Engine

Application	661LA	662NA	662LA	2.0L DOCH	2.3L DOCH	3.2L DOCH
Engine Type	4Cylinder DIESEL	5Cylinder DIESEL	5Cylinder DIESEL	4Cylinder GASOLINE	4Cylinder GASOLINE	6Cylinder GASOLINE
Bore (mm)	89	89	89	89.9	90.9	89.9
Stroke (mm)	92.4	92.4	92.4	78.7	88.4	84
Total Displacement (cc)	2299	2874	2874	1998	2295	3199
Compression Ratio	22:1	22:1	22:1	9.6:1	10.4:1	10:1
Maximum Power (ps/rpm)	101/4000	95/4000	120/4000	135/5500	149/5500	222/5500
Maximum Torque (kg.m/rpm)	21.5/2400	19.6/2400	25.5/2400	19.3/4000	22.4/4000	31.6/3750

Ignition System

Application	2.0L DOHC	2.3L DOHC	3.2L DOHC
Ignition Type	Distributorless ignition		
Ignition Timing (BOTH)	6°± 2°	6°± 2°	8°± 2°
Ignition Sequence	1-3-4-2	1-3-4-2	1-5-3-6-2-4
Spark Plug Gap (mm)	0.8 ± 0.1	0.8 ± 0.1	0.8 ± 0.1
Spark Plug Maker	Bosch, Chapion, Beru		
Spark Plug Type	F8DC4(BOSCH) C11YCC(CHAMPION) 14F8DU4(BERU)		

Clutch - Manual Type

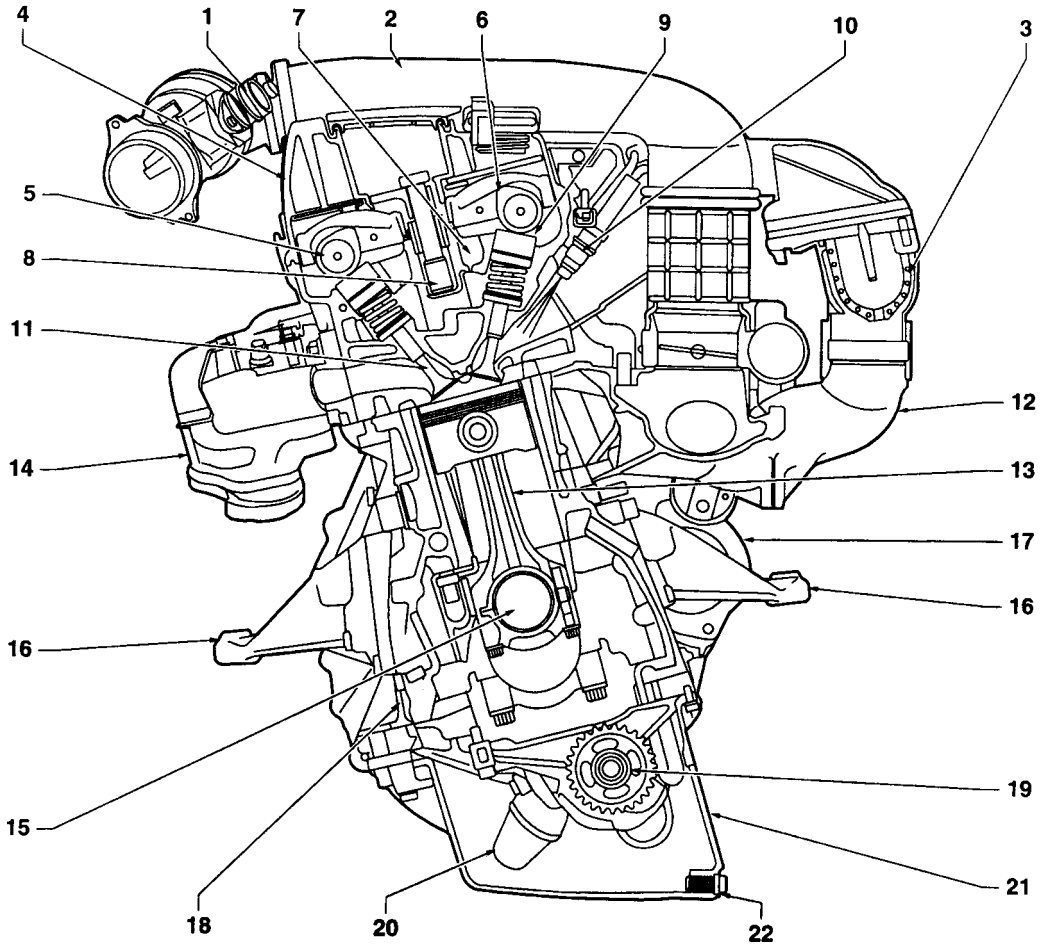
Application	661LA	662NA	662LA	2.0L DOHC	2.3L DOHC	3.2L DOHC
Type	Single Dry Diaphram					
Outside Diameter (mm)	225	225	240	225	225	240
Inside Diameter (mm)	150	150	150	150	150	155
Thickness	9.2	9.2	9.2	9.2	9.2	9.3
Fluid	Common use :Brake Fluid					

Manual Transmission

Application	661LA	662NA	662LA	2.0L DOHC	2.3L DOHC	3.2L DOHC
Maker	TREMEC	TREMEC	TREMEC	TREMEC	TREMEC	TREMEC
Type or Model	T5	T5	T5	T5	T5	T5
Gear Ratio : 1st	3.969	3.969	3.969	3.969	3.969	3.969
2nd	2.341	2.341	2.341	2.341	2.341	2.341
3rd	1.457	1.457	1.457	1.457	1.457	1.457
4th	1.000	1.000	1.000	1.000	1.000	1.000
5th	0.851	0.851	0.851	0.851	0.851	0.851
Reverse	3.705	3.705	3.705	3.705	3.705	3.705
Final Drive Ratio	4.55	4.55	4.27	4.89	4.55	3.73
Oil Capacity (L)	3.4	3.4	3.4	3.4	3.4	3.4

COMPONENT LOCATOR

FRONT VIEW



1 HFM Sensor
2 Intake Air Duct
3 Resonance Flap
4 Cylinder Head Cover
5 Exhaust Camshaft
6 Intake Camshaft
7 Cylinder Head
8 Spark Plug Connector
9 Valve Tappet
10 Injector
11 Exhaust Valve
12 Intake Manifold
13 Connecting Rod
14 Exhaust Manifold
15 Crankshaft
16 Engine Mounting Bracket
17 Starter
18 Crankcase
19 Oil Pump Sprocket
20 Oil Strainer
21 Oil Pan
22 Drain Plug

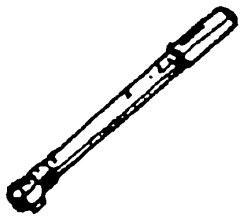
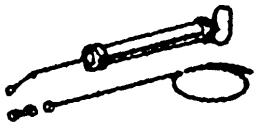
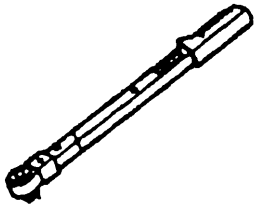
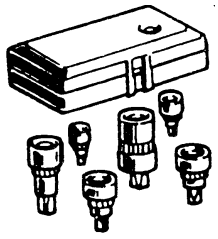
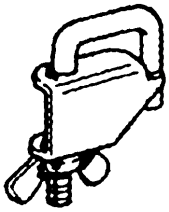
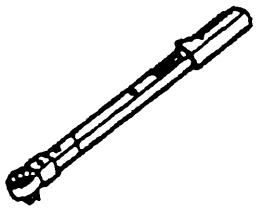
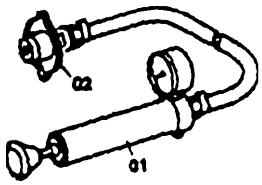
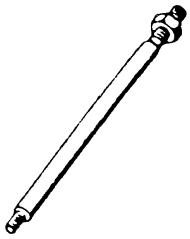
SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Application		N·m
Power Steering Hydraulic Lines		35 - 40
A/C High Pressure and Liquid Hose		10 - 15
Radiator Support Menber Bolt		5 - 10
Fuel Supply and Return Hose to Fuel Distributor		21 - 25
Exhaust Manifold and Pipe		30
Propeller Shaft to Transmission		56 - 66
Engine Mounting Nut		50 - 60
Alternator Carrier Bolt		10 - 15
Belt Pulley Bolt		41.5 - 49.5
Steering Pump Bolt		22.5 - 27.5
A/C Bracket Bolt		22.5 - 27.5
Intake Air Duct Bolt		9 - 11
Ignition Cable Cover Bolt		9 - 11
Cylinder Head Cover Bolt		22.5 - 27.5
Camshaft Adjuster Bolt		9 - 11
Cylinder Head Front Cover Bolt		22.5 - 27.5
Flange Bolt in Exhaust Camshaft Sprocket		10 +90°
Cylinder Head Bolt		55 +90° +90°
Cooling Fan Bracket Bolt		22.5 - 27.5
Timing Gear Case Cover Bolt	M8	22.5 - 27.5
	M6	9 - 10
Crankshaft Rear Cover Bolt		9-10
Vibration Damper Center Bolt		200 +90°
Connecting Rod Bearing Cap Bolt		40 +90°
Flywheel Stretch Bolt		45 +90°
Amarture Bolt in Flywheel		35
Ring and Seal Cover Nut in Flywheel		9 - 11
Sprocket Bolt to Exhaust Camshaft		20 +90°
Camshaft Adjuster Flange Bolt		20 +90°
Intake Flange Shaft Bolt		20 / +90°
Exhaust Camshaft Sprocket Bolt		20 / +90°
Camshaft Bearing Cap Bolt		22.5 - 27.5

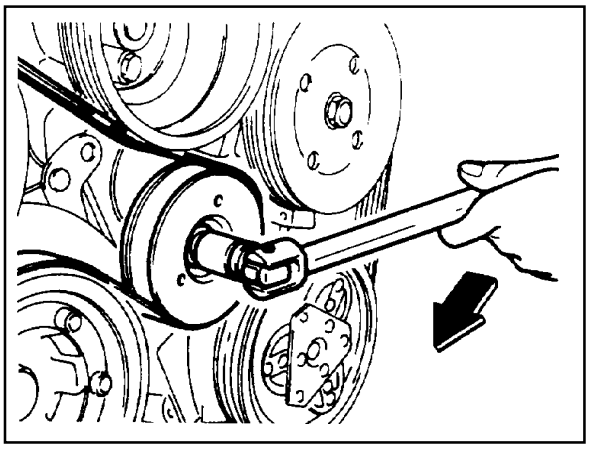
SPECIAL TOOLS

SPECIAL TOOLS TABLE

	**000 589 10 99 01** **Torque Wrench**
	**112 589 00 72 00** **Oil Extractor**
	**001 589 66 21 00** **Torque Wrench**
	**000 589 01 10 00** **Box Wrench Insert**
	**000 589 40 37 00** **Hose Clamp**
	**000 589 72 21 00** **Torque Wrench**
	**124 589 15 21 00** **Radiator Cap** **Testing Unit**
	**116 589 02 34 00** **Screw-Fixed Pin**

Removal & Installation Procedure

1. Remove the belt pulley.



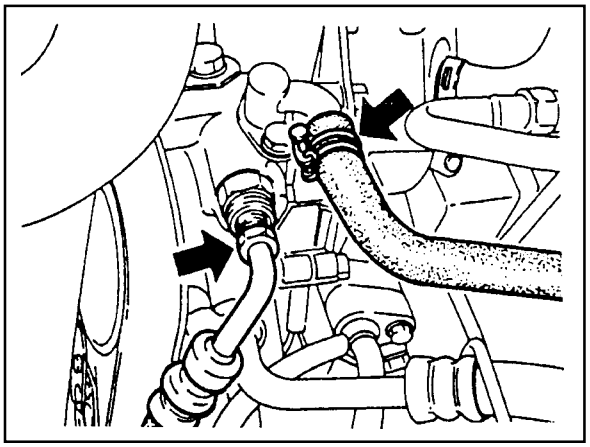
Installation Notice

Tightening Torque	40.5 - 49.5 Nm

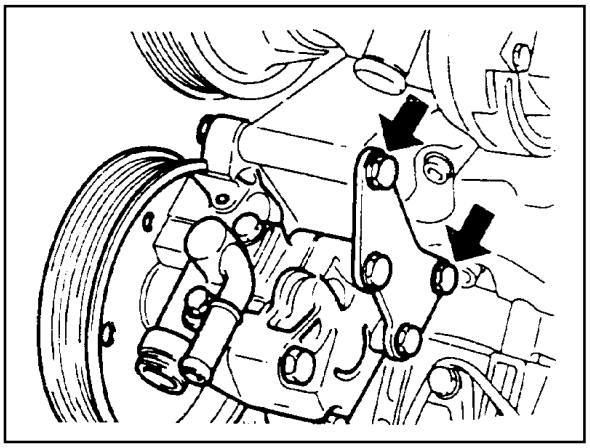
Notice

Pull the tensioning pulley clockwise as shown in the figure.

2. Disconnect the hydraulic pipe of the power steering pump and drain the oil.



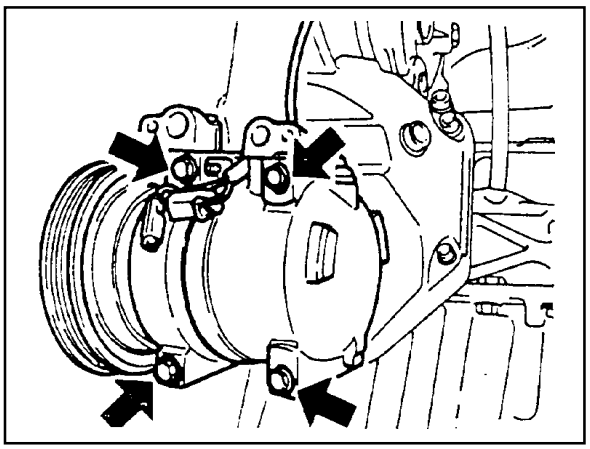
3. Unscrew the bolts (arrows) and remove the steering pump.



Installation Notice

Tightening Torque	22.5 - 27.5 Nm

4. Remove the compressor after disconnecting the wiring connector and refrigerant pipe of A/C compressor.



Notice

Discharge all the refrigerant before removing the pipes.

MAINTENANCE AND REPAIR

ON-VEHICLE SERVICE

ENGINE ASSEMBLY

Tools Required

000 589 10 99 01 Torque Wrench
000 589 40 37 00 Hose Clamp
112 589 00 72 00 Oil Extractor
000 589 72 21 00 Torque Wrench
001 589 66 21 00 Torque Wrench
124 589 15 21 00 Radiator Cap Testing Unit

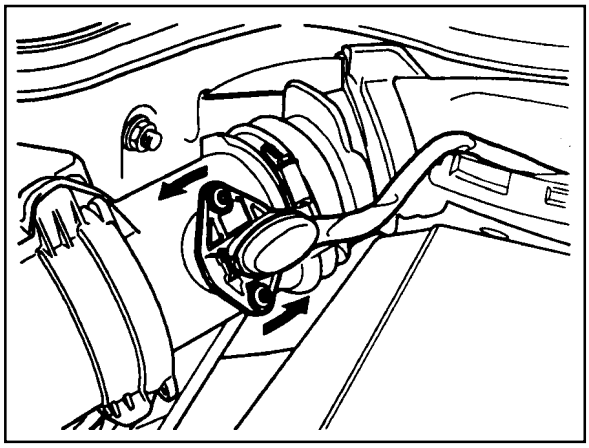
Removal & Installation Procedure

1. Disconnect the negative terminal of battery.
2. Remove the hood.
3. Remove the under cover.

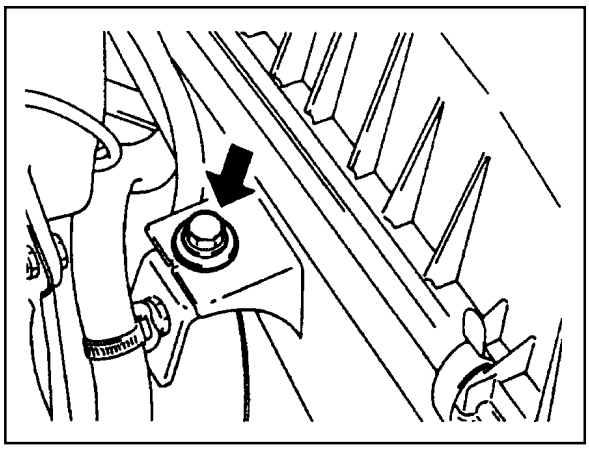
Installation Notice

Tightening Torque	28 - 47 Nm

4. Disconnect the coupling of HFM sensor and remove the air cleaner cross pipe.

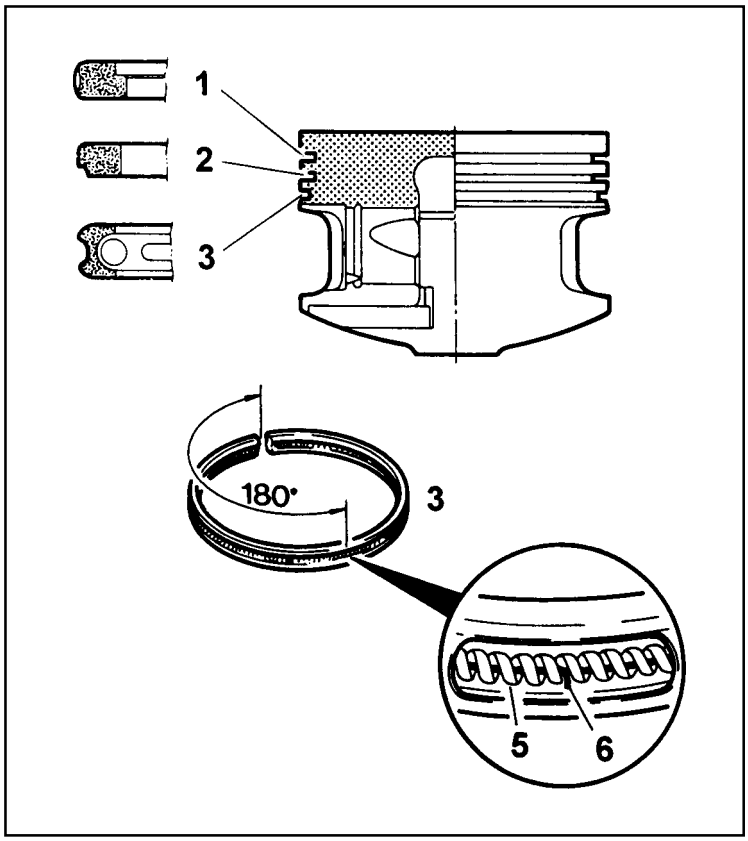


5. Remove the air cleaner cover. Remove the mounting bolts and air cleaner housing and element assembly.



PISTON RING

Preceding Work : Removal of piston



1 Piston Compression Ring (Top Ring)
2 Piston Compression Ring (2nd Ring)
3 Piston Oil Ring
4 -
5 Spacer
6 Side Rail

Tools Required

000 589 51 37 00 Clamping Strap

Replacement Procedure

1. Measure the piston ring's gap.

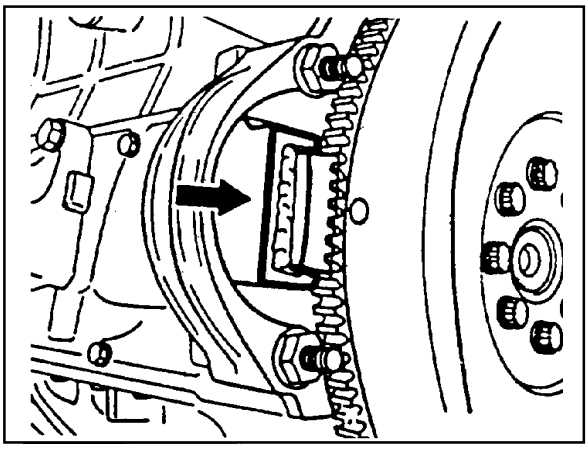
End Gap of The Piston Ring	Groove 1 0.20 - 0.40 mm
	Groove 2 0.20 - 0.40 mm
	Groove 3 0.20 - 0.45 mm
Gap Between The Piston and The Piston Ring	Groove 1 0.028 - 0.060 mm
	Groove 2 0.010 - 0.045 mm
	Groove 3 0.010 - 0.045 mm

Notice

If out of specification, replace the piston ring.

Removal Procedure

1. Remove the starter motor and install the engine lock into the wheel ring gear.

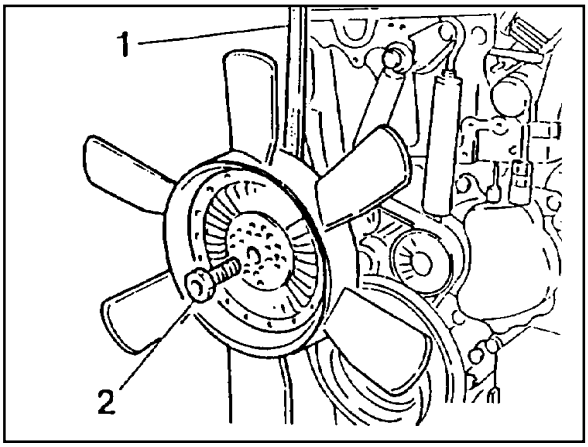


Engine Lock 602 589 00 40 00

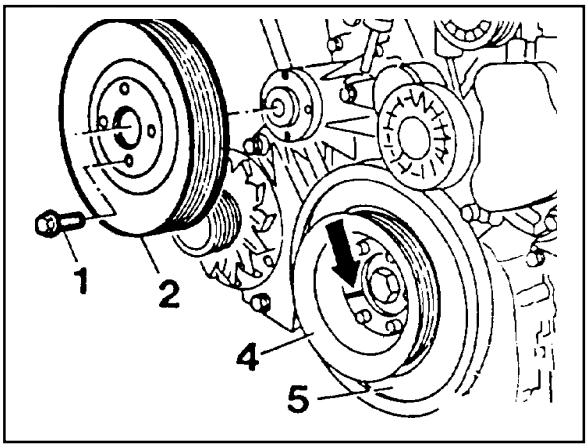
2. Remove the poly V-belt.
3. Remove the cooling fan.

Notice

Keep the fan in vertical position.



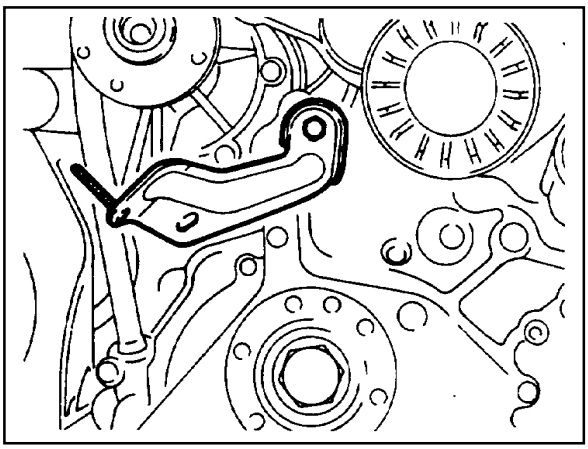
4. Remove the cooling fan belt pulley (2).
5. Place alignment marks (arrow) on the vibration damper (5) and crankshaft belt pulley (4).



6. Remove the timing sensor bracket.

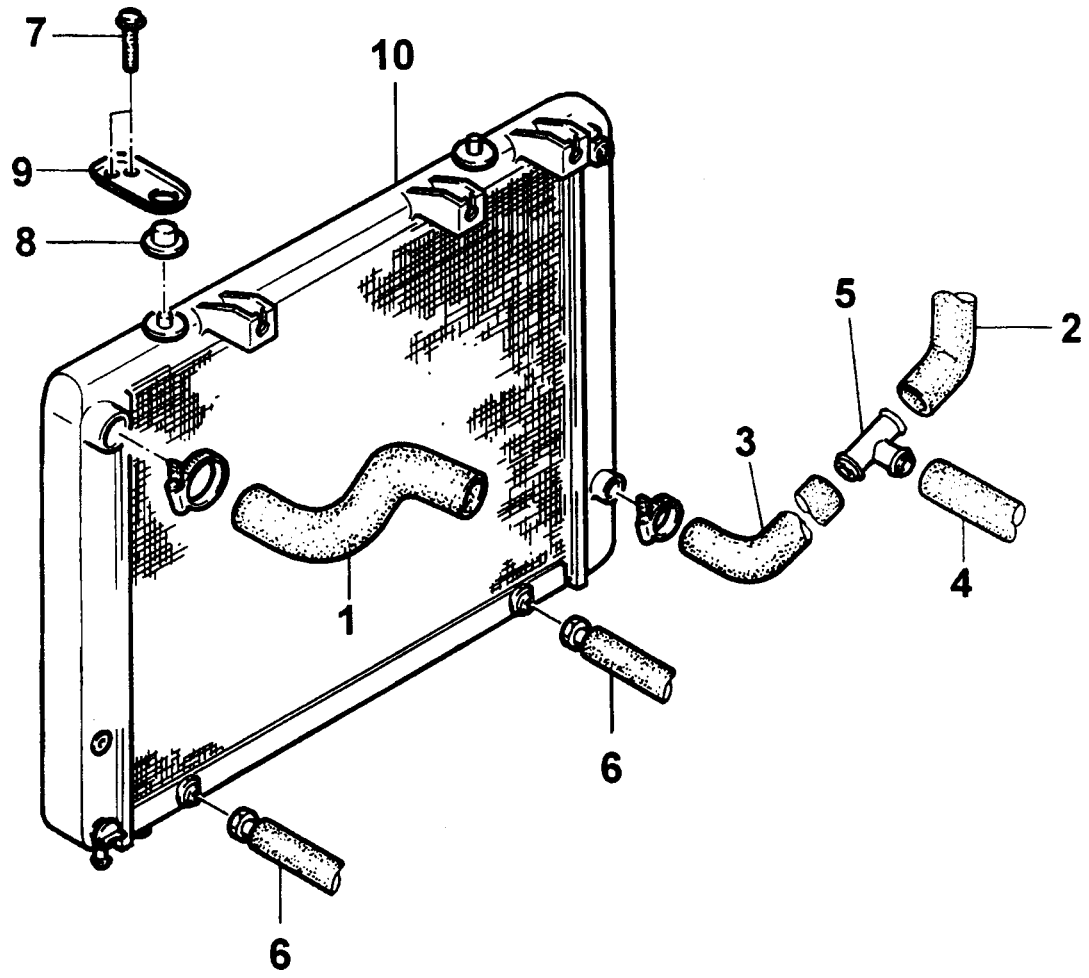
Notice

Remove if necessary.



REMOVAL AND INSTALLATION OF RADIATOR

Preceding Work : Removal of cooling fan shroud



1 Inlet Hose
2 Hose (to Engine)
3 Hose (to 3-way Connector)
4 Make-up Hose (to Coolant Reservoir)
5 3-way Connector
6 Automatic Transmission Oil Cooling Hose (A/T Equippend Vehicle)
7 Bolt (M6 X 20, 4 pieces) ..... 3-7 Nm
8 Insulator
9 Radiator Bracket
10 Radiator

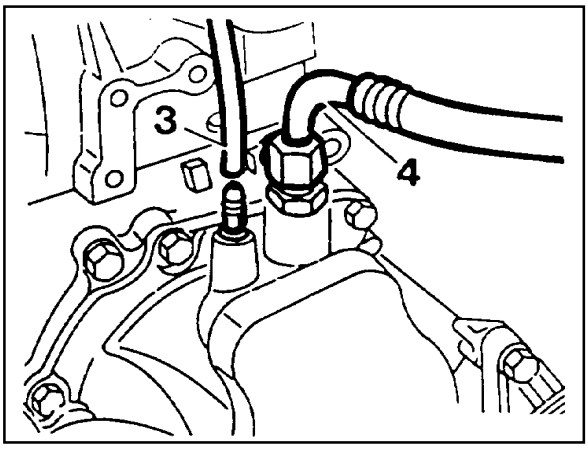
Application

Pin No.	Description	Abbreviation	E23 ENG, 5speed A/T	E23 ENG, 4speed A/T	E20 ENG, 4speed A/T
1	-	-	-	-	-
2	Starter motor TM.50	TM.50	●	●	●
3	-	-	-	-	-
4	-	-	-	-	-
5	Electronic ground	GND	●	●	●
6	-	-	-	-	-
7	Lambda probe 2 heating	LSH2	-	-	-
8	-	-	-	-	-
9	Lambda probe 1 heating	LSH1	●	●	●
10	Power ground TM.31	TM.31	●	●	●
11	V-BATTERY TM.87	TM.87	●	●	●
12	V-BATTERY TM.30	TM.30	●	●	●
13	Immobilizer crypto read	WFS I/O	●	●	●
14	Immobilizer crypto write	WFS O	●	●	●
15	-	-	-	-	-
16	Lambda probe 1 ground	GND	●	●	●
17	Lambda probe 1 signal	LS1	●	●	●
18	-	-	-	-	-
19	-	-	-	-	-
20	-	-	-	-	-
21	Brake switch	BRS	○	○	○
22	-	-	-	-	-
23	-	-	-	-	-
24	-	-	-	-	-
25	-	-	-	-	-
26	-	-	-	-	-
27	Air conditioning clutch relay	KLIKU	●	●	●
28	-	-	-	-	-
29	-	-	-	-	-
30	-	-	-	-	-

●:Standard, ○:Option

Removal & Installation Procedure

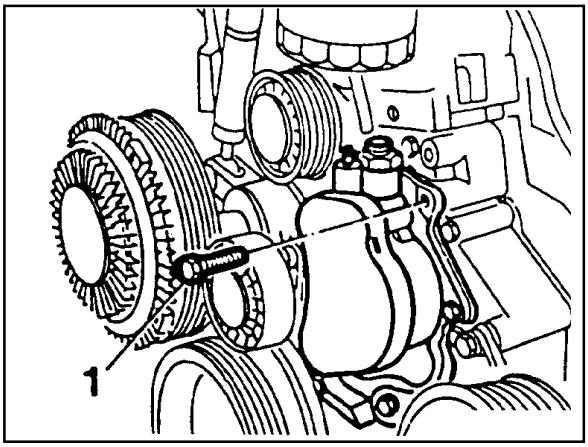
1. Remove the vacuum line (3, 4).



2. Remove the bolts (1) evenly.

   Notice

   If necessary, rotate the engine until the pressure on the tappet of the vacuum pump is released.



3. Remove the vacuum pump (2).

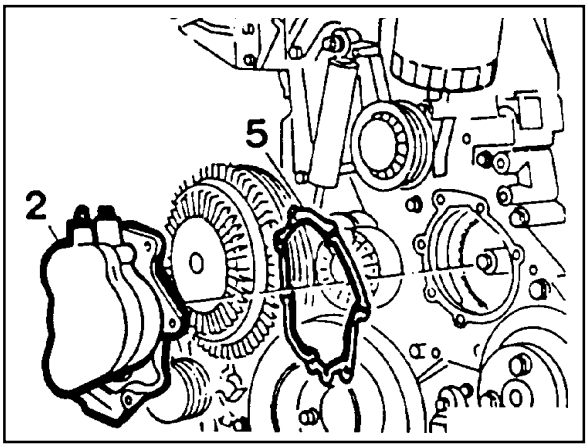
4. Install the vacuum pump (2).

Tightening Torque	10 Nm

   Notice

   Clean the gasket residues of sealing surface of vacuum pump and replace the gasket(5).

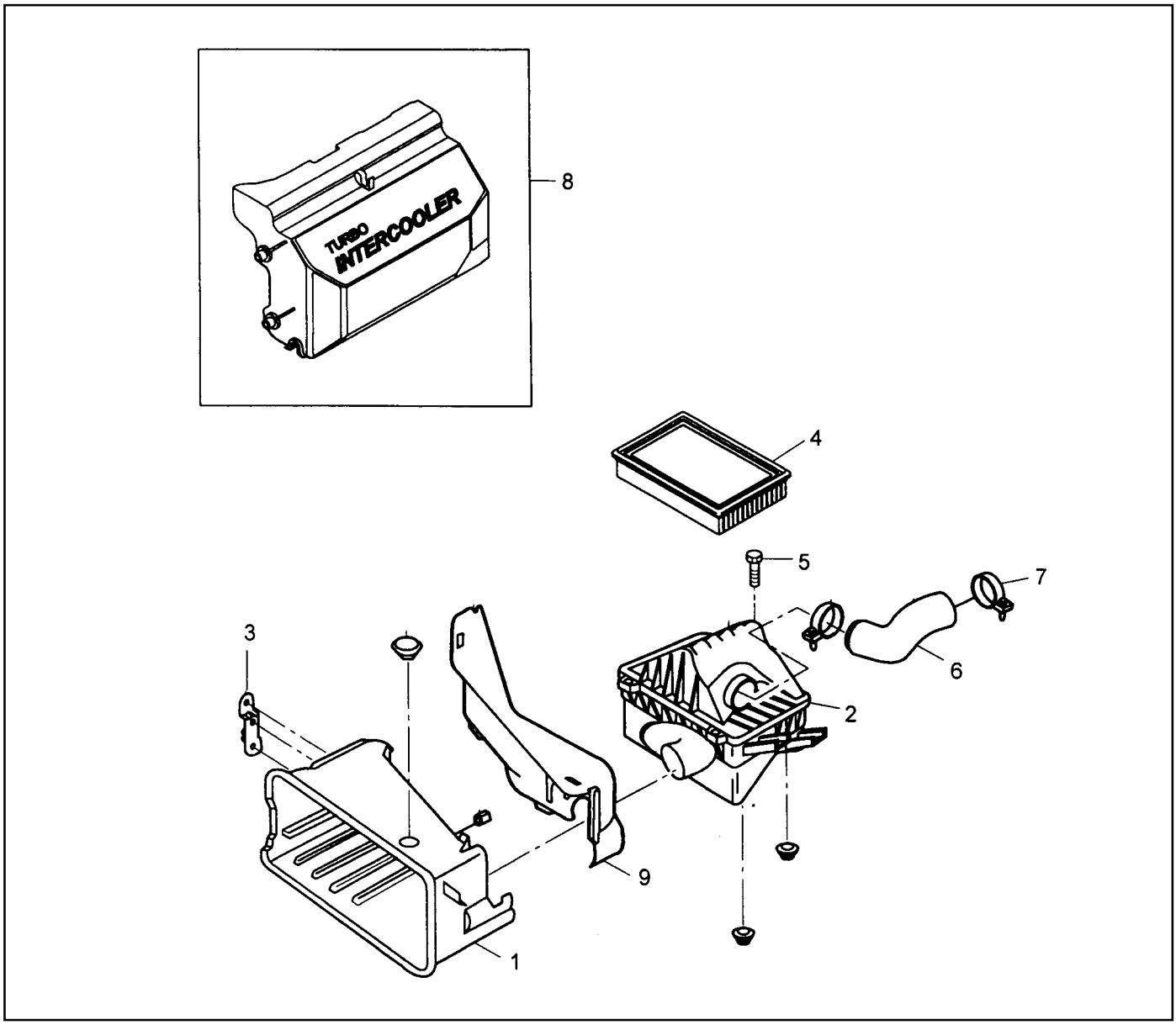
5. Connect the vacuum line (3, 4).



MAINTENANCE AND REPAIR

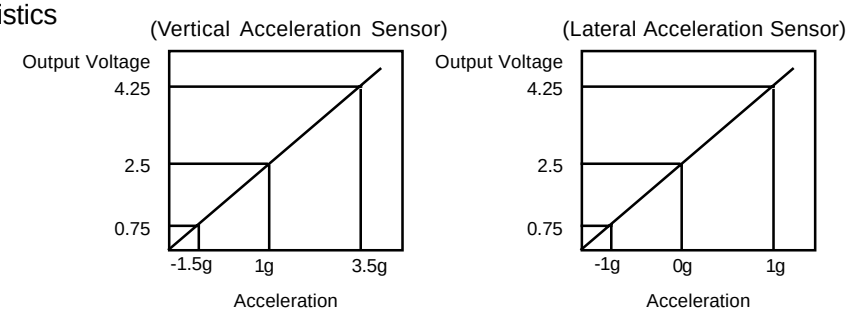
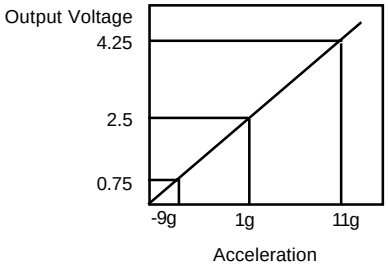
ON-VEHICLE SERVICE

AIR CLEANER AND INLET DUCT & HOSE



1 Air Intake Shield Assembly
2 Air Cleaner Assembly
3 Mounting Bracket
4 Air Cleaner Element ..... Clean : 20,000km
Replace : 60,000km
5 Bolt 9-11Nm
6 House
7 Clamp
8 Engine Cover Assembly (Turbo)
9 Mounting Bracket

GENERAL SPECIFICATIONS (Cont'd)

Application		Description
Body Vertical and Lateral Acceleration Sensor	Power Voltage (V)	4.75 - 5.25
	Consuming Current (mA)	Less than 10
	Output Current (mA)	Less than 2.0
	Operating Characteristics	
Damping Force Switching Actuator	Type	3-stage Rotary Step Motor Type
	Voltage Rating (V)	DC12
	Current Rating (A)	Less than 2.5
	Current Time (mS)	95 - 105
Axle Vertical Acceleration Sensor (Wheel G Sensor)	Power Voltage (V)	4.75 - 5.25
	Consuming Current (mA)	Less than 10
	Output Current (mA)	Less than 2.0
	Operating Characteristics	

DIAGNOSIS

GENERAL DIAGNOSIS

Problems in the steering, the suspension, the tires, and the wheels involve several systems. Consider all systems when you diagnose a complaint. Some problems, such as abnormal or excessive tire wear and scuffed tires, may by the result of hard driving. Always road test the vehicle first. If possible, do this road test with the customer.

Proceed with the following preliminary checks. Correct any substandard conditions.

Vehicle Rolling

Checks	Action
Broken Stabilizer Bar	Replace
Faulty Shock Absorber	Replace

Abnormal Noises

Checks	Action
Loosened Mountings	Retightening
Damaged or Worn wheel Bearing	Replace
Damaged Shock Absorber	Replace
Damaged Tire	Replace

Poor Riding

Checks	Action
Over Inflated Tire	Pressure Adjustment
Faulty Shock Absorber	Replace
Loosened wheel Nut	Tighten as Specified
Bent or Broken Coil Spring	Replace
Damaged Tire	Replace
Worn Bushing	Replace

Vehicle Pulls to Right or Left

Checks	Action
Deformed Arm Assembly	Replace
Worn Bushing	Replace
Bent or Broken Coil Spring	Replace
Difference Between L/H & R/H Heights	Adjust

Hard Steering

Checks	Action
Incorrect Wheel Alignment	Repair
Excessive Resistance of Lower Arm Ball Joint	Replace
Insufficient Tire Pressure	Adjust
Faulty Power Steering	Repair or Replace

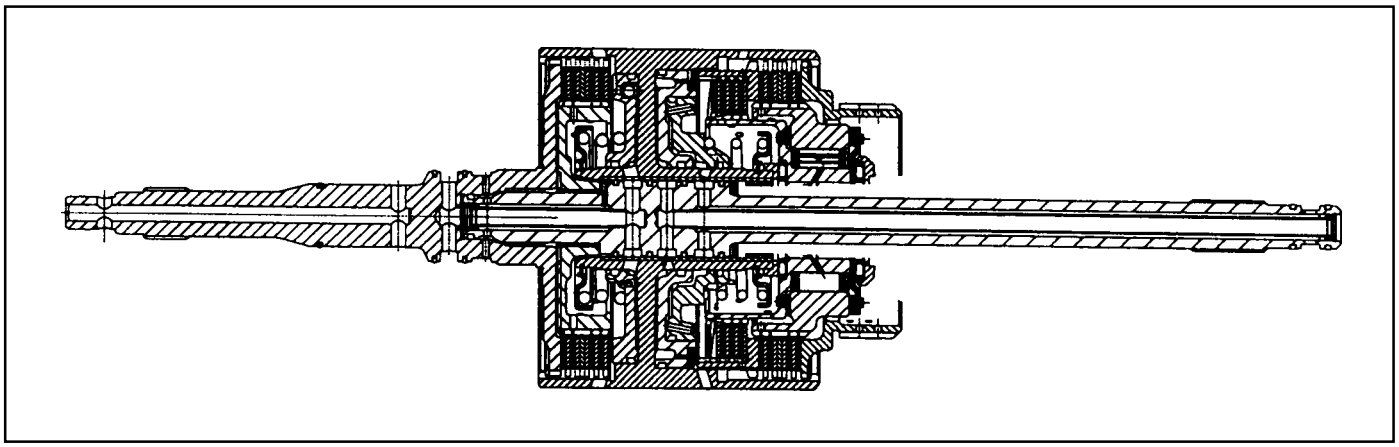


Figure 8.4 - Forward Clutch Cylinder Assembly

Forward Clutch Cylinder

To remove the forward clutch cylinder, refer to figure 8.4, proceed as follows.

1. Place the assembly in a horizontal position.
2. Remove the thrust bearing and adjustment shims from the input shaft.
3. Remove the circlip from the front of the clutch cylinder and remove the input shaft.
4. Remove the overdrive shaft and the C1 clutch hub assembly from the clutch cylinder.
5. Remove the C1 clutch plates from the cylinder.
6. Remove the circlip retaining the C3 clutch hub in the rear of the clutch cylinder and remove the hub.
7. Remove the C2/C4 clutch hub assembly and remove the thrust bearing from the C4 hub.
8. Remove the C2 clutch plates.
9. Invert the clutch cylinder and remove the C4 clutch sleeve, clutch plates and the two wave washers. The 3-4 one way clutch is located between the C2 and C4 clutch hubs, and the hubs may be separated by rotating one hub clockwise and withdrawing it from the other.