2003 ENGINES

1.6L DOHC 4-Cylinder - Accent

GENERAL

SPECIFICATION

GENERAL SPECIFICATIONS

Description	Specification	Limit
General		
Type	In-line, Double Over Head Camshaft	
Number of cylinders	4	
Bore	76.5 mm (3.0118 in)	
Stroke	87 mm (3.4252 in)	
Total displacement	1599 cc (97.54 cu.in)	
Compression ratio	10	
Firing order	1-3-4-2	
Valve timing		
Intake valve		
Opens (BTDC)	5°	
Closes (ABDC)	35°	
Exhaust valve		
Opens (BBDC)	43°	
Closes (ATDC)	5°	
Valve overlap	10°	
Cylinder head		
Flatness of cylinder head surface	Max. 0.03 mm (0.0012 in.)	0.1 mm (0.0039 in.)
Flatness of mainfold mounting surface	0.15 mm (0.0059 in.)	0.2 mm (0.008 in.)
Oversize rework dimension of valve seat hole		
Intake		
0.3 mm (0.012 in.) O.S.	30.7 ~ 30.721 mm (1.2087 ~ 1.2095 in.)	
0.6 mm (0.024 in.) O.S.	31.0 ~ 31.021 mm (1.2205 ~ 1.2213 in.)	
Exhaust		
0.3 mm (0.012 in.) O.S.	27.3 ~ 27.321 mm (1.0748 ~ 1.0756 in.)	
0.6 mm (0.024 in.) O.S	27.6 ~ 27.621 mm (1.0866 ~ 1.0874 in.)	
Oversize rework dimensions of		

valve		
Guide hole		
0.05 mm (0.002 in.) O.S.	11.05 ~ 11.068 mm (0.435 ~ 0.4357 in.)	
0.25 mm (0.010 in.) O.S.	11.25 ~ 11.268 mm (0.443 ~ 0.4436 in.)	
0.50 mm (0.020 in.) O.S.	11.50 ~ 11.518 mm (0.453 ~ 0.4535 in.)	
Camshaft		
Cam lobe height		
Intake	43.4484 mm (1.7106 in.)	42.9484 mm (1.6909 in.)
Exhaust	43.8489 mm (1.7263 in.)	43.3489 mm (1.7.66 in.)
Journal O.D	027 mm (1.0630 in.)	
Bearing oil clearance	0.035 ~ 0.072 mm (0.0014 ~ 0.0028 in.)	
End play	0.1 ~ 0.2 mm (0.004 ~ 0.008 in.)	
Valve		
Valve length		
Intake	91.7 mm (3.6102 in.)	
Exhaust	92.3 mm (3.6339 in.)	
Stem O.D.		
Intake	5.955 ~ 5.97 mm (0.2344 ~ 0.2350 in.)	
Exhaust	5.935 ~ 5.95 mm (0.2337 ~ 0.2343 in.)	
Face angle thickness of valve head (Margin)		
Intake	1.1 mm (0.0433 in.)	0.8 mm (0.031 in.)
Exhaust	1.3 mm (0.0512 in.)	1.0 mm (0.039 in.)
Valve stem to valve guide clearance		
Intake	0.03 ~ 0.06 mm (0.0012 ~ 0.0024 in.)	0.10 mm (0.0039 in.)
Exhaust	0.05 ~ 0.08 mm (0.0020 ~ 0.0031 in.)	0.15 mm (0.0059 in.)
Valve guide		
Installed dimension O.D.		
Intake	12.8 mm (0.504 in.)	
Exhaust	12.8 mm (0.504 in.)	
Service size	0.05, 0.25, 0.50 mm (0.002, 0.010, 0.020 in.) oversize	
Valve seat		
Width of seat contact		
Intake	0.8 ~ 1.2 mm (0.031 ~ 0.047 in.)	

Exhaust	1.3 ~ 1.7 mm (0.051 ~ 0.066 in.)	
Seat angle	45°	
Oversize	0.3, 0.6 mm (0.012, 0.024 in.) oversize	
Valve spring		
Free length	44.00 mm (1.7323 in.)	
Load	21.6 kg/ 35 mm (47.6 lb/1.3780 in.)	
	45.1 kg/27.2 mm (99.4 lb/1.071 in.)	
Squareness	1.5° or less	
Cylinder block		
Cylinder bore	76.50 ~ 76.53 mm (3.0118 ~ 3.0130 in.)	
Out- of- round and taper of cylinder bore Clearance with piston	Less than 0.01 mm (0.0004 in.)	
	0.025 ~ 0.045 mm (0.0009 ~ 0.0017 in.)	
Piston		
O.D.	76.465 ~ 76.495 mm (3.0104 ~ 3.0116 in.)	
Service size	0.25 mm (0.010 in.) oversize	
Piston ring		
Side clearance		
No. 1	0.04 ~ 0.085 mm (0.0015 ~ 0.0033 in.)	0.1 mm (0.004 in.)
No. 2	0.04 ~ 0.085 mm (0.0015 ~ 0.0033 in.)	0.1 mm (0.004 in.)
End gap		
No. 1	0.15 ~ 0.30 mm (0.0059 ~ 0.012 in.)	1.0 mm (0.039 in.)
No. 2	0.30 ~ 0.45 mm (0.012 ~ 0.0177 in.)	1.0 mm (0.039 in.)
Oil ring side rail	0.2 ~ 0.7 mm (0.0078 ~ 0.0275 in.)	1.0 mm (0.039 in.)
Service size	0.25 mm (0.010 in.) oversize	
Connecting rod		
Bend	0.05 mm (0.0020 in.) or less	
Twist	0.1 mm (0.0039 in.) or less	
Connecting rod big end to crankshaft side clearance	0.100-0.250 mm (0.0039-0.0098 in.)	0.4 mm (0.0157 in.)
Connecting rod bearing oil clearance	0.018-0.036 mm (0.0007-0.0014 in.)	

Undersize	0.25, 0.50, 0.75 mm (0.010, 0.020, 0.030 in.)	
Crankshaft		
Pin O.D.	45 mm (1.77 in.)	
Journal O.D.	50 mm (1.97 in.)	
Bend	0.03 mm (0.0012 in.) or less	
Out- of- round, taper of journal and pin	0.005 mm (0.0002 in.) or less	
End play	0.05 - 0.175 mm (0.0019 - 0.0068 in.)	
Undersize rework dimension of pin		
0.25 mm (0.010 in.)	44.725 ~ 44.74 mm (1.7608 ~ 1.7614 in.)	
0.50 mm (0.020 in.)	44.475 ~ 44.49 mm (1.7509 ~ 1.7516 in.)	
0.75 mm (0.030 in.)	44.225 ~ 44.24 mm (1.7411 ~ 1.7417 in.)	
Undersize rework dimension of journal		
0.25 mm (0.010 in.)	49.727 ~ 49.742 mm (1.9577 ~ 1.9583 in.)	
0.50 mm (0.020 in.)	49.477 ~ 49.492 mm (1.9479 ~ 1.9485 in.)	
0.75 mm (0.030 in.)	49.227 ~ 49.242 mm (1.9380 ~ 1.9386 in.)	
Flywheel		
Runout	0.1 mm (0.0039 in.)	0.13 mm (0.0051 in.)
Oil pump		
Clearance between outer circumference and front case (body clearance)	0.12 ~ 0.18 mm (0.0047 ~ 0.0070 in.)	
Front case tip clearance Side clearance	0.025 ~ 0.069 mm (0.001 ~ 0.0027 in.)	
Inner gear	0.04 ~ 0.085 mm (0.0016 ~ 0.0033 in.)	
Outer gear	0.04 ~ 0.09 mm (0.0016 ~ 0.0035 in.)	
Engine oil pressure		
Engine at idle [Oil temperature is 90 to 100°C (194 to 215°F)]	147 KPa (1.5 kg/ cm^2 , 21.33 psi)	
Relief spring		
Free height	46.6 mm (1.8346 in.)	
Load	6.1 kg at 40.1 mm (13.42 lb/ 1.578 in.)	

Cooling method	Water-cooled, pressurized, forced circulation with electrical fan	
Coolant Quantity Radiator Type	 6.5 liter Pressurized corrugated fin type	
Radiator cap Main valve opening pressure Vacuum valve opening pressure	 81.4 ~ 108 kpa (11.8 ~ 15.6 psi., 0.83 ~ 1.1 kg/cm^2) -6.86 kpa (-1.00 psi, -0.07 kg/cm^2 or less	
Coolant pump	Centrifugal type impeller	
Thermostat Type Valve opening temperature Full-opening temperature	 Wax pellet type with jiggle valve 82°C (180°F) 95°C (203°F)	
Engine coolant temperature sensor Type Resistance	 Heat-sensitive thermistor type 2.31 ~ 2.59k ohms at 20°C (68°F) 146.9 ~ 147.3 ohms at 110°C (230°F)	
Air cleaner Type Element	 Dry type Unwoven cloth type	
Exhaust pipe Muffler Suspension system	 Expansion resonance type Rubber hangers	

NOTE:
O.D. = Outer Diameter
I.D. = Inner Diameter
O.S. = Oversize Diameter
U.S. = Undersize Diameter

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

Application	Ft Lbs. (N.m)
Alternator Brace Bolt	15-21 (20-28)
Alternator Lock Bolt	11-16 (15-22)
Alternator Support Fasteners	15-18 (20-25)
Camshaft Bolt	15-20 (20-27)
Camshaft Sprocket Bolt	59-74 (80-100)

Connecting Rod Cap Nut	24-26 (32-35)
Coolant Outlet Fitting Bolt	13-15 (17-20)
Coolant Temperature Sensor	11-15 (15-20)
Crankshaft Bearing Cap Bolt	41-44 (55-60)
Crankshaft Sprocket Bolt	103-111 (140-150)
Cylinder Head Bolts (1)	
Step 1	17-20 (23-27)
Step 2	Tighten An Additional 60 Degrees
Step 3	Tighten An Additional 45 Degrees
Driveplate/Flywheel Bolts	96-103 (130-140)
Engine Mounting Components	
Engine Mounting Bracket-To-Engine Nuts & Bolts	37-48 (50-65)
Engine Mounting Insulator Bolt	66-81 (90-110)
Front Roll Stopper Bracket-To-Sub Frame	22-30 (30-40)
Front Roll Stopper Insulator Bolt	33-44 (45-60)
Rear Roll Stopper Bracket Subframe Bolts	22-30 (30-40)
Rear Roll Stopper Insulator Nut	33-44 (45-60)
Transaxle Insulator Bracket-To-Side Member Nut	22-30 (30-40)
Transaxle Mount Insulator Bolt	66-81 (90-110)
Exhaust Components	
Exhaust Pipe-To-Catalytic Converter	30-40 (40-60)
Exhaust Pipe-To-Exhaust Manifold Nut	22-30 (30-40)
Exhaust Manifold Nut	11-15 (15-20)
Front Exhaust Bracket Bolts	22-30 (30-40)
Intake Manifold Bolts & Nuts	11-15 (15-20)
Left Engine Support Bracket Bolt	22-31 (30-42)
Oil Filter	9-12 (12-16)
Oil Pan Drain Plug	25-33 (35-45)
Oil Screen Bolts	11-16 (15-22)
Oxygen Sensor	37-44 (50-60)
Rocker Arm Shaft Bolt	15-20 (20-27)
Surge Tank Stay-To-Inlet Manifold Nuts & Bolts	11-15 (15-20)
Thermostat Housing Bolt	11-15 (15-20)
Timing Belt Tensioner Bolt	15-20 (20-27)
	INCH Lbs. (N.m)
Air Cleaner Body Mounting Bolts	71-89 (8-10)
Alternator Lock Bolt	106-133 (12-15)
Coolant Pump Pulley Bolt	71-89 (8-10)
Cylinder Head Cover Bolts	71-89 (8-10)

Coolant Pump Bolt	106-133 (12-15)
Coolant Temperature Gauge Unit	89-106 (10-12)
Front Case Bolt	106-133 (12-15)
Oil Pan Bolts	53-71 (6-8)
Oil Pressure Switch	115-133 (13-15)
Rear Plate Bolt	71-89 (8-10)
Resonator Mounting Bolt	35-53 (4-6)
Rocker Cover Bolt	71-89 (8-10)
Throttle Body-To-Surge Tank Bolts	35-53 (4-6)
Timing Belt Cover Bolt	62-80 (10-12)
(1) Tighten cylinder head bolts in sequence. See **Fig. 1**.	

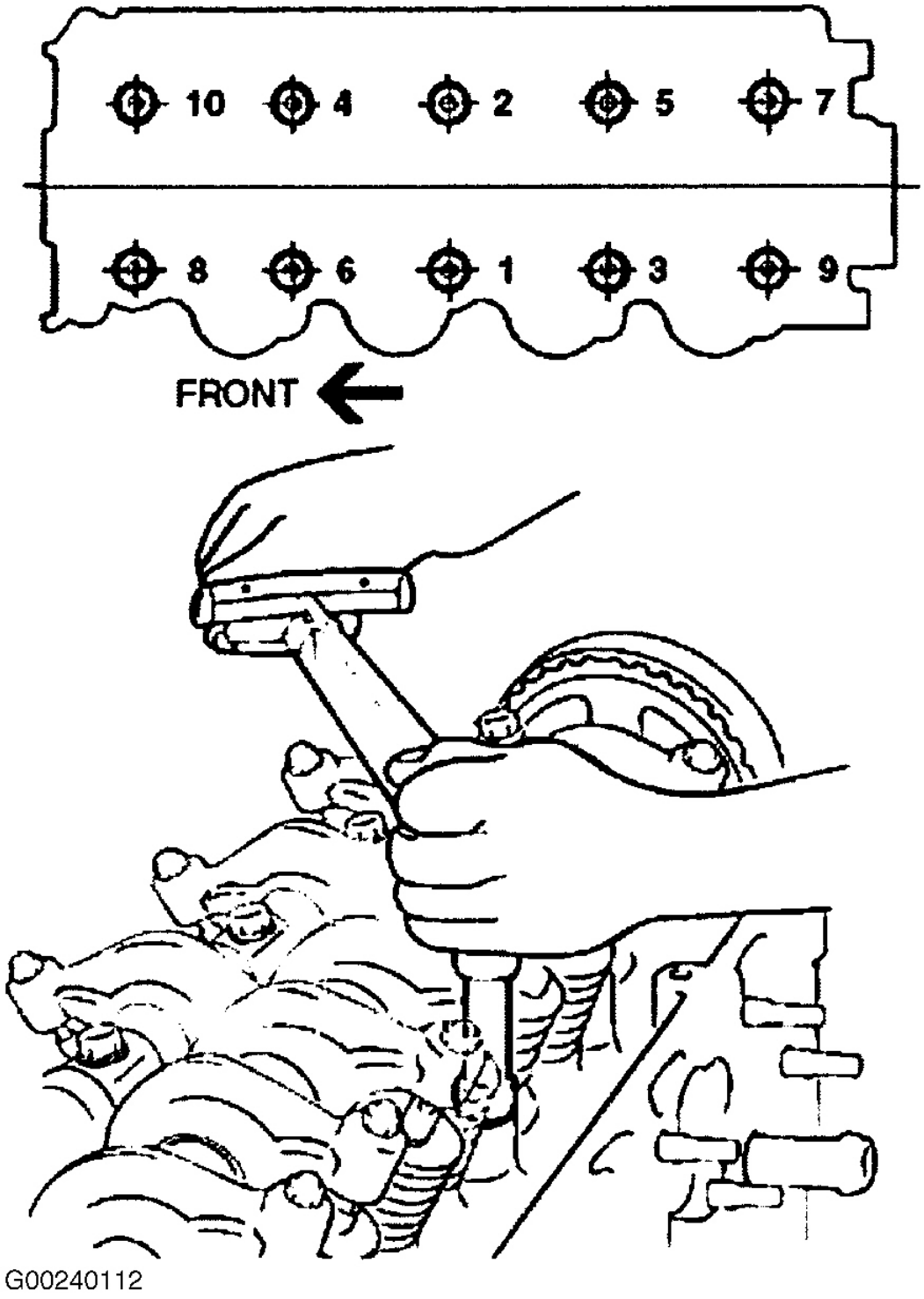


Fig. 1: Identifying Cylinder Head Tightening Sequence
Courtesy of HYUNDAI MOTOR CO.

SERVICE STANDARD

Standard value	
Antifreeze	Mixture ratio of anti-freeze in coolant
ETHYLENE GLYCOL BASE FOR ALUMINUM	50%

G00965638

Fig. 2: Service Standard Table
Courtesy of HYUNDAI MOTOR CO.

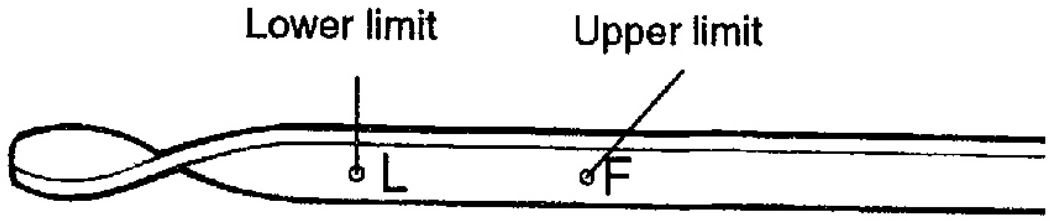
MAINTENANCE

CHECKING ENGINE OIL

1. Position the vehicle on a level surface.
2. Warm up the engine.

NOTE: If a vehicle has been out of service for a prolonged period of time, warm up the engine for approximately 20 minutes.

3. Turn off the engine, and wait 2 or 3 minutes, then check the oil level.
4. Check that the engine oil level is within the level range indicated on the oil dipstick. If the oil level is found to have fallen to the lower limit (the L mark), refill to the "F" mark.



G00965639

Fig. 3: Identifying Oil Level Dipstick
Courtesy of HYUNDAI MOTOR CO.

NOTE: When refilling, use the same type of engine oil.

5. Check that the oil is not dirty or contaminated with coolant or gasoline, and that it has the proper viscosity.

CHANGING ENGINE OIL

CAUTION: Be careful not to burn yourself, as the engine oil is hot.

1. Run the engine until it reaches normal operating temperature.
2. Turn off the engine
3. Remove the oil filler cap and the drain plug (on the oil pan). Drain the engine oil.

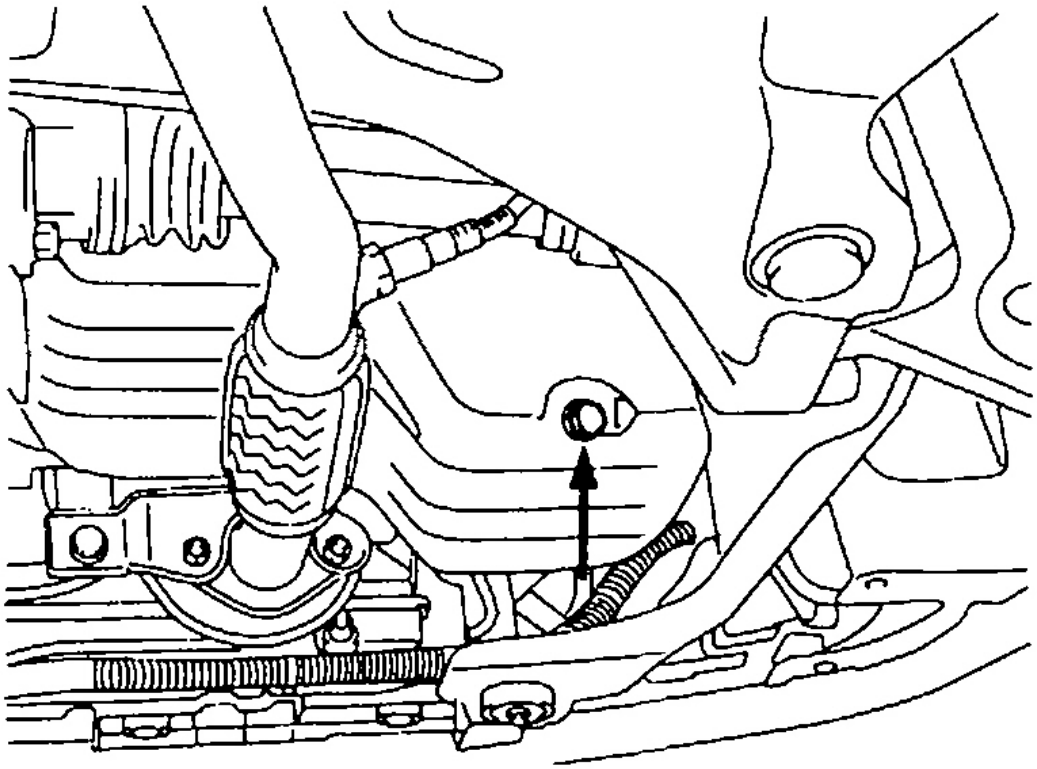


Fig. 4: Identifying Oil Pan Drain Plug
Courtesy of HYUNDAI MOTOR CO.

4. Install and tighten the drain plug to the specified torque.
   Tightening torque
   Drain plug: 35-45 Nm (350-450 kg.cm, 24-33 lb.ft)
5. Fill the crankcase with fresh engine oil through the oil filler cap opening.
   Drain and Refill Without oil filter:
   3.0 liter (3.17 U.S. qts, 2.64 Imp.qts)

Drain and Refill With oil filter:

3.3 liter (3.48 U.S.qts, 2.64 Imp.qts)

6. Install the oil filler cap.
7. Start and run the engine.
8. Turn off the engine and then check the oil level. Add oil if necessary.

FILTER SELECTION

All Hyundai engines are equipped with a high quality, disposable oil filter. This filter is recommended as a replacement filter on all vehicles. The quality of replacement filters varies considerably. Only high quality filters should be used to assure the most efficient service. Make sure that the rubber gasket from the old oil filter is completely removed from the contact surface on the engine block before installing the new filter.

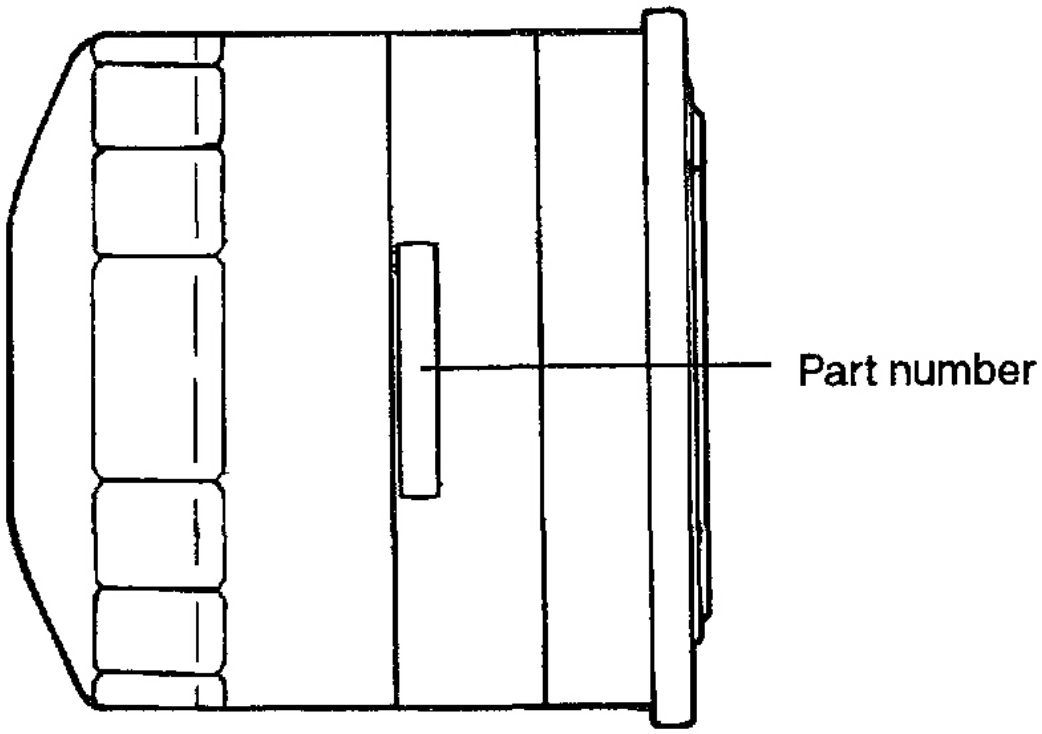


Fig. 5: Identifying Oil Filter Part Number
Courtesy of HYUNDAI MOTOR CO.

PROCEDURE FOR REPLACING THE OIL FILTER

CAUTION: Be careful not to burn yourself, as the engine and engine oil are hot.

1. Use a filter wrench to remove the oil filter.
2. Before installing the new oil filter on the engine, apply clean engine oil to the surface of the rubber gasket.

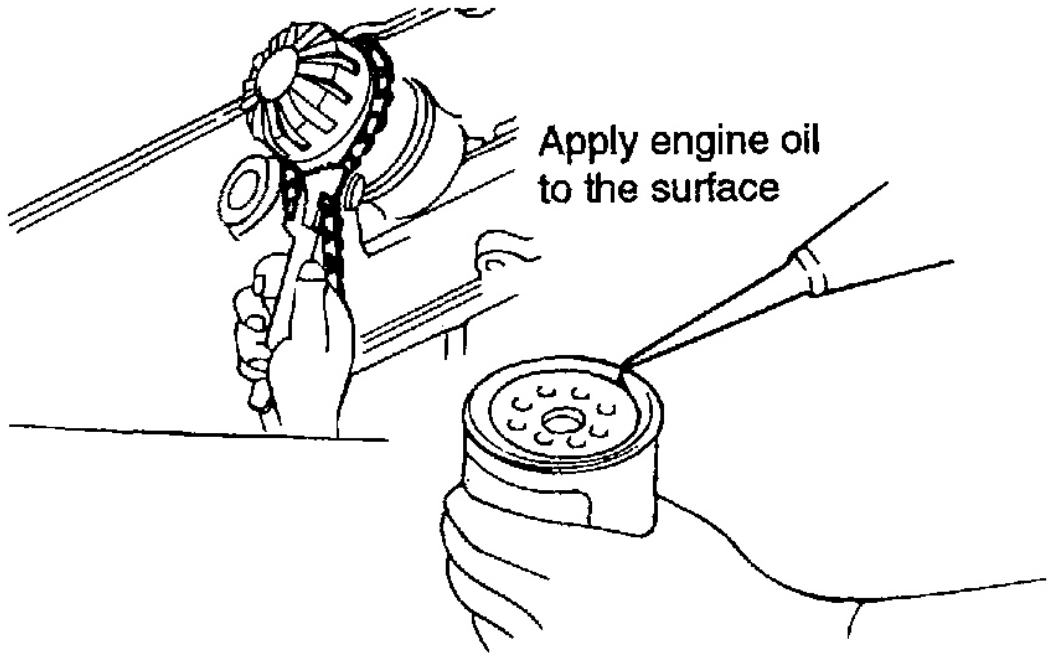
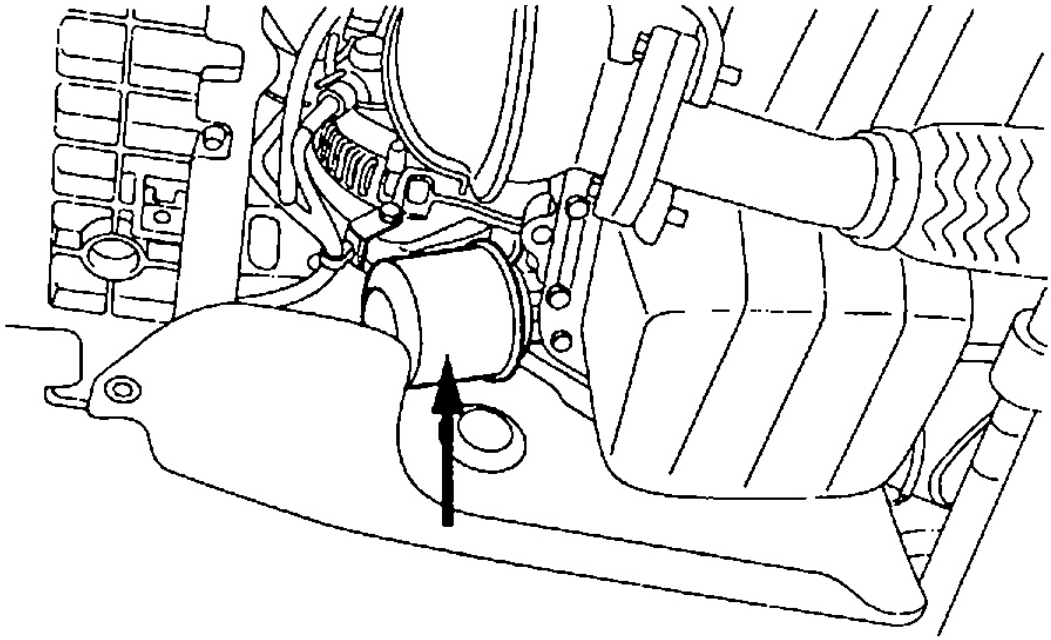


Fig. 6: Removing & Applying Oil To Filter Gasket
Courtesy of HYUNDAI MOTOR CO.

3. Tighten the oil filter to the specified torque.



G00965643

Fig. 7: Identifying Oil Filter Installed
Courtesy of HYUNDAI MOTOR CO.

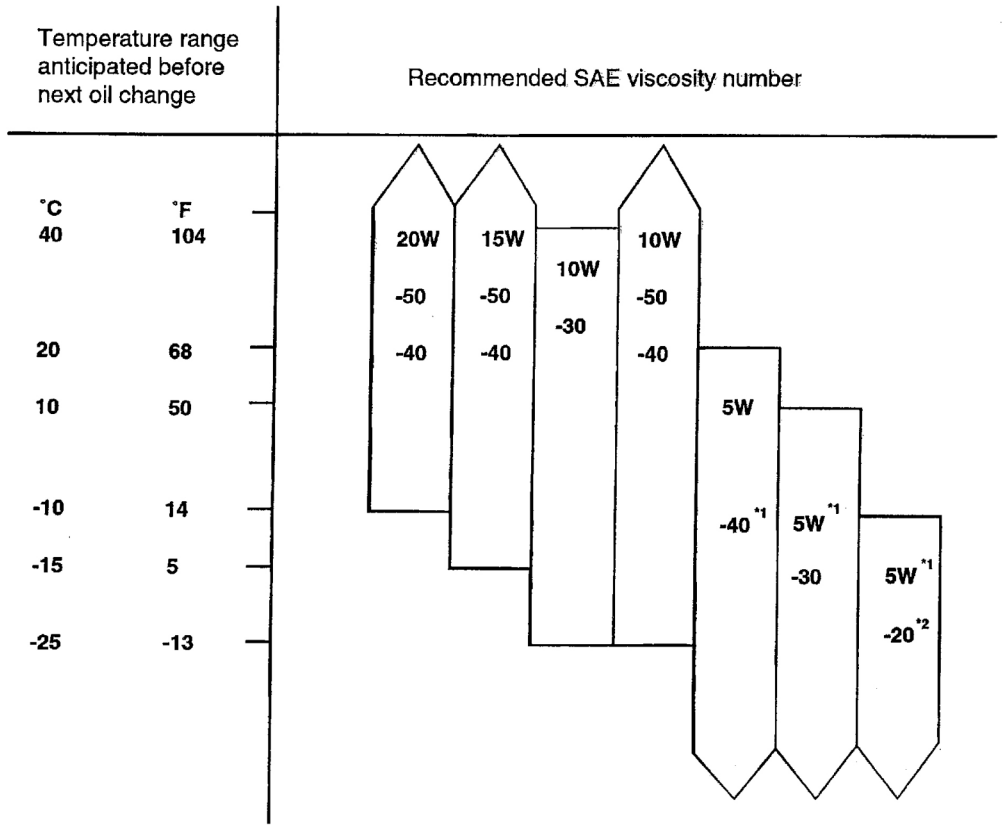
Tightening torque

Oil filter: 12-16 Nm (120-160 kg.cm, 9-12 lb.ft)

4. Run the engine to check for engine oil leaks.
5. After turning off the engine, check the oil level and add oil as necessary.

SELECTION OF ENGINE OIL

Recommended API classification: SH OR ABOVE SG



***1 Restricted by driving condition and environment.**
***2 Not recommended for sustained high speed vehicle operation**

G00965644

Fig. 8: Recommended SAE Viscosity Grades
Courtesy of HYUNDAI MOTOR CO.

NOTE: For best performance and maximum protection of all types of operation, select only those lubricants which:

1. **Satisfy the requirements of the API classification.**
2. **Have proper SAE grade number for expected ambient temperature range.**

Lubricant that does not have both an SAE grade number and an API service classification on the container should not be used.

CHECKING COOLANT LEAK

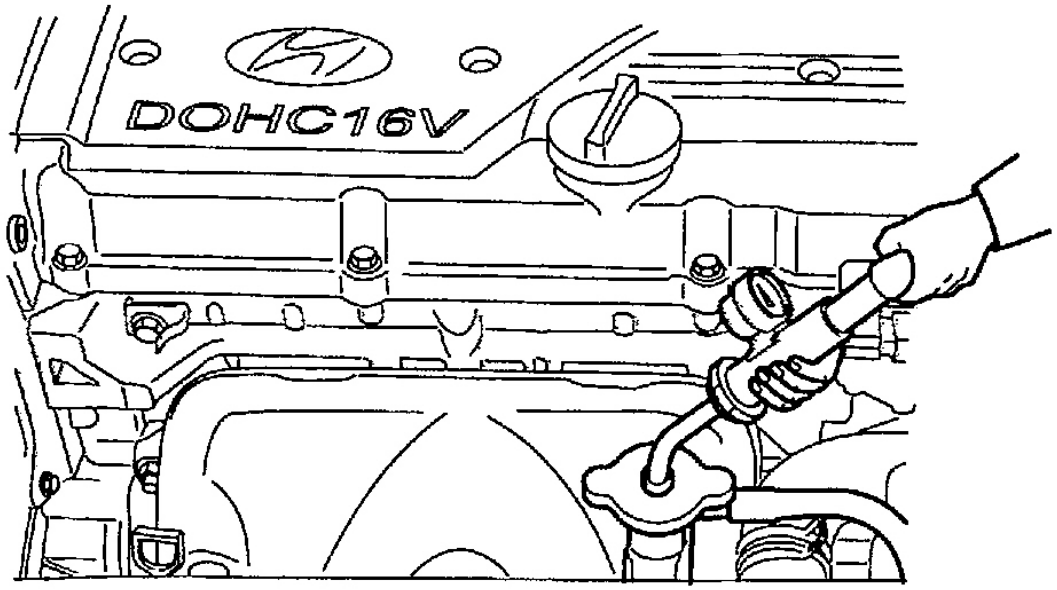
1. Wait until the engine is cool, then carefully remove the radiator cap.
2. Confirm that the coolant level is up to the filler neck.
3. Install a radiator cap tester to the radiator filler neck and apply 140 kPa (1.4 kg/cm^2 , 20 psi) pressure. Hold it for two minutes in that condition, while checking for leakage from the radiator, hoses or

connections.

NOTE:

1. **Radiator coolant may be extremely hot. Do not open the system because hot, or scalding water could gush out causing personal injury. Allow the vehicle to cool before servicing this system.**
2. **Be sure to clean away any moisture from the places checked completely.**
3. **When the tester is removed, be careful not to spill any coolant from it.**
4. **Be careful, when installing and removing the tester and when testing, not to deform the filler neck of the radiator.**

4. If there is leakage, repair or replace with the appropriate part.



G00965645

Fig. 9: Pressure Testing Cooling System
Courtesy of HYUNDAI MOTOR CO.

RADIATOR CAP PRESSURE TEST

1. Remove the radiator cap, wet its seal with engine coolant, then install it on the tester.
2. Increase the pressure until the gauge stops moving.

   Main valve opening pressure:

   83-110 kPa (0.83-1.1 kg/cm^2 , 12-16 psi)

Vacuum valve opening pressure:

-7 kPa (-0.07 kg/cm^2 , -1.0 psi)

3. Check that the pressure level is maintained at or above the limit.
4. Replace the radiator cap if the reading does not remain at or above the limit.

NOTE: Be sure that the cap is clean before testing, since rust or other foreign material on the cap seal will cause an incorrect reading.

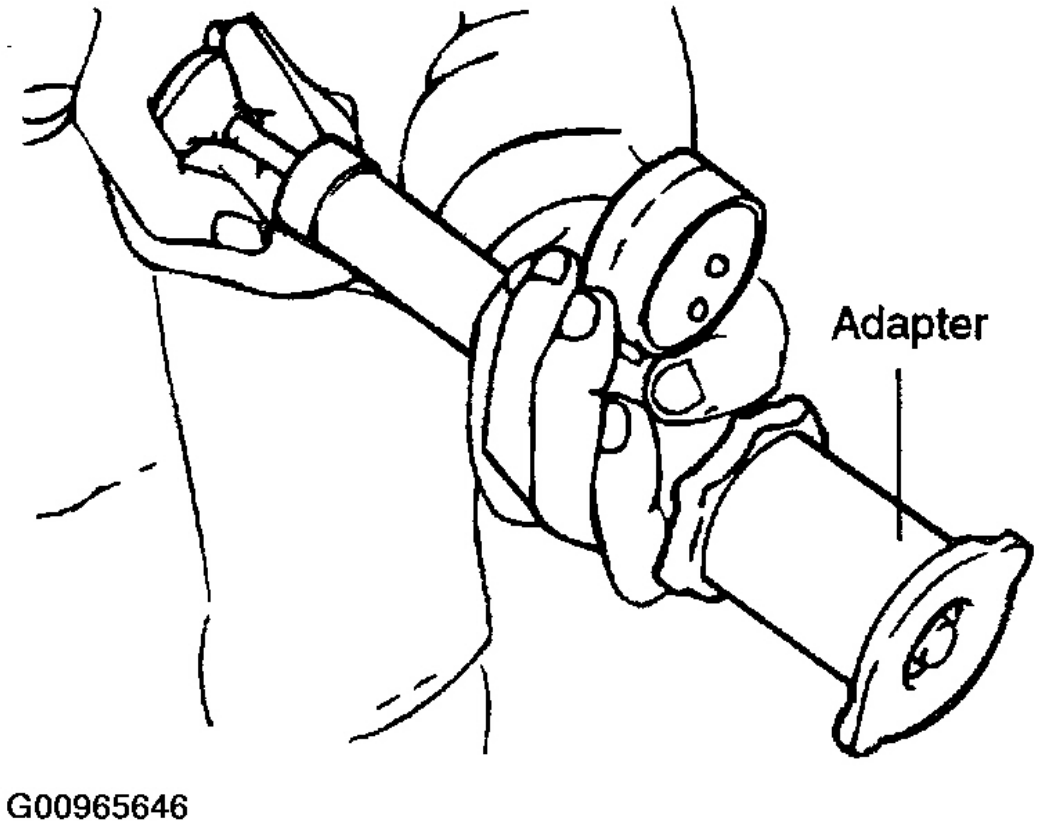
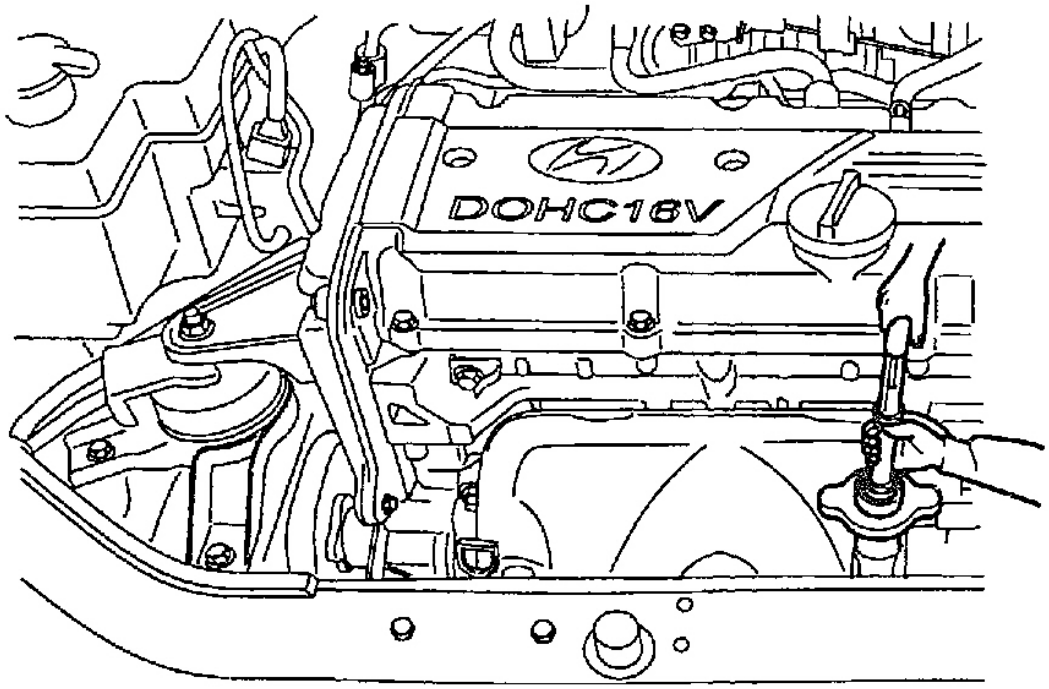


Fig. 10: Pressure Testing Radiator Cap
Courtesy of HYUNDAI MOTOR CO.

SPECIFIC GRAVITY TEST

1. Measure the specific gravity of the coolant with a hydrometer.
2. Measure the coolant temperature and calculate the concentration from the relation between the specific gravity and temperature, using the following table for reference. Refer to **Fig. 12**.



G00965647

Fig. 11: Checking Coolant With Hydrometer
Courtesy of HYUNDAI MOTOR CO.

RELATION BETWEEN COOLANT CONCENTRATION & SPECIFIC GRAVITY

Coolant temperatur °C (°F) and specific gravity					Freezing temperature °C (°F)	Safe operating temperature °C (°F)	Coolant concentration (Specific volume)
10 (50)	20 (68)	30 (86)	40 (104)	50 (122)			
1.054	1.050	1.046	1.042	1.036	-16 (3.2)	-11 (12.2)	30%
1.063	1.058	1.054	1.049	1.044	-20 (-4)	-15 (5)	35%
1.071	1.067	1.062	1.057	1.052	-25 (-13)	-20 (-4)	40%
1.079	1.074	1.069	1.064	1.058	-30 (-22)	-25(-13)	45%
1.087	1.082	1.076	1.070	1.064	-36 (-32.8)	-31 (-23.8)	50%
1.095	1.090	1.084	1.077	1.070	-42 (-44)	-37 (-35)	55%
1.103	1.098	1.092	1.084	1.076	-50 (-58)	-45 (-49)	60%

G00965648

Fig. 12: Coolant Concentration Table
Courtesy of HYUNDAI MOTOR CO.

Example

The safe operating temperature is -15°C (5°F) when the measured specific gravity is 1.058 at coolant temperature of 20°C (68°F)

CAUTION:

- **If the concentration of the coolant is below 30%, its anti-corrosion properties will be adversely affected.**
- **If the concentration is above 60%, both the anti-freeze and engine cooling property will decrease, affecting the engine adversely. For these reasons, be sure to maintain the concentration level within the specified range.**
- **Do not use together with another brand's product.**

RECOMMENDED COOLANT

Antifreeze	Mixture ratio of anti freeze in coolant
ETHYLENE GLYCOL BASE FOR ALUMINUM	50% [Except tropical areas] 40% [Tropical areas]

G00965649

Fig. 13: Recommended Coolant
Courtesy of HYUNDAI MOTOR CO.

CHANGING ENGINE COOLANT

CAUTION: When pouring engine coolant, be sure to shut the relay box lid and not to let coolant spill on electrical parts or the paint If any coolant spills, rinse it off immediately.

1. Slide the heater temperature control lever to maximum heat. Make sure the engine and radiator are cool to the touch.
2. Remove the radiator cap.
3. Loosen the drain plug, and drain the coolant.

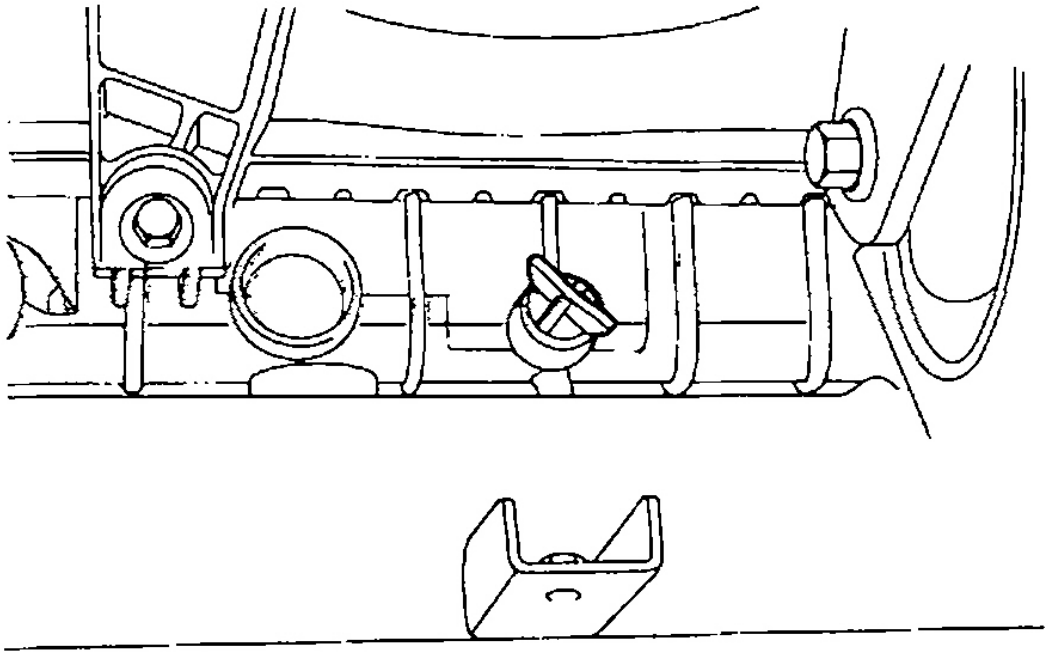


Fig. 14: Identifying Coolant Drain Plug
Courtesy of HYUNDAI MOTOR CO.

4. Tighten the radiator drain plug securely.
5. Remove, drain and reinstall the reservoir.

   Fill the tank halfway to the MAX mark with water, then up to the MAX mark with antifreeze.

6. Pour coolant into the radiator up to the base of the filler neck, and install the radiator cap loosely.
7. Start the engine and let it run until it warms up (the radiator fan comes on at least twice).
8. Turn off the engine.

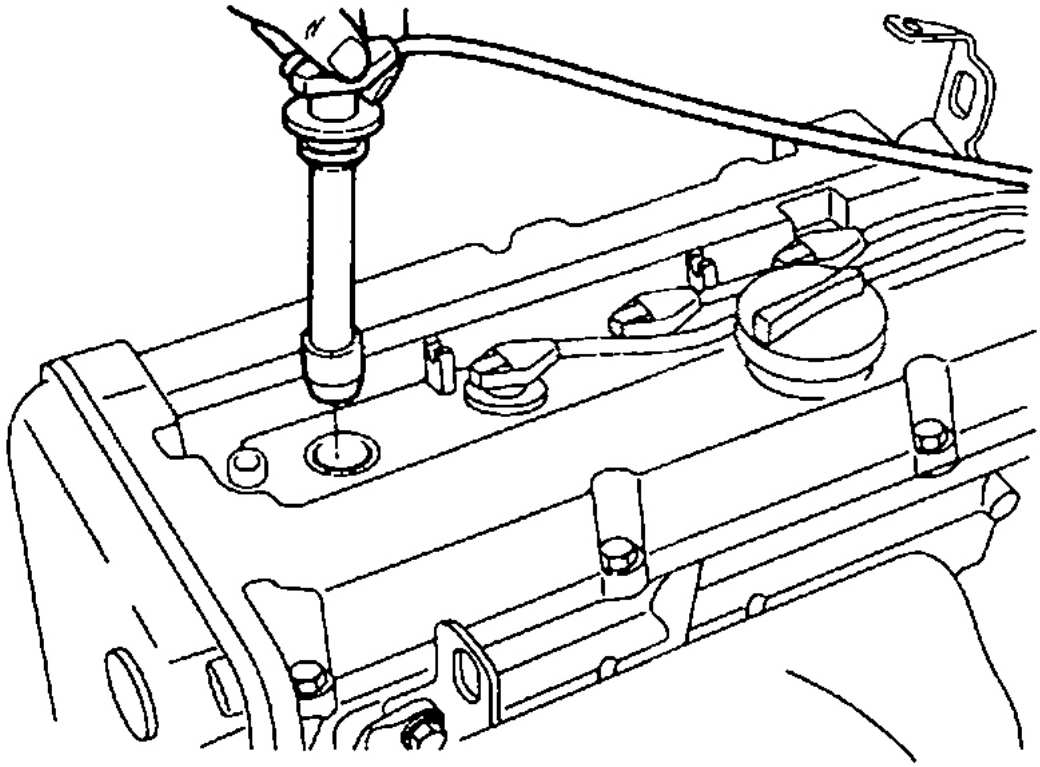
   Check the level in the radiator, add coolant if needed.

9. Put the radiator cap on tightly, then run the engine again and check for leaks.

CHECKING COMPRESSION PRESSURE

1. Before checking engine compression, check the engine oil level. Also check that the starter motor and battery are all in normal operating condition.
2. Check the DTC and note it. Use the scan tool to clear the ECM'S memory.
3. Start the engine and wait until engine coolant temperature reaches 80-95°C (176-205°F).

4. Disconnect the fuel pump connector.
5. Turn off engine and disconnect the spark plug cables.



G00965651

Fig. 15: Removing Spark Plug Wire
Courtesy of HYUNDAI MOTOR CO.

6. Remove the spark plugs.
7. Disconnect the IG. connector.
8. Crank the engine to remove any foreign material in the cylinders.
9. Insert the compression gauge into the spark plug hole.

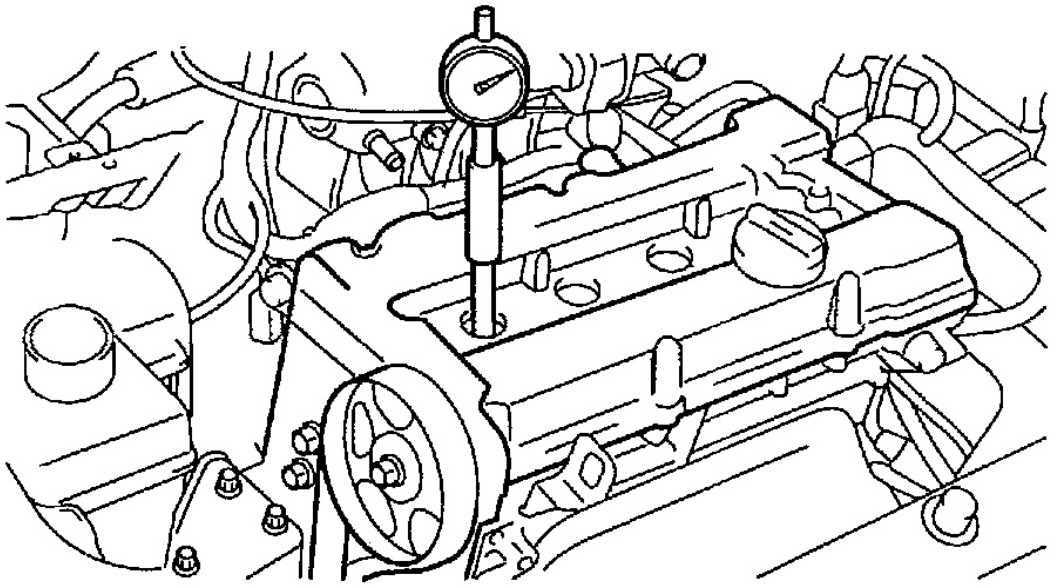


Fig. 16: Identifying Compression Gauge In The Spark Plug Hole
Courtesy of HYUNDAI MOTOR CO.

10. Depress the accelerator pedal to open the throttle fully.
11. Crank the engine and read the gauge.

    Standard value: 1500 kPa (15 kg/cm^2 , 218 psi)

    Limit: 1400 kPa (14 kg/cm^2 , 203 psi)
12. Repeat steps 9 to 11 over all cylinders, ensuring that the pressure differential for each of the cylinders is within the specified limit.

    Limit: Max 100 kPa (1.0 kg/cm^2 , 14 psi) between cylinders
13. If a cylinder's compression or pressure differential is outside the specification, add a small amount of oil through the spark plug hole, and repeat steps 9 to 12.

1. If the addition of oil makes the compression to rise, it is likely that there may be wear between the piston ring and cylinder wall.
2. If compression remains the same, valve seizure, poor valve seating or a compression leak from the cylinder head gasket are all possible causes.

Tightening torque

Spark plug: 20-30 Nm (200-300 kg.cm, 14-22 lb.ft)

ADJUSTING TIMING BELT TENSION

1. Rotate the steering wheel counter-clockwise thoroughly.

NOTE: Do watch not to over load.

2. Lift the vehicle by using of jack.

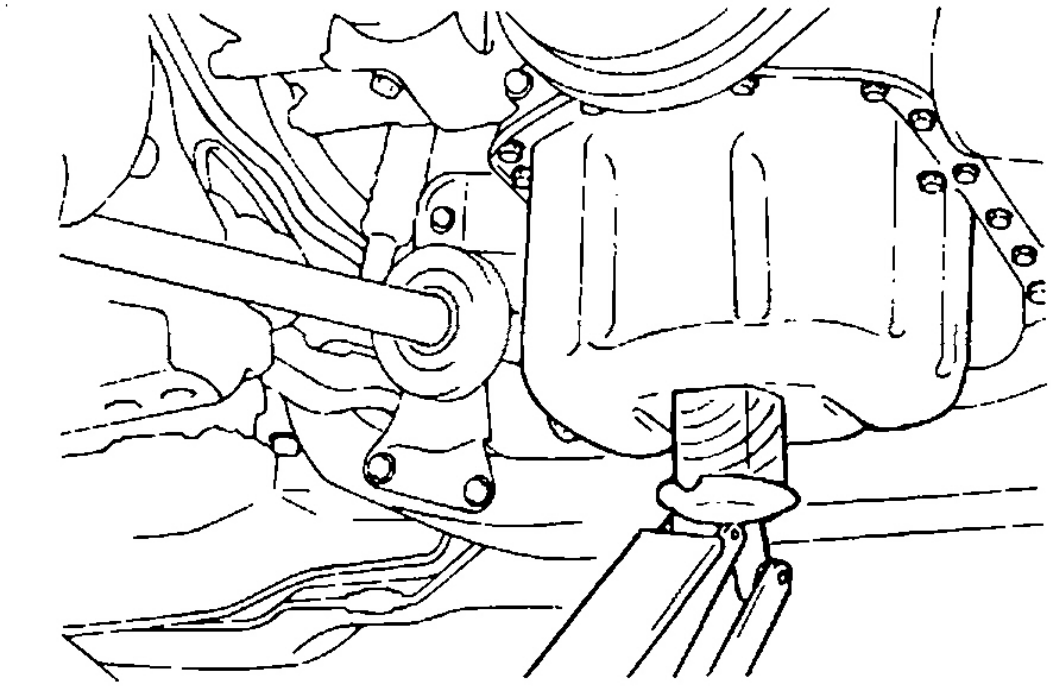
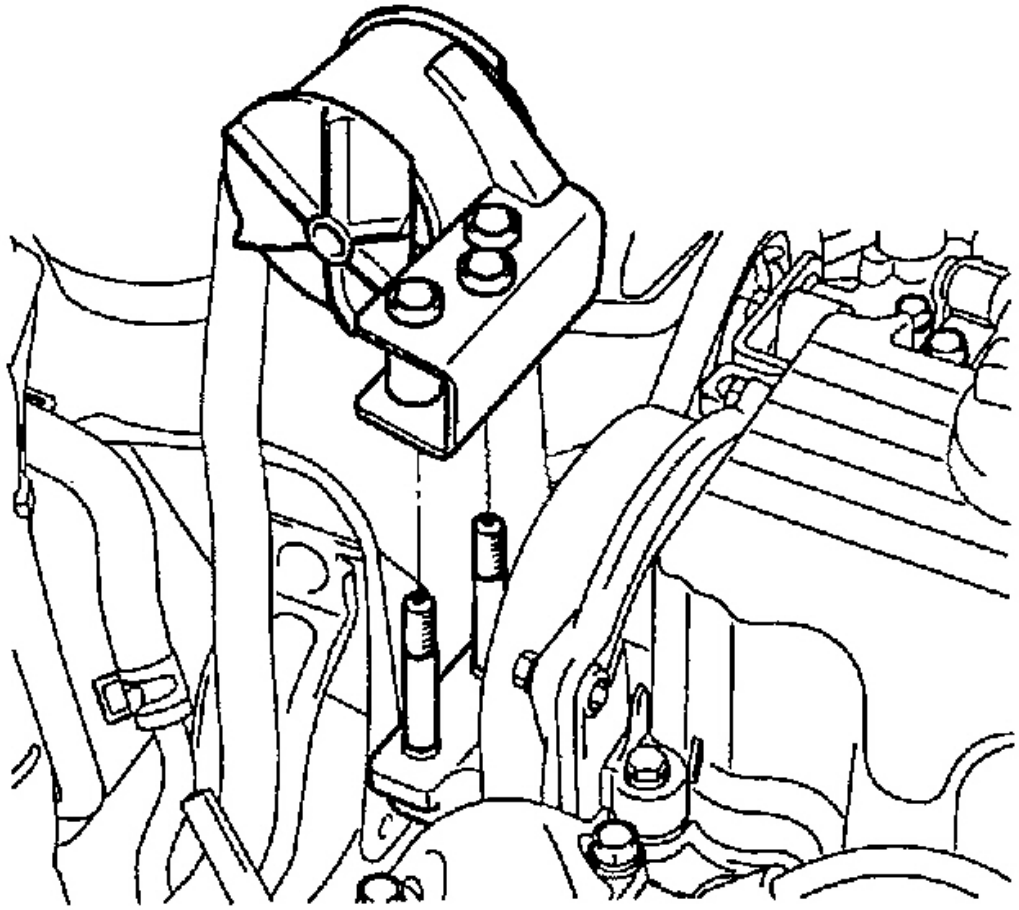


Fig. 17: Lifting Engine
Courtesy of HYUNDAI MOTOR CO.

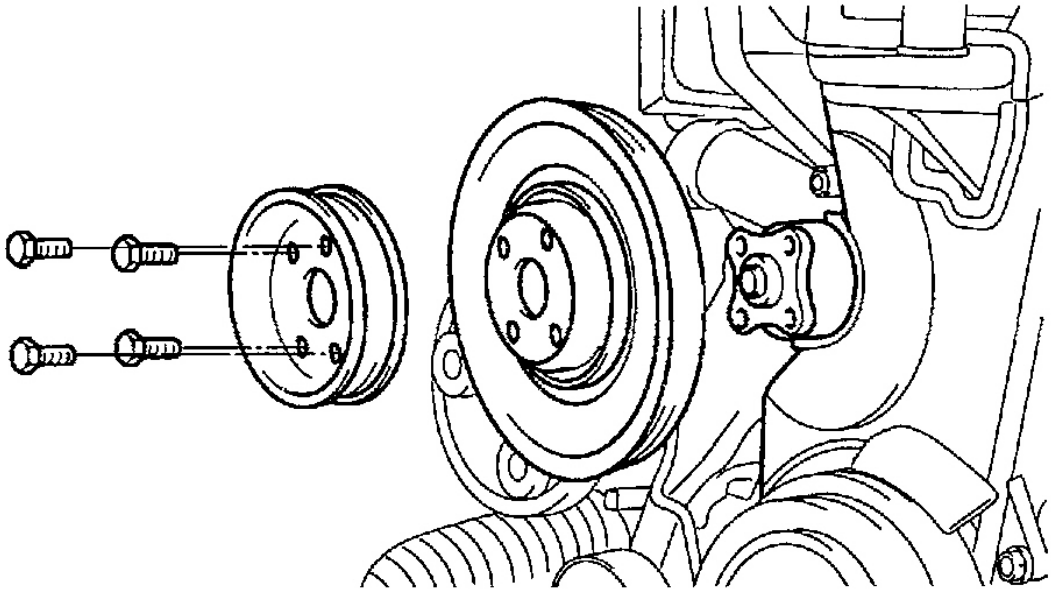
3. Remove the engine support bracket. (14mm bolt and 2 nuts, 17mm bolt)



G00965654

Fig. 18: Removing Engine Support Bracket
Courtesy of HYUNDAI MOTOR CO.

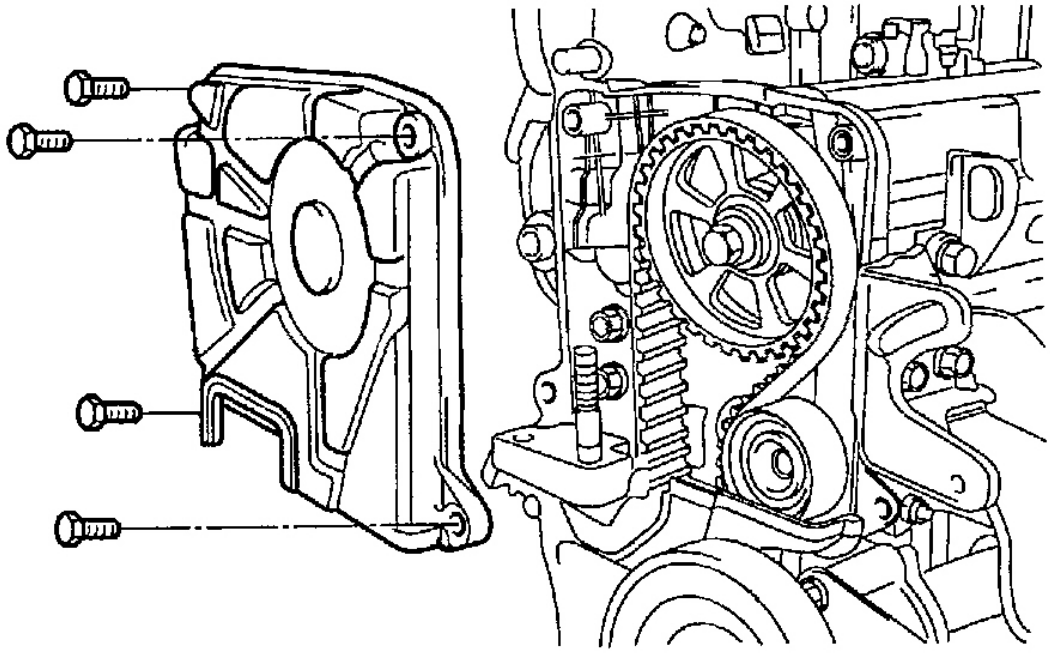
4. Remove the drive belts and the water pump pulley. (10mm 4 bolts)



G00965655

Fig. 19: Removing Water Pump Pulley
Courtesy of HYUNDAI MOTOR CO.

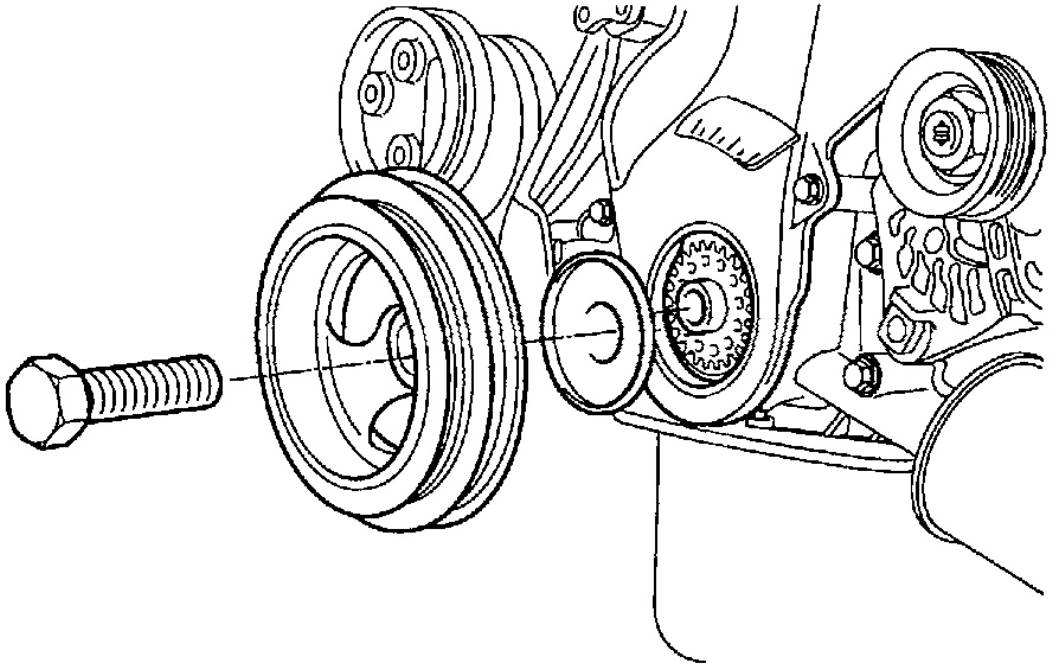
5. Remove the timing belt upper cover. (10mm 4 bolts)



G00965656

Fig. 20: Removing Timing Belt Cover
Courtesy of HYUNDAI MOTOR CO.

6. Remove the crankshaft pulley.



G00965657

Fig. 21: Removing Crankshaft Pulley
Courtesy of HYUNDAI MOTOR CO.

7. Remove the timing belt lower cover.
8. Place the piston of No. 1 cylinder to TDC of the compression stroke by rotating the crankshaft clockwise.

NOTE: Crankshaft is to be rotated clockwise otherwise, the tension is inadequately adjusted.

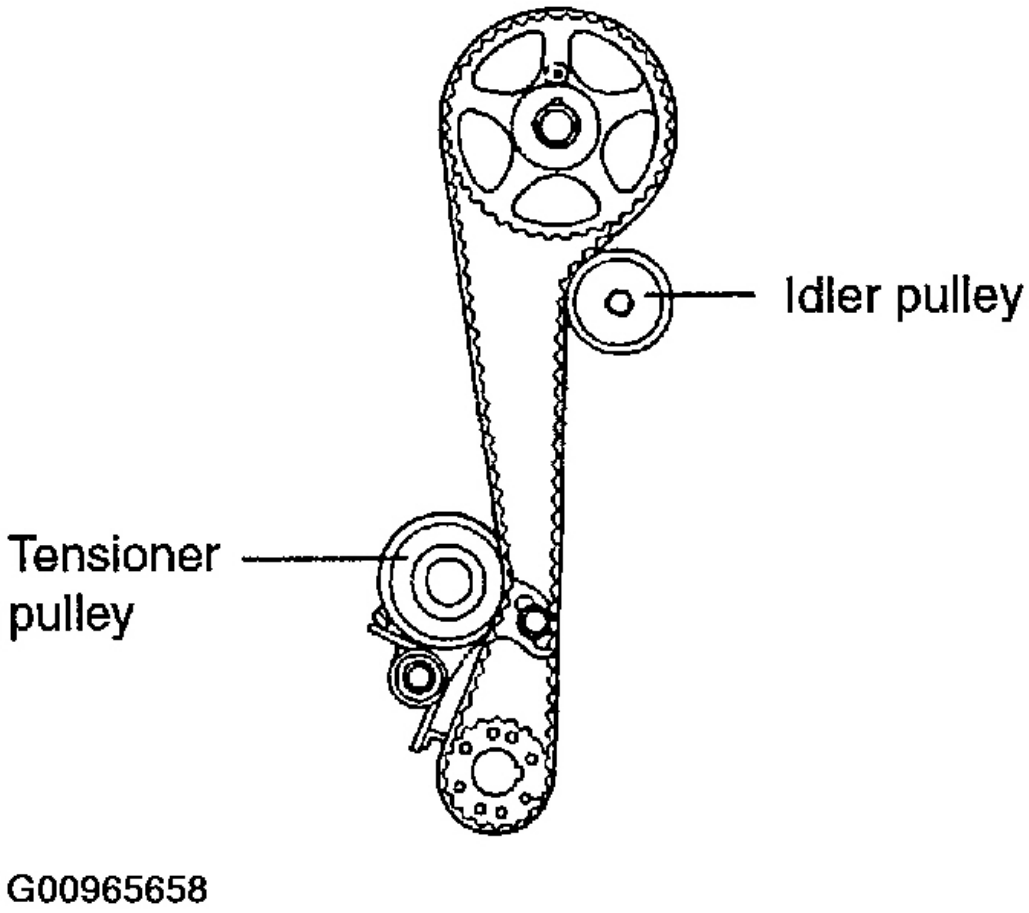
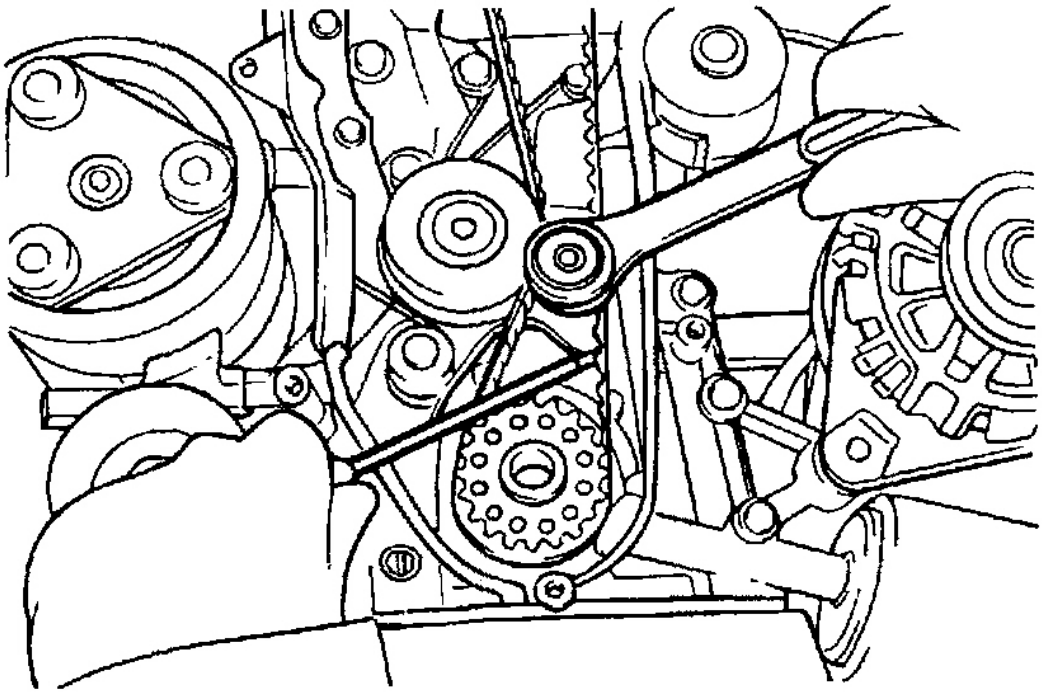


Fig. 22: Identifying Idler Pulley & Tensioner Pulley
Courtesy of HYUNDAI MOTOR CO.

9. Loosen the tensioner bolt of pivot side and slot side.



G00965659

Fig. 23: Loosening Tensioner Bolt
Courtesy of HYUNDAI MOTOR CO.

10. Rotate the crankshaft clockwise as many as 2 teeth of camshaft sprocket.
11. Check that the teeth of the sprocket and belt coincide with each other.
12. Tighten the slot side bolt first and then tighten the bolt of pivot side.
13. Check the tension of the timing belt.

    When the tensioner and the tension side of the timing belt are pushed in horizontally with a moderate force [approx. 49 N (11 lb)], the timing belt log end is approx. half of the tensioner mounting bolt head radius (cross flats) away from the bolt head center.

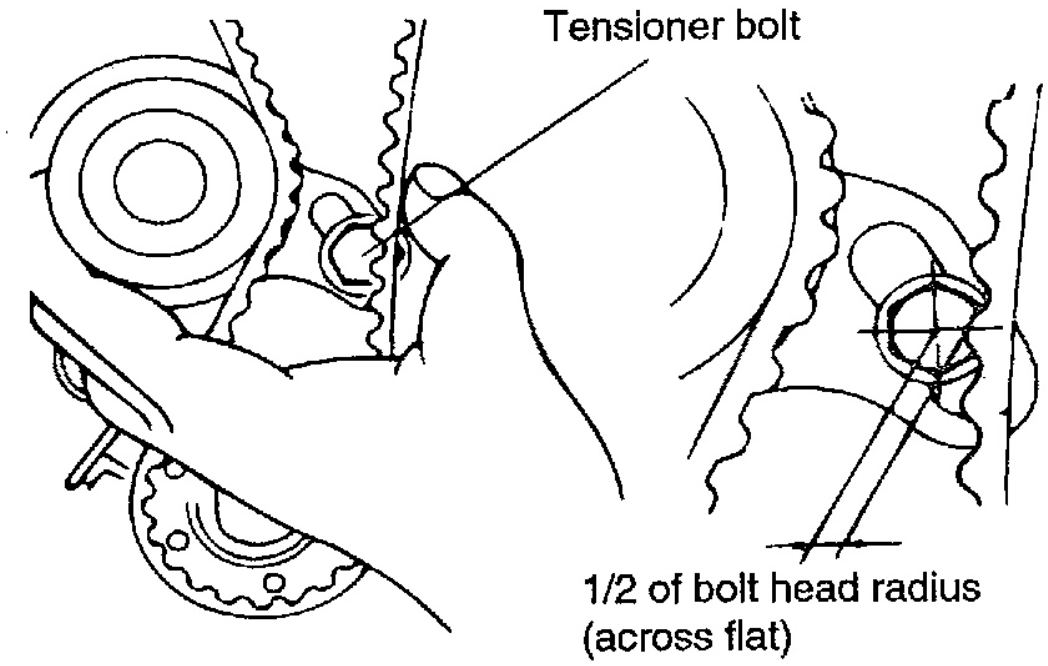


Fig. 24: Identifying Tensioner Bolt
Courtesy of HYUNDAI MOTOR CO.

14. Rotate the crankshaft pulley two turns clockwise so that the timing belt positions on the pulleys.
15. Install the timing belt lower cover.
16. Install the crankshaft pulley.
17. Install the timing belt upper cover.
18. Install the water pump pulley and engine support bracket.

ADJUSTING DRIVE BELT TENSION

1. Check that the belts are not damaged and are properly fit for the pulley grooves.
2. Apply 100 N (22 lbs.) force to the back and midway portion of the belt between the pulleys as shown in the illustration, measure the amount of deflection with a tension gauge.

CAUTION:
1. **When installing the V-ribbed belt, check that the V-ribs are properly aligned.**
2. **If noise or slippage is detected, check the belt for wear, damage, or breakage on the pulley contact surface, and check the pulley for scoring. Also check the amount that the belt is deflected.**

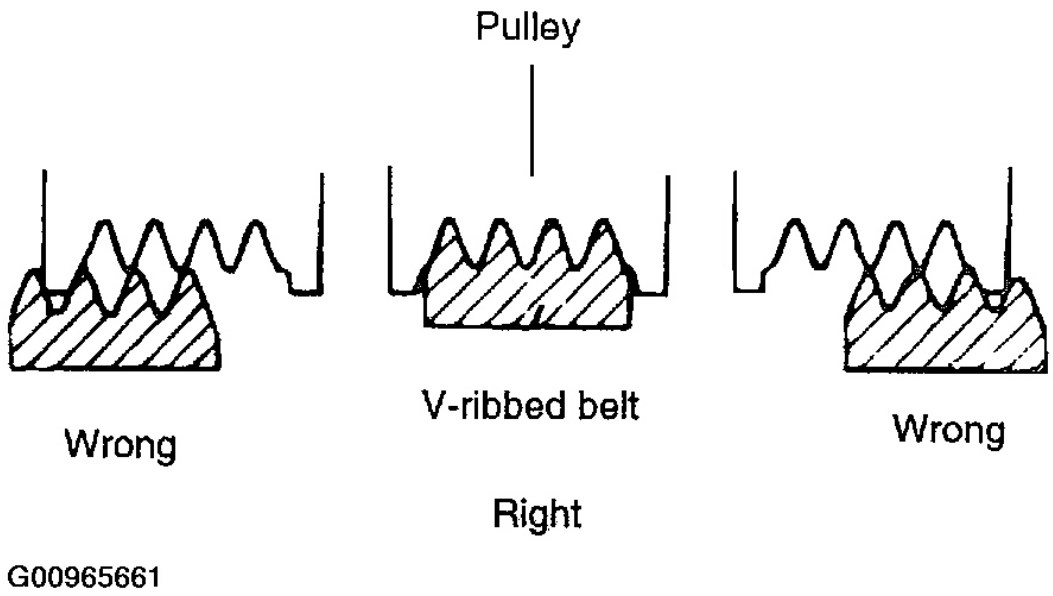


Fig. 25: Drive Belt Proper Installation
Courtesy of HYUNDAI MOTOR CO.

Itmes		Inspection	Adjustment	
			New	Used
For alternator	Deflection mm (in.)	5.1~6.0(0.200~0.236)	4.0~4.4(0.157~0.173)	5.0~5.7(0.200~0.224)
	Tension N (lb)	350~500(79~112	650~750(143~165)	400~500(88~110)
For air conditioner	Deflection mm (in.)	8(0.31)	5.0~5.5(0.20~0.22)	6.0~7.0(0.24~0.28)
	Tension N (lb)	250~500(56~112)	470~570(106~128)	320~400(72~90)
For power steering	Deflection mm (in.)	6.0~9.0(0.24~0.35)		

G00965662

Fig. 26: Standard Value Table
Courtesy of HYUNDAI MOTOR CO.

NOTE:

1. **The belt tension must be measured half-way between the specified pulleys.**
2. **When a new belt is installed, adjust the tension to the central value of the standard range indicated under "New" in the above table. Let the engine idle for 5 minutes or more, and check the standard value indicated under "Inspection." Refer to Fig. 26.**
3. **When adjusting a belt which has been used, or newly installed, after 5 minutes or more of operation, refer to Fig. 26 under "Used" in the above table.**

4. Refer to Fig. 26 under "Inspection" for periodic inspections.

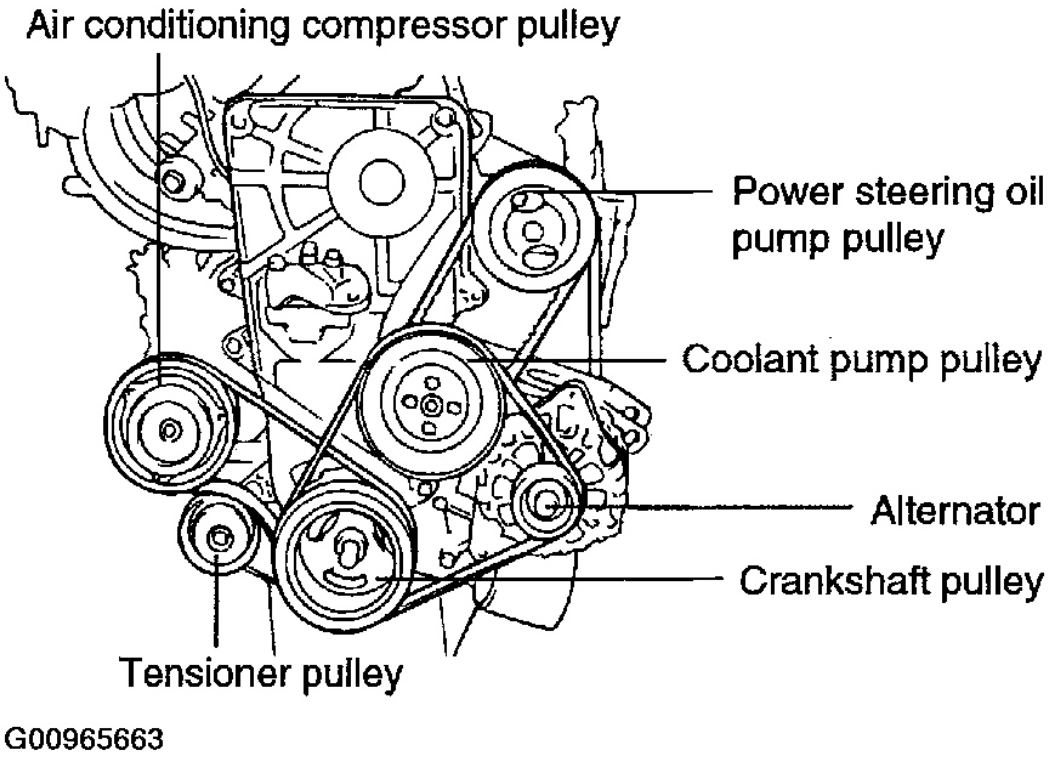


Fig. 27: View Of Belts & Pulleys
Courtesy of HYUNDAI MOTOR CO.

TYPE A TENSION GAUGE

Do not let the dial section of the tension gauge contact other objects during measurement.

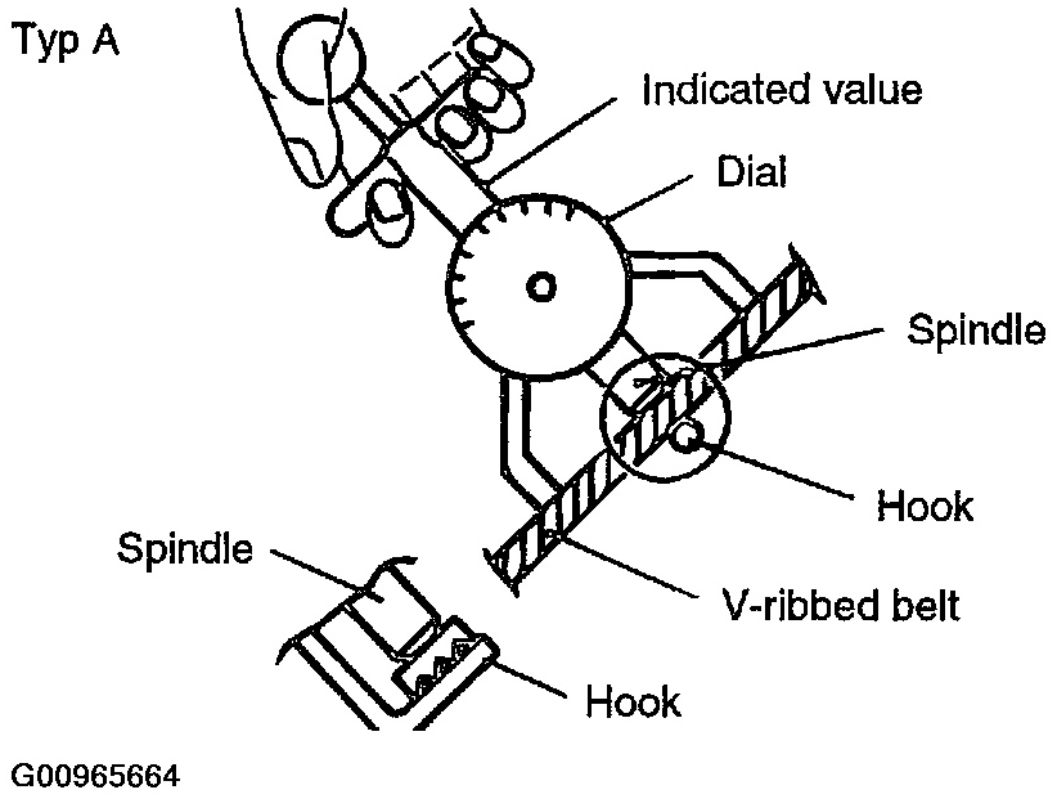


Fig. 28: Checking Belt Tension With Type A Tension Gauge
Courtesy of HYUNDAI MOTOR CO.

TYPE B TENSION GAUGE

1. When measuring, turn the reset button in the direction of the arrow and set the gauge needle to the RESET position.
2. If the tension gauge is removed from the belt, the needle will still indicate the tension. Read the tension value after removing the gauge.

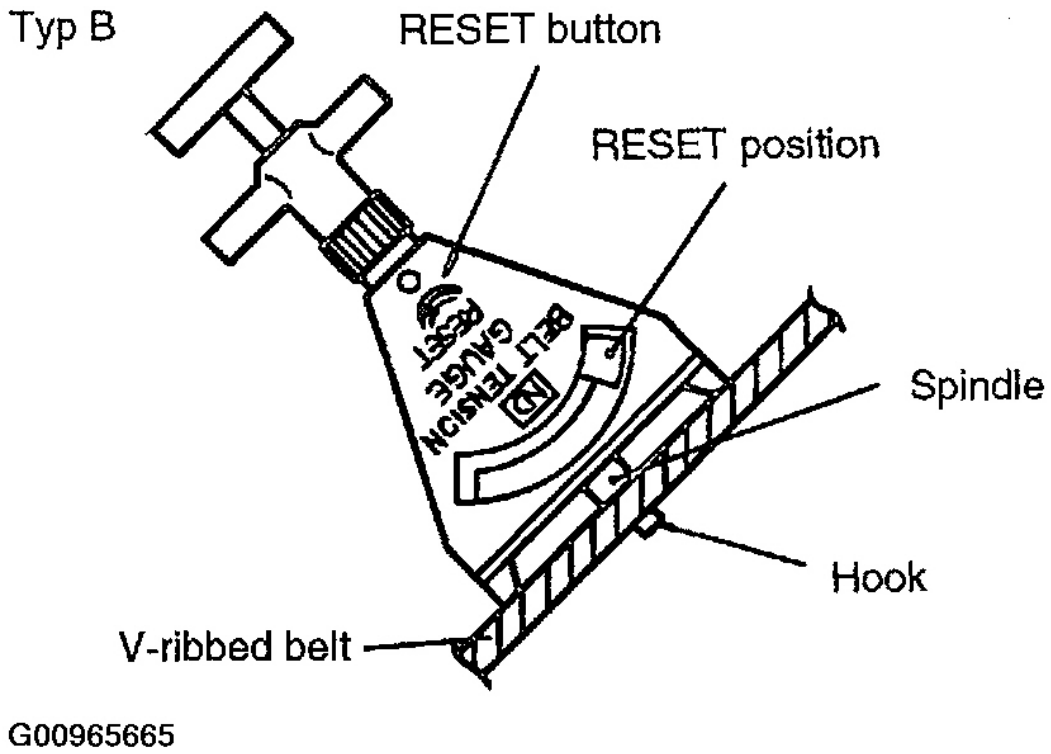


Fig. 29: Checking Belt Tension With Type B Tension Gauge
Courtesy of HYUNDAI MOTOR CO.

ADJUSTING THE ALTERNATOR BELT

CAUTION: If the belt is too loose, it will cause noise or sudden wear.

If the belt is too tight, the engine coolant pump bearing or the alternator can get damaged.

1. Loosen the alternator nut "A" and the tension adjuster lock bolt "B".
2. Using the tension adjuster bolt, adjust the belt tension to the specification.
3. Tighten the adjuster lock bolt "B".
4. Tighten the alternator nut "A".
5. Check the tension or the deflection of belt, readjust if necessary.

Tightening torque
Alternator support bolt and nut:
20 ~ 25 Nm (200 ~ 250 kg.cm, 14 ~ 18 lb.ft)

Alternator lock bolt B:
12 ~ 15 Nm (120 ~ 150 kg.cm, 9 ~ 11 lb.ft)
Alternator brace mounting bolt:
20 ~ 27 Nm (200 ~ 270 kg.cm, 15 ~ 20 lb.ft)

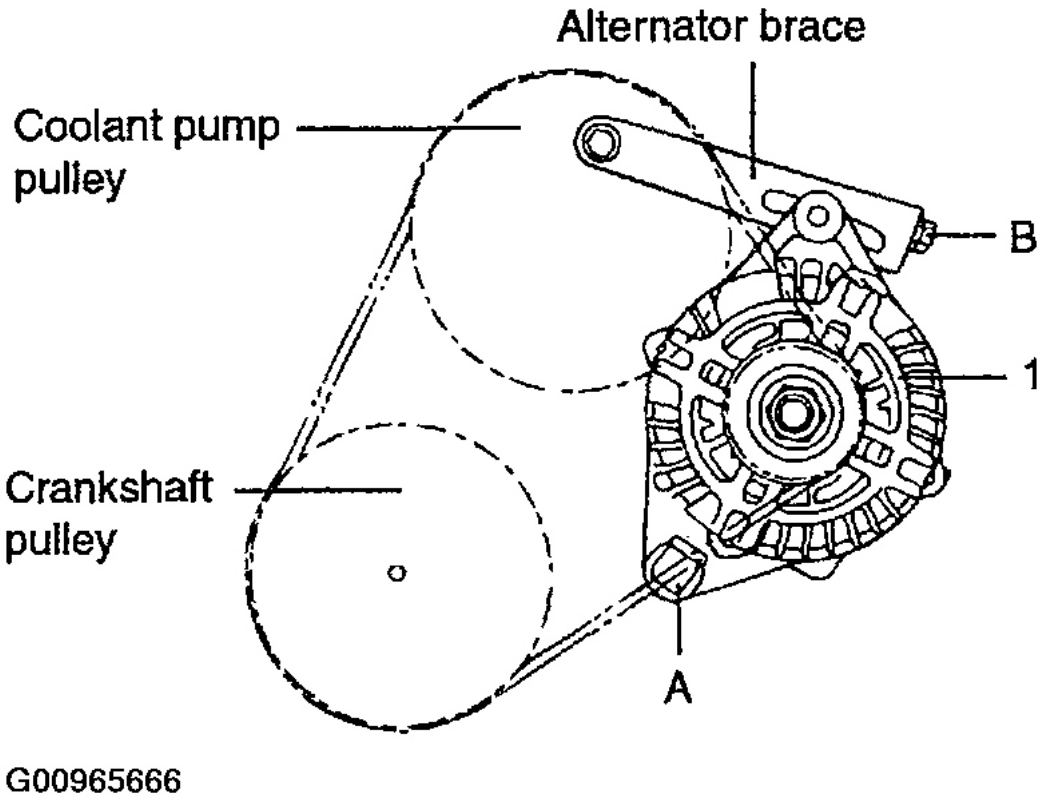
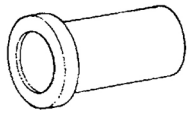
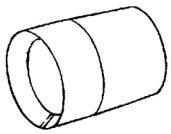
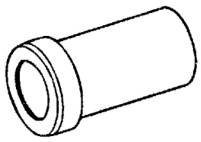
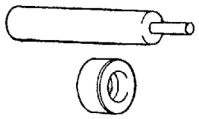
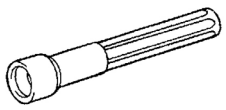


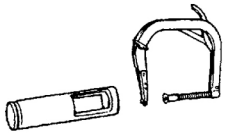
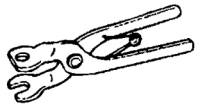
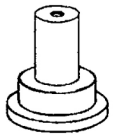
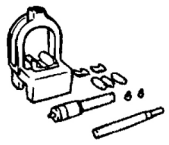
Fig. 30: Identifying Alternator Belt Adjustment
Courtesy of HYUNDAI MOTOR CO.

SPECIAL TOOLS

Tool (Number and name)	Illustration	Use
Crankshaft front oil seal installer (09214 - 21000)		Installation of the front oil seal
Crankshaft front oil seal guide (09214 - 21100)		Guide of oil seal
Camshaft oil seal installer (09221 - 21000)		Installation of the camshaft oil seal
Valve guide installer (09221 - 22000)		Removal and installation of valve guides
Valve stem oil seal installer (09222 - 22001)		Installation of valve stem oil seals

G00965667

Fig. 31: Identifying Special Tools (1 Of 2)
Courtesy of HYUNDAI MOTOR CO.

Tool (Number and name)	Illustration	Use
Valve spring compressor (09222 - 28000) Valve spring compressor holder (09222 - 28000)		Removal and installation of intake and exhaust valves
Valve stem seal remover 09222 - 29000)		Removal of valve stem seal
Crankshaft rear oil seal installer (09231 - 21000)		Installation of engine real oil seal and crankshaft rear oil seal
Piston pin remover and installer kit (09234 - 33001)		Removal and installation of piston pin (Use with 09234 - 33003)
Piston pin setting tool insert (09234 - 33002)		Removal and installation of piston pin (Use with 09234 - 33001)

G00965668

Fig. 32: Identifying Special Tools (2 Of 2)
Courtesy of HYUNDAI MOTOR CO.

TROUBLESHOOTING

Symptom	Probable cause	Remedy
Low compression	Blown cylinder head gasket	Replace gasket
	Worn or damaged piston rings	Replace rings
	Worn piston or cylinder	Repair or replace piston and/or cylinder block
	Worn or damaged valve seat	Repair or replace valve and/or seat ring
Low oil pressure	Low engine oil level	Check engine oil level
	Faulty oil pressure switch	Replace
	Clogged oil filter	Replace
	Worn oil pump gears or cover	Replace
	Thin or diluted engine oil	Change and determine cause
	Oil relief valve stuck (open)	Repair
	Excessive bearing clearance	Replace
High oil pressure	Oil relief valve sutck (closed)	Repair
Excessive engine vibration	Loose engine roll stopper (front, rear)	Re-tighten
	Loose transaxle mount bracket	Re-tighten
	Loose engine mount bracket	Re-tighten
	Loose center member	Re-tighten
	Broken transaxle mount insulator	Replace
	Broken engine mount insulator	Replace
	Broken engine roll stopper insulator	Replace
Noisy valves	Thin or diluted engine oil (low oil pressure)	Change
	Worn or damaged valve stem or valve guide	Replace
	HLA abnormal operation	Speed the engine up (for venting) or Replace the HLA
Connecting rod and/or main bearing noise	Insufficient oil supply	Check engine oil level
	Thin or diluted engine oil	Change and determine cause
	Excessive bearing clearance	Replace
Timing belt noise	Incorrect belt tension	Adjust belt tension
Low coolant level	Leakage of coolant	
	1. Heater or radiator hose	Repair or replace parts
	2. Faulty radiator cap	Tighten or replace clamps
	3. Thermostat housing	Replace gasket or housing
	4. Radiator	Repair or replace
	5. Engine coolant pump	Replace parts
Clogged radiator	Foreign material in coolant	Replace coolant

G00965669

Fig. 33: Troubleshooting Symptom Chart (1 Of 2)
Courtesy of HYUNDAI MOTOR CO.

Symptom	Probable cause	Remedy
Abnormally high coolant temperature	Faulty thermostat	Replace parts
	Faulty radiator cap	Replace parts
	Restricted flow in cooling system	Clear restriction or replace parts
	Loose or missing drive belt	Adjust or replace
	Faulty water pump	Replace
	Faulty electric fan	Repair or replace
	Insufficient coolant	Refill coolant
Abnormally low coolant temperature	Faulty thermostat	Replace
	Faulty temperature sensor wiring	Repair or replace
Inoperative electrical cooling fan	Damaged thermo sensor, electrical motor, radiator fan relay and wiring, fuse	Replace or repair
Exhaust gas leakage	Loose connections	Retighten
	Broken pipe or muffler	Repair or replace
Abnormal noise	Detached baffle plate in muffler	Replace
	Broken rubber hanger	Replace
	Pipe or muffler contacting vehuicle body	Correct
	Broken pipe or muffler	Repair or replace

G00965670

Fig. 34: Troubleshooting Symptom Chart (2 Of 2)
Courtesy of HYUNDAI MOTOR CO.

ENGINE & TRANSAXLE ASSEMBLY

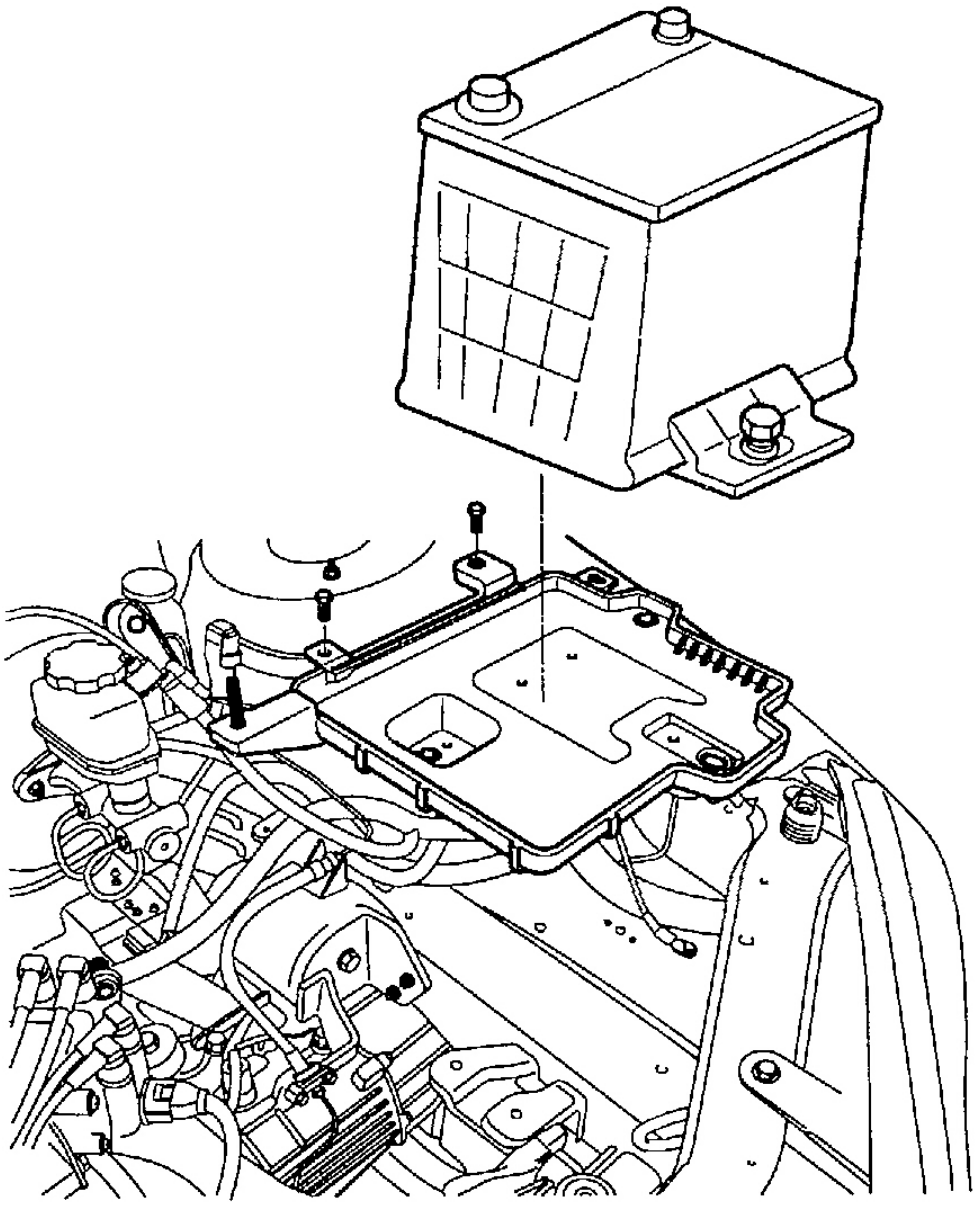
REMOVAL

WARNING:

- **Make sure jacks and safety stands are placed properly and hoist brackets are attached to the correct position on the engine.**
- **Make sure the vehicle will not roll off stands and fall while you are working under it.**

CAUTION: Use fender covers to avoid damaging painted surface.

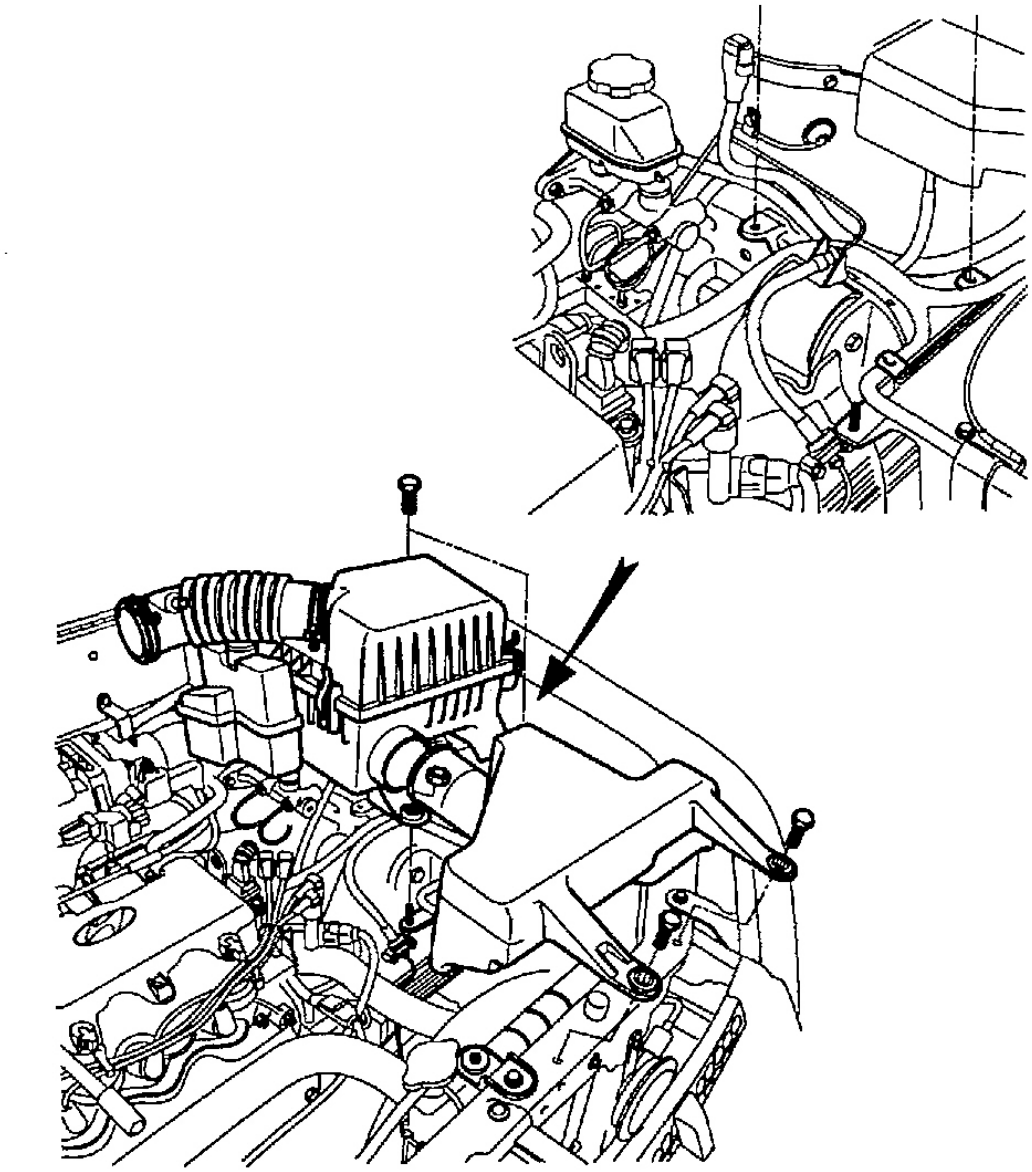
1. Remove the battery.



G00965671

Fig. 35: Removing Battery
Courtesy of HYUNDAI MOTOR CO.

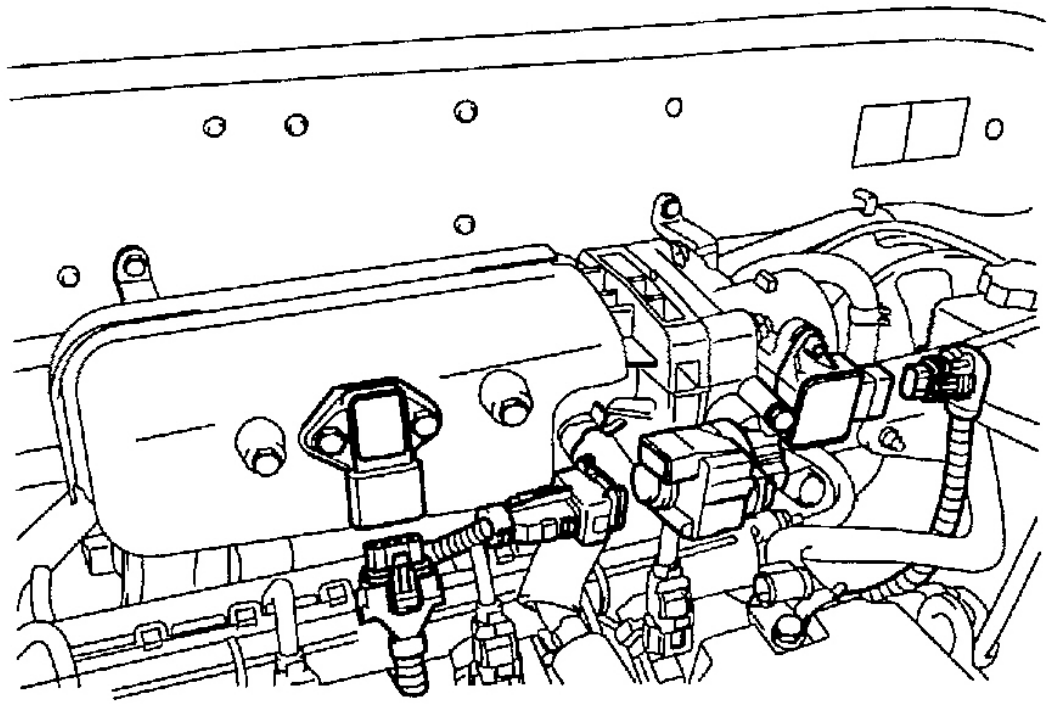
2. Detach the air cleaner.



G00965672

Fig. 36: Detaching Air Cleaner
Courtesy of HYUNDAI MOTOR CO.

3. Disconnect the connectors for engine harness.



G00965673

Fig. 37: Identifying Engine Harness Connectors (1 Of 2)
Courtesy of HYUNDAI MOTOR CO.

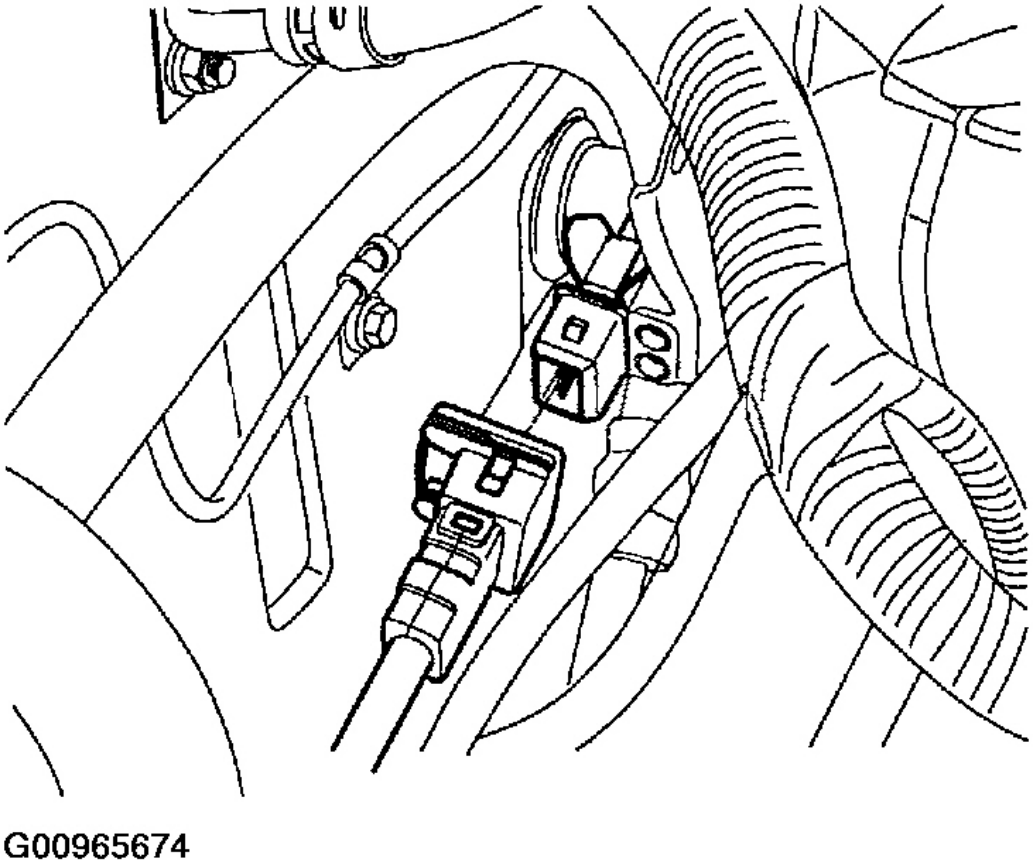
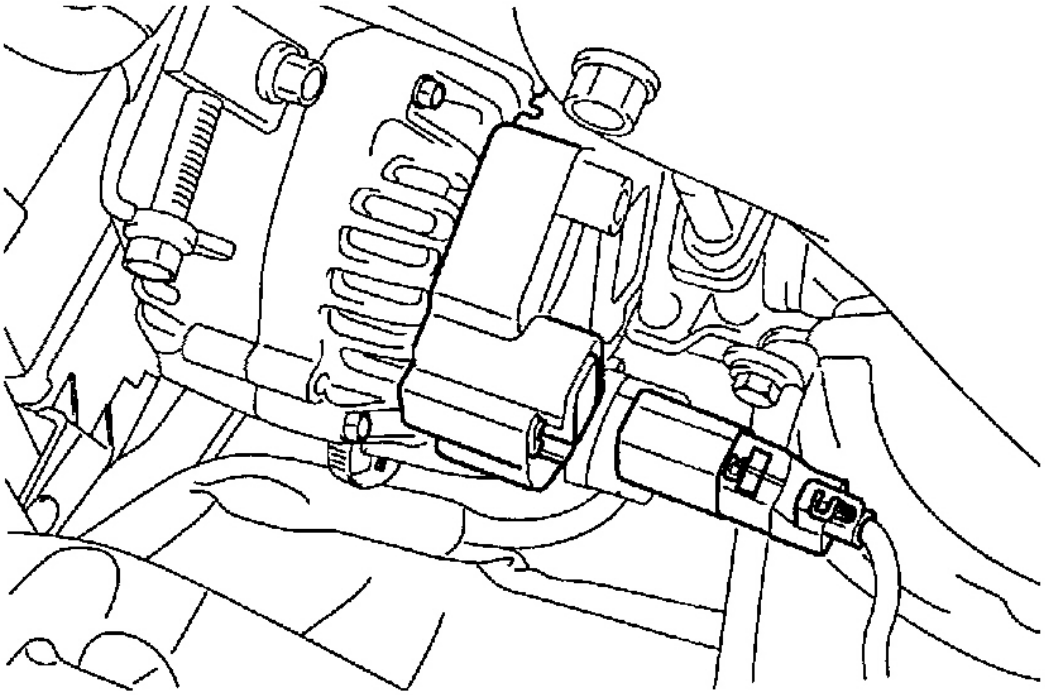


Fig. 38: Identifying Engine Harness Connectors (2 Of 2)
Courtesy of HYUNDAI MOTOR CO.

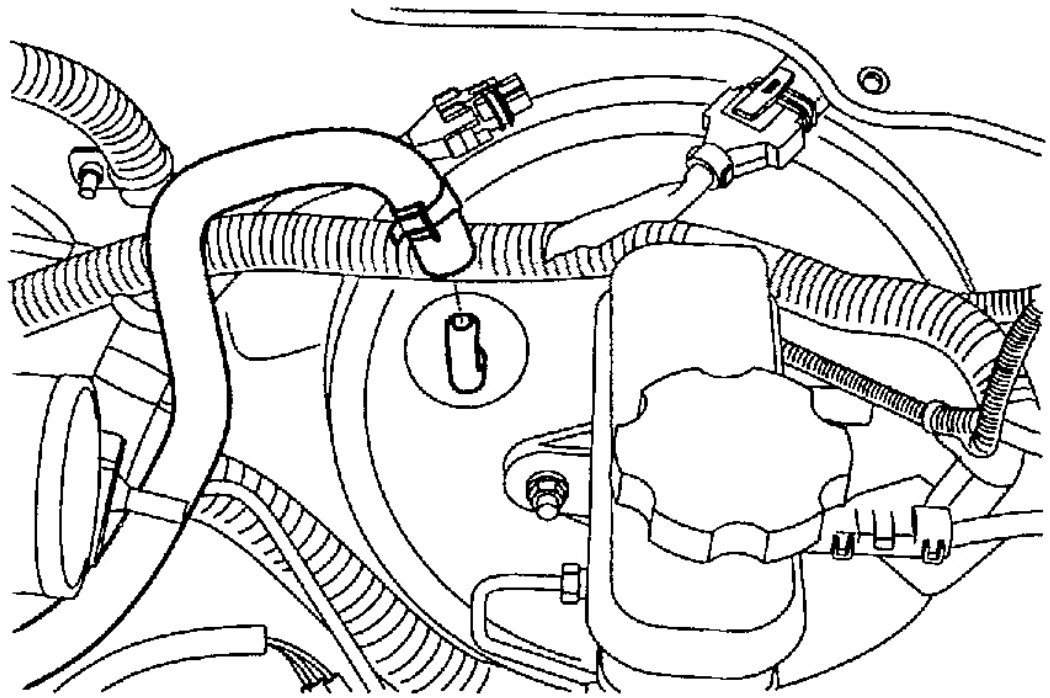
4. Disconnect the engine ground.
5. Disconnect the connectors for the alternator harness and the oil pressure gauge wiring.



G00965675

Fig. 39: Identifying Alternator Harness
Courtesy of HYUNDAI MOTOR CO.

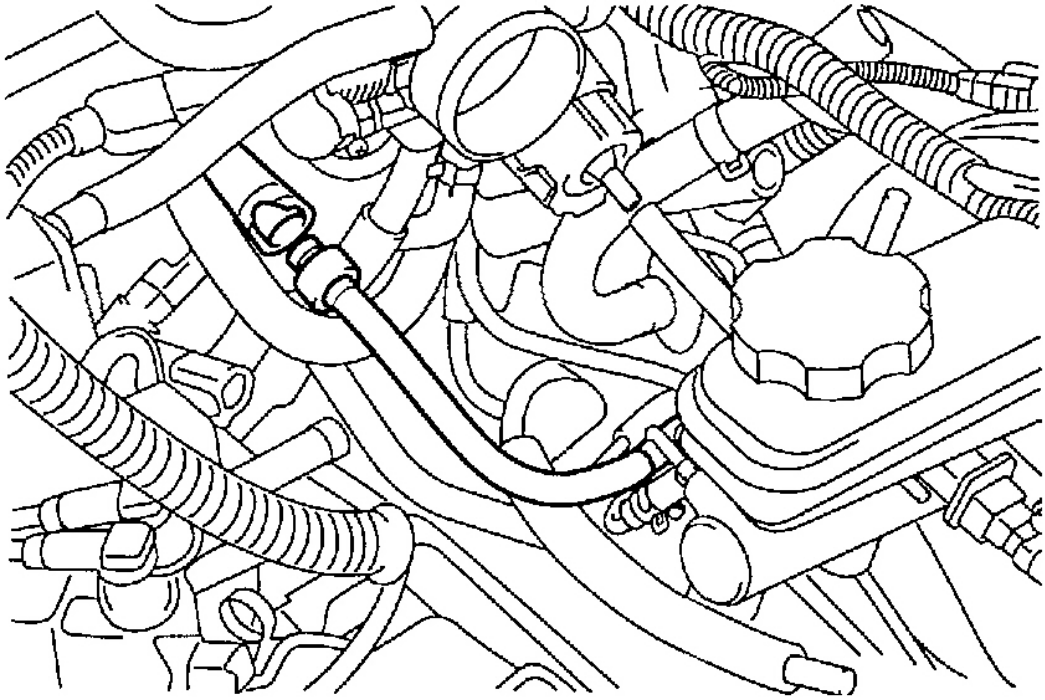
6. Disconnect the brake booster vacuum hose.



G00965676

Fig. 40: Disconnecting Brake Booster Vacuum Hose
Courtesy of HYUNDAI MOTOR CO.

7. Remove the main fuel line, the return and vapor hoses from the engine side.



G00965677

Fig. 41: Identifying Main Fuel Line
Courtesy of HYUNDAI MOTOR CO.

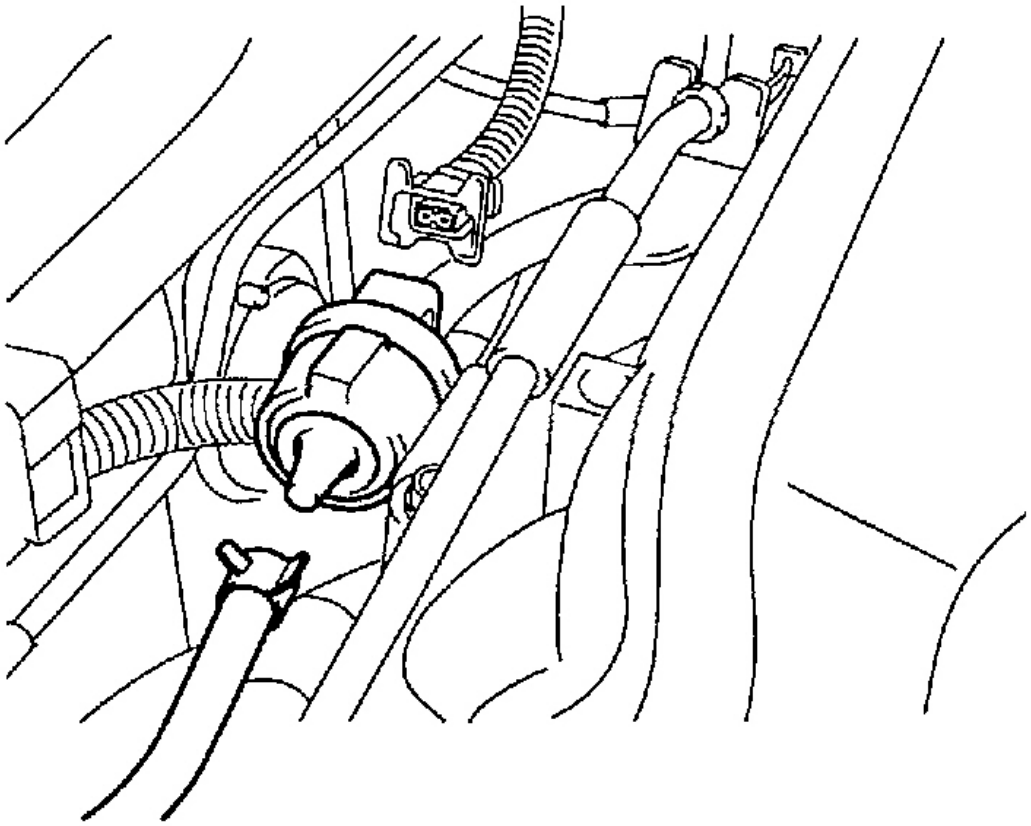
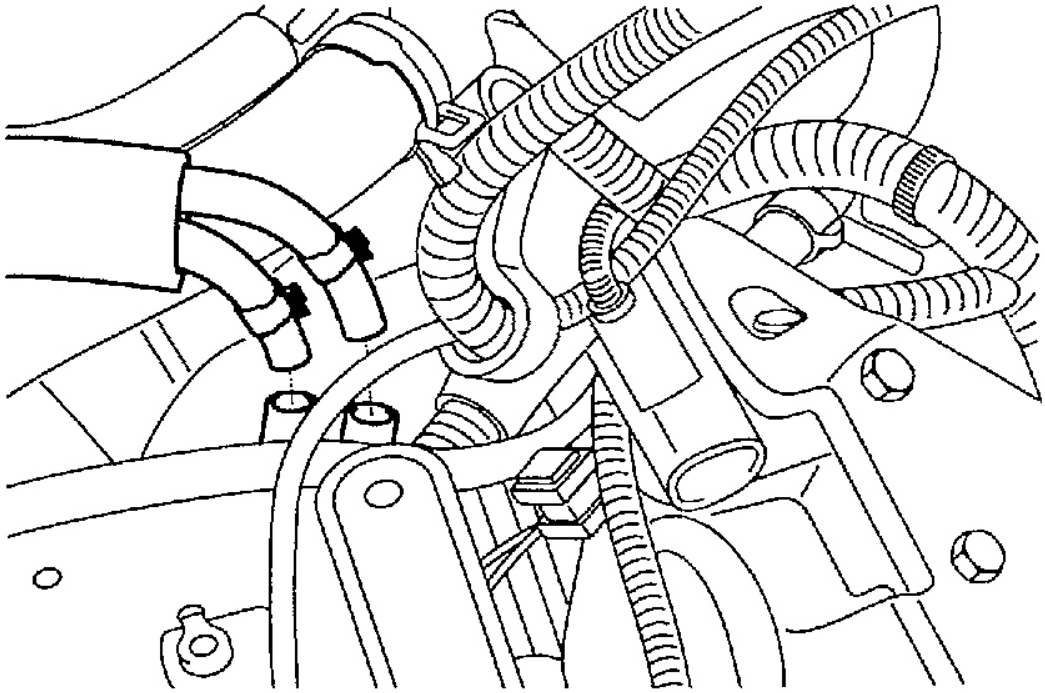


Fig. 42: Identifying Fuel Vapor Line
Courtesy of HYUNDAI MOTOR CO.

8. Disconnect the transaxle oil cooler hoses. (A/T)



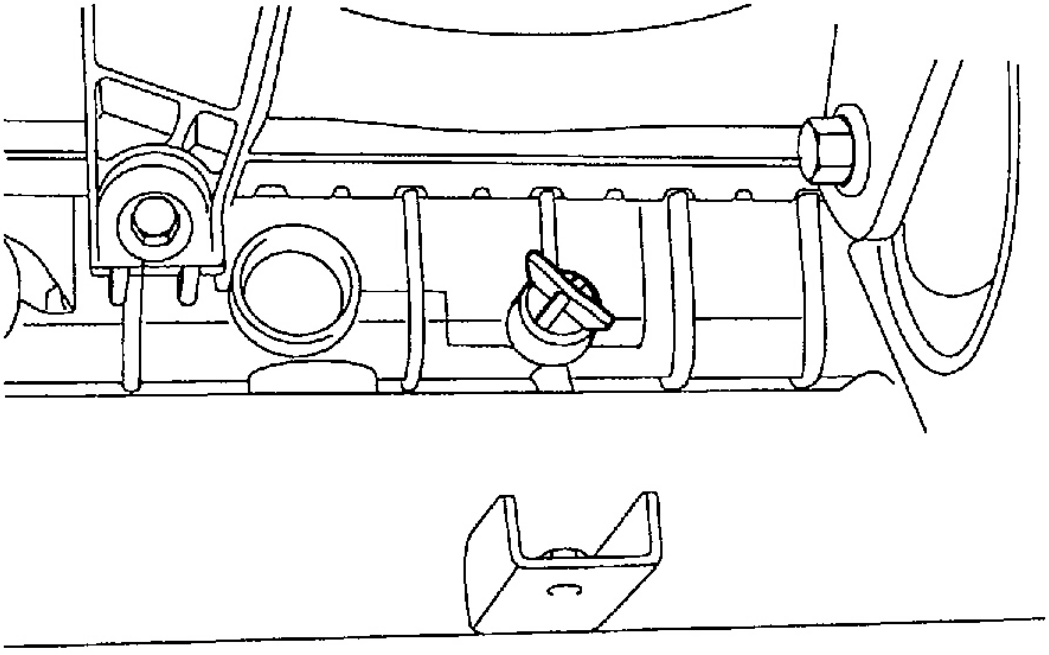
G00965679

Fig. 43: Disconnecting Transaxle Oil Cooler Hoses
Courtesy of HYUNDAI MOTOR CO.

NOTE: When disconnecting hoses, make identification marks to ensure they are reconnected correctly.

CAUTION: Be careful not to spill oil or fluid from hoses. Plug the openings to prevent foreign material from entering.

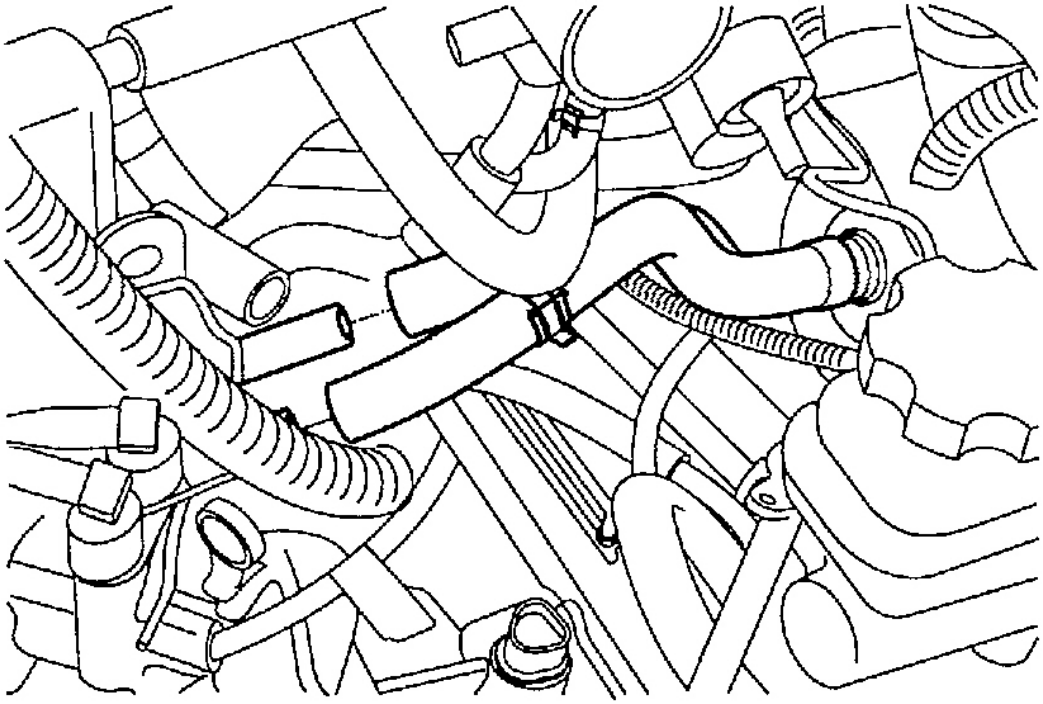
9. Drain the engine coolant.



G00965680

Fig. 44: Identifying Coolant Drain Plug
Courtesy of HYUNDAI MOTOR CO.

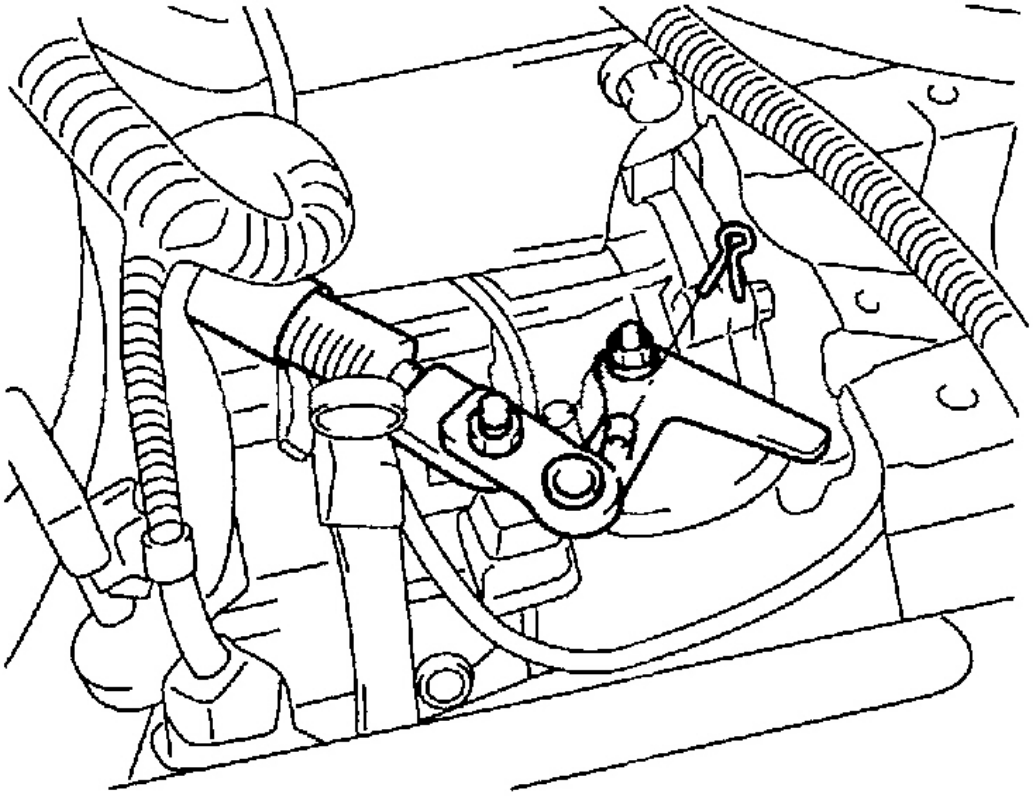
10. Disconnect the radiator upper and lower hoses on the engine side, then remove the radiator assembly.
11. Disconnect the heater hoses (inlet and outlet) on the engine side.



G00965681

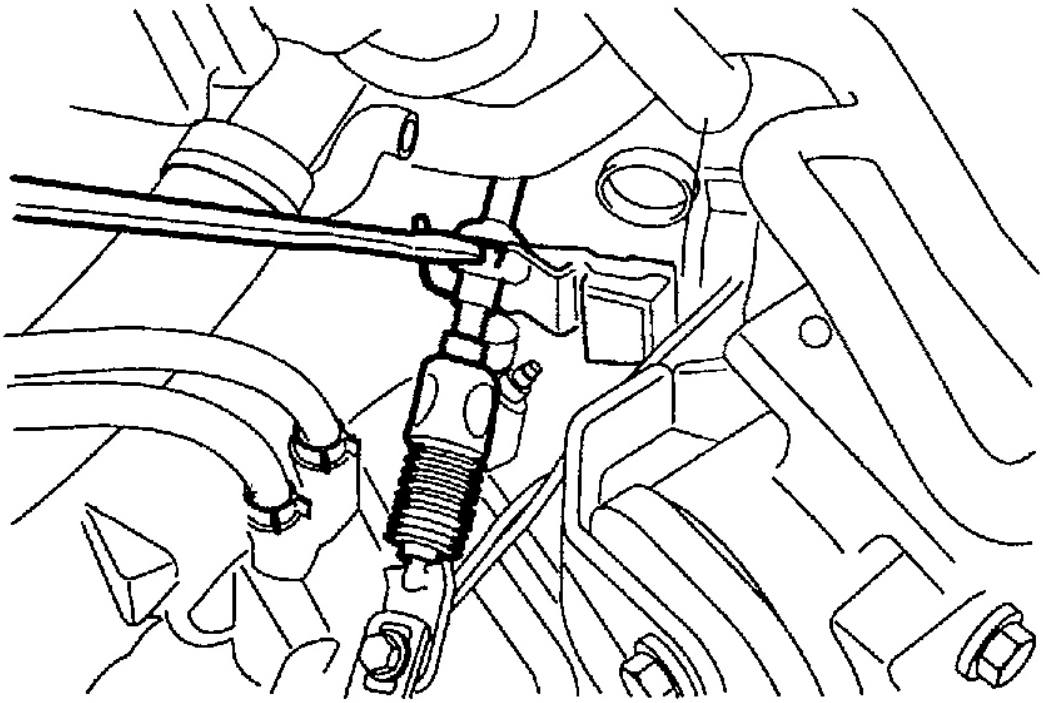
Fig. 45: Disconnecting Heater Hoses
Courtesy of HYUNDAI MOTOR CO.

12. Disconnect the accelerator cable at the engine side.
13. For vehicles with automatic transmission, remove the control cable from the transmission.



G00965682

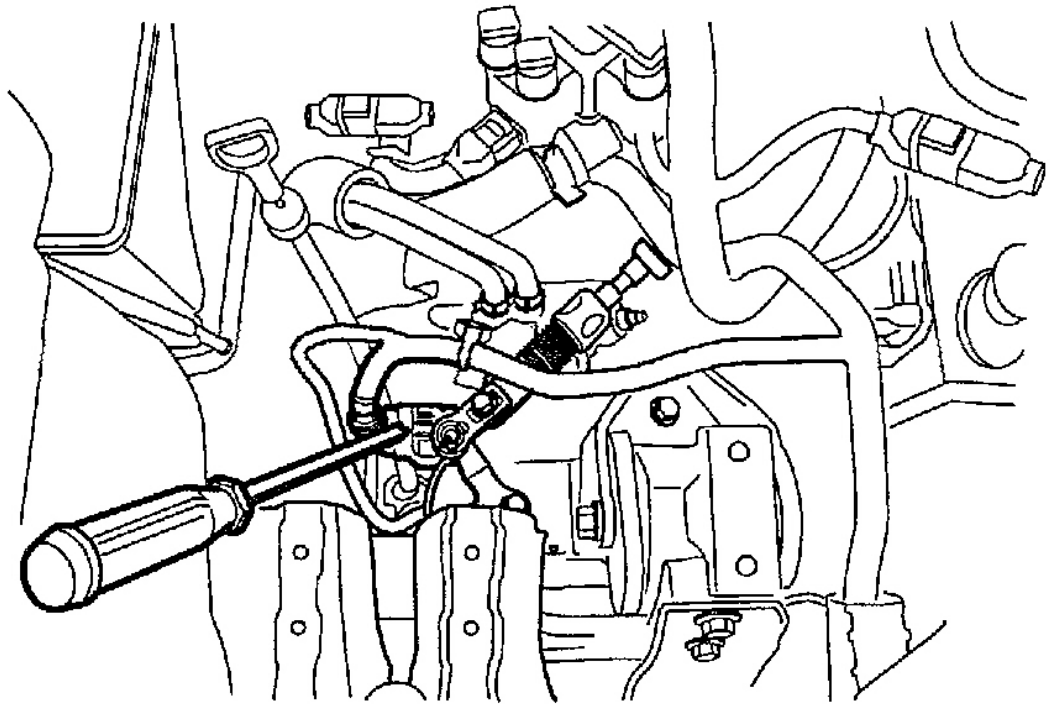
Fig. 46: Removing Transmission Control Cable (1 Of 2)
Courtesy of HYUNDAI MOTOR CO.



G00965683

Fig. 47: Removing Transmission Control Cable (2 Of 2)
Courtesy of HYUNDAI MOTOR CO.

14. Disconnect the inhibitor switch and solenoid valve connector.



G00965684

Fig. 48: Disconnecting Inhibitor Switch
Courtesy of HYUNDAI MOTOR CO.

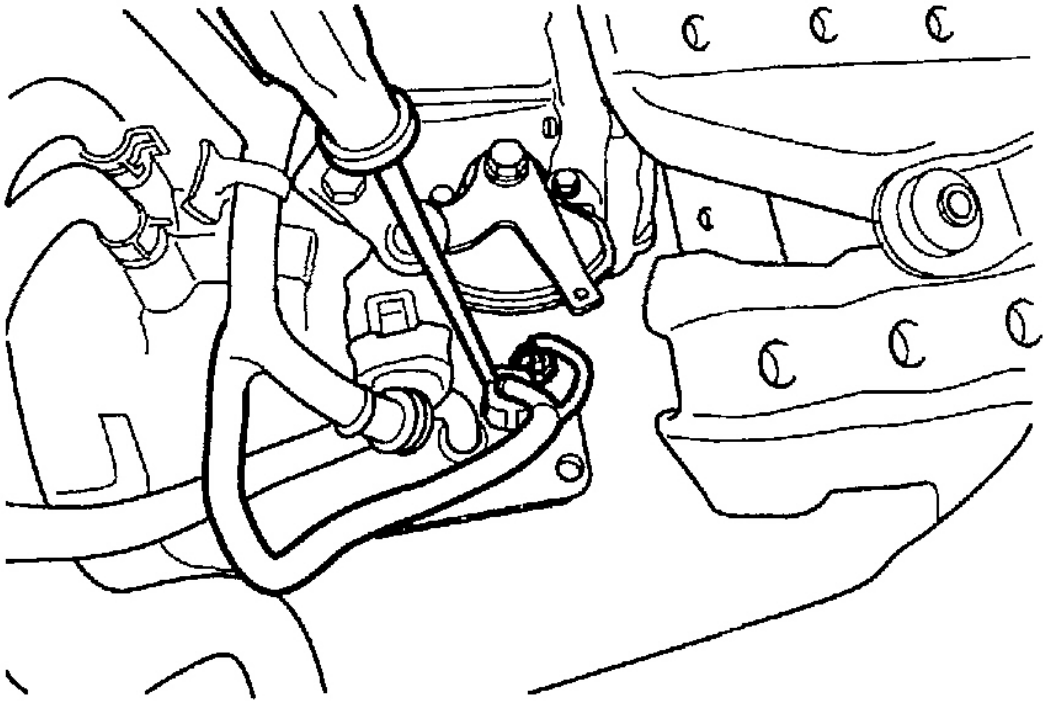
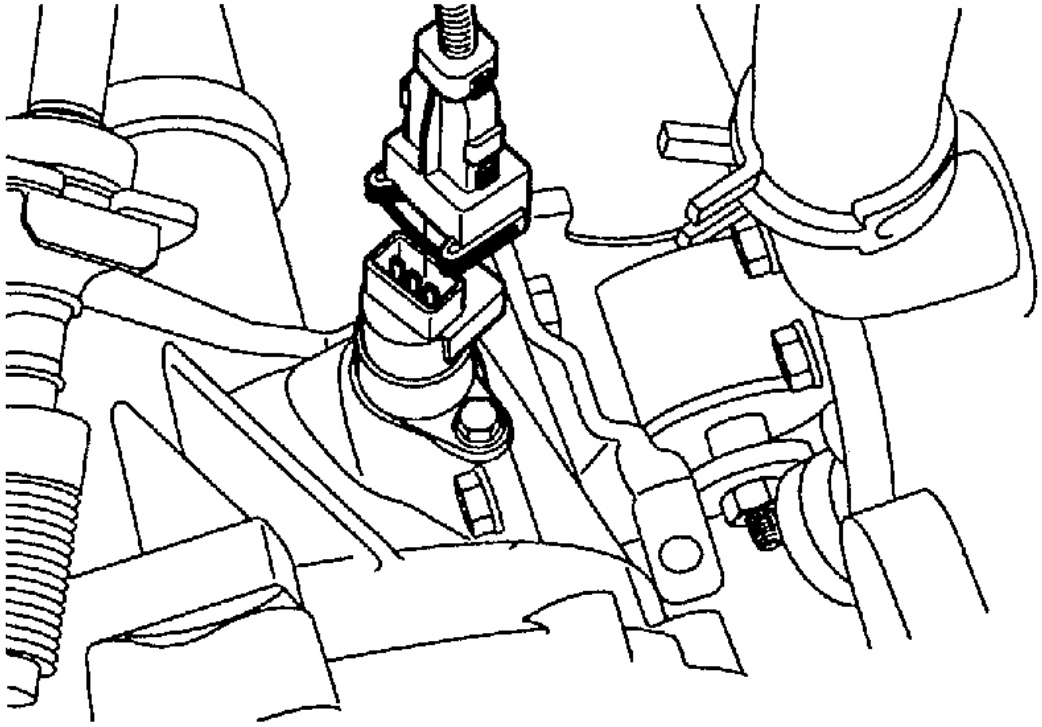


Fig. 49: Disconnecting Solenoid Valve Connector
Courtesy of HYUNDAI MOTOR CO.

15. Disconnect the vehicle speed sensor connector.



G00965686

Fig. 50: Disconnecting Vehicle Speed Sensor Connector
Courtesy of HYUNDAI MOTOR CO.

16. Disconnect the clutch tube.

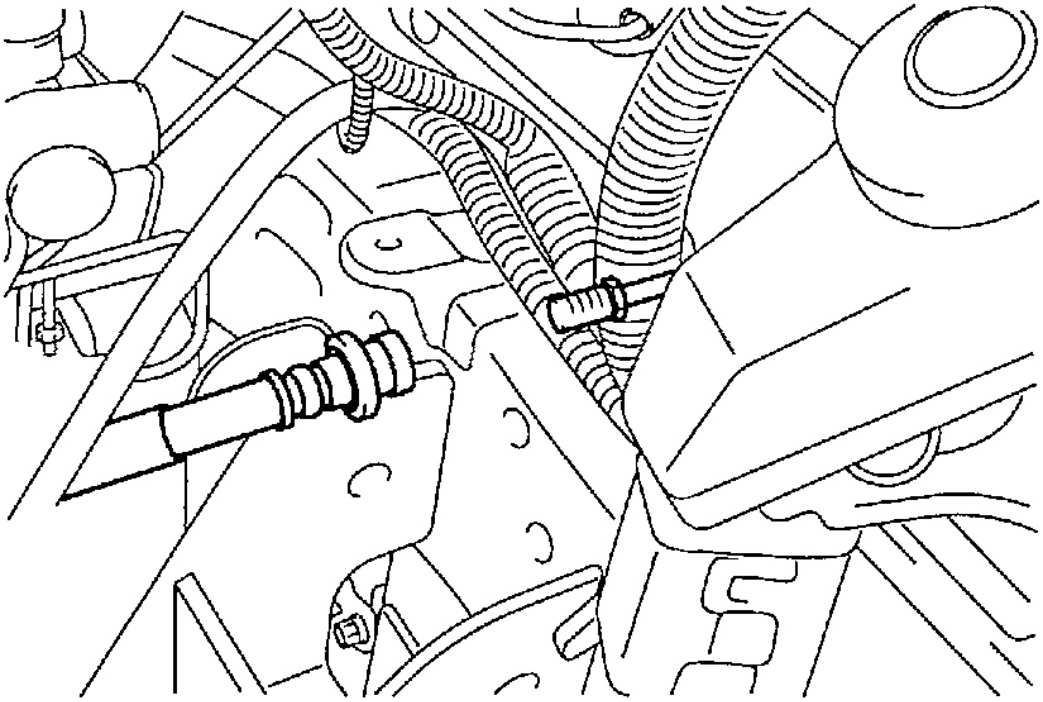
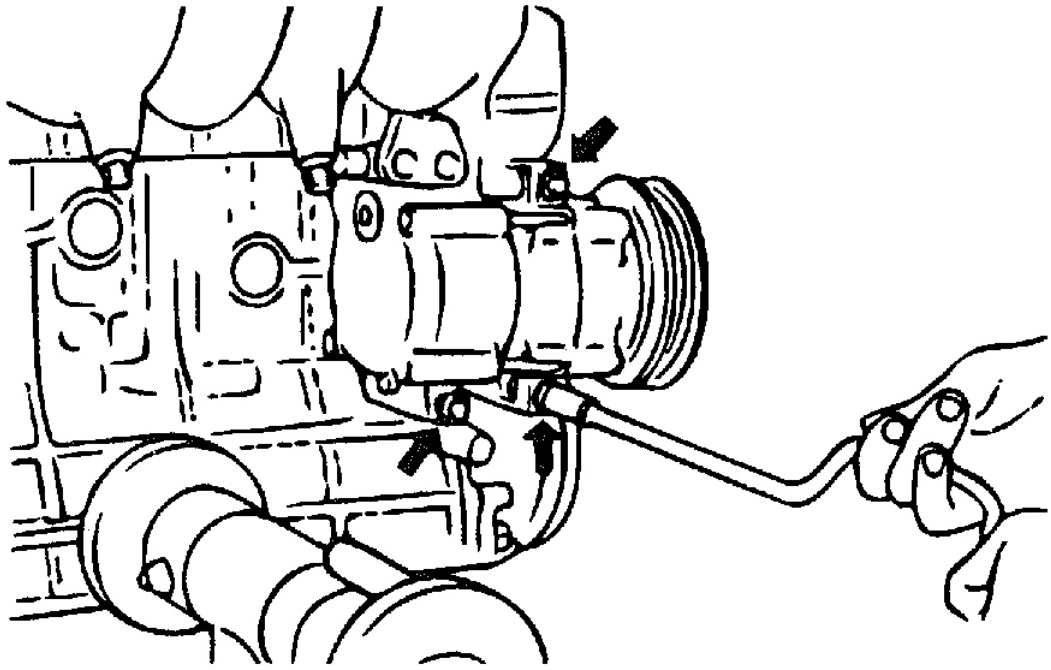


Fig. 51: Disconnecting Clutch Tube
Courtesy of HYUNDAI MOTOR CO.

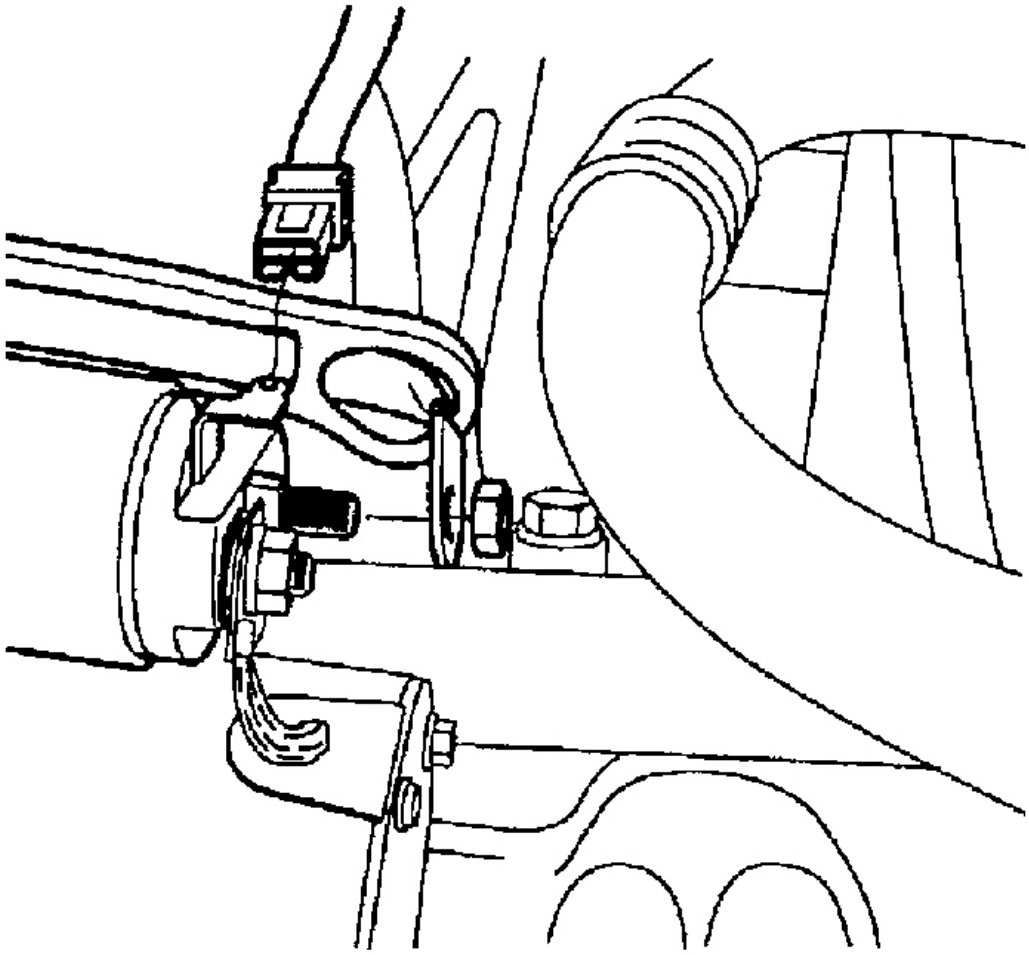
17. Disconnect the air conditioner compressor from the mounting bracket.



G00965688

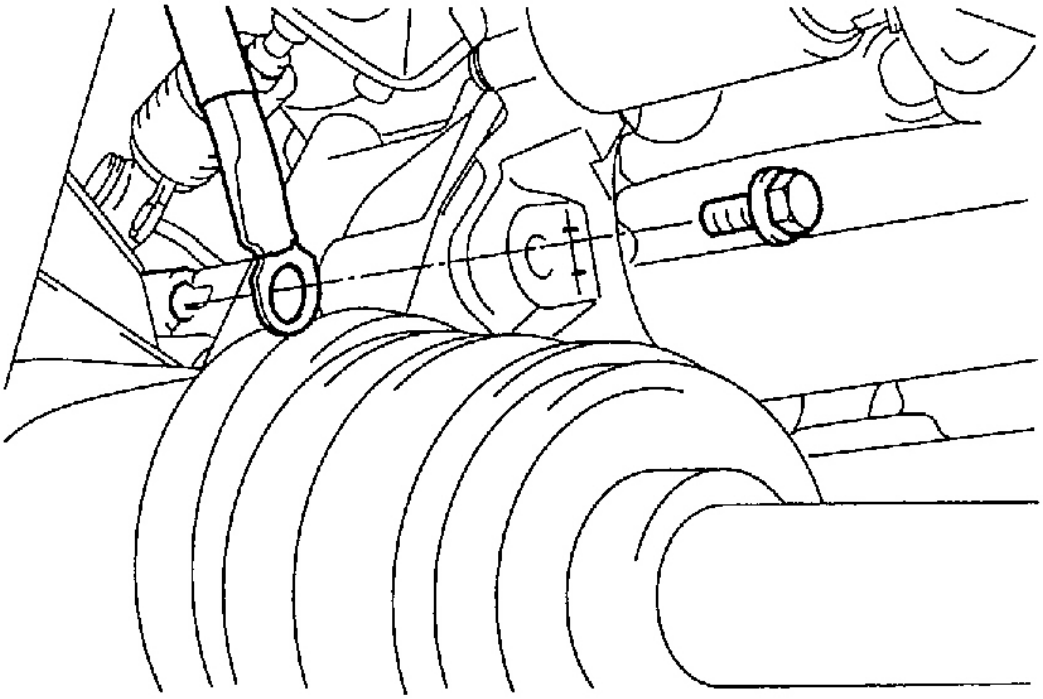
Fig. 52: Removing A/C Compressor
Courtesy of HYUNDAI MOTOR CO.

18. Jack up the vehicle.
19. Disconnect the start motor connector and ground.



G00965689

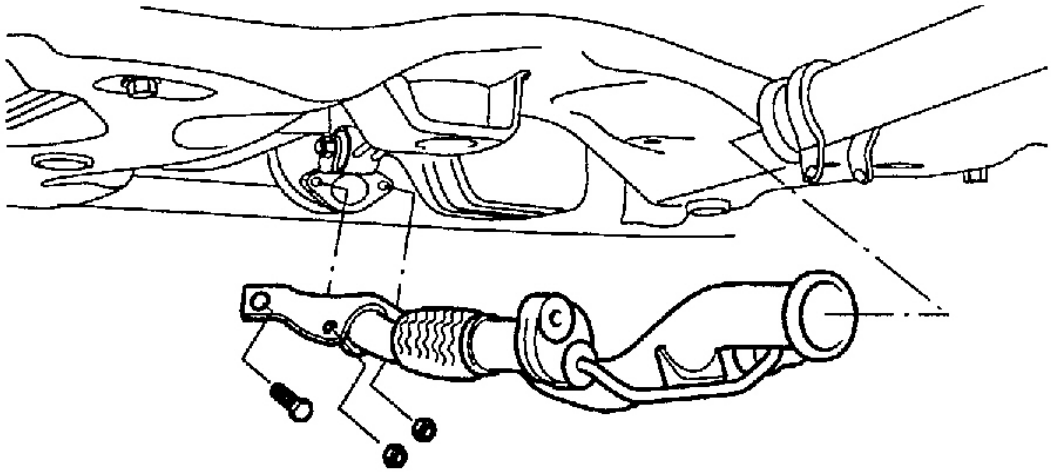
Fig. 53: Disconnecting Starter Motor Connector
Courtesy of HYUNDAI MOTOR CO.



G00965690

Fig. 54: Disconnecting Starter Motor Ground
Courtesy of HYUNDAI MOTOR CO.

20. Disconnect the front exhaust pipe from the manifold.



G00965691

Fig. 55: Disconnecting Exhaust Pipe
Courtesy of HYUNDAI MOTOR CO.

NOTE: Use wire to suspend the exhaust pipe from the bottom of the vehicle.

21. Remove the knuckle form the front damper.

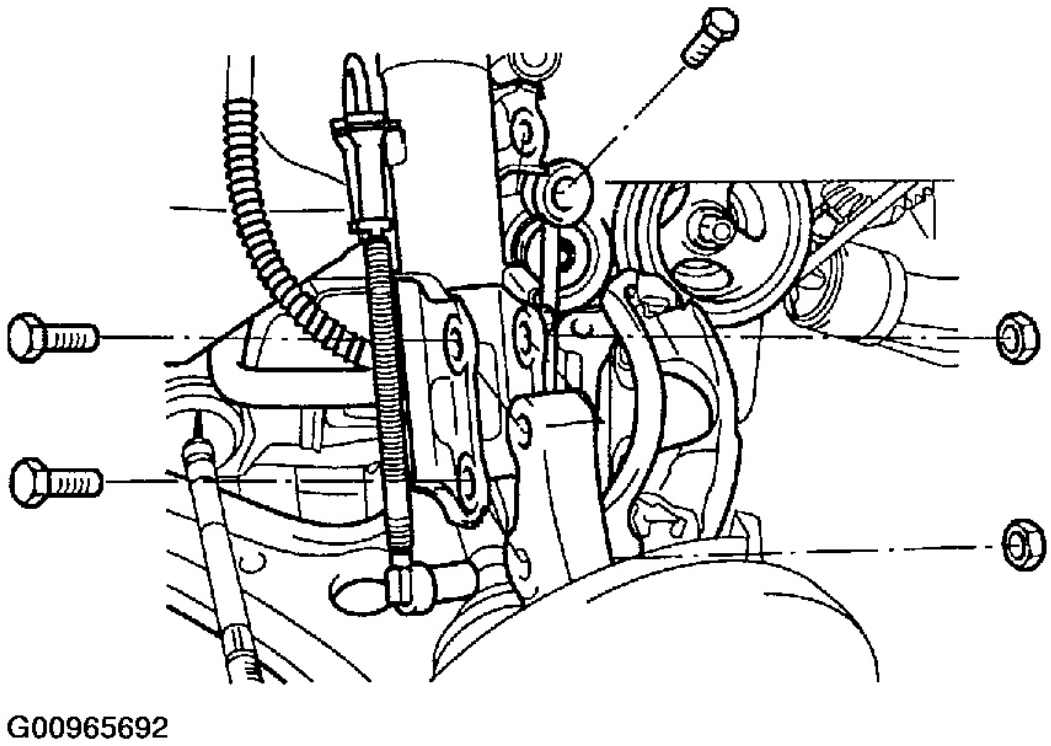


Fig. 56: Removing Knuckle From Front Damper
Courtesy of HYUNDAI MOTOR CO.

22. Remove the caliper from the knuckle and hang the caliper from the front damper with wine.

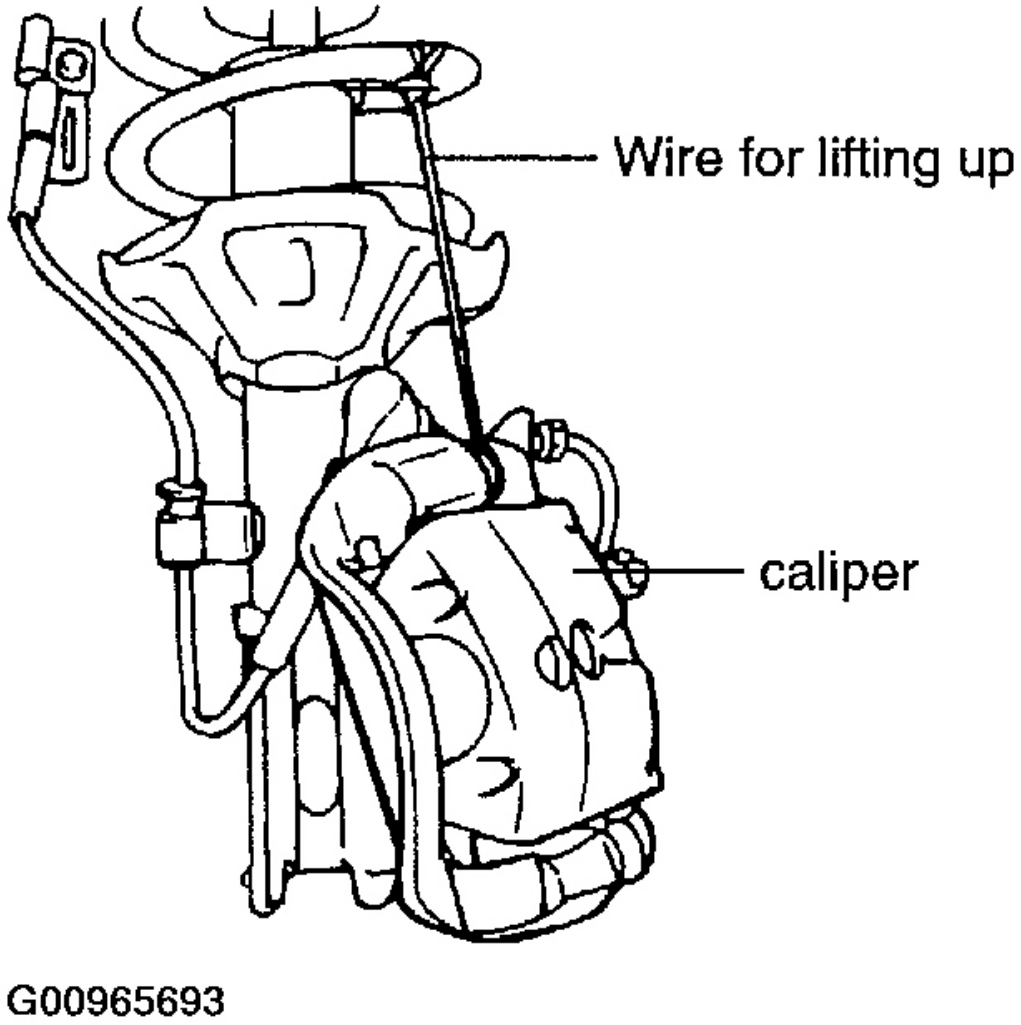
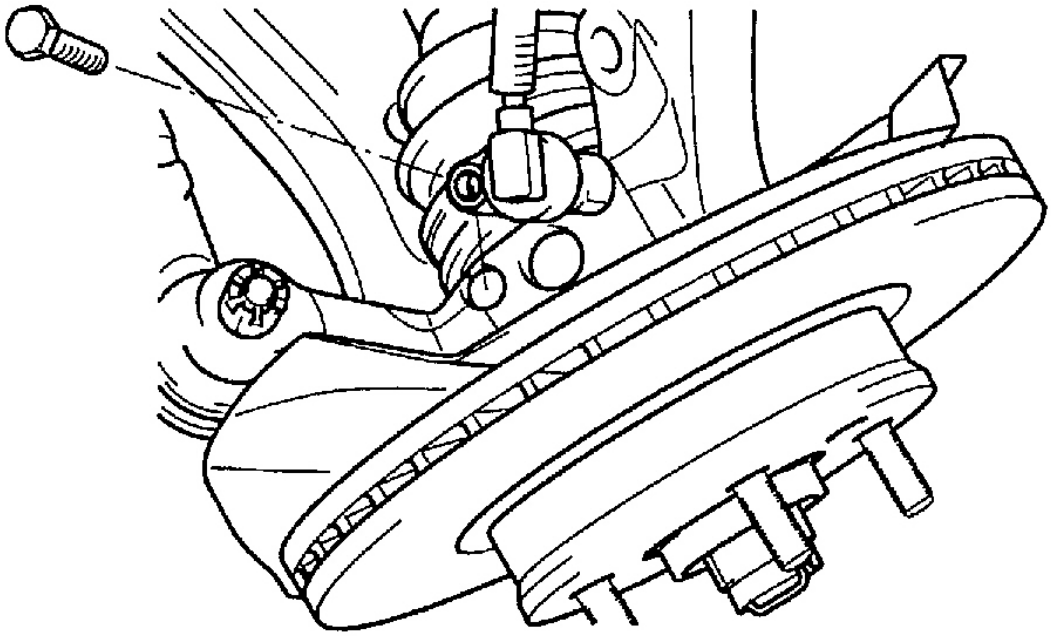


Fig. 57: Supporting Brake Caliper
Courtesy of HYUNDAI MOTOR CO.

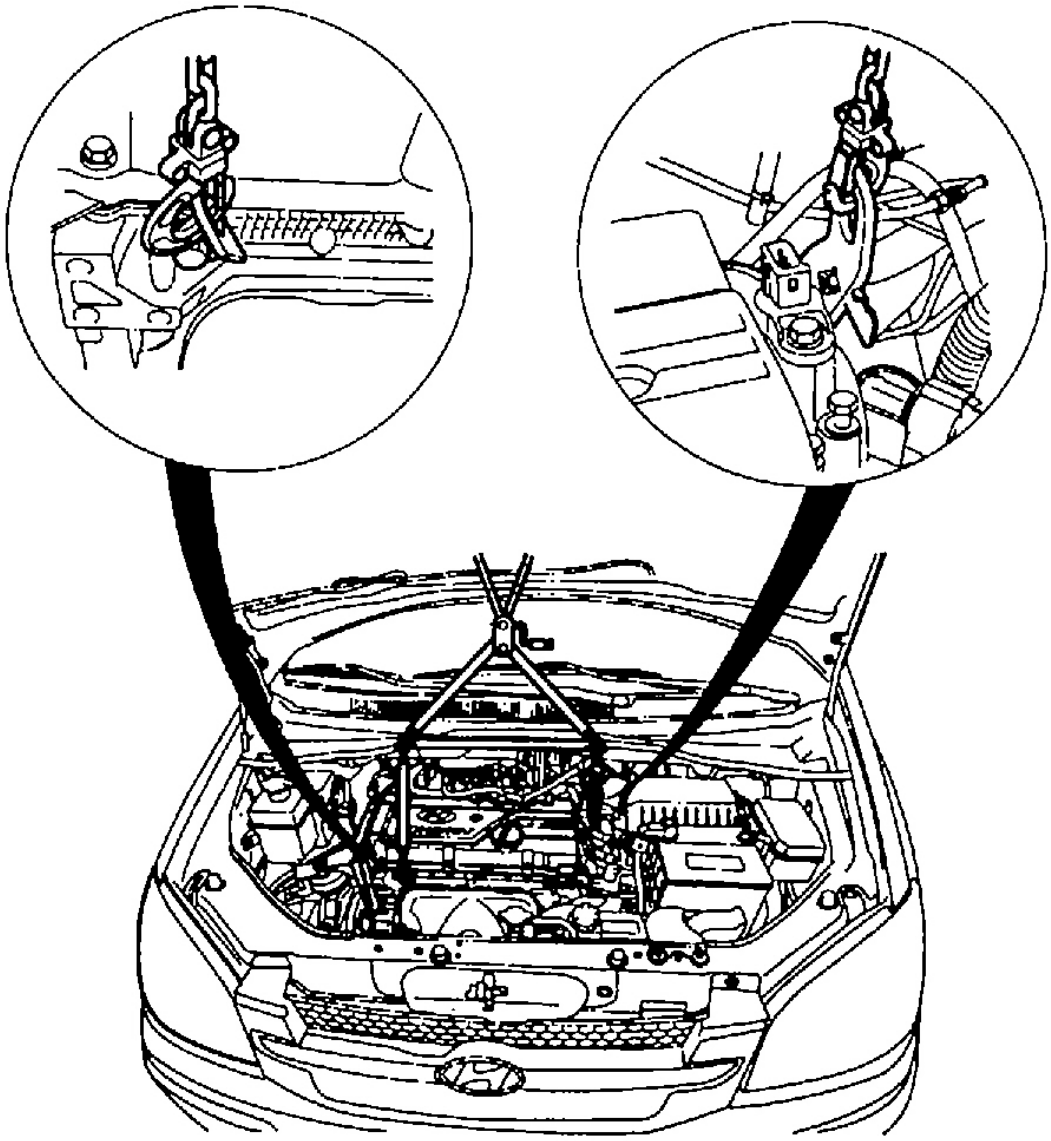
23. Remove the wheel speed sensor form the knuckle, (with ABS).



G00965694

Fig. 58: Removing Wheel Speed Sensor
Courtesy of HYUNDAI MOTOR CO.

24. Attach a chains or cables to the engine. Use an engine hoist or a chain hoist to slightly raise the engine (enough to support the engine's weight while processing with the following steps).



G00965695

Fig. 59: Attaching Chains To Engines
Courtesy of HYUNDAI MOTOR CO.

25. Remove the steering joint bolt.

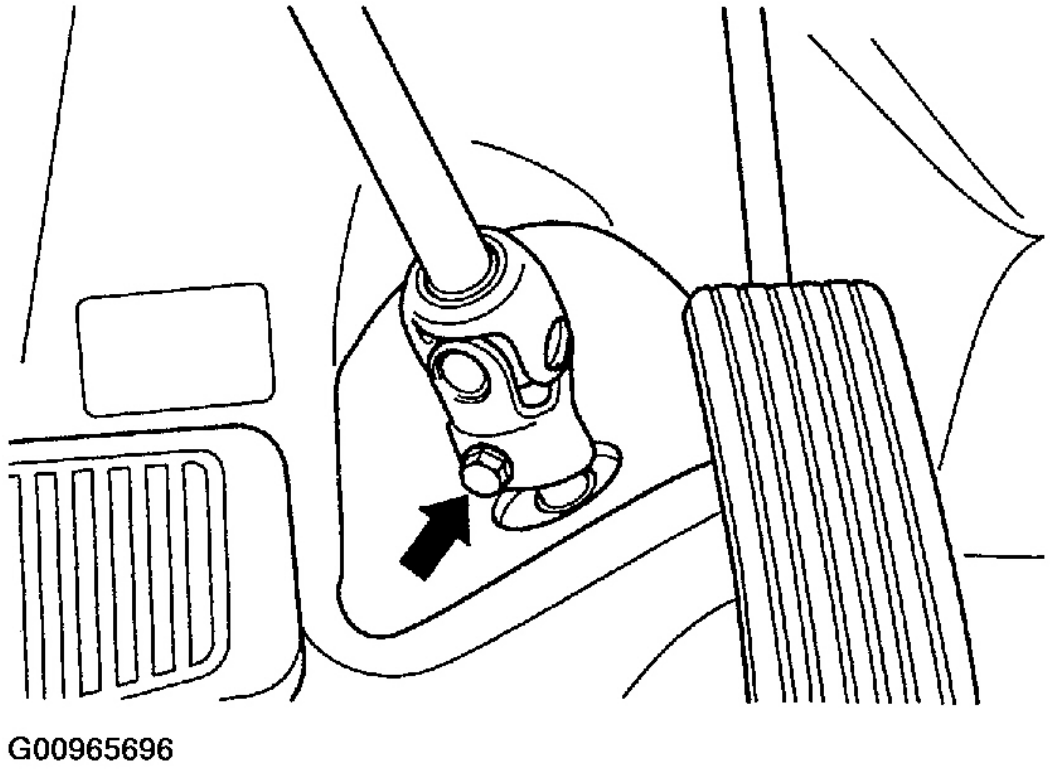
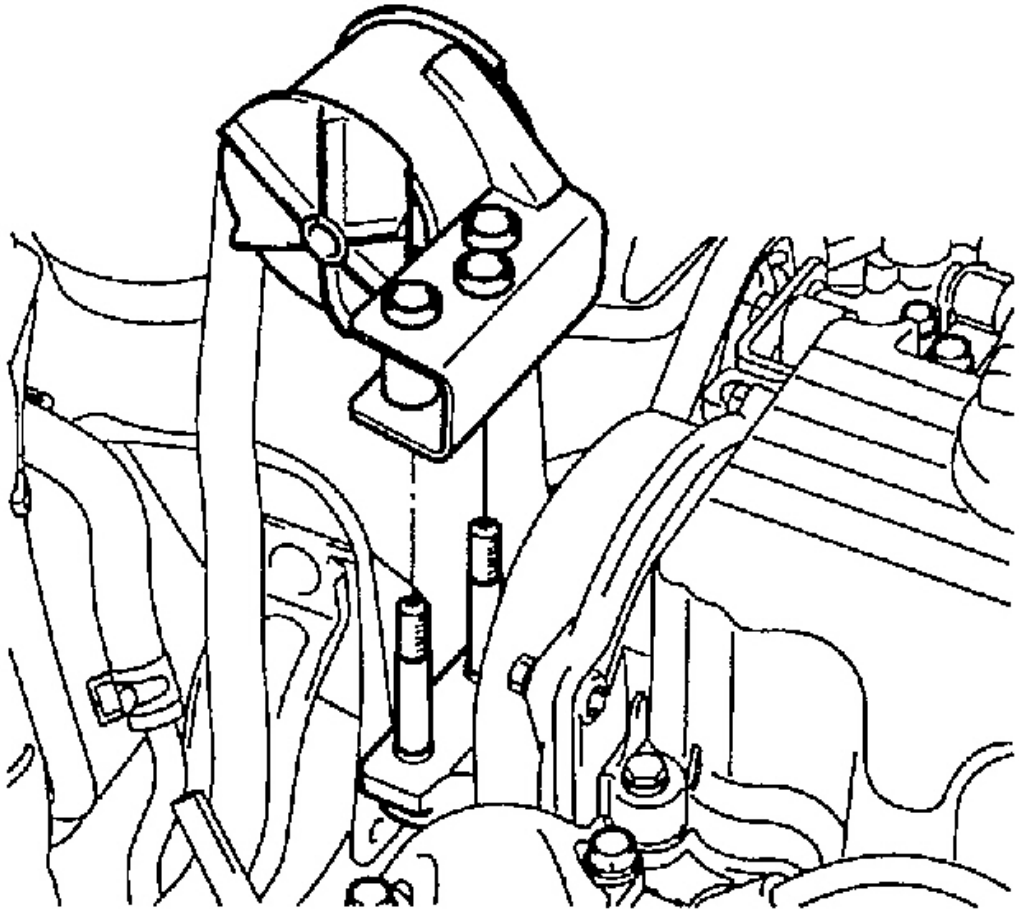


Fig. 60: Removing Steering Joint Bolt
Courtesy of HYUNDAI MOTOR CO.

26. Remove the engine mounting bracket from the engine.



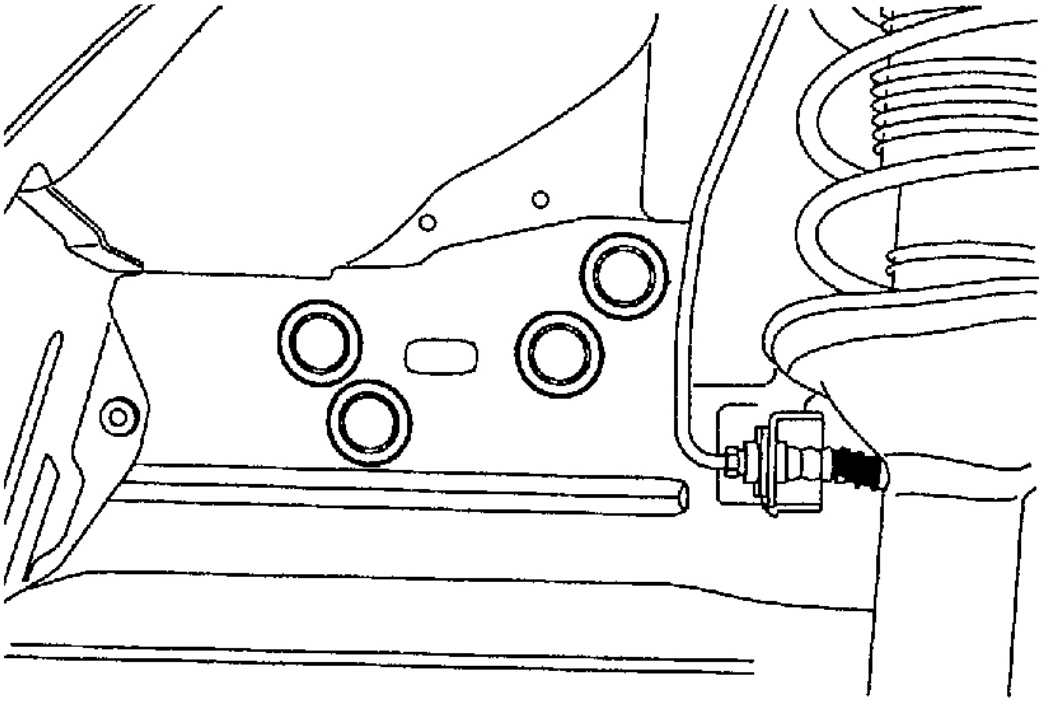
G00965697

Fig. 61: Removing Engine Mounting Bracket
Courtesy of HYUNDAI MOTOR CO.

27. Slowly raise the engine (to the extent that the weight of the engine and transmission assembly is not applied to the mounting portions) and temporarily hold it in the raised position.

CAUTION: Check that all cables, hoses, harnesses, connectors etc. are disconnected from the engine.

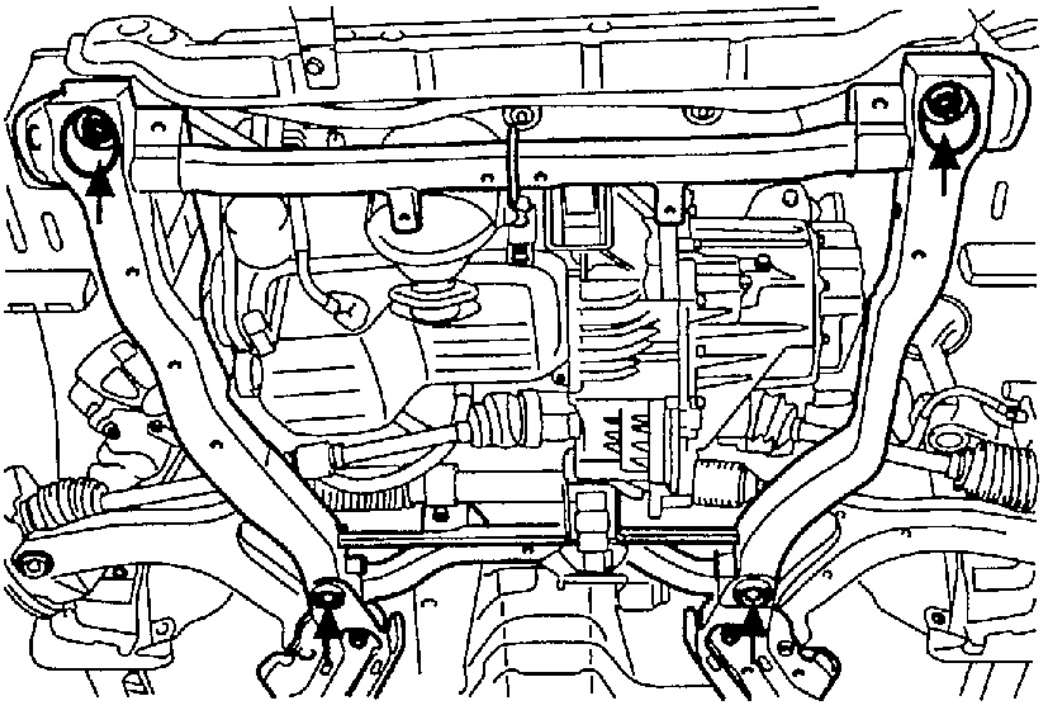
28. Remove the caps from the inside of the right fender shield and remove the transaxle mount bracket bolts.



G00965698

Fig. 62: Identifying Transaxle Mount Bracket Bolt Caps
Courtesy of HYUNDAI MOTOR CO.

29. Remove the cross member fixing bolts and nuts.



G00965699

Fig. 63: Identifying Cross Member Fixing Bolts & Nuts
Courtesy of HYUNDAI MOTOR CO.

30. While directing the transmission side downward, lift the engine and transmission assembly up and out of the vehicles.

TIMING SYSTEM

TIMING BELT

COMPONENTS

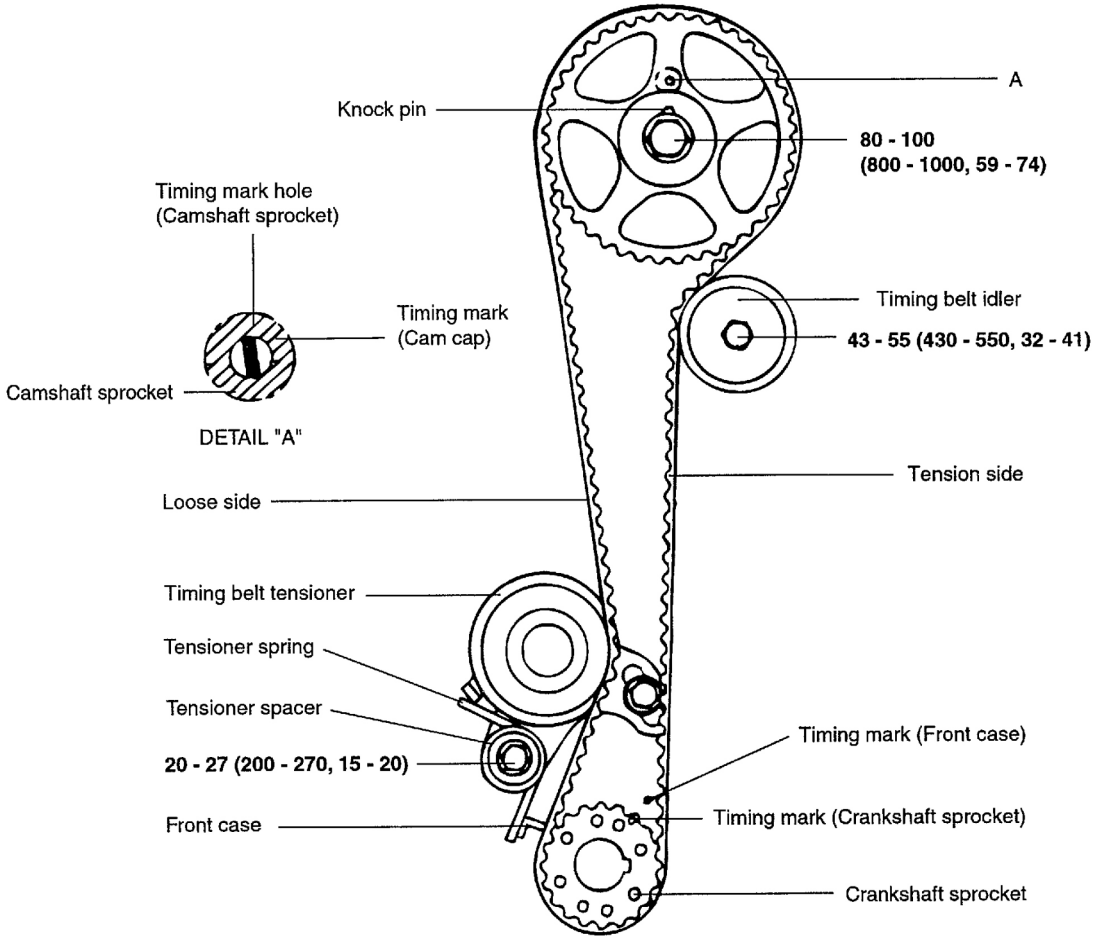
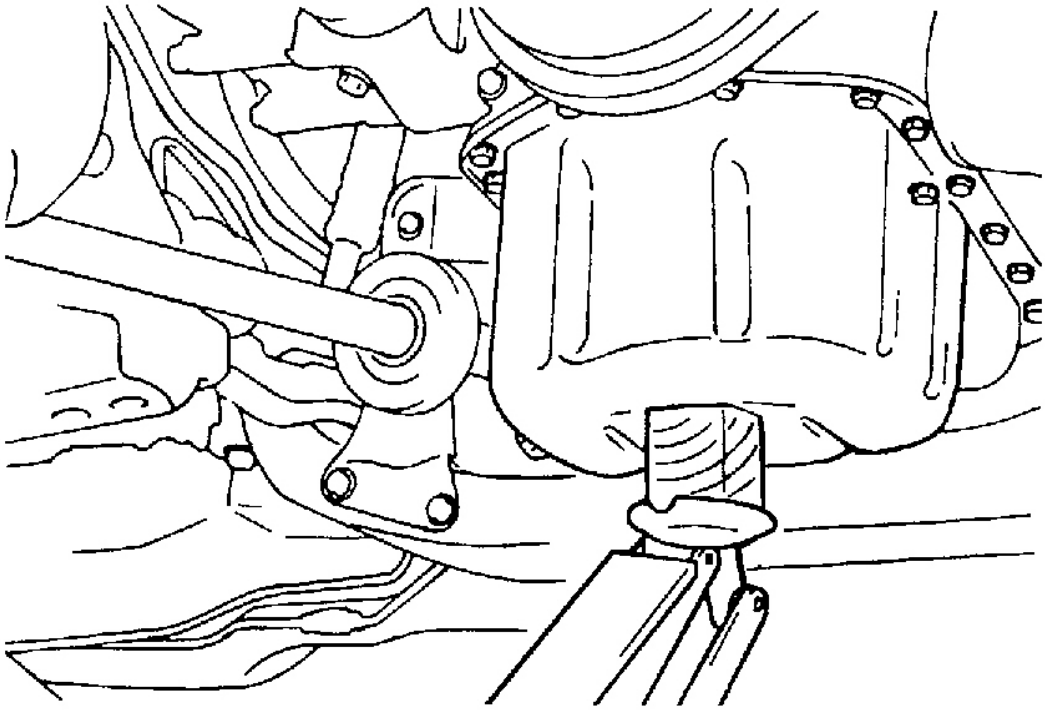


Fig. 64: Timing Belt Components
Courtesy of HYUNDAI MOTOR CO.

DISASSEMBLY

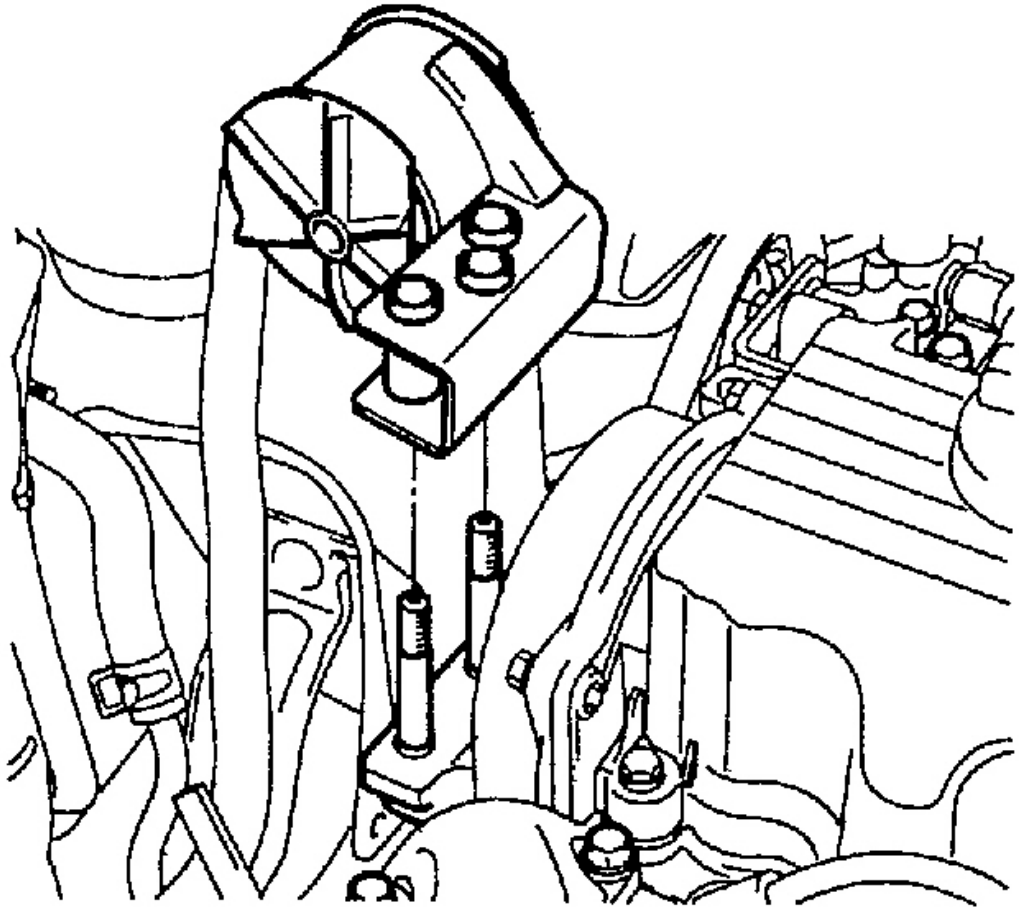
1. Lift the vehicle by using of jack.



G00965701

Fig. 65: Lifting Engine
Courtesy of HYUNDAI MOTOR CO.

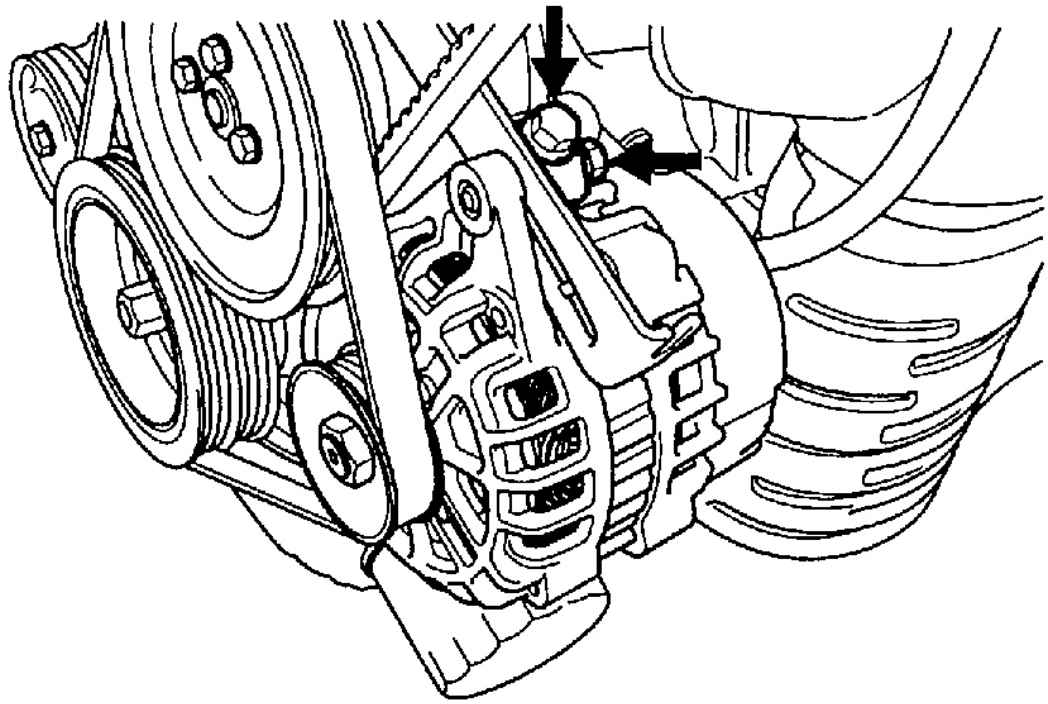
2. Remove the engine support bracket. (14mm bolt and 2 nuts, 17mm bolt)



G00965702

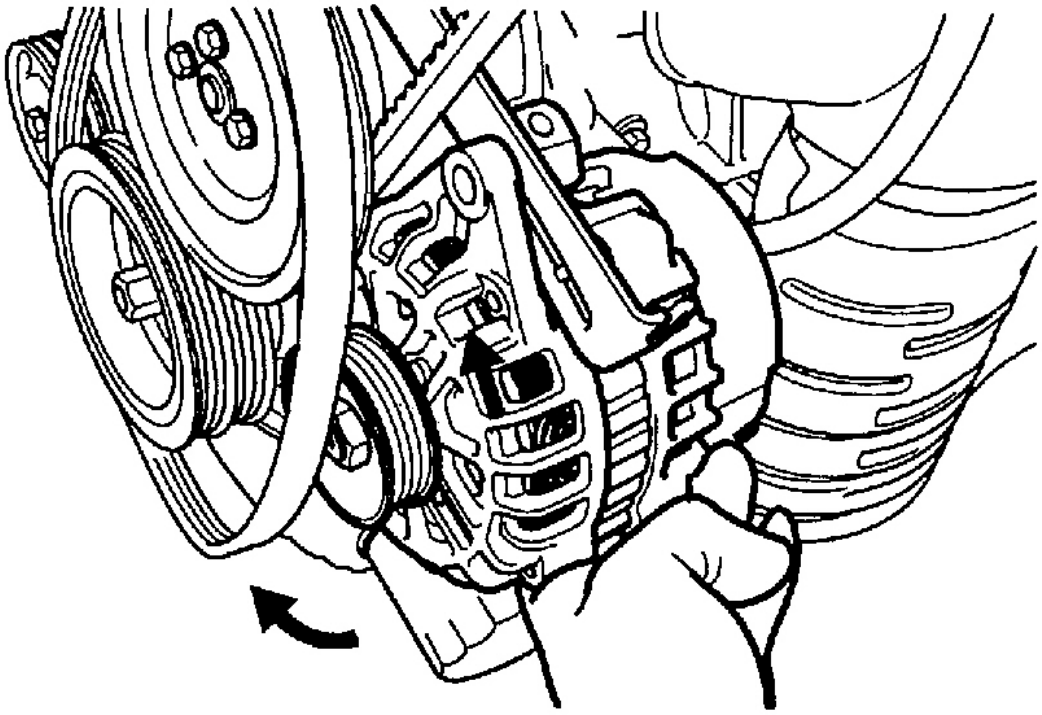
Fig. 66: Removing Engine Support Bracket
Courtesy of HYUNDAI MOTOR CO.

3. Remove the power steering belt.
4. Remove the air conditioning compressor belt.
5. Remove the alternator belt.



G00965703

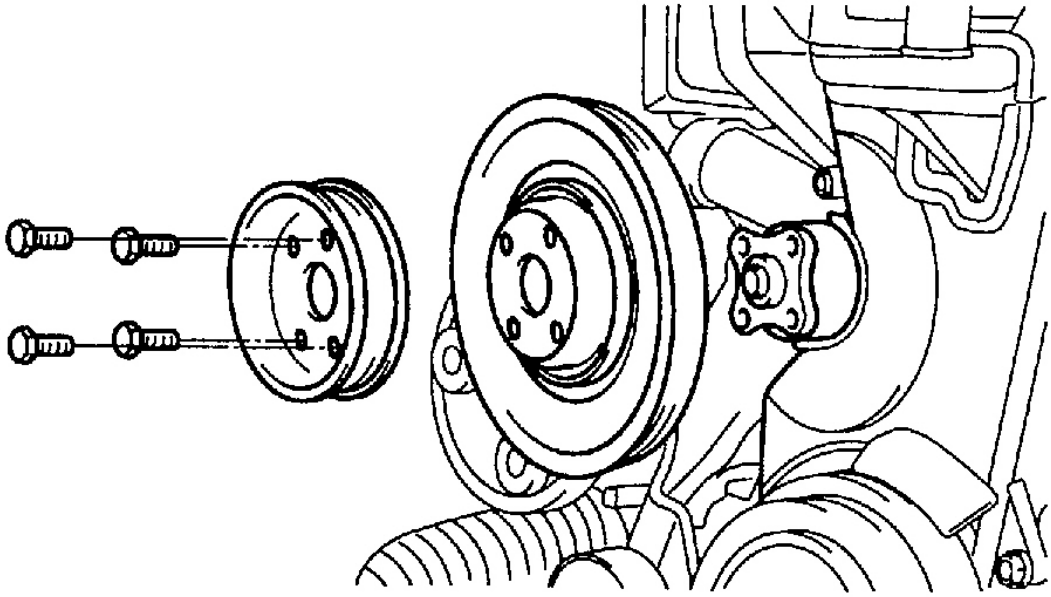
Fig. 67: Identifying Alternator Belt Adjustment Bolt
Courtesy of HYUNDAI MOTOR CO.



G00965704

Fig. 68: Removing Alternator Belt
Courtesy of HYUNDAI MOTOR CO.

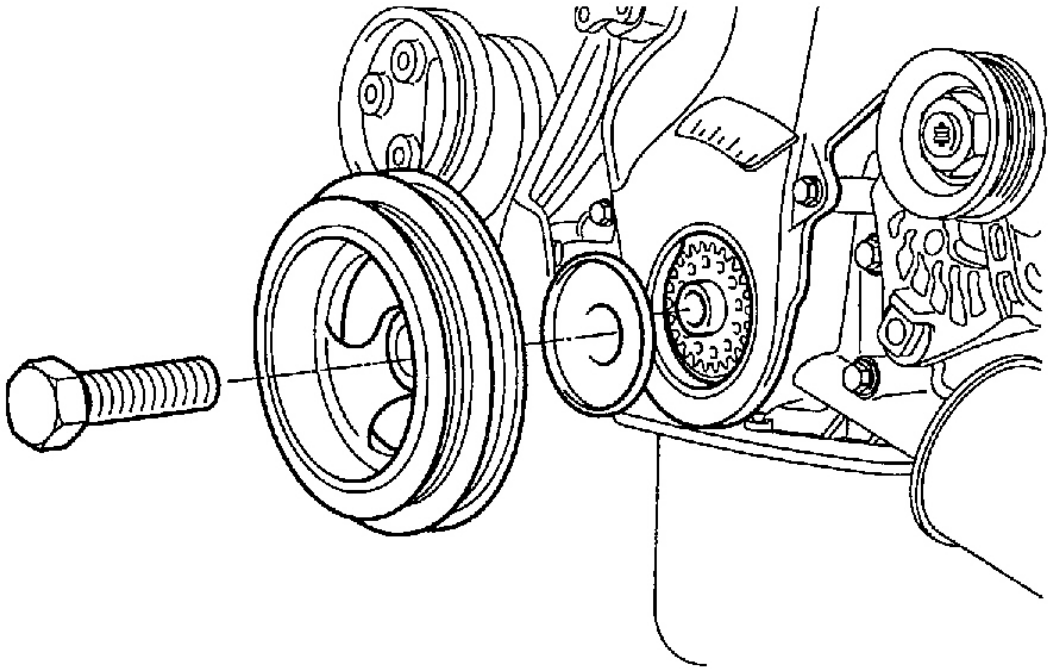
6. Remove the coolant pump pulley.



G00965705

Fig. 69: Removing Coolant Pump Pulley
Courtesy of HYUNDAI MOTOR CO.

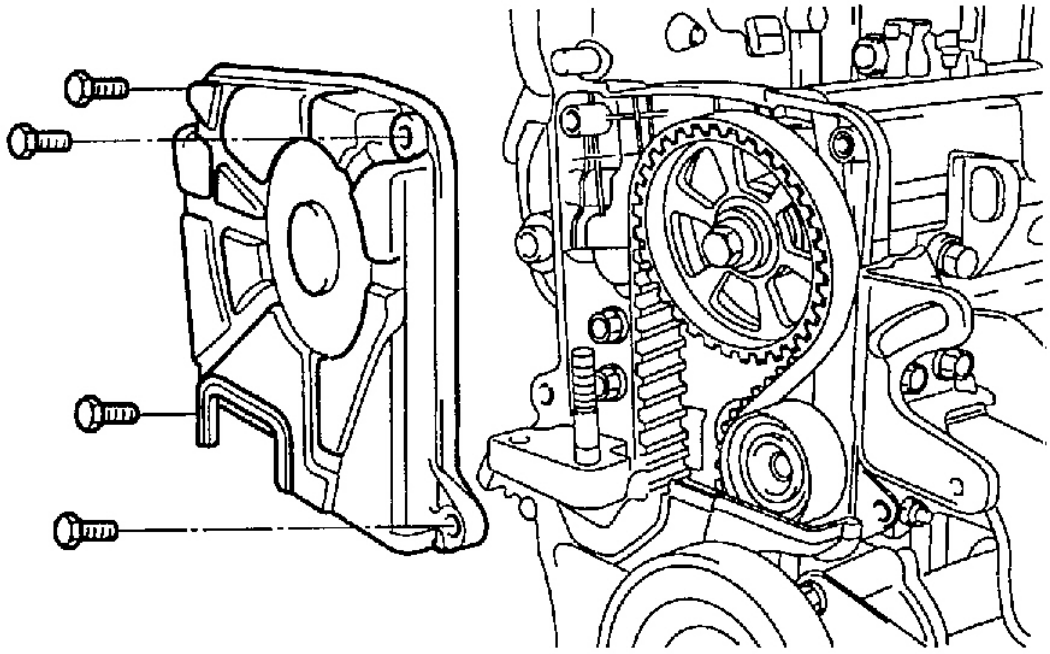
7. Remove the crankshaft pulley.



G00965706

Fig. 70: Removing Crankshaft Pulley
Courtesy of HYUNDAI MOTOR CO.

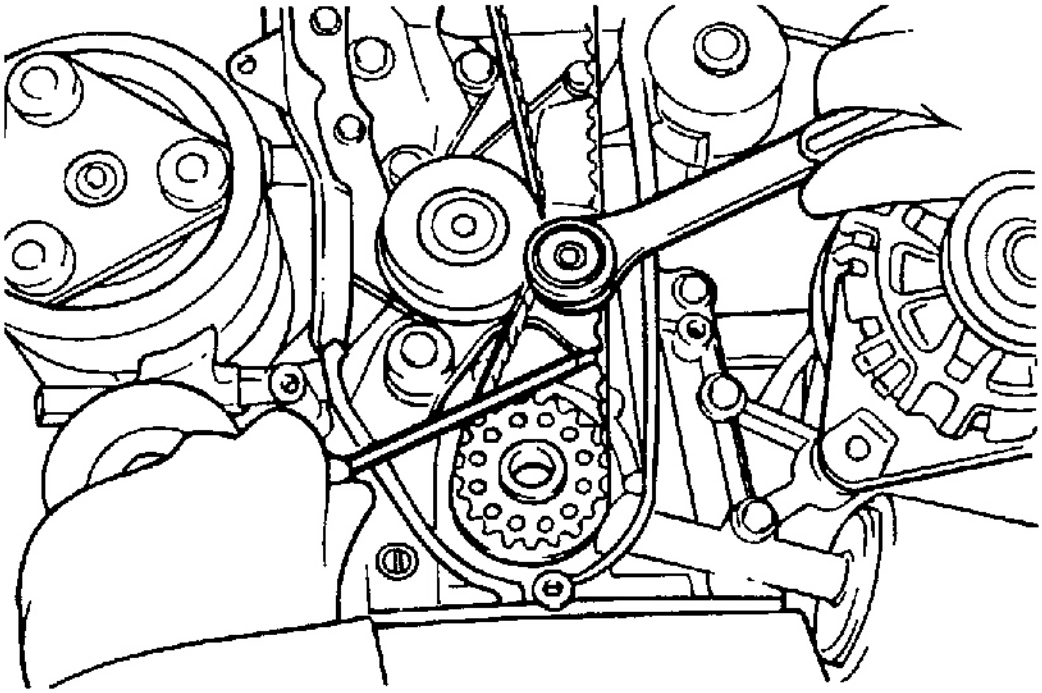
8. Remove the timing belt cover.



G00965707

Fig. 71: Removing Timing Belt Cover
Courtesy of HYUNDAI MOTOR CO.

9. Move the timing belt tensioner pulley toward the coolant pump and temporarily secure it.

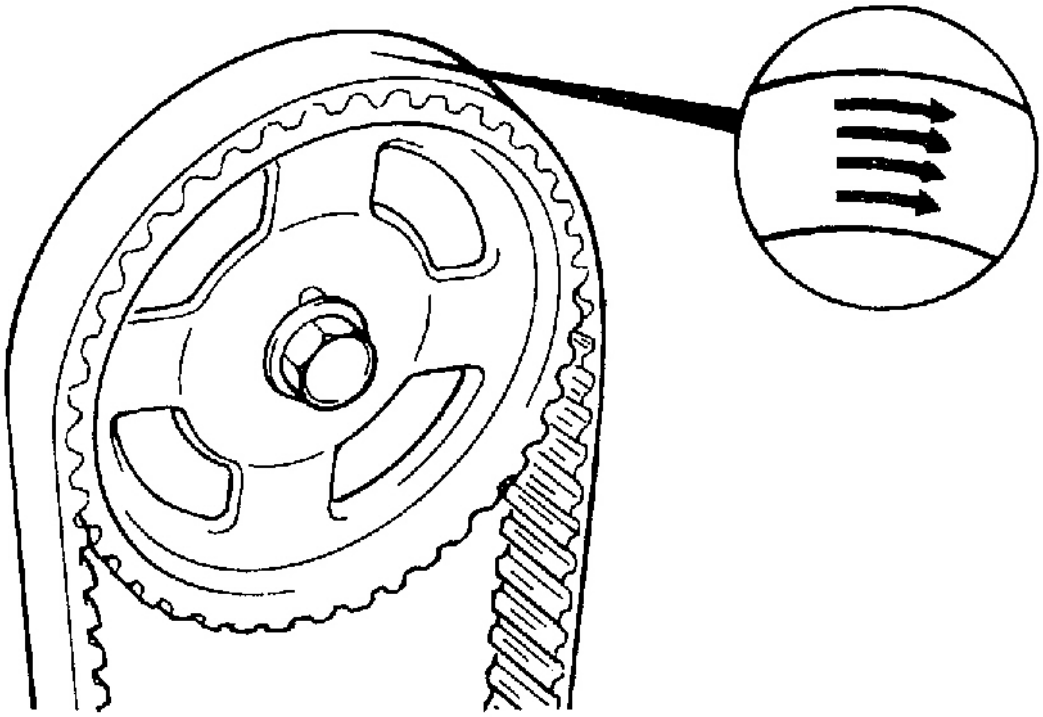


G00965708

Fig. 72: Moving Timing Belt Tensioner Pulley Toward Coolant Pump
Courtesy of HYUNDAI MOTOR CO.

10. Remove the timing belt.

NOTE: **If the timing belt is reused, mark with an arrow to indicate direction of rotation (on the front of the engine) to make sure that the belt is reinstalled in the same direction as before.**



G00965709

Fig. 73: Identifying Reference Arrows
Courtesy of HYUNDAI MOTOR CO.

11. Remove the camshaft from the camshaft sprocket.
12. Remove the crankshaft sprocket and flange.
13. Remove the timing belt idler.
14. Remove the timing belt tensioner.

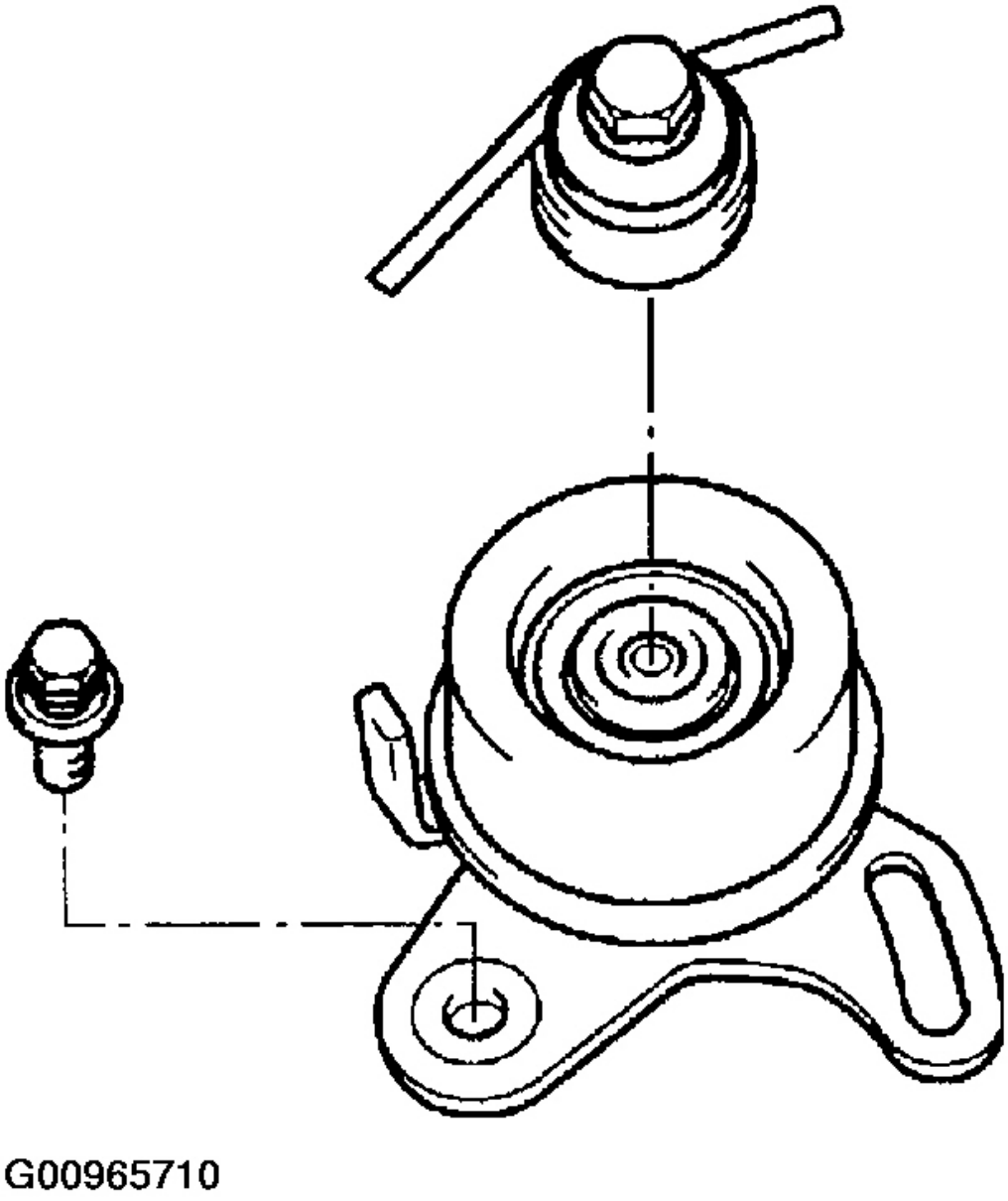


Fig. 74: Identifying Timing Belt Tensioner
Courtesy of HYUNDAI MOTOR CO.

INSPECTION

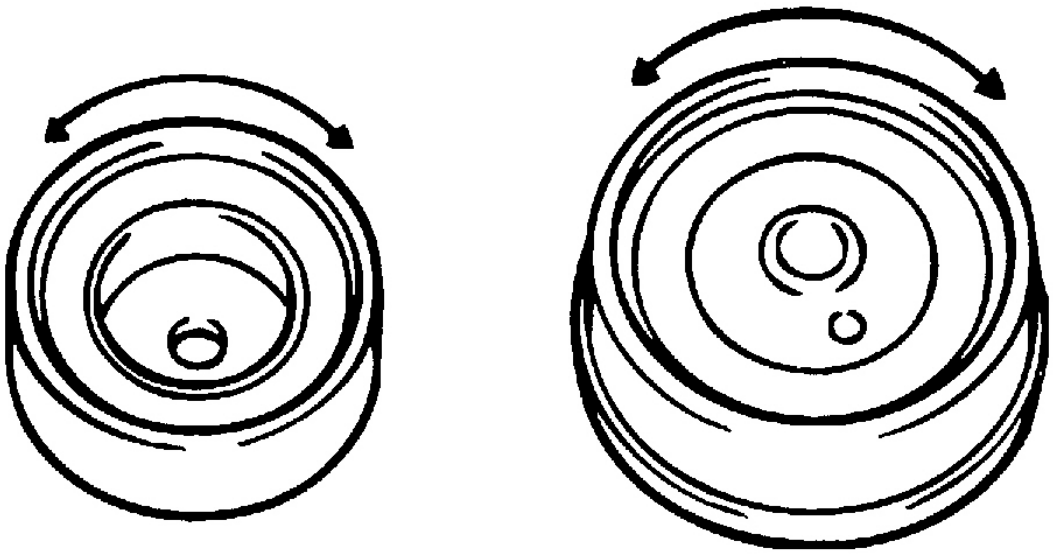
SPROCKETS TENSIONER PULLEY, & IDLER PULLEY

1. Check the camshaft sprocket, crankshaft sprocket, tensioner pulley, and idler pulley for abnormal wear,

cracks, or damage.

Replace as necessary.

2. Inspect the tensioner pulley and the idler pulley for easy and smooth rotation and check for play or noise. Replace as necessary.
3. Replace the pulley if there is a grease leak from its bearing.



G00965711

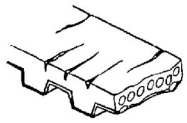
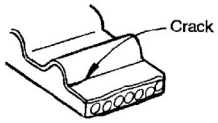
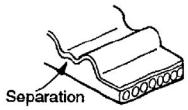
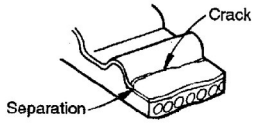
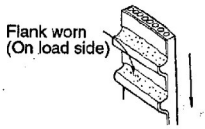
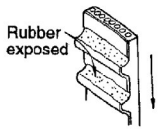
Fig. 75: Checking Pulleys Rotation
Courtesy of HYUNDAI MOTOR CO.

TIMING BELT

1. Check the belt for oil or dust deposits. Replace, if necessary.

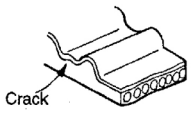
   Small deposits should be wiped away with a dry cloth or paper. Do not clean with solvent.

2. When the engine is overhauled or belt tension adjusted, check the belt carefully. If any of the following flaws are evident, replace the belt with a new one.

Description	Flaw conditions
1. Hardened back surface • Back surface is glossy, non-elastic and so hard that when your fingernail is pressed into it. no mark is produced.	
2. Cracked back surface rubber	
3. Cracked or separating canvas	
	
	
4. Badly worn teeth (initial stages) • Canvas on load side of tooth flank worn (Fluffy canvas fibers, rubber gone and color changed to white, and unclear canvas texture)	
5. Badly worn teeth (last stage) • Canvas on load side of tooth flank worn down and rubber exposed (tooth width reduced)	

G00965713

Fig. 76: Timing Belt Inspection Table (1 Of 2)
Courtesy of HYUNDAI MOTOR CO.

Description	Flaw conditions
6. Cracked tooth bottom	
7. Missing tooth	
8. Side of belt badly worn **NOTE** *Normal belt shluld have precisely cut sides as if cut by a sharp knife.*	
9. Side of belt cracked	

G00965714

Fig. 77: Timing Belt Inspection Table (2 Of 2)
Courtesy of HYUNDAI MOTOR CO.

REASSEMBLY

1. Install the flange and crankshaft sprocket as shown. Pay close attention to their mounting directions.

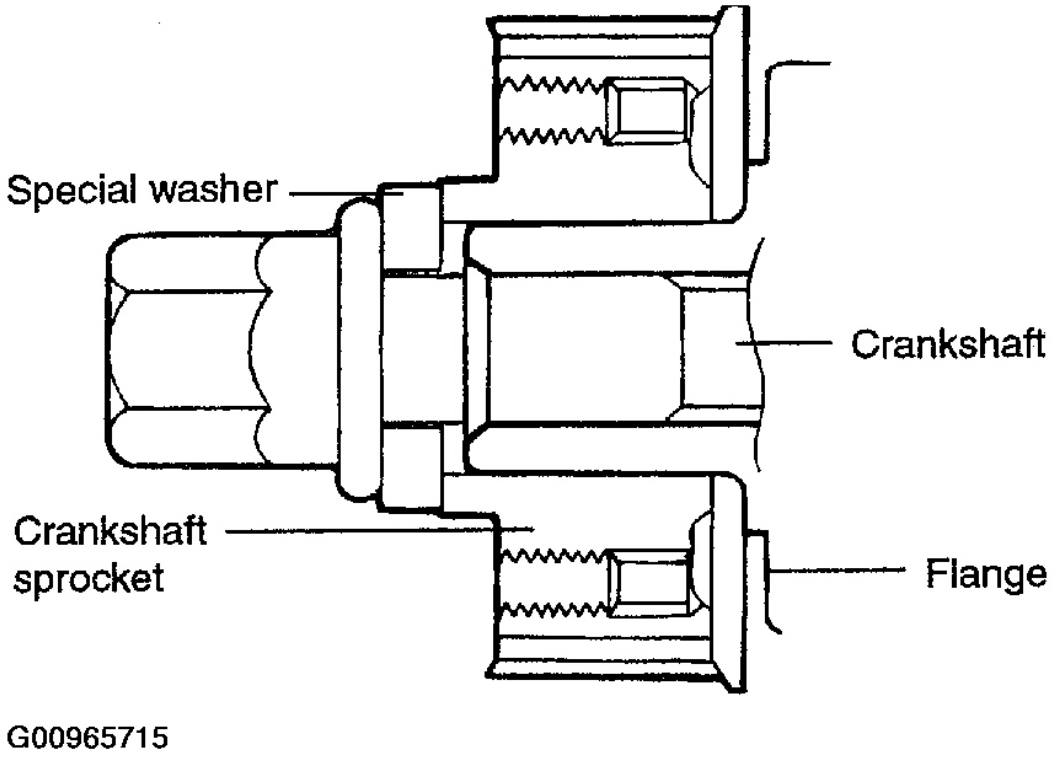


Fig. 78: Installing Flange & Crankshaft Sprocket
Courtesy of HYUNDAI MOTOR CO.

2. Install the camshaft sprocket and tighten the bolt to the specified torque.

   Tightening torque

   Camshaft sprocket bolt:
   80-100 N.m (800-1000 kg.cm, 59-74 Ib.ft)
3. Install the idler and tighten the idler bolt to the specified torque.

   Tightening torque

   Idler bolt: 43-55 N.m (430-550 kg.cm, 32-41 Ib.ft)
4. Align the timing marks of the camshaft sprocket (A) and camshaft bearing cap (B).

   Then align the timing marks of crankshaft sprocket and front case with the No. 1 piston placed at top dead center on its compression stroke as shown in the illustration.

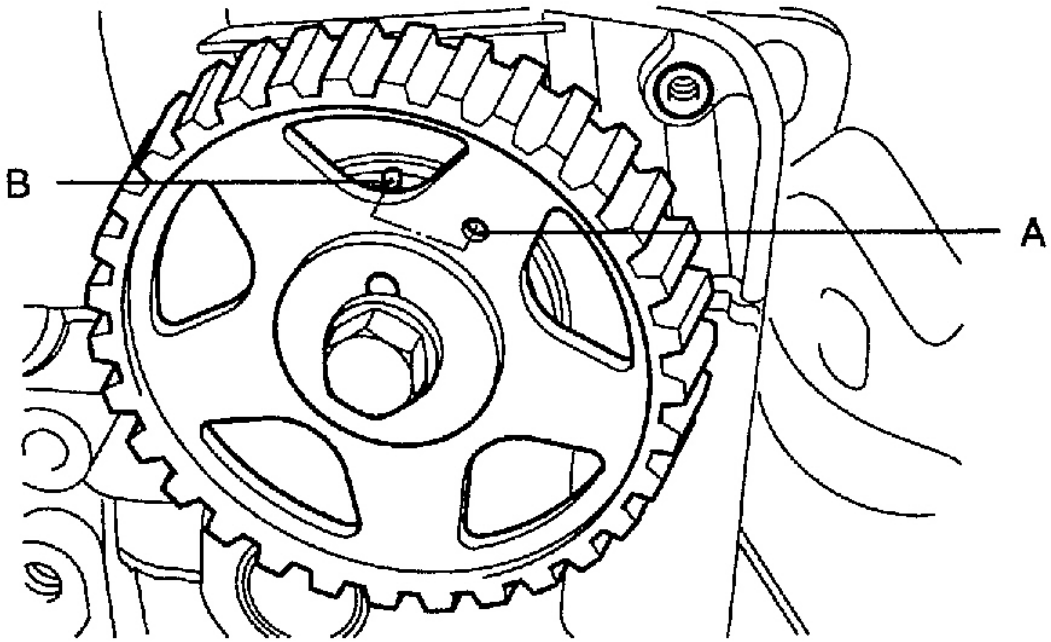
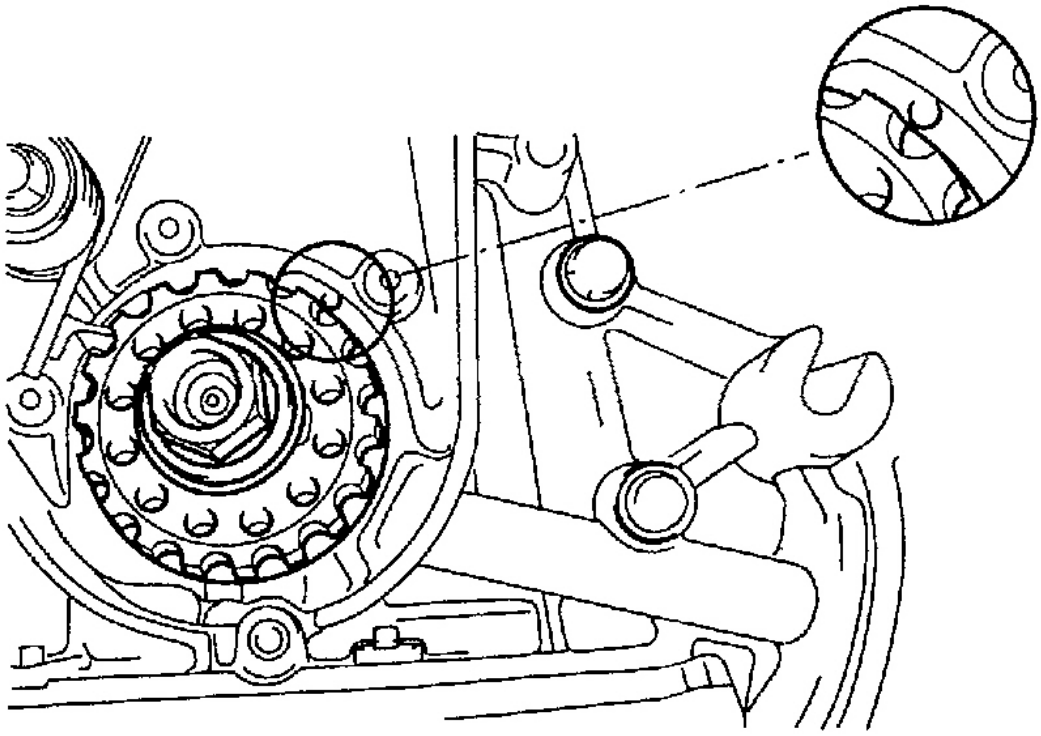


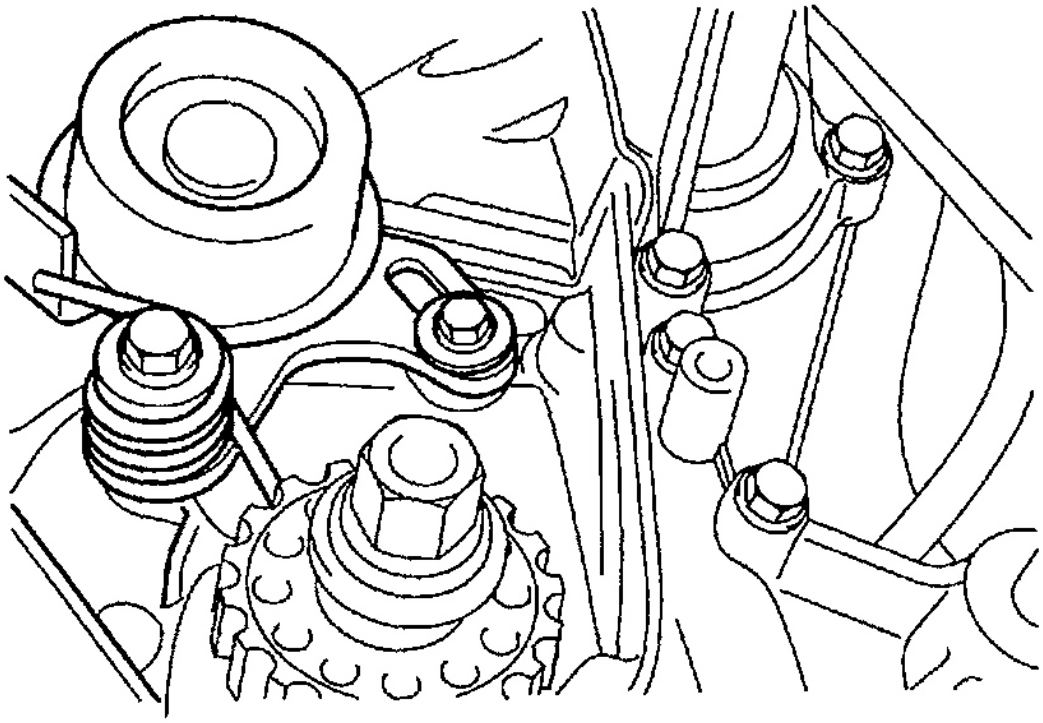
Fig. 79: Identifying Timing Marks (1 Of 2)
Courtesy of HYUNDAI MOTOR CO.



G00965717

Fig. 80: Identifying Timing Marks (2 Of 2)
Courtesy of HYUNDAI MOTOR CO.

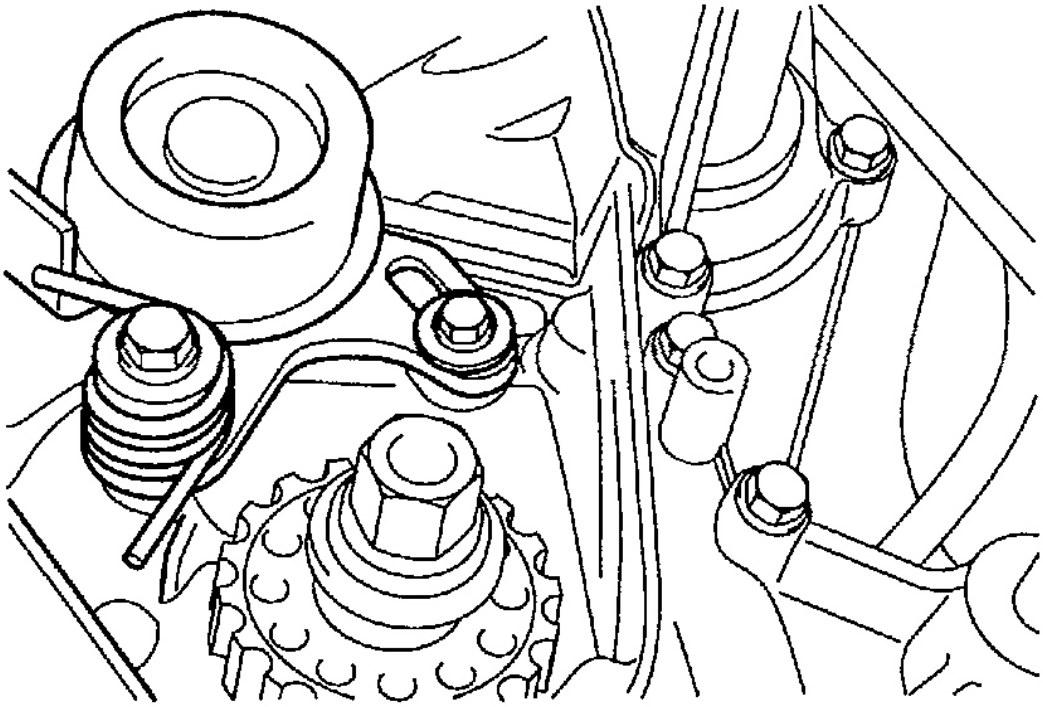
5. To install the timing belt tensioner, first mount the tensioner, spring, and spacer. Temporarily tighten the bolts. Next, temporarily tighten the tensioner long hole side washer and bolts. Install the bottom end of the spring against the front case as shown in the illustration.



G00965718

Fig. 81: Installing Timing Belt Tensioner
Courtesy of HYUNDAI MOTOR CO.

6. Secure the tensioner, positioned towards the water pump.



G00965719

Fig. 82: Positioning Spring Towards Water Pump
Courtesy of HYUNDAI MOTOR CO.

7. Install the timing belt on the crankshaft sprocket. (1) Crankshaft sprocket >(2) Timing belt idler >(3) Camshaft sprocket >(4) Timing belt tensioner.

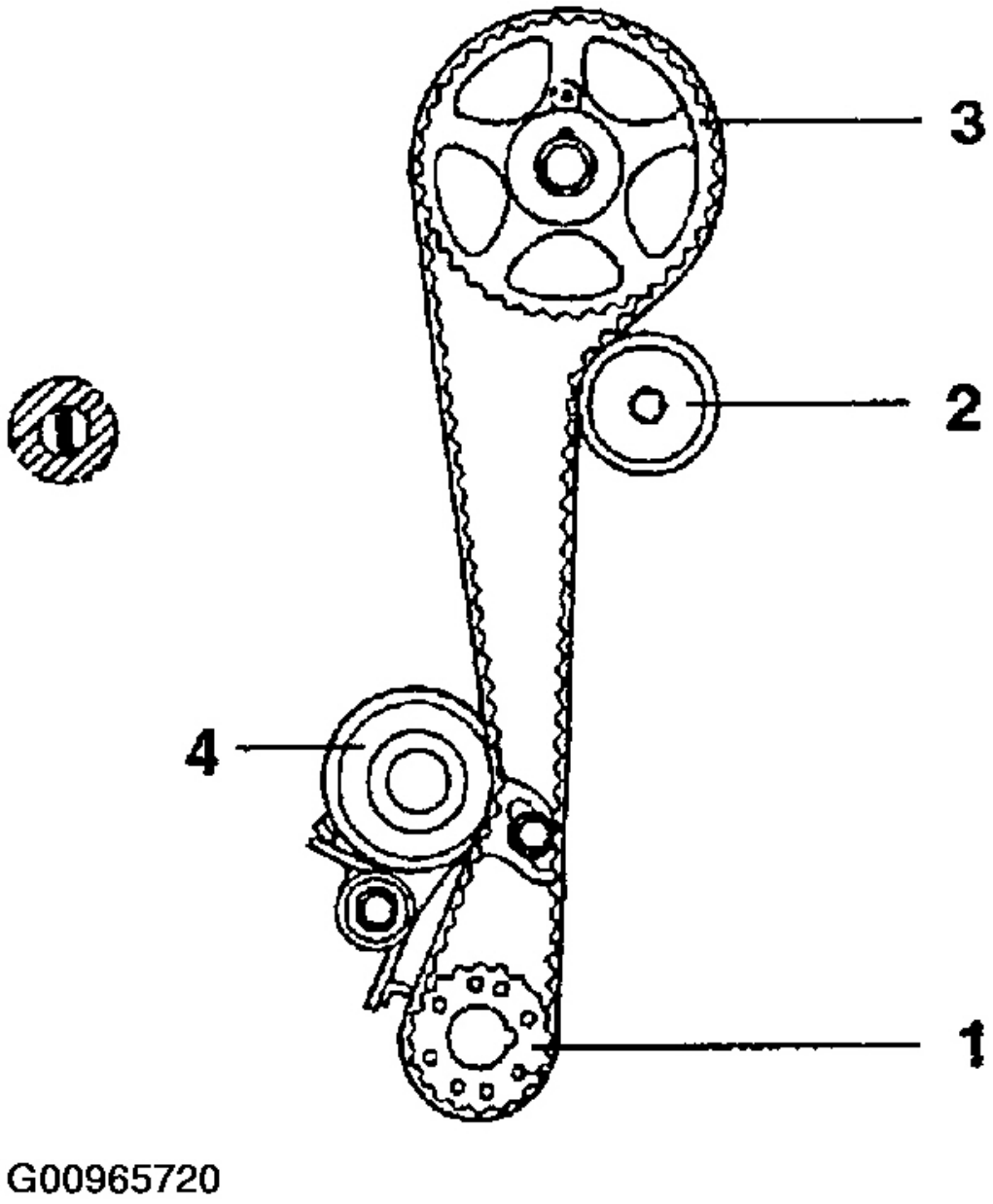


Fig. 83: Installing Timing Belt
Courtesy of HYUNDAI MOTOR CO.

8. Install the timing belt on the camshaft sprocket. When the timing belt is installed on the camshaft sprocket, make sure that the tension side is tight. Then, check to ensure that when the tension side is tightened by turning the camshaft sprocket in a reverse direction and all timing marks are in line.

9. Tighten the tensioner bolts.

   Tightening torque

   Tensioner attaching bolt:
   20-27 N.m (200-270 kg.cm, 15-20 Ib.ft)

10. Turn the crankshaft two turns in its operating direction (clock-wise) and realign the camshaft sprocket timing mark with the top dead center position.
11. Then recheck the belt tension Verify that when the tensioner and the tension side of the timing belt are pushed in horizontally with a moderate force [approx. 49 N (11 Ib)], the timing belt cog end is approx. 1/2 of the tensioner mounting bolt head radius (across flats) away from the bolt head center.

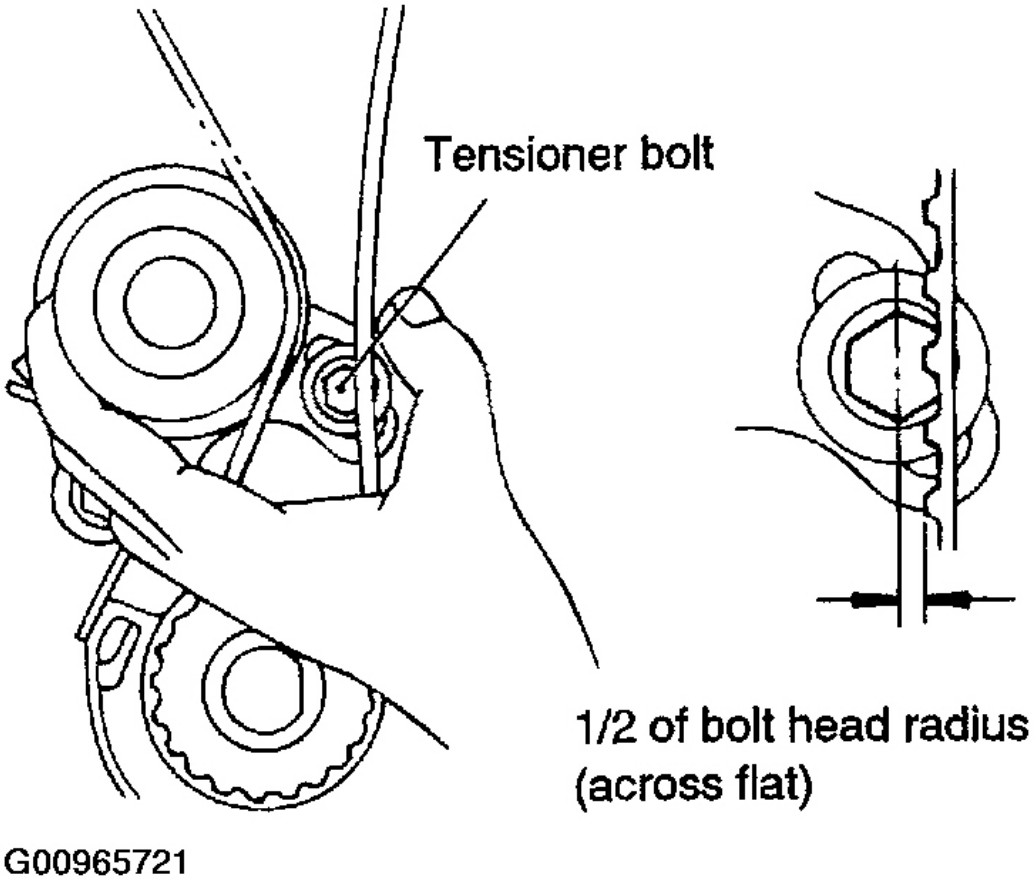
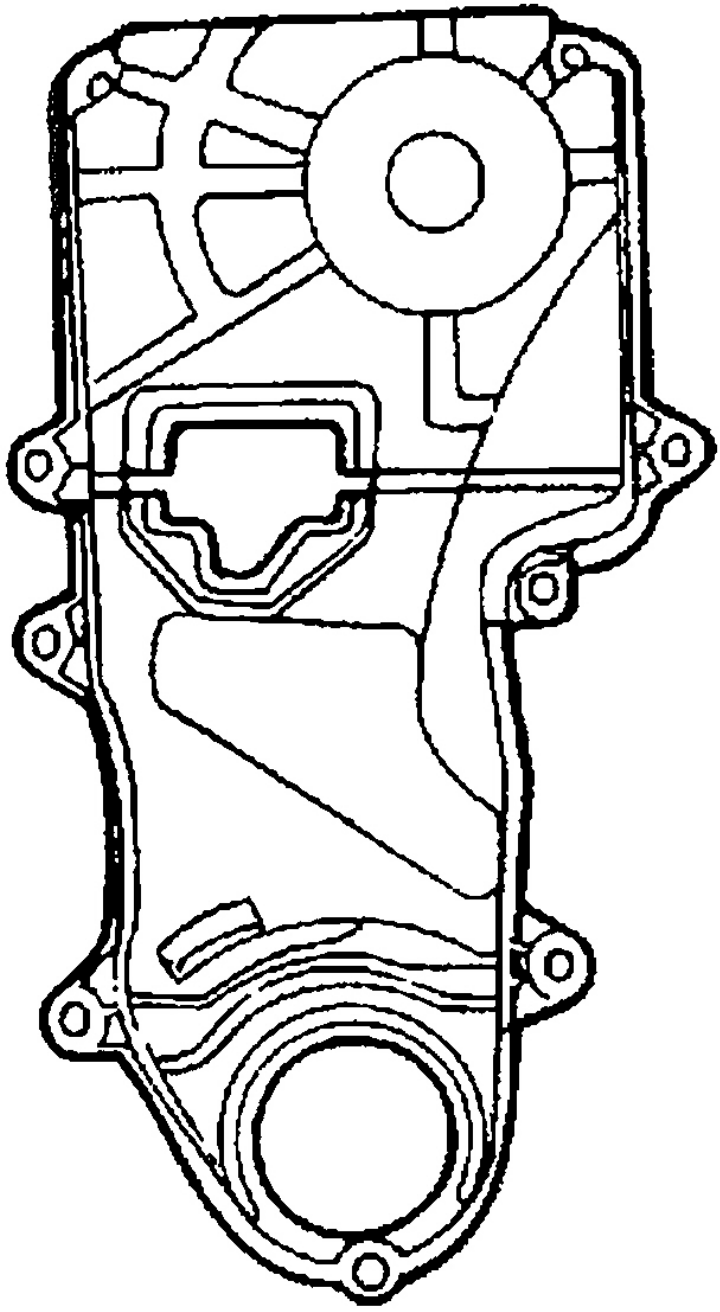


Fig. 84: Checking Belt Tension
Courtesy of HYUNDAI MOTOR CO.

12. Install the timing belt cover.



G00965722

Fig. 85: Installing Timing Belt Cover
Courtesy of HYUNDAI MOTOR CO.

Tightening torque

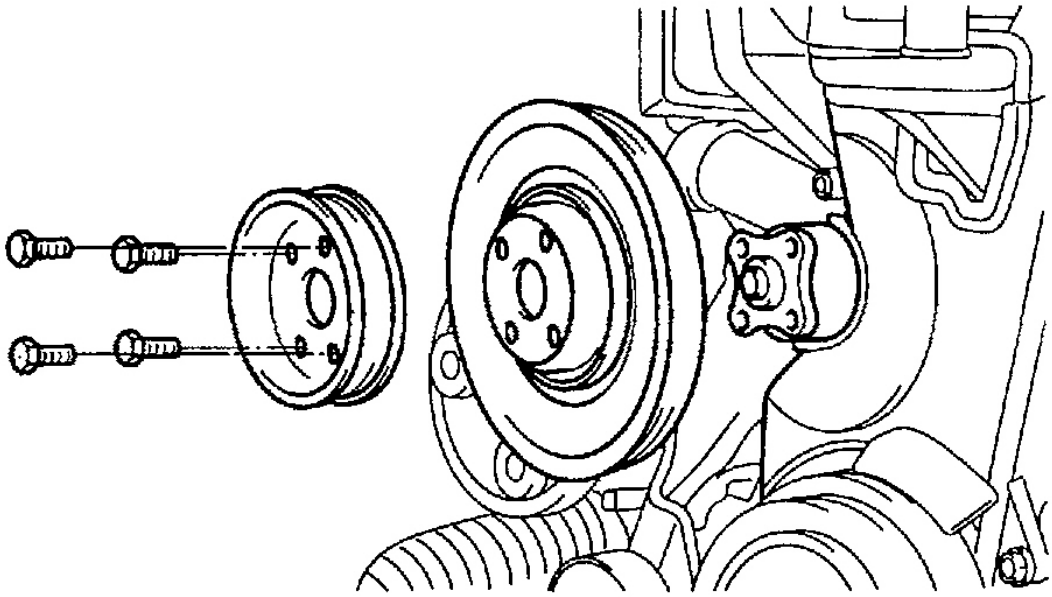
Timing belt cover bolt:
8-10 N.m (80-100 kg.cm, 6-7 Ib.ft)

13. Install the crankshaft pulley. Make sure that the crankshaft sprocket pin fits the small hole in the pulley.

Tightening torque

Crankshaft pulley bolt:
140-150 N.m (1400-1500 kg.cm, 103-111 Ib.ft)

14. Install the water pump pulley.



G00965723

Fig. 86: Installing Water Pump Pulley
Courtesy of HYUNDAI MOTOR CO.

15. Install the alternator belt and adjust the belt tension.
16. Install the air conditioning compressor belt and adjust the belt tension.
17. Install the power steering belt and adjust the belt tension.

CYLINDER HEAD ASSEMBLY

CYLINDER HEAD

COMPONENTS

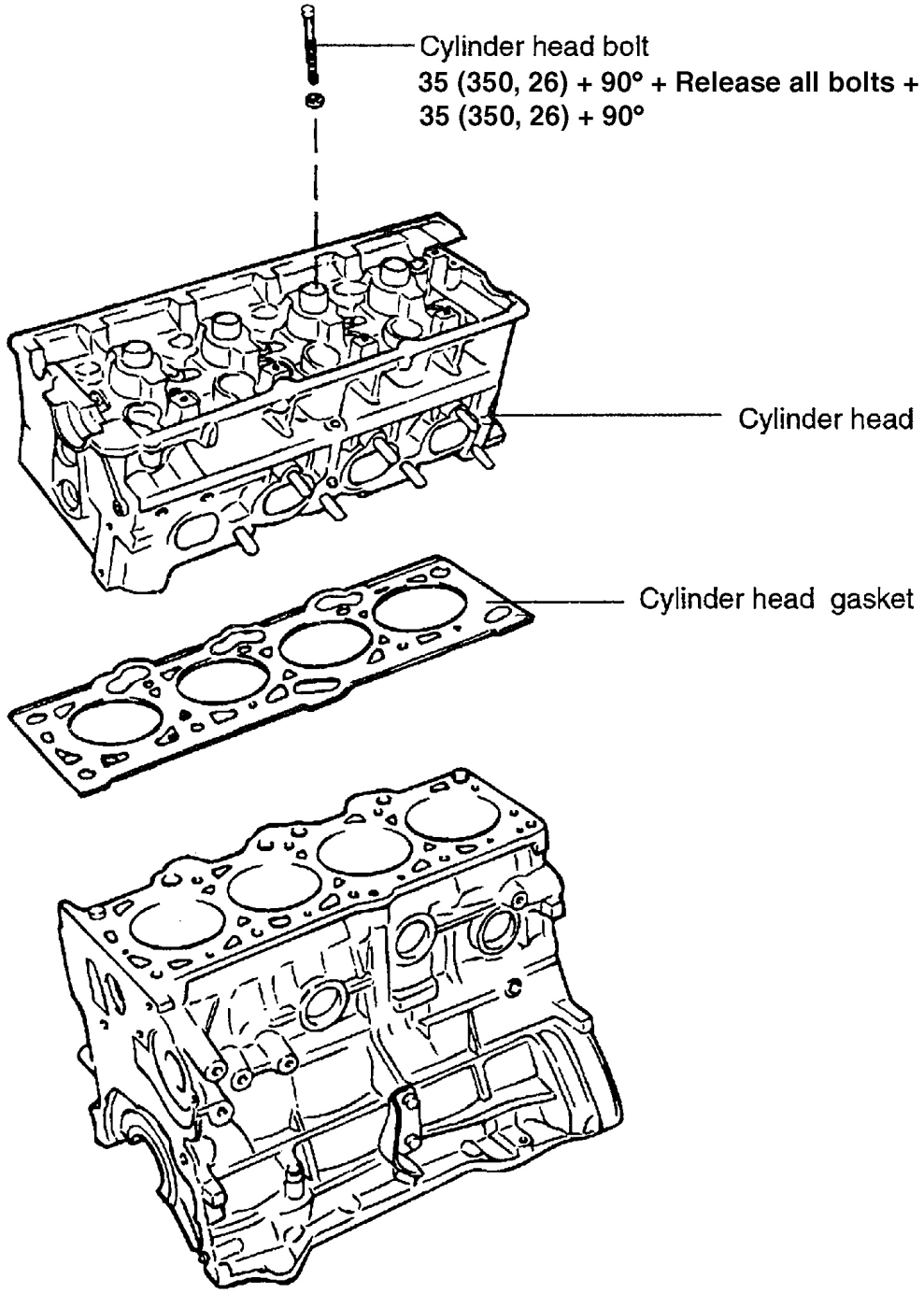


Fig. 87: Cylinder Head Components (1 Of 2)
Courtesy of HYUNDAI MOTOR CO.

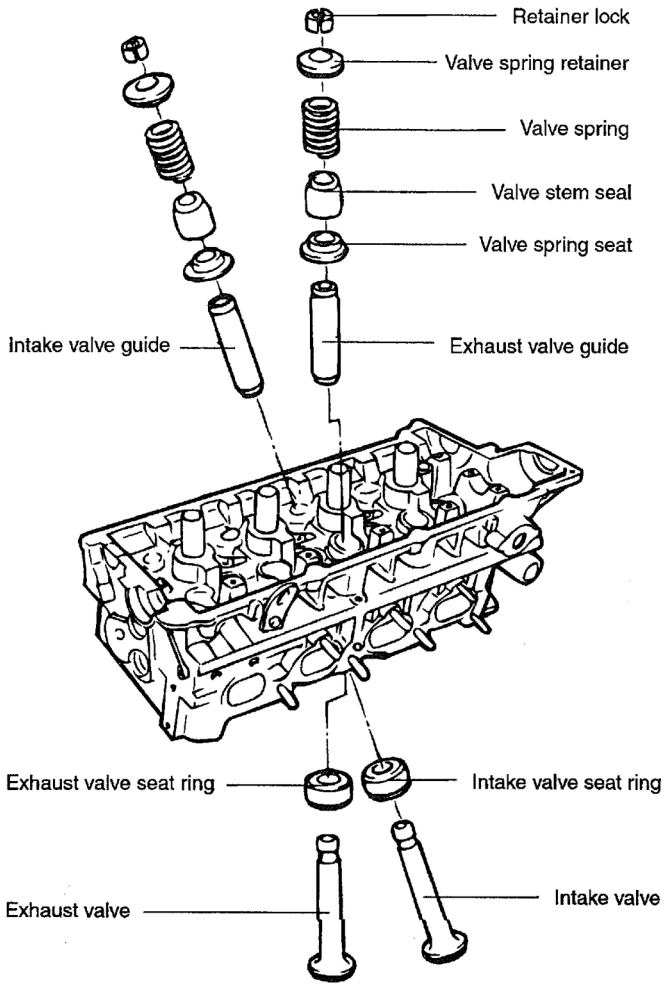
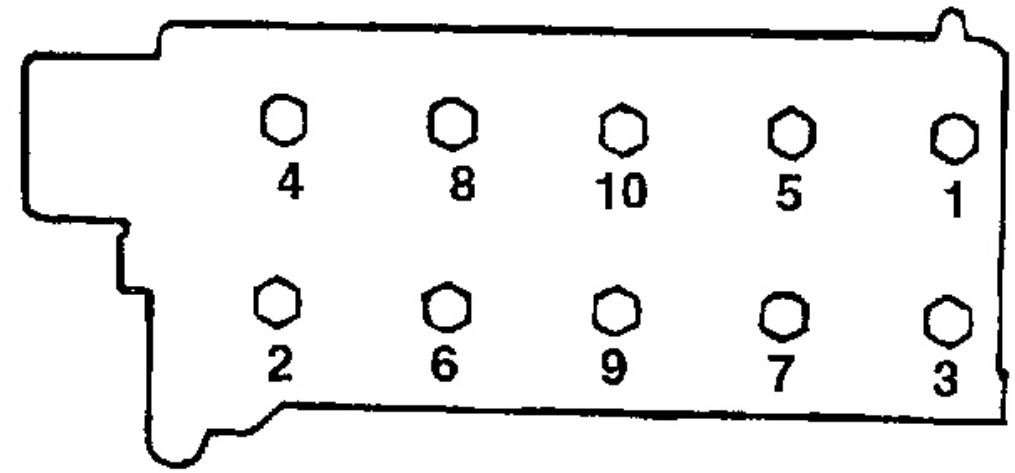
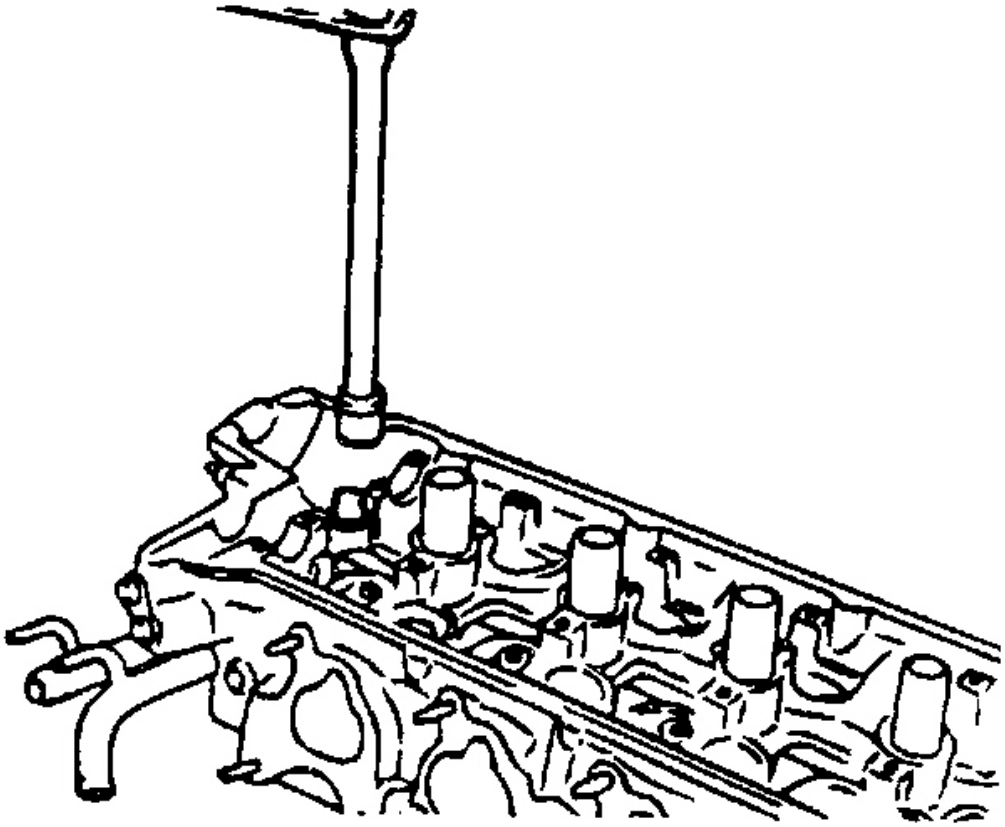


Fig. 88: Cylinder Head Components (2 Of 2)
Courtesy of HYUNDAI MOTOR CO.

DISASSEMBLY

1. Using a tool remove the cylinder head bolts in the order shown in the illustration.





G00965726

Fig. 89: Cylinder Head Removal Sequence
Courtesy of HYUNDAI MOTOR CO.

2. Using the special tool (09222-28000, 09222-28100), remove the valve retainer lock. Next remove the spring retainer, valve spring, spring seat and valve.

NOTE: Arrange these parts so that they can be reinstalled in their original positions.

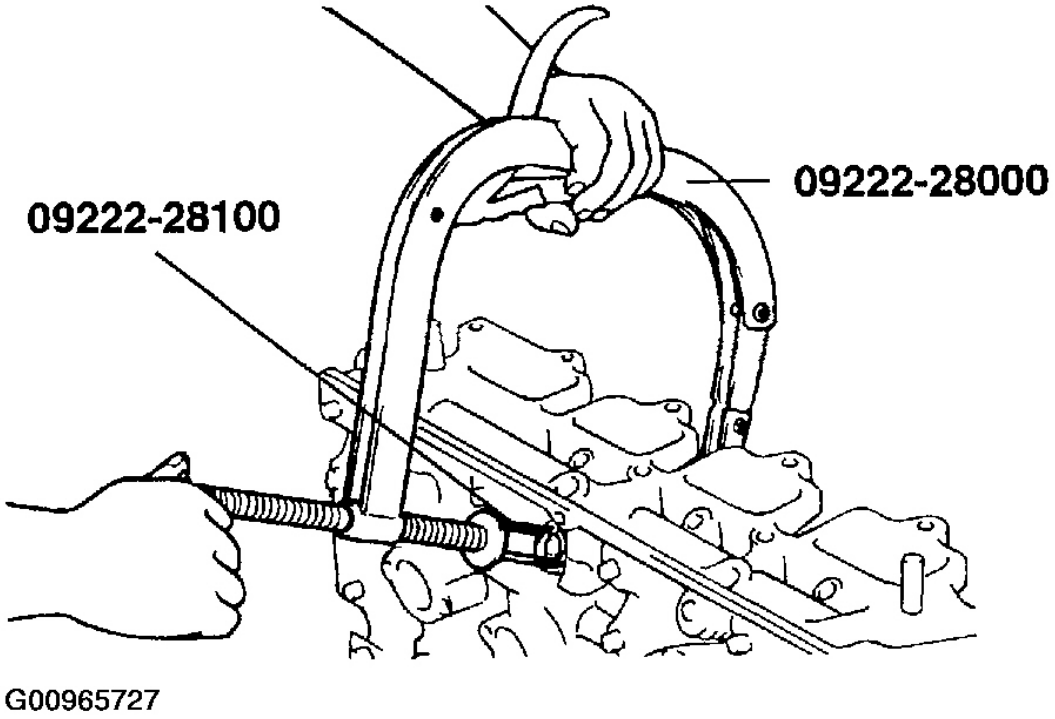


Fig. 90: Removing Valve Retainer Lock
Courtesy of HYUNDAI MOTOR CO.

3. Remove the valve stem seals with pliers.

NOTE: Do not reuse the valve stem seals.

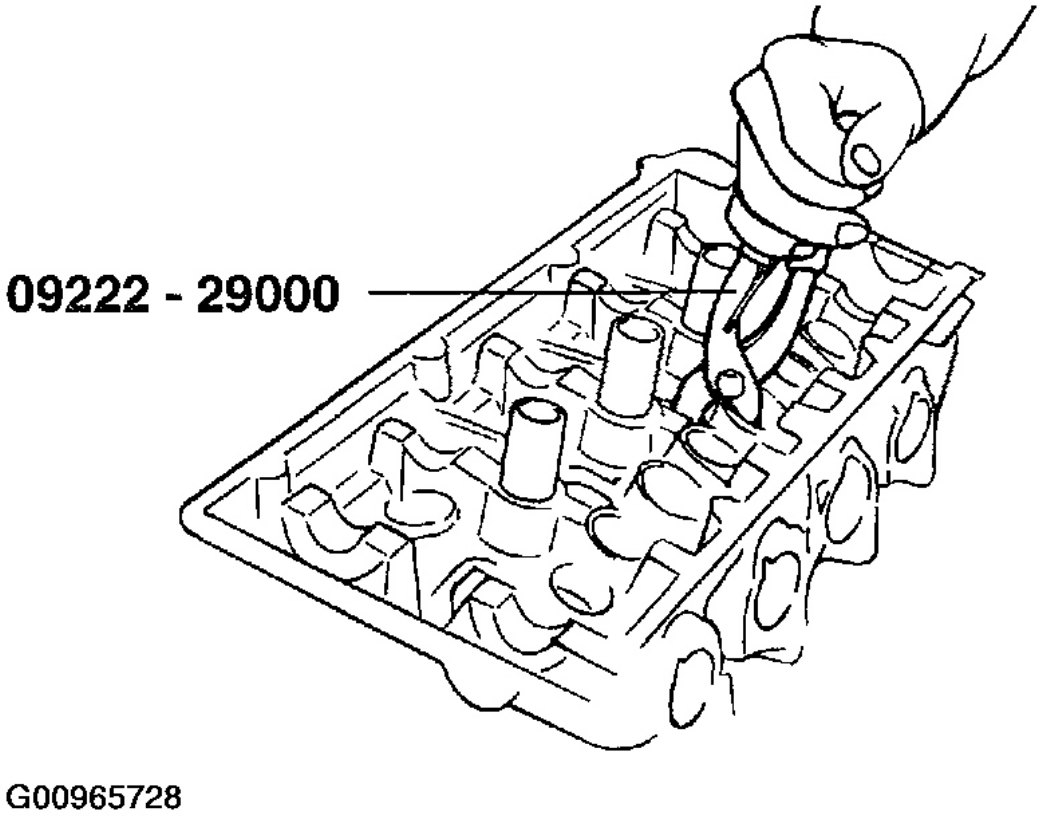


Fig. 91: Removing Valve Stem Seals
Courtesy of HYUNDAI MOTOR CO.

INSPECTION

CYLINDER HEAD

1. Check the cylinder head for cracks, damage and coolant leakage. If cracked, replace the cylinder head.
2. Remove scale, sealing compound and carbon deposits completely. After cleaning the oil passages, apply compressed air to verify that the passages are not clogged.

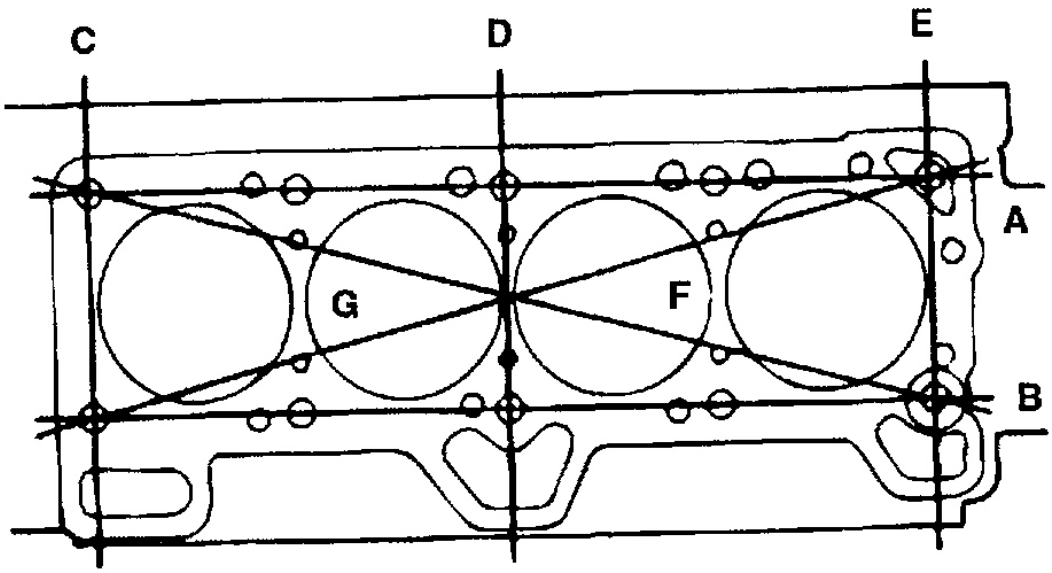


Fig. 92: Checking Cylinder Head Flatness
Courtesy of HYUNDAI MOTOR CO.

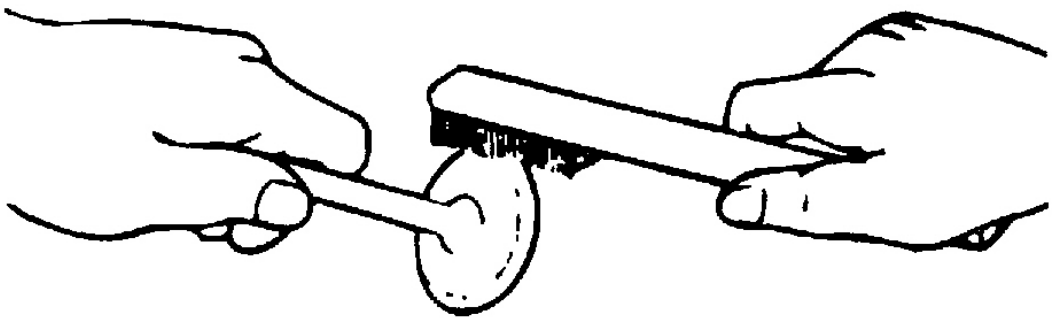
3. Check the cylinder head surface for flatness in the direction as shown in the illustration. If flatness exceeds the service limit in any direction, either replace the cylinder head or machine the cylinder head matching surface lightly.

Flatness of cylinder head gasket surface

Standard: Less than 0.03mm (0.0012 in.)
Limit: 0.05mm (0.002 in.)

VALVES

1. Using a wire brush, clean the valve thoroughly.



G00965730

Fig. 93: Cleaning Valve
Courtesy of HYUNDAI MOTOR CO.

2. Check each valve for wear, damage and distortion of the head and the stem at B position. Replace, if necessary. If stem end, A, is hollowed out or worn, resurface as necessary. This correction must be limited to a minimum. Also resurface the valve face.

Replace the valve if the margin has decreased to less than the service limit.

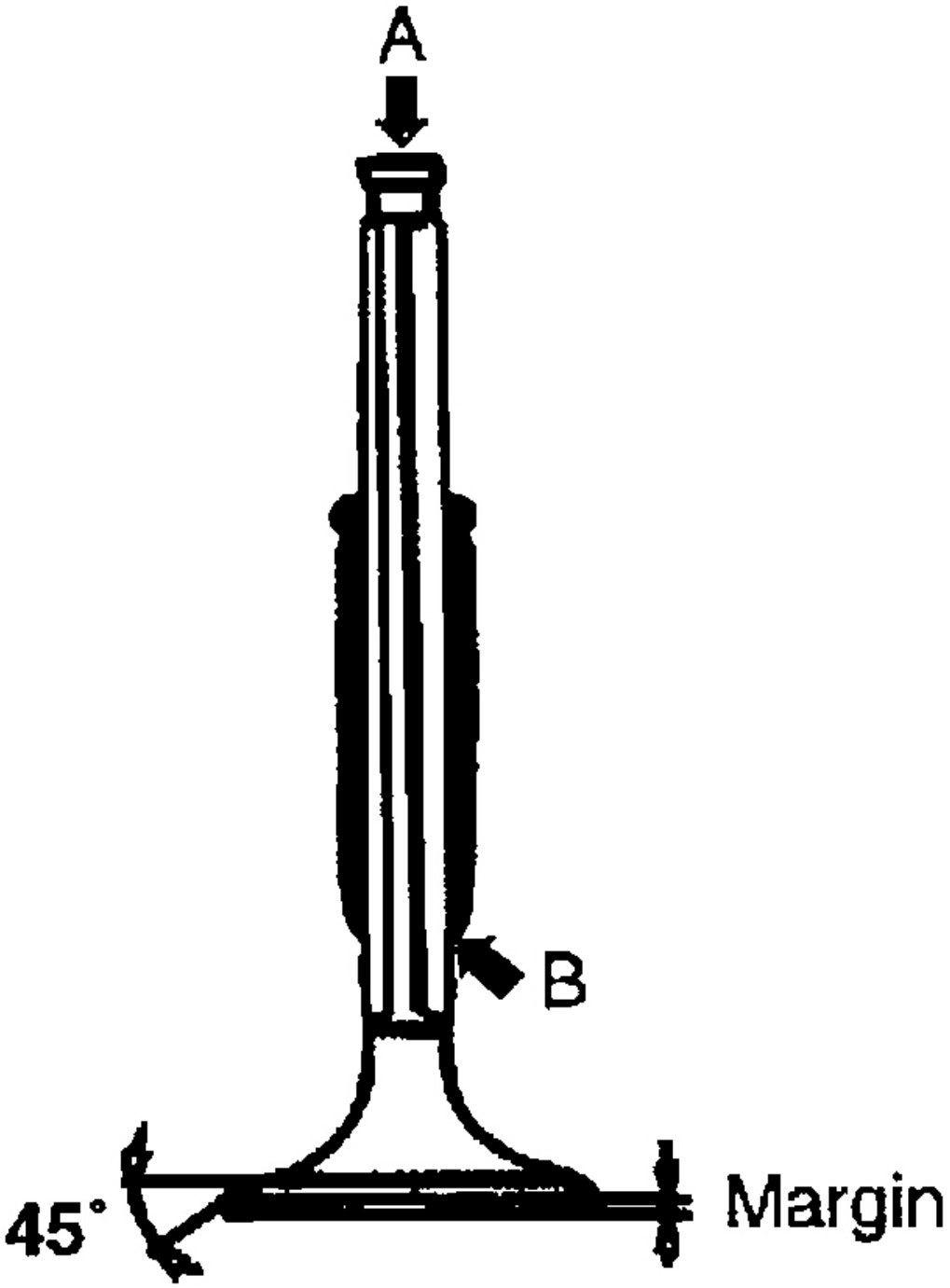
Margin

[Standard]

Intake: 1.1mm (0.043 in.)
Exhaust: 1.3mm (0.051 in.)

[Limit]

Intake: 0.8mm (0.028 in.)
Exhaust: 1.0mm (0.040 in.)



G00965731

Fig. 94: Identifying Valve Margin
Courtesy of HYUNDAI MOTOR CO.

VALVE SPRINGS

1. Check the free height of each valve spring. If they exceed the serviced limit, replace the springs.
2. Using a square, test the squareness of each spring. If a spring is excessively out - of - square, replace it.

Valve spring

[Standard]

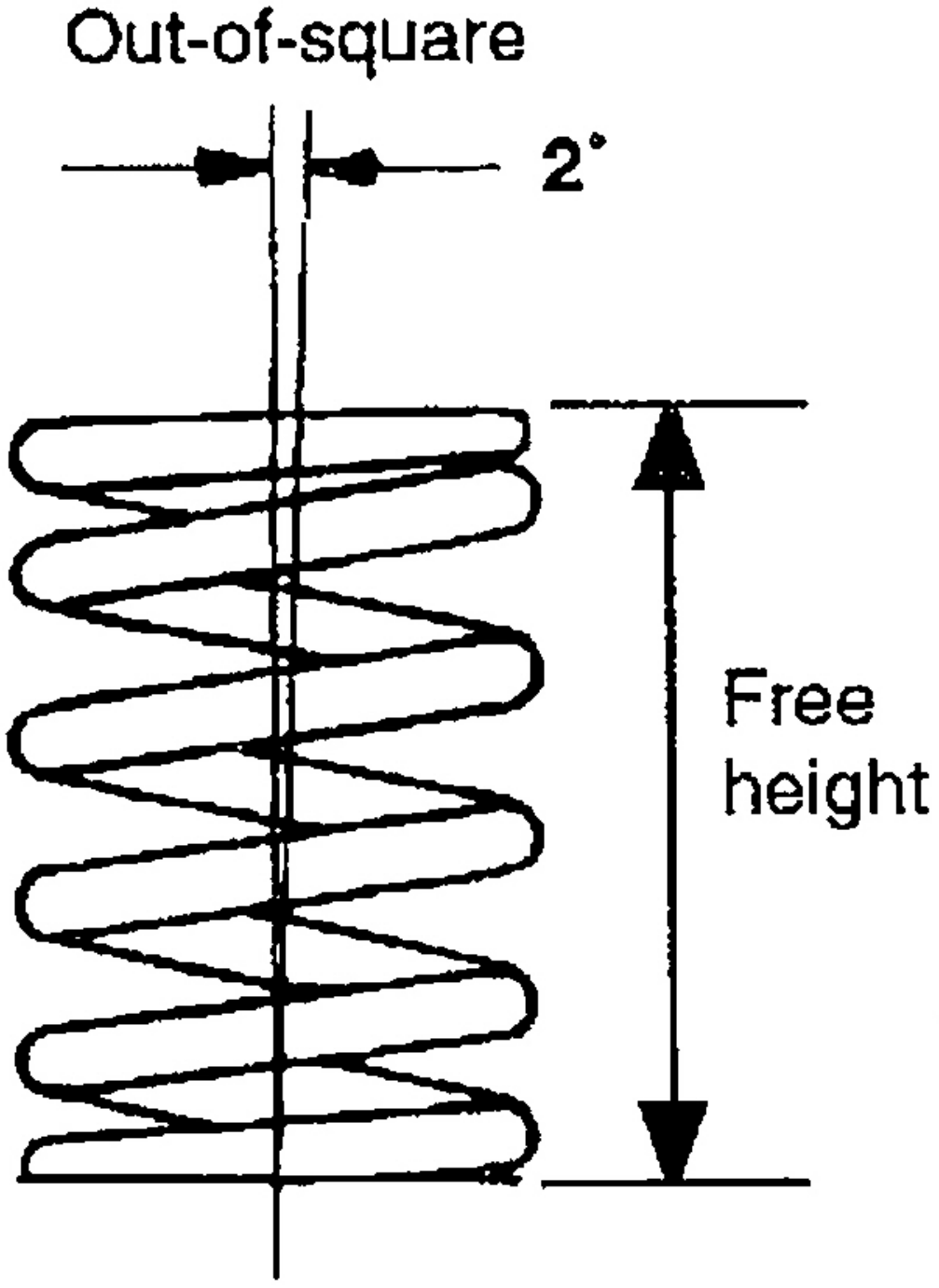
Free height: 44mm (1.7323 in.)

Load:

21.6 kg/35mm (47.6 lb/1.3780 in.)
45.1 kg/27.2mm (99.4 lb/1.0709 in.)
Out of square: 1.5° or less 100

[Limit]

Free height: - 1.0mm (- 0.039 in.)
Out of square



G00965732

Fig. 95: Identifying Valve Spring Free Height
Courtesy of HYUNDAI MOTOR CO.

Check the valve stem-to-guide clearance. If the clearance exceeds the service limit, replace the valve guide with the next oversize part.

Valve stem-to-clearance

[Standard]

Intake: 0.03 - 0.06 mm (0.0012 - 0.0024 in.)
Exhaust: 0.05 - 0.08 mm (0.0020 - 0.0031 in.)

[Limit]

Intake: 0.1 mm (0.0040 in.)
Exhaust: 0.15 mm (0.0059 in.)

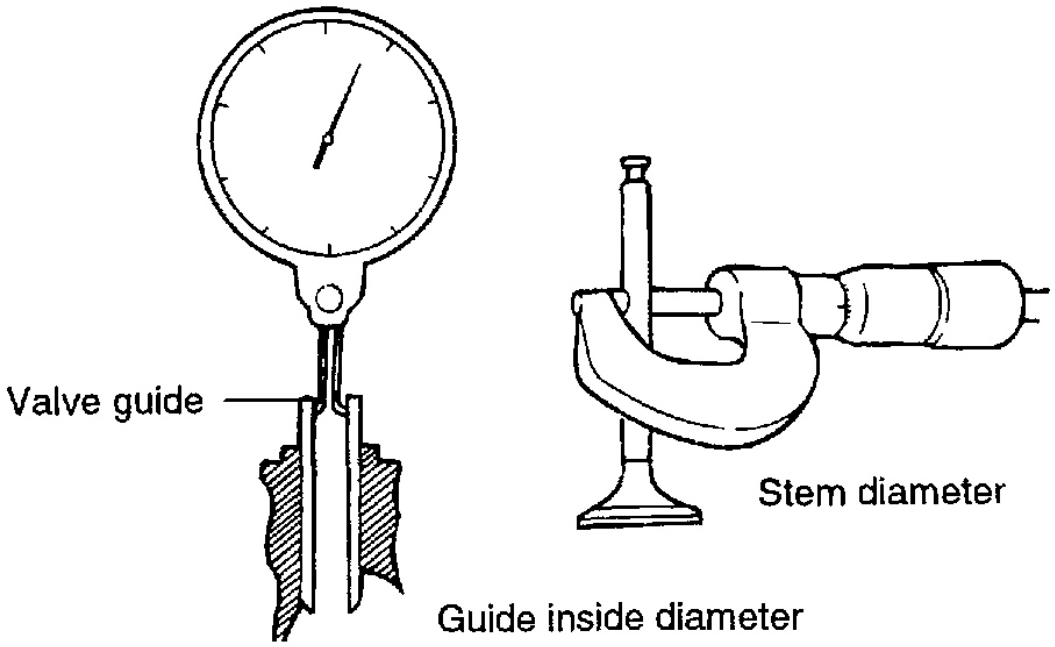


Fig. 96: Measuring Valve Stem-T-Guide Clearance
Courtesy of HYUNDAI MOTOR CO.

RECONDITIONING VALVE SEAT

Check the valve seat for overheating and unequal contact with the valve face. Recondition or replace the seat if necessary. Before reconditioning the seat, check the valve guide for wear. If the valve guide is worn, replace it and then recondition the seat. Recondition the valve seat with a valve seat grinder or cutter. The valve seat contact width should be within specifications and centered on the valve face. After reconditioning, the valve and valve seat should be lapped lightly with a lapping compound.

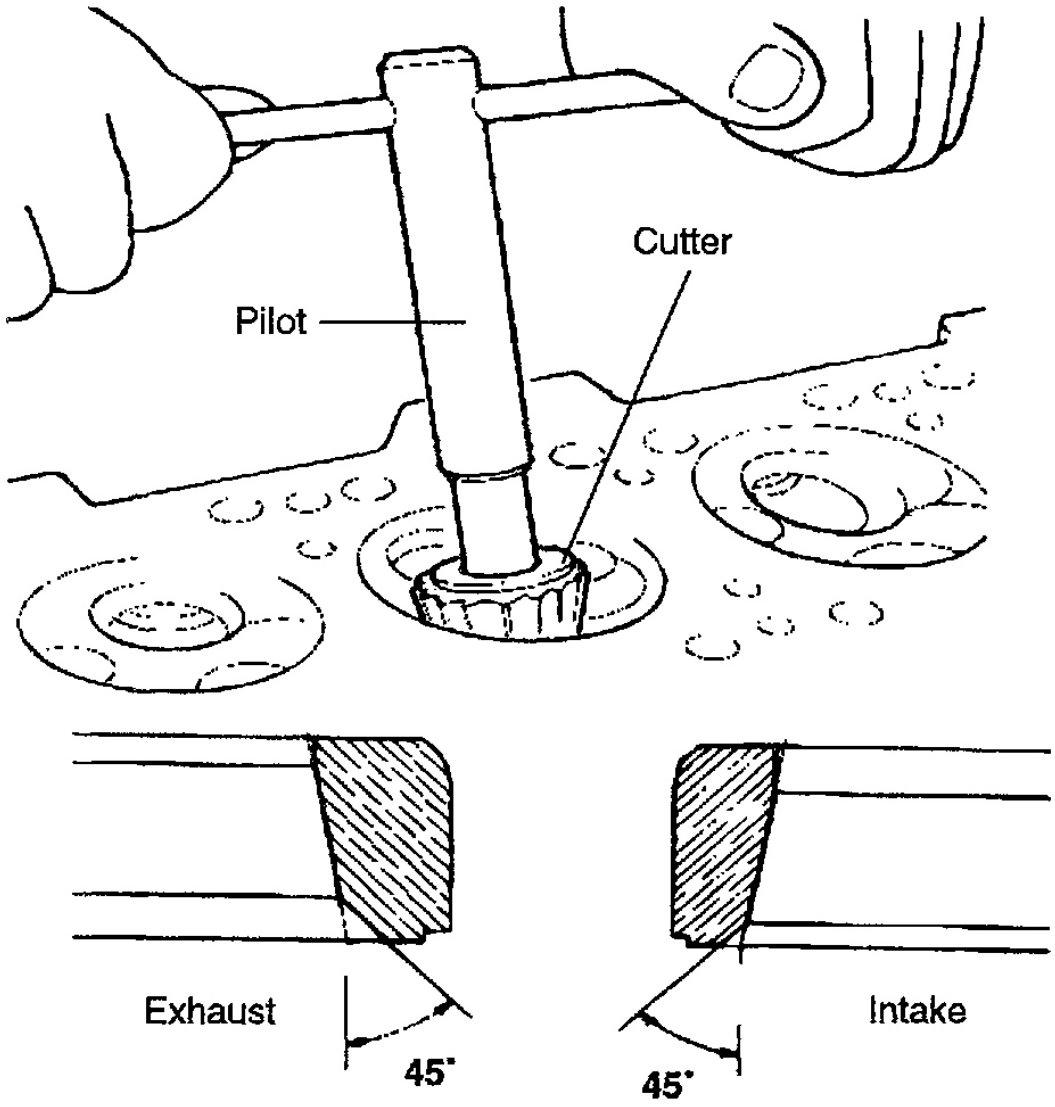


Fig. 97: Reconditioning Valve Seat
Courtesy of HYUNDAI MOTOR CO.

REPLACING THE VALVE SEAT RING

1. Cut away the inner face of the valve seat to reduce the wall thickness.

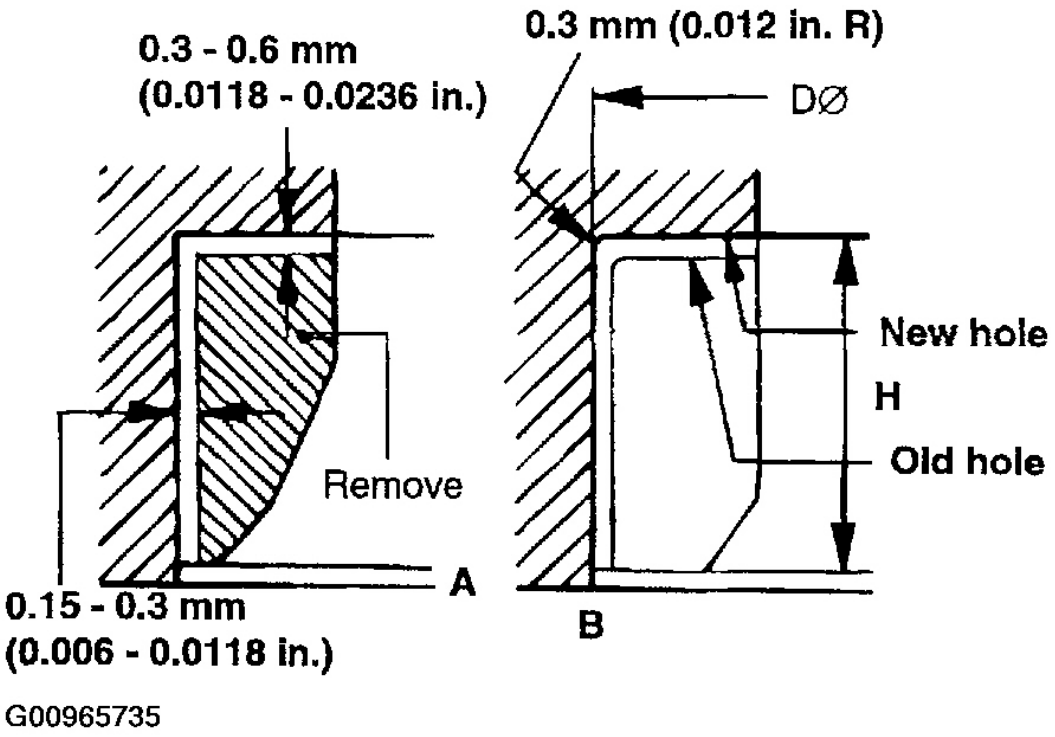


Fig. 98: Enlarging Inner Face Of Valve Seat
Courtesy of HYUNDAI MOTOR CO.

2. Enlarge the diameter of the valve seat so that it matches the specified oversize hole diameter of the new valve seat ring.
3. Heat the cylinder head to about 250°C (480°F) and press - fit an oversize seat ring for the bore in the cylinder head.
4. Using lapping compound, lap the valve to the new seat.

Valve seat contact width
Intake: 0.8 - 1.2 mm (0.0315 - 0.0472 in.)
Exhaust: 1.3 - 1.7 mm (0.0512 - 0.0670 in.)

VALVE SEAT INSERT OVERSIZES

Description	Size mm (in.)	Size mark	Seat ring height H mm (in.)	Oversize hole diameter I.D. mm (in.)
Intake valve Seat ring	0.3 (0.012) O.S.	30	5.1~5.3(0.2008~0.2087)	30.7~30.721 (1.2087~1.2095
	0.6 (0.024) O.S.	60	5.4~5.6(0.2126~0.2205)	31.0~31.021(1.2205~1.2213)
Exhaust valve Seat ring	0.3 (0.012) O.S.	30	6.2~6.4(0.2441~0.2520)	27.3~27.321(1.0748~1.0756)
	0.6 (0.024) O.S.	60	6.5~6.7(0.2560~0.2638)	27.6~27.621(1.0866~1.0874)

G00965736

Fig. 99: Valve Seat Insert Oversizes Table
Courtesy of HYUNDAI MOTOR CO.

REPLACING VALVE GUIDE

1. Using the special tool (09221 -22000 A/B), withdraw the old valve guide toward the bottom of cylinder head.
2. Recondition the valve guide hole so that it can match the newly press-fitted oversize valve guide.
3. Using the special tool (09221 - 22000 A/B), press-fit the valve guide. The valve guide must be press-fitted from the upper side of the cylinder head.
4. After the valve guide is press-fitted, insert a new valve and check for proper the clearance
5. After the valve guide is replaced, check that the valve is seated properly. Recondition the valve seats as necessary.

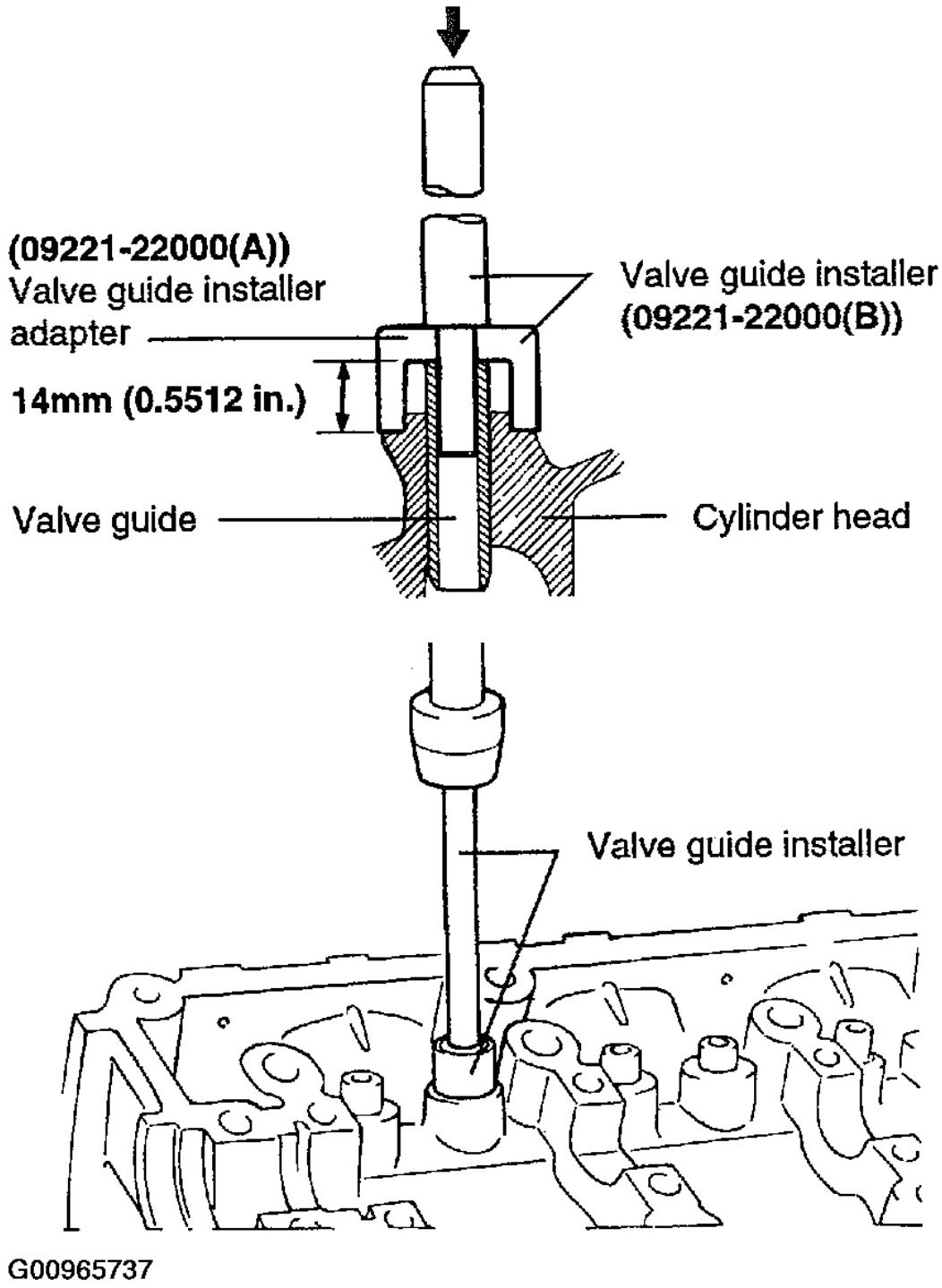


Fig. 100: Installing Valve Guide
Courtesy of HYUNDAI MOTOR CO.

VALVE GUIDE OVERSIZES

Over size mm (in.)	Size mark	Oversize valve guide hole size mm (in.)
0.05 (0.002)	5	11.05~11.068 (0.4350~0.4357)
0.25 (0.010)	25	11.25~11.268 (0.4429~0.4436)
0.50 (0.020)	50	11.50~11.518 (0.4528~0.4535)

G00965738

Fig. 101: Valve Guide Oversizes Table
Courtesy of HYUNDAI MOTOR CO.

REASSEMBLY

NOTE:

1. **Clean each part before assembly.**
2. **Apply engine oil to the sliding and rotating parts.**

1. Install the spring seats.

   Using a special tool (09222-22001), tap the seal in position lightly.

NOTE:

- **Do not reuse old valve stem seals.**
- **Incorrect installation of the seal could result in oil leakage past the valve guides.**

2. Apply engine oil to each valve. Insert the valve into the valve guide.

   Avoid pushing the valve into the seal by force. After inserting the valve, check that it moves smoothly.

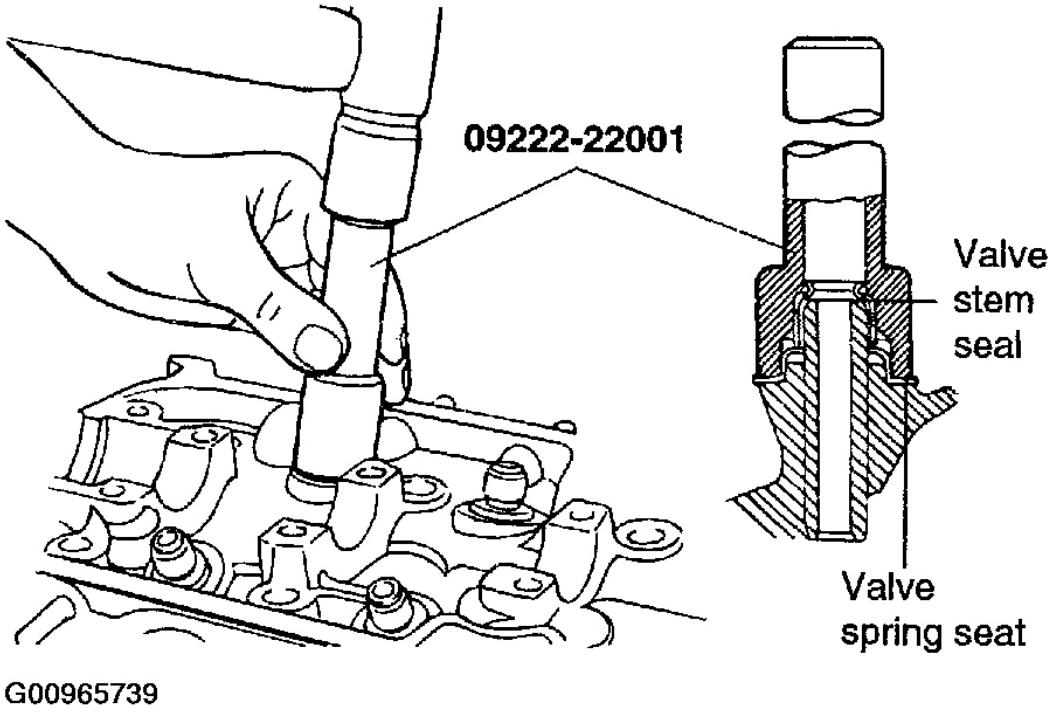


Fig. 102: Installing Valve
Courtesy of HYUNDAI MOTOR CO.

3. Place valve springs so that the side coated with enamel faces toward the valve spring retainer and then install the retainer.

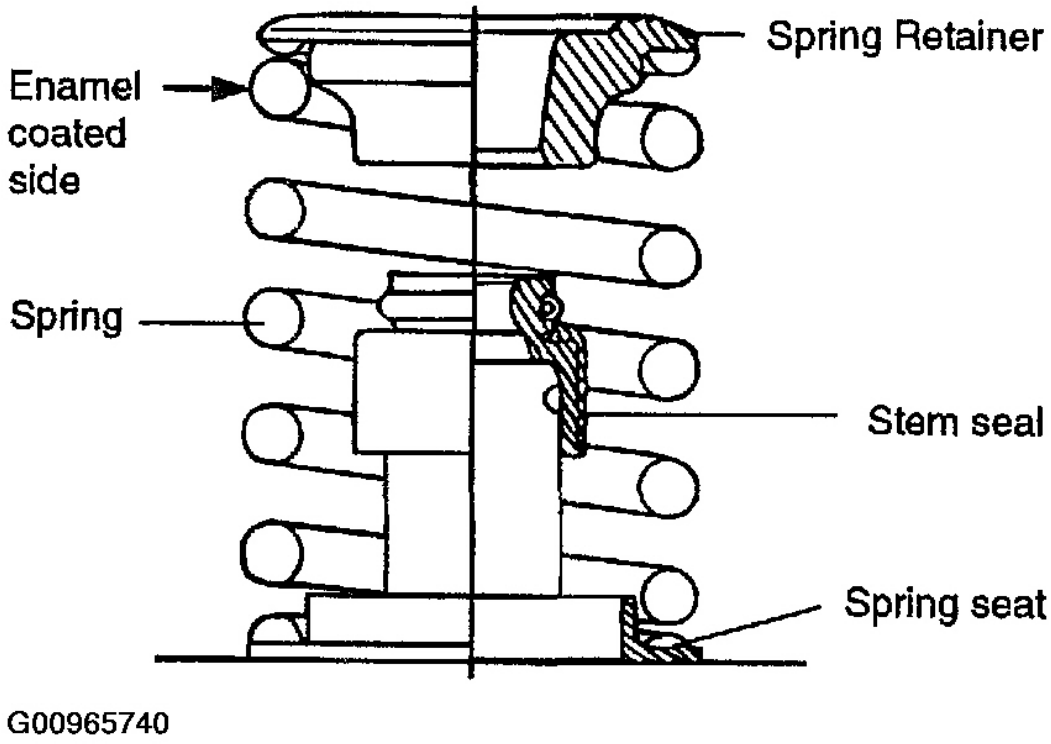


Fig. 103: Proper Valve Spring Installation
Courtesy of HYUNDAI MOTOR CO.

4. Using the special tool (09222-28000, 09222-28100), compress the spring and install the retainer locks. After installing the valves, ensure that the retainer locks are correctly in place before releasing the valve spring compressor.

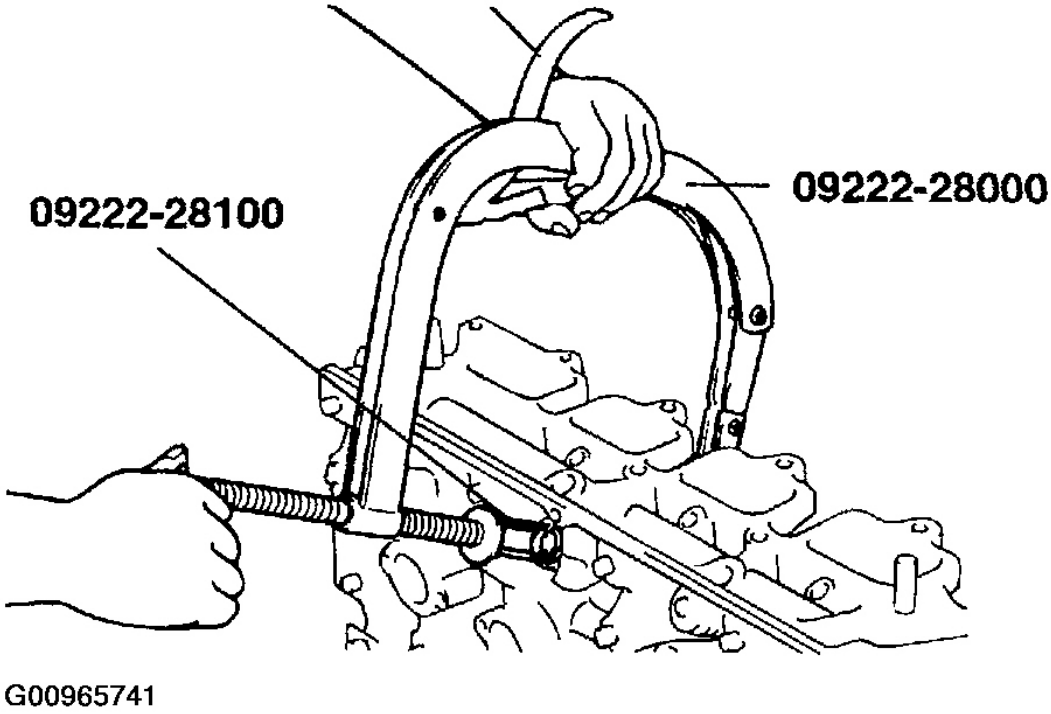


Fig. 104: Installing Valve Spring Retainer Locks
Courtesy of HYUNDAI MOTOR CO.

NOTE: When the spring is compressed, Check that the valve stem seal is not pressed against the bottom of the retainer.

5. Clean both gasket surfaces of the cylinder block and cylinder head.
6. Verify the identification marks on the cylinder head gasket.
7. Install the gasket so that the surface with the identification mark faces toward the cylinder head.
8. Tighten the bolts to the specified torque in the sequence shown.

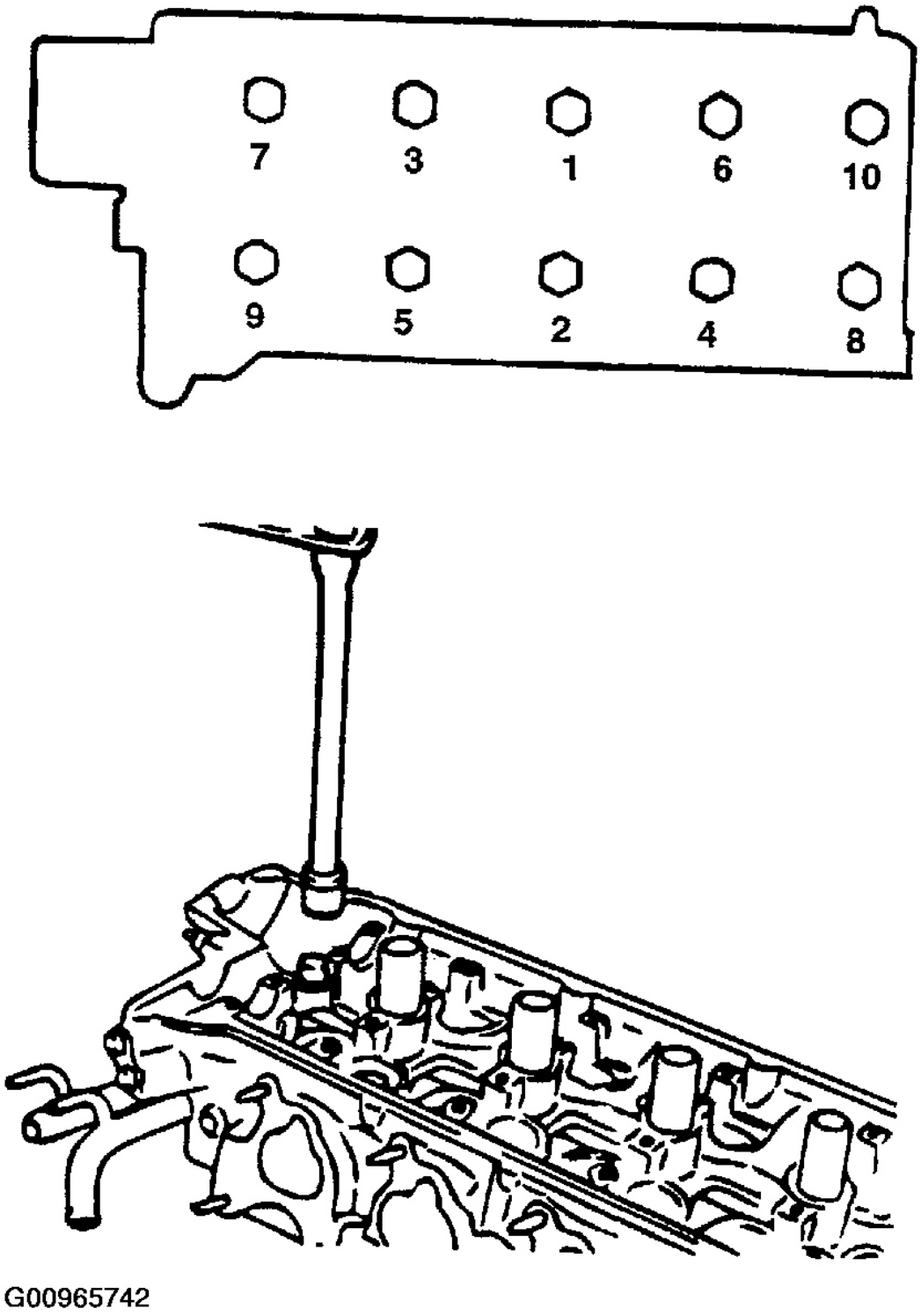


Fig. 105: Cylinder Head Bolt Torque Sequence

Courtesy of HYUNDAI MOTOR CO.

Cylinder head bolt:
30 Nm (300 kg.cm, 22 lb.ft) + 90° + Release all bolts
+ 30 Nm (300 kg.cm, 22 lb.ft) + 90°

MAIN MOVING SYSTEM

CAM SHAFT

COMPONENTS

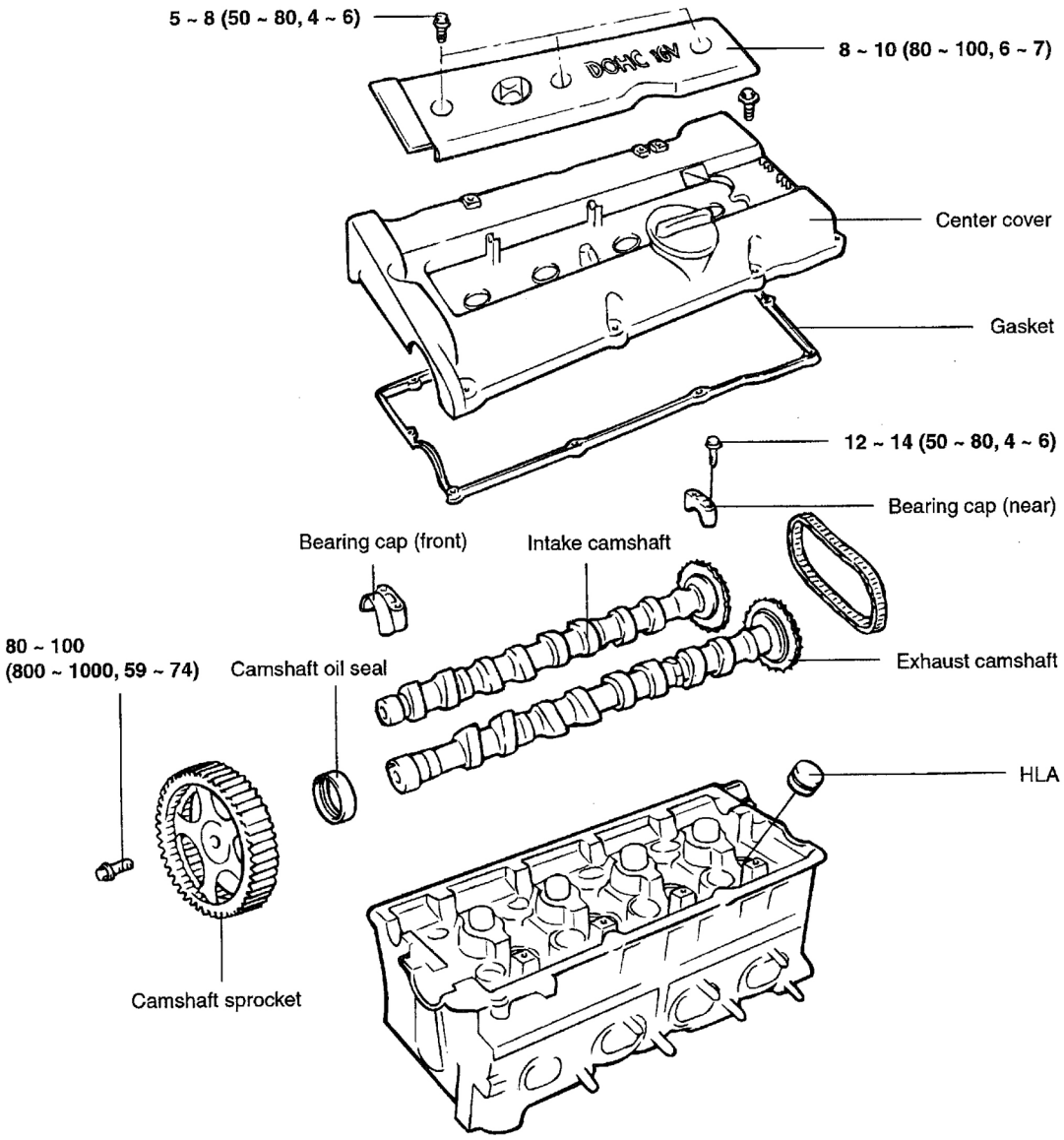
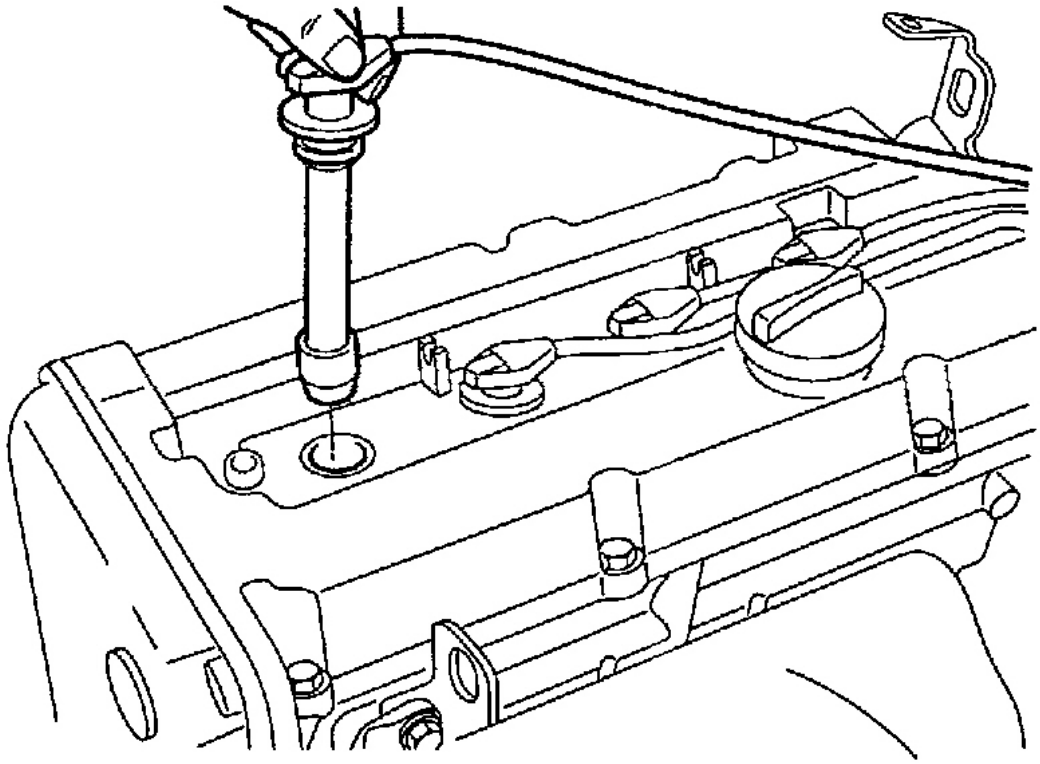


Fig. 106: Camshaft Components
Courtesy of HYUNDAI MOTOR CO.

DISASSEMBLY

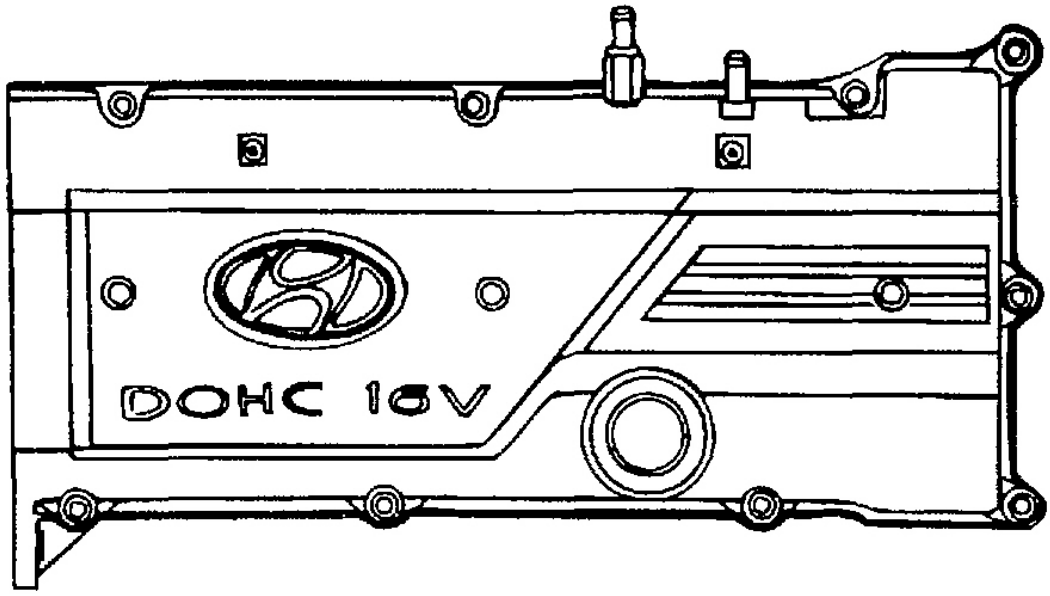
1. Disconnect the breather hose and the PCV hose.
2. Loosen the center cover bolts and then remove the center cover.
3. Remove the ignition coil assembly and the spark plug cables.



G00965744

Fig. 107: Removing Spark Plug Cables
Courtesy of HYUNDAI MOTOR CO.

4. Loosen the cylinder head cover bolts and then remove the cylinder head cover.



G00965745

Fig. 108: Identifying Cylinder Head Cover
Courtesy of HYUNDAI MOTOR CO.

5. Remove the camshaft sprocket.
6. Remove the camshaft bearing caps and timing chain.
7. Remove the camshaft.
8. Remove the HLA.

INSPECTION

1. Check the camshaft journals for wear. If the journals are badly worn, replace the camshaft.
2. Check the cam lobes for damage. If the lobe is damaged or worn excessively, replace the camshaft.
   Standard value
   Intake: 43.4484 mm (1.7106 in.)
   Exhaust: 43.8489 mm (1.7263 in.)
   Limit
   Intake: 42.9484 mm (1.6909 in.)
   Exhaust: 43.3489 mm (1.7066 in.)

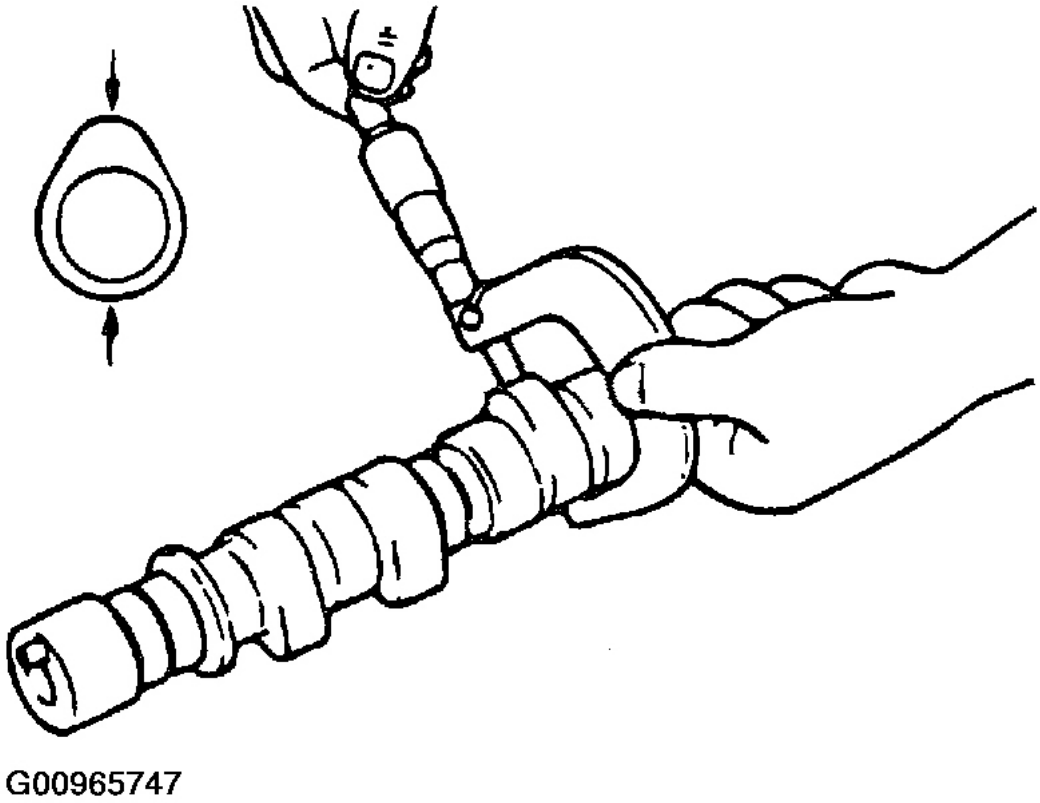


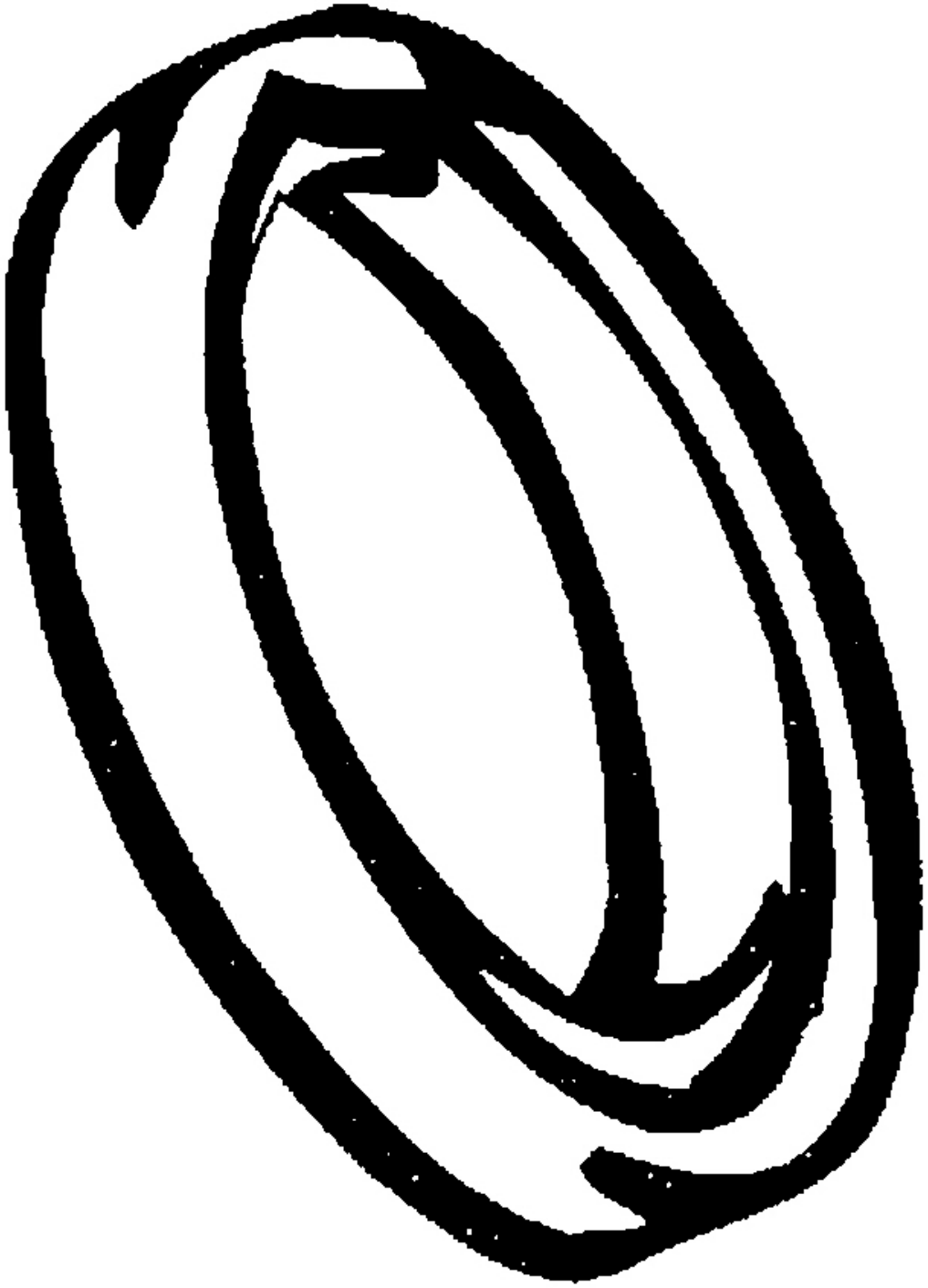
Fig. 109: Measuring Cam Lobes
Courtesy of HYUNDAI MOTOR CO.

3. Check the cam surface for abnormal wear or damage, and replace if necessary.
4. Check each bearing for damage. If the bearing surface is excessively damaged, replace the cylinder head assembly or camshaft bearing cap, as necessary.

Camshaft end play: 0.1 - 0.2 mm (0.0039 - 0.0079 in.)

OIL SEAL

1. Check the lips for wear. If the lip threads are worn, replace.
2. Check the oil seal lip contacting surface of the camshaft. If it is worn, replace the camshaft.



G00965748

Fig. 110: Identifying Oil Seal
Courtesy of HYUNDAI MOTOR CO.

HLA (HYDRAULIC LASH ADJUSTER)

With the HLA filled with engine oil, hold A and press B by hand. If B moves, replace the HLA.

For other specific troubleshooting regarding HLA, refer to **Fig. 112**.

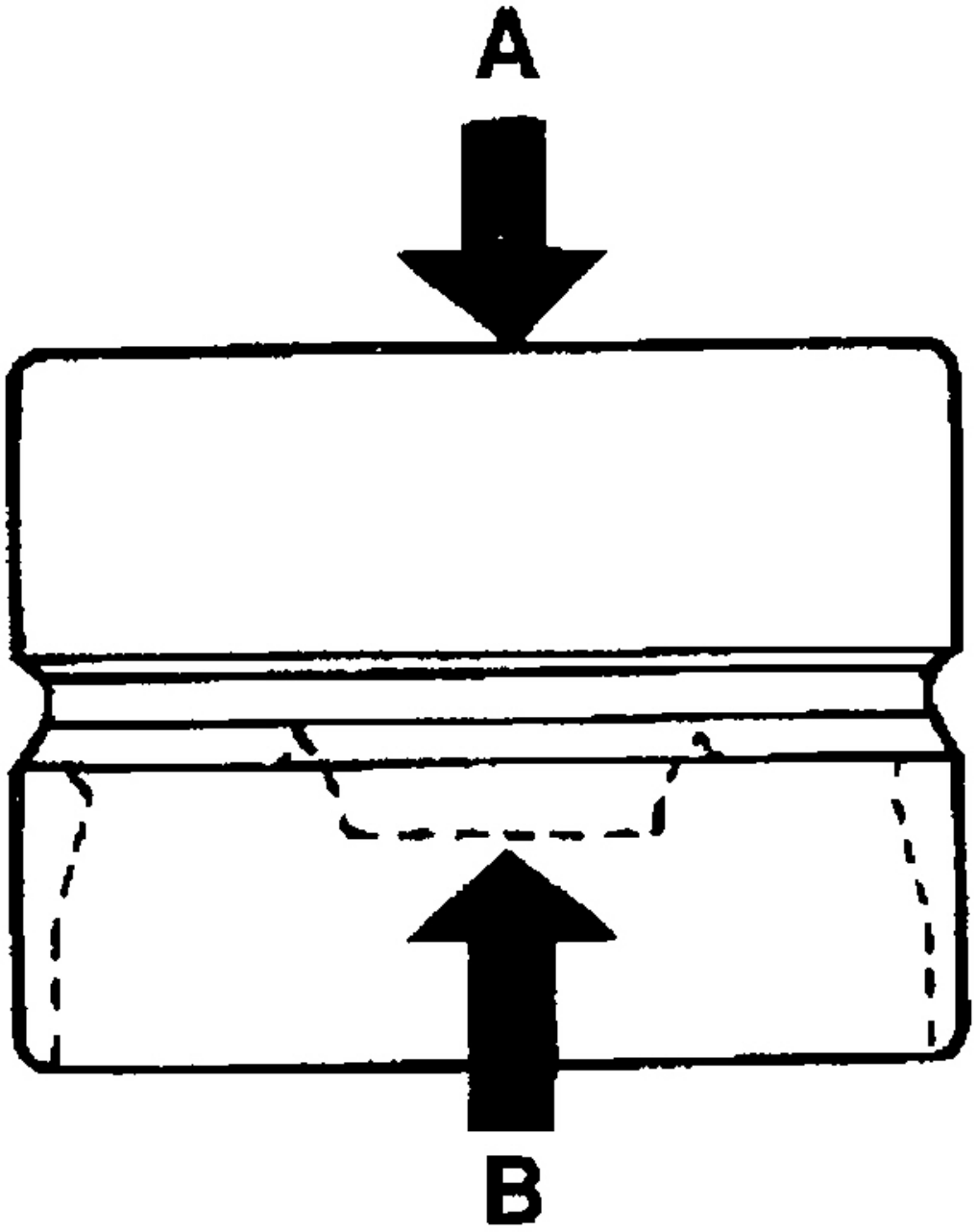


Fig. 111: Identifying Hydraulic Lash Adjuster
Courtesy of HYUNDAI MOTOR CO.

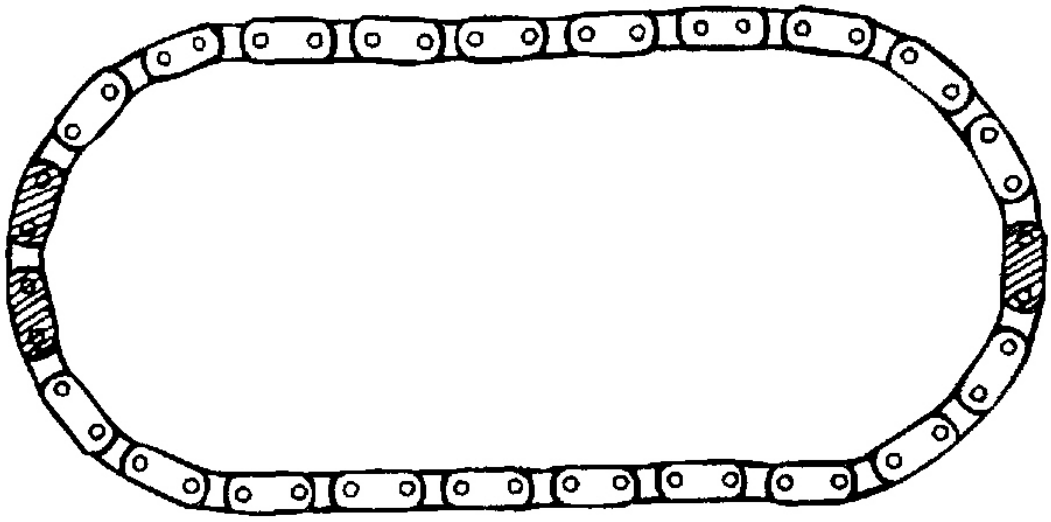
Problem	Possible cause	Action
Temporary noise on starting a cold engine.	Normal	This noise will disappear after the oil in the engine has reached normal pressure.
Continuous noise when engine is running after sitting more than 48 hours.	Oil leakage of the high pressure chamber on HLA, allowing air to get in.	Noise will disappear within 15 minutes when engine runs at 2000~3000 rpm If it doesn't disappear, refer to item 7 below
Continuous noise when engine is first started after rebuilding cylinder head.	Insufficient oil in cylinder head oil gallery.	
Continuous noise when engine is running after excessive cranking.	Oil drain out of the high-pressure chamber in HLA, allowing air to get in. Insufficient oil in HLA.	
Continuous noise when engine is running after changing HLA.		⚠ ***CAUTION*** ***Do not run engine at a speed higher than 3000 rpm as this may damage HLA.***
Continuous noise during idle after high speed running.	Engine oil level too high or too low.	Check oil level. Drain or add oil as necessary.
	Excessive amount of air in the oil at high engine speed.	Check oil supply system
	Deteriorated oil	Check oil quality.
Noise continuous for more than 15 minutes.	Low oil pressure	Check oil pressure and oil supply system of each part of engine
	Faulty HLA.	Remove the cylinder head cover and press down on the HLA by hand. If it move, replace HLA. ⚠ ***CAUTION*** ***Be careful of hot HLA.***

G00965750

Fig. 112: Problem & Possible Cause Table
Courtesy of HYUNDAI MOTOR CO.

TIMING CHAIN

Check the bushing and plate of timing chain for wear. Replace if wear is severe.



G00965751

Fig. 113: Identifying Timing Chain
Courtesy of HYUNDAI MOTOR CO.

REASSEMBLY

1. Install the HLA.
2. Align the camshaft timing chain with intake timing chain sprocket and exhaust timing chain sprocket as shown.

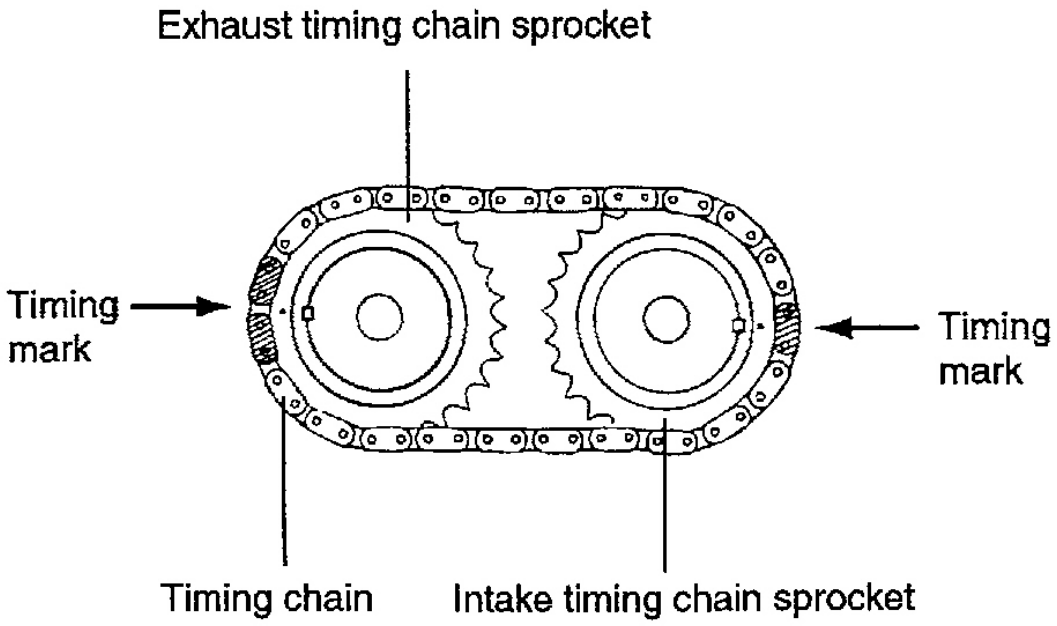


Fig. 114: Identifying Timing Marks
Courtesy of HYUNDAI MOTOR CO.

3. Install the camshaft after lubricating the camshaft journals with engine oil.
4. Install the bearing caps. The markings on the caps are for intake/exhaust identification.

   I: Intake camshaft

   E: Exhaust camshaft

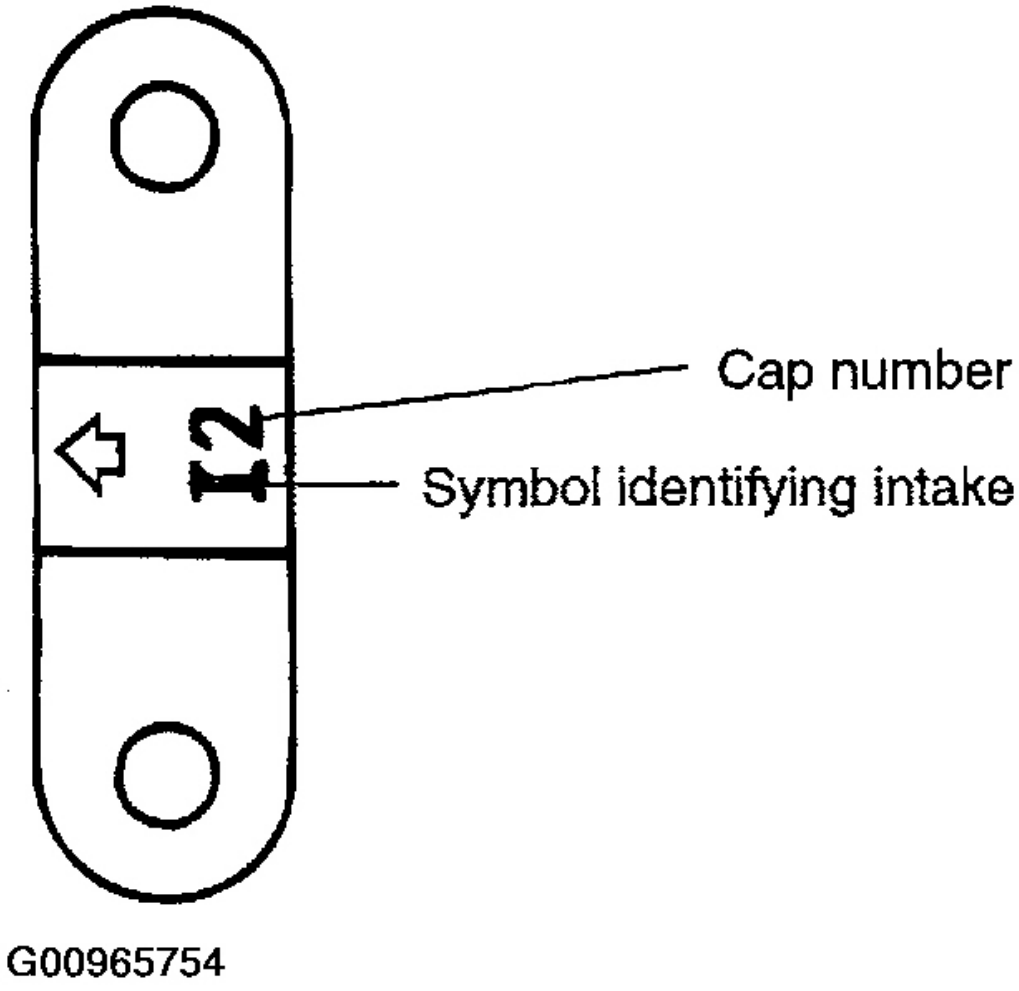


Fig. 115: Identifying Bearing Cap
Courtesy of HYUNDAI MOTOR CO.

5. Tighten the bearing caps to the specified torque in two or three steps as shown.

Tightening torque

Bearing cap bolt:

12 ~ 14 Nm (120 ~ 140 kg.cm, 9 ~ 10 lb.ft)

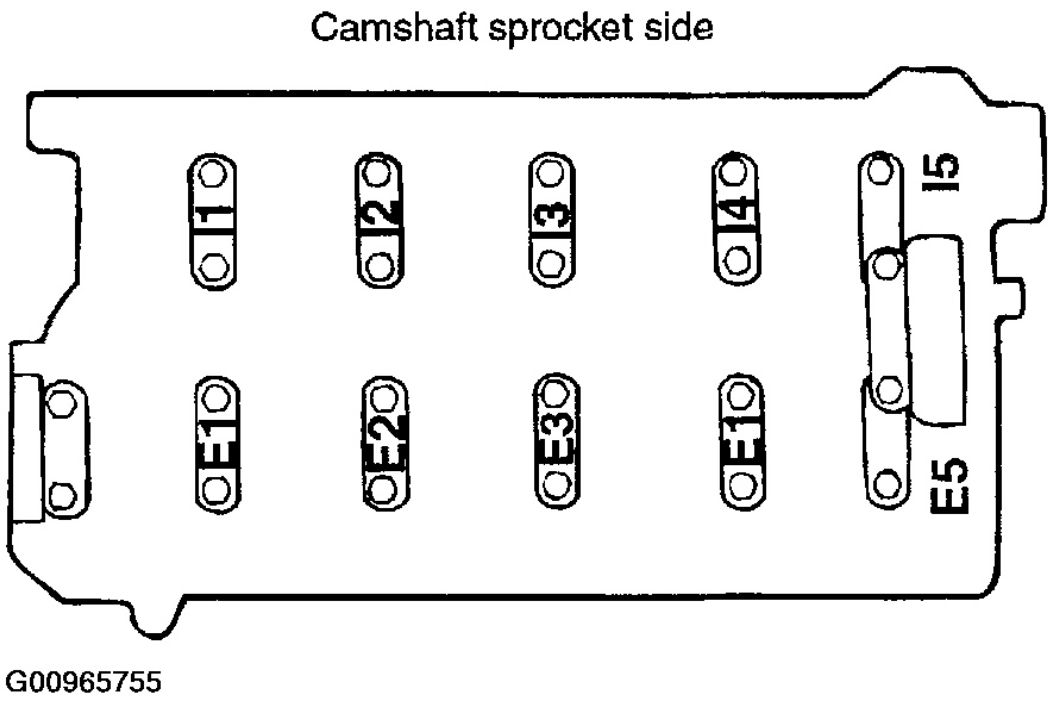


Fig. 116: View Of Bearing Caps Installed
Courtesy of HYUNDAI MOTOR CO.

6. Using the special tool, camshaft oil seal installer (09221-21000), press fit the camshaft oil seal. Be sure to apply engine oil to the oil seal lip. Insert the oil seal along the camshaft front end and install by driving the installer with a hammer until the oil seal is fully seated.

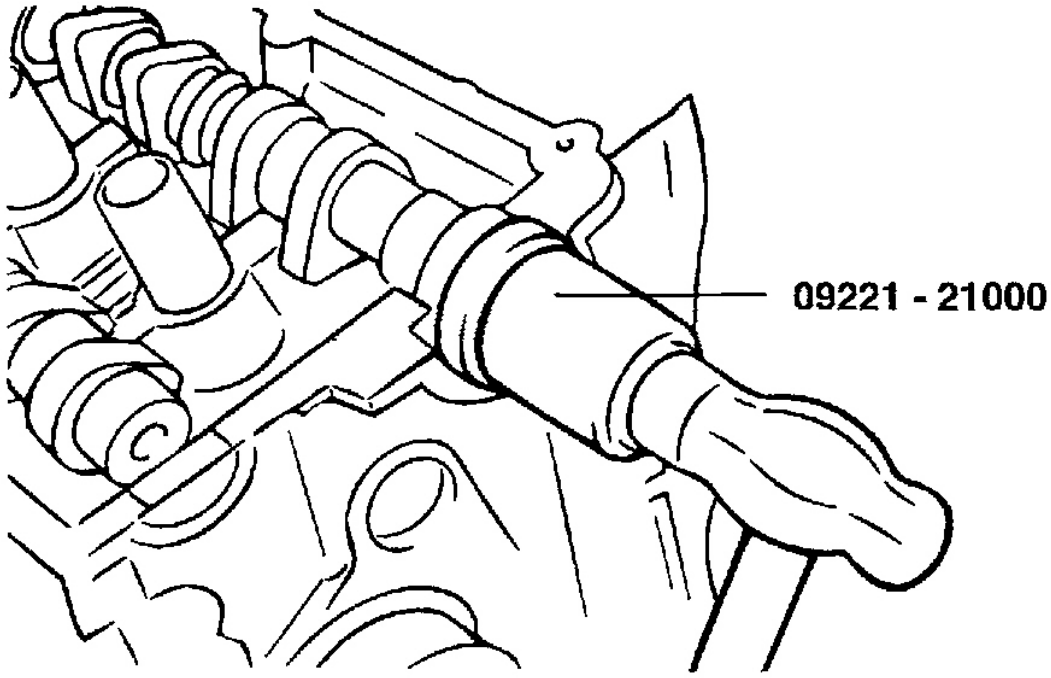


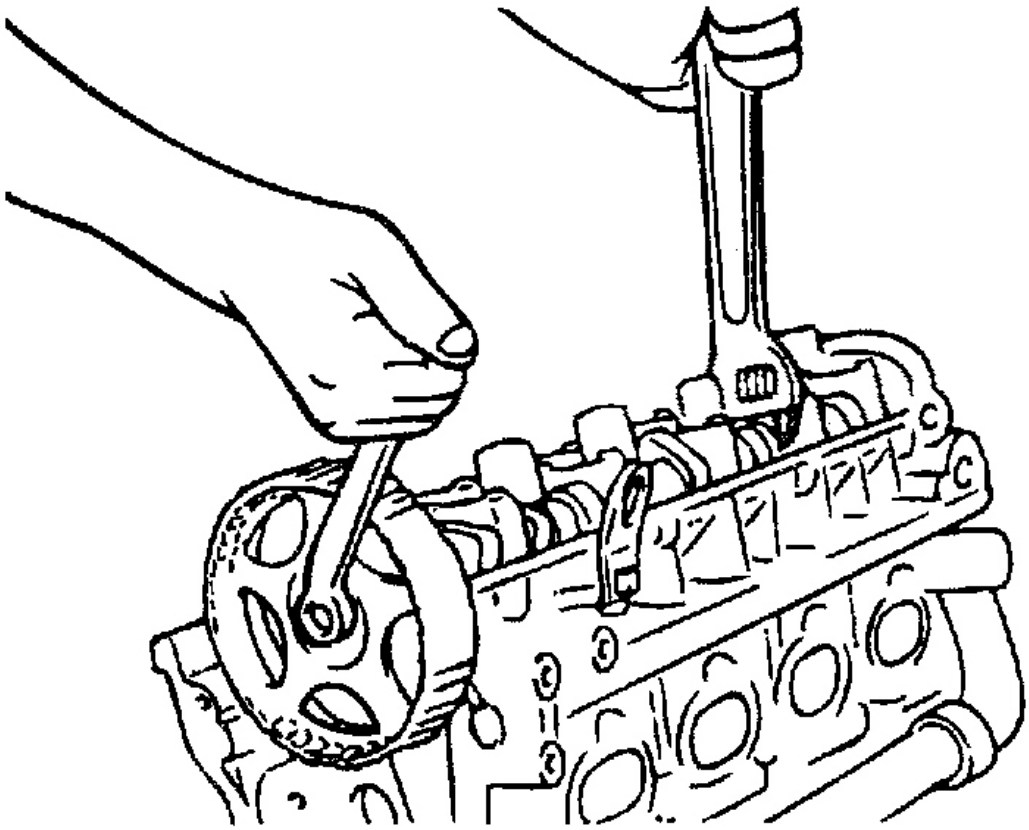
Fig. 117: Installing Camshaft Oil Seal
Courtesy of HYUNDAI MOTOR CO.

7. Install the camshaft sprocket bolts to the specified torque.

   Tightening torque

   Camshaft sprocket bolt:

   80 ~ 100 N.m (800 ~ 1000 kg.cm, 59 ~ 74 lb.ft)



G00965757

Fig. 118: Installing Cam Shaft Sprocket
Courtesy of HYUNDAI MOTOR CO.

8. Align the camshaft sprocket and crankshaft sprocket timing marks. Place the piston in the No. 1 cylinder to top dead center on the compression stroke. Refer to **TIMING BELT**.
9. Install the cylinder head cover.

   Tightening torque

   Cylinder head cover bolts:

   8 ~ 10 N.m (80 ~ 100 kg.cm, 6 ~ 7 lb.ft)
10. Install the spark plug cables, ignition coil assembly and cylinder head center cover.
11. Install the timing belt and then tighten the timing belt tensioner pulley.
12. Install the timing belt cover.

    Tightening torque

    Timing belt cover: 8 ~ 10 N.m (80 ~ 100 kg.cm, 6 ~ 7 lb.ft)

CRANK SHAFT

COMPONENTS

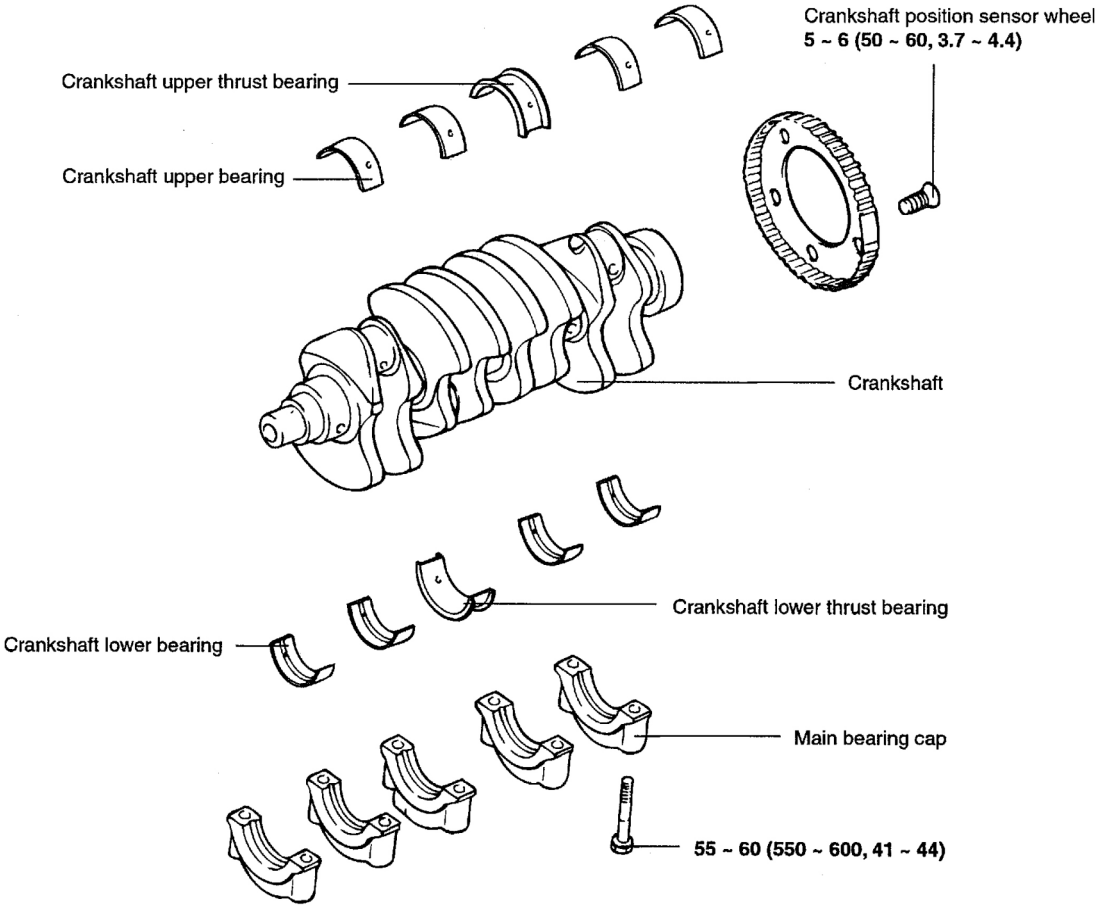


Fig. 119: Crank Shaft Components
Courtesy of HYUNDAI MOTOR CO.

DISASSEMBLY

1. Remove the following:
   - Timing belt. Refer to **TIMING BELT**.
   - Front case.
   - Flywheel. Refer to **FLY WHEEL**.
   - Cylinder head assembly. Refer to **CYLINDER HEAD**.
   - Oil pan.
2. Remove the rear plate and the rear oil seal.

3. Remove the connecting rod caps.
4. Remove the main bearing caps and remove the crankshaft.
5. Remove the crankshaft position sensor wheel.

CAUTION: Mark the main bearing caps to permit reassembly in the original position and direction.

INSPECTION

CRANKSHAFT

1. Check the crankshaft journals and pins for damage, uneven wear, and cracks. Also check oil holes for clogging. Correct or replace any defective part.
2. Inspect the crankshaft journal for taper and out - of - round.

   Standard value

   Crankshaft journal OD: 50 mm (1.9685 in.)

   Crankshaft pin OD: 45 mm (1.7717 in.)

   Crankshaft journal, pin out-of-roundness and taper:

   0.005 mm (0.0002 in.) or less

MAIN BEARINGS & CONNECTING ROD BEARINGS

Visually inspect each bearing for peeling, melting, seizure, and improper contact. Replace the defective bearings.

OIL CLEARANCE MEASUREMENT

1. Measure the diameter of the crankshaft journal and pin.
2. Measure the diameter of the crankshaft bore and connecting rod bore.
3. Measure the thickness of the crankshaft bearing and connecting rod bearing.
4. Measure the clearance by the value that subtract the diameter of journal and pin and the thickness of bearing from the diameter of bore.

   Connecting rod bearing oil clearance:

   0.018 ~ 0.036 mm (0.0007 ~ 0.0014 in.)

   Crankshaft main bearing oil clearance

   No. 1,2,4,5: 0.022 ~ 0.040 mm (0.0009 ~ 0.0018 in.)

   No. 3: 0.028 ~ 0.046 mm (0.0011 ~ 0.0018 in.)

OIL SEAL

Check front and rear oil seals for damage or wear. Replace any seal that is defective.

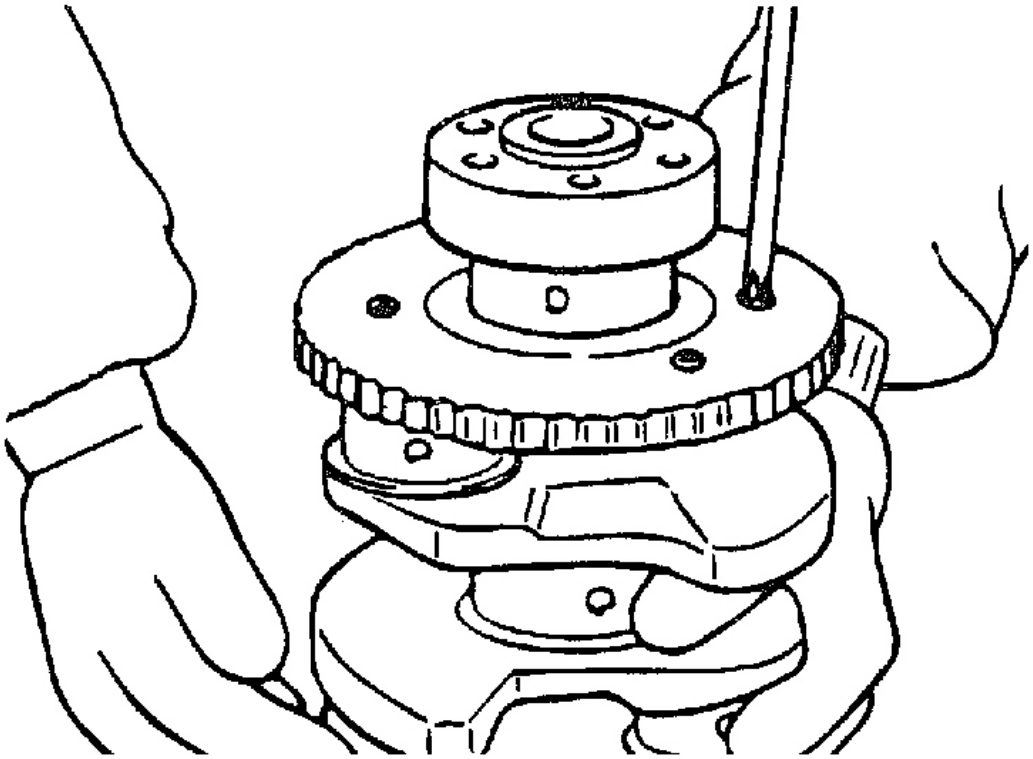
CRANKSHAFT SENSOR WHEEL

1. Remove the sensor wheel.
2. Check the sensor wheel for damage, cracks and wear, and replace if necessary.
3. Check the clearance between the sensor wheel and the crank position sensor with a depth gage.

   Standard value

   Clearance between sensor wheel and crank position

   Sensor: 0.5 ~ 1.1 mm (0.020 ~ 0.043 in.)



G00965760

Fig. 120: Removing Crankshaft Sensor Wheel
Courtesy of HYUNDAI MOTOR CO.

NOTE:

1. **Measure the depth of the top of sensor wheel tooth and the cylinder block mounting block.**
2. **Measure the difference between sensor length and depth.**
3. **Sensor length is the distance between the end of the sensor and the inner point of the contacting face.**

REPLACEMENT

1. Check the cylinder block crankshaft bore size code.

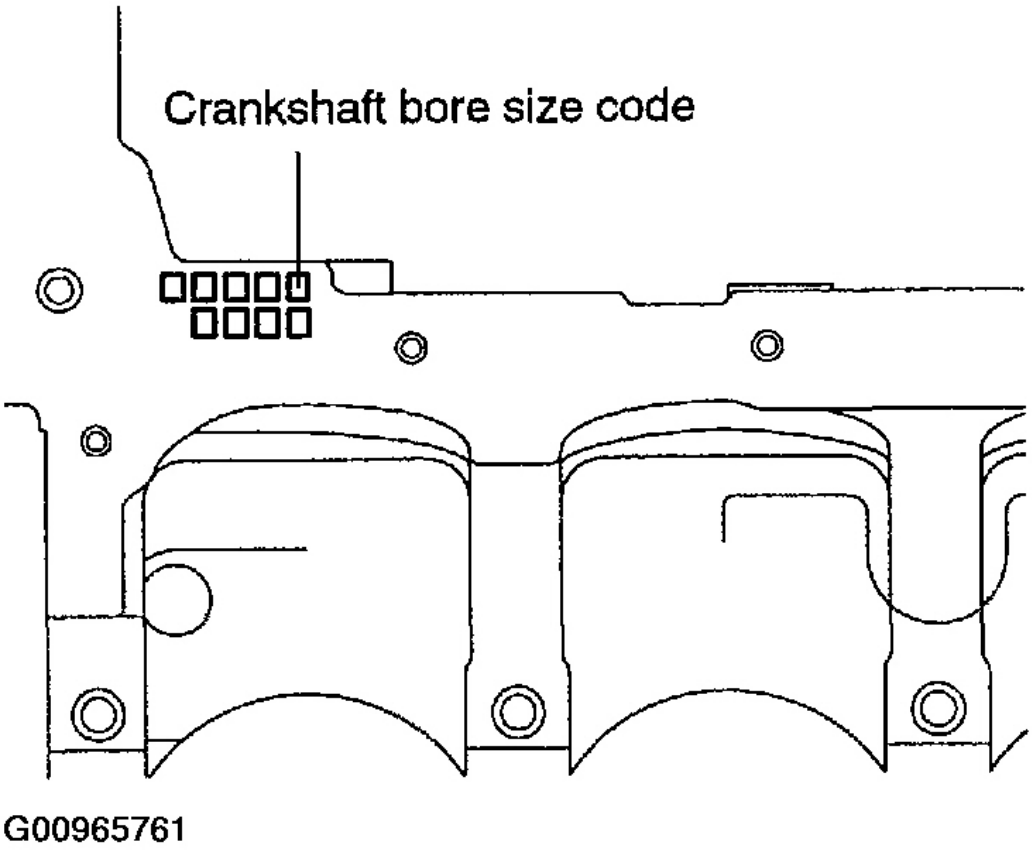


Fig. 121: Identifying Cylinder Block Crankshaft Bore Size Code
Courtesy of HYUNDAI MOTOR CO.

NOTE: Record the cylinder block crankshaft bore size code letters on cylinder block as shown.
Reading order is from left to right with front crankshaft bore size code shown first.

Class	Crankshaft bore diameter	Size code
a	54~54.006mm (2.1259~2.1262in.)	A
b	54.006~54.012mm (2.1262~2.1264in.)	B
c	54.012~54.016mm (2.1264~2.1266in.)	C

G00965762

Fig. 122: Crankshaft Bore Diameter Table
Courtesy of HYUNDAI MOTOR CO.

2. Check the crankshaft main journal size code.

NOTE: **Record the main journal size code letters on the crankshaft balance weight.**
Reading order is from left to right as shown, with No. 1 main journal size code shown first.

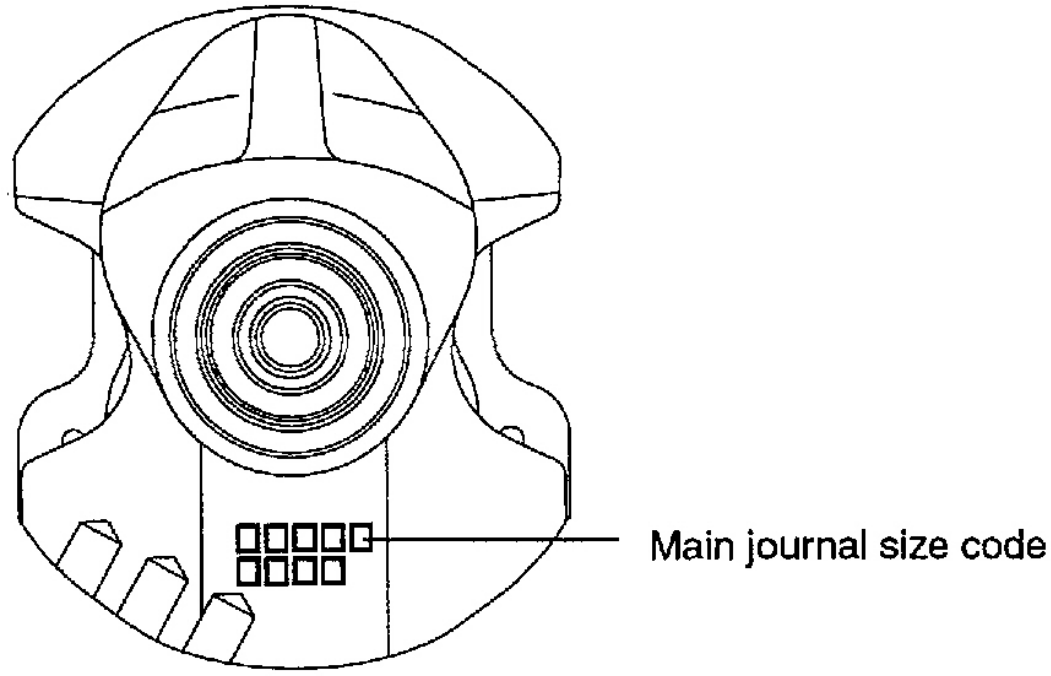


Fig. 123: Identifying Crankshaft Main Journal Size Code
Courtesy of HYUNDAI MOTOR CO.

Class	Main journal diameter	Size code
I	49.968 ~ 49.962 mm (1.9672 ~ 1.9670 in.)	A
II	49.962 ~ 49.956 mm (1.9670 ~ 1.9667 in.)	b
III	49.956 ~ 49.950 mm (1.9667 ~ 1.9665 in.)	c

G00965764

Fig. 124: Crankshaft Main Journal Diameter
Courtesy of HYUNDAI MOTOR CO.

Color	Main journal bearing thinckness
Yellow	2.002 ~ 2.005 mm (0.0788 ~ 0.0789 in.)
Green	2.005 ~ 2.008 mm (0.0789 ~ 0.0790 in.)
No color	2.008 ~ 2.011 mm (0.0790 ~ 0.0791 in.)
Black	2.011 ~ 2.014 mm (0.0791 ~ 0.0793 in.)
Blue	2.014 ~ 2.017 mm (0.0793 ~ 0.0794 in.)

G00965765

Fig. 125: Main Journal Bearing Thickness Table No. 1, 2, 4, 5 (Main Bearing)
Courtesy of HYUNDAI MOTOR CO.

Color	Main journal bearing thickness
Yellow	1.999 ~ 2.002 mm (0.0787 ~ 0.0788 in.)
Green	2.002 ~ 2.005 mm (0.0788 ~ 0.0789 in.)
No color	2.005 ~ 2.008 mm (0.0788 ~ 0.0790 in.)
Black	2.008 ~ 2.011 mm (0.0790 ~ 0.0791 in.)
Blue	2.011 ~ 2.014 mm (0.0791 ~ 0.0793 in.)

G00965766

Fig. 126: Main Journal Bearing Thickness Table No. 3 (Center Bearing)
Courtesy of HYUNDAI MOTOR CO.

3. Choose proper main journal bearing in table.

REASSEMBLY

1. Install the upper main bearing inserts in the cylinder block.

   When reusing the main bearings, remember to install them by referring to the location marks made at the time of disassembly.

2. Install the crankshaft. Apply engine oil to the journals.

3. Install bearing caps and tighten cap bolts to the specified torque in the following sequence; center, No. 2, No. 4, front, and rear caps.

   Cap bolts should be tightened evenly in 2 to 3 stages before they are tightened to the specified torque.

   The caps should be installed with the arrow mark directed toward the crank pulley side of engine. Cap numbers must be correct.

   Tightening torque

   Main bearing cap bolt: 55 ~ 60 Nm (550 ~ 600 kg.cm, 41 ~ 44 lb.ft)
   Connecting rod cap bolt: 32 ~ 35 Nm (320 ~ 350 kg.cm, 24 ~ 26 lb.ft)

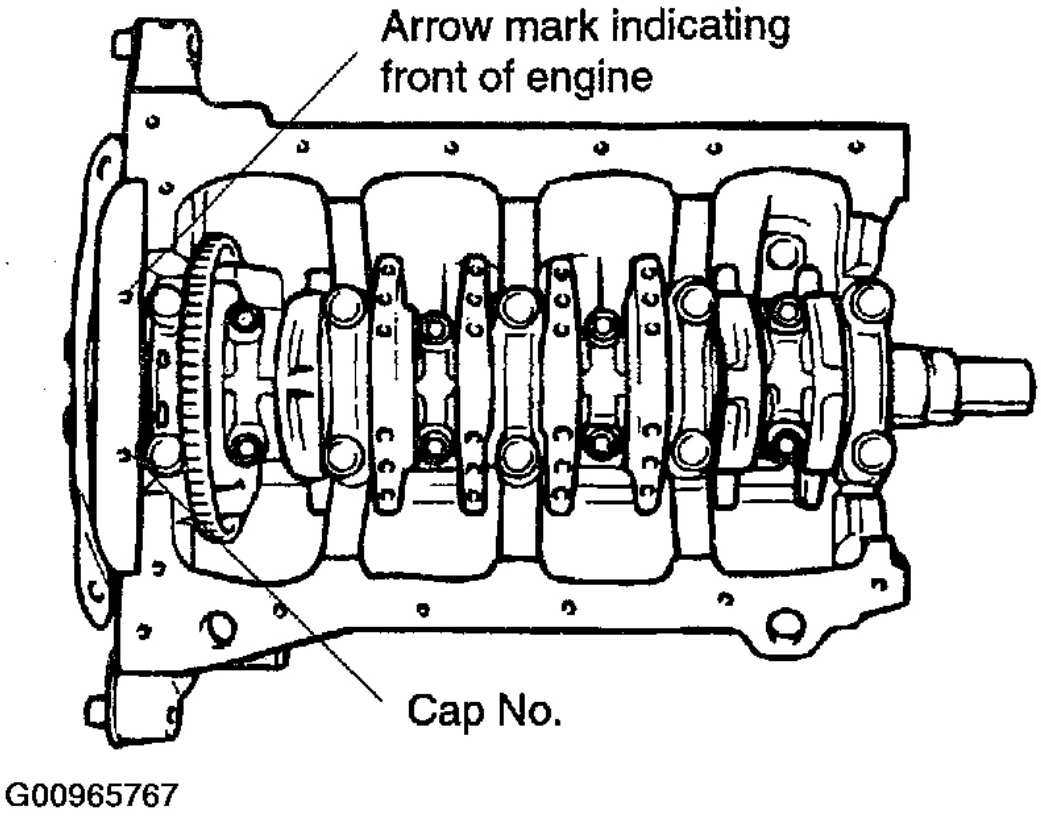


Fig. 127: Identifying Front Of Engine
Courtesy of HYUNDAI MOTOR CO.

4. Make certain that the crankshaft turns freely and has the proper clearance between the center main bearing thrust flange and the connecting rod big end bearing.

Standard value - Crankshaft end play: 0.05-0.175 mm (0.0019-0.0068 in.)

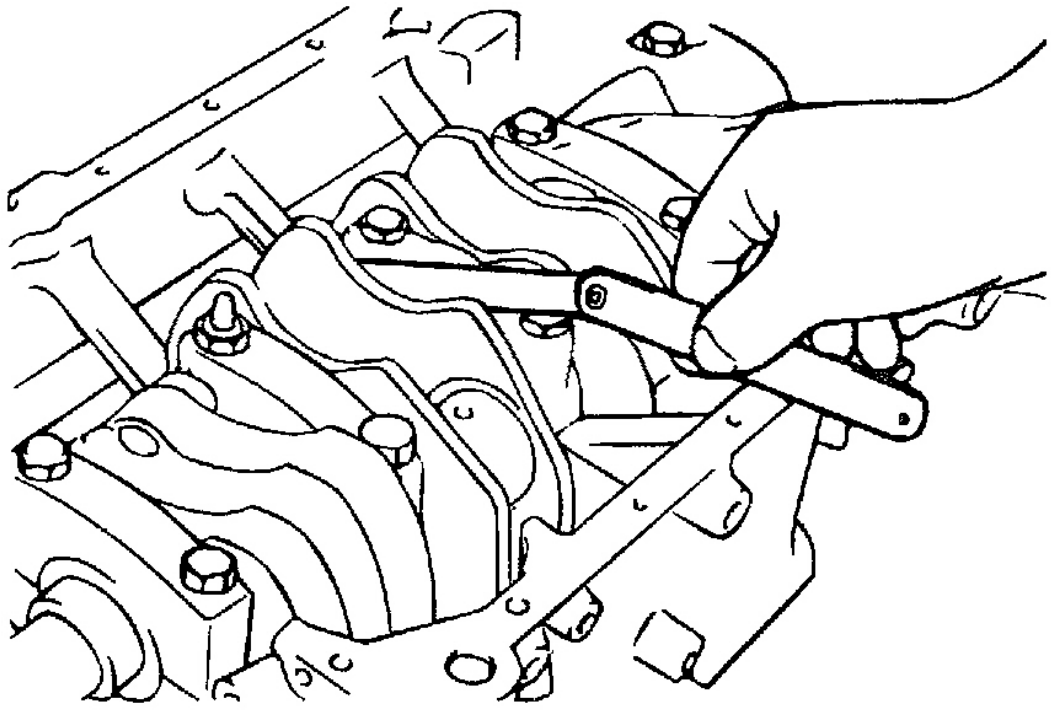


Fig. 128: Checking Clearance Between Center Main Bearing Thrust Flange & Connecting Rod Big End Bearing
Courtesy of HYUNDAI MOTOR CO.

5. Install the oil seal in the crankshaft rear oil seal case. Use the Special Tool, Crankshaft Rear Oil Seal Installer (09231 - 21000) as shown. Press fit the oil seal all the way in, being careful not to misalign it.

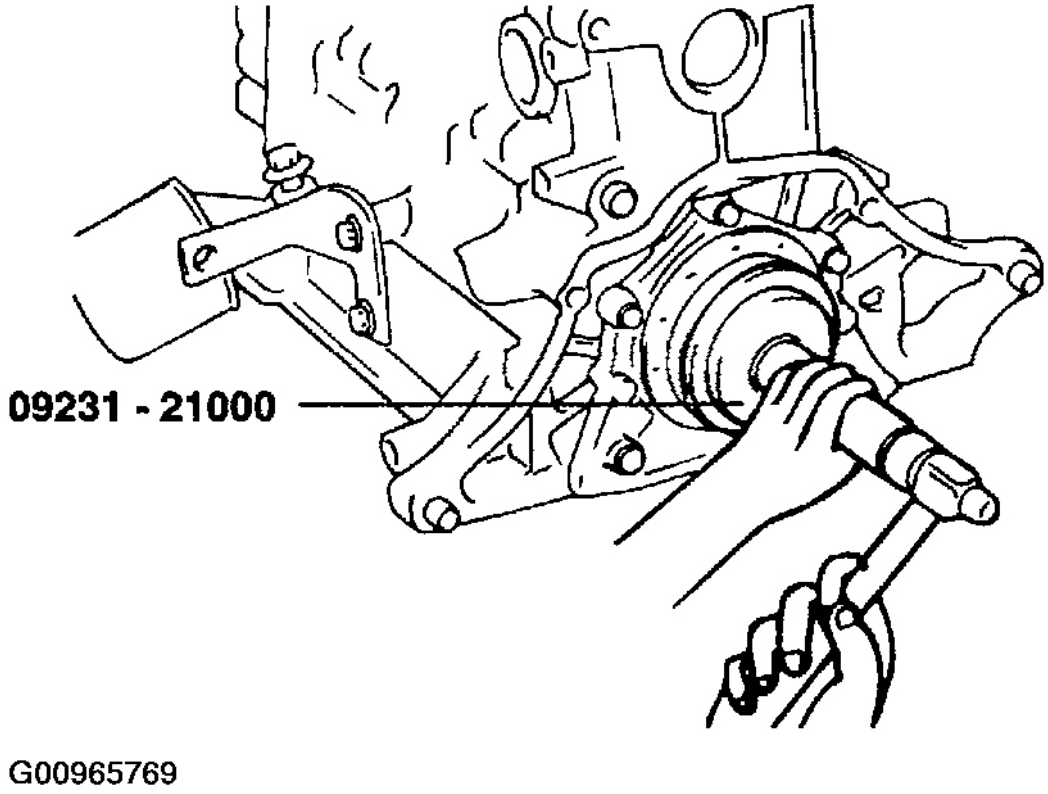


Fig. 129: Installing Crankshaft Rear Oil Seal
Courtesy of HYUNDAI MOTOR CO.

6. Install the rear plate and tighten the bolts.
7. Install the connecting rod caps.
8. Install the flywheel, front case, oil pan and timing belt.

FLY WHEEL

COMPONENTS

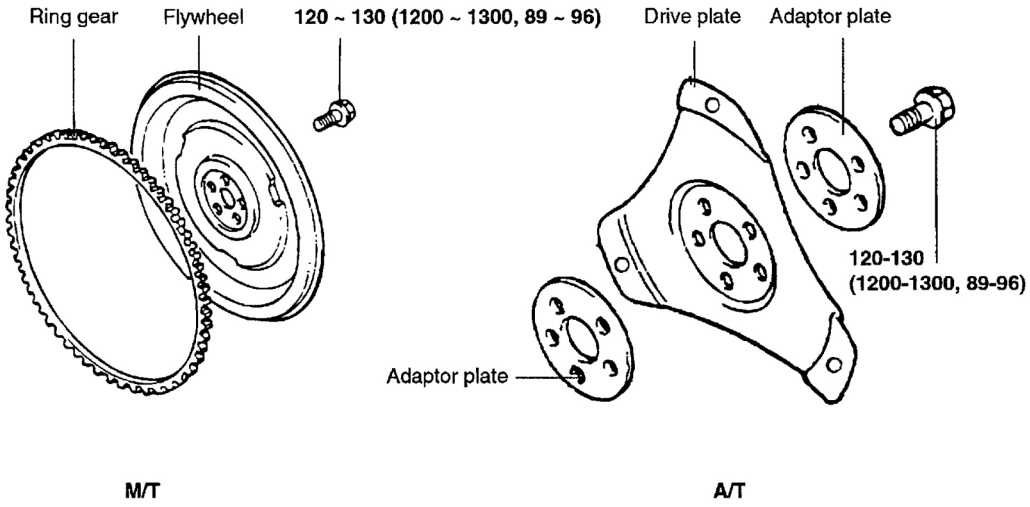


Fig. 130: Fly Wheel & Drive Plate Components
Courtesy of HYUNDAI MOTOR CO.

M/T: Manual Transmission Vehicles

A/T: Automatic Transmission Vehicles

DISASSEMBLY

1. Remove the Transmission and clutch.
2. Remove the flywheel.

INSPECTION

1. Check the clutch disc contacting surface of the flywheel for damage and wear. Replace the flywheel if excessively damaged or worn.
2. Check the clutch disc contacting surface of the flywheel for runout.
   Standard value
   Flywheel run - out: 0.1 mm (0.0039 in.)
3. Check the ring gear for damage, cracks, and wear, and replace if necessary.

REASSEMBLY

Install the flywheel assembly and tighten the bolts to the specified torque.

Tightening torque

Flywheel bolt: 120 ~ 130 Nm (1200 ~ 1300 kg.cm, 89 ~ 96 lb.ft)

PISTON

COMPONENTS

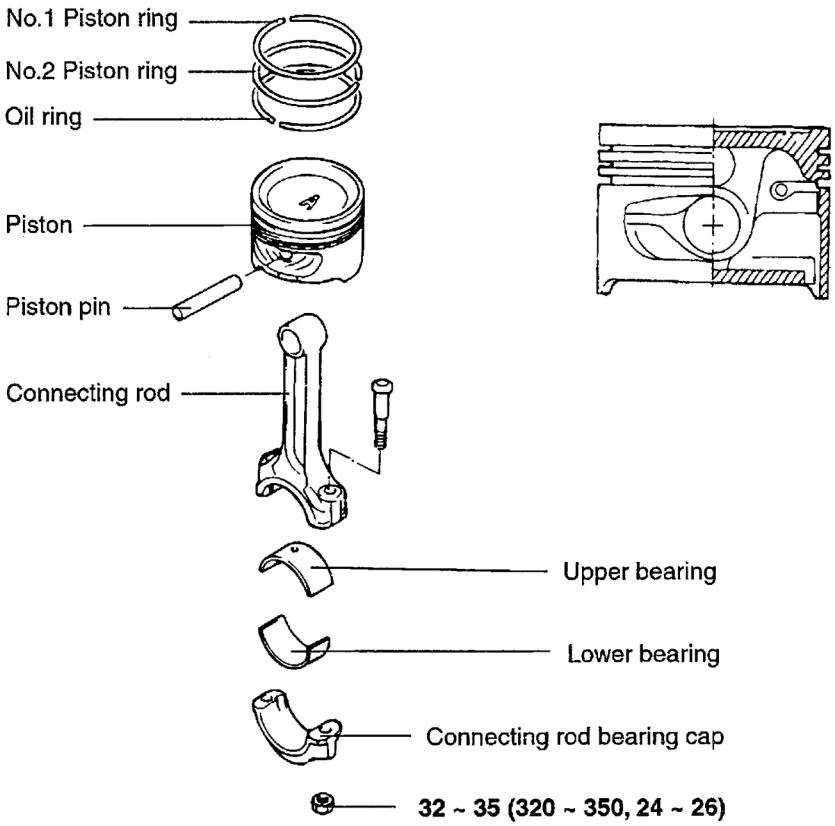


Fig. 131: Piston Components
Courtesy of HYUNDAI MOTOR CO.

DISASSEMBLY

CONNECTING ROD CAP

CAUTION: Keep the bearings in order with their corresponding connecting rods (according to cylinder numbers) for proper reassembly.

1. Remove the connecting rod cap bolts, then remove the caps and the big end lower bearing.
2. Push each piston connecting rod assembly toward the top of the cylinder.

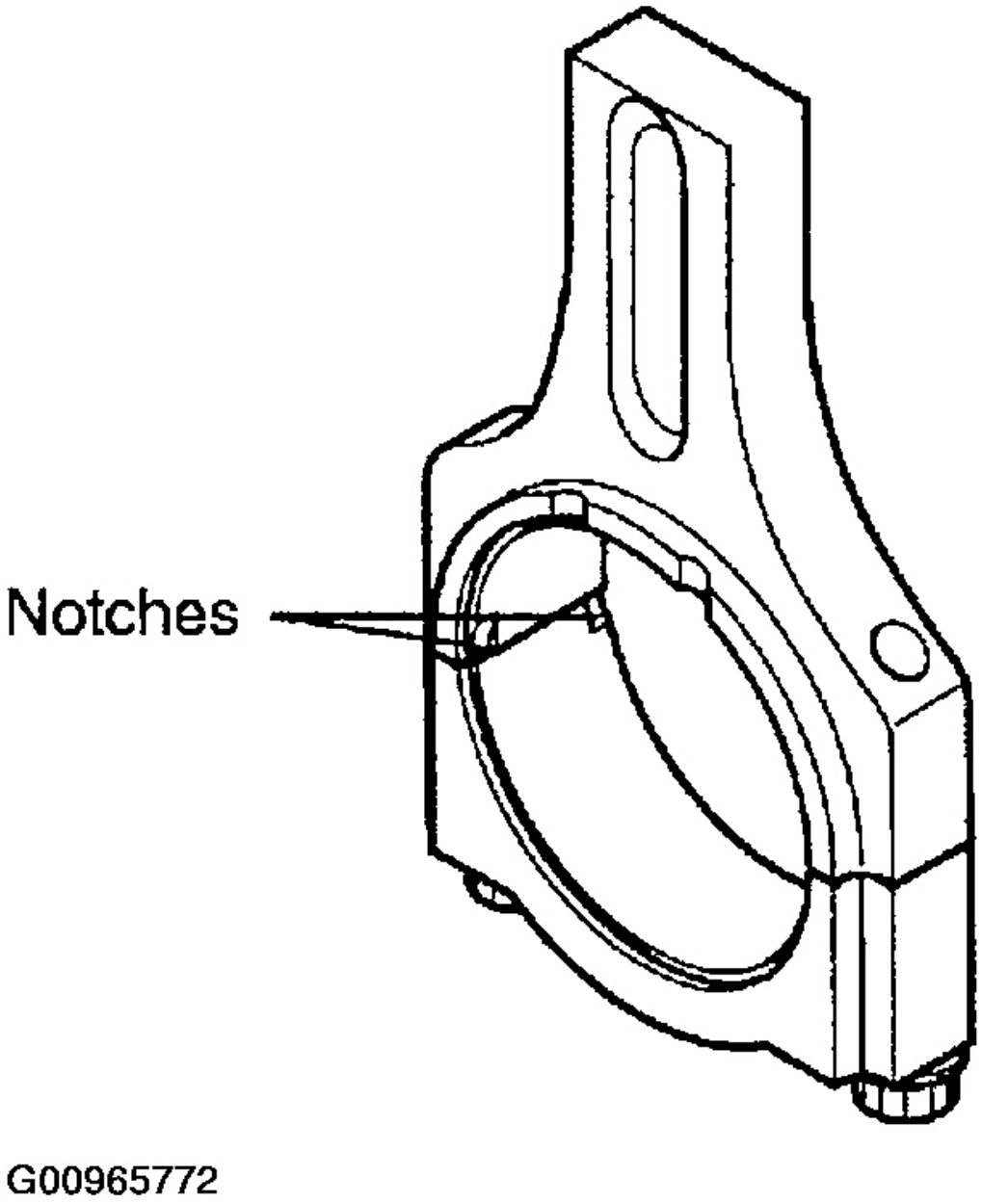


Fig. 132: Identifying Connecting Rod Bearing Notches
Courtesy of HYUNDAI MOTOR CO.

DISASSEMBLY & REASSEMBLY OF THE PISTON PIN

1. Using the special tools (09234-33001) and (09234-33002), disassemble and reassemble the piston and

connecting rod.

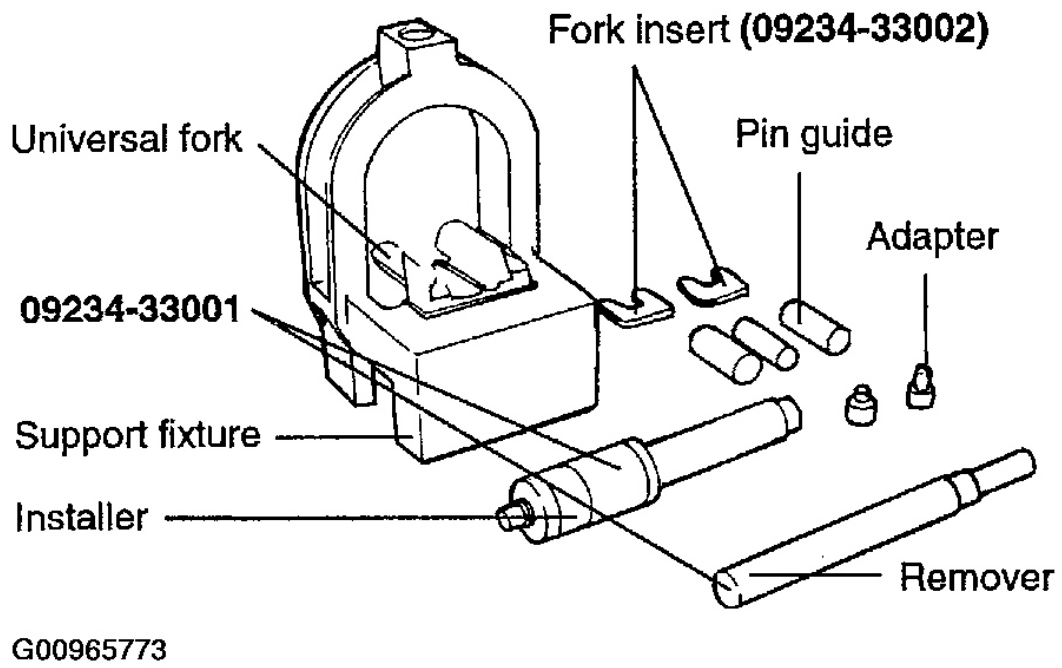


Fig. 133: Identifying Special Tools
Courtesy of HYUNDAI MOTOR CO.

2. The piston pin is press fit into the rod little end, and the piston floats on the pin.
3. The tool consists of a support fixture with fork inserts, guides, adapters, an installer and a remover. The piston is supported in the support fixture while the pin is being installed or removed. Guides help position the pin as it is installed or removed, while the rod is supported by fork inserts.
4. To remove the pin from the piston, place the piston in the support fixture with the rod resting on the fork inserts. Pass the remove tool through the top of the support fixture and use it to press out the pin.

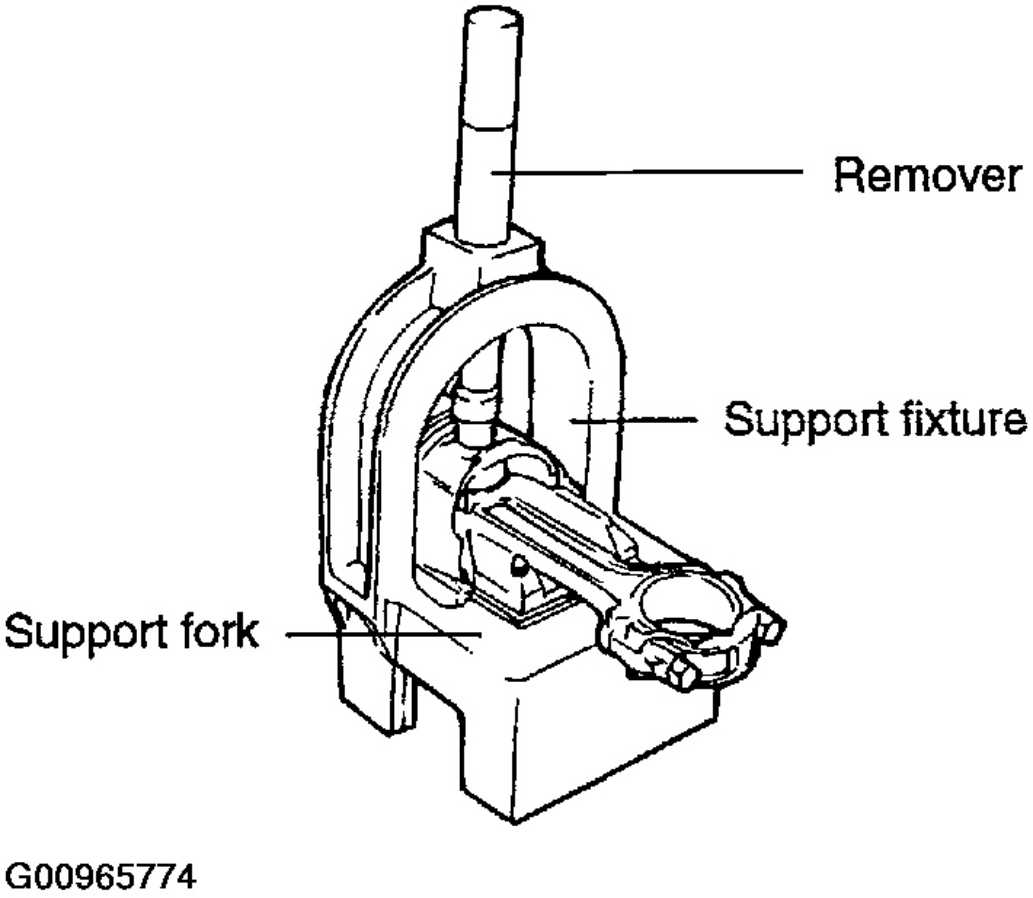


Fig. 134: Removing Piston Pin
Courtesy of HYUNDAI MOTOR CO.

5. To install a new pin, the proper fork inserts must be in place to support the rod.
6. Position the rod inside the piston. Insert the proper pin guide through one side of the piston and through the rod.

   Hand tap the pin guide so it is held by the piston. Insert the new pin into the piston from the other side and set the assembly into the support fixture with the pin guide facing down.

NOTE: The pin guide should be centered on the connecting rod through the piston. If assembled correctly, the pin guide will sit exactly under the center of the hole in the tool's arch, and rest evenly on the fork inserts. If the wrong size pin guide is used, the piston and pin will not line up with the support fixture.

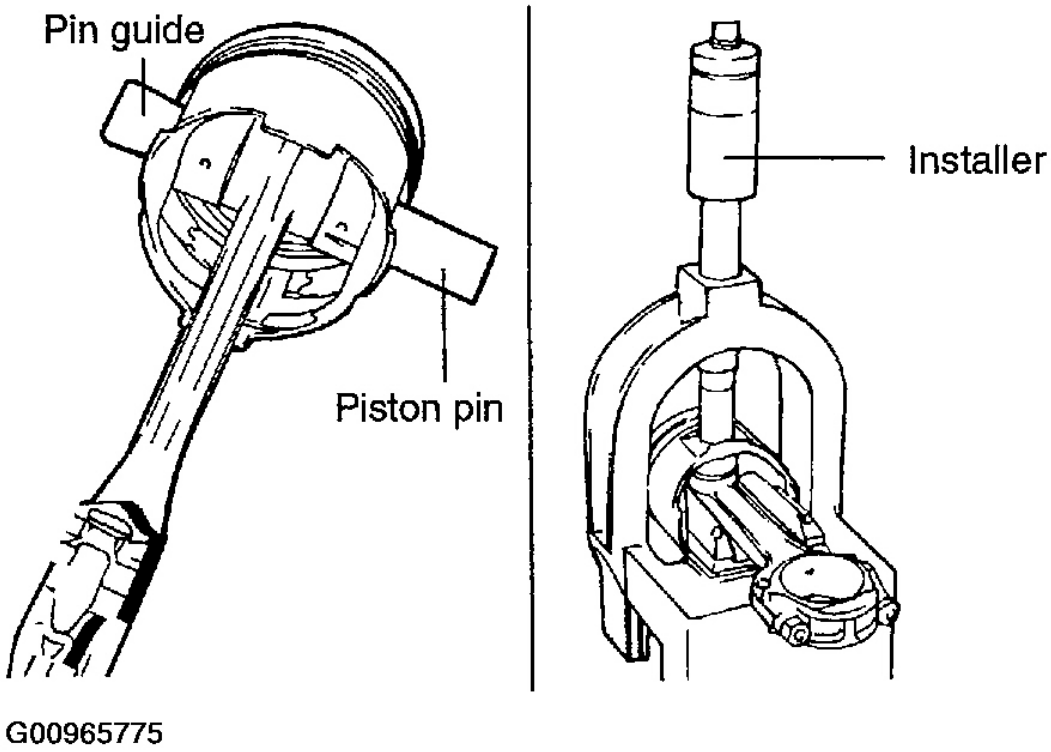


Fig. 135: Installing Piston Pin
Courtesy of HYUNDAI MOTOR CO.

7. Insert the installer tool through the hole in the arch of the support fixture and use an hydraulic press to force the piston pin through the rod little end. Continue pressing until the pin guide falls free and the installer tool seats against the top of the arch.

CAUTION: Do not exceed 1250 +/- 500 kg (2765 +/- 1102 lb) of force when the installing tool seats against the top of the arch.

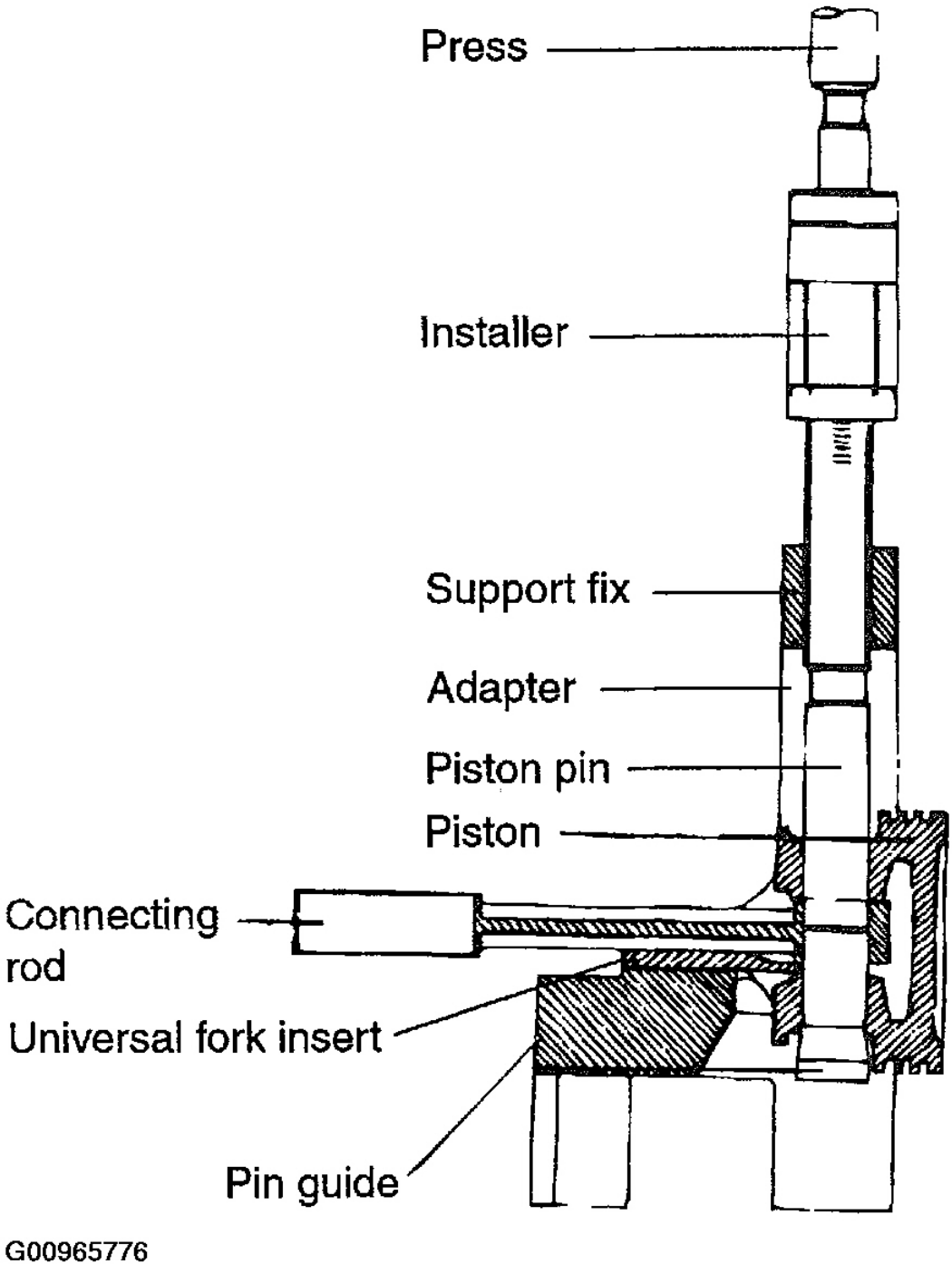


Fig. 136: Pressing Piston Pin Into Piston Assembly
Courtesy of HYUNDAI MOTOR CO.

INSPECTION

PISTONS & PISTON PINS

1. Check each piston for scuffing, scoring, wear and other defects. Replace any piston that is defective.
2. Check each piston ring for breakage, damage and abnormal wear. Replace the defective rings.

   When the piston requires replacement, its rings should also be replaced.

3. Check that the piston pin fits in the piston pin hole. Replace any piston and pin assembly that is defective. The piston pin must be smoothly pressed by hand into the pin hole (at room temperature).

PISTON RINGS

1. Measure the piston ring side clearance. If the measured value exceeds the service limit, insert a new ring in the ring groove to measure the side clearance. If the clearance still exceeds the service limit, replace the piston and rings together. If it is less than the service limit, replace the piston rings only.

   Piston ring side clearance

   No. 1: 0.04-0.085mm (0.0016-0.0033 in.)
   No. 2: 0.04-0.085mm (0.0016-0.0033 in.)

   Limit

   No. 1: 0.1mm (0.004 in.)
   No. 2: 0.1mm (0.004 in.)
2. To measure the piston ring end gap, insert a piston ring into the cylinder bore. Position the ring at right angles in the cylinder wall by gently pressing it down with a piston. Measure the gap with a feeler gauge. If the gap exceeds the service limit, replace the piston ring.

   Piston ring end gap

   [Standard dimensions]

   No. 1: 0.20-0.35mm (0.0079-0.0138 in.)
   No. 2: 0.37-0.52mm (0.0146-0.020 in.)
   Oil ring side rail: 0.2-0.7mm (0.0079-0.0276)

   [Limit]

   No. 1, No. 2: 1.0mm (0.039 in.)
   Oil ring side rail: 1.0mm (0.039 in.)

   When replacing the ring without correcting the cylinder bore, check the gap with the ring situated at the low part of cylinder that is less worn out.

PISTON RING SERVICE SIZE & MARK

Standard	None
0.25 mm (0.010 in.) O.S	25
0.50 mm (0.020 in.) O.S	50
0.75 mm (0.030 in.) O.S	75
1.00 mm (0.039 in.) O.S	100

G00965777

Fig. 137: Piston Ring Service Size & Mark Table
Courtesy of HYUNDAI MOTOR CO.

NOTE: The mark can be found on the upper side of the ring next to the end.

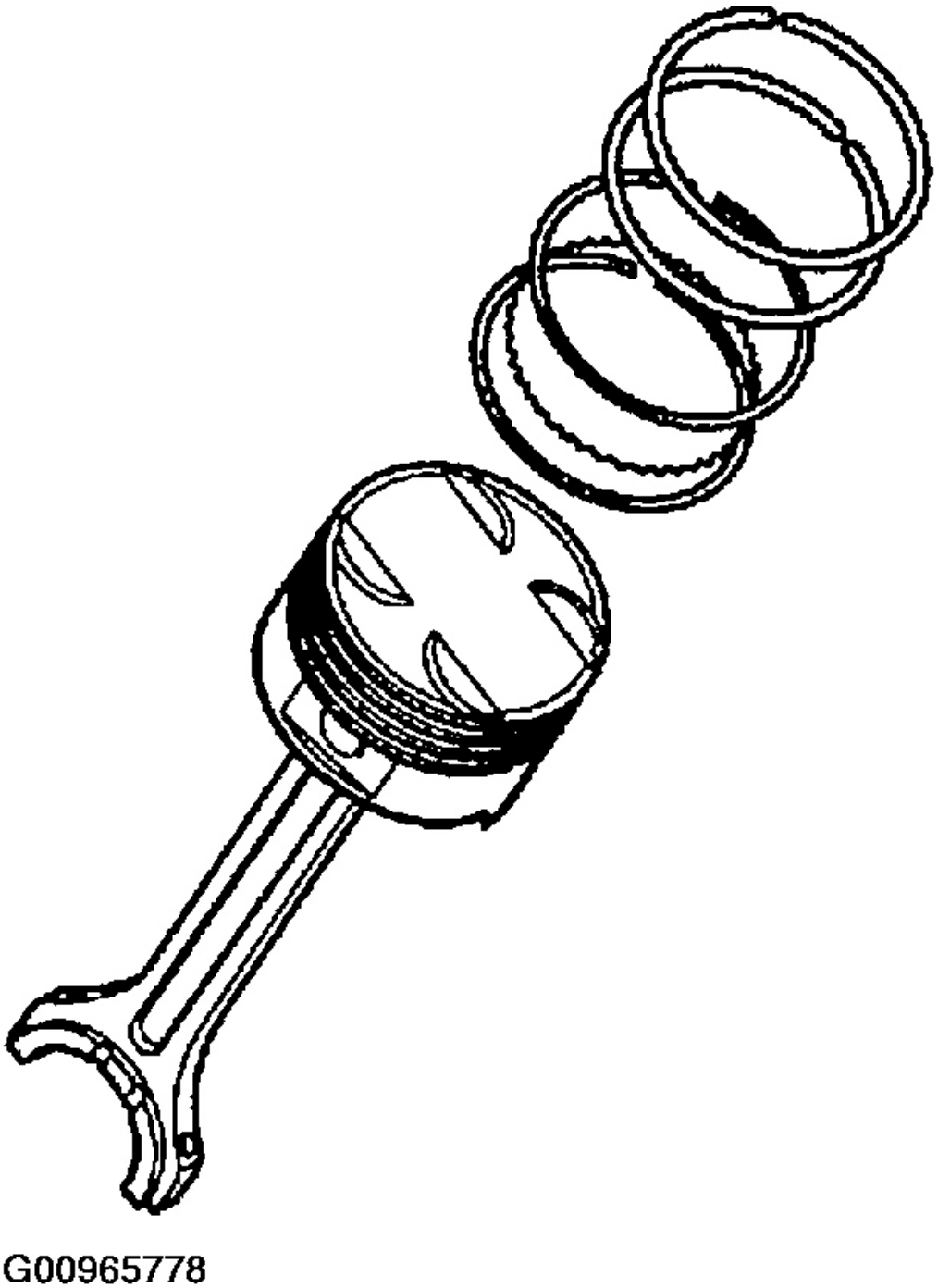


Fig. 138: View Of Piston & Rings
Courtesy of HYUNDAI MOTOR CO.

CONNECTING RODS

1. When the connecting rod cap is installed, make sure that the cylinder numbers, marked on rod end cap at disassembly, match.

   When a new connecting rod is installed, make sure that the notches holding the bearing in place are on the same side.

2. Replace the connecting rod if it is damaged at either end of the thrust faces. If it has a stratified wear in, or if the surface of the inside diameter of the small end is severely rough, replace the rod.

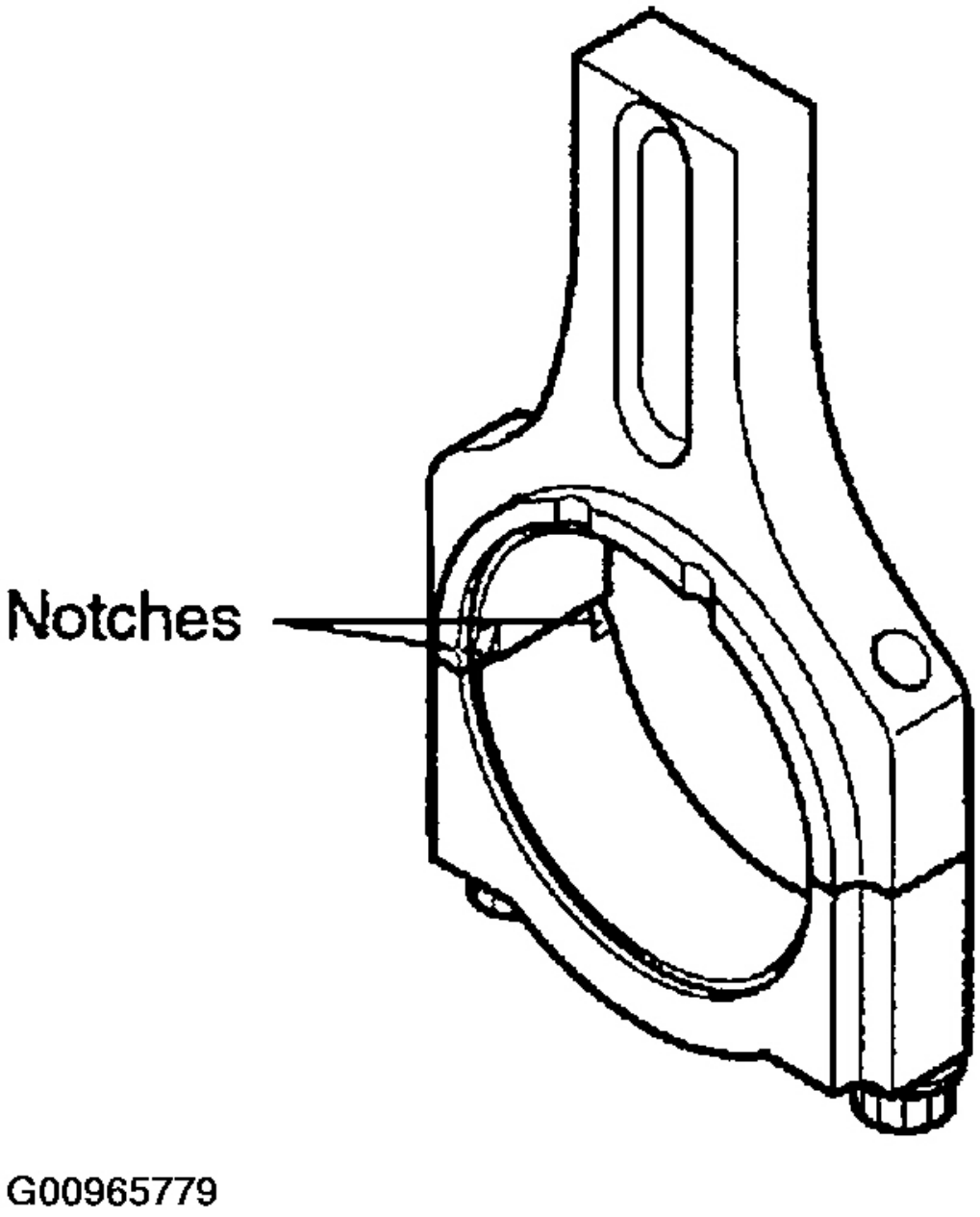


Fig. 139: Identifying Connecting Rod Bearing Notches
Courtesy of HYUNDAI MOTOR CO.

REPLACEMENT

1. Check the cylinder bore size code on the cylinder block bottom face.

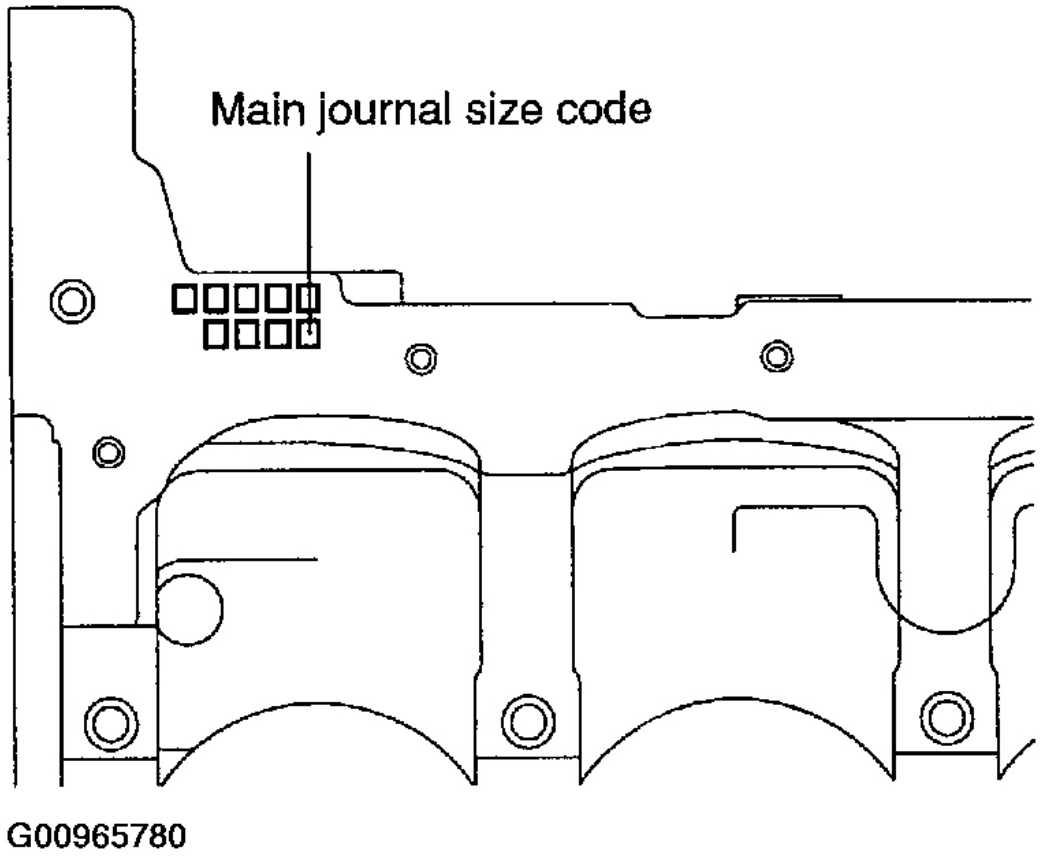


Fig. 140: Identifying Cylinder Bore Size Code
Courtesy of HYUNDAI MOTOR CO.

Class	Cylinder bore inner diameter	Size code
A	76.5~76.51mm (3.0118~3.0121in.)	A
B	76.51~76.52mm (3.0121~3.0126in.)	B
C	76.52~76.53mm (3.0126~3.0129in.)	C

G00965781

Fig. 141: Cylinder Bore Inner Diameter Table
Courtesy of HYUNDAI MOTOR CO.

2. Check the piston size code on the piston top face.

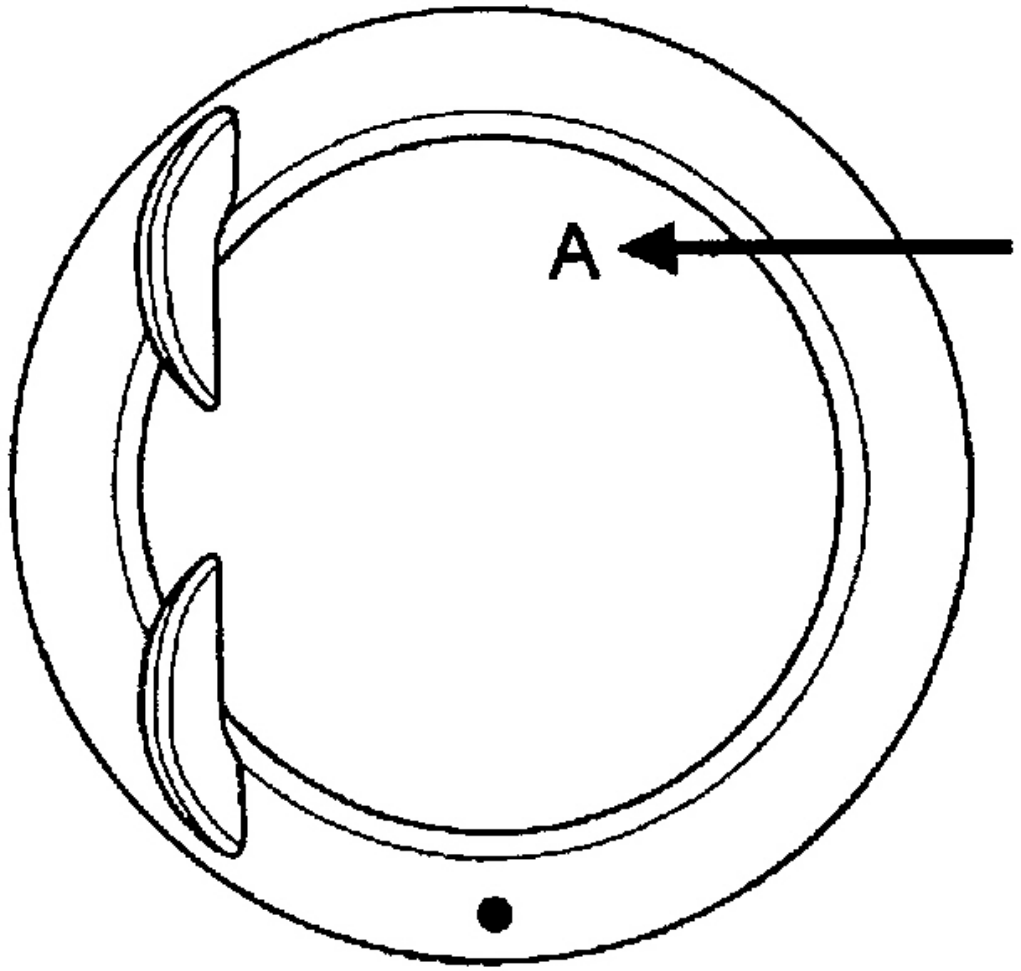


Fig. 142: Identifying Piston Size Code
Courtesy of HYUNDAI MOTOR CO.

NOTE: Stamp the grade mark of basic diameter with rubber stamp.

Class	Piston outer diameter	Size code
A	76.465~76.475mm (3.0104~3.0108in.)	A
B	76.475~76.485mm (3.0108~3.0112in.)	B
C	76.485~76.495mm (3.0112~3.0116in.)	C

G00965783

Fig. 143: Piston Outer Diameter Table
Courtesy of HYUNDAI MOTOR CO.

3. Select the piston related to cylinder bore class.

   Oil clearance: 0.025-0.045mm (0.00098-0.00177 in.)

REASSEMBLY

1. Install the spacer.

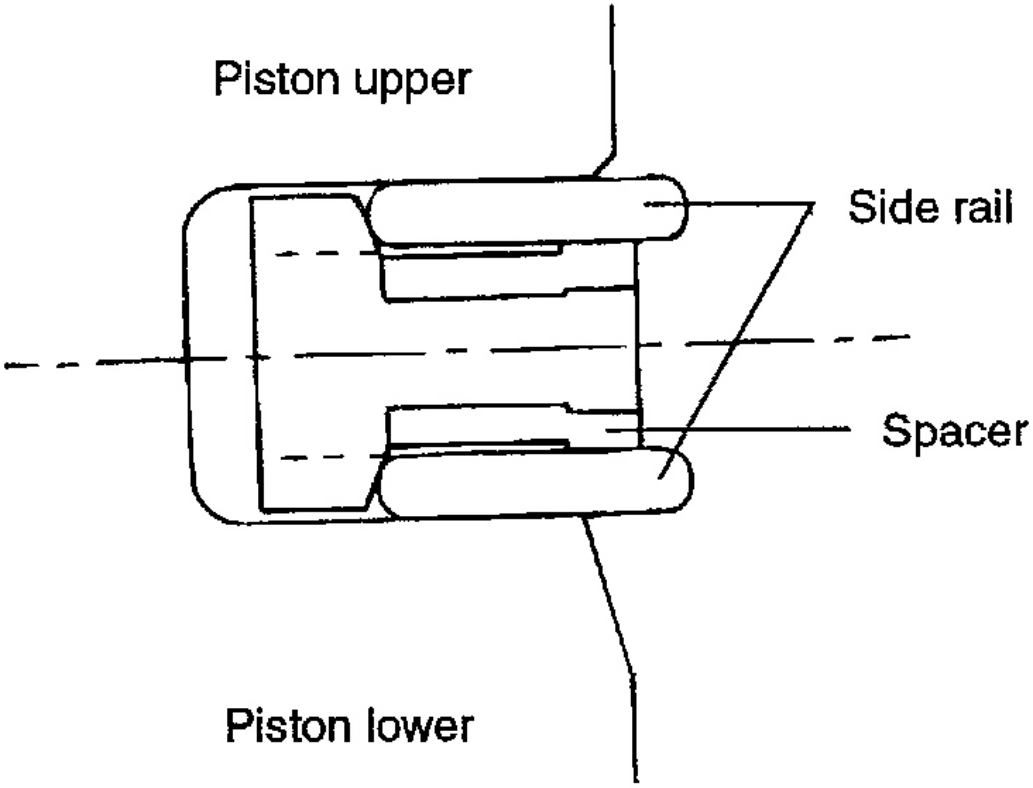


Fig. 144: Installing Spacer (1 Of 2)
Courtesy of HYUNDAI MOTOR CO.

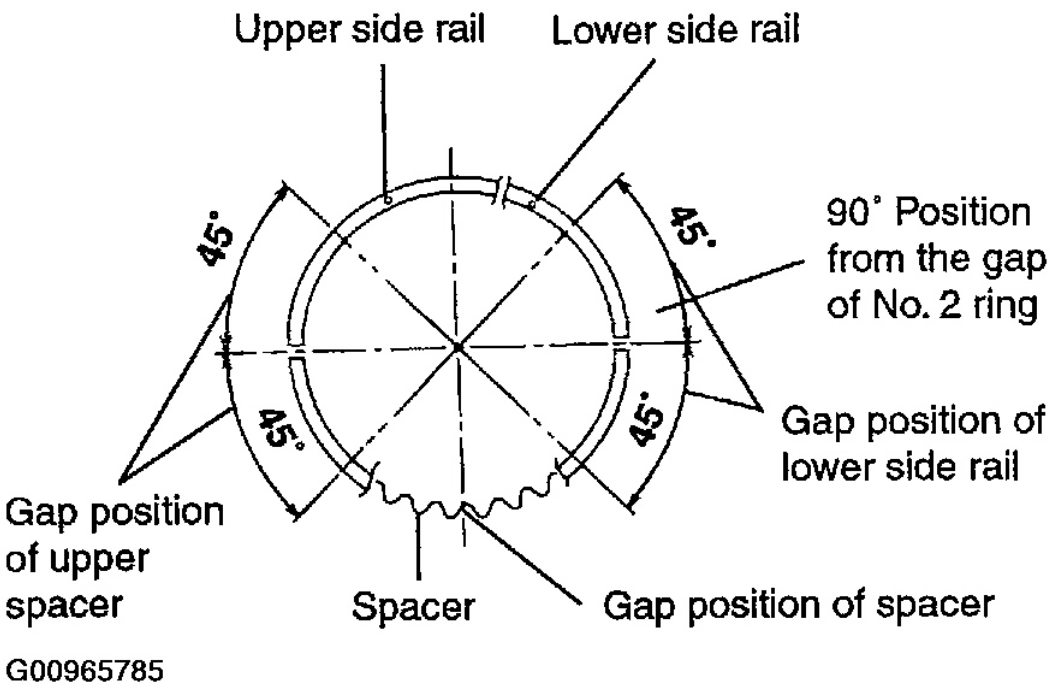


Fig. 145: Installing Spacer (2 Of 2)
Courtesy of HYUNDAI MOTOR CO.

2. Install the upper side rail. To install the side rail, first put one end of the side rail between the piston ring groove and spacer, hold it firmly, and press down with a finger on the portion to be inserted into the groove (as illustrated).

CAUTION: Do not use a piston ring expander when installing side rail.

3. Install the lower side rail by the same procedure described in Step 2.

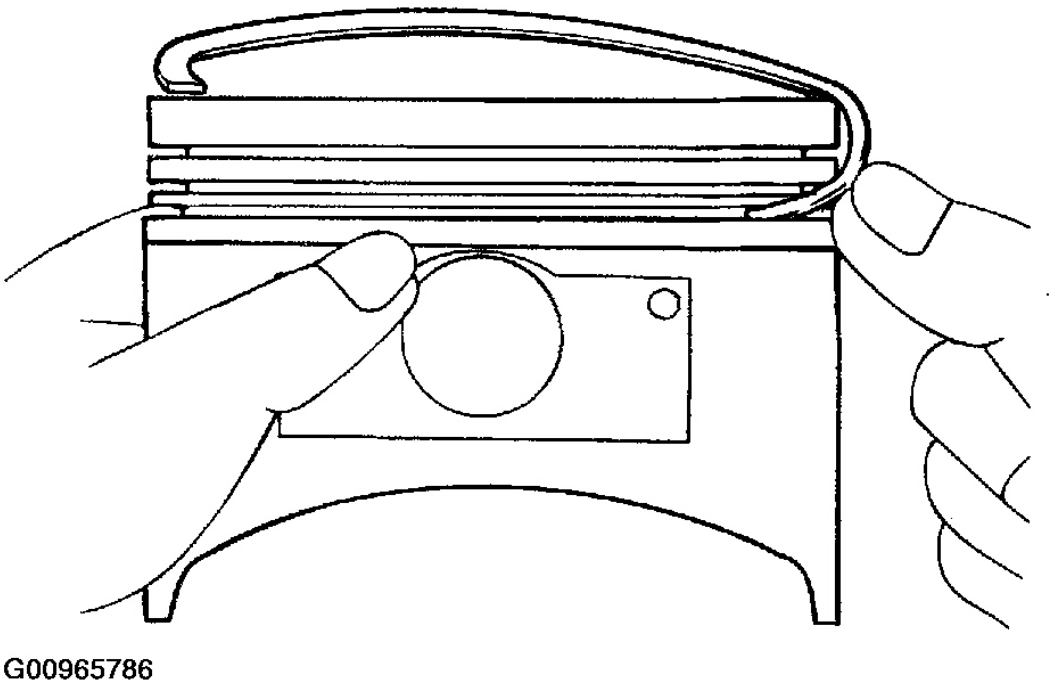


Fig. 146: Installing Side Rail
Courtesy of HYUNDAI MOTOR CO.

4. Apply engine oil around the piston and piston grooves.
5. Using a piston ring expander, install the No. 2 piston ring.
6. Install the No. 1 piston ring.

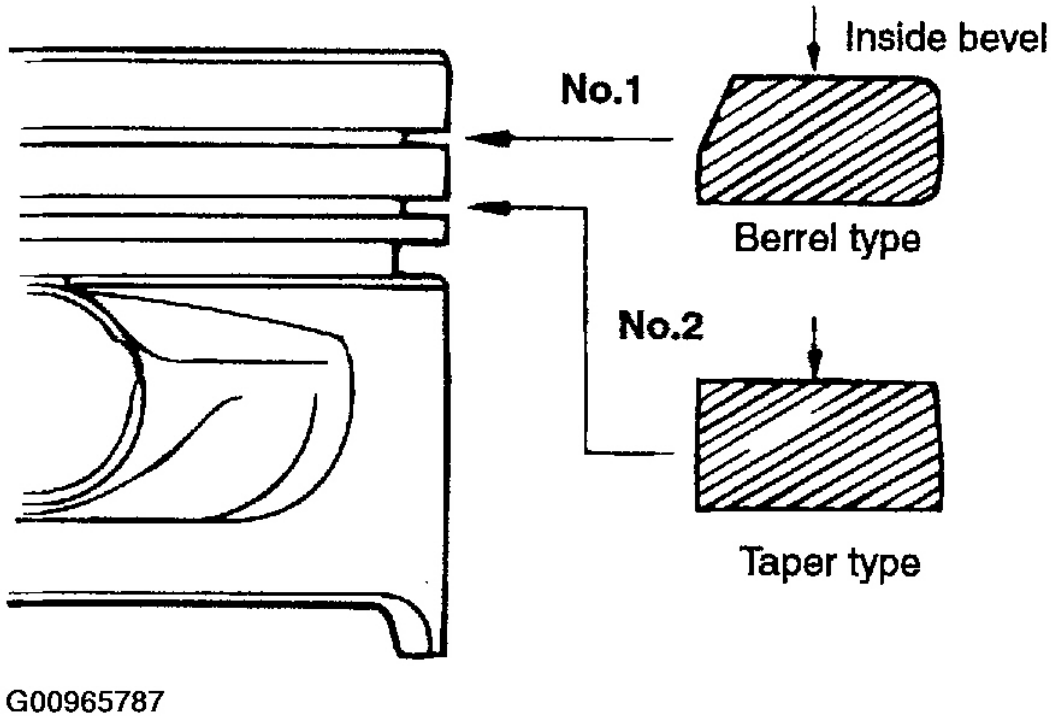


Fig. 147: Identifying Piston Rings
Courtesy of HYUNDAI MOTOR CO.

7. Position each piston ring end gap as far away from its neighboring gaps as possible. Make sure that the gaps are not positioned in the thrust and pin directions.
8. Hold the piston rings firmly with a piston ring compressor as they are inserted into cylinder.

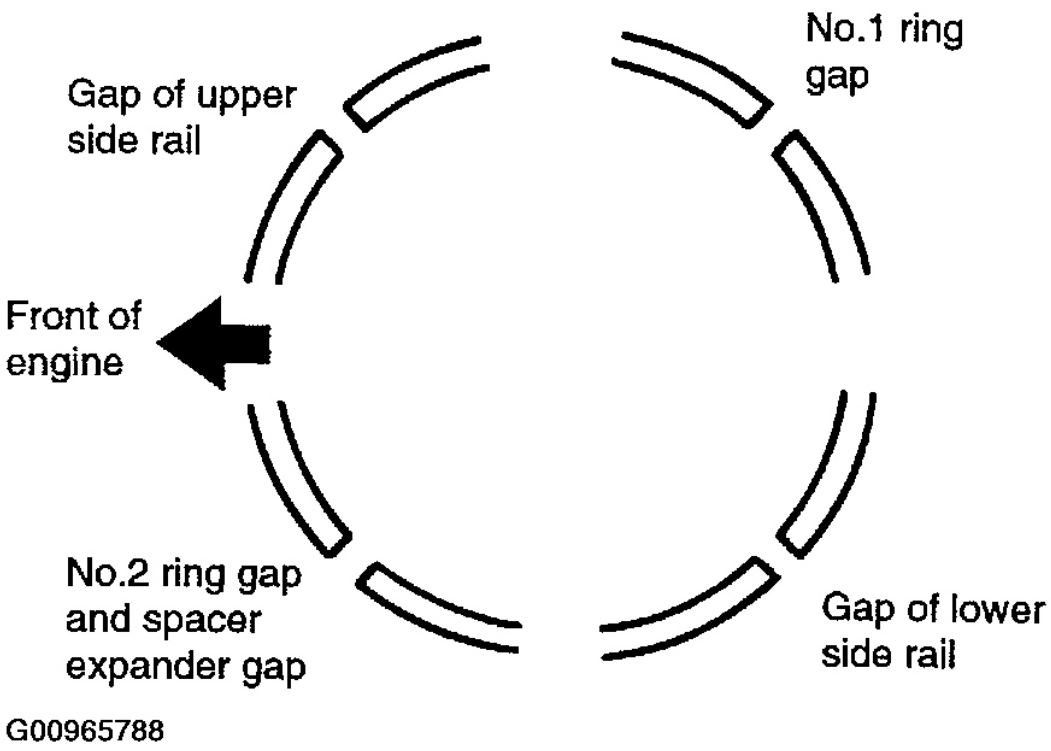


Fig. 148: Identifying Piston Ring Gap Positioning
Courtesy of HYUNDAI MOTOR CO.

9. Install the upper main bearings in the cylinder block.
10. Install the lower main bearings in the main bearing caps.
11. Make sure that the front mark of the piston and the front mark (identification mark) of the connecting rod are directed toward the front of the engine.
12. When a new connecting rod is installed, make sure that the notches for holding the bearing in place are on the same side.
13. When assembling, bolts should be fastened by the angle - torque controlled method as the following.
    1. Apply oil to the thread of nuts and spot areas.
    2. Tighten the connecting rod bolt.

Tightening torque Connecting rod cap nut: 32-35 N.m (320-350 kg.cm, 24-26 lb.ft)

CAUTION: After removing the connecting rod bolt, do not use it again. When using a new bolt, do not tighten the bolt more than 3 times.

14. Check the connecting rod side clearance.

Connecting rod side clearance

Standard: 0.10-0.25mm (0.0039-0.0098 in.)
Limit: 0.4mm (0.0157 in.)

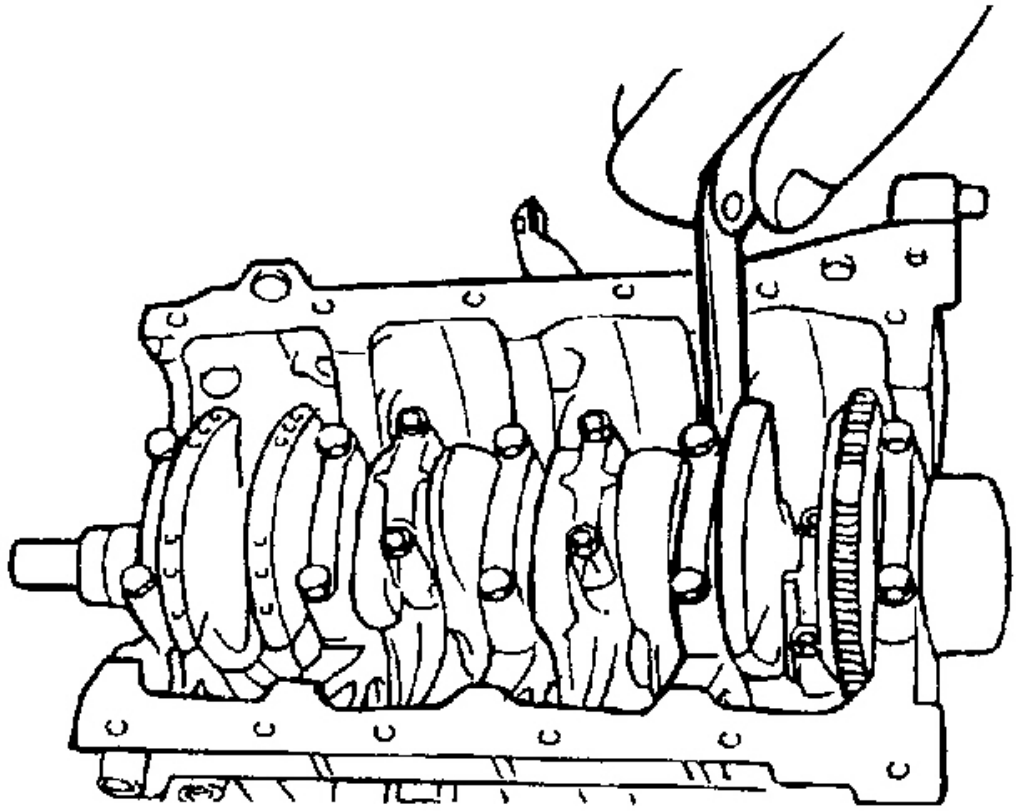


Fig. 149: Checking Connecting Rod Side Clearance
Courtesy of HYUNDAI MOTOR CO.

15. Install the oil screen.
16. Install the oil pan.
17. Install the cylinder head.

COOLING SYSTEM

ENGINE COOLANT HOSE/PIPES

COOLING SYSTEM

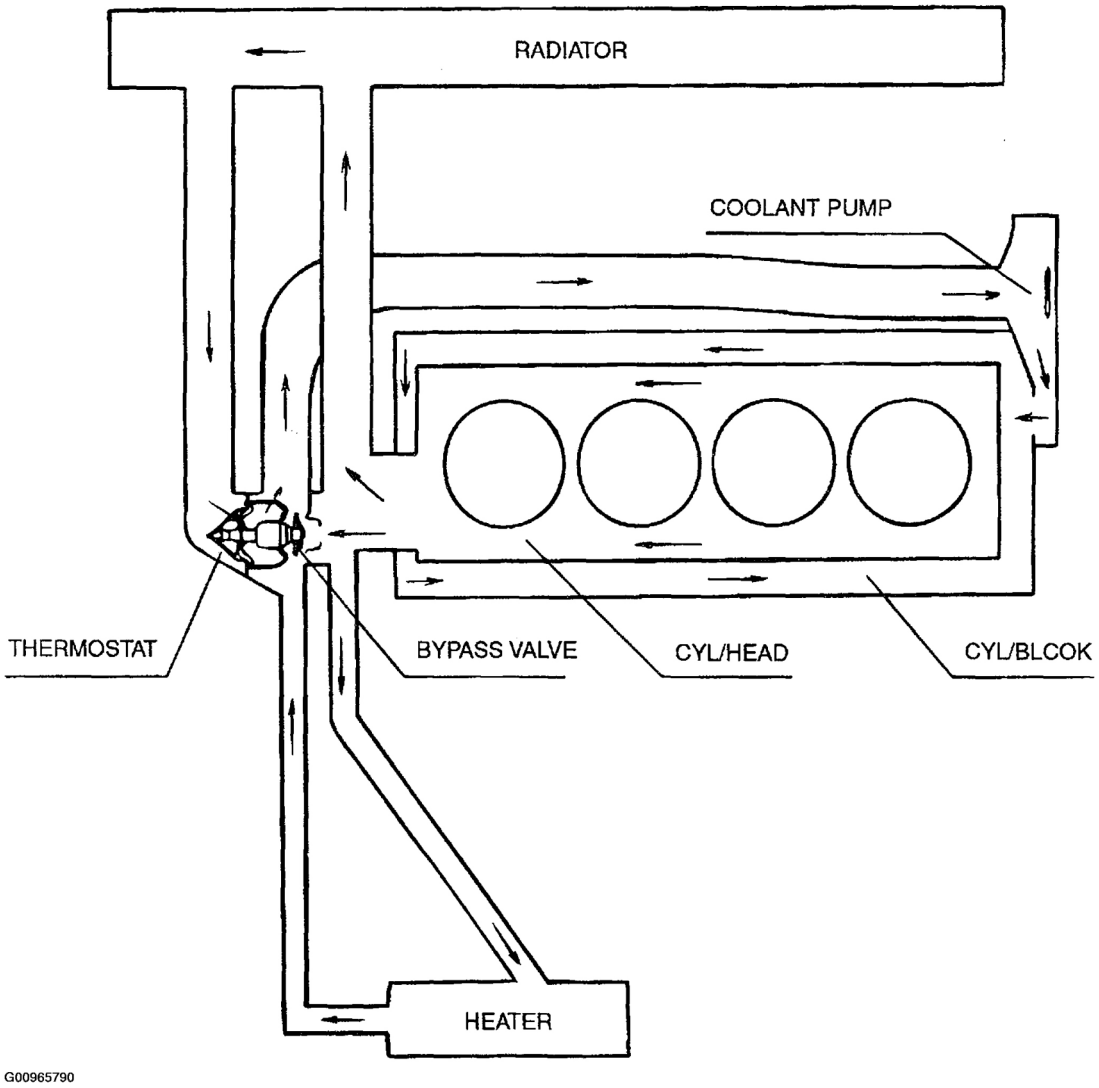


Fig. 150: Identifying Cooling System
Courtesy of HYUNDAI MOTOR CO.

COMPONENTS

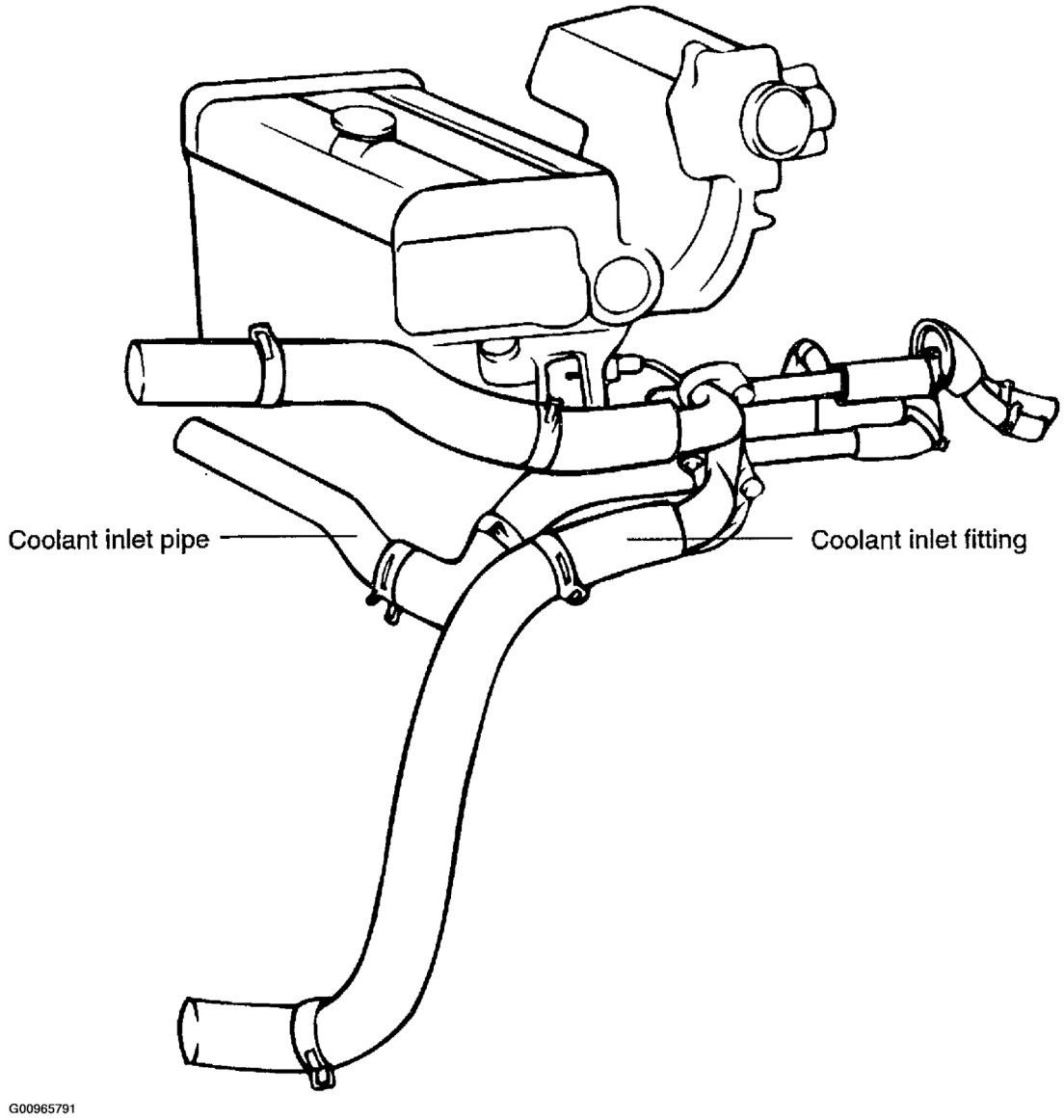


Fig. 151: Cooling System Components
Courtesy of HYUNDAI MOTOR CO.

INSPECTION

Check the coolant pipe and hoses for cracks, damage, or restrictions.

Replace if necessary.

REASSEMBLY

Fit on O-Ring in the groove provided at the coolant inlet pipe end, wet the O-ring with coolant and insert the coolant inlet pipe.

NOTE:

1. **Do not apply oil or grease to the coolant pipe O-ring.**
2. **Keep the coolant pipe connections free of sand, dust, etc.**
3. **Insert the coolant pipe fully into the cylinder block.**
4. **Do not reuse the O-ring. Replace it with a new part.**

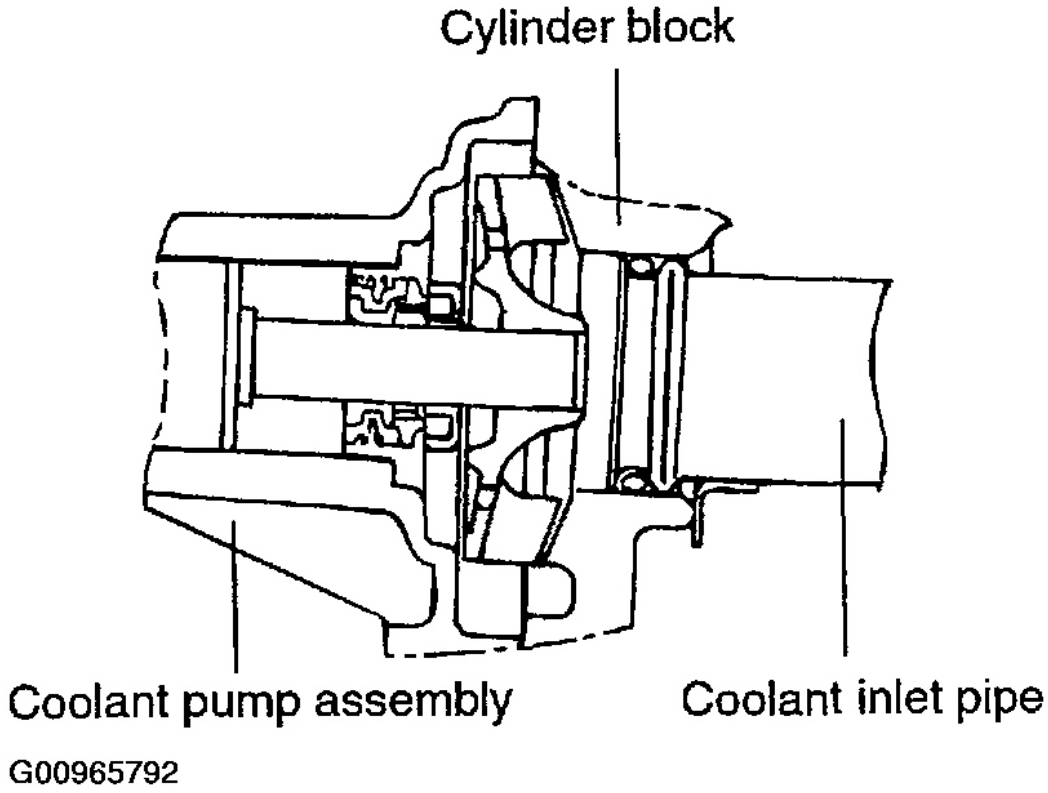


Fig. 152: View Of Coolant Inlet Pipe-To-Pump
Courtesy of HYUNDAI MOTOR CO.

ENGINE COOLANT PUMP

COMPONENTS

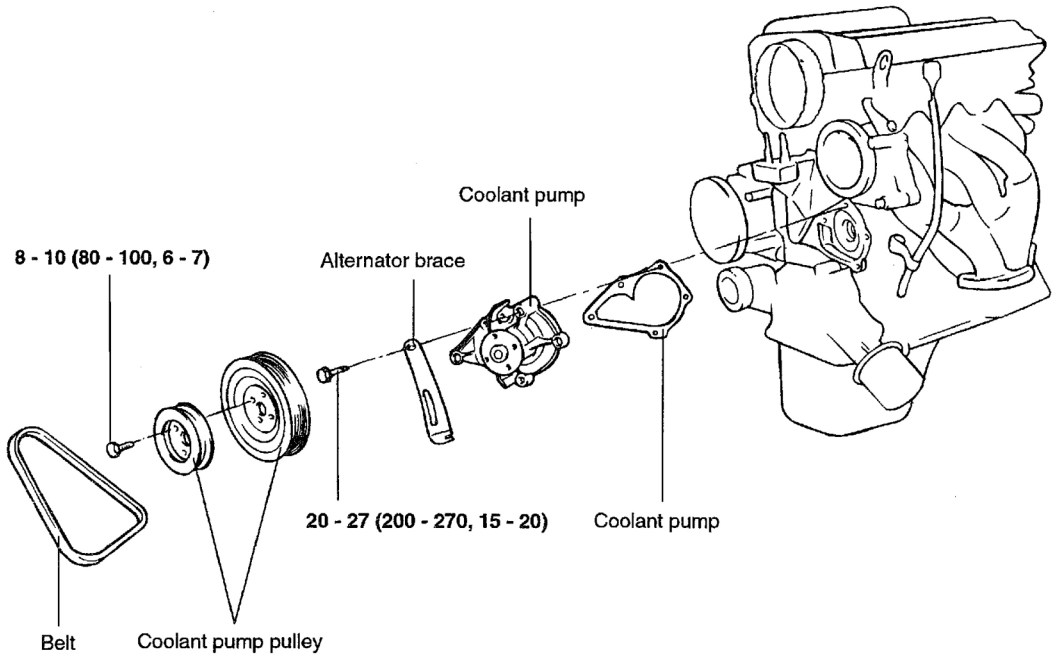


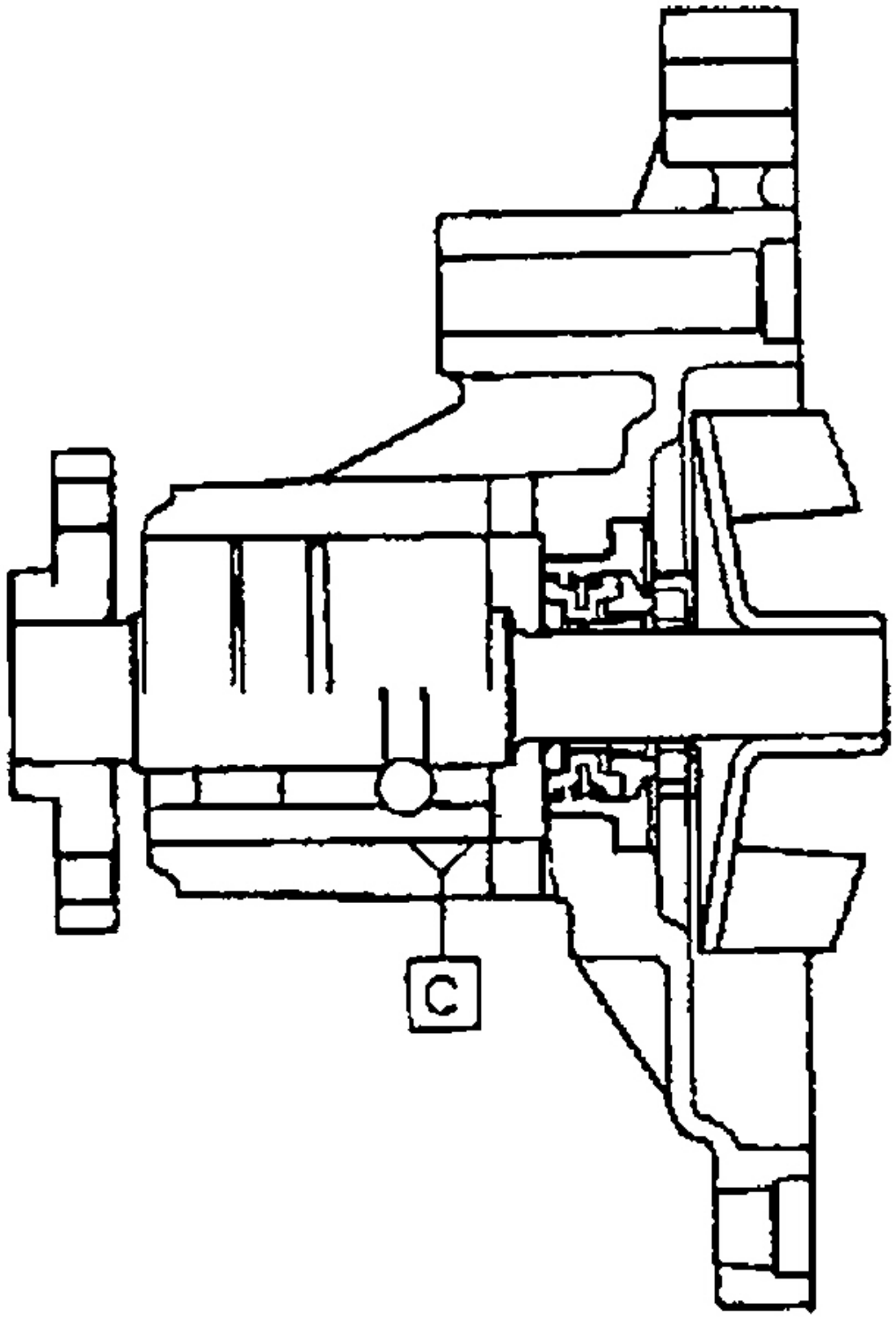
Fig. 153: Engine Coolant Pump Components
Courtesy of HYUNDAI MOTOR CO.

DISASSEMBLY

1. Drain the coolant and disconnect the coolant inlet pipe connection hose from the coolant pump.
2. Remove the drive belt and engine coolant pump pulley.
3. Remove the timing belt covers and the timing belt idler.
4. Remove the coolant pump mounting bolts, then remove the alternator brace.
5. Remove the coolant pump assembly from the cylinder block.

INSPECTION

1. Check each part for cracks, damage or wear, and replace the coolant pump assembly if necessary.
2. Check the bearing for damage, abnormal noise and sluggish rotation, and replace the coolant pump assembly if necessary.
3. Check for coolant leakage. If coolant leaks then the seal is defective. Replace the coolant pump assembly.



G00965794

Fig. 154: Identifying Coolant Pump
Courtesy of HYUNDAI MOTOR CO.

REASSEMBLY

1. Clean the gasket surfaces of the coolant pump body and the cylinder block.
2. Install a new coolant pump gasket to the coolant pump and tighten the bolts to the specified torque.

Tightening torque Coolant pump to cylinder block:
A: 12-15 N.m (120-150 kg.cm, 9-11 lb.ft)
B: 20-27 N.m (200-270 kg.cm, 15-20 lb.ft)

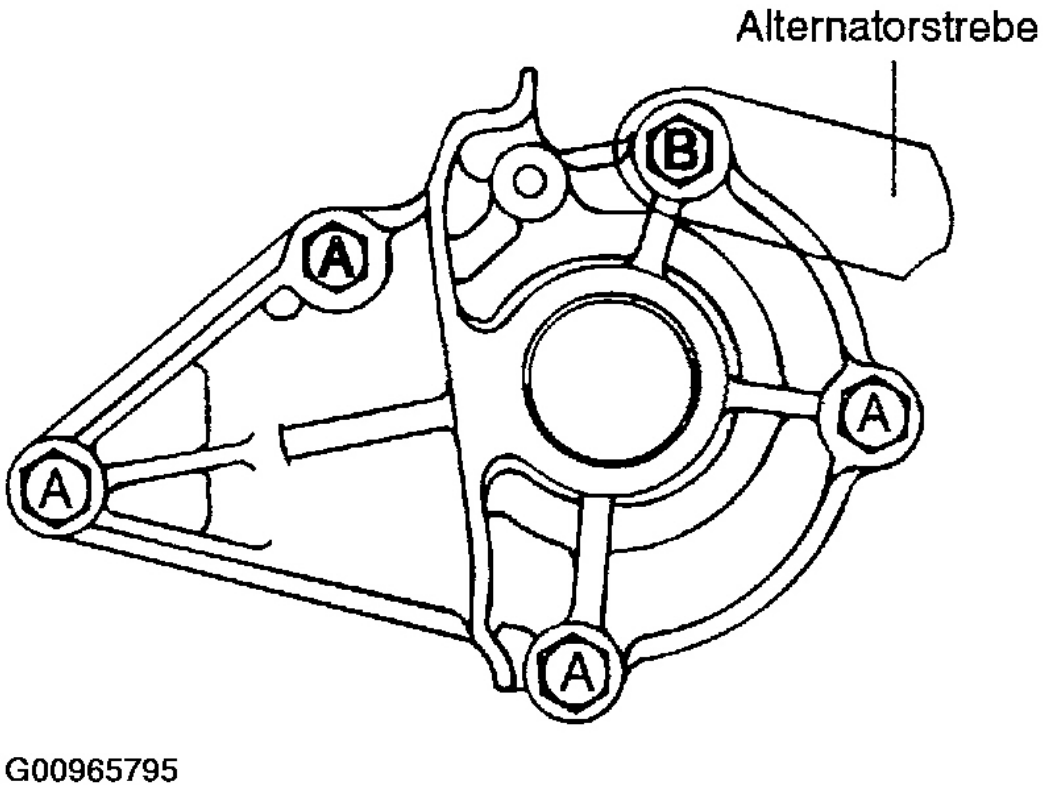


Fig. 155: Identifying Coolant Pump Bolts
Courtesy of HYUNDAI MOTOR CO.

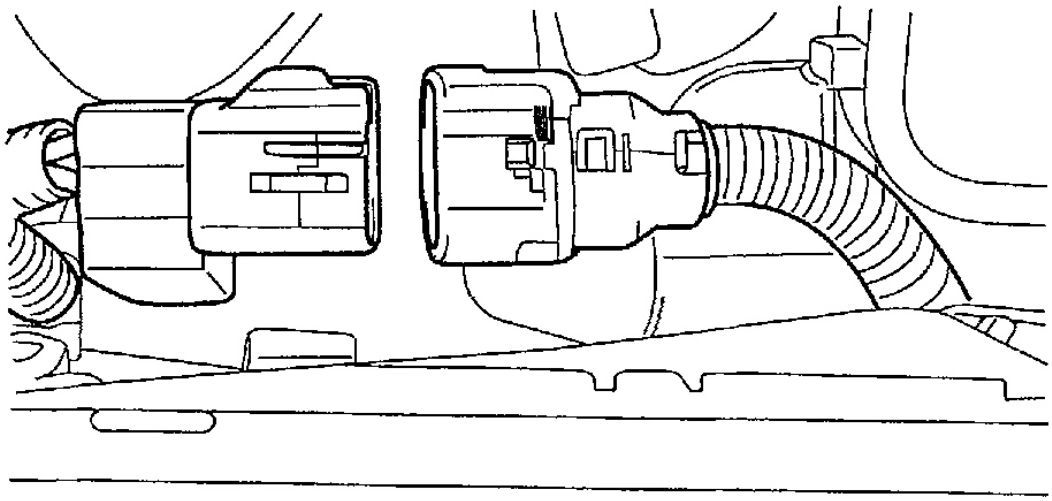
3. Install the timing tensioner and timing belt. Adjust the timing belt tension.
4. Install the timing belt covers.
5. Install the coolant pump pulley and drive belt, and then adjust the belt tension.
6. Refill the system with clean coolant.

7. Run the engine and check for leaks.

RADIATOR

DISASSEMBLY

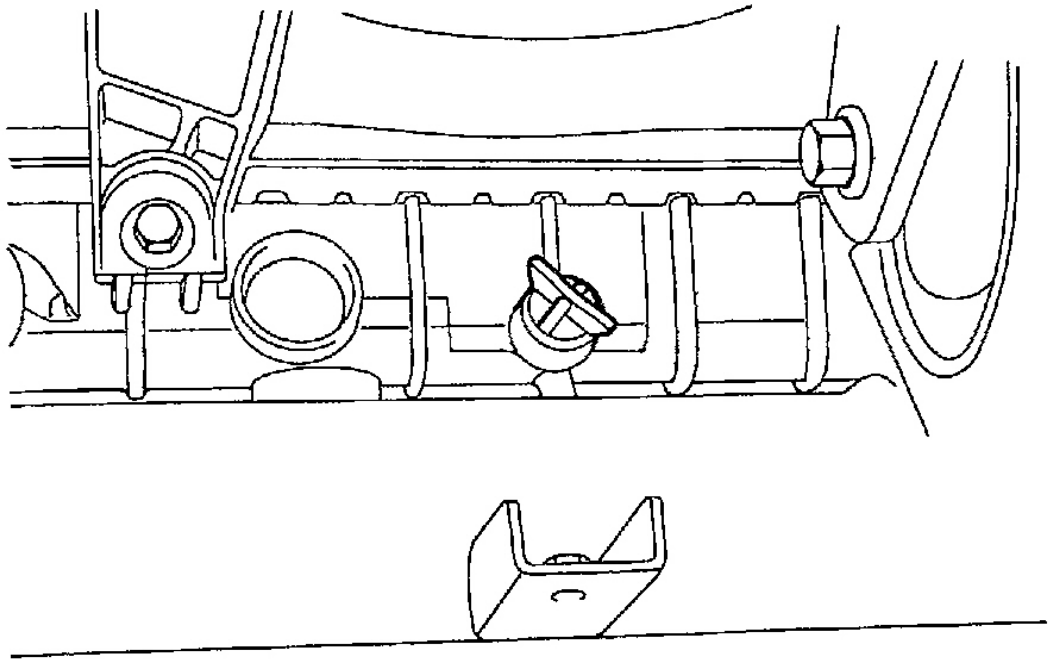
1. Disconnect the radiator fan motor connector.



G00965796

Fig. 156: Identifying Radiator Fan Motor Connector
Courtesy of HYUNDAI MOTOR CO.

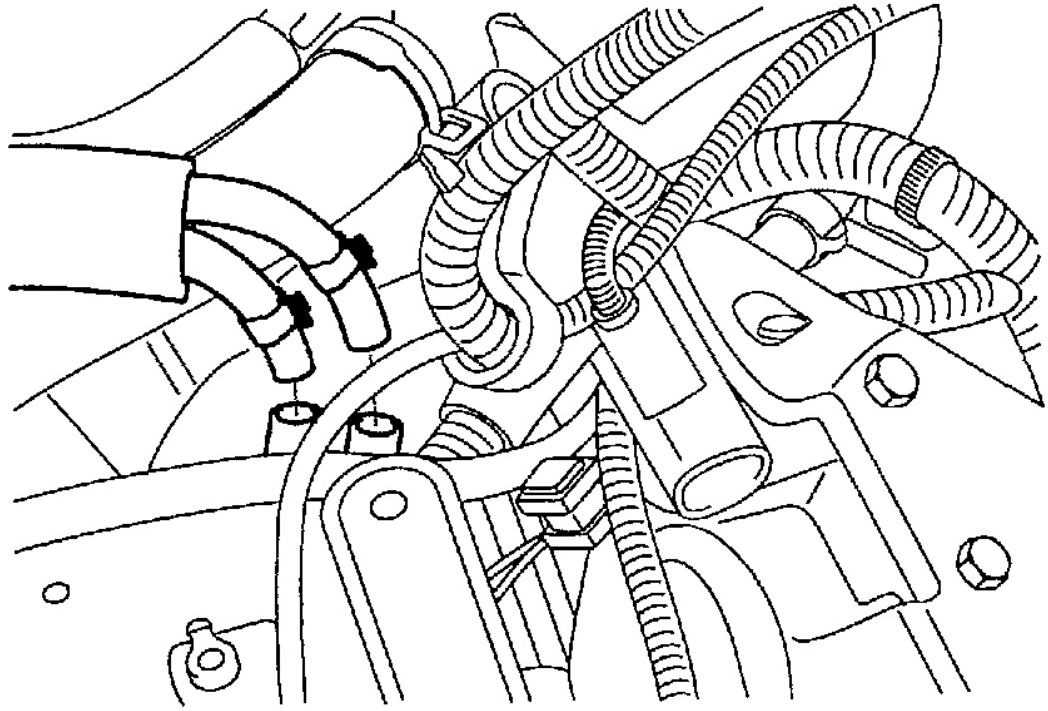
2. Set the temperature of the heater control to the hot position.
3. Loosen the radiator drain plug to drain coolant.



G00965797

Fig. 157: Identifying Radiator Drain Plug
Courtesy of HYUNDAI MOTOR CO.

4. Disconnect the upper and lower hose and overflow tube.
5. For vehicles with automatic transmission, disconnect the oil cooler hoses from the automatic transmission.



G00965798

Fig. 158: Disconnecting Automatic Transaxle Oil Cooler Hoses
Courtesy of HYUNDAI MOTOR CO.

CAUTION: Plug the ends of the oil cooler hoses and the automatic transmission fittings to prevent transmission fluid from spilling out and foreign material from entering

6. Remove the radiator mounting bolts.

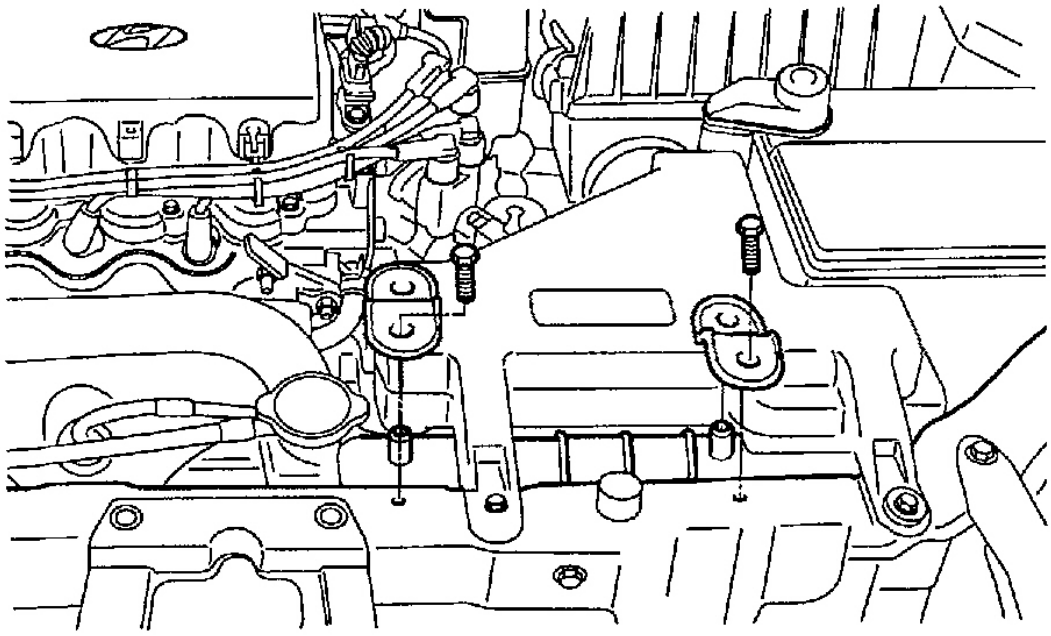


Fig. 159: Removing Radiator Mounting Bolts
Courtesy of HYUNDAI MOTOR CO.

7. Remove the radiator together with the fan motor.
8. Remove the fan motor from the radiator.

INSPECTION

1. Check the radiator for bent, broken or plugged fins.
2. Check the radiator for corrosion, damage, rust or scale.
3. Check the radiator hoses for cracks, damage or deterioration.
4. Check the reservoir tank for damage.
5. Check the radiator cap spring for damage.
6. Test the pressure of the cap using a cooling system checker.
7. Check the radiator cap seal for cracks or damage.

RADIATOR FAN MOTOR

1. Check that the radiator fan rotates when the battery voltage is applied to the terminals.

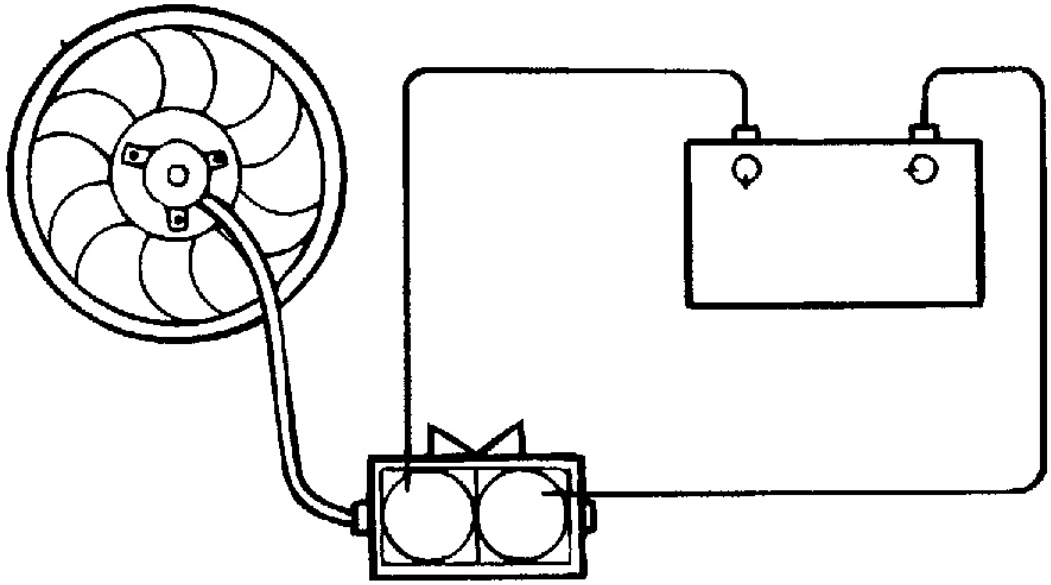


Fig. 160: Checking Radiator Fan Operation
Courtesy of HYUNDAI MOTOR CO.

2. Check that abnormal noises are not produced while the motor is turning.

REASSEMBLY

1. Fill the radiator and reservoir tank with clean coolant mixture.
2. Run the engine until the thermostat opens, and then stop the engine.
3. Remove the radiator cap, and add coolant up to the filler neck of the radiator, and then fill the reservoir tank to the upper level. Replace the radiator cap.
4. Check that there are no leaks from the radiator, hoses or connections.

RADIATOR CAP

COMPONENTS

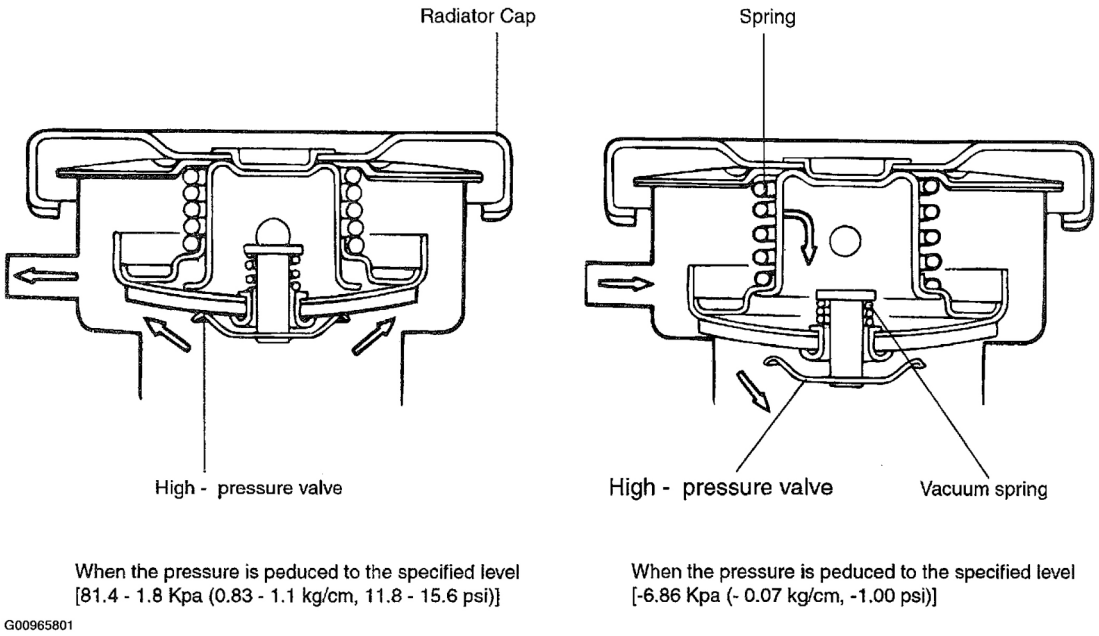


Fig. 161: Identifying Radiator Cap
Courtesy of HYUNDAI MOTOR CO.

INSPECTION

1. Check the radiator cap for damage, cracks and deterioration.

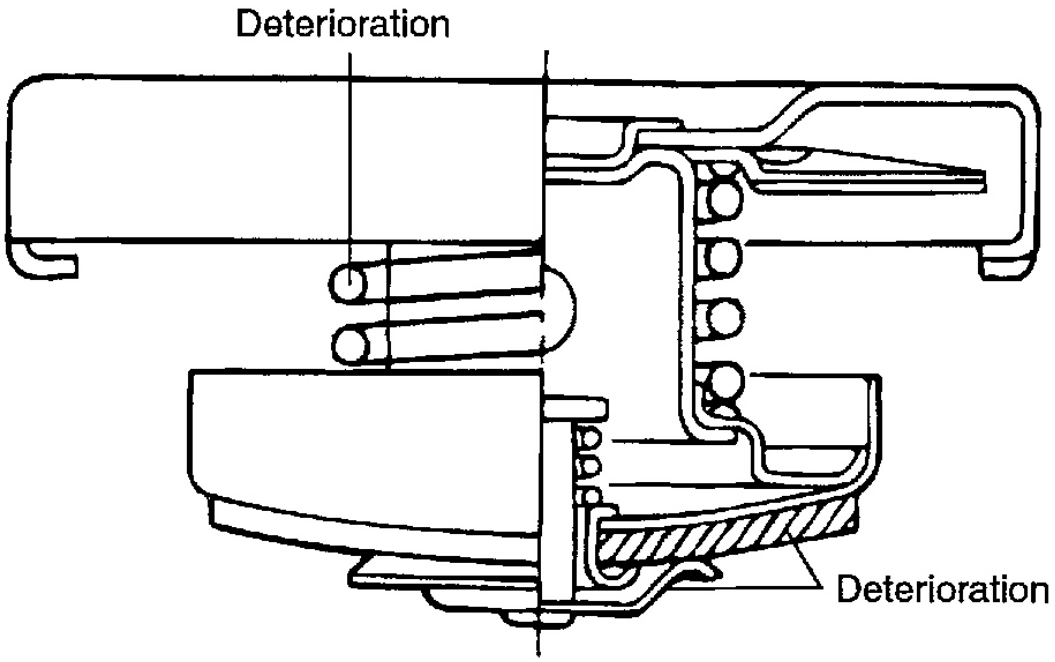


Fig. 162: Inspecting Radiator Cap
Courtesy of HYUNDAI MOTOR CO.

2. Attach a radiator cap tester to the radiator
3. Pump the tester until the pointer stabilizes.
4. If the pointer stays constant for 10 sec. at a point exceeding the service limit, the radiator cap is good.

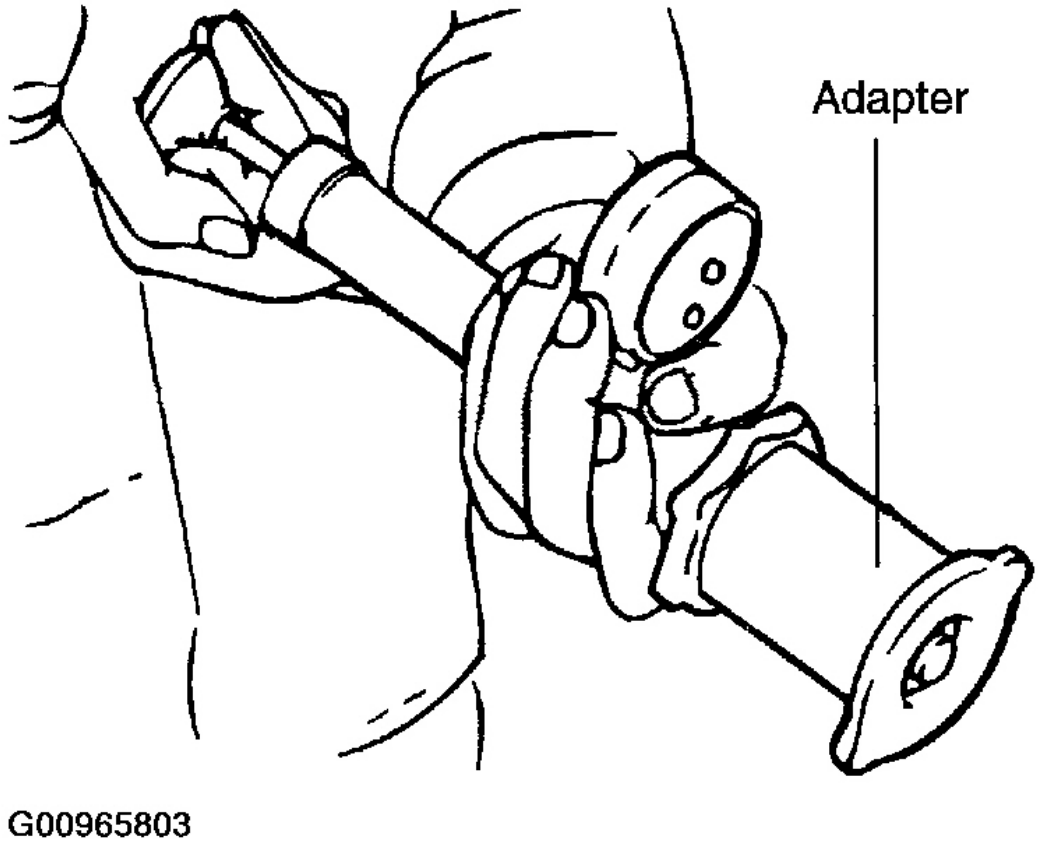


Fig. 163: Pressure Testing Radiator Cap
Courtesy of HYUNDAI MOTOR CO.

THERMOSTAT

COMPONENTS

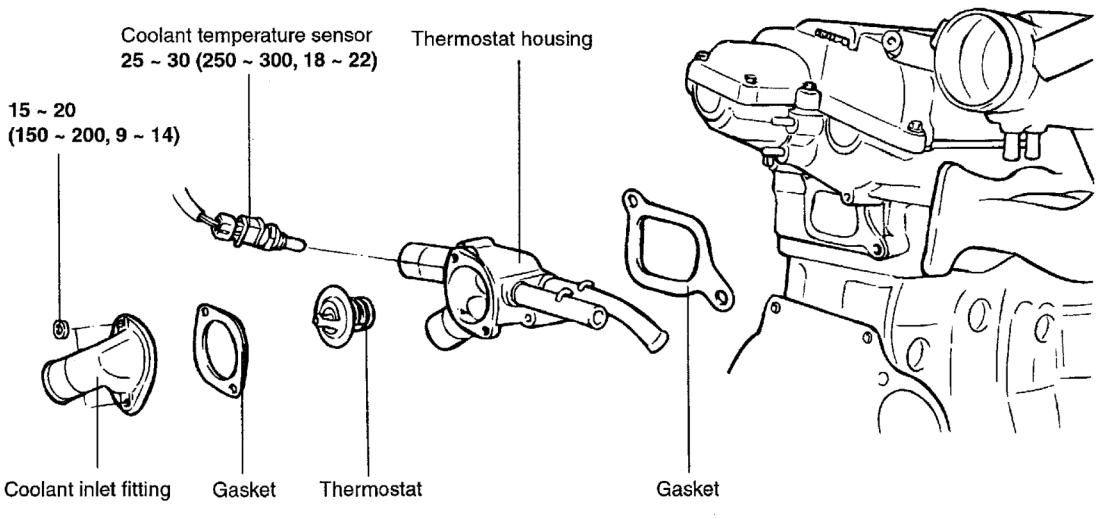


Fig. 164: Thermostat Components
Courtesy of HYUNDAI MOTOR CO.

INSPECTION

1. Drain the coolant so its level is below thermostat.
2. Remove the inlet fitting and gasket.
3. Remove the thermostat.
4. Immerse thermostat in hot coolant to check proper valve opening temperature. Replace if necessary.
   Valve opening temperature: 82°C (177°C)
   Full opening temperature: 95°C (205°F)

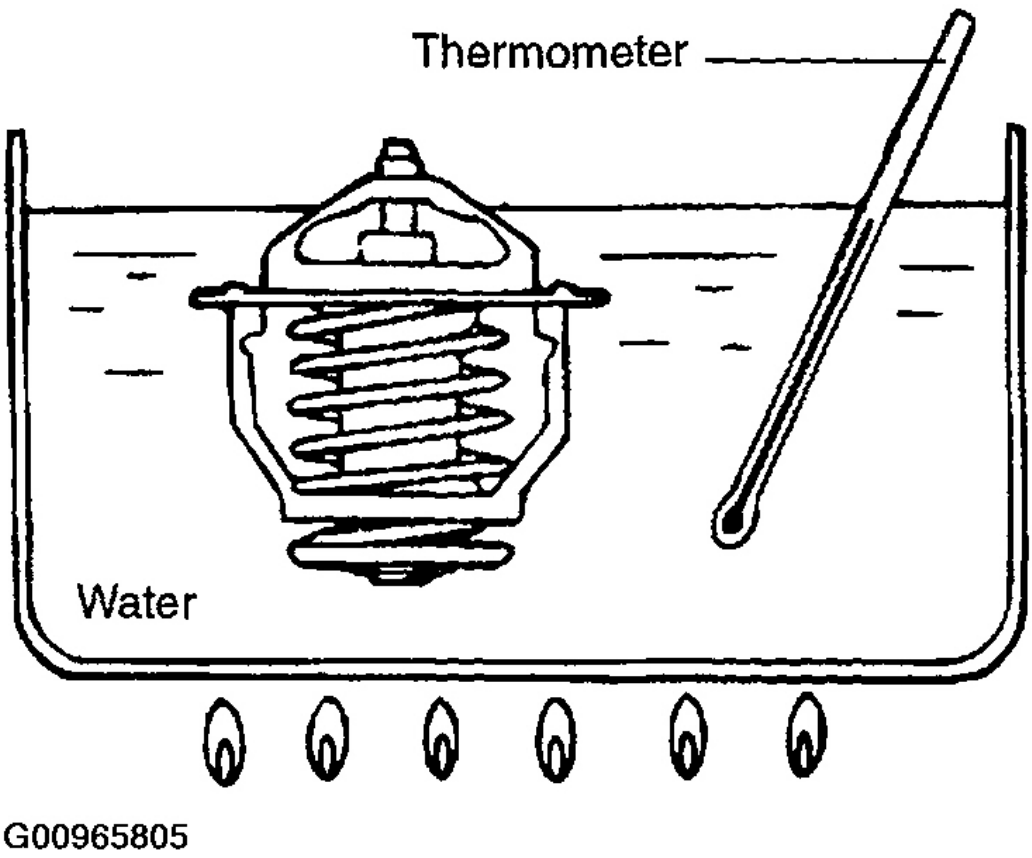


Fig. 165: Checking Thermostat Operation
Courtesy of HYUNDAI MOTOR CO.

COOLANT TEMPERATURE SENSOR

1. Heat the sensor by submerging it in hot engine coolant.
2. Check that the resistance is within the specified range.

Resistance

At: 20°C (68°F): 2.31-2.59K ohms

REASSEMBLY

1. Check that the flange of the thermostat is correctly seated in the socket of the thermostat housing.
2. Install a new gasket and the coolant inlet fitting.
3. Refill the system with clean coolant.

Tightening torque

Coolant temperature sensor:

25-30 N.m (250-300 kg.cm, 18-22 lb.ft)

LUBRICATION SYSTEM

OIL PUMP

COMPONENTS

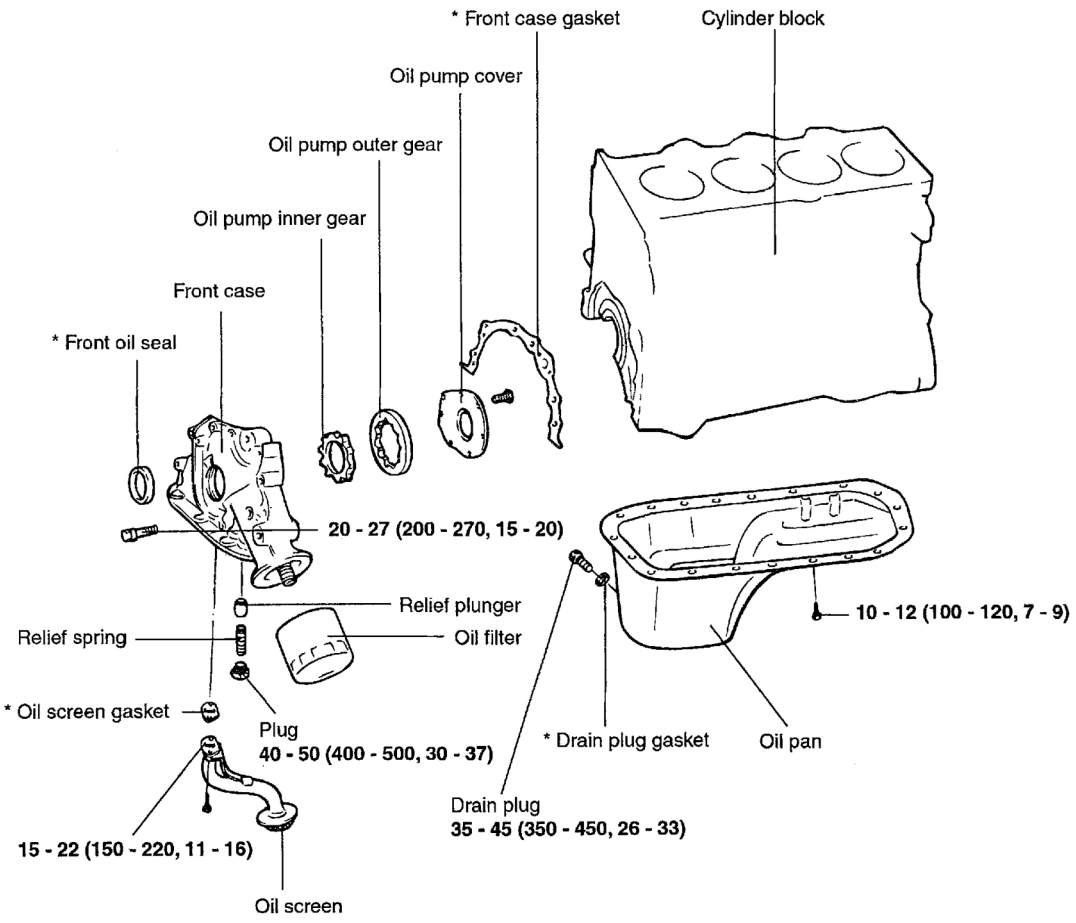


Fig. 166: Oil Pump Components
Courtesy of HYUNDAI MOTOR CO.

DISASSEMBLY

1. Remove the timing belt.
2. Remove all the oil pan bolts.
3. Remove the oil pan.
4. Remove the oil screen.
5. Remove the front case assembly.

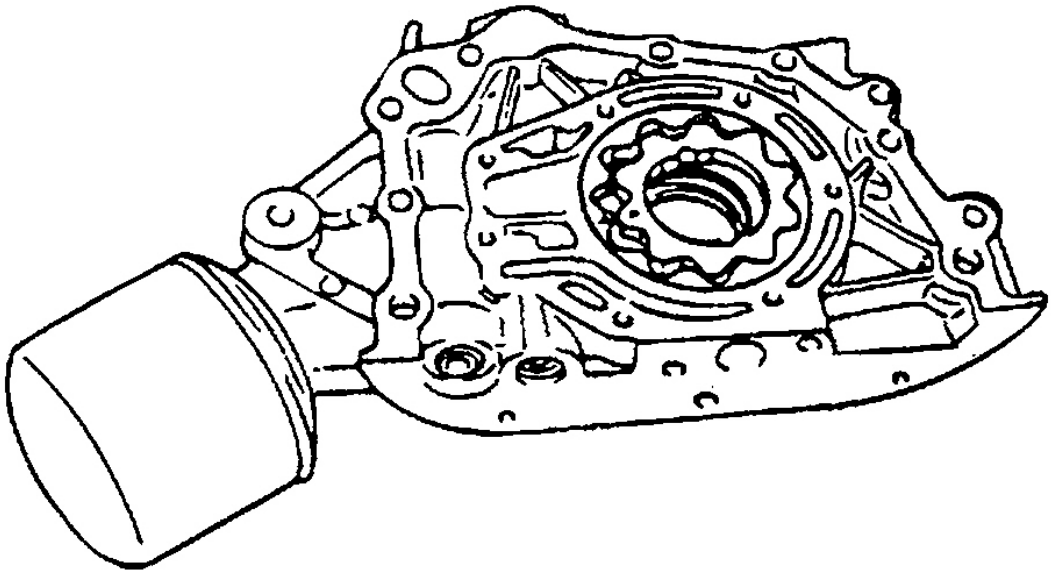


Fig. 167: View Of Front Case Removed
Courtesy of HYUNDAI MOTOR CO.

6. Remove the oil pump cover.
7. Remove the inner and outer gears from the front case. The matching marks on the inner and outer gears indicate the direction of installation.
8. Remove all the oil pan bolts.

INSPECTION

FRONT CASE

1. Check the front case for cracks or damage. Replace as necessary.
2. Check the front oil seal for worn or damaged lips. Replace if defective.

OIL PAN & OIL SCREEN

1. Check the oil pan for failure, damage or cracks. Replace if defective.

2. Check the oil screen for failure, damage and cracks and replace if defective.

FRONT CASE & OIL PUMP COVER

Check the surfaces contacting the gears for damage or wear.

OIL PUMP GEARS

1. Check the gear tooth surfaces for wear or damage.
2. Measure the clearance between outer gear and front case.

Body clearance: 0.12-0.185mm (0.0047-0.0073 in.)

Tip clearance: 0.025-0.069 mm (0.0010-0.0027 in.)

Side clearance

Outer gear: 0.06-0.11 mm (0.0023-0.0043 in.)
Inner gear: 0.04-0.085 mm (0.0016-0.0033 in.)

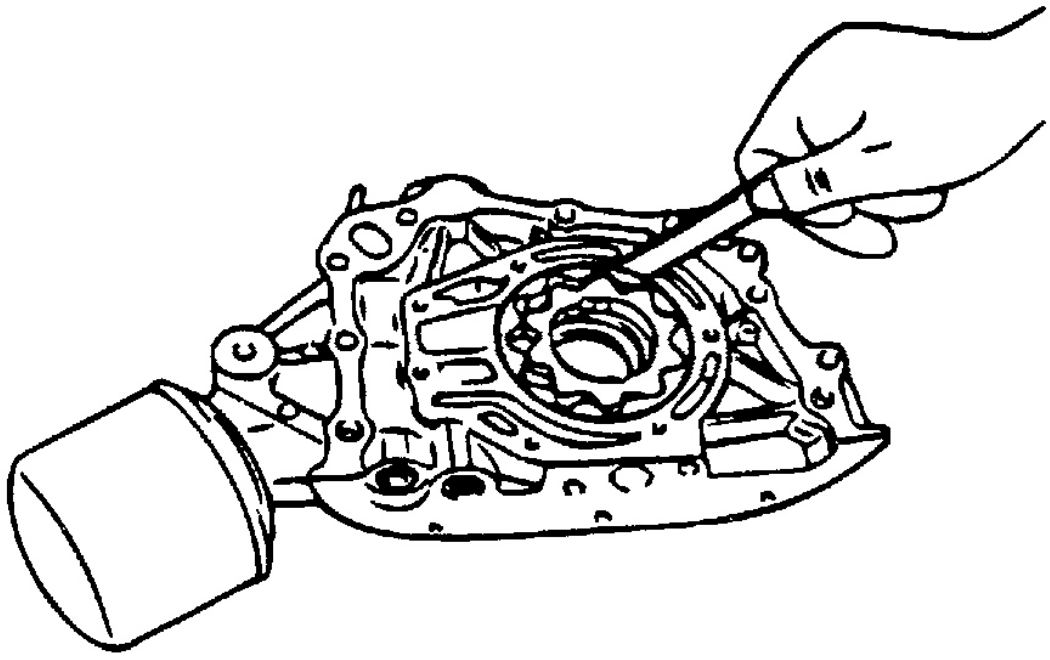


Fig. 168: Checking Clearance Between Outer Gear & Front Case
Courtesy of HYUNDAI MOTOR CO.

3. Check the tip clearance on the pump rotor.

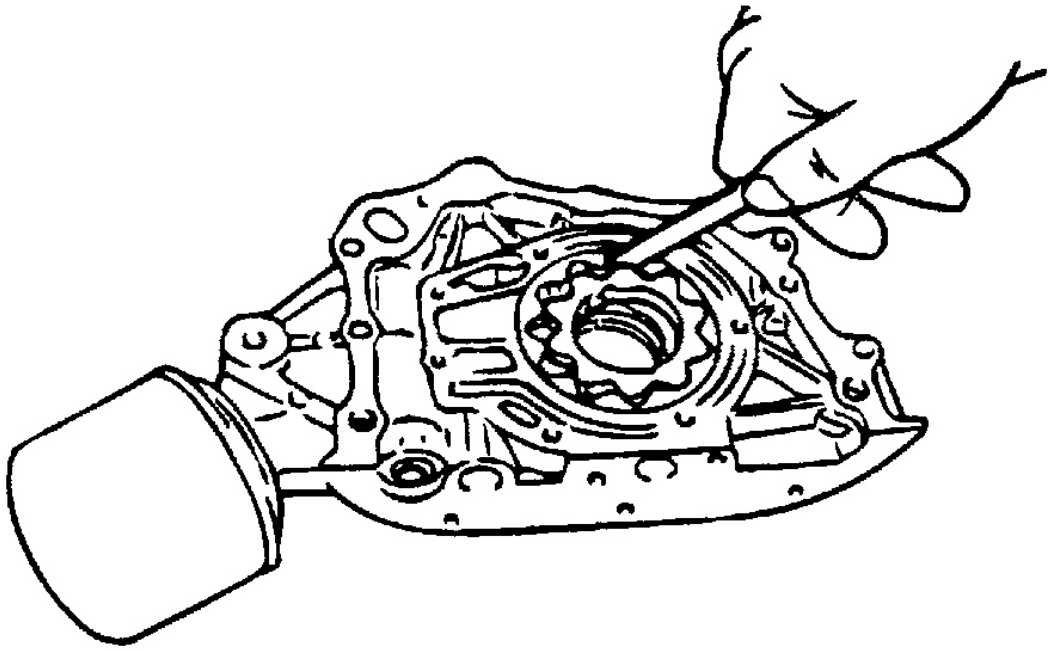
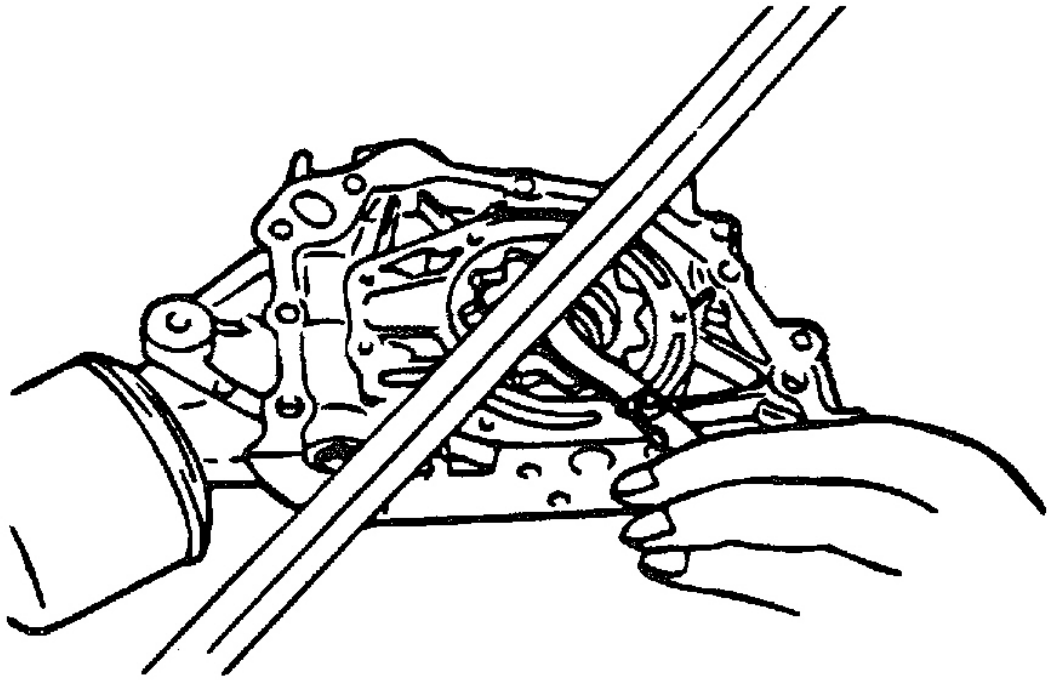


Fig. 169: Checking Tip Clearance
Courtesy of HYUNDAI MOTOR CO.



G00965810

Fig. 170: Checking Side Clearance
Courtesy of HYUNDAI MOTOR CO.

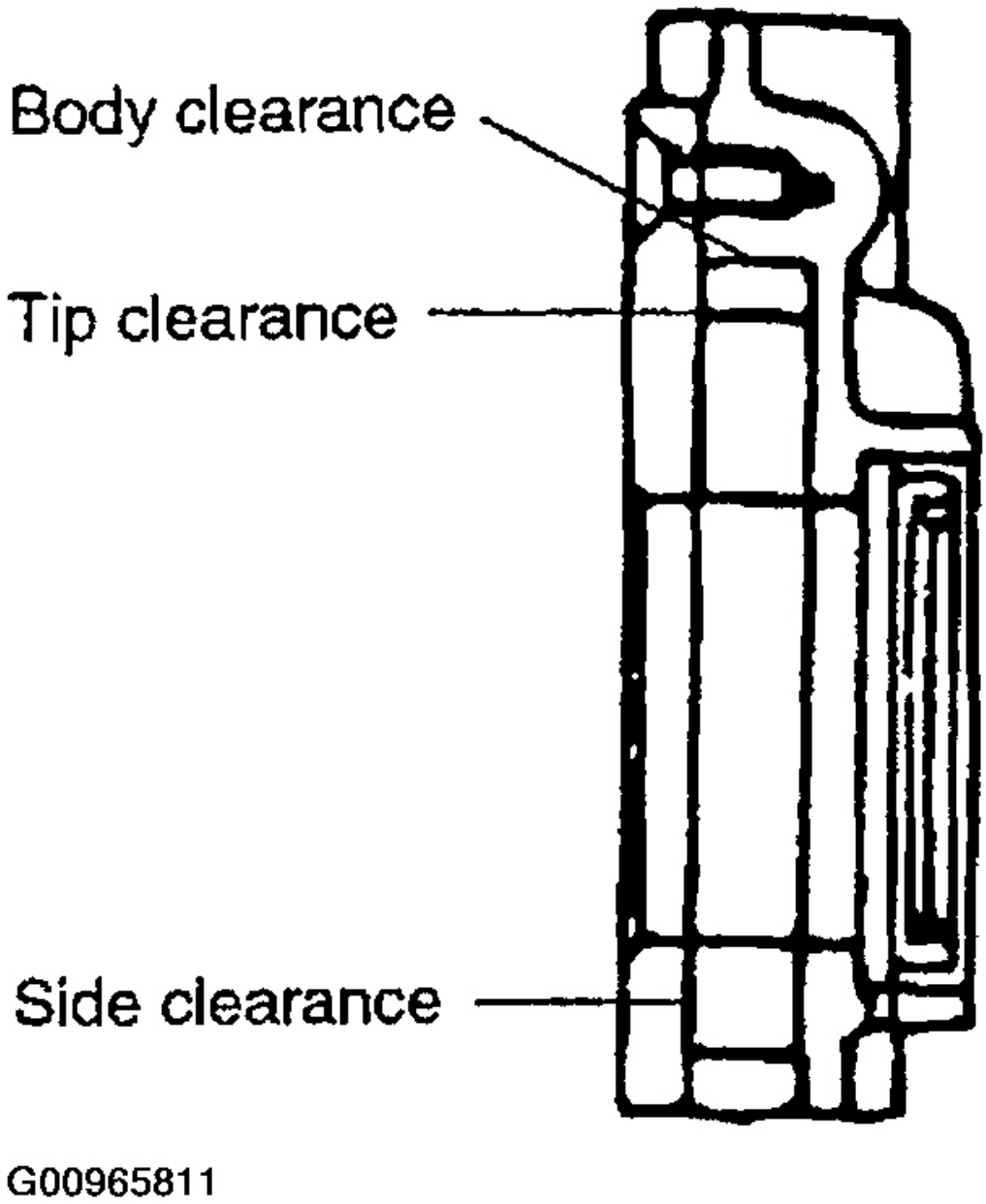


Fig. 171: Identifying Body, Tip & Side Clearances
Courtesy of HYUNDAI MOTOR CO.

RELIEF VALVE & SPRING

1. Check sliding condition of the relief valve inserted in the front case.

2. Inspect for distorted or broken relief valve spring.

Standard value

Free height: 46.6 mm (1.8346 in.)
Load: 6.1 kg/40.1 mm (13.42 lb/1.578 in.)

OIL PRESSURE SWITCH

1. Use an ohmmeter to check the continuity between the terminal and the body. If there is no continuity, replace the oil pressure switch.

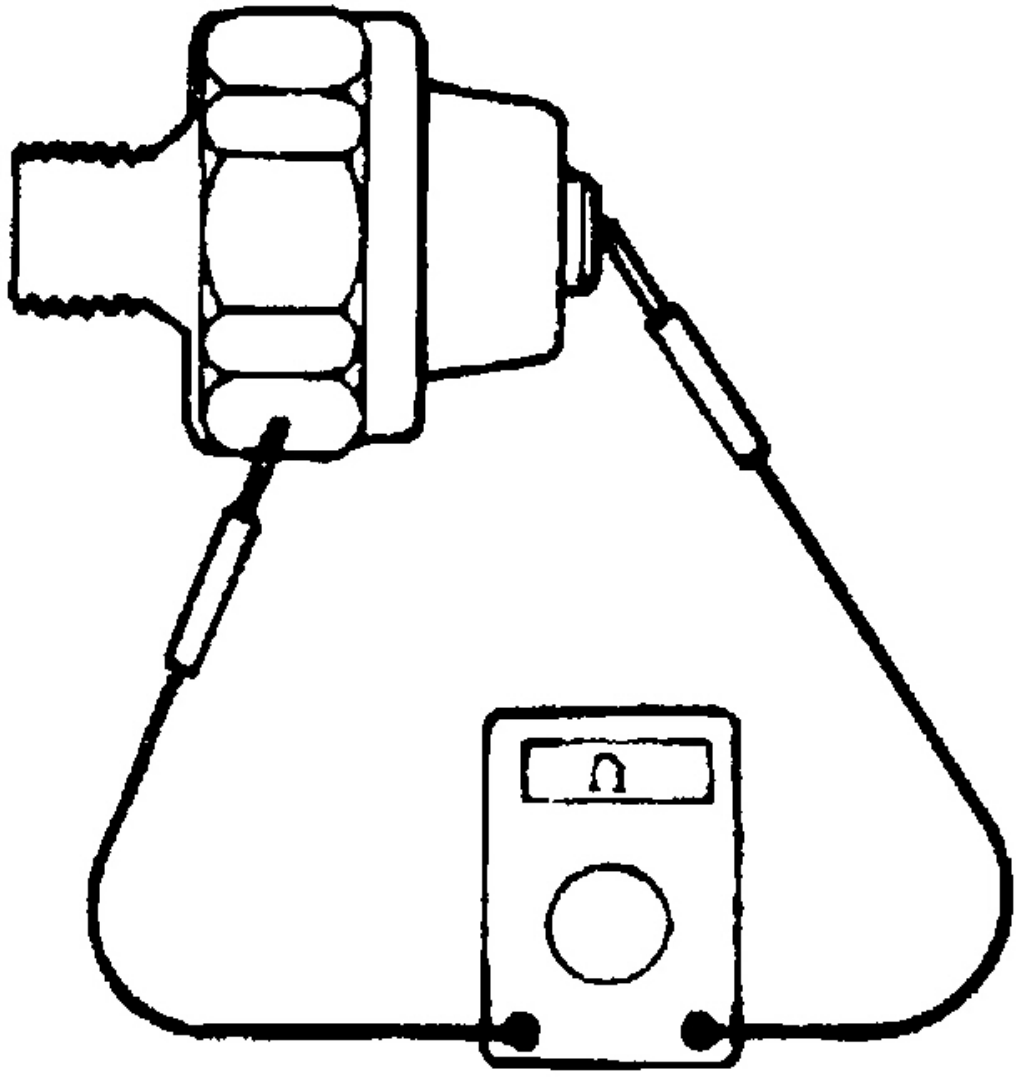


Fig. 172: Measuring Oil Pressure Switch Continuity
Courtesy of HYUNDAI MOTOR CO.

2. Check the continuity between the terminal and the body when the fine wire is pushed. If there is continuity even when the fine wire is pushed, replace the switch.
3. If there is no continuity when a 50 kPa (7 psi) vacuum is applied through the oil hole, the switch is operating properly.

Check for air leaks. If air does leak, the diaphragm is broken. Replace the switch.

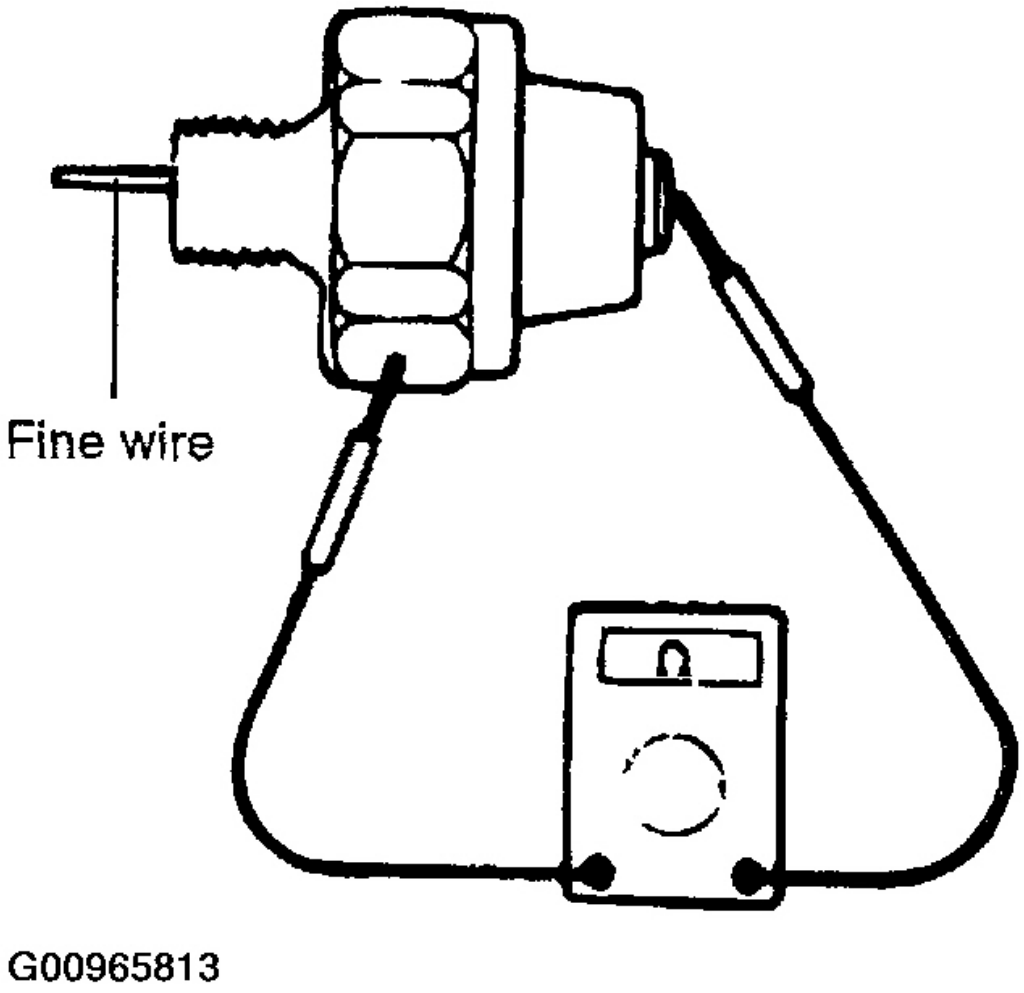


Fig. 173: Measuring Oil Pressure Switch Continuity With Fine Wire Installed
Courtesy of HYUNDAI MOTOR CO.

REASSEMBLY

OIL PUMP

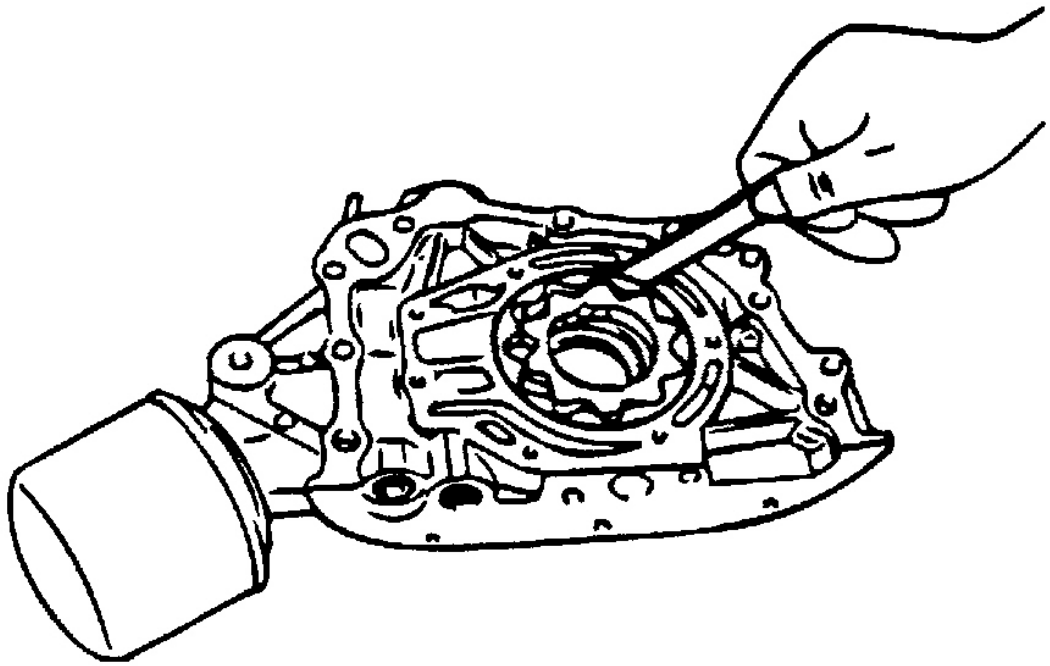
1. Install the outer and inner gears into the front case Make sure that the inner and outer gears are installed in the same direction as shown.
2. Install the oil pump cover and tighten the bolts to the specified torque. After the bolts have been tightened, check to ensure that the gear turns smoothly.

Tightening torque

Oil pump cover bolt: 8-12 N.m (80-120 kg.cm, 6-9 lb.ft)

3. Install the relief valve and spring. Tighten the plug to the specified torque. Apply engine oil to the relief valve.

   Relief valve plug: 40-50 N.m (400-500 kg.cm, 30-37 lb.ft)



G00965814

Fig. 174: Measuring Body Clearance
Courtesy of HYUNDAI MOTOR CO.

FRONT CASE

1. Install the front case assembly with a new gasket, and tighten the bolts to the specified torque.

   Tightening torque:

   20-27 N.m (200-270 kg.cm, 15-20 lb.ft) Length

   A: 30 mm (1.18 in.)

   B: 45 mm (1.77 in.)

   C: 60 mm (2.36 in.)

   D: 22 mm (0.89 in.)

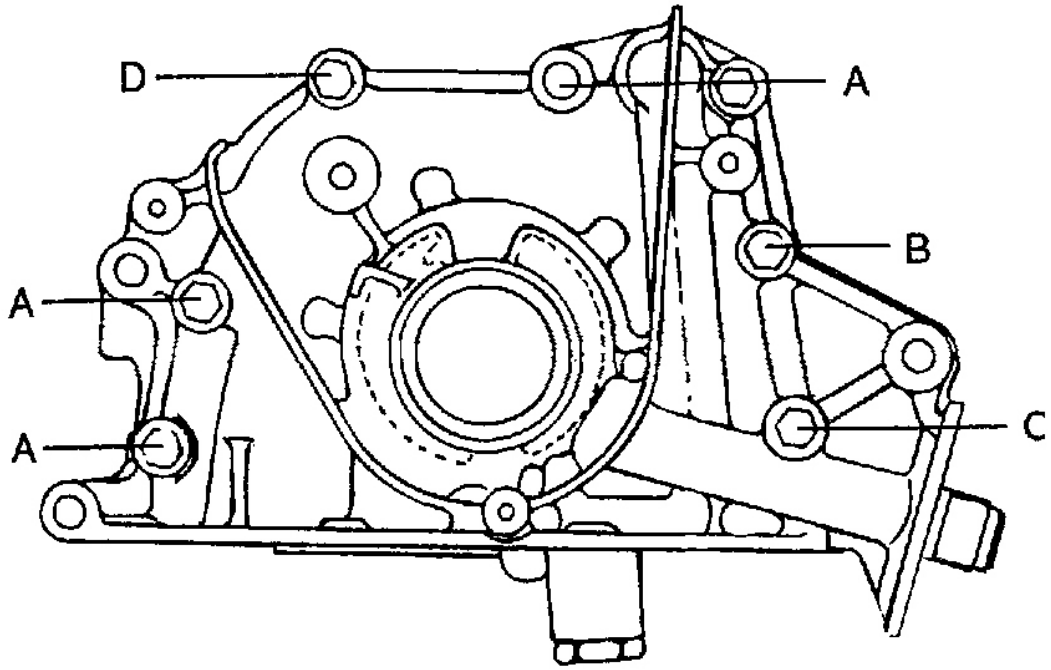


Fig. 175: Identifying Front Case Bolts
Courtesy of HYUNDAI MOTOR CO.

OIL SEAL

1. Using the special tool, Crankshaft Oil Seal Guide (09214-21100), install the oil seal.

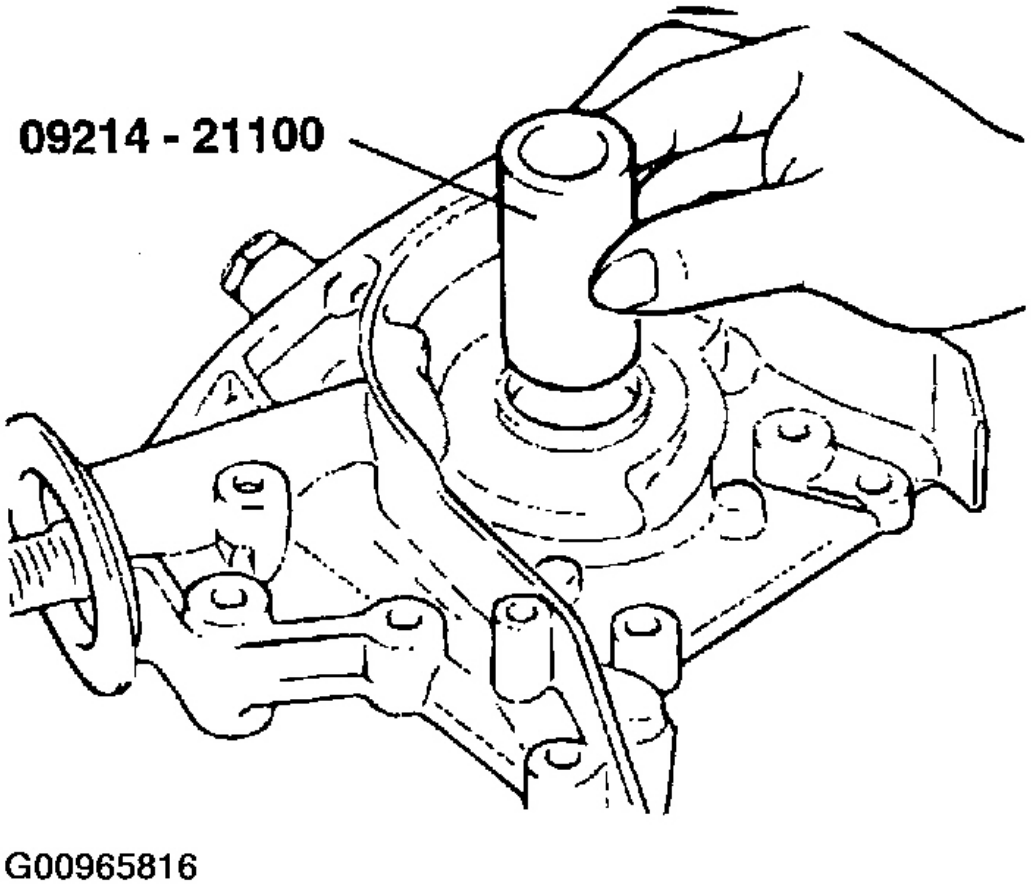


Fig. 176: Installing Crankshaft Oil Seal
Courtesy of HYUNDAI MOTOR CO.

2. Using the special tool, Crankshaft Front Oil Seal Installer (09214-21000), install the oil seal.

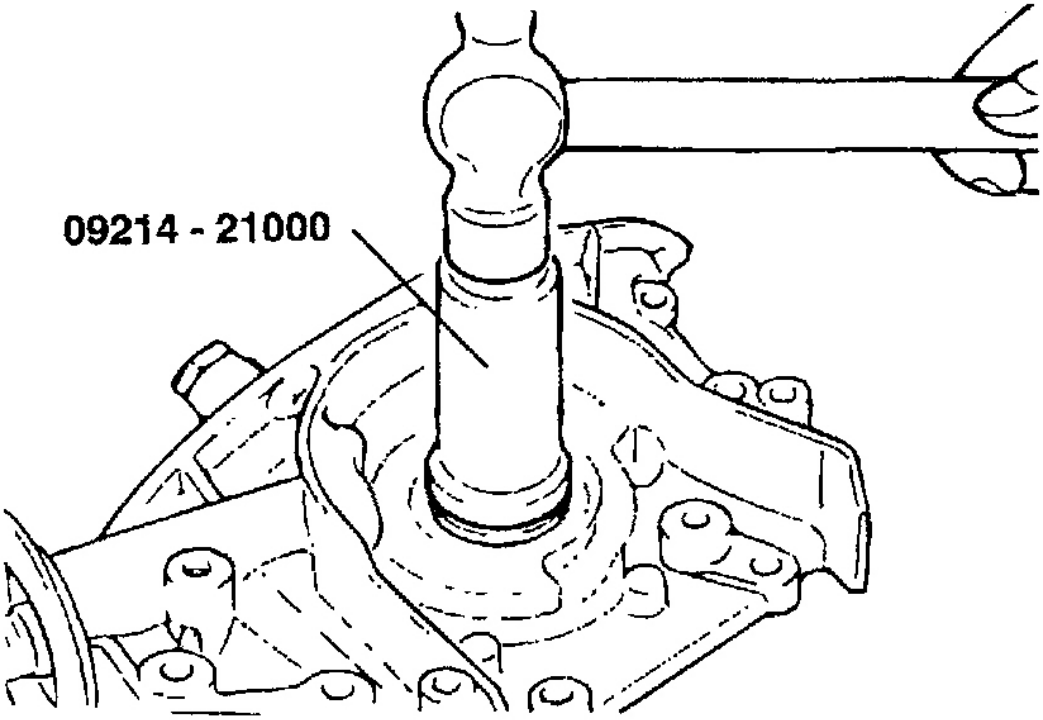


Fig. 177: Installing Crankshaft Oil Seal
Courtesy of HYUNDAI MOTOR CO.

3. Install the oil screen.
4. Clean both gasket surfaces of the oil pan and the cylinder block.
5. Apply sealant into the groove of the oil pan flange as shown.

CAUTION:
- **Apply sealant approx. 4mm (0.16 in.) in thickness.**
- **After application of sealant, do not exceed 15 minutes before installing the oil pan.**

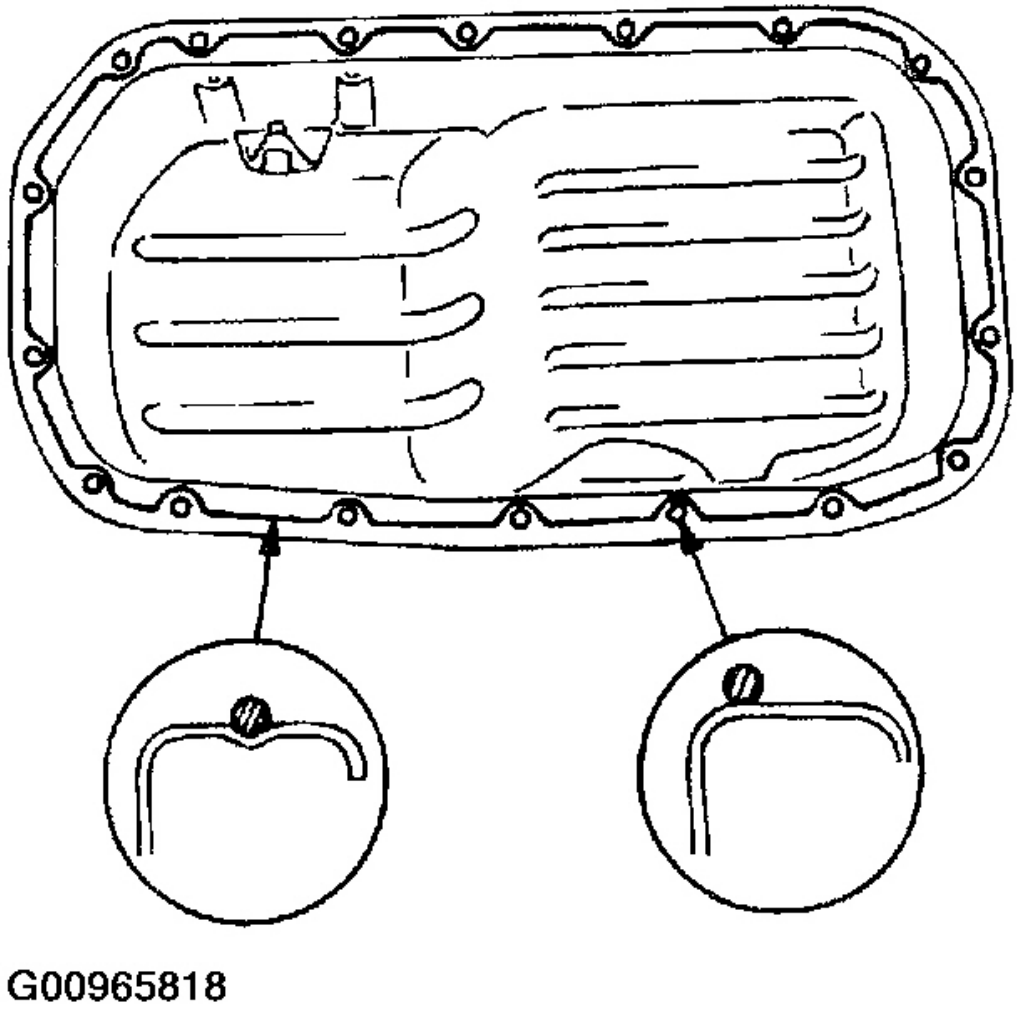


Fig. 178: Identifying Oil Pan Sealant Application
Courtesy of HYUNDAI MOTOR CO.

6. Install the oil pan and tighten the bolts to the specified torque.

Tightening torque

Oil pan bolt: 10-12 N.m (100-120 kg.cm, 7-9 lb.ft)

ENGINE BLOCK

ENGINE BLOCK

COMPONENTS

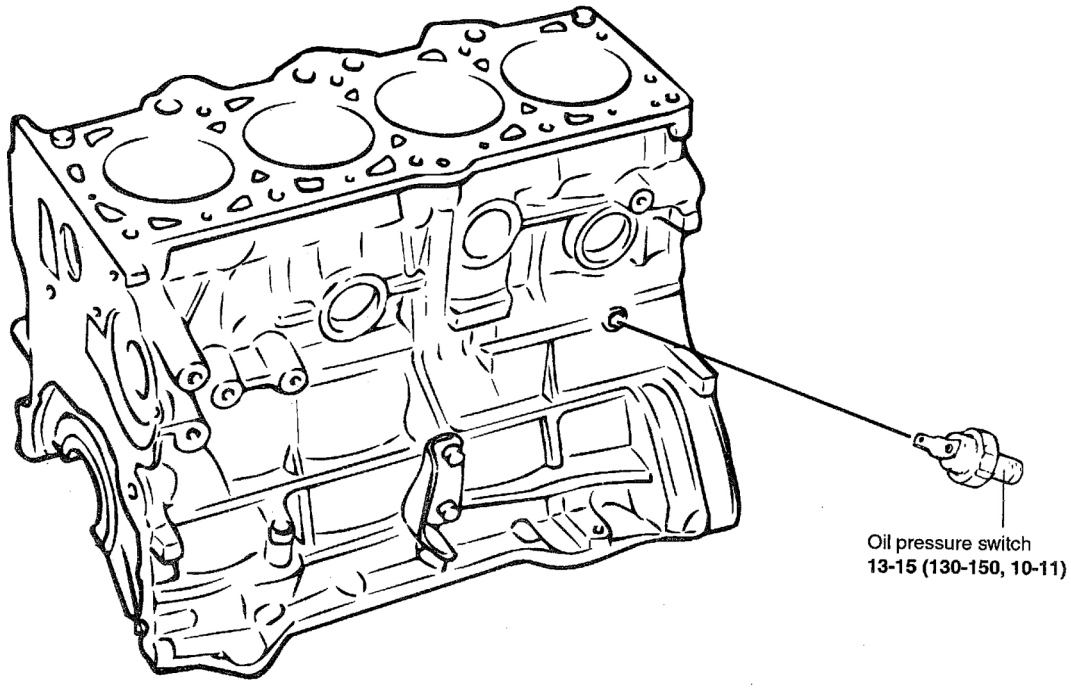


Fig. 179: Engine Block Components
Courtesy of HYUNDAI MOTOR CO.

DISASSEMBLY

1. Remove the timing belt, cylinder head, front case, flywheel, pistons and crankshaft.
2. Remove the oil pressure switch.

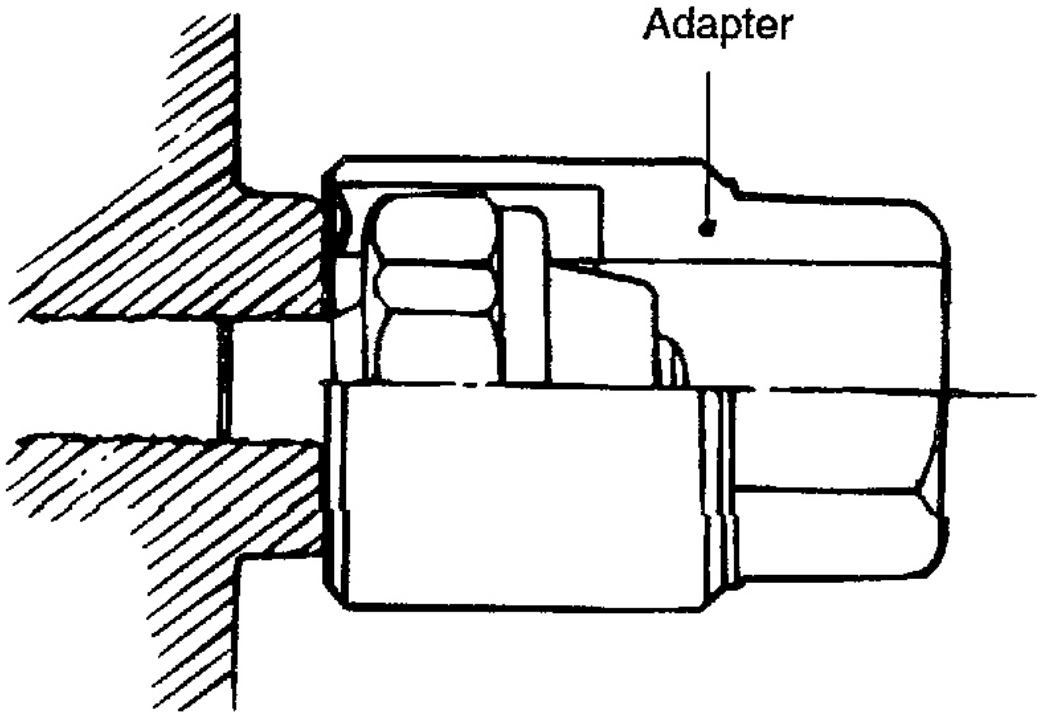


Fig. 180: Removing Oil Pressure Switch
Courtesy of HYUNDAI MOTOR CO.

INSPECTION

1. Check the engine block for scores, rust and corrosion. Also check for cracks or any other defects. Replace the block if defective.
2. Using a straight edge and feeler gauge, check the top surface of the block for warpage. Make sure that the surface is free from gasket chips or other foreign material.

   Standard: 0.03mm (0.0012 in.) or less

   Limit: 0.15mm (0.0059 in.) or less

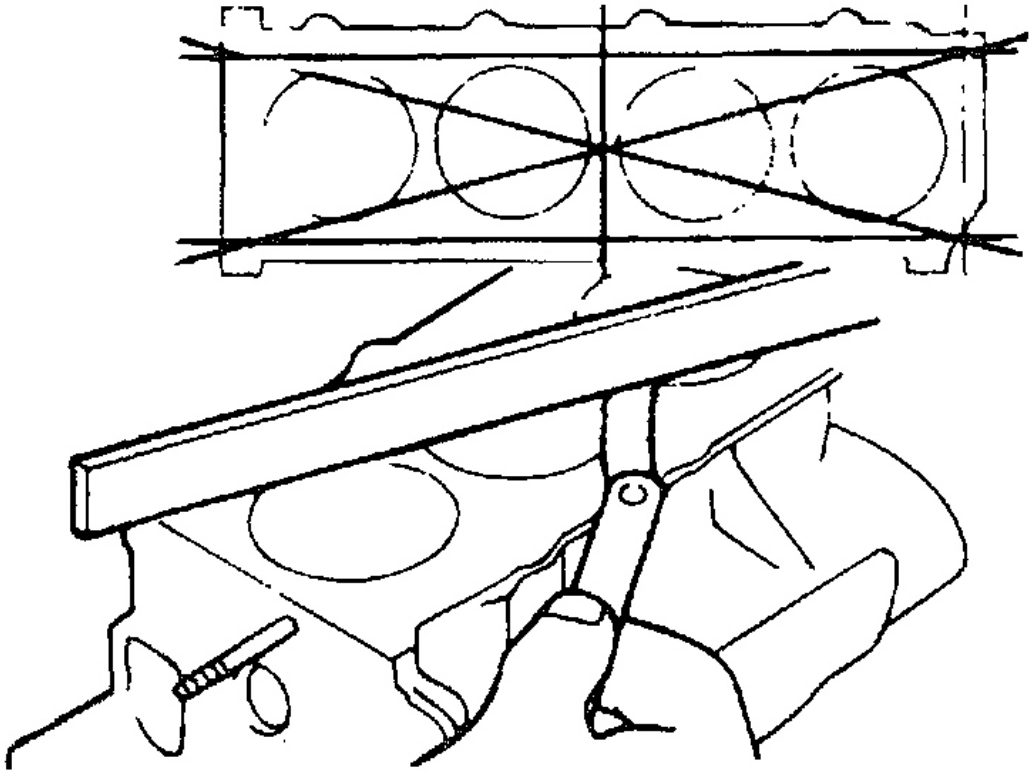


Fig. 181: Checking Cylinder Block Flatness
Courtesy of HYUNDAI MOTOR CO.

3. Measure the cylinder bore with a cylinder gauge at three levels in the direction of A and B. If the cylinder bores show more than the specified out-of-round or taper or if the cylinder walls are badly scuffed or scored, the cylinder block should be rebored and honed. Oversize pistons and rings must be fitted.

   Cylinder I.D: 76.5-76.53mm (3.0118-3.0130 in.)

   Cylinder I.D taper: 0.01mm (0.0004 in.) or less

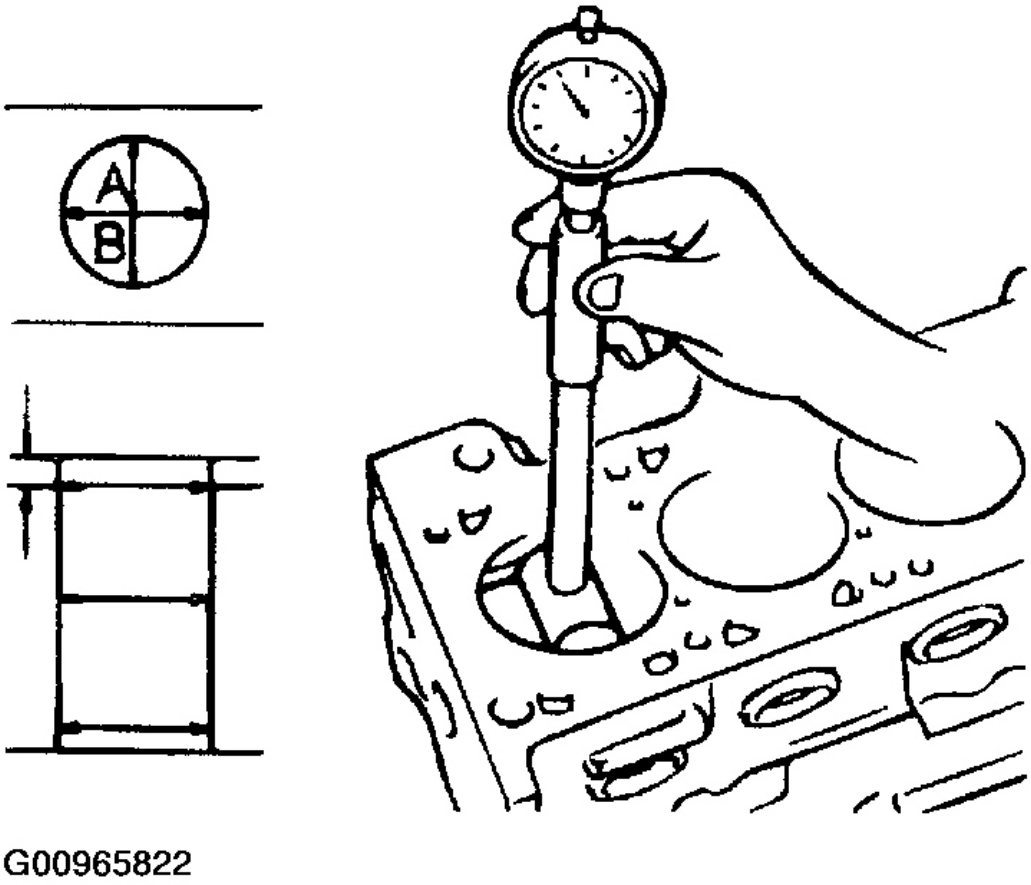


Fig. 182: Measuring Cylinder Bore
Courtesy of HYUNDAI MOTOR CO.

4. If a cylinder ridge exists, cut away with a ridge reamer.
5. Oversize pistons are available in four sizes.

   Piston service size and mark mm (in.)

   0.25 (0.010) O.S.: 0.25

   0.50 (0.020) O.S.: 0.50

   0.75 (0.030) O.S.: 0.75

   1.00 (0.039) O.S.: 1.00
6. When boring the cylinder to the oversize, maintain the specified clearance between the oversize piston and the bore, and make sure that all pistons used are the same oversize.

   The standard measurement of the piston's outside diameter is taken 47mm (1.85 in.) from the top land of the piston.

Piston-to-cylinder clearance: 0.025-0.045mm (0.0010-0.0018 in.)

ENGINE MOUNTS

COMPONENTS

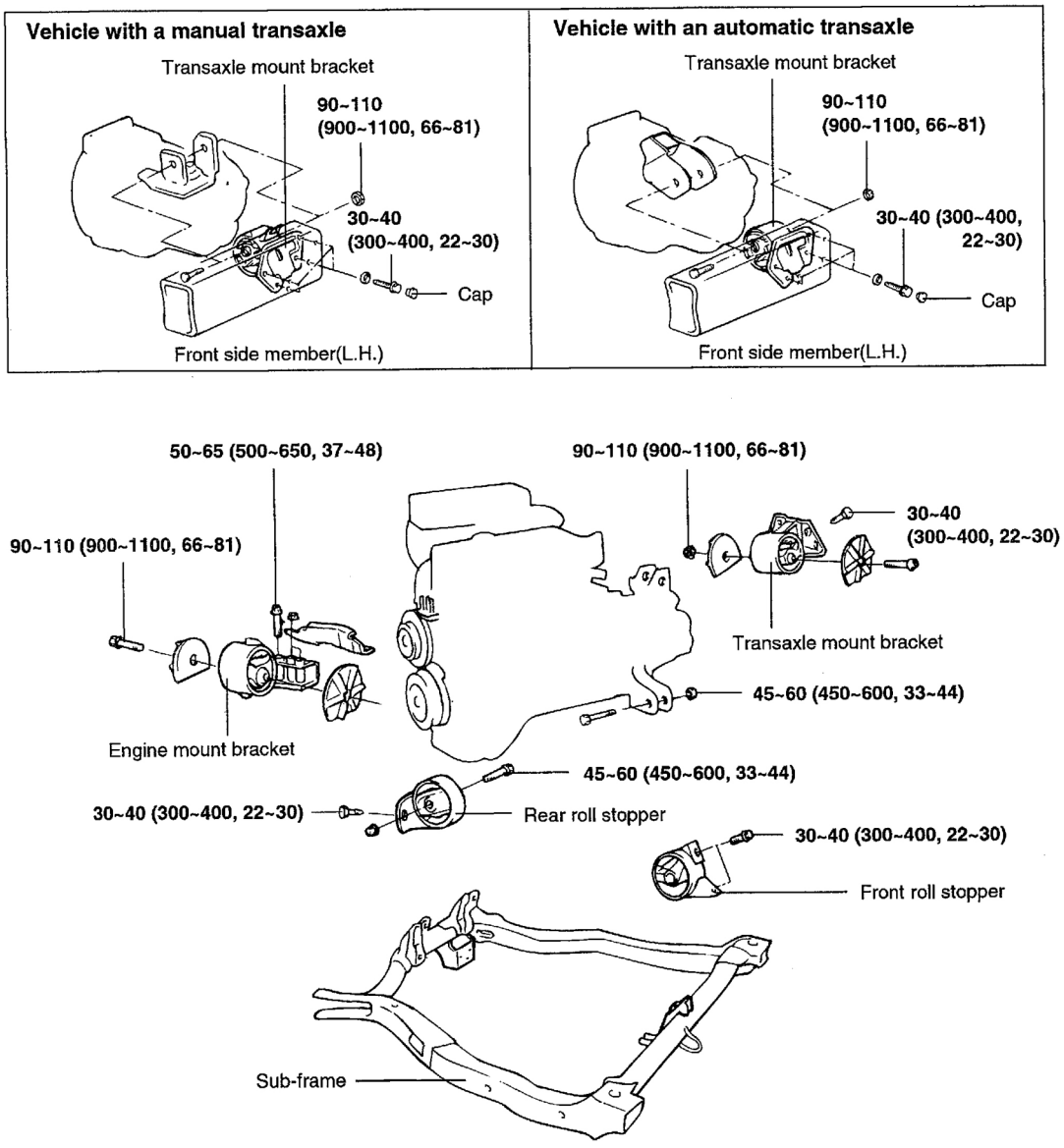
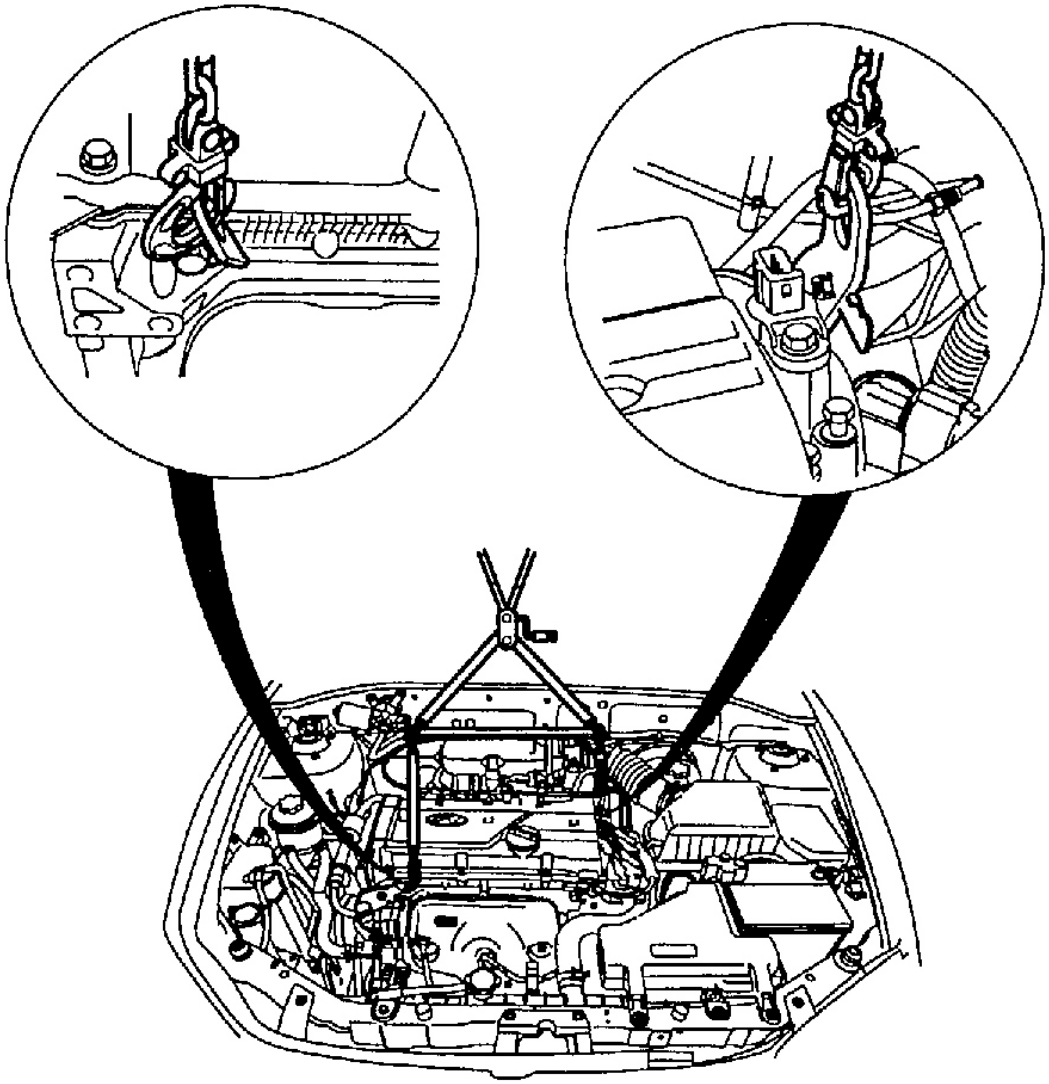


Fig. 183: Engine Mount Components
Courtesy of HYUNDAI MOTOR CO.

REMOVAL

Attach an engine hoist to the engine hooks, and raise the engine just enough so that there is no pressure on the insulators.

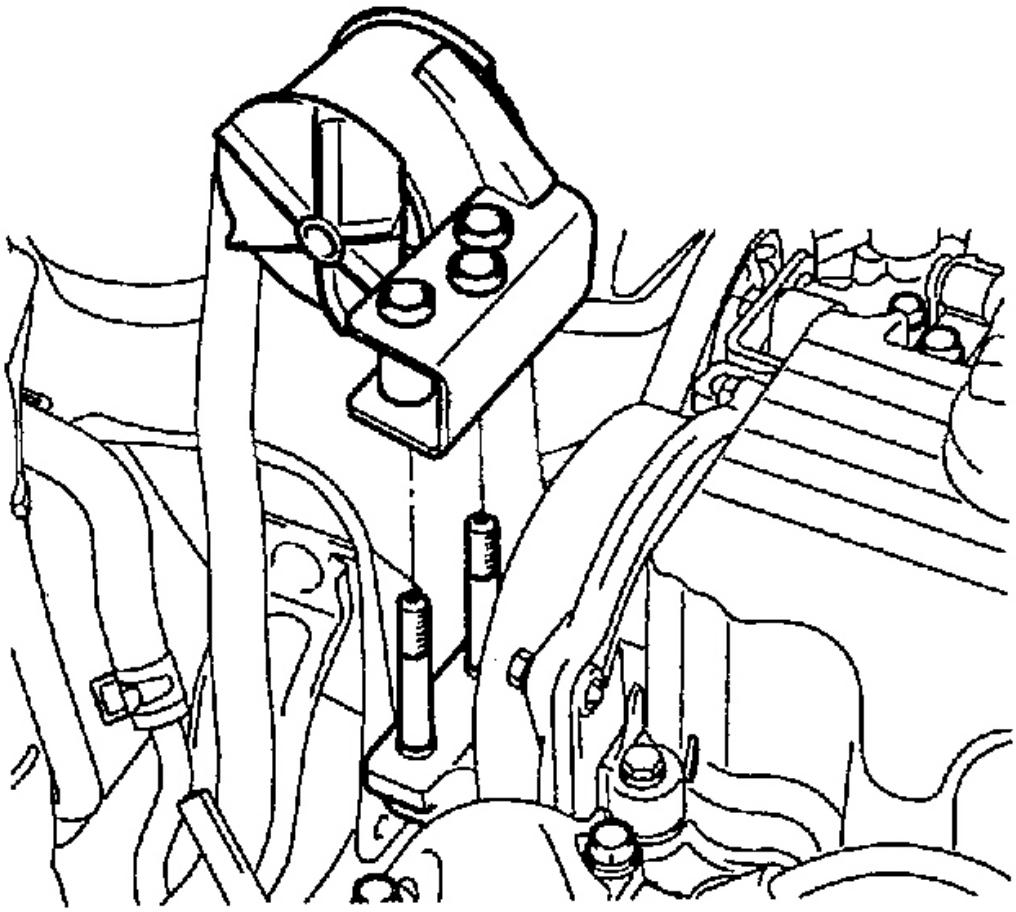


G00965824

Fig. 184: Attaching Engine Hoist
Courtesy of HYUNDAI MOTOR CO.

ENGINE MOUNTING

Remove the engine mounting support bracket from the engine.



G00965825

Fig. 185: Removing Engine Mounting Support Bracket
Courtesy of HYUNDAI MOTOR CO.

TRANSMISSION MOUNTING

1. Remove the air cleaner.

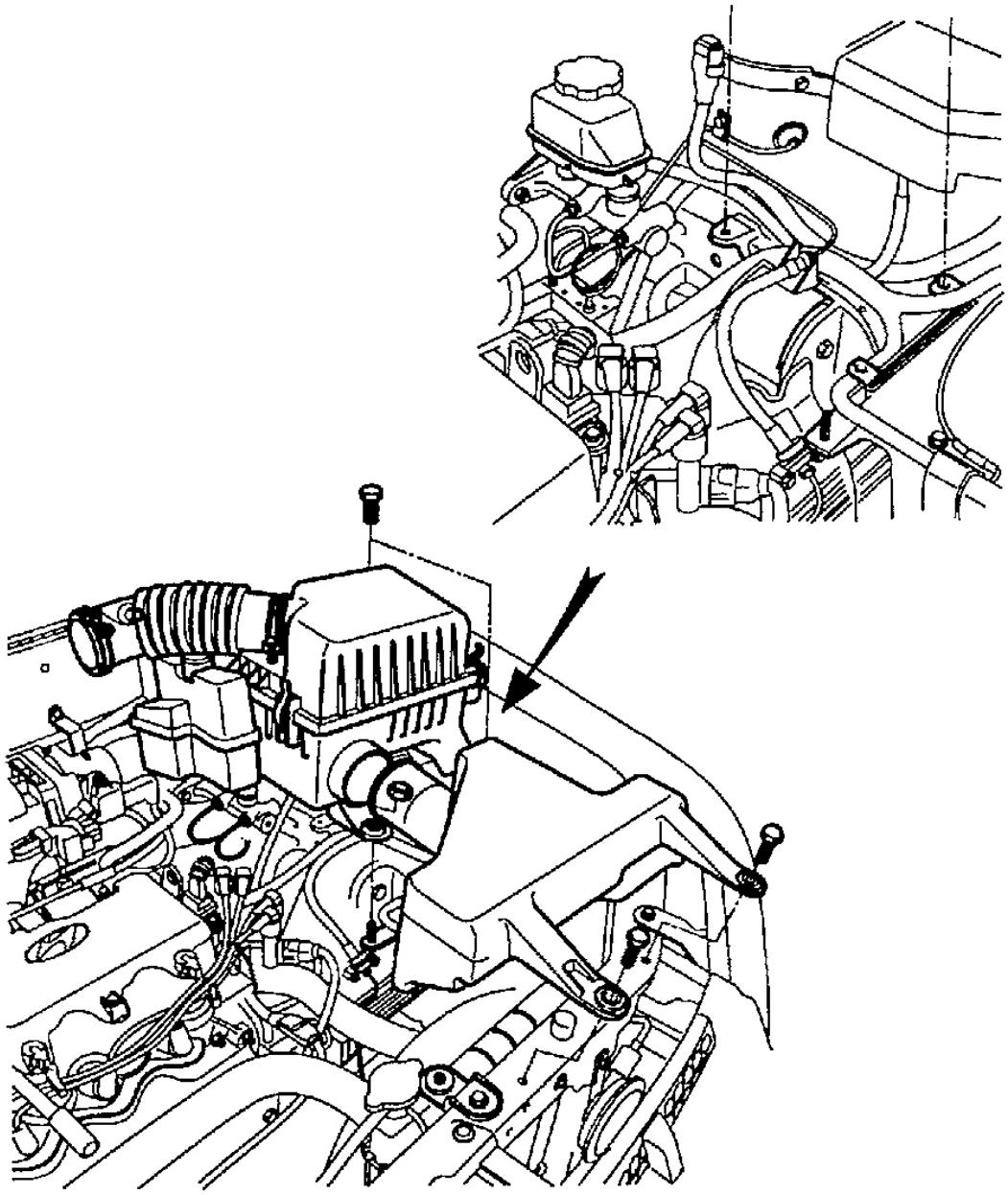


Fig. 186: Removing Air Cleaner
Courtesy of HYUNDAI MOTOR CO.

2. Remove the transmission mounting bolt. (17mm)

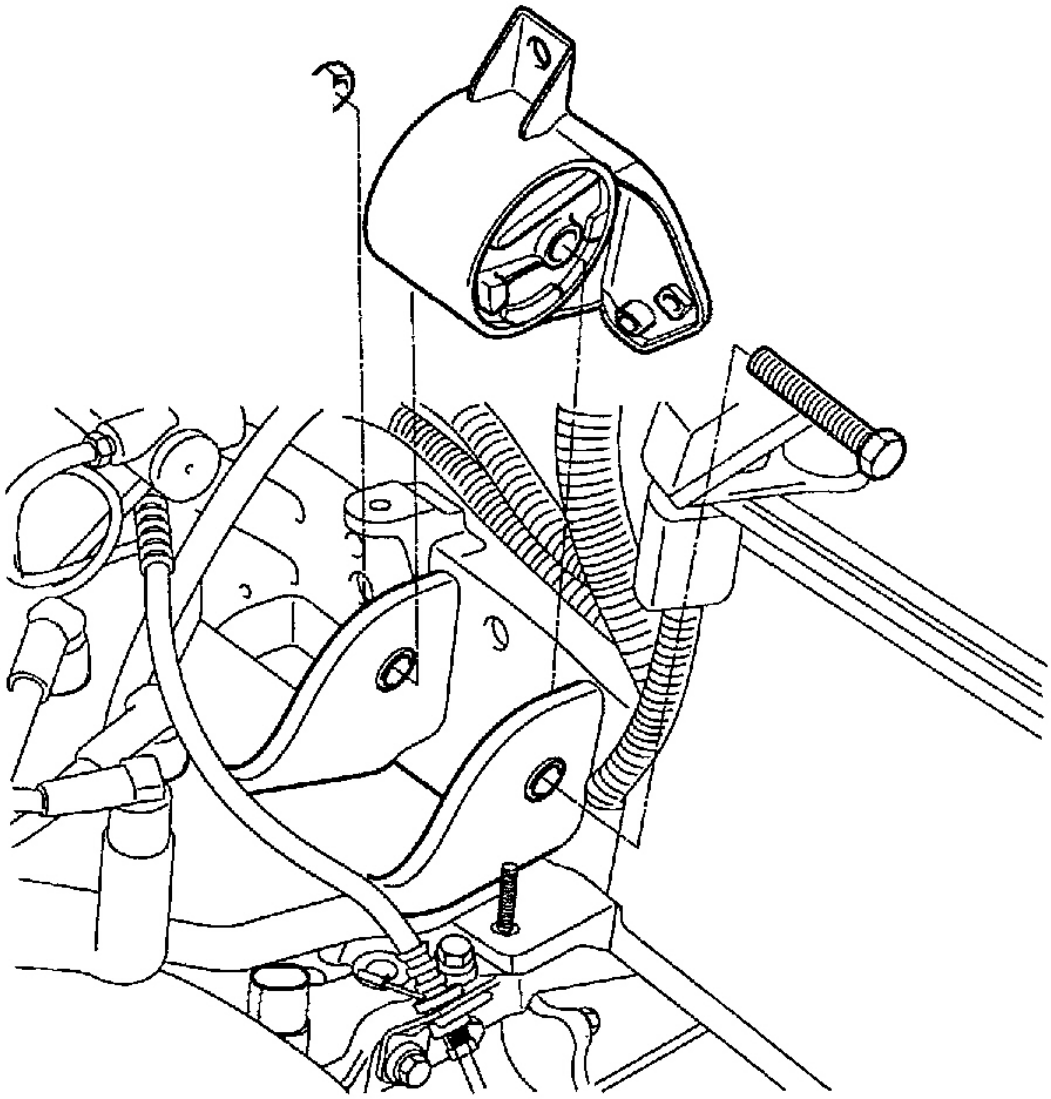
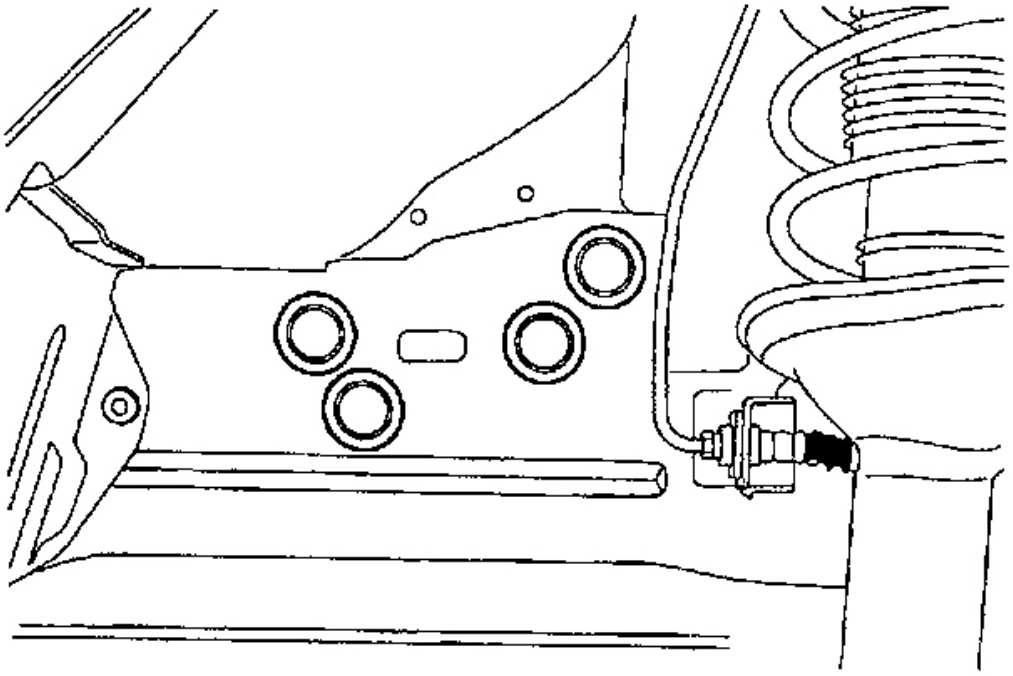


Fig. 187: Removing Transmission Mounting Bolt
Courtesy of HYUNDAI MOTOR CO.

3. Detach the cap from inside the right fender shield. Remove the transmission mounting bolts. (14mm)



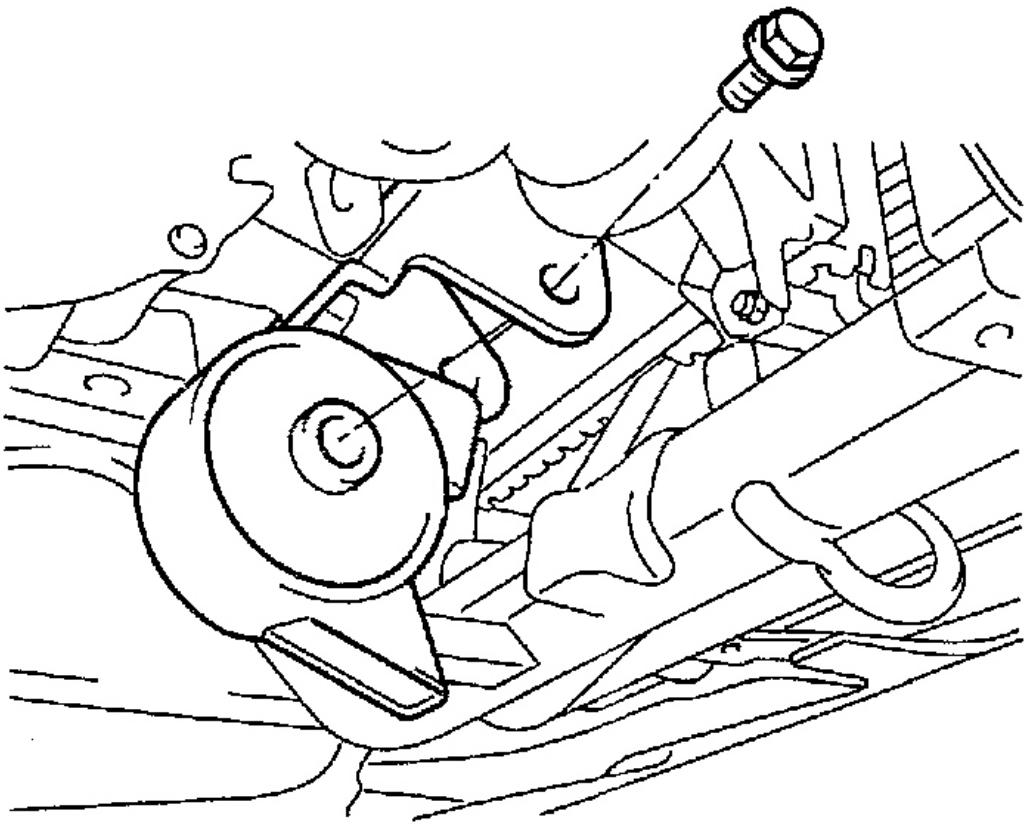
G00965828

Fig. 188: Identifying Transmission Mounting Bolts Caps
Courtesy of HYUNDAI MOTOR CO.

4. Remove the transmission bracket.

FRONT ROLL STOPPER BRACKET

Remove the roll rod bracket from the cross member.

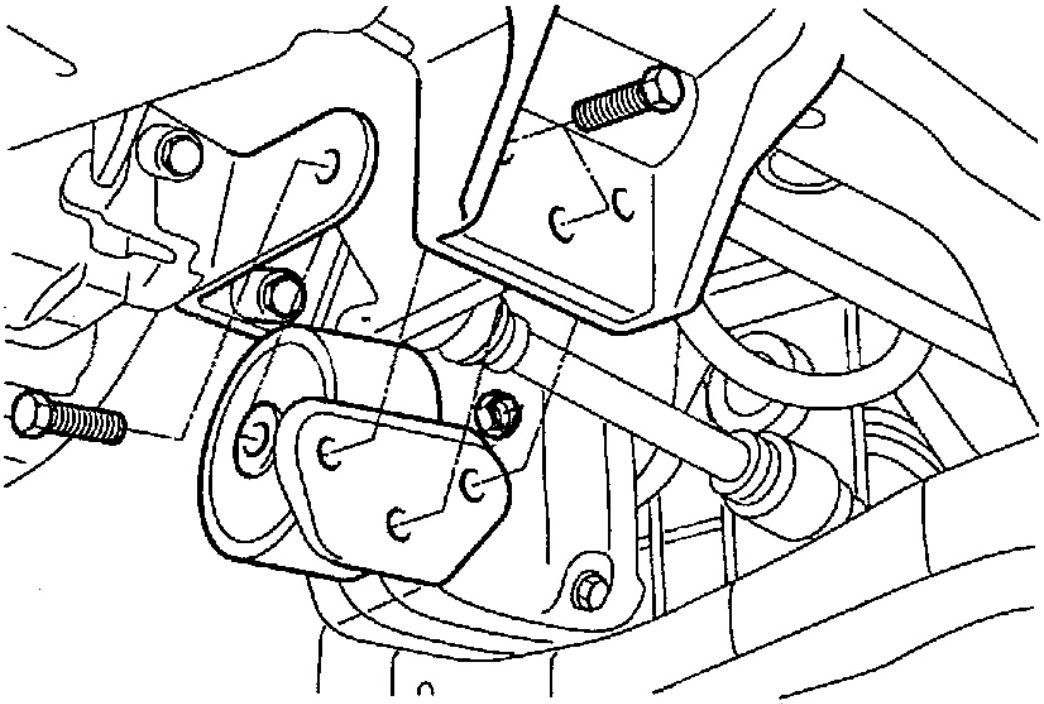


G00965829

Fig. 189: Removing Roll Rod Bracket From Cross Member
Courtesy of HYUNDAI MOTOR CO.

REAR ROLL STOPPER BRACKET

Remove the rear roll stopper bracket from the sub frame.



G00965830

Fig. 190: Removing Rear Roll Stopper Bracket From Sub Frame
Courtesy of HYUNDAI MOTOR CO.

INTAKE & EXHAUST SYSTEM

EXHAUST MANIFOLD

COMPONENTS

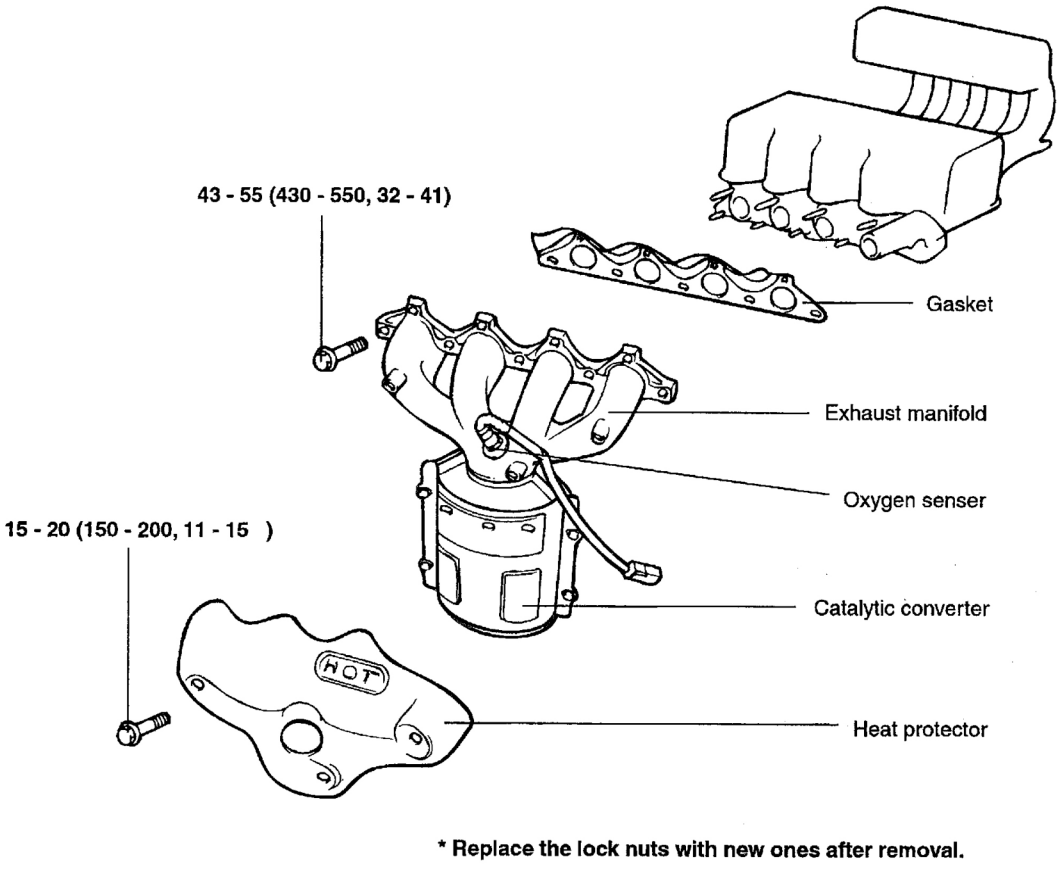


Fig. 191: Exhaust Manifold Components
Courtesy of HYUNDAI MOTOR CO.

DISASSEMBLY

1. Disconnect the oxygen sensor connect.

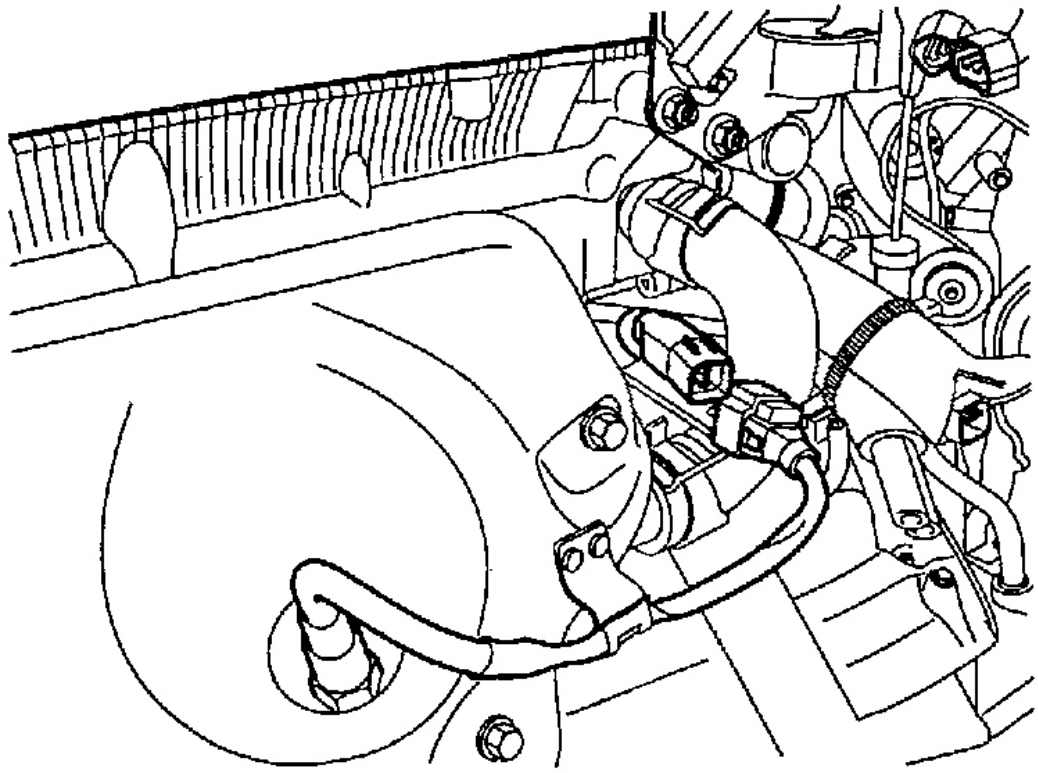


Fig. 192: Disconnecting Oxygen Sensor
Courtesy of HYUNDAI MOTOR CO.

2. Remove the exhaust manifold heat protector.
3. Remove the exhaust manifold assembly from the cylinder head.
4. Remove the exhaust manifold gasket.

INSPECTION

EXHAUST MANIFOLD

1. Check for damage or cracking.
2. Check for damage or cracking of welding between exhaust manifold and converter.

REASSEMBLY

Install the exhaust manifold in the reverse order of removal.

CAUTION: Replace the exhaust manifold gasket and lock nut when reassembling.

INTAKE MANIFOLD

COMPONENTS

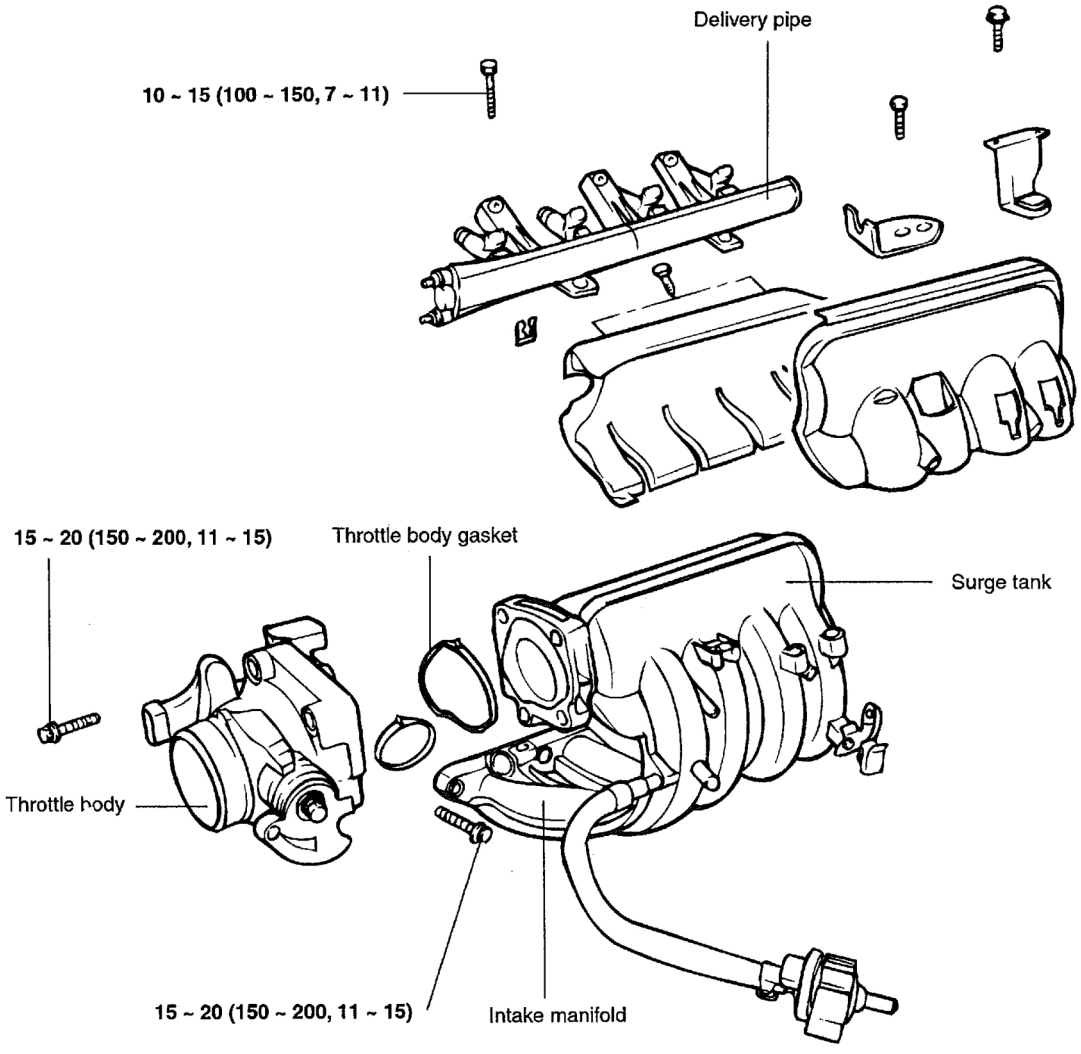


Fig. 193: Intake Manifold Components
Courtesy of HYUNDAI MOTOR CO.

REMOVAL

1. Disconnect the MAP, ISA and TPS connectors.

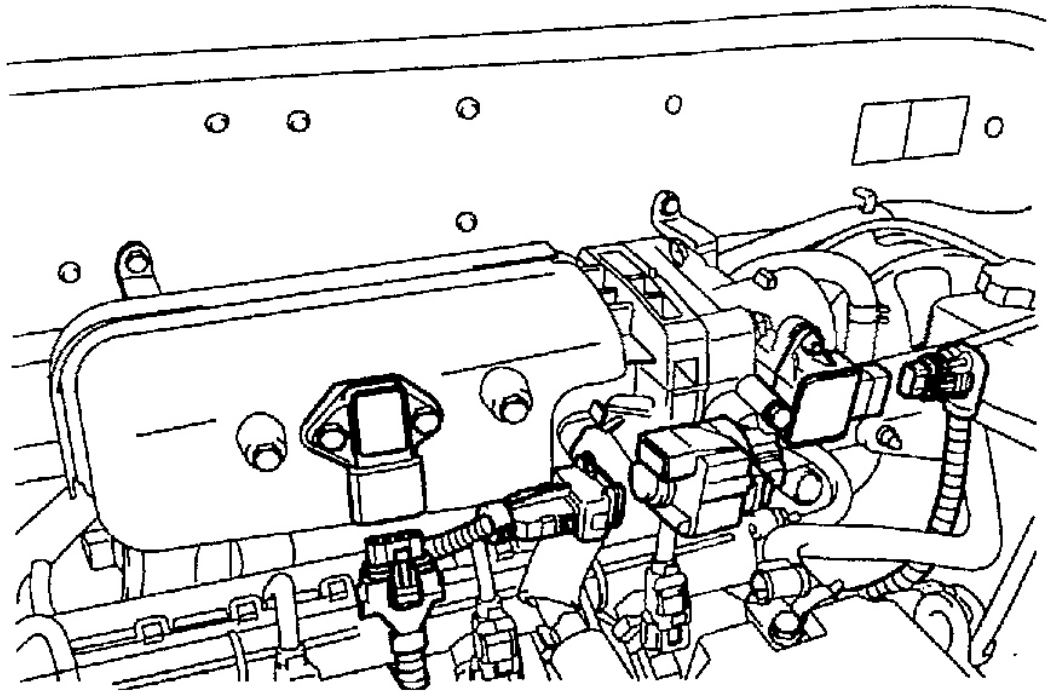


Fig. 194: Identifying MAP, ISA & TPS connectors
Courtesy of HYUNDAI MOTOR CO.

2. Remove the intake air hose connected to the throttle body.
3. Remove the accelerator cable.
4. Remove the PCV hose and brake booster vacuum hoses.

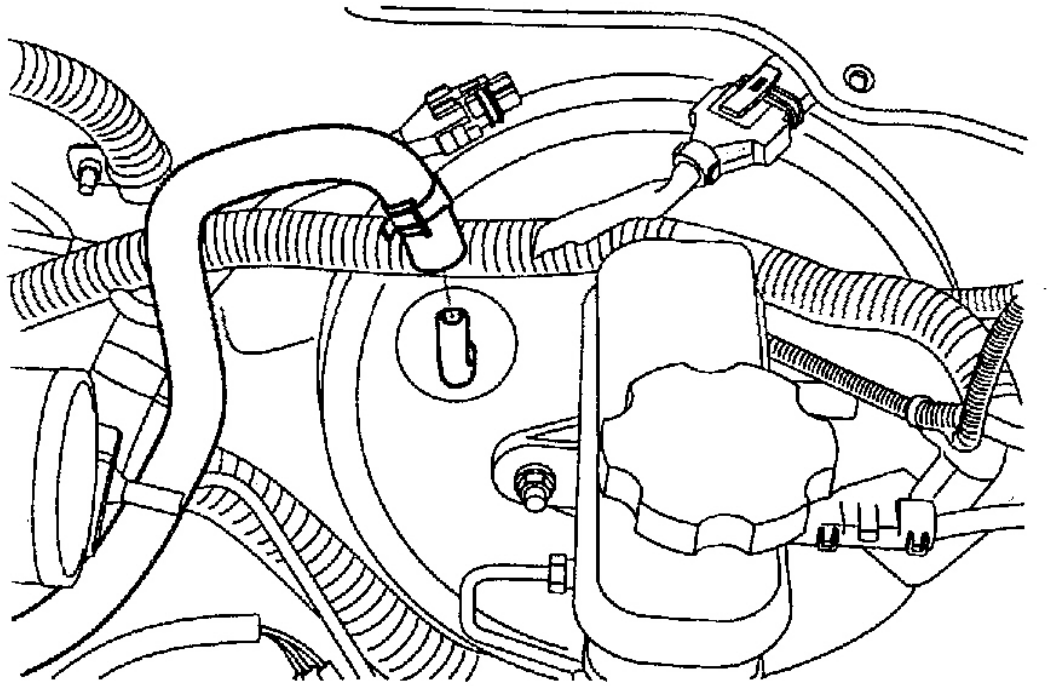


Fig. 195: Removing PCV Hose
Courtesy of HYUNDAI MOTOR CO.

5. Disconnect the coolant hose connections front the throttle body.

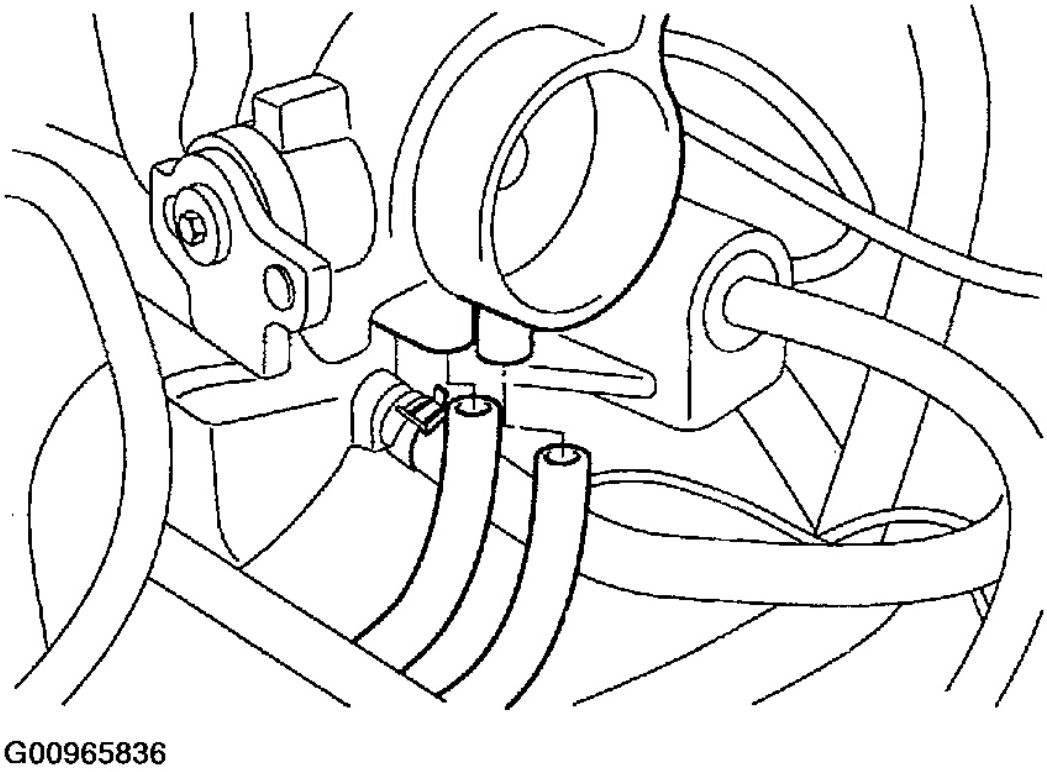
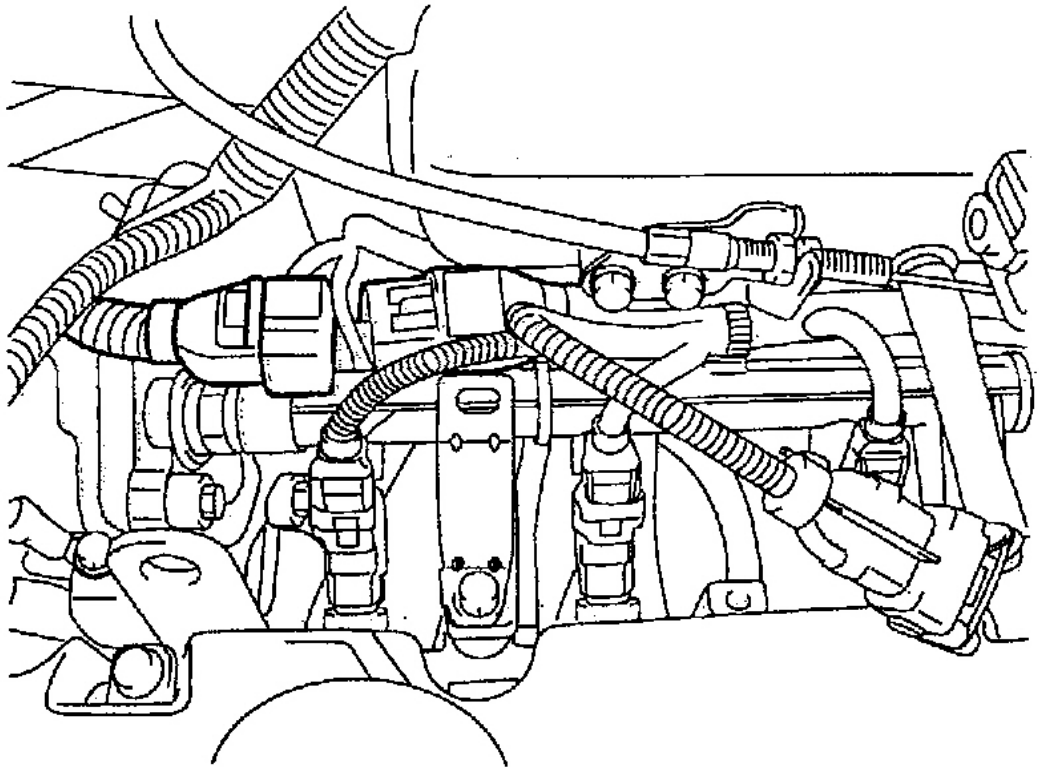


Fig. 196: Removing Coolant Hose
Courtesy of HYUNDAI MOTOR CO.

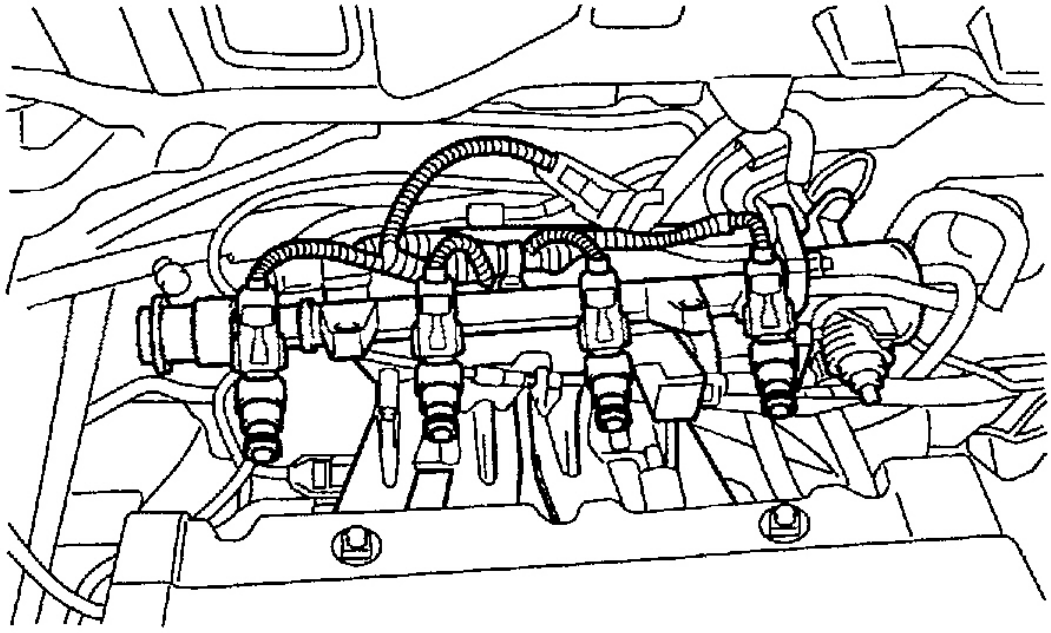
6. Disconnect the fuel injector harness connector.



G00965837

Fig. 197: Disconnecting Fuel Injector Harness Connector
Courtesy of HYUNDAI MOTOR CO.

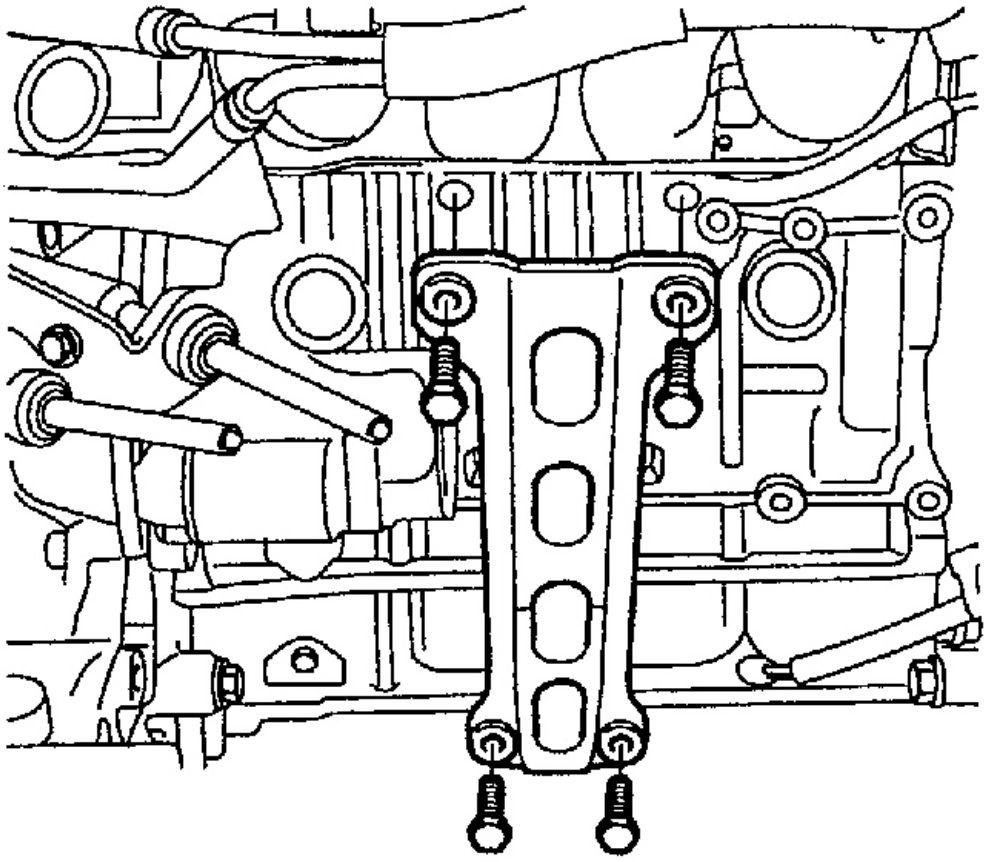
7. Remove the delivery pipe with the fuel injectors.



G00965838

Fig. 198: Removing Fuel Injector Delivery Pipe
Courtesy of HYUNDAI MOTOR CO.

8. Remove the intake manifold stay.



G00965839

Fig. 199: Identifying Intake Manifold Stay
Courtesy of HYUNDAI MOTOR CO.

9. Remove the intake manifold.
10. Remove the intake manifold assembly and gasket.

INSPECTION

INTAKE MANIFOLD

Check the parts for damage or cracking.

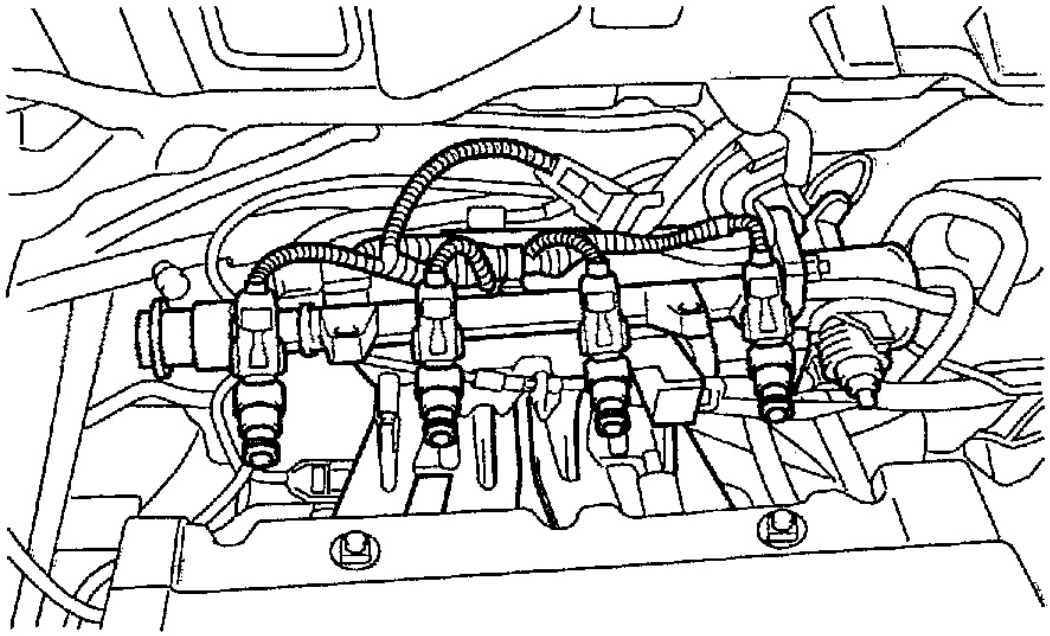
AIR HOSE

Check for damage or cracking of any part.

INSTALLATION

1. Replace the intake manifold gasket and install the intake manifold.
2. Install the intake manifold stay.
3. Install the delivery pipe with the fuel injectors.

CAUTION: Be careful not to drop the injectors when removing the delivery pipe.



G00965840

Fig. 200: View Of Fuel Delivery Pipe
Courtesy of HYUNDAI MOTOR CO.

4. Connect the fuel injector harness connector.
5. Install the PCV hose and brake booster vacuum hose.
6. Install the intake air hose to the throttle body.
7. Install the accelerator cable.
8. Connect the ISA and TPS wire harness connector.

MUFFLER

COMPONENTS

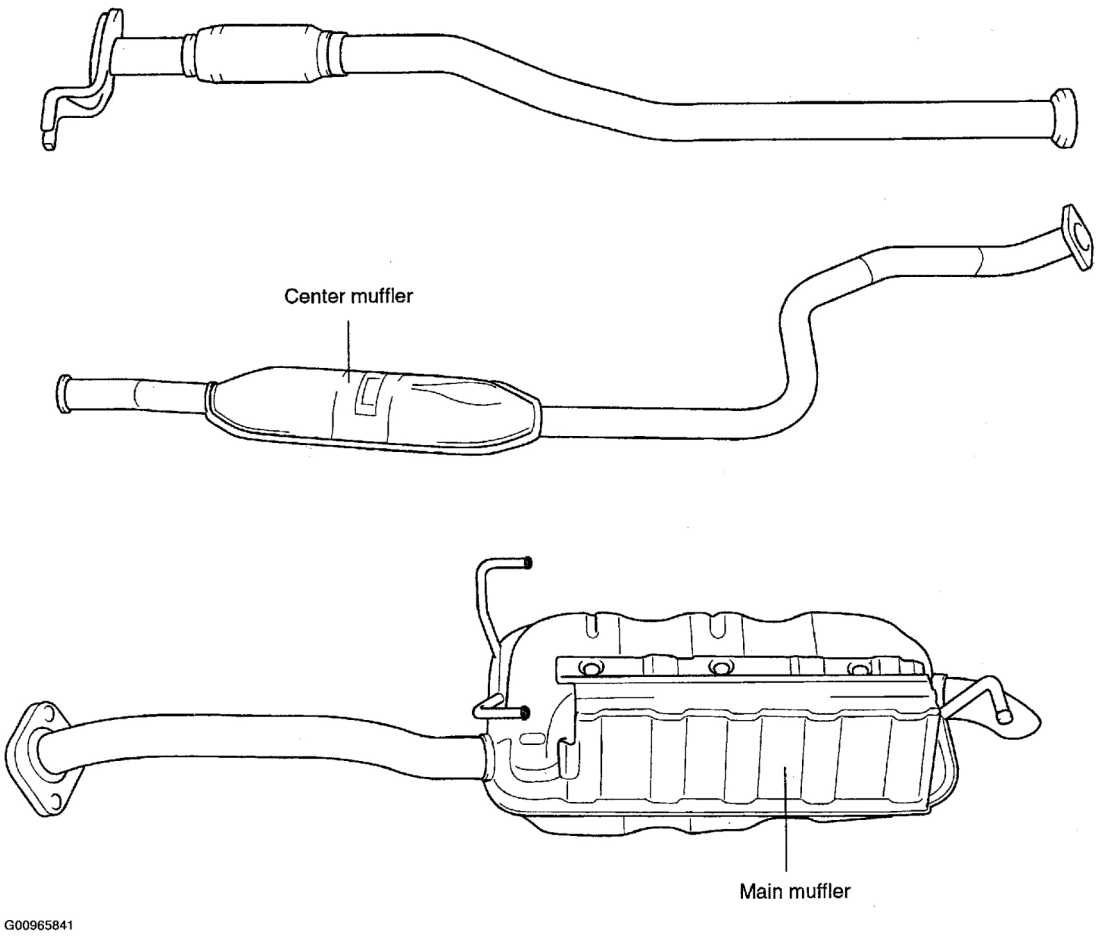


Fig. 201: Muffler Components
Courtesy of HYUNDAI MOTOR CO.

REMOVAL

REAR MUFFLER

CAUTION: Before removing or inspecting the exhaust system, ensure that the exhaust system is cool.

1. Disconnect the rear muffler from the center muffler.
2. Remove the rubber hangers and remove the rear muffler.

CENTER MUFFLER

1. Remove the center muffler assembly from the rear muffler and front exhaust pipe.

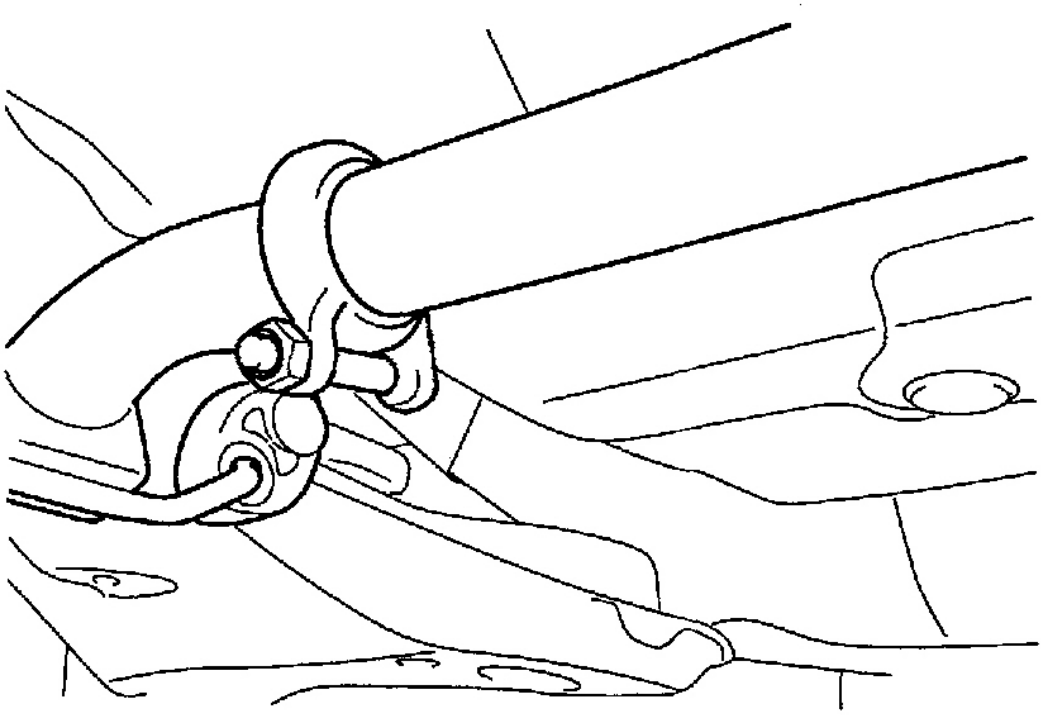
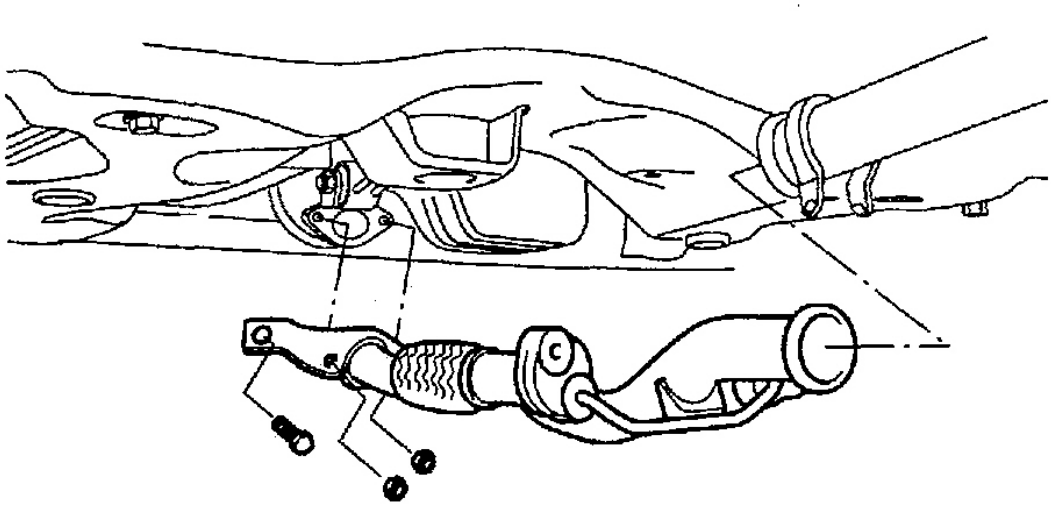


Fig. 202: Identifying Center Muffler Assembly
Courtesy of HYUNDAI MOTOR CO.

2. Remove the rubber hanger, then remove the center muffler.

FRONT EXHAUST PIPE

1. Remove the front exhaust pipe clamp bolts, and remove the front exhaust pipe nuts from the catalytic converter.
2. Remove the front exhaust pipe and center muffler bolt.



G00965844

Fig. 203: Removing Front Exhaust Pipe
Courtesy of HYUNDAI MOTOR CO.

INSTALLATION

1. Temporarily install the front exhaust pipe, the center exhaust pipe, and the rear muffler, in that order.
2. Tighten the parts securely. Make sure there is no interference with any body components.

AIR CLEANER (ACL)

COMPONENTS

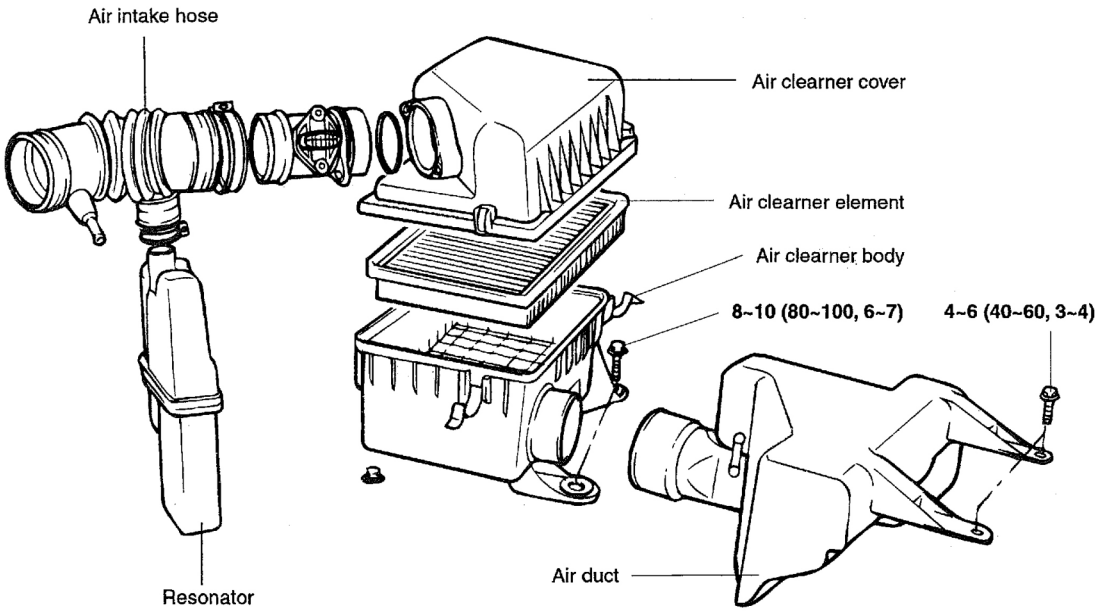
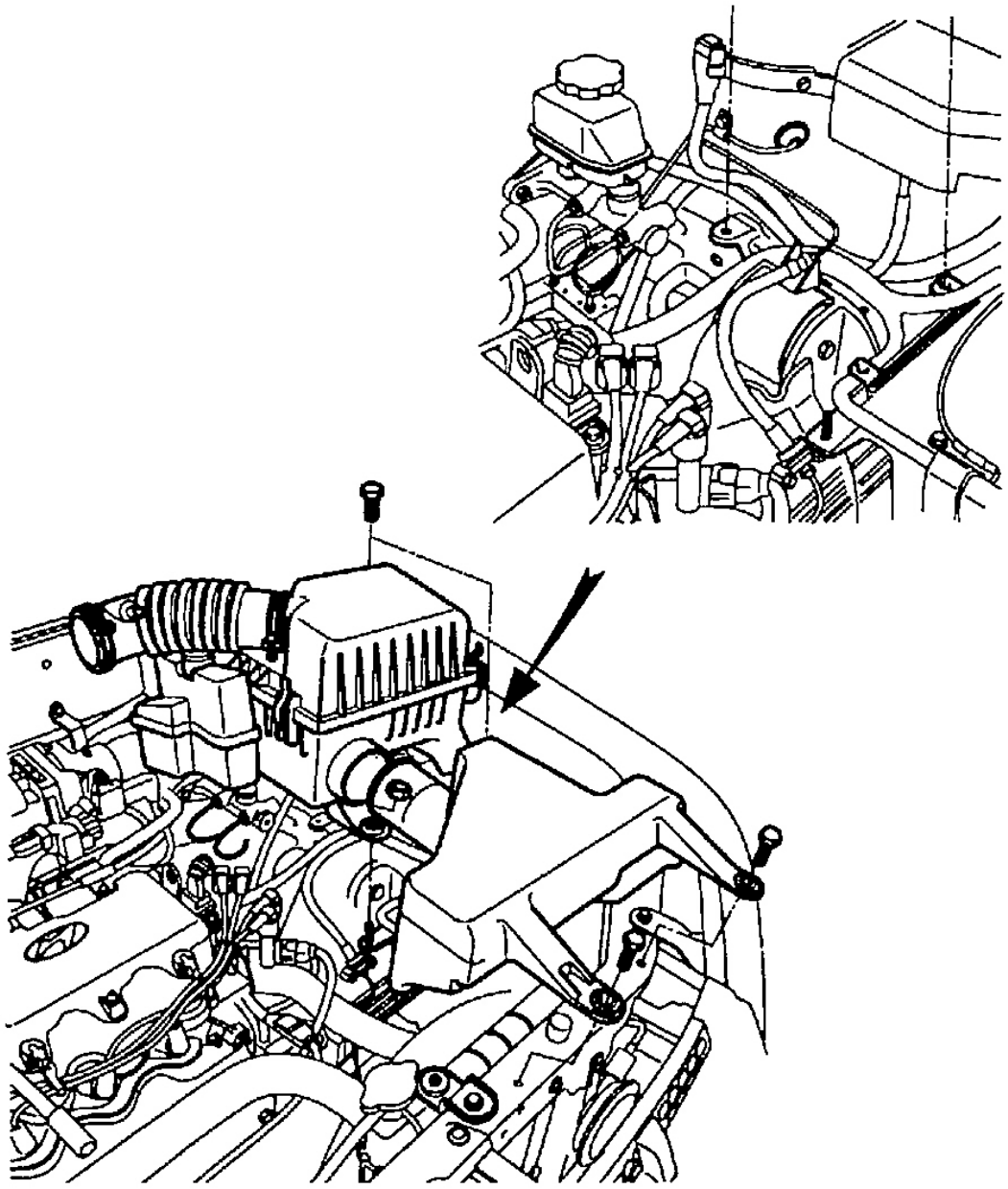


Fig. 204: Air Cleaner Components
Courtesy of HYUNDAI MOTOR CO.

REMOVAL

1. Remove the air duct connected to the air cleaner.
2. Remove the air intake hose at the air cleaner side.
3. Remove the air cleaner cover and filter.
4. Remove the air cleaner mounting bolts and remove the air cleaner.



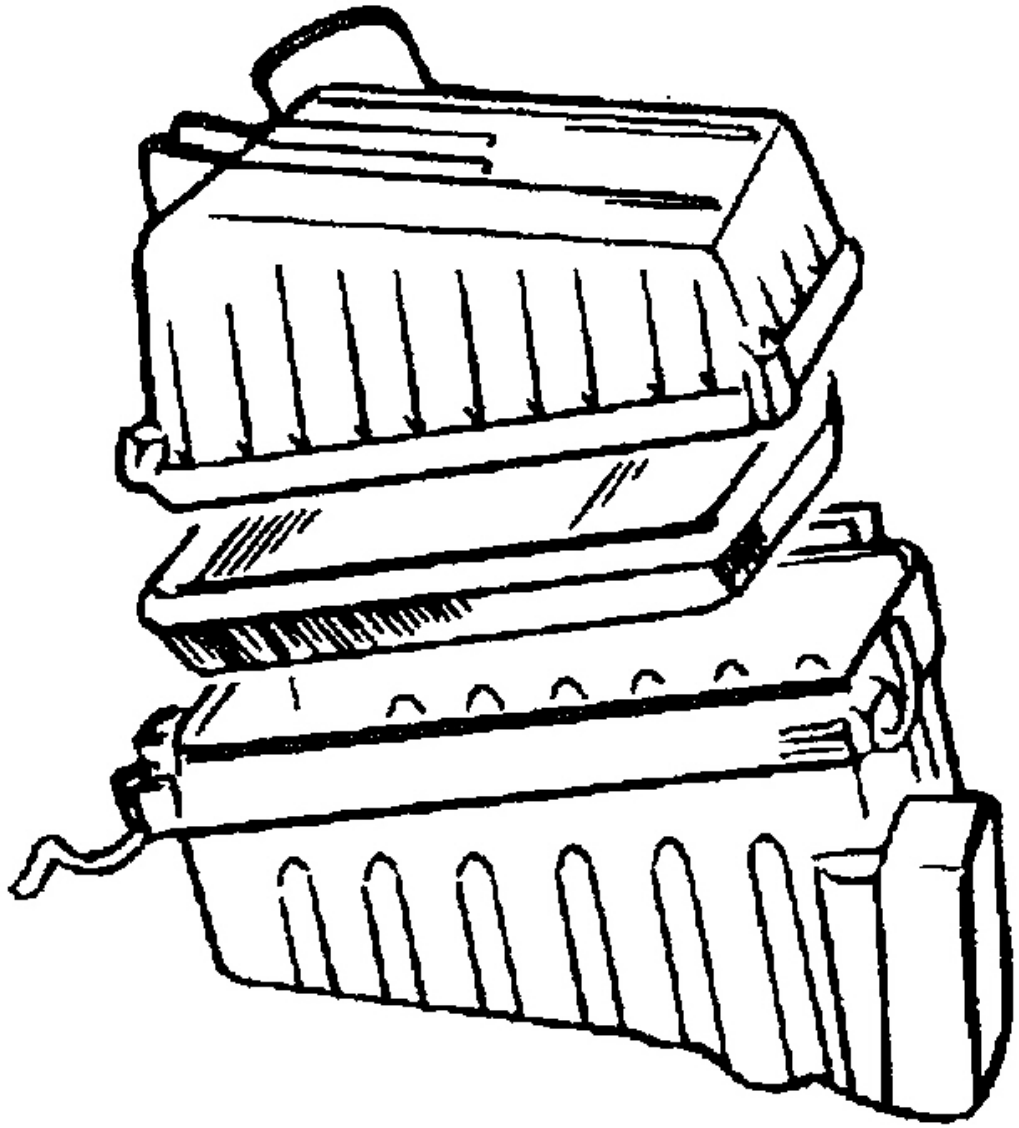
G00965846

Fig. 205: Removing Air Cleaner
Courtesy of HYUNDAI MOTOR CO.

INSPECTION

1. Check the air cleaner body, cover, or filter for distortion, corrosion or damage.
2. Check the air duct for damage.

3. Check the resonator for distortion or damage.



G00965847

Fig. 206: Identifying Air Cleaner Body
Courtesy of HYUNDAI MOTOR CO.

4. Check the air cleaner filter for restriction, contamination or damage. If the filter is slightly restricted, remove the dust and other contaminants by blowing compressed air from the upper side through the filter.

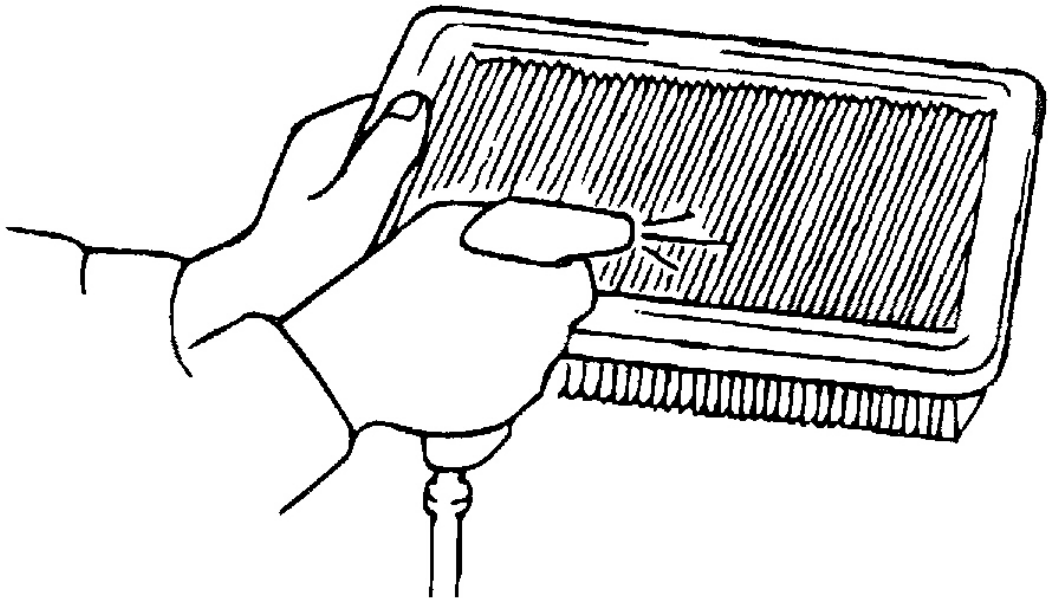


Fig. 207: Cleaning Air Filter
Courtesy of HYUNDAI MOTOR CO.

5. Check the air cleaner housing for restrictions, contamination or damage.

INSTALLATION

Install the air cleaner assembly following the reverse order of removal.

