TRAINING
SERVICES
MME

mazda

Training Manual

Mazda BT-50

NMT-009

ZOOM-ZOOM

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Notes:

General Information

Product Concept

- The new Mazda BT-50 supersedes the B-Series, Mazda's present pick-up truck. The aim of the BT-50 development team was to create a new pickup model in line with the current model range delivering Mazda's Zoom-Zoom spirit in its individual and distinctive way.
- The BT-50 has inherited the tough and reliable commercial truck performance of the B-Series. Simultaneously it presents a new fresh body styling and technologies that customers enjoy on passenger cars and also demand more and more for pick-up trucks.
- The BT-50 is offered with **RWD** (**R**ear **W**heel **D**rive) layout as 2WD or as manually activated part-time 4WD.

BT-50_00001

- Plane body panels without the formerly used swage lines and other new styling elements contribute to a more brawny, but clear and modern overall styling impression.

BT-50_00002

BT-50_00022

- The design and material quality of the interior has been improved and now reminds more of a passenger car than of a pick-up truck.

BT-50_00003

- Beside the clearly arranged instrument panel the completely new T-shaped dashboard contains a centre stack panel incorporating the latest modular audio system and the climate control panel, both with easy to operate control elements.

BT-50_00004

- New features of the powertrain, such as the 16-valve DOHC-diesel engine with common rail direct injection and Euro 4 emission standard, the dual-mass flywheel or the 5-speed transmission S15M(X)-D contribute to a driving performance and emission output that are comparable to passenger cars.
- The noise level emitted by the engine has been significantly reduced by the common rail injection system and additionally dampened by broad use of insulation materials.

BT-50_00005

- Other well-proven components, which are adopted from the B-Series as e.g. the chassis with the ladder frame and the suspension, are refined by major or minor changes in material, form, and/or dimension.

BT-50_00006

- The supplemental restraint system is now enhanced by combined head / side airbags as used on the MX-5 (NC).

BT-50_00007

- The BT-50 is basically offered in three different body versions:
  - **REG** (**REG**ular) Cabin, available in 2WD or 4WD layout

BT-50_00008

  - **RAP** (**R**ear **A**ccess **P**anel) Cabin (marketing name is ‘Freestyle Cab’), available in 4WD layout

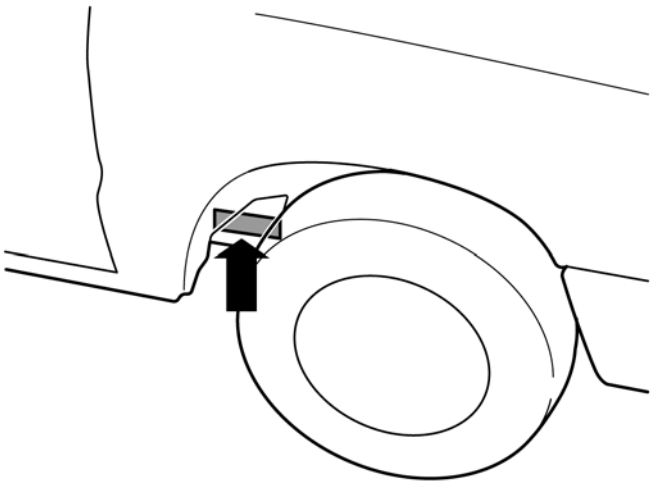
BT-50_00009

  - **DBL** (**D**ou**BL**e) Cabin, available in 4WD layout

BT-50_00010

Vehicle Identification Number

- The VIN is located on the outside of the right chassis member (visible from the right front wheel arch). The model code of the BT-50 has remained ‘UN’, while the serial number starts at 600,001.



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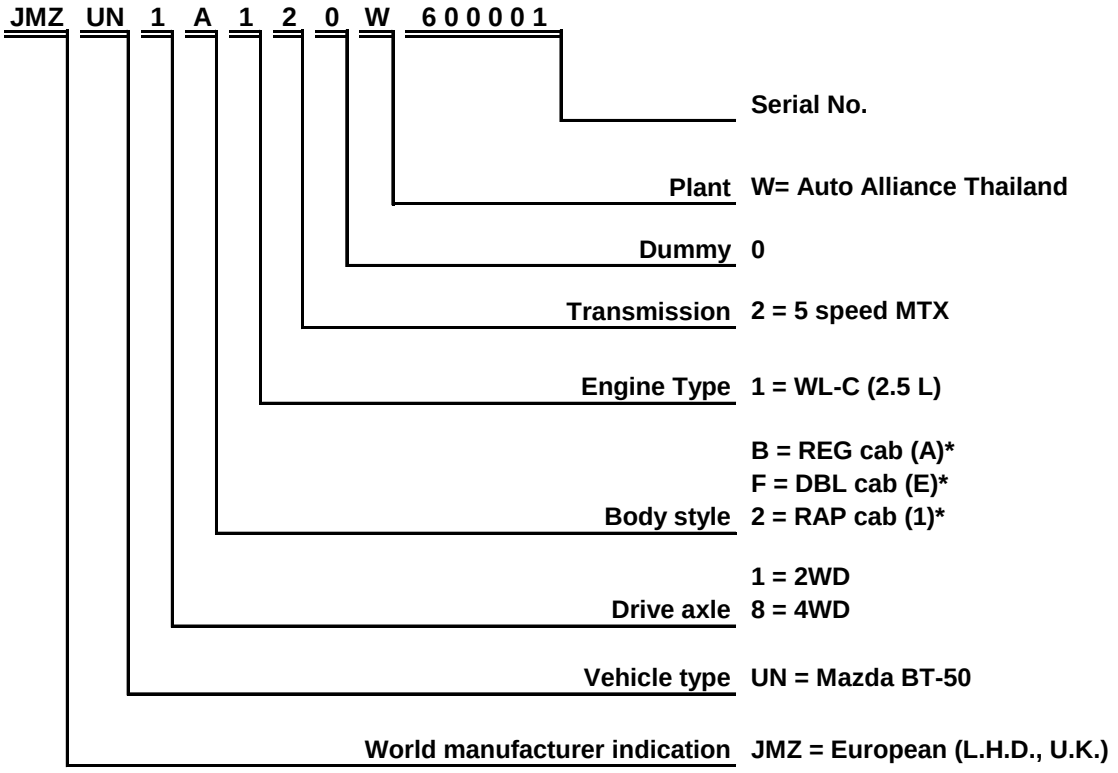
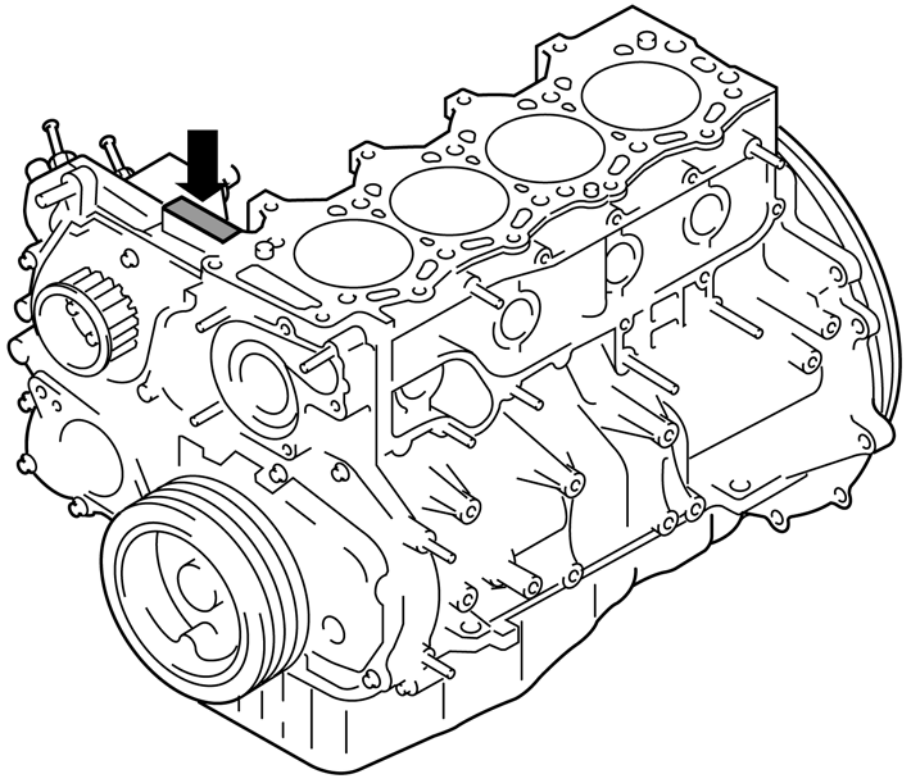


* without cargo box

BT-50_T00001

Engine Identification Number

- The engine identification number of the WL-C engine is located on the timing gear-side of the cylinder block.

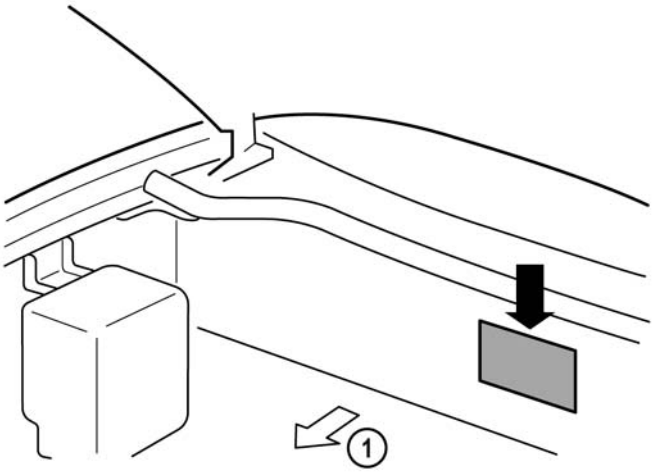


BT-50_00012

Other Vehicle Information Labels

Model Plate

- The model plate is located on the right side of the bulkhead in the engine compartment.

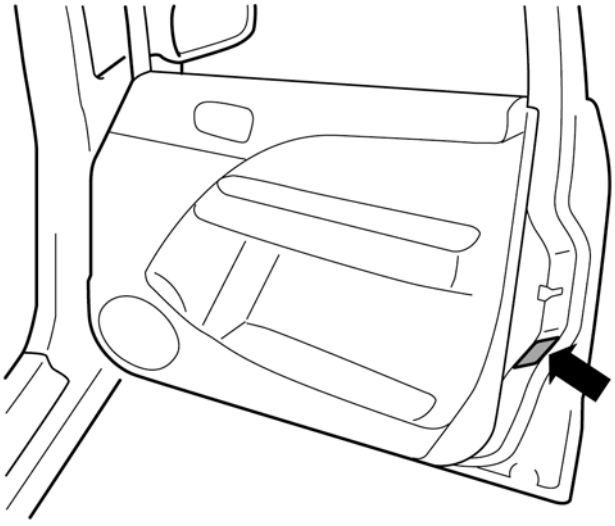


BT-50_00013

1 Driving direction

Tyre Pressure Label

- The tyre pressure label is located on the driver's door as shown below.



BT-50_00014

Technical Data

Item	Unit	REG		RAP	DBL
		2WD	4WD		
Overall length (w/o rear step bumper)	mm	5,075			
Overall width (AWD models with Overfenders)		1,715	1,805		
Overall height (unladen)		1,620	1,745 *1		1,755 *1
			1,750 *2		1,760 *2
Front track		1,445	1,445 *1		
			1,495 *2		
Rear track		1,450	1,440 *1		
			1,470 *2		
Wheelbase		2,985	3,000		
Ground clearance (unladen)		181	207		
Maximum fording depth		300	450		
Angle of approach (unladen)	°	24	32		
Angle of departure (unladen)		26	27		
Minimum turning circle (wall-to-wall)	m	12	12.6		

*1 P235/75R15 *2 245/70R16

BT-50_T00002

Item		Maximum Weight (kg)			
		REG		RAP	DBL
		2WD	4WD		
Curb weight		1,587	1,798	1,886	1,895
Gross vehicle weight		2,795	3,010	3,080	3,030
Gross axle weight	Front	1,170	1,430	1,430	1,430
	Rear	1,860	1,850	1,850	1,850
Max.trailing load	unbraked	750			
	braked	1,600	3,000		

BT-50_T00004

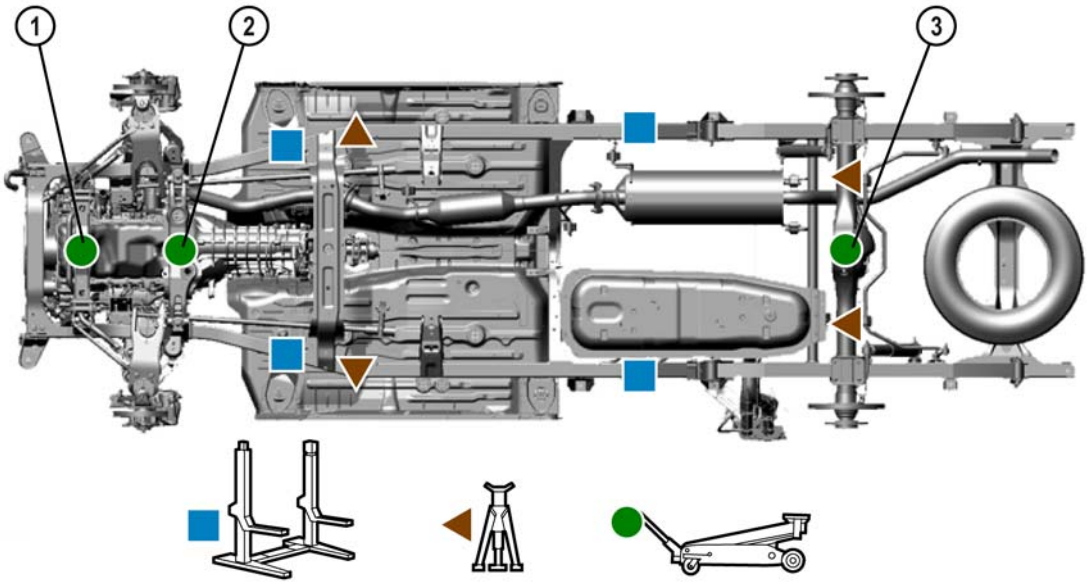
Item	2.5 MZR-CD (WL-C) Engine
Engine type	Inline 4 Cyl., DOHC 16-valve, Turbocharged w.Intercooler
Displacement	2,499 cm^3
Bore x stroke	93 x 92 mm
Compression ratio	18.0 : 1
Max. power	105 kW (143 PS) at 3,500 min^{-1}
Max. torque	330 Nm at 1,800 min^{-1}
Emission standard	Euro 4
Transmission	5-speed manual (S15M(X)-D)

BT-50_T00005

Jacking and Lifting

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

NOTE: The jacking point on the front axle for the 2WD is different to the 4WD model.

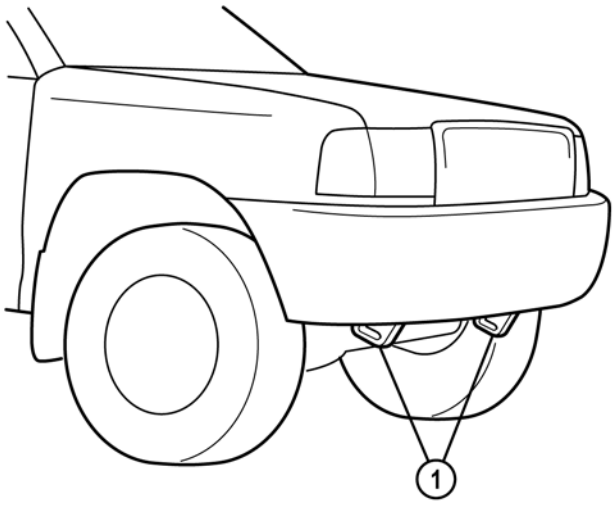


BT-50_00023

1 only 2WD
2 only 4WD
3 2WD and 4WD

Towing

- The towing hooks on the 2WD model are different from the 4WD model.

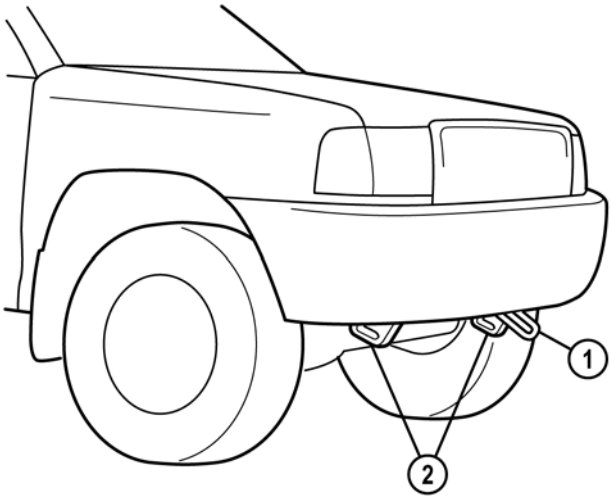


BT-50_00020

2WD

1 Towing hooks

- The 4WD model has two tie-down hooks that may not be used for towing. The towing hook is located on the left side.



BT-50_00021

4WD

1 Towing hook

2 Tie-down hooks

Scheduled Maintenance Table

Maintenance Interval		Number of months or kilometers (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**
ENGINE										
Engine valve clearance		I					I			
Engine timing belt[*1]		Replace every 120,000 km (75,000 miles)								
Engine timing belt auto tensioner*[1]		Replace every 120,000 km (75,000 miles)								
Engine oil[*2]		R	R	R	R	R	R	R	R	R
Engine oil filter[*2]		R	R	R	R	R	R	R	R	R
Drive belts[*3]		I	I	I	I	I	I	I	I	I
COOLING SYSTEM										
Cooling system (including coolant level adjustment)			I		I		I		I	
Engine coolant	FL22 type [*4]	Replace every 200,000 km (125,000 miles) or 11 years								
	Others	Replace first at 100,000 km (62,500 miles) or 4 years; after that every 2 years								
FUEL SYSTEM										
Air cleaner element [*5]		C	C	R	C	C	R	C	C	R
Fuel filter			R		R		R		R	
Fuel lines and hoses		I	I	I	I	I	I	I	I	I
EMISSION CONTROL SYSTEM										
Air intake system		I	I	I	I	I	I	I	I	I
ELECTRICAL SYSTEM										
Battery electrolyte level and specific gravity		I	I	I	I	I	I	I	I	I

BT-50_T00006

Maintenance Interval	Number of months or kilometers (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**
CHASSIS and BODY										
Brake lines, hoses and connections			I		I		I		I	
Brake fluid [*6]			R		R		R		R	
Parking brake		I	I	I	I	I	I	I	I	I
Brake booster and hoses		Inspect every 200,000 km (125,000 miles)								
Disc brakes[*7]		I	I	I	I	I	I	I	I	I
Drum brakes[*7]			I		I		I		I	
Power steering fluid, lines, hoses and connections			I		I		I		I	
Steering operation and linkages		I	I	I	I	I	I	I	I	I
Manual transmission oil			I		I	R		I		I
Rear differential oil (2WD)			I		R		I		R	
Front and rear differential oil (4WD)		R	I	R	I	R	I	R	I	R
Transfer oil (4x4)			I		I	R		I		I
Drive shaft dust boots (4WD)			I		I		I		I	
Propeller shaft joints (4WD)			L		L		L		L	
Front and rear suspension and ball joints		I	I	I	I	I	I	I	I	I
Front wheel bearing grease (2WD) [*8]			R		R		R		R	
Wheel bearing axial play		I	I	I	I	I	I	I	I	I
Exhaust system and heat shields		Inspect every 80,000 km (50,000 miles) or 5 years								
Bolts and nuts on chassis and body		T	T	T	T	T	T	T	T	T
Body condition (for rust, corrosion and perforation)		Inspect annually								
Tyres (including spare tyre) with inflation pressure adjustment		I	I	I	I	I	I	I	I	I

BT-50_T00007

Chart symbols

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

R: Replace

T: Tighten

L: Lubricate

C: Clean

Remarks

- Refer below for a description of items marked with * in the maintenance chart.
  - *1: Replacement of the engine timing belt and auto tensioner is required at every 120,000 km (75,000 miles). Failure to replace the timing belt and the auto tensioner may result in damage to the engine.
  - *2: If the vehicle is operated primarily under any of the following conditions, replace the engine oil and oil filter more often than the recommended intervals.
    a) Driving in dusty conditions
    b) Extended periods of idling or low speed driving
    c) Driving for long periods in cold temperatures or driving regularly at short distance (less than 8 km/ 5 miles) only
  - *3: Also inspect and adjust the power steering and air conditioner drive belts, if installed.
  - *4: 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.
  - *5: If the vehicle is operated in very dusty or sandy areas, clean the air cleaner element at every 10,000 km (6,250 miles) or 6 months. Replace the air cleaner element at every 30,000 km (18,750 miles) or 18 months.
  - *6: If the brakes are used extensively (for example, continuous hard driving or mountain driving) or if the vehicle is operated in extremely humid climates, replace the brake fluid annually.
  - *7: If the vehicle is operated primarily under any of the following conditions, inspect the disc brakes and drum brakes more often than the recommended intervals.
    a) Driving on bumpy roads, gravel roads, snowy roads or unpaved roads
    b) Driving uphill and downhill frequently
    c) Repeated short-distance driving
  - *8: If the vehicle is operated primarily under any of the following conditions, replace the front wheel bearing grease at every 20,000 km (12,500 miles) or 12 months.
    a) Driving in dusty conditions
    b) Driving in rough, muddy or snow-melted conditions
    c) Towing a trailer

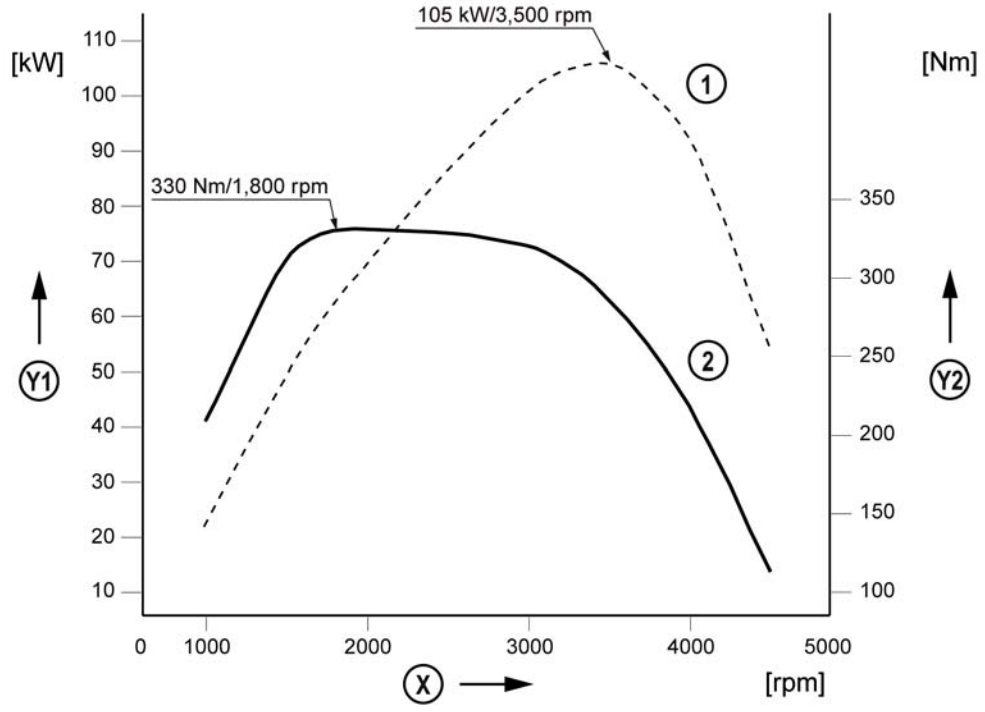
Notes:

WL-C Engine

- The BT-50 is offered with the 2.5 L common rail diesel engine, which has the identification code WL-C.
- The design and operation of the WL-C engine are essentially carried over from that of the B-Series with WLT-3 engine, except for the new features described in the respective sections.

NOTE: Further information can be found in the Training Manual of the 'B-Series' (NMT-005) and in 'Basic Diesel Engine Management' (CT-L2005) and 'Advanced Diesel Engine Management' (CT-L3004).

Engine Performance Curve



BT-50_01001

X	Engine speed	1	Power curve
Y1	Engine power	2	Torque curve
Y2	Engine torque		

Overview

BT-50_01002

Mechanical

Features

- The mechanical system of the WL-C engine has the following new features:
  - Pistons with integrated combustion chamber
  - Coated piston skirt
  - Reduced compression ratio
  - Newly constructed aluminium alloy cylinder head
  - Double overhead camshafts (driven by a timing belt)
  - Four valves per cylinder
  - Adjustable roller-type rocker arms
  - Timing belt auto tensioner

Specifications

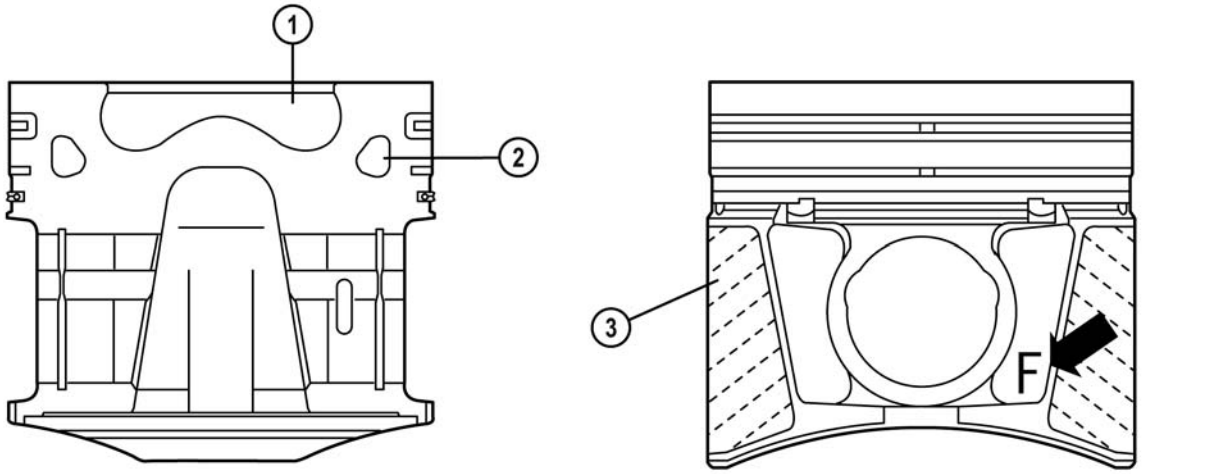
Item			Specification
			WL-C
Type			Diesel 4-stroke
Cylinder arrangement and number			Inline, 4-cylinder
Combustion chamber			Direct injection
Valve system			DOHC, timing gear and belt driven, 16 valves
Displacement		ml	2,499
Bore x stroke		mm	93.0 x 92.0
Compression ratio			18.0:1
Compression pressure		kPa	2,942 (standard) 2,648 (minimum)
Valve timing	IN	Open BTDC (°)	10
		Close ABDC (°)	30
	EX	Open BBDC (°)	40
		Close ATDC (°)	8
Valve clearance (engine cold)	IN	mm	0.10-0.16
	EX	mm	0.17-0.23

BT-50_T01001

Piston

- In accordance with the adoption of the common rail injection system, the piston head shape now incorporates the combustion chamber. Due to the modified piston shape the compression ratio is reduced from 21.6: 1 on the WLT-3 engine to 18.0: 1.
- A reduction of the internal friction and hence of the engine's mechanical loss has been achieved by coating of the piston skirt area.

NOTE: The piston side marked with 'F' must be installed towards the timing gear-side of the engine.



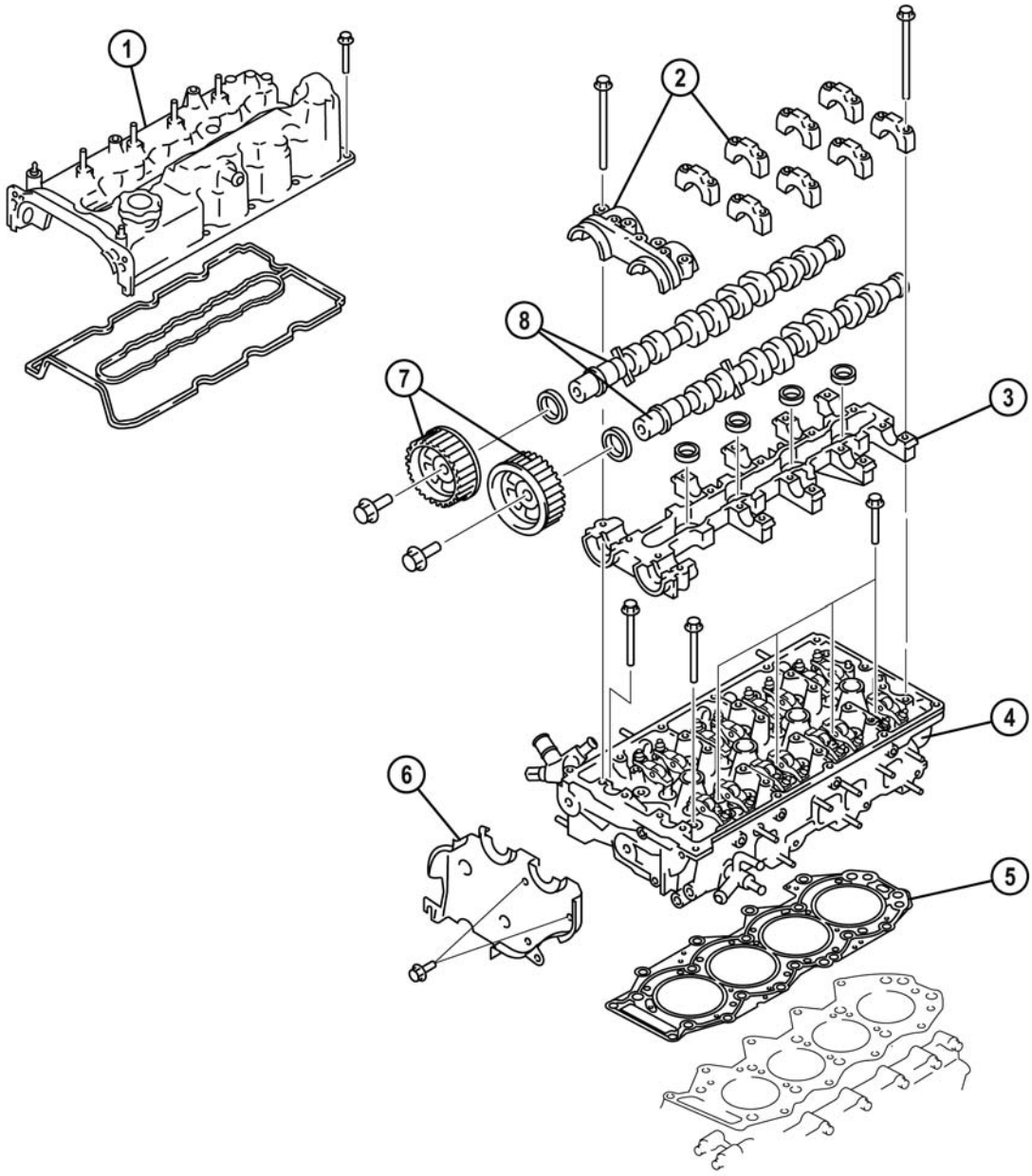
BT-50_01006

1 Combustion chamber
2 Cooling oil channel
3 Piston skirt coating

NOTE: Oversize bearings for the crankshaft and connecting rods, as well as oversize pistons are available in various dimensions (refer to Engine W/M).

Cylinder Head

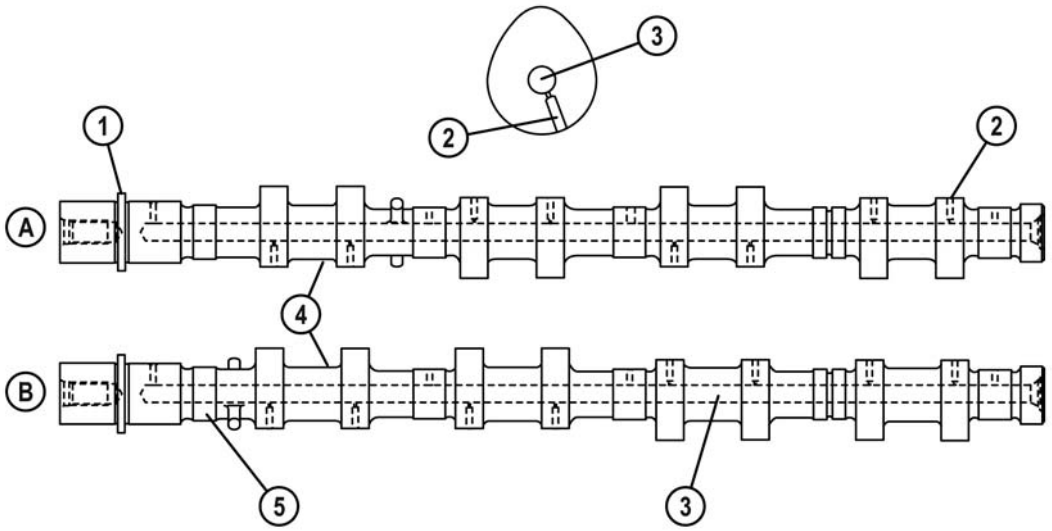
Parts Location



BT-50_01007

1 Cylinder head cover
2 Upper camshaft bearing caps
3 Lower camshaft bearing case with injector sealing rings
4 Cylinder head
5 Cylinder head gasket
6 Seal plate
7 Camshaft pulley
8 Camshaft

- The cylinder head and the full floating cylinder head cover are made of aluminium alloy.
- The steel laminated cylinder head gasket is available in three different thicknesses depending on the piston protrusion. The gasket is marked respectively (refer to Engine W/M).
- The camshafts are supported in a separate bearing case, which is available as a separate spare part.
- For lubrication of the cam lobes, bearings / journals and rocker arms, the camshafts are hollow and have oil bores at each lubricating point.



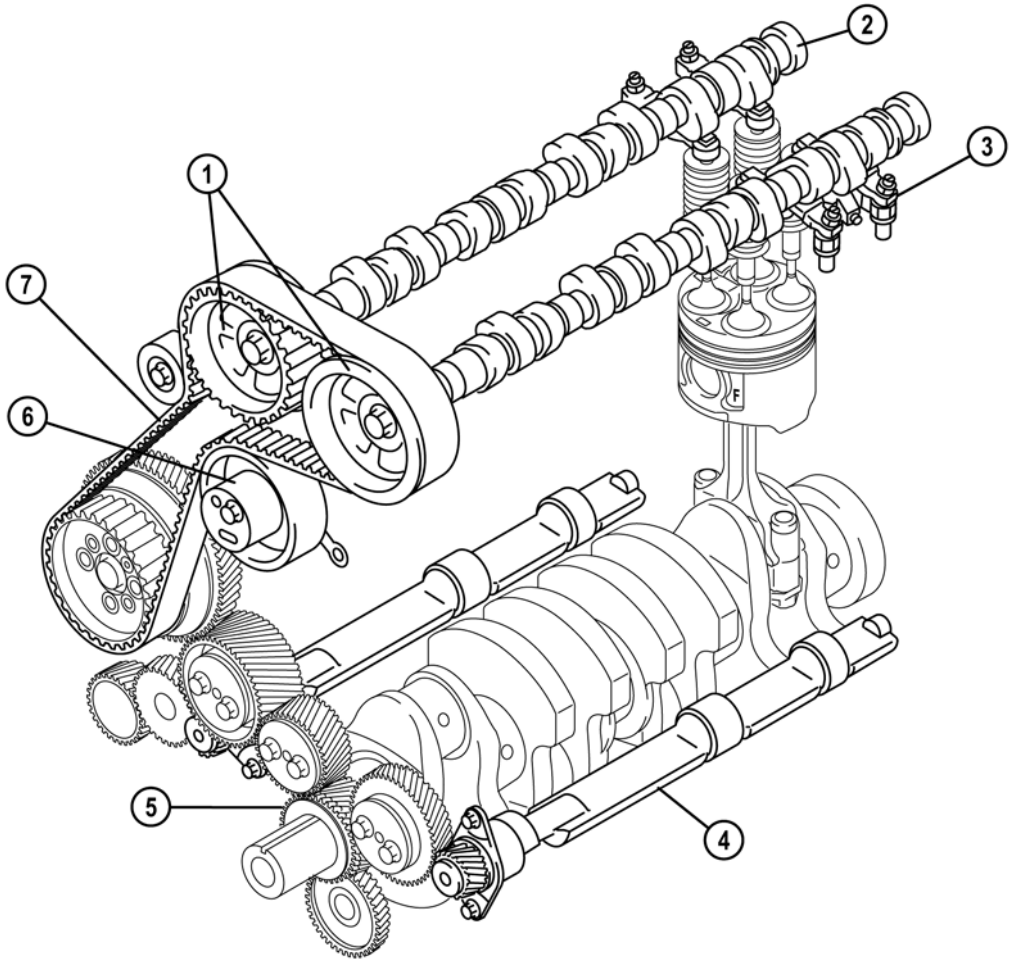
BT-50_01008

A	Exhaust camshaft	3	Oil passage
B	Intake camshaft	4	Location of cylinder no.1
1	Thrust force bearing boss	5	Hexagonal shaped surface
2	Oil bore		

NOTE: The cylinder head surface must not be machined. If necessary, the cylinder head must be replaced (refer to Engine W/M).

Valve Gear

- The valve gear comprises helical gears and a timing belt
- The timing belt drives two camshafts and is adjusted by an auto tensioner.
- Adjustable roller type rocker arms have been adopted to lower the friction between camshaft lobe and rocker arm, reducing the engine's mechanical loss.



BT-50_01009

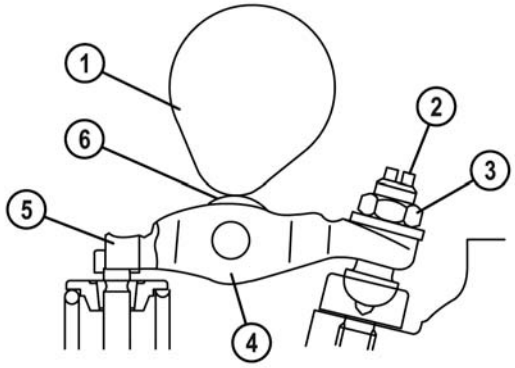
1 Camshaft pulley
2 Camshaft
3 Rocker arm
4 Balancer shaft
5 Helical gear
6 Timing belt auto tensioner
7 Timing belt

NOTE: The construction of the helical gears and their adjustment procedure is identical to that of the WLT-3 engine (refer to the engine W/M).

Valve-Clearance Adjustment

- The valve clearance is measured between roller and cam lobe.

CAUTION: For loosening the locknut of the adjusting screw the cam lobe must push down the rocker arm firmly as shown in the figure below. Otherwise the claw of the rocker arm might be damaged.

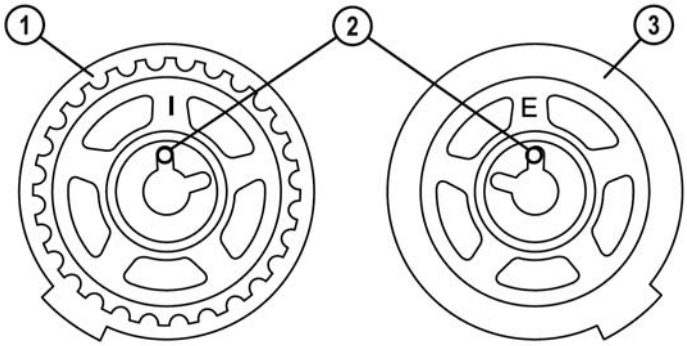


BT-50_01010

1 Cam lobe
2 Adjusting screw
3 Locknut
4 Rocker arm
5 Claw
6 Roller

Camshaft Pulleys

- The camshaft pulleys for intake and exhaust camshaft are identical. They are positioned on the camshaft with pins and have to be installed as shown in the figure below.

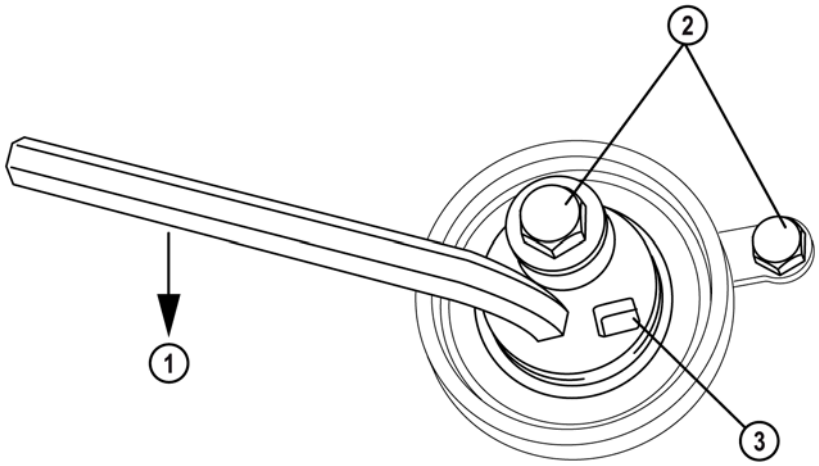


BT-50_01011

1 Intake side camshaft pulley
2 Pin
3 Exhaust side camshaft pulley

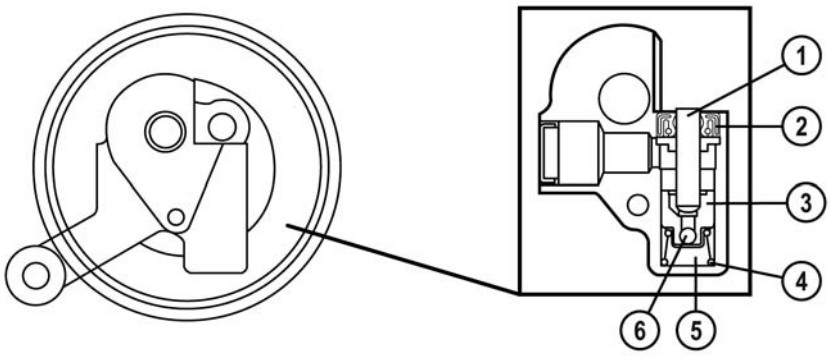
Timing Belt Auto Tensioner

- A timing belt auto tensioner has been adopted to maintain timing belt tension constant. The timing belt tension is released by turning the auto tensioner counterclockwise with the aid of an Allen wrench (with max. 39 Nm apply force). The turned back tensioner is secured by inserting a fixing pin with 6 mm diameter into the appropriate bore (No. 3 in figure below).



BT-50_01055

1 Apply force (max. 39 Nm)
2 Mounting bolts (C+B)
3 Hole for fixing pin



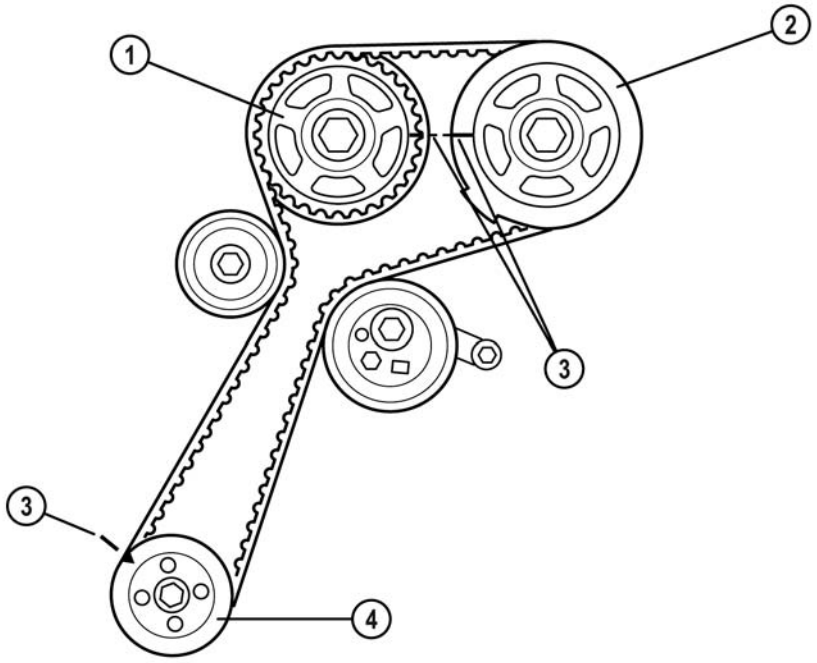
BT-50_01014

1 Rod
2 Seal
3 Plunger
4 Spring
5 Oil
6 Ball

NOTE: In case air has entered the pressure chamber of the auto tensioner, it must be bled using a certain procedure (refer to W/M).

Engine Timing

- When replacing the timing belt the timing marks must be positioned as shown in the figure below.



BT-50_01013

1	Intake camshaft pulley	3	Timing mark
2	Exhaust camshaft pulley	4	High-pressure pump pulley

Lubrication System

Features

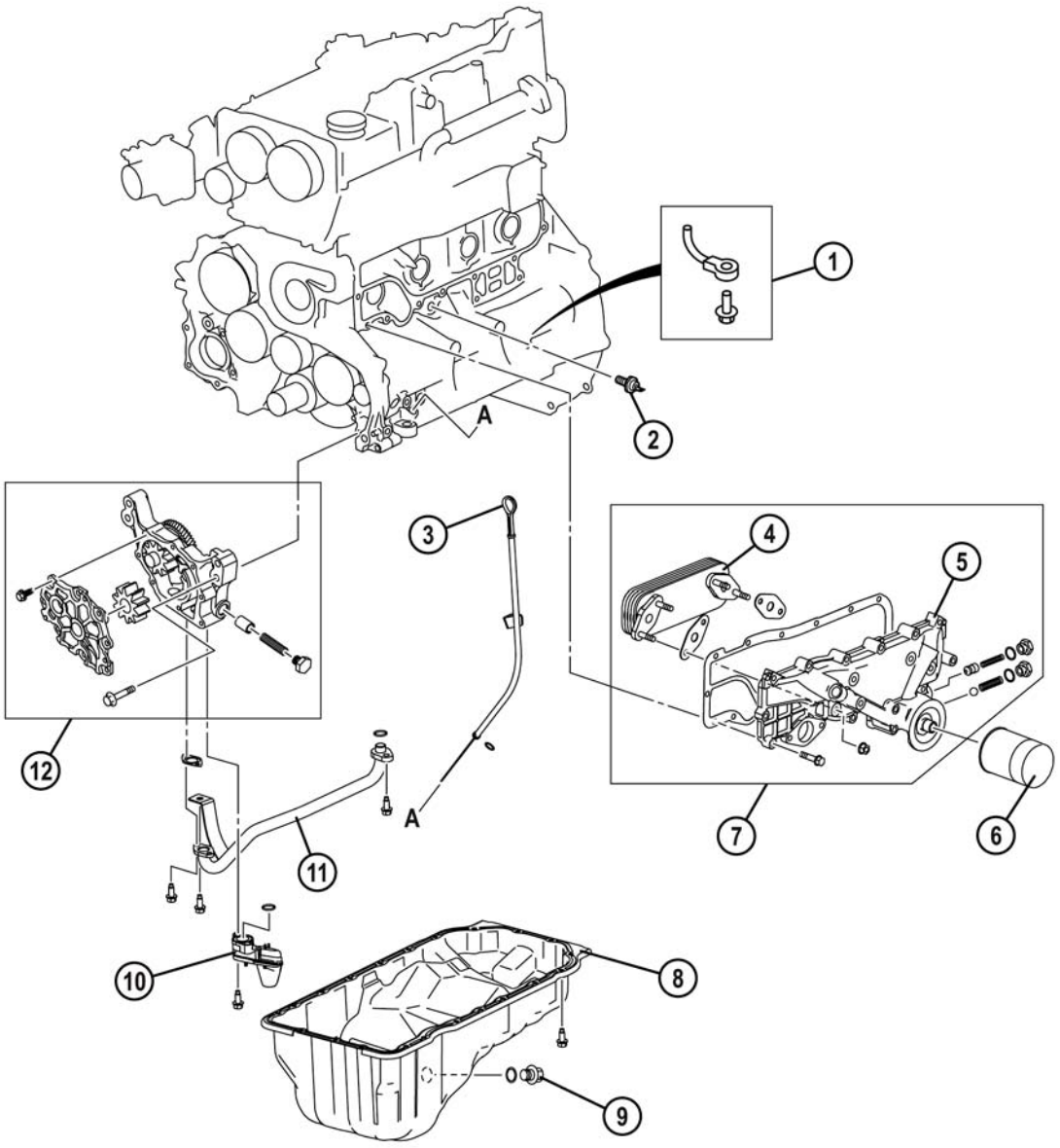
- The lubrication system of the WL-C engine has the following new features:
  - Plastic oil strainer with resin filter
  - Spin-on type oil filter with full-flow paper element
  - Double layer oil pan with additional oil baffle

Specifications

Item			Specification
			WL-C
Type			Force-fed type
Oil pressure (reference values) [after warm up]		(at idle) kPa	100-330
		(at 2,500 rpm) kPa	410-570
Oil pump	Type		Gear type
	Relief valve opening pressure (reference value)	kPa	580-700
Oil cooler	Type		Water-cooled
Oil cooler bypass valve opening pressure		kPa	164-200
Oil filter	Type		Full-flow paper element, spin-on type
	Bypass pressure	kPa	80-120
Oil capacity (approx. quantity)	Total (dry engine)	L	8.0
	Oil replacement		6.8
	Oil and oil filter replacement		7.0
Grade			API CF or ACEA B1/B3/B5
Viscosity (SAE)			5W-30
Remarks			e.g. Mazda genuine Dexelia oil

BT-50_T01003

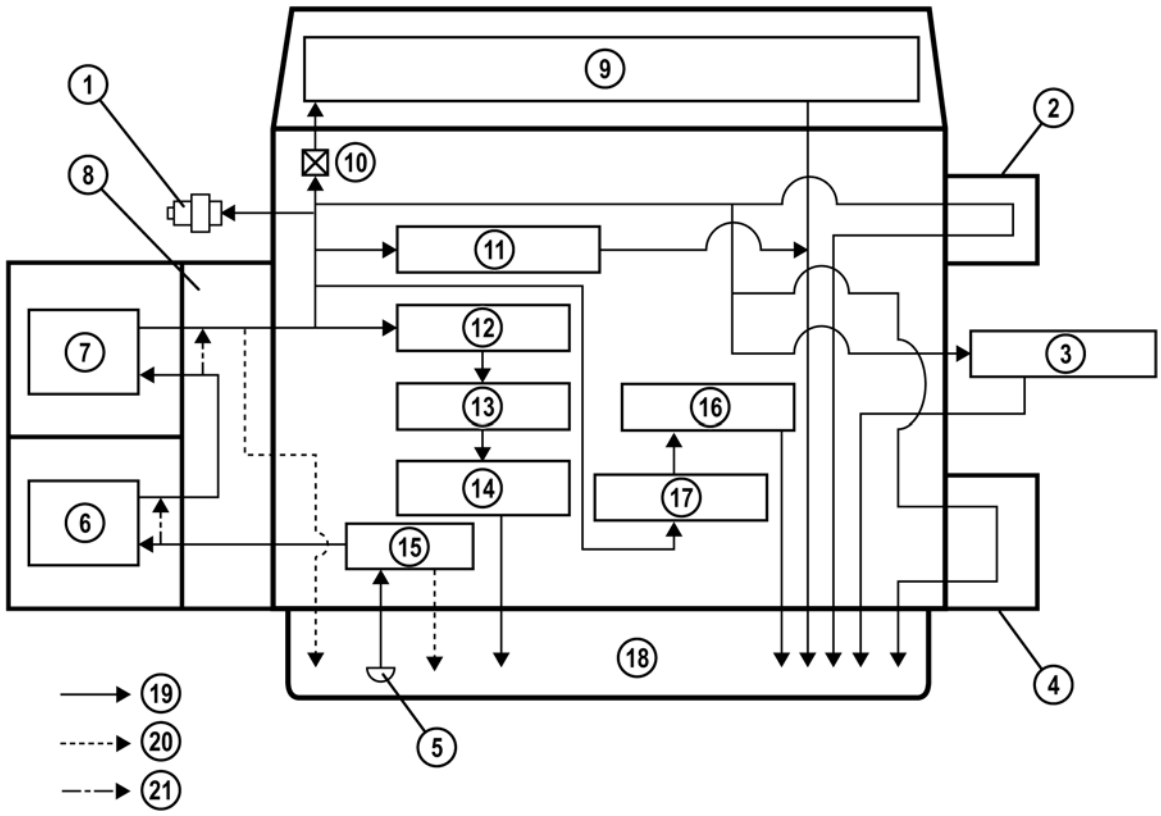
Parts Location



BT-50_01044

1 Oil jet valve
2 Oil pressure switch
3 Oil dipstick
4 Oil cooler
5 Oil filter body
6 Oil filter
7 Oil cooler and oil filter body component
8 Oil pan
9 Oil drain plug
10 Oil strainer
11 Oil outlet pipe
12 Oil pump

System Overview

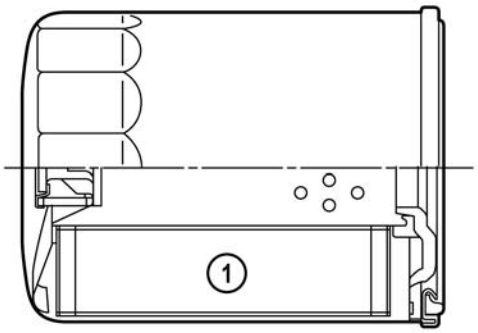


BT-50_01015

1	Oil pressure switch	12	Main bearing
2	Vacuum pump	13	Crankshaft
3	Turbocharger	14	Connecting rod bearing
4	Timing gears	15	Oil pump
5	Oil Strainer	16	Piston
6	Oil filter	17	Oil jet valve
7	Oil cooler	18	Oil pan
8	Oil cooler and oil filter body component	19	Oil passage
9	Camshaft	20	Oil relief passage
10	Orifice	21	Oil bypass passage
11	Balancer shaft		

Oil Filter

- The spin-on type oil filter consists of one full flow element. The bypass element that has been additionally used on the filter WLT-3 engine has been dropped.



BT-50_01017

1 Full-flow paper element

Cooling System

Features

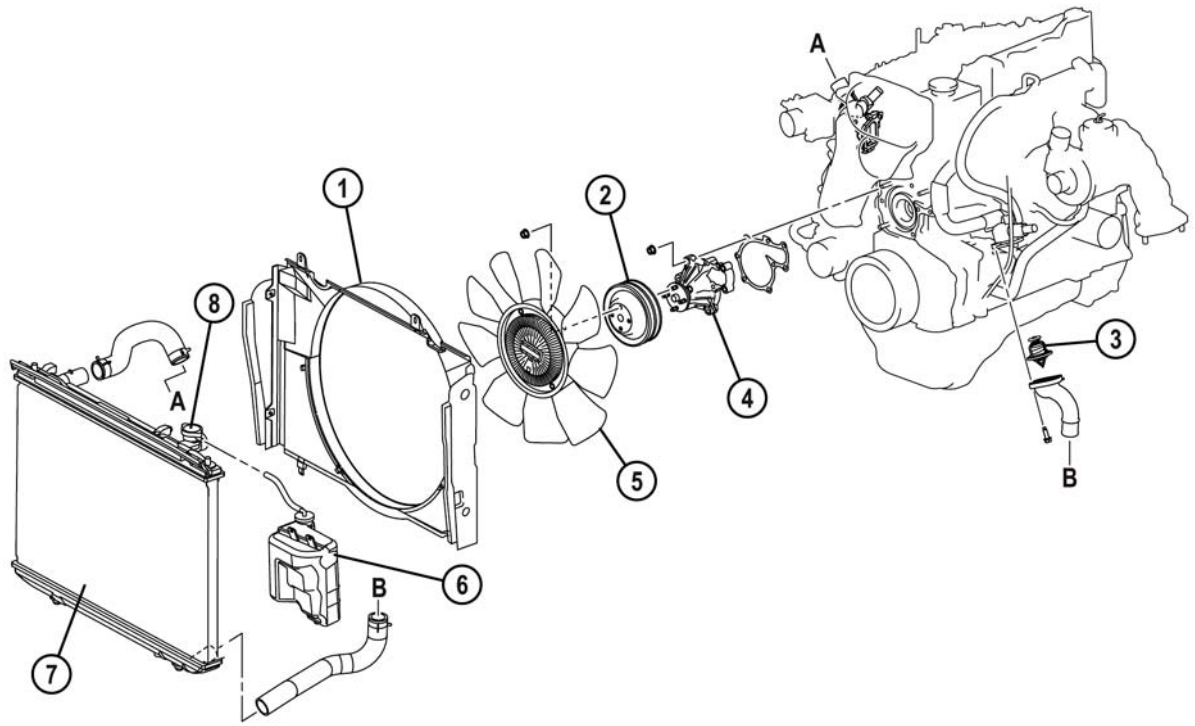
- The cooling system of the WL-C engine has the following new features:
  - Longlife engine coolant FL-22
  - Asymmetric positioned radiator fan blades for noise reduction (thermo-modulated fan-type)

Specifications

Item			Specification
			WL-C
Type			Water-cooled, forced circulation
Coolant capacity (approx. quantity)		L	Without heater: 8.8 With heater: 9.4
Water pump	Type		Centrifugal, V-belt driven
Thermostat	Type		Wax, bottom-bypass
	Opening temperature	°C	80-84
	Full-open temperature	°C	95
	Full-open lift	mm	8.5 or more
Radiator	Type		Corrugated fin
Cooling system cap	Cap valve opening pressure	kPa	93.2-122.6
Cooling fan	Type		Thermo-modulation type
	Number of blades		9
	Outer diameter	mm	450

BT-50_T01005

Parts Location

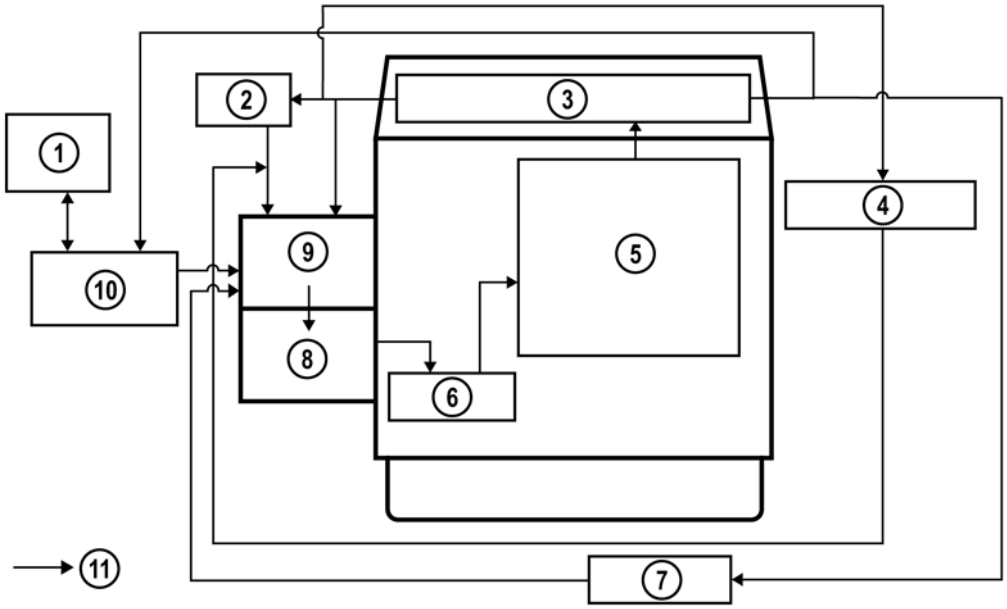


BT-50_01045

1	Radiator cowling	5	Cooling fan
2	Water pump pulley	6	Coolant reserve tank
3	Thermostat	7	Radiator
4	Water pump	8	Cooling system cap

NOTE: To bleed the cooling system follow the instructions of the W/M.

System Overview



BT-50_01018

1 Coolant reserve tank
2 EGR cooler
3 Cylinder head
4 Turbocharger
5 Cylinder block
6 Oil cooler
7 Heater
8 Water pump
9 Thermostat
10 Radiator
11 Coolant flow direction

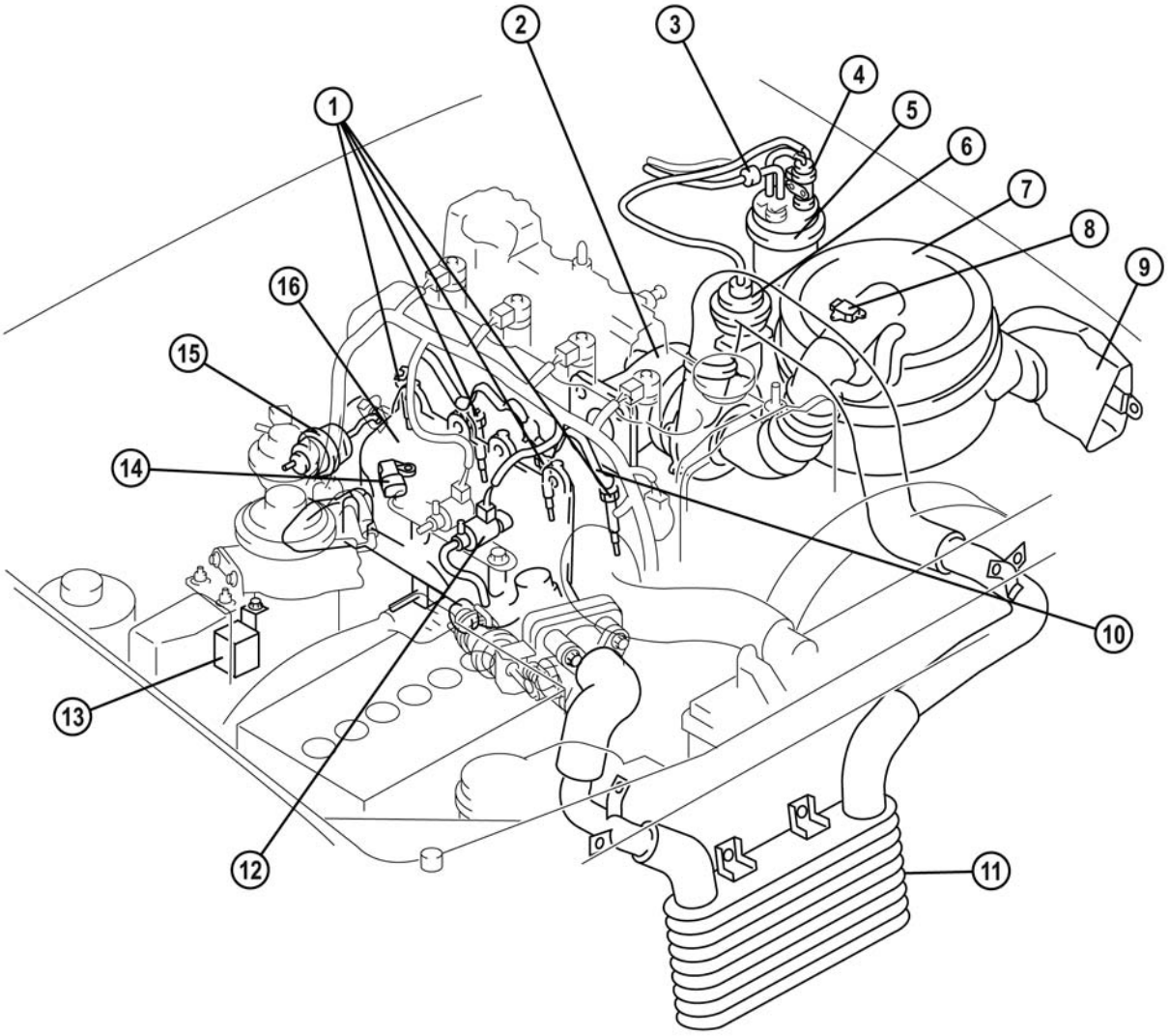
Intake-Air System

Features

- The intake-air system of the WL-C engine has the following new features:
  - Newly designed air cleaner housing with dry filter element
  - **MAF** (**M**ass **A**ir **F**low) sensor with integrated **IAT** (Intake Air Temperature) sensor no.2 *[1)] and MAF learning function
  - **VGT** (**V**ariable **G**eometry **T**urbocharger) with **VBC** (**V**ariable **B**oost **C**ontrol) system *[1)]
  - Enlarged charge-air cooler made of aluminium alloy
  - Newly designed intake manifold with **VSC** (**V**ariable **S**wirl **C**ontrol) system *[1)]
  - Vacuum chamber to reduce vacuum fluctuations
  - **MAP** (**M**anifold **A**bsolute **P**ressure) sensor with integrated IAT sensor no. 1

*[1)] Similar to Mazda6 pre F/L (2.0 MZR-CD)

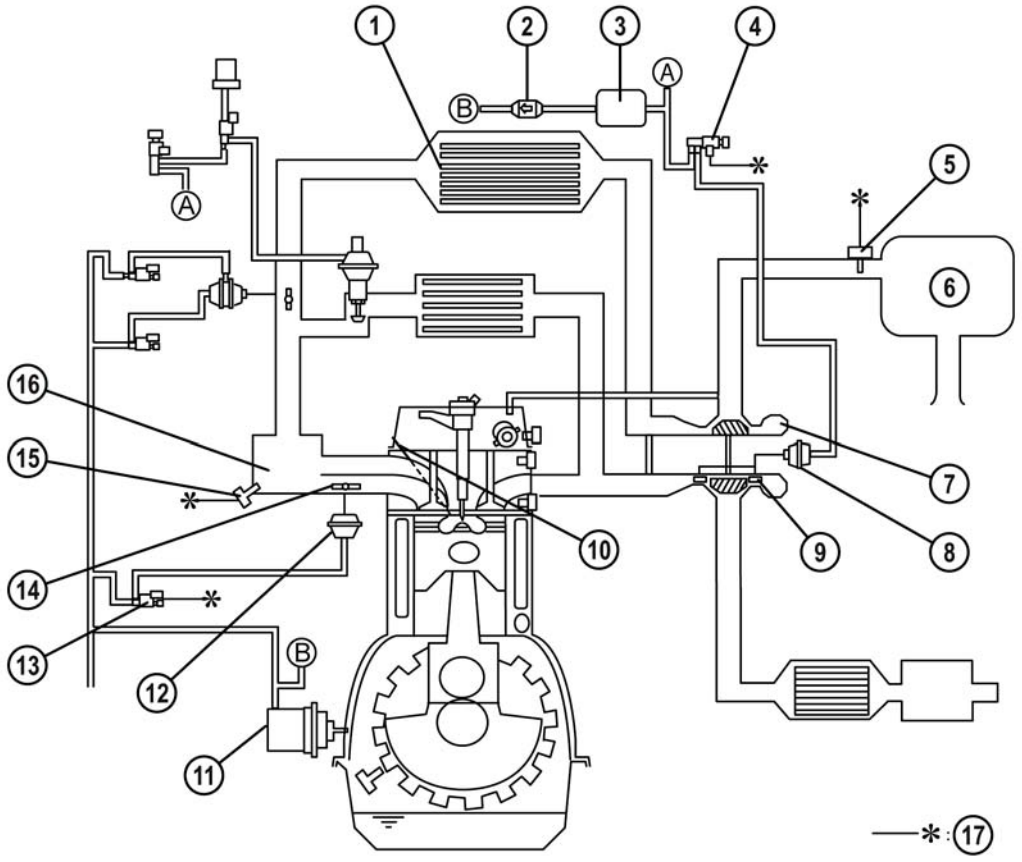
Parts Location



BT-50_01021

1	Glow plug	9	Fresh-air duct
2	VGT	10	Glow plug cord
3	Check valve	11	Charge-air cooler
4	VBC solenoid valve	12	VSC solenoid valve
5	Vacuum chamber	13	Glow plug relay
6	VBC vacuum actuator	14	MAP / IAT no.1 sensor
7	Air cleaner	15	VSC vacuum actuator
8	MAF / IAT no.2 sensor	16	Intake manifold

System Overview



BT-50_01020

1 Charge-air cooler
2 Check valve
3 Vacuum chamber
4 VBC solenoid valve
5 MAF / IAT no.2 sensor
6 Air cleaner
7 VGT
8 VBC vacuum actuator
9 Guide blades
10 Glow plug
11 Vacuum pump
12 VSC vacuum actuator
13 VSC solenoid valve
14 VSC shutter valves
15 MAP / IAT no.1 sensor
16 Intake manifold
17 To PCM

MAF Sensor

- The MAF sensor with integrated IAT sensor no.2 is installed on the air filter.

MAF Learning Function

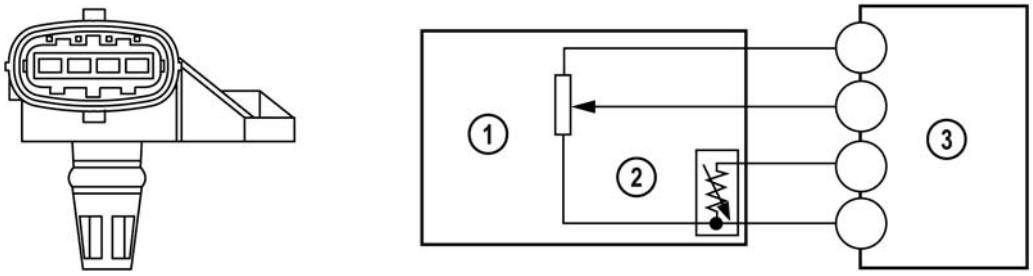
- The MAF learning function is used to compensate any deterioration of the MAF sensor. It should be carried out at each service interval by means of M-MDS (refer to chapter ‘Maintenance and Repair’).

MAF Data Reset

- When the MAF sensor is replaced the adaptation values in the PCM must be reset by means of M-MDS (refer to chapter ‘Maintenance and Repair’).

MAP Sensor / IAT Sensor No.1

- The MAP sensor incorporates IAT sensor no.1 and is installed on the intake manifold.

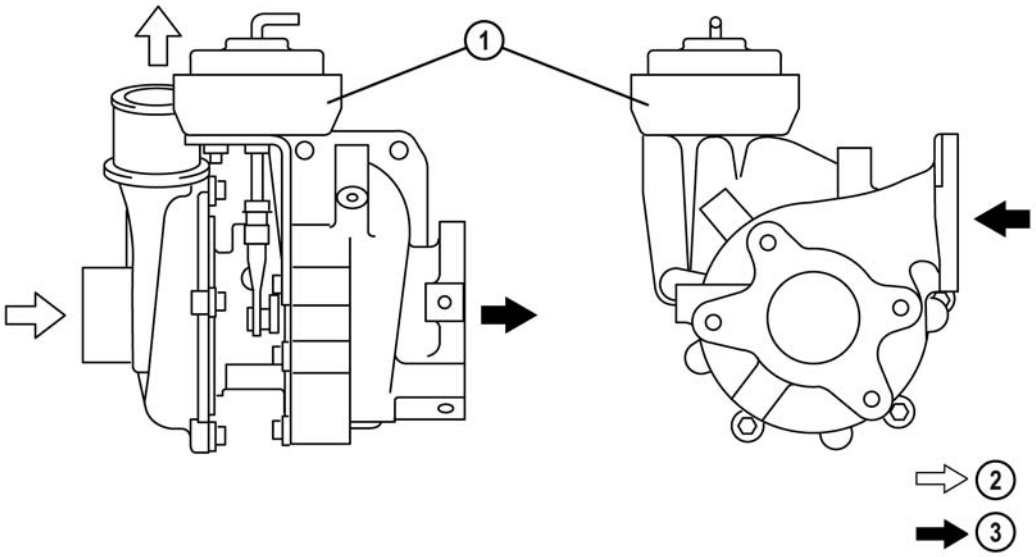


BT-50_01052

1 Boost sensor
2 IAT sensor no.1
3 PCM

Variable Geometry Turbocharger

- The BT-50 uses a VGT, which controls the boost pressure by adjusting guide blades. The operation is similar to that of the VGT used on the Mazda6 (2.0 MZR-CD).

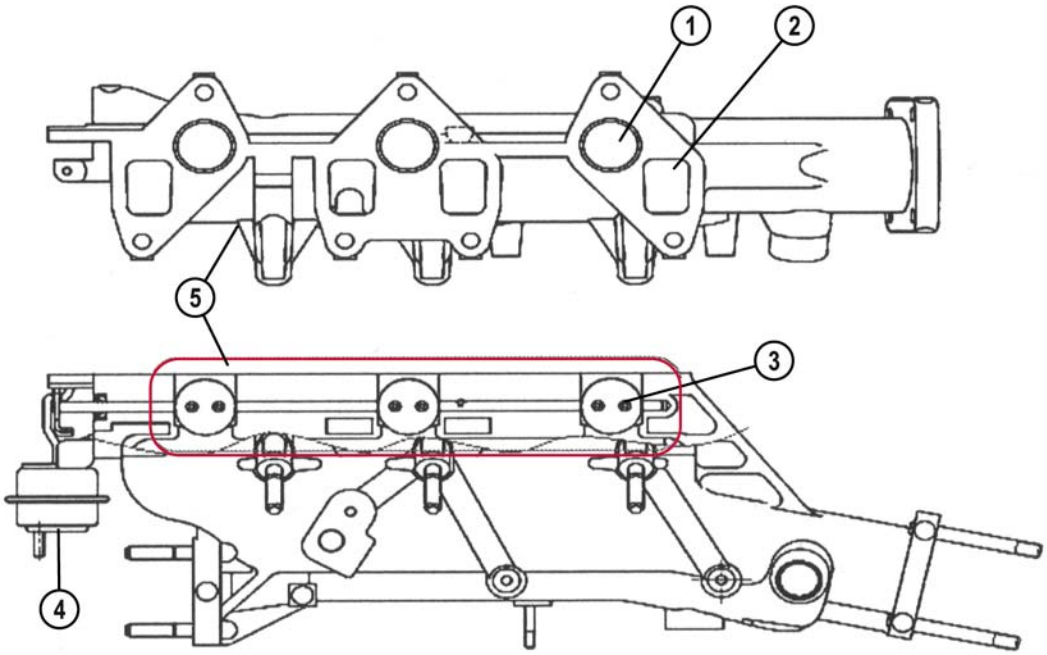


BT-50_01046

1 VBC vacuum actuator
2 Intake-air flow
3 Exhaust-gas flow

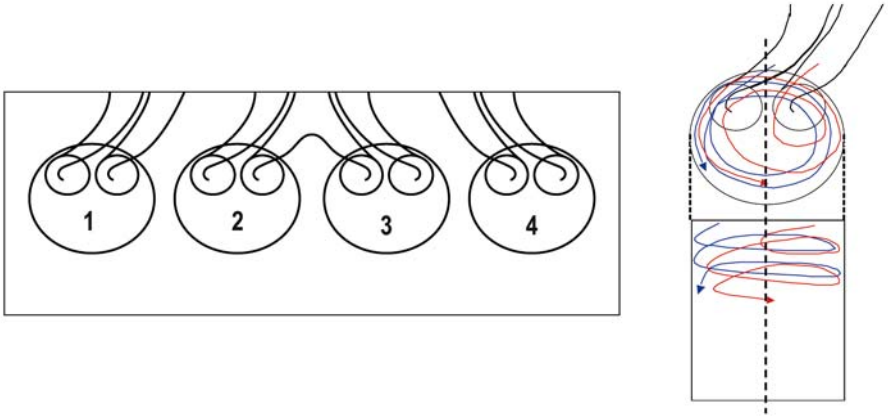
Intake Manifold

- The intake manifold features two helical intake ports per cylinder for optimal swirl of intake air. The 2nd and 3rd cylinder share a common secondary intake port to minimise the required space.



BT-50_01024

1 Secondary intake port
2 Primary intake port
3 VSC shutter valves
4 VSC vacuum actuator
5 Intake manifold



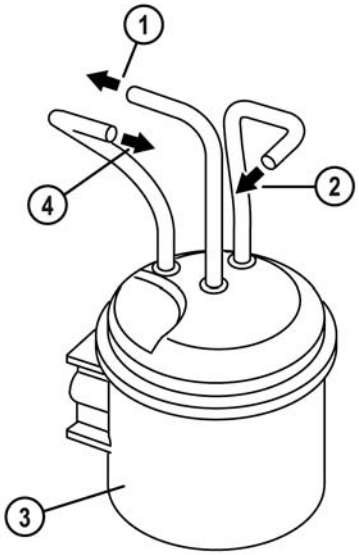
BT-50_01023

Variable Swirl Control Shutter Valves

- The BT-50 uses VSC shutter valves, which reduce the exhaust emissions at low engine speeds. The operation is similar to that of the VSC shutter valves used on the Mazda6 pre F/L with 2.0 MZR-CD engine. The VSC shutter valves are located in the secondary intake ports.
- The VSC shutter valves are operated from idle speed to 2,300 rpm.

Vacuum Chamber

- The vacuum chamber reduces vacuum fluctuations in the vacuum supply line for the VBC and EGR solenoid valve.



BT-50_01025

1 To vacuum pump
2 To VBC solenoid valve
3 Vacuum chamber
4 To EGR solenoid valve

Fuel System

Features

- The fuel system of the WL-C engine has the following new features:
  - High-pressure pump incorporating gear-type feed pump with overflow valve, three element-type radial piston pump, fuel metering valve, and fuel temperature sensor *1)
  - Common rail with fuel pressure sensor and pressure limiter valve *2)
  - Solenoid valve-type fuel injectors with injector correction factors, directly controlled by the PCM *1)
  - Multiple fuel injection (up to two pilot injections, but no post injections)
  - Check valve in the fuel return line to prevent fuel from flowing back to the injectors

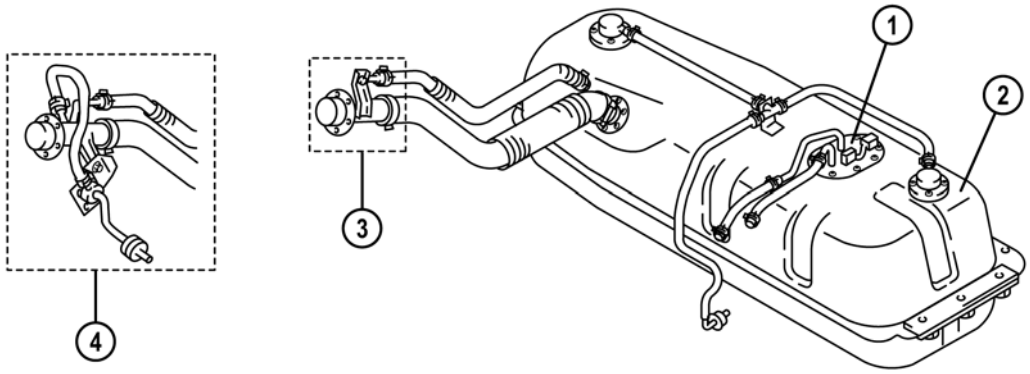
*1) Similar to Mazda3 (1.6 MZ-CD)
*2) Similar to Mazda6 (2.0 MZR-CD)

Specifications

Item		Specification	
High-pressure pump		Bosch CP3S3	
Rail Pressure	MPa	at idle	Max.
		32	160
Fuel tank capacity	L	2WD	4WD
		63	70

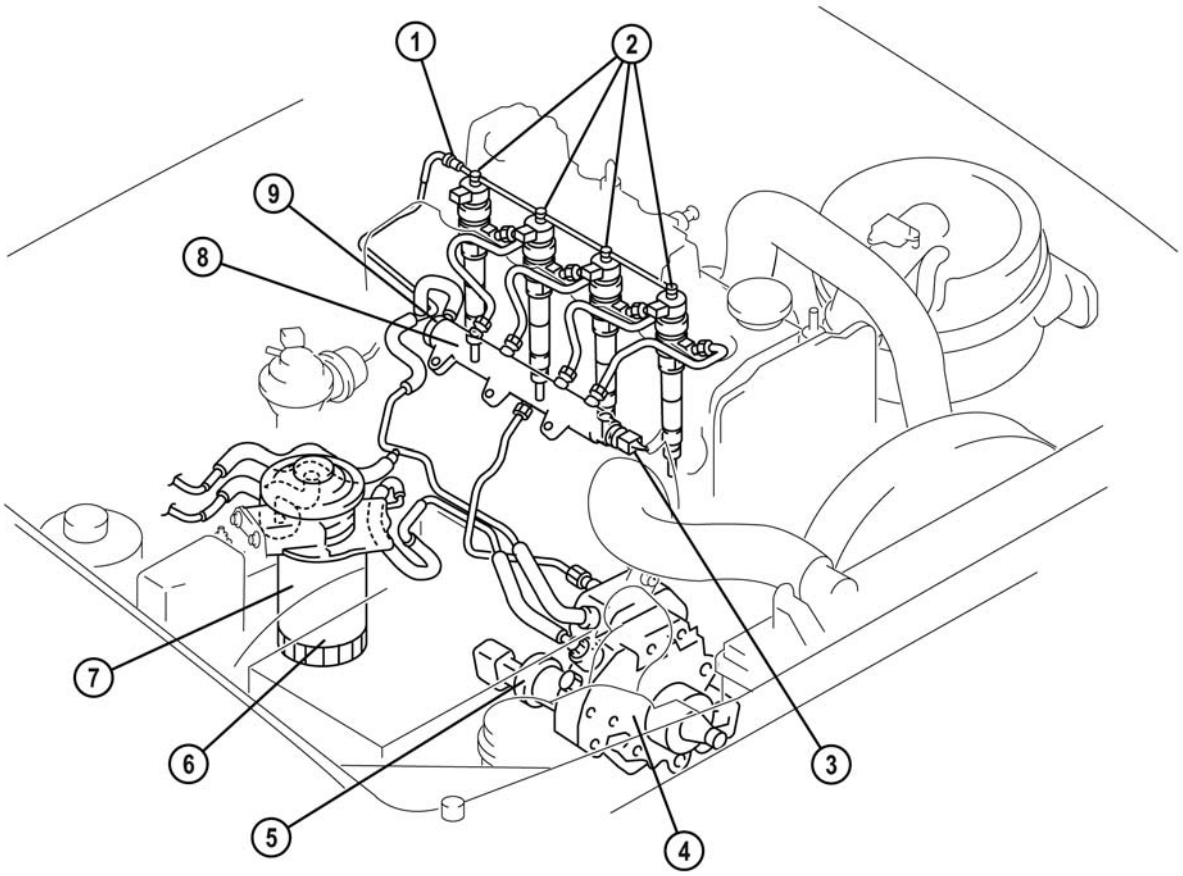
BT-50_T01012

Parts Location



BT-50_01027

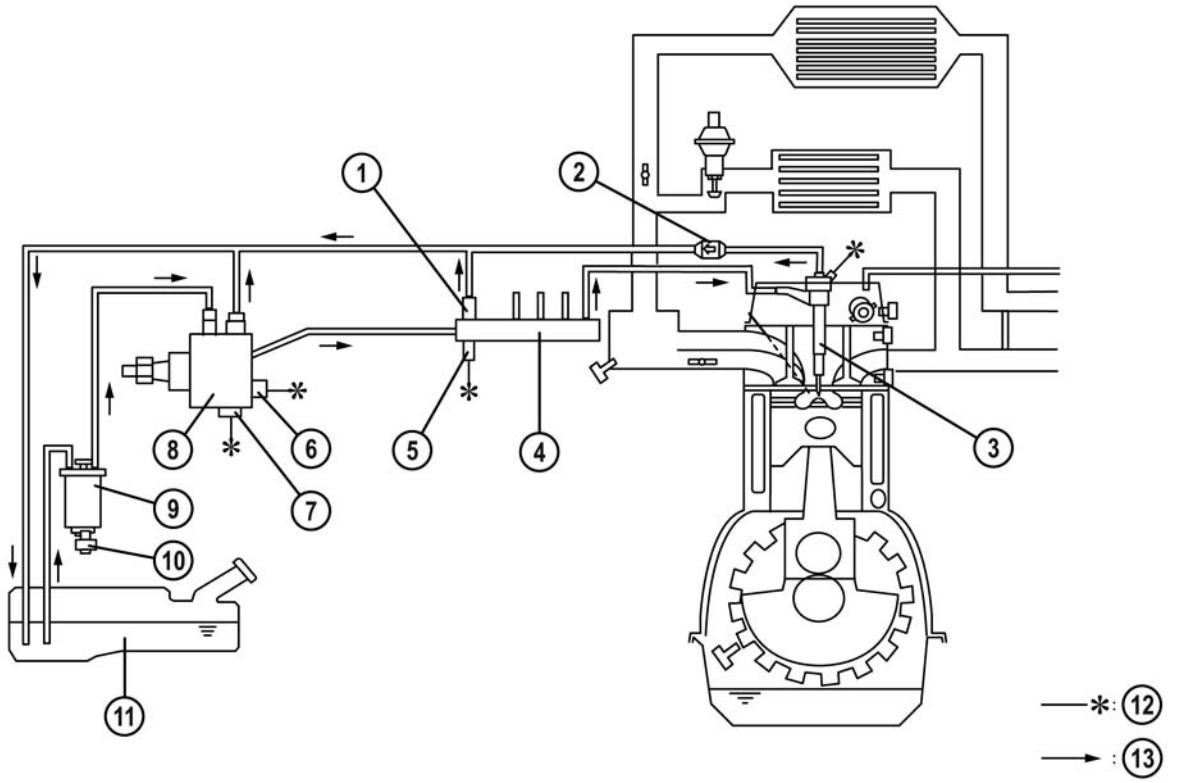
1 Fuel gauge sender unit
2 Fuel tank (4WD)
3 Vehicles with cargo box
4 Vehicles without cargo box



BT-50_01028

1 Check valve in fuel return line
2 Fuel injectors
3 Fuel pressure sensor
4 High-pressure pump
5 Fuel metering valve
6 Sedimentor switch
7 Fuel filter (incl. fuel warmer for cold regions)
8 Common rail
9 Pressure limiter valve

System Overview

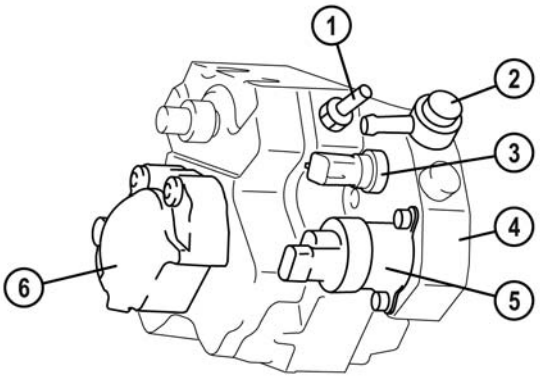


BT-50_01029

1 Pressure limiter valve
2 Check valve
3 Fuel injector
4 Common rail
5 Fuel pressure sensor
6 Fuel metering valve
7 Fuel temperature sensor
8 High-pressure pump
9 Fuel filter
10 Sedimentor switch
11 Fuel tank
12 To PCM
13 Fuel flow

High-Pressure Pump

- The BT-50 uses the high-pressure pump (CP3S3) with three pumping elements offset by 120°. The operation is similar to the high-pressure pump (CP3.2) used on the Mazda3 (1.6 MZ-CD), which is also manufactured by Bosch.

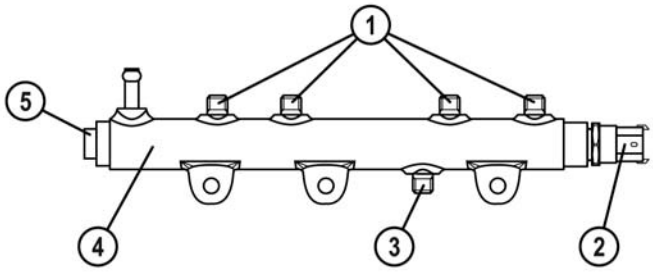


BT-50_01030

1 Fuel return
2 Fuel high-pressure from fuel filter
3 Fuel temperature sensor
4 High-pressure pump
5 Fuel metering valve
6 Gear-type feed pump

Common Rail

- The common rail is equipped with a fuel pressure sensor and a pressure limiter valve, which are not available as separate spare parts. In case of a malfunction on these components the common rail must be replaced as a unit.



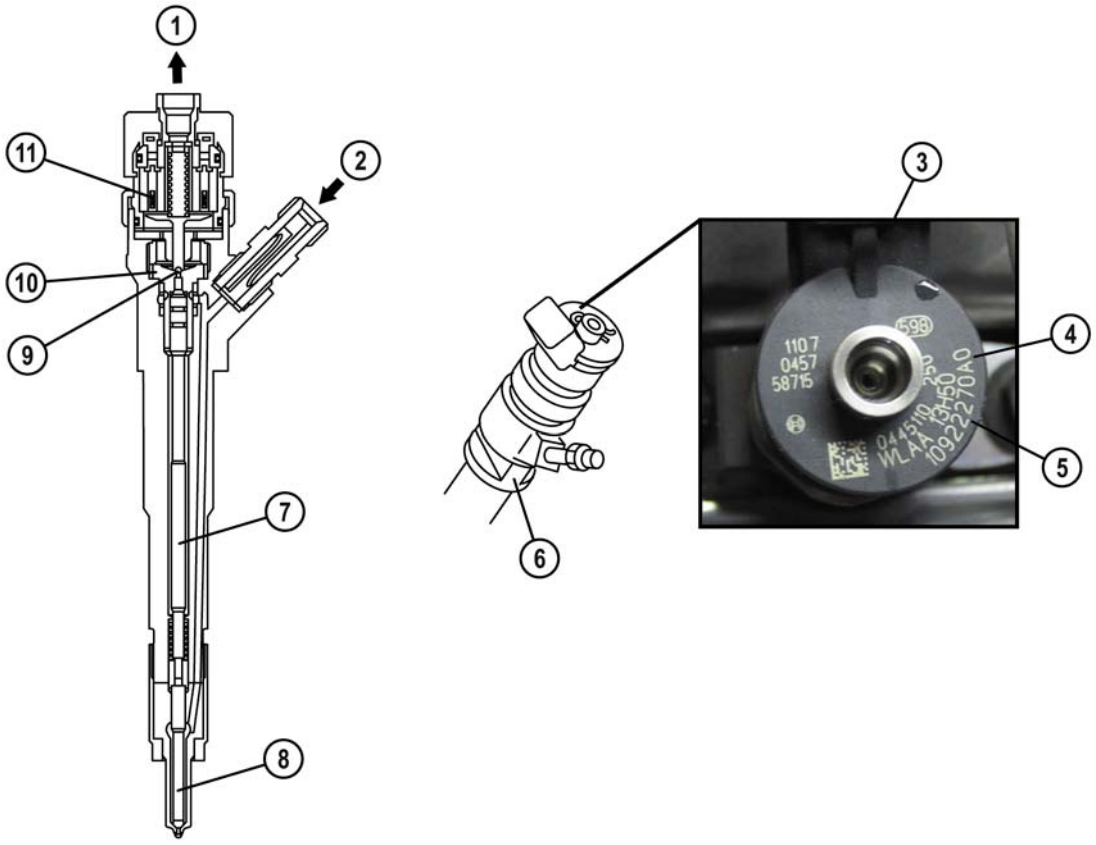
BT-50_01031

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

NOTE: The high-pressure pipes can be re-used up to five times after removing.

Fuel Injectors

- The WL-C engine uses solenoid valve-type fuel injectors, which are directly controlled by the PCM. The operation is similar to the Mazda3 (1.6 MZ-CD).
- The fuel injectors are mounted with brackets to the cylinder head.
- When a fuel injector has to be replaced the eight-digit injector correction factor must be programmed into the PCM by means of M-MDS (refer to the chapter ‘Maintenance and Repair’).



BT-50_01048

1	Return fuel flow (to fuel tank)	7	Valve control plunger
2	Fuel flow (from common rail)	8	Nozzle needle
3	Injector head	9	Valve ball
4	Injector classification code (A0 for the WL-C engine)	10	Orifice plate
5	Injector correction factor	11	Solenoid valve coil
6	Fuel injector		

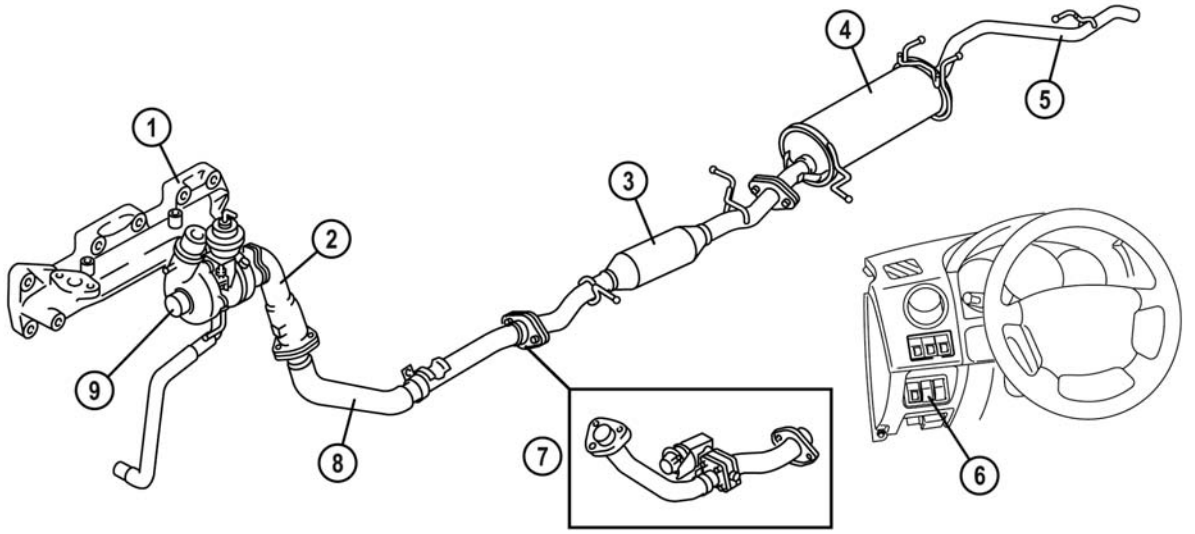
NOTE: The injector sealing rings located in the lower camshaft bearing case have to be replaced at each removal of the injectors.

Exhaust System

Features

- The exhaust system has the following new features:
  - Modified exhaust manifold
  - Warm up system with exhaust shutter valve (if equipped)

Parts Location



BT-50_01034

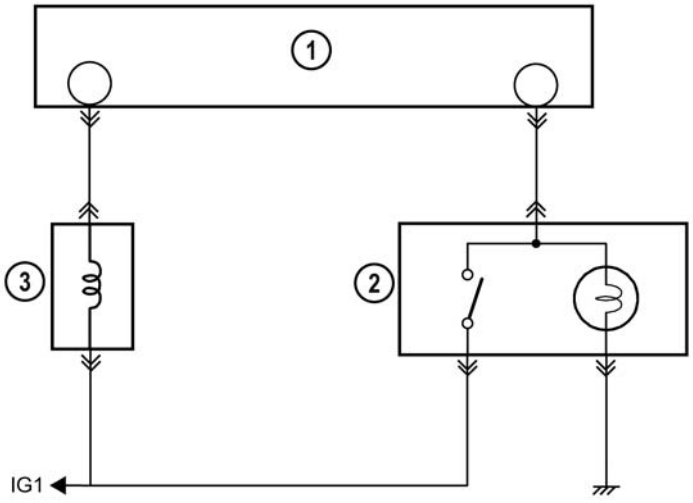
1 Exhaust manifold
2 Joint pipe
3 Oxidation catalytic converter
4 Main silencer
5 Tail pipe
6 Warm up switch
7 With exhaust shutter valve
8 Front pipe
9 VGT

Warm-Up System

- Since the common-rail diesel engines do not provide enough residual heat for the heating system of the vehicle, a warm-up system has been adopted to heat up the passenger compartment quickly at low ambient temperatures. It consists of:
  - Warm-up switch
  - PCM
  - Exhaust shutter valve solenoid valve
  - Exhaust shutter valve vacuum actuator
  - Exhaust shutter valve

- When the driver pushes the warm-up switch the PCM energizes the exhaust shutter valve solenoid valve. Thereby vacuum is applied to the exhaust shutter valve vacuum actuator, which closes the exhaust shutter valve in the front pipe of the exhaust system. Due to the closed shutter valve the exhaust gas backpressure raises, accelerating engine warming-up and thus quickly providing warm engine coolant for the heating system.

Wiring Diagram



BT-50_01054

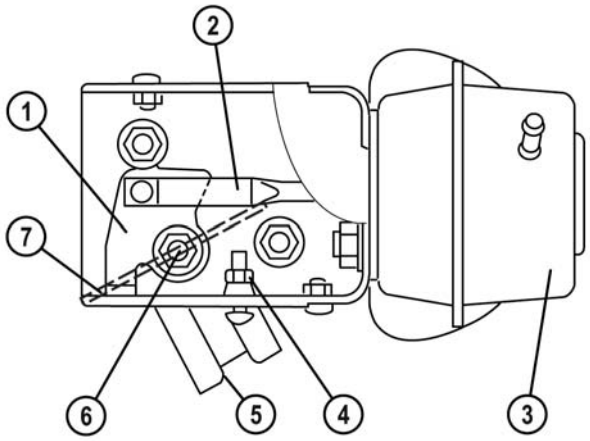
1 PCM
2 Warm up switch
3 Exhaust shutter valve solenoid valve

Exhaust Shutter Valve Solenoid Valve

- The exhaust shutter valve solenoid valve (ON/OFF-type) is located above the vacuum chamber in the engine compartment.

Exhaust Shutter Valve Unit

- The exhaust shutter valve unit consists of exhaust shutter valve, exhaust flange, transfer lever, stop screw, actuation rod, and vacuum actuator.



BT-50_01053

1 Transfer lever
2 Actuation rod
3 Exhaust shutter valve vacuum actuator
4 Stop screw
5 Exhaust flange
6 Pivot
7 Exhaust shutter valve

Operating Conditions

- The warm-up system operates when all of the following conditions are met:
  - Warm-up switch pushed
  - ECT below 77 °C
  - IAT (no.2) below 13 °C
  - Engine speed below 1,370 rpm.

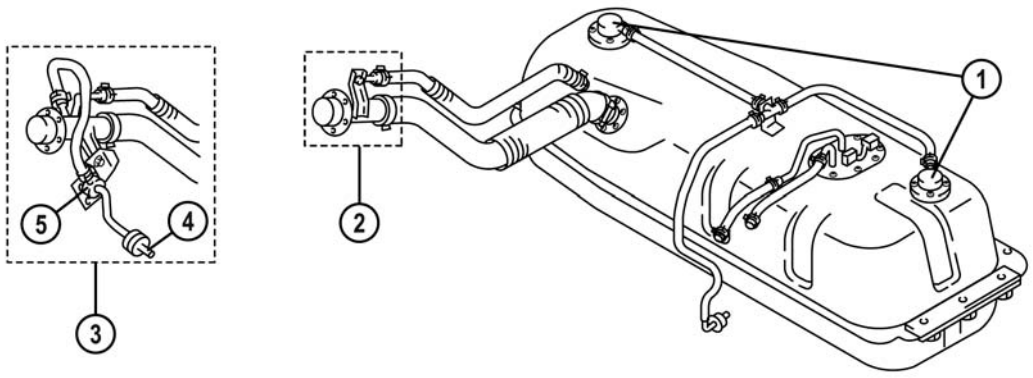
Emission System

Features

- The emission system of the WL-C engine has the following features:
  - One EGR solenoid valve to control EGR valve position instead of two solenoid valves as used on the B-series *1)
  - EGR control solenoid valve for quick EGR cut-off
  - EGR valve position sensor
  - Enlarged EGR cooler
  - Three-step **ISV** (**I**ntake **S**hutter **V**alve) with vacuum actuator *2)
  - ISV solenoid valve (half) and ISV solenoid valve (full) *2)
  - Oxidation catalytic converter

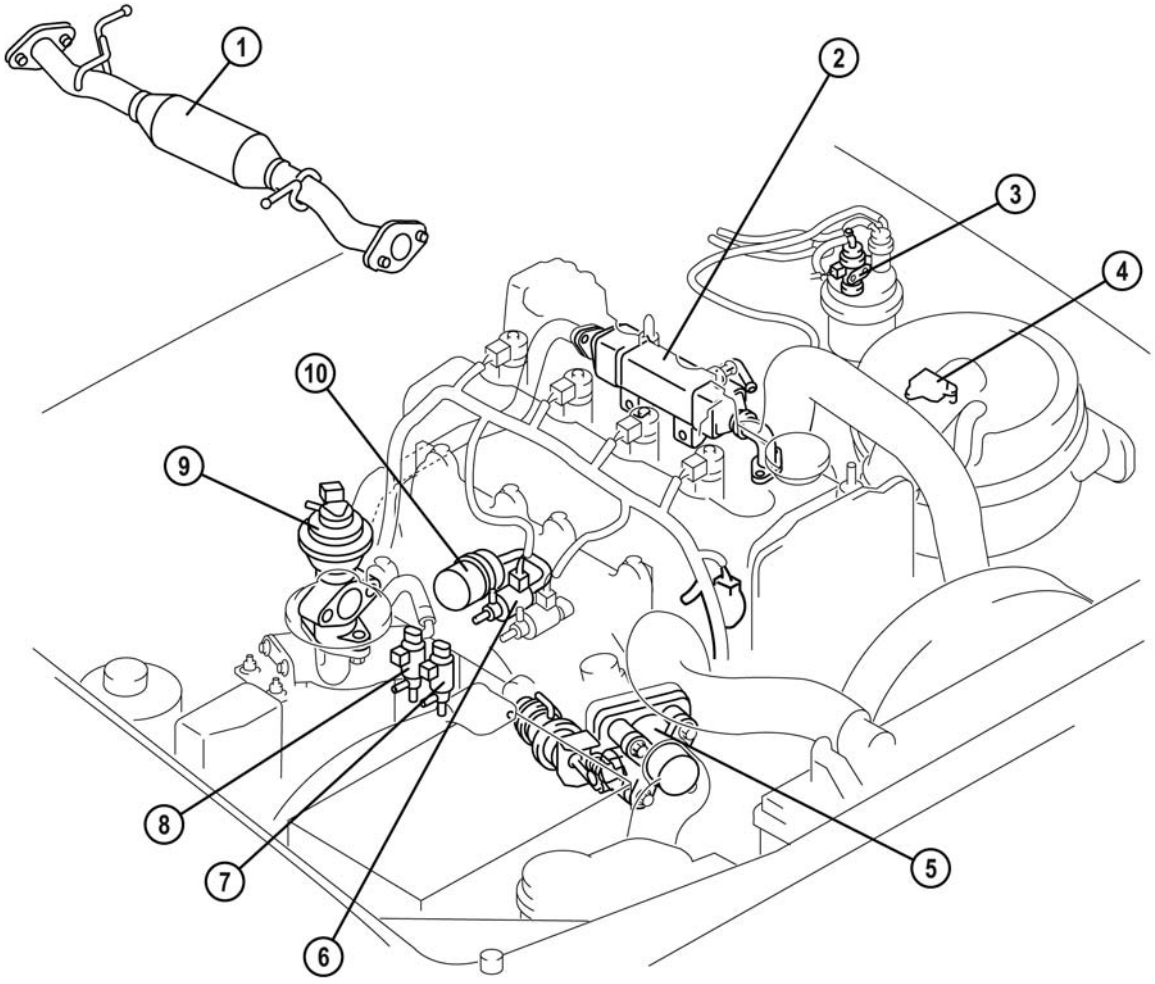
*1) Similar to Mazda2 pre F/L (1.4 MZ CD)
*2) Similar to Mazda6 pre F/L (2.0 MZR CD)

Parts Location



BT-50_01032

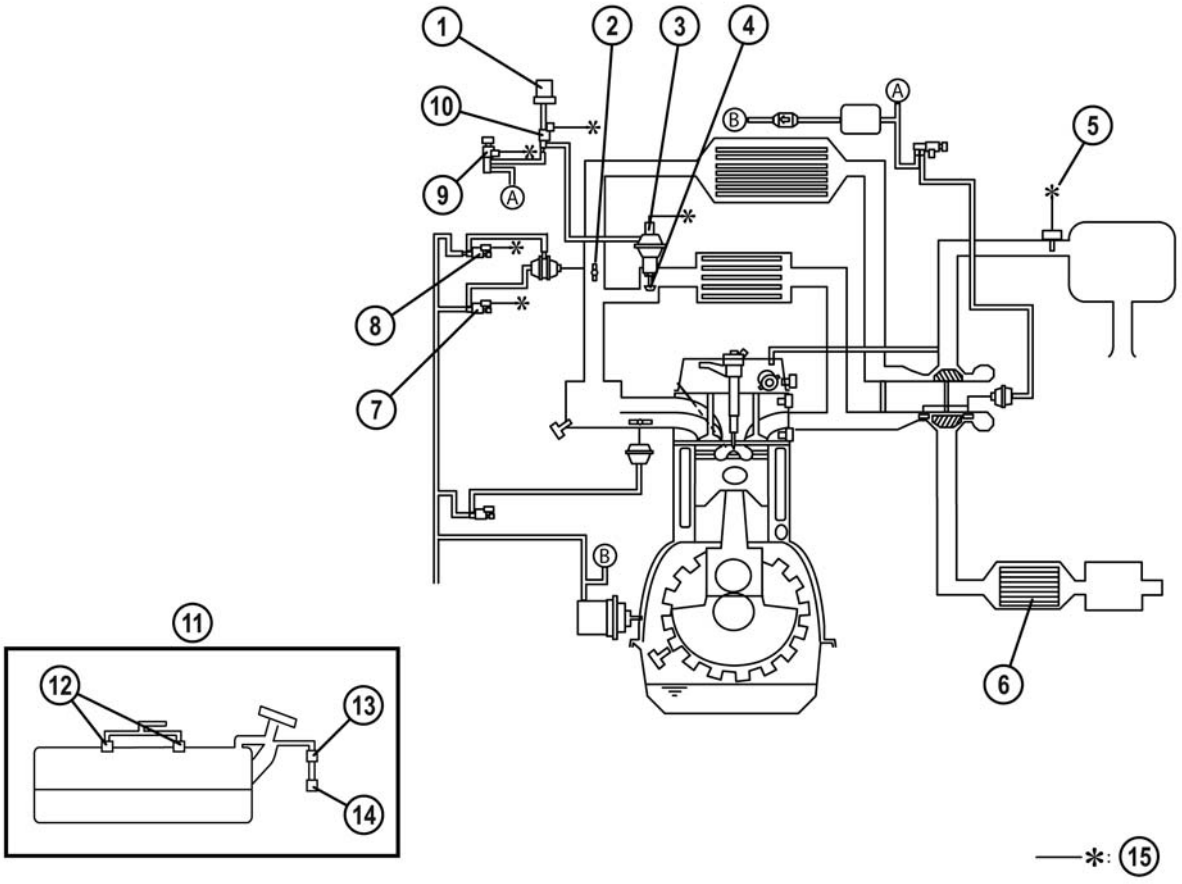
1 Rollover valves
2 Vehicles with cargo box
3 Vehicles without cargo box
4 Evaporative chamber
5 Check valve (two-way)



BT-50_01033

1 Oxidation catalytic converter
2 EGR cooler
3 EGR solenoid valve
4 MAF sensor
5 ISV
6 EGR control solenoid valve
7 ISV solenoid valve (full)
8 ISV solenoid valve (half)
9 EGR valve
10 Air filter

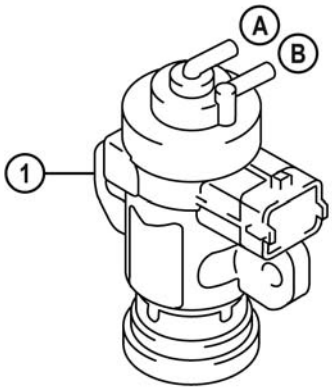
System Overview



BT-50_01035

1 Air filter
2 ISV
3 EGR valve position sensor
4 EGR valve
5 MAF sensor
6 Oxidation catalytic converter
7 ISV solenoid valve (full)
8 ISV solenoid valve (half)
9 EGR solenoid valve
10 EGR control solenoid valve
11 Fuel tank
12 Rollover valves
13 Check valve (two-way) (without cargo box)
14 Evaporative chamber (without cargo box)
15 To PCM

EGR Solenoid Valve



BT-50_01047

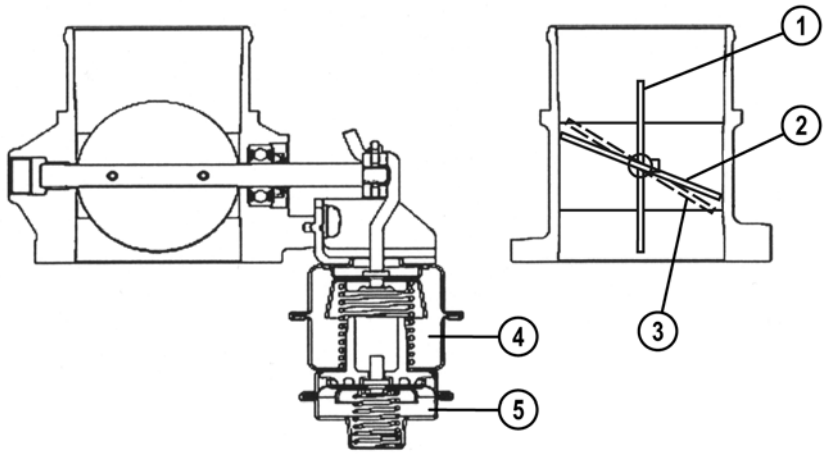
A To EGR valve
B To vacuum chamber
1 EGR solenoid valve

EGR Control

- The PCM controls the position of the EGR valve by means of the EGR solenoid valve (via duty signal) and the EGR control solenoid valve (via ON/OFF signal).
  - When EGR is desired the PCM controls the EGR solenoid valve with a large duty ratio and energizes the EGR control solenoid valve, so that vacuum is applied to the EGR vacuum actuator. Due to this the EGR valve opens and exhaust gas is recirculated.
  - When less or no EGR is desired the PCM controls the EGR solenoid valve with a small duty ratio and energizes the EGR control solenoid valve, so that the vacuum applied to the EGR vacuum actuator is reduced by a ventilation passage. Due to this the spring-loaded EGR valve closes and less or no exhaust gas is recirculated.
  - When the EGR should be cut off (e.g. during acceleration) the PCM de-energizes the EGR control solenoid valve, so that the EGR vacuum actuator is ventilated irrespective of the control by the EGR solenoid valve. Due to this the EGR valve closes quickly and EGR is stopped.

Intake Shutter Valve

- The WL-C engine uses a three-step ISV, which increases the EGR rate at low engine speeds and prevents bucking movements of the engine during shut-off. The operation is similar to the ISV used on the Mazda6 pre F/L (2.0 MZR-CD).



BT-50_01026

1 Fully opened at normal driving (for low EGR rate or no EGR)

2 Fully closed when the engine is shut off

3 Slightly opened to create vacuum (for high EGR rate)

4 First vacuum actuator operates for high EGR rate and shortly when the engine is shut off

5 Second vacuum actuator operates shortly when the engine is shut off

NOTE: Function and operation of the ISV are as described for the Denso common rail system in the course 'Basic Diesel Engine Management' (CT-L2005).

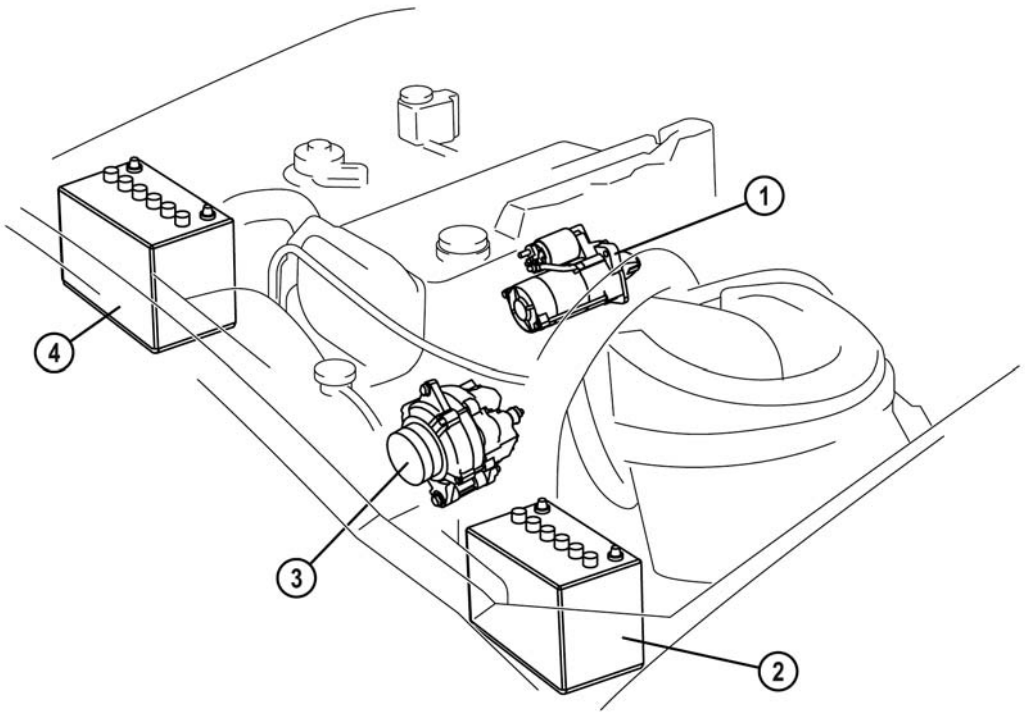
Charging and Starting System

- A modified generator has been adopted for the charging system, while the starting system is identical to that used on the B-Series.

Item			Specification
			WL-C
Battery	Voltage	(V)	12
	Type and capacity (5-hour rate)	(Ah)	95D31R (64)
Generator	Output	(V-A)	12-70
	Regulated voltage	(V)	14.1-14.7
	Self diagnosis function		Equipped
Starter	Type		Coaxial reduction
	Output	(kW)	2.2

BT-50_T01009

Parts Location



BT-50_01039

1 Starter
2 Additional battery (for cold regions)
3 Generator
4 Main battery

Control System

Features

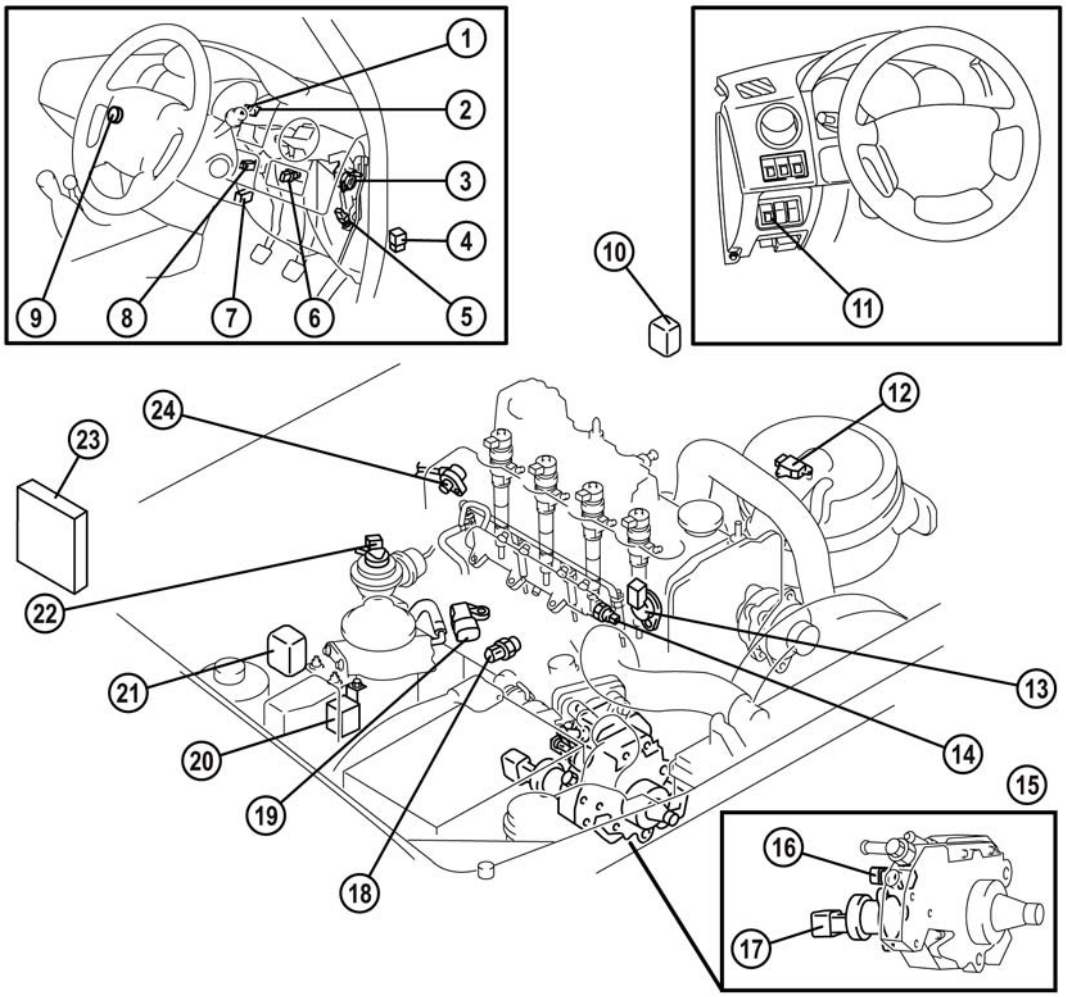
- The control system of the WL-C engine has the following new features:
  - **CKP** (**C**ran**K**shaft **P**osition) sensor located at the flywheel
  - **CMP** (**C**a**M**shaft **P**osition) sensor
  - **PCM** (**P**owertrain **C**ontrol **M**odule) with extended control strategies

Specifications

Item	Specification
	WL-C
IAT sensor No.2 (built into MAF sensor)	Thermistor
MAF sensor	Hot-wire
IAT sensor No.1(built into MAP sensor)	Thermistor
MAP sensor	Piezoelectric element
ECT sensor	Thermistor
CMP sensor	Hall element type
CKP sensor	Inductive type
APP sensor	Potentiometer
EGR valve position sensor	Potentiometer
BARO sensor (built into PCM)	Piezoelectric element
Fuel temperature sensor	Thermistor
Fuel pressure sensor	Piezoelectric element
Neutral switch	ON/OFF
CPP switch	ON/OFF
Idle switch	ON/OFF

BT-50_T01006

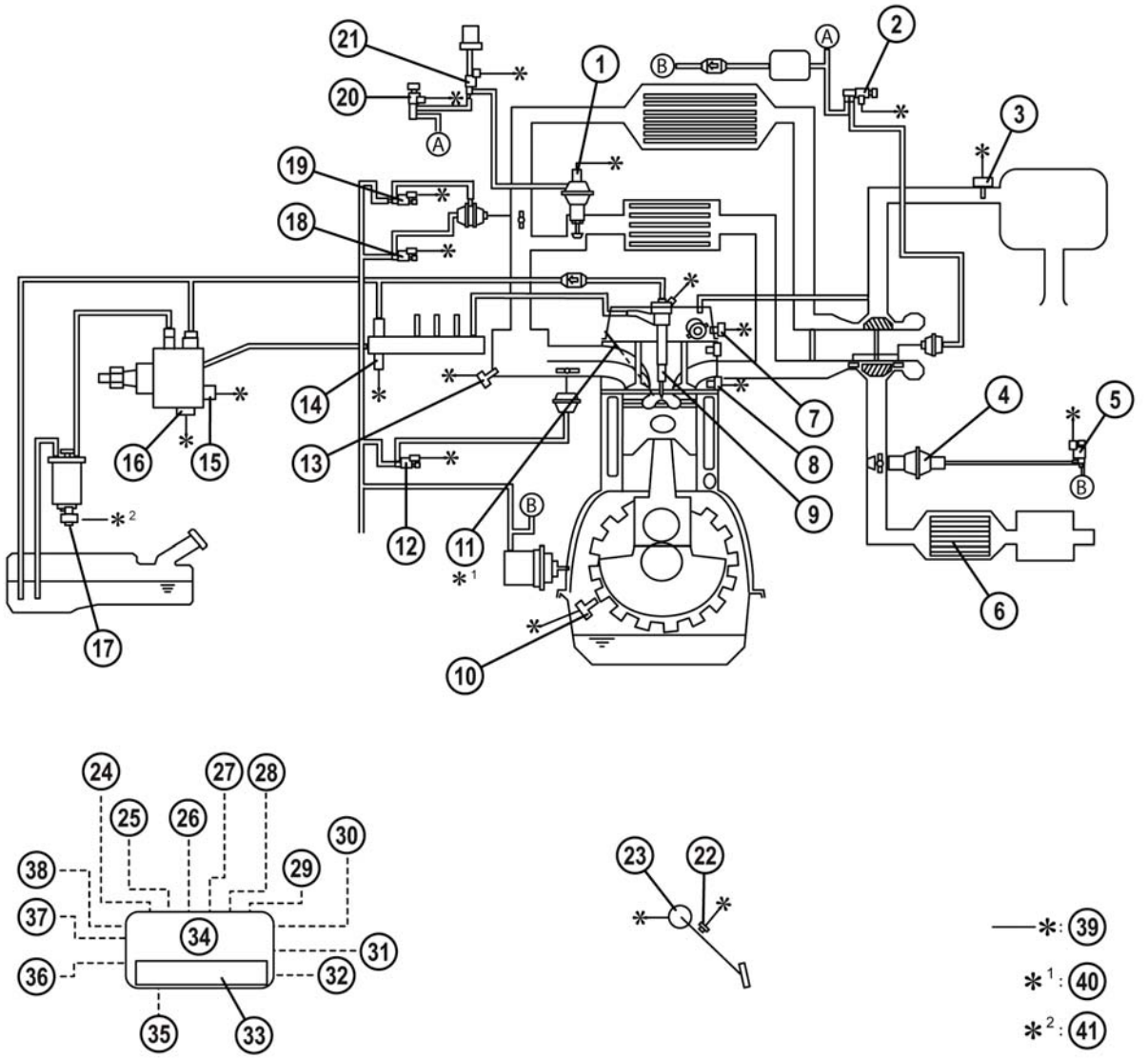
Parts Location



BT-50_01036

1 **MIL** (**M**alfunction **I**ndicator **L**amp)
2 Glow indicator light
3 APP sensor
4 Main relay
5 Idle switch
6 Brake switch
7 **DLC**-2 (**D**ata **L**ink **C**onnector)
8 CPP switch
9 A/C switch
10 DLC-1
11 Warm up switch
12 MAF sensor / IAT sensor no.2
13 CMP sensor
14 Fuel pressure sensor
15 High-pressure pump
16 Fuel temperature sensor
17 Fuel metering valve
18 ECT sensor
19 MAP sensor / IAT sensor no.1
20 Glow plug relay
21 A/C relay
22 EGR valve position sensor
23 PCM (with built-in BARO sensor)
24 CKP sensor

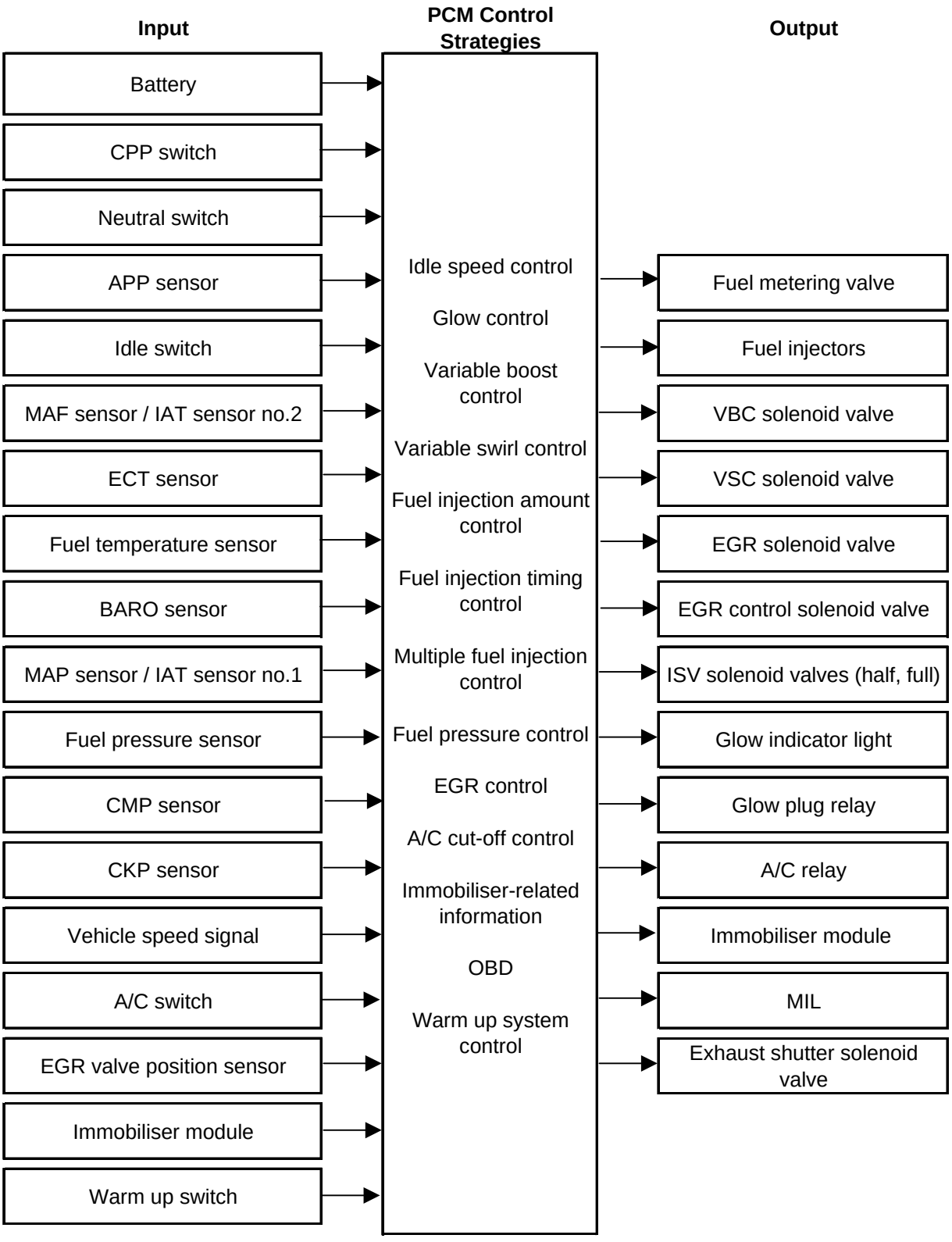
System Overview



BT-50_01037

1 EGR valve position sensor
2 VBC solenoid valve
3 MAF sensor / IAT sensor no.2
4 Exhaust shutter valve
5 Exhaust shutter solenoid valve
6 Oxidation catalytic converter
7 CMP sensor
8 ECT sensor
9 Fuel injectors
10 CKP sensor
11 Glow plugs
12 VSC solenoid valve
13 MAP sensor / IAT sensor no.1
14 Fuel pressure sensor
15 Fuel metering valve
16 Fuel temperature sensor
17 Sedimentor switch
18 ISV solenoid valve (full)
19 ISV solenoid valve (half)
20 EGR solenoid valve
21 EGR control solenoid valve
22 Idle switch
23 APP sensor
24 Main relay
25 Engine switch
26 Neutral switch
27 A/C switch
28 DLC-1 / DLC-2
29 Vehicle speed signal
30 CAN Bus
31 CPP switch
32 A/C relay
33 BARO sensor
34 PCM
35 Glow plug relay
36 MIL
37 Glow indicator light
38 Tachometer
39 To PCM
40 To glow plug relay
41 To **IC** (**I**nstrument **C**luster)

Block Diagram



BT-50_T01007

Relationship Chart

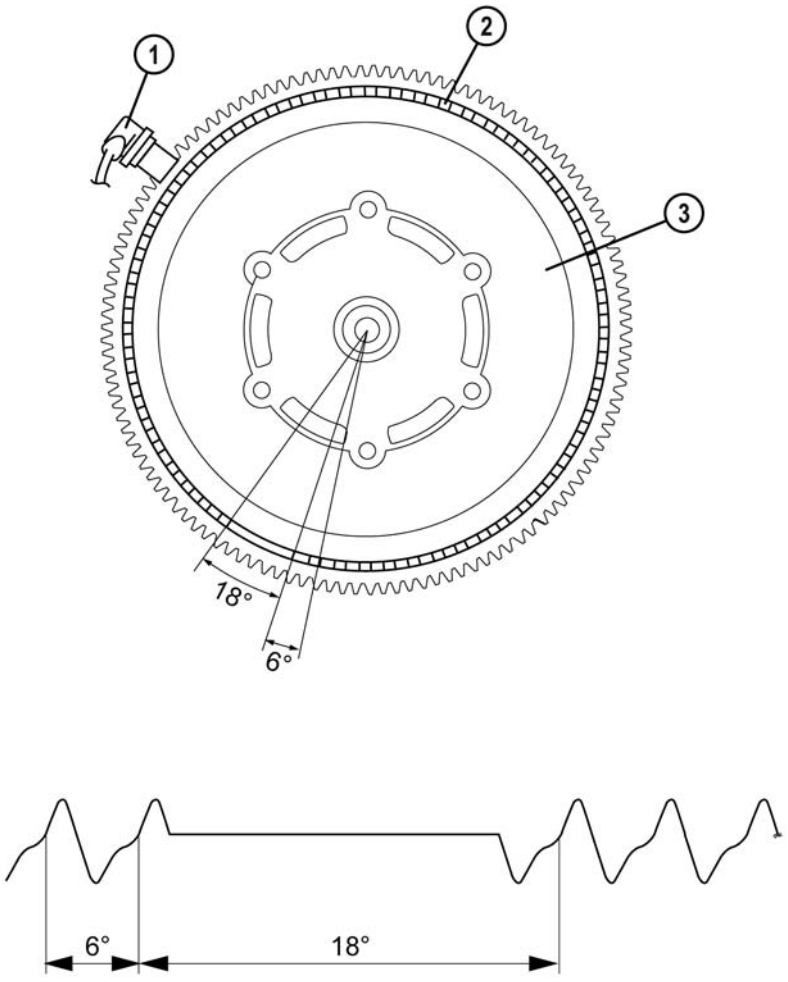
x: Applicable

Item	Control Item										
	Idle speed control	Warm up system control	Glow control	Variable boost control	Variable swirl control	Fuel injection timing control	Multiple fuel injection control	Fuel pressure control	EGR control	A/C cut-off control	Immobiliser system
Input device											
Battery				x							
CPP switch	x	x				x	x		x		
Neutral switch	x	x				x	x		x		
APP sensor	x	x		x	x	x	x	x	x	x	
Idle switch									x		
MAF sensor		x				x	x	x	x		
IAT sensor no.2		x			x	x	x	x	x		
IAT sensor no.1						x					
ECT sensor	x	x	x	x	x	x	x	x	x	x	
Fuel temperature sensor						x		x			
BARO sensor				x	x	x	x	x	x		
MAP sensor				x							
Fuel pressure sensor								x	x		
CMP sensor	x					x	x				
CKP sensor	x		x	x	x	x	x	x	x	x	
Vehicle speed signal	x								x	x	
A/C switch	x										
EGR valve position sensor									x		
Warm up switch	x	x									
Immobiliser-related information											x
Output device											
Fuel metering valve								x			x
Fuel injectors	x					x	x				x
VBC solenoid valve				x							
VSC solenoid valve					x						
EGR control solenoid valve									x		
ISV solenoid valve (half, full)									x		
Exhaust shutter solenoid valve		x									
Glow indicator light			x								
Glow plug relay			x								
A/C relay										x	
Immobiliser-related information											x

BT-50_T01008

Crankshaft Position Sensor

- The inductive type CKP sensor is located at the upper part of clutch housing. The pulse wheel is installed to the primary mass of the flywheel, and has 58 projections with a space of 6°crank angle between each projection. A space of 18° defines a determined crankshaft position.



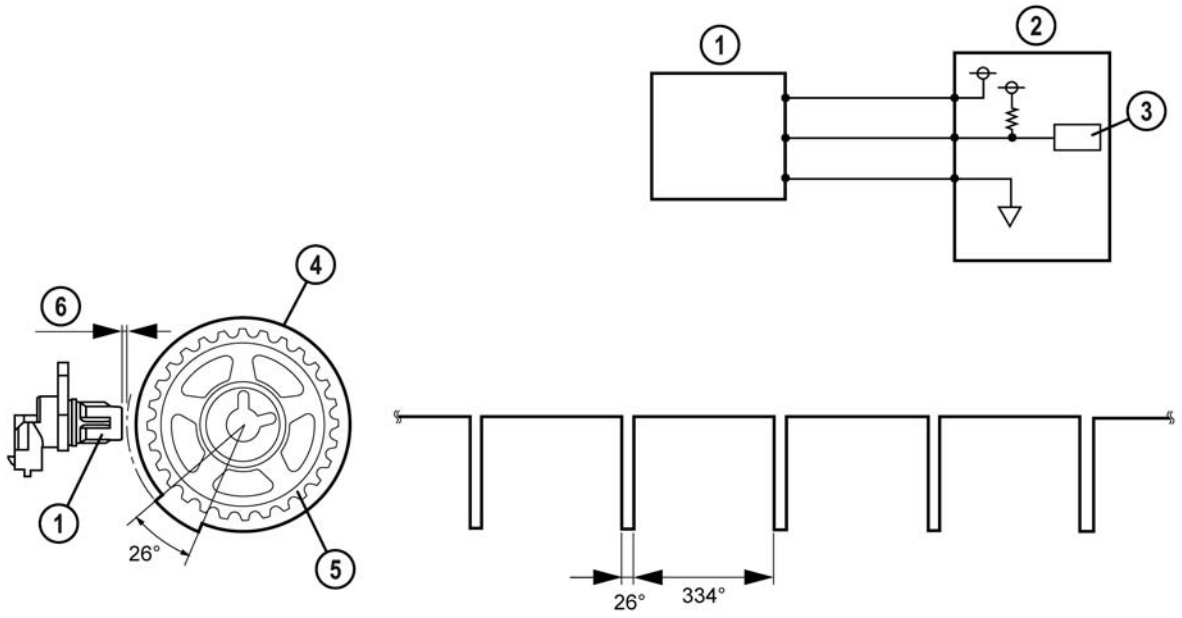
BT-50_01050

1 CKP sensor
2 Pulse wheel
3 Flywheel

NOTE: When the CKP signal fails during engine operation, the engine stalls and will not start again.

Camshaft Position Sensor

- The Hall-type CMP sensor is installed at the right front side of the cylinder head. A projection on the intake camshaft pulley covers 26° camshaft rotation angle.



BT-50_01051

1	CMP sensor	4	Pulse wheel
2	PCM	5	Intake camshaft pulley
3	CPU	6	Gap (1,4 mm)

NOTE: When the CMP signal fails during engine operation, the engine continues to run and will start again (with little extended cranking time) after it has been shut off.

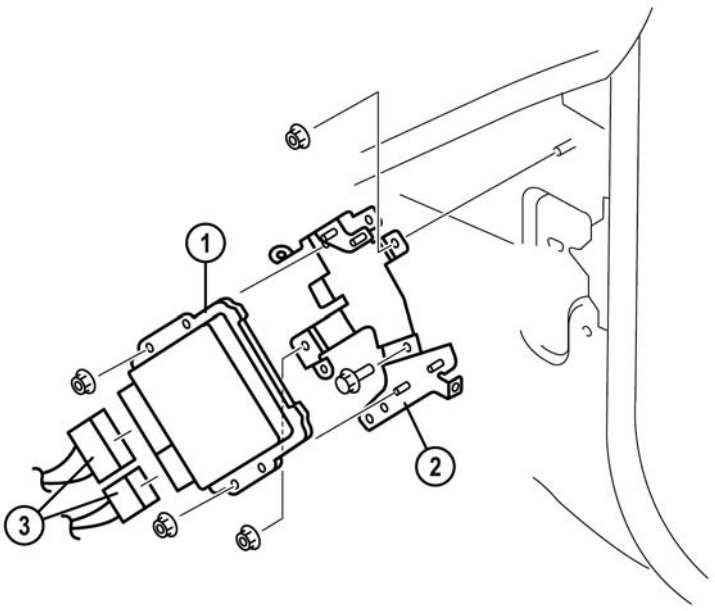
Powertrain Control Module

Features

- The PCM has the following new features:
  - Programmable module
  - Built in BARO sensor
  - **A/C** (**A**ir **C**onditioning) cut-off control
  - Glow plug relay with feedback to PCM *[1)]
  - Integrated **RFW** (**R**emote **F**ree **W**heel) control on versions with 4WD (refer to chapter 'Driveline / Axle')
  - **HS-CAN** (**H**igh **S**peed **C**ontroller **A**rea **N**etwork) connection to DLC-2 for communication with M-MDS (refer to chapter 'Body & Accessories')

*[1)] Similar to Mazda6 (2.0 MZR CD)

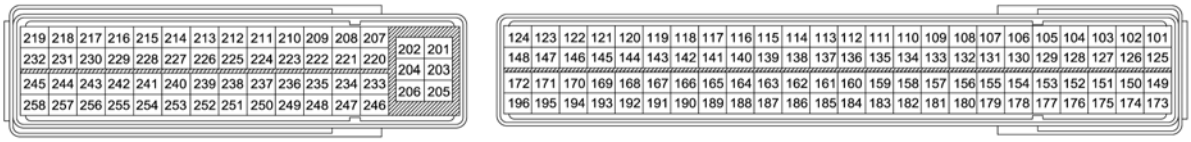
- The PCM is mounted on the driver's side in the passenger compartment at the lower A-pillar. On vehicles with U.K. specification a cover with shear bolts secures the PCM.



BT-50_01040

1 PCM
2 Bracket
3 Connector

- The PCM has two connectors with 154 pins in total.



BT-50_01041

- Similar to other current modules the PCM now allows to carry out the following programming functions by means of M-MDS:
  - Programmable module installation (to replace PCM)
  - Module reprogramming (to update software calibration)
  - Programmable parameters (to input injector correction factors)
  - As-build data (to update As-build data)
  - Data reset (PCM and MAF sensor)
  - MAF learning (to adapt MAF sensor condition to PCM)

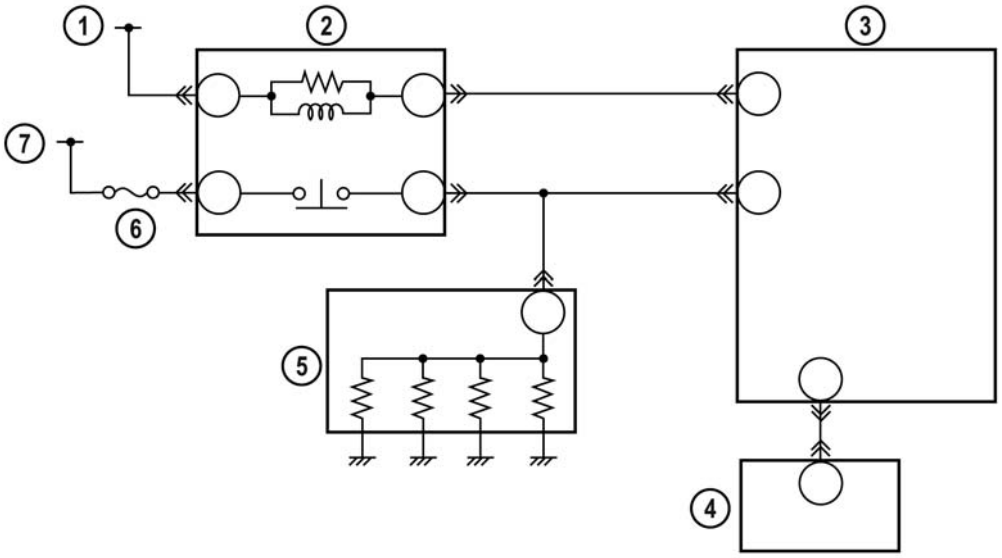
NOTE: For replacement of the PCM certain procedures have to be followed (refer to the chapter ‘Maintenance and Repair’).

A/C Cut-Off Control

- Under the following engine operating conditions the PCM turns the A/C relay off to improve driveability:
  - For a certain time when the accelerator-opening angle is 87.5 % or more.
  - Permanently when ECT is above 113 °C until temperature falls below 110 °C.

Glow Plug Relay

- The glow plug relay has a feedback line to the PCM to facilitate failure detection. The PCM operates the glow plug relay for max. 120 s at an engine coolant temperature below 32 °C.



BT-50_01038

1 From main relay
2 Glow plug relay
3 PCM
4 Glow indicator light (IC)
5 Glow plugs
6 Glow plug circuit fuse
7 From battery

On-Board Diagnostic System

Features

- The **OBD** (**O**n-**B**oard **D**iagnostic) system has the following features:
  - MIL
  - Self test
  - PID monitor
  - Simulation test

Malfunction Indicator Lamp

- The MIL is located in the IC. It illuminates when emission related malfunction have been detected by the OBD system. In this case a corresponding DTC is stored in the PCM. The glow plug indicator light has no indication function for any detected malfunction as on the B-series.

Self Test

- The self-test function allows reading out DTCs of the PCM. Therefore connect the M-MDS to the DLC-2 of the vehicle and select the option **Toolbox→Self Test→Modules→ PCM →Retrieve CMDTCs.**
- In addition the **KOEO** (**K**ey **O**n, **E**ngine **O**ff) self-test and the **KOER** (**K**ey **O**n, **E**ngine **R**unning) self test can be performed. Therefore connect the M-MDS to the DLC-2 of the vehicle and select the option **Toolbox→Self Test→Modules→PCM→KOEO/KOER On Demand Self Test**.

NOTE: The self-test function cannot be carried out by using DLC-1.

PID Monitor

- The PID monitor function allows monitoring the PIDs of the PCM. Therefore connect the M-MDS to the vehicle and select the option **Toolbox→Datalogger→Modules→PCM.**

PID	Definition	Unit/Condition
AAT	Ambient air temperature	°C
AC_REQ	A/C request signal	OFF/ON
ACCS	A/C relay	OFF/ON
APP	Accelerator pedal position	%
APP1	Accelerator pedal position sensor no.1	%
		V
APP2	Accelerator pedal position sensor no.2	%
		V
ARPMDES	Target engine speed	rpm
BARO	Barometric pressure	Pa
		V
BOO	Brake switch	OFF/ON
CPP	Clutch pedal position switch	OFF/ON
DTCCNT	DTC count	—
ECT	Engine coolant temperature	°C
		V
EGRV2	EGR control solenoid valve	OFF/ON
FIP_FL	High-pressure pump flow control	A
		%
FIP_SCV	Fuel metering valve	A
FLT	Fuel temperature	°C
FRP	Fuel rail pressure	Pa
GP_LMP	Glow indicator light	OFF/ON
GPC	Glow plug relay	OFF/ON
IASV	ISV solenoid valve (half)	OFF/ON
IASV2	ISV solenoid valve (full)	OFF/ON
IAT	Intake air temperature (IAT sensor no.1)	°C
		V
INGEAR	Load / no load condition	OFF/ON
IVS	Idle switch	OFF Idle / Idle
LOAD	Engine load	%

BT-50_T01010a

PID	Definition	Unit/Condition
MAF	Mass airflow	g/s
		V
MAP	Manifold absolute pressure	Pa
		V
MIL	Malfunction indicator lamp	OFF/ON
MIL_DIS	Distance travelled since the MIL was activated	km
RPM	Engine speed	rpm
SEGRP DSD	Desired EGR valve position	%
SELTESTDTC	Diagnostic trouble codes	—
VBCV	VBC solenoid valve	%
VPWR	Module supply voltage	V
VSS	Vehicle speed	km/h
WARMSW	Warm-up switch	OFF/ON
WARMSOL	Exhaust solenoid valve shutter valve	OFF/ON

BT-50_T01010b

Simulation Test

- The simulation test function allows activating certain PIDs of the PCM. Therefore connect the M-MDS to the vehicle and select the option **Toolbox→Datalogger→ Modules→PCM.**

×: Applicable
—: Not applicable

PID	Applicable component	Unit/Condition	Test condition	
			KOEO	KOER
ACCS #	A/C relay	OFF/ON	×	x
EGRV2 #	EGR control solenoid valve	OFF/ON	×	x
GP_LMP #	Glow indicator light	OFF/ON	×	x
GPC #	Glow plug relay	OFF/ON	×	x
IASV #	ISV solenoid valve (half)	OFF/ON	×	x
IASV2 #	ISV solenoid valve (full)	OFF/ON	×	x
INJ_1 #	Fuel injector no.1	OFF	—	×
INJ_2 #	Fuel injector no.2	OFF	—	×
INJ_3 #	Fuel injector no.3	OFF	—	×
INJ_4 #	Fuel injector no.4	OFF	—	×
SEGRP #	EGR solenoid valve	%	—	x
VBCV #	VBC solenoid valve	%	—	x

BT-50_T01011

Maintenance and Repair

MAF Sensor Learning Function

- The MAF learning procedure by means of M-MDS must be carried out at every service interval. During this procedure the MAF learning is performed at engine speeds of 750 min^{-1}, 1850 min^{-1}, and 2500 min^{-1}. To perform the procedure select **Toolbox→ Powertrain→Engine Checks→Learning** and follow the instructions.
- The MAF learning procedure can also be initiated manually via DLC-1. Therefore, connect terminal **TEN** (**T**est **EN**gine) five times to ground within five seconds. The glow indicator light is illuminated while MAF learning is performed and flashes five times after the procedure is completed.

Replacing the MAF Sensor

- After replacing the MAF sensor certain procedures have to be performed in the following order:
  1. Perform MAF sensor data reset procedure to reset the adaptation values in the PCM for the MAF sensor. Therefore, select the option **Toolbox→Powertrain→Data Reset→MAF sensor** and follow the instructions.
  2. Perform KOEO self-test procedure.
  3. Turn the engine switch to the OFF position.
  4. Wait for 5 s.
  5. Start the engine.
  6. Perform KOER self-test procedure.
  7. Turn the engine switch to the off position.

NOTE: It is recommended to perform the MAF sensor learning function when a MAF data reset has been carried out.

PCM Replacement

- When the PCM has been replaced certain procedures have to be performed in the following order:
  1. Perform PCM configuration procedure.
  2. Perform IMMOBILISER SYSTEM programming.
  3. Perform PCM data reset procedure to reset all adaptation values in the PCM with the aid of the M-MDS. Therefore, select the option **Toolbox→Powertrain→Data Reset→PCM** and follow the instructions.
  4. Perform After repair procedure.
  5. Start the engine.
  6. Turn the engine switch to the off position.
  7. Turn the engine switch to the ON position (Engine off).
  8. Perform KOEO self-test procedure.
  9. Turn the engine switch to the off position.
  10. Wait for 5 s.
  11. Start the engine.
  12. Perform KOER self-test procedure.
  13. Turn the engine switch to the off position.

NOTE: For further information refer to the W/M.

NOTE: It is recommended to perform the MAF sensor learning function when a PCM data reset has been carried out.

Notes:

Suspension

Features

- The front and rear suspension of the BT-50 have the following new features:
  - Enlarged diameter and modified damper valve tuning of the double acting low pressurised shock absorbers
  - Enlarged diameter of the front stabiliser
  - Extended leaf springs on the rear axle
  - Modified wheel alignment values

Specifications

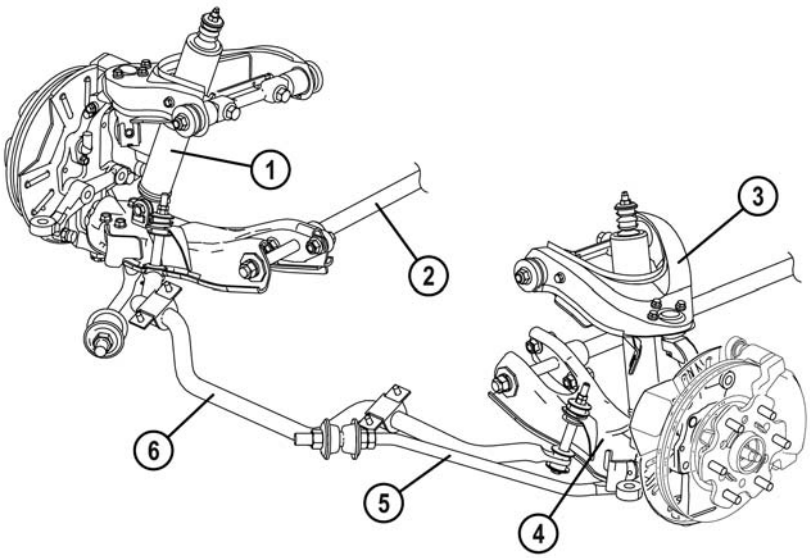
Item			Specification	
			2WD	4WD
Front suspension				
Suspension type			Double wishbone	
Spring type			Torsion bar spring	
Stabilizer	Type		Torsion bar	
	Diameter	mm	27	28
Shock absorber type			Cylindrical, double-acting	
Front wheel alignment (Unloaded condition*)	Maximum steering angle	Inner	33°00'-37°00'	31°30'-35°30'
		Outer	30°00'-35°00'	27°00'-32°00'
	Total toe-in	mm	2-8	3-9
	Camber angle (reference value)		0°35' ±1°	RAP cab: 0°44' ±1° DBL cab: 0°45' ±1°
	Caster angle (reference value)		1°56' ±1°	RAP cab: 2°07' ±1° DBL cab: 2°06' ±1°
	Steering axis inclination		8°25'	RAP cab: 10°37' DBL cab: 10°35'
Rear suspension				
Suspension type			Leaf spring	
Spring type			Semi elliptic leaf spring	
Shock absorber type			Cylindrical, double-acting	

* : Fuel tank full; engine coolant and engine oil at specified level, and spare tire, jack and tools in designated position.

BT-50_T02001

Parts Location

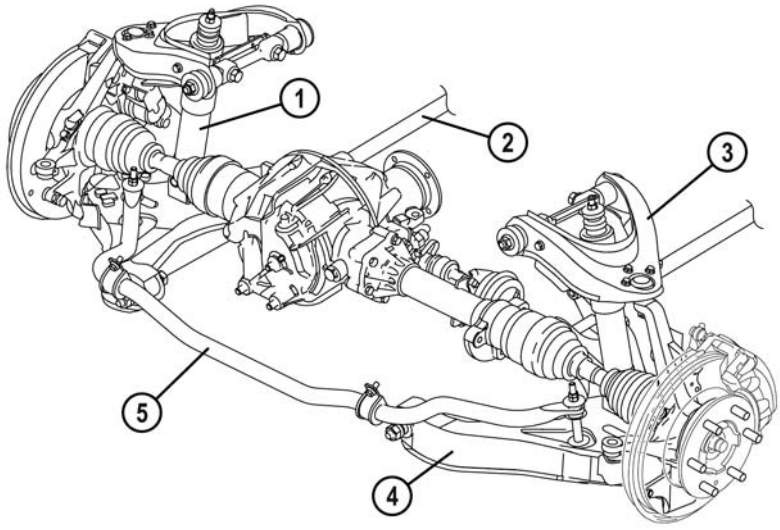
Front Suspension 2WD



BT-50_02002

1 Front shock absorber
2 Torsion bar spring
3 Upper arm
4 Lower arm
5 Tension rod
6 Front stabiliser

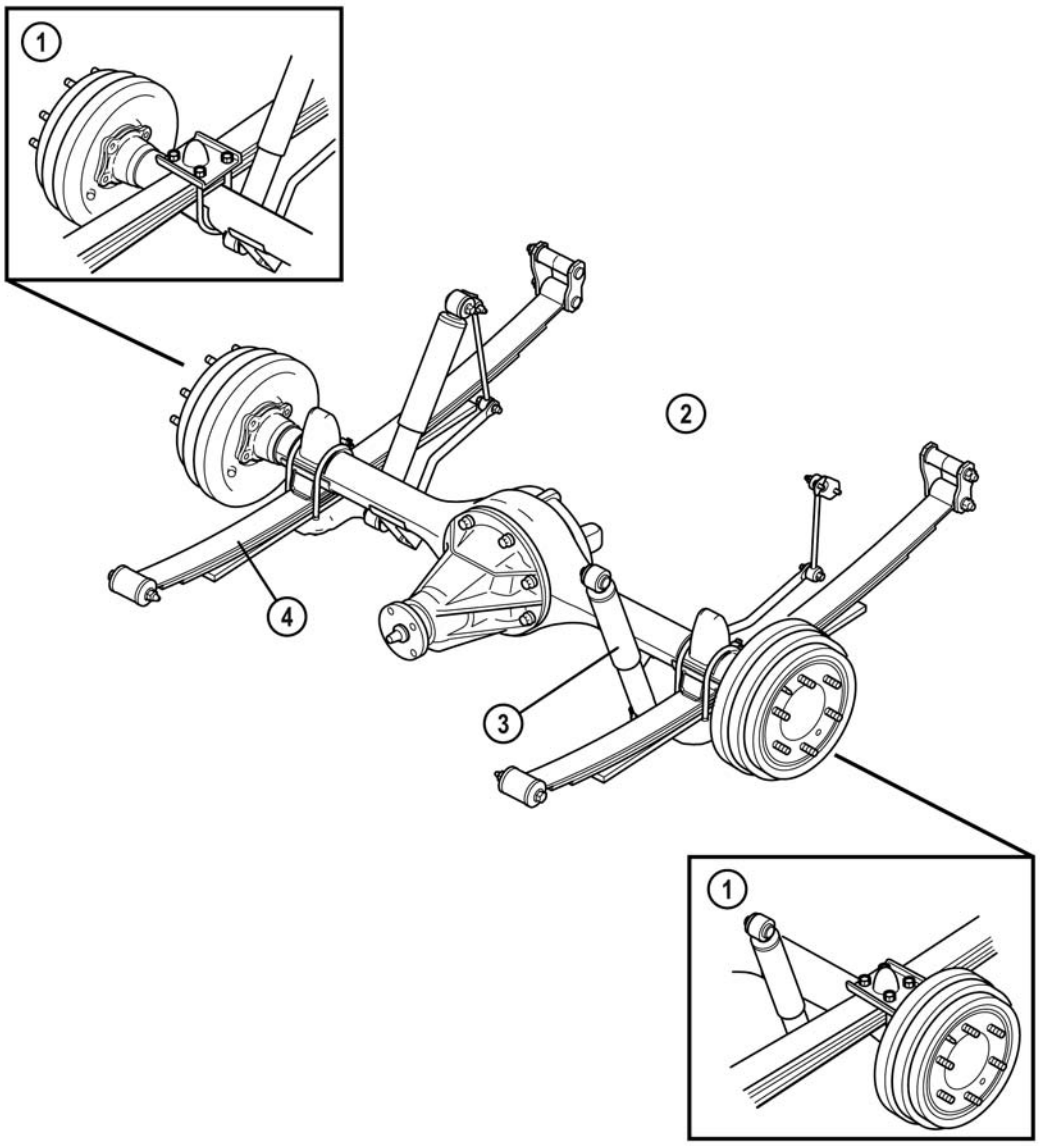
Front Suspension 4WD



BT-50_02003

1 Shock absorber
2 Torsion bar spring
3 Upper arm
4 Lower arm
5 Front stabiliser

Rear Suspension

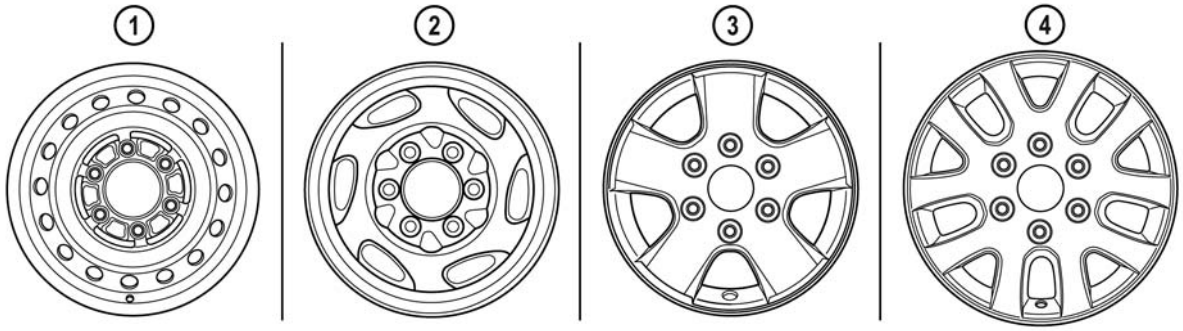


BT-50_02004

1 4WD
2 2WD
3 Shock absorber
4 Leaf spring

Wheels and Tyres

- The wheels and tyres have the following new features:
  - Modified wheel and tyre sizes
  - Modified wheel offset
  - New designs for 15- and 16-inch aluminium alloy wheels and 15-inch steel wheels.



BT-50_02001

1 15-inch standard steel rim (2WD)
2 15-inch design steel rim (4WD)
3 15-inch aluminium alloy rim (2WD)
4 16-inch aluminium alloy rim (4WD)

Specifications

Item				Specification			
Wheel	Size			15 x 61/2J		15 x 61/2JJ	16 x 7J
	Offset mm			20		25	10
	Pitch circle diameter mm			139.7			
	Material			Steel	Aluminium alloy	Steel	Aluminium alloy
Tyre	Size			215/70R15C 106/104S		235/75R15 109S	245/70R16 111S
	Air pressure kPa	Front	Up to four persons	220		210	210
			Full load				
		Rear	Up to four persons	210		210	210
			Full load	375		290	270
	Remaining tread mm			1.6			
Wheel and tyre	Wheel nut tightening torque Nm			88.2-117.6			
	Wheel and tyre runout mm		Radial direction	1.5 max.			
			Axial direction	2.0 max.			

BT-50_T02002

Notes:

Driveline / Axle

Driveline / Axle

Features

- The driveline / axle of the BT-50 has the following new features:
  - Modified transfer case due to increased engine torque and new transmission
  - RFW control with OBD function integrated in PCM (separate RFW module has been dropped)

NOTE: Further information can be found in the Training Manuals ‘B-Series’ (NMT-005) and in ‘Manual transmission and 4WD’ (CT-L1002).

Specifications

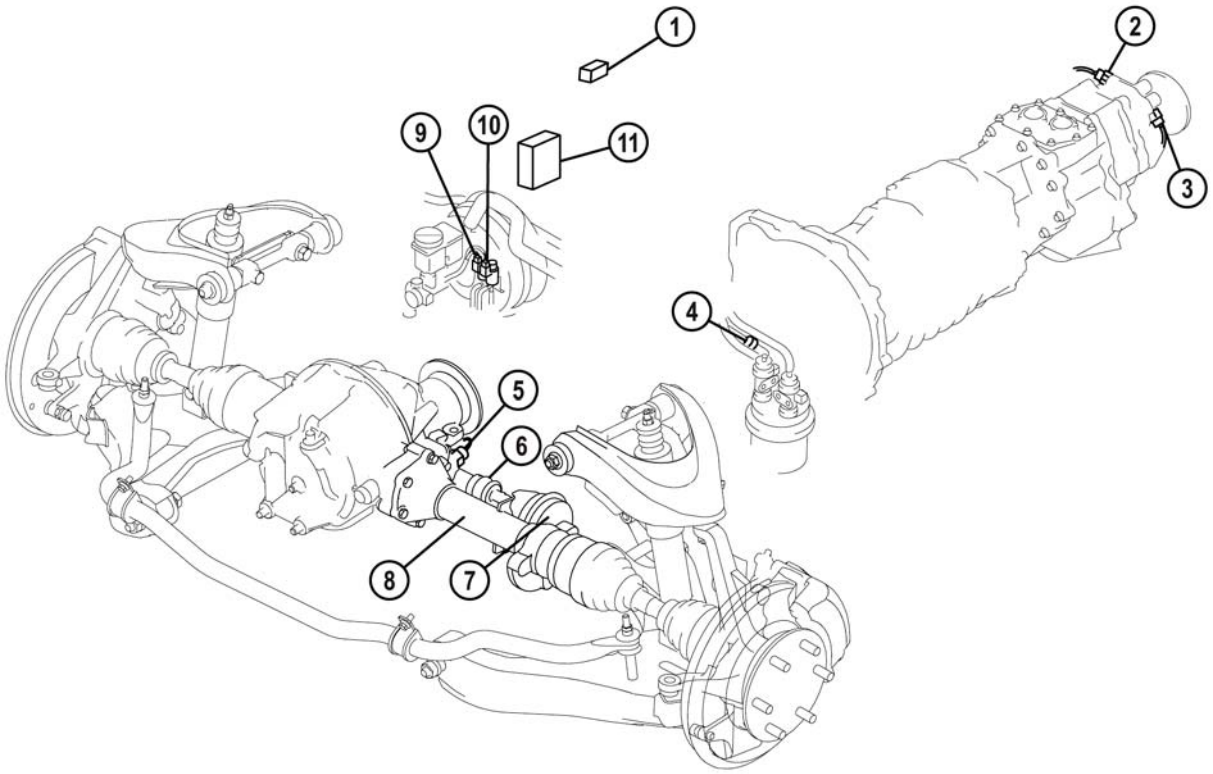
Item				Specification	
Drive type				**2WD**	**4WD**
Transmission type				**S15M-D**	**S15MX-D**
Front axle					
Bearing type				Taper roller bearing	
Rear axle					
Bearing type				Taper roller bearing	
Support type				Semi-floating	
Casing				Banjo type	
Length			mm	739	
Diameter			mm	35.0	
Rear differential					
Reduction gear				Hypoid gear	
Differential gear				Straight bevel gear	
Ring gear size			(Inch)	8.9	
Final gear ratio				3.416	3.727
Differential oil	Type	Grade		API service GL-5	
		Viscosity		SAE 90	
		Capacity	L	2.45	2.35
Front differential					
Reduction gear				–	Hypoid gear
Differential gear					Straight bevel gear
Ring gear size			(Inch)		8.00
Final gear ratio					3.727
Differential oil	Type	Grade			API service GL-5
		Viscosity			Above -18°C: SAE 90 Below -18°C: SAE 80
		Capacity	L		1.9

BT-50_T03001

RFW System

- The RFW system is controlled by the PCM. The input and output components are the same as used for the B-Series with separate RFW control module.

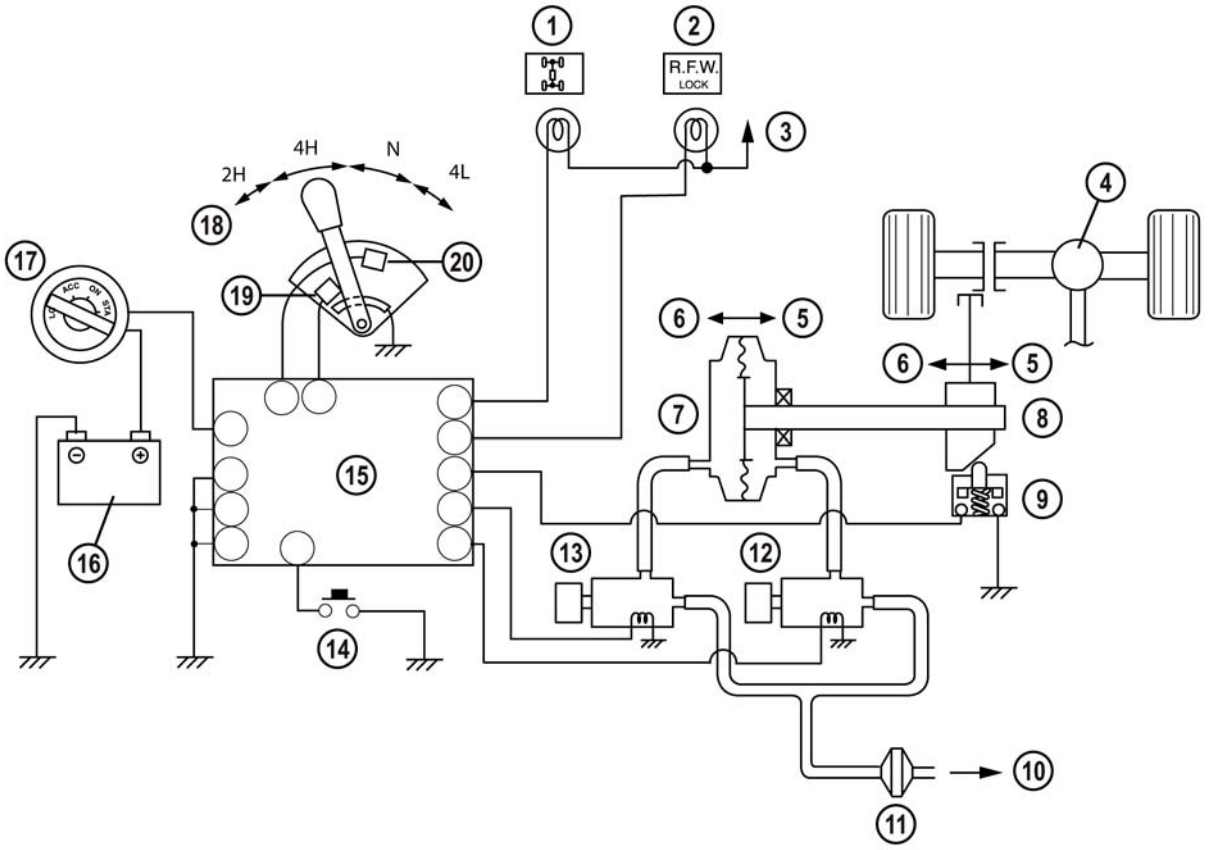
Parts Location



BT-50_03001

1 RFW main switch
2 Transfer neutral switch
3 4WD switch
4 One-way check valve
5 RFW switch
6 RFW unit
7 RFW vacuum actuator
8 Joint shaft component
9 Lock solenoid valve
10 Free solenoid valve
11 PCM

System Overview



BT-50_03002

1 4WD indicator light
2 RFW indicator light
3 To battery
4 Front differential
5 Lock
6 Free
7 RFW vacuum actuator
8 RFW unit
9 RFW switch
10 To vacuum pump
11 One-way check valve
12 Lock solenoid valve
13 Free solenoid valve
14 RFW main switch
15 PCM
16 Vehicle battery
17 Engine switch
18 Selector lever
19 4WD switch
20 Transfer neutral switch

On-Board Diagnostic System

- Detected malfunctions are stored as 4-digit DTCs in the PCM memory and can be retrieved by means of M-MDS.

DTC Table

DTC	Malfunction
P1812	RFW lock solenoid valve circuit failure
P1813	RFW lock solenoid valve open circuit
P1814	RFW lock solenoid valve circuit/short to battery
P1815	RFW lock solenoid valve circuit/short to ground
P1878	RFW free solenoid valve circuit failure
P1879	RFW free solenoid valve open circuit
P1880	RFW free solenoid valve circuit/short to battery
P1885	RFW free solenoid valve circuit/short to ground

BT-50_T03002

Simulation Test

- A simulation test has been adopted to check the function of certain output components by means of M-MDS.

PID	Applicable component	Condition	Test condition
4WDMODE_L #	4WD indicator light	OFF/ON	Engine switch at ON
HUBLOCK #	RFW lock solenoid valve	OFF/ON	
HUBLOCK_L #	RFW free solenoid valve	OFF/ON	
NTFLAMP #	RFW indicator light	OFF/ON	

BT-50_T03003

NOTE: Further diagnosis is supported by the symptom troubleshooting section in the W/M.

Clutch

Features

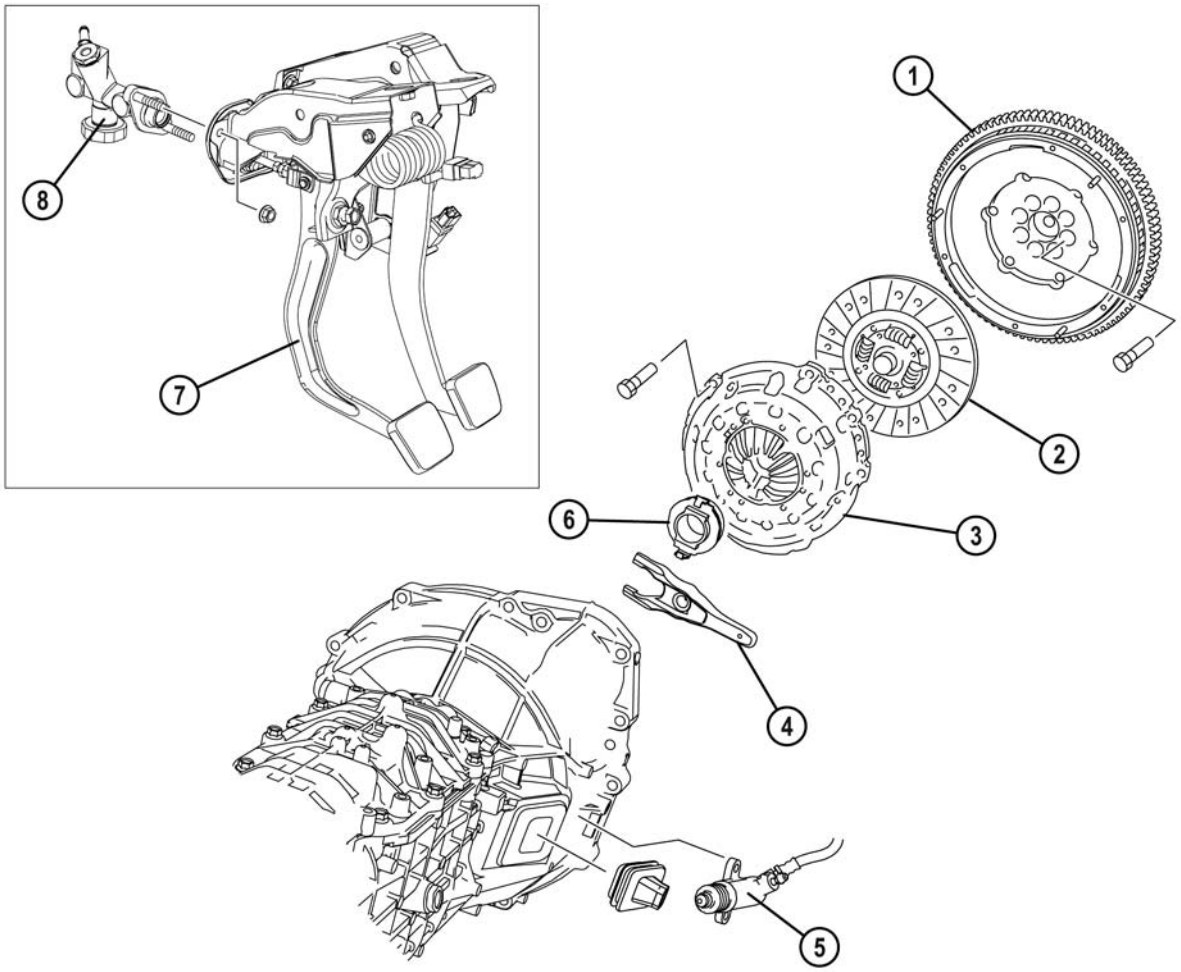
- The clutch system of the BT-50 has the following new features:
  - Clutch master cylinder with one-way valve and pulsation damper
  - Dual mass flywheel

Specifications

Item			Specification
Manual transmission type			**S15M-D, S15MX-D**
Clutch control			Hydraulic
Clutch cover	Spring type		Diaphragm
	Set load	N	10,100
Clutch disc	Outer diameter	mm	250
	Inner diameter	mm	155
Clutch pedal	Type		Suspended
	Pedal ratio		5.2
	Full stroke	mm	152
Clutch master cylinder inner diameter		mm	15.87
Clutch release cylinder inner diameter		mm	22.23
Clutch fluid type			SAE J1703, FMVSS 116 DOT-3

BT-50_T05001

Parts Location

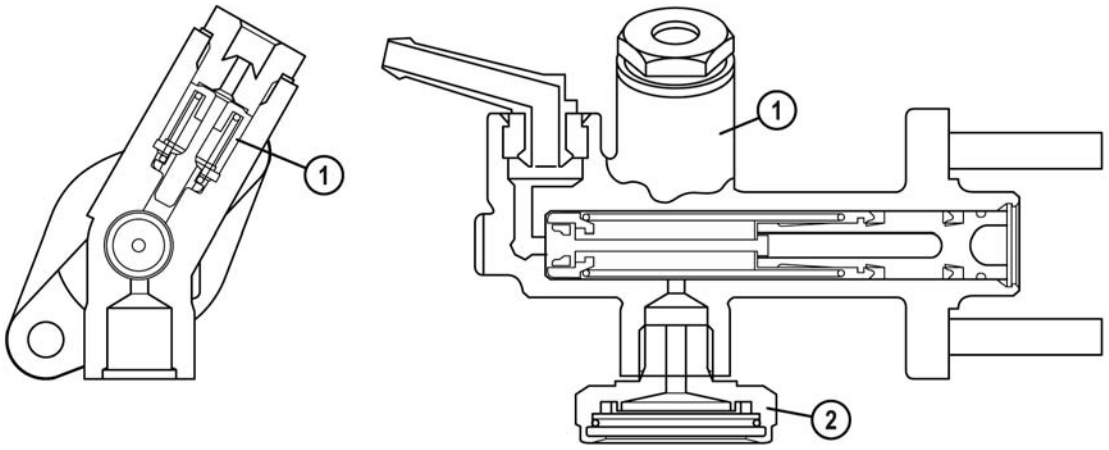


BT-50_05013

1 Dual-mass flywheel
2 Clutch disc
3 Clutch cover
4 Clutch release fork
5 Clutch release cylinder
6 Clutch release collar
7 Clutch pedal
8 Clutch master cylinder

Clutch Master Cylinder

- The one-way valve prevents harsh clutch engagement by a throttle, which prevents too quick back flowing of the fluid when the clutch is engaged thus ensuring smooth driving off.
- The pulsation damper reduces pressure fluctuations in the hydraulic line during clutch operation, minimizing operation noise and vibration transmission to the clutch pedal.



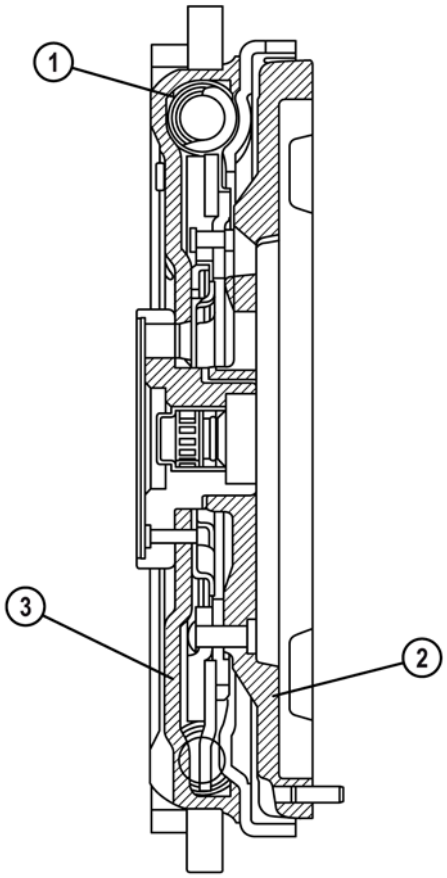
BT-50_05001

1 One-way valve

2 Pulsation damper

Dual Mass Flywheel

- The dual mass flywheel compensates torque fluctuations thus reducing rattle noises of the transmission gears.



BT-50_05014

1 Torsional-vibration damping spring
2 Secondary flywheel
3 Primary flywheel

S15M(X)-D Manual Transmission

- Due to the increased engine torque the newly developed three-shaft 5-speed manual transmission S15M-D has been adopted for the 2WD version, while the S15MX-D transmission with an additional transfer case has been adopted for the 4WD version.
- Except for the transfer case the construction and operation of both transmissions are basically the same. They have superseded the R15M(X)-D transmission used on the B-Series.

Features

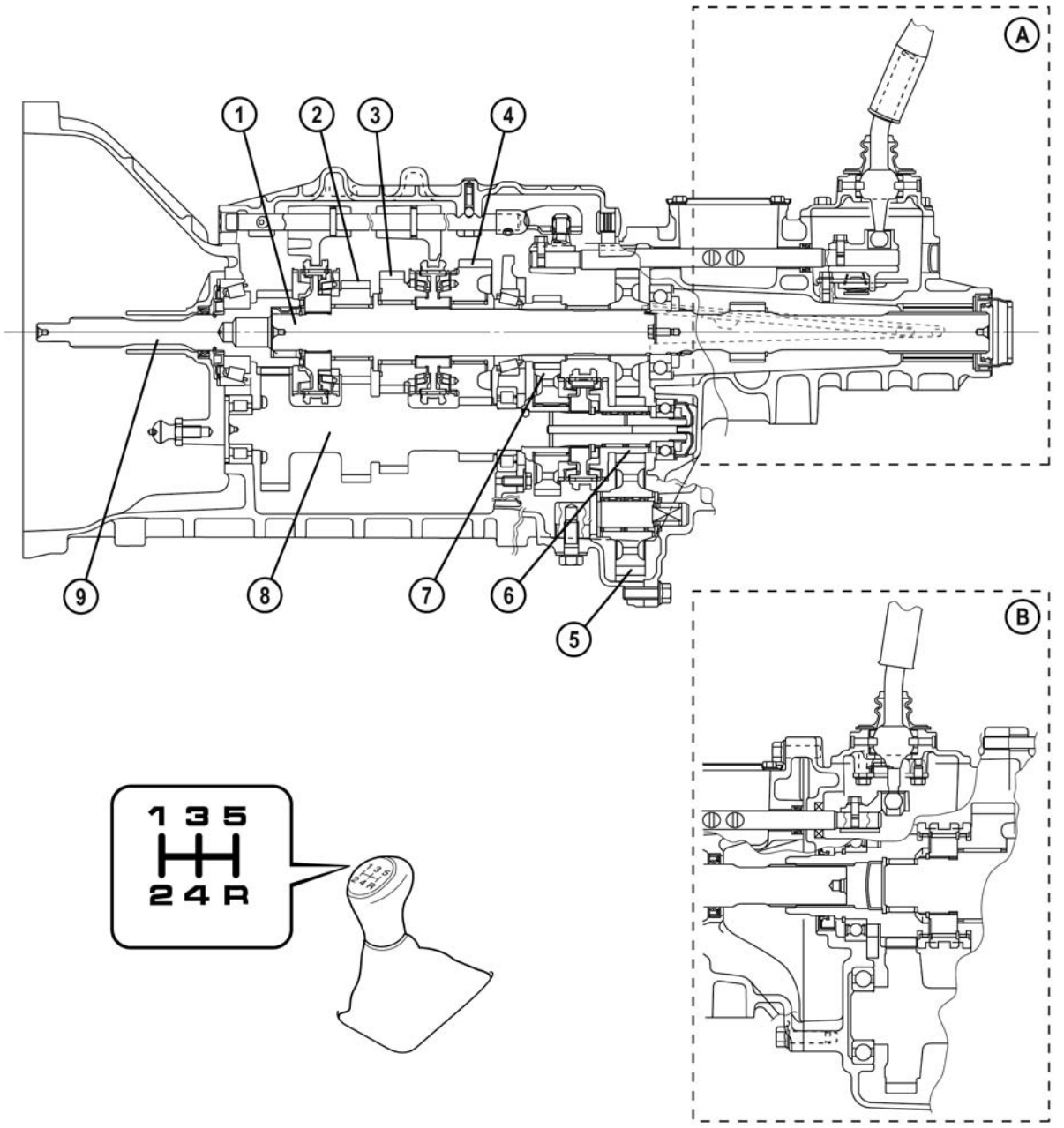
- Construction and operation of the S15M(X)-D transmission are quite similar to the P66M-D transmission introduced on the MX-5 (NC). It has the following features:
  - Triple-cone synchroniser mechanism for the 1st and 2nd gear
  - Double-cone synchroniser mechanism for the 3rd gear
  - Single-cone synchroniser mechanism for 4th, 5th and reverse gear
  - Integrated shift mechanism unit comprising shift rods and forks, detent balls, and pin-type interlock mechanism
  - Cam-type reverse lockout mechanism

Specifications

Item			Specification
Transmission type			**S15M-D, S15MX-D**
Transmission/Transfer control			Floor-shift
Shift assist			Synchromesh
Gear ratio	1GR		3.905
	2GR		2.248
	3GR		1.491
	4GR		1.000
	5GR		0.800
	Reverse		3.391
Transmission case oil	Type		Manual Transmission fluid type A
	Capacity (approx.quantity)	L	3.55
Shift control case oil [S15M-D]	Type		Manual Transmission fluid type A
	Capacity (approx.quantity)	ml	220-260
Transfer ratio	High		1.000
	Low		2.020
Transfer case oil [S15MX-D]	Type		Manual Transmission fluid type A
	Capacity (approx.quantity)	L	1.85

BT-50_T05002

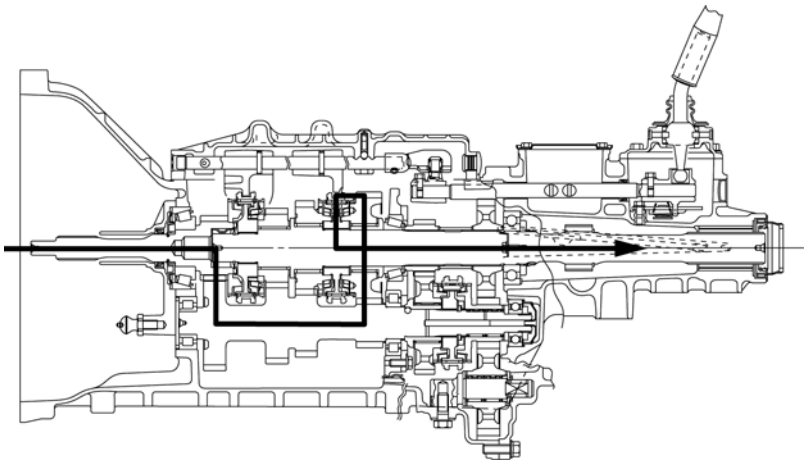
Overview



BT-50_05002

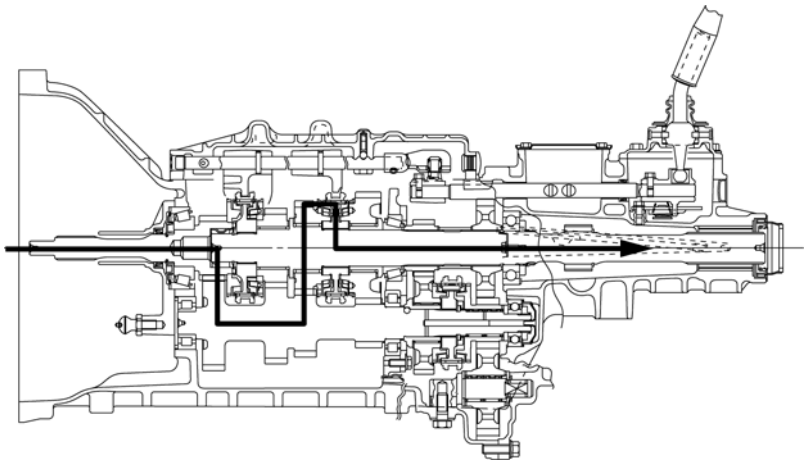
A Extension housing (S15M-D)
B Transfer case (S15MX-D)
1 Output shaft
2 3rd gear
3 2nd gear
4 1st gear
5 Reverse idler gear
6 Reverse gear
7 5th gear
8 Counter shaft
9 Input shaft

Power Flow



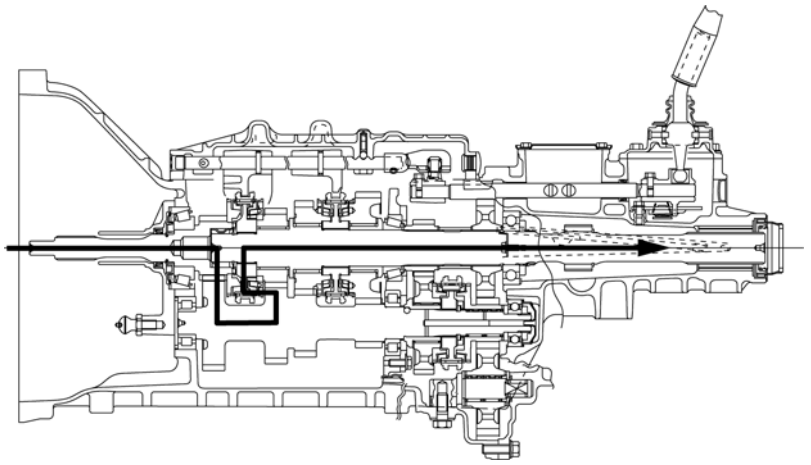
BT-50_05003

1st Gear



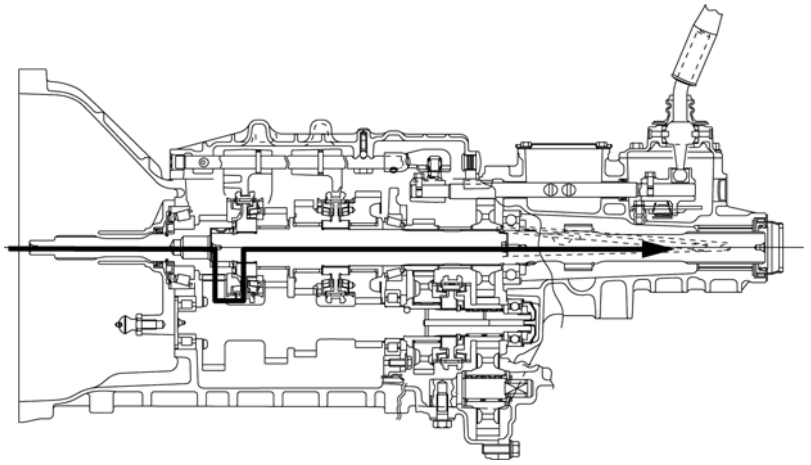
BT-50_05004

2nd Gear



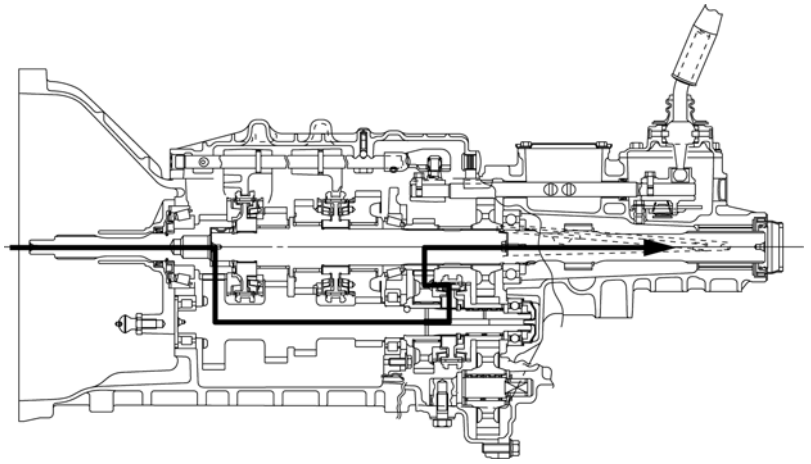
BT-50_05005

3rd Gear



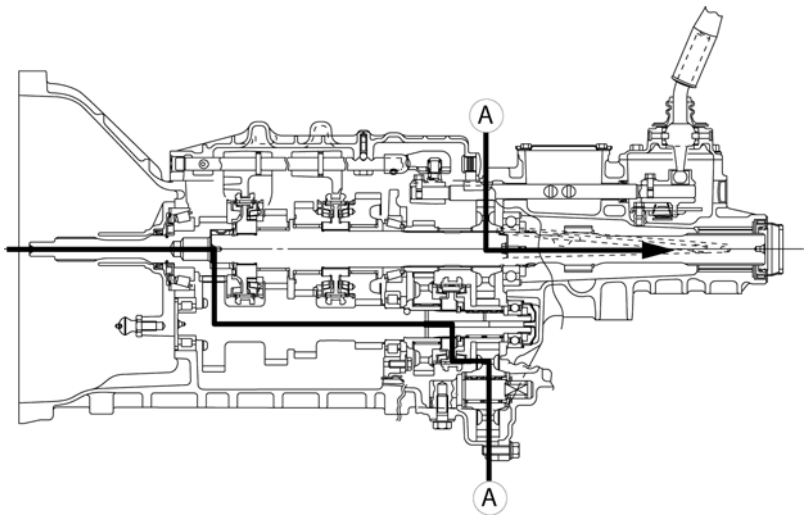
BT-50_05006

4th Gear



BT-50_05007

5th Gear

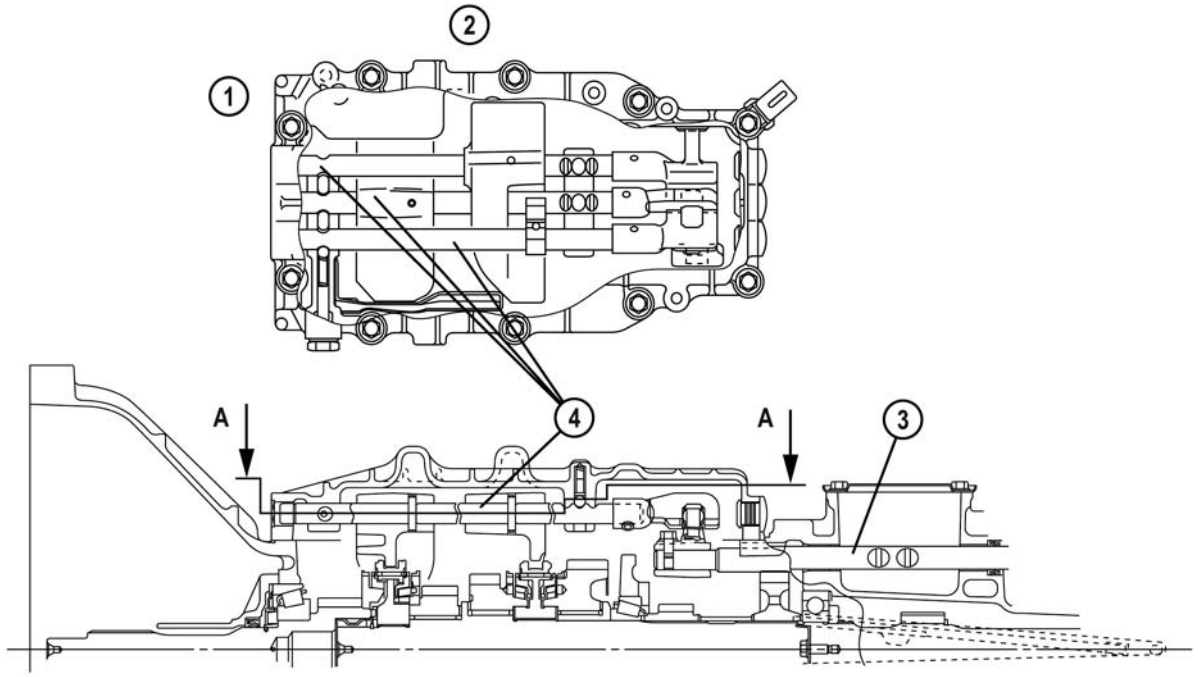


BT-50_05008

Reverse Gear

Shift Mechanism

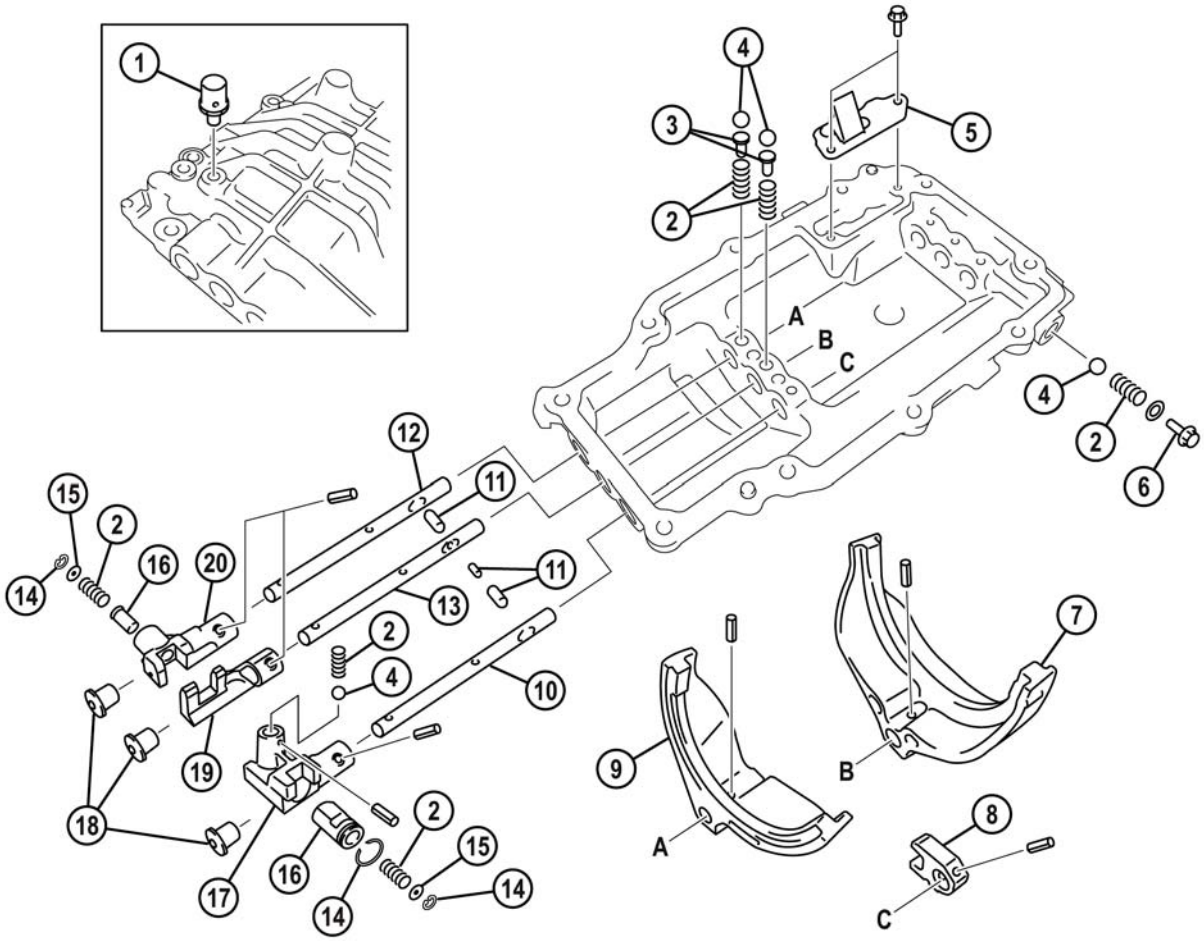
- Most of the shift mechanism components are accommodated in the shift mechanism unit. Due to its five speed layout the S15M(X)-D transmission requires four shift rods in total (three in the shift mechanism unit and one in the transmission housing).



BT-50_05009

1 Section A-A
2 Shift mechanism unit
3 Control rod
4 Shift rod

Shift Mechanism Unit

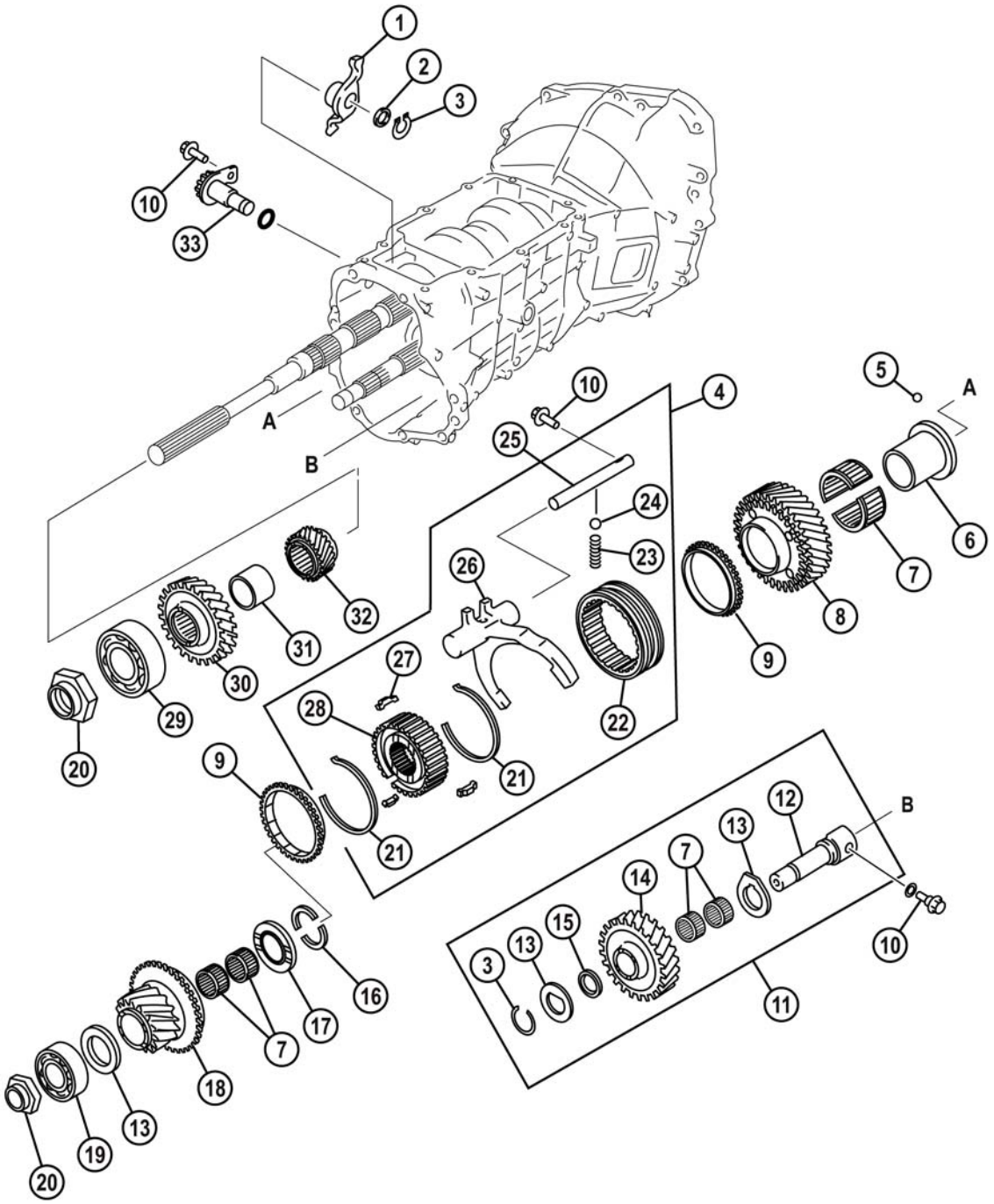


BT-50_05010

1 Transmission breather
2 Spring
3 Plastic spring seat
4 Detent ball
5 Oil baffle plate
6 Retaining bolt
7 3rd/4th shift fork
8 Stopper block
9 1st/2nd shift fork
10 5th/reverse shift rod
11 Interlock pin
12 1st/2nd shift rod
13 3rd/4th shift rod
14 Retaining ring
15 Plain washer
16 Push pin
17 5th/reverse shift rod end
18 Rubber plug
19 3rd/4th shift rod end
20 1st/2nd shift rod end

5th / Reverse Gear Mechanism

- The shift fork for the 5th / reverse gear is mounted on an additional shift rod inside the gearbox. It is operated by the 5th / reverse shift rod in the shift mechanism unit via the counter lever.

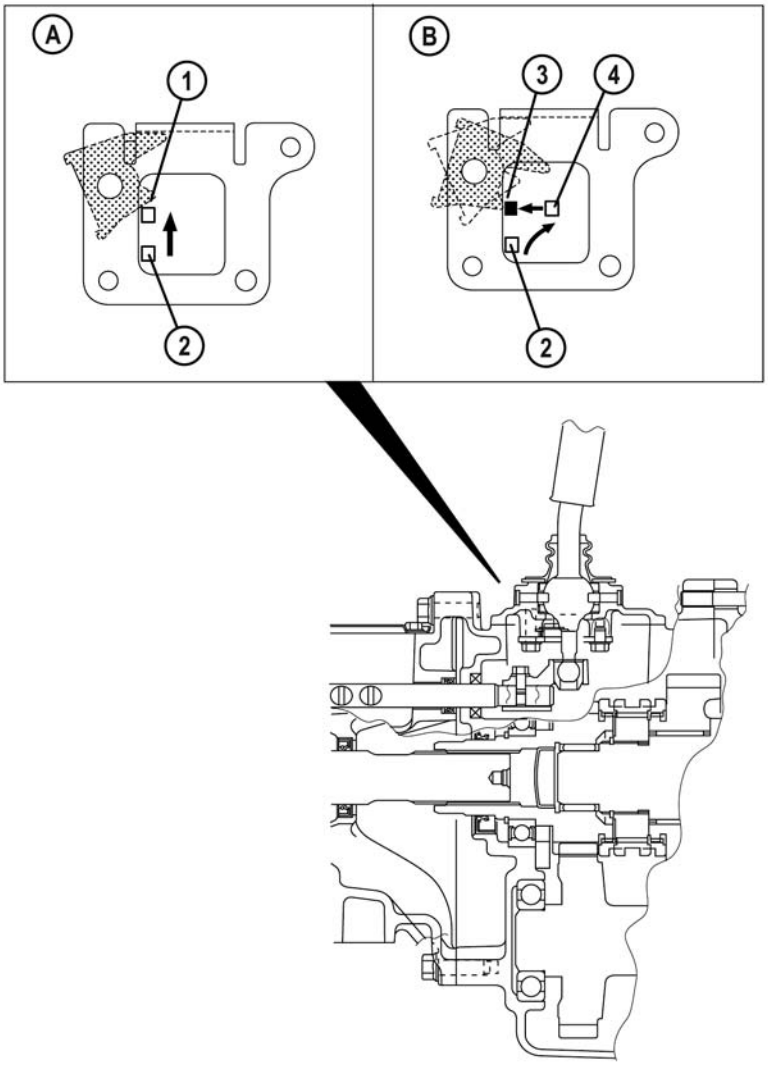


BT-50_05011

1 Counter lever
2 Washer
3 Retaining ring
4 5th/reverse clutch hub and shift fork component
5 Steel ball
6 5th gear bearing inner race
7 Needle bearing
8 5th gear
9 Synchronizer ring
10 Retaining bolt
11 Reverse idler gear shaft component
12 Reverse idler gear shaft
13 Thrust washer
14 Reverse idler gear
15 Friction damper
16 Thrust washer (Selective)
17 Spacer (Selective)
18 Reverse gear
19 Countershaft rear bearing
20 Locknut
21 Synchronizer key spring
22 Clutch hub sleeve
23 Detent spring
24 Detent ball
25 5th/reverse shift rod
26 5th/reverse shift fork
27 Synchronizer key
28 5th/reverse clutch hub
29 Output rear bearing
30 Reverse counter gear
31 Spacer
32 5th counter gear
33 Counter lever shaft component

Reverse Gear Lockout Mechanism

- To prevent accidental shifting into reverse gear while downshifting from the 5th to the 4th gear a cam-type lockout mechanism is installed in the extension housing (2WD) or in the transfer case (4WD). The figure below shows the variant of the 4WD version.



BT-50_05012

A	Shifting directly from 5th to reverse gear (locked)	2	Selector in 5th gear position
B	Shifting from 5th to reverse gear via neutral (released)	3	Lockout mechanism released
1	Selector locked	4	Selector in Neutral position

Basic System

Features

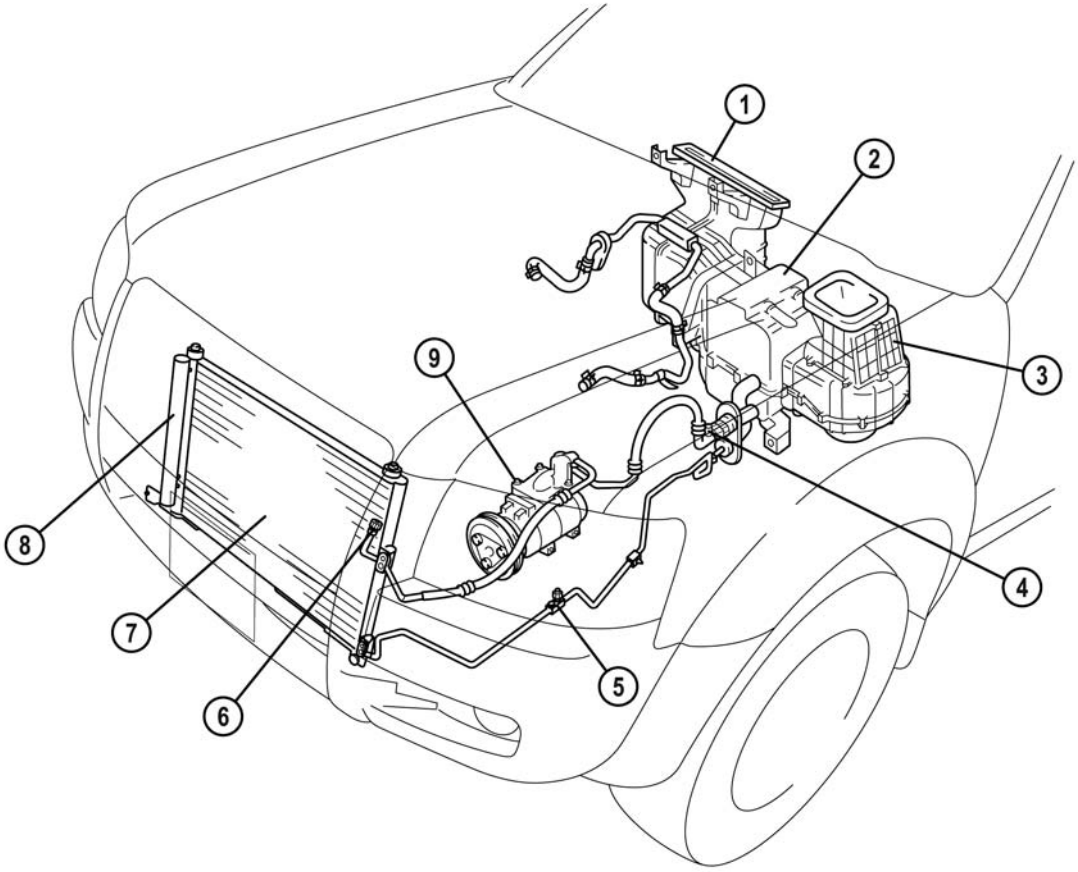
- The **HVAC** (**H**eating, **V**entilation, **A**ir **C**onditioning) basic system of the BT-50 has the following new features:
  - Modified blower unit to reduce fan noise
  - Condenser with sub-cooling function and integrated receiver / drier

Specifications

Item					Specification	
Heating capacity				kW	4.86	
Cooling capacity				kW	4.012	
Refrigerant	Type				R-134a	
	Regular amount approx.			g	475	
A/C compressor	Type				Swash plate	
	Discharge capacity			ml	154	
	Max. allowable speed			rpm	7,000	
	Lubrication	PAG oil type			FD46XG	
		Sealed volume		ml	180	
	Magnetic clutch clearance			mm	0.35-0.75	
	Fusible plug	Melting point		°C	102-107	
Condenser	Type				Multiflow (sub-cooling type)	
	Radiated heat			kW	10.46	
	Receiver/drier capacity			ml	220	
	Desiccant				Synthetic zeolite	
Expansion valve	Type				Internal regulating type	
Evaporator	Type				Single tank drawn cup	
Temperature control					Reheat full air mix type	
Electrical consumption (during A/C operation)		Blower motor		W	220	
		Magnetic clutch		W	48	
Blower motor	Type				Sirocco	
Magnetic clutch control	Refrigerant pressure switch	Condition			ON	OFF
		Operating pressure kPa	High		390 - 790	2940 - 3340
			Low		176 - 216	20 or less
	Evaporator temperature sensor	Condition			ON	OFF
		Evaporator temperature		°C	3.0 +/- 0.6	1.0 +/- 0.6

BT-50_T07001

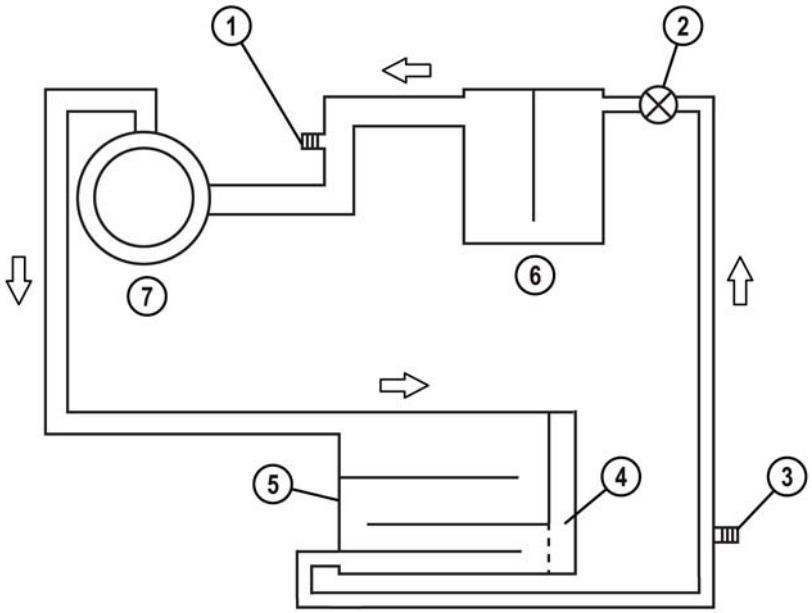
Parts Location



BT-50_07001

1 Heater / air distribution unit
2 Cooling unit
3 Blower unit
4 Low pressure charging valve
5 Refrigerant pressure switch
6 High pressure charging valve
7 Condenser
8 Receiver / drier
9 Compressor

Refrigerant System



BT-50_07006

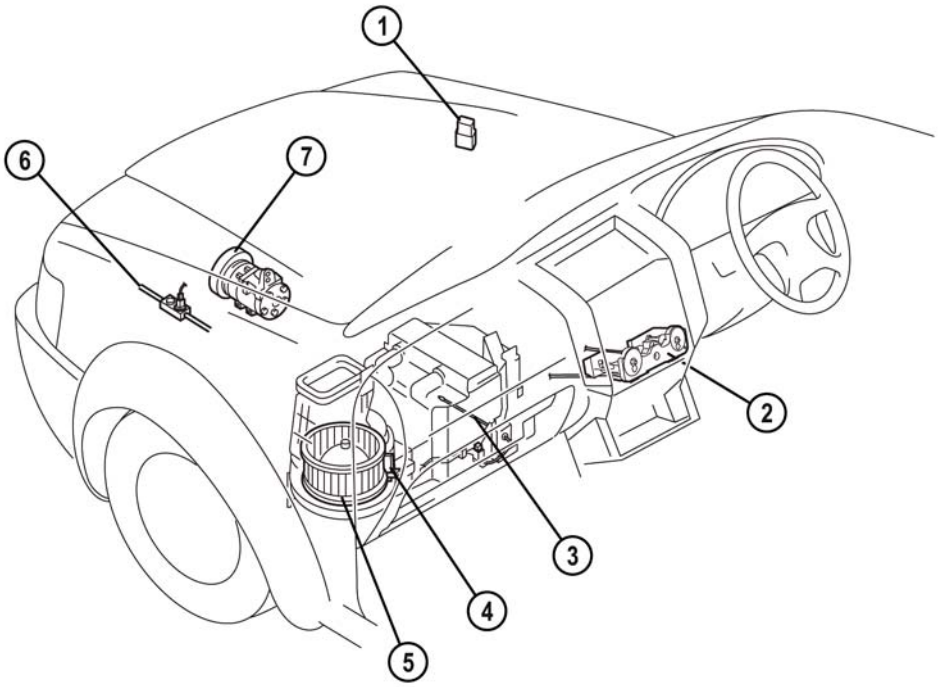
1 Low-pressure charging valve
2 Expansion valve
3 High-pressure charging valve
4 Receiver / drier
5 Condenser
6 Evaporator
7 A/C Compressor

Control System

Features

- The HVAC control of the BT-50 has the following new features:
  - Newly designed control panel with larger dials

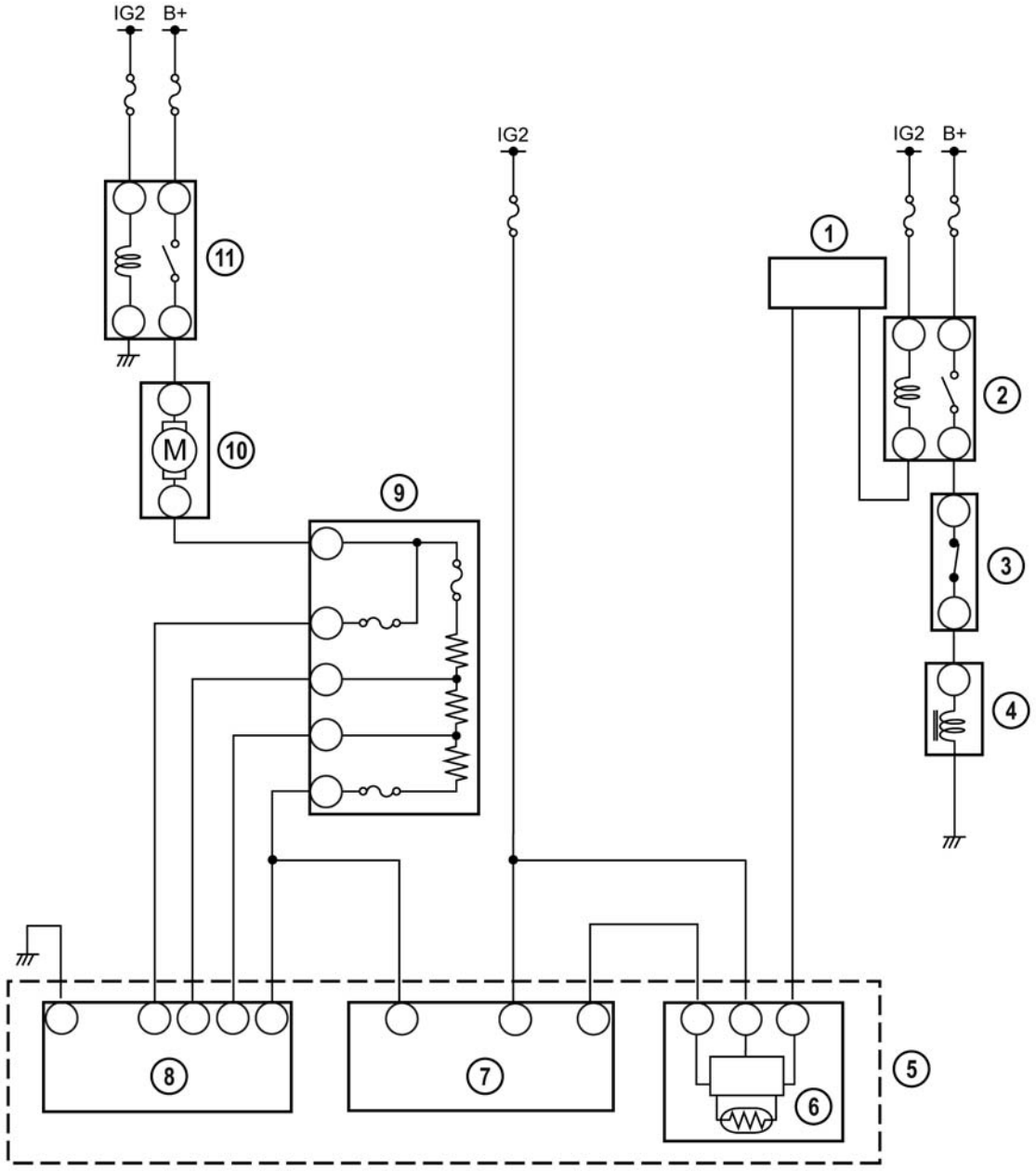
Parts Location



BT-50_07003

1 A/C relay
2 Climate control unit
3 Evaporator temperature sensor
4 Blower resistor
5 Blower motor
6 Refrigerant pressure switch
7 Magnetic clutch

Wiring Diagram

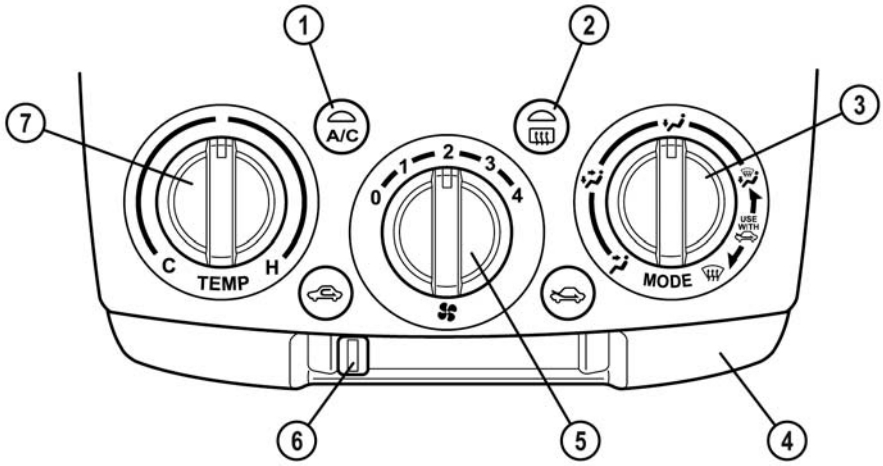


BT-50_07004

1 PCM
2 A/C relay
3 Refrigerant pressure switch
4 Magnetic clutch
5 Climate control unit
6 A/C Amplifier / Thermoswitch (incl. evaporator temperature sensor)
7 A/C switch
8 Fan switch
9 Blower resistor
10 Blower motor
11 Blower relay

Climate Control Unit

- A new designed cable operated climate control unit has been adopted.



BT-50_07005

1 A/C switch
2 Rear window defroster switch
3 Airflow mode selector dial
4 Climate control unit
5 Fan switch
6 Rec/Fresh lever
7 Temperature control dial

Airbag System

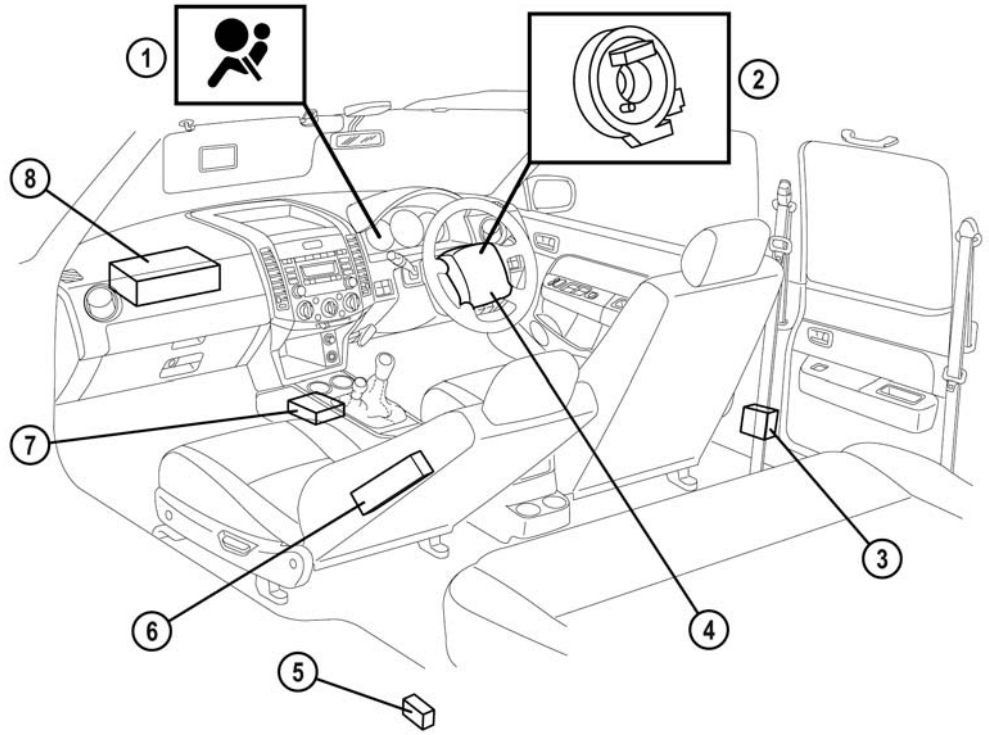
Features

- The airbag system of the BT-50 has the following new features:
  - Side airbags integrated in the backrests of the front seats (depending on grade) *[1)]
  - Side airbag sensors installed on the door sills
  - **SAS** (**S**ophisticated **A**irbag **S**ensor) control module with enhanced OBD system
  - Rack-type seatbelt pretensioners, height-adjustable on front seats of DBL cab version *[1)]

*[1)] Similar to MX-5 (NC)

NOTE: Further information can be found in the Training Manual of the ‘B-Series’ (NMT-005) and ‘MX-5’ (NMT-008), and ‘Supplemental Restraint System’ (CT-L1003).

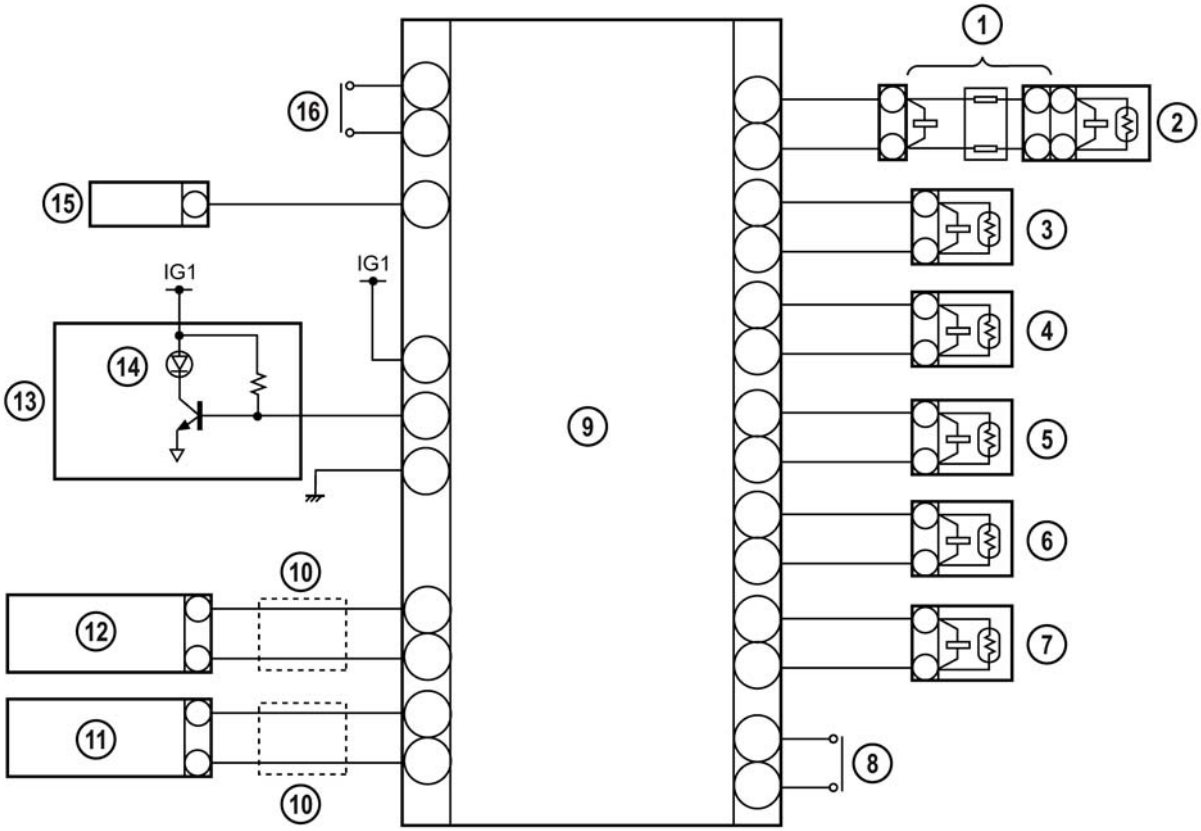
Parts Location



BT-50_08001

1 Airbag system warning light
2 Clock spring
3 Seat belt pretensioner
4 Driver-side airbag module
5 Side airbag sensor
6 Side airbag module
7 SAS control module
8 Passenger-side airbag module

Wiring Diagram

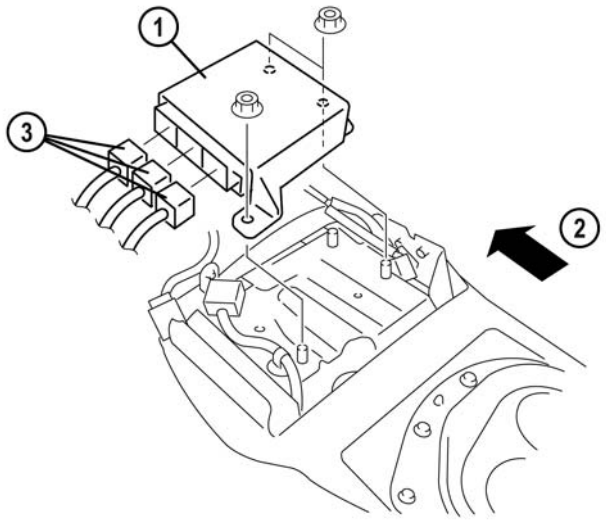


BT-50_08002

1 Clock spring
2 Driver-side airbag module
3 Passenger-side airbag module
4 Driver-side seat belt pretensioner
5 Driver-side side airbag module
6 Passenger-side seat belt pretensioner
7 Passenger-side side airbag module
8 Poor connection detection bar (connector no.2)
9 SAS control module
10 Twisted pair wire
11 Passenger-side side airbag sensor
12 Driver-side side airbag sensor
13 IC
14 Airbag system warning light
15 DLC-2
16 Poor connection detection bar (connector no.1)

SAS Control Module

- The SAS control module is located on the centre tunnel, in front of the shift lever.
- The SAS control module processes the signals it receives from the internal micro-mechanical sensor and the side airbag sensors. If the acceleration/deceleration caused by a frontal or side impact exceeds a predetermined threshold, the SAS control module triggers the airbags / pre-tensioners or only the side airbags with a DC signal.

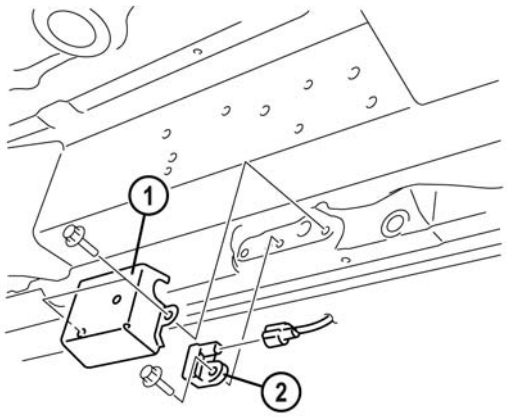


BT-50_08003

1 SAS control module
2 Driving direction
3 Connector

Side Airbag Sensors

- The side airbag sensors are installed under the vehicle on the door sills, close to the B-pillar. A rigid metal cover protects the sensors against any damage during off-road driving.
- The side airbag sensor measures the acceleration / deceleration of the vehicle during a side impact and transmits this information to the SAS control module.

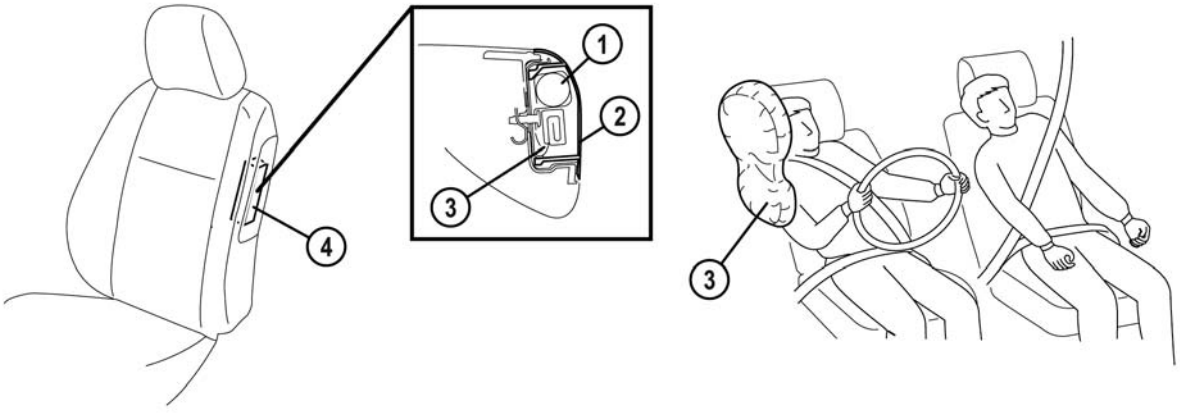


BT-50_08004

1 Protection cover
2 Side airbag sensor

Side Airbags

- The BT-50 is equipped with side airbags, which protect the head and chest area of the occupants during a side impact. The operation is similar to that of the MX-5 (NC).

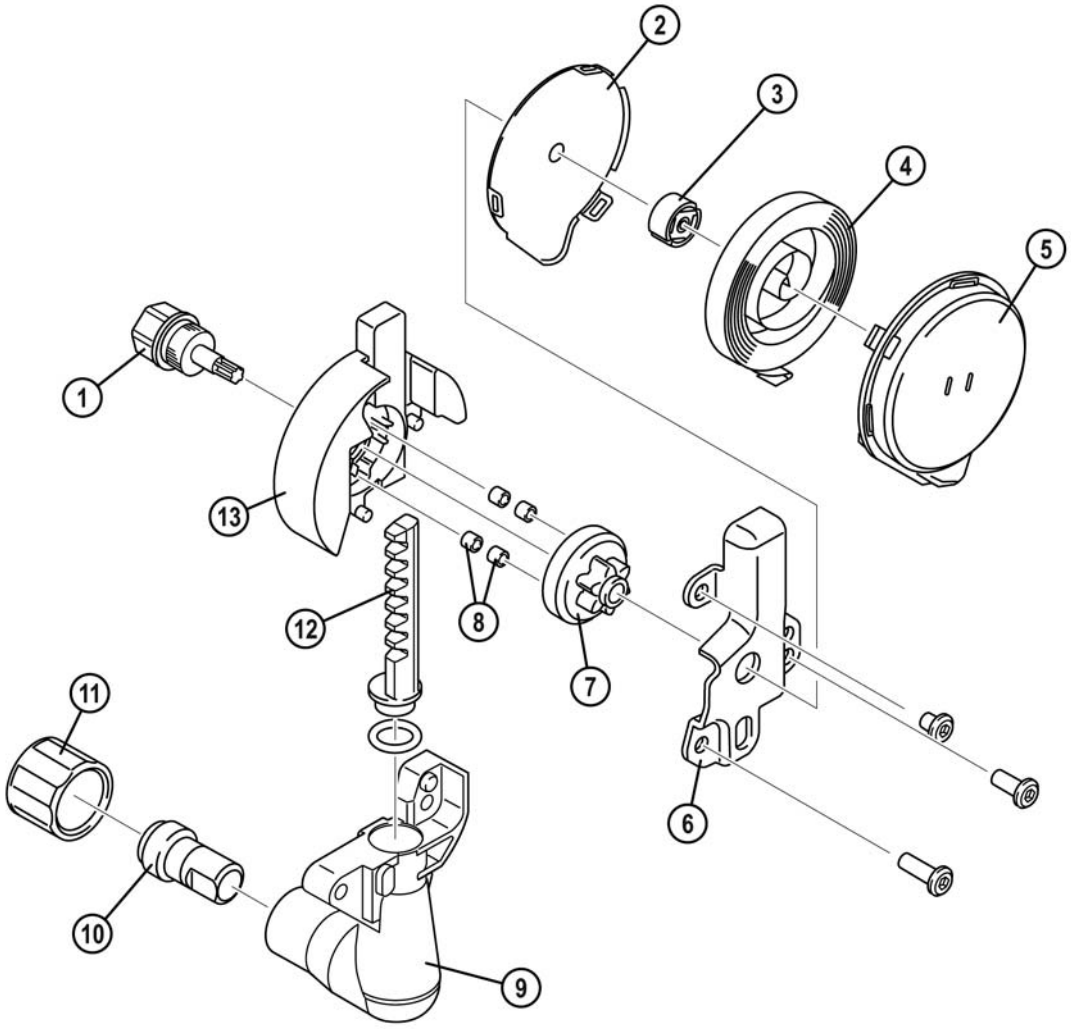


BT-50_08005

1 Inflator
2 Module cover
3 Airbag
4 Side airbag module

Seat Belt Pretensioners

- The BT-50 is equipped with rack-type seat belt pretensioners, which remove the excess slack from the seat belt in case of an accident. The operation is similar to that of the MX-5 (NC) seat belt pretensioners.



BT-50_08006

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

On-Board Diagnostic System

Features

- The OBD system of the airbag system allows bi-directional communication with M-MDS, enabling a quicker and more precise diagnosis. It has the following new features:
  - Selftest (retrieving four digit DTCs stored for present and past malfunctions)
  - PID monitor

Self Test

- The self-test function comprises displaying present and past four-digit DTCs by means of M-MDS. To read out the DTCs of the SAS control module connect the M-MDS to the vehicle and select the option **Toolbox→Self Test→Modules→RCM**.
- The excerpt of the DTC table below shows that a malfunction, which is indicated by the airbag system warning light with only one flashing pattern e.g. DTC 22, can actually have several different root causes. A more detailed description of the root cause is only displayed when performing the self test with M-MDS.
- When a malfunction of the airbag system is present the warning light flashes a two-digit DTC for ten times. Then the light stays illuminated. The flashing starts again when the ignition is switched off and on.

DTC				Malfunction
M-MDS display	Air bag system warning light			
	Flashing pattern		Priority ranking	
B1933	21		7	Passenger-side air bag module circuit resistance high
B1934	19		8	Driver-side air bag module circuit resistance low
B1935	21		7	Passenger-side air bag module circuit resistance low
B1992	22		12	Driver-side side air bag module circuit short to power supply
B1993				Driver-side side air bag module circuit short to ground
B1994				Driver-side side air bag module circuit resistance high
B1995				Driver-side side air bag module circuit resistance low

BT-50_T08001

PID Monitor

- The PID monitor function allows monitoring the PIDs of the SAS control module. Therefore, connect the M-MDS to the vehicle and select the option **Toolbox→ Datalogger→Modules→ RCM**.

PID	Definition	Unit/Condition
CONT_RCM	Number of continuous DTCs	Num
CRSH_ST_D1	Driver-side airbag sensor communication state	OK/FAULT
CRSH_ST_D2	Driver-side airbag sensor circuit state	OK/FAULT
CRSH_ST_P1	Passenger-side airbag sensor communication state	OK/FAULT
CRSH_ST_P2	Passenger-side airbag sensor circuit state	OK/FAULT
D_PTENSFLT	Driver-side seat belt pretensioner circuit state	*1)
DABAGR	Driver-side airbag module resistance	ohm
DR_PTENS	Driver-side seat belt pretensioner resistance	ohm
DS_AB	Driver-side, side airbag module resistance	ohm
DS_AB_ST	Driver-side, side airbag module circuit state	*1)
DS1_STAT	Driver-side airbag module circuit state	*1)
DSB_P_ST	Driver-side seat belt pretensioner circuit state	*1)
IG_V_2	System IG1 voltage value	V
OD_CRST_D1	On-demand driver-side, side airbag sensor communication state	OK/FAULT
OD_CRST_D2	On-demand driver-side, side airbag sensor circuit state	OK/FAULT
OD_CRST_P1	On-demand passenger-side, side airbag sensor communication state	OK/FAULT
OD_CRST_P2	On-demand passenger-side, side airbag sensor circuit state	OK/FAULT
OD_DAB1_ST	On-demand driver-side airbag module circuit state	*1)
OD_DSAB_ST	On-demand driver-side, side airbag circuit state	*1)
OD_PAB1_ST	On-demand passenger-side airbag module circuit state	*1)
OD_PSAB_ST	On-demand passenger-side, side airbag sensor circuit state	*1)
P_PTENSFLT	Passenger-side seat belt pretensioner circuit state	*1)
PABAGR	Passenger-side airbag module resistance	ohm
PS_AB	Passenger-side, side airbag module resistance	ohm
PS_AB_ST	Passenger-side, side airbag sensor circuit state	*1)
PS_PTENS	Passenger-side seat belt pretensioner resistance	ohm
PS1_STAT	Passenger-side airbag module circuit state	*1)
PSB_P_ST	Passenger-side seat belt pretensioner circuit state	*1)

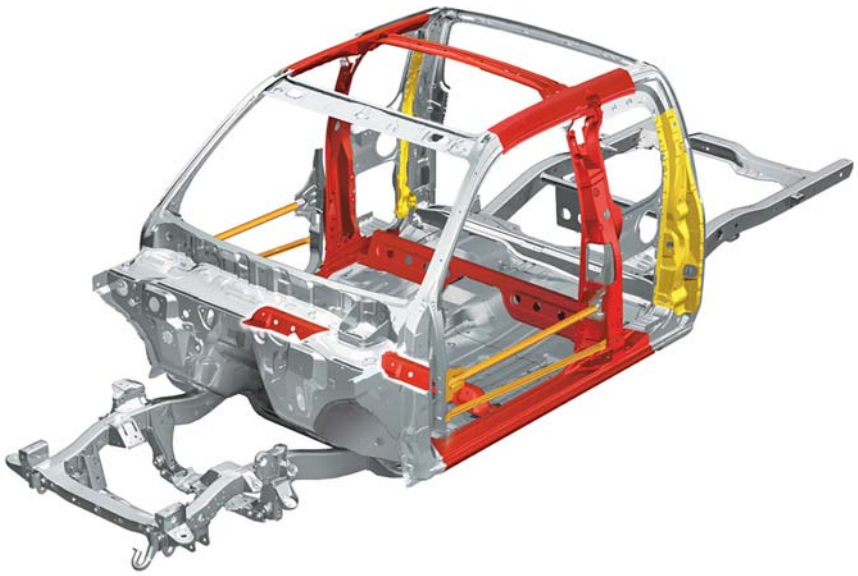
BT-50_T08002

*1) SQ_LOWRES / OPEN / SHRT_B+ / SHRT_GND / Normal

Body Panels

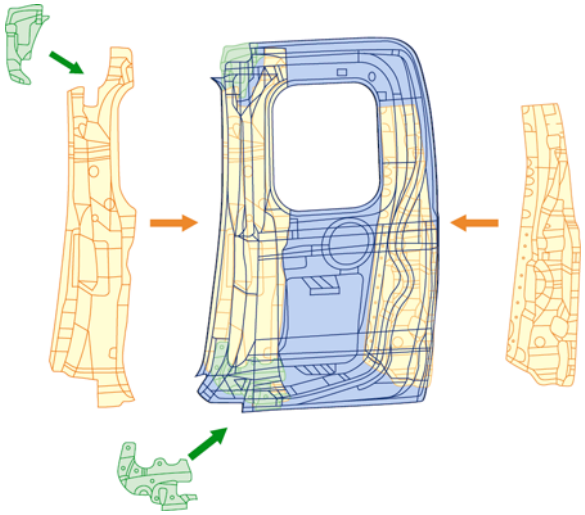
Cabin

- The cabin structure of the BT-50 (DBL cab version) with its triple-H structure, the side-door beams, and the use of high-tensile steel, provide a class top level of passive safety in conjunction with the rigid ladder frame satisfying stringent European collision-safety standards.



BT-50_09001

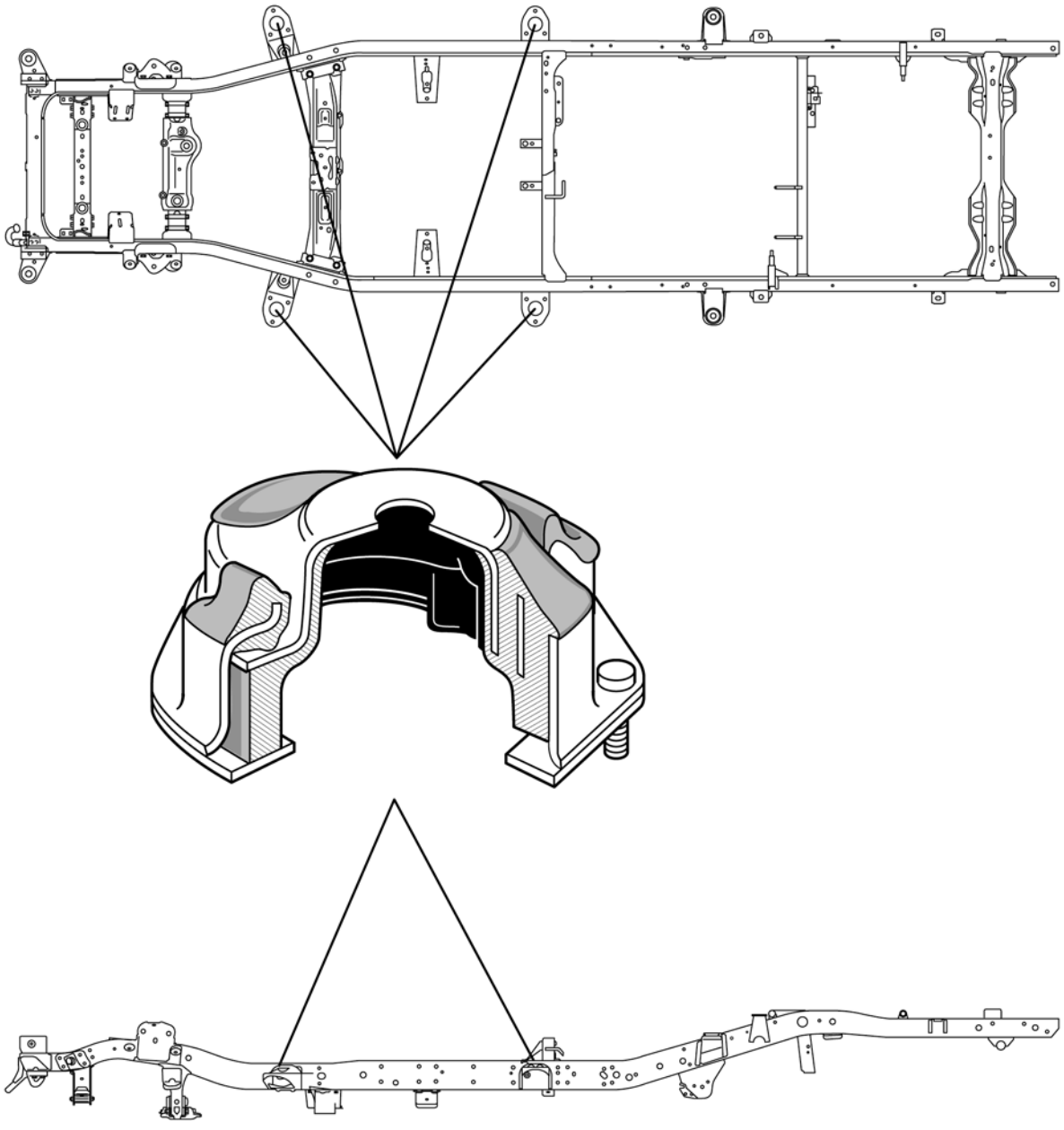
- Despite having no B-pillars the RAP cab version satisfies the European collision-safety standards by reinforcements in the rear access panel.



BT-50_09002

Ladder Frame

- The cross-braced ladder frame of the BT-50 is essentially carried over from the B-Series, just as four cabin mounts, which minimise lateral movement, but allow for compliance in vertical movement providing comfortable driving.



BT-50_09003

DBL Cab Frame

Cargo Box

- The cargo box of the BT-50 has the following new features allowing a more versatile usage of the cargo box:
  - Taller cargo box walls to increase the load capacity.
  - New structure of the inner cargo box walls with one horizontal and several vertical guiding grooves that allow splitting up the cargo space with boards.
  - Inner rope hooks that are placed closer to the floor to ease firm securing of load.

BT-50_09004

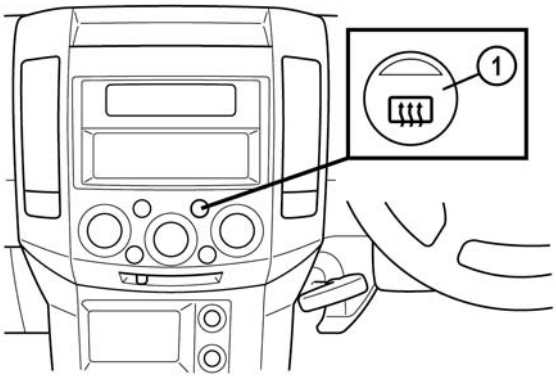
1 Vertical guiding grooves
2 Horizontal guiding groove
3 Inner rope hook

Anti-Corrosion Measures

- The body of the BT-50 features improved anti-corrosion measures:
  - Organic-resin coated steel is used on body panels that are regularly exposed to weather, such as the cowl, bonnet and outer door panels. Undercoating, PVC and wax coatings are used extensively to protect the underbody, frame and other exposed areas, against corrosion.
  - Galvanized steel is used for fenders, rocker panels, outer cargo box panels, the cargo box floor panel, wheel wells and load gate.

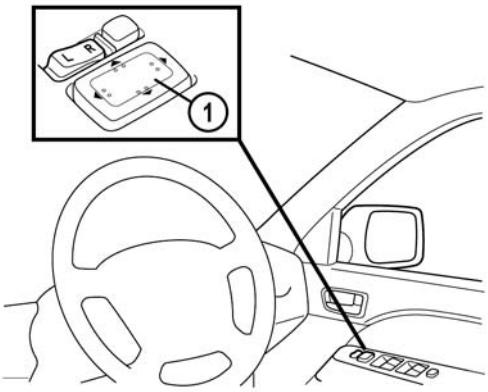
Glass/Windows/Mirrors

- The glass/windows/mirrors of the BT-50 have following new features:
  - Rear window defroster switch installed in centre panel
  - Power outer mirror switch installed in driver door trim
  - Enlarged power outer mirrors



BT-50_09006

1 Rear window defroster switch



BT-50_09007

1 Power outer mirror switch

Security and Locks

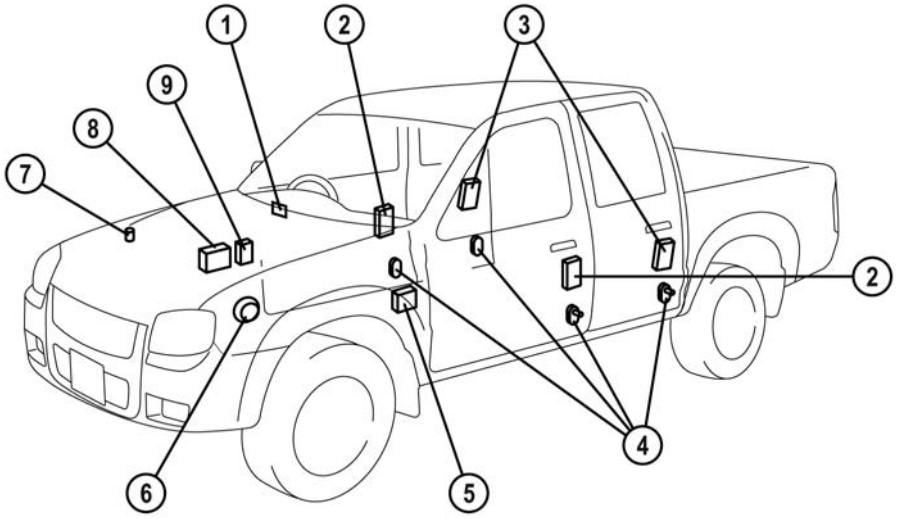
Features

- The security and locks system of the BT-50 has the following features:
  - Power door lock system (without double lock)
  - Keyless entry system (keyless transmitter with retractable key)
  - Mazda immobiliser system with separate immobiliser module
  - Theft-deterrent system (for vehicles with U.K. specification)

NOTE: Further information can be found in the Training Manuals of the 'B-Series' (NMT-005) and 'Immobiliser System' (CT-L 1007).

Theft-Deterrent System

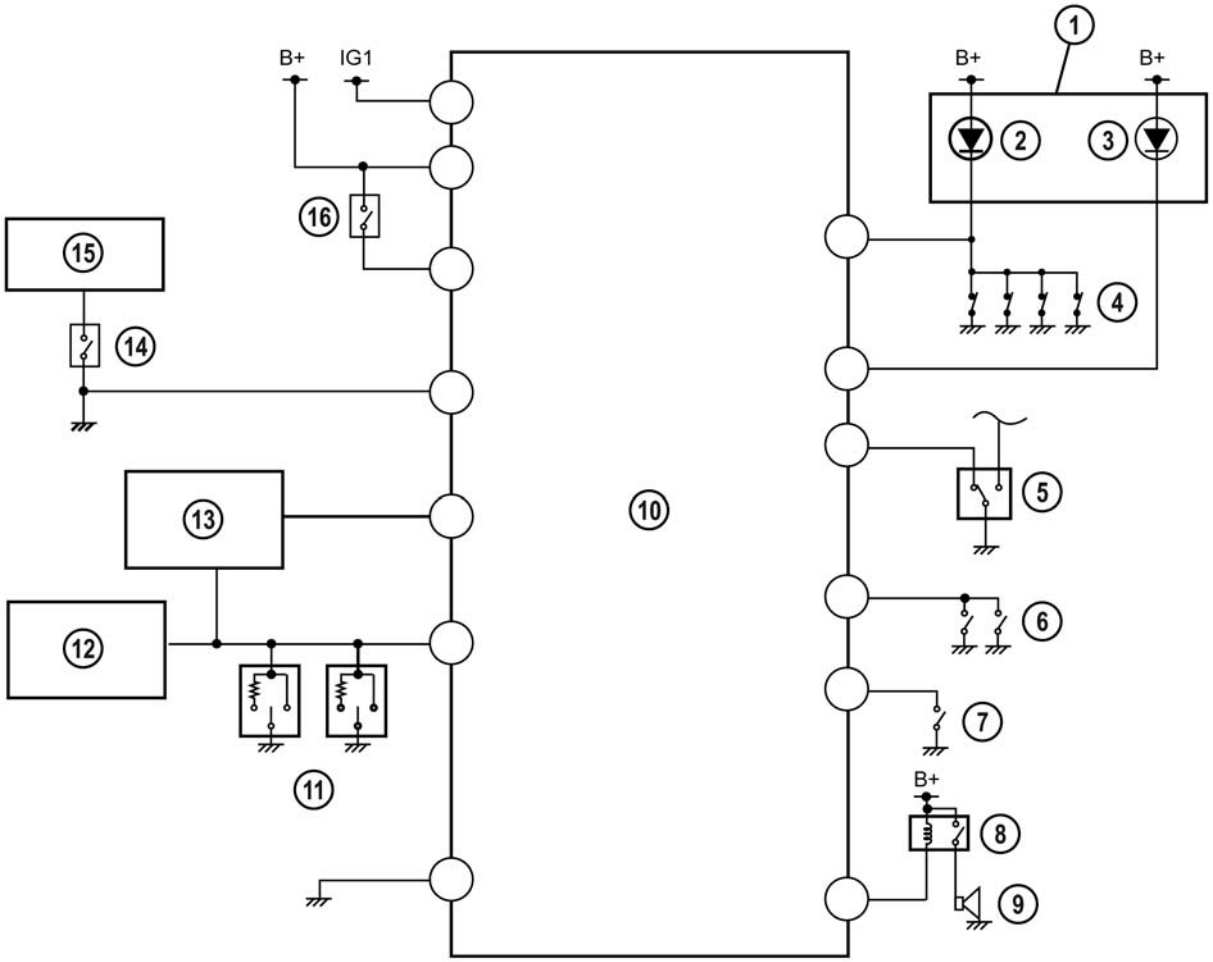
- The theft-deterrent system activates the turn lights and the theft-deterrent horn when the bonnet or a door is opened by means of other than the key or the keyless transmitter. The system is deactivated when a door is opened with the key or the unlock button of the keyless transmitter.



BT-50_09008

1 Engine switch
2 Front door latch and lock actuator
3 Rear door latch and lock actuator
4 Door switch
5 Keyless control module
6 Theft-deterrent horn
7 Bonnet switch
8 Door lock control module
9 Theft-deterrent control module

Wiring Diagram



BT-50_09009

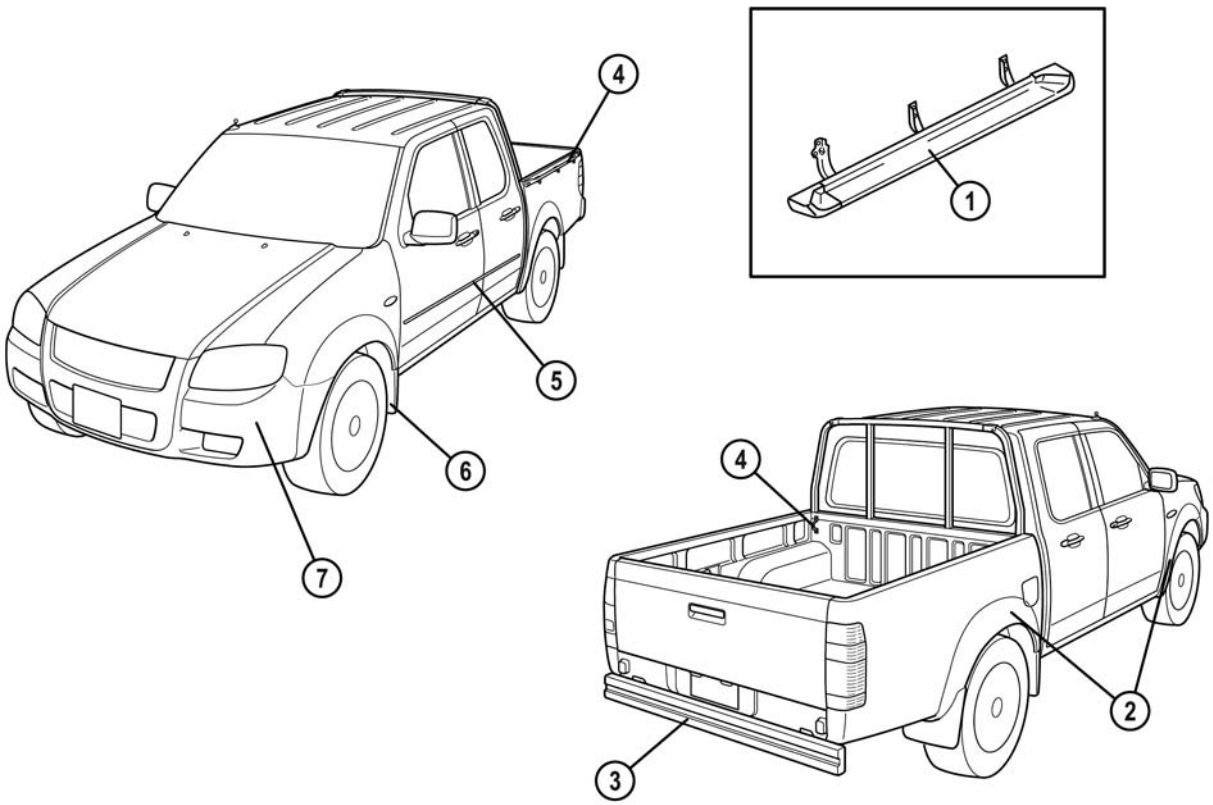
1 Instrument cluster
2 Door ajar warning light
3 Security light
4 Door switches
5 Driver's door lock-link switch
6 Rear door lock-link switches
7 Bonnet switch
8 Theft-deterrent horn relay
9 Theft-deterrent horn
10 Theft-deterrent control module
11 Door key cylinder switches
12 Door lock control module
13 Keyless control module
14 Hazard warning switch
15 Flasher control module
16 Key reminder switch

Exterior Trim

Features

- The exterior trim of the BT-50 has the following new features (depending on grade):
  - Painted front bumper with integrated front grille
  - New designed chrome door handles
  - Larger wheel arch extensions
  - Modified side steps

Parts Location

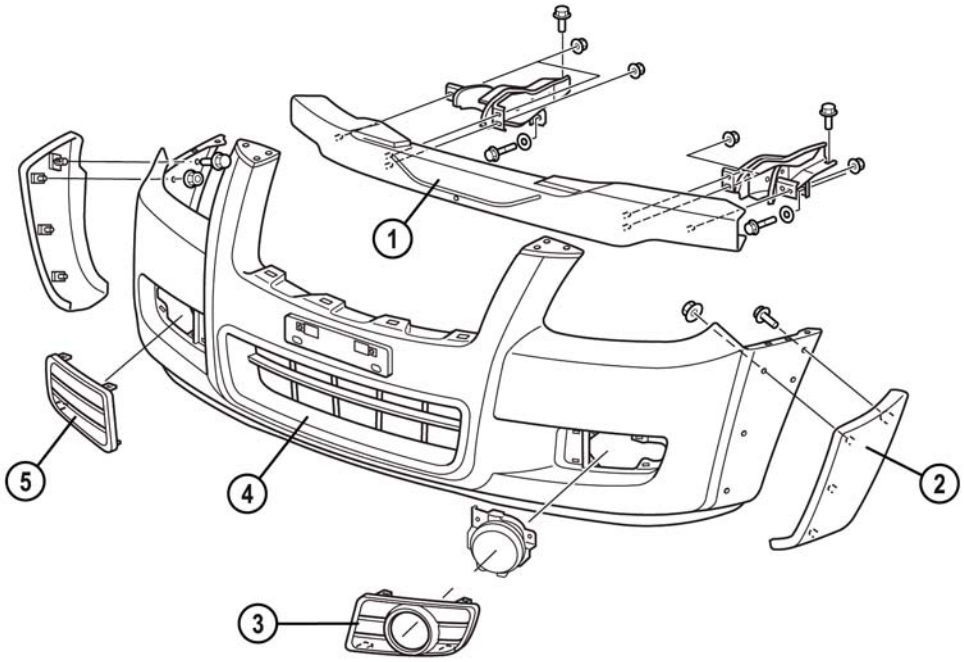


BT-50_09026

1 Side step
2 Wheel arch extension
3 Rear bumper
4 Rope hook
5 Side protector
6 Front flap
7 Front bumper

Front and Rear Bumper

- The front bumper is completely new designed, while the rear bumper is the same as used on the B-Series.
- The plastic front bumper is installed on a steel reinforcement. The bumper also accommodates the front grille, newly designed front fog lights and the lower wheel arch extensions (if equipped).



BT-50_09005

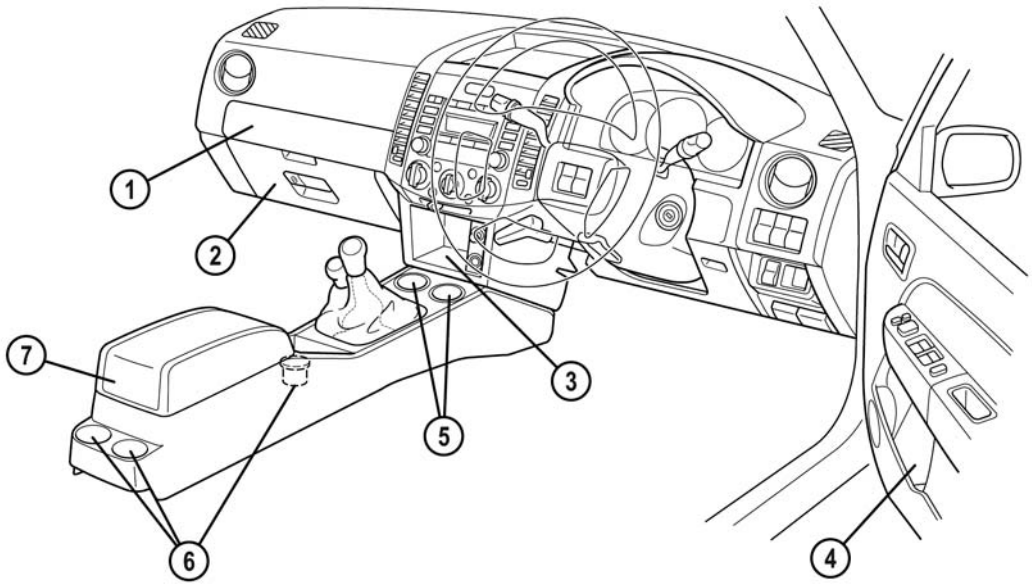
1 Bumper reinforcement
2 Lower wheel arch extension
3 Front hole cover (with front fog lights)
4 Front bumper
5 Front hole cover (without front fog lights)

Interior Trim

Features

- The interior trim of the BT-50 has the following new features:
  - Newly designed dashboard installed on a steel crossmember
  - Front door pockets with bottle holder
  - Sliding upper glove compartment
  - Newly designed centre console

Parts Location



BT-50_09010

1 Sliding upper glove compartment
2 Glove compartment
3 Storage compartment
4 Door pocket
5 Cup holder
6 Cup holder (except REG cab)
7 Centre console

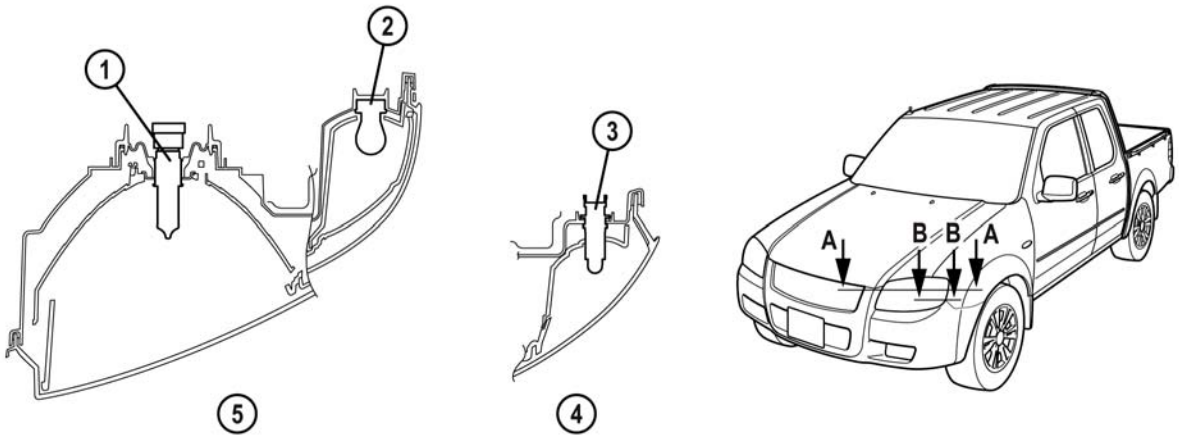
Lighting System

Features

- The lighting system of the BT-50 has the following new features:
  - Front combination light with multi-reflector headlight type, turn and parking light
  - Rear combination light with stepped reflector
  - Front and rear fog light switch incorporated in light switch
  - Rear fog light integrated in rear combination light or in rear bumper (depending on market)
  - Centre console illumination light
  - Room light incorporating spot lights
  - **DRL** (**D**aytime **R**unning **L**ight) (depending on market)

Parts Location

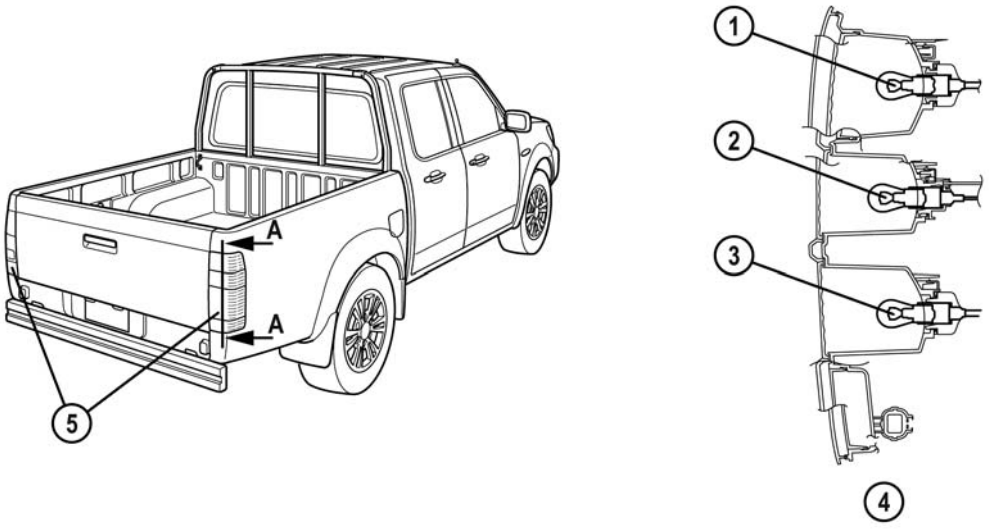
Front Combination Light



BT-50_09012

1 Headlight bulb
2 Front turn light bulb
3 Parking light bulb
4 Section B-B
5 Section A-A

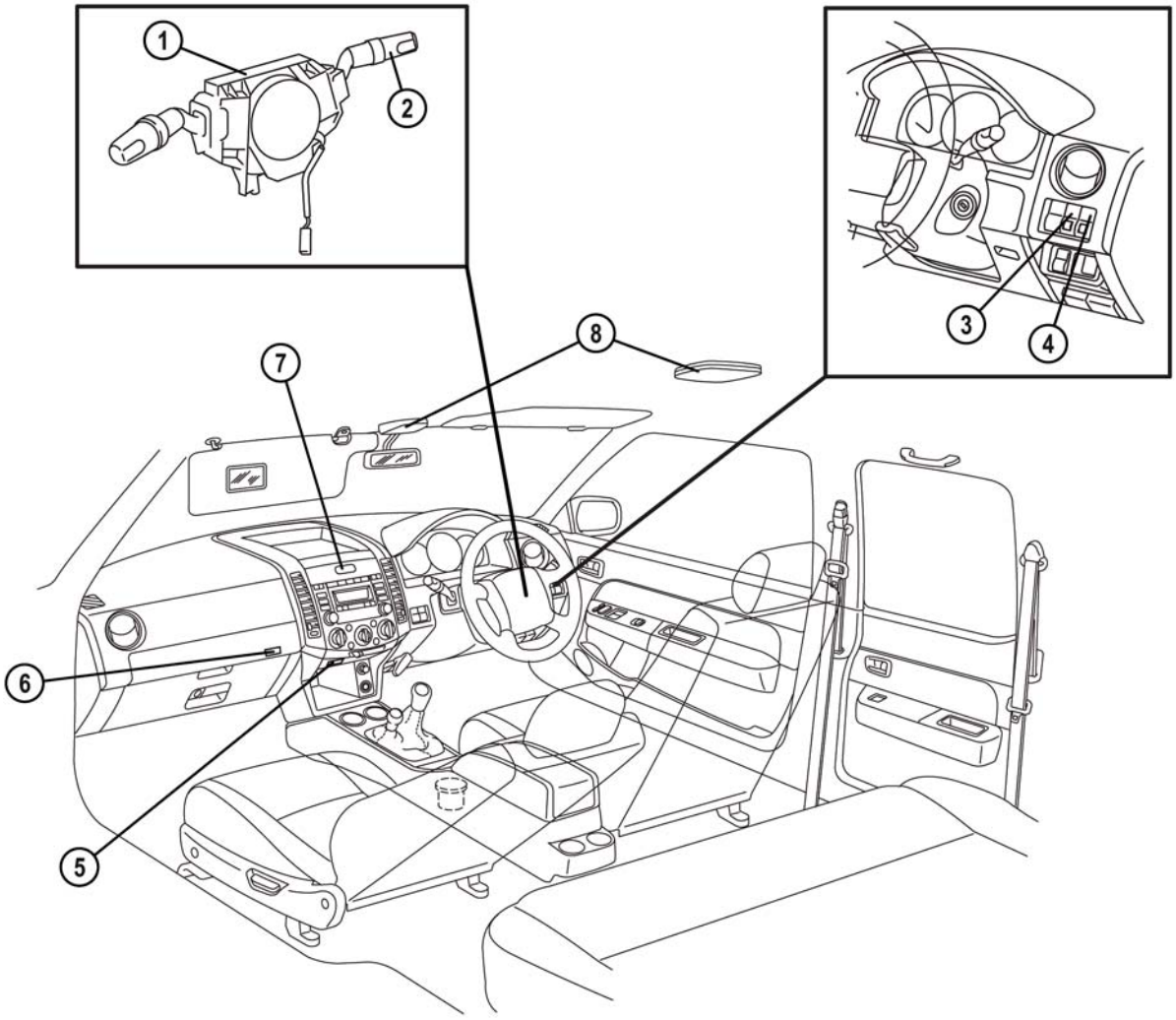
Rear Combination Light



BT-50_09013

1 Brake/taillight bulb
2 Turn light bulb
3 Back-up light bulb (LH)
Rear fog light bulb (RH)
4 Section A-A
5 Rear combination light

Overview



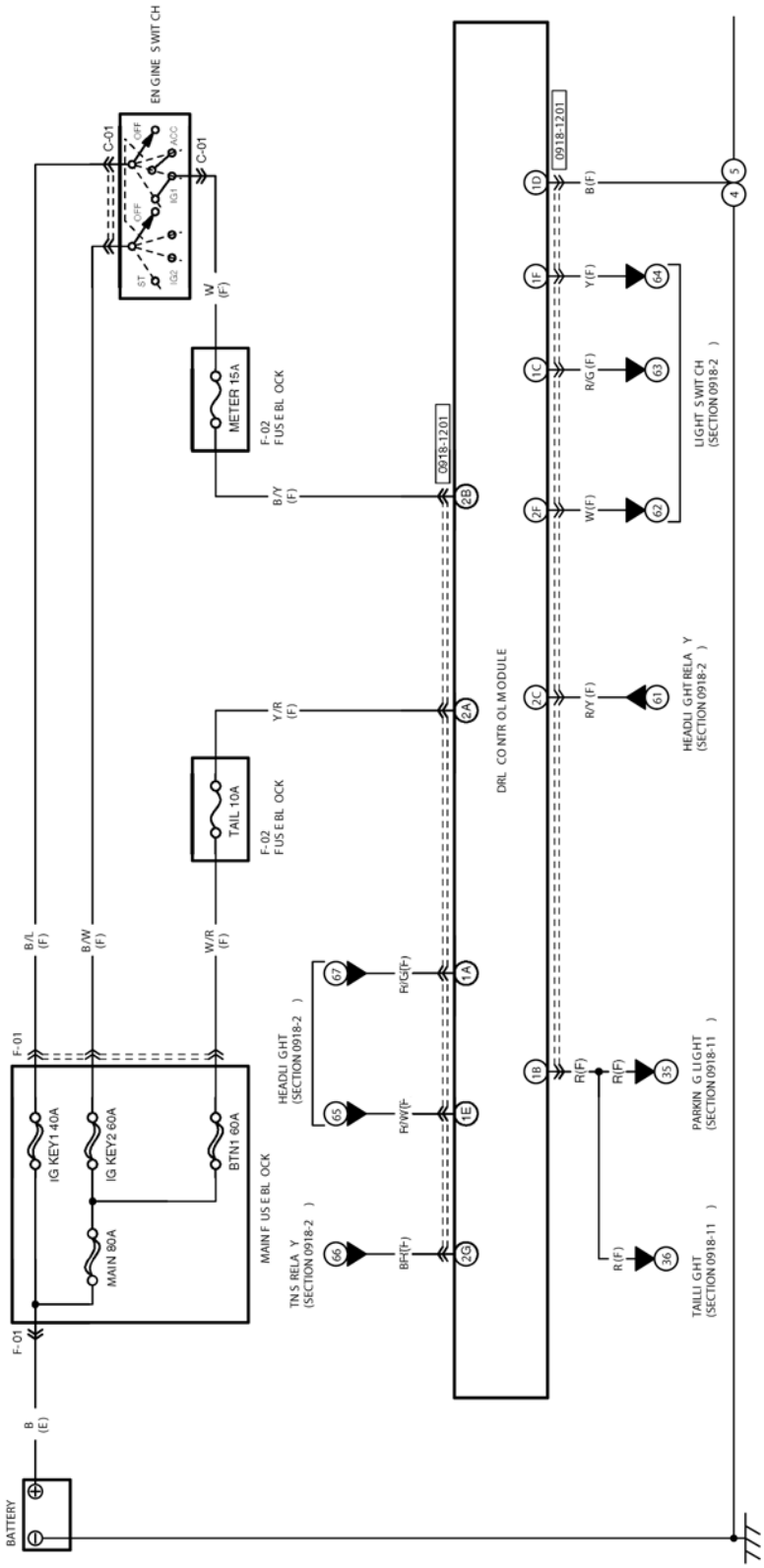
BT-50_09014

1 Combination switch
2 Light switch
3 Panel light control switch
4 Headlight levelling switch
5 Centre console illumination
6 Glove compartment light
7 Hazard warning switch
8 Interior light

Daytime Running Light

- Since some countries outlaw driving vehicles without switched on headlights during daytime, a DRL system is available for these markets. On the BT-50, a DRL control module automatically switches on the headlights when the ignition is in IG1 position.

Wiring Diagram



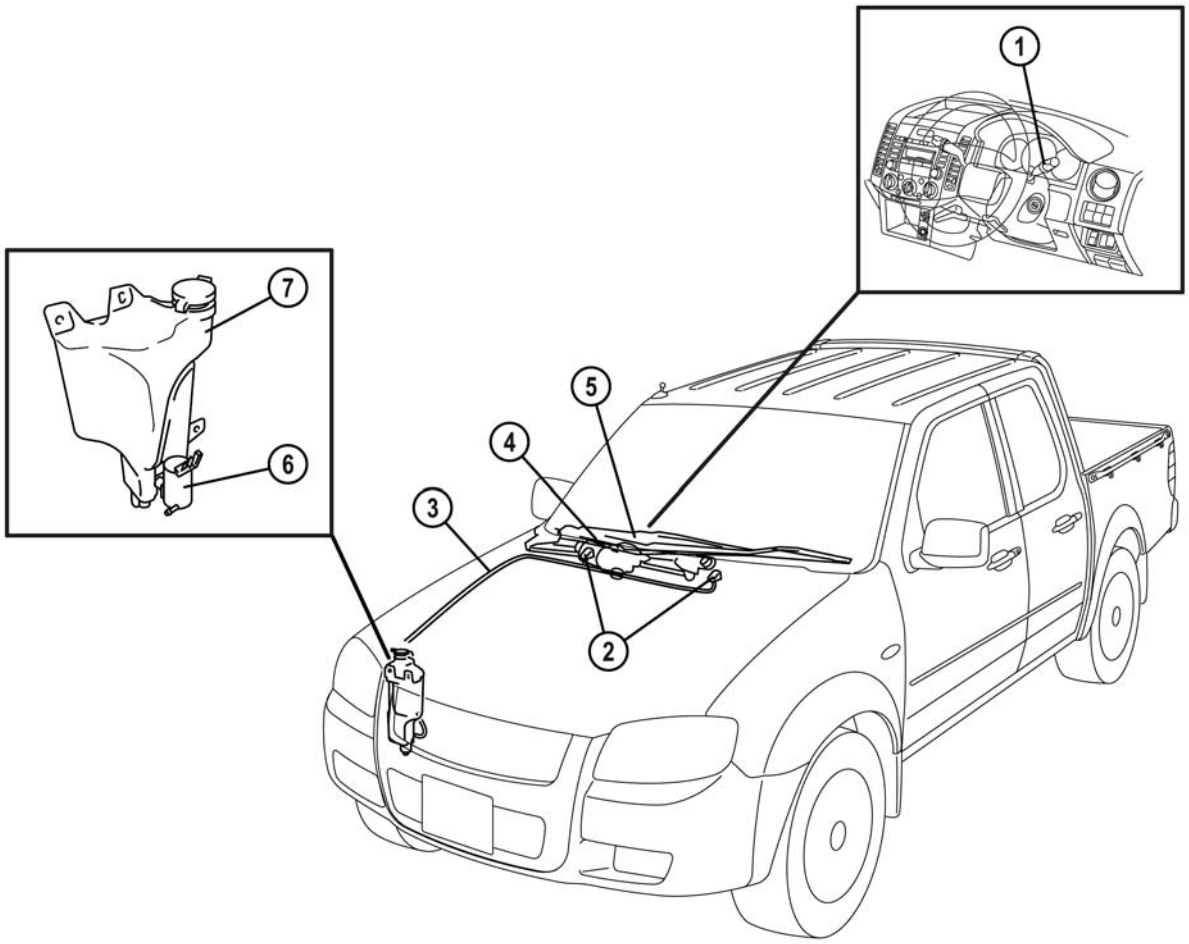
BT-50_09028

Wiper / Washer System

Features

- The wiper / washer system of the BT-50 has the following new features:
  - Intermittent wiper function with adjustable interval

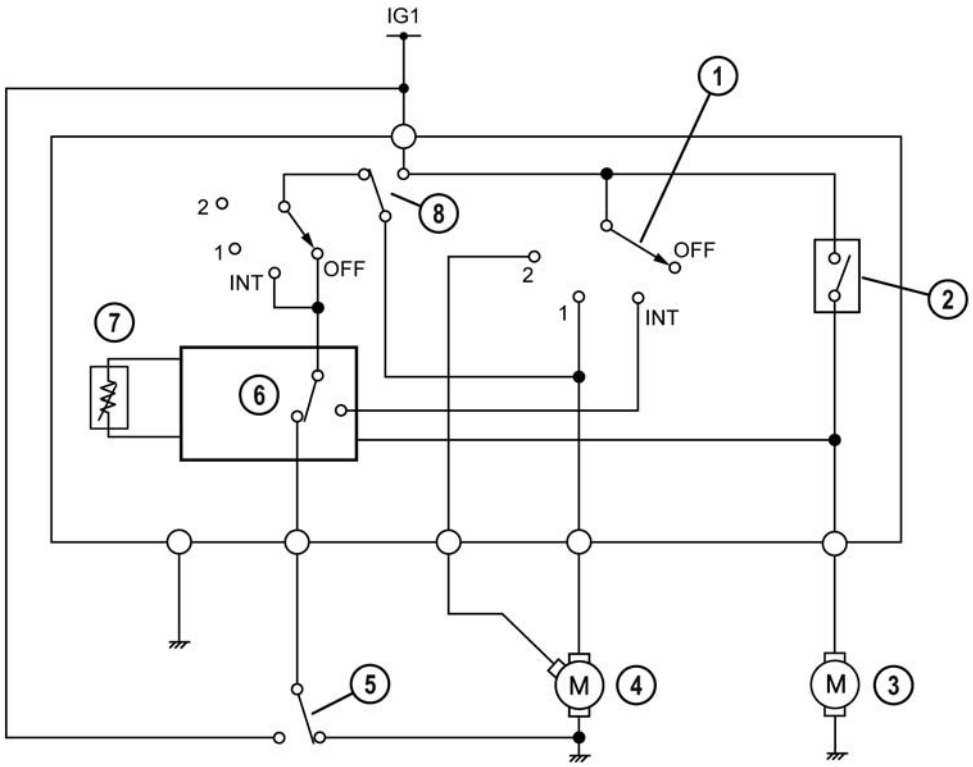
Parts Location



BT-50_09016

1 Wiper and washer switch
2 Washer nozzle
3 Washer hose
4 Wiper motor
5 Wiper arm and blade
6 Washer motor
7 Washer tank

Wiring Diagram



BT-50_09024

1 Wiper switch
2 Washer switch
3 Washer motor
4 Wiper motor
5 Auto-stop switch
6 Interval relay
7 Interval control switch
8 One-touch switch

Audio System

Features

- The modular audio system of the BT-50 is available in two different variants: Radio with CD player or with 6-CD changer. It has the following features:
  - AM/FM tuner with **RDS** (**R**adio **D**ata **S**ystem) and **ALC** (**A**udio **L**evel **C**ontrol)
  - Single CD player or 6-CD changer with MP3 compatibility
  - I-Pod adapter compatibility (16-pin connector)
  - 6-Loudspeaker system comprising four door speakers and two tweeters
  - OBD system

Specifications

Audio Unit

Item				Specification		
				Type A		Type B
				With RDS	Without RDS	
Rated voltage			V	12		
Frequency band	AM	LW	kHz	153-279	–	
		MW	kHz	531-1602	522-1629	531-1629
	FM		MHz	87.5-108		
Audio amplifier maximum output power			W	35×4		
Output impedance			ohm	4		

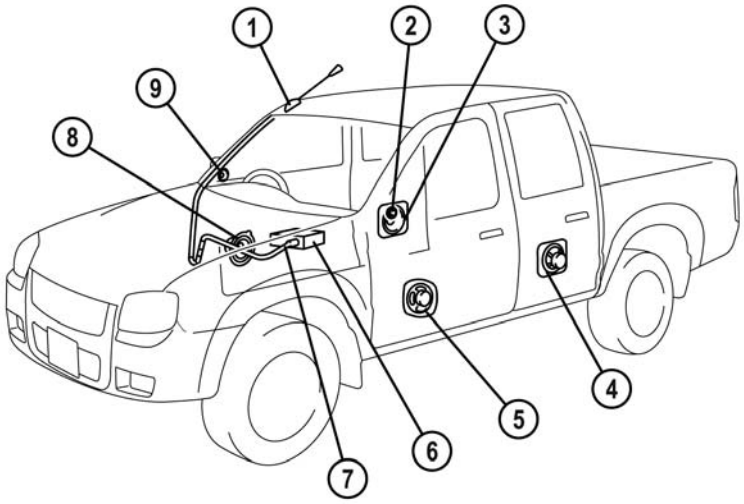
BT-50_T09004

Speakers

Item		Specification			
		Front speaker	Rear speaker		Tweeter
			DBL cab	RAP cab	
Maximum input	W	25			
Impedance	ohm	4			
Size	mm	160	100	160	30

BT-50_T09005

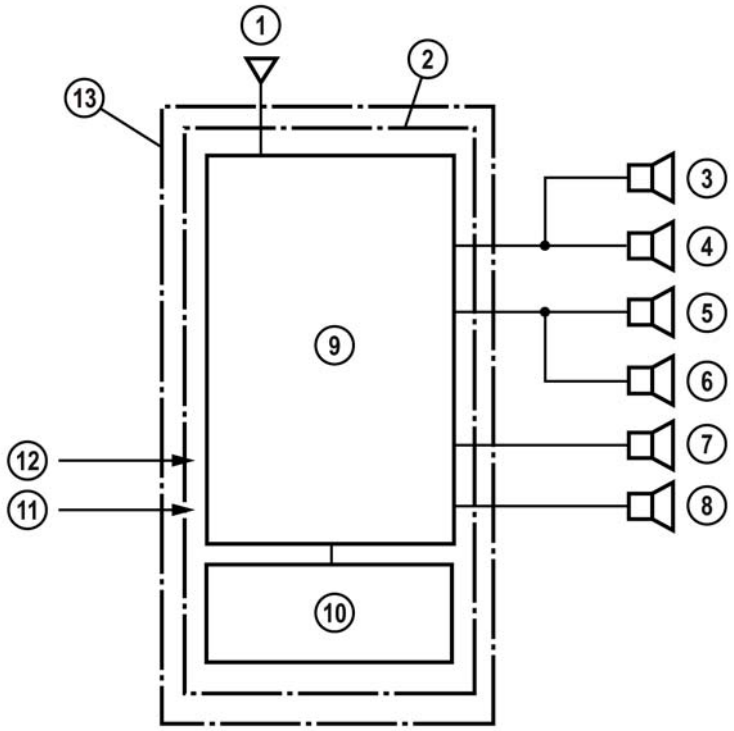
Parts Location



BT-50_09017

1 Roof antenna
2 Tweeter LH
3 Rear speaker RH
4 Rear speaker LH
5 Front speaker LH
6 Audio unit
7 Antenna cable
8 Front speaker RH
9 Tweeter RH

System Overview

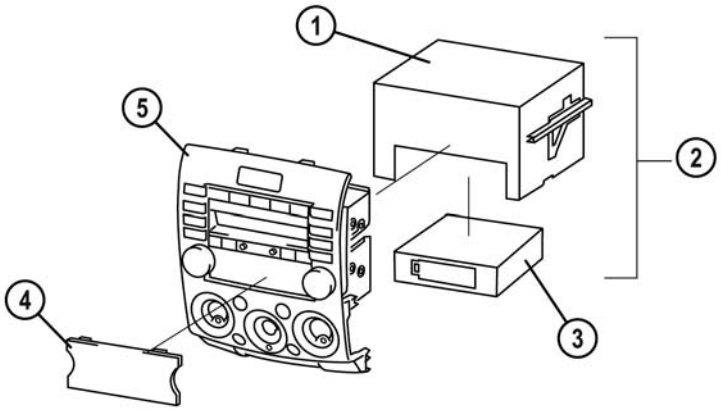


BT-50_09019

1 Roof antenna
2 Audio unit
3 Tweeter (RH)
4 Front speaker (RH)
5 Front speaker (LH)
6 Tweeter (LH)
7 Rear speaker (RH)
8 Rear speaker (LH)
9 Base unit
10 Lower module
11 Vehicle speed signal
12 TNS signal
13 Centre panel unit

NOTE: A telephone mute function is only available by using an appropriate connector adapter, which is provided as accessory part by Mazda Motor Europe.

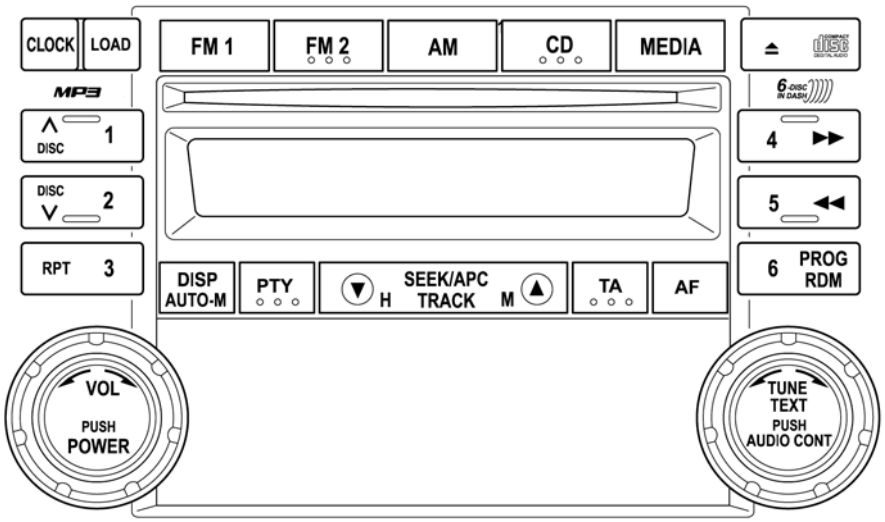
- The modular audio system consists of the base unit, the lower module (if equipped) and the centre panel. The base unit with CD player is different from the one with 6-CD changer.



BT-50_09018

1 Base unit
2 Audio unit
3 Lower module
4 Cover
5 Centre panel

NOTE: **MC** (**M**usic **C**assette) drive or **MD** (**M**ini **D**isc) player are currently not available for Europe.



BT-50_09025

Operating key layout of the 6-CD changer

On-Board Diagnostic System

- The OBD system of the modular audio system comprises a self-test and a diagnostic assist function.

Self-Test Function

- The fault memory of the audio module can store up to three DTCs. If a fourth fault is detected when three DTCs are already stored, the oldest DTC is deleted and the new one stored.
- Once a DTC is stored in the non-volatile memory of the audio unit it can be displayed on the information display when the test mode has been activated. In addition, the self-test function allows deleting the stored DTCs.

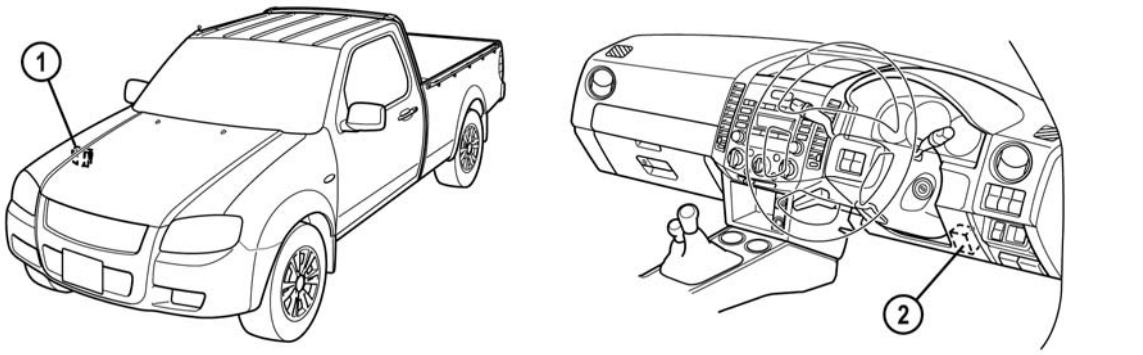
Diagnostic Assist Function

- The diagnostic assist function allows checking of the following components:
  - Information display
  - Speakers
  - Radio reception condition
  - Antenna condition

NOTE: For further information about the self-test and diagnostic assist function refer to the W/M.

Power Systems

Parts Location



BT-50_09020

1 Main fuse block

2 Fuse block

Instrumentation / Driver Information System

Features

- The instrumentation / driver information system of the BT-50 has the following new features:
  - LED-type warning and indicator lights
  - Front and rear fog light indicator lights incorporated in the IC
  - Key reminder warning alarm
  - Extended input / output check code functions

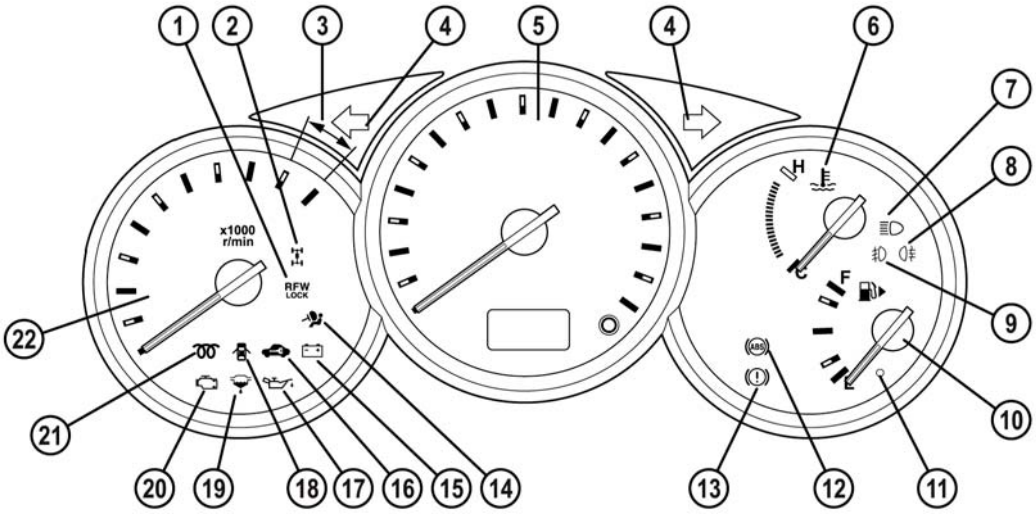
Specifications

Item			Specification
Speedometer	Meter type		Stepper motor type
	Indication range	km/h	0–180
	Input signal source		Speedometer sensor
	Rated voltage	V	DC 12
Tachometer	Meter type		Stepper motor type
	Indication range	rpm	0–5,500
	Red zone	rpm	4,500–5,000
	Input signal source		PCM
	Rated voltage	V	DC 12
Fuel level gauge	Meter type		Stepper motor type (Reset-to-zero type)
	Input signal source		Fuel gauge sender unit
	Rated voltage	V	DC 12
Water temperature gauge	Meter type		Stepper motor type (Medium range stabilised type)
	Input signal source		ECT sensor
	Rated voltage	V	DC 12
Odometer/ Tripmeter	Display		LCD
	Indication digits		Odometer: 6 digits, Tripmeter: 4 digits
	Rated voltage	V	DC 12
Warning alarms	Sound frequency	Hz	2,000–2,200
	Output sound pressure level	dB	67.5
Clock accuracy (reference value)*		s/day	-1.5–1.5

BT-50_T09009

* : If the clock accuracy varies largely from the reference value, battery deterioration or an audio unit (base unit) malfunction may have occurred.

Instrument Cluster Overview



BT-50_09023

No.	Item	Input signal source
1	RFW indicator light	PCM
2	4x4 indicator light	RFW main switch
3	Red Zone	
4	Turn indicator light	Flasher control module
5	Speedometer gauge	VSS
6	Water temperature gauge	ECT sensor
7	High-beam indicator light	Headlight switch
8	Front fog light indicator light	Front fog light relay
9	Rear fog light indicator light	Rear fog light relay
10	Fuel level gauge	Fuel gauge sender unit
11	Fuel-level warning light	Fuel gauge sender unit
12	ABS warning light	ABS HU/CM
13	Brake system warning light	• Parking brake switch • Brake fluid level sensor
14	Airbag system warning light	SAS control module
15	Generator warning light	Generator
16	Security light	• Immobilizer module • Theft deterrent control module
17	Oil pressure warning light	Oil pressure switch
18	Door ajar warning light	Door switches
19	Sedimentor warning light	Sedimentor switch
20	MIL	PCM
21	Glow indicator light	PCM
22	Tachometer gauge	CKP sensor

BT-50_T09010

Key Reminder Warning Alarm

- This function warns with an intermittent sound from the buzzer in the IC that the key is in the steering lock in position ACC or LOCK when any door is opened. Additionally a permanent sound warns when a door is opened and the lights are switched on.

Input / Output Check Mode

- This function allows checking the input and output circuits of the instrument cluster. It can be activated in the following way:
  1. Press and hold the odometer/tripmeter switch, and turn the ignition switch to the ON position.
  2. Continue holding the odometer/tripmeter switch for approx. 5 s. until **tESt** is displayed on the LCD.
  3. Release the odometer/tripmeter switch within 3 s after **tESt** is displayed.
  4. When the odometer/tripmeter indicates check code 00, push the odometer/tripmeter switch to select a check code.
  5. Inspect the check codes according to the W/M.

Check code	Check item	Related items
04	Door switch	• Key reminder warning alarm • Lights-on reminder warning alarm
08	TNS relay	• Lights-on reminder warning alarm • Each illumination light
09	Headlight switch	• Headlight • Rear fog light control system
10	Speedometer sensor	Speedometer
11	PCM	Tachometer
12	Speedometer	Speedometer
13	Tachometer	Tachometer
14	Buzzer	Buzzer
15	Rear fog light relay	Rear fog light indicator light
16	Fuel-level warning light	Fuel-level warning light
18	Engine key illumination	Engine key illumination
22	Fuel gauge sender unit	Fuel gauge
23	Fuel gauge	Fuel gauge
24	ECT sensor	Water temperature gauge
25	Water temperature gauge	Water temperature gauge
26	• Odometer/tripmeter (LCD) • Warning and indicator lights	• Odometer/tripmeter (LCD) • Warning and indicator lights
29	Rear fog light switch	Rear fog light control system
31	Key reminder switch	Key reminder warning alarm
40	Front fog light relay	Front fog light relay

BT-50_T09011

Control System

Features

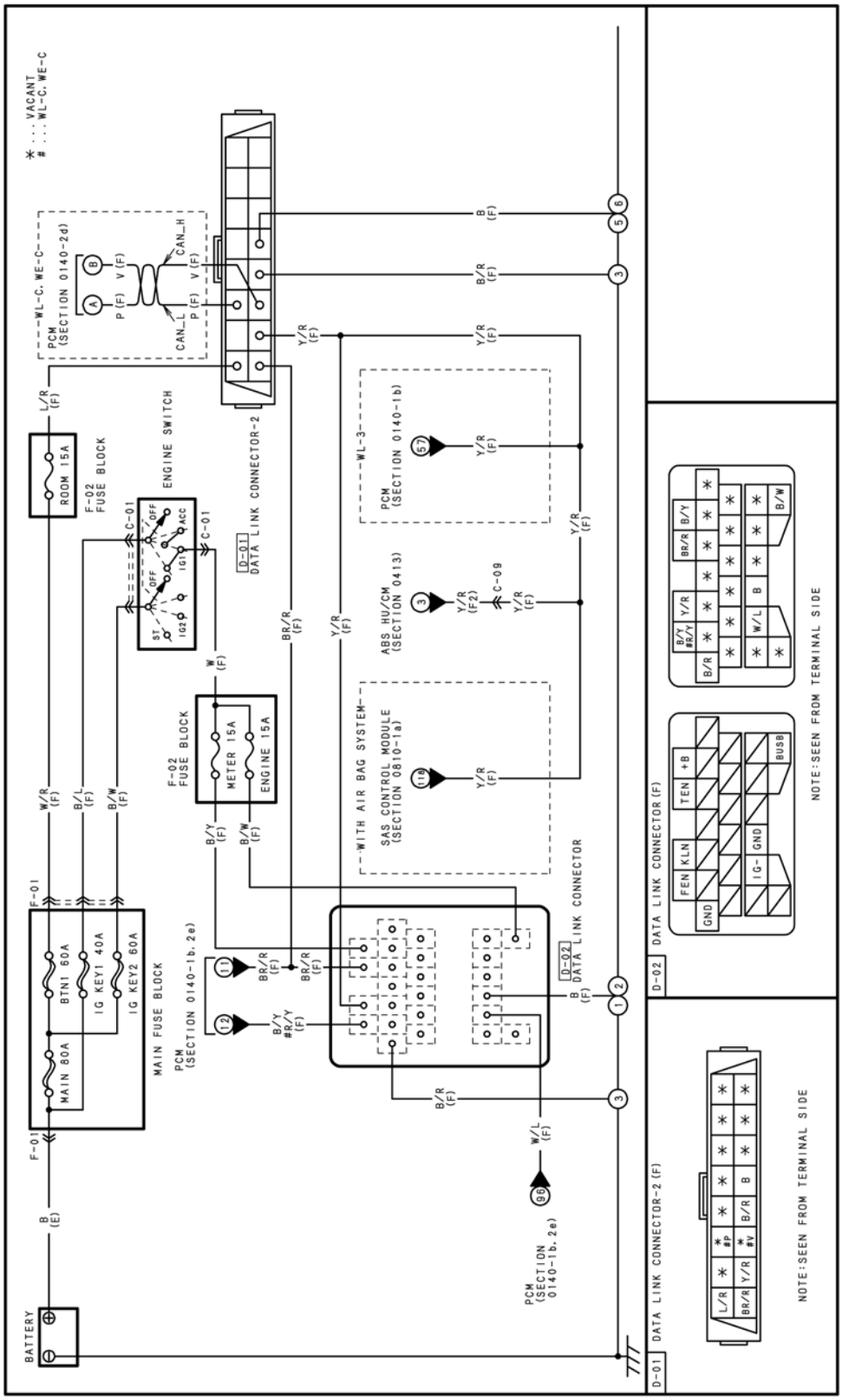
- The control system of the BT-50 has the following new features:
  - DLC-2
  - HS-CAN connection between PCM and DLC-2 for communication with M-MDS

Data Link Connector

- The DLC-2 is located under the dashboard next to the centre panel.
- The 17-pin DLC-1, known from the previous B-Series, is installed on the left rear side in the engine compartment. It cannot be used for communication with M-MDS.

NOTE: For communication with M-MDS the control modules of the **ABS** (**A**ntilock-**B**rake **S**ystem) and the SAS are connected to DLC-2 via **ISO** (**I**nternational **S**tandard **O**rganisation) bus.

Wiring Diagram



BT-50_09027

ABS	**A**nti-lock **B**rake **S**ystem
A/C	**A**ir **C**onditioning
APP	**A**ccelerator **P**edal **P**osition
CAN	**C**ontroller **A**rea **N**etwork
CKP	**C**ran**K**shaft **P**osition
CMP	**C**a**M**shaft **P**osition
CPP	**C**lutch **P**edal **P**osition
DBL	**D**ou**BL**e
DLC	**D**ata **L**ink **C**onnector
DLR	**D**aytime **R**unning **L**ight
DTC	**D**iagnostic **T**rouble **C**ode
ECT	**E**ngine **C**oolant **T**emperature
EGR	**E**xhaust **G**as **R**ecirculation
FEN	**F**ault **EN**gine
HVAC	**H**eating**, V**entilation**, A**ir **C**onditioning
HU/CM	**H**ydraulic **U**nit/**C**ontrol **M**odule
IAT	**I**ntake **A**ir **T**emperature
IC	**I**nstrument **C**luster
ISO	**I**nternational **S**tandard **O**rganisation
ISV	**I**ntake **S**hutter **V**alve
KLN	**K**-**LiN**e
LCD	**L**iquid **C**rystal **D**isplay
LED	**L**ight **E**mitting **D**iode
LSD	**L**imited **S**lip **D**ifferential
MAF	**M**ass **A**ir **F**low
MAP	**M**anifold **A**bsolute **P**ressure
MIL	**M**alfunction **I**ndicator **L**amp
MC	**M**usic **C**assette
MD	**M**ini **D**isc
M-MDS	**M**azda-**M**odular **D**iagnostic **S**ystem

List of Abbreviations

OBD	**O**n-**B**oard **D**iagnostics	**VSC**	**V**ariable **S**wirl **C**ontrol
PCM	**P**owertrain **C**ontrol **M**odule	**VSS**	**V**ehicle **S**peed **S**ensor
PID	**P**arameter **ID**entification	**VIN**	**V**ehicle **I**dentification **N**umber
RAP	**R**andom **A**ccess **P**anel		
REG	**REG**ular		
RFW	**R**emote **F**ree**W**heel		
RWD	**R**ea**r** **W**heel **D**rive		
SAS	**S**ophisticated **A**irbag **S**ensor		
SRS	**S**upplemental **R**estraint **S**ystem		
SST	**S**pecial **S**ervice **T**ool		
TEN	**T**est **EN**gine		
W/D	**W**iring **D**iagram		
W/M	**W**orkshop **M**anual		
VBC	**V**ariable **B**oost **C**ontrol		
VGT	**V**ariable **G**eometry **T**urbocharger		