
BODY ELECTRICAL

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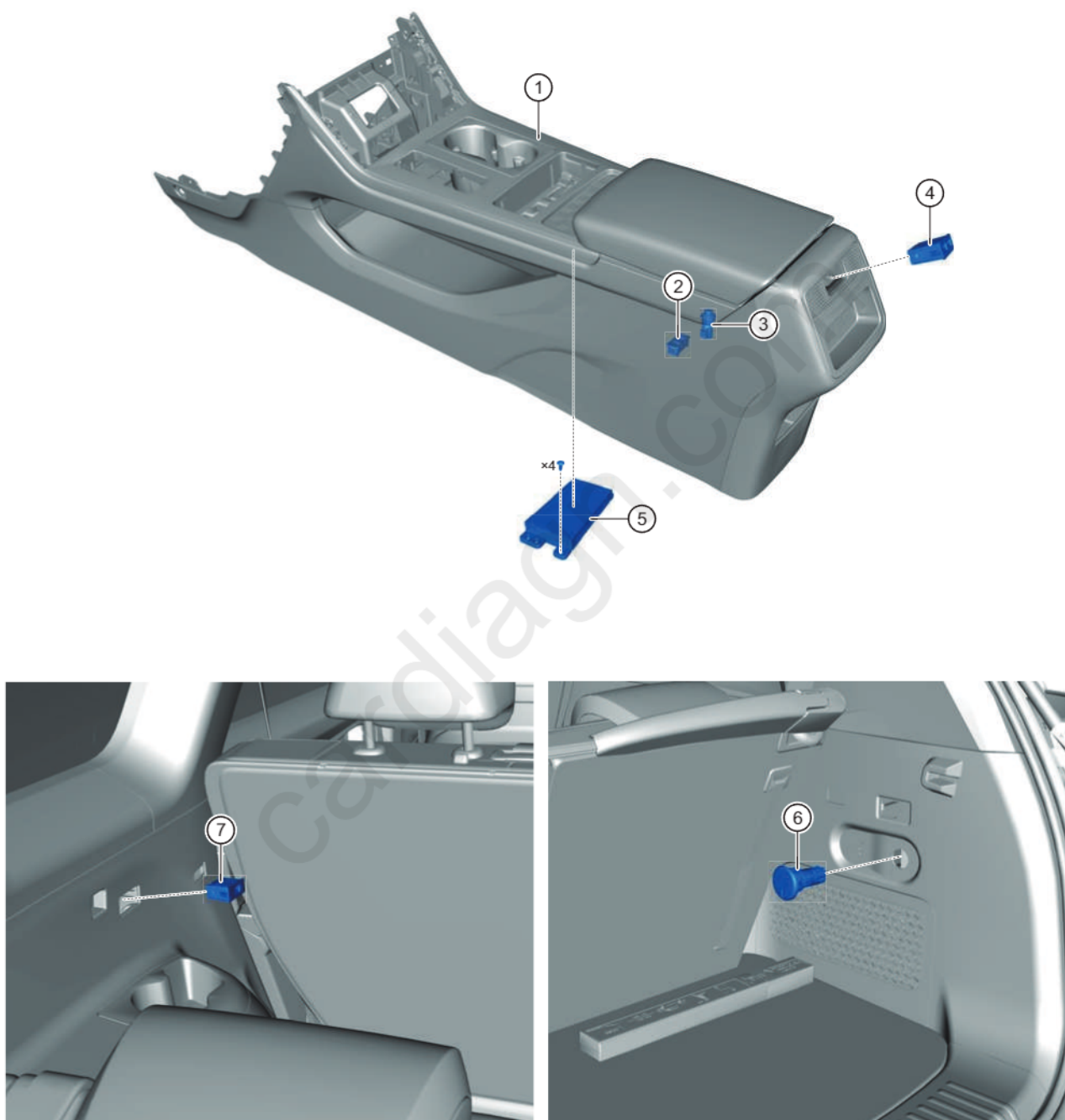
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48.1 BODY CONTROL SYSTEM

1 System Overview

1.1 System Components Diagram



W20010

BCM is installed under instrument panel on driver side. Body control module is called BCM for short which integrates most of vehicle electrical appliances, and it is an important part of the body electrical system.

1.2 Component Operation Description

■ Function description

- Tire pressure function (if equipped): Tire pressure monitoring system is an active safety device, which can monitor tire pressure and temperature in real time and display tire pressure and temperature on meter. When tire pressure is too low or temperature is too high, tire pressure monitoring system will warn the driver of driving danger.
- Window jam protection function (if equipped): When window auto up or remote one-button window up function is operated, if a passenger is jammed by automatically rising window due to carelessness, the jam protection control module controls glass regulator motor to operate in reverse before motor reaches the set jam protection force, so that window glass lowers a certain distance, thus preventing passenger from being jammed.
- The main functions are as follows: Defrost, turn signal light, lane change, hazard warning light, position light, park light, low beam light, follow me home, car location, automatic lighting, high beam light, flash function, rear fog light control, daytime running light, battery save, dome light, rear dome light, rear view mirror foot light, window, PEPS start button backlight control, anti-theft management, luggage compartment door opening management (with PLG), door status, central lock, front wiper control, front washer control, rear wiper control, rear washer control, back-up light control, key status position signal, sudden braking hazard warning light double flashing alarm function, assist steering illumination, brake light control, rear view mirror folding, DVD settings, remote control function, LIN ambient light.

1.3 Defrost function

- (1) When IGN ON and engine is started (including the state that engine automatically turns off when idle start and stop system operates), defrost signal is activated.
- (2) When defroster is operating: Defroster stops after 20 minutes are elapsed.
- (3) When defroster is operating: Defroster stops when defroster signal is activated again.
- (4) When defroster is operating: Defroster stops when key is switched from IGN ON to ACC or OFF.
- (5) When defroster is operating: After the operation time reaches to 20 min. $\pm$ 5 s, defroster stops.
- (6) When defroster is operating: Defroster function pauses when engine cranks while it resumes after engine has started.

Caution

Under normal temperature (3°C ~ 5°C), when battery power is less than 35% (open circuit voltage of battery is about 12.22 V), defroster function will be disabled and unavailable; after battery power is greater than 37.5%, defroster function will be available again.

1.4 Turn signal light function

- (1) With hazard warning light not activated, if hazard warning light switch is pressed, BCM should light up turn signal lights on both sides at the same time in a cycle of 960 ms;
- (2) When ignition switch state is in KL15, KL15+ or KL50 and BCM receives a valid CAN signal during emergency braking, BCM should light up turn signal lights on both sides in a cycle of 240 ms;
- (3) When BCM receives a valid CAN network collision signal, BCM should light up turn signal lights on both sides in a cycle of 960 ms.

1.5 Hazard warning light function

- (1) With hazard warning light not activated, if hazard warning light switch is pressed, BCM should light up turn signal lights on both sides at the same time in a cycle of 960 ms;
- (2) When ignition switch state is in KL15, KL15+ or KL50 and BCM receives a valid CAN signal during emergency braking, BCM should light up turn signal lights on both sides in a cycle of 240 ms;
- (3) When BCM receives a valid CAN network collision signal, BCM should light up turn signal lights on both sides in a cycle of 960 ms.

1.6 Position light

- (1) Activation conditions for position light: Power supply is in IGN ON, ACC, START position; position light input or low beam light input is activated.
- (2) When position light is operating: BCM should send CAN signal.

- (3) When position light is operating: When position light input and low beam input are deactivated, position light stops operating.
- (4) When position light comes on, if ignition key is turned to OFF position, position light will turn off after 30 minutes. If any state of four doors and back door changes or an unlock/lock signal is received within 30 minutes, the timing will restart.

1.7 Low beam light

- (1) Activation conditions for low beam light: IGN ON, low beam light switch is activated.
- (2) When low beam light is activated: BCM sends CAN signal.
- (3) When low beam light is activated: When low beam light switch input is canceled, low beam light turns off immediately.
- (4) When low beam light is activated: When key is turned from IGN ON to ACC or OFF, low beam light turns off immediately.

1.8 Follow me home

- Within 1 minute after ENGINE START STOP switch is switched to OFF mode, operate combination light switch to steering wheel side or away from steering wheel side and release, follow me home function is activated, and low beam and position light will come on for 30 seconds; Operate follow me home function again before the setting time is reached, the follow me home function will be turned off; Follow me home function will automatically turn off, and low beam and position light will go off immediately after the setting time is reached.
- When ENGINE START STOP switch is switched to ACC/ON mode, follow me home function will automatically turn off, and low beam and position light will go off immediately.
- User can set delay on/off for headlight in head unit system and turn on follow me home function and set the time for light to automatically turn on; within 1 minute after ENGINE START STOP switch is switched to OFF mode, follow me home function can be turned on and off any number of times.

1.9 Car locating

- After the vehicle is locked, operate remote control lock button twice within 2 seconds to activate intelligent car locating function, low beam light and position light will automatically turn on for 30 seconds, turn signal light will flash three times and horn will sound three times. When car locating function is activated, if accompanying horn sound prompt can be set in head unit.

1.10 Automatic lighting

- (1) Activation conditions for automatic light: IGN is in ON position; light switch is turned to AUTO, LIN valid signal sent from rain sensor is received.
- (2) After automatic lighting is activated, BCM sends low beam light and position light CAN signal to the instrument cluster.
- (3) Low beam lights turn off if any condition is met.
 - IGN switch is not in ON position.
 - Light switch is switched from AUTO.
 - Rain sensor LIN signal is invalid.
- (4) When automatic light function is activated and deactivated, position light and low beam light turn on and off at the same time.

1.11 High beam light

- (1) Operating conditions for high beam light: IGN ON; low beam light is in activated status, and high beam light switch is activated.
- (2) When high beam light is operating: High beam light turns on and sends CAN signal.
- (3) When low beam light is operating: When engine starts, high beam light temporarily stops operating but CAN data will be sent continuously and resume operation after engine starts.
- (4) When high beam light is operating: When high beam light switch is deactivated, high beam light turns off.
- (5) When high beam light is operating: When low beam light switch is deactivated, high beam light turns off.
- (6) When high beam light is operating: When key is turned from IGN ON to ACC or OFF, high beam light turns off.

1.12 Flash function

- (1) Flash operating conditions: It can be activated at any power supply position (except starting process).
- (2) When Flash is operating: High beam lights turn on and send CAN signal.
- (3) When Flash is operating: When engine starts, high beam lights temporarily stop operating but CAN data will be sent continuously and resume operation after engine starts.
- (4) When Flash is operating: When Flash switch is deactivated, high beam light turns off.

1.13 Front fog light control

- (1) Operating conditions for front fog light: With IGN-ON, position light or low beam light turned on, front fog light switch is activated.
- (2) When front fog light is operating: Front fog lights turn on and sends CAN signal.
- (3) When front fog light is operating: When front fog light switch is activated again, front fog light turns off.
- (4) When front fog light is operating: When key is switched from IGN ON to ACC or OFF, front fog light turns off.
- (5) When front fog light is operating: When position light and low beam light are turned off, front fog light turns off.

1.14 Rear fog light control

- (1) Operating conditions for rear fog light: With IGN ON, front fog light or low beam light or high beam light turned on, rear fog light switch is activated.
- (2) When rear fog light is operating: Rear fog light turns on and sends CAN signal.
- (3) When rear fog light is operating: When rear fog light switch is activated again, rear fog light turns off.
- (4) When rear fog light is operating: When key is switched from IGN ON to ACC or OFF, rear fog light turns off.
- (5) When rear fog light is operating: When front fog light is turned off (if front fog light is equipped) or low beam light is turned off (if front fog light is not equipped), rear fog light turns off.

1.15 Daytime running light

- (1) Operating conditions for daytime running light: Engine is started, position light is not activated;
- (2) When daytime running light is operating: When engine is stopped, daytime running light function turns off.
- (3) When daytime running light is operating: Position light or hazard warning light is activated, causing daytime running light to be turned off. When turn signal light is activated, daytime running light on the illuminated side of turn signal light turns off.
- (4) When daytime running light is operating: Flash function does not affect daytime running light operation.

1.16 Dome light

- (1) Dome light ON mode
 - If corresponding map light switch is in OFF state and the current mode switch is in ON state, front map light will be in dome light ON mode; if corresponding mode switch is in AUTO mode, rear map light will also be in dome light ON mode.
- (2) Dome light OFF mode
 - If corresponding mode switch is in OFF state, the corresponding map mode switch will be in OFF mode, and rear map light will be in dome light OFF mode.
 - If the corresponding mode switch is in OFF state, front map light will be in dome light OFF mode when the current mode switch is in OFF mode; if corresponding mode switch is in AUTO mode, rear map light will also be in dome light OFF mode.
- (3) Door opening AUTO mode
 - If the corresponding map light switch is in OFF state, front map light will be in AUTO mode when the current mode switch is in AUTO mode. If the corresponding mode switch is in AUTO mode, rear map light will also be in AUTO mode.

1.17 Luggage compartment light

- (1) Operating conditions for luggage compartment light: When luggage compartment door is opened, luggage compartment light continuously turns on.
- (2) When luggage compartment light is operating: When luggage compartment door is closed, luggage compartment light turns off immediately.

1.18 Rear view mirror foot light

- (1) Unlocking operation triggering foot light function
 - Condition: Complete a unlocking operation successfully in OFF position (including remote control unlocking, mechanical key unlocking, touch door handle switch unlocking and induction unlocking); Operation after the rear view mirror is unfolded in night mode: Foot light comes on for 25 seconds immediately after unlocking operation is performed (if rear view mirror is in folded state currently, a delay of 2 seconds will be required, the light comes on after rear view mirror unfolds; If the rear view mirror is in unfolded state currently, the light comes on immediately); after 25 seconds, if timeout occurs or locking operation is performed or if ignition switch is switched to any position other than OFF, foot light will be turned off immediately.
- (2) Courtesy light triggering foot light function
 - Condition: Courtesy light comes on in OFF position; Operation after the rear view mirror is unfolded in night mode: Foot light comes on for 25 seconds immediately after unlocking operation is performed (if rear view mirror is in folded state currently, a delay of 2 seconds will be required, the light comes on after rear view mirror unfolds; If the rear view mirror is in unfolded state currently, the light comes on immediately); after 25 seconds, if timeout occurs or courtesy light is turned off or if ignition switch is switched to any position other than OFF, foot light will be turned off immediately.
- (3) Door opening triggering foot light function
 - Conditions: Operation with vehicle in deactivation mode, any one of four side doors open and rear view mirror in unfolded state: Foot light comes on for 10 minutes immediately after unlocking operation is performed (if rear view mirror is in folded state currently, the light will not come on); After 10 minutes, if timeout occurs or if ignition switch is switched to any position other than OFF, foot light will be turned off immediately; If the four side doors are closed, foot light will be turned off after a delay of 25 seconds.

Caution
During lighting up of foot light, if other operating conditions are met, foot light will start timing again according to the new operating condition.

1.19 Window

- (1) Activation condition for window: Within 1 minute after turning to IGN ON, ACC or OFF and both front doors are not opened, window switch is activated.
- (2) Window switch has 4 states:
 - Manual UP: When switch is in this position, window is moving up. When switch leaves this position, window stops.
 - Manual DOWN: When switch is in this position, window is moving down. When switch leaves this position, window stops.
 - Auto UP: When switch is in this position, window is moving up automatically until it stops due to block or position changed.
 - Auto DOWN: When switch is in this position, window is moving down automatically until it stops due to block or position changed.
- (3) When window is operated under auto mode: Press corresponding window up or down switch again to stop the operation.
- (4) When window is operated under auto mode: For example, after 1 minutes which described in point 1, the operating window stops after finishing this operation.
- (5) When window is operated under manual mode: For example, after 1 minutes which described in point 1, the operating window stops immediately.
- (6) Within 1 minutes when key is turned to OFF: If front left door opens, window function is disabled.

- (7) When window disable switch is activated: Input of passenger side will be disabled; The automatically operating window operated by passenger side switch will stop after this window operation is completed, and the manual mode window operation operated by passenger side switch will stop immediately. When window disable switch is deactivated, passenger side input is disabled to cancel and window disabled indicator goes off.
- (8) With key in OFF: When front left door is opened, window switch input will be invalid (it is still invalid when front door is opened and then closed); With front door open, the automatically operating window will stop after this window operation is completed, and the manual mode window operation will stop immediately.
- (9) When engine starts, the automatically operating window will stop immediately, and it automatically resumes the operation after starting. The window operation in manual mode will stop when starting, and it cannot resume after engine is started.

1.20 Anti-theft management

(1) Fortifying mode

1) Trigger conditions:

- IGN is in OFF (it is not in IGN ON or ACC)
- Four doors & two covers are closed;
- BCM receives remote control lock command.

2) BCM feedback when fortifying mode is entered:

- Turn signal light flashes once and sends corresponding CAN signal;
- Anti-theft indicator flashes;
- Actuate the anti-theft horn to sound.

(2) Fortifying failure mode

1) Trigger conditions:

- IGN OFF;
- Any of four doors & two covers is open;
- BCM receives remote control lock command.

2) When entering fortifying failure mode:

- If four doors are closed and any of the two covers is open, BCM will perform lock once, while turn signal light flashes three times and horn sounds three times;
- If any door other than front left door is not closed, BCM will perform central control lock operation, turn signal light will not flash, and horn will not sound;
- If front left door is not closed, BCM will do not perform central control lock, turn signal light will not flash, and horn will not sound.

(3) Intrusion mode

1) Trigger conditions: BCM will enter to alarm status after the following conditions are met when the vehicle is in fortifying mode:

- Doors or engine hood is opened;
- Key is turned to IGN ON;
- Luggage compartment is opened forcibly.

2) After entering to intrusion mode, BCM feedback the conditions within one alarm cycle (300 s):

- After anti-theft alarm is triggered, horn will sound for 30 seconds within one alarm cycle; Turn signal light will flash for 300 seconds; Anti-theft indicator will not flash.

3) All doors, engine hood, luggage compartment and IGN ON illegal activation action are alarm trigger sources:

- 10 alarm cycles can be triggered at most;
- Once triggered, no matter whether trigger source disappears or not, an alarm cycle will be completed; If the alarm is triggered again, it will re-enter the alarm state; After the alarm cycle ends, BCM is still in fortifying mode.

(4) Fortifying deactivation mode

- Activation conditions: Vehicle is in alarm mode; BCM receives RF unlock command or signal is detected within 1 second after key is turned to IGN ON;

- When alarm is released: Vehicle exits anti-theft function mode; anti-theft horn (high and low pitched horns (if equipped)) stops working, and the turn signal light stops flashing;
 - After alarm is released: Anti-theft indicator turns off.
- (5) Re-fortifying mode
- 1) Trigger conditions:
 - Vehicle is in fortifying mode;
 - BCM receives remote control unlock command.
 - 2) BCM feedback when fortifying mode is released:
 - Theft deterrent indicator turns off immediately;
 - Turn signal light flashes twice and sends corresponding signal.
 - 3) Within 30 ± 2 seconds after fortifying mode is released:
 - If any of all doors, engine hood or luggage compartment are open, BCM exits anti-theft mode;
 - If all four doors & two covers are always closed, BCM will lock automatically and enter the fortifying state after 30 seconds, and anti-theft indicator will flash.
- (6) Luggage compartment opening mode
- 1) Trigger conditions:
 - Vehicle is in fortifying mode;
 - BCM receives the remote control open command of luggage compartment.
 - 2) BCM feedback when luggage compartment opening mode is triggered:
 - Turn signal light illuminates and sends the corresponding signals;
 - Luggage compartment is open and no alarm is triggered.
 - 3) Then close the luggage compartment, vehicle returns to the fortifying state, the luggage compartment switch cannot open luggage compartment.
 - 4) After using remote control to open the luggage compartment: After BCM receives remote control lock command, vehicle will immediately lock and return to fortifying state, but the turn signal light prompts fortifying failure.
 - 5) After using remote control to open the luggage compartment and close it again: After BCM receives remote control lock command, vehicle will immediately lock and return to fortifying state, but the turn signal light prompts fortifying successfully. If there is no registered key after the luggage compartment closed, the switch will not open the luggage compartment.

1.21 Luggage compartment opening management

- (1) When the vehicle is in fortifying deactivation mode:
 - 1) When the luggage compartment switch is activated, the luggage compartment opens/closes, and turn signal light flashes.
 - 2) During the process of opening/closing back door, press remote control briefly to stop the current action of back door.
- (2) When the vehicle is in fortifying mode:
 - 1) Luggage compartment is open/closed.
 - IGN OFF/ACC position;
 - BCM receives remote control luggage compartment command, turn signal light flashes.
 - 2) During the process of opening / closing back door, press remote control briefly to stop the current action of back door.
 - 3) After back door is closed, the vehicle returns to fortifying state.

1.22 Door, hood and luggage compartment door status

- (1) BCM sends CAN signal to open/close front left door.
- (2) BCM sends CAN signal to open/close front right door.
- (3) BCM sends CAN signal to open/close rear left door.
- (4) BCM sends CAN signal to open/close rear right door.
- (5) BCM sends CAN signal to open/close engine hood.

- (6) BCM sends CAN signal to open/close luggage compartment.

1.23 Central control lock

- (1) Central control lock activation conditions:
 - Close all four doors;
 - Vehicle is not in anti-theft state;
 - Central control lock locked switch is activated.
- (2) Central control unlock activation conditions:
 - Central control lock unlocked switch is activated;
 - Vehicle is not in anti-theft state.
- (3) Activation conditions for locking/unlocking mechanical lock:
 - Activation conditions for mechanical central control unlock: Power supply is in OFF, ACC or ON;
 - Activation conditions for mechanical central control lock: Power supply is in OFF or ACC;
- (4) Activation conditions for auto unlock (if equipped):
 - Vehicle speed is 0 km/h;
 - Door lock is locked;
 - Key is switched to OFF from other positions.

Caution

The bench testing needs to ensure that there is no speed signal after IGN is turned off.

- (5) Collision unlock:
 - After BCM receives CAN signal with IGN ON: BCM performs central control unlock twice and the interval time is 3 seconds (regardless of the door state); lock operation is prohibited; When key is turned to OFF and then back to ACC/ON, or any door status changes from open to closed, BCM receives unlock or lock signal twice within 240 ms, and the second time will be ignored.

Caution

- **BCM receives unlock or lock command twice within 3 seconds and the second time will be ignored.**
- **BCM is powered on again after powered off, BCM has no lock or unlock action.**
- **For remote control lock and unlock function, please refer to lock and unlock contents in anti-theft management.**

1.24 Front wiper control

- (1) Low speed wiper mode (Note: Wiper switch)
 - Activation conditions: IGN ON, low speed range switch of the wiper is activated;
 - When low speed wiper is operating: When wiper switch is switched to other operation mode, the wiper will work in other modes immediately;
 - When wiper switch is switched to OFF from low speed range, the wiper will operate at low speed automatically until it returns to wiper stop position (whether it is IGN ON or not).
- (2) High speed wiper mode
 - Activation conditions: IGN ON, high speed range switch of the wiper is activated;
 - When high speed wiper is operating: When wiper switch is switched to other operation mode, the wiper will work in other modes immediately;
 - When wiper switch is switched to OFF from high speed range, the wiper will operate at low speed automatically until it returns to wiper stop position (whether it is IGN ON or not).
- (3) Intermittent wiper mode (without rain sensor)
 - 1) Activation conditions: IGN ON, wiper intermittent/automatic switch is activated.
 - 2) Wiper sensitivity switch is used to select 4 gear positions: Intermittent time corresponding to each sensitivity switch of the wiper is related to the vehicle speed. The higher the vehicle speed, the

shorter the intermittent time. When vehicle speed is less than 5 km/h, the intermittent time is: 24s, 15s, 8s, 3s.

- 3) When the intermittent wiper activation status switches intermittent time to other gear positions, the operation status of wiper is as below:

When new time interval is shorter than the original one:

- If wiper is in pause status, wiper will operate at new interval at once;
- If wiper is in moving status, wiper will operate at new interval since it is paused.

When new time interval is longer than the original one:

- If wiper is in pause status, wiper will start to operate at a new interval at once;
- If wiper is in moving status, wiper will operate at new interval since it is paused.

- (4) Auto wiper (with rain sensor)

- With switch at AUTO position, BCM receives LIN signal sent from rain sensor, and drives wiper to operate;
- Once LIN signal S_AUTO_H is received, wiper operates at high speed;
- Once LIN signal S_AUTO_L is received, wiper operates at low speed;
- When LIN signal stops or ignition key is turned from ON, if wiper is not at stop position, wiper stops after operating to stop;
- Operation stops during ignition and restores when ignition is finished.

- (5) Wiper service mode

- Within 30 seconds when ignition state is switched from IGN-ON to IGN-OFF, if ignition switch is valid, BCM drives front wiper to operate in low-speed mode for 700 ms and stop at the middle of the windshield for easy maintenance;
- With wiper in wiper maintenance position, if ignition state is switched to IGN-ON, wiper is activated, or ignition state is switched from OFF to ON again, BCM will drive wiper back to the initial position.

1.25 Front washer control

- (1) Operating condition for front washer: IGN ON.
- (2) Front washer operation will keep on outputting when front washer input is activated, the maximum output time is 12 seconds each time.
- (3) The washer stops operating when starting, and resumes operating after starting.
- (4) When front washer operation is over.
 - When wiper switch is in OFF position, wiper will operate for 3 cycles at low speed, and it operates for 1 cycle again after 6 ± 0.2 seconds; If BCM receives new front washer operation requirements during 3 cycles and 6 seconds of this wiper, wiper will perform new operation;
 - When front washer operation ends, if wiper is in intermittent, low speed, and high speed mode, wiper will wipe at low speed for 3 cycles, and then continue to maintain the previous operating mode.

1.26 Rear wiper control

- (1) Activation conditions: IGN ON, rear wiper is activated.
- (2) During rear wiper is operating, if rear wiper switch is turned to OFF and rear wiper is not in Stop position, rear wiper will continue to operate until it stops at stopping position.
- (3) During rear wiper is operating, if ignition key is turned to ON and rear wiper is not in Stop position, rear wiper will continue to operate until it stops at stopping position.
- (4) During rear wiper operation, the rear wiper when engine starts, and resumes operating after engine has started.
- (5) When BCM judges front wiper is opened and reverse gear is input, rear wiper operates automatically at intermittent position. When either front wiper or reverse gear is closed, rear wiper stops operation.

1.27 Rear washer control

- (1) Operating condition for rear washer: IGN ON.
- (2) Rear washer operation will keep on outputting when rear washer input is activated, the maximum output time is 12 seconds each time.
- (3) The rear washer stops operating when engine starts, and resumes operating after engine has started.

- (4) When rear washer operation is finished:
 - When wiper switch is in OFF position, wiper will operate for 3 cycles at low speed; If BCM receives new rear reset operation requirements during 3 cycles, wiper will perform new operation;
 - When wiper is in sweeping mode, wiper will sweep in original condition and continue to keep original condition after washer switch is released.

1.28 Back-up light control

- (1) If all of the following conditions are met, back-up light should be activated:
 - Ignition state is kl15; or
 - Shift input is activated.
- (2) Shift input is activated.
 - Ignition state is OFF;
 - Reverse gear input is invalid.

1.29 Emergency alarm function

■ Emergency alarm function activated

- (1) BCM should output a alarm request (REQ_PanicAlarm = Activation) through an internal signal, if all the following conditions are met:
 - Emergency alarm function is not activated;
 - Emergency alarm function is set to ON (Setting_Panicenable = Enable);
 - Without DCM: Long press CDL switch lock button (HW_CDL_SW = lock) (press for more than CDL_LONG_PRESS_TIME), after receiving an alarm command, BCM should send an alarm immediately;
 - In addition, once emergency alarm function is activated, BCM will output an alarm message via CAN signal (WarnMsg_BCM) for the message reminder on the IPC.

■ Emergency alarm function OFF

- (1) When emergency alarm function is activated and the following conditions are met, BCM does not output an alarm request through internal signals:
 - Emergency alarm function is set to OFF to receive RKE lock signal from CAN;
 - Receive RKE unlock signal from CAN;
 - Using DCM: Once CDL command signal—value of Lock || is received;
 - Using DCM: Once the CDL command signal with -UnLock || is received;
 - Without DCM: Press CDL switch to lock the button;
 - Without DCM: Press CDL switch to unlock the button;
 - In addition, once alarm function is invalid, BCM will output alarm message via CAN signal for the message reminder OFF on the IPC.

1.30 Brake light control

- (1) When any of following conditions is met, turn on the brake light function:
 - When brake switch is pressed, brake switch is a high level self-locking switch;
 - CAN signal sent from EPB is received;
 - CAN signal sent from ESC is received.
- (2) When brake light function is turned on, left and right brake lights and high mounted stop light turn on at the same time.
- (3) When all the above conditions are not met, left and right brake lights and high mounted stop light will turn off simultaneously.

1.31 Rear view mirror folding and heating

■ Rear view mirror folding

- (1) The switch is point contact type. Press the folding switch, the mirror is automatically folded, and press it again, the mirror is automatically unfolded.
- (2) After power supply is cut off, BCM determines that rear view mirror is in folded state by default, and folding switch operation needs to be operated once to synchronize BCM memory state with the actual state.

- (3) When the vehicle speed is greater than 15 km/h, the folding function is shielded and the unfolding function works.
- (4) When engine starts, the unfolding/folding function is paused and the function resumes after engine has started.

■ Rear view mirror heating

(1) Rear view mirror heating

- Heating state of rear view mirror is the same as that of rear window;
- If rear window heater is activated, BCM should activate rear view mirror heating function at the same time;
- If rear window heating function is in OFF status, BCM should turn off rear view mirror heating function at the same;

(2) Automatic rear view mirror heating

Automatic heating function of OSM complies with the rain condition provided by RLS when front wiper switch is in the "automatic wiper" position. When rear view mirror is automatically heated, it will not be affected by rear window defroster switch command and OSM heating command.

If the following conditions are met, BCM should automatically activate rear view mirror heating function:

- Automatic rear view mirror heating function is set to ON;
- Ignition status is in ON;
- Engine status (KL15+) (EngineState = running);
- Front wiper switch is in "automatic wiper" position;
- While receiving front wiper operation signal, BCM outputs the following CAN signals: Automatic rear view mirror heating; rear view mirror automatically heats up through an alarm message.

Hint

The automatic rear view mirror heating is affected by engine start and stop function.

1.32 DVD settings

(1) Fortifying prompt

- DVD is set to Light, turn signal light flashes once and horn does not sound when it is fortified;
- DVD is set to Horn, horn sounds and turn signal light does not flash when it is fortified;
- DVD is set to Light and Horn, turn signal light flashes and horn sounds when it is fortified.

(2) Auto lock

- DVD is set to ON to turn on the auto lock function; DVD setting is OFF to turn off the auto lock function.

(3) Headlight delay

- DVD is set to On to turn on the headlight delay function; DVD is set to off to turn off the headlight delay function.

(4) Rear view mirror folding

- DVD is set to On to turn on the rear view mirror auto folding function; DVD is set to off to turn off the rear view mirror auto folding function.

1.33 Remote control function

(1) Remote fortifying mode

1) Trigger conditions:

- IGN is in OFF (it is not in IGN ON or ACC)
- Four doors & two covers are closed;
- BCM receives remote fortifying command.

2) BCM feedback when fortifying mode is entered:

- Turn signal light flashes once and sends corresponding signal;

(2) Remote fortifying deactivation mode

- 1) Trigger conditions:
 - IGN is in OFF (it is not in IGN ON or ACC)
 - Four doors & two covers are closed;
 - BCM receives remote fortifying command.
- 2) BCM feedback when remote fortifying deactivation mode is entered:
 - BCM performs fortifying deactivation operation, four doors and luggage compartment unlock and left/right turn signal lights flash twice.
- (3) Remote open luggage compartment mode
 - 1) Trigger conditions:
 - Key position is in OFF;
 - BCM receives remote open luggage compartment command.
 - 2) BCM feedback when luggage compartment opening mode is triggered:
 - Turn signal light illuminates and sends the corresponding signals;
 - Meanwhile, trunk is opened and no alarm is triggered.
- (4) Remote car location mode
 - 1) Trigger conditions:
 - IGN-OFF/IGN-ACC;
 - BCM receives car location function command.
 - 2) BCM feedback when remote fortifying deactivation mode is entered:
 - High and low pitched horns sound, left and right turn signal lights flash and low beam lights turn on.
- (5) Remote start mode
 - 1) Trigger conditions: BCM receives PEPS signal.
 - 2) BCM feedback when remote start mode is entered.
 - Anti-theft alarm function caused by ON gear position is shielded, but caused by four doors, engine hood and luggage compartment is not shielded;
 - After BCM receives engine state signal, it will turn on position light and send signals.
 - 3) Exit remote start mode: Turn the key to OFF position.
 - 4) BCM feedback when remote start mode is exited:
 - BCM will not shield the anti-theft alarm caused by ON gear position;
 - BCM sends signals.

1.34 LIN ambient light

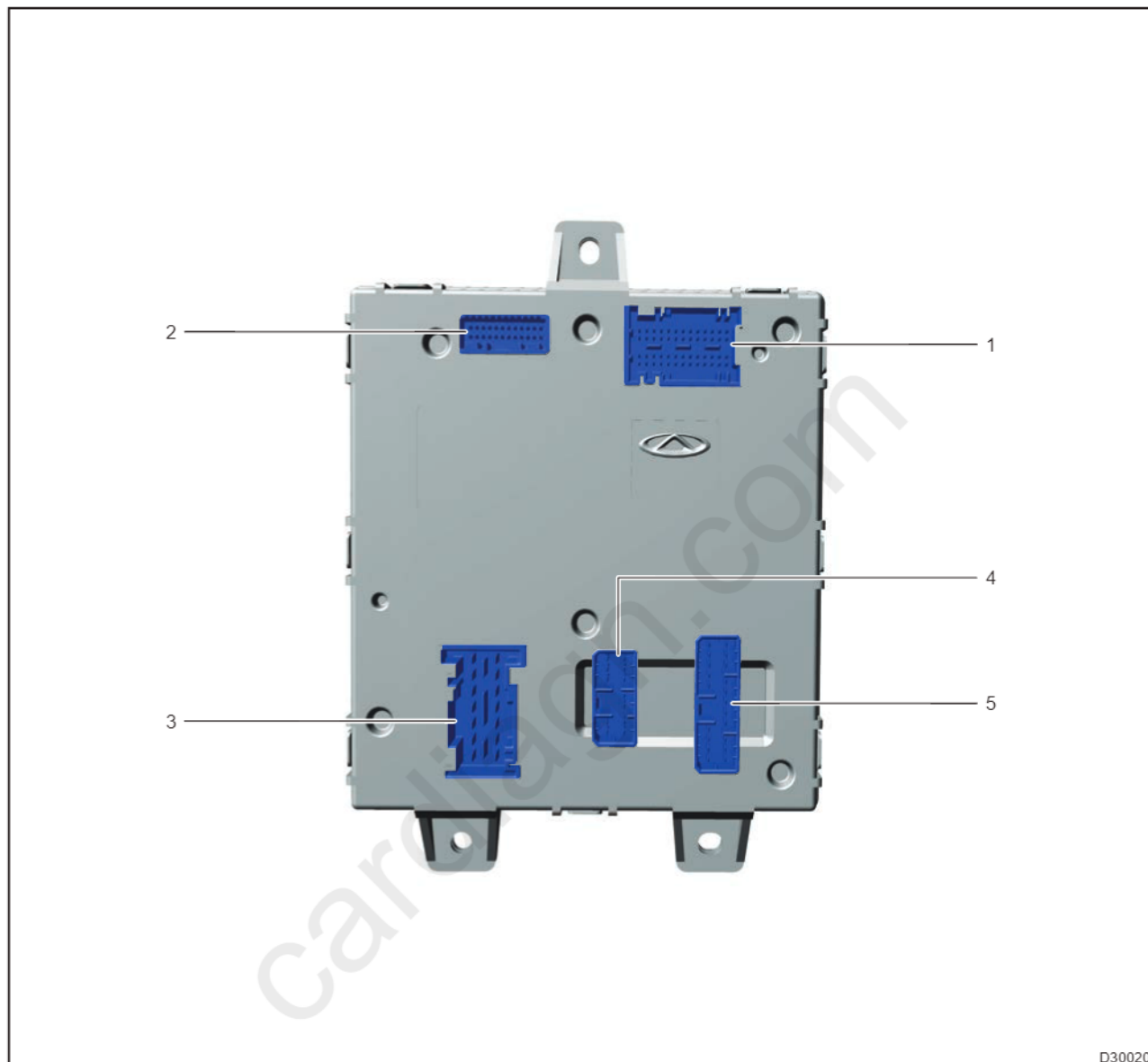
- (1) Initial status
 - When vehicle rolls from the line and powered on for the first time or vehicle battery is powered on again after disconnection, ambient light function default is on, and it turns on/off according to DVD setting.
- (2) Ambient light turns on/off
 - 1) When all the following conditions are met, BCM sends LIN signals (ambient light ON):
 - Position light output is in activated state;
 - DVD setting is ON.
 - 2) Position light output is deactivated or DVD setting is OFF, ambient light turns off.
- (3) Door control logic related to ambient light
 - 1) When all the following conditions are met, BCM sends LIN signals (ambient light ON):
 - Position light output is deactivated;
 - Vehicle is in fortifying deactivation mode;
 - Any door is open;
 - DVD setting is ON.

- 2) Ambient light turns on for 3 minutes.
 - 3) Close all vehicle doors within 3 minutes after ambient light is turned on, and ambient light is turned off after 8 seconds.
 - 4) Open any other door within 3 minutes after ambient light comes on, and then count again for 3 minutes after last door is opened.
 - 5) When the position light output is not activated, if any condition is met, BCM will immediately send LIN signal (ambient light turns off):
 - Vehicle enters fortifying mode successfully;
 - DVD setting is off.
- (4) Ambient light color
- 1) After the vehicle is powered on first time after leaving production line or powered on after battery is disconnected and reconnected from vehicle, the related driving mode is OFF by default. And it turns on/off according to DVD setting.
 - 2) When related driving mode is off: Ambient light default color is blue, and different colors can be selected according to DVD setting.
 - 3) When related driving mode is on:
 - Ambient light is green under ECO mode;
 - Ambient light is red under sport mode;
 - Ambient light is blue under Normal mode.
- (5) Ambient light brightness (musical rhythm)
- 1) Initial status
 - When vehicle rolls from the line and powered on for the first time or vehicle battery is powered on again after disconnection, musical rhythm mode default is off.
 - 2) When musical rhythm mode is off: Ambient light brightness is Level 3, and different levels can be selected according to DVD setting.
 - 3) When musical rhythm mode is on: According to different brightness level signals sent from IHU, it changes levels from zero with the musical rhythm.

2 DIAGNOSIS & TESTING

2.1 Terminal Definition

■ Body Control Module Terminal Definition



D30020

1-52	Pin Connector	2-24	Pin Connector
3-14	Pin Connector	4-12	Pin Connector
5-20	Pin Connector		

■ Pin No.52 Connector Terminal Definition

PIN	Description	PIN	Description
1-01	-	1-27	Dome Light Output
1-02	-	1-28	-
1-03	-	1-29	Rear Defroster Output
1-04	Window Lock Indicator Light	1-30	High Speed Wiper Output

PIN	Description	PIN	Description
1-05	Front Left Steering Diagnosis	1-31	Position Light and Signal Light Output
1-06	Front Right Turn Diagnosis	1-32	-
1-07	Hard Wire Crash	1-33	Driver Side Front Right Window Regulator Switch 8
1-08	Rear Right Position Feedback	1-34	Driver Side Front Left Window Regulator Switch
1-09	-	1-35	Back Door Unlock Signal Input
1-10	Rear Left Door Open Signal	1-36	Passenger Side Window Regulator Disabled Switch
1-11	-	1-37	Front Right Door Open Signal
1-12	Rear Right Door Open Signal	1-38	-
1-13	Front Left Door Unlock Status Signal	1-39	Brake Switch Signal
1-14	-	1-40	-
1-15	-	1-41	Rear View Mirror Defroster Output
1-16	LIN Signal (TDL + RSM)	1-42	Low Speed Wiper Output
1-17	Front Fog Light Output	1-43	Low Beam Light Output
1-18	High Beam Light Output	1-44	Horn Output
1-19	Driver Side Rear Right Window Regulator Switch	1-45	AGND
1-20	Passenger Side Front Right Window Regulator Switch	1-46	-
1-21	Passenger Side Rear Left Window Regulator Switch	1-47	Driver Side Rear Left Window Regulator Switch
1-22	Passenger Side Rear Right Window Regulator Switch	1-48	Back Door Open Signal
1-23	Front Left Door Open Signal	1-49	Central Control Lock Switch Input
1-24	Front Wiper Stop Signal	1-50	Central Control Unlock Switch Input
1-25	Rear Left Position feedback	1-51	-
1-26	Rear Wiper Stop Position Signal	1-52	Engine Hood Contact Switch

■ Pin No.24 Connector Terminal Definition

PIN	Description	PIN	Description
2-01	ESS Indicator Output	2-13	Sign Light Start
2-02	HS-CAN_L	2-14	Hazard Warning Light Operation Indicator Input
2-03	-	2-15	HS-CAN_H
2-04	-	2-16	-
2-05	-	2-17	IGN-ON Signal Input
2-06	-	2-18	-
2-07	ESS Switch Input	2-19	-
2-08	-	2-20	-
2-09	LDW Switch Input	2-21	-
2-10	Rear View Mirror Folding Input	2-22	-
2-11	Hazard Warning Light Input	2-23	-
2-12	-	2-24	Light Adjustment Input

■ Pin No.14 Connector Terminal Definition

PIN	Description	PIN	Description
3-01	Power Supply 3 (Driver Unlock, Rear Wiper and Front/Rear Washer)	3-08	Rear Left Window Up Output
3-02	Power Supply 6 (Door Lock)	3-09	Rear Left Window Down Output
3-03	Ground 1	3-10	Power Supply 1 (Front Right Window and Rear Left Window)
3-04	Ground 2	3-11	Front Right Window Up Output
3-05	Rear Right Window Down Output	3-12	Front Right Window Down Output
3-06	Rear Right Window Up Output	3-13	Front Left Window Up Output
3-07	Power Supply 2 (Front Left Window and Rear Right Window)	3-14	Front Left Window Down Output

■ Pin No.12 Connector Terminal Definition

PIN	Description	PIN	Description
4-01	-	4-07	Backlight Adjustment Output
4-02	Central Control Unlock Output	4-08	Back-up Light Output

PIN	Description	PIN	Description
4-03	Central Control Lock Output	4-9	Power Supply 5 (AZ Lighting and Rear View Mirror)
4-04	Driver Unlock Output	4-10	Rear Wiper Output
4-05	Front Washer Output	4-11	-
4-06	-	4-12	Rear Washer Output

■ Pin No.20 Connector Terminal Definition

PIN	Description	PIN	Description
5-01	-	5-11	High Mounted Stop Light Output
5-02	Rear View Mirror Unfolding Output	5-12	Red Ambient Light Output
5-03	Rear View Mirror Folding Output	5-13	Blue Ambient Light Output
5-04	Left Turn Signal Light Output	5-14	Left Daytime Running Light Output
5-05	Right Turn Signal Light Output	5-15	Right Daytime Running Light Output
5-06	Central Door Lock Indicator	5-16	Battery Save Output
5-07	Front Position Light	5-17	Rear Fog Light Output
5-08	Stop Light Output	5-18	Left Steering Auxiliary Lighting
5-09	Foot Light Output	5-19	Sign Light
5-10	Luggage Compartment Light Output	5-20	Power Supply 4 (Lighting Power Supply)

2.2 Problem Symptoms Table

Symptom	Probable Cause and Recommended Countermeasures
Remote controller failure or distance of remote control is close	(For PEPS model, remote controller failure has nothing to do with BCM. BCM cannot be replaced) - Battery voltage of remote controller is low - Replace the battery. (Voltage of new replaced battery should be more than 2.9 V), it needs to rematch - Metallic films are attached to windows, which causes signal to be shielded and vehicle is malfunctioning without any reason. Peel off the metallic films to solve the problem. - There is electromagnetic interference. Perform the test at another place. - If remote controller is damaged, replace and rematch it.
Rear defroster does not operate	Refer to operation principle (control logic). Check the input and output signal. For diagnosis, please refer to "Perform Diagnosis According to Symptoms"
Turn signal light does not come on	
Small light does not come on	
High beam light does not come on	
Fog light does not come on	
Daytime running light does not come on	
Glass cannot raise up and down	
Door lock cannot lock/unlock/luggage compartment cannot open	
Wiper washer dose not operate or operate abnormally	
Only horn alarms or only turn signal light flashes when it fortifies	It can be set on DVD/navigation interface, refer to On-vehicle Service section

2.3 Diagnostic Help

- Connect diagnostic tester X-431 3G (the latest software) to Data Link Connector (DLC), and make it communicate with vehicle electronic module through data network.
- Confirm that malfunction is current, and carry out diagnostic test and repair procedures.
- If Diagnostic Trouble Code (DTC) cannot be cleared, it indicates that there is a current malfunction.
- Only use a digital multimeter to measure voltage of electronic system.
- Refer to any Technical Bulletin that may apply to this malfunction.
- Visually check related wire harness and connector.
- Check and clean all CD system grounds related to the latest DTCs.
- If numerous trouble codes are set, refer to circuit diagram and look for any common ground circuit or power supply circuit applied to DTC.

2.4 Intermittent DTC Troubleshooting

If malfunction is intermittent, perform the followings:

- Check if connector is loose.
- Check if wire harness is worn, pierced, pinched or partially broken.
- Monitor diagnostic tester (the latest software) data that is related to this circuit.
- Wiggle related wire harnesses and connectors and observe if signal is interrupt in related circuit.

- If possible, try to duplicate the conditions under which DTC was set.
- Look for data that has changed or DTC to reset during wiggle test.
- Look for broken, bent, protruded or corroded terminals.
- Inspect airbag components and mounting areas for damage, foreign matter, etc. that will cause incorrect signals.
- Check and clean all wire harness connectors and ground parts related to DTC.
- If multiple trouble codes were set, refer to circuit diagrams to look for any common ground circuit or power supply circuit applied to DTC.
- Refer to any Technical Bulletin that may apply to this malfunction.

2.5 Ground Inspection

Ground points are very important to the proper operation of circuits. Ground points are often exposed to moisture, dirt and other corrosive environments. Corrosion (rust) may increase load resistance. This situation may change the way in which a circuit operates. Circuits are very sensitive to proper grounding. A loose or corroded ground can seriously affect the control circuit. Check the ground points as follows:

- (1) Remove ground bolt or nut.
- (2) Check all contact surfaces for tarnish, dirt and rust, etc.
- (3) Clean as necessary to ensure that contact is in good condition.
- (4) Reinstall ground bolt or nut securely.
- (5) Check if any additional accessories interfere with ground circuit.
- (6) If several wire harnesses are crimped into one ground terminal, check for proper crimp condition. Make sure that all wire harnesses are clean and securely fastened while providing a proper ground path.

2.6 Malfunction Diagnosis Repair Flow

Caution
When reading DTCs, some DTCs are not related to trouble symptom. And these functions are normal and not affect vehicle use, clear them.

- (1) Check if DTC occurs again
 - If malfunction does not occur, check and repair the suspected wire harness and electrical connector. Proceed to the next step if malfunction occurs again.
- (2) Check for DTCs
 - Perform reading to check whether there is any DTC. Proceed to the diagnostic procedures based on malfunction symptoms when there is no DTC. Proceed to the next step when DTC is found:
- (3) Clear and read DTCs again
 - Record DTCs and clear them. Perform test and read DTC again to check whether there is any DTC. Proceed to the diagnostic procedures based on malfunction symptoms when there is no DTC. Proceed to the next step when DTC related to malfunction symptom is found.
- (4) Deal with the malfunction symptom according to DTC
- (5) After inspection and repair, perform test again according to DTC strategy
 - Check and repair it again if malfunction has not been solved.
- (6) After malfunction has been solved, prevent the malfunction from reoccurring according to malfunction causes.
- (7) Malfunction diagnosis ends.

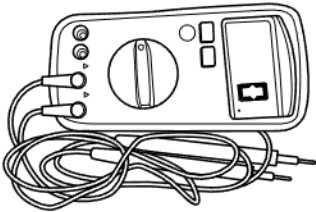
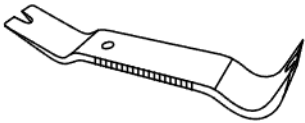
2.7 Trouble Symptom Diagnosis

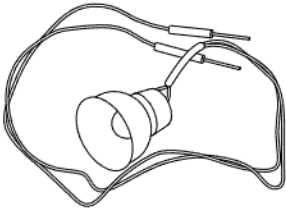
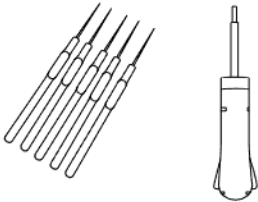
Caution
• If a function of BCM is failed, but there is no DTC, perform diagnosis according to trouble symptom. • This diagnosis needs to combine with control logic (see Operation section). Check input/output signal of BCM for normal operation. If input/output is normal, there is a malfunction in BCM. Otherwise, check the input or output part.

- (1) Check if DTC occurs again
 - If malfunction does not occur, check and repair the suspected wire harness and electrical connector. Proceed to the next step if malfunction occurs again.
- (2) Check if power supply and ground of controller are normal
 - If it is abnormal, repair the power supply and ground based on the electronic diagram. Proceed to the next step if it is normal.
- (3) According to the control logic, read related data stream with diagnostic tester and check if it is normal
 - If it is abnormal, repair the related input signals based on the circuit diagram. Proceed to the next step if it is normal.
- (4) Perform operation test using diagnostic tester to see if there is any related operations performed by diagnostic tester.
 - If it is normal, input part has no malfunction. Otherwise, proceed to the next step.
- (5) Check if actuator is normal.
 - If result is abnormal, check and repair actuator.
- (6) If above diagnostic results are normal, replace BCM

3 ON-VEHICLE SERVICE

3.1 Tools

Tool Name	Tool Drawing
X-431 PAD Diagnostic Tester	 RCH0001006
Digital Multimeter	 RCH000206
Interior Crow Plate	 RCH002506

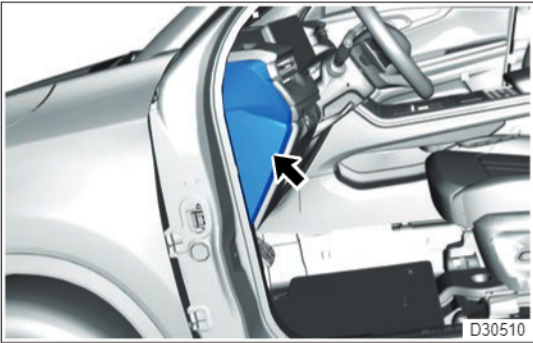
Tool Name	Tool Drawing
Bulb Test Light (21 W)	 RCH008706
Jumper Wire	 RCH008806
Wire Harness Terminal Tools	 RCH008906

3.2 Body Control Module

■ Removal

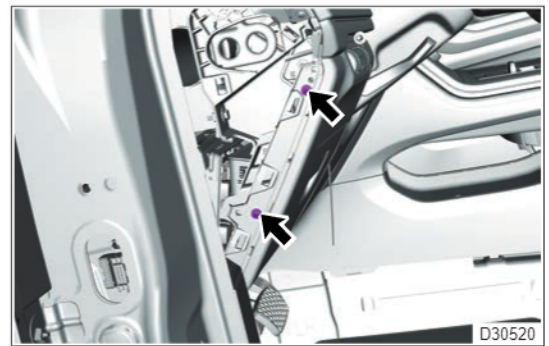
Hint:

- Before replacing BCM, read configurations of the original software. After replacing it, write the original configuration codes.
- Turn off all electrical equipment and ENGINE START STOP switch.
 - Disconnect the negative battery cable.
 - Remove the body control module.
 - Remove the instrument panel left end panel assembly.



- 2) Remove 2 fixing screws from instrument panel lower left protector assembly.

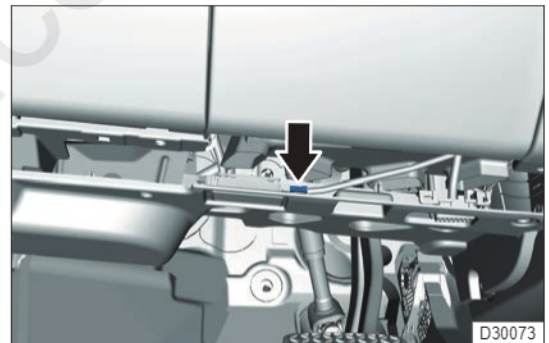
Tightening torque
 $1.5 \pm 0.5 \text{ N}\cdot\text{m}$



- 3) Remove the 5 plastic rivets from soundproof board on driver side.



- 4) Disconnect glove box light connector and remove soundproof board on driver side.



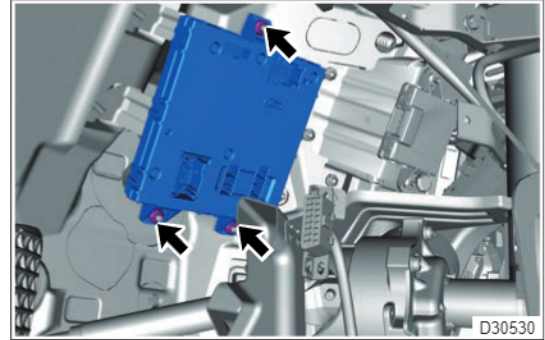
- 5) Remove the instrument panel left lower protector assembly.



- 6) Disconnect the headlight switch wire harness connector.



- 7) Remove the instrument panel fuse and relay box assembly.
- 8) Disconnect the body control module connector.
- 9) Remove 3 fixing nuts from body control module bracket.



■ Installation

- (1) Installation is in the reverse order of removal.

■ Matching Learning

■ Software Configuration Information Writing

Caution

- Write the configuration code after replacing BCM with a new one.
- If it is a non-PEPS model and has engine immobilizer configuration, it needs to be configured for anti-theft matching and then for remote control matching, if it is a PEPS model, there is no need to do the operation in this step.
- Perform tire pressure sensor learning if the vehicle has a tire pressure configuration.
- Perform jam protection learning if the vehicle has a window jam protection configuration.

- (1) Use the diagnostic tester to connect the vehicle to enter the system. Click Body Control Module (BCM).
- (2) Before removing the old BCM, click "Version Information" to read VIN code of the old BCM module; click "Read Data Stream" to read the vehicle configuration code of old BCM.
- (3) After new BCM is installed, click "Special Operation", click "Write Body Controller Module (BCM) Configuration Data" to write the configuration code of the new BCM module by manually writing, saving and pasting; click "Write VIN Code", enter the recorded 17-digit VIN code and then click "OK" , confirm it again and go back.

