■ AIM OF DEVELOPMENT [(E)]

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Vehicle Outline

External view

5WGN

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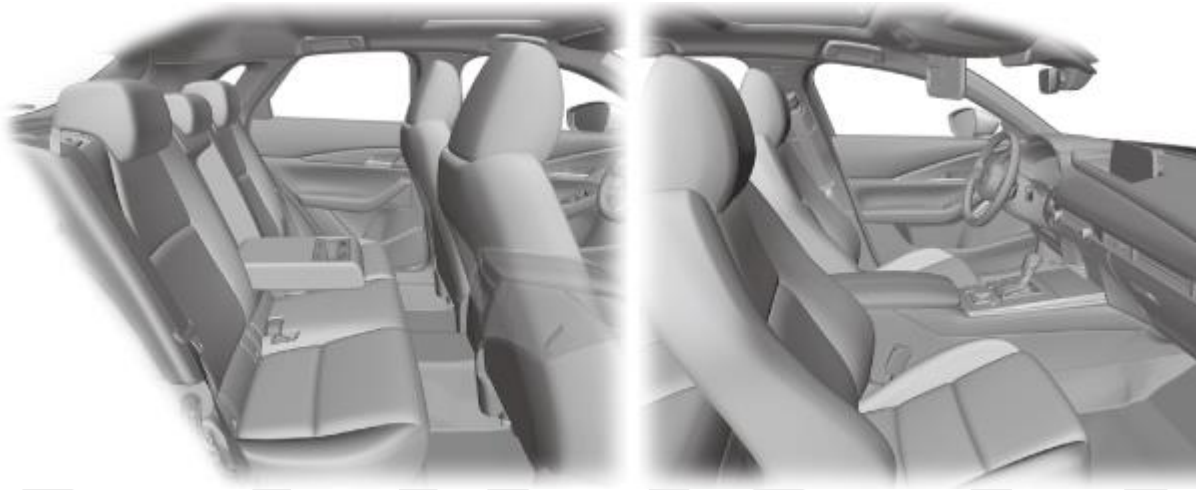
Interior design



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Engine

- SKYACTIV-G 2.0, SKYACTIV-D 1.8 and SKYACTIV-X 2.0 have been adopted.

Engine mechanical [SKYACTIV-G (with cylinder deactivation)]

- For SKYACTIV-G 2.0, the following improvements have been made to lower fuel consumption.

— Improvement of pumping loss

- Cylinder deactivation control adopted

— Cooling loss improvement

- Coolant control valve adopted
- Optimized engine coolant passage

Engine mechanical [SKYACTIV-D 1.8]

- For SKYACTIV-D 1.8, the following have been adopted to lower fuel consumption.

— Low compression ratio

- Combustion efficiency by lower compression ratio (14.8)

— Weight reductions

- Aluminum alloy cylinder block adopted
- Hard-plastic intake manifold adopted
- Exhaust manifold integrated cylinder head adopted

— Improvement of mechanical resistance loss

• Optimized oil passage

• Optimized oil pump shape

• Optimized engine coolant passage

• Optimized water pump impeller shape

— Weight reduction and mechanical resistance loss improvements

• Piston shape optimized

• Narrowed down crankshaft journal

— Heat loss reduction

• Water jacket spacer adopted

— Cooling loss improvement

• Coolant control valve adopted

• Glow control has been adopted to improve engine startability and diesel particulate filter regeneration performance.

— Glow control module adopted

• Engine hydraulic pressure switching control has been adopted reducing engine load.

— Engine oil solenoid valve adopted

• An exhaust gas recirculation (EGR) system has been adopted which achieves cleaner exhaust emissions and improved fuel efficiency.

• Boost control has been adopted for improved vehicle acceleration performance, fuel economy, and environmental performance.

— Variable geometry turbocharger adopted

— Speed sensor component (variable geometry turbocharger) adopted

• Generator output control adopted, fuel economy/idling stability improved.

— Current sensor adopted

• LIN communication has been adopted to the current sensor and DC-DC converter for simplified wiring harnesses.

• i-stop control has been adopted for improved fuel efficiency, reduced exhaust gas emissions, and reduced idling noise.

• DC-DC converter control has been adopted for improved power supply stability.

— DC-DC converter adopted

Engine control [SKYACTIV-G (with cylinder deactivation)]

• The engine coolant control valve adjusts the engine coolant control valve opening angle and supplies engine coolant to the appropriate engine coolant passage according to the changes in the engine coolant temperature.

• Further engine warming has been promoted by blocking each water passage while the engine is cool.

— Coolant control valve adopted

• Pumping loss due to intake/exhaust stroke is reduced to improve fuel economy during low engine loads.

— Cylinder deactivation control adopted

Engine control [SKYACTIV-D 1.8]

• Glow control has been adopted to improve engine startability and diesel particulate filter regeneration performance.

— Glow control module adopted

• Engine hydraulic pressure switching control has been adopted reducing engine load.

— Engine oil solenoid valve adopted

• Coolant control valve control has been adopted for improved fuel economy.

— Coolant control valve adopted

• Exhaust gas recirculation (EGR) system has been adopted which achieves cleaner exhaust emissions and improved fuel efficiency.

• Boost control has been adopted for improved vehicle acceleration performance, fuel economy, and environmental performance.

— Variable geometry turbocharger adopted

• Generator output control adopted, fuel economy/idling stability improved.

— Current sensor adopted

• LIN communication has been adopted to the current sensor for simplified wiring harnesses.

• i-stop control has been adopted for improved fuel economy and reduce exhaust gas and idling noise.

• DC-DC converter control has been adopted for improved power supply stability.

— DC-DC converter adopted

• Purifies contaminants occluded in the NSC by utilizing chemical reactions.

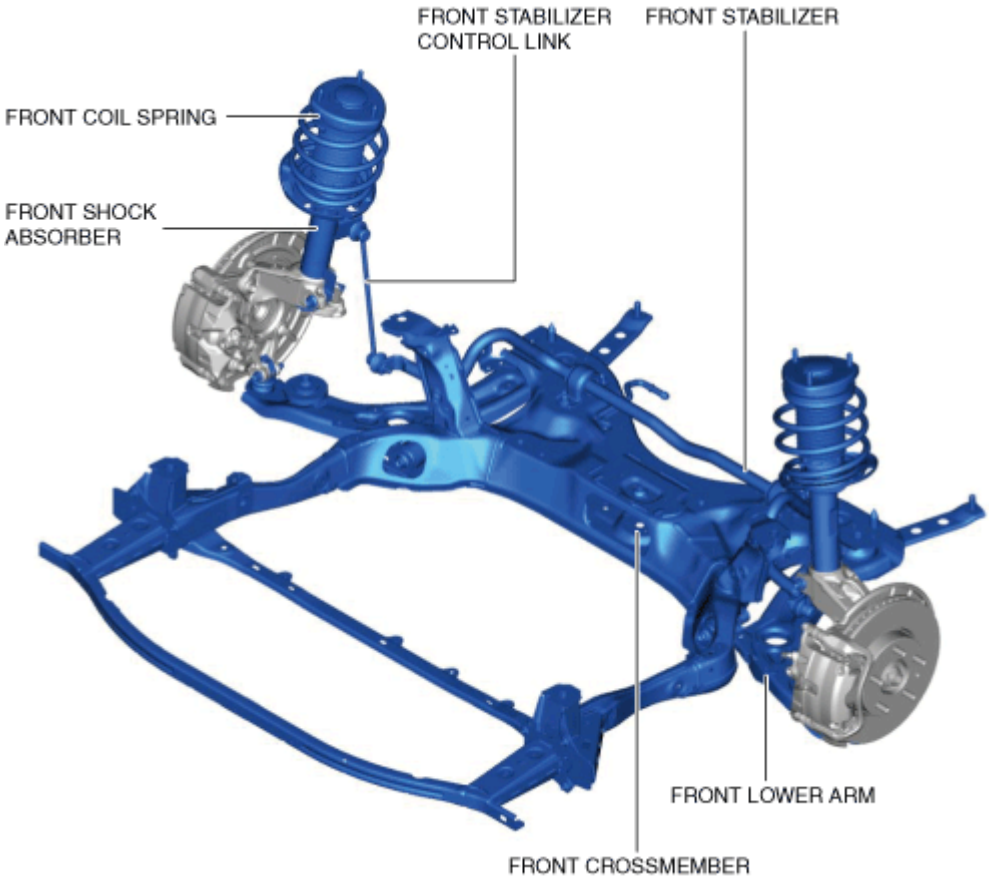
— NSC control adopted

Suspension

Front suspension

• Strut-type suspension adopted

• The connection area of the front crossmember and body is a 6-point rigid mount type.



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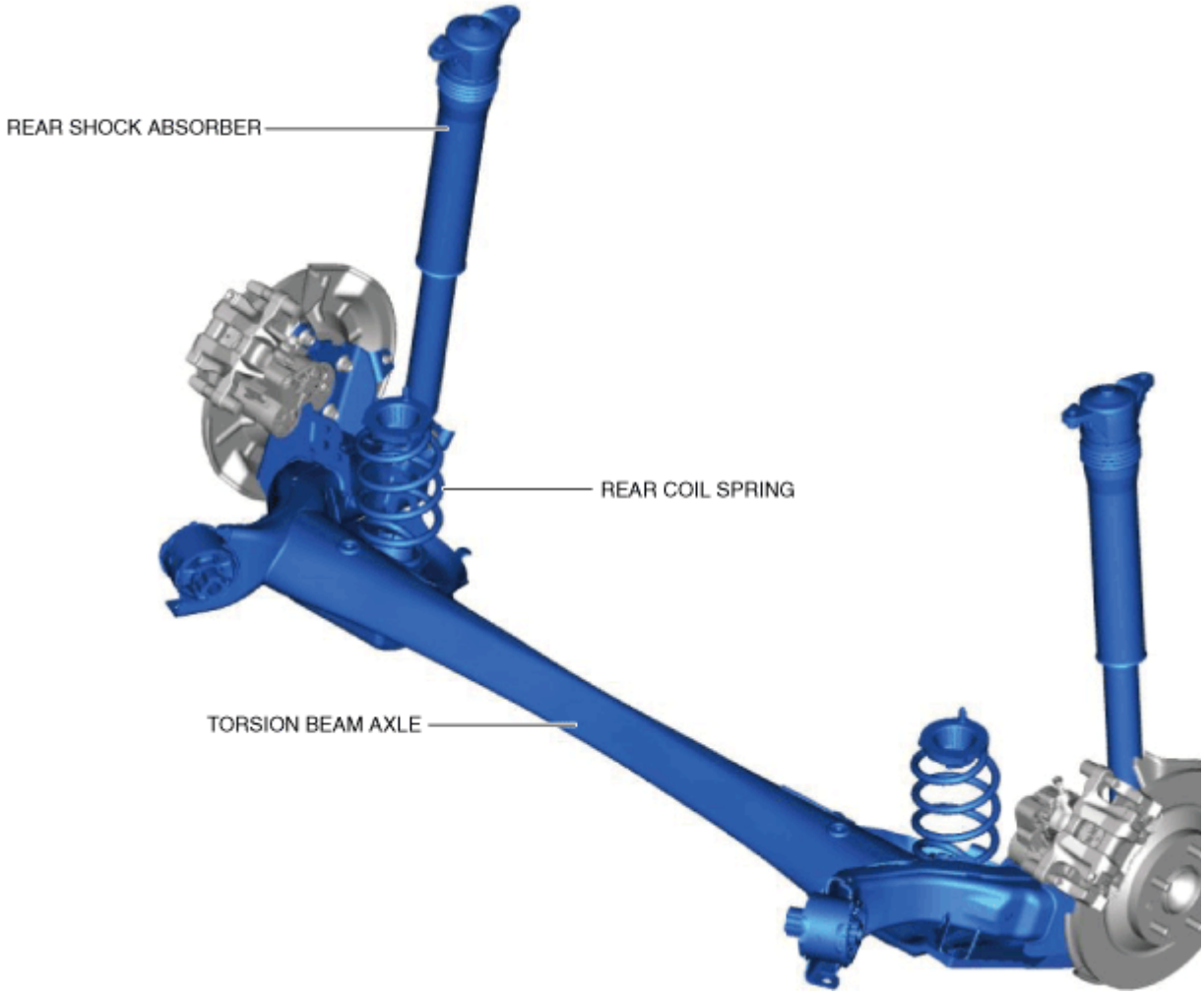
Rear suspension

• Torsion beam axle-type rear suspension has been adopted.

• Large-size rubber bushing has been adopted for the rear trailing arm bushing to enhance the handling performance and the ride comfort.

2WD



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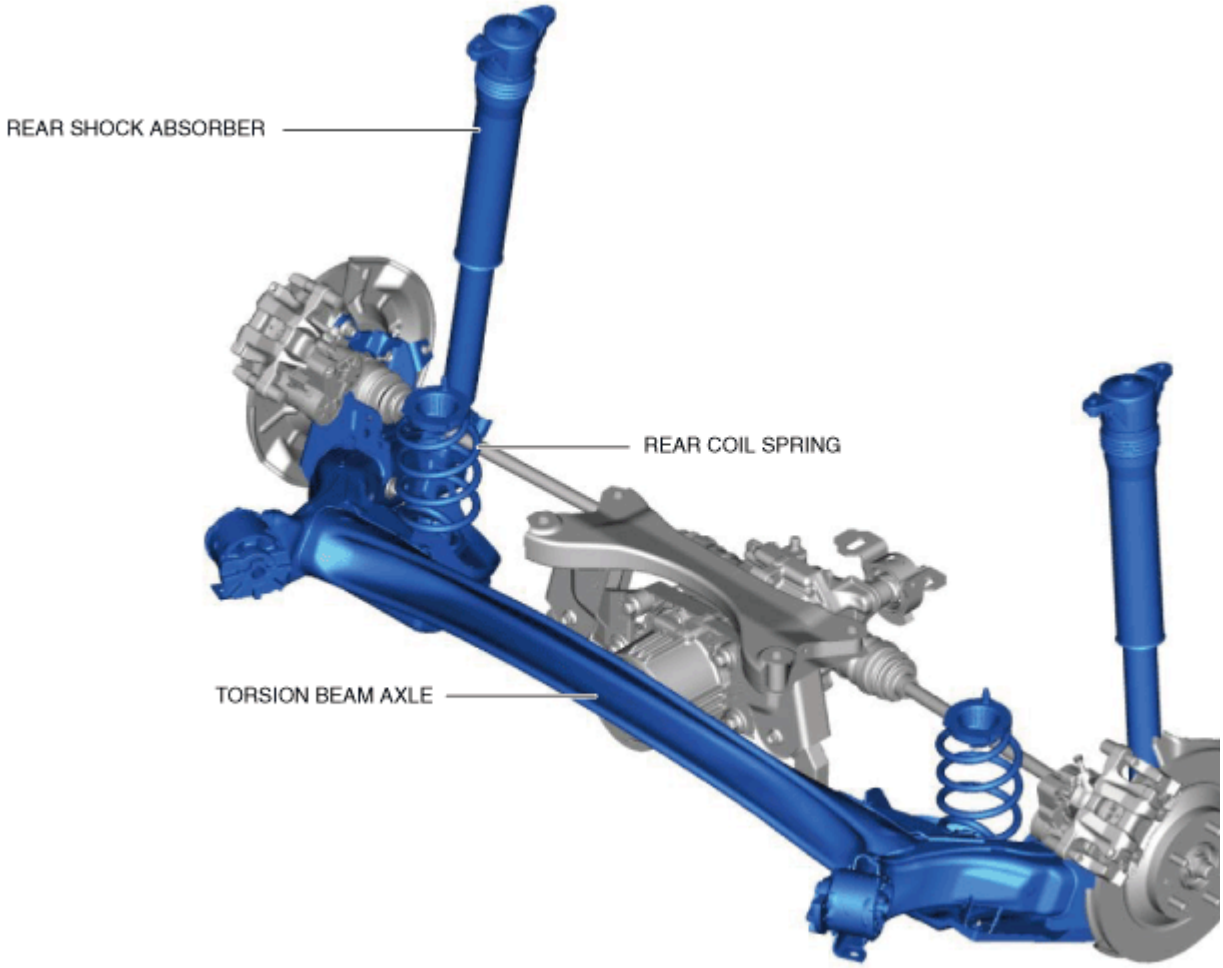
AWD

2h82a



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Driveline/axle

- Unit-design, double angular ball bearings with low rotational resistance have been adopted for the front and rear axles.
- Unit bearings that require no preload adjustment have been adopted for the front and rear wheels.
- The following parts have been adopted to reduce vibration and noise:

— Bell-shaped constant velocity joint has been adopted for the wheel-side joint of the front drive shaft.

— A tripod-shaped constant velocity joint has been adopted for the differential-side joint of the front drive shaft.

Brakes

Conventional brake system

• A brake pedal with an intrusion minimizing mechanism has been adopted. As a result, driver safety has been improved.

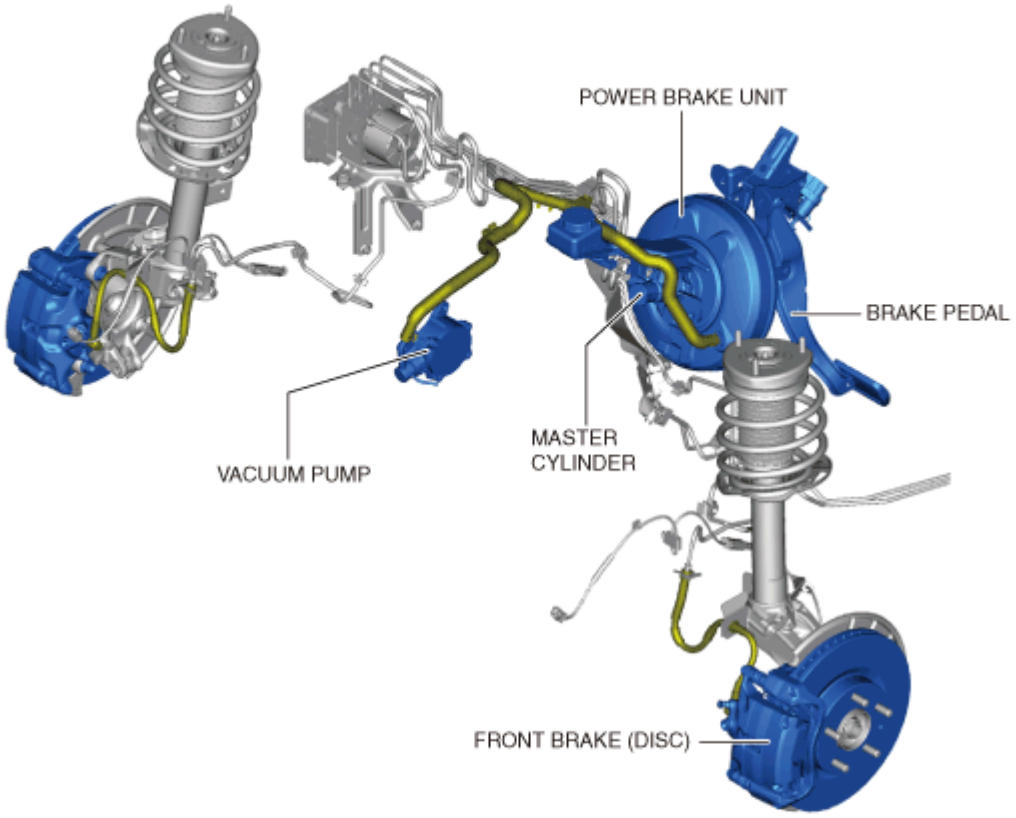
• A vacuum pump has been adopted, improving braking force.

• A large diameter, ventilated disc-type front brake has been adopted, improving braking force.

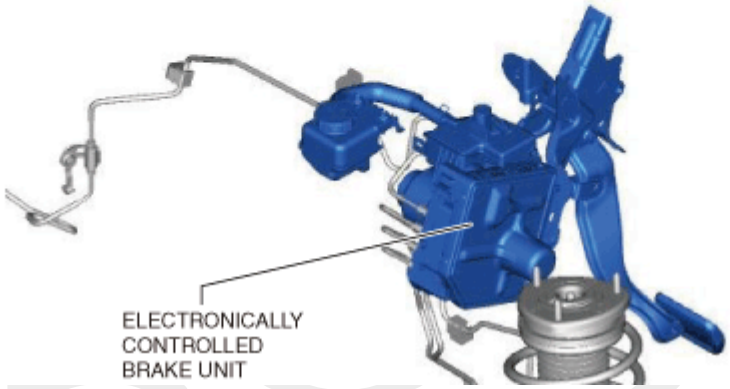
• A large diameter, solid disc-type rear brake has been adopted, improving braking force.

Vehicle front side (L.H.D.)

WITHOUT M Hybrid SYSTEM



WITH M Hybrid SYSTEM



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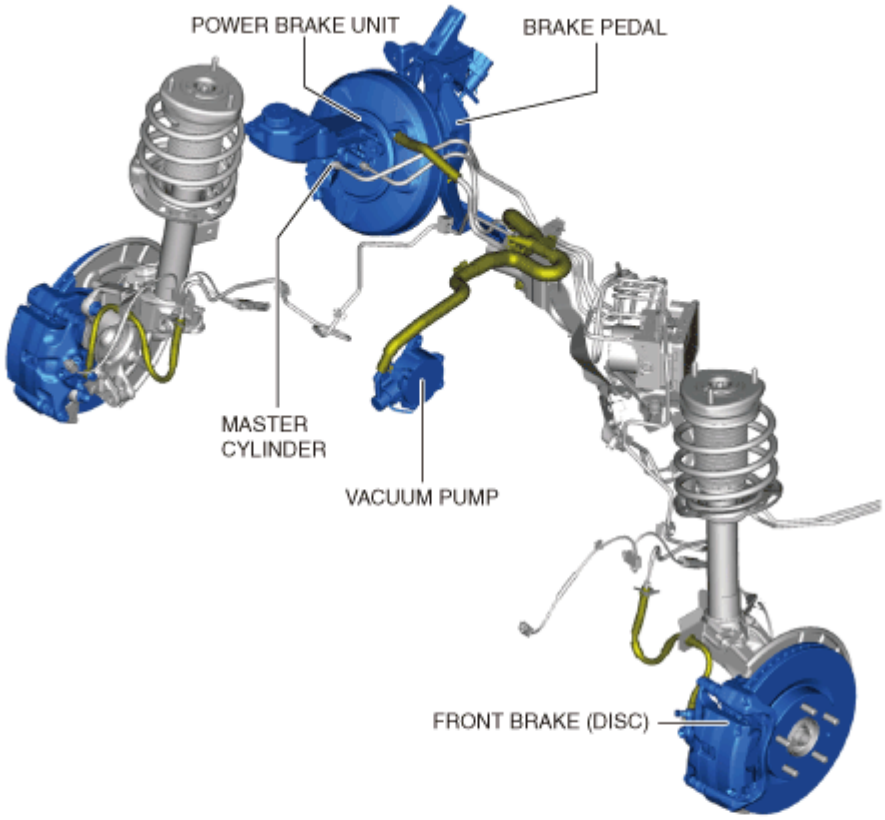
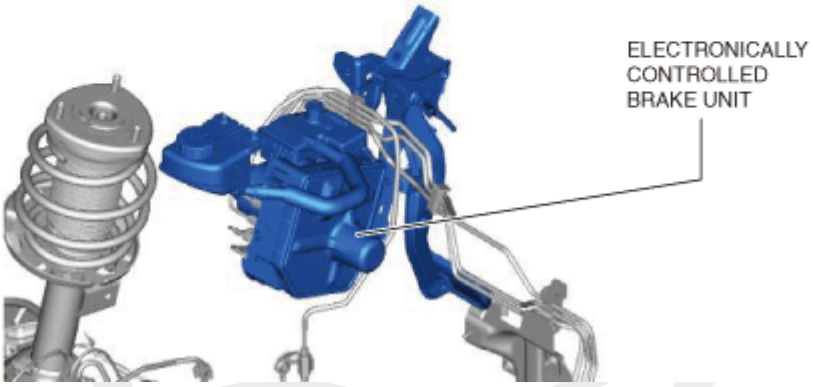
Vehicle front side (R.H.D.)

WITHOUT M Hybrid SYSTEM



WITH M Hybrid SYSTEM



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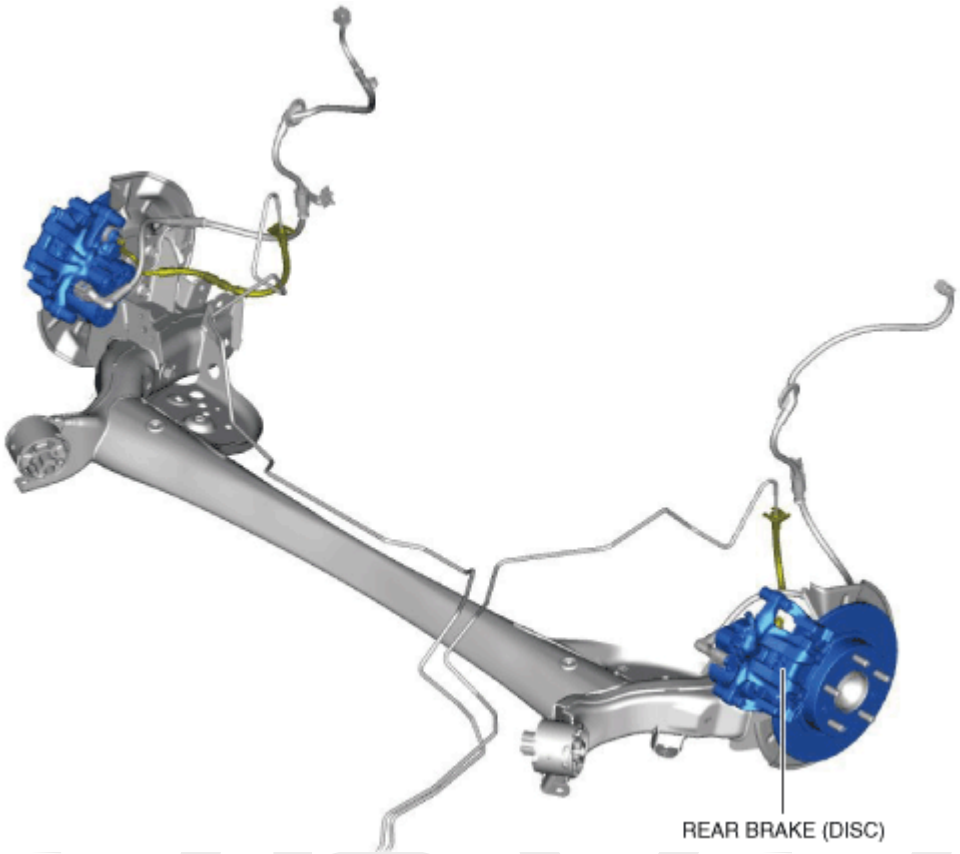
Vehicle rear side



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Dynamic stability control

• Electrical brake assist control has been adopted, improving safety.

• The DSC HU/CM, integrating both the Hydraulic Unit (HU) and Control Module (CM), has been adopted, resulting in a size and weight reduction.

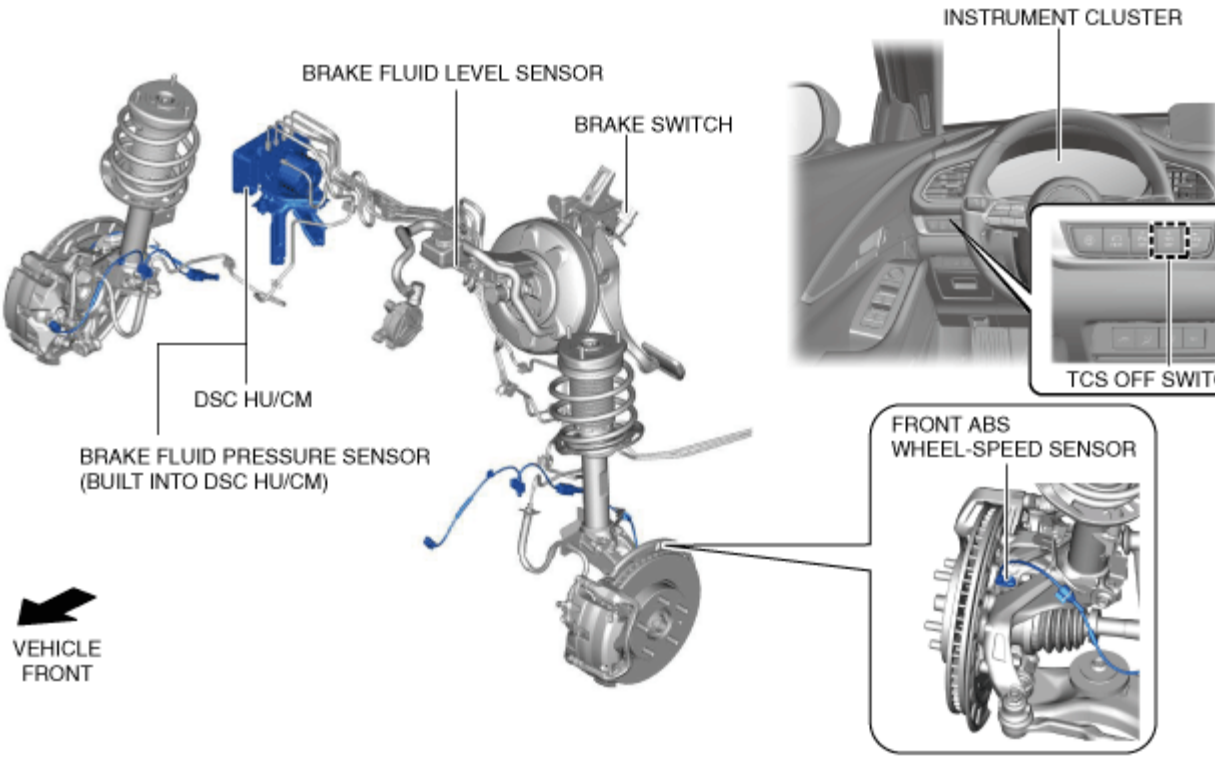
• An enhanced malfunction diagnosis system, used with the Mazda Modular Diagnostic System (M-MDS), improving serviceability.

• Serviceability improved by the automatic configuration function.

• Receives the lateral-G, longitudinal-G, and yaw rate signals between the Sophisticated Air bag Sensor (SAS) control module and the DSC HU/CM via Controller Area Network (CAN) lines instead of the conventional combined sensor.

• The hill launch assist (HLA), vehicle roll prevention function and secondary collision reduction*have been adopted, improving safety.

Vehicle front side (L.H.D.)



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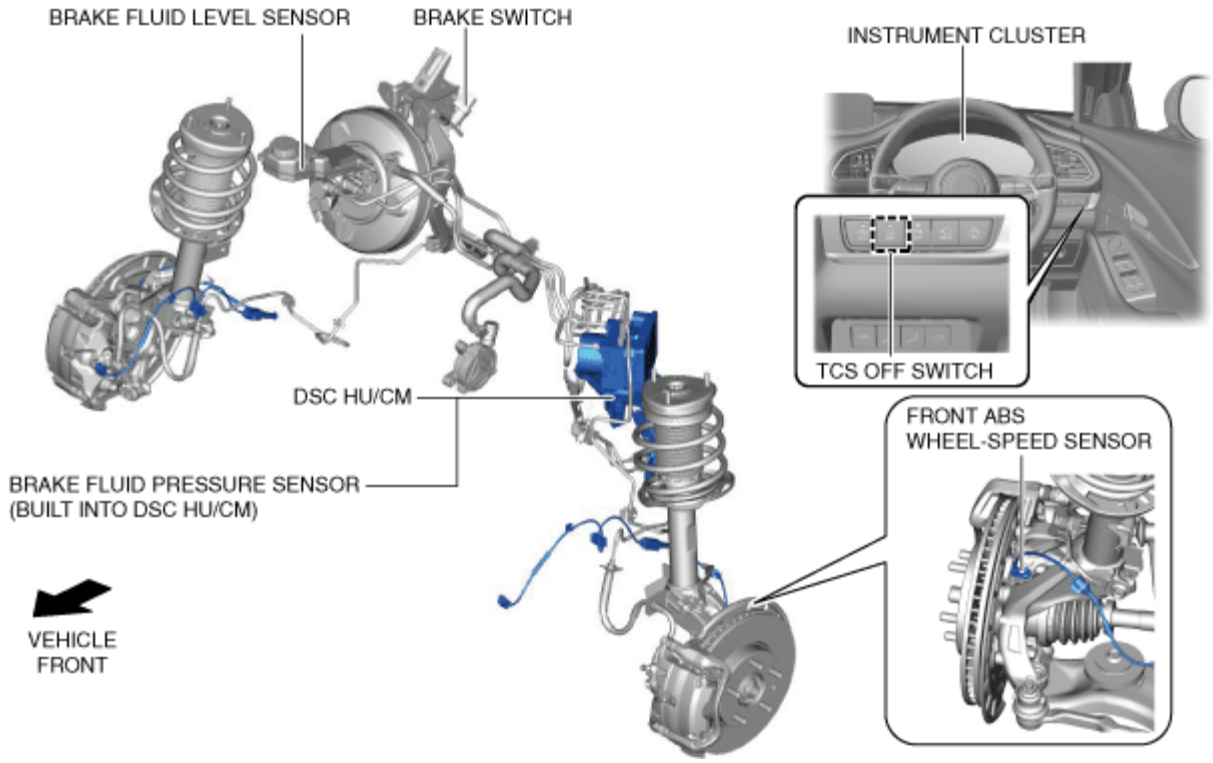
Vehicle front side (R.H.D.)



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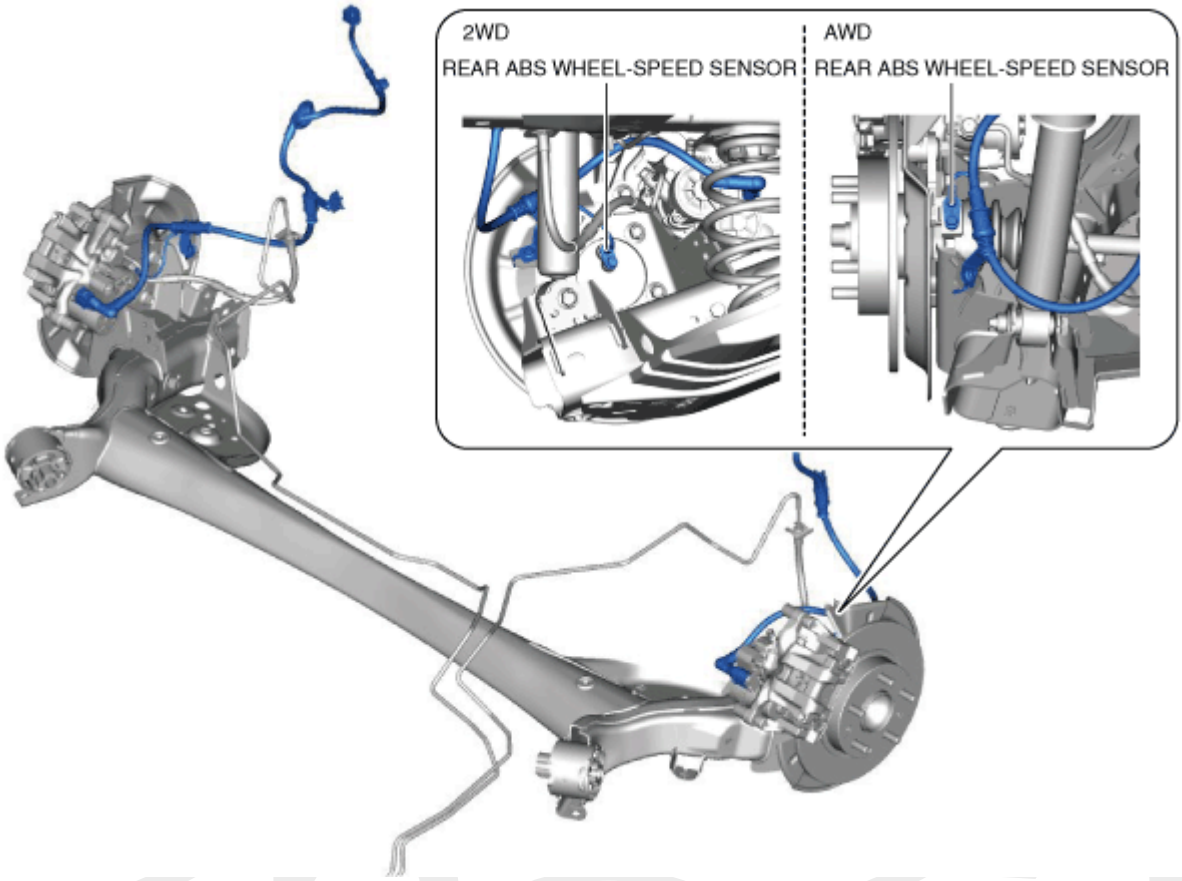
Vehicle rear side



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*:Vehicles with Mazda radar cruise control (MRCC) system

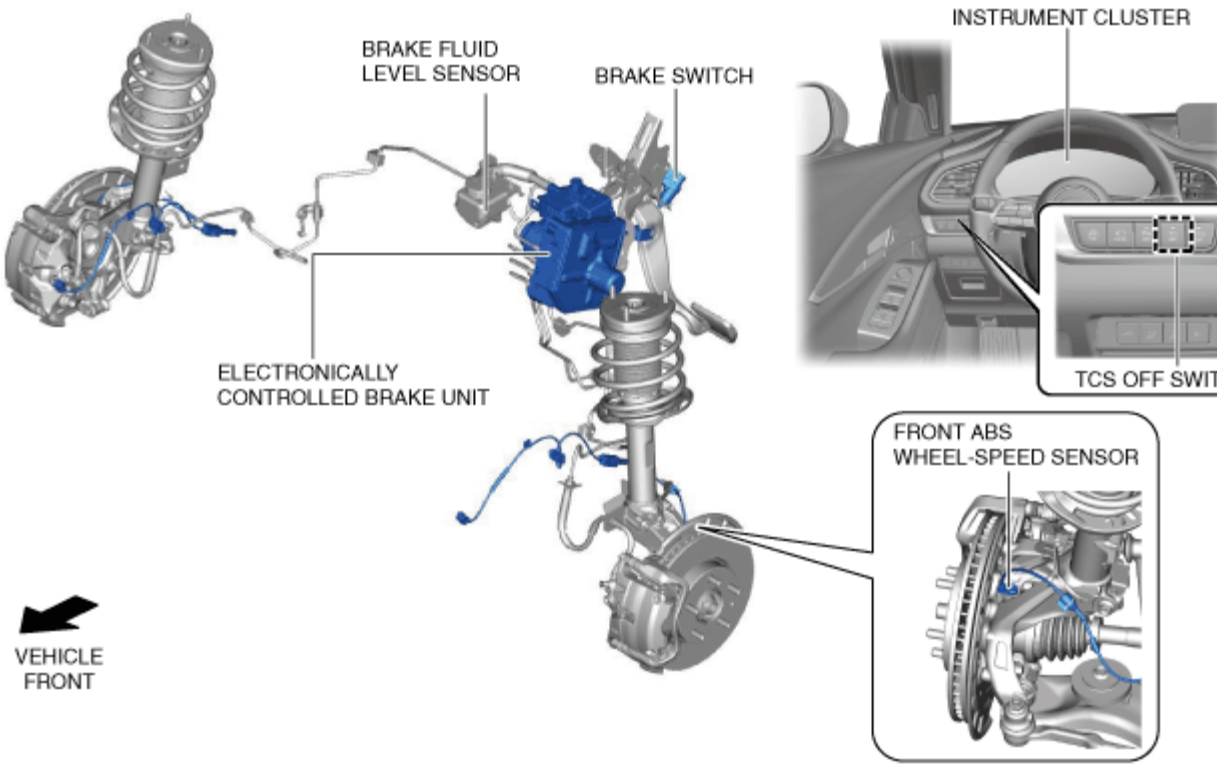
Electronically controlled brake system

• The electronically controlled brake system recovers the kinetic energy of the vehicle as electrical energy using the integrated starter generator during vehicle speed deceleration. The electronically controlled brake system controls the braking force of the hydraulic brakes according to the change in the vehicle deceleration (regenerative braking force) by the resistance of the integrated starter generator.

• The electronically controlled brake system executes each function of the DSC system (ABS, EBD, TCS, DSC, brake assist control, vehicle roll prevention, Hill Launch Assist (HLA), and the secondary collision reduction system) according to the driving conditions.

• Serviceability is improved by the automatic configuration function.

Vehicle front side (L.H.D.)



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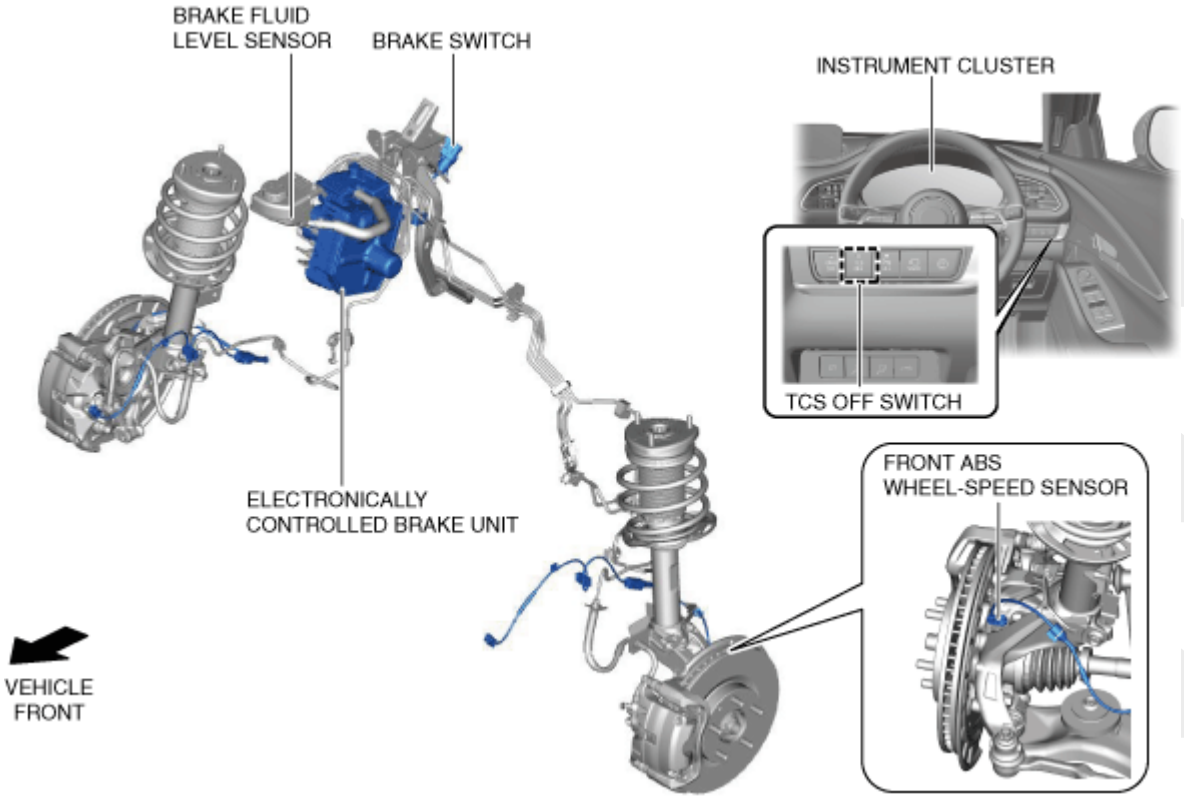
Vehicle front side (R.H.D.)



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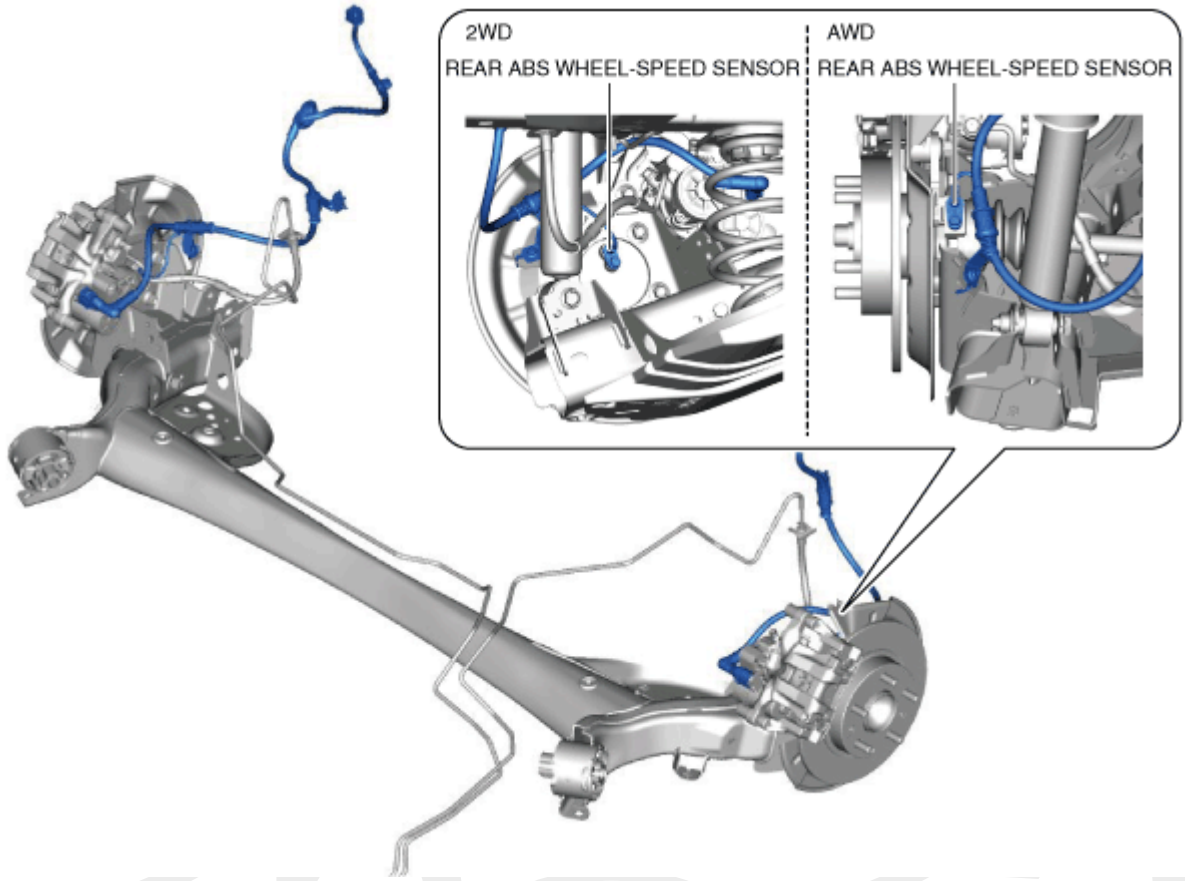
Vehicle rear side



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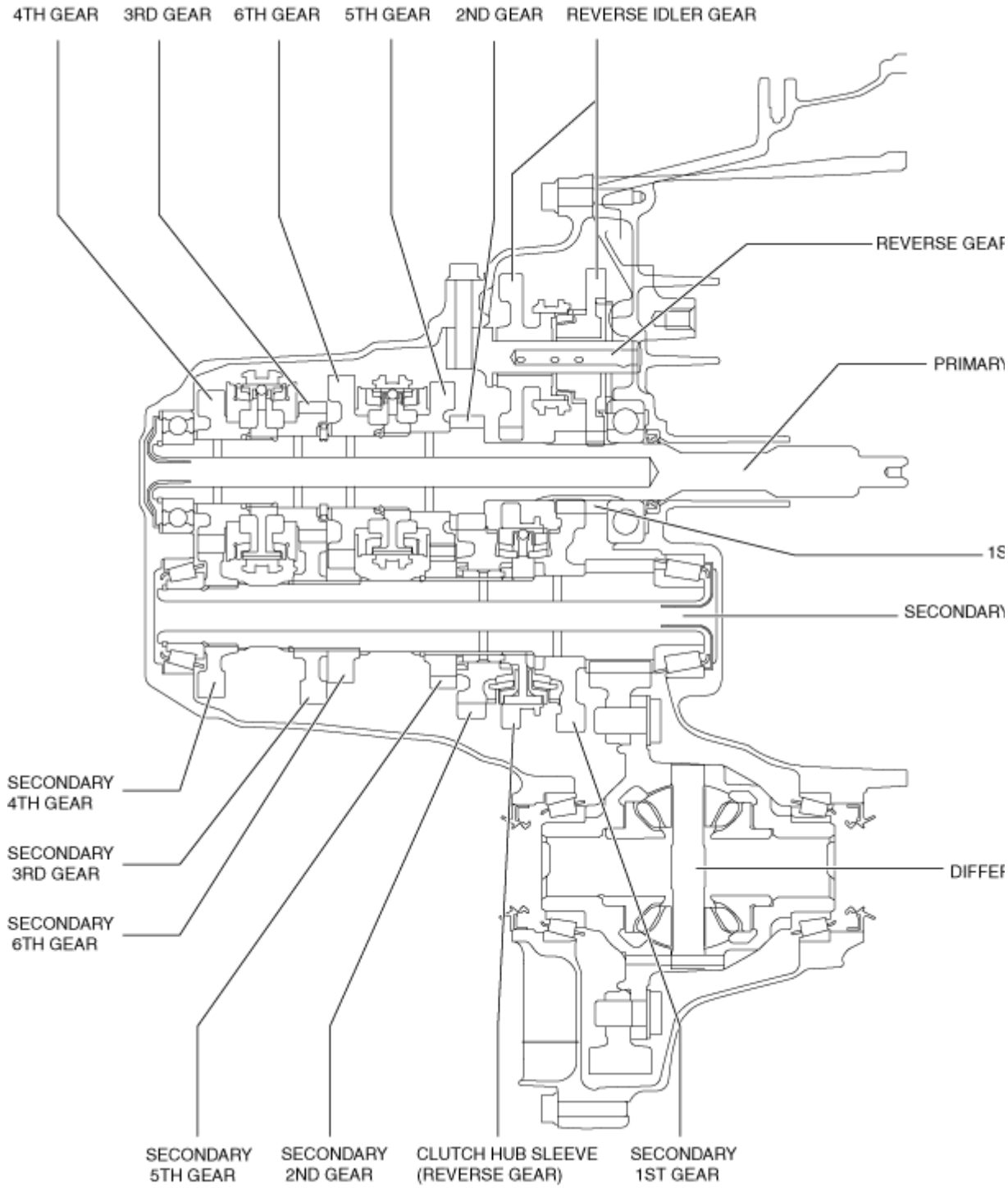
Transaxle

C66M-R

• For SKYACTIV-G 2.0, SKYACTIV-D 1.8 and SKYACTIV-X 2.0, six-speed C66M-R manual transaxle has been adopted.



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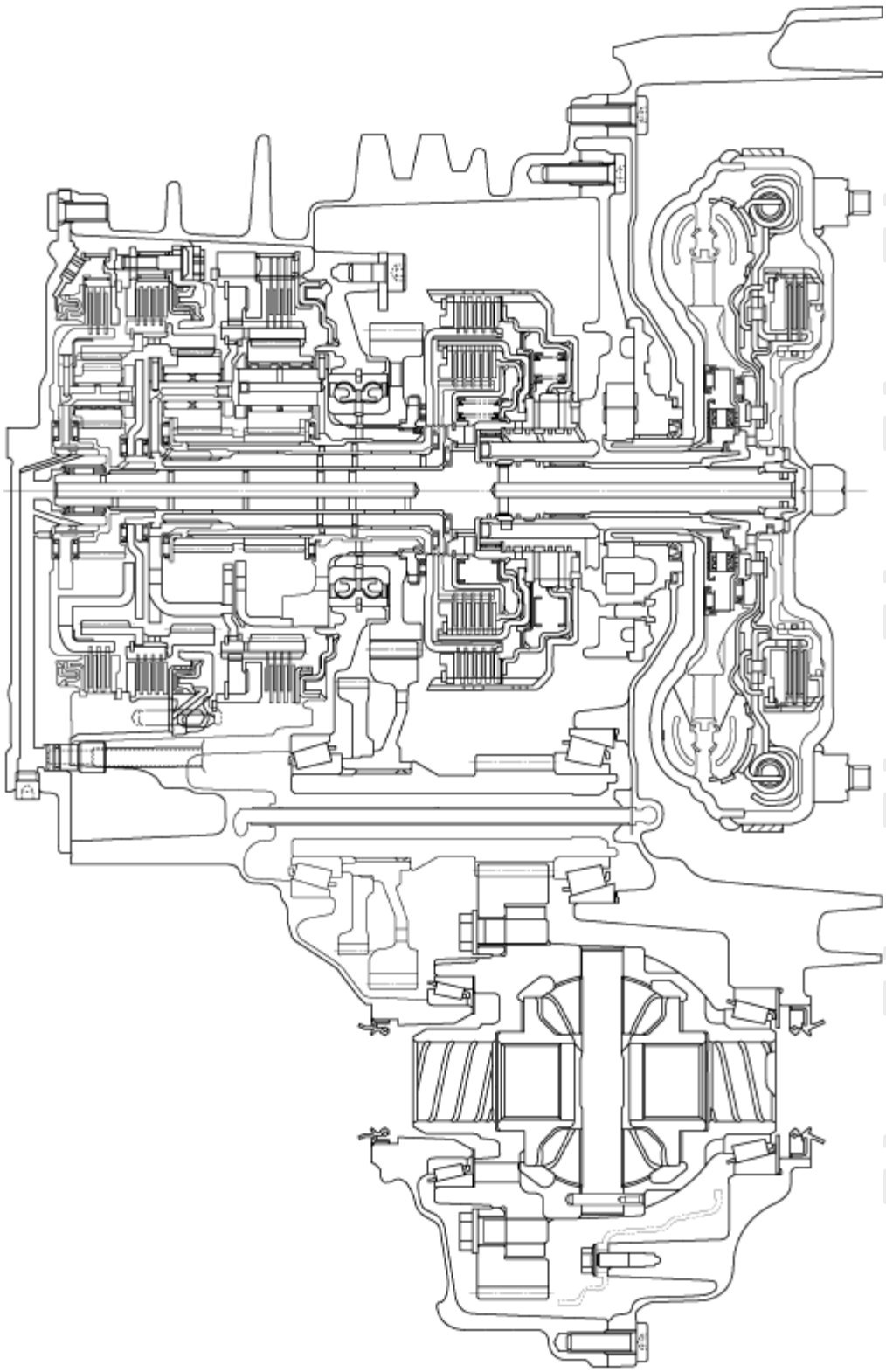
• For SKYACTIV-D 1.8 and SKYACTIV-X 2.0, six-speed ET6A-EL automatic transaxle has been adopted.



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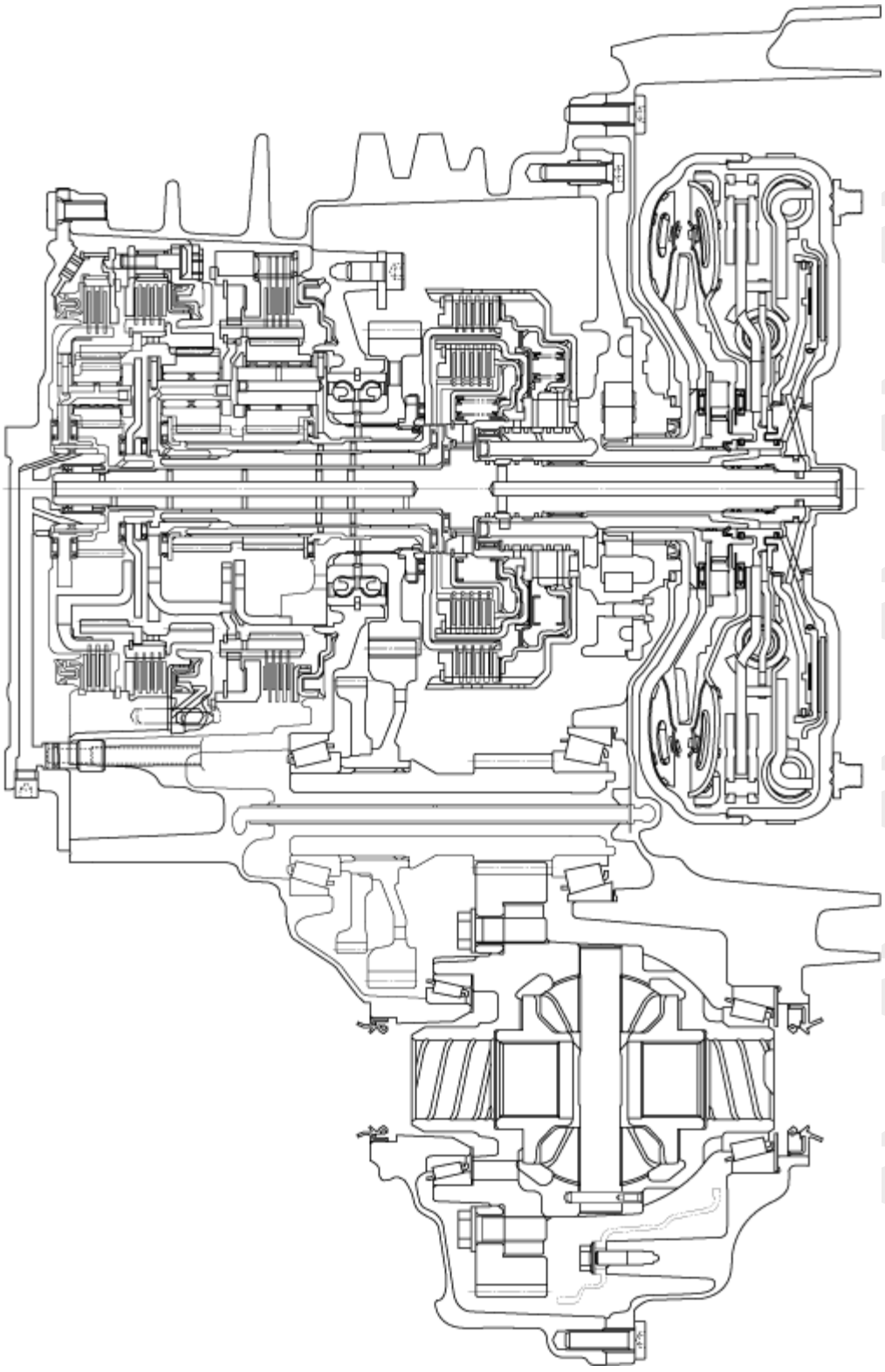
EV6A-EL

• For SKYACTIV-G 2.0 (with cylinder deactivation), six-speed EV6A-EL automatic transaxle has been adopted.



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Steering

Power steering

• A column-assist type electric power steering (EPS) has been adopted with a motor installed to the steering column to assist in the steering force.

• The size and weight of the system have been reduced by integrating the EPS control module (CM) and the EPS motor.

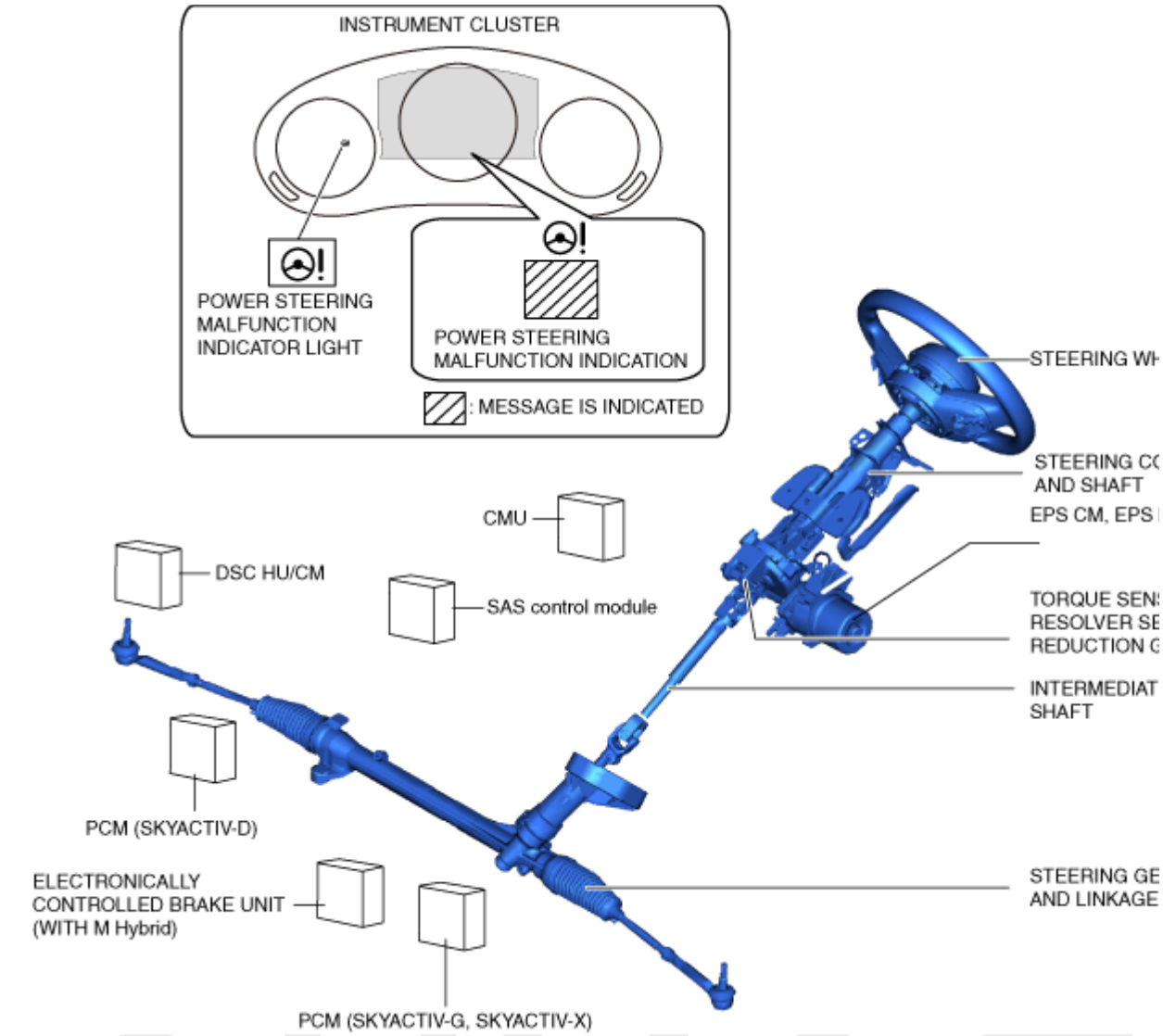
• The EPS achieves smooth handling performance from low to high speed and excellent steering feel by the vehicle speed response control.

• A steering column with a tilt/telescoping mechanism has been adopted allowing fine adjustment of the steering wheel position according to the driving posture of the driver.

• A steering column and shaft with a shock-absorbing mechanism has been adopted.

• The automatic configuration function and the steering wheel angle neutral position auto-learning function have been adopted.

L.H.D.



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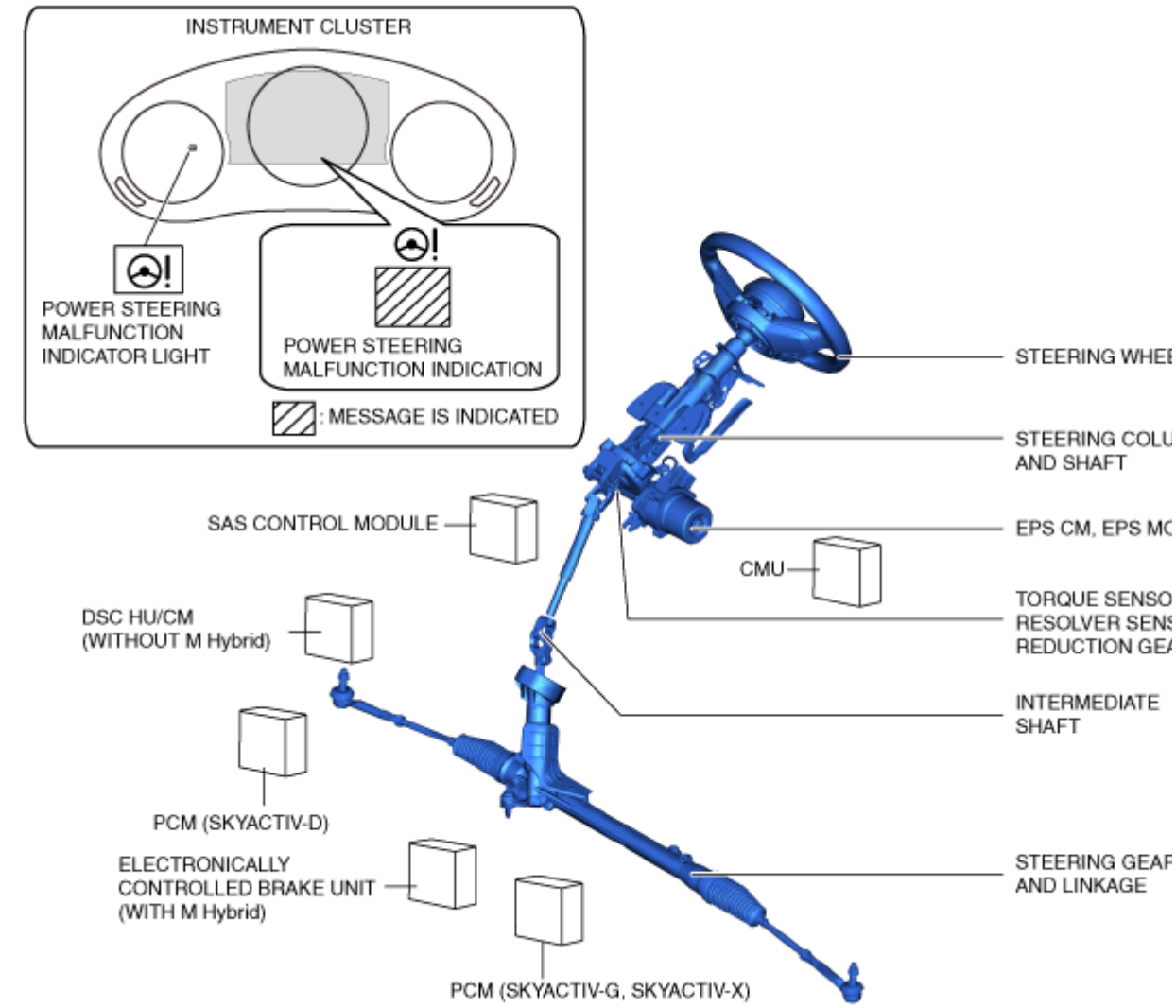
R.H.D.



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Heater, ventilation and air conditioning

- A variable displacement, swash plate type A/C compressor has been adopted which increases or decreases the quantity of refrigerant compression depending on the vehicle conditions.
- A dash-electrical supply unit has been adopted which controls the air conditioner system.
- A dash-electrical supply unit built into the blower fan controller has been adopted.
- LIN communication control has been adopted for control of the air intake actuator, air mix actuator, and the mode actuator.
- LIN communication control has been adopted for control of the rear vent actuator. (With rear vent)

• A climate control unit has been adopted with which the airflow temperature setting for the driver and passenger sides can each be adjusted independently. (full-auto air conditioner)

• HFO-1234yf has been adopted as the new refrigerant. HFO-1234yf refrigerant has little effect on global warming. (With HFO-1234yf)

• To improve the heating performance temporarily under cold diesel engine conditions, a PTC heater which uses electricity as the heat source as been adopted. (SKYACTIV-D 1.8 (With PTC heater))

Restraints

Standard deployment air bag control system

• The following have been adopted to the air bag modules and seat belts.

×: Applicable—: Not applicable

Seat position	Air bag module					Seat belt			
	Driver-side air bag module	Passenger-side air bag module	Knee air bag module	Side air bag module	Curtain air bag module	ELR (Emergency Locking Retractor)	Load limiter	Front pre-tensioner seat belt	Rear pre-tensioner seat belt
Driver's seat	×	—	×	×	×	×	×	×	—
Passenger's seat	—	×	—	×	×	×	×	×	—
Rear seat (LH/RH)	—	—	—	—	×	×	—	—	× *
Rear seat (center)	—	—	—	—	—	×	—	—	—

* :Chinese specs.

Two-step deployment air bag control system

• The following have been adopted to the air bag modules and seat belts.

×: Applicable—: Not applicable

Seat position	Air bag module					Seat belt				
	Driver-side air bag	Passenger-side air bag module	Knee air bag	Side air bag	Curtain air bag	ELR (Emergency Locking	Load limiter	ALR (Automatic Locking	Front pre-tensioner	Rear pre-tensioner

	module		module	module	module	Retractor)		Retractor)	seat belt	seat belt
Driver's seat	×	—	×	×	×	×	×	—	×	—
Passenger's seat	—	×	—	×	×	×	×	—	×	—
Rear seat (LH/RH)	—	—	—	—	×	×	×	× *	—	×
Rear seat (center)	—	—	—	—	—	×	—	—	—	—

* :Australian specs.

M Hybrid

Outline

• M Hybrid uses the ISG with excellent power generation efficiency to generate electricity from the kinetic energy generated when the vehicle decelerates. The system uses the electrical power stored in the M Hybrid battery, which is a large-capacity battery to improve drivability and fuel economy by reducing engine load and providing motor assist. In addition, the ISG provides quiet engine restarting after the engine is stopped by after the i-stop function (idling stop).

i-ACTIVSENSE

Active safety technology

• The active safety technology is designed to support safe and assured driving, and to prevent accidents.

• The active safety technology consists of the following systems.

System	Outline	Reference
Mazda Radar Cruise Control (MRCC) system	The Mazda radar cruise control (MRCC) system can perform headway control and maintain a constant speed at a set vehicle speed and distance from a vehicle ahead using a front radar sensor and forward sensing camera (FSC) which detects the vehicle ahead without the driver having to depress the accelerator or brake pedal. Additionally, if the detecting vehicle approaches the vehicle ahead too closely such as when the vehicle ahead is braking suddenly, the system alerts the driver using a warning sound and warning indication.	(See MAZDA RADAR CRUISE CONTROL (MRCC) SYSTEM.)
Mazda Radar Cruise Control with stop go function (MRCC with stop go function) system	The Mazda Radar Cruise Control with Stop Go function (MRCC with Stop Go function) uses a front radar sensor and the forward sensing camera (FSC) to detect a vehicle ahead, and performs headway control to maintain a constant distance from a vehicle ahead without the driver having to depress the accelerator or brake pedal. In addition, the detecting vehicle stops when the vehicle ahead stops, and headway control resumes by operating the RES switch/accelerator pedal after the vehicle ahead moves again. This reduces the strain of operating the vehicle such as during long-distance driving, driving at high speeds, and while in heavy traffic. If the detecting vehicle approaches the vehicle ahead too closely such as when the vehicle ahead is braking suddenly, the system alerts the driver using a warning sound and warning indication.	(See MAZDA RADAR CRUISE CONTROL WITH STOP & GO FUNCTION (MRCC WITH STOP GO FUNCTION).)

Cruising Traffic Support (CTS)	• The Cruising Traffic Support (CTS) reduces the strain of operating the vehicle on the highway or motorways using headway control function and steering assist function. • The Cruising Traffic Support (CTS) performs vehicle speed control at a constant speed by user setting and headway control to maintain a constant distance from a vehicle ahead without the driver having to depress the accelerator or brake pedal. • When the detected vehicle ahead stops the monitoring vehicle stop, and headway control resume after the vehicle ahead moves again (Automatic transmission vehicle). • If the monitoring vehicle approaches the vehicle ahead too closely, the system alerts the driver using a warning sound and warning indication. In addition, the steering assist function assists to help keep the vehicle within the lane lines. If the system does not detect the lane lines, the system assists to help keep the vehicle along the motion path with the vehicle ahead.	(See CRUISING TRAFFIC SUPPORT (CTS).)
Distance Speed Alert (DSA)	The distance speed alert (DSA) warns the driver using the multi-infomation display based on the calculated time to the vehicle ahead.	(See DISTANCE SPEED ALERT (DSA) [(E)])
Lane-keep assist system	• The lane-keep assist system provides steering assistance to help the driver stay within the vehicle lane if the vehicle might be deviating. • The forward sensing camera (FSC) detects the white lines (yellow lines) of the vehicle lane in which the vehicle is traveling and if the system determines that the vehicle may deviate from its lane, it operates the electric power steering to assist the driver's steering operation.	(See LANE-KEEP ASSIST SYSTEM [(E)].)
Lane Departure Warning System (LDWS)	The Lane Departure Warning System (LDWS) recognizes vehicle lane lines on a road using the forward sensing camera (FSC) installed to the windshield, and if the vehicle departs from its lane unknowingly by the driver, the system alerts the driver of the lane departure using a warning indication and warning sound.	(See LANE DEPARTURE WARNING SYSTEM (LDWS).)

Adaptive LED headlights	The adaptive LED headlights improve visibility by changing the headlight illumination range depending on the vehicle driving conditions and the surrounding conditions without switching the headlights between HI/LO.	(See ADAPTIVE LED HEADLIGHTS [(E)].)
High Beam Control (HBC) System	The High Beam Control (HBC) system turns the headlights HI off when the forward sensing camera (FSC) installed to the windshield recognizes a vehicle ahead and when traveling through towns and cities while the vehicle is being driven with the headlights HI turned on. Due to this, blinding of other vehicles from headlight glare is prevented and driver visibility is assured.	(See HIGH BEAM CONTROL (HBC) SYSTEM.)
Blind Spot Monitoring (BSM) system	The blind spot monitoring (BSM) system detects vehicles approaching from behind using radar and alerts the driver of the presence of an approaching vehicle. In addition, if the turn switch is operated when a vehicle is approaching from behind, it warns the driver by operating the warnings.	(See BLIND SPOT MONITORING (BSM) SYSTEM [(E)].)
Front Cross Traffic Alert (FCTA) system	• The front cross traffic alert (FCTA) is designed to assist the driver in checking both sides of the vehicle when the vehicle starts to drive at an intersection. • The front cross traffic alert (FCTA) detects vehicle approaching from the blind spots on the front left and right sides of the vehicle when the vehicle starts to drive at an intersection, and notifies the driver of possible danger using the warning indication on the display and the warning sound.	(See FRONT CROSS TRAFFIC ALERT (FCTA) SYSTEM.)
Rear Cross Traffic Alert (RCTA) system	The rear cross traffic alert (RCTA) system detects vehicles approaching from behind using radar and alerts the driver of the presence of an approaching vehicle.	(See REAR CROSS TRAFFIC ALERT (RCTA) SYSTEM.)
Driver Attention Alert system	• The driver attention alert system warns the driver using the warning display and sound if it detects the driver's lack of attentiveness. • The driver attention alert system activates the warning if the driver's attention decreases due to driving long distances for long periods causing the vehicle to sway.	(See DRIVER ATTENTION ALERT SYSTEM.)

Driver Monitoring (DM)	The driver monitoring (DM) detects an action state of the driver (looking away, drowsiness level) by the camera inside the vehicle and the vehicle information. If the system determines dangerous driving (looking away), it ensures the driver safety by warning display, warning sound and start of automatic braking.	(See DRIVER MONITORING (DM).)
Traffic Sign Recognition system (TSR)	• The traffic sign recognition system (TSR) provides support for safe driving by displaying traffic signs on the active driving display or by notifying the driver of excessive speed. • The traffic sign recognition system (TSR) helps prevent accidents caused by overlooking traffic signs by automatically displaying the traffic signs on the active driving display where the driver can easily recognize them.	(See TRAFFIC SIGN RECOGNITION SYSTEM (TSR) [(E)].)
360°View Monitor system	• The 360° view monitor system is technology created from Mazda's safety philosophy stated as the reduction of accident occurrence risk itself, and which is particular to the recognition support function. • The 360° view monitor system displays the images shot by the four cameras (front camera, side cameras (LH, RH), rear mount camera) equipped to the vehicle at the viewpoints from the front/back, left/right, and above the vehicle on the center display, and supports the driver in recognizing risks in the driver's blind spot areas.	(See 360°VIEW MONITOR SYSTEM.)
Adjustable speed limiter	• For the purpose of safety performance improvement, the adjustable speed limiter restricts unintended excess vehicle speed by allowing the driver to optionally set the maximum vehicle speed. • The adjustable speed limiter restricts the engine output so that the vehicle speed does not exceed the set maximum vehicle speed even if the accelerator pedal is being depressed. • The adjustabel speed limiter does not operate simultaneously with the cruise control system.	(See ADJUSTABLE SPEED LIMITER [(E)].)

Intelligent Speed Assistance (ISA)	The Intelligent Speed Assistance (ISA) is a function which keeps the vehicle speed below the speed limit set from a speed limit sign or an optionally set speed limit. If the vehicle speed exceeds the set speed limit while driving on steep slopes, the system notifies the driver using the display and a warning sound.	(See INTELLIGENT SPEED ASSISTANCE (ISA) [(E)].)

Pre-crash safety technology

• The pre-crash safety technology is designed to assist the driver in averting collisions or reducing their severity in situations where they cannot be avoided.

• The pre-crash safety technology consists of the following systems.

System	Outline	Reference
Smart Brake Support (SBS)	• The Smart Brake Support (SBS) warns the driver using the warning indication in the active driving display or multi-information display and warning alarm sounds when the front radar sensor, ultrasonic sensor and forward sensing camera (FSC) detect a vehicle ahead, pedestrian or bicycle, and if there is the possibility of a collision . • If the possibility of a collision increases, it operates the brakes automatically to decrease the damage from the possible collision.	(See SMART BRAKE SUPPORT (SBS).)
Smart Brake Support [Rear] (SBS-R)	The Smart Brake Support [Rear] (SBS-R) system is designed to apply the brakes automatically to reduce the damage from a possible collision if the driver fails to confirm the safety at the rear while reversing resulting in an increased possibility of a collision with vehicles or obstructions at the rear of the vehicle.	(See SMART BRAKE SUPPORT [REAR] (SBS-R).)
Smart Brake Support [Rear Crossing] (SBS-RC)	The Smart Brake Support [Rear Crossing] (SBS-RC) system is designed to apply the brakes automatically to reduce the damage from a possible collision with vehicles crossing from rear side of the vehicle when the vehicle is reversing to get out of the parking lot.	(See SMART BRAKE SUPPORT [REAR CROSSING] (SBS-RC).)