch is in unlock position.)	All doors are closed. (All door latch switches on, door switches off)	Approx.15 s	60 %	• Turn the ignition switch to the ON position. • Any door open. (Any door latch switch off, door switch on) • Driver's door lock knob is locked. (Door lock-link switch is in lock position.) • After illumination time.*1

*1 : After interior light is turned off according to this cancel condition, the light will illuminate again when either of the following conditions are satisfied:

- After all doors are closed, then any door is reopened. (After all door latch switches are on and door switches are off, any door latch switch is off and door switch is on)
- After all doors are closed, then ignition switch is at the ON position. (IG ON)



DPE918ZN1022

1	Door lock-link switch
2	Door
3	Key reminder switch
4	Map light/Interior light
5	Lock
6	Unlock
7	CLOSE
8	OPEN

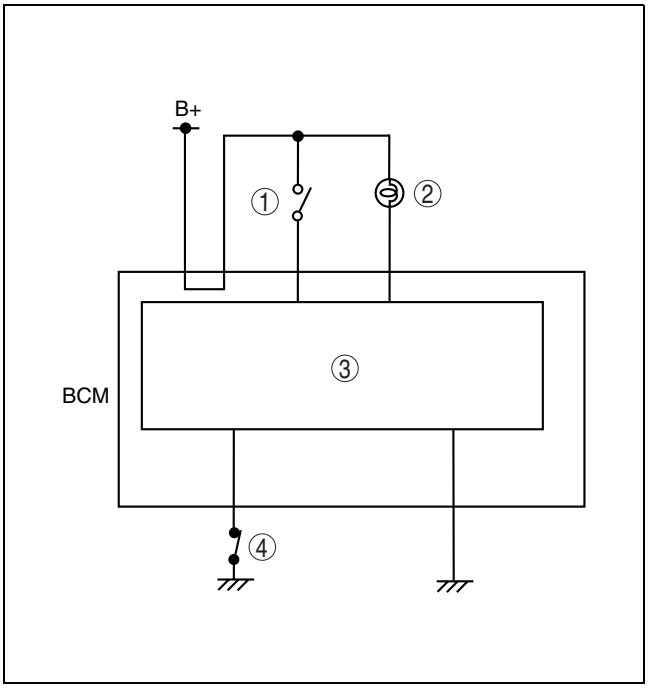
9	ON
10	OFF
11	100%
12	60%
13	0%
14	View A
15	Approx. 30 s
16	Approx. 15 s

17	Approx. 1 s
18	Approx. 30 min

IGNITION KEY ILLUMINATION FUNCTION

DPE091851311T04

- The illumination time of the ignition key illumination is controlled by the microcomputer in the BCM.
- When the ignition switch is in the LOCK position (or ACC) position and the driver's door is open, the ignition key illumination is illuminated.



DPE918ZN1023

1	Key reminder switch
2	Ignition key illumination bulb
3	Microcomputer
4	Front door latch switch (Driver's side)

IGNITION KEY ILLUMINATION OPERATION

DPE091851311T05

Illumination Condition

- The ignition key illumination glows under all of the following conditions:
  - — Driver-side door is open. (Driver-side latch switch is on.)
  - — Ignition switch is in the LOCK or ACC position. (IG off)

Cancel Condition

- The ignition key illumination goes out under any of the following conditions:
  - — 15 s have elapsed since the driver's door was closed (After driver's door latch switch is on).
  - — Ignition switch is in the ON position. (IG on)
  - — With all the doors closed, a lock signal from the keyless entry is received.
  - — Approx. 30 min have elapsed since the driver's door open (Driver's door latch switch is off)

STEERING ANGLE SENSOR FUNCTION

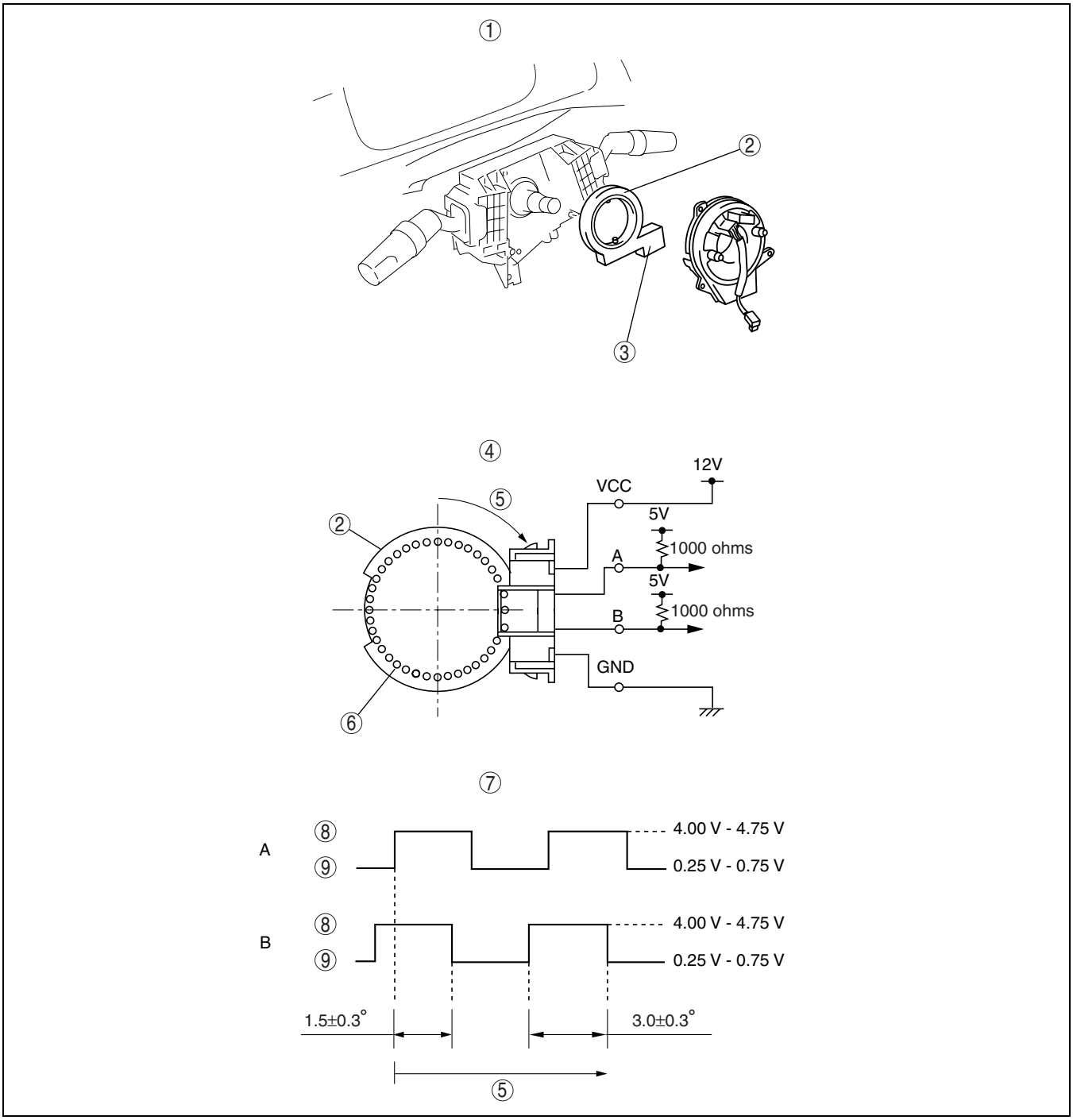
DPE091866120T01

- The steering angle sensor is built into the combination switch and transmits steering angle (amount of position change) signals to each unit.

STEERING ANGLE SENSOR CONSTRUCTION

DPE091866120T02

- The steering angle sensor has a sensor unit with a photo transistor positioned opposite an LED straddling a slitted disc that moves together with the steering wheel.
- As the disc moves with the steering wheel, the LED light received by the photo transistor varies due to the slits on the disc. The photo transistor reads the variation and outputs a signal. Each unit calculates the steering angle and speed based on the phase difference between sensor A and B outputs.



DPE918ZN1024

1	Installation position
2	Disc
3	Sensor unit
4	Structural view
5	Clockwise rotation

6	Slit
7	Output wave pattern
8	High
9	Low

09–19 WIPER/WASHER SYSTEM

WIPER/WASHER OUTLINE

DPE091900000T01

Design Improvement	• A pop-up type headlight cleaner has been adopted in the front bumper.
Improved convenience	• A washer fluid-level sensor is installed in the windshield washer tank.
Improved marketability	• Auto wiper system adopted which enables fully automatic windshield wiper operation

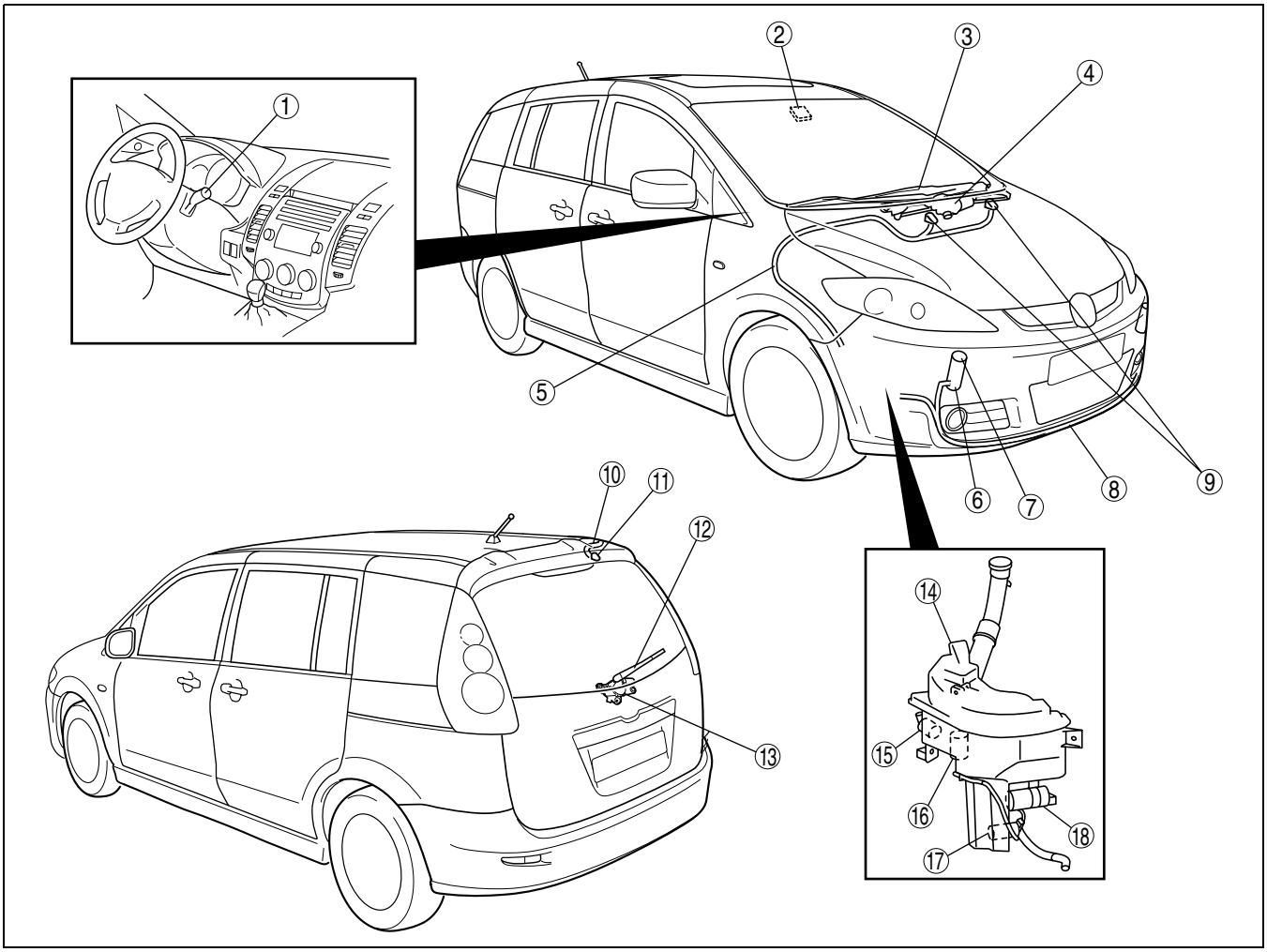
WASHER TANK SPECIFICATION

DPE091900000T10

Item	Vehicles with the headlight cleaner	Vehicles without the headlight cleaner
Washer tank capacity	4.0 L {4.2 US qt, 3.5 Imp qt}	2.5 L {2.6 US qt, 2.2 Imp qt}

WIPER/WASHER SYSTEM STRUCTURAL VIEW

DPE091900000T03



DPE919ZW1100

1	Wiper and washer switch
2	Rain sensor
3	Windshield wiper arm and blade
4	Windshield wiper motor
5	Windshield washer hose
6	Headlight cleaner actuator
7	Headlight cleaner nozzle
8	Headlight cleaner hose
9	Windshield washer nozzle

10	Rear washer hose
11	Rear washer nozzle
12	Rear wiper arm and blade
13	Rear wiper motor
14	Washer tank
15	Rear washer motor
16	Washer fluid-level sensor
17	Windshield washer motor
18	Headlight cleaner motor

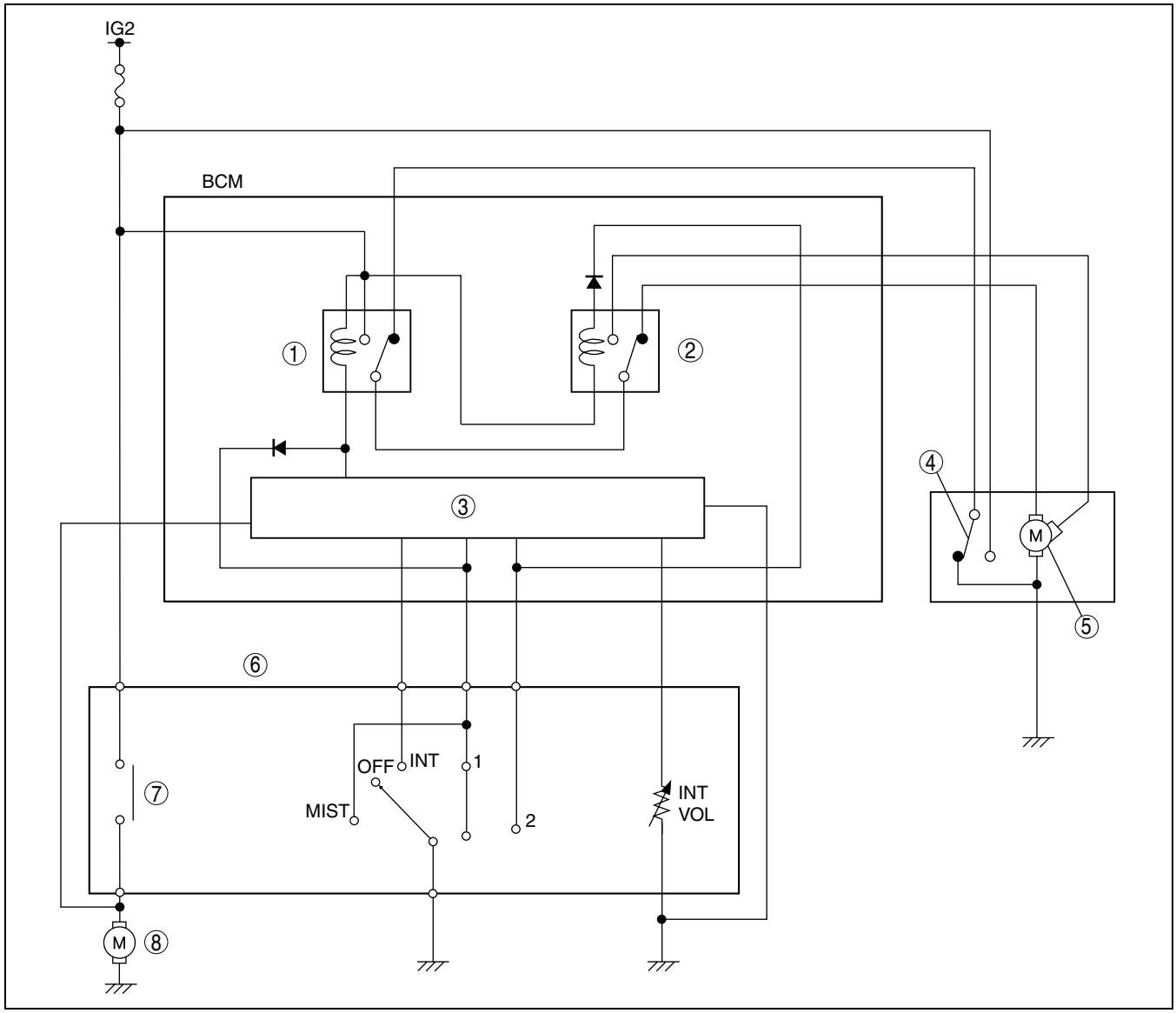
WINDSHIELD WIPER SYSTEM OUTLINE

DPE091900000T04

- The windshield wiper system has auto-stop function, one-touch function, intermittent function, and synchronized washer and wiper function with various timings.

WINDSHIELD WIPER SYSTEM WIRING DIAGRAM

DPE091900000T05



DPE919ZT1102

1	Windshield wiper relay
2	Windshield wiper HI relay
3	Microcomputer
4	Auto-stop switch

5	Windshield wiper motor
6	Windshield wiper and washer switch
7	Windshield washer switch
8	Windshield washer motor

WINDSHIELD WIPER SYSTEM OPERATION

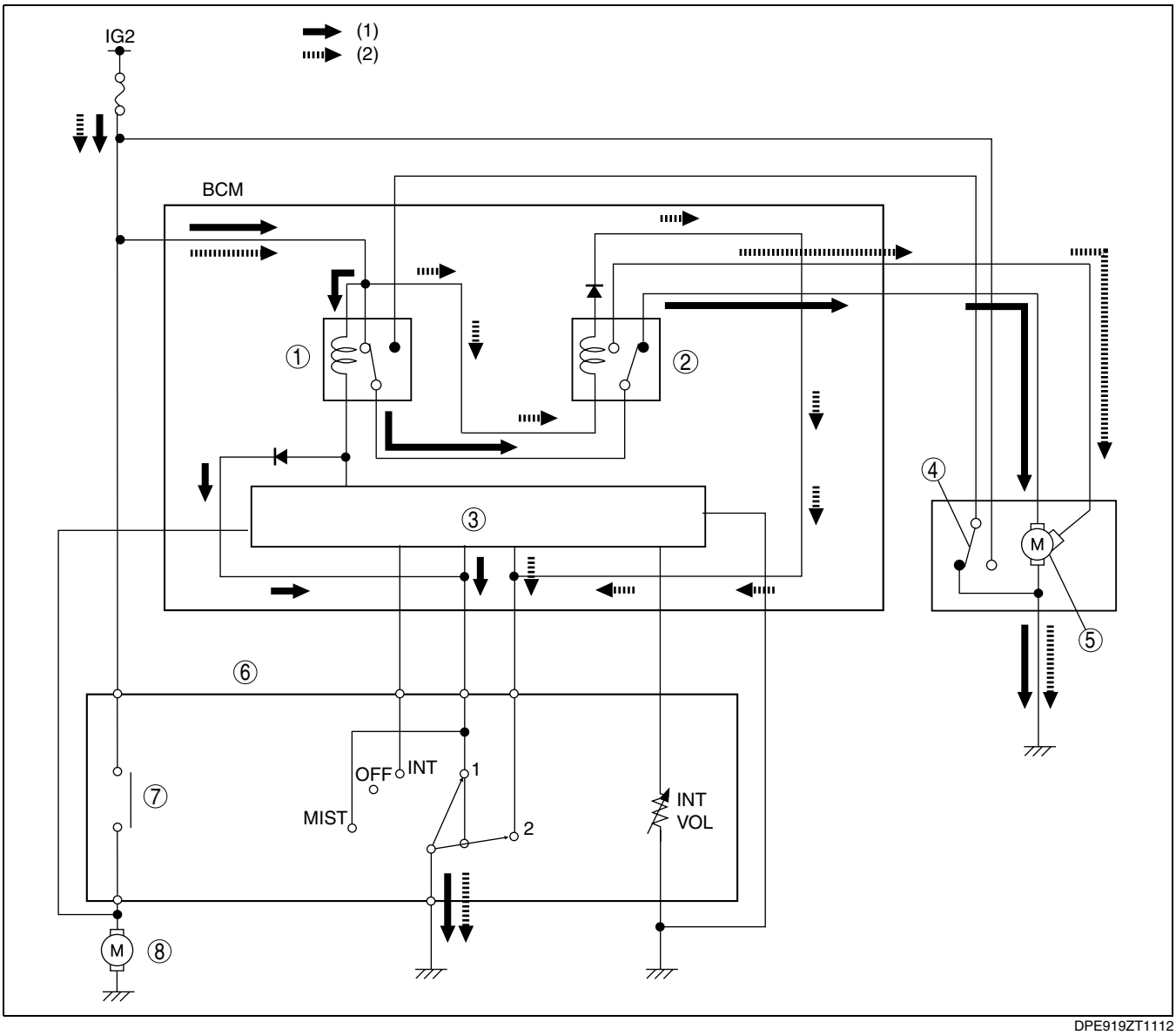
DPE091900000T06

Continuous Operation

1. When the windshield wiper switch is turned to 1, current (1) flows, and the windshield wiper motor operates at low speed.

09

2. When the windshield wiper switch is turned to 2, current (2) flows, and the windshield wiper motor operates at high speed.



DPE919ZT1112

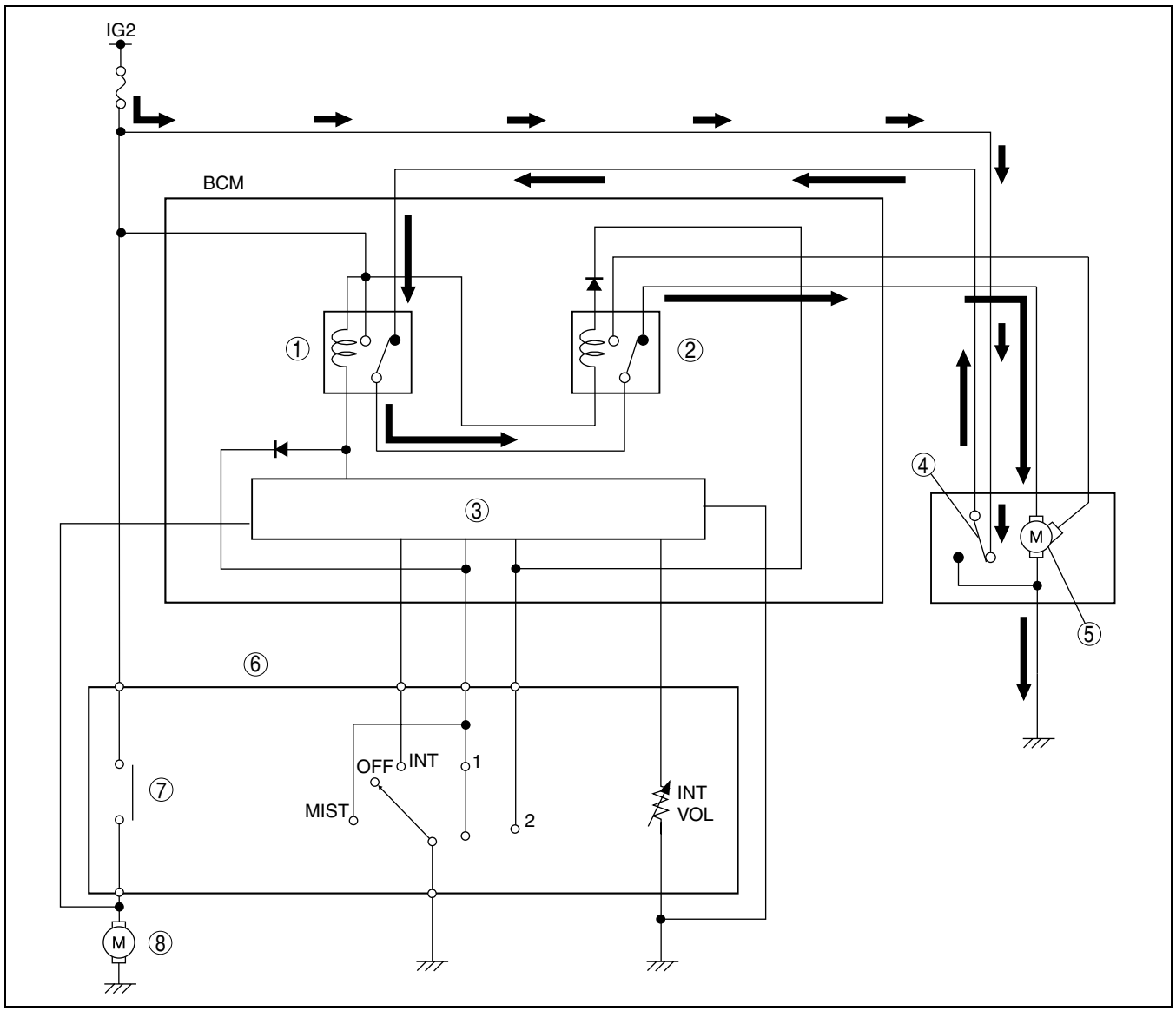
1	Windshield wiper relay
2	Windshield wiper HI relay
3	Microcomputer
4	Auto-stop switch

5	Windshield wiper motor
6	Windshield wiper and washer switch
7	Windshield washer switch
8	Windshield washer motor

3. When the windshield wiper switch is turned to the OFF position, the wipers stop in the park position due to the autostop operation.

Autostop Operation

1. When the windshield wiper switch is turned to the OFF position while the wipers are operating, current flows to the autostop switch, which is on, and the windshield wiper motor operates until it returns to the park position, stopping the wipers.



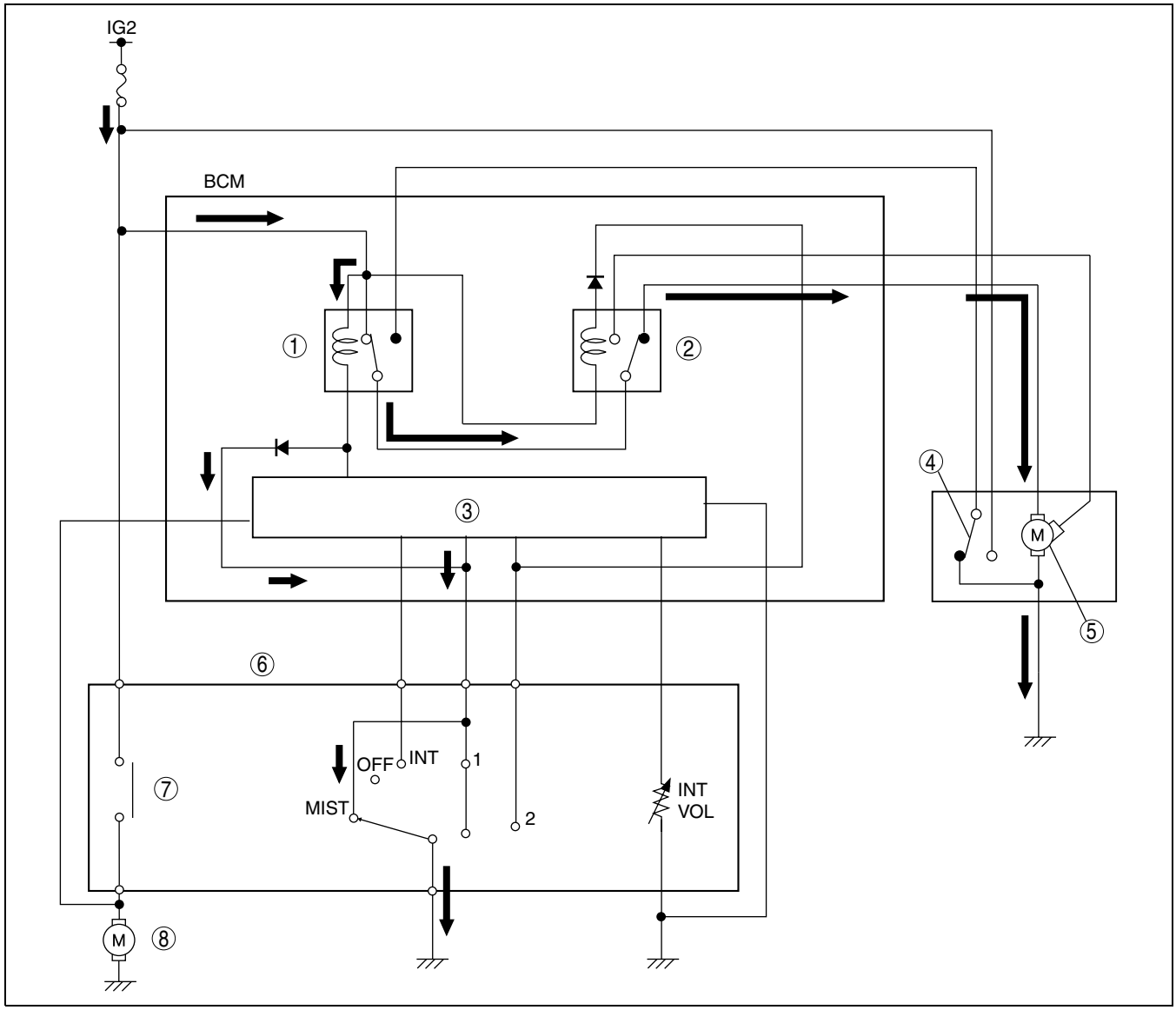
DPE919ZT1113

1	Windshield wiper relay
2	Windshield wiper HI relay
3	Microcomputer
4	Auto-stop switch

5	Windshield wiper motor
6	Windshield wiper and washer switch
7	Windshield washer switch
8	Windshield washer motor

One-touch Wiper Operation

1. When the windshield wiper lever is pulled up, the one-touch switch is on and the current flows, causing the windshield wiper motor to operate at low speed.



DPE919ZT1114

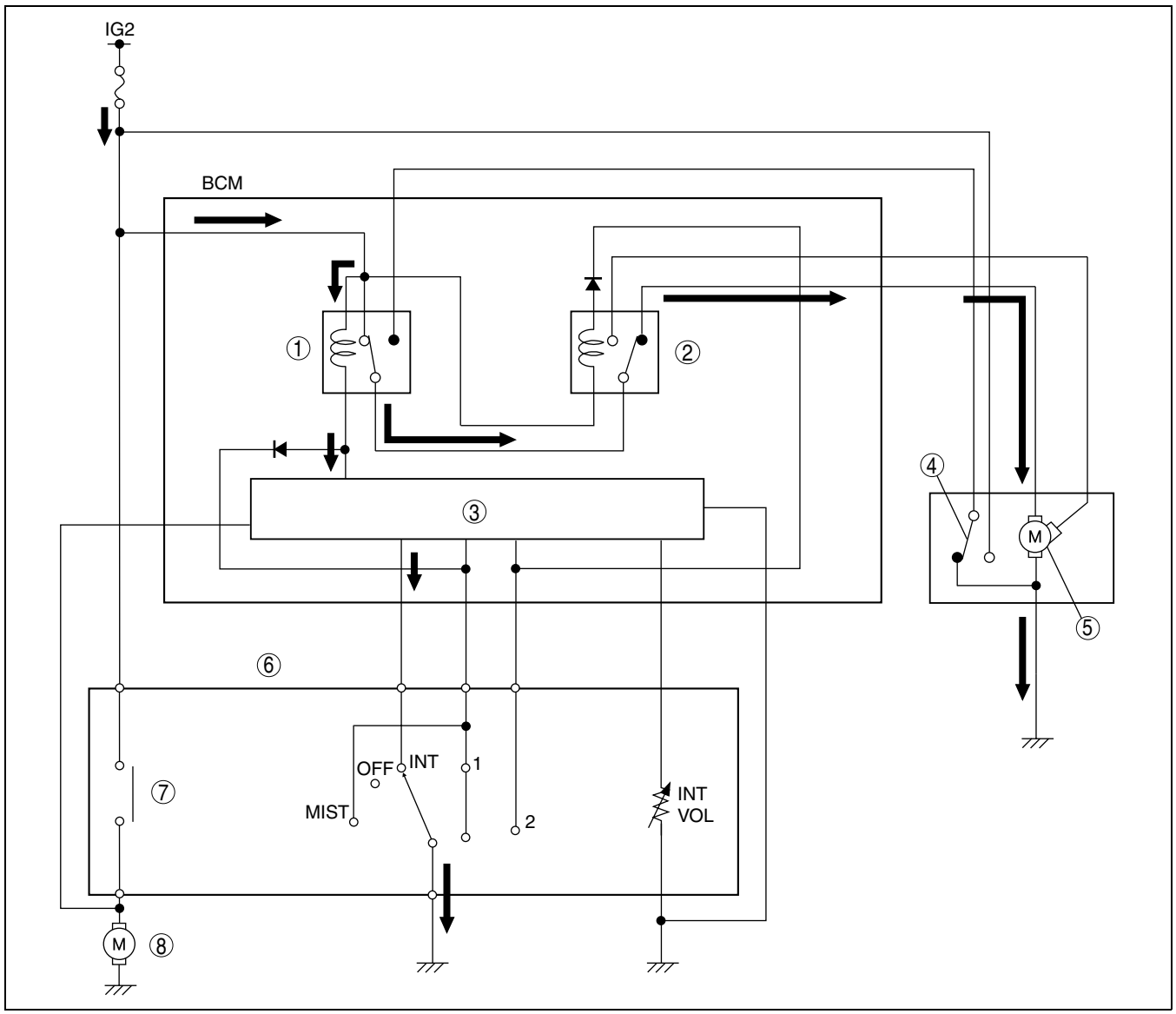
1	Windshield wiper relay
2	Windshield wiper HI relay
3	Microcomputer
4	Auto-stop switch

5	Windshield wiper motor
6	Windshield wiper and washer switch
7	Windshield washer switch
8	Windshield washer motor

2. The windshield wipers operate at low speed while the windshield wiper lever is pulled up. When the windshield wiper lever is released, the wipers stop in the park position due to the autostop operation.

Intermittent Wiper Operation

1. When the windshield wiper switch is turned to the INT position, current flows to the windshield wiper motor due to a control signal from the microcomputer in the BCM, and the windshield wiper motor operates at low speed.



DPE919ZT1115

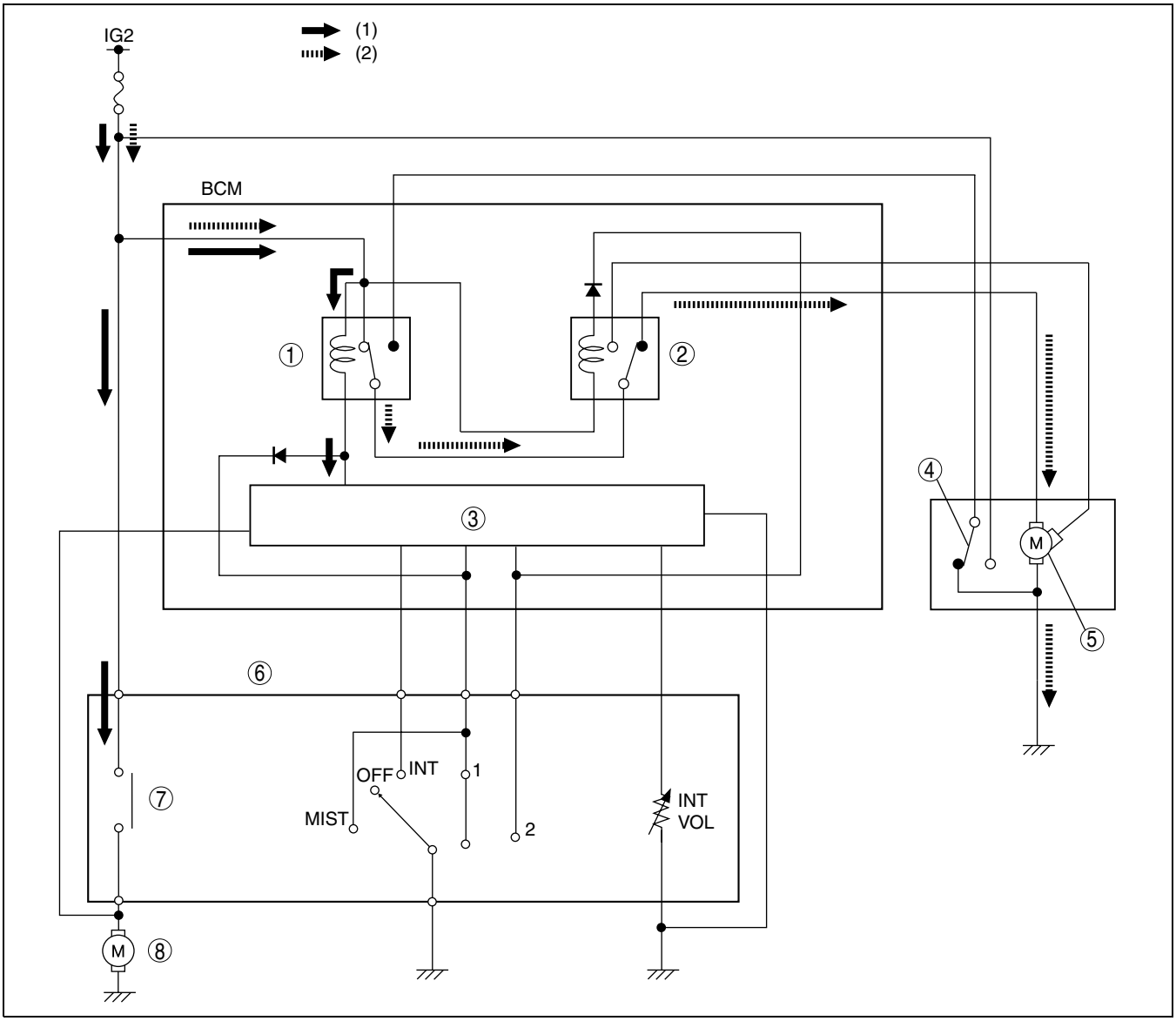
1	Windshield wiper relay
2	Windshield wiper HI relay
3	Microcomputer
4	Auto-stop switch

5	Windshield wiper motor
6	Windshield wiper and washer switch
7	Windshield washer switch
8	Windshield washer motor

2. When a pre-set time has passed, current is stopped due to a control signal from the microcomputer in the BCM. Accordingly, current flow to the windshield wiper motor ceases, causing the wipers to stop at the park position due to the autostop operation. This sequence repeats causing the wipers to operate intermittently.
3. The windshield wipers operation timing (INT relay OFF to ON) during intermittent operation can be set freely using the INT volume switch.

Synchronized Washer And Wiper Operation

1. When the windshield washer switch is turned on, current (1) flows and the windshield washer motor operates, and washer fluid is sprayed. At the same time, a washer motor operation signal is sent to the INT relay causing the relay to turn on, current (2) to flow, and the windshield wiper motor to operate at low speed.



DPE919ZT1116

1	Windshield wiper relay
2	Windshield wiper HI relay
3	Microcomputer
4	Auto-stop switch

5	Windshield wiper motor
6	Windshield wiper and washer switch
7	Windshield washer switch
8	Windshield washer motor

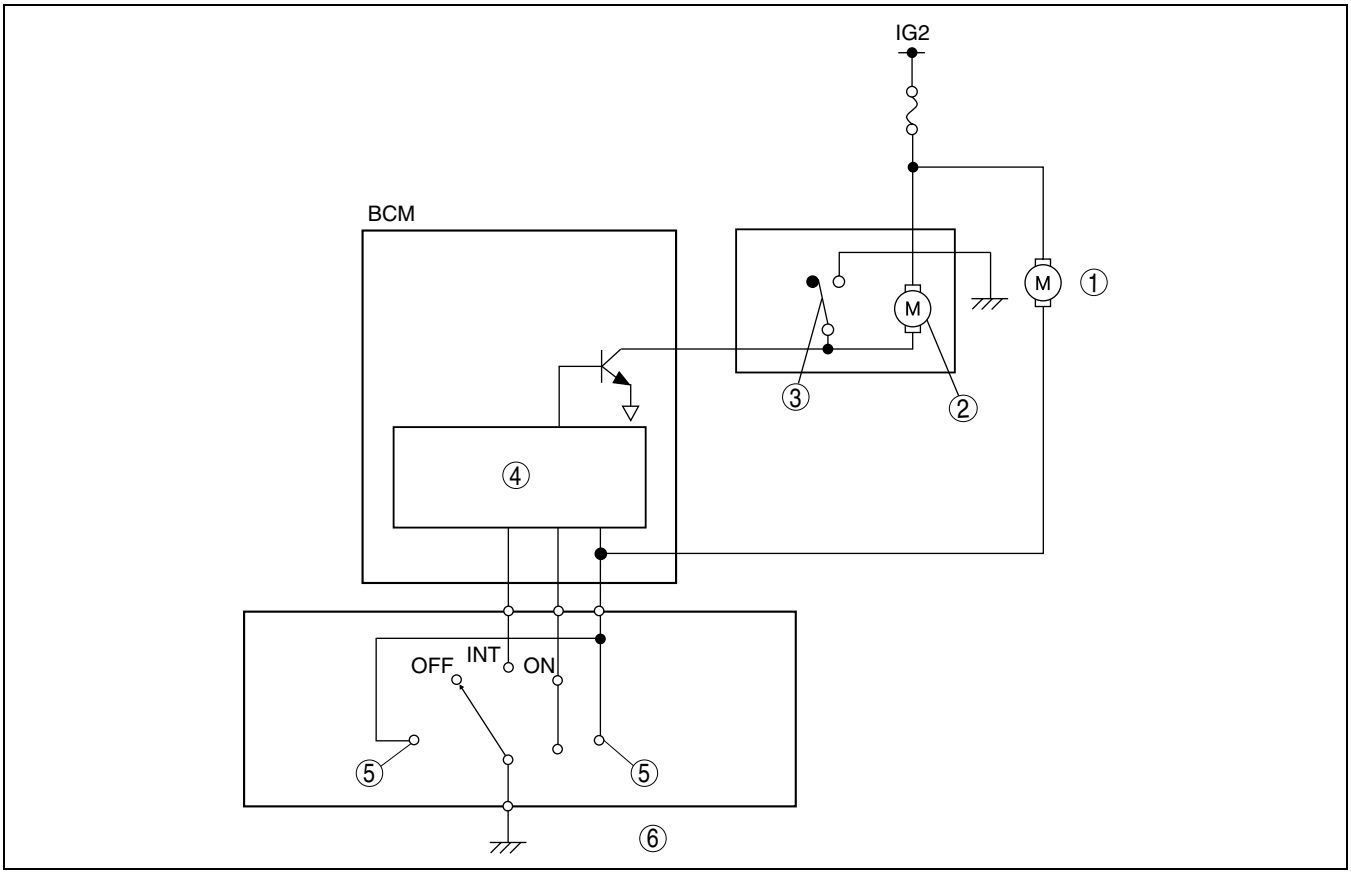
REAR WIPER SYSTEM OUTLINE

DPE091900000T07

- The rear wiper system has auto-stop function, one-touch function, intermittent function, and synchronized washer and wiper function.

REAR WIPER SYSTEM WIRING DIAGRAM

DPE091900000T08



DPE919ZT1103

1	Rear washer motor
2	Rear wiper motor
3	Auto-stop switch

4	Microcomputer
5	Rear washer switch
6	Rear wiper and washer switch

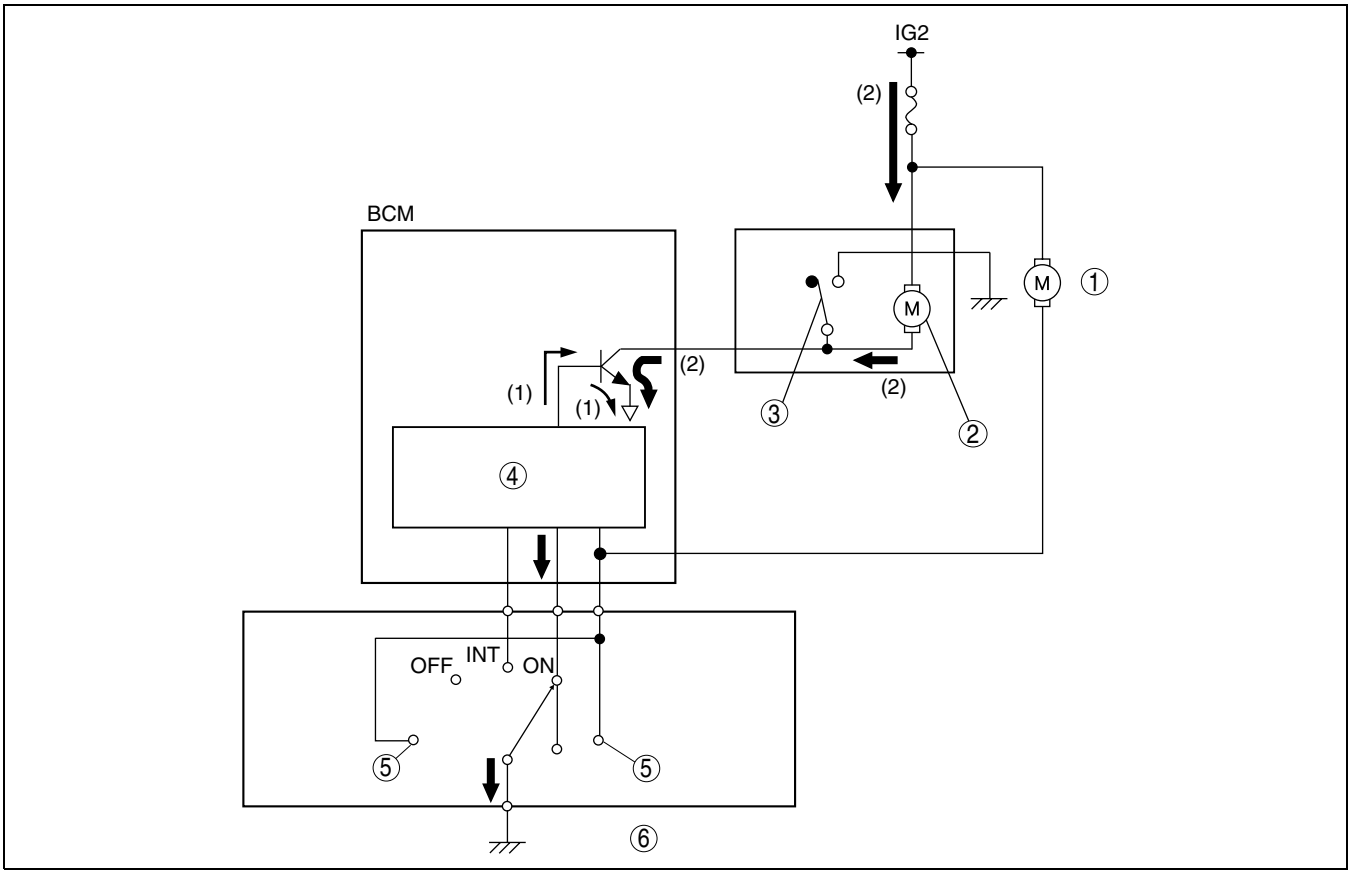
REAR WIPER SYSTEM OPERATION

DPE091900000T09

Continuous Operation

1. When the rear wiper switch is turned to the ON position, control signal (1) is output from the microcomputer in the BCM, and the transistor is turned on.
2. When the transistor is on, current (2) flows to the rear wiper motor and continuous operation starts.

- When the rear wiper switch is turned to the OFF position while the rear wiper is operating, the rear wiper motor performs an autostop and stops in the park position.



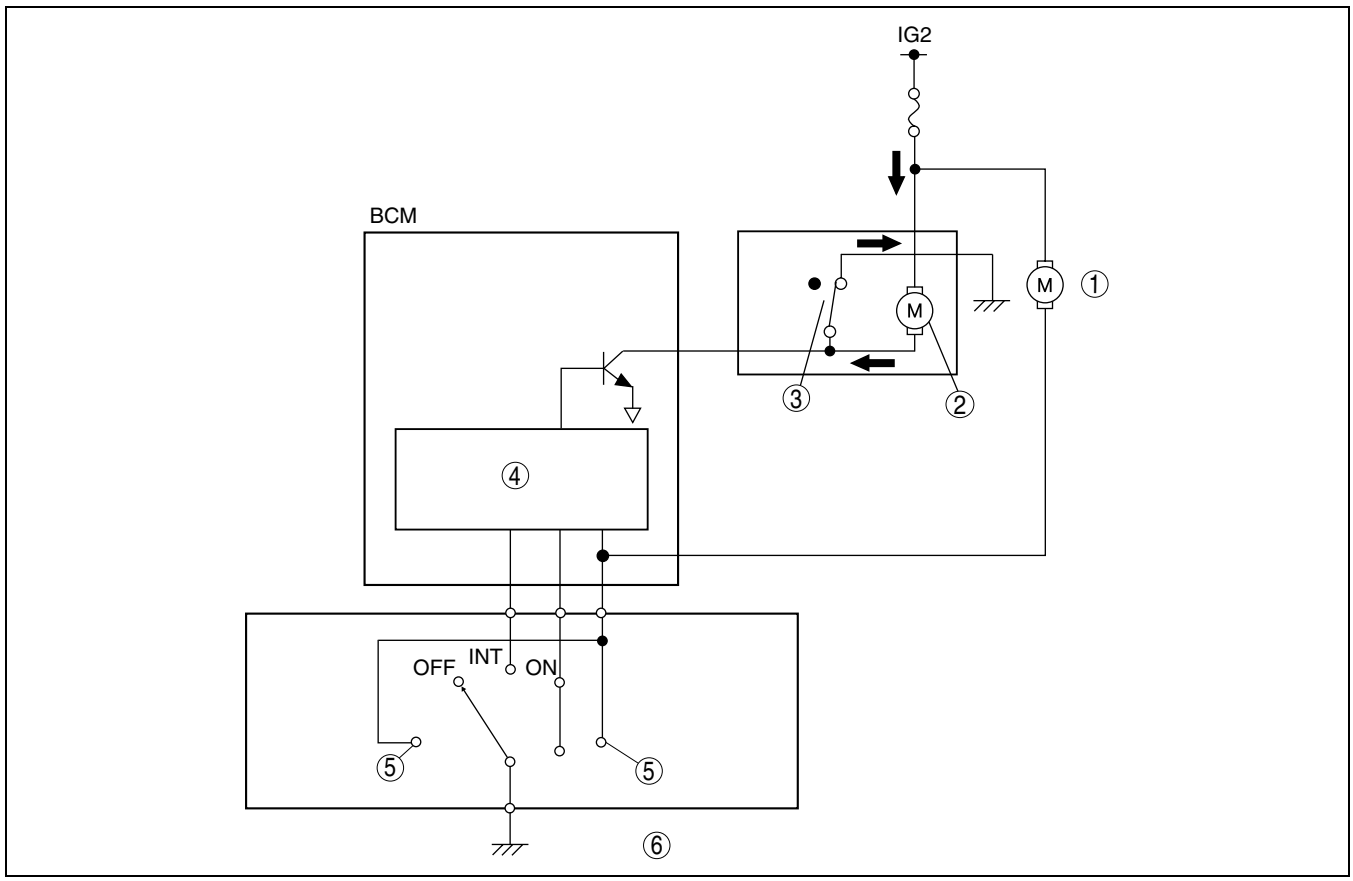
DPE919ZT1104

1	Rear washer motor
2	Rear wiper motor
3	Auto-stop switch

4	Microcomputer
5	Rear washer switch
6	Rear wiper and washer switch

Autostop Operation

- When the rear wiper switch is turned to the OFF position while the wiper is operating, current flows to the autostop switch, which is on, and the rear wiper motor operates until it returns to the park position, stopping the wiper.



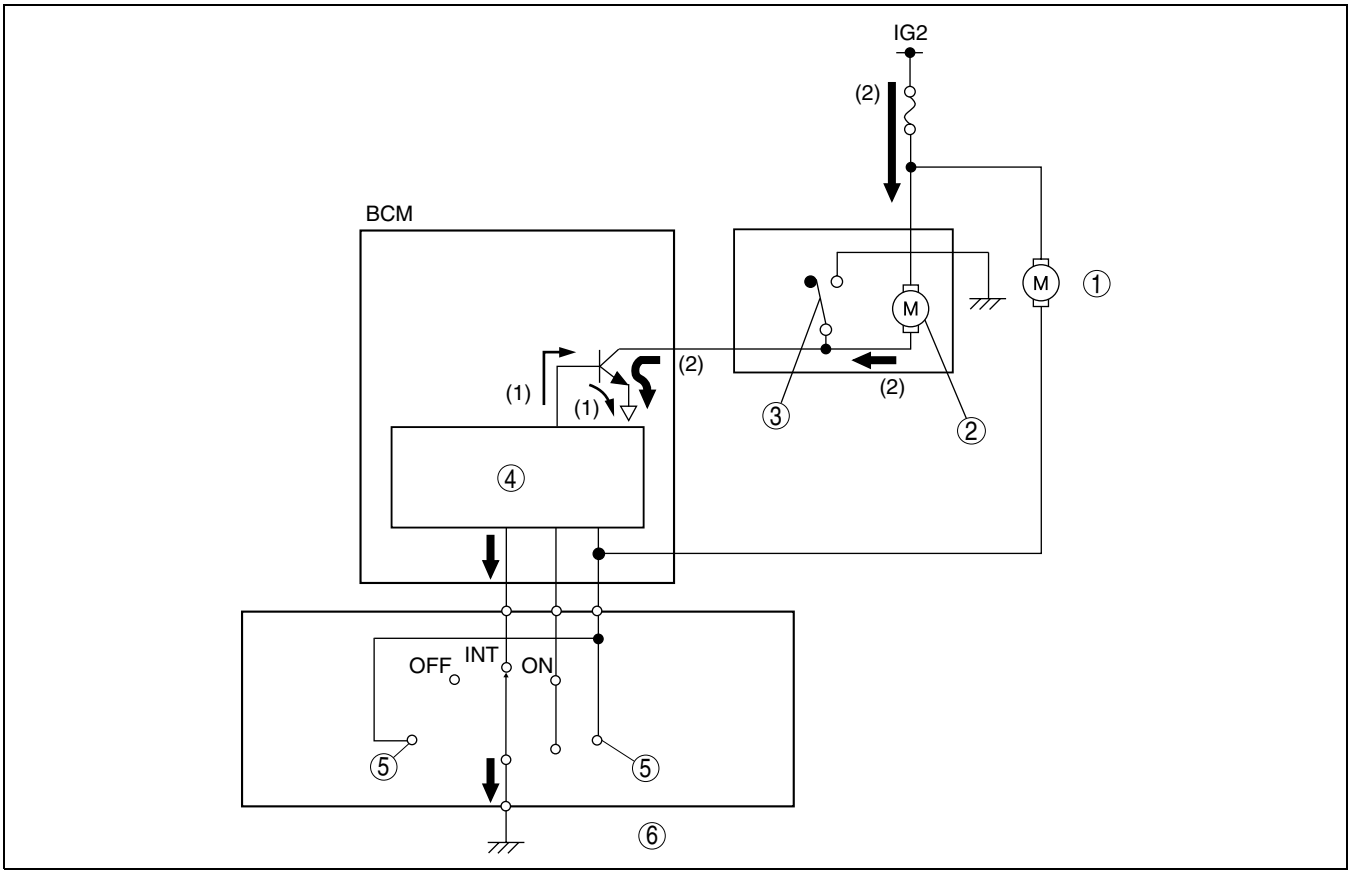
DPE919ZT1105

1	Rear washer motor
2	Rear wiper motor
3	Auto-stop switch

4	Microcomputer
5	Rear washer switch
6	Rear wiper and washer switch

Intermittent Wiper Operation

- When the rear wiper switch is turned to the INT position, the microcomputer in the BCM supplies current (1) at 10 s intervals to turn on the transistor intermittently.
- As a result, current (2) flows at 10 s intervals causing the rear wiper to operate intermittently.
- When the rear wiper switch is turned to the OFF position while the wiper is operating, the rear wiper motor performs an autostop and stops in the park position.



DPE919ZT1106

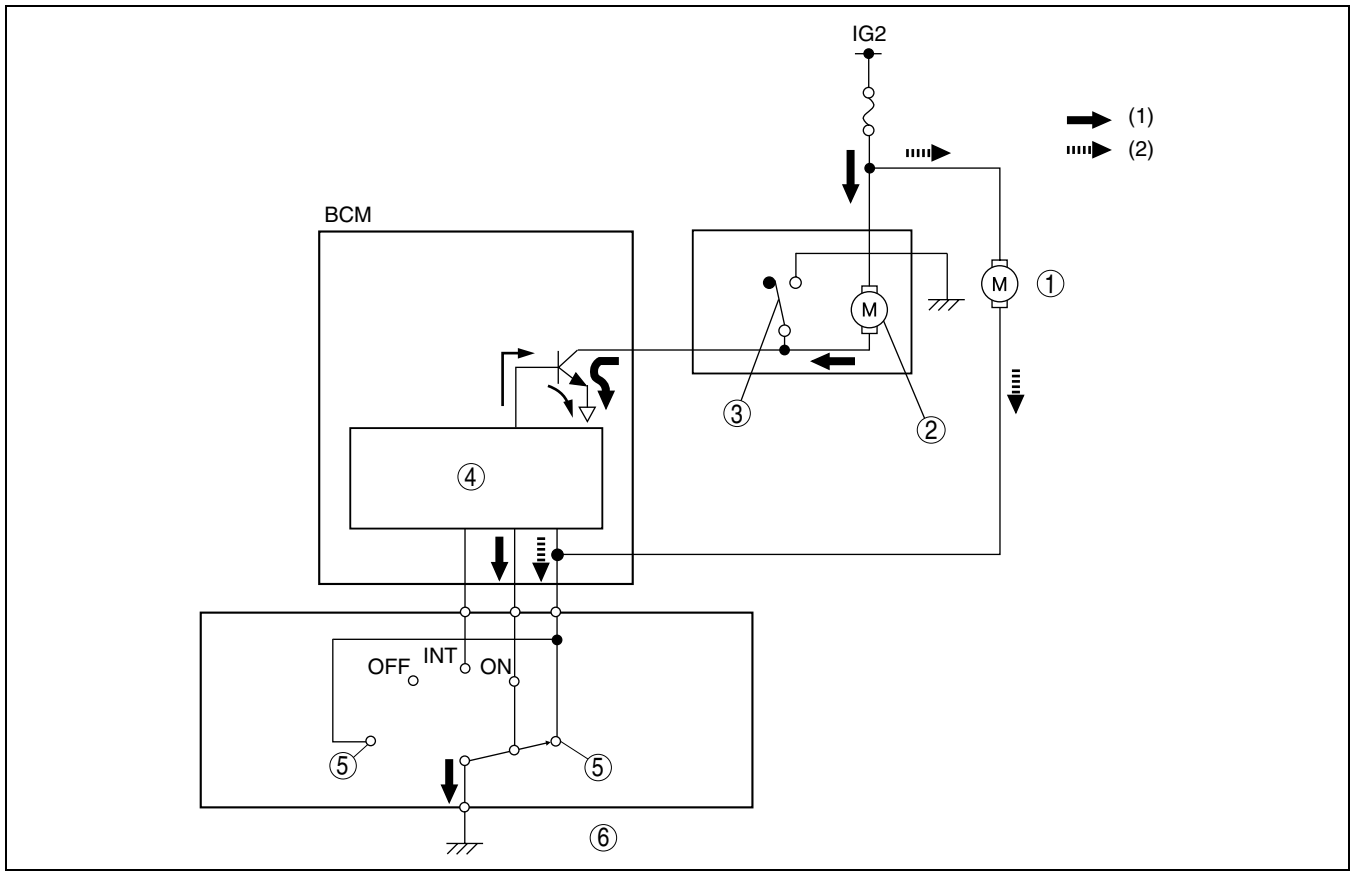
1	Rear washer motor
2	Rear wiper motor
3	Auto-stop switch

4	Microcomputer
5	Rear washer switch
6	Rear wiper and washer switch

Synchronized Washer And Wiper Operation

- When the rear wiper switch is turned upward from the ON position, current (2) flows, the rear washer motor

operates and washer fluid is sprayed from the rear washer nozzle.



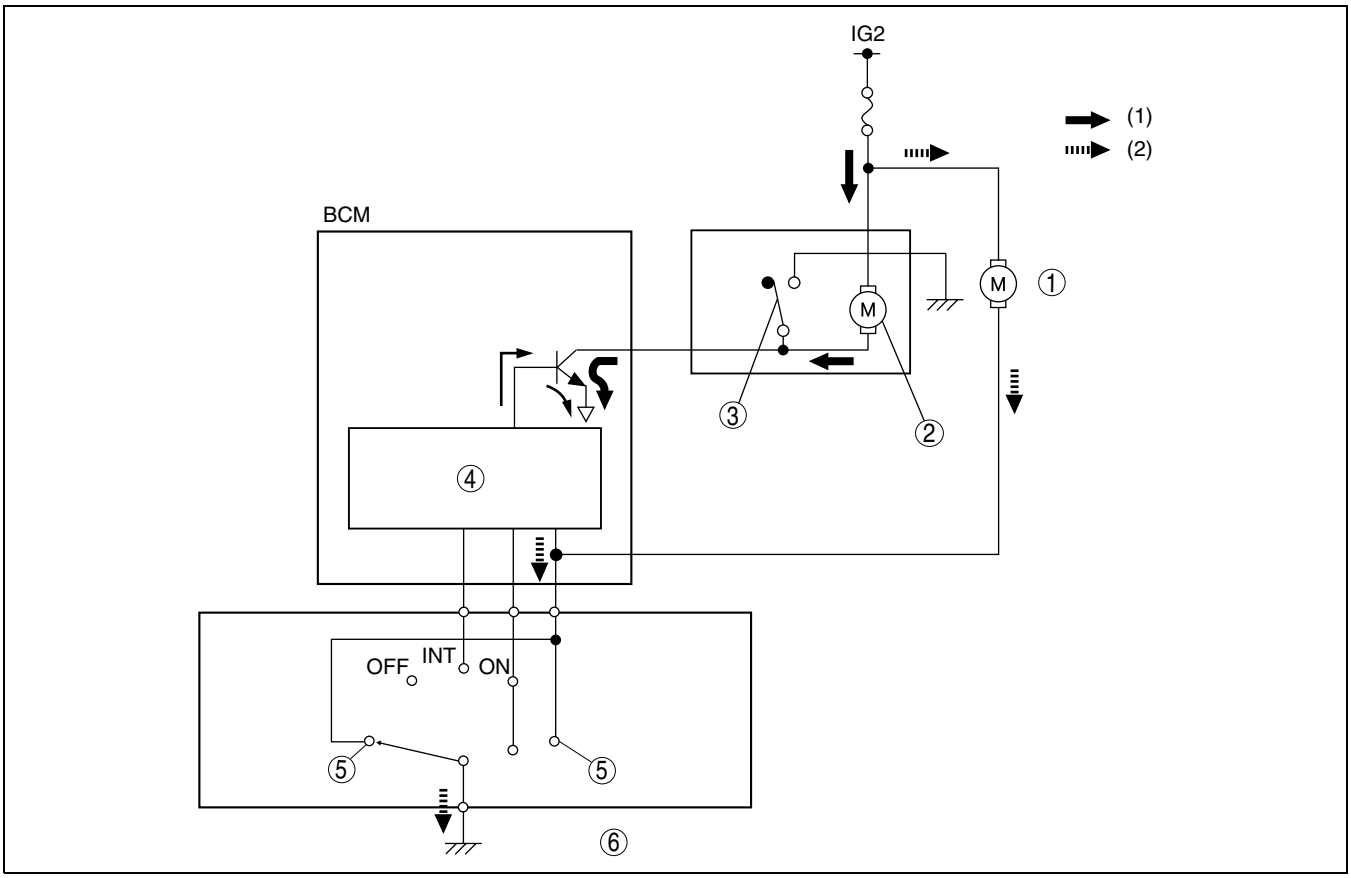
DPE919ZT1107

1	Rear washer motor
2	Rear wiper motor
3	Auto-stop switch

4	Microcomputer
5	Rear washer switch
6	Rear wiper and washer switch

- While turning the rear wiper switch downward from the OFF position, current (2) flows, the rear washer motor operates and washer fluid is sprayed from the rear washer nozzle. Current (1) flows at the same time according

to the control signal from the microcomputer and the rear wiper motor operates continuously.



DPE919ZT1119

1	Rear washer motor
2	Rear wiper motor
3	Auto-stop switch

4	Microcomputer
5	Rear washer switch
6	Rear wiper and washer switch

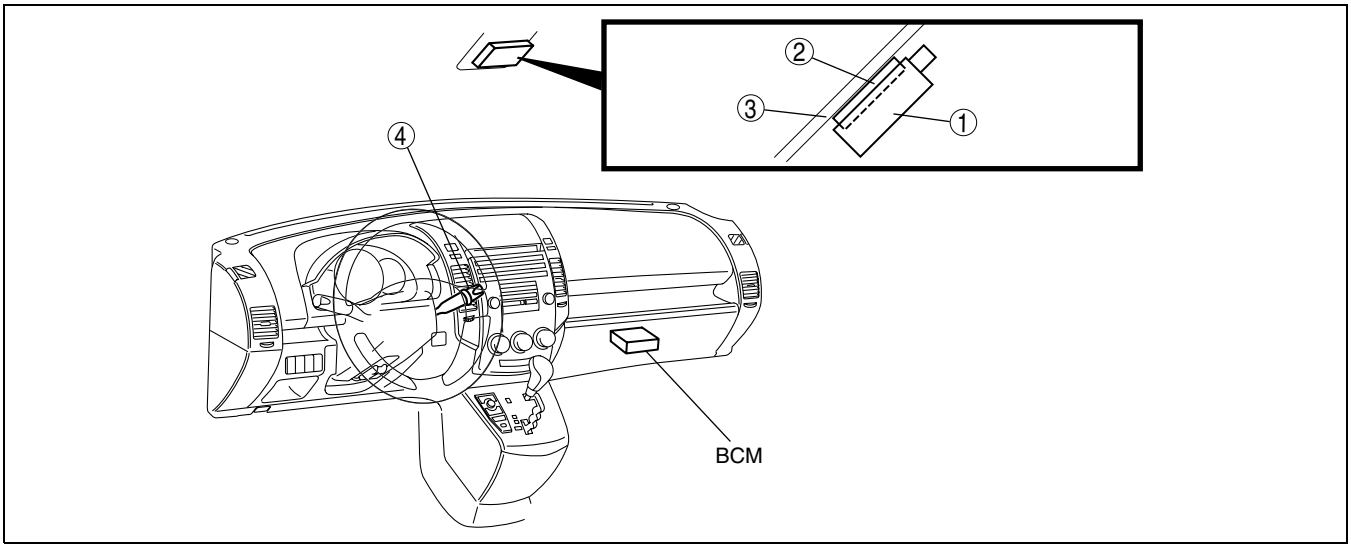
AUTO WIPER SYSTEM OUTLINE

DPE091966500T01

- An auto wiper system that detects rainfall on the windshield and automatically controls all operation (stop, interval, low, and high) has been adopted, removing the burden of operating switches from the driver.

AUTO WIPER SYSTEM STRUCTURAL VIEW

DPE091966500T02



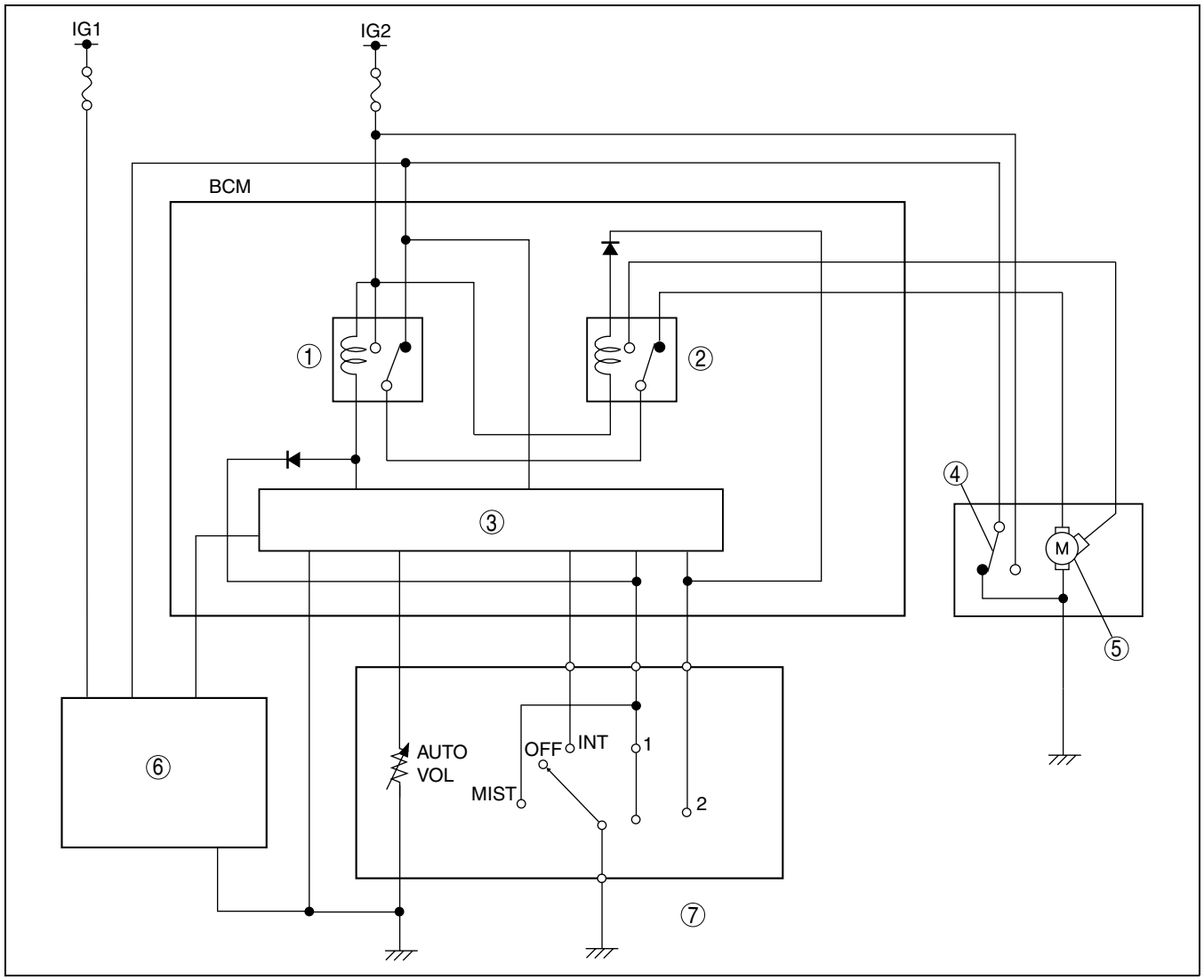
DPE919ZT1111

1	Rain sensor
2	Lens sensor

3	Windshied
4	Wiper and washer switch

AUTO WIPER SYSTEM WIRING DIAGRAM

DPE091966500T03



DPE919ZT1108

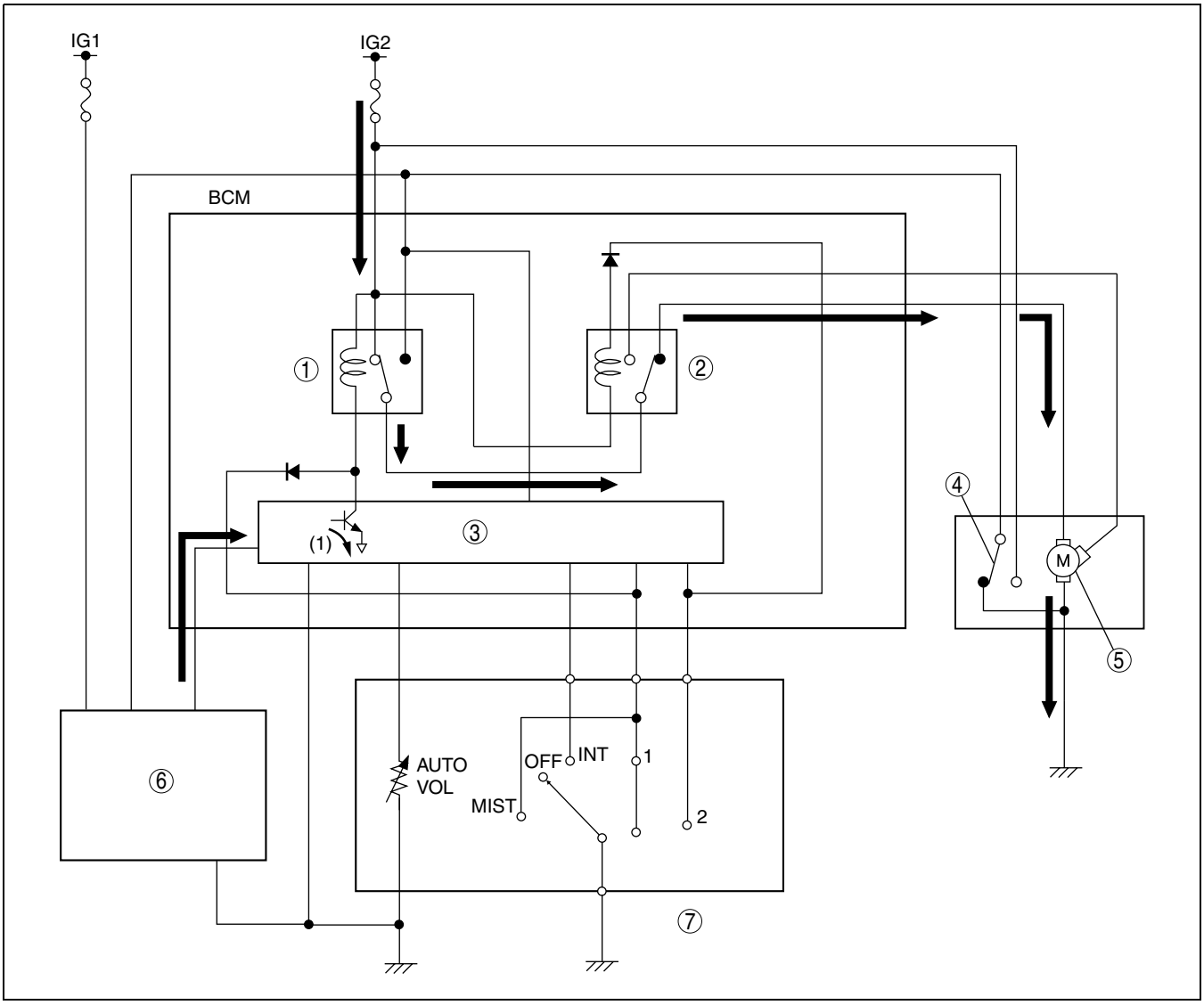
1	Windshield wiper relay
2	Windshield wiper HI relay
3	Microcomputer
4	Auto-stop switch

5	Windshield wiper motor
6	Rain sensor
7	Windshield wiper and washer switch

AUTO WIPER SYSTEM OPERATION

DPE091966500T04

1. The rain sensor installed in the windshield detects rainfall amount when the wiper and washer switch is turned to the AUTO position.
2. The detected rainfall amount is converted to an electronic signal and transmitted to the BCM as a windshield wiper operation control signal.
3. When the microcomputer in the BCM receives the control signal, current (1) flows to the transistor and the transistor is turned on.
4. When the transistor turns on, the windshield wiper relay turns on.
5. When the windshield wiper relay turns on, the current flows to the windshield wiper motor, and the wiper operates at low speed.



DPE919ZT1109

1	Windshield wiper relay
2	Windshield wiper HI relay
3	Microcomputer
4	Auto-stop switch

5	Windshield wiper motor
6	Rain sensor
7	Windshield wiper and washer switch

Intermittent Operation
- If the windshield wipers are stopped and the rain sensor detects a specified amount of rainfall, the wipers are operated at low speed. The interval timing is adjusted according to the amount of rainfall detected.

Low Speed Operation
- If the windshield wipers are operating intermittently and the rain sensor detects an amount of rainfall specifc to wiper operation greater than low speed, but less than high speed, the wipers are operated continuously at low speed.

High Speed Operation
- If the windshield wipers are operating at low speed or stopped and the rain sensor detects an amount of rainfall specific to high speed operation or greater, the wipers are operated two times at high speed. If the rain sensor receives a signal for high speed operation after the wipers are operated at high speed twice, the high speed operation is continued.

RAIN SENSOR FUNCTION

DPE091966500T05

Rainfall detection function
- The LED in the rain sensor emits infrared light which is reflected off the windshield via the lens sensor and then

received by the photodiode in the rain sensor. If the rate of reflected infrared light is reduced, it is determined that rain is contacting the windshield and the intensity of the rainfall is calculated from the amount of reflection rate reduction.

Sensitivity Adjustment Function
- By changing the sensitivity adjustment volume, installed on the wiper and washer switch, the sensitivity of the rain sensor can be freely adjusted.

Initial Setting Function
- When the ignition switch is turned to the ON position after replacing the rain sensor with a new one, the initial setting is stored after verifying the windshield condition.
- The initial setting of the rain sensor can be performed using the specified procedure.
  — Refer to the Workshop Manual for the initial setting procedure.

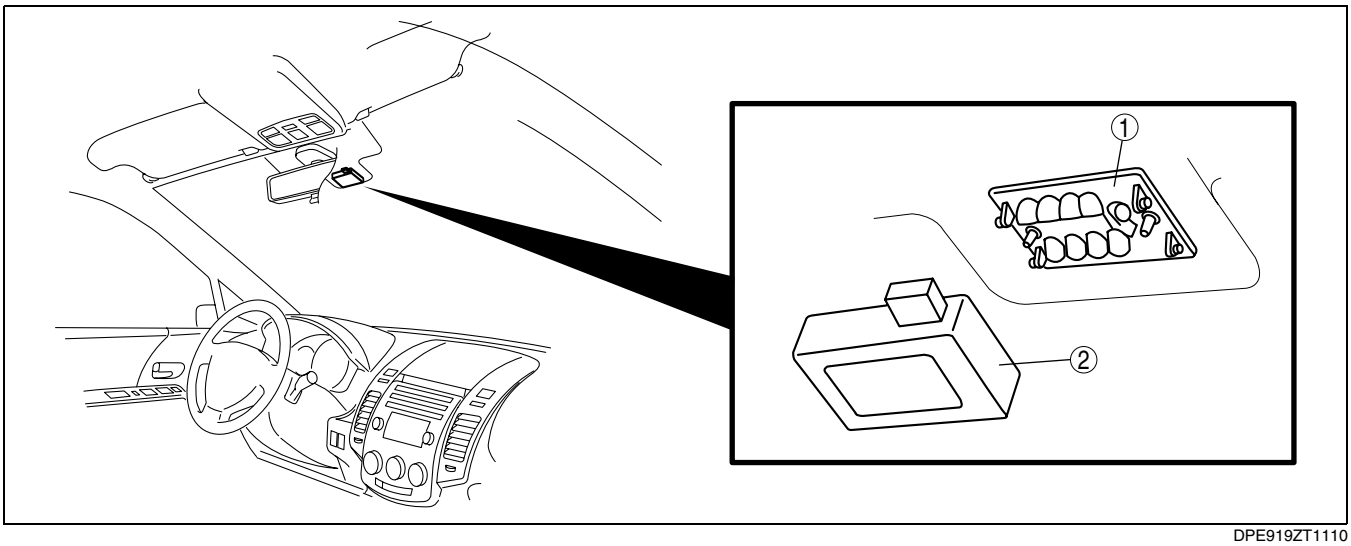
On-board Diagnostic Function
- If the voltage input to the rain sensor is not within the operational voltage (**approx. 9—16 V**), the BCM is informed of the malfunction and a BCM DTC is detected.
- If there is any malfunction in the rain sensor, the BCM is informed of the malfunction and a BCM DTC is detected.

Fail-Safe Function
- If the rain sensor detects rainfall and then detects no change in the detected amount after the wipers have been operated two times, the windshield is determined to be dirty and windshield wiper operation is stopped.
- When the temperature sensor inside the rain sensor detects **approx. -10 °C or less** when the vehicle speed is **0 km/h**, the windshield wipers do not operate.

RAIN SENSOR CONSTRUCTION/OPERATION

DPE091966500T06

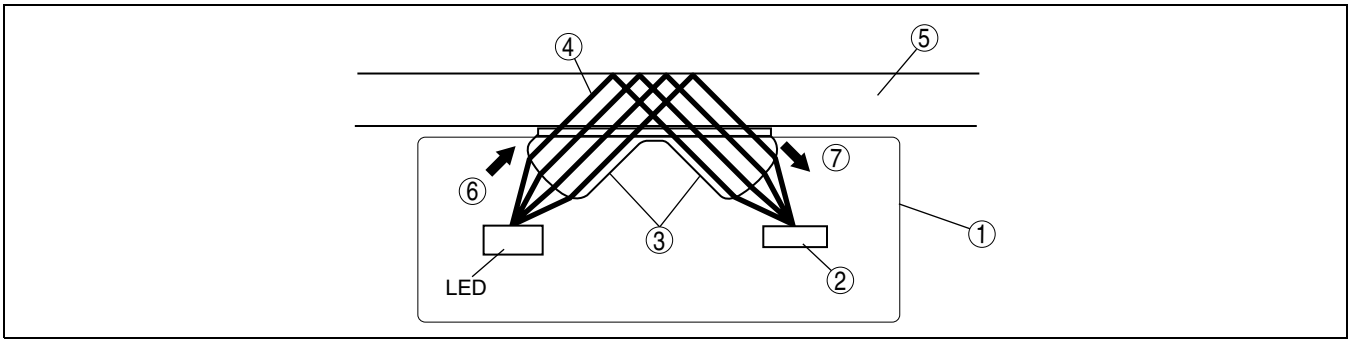
- Installed on the underside of the rearview mirror (windshield center).



DPE919ZT1110

1	Lens sensor	2	Rain sensor

Operation With No Rainfall Contacting Windshield
1. Infrared light is emitted from the LED in the rain sensor towards the windshield.
2. The emitted infrared light passes through the lens sensor and is reflected off the windshield.
3. The infrared light reflected off the windshield is received by the photodiode in the lens sensor.
4. The photodiode receives the light, the microcomputer in the rain sensor calculates the rainfall amount from the reflection rate, converts this to an electric signal and sends a windshield wiper control signal to the BCM.



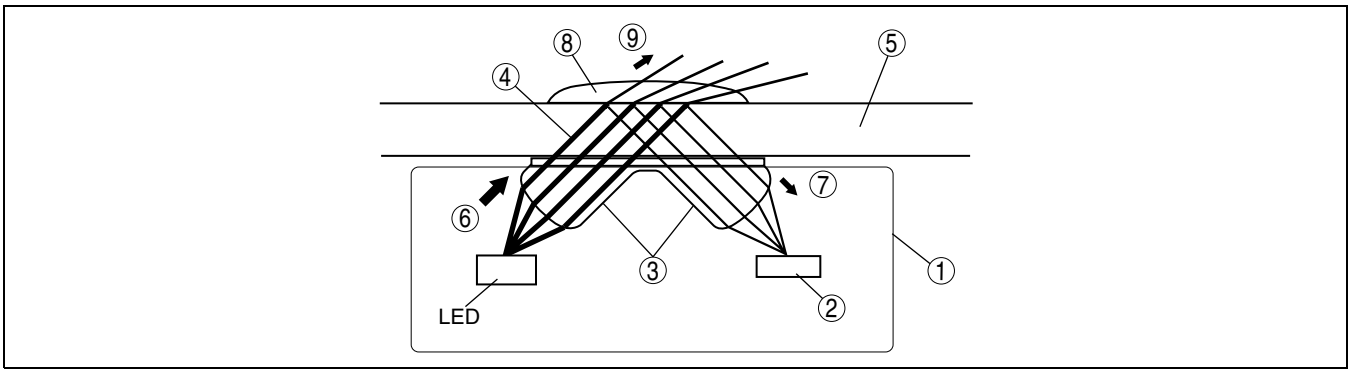
B3E0919T005

1	Rain sensor
2	Photodiode
3	Lens sensor
4	Infrared light

5	Windshield
6	Emitted light
7	Received light

Operation With Rainfall Contacting Windshield

1. Infrared light is emitted from the LED in the rain sensor towards the windshield.
2. Emitted infrared light passing through the lens sensor is received by the windshield and diffused by the rainfall contacting the windshield.
3. The infrared light that is not diffused is reflected by the windshield and received by the photodiode in the lens sensor.
4. The photodiode receives the light, the microcomputer in the rain sensor calculates the rainfall amount from the reflection rate, converts this to an electric signal and sends a windshield wiper control signal to the BCM.



B3E0919T006

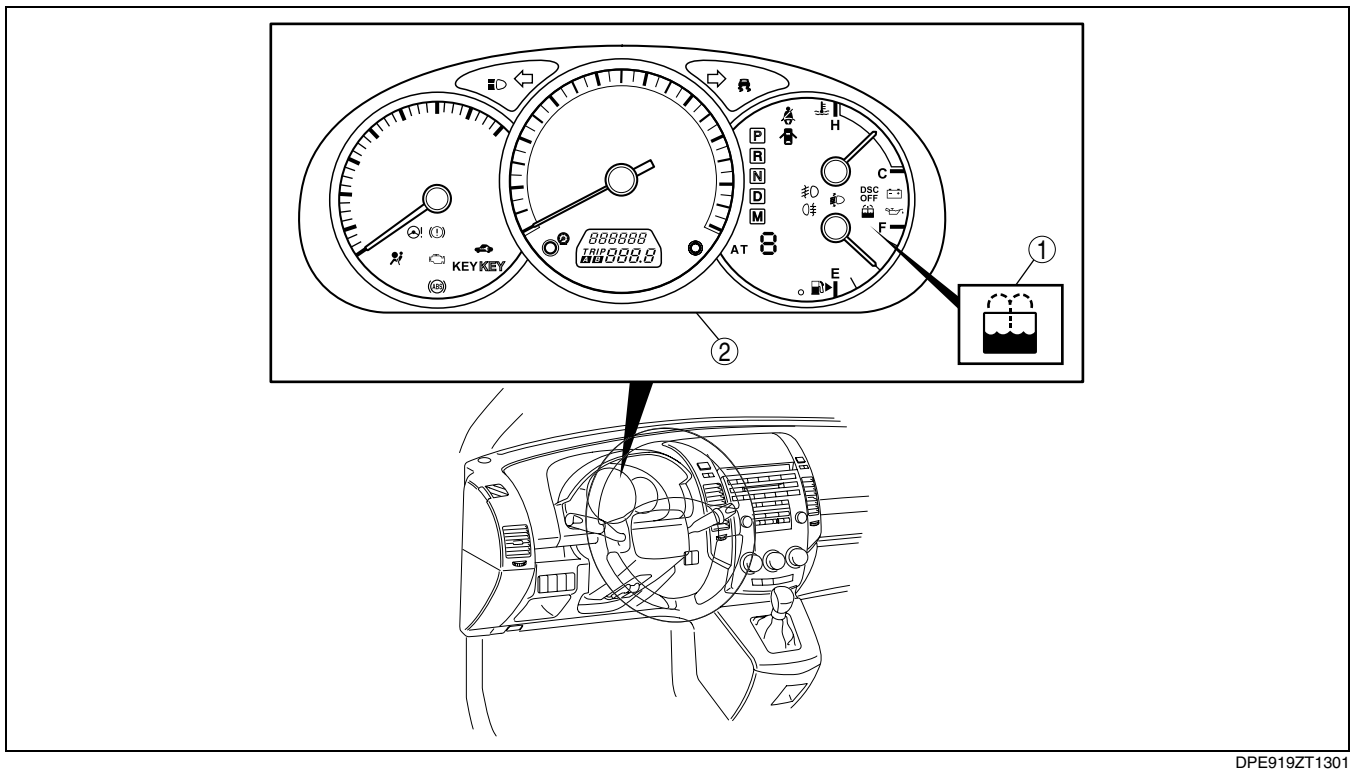
1	Rain sensor
2	Photodiode
3	Lens sensor
4	Infrared light
5	Windshield

6	Emitted light
7	Received light
8	Rainfall
9	Diffusion

WASHER FLUID-LEVEL SENSOR FUNCTION

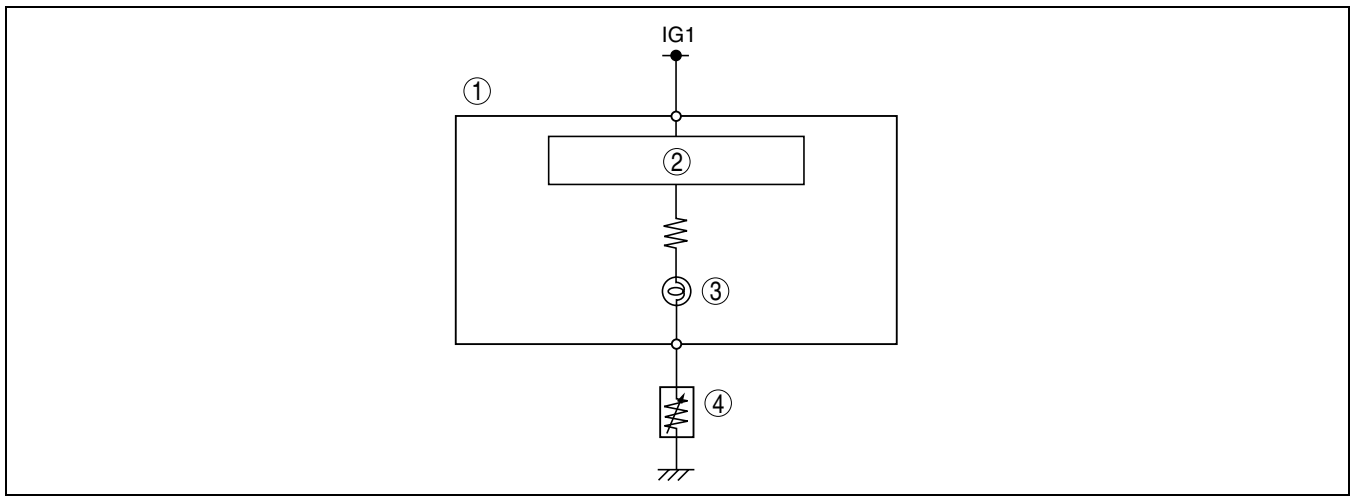
DPE091967488T01

- Warns the driver that the washer fluid-level is low.



DPE919ZT1301

1	Washer fluid-level indicator light
2	Instrument cluster



B3E0919T117

1	Instrument cluster
2	Microcomputer
3	Washer fluid-level indicator light
4	Washer fluid-level sensor

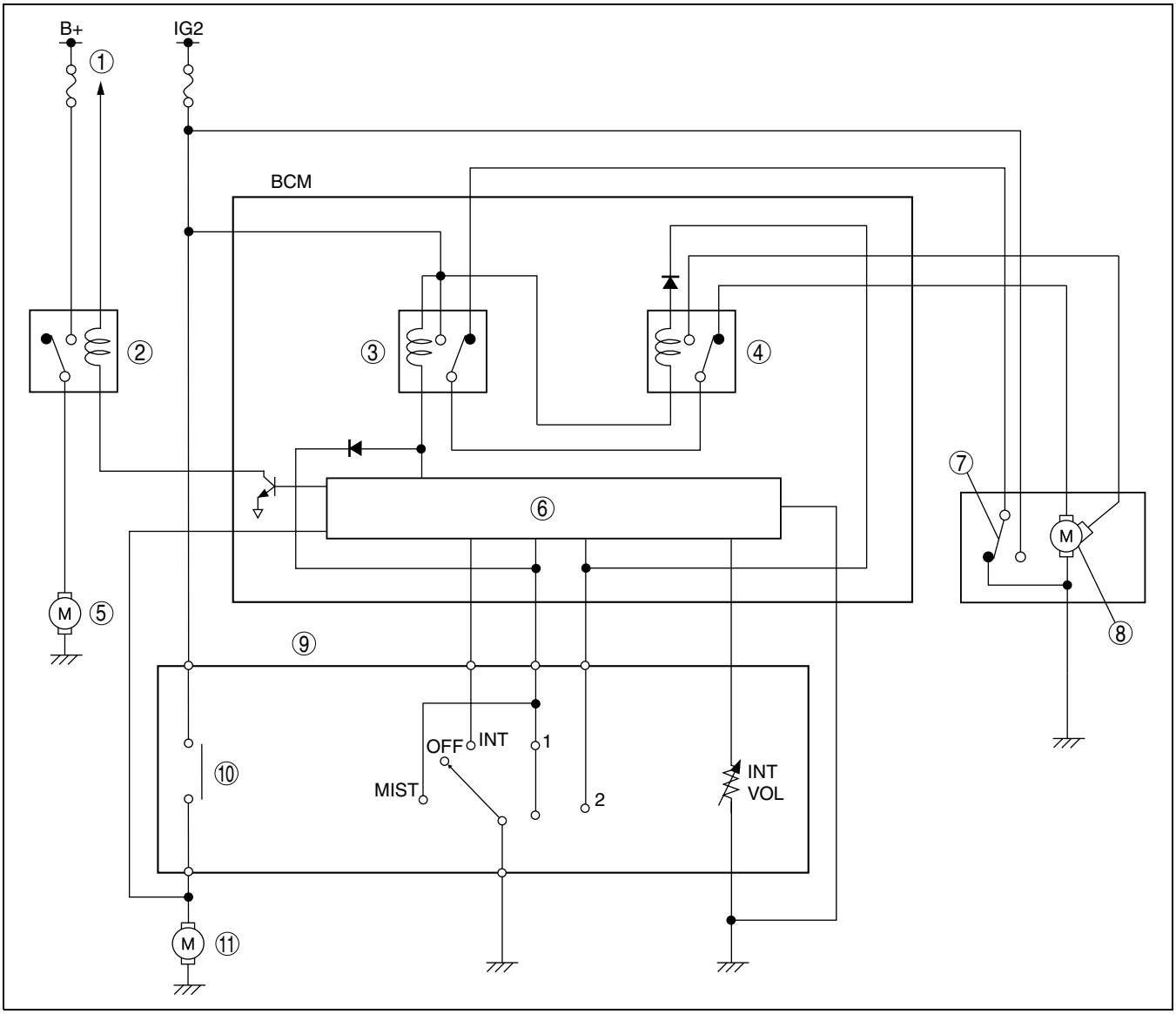
HEADLIGHT CLEANER SYSTEM OUTLINE

DPE091951801T01

- A pop-up type headlight cleaner has been adopted.

HEADLIGHT CLEANER SYSTEM WIRING DIAGRAM

DPE091951801T02



DPE919ZT1304

1	Headlight LO relay
2	Headlight cleaner relay
3	Windshield wiper relay
4	Windshield wiper HI relay
5	Headlight cleaner motor
6	Microcomputer

7	Auto-stop switch
8	Windshield wiper motor
9	Windshield wiper and washer switch
10	Windshield washer switch
11	Windshield washer motor

HEADLIGHT CLEANER SYSTEM OPERATION

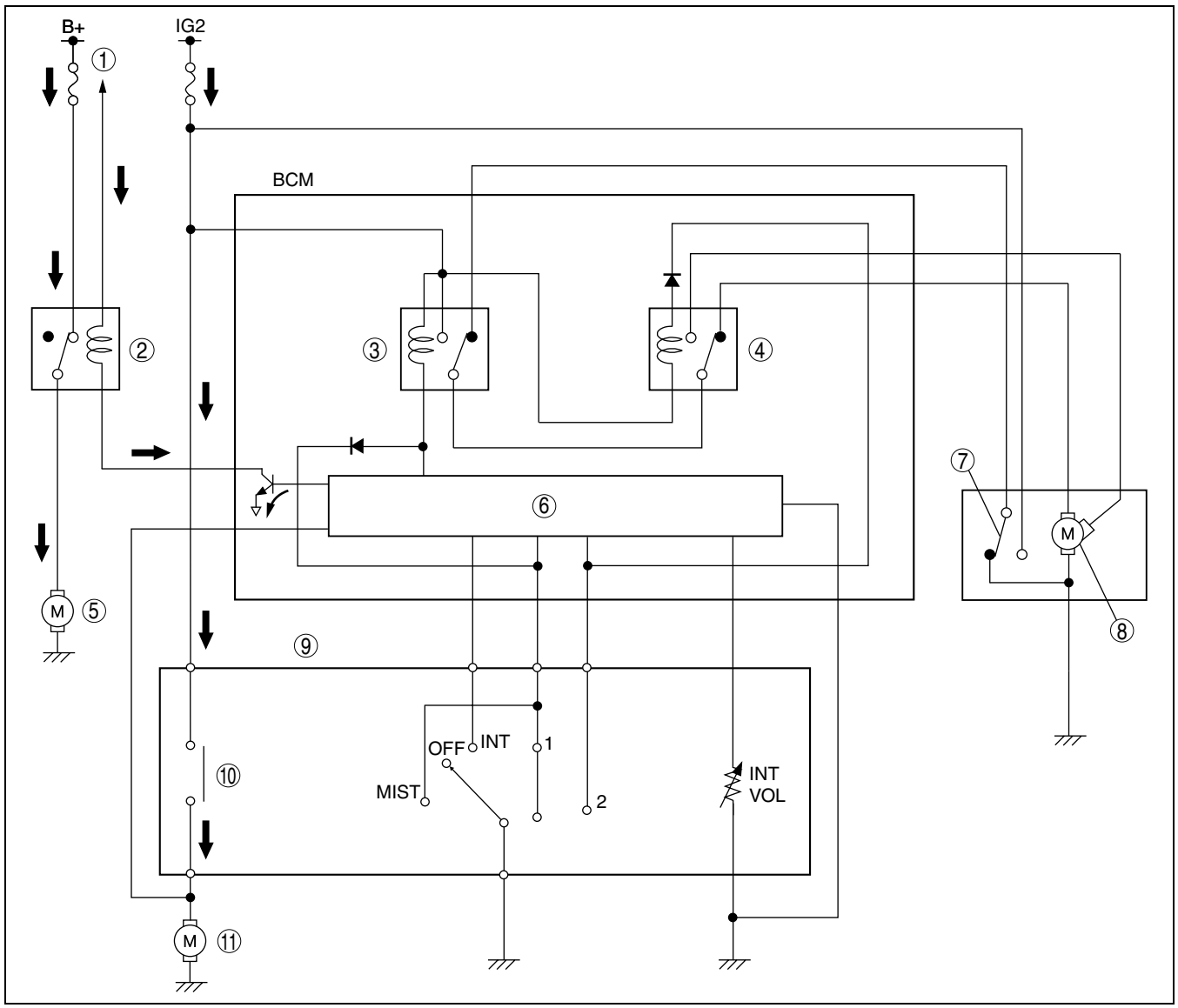
DPE091951801T03

Auto-operation

- If the windshield washer switch is turned on when the ignition and headlight switches are at the ON position, the headlight cleaner motor operates.
- The headlight cleaner operates only one time for every five times the windshield washer switch is operated.
- If the headlight switch is turned to the OFF and then to the ON position, the count is reset when the windshield washer switch is turned on.

Manual Operation

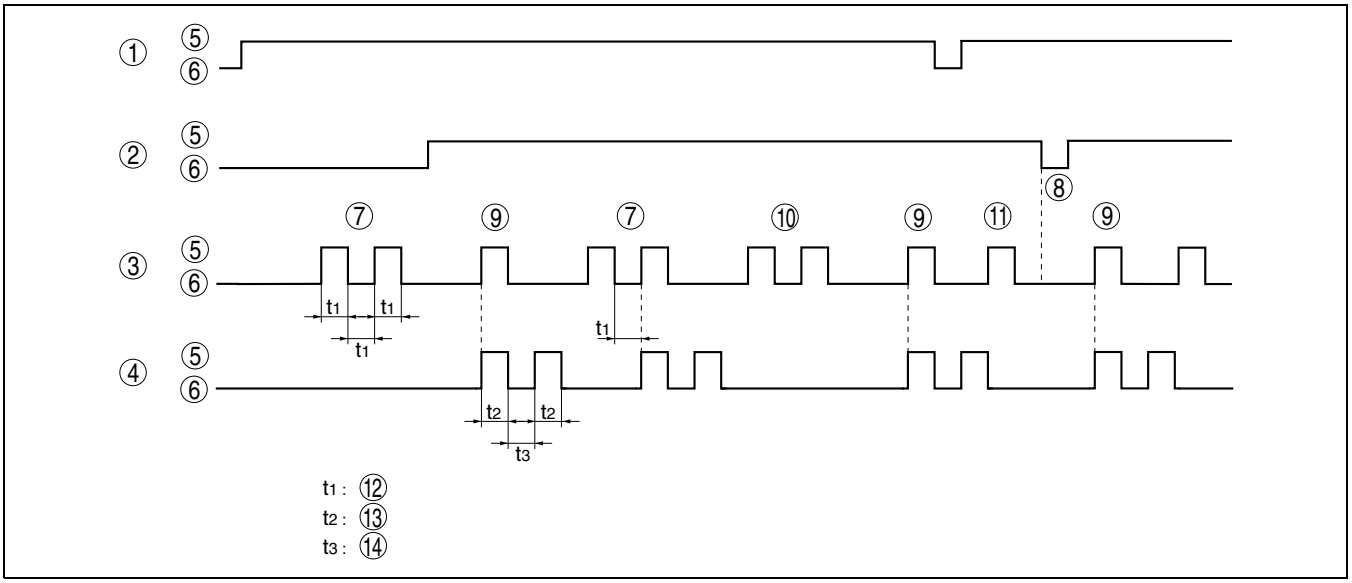
- If the windshield washer switch is turned on two consecutive times when the ignition and headlight switches are at the ON position, the headlight cleaner motor operates.



DPE919ZT1305

1	Headlight LO relay
2	Headlight cleaner relay
3	Windshield wiper relay
4	Windshield wiper HI relay
5	Headlight cleaner motor
6	Microcomputer

7	Auto-stop switch
8	Windshield wiper motor
9	Windshield wiper and washer switch
10	Windshield washer switch
11	Windshield washer motor



DPE919ZT1306

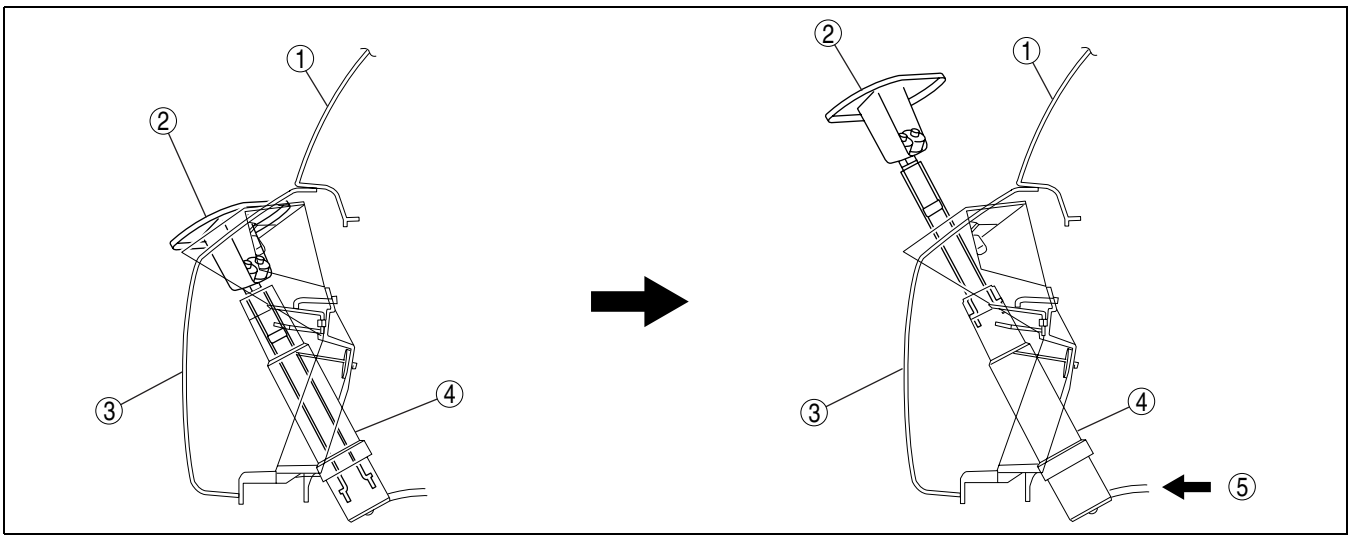
1	Ignition switch
2	Headlight switch
3	Windshield washer switch
4	Headlight cleaner relay
5	ON
6	OFF
7	Double click (Reset)

8	Reset
9	1ST
10	2ND—5TH
11	2ND
12	1 s or Less
13	approx. 0.57 s
14	approx. 3 s

HEADLIGHT CLEANER ACTUATOR OPERATION

DPE091951801T04

- The headlight cleaner nozzle is held retracted by a spring within the headlight cleaner actuator.
- When fluid pressure rises due to the operation of the headlight cleaner motor, the piston in the headlight cleaner actuator is pushed, causing the nozzle to pop out of the front bumper and spray washer fluid.



B3E0919T114

1	Headlight
2	Headlight cleaner nozzle
3	Front bumper

4	Headlight cleaner actuator
5	Fluid pressure

09–20 ENTERTAINMENT

ENTERTAINMENT OUTLINE

DPE092000001T01

- A center panel module, composed of the installed audio unit and the audio switches built into the center panel, has been adopted.
- ~~A music HDD (hard disc drive) type audio unit has been adopted.~~
- The audio unit consists of the following parts:
  - — Base unit
    Type A
    - — AM/FM tuner
    - — CD player

    Type B
    - — AM/FM tuner
    - — CD player
    - — RDS

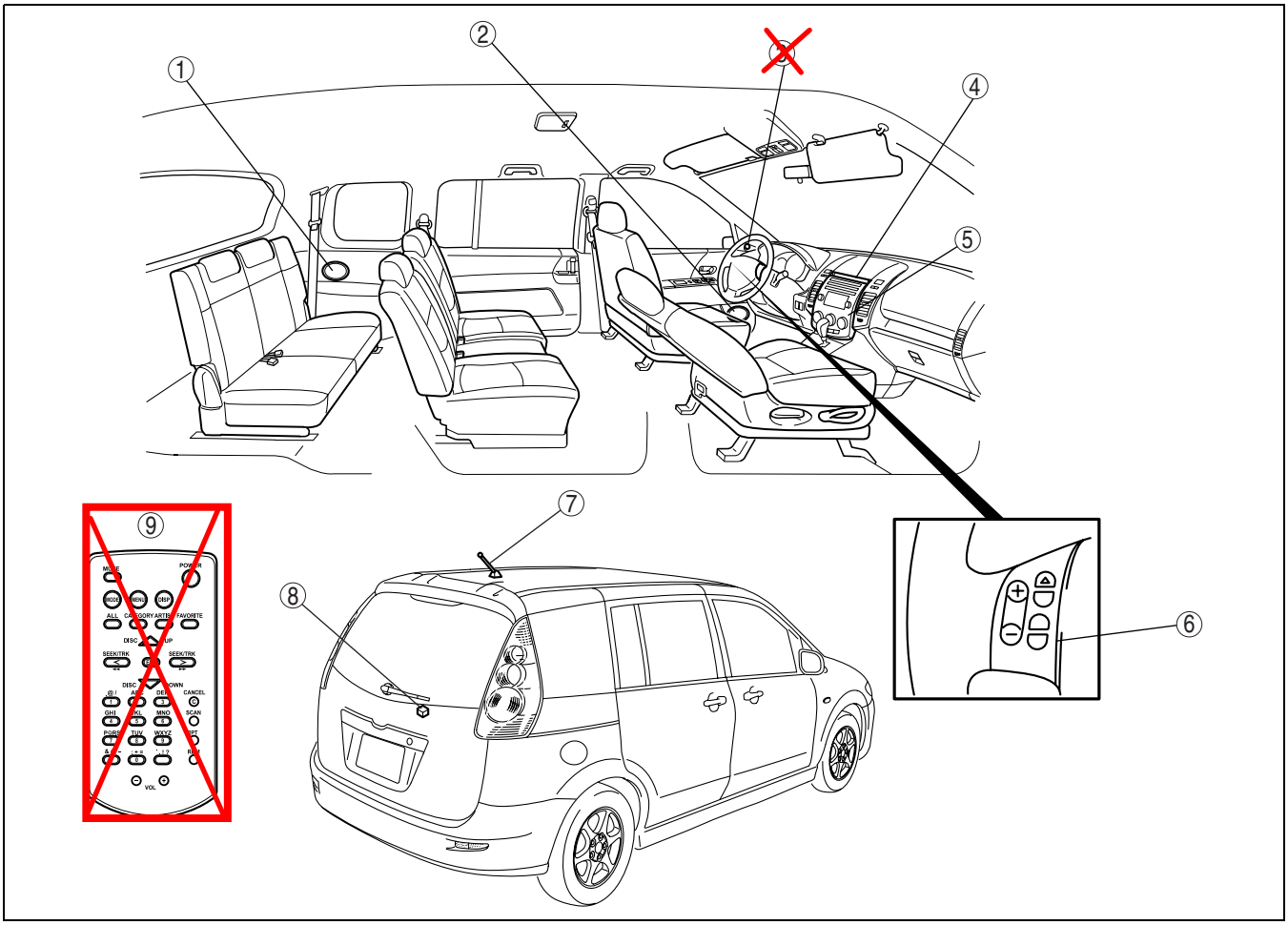
09

Type C
  - AM/FM tuner
  - CD player
  - HDD (hard disc drive)
  - RDS
- Lower module (cassette deck or MD player) (without Type C (music HDD) models)
- Cover

- The lower module (cassette deck or MD player) is optional accessories.
- Module availability depends on vehicle grade.
- An audio control switch is equipped on the steering wheel for audio operation.
- A center roof antenna has been adopted.
- The following speakers have been adopted (6 speakers):
  - Front door speaker
  - Rear speaker
  - Front tweeter
- A condenser has been installed on the high-mount brake light for improved noise reduction.
- All information related to the audio system is displayed on the information display's LCD.

AUDIO SYSTEM STRUCTURAL VIEW

DPE092000001T02



DPE920ZTB001

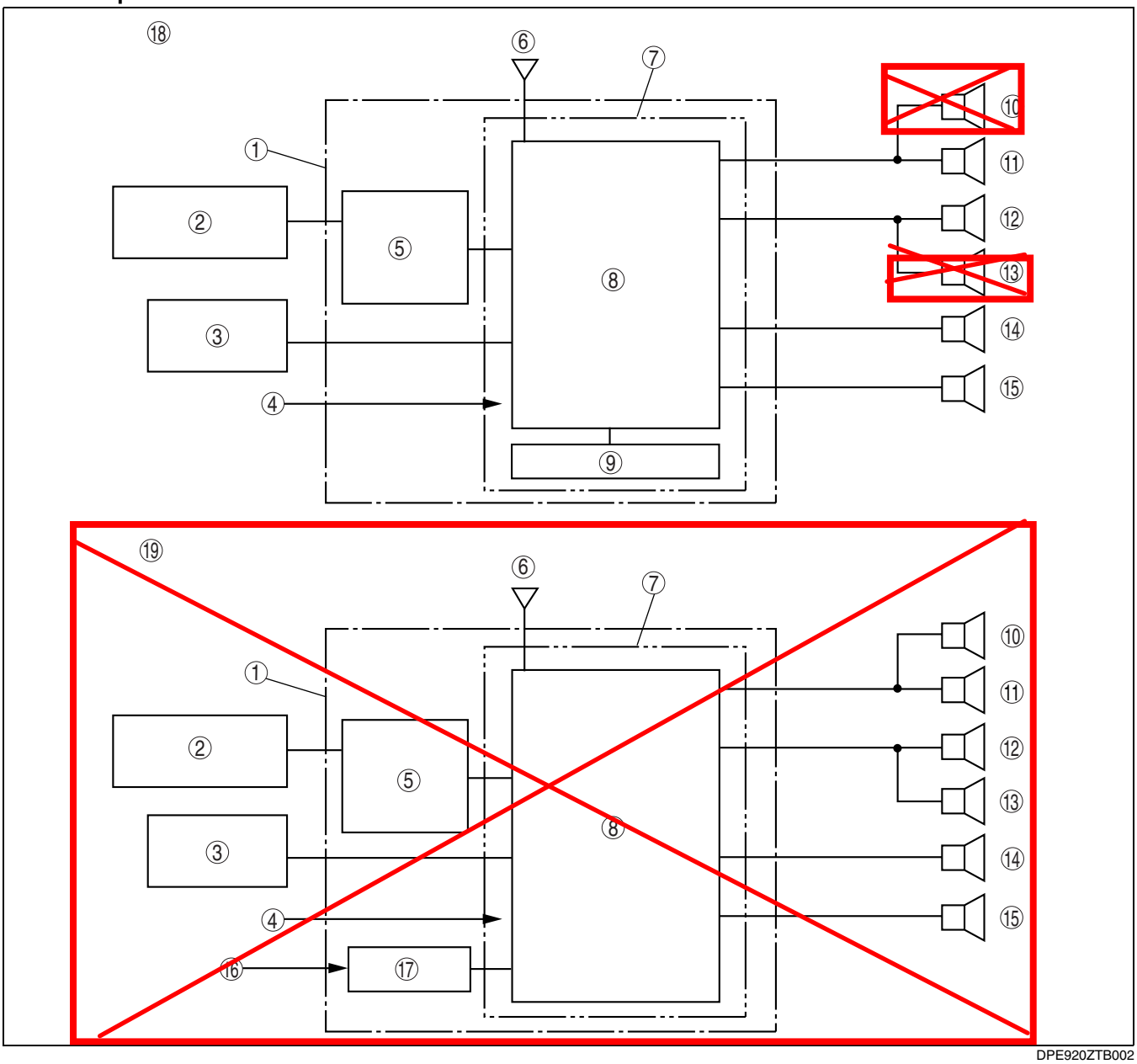
1	Rear speaker
2	Front door speaker
3	Front tweeter
4	Information display
5	Center panel module

6	Audio control switch
7	Center roof antenna
8	Condenser
9	Remote controller (with music HDD)

AUDIO SYSTEM BLOCK DIAGRAM

DPE092000001T03

Standard specification Vehicles



DPE920ZTB002

1	Center panel module (built-in audio unit)
2	Information display
3	Audio control switch
4	TNS signal
5	Audio control circuit
6	Antenna
7	Audio unit
8	Base unit
9	Lower module
~~10~~	~~Front tweeter (right)~~

11	Front door speaker (right)
~~12~~	~~Front tweeter (left)~~
13	Front door speaker (left)
14	Rear speaker (right)
15	Rear speaker (left)
~~16~~	~~Remote controller (with music HDD)~~
17	Infrared sensor
18	Type A/Type B ~~(without music HDD)~~
~~19~~	~~Type C (with music HDD)~~

AUDIO SYSTEM SPECIFICATIONS

DPE092000001T04

Audio Unit

Item				Specification		
				Type A	Type B	~~Type C~~
				Without RDS	With RDS	
Rated voltage			(V)	12		
Frequency band	AM	LW	(kHz)	—	153—279	
		MW	(kHz)	530—1620	531—1629	
	FM		(MHz)	87.5—108.0		
Audio amplifier maximum output power			(W)	25×4		
Output impedance			(ohm)	4		
HDD			(GB)	—		~~20~~

Speaker

Item		Specification	
		Front door speaker/rear speaker	~~Front tweeter~~
Maximum input	(W)	35	
Impedance	(ohm)	4	
Size	(cm)	14×19	~~5~~

CENTER PANEL MODULE OUTLINE

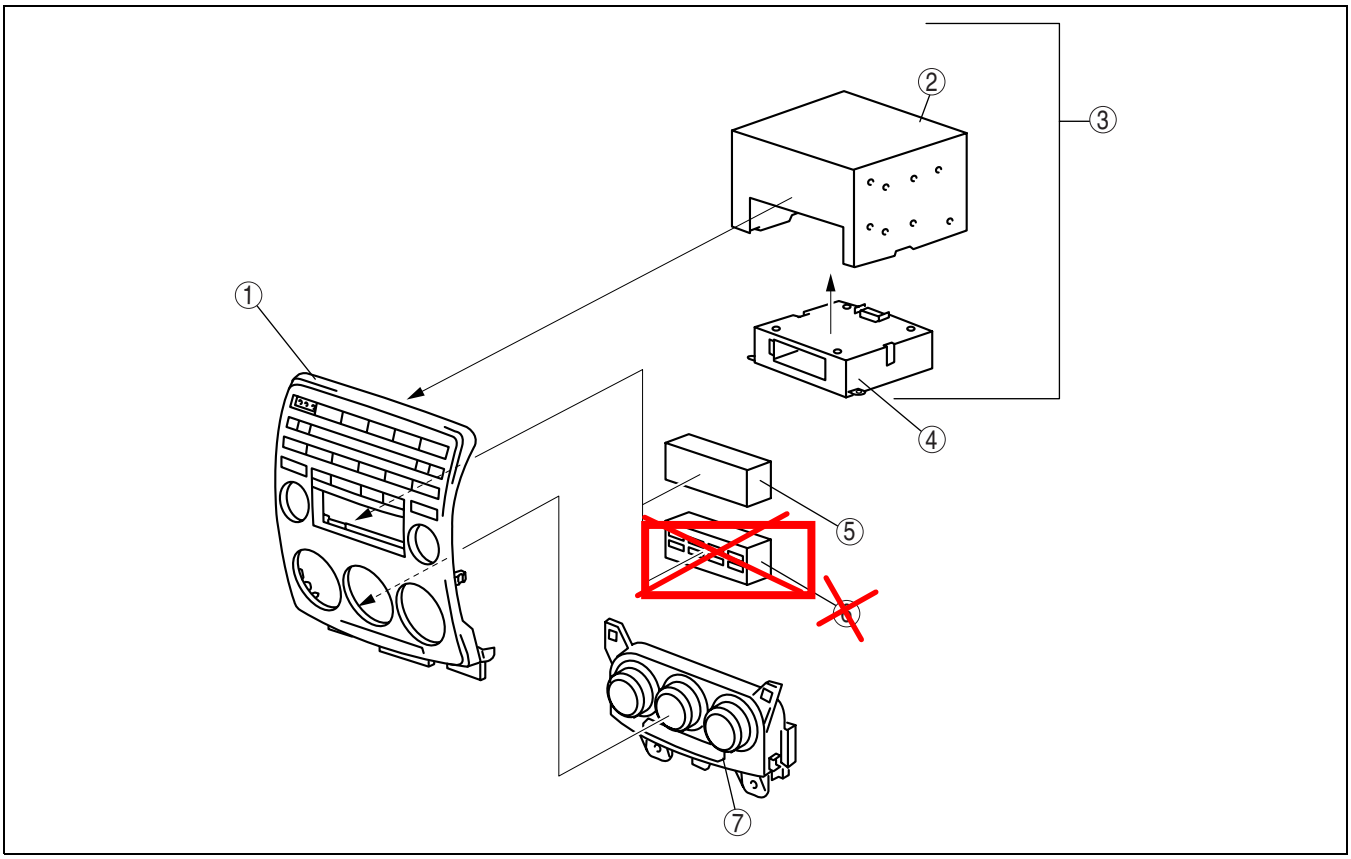
DPE092066900T01

- The center panel module is composed of the installed audio unit and the audio switches built into the center panel.

CENTER PANEL MODULE CONSTRUCTION

DPE092066900T02

Structural View

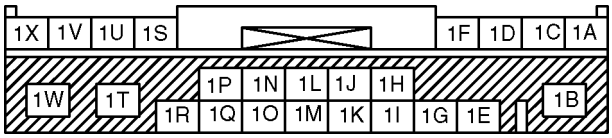


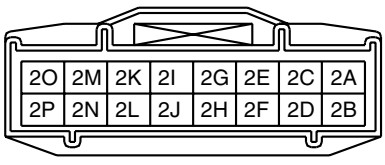
DPE920ZTB003

1	Center panel	3	Audio unit
2	Base unit	4	Lower module

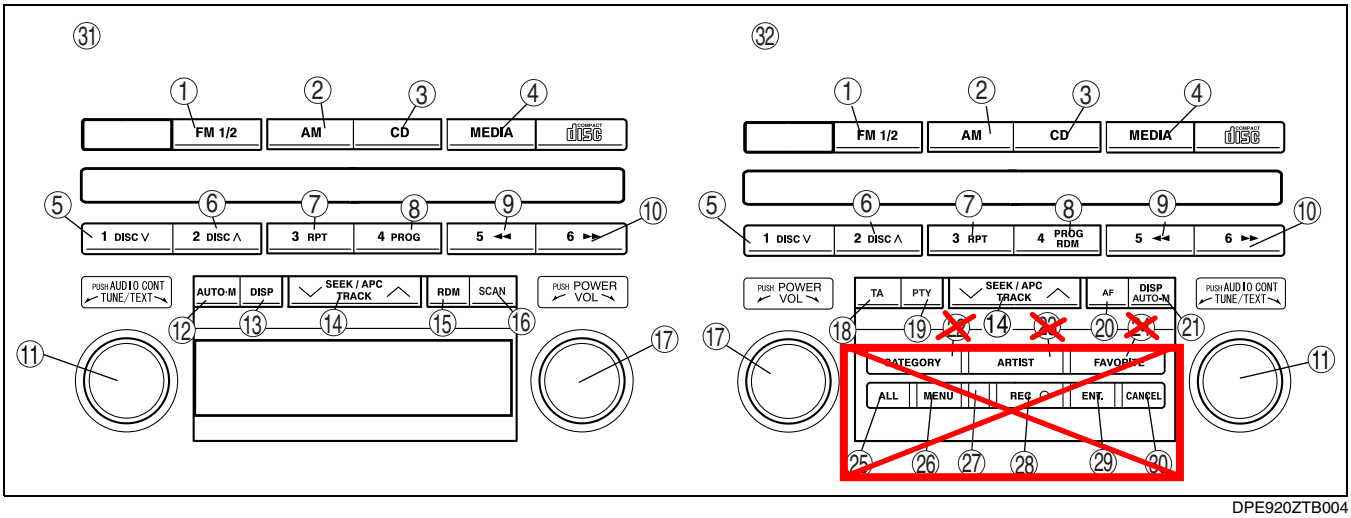
5	Cover (without music HDD)
6	Cover (with music HDD)
7	Climate control unit

Terminal Layout and Signal
Audio unit

Terminal		Signal
	1A	Left front door speaker (+)
	1B	B+ (Power back up)
	1C	Left front door speaker (–)
	1D	Right front door speaker (+)
	1E	Illumination (+)
	1F	Right front door speaker (–)
	1G	Illumination (–)
	1H	Antenna
	1I	—
	1J	—
	1K	—
	1L	—
	1M	—
	1N	Audio control switch 1
	1O	CAN (+)
	1P	Audio control switch 2
	1Q	CAN (–)
	1R	ACC
	1S	Left rear speaker (+)
	1T	—
	1U	Left rear speaker (–)
	1V	Right rear speaker (+)
	1W	Power ground
	1X	Right rear speaker (–)

Terminal		Signal
	2A	—
	2B	—
	2C	Input signal RH (+)
	2D	—
	2E	Input signal LH (+)
	2F	—
	2G	—
	2H	—
	2I	—
	2J	—
	2K	—
	2L	—
	2M	RES/AUX CONT
	2N	—
	2O	—
	2P	—

Button Location



DPE920ZTB004

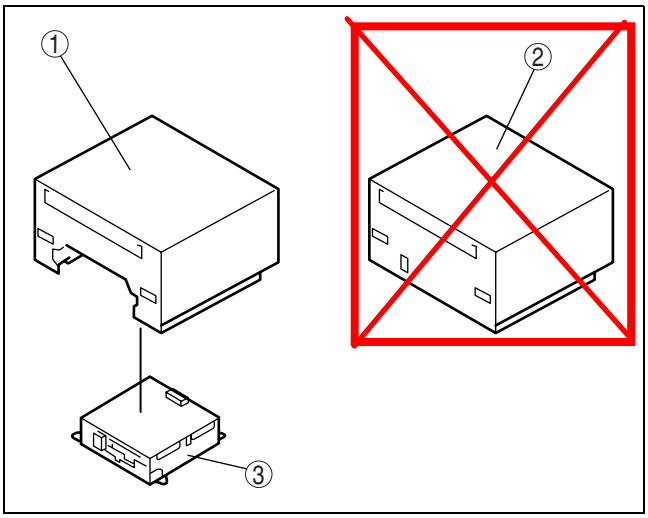
1	FM 1/2 button
2	AM button
3	CD button
4	MEDIA button
5	Preset button “1”
6	Preset button “2”
7	Preset button “3”
8	Preset button “4”
9	Preset button “5”
10	Preset button “6”
11	AUDIO CONT/TUNE/TEXT button
12	AUTO-M button
13	DISP button
14	SEEK button
15	RDM button
16	SCAN button

17	POWER/VOLUME button
18	TA button
19	PTY button
20	AF button
21	DISP/AUTO-M button
22	CATEGORY button (Type C only)
23	ARTIST button (Type C only)
24	FAVORITE button (Type C only)
25	ALL button (Type C only)
26	MENU button (Type C only)
27	Infrared sensor (Type C only)
28	REC button (Type C only)
29	ENT. button (Type C only)
30	CANCEL button (Type C only)
31	Type A
32	Type B/Type C

AUDIO UNIT CONSTRUCTION/OPERATION

DPE092066900T03

- The audio unit is composed of the base unit and lower module.
- Lower module availability depends on vehicle grade.



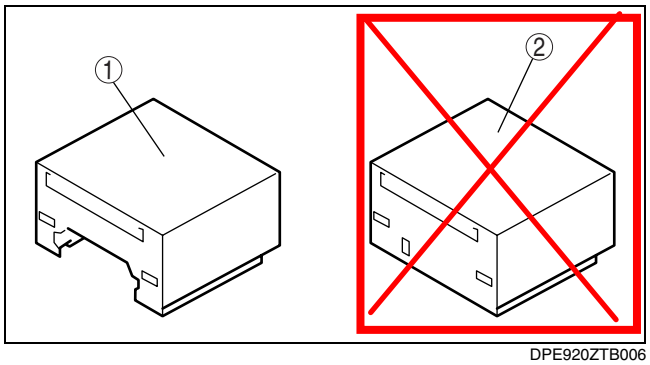
DPE920ZTB005

1	Base unit (without music HDD)
2	Base unit (with music HDD)

3	Lower module (cassette deck or MD player)

Terminal Layout and Signal
- (See 09–20–4 CENTER PANEL MODULE CONSTRUCTION.)

Base Unit
- The base unit controls the AM/FM tuner and lower modules.

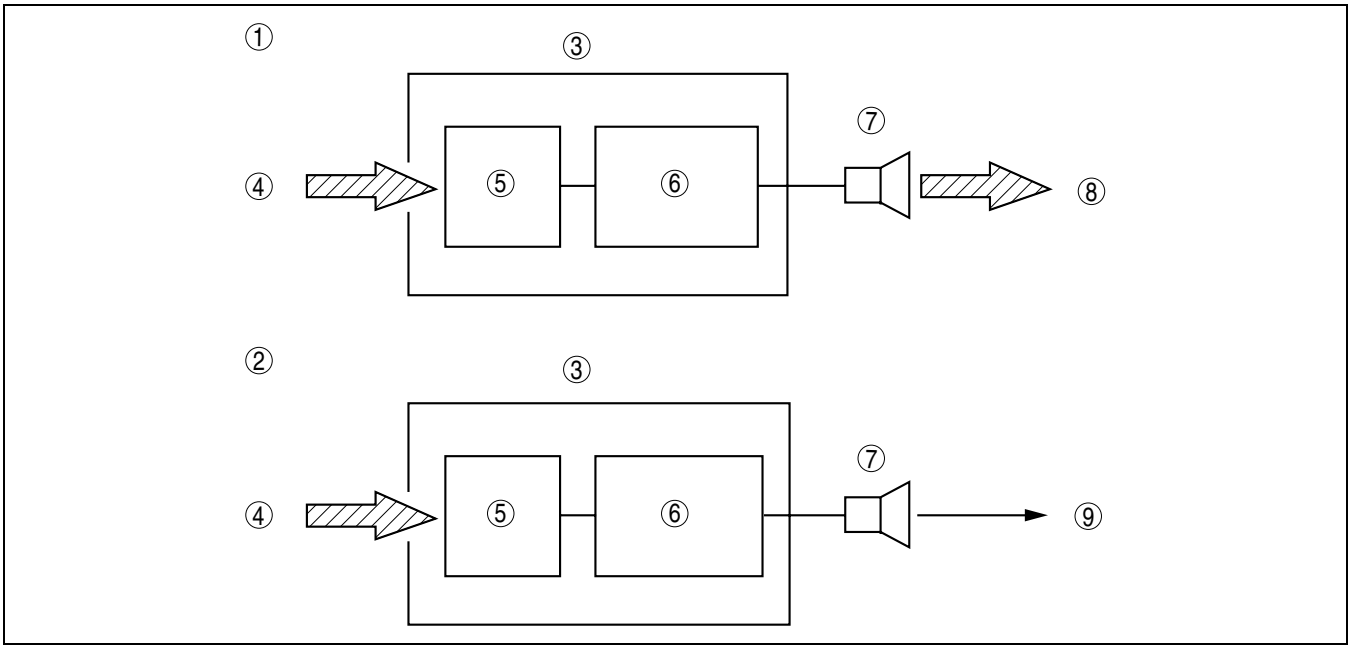


DPE920ZTB006

1	Base unit (~~without music HDD~~)
~~1~~	~~Base unit (with music HDD)~~

Auto Level Control (ALC) Function (Standard Specification Vehicle)
Function
- Adjusts the audio volume so that the sound is balanced against wind and road noise while driving.

Operation
- The audio unit changes the volume automatically based on the vehicle speed signal sent from the DSC HU/CM.



BHE0920T007

1	Higher vehicle speed
2	Lower vehicle speed
3	Audio unit (base unit)
4	Vehicle speed signal
5	ALC circuit

6	Power amplifier
7	Speaker
8	Higher volume
9	Normal volume

- The ALC function is divided into four modes that can be used effectively to match the driving conditions.

Mode	Condition
ALC OFF	ALC function cancelled
ALC LEVEL1	Outside road noise low
ALC LEVEL2	Outside road noise slightly high
ALC LEVEL3	Outside road noise high

ON-BOARD DIAGNOSTIC SYSTEM OUTLINE

DPE092066900T04

- The on-board diagnostic system has a self-diagnostic function and diagnostic assist function to help technicians locate malfunctions.

ON-BOARD DIAGNOSTIC SYSTEM FUNCTION

DPE092066900T05

Self-diagnostic Function

Malfunction detection function

- The malfunction detection section detects malfunctions occurring in the system.

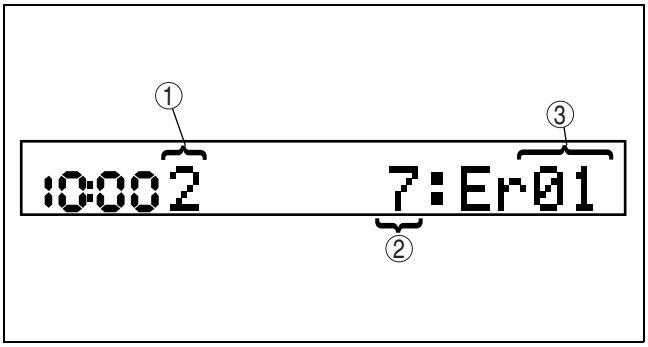
Memory function

- The memory function detects a malfunction, changes it to a DTC, and stores it in the memory. The memory can store a maximum of three DTCs. If another malfunction is detected when three DTCs are already stored, the memory function clears the oldest DTC and stores the new one.
- Once a DTC is stored, it can only be cleared by the designated procedure; not by turning the ignition switch to the LOCK position or disconnecting the negative battery cable. The procedure is mentioned in the Service Section.

Display function

- When the self-diagnostic function is activated, the information display displays the DTC stored in the memory.
- The DTC consists of the following codes and numbers:
  - — Supplier code (indicates manufacturer)
  - — Part number (indicates malfunctioning part)
  - — Error code (indicates malfunction description)
- Refer to the Service Section for the display method.

1	Supplier code
2	Part number
3	Error code



DPE920ZTB007

Supplier code	Supplier name
1	SANYO Automedia
2	Panasonic
3	Clarion
4	Pioneer

Parts number	Parts name
00	Cassette deck (lower module)
03	CD player (upper module)
05	CD changer (external)
06	CD changer (upper module)
07	MD player (lower module)
09	Base unit
10	CAN communication line
16	CAN communication line
17	CAN communication line
18	CAN communication line
19	CAN communication line

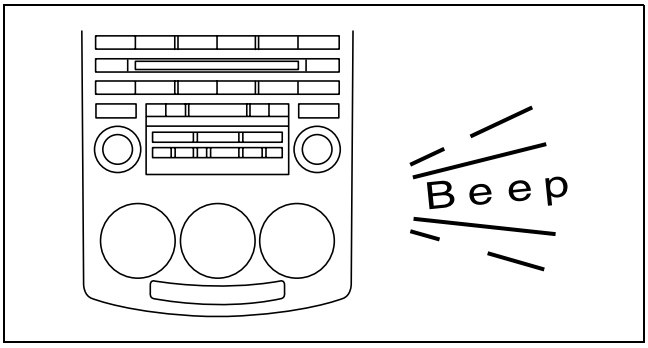
Parts number	Parts name
~~20~~	~~Music HDD (base unit)~~
21	Audio cover
22	CD changer (upper module)

Error code	Malfunction description
01	Internal mechanism error
02	Servo mechanism error
03	Mechanism stuck
04	Tape malfunction
07	Disc reading error
08	Blank media
10	BUS line (communication line) error
11	CAN line (communication line) error
12	CAN line (communication line) error
~~14~~	HDD data base error
15	REC stop (insufficient power supply
~~16~~	HDD malfunction
17	CAN line (communication line) error (center panel)
18	CAN line (communication line) error (center panel)
19	CAN line (communication line) error (center panel)
20	Insufficient power supply
21	Amplifier related circuit
22	Tuner error
30	High temperature

Screen display		Malfunction location
DTC	Output signal	
09: Er22	—	Base unit (peripheral circuit for tuner)
09: Er20	—	Power supply circuit to base unit
00: Er10	—	Cassette deck communication circuit system
03: Er10	—	CD player communication circuit system
05: Er10	—	CD changer (external) communication circuit system
06: Er10	—	CD changer (upper module) communication circuit system
07: Er10	—	MD player communication circuit system
03: Er01	—	CD player system
03: Er02	CHECK CD	CD player system
03: Er07	CHECK CD	CD player system
00: Er01	—	Cassette deck system
00: Er03	—	Cassette deck system
00: Er04	CHECK TAPE	Cassette tape system
05: Er01	—	CD changer (external) system
05: Er07	CHECK CD	CD changer (external) system
06: Er01	—	CD changer (upper module) system
06: Er02	CHECK CD	CD changer (upper module) system
06: Er07	CHECK CD	CD changer (upper module) system
07: Er01	—	MD player system
07: Er02	CHECK MD	MD player system
07: Er07	CHECK MD	MD player system
07: Er08	CHECK MD	MD system
10: Er01	—	MP3 applicable CD player system
10: Er02	CHECK CD	MP3 applicable CD player system
no Er	—	No DTCs stored

Diagnostic Assist Function
- The diagnostic assist function displays the operating condition of the following functions (components) and forces them to operate in order to examine whether they are malfunctioning or not.
- For the start procedure of each mode, refer to the Service Section.

Switch
- The diagnostic assist function sounds the buzzer when the switches are pressed to check their operating condition.

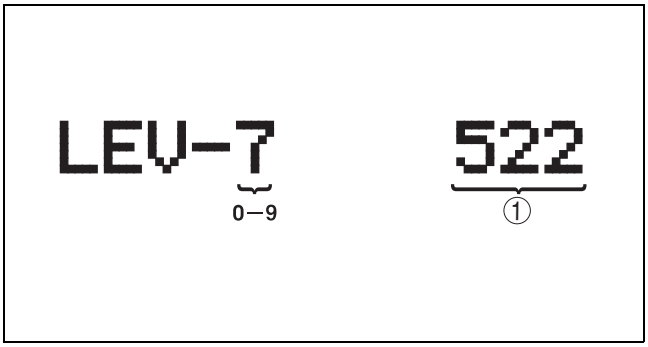


CPJ920ZNB006

Speaker
- The diagnostic assist function outputs sound to the speakers in the following order to determine the operating condition of the speakers and wiring harnesses between the base unit and each speaker.
  1. Left front door speaker and tweeter
  2. Right front door speaker and tweeter
  3. Right rear speaker
  4. Left rear speaker

Radio
- The diagnostic assist function displays the radio reception condition in 10 levels (0-9) to assist in determining the condition of the antenna, antenna feeders, and base unit (tuner).

1	Frequency



DPE920ZTB008

CONTROLLER AREA NETWORK (CAN) OUTLINE

DPE092066900T06
- The center panel module sends and receives data to and from other modules via the CAN system (MS-CAN). Refer to Section 09 for a detailed explanation of the CAN system.

Data sent
- Temperature unit
- INFO switch status

Data received
- Ambient temperature
- A/C status display request
- Temperature unit
- Vehicle speed
- Ignition key position
- Drive information system data

MUSIC HDD (HARD DISC DRIVE) FUNCTION

DPE092066900T07
- Sound source from CD player playback can be recorded to the HDD built into the base unit and played.
- The following functions have been adopted to the HDD audio.
  — Playback function
  — Recording function
  — Track information editing function

— HDD maintenance function
— HDD protection function
— Operation restriction function while driving

Item	Specification
HDD capacity	20 GB
Playback signal compression method	Encrypted MP3
Maximum recordable tracks capacity	3000
Maximum recordable albums (artist) capacity	999
Favorite track registration capacity	Number of favorite lists: 4 Number of registerable track per each list: 100
Category registration capacity	Number of category:5 Number of registerable album per each category: 999

MUSIC HDD (HARD DISC DRIVE) CONSTRUCTION/OPERATION

DPE092066900T08

Playback Function

- Music recorded into the HDD can be played.

Playback mode

- Playback in one of the four playback modes.
- Playback, in any mode other than favorite playback, is by album unit.

All playback mode (ALL)
— All albums are played in the order of their recording.
Category playback mode (CATEGORY)
— Albums which belong to the selected category are played in the order of their recording.
Artist playback mode (ARTIST)
— Albums of the selected artist are played in the order of their recording.
Favorite playback mode (FAVORITE)
— Tracks which belongs to the selected favorite list are played in the order of their recording.

Playback functions

- Repeat play and scan play are possible.

NEXT/PREV TRACK
— Next or previous track is played.
FF/REW
— Fast-forward or reverse operation (Sound muted)
NEXT/PREV ALBUM
— Next or previous album is played.
REPEAT [TRK]
— Current track is played repeatedly.
REPEAT [ALBUM]
— Current album is played repeatedly.
RANDOM [ALBUM]
— Tracks in an album are played ramdomly.
RANDOM [ALL]
— All tracks in the selected playback mode are played.
SCAN [TRK]
— The beginning of each track in the selected playback mode is played for 10 s.
SCAN [ALBUM]
— The beginning of the first track of each album in the selected playback mode is played for 10 s.

Resume-playback

When the unit is turned on/when the audio source is changed

- When the audio unit is turned on or changed from other sources (CD or Radio), the unit starts playback from the point previously stopped.

When the playback mode is changed

- When the playback mode is changed, the unit starts playback from the beginning of the track previously played in each mode.

Recording Functions

- One recording operation is regarded as one album. Up to 999 albums can be recorded.

Normal recording
— Press the 'REC switch' on the panel for 1.5 s or more while a CD is being played. The unit is now in the

recording pause mode. Press the 'MENU switch' while in this mode. The unit changes to the 'REC MENU' mode and the category, artist name, and album name can be registered in this mode.
  a. If vehicle speed is detected while in the 'REC MENU' mode, the 'REC MENU' mode is canceled. Also, the 'REC switch' is inoperable while the vehicle is moving.
  b. When the 'REC switch' is pressed while in the recording pause mode, the 'REC MENU' mode is skipped and recording starts.
- After setting the information such as category, press the 'REC switch' for less than 1.5 s to start recording.
- Recording stops if any of the following conditions are met:
  a. Recording of an album is completed.
  b. The CANCEL switch is pressed for 1.5 s or more.
  c. A copyguard signal is detected from the CD.
  d. The HDD protection function (temperature, supply voltage) is activated.
  e. The ignition switch is turned to the LOCK position.

Resume-recording
- After a recording has been stopped halfway, if the CD has not been ejected, resume-recording from the track previously being recorded is possible by activating the recording operation again.

ACC OFF recording
- Recording of an inserted CD is possible by operating the REC switch even though the ignition switch is in the LOCK position.
  a. There is no output from the speakers during an ACC OFF recording.
  b. A CD cannot be changed during an ACC OFF recording.
  c. If the previous recording is not completed and the CD has not been ejected, resume-recording will be activated.
- Recording stops if any of the following conditions are met:
  a. Recording of an album is completed.
  b. The CANCEL switch is pressed for 1.5 s or more.
  c. 80 minutes have elapsed from when the recording was started.
  d. A copyguard signal is detected from the CD.
  e. The HDD protection function (temperature, supply voltage) is activated.
  f. The ignition switch is turned to the ACC or ON position.

Track Information Editing Functions
- Track information input and data deletion are possible while in the 'HDD MENU'.

M1:Set INFO
- The album and artist names for recorded data can be input, and its category can be set.
- Up to 24 characters can be input for an album name or artist name. The following alphabet, numbers, and symbols are available.
  - A B C D E F G H I J K L M N O P Q R S T U V W X Y Z 0 1 2 3 4 5 6 7 8 9 : = ? ! & ' + - . / , ( ) @

M2:Info
- Memory status of the HDD (recorded data amount) and the number of recorded tracks in each category can be displayed.

M3:Del Song
- Deletion of data (an album, one track, or all albums) is possible.

M4:REC Set
- Specific recording (Resume, ACC OFF) can be started.

M5:Maintain
- Compression of the album number and cancellation of favorite track registration are possible.

HDD Maintenance Function (Secret Menu)
- HDD formatting and database rebuild are possible while in the Secret Menu.
  - TEST PLAY: Plays the pre-installed tracks in the HDD before shipment.
  - Format: Formats the HDD.
  - FW Info: Displays the DSP firmware version.
  - DB Rebuil: Rebuilds the data base.
  - FW Update: Updates the DSP firmware.
  - ScanDisk: Activates the scan disk.

HDD Protection Function
- If any of the following conditions are met, the HDD operation is stopped to protect the HDD.
  - The power supply voltage (+B) is approx. 10.5V or less.

— The temperature of the HDD is 85° or more, or -20° or less.

Operation Restriction Function

- If the vehicle is determined to be moving based on the vehicle speed signal input, the audio unit does not accept the operation of the following items:
  — HDD MENU
  — REC MENU
- If the vehicle is determined to be stopped, the operation can be resumed.

REMOTE CONTROLLER FUNCTION [MUSIC HDD]

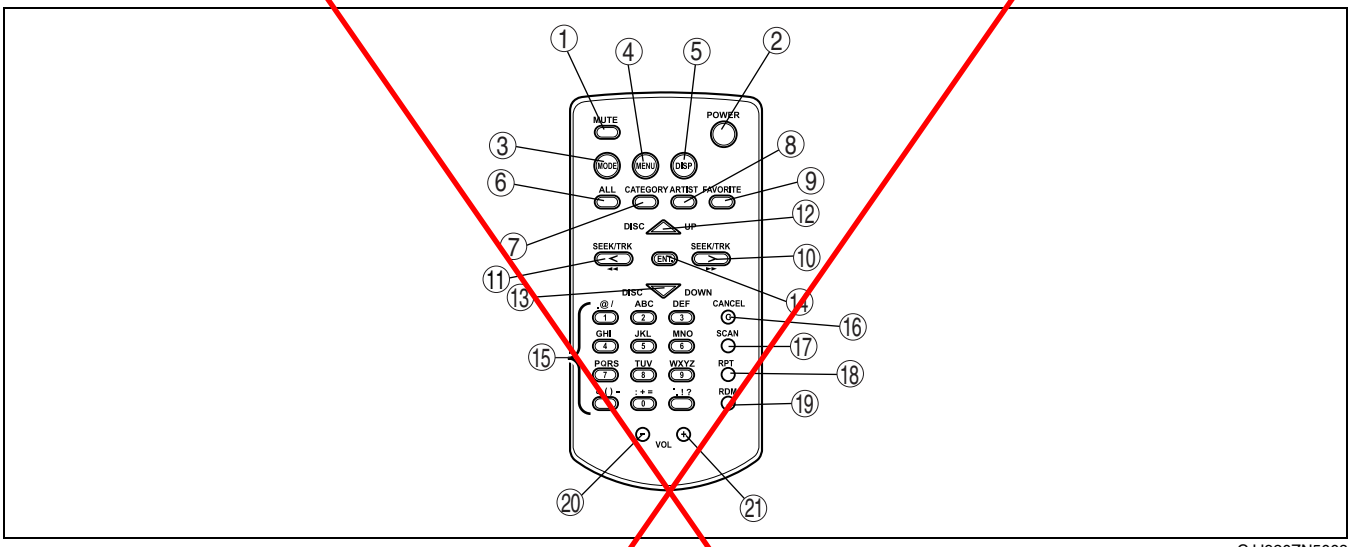
DPE092000174T05

- The music HDD operation signal is sent to the center panel module.

REMOTE CONTROLLER CONSTRUCTION/OPERATION

DPE092000174T06

- When the remote controller is operated, infrared light is output from the transmitter on the end of the remote controller. The operation signal is sent to the center panel module using the infrared light.



CJJ920ZN5008

No.	Button		Function
1	MUTE button		Mute
2	POWER button		Power ON/OFF
3	MODE button		Audio mode changes (FM1→FM2→AM→CD→HDD→AUX*)
4	MENU button		Menu screen is displayed
5	DISP button		Playback display changes
6	ALL button		HDD playback mode changes to all tracks playback mode
7	CATEGORY button		HDD playback mode changes to selected category playback mode
8	ARTIST button		HDD playback mode changes to selected artist playback mode
9	FAVORITE button		HDD playback mode changes to favorite track playback mode
10	TRK/SEEK UP button	Lightly press (less than 1.5 s)	• Track up during CD or HDD playback • Cursor moves to the right during track information input
		Press and hold (1.5 s or more)	• Track fast-forward during CD or HDD playback • Seek up during radio mode
11	TRK/SEEK DOWN button	Lightly press (less than 1.5 s)	• Track down during CD or HDD playback • Cursor moves to the left during track information input
		Press and hold (1.5 s or more)	• Track reverse during CD or HDD playback • Seek down during radio mode
12	DISC UP button		Album change (UP) during HDD playback
13	DISC DOWN button		Album change (DOWN) during HDD playback
14	ENT. button		Enter key
15	Number and symbol keys		Number, character, and symbol input
16	CANCEL button	Lightly press (less than 1.5 s)	• Selected item or mode is canceled • Delete one character during character input
		Press and hold (1.5 s or more)	Delete all characters during character input

No.	Button	Function
17	SCAN button	Scan play
18	RPT button	Repeat play
19	RDM button	Random play
20	VOL button (-)	Volume down
21	VOL button (+)	Volume up

* : Vehicles with TV tuner or auxiliary unit only

FRONT DOOR SPEAKER CONSTRUCTION

DPE092066961T01

- Located in the front door trim.

REAR SPEAKER CONSTRUCTION

DPE092066961T02

- Located in the trunk side trim.

TWEETER CONSTRUCTION

DPE092068966T01

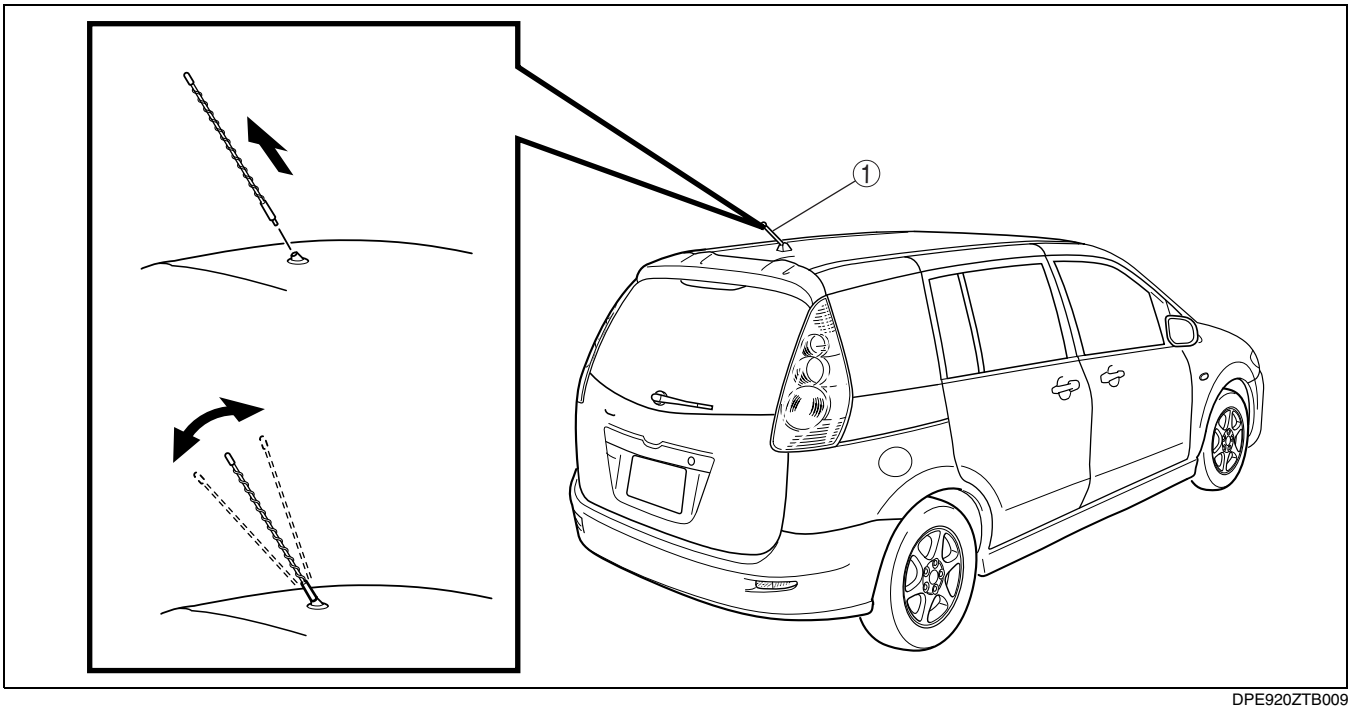
- Tweeters (high-frequency speaker) are installed in the front door inner garnishes (right and left), providing wide-range sound.

ANTENNA CONSTRUCTION

DPE092066939T01

Center Roof Antenna

- For improved convenience, the center roof antenna is removable.
- A flexible antenna mast with a built-in spring is used to prevent deformation.



DPE920ZTB009

1	Center roof antenna

AUDIO CONTROL SWITCH OUTLINE

DPE092000148T01

- A remote control for the audio system, with simplified design for easy operation, has been adopted.

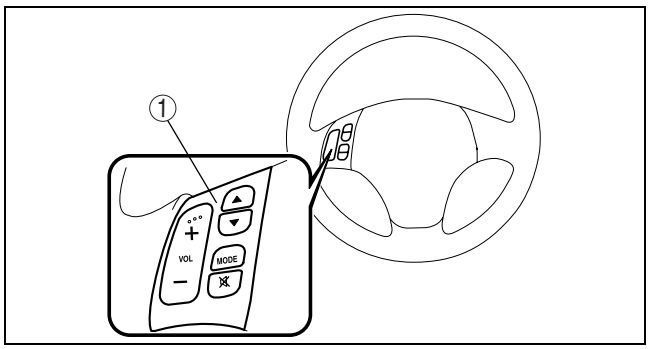
AUDIO CONTROL SWITCH CONSTRUCTION/OPERATION

DPE092000148T02

Construction

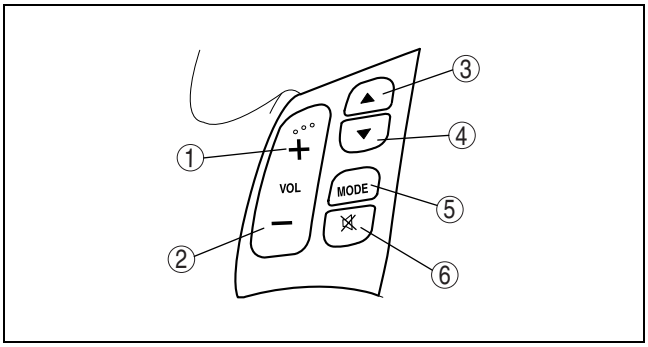
- The audio control switch is located on the steering wheel.

1	Audio control switch



BHE0920T130

Operation



CHU0920S007

No.	Button (component)	Function
1	Volume button (+)	Volume up
2	Volume button (-)	Volume down
3	AUTO scan button	Selects radio stations
	AUTO track button	Changes tracks
4	Preset button	Selects the preset button
5	Mode button	Selects the audio mode (AM→FM1→FM2→Cassette tape/MD→CD/CD changer)
6	Mute button	Mute
	Voice recognition switch	Voice recognition function ON/OFF (with car-navigation system)

CAR-NAVIGATION SYSTEM OUTLINE

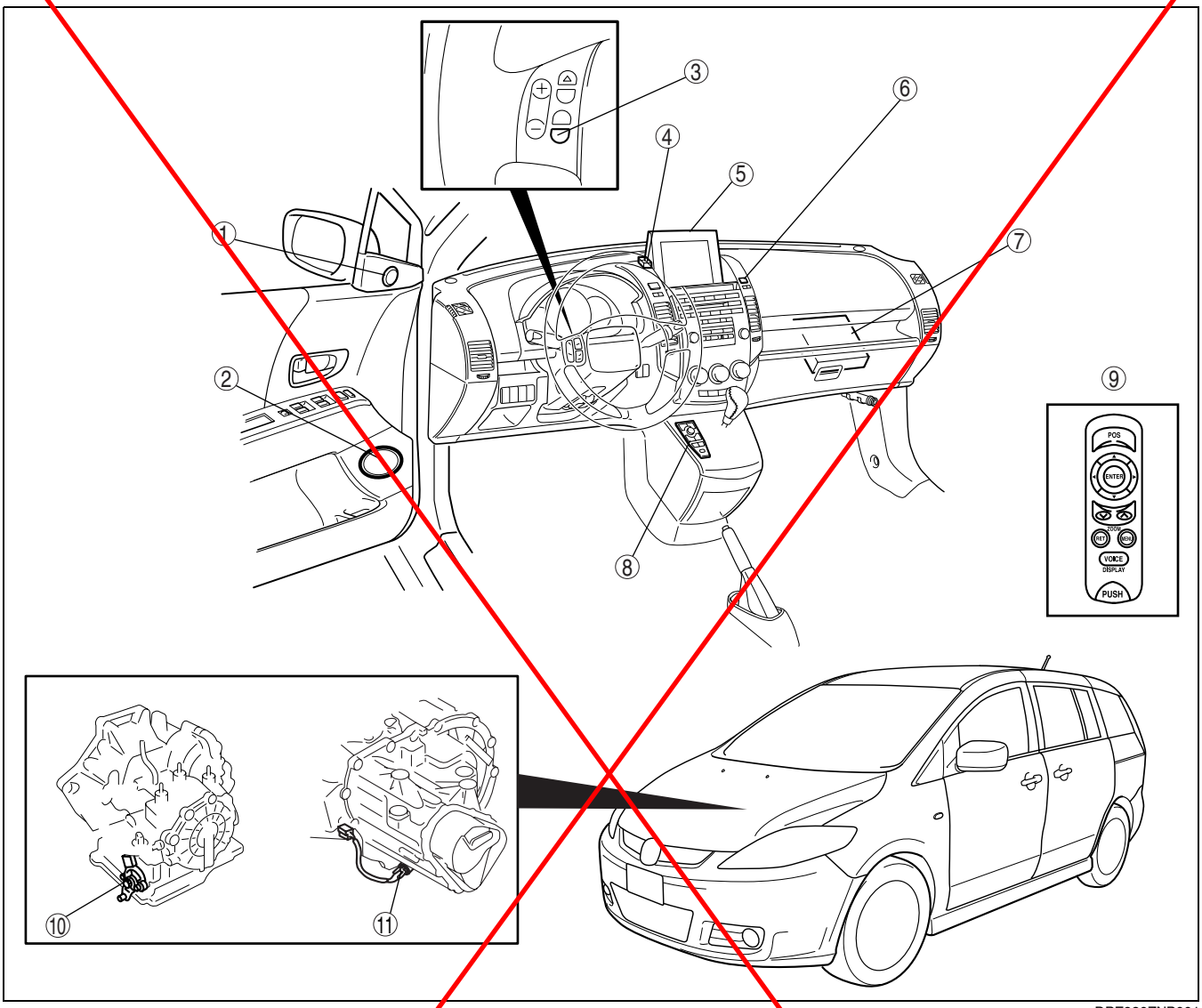
DPE092066000T0

- A 7 inch wide, pop-up LCD (*TFT) has been adopted to improve marketability.
- A hybrid in car-navigation system and map-matching function has been adopted to improve accuracy of vehicle position.
- A voice recognition function has been adopted.
- A remote control with an infrared transmitter has been adopted to improve operational ability. (UK specs. only)
- The languages and voices available for use with the car-navigation unit include English (U.S.A), English (UK), French, German, Dutch, Spanish, Portuguese, Swedish, Danish, Norwegian, Finnish, and Italian. However, the language used in this manual is in **English only**.

*TFT: Thin Film Transistor

CAR-NAVIGATION SYSTEM STRUCTURAL VIEW

DPE0920660007 02



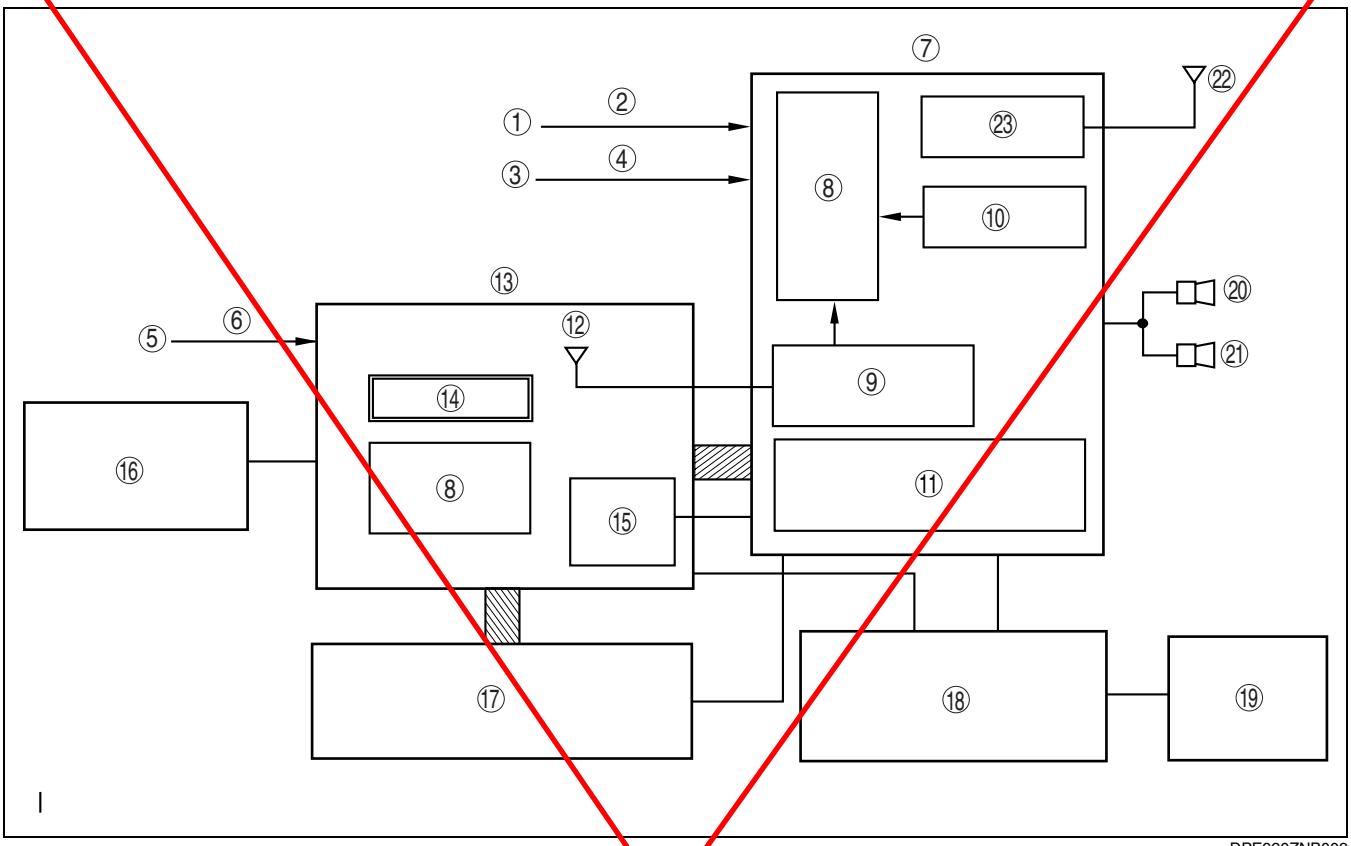
DPE920ZNB001

1	Front tweeter
2	Front door speaker
3	Voice recognition switch
4	GPS antenna
5	LCD unit
6	Microphone

7	Car-navigation unit
8	Car-navigation control switch (except UK specs.)
9	Remote controller (UK specs.)
10	TR switch (ATX)
11	Back-up light switch (MTX)

CAR-NAVIGATION SYSTEM BLOCK DIAGRAM

DPE092066000T03



DPE920ZNB002

1	Instrument cluster
2	Vehicle speed signal
3	TR switch (ATX) or back-up light switch (MTX)
4	R-range signal
5	Parking brake switch
6	Parking brake signal
7	Car-navigation unit
8	CPU
9	GPS receiver
10	Gyro sensor
11	DVD driver
12	GPS antenna

13	LCD unit
14	LCD
15	Microphone and amplifier
16	Car-navigation control switch or remote controller
17	Audio unit
18	Rear view monitor control module
19	Back camera
20	Front tweeter (driver side)
21	Front door speaker (driver side)
22	RDS-TMC antenna
23	RDS-TMC tuner

CAR-NAVIGATION SYSTEM SPECIFICATIONS

DPE092066000T04

Car-navigation Unit

Item		Specification
Unit type		Stand alone
Rated voltage	(V)	12
ROM type		DVD-ROM
Voice guidance output power	(W)	5

LCD Unit

Item			Specification
Unit type			Pop-up
Rated voltage		(V)	12
Display (for car-navigation system)	Size	(inch)	7 (wide)
	Type		TFT (Thin Film Transistor); Full-color

Speaker
- Refer to audio system. (See 09–20–4 AUDIO SYSTEM SPECIFICATIONS.)

COMPONENT PART AND FUNCTION

DPE092066000T05

Item	Function
Car-navigation unit	• Reads the data (map, voice and other) from the DVD-ROM. • Calculates and displays vehicle position from various signals. • Calculates the route to the destination. • Navigates the driver to the destination using the map screen and/or voice. **Note** • DVD audio and video are not supported by this system. • This unit does not support all Video CD and CD formats.
LCD unit	• Displays the screen (menus, maps and other screens) by remote control operation.
GPS antenna	• Receives GPS signal from satellites.
Gyro sensor (inside of the car-navigation unit)	• Sends yaw-rate signal to the CPU in the car-navigation unit.
TR switch (ATX) or back-up light switch (MTX)	• Sends R-range or reverse signal to the car-navigation unit.
Instrument cluster	• Sends vehicle speed signal to the car-navigation unit.
Front door speaker and tweeter (driver side)	• Outputs voice and audio sound.
DVD-ROM (inside of the car-navigation unit)	• Contains map information data of each country. • Contains voice data used to guide the route. • Contains route information data to search for the route.
Voice recognition switch	• Set the voice recognition function activate/deactivate
Car-navigation control switch	• Changes display screens, settings and other functions by button operation.

CAR-NAVIGATION UNIT OUTLINE

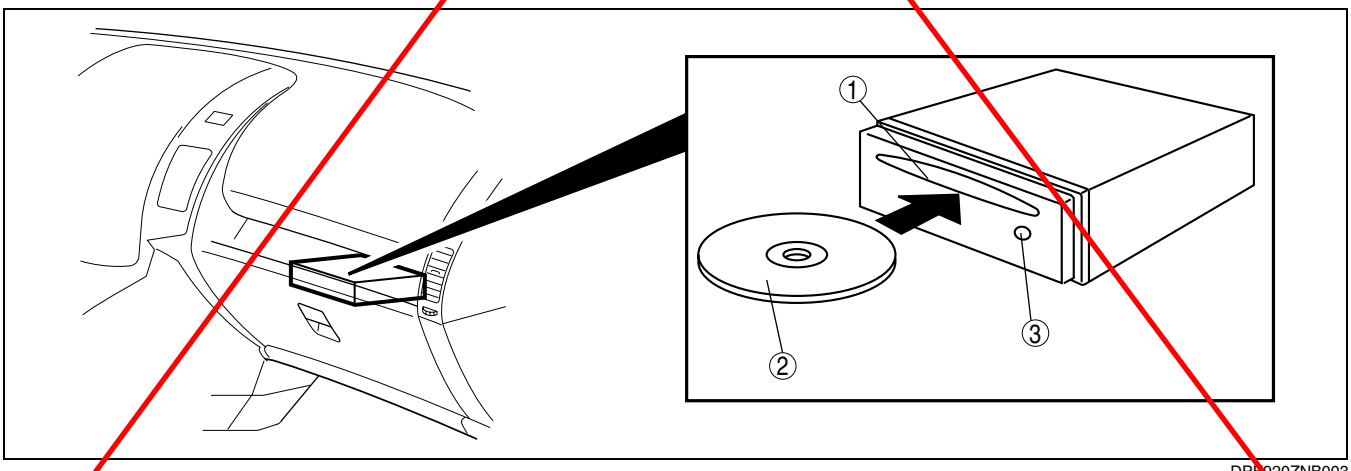
DPE092066902T01

- Using exterior signal input and DVD-ROM information, this unit detects vehicle position, provides destination route guidance, and displays color maps.

CAR-NAVIGATION UNIT CONSTRUCTION

DPE092066902T02

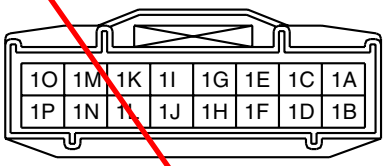
Structure
- The car-navigation unit is located in the glove compartment.
- An eject button, to eject the DVD-ROM from the loading slot, is included in the unit.
- A gyro sensor which detects vehicle cornering angle is built into the unit.

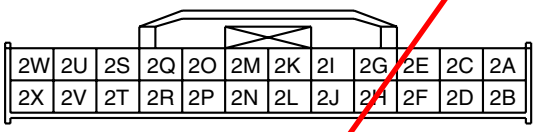


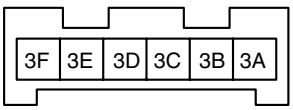
DPE920ZNB003

1	DVD-ROM loading slot	3	Eject button
2	DVD-ROM		

Terminal Layout and Signals

Terminal		Signals 16-pin connector
	1A	GND
	1B	B+
	1C	–
	1D	ACC
	1E	–
	1F	–
	1G	–
	1H	Vehicle speed
	1I	–
	1J	–
	1K	–
	1L	R-range
	1M	Front speaker output (-)
	1N	Front speaker output (+)
	1O	Front speaker input (-)
	1P	Front speaker input (+)

Terminal		Signals 24-pin connector
	2A	–
	2B	–
	2C	–
	2D	–
	2E	–
	2F	–
	2G	–
	2H	–
	2I	–
	2J	–
	2K	–
	2L	–
	2M	–
	2N	Monitor serial input
	2O	Shield GND
	2P	Monitor serial output
	2Q	Shield GND
	2R	Video (composit sync)
	2S	–
	2T	Video (B)
	2U	Video GND
	2V	Video (G)
	2W	–
	2X	Video (R)

Terminal		Signals 6-pin connector
	3A	Mic (+)
	3B	Mic (-)
	3C	Mic power
	3D	GND
	3E	Mic sense
	3F	–

Terminal		Signal 1-pin connector
	4A	GPS antenna input

Terminal		Signal 1-pin connector
	5A	RDS-TMC antenna input

Terminal		Signal 1-pin connector
	6A	GND

AUTONOMOUS NAVIGATION OPERATION

DPE092066902T05

- The navigation unit detects the position of the vehicle from a cumulative calculation of the vehicle's direction and travelled distance based on the processing of direction data obtained from the gyro sensor and vehicle speed signals obtained from the instrument cluster.
- Even when GPS satellite reception is not available, accurate detection of vehicle's position is still possible.
- Signals from GPS satellites are used partially for detecting direction data.

GYRO SENSOR FUNCTION

DPE092066902T03

- The gyro sensor is located in the navigation unit. The sensor converts yaw rate, which is one of the inputs used in calculating the vehicle direction of travel from the vehicle cornering angle, into electrical signals. It then sends these signals to the navigation unit.

GPS (GLOBAL POSITIONING SYSTEM) NAVIGATION OUTLINE

DPE092066902T06

- GPS is a navigation system developed by the U.S. Department of Defence. The system has GPS satellites orbiting the earth at an altitude of approximately 21,000 km {13,000 miles}.
- There are at least five satellites over any point 24 hours a day.
- The navigation unit receives radio signals from these satellites and determines a vehicle's position.

GPS (GLOBAL POSITIONING SYSTEM) NAVIGATION OPERATION

DPE092066902T07

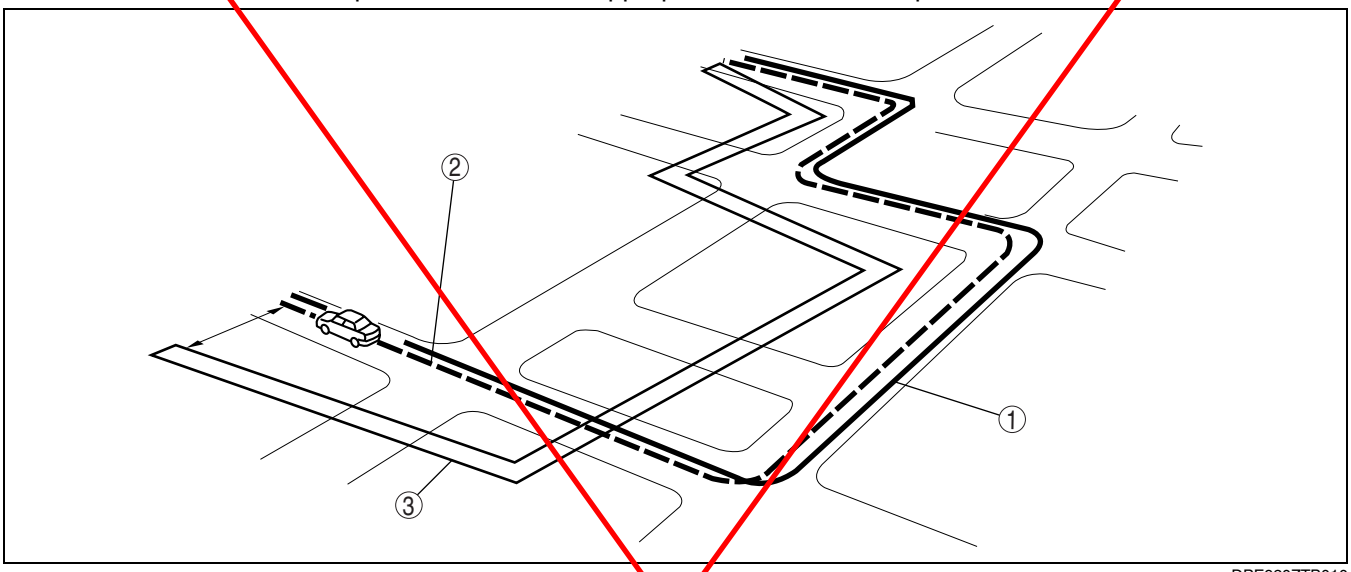
- When using the navigation system for the first time after purchase or for the first time after a long period during which it was not used, it may take about 5—15 min. until the current position is measured. Also, even during normal use, it may take about 2—3 min. for measurement.
- The GPS antenna may be unable to receive GPS satellite signals when a vehicle passes through tunnels, valleys between tall buildings, or in the mountains.
- Placing an object above the GPS antenna may prevent the navigation unit from taking measurements.
- When GPS measurement conditions are bad, the navigation unit may be unable to compute dimensions or correct to the proper position.
- The position measurement error for GPS information can be reduced by reception conditions, the time band, and by deliberate reduction in satellite accuracy by the United States Department of Defence. Also, under the following conditions, interference with satellite signals may make it temporally impossible to receive signals from GPS satellites.
  - — When receiving monitor channel 56 (UHF)
  - — When an automobile phone or cellular phone is used near the GPS antenna
- The navigation unit can locate absolute position only when the vehicle is in motion. Therefore, the navigation unit does not correct direction when the vehicle is not moving.
- The navigation unit computes three positions (latitude, longitude, and altitude) using radio signals from four or more satellites, called three-dimensional positioning. The more GPS satellite signals received, the more accurate the three-dimensional positioning is performed. The navigation unit can receive a maximum of eight satellite signals to compute a vehicle's position.

- If only three satellite signals can be received, the navigation unit uses two positions (latitude and longitude) and the altitude calculated while in three-dimensional positioning to compute a vehicle's position. This is called two-dimensional positioning.
- There can be as much as a 30-m +/- factor in the position detection system, even using the three-dimensional positioning, which is highly accurate.
- The position detection system is affected by positions of the GPS satellites which send signals.

MAP MATCHING OUTLINE

DPE092066902T08

- This function compares the route shape the vehicle is travelling to map data using the GPS satellite signals, and corrects the vehicle's position to the most appropriate road on the map data.



DPE920ZTB010

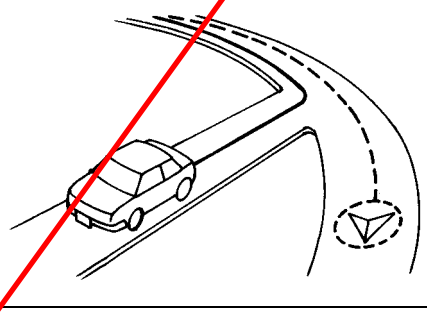
1	Map-matched route
2	Actual indicated route
3	Estimated route based on self-contained navigation

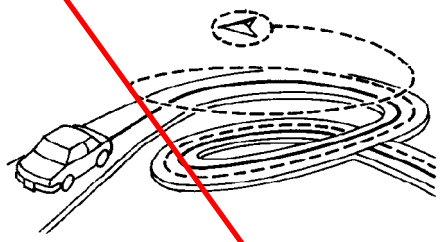
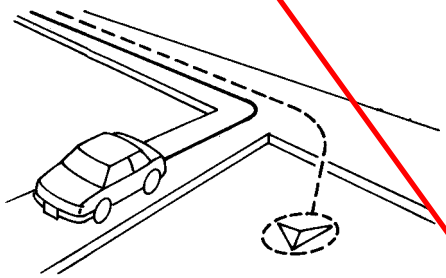
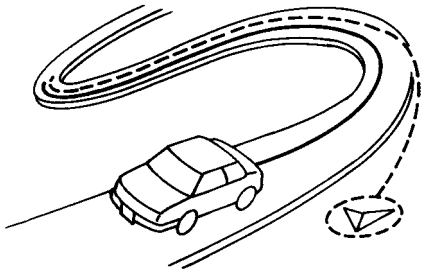
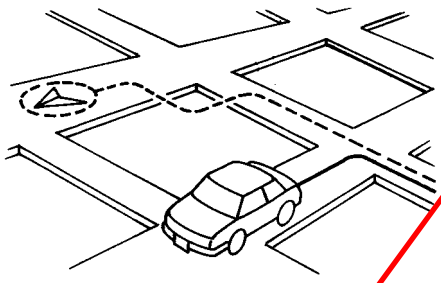
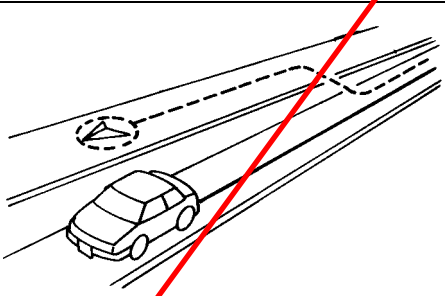
MAP MATCHING OPERATION

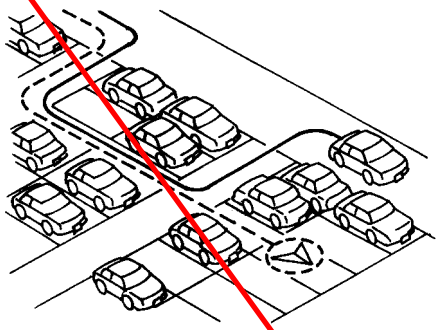
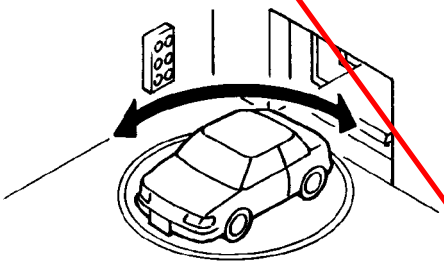
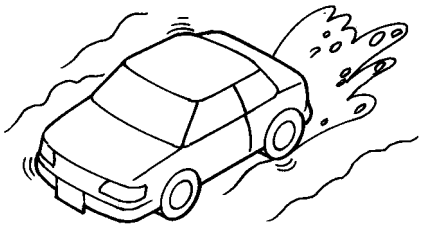
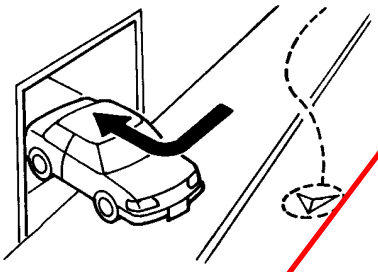
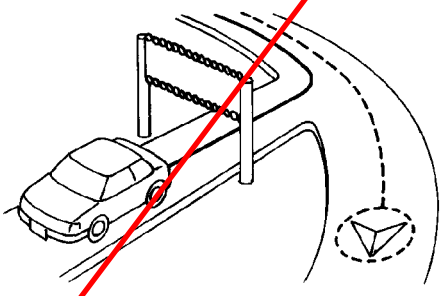
DPE092066902T09

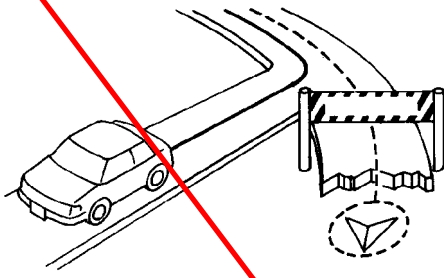
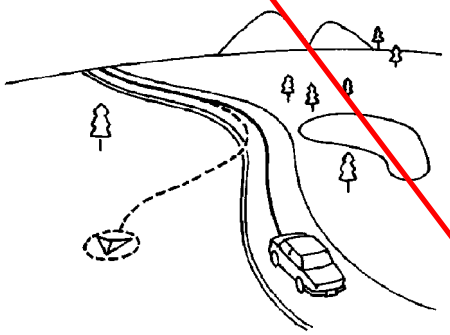
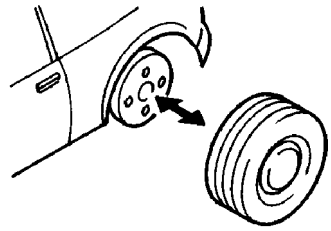
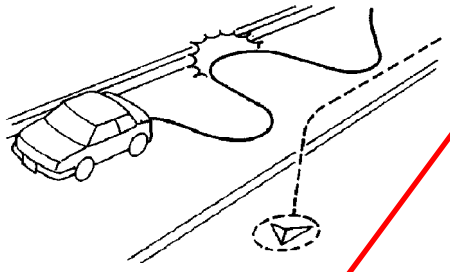
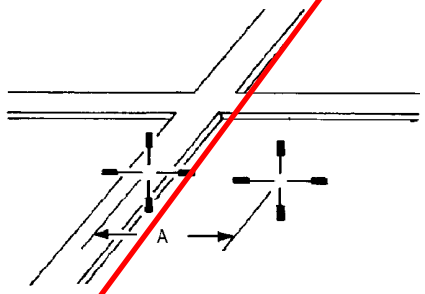
Map Matching Remarks

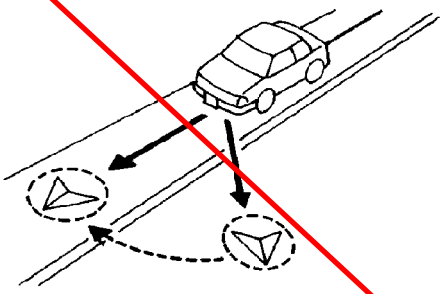
- The map matching function proposes route correction on an order of priority other than the currently indicated route. Therefore, when the navigation unit detects travelling speed or progressive direction errors, it could mistake the order of priority and fail to correct the route.
- Due to the system operation principles, the map matching function may be unable to determine which route a vehicle is taking when there are similar roads around the vehicle, and may not correct the vehicle's position until it can find a particular route.
- While driving on a road that does not exist in the map data or when the actual vehicle's position is far away from the position indicated by the vehicle locator mark, map matching will not be performed.
- Under the following driving conditions and GPS satellite conditions, the vehicle locator mark may deviate from the actual position of the vehicle. This does not indicate any breakdown in the system and if driving continues for a while, the current position will be corrected automatically.

Cause (Condition)	Driving condition
	• At a Y-shaped fork in the road where the roads separate gradually, the vehicle locator mark may be displayed on the wrong road.

Cause (Condition)	Driving condition
	• If the vehicle makes continuous, large turns, for example on a loop structure, the vehicle locator mark may go off the road altogether.
	• After driving for a long distance in a straight line or through gentle curves, if the vehicle turns a corner, the vehicle locator mark may be displayed on the wrong road.
	• On a zigzag road, the vehicle locator mark may go off the road.
	• If the roads form a grid, the vehicle locator mark may go off the road.
	• If there are parallel roads nearby, for example motorways and service roads, the vehicle locator mark may go off the road.

Cause (Condition)	Driving condition
	• If driving in an area where roads are not available on the map, the vehicle locator mark may deviate from the correct position when the vehicle returns to the road. Also, when you turn or go back and forth repeatedly, the vehicle locator mark may not line up correctly with the road.
	• If the vehicle rotates on a turntable, the navigation system may have difficulty returning the vehicle locator mark to the road correctly.
	• On slippery roads; for example, snow and ice-covered roads, wet roads, gravel roads, the vehicle locator mark may deviate from the correct road.
	• If the vehicle turns on an embankment; for example, at a parking garage entrance, on slope or banked roads, the vehicle locator mark may go off the road.
	• If driving on a new road not registered in the map data, the navigation system may incorrectly match the vehicle's position with a nearby road and when the vehicle returns to a road available in the map data, the vehicle locator mark may be off the correct road.

Cause (Condition)	Driving condition
	• If the road registered in the map data and the actual road configuration differ, the vehicle locator mark may be off the correct road.
	• For regions where there is no detailed map, the navigation system compares regions where there are detailed maps and configuration is sometimes not expressed correctly. Also, because few minor roads are registered, when the vehicle drives on a road not available in the map data, the vehicle locator mark may go off the correct road.
	• If the vehicle has tire chains, the distance travelled is not correctly detected and the vehicle locator mark may go off the correct road.
	• If the vehicle moves erratically, for example spinning wheels, the vehicle locator mark may go off the correct road.
	• In locations such as cities where there are a lot of roads, if the setting accuracy is poor when the vehicle's position is moved, the navigation system may be unable to find the correct road and accuracy may drop.

Cause (Condition)	Driving condition
	• If the vehicle's position is moved and the vehicle direction does not match, the accuracy may drop afterwards.

LCD UNIT OUTLINE

DPE092066901T01

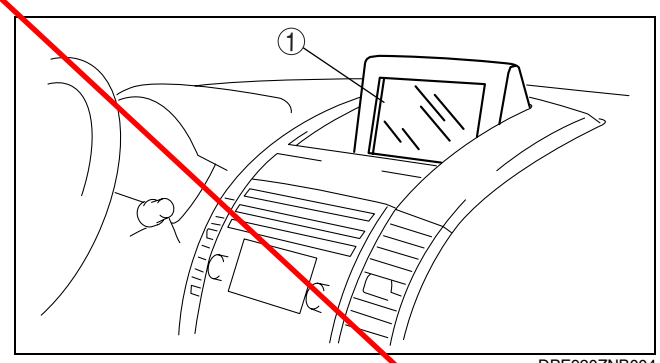
- The LCD display navigational information based on signals from the car-navigation unit.
- The LCD unit senses the user operations from the remote controller (Uk specs.)/car-navigation control switch (except UK specs.) and sends a signal to the car-navigation unit.

LCD UNIT CONSTRUCTION

DPE092066901T02

Structural View

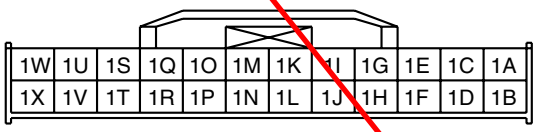
- Located at the center of the dashboard.

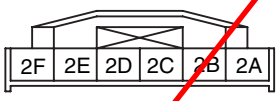


DPE920ZNB004

1	LCD unit

Terminal Layout and Signal

Terminal		Signal
		24-pin connector
	1A	Video (B)
	1B	Video (G)
	1C	Video (composite sync)
	1D	Video (R)
	1E	Video GND
	1F	Video GND
	1G	Shield GND
	1H	–
	1I	Monitor serial output
	1J	Shield GND
	1K	Monitor serial input
	1L	–
	1M	Rear cam
	1N	–
	1O	ACC
	1P	GND
	1Q	B+
	1R	Parking brake signal
	1S	Shield GND
	1T	–
	1U	UART2
	1V	Illumination (+)
	1W	UART1
	1X	Illumination (-)

Terminal		Signal
		6-pin connector
	2A	Power
	2B	GND
	2C	Illumination
	2D	—
	2E	Remote data
	2F	Shield GND

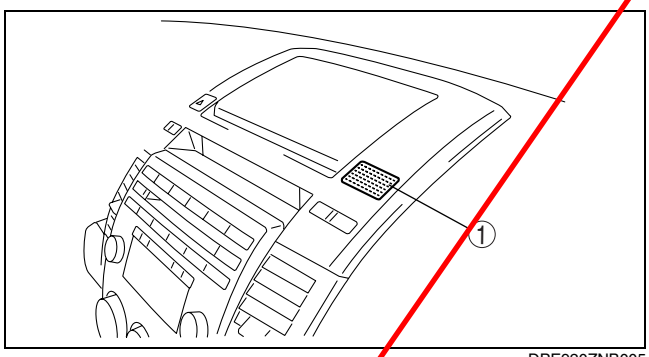
Terminal		Signal
		1-pin connector
	3A	GND

MICROPHONE CONSTRUCTION/OPERATION

DPE0920000175T01

- Located at the center of the LCD unit.

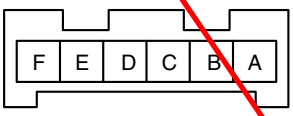
- Recognize the voice entry.



DPE920ZNB005

1	Microphone

Terminal Layout and Signals

Terminal		Signals
		6-pin connector
	A	Mic (+)
	B	Mic (-)
	C	Mic power
	D	GND
	E	Mic sense
	F	–

CAR-NAVIGATION CONTROL SWITCH OUTLINE

DPE092066921T01

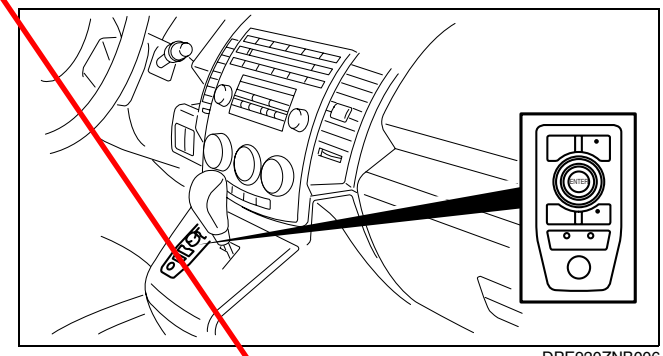
- A remote control for the car-navigation system, with simplified design for easy operation, has been adopted.

CAR-NAVIGATION CONTROL SWITCH CONSTRUCTION/OPERATION

DPE092066921T02

Construction

- The car-navigation control switch is located on the console.

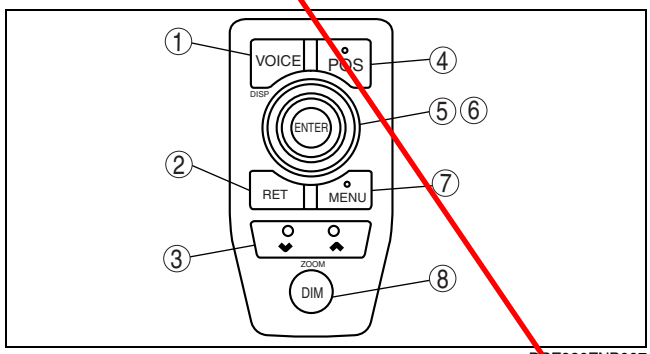


DPE920ZNB006

1	Car-navigation control switch

Operation

No.	Button (component)	Function
1	[VOICE] button	• Initiates vocal guidance for route maneuvers. • Adjusts the display.
2	[RET] button	Returns to the previous screen.
3	[ZOOM] button	Changes the map scale.
4	[POS (Position)] button	Displays the current position.
5	Joystick	Selects items by tilting it up, down, right and left.
6	[ENTER] button	Executes a selected item.
7	[MENU] button	Selects menus.



DPE920ZNB007

No.	Button (component)	Function
8	[DIM] button	Cancel the night mode.

REMOTE CONTROLLER OUTLINE [CAR-NAVIGATION SYSTEM]

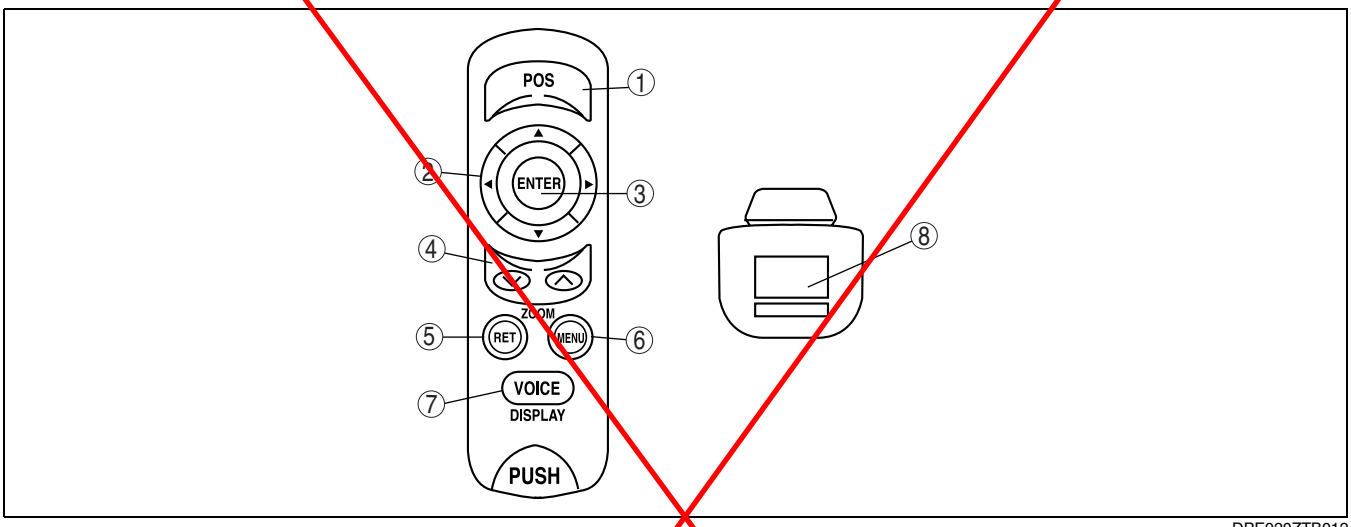
DPE092000174T03

- A remote control for the car-navigation system, with simplified design for easy operation, has been adopted.
- A cradle to hold the remote control has been adopted.

REMOTE CONTROLLER CONSTRUCTION [CAR-NAVIGATION SYSTEM]

DPE092000174T04

- The buttons and joystick for controlling car-navigation are located on the top side of the remote controller. The infrared transmitter sends signals through a terminal on the front and back of the remote controller.
- An infrared sensor that receives signals from the remote controller is located on the LCD unit.



DPE920ZTB012

No.	Button (component)	Function
1	[POS (Position)] button	Displays the current position.
2	Joystick	Selects items by tilting it up, down, right and left.
3	[ENTER] button	Executes a selected item.
4	[ZOOM] button	Changes the map scale.
5	[RET] button	Returns to the previous screen.
6	[MENU] button	Select a menu.
7	[VOICE] button	Initiates vocal guidance for route maneuvers.
8	Infrared transmitter	–

NAVIGATION FUNCTION

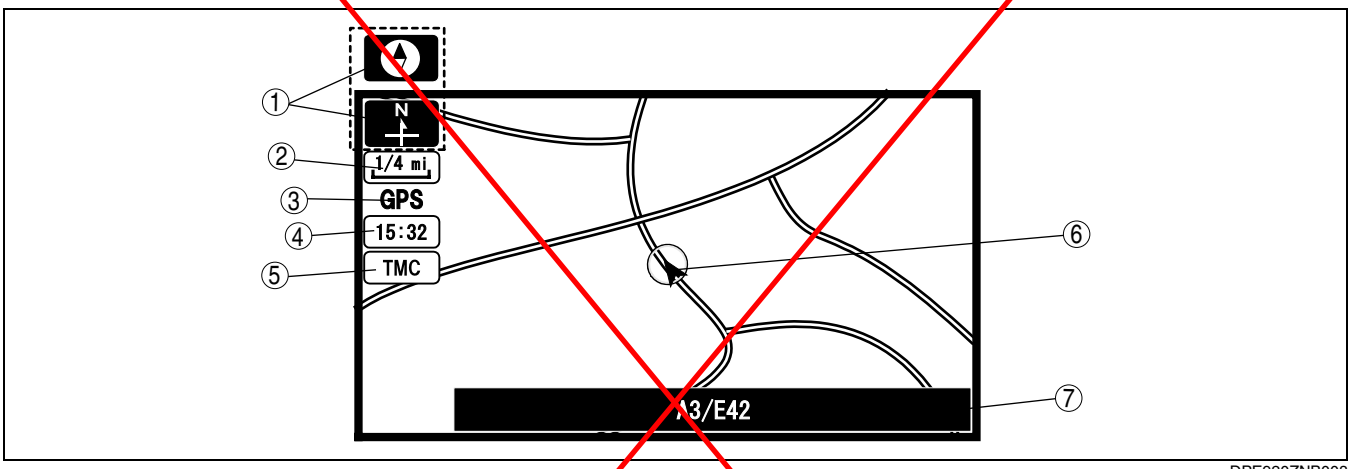
DPE092066000T06

Outline

- A vehicle's position is measured by a hybrid method of autonomous navigation (using yaw-rate signals from the gyro sensor and vehicle speed signals from the instrument cluster) and GPS navigation (using signals from GPS satellites). Accurate detection of the vehicle's position is possible based on the adoption of a map-matching function which specifies the vehicle's position as compared with the map data read from the DVD-ROM and the vehicle's position measured from autonomous navigation and GPS navigation.
- Guidance to destination is provided via display of the recommended route on the map screen, as well as voice messaging guidance at intersections and points of divergence.
- RDS-TMC system has been adopted.
- Based on inputted signals and information on the DVD-ROM, the following features are available:
  - — Destination can be selected based on address, POI (Point of Interest), postcode, memory point, home, preset destination, junction, motorway Ent/Exit, coordinates, map or previous destination.
  - — Route information is available in map, turn list, turn arrow, enlarged junction diagram, motorway information mode.
  - — Voice guidance and menus are available in twelve languages.
  - — A map screen that displays maps in thirteen steps with scales from 50 m to 256 km.
  - — A map screen that displays routes according to Search condition and route preferences.

Search condition
Quick: The route with the quickest time will be used.
Altern.: The alternative route will be used.
Short: The route with the shortest distance.
Route preferences
Allow Major roads
Allow toll road
Allow restricted road
Allow ferry
Allow car train

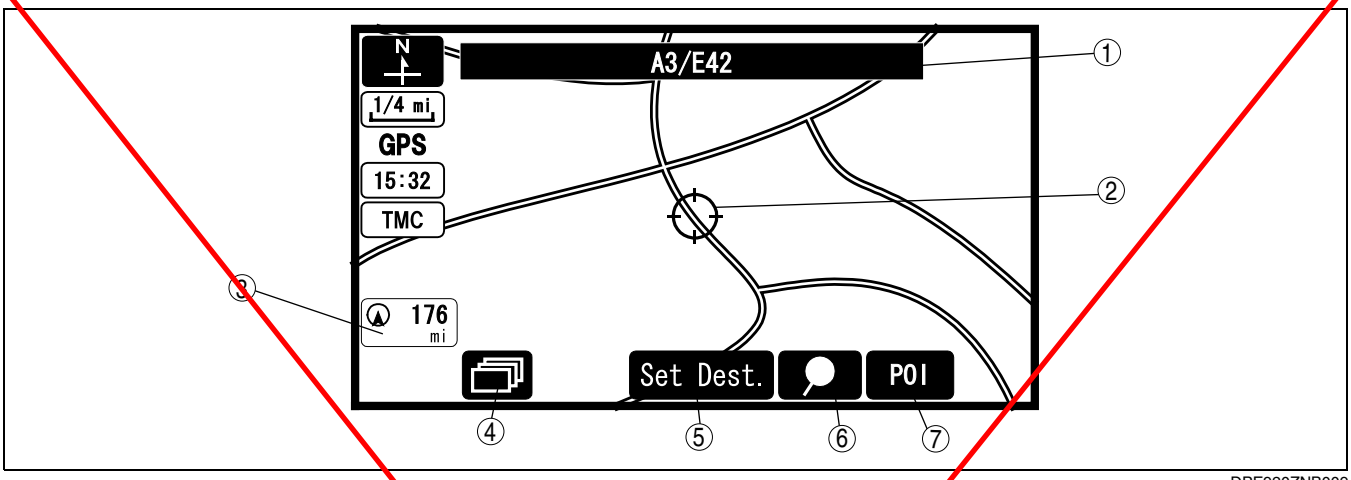
Map Screen Selection
Current position map
- The location of the vehicle and surrounding area are shown.



DPE920ZNB008

No.	Contents	Description
1	Map orientation	**North up** • Geographic north is up. **Head up** • The direction you are heading is up.
2	Map scale	The map can be displayed in 9 steps with scale from 50 m {1/32 ml} to 256 km {128 ml}
3	GPS reception indicator	Illuminates when receiving signals from 3 or more satellites.
4	Clock	Clock will be displayed when you set up clock on navigation set up on.
5	TMC icon	Shown on the display when there is TMC station reception.
6	Vehicle position	Shows the current position and direction of the vehicle.
7	Road name	Shows the name of the road you are currently driving on.

Scroll map mode
- The scroll map is displayed when operating the joystick on the current position map.
- This map can be scrolled with the crosshair cursor.



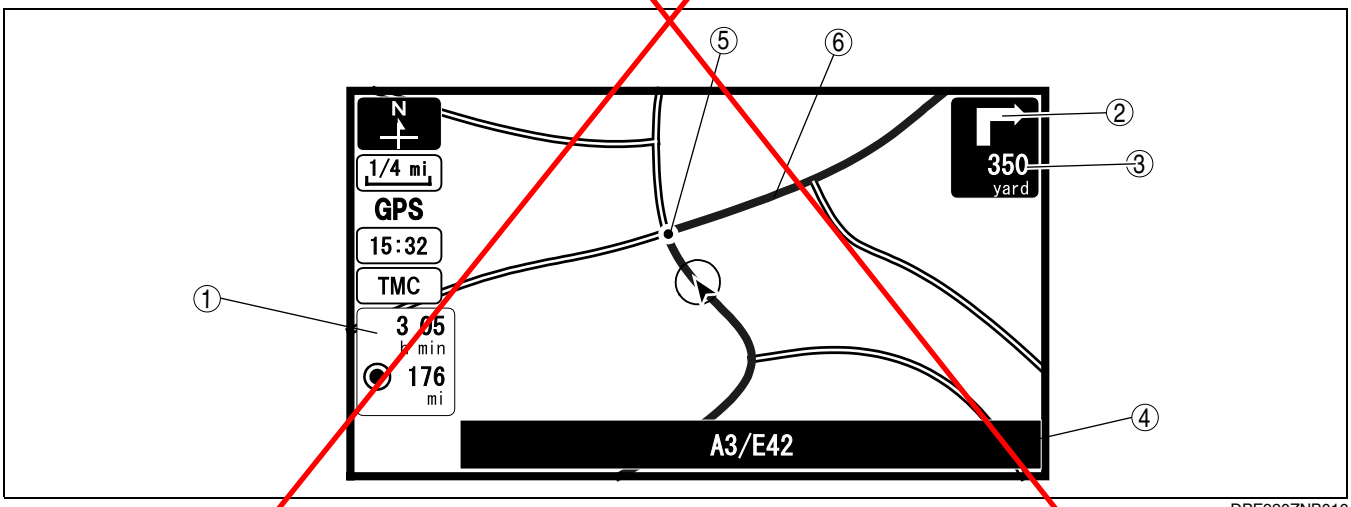
DPE920ZNB009

1	Road name
2	Crosshair cursor
3	Distance to the current position
4	Display mode button

5	Destination/via point button
6	Mark point button
7	POI button

Guide mode

- Displays an enlarged view of the road using an arrow to indicate destination, and also displays route and destination guidance information. (While in route guidance.)



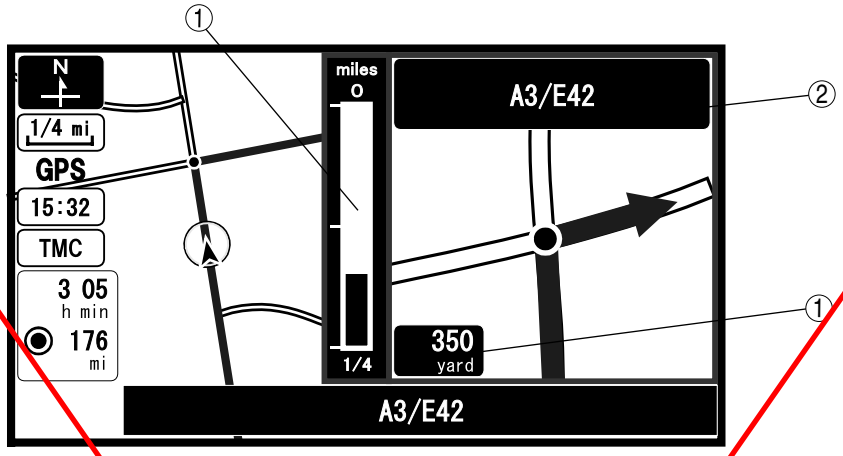
DPE920ZNB010

1	Estimated travel (arrival) time/Destination distance
2	Arrow guidance for the next turn
3	Distance to the turn after the next turn

4	Road name
5	Guidance point
6	Route display

Intersection zoom map

- An enlarged map is displayed when approaching a roundabout or intersection. (While in route guidance.) Activated by selecting Guidance Screen (On) in setup mode.



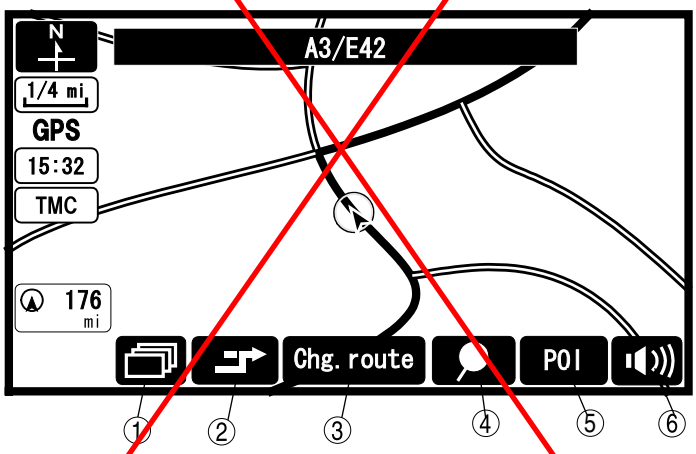
DPE920ZNB011

1	Distance to the next turn

2	Next road name

Pop Up Menu

- Pop up menu appears when pressing the [ENTER] button.
- The following items are displayed on the pop up menu. The actual displayed items vary according to the selected map, guidance, and other factors.



DPE920ZNB012

No.	Contents	Description
1	Display configuration	The following items can be selected. • single or dual map • Turn list • Turn arrow • Enlarged junction diagram • Motor way information
2	Detour	Searches for detour.
3	Change route	Changes route search settings.
4	Store memory point	Stores markers on the map.
5	POI (Point of Interest) display	Displays POI on the map.
6	Volume	Adjusts volume of voice guidance.

Destination Setting Function

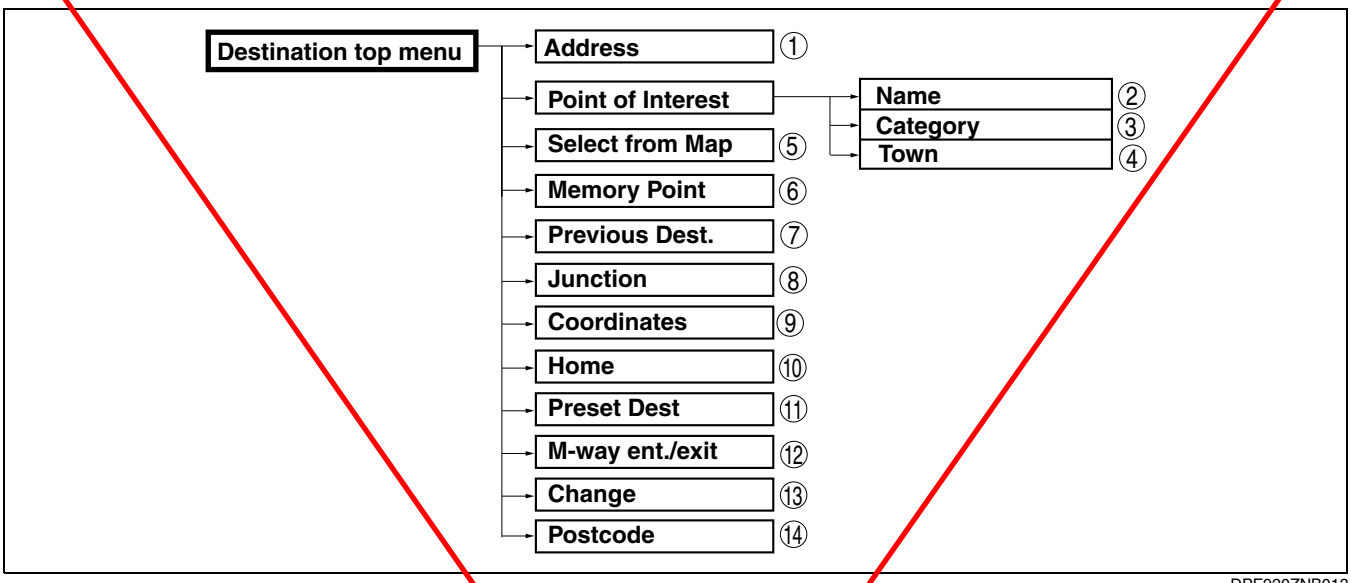
Outline

- The following instructions explain how destinations can be chosen and set.

Note

- A destination can be set to where the crosshair cursor indicates by selecting the Destination option of the

scroll map mode pop-menu.

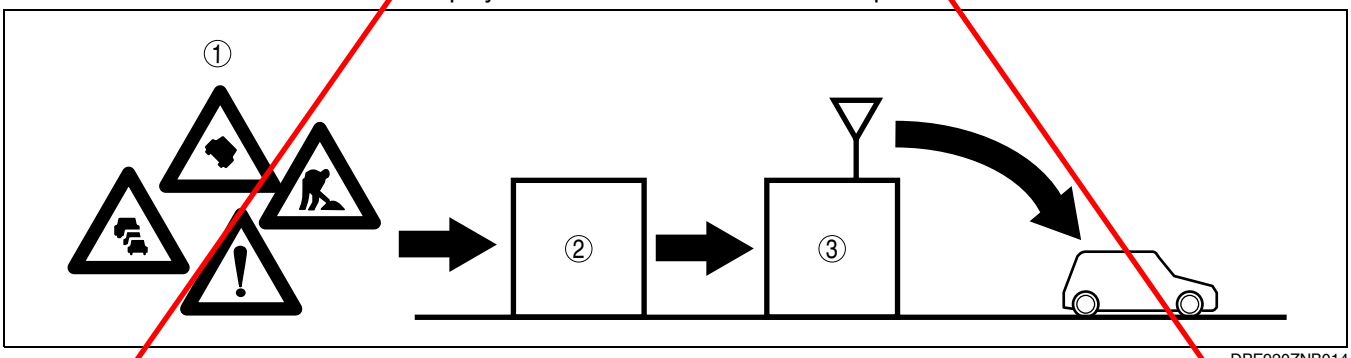


DPE920ZNB013

No.	Contents
1	Sets destination by inputting address.
2	Sets destination by inputting POI name.
3	Sets destination by selecting POI category, inputting target name and selecting POI.
4	Sets destination by selecting POI category, inputting city name and selecting POI.
5	Sets destination by moving the crosshair cursor to the destination when in scroll map mode.
6	Sets destination from a list of points stored by the user.
7	Sets destination from a list of recent destinations.
8	Sets destination by selecting junction name.
9	Sets destination by inputting coordinates.
10	Sets destination to home.
11	Sets destination to preset destination point.
12	Sets destination by selecting M-way ent./exit.
13	Changes search area.
14	Sets destination by inputting postal code.

RDS-TMC Function

- The Traffic Message Channel (TMC) is a specific application of the Radio Data System (RDS) used for broadcasting real-time traffic and weather information.
- The TMC icon is shown on the display when there is TMC station reception.



DPE920ZNB014

1	Traffic messages
2	Traffic information center (TIC)

3	Radio broadcast station

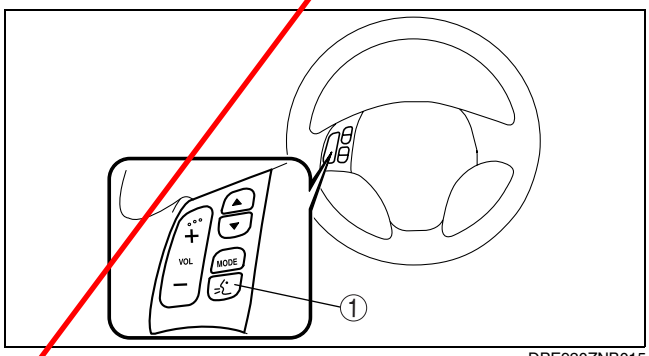
TMC (Traffic Massage Channel) icon function

- The color which are related to the events are described in the following table.

Color	Description
Red	Stationary traffic
Orange	Traffic jam
Pink	• Accidents • Road works • Danger (disaster information)
Black	Closed road
Yellow	• Road conditions • Weather • Delays (delays by the stationary/ queuing traffic)
Gray	Out of order (other than those above)

Voice Recognition Function

- Voice control can be carried out by simply pressing voice recognition switch and speaking voice command into the microphone.



DPE920ZNB015

1	Voice recognition switch

- The languages for use with the Voice recognition function include English (U.S.A), English (UK), French, German, Dutch, Spanish, and Italian. However, the language used in this manual is in **English only**.

Voice recognition command

Note

Read notes listed below to have voice recognition recognize your voice properly.

- Speak a voice command clearly.
- Keep yourself in a safe driving position. Do not face or approach the microphone to speak a voice command into it.
- Voice recognition may fail in recognizing your command due to a tone of your voice. In such cases, change the tone by speaking more loudly and clearly, etc.
- Keep inside the vehicle quite when speaking a voice command. Your command may be disturbed by noises made by people, blinkers, the horn, and vehicle's vibration etc, and noise from outside the vehicle.
- Use the language you selected in voice recognition.

- The following voice commands can be used with voice recognition function.

Shortcut Commands

[Show] Current (Position/Location)
[Show] Map
Repeat [Voice] [Guidance]
Cancel

( ) : Indicates the commands to be the object of "/"
[ ] : Recognizes without uttering the command in "[ ]"
/ : Recognizes when uttering either commands before and after "/"

Map Operation Commands

Zoom In
Zoom Out
Zoom In Maximum
Zoom Out Maximum
Right Map Zoom In
Right Map Zoom Out
Right Map (Zoom In Maximum/Minimum Scale)
Right Map (Zoom Out Maximum/Maximum Scale)
[Change to/Show] North up [Mode]
[Change to/Show] Heading up [Mode]
[Change] Map Direction
Right Map [Show] North up [Mode]
Right Map [Show] Heading up [Mode]
Right Map [Change] Map Direction
[Show/Change to] Dual Map [Mode]
[Show/Change to] Single Map [Mode]
(Store/Mark) [This point]

( ) : Indicates the commands to be the object of "/"
[ ] : Recognizes without uttering the command in "[ ]"
/ : Recognizes when uttering either commands before and after "/"

POI Display Commands

Petrol Station/Petrol
Parking/Car Park/Multi storey Car Park/Car Park
Town Centre/City centre
Town hall
Exhibition centre/Convention Centre
Community centre/Civic Centre
University/Higher Education/College
Hospital
Park/Park & Recreation/Recreation/Amusement Park
Bowling centre/Bowling alley
Casino
Cinema
Golf course
Historical Monument
Ice Skating rink/Ice rink
Museum
Music club
Ski resort/Skiing
Sports centre/Sports Complex/Stadium
Theatre
Tourist attraction
Tourist information
Winery/Vineyard
Restaurant/I'm Hungry/Show Restaurant
Chinese Restaurant/Chinese Food
Fast Food/Fast Food Restaurant
French Restaurant/French Food
Italian Restaurant/Italian Food
Japanese Restaurant/Japanese Food
Other Restaurant/Other Food
Shopping centre/Shops
Airport
Bus station
Ferry port/Ferries
Hotel
Park & Ride/Rest Area
Car Rental
Motorway service
Railway station/Underground Station/Train Station
POI Off

( ) : Indicates the commands to be the object of "/"
[ ] : Recognizes without uttering the command in "[ ]"
/ : Recognizes when uttering either commands before and after "/"

Destination Operation Commands

[Go] Home
Enter Destination
Add to way point
[Go to/Previous] Starting Point
[Go to] Previous Destination
[Go to] Preset Destination [Number] 1
[Go to] Preset Destination [Number] 2
[Go to] Preset Destination [Number] 3
[Go to] Preset Destination [Number] 4
[Go to] Preset Destination [Number] 5
Cancel

( ) : Indicates the commands to be the object of "/"
[ ] : Recognizes without uttering the command in "[ ]"
/ : Recognizes when uttering either commands before and after "/"

Guidance Commands

Louder
Softer
[Show] (Whole/Entire) Route [Map]
[Show] Next Way Point [Map]
Show First Way Point [Map]
Show Second Way Point [Map]
Show Third Way Point [Map]
Show Fourth Way Point [Map]
Show Fifth Way Point [Map]
Show Destination [Map]
(Delete/Cancel) Next Way Point
Yes
No
(Delete/Cancel) Destination
(Delete/Cancel) All Way Points and Destination
Voice guidance OFF
Voice guidance ON
Quick
Alternative
Short
Detour
Detour Entire Route
[Change to] Arrow (Guide/Guidance)
[Change to] Turn List (Guide/Guidance)
[Change to] Motorway (Guide/Guidance)
[Change to] Crossroads (Guide/Guidance)
Display Commands
Display [set] day [mode]
Display [set] night [mode]
Display [set] auto [mode]

( ) : Indicates the commands to be the object of "/"
[ ] : Recognizes without uttering the command in "[ ]"
/ : Recognizes when uttering either commands before and after "/"

REAR ENTERTAINMENT SYSTEM (RES) OUTLINE

DPE092066904T01

Outline

- The rear entertainment system (RES) has a 7.0-inch wide LCD, as well as DVD video, video CD, audio CD, and MP3 CD playback function.

- The RES is equipped with input terminals for video picture and audio sound, and AV equipment such as a video game player or a video camera can be connected and displayed on the LCD.
- Sound/music being played by the RES can be heard from the vehicle speakers.
- To listen to the RES sound from something other than the vehicle speakers, an optional wireless headphone must be purchase.
- Operate the RES with the remote controller except for disc insertion/ejection.

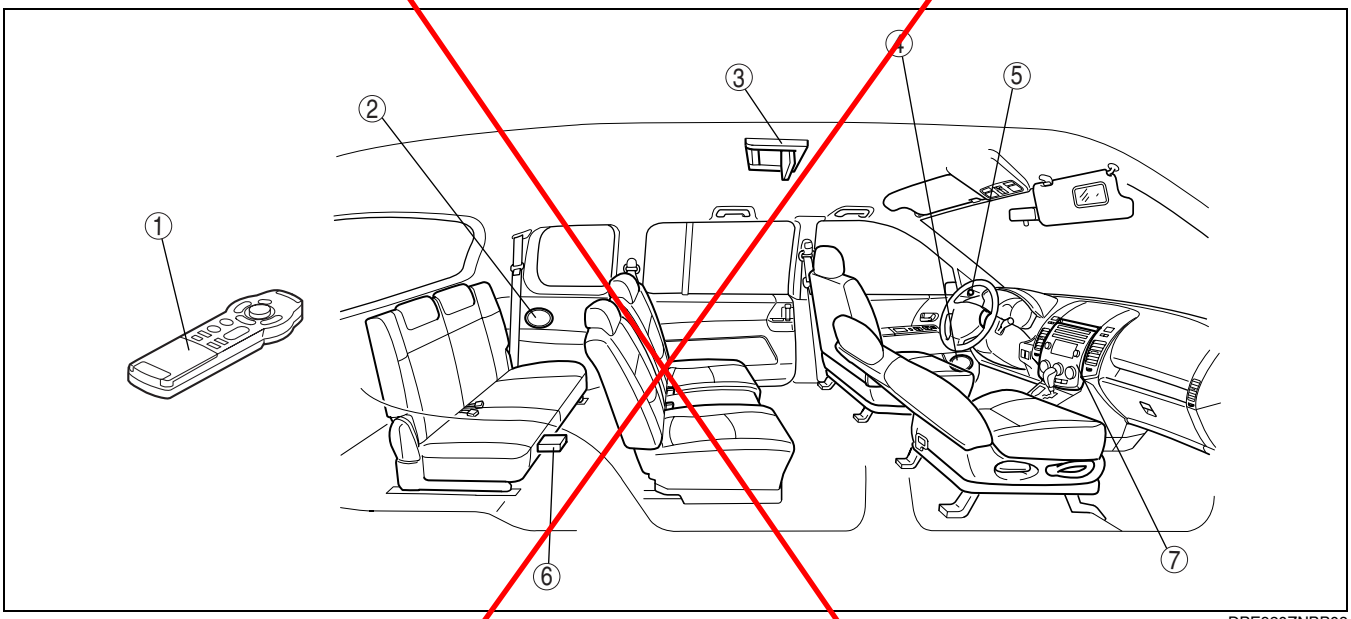
Specifications
RES unit

Item			specification
Rated voltage		(V)	12
Output impedance		(ohm)	Less than 1000
Display	Size	(inch)	7
	Type		TFT (Thin Film Transistor); Full-color

REAR ENTERTAINMENT SYSTEM (RES) CONSTRUCTION

DPE092066904T02

Structural View



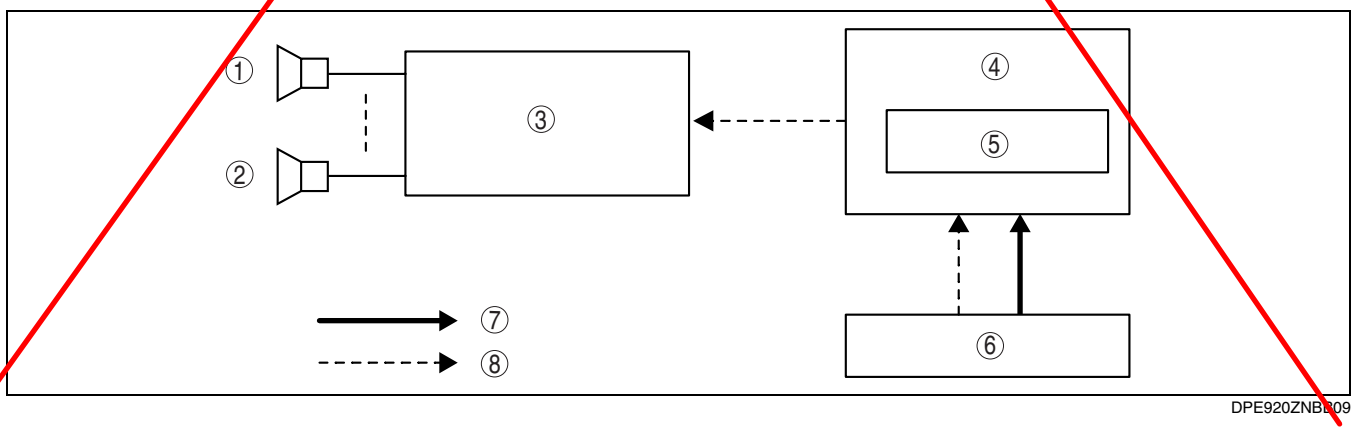
DPE920ZNBB08

1	Remote controller
2	Rear speaker
3	RES unit
4	Front door speaker

5	Tweeter
6	Auxiliary terminal unit
7	audio unit

RES BLOCK DIAGRAM

DPE092066904T03



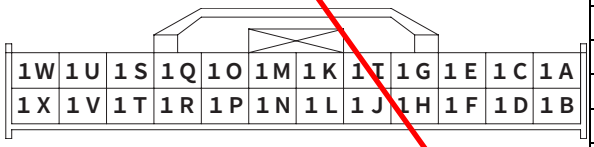
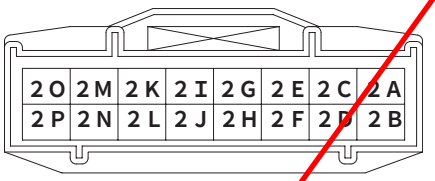
DPE920ZNBB09

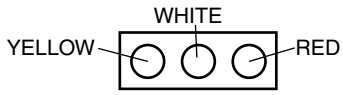
1	Front door speaker/tweeter
2	Rear speaker
3	Audio unit
4	RES unit

5	LCD
6	Auxiliary terminal unit
7	Image signal
8	Sound signal

Terminal layout and signals

RES unit

Terminal		Signal
	1A	Audio output (RH)
	1B	-
	1C	Audio output (LH)
	1D	Audio GND
	1E	Aux. cont
	1F	Level SW
	1G	-
	1H	-
	1I	-
	1J	-
	1K	-
	1L	-
	1M	-
	1N	-
	1O	-
	1P	-
	1Q	-
	1R	-
	1S	-
	1T	-
	1U	-
	1V	-
	1W	-
	1X	-
	2A	B+
	2B	-
	2C	ACC
	2D	-
	2E	TNS
	2F	-
	2G	Video input
	2H	Video GND
	2I	Audio input (LH)
	2J	Video input GND
	2K	Audio input (RH)
	2L	Status
	2M	Remote control signal
	2N	Remote control GND
	2O	-
	2P	GND

Auxiliary terminal unit		
Terminal		Signal
	A	Video output
	B	Video GND
	C	Audio output (LH)
	D	Audio GND
	E	Audio output (RH)
	F	Status
	G	Remote control signal
	H	Remote control GND
	I	-
	J	-
	K	-
	L	-
	M	-
	N	-
	O	B+
	P	ACC
	Yellow	Video input
	White	Audio input (LH)
	Red	Audio input (RH)

RES UNIT UNCTION

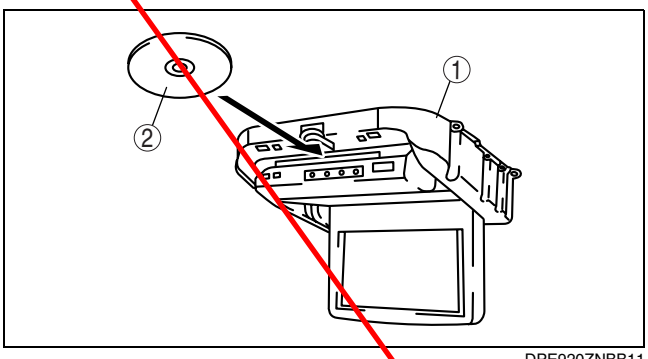
DPE092066904T04

DVD/CD Play Function

- Following discs can be played.
  DVD video
  - — 12 cm or 8cm size
  - — PAL (Phase Alternation by Line) recorded type.
  - — Region code must include “2” or “ALL”.

  video CD, audio CD, CD-R, and CD-RW
  - — 12 cm or 8cm size
  - — Playback control function supported.
  - — MP3 recorded type.

1	RES unit
2	Disc



DPE920ZNBB11

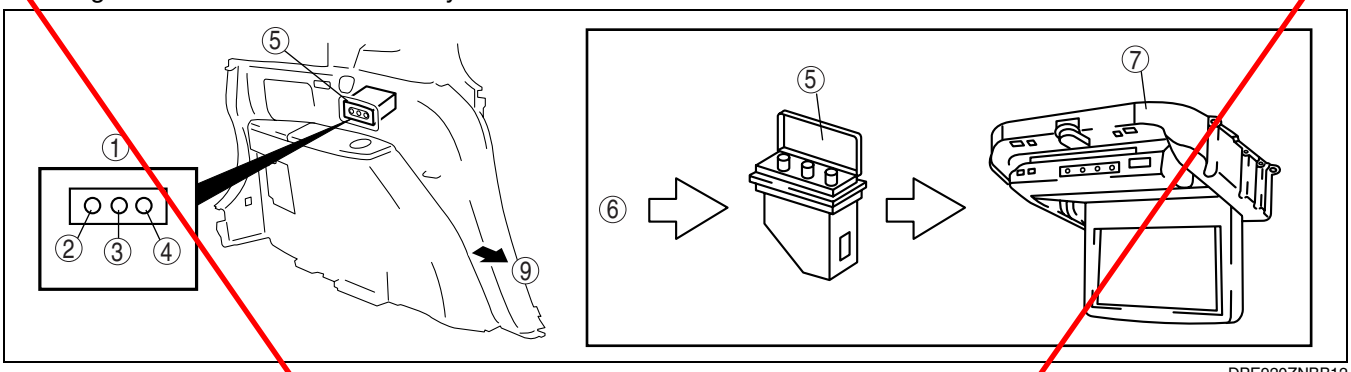
Note

- Following discs cannot be played.
  - — Discs not including “2” or “ALL” in region code.
  - — Discs recorded in the order than PAL (e.g. NTSC or SECAM).
  - — DVD-ROM/RAM, DVD-R, DVD-RW, DVD+RW, DVD-AUDIO, CD-ROM, CDV, CD-G, CVD, VSD, SVCD, SACD, photo CD, dts CD, non-conventional discs (e.g. heart-shaped), and partially transparent.
- Discs recorded in CD-TEXT or DTS format.

Auxiliary Input Function

- In AUX mode, AV equipment such as a video game player or a video camera can be used be connecting the

image and sound leads to auxiliary terminals.



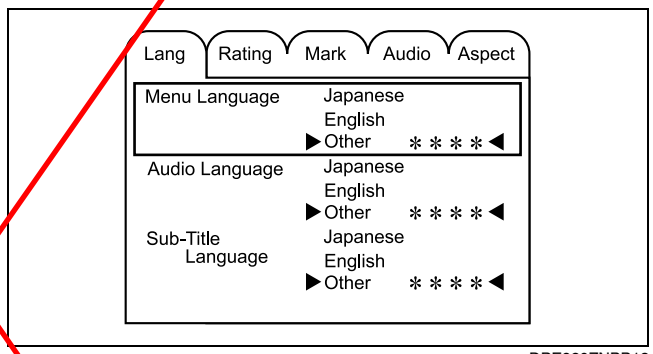
DPE920ZNBB12

1	Terminal layout
2	Image input terminal (yellow)
3	Sound (left) input terminal (white)
4	Sound (right) input terminal (red)

5	Auxiliary terminal unit
6	AV equipment
7	RES unit

Initial Setting Function

- Following items can be set in the initial setting mode.
  - — Lang: Sound and subtitle setting
  - — Rating: Parental lock setting
  - — Mark: On-screen mark, angle mark and mode priority setting.
  - — Audio: Audio DRC setting
  - — Aspect: Not available



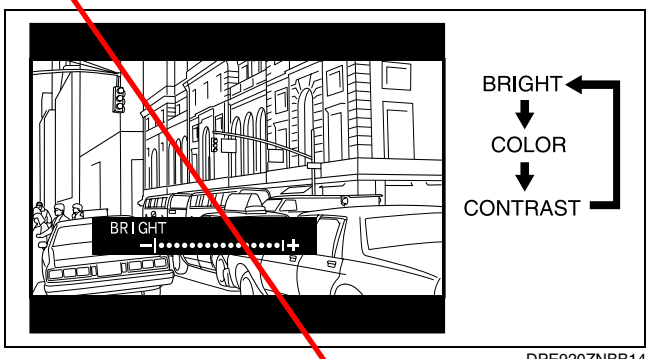
DPE920ZNBB13

Picture Adjustment Function

- Following items can be set in the picture adjustment mode.
  - — BRIGHT: Brightness.
  - — COLOR: Color density.
  - — CONTRAST: Contrast.

Note

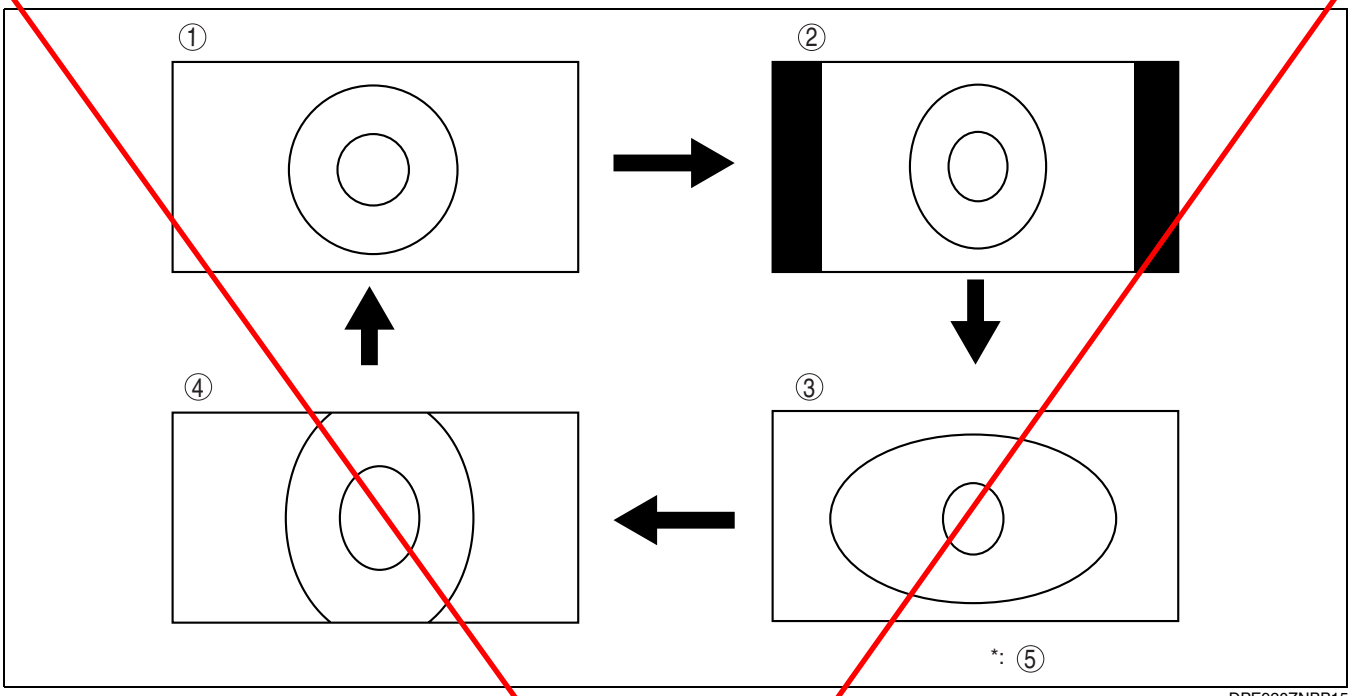
- If the picture adjustment mode is on and no operation has been done for approx. 5 s, the mode is cancelled automatically.



DPE920ZNBB14

Screen Size Setting Function

- The size of screen can be changed
- The screen size changes in the order of Fll Normal Wide Cinema each time the DISPLAY MODE button is pressed.



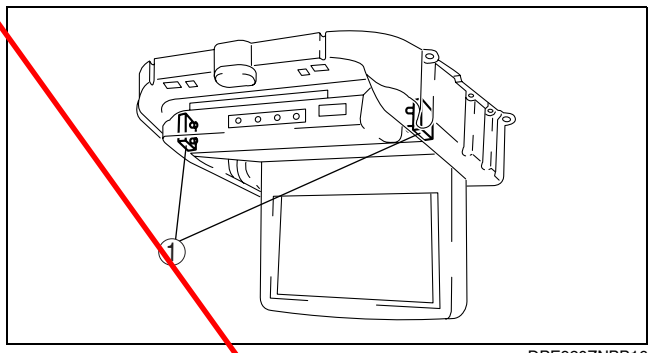
DPE920ZNBB15

1	Full screen
2	Normal screen
3	Wide screen
4	Cinema screen
5	A 16:9 screen ratio image is shown in the figure

Display Open/Close Detection Function

- If the display is closed while the power is on, it autmatically turns off.

1	Display open/close detection switch

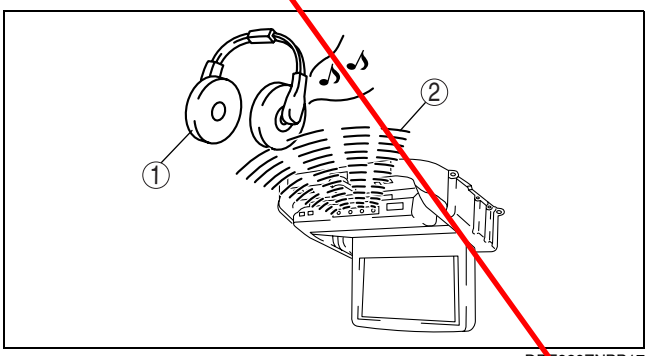


DPE920ZNBB16

Wireless Sound Output Function

- To listen to the RES sound from something other than the vehicle speakers, an optional wireless headphone must be purchase.

1	Wireless headphone
2	Infrared rays



DPE920ZNBB17

Abnormal Temperature Detection and Protection Function

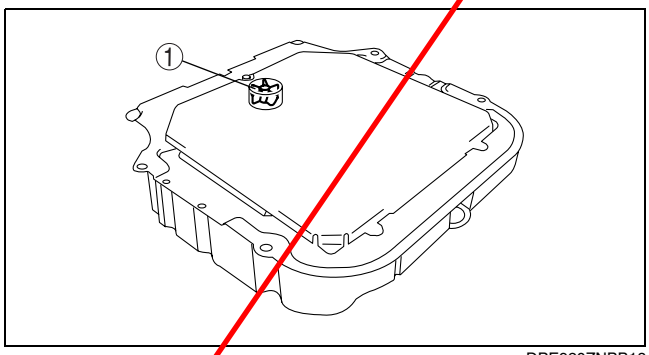
- The RSES unit stops operation if the temperature surrounding the DVD/CD player and the display is the specified value or more to prevent miss-operation of parts or to protect parts.

Part	Operation stop temperature	Operation resume temperature
DVD/CD player	Approx. 88 °C {190 °F}	Approx. 70 °C {158 °F}
Display	Approx. 95°C {203 °F}	Approx. 85 °C {185 °F}

Fun Control Function

- If the internal temperature of the RSES unit increases to 50 °C {122 °F} or more, the fan in the RSES unit operates to lower the temperature.
- If the temperature decreases to approx. 40 °C {104 °F} or less, the fan stops.

1	Fan



DPE920ZNBB18

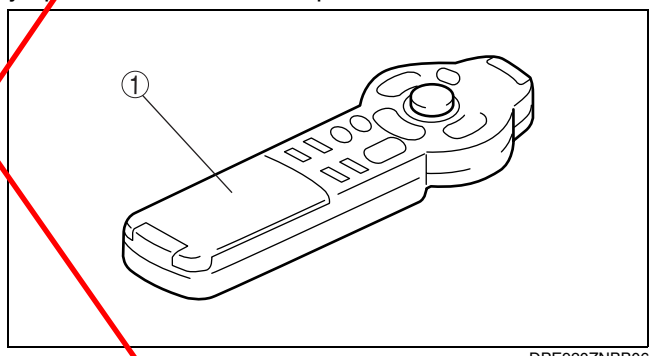
Low Voltage Detection and Protection Function

- If the ACC voltage lowers to approx. 9.5 V or less, the operation stops after “BATTERY ERROR” is displayed on the screen to prevent a system miss-operation.

REMOTE CONTROLLER CONSTRUCTION [RES]

DPE092000174T01

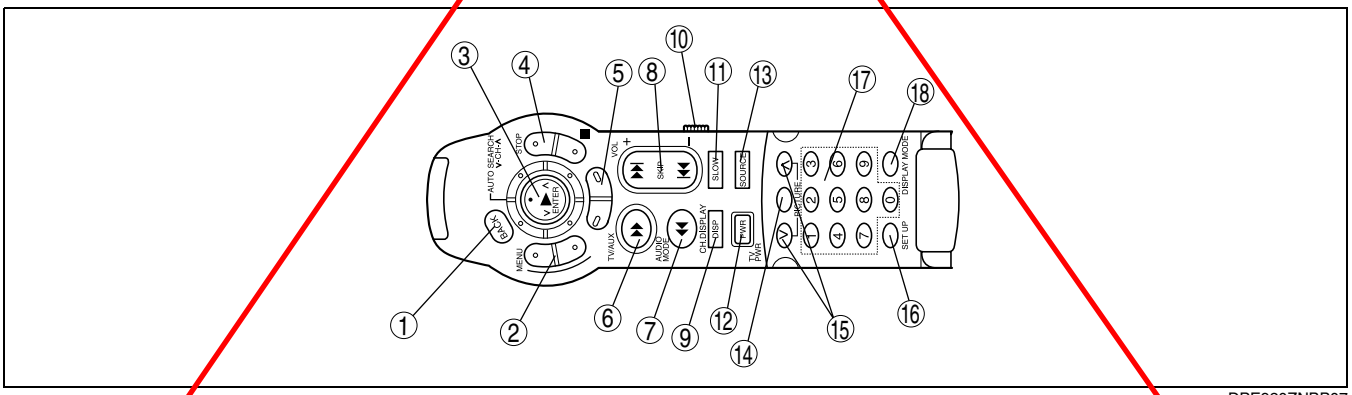
- A remote control for RES, with somplified design for easy operation, has been adopted.
- Operate the remote controller with it pointed to the disk slot of the RES unit or the LCD unit (car navigation system) in the front.



DPE920ZNBB06

REMOTE CONTROLLER FUNCTION [RES]

DPE092000174T02



DPE920ZNBB07

1	BACK (cancel) button
2	MENU button
3	ENTER/Select button
4	STOP button
5	PAUSE button
6	Fast-forward button
7	Reverse button

8	SKIP button
9	DISPLAY button
10	Remote controller selector switch
11	Slow playback button
12	PWR (power) button
13	SOURCE button
14	Picture adjust mode button

15	Picture sdjust button
16	SET UP button
17	Number keys
18	DISPLAY MODE button

REAR VIEW MONITOR OUTLINE

DPE092000160T01

- The rear view monitor is a visual assist system when reversing the vehicle using guide lines which appear on the screen's rear view image.
- Descriptions that appear on the display when using the rear view monitor can changed to the following languages.
  — English, French, Italian, Spanish, Danish, German, Dutch, Swedish, Portugal and Japanese.

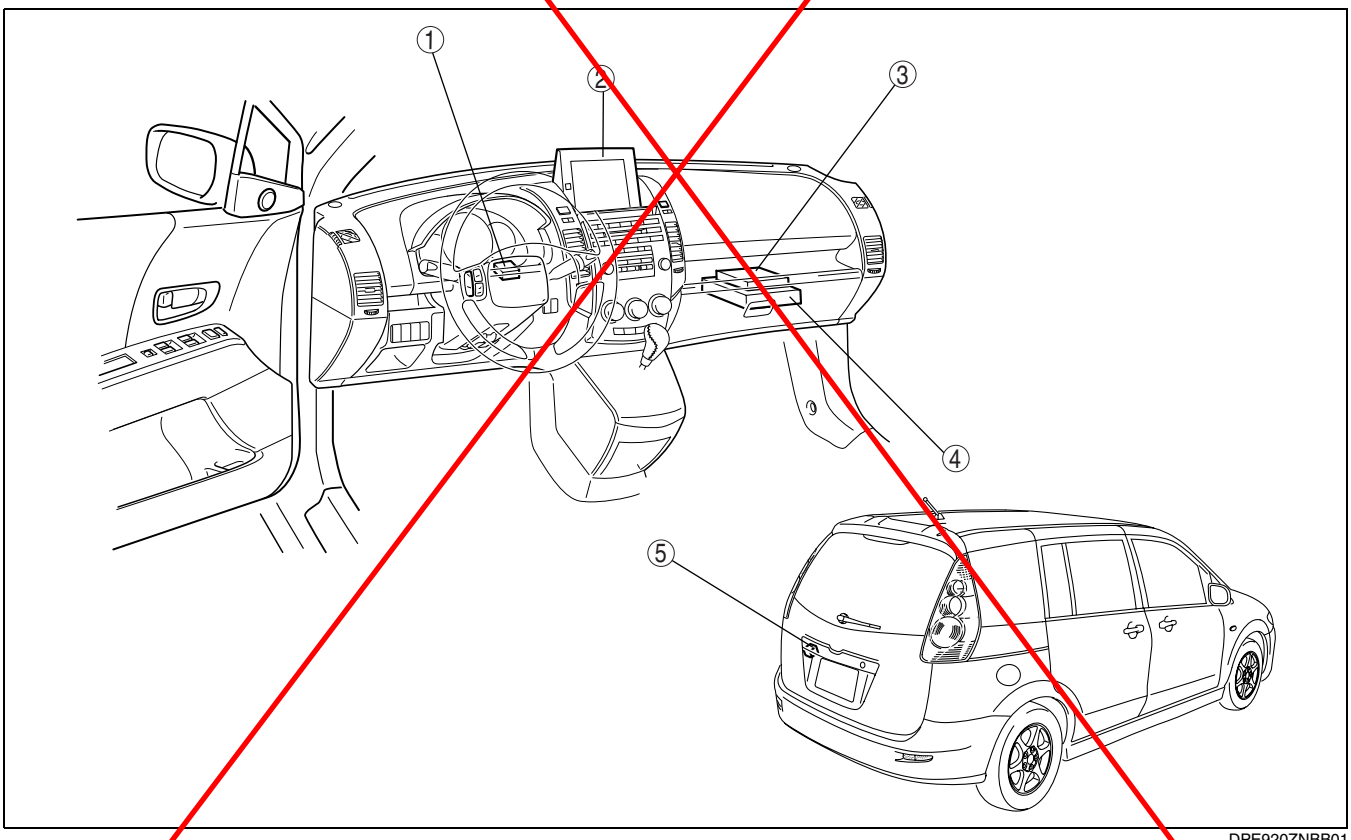
Caution

- **The rear view monitor is only a visual assist device when reversing the vehicle. The images on the screen may be different from the actual conditions. Always drive carefully confirming the safety of the rear and surrounding conditions by looking directly with your eyes.**
  Reversing the vehicle by only looking at the screen may cause an accident or collision with an object.

REAR VIEW MONITOR STRUCTURAL VIEW

DPE092000160T02

Structural View

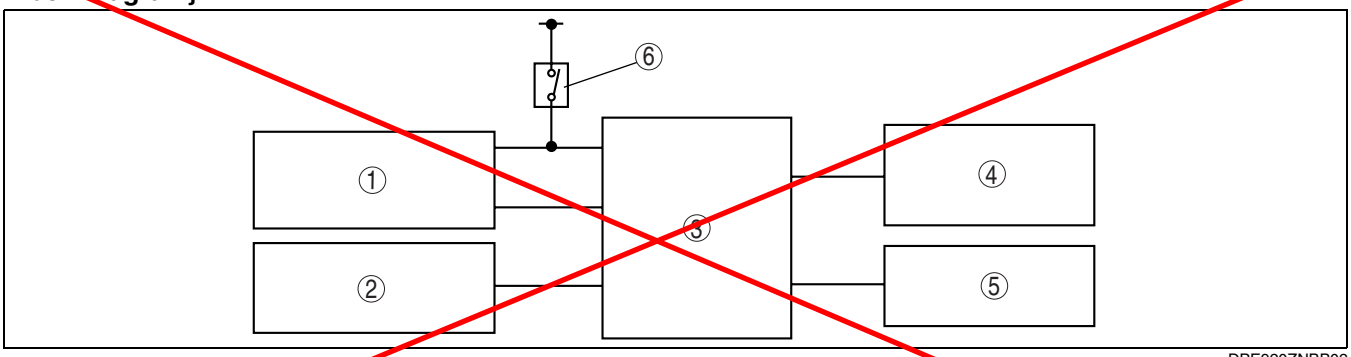


DPE920ZNBB01

1	Steering angle sensor
2	LCD unit
3	Rear view monitor control module

4	Car-navigation unit
5	Back camera

Block Diagram}



DPE920ZNBB02

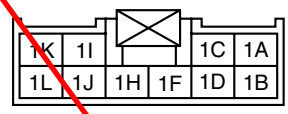
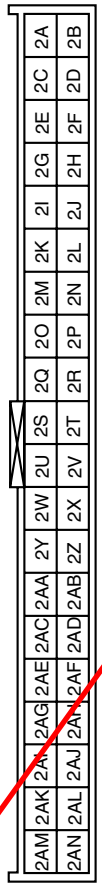
1	Car-navigation unit
2	LCD unit
3	Rear view monitor control module

4	Steering angle sensor
5	Back camera
6	• Back-up light switch (MTX) • TR switch (ATX)

REAR VIEW MONITOR CONSTRUCTION

DPE092000160T03

Terminal Layout and Signal

Terminal		Signal
	1A	B+
	1B	-
	1C	-
	1D	-
	1F	-
	1H	GND
	1I	ACC
	1J	-
	1K	IG1
	1L	-
	2A	Steering angle 2 (B)
	2B	-
	2C	Steering angle 1 (A)
	2D	-
	2E	R-range
	2F	Audio control switch
	2G	-
	2H	GND (audio control switch)
	2I	Vehicle speed
	2J	-
	2K	-
	2L	-
	2M	CAN (-)
	2N	-
	2O	CAN (+)
	2P	-
	2Q	Video GND (shield)
	2R	-
	2S	Video output (R)
	2T	Display mode request
	2U	Video output (G)
	2V	Composite sync output
	2W	Video output (B)
	2X	Video GND
	2Y	Video input (B)
	2Z	Video GND
	2AA	Video input (G)
	2AB	Composite sync input
	2AC	Video input (R)
	2AD	-
	2AE	Video GND (shield)
	2AF	-
	2AG	-
	2AH	-
	2AI	-
	2AJ	-
	2AK	Back camera GND (shield)
	2AL	Back camera GND
	2AM	Back camera power
	2AN	Back camera signal input

REAR VIEW MONITOR FUNCTION

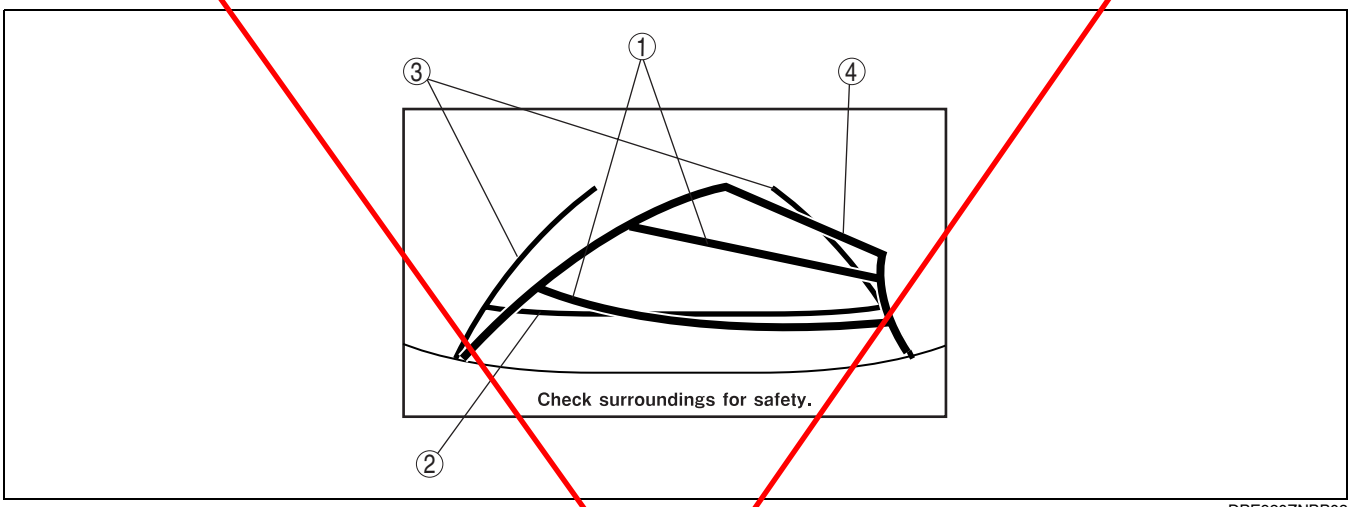
DPE092000160T04

Outline

- Guide line is displayed when the shift lever is shifted to reverse.

Caution

- **The position of the guide lines may vary depending on the vehicle conditions (such as the number of passengers and the load conditions) and road conditions (such as steep grade behind the vehicle). Always drive carefully confirming the rear and surrounding conditions of the vehicle directly with your eyes.**

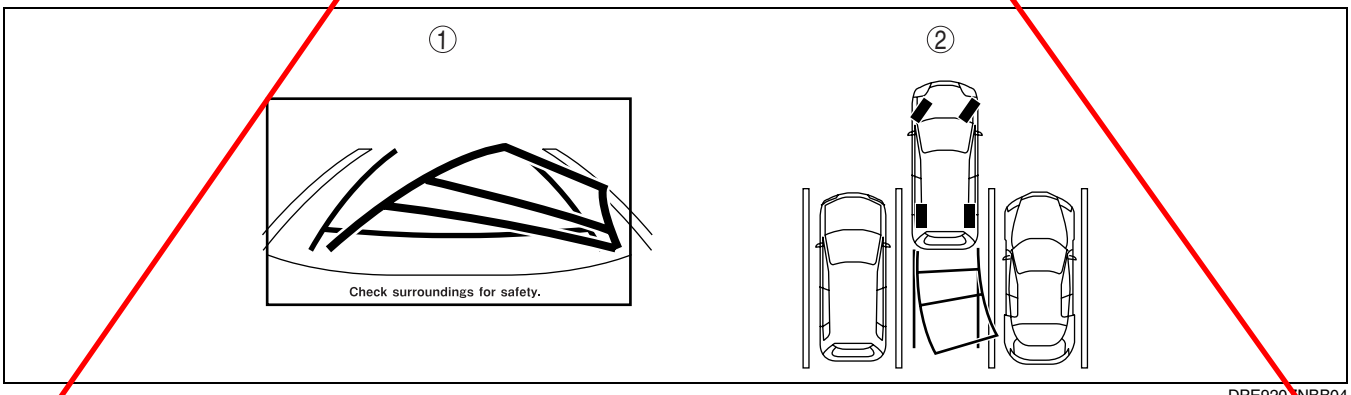


DPE920ZNBB03

No.	Line	color	Description
1	Distance indication line	Red	• This line indicate the position about 0.5 m {1.64 ft} from the end of rear bumper. • The direction of the lines changes according to the steering operation.
		Yellow	• This line indicate the position about 1 m {3.28 ft} from the end of rear bumper. • The direction of the lines changes according to the steering operation.
2	Distance indication line	Green	• This line indicate the position about 0.5 m {1.64 ft} from the end of rear bumper. • This line does not change according to the steering operation.
3	Vehicle width progression indication line	Green	• These lines indicate the vehicle width progression. • These lines do not change according to the steering operation.
4	Anticipated course line	Yellow	• These lines indicate the anticipated vehicle course. • The direction of the lines changes according to the steering operation.

Anticipated course line operation

- The rear view monitor control module receives steering angle signals from the EHPAS control module via CAN. Based on these signals, calculations are made internally and the anticipated vehicle course line is combined with the camera image and displayed.



DPE920ZNBB04

1	Screen display	2	Actual view

BACK CAMERA FUNCTION

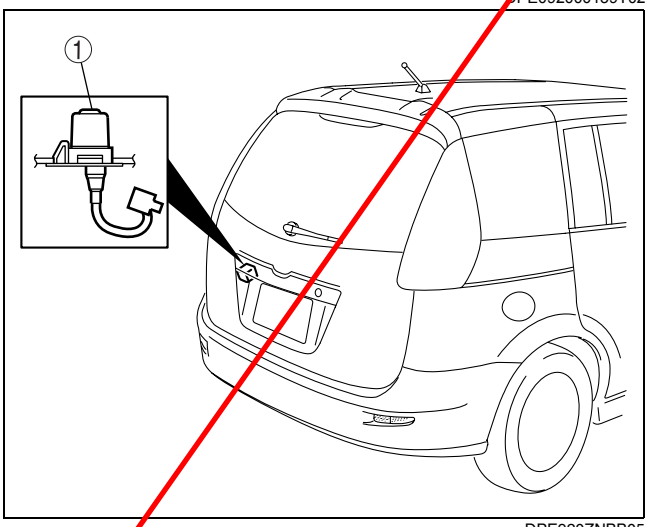
DPE092000159T01

- The back camera shoots color pictures of the rear condition of the vehicle and outputs the image signal to the LCD unit.

BACK CAMERA CONSTRUCTION/OPERATION

DPE092000159T02

- The back camera is located in the liftgate.



DPE920ZNBB05

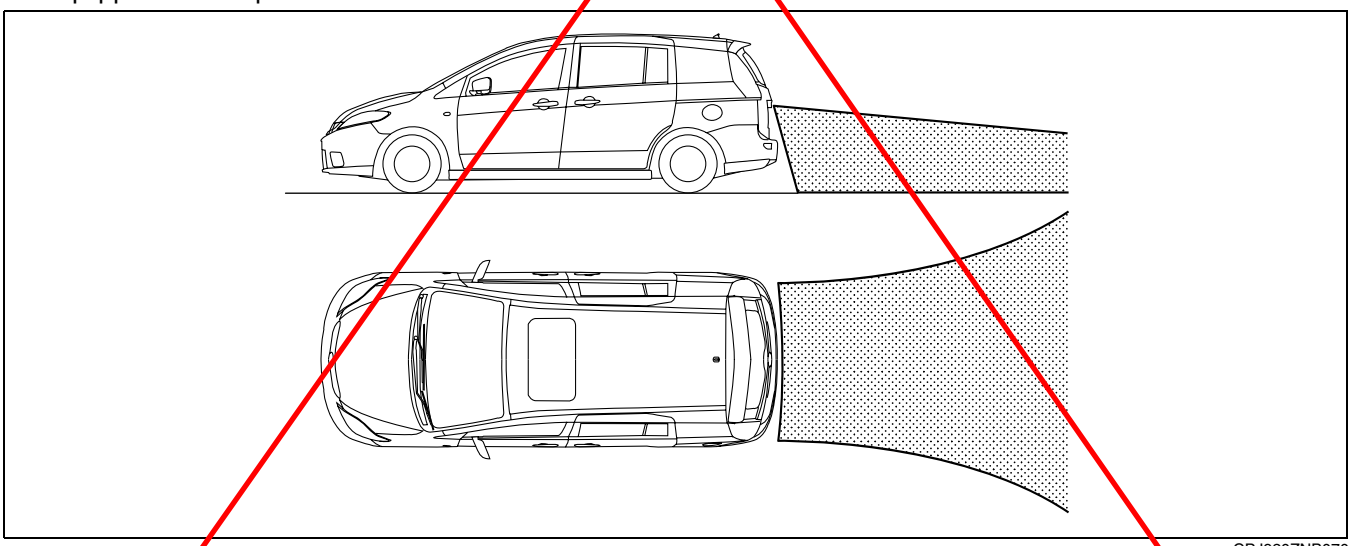
1	Back camera

- super wide angle lens that can shoot a broad spectrum has been combined with a small (1/4 in.) color CCD*1 camera which has a high-sensitivity CCD image element.

*1 : Charge Coupled Device

Displayable Range

- The displayable range varies depending on the vehicle and road conditions.
- The displayable range is limited. Objects under the bumper or around the bumper ends cannot be displayed.
- The distance appearing in the displayed image is different from the actual distance because the back camera is equipped with a specific lens.



CPJ920ZNB070

- It may be difficult to see the display under the following conditions, however, it does not indicate a malfunction.
  - — In a darkened areas.
  - — When the temperature around the lens is high/low.
  - — When the camera is wet such as on a rainy day or during period of high humidity.
  - — When foreign material such as mud is stuck around the camera.
  - — When the camera lens reflects sunlight or headlight beams.
- If the camera picks up a high-intensity light such as sunlight reflected off the vehicle body, a bright belt (light line) may appear on the display. (Smear phenomenon)

09–21 POWER SYSTEMS

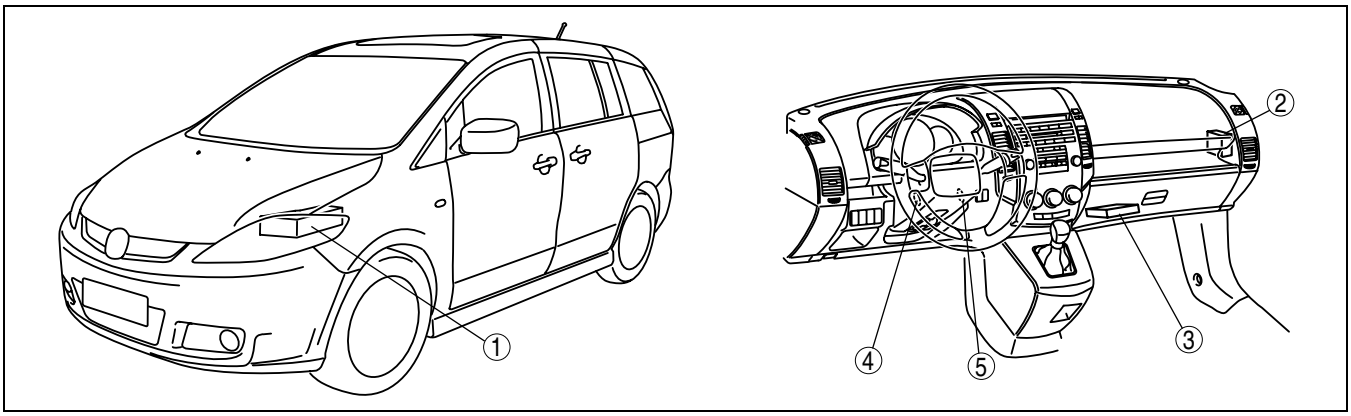
POWER SYSTEMS OUTLINE

DPE092100200T01

- All relays and fuses are located in the main fuse block, fuse block and body control module (BCM).
- The keyless switch is built into the steering lock unit (with advanced keyless entry system) or ignition switch (without advanced keyless entry system).

POWER SYSTEMS STRUCTURAL VIEW

DPE092100200T02



DPE921ZT1001

1	Main fuse block
2	Fuse block
3	Body control module (BCM)

4	Ignition switch
5	Steering lock unit

09–22 INSTRUMENTATION/DRIVER INFO.

INSTRUMENT CLUSTER OUTLINE

DPE092255430T01

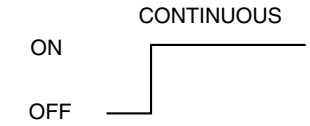
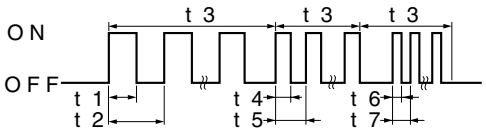
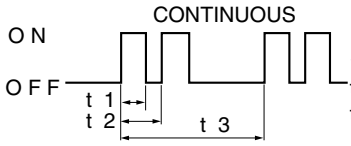
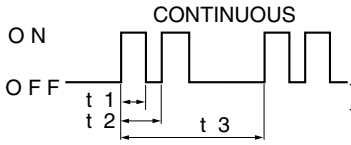
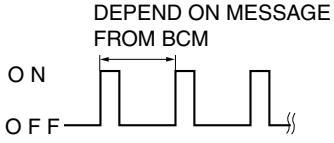
- The CAN system has been adopted for the control signals of the input/output communication circuit of the meters, gauges and warning and indicator lights. (See 09–40–9 CONTROLLER AREA NETWORK (CAN) SYSTEM OUTLINE.)
- LEDs have been adopted for warning and indicator lights installed on the instrument cluster.
- The information display, which includes the clock, audio system, and A/C system displays, has been placed in the center of the instrument panel. It also includes the drive information system, depending on the vehicle grade.
- A trumpet-type horn with spiral, resonant pipes, has been adopted.

INSTRUMENT CLUSTER SPECIFICATIONS

DPE092255430T02

Item			Specification
Speedometer	Meter type		Stepping motor type
	Indication range	(mph {km/h})	0—143 {0—230}
	Input signal communication system		CAN system
	Input signal source		PCM
	Rated voltage	(V)	DC 12
Tachometer	Meter type		Stepping motor type
	Indication range	(rpm)	0—8,000 (L8, LF), 0—6,000 (MZR-CD (RF Turbo))
	Red zone	(rpm)	6,500—8,000 (L8, LF) 5,000—6,000 (MZR-CD (RF Turbo))
	Input signal communication system		CAN system
	Input signal source		PCM
	Rated voltage	(V)	DC 12
Fuel gauge	Meter type		Stepping motor type (Reset-to-zero type)
	Input signal communication system		Conventional communication system
	Input signal source		Fuel gauge sender unit
	Rated voltage	(V)	DC 12

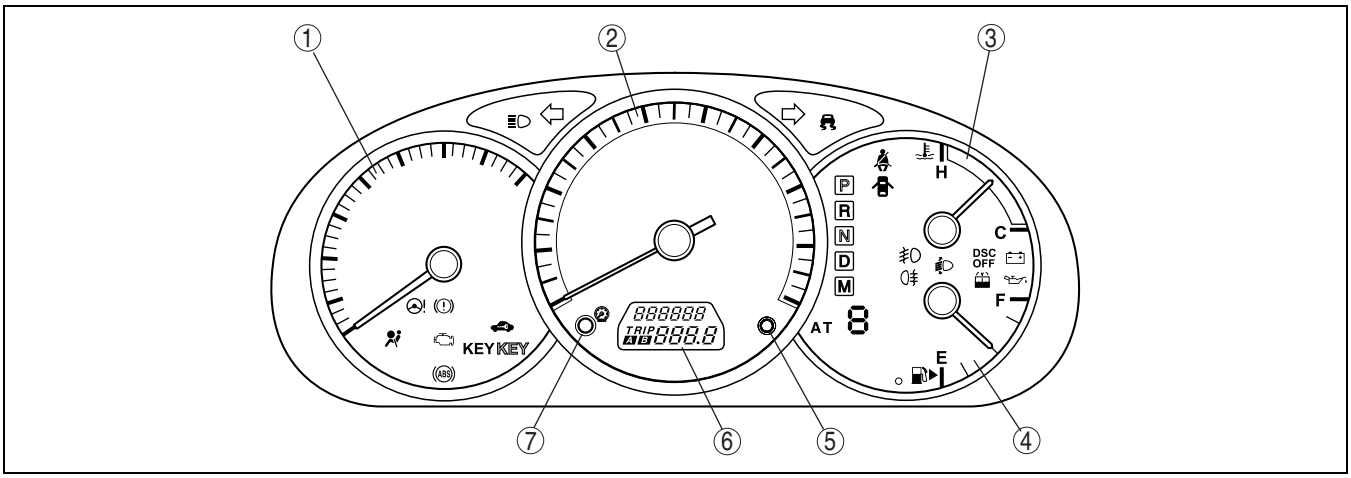
09

Item				Specification
Water temperature gauge	Meter type			Stepping motor type (Medium range stabilized type)
	Input signal communication system			CAN system
	Input signal source			PCM
	Rated voltage		(V)	DC 12
Odometer/ Tripmeter	Display			LCD
	Indication digits			Odometer: 6 digits, Tripmeter: 4 digits
	Input signal communication system			CAN system
	Input signal source			PCM
	Rated voltage		(V)	DC 12
Warning alarms	Sound frequency		(Hz)	1,500—2,400
	Output sound pressure level		(dB)	73.5—85.0
	Lights-on reminder warning alarm	Sound frequency	(Hz)	1,500 ~~(European (L.H.D. U.K.) specs.)~~ ~~1,900 (General (L.H.D. R.H.D.) specs.)~~
		Sound cycle		
	Seat belt warning alarm	Sound frequency	(Hz)	2,400
		Sound cycle		 t 1 : approx. 0.25 S t 5 : approx. 0.20 S t 2 : approx. 0.50 S t 6 : approx. 0.05 S t 3 : approx. 31.0 S t 7 : approx. 0.10 S t 4 : approx. 0.10 S
	Key reminder warning alarm	Sound frequency	(Hz)	1,800
		Sound cycle		 t 1 : approx. 0.22 S t 2 : approx. 0.33 S t 3 : approx. 1.25 S
	Advanced keyless entry system warning alarm	Sound frequency	(Hz)	1,500 ~~(European (L.H.D. U.K.) specs.)~~ ~~1,800 (General (L.H.D. R.H.D.) specs.)~~
		Sound cycle		 t 1 : approx. 0.22 S t 2 : approx. 0.33 S t 3 : approx. 1.25 S
Indicator alarm	Output sound pressure level		(dB)	54.5
	Turn and hazard indicator alarm	Sound cycle		

INSTRUMENT CLUSTER STRUCTURAL VIEW

DPE092255430T04

Meter And Gauge

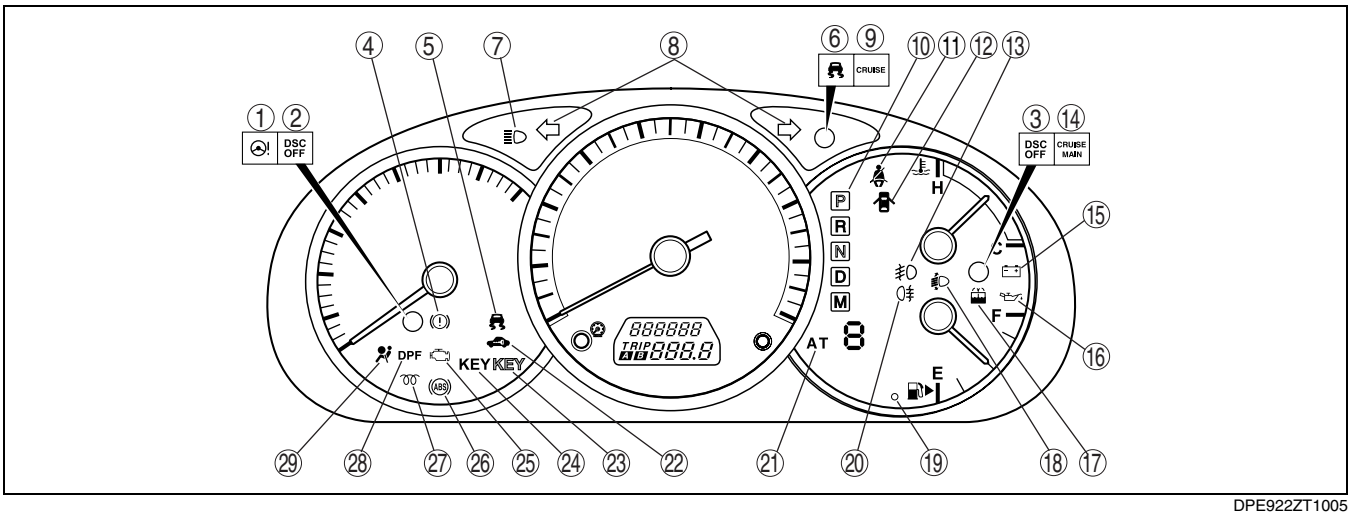


DPE922ZT1004

1	Tachometer
2	Speedometer
3	Water temperature gauge
4	Fuel gauge

5	Tripmeter switch
6	Odometer/tripmeter
7	Panel light control switch

Warning And Indicator Light



DPE922ZT1005

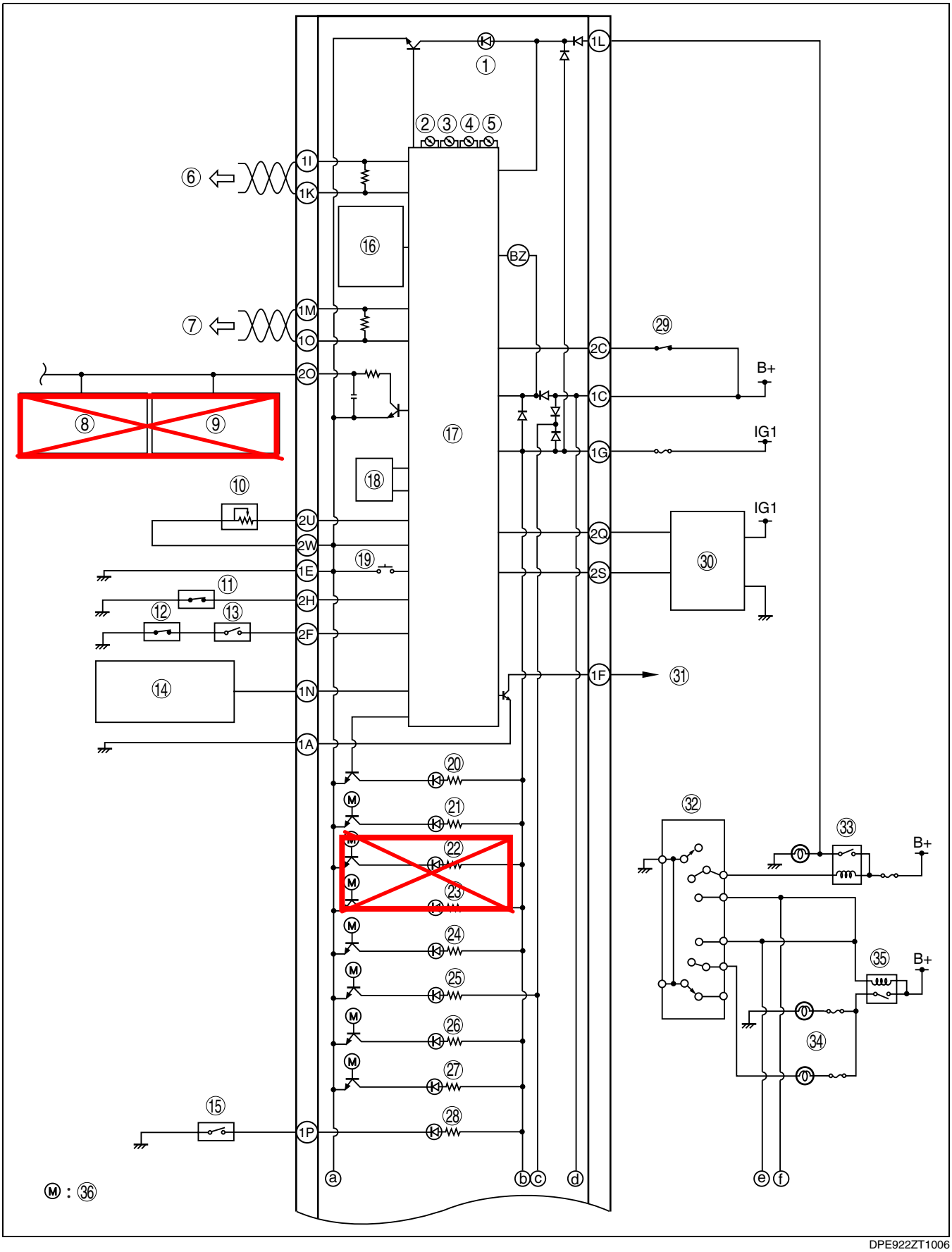
×: Applicable

No.	Warning and indicator light	Input signal source	CAN system	Note
1	EHPAS warning light	EHPAS control module	×	With EHPAS system
2	DSC OFF light	DSC HU/CM	×	MZR-CD (RF turbo)
3				L8, LF
4	Brake system warning light	• DSC HU/CM • ABS HU/CM	×	—
5	DSC indicator light	DSC HU/CM	×	MZR-CD (RF turbo)
6				L8, LF
7	High-beam indicator light	BCM	×	—
8	Turn indicator light	BCM	×	—
9	Cruise set indicator light	PCM	×	With cruise control system
10	Selector indicator light	PCM	×	ATX
11	Seat belt warning light	Buckle switch	—	—
12	Door ajar warning light	BCM	×	—

No.	Warning and indicator light	Input signal source	CAN system	Note
13	Front fog indicator light	Front fog light relay	—	—
14	Cruise main indicator light	PCM	×	With cruise control system
15	Generator warning light	PCM	×	—
16	Oil pressure warning light	Oil pressure switch	—	—
17	Washer fluid level warning light	Washer fluid level sensor	—	—
18	Headlight auto leveling warning light	Auto leveling control module	—	With discharge headlight
19	Fuel-level warning light	Fuel gauge sender unit	—	—
20	Rear fog indicator light	Rear fog light relay	—	—
21	AT warning light	PCM	×	ATX
22	Security light	—	—	—
23	Keyless indicator light	Keyless control module	×	With advanced keyless entry system
24	Keyless warning light	Keyless control module	×	With advanced keyless entry system
25	MIL	PCM	×	—
26	ABS warning light	• DSC HU/CM • ABS HU/CM	×	—
27	Glow indicator light	PCM	×	MZR-CD (RF turbo)
28	Diesel particulate filter (DPF) indicator light	PCM	×	MZR-CD (RF turbo)
29	Air bag system warning light	SAS unit	—	—

INSTRUMENT CLUSTER SYSTEM WIRING DIAGRAM

DPE092255430T06

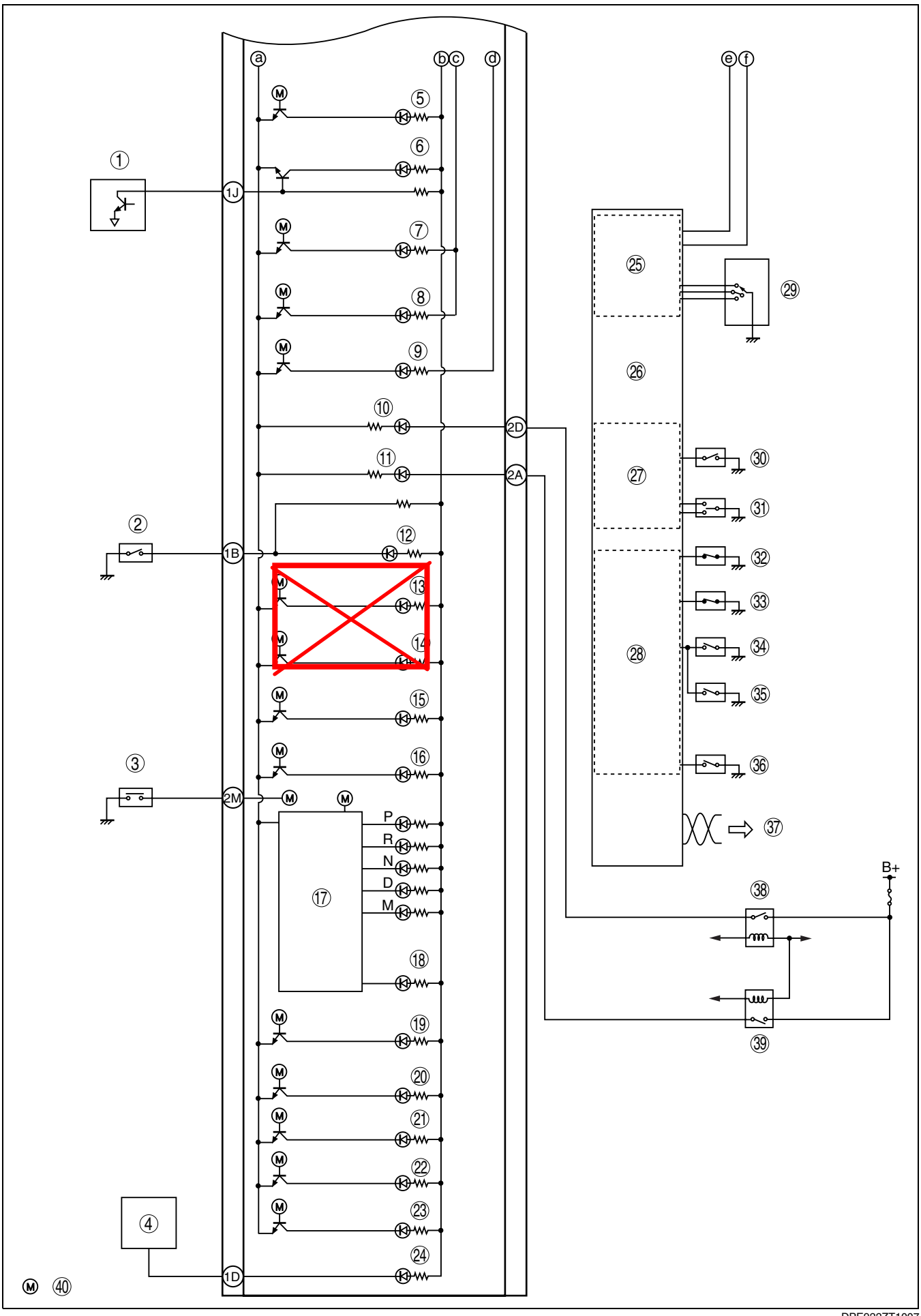


DPE922ZT1006

1	Instrument cluster illumination
2	Water temperature gauge

3	Fuel gauge
4	Tachometer

5	Speedometer
6	CAN system-related module (PCM, EHPAS control module, ~~DCC HU/CM or~~ ABS HU/CM, ~~parking assist control module~~, keyless control module)
7	CAN system-related module (BCM, Climate control unit, Audio unit (base module), information display, ~~water heater unit~~)
~~8~~	~~Car navigation unit~~
~~9~~	~~PSD control module~~
10	Fuel gauge sender unit
11	Buckle switch (driver's side)
12	Buckle switch (passenger's side)
13	Occupancy sensor
14	Keyless control module
15	Washer fluid-level sensor
16	Odometer/tripmeter
17	Microcomputer
18	Panel light control switch
19	Tripmeter switch
20	Fuel-level warning light
21	Generator warning light
~~22~~	~~Glow indicator light~~
~~23~~	~~Diesel particulate filter (DPF) indicator light~~
24	MIL
25	Door ajar warning light
26	Seat belt warning light
27	AT warning light
28	Washer fluid-level warning light
29	Key reminder switch
30	Coil
31	To illumination light bulbs
32	Light switch
33	TNS relay
34	Headlight
35	Headlight relay
36	To microcomputer



DPE922ZT1007

1	SAS control module
2	Oil pressure switch
3	Brake switch
4	Auto leveling control module
5	High-beam indicator light
6	Air bag system warning light
7	Turn indicator light (LH)
8	Turn indicator light (RH)
9	Security light
10	Front fog indicator light
11	Rear fog indicator light
12	Oil pressure warning light
13	DSC indicator light
14	DSC OFF light
15	ABS warning light
16	Brake system warning light
17	Selector indicator drive circuit
18	Gear position indicator
19	Keyless warning light
20	Keyless indicator light

21	EHPAS warning light
22	Cruise main indicator light
23	Cruise set indicator light
24	Auto leveling indicator light
25	Headlight control
26	BCM
27	Flasher control
28	Door lock control
29	Light switch
30	Hazard warning switch
31	Turn switch
32	Door latch switch (driver's side)
33	Door latch switch (passenger's side)
34	Door switch (RL)
35	Door switch (RR)
36	Liftgate latch switch
37	Can system-related module
38	Front fog light relay
39	Rear fog light relay
40	To microcomputer

INPUT/OUTPUT CHECK MODE OUTLINE

DPE092255430T08

- The microcomputer built into instrument cluster detects the quality of input signals and individual parts.
- Input/output check mode has both input circuit inspection and individual part inspection functions.

INPUT/OUTPUT CHECK MODE OPERATION

DPE092255430T09

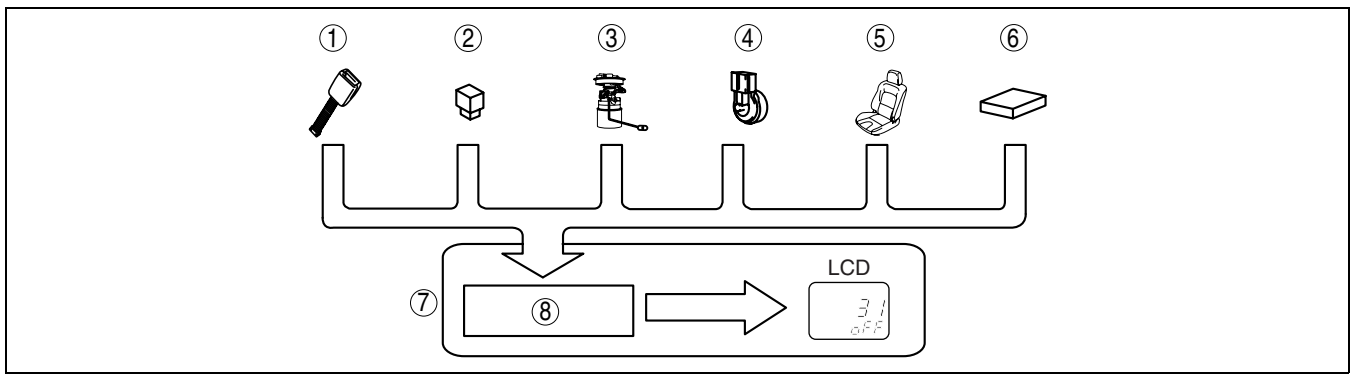
Operation procedure

- Refer to Mazda5 Workshop Manual.

Input circuit check

- When the parts listed in the chart are operated and signal is output to the instrument cluster, the built-in microcomputer determines the operability of the input circuit based on that signal.

Check code	Parts sending input signal
01	Buckle switch
08	TNS relay
22	Fuel gauge sender unit
31	Key reminder switch (built into the ignition switch or steering lock unit)
58	Passenger sensing system (passenger side buckle switch and occupancy sensor)
59	Fuel system signal



DPE922ZT1008

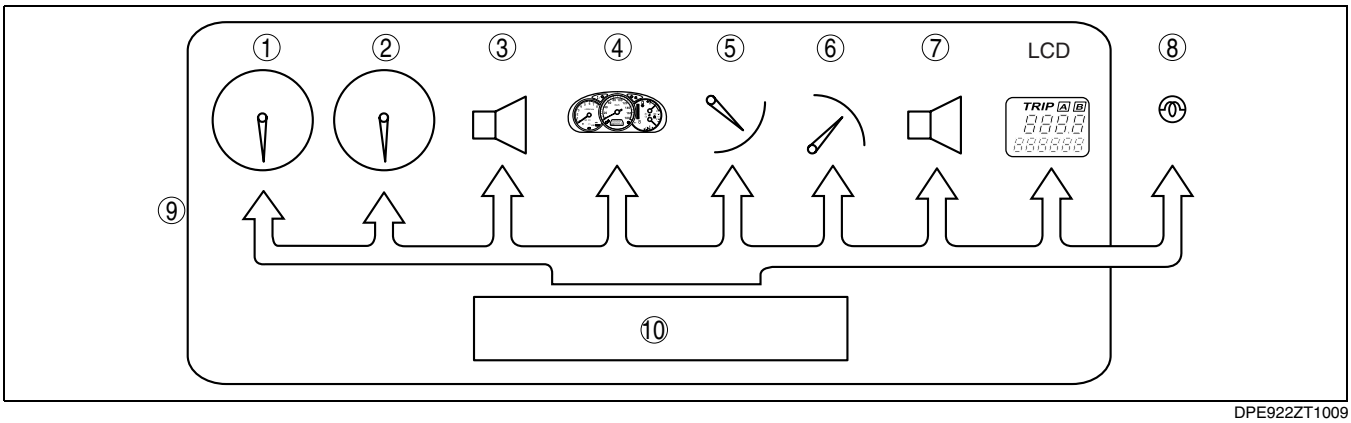
1	Buckle switch
2	TNS relay
3	Fuel gauge sender unit
4	Key reminder switch

5	Passenger sensing system
6	PCM
7	Instrument cluster
8	Microcomputer

Individual circuit check

- By operating the parts listed in the chart, the built-in microcomputer determines the operability of the individual parts.

Check code	Parts sending input signal
12	Speedometer
13	Tachometer
14	Buzzer
16	Fuel-level warning light
23	Fuel gauge
25	Water temperature gauge
26	LCD, warning and indicator light
32	Indicator buzzer
57	Panel light control



DPE922ZT1009

1	Speedometer
2	Tachometer
3	Buzzer
4	Warning and indicator light
5	Fuel gauge

6	Water temperature gauge
7	Indicator buzzer
8	Illumination light bulb
9	Instrument cluster
10	Microcomputer

PID/Data Monitor and Record

- The PID/data monitoring items for the instrument cluster is as shown in following the table:

Monitor item table

—: Not applicable

Monitor item	Input-output signal/part name	Unit/State		Terminal
CCNT_HE	Number of continuous DTCs	—		—
ECT_GAUGE	Water temperature gauge	°F	°C	1I, 1K
NUMKEYS	Number of key ID numbers registered with the vehicle	—		—
ODO COUNT	Odometer	m		1I, 1K
SPDOMETER	Speedometer	MPH	KPH	
TACH	Tachometer	RPM		

LIGHTS-ON REMINDER WARNING ALARM OUTLINE

DPE092255430T10

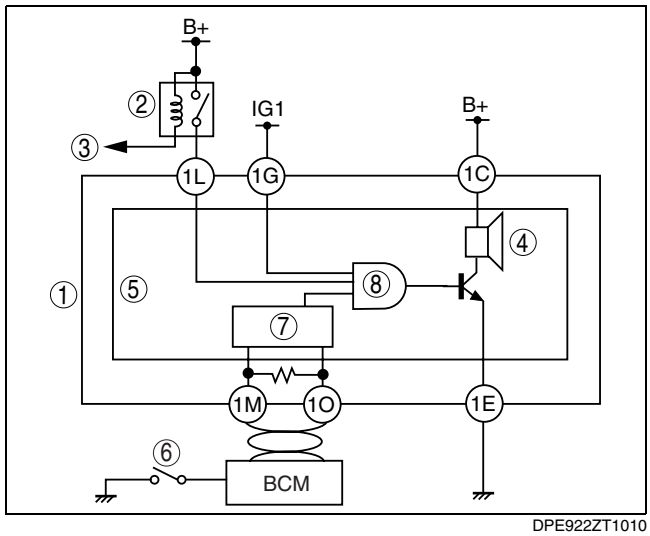
- Warns the driver that the headlights or TNS are on when the driver-side door is opened.

LIGHTS-ON REMINDER WARNING ALARM CONSTRUCTION/OPERATION

DPE092255430T11

System Wiring Diagram

1	Instrument cluster
2	TNS relay
3	To light switch
4	Buzzer
5	Microcomputer
6	Door switch (driver's side)
7	CAN control circuit
8	AND



DPE922ZT1010

Operation

- The buzzer in the instrument cluster sounds continuously when all the following three conditions are met:
  — The ignition switch is in the LOCK or ACC position.
  — The headlight switch is in the TNS or headlight position.
  — The driver-side door is open (driver-side door switch is on).

SEAT BELT WARNING ALARM OUTLINE

DPE092255430T24

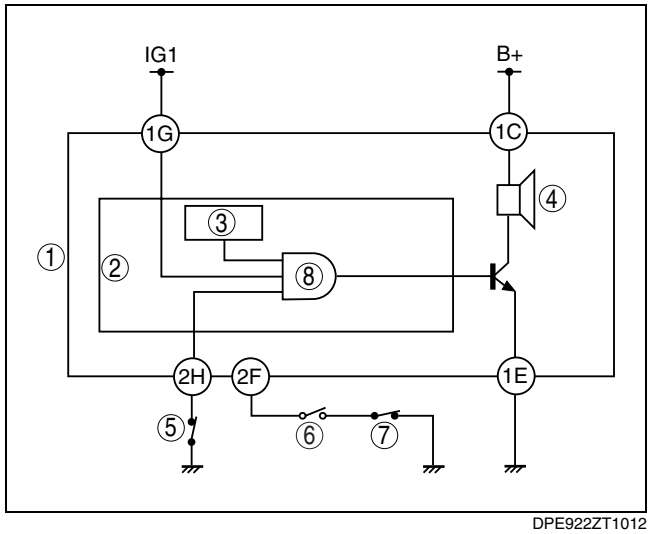
- Warns the driver that the seat belt (driver-side or passenger-side) is unfastened.

SEAT BELT WARNING ALARM CONSTRUCTION/OPERATION

DPE092255430T25

System Wiring Diagram

1	Instrument cluster
2	Microcomputer
3	Timer
4	Buzzer
5	Buckle switch (driver's side)
6	Occupancy sensor
7	Buckle switch (passenger's side)
8	AND



DPE922ZT1012

Operation

- The buzzer in the instrument cluster sounds for **93 s** when all the following two conditions are met:
  — The seat belt (driver-side or passenger-side) is unfastened (driver-side: buckle switch is off, passenger-side: buckle switch is off and occupancy sensor is on).
  — The vehicle speed is **20 km/h {12.4 mph} or more**.

KEY REMINDER WARNING ALARM OUTLINE

DPE092255430T22

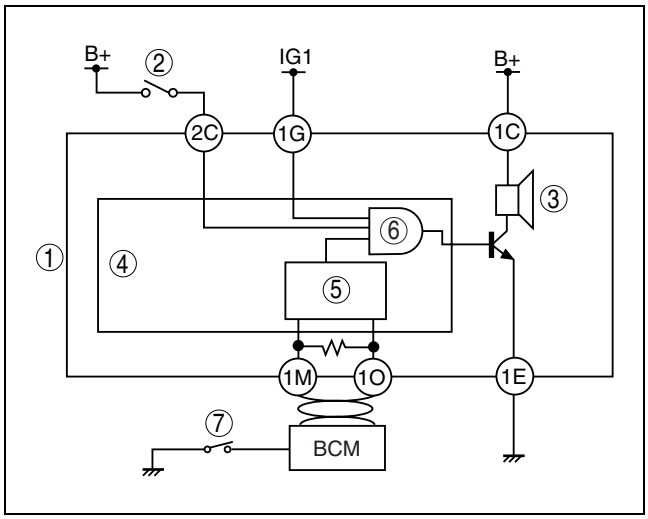
- Warns the driver that the key is in the steering lock when the driver-side door is opened.

KEY REMINDER WARNING ALARM CONSTRUCTION/OPERATION

DPE092255430T23

System Wiring Diagram

1	Instrument cluster
2	Key reminder switch
3	Buzzer
4	Microcomputer
5	CAN control circuit
6	AND
7	Door switch (driver's side)



DPE922ZT1011

Operation

- The buzzer in the instrument cluster sounds when all the following three conditions are met:
  — The ignition switch is in the LOCK or ACC position.
  — The key is in the steering lock (key reminder switch is on).
  — The driver-side door is open (driver-side door switch is on).

TURN AND HAZARD INDICATOR ALARM OUTLINE

DPE092255430T12

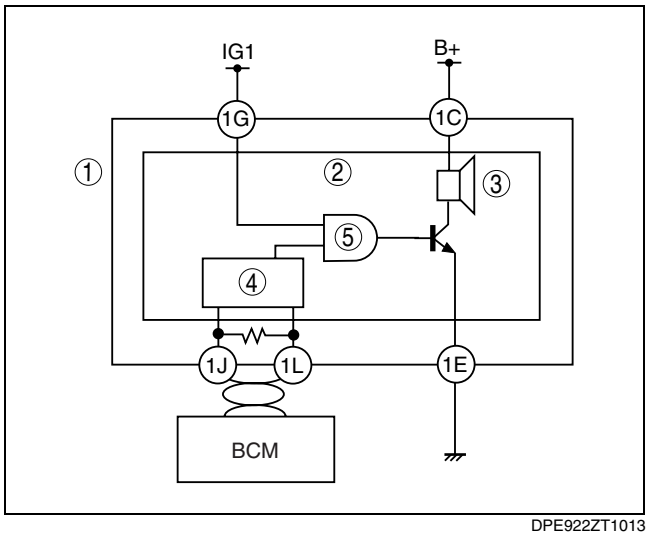
- The indicator buzzer sounds when the turn indicator flashes.

TURN AND HAZARD INDICATOR ALARM CONSTRUCTION/OPERATION

DPE092255430T13

System Wiring Diagram

1	Instrument cluster
2	Microcomputer
3	Indicator buzzer
4	CAN control circuit
5	AND



DPE922ZT1013

Operation

- The turn and hazard signal sent from the BCM via the CAN system is input to the microcomputer in the instrument cluster. The microcomputer sends an output signal to the turn indicator light and the indicator buzzer.

SPEEDOMETER CONTROL OUTLINE

DPE092255430T14

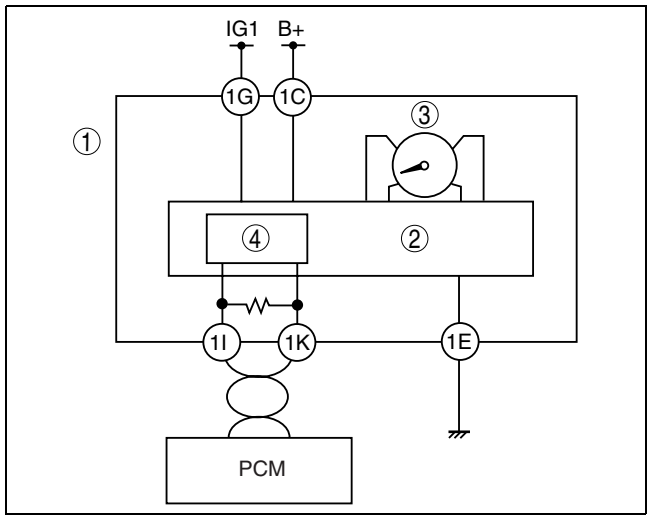
- The vehicle speed signal is output from the PCM to the microcomputer in the instrument cluster.

SPEEDOMETER CONTROL CONSTRUCTION/OPERATION

DPE092255430T15

System Wiring Diagram

1	Instrument cluster
2	Microcomputer
3	Speedometer
4	CAN control circuit



B3E0922T012

Operation

- The vehicle speed signal sent from the PCM via the CAN system is input to the microcomputer in the instrument cluster. The microcomputer calculates the current vehicle speed based on the vehicle speed signal, and sends an output signal to the speedometer.

TACHOMETER CONTROL OUTLINE

DPE092255430T16

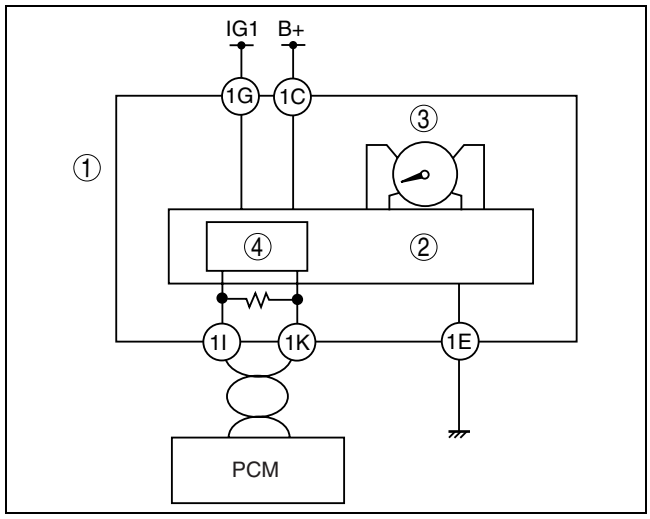
- The engine speed signal is output from the PCM to the microcomputer in the instrument cluster.

TACHOMETER CONTROL CONSTRUCTION/OPERATION

DPE092255430T17

System Wiring Diagram

1	Instrument cluster
2	Microcomputer
3	Tachometer
4	CAN control circuit



B3E0922T013

Operation

- The engine speed signal sent from the PCM via the CAN system is input to the microcomputer in the instrument cluster. The microcomputer calculates the current engine speed based on the engine speed signal, and sends an output signal to the tachometer.

FUEL GAUGE CONTROL OUTLINE

DPE092255430T18

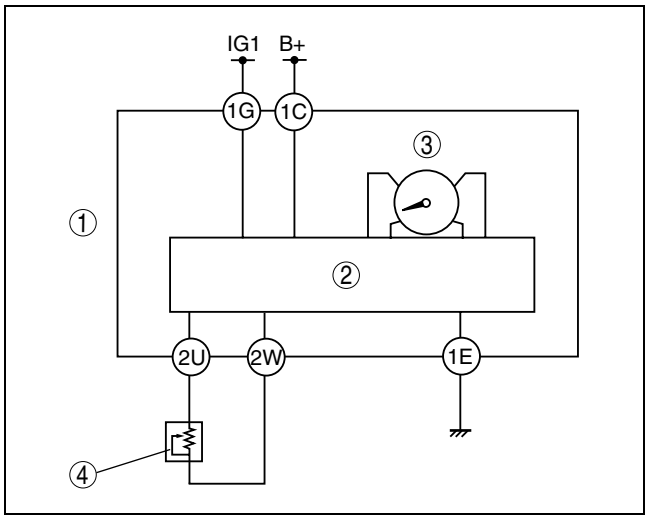
- The fuel level signal is output from the fuel gauge sender unit to the microcomputer in the instrument cluster. Fuel gauge variation caused by fluctuating fuel level when cornering or driving on a slope, is reduced by microcomputer control.

FUEL GAUGE CONTROL CONSTRUCTION/OPERATION

DPE092255430T19

System Wiring Diagram

1	Instrument cluster
2	Microcomputer
3	Fuel gauge
4	Fuel gauge sender unit



B3E0922T014

Operation

- A resistance according to fuel level is sent from the fuel gauge sender unit to the microcomputer. The microcomputer calculates the average resistance within a specified time, and sends the output signal to the fuel gauge based on the calculated value.

WATER TEMPERATURE GAUGE CONTROL OUTLINE

DPE092255430T20

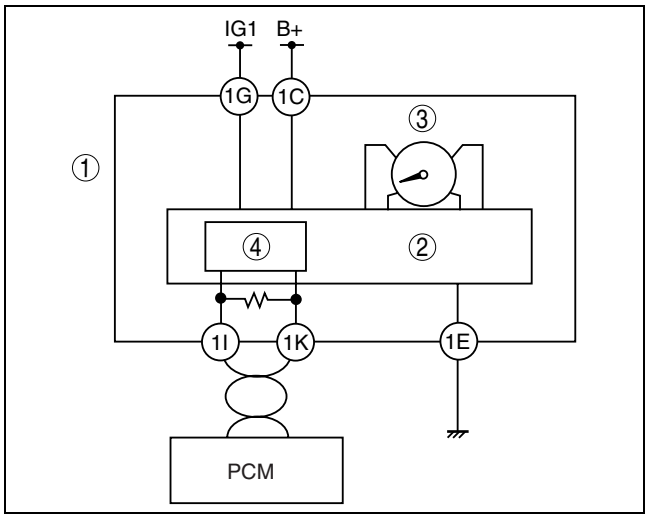
- The engine coolant temperature signal is output from the PCM to the microcomputer in the instrument cluster.

WATER TEMPERATURE GAUGE CONTROL CONSTRUCTION/OPERATION

DPE092255430T21

System Wiring Diagram

1	Instrument cluster
2	Microcomputer
3	Water temperature gauge
4	CAN control circuit



B3E0922T015

Operation

- The engine coolant temperature signal sent from the PCM via the CAN system is input to the microcomputer in the instrument cluster. The microcomputer calculates the current engine coolant temperature based on the engine coolant temperature signal, and sends an output signal to the water temperature gauge.

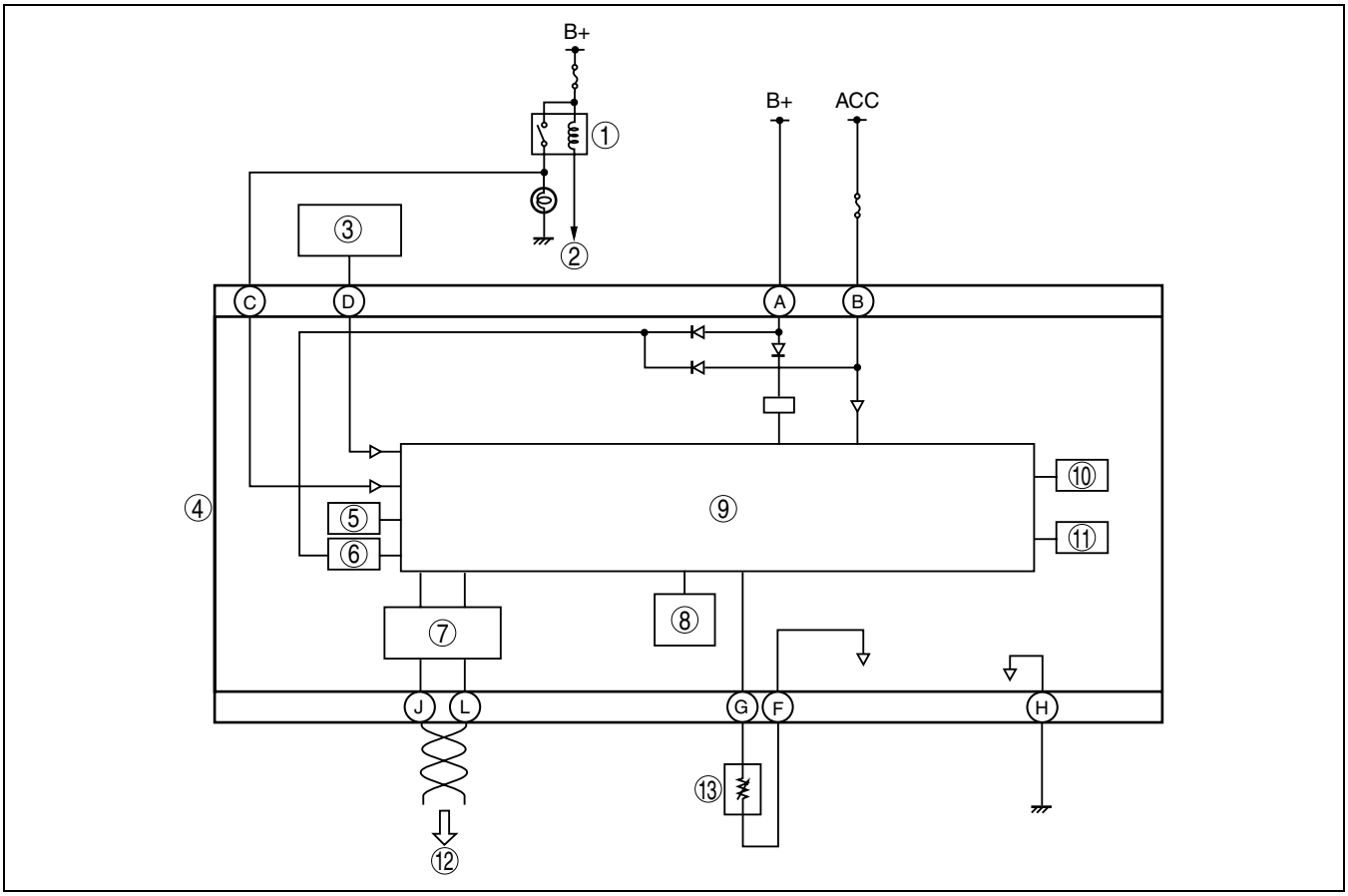
INFORMATION DISPLAY FUNCTION

DPE092255000T01

- The information display has the following functions:
  - — Display function
  - — Clock function
  - — Input/output check function

INFORMATION DISPLAY SYSTEM WIRING DIAGRAM

DPE092255000T03



DPE922ZT1015

1	TNS relay
2	To light switch
3	Instrument cluster (panel light control)
4	Information display
5	LCD
6	Back light
7	CAN control circuit

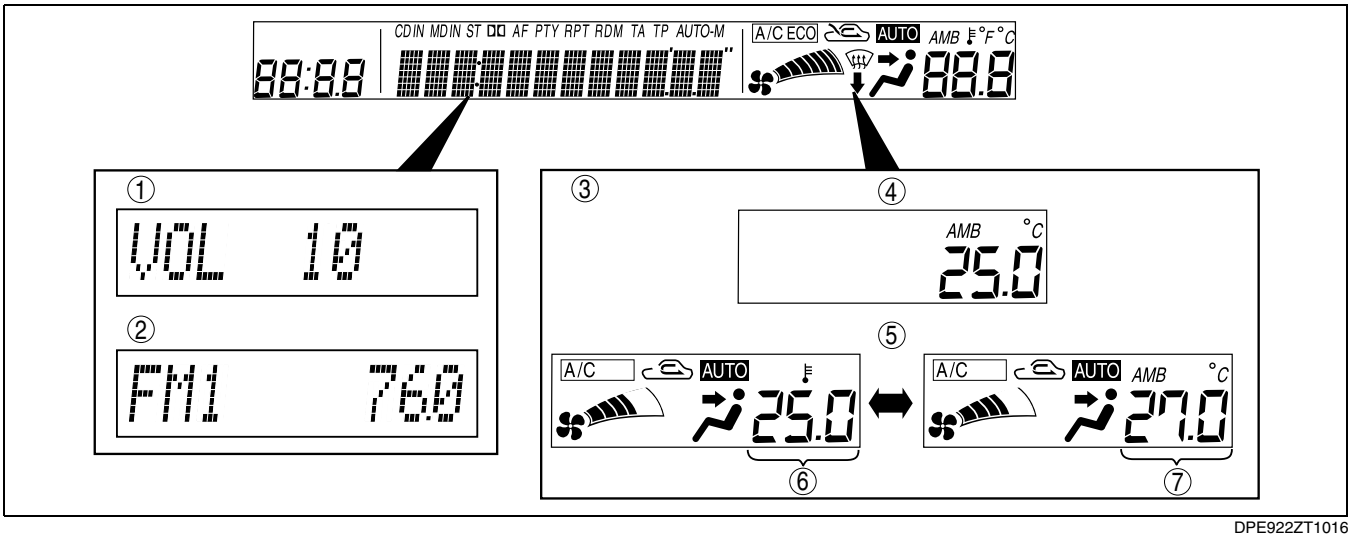
8	Clock circuit
9	Microcomputer
10	CLOCK switch
11	SET switch or INFO switch
12	CAN system-related module
13	Ambient temperature sensor

INFORMATION DISPLAY CONSTRUCTION/OPERATION

DPE092255000T02

Display Function

- Displays information for the audio system (such as volume and frequency) and air conditioner system (such as air flow volume, set temperature, and mode) based on the signals from the audio unit and the climate control module.
- Manual A/C equipped vehicles normally display the ambient temperature on the air conditioning display. Also, the display for full-auto A/C equipped vehicles can be switched between the set temperature or the ambient temperature each time the AMB button on the climate control module is operated.

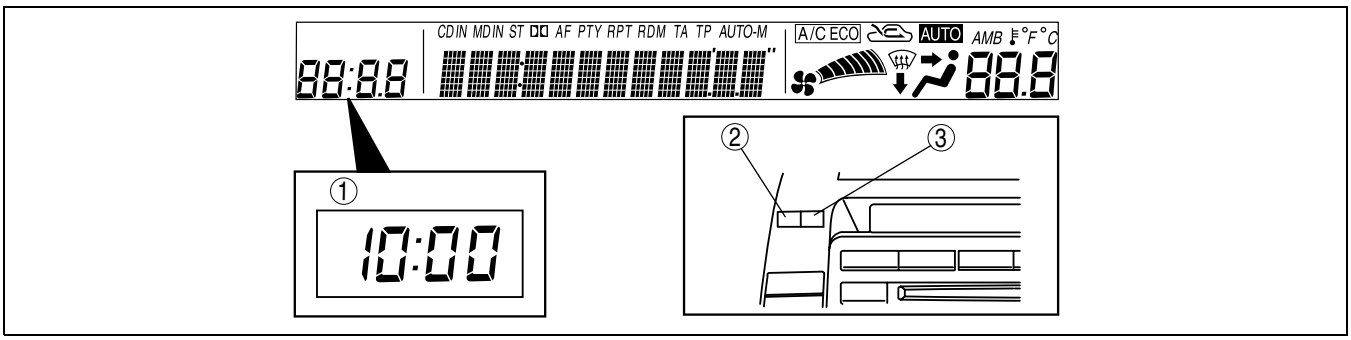


DPE922ZT1016

1	Audio volume display
2	Frequency display
3	Air conditioner display
4	Vehicle with manual A/C

5	Vehicle with full-auto A/C
6	Set temperature
7	Ambient temperature

Clock Function
- A clock is integrated.
- Time can be adjusted with the buttons on the left side of the information display.



DPE922ZT1017

1	Time display
2	Clock button

3	Set button

Input/output Check Function
- An input/output check function has been adopted which performs signal input to the display and examines the LCD according to the micro-computer built into the information display.

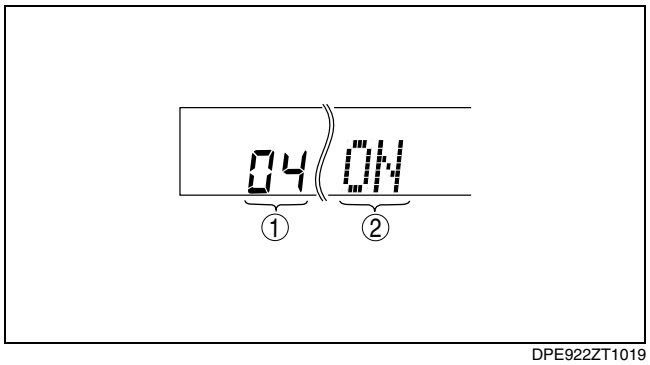
Check code
- When the signal output part indicated in the table below is activated, the micro-computer performs self-diagnosis of the signal input to the information display. Also, inspection of segments and dots is possible by illuminating the entire LCD.

Check code	Signal output part	Malfunction location
01	Information display	CAN system communication error
02	• Audio unit • Climate control module • Instrument cluster	Communication error to signal output part
03	LCD	—
04	TNS relay	• TNS relay • BCM • TNS signal wiring harness

Check code	Signal output part	Malfunction location
05	Ambient temperature sensor	• Ambient temperature sensor • Ambient temperature signal wiring harness

Check code display

- The check code and inspection display are displayed in the LCD clock and audio display areas.



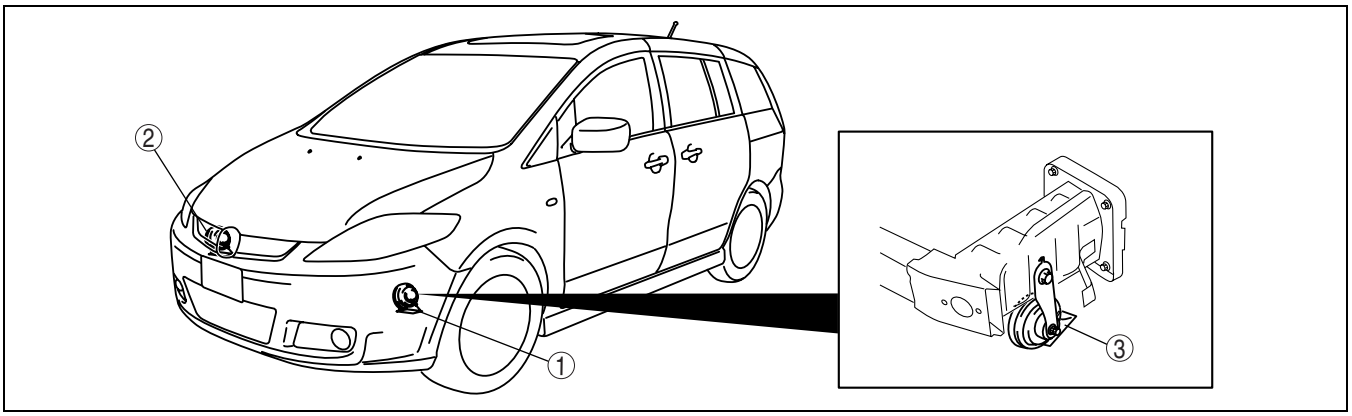
DPE922ZT1019

1	Check code
2	Inspection display

HORN CONSTRUCTION

DPE092266790T01

- A trumpet-type horn with spiral-shaped resonant pipes has been adopted. Horns are located symmetrically, one each on the right and left.



DPE922ZT1014

1	Horn (HI)
2	Horn (LO)

3	Horn

09–40 CONTROL SYSTEM

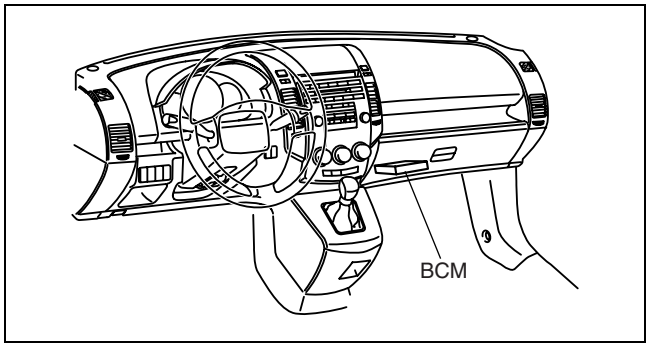
BODY CONTROL MODULE (BCM) OUTLINE

DPE094000200T01

- The following relays are built into the BCM:
  - — Windshield wiper relay
  - — Windshield wiper HI relay
  - — Door lock/unlock relays
- The BCM controls the following systems:
  - — Lighting system
  - — Wiper/washer system
  - — Power door lock system
  - — Keyless entry system

BODY CONTROL MODULE (BCM) STRUCTURAL VIEW

DPE094000200T02

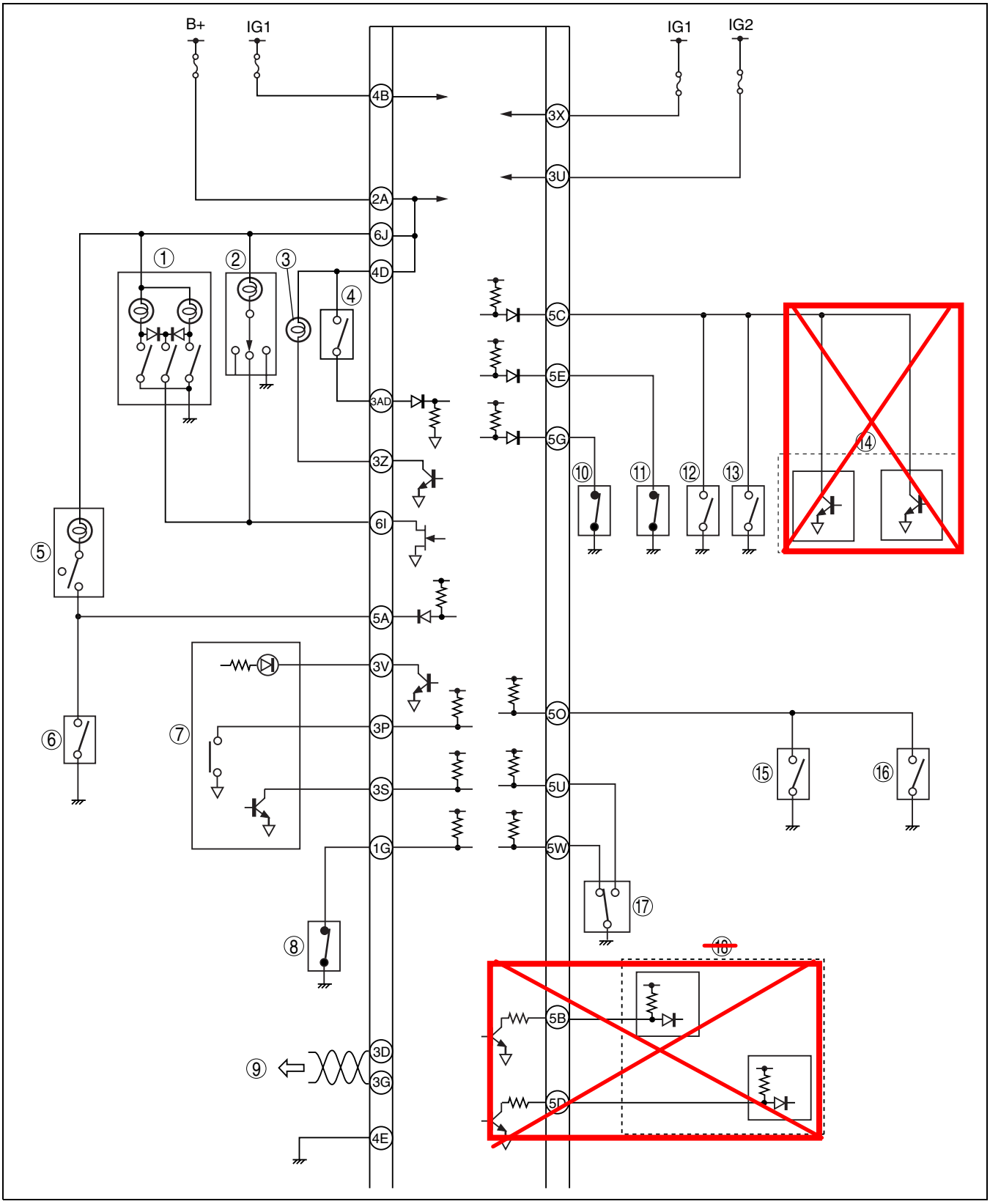


DPE940ZT1001

09

BODY CONTROL MODULE (BCM) WIRING DIAGRAM

DPE094000200T03

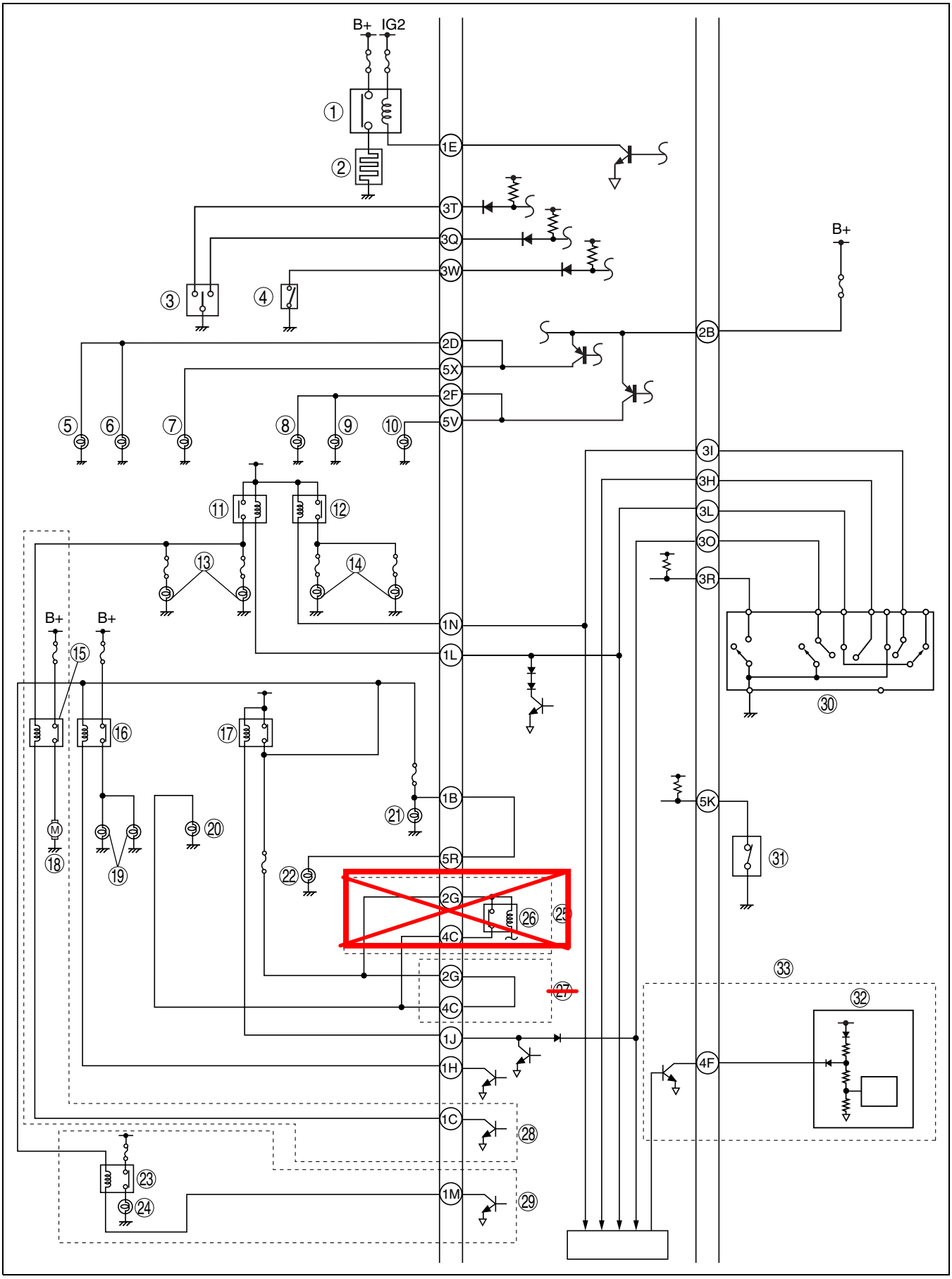


DPE940ZT1002

1	Map light
2	Interior light
3	Ignition key illumination
4	Key reminder switch
5	Cargo compartment light

6	Liftgate latch switch
7	Climate control unit (with manual air conditioner)
8	Brake fluid level sensor
9	To CAN system-related module
10	Front door latch switch (LH)

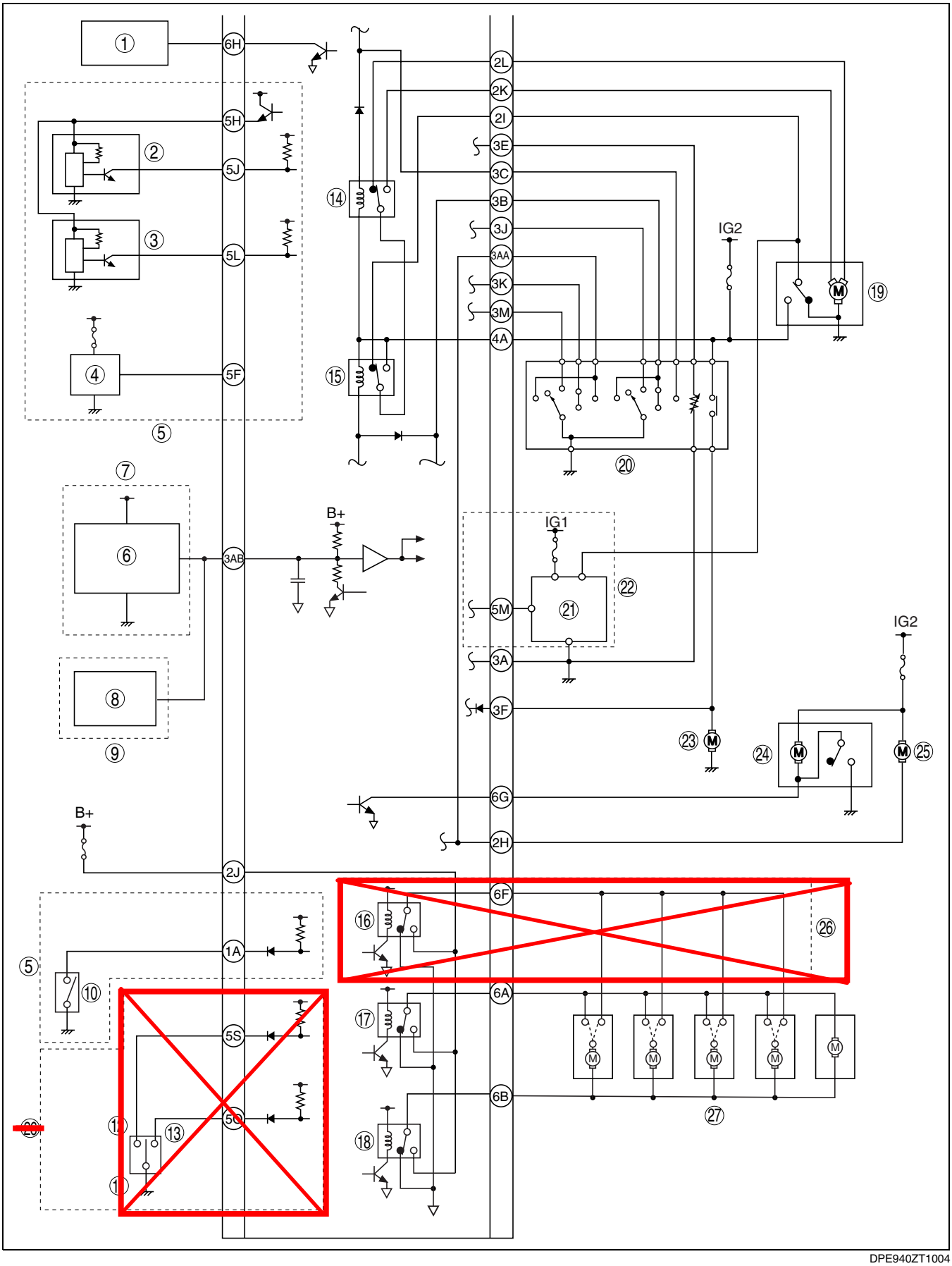
11	Front door latch switch (RH)
12	Sliding door switch (LH)
13	Sliding door switch (RH)
~~14~~	~~PSD control module (with PSD system)~~
15	Sliding door lock-link switch (LH)
16	Sliding door lock-link switch (RH)
17	Driver-side door lock-link switch
~~18~~	~~PSD control module (with PSD system)~~



DPE940ZT1003

1	Rear window defroster relay
2	Rear window defroster

3	Turn switch
4	Hazard warning switch
5	Turn light (LH, front)
6	Turn light (LH, ront side)
7	Turn light (LH, rear)
8	Turn light (RH, ront)
9	Turn light (RH, ront side)
10	Turn light (RH, rear)
11	Headlight LO relay
12	Headlight HI relay
13	Headlight (LO)
14	Headlight (HI)
15	Headlight cleaner relay
16	Front fog light relay
17	TNS relay
18	Headlight cleaner motor
19	Front fog light
20	Illumination light
21	Parking light
22	Taillight, licence plate light
23	Rear fog light relay
24	Rear fog light
25	With running light system
26	Running light relay
27	Without running light system
28	With headlight cleaner system
29	With rear fog light system
30	Light switch
31	Parking brake switch
32	Auto leveling control module
33	With headlight auto leveling system



1	Power window main switch
2	Intruder sensor (rear)

3	Intruder sensor (front)
4	Theft-deterrent siren

5	With theft-deterrent system
6	Keyless control module
7	With advanced keyless system
8	Keyless receiver
9	With keyless entry system
10	Bonnet latch switch
11	Driver-side door key cylinder switch
12	Lock
13	Unlock
14	Windshield wiper HI relay
15	Windshield wiper relay
16	Double lock relay
17	Door lock relay
18	Door unlock relay
19	Windshield wiper motor
20	Windshield wiper and washer switch
21	Rain sensor
22	With auto wiper system
23	Windshield washer motor
24	Rear wiper motor
25	Rear washer motor
26	With double lock function
27	Door lock actuators

ON-BOARD DIAGNOSTIC FUNCTION [BODY CONTROL MODULE (BCM)]

DPE094000200T04

- The on-board diagnostic system consists of a malfunction detection system that detects abnormalities in input/output signals, a data monitor function that reads out specified input/output signals.
- The data link connector 2 (DLC-2), which groups together all the connectors used for malfunction diagnosis and detecting/repair into a single location, has been adopted, thereby improving serviceability. Diagnosis is performed by connecting the WDS or equivalent to the DLC-2.
- In addition to DTC read-out, the WDS or equivalent is used to clear DTCs using the display screen of the diagnostic tester, and to access the PID/data monitor function, providing enhanced malfunction diagnosis and improved serviceability.

Malfunction Detection Function

- The malfunction detection function detects malfunctions in the input/output signal system of the BCM.

DTC table

DTC No.	Description	Detection condition
B1014	Rain sensor error	Rain sensor internal malfunction
B1311	Unlock switch circuit open	Open circuit in wiring harness between BCM and driver-side door lock-link switch (unlock signal)
B1317	Battery voltage high	Input voltage from the battery is excessively high
B1318	Battery voltage low	Input voltage from the battery is excessively low
B1320	Driver door ajar circuit open	Open circuit in wiring harness between BCM and front door latch switch (driver-side)
B1328	Passenger door ajar circuit open	Open circuit in wiring harness between BCM and front door latch switch (passenger-side)
B1342	ECU is faulted	BCM microcomputer malfunction
B1345	Heated backlite input circuit short to ground	Short to GND in wiring harness between BCM and climate control unit (rear window defroster switch)
B1447	Wiper park sense circuit open	Open circuit in wiring harness between BCM and windshield wiper motor (autostop switch)
B1472	Headlight on switch input circuit short to ground	Short to GND in wiring harness between BCM and light switch (low beam)
B1506	Turn signal switch circuit short to ground	Short to GND in wiring harness between BCM and turn switch
B1570	Headlight high beam switch input circuit short to ground	Short to GND in wiring harness between BCM and light switch (high beam)
B1572	Sliding door ajar circuit open	Open circuit in wiring harness between BCM and sliding door switch
B1614	Rear wiper interval switch input circuit short to ground	Short to GND in wiring harness between BCM and rear wiper and washer switch (INT)
B1696	Auto light switch input circuit short to ground	Short to GND in wiring harness between BCM and light switch (AUTO)
B1798	Position lights switch (TNS) input circuit short to ground	Short to GND in wiring harness between BCM and light switch (TNS)
B1873	Hazard switch input circuit short to ground	Short to GND in wiring harness between BCM and hazard warning switch
B2114	Front washer switch input circuit short to battery	Short to power supply in wiring harness between BCM and windshield wiper and washer switch (front washer)
B2175	A/C request switch circuit short to ground	Short to GND in wiring harness between BCM and climate control unit (A/C ON request)
B2177	Intruder sensor circuit failure	Intruder sensor malfunction or circuit malfunction
B2180	Front wiper switch (slow) circuit short to ground	Short to GND in wiring harness between BCM and windshield wiper and washer switch (low)
B2181	Front wiper switch (high) circuit short to ground	Short to GND in wiring harness between BCM and windshield wiper and washer switch (high)
B2259	Intermittent wiper circuit short to ground	Short to GND in wiring harness between BCM and windshield wiper and washer switch (INT or AUTO)
B2264	Rear fog light switch short to ground	Short to GND in wiring harness between BCM and rear fog light switch
B2479	Park brake switch circuit open	Open circuit in wiring harness between BCM and parking brake switch
B2574	Driver door lock switch short to ground	Short to GND in wiring harness between BCM and driver-side door lock-link switch
B2665	Battery back sounder circuit failure	Short to GND or power supply in wiring harness between BCM and theft-deterrent siren
B2721	Liftgate ajar output short to ground	Short to GND in wiring harness between BCM and liftgate latch switch
U2030	Rain sensor communication fault	Communication error to rain sensor

PID/Data Monitor Function

- The PID/data monitor function is used for optionally selecting input/output signal monitor items preset in the BCM and reading them out in real-time.

PID/data monitor item	Unit/Condition (Tester display)	Input/output part	BCM terminal
ACSW	On/Off	Climate control unit (A/C switch)	3S
AUTOLMP	On/Off	Light switch (AUTO)	3H

PID/data monitor item	Unit/Condition (Tester display)	Input/output part	BCM terminal
BRK_WRN	On/Off	Parking brake switch, brake fluid level sensor	5K, 1G
CCNT_GE	—	DTC	—
DD_LOCK	LOCK/UNLOCK	Driver-side door lock-link switch	5U, 5W
F_FOG_LMP	On/Off	Fog light switch	3R
HAZARD	On/Off	Hazard warning switch	3W
HBEAMSW	On/Off	Light switch (high beam)	3I
HEADLAMP	On/Off	Light switch (low beam)	3L
LF_AJAR	OPEN/CLOSE	Front door latch switch (LH)	5E
PARK_SW	On/Off	Light switch (TNS)	3O
R_FOG_LMP	On/Off	Rear fog light switch	3N
RDEF_SW	On/Off	Climate control unit (rear window defroster switch)	3P
REAR_AJAR	OPEN/CLOSE	Sliding door switch	5C
RF_AJAR	OPEN/CLOSE	Front door latch switch (RH)	5G
T_AJAR	OPEN/CLOSE	Liftgate latch switch	5A
TURN_SW	On/Off	Turn switch	3T, 3Q
WASH_FRT	On/Off	Windshield wiper and washer switch (washer)	3F
WPFAST_FRT	On/Off	Windshield wiper and washer switch (high)	3C
WPINT_FRT	On/Off	Windshield wiper and washer switch (INT or AUTO)	3J
WPINT_REAR	On/Off	Rear wiper and washer switch (INT)	3M
WPRPRKSTS	On/Off	Windshield wiper motor (auto stop switch)	2I
WP_SW_FRT	On/Off	Windshield wiper and washer switch (low)	3B

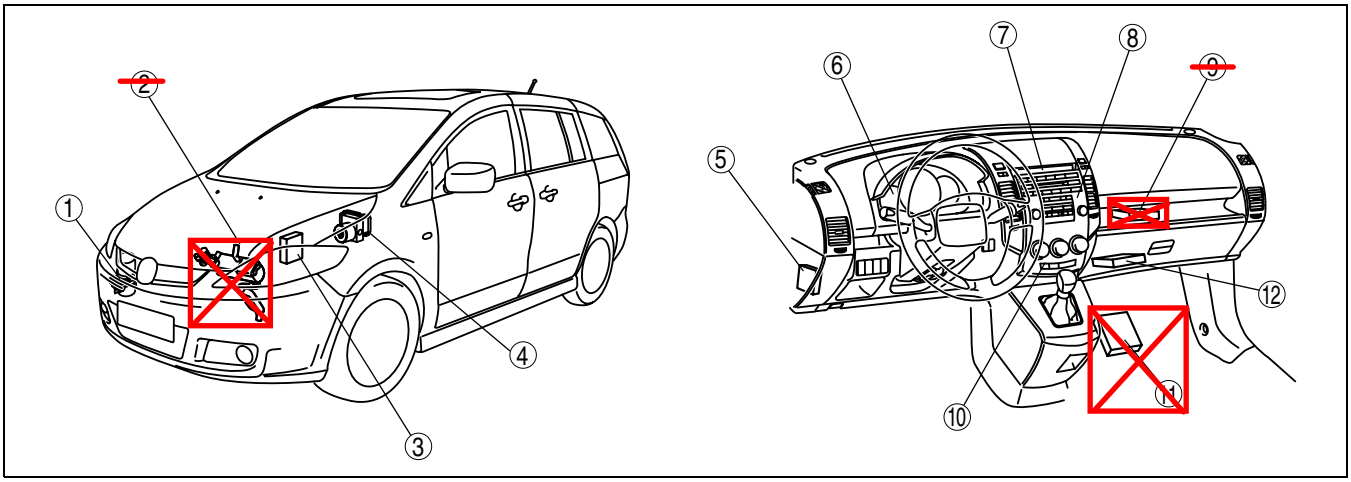
CONTROLLER AREA NETWORK (CAN) SYSTEM OUTLINE

DPE094055430T01

- Due to the simplification of the wiring harness, a CAN system for transmission of multiplex input/output signals among electrical modules has been adopted.
- Twisted-pair wiring is used for connections between the following modules. (Each electrical module hereafter referred to as a CAN system-related module):
  - — PCM
  - — EHPAS control module
  - — ~~DSC HU/CM (with DSC~~)
  - — ABS HU/CM (with ABS)
  - — ~~Rear view monitor control module~~
  - — Keyless control module
  - — Instrument cluster
  - — BCM
  - — Climate control unit
  - — Information display
  - — Audio unit (base module)
  - — ~~Water heater unit~~
- With an on-board diagnostic function included for each multiplex module, display of DTCs using the WDS or equivalent has improved serviceability.

CAN SYSTEM STRUCTURAL VIEW

DPE094055430T02



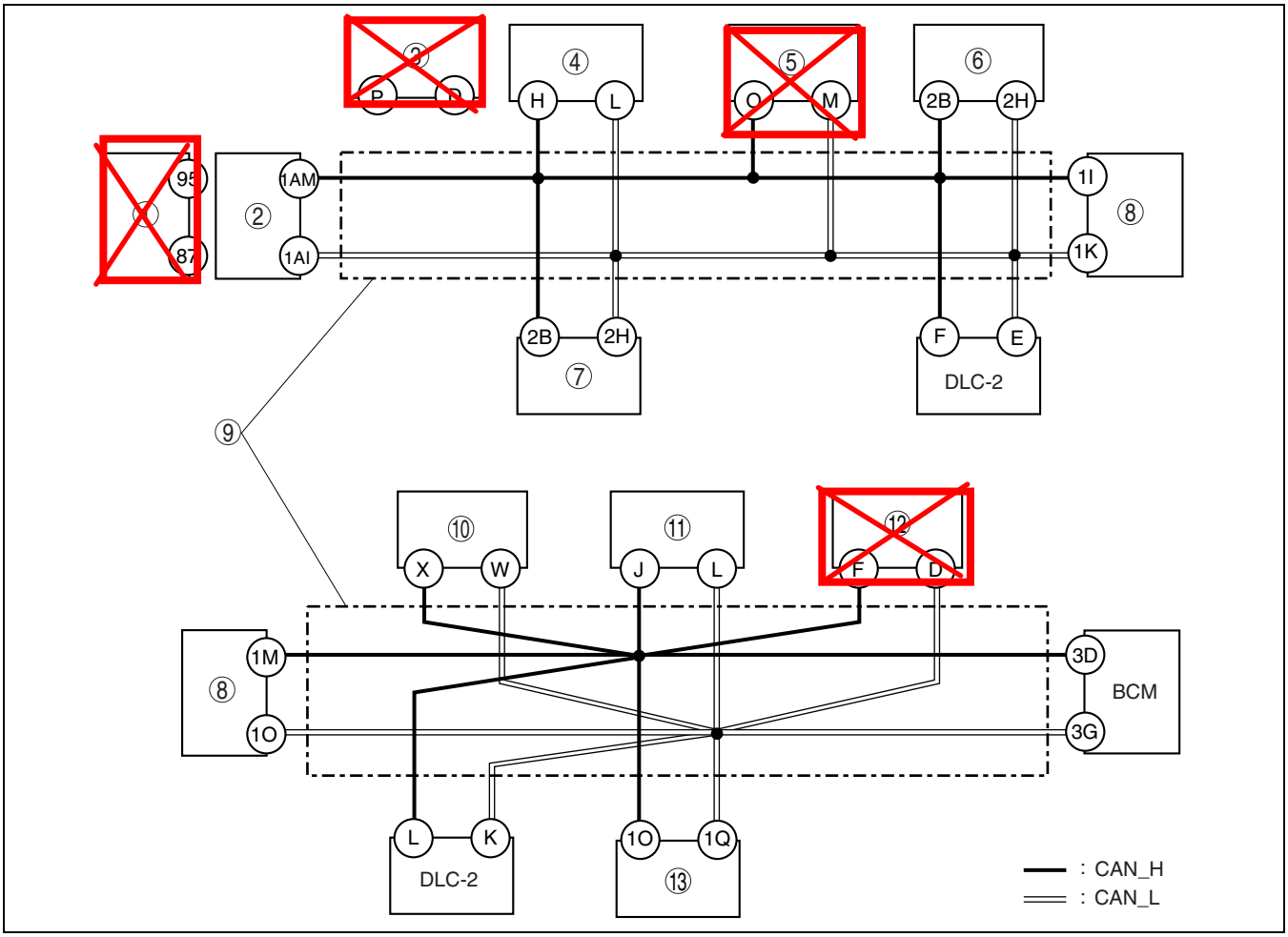
DPE940ZT1501

1	EHPAS control module
2	~~Water heater unit (MZR-CD (RF Turbo))~~
3	PCM ~~(L8, LF)~~
4	~~DSC HU/CM (with DSC) or~~ ABS HU/CM ~~(with ABS)~~
5	Keyless control module
6	Instrument cluster

7	Information display
8	Audio unit (base module)
9	~~Rear view monitor control module~~
10	Climate control unit
11	~~PCM (MZR-CD (RF Turbo))~~
12	BCM

CAN SYSTEM WIRING DIAGRAM

DPE094055430T03



DPE940ZT1502

1	PCM (MZR-CD (RF Turbo))
2	PCM (L8, LF)
3	DSC HU/CM (with DSC)
4	ABS HU/CM (with ABS)
5	Rear view monitor cntrol module
6	Keyless control module
7	EHPAS control module

8	Instrument cluster
9	Twisted pair
10	Climate control unit (with full-auto air conditioner system)
11	Information display
12	Water heater unit
13	Audio unit (base module)

CAN SYSTEM DESCRIPTION

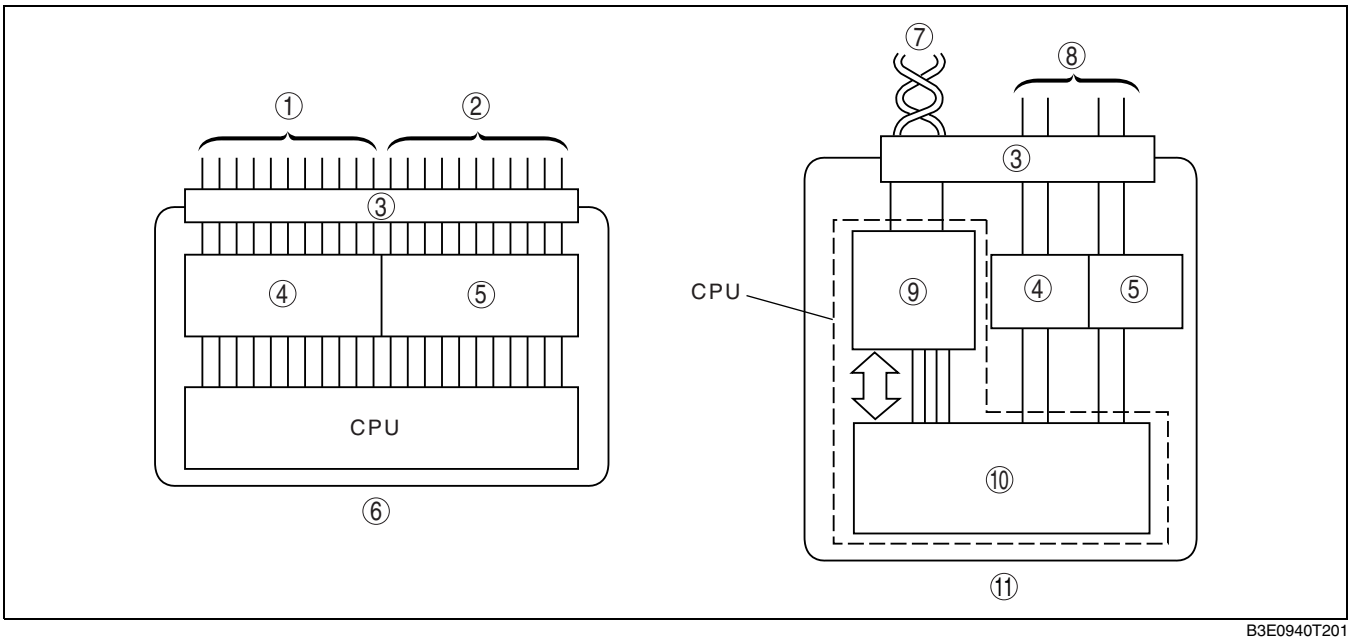
DPE094055430T04

Mechanism of CAN System-Related Module

- A CAN system-related module is composed of an electrical circuit, CPU, and input/output interface.
- The size of the module has been reduced due to the elimination of the bulky, superfluous, input/output interface in the conventional type of electrical module.
- The CPU (multiplex block) controls all signals exchanged on the CAN harness.
- Communication with non-multiplex parts is carried out by conventional input/output interface.
- The functions of each component are shown below.

Component		Function
Electrical circuit		Supplies power to CPU and vicinity, and to input/output interface.
CPU	Computation processing block	Control function has been expanded, and when transmission is necessary, transmitted data is stored in a multiplex block. If a multiplex block receives a request to read stored data, transmitted data is read from the multiplex block.
	Multiplex block	Transmits data received from bus line to computation processing block. In addition, sends transmitted data stored from computation processing block to bus line.

Component	Function
Input/Output interface	Electrically converts information signals from switches to, be input to CPU, and signals output from CPU for operating actuator or indicator lights.



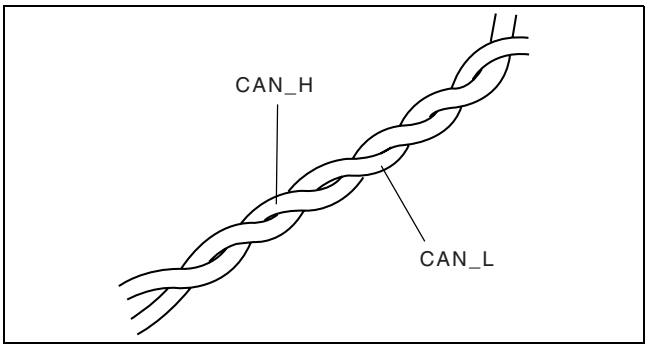
B3E0940T201

1	Input signal
2	Output signal
3	Connector
4	Input interface
5	Output interface
6	Conventional module

7	CAN harness (twisted pair)
8	Conventional wiring harness
9	Multiplex block
10	Computation processing block
11	CAN system-related module

Twisted Pair

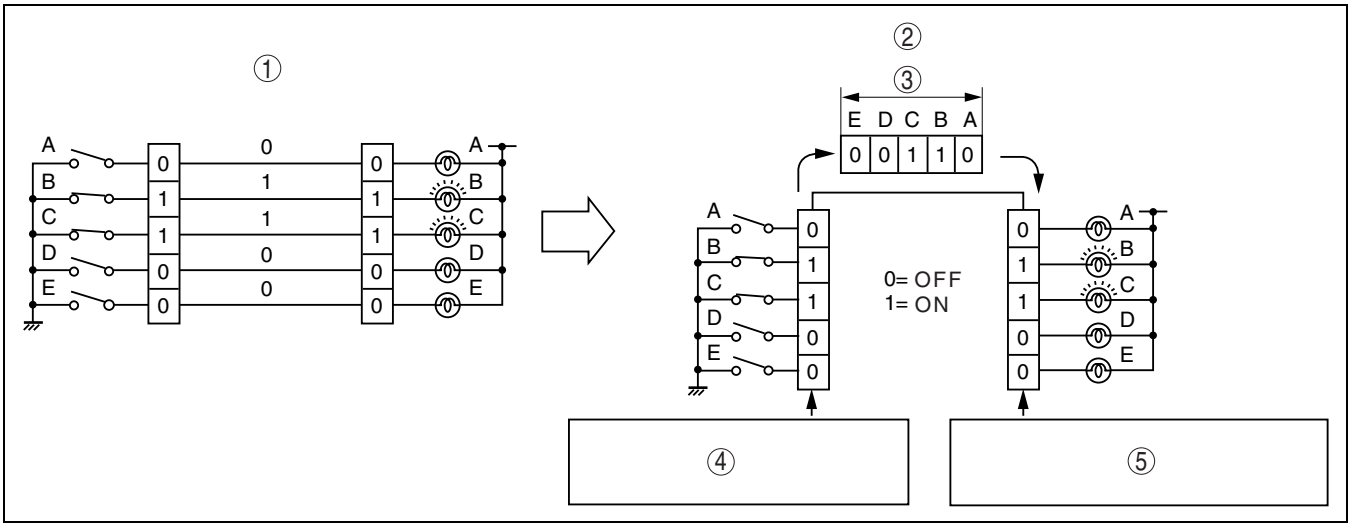
- The multichannel use two spirally twisted wires called a twisted pair, and each wire, CAN_L and CAN_H, has its own special function.
- Both bus lines are opposite phase voltage. This allows for minimal noise being emitted and makes if difficult for noise interference to be received.



B3E0940T202

Time Division Multiplex

- For information exchange between electrical modules in a conventional system, a wire connection was necessary for each information signal. However, by sending the different signal at varying times over one channel, it is possible to send a large amount of information via a small harness.
- In the conventional, non-multiplex system, in order to control the illumination of the five bulbs, one switch and one channel was necessary for each bulb. For bulbs B and C to illuminate, switches B and C must be ON and electricity must flow through the channel. With the time multiplex system, this can be done through one channel. The channel is comprised of five data signal transmitters which transmit either a “0” or “1” signal to indicate whether a bulb turns ON or OFF. For example, to illuminate bulbs B and C, transmitters B and C transmit a “1” and transmitters A, D, and E transmit a “0”. When the receiver receives these signal, bulbs B and C illuminate.



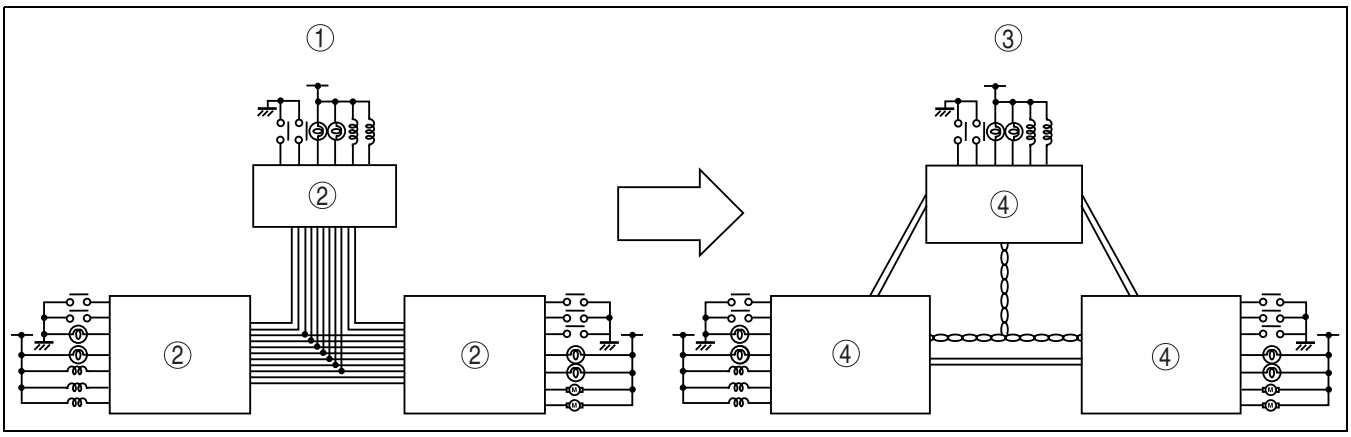
B3E0940T203

1	Non-multiplex system
2	Time division multiplex system
3	Data

4	Each signal is transmitted one by one through the channel as it is received.
5	Each signal is output one by one as it is received from the channel.

Vehicle CAN System

- By rearranging the multiple signal, common information between the CAN system-related modules is transmitted and received through the multichannel.
- The signal transmitted by one CAN system-related module is sent through the multichannel to all the CAN system-related modules, but only the concerned module (s) receives the signal and performs the appropriate operation (ex. light illumination, fan operation).



BHE0940T006

1	Conventional system
2	Electrical module

3	CAN system
4	CAN system-related module

CAN Signal-Chart (HS-CAN)

OUT: Output (sends signal)
IN: Input (receives signal)

Signal	Multiplex module					
	PCM	EHPAS control module	~~DSC HU/CM~~ ABS HU/CM	~~Rear view monitor control module~~	Keyless control module	Instrument cluster
Engine speed	OUT	IN	IN	–	IN	IN
Vehicle speed	OUT	IN	–	–	IN	IN

Signal	Multiplex module					
	PCM	EHPAS control module	~~DSC HU/CM~~ ABS HU/CM	Rear view monitor control module	Keyless control module	Instrument cluster
ATX gear position/selector lever position ~~(ATX)~~	OUT	IN	–	–	–	IN
~~Neutral switch position (MTX)~~	OUT	IN	–	–	–	–
~~Engine torque~~	OUT	–	IN –	–	–	–
~~Accelerator pedal position~~	OUT	–	IN –	–	–	–
Brake pedal position	~~OUT~~ IN	–	~~IN~~ –	–	–	– OUT
Transaxle specifications	OUT	–	IN –	–	–	–
Tire circumference (front/ rear)	OUT IN	–	IN OUT	–	–	–
Desired gear/change lever position	OUT	–	IN	–	–	–
TCC status (ATX)	OUT	–	IN	–	–	–
~~Engine specifications~~	~~OUT~~	~~–~~	~~IN~~ ~~–~~	~~–~~	~~–~~	~~–~~
Immobilizer-related information	OUT IN	–	–	–	–	IN OUT
AT warning light on request (ATX)	OUT	–	–	–	–	IN
Engine coolant temperature	OUT	–	–	–	–	IN
Travelled distance	OUT	–	–	–	–	IN
Fuel injection amount	OUT	–	–	–	–	IN
MIL on request	OUT	–	–	–	–	IN
Generator warning light on request	OUT	–	–	–	–	IN
Cruise main/set indicator light on request	OUT	–	–	–	–	IN
Steering angle	–	OUT	–	IN	–	–
EHPAS control module malfunction	–	OUT	–	–	–	IN
Brake system status (EBD/ ABS/DSC)	IN	–	OUT	–	–	–
Wheel speed (LF, RF, LR, RR)	IN	–	OUT	–	–	–
Brake system warning light on request	–	–	OUT	–	–	IN
ABS warning light on request	–	–	OUT	–	–	IN
~~DSC indicator light on request~~		–	OUT –	–	–	IN
~~DSC OFF light on request~~	–	–	OUT –	–		IN
Keyless warning/indicator light on request	–	–	–	–	OUT	IN
Keyless warning buzzer on request	–	–	–	–	OUT	IN
Fuel tank level	IN	–	–	–	–	OUT
A/C on request	IN	–	–	–	–	OUT

Signal	Multiplex module					
	PCM	EHPAS control module	~~DSC HU/CM~~ ABS HU/CM	Rear view monitor control module	Keyless control module	Instrument cluster
Transaxle in reverse position	IN	–	–	–	–	OUT
Parking brake position	–	IN	–	–	–	OUT

CAN Signal-Chart (MS-CAN)

OUT: Output (sends signal)
IN: Input (receives signal)

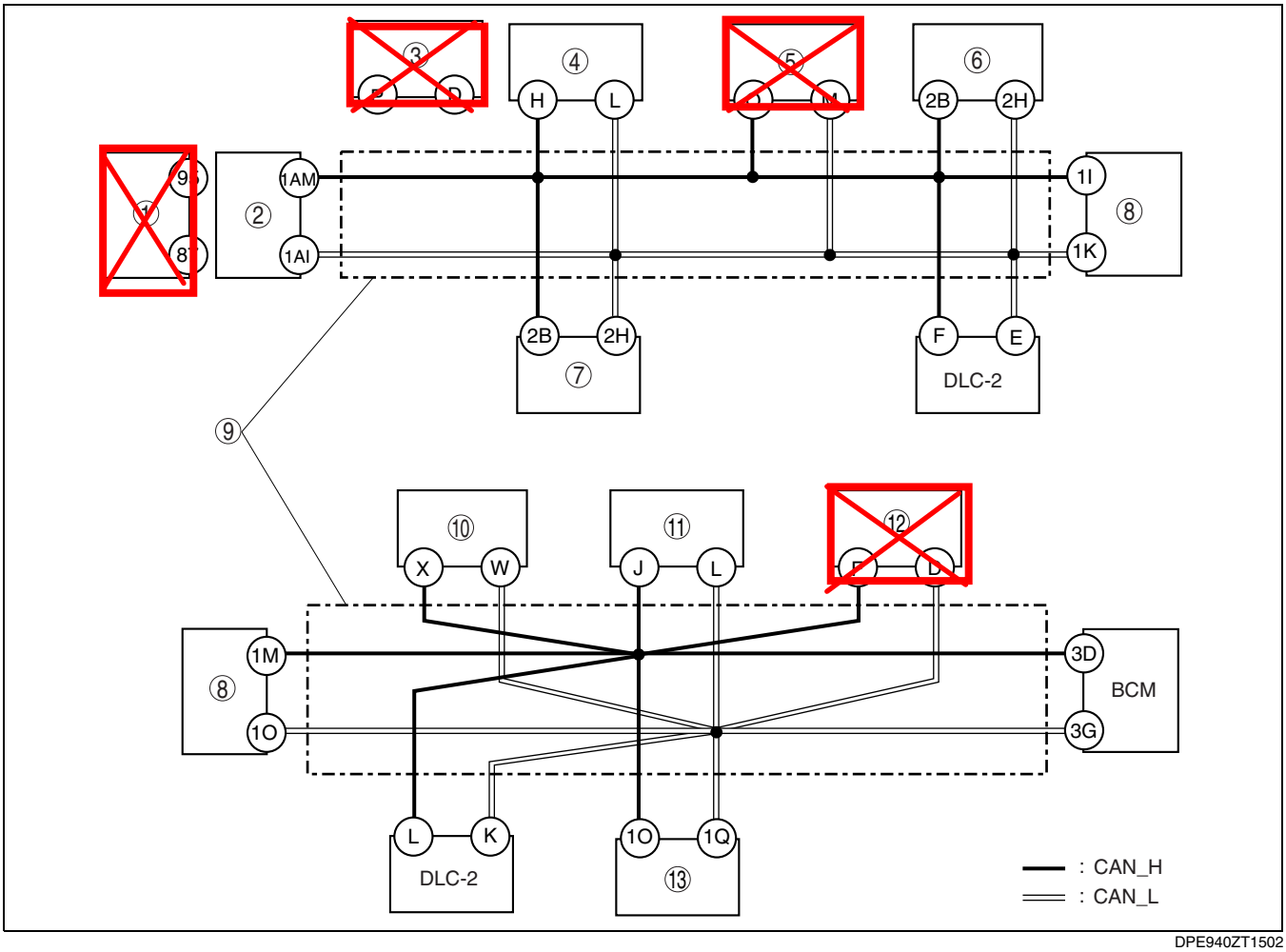
Signal	Multiplex module					
	Body control module (BCM)	Climate control unit	Information display	Audio unit (base module)	Water heater unit	Instrument cluster
Front wiper status	OUT	IN	–	–	–	–
TNS status	OUT	IN	–	–	–	–
Door lock status	OUT	–	–	–	–	IN
Turn indicator light on request	OUT	–	–	–	–	IN
Security light on request	OUT	–	–	–	–	IN
Alarm on request	OUT	–	–	–	–	IN
Each door status	OUT	–	–	–	–	IN
Brake fluid level	OUT	–	–	–	–	IN
High-beam indicator light on request	OUT	–	–	–	–	IN
Parking brake position	OUT	–	–	–	–	IN
Rear window defroster on request	IN	OUT	–	–	–	–
	OUT	IN				
A/C on request	IN	OUT	–	–	–	–
	OUT	–				IN
Ambient temperature	IN	OUT	–	–	IN	–
A/C status display request	–	OUT	IN	–	–	–
Temperature unit	–	OUT	IN	–	–	–
	IN	–	–			OUT
Audio status display request	–	–	IN	OUT	–	–
Water heater fuel consumption	–	–	–	–	OUT	IN
Engine speed	IN	–	–	–	IN	OUT
Vehicle speed	IN	IN	IN	IN	–	OUT
Engine coolant temperature	–	IN	IN	–	–	OUT
Ignition key position	–	IN	IN	IN	IN	OUT
Drive information system data	–	–	IN	–	–	OUT

On-Board Diagnostic Function

- The on-board diagnostic function is incorporated into the following module:
  - — PCM
  - — ABS HU/CM ~~(with ABS) or DSC HU/CM (with DSC)~~
  - — EHPAS control module
  - — Keyless control module
  - — Body control module (BCM)
  - — Climate control unit
  - — Information display
  - — Audio unit (base module)
  - — ~~Water heater unit~~
  - — Instrument cluster

- This function can narrow down CAN system malfunction locations.
- The on-board diagnostic function consists of the following functions.
  - — Failure detection function, which detects DTCs malfunctions in CAN system-related parts.
  - — Memory function, which stores detected.
  - — Self-malfunction diagnostic function, which indicates system malfunctions using DTCs and warning lights.
  - — PID/DATA monitoring function, which verifies the input/output condition of specific input/output signals being read out.
- Using the WDS or equivalent, DTCs can be read out and deleted, and the PID/DATA monitoring function can be activated.
- The CAN system has a fail-safe function. When a malfunction occurs in CAN system, the transmission module sends a warning signal and the receiving module illuminates the warning light.

Block diagram



DPE940ZT1502

1	PCM (MZR-CD (RF Turbo))
2	PCM (L8, LF)
3	DSC HU/CM (with DSC)
4	ABS HU/CM (with ABS)
5	Rear view monitor cntrol module
6	Keyless control module
7	EHPAS control module

8	Instrument cluster
9	Twisted pair
10	Climate control unit (with full-auto air conditioner system)
11	Information display
12	Water heater unit
13	Audio unit (base module)

Failure detection function

- The failure detection function in each CAN system-related module detects malfunctions in input/output signals.
- This function outputs the DTC for the detected malfunction to the DLC-2, and also sends the detected result to the memory function and fail-safe function.

Fail-safe function

- When the failure detection function determines that there is a malfunction, the fail-safe function illuminates a

warning light to inform the driver of the malfunction.

Memory function
- The memory function stores the DTC for the malfunction of input/output signals for related parts, as determined by the failure detection function.

Self-malfunction diagnostic function
- The self-malfunction diagnostic function determines that there is a malfunction, and outputs a signal, as a DTC, to the DLC-2. The DTC can be read out using the WDS or equivalent.

DTC table

DTC	Malfunction location	DTC output module
U0073	CAN system communication error	• PCM • EHPAS control module • Instrument cluster • Keyless control module • BCM
U0100	Communication error to PCM	• EHPAS control module • Instrument cluster • Keyless control module • BCM
U0121	Communication error to DSC HU/CM or ABS HU/CM	• PCM • Instrument cluster
U0131	Communication error to EHPAS control module	Instrument cluster
U0140	Communication error to BCM	• Instrument cluster • Climate control unit • Keyless control module
U0155	Communication error to instrument cluster	• PCM • Climate control unit • BCM
U0164	Communication error to climate control unit	• BCM • Information display
U0181	Communication error to instrument cluster	Information display
U0184	Communication error to audio unit (base module)	• Instrument cluster • Climate control unit • Information display
U0323	Communication error to instrument cluster	Keyless control module
U0516	CAN system communication error	• Climate control unit
U1900	Communication error to instrument cluster	• ABS HU/CM (with ABS) • DSC HU/CM (with DSC)
	Communication error to other module	Water heater unit
U2012	CAN system communication error	• ABS HU/CM (with ABS) • DSC HU/CM (with DSC)
U2023	Abnormal message from PCM	• DSC HU/CM (with DSC) • EHPAS control module • Keyless control module
U2202	Communication error to PCM	DSC HU/CM (with DSC)
U2516	CAN system communication error	• Instrument cluster • Information display • Water heater unit
16: Er12	CAN system communication error	Audio unit (base module)
17: Er11	Communication error to instrument cluster	
18: Er11	Communication error to BCM	
19: Er11	Communication error to climate control unit	

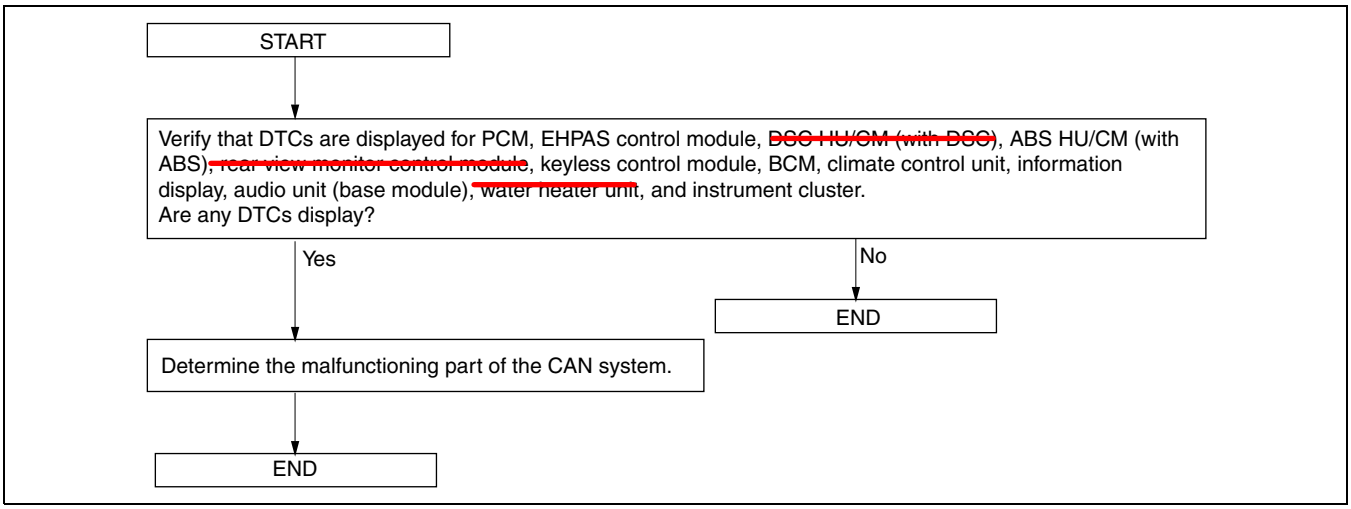
PID/data monitoring function
- The PID/data monitoring function is used to freely select and read out, in real time, the monitored items for the input/output signals of the climate control unit .
- A WDS or equivalent is used to read out the PID/data monitor information.

PID name (definition)	WDS display	Detection state	PID monitor module	Terminal
FFH_MSG (Signal reception error from the water heater unit)	Present	Circuit between the water heater unit and monitor module is normal.	Climate control unit	Climate control unit : W, X
	Not Present	Circuit between the water heater unit and monitor module is abnormal.		

Narrowing down malfunction locations

- The on-board diagnostic function, by verifying the detected DTC and PID/data monitor information from each module, can narrow down a CAN system malfunction location. Refer to the self-malfunction diagnostic function and PID/data monitoring function for detailed information regarding DTCs and the PID/data monitor. (See09–40–17 Self-malfunction diagnostic function.) (See09–40–17 PID/data monitoring function.)

Flowchart



DPE940ZT1503

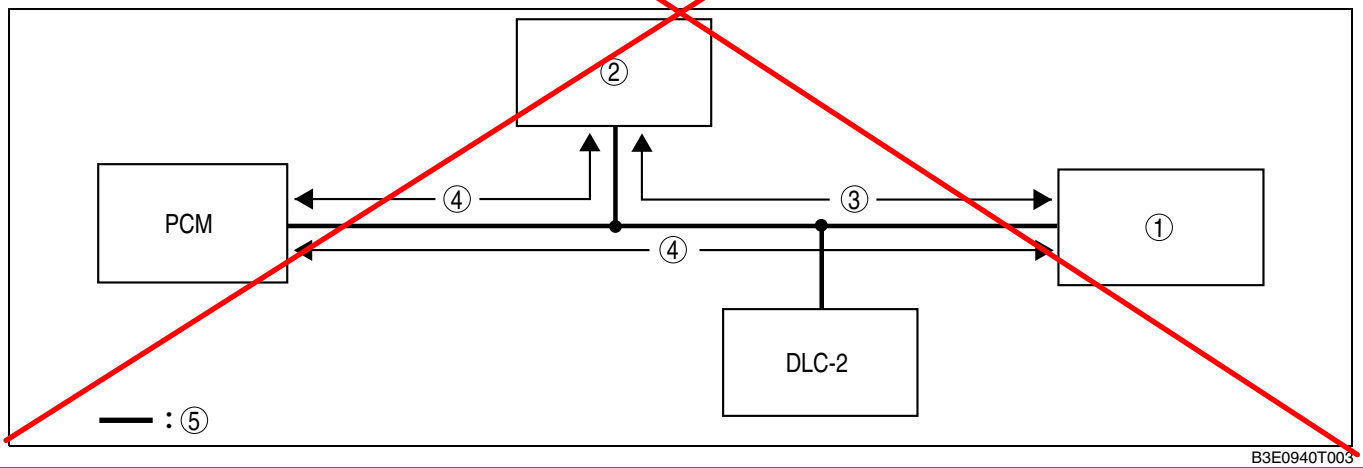
Example (PCM-related communication error)

Note

- This example is for L8 with DSC.

1. DTCs for the PCM, DSC HU/CM and instrument cluster can be verified using the WDS or equivalent.

Module	Displayed DTC	Probable malfunction location
PCM	U0073	PCM-related CAN system malfunction
	U0121	Communication error between PCM and DSC HU/CM
	U0155	Communication error between PCM and instrument cluster
DSC HU/CM	U2023	Communication error between DSC HU/CM and PCM
Instrument cluster	U0100	Communication error between instrument cluster and PCM



B3E0940T003

1	Instrument cluster
2	DSC HU/CM
3	Normal

4	Communication error
5	Twisted pair

2. If there is a communication error between the instrument cluster and PCM, even if the communication between the DSC HU/CM and the instrument cluster is normal, it is probable that there is a malfunction in the PCM or PCM-related wiring harnesses.