ENGINE (DOHC)

FEATURES

SERVICE

13E0B2-301

OUTLINE

OUTLINE OF CONSTRUCTION

- The engine is the same as of the previous BP-DOHC Turbo engine. However, some of the components are modified for greater reliability and performance.
- Metallic sodium-filled exhaust valves are adopted.

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SPECIFICATIONS

Item \ Engine			BP DOHC Turbo
Type			Gasoline, 4-cycle
Cylinder arrangement and number			In-line, 4 cylinders
Combustion chamber			Pentroof
Valve system			DOHC, belt-driven
Displacement cm^3 {cu in}			1,839 {112.2}
Bore and stroke mm {in}			83.0 × 85.0 {3.27 × 3.35}
Compression ratio			8.2
Compression pressure kPa {kgf/cm^2, psi}-rpm			1,127 {11.5, 164}-300
Valve timing	IN	Open BTDC	2°
		Close ABDC	51°
	EX	Open BBDC	59°
		Close ATDC	8°
Valve clearance mm {in}		IN	0: Maintenance-free
		EX	0: Maintenance-free
Idle speed* rpm			800 ± 50
Ignition timing* BTDC			10° ± 1°
Firing order			1—3—4—2

*...TEN terminal of diagnosis connector grounded.

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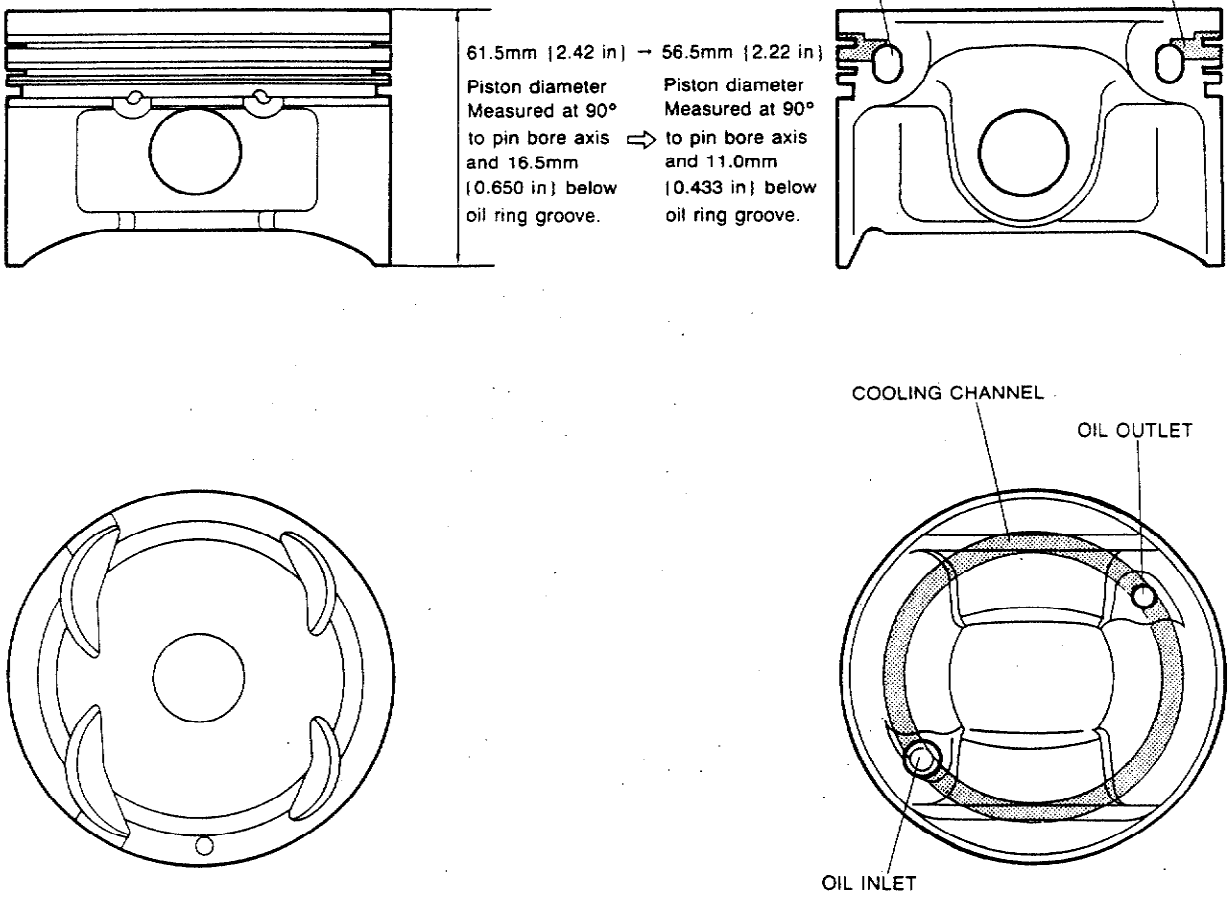
INTERCHANGEABILITY

The following chart shows interchangeability of the main parts of the previous BP DOHC Turbo engine and the new BP DOHC Turbo engine for 4WD models.

Symbols: ○ .... Interchangeable X .... Not interchangeable

Part name			Interchangeability	Remark
Cylinder block related	Cylinder head		○	
	Camshaft oil seal		○	
	Cylinder head bolt		○	
	Cylinder head gasket		○	
	Cylinder head cover		○	
	Cylinder head cover gasket		○	
	Cylinder block		○	
	Main bearing cap		○	
	Main bearing support plate		○	
	Oil pan		×	Turbocharger oil return pipe hole increased from 13mm {0.51 in} to 17mm {0.67 in}
	Timing belt cover		○	
	Seal plate		○	
	Front oil seal		○	
	Rear oil seal		○	
Crankshaft related	Crankshaft		○	
	Main bearing		○	
	Thrust bearing		○	
	Connecting rod		×	Shape different
	Connecting rod bearing		○	
	Piston		×	Piston skirt shortened
	Piston pin		○	
	Piston ring	Top	×	Sectional shape different
		Second	×	Piston ring end gap increased from 0.15—0.30mm {0.006—0.011 in} to 0.35—0.50mm {0.014—0.019 in} (Measured in cylinder)
	Crankshaft pulley		×	Shape different
	Rear cover		○	
	Flywheel		○	
	Flywheel bolt		○	
Timing belt related	Timing belt		○	
	Timing belt crank pulley		○	
	Camshaft pulley		○	
	Timing belt tensioner and spring		○	
	Idler		○	
Valve related	Camshaft		○	
	HLA		○	
	Valve	Intake	○	
		Exhaust	×	Metallic sodium-filled valve
	Valve spring and seat	Intake	○	
		Exhaust	○	
	Valve guide		○	
	Valve seal		○	
Lubrication system related	Oil pump		○	
	Oil pump gasket		○	
	Oil strainer		○	
	Oil strainer gasket		○	
	Oil cooler		×	Heat dissipation capacity increased
	Oil jet		×	Shape different
	Oil filter		○	
Cooling system related	Water pump		○	
	Thermostat		○	
	Radiator		○	
	Cooling fan		○	

PISTON



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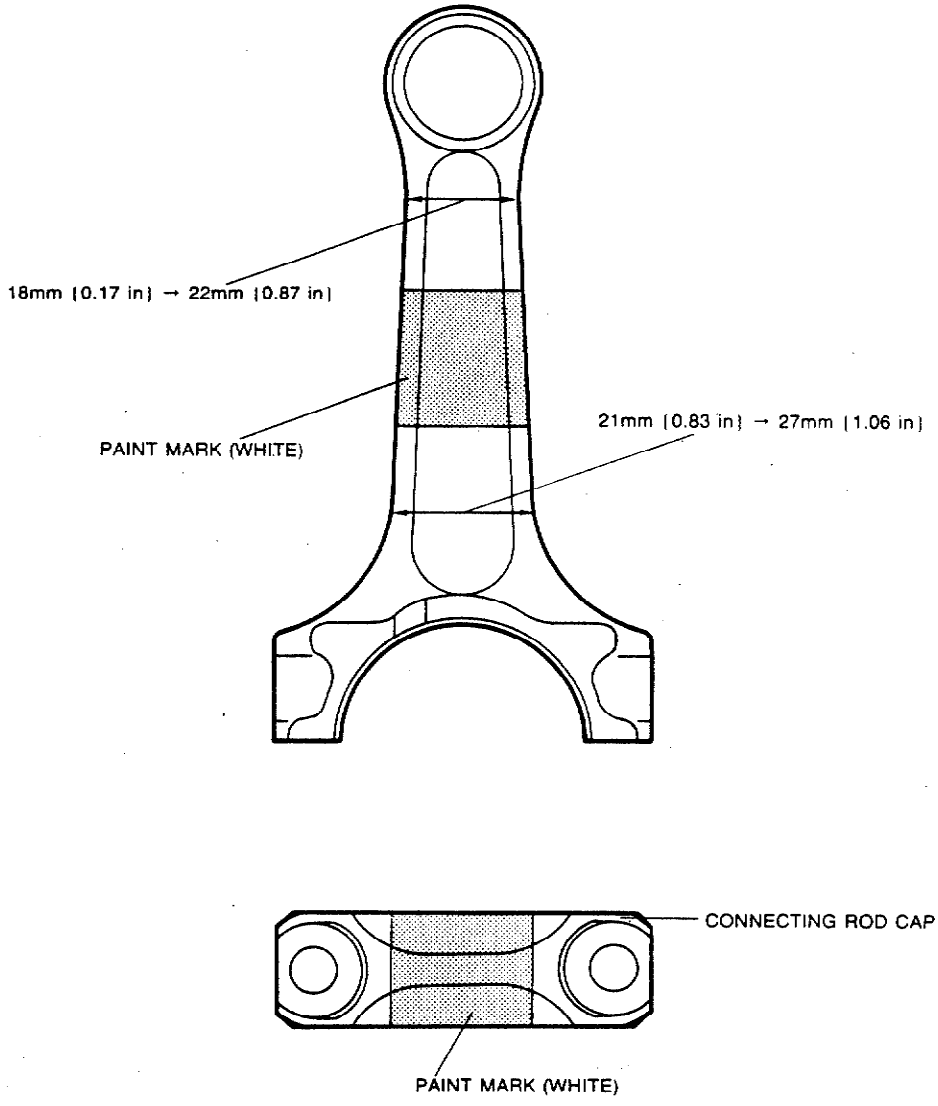
- The piston skirt is shortened for reduced weight and friction.
- A cast iron ring carrier is installed in the piston to reduce piston-ring groove wear.
- A cooling channel is incorporated in the body of the piston. The oil jet squirts oil into this cooling channel and the oil absorbs the heat from around the ring lands, reducing piston ring and cylinder wall wear.

CONNECTING ROD



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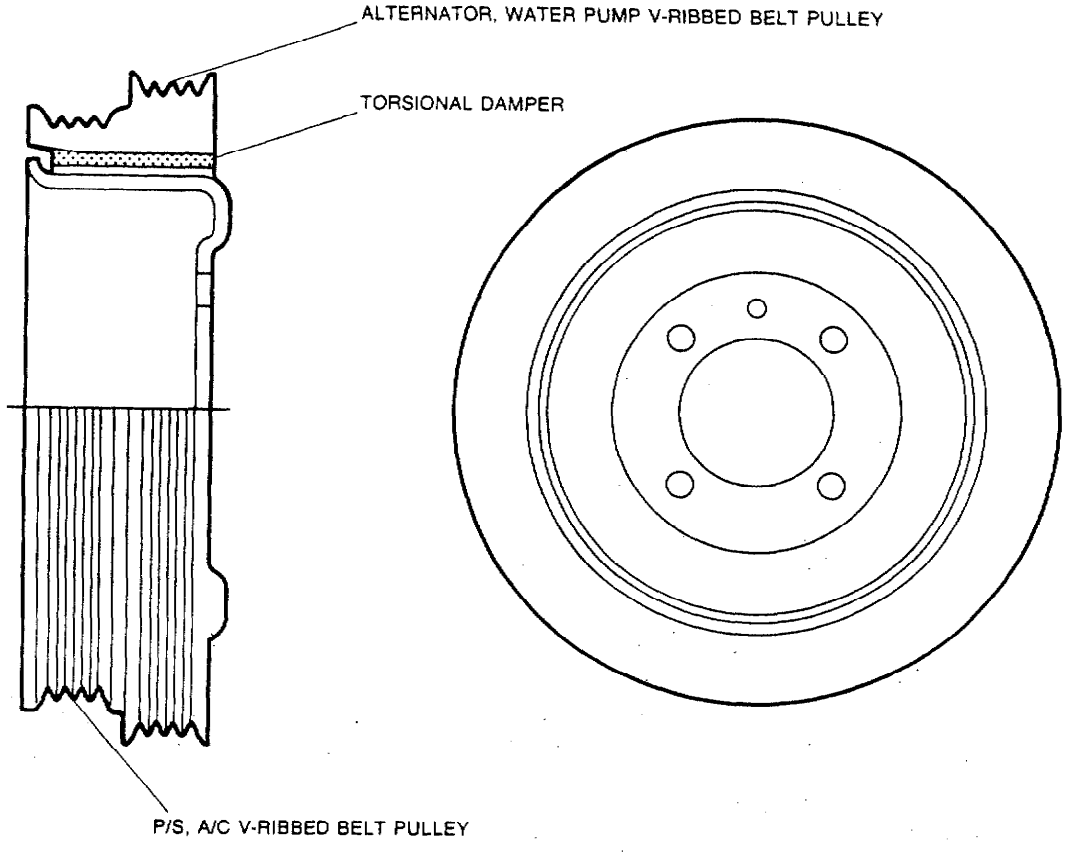
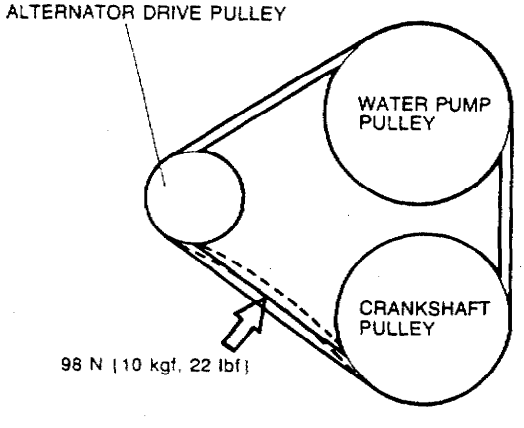
- The connecting rod beam is windened for increased strength.
- The connecting rod and cap are marked with white paint for identification.

CRANKSHAFT PULLEY





Deflection (98 N {10 kgf, 22 lbf}) mm {in}

Drive belt	New	Used	Limit
Alternator	5.5—7.0 {0.22—0.27}	6.0—7.5 {0.24—0.29}	8.0 {0.31}

Tension N {kgf, lbf}

Drive belt	New	Used	Limit
Alternator	460—660 {46—68, 110—140}	400—580 {40—60, 88—130}	340 {35, 77}

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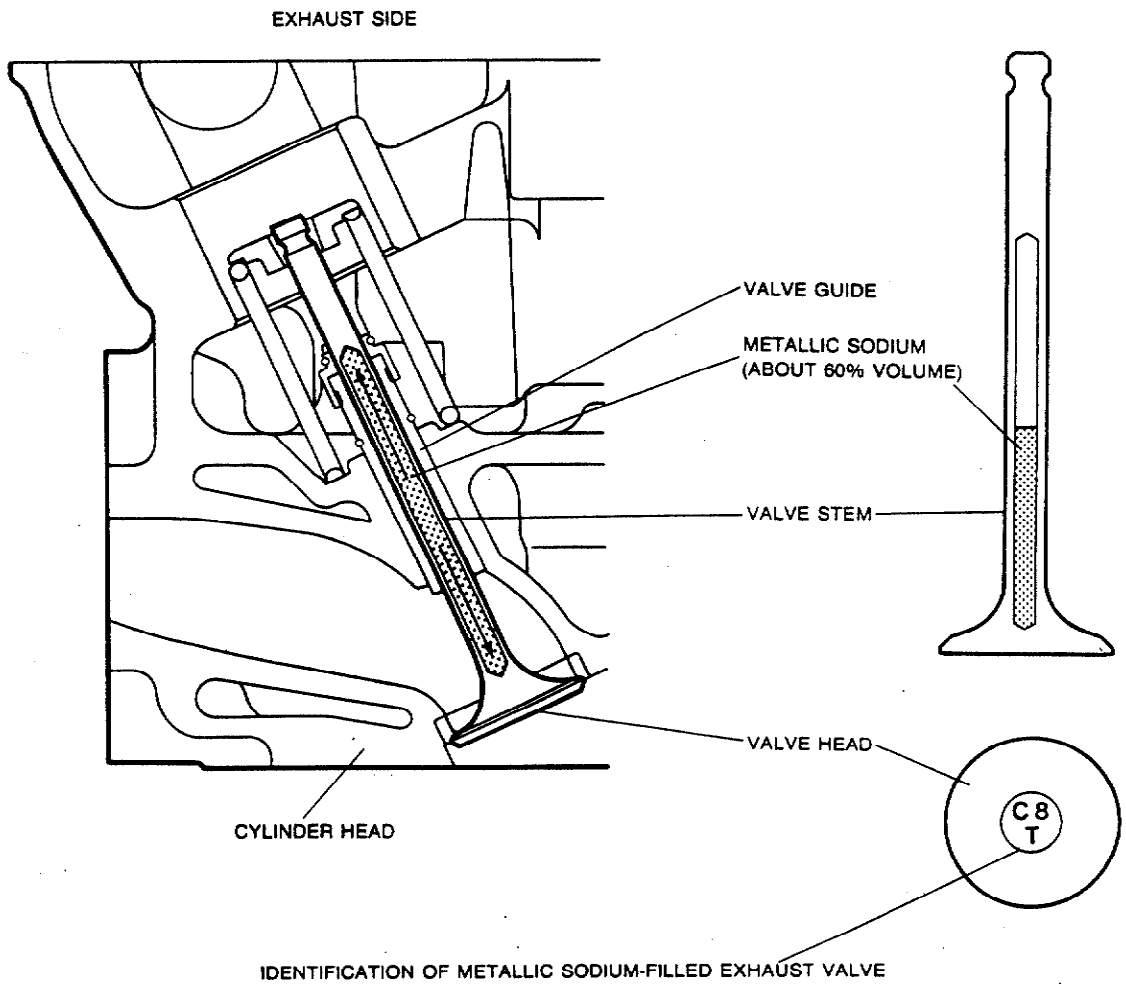
- The alternator and water pump pulleys are changed to V-ribbed type for improved performance.
- With the adoption of the V-ribbed belt, the belt adjustment specifications are changed.

EXHAUST VALVE



IDENTIFICATION OF METALLIC SODIUM-FILLED EXHAUST VALVE

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- Superior heat dissipating metallic sodium-filled exhaust valves are adopted. During engine operation, the metalic sodium inside the valve stem melts. As the valve moves up and down, the sodium splashes around inside the valve and helps to absorb heat from the cylinder head and to transfer it back to the engine coolant through the valve guide. In this way, the combustion chamber temperature is reduced, reducing knocking and improving fuel efficeincy.
- Special handling of sodium filled valves is required for personal safety. (See next page.)

INSTRUCTION FOR HANDLING METALLIC SODIUM-FILLED EXHAUST VALVE

Improper handling of metallic sodium can cause sever burns, loss of eye sight, and the production of highly flammable hydrogen gas. Therefore, handle and dispose of such valves carefully.

First aid
- **If metallic sodium get into your eyes, quickly flush it out with large amounts of water. See a physician.**
- **If it gets on your skin, wash it off with plenty of water. See a physician.**
- **If it catches fire, use a dry powder fire extinguisher or dry sand to put it out. Never use water.**

Note
- **Do not use the valve as tool.**
- **Do not drain the metallic sodium from the valve.**
- **Neutralize the metallic sodium-filled valve before its disposal.**

Reference
- **" $\overset{C8}{T}$ " is embossed on the valve head to identify a metallic sodium-filled exhaust valve.**

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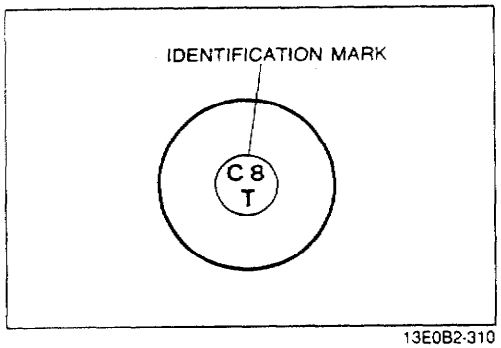

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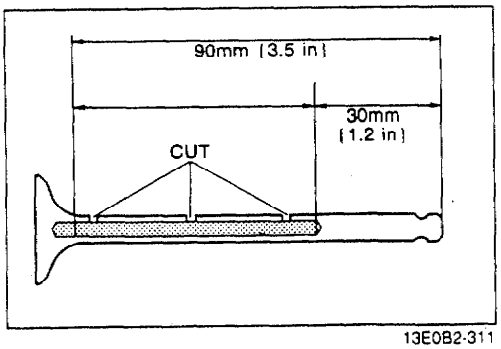

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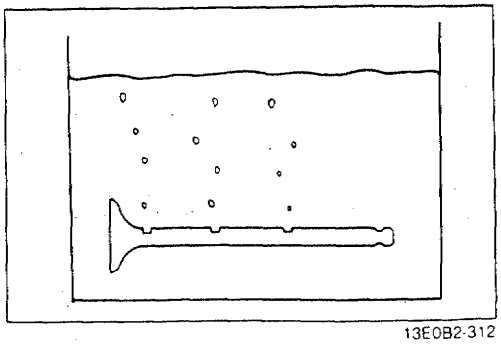

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Disposal procedure

Follow the procedure below to neutralize the valve.

(1) Prepare a water-filled bucket (10 Liters {11 US qt, 8.8 Imp qt} or more) and a dry powder fire extinguisher in a well ventilated place.

(2) Wear safety glasses and gloves.

Note
- **If the valve is broken skip Step (3).**

(3) Secure the valve in a vice and, using a hacksaw, cut a few 1.5mm {0.059 in} deep slits 30—90mm {1.2—3.5 in} from the valve stem end.

(4) Quickly submerge the valve in the bucket of water. (Treat up to eight valve at a time.)

(5) Leave the valve in the water for about one hour until the bubbles stop. (Stir occasionally with a metal rod for complete reaction.)

Caution
- **Do not reach into the solution or let it get on your skin or clothing; burning may result.**

(6) Remove the valve with tongs and dispose of as for a conventional part.

(7) Follow local regulations for disposal of the solution.

SUPPLEMENTAL SERVICE INFORMATION

The following points in this section are changed in comparison with 323 Workshop Manual [Europe, Australia (1229-10-89L)].

Engine
- Removal
- Installation

- The intercooler installation position is changed because the intercooler is enlarged. With this change, the engine can be removed and installed without removing the intercooler. The engine removal / installation procedure is the same as of the previous BP-DOHC Turbo engine.

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