



TRAINING MANUAL

Mazda5

ZOOM-ZOOM



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Training Services

ZOOM-ZOOM

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General Information

00 General Information

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General Information

General Information

Product Concept

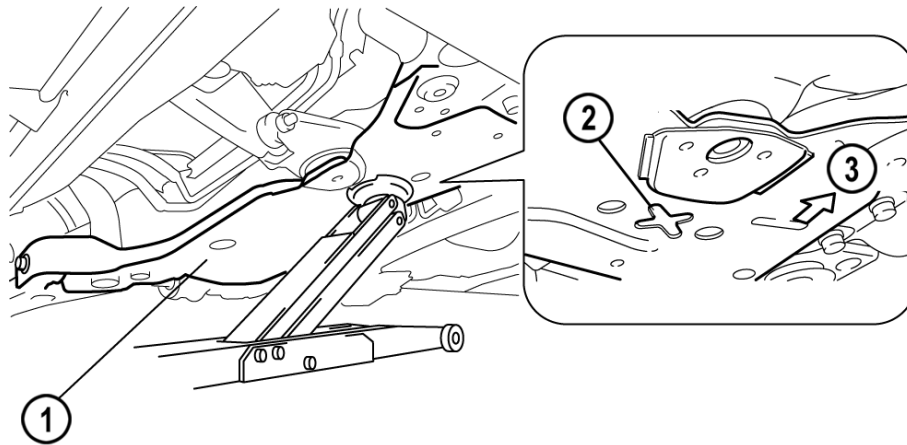
- When Mazda began developing its next-generation **MAV (Multi Activity Vehicle)**, it set its sights on creating a new global standard. It goes without saying that a MAV is intended to carry a lot of people and a lot of luggage. From this basic premise, we characterized our MAV as a 'lifestyle partner' that enables people to enjoy activities together with relatives and friends.
- Given our focus on creating a MAV that enhances communication, we decided to use an entirely new seven seater packaging concept. In contrast to the '5+2' concept, whereby space is evenly divided among the five seating positions rear of the front seats, our '6+One' packaging concept provides for the occasional use of one seat, creating more space for the rest of the occupants.
- At the same time, we provided the Mazda5 with performance that's focused on easy, enjoyable driving and riding, rather than the kind of performance that's reflected in overwhelming power. The choice of either a 1.8 liter or 2.0 liter gasoline engine coupled to a 5-speed manual transmission, or 2.0 liter turbo-diesel engine (in high-power and standard-power versions) with particulate filter coupled to a six-speed manual transmission allow the customer to choose between performance and economy. Sporty chassis performance completes the package, providing a total Zoom-Zoom driving experience for the driver and passengers.



M5_00001

Jacking and Lifting

- The front of the vehicle can be lifted with a jack near the center of the front crossmember.

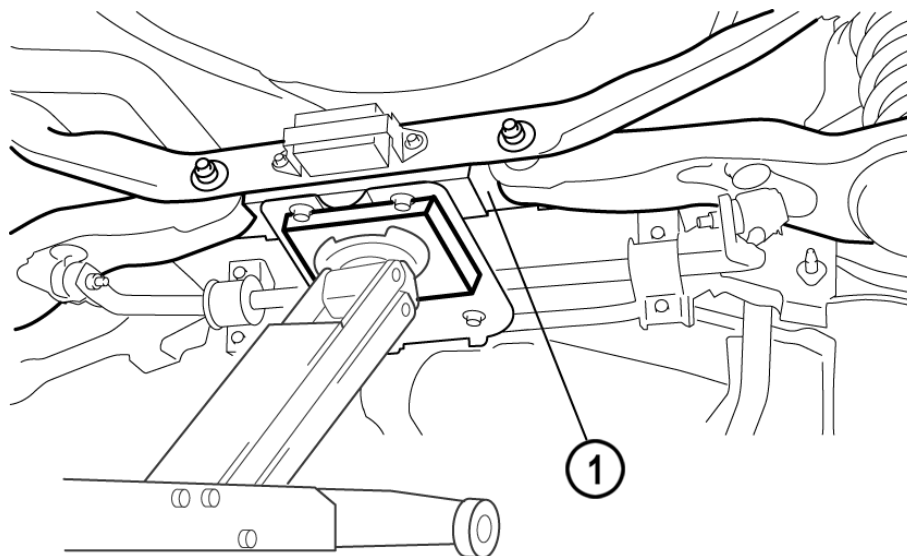


M5_00002

- | | | | |
|---|-------------------|---|-------|
| 1 | Front crossmember | 3 | Front |
| 2 | Jack up position | | |

NOTE: To prevent obstruction between the jack body and front bumper when the jack body is inserted, use a low floor type jack (frame height is 170 mm or less).

- The rear of the vehicle can be lifted with a jack at the center of the rear crossmember.



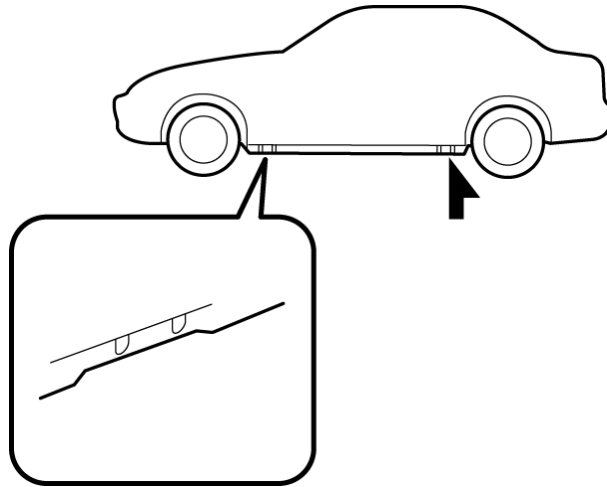
M5_00003

- | | |
|---|------------------|
| 1 | Rear crossmember |
|---|------------------|

NOTE: Place a board (approximately 20 mm {0.78 in} thick) between the rear crossmember and the jack to prevent damage to the crossmember.

General Information

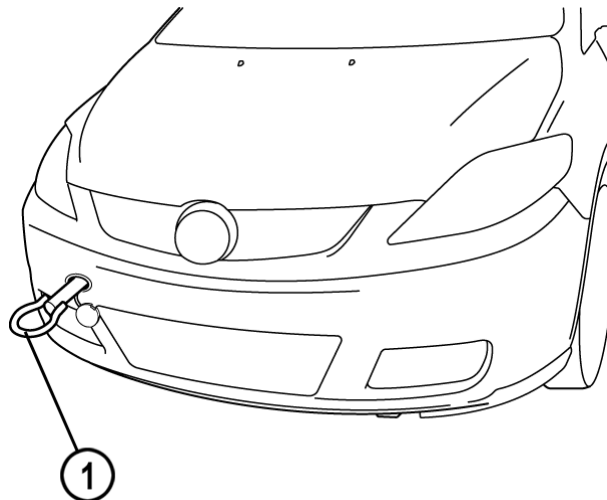
- The vehicle can be lifted with a lift at the indicated positions on the side sill.



M5_00004

Towing

- When towing the vehicle, remove the towing eyelet from the storage box in the rear cargo area, open the cap located on the front bumper and install the towing eyelet.

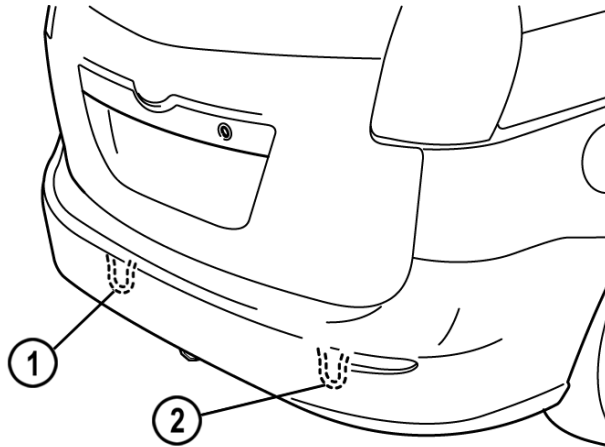


M5_00005

- 1 Towing eyelet

General Information

- A towing eyelet and tie down hook are provided at the rear of the vehicle.



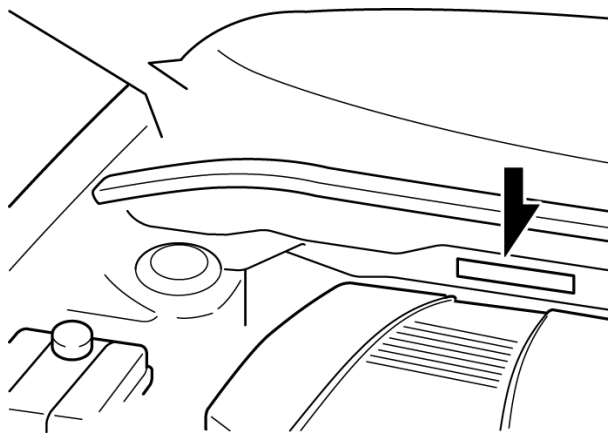
M5_00006

1 Tie down hook

2 Towing eyelet

Vehicle Identification Number

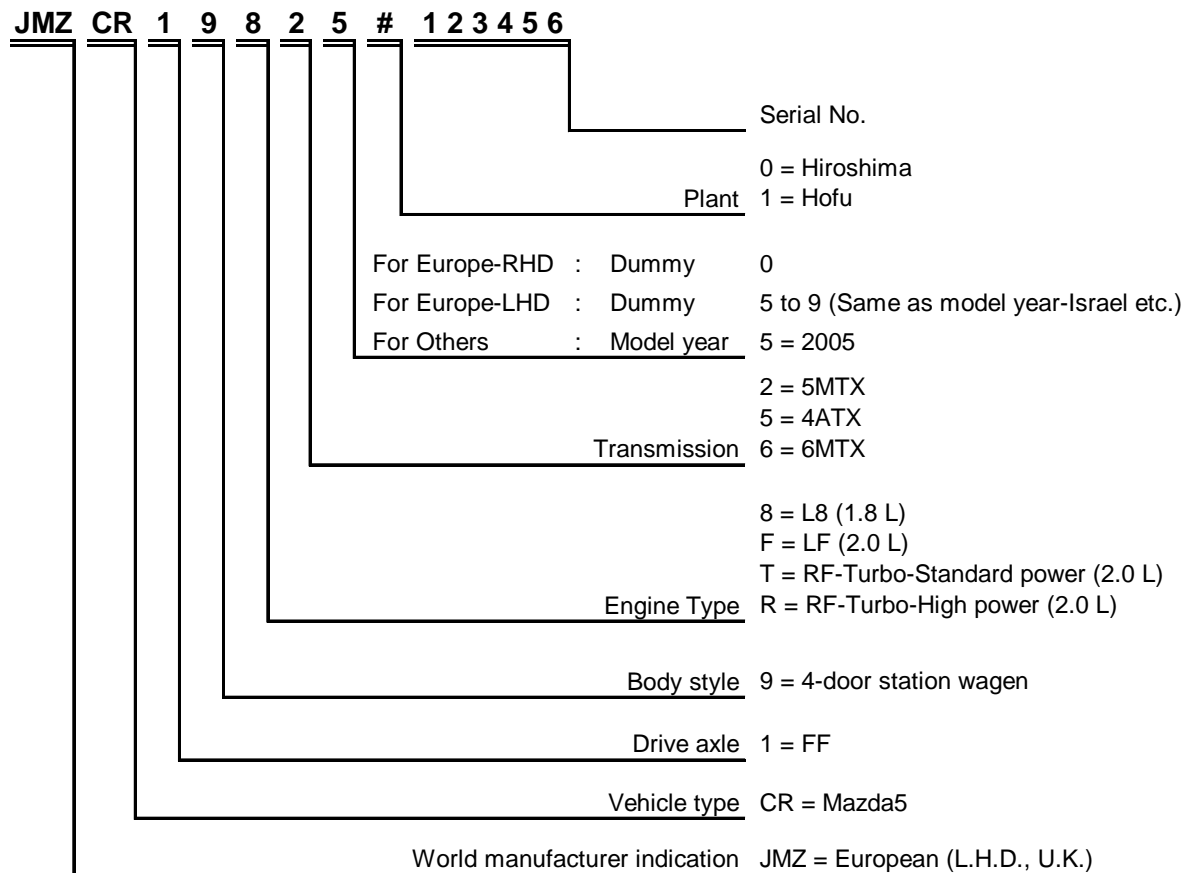
- The **VIN** (Vehicle Identification Number) is located on the cowl plate in the engine compartment.



M5_00007

General Information

- The VIN key is shown as below:



M5_00T001

For European (L.H.D.) Specifications

JMZCR1982##100001 —
 JMZCR19F2##100001 —
 JMZCR19R6##100001 —
 JMZCR19T6##100001 —

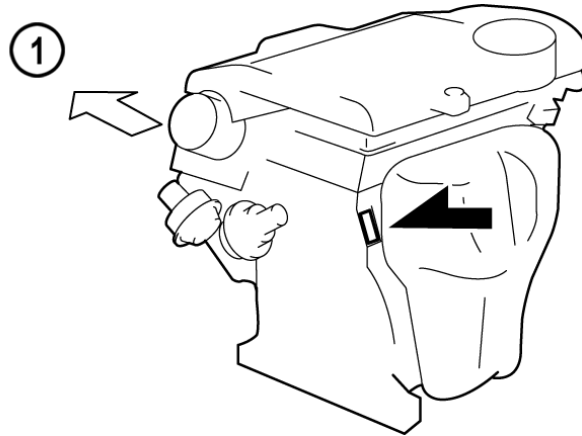
For UK Specifications

JMZCR19820#100001 —
 JMZCR19F20#100001 —
 JMZCR19R60#100001 —
 JMZCR19T60#100001 —

Engine Identification Number

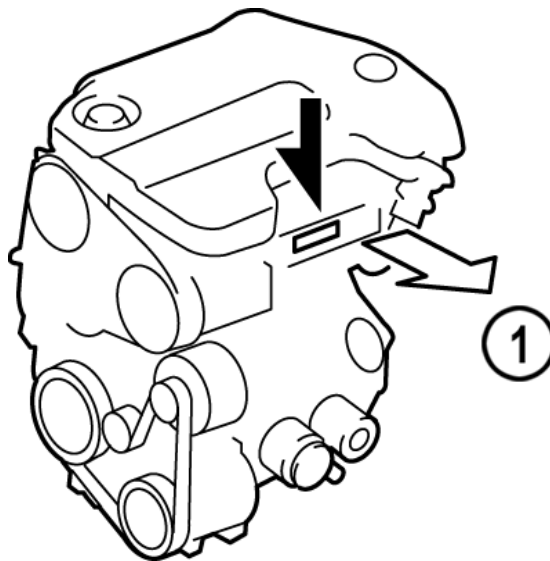
- The engine identification number is located on the cylinder block as shown below:

L8/LF



M5_00008

MZR-CD



M5_00009

1 Front

General Information

Technical Data

1.8 L MZR Engine	
Displacement	1798 cm ³
Bore x Stroke	83 x 83.1 mm
Compression Ratio	10.8:1
Maximum Power	85 kW {115 PS} at 5,300 rpm
Maximum Torque	165 Nm at 4,000 rpm
Emission Standard	Euro 4

2.0 L MZR Engine	
Displacement	1999 cm ³
Bore x Stroke	87.5 x 83.1 mm
Compression Ratio	10.8:1
Maximum Power	107kW {145 PS} at 6,000 rpm
Maximum Torque	185 Nm at 4,500 rpm
Emission Standard	Euro 4

2.0 L MZR-CD Engine	Standard Power	High Power
Displacement	1998 cm ³	
Bore x Stroke	86 x 86 mm	
Compression Ratio	16.7:1	
Maximum Power	81 kW {110PS} at 3,500 rpm	105 kW {143 PS} at 3,500 rpm
Maximum Torque	310 Nm at 2,000 rpm	360 Nm at 2,000 rpm
Emission Standard	Euro 4	

M5_00T002

General Information

Maintenance Schedule

Maintenance Item	Maintenance Interval (Number of months or km (miles), whichever comes first)									
	Months	12	24	36	48	60	72	84	96	108
	x1000 km	20	40	60	80	100	120	140	160	180
	x1000 miles	12.5	25	37.5	50	62.5	75	87.5	100	112.5
GASOLINE ENGINE										
Engine valve clearance	Audible inspection every 120,000 km (75,000 miles), if noisy, adjust.									
Spark plugs	Replace every 120,000 km (75,000 miles)									
Air cleaner element			R			R				R
Evaporative system (if installed)			I			I				I
DIESEL ENGINE										
Engine valve clearance	I					I				
Engine timing belt	Replace every 120,000 km (75,000 miles)									
Fuel filter			R			R				R
Fuel injection system	I		I			I				I
Fuel system (Drain water)	D	D	D	D	D	D	D	D	D	D
Air cleaner element	C	C	R	C	C	R	C	C	C	R
GASOLINE and DIESEL ENGINE										
Engine oil *1	R	R	R	R	R	R	R	R	R	R
Engine oil filter *1	R	R	R	R	R	R	R	R	R	R
Drive belts			I			I				I
Cooling system/coolant top-up		I		I		I		I		
Engine coolant	FL22 type *2	Replace every 200,000 km (125,000 miles) or 11 years								
	Others	Replace at first 100,000 km (62,500 miles) or 4 years; after that, every 2 years								
Fuel lines and hoses		I		I		I		I		
Battery electrolyte level and specific gravity	I	I	I	I	I	I	I	I	I	I
Brake lines, hoses and connections	I	I	I	I	I	I	I	I	I	I
Brake fluid *3		R		R		R		R		
Parking brake	I	I	I	I	I	I	I	I	I	I
Disc brakes	I	I	I	I	I	I	I	I	I	I
Power steering fluid, lines, hoses, and connections	I	I	I	I	I	I	I	I	I	I
Steering operation and linkages		I		I		I		I		
Manual transaxle oil						R				
Front and rear suspension and ball joints		I		I		I		I		
Drive shaft dust boots		I		I		I		I		
Exhaust system and heat shields	Inspect every 80,000 km (50,000 miles) or 5 years									
Body condition (for rust, corrosion and perforation)	Inspect annually									
Cabin air filter (if installed)		R		R		R		R		
Tires (including spare tire) (with inflation pressure adjustment)	I	I	I	I	I	I	I	I	I	I

M5_00T003

General Information

I : Inspect and clean, repair, adjust, or replace if necessary.

R : Replace

C : Clean

D : Drain

- Refer below for a description of items marked * in the maintenance chart.
 - *1: If the vehicle is operated under hard conditions (dusty road, extended periods of idling or low speed operation, cold temperature or short driving distances), change the engine oil and oil filter every 10,000 km (6,250 miles) or less.
 - *2: Use FL22 type coolant in vehicles with the inscription “FL22” on the radiator cap itself or the surrounding area. Use FL22 when replacing the coolant.
 - *3: If the brakes are used extensively (for example, continuous hard driving or mountain driving) or if the vehicle is operated in extremely humid climates, change the brake fluid annually.

NOTES:

01

Engines

01 Engines

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2.0 MZR-CD Engine

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Mechanical System

Features

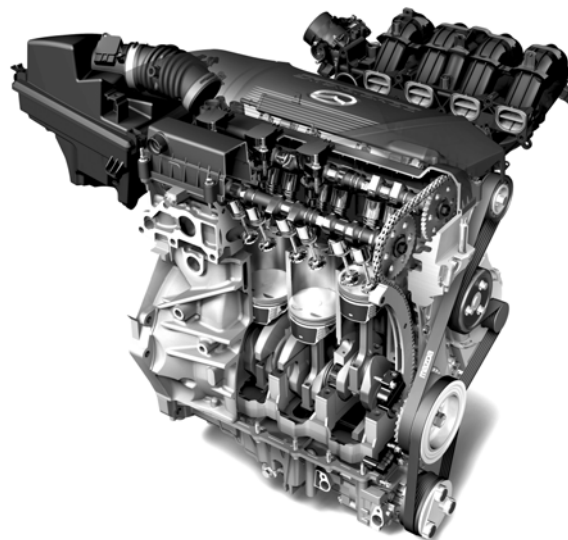
- The mechanical system of the L8/LF engines is essentially the same as the Mazda6 (GG/GY) with L8/LF engines except for the following:
 - A new engine support hanger SST (49C0175AO) has been introduced.

Specifications

Item		Specification		
		L8	LF	
Type		Gasoline 4-stroke		
Cylinder arrangement and number		Inline, 4-cylinder		
Combustion chamber		Pentroof		
Valve system		DOHC, Timing chain driven, 16 valves		
Displacement (ml {cc, cu in})		1,798 {1,798, 109.7}	1,999 {1,999, 122}	
Bore x stroke (mm {in})		83 x 83.1	87.5 x 83.1	
Compression ratio		10.8	10.8	
Compression pressure (kPa {kgf/cm ² , psi} [rpm])		1,750 {17.85, 253.82} [300]	1,720 {17.54, 249.5} [300]	
Valve timing	IN	Open BTDC (°)	4	4
		Close ABDC (°)	33	52
	EX	Open BBDC (°)	37	37
		Close ATDC (°)	4	4
Valve clearance (engine cold)	IN	(mm {in})	0.22-0.28 {0.0087-0.0110}	
	EX	(mm {in})	0.27-0.33 {0.0107-0.0129}	

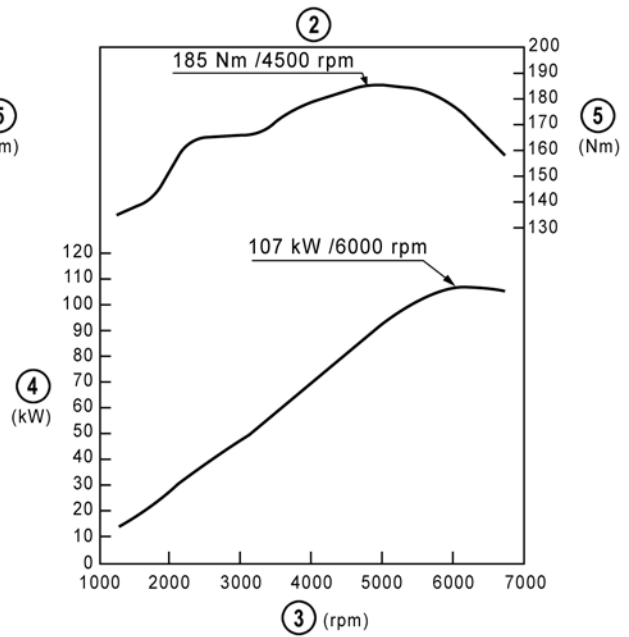
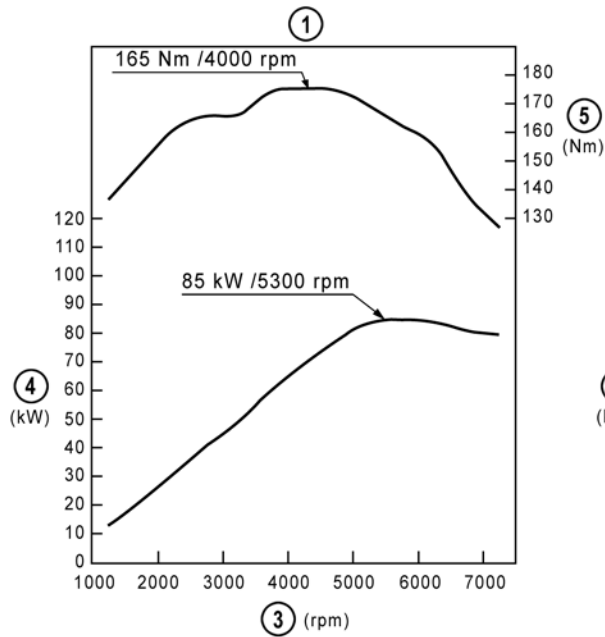
M5_01T018

Overview



M5_01017

Engine Performance Curve



M501T066

- 1 L8 engine
- 2 LF engine
- 3 Engine speed

- 4 Output
- 5 Torque

Lubrication System

Features

- The lubrication system is essentially the same as that on the Mazda6 (GG/GY). It has the following features:
 - Spin-on type oil filter.
 - Water-cooled type oil cooler.

Specifications

Item		Specification
Type		Force-fed type
Oil pressure [oil temperature: 100°C {212°F}]		234—521 {2.39—5.31, 33.9—75.5} [3,000]
Oil pump	Type	Trochoid gear type
	Relief valve opening pressure	450—550 {4.59—5.61, 65.3—79.8}
Oil Cooler	Type	Water-cooled
Oil filter	Type	Full-flow, paper element
	Bypass pressure	80— 120 {0.82— 1.22, 11.6—17.4}
Oil capacity (approx. quantity)	Total (dry engine)	4.6 {4.8, 4.0}
	Oil replacement	3.9 {4.1, 3.4}
	Oil and oil filter replacement	4.3 {4.5, 3.8}

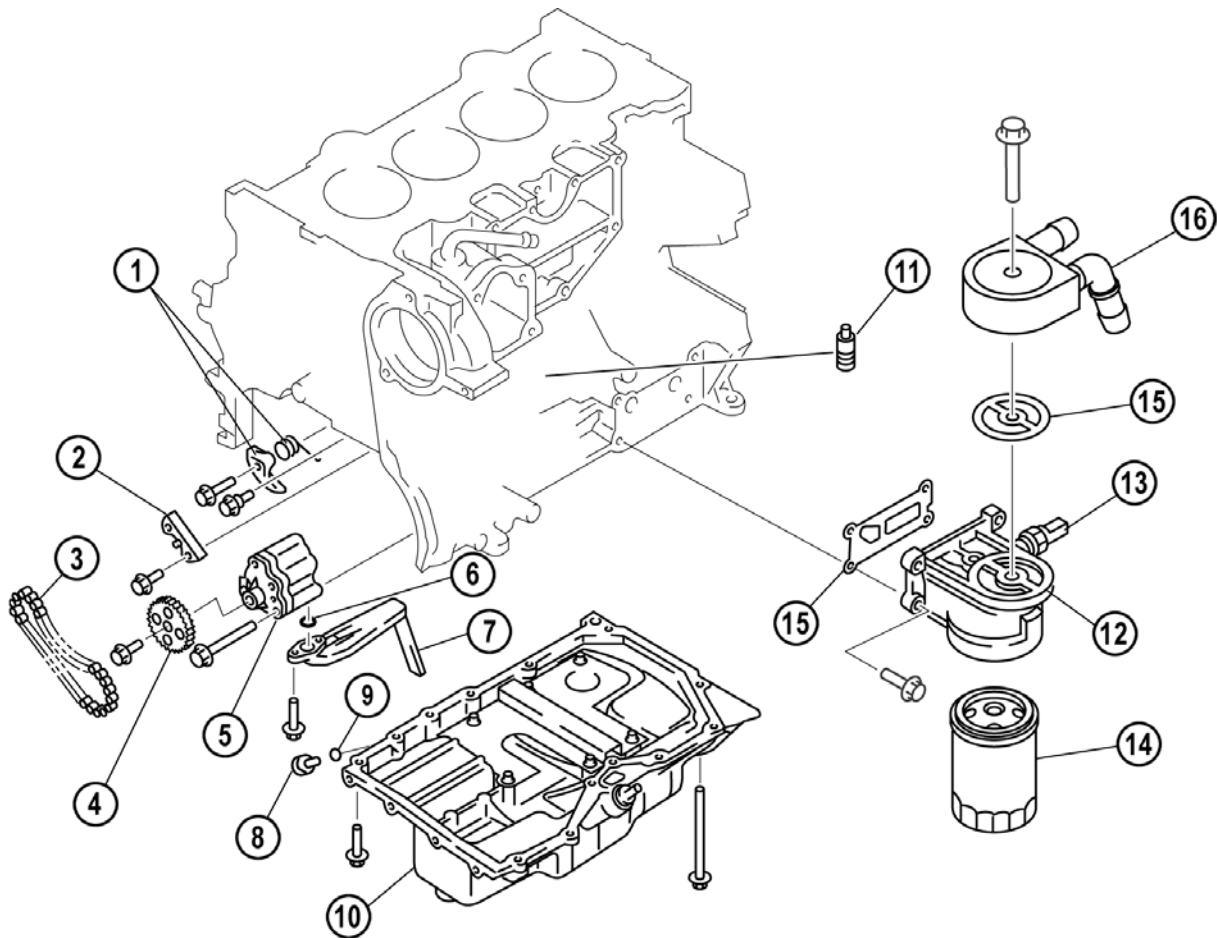
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Engine Oil

Item	Specification		
Grade	API SL, ACEA A3		
Viscosity (SAE)	5W – 30	10W – 40	5W – 20
Remarks	Mazda genuine Dexelia oil e.g.		–

M5_01T002

Parts Location



M5_01001

- | | | | |
|---|--------------------------|----|---------------------|
| 1 | Oil pump chain tensioner | 9 | Washer |
| 2 | Oil pump chain guide | 10 | Oil pan |
| 3 | Oil pump chain | 11 | Oil jet valve |
| 4 | Oil pump sprocket | 12 | Oil filter adapter |
| 5 | Oil pump | 13 | Oil pressure switch |
| 6 | O-ring | 14 | Oil filter |
| 7 | Oil strainer | 15 | Gasket |
| 8 | Oil drain plug | 16 | Oil cooler |

Cooling System

Features

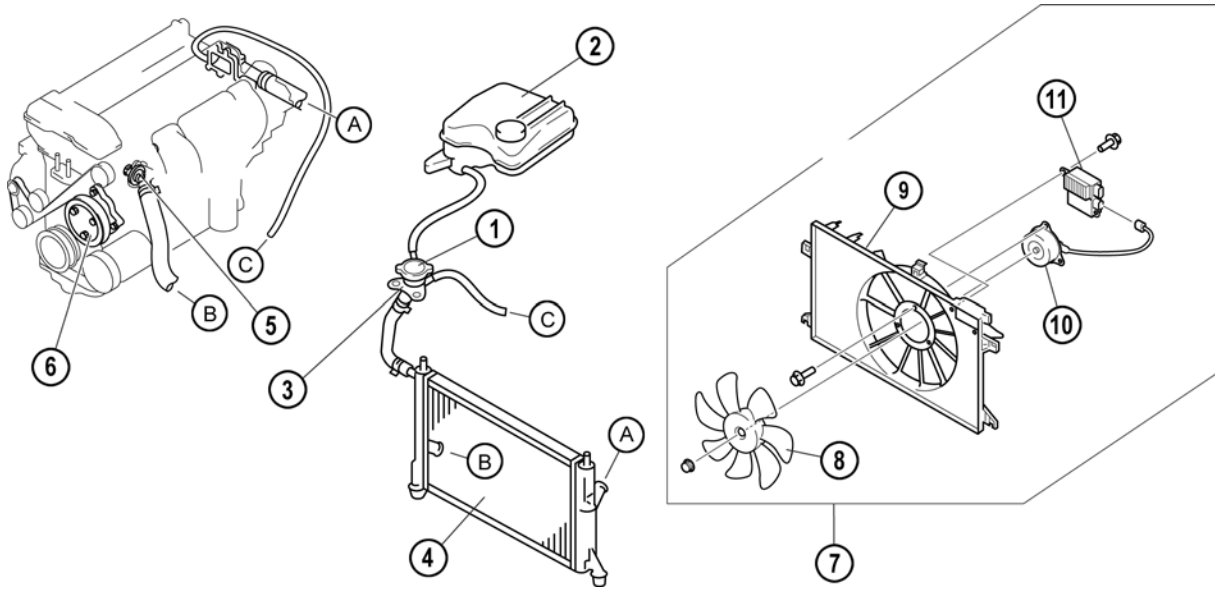
- The cooling system has the following features:
 - Cooling system pressure cap has been moved from the coolant reserve tank to the cooling system filler neck.
 - A long-life engine coolant has been introduced.
 - Separate cooling system filler neck has been introduced.
 - Stepless cooling fan controlled by a fan control module has been introduced.

Specifications

Item		Specification
Type		Water-cooled, Electromotive
Coolant capacity (approx. quantity) (L {US qt, Imp qt})		With heater: 7.0 {7.4, 6.2} Without heater: 6.5 {6.9, 5.7}
Water pump	Type	Centrifugal, V-ribbed belt-driven
Thermostat	Type	Wax, bottom-bypass
	Opening temperature (°C {°F})	80—84 {176—183}
	Full-open temperature (°C {°F})	97 {207}
	Full-open lift (mm {in})	8.0 {0.31} or more
Radiator	Type	Corrugated fin
Cooling system cap	Cap valve opening pressure (kPa {kgf/cm ² , psi})	93.2—122.6 {0.95—1.25, 13.5—17.8}
Cooling fan	Type	Electric
	Number of blades	7
	Outer diameter (mm {in})	360 {14.2}
	Fan motor output (W)	240

M5_01T003

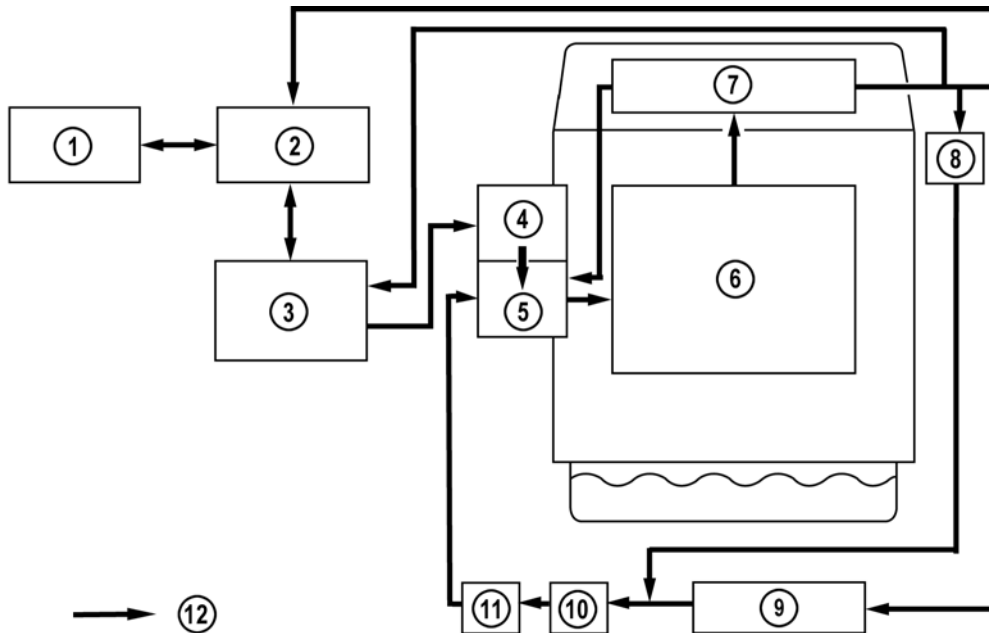
Parts Location



M5_01002

- | | | | |
|---|----------------------------|----|----------------------|
| 1 | Cooling system cap | 7 | Cooling fan assembly |
| 2 | Coolant reserve tank | 8 | Cooling fan |
| 3 | Cooling system filler neck | 9 | Radiator cowling |
| 4 | Radiator | 10 | Cooling fan motor |
| 5 | Thermostat | 11 | Fan control module |
| 6 | Water pump | | |

System Overview

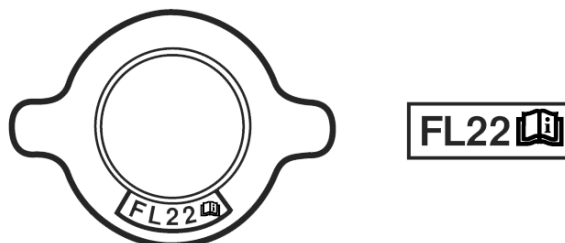


M5_01003

- | | | | |
|---|----------------------------|----|-----------------|
| 1 | Coolant reserve tank | 7 | Cylinder head |
| 2 | Cooling system filler neck | 8 | EGR valve |
| 3 | Radiator | 9 | Heater |
| 4 | Thermostat | 10 | Oil cooler (AT) |
| 5 | Water pump | 11 | Oil cooler |
| 6 | Cylinder block | 12 | Coolant flow |

Long Life Coolant

- The use of long life coolant means that coolant life is extended to 200,000 km (125,000 miles) or 11 years.
- It is not recommended that normal coolant is mixed with long life coolant, as the life of the long life coolant will be reduced.
- Because the long life coolant is green, and therefore indistinguishable from normal coolant, the designation 'FL22' is written on or near the cooling system pressure cap to indicate the correct coolant type.

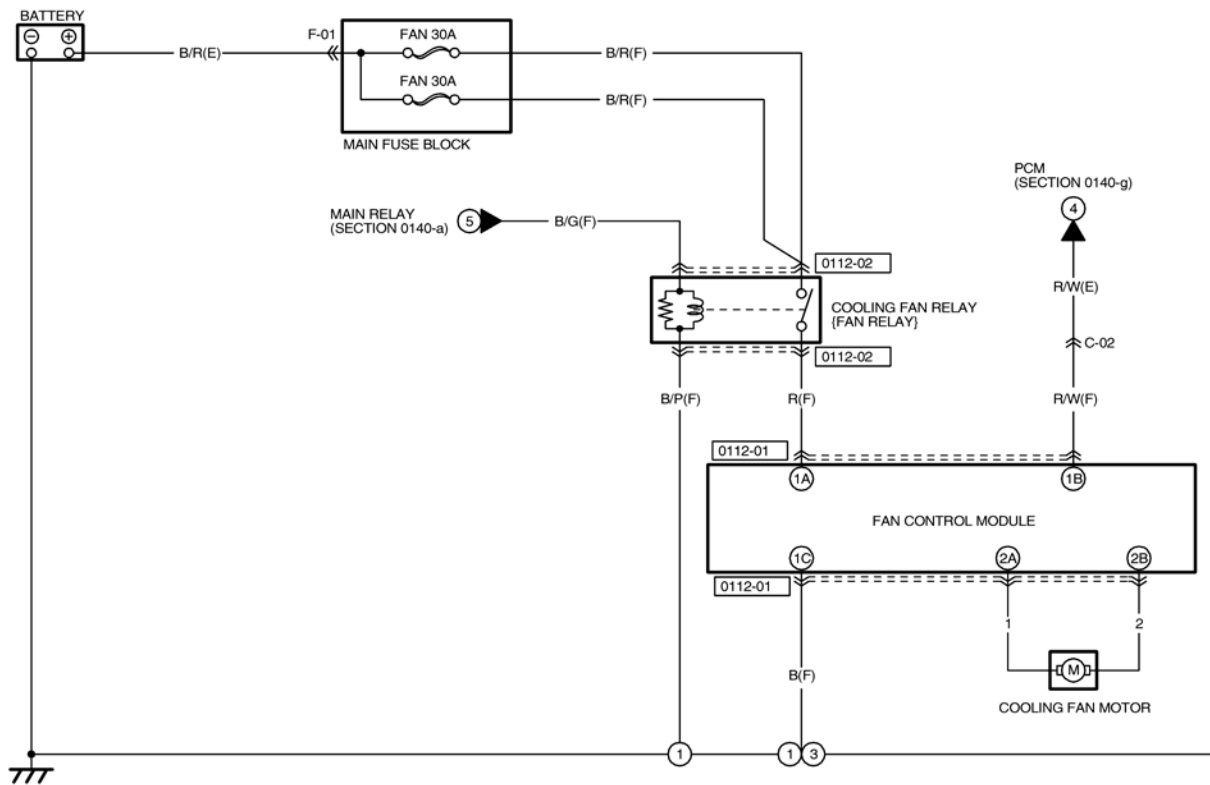


M5_01004

Cooling Fan

- The cooling fan assembly consists of the radiator cowling, cooling fan, cooling fan motor, and the fan control module.
- The fan control module drives the fan motor based on a duty signal received from the PCM. This allows variable control of the fan motor speed, reducing fan operation noise and electrical load, and improving engine warm up time.
- Power to the fan control module is controlled by the main relay, and supplied through two 30 A fuses by the cooling fan relay (similar to current MPV).

Wiring Diagram



M5_01005

Control

- The cooling fan is controlled according to the engine coolant temperature as follows :

Conditions	Duty ratio
• Engine coolant temperature is less than 100 °C {212 °F}.	0%
• Engine coolant temperature is 106—108 °C {223—226 °F}.	75%
• Engine coolant temperature is 108 °C {226 °F} or more.	100%

M5_01T004

- The cooling fan is controlled according to the refrigerant pressure switch condition as follows:

Conditions	Duty ratio
<ul style="list-style-type: none"> When all of the following conditions are met: <ul style="list-style-type: none"> — A/C is on. — Refrigerant pressure switch (medium pressure) is off. — Vehicle speed is 85 km/h {53 mph} or more. A/C is off. 	0%
<ul style="list-style-type: none"> When all of the following conditions are met: <ul style="list-style-type: none"> — A/C is on. — Refrigerant pressure switch (medium pressure) is off. — Vehicle speed is 45—85 km/h {28—52 mph}. 	60%
<ul style="list-style-type: none"> When all of the following conditions are met: <ul style="list-style-type: none"> — A/C is on. — Refrigerant pressure switch (medium pressure) is off. — Vehicle speed is 45 km/h {27 mph} or less. 	65%
<ul style="list-style-type: none"> When all of the following conditions are met: <ul style="list-style-type: none"> — A/C is on. — Refrigerant pressure switch (medium pressure) is on. 	75%

M5_01T005

Fail-safe Function

Over-current Failsafe

- If current to the fan motor exceeds a specified value, the fan control module stops the fan motor for a specified amount of time.

Overheat Failsafe

- If the internal temperature of the fan module exceeds a specified value, the fan control module operates the cooling fan at high speed. If the temperature continues to rise, the cooling fan is switched off (normal cooling fan control will be resumed by switching the ignition switch OFF and then ON again).

Fan Control Module Input Signal Failsafe

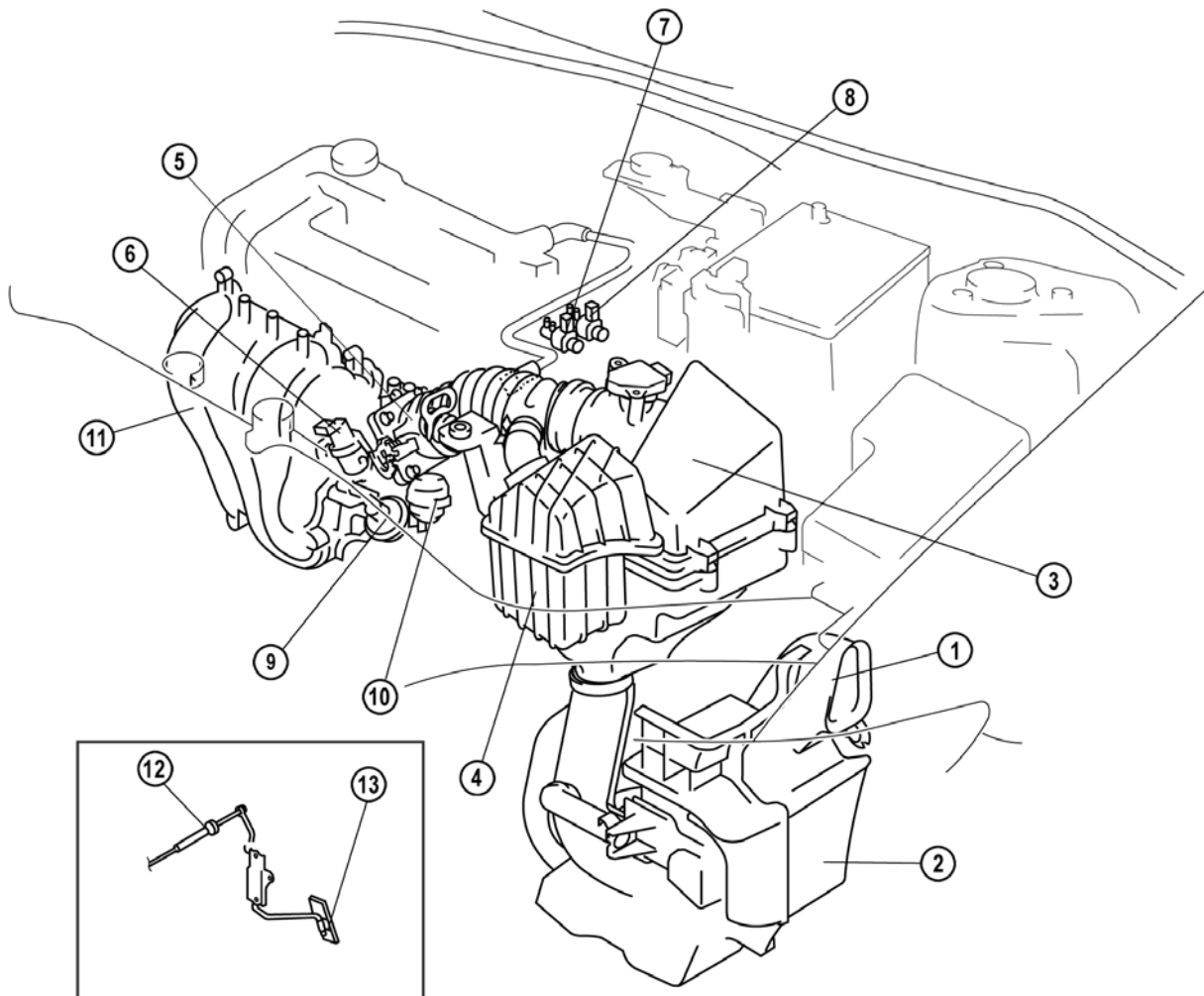
- If the voltage at input signal terminal from the fan control module remains low or high, the module determines that the fan control circuit has a malfunction and will operate the fan at high speed.

Intake-air System

Features

- The intake-air system is essentially the same as that on the current Mazda3 (BK) with LF engine. It has the following features:
 - Variable intake air system is used (LF engines only).
 - Variable tumble control system is used.
 - Two resonance chambers, one near the fresh-air duct and one near the air cleaner are used.
 - Plastic intake manifold is used.

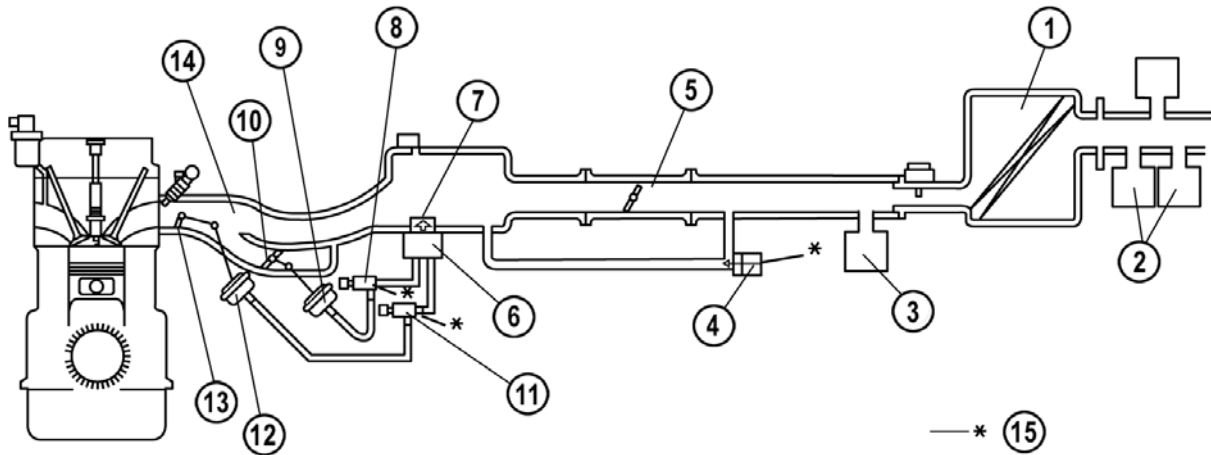
Parts Location



M5_01070

- | | | | |
|---|--|----|--|
| 1 | Fresh-air duct | 8 | Variable tumble solenoid valve |
| 2 | Resonance chamber (fresh-air duct side) | 9 | Variable intake air shutter valve actuator (LF engine) |
| 3 | Air cleaner | 10 | Variable tumble shutter valve actuator |
| 4 | Resonance chamber (air cleaner side) | 11 | Intake manifold |
| 5 | Throttle body | 12 | Accelerator cable |
| 6 | IAC valve | 13 | Accelerator pedal |
| 7 | Variable intake air solenoid valve (LF engine) | | |

System Overview



M5_01071

- | | | | |
|---|--|----|--|
| 1 | Air cleaner | 9 | Variable intake air shutter valve actuator (LF engine) |
| 2 | Resonance chamber (fresh-air duct side) | 10 | Variable intake air shutter valve (LF engine) |
| 3 | Resonance chamber (air cleaner side) | 11 | Variable tumble solenoid valve |
| 4 | IAC valve | 12 | Variable tumble shutter valve actuator |
| 5 | Throttle body | 13 | Variable tumble shutter valve |
| 6 | Vacuum chamber | 14 | Intake manifold |
| 7 | Check valve | 15 | To Powertrain Control Module |
| 8 | Variable intake air solenoid valve (LF engine) | | |

Fuel System

Features

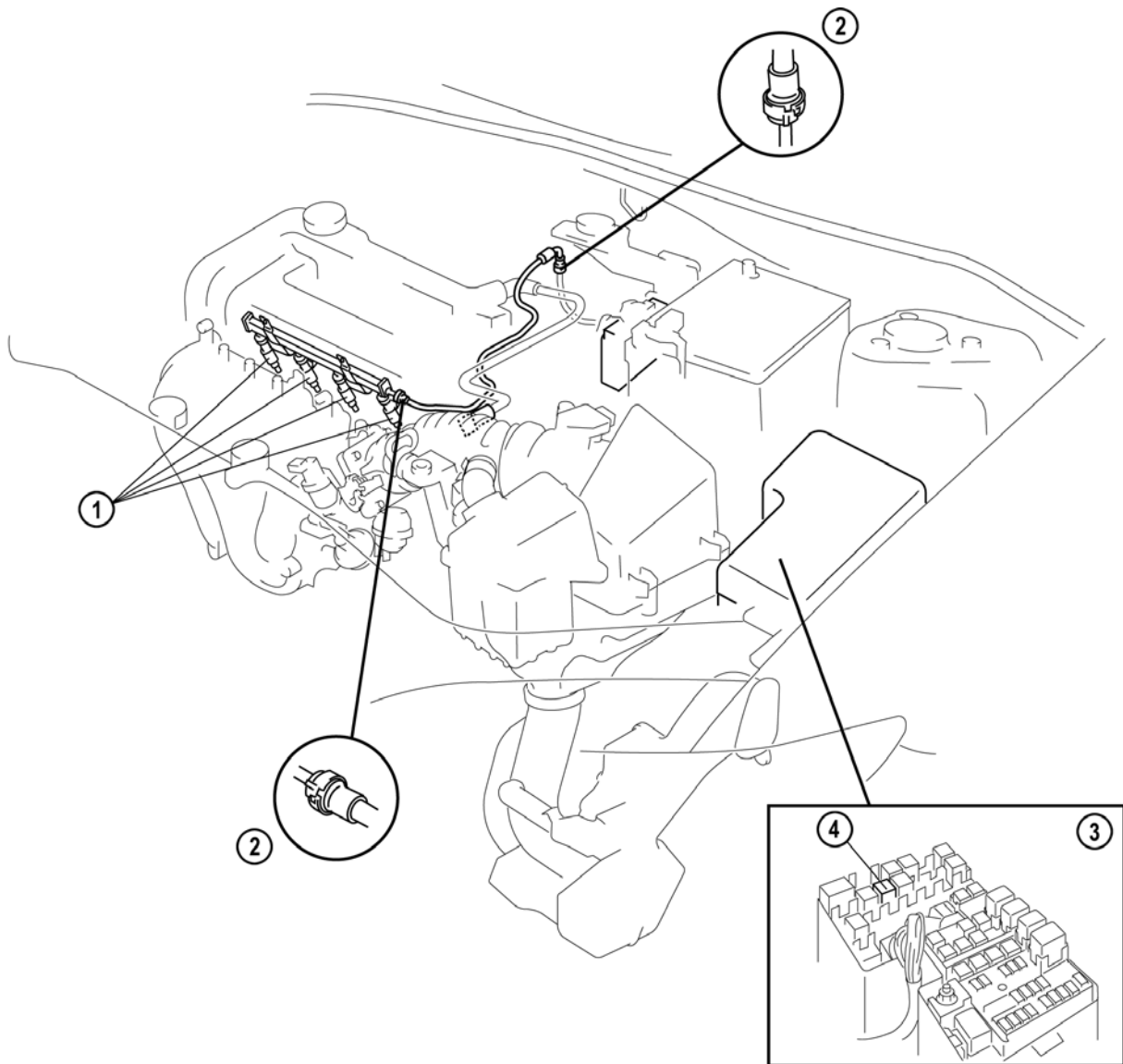
- The fuel system is essentially the same as that used on the current Mazda3 (BK) except for the following:
 - Steel fuel tank is used.
 - Fuel pump unit can be removed through access hole under second row seats.
 - Fuel pump unit can be disassembled and individual components replaced (fuel pump motor, fuel gauge sender, low pressure filter, pressure regulator).
 - Quick connectors attaching the fuel hoses to the fuel tank have been changed.
 - New SST for quick connector removal has been established.

Specifications

Item		Specifications
Injector	Type	Hi-ohmic
	Type of fuel delivery	Top-feed
	Type of drive	Voltage
Pressure regulator	Regulating pressure (approximately) (kPa {kgf/cm ² , psi})	390 {3.98, 56.6}
Fuel tank	Capacity (L {US gal, Imp gal})	60 {16, 13}
Fuel pump	Type	Electric
Fuel	Quality	Premium unleaded fuel (Research octane number is 95 or more (conforming to EN228))

M5_01T006

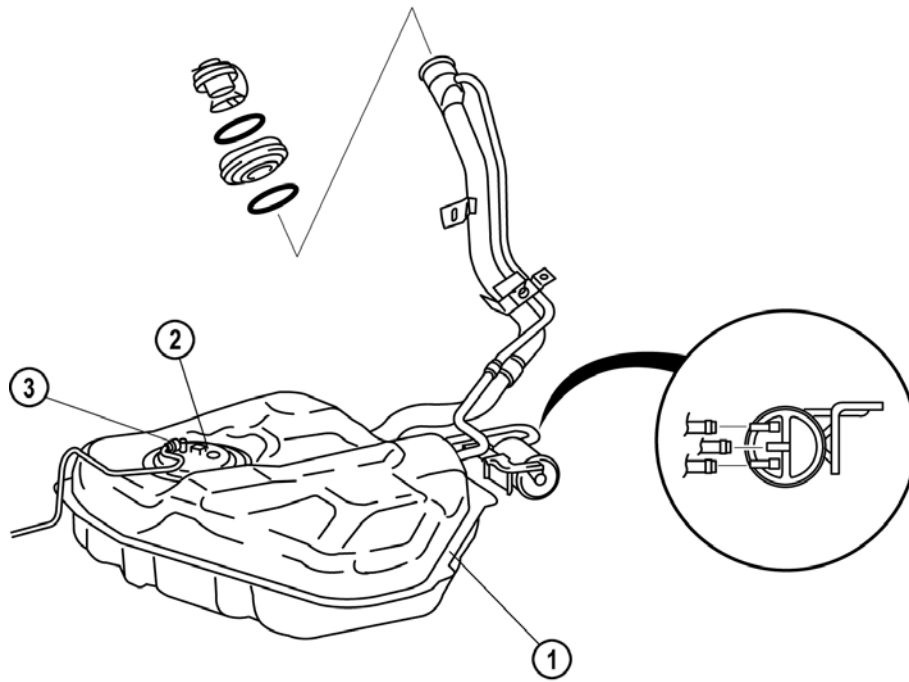
Parts Location



M5_01007

- 1 Fuel injector
- 2 Quick release connectors

- 3 Main fuse block
- 4 Fuel pump relay



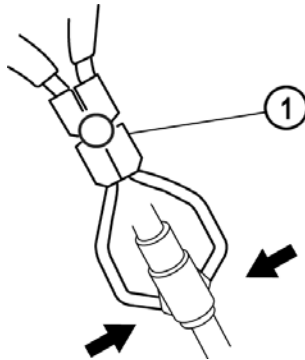
M5_01008

- 1 Fuel tank
- 2 Fuel pump unit

- 3 Quick release connector

Fuel Line Removal

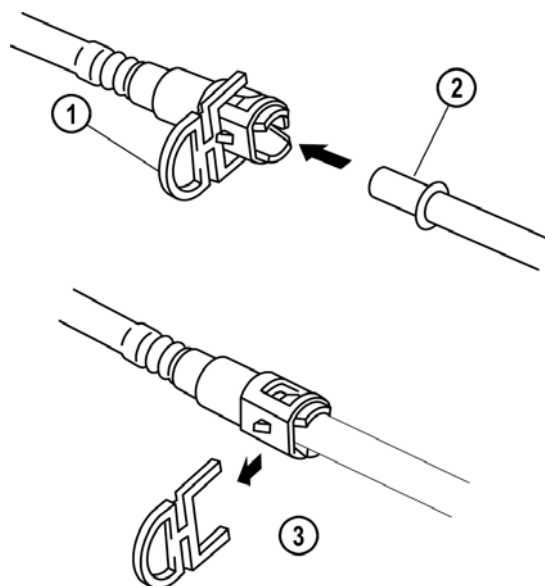
- A new SST has been introduced to enable the disconnection of the fuel line quick connector used at the fuel pump unit..
- The quick release connector can be disconnected by pinching the retainer tab with the SST and pulling the connector.



M5_01009

1 SST 49 E042 001

- The quick release connectors are fitted with a checker tab that prevents improper fit. This checker tab cannot normally be removed. When the quick release connector is properly connected to the fuel pipe, the lock is released and the checker tab comes off.



M5_01010

1 Checker tab

2 Fuel pipe

3 Fuel pipe correctly connected

Fuel Pump Control

- When the ignition is switched ON, the PCM turns the fuel pump relay on for one second.
- When a crankshaft position sensor signal is detected during cranking, the fuel pump relay is turned ON.
- The fuel pump relay remains ON for approximately two seconds after the ignition has been switched OFF, to improve engine starting.

Fuel Injection Control

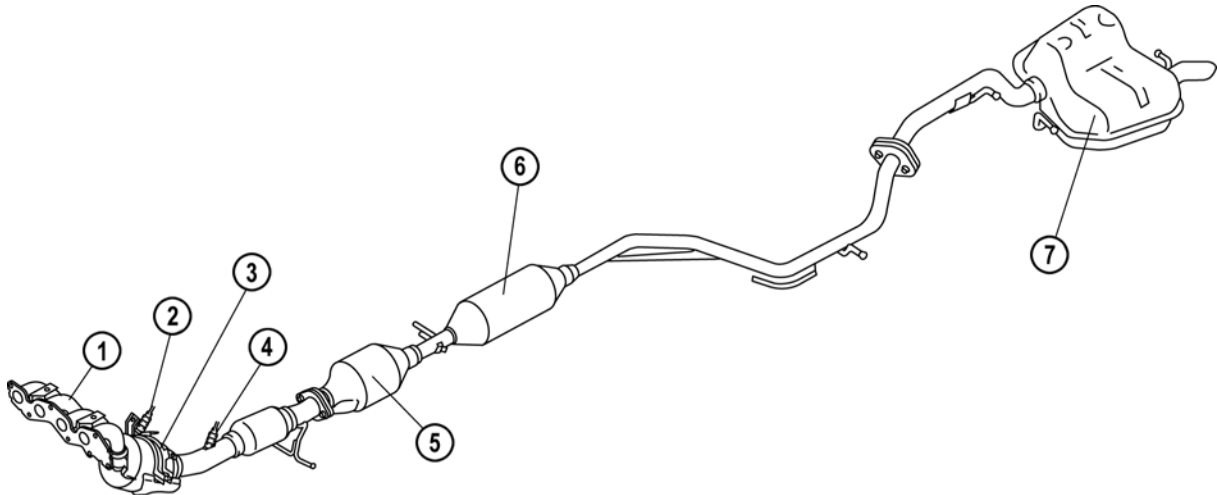
Excessive Speed Fuel Cut

- Fuel injection is cut when any of the following conditions are met:
 - When the engine speed is 6,800 rpm or more on the L8 engine, or 7,000 rpm or more on the LF engine.
 - When engine speed is 5,500 rpm or more and the engine coolant temperature is approximately -15 °C {5 °F} or less.
 - If the vehicle is stopped, and for 2 min or more the engine speed is 5,000 rpm or more and the engine coolant temperature is approximately 117 °C {243 °F}.

Exhaust System

Features

- The exhaust system has the following features:
 - An exhaust system that can be replaced in sections has been utilized.



M5_01011

- 1 Exhaust manifold
- 2 Front oxygen sensor
- 3 Warm-up three-way-catalyst
- 4 Rear oxygen sensor

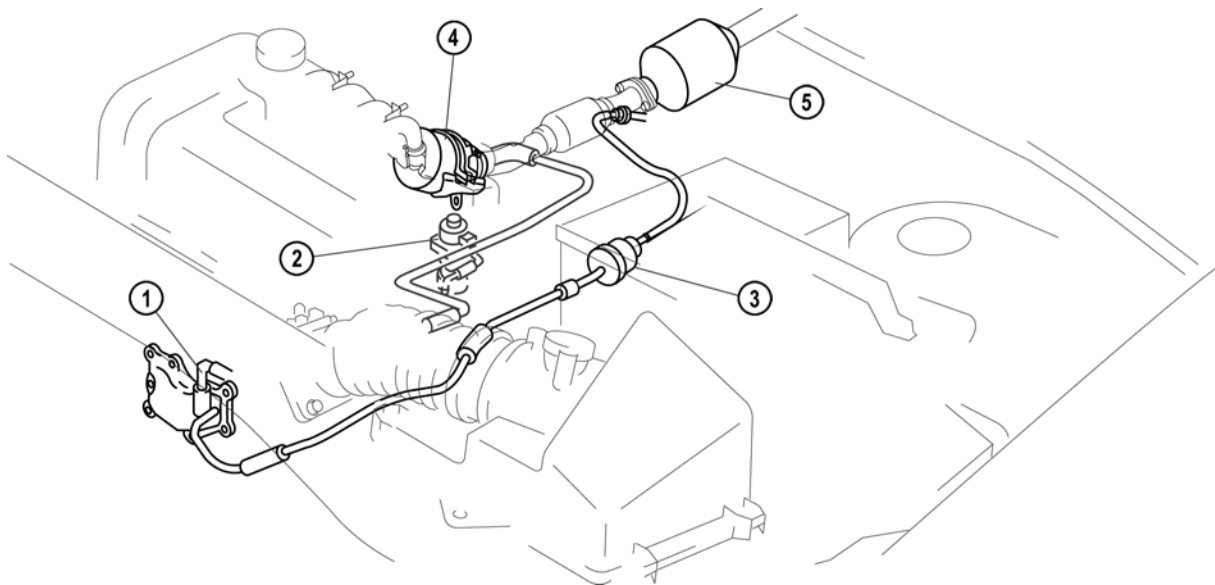
- 5 Three-way-catalyst
- 6 Pre-silencer
- 7 Main silencer

Emission System

Features

- The emission system on the Mazda5 is the same as that of the current Mazda3 (BK) with LF engine. It has the following features:
 - Exhaust gas recirculation system is used.
 - Three-way catalytic converter with warm-up converter is used.

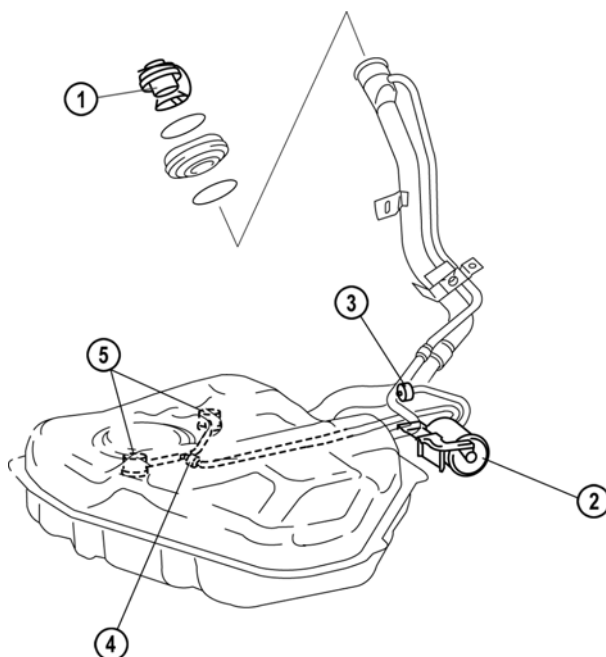
Parts Location



M5_01067

- | | | | |
|---|--------------------------------------|---|----------------------------|
| 1 | Positive crankcase ventilation valve | 4 | Warm-up three-way catalyst |
| 2 | Exhaust gas recirculation valve | 5 | Three-way catalyst |
| 3 | Purge solenoid valve | | |

Fuel Tank



M5_01068

- | | | | |
|---|---------------------|---|-----------------------|
| 1 | Fuel filler cap | 4 | Check valve (two-way) |
| 2 | Charcoal canister | 5 | Rollover valve |
| 3 | Evaporative chamber | | |

Charging System

Features

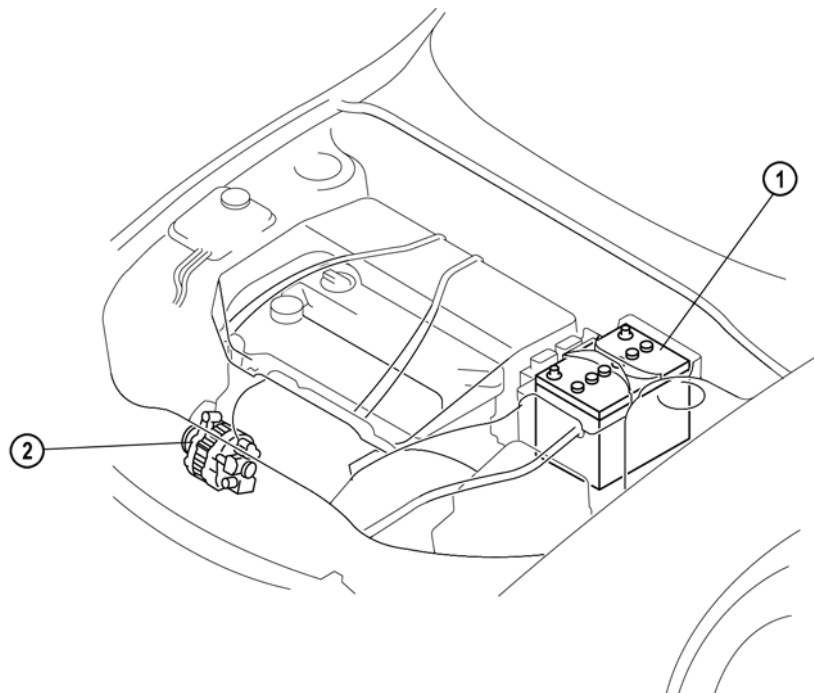
- The charging system on the Mazda5 is the same as that of the current Mazda3 (BK) with LF engine. It has the following features:
 - A non-regulator type generator with built-in power transistor is used.
 - Cooling duct is provided for the battery.

Specifications

Item		Specifications
Battery	Voltage (V)	12
	Type and capacity (5-hour rate) (A·h)	50D20L (40), 75D26L (52),
Generator	Output (V-A)	12-90
	Regulated voltage	Controlled by PCM
	Self diagnosis function	

M5_01T020

Parts Location



M5_01069

1 Battery

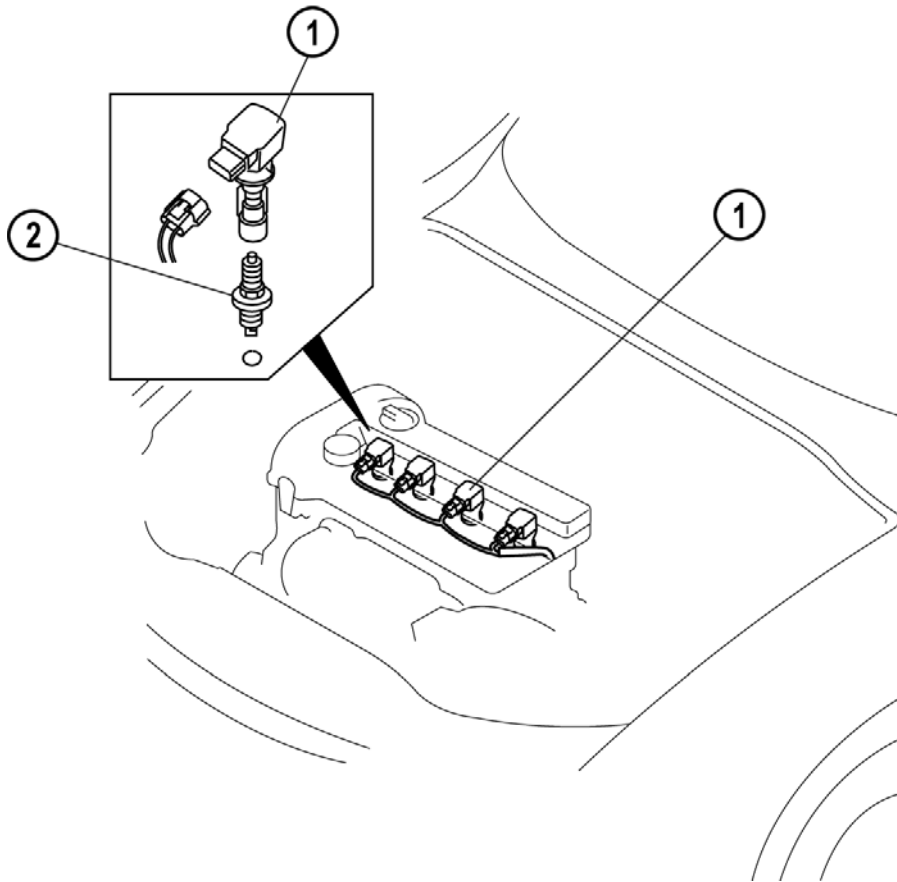
2 Generator

Ignition System

Features

- The ignition system has the following features:
 - An ignition system with direct ignition coils and independent ignition control has been adopted.
 - Iridium type spark plugs are used.

Parts Location



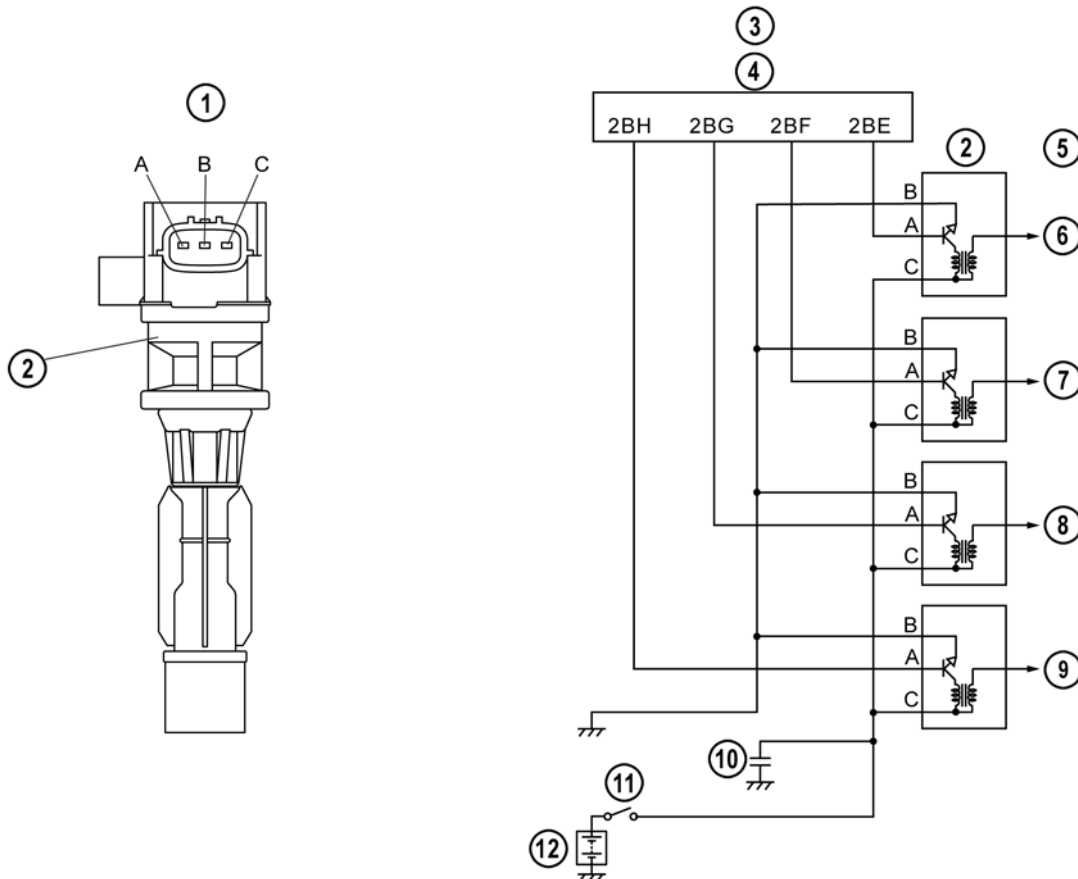
M5_01013

1 Ignition coil

2 Spark plug

Ignition Coils

- Ignition coils installed directly to each spark plug have been adopted.
- The direct ignition coil consists of an ignition coil with integrated power transistor, ignition coil connector, and rubber boot.
- Construction of the ignition coils is essentially the same as those on the current Mazda3 (BK) with ZJ/Z6 engine.



M5_01014

- | | | | |
|---|----------------------------------|----|-----------------|
| 1 | Ignition coil external view | 7 | No. 2 |
| 2 | Ignition coil | 8 | No. 3 |
| 3 | Ignition coil electrical circuit | 9 | No. 4 |
| 4 | PCM | 10 | Capacitor |
| 5 | Cylinder number | 11 | Ignition switch |
| 6 | No. 1 | 12 | Battery |

Control System**Features**

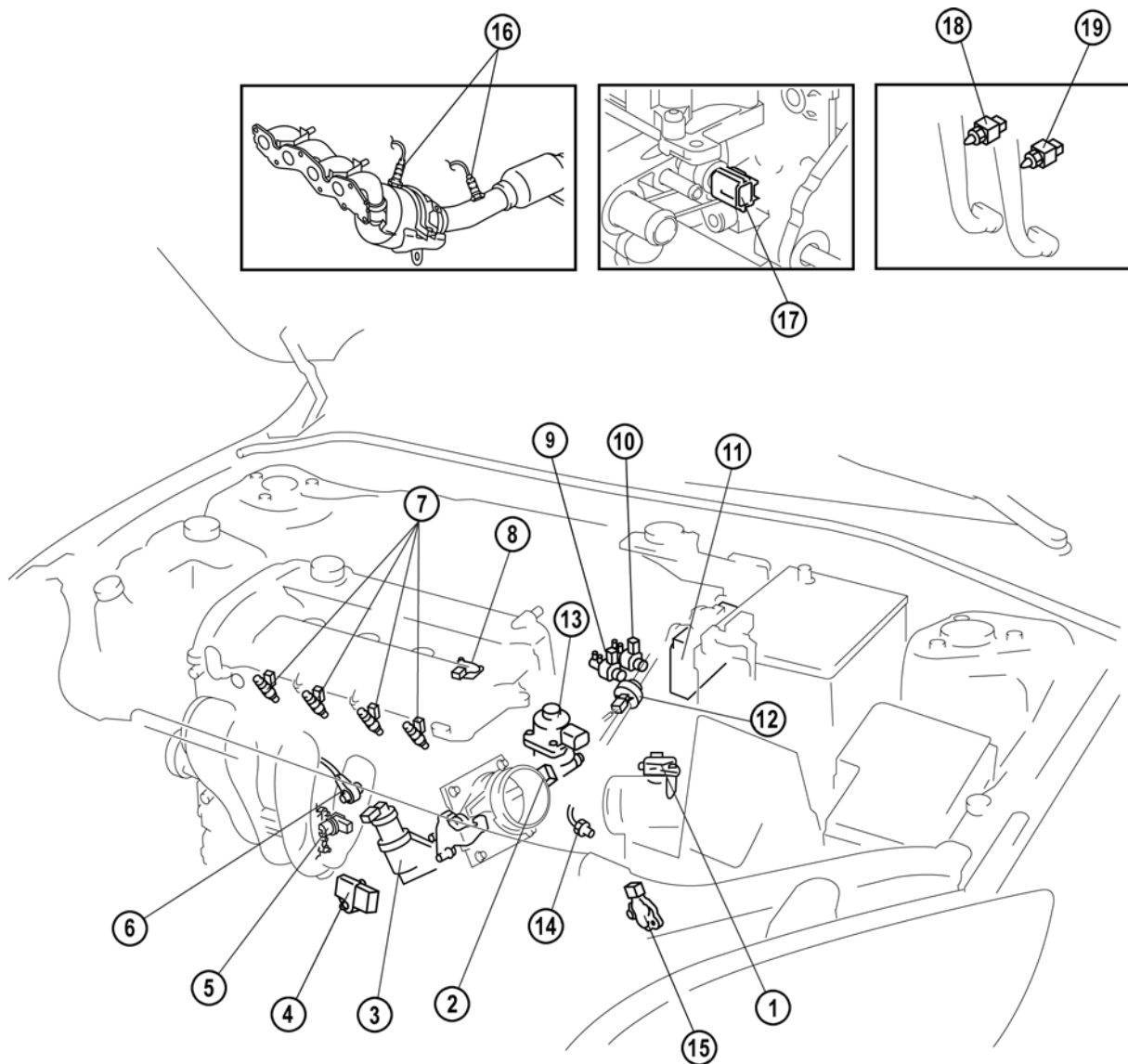
- The engine control system is essentially the same as that of the Mazda3 (BK) with LF engine.

Specifications

Item	Specification
Neutral switch	ON/OFF
CPP switch	ON/OFF
ECT sensor	Thermistor
IAT sensor (inside MAF)	Thermistor
TP sensor	Potentiometer
MAF sensor	Hot-wire
Front HO ₂ S	Zirconia element (Stoichiometric air/fuel ratio sensor)
Rear HO ₂ S	Zirconia element (Stoichiometric air/fuel ratio sensor)
BARO sensor (built into PCM)	Piezoelectric element
KS	Piezoelectric element
MAP sensor	Piezoelectric element
CKP sensor	Magnetic pickup
CMP sensor	Magnetic pickup
Brake switch	ON/OFF

M5_01T019

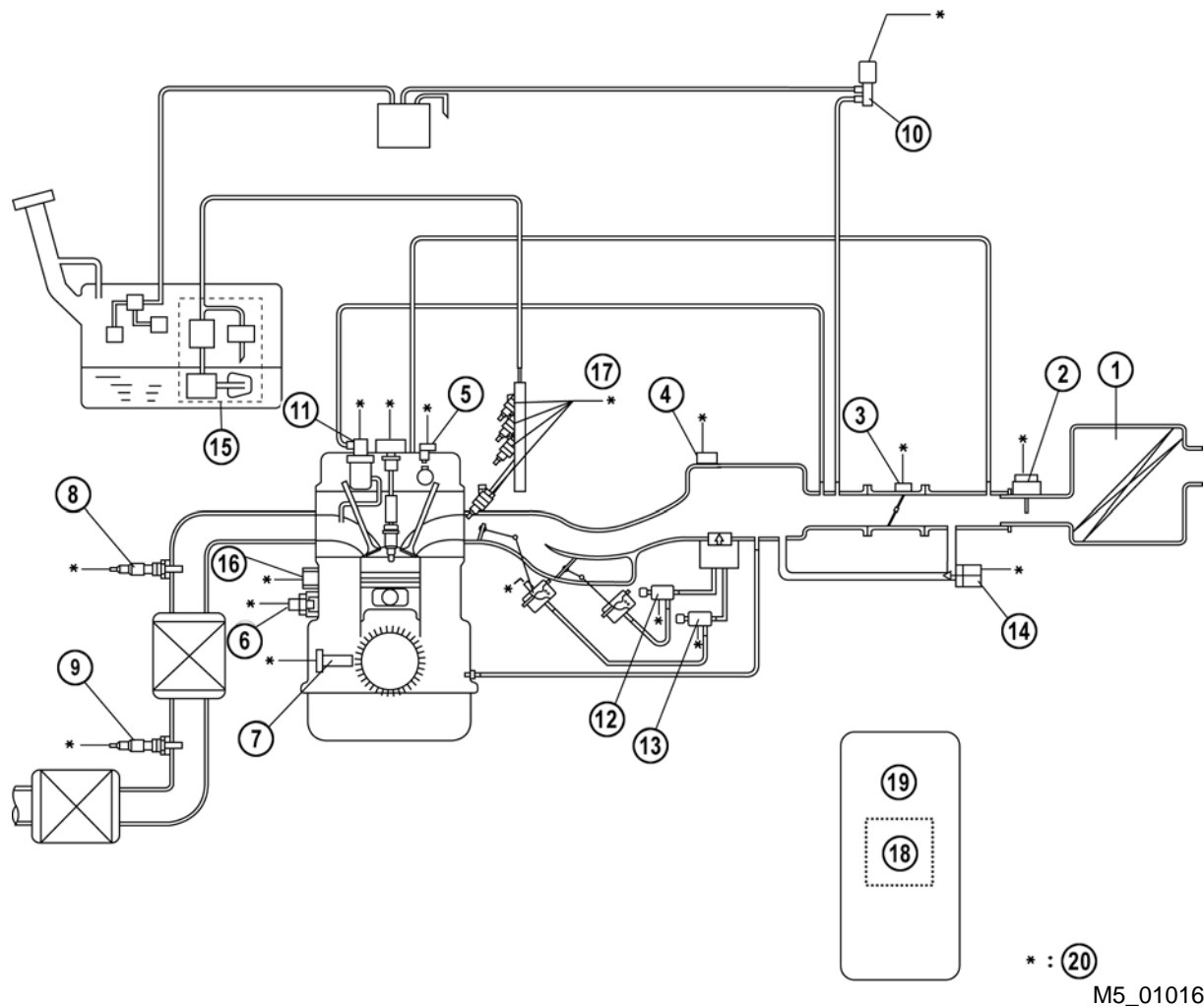
Parts Location



M5_01015

- | | | | |
|----|--------------------------------|----|----------------------|
| 1 | MAF/IAT sensor | 11 | PCM |
| 2 | TP sensor | 12 | Purge solenoid valve |
| 3 | IAC valve | 13 | EGR valve |
| 4 | MAP sensor | 14 | Neutral switch (MT) |
| 5 | CKP sensor | 15 | TR switch (AT) |
| 6 | KS | 16 | HO2S (front, rear) |
| 7 | Fuel injector | 17 | ECT sensor |
| 8 | CMP sensor | 18 | Brake switch |
| 9 | VIS solenoid valve (LF engine) | 19 | CPP switch (MT) |
| 10 | VTCS solenoid valve | | |

System Overview



- 1 Air cleaner
- 2 MAF/IAT sensor
- 3 TP sensor
- 4 MAP sensor
- 5 CMP sensor
- 6 ECT sensor
- 7 CKP sensor
- 8 Front H O2S
- 9 Rear HO2S
- 10 Purge solenoid valve

- 11 EGR valve
- 12 VIS solenoid valve (LF engine)
- 13 VTCS solenoid valve
- 14 IAC valve
- 15 Fuel pump unit
- 16 KS
- 17 Fuel injector
- 18 BARO sensor
- 19 PCM
- 20 To PCM

M5_01016

Relationship Chart

Component	Idle air control (IAC)	Variable intake-air system	Variable tumble control system	Fuel injection control	Fuel pump control	Electronic spark advance (ESA) control	EGR control	Purge control	Front HO2S heater control	Rear HO2S heater control	A/C cut-off control	Electrical fan control	Immobiliser system	Generator control
Input														
IAT sensor	x			x		x	x	x	x					x
MAF sensor	x			x		x	x	x	x	x				
TP sensor	x		x	x		x	x		x		x	x		
MAP sensor	x			x										
ECT sensor	x		x	x		x	x		x	x	x	x		x
CMP sensor				x		x								
CKP sensor	x	x	x	x	x	x	x	x	x	x	x			x
KS						x								
Front HO2S				x				x						
Rear HO2S				x										
BARO sensor	x			x										
Neutral switch	x			x										
CPP switch	x			x										
Brake switch	x			x										
A/C on request signal, refrigerant pressure switch (high, low pressure)	x			x		x					x	x		
Refrigerant pressure switch (medium pressure)	x													
Battery voltage				x		x	x	x				x		x
Generator (terminal P: stator coil)	x			x		x								x
Vehicle speed signal	x			x		x	x					x		x
Instrument cluster	x			x	x	x							x	
Output														
IAC valve	x													
VIS solenoid valve		x												
VTCS solenoid valve			x											
Fuel injectors				x										
Fuel pump relay					x									
Ignition coil						x								
EGR valve							x							
Purge solenoid valve								x						
Front HO2S heater									x					
Rear HO2S heater										x				
A/C relay											x			
Fan control module												x		
Starter relay													x	
Generator (terminal D: field coil)														x

M5_01T007

Mechanical System

Features

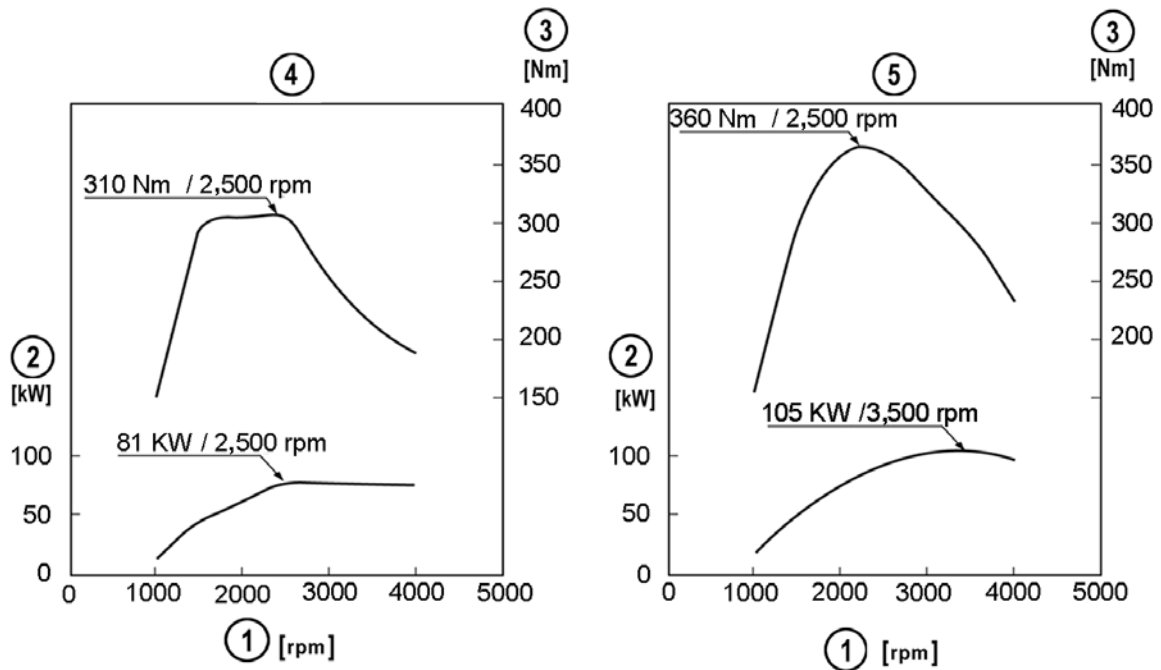
- The mechanical system of the vehicles with 2.0 MZR-CD engine has the following features:
 - Pistons with a modified combustion chamber have been introduced.
 - Cylinder head with integrated injector leak-off lines has been introduced.

Specifications

Item		Specification	
Type		Diesel 4-stroke	
Cylinder arrangement and number		Inline, 4-cylinder	
Combustion chamber		Direct injection	
Valve system		SOHC, belt driven, 16-valve	
Displacement		(ml {cc, cu in})	1,998 {1,988, 122.9}
Bore x stroke		(mm {in})	86.0 x 86.0 {3.39 x 3.39}
Compression ratio		16.7	
Compression pressure		(kPa {kgf/cm ² , psi} [rpm])	2,900 {29.6, 420.7} [250]
Valve timing	IN	Open BTDC (°)	6
		Close ABDC (°)	30
	EX	Open BBDC (°)	41
		Close ATDC (°)	8
Valve clearance (engine cold)	IN	(mm {in})	0.12-0.18 {0.0048-0.0070}
	EX	(mm {in})	0.32-0.38 {0.0126-0.0149}

M5_01T008

Engine Performance Curve

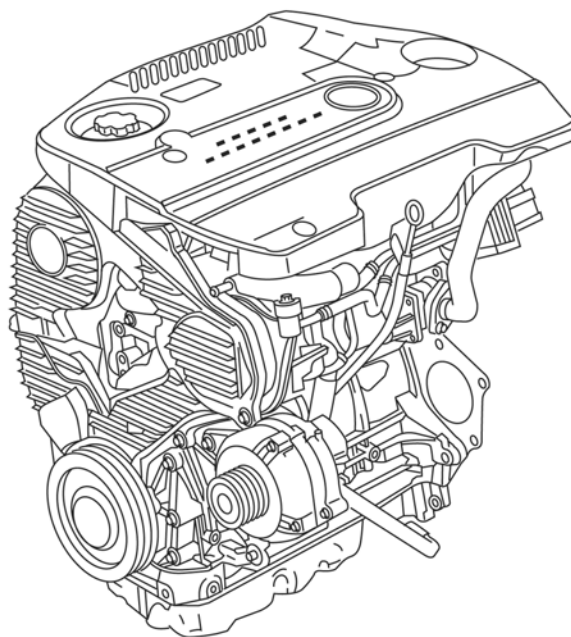


- 1 Engine speed
- 2 Power
- 3 Torque

- 4 Standard power engine
- 5 High power engine

M5_01018

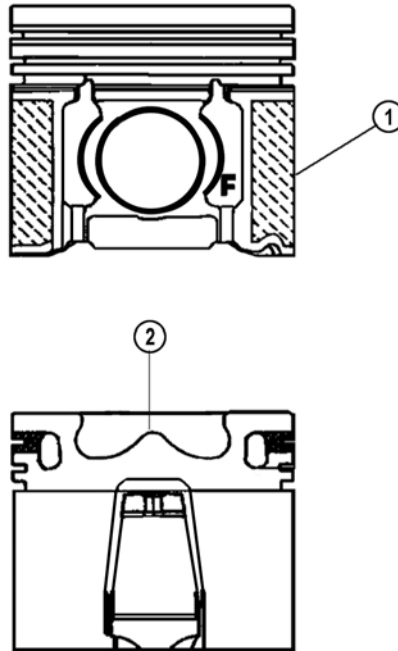
Overview



M5_01019

Pistons

- Pistons with a modified combustion chamber have been introduced to achieve a lower compression ratio of $\epsilon = 16.7$. This leads to lower pumping losses and optimized thermal efficiency at middle and high engine load, reducing the fuel consumption.



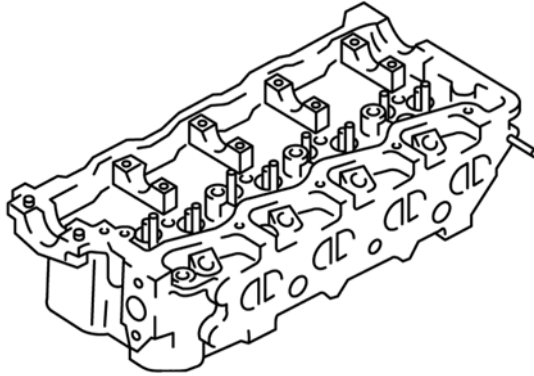
M5_01020

1 Coating

2 Combustion chamber

Cylinder Head

- A cylinder head with integrated leak-off lines for the injectors has been introduced.



M5_01021

Lubrication System

Features

- The lubrication system of the vehicles with 2.0 MZR-CD engine has the following features:
 - An engine oil with reduced ash content has been introduced.
 - An oil dipstick with an additional “X” mark has been introduced.
 - Oil cooler and oil filter located at the rear of the engine have been introduced.

Specifications

Item		Specification
Type		Force-fed type
Oil pressure (reference value) [oil temperature: 100 °C {212 °F}]		(kPa {kgf/cm ² , psi}) 147 {1.5, 21} min. [1,000] [rpm] 343 {3.5, 50} min. [3,000]
Oil pump	Type	Trochoid gear type
	Relief valve opening pressure (reference value)	(kPa {kgf/cm ² , psi}) 580-700 {5.9-7.1, 84.1-101.5} [3,000] [rpm]
Oil cooler	Type	Water-cooled
Oil filter	Type	Full-flow, paper element
	Bypass pressure	(kPa {kgf/cm ² , psi}) 78-118 {0.8-1.2, 11.3-17.1}
Oil capacity (approx. quantity)	Total (dry engine)	(L {US qt, Imp qt}) 5.5 {5.8, 4.8}
	Oil replacement	(L {US qt, Imp qt}) 4.9 {5.2, 4.3}
	Oil and oil filter replacement	(L {US qt, Imp qt}) 5.1 {5.4, 4.5}

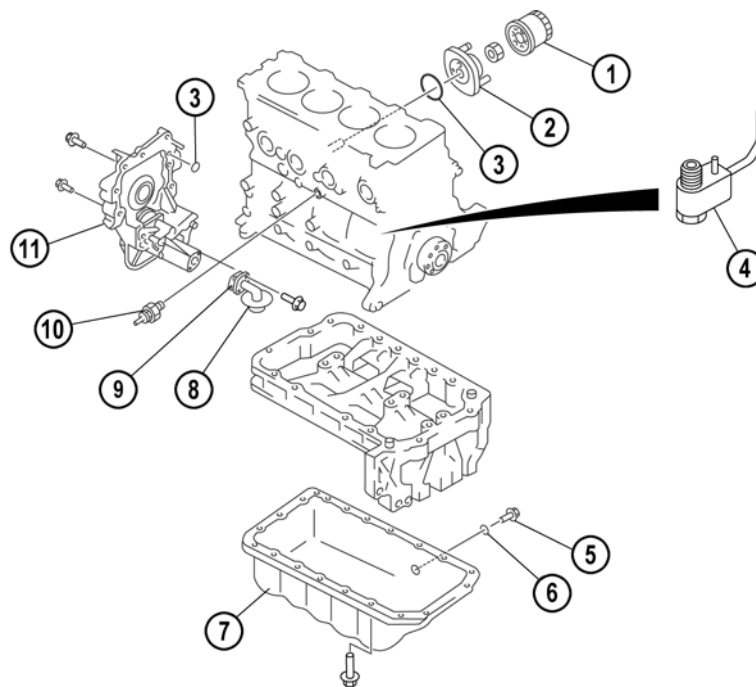
M5_01T009

Engine Oil

Item	Specification
Grade	ACEA C1 or JASO DL-1
Viscosity	SAE 5W-30
Recommended oil	e.g. Mazda genuine Dexelia DPF

M5_01T010

Parts Location



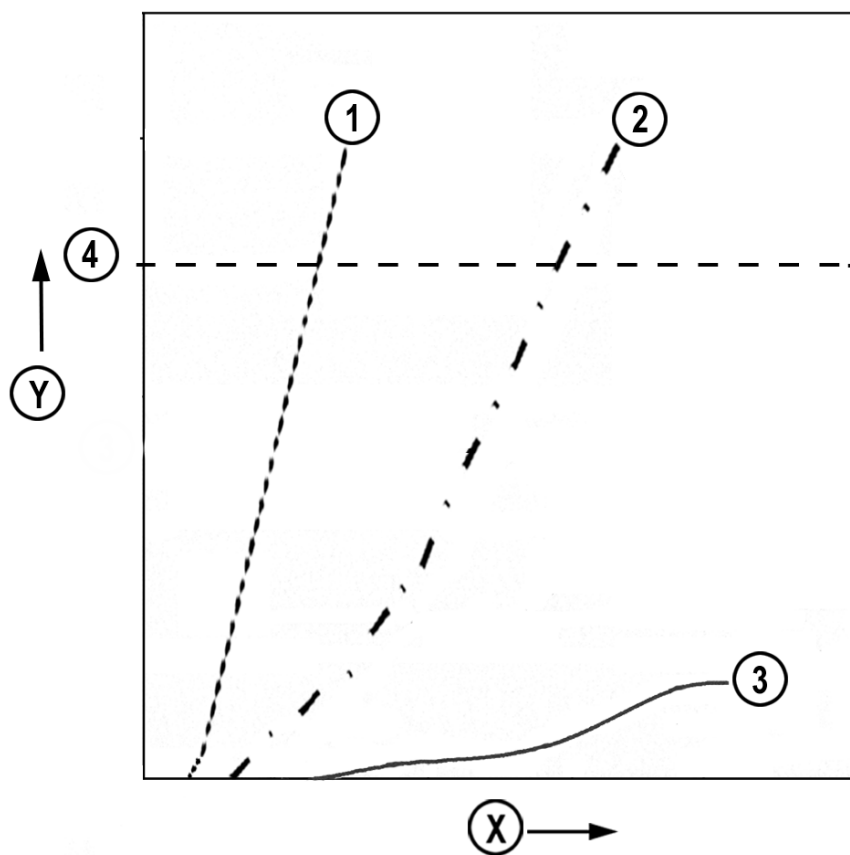
M5_01022

- | | | | |
|---|----------------|----|---------------------|
| 1 | Oil filter | 7 | Oil pan |
| 2 | Oil cooler | 8 | Oil strainer |
| 3 | O-ring | 9 | Gasket |
| 4 | Oil jet valve | 10 | Oil pressure switch |
| 5 | Oil drain plug | 11 | Oil pump |
| 6 | Washer | | |

Engine Oil

- In order to limit the ash amount accumulated in the diesel particulate filter, an engine oil with reduced ash content is required. This oil must meet the specification ACEA C1 (equivalent to the Japanese specification JASO DL-1) and is also termed as low **SAPS** (**S**ulphate **A**sh, **P**hosphor, **S**ulphur) oil, since it has a reduced proportion of these components.

NOTE: The use of engine oil with a higher ash content is strictly forbidden as this can lead to blockage of the DPF. In addition, the usable filter volume is reduced significantly due to the ash amount deposited in the DPF. As a result, the regeneration intervals are shortened, so that the fuel consumption and hence the oil dilution are increased.



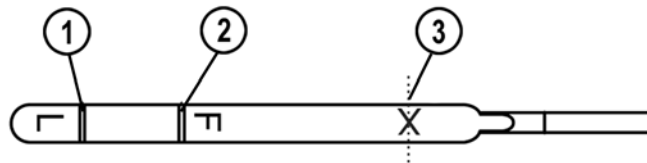
M5_01058

- | | | | |
|---|--|---|------------------------------|
| X | Service life of DPF | Y | Ash amount in the DPF |
| 1 | Normal engine oil (ACEA A3/B3/B4) | 3 | Mazda low SAPS oil (ACEA C1) |
| 2 | Conventional low SAPS oil (ACEA C2/C3) | 4 | DPF blocked with ash |

Oil Dipstick

- Since the fuel post-injections required to regenerate the DPF can lead to an excessively high engine oil dilution, an “X” mark has been added to the oil dipstick to make the customer aware of this condition. If the oil level is close to or exceeds the “X” mark, the engine oil must be replaced.

NOTE: Every time the engine oil is replaced, the parameter “Calculated oil dilution” in the PCM must be reset (refer to the section “Control System, Maintenance and Repair”).



M5_01023

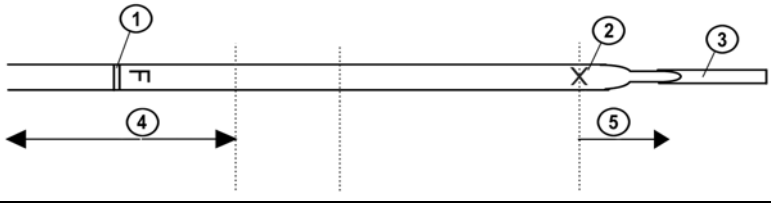
- 1 L mark (Low)
- 2 F mark (Full)

- 3 X mark (Excessive)

Oil Dilution Calculation

- The PCM calculates the oil dilution amount based on the duration of the regeneration process and the regeneration intervals.
- If the engine oil level reaches a certain limit due to oil dilution, DTC P252F is stored in the PCM but no warning light is illuminated. This DTC comes up when the regeneration of the DPF has been started multiple times but could never be completed due to the driving method (such as frequent short distance driving with low engine speed etc.). In this case, check the engine oil level. If the oil level is lower than the “X” mark on the dipstick, delete the DTC. In addition, the customer must be informed to change the driving method (such as driving the vehicle at middle or high engine speeds for a longer distance), so that regeneration of the DPF is enabled.
- If the engine oil performance and engine oil level is approaching the limit due to oil dilution, the DPF indicator light flashes and DTC P253F is stored in the PCM. In addition, the PCM reduces the fuel injection amount to protect the engine. However, the engine could be damaged if the vehicle continues to be driven. In this case, replace the engine oil even if the engine oil level is lower than the “X” mark on the dipstick. In addition, the customer must be informed to change the driving method (such as driving the vehicle at middle or high engine speeds for a longer distance), so that regeneration of the DPF is enabled.

- The different conditions of the oil dilution are described in the following table.

Item	Engine oil dilution		
Engine oil level			
DPF indicator light	—	—	Flashes every 0.4 s
MIL	—	—	—
Output restriction	—	—	Max. 150 km/h (93 mph)
DTC stored in PCM	P252F		P253F
Customer action	—	—	Bring the vehicle to a dealer
DPF automatic regeneration	Enabled		Disabled
Dealer action	—	—	<p>If DTC 253F is stored in the PCM, replace the engine oil even if the engine oil level is lower than the "X" mark on the oil dipstick.</p> <p>After inspecting engine oil level replace the engine oil.</p>

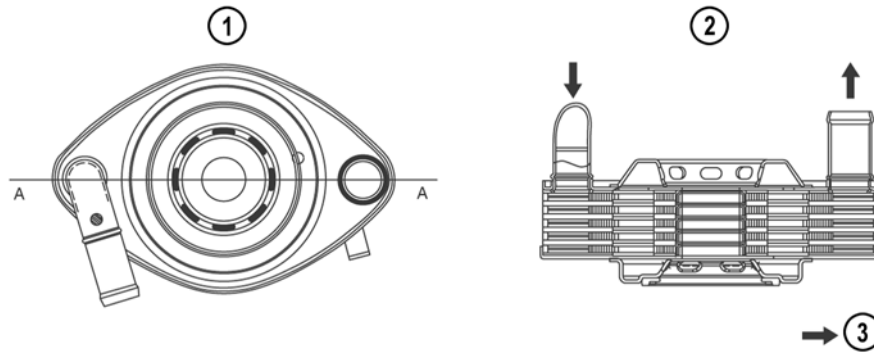
M5_01T011

- 1 F mark
- 2 X mark
- 3 Oil dipstick

- 4 Oil level okay
- 5 Oil level excessive

Oil Cooler and Oil Filter

- An oil cooler and oil filter located at the rear of the engine have been introduced.



M5_01024

- 1 External view
- 2 Cut-view A-A

- 3 Engine coolant flow direction

Cooling System

Features

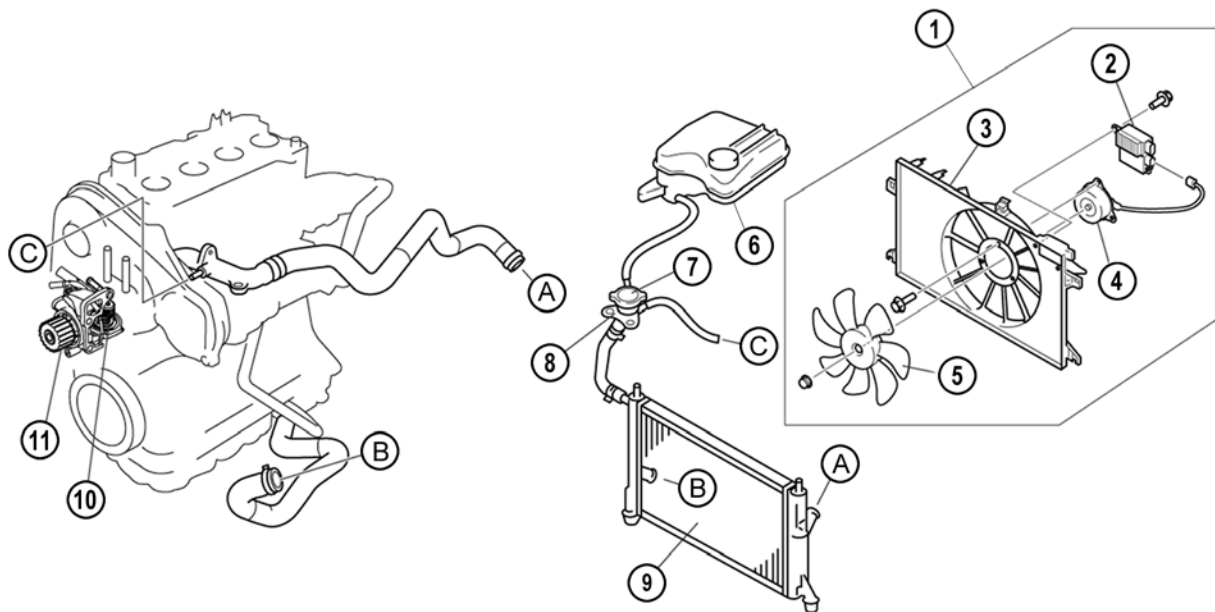
- The cooling system of the vehicles with 2.0 MZR-CD engine has the following features:
 - A long-life engine coolant has been introduced (similar to that of the L8/LF engines).
 - Separate cooling system filler neck has been introduced (similar to that of the L8/LF engines).
 - Stepless cooling fan controlled by a fan control module has been introduced (similar to that of the L8/LF engines).

Specifications

Item		Specification
Type		Water-cooled, Electromotive
Coolant capacity (approx. quantity) (L {US qt, Imp qt})		With heater: 8.5 {9.0, 7.5} Without heater: 8.0 {8.5, 7.0}
Water pump	Type	Centrifugal, Timing belt-driven
Thermostat	Type	Wax, bottom-bypass
	Opening temperature (°C {°F})	80-84 {176-183}
	Full-open temperature (°C {°F})	95 {203}
	Full-open lift (mm {in})	8.5 {0.33} or more
Radiator	Type	Corrugated fin
Cooling system cap	Cap valve opening pressure (kPa {kgf/cm ² , psi})	93.2-122.6 {0.95-1.25, 13.5-17.8}
Cooling fan	Type	Electric
	Number of blades	7
	Outer diameter (mm {in})	360 {14.2}
	Fan motor output (W)	240

M5_01T012

Parts Location



M5_01025

- 1 Cooling fan assembly
- 2 Fan control module
- 3 Radiator cowling
- 4 Cooling fan motor
- 5 Cooling fan
- 6 Coolant reserve tank

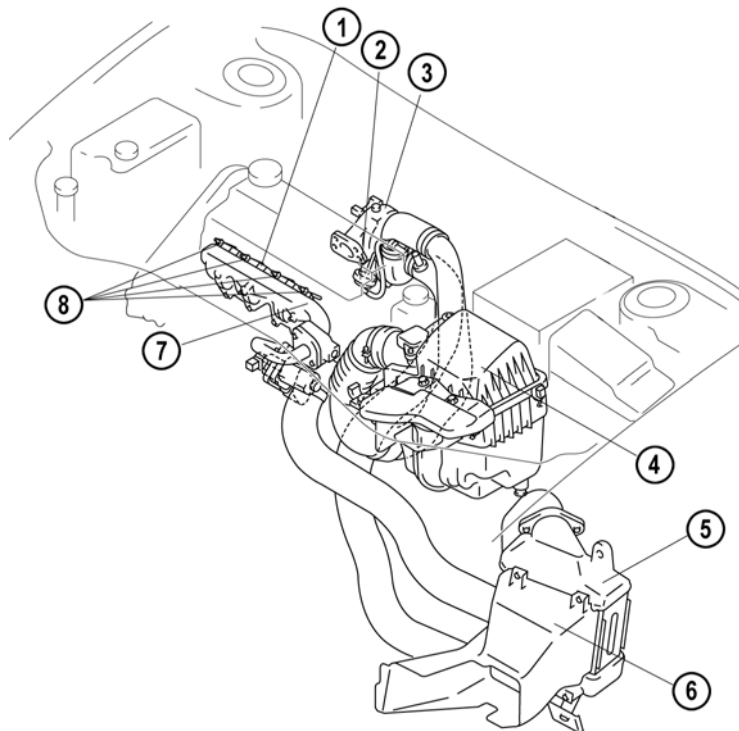
- 7 Cooling system cap
- 8 Cooling system filler neck
- 9 Radiator
- 10 Thermostat
- 11 Water pump

Intake-air System

Features

- The intake-air system of the vehicles with 2.0 MZR-CD engine has the following features:
 - MAF learning function has been cancelled.
 - Turbocharger with variable geometry turbine and reduced turbine diameter has been introduced.
 - Manifold absolute pressure sensor located above the intake manifold has been introduced.
 - Variable swirl control valves have been cancelled.

Parts Location

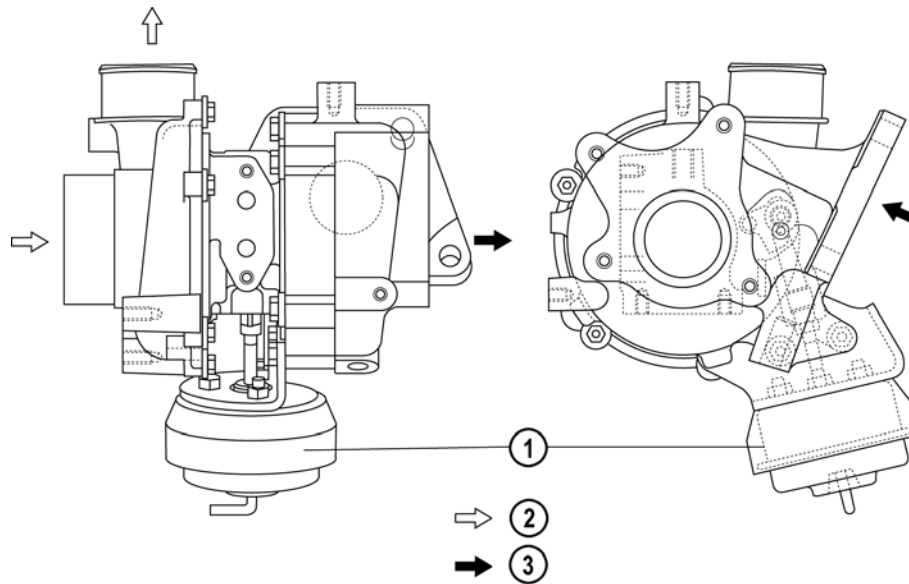


M5_01026

- | | | | |
|---|---------------------|---|------------------------|
| 1 | Glow plug lead | 5 | Charge-air cooler |
| 2 | VBC vacuum actuator | 6 | Charge-air cooler duct |
| 3 | Turbocharger | 7 | Intake manifold |
| 4 | Air cleaner | 8 | Glow plug |

Turbocharger

- A turbocharger with variable geometry turbine and reduced turbine diameter has been introduced. This leads to a lower inertia moment of the turbine, improving the response of the engine during acceleration.



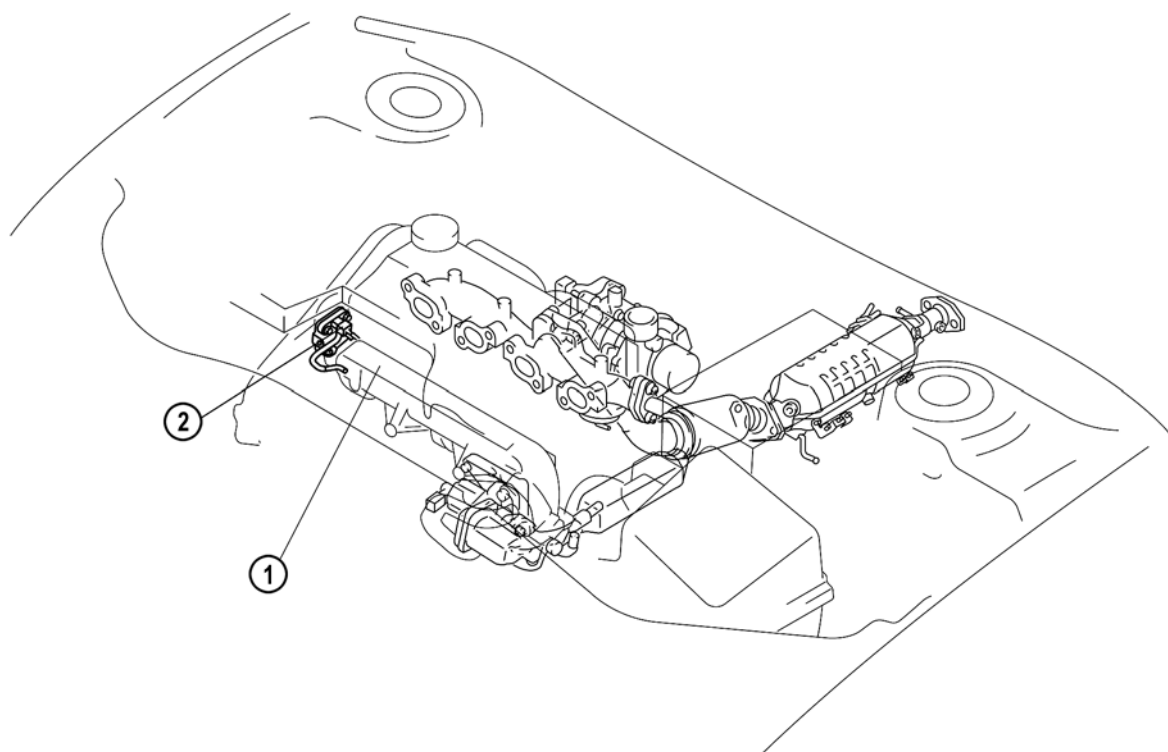
M5_01027

- 1 VBC vacuum actuator
- 2 Intake air flow

- 3 Exhaust gas flow

Manifold Absolute Pressure Sensor

- A **MAP (Manifold Absolute Pressure)** sensor located above the intake manifold has been introduced.



M5_01059

1 Intake manifold

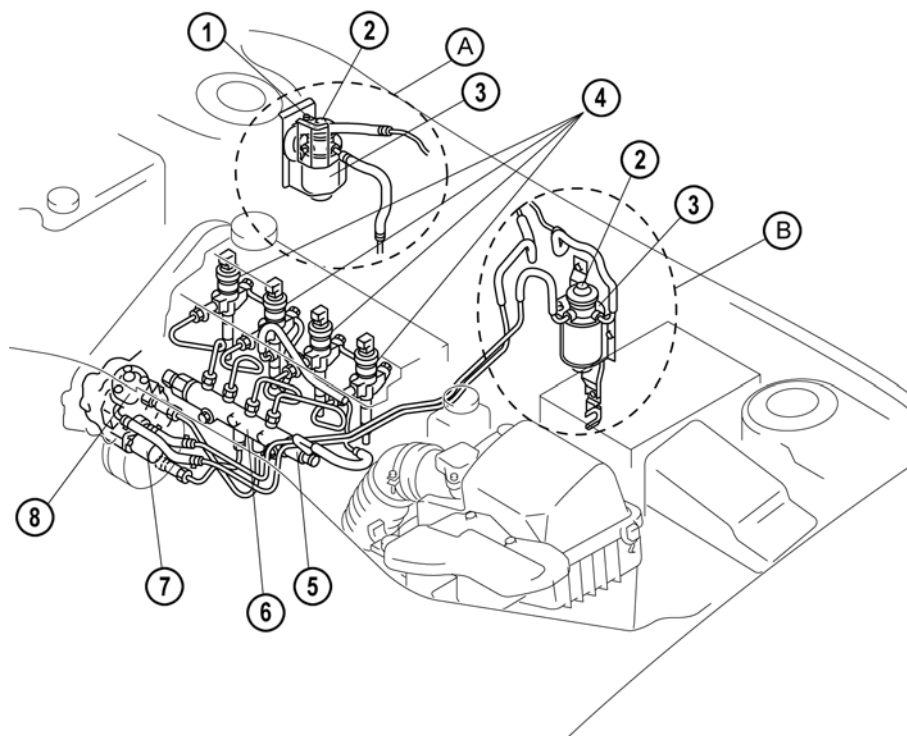
2 MAP sensor

Fuel System

Features

- The fuel system of the vehicles with 2.0 MZR-CD engine has the following features:
 - Common rail located above the intake manifold has been introduced.
 - Solenoid valve-type injectors with injector correction factors have been introduced.
 - Injector driver module has been cancelled.
 - Injection amount learning function has been modified.

Parts Location

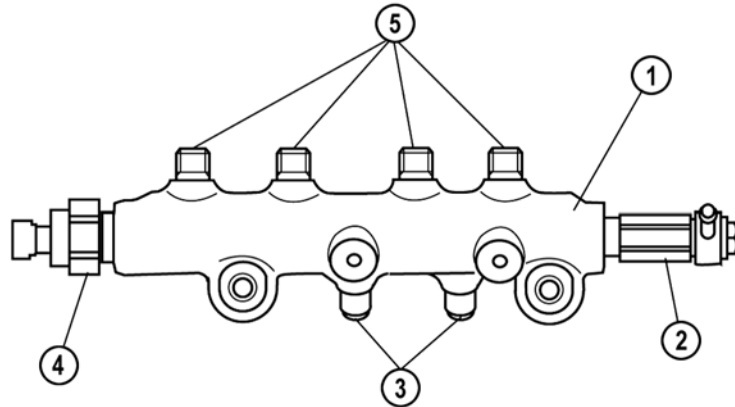


M5_01028

A	LHD	B	RHD
1	Fuel warmer	5	Pressure limiter valve
2	Priming pump	6	Common rail
3	Fuel filter	7	Fuel metering valve
4	Fuel injector	8	High-pressure pump

Common Rail

- A common rail located above the intake manifold has been introduced.

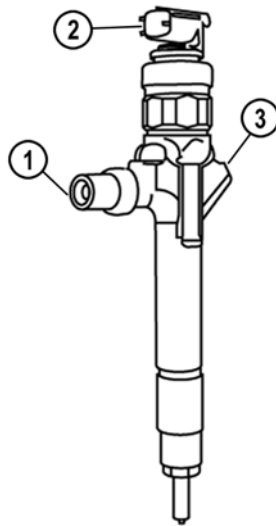


M5_01060

- | | | | |
|---|--------------------------------------|---|---------------------------------|
| 1 | Common rail | 4 | Fuel pressure sensor |
| 2 | Pressure limiter valve | 5 | Connection (fuel injector-side) |
| 3 | Connection (high-pressure pump-side) | | |

Injectors

- Solenoid valve-type injectors with lower power consumption and better response have been introduced.



M5_01072

1 From common rail
2 Connector

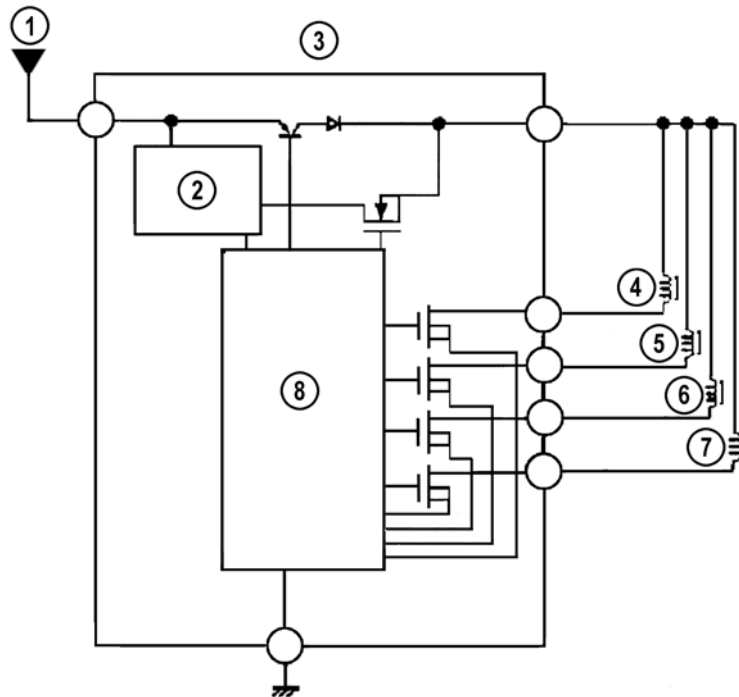
3 To fuel tank

NOTE: Since the size of the injector connector is relatively big compared to the diameter of the injector head, there might be an interference between the connector and the injector seal during removal and installation of the cylinder head cover. In order to prevent any damage to the seal, wrap vinyl tape around the injector connector covering its edges.

- In addition, the leak-off lines of the injectors are located under the cylinder head cover. As a result, the total leak-off amount of the injectors must be measured and compared to the values of a known good vehicle in order to detect a leaking solenoid valve.

NOTE: Always replace the gaskets of the injector leak-off lines when removing them. As the leak-off lines are located under the cylinder head cover, fuel leaking from the lines can contaminate the engine oil. This results in engine oil dilution and hence in engine damage.

- The injectors are directly driven by the PCM. The module has a high-voltage generator inside, which amplifies the battery voltage into a high voltage of approx. 90 V and stores it in a capacitor. A control circuit outputs the high voltage to the injectors as a drive signal.



M5_01073

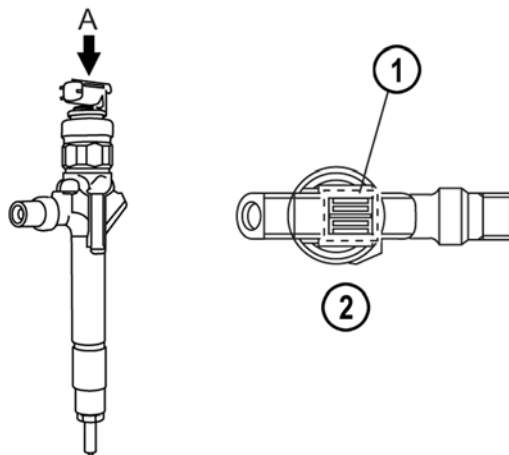
1	From PCM control relay	5	Injector no 2
2	High voltage generator	6	Injector no 3
3	PCM	7	Injector no.4
4	Injector no.1	8	Control circuit

- All injectors are connected in parallel, i.e. they feature the same PCM terminal for the positive voltage supply. In case of an open circuit on one injector the PCM cuts off the power supply for this injector, so that the engine still runs on three cylinders.

- When the required injection amount is small, the PCM outputs a short drive signal to the injectors. As a result, the opening time of the injectors is short, resulting in a small injection amount.
- When the required injection amount is large, the PCM outputs a long drive signal to the injectors. As a result, the opening time of the injectors is long, resulting in a large injection amount.

Injector Correction Factors

- The manufacturing tolerances of the injectors are taken into account by injector correction factors. The correction factors are determined during injector production and are labeled as hexadecimal numbers (seven four-digit blocks and one two-digit block) on top of the injector connector.
- At the end of the vehicle production line the injector correction factors of the installed injectors are programmed into the PCM. Hereby the PCM equalizes the injection amount of the individual injectors in order to improve engine running, combustion noise and exhaust emissions.



M5_01029

1 Injector correction factor

2 View from A

NOTE: After replacing one or more injectors, several steps must be performed to ensure their proper function (refer to the section “Control System, Maintenance and Repair”).

NOTE: When re-installing the injectors after a repair, they must be matched to the cylinders they were removed from. Therefore make a note of the injector correction factors and the allocated cylinders before removing the injectors. Failure to follow this instruction may cause irregular idling, increased combustion noise and/or increased black smoke emissions.

Injection Amount Learning Function

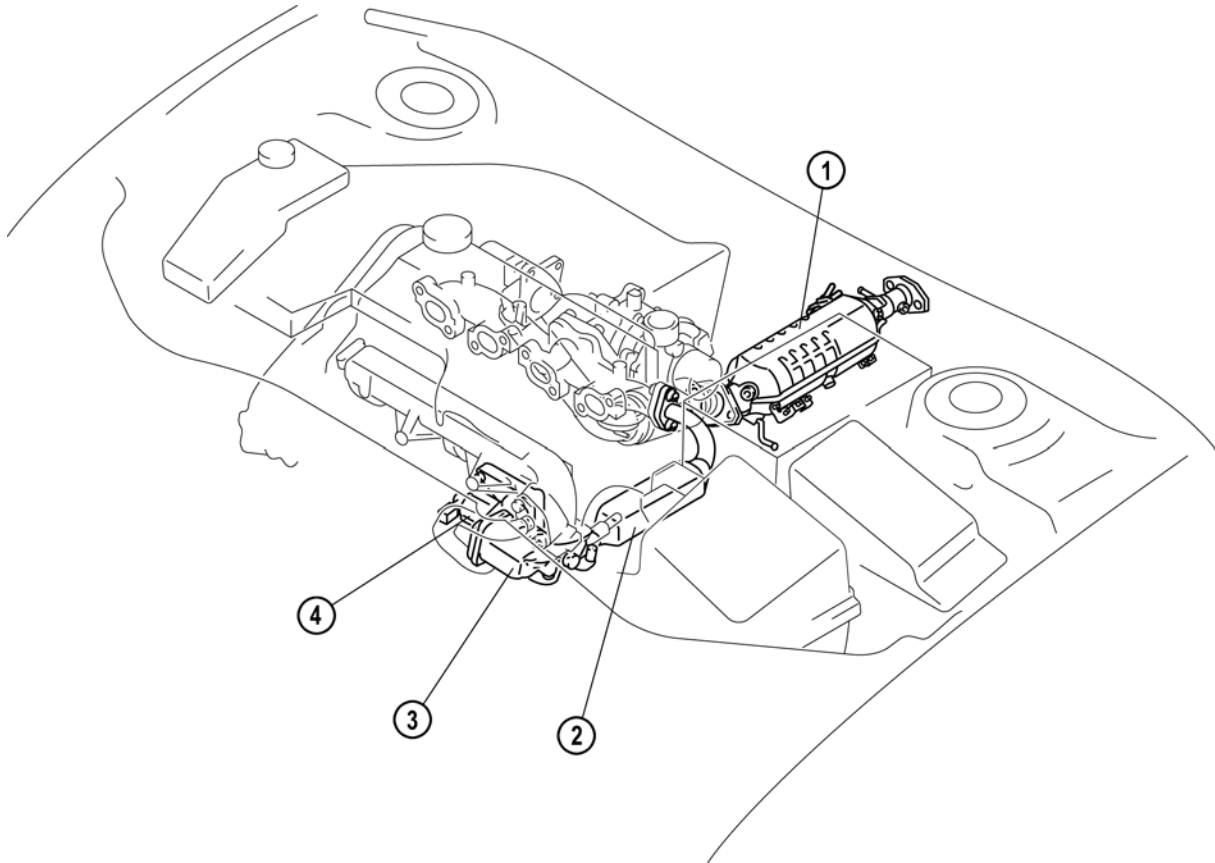
- The injection amount learning function has been modified. As a result, the PCM carries out the injection amount learning function every 150 km within the first 1,500 km and after that every 3,000 km, when all of the following conditions are met:
 - Engine is idling
 - Shift lever is in Neutral position
 - Vehicle speed is 0 km/h
 - Engine coolant temperature is between 65...95 °C
 - A/C is not operating
 - Accelerator pedal is not depressed
 - DPF regeneration is not performed
- If any of these conditions change while carrying out the injection amount learning function, the process will be suspended until the conditions are once again met. In addition, the injection amount learning function has to be carried out at specified service intervals (refer to the workshop manual).

NOTE: The injection amount learning function is performed several times at a fuel pressure of 35 MPa, 65 MPa, 100 MPa and 140 MPa. As a result, slight changes in engine sound are normal.

NOTE: The injection amount learning function will be aborted, if the idle fluctuation of the engine is too high (e.g. due to a faulty injector). In this case the WDS indicates a communication fault, although the communication between WDS and PCM is okay

Emission System

Parts Location



M5_01030

- 1 Oxidation catalytic converter and diesel particulate filter
- 2 EGR cooler

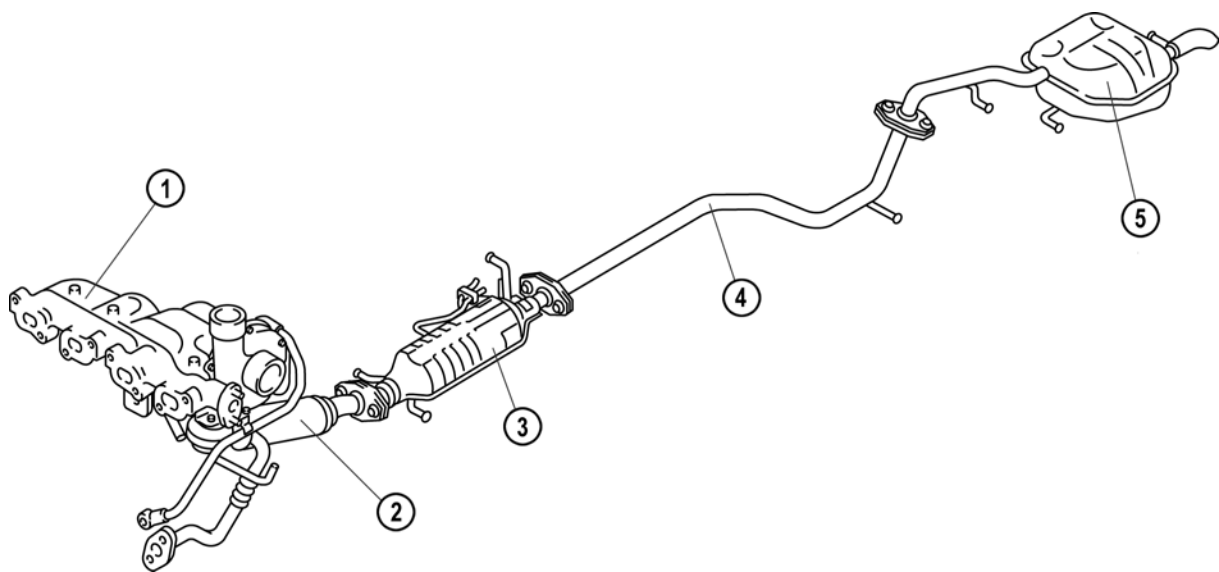
- 3 Intake shutter valve
- 4 EGR valve

Exhaust System

Features

- The exhaust system of the vehicles with 2.0 MZR-CD engine has the following features:
 - Warm-up oxidation catalytic converter has been cancelled.
 - Diesel particulate filter integrated in the housing of the oxidation catalytic converter has been introduced.

Parts Location



M5_01031

- | | | | |
|---|---|---|---------------|
| 1 | Exhaust manifold | 4 | Middle pipe |
| 2 | Flexible pipe | 5 | Main silencer |
| 3 | Oxidation catalytic converter and diesel particulate filter | | |

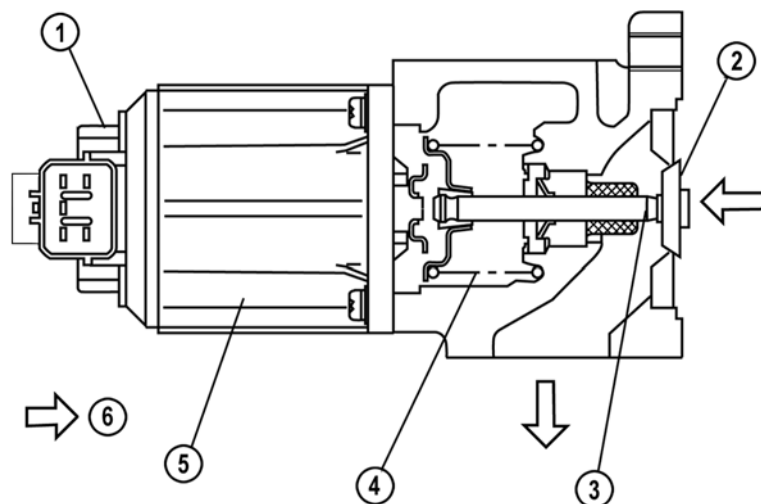
Exhaust Gas Recirculation System

Features

- The exhaust gas recirculation system of the vehicles with 2.0 MZR-CD engine has the following features:
 - EGR valve with direct current motor and position sensor has been introduced.
 - EGR cooler located at the transmission-side of the engine has been introduced.
 - Intake shutter valve with direct current motor and position sensor has been introduced.

EGR Valve

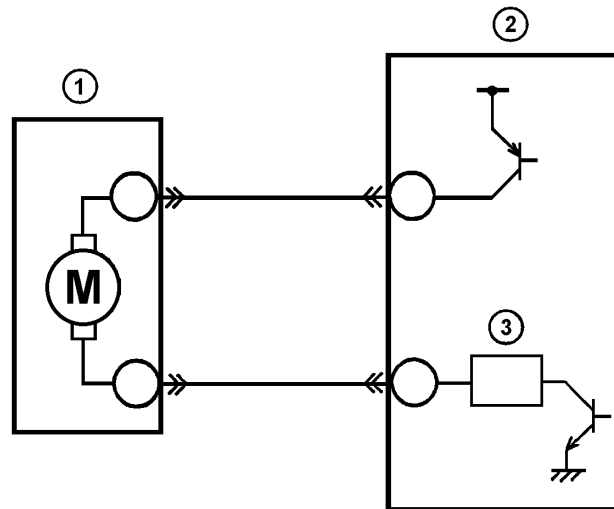
- An EGR valve with **DC (Direct Current)** motor and position sensor has been introduced. A threaded spindle transforms the rotational movement of the motor into an axial movement of the EGR valve.



M5_01032

- | | | | |
|---|---------------------------|---|------------------|
| 1 | EGR valve position sensor | 4 | Return spring |
| 2 | Valve | 5 | DC motor |
| 3 | Push rod | 6 | Exhaust gas flow |

- The position of the EGR valve is controlled by the PCM, which activates the DC motor via a duty signal.



M5_01033

1 DC motor
2 PCM

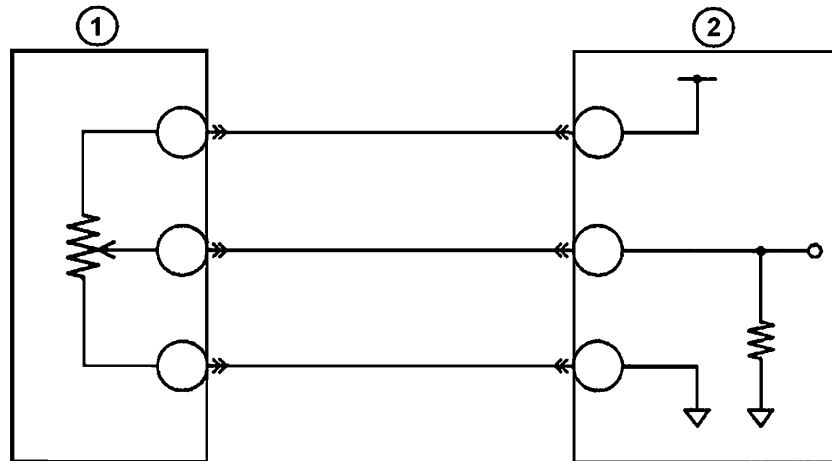
3 Current detection circuit

- At low engine speeds the PCM controls the DC motor with a large duty cycle, so that the EGR valve opens and exhaust gas is recirculated.
- At high engine speeds the PCM controls the DC motor with a small duty cycle, so that the EGR valve closes and no exhaust gas is recirculated.
- In order to remove any carbon deposits from the EGR valve seat a cleaning mode is activated each time the engine is shut off. Therefore, the PCM actuates the EGR valve so that it is moved from the fully open to the fully closed position several times. This process takes approx. 10 s.
- The PCM controls the DC motor by a duty signal 0 V/12 V.

NOTE: If the EGR system fails, the EGR valve adopts in the closed position in which no exhaust gas is recirculated.

- The **EGRVP (EGR Valve Position)** sensor is integrated in the DC motor and detects its position by a sliding contact potentiometer. When the EGR valve opens the resistance of the potentiometer rises. The sensor supplies the PCM with an analogue voltage signal between 0...5 V.

NOTE: After the EGR valve is replaced, its adaptation values in the PCM must be reset and the EGRVP sensor initialized (refer to the section “Control System, Maintenance and Repair”).



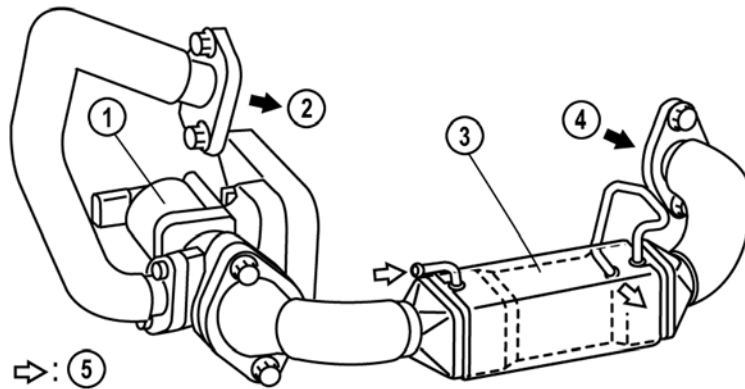
M5_01034

1 EGRVP sensor

2 PCM

EGR Cooler

- An EGR cooler located at the transmission-side of the engine has been introduced.

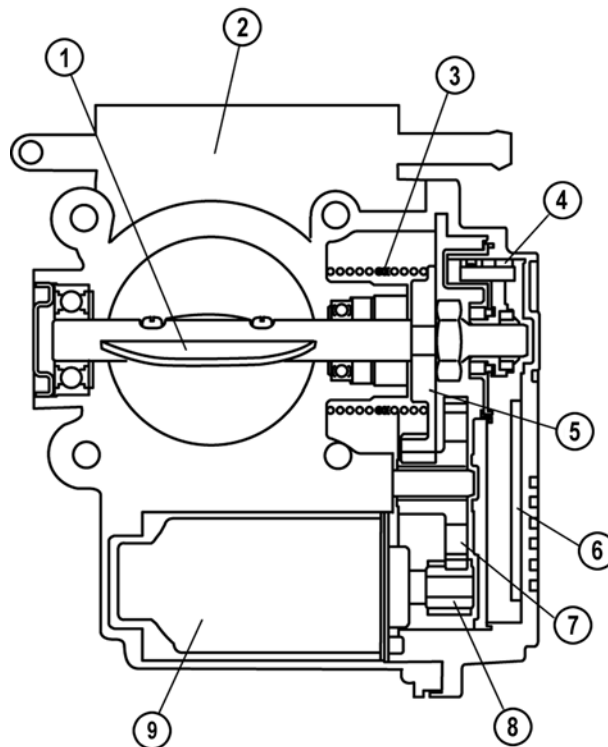


M5_01061

- | | | | |
|---|--------------------|---|-----------------------|
| 1 | EGR valve | 4 | From exhaust manifold |
| 2 | To intake manifold | 5 | Engine coolant flow |
| 3 | EGR cooler | | |

Intake Shutter Valve

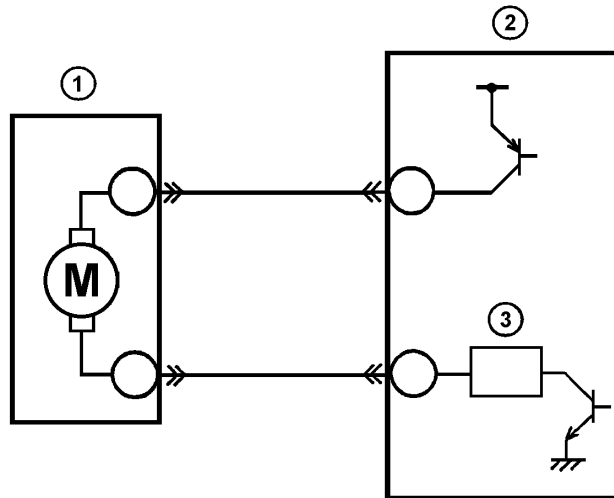
- An **ISV** (Intake **S**hutter **V**alve) with DC motor and position sensor has been introduced. A reduction gear ensures, that a large rotation angle of the motor results in a small rotation angle of the valve.
- The valve body is connected to the engine coolant circuit to prevent icing of the ISV at low ambient temperatures.



M5_01035

- | | | | |
|---|---------------------------------|---|-------------------|
| 1 | ISV | 6 | Drive circuit |
| 2 | Valve body | 7 | Intermediate gear |
| 3 | Return spring | 8 | Drive gear |
| 4 | Stator with hall element | 9 | DC motor |
| 5 | Driven gear with magnetic rotor | | |

- The position of the ISV is controlled by the PCM, which activates the DC motor via a duty signal.



M5_01033

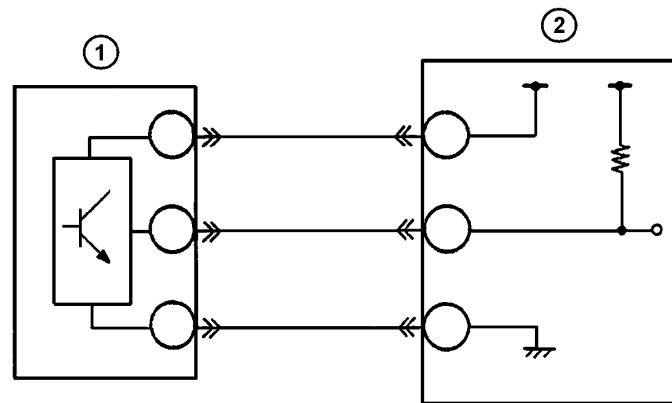
- | | | | |
|---|----------|---|---------------------------|
| 1 | DC motor | 3 | Current detection circuit |
| 2 | PCM | | |

- When the required EGR rate is high the PCM controls the DC motor with a large duty cycle. As a result, the ISV closes halfway, reducing the cross-section of the intake pipe. Thus a vacuum is generated in the intake manifold and a large amount of exhaust gas can be recirculated.
- When the required EGR rate is low the PCM controls the DC motor with a small duty cycle. As a result, the ISV opens, making the complete cross-section of the intake pipe available. Thus atmosphere or boost pressure is generated in the intake manifold (depending on the operating conditions) and only a small amount of exhaust gas can be recirculated.
- When the engine is switched off the PCM controls the DC motor with maximum duty cycle. As a result, the ISV closes fully and no air is induced into the engine, preventing bucking movements during shut-off.

- In order to remove any deposits from the ISV a cleaning mode is activated each time the engine is shut off. Therefore, the PCM actuates the ISV so that it is moved from the fully open position to the fully closed position several times. This process takes approx. 10 s.
- The PCM controls the DC motor by a duty signal 0 V/12 V.

NOTE: If the ISV system fails, the ISV adopts in the open position in which no vacuum is produced.

- The ISV position sensor is integrated in the cover of the valve body and detects the ISV position by a hall-type sensor. The sensor consists of a stator with hall element and a magnetic rotor joint to the driven gear.



1 ISV position sensor

2 PCM

M5_01036

- When the magnetic rotor rotates, a voltage is generated in the hall element. As the hall voltage is very low, it is amplified in the sensor and input to the PCM.

NOTE: After the ISV is replaced, its adaptation values in the PCM must be reset and the ISV position sensor initialized (refer to the section “Control System, Maintenance and Repair”).

Diesel Particulate Filter System

Features

- The diesel particulate filter system of the vehicles with 2.0 MZR-CD engine has the following features:
 - Diesel particulate filter with differential pressure sensor and three exhaust gas temperature sensors (upper/middle/lower) has been introduced.
 - Heated oxygen sensor located behind the diesel particulate filter has been introduced.

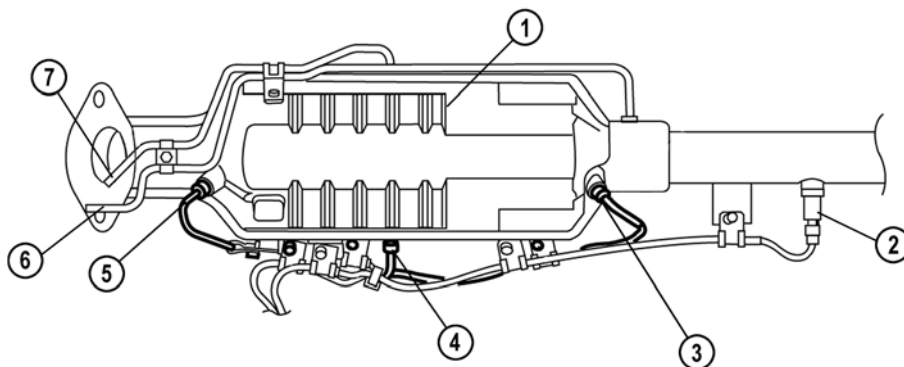
Diesel Particulates

- Under engine operating conditions such as cold start, acceleration and high load the combustion process of the diesel engine is incomplete, resulting in an increased formation of soot particles. These microscopically small particles have a diameter of only about 0.05 μm .
- Soot itself has no harmful effect on the human organism. Hydrocarbons originating from the fuel and lubricants, as well as water and sulphates, attach themselves to these granulates, increasing their size to 0.09 μm . In this way the harmful soot particles are formed.
- The human nose and bronchial tubes are not able to filter out particles smaller than 2.5 μm (for comparison: a hair is about 70 μm thick). As a result, the particles can then penetrate through the airways deep into the lungs and pose a health threat especially to children and adults with certain medical conditions. Soot particles are suspected of triggering allergies and even cancer. This is especially true of the smallest particles measuring between 0.1...1.0 μm .
- The European Union is introducing progressively stricter emissions legislation to achieve a long-lasting reduction in air pollution from vehicle emissions. As part of this legislation, all new Diesel passenger vehicles requiring type approval from January 1st 2005 must comply with the Euro 4 emission standard. In addition, all Diesel passenger vehicles first registered from January 1st 2006 must meet the Euro 4 standard.

- In comparison to the particulate matter limit for Euro 3 vehicles (0.05 g/km), the limit for Euro 4 vehicles (0.025 g/km) has been lowered by 50 %. In order to comply with the strict Euro 4 emission legislation, the Mazda5 CR with 2.0 MZR-CD engine is equipped with a diesel particulate filter system.
- The following sample calculation shows the benefit of a diesel particulate filter: A modern Common Rail diesel engine without diesel particulate filter has emitted on average about 3 kg of soot after 80.000 km. With a filter it would have emitted less than 100 g over the same mileage, which is a reduction of 95 %.

Diesel Particulate Filter

- The oxidation catalytic converter and the **DPF (Diesel Particulate Filter)** are located one behind another in a combined housing.



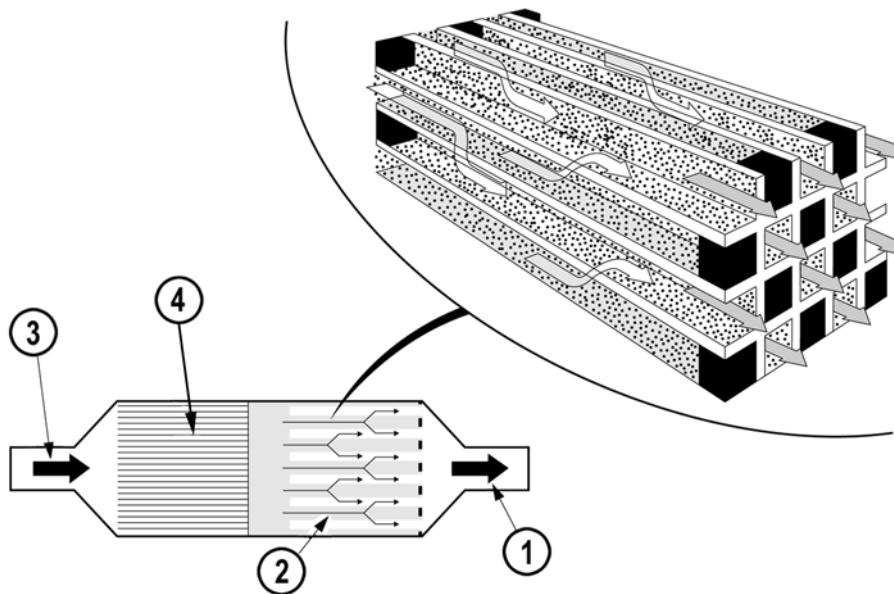
M5_01037

- | | | | |
|---|---|---|--|
| 1 | Oxidation catalytic converter and DPF | 5 | Exhaust gas temperature sensor (upper) |
| 2 | Heated oxygen sensor | 6 | Connection for reference pressure |
| 3 | Exhaust gas temperature sensor (lower) | 7 | Connection for high pressure |
| 4 | Exhaust gas temperature sensor (middle) | | |

NOTE: To ensure proper function of the DPF system only mineral diesel fuel with a maximum sulphur proportion of 350 ppm according to DIN EN 590 must be used. The use of fuel with a higher sulphur proportion is strictly forbidden as this can lead to blockage of the DPF.

NOTE: Mixing of any additives with metallic compounds to the diesel fuel (e.g. valve cleaner, coldstart accelerator) is strictly forbidden since this leads to an increased ash formation, resulting in a blocked DPF.

- The DPF is a monolith made of silicon carbide ceramics, which features a high resistance against temperature fluctuations. The individual channels of the filter have porous dividing walls and are closed at alternative ends. As a result, the exhaust gas is forced to flow through the dividing walls, which retain the soot particles and allow gaseous components to pass. The accumulation of particles in the filter increases the filtration effect still further.



M5_01038

- | | | | |
|---|---------------------|---|-------------------------------|
| 1 | Cleaned exhaust gas | 3 | Exhaust gas from engine |
| 2 | DPF | 4 | Oxidation catalytic converter |

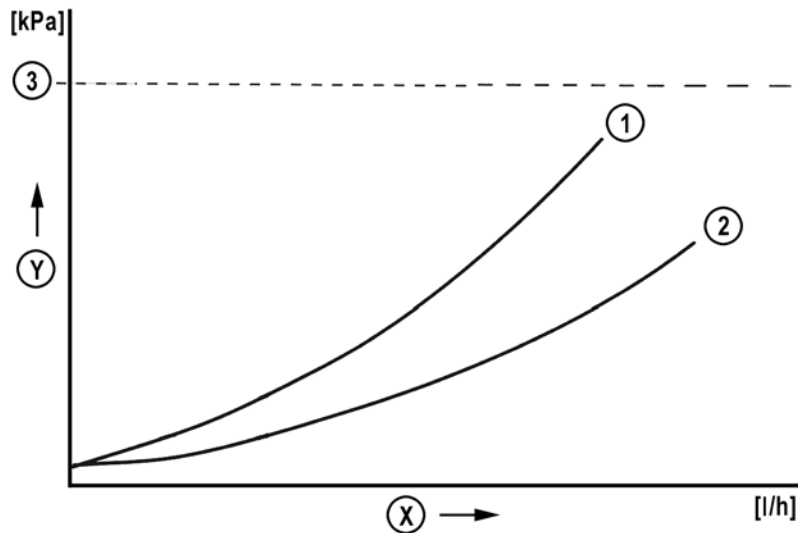
- To avoid the DPF from becoming blocked with soot particles it must be regenerated at regular intervals, i.e. the soot particles accumulated in the filter are burnt off. In addition, the regeneration process reduces the exhaust gas back-pressure caused by the soot amount accumulated, preventing an increase in fuel consumption.

NOTE: On vehicles with a higher mileage soot residues can often form on the exhaust tailpipe. This is an inherent by-product of the regeneration process and should not be considered a concern.

NOTE: Under certain conditions it is possible for white smoke to be emitted from the exhaust tailpipe during regeneration. This is also a by-product of the regeneration process and should not be considered a concern.

- The channels of the DPF are coated with platinum. This catalytic coating facilitates the regeneration of the filter by significantly lowering the light-off temperature of the soot and by accelerating the combustion of the particles. Without coating the burn-off of the particles takes place above a temperature of approx. 600 °C. Due to the effect of the platinum coating the light-off temperature of the soot is lowered to 500 °C.
- After regeneration ash residues that have formed from the engine oil and diesel fuel remain in the DPF and cannot be further converted. These residues reduce the usable filter volume, shortening the regeneration intervals. Since the filter pores are clogged by the ash residues, the exhaust gas back-pressure and hence the fuel consumption are increased. Due to the use of an engine oil with low ash content, these effects can be reduced to a minimum. For this reason, there is no replacement interval given for the filter.
- However, depending on the operating conditions the usable filter volume reaches the limit within the lifetime of the vehicle. In this case, the DPF must be replaced.

NOTE: After replacing the DPF, several steps must be performed to ensure its proper function (refer to the section “Control System, Maintenance and Repair”).



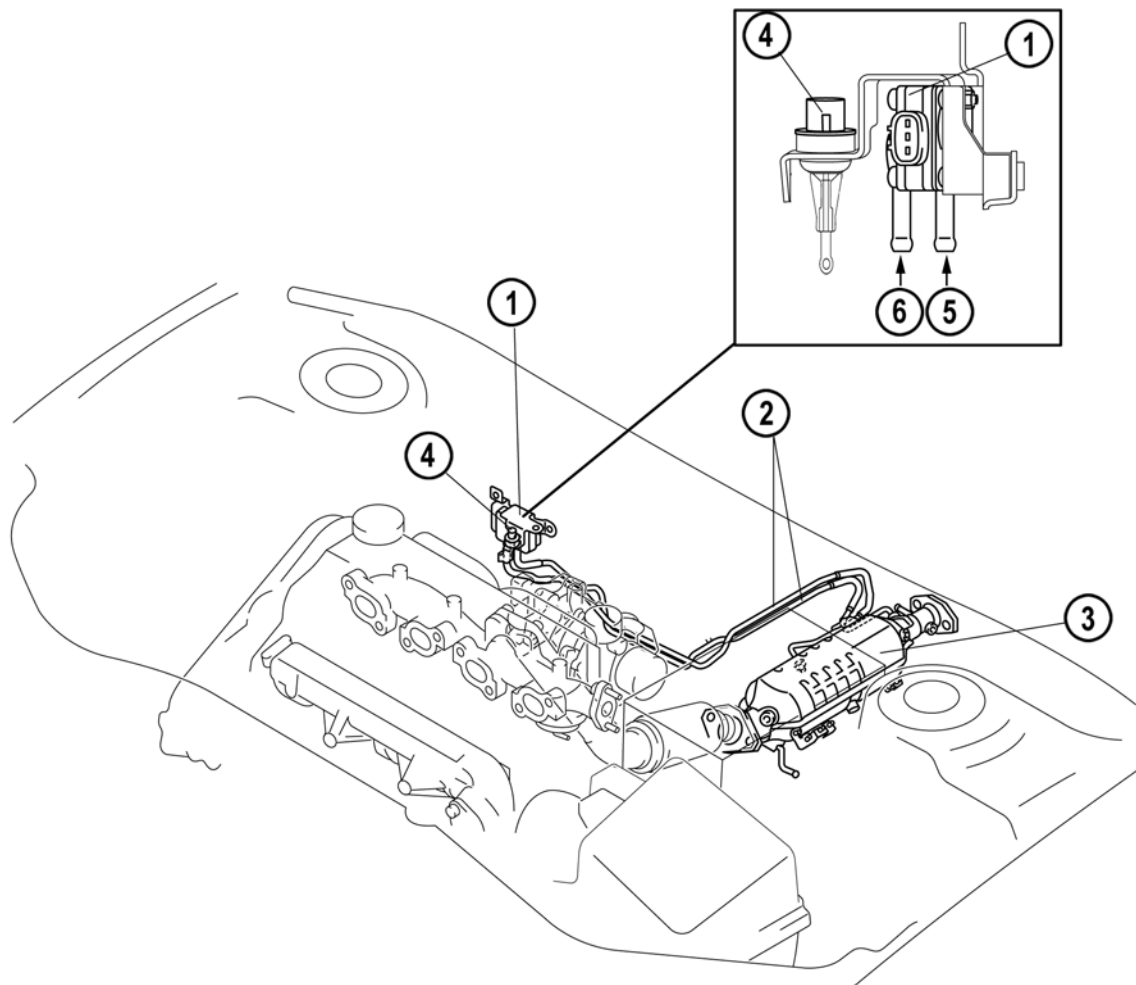
M5_01039

X Exhaust-gas volume flow
1 Used filter
2 New filter

Y Differential pressure
3 Differential pressure limit

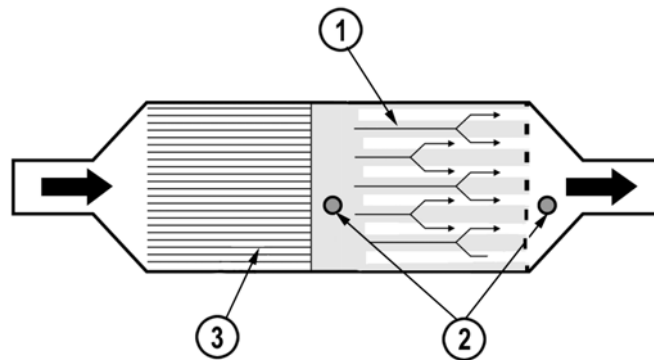
DPF Differential Pressure Sensor

- The DPF differential pressure sensor detects the pressure difference in the exhaust gas flow upstream and downstream of the DPF. The pressure difference is a measure for the soot amount accumulated in the filter (i.e. the higher the pressure difference, the higher the soot amount). The sensor is located in the engine compartment at the bulkhead and is connected to the upstream and downstream measuring point of the DPF by means of pressure lines.
- The differential pressure sensor consists of a pressure chamber with integrated semi-conductor element. The electrical resistance of the element varies, when its shape changes due to exposure to pressure.



M5_01040

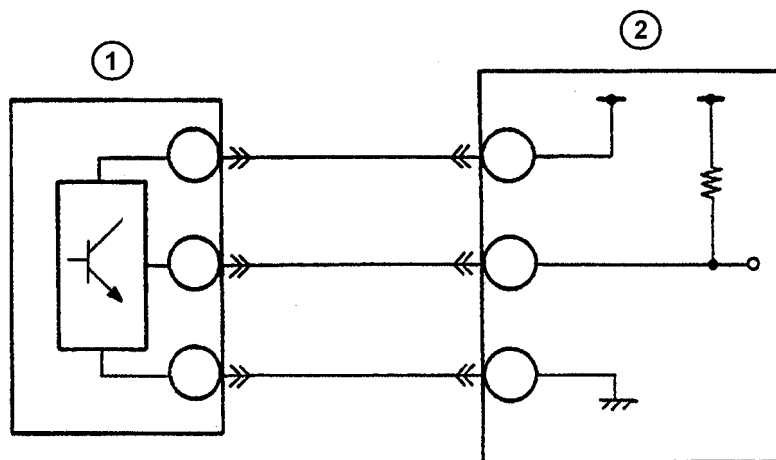
- | | | | |
|---|---------------------------------------|---|-----------------------------------|
| 1 | DPF differential pressure sensor | 4 | Temperature correction sensor |
| 2 | Pressure lines | 5 | Connection for reference pressure |
| 3 | Oxidation catalytic converter and DPF | 6 | Connection for high pressure |



M5_01041

- 1 DPF
- 2 Measuring points for DPF differential pressure sensor
- 3 Oxidation catalytic converter

- The signal of the DPF differential pressure sensor is used to determine, whether the soot amount requires regeneration of the filter. In addition, the signal serves to monitor the regeneration process.
- The DPF differential pressure sensor supplies the PCM with an analogue voltage signal between 0...5 V.



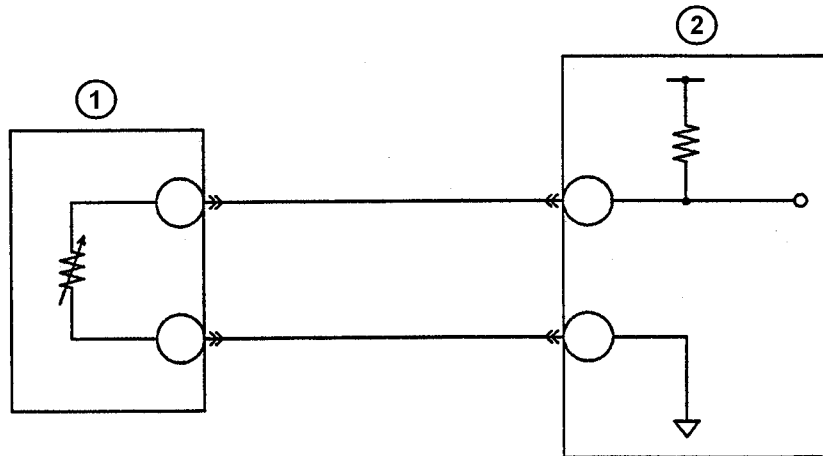
M5_01042

- 1 DPF differential pressure sensor
- 2 PCM

- In addition, the DPF differential pressure sensor features a temperature correction sensor, which is located on the bracket of the differential pressure sensor and detects the temperature in the engine compartment. The sensor is a temperature-resistive resistor with **NTC (Negative Temperature Coefficient)**, i.e. its resistance becomes smaller when the temperature rises. The temperature correction sensor supplies the PCM with an analogue voltage signal between 0...5 V.
- The signal of the temperature correction sensor is used to compensate the temperature characteristics of the DPF differential pressure sensor.

NOTE: Since the output characteristics of the DPF differential pressure sensor is adjusted while it is installed to the bracket, always replace the sensor and the bracket as a unit.

NOTE: After replacing the DPF differential pressure sensor, several steps must be performed to ensure its proper function (refer to the section "Control System, Maintenance and Repair").



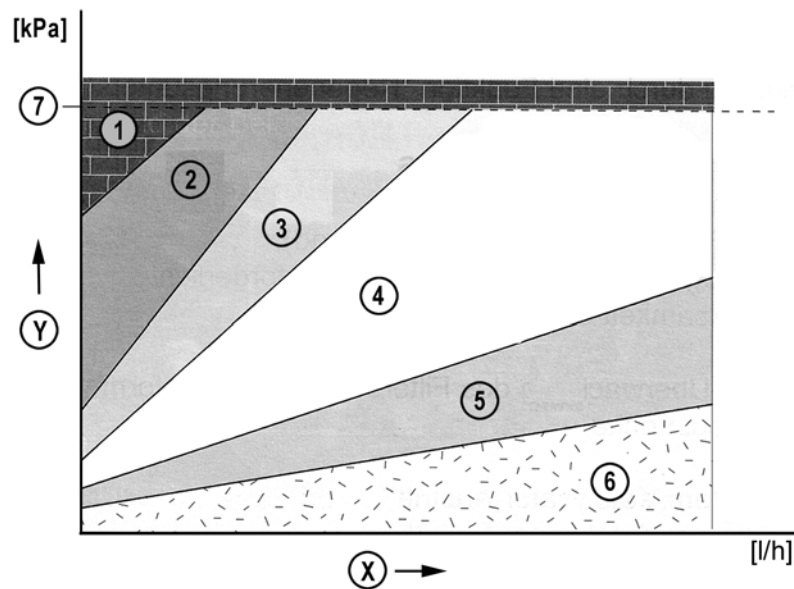
M5_01042A

1 Temperature correction sensor

2 PCM

Diagnostics

- Since the filter itself creates a certain resistance in the exhaust gas flow, the signal of the DPF differential pressure sensor is also used to determine the filter condition.



M5_01043

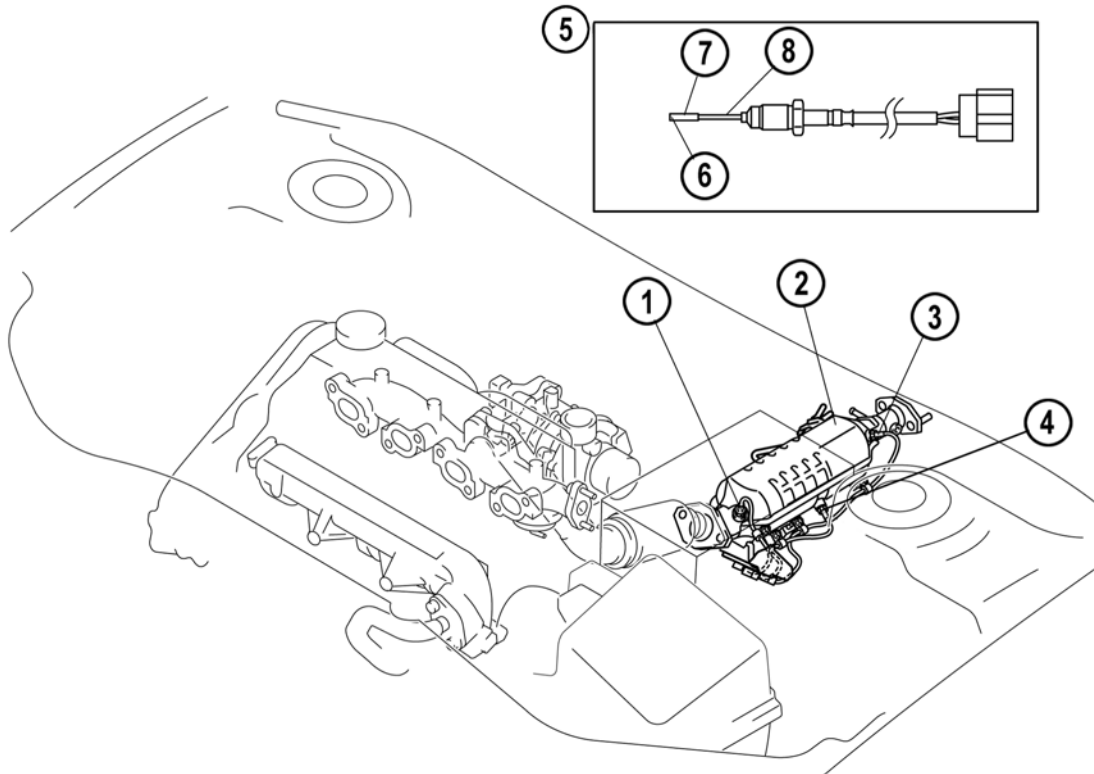
X	Exhaust-gas volume flow	Y	Differential pressure
1	Blocked condition of filter	5	Regenerated condition of filter
2	Overloaded condition of filter	6	Damaged condition of filter
3	Loaded condition of filter	7	Differential pressure limit
4	Intermediate condition of filter		

- If the value measured by the DPF differential pressure sensor is above a certain limit, the DPF is recognized as being blocked. Then the PCM stores a corresponding DTC, illuminates the MIL and activates the limp home mode.
- The blocking of the DPF is often as a result of excessive soot emission by the engine (e.g. due to EGR valve stuck open, leak in the intake-air system etc.) or can be attributed to multiple failed regeneration processes. To rectify this concern, a manual regeneration should be carried out using WDS (refer to the section "Control System, Maintenance and Repair").

- If the value measured by the DPF differential pressure sensor is below a certain limit, the DPF is recognized as being damaged. Then the PCM stores a corresponding DTC, illuminates the MIL and activates the limp home mode.
- In this case, the DPF differential pressure sensor should be checked first. Call up the Datalogger of the PCM and select the PID **EXHPRESS_DIF** (Press). Then connect a hand-operated pressure/vacuum pump to the upstream pressure line at the DPF, apply a pressure of 30 kPa and monitor the PID. If the PID indicates 30 kPa, replace the DPF. Otherwise check the upstream pressure line and the DPF differential pressure sensor.

Exhaust Gas Temperature Sensors

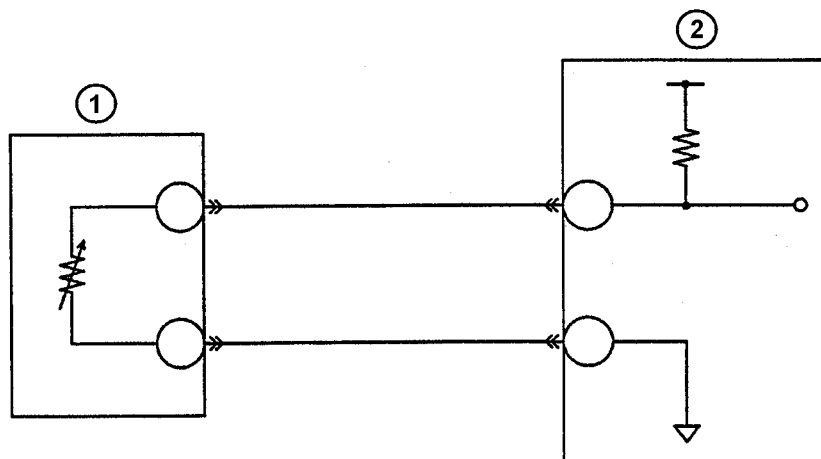
- The three exhaust gas temperature sensors (upper/middle/lower) are located in the combined housing of the oxidation catalytic converter/DPF and detect the temperature of the exhaust gas upstream of the oxidation catalytic converter, as well as upstream and downstream of the DPF. Each sensor is a temperature-resistive resistor with NTC, i.e. its resistance becomes smaller when the temperature rises. Each exhaust gas temperature sensor supplies the PCM with an analogue voltage signal between 0...5 V.



M5_01044

- | | | | |
|---|---|---|--------------------------------|
| 1 | Exhaust gas temperature sensor (upper) | 5 | Exhaust gas temperature sensor |
| 2 | Oxidation catalytic converter and DPF | 6 | NTC element |
| 3 | Exhaust gas temperature sensor (lower) | 7 | Cover |
| 4 | Exhaust gas temperature sensor (middle) | 8 | Sheath pin |

- The signal of the upper exhaust gas temperature sensor allows to check, whether the exhaust gas temperature required for operation of the oxidation catalytic converter is reached.
- The signal of the middle exhaust gas temperature sensor is used to determine, whether the exhaust gas temperature required for regeneration of the filter is reached.
- The signal of the lower exhaust gas temperature sensor serves to monitor the exhaust gas temperature during the regeneration process.
- In addition, the information from the exhaust gas temperature sensors is used for the calculation of the soot amount burnt off in the DPF.



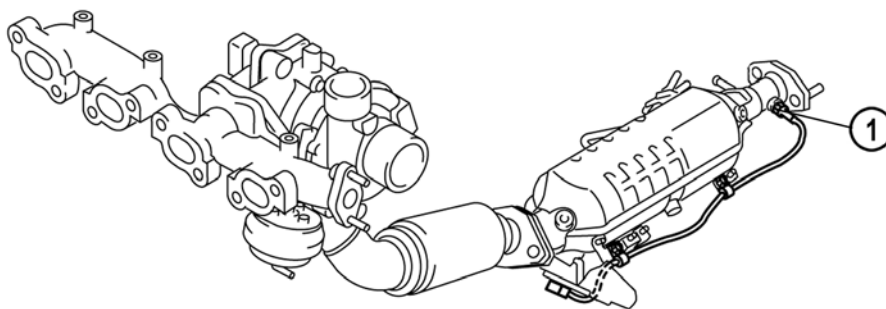
M5_01042A

1 Exhaust gas temperature sensor

2 PCM

Heated Oxygen Sensor

- The **HO2S (Heated O₂ Sensor)** is located behind the DPF and detects the oxygen concentration in the exhaust gas. The HO2S is a broad-band type sensor, i.e. it generates a clear electrical signal in a wide range from $\lambda = 0.7 \dots \infty$ (∞ = air with 21 % oxygen). As a result, the sensor is also capable of detecting the oxygen concentration in the exhaust gas of a diesel engine, which generally works with an excess-air factor of $\lambda \sim 1.4$ (at full load) to $\lambda \sim 3.4$ (at idle).
- The information of the HO2S is used for the calculation of the soot amount burnt off in the DPF.

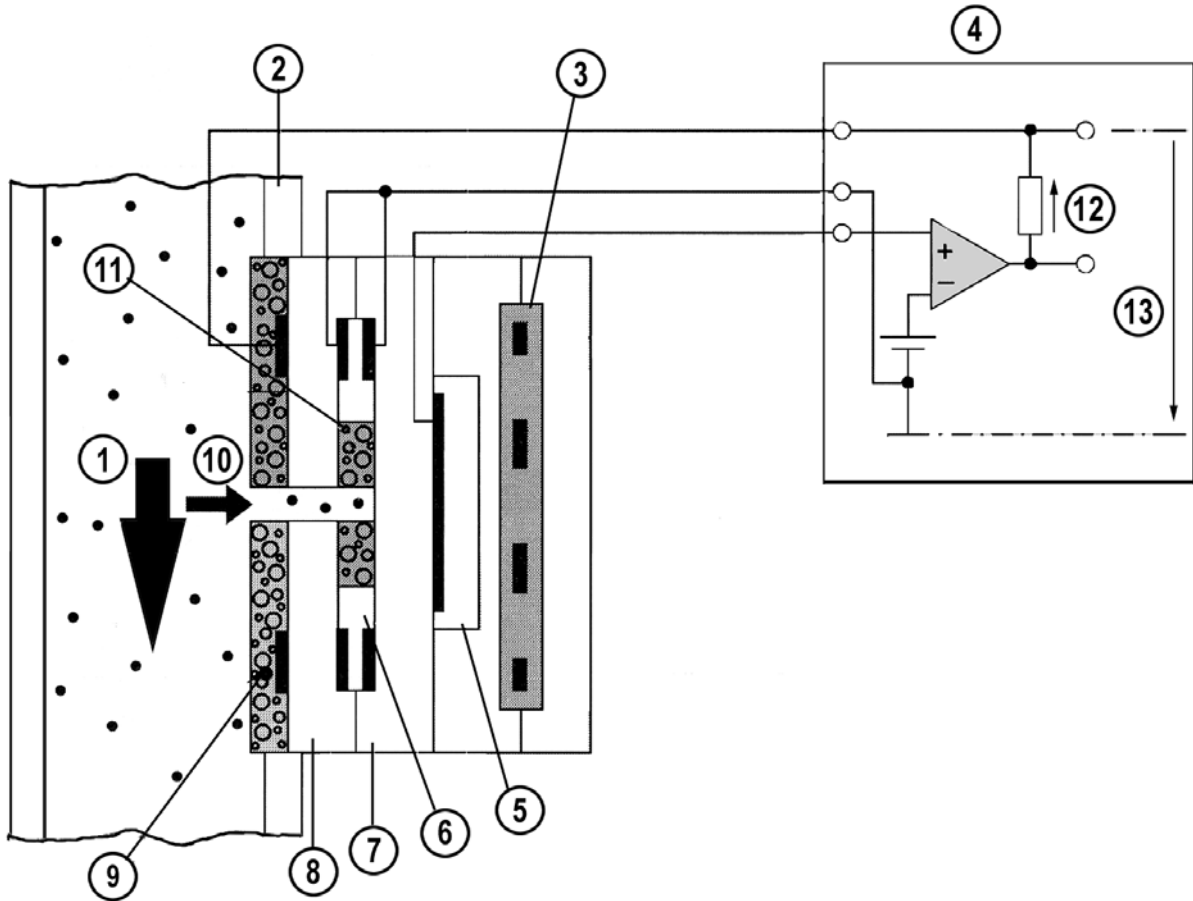


M5_01045

1 HO2S

- The broad-band type HO2S consists of an oxygen pump cell and a narrow-band O₂ sensor (= Nernst cell). Between the pump cell and Nernst cell is a diffusion gap, into which exhaust gas enters through the gas access passage. The Nernst cell compares the oxygen concentration of the exhaust gas in the diffusion gap to the oxygen concentration of the ambient air in the reference air chamber, and outputs a voltage to the PCM.
- The pump cell serves to maintain the composition of gas in the diffusion gap at $\lambda = 1$. By applying a voltage to the pump cell, oxygen can be pumped from the exhaust gas into the diffusion gap or vice versa. To achieve this, the PCM compares the output voltage of the Nernst cell with a reference voltage of 450 mV (equivalent to $\lambda = 1$) and controls the voltage applied to the pump cell accordingly.

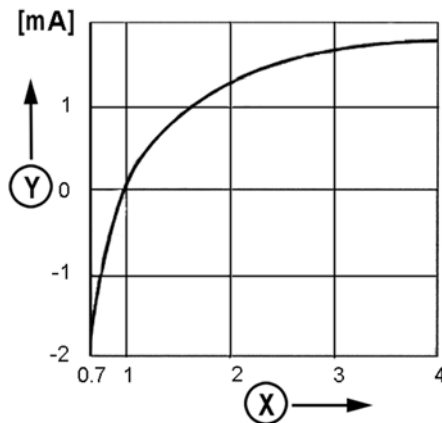
- If the exhaust gas is lean, the pump cell pumps oxygen out of the diffusion gap back into the exhaust gas, resulting in a positive pump current. Conversely, if the exhaust gas is rich, oxygen is pumped from the exhaust gas into the diffusion gap, leading to a negative pump current. If the composition of gas in the diffusion gap is $\lambda = 1$, no pumping takes place and the pump current is zero.



M5_01046

- | | | | |
|---|-----------------------|----|--------------------------|
| 1 | Exhaust gas flow | 8 | Pump cell |
| 2 | Exhaust pipe | 9 | Porous protective layer |
| 3 | Heater element | 10 | Gas access passage |
| 4 | PCM | 11 | Porous diffusion barrier |
| 5 | Reference air chamber | 12 | Sensor voltage |
| 6 | Diffusion gap | 13 | Pump voltage |
| 7 | Nernst cell | | |

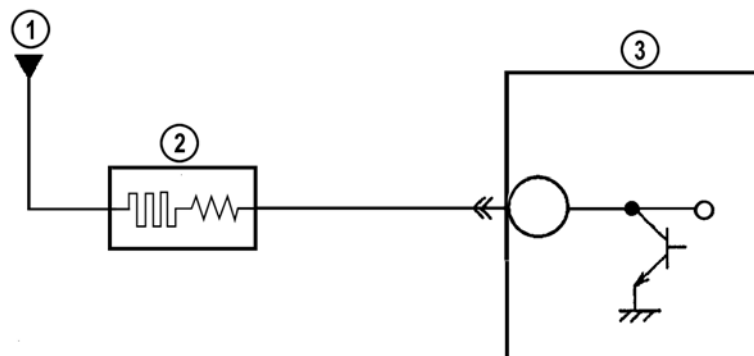
- The HO2S supplies the PCM with a current between -1.8...+1.8 mA.



M5_01047

- X Excess-air factor λ
- Y Current

- Since the HO2S only generates a usable signal above a certain temperature, it features an integral heater element. The temperature of the HO2S is controlled by the PCM, which activates the heater element via a duty signal.



M5_01048

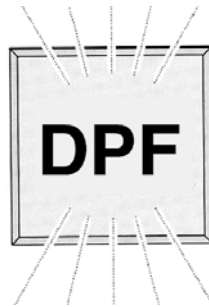
- 1 From PCM control relay
- 2 Heater element
- 3 PCM

- At low exhaust gas temperatures the PCM controls the heater element by a large duty cycle, so that the required operating temperature is reached quickly.
- At high exhaust gas temperatures the PCM controls the heater element by a small duty cycle, so that no heating takes place.
- The PCM controls the heater element by a duty signal 0 V/12 V.

NOTE: After replacing the HO2S, its adaptation values in the PCM must be reset (refer to the section “Control System, Maintenance and Repair”).

DPF Indicator Light

- The DPF indicator light is located in the instrument cluster and serves to alert the driver to a malfunction in the DPF system. During normal operation the DPF indicator light illuminates when the ignition is on and is extinguished after a few seconds. If the DPF indicator light illuminates or flashes during driving, then a fault has been detected.



M5_01049

Regeneration Control

- The regeneration control determines the soot amount accumulated in the DPF and starts the regeneration process accordingly. The regeneration control is integrated in the PCM.

Soot Amount Calculation

- The PCM receives information about the soot amount accumulated in the filter from the DPF differential pressure sensor. In order to establish the soot emission of the engine, the PCM evaluates the customer's driving method by monitoring the engine load, engine speed and vehicle speed. In addition, the PCM calculates the soot amount burnt off in the DPF using the signals from the HO₂S and the exhaust gas temperature sensors.
- Depending on the signal from the DPF differential pressure sensor, the calculated soot emission, the burnt-off soot amount and the distance travelled, the PCM decides whether and when a regeneration should be carried out. In this way, the filter does neither become blocked nor damaged by a violent regeneration following an over-accumulation of soot. As a result, it is possible to maintain the long-term integrity of the DPF while achieving minimum fuel consumption, minimum oil dilution and optimum engine performance.
- If the soot accumulation rate in the DPF is 80 % or more, the DPF indicator light illuminates. In this case an automatic regeneration of the DPF must be enabled by driving the vehicle at an engine speed of 2000 min⁻¹ or more and a vehicle speed of 40 km/h or more for approx. 10...15 min. As soon as the automatic regeneration process starts, the DPF indicator light turns off.

NOTE: Although the DPF indicator light turns off when the automatic regeneration is started, the regeneration process is continued until the soot accumulation rate decreases to 60 % or less.

NOTE: If the customer complains that the DPF indicator light illuminates frequently, he must be informed to change the driving method (such as driving the vehicle at middle or high engine speeds for a longer distance), so that regeneration of the DPF is enabled.

- If the soot accumulation rate in the DPF reaches 100 % or more, the DPF indicator light flashes and DTC P2458 is stored in the PCM. In addition, the PCM reduces the fuel injection amount to lower the exhaust gas temperature, preventing the filter from overheating. Due to the reduced injection amount the soot emission of the engine and hence the soot amount accumulated in the filter is also reduced. In this case a manual regeneration of the DPF must be performed.

NOTE: Do NOT perform automatic regeneration when the soot accumulation rate in the DPF is 100 % or more, since this may cause damage to the filter or the engine.

- If the soot accumulation rate in the DPF reaches 140 % or more, the MIL also illuminates and DTC P242F is stored in the PCM. In addition, the PCM further reduces the fuel injection amount and hence the soot emission of the engine, resulting in a lower soot amount accumulated in the filter. Here, a manual regeneration of the DPF must also be performed.
- If the soot accumulation rate in the DPF reaches 200 %, the filter cannot be regenerated anymore and must therefore be replaced.
- The different conditions of the soot accumulation in the DPF are described in the following table:

Item	Soot accumulation in the DPF					
	60%	80%	100%	125%	140%	200%
Soot accumulation rate						
DPF indicator light	—	—	Illuminates	Flashes every 0.4 s		
MIL	—	—	—	—	—	Illuminates
Output restriction	—	—	—	Max. 150 km/h (93 mph)		Max. 70 km/h (43 mph)
DTC stored in PCM	—	—	—	P2458		P242F
Customer action	—	—	Enable automatic regeneration by driving the vehicle at an engine speed of 2,000 rpm or more and a vehicle speed of 40 km/h (22 mph) or more for 10...15 min	Bring the vehicle to a dealer		
DPF automatic regeneration	—	Enabled		Disabled		
Dealer action	—	—		Perform manual regeneration (normal mode)	Perform manual regeneration (long mode)	Replace the DPF

M5_01T013

Regeneration Process

- Due to the effect of the catalytic coating the diesel particles are burnt off above a temperature of 500 °C. Since the exhaust gas temperature during normal driving is between 150...400 °C (depending on the engine operating conditions), it must be increased artificially by external intervention from the engine management system to start the regeneration process.
- If regeneration of the DPF is required, the PCM checks whether the engine operating conditions are suitable to start the regeneration process. If the requirements for regeneration are met, the PCM performs the following measures to artificially increase the exhaust gas temperature:
 - Closing the EGR valve to increase the combustion temperature by highering the oxygen proportion of the cylinder charge
 - Closing the ISV partially to increase the combustion temperature by reducing the excess air
 - Performing an early post-injection to increase the combustion temperature by burning an additional fuel amount
 - Performing two late post-injections to increase the exhaust gas temperature by burning fuel in the oxidation catalytic converter
- By these measures the minimum exhaust gas temperature of 150 °C (at low engine load and engine speed) is increased to 500 °C and regenerations starts. Then the PCM monitors the regeneration process using the signals from the DPF differential pressure sensor and from the exhaust gas temperature sensors. Control over the regeneration process is critically important since the DPF is damaged when its temperature exceeds 1000 °C.
- The regeneration process takes up to 15 min. When regeneration has started it will be completed regardless of the engine operating conditions. It is only stopped when the engine is shut off. In this case, the regeneration process is started again once the required operating conditions are met.

Regeneration Intervals

- Depending on the operating conditions of the vehicle the DPF is regenerated every 100...300 km. Due to the ash residues that have formed from the engine oil and diesel fuel the usable filter volume is reduced. Since the ash amount accumulated in the DPF increases with every regeneration process, the regeneration intervals become shorter with rising mileage.

NOTE: High fuel consumption, low fuel quality (high sulphur content), high engine oil consumption and low oil quality (high ash content) accelerate the accumulation of ash in the DPF, shortening the regeneration intervals more quickly.

Charging System

Features

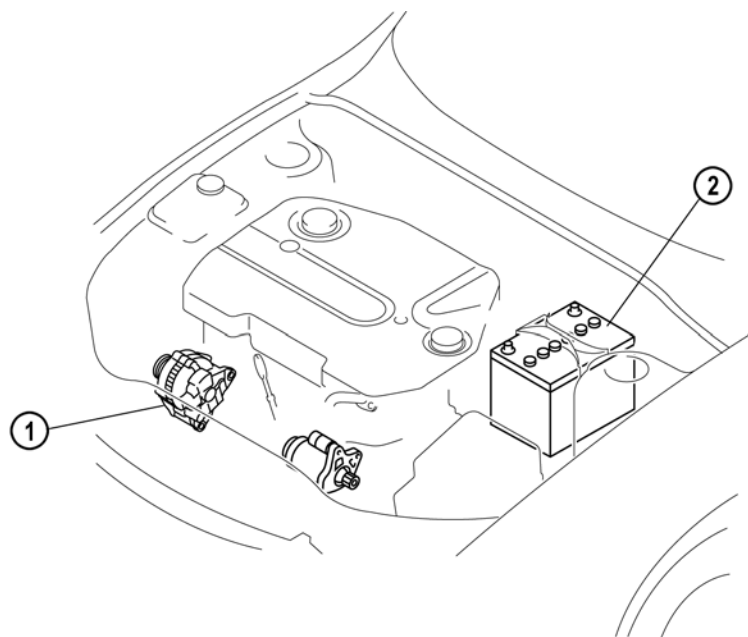
- The charging system of the vehicles with 2.0 MZR-CD engine has the following features:
 - Smart charging system has been introduced.

Specifications

Item		Specification
Battery	Voltage (V)	12
	Type and capacity (5-hour rate) (Ah)	95D31L (64), 115D31L (70)
Generator	Output (V-A)	12-90
	Regulated voltage	Controlled by PCM
	Self diagnosis function	

M5_01T014

Parts Location



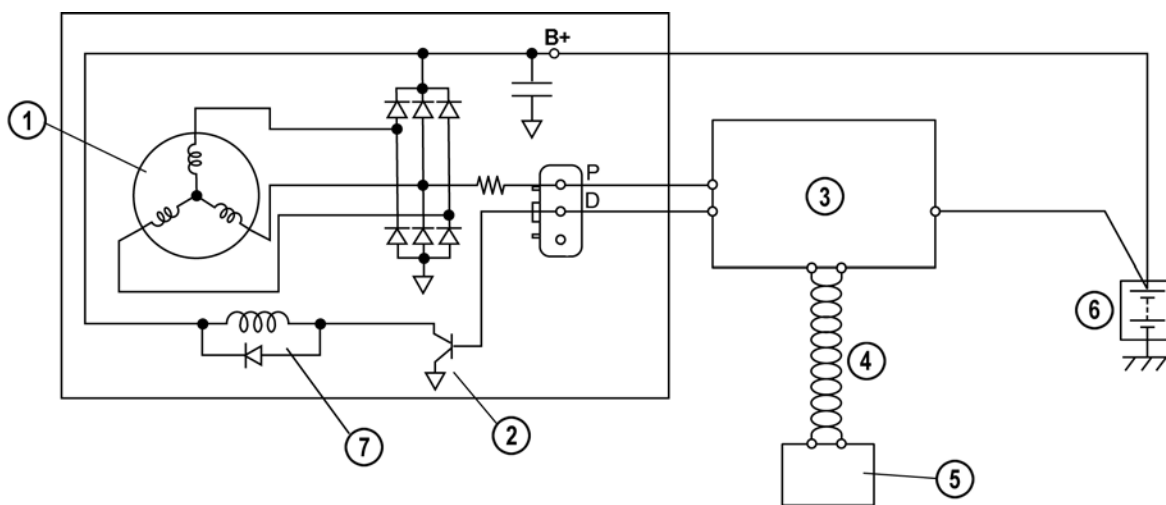
M5_01050

1 Generator

2 Battery

Smart Charging System

- A so-called "Smart Charging System" has been introduced to improve battery charging and durability. The exciting current of the field coil and hence the charging voltage is controlled by the PCM, which actuates the generator by a duty signal. In addition, the generator sends a feedback signal to the PCM, which hereby monitors the generator load.
- The PCM determines the duty ratio outputted to the generator according to the battery voltage, battery electrolyte temperature (derived from the intake air temperature, engine coolant temperature and vehicle speed signal) and generator load. In addition, the PCM transmits information about the generator warning light status via the high-speed CAN bus to the instrument cluster, which activates the generator warning light accordingly.



M5_01051

- | | | | |
|---|--------------------|---|--------------------|
| 1 | Stator coil | 5 | Instrument cluster |
| 2 | Power transistor | 6 | Battery |
| 3 | PCM | 7 | Field coil |
| 4 | High-speed CAN bus | | |

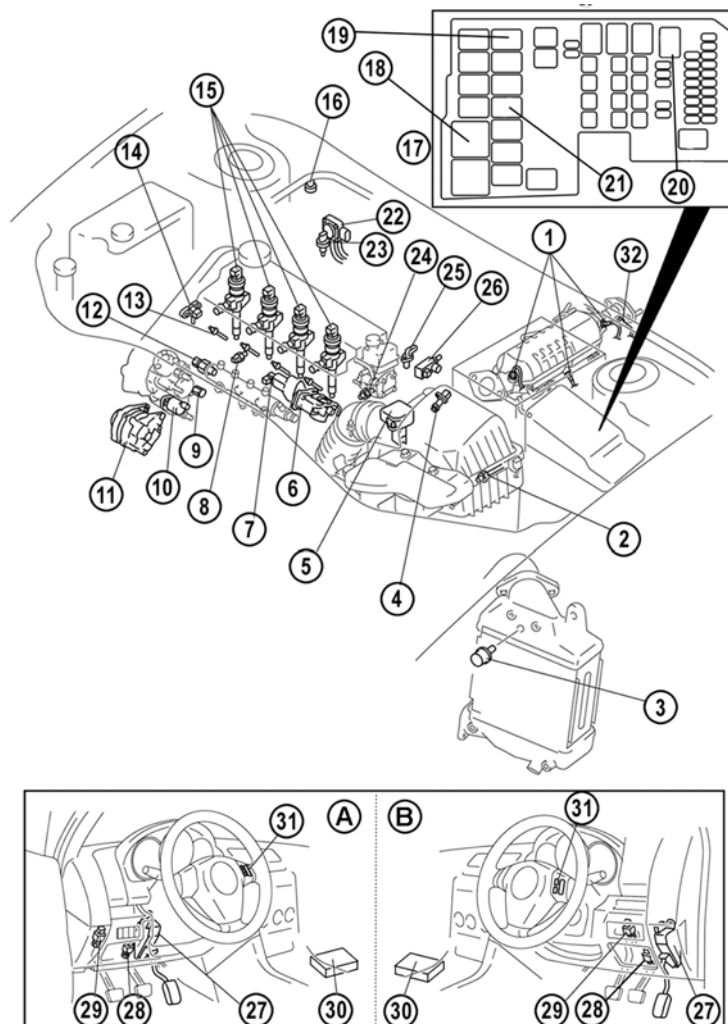
- When the battery voltage/battery electrolyte temperature is high and/or the generator load is low, the PCM controls the generator with a small duty cycle. As a result, a low exciting current flows through the field coil and the generator outputs a low charging voltage.
- When the battery voltage/battery electrolyte temperature is low and/or the generator load is high, the PCM controls the generator with a large duty cycle. As a result, a high exciting current flows through the field coil and the generator outputs a high charging voltage.

Control System

Features

- The control system of the vehicles with 2.0 MZR-CD engine has the following features:
 - Powertrain control module with EEPROM has been introduced.
 - Magneto resistive-type crankshaft and camshaft position sensor have been introduced.
 - Hall-type accelerator pedal position sensor has been introduced.
 - Idle switch has been cancelled.
 - Power steering pressure switch has been introduced.

Parts Location



M5_01052

A	LHD	B	RHD
1	Exhaust gas temperature sensor	17	Main fuse box
2	Park neutral position switch	18	Glow plug relay
3	Intake air temperature sensor no.2	19	Starter relay
4	Crankshaft position sensor	20	PCM control relay
5	MAF/IAT sensor	21	A/C relay
6	ISV with DC motor and position sensor	22	DPF differential pressure sensor
7	EGR valve with DC motor and position sensor	23	Temperature correction sensor
8	Engine coolant temperature sensor	24	Power steering pressure switch
9	Fuel temperature sensor	25	Camshaft position sensor
10	Fuel metering valve	26	VBC solenoid valve
11	Generator (stator coil and field coil)	27	Accelerator pedal position sensor
12	Fuel pressure sensor	28	Brake switch
13	Glow plug	29	Clutch pedal position switch
14	MAP sensor	30	PCM (with built-in BARO sensor)
15	Fuel injector	31	Cruise control switches
16	Refrigerant pressure switch	32	HO2S

Relationship Chart

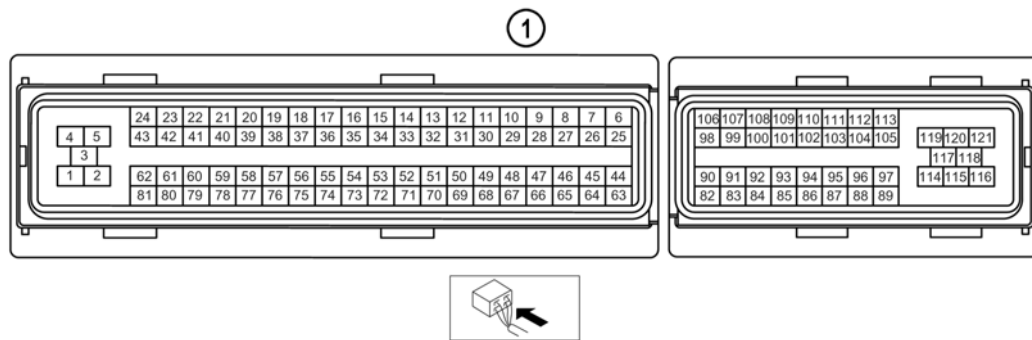
Device	Control Item															
	Idle speed control	Glow control	Variable boost control	Injection amount control	Injection timing control	Multiple injection control	Fuel pressure control	ISV control	EGR control	HO2S heater control	DPF regeneration control	Cruise control system	Electrical fan control	A/C control	Generator control	Immobilizer system
Battery			X					X	X	X					X	
Starter signal	X	X	X	X	X	X	X	X	X	X				X		
Clutch pedal position switch	X			X	X	X		X			X	X				
Park/Neutral position switch	X			X	X	X		X			X	X		X		
Brake switch												X				
Power steering pressure switch	X			X							X					
Refrigerant pressure switch	X												X	X		
Cruise control switches												X				
Accelerator pedal position sensor	X		X	X	X	X	X	X	X		X			X		
MAF/IAT sensor					X	X	X	X	X	X	X				X	
IAT sensor no.2				X		X			X		X					
Engine coolant temperature sensor	X	X	X	X	X	X	X	X	X		X		X	X	X	
Fuel temperature sensor						X	X									
BARO sensor (integrated in PCM)			X	X	X		X	X	X	X	X					
MAP sensor			X	X				X	X		X					
Fuel pressure sensor				X			X				X					
Camshaft position sensor				X	X	X										
Crankshaft position sensor	X	X	X	X	X	X	X	X	X	X	X			X	X	
Vehicle speed signal	X	X	X	X				X			X	X	X		X	
Generator (stator coil)	X			X											X	
DPF differential pressure sensor	X										X					
Temperature correction sensor											X					
Exhaust gas temperature sensor (upper/middle/lower)								X	X	X	X					
ISV position sensor								X			X					
EGRVP sensor									X		X					
HO2S (sensor)				X					X		X					
Immobilizer-related information																X
Starter relay																X
Fuel metering valve							X									X
Fuel injectors	X			X	X	X					X	X				X
VBC solenoid valve			X													
EGR valve DC motor									X		X					
ISV DC motor								X			X					
Glow indicator light		X														
Cruise main indicator light												X				
Cruise set indicator light												X				
Glow plug relay		X														
Generator (field coil)															X	
HO2S (heater element)										X						
A/C relay														X		
Fan control module													X			
Immobilizer-related information																X

M5_01T015

Powertrain Control Module

- The **PCM (Powertrain Control Module)** is located behind a cover in the passenger footwell and features a 121-pin (two-block) connector.

NOTE: When replacing the PCM, several steps must be performed to ensure its proper function (refer to the section “Control System, Maintenance and Repair”).



M5_01062

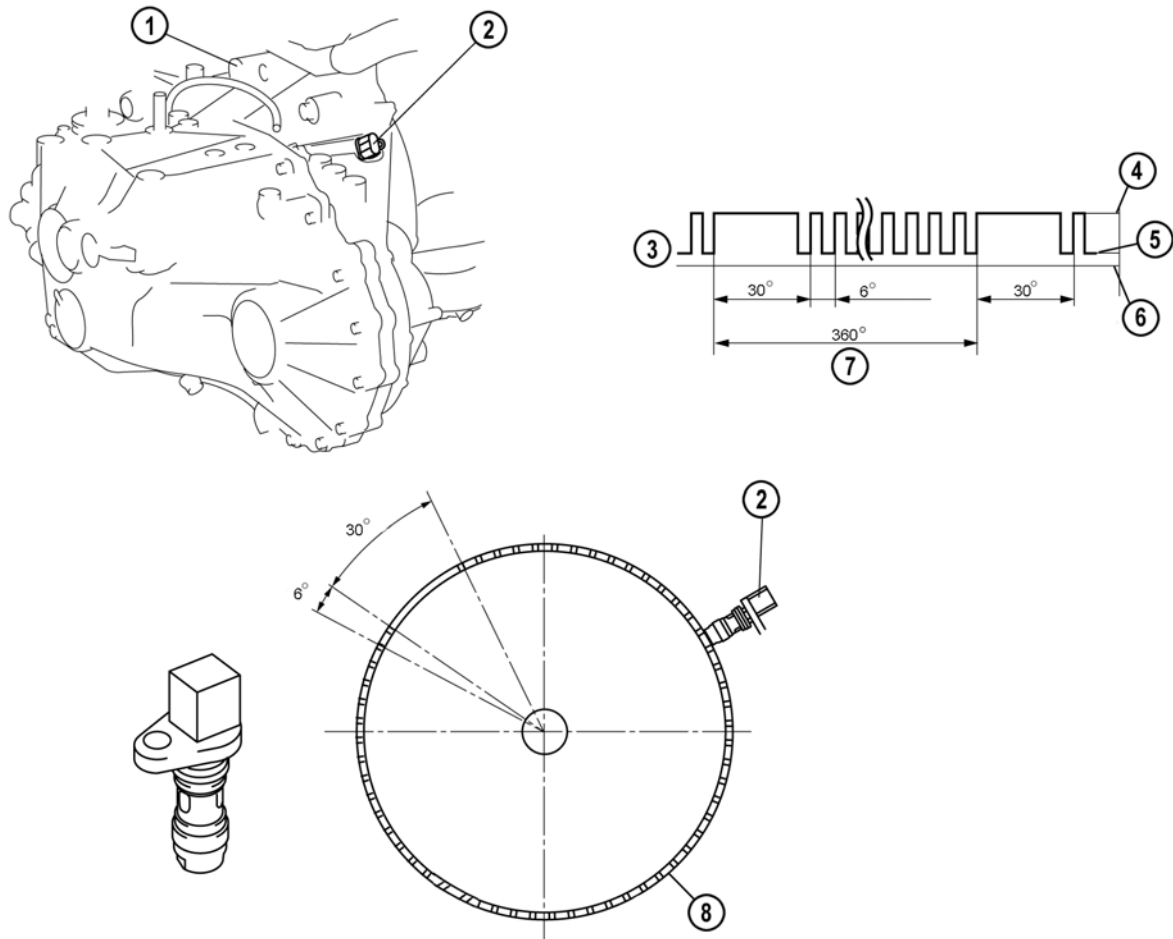
1 Wiring harness side-connector of the PCM

- The PCM features an **FEEPROM (Flash Electronically Erasable Programmable ROM)**, which can be erased electronically by a flash voltage and reprogrammed with updated calibration data. As a result, the strategy program and the calibration data logged in the FEEPROM can be updated without replacing the PCM.
- If the PCM should be updated with a later software calibration, the module has to be reprogrammed with the aid of the WDS. Therefore, select the option **Toolbox → Module Programming → Module Reprogramming → PCM** and follow the instructions of the WDS.

NOTE: As later software calibrations are usually released to resolve specific customer concerns, module reprogramming should only be carried out when recommended e.g. by a Service Information or by the Technical Hotline/Technical Service Department.

Crankshaft Position Sensor

- An magneto resistive-type **CKP (Crankshaft Position)** sensor has been introduced, which is located at the rear side of the clutch housing. The sensor consists of two magneto resistive elements and a magnet, which scan a rotor with 56 teeth, missing five teeth in one location. The rotor is integrated in the flywheel.



M5_01053

- 1 Clutch housing
- 2 CKP sensor
- 3 Output signal
- 4 5 V

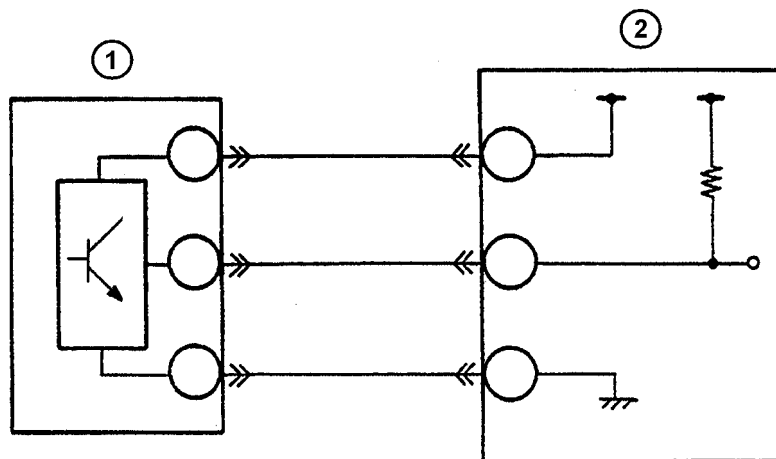
- 5 0.5 V
- 6 Ground
- 7 Crank angle
- 8 Toothed rotor

- The magneto resistive elements have the characteristics that their resistance changes depending on the magnetic flux. When the rotor passes the sensor, an alternating magnetic field is generated that changes the resistance of the magneto resistive elements. An integrated circuit converts the output voltage of the magneto resistive elements into a rectangular wave signal, which is then input to the PCM.

NOTE: When the CKP sensor fails, the engine stalls and does not start anymore.

NOTE: When installing the CKP sensor, verify that no swarfs adhere to the sensor. These could cause fluctuation of the magnetic flux, affecting the sensor signal and hence the engine control.

- The CKP sensor supplies the PCM with a digital voltage signal 0 V/5 V.



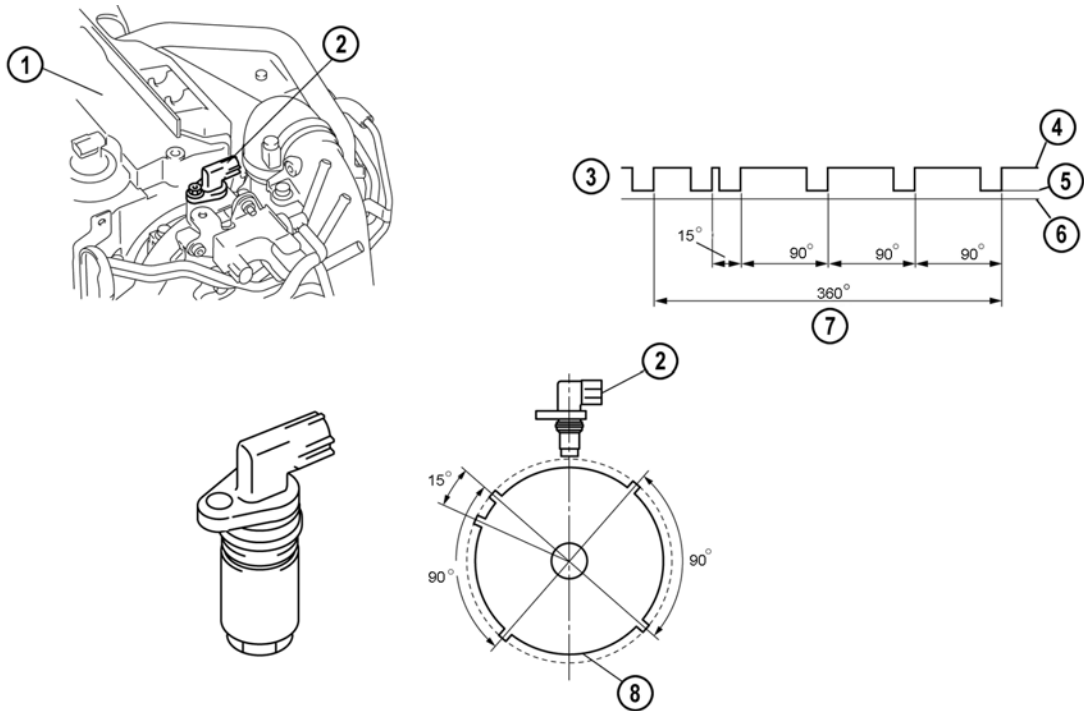
M5_01054

1 CKP sensor

2 PCM

Camshaft Position Sensor

- An magneto resistive-type **CMP (Camshaft Position)** sensor has been introduced, which is located at the vacuum pump. The sensor consists of two magneto resistive elements and a magnet, which scan a rotor with five teeth. The rotor is attached to the drive gear of the power steering oil pump.



M5_01055

- 1 Cylinder head
- 2 CMP sensor
- 3 Output signal
- 4 5 V

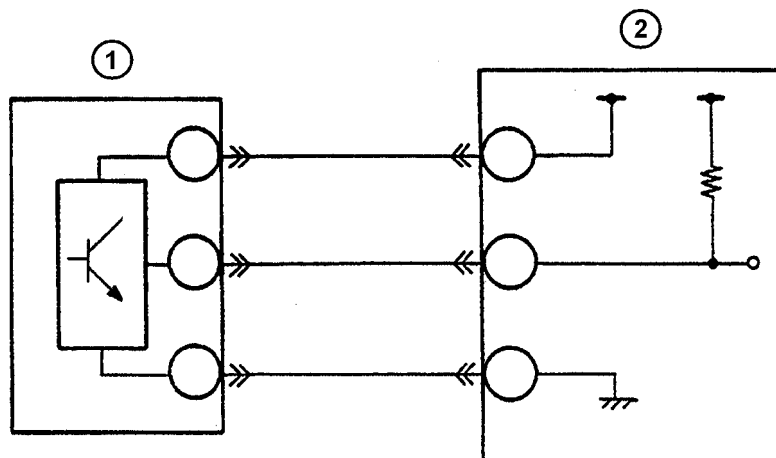
- 5 0.5 V
- 6 Ground
- 7 Cam angle
- 8 Toothed rotor

- The magneto resistive elements have the characteristics that their resistance changes depending on the magnetic flux. When the rotor passes the sensor, an alternating magnetic field is generated that changes the resistance of the magneto resistive elements. An integrated circuit converts the output voltage of the magneto resistive elements into a rectangular wave signal, which is then input to the PCM.

NOTE: When the CMP sensor is faulty, this can be recognized by the increased engine noise (Diesel knocking). In order to identify cylinder no.1 during engine start the PCM injects metered quantities of fuel into the individual cylinders and monitors the engine speed via the CKP sensor. The cylinder in question is the one where the engine speed increases after fuel has been injected. As a result, the starting process takes longer than normal.

NOTE: When installing the CMP sensor, verify that no swarfs adhere to the sensor. These could cause fluctuation of the magnetic flux, affecting the sensor signal and hence the engine control.

- The CMP sensor supplies the PCM with a digital voltage signal 0 V/5 V.



M5_01063

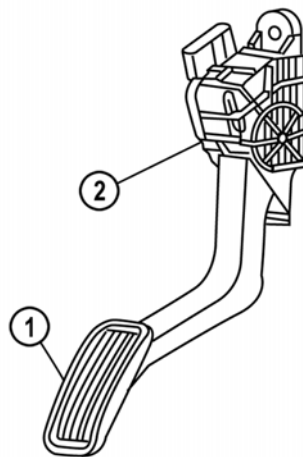
1 CMP sensor

2 PCM

Accelerator Pedal Position Sensor

- A hall-type **APP (Accelerator Pedal Position)** sensor has been introduced. For safety reasons the APP sensor consists of two hall elements integrated in the stator and a magnetic rotor joint to the accelerator pedal.

NOTE: If one hall-type sensor fails, the PCM uses the signal from the other sensor to detect the driver's acceleration demand. As a result, the engine speed is limited to approx. 2500 min⁻¹. If the APP sensor fails completely, the engine speed is limited to 1500 min⁻¹.

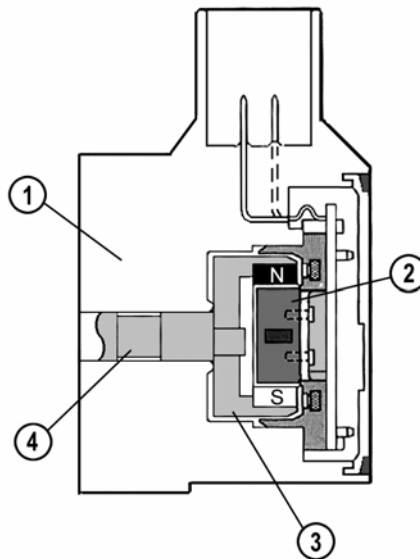


M5_01056

1 Accelerator pedal

2 APP sensor

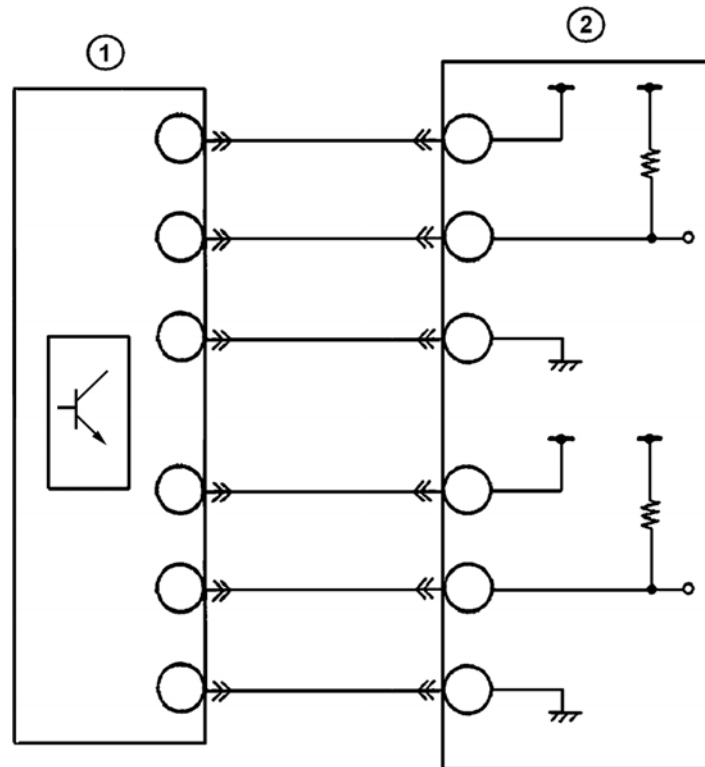
- When the magnetic rotor rotates, a voltage is generated in the hall elements. As the hall voltage is very low, it is amplified in the sensor and input to the PCM.



M5_01057

- | | | | |
|---|---------------------------|---|----------------|
| 1 | Sensor body | 3 | Magnetic rotor |
| 2 | Stator with hall elements | 4 | Shaft |

- Each hall-type sensor supplies the PCM with an analogue voltage signal between 0...5 V. In order to facilitate failure detection there is a voltage offset of 0.5 V between both signals.



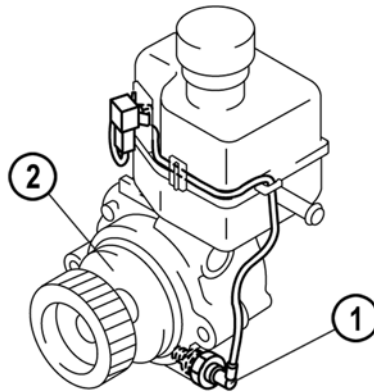
M5_01064

1 APP sensor

2 PCM

Power Steering Pressure Switch

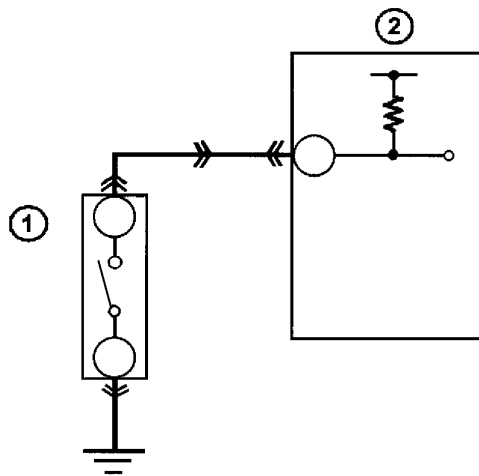
- A **PSP (Power Steering Pressure)** switch located at the power steering oil pump has been introduced to detect the load condition of the power steering. If the power steering oil pressure exceeds a given value, the switch closes and supplies the PCM with a voltage signal of 0 V.



M5_01065

1 PSP switch

2 Power steering oil pump



M5_01066

1 PSP switch

2 PCM

Maintenance and Repair

Replacing the engine oil

- Every time the engine oil is replaced, the parameter “Calculated oil dilution” in the PCM must be reset with the aid of WDS. Therefore, select the option **Toolbox**→**Powertrain**→**Data Reset**→**Engine Oil**.

Manual regeneration

- If the DPF is blocked due to an excessive soot amount accumulated, it must be regenerated manually with the aid of WDS. Therefore, select the option **Toolbox**→**Powertrain**→**DPF**→**DPF Regeneration**.
- Depending on the amount of soot accumulated in the DPF the PCM automatically selects normal regeneration mode (34 min) or long regeneration mode (60 min). Long regeneration mode is performed when the soot accumulation rate exceeds 125 %. Due to the longer duration the manual regeneration can be performed at a lower exhaust gas temperature. As a result, damage of the DPF by a violent regeneration following an over-accumulation of soot is prevented.
- In order to cancel the manual regeneration process perform the following procedure:
 1. Depress the clutch pedal, shift to 1st gear and verify that the engine speed decreases to idle speed (manual regeneration is cancelled).
 2. Shift to neutral and increase the engine speed to 3000 min⁻¹ for 1 min (DPF is cooled).
 3. If the manual regeneration must be performed again, wait for approx. 5 min before re-starting the regeneration process.

NOTE: Always perform the manual regeneration in a well-ventilated place and use an appropriate exhaust-gas extraction system. The vehicle should also not be parked in front of any flammable or low heat resistant material, since high temperature exhaust gas is emitted during this process. In addition, the hood should be opened to prevent the engine from overheating. Do NOT apply electrical load (such as turning on the headlights or rear window defroster) during manual regeneration, since the post injection amount is changed and regeneration may not be performed correctly.

NOTE: If the exhaust gas temperature during manual regeneration exceeds a certain limit, the PCM stops the regeneration process and increases the engine speed to 2500 min⁻¹ to cool the DPF.

NOTE: Depending on the amount of soot accumulated the PCM performs normal and long regeneration mode one after another, i.e. the regeneration process may take up to 94 min. If the DPF indicator light does not extinguish after the manual regeneration is completed, perform the regeneration process again.

Replacing the MAF sensor

- After replacing the MAF sensor, its adaptation values in the PCM must be reset with the aid of the WDS. Therefore, select the option **Toolbox→Powertrain→Data Reset→MAF Sensor**.

Replacing the high-pressure pump

- After replacing the high-pressure pump, its adaptation values in the PCM must be reset with the aid of the WDS. Therefore, select the option **Toolbox→Powertrain→Data Reset→Fuel Pump**.

Replacing injectors

- After replacing one or more injectors, the following steps must be performed:
 1. The injector adaptation values in the PCM must be reset using the option **Toolbox→Powertrain→Data Reset→Injector**.
 2. The injector correction factors must be programmed into the PCM via the option **Toolbox→Module Programming→Programmable Parameters→Injector Correction Factors**.
 3. The injection amount learning function must be performed using the option **Toolbox→Powertrain→Engine Checks→Learning→Correction after Parts Installation**.

Replacing the EGR valve or the ISV

- After replacing the EGR valve or the ISV, its adaptation values in the PCM must be reset with the aid of the WDS. Therefore, select the option **Toolbox→Powertrain→Data Reset→ETB/EGR**. Then the EGRVP sensor or the ISV position sensor must be initialized using the option **Toolbox→Powertrain→ETB/EGR Initialization**.

Replacing the DPF

- After replacing the DPF, the following steps must be performed:
 1. The DPF adaptation values in the PCM must be reset using the option **Toolbox→Powertrain→Data Reset→DPF**.
 2. The regeneration control in the PCM must be reset via the option **Toolbox→Powertrain→DPF→DPF Reset**.
 3. The injection amount learning function must be performed using the option **Toolbox→Powertrain→Engine Checks→Learning→Injection Amount Correction**.
 4. The DPF must be regenerated manually via the option **Toolbox→Powertrain→DPF→DPF Regeneration**.
 5. The pressure difference of the DPF must be assessed using the option **Toolbox→Powertrain→DPF→DPF Assessment**.

Replacing the DPF differential pressure sensor

- After replacing the DPF differential pressure sensor, the following steps must be performed:
 1. The adaptation values of the DPF differential pressure sensor in the PCM must be reset using the option **Toolbox→Powertrain→Data Reset→DPF Pressure Sensor**.
 2. The regeneration control in the PCM must be reset via the option **Toolbox→Powertrain→DPF→DPF Reset**.
 3. The pressure difference of the DPF must be assessed using the option **Toolbox→Powertrain→DPF→DPF Assessment**.

Replacing the HO2S

- After replacing the HO2S, its adaptation values in the PCM must be reset with the aid of the WDS. Therefore, select the option **Toolbox→Powertrain→Data Reset→O2 Sensor**.

Replacing the PCM

- After replacing the PCM, the following steps must be performed:
 1. The PCM must be configured using the option **Toolbox→Module Programming→Programmable Module Installation→PCM**.
 2. The keys must be programmed via the option **Toolbox→Body→Security→PATS Functions**.
 3. All the adaptation values in the PCM must be reset using the option **Toolbox→Powertrain→Data Reset→PCM**.
 4. The EGRVP sensor and the ISV position sensor must be initialized via the option **Toolbox→Powertrain→ETB/EGR Initialization**.
 5. The regeneration control in the PCM must be reset using the option **Toolbox→Powertrain→DPF→DPF Reset**.
 6. The injection amount learning function must be performed via the options **Toolbox→Powertrain→Engine Checks→Learning→Correction after Parts Installation/Injection Amount Correction**.
 7. The DPF must be regenerated manually via the option **Toolbox→Powertrain→DPF→DPF Regeneration**.
 8. The pressure difference of the DPF must be assessed using the option **Toolbox→Powertrain→DPF→DPF Assessment**.
 9. Since the parameter “Calculated oil dilution” has also been reset, the engine oil level must be checked. If the oil level is close to or exceeds the “X” mark on the dipstick, replace the engine oil.

On-board Diagnostic System

Features

- The On-board diagnostic system consists of the following functions:
 - Self-test function
 - PID monitor function
 - Simulation test function

Self Test

- The self-test function allows to read out the CMDTCs of the PCM with the aid of WDS. Therefore, select the option **Toolbox→Self Test→Modules→PCM→Retrieve CMDTCs**.
- In addition, the KOEO self-test can be performed using the option **Toolbox→Self Test→Modules→PCM→KOEO On-demand Self Test**.
- In order to conduct the KOER self-test select the option **Toolbox→Self Test→Modules→PCM→KOER On-demand Self Test**.

PID Monitor

- The PID monitor function allows to monitor the PIDs of the PCM with the aid of WDS. Therefore, select the option **Toolbox→Datalogger→Modules→PCM**.

Item	Definition	Unit/Condition
AC_REQ	A/C ON request	On/Off
ACCS	A/C compressor cycling switch	On/Off
ALTF	Generator field current control duty cycle	%
ALTT V	Generator output voltage	V
APP	Accelerator pedal position	%
APP_LRN	APP learning value - closed	V
APP1	APP sensor no.1	%
		V
APP2	APP sensor no.2	%
		V
ARPMDES	Target idle speed	RPM
BARO	Barometric pressure sensor	Pa
		V
BOO	Brake switch	On/Off
BOOST_DSD	Boost pressure desired	Pa
CATT11_DSD	Catalyst temperature desired (upper)	°C
CATT12_DSD	Catalyst temperature desired (middle)	°C
CATT21_DSD	Catalyst temperature desired (lower)	°C
CHRGLP	Generator warning light	On/Off
CPP	CPP switch	On/Off
DEC_CMP	Fuel correction for deceleration	No unit
DSC_ACT	DSC control	Enabled/ Disabled
DTCCNT	DTC count	No unit
ECT	ECT sensor	°C
		V
EGR_LRN	EGR valve learning value - closed	mm
EGRP	EGRVP sensor	V
		mm
		%
EQ_RAT11	Equivalence ratio (lambda)	No unit
ETC_ACT	ISV position actual	°
ETC_DSD	ISV position desired	%
		°C
EXHPRESS_DIF	DPF differential pressure sensor	Pa
EXHPRESS_LRN	DPF differential pressure sensor learning value	Pa
EXHPRESS2	DPF differential pressure sensor (middle)	Pa
EXHTEMP1	Exhaust gas temperature sensor (upper)	°C
EXHTEMP2	Exhaust gas temperature sensor (middle)	°C
EXHTEMP3	Exhaust gas temperature sensor (lower)	°C

M5_01016

Item	Definition	Unit/Condition
FAN_DUTY	Fan control duty cycle	%
FI_LRN_01	Fuel injection learning value (injector 1 at 35 MPa)	ms
FI_LRN_02	Fuel injection learning value (injector 2 at 35 MPa)	ms
FI_LRN_03	Fuel injection learning value (injector 3 at 35 MPa)	ms
FI_LRN_04	Fuel injection learning value (injector 4 at 35 MPa)	ms
FI_LRN_11	Fuel injection learning value (injector 1 at 65 MPa)	ms
FI_LRN_12	Fuel injection learning value (injector 2 at 65 MPa)	ms
FI_LRN_13	Fuel injection learning value (injector 3 at 65 MPa)	ms
FI_LRN_14	Fuel injection learning value (injector 4 at 65 MPa)	ms
FI_LRN_21	Fuel injection learning value (injector 1 at 100 MPa)	ms
FI_LRN_22	Fuel injection learning value (injector 2 at 100 MPa)	ms
FI_LRN_23	Fuel injection learning value (injector 3 at 100 MPa)	ms
FI_LRN_24	Fuel injection learning value (injector 4 at 100 MPa)	ms
FI_LRN_31	Fuel injection learning value (injector 1 at 140 MPa)	ms
FI_LRN_32	Fuel injection learning value (injector 2 at 140 MPa)	ms
FI_LRN_33	Fuel injection learning value (injector 3 at 140 MPa)	ms
FI_LRN_34	Fuel injection learning value (injector 4 at 140 MPa)	ms
FIA_DSD	Fuel injection amount desired [mm ³ /stroke]	No unit
FIP_FL	High-pressure pump flow	A
FIP_FL_DSD	High-pressure pump flow desired	No unit
FIP_SCV	Fuel metering valve	A
FLT	Fuel temperature sensor	°C
FP	Fuel metering valve duty cycle	%
FRP	Fuel pressure sensor	V Pa
FRP_A	Fuel pressure after fuel injection	Pa
GENVDSD	Generator voltage desired	V
GLWPG V	Glow plug voltage	V
GP_LMP	Glow plug indicator light	On/Off
GPC	Glow plug relay	On/Off
HTR11	HO2S (heater element)	% Ohms
HTR_OFF	HO2S voltage - off	V
HTR_ON	HO2S voltage - on	V
IAT	IAT sensor	V °C
IAT2	IAT sensor no.2	V °C
ICP	Injector control pressure	Pa
ICP_DSD	Injector control pressure desired	Pa
INGEAR	Load/No load condition	On/Off
ISV_LRN_C	ISV learning value - closed	%
ISV_LRN_O	ISV learning value - open	%
IVS	Idle validation switch	Idle/Off Idle
LOAD	Engine load	%

M5_01T016A

Item	Definition	Unit/Condition
MAF	MAF sensor	g/s
		V
MAF_C	Mass air flow per cylinder	g
MAF_C_DSD	Mass air flow per cylinder desired	g
MAP	MAP sensor	Pa
		V
MIL	Malfunction indicator light	On/Off
MIL_DIS	Travelled distance since MIL illuminated	km
O2	Oxygen concentration in exhaust gas	%
O2S11	HO2S (sensor)	Current
O2S11_CAL	HO2S calibration value	No unit
PM_ACC	Soot accumulation amount	g/L
PM_ACC_DSD	Soot accumulation amount desired	g/L
PM_GEN	Soot generation amount	g/L
PSP	PSP switch	Low/High
REG_AUTO	Automatic regeneration	On/Off
REG_MAN	Manual regeneration	On/Off
RPM	Engine speed	RPM
SC_CANCEL	Cruise control cancel switch	Active/Inactive
SC_COAST	Cruise control coast switch	Active/Inactive
SC_MAIN	Cruise control main switch	Active/Inactive
SC_MODE	Cruise control operation mode	Off/Standby/ Active/Tap-up/ Set/Tap-down/ Coast
SC_ON	Cruise control actuator switch on	On/Off
SC_RES	Cruise control resume switch	Active/Inactive
SC_SET	Cruise control set indicator light	On/Off
SC_SET/ACC	Cruise control set/acceleration switch	Active/Inactive
SCCS	Cruise control command switch	V
TC_CMP	Fuel correction for torque-down control [mm ³ /stroke]	No unit
TIRE SIZE	Tire revolution per mile	rev/mile
TP1	ISV position sensor	%
		V
VBCV	VBC solenoid valve duty cycle	%
VPWR	Battery positive voltage	V
VSS	Vehicle speed	km/h

M5_01T016B

Simulation Test

- The simulation test function allows to activate certain PIDs of the PCM with the aid of WDS. Therefore, select the option **Toolbox→Datalogger→Modules→PCM**.

x: Applicable
—: Not applicable

Item	Definition	Unit/Condition	Test condition	
			KOEO	KOER
ACCS	A/C compressor cycling switch	On/Off	X	X
EGRP	EGR valve position sensor	%	X	X
GENVDSD	Generator voltage desired	V	—	X
GP_LMP	Glow plug indicator light	On/Off	X	X
GPC	Glow plug relay	On/Off	X	X
INJ_1	Fuel injector no.1	On/Off	—	X
INJ_2	Fuel injector no.2	On/Off	—	X
INJ_3	Fuel injector no.3	On/Off	—	X
INJ_4	Fuel injector no.4	On/Off	—	X
VBCV	VBC solenoid valve duty cycle	%	X	X

M5_01T0017

Notes:

02

Suspension

02 Suspension

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Rear Shock Absorber.....	6

Wheels and Tires

- Wheel and tire sizes are the same as the current Mazda3 (BK), but tire speed ratings have changed.

Specifications

Standard Tire

Item		Specifications		
Tire	Size	195/65R15 91V	205/55R 16 91V	205/50R 17 93V
Wheel	Size	15 X 6J		16 X 6 1/2J 17 X 6 1/2J
	Material	Steel	Aluminium alloy	Aluminium alloy
	Offset (mm {in})	52.5 (2.07)		
	Pitch circle diameter (mm {in})	114.3 (4.50)		

M5_02T002

Temporary Spare Tire

Item		Specifications	
Tire	Size	T115/70D 15	T125/70D 16
Wheel	Size	15 X 4T	16 X 4T
	Material	Steel	
	Offset (mm/(in))	4.5 (1.8)	
	Pitch circle diameter (mm/(in))	114.3 (4.50)	

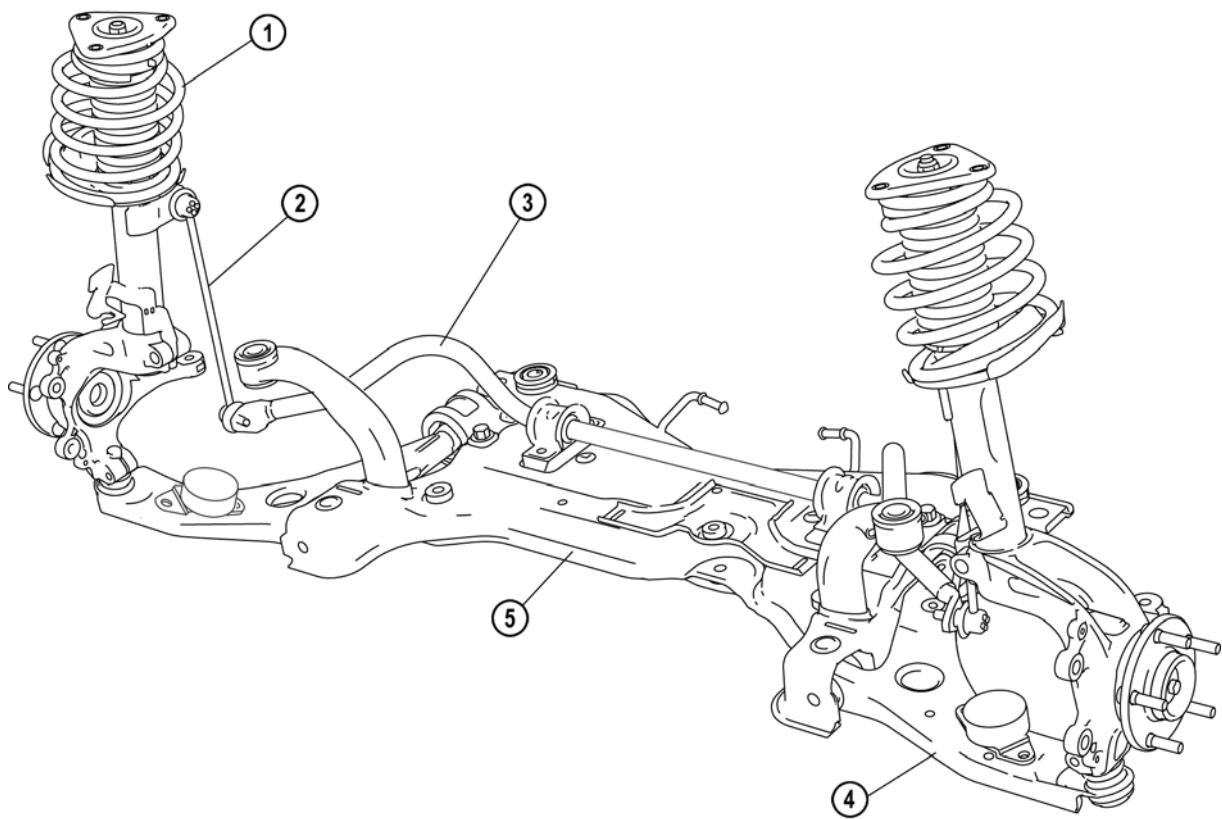
M5_02T003

Front Suspension

Features

- The front suspension of the Mazda5 is essentially the same as the current Mazda3 (BK). It has the following features:
 - Strut-type design.
 - Front crossmember rubber mounted to the body at four points.
 - Oil filled bushes used for the front lower arms.

Overview



M5_02003

- | | | | |
|---|--------------------------------------|---|-------------------|
| 1 | Front shock absorber and coil spring | 4 | Front lower arm |
| 2 | Front stabilizer control link | 5 | Front crossmember |
| 3 | Front stabilizer | | |

Specifications

		Item		Specification	
		Engine type		L8,LF	
Type		Strut type			
Spring type		Coil spring			
Shock absorber type		Low-pressure gas charged, cylindrical, double-acting			
Stabilizer	Type	Torsion bar			
	Diameter (mm {in})	23 {0.90}			
Front suspension	Total toe-in	Tire [Tolerance ± 4 {0.15}] (mm {in})	2 {0.08}		
		Rim inner	1 \pm 3 {0.04 \pm 0.12}		
	Degree		0 ° 11' \pm 22		
	Maximum steering angle [Tolerance ± 3 °]	Inner	40 ° 05'		
Outer		33 ° 07'			
Wheel alignment (unloaded)	Caster angle (Reference) [Tolerance ± 1 °]		3 ° 14'	3 ° 12'	
	Camber angle (Reference) [Tolerance ± 1 °]		-0 ° 42'	-0 ° 44'	
	Steering axis inclination (Reference)		13 ° 59'	14 ° 04'	

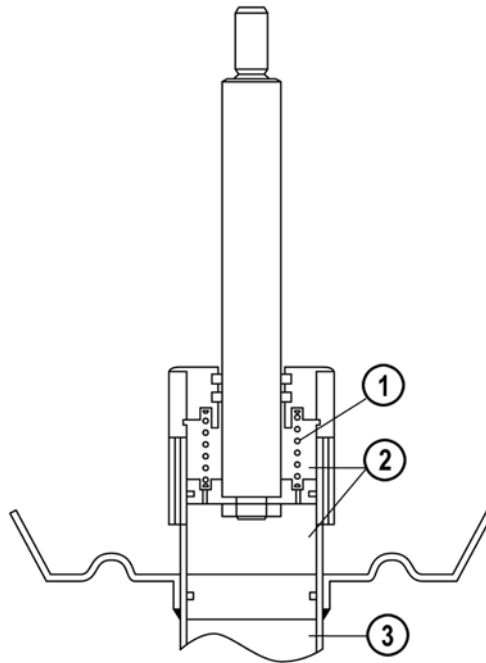
M5_02T001

NOTE: The camber and caster angle are not adjustable.

Front Shock Absorber

- A shock absorber with an internal rebound spring is used to control wheel-lift* during hard cornering. The rebound spring allows a limited amount of movement of the shock absorber when it is fully extended. Without the spring the shock absorber would top-out, making the suspension ineffective and causing wheel hop or wheel lift.

*Wheel-lift: Tendency for wheels on the inside of a curve to lift off the ground during cornering.



M5_02001

- 1 Rebound spring
- 2 Oil chamber

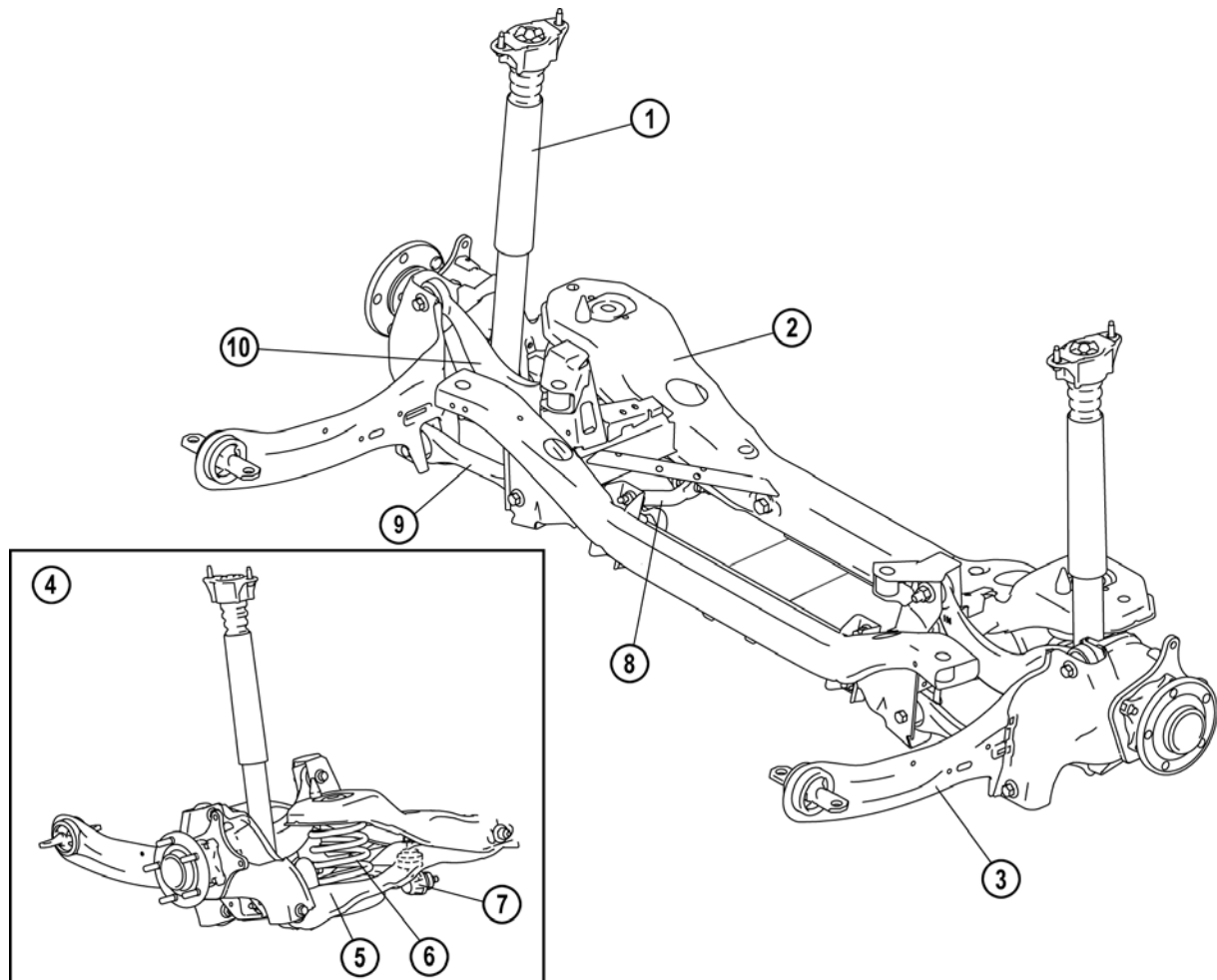
- 3 Gas chamber

Rear Suspension

Features

- The rear suspension is essentially the same as the current Mazda3 (BK). It has the following features:
 - E-type design layout.
 - Separate shock absorber and springs.

Overview



M5_02004

- | | | | |
|---|---------------------------|----|------------------------------|
| 1 | Rear shock absorber | 6 | Rear coil spring |
| 2 | Rear crossmember | 7 | Rear stabilizer control link |
| 3 | Rear trailing link | 8 | Rear stabilizer |
| 4 | View from rear of vehicle | 9 | Rear lateral link |
| 5 | Rear lower arm | 10 | Rear upper arm |

Specifications

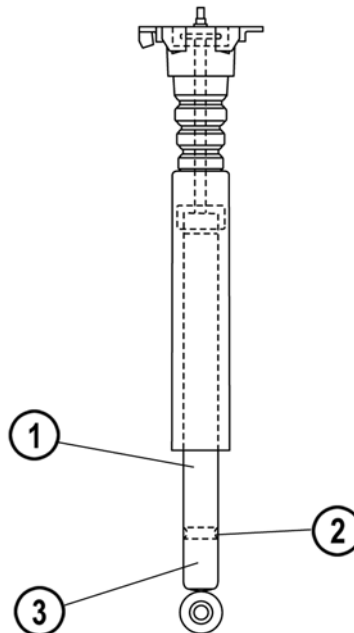
		Item		Specification	
Rear suspension	Type		Multi-link		
	Spring type		Coil spring		
	Shock absorber type		High-pressure gas charged, cylindrical, double-acting		
	Stabilizer	Type		Torsion bar	
		Diameter (mm {in})		20 {0.79}	
	Wheel alignment (unloaded)	Total toe-in	Tire [Tolerance ± 4 {0.15}] (mm {in})	2 {0.08}	
			Rim inner	1 ± 3 {0.04 \pm 0.12}	
		Degree		$0^\circ 11' \pm 22'$	
		Camber angle [Tolerance $\pm 1^\circ$]		$-1^\circ 29'$	
		Thrust angle [Tolerance $\pm 48'$]		0°	

M5_02T004

NOTE: The camber angle is not adjustable.

Rear Shock Absorber

- A monotube-type rear shock absorber is used. The advantages of monotube construction are that oil foaming is eliminated, and that shock absorber performance does not deteriorate at high temperatures.



M5_02002

- 1 Oil
2 Free piston

- 3 High-pressure gas

03

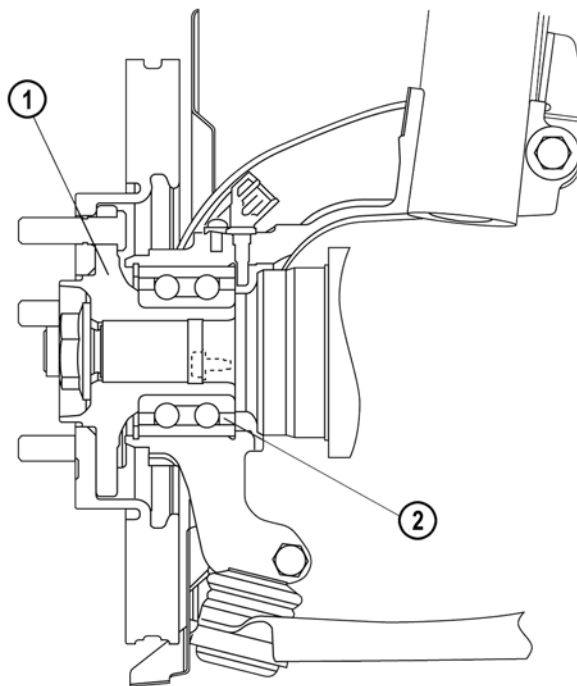
**Driveline/
Axle**

03 Driveline/Axle

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Overview.....	2
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Front Axle**Features**

- The front axle on the Mazda5 is essentially the same design as that of the current Mazda3 (BK). It has the following features:
 - Unit-design angular ball bearings are used.

Overview

1 Wheel hub

2 Wheel bearing

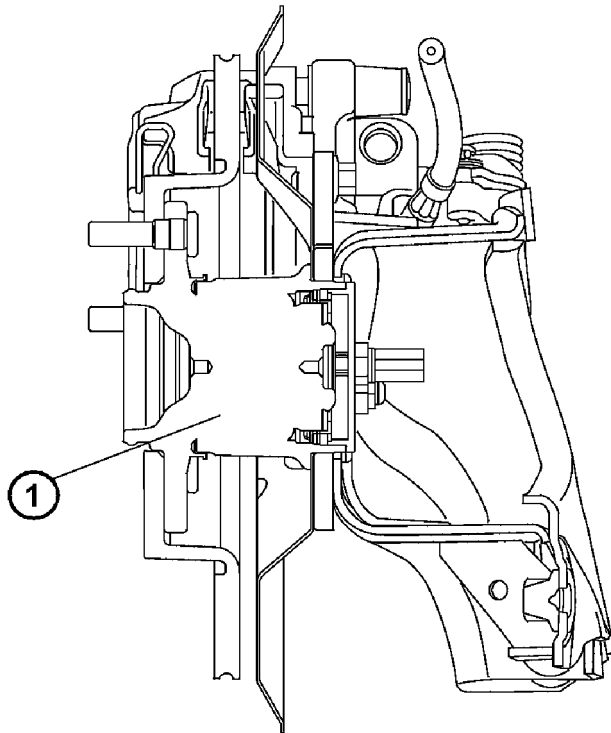
M5_03002

Rear Axle

Features

- The rear axle on the Mazda5 is essentially the same design as that of the current Mazda3 (BK). It has the following features:
 - Unit-design angular ball bearings are used.

Overview



- 1 Wheel hub (integrated with wheel bearing)

M5_03001

Drive Shaft

Features

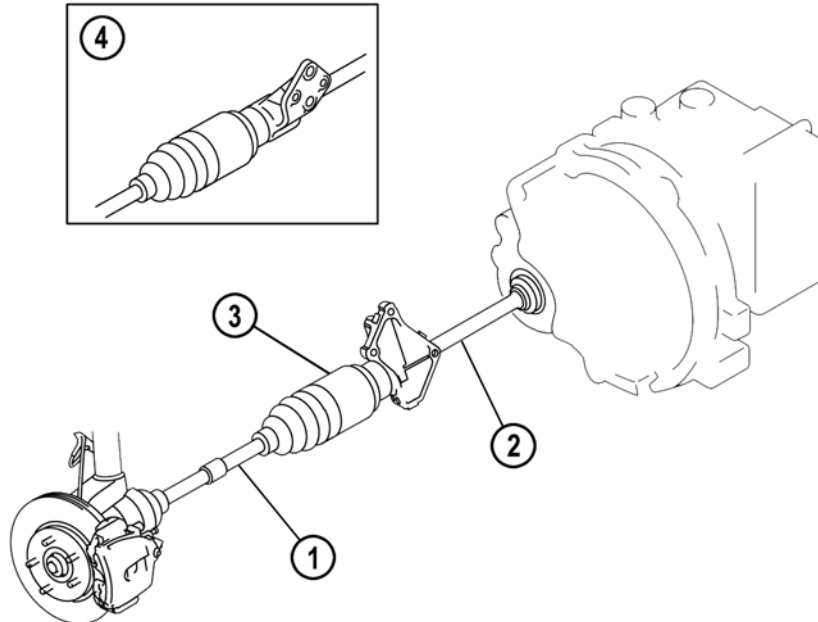
- The drive shafts on the Mazda5 are essentially the same design as those on the current Mazda3 (BK). They have the following features:
 - A bell joint is used for the wheel-side constant velocity joints.
 - A tripod joint is used for the transaxle-side constant velocity joint.

Specifications

Item		Specifications		
		L8	LF	MZR-CD
Joint type	Wheel side	Bell joint		
	Differential side	RH	Double offset joint	Tripod joint
LH		Tripod joint		
Shaft diameter	(mm{in})	26.0 {1.02}		
Joint shaft				
Shaft diameter	(mm{in})	40.0 {1.57}		

M5_03T001

Overview



- 1 Front drive shaft
- 2 Joint shaft

- 3 L8, LF
- 4 MZR-CD

M5_03003

NOTES:

04

Brakes

04 Brakes

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Dynamic Stability Control	4
Parts Location	4
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Conventional Brake System

Features

- The construction and operation of the brake system is essentially the same as the current Mazda3 (BK). It has the following features:
 - An intrusion minimizing brake pedal is used.
 - Mechanical brake assist is included in the power brake unit.
 - A remote master cylinder reservoir tank has been added.

Specifications

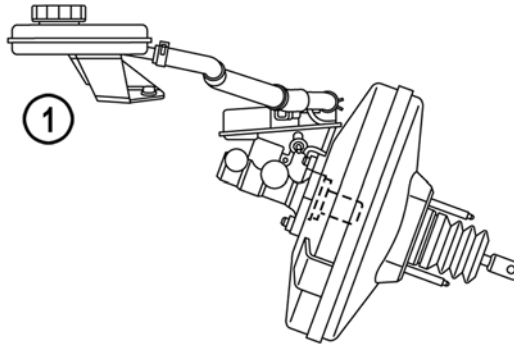
Item		Specification
Brake pedal	Type	Suspended design
	Pedal lever ratio	2.8
	Max. Stroke (mm {in})	117 {4.61}
Master cylinder	Type	Tandem
	Cylinder bore (mm {in})	22.2 {0.874}
Front brake	Type	Ventilated disc
	Cylinder bore (mm {in})	57 {2.2}
	Pad dimensions (area x thickness) (mm ² x mm {in ² x in})	5,140 x 12.0 {7.967 x 0.47}
	Disc plate dimensions (mm {in})	With 15 inch brake: 278 x 25 {10.9 x 0.98}
		With 16 inch brake: 300 x 25 {11.8 x 0.98}
Type	Solid disc	
Rear brake	Cylinder bore (mm {in})	38 {1.5}
Rear brake	Pad dimensions (area x thickness) (mm ² x mm {in ² x in})	2,700 x 10.8 {4.185 x 0.43}
	Disc plate dimensions (mm {in})	With 15 inch brake: 280 x 11 {11.0 x 0.43}
		With 16 inch brake: 302 x 11 {11.9 x 0.43}
Power brake unit	Type	Vacuum multiplier, single diaphragm
	Outer diameter (mm {in})	272.1 {10.71}
Rear wheel braking force control device	Type	Electronic Brakeforce Distribution (EBD)
Brake piping	Piping layout	X pattern
Parking brake	Type	Mechanical design, rear two-wheel braking
	Operating method (application/release)	Manually operated lever design
	Play adjustment method	Auto-adjusting
Brake fluid	Type	SAE J1703, FMVSS 116 DOT-3 or DOT-4

M5_04T001

Master Cylinder

- The master cylinder remote reservoir is attached to the vehicle body under the cowl panel, and connected to the master cylinder via a rubber hose.

NOTE: The remote reservoir and connecting hoses can be replaced separately, but the master cylinder and main reservoir cannot. If a fault exists in the master cylinder or main reservoir, they must be replaced as an assembly.



M5_04001

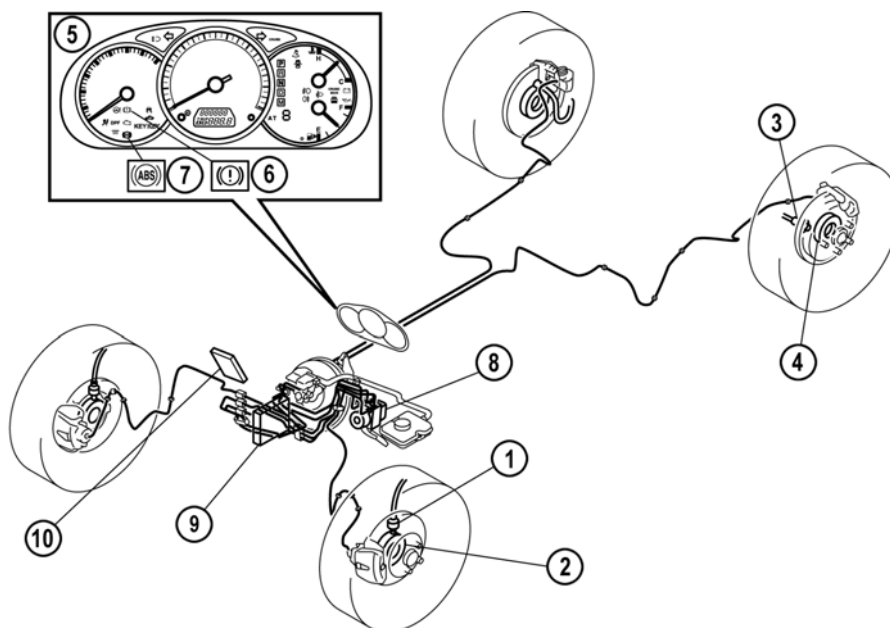
- 1 Brake master cylinder and reservoir

Antilock Brake System

Features

- The construction and operation of the **ABS (Antilock Brake System)** is essentially the same as the current Mazda3 (BK). It has the following features:
 - A TEVES MK7 hydraulic unit/control module is used to control ABS and Electronic Brake force Distribution operation (vehicles without DSC).
 - Giant Magneto Resistance element type ABS wheel speed sensors are used.
 - Magnetic encoder type ABS sensor rotor that is integrated with the hub is used.

Parts Location



M5_04002

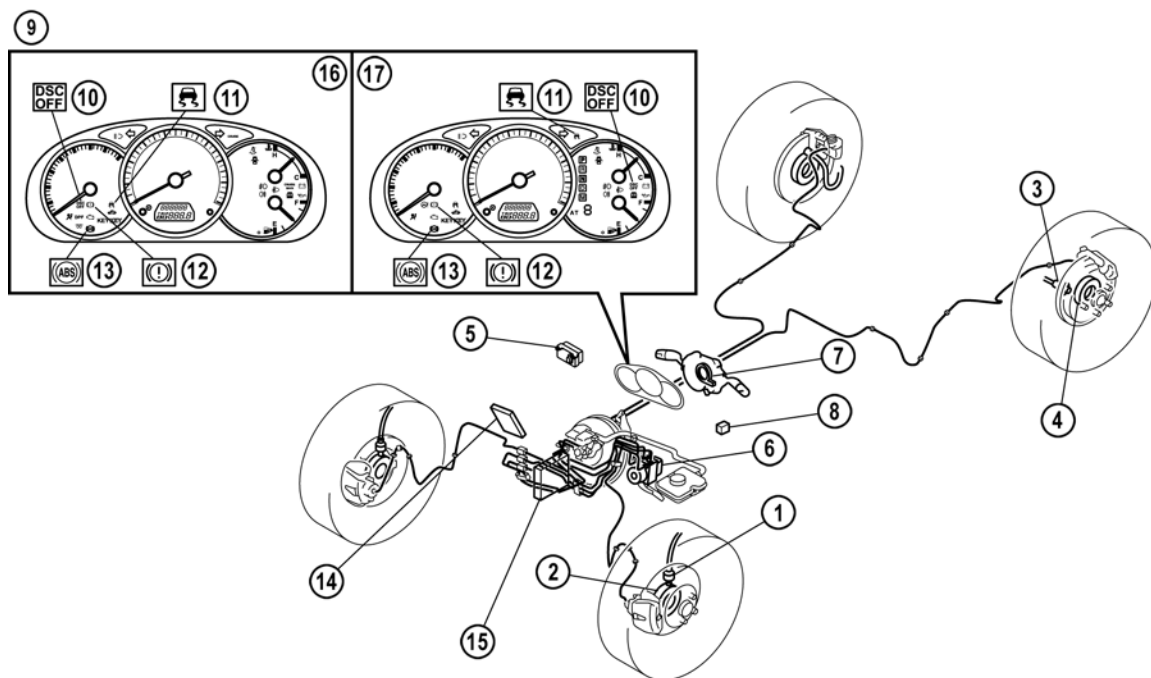
1	Front ABS wheel-speed sensor	6	Brake system warning light
2	Front ABS sensor rotor	7	ABS warning light
3	Rear ABS wheel-speed sensor	8	ABS HU/CM
4	Rear ABS sensor rotor	9	PCM (L8,LF)
5	Instrument cluster	10	PCM (MZR-CD)

NOTE: When replacing the ABS control module, the new module has to be configured. To do this connect the WDS to the vehicle, select the option **Toolbox→Module programming→Programmable module installation→ABS**.

Dynamic Stability Control

- The construction and operation of the **DSC (Dynamic Stability Control)** is essentially the same as the current Mazda3 (BK). It has the following features:
 - A TEVES MK6 DSC hydraulic unit/control module, controlling DSC/TCS/ABS/EBD is used.
 - A combine sensor, integrating both the yaw rate sensor and lateral-G sensor is used.
 - A private controller area network system is used for communication between the combine sensor and DSC control module.

Parts Location



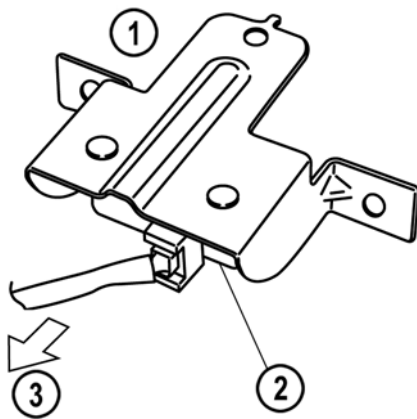
M5_04003

- | | | | |
|---|--|----|----------------------------|
| 1 | Front ABS wheel-speed sensor | 10 | DSC OFF light |
| 2 | Front ABS sensor rotor | 11 | DSC indicator light |
| 3 | Rear ABS wheel-speed sensor | 12 | Brake system warning light |
| 4 | Rear ABS sensor rotor | 13 | ABS warning light |
| 5 | Combine sensor | 14 | PCM (MZR-CD) |
| 6 | Brake fluid pressure sensor (built into DSC HU/CM) | 15 | PCM (L8,LF) |
| 7 | Steering angle sensor | 16 | Diesel engine |
| 8 | DSC OFF switch | 17 | Gasoline engine |
| 9 | Instrument cluster | | |

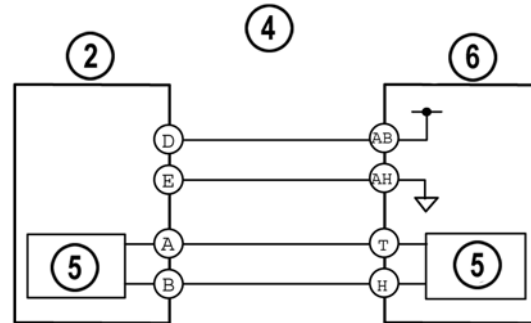
Combine Sensor

- The combine sensor is located on the cross member under the front right seat, and detects the vehicle yaw rate and lateral-G force. The combine sensor transmits yaw and lateral acceleration information to the DSC HU/CM via a dedicated CAN bus (independent of the MS-CAN/HS-CAN).

NOTE: When replacing the combine sensor, the new sensor has to be initialized. To do this, connect **WDS (Worldwide Diagnostic System)** to the vehicle and select the option **Toolbox→Chassis→ABS/DSC→Sensor Initialization**. Alternatively, select the option **Toolbox→Datalogger→Modules→ABS**. Then set the PIDs **LATACCEL #** and **YAWRATE #** to TRUE. After initialization has been completed, the vehicle should be driven for five minutes or more.



- 1 External view
- 2 Combine sensor
- 3 Vehicle front



- 4 System wiring diagram
- 5 CAN driver
- 6 DSC HU/CM

M5_04004

NOTES:

05

**Transmission/
Transaxle**

05 Transmission/ Transaxle

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Transmission/Transaxle

Manual Transaxle

Features

- The transmission/transaxle has the following features:
 - Cable operated shift mechanism.
 - Shift lever located at centre of dashboard.
 - Hydraulically operated clutch (same as Mazda3 (BK)).
 - Quick connector clutch pipes (same as Mazda3 (BK)).
 - 5-speed G35M-R manual transmission for gasoline engine models (similar to Mazda3 (BK)).
 - 6-speed A26M-R manual transmission for diesel engine models.
 - Dual-mass flywheel for diesel engine models (same as Mazda6 (GG/GY)).
 - Self-adjusting clutch cover for diesel engine models (same as Mazda2 (DY)).

G35M-R Transmission

- The G35M-R manual transaxle is essentially the same as that used on the current Mazda3 (BK) with LF engine, except for the following:
 - Triple-cone synchronizer is used for first and second gears.
 - Double-cone synchronizer is used for third and fourth gears.

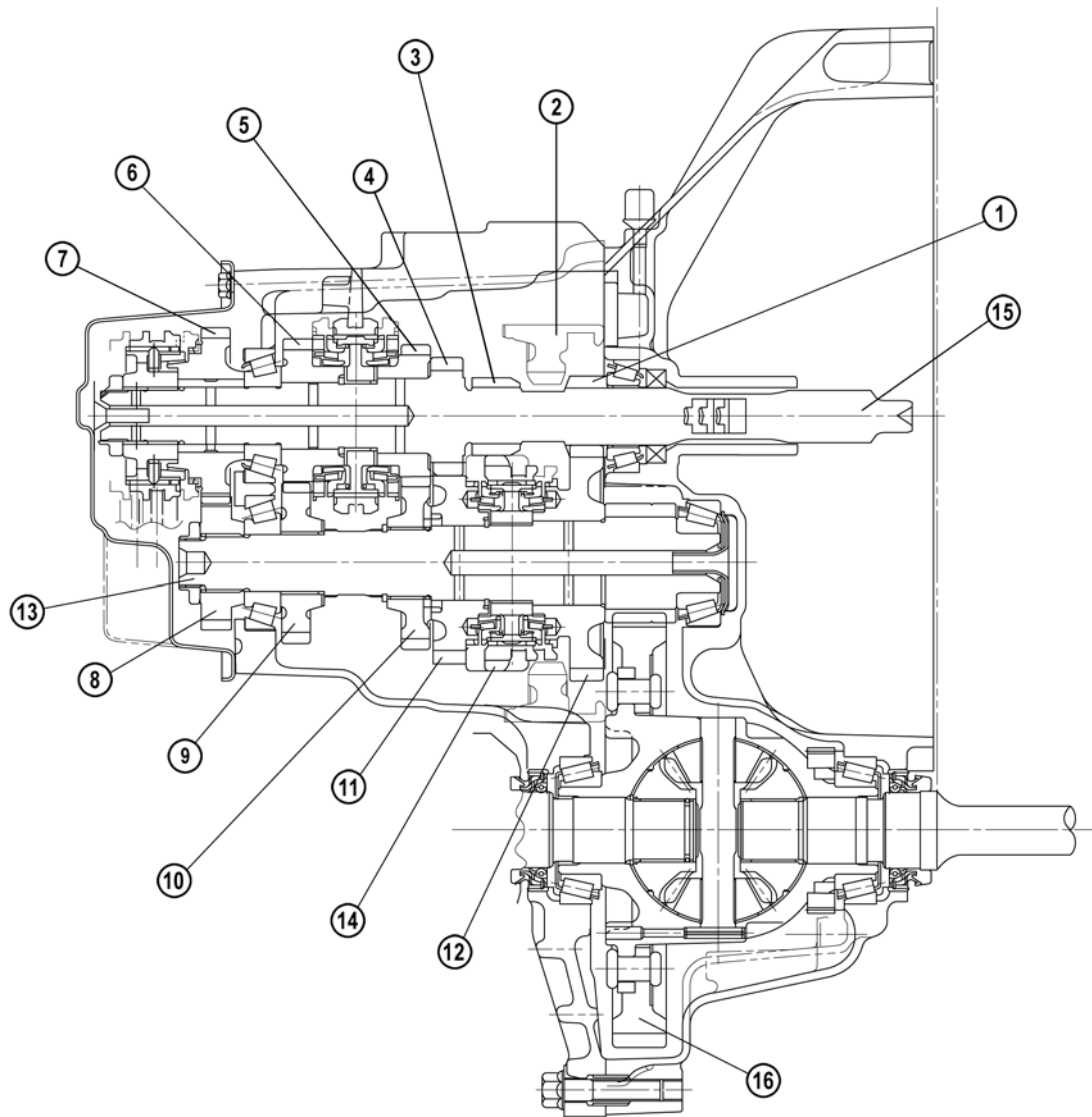
Specifications

Item		Specifications	
Engine type		L8	LF
Manual transaxle type		G35M-R	
Operation system		Cable	
Transaxle control		Floor-shift	
Shift assist	Forward	Synchromesh	
	Reverse	Selective sliding and synchromesh	
Gear ratio	1GR	3,666	3,307
	2GR	2,059	1,842
	3GR	1,392	1,310
	4GR	1,030	
	5GR	0,795	
	Reverse	3,454	
Final gear ratio		4,388	4,588
Oil	Grade	API service GL-4 or GL-5	
	Viscosity	All season	SAE 75W-90
		Above 10°C{50°F}	SAE 80W-90
Capacity (approximately)	(L{US qt, Imp qt})	2.87 {3.03, 2.53}	

M5_05T001

Transmission/Transaxle

Overview

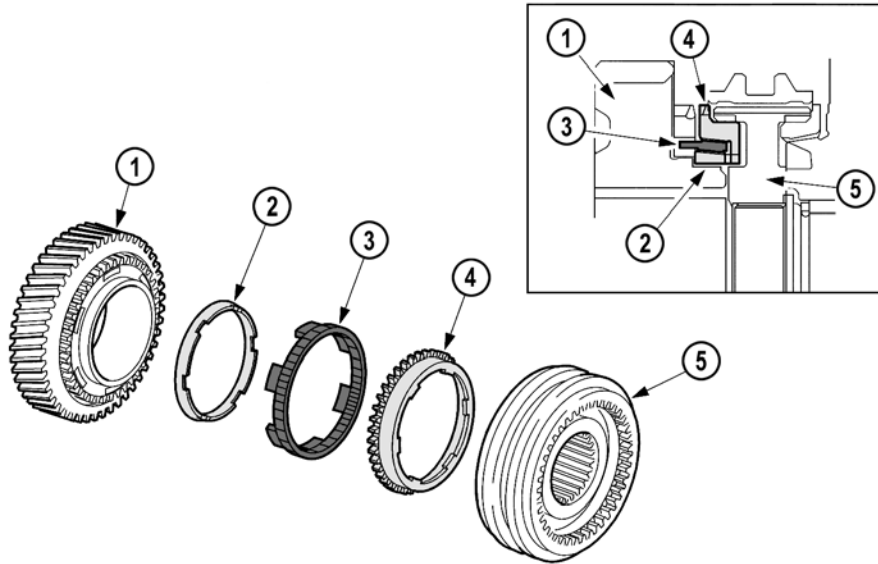


M5_05016

- | | | | |
|---|----------------------------|----|----------------------------------|
| 1 | First gear | 9 | Secondary shaft fourth gear |
| 2 | Reverse idler gear | 10 | Secondary shaft third gear |
| 3 | Reverse gear | 11 | Secondary shaft second gear |
| 4 | Second gear | 12 | Secondary shaft first gear |
| 5 | Third gear | 13 | Secondary shaft |
| 6 | Fourth gear | 14 | Clutch hub sleeve (reverse gear) |
| 7 | Fifth gear | 15 | Primary shaft |
| 8 | Secondary shaft fifth gear | 16 | Differential gear |

Triple Cone Synchronizer

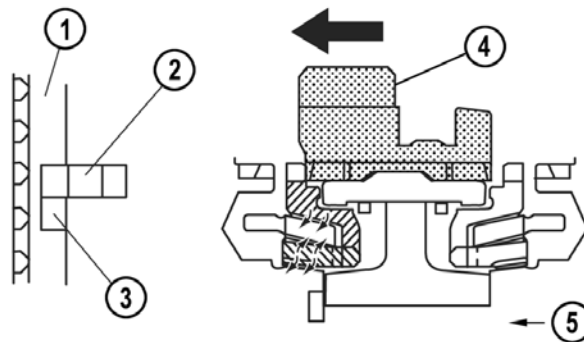
- A triple-cone synchronizer mechanism is used for the first and second gears.
- The construction of the triple-cone synchronizer is essentially the same as a double-cone synchronizer, except that the inner surface of the inner ring is used as a friction surface on the triple-cone synchronizer.



- | | | | |
|---|-------------------------|---|---------------------------|
| 1 | Gear | 4 | Outer synchronizer ring |
| 2 | Inner synchronizer ring | 5 | Synchronizer hub assembly |
| 3 | Synchronizer cone | | |

M5_05002

Operation



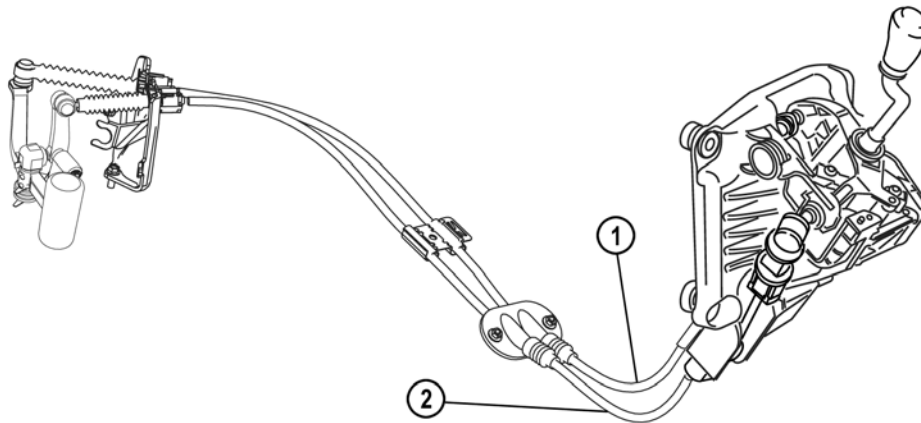
- | | | | |
|---|-------------------|---|-------------------------|
| 1 | Synchronizer ring | 4 | Synchronizer hub sleeve |
| 2 | Synchronizer key | 5 | Friction surface |
| 3 | Key groove | | |

M5_05003

Transmission/Transaxle

Shift Mechanism

- A cable operated shift mechanism similar to the current Mazda3 (BK) is used.
- The main selector cable is adjusted by unclipping it from the selector mechanism and then reattaching it to achieve the correct cable length, the same as on the Mazda3.



M5_05004

1 Main shift cable

2 Main selector cable

A26M-R Transmission

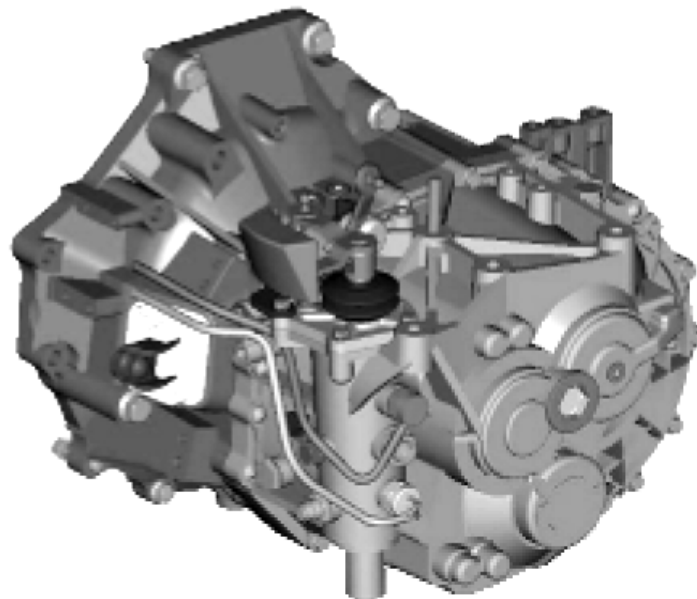
- The A26M-R 6-speed manual transaxle is manufactured by Aisin, and designed for front-wheel-drive vehicles with a transversely mounted powertrain.

Specifications

Item		Specifications	
Engine type		MZR-CD	
Manual transaxle type		A26M-R	
Operation system		Cable	
Shift assist	Forward	Synchromesh	
	Reverse	Synchromesh (lever type)	
Gear ratio	1GR	3,538	
	2GR	1,913	
	3GR	1,218	
	4GR	0,880	
	5GR	0,809	
	6GR	0,673	
	Reverse	3,166	
Final gear ratio		1GR, 2GR, 3GR, 4GR: 3.611 5GR, 6GR, Reverse: 3.095	
Oil	Grade	API service GL-4 or GL-5	
	Viscosity	All season	SAE 75W-90
		Above 10°C{50°F}	SAE 80W-90
	Capacity (approximately)	(L{US qt, Imp qt})	2.55 {2.69, 2.24}

M5_05T002

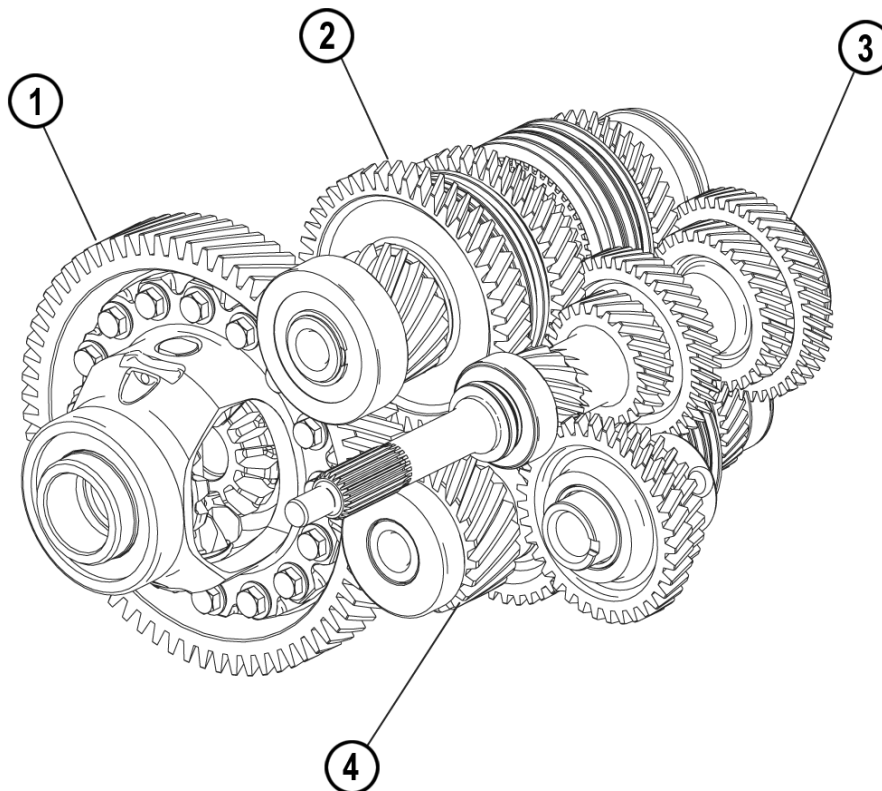
Overview



M5_05005

Construction

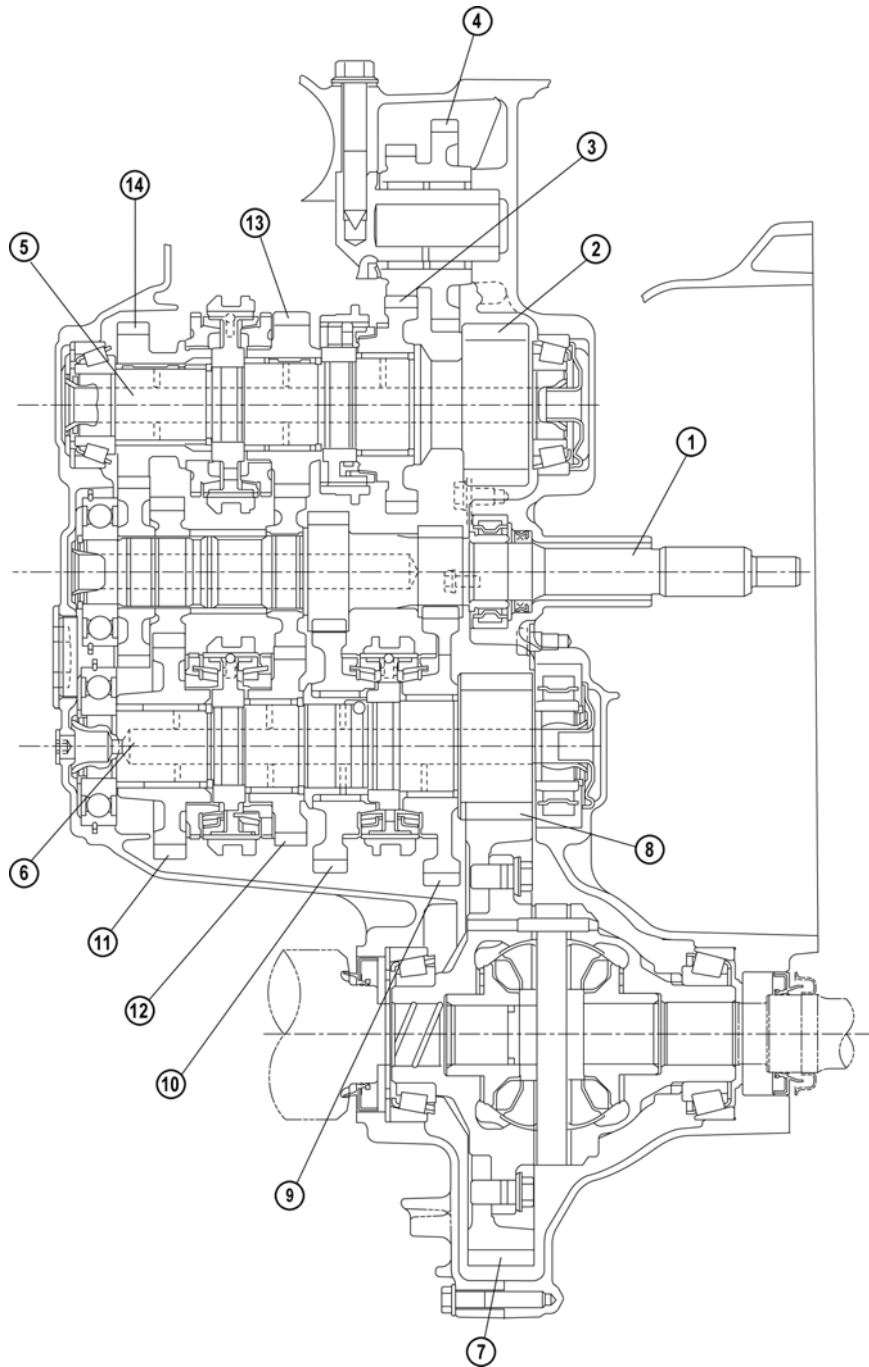
- The A26M-R manual transaxle is a three-shaft design; one primary (input) shaft and two secondary (output) shafts.
- The three-shaft design allows for a more compact construction due to the fact that each output shaft needs only to carry three or four gears, so can thus be made shorter.
- As a result of the three shaft construction there are two final gear ratios; one for the first to fourth gears and a different one for the fifth, sixth and reverse gears.
- A triple-cone synchronizer mechanism is used for first, second, and third gears. Fourth gear has a double-cone synchronizer mechanism.



M5_05006

- | | | | |
|---|-----------------------|---|-----------------------|
| 1 | Differential | 3 | Primary shaft |
| 2 | Secondary shaft No. 1 | 4 | Secondary shaft No. 2 |

Cross-sectional View

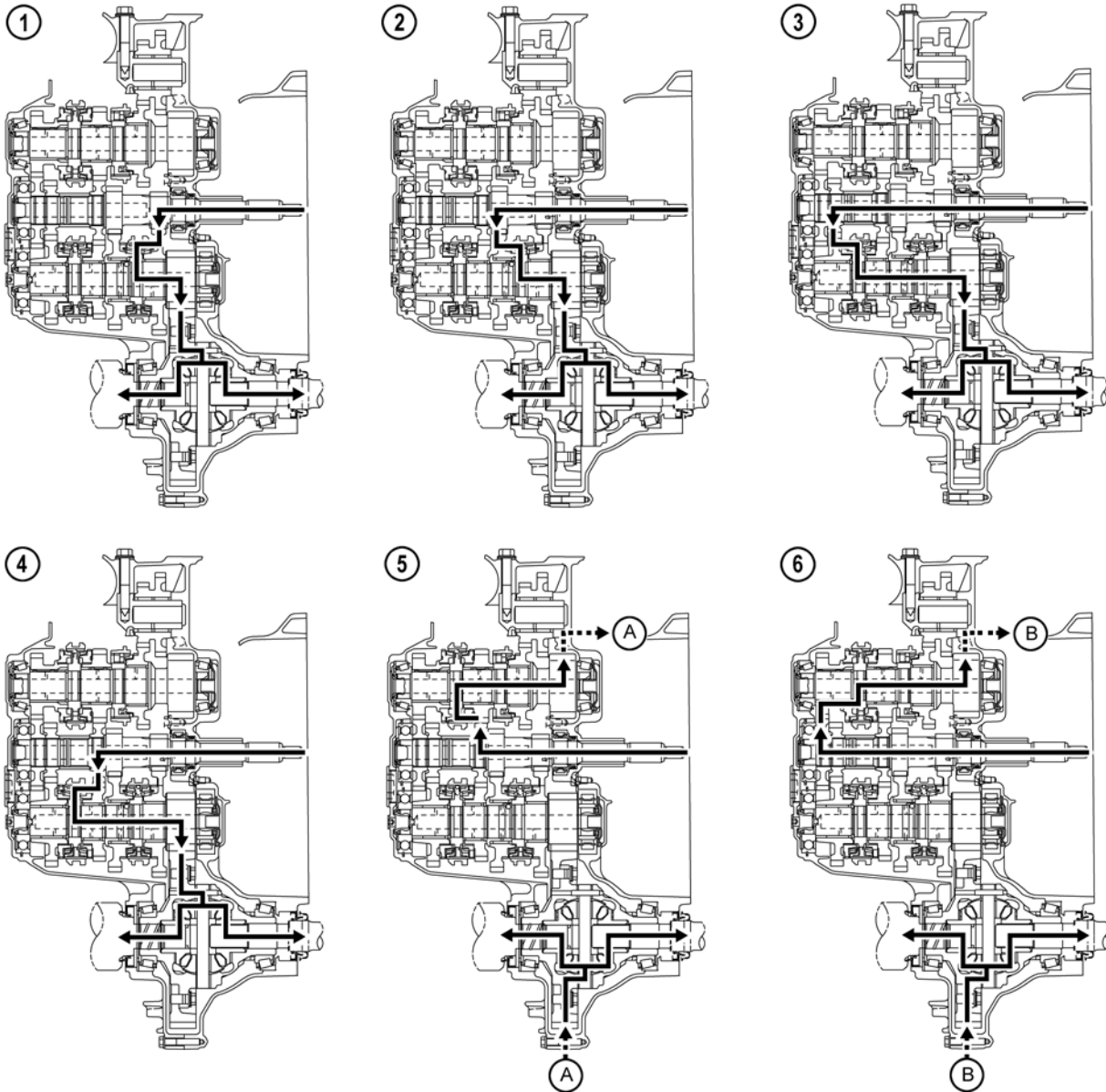


M5_05007

- | | | | |
|---|------------------------|----|------------------|
| 1 | Primary shaft | 8 | Final gear No. 1 |
| 2 | Final gear No. 2 | 9 | First gear |
| 3 | Reverse gear | 10 | Second gear |
| 4 | Reverse idler gear | 11 | Third gear |
| 5 | Secondary shaft No. 2 | 12 | Fourth gear |
| 6 | Secondary shaft No. 1 | 13 | Fifth gear |
| 7 | Differential ring gear | 14 | Sixth gear |

Power Flow

First to Sixth Gear

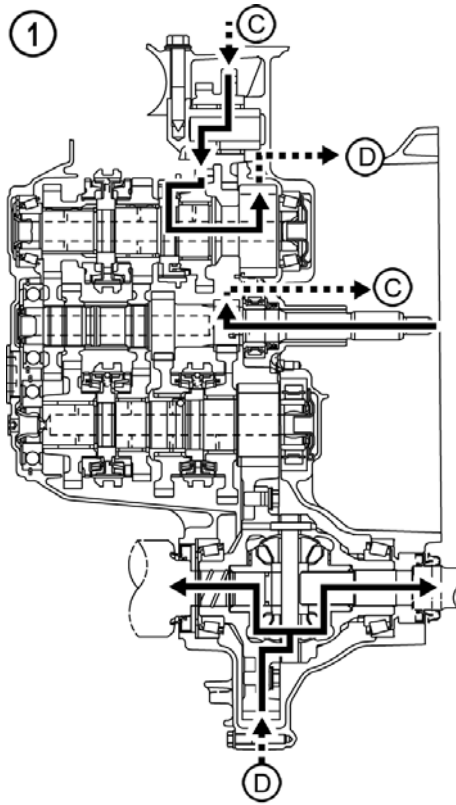


M5_05008

- 1 First gear
- 2 Second gear
- 3 Third gear

- 4 Fourth gear
- 5 Fifth gear
- 6 Sixth gear

Reverse Gear

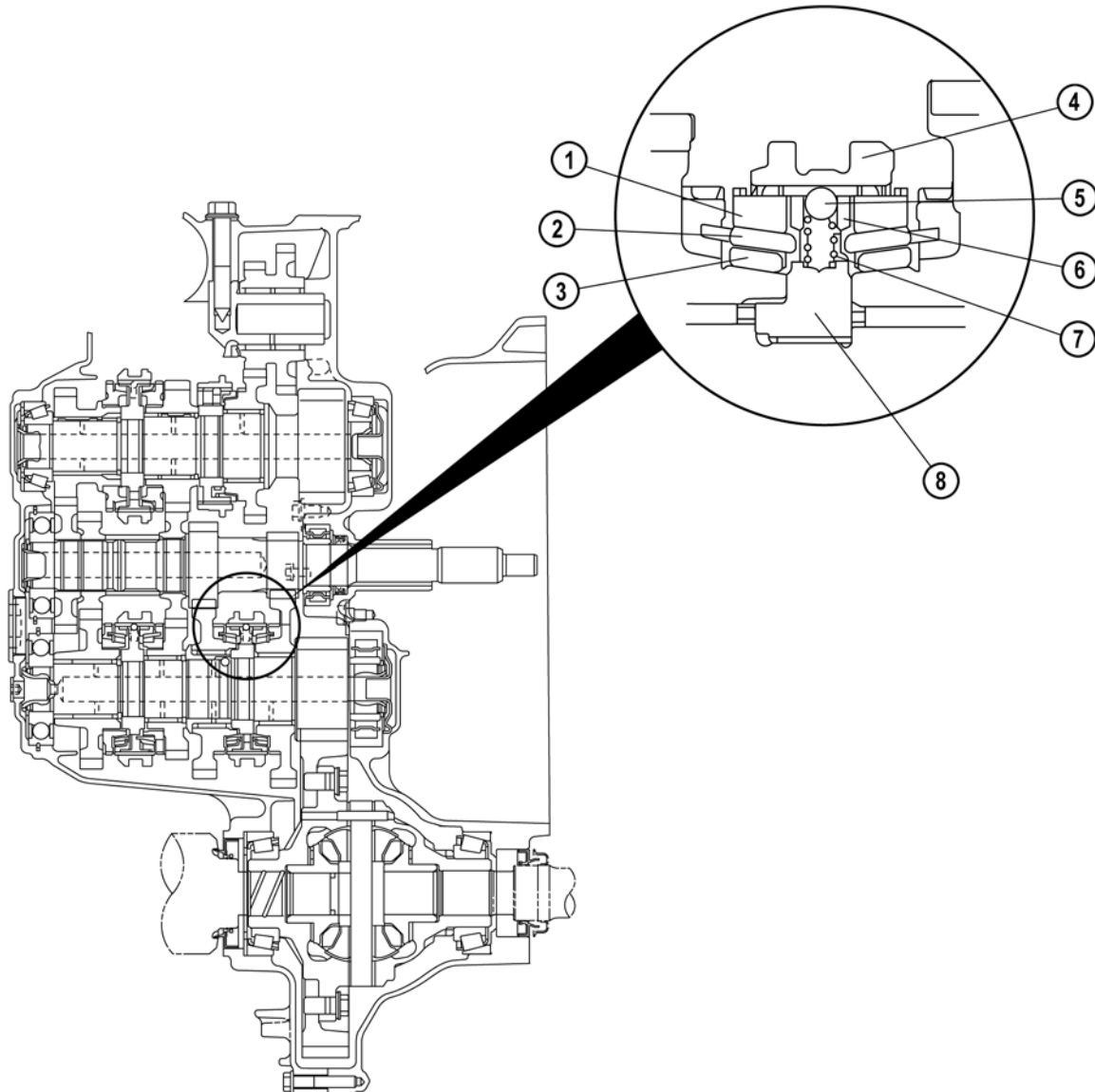


M5_05009

- 1 Reverse gear

Synchronizer Clutch Hub

- A ball-type detent mechanism is used in each clutch hub to reduce the overall dimensions of the hub.
- The ball-type detent mechanism consists of a coil-type synchronizer key spring, synchronizer key, and ball. Its function is essentially the same as the radial-type spring found in other transaxles.

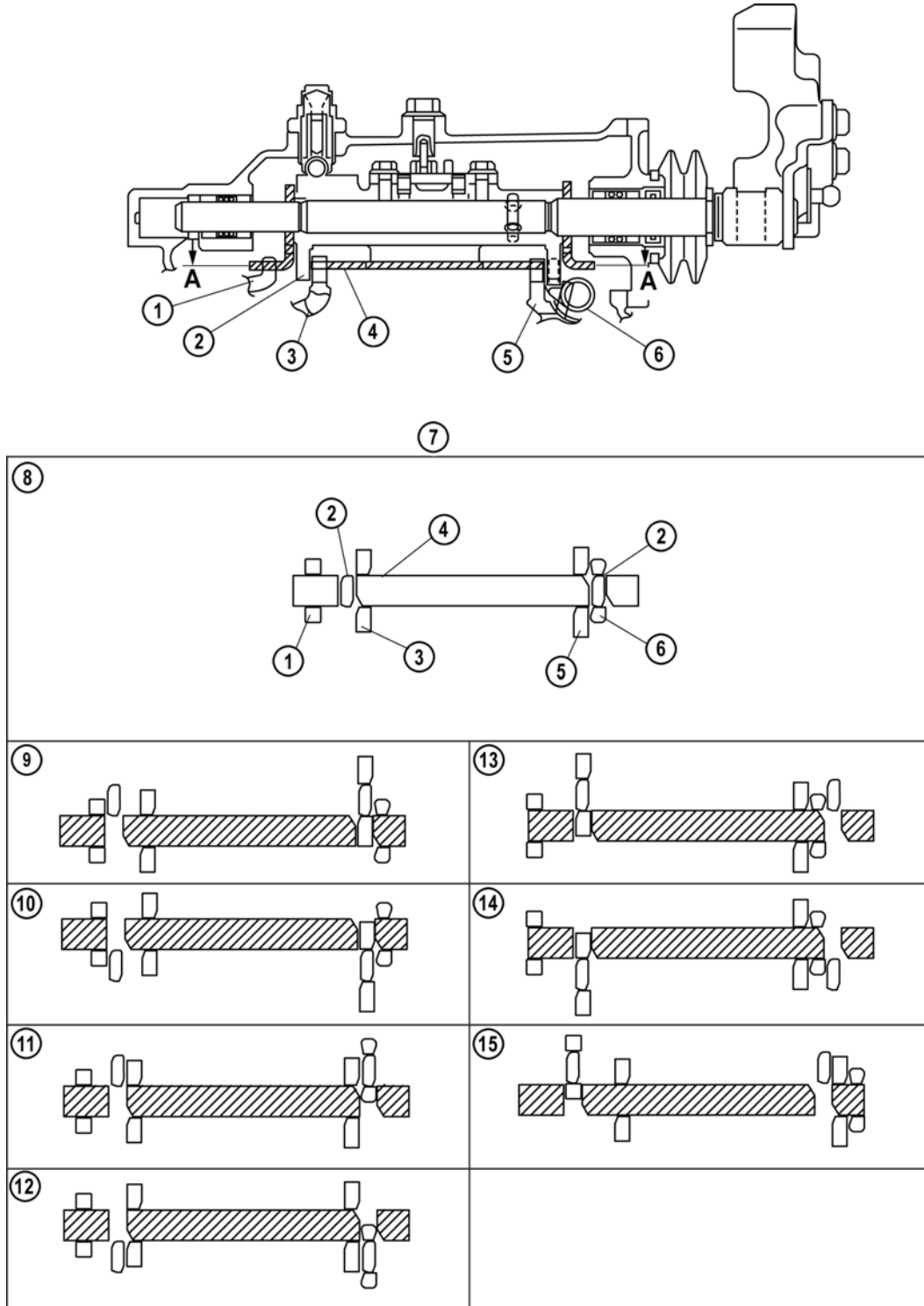


M5_05010

- | | | | |
|---|-------------------------|---|-------------------------|
| 1 | Outer synchronizer ring | 5 | Ball |
| 2 | Synchronizer cone | 6 | Synchronizer key |
| 3 | Inner synchronizer ring | 7 | Synchroniser key spring |
| 4 | Hub sleeve | 8 | Synchronizer hub |

Shift Interlock Mechanism

- The shift interlock mechanism prevents two gears being engaged at the same time. During shifting, the shift forks and control rod, except for the one in operation, are locked in the neutral position by the interlock plate.

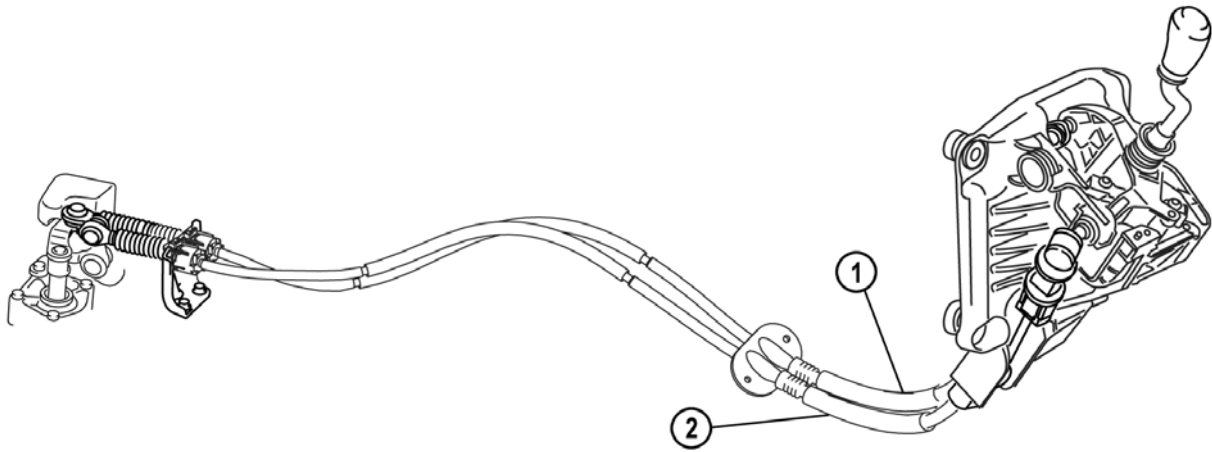


M5_05011

- | | | | |
|---|-------------------------------|----|--------------|
| 1 | Reverse shift fork | 9 | First gear |
| 2 | Inner lever | 10 | Second gear |
| 3 | Fifth/sixth gear shift fork | 11 | Third gear |
| 4 | Interlock plate | 12 | Fourth gear |
| 5 | First/second gear shift fork | 13 | Fifth gear |
| 6 | Third/fourth gear control rod | 14 | Sixth gear |
| 7 | A-A sectional view | 15 | Reverse gear |
| 8 | Neutral | | |

Shift Mechanism

- A cable operated shift mechanism similar to the current Mazda3 (BK) is used.
- The main selector cable is adjusted the same way as on the Mazda3.



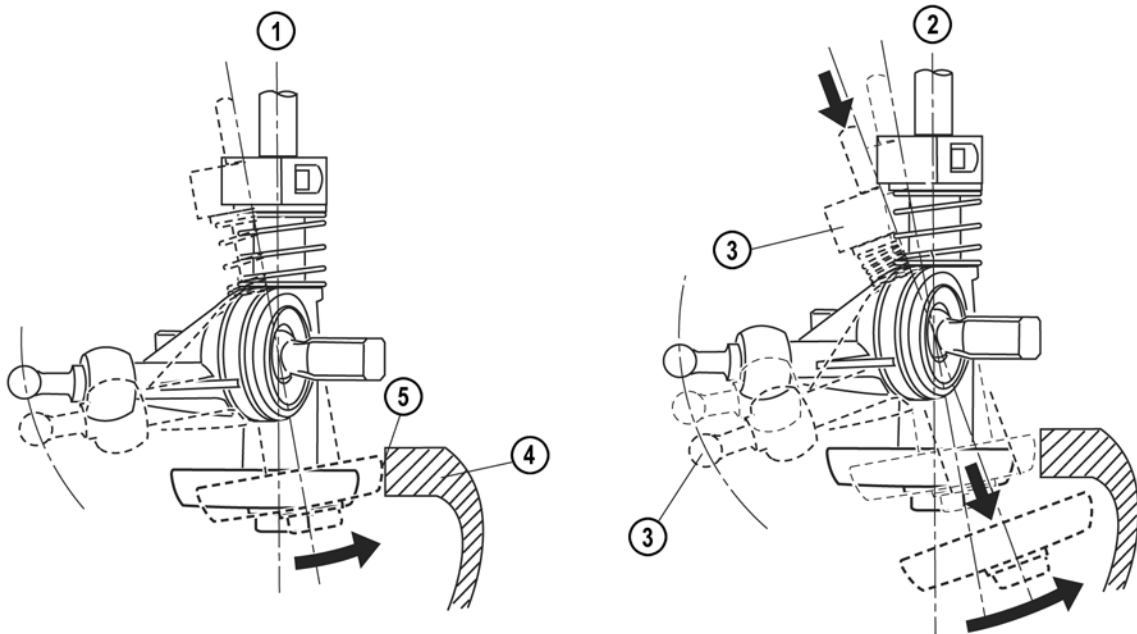
M5_05012

1 Main shift cable

2 Main selector cable

Reverse Lockout Mechanism

- The reverse lockout mechanism consists of a guide plate attached to the shift lever assembly, which restricts the movement of the shift lever to prevent accidentally selecting reverse when shifting into first gear.
- Under normal conditions, movement of the shift lever is restricted by the guide plate. When the shift lever is pressed down and moved towards the reverse position, the projection is pushed below the guide plate, thus allowing reverse gear to be selected.



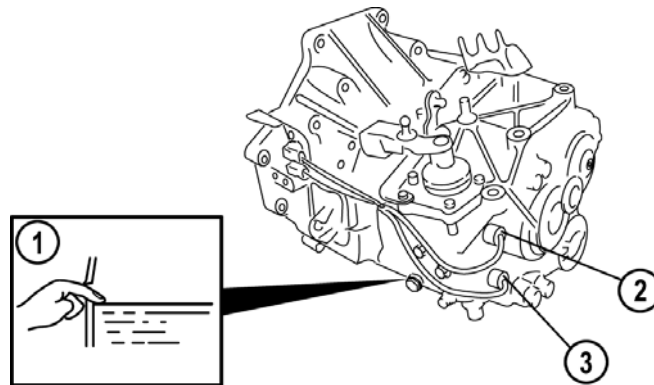
M5_05013

- 1 Normal conditions
- 2 Pushing shift lever
- 3 Reverse position

- 4 Guide plate
- 5 Movement restricted

Oil Level Inspection

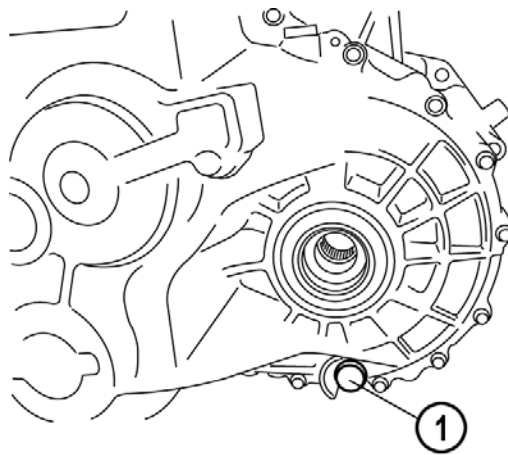
- The A26M-R manual transaxle is filled with 2.55 litres of manual transaxle oil which complies with the specification API Service GL-4 or GL-5 (grade) and SAE 75W-90 (viscosity).
- To check the transaxle oil level, verify that the oil level is near the brim of the filler plug hole. If the oil level is low, add the specified amount and type of oil through the plug hole.



- 1 Oil level
2 Back-up light switch

3 Neutral switch

M5_05014

Drain Plug Location

- 1 Drain plug

M5_05015

06

Steering

06 Steering

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Features	2
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Features	4
Wiring Diagram	5
Steering Angle Sensor	5

Steering

Steering

Features

- The steering system has the following features:
 - Steering column with tilt and telescopic adjustment, as well as bending sheet and telescopic energy absorption mechanism (same as current Mazda3 (BK)).

Specifications

Item			Specifications
Steering wheel	Outer diameter (mm {in})		372 {14.6}
	Lock to lock (turns)		2,9
Steering shaft	Shaft type		Collapsible design
	Coupling type		Cross-shaped joint design
	Tilt amount (mm {in})		40 {1.6}
	Telescope amount (mm {in})		50 {2.0}
Steering gear and linkage	Type		Rack and pinion design
	Rack stroke (mm {in})		81.0 {3.19} x 2
Power steering	Power assist system		Engine speed sensing (MZR-CD) Vehicle speed sensing (L8, LF)
	Fluid specification	Type	ATF M-III or equivalent (e.g. Dexron®II)
		Capacity * (approximate quantity)	(L {USqt, Imp qt)

* When fluid reservoir tank is at maximum volume.

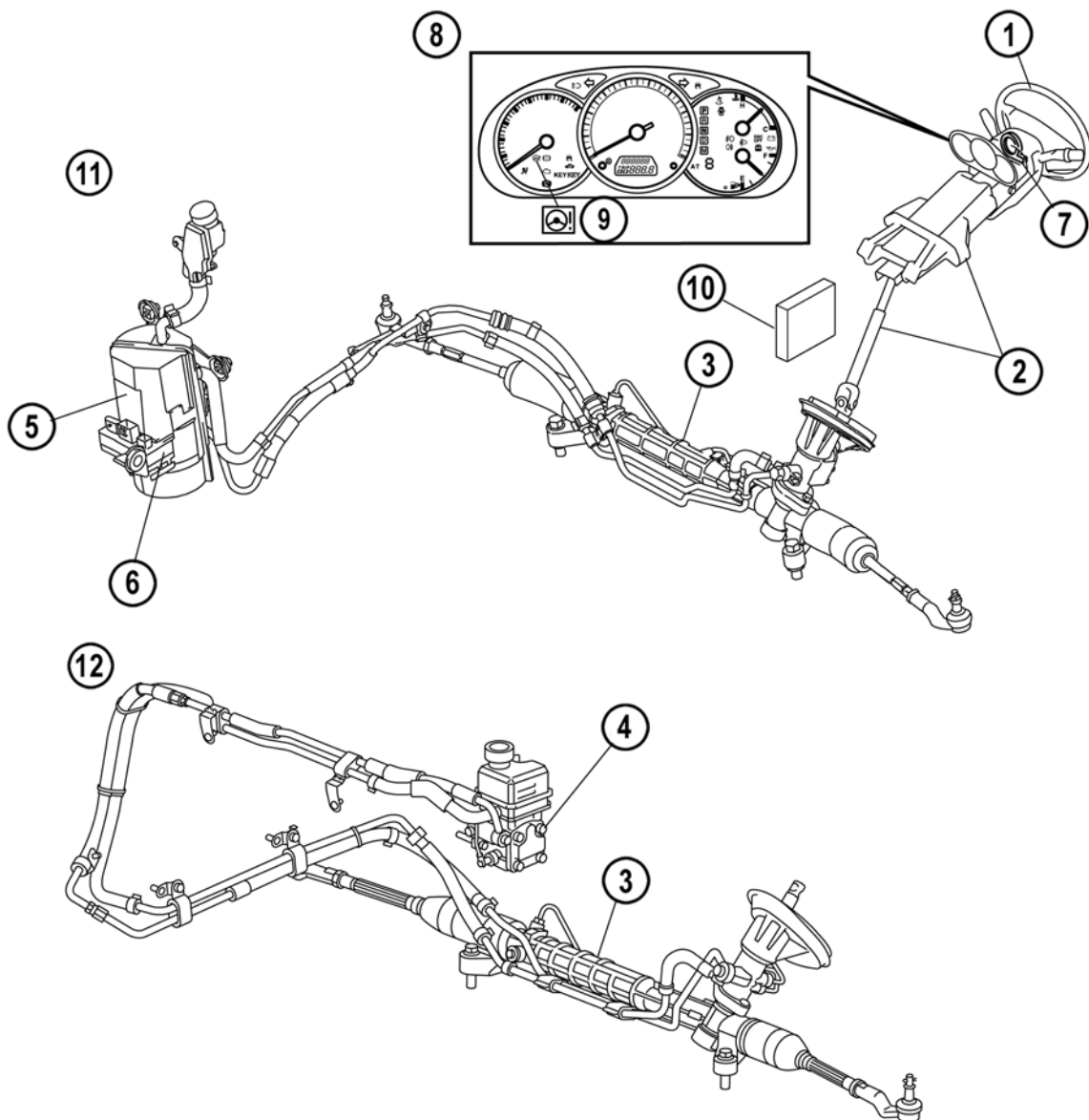
M5_06T001

Power Steering

Features

- Electro-hydraulic power steering for vehicles with L8/LF engine (similar to Mazda3 (BK) with LF engine).
- Hydraulic power steering for vehicles with MZR-CD engine (similar to Mazda6 (GG/GY) with MZR-CD engine).

Parts Location



M5_06001

Steering

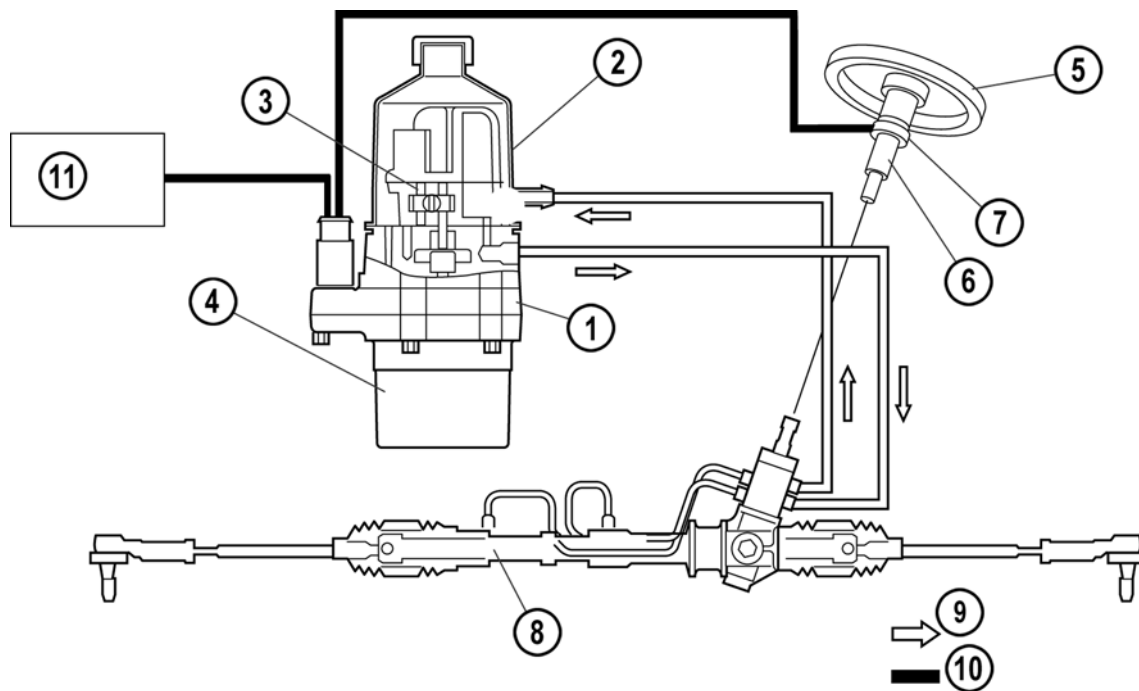
Power Steering

1	Steering wheel	7	Steering angle sensor
2	Steering column and shaft	8	Instrument cluster
3	Steering gear and linkage	9	EHPAS warning light
4	Power steering oil pump	10	PCM
5	Electric power steering oil pump	11	L8, LF
6	EHPAS control module (built into electric power steering oil pump	12	MZR-CD

Electro Hydraulic Power Assist Steering (L8/LF engines)

Features

- The same EHPAS as that utilized on the current Mazda3 (BK) with LF engine is used on the Mazda5 with L8/LF engines, with the following changes:
 - Steering angle sensor built into steering gear has been discontinued.

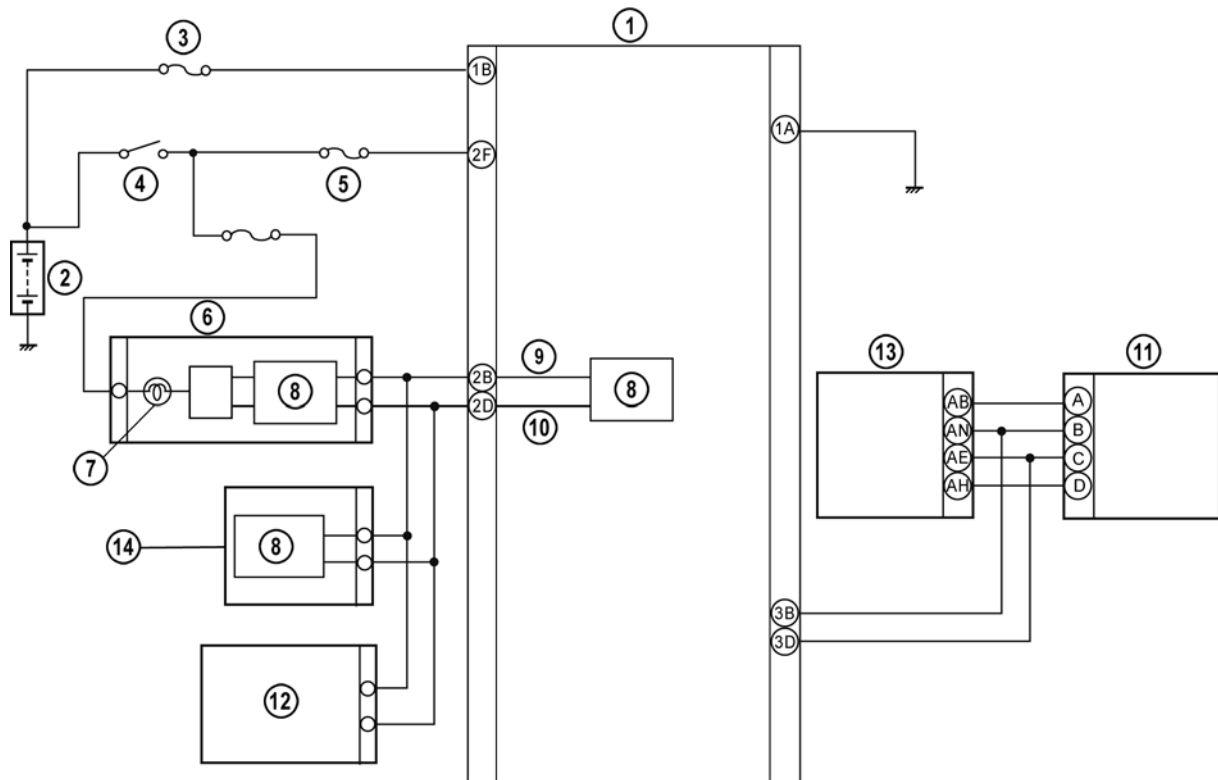


M5_06002

- 1 EHPAS control module
- 2 Reserve tank
- 3 Pump
- 4 Motor
- 5 Steering wheel
- 6 Steering shaft

- 7 Steering angle sensor
- 8 Steering gear and linkage
- 9 Hydraulic pressure
- 10 Electric signal
- 11 PCM

Wiring Diagram



M5_06003

1	EHPAS control module	8	CAN driver
2	Battery	9	CAN_L
3	EHPAS 80 A fuse	10	CAN_H
4	Ignition switch	11	Steering angle sensor
5	EHPAS 5 A fuse	12	DLC-2
6	Instrument cluster	13	DSC HU/CM
7	EHPAS warning light	14	PCM

Steering Angle Sensor

- Instead of using a steering angle sensor located on the steering gear as on the Mazda3, the Mazda5 EHPAS uses the DSC steering angle sensor (fitted to the steering column) to detect steering rotation speed.
- Vehicles that do not have DSC fitted will still have a steering angle sensor fitted to the steering column.

NOTES:

07

**Heating, Ventilation &
Air Conditioning**

07 HVAC

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Basic System

Features

- The construction and operation of the **HVAC (Heater/Ventilator/Air Conditioning)** is essentially the same as the current Mazda3 (BK).
 - Sirocco blower motor is used.
 - Pollen filter is used.
 - Triple-type refrigerant pressure switch is used.
 - Sub-cooling type condenser is used.

Specifications

Item		Specification
Heating capacity (kW {kcal/h})		4.550 {3,913}: LF, L8 5.200 {4.472}: MZR-CD
Cooling capacity (kW {kcal/h})		3.960 {3,406}
Refrigerant	Type	R-134a
	Amount (approximately) (g {oz})	500 {17.7}
A/C compressor	Type	Vane-rotary
	Discharge capacity (ml {cc, fl,oz})	120 {120, 4.06}
	Max. allowable speed (rpm)	7,200: LF, L8 6,400: MZR-CD
	Lube oil	Type
Sealed volume (approximately) (ml {cc, fl,oz})		150 {150, 5.07}
Condenser	Type	Multiflow (sub-cooling type)
	Radiated heat (kW {kcal/h})	6.600 {5,680}
	Receiver/drier capacity (ml {cc, fl,oz})	180 {180, 6.08}
	Desiccant	Synthetic zeolite
Expansion valve	Type	Block type
Evaporator	Type	Double-tank drawn cup
Temperature control		Reheat full air mix type

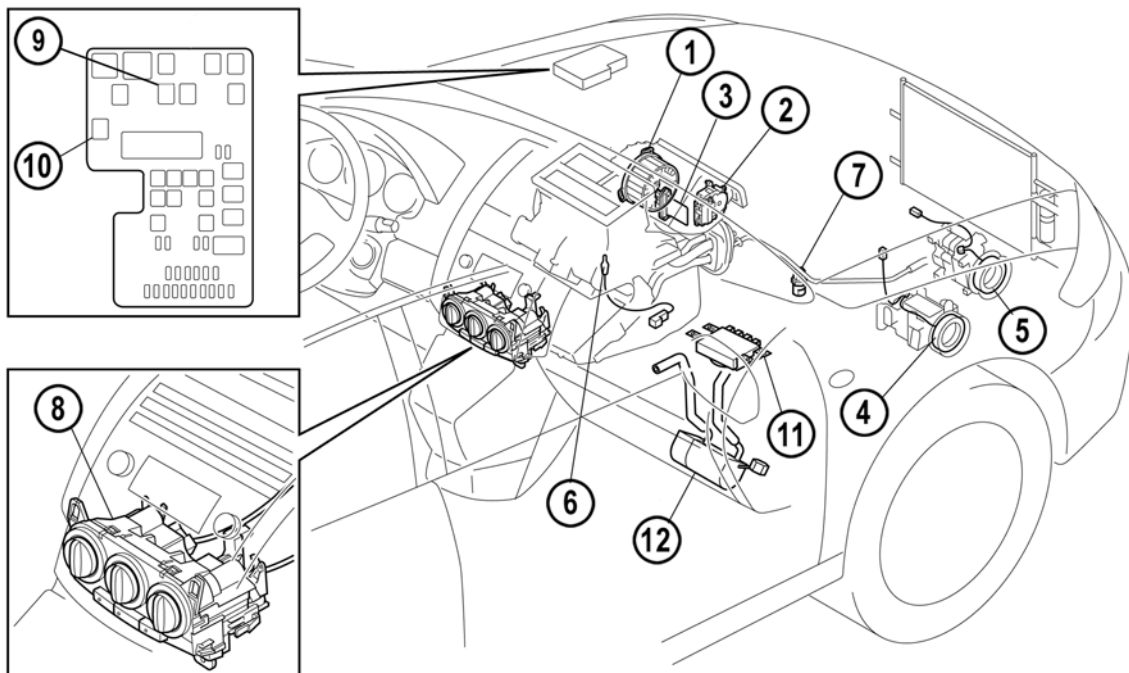
M5_07T001

Control System

Manual Air Conditioning

- Control of the manual air conditioning is essentially the same as that for the current Mazda3 (BK).

Parts Location



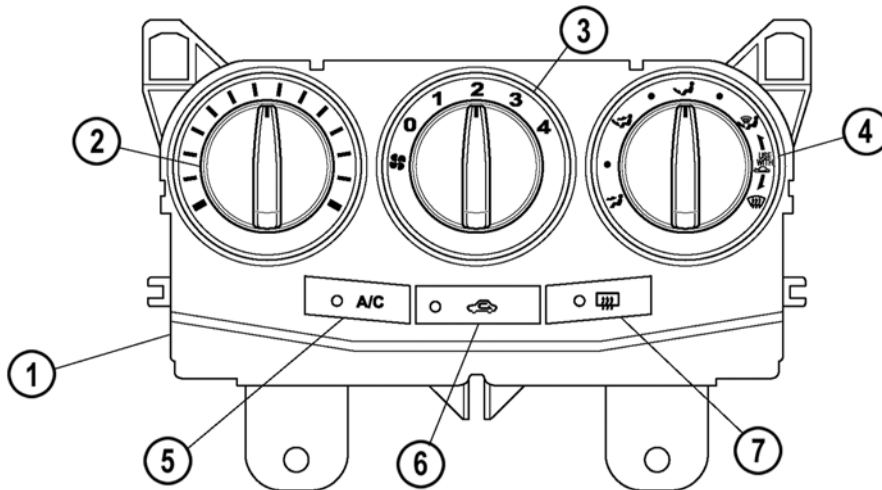
M5_07002

- | | | | |
|---|-------------------------------|----|-----------------------------|
| 1 | Blower motor | 7 | Refrigerant pressure switch |
| 2 | Air intake actuator | 8 | Climate control unit |
| 3 | Resistor | 9 | A/C relay |
| 4 | Magnetic clutch (LF, L8) | 10 | Blower relay |
| 5 | Magnetic clutch (MZR-CD) | 11 | BCM |
| 6 | Evaporator temperature sensor | 12 | Water heater unit (MZR-CD) |

Climate Control Unit

- A wire operated climate control unit is used with the manual air conditioning.
- The airflow mode dial features an additional microswitch to turn the air intake mode to fresh when the airflow mode is set to the defrost position.

NOTE: The illumination bulbs can be replaced separately.

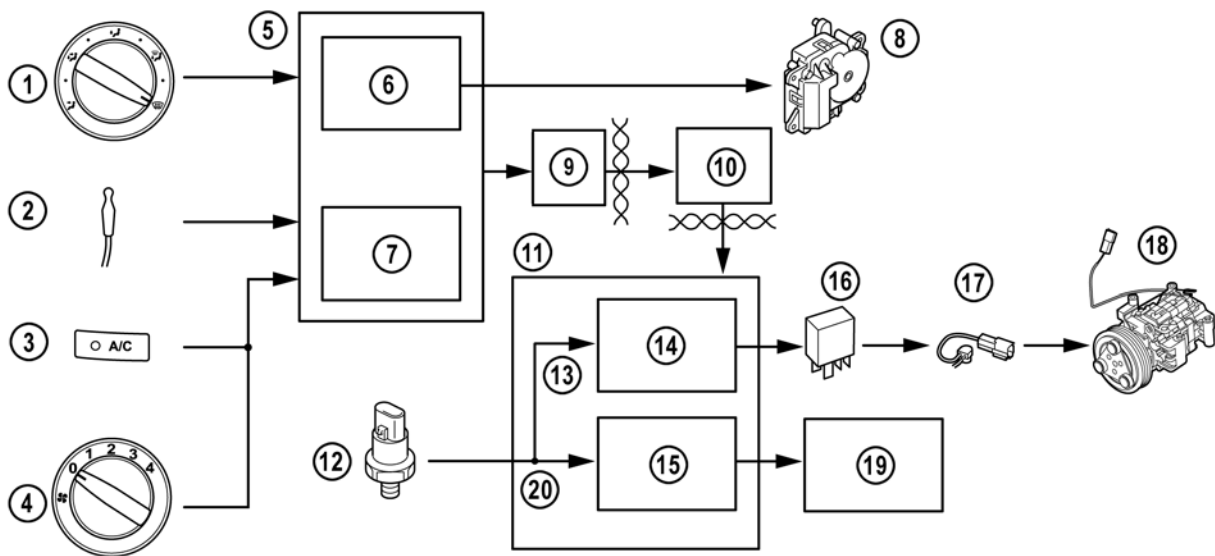


M5_07003

- | | | | |
|---|----------------------------|---|------------------------------|
| 1 | Climate control unit | 5 | A/C switch |
| 2 | Temperature control dial | 6 | REC switch |
| 3 | Fan control dial | 7 | Rear window defroster switch |
| 4 | Airflow mode selector dial | | |

Operation

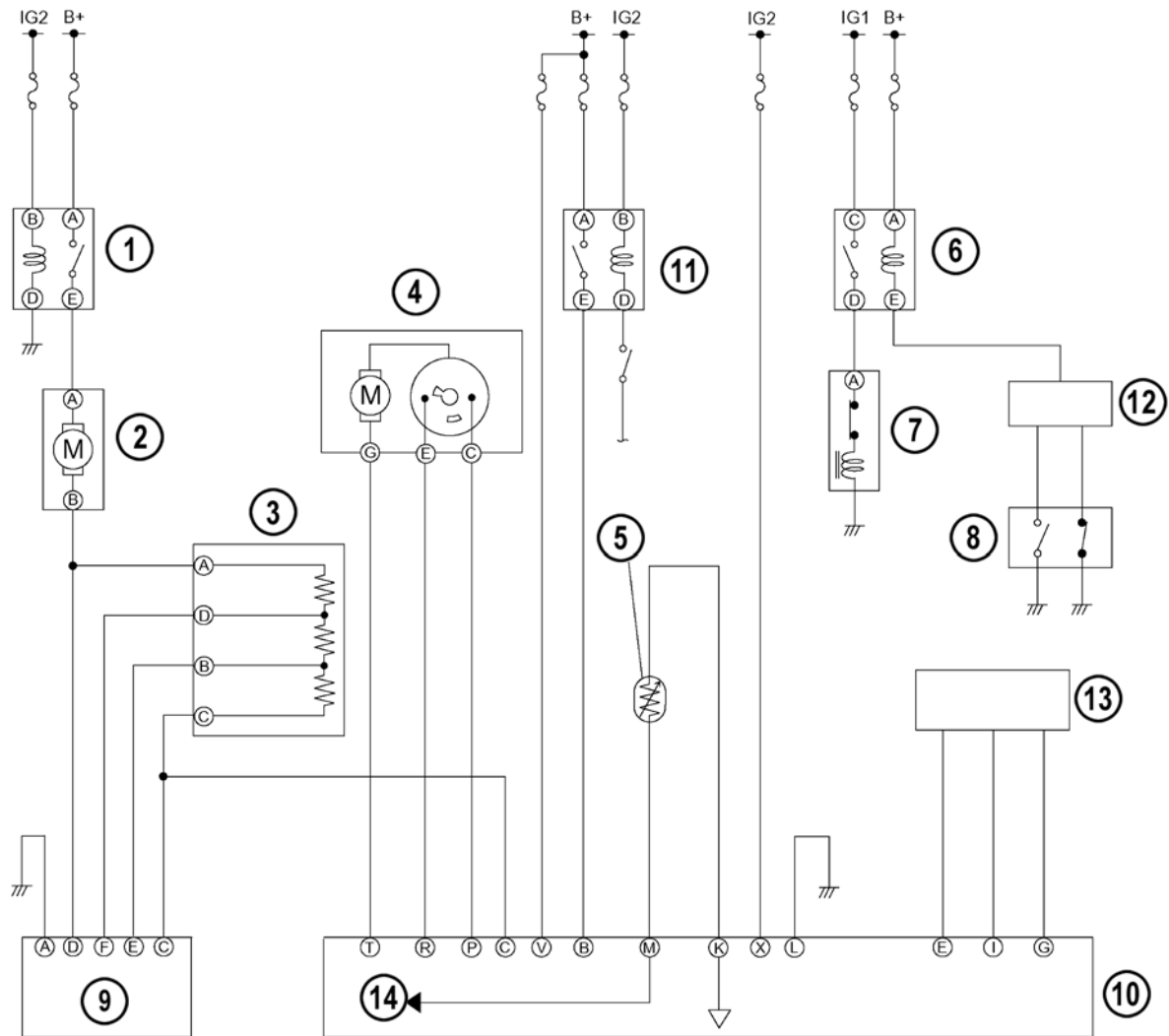
- When the A/C is switched on, the climate control unit sends an "A/C on request" signal via cable to the **BCM (Body Control Module)**. The BCM forwards this information via the **MS-CAN (Middle-Speed CAN)** bus to the instrument cluster. From there the signal is transmitted via the **HS-CAN (High-Speed CAN)** bus to the PCM, which operates the A/C relay and the fan control module accordingly.



M5_07004

- | | | | |
|----|-------------------------------|----|------------------------------|
| 1 | Airflow mode selector switch | 11 | PCM |
| 2 | Evaporator temperature sensor | 12 | Refrigerant pressure switch |
| 3 | A/C switch | 13 | High/low pressure signal |
| 4 | Fan switch | 14 | A/C cut-off control |
| 5 | Climate control unit | 15 | Electric fan control |
| 6 | Defroster control | 16 | A/C relay |
| 7 | A/C compressor control | 17 | Stator and thermal protector |
| 8 | Air intake actuator | 18 | Magnetic clutch |
| 9 | BCM | 19 | Fan control module |
| 10 | Instrument cluster | 20 | Medium pressure signal |

Wiring Diagram



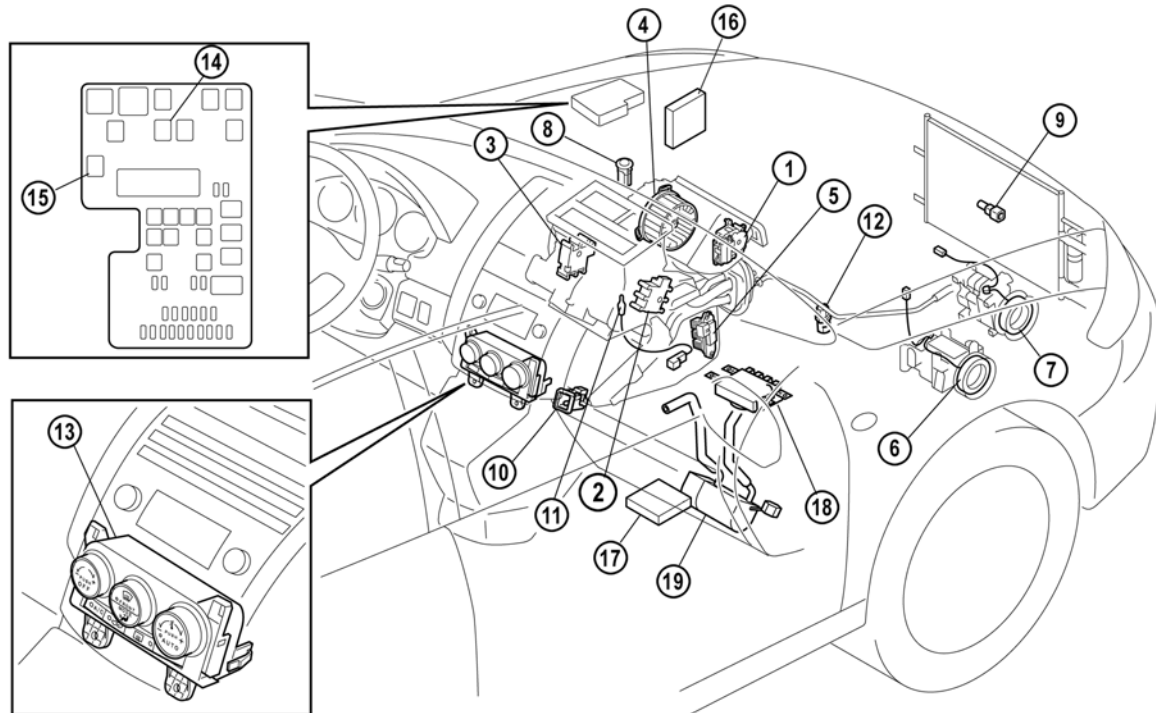
M5_07005

- | | | | |
|---|-------------------------------|----|-----------------------------|
| 1 | Blower relay | 8 | Refrigerant pressure switch |
| 2 | Blower motor | 9 | Fan switch |
| 3 | Resistor | 10 | Climate control unit |
| 4 | Air intake actuator | 11 | TNS relay |
| 5 | Evaporator temperature sensor | 12 | PCM |
| 6 | A/C relay | 13 | BCM |
| 7 | Magnetic clutch | 14 | To CPU |

Full-auto Air Conditioning

- Control of the full-auto air conditioning is essentially the same as that for the current Mazda3 (BK).

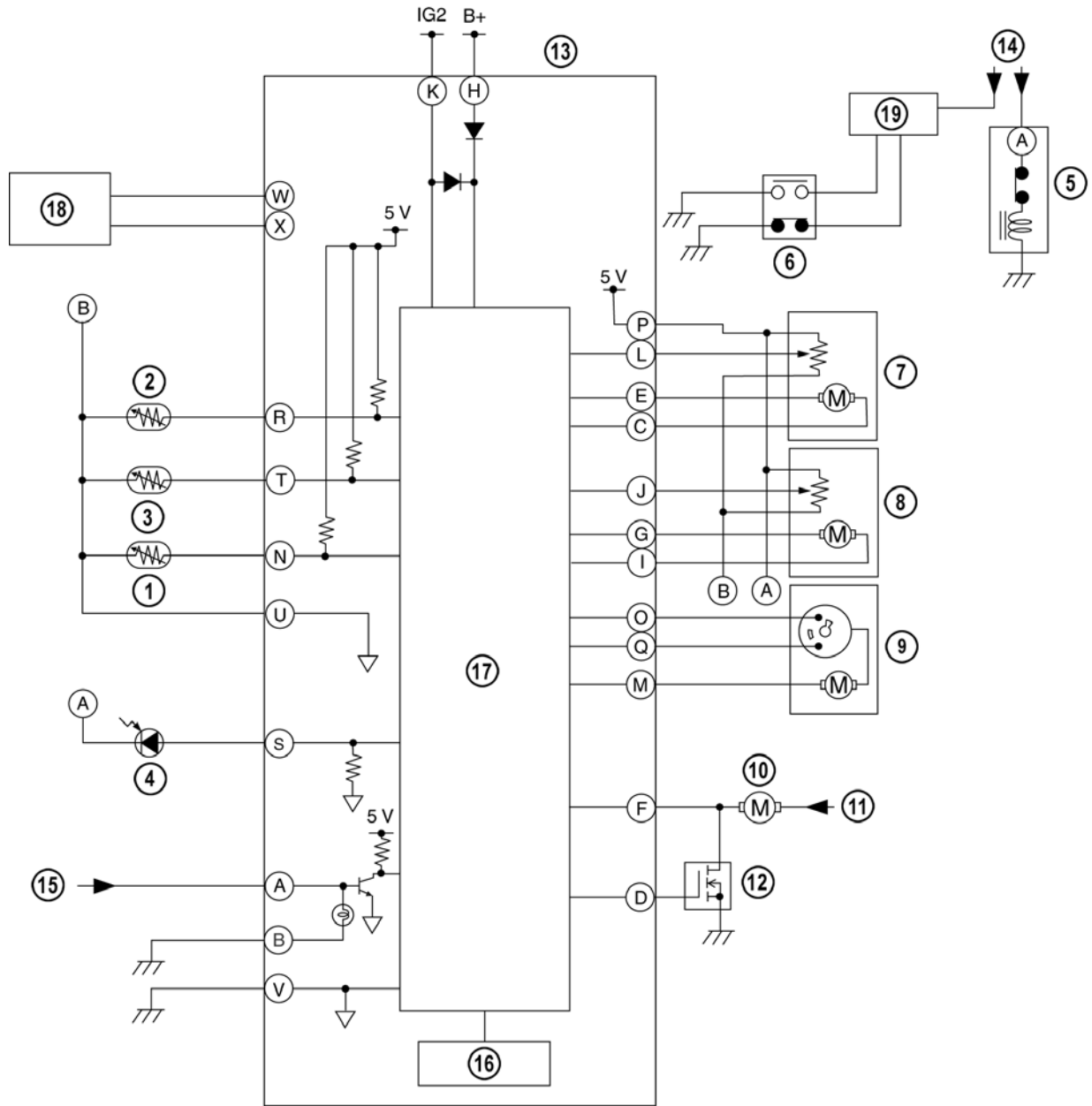
Parts Location



M5_07006

- | | | | |
|----|----------------------------|----|-------------------------------|
| 1 | Air intake actuator | 11 | Evaporator temperature sensor |
| 2 | Air mix actuator | 12 | Refrigerant pressure switch |
| 3 | Air flow mode actuator | 13 | Climate control unit |
| 4 | Blower motor | 14 | A/C relay |
| 5 | Power MOS-FET | 15 | Blower relay |
| 6 | Magnetic clutch (LF, L8) | 16 | PCM (LF, L8) |
| 7 | Magnetic clutch (MZR-CD) | 17 | PCM (MZR-CD) |
| 8 | Solar radiation sensor | 18 | BCM |
| 9 | Ambient temperature sensor | 19 | Water heater (MZR-CD) |
| 10 | Cabin temperature sensor | | |

Wiring Diagram



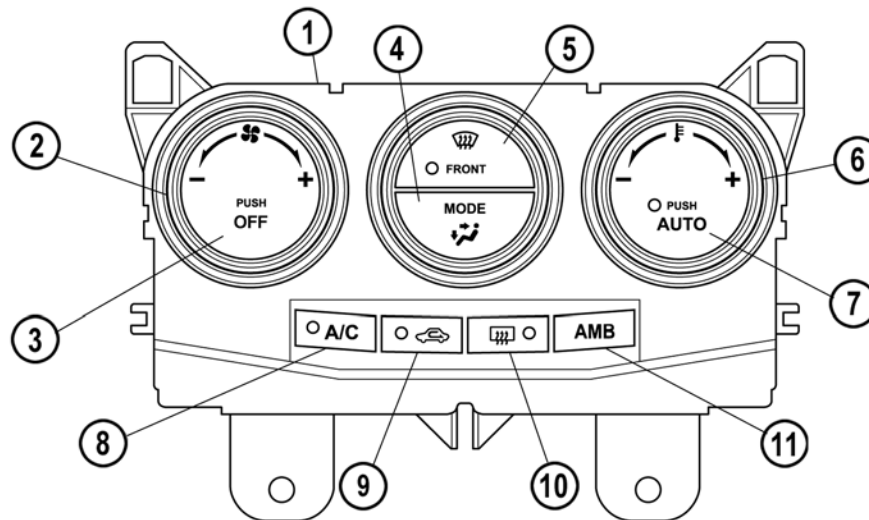
M5_07012

1	Ambient temperature sensor	11	Blower relay
2	Cabin temperature sensor	12	Power MOS-FET
3	Evaporator temperature sensor	13	Climate control unit
4	Solar radiation sensor	14	A/C relay
5	Magnetic clutch	15	TNS relay
6	Refrigerant pressure switch	16	Climate control unit switches
7	Air mix actuator	17	CPU
8	Airflow mode actuator	18	BCM
9	Air intake actuator	19	PCM
10	Blower motor		

Climate Control Unit

- A logic-type climate control unit is used. It is connected via the MS-CAN to the BCM.
- The current status of the full-auto A/C system is displayed on the information display (refer to section 09, "Instrumentation/Driver Info").

NOTE: The illumination bulbs can be replaced separately.

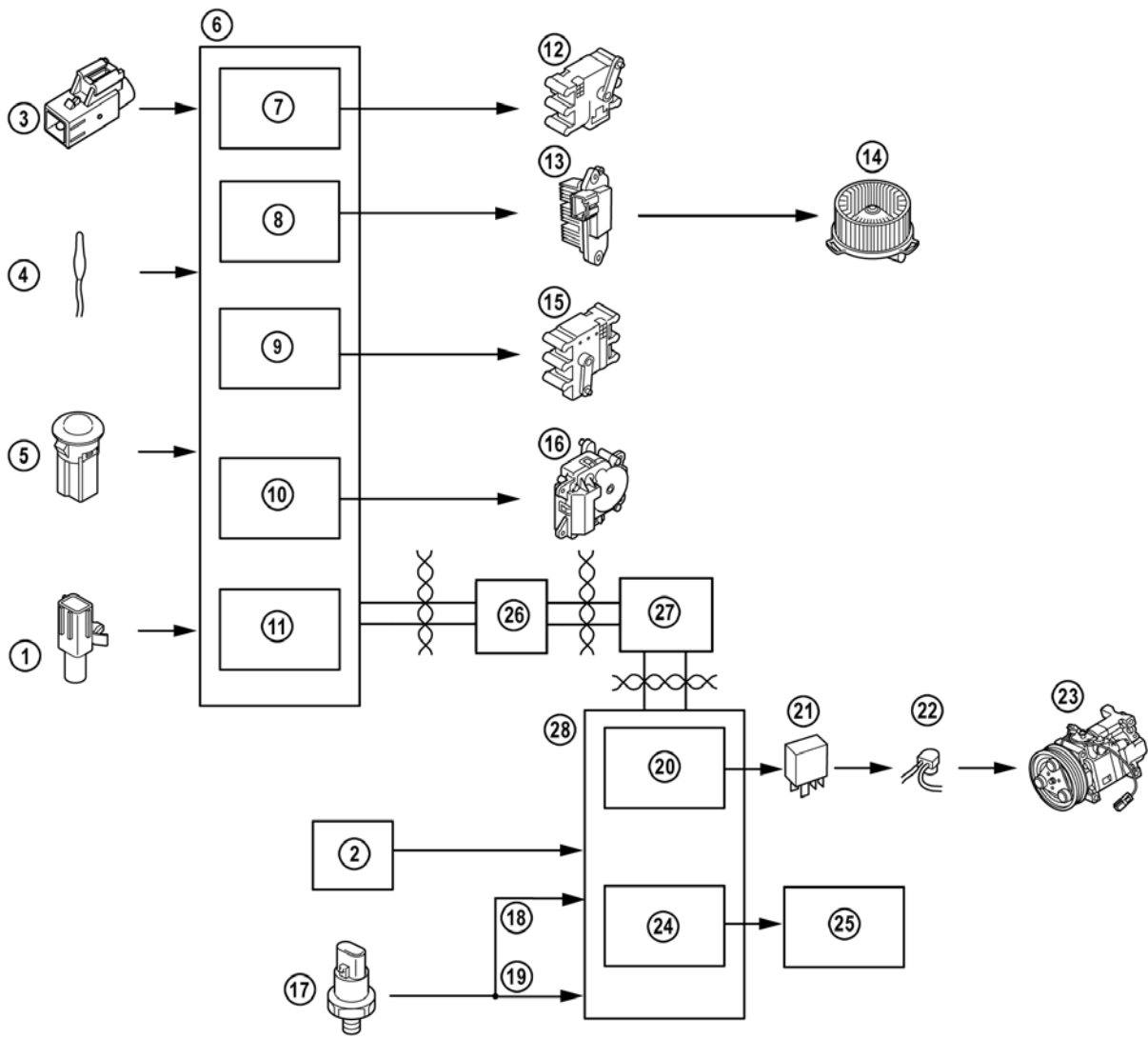


M5_07007

- | | | | |
|---|--------------------------|----|------------------------------------|
| 1 | Climate control unit | 7 | AUTO switch |
| 2 | Fan control dial | 8 | A/C switch |
| 3 | OFF switch | 9 | Recirculate switch |
| 4 | MODE switch | 10 | Rear window defroster switch |
| 5 | DEFROSTER switch | 11 | Ambient temperature display switch |
| 6 | Temperature control dial | | |

Operation

- When the A/C is switched on, the climate control unit sends an "A/C on request" signal via the MS-CAN to the BCM. The BCM forwards this information via the MS-CAN to the instrument cluster. From there the signal is transmitted via the HS-CAN to the PCM which operates the A/C relay and the fan control module accordingly.



M5_07008

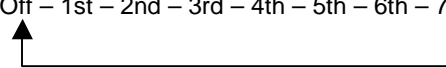
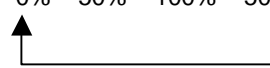
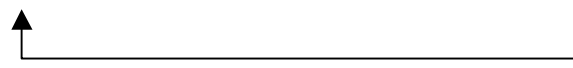
1	Ambient temperature sensor	15	Airflow mode actuator
2	ECT sensor	16	Air intake actuator
3	Cabin temperature sensor	17	Refrigerant pressure switch
4	Evaporator temperature sensor	18	High/Low pressure signal
5	Solar radiation sensor	19	Medium pressure signal
6	Climate control unit	20	A/C cut-off control
7	Airflow temperature control	21	A/C relay
8	Airflow volume control	22	Thermal protector
9	Airflow mode control	23	Magnetic clutch
10	Air intake control	24	Electric fan control
11	A/C compressor control	25	Fan control module
12	Air mix actuator	26	BCM
13	Power MOS-FET	27	Instrument cluster
14	Blower motor	28	PCM

On-board Diagnostic System

- The on-board diagnostic system is essentially the same as the current Mazda3 (BK) except for the following:
 - Simulation test function for climate control unit has been added to WDS.

Simulation Test

- The simulation test function allows the respective components controlled by the climate control unit to be operated manually. To do this, connect the WDS to the vehicle and select the option **Toolbox→Datalogger→Modules→EATC**.

Item	Target Part	Operation condition	Display*
DISPLAY #	Information display	All A/C related segments in information display illuminated	ALL
BLOWER #	Blower motor	Off – 1st – 2nd – 3rd – 4th – 5th – 6th – 7th 	1
MIX_ACT #	Air mix door	0% – 50% – 100% – 50% 	20.0 (0%) 20.5 (50%) 21.0 (100%) 20.5 (50%)
MODE_ACT #	Airflow mode door	VENT – BL-LEVEL – HEAT – HEAT/DEF – DFROSTER 	3
REC/FRESH #	REC/FRESH switch	FRESH ↔ REC ON ↔ OFF	4

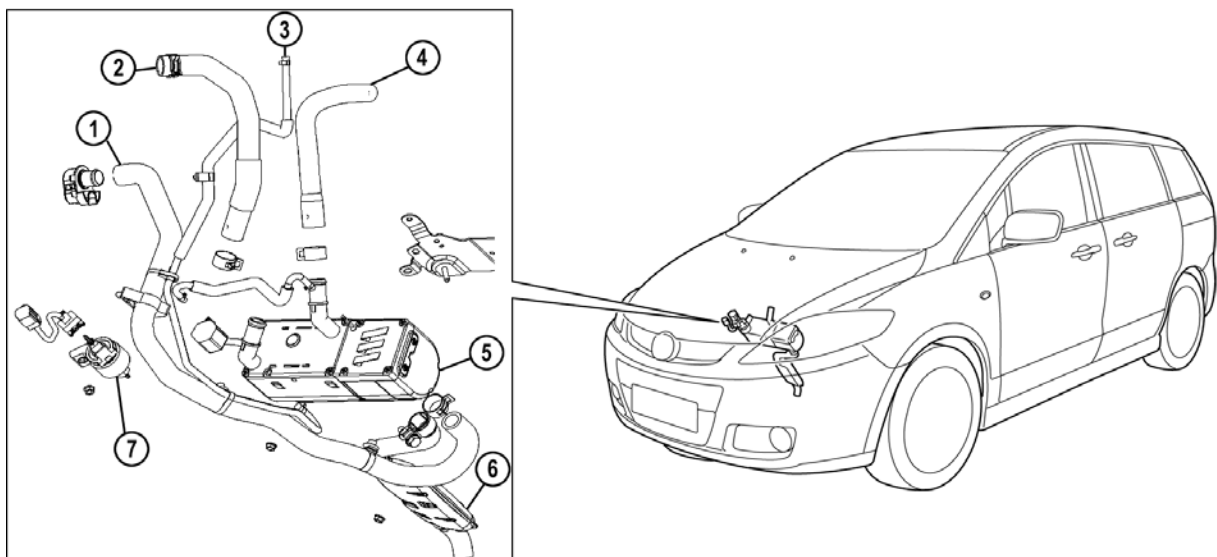
* Status displayed in Information Display

M5_07T002

Water Heater System (MZR-CD engine)

- To improve heating capability directly after cold start, an additional water heater system has been adopted.
- The heater mainly consists of a combustion chamber, heat exchanger, fresh air blower and electronic control module. The unit used on the Mazda5 (CR) is supplied by Eberspächer.
- Fuel is combusted within the water heater unit and used to heat the engine coolant.
- The heated coolant is then passed through the heater core, which uses it to provide heated air to the vehicle cabin.
- The water heater is connected to the MS-CAN to allow it to access ambient temperature, engine speed and ignition switch position information, and to send water heater fuel consumption information to the instrument cluster. The MS-CAN is also used for diagnostics of the water heater.

Parts Location

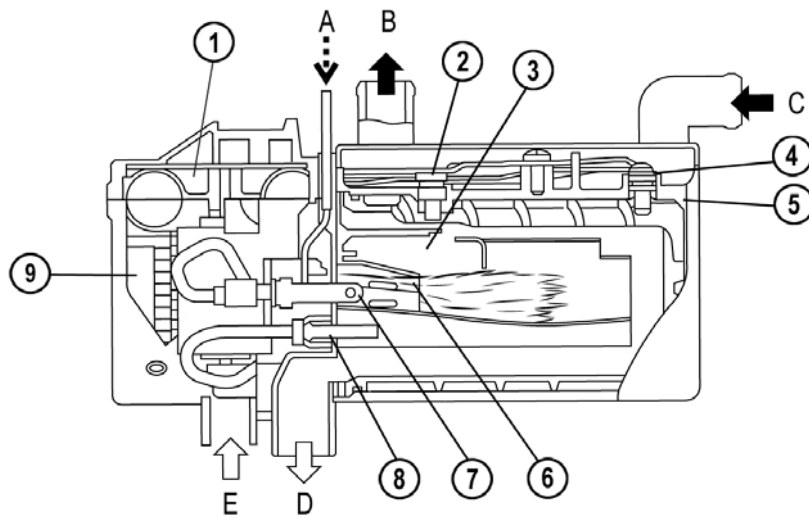


M5_07009

- | | | | |
|---|--------------------------|---|--------------------|
| 1 | Air intake | 5 | Water heater unit |
| 2 | Coolant inlet | 6 | Exhaust |
| 3 | Fuel inlet | 7 | Fuel metering pump |
| 4 | Coolant outlet (to HVAC) | | |

Operation

- The water heater control module outputs a signal to the blower fan and the fuel pump, which then deliver air and fuel to the unit.
- Within the unit, fuel is vaporized and mixed with air, and then sent to the combustion chamber.
- The mixture is ignited by the glow plug in the combustion chamber.
- Engine coolant temperature is raised as it circulates along the outside of the combustion chamber.



M5_07010

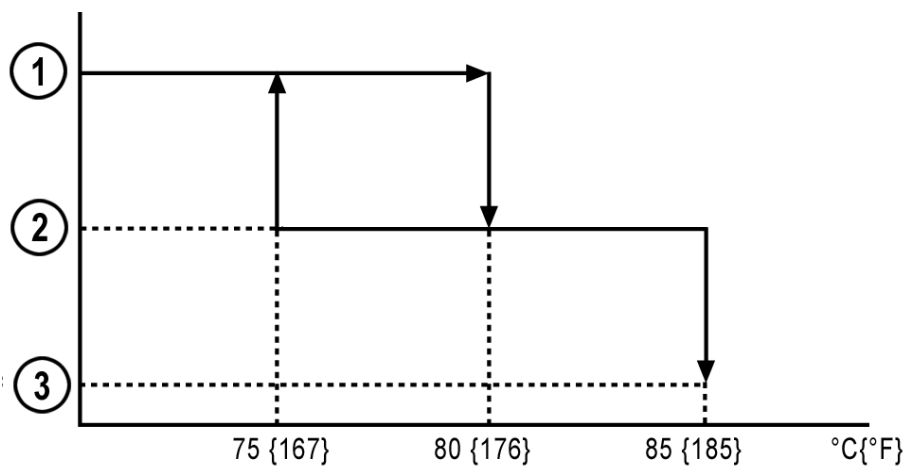
- | | | | |
|---|--------------------|---|---------------------------|
| 1 | Blower fan | 8 | Flame sensor |
| 2 | Temperature sensor | 9 | Electronic control module |
| 3 | Combustion chamber | A | From fuel metering pump |
| 4 | Overheating sensor | B | Coolant outlet |
| 5 | Heat exchanger | C | Coolant inlet |
| 6 | Burner | D | Exhaust |
| 7 | Glow plug | E | Fresh air supply |

Starting Conditions

- The water heater system will start to operate when all of the following conditions are met:
 - Ambient temperature less than 5 °C {41 °F}.
 - Water temperature less than 70 °C {158 °F}.

Full/half Switching

- Depending on the engine coolant temperature, the water heater control module sets the heater output to either full or half strength settings.



M5_07011

1 Full mode
2 Half mode

3 Idle mode

On-board Diagnostics

- The on-board diagnostic system consists of the following functions:
 - Self-test
 - PID monitor
 - Simulation test function

Self Test

- The self-test function allows water heater DTCs to be displayed. To view these connect the WDS to the vehicle and select the option **Toolbox→Self Test→Electrical→Supplemental Heater**.

PID Monitor

- The PID monitor function allows the PIDs of the water heater to be monitored. To view these connect the WDS to the vehicle and select the option **Toolbox→Datalogger→Modules→FFH**.

Item	Unit/ Condition	Definition
CCNTFFH	–	Continuous Codes
VOLT_MDL	V	Control Module Voltage

Simulation Test

- The simulation function allows certain water heater PIDs to be activated. To do this connect the WDS to the vehicle and select the option **Toolbox→Datalogger→Modules→FFH**.

Item	Unit/ Condition	Definition
HEATER	Inactive/Active	Heater Status
FAN	On/Off	Blower fan
GLOW	On/Off	Glow plug
FUEL_PMP	On/Off	Fuel pump

Start Heater Utility

- The operation of the water heater can be tested by using the FFH Start Heater Utility. To do this first verify that the coolant temperature is low, then connect the WDS to the vehicle and select the option **Toolbox→Electrical→Supplemental Heater→FFH→FFH Start Heater Utility**.

NOTE: The Start Heater Utility will operate the water heater for a predetermined length of time, after which the heater will automatically switch off. After switching off the blower fan will operated for approximately two minutes.

Prefill Utility

- If the water heater metering pump is replaced, the fuel supply line must first be primed before the water heater is operated. To do this connect the WDS to the vehicle and select the option **Toolbox→Electrical→ Supplemental Heater→FFH→FFH Self Test and Prefill Utility**.

Water Heater System Unlock Utility

- If the water heater has been disabled due to a malfunction, or a new water heater has been installed the system must be 'unlocked' before it can be operated again. To do this connect the WDS to the vehicle and select the option **Toolbox→Electrical→ Supplemental Heater→FFH→FFH Unlock Utility**.

NOTES:

08

Restraint System

08 Restraint System

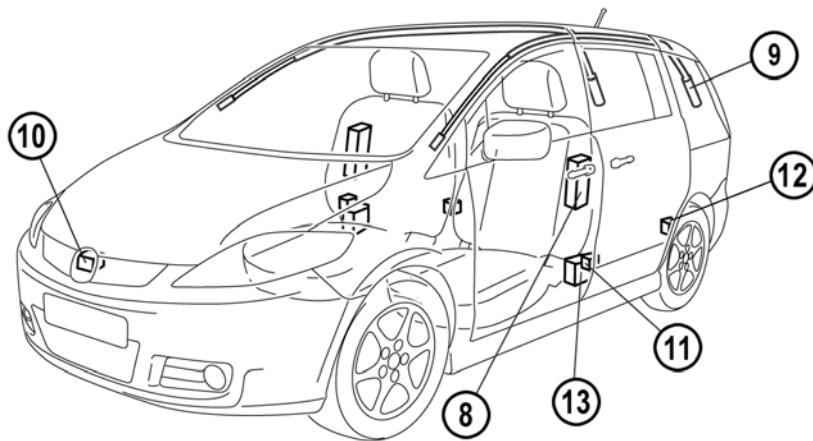
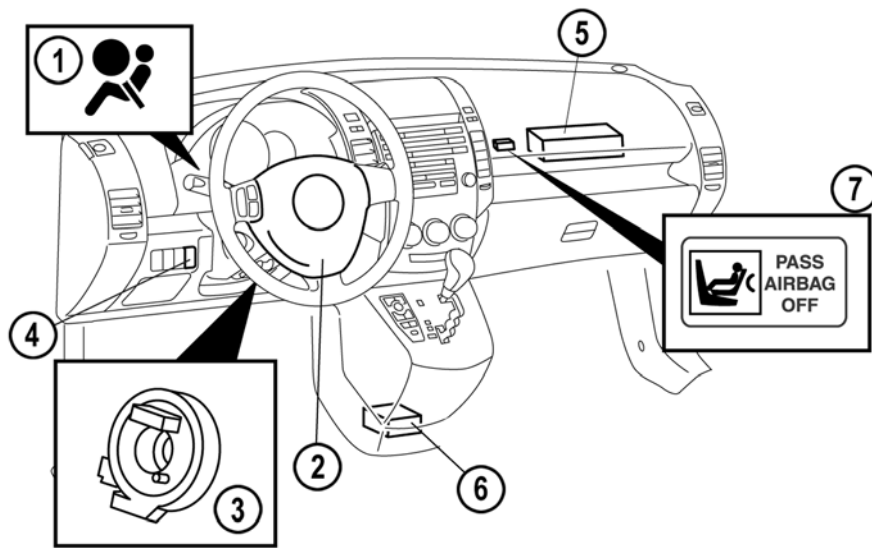
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Airbag System

Features

- The airbag system has the following features:
 - Single-stage front airbags are used.
 - Side airbags are fitted.
 - Stored gas-type curtain airbags are used.
 - Dual side airbag sensors are fitted.
 - Rack-operated belt pretensioners are used.

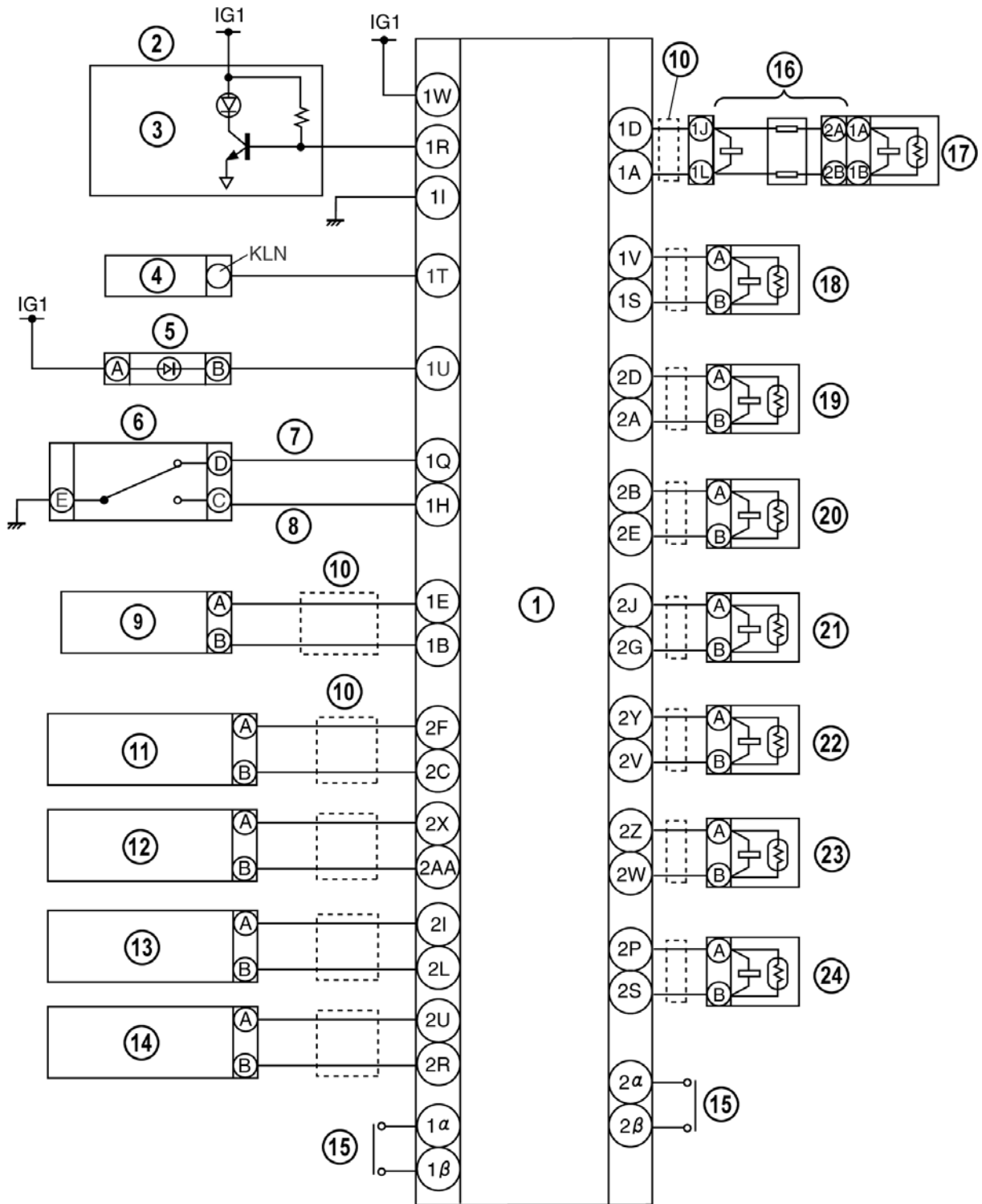
Parts Location



M5_08001

- | | | | |
|---|-----------------------------|----|--------------------------|
| 1 | Airbag system warning light | 8 | Side airbag |
| 2 | Driver-side airbag | 9 | Curtain airbag |
| 3 | Clock spring | 10 | Crash zone sensor |
| 4 | PAD switch | 11 | Side airbag sensor No. 1 |
| 5 | Passenger-side airbag | 12 | Side airbag sensor No. 2 |
| 6 | SAS control module | 13 | Belt pretensioner |
| 7 | PAD indicator light | | |

Wiring Diagram



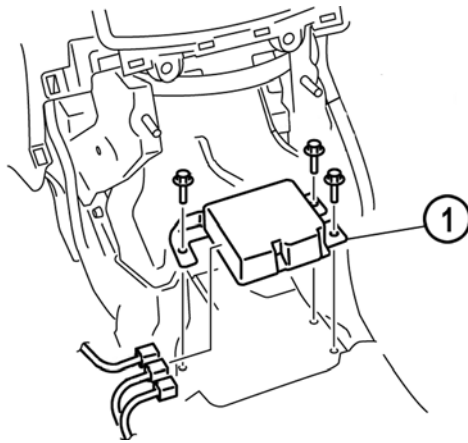
M5_08002

1	SAS control module	14	Passenger-side side airbag sensor No. 2
2	Instrument cluster	15	Poor connection detector bar
3	Airbag system warning light	16	Clock spring
4	DLC-2	17	Driver-side airbag
5	PAD indicator light	18	Passenger-side airbag
6	PAD switch	19	Driver-side pre-tensioner seat belt
7	PASS AIRBAG ON	20	Driver-side curtain airbag
8	PASS AIRBAG OFF	21	Driver-side side airbag
9	Crash zone sensor	22	Passenger-side belt pre-tensioner
10	Twisted pair	23	Passenger-side curtain airbag
11	Driver-side side airbag sensor No. 1	24	Passenger-side side airbag
12	Passenger-side side airbag sensor No. 1	25	KLN
13	Driver-side side airbag sensor No. 2		

SAS Control Module

- The **SAS (Sophisticated Airbag Sensor)** control module is located on the centre tunnel, near to the gear lever.
- A micromechanical crash sensor is incorporated into the SAS control module, which measures the acceleration/deceleration of the vehicle in a crash.
- The SAS control module processes the signals it receives from the crash zone sensor, the side airbag sensors and the internal micromechanical sensor. If the acceleration/deceleration caused by a frontal or side impact exceeds a predetermined threshold, the SAS control module triggers the airbags and pretensioners with a DC signal.

NOTE: When replacing the SAS control module, the new module has to be configured. To do this, connect the WDS to the vehicle and select the option **Toolbox→Module Programming→Programmable Module Installation→RCM**.



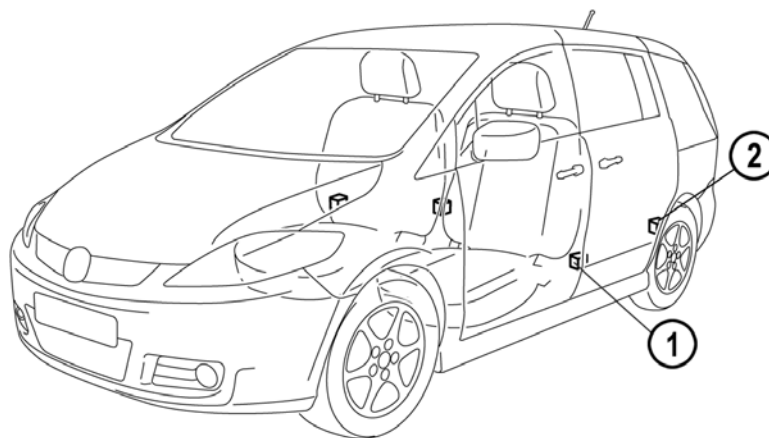
1 SAS control module

M5_08003

Side Airbag Sensors

- Two side airbag sensors are installed to each side of the vehicle, one at the base of the B-pillar and one near the rear wheelhouse.
- Side airbag sensor No. 1 and No. 2 are different part numbers, so are not interchangeable.
- The sensor initialisation procedure is the same as that for the Mazda3 (BK) (turn ignition switch to ON and confirm that the airbag warning light illuminates for approximately six seconds, then goes out. During this time the SAS control module learns the ID of the new sensor).

NOTE: If the initialisation procedure is not carried out correctly the side airbag sensor will have to be replaced with a new one.



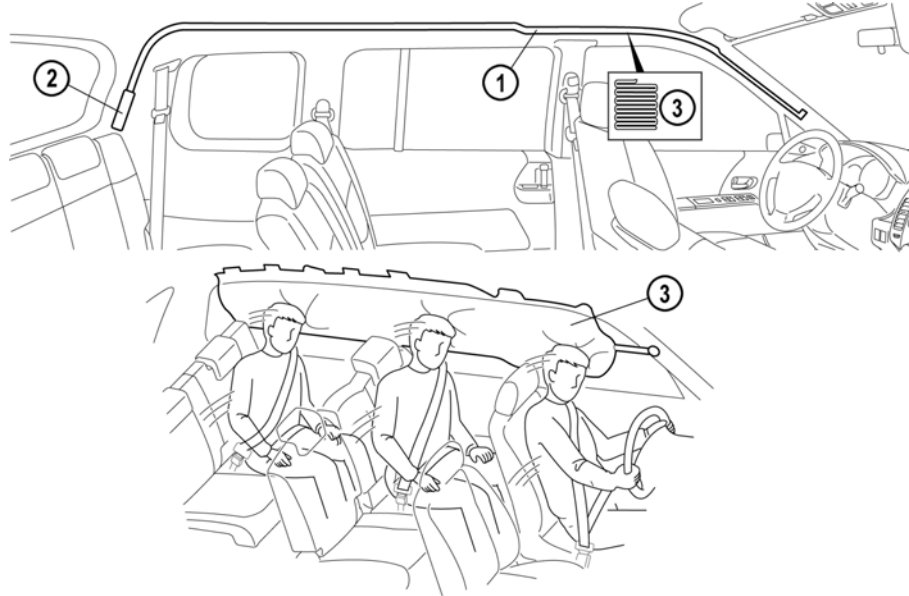
1 Side airbag sensor No. 1

2 Side airbag sensor No. 2

M5_08004

Curtain Airbags

- Instead of using propellants to inflate the curtain airbags, the curtain airbags of the Mazda5 utilize gas stored inside the inflator.



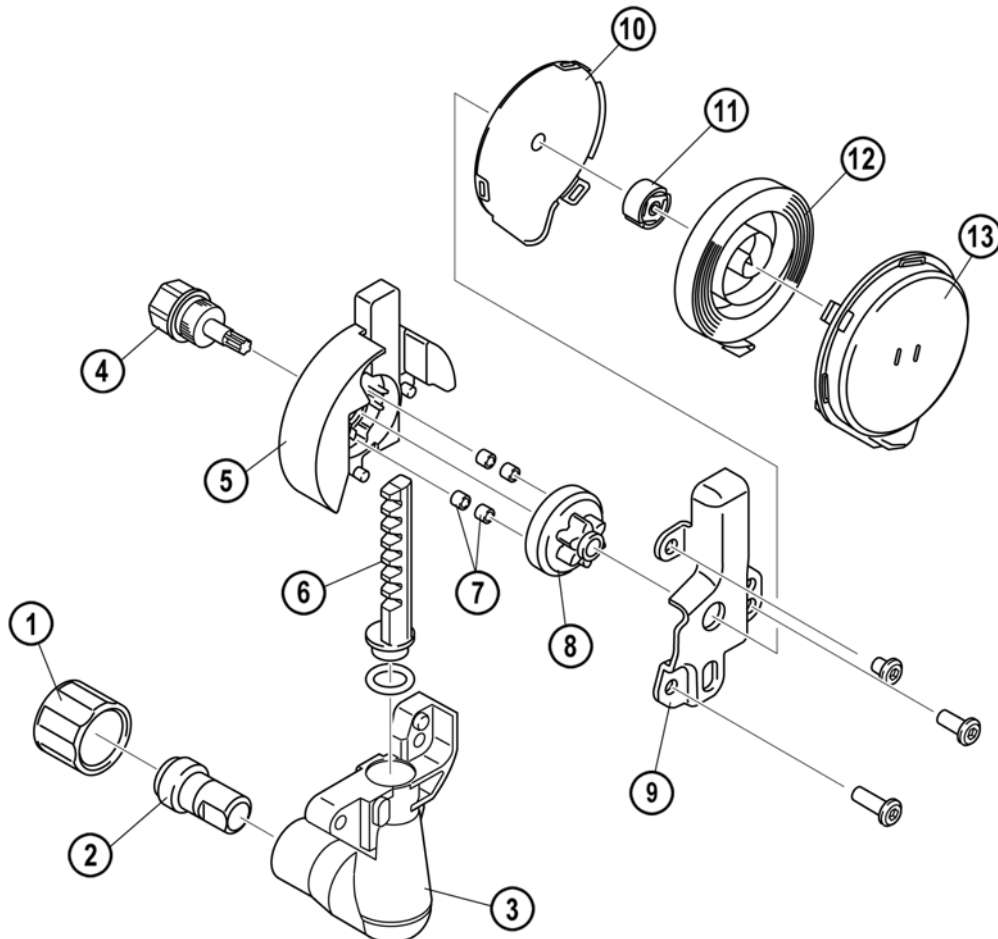
1 Curtain airbag
2 Inflator

3 Airbag

M5_08005

Seatbelt Pretensioners

- Rack-type seatbelt pretensioners similar to those used in the Mazda2 have been adopted for the front seats.
- When a deployment signal is received from the SAS module during a frontal or offset collision, the pretensioners operate, tightening the seat belt webbing thus restraining the driver and front seat passenger.

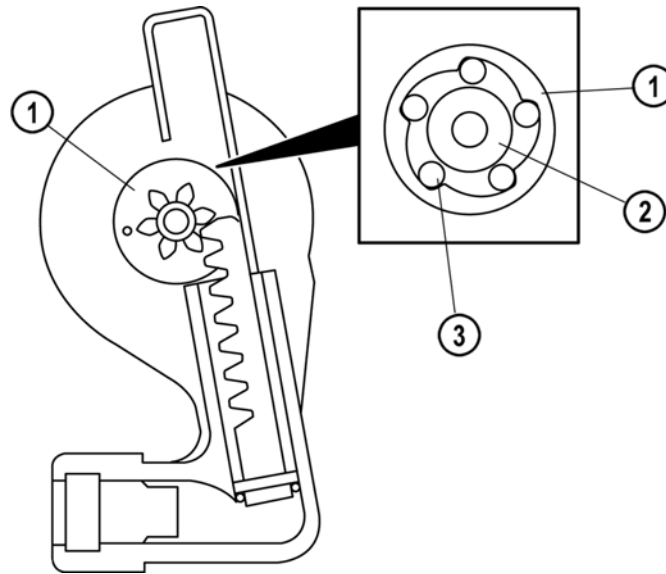


M5_08007

- | | | | |
|---|---------------|----|--------------|
| 1 | Cap nut | 8 | Gear |
| 2 | Gas generator | 9 | Cover |
| 3 | Cylinder | 10 | Spring seat |
| 4 | Spindle | 11 | Spring shaft |
| 5 | Base | 12 | Spring |
| 6 | Rack | 13 | Spring case |
| 7 | Clutch roller | | |

Operation

- Under normal conditions, the clutch rollers that are installed around the circumference of the spindle roll freely in the space between the gear and spindle, without resistance being applied to the spindle.
- Because the spindle and gear are free to move separately, only the spindle rotates when the seatbelt webbing is extended/retracted, while the gear remains stationary.

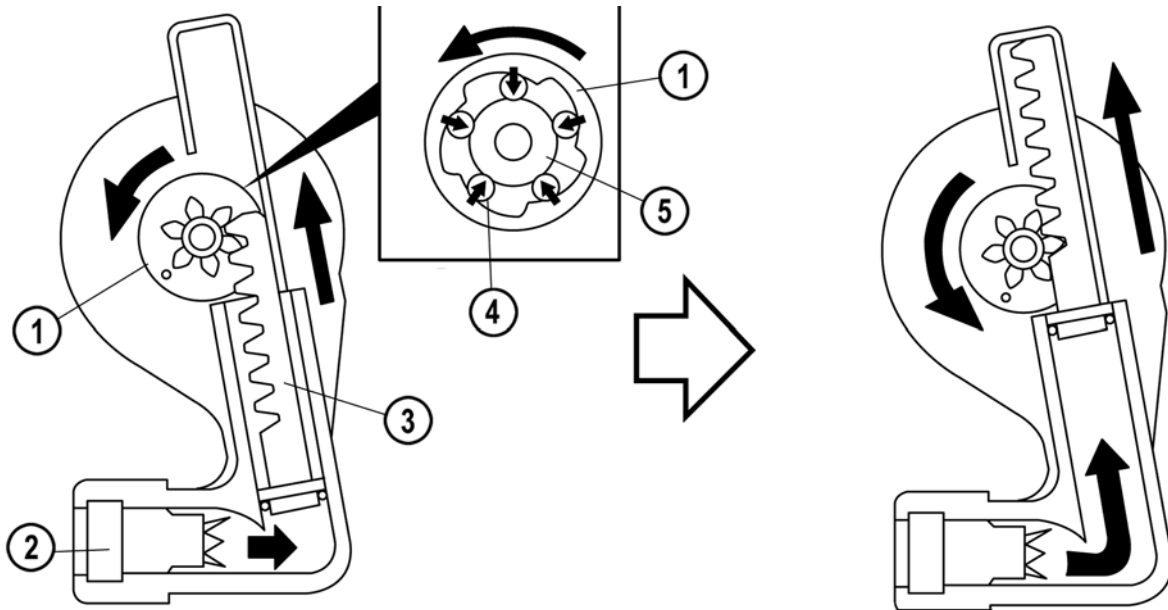


M5_08008

1 Gear
2 Spindle

3 Clutch roller

- When a deployment signal is received from the SAS module, gas is produced by the gas generator (gas is generated in the same way as in airbag inflators). The pressure of this gas pushes the rack up in the cylinder.
- As the rack moves upwards, it causes the gear to rotate.
- The rotation of the gear pushes the clutch rollers against the spindle, locking the gear and spindle together.
- As the gear is rotated, so is the spindle, and the seat belt webbing is retracted.



M5_08009

- 1 Gear
- 2 Gas generator
- 3 Rack

- 4 Clutch roller
- 5 Spindle

On-board Diagnostic System

- The main functions of the on-board diagnostic system are:
 - Self-test
 - PID monitor

Self Test

- The self-test function allows airbag system DTCs to be displayed. To do this, connect the WDS to the vehicle and select the option **Toolbox→Self Test→Modules→RCM**.

PID Monitor

- The PID monitor function allows airbag system PIDs to be monitored. To do this, connect the WDS to the vehicle and select the option **Toolbox→Datalogger→Modules→RCM**.

Item	Definition	Unit/Condition
CCNT_RCM	Number of continuous DTCs	—
CR2D_Comm	Driver-side side airbag sensor No. 2 system communication data error	OK/FAULT
CR2D_Inter	Driver-side side airbag sensor No. 2 system internal circuit disabled	OK/FAULT
CR2D_Mount	Driver-side side airbag sensor No. 2 assembly incorrect	OK/FAULT
CR2D_Short	Driver-side side airbag sensor No. 2 system communication error	OK/FAULT
CR2P_Comm	Passenger-side side airbag sensor No. 2 system communication data error	OK/FAULT
CR2P_Inter	Passenger-side side airbag sensor No. 2 system internal circuit disabled	OK/FAULT
CR2P_Mount	Passenger-side side airbag sensor No. 2 assembly incorrect	OK/FAULT
CR2P_Short	Passenger-side side airbag sensor No. 2 system communication error	OK/FAULT
IGN_V_2	IG1 voltage	V
I_PAD_SW	PAD switch status	On/Off
RES_AB_D	Driver-side airbag resistance	ohm
RES_AB_P	Passenger-side airbag resistance	ohm
RES_CAB_D	Driver-side curtain airbag resistance	ohm
RES_CAB_P	Passenger-side curtain airbag resistance	ohm
RES_PT_D	Driver-side belt pretensioner resistance	ohm
RES_PT_P	Passenger-side belt pretensioner resistance	ohm
RES_SAB_D	Driver-side side airbag resistance	ohm
RES_SAB_P	Passenger-side side airbag resistance	ohm

M5_08T001

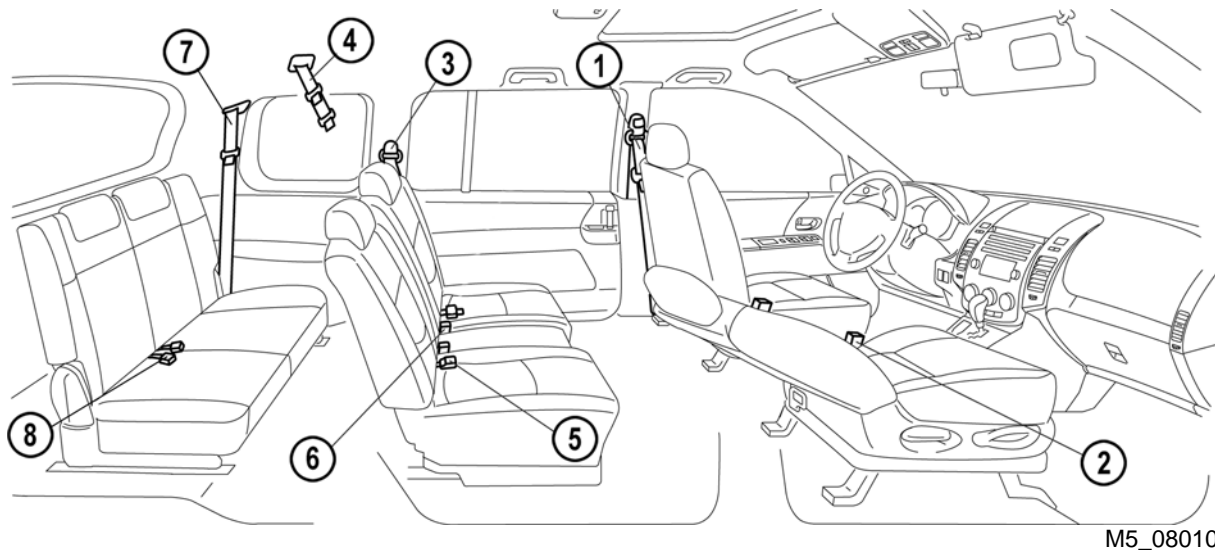
NOTE: PIDs are only available for side airbag sensor No. 2 presently, but not for No. 1 sensor. For diagnostics of the No. 1 side airbag sensors DTCs stored by the on-board diagnostic system may be used.

Seat Belts

Features

- The seatbelts of the Mazda5 have the following features:
 - Seatbelts with pretensioners, load limiter, and ELR are used for the front seats.
 - Seatbelts with ELR are used for the two outer second row seats and the third row seats.
 - Isofix and tether strap child restraint seat anchors are provided for the two outer second row seats.

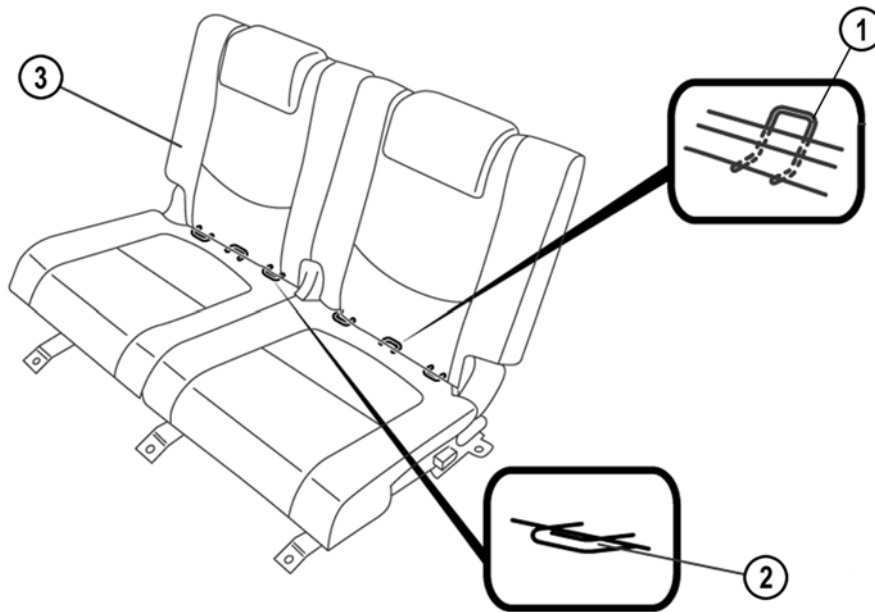
Parts Location



M5_08010

- | | | | |
|---|-----------------------------|---|--------------------------|
| 1 | Front seat belt | 5 | Second-row centre buckle |
| 2 | Front buckle | 6 | Second-row buckle |
| 3 | Second-row seat belt | 7 | Third-row seat belt |
| 4 | Second-row centre seat belt | 8 | Third-row buckle |

Child Restraint Anchors



M5_08011

- 1 Top tether belt
- 2 ISOFIX anchor

- 3 Second-row seat

09

Body & Accessories

09 Body & Accessories

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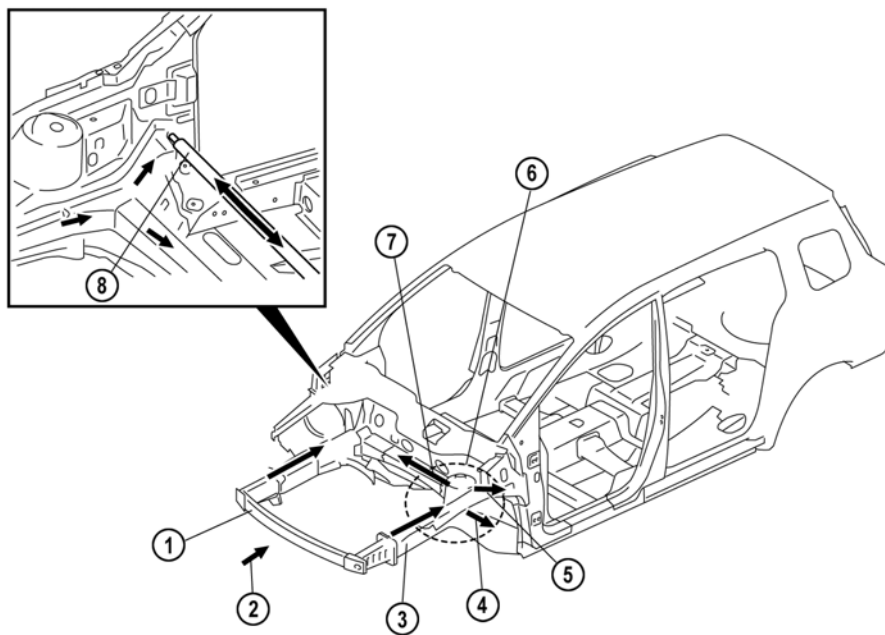
Body Panels

Features

- The body shell of the Mazda5 has the following features:
 - Triple H-construction is used.
 - Front bumper and rear bumper reinforcements used.

Cabin

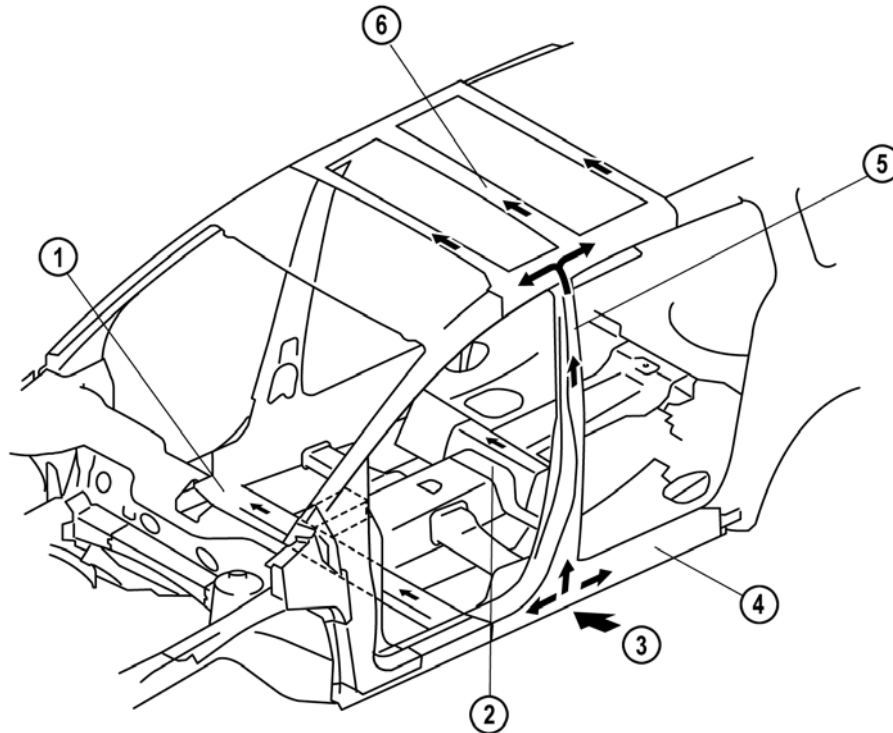
- The cabin utilizes the same **MAIDAS (Mazda Advanced Impact Distribution and Absorption System)** concept as the Mazda3. The three fork structure at the back of each front side frame directs frontal impact energy toward the A-pillar, crossmember No. 1, and the side sill, therefore minimizing deformation in the area around the front seat occupants feet. A crossbeam is also utilized to prevent hinge pillars from moving outward during collisions.



M5_09001

- | | | | |
|---|----------------------------|---|--|
| 1 | Front bumper reinforcement | 5 | To A-pillar |
| 2 | Collision energy | 6 | Impact dispersing three-fork structure |
| 3 | Front side frame | 7 | To crossmember No. 1 |
| 4 | To side sill | 8 | Crossbeam |

- In the event of a side collision, the triple-H frame structure effectively distributes force in an H-pattern along the floor, the side and the roof of the vehicle. This structure not only improves the safety of the cabin, but also helps it resist body twisting and improves steering performance.



M5_09002

- 1 Crossmember No.2
- 2 Crossmember No.3
- 3 Collision energy

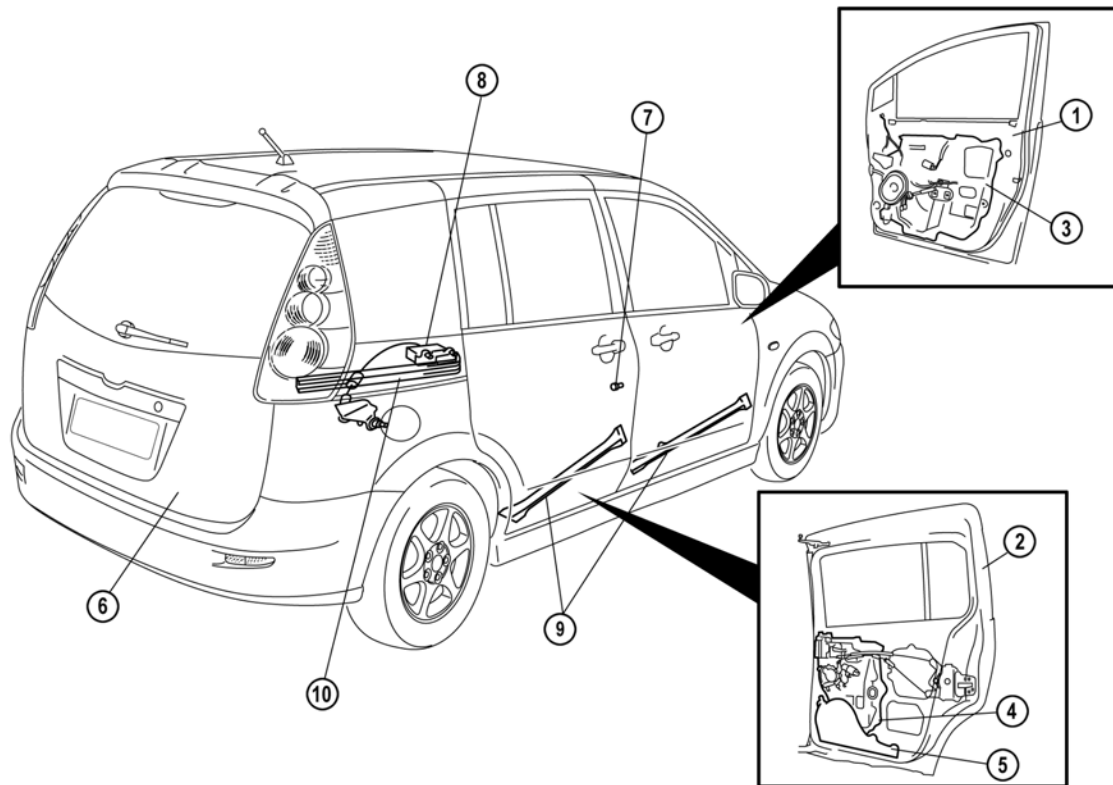
- 4 Side sill
- 5 B-pillar
- 6 Roof reinforcement

Doors and Liftgate

Features

- The doors on the Mazda5 have the following features:
 - Door units integrating power window motor and regulator, inner door handle and speaker (front doors only) are used.
 - Side impact bars are utilized.
 - Plastic liftgate has been utilized.
 - Sliding doors are used on both sides of vehicle.

Parts Location

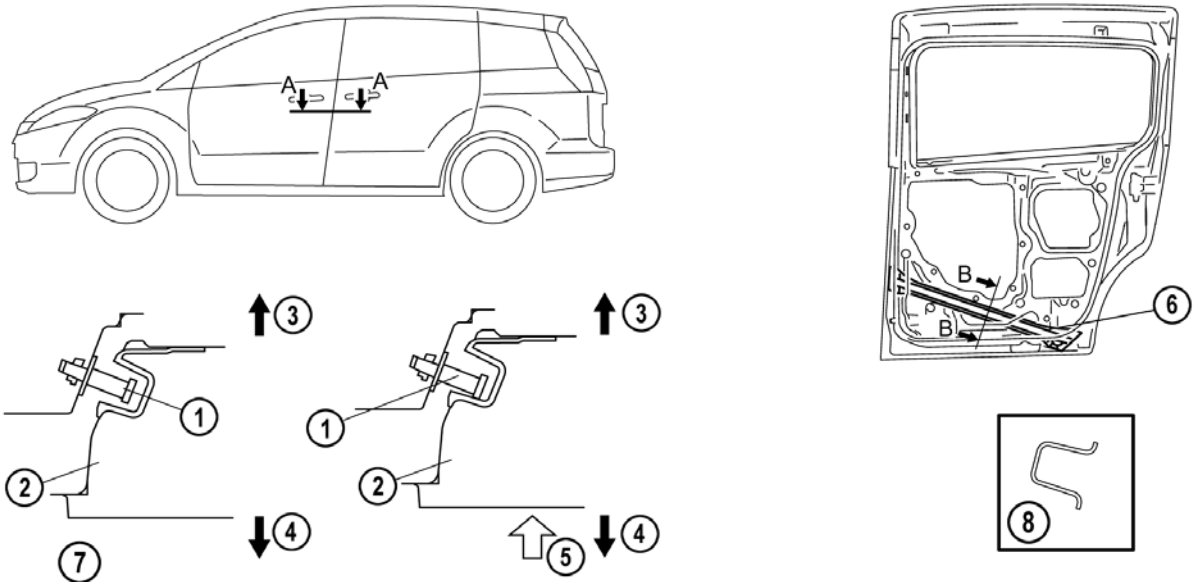


M5_09003

- | | | | |
|---|-------------------|----|---------------------------------|
| 1 | Front door | 6 | Liftgate |
| 2 | Sliding door | 7 | Sliding door catcher pin |
| 3 | Front door unit | 8 | Sliding door open lock actuator |
| 4 | Sliding door unit | 9 | Side impact bar |
| 5 | Wiring harness | 10 | Sliding door guide rail |

Sliding Doors

- To allow easier entry and exiting of the vehicle, sliding doors are provided on both sides.
- The sliding doors incorporate a side impact bar, and catcher pins to increase safety in the event of a side collision.

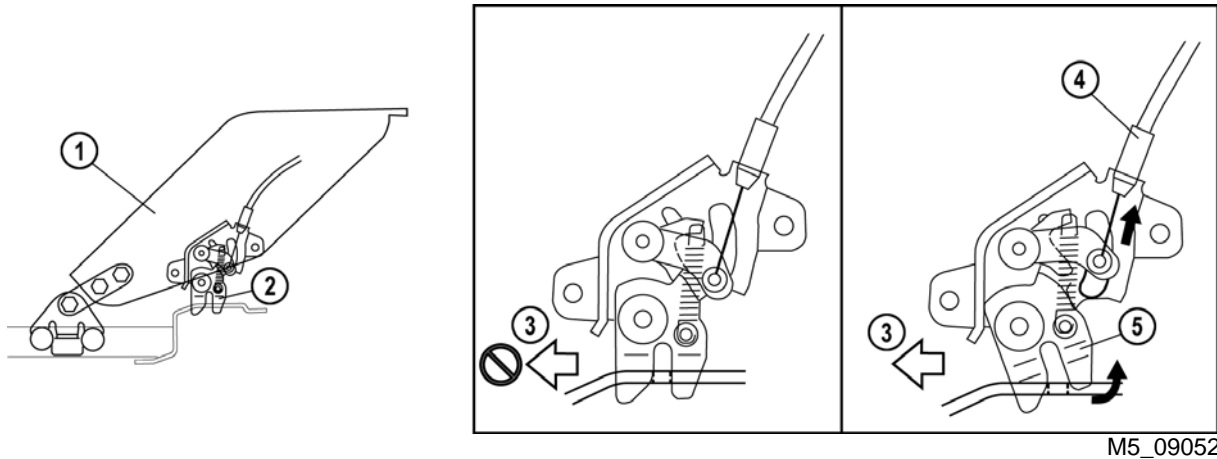


M5_09004

- | | | | |
|---|--------------------------|---|------------------|
| 1 | Sliding door catcher pin | 5 | Collision energy |
| 2 | Sliding door | 6 | Side impact bar |
| 3 | Inside of vehicle | 7 | Section A-A |
| 4 | Outside of vehicle | 8 | Section B-B |

Sliding Door Open Lock Actuator

- The sliding door open lock actuator holds the sliding door in the fully open position to prevent the door closing unexpectedly.
- When the inner or outer sliding door handle is operated, a cable releases the open lock actuator, allowing the door to be closed.



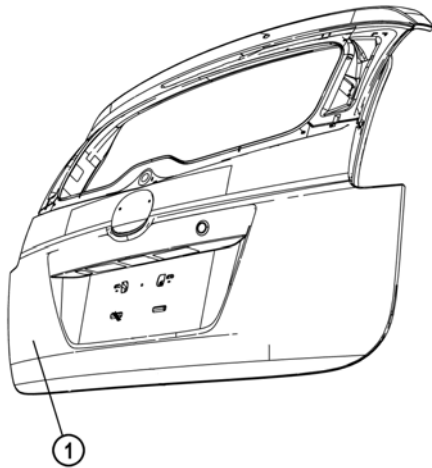
M5_09052

- 1 Lower roller bracket
- 2 Open lock actuator
- 3 Closing direction

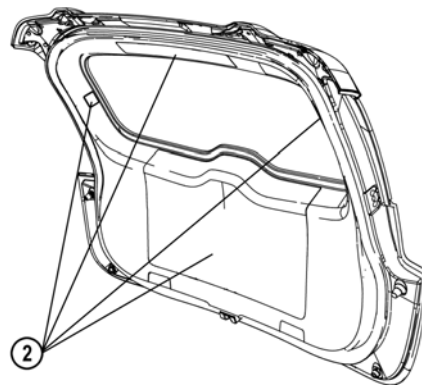
- 4 Cable
- 5 Latch

Liftgate

- The liftgate consists of an outer skin made of polycarbonate **ABS** (**A**crylonitrile-**B**utadiene-**S**tylene) plastic, and an inner made of glass fibre reinforced polypropylene bonded together. The liftgate harness is incorporated into the liftgate assembly and cannot be replaced separately.
- Liftgate dampers that allow the liftgate to be opened to two heights are used.



1 Liftgate



2 Access panels

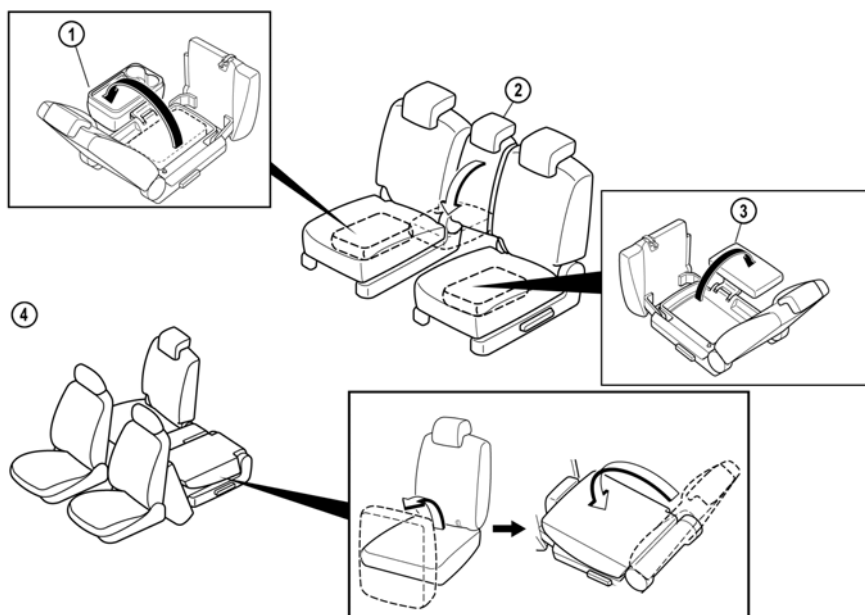
M5_09005

Seats

Features

- The seats on the Mazda5 have the following features:
 - The Mazda5 is available in two seating layouts, a five seater and a seven seater.
 - The second row of both layouts features a fold-away centre seat, the seat back of which can also be used as an armrest. When this seat is not needed it can be stowed in a storage compartment under the left-hand second row seat seat-cushion.
 - The right-hand second row seat features a storage box under the seat cushion, as well as a stowable tray that can be unfolded and positioned between the second row seats.
 - The seat cushion and seat back of the second row seats fold separately, allowing a nearly flat floor surface for storage.
 - The third row seats are a 'Karakuri' design, and fold into the floor for more rear storage space when not being used.

Second Row Seats



- 1 Storage box
- 2 Armrest

- 3 'Karakuri' 7th seat
- 4 Double fold-down

M5_0909010

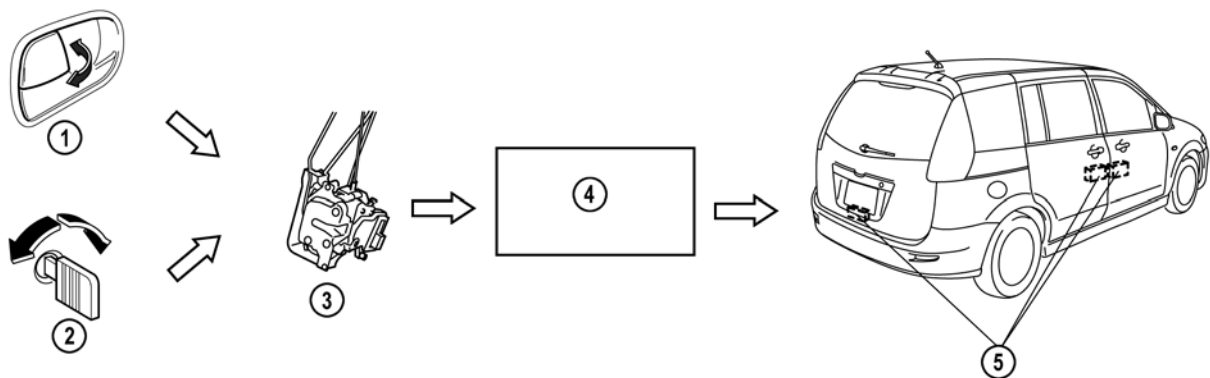
Security and Locks

Features

- The security and lock system on the Mazda5 (CR) has the following features:
 - Advanced Keyless Entry and Starting System has been adopted (depends on grade).
 - Power door lock system controlled by the BCM is used.
 - Double-locking function is used.
 - Auto re-lock function is used.
 - Theft deterrent system controlled by BCM is used.

Power Door Lock System

- When the driver's door is unlocked or locked with the key, or by pushing the lock knob, the lock link switch in the door lock actuator sends a lock or unlock signal to the **BCM** (**B**ody **C**ontrol **M**odule), which operates the locks on all doors.



M5_09013

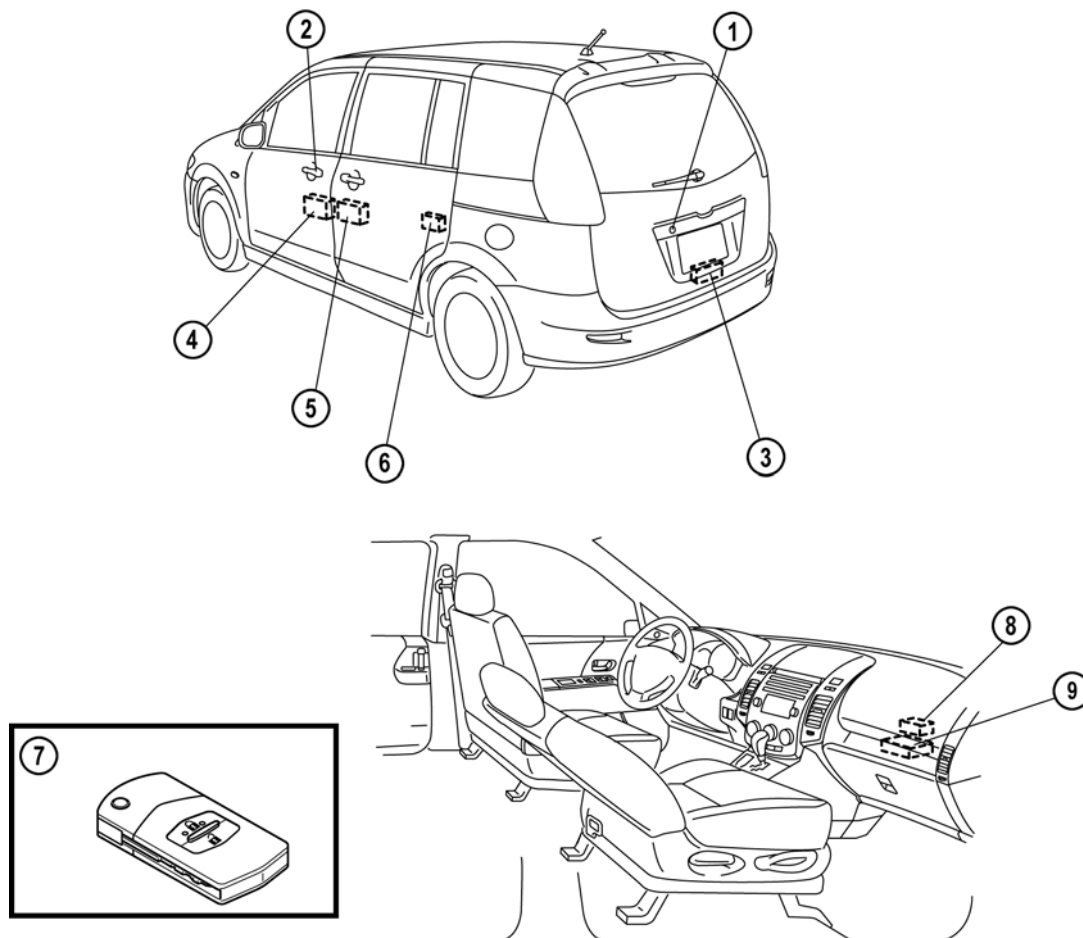
- 1 Driver's door lock knob
- 2 Driver's door key cylinder
- 3 Door lock-link switch

- 4 BCM
- 5 Lock Actuator

Standard Keyless Entry system

- The standard Keyless Entry system is similar to that on the Mazda3, with the following exceptions:
 - Switchblade type retractable key has been adopted.

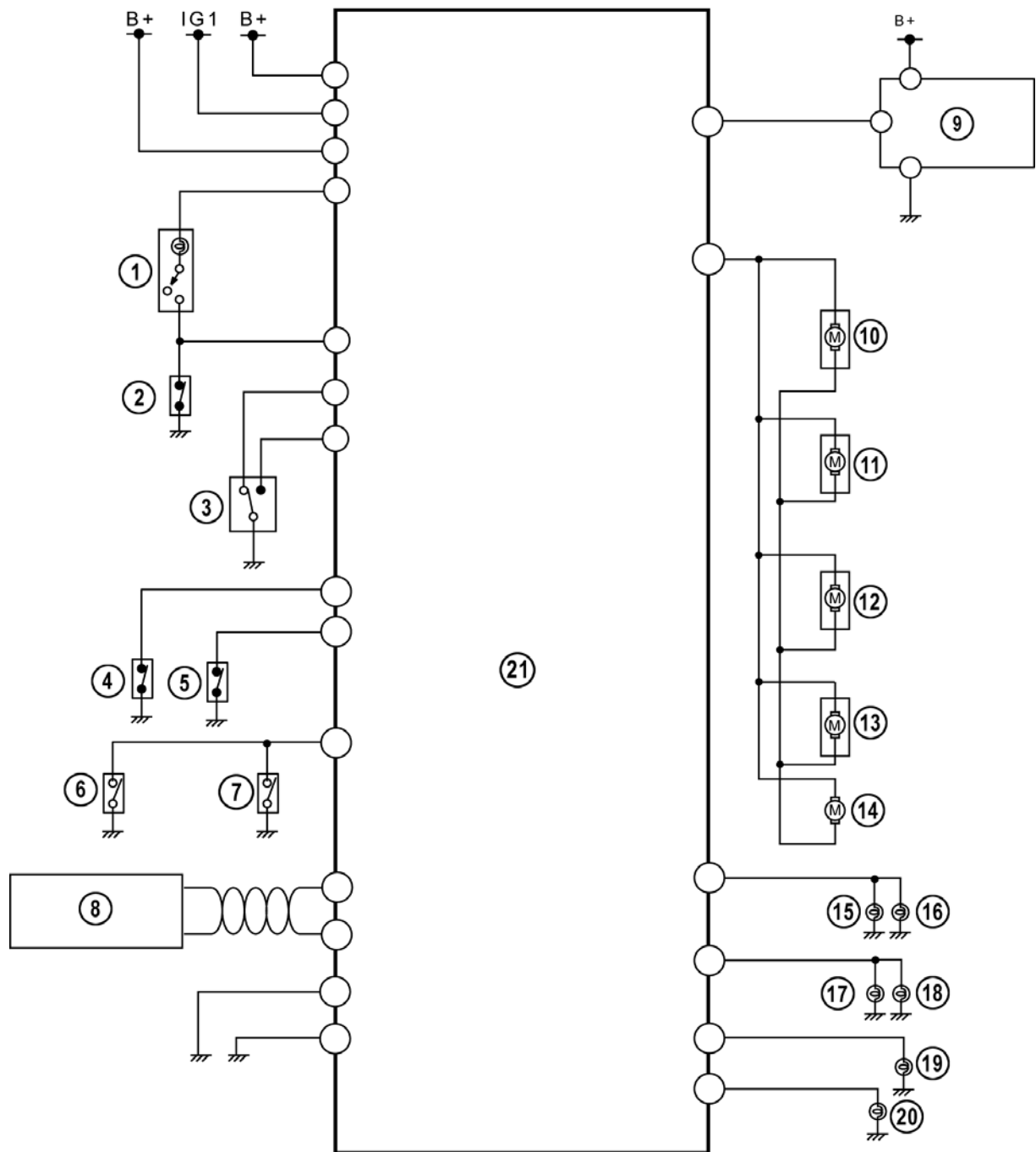
Parts Location



M5_09025

- | | | | |
|---|-------------------------------------|---|-------------------|
| 1 | Liftgate key cylinder | 6 | Rear door latches |
| 2 | Driver's door key cylinder | 7 | Transmitter |
| 3 | Liftgate latch and lock actuator | 8 | Keyless receiver |
| 4 | Front door latch and lock actuators | 9 | BCM |
| 5 | Rear door lock actuators | | |

Wiring Diagram

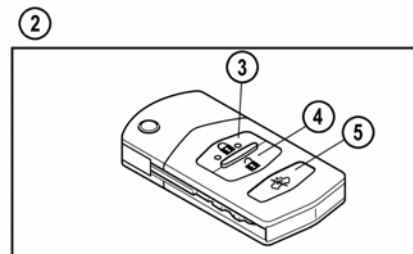
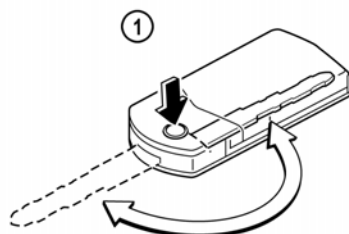


M5_09026

1	Cargo compartment light	12	Sliding door lock actuator (LH)
2	Liftgate latch switch	13	Sliding door lock actuator (RH)
3	Door lock-link switch	14	Liftgate lock actuator
4	Front door latch switch (LH)	15	Front turn signal (LH)
5	Front door latch switch (RH)	16	Side turn signal (LH)
6	Sliding door switch (LH)	17	Front turn signal (RH)
7	Sliding door switch (RH)	18	Side turn signal (RH)
8	To CAN bus	19	Rear turn signal (LH)
9	Keyless receiver	20	Rear turn signal (RH)
10	Front door lock actuator (driver side)	21	BCM
11	Front door lock actuator (passenger side)		

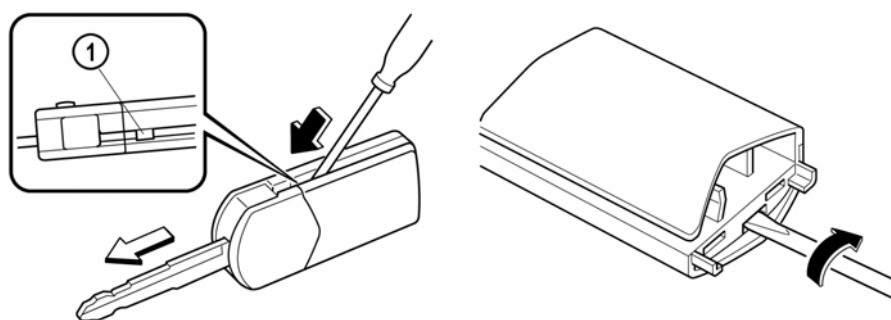
Transmitter

- The keyless transmitter on vehicles with standard keyless entry incorporates buttons to lock and unlock the doors and to disable the intrusion sensor (when theft-deterrent system fitted), a button type battery (CR2025), and a retractable ignition key with integrated transponder.
- By pushing the release button on the transmitter the ignition key will automatically pop out. When the key is no longer needed, it can be folded back into the transmitter case.
- The key can be separated from the transmitter, and the transmitter case opened to allow battery replacement.



M5_09027

1	Retractable key	4	Unlock button
2	Keyless transmitter	5	Intruder sensor cut-off button (with theft-deterrent system)
3	Lock button		



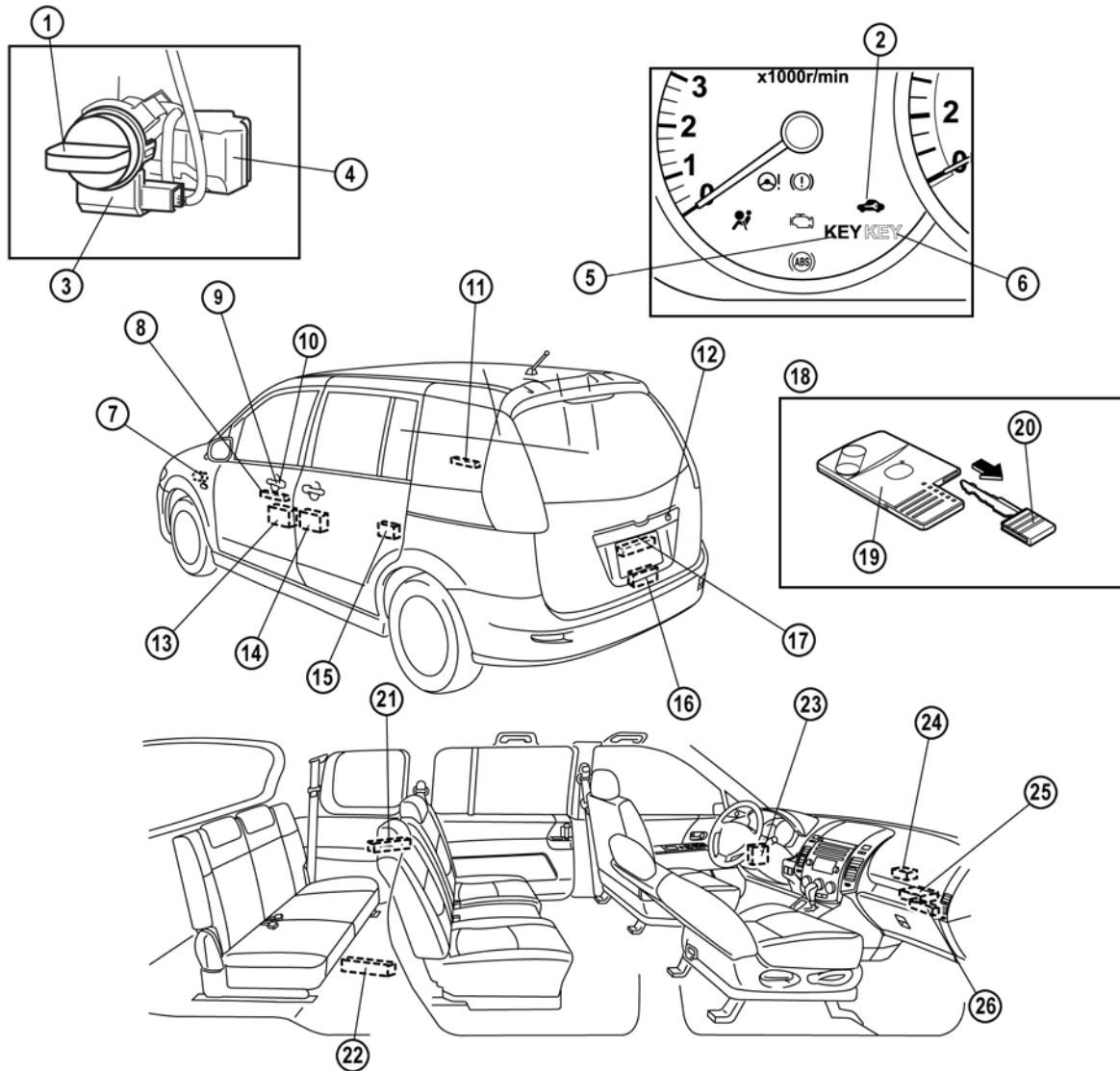
M5_09028

1 Release tab

Advanced Keyless Entry and Start System

- The Advanced Keyless Entry and Start System allows the vehicle to be unlocked and started without using a key. As long as the driver has an advanced keyless entry card key in their possession, operation of the doorlocks and start knob (to start the engine) can be achieved without actually removing the card key from their pocket or bag.

Parts Location



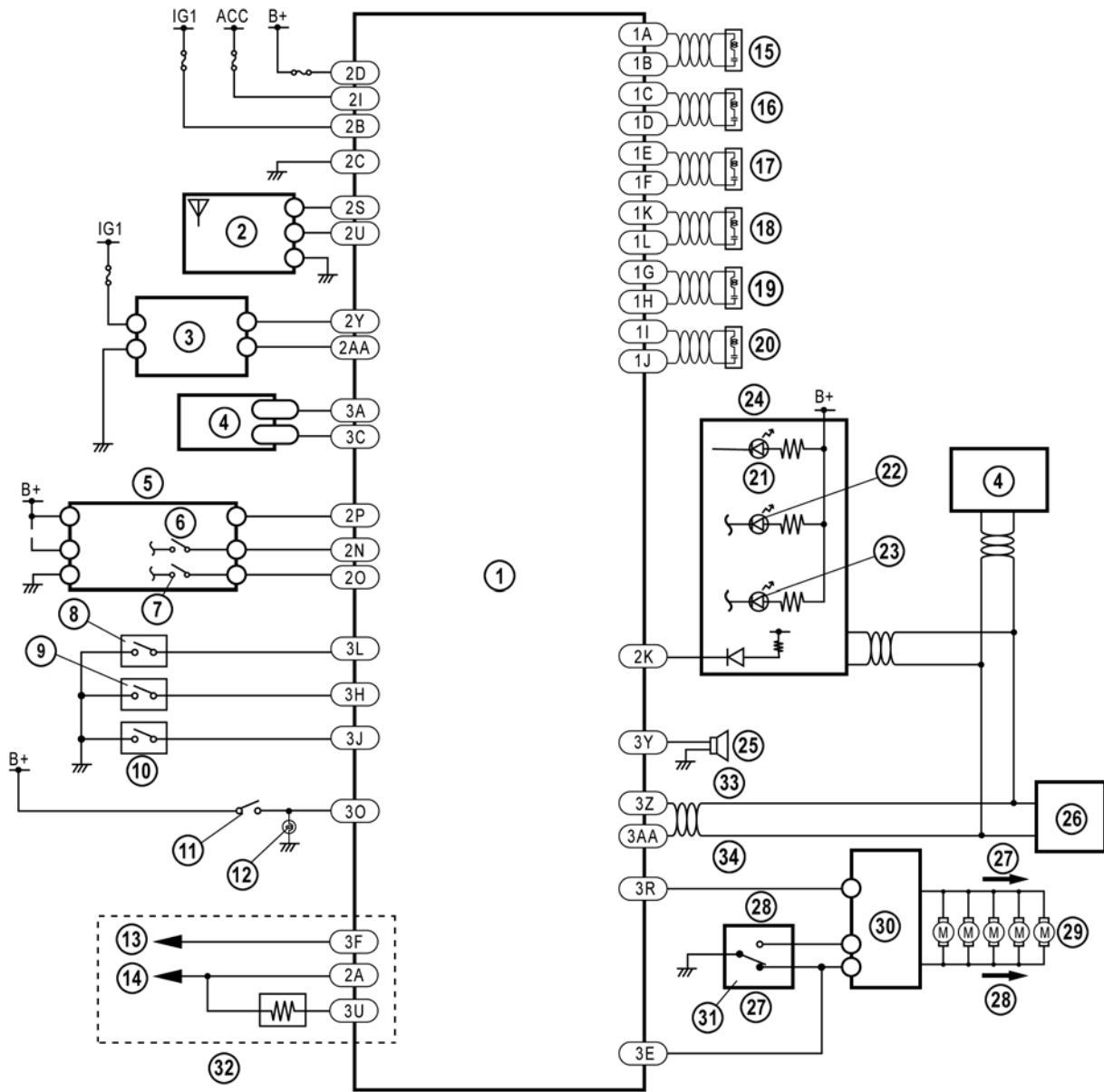
M5_09011

Security and Locks

Body & Accessories

1	Start knob (ignition switch)	14	Rear door lock actuator
2	Security light	15	Rear door latch
3	Coil antenna	16	Liftgate latch and lock actuator
4	Steering lock unit	17	Keyless antenna (liftgate)
5	Keyless warning light (red)	18	Card key
6	Keyless indicator light (green)	19	Transmitter
7	Keyless buzzer	20	Auxiliary key
8	Keyless antenna (driver side)	21	Keyless antenna (interior, rear-left)
9	Request switch (driver side)	22	Keyless antenna (interior, rear-right)
10	Front door key cylinder	23	Keyless control module
11	Keyless antenna (passenger side)	24	Keyless receiver
12	Request switch (liftgate)	25	BCM
13	Front door latch and lock actuator	26	Keyless antenna (interior, front)

Wiring Diagram



M5_09012

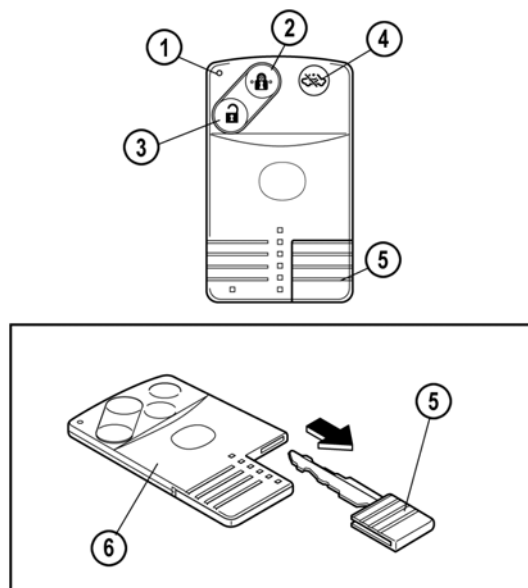
Security and Locks

Body & Accessories

1	Keyless control module	18	Keyless antenna (interior, front)
2	Keyless receiver	19	Keyless antenna (interior, RR)
3	Coil antenna	20	Keyless antenna (interior, RL)
4	PCM	21	Security light
5	Steering lock unit	22	Keyless indicator light (green)
6	Start knob push switch	23	Keyless warning light (red)
7	Key reminder switch	24	Instrument cluster
8	Request switch (liftgate)	25	Keyless buzzer
9	Request switch (driver side)	26	DLC-2
10	Request switch (passenger side)	27	LOCK
11	Brake light switch	28	UNLOCK
12	Brake light	29	Door lock actuator
13	Selector lever	30	BCM
14	Key interlock solenoid	31	Door lock-link switch
15	Keyless antenna (driver side)	32	With AT
16	Keyless antenna (passenger side)	33	CAN-L
17	Keyless antenna (liftgate)	34	CAN-H

Card Key

- A thin, card type transmitter has been adopted.
- The card key incorporates buttons to lock and unlock the doors and to disable the intrusion sensor (when theft-deterrent system fitted), a button type battery (CR2025), an auxiliary key, and an indicator light.
- When the LOCK or UNLOCK buttons are operated or a request signal is received from the vehicle, the indicator light illuminates.
- If the Advanced Keyless Entry system is malfunctioning, the driver's door can be opened and the engine started using the auxiliary key.
- A transponder is built into the auxiliary key.



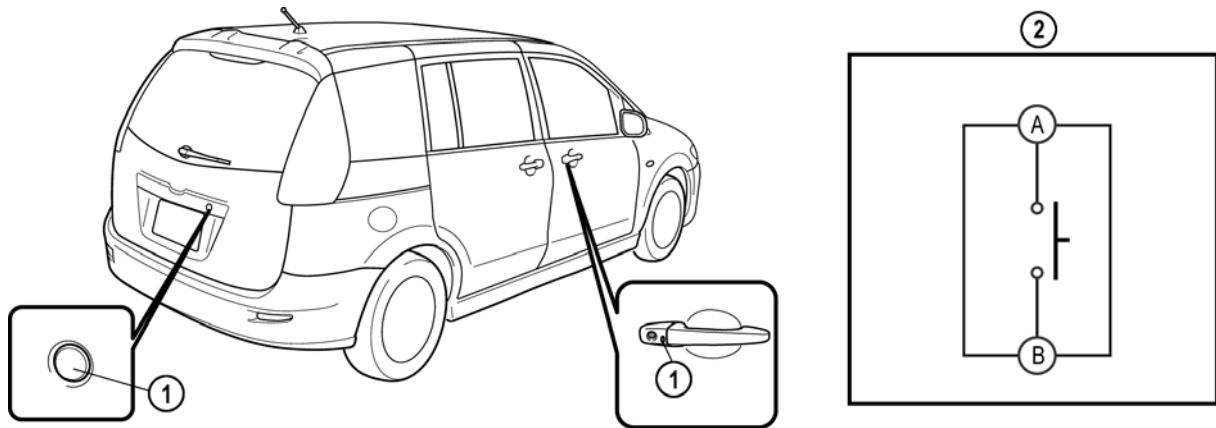
M5_09017

- 1 Indicator light
- 2 Lock button
- 3 Unlock button

- 4 Intruder sensor cut-off button (with theft-deterrent system)
- 5 Auxiliary key
- 6 Transmitter

Request Switch

- Request switches are installed to driver's door, passenger's door, and liftgate respectively. When the request switch is pressed, the Keyless Control Module sends a request signal to the card key. The request switch on the driver's door can also be used to open and close the windows (see "Power Window System")



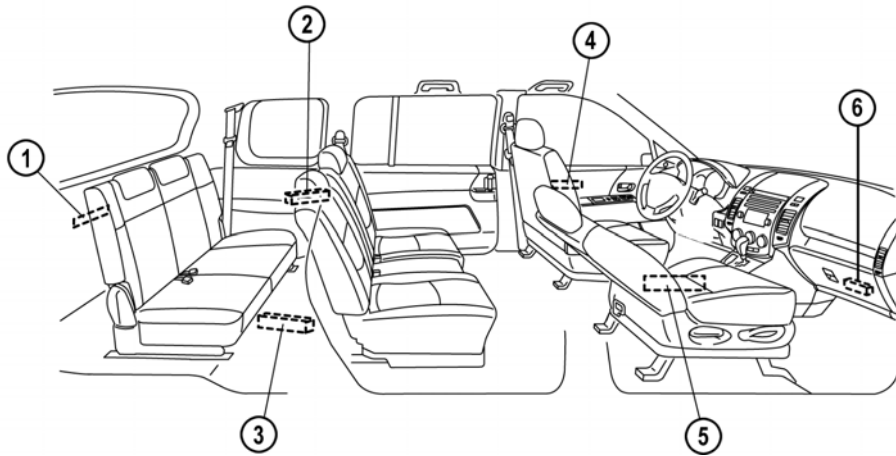
M5_09019

1 Request switch

2 Internal circuit diagram

Keyless Antennas

- A total of six antennas send request signals to card keys, and relay card key ID's to the Keyless Control Module.
- The antennas in the front doors and the liftgate are used to detect card keys outside the vehicle, and those in the rear interior panels and behind the glovebox detect card keys inside the vehicle.
- If more than one card keys are within the reception range of the keyless antennas, the card key ID received by the antenna with the strongest signal is used by the Keyless Control Module.



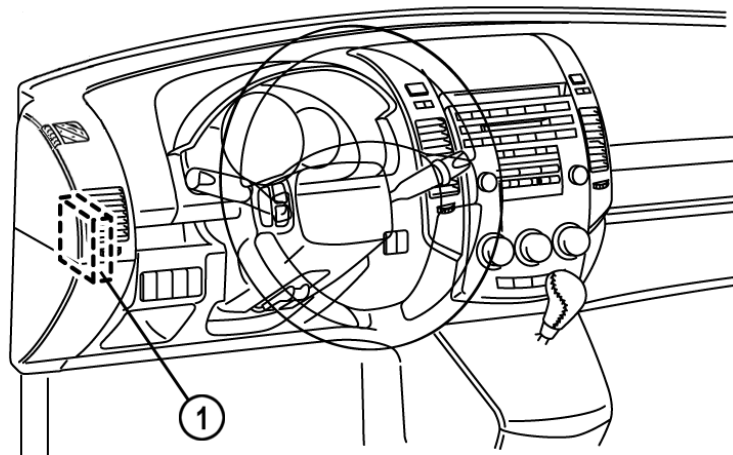
M5_09018

- | | | | |
|---|--------------------------------------|---|--|
| 1 | Keyless antenna (exterior, liftgate) | 4 | Keyless antenna (exterior, driver side) |
| 2 | Keyless antenna (interior, RL) | 5 | Keyless antenna (exterior, passenger side) |
| 3 | Keyless antenna (interior, RR) | 6 | Keyless antenna (interior, front) |

Keyless Control Module

- The Keyless Control Module is located behind the driver's side kick panel. It confirms the identification of the card keys and transmits this information to the PCM and BCM.
- The Keyless Control Module is connected to the HS-CAN bus.

NOTE: When replacing the Keyless Control Module, the new module has to be configured. To do this connect WDS to the vehicle and select the option **Toolbox→Module Programming→Programmable Module Installation→RKE**.

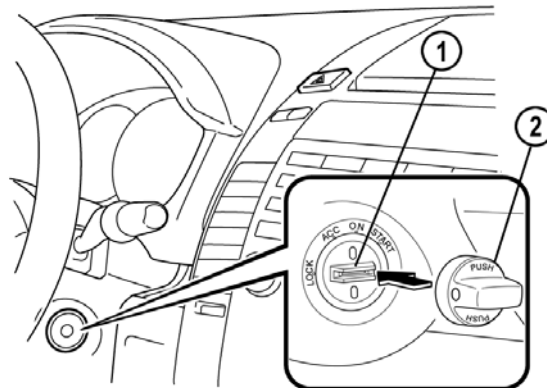


M5_09022

- 1 Keyless control module

Steering Lock Unit

- The steering lock unit consists of the steering lock and the start knob. When the start knob is pushed in a request signal is sent by the Keyless Control Module via the keyless antennas. If the Keyless Control Module successfully identifies a valid card key, it sends a signal to the steering lock unit, allowing the steering to be unlocked and the start knob to be turned to the ON position. If for some reason the card key cannot be identified, or is not functioning, the start knob can be removed and the auxiliary key inserted to start the engine.



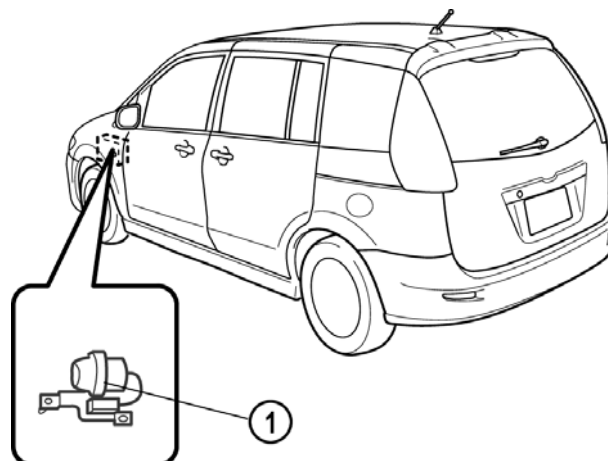
M5_09021

1 Steering lock unit

2 Start knob

Keyless Buzzer

- The keyless buzzer provides audible confirmation that the doors have been locked or unlocked (answer-back function), or that the system is not being used correctly.
- The keyless buzzer is attached to the body inside the left side mudguard. To access it, the front inner mudguard must be removed.



M5_09020

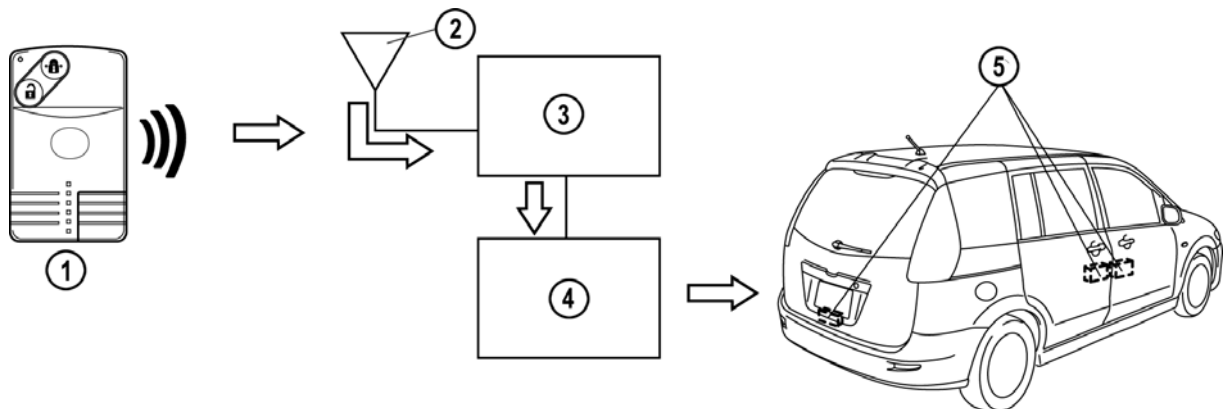
1 Keyless buzzer

Keyless Entry Function

- Unlocking and locking of doors can be achieved either by using the auxiliary key, by pushing the buttons on the transmitter (card key), or simply by pressing the request switches on each of the front doors or liftgate.
- An answer-back function is provided for visual and audible confirmation of door lock operation.
- A guidance function consisting of two indicator lights in the instrument cluster, and interior and exterior buzzers informs the driver if the system is not being used correctly, or if there is a fault.
- A rolling code type transmitter is used in the card key to reduce the possibility of theft.

Locking/Unlocking Using Transmitter

- When either of the buttons on the transmitter is pushed, the transmitter **ID (Identification)** and a rolling code are transmitted as radio waves. The signal is detected by the keyless receiver and communicated to the Keyless Control Module. The Keyless Control Module verifies that the ID of the key is valid, and sends a signal to the BCM to operate the door lock actuators.
- If any of the below conditions are met while the lock button is being pressed, the doors will not be locked:
 - The auxiliary key is in the ignition.
 - The start knob is in any position other than LOCK.
 - The start knob is being pressed.
 - Any of the doors or the liftgate are open.
- The Keyless Control Module then sends a signal to the keyless buzzer, and to the BCM to operate the hazard lights (answer back function).
- If any of the below conditions are met while the unlock button is being pressed, the doors will not be unlocked:
 - The auxiliary key is in the ignition.
 - The start knob is in any position other than LOCK.
 - The start knob is being pressed.



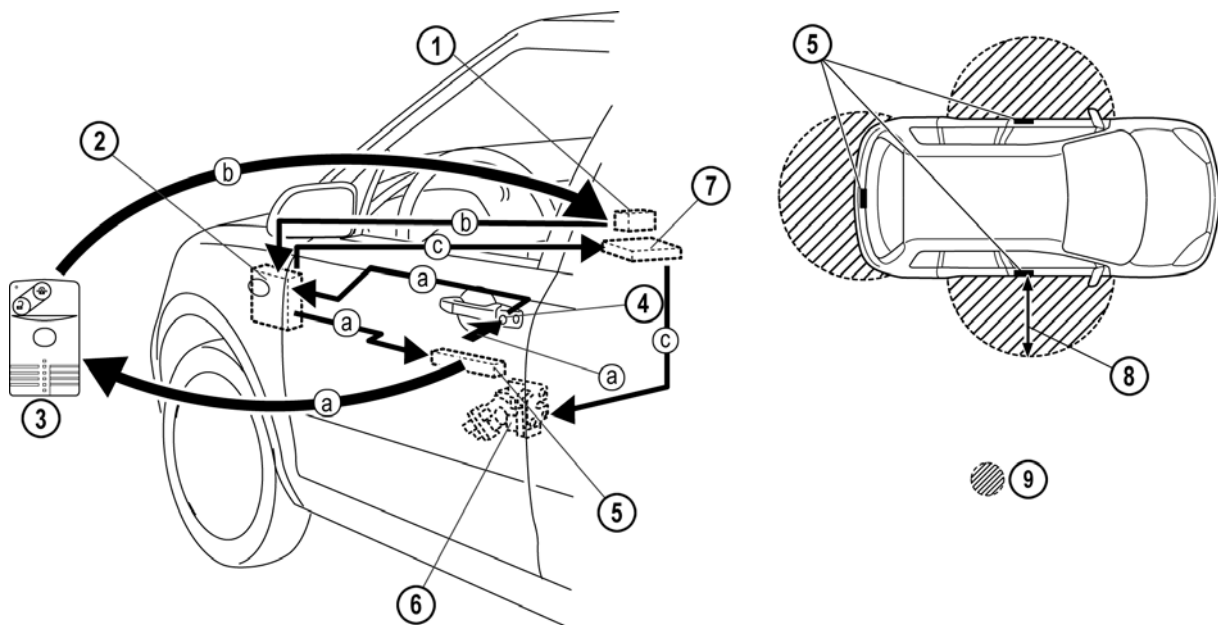
M5_09014

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

- 4 BCM
- 5 Lock actuator

Locking/Unlocking Using Request Switches

- Whenever one of the request switches is pressed, the Keyless Control Module transmits an ID request signal via the keyless antennas to the card key (a). If the driver's door request switch is operated, for example, the ID request signal will only be transmitted to the area outside the driver's door. The same occurs respectively for the other request switches.
- When the card key receives the ID request signal, the indicator light on it flashes once, and it transmits its ID to the keyless receiver, which passes the information on to the Keyless Control Module (b).
- The Keyless Control Module verifies that the ID of the card key is valid, and sends a signal to the BCM to operate the door lock actuators (c).
- The Keyless Control Module then sends a signal to the keyless buzzer, and to the BCM to operate the hazard lights (answer-back function).



M5_09015

- | | | | |
|---|------------------------|---|------------------------------|
| 1 | Keyless receiver | 6 | Lock Actuator |
| 2 | Keyless control module | 7 | BCM |
| 3 | Transmitter (card key) | 8 | Approximately 80 cm {2.6 ft} |
| 4 | Request switch | 9 | Effective range |
| 5 | Keyless antenna | | |

- The doors will only lock when a request switch is pushed if the following conditions are all met:
 - There is no card key inside the vehicle.
 - All doors and liftgate are closed.
 - Auxiliary key is not in the ignition.
 - Start knob is in the LOCK position.
 - A card key is within the reception range of the keyless antennas in the front doors/liftgate.
- The doors will only unlock when a request switch is pushed if the following conditions are all met:
 - Auxiliary key is not in the ignition.
 - Start knob is in the LOCK position.
 - A card key is within the reception range of the keyless antennas in the front doors/liftgate.

Auto Re-lock Function

- The doors will automatically re-lock 30 seconds after being unlocked unless any of the following conditions are met:
 - Any of the doors or liftgate are opened.
 - The auxiliary key is inserted in the ignition.
 - The start knob is pressed.
 - Any of the buttons of the transmitter are operated (the auto re-lock timer will be reset to '0' if the UNLOCK button is pressed).
 - Any of the request switches are pushed.

Out of Range Auto Lock Function

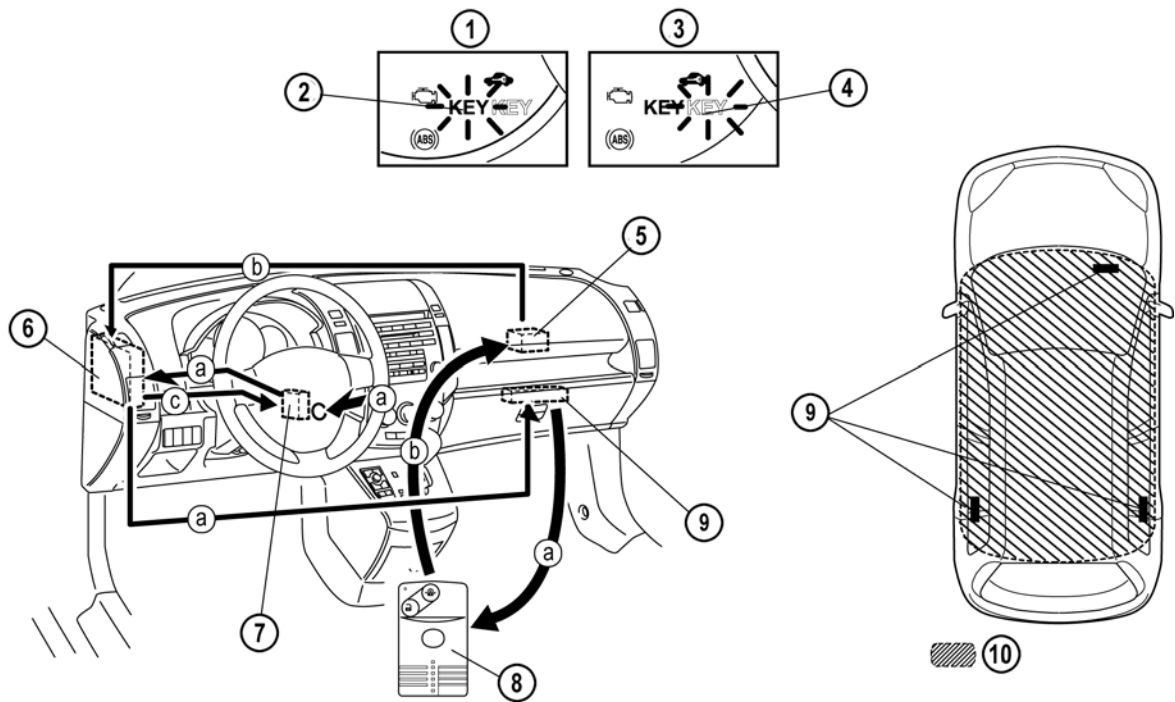
- If the card key moves out of the reception range of the front door/liftgate antennas while all the doors are closed, the doors will automatically be locked (this function is set to OFF for new vehicles).
- The keyless buzzer sounds one time and the system enters 'standby mode' (but locks are not operated) when the following conditions are met:
 - All doors and liftgate are closed (door switch OFF) after one or more having been opened (door switch ON).
 - The card key is not inside the vehicle.
 - A card key is within the reception range of the keyless antennas in the front doors/liftgate.
 - The auxiliary key is not in the ignition.
 - The start knob is in the LOCK position.
- Approximately two seconds after the keyless antenna detects that no card keys are within the reception range the doors are locked.
- The hazard lights flash once to indicate the doors are locked.

Keyless Start Function

- If the driver has a card key with them when they enter the car, it is not necessary to insert a key in the ignition switch to start the engine. The ignition can be switched ON and the engine started simply by turning the start knob.
- When the start knob is pressed the Keyless Control Module transmits an ID request signal inside the vehicle, via the interior keyless antennas (a).
- When the card key receives the ID request signal, the indicator light on it flashes once, and it transmits its ID to the keyless receiver, which passes the information on to the Keyless Control Module (b).
- The Keyless Control Module verifies that the ID of the card key is valid, and unlocks the steering lock. At the same time, it illuminates the green keyless indicator light in the instrument cluster (c).

NOTE: If the ID of the card key is not recognised (unregistered or a faulty card key) the start steering lock will not be unlocked and the red keyless indicator light will flash on and off.

- The card key ID is verified a second time when the ignition is turned to the ON position, the indicator light on the card key will flash once, and a permission signal is sent to the PCM to allow the engine to be started.



M5_09016

- | | | | |
|---|---|----|----------------------------|
| 1 | ID verification NG | 6 | Keyless control module |
| 2 | Red keyless indicator light (flashing) | 7 | Steering lock unit |
| 3 | ID verification OK | 8 | Transmitter (card key) |
| 4 | Green keyless indicator light (illuminated) | 9 | Keyless antenna |
| 5 | Keyless receiver | 10 | Reception range (interior) |

Guidance Function

- The driver is informed of faults or misuse of the system via the warning light and the internal buzzer in the instrument cluster, or the external keyless buzzer.

Item	Operation condition	Exterior keyless buzzer	Instrument cluster			
			Interior buzzer	Keyless warning light (red)	Keyless indicator light (green)	
Warning	Start knob not in LOCK position	Driver's door is open with start knob in ACC position	-	Sounds (approx. 6 s)	-	-
	Card key out of vehicle *1	Card key cannot be detected inside vehicle with driver's door open and start knob in any position except lock	-	Sounds 3 times *2	Flashes *4	-
		Card key cannot be detected inside vehicle with all doors closed and start knob in any position except lock	Sounds 3 times	-	Flashes *4	-
		Card key cannot be detected inside vehicle with start knob in any position except lock and under any condition other than above	-	-	Flashes *4	-
	Door lock inoperable *3	Request switch is pressed from outside vehicle with proper card key inside vehicle and another card key carried	Sounds 3 times	-	-	-
		Attempt is made to lock doors with request switch while carrying card key, when a door is already open or the start knob in any position other than lock	Sounds 3 times	-	-	-
	Battery voltage low	Card key battery voltage depleted	-	-	-	Flashes (Approx. 30 s after IG ON)

M5_09T001

Item		Operation condition	Keyless buzzer (outside the vehicle)	Instrument cluster		
				Buzzer (Interior)	Keyless warning light (red)	Keyless indicator light (green)
Guidance	Start knob operable	Start knob is operable (lock released) when it is pressed	-	-	-	On (Max. 3 s)
	Start knob inoperable	Start knob is inoperable (locked) when it is pressed	-	-	Flashes	-
	Lock/unlock answer back *3	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 steering will be locked (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 : Set to OFF from factory.

*4 : Stops flashing and goes out if the card key is detected inside the vehicle.

M5_09T001a

Customization

- The following functions can be switched ON or OFF using WDS:
 - Out of range auto-lock function (set to OFF from factory).
 - Lock/unlock answer back function (set to OFF from factory).
 - Low card key battery warning (set to ON from factory).

Service and Repair

Programming Additional Card Keys With Two or More Card Keys

- If two or more registered card keys are available, additional keys can be programmed without the use of WDS. A maximum of six card keys can be programmed.

NOTE: Steps 3 to 6 below must be completed within 30 seconds of inserting the auxiliary key in the ignition.

NOTE: Do not program card keys while WDS or any other computer devices are in the vehicle. Make sure all card keys are operational and have good batteries.

1. Bring the two registered card keys (key 1 and key 2), and the card keys to be programmed into the vehicle and close all doors.
2. Insert auxiliary key in ignition.
3. Turn the ignition ON.
4. Push the UNLOCK button on card key 1 once.
5. Push the UNLOCK button on card key 2 once.
6. Turn ignition switch to ACC then back to ON three times.
7. Open and close the driver's door three times. The door lock actuators will lock once, then unlock to confirm that key programming mode is active.
8. Push the UNLOCK button on the card key card to be programmed twice. The door lock actuators will lock once, then unlock to confirm that programming was successful.

Programming Additional Card Keys With WDS

1. Establish communication between WDS and the vehicle.
2. Select the option **Toolbox→Body→Security→PATS Functions**.
3. Carry out the security access procedure (read out the WDS outcode, and input corresponding incode).
4. Select the option "Card Key Programming". The door lock actuators will lock once, then unlock to confirm that key programming mode is active.
5. Push the UNLOCK button on the card key to be programmed twice. The door lock actuators will lock once, then unlock to confirm that programming was successful.

Erasing Registered Card Keys

1. Establish communication between WDS and the vehicle.
2. Select the option **Toolbox→Body→Security→PATS Functions**.
3. Carry out the security access procedure (read out the WDS outcode, and input corresponding incode).
4. Select the option “Card Key Clearing”.
5. Complete procedure by programming at least one new card keys.

NOTE: Only one registered card key is necessary for the system to function correctly. However, it is recommended that two card keys be programmed so that the “Programming additional card keys with two or more card keys” procedure can be carried out by the customer if they wish to do so in the future.

Steering Lock Unit Programming

- If the steering lock unit is replaced, the new unit must be programmed using WDS.

NOTE: Do not program the steering lock unit while WDS or any other computer devices are in the vehicle. Make sure all card keys are operational and have good batteries.

NOTE: To program the steering lock unit a registered card key is necessary. If there is no programmed card key, perform the steering lock unit programming after the card key programming.

1. Bring a registered card key into the vehicle and close all the doors.
2. Establish communication between WDS and the vehicle.
3. Select the option **Toolbox→Body→Security→PATS Functions**.
4. Carry out the security access procedure (read out the WDS outcode, and input corresponding incode).
5. Select the option “Steering Lock Unit Programming”.

On-board Diagnostic System

- The on-board diagnostic system consists of the following functions:
 - Self-test
 - PID monitor
 - Simulation test function

Self Test

- The self-test function allows the Advanced Keyless Entry system DTCs to be displayed. To view these, connect WDS to the vehicle and select the option **Toolbox→Self Test→Modules→RKE**.

PID Monitor

- The PID monitor function allows the PIDs for the Advanced Keyless Entry system to be monitored. To view these connect WDS to the vehicle and select the option **Toolbox→Datalogger→Modules→RKE**.

Item	Definition	Unit/ Condition
DTC_CNT	Number of continuous DTCs	-
RPM	Engine speed	RPM
VSS	Vehicle speed	KPH
VPWR	Supply voltage	V
NUMCARD	Number of programmed card keys	-
NUMKEY	Number of programmed key ID numbers	-
DRSW_D	Door switch (Driver's door)	OPEN/ CLOSE
DRSW_ALL	Door switch (All doors and liftgate)	OPEN/ CLOSE
BOO	Brake pedal position (Brake switch)	On/Off
REQ_SW_D	Request switch (Driver's door)	On/Off
REQ_SW_P	Request switch (Passenger door)	On/Off
REQ_SW_BK	Request switch (Liftgate)	On/Off
LOCK_SW_D	Door lock-link switch	On/Off
IMMOBI	Immobilizer system equipped or not	On/Off
TR/LG_SW	Liftgate latch switch	OPEN/ CLOSE
IG_KEY_IN	Key reminder switch	Key-In/ Key-Out
IG_SW_ST	Ignition switch (Push switch)	Pushed/ Not Pushed
BUZZER	Keyless buzzer	On/Off
PWR_IG1	Power supply (IG1)	On/Off
PWR_ACC	Power supply (ACC)	On/Off

M5_09T002

Simulation Test

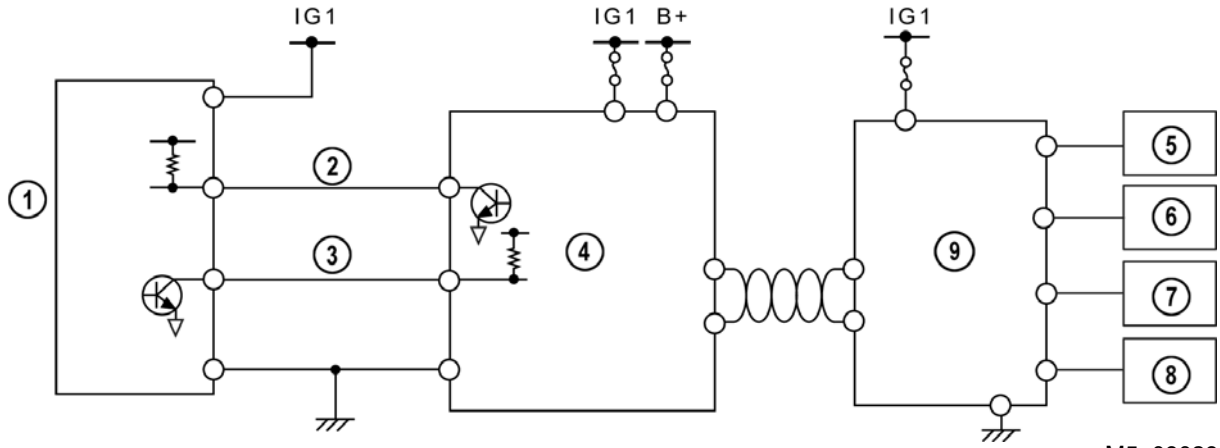
- The simulation test function allows certain PIDs for the Advanced Keyless Entry system to be activated. To do this, connect WDS to the vehicle and select the option **Toolbox→Datalogger→Modules→RKE.**

Item	Applicable Component	Unit/ Condition
BZR_OUT	Keyless buzzer	On/Off
BZR_IN	Interior buzzer (Instrument cluster)	On/Off
LNP_RED	Keyless warning light (red)	On/Off
LNP_GREEN	Keyless indicator light (green)	On/Off
DR_LOCK	All doors Lock/Off	Lock/ Off
DR_UNLOCK	All doors unlock/Off	Unlock/ Off
SUPERLOCK	All doors Lock/Off	Lock/ Off

M5_09T003

Immobilizer System (vehicles with standard Keyless Entry system)

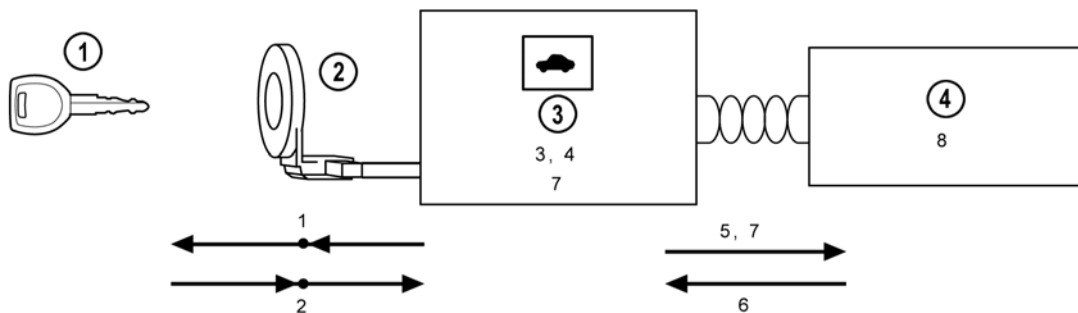
- The immobilizer system is basically the same as that in the Mazda3 (BK). Control of the immobilizer is carried out by the instrument cluster.



M5_09029

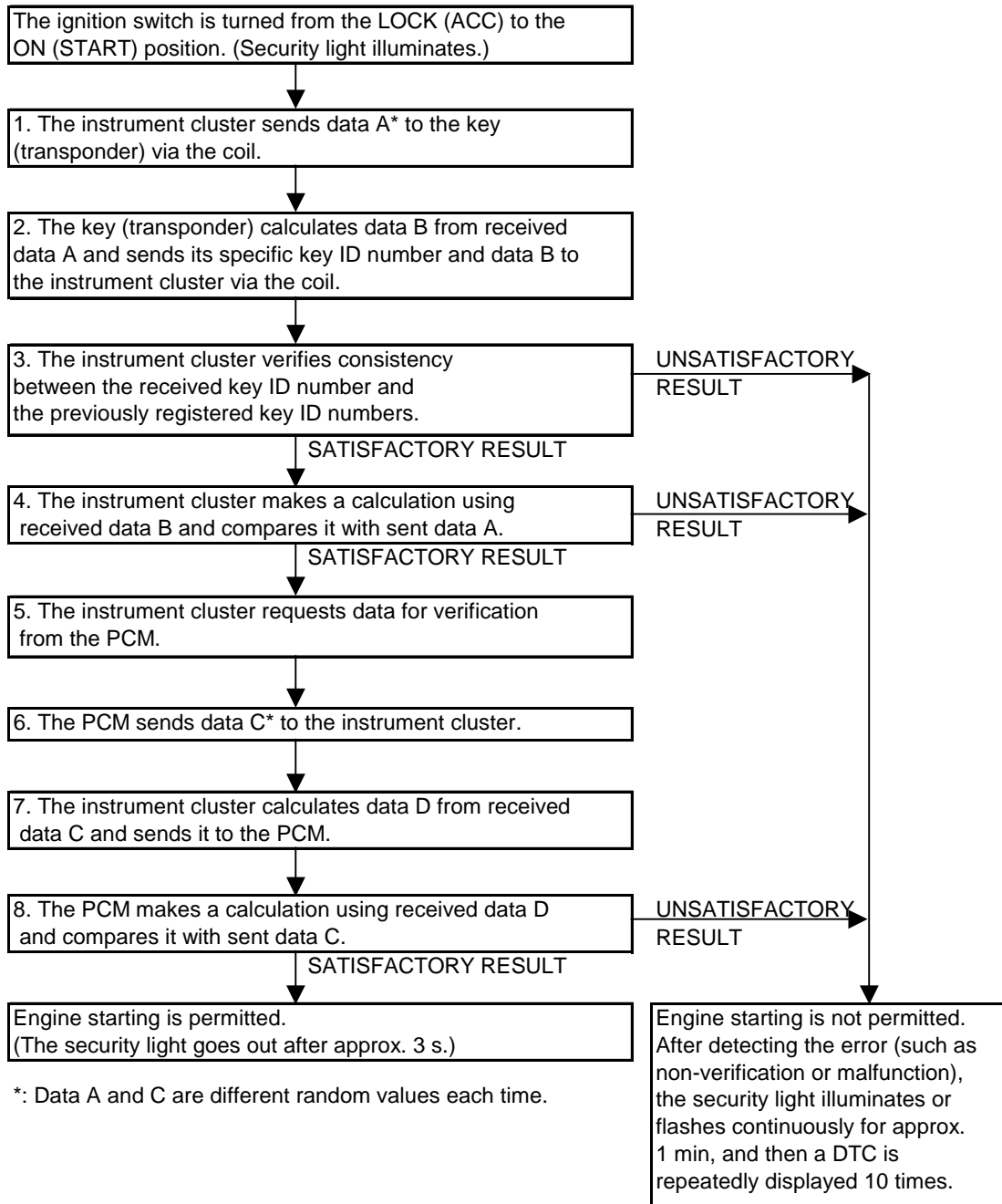
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|---|--------------------|---|--|
| 1 | Coil antenna | 6 | Fuel pump relay (gasoline engine) or fuel metering valve (diesel engine) |
| 2 | Tx line | 7 | Ignition coil (only gasoline engine) |
| 3 | Rx line | 8 | Starter relay |
| 4 | Instrument cluster | 9 | PCM |
| 5 | Fuel injector | | |

Operation



M5_T09030

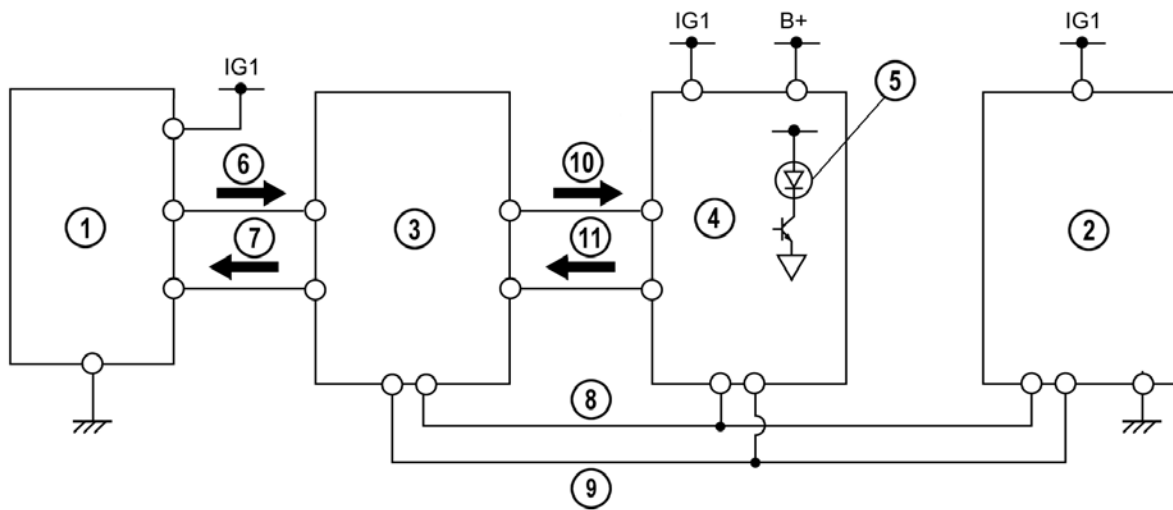
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|---|-------------------|---|--------------------|
| 1 | Key (transponder) | 3 | Instrument cluster |
| 2 | Coil antenna | 4 | PCM |



M5_09T008

Immobilizer System (vehicles with Advanced Keyless Entry system)

- A **D-PATS (Distributed Passive Anti-Theft System)** type immobilizer system is used. The system consists of the auxiliary key (with integrated transponder), coil antenna, Keyless Control Module, instrument cluster and PCM.
- A maximum of eight keys can be programmed.
- The coil antenna is connected to the Keyless Control Module, which communicates via two separate communication lines to the instrument cluster. Communication between instrument cluster and PCM is conducted via the HS-CAN bus.

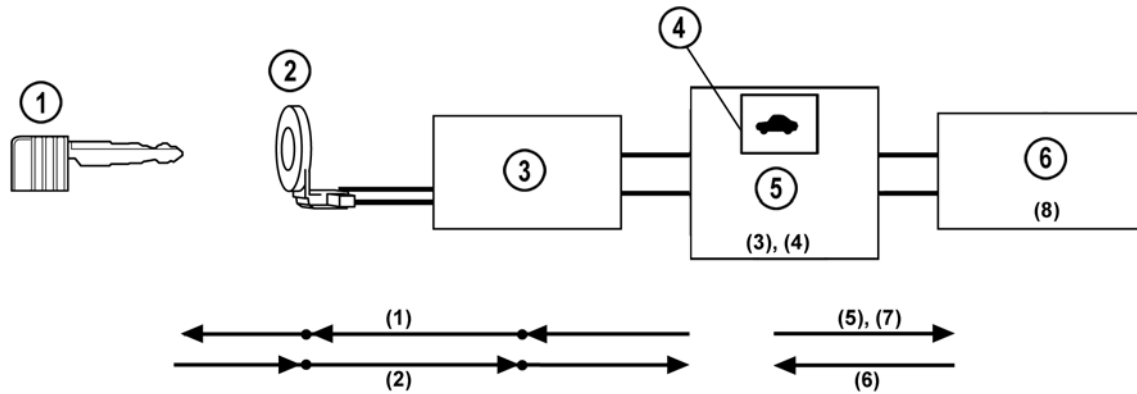


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- | | | | |
|---|------------------------|----|-----------|
| 1 | Coil antenna | 7 | Rx signal |
| 2 | PCM | 8 | CAN-High |
| 3 | Keyless control module | 9 | CAN-Low |
| 4 | Instrument cluster | 10 | Tx line |
| 5 | Security light | 11 | Rx line |
| 6 | Tx signal | | |

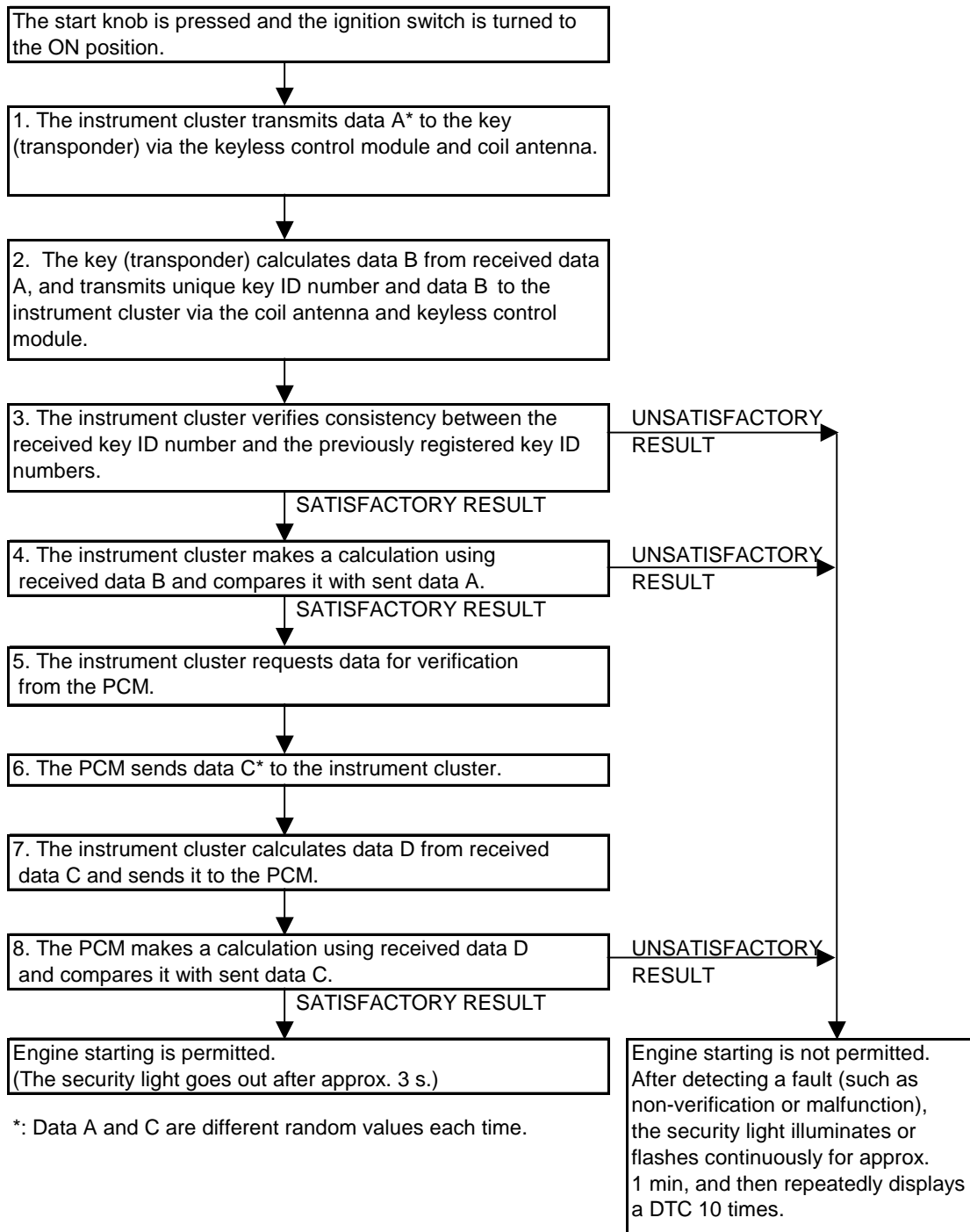
Operation

- Control of the immobilizer system on the Mazda5 with Advanced Keyless Entry system is carried out by the instrument cluster. The keys contain a unique ID number that is programmed into the instrument cluster, PCM and Keyless Control Module.



M5_09088

- | | | | |
|---|------------------------|---|--------------------|
| 1 | Key transponder | 4 | Security light |
| 2 | Coil antenna | 5 | Instrument cluster |
| 3 | Keyless control module | 6 | PCM |



M5_09T004a

Immobilizer System Component Replacement

Operation	Necessary Preparation	Required Action
Adding keys/card keys (two or more programmed keys/card keys available)	<ul style="list-style-type: none"> Two or more programmed keys/card keys. One or more keys/card keys to be programmed. 	<ul style="list-style-type: none"> Can be performed without WDS, providing "Customer spare key programming" function is enabled. If "Customer spare key programming" function is disabled, perform the following procedure with WDS: Program Additional Ignition Key/ Program Additional Card Key
Adding keys/card keys (one or no programmed key/card key available)	<ul style="list-style-type: none"> One or more keys/card keys to be programmed. 	<ul style="list-style-type: none"> Perform the following procedure with WDS: Program Additional Ignition Key/ Program Additional Card Key
Clearing key IDs	<ul style="list-style-type: none"> Two or more keys to be programmed. 	<ul style="list-style-type: none"> All keys for the vehicle must be collected and programmed. Perform the following procedure with WDS: Ignition Key Code Erase
Clearing card key IDs	<ul style="list-style-type: none"> One or more card keys to be programmed. 	<ul style="list-style-type: none"> All card keys for the vehicle must be collected and programmed. Perform the following procedure with WDS: Card Key Code Erase
Replacing PCM	<ul style="list-style-type: none"> New PCM. Keys to be programmed (two or more.) 	<ul style="list-style-type: none"> All keys for the vehicle must be collected and programmed. Perform the following procedure with WDS: Parameter Reset
Replacing steering lock unit	<ul style="list-style-type: none"> New steering lock unit. One programmed card key. Keys to be programmed (two or more.) 	<ul style="list-style-type: none"> Perform the following procedures with WDS in the indicated order: <ol style="list-style-type: none"> Ignition Key Code Erase Steering Lock Unit Programming
Replacing keyless control module	<ul style="list-style-type: none"> New keyless control module. Card keys to be programmed (one or more). Keys to be programmed (two or more.) 	<ul style="list-style-type: none"> All keys and card keys for the vehicle must be collected and programmed. Perform the following procedures with WDS in the indicated order: <ol style="list-style-type: none"> Ignition Key Code Erase Card Key Code Erase Steering Lock Unit Programming
Replacing instrument cluster	<ul style="list-style-type: none"> New instrument cluster. Keys to be programmed (two or more.) 	<ul style="list-style-type: none"> All keys for the vehicle must be collected and programmed. Perform the following procedures with WDS in the indicated order: <ol style="list-style-type: none"> Ignition Key Code Erase Parameter Reset
Replacing coil antenna	<ul style="list-style-type: none"> New coil antenna. 	<ul style="list-style-type: none"> No immobilizer system programming or resetting necessary.

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On-board Diagnostic System

- The on-board diagnostic system consists of the following:
 - Self-test

Self Test

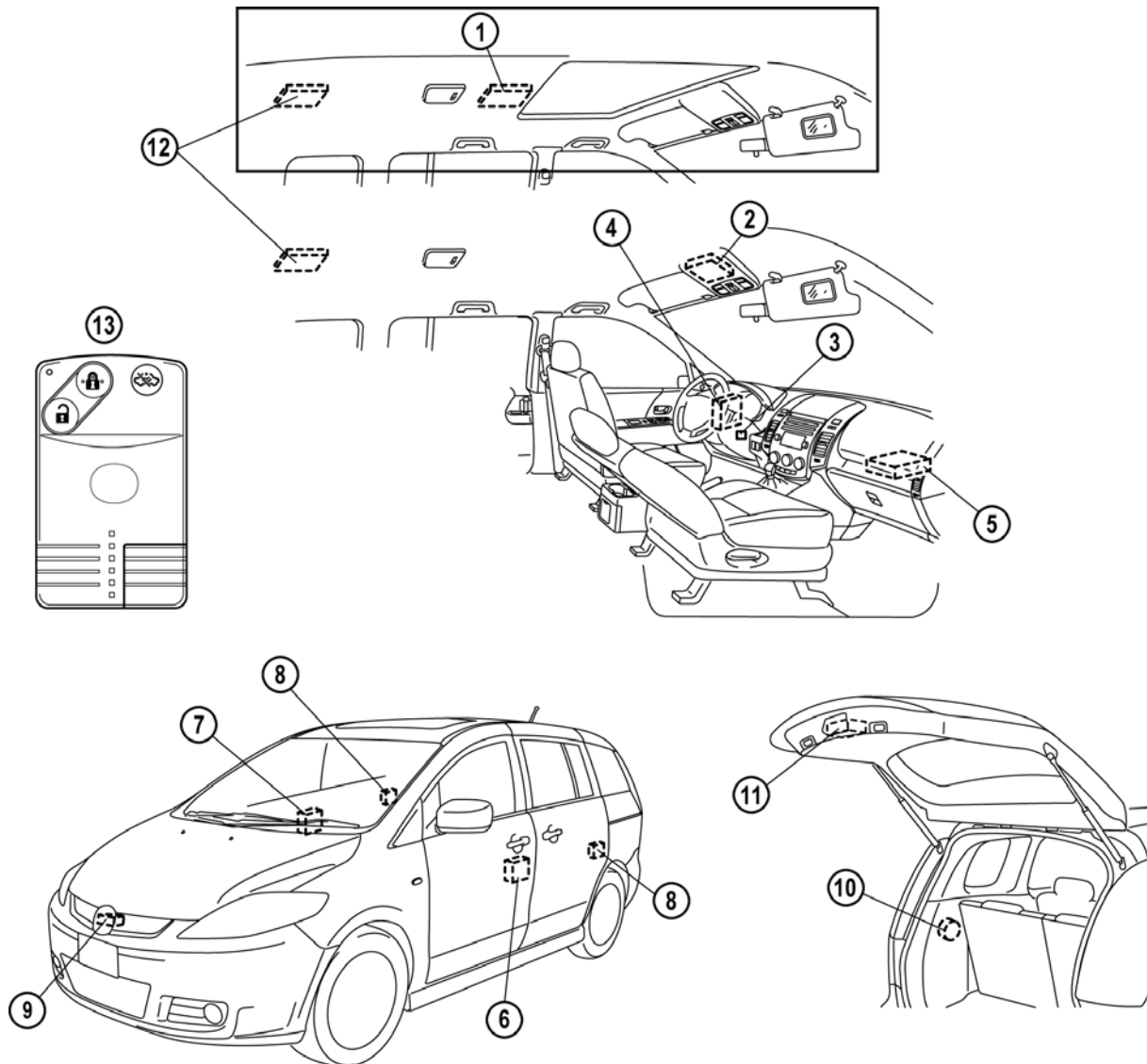
- The self-test function allows immobilizer system DTCs to be displayed. To do this, connect the WDS to the vehicle and select the option **Toolbox→Self Test→Modules→IC, PCM** and/or **RKE**.
- The security light displays stored DTCs by flashing on and off. The on/off pattern will differ depending on which DTC is stored.
- DTCs are stored in the instrument cluster, PCM and Keyless Control Module, depending on the malfunction. The module that each DTC applies to can be verified by referring to the workshop manual.

NOTE: If the on-board diagnostic system detects more than one malfunction in the immobilizer system, the security light will display only the DTC with the lowest number. For this reason, it is recommended that WDS be used to verify DTCs whenever a fault is present in the immobilizer system.

Theft Deterrent System

- The construction and operation of the theft deterrent system on the Mazda5 is essentially the same as that on the current Mazda3 (BK), except for the following:
 - An additional intruder sensor is installed near the rear of the passenger compartment.

Parts Location



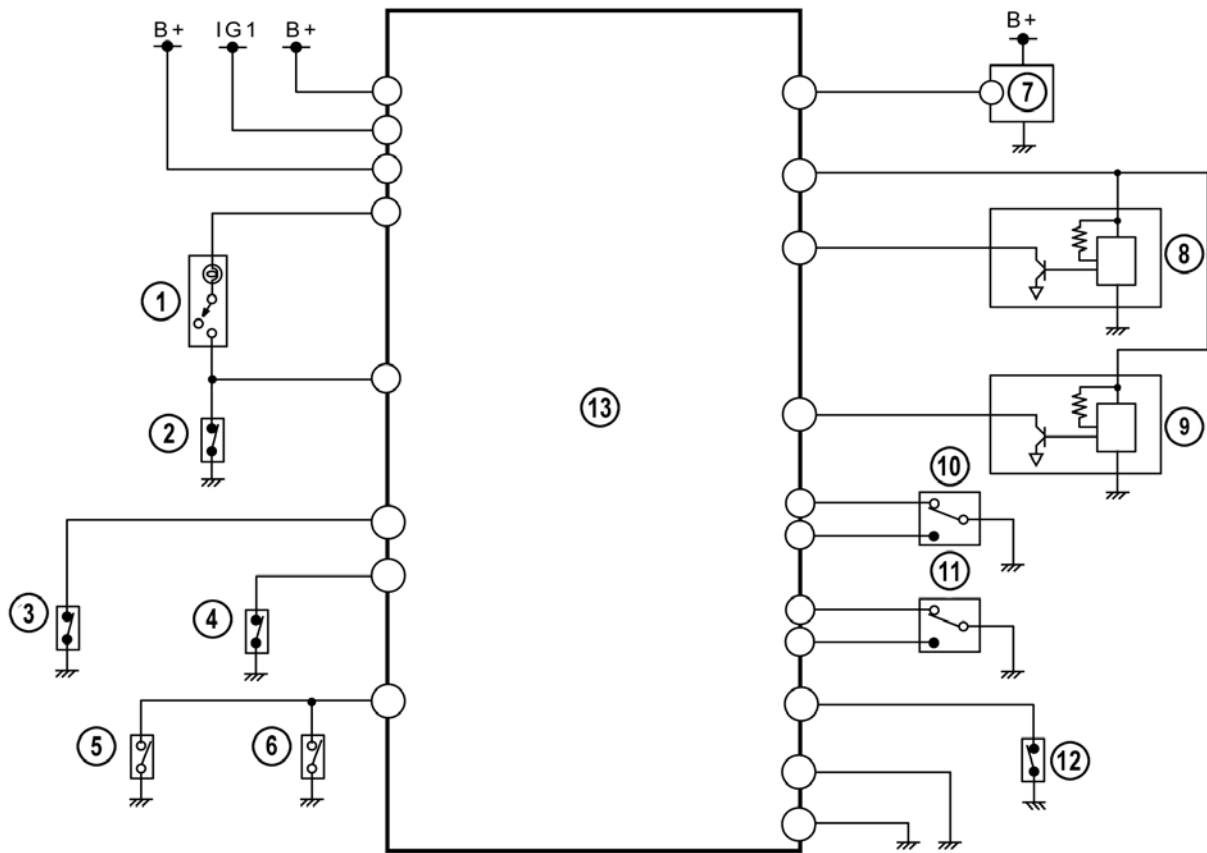
M5_09031

Security and Locks

Body & Accessories

1	Front intruder sensor (vehicles with sunroof)	8	Rear door switch
2	Front intruder sensor (vehicles without sunroof)	9	Bonnet latch switch
3	Key reminder switch	10	Theft-deterrent siren
4	Keyless control module	11	Liftgate latch and lock actuator
5	BCM	12	Rear intruder sensor
6	Front door latch and lock actuator (driver side)	13	Transmitter
7	Front door latch and lock actuator (passenger side)		

Wiring Diagram



M5_09032

- | | | | |
|---|--------------------------------|----|--|
| 1 | Cargo compartment light switch | 8 | Intruder sensor (front) |
| 2 | Liftgate latch switch | 9 | Intruder sensor (rear) |
| 3 | Front door latch switch (LH) | 10 | Door lock-link switch |
| 4 | Front door latch switch (RH) | 11 | Door key cylinder switch (driver side) |
| 5 | Sliding door switch (LH) | 12 | Bonnet switch |
| 6 | Sliding door switch (RH) | 13 | BCM |
| 7 | Theft-deterrent siren | | |

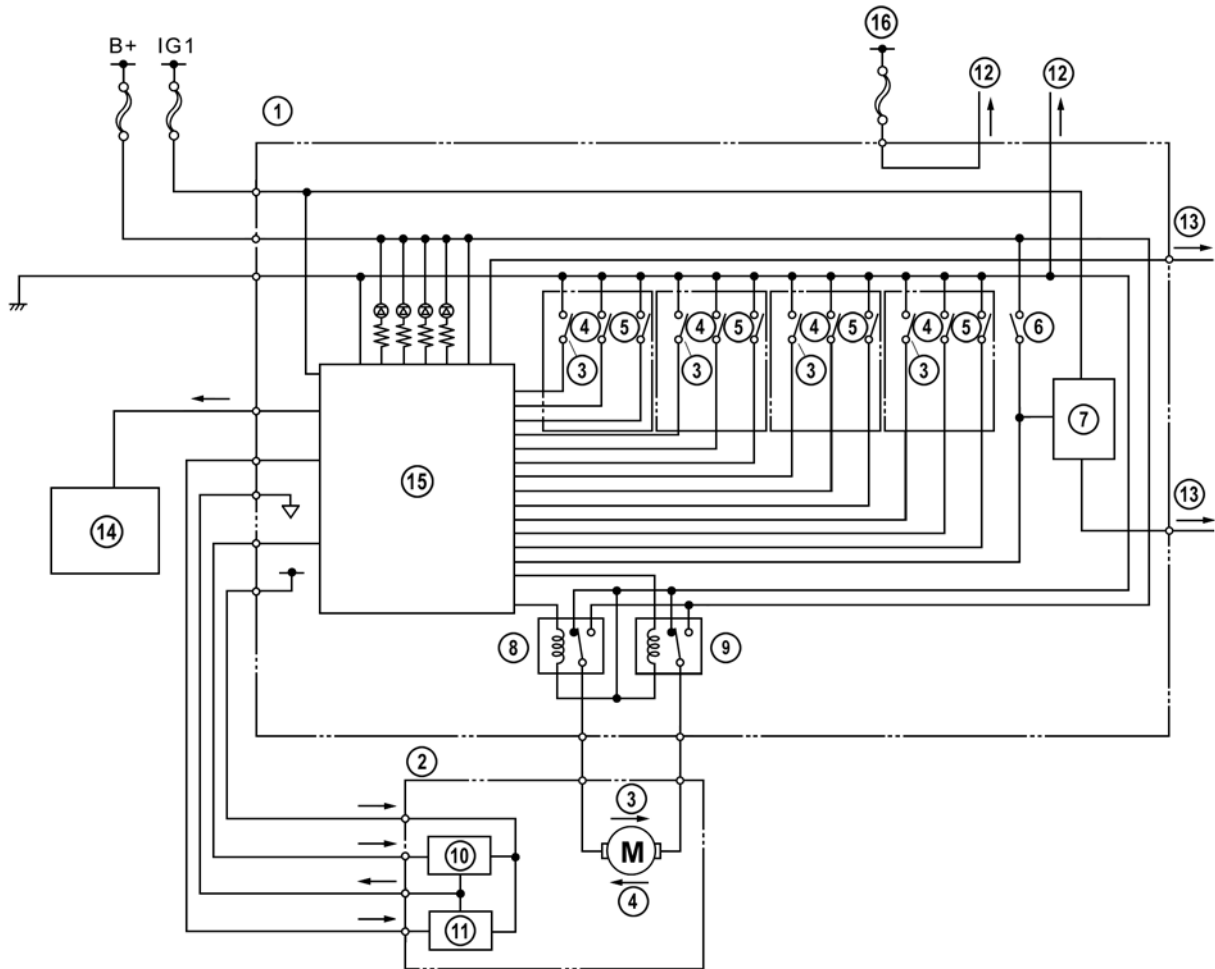
Glass/Windows/Mirrors**Features**

- The glass/windows/mirrors have the following features:
 - Rear defroster controlled by the Body Control Module is used (same as Mazda3).
 - Power window system with auto-open/close function available on all windows.

Power Window System**Features**

- The power window system is essentially the same as that on the current Mazda3 (BK), and has the following features:
 - Manual open/close function on all windows.
 - Auto open/close function on all windows.
 - Auto reverse pinch protection function on all windows.
 - Two step down function on all windows.
 - Ignition off timer function (40 seconds) is used.
 - Exterior opening/closing function available.
 - Power window motors with hall sensors are used.
 - Illumination Light Emitting Diodes are used in the power window main switch and subswitches.

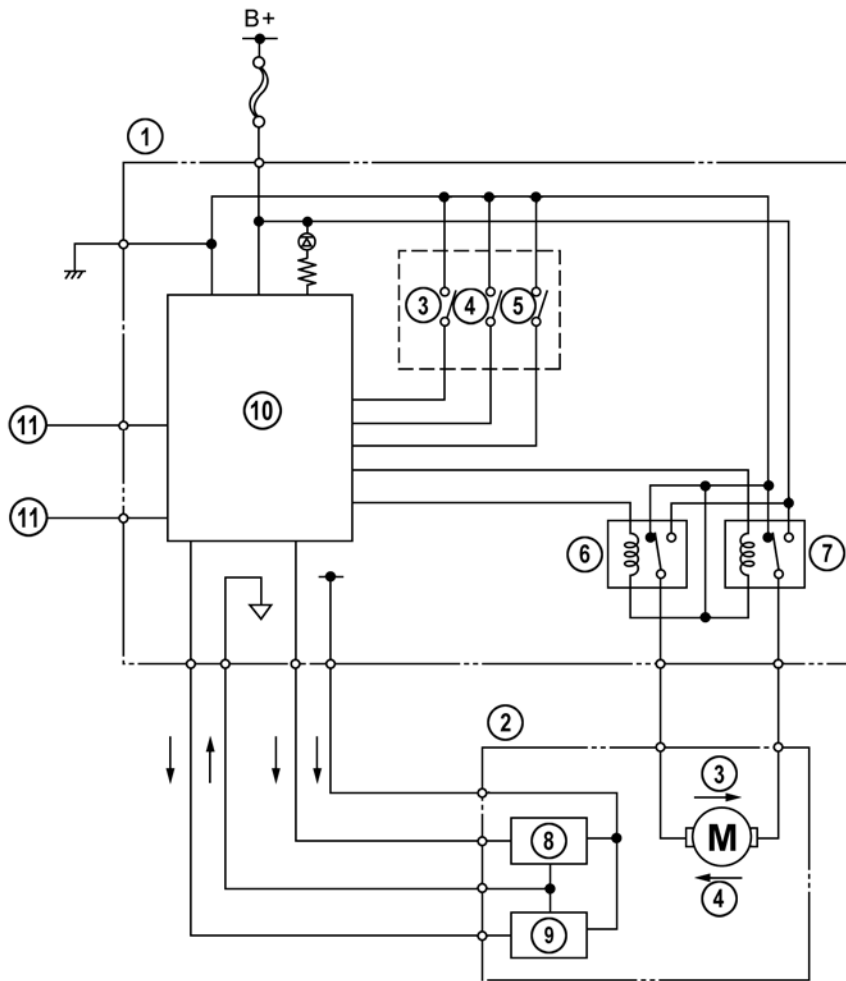
Power Window Main Switch



M5_09006

- | | | | |
|---|----------------------------------|----|-----------------------------|
| 1 | Power window main switch | 9 | Open relay |
| 2 | Power window motor (driver side) | 10 | Hall effect switch 1 |
| 3 | Close | 11 | Hall effect switch 2 |
| 4 | Open | 12 | To power mirror switch |
| 5 | Auto | 13 | To power window subswitches |
| 6 | Power-cut switch | 14 | BCM |
| 7 | Conjunction circuit | 15 | Power window control module |
| 8 | Close relay | | |

Power Window Subswitch



M5_09007

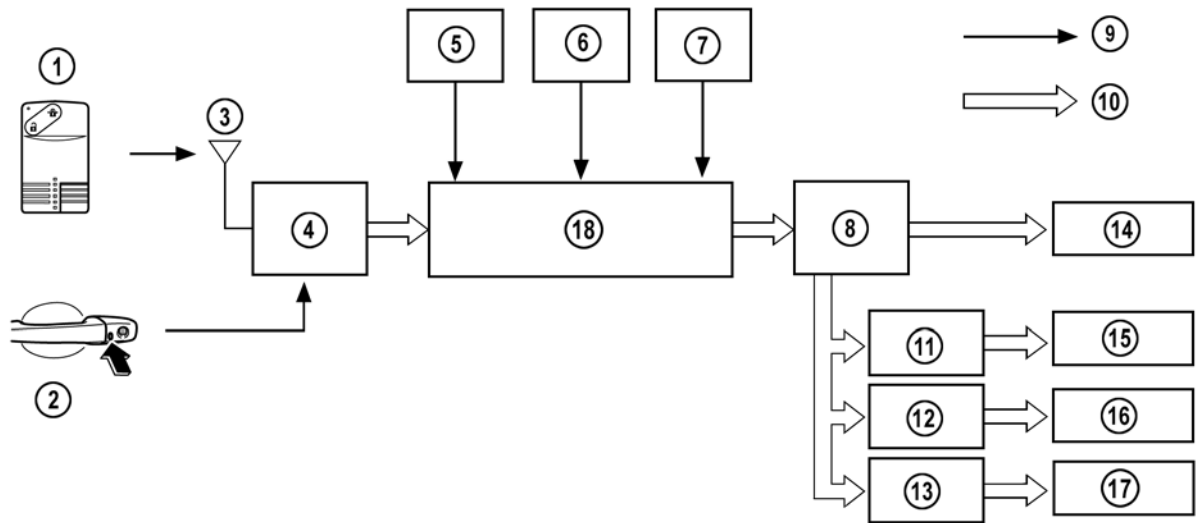
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|---|------------------------|----|-------------------------------|
| 1 | Power window subswitch | 7 | Open relay |
| 2 | Power window motor | 8 | Hall effect switch 1 |
| 3 | Close | 9 | Hall effect switch 2 |
| 4 | Open | 10 | Power window control module |
| 5 | Auto | 11 | From power window main switch |
| 6 | Close relay | | |

Exterior Opening/Closing Function

- The exterior opening/closing function allows all of the windows to either be opened, or closed from outside the vehicle.
- By pressing the driver's door request switch, or the LOCK button on a card key or a retractable type key transmitter for approximately 1.5 seconds, all of the windows can be closed.
- Conversely, by pressing the UNLOCK button on a card key or a retractable type key transmitter for approximately 1.5 seconds, all of the windows can be opened.
- The windows will be closed using manual mode, i.e. when the LOCK button or request switch is released, the windows will stop closing immediately. However, when the UNLOCK button is being pressed the windows will open in automatic mode, i.e. the windows will open fully, even if UNLOCK switch is released while they are still moving.
- During IG OFF timer operation the power window switch operation has priority over the exterior open/close function.

Operation

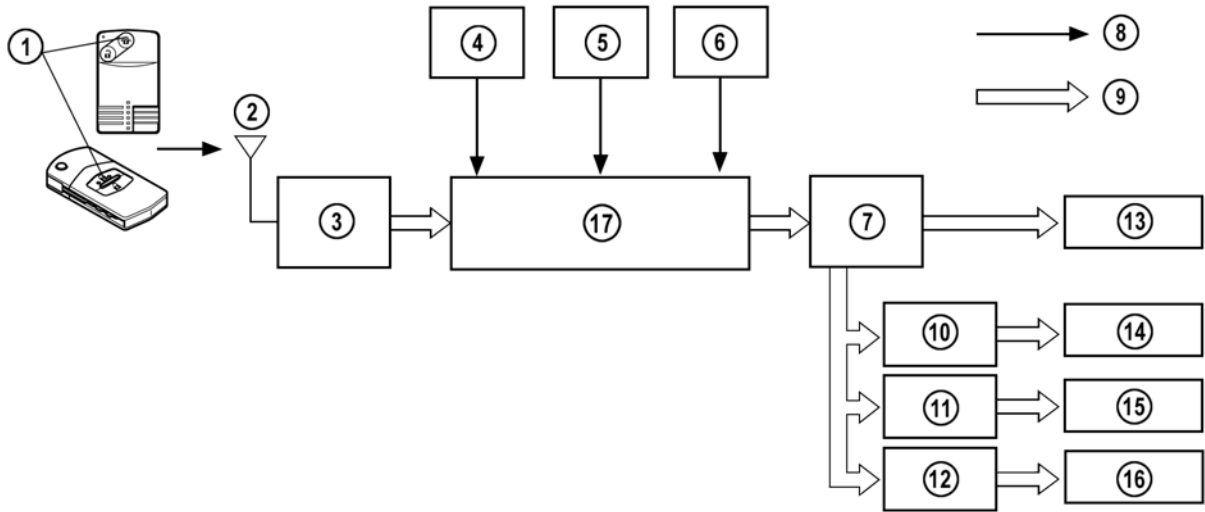
Using Request Switch



M5_09086

- | | | | |
|---|--------------------------------|----|-----------------------------|
| 1 | Transmitter | 10 | Control signal |
| 2 | Request switch (driver side) | 11 | Power window subswitch (RF) |
| 3 | Keyless receiver | 12 | Power window subswitch (LR) |
| 4 | Keyless control module | 13 | Power window subswitch (RR) |
| 5 | Door latch switch | 14 | Power window motor (LF) |
| 6 | Start knob/key reminder switch | 15 | Power window motor (RF) |
| 7 | Cargo compartment light switch | 16 | Power window motor (LR) |
| 8 | Power window main switch | 17 | Power window motor (RR) |
| 9 | Input signal | 18 | BCM |

Using Transmitter



M5_09008

- | | | | |
|---|--------------------------------|----|-----------------------------|
| 1 | Transmitter | 10 | Power window subswitch (RF) |
| 2 | Keyless receiver | 11 | Power window subswitch (LR) |
| 3 | Keyless control module | 12 | Power window subswitch (RR) |
| 4 | Door latch switch | 13 | Power window motor (LF) |
| 5 | Start knob/key reminder switch | 14 | Power window motor (RF) |
| 6 | Cargo compartment light switch | 15 | Power window motor (LR) |
| 7 | Power window main switch | 16 | Power window motor (RR) |
| 8 | Input signal | 17 | BCM |
| 9 | Control signal | | |

Operation Prohibition

- When the following conditions are met before, or during window operation, the exterior open/close function does not operate.
 - Either door is opened (when the door switch is ON)
 - The key is inserted in the steering lock (when the keyless switch is ON)
 - The start knob is pressed in (vehicles with Advanced Keyless Entry system) or the ignition switch is in any position other than LOCK
 - The transmitter is not in the reception area
 - A recognised card key is not in the reception area when the driver-side request switch is operated (vehicles with Advanced Keyless Entry system)
 - Any button on the transmitter is operated while window is opening

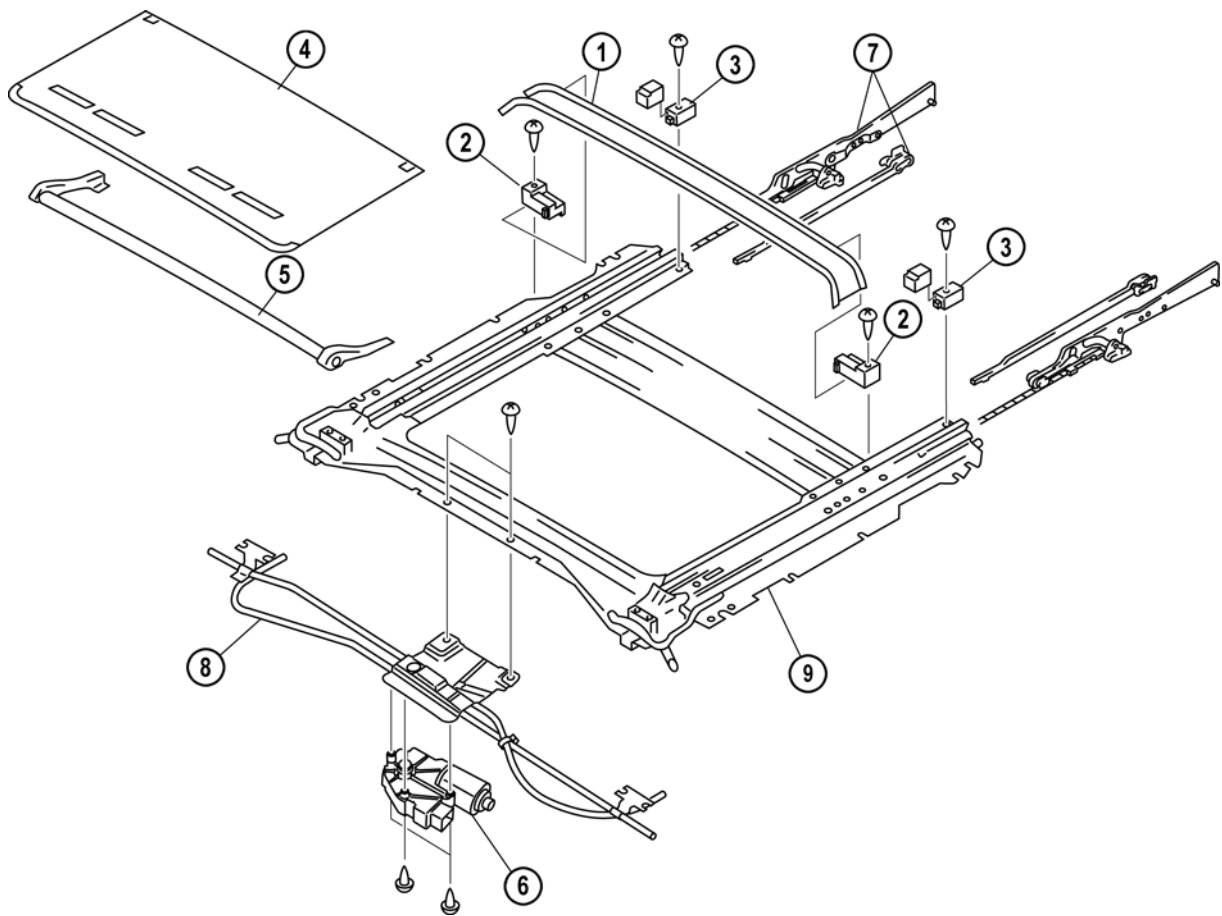
Sunroof

- The construction and operation of the sunroof on the Mazda5 is essentially the same as that on the current Mazda3 (BK), except for the following:
 - Drive unit for sunroof is now available as a separate part.

Specifications

Item	Specification
Slide system	Outer slide
Opening measurement (mm {in})	202 x 722 {7.95 x 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

M5_09T009



M5_09033

- | | | | |
|---|--------------|---|---------------------------|
| 1 | Drip rail | 6 | Sunroof motor |
| 2 | Drip guide | 7 | Guide and decoration trim |
| 3 | Rear stopper | 8 | Drive unit |
| 4 | Sunshade | 9 | Frame |
| 5 | Deflector | | |

Lighting System

Features

- The headlight system on the Mazda5 is essentially the same as the current Mazda3 (BK). It has the following features:
 - Projector type headlights (low-beam).
 - Discharge headlights with auto leveling system (depending on grade).
 - Stepped reflectors in the rear combination lights.
 - Light Emitting Diode type high-mount brake light.
 - Auto headlight system (depending on grade).
 - Headlights, interior illumination, tail/number plate/side lights, turn signals and rear fog light controlled by the BCM.
 - Daytime running lights (depending on market).

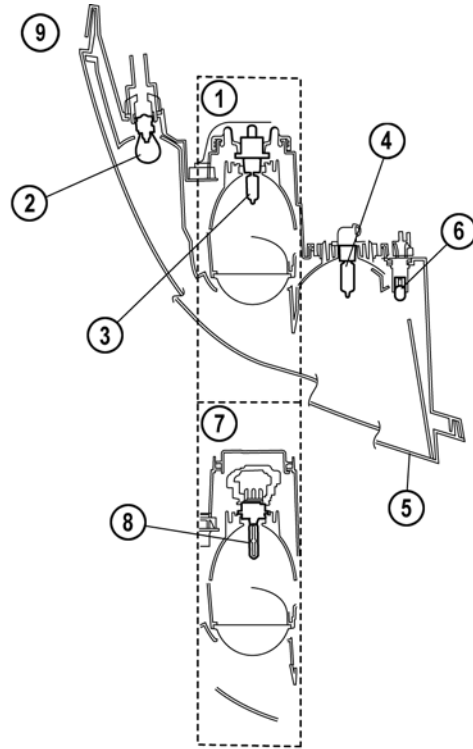
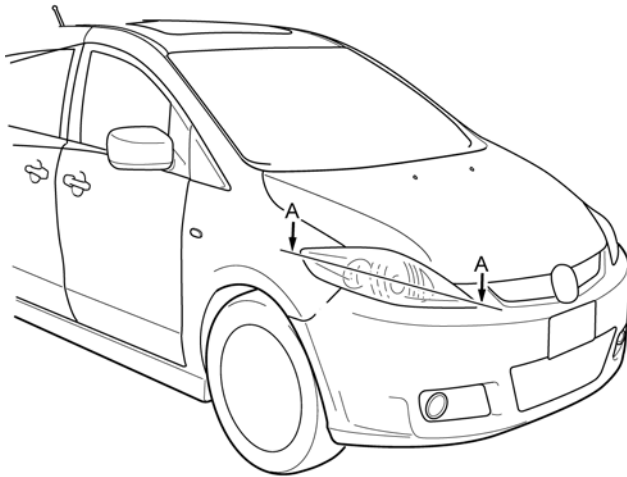
Specifications

	Item	Specifications (W) x number
Exterior light bulb capacity	Headlight bulb (high-beam)	60 x 2
	Discharge headlight bulb (low-beam)	35 x 2
	Halogen headlight bulb (low-beam)	55 x 2
	Front turn signal bulb	21 x 2
	Parking light bulb	5 x 2
	Front fog light bulb	55 x 2
	Side turn signal bulb	5 x 2
	Brake light/taillight bulb	21/5 x 2
	Rear turn signal bulb	21 x 2
	Back-up light bulb	18 x 2
	Rear fog light	21 x 2
	License plate light bulb	5 x 2
	High-mount brake light bulb	21.4
	Interior light bulb capacity	Map light bulb
Interior light bulb		10 x 1
Cargo compartment light bulb		8 x 1
Glove compartment light bulb		1.7 x 1
Ignition key illumination bulb		1.4 x 1

M5_09T010

Front Combination Light

- Projector type headlights with built-in front turn signal light and parking light are used.



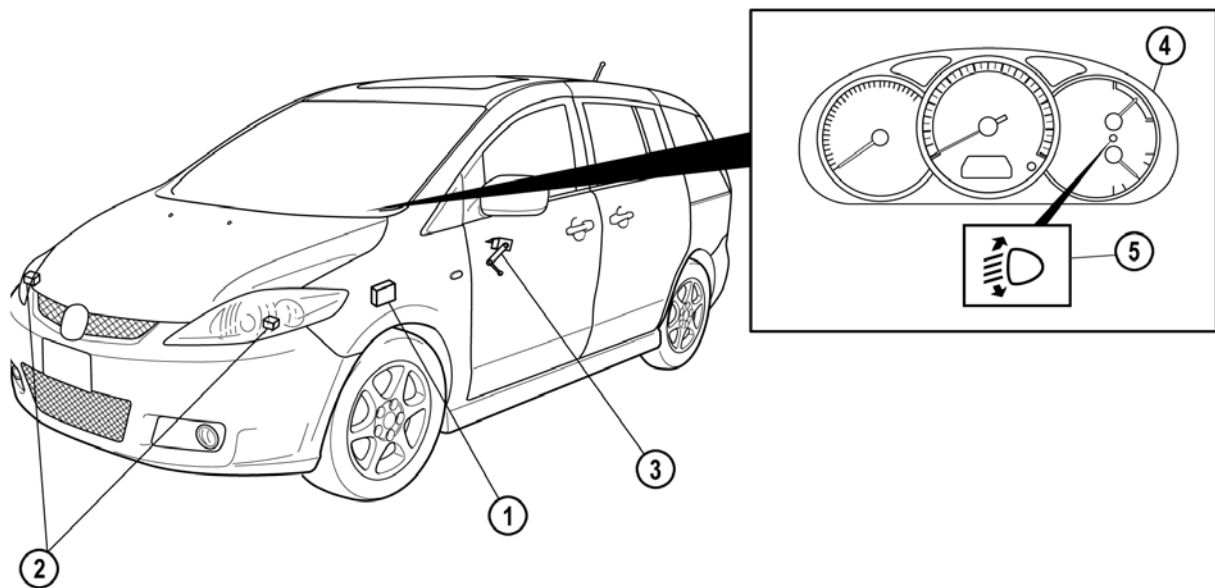
M5_09034

- | | | | |
|---|-----------------------------|---|-------------------------------|
| 1 | Halogen headlight type | 6 | Parking light bulb |
| 2 | Front turn signal bulb | 7 | Discharge headlight type |
| 3 | Halogen headlight bulb (LO) | 8 | Discharge headlight bulb (LO) |
| 4 | Headlight bulb (HI) | 9 | Section A-A |
| 5 | Front combination light | | |

Headlight Auto Leveling System

- The construction and operation of the headlight auto leveling system is essentially the same as that on the current Mazda3 (BK), except for the following:
 - Conditions necessary before auto leveling control commences are different.
 - The headlight auto leveling module requires initialization after related components are replaced.

Parts Location

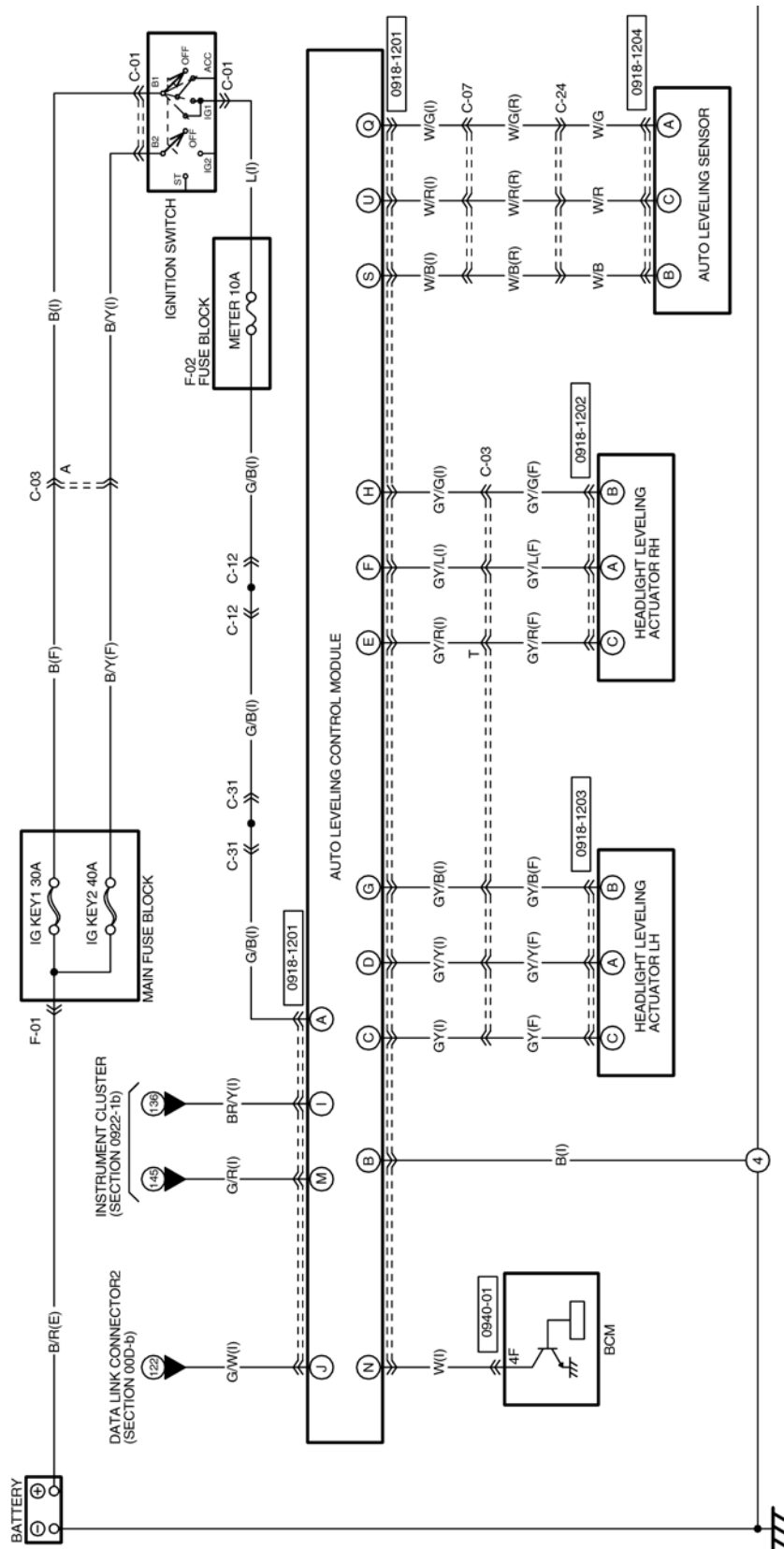


M5_09035

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

- 4 Instrument cluster
- 5 Auto leveling warning light

Wiring Diagram



M5_09036

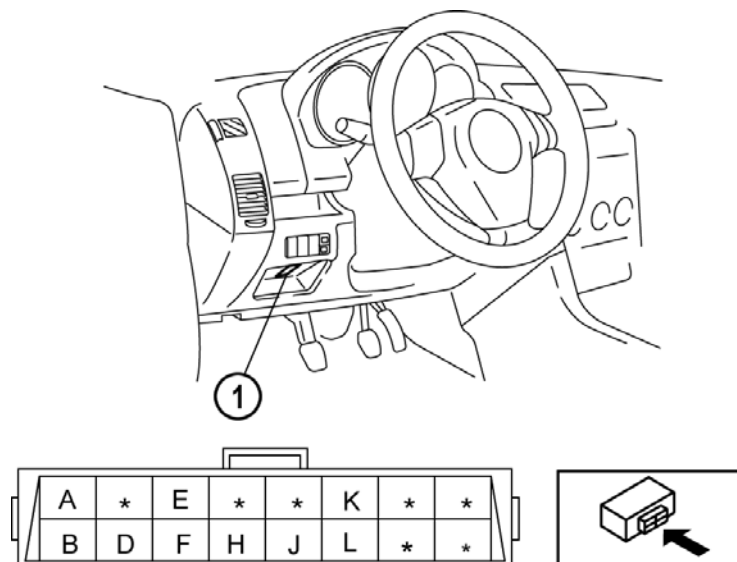
Operation

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

Auto Leveling Control Module Initialization

- The auto levelling control module should be initialized 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 parts replacement or work that effects vehicle height

NOTE: The auto leveling control module can be initialized by shorting the B terminal of the DLC-2 to earth, or by connecting WDS to the vehicle and selecting **Toolbox→Electrical→Exterior Lighting→Headlamp→Auto Leveling Sensor Re-zero Procedure.**

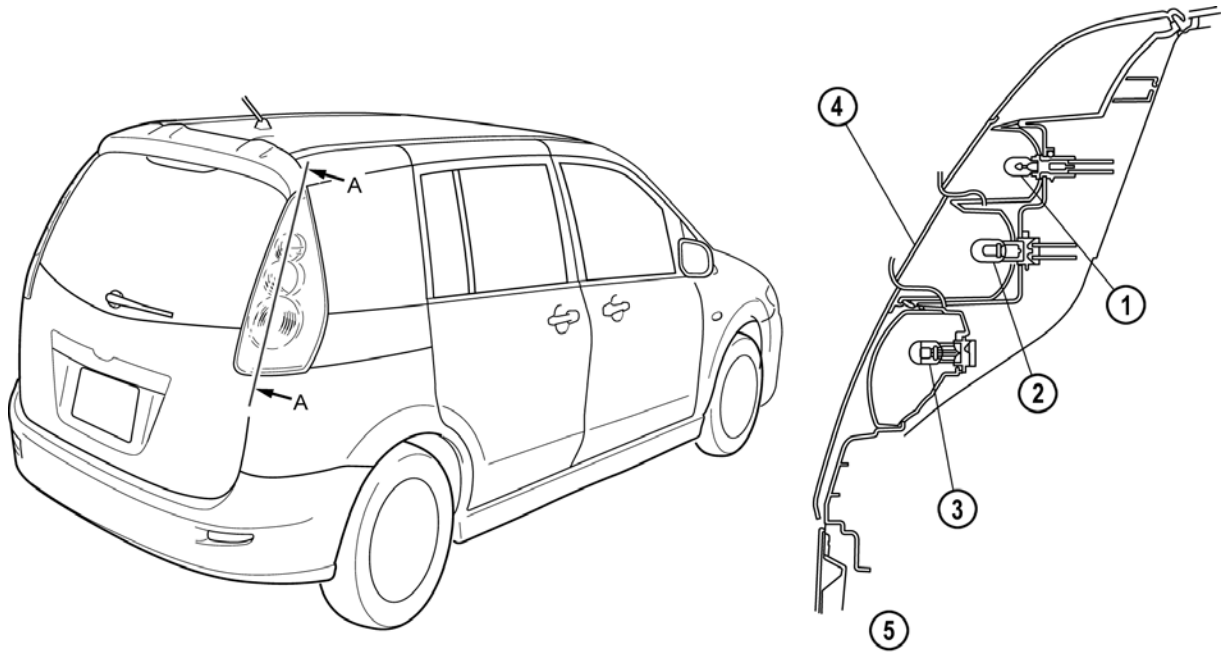


M5_09037

1 DLC - 2

Rear Combination Light

- A stepped reflector that diffuses and reflects the light of the rear combination lights is used.
- A round reflector is incorporated in the lower part of the rear combination light.



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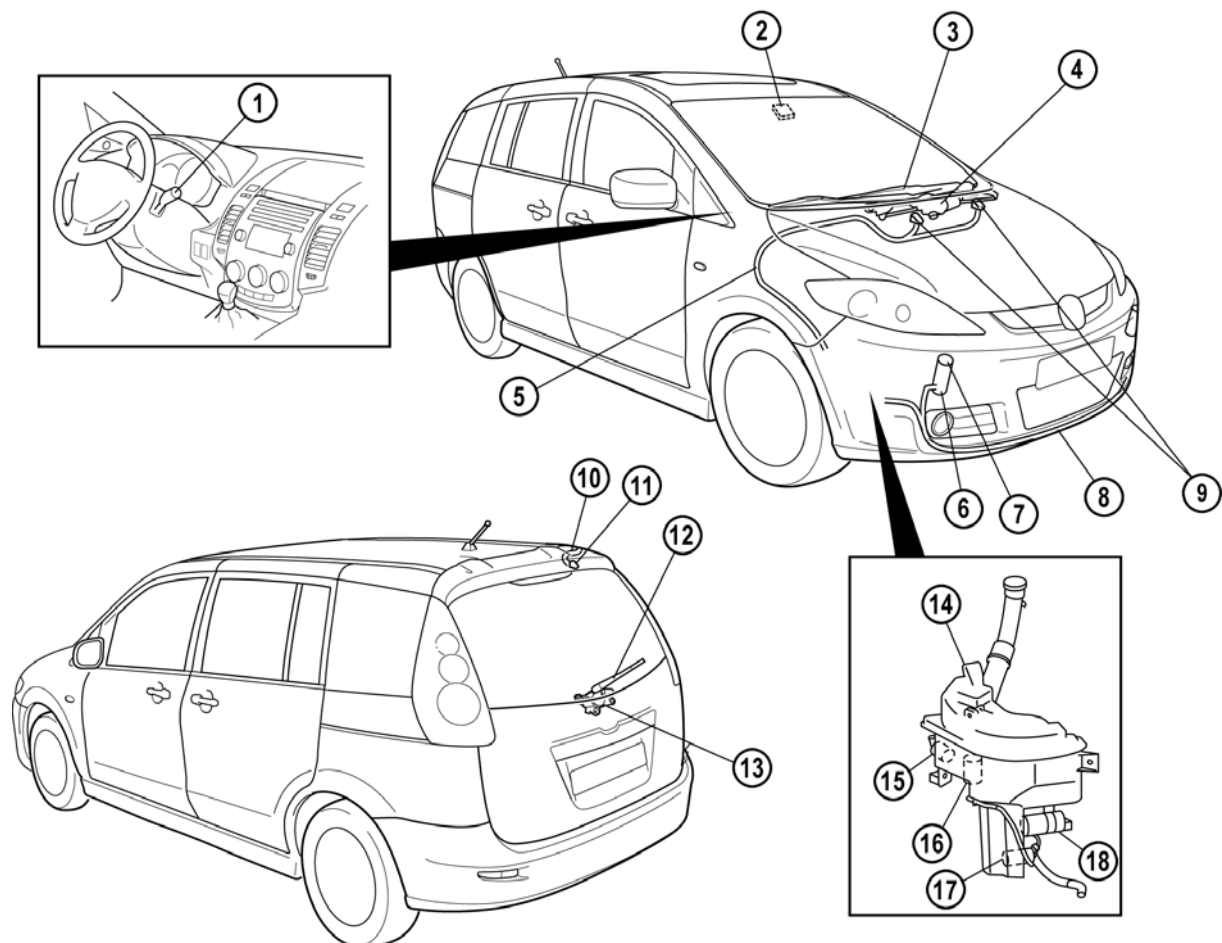
- 1 Back-up light bulb
- 2 Rear turn light bulb
- 3 Brake light/taillight bulb

- 4 Rear combination light
- 5 Section A-A

Wiper/Washer System

- The wiper/washer system is essentially the same as the current Mazda3 (BK). It has the following features:
 - Front wiper/washer and headlight cleaner system controlled by the BCM.
 - Auto wiper system (depending on grade).
 - Rear wiper/washer controlled by the BCM.
 - Washer fluid level sensor installed in the windshield washer tank (depending on grade).

Parts Location



M5_09039

1	Wiper and washer switch	10	Rear washer hose
2	Rain sensor	11	Rear washer nozzle
3	Windshield wiper arm and blade	12	Rear wiper arm and blade
4	Windshield wiper motor	13	Rear wiper motor
5	Windshield washer hose	14	Washer tank
6	Headlight cleaner actuator	15	Rear washer motor
7	Headlight cleaner nozzle	16	Washer fluid-level sensor
8	Headlight cleaner hose	17	Windshield washer motor
9	Windshield washer nozzle	18	Headlight cleaner motor

Rain Sensor Initialization

- When replacing the rain sensor, or reinstalling a rain sensor after replacing the windshield, the sensor must be initialized.

Initialization Without Using WDS

1. Clean the front windshield glass.
2. Turn the ignition to OFF.
3. Turn the front wiper switch to the AUTO position.
4. Switch the ignition ON, and within 10 seconds turn the wiper switch from AUTO to OFF five times. The front wipers will sweep across the windshield once to indicate the initialization procedure was successful.

NOTE: Do not operate the wiper switch too quickly. On average one cycle of AUTO→OFF→AUTO per second is recommended.

Initialization Using WDS

- The rain sensor can also be initialized by using WDS. To do this connect the WDS to the vehicle and select the option **Toolbox→Electrical→Rain Sensor Reset**.

Entertainment Systems**Audio System****Features**

- The audio unit is of a modular construction, similar to the Mazda3. Three base audio unit combinations are available:

Type A

- AM/FM tuner
- CD player

Type B

- AM/FM tuner
- CD player
- **RDS (Radio Data System)**

Type C

- AM/FM tuner
- CD player
- Hard Disc Drive
- RDS
- **MD (Mini Disc)** player, cassette deck, or 6-disc **CD (Compact Disc)** changer are available as options. The optional CD changer is **MP3 (Moving Picture Experts Group Layer-3 Audio)** compatible, the single CD player fitted to the above base units is not.

NOTE: To replace the single CD player with a 6-CD changer the base unit must be replaced. However, a socket is provided in the rear panel of the audio unit to allow connection of an external CD-changer.

- **ALC (Auto Level Control)** is incorporated into the radio.
- Either a four speaker system or a six speaker system with two additional tweeters is available, depending on grade.

Specifications

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 x 4		
Output impedance (ohm)			4		
HDD (GB)			–		20

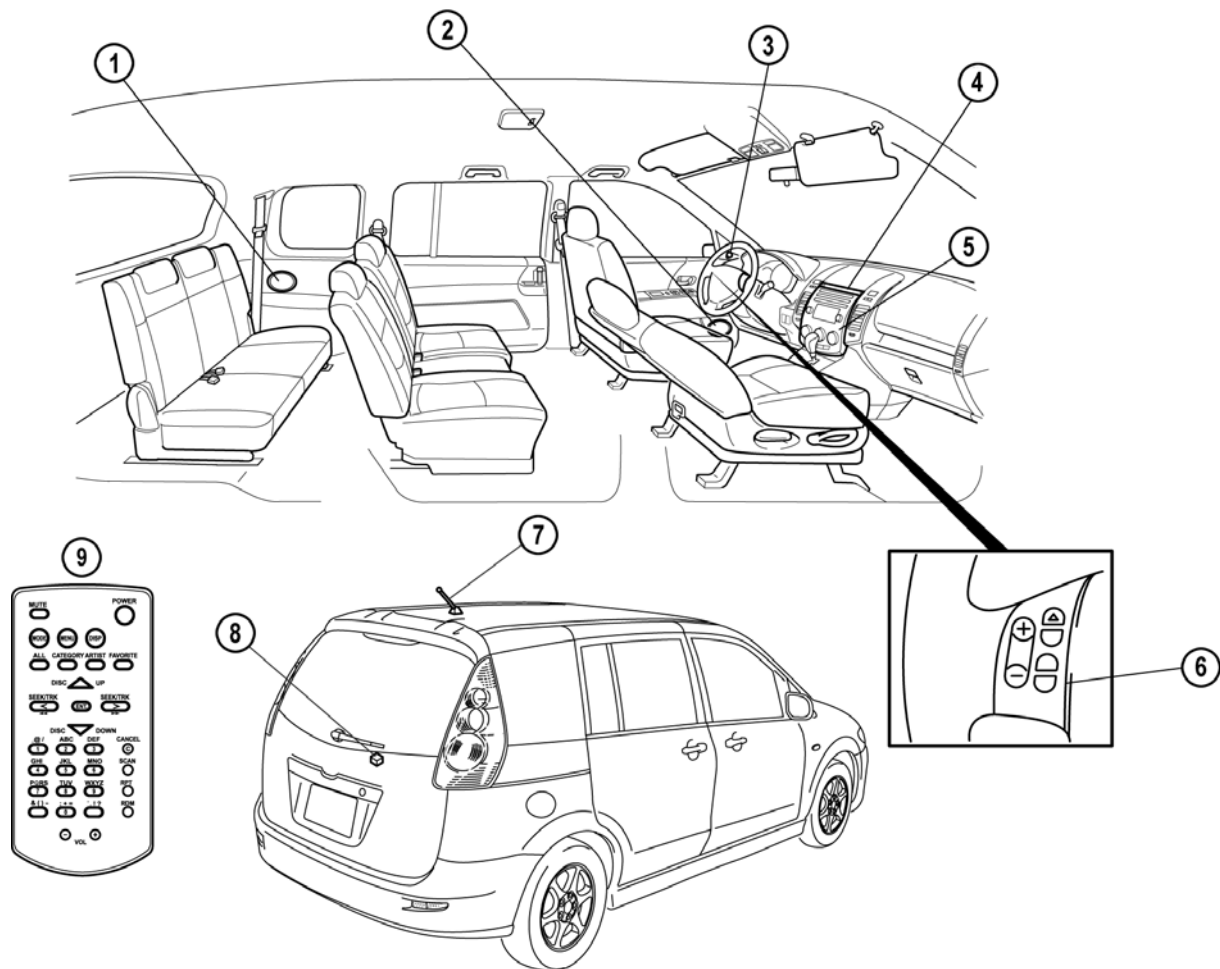
M5_09T011

Speakers

Item	Specification	
	Front door speaker/rear speaker	Front tweeter
Maximum input (W)	35	
Impedance (ohm)	4	
Size (cm)	14 x 9	5

M5_09T012

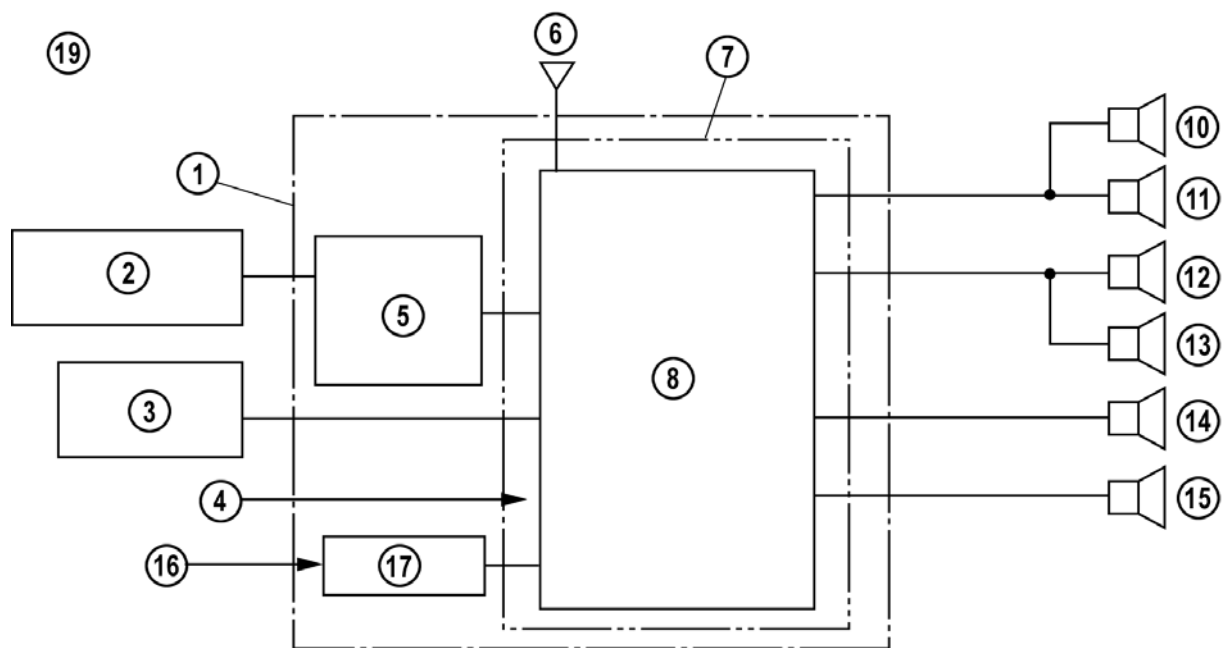
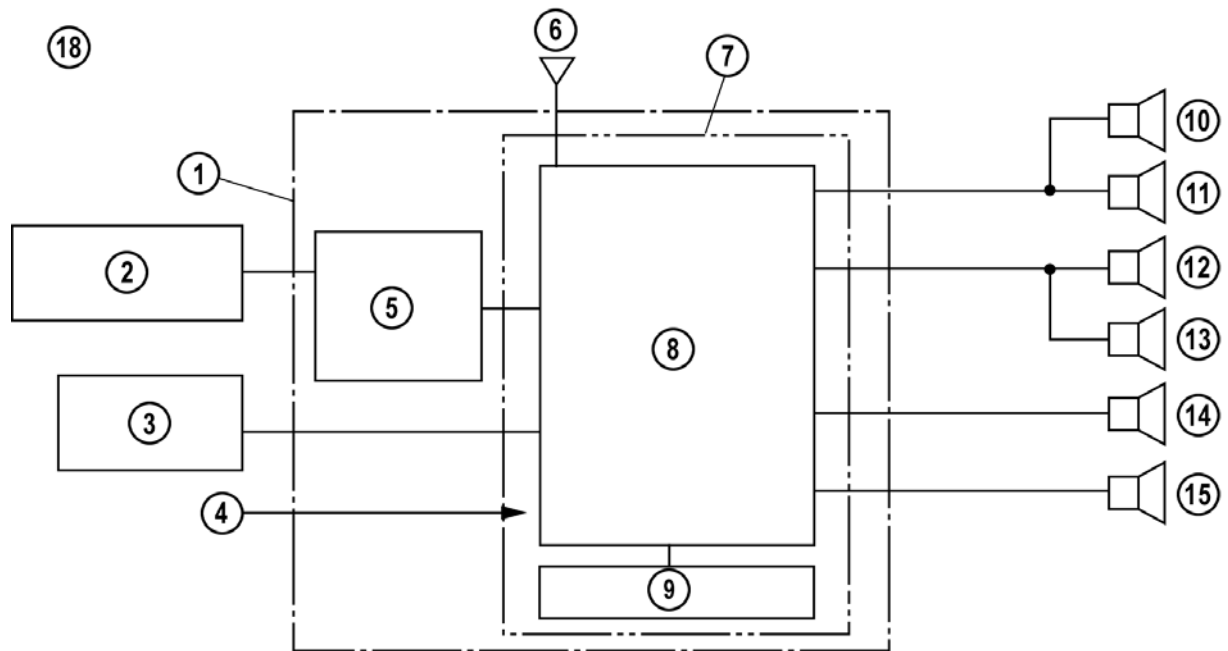
Parts Location



M5_09040

- | | | | |
|---|---------------------|---|---------------------------|
| 1 | Rear speaker | 6 | Audio control switches |
| 2 | Front door speaker | 7 | Centre roof antenna |
| 3 | Front tweeter | 8 | Capacitor |
| 4 | Information display | 9 | Remote control (with HDD) |
| 5 | Centre panel module | | |

System Overview



M5_09041

Body & Accessories

Entertainment Systems

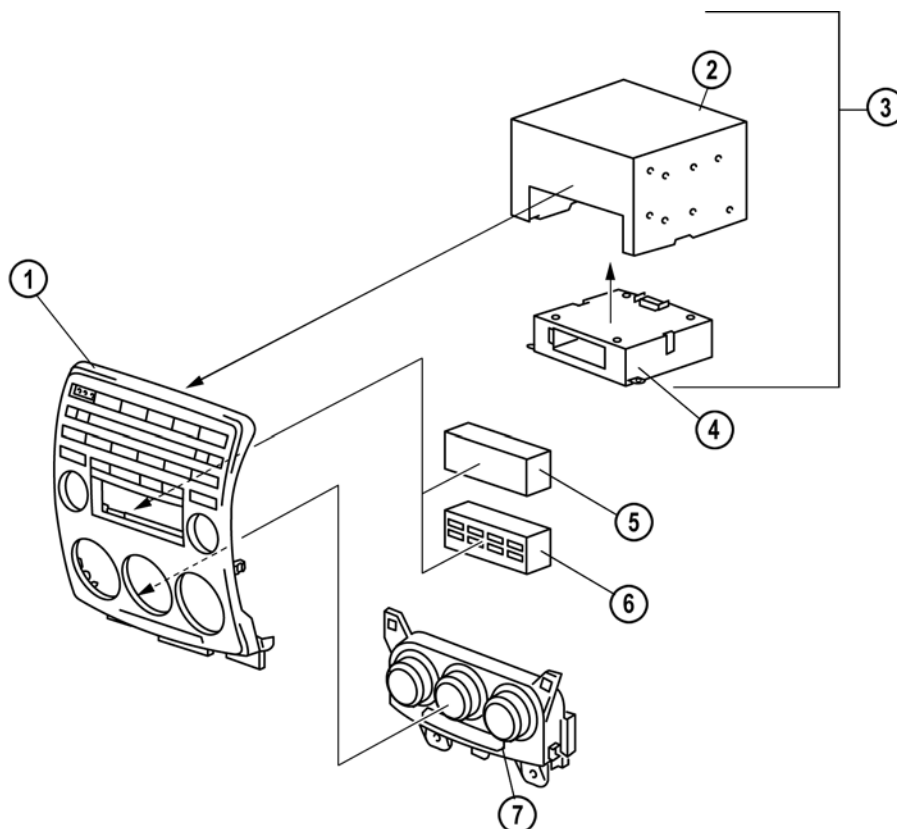
- 1 Centre panel module
- 2 Information display
- 3 Audio control switch
- 4 TNS signal
- 5 Audio control circuit
- 6 Antenna
- 7 Audio unit
- 8 Base unit
- 9 Lower module
- 10 Front tweeter (right)

- 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 HDD)
- 17 Infrared sensor
- 18 Type A/Type B (without HDD)
- 19 Type C (with HDD)

Centre Panel Module

- The centre panel module consists of the audio unit and switches, and the heater control unit. A lower module (cassette deck or MD player) may be added to type A or type B audio systems, but not to type C (with HDD).
- The centre panel module is connected to the MS-CAN bus.

NOTE: There is no mute connector provided on the audio unit.



M5_09042

- | | | | |
|---|--------------|---|----------------------|
| 1 | Centre panel | 5 | Cover (without HDD) |
| 2 | Base unit | 6 | Cover (with HDD) |
| 3 | Audio unit | 7 | Climate control unit |
| 4 | Lower module | | |

Music Hard Disc Drive

- The **HDD (Hard Disc Drive)** unit allows albums to be recorded from the CD player, stored on the hard disc in MP3 format, and played back.
- Music recorded on the HDD can be categorized by album name, artist, music style, or compiled into favourites lists to allow more convenient searching and playback.
- Recording of music can be carried out while driving, or while the ignition is OFF (provided the ACC OFF recording function is set to ON).
- Recording of a CD can be resumed from the song being played back when recording was stopped, even if the ignition was switched OFF then ON again.
- A 'Secret Menu' function is provided to allow maintenance of the HDD database.
- The HDD protection function stops HDD operation if supply voltage drops below 10.5 V, or the HDD internal temperature rises above 85°C or below -20°C. The operation restriction function prevents the HDD main menu or the REC (recording) menu from being entered while the vehicle is moving, thus preventing damage to the HDD.

Specifications

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

M5_09T014

Secret Menu

- The secret menu allows the following operations to be carried out:
 - Format the hard disc.
 - Display or update the Firmware installed. (Firmware is the software that manages the HDD database. It is usually not necessary for the workshop to update this software.)
 - Rebuild the HDD database. (If “DB ERROR” is displayed on the information display, it is possible that rebuilding the HDD database will restore the functionality of the unit.)
 - Scan the HDD disc for errors.

NOTE: Care should be taken not to interrupt the power supply, or to jolt or knock the HDD while any of the secret menu functions are being carried out, as this could cause the HDD head to ‘crash’ (contact the HDD disc), damaging the HDD.

- The HDD secret menu can be activated by using the following procedure:
 1. While the HDD is playing back, press and hold the MENU button, and then immediately press the ENTER and ARTIST buttons simultaneously for approximately 1 second.
 2. Rotate and then press the AUDIO CONT switch to select the desired function.
 3. Press the MENU switch to exit the secret menu. Alternatively, press the CANCEL button quickly (less than 1.5 seconds) to go back one step, or press it longer (more than 1.5 seconds) to return to the main menu.

On-board Diagnostic System

- The on-board diagnostic system is similar to the Mazda3 (BK), and consists of the following functions:
 - Self-diagnostic function
 - Diagnostic assist function

Self Diagnostic Function

- The self-diagnostic function allows DTCs in the audio unit to be displayed. It can be entered as follows:
 1. Turn the ignition switch to the ACC or ON position.
 2. Confirm that the audio unit is switched off. If it is not, turn the audio POWER button off.
 3. While pressing the POWER button, simultaneously press the FM1/2 button and the MEDIA button for 2 seconds or more.

Diagnostic Assist Function

- The diagnostic assist function allows the different components of the audio system to be checked. The procedures for entering it are shown below:

Component Tested	Procedure
Buttons	With the audio power on, press the POWER button and simultaneously press the MEDIA button for approximately 1 second.
Speakers	With the audio power on, press the POWER button and simultaneously press the AUTO-M button for approximately 1 second.
Radio reception	With the audio power on, press the POWER button and simultaneously press the AUTO-M button for approximately 1 second.

M5_09T028

Car Navigation System

Features

- The Mazda5 is equipped with a new navigation system manufactured by Denso. The construction and operation of the navigation system is essentially carried over from that of the Mazda3 (BK), except for the following features:
 - The speed of operation has been improved.
 - A split screen function has been adopted for more convenient route guidance.
 - A Traffic Message Channel function and a Dynamic Route Guidance System have been adopted to automatically select a detour in case of traffic jams.
 - A voice control system has been adopted to enable the customer to verbally control most functions of the navigation system. The following languages can be selected: English (British), English (American), German, French, Italian, Spanish and Dutch.
 - The voice guidance and screen display can be set to the following languages: English (British), English (American), German, French, Italian, Spanish, Dutch, Portuguese, Swedish, Danish, Norwegian and Finnish.
 - An OBD function has been adopted to simplify the diagnostic procedure.

Specifications

Navigation Unit

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

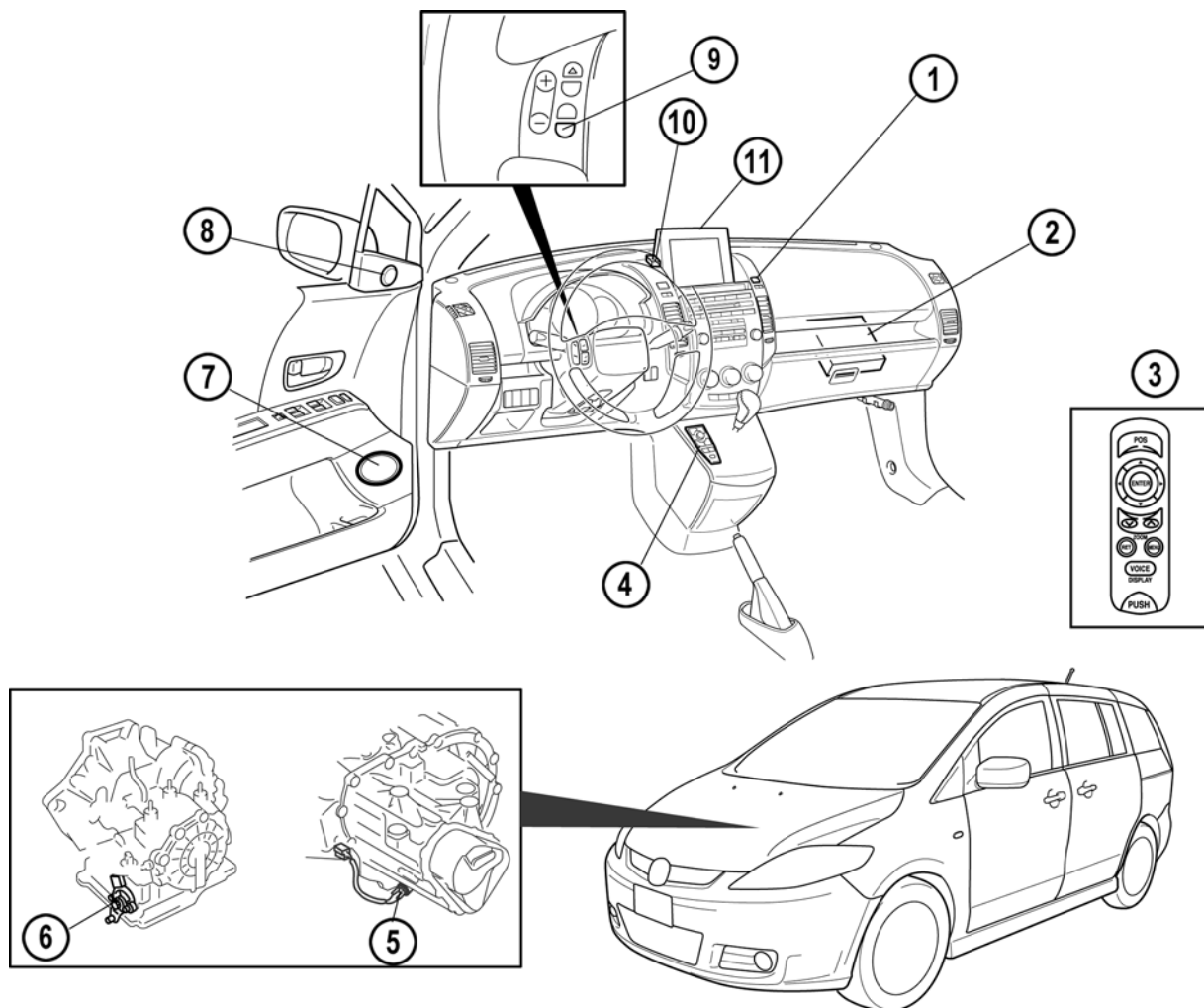
LCD Unit

Item	Specification	
Unit type	Pop-up	
Rated voltage	12 V	
Display	Size	7 inch (wide screen)
	Type	LCD TFT (full-colour)

Speaker

- The system uses the audio speakers in the driver's door, refer to the audio unit.

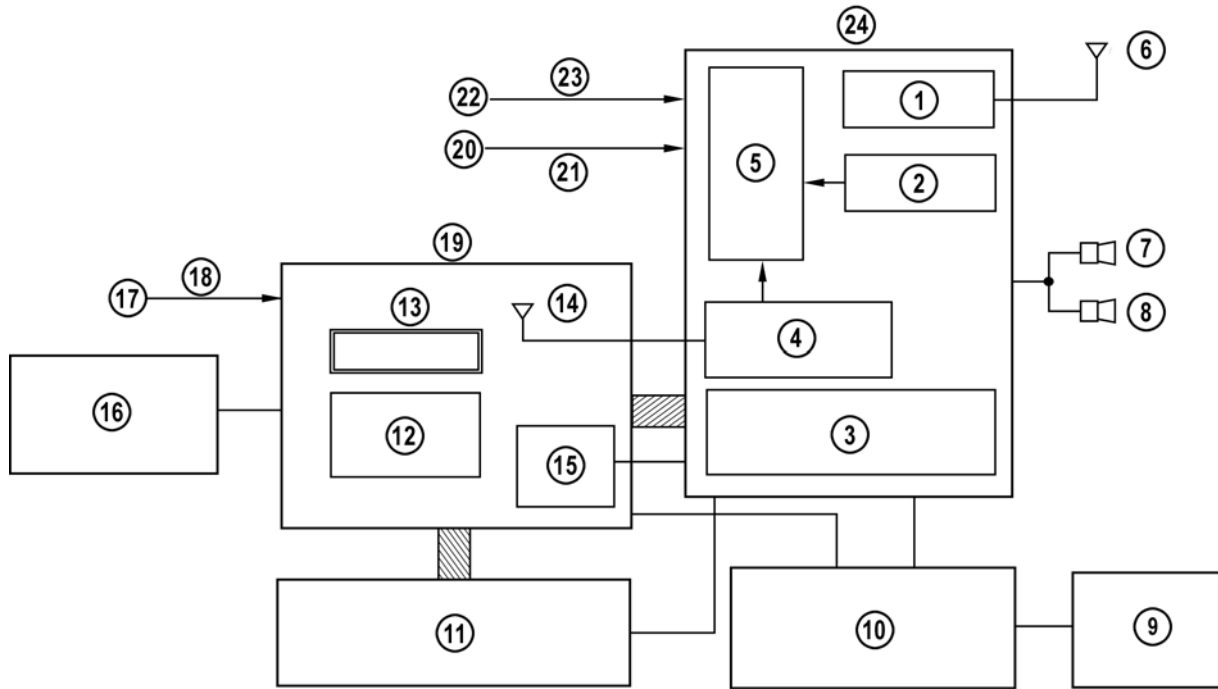
Parts Location



M5_09054

- | | | | |
|---|------------------------------------|----|--------------------------|
| 1 | Microphone | 7 | Front door speaker |
| 2 | Car-navigation unit | 8 | Front tweeter |
| 3 | Remote control (RHD) | 9 | Voice recognition switch |
| 4 | Car-navigation control panel (LHD) | 10 | GPS antenna |
| 5 | Back-up light switch (MTX) | 11 | LCD unit |
| 6 | TR switch (ATX) | | |

System Overview

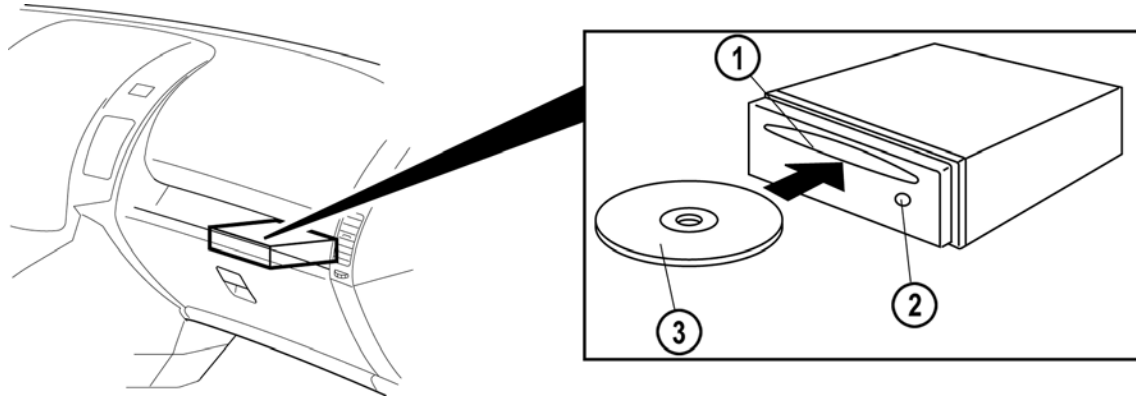


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- | | | | |
|----|----------------------------------|----|--|
| 1 | RDS-TMC tuner | 13 | LCD |
| 2 | Gyro sensor | 14 | GPS antenna |
| 3 | DVD driver | 15 | Microphone with amplifier |
| 4 | GPS receiver | 16 | Car-navigation control panel or remote control |
| 5 | CPU | 17 | Parking brake switch |
| 6 | RDS-TMC antenna | 18 | Parking brake signal |
| 7 | Front tweeter (driver side) | 19 | LCD unit |
| 8 | Front door speaker (driver side) | 20 | TR switch (ATX) or back-up light switch (MTX) |
| 9 | Rear camera | 21 | R-range signal |
| 10 | Rear view monitor control module | 22 | Instrument cluster |
| 11 | Audio unit | 23 | Vehicle speed signal |
| 12 | CPU | 24 | Car navigation unit |

Car Navigation Unit

- The car navigation unit is located in the glove compartment and incorporates the DVD-ROM drive and the gyro sensor.



M5_09056

- 1 DVD-ROM loading slot
- 2 Eject button

- 3 DVD-ROM

LCD Unit

- The LCD unit is a pop-up type incorporated in the dashboard. It serves as a display for the navigation system during normal operation and as a display for the rear view camera when reverse gear is selected.
- The LCD unit features a dedicated bidirectional serial bus to the navigation unit and the audio unit. All necessary video signals are separately sent as a RGB signal.
- It features different illumination brightness levels for the navigation display. The driver can select between automatic, day and night mode.

Automatic Mode

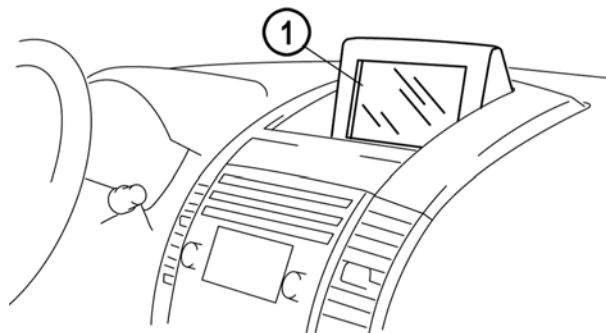
- When automatic mode is selected, the display switches automatically to night mode when at least the parking lights or head lights are switched on, and it automatically switches back to day mode when the lights are switched off. On LHD vehicles, the driver can select between day mode and night mode by pressing the DIM button when automatic mode is selected.

Day Mode

- When day mode is selected, the display is fixed at a higher brightness level. On LHD vehicles, the driver can select between two different brightness levels by pressing the DIM button when day mode is selected.

Night Mode

- When night mode is selected, the display is fixed at a lower brightness level. On LHD vehicles, the driver can select between two different brightness levels by pressing the DIM button when night mode is selected.



M5_09057

1 LCD unit

Split Screen

- Different display modes can be selected with the split screen function. Some of the possible display options are shown below:

One-screen Map Display



M5_09058

Dual-screen Map Display with Different Scales



M5_09059

Map and Turn List



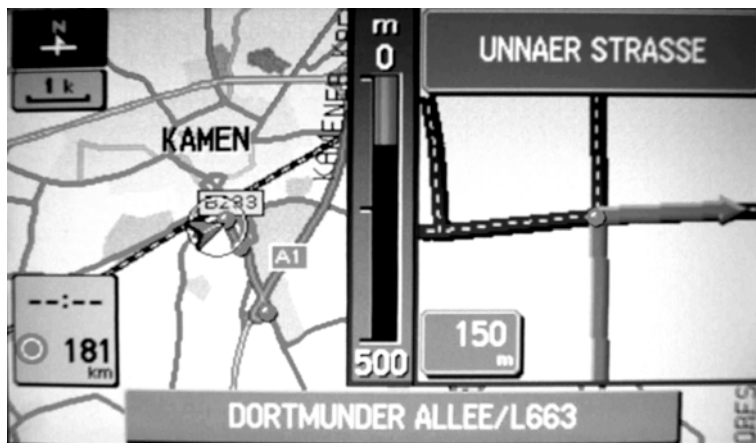
M5_09060

Map and Turn Arrows



M5_09061

Automatically Enlarged Illustration of a Nearby Intersection



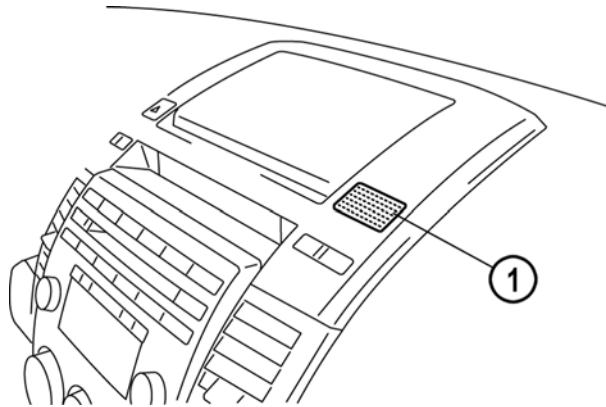
M5_09062



M5_09063

Microphone

- The microphone is located beside the LCD unit and recognizes verbal commands in order to control several functions of the navigation system.
- The microphone incorporates an amplifier and is connected to the navigation unit.
- To enable the recognition function, the voice recognition button on the steering wheel has to be pressed first.

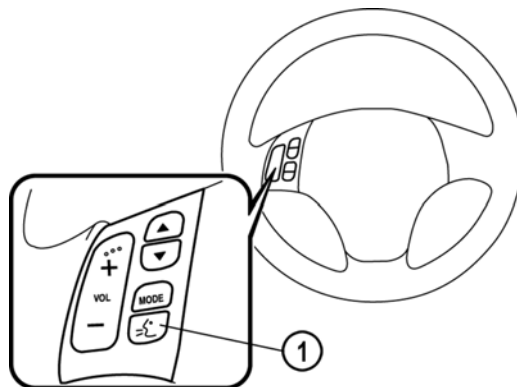


M5_09064

1 Microphone

Voice Recognition Button

- The voice recognition button is incorporated in the steering wheel. Its signal is forwarded on the serial bus from the audio unit via the LCD display unit to the navigation unit.
- To activate the voice recognition, the driver has to press the button. This activates the microphone and mutes the audio unit for a specified time, during which the driver can input verbal commands.
- The system then confirms the command, carries out the appropriate action and then deactivates the mute function.



M5_09065

- 1 Voice recognition button

- The list of verbal commands that the navigation system will follow is shown below:

Shortcut Commands	Casino	[Go to] Preset Destination [Number] 1
[Show] Current (Position/Location)	Cinema	[Go to] Preset Destination [Number] 2
[Show] Map	Golf course	[Go to] Preset Destination [Number] 3
Repeat [Voice] [Guidance]	Historical Monument	[Go to] Preset Destination [Number] 4
Cancel	Ice Skating rink/Ice rink	[Go to] Preset Destination [Number] 5
Map Operation Commands	Museum	Cancel
Zoom In	Music club	Guidance Commands
Zoom Out	Ski resort/Skiing	Louder
Zoom In Maximum	Sports centre/Sports Complex/ Stadium	Softer
Zoom Out Maximum	Theatre	[Show] (Whole/Entire) Route [Map]
Right Map Zoom In	Tourist attraction	[Show] Next Way Point [Map]
Right Map Zoom Out	Tourist information	Show First Way Point [Map]
Right Map (Zoom In Maximum/ Minimum Scale)	Winery/Vineyard	Show Second Way Point [Map]
Right Map (Zoom Out Maximum/ Maximum Scale)	Restaurant/I'm Hungry/Show Restaurant	Show Third Way Point [Map]
[Change to/Show] North up [Mode]	Chinese Restaurant/Chinese Food	Show Fourth Way Point [Map]
[Change to/Show] Heading up [Mode]	Fast Food/Fast Food Restaurant	Show Fifth Way Point [Map]
[Change] Map Direction	French Restaurant/French Food	Show Destination [Map]
Right Map [Show] North up [Mode]	Italian Restaurant/Italian Food	(Delete/Cancel) Next Way Point
Right Map [Show] Heading up [Mode]	Japanese Restaurant/Japanese Food	Yes
Right Map [Change] Map Direction	Other Restaurant/Other Food	No
[Show/Change to] Dual Map [Mode]	Shopping centre/Shops	(Delete/Cancel) Destination
[Show/Change to] Single Map [Mode]	Airport	(Delete/Cancel) All Way Points and Destination
(Store/Mark) [This point]	Bus station	Voice guidance OFF
POI Display Commands	Ferry port/Ferries	Voice guidance ON
Petrol Station/Petrol	Hotel	Quick
Parking/Car Park/Multistorey Car Park	Park & Ride/Rest Area	Alternative
Town Centre/City centre	Car Rental	Short
Town hall	Motorway service	Detour
Exhibition centre/Convention Centre	Railway station/Underground Station/ Train Station	Detour Entire Route
Community centre/Civic Centre	POI Off	[Change to] Arrow (Guide/Guidance)
University/Higher Education/College	Destination Operation Commands	[Change to] Turn List (Guide/Guidance)
Hospital	[Go] Home	[Change to] Motorway (Guide/Guidance)
Park/Park & Recreation/Recreation/ Amusement Park	Enter Destination	[Change to] Crossroads (Guide/ Guidance)
Bowling centre/Bowling alley	Add to waypoint	Display Commands
	[Go to/Previous] Starting Point	Display [set] day [mode]
	[Go to] Previous Destination	Display [set] night [mode]
		Display [set] auto [mode]

(): Indicates the commands to be the object of “/”

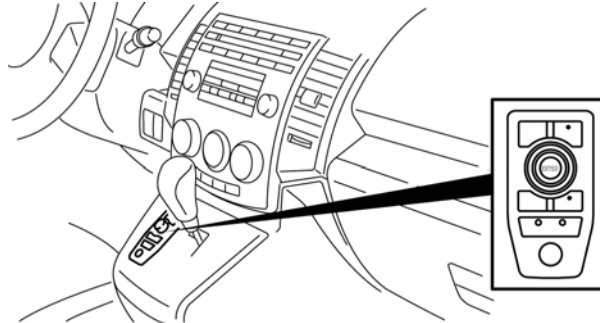
[]: Recognizes without saying the command in “[]”

“/”: Recognizes when saying either commands before and after “/”

M5_09083

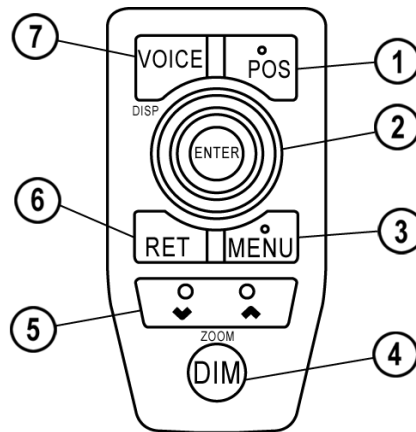
Control Panel

- The navigation control panel is located on the centre console. RHD vehicles are equipped with a remote control instead of the control panel.



M5_09067

- The layout of the control types is different, but the functions are the same, except for the fact that the remote control does not feature a DIM button.

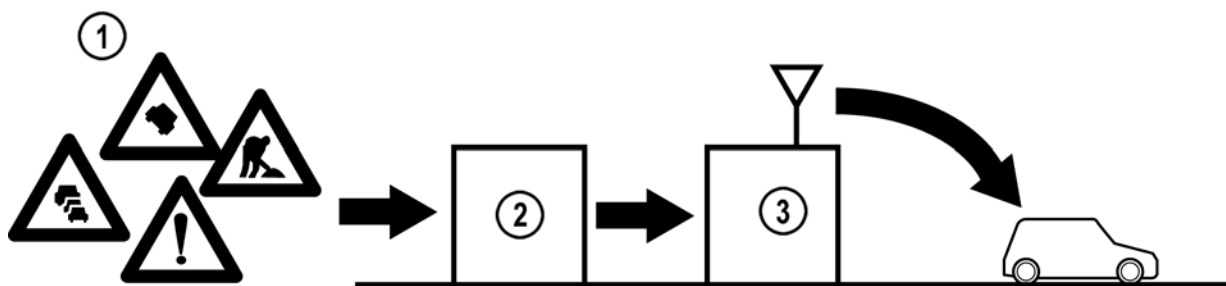


M5_09068

1	Position button	Displays the current position
2	Joystick/ Enter button	Selects items by tilting it up, down, right and left and executes a selected item
3	Menu button	Selects menus
4	Dim button	Switches between display illumination modes
5	Zoom button	Changes the map scale
6	Return button	Returns to the previous screen
7	Voice button	Initiates verbal guidance for route maneuvers and adjusts the display

Traffic Message Channel

- The **TMC (Traffic Message Channel)** function is a specific application of the **RDS (Radio Data System)**, using a FM receiver that is incorporated in the navigation unit. It receives traffic messages and forwards the received information to the CPU. The messages can be displayed and the route can be automatically recalculated when there are traffic jams along the first selected route.
- TMC is a service which is provided free of charge by some radio stations. The quality of the traffic information depends on the source of information. Either the radio stations receive the information from the police and listeners, or in addition from companies providing more detailed information. Sometimes the verbal information broadcasted by a radio station is different to the TMC information they transmit.



M5_09069

- | | |
|--|---|
| <ul style="list-style-type: none"> 1 Traffic messages 2 Traffic information center | <ul style="list-style-type: none"> 3 Radio station |
|--|---|

- The TMC icon is shown on the display when the system receives a signal from at least one radio station that broadcasts TMC information.



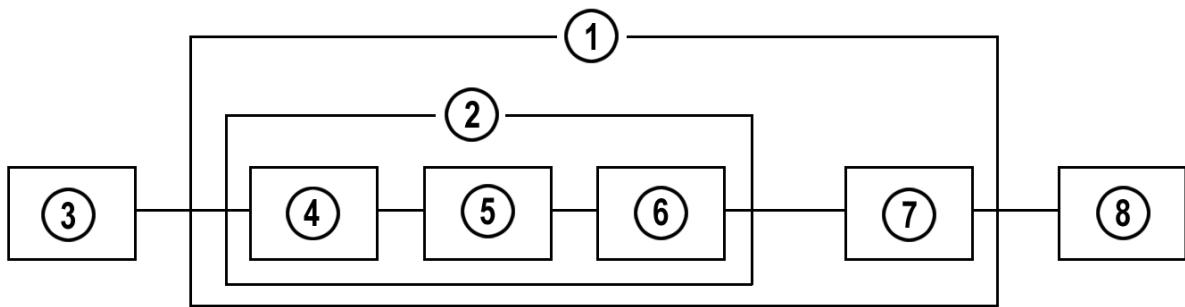
M5_09070

- 1 TMC icon

- Traffic events received by the TMC receiver are shown as a symbol on the Navigation display in a scale of 50m...4km. Events within a 25km radius of the vehicle are monitored by the system in order to automatically select a detour if necessary.
- The colour and type of the TMC symbol depends on the traffic information. The colours which are assigned to each type of traffic event are described in the following table:

Traffic event	Colour
Stationary	Traffic Red
Traffic Jam	Orange
Accidents	Pink
Road closed	Road Black
Road Works/Danger	Pink
Road Conditions/Weather/Delays	Yellow
Parking/Out of order	Grey

- Inside the vehicle the TMC signals are processed as shown below.



M5_09071

- | | | | |
|---|------------------|---|---------------------------|
| 1 | Navigation unit | 5 | Decoder |
| 2 | RDS-TMC receiver | 6 | CPU communication control |
| 3 | Vehicle antenna | 7 | Navigation ECU |
| 4 | FM tuner | 8 | Display |

- Each traffic event is indicated by one sign.



M5_09072

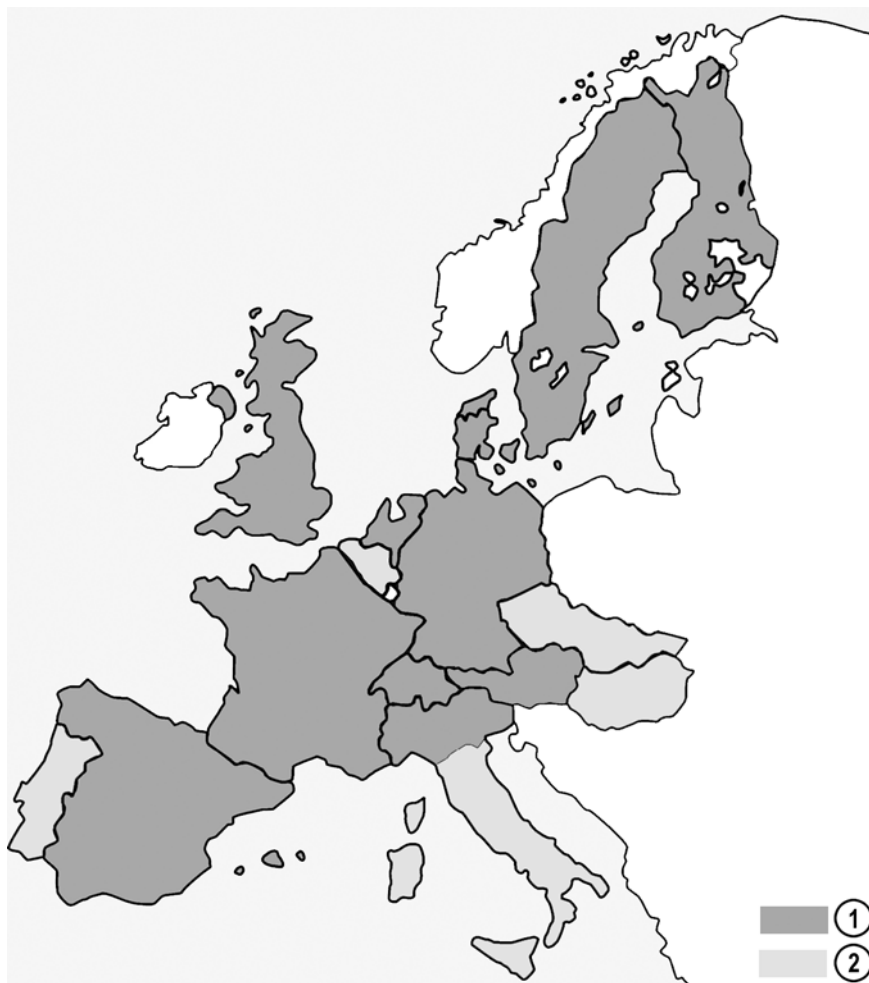
- 1 Icon for traffic event

TMC Availability

- The map below shows the availability of TMC in Europe.

NOTE: Even when the TMC displays traffic events on other road types (e.g. major roads), the **DRGS (Dynamic Route Guidance System)** recalculates the route only for traffic events on motorways.

NOTE: TMC information about a large traffic jam does not necessarily mean that the navigation system will reroute the vehicle. Rerouting always depends on local conditions (such as length of possible detour etc.).



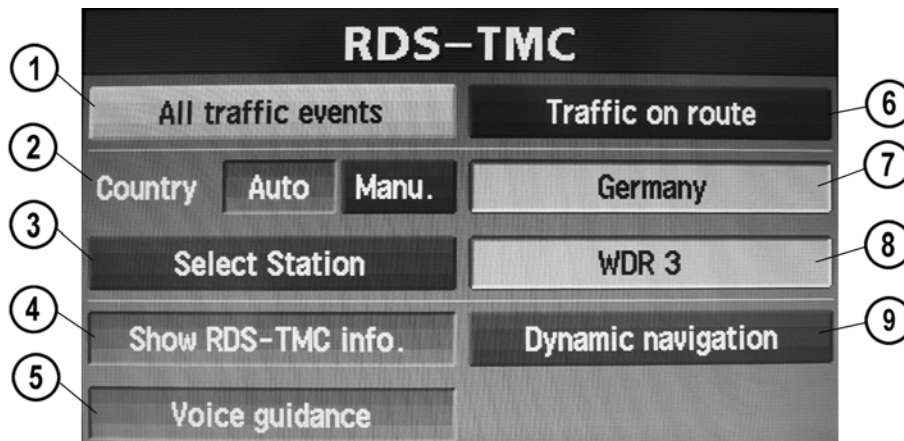
M5_09073

1 TMC operational

2 TMC planned

Activation of TMC and DRGS

- To switch on the TMC and DRGS first select “RDS-TMC” from the main menu. A new menu will be displayed where several options can be selected.



M5_09074

- | | | | |
|---|---|---|---|
| 1 | Displays all traffic events | 6 | Displays traffic events on the guided route |
| 2 | Switches between automatic and manual country selection | 7 | Selected country |
| 3 | Selects a TMC radio station | 8 | Selected TMC radio station |
| 4 | Activates TMC | 9 | Activates DRGS |
| 5 | Activates verbal information regarding traffic events | | |

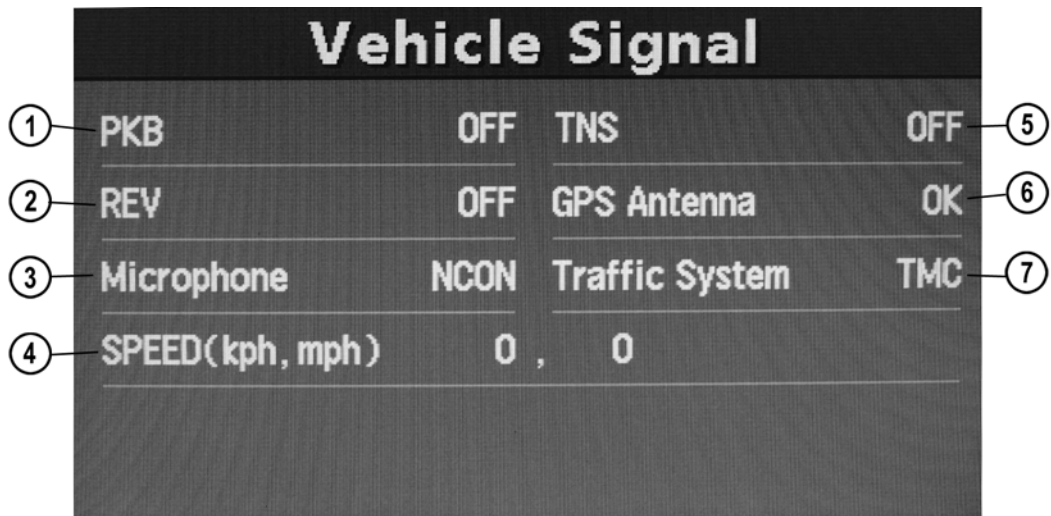
On-board Diagnostic System

- The on-board diagnostic system has the following functions:
 - Vehicle Signal Check
 - Navigation Check
 - Product Version
 - Error Code
- To access the OBD function, press the “Menu” button and select **Navigation Set Up → Calibration → Map Version**. Then push the joystick up two times and down two times. Now, the “Diagnosis Check” screen is displayed. After selecting “Menu” the OBD main menu is displayed on the screen.
- The “Return” button has to be pressed to leave a menu point. To cancel the diagnostic mode, the ignition must be switched off.

NOTE: After the tires have been replaced, the vehicle speed signal needs to be recalibrated. To do this, press the “Menu” button and select **Navigation Set Up → Calibration → Distance**. The vehicle speed signal will then be automatically recalibrated during the next few kilometers driven (the required distance depends on the route used for calibration).

Vehicle Signal Check

- The “Vehicle Signal Check” allows several input signals of the navigation system to be checked.



M5_09075

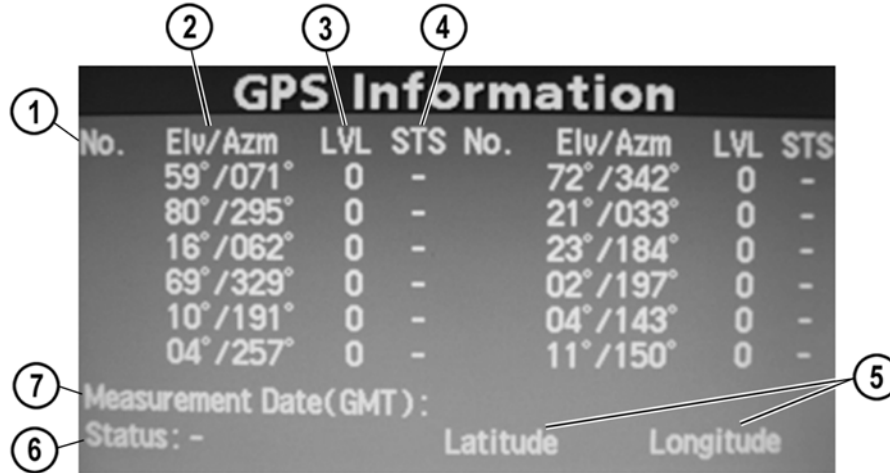
1	PKB	ON = Parking brake signal is ON OFF = Parking brake signal is OFF
2	REV	ON = Reverse gear selected OFF = Reverse gear not selected
3	Microphone	OK = Connected NCON = Disconnected
4	Speed	Current vehicle speed in kph/mph
5	TNS	ON: TNS signal ON OFF: TNS signal OFF
6	GPS antenna	OK = Connected NCON = Disconnected
7	Traffic system	TMC = TMC tuner incorporated

Navigation Check

- A sub-menu is displayed when “Navigation Check” has been selected. The following options can be entered via this sub menu:
 - GPS Information
 - Microphone Check
 - Vehicle Sensors
 - History

GPS Information

- The option "GPS Information" allows the data received from GPS satellites to be checked.

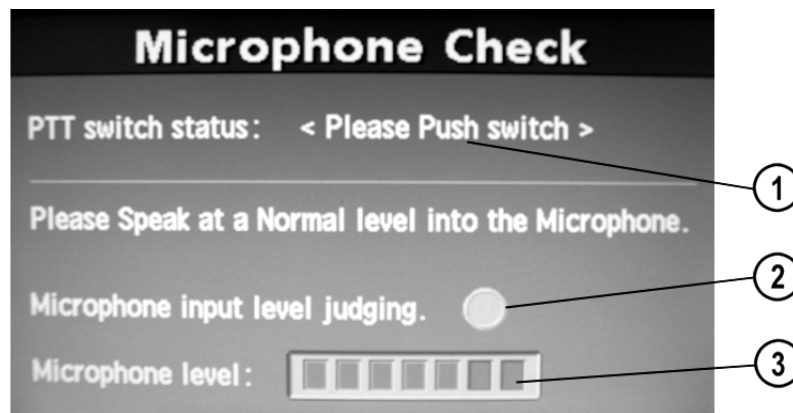


M5_09076

1	No.	Individual number of the satellite
2	Elv/Azm	Elevation azimuth (position of the satellite)
3	LVL	Signal level
4	STS	Reception status P = Data are received and used for positioning T = Data are received but not used for positioning - = No data are received
5	Latitude/Longitude	Current position in degrees, minutes and seconds
6	Measurement Date (GMT)	Date and time obtained from GPS satellites. Time is GMT (Greenwich Mean Time)
7	Status	2D = Two-dimensional positioning 3D = Three-dimensional positioning NG = Unusable positioning data error = Error in communication between GPS receiver and navigation unit - = Two dimensional positioning is not possible, signals are being received from two or less satellites

Microphone Check

- The “Microphone Check” allows to check the input signals of the microphone.

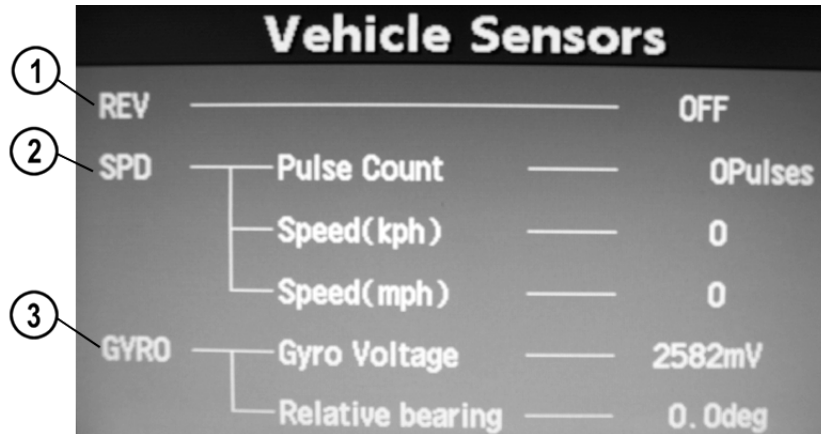


M5_09077

1	PTT switch status	Please Push Switch = Voice recognition button is not pressed OK = Voice recognition button is pressed
2	Microphone input level judging	Blue indicator = spoken word is above the threshold
3	Microphone level	Indicates input level of the microphone by a bar graph

Vehicle Sensors

- The option "Vehicle Sensors" allows the sensor signals of the navigation system to be checked.

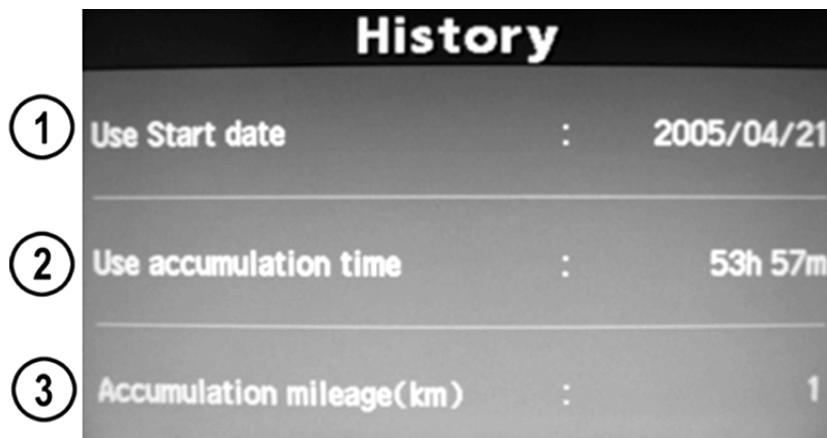


M5_09078

1	REV	Shows whether the reverse gear signal is ON or OFF (reverse gear signal is also ON when display switches to rear view camera)
2	SPD	Displays the number of vehicle speed pulses for a specified distance and the calculated speed
3	GYRO	Displays the gyro voltage and the relative angle calculated according to the voltage

History

- The option “History” allows the usage of the navigation system in the past to be checked.

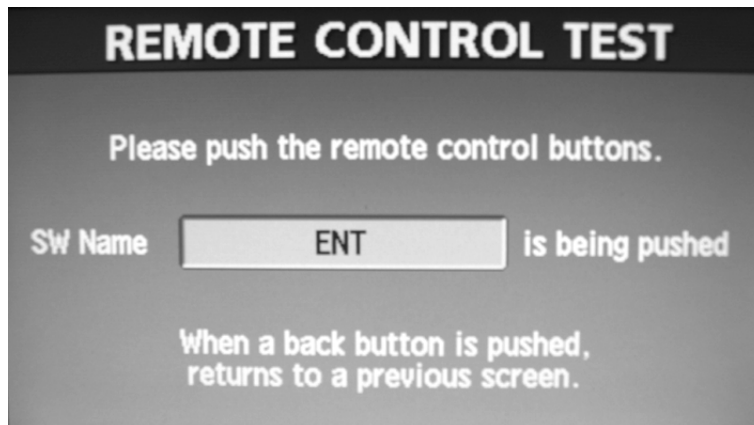


M5_09079

1	Use Start date	Displays the date on which the navigation was used for the first time
2	Use accumulation time	Displays the elapsed usage time of the navigation (if the maximum time value is exceeded, a time of 65536 hours is set)
3	Accumulation Mileage	Displays the elapsed usage distance (in km) of the navigation (if the maximum distance value is exceeded, a distance of 1048576 km is set)

Remote Control Test

- The "Remote Control Test" allows the buttons of the control panel/remote control to be checked. The display informs the technician how to proceed after the test has been selected.



M5_09080

Product Version

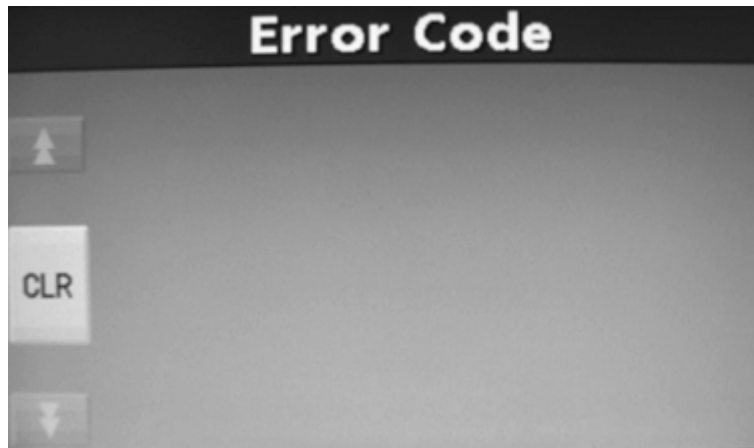
- The option "Products Version" allows the hardware and software version of the navigation system to be checked.



M5_09081

Error Code

- The option “Error Code” allows DTCs stored in the navigation system to be inspected.



M5_09081

Rear Entertainment System

Features

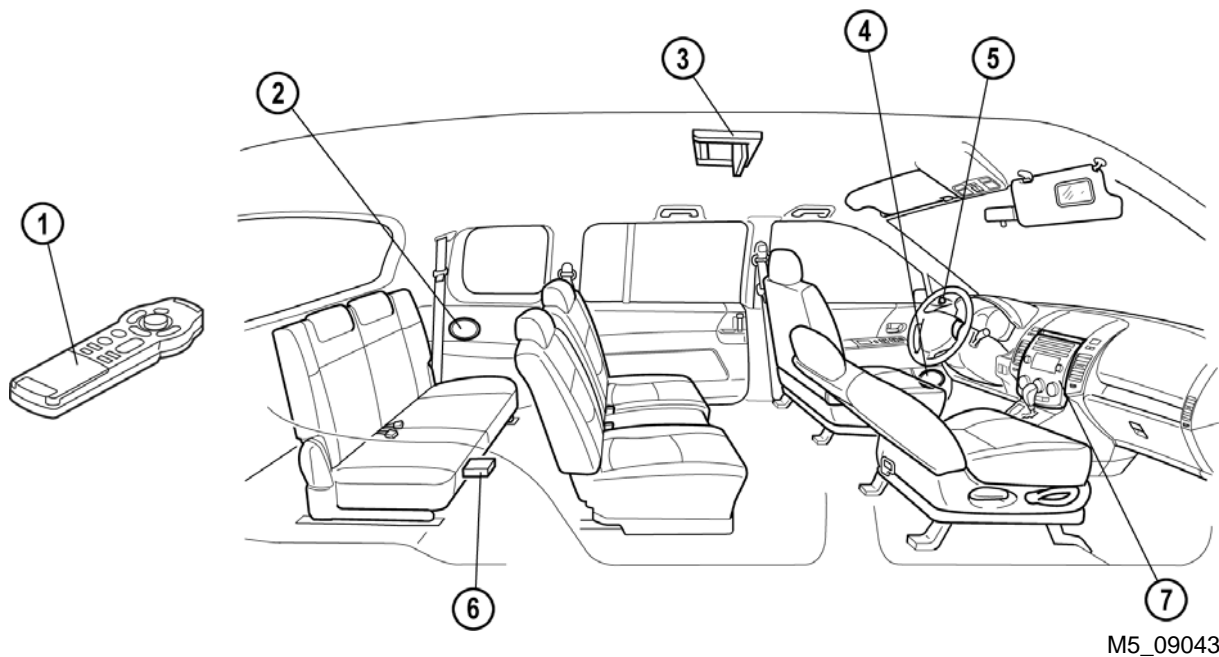
- The **RES (Rear Entertainment System)** unit consists of a DVD/CD player and built in display.
- In addition, an input for external devices (such as video games) is provided behind the second row seats.
- Audio from the RES can be played back through the vehicle audio system, or listened to using infrared type wireless headphones (purchased separately).
- An infrared remote control is provided to operate the RES. The remote control can be used in the front or rear of the car.
- The RES unit also has the following features:
 - Automatic muting. When the source is changed (for example from an external device like a video game, to **DVD (Digital Versatile Disc)**), sound and picture are stopped for 0.5 seconds to prevent noise.
 - Auto power off. When the RES display is closed during operation the power is automatically switched off.
 - Automatic dimming. The RES display will be dimmed when the headlight switch is ON.

Specifications

Item		Specification
Rated voltage	(V)	12
Output impedance	(ohm)	Less than 1000
Display	Size (inch)	7
	Type	TFT (full-colour)

M5_09T015

Parts Location



- | | | | |
|---|--------------------|---|-------------------------|
| 1 | Remote control | 5 | Tweeter |
| 2 | Rear speaker | 6 | Auxiliary terminal unit |
| 3 | RES unit | 7 | Audio unit |
| 4 | Front door speaker | | |

DVD/CD Playback

- The below DVD/CD formats can be played back:
 - 12 cm or 8 cm DVD-VIDEO (PAL format, Region Code '2' or 'ALL')
 - 12 cm or 8 cm Video-CD (PAL format)
 - CD-R (CD-AUDIO, MP3)
 - CD-RW (CD-AUDIO, MP3)

Customisation

- The following DVD preset and playback settings can be changed using the remote control:
 - Language (menu language, subtitle/spoken language)
 - Parent lock setting (when available on DVD)
 - DVD movie camera angle (when available on DVD)
 - DVD movie screen size
 - Picture quality
 - Sound output balance (left, right, or both)

Overheat Protection Function

- If the internal temperature of the DVD/CD player or display exceeds the threshold, operation of the DVD/CD player or display will be automatically stopped to prevent possible malfunctions. Operation will be recommenced when the temperature has dropped to a second threshold.

Item	Operation Stopped	Operation Resumed
DVD/CD player	Approximately 88° C	Approximately 70° C
Display	Approximately 95° C	Approximately 85° C

Cooling Function

- The RES unit incorporates an internal cooling fan to control the internal temperature.
- The cooling fan switches on when the internal temperature of the RES unit reaches approximately 50°C, and switches off when the temperature drops to approximately 40°C .

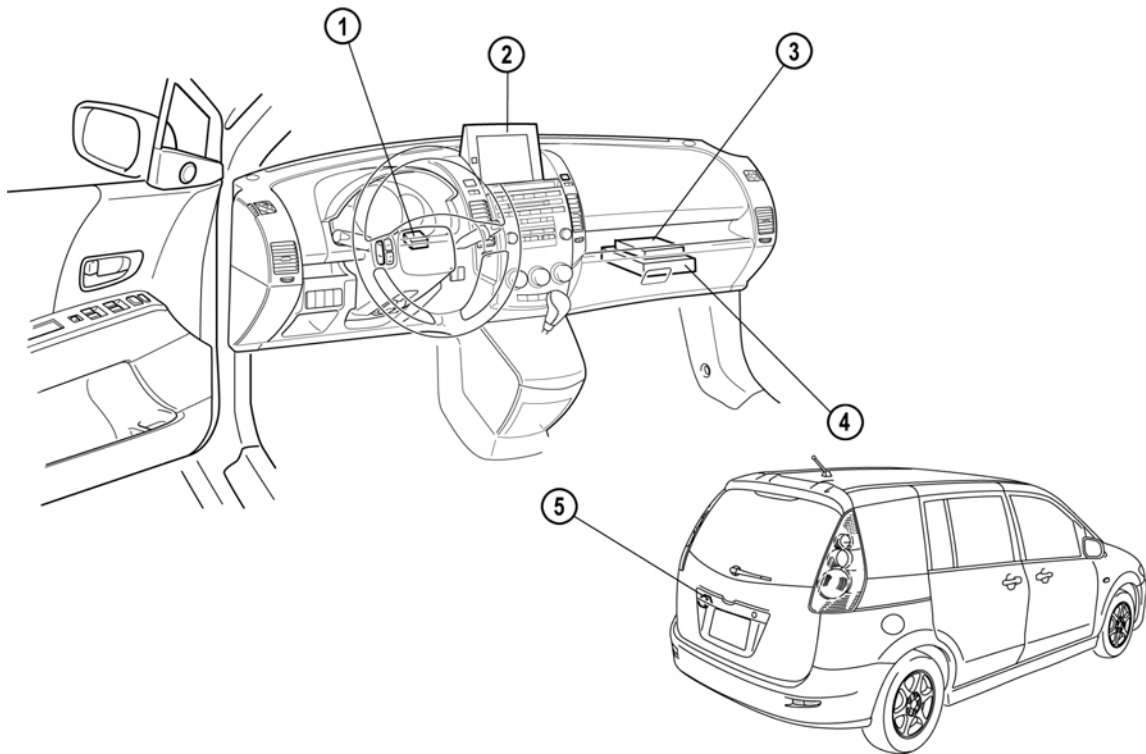
Low Voltage Detection Function

- To prevent malfunctions, operation of the RES will be automatically stopped and “Battery Error” displayed on the display if supply voltage drops below 9.5 V.

Rear View Monitor

- The rear view monitor consists of the rear view monitor control module, the rear camera, the steering angle sensor, the **LCD (Liquid Crystal Display)** unit (integrated with the car navigation system) and the reverse light switch.
- When the driver selects reverse gear while the ignition is in the ON position, the rear camera switches on and displays the area behind the vehicle on the car navigation display.
- Reference lines showing the estimated course of the vehicle, as well as vehicle width reference lines are overlaid onto the image.
- Information from the steering angle sensor is received by the rear view monitor control module via the HS-CAN, processed by the module and reflected as different coloured lines on the display.
- As the steering wheel is turned, the estimated course of the vehicle is changed on the display.

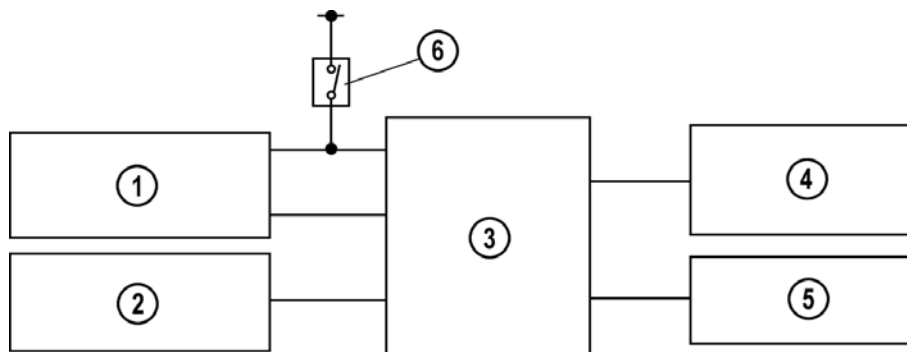
Parts Location



M5_09044

- | | | | |
|---|----------------------------------|---|---------------------|
| 1 | Steering angle sensor | 4 | Car-navigation unit |
| 2 | LCD unit | 5 | Rear camera |
| 3 | Rear view monitor control module | | |

System Overview

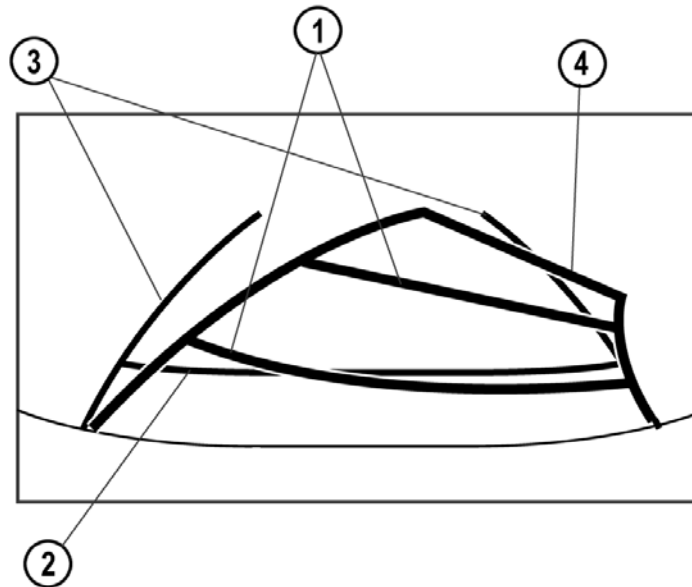


M5_09045

- | | | | |
|---|----------------------------------|---|----------------------------|
| 1 | Car-navigation unit | 4 | Steering angle sensor |
| 2 | LCD unit | 5 | Rear camera |
| 3 | Rear view monitor control module | 6 | Back-up light switch (MTX) |

Reference Lines

- The following reference lines are superimposed on the image provided by the back camera, to assist the driver when reversing into a parking space:



M5_09046

No.	Line	Color	Description
1	Distance indication lines	Red	<ul style="list-style-type: none"> • This line indicates about 0.5 m {1.64 ft} from the end of rear bumper. • It moves according to steering operation.
		Yellow	<ul style="list-style-type: none"> • This line indicates about 1 m {3.28 ft} from the end of rear bumper. • It moves according to steering operation.
2	Distance indication line	Green	<ul style="list-style-type: none"> • This line indicates about 0.5 m {1.64 ft} from the end of rear bumper. • It does not move according to steering operation.
3	Vehicle with indication lines	Green	<ul style="list-style-type: none"> • These lines indicate the vehicle width. • They do not move according to the steering operation.
4	Anticipated course line	Yellow	<ul style="list-style-type: none"> • These lines indicate the anticipated vehicle course. • They move according to steering operation.

M5_09T016

Rear View Monitor Control Module Initialization

- When replacing the rear view monitor control module, rear camera or liftgate, the rear view monitor control module must be initialized. The initialization mode can be entered by conducting the following procedure:
 1. Turn the audio unit off and turn the ignition switch to the LOCK position.
 2. Turn the ignition switch to the ON position while pressing the “MODE” switch on the steering wheel audio control, and hold for approximately 2 seconds.
 3. When “Input Check” is displayed on the car navigation display, release the “MODE” switch and press the volume switches on the steering wheel in the following order:
VOL+→VOL-→VOL+→VOL-→VOL+→VOL

Instrumentation/Driver Information System**Features**

- The construction and operation of the instrumentation/driver information system is essentially the same as that on the Mazda3 (BK) except for the following:
 - Mileage data is uploaded into new instrument cluster during configuration procedure.
 - Code numbers for instrument cluster input/output check mode have been changed.
 - Information display is now connected to the MS-CAN bus.
 - Seat belt warning with occupancy sensor has been adopted for passenger's seat.

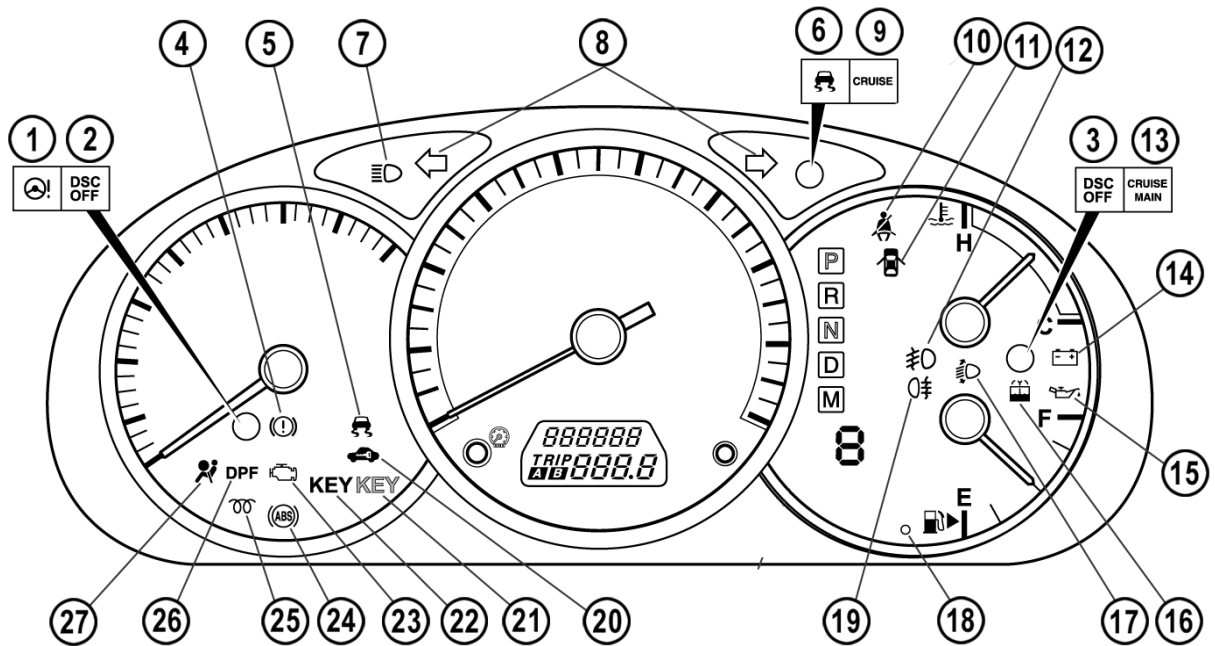
Specifications

Item		Specification
Speedometer	Meter type	Stepper 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	Stepper motor type
	Indication range (rpm)	0—8,000 (L8, LF), 0—6,000 (MZR-CD)
	Red zone (rpm)	6,500—8,000 (L8, LF) 5,000—6,000 (MZR-CD)
	Input signal communication system	CAN system
	Input signal source	PCM
	Rated voltage (V)	DC 12
Fuel gauge	Meter type	Stepper 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
Water temperature gauge	Meter type	Stepper 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

M5_09T017

Instrument Cluster

- The instrument cluster features LEDs for the warning and indicator lights. It is connected to the HS- and the MS-CAN bus.



M5_09085

No.	Item	Input signal source	CAN system
1	EHPAS warning light	EHPAS control module	x
2 ¹	DSC OFF light	DSC HU/CM	x
3 ²			x
4	Brake system warning light	• DSC HU/CM • ABS HU/CM	x
5 ¹	DSC indicator light	DSC HU/CM	x
6 ²			x
7	High-beam indicator light	BCM	x
8	Turn signal light	BCM	x
9	Cruise set indicator light	PCM	x
10	Seat belt warning light	Buckle switch	—
11	Door ajar warning light	BCM	x
12	Front fog indicator light	Front fog light relay	—
13	Cruise main indicator light	PCM	x
14	Generator warning light	PCM	x
15	Oil pressure warning light	Oil pressure switch	—
16	Washer fluid level warning light	Washer fluid level sensor	—
17	Headlight auto leveling warning light	Auto leveling control module	—
18	Fuel-level warning light	Fuel gauge sender unit	—
19	Rear fog indicator light	Rear fog light relay	—
20	Security light	—	—
21	Keyless indicator light	Keyless control module	x
22	Keyless warning light	Keyless control module	x
23	MIL	PCM	x
24	ABS warning light	• DSC HU/CM • ABS HU/CM	x
25	Glow indicator light	PCM	x
26	DPF indicator light	PCM	x
27	Airbag system warning light	SAS unit	—

1: MZR-CD

2: L8, LF

M5_09T018

Input/Output Check Mode

1. To enter the input/output check mode, turn the ignition switch to ON while pushing the odometer/ tripmeter switch. Keep pressing the odometer/tripmeter switch until "test" is displayed on the odometer/tripmeter display.
2. Press the odometer/tripmeter switch to move from one check mode to the next.

Check Code	Item
1	Driver's buckle switch
8	TNS relay
12	Speedometer
13	Tachometer
14	Buzzer
16	Fuel level warning light
22	Fuel gauge sender unit
23	Fuel gauge
25	Water temperature gauge
26	Odometer display and warning lights controlled by CAN
31	Key reminder switch
32	Indicator buzzer
57	Panel light control
58	<ul style="list-style-type: none">• Passenger-side buckle switch• Occupancy sensor
59	<ul style="list-style-type: none">• CAN system• Fuel gauge sender unit

M5_09T029

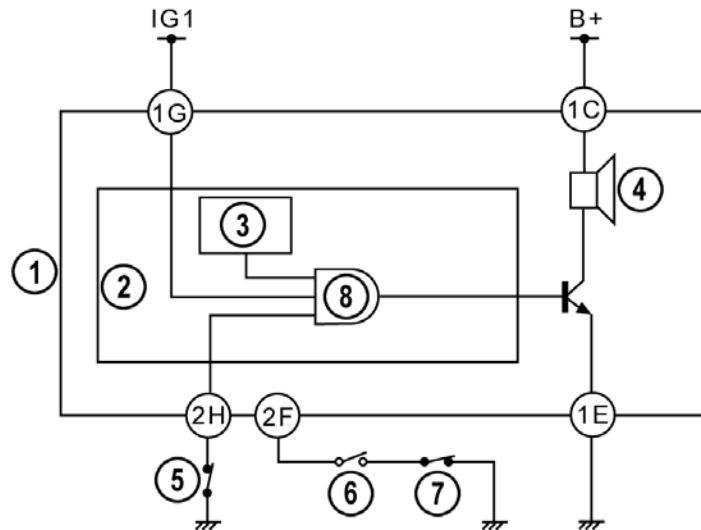
Configuring Instrument Cluster

- When replacing the instrument cluster, the new cluster has to be configured. To do this, connect the WDS to the vehicle and select the option **Toolbox→Module Programming→Programmable Module Installation→IC**. During this procedure the mileage is uploaded into the new instrument cluster.

NOTE: Configuring of the instrument cluster can only be conducted once. The new module must display less than 100 km for the mileage data to be uploaded. If a module with more than 100 km is configured, WDS will display an error message after configuring and indicate that the procedure failed. In this situation, all data other than the mileage will have been uploaded into the new instrument cluster, so the configuration is actually successful.

Seat Belt Warning

- Seat belt warnings are provided for both the driver’s seat and the passenger’s seat. The operation of the seat belt warning light and warning chime is controlled by the instrument cluster.



M5_09048









- | | | | |
|---|--------------------|---|--|
| 1 | Instrument cluster | 5 | Buckle switch (driver side) |
| 2 | Microcomputer | 6 | Seat occupancy sensor (passenger side) |
| 3 | Timer | 7 | Buckle switch (passenger side) |
| 4 | Buzzer | 8 | AND logic circuit |

Driver’s Seat Belt Warning

- For the control of the driver’s seat belt warning, the signal from the driver’s seat belt buckle is used. When the driver’s seat belt is unbuckled, the switch closes and a ground signal is sent to the instrument cluster.


Passenger's Seat Belt Warning


- For the control of the passenger's seat belt warning, the signal from the passenger's seat belt buckle switch and an additional seat occupancy sensor is used. The occupancy sensor is located on the seat cushion, and informs the instrument cluster whether the seat is occupied or not.
- If the occupancy sensor detects a load of approximately 15 kg or more, and the passenger's seat belt is unbuckled, both switches close and a ground signal is sent to the instrument cluster.
- Depending on the vehicle speed and driver's/passenger's seat belt buckle switch status, the seat belt warning light will be illuminated and the warning chime operated. The below table shows the operation of the warning light and chime (with both driver's and passenger's seats occupied).


Condition	Vehicle speed							
	Between 0 – 20 km/h (0 – 12 mph)				20 km/h (12mph) or more			
Driver seat belt	○	○	×	×	○	○	×	×
Passenger seat belt	○	×	○	×	○	×	○	×
Seat belt warning light								
Warning chime								

○ : Fastened

× : Unfastened

 : Illuminated

 : Flashing

 : Beep

M5_09T019

- The chime will continue sounding for 90 seconds, even if the vehicle speed drops below 20 km/h before 90 seconds has elapsed.

Information Display

- The information display indicates information for the audio system, climate control system, and driver information such as fuel economy data.
- Information between the information display and other modules is exchanged via the MS-CAN bus.

Input/Output Check Mode

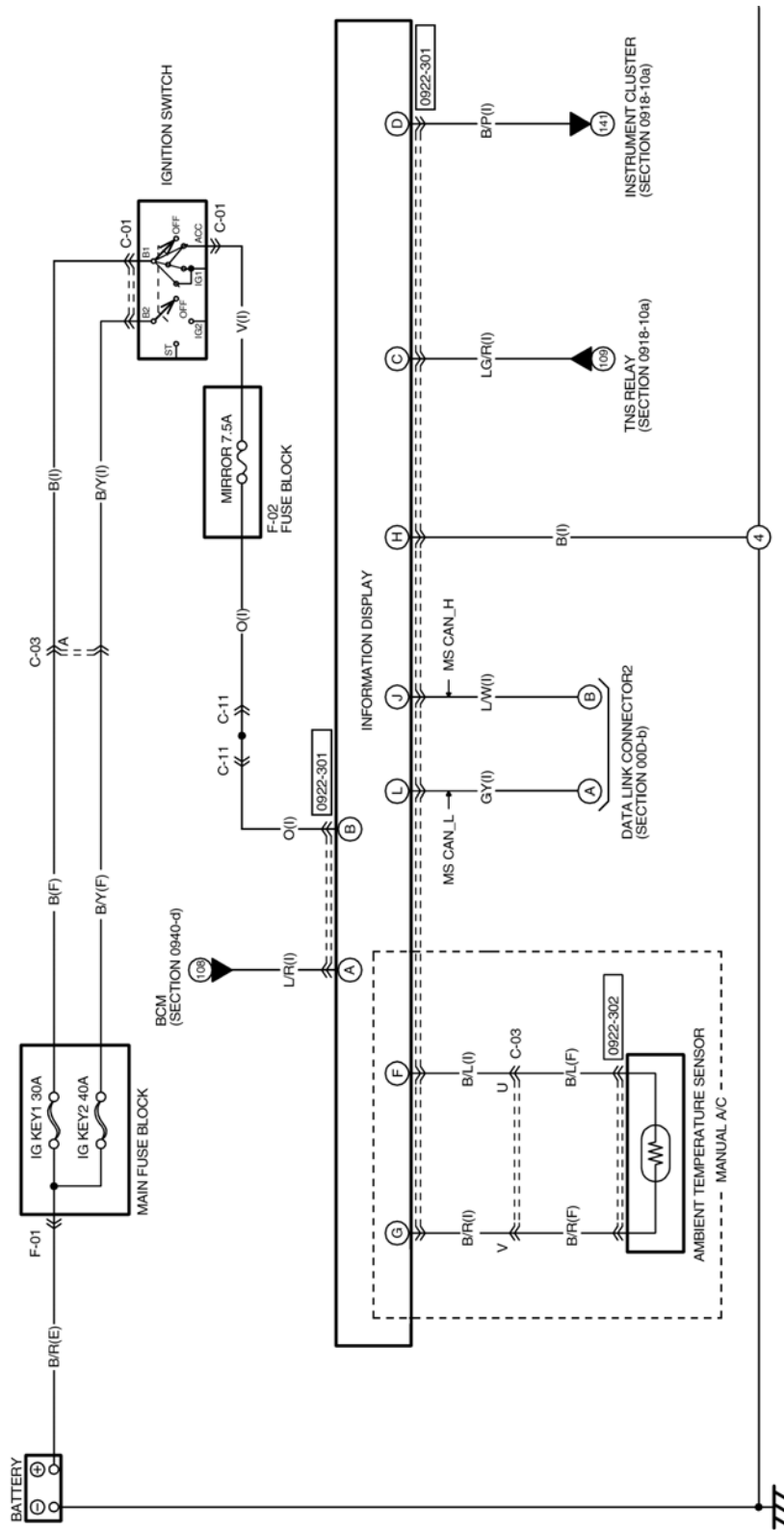
- An input/output check mode is provided to allow diagnostics of the information display. By using the input/output check mode, different check codes can be selected to confirm the operating condition of the input and output devices for the information display.

Check code	Signal output part	Malfunction location
01	Information display	CAN system communication error
02	<ul style="list-style-type: none"> • Audio unit • Climate control module • Instrument cluster 	Communication error to signal output part
03	LCD	—
04	TNS relay	<ul style="list-style-type: none"> • TNS relay • BCM • TNS signal wiring harness
05	Ambient temperature sensor	<ul style="list-style-type: none"> • Ambient temperature sensor • Ambient temperature signal wiring harness

M5_09T020

- To enter the input/output check mode, use the following procedure:
 1. Switch the ignition ON while pressing the CLOCK and INFO buttons. Keep pressing the CLOCK and INFO buttons until “test” is displayed on the information display.
 2. Press the INFO button to move from one check code to the next.
 3. When all the check codes have been displayed, “end” will be displayed on the information display. To repeat the test the ignition must be switched OFF once and the above procedure repeated.

Wiring Diagram



M5_09049

Control System

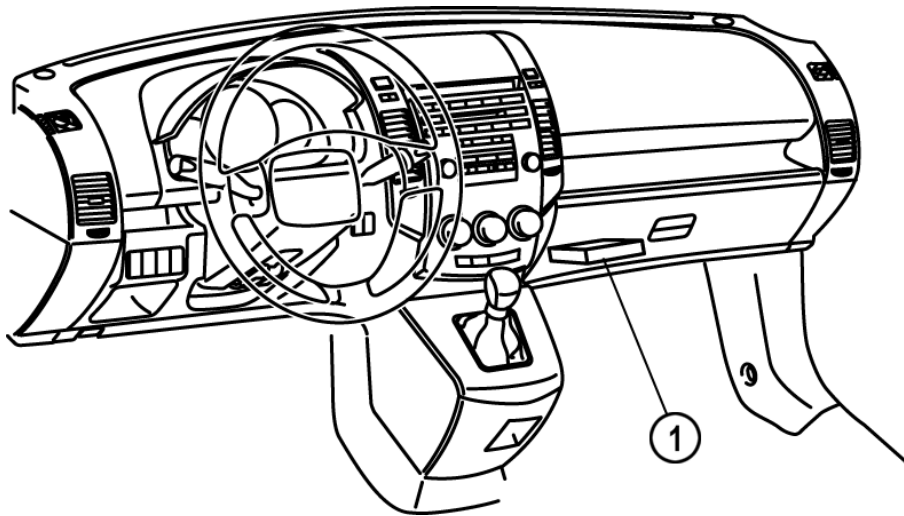
Features

- With the introduction of the Mazda5 (CR) a new control system for body electrics has been adopted. It has the following features:
 - A Body Control Module has been adopted.
 - An interior fuse box separate to the Body Control Module (at end of instrument panel on passenger's side).
 - Controller Area Network with HS-CAN and MS-CAN bus communication.

Body Control Module

- The BCM is installed on the passenger's side underneath the dashboard. It exchanges information with other modules via the MS-CAN bus.
- The BCM incorporates the following relays:
 - Front wiper relay
 - Front wiper high relay
 - Door lock relay
 - Door unlock relay
- The BCM controls the following systems:
 - Lighting system
 - Wiper and washer
 - Power door lock system
 - Keyless Entry system (except for vehicles equipped with Advanced Keyless Entry system)
 - Rear defroster

BCM Location



M5_09050

- 1 BCM

NOTE: The BCM does not require configuring when it is replaced.

NOTE: Directly after switching off the ignition a current draw of approximately 180 mA for 30 minutes is normal, after which it drops to approximately 20 mA.

On-board Diagnostic System

- The on-board diagnostic system consists of the following functions:
 - Self test
 - PID monitor

Self Test

- The self test function allows BCM DTCs to be displayed on WDS. To do this, connect WDS to the vehicle and select the option **Toolbox→Self Test→Modules→GEM**.
- When the ignition is switched off, DTCs stored by the self test will be deleted.
- To conduct the self test, the following conditions must first be met:
 - Ignition switch ON
 - All switches other than ignition switch OFF
 - All doors, bonnet, trunk lid and liftgate are closed and unlocked
 - Park brake is engaged

PID Monitor

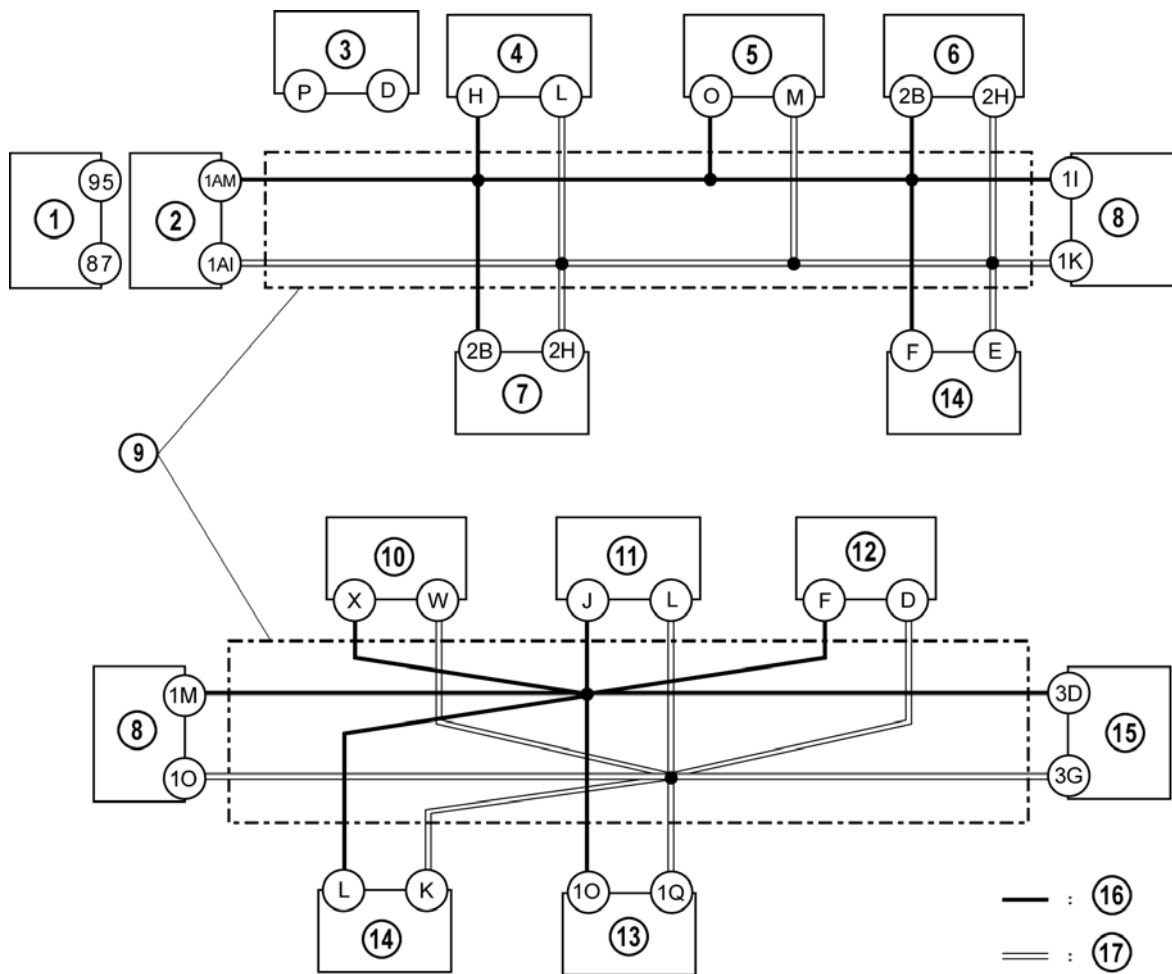
- The PID monitor function allows BCM PIDs to be displayed. To do this, connect WDS to the vehicle and select the option **Toolbox→Datalogger→Modules→GEM**.

Item	Description	Unit/Condition
ACSW	Climate control unit (A/C switch)	On/Off
AUTOLMP	Light switch (AUTO)	On/Off
BRK_WRN	Parking brake switch, brake fluid level sensor	On/Off
CCNT_GE	Number of DTCs	-
DD_LOCK	Driver's door lock-link switch	LOCK/UNLOCK
F_FOG_LMP	Front fog light switch	On/Off
HAZARD	Hazard warning switch	On/Off
HBEAMSW	Light switch (high beam)	On/Off
HEADLAMP	Light switch (low beam)	On/Off
LF_AJAR	Front door latch switch (LH)	Open/Close
PARK_SW	Light switch (TNS)	On/Off
R_FOG_LMP	Rear fog light switch	On/Off
RDEF_SW	Climate control unit (rear window defroster switch)	On/Off
REAR_AJAR	Sliding door switch	Open/Close
RF_AJAR	Front door latch switch (RH)	Open/Close
T_AJAR	Liftgate latch switch	Open/Close
TURN_SW	Turn signal switch	On/Off
WASH_FRT	Windshield wiper and washer switch (washer)	On/Off
WPFAST_FRT	Windshield wiper and washer switch (high)	On/Off
WPINT_FRT	Windshield wiper and washer switch (INT or AUTO)	On/Off
WPINT_REAR	Rear wiper and washer switch (INT)	On/Off
WPRPRKSTS	Windshield wiper motor (auto stop switch)	On/Off
WP_SW_FRT	Windshield wiper and washer switch (low)	On/Off

M5_09T021

Controller Area Network

- The Mazda5 uses an **MS-CAN** (**M**iddle **S**peed-**C**ontroller **A**rea **N**etwork) and an **HS-CAN** (**H**igh **S**peed-**C**ontroller **A**rea **N**etwork) for transmission of multiplex input/output signals between electrical modules, similar to the Mazda3. The instrument cluster is connected to both networks and operates as portal, allowing information exchange between the MS-CAN and the HS-CAN.



M5_09051

- | | | | |
|---|---|----|---|
| 1 | PCM (MZR-CD) | 10 | Climate control unit (with full-auto A/C) |
| 2 | PCM (L8, LF) | 11 | Information display |
| 3 | DSC HU/CM (with DSC) | 12 | Water heater unit (with MZR-CD engine) |
| 4 | ABS HU/CM (with ABS) | 13 | Audio unit (base module) |
| 5 | Rear view monitor control module | 14 | DLC-2 |
| 6 | Keyless control module (with Advanced Keyless Entry system) | 15 | BCM |
| 7 | EHPAS control module (with L8/LF engine) | 16 | CAN-H |
| 8 | Instrument cluster | 17 | CAN-L |
| 9 | Twisted pair | | |

HS-CAN Signal Chart

- The following signals are transmitted via the HS-CAN bus.

Signal	Multiplex module					
	PCM	EHPAS control module (L8, LF)	DSC HU/CM	Rear view monitor control module	Keyless control module	Instrument cluster
			ABS HU/CM			
Engine speed	OUT	IN	IN	–	IN	IN
Vehicle speed	OUT	IN	–	–	IN	IN
Neutral switch position	OUT	IN	–	–	–	–
Engine torque	OUT	IN	IN	–	–	–
			–			
Accelerator pedal position	OUT	–	IN	–	–	–
			–			
Brake pedal position	OUT	–	IN	–	–	–
	IN		–			OUT
Transaxle specifications	OUT	–	IN	–	–	–
			–			
Tire circumference	OUT	–	IN	–	–	–
	IN		OUT			
Engine specifications	OUT	–	IN	–	–	–
			–			
Immobilizer-related information	OUT	–	–	–	–	IN
	IN					OUT
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 (L8, LF)	–	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

M5_09T022-1

Signal	Multiplex module					
	PCM	EHPAS control module (L8, LF)	DSC HU/CM	Rear view monitor control module	Keyless control module	Instrument cluster
			ABS HU/CM			
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
Transaxle in reverse position	IN	-	-	-	-	OUT
Parking brake position	-	IN	-	-	-	OUT
Glow indicator light (MZR-CD)	OUT	-	-	-	-	IN
DPF indicator light (MZR-CD)	OUT	-	-	-	-	IN

M5_09T022-2

MS-CAN Signal Chart

- The following signals are transmitted via the MS-CAN bus.

Signal	Multiplex module					
	Body control module	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 signal 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	–				
Ambient temperature	IN	OUT	–	–	IN	–
A/C Status display request	–	OUT	–	–	–	–
Temperature measuring unit	–	OUT	–	–	–	–
	IN	–				
Audio status display request	–	–	–	–	–	–
Water heater fuel consumption	–	–	–	–	–	IN
Engine speed	IN	–	–	–	–	OUT
Vehicle speed	IN	IN	IN	IN	–	OUT
Engine coolant temperature	–	IN	IN	–	–	OUT
Ignition key position	–	IN	IN	IN	IN	OUT
Driver information system data	–	–	IN	–	–	OUT

M5_09T023

On-board Diagnostic System

- The on-board diagnostic system is essentially the same as the Mazda3, except for the following:
 - CAN related DTCs can now be stored in the information display and Keyless Control Module as these modules are now connected to the area network.

List of Abbreviations

ABS	Acrylonitrile-Butadiene-Styrene	CAN-L	CAN-Low
ABS	Anti-lock Brake System	CD	Compact Disc
ABDC	After Bottom Dead Center	CKP	Crankshaft Position
A/C	Air Conditioning	CMDTC	Continuous Memory DTC
ALC	Auto Level Control	CMP	Camshaft Position
APP	Accelerator Pedal Position	CPP	Clutch Pedal Position
AT	Automatic Transmission	CPU	Central Processing Unit
ATDC	After Top Dead Center	CRS	Child Restraint Seat
ATX	Automatic Transaxle	DC	Direct Current
BARO	Barometric Pressure	DLC	Data Link Connector
BBDC	Before Bottom Dead Center	DSC	Dynamic Stability Control
BCM	Body Control Module	D-PATS	Distributed-PATS
BTDC	Before Top Dead Center	DPF	Diesel Particulate Filter
CAN	Controller Area Network	DRGS	Dynamic Route Guidance System
CAN-H	CAN-High	DTC	Diagnostic Trouble Code

List of Abbreviations

DVD	D igital V ersatile D isc	HDD	H ard D isc D rive
EBD	E lectronic B rake F orce D istribution	HI	H igh
ECT	E ngine C oolant T emperature	HO2S	H eated O2 S ensor
EGR	E xhaust G as R ecirculation	HS-CAN	H igh- S peed CAN
EGRVP	EGR V alve P osition	HU/CM	H ydraulic U nit/ C ontrol M odule
EHPAS	E lectro H ydraulic P ower A ssist S teering	HVAC	H eater, V entilation & A ir C onditioning
ELR	E mergency L ocking R etractor	IAC	I dle A ir C ontrol
EVAP	E vaporative E mission	IAT	I ntake A ir T emperature
FEEPROM	F lash E lectronically E rasable P rogrammable R OM	IC	I nstrument C luster
GMR	G iant M agneto R esistance	ID	I dentification
GND	G round	IG	I gnition
GPS	G lobal P ositioning S ystem	ISV	I ntake S hutter V alve
GR	G ear R atio	KOEO	K ey O n E ngine O ff
		KOER	K ey O n E ngine R unning

List of Abbreviations

KS	Knock Sensor	MOS-FET	Metal Oxide Semiconductor Field Effect Transistor
LCD	Liquid Crystal Display	MP3	Moving Picture Experts Group Layer-3
LED	Light Emitting Diode	MS-CAN	Middle-Speed CAN
LF	Left Front	MTX	Manual Transaxle
LH	Left Hand	NOx	Nitrous Oxide
LO	Low	NTC	Negative Temperature Coefficient
LR	Left Rear	NVH	Noise, Vibration & Harshness
MAF	Mass Air Flow	OBD	On Board Diagnostics
MAP	Manifold Absolute Pressure	OCV	Oil Control Valve
MAV	Multi Activity Vehicle	PAD	Passenger Airbag Deactivation
MAIDAS	Mazda Advanced Impact Distribution and Absorption System	PATS	Passive Anti-Theft System
MD	Mini Disc	PCM	Powertrain Control Module
MD-LP	Mini Disc Long Play	PCV	Positive Crankcase Ventilation
MIL	Malfunction Indicator Light		

List of Abbreviations

PID	Parameter Identification	SAS	Sophisticated Airbag Sensor
PJB	Passenger Junction Box	SST	Special Service Tool
P/S	Power Steering	TCC	Torque Converter Clutch
PSP	Power Steering Pressure	TCS	Traction Control System
P/W CM	Power Window Control Module	TDC	Top Dead Center
RDS	Radio Data System	TFT	Transmission Fluid Temperature
RES	Rear Entertainment System	TMC	Traffic Message Channel
RF	Right Front	TNS	Tail, Number & Side lights
RGB	Red, Green, Blue	TP	Throttle Position
RH	Right Hand	TR	Transmission Range
ROM	Read-Only Memory	Tx	Transmitter (line)
RR	Right Rear	VBC	Variable Boost Control
Rx	Receiver (line)	VIN	Vehicle Identification Number
SAPS	Sulphate Ash, Phosphor, Sulphur	VIS	Variable Intake-air System

List of Abbreviations

VSS	V ehicle S peed S ensor
VTCS	V ariable T umble C ontrol S ystem
WDS	W orldwide D iagnostic S ystem
WU-TWC	W arm U p T hree- W ay C atalyst

List of Abbreviations
