

2005 Hyundai Tiburon GT

2005 ENGINE Engine Mechanical System (G6BA-GSL 2.7L) - Tiburon

2005 ENGINE**Engine Mechanical System (G6BA-GSL 2.7L) - Tiburon****SPECIFICATIONS****ENGINE GENERAL SPECIFICATIONS (G6BA - GSL 2.7L)**

Description	Specifications	Limit
General		
Type	V-type, DOHC	
Number of cylinder	6	
Bore	86.7mm (3.4133in.)	
Stroke	75mm (2.9528in.)	
Total displacement	2,656cc	
Compression ratio	10:1	
Firing order	1-2-3-4-5-6	
Valve timing		
Intake valve		
Opens (BTDC)	6°	
Closes (ABDC)	46°	
Exhaust valve		
Opens (BBDC)	44°	
Closes (ATDC)	8	
Camshaft		
Drive mechanism	Cogged type belt	
Cam height		
Intake	43.95 ~ 44.15mm (1.7303 ~ 1.7382in.)	43.45mm (1.7106in.)
Exhaust	43.95 ~ 44.15mm (1.7303 ~ 1.7382in.)	43.45mm (1.7106in.)
Journal diameter	25.964 ~ 25.980mm (1.0222 ~ 1.0228in.)	25.914mm (1.0202in.)
Bearing oil clearance	0.02 ~ 0.061mm (0.0007 ~ 0.0024in.)	0.1mm (0.0039in.)
End play	0.1 ~ 0.15mm (0.0039 ~ 0.0059in.)	
Cylinder head		
Flatness of cylinder head surface	Max. 0.03mm (0.0012in.)	0.05mm (0.0020in.)
Flatness of manifold mounting surface		
Intake	Max. 0.15mm (0.0059in.)	0.15mm (0.0059in.)
Exhaust	Max. 0.15mm (0.0059in.)	0.15mm (0.0059in.)
Valve guides hole diameter		

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0.05 (0.002) O.S.	11.05 ~ 11.068mm (0.435 ~ 0.436in.)	
0.25 (0.010) O.S.	11.25 ~ 11.268mm (0.443 ~ 0.444in.)	
0.50 (0.020) O.S.	11.50 ~ 11.518mm (0.453 ~ 0.453in.)	
Intake valve seat ring hole diameter		
0.3 (0.012) O.S.	33.300 ~ 33.325mm (1.311 ~ 1.312in.)	
Exhaust valve seat ring hole diameter		
0.3 (0.012) O.S.	28.600 ~ 28.621mm (1.126 ~ 1.127in.)	
Valve		
Overall length		
Intake	96.1mm (3.783in.)	
Exhaust	97.15mm (3.825in.)	
Stem diameter		
Intake	5.965 ~ 5.98mm (0.235 ~ 0.2354in.)	
Exhaust	5.95 ~ 5.965mm (0.234 ~ 0.235in.)	
Face angle	45° ~ 45.5°	
Margin		
Intake	1.0mm (0.0394in.)	0.5mm (0.0197in.)
Exhaust	1.3mm (0.0512in.)	0.8mm (0.0315in.)
Clearance (Stem-to-guide)		
Intake	0.02 ~ 0.05mm (0.008 ~ 0.0020in.)	0.10mm (0.0039in.)
Exhaust	0.030 ~ 0.065mm (0.0012 ~ 0.0026in.)	0.13mm (0.0051 in.)
Valve spring		
Free length	42.5mm (1.6732in.)	41.5mm (1.6339in.)
Load	21kg/35mm (48.4lb/1.3780in.)	21.9kg/34mm (48.4lb/1.3386in.)
Out of squareness	Max. 1.5°	Max. 3°
Piston		
Diameter (Standard)	86.68 ~ 86.71mm (3.413 ~ 3.414in.)	
Clearance (Piston-to-cylinder)	0.01 ~ 0.03mm (0.0004 ~ 0.0012in.)	
Ring groove width		
No.1	1.230 ~ 1.250mm (0.0484 ~ 0.0492in.)	

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No.2	1.220 ~ 1.240mm (0.0480 ~ 0.0488in.)	
Oil	2.515 ~ 2.535mm (0.0990 ~ 0.0998in.)	
Piston for service	0.25mm (0.010in.), 0.50mm (0.020in.)	
Piston ring		
Number of rings per piston	3	
Compression ring	2	
Oil ring	1	
Compression ring type		
No.1	Inner bevel type	
No.2	Taper type	
Oil ring type	3-piece type	
Ring end gap		
No.1	0.20 ~ 0.35mm (0.0079 ~ 0.0138in.)	0.8mm (0.031 in.)
No.2	0.37 ~ 0.52mm (0.0146 ~ 0.0205in.)	0.8mm (0.031 in.)
Oil ring side rail	0.2 ~ 0.7mm (0.0079 ~ 0.0276in.)	1.0mm (0.039in.)
Ring side clearance		
No.1	0.04 ~ 0.08mm (0.0016 ~ 0.0031 in.)	0.1mm (0.004in.)
No.2	0.03 ~ 0.07mm (0.0012 ~ 0.0028in.)	0.1mm (0.004in.)
Rings for service	0.25mm (0.010in.), 0.50mm (0.020in.)	
Connecting rod		
Piston pin installation force	2,450 ~ 12.225N (250 ~ 1,250kg, 551 ~ 2,755lb)	
Side clearance (big end)	0.10 ~ 0.25mm (0.0039 ~ 0.0098in.)	0.4mm (0.016in.)
Bend	0.05mm or less/100mm (0.0020in. or less/3.937in.)	
Bearing oil clearance	0.018 ~ 0.036mm (0.0007 ~ 0.0014in.)	0.1mm (0.004in.)
Crankshaft		
Journal O.D.	61.982 ~ 62.000mm (2.4402 ~ 2.4409in.)	
Pin O.D.	47.982 ~ 48.000mm (1.8891 ~ 1.8898in.)	
Out-of-round, taper of journal and pin	Max. 0.003mm (0.0012in.)	

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Taper of journal and pin	Max. 0.005mm (0.00020in.)	
End play	0.070 ~ 0.250mm (0.0028 ~ 0.0098in.)	0.4mm (0.016in.)
Main bearing clearance	0.004 ~ 0.022mm (0.0002 ~ 0.0009in.)	0.1mm (0.004in.)
Cylinder block		0.05mm (0.002in.)
Cylinder bore	86.7mm (3.4134in.)	
Flatness of gasket surface	Max. 0.03mm (0.0012in.)	
Out-of-round of cylinder bore	Max. 0.02mm (0.0008in.)	
Oil pump		
Body clearance	0.100 ~ 0.181mm (0.0039 ~ 0.0071 in.)	
Side clearance	0.040 ~ 0.095mm (0.0016 ~ 0.0037in.)	
Relief spring		
Free height	43.8mm (1.724in.)	
Load	4.6kg/39.3mm (10lb/1.548in.)	
Oil filter		
Type	Cartridge, full flow	
Engine oil pressure	50kPa (7.3psi) or more	
	[Conditions: Oil temperature is 75 to 90°C (167 to 194°F)]	
Cooling method	Engine coolant cooling, forced circulation with electric fan	
Cooling system quantity	7.0lit (7.4U.S.qts., 6.1imp.qts)	
Thermostat		
Type	Wax pellet type with jiggle valve	
Normal opening temperature	82 +/-2.0°C (179.6 +/- 3.6°F)	
Opening temperature range	80 ~ 84°C (176 ~ 183.2°F)	
Wide open temperature	95°C (203°F)	
Radiator cap		
Main valve opening pressure	107.9 +/- 14.7kPa (1.1 +/- 0.15kg/cm ² , 15.65 +/- 2.13psi)	
Main valve closing pressure	83.4kPa (0.85kg/cm ² , 12.1 psi)	
Vacuum valve opening pressure	-6.86kPa (-0.07kg/cm ² , -1.00 psi)	
Air cleaner		
Type	Dry	
Element	Paper type	
Exhaust pipe		
Muffler	Expansion resonance type	
Suspend system	Rubber hangers	

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SERVICE STANDARDS

SERVICE STANDARDS

Standard value	
Coolant concentration	
Tropical areas	40%
Other areas	50%

COOLANT

COOLANT SPECIFICATION

Engine coolant	Ethylene glycol base for aluminum radiator
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SEALANT

SEALANT SPECIFICATIONS

Engine coolant temperature sensor	LOCTITE 262 or equivalent, Three bond No. 1324 or equivalent.
Oil pressure switch	3M ATD No.8660 or Three bond No.1141E
PCV valve	LOCTITE 242 or equivalent

TIGHTENING TORQUE

TIGHTENING TORQUE SPECIFICATIONS

Item	Nm	kgf.cm	lbf.ft
Camshaft sprocket bolt	90 ~ 110	900 ~ 1,100	65 ~ 85
Cylinder head cover bolt	8 ~ 10	80 ~ 100	5.8 ~ 7.2
Main bearing cap bolt			
M10	27~33 + (90°~94°)	270~300 + (90°~94°)	19.5~24+ (90°~94°)
M8	13~19 + (90°~94°)	130~190 + (90°~94°)	10~14+ (90°~94°)
Connecting rod bolt	16~20+ (90°~94°)	160~200+ (90°~94°)	12~15+ (90°~94°)
Cylinder head bolt (Cold engine)	25 + (58°~62°) + (43°~47°)	250 + (58°~62°) + (43°~47°)	18 + (58°~62°) + (43°~47°)
Oil pan drain plug	35 ~ 45	350 ~ 450	25 ~ 33
Lower oil pan bolt	10 ~ 12	100 ~ 120	7~9
Upper oil pan bolt			
[10 x 38mm (0.937 x 1.4961 in.)]	30 ~ 42	300 ~ 420	22 ~ 30
[8 x 22mm (0.3150 x 0.8661 in.)]	19 ~ 28	190 ~ 280	14 ~ 20
[161.5mm (6.3582in.)]	5 ~ 7	50 ~ 70	4 ~ 5
[152.5mm (6.0039in.)]	5 ~ 7	50 ~ 70	4 ~ 5
Oil screen bolt	15 ~ 22	150 ~ 220	11 ~ 16

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Oil pump case bolt	12 ~ 15	120 ~ 150	9 ~ 11
Oil relief valve plug	40 ~ 50	400 ~ 500	29 ~ 36
Oil pressure switch	15 ~ 22	150 ~ 220	11 ~ 16
Oil pressure cover screw	8 ~ 12	80 ~ 120	6 ~ 9
Oil filter	12 ~ 16	120 ~ 160	9 ~ 12
Drive plate and adapt	73 ~ 77	730 ~ 770	53 ~ 56
Air cleaner body installation bolt	8 ~ 12	80 ~ 120	6 ~ 9
Surge tank stay	15 ~ 20	150 ~ 200	11 ~ 14
Air intake surge tank to intake manifold (bolt)	15 ~ 20	150 ~ 200	11 ~ 14
Air intake surge tank to intake manifold (nut)	15 ~ 20	150 ~ 200	11 ~ 14
Intake manifold to cylinder head	19 ~ 21	190 ~ 210	14 ~ 15
Heat protector exhaust manifold	17 ~ 22	170 ~ 220	12 ~ 16
Exhaust manifold to cylinder head (Self-locking nut)	30 ~ 35	300 ~ 350	22 ~ 26
Oil level gauge guide to engine	12 ~ 15	120 ~ 150	9 ~ 11
Water outlet fitting bolt	17 ~ 20	170 ~ 200	12 ~ 14
Power steering oil pump bracket to cylinder head	17 ~ 26	170 ~ 260	12 ~ 19
Crank position sensor wheel screw	5-6	50 ~ 60	3.6 ~ 4.3
Engine mounting insulator bolt	50 ~ 65	500 ~ 650	36 ~ 47
Engine mounting bracket nut	60 ~ 80	600 ~ 800	43 ~ 58
Engine mounting bracket bolt	60 ~ 80	600 ~ 800	43 ~ 58
Engine support bracket bolt	60 ~ 70	600 ~ 700	43 ~ 51
Front roll stopper bracket sub frame bolt	50 ~ 65	500 ~ 650	36 ~ 47
Front roll stopper insulator bolt and nut	50 ~ 65	500 ~ 650	36 ~ 47
Rear roll stopper bracket to sub frame	50 ~ 65	500 ~ 650	36 ~ 47
Rear roll stopper insulator bolt and nut	50 ~ 65	500 ~ 650	36 ~ 47
Transaxle mounting	50 ~ 65	500 ~ 650	36 ~ 47

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bracket bolt			
Transaxle mounting insulator bolt	90-110	900 ~ 1,100	65 ~ 80
Fuel hose clamp to rear cylinder head assembly	12 ~ 15	120 ~ 150	9 ~ 11
Transaxle mounting plate	10 ~ 12	100 ~ 120	7 ~ 9
Rear plate	10 ~ 12	100 ~ 120	7 ~ 9
Oil seal case	10 ~ 12	100 ~ 120	7 ~ 9
Crankshaft pulley bolt	180 ~ 190	1,800 ~ 1,900	130 ~ 138
Timing belt cover bolt	10 ~ 12	100 ~ 12	7 ~ 9
Engine hanger bracket to engine	20 ~ 27	200 ~ 270	14 ~ 20
Alternator mounting bracket to engine	20 ~ 30	200 ~ 300	14 ~ 22
Alternator mounting nut (Engine front case side)	20 ~ 30	200 ~ 300	14 ~ 22
Alternator mounting bolt (Alternator mounting bracket side)	20 ~ 30	200 ~ 300	14 ~ 22
Starter to transmission (nut)	20 ~ 30	200 ~ 300	14 ~ 22
Starter to transmission (bolt)	27 ~ 34	270 ~ 340	20 ~ 25
Drive belt pulley bolt	35 ~ 55	350 ~ 550	25 ~ 40
Drive belt tensioner bolt	20 ~ 27	200 ~ 270	14 ~ 20
Engine coolant pump to cylinder block bolt (Head mark "7" mark)	15 ~ 22	150 ~ 220	11 ~ 16
Engine coolant temperature sensor	20 ~ 40	200 ~ 400	14 ~ 29
Engine coolant inlet fitting attaching bolt	17 ~ 20	170 ~ 200	12 ~ 14
Throttle body to surge tank bolt	15 ~ 20	150 ~ 200	11 ~ 14
Oxygen sensor to exhaust manifold	40 ~ 50	400 ~ 500	29 ~ 36
Front exhaust pipe to exhaust manifold nut	30 ~ 40	300 ~ 400	22 ~ 29
Front exhaust pipe to catalytic converter bolt	40 ~ 60	400 ~ 600	29 ~ 43
Catalytic converter to center exhaust pipe nut	40 ~ 60	400 ~ 600	29 ~ 43
Center exhaust pipe to main muffler nut	40 ~ 60	400 ~ 600	29 ~ 43

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Main muffler hanger support bracket bolt	10 ~ 15	100 ~ 150	7 ~ 11
Delivery pipe installation bolt	10 ~ 15	100 ~ 150	7 ~ 11
Timing belt tensioner pulley bolt	43 ~ 55	430 ~ 550	31 ~ 40
Timing belt idler pulley bolt	50 ~ 60	500 ~ 600	36 ~ 43
Timing belt tensioner arm fixed bolt	35 ~ 55	350 ~ 550	25 ~ 40
Auto tensioner fixed bolt	20 ~ 27	200 ~ 270	14 ~ 20
Accelerator cable bracket	4-6	40 ~ 60	3-4
Spark plug	20 ~ 30	200 ~ 300	14 ~ 22

COMPRESSION

NOTE: If the there is lack of power, excessive oil consumption or poor fuel economy, measure the compression pressure.

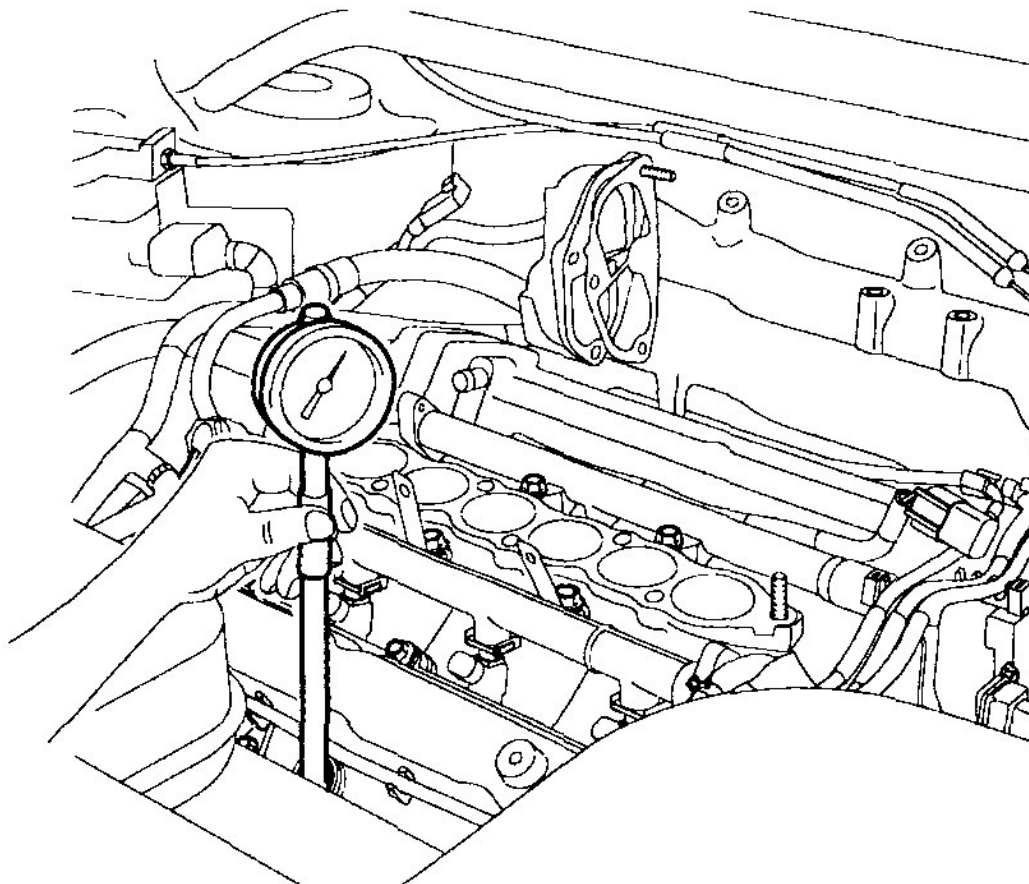
1. Warm up and stop engine

Allow the engine to warm up to normal operating temperature.

2. Remove ignition coils. (See **IGNITION SYSTEM**)
3. Remove spark plugs.

Using a 16mm plug wrench, remove the 6 spark plugs.

4. Check cylinder compression pressure
 - a. Insert a compression gauge into the spark plug hole.



G03848804

Fig. 1: Inserting Compression Gauge Into Spark Plug Hole
Courtesy of HYUNDAI MOTOR CO.

- b. While cranking the engine, measure the compression pressure.

NOTE: Always use a fully charged battery to obtain engine speed of 250 RPM or more.

- c. Repeat steps (a) through (b) for each cylinder.

NOTE: This measurement must be done in as short a time as possible.

Compression pressure:

1,420kPa (14.5kgf/cm² , 206psi)

Minimum pressure:

1,270kPa (13kgf/cm² , 184psi)

Difference between each cylinder:

100kPa (1.0kgf/cm² , 15psi) or less

- d. If the cylinder compression in 1 or more cylinders is low, pour a small amount of engine oil into the cylinder through the spark plug hole and repeat steps (a) through (b) for cylinders with low compression.
 - If adding oil helps the compression, it is likely that the piston rings and/or cylinder bore are worn or damaged.
 - If pressure stays low, a valve may be sticking or seating is improper, or there may be leakage past the gasket.
5. Reinstall spark plugs. (See **INSPECT SPARK PLUG AND SPARK PLUG CABLE**)
6. Install ignition coils. (See **IGNITION SYSTEM**)

TROUBLESHOOTING

PROBLEM SYMPTOMS

Symptom	Suspect area	Remedy
Engine misfire with abnormal internal lower engine noises.	Loose or improperly installed engine flywheel.	Repair or replace the flywheel as required.
	Worn piston rings (Oil consumption may or may not cause the engine to misfire.)	Inspect the cylinder for a loss of compression. Repair or replace as required.
	Worn crankshaft thrust bearings	Replace the crankshaft and bearings as required
Engine misfire with abnormal valve train noise.	Stuck valves. (Carbon buildup on the valve stem)	Repair or replace as required
	Excessive worn or misaligned timing chain	Replace the timing chain and sprocket as required.
	Worn camshaft lobes.	Replace the camshaft and valve lifters.
Engine misfire with coolant consumption	• Faulty cylinder head gasket and/or cranking or other damage to the cylinder head and engine block cooling system. • Coolant consumption may or may not cause the engine to overheat.	• Inspect the cylinder head and engine block for damage to the coolant passages and/or a faulty head gasket. • Repair or replace as required.
Engine misfire with excessive oil	Worn valves, guides and/or valve	Repair or replace as required.

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consumption	stem oil seals.	
	Worn piston rings. (Oil consumption may or may not cause the engine to misfire)	• Inspect the cylinder for a loss of compression. • Repair or replace as required.
Engine noise on start-up, but only lasting a few seconds.	Incorrect oil viscosity	• Drain the oil. • Install the correct viscosity oil.
	Worn crankshaft thrust bearing.	• Inspect the thrust bearing and crankshaft. • Repair or replace as required.
Upper engine noise, regardless of engine speed.	Low oil pressure	Repair or replace as required.
	Broken valve spring.	Replace the valve spring.
	Worn or dirty valve lifters.	Replace the valve lifters.
	Stretched or broken timing chain and/or damaged sprocket teeth.	Replace the timing chain and sprockets.
	Worn timing chain tensioner, if applicable.	Replace the timing chain tensioner as required.
	Worn camshaft lobes.	• Inspect the camshaft lobes. • Replace the timing camshaft and valve lifters as required.
	Worn valve guides or valve stems.	Inspect the valves and valve guides, then repair as required.
	Stuck valves. (Carbon on the valve stem or valve seat may cause the valve to stay open.	Inspect the valves and valve guides, then repair as required.
Lower engine noise, regardless of engine speed	Low oil pressure.	Repair or required.
	Loose or damaged flywheel.	Repair or replace the flywheel.
	Damaged oil pan, contacting the oil pump screen.	• Inspect the oil pan. • Inspect the oil pump screen. • Repair or replace as required.
	Oil pump screen loose, damaged or restricted.	• Inspect the oil pump screen. • Repair or replace as required.
	Excessive piston-to-cylinder bore clearance.	• Inspect the piston, piston pin and cylinder bore. • Repair as required.
	Excessive piston pin-to-connecting rod clearance	• Inspect the piston, piston pin and the connecting rod.

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		• Repair or replace as required.
	Excessive connecting bearing rod clearance	Inspect the following components and repair as required. • The connecting rod bearings. • The connecting rods. • The crankshaft. • The crankshaft journal.
	Excessive crankshaft bearing clearance	Inspect the following components, and repair as required. • The crankshaft bearing. • The crankshaft journals.
	Incorrect piston, piston pin and connecting rod installation	• Verify the piston pins and connecting rods are installed correctly. • Repair as required.
Engine noise under load	Low oil pressure	Repair or replace as required.
	Excessive connecting rod bearing clearance	Inspect the following components and repair as required: • The connecting rod bearings. • The connecting rods. • The crankshaft
	Excessive crankshaft bearing clearance	Inspect the following components, and repair as required. • The crankshaft bearings. • The crankshaft journals. • The cylinder block crankshaft
Engine will not crank-crankshaft will not rotate	Hydraulically locked cylinder • Coolant/antifreeze in cylinder. • Oil in cylinder. • Fuel in cylinder	1. Remove spark plugs and check for fluid. 2. Inspect for broken head gasket. 3. Inspect for cracked engine block or cylinder head. 4. Inspect for a sticking fuel injector and/or leaking fuel

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		regulator.
Broken timing chain and/or timing chain gears.		1. Inspect timing chain and gears. 2. Repair as required.
Material in cylinder • Broken valve • Piston material • Foreign material		1. Inspect cylinder for damaged components and/or foreign materials. 2. Repair or replace as required.
Seized crankshaft or connecting rod bearings.		1. Inspect crankshaft and connecting rod bearing. 2. Repair as required.
Bend or broken connecting rod.		1. Inspect connecting rods. 2. Repair as required.
Broken crankshaft		1. Inspect crankshaft. 2. Repair as required.

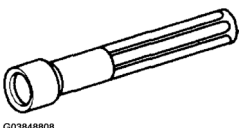
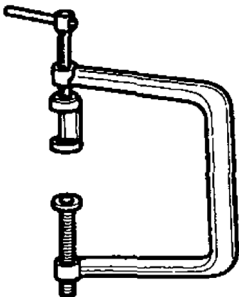
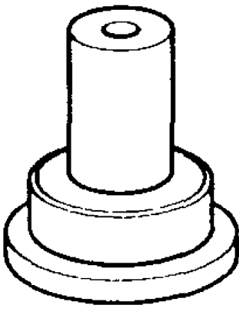
SPECIAL TOOLS

SPECIAL TOOLS DESCRIPTION

Tool (Number and name)	Illustration	Use
Crankshaft front oil seal installer (09214-33000)	 G03848805	Installation of the front oil seal
Camshaft oil seal installer (09214-21000)	 G03848806	Installation of the camshaft oil seal
Valve guide installer (09221-3F100 A/B)	 G03848807	Remove and installation of the valve guide

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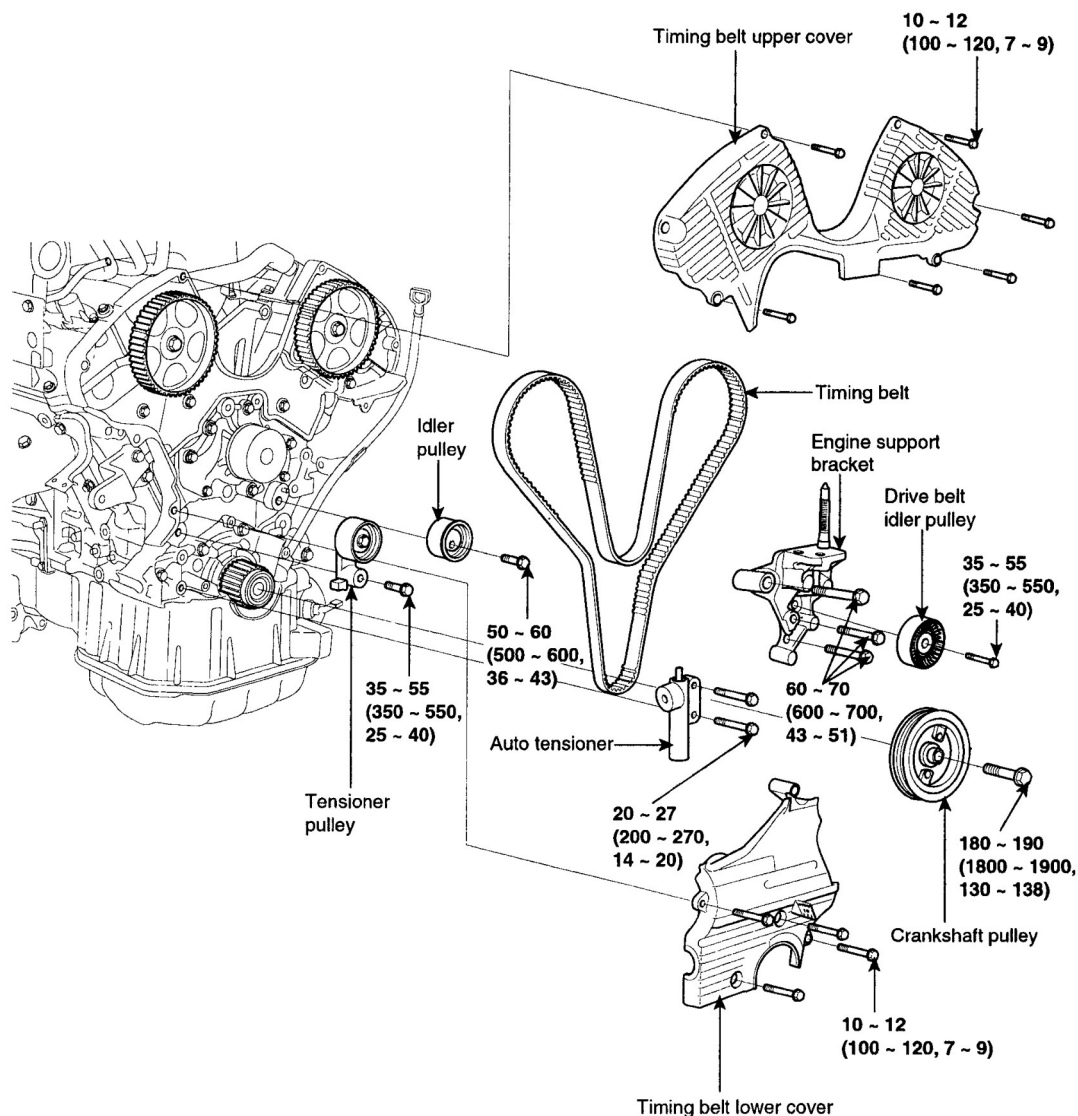
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Valve stem oil seal installer (09222-22001)	 G03848808	Installation of the valve stem oil seal
Valve spring compressor & adaptor (09222-28000, 09222-28100)	 G03848809	Removal and installation of the intake or exhaust valve
Crankshaft rear oil seal installer (09231-33000)	 G03848810	1. Installation of the engine rear oil seal 2. Installation of the crankshaft rear oil seal

TIMING SYSTEM

TIMING BELT

COMPONENT



TORQUE : Nm (kgf.cm, lbf.ft)

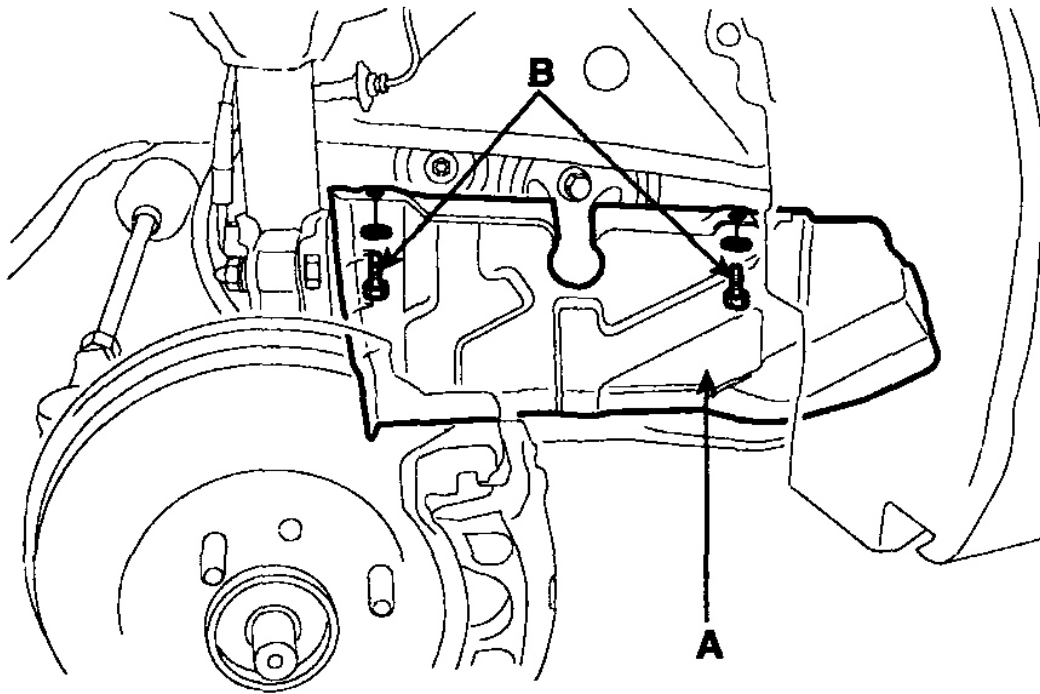
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Fig. 2: Identifying Timing System Components And Torque Specifications.
Courtesy of HYUNDAI MOTOR CO.

REMOVAL

Engine removal is not required for this procedure.

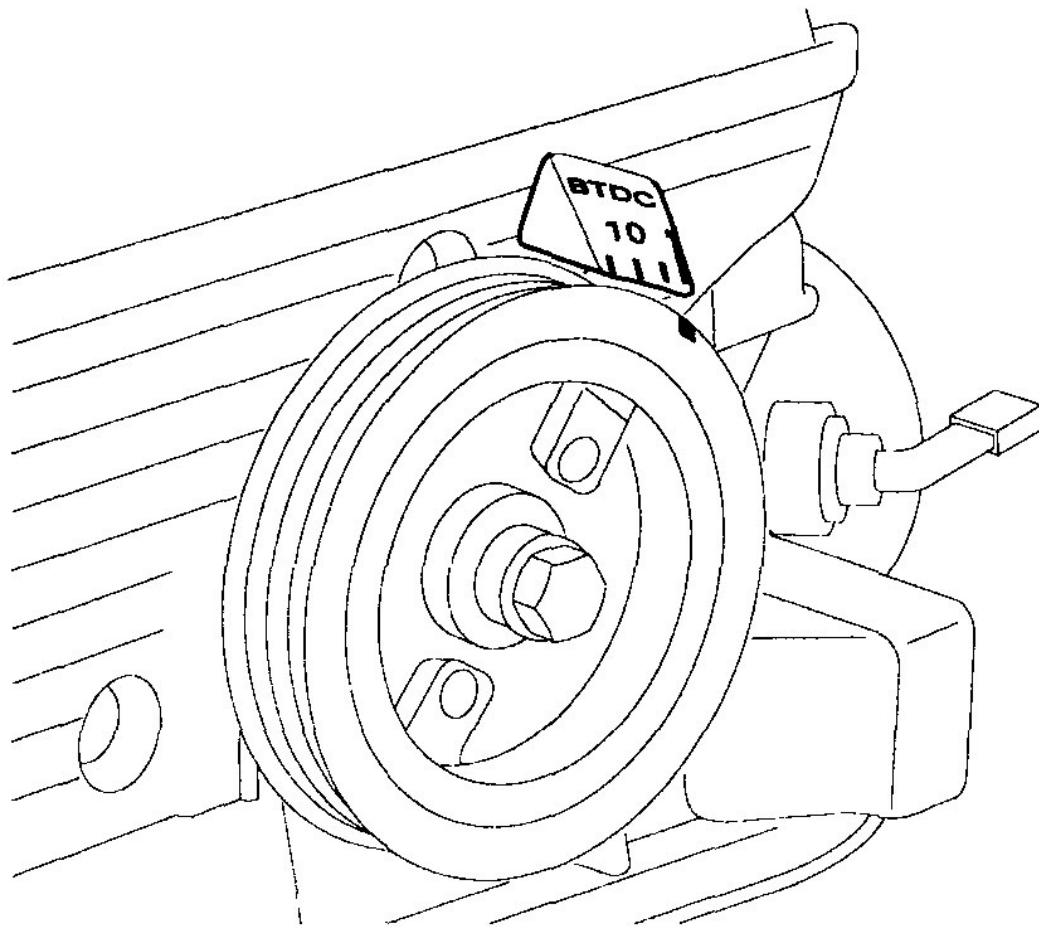
1. Remove the engine cover.
2. Remove RH front wheel.
3. Remove 2 bolts (B) and RH side cover (A).



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Fig. 3: Removing 2 Bolts And RH Side Cover
Courtesy of HYUNDAI MOTOR CO.

4. Turn the crankshaft pulley, and align its groove with timing mark "T" of the timing belt cover.

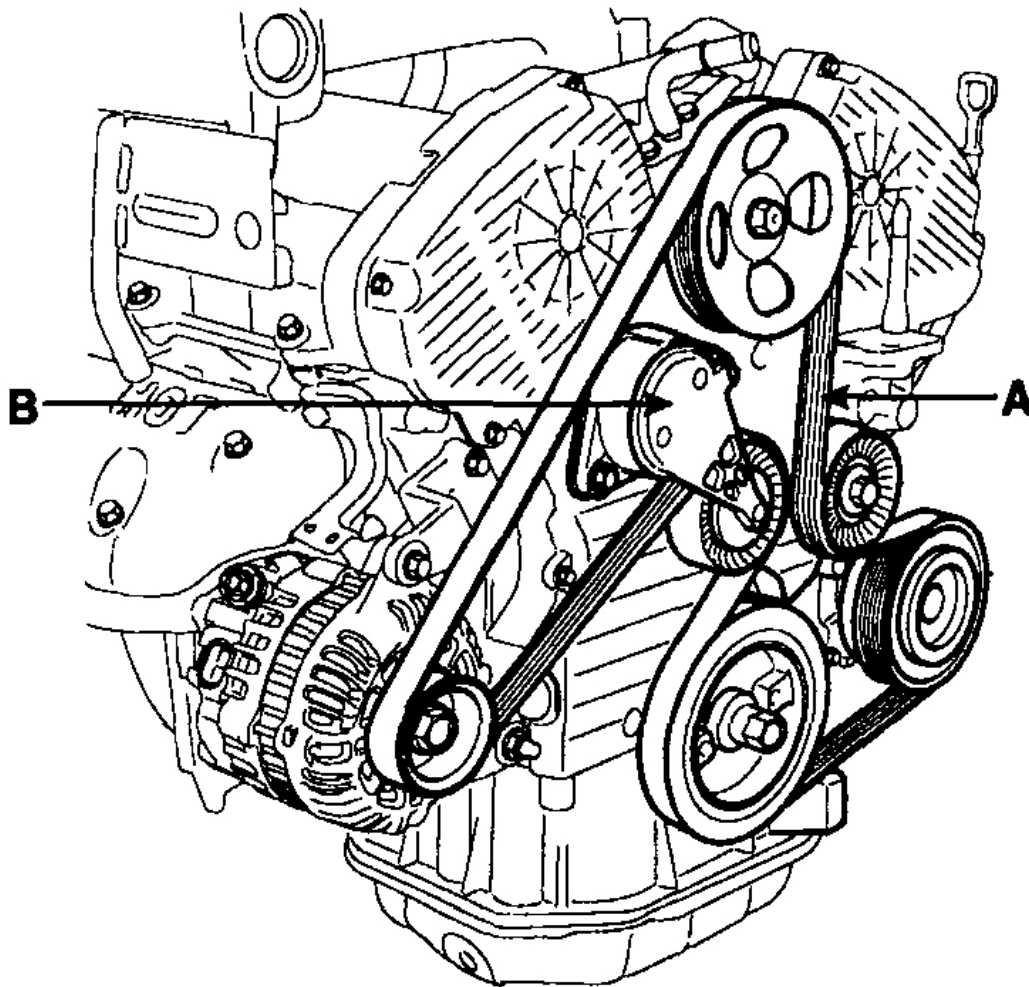


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Fig. 4: Aligning Crankshaft Pulley Groove With Timing Mark "T" Of Timing Belt Cover
Courtesy of HYUNDAI MOTOR CO.

NOTE: Always turn the crankshaft clockwise.

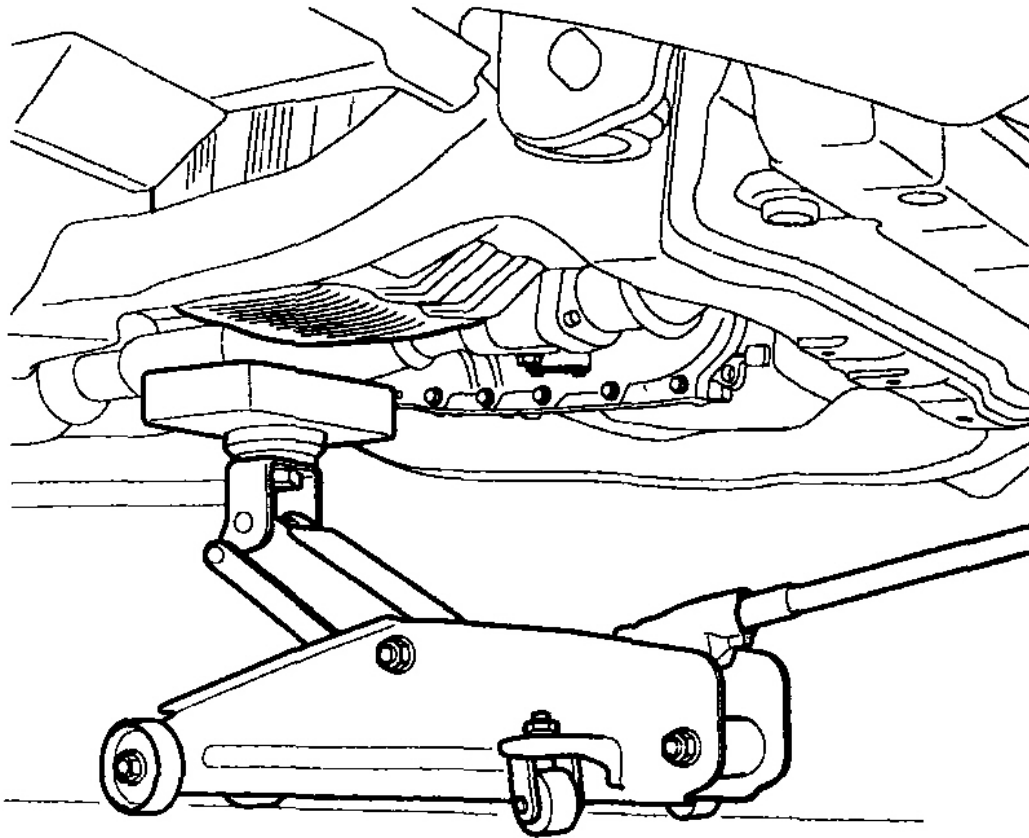
5. Remove drive belt (A) and belt tensioner (B).



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Fig. 5: Removing Drive Belt And Belt Tensioner
Courtesy of HYUNDAI MOTOR CO.

6. Remove the engine mount bracket.
 1. Set the jack to the engine oil pan.

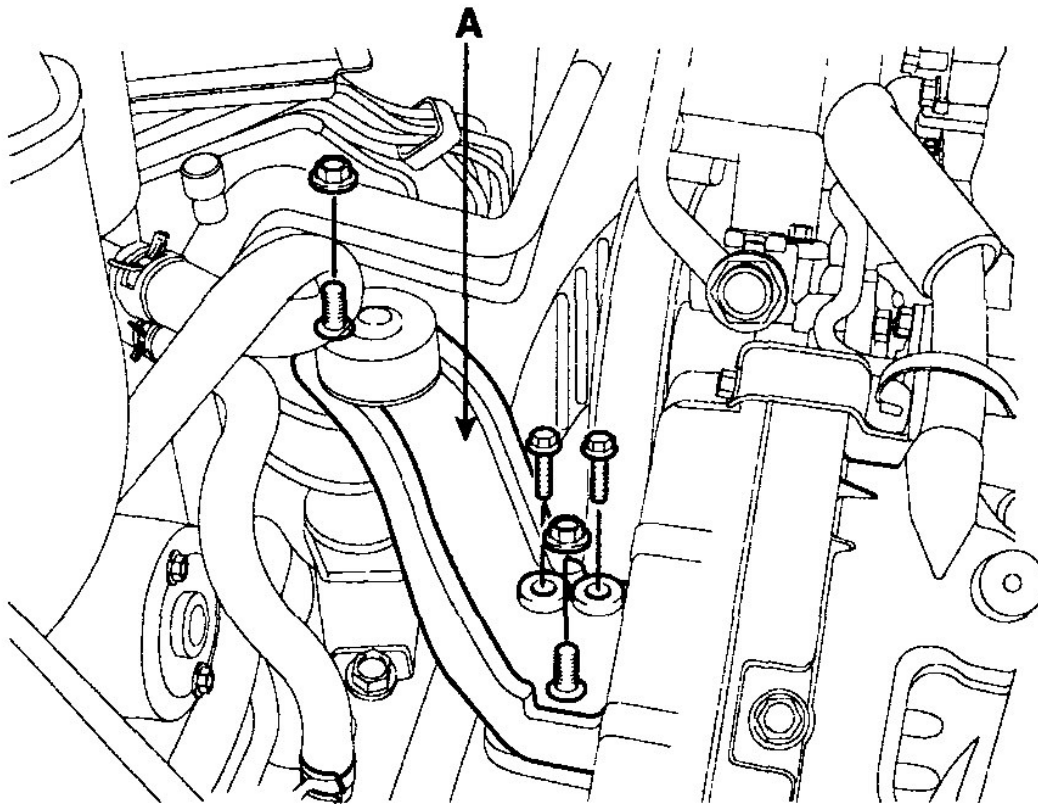


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Fig. 6: Setting Jack To Engine Oil Pan
Courtesy of HYUNDAI MOTOR CO.

NOTE: Place wooden block between the jack and engine oil pan.

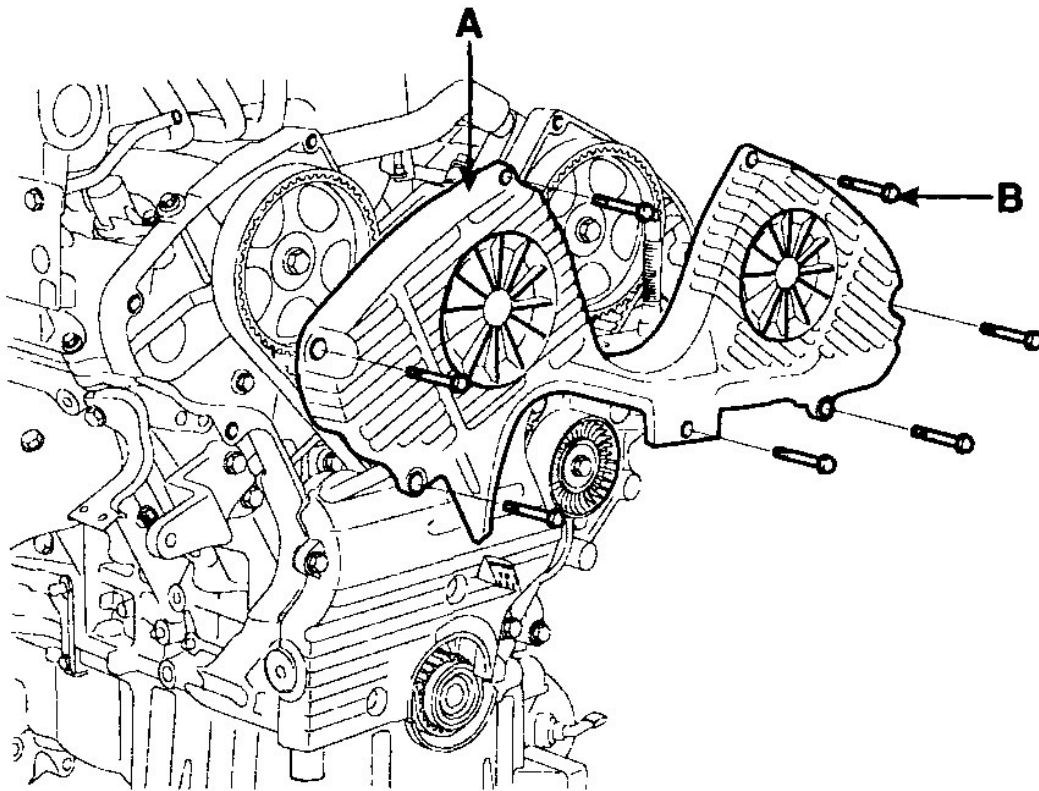
2. Remove the 2 bolts, 2 nuts and engine mount bracket (A).



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Fig. 7: Removing 2 Bolts, 2 Nuts And Engine Mount Bracket
Courtesy of HYUNDAI MOTOR CO.

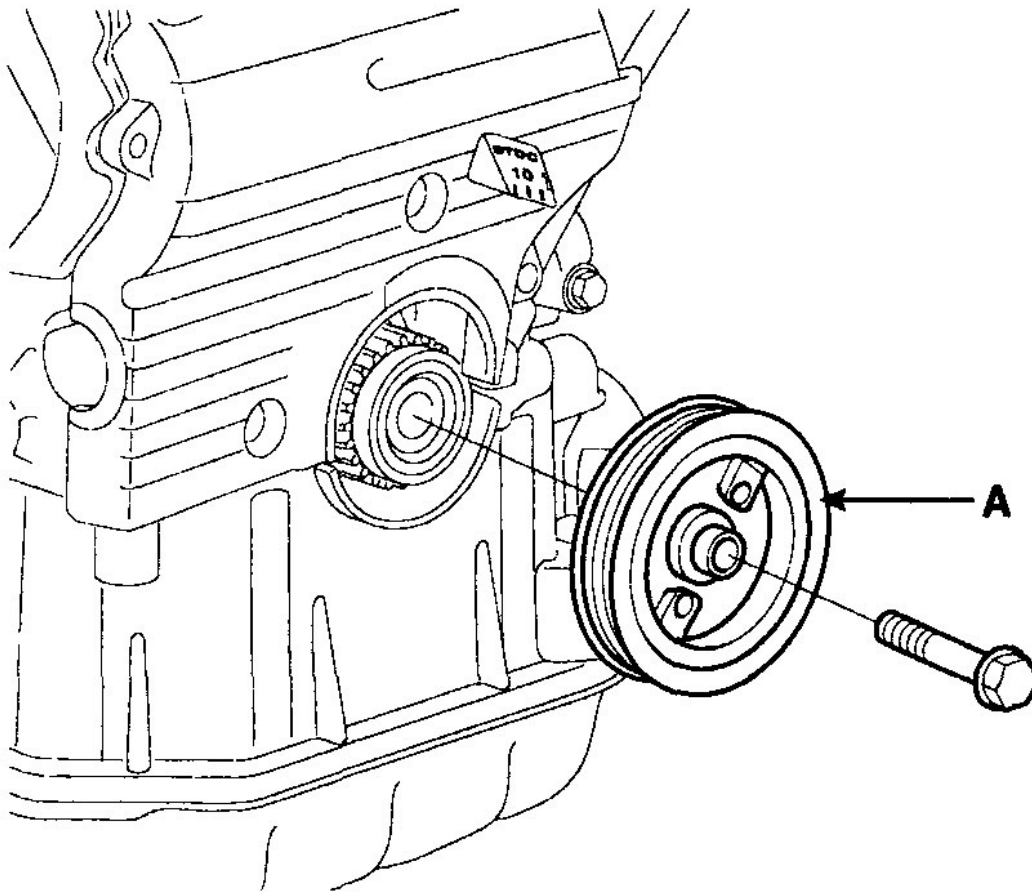
7. Remove the power steering pump. (See **MECHANICAL POWER STEERING SYSTEM**)
8. Remove the 7 bolts (B) and timing belt upper cover (A).



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Fig. 8: Removing 7 Bolts And Timing Belt Upper Cover
Courtesy of HYUNDAI MOTOR CO.

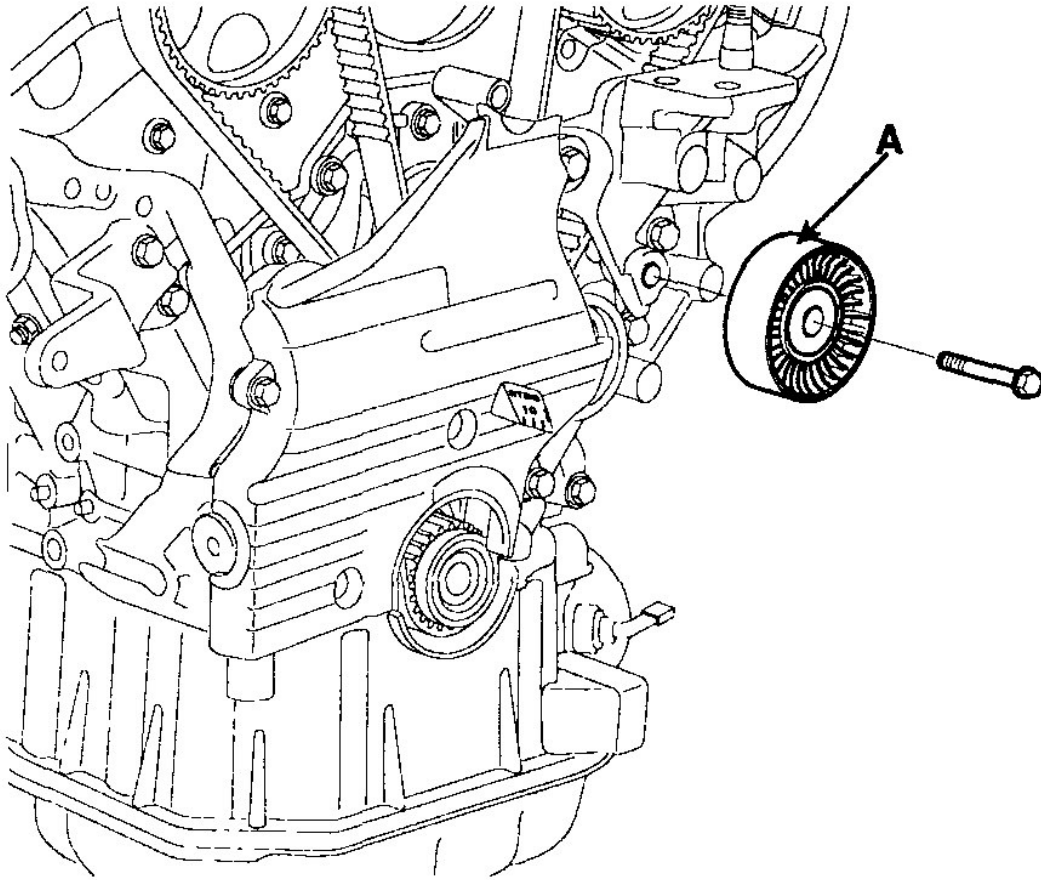
9. Remove the crankshaft pulley bolt and crankshaft pulley (A).



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Fig. 9: Removing Crankshaft Pulley Bolt And Crankshaft Pulley
Courtesy of HYUNDAI MOTOR CO.

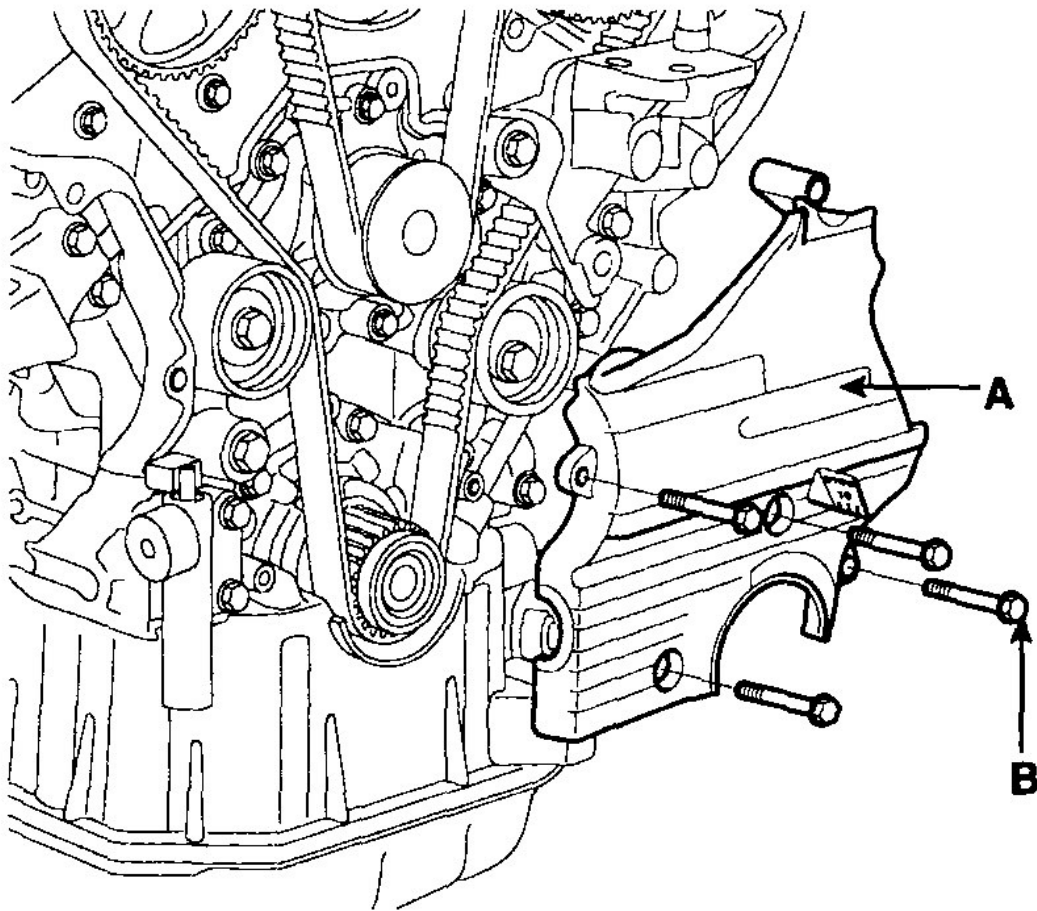
10. Remove the drive belt idler pulley (A).



G03848819

Fig. 10: Removing Drive Belt Idler Pulley
Courtesy of HYUNDAI MOTOR CO.

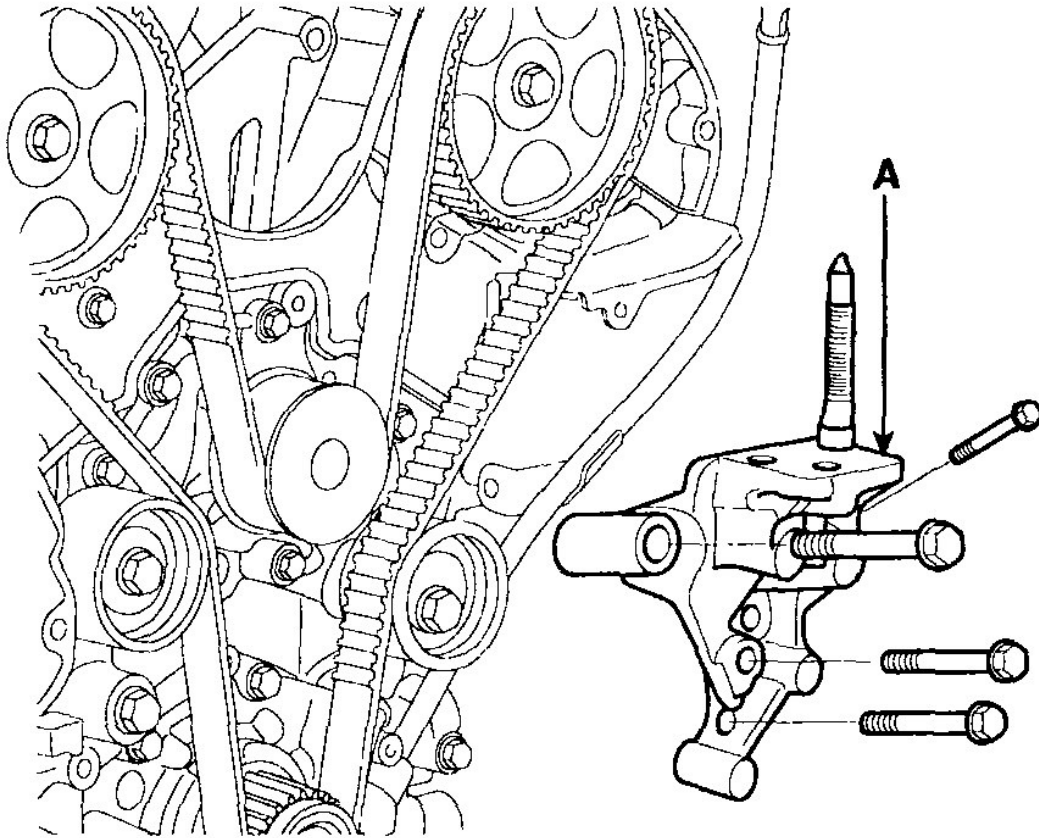
11. Remove the 4 bolts (B) and timing belt lower cover (A).



G03848820

Fig. 11: Removing 4 Bolts And Timing Belt Lower Cover
Courtesy of HYUNDAI MOTOR CO.

12. Remove the engine support bracket (A).

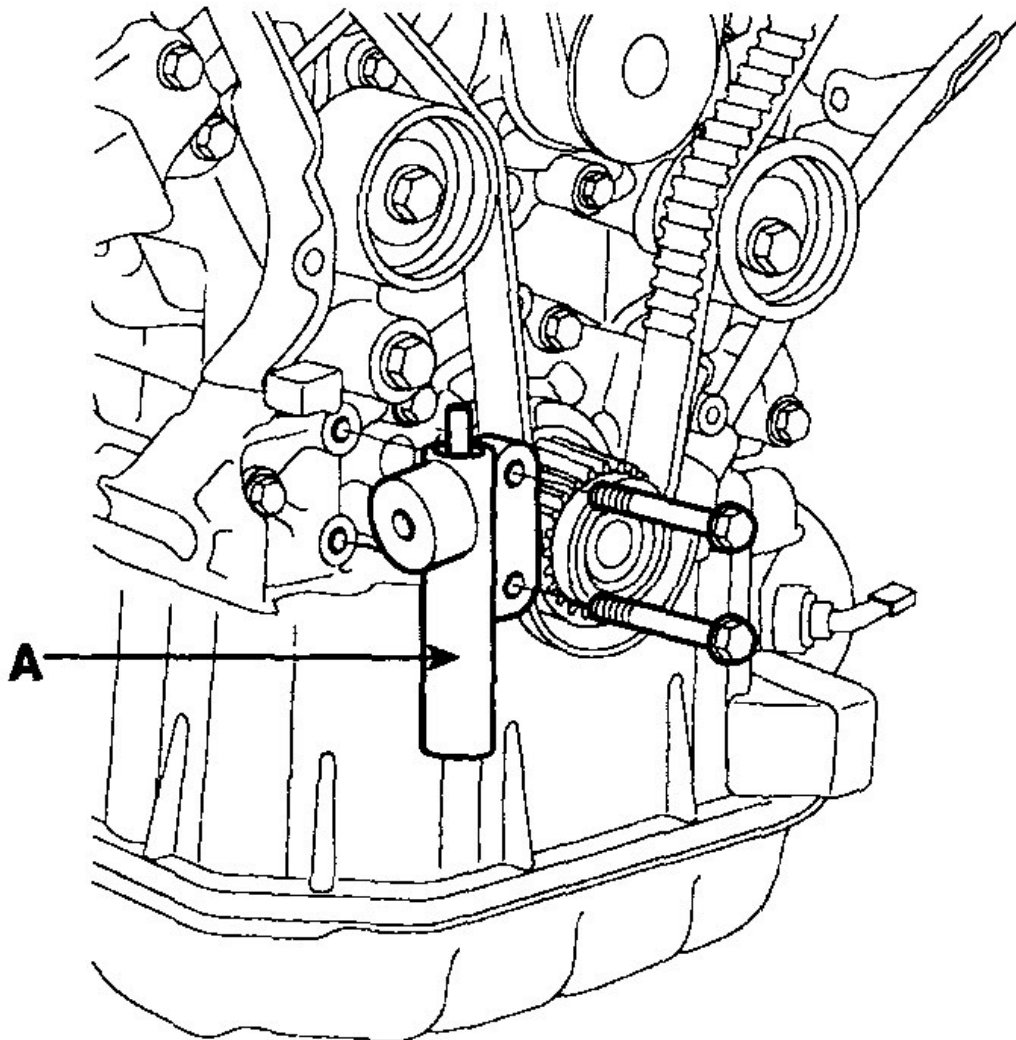


G03848821

Fig. 12: Removing Engine Support Bracket
Courtesy of HYUNDAI MOTOR CO.

13. Check that timing marks of the camshaft timing pulleys and cylinder head covers are aligned. If not, turn the crankshaft 1 revolution (360°).
14. Remove timing belt tensioner.

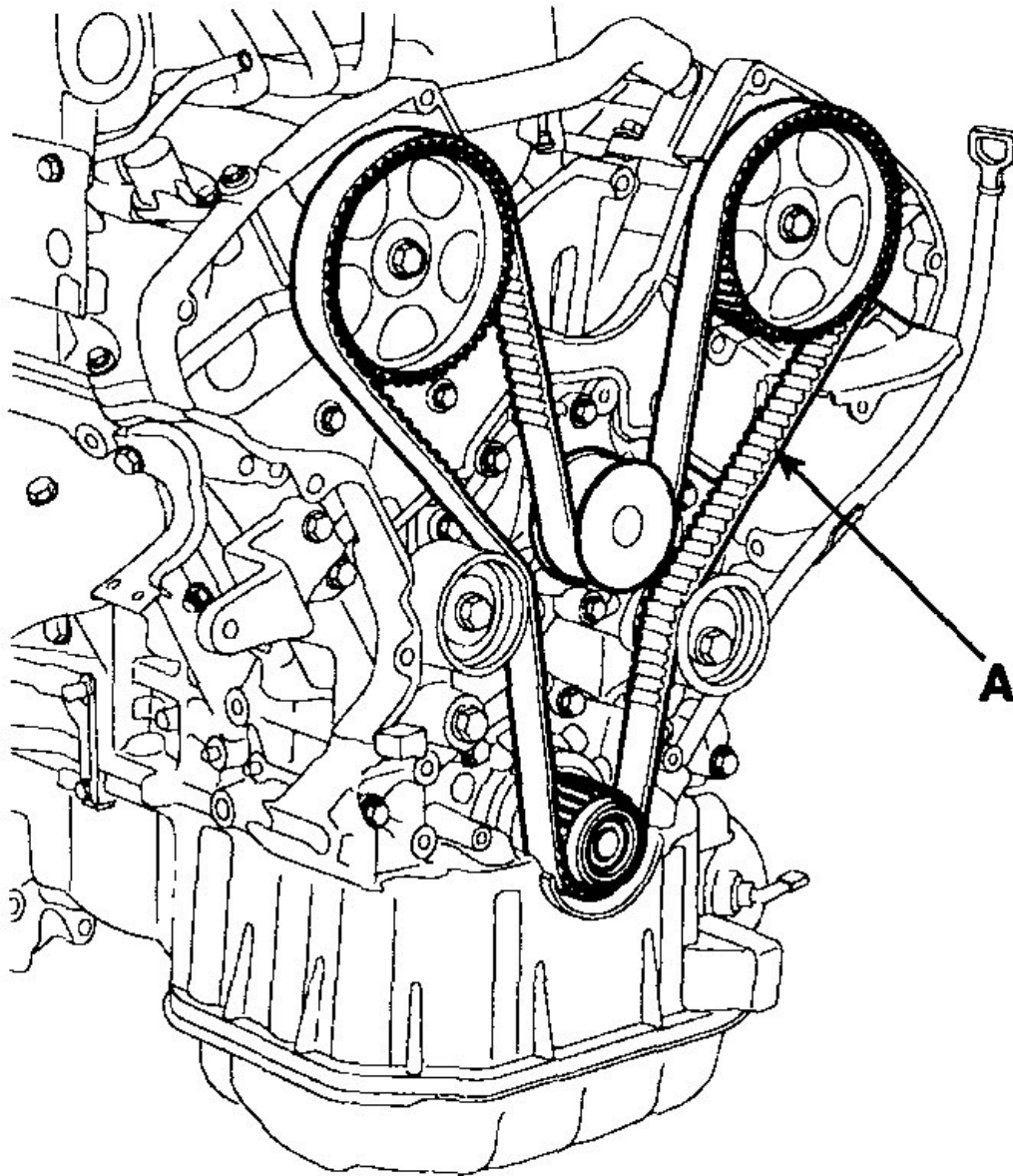
Alternately loosen the 2 bolts, and remove the tensioner (A).



G03848822

Fig. 13: Loosening 2 Bolts And Removing Tensioner
Courtesy of HYUNDAI MOTOR CO.

15. Remove the timing belt (A).

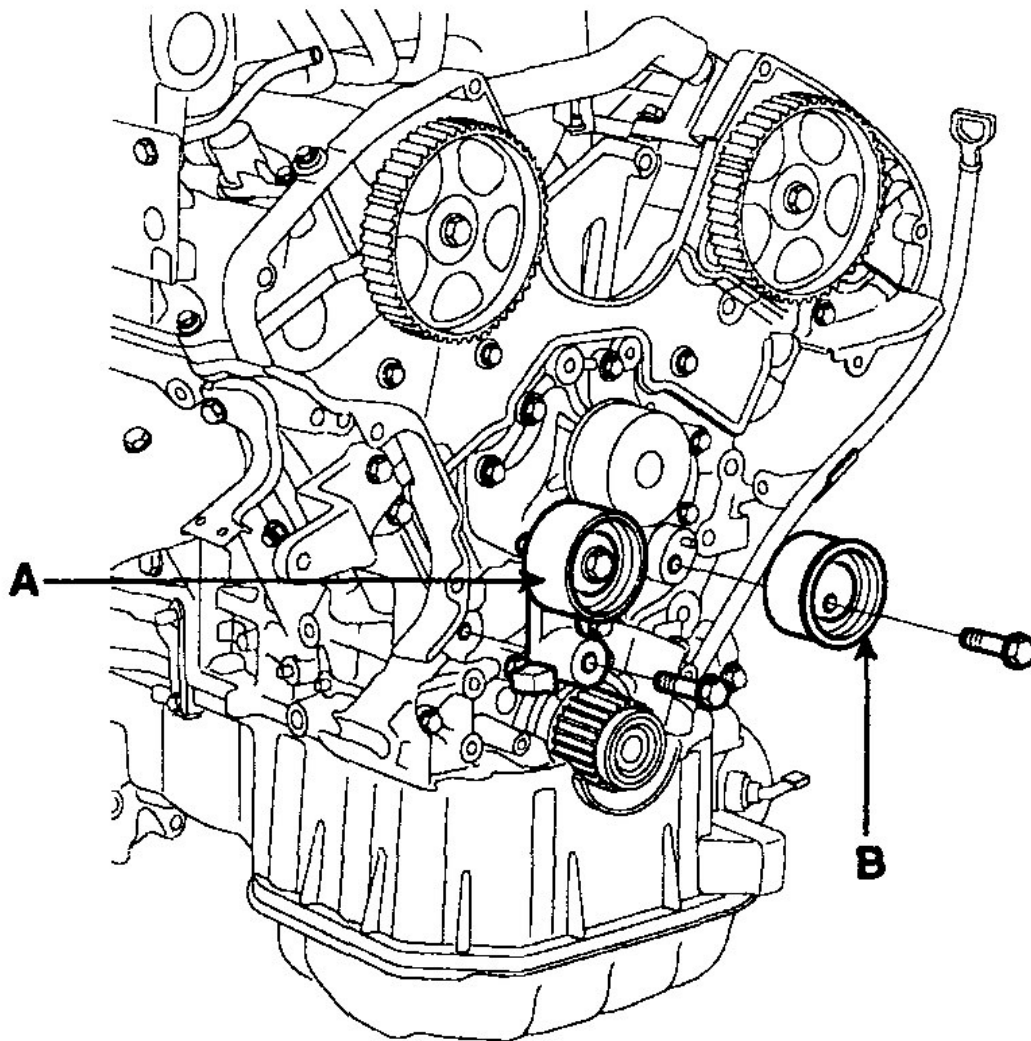


G03848823

Fig. 14: Removing Timing Belt
Courtesy of HYUNDAI MOTOR CO.

NOTE: If the timing belt is reused, make an arrow indicating the turning direction to make sure that the belt is reinstalled in the same direction as before.

16. Remove the tensioner pulley (A) and timing belt idler pulley (B).



G03848824

Fig. 15: Removing Tensioner Pulley And Timing Belt Idler Pulley
Courtesy of HYUNDAI MOTOR CO.

17. Remove the crankshaft sprocket.
18. Remove camshaft sprockets.

Hold the hexagonal head wrench portion of the camshaft with a wrench and remove the bolt and camshaft sprocket.

CAUTION: Be careful not to damage the cylinder head and valve lifter with the wrench.

INSPECTION

SPROCKETS, TENSIONER, IDLER

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.

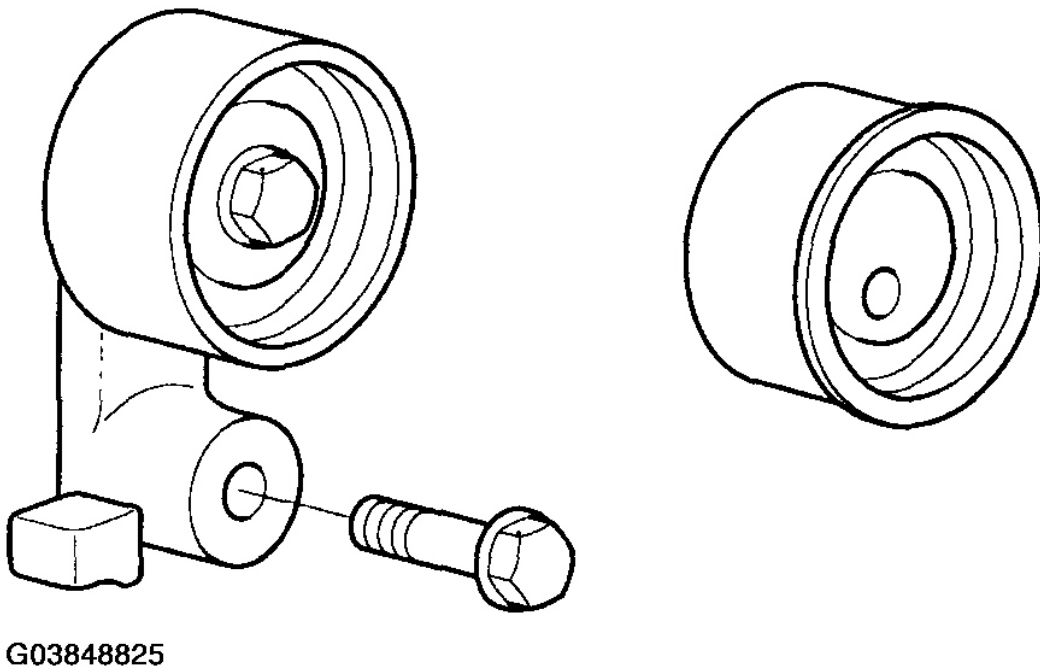


Fig. 16: Inspecting Tensioner Pulley And Idler Pulley For Easy And Smooth Rotation And Checking For Play Or Noise
Courtesy of HYUNDAI MOTOR CO.

3. Replace the pulley if there is a grease leak from its bearing.

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.

NOTE:

- **Do not bend, twist or turn the timing belt inside out.**
- **Do not allow the timing belt to come into contact with oil, water and steam.**

INSTALLATION

1. Install the crankshaft sprocket.

Align the pulley set key with the key groove the crankshaft sprocket and slide on the crankshaft sprocket.

2. Install the camshaft sprockets and tighten the bolts to the specified torque.
 1. Temporarily install the camshaft sprocket bolts.
 2. Hold the hexagonal head wrench portion of the camshaft with a wrench, and tighten the camshaft sprocket bolts.

Tightening torque

Camshaft sprocket bolt

90 ~ 110Nm (900 ~ 1100kgf.cm, 65 ~ 80lbf.ft)

3. Install the idler pulley (B) and the tensioner pulley (A).

Tightening torque

Idler pulley bolt

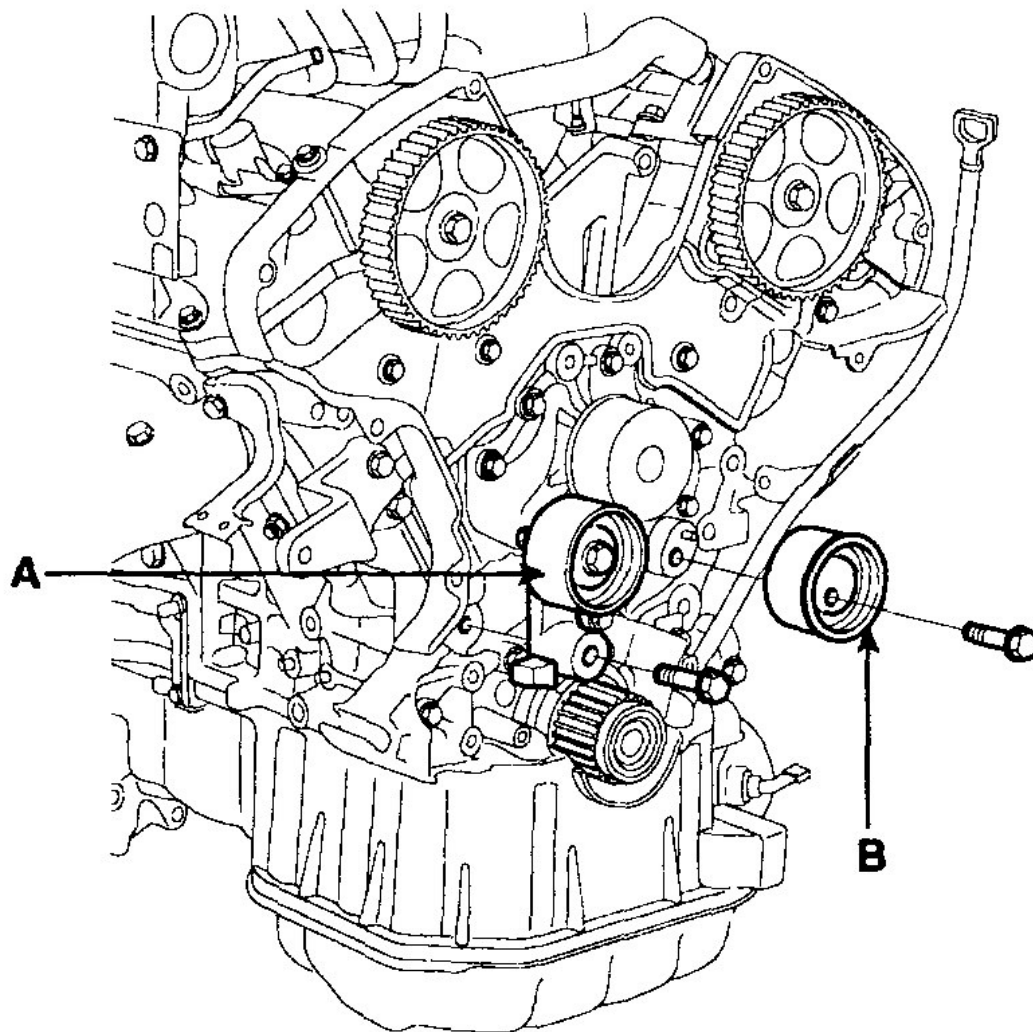
50 ~ 60Nm (500 - 600kgf.cm, 36 - 43lbf.ft)

Tensioner arm fixed bolt

35 ~ 55Nm (350 ~ 550kgf.cm, 25 ~ 40lbf.ft)

NOTE:

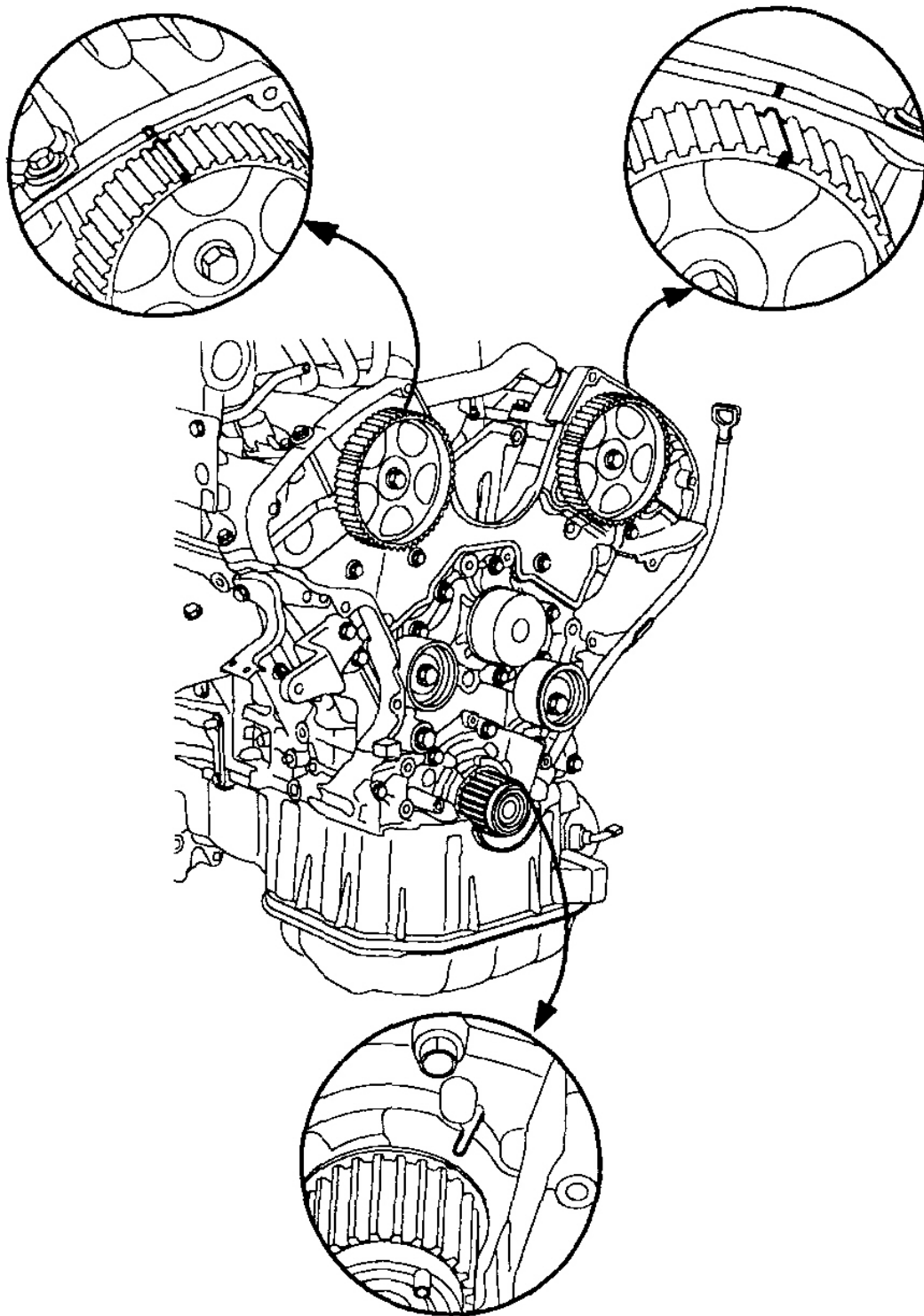
Insert and install the idler pulley to the roll pin that is pressed in the water pump boss.



G03848826

Fig. 17: Installing Idler Pulley And Tensioner Pulley
Courtesy of HYUNDAI MOTOR CO.

4. Align the timing marks of the camshaft sprocket and crankshaft sprocket with the No.1 piston placed at top dead center and its compression stroke.



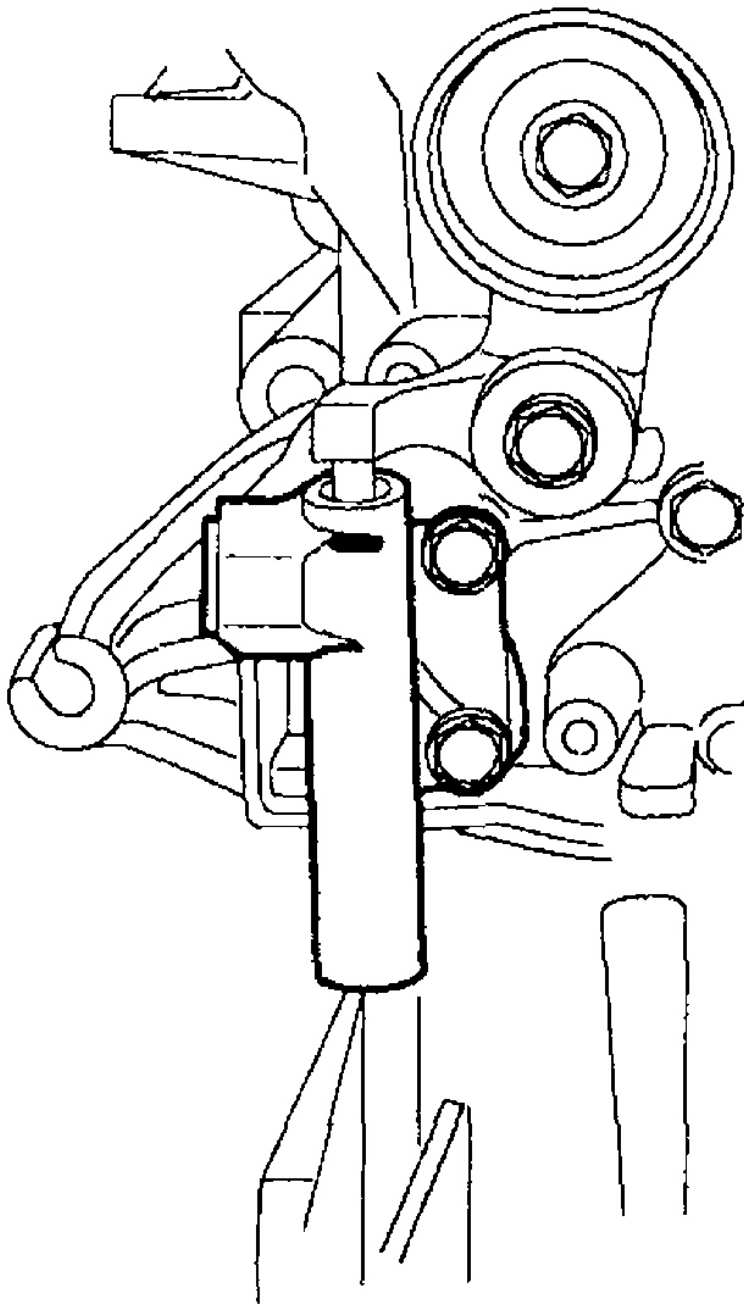
G03848827

Fig. 18: Aligning Timing Marks Of Camshaft Sprocket And Crankshaft Sprocket With No 1 Piston Placed At Top Dead Center
Courtesy of HYUNDAI MOTOR CO.

5. Set timing belt tensioner.
 1. Using a press, slowly press in the push rod.
 2. Align the holes of the push rod and housing pass a set pin through the holes to keep the setting position of the push rod.
 3. Release the press.
6. Install the timing belt tensioner.
 1. Temporarily install the tensioner with the 2 bolts.
 2. Alternately tighten the 2 bolts.

Tightening torque

20 ~ 27Nm (200 - 270kgf.cm, 14 - 20lbf.ft)



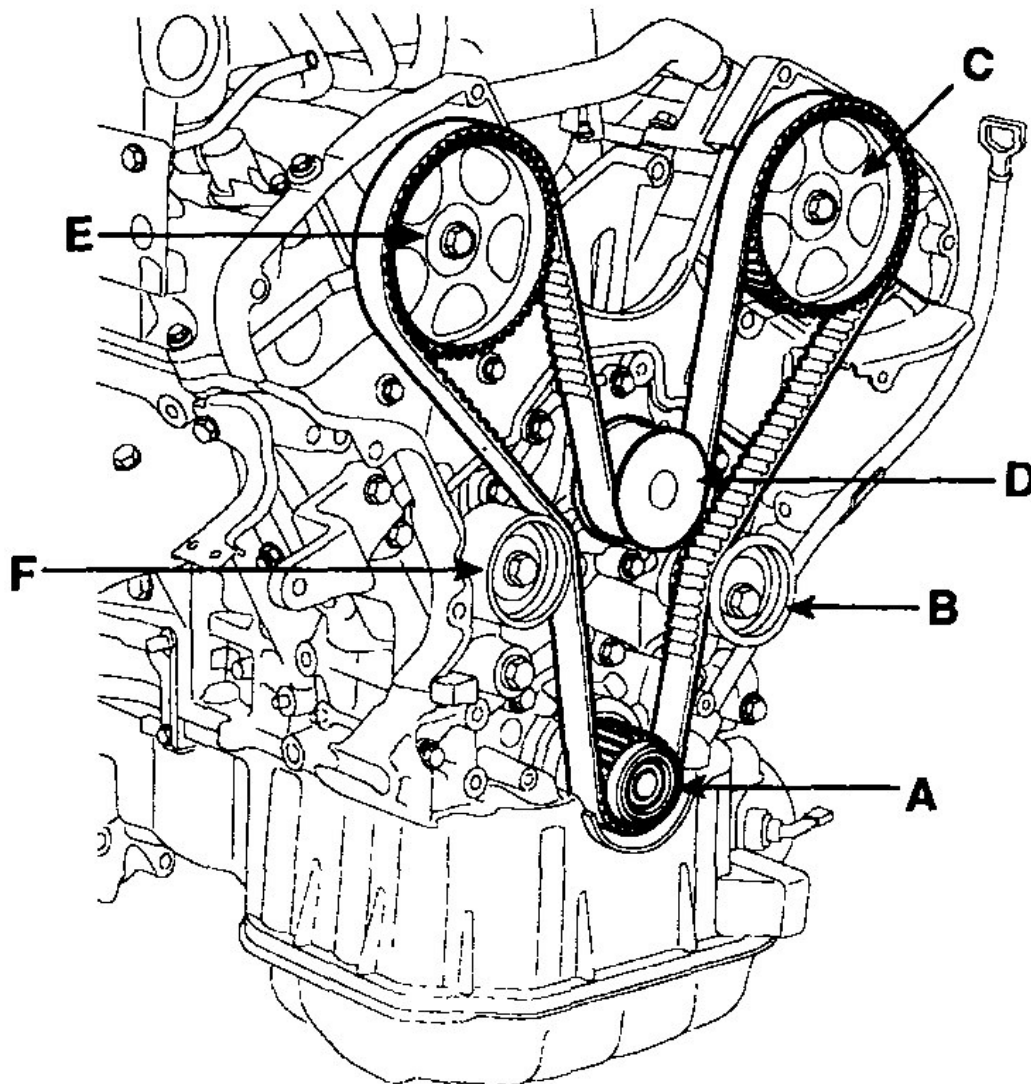
G03848828

Fig. 19: Installing Timing Belt Tensioner
Courtesy of HYUNDAI MOTOR CO.

7. Install the timing belt.

1. Remove any oil or water on the sprockets, and keep them clean.
2. Install the timing belt in this order.

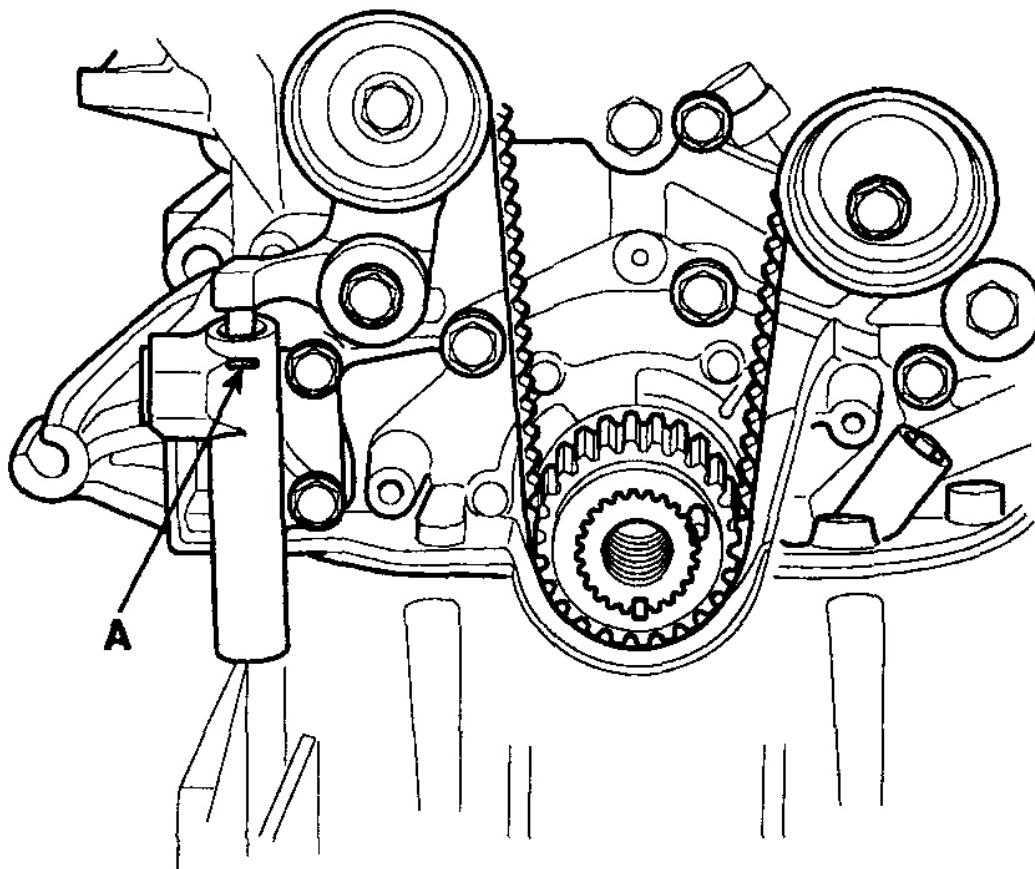
Crankshaft sprocket (A) --> Idler pulley (B) --> Camshaft sprocket LH side (C) --> Water pump pulley (D) --> Camshaft sprocket RH side (E) --> Tensioner pulley (F).



G03848829

Fig. 20: Installing Timing Belt
Courtesy of HYUNDAI MOTOR CO.

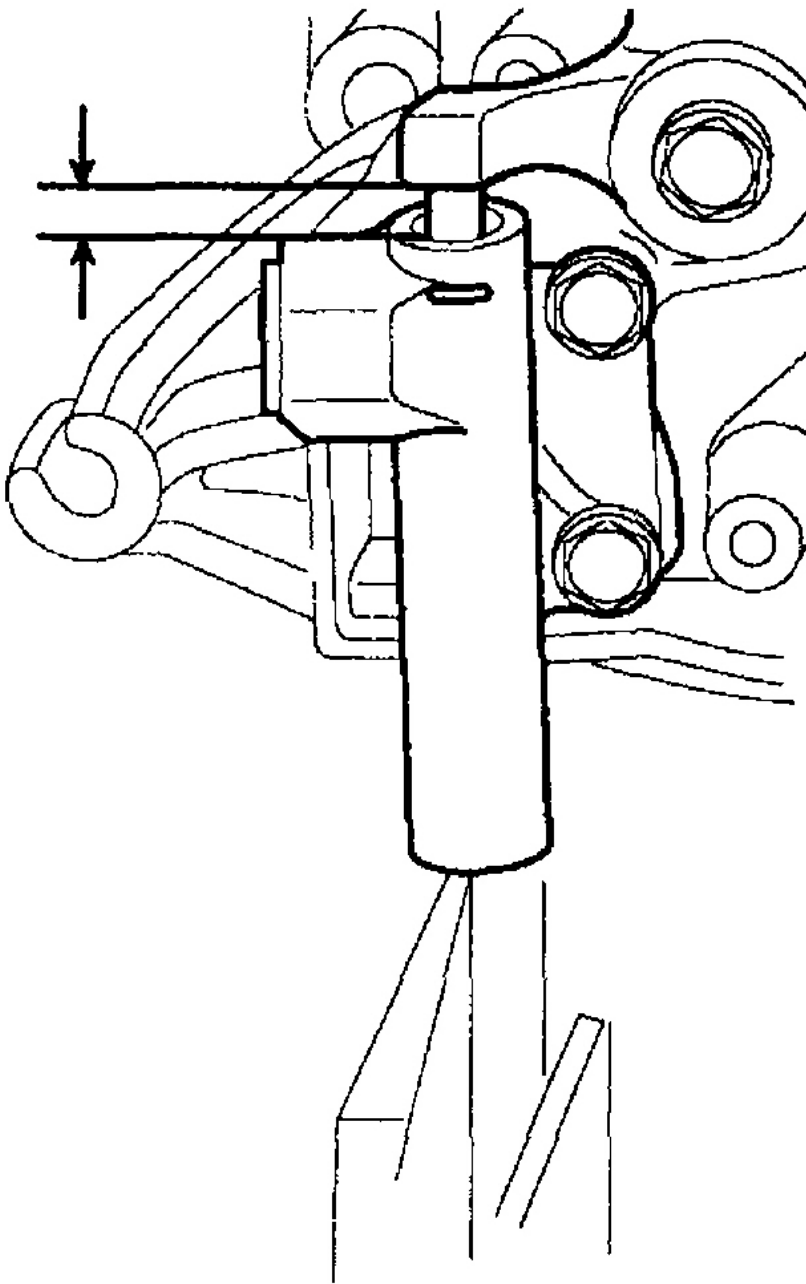
8. Remove the set pin (A) from the tensioner.



G03848830

Fig. 21: Removing Set Pin From Tensioner
Courtesy of HYUNDAI MOTOR CO.

9. Timing belt tensioner checking.
 1. Rotate the crankshaft 2 turns clockwise and measure the projected length of the auto tensioner at TDC (#1 compression stroke) after 5 minutes.
 2. The projected length should be 7 ~ 9mm (0.27 ~ 0.31 in.)



G03848831

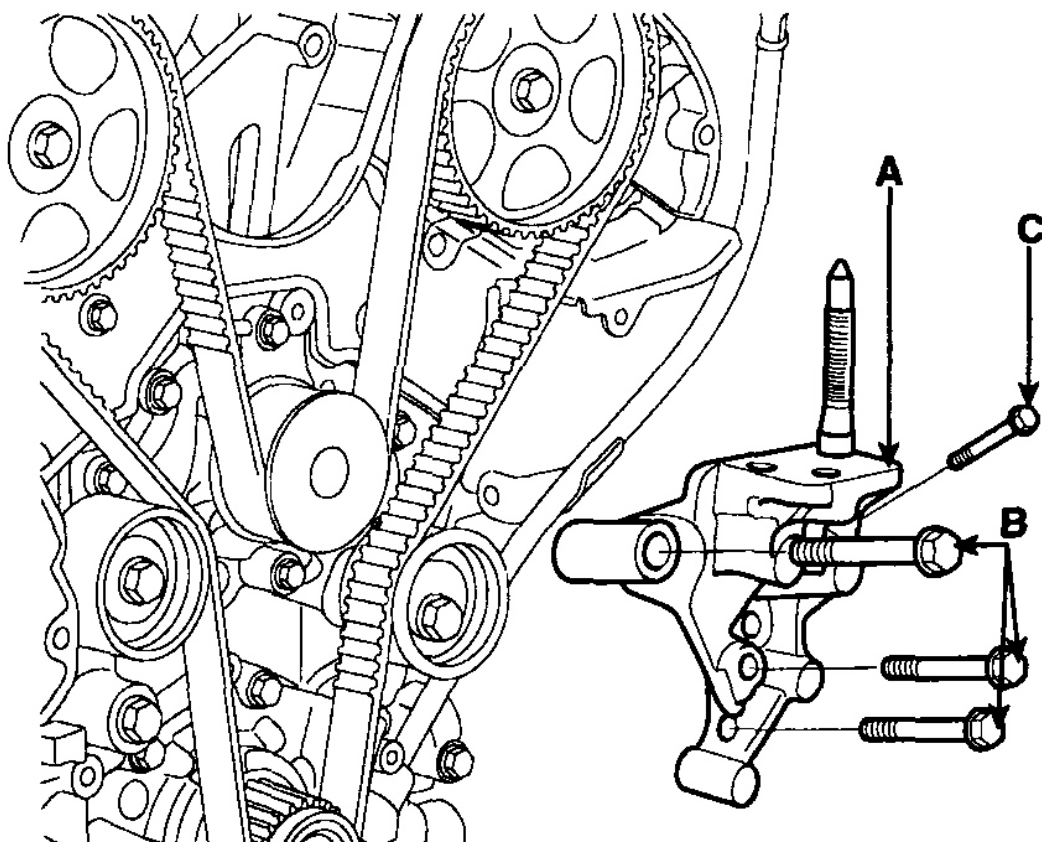
Fig. 22: Measuring Projected Length Of Auto Tensioner At TDC
Courtesy of HYUNDAI MOTOR CO.

10. Install the engine support bracket (A).

Tightening torque

B: 60 ~ 70Nm (600 ~ 700kgf.cm, 43 ~ 51 lbf.ft)

C: 15 ~ 22Nm (150 ~ 220kgf.cm, 11 ~ 16lbf.ft)



G03848832

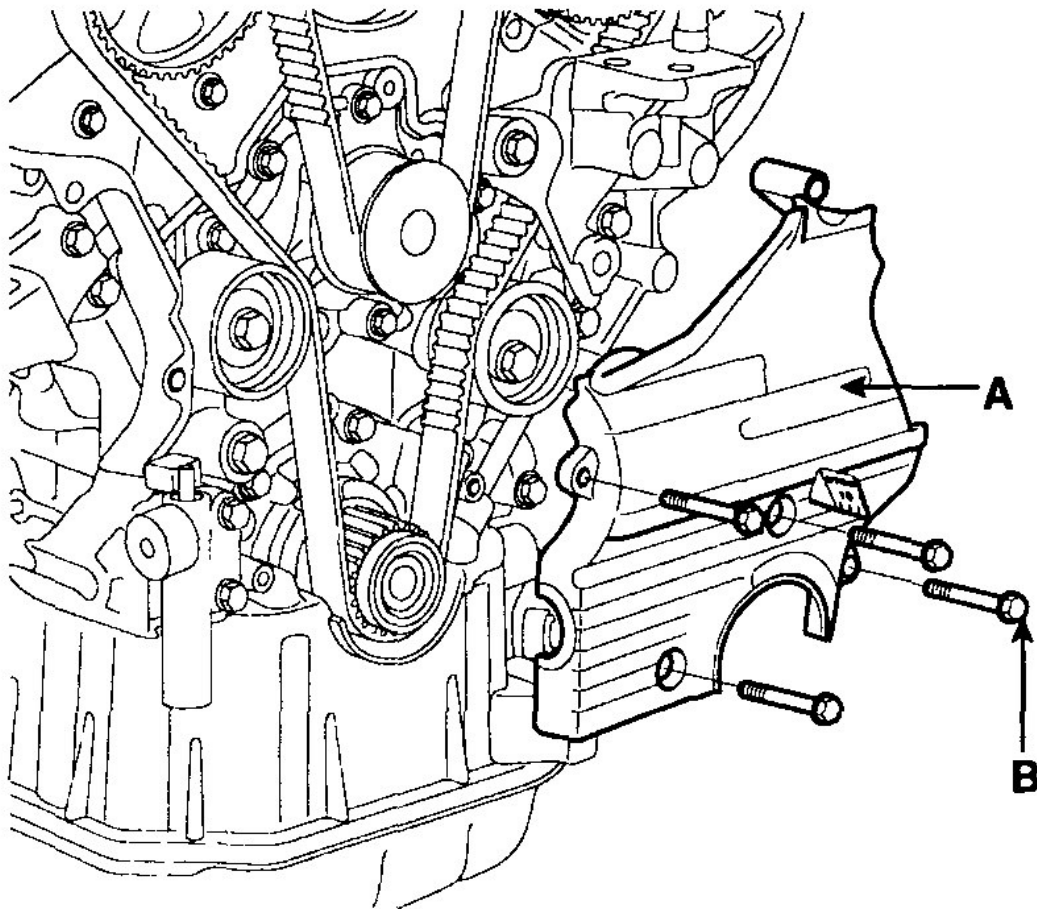
Fig. 23: Installing Engine Support Bracket
Courtesy of HYUNDAI MOTOR CO.

11. Install the timing belt lower cover (A) with 4 bolts (B).

Tightening torque

Timing belt cover bolt

10 ~ 12Nm (100 ~ 120kgf.cm, 7 ~ 9lbf.ft)



G03848833

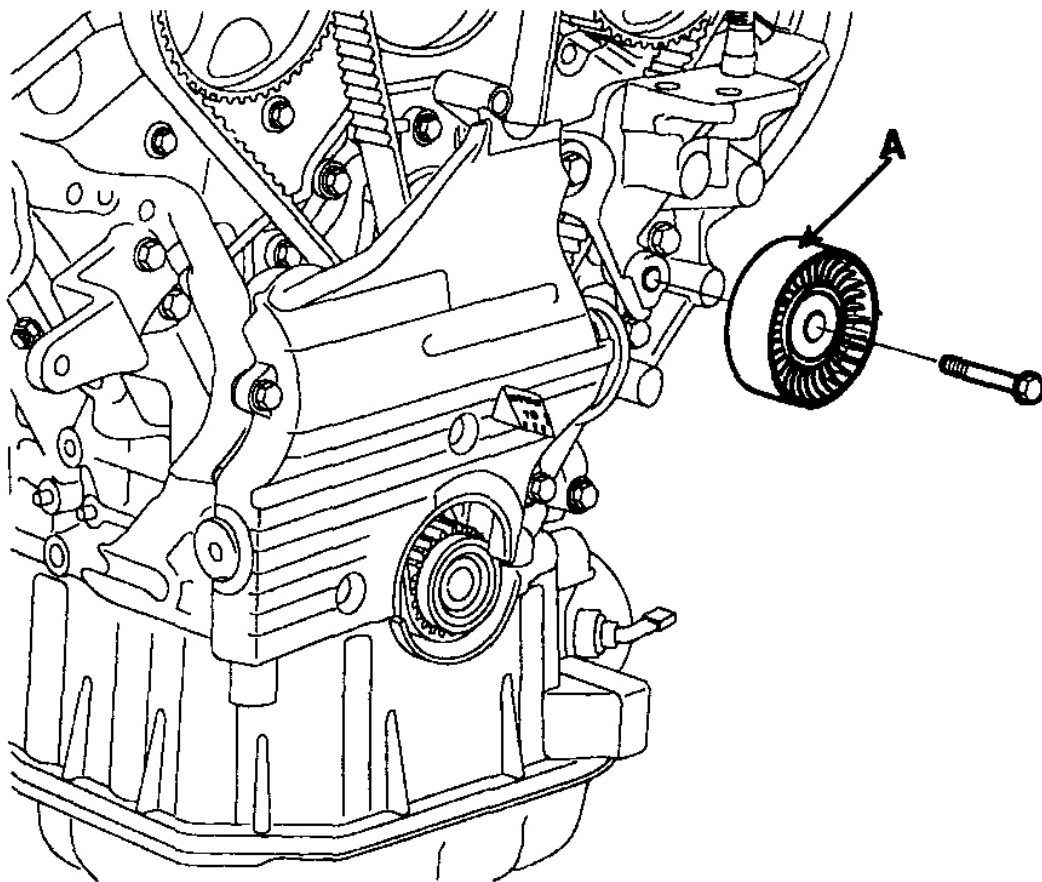
Fig. 24: Installing Timing Belt Lower Cover With 4 Bolts
Courtesy of HYUNDAI MOTOR CO.

12. Install the drive belt idler pulley (A).

Tightening torque

Idler pulley bolt

35 ~ 55Nm (350 ~ 550kgf.cm, 25 ~ 40lbf.ft)



G03848834

Fig. 25: Installing Drive Belt Idler Pulley
Courtesy of HYUNDAI MOTOR CO.

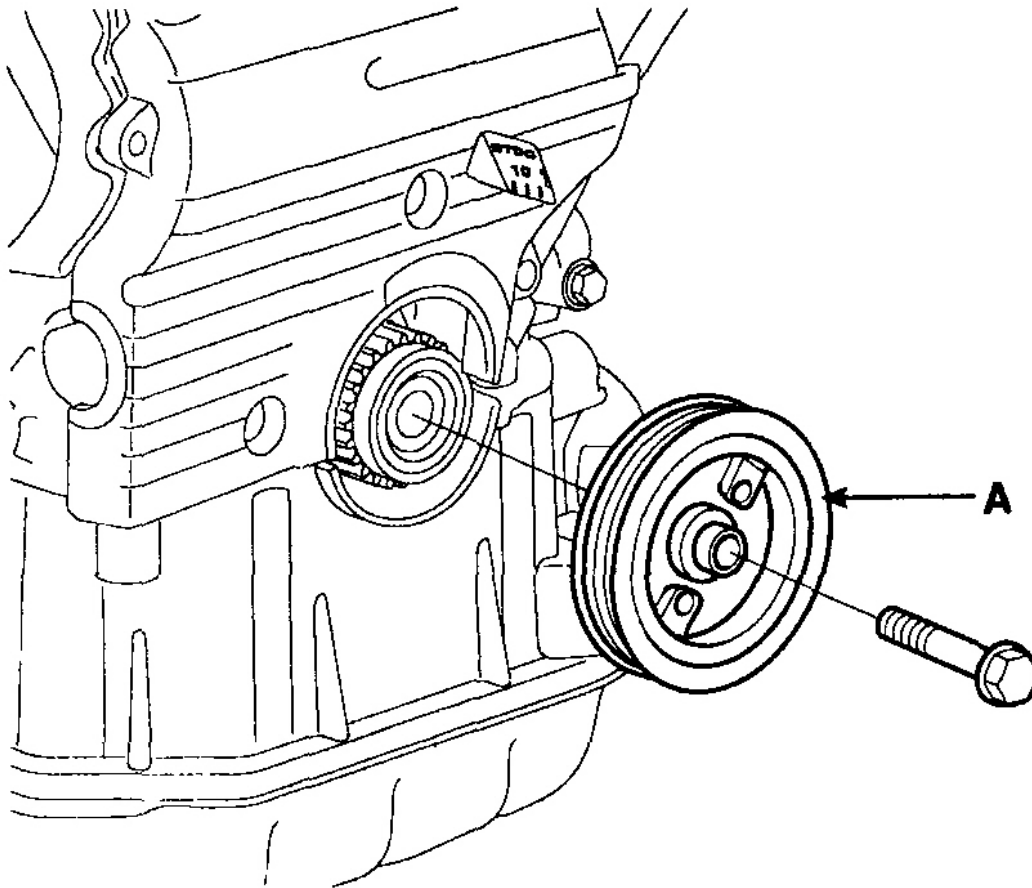
13. Install the crankshaft pulley (A).

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

Tightening torque

Crankshaft pulley bolt

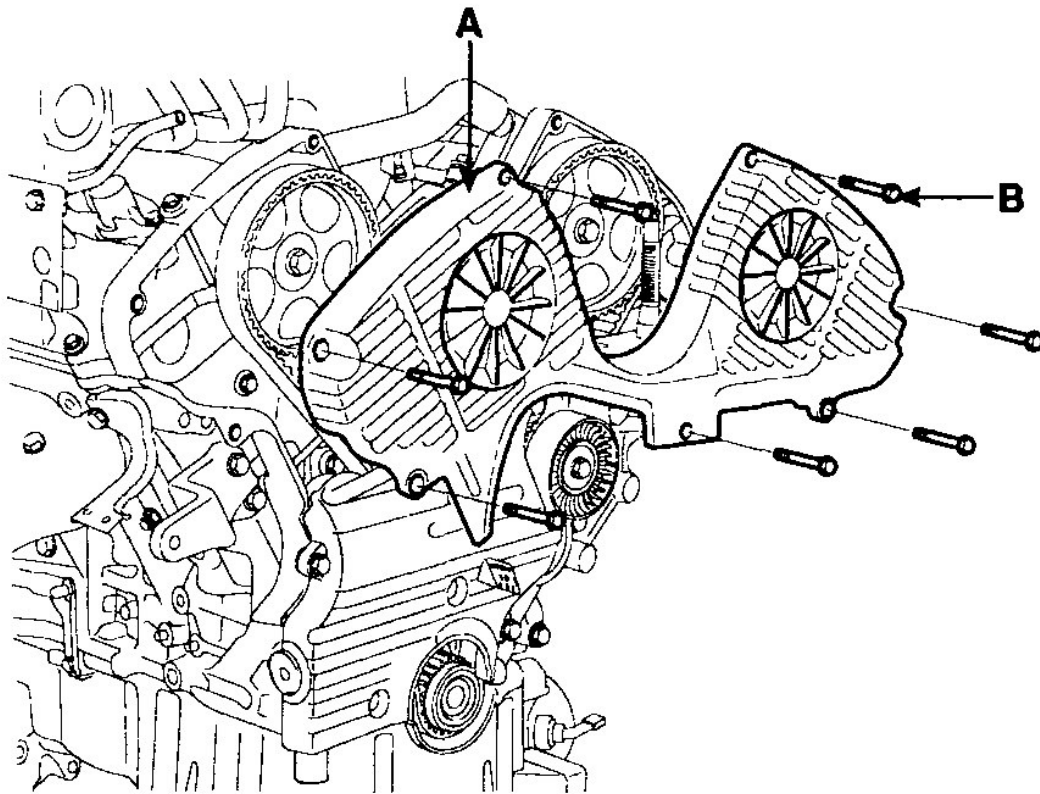
180 ~ 190Nm (1800 ~ 1900kgf.cm, 130 ~ 138lbf.ft)



G03848835

Fig. 26: Installing Crankshaft Pulley
Courtesy of HYUNDAI MOTOR CO.

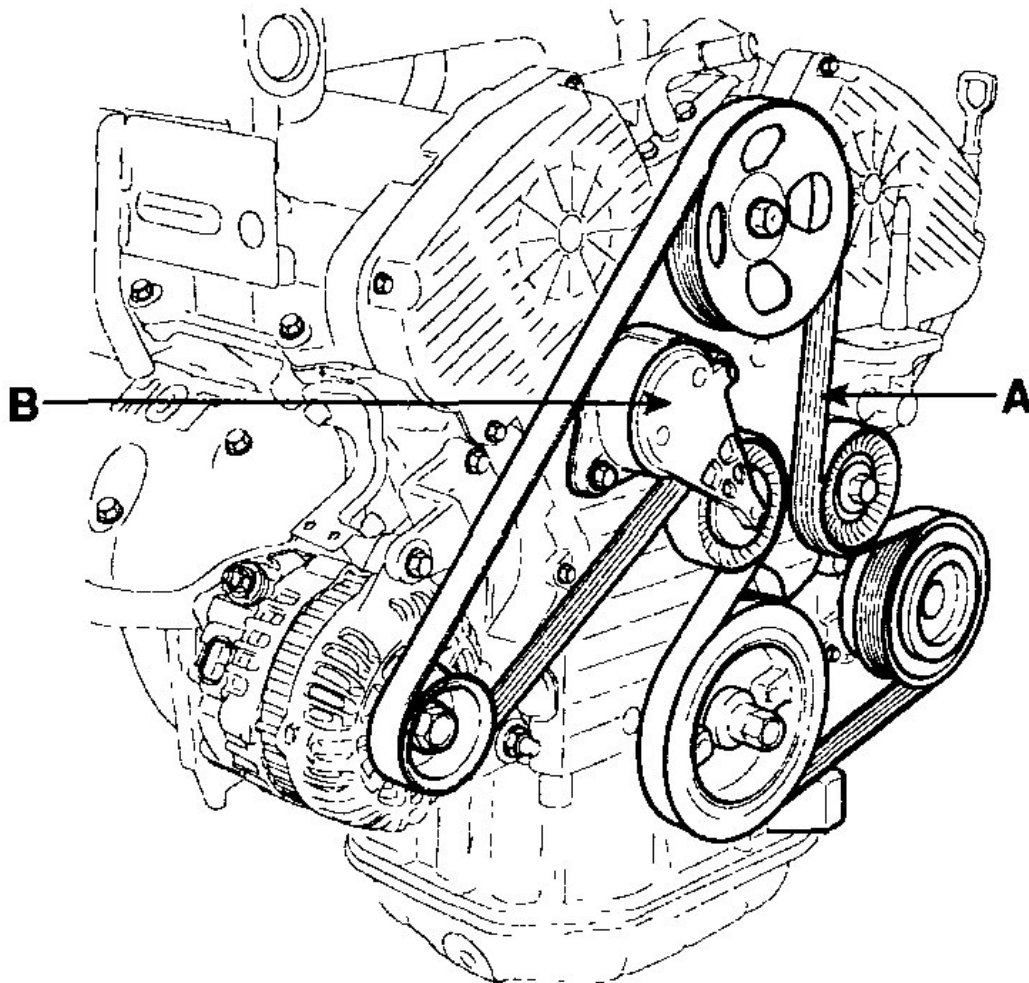
14. Install the timing belt upper cover (A) with 7 bolts (B).



G03848836

Fig. 27: Installing Timing Belt Upper Cover With 7 Bolts
Courtesy of HYUNDAI MOTOR CO.

15. Install the power steering pump. (See MECHANICAL POWER STEERING SYSTEM)
16. Install the drive belt tensioner (B) and drive belt (A).



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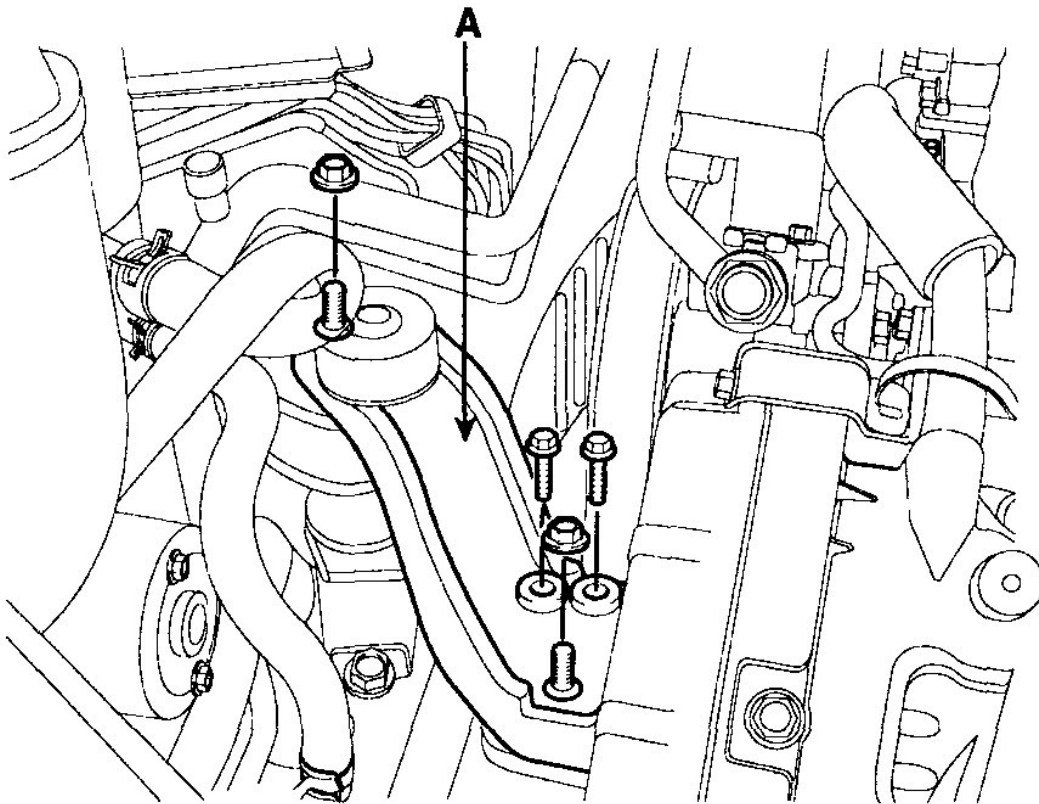
Fig. 28: Installing Drive Belt Tensioner And Drive Belt
Courtesy of HYUNDAI MOTOR CO.

17. Install the engine mount bracket.

Install engine mount bracket with 2 nuts and 2 bolt.

Tightening torque

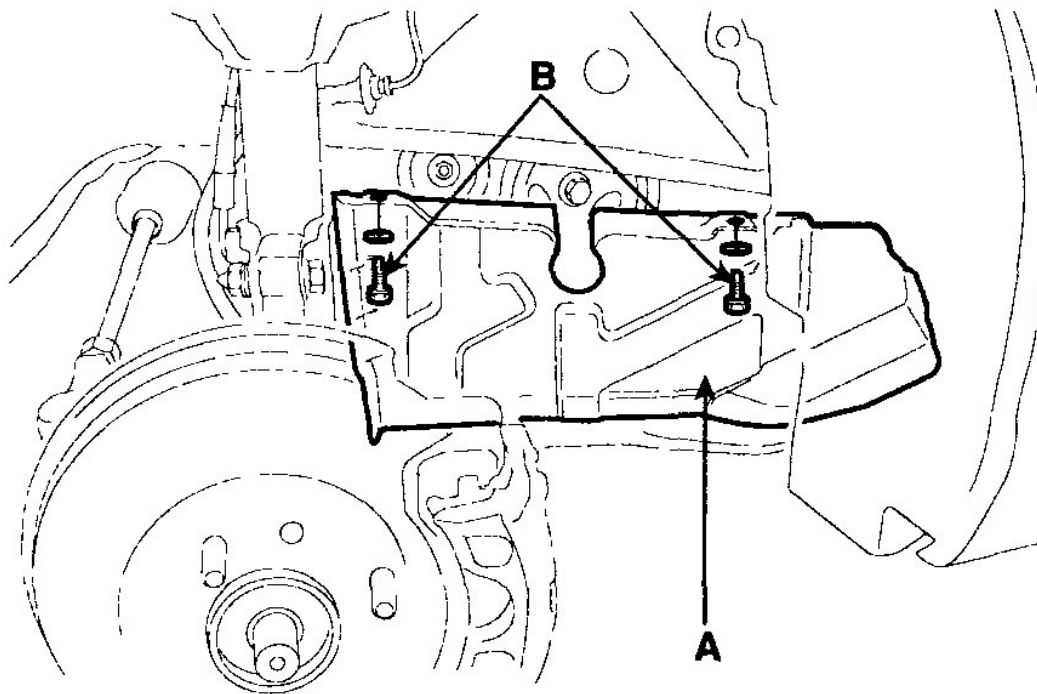
60 ~ 80Nm (600 ~ 800kgf.cm, 44 ~ 59lbf.ft)



G03848838

Fig. 29: Installing Engine Mount Bracket
Courtesy of HYUNDAI MOTOR CO.

18. Install RH side cover (A) with 2 bolts (B).



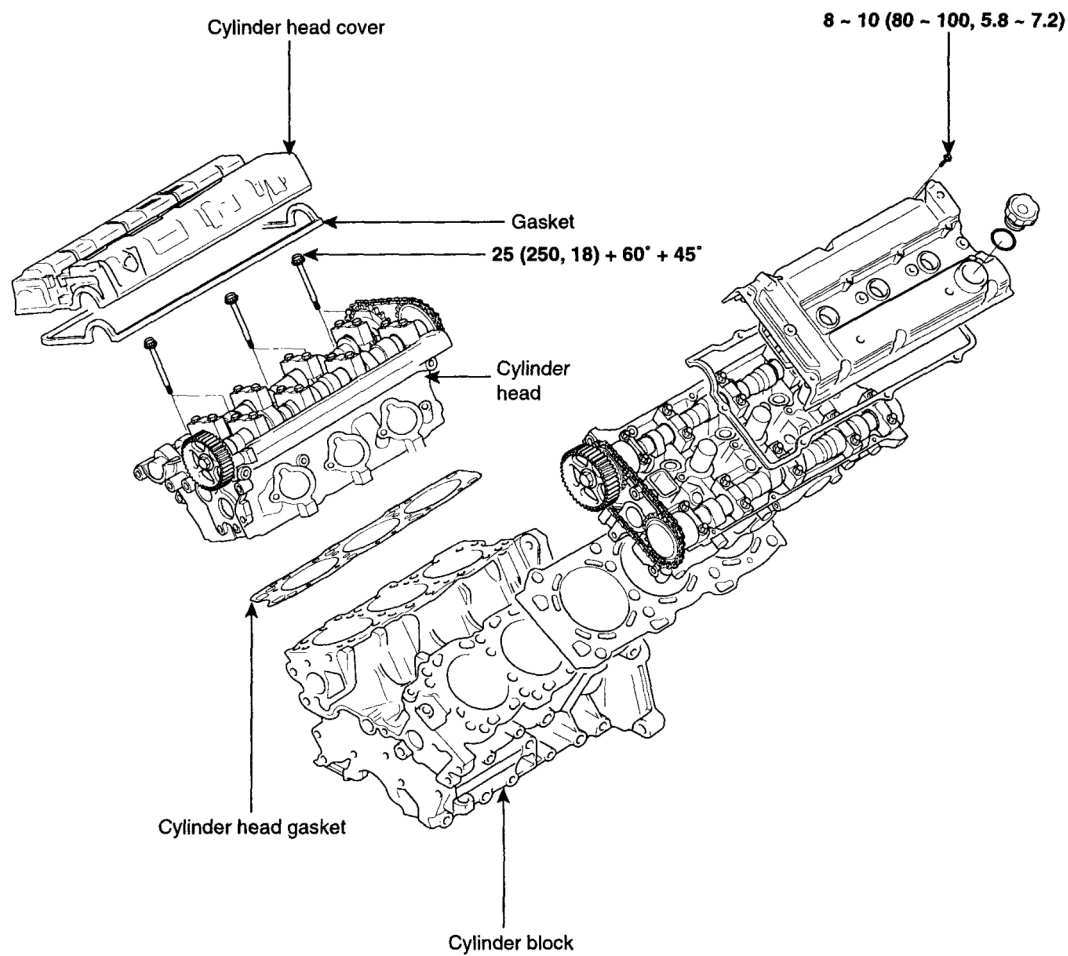
G03848839

Fig. 30: Installing RH Side Cover With 2 Bolts
Courtesy of HYUNDAI MOTOR CO.

19. Install RH front wheel.
20. Install engine cover.

CYLINDER HEAD ASSEMBLY

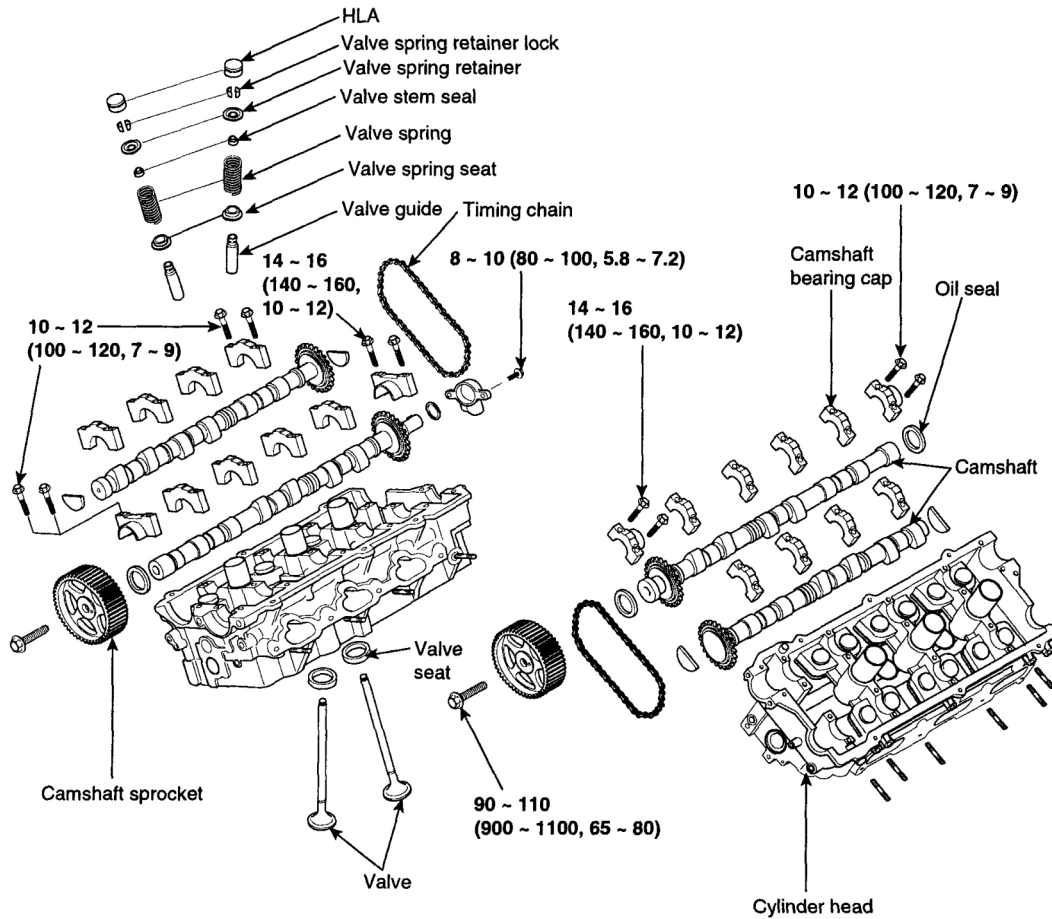
COMPONENTS



TORQUE : Nm (kgf.cm, lbf.ft)

G03848840

Fig. 31: Identifying Cylinder Head Assembly Components And Torque Specifications (1 Of 2)
 Courtesy of HYUNDAI MOTOR CO.



TORQUE : Nm (kgf.cm, lbf.ft)

G03848841

Fig. 32: Identifying Cylinder Head Assembly Components Torque Specifications (2 Of 2)
Courtesy of HYUNDAI MOTOR CO.

REMOVAL

Engine removal is not required for this procedure.

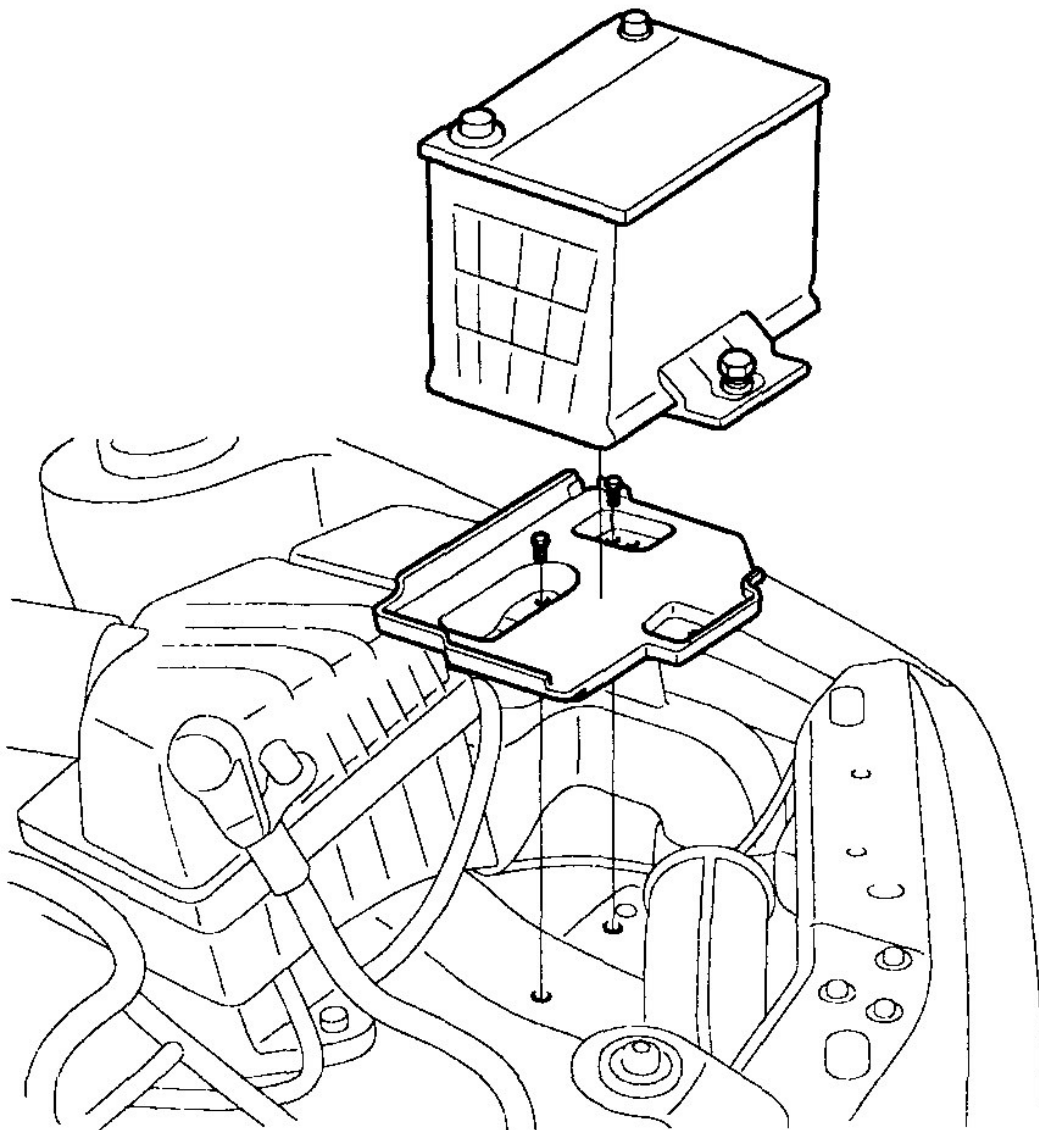
CAUTION:

- Use fender covers to avoid damaging painted surfaces.
- To avoid damaging the cylinder head, wait until the engine coolant temperature drops below normal temperature before removing it.
- When handling a metal gasket, take care not to fold the gasket or damage the contact surface of the gasket.
- To avoid damage, unplug the wiring connectors carefully while holding the connector portion.

NOTE:

- Mark all wiring and hoses to avoid misconnection.
- Inspect the timing belt before removing the cylinder head.
- Turn the crankshaft pulley so that the No. 1 piston is at top dead center. (See **REMOVAL**).

1. Disconnect the negative terminal from the battery.

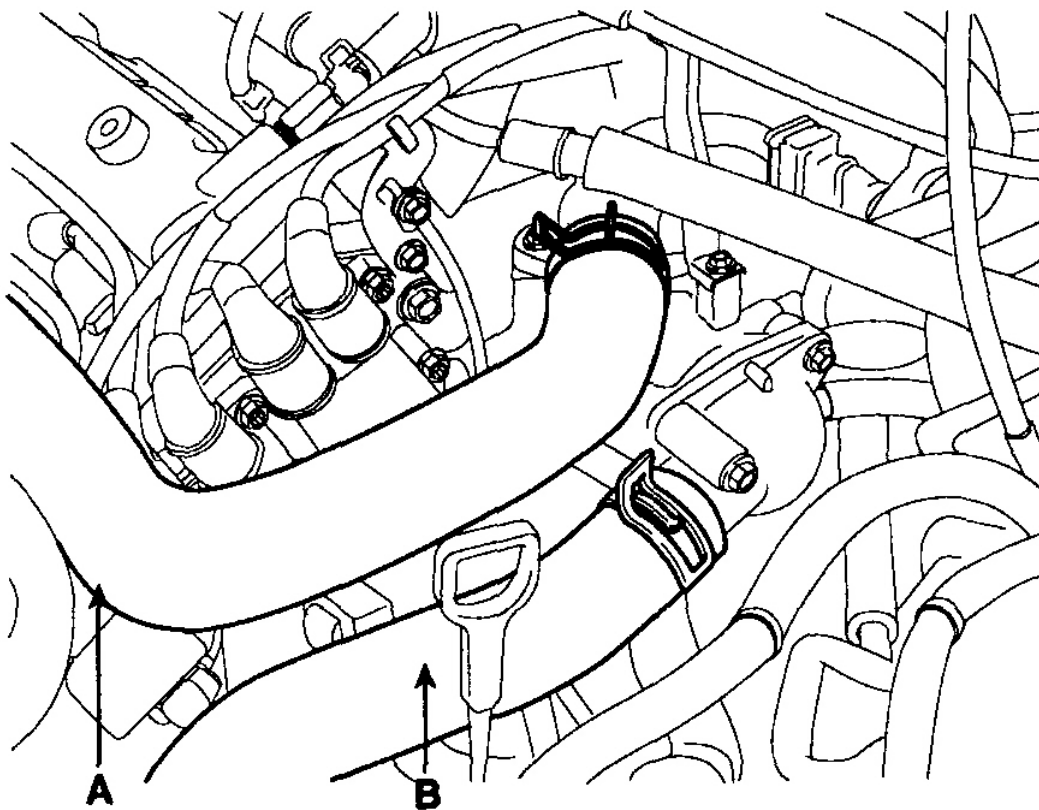


G03848842

Fig. 33: Removing Battery

Courtesy of HYUNDAI MOTOR CO.

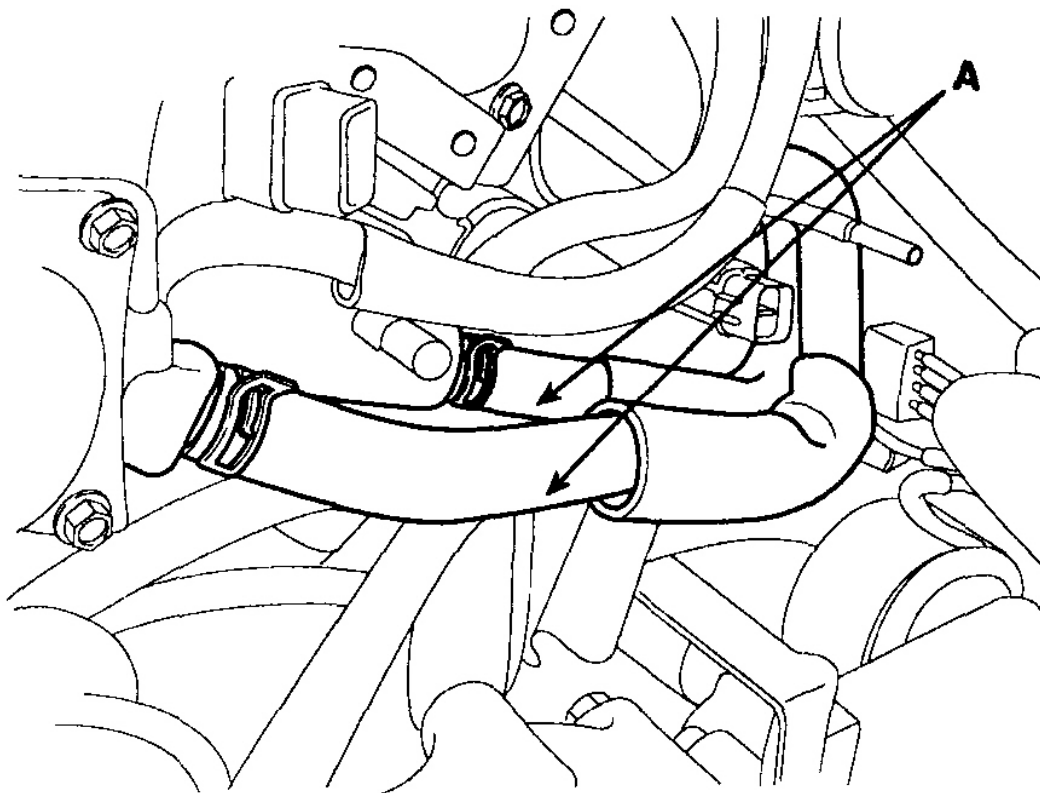
2. Remove the engine cover.
3. Drain the engine coolant. (See **ENGINE COOLANT REFILLING AND BLEEDING**) Remove the radiator cap to speed draining.
4. Remove the intake air hose and air cleaner assembly.
 1. Disconnect the AFS connector.
 2. Disconnect the breather hose from air cleaner hose.
 3. Remove the intake air hose and air cleaner assembly.
5. Remove the upper radiator hose (A) and lower radiator hose (B).



G03848843

Fig. 34: Removing Upper Radiator Hose And Lower Radiator Hose
Courtesy of HYUNDAI MOTOR CO.

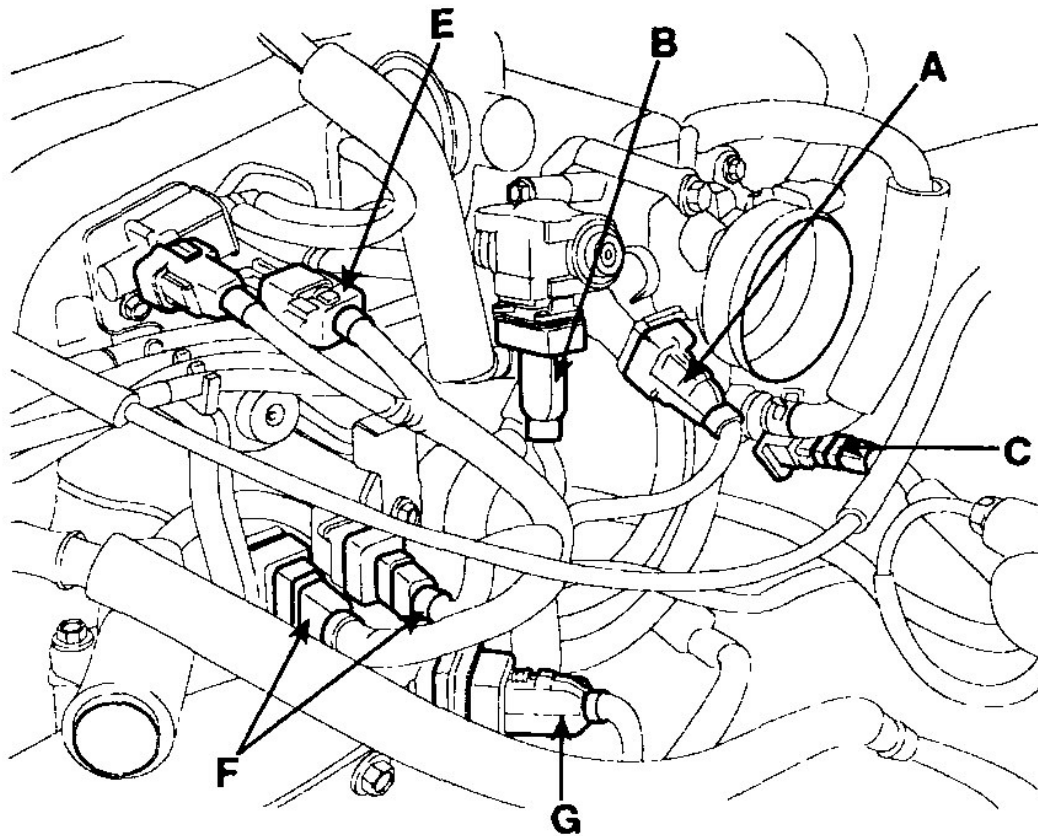
6. Remove the heater hoses (A).



G03848844

Fig. 35: Removing Heater Hoses
Courtesy of HYUNDAI MOTOR CO.

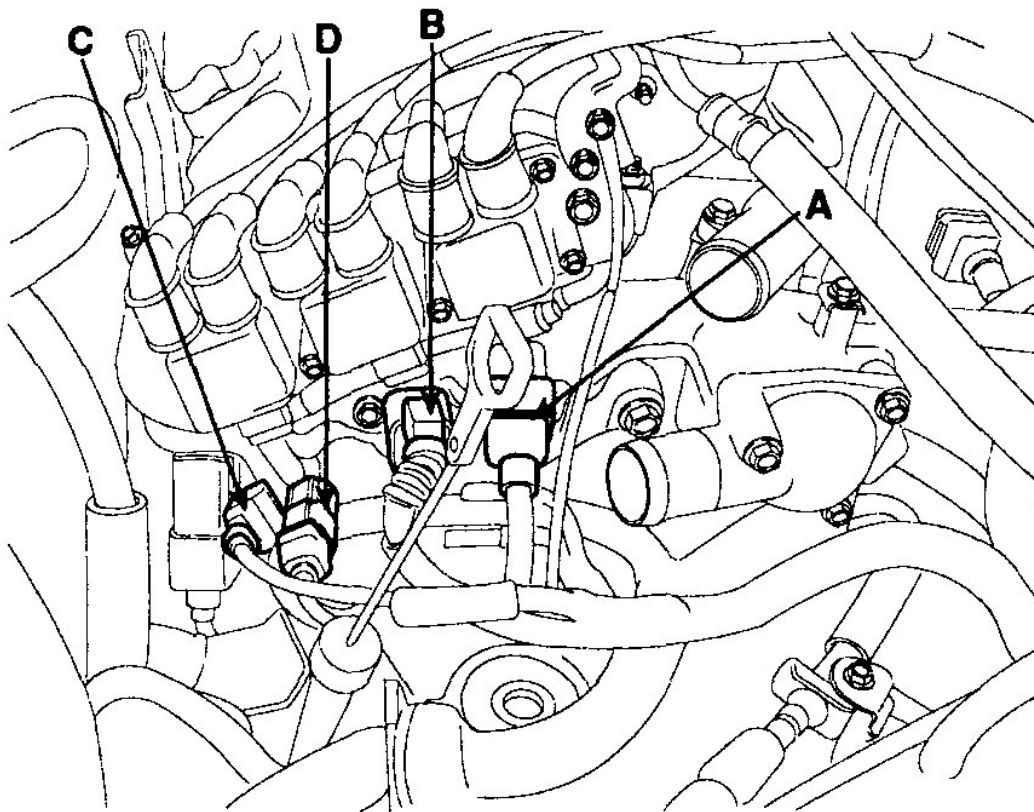
7. Remove the engine wire harness connectors and wire harness clamps from the cylinder head and the intake manifold.
 1. TPS (Throttle Position Sensor) connector (A).
 2. ISA (Idle Speed Actuator) connector (B).
 3. PCSV (Purge Control Solenoid Valve) connector (C).
 4. Injector connector (E).
 5. Knock sensor connectors (F).
 6. CMP (Camshaft Position Sensor) connector (G).



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Fig. 36: Removing Engine Wire Harness Connectors And Wire Harness Clamps From Cylinder Head And Intake Manifold
Courtesy of HYUNDAI MOTOR CO.

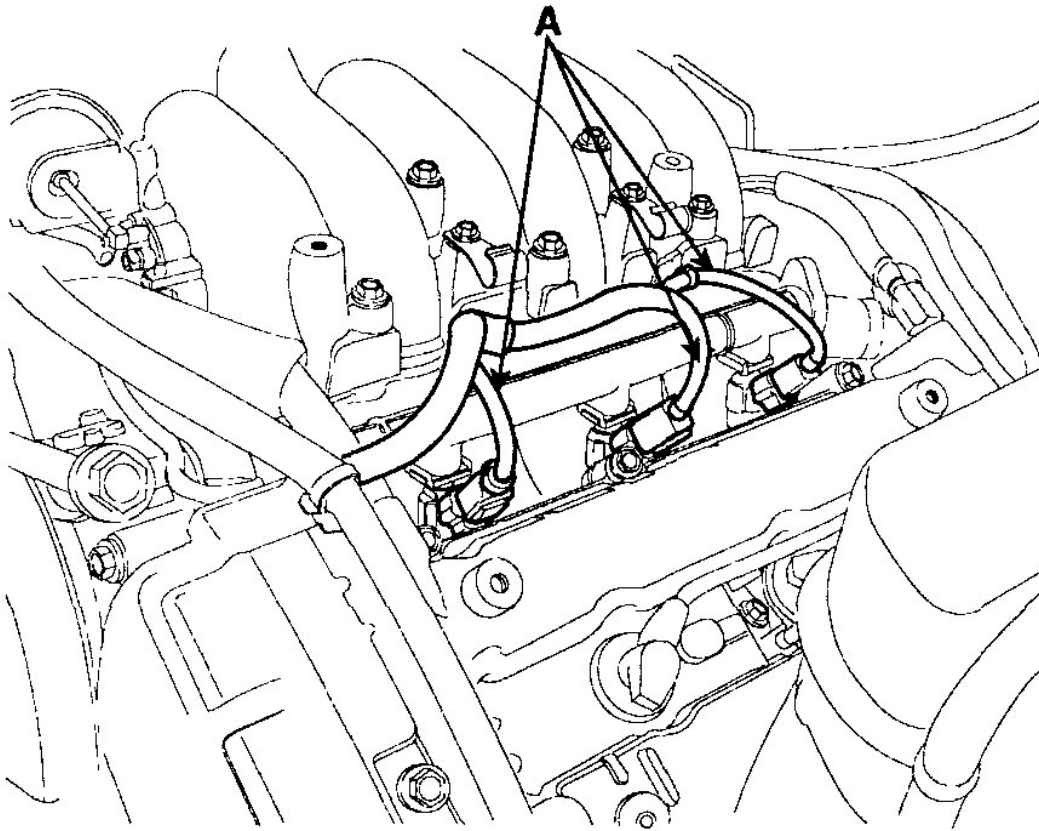
7. ECT (Engine Coolant Temperature) sensor connector (A).
8. Ignition coil connector (B).
9. Crankshaft position sensor connector (C).
10. Oxygen sensor connector (D).



G03848846

Fig. 37: Removing Crankshaft Position Sensor Connector, Oxygen Sensor Connector, ECT And Ignition Coil Connector
Courtesy of HYUNDAI MOTOR CO.

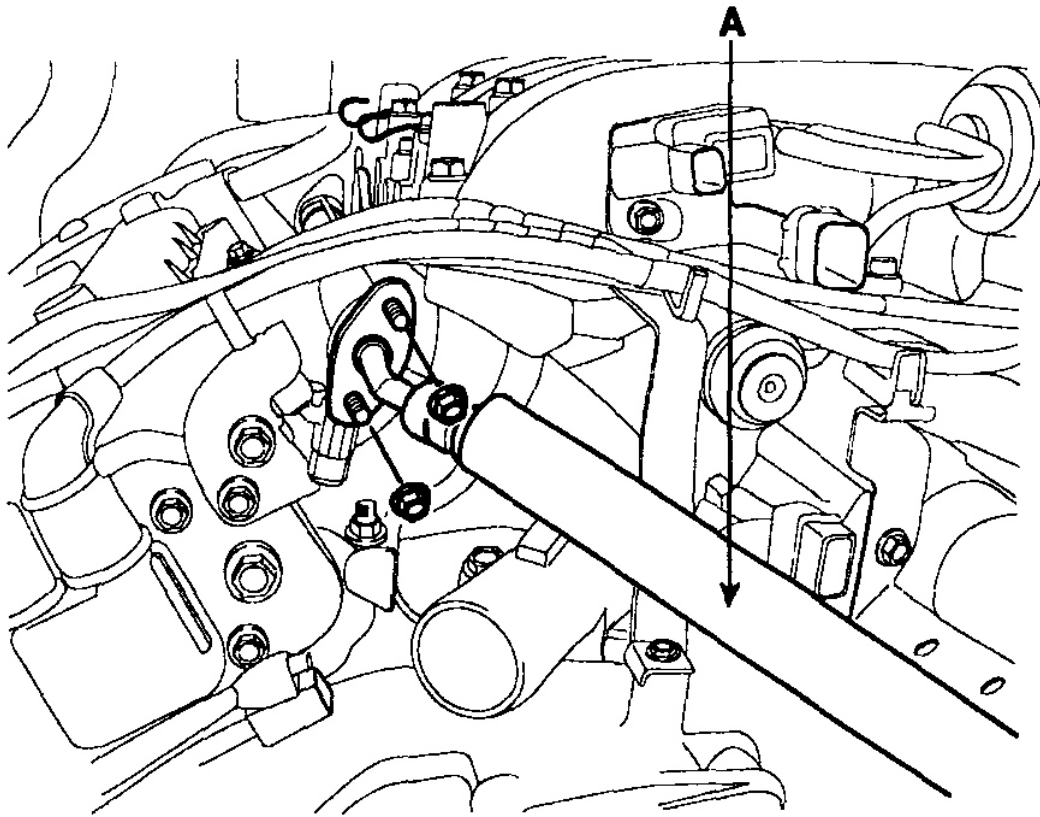
11. Three fuel injector connectors (A).



G03848847

Fig. 38: Removing Fuel Injector Connectors
Courtesy of HYUNDAI MOTOR CO.

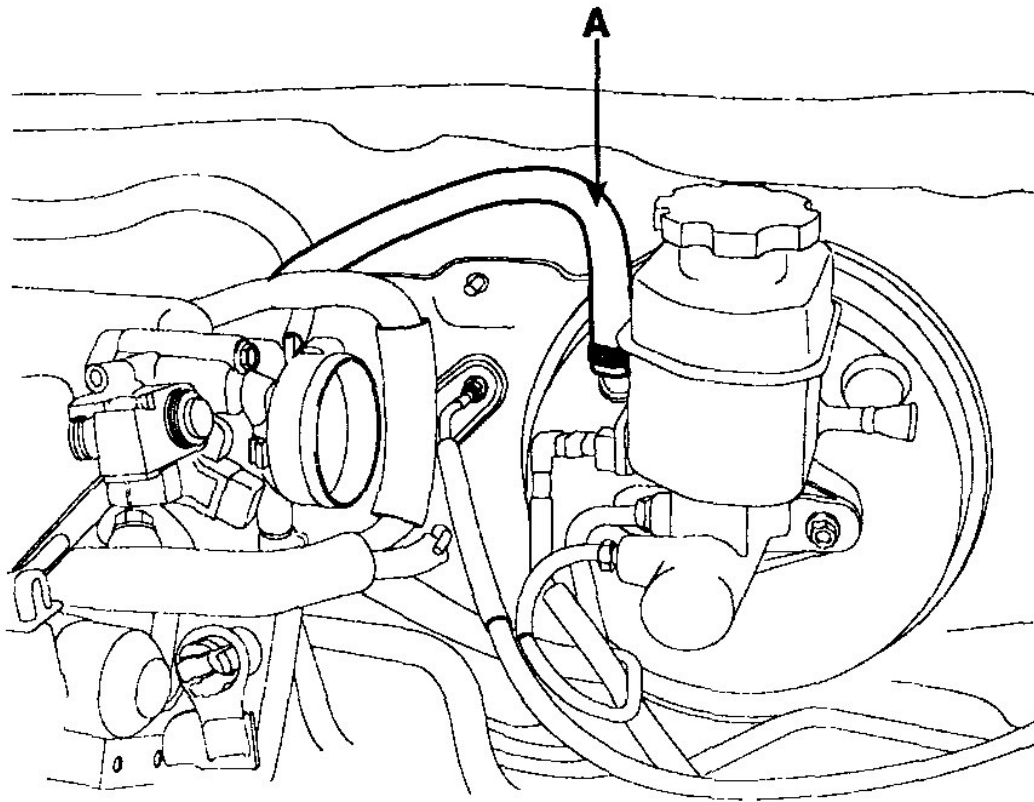
8. Remove the fuel inlet hose (A) from delivery pipe.



G03848848

Fig. 39: Removing Fuel Inlet Hose From Delivery Pipe
Courtesy of HYUNDAI MOTOR CO.

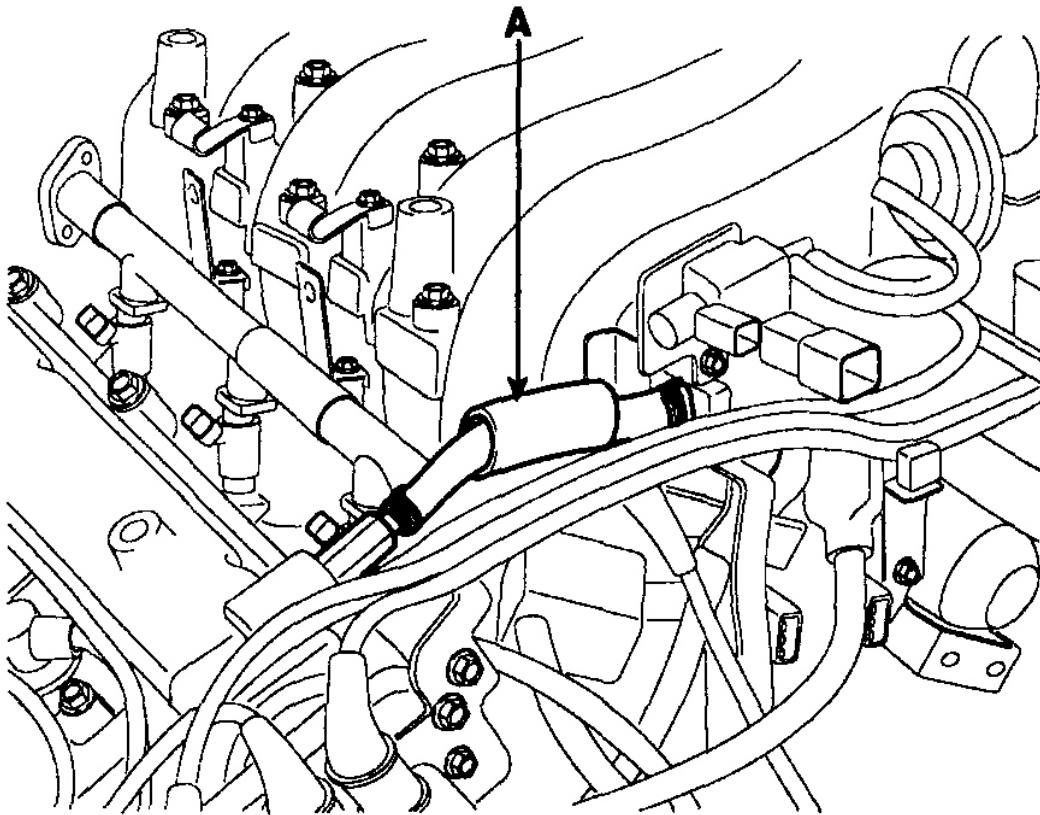
9. Remove the PCSV hose.
10. Remove the brake booster vacuum hose (A).



G03848849

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

11. Remove the accelerator cable by loosening the lock-nut, then slip the cable end out of the throttle linkage.
12. Remove the PCV hose (A).

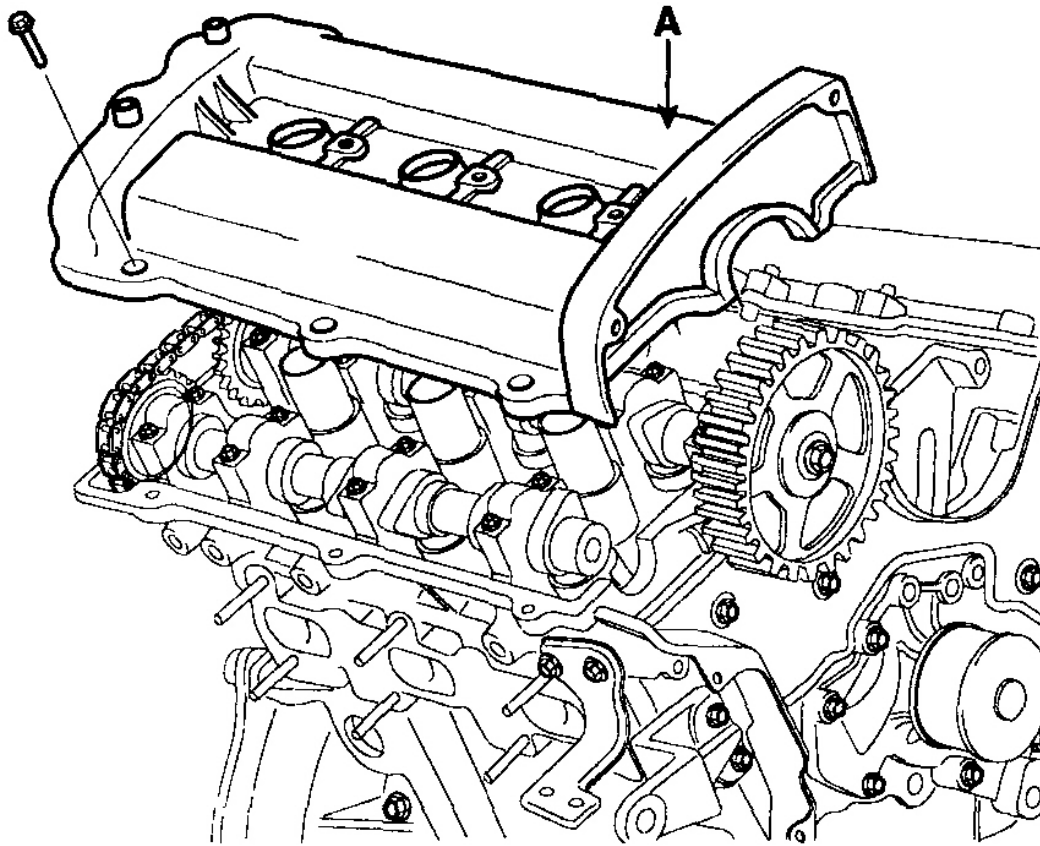


G03848850

Fig. 41: Removing PCV Hose

Courtesy of HYUNDAI MOTOR CO.

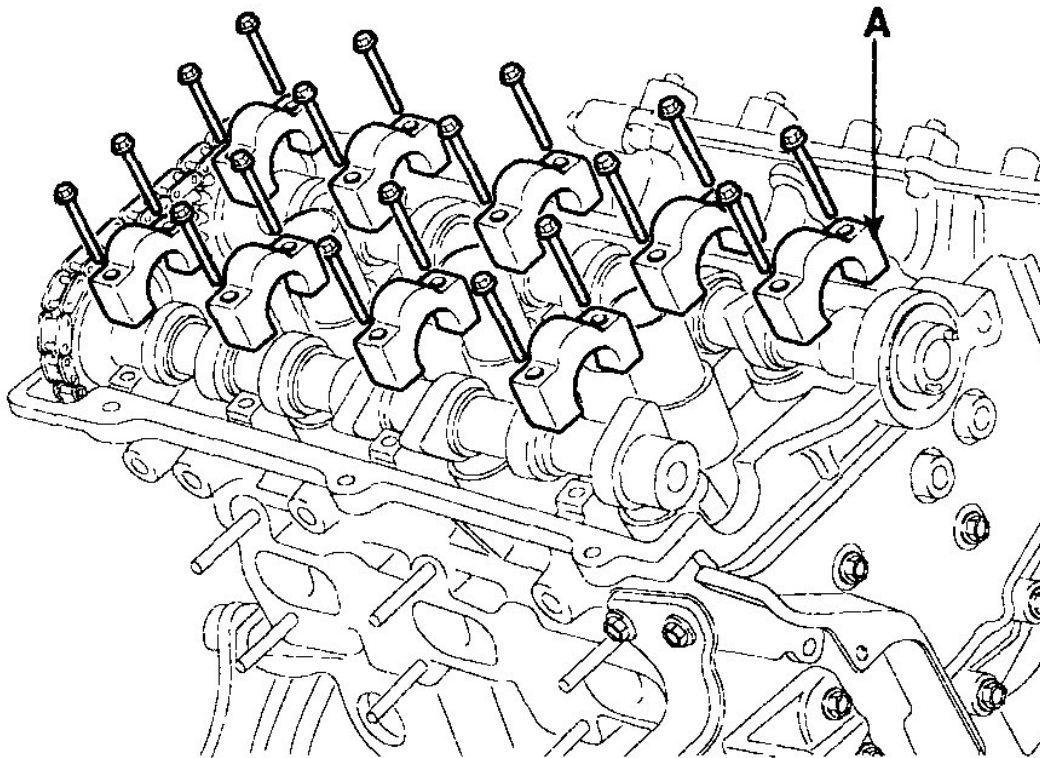
13. Remove the Intake Manifold. (See **INTAKE MANIFOLD**)
14. Remove the power steering pump. (See **POWER STEERING OIL PUMP**).
15. Remove the Exhaust Manifold. (See **EXHAUST MANIFOLD**)
16. Remove the timing belt. (See **REMOVAL**)
17. Remove the spark plug cable. (See **INSPECT SPARK PLUG AND SPARK PLUG CABLE**)
18. Remove the cylinder head covers (A).



G03848851

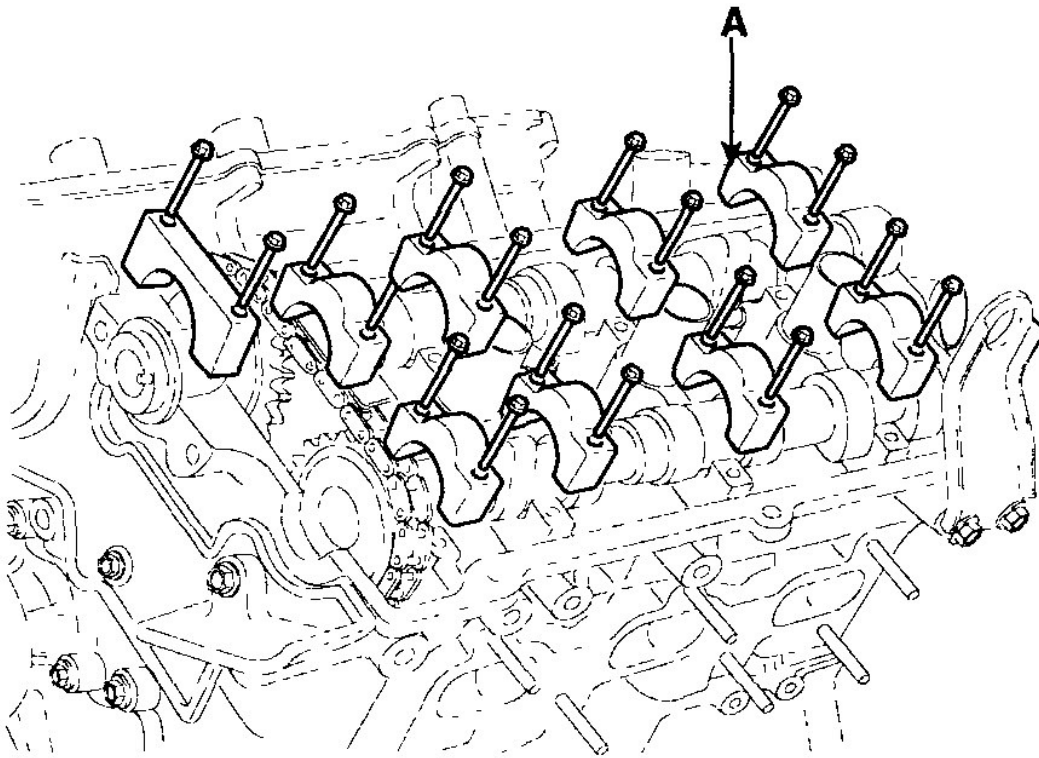
Fig. 42: Removing Cylinder Head Cover
Courtesy of HYUNDAI MOTOR CO.

19. Remove the camshaft sprocket.
20. Remove the camshaft bearing caps (A).



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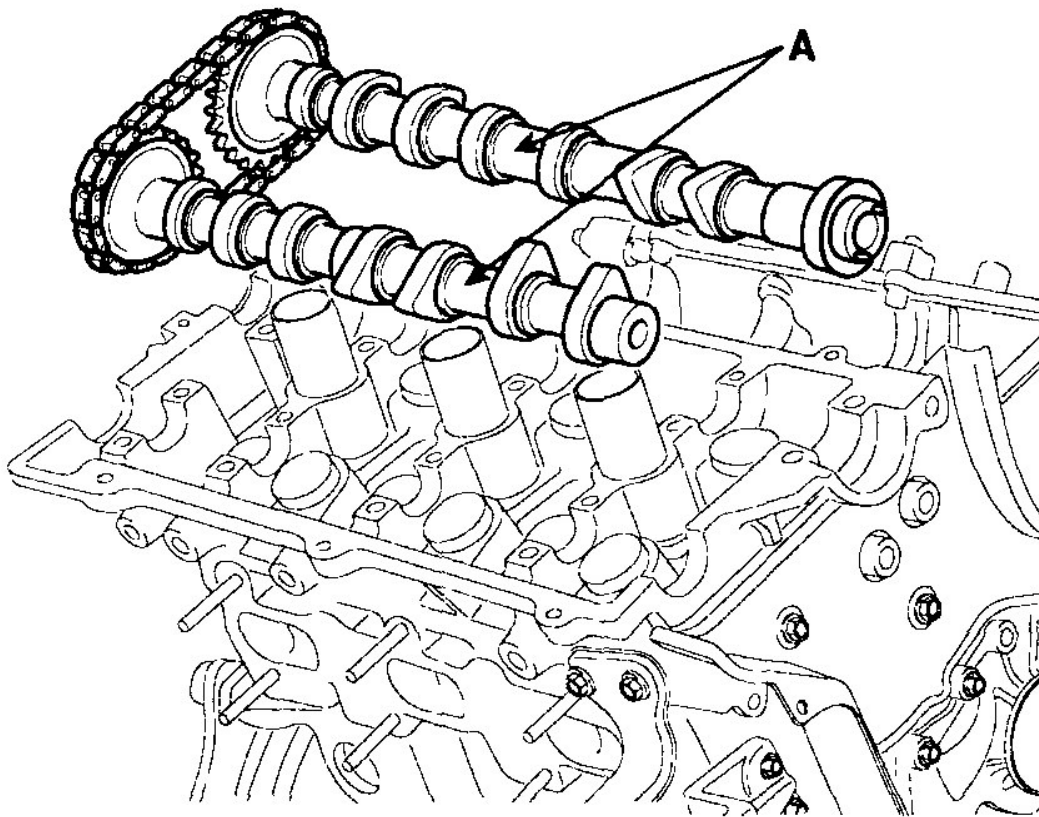
Fig. 43: Removing Camshaft Bearing Caps (1 Of 2)
Courtesy of HYUNDAI MOTOR CO.



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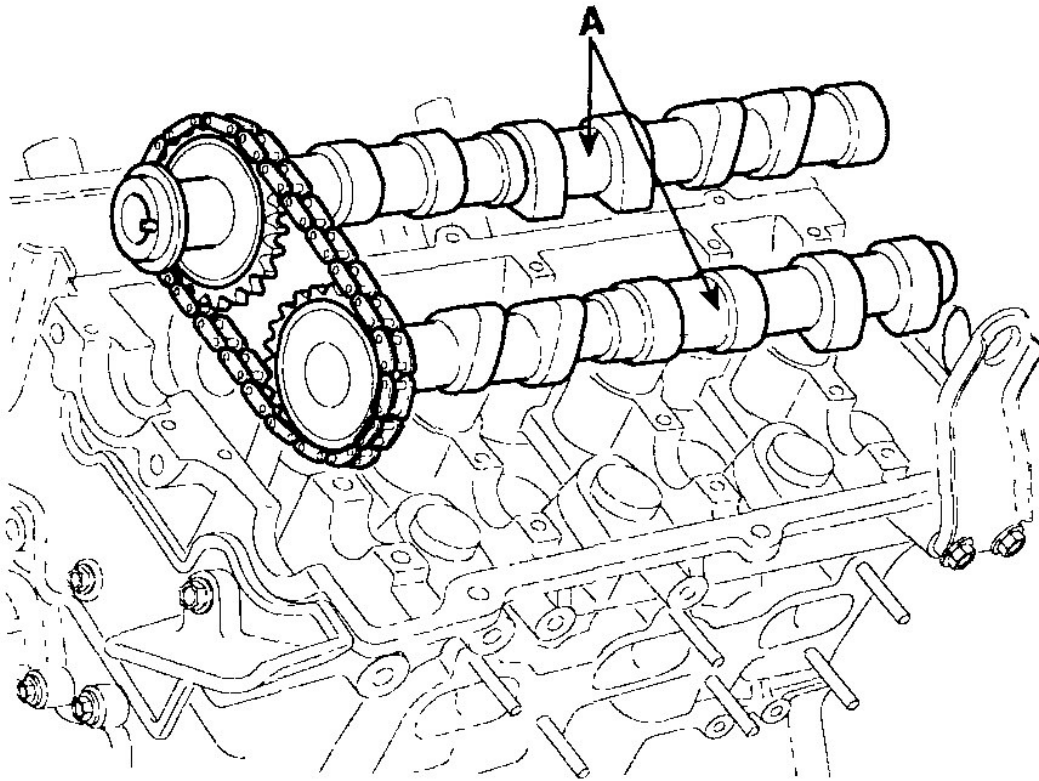
Fig. 44: Removing Camshaft Bearing Caps (2 Of 2)
Courtesy of HYUNDAI MOTOR CO.

21. Remove the camshafts (A).



G03848854

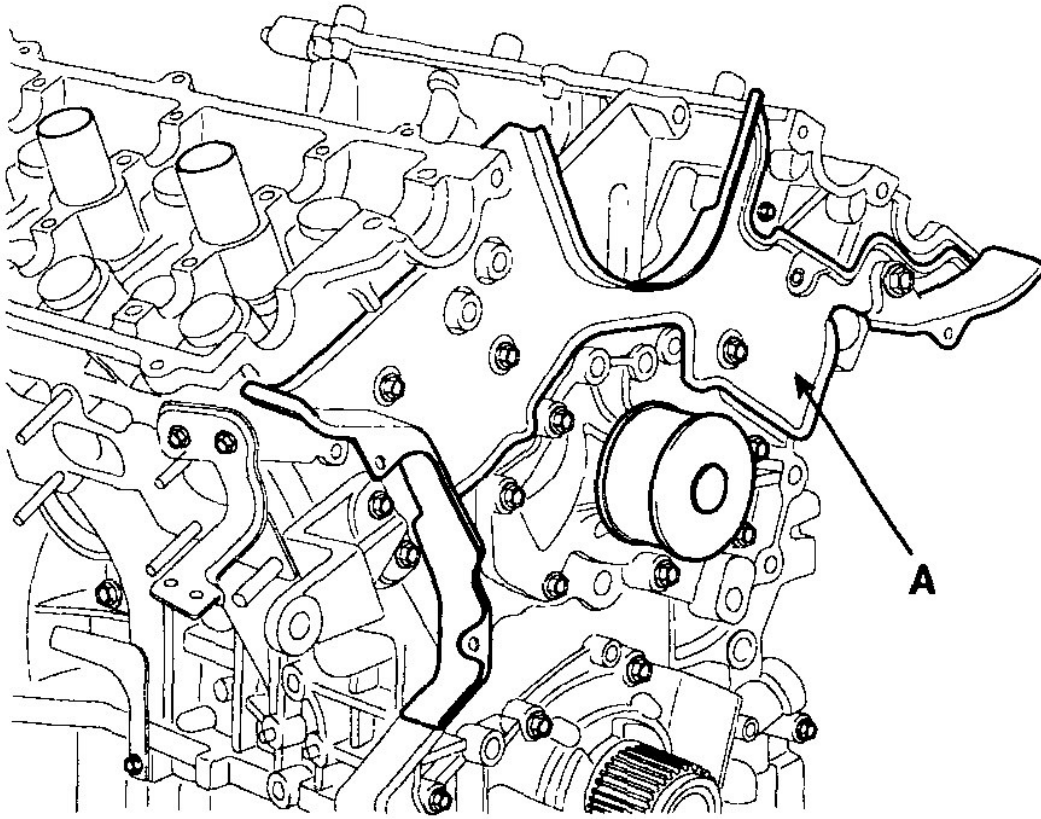
Fig. 45: Removing Camshafts (1 Of 2)
Courtesy of HYUNDAI MOTOR CO.



G03848855

Fig. 46: Removing Camshafts (2 Of 2)
Courtesy of HYUNDAI MOTOR CO.

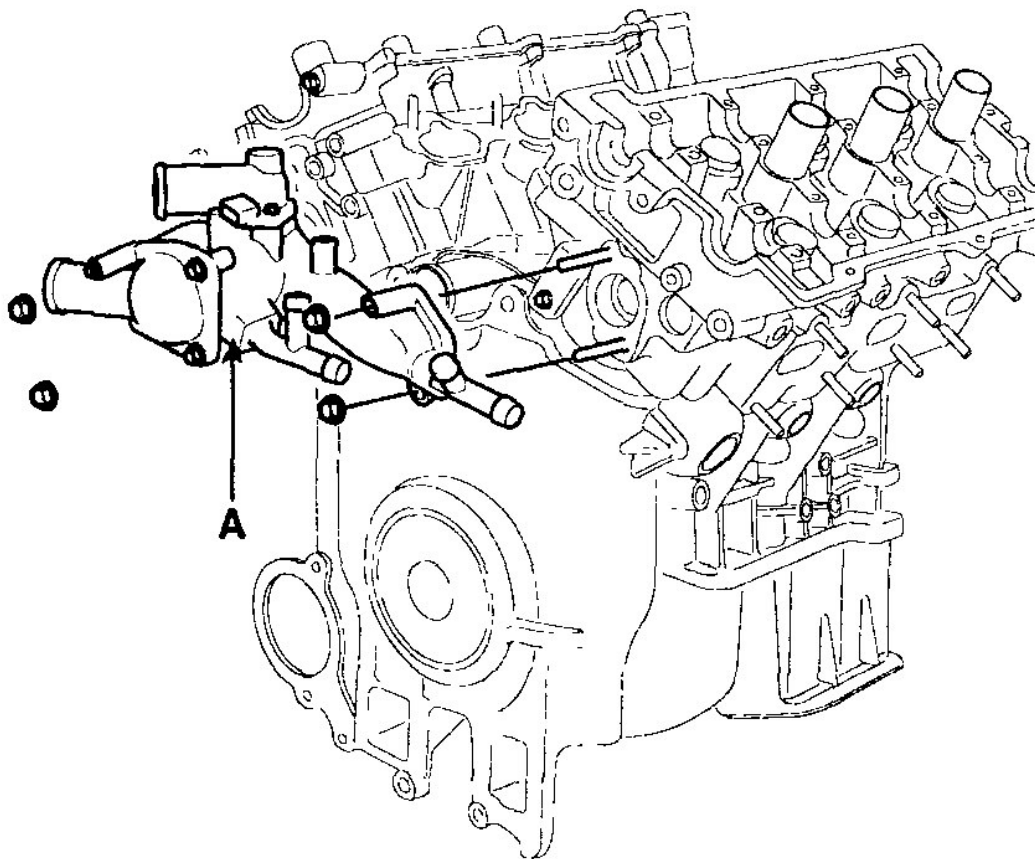
22. Remove the timing belt rear cover (A).



G03848856

Fig. 47: Removing Timing Belt Rear Cover
Courtesy of HYUNDAI MOTOR CO.

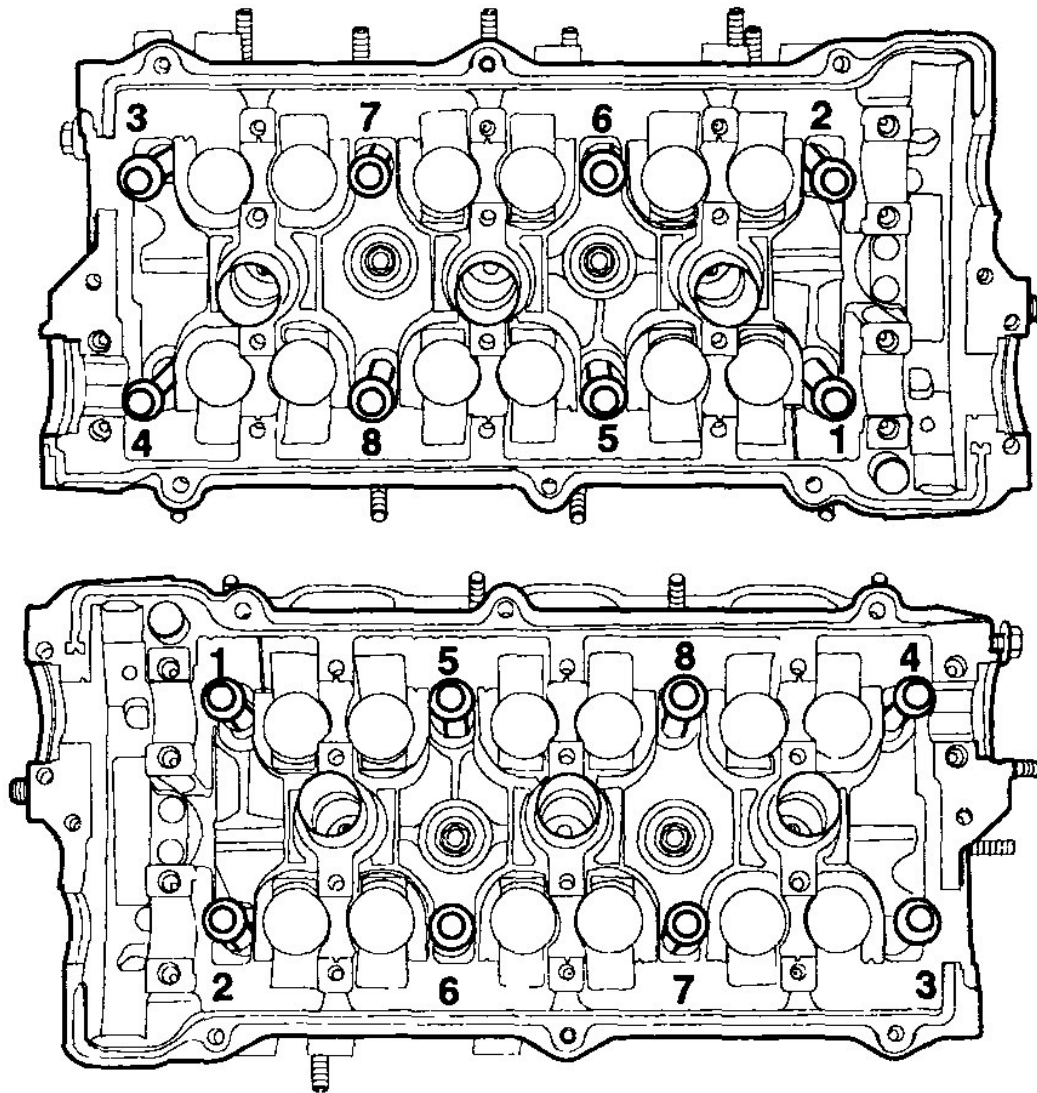
23. Remove the water temperature control assembly (A) and water pipe.



G03848857

Fig. 48: Removing Water Temperature Control Assembly And Water Pipe
Courtesy of HYUNDAI MOTOR CO.

24. Remove the cylinder head bolts, then remove the cylinder heads.
 1. Uniformly loosen and remove the 8 cylinder head bolts on each cylinder head in several passes and in the sequence shown, then repeat for the other side, as shown. Remove the 16 cylinder head bolts and plate washer.



G03848858

Fig. 49: Identifying Removal Sequence Of Cylinder Head Bolts
Courtesy of HYUNDAI MOTOR CO.

CAUTION: Head warpage or cracking could result from removing bolts in an incorrect order.

2. Lift the cylinder head from the dowels on the cylinder block and place the cylinder head on wooden blocks on a bench.

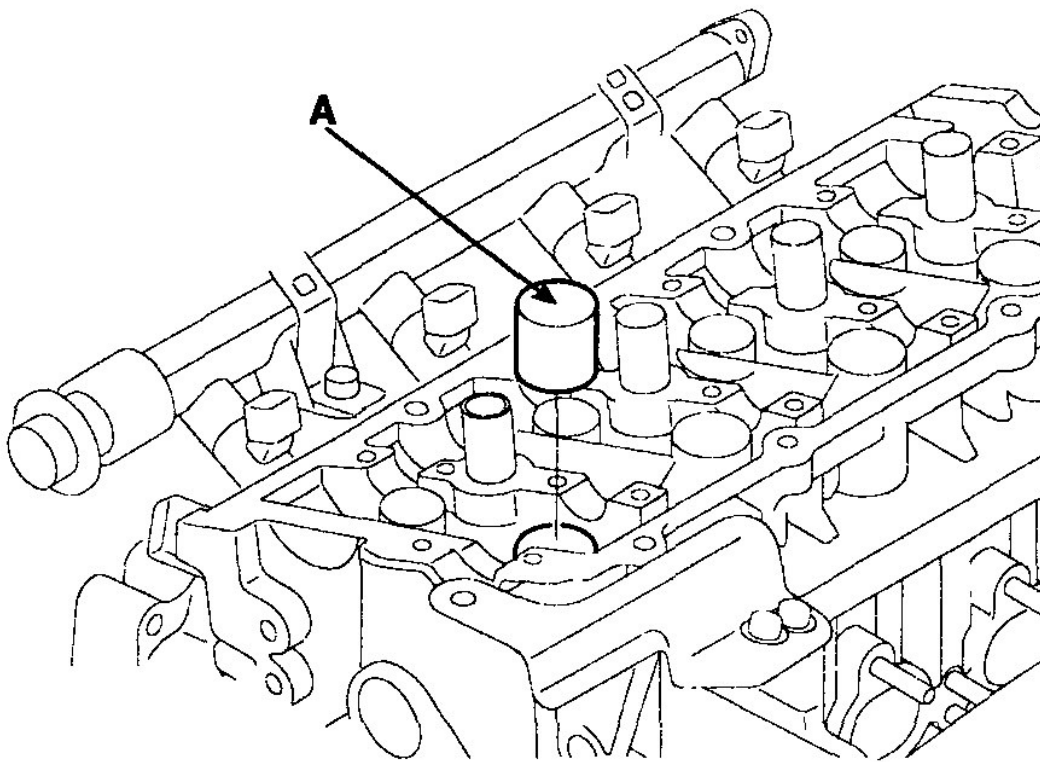
CAUTION: Be careful not to damage the contact surfaces of the cylinder

head and cylinder block.

DISASSEMBLY

NOTE: Identify HLA (Hydraulic Lash Adjuster), valves, valve springs as they are removed so that each item can be reinstalled in its original position.

1. Remove HLAs (A).



G03848859

Fig. 50: Removing Hydraulic Lash Adjuster
Courtesy of HYUNDAI MOTOR CO.

2. Remove valves.
 1. Using SST (09222-28000, 09222-28100), compress the valve spring and remove retainer lock.

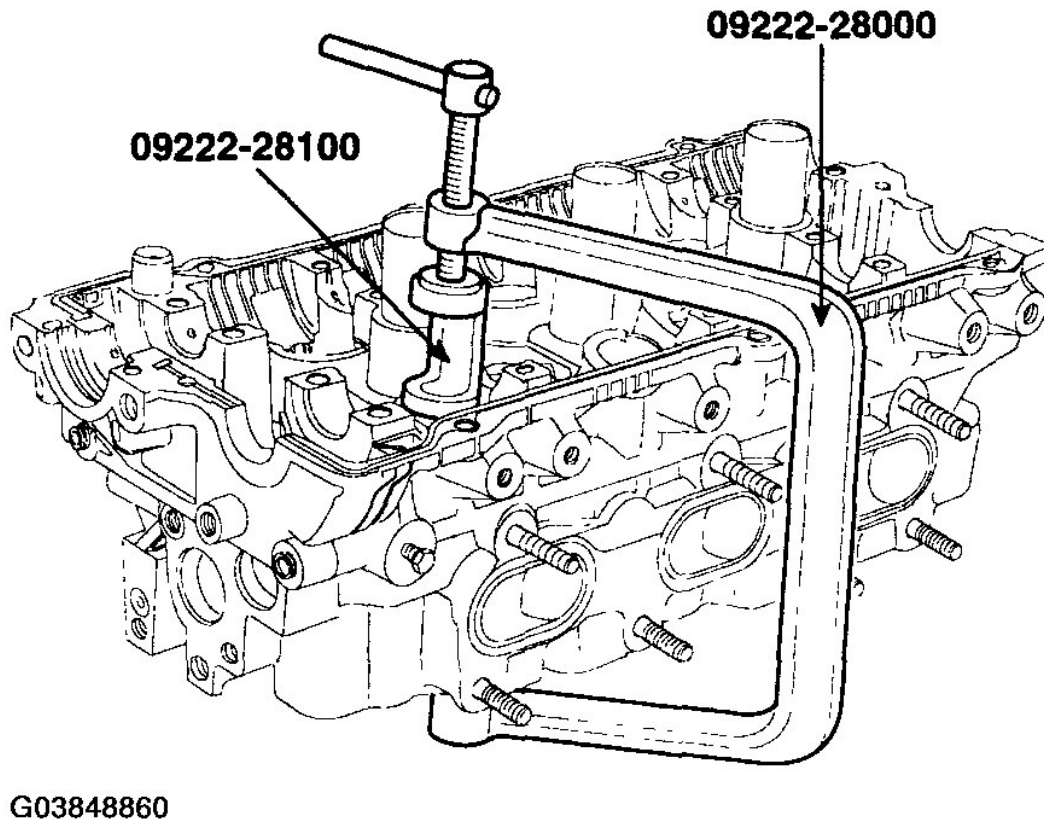


Fig. 51: Using SST (09222-28000, 09222-28100) To Compress Valve Spring And Remove Retainer Lock
Courtesy of HYUNDAI MOTOR CO.

2. Remove the spring retainer.
3. Remove the valve spring.
4. Remove the valve.
5. Using needle-nose pliers, remove the oil seal.
6. Using a magnetic finger, remove the spring seat.

INSPECTION

CLEANING

1. Clean top surfaces of pistons and cylinder block.
 1. Turn the crankshaft, and bring each piston to top dead center (TDC).

Using a gasket scraper, remove all the carbon from the piston top surface.

2. Using a gasket scraper, remove all the gasket material from the cylinder block surface.
3. Using compressed air, blow carbon and oil from the bolt holes.
2. Remove gasket material.

Using a gasket scraper, remove all the gasket material from the cylinder block contact surface.

CAUTION: Be careful not to scratch the cylinder block contact surface.

3. Clean combustion cambers.

Using a wire brush, remove all the carbon from the combustion cambers.

CAUTION: Be careful not to scratch the cylinder block contact surface.

4. Clean cylinder heads.

Using a soft brush and solvent, thoroughly clean the cylinder head.

5. Clean valves.
 1. Using a gasket scraper, chip off any carbon from the valve head.
 2. Using a wire brush thoroughly clean the valve.

CYLINDER HEAD

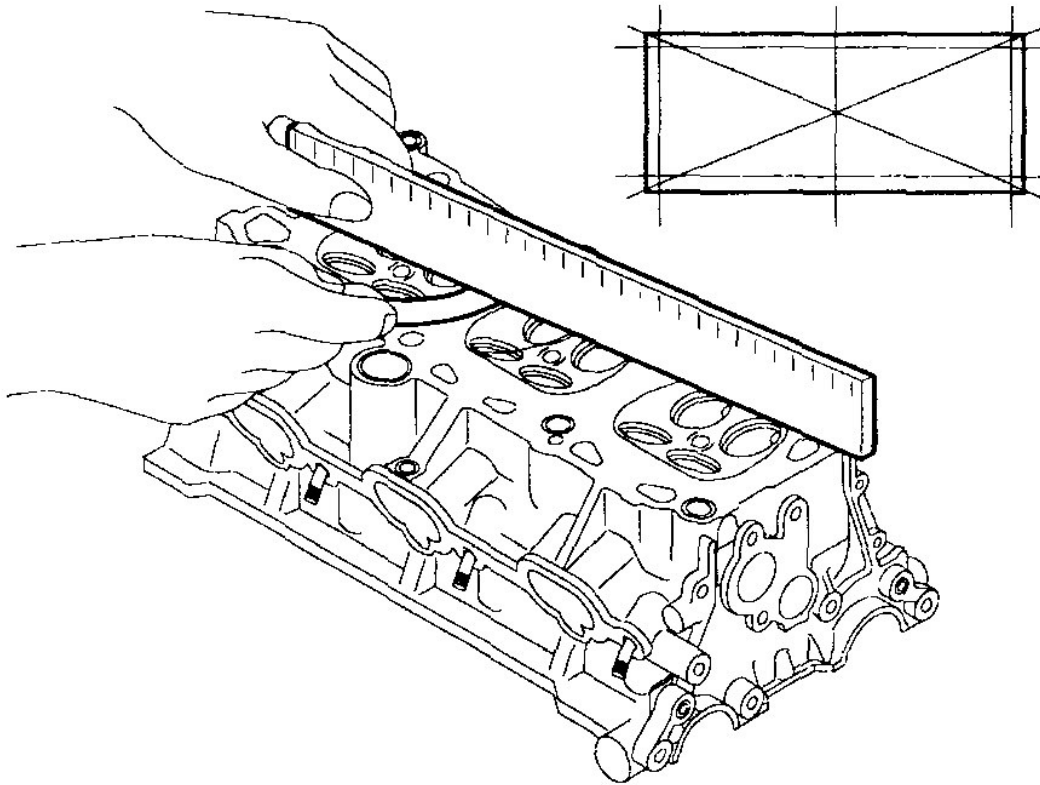
1. Inspect for flatness.

Using a precision straight edge and feeler gauge, measure the surface Contacting the cylinder block for warpage.

Flatness of cylinder head gasket surface

Standard: Less than 0.03mm (0.0012 in.)

Limit: 0.05 mm (0.0020 in.)



G03848861

Fig. 52: Using Precision Straight Edge And Feeler Gauge To Measure Surface Contacting Cylinder Block For Warpage
Courtesy of HYUNDAI MOTOR CO.

2. Inspect for cracks.

Check the combustion chamber, intake ports, exhaust ports and cylinder block surface for cracks. If cracked, replace the cylinder head.

VALVE AND VALVE SPRING

1. Inspect valve stems and valve guides.
 1. Using a caliper gauge, measure the inside diameter of the valve guide.

Valve guide inside.

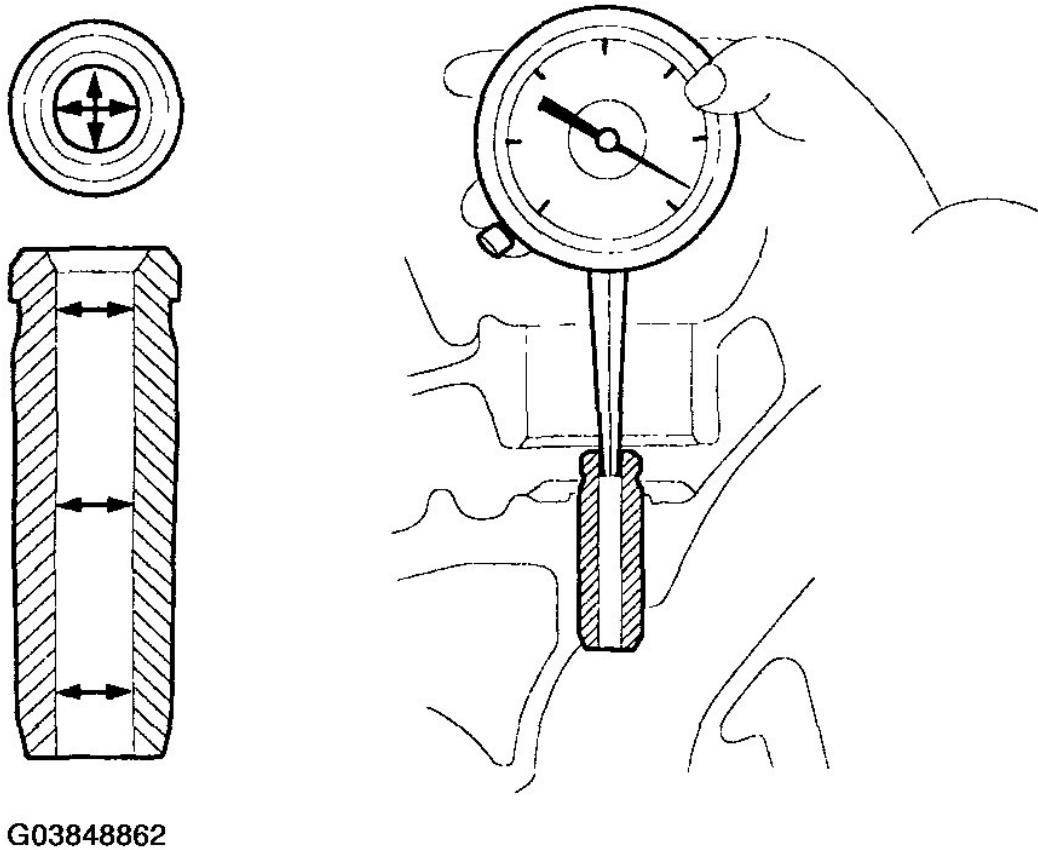


Fig. 53: Using Caliper Gauge To Measure Inside Diameter Of Valve Guide
Courtesy of HYUNDAI MOTOR CO.

2. Using a micrometer, measure the diameter of the valve stem.

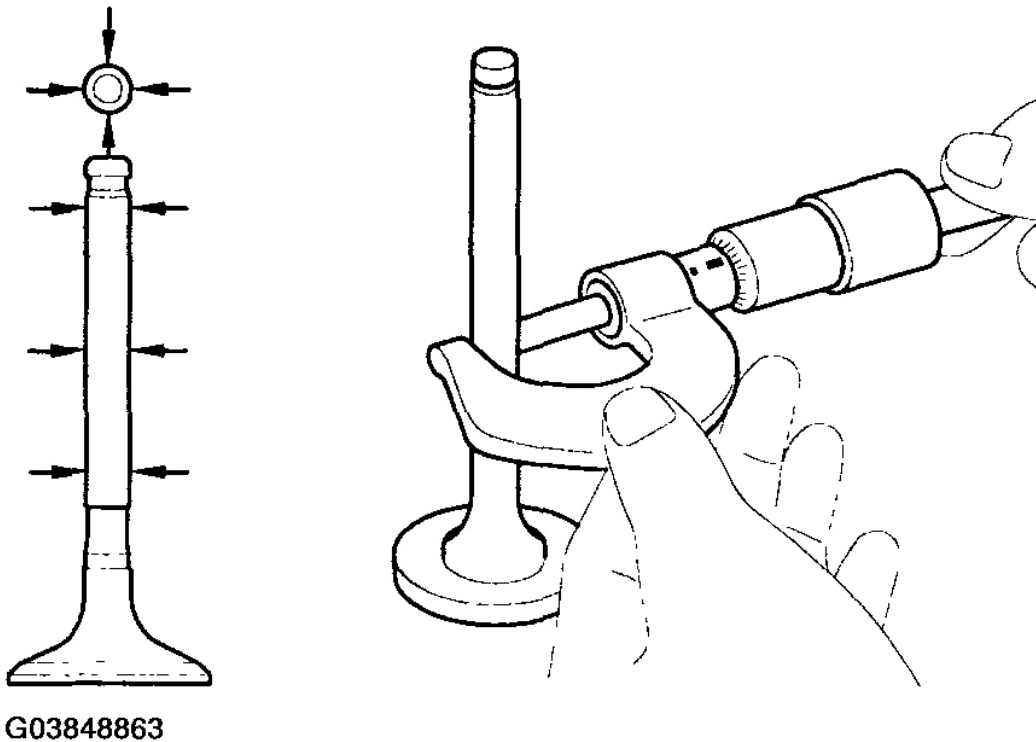


Fig. 54: Using Micrometer To Measure Diameter Of Valve Stem
Courtesy of HYUNDAI MOTOR CO.

3. Subtract the valve stem diameter measurement from the valve guide inside diameter measurement.

Valve stem-to-guide clearance

[Standard]

Intake: 0.02 ~ 0.05mm (0.0008 ~ 0.0020 in.)

Exhaust: 0.030 ~ 0.065mm (0.0012 ~ 0.0026 in.)

[Limit]

Intake: 0.1mm (0.0040 in.)

Exhaust: 0.13mm (0.0051 in.)

If the clearance is greater than maximum, replace the valve and valve guide.

2. Inspect valves.

1. Check the valve is ground to the correct valve face angle.
2. Check that the surface of the valve for wear. If the valve face is worn, replace the valve.
3. Check the valve head margin thickness. If the margin thickness is less than minimum, replace the valve.

Margin

[Standard]

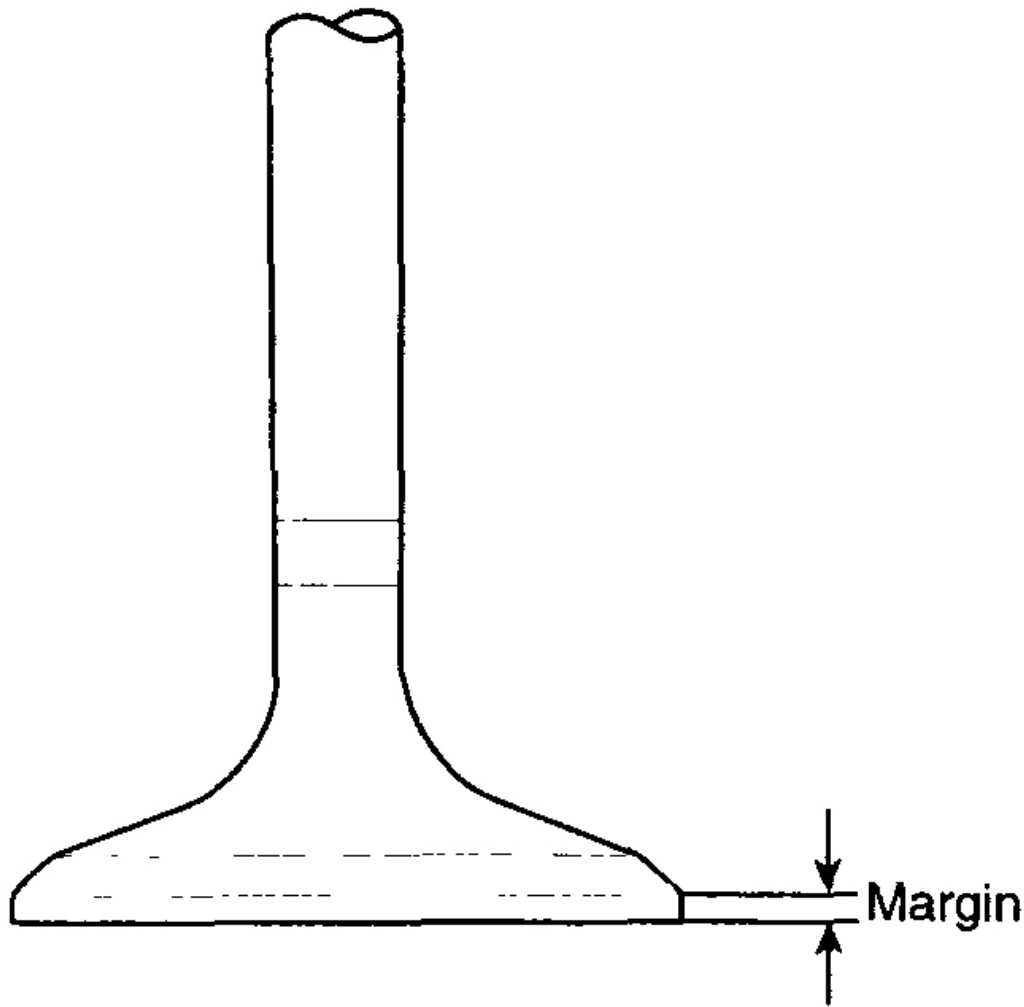
Intake: 1.0mm (0.0394 in.)

Exhaust: 1.3mm (0.0512 in.)

[Limit]

Intake: 0.5mm (0.0197 in.)

Exhaust: 0.8mm (0.0315 in.)



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Fig. 55: Checking Valve Head Margin Thickness
Courtesy of HYUNDAI MOTOR CO.

4. Check the surface of the valve stem tip for wear. If the valve stem tip is worn, replace the valve.
3. Inspect valve seats

Check the valve seat for evidence of overheating and improper contact with the valve face.

Replace the seat if necessary.

Before reconditioning the seat, check the valve guide for wear. If the valve guide is worn, replace it, 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.

4. Inspect valve springs.

1. Using a steel square, measure the out-of-square of the valve spring.
2. Using a vernier calipers, measure the free length of the valve spring.

Valve spring

[Standard]

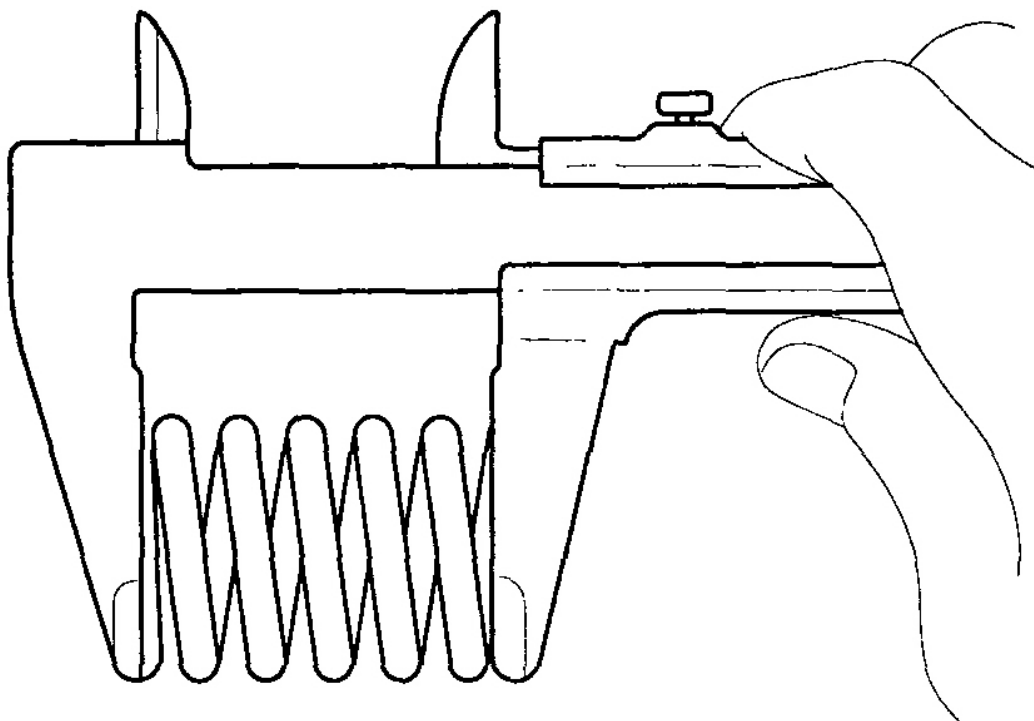
Free height: 42.5mm (1.6732 in.)

Load: 21kg/35mm (48.4kg/1.378mm)

[Limit]

Free height: -1.0mm (-0.0394 in.)

Out-of-square: 3°



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Fig. 56: Using Vernier Calipers To Measure Free Length Of Valve Spring
Courtesy of HYUNDAI MOTOR CO.

If the free length is not as specified, replace the valve spring.

CAMSHAFT

1. Inspect cam lobes.

Using a micrometer, measure the cam lobe height.

Cam height

[Standard value]

Intake: 43.95 ~ 44.15mm (1.7303 ~ 1.7382 in.)

Exhaust: 43.95 ~ 44.15mm (1.7303 ~ 1.7382 in.)

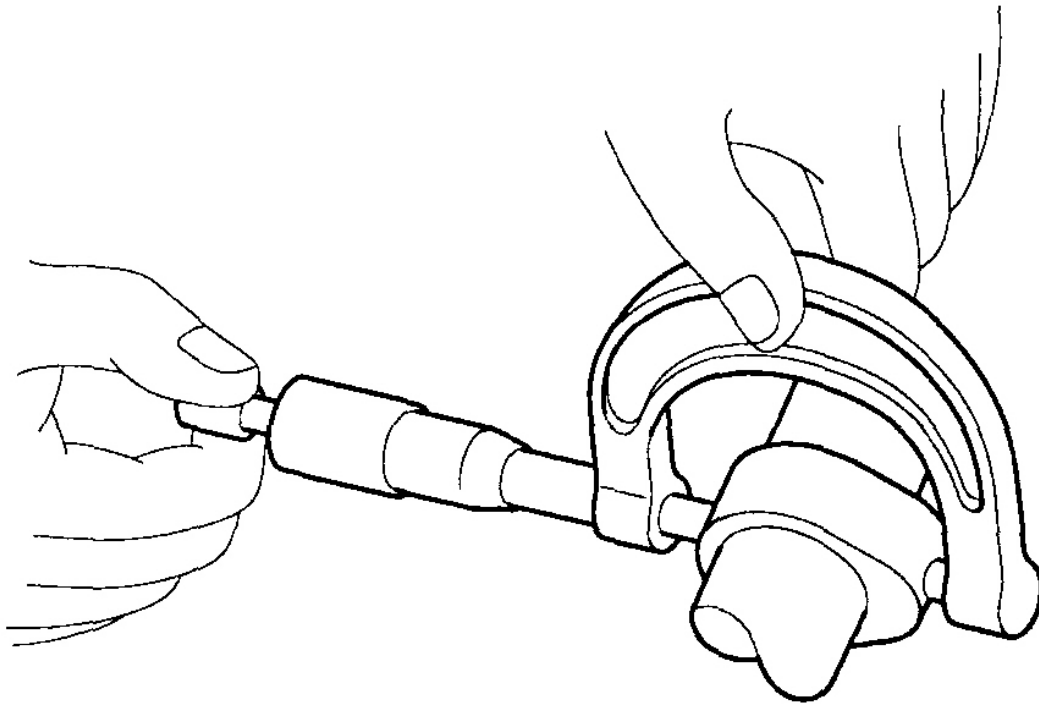
**G03848866**

Fig. 57: Using Micrometer To Measure Cam Lobe Height
Courtesy of HYUNDAI MOTOR CO.

If the cam lobe height is less than minimum, replace the camshaft.

2. Inspect cam journals.

Using a micrometer, measure the journal diameter.

Journal diameter

Standard value

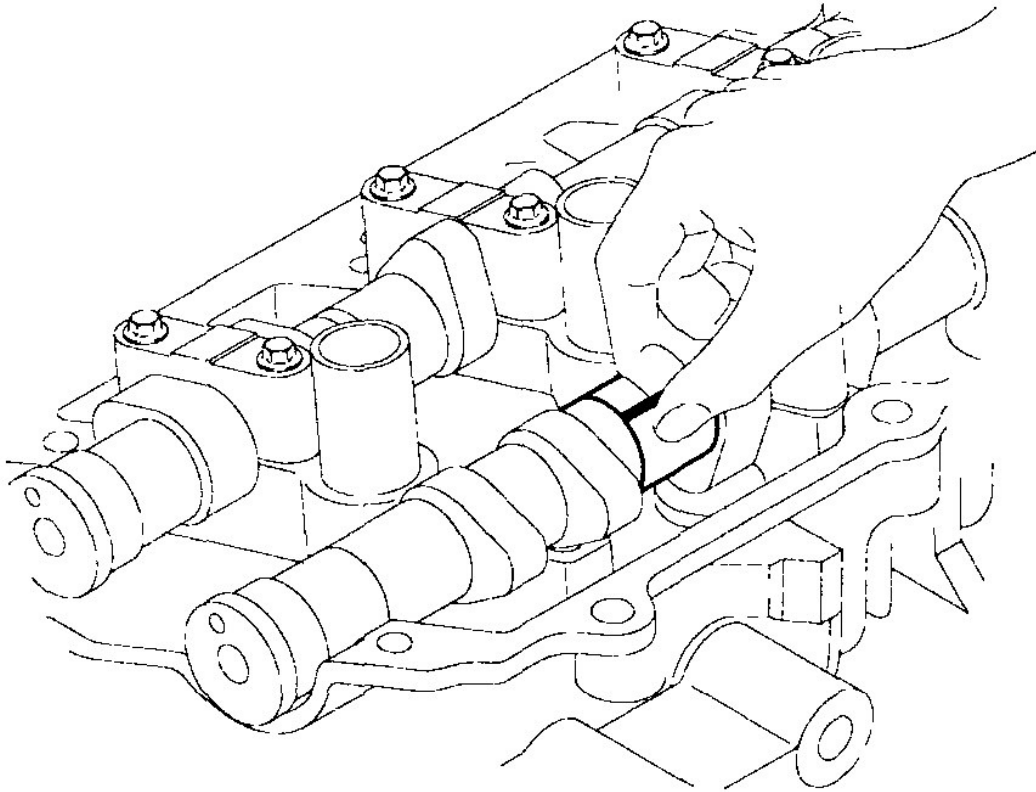
25.964 ~ 25.980mm (1.0222 ~ 1.0228 in.)

If the journal diameter is not as specified, check the oil clearance.

3. Inspect camshaft bearings.

Check that bearing for flaking and scoring. If the bearings are damaged, replace the bearing caps and cylinder head as a set.

4. Inspect camshaft journal oil clearance.
 1. Clean the bearing caps and camshaft journals.
 2. Place the camshafts on the cylinder head.
 3. Lay a strip of plastigage across each of the camshaft journal.



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Fig. 58: Laying Strip Of Plastigage Across Each Of Camshaft Journal
Courtesy of HYUNDAI MOTOR CO.

4. Install the bearing caps. (See step 3)

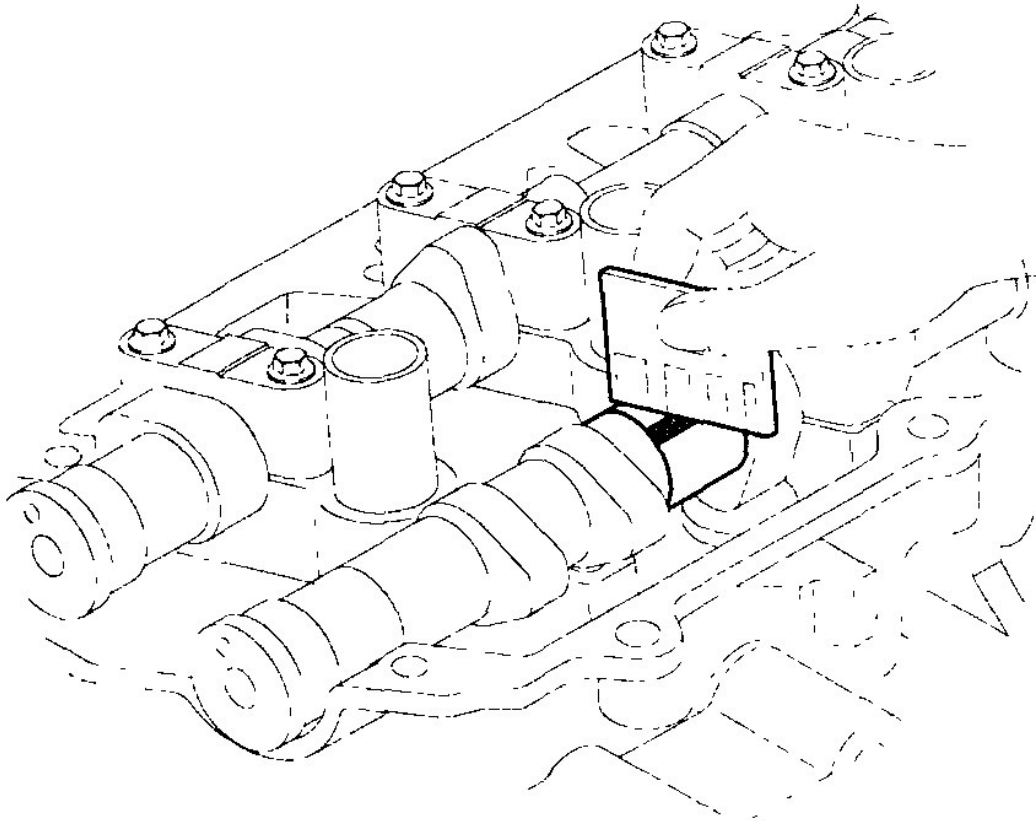
CAUTION: Do not turn the camshaft.

5. Remove the bearing caps.
6. Measure the plastigage at its widest point.

Bearing oil clearance

Standard value: 0.02 ~ 0.061mm (0.0008 ~ 0.0024 in.)

Limit: 0.1mm (0.0039 in.)



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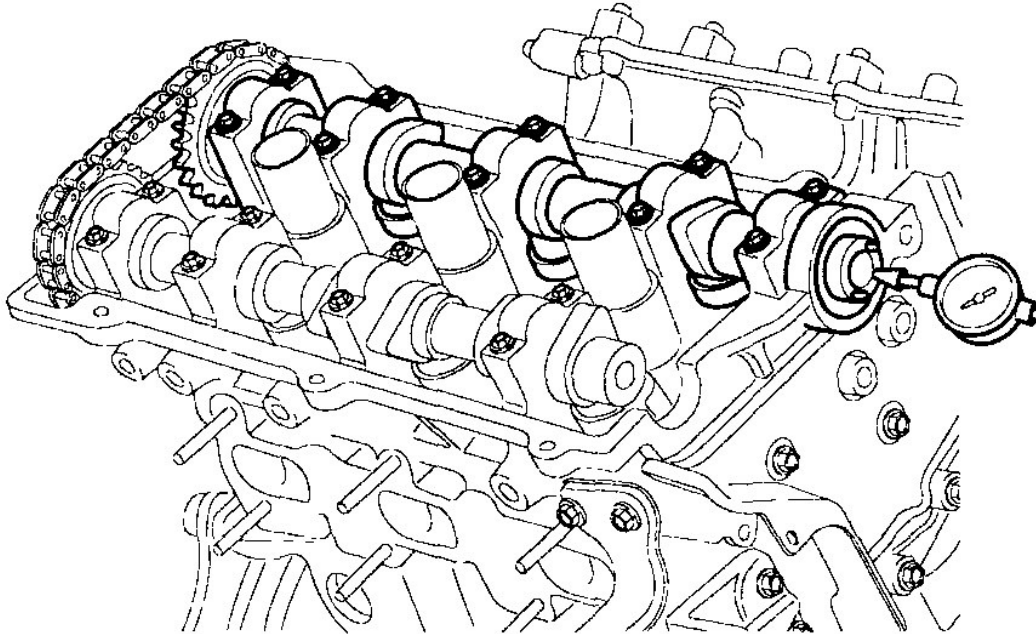
Fig. 59: Measuring Plastigage At Its Widest Point
Courtesy of HYUNDAI MOTOR CO.

If the oil clearance is greater than maximum, replace the camshaft. If necessary, replace the bearing caps and cylinder head as a set.

7. Completely remove the plastigage.
8. Remove the camshafts.
5. Inspect camshaft end play.
 1. Install the camshafts. (See step 6)
 2. Using a dial indicator, measure the end play while moving the camshaft back and forth.

Camshaft end play

Standard value: 0.1 ~ 0.15mm (0.004 ~ 0.0059 in.)



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Fig. 60: Using Dial Indicator To Measure End Play While Moving Camshaft Back And Forth
Courtesy of HYUNDAI MOTOR CO.

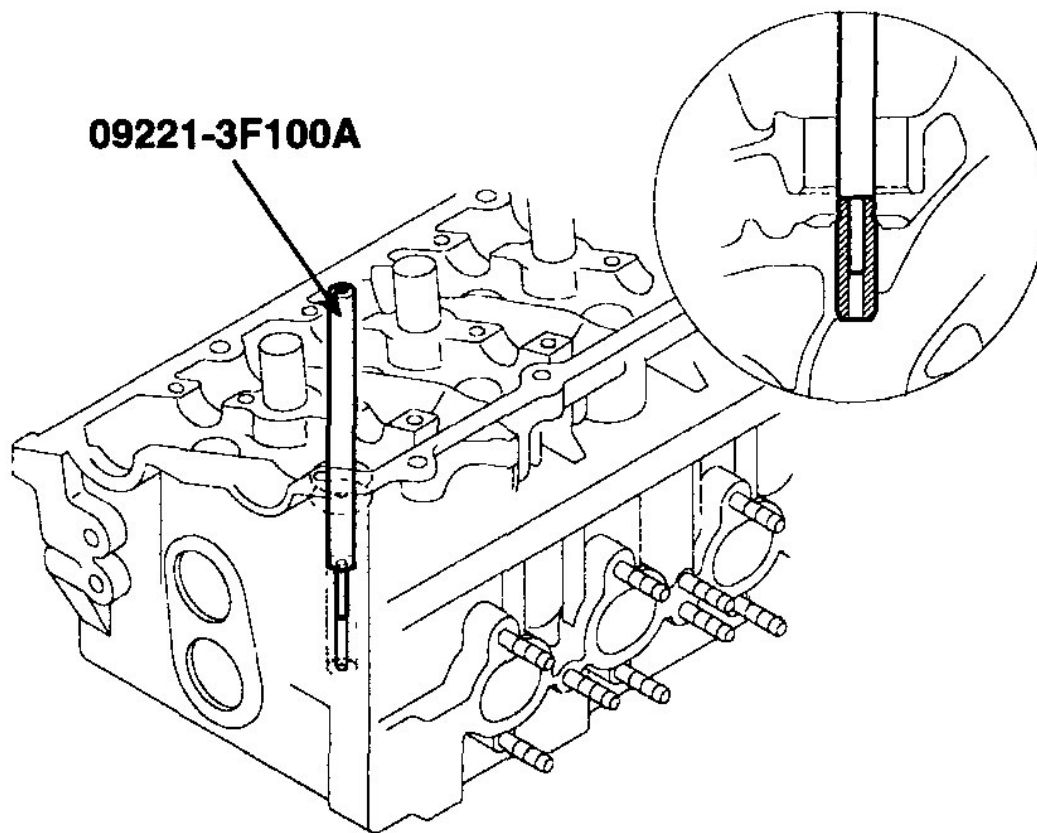
If the end play is greater than maximum, replace the camshaft. If necessary, replace the bearing caps and cylinder head as a set.

3. Remove the camshafts.

REPLACEMENT

VALVE GUIDE

1. Using the SST (09221-3F100A), withdraw the old valve guide toward the bottom of the cylinder head.



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Fig. 61: Using SST (09221-3F100A) To Withdraw The Old Valve Guide Toward The Bottom Of Cylinder Head

Courtesy of HYUNDAI MOTOR CO.

2. Recondition the valve guide hole so that it can match the newly press-fitted oversize valve guide.
3. Using the SST (09221-3F100A/B), press-fit the valve guide. The valve guide must be press-fitted from the upper side of the cylinder head. Keep in mind that the intake and exhaust valve guides are different in length.

OVERSIZE VALVE GUIDE SPECIFICATIONS

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)

Valve guide length

Intake: 39mm (1.535 in.)

Exhaust: 43mm (1.693 in.)

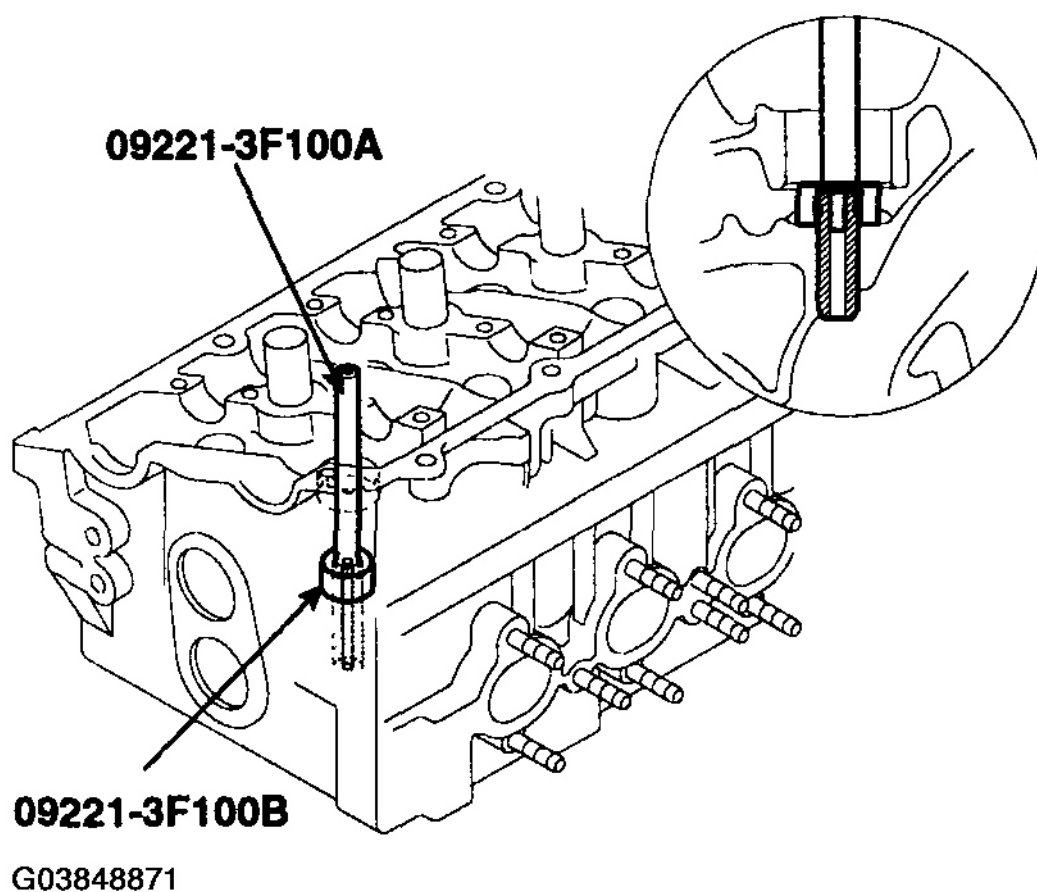


Fig. 62: Using SST (09221-3F100A/B) To Press-Fit Valve Guide
Courtesy of HYUNDAI MOTOR CO.

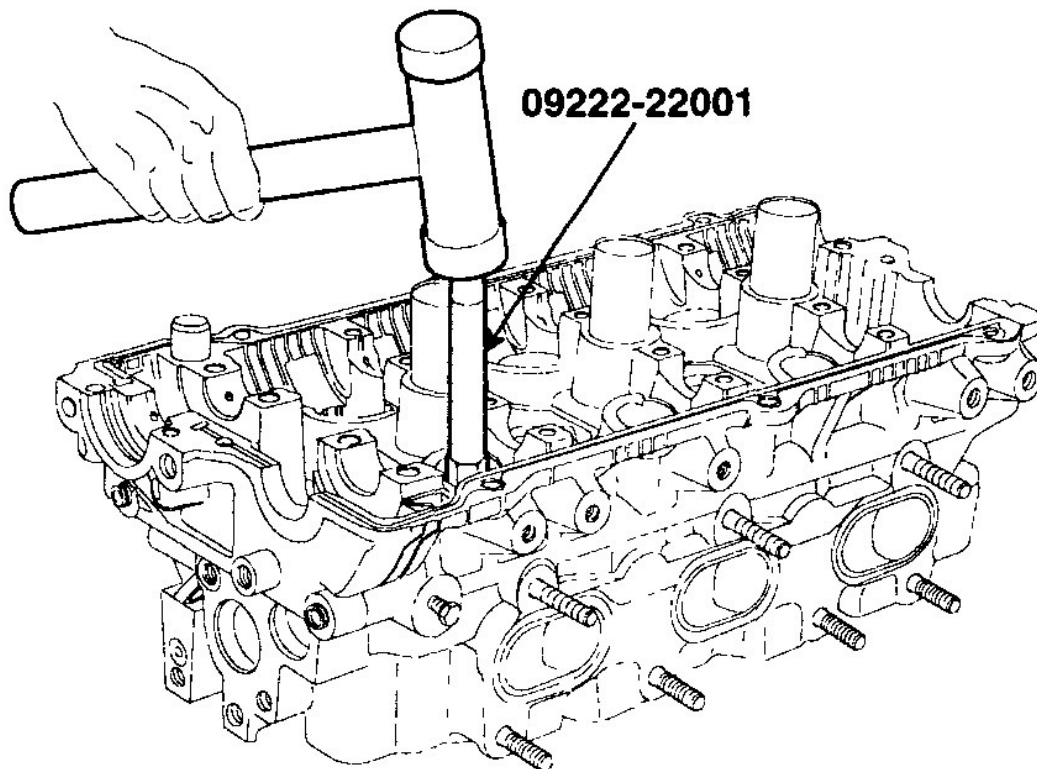
4. After the valve guide is press-fitted, insert a new valve and check for proper stem-to-guide clearance.
5. After the valve guide is replaced, check that the valve is seated properly. Recondition the valve seats as necessary.

REASSEMBLY

NOTE: Thoroughly clean all parts to be assembled. Before installing the parts, apply fresh engine oil to all sliding and rotating surfaces.
Replace oil seals with new ones.

1. Install valves.
 1. Install the spring seats.
 2. Using SST (09222-22001), push in a new oil seal.

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



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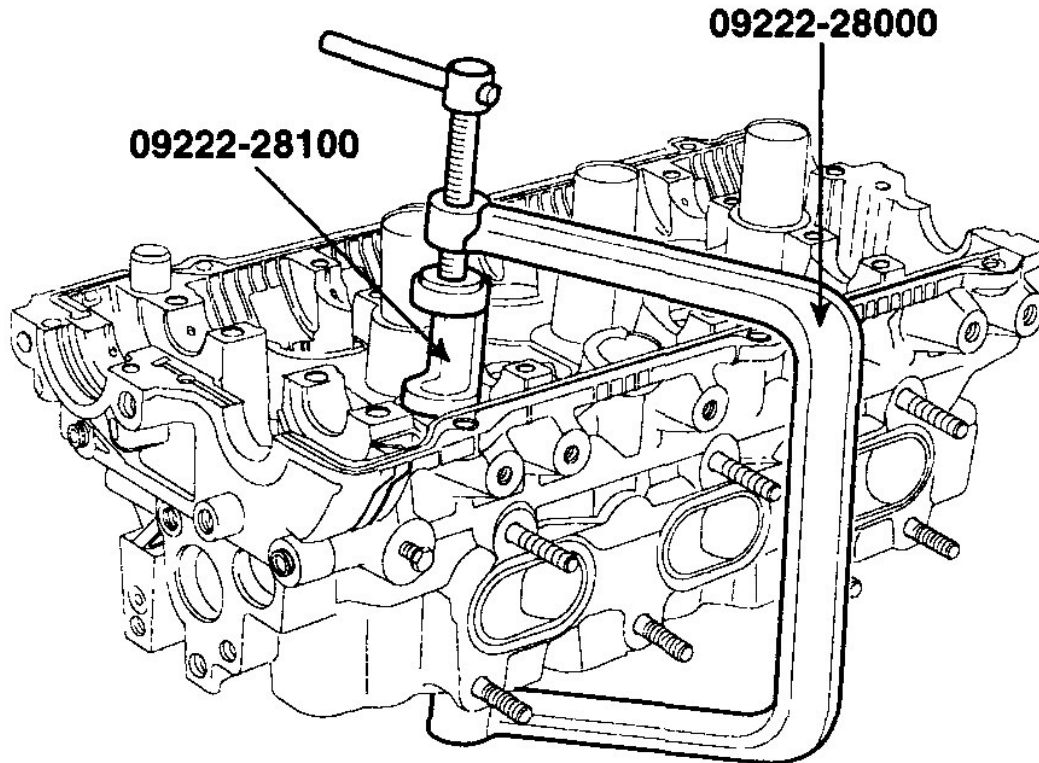
Fig. 63: Using SST (09222-22001) To Push In A New Oil Seal
Courtesy of HYUNDAI MOTOR CO.

3. Install the valve, valve spring and spring retainer.

NOTE: Place valve springs so that the side coated with enamel faces toward

the valve spring retainer and then installs the retainer.

4. Using the SST (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.

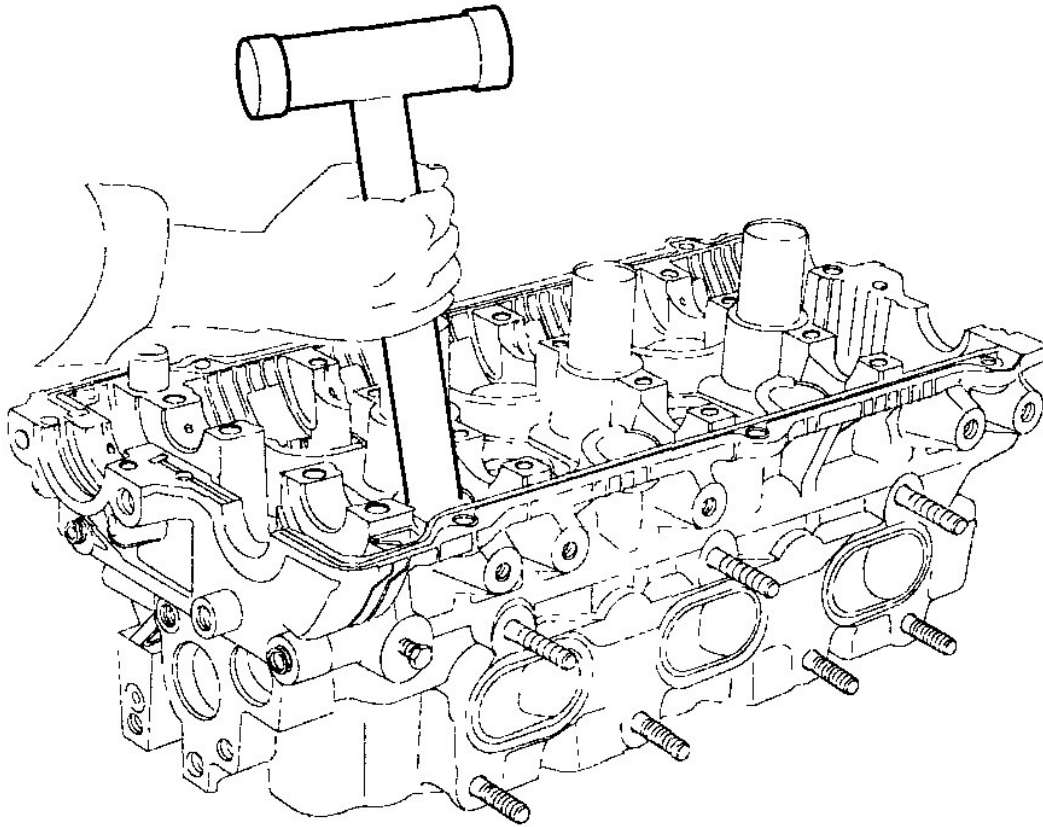


G03848873

Fig. 64: Using SST (09222-28000, 09222-28100) To Compress Spring And Install Retainer Locks

Courtesy of HYUNDAI MOTOR CO.

5. Lightly tap the end of each valve stem two or three times with the wooden handle of a hammer to ensure proper seating of the valve and retainer lock.

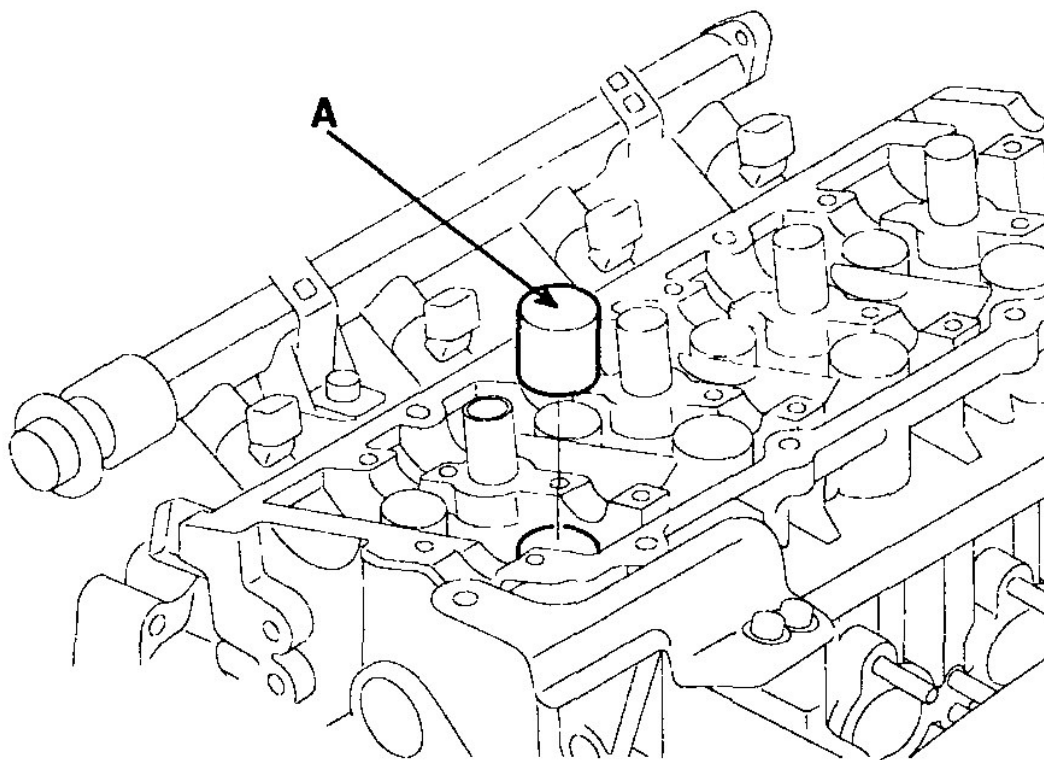


G03848874

Fig. 65: Ensure Proper Seating Of Valve And Retainer Lock Using Wooden Handle Of A Hammer
Courtesy of HYUNDAI MOTOR CO.

2. Install HLAs.

Check that the HLA rotates smoothly by hand.



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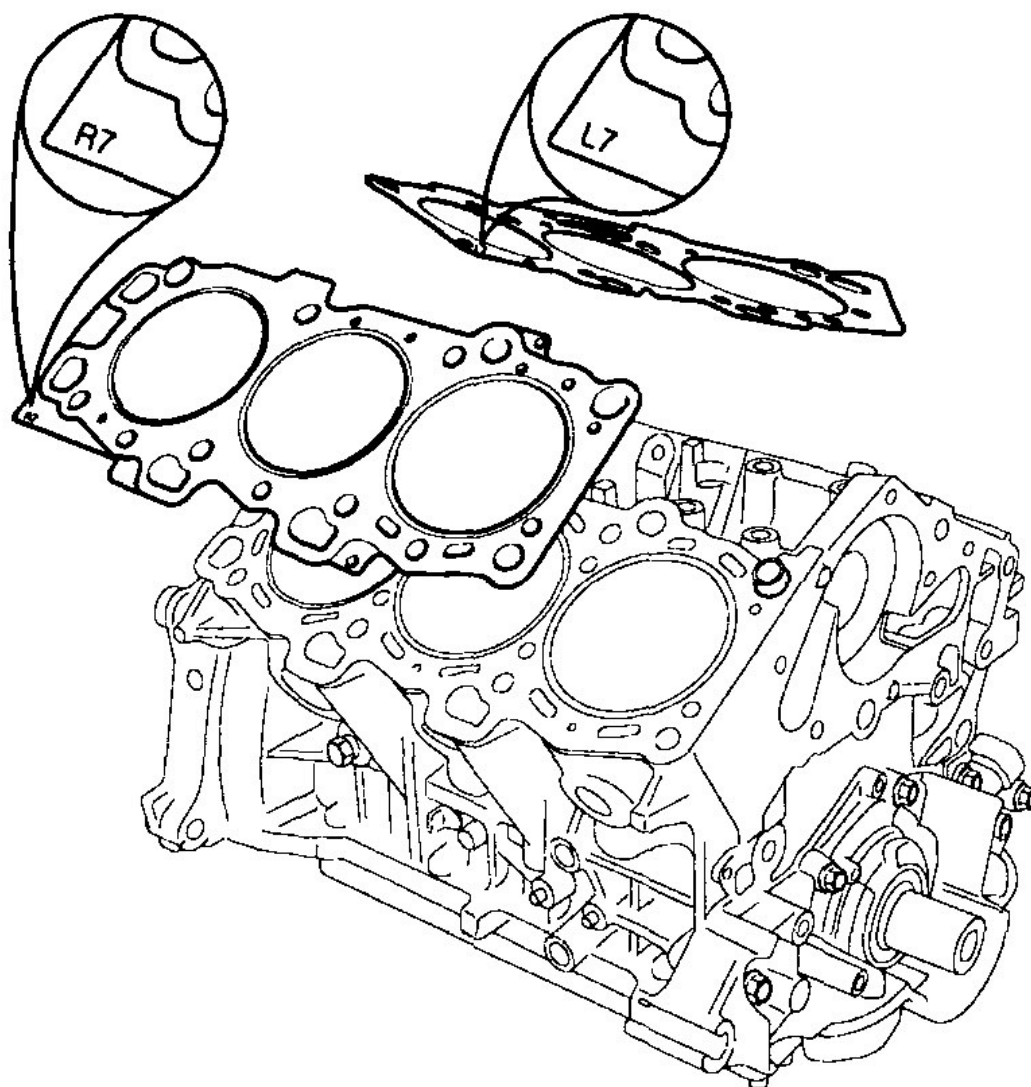
Fig. 66: Installing Hydraulic Lash Adjuster
Courtesy of HYUNDAI MOTOR CO.

INSTALLATION

NOTE:

- Thoroughly clean all parts to be assembled.
- Always use a new head and manifold gasket.
- The cylinder head gasket is a metal gasket. Take care not to bend it.
- Rotate the crankshaft, set the No. 1 piston at TDC. (See REMOVAL).

1. Install the cylinder head gaskets on the cylinder block.



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Fig. 67: Installing Cylinder Head Gaskets On Cylinder Block
 Courtesy of HYUNDAI MOTOR CO.

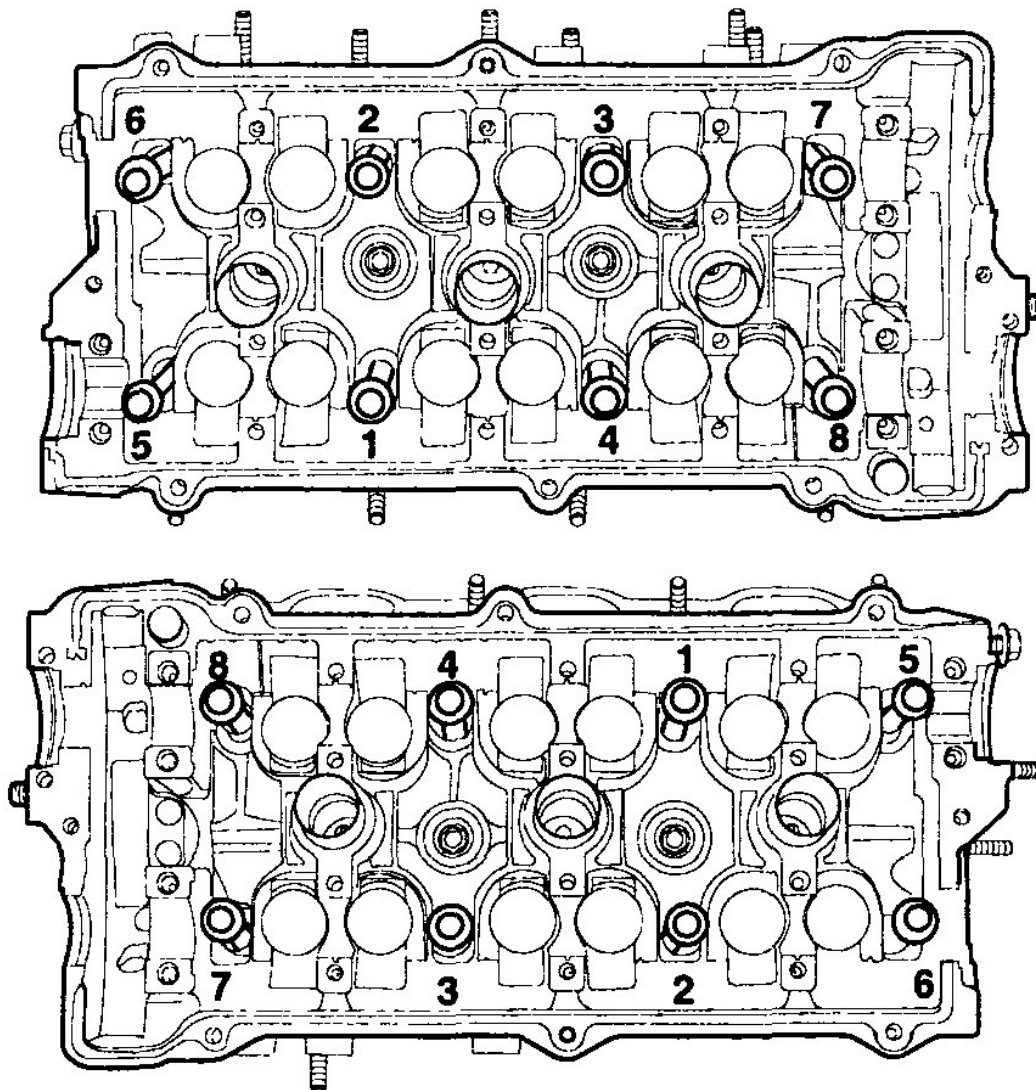
NOTE: Be careful of the installation direction.

2. Place the cylinder head quietly in order not to damage the gasket with the bottom part of the end.
3. Install cylinder head bolts.

Tightening torque

25Nm (250kgf.cm, 18lbf.ft) + 60° + 45°

1. Apply a light coat of engine oil on the threads and under the heads of the cylinder head bolts.
2. Install the plate washer to the cylinder head bolt.
3. Install and uniformly tighten the cylinder head bolts on each cylinder head in several passes and in the sequence shown, then repeat for the other side, as shown.

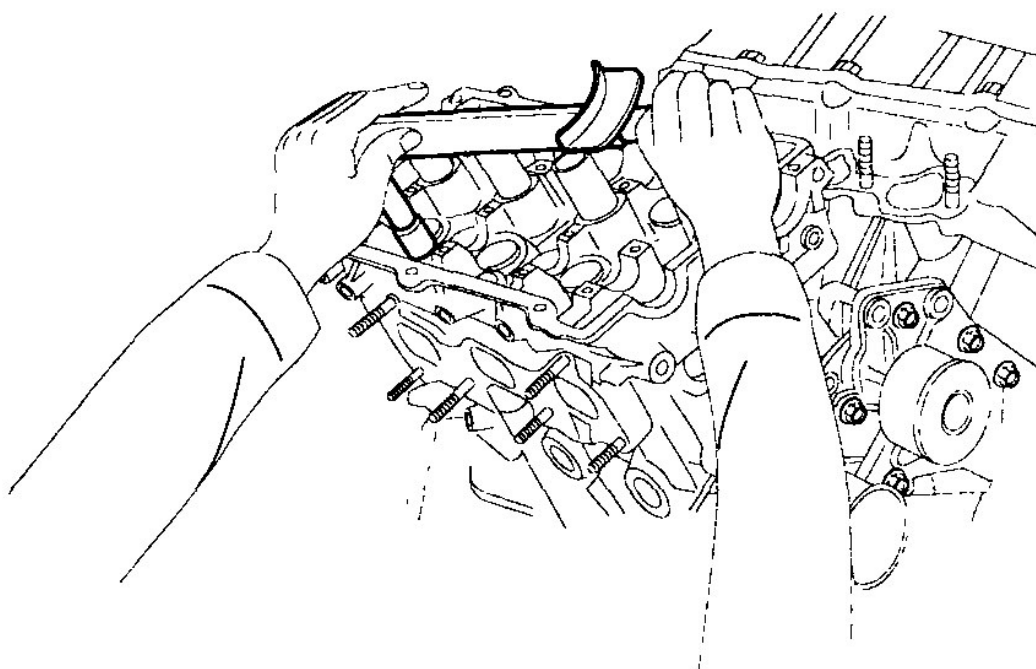


G03848877

Fig. 68: Identifying Tightening Sequence Of Cylinder Head Bolts
 Courtesy of HYUNDAI MOTOR CO.

If only one of the cylinder head bolts dose not meet the torque specification, replace the cylinder head bolt.

Torque: 25Nm (250kgf.cm, 18lb.ft)



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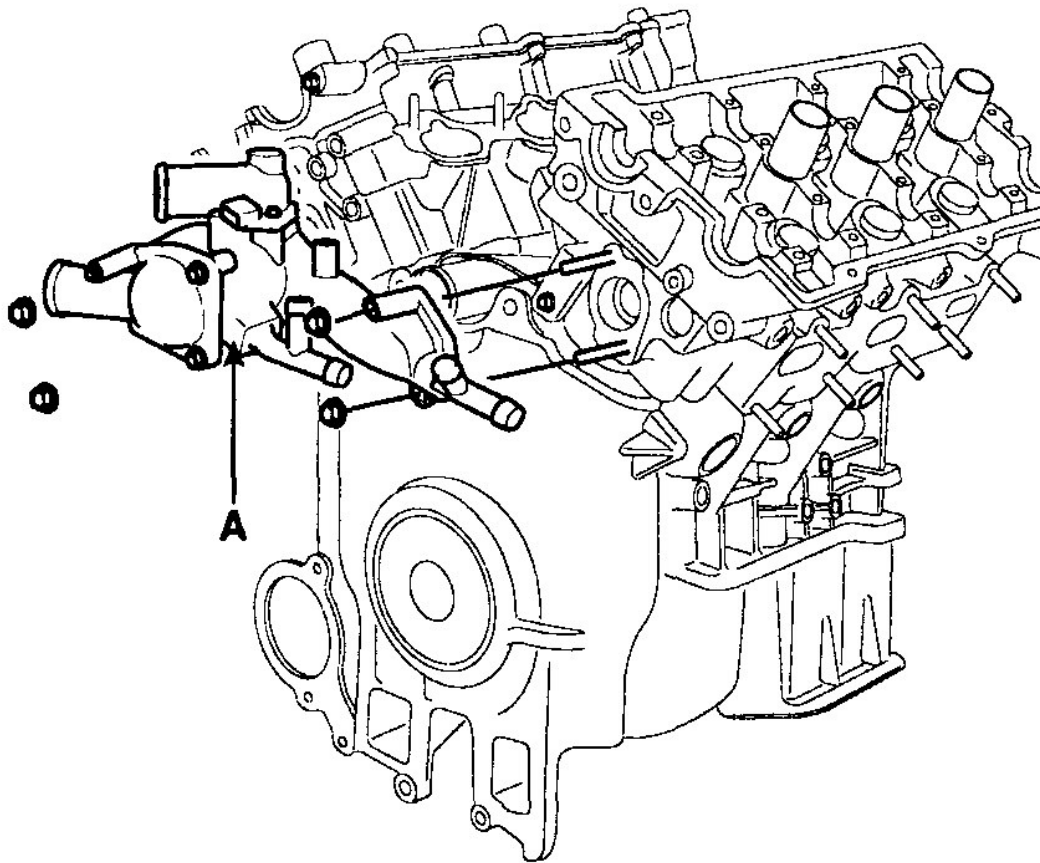
Fig. 69: Retightening Cylinder Head Bolts
Courtesy of HYUNDAI MOTOR CO.

4. Retighten the cylinder head bolts by 60° in the numerical order shown.
5. Retighten the cylinder head bolts by 45° in the numerical order shown.
4. Install the water pipe and water temperature control assembly (A).

Tightening torque

Water temperature control

15 - 20Nm (150 ~ 200kgf.cm, 11 ~ 14lb.ft)



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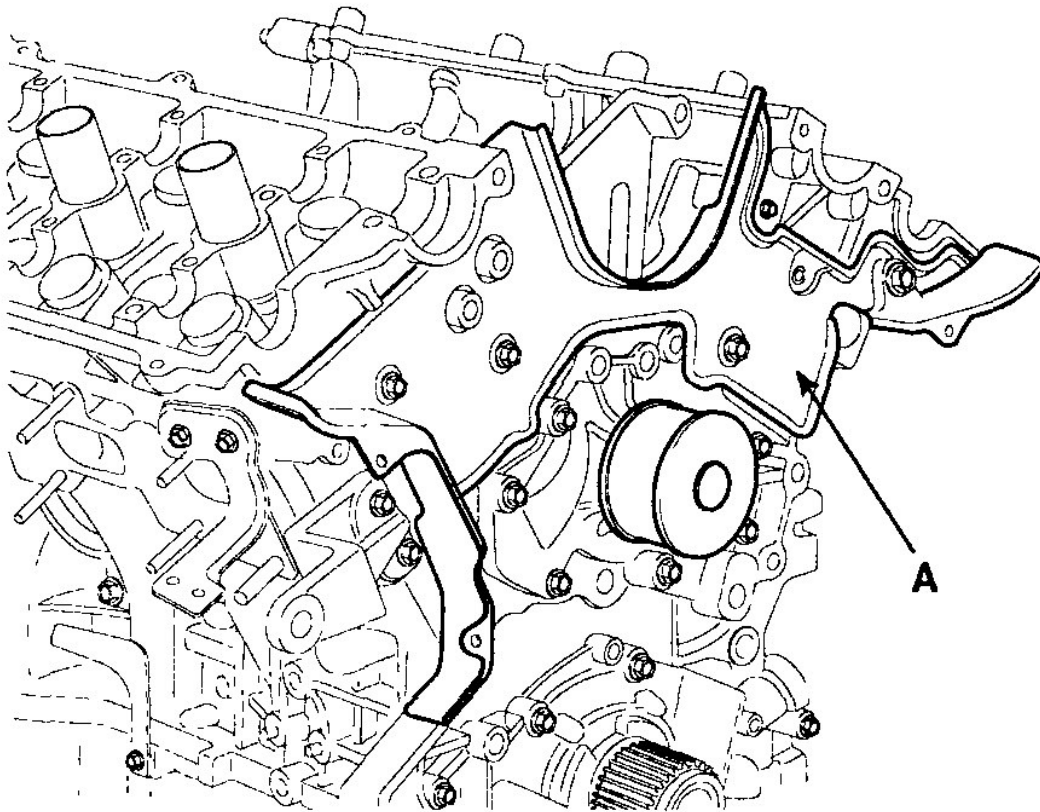
Fig. 70: Installing Water Temperature Control Assembly
Courtesy of HYUNDAI MOTOR CO.

5. Install the timing belt rear cover (A).

Tightening torque

Timing belt rear cover

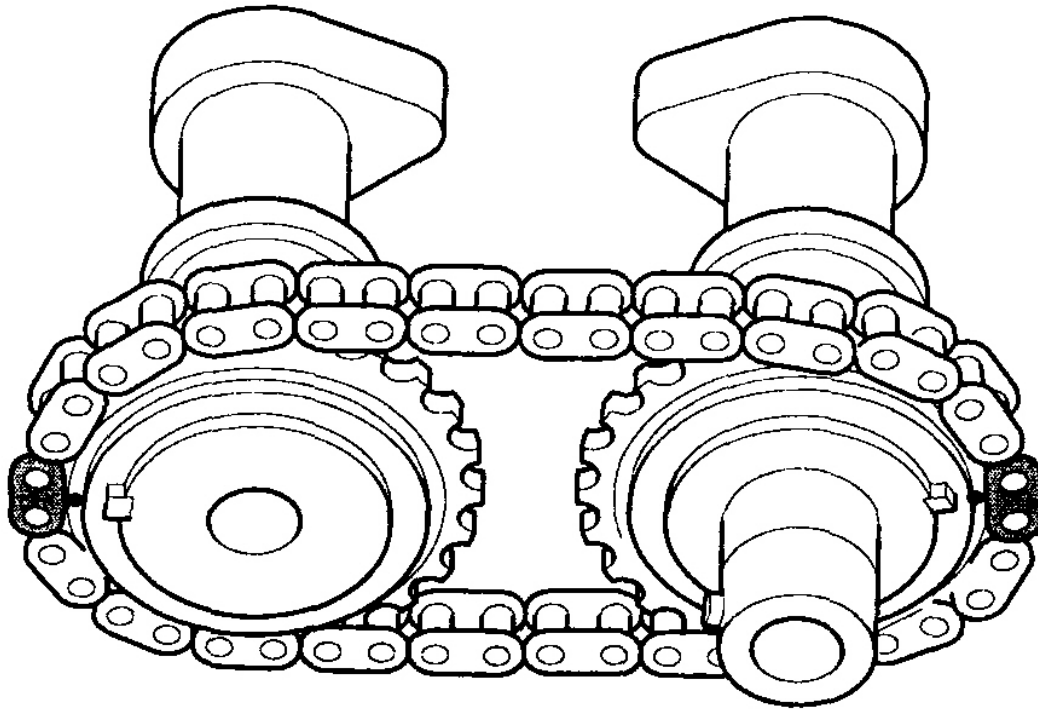
10 ~ 12Nm (100 ~ 120kgf.cm, 7 ~ 9lbf.ft)



G03848880

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

6. Install the camshafts.
 1. Align the camshaft timing chain with the intake timing chain sprocket and exhaust timing chain sprocket as shown.

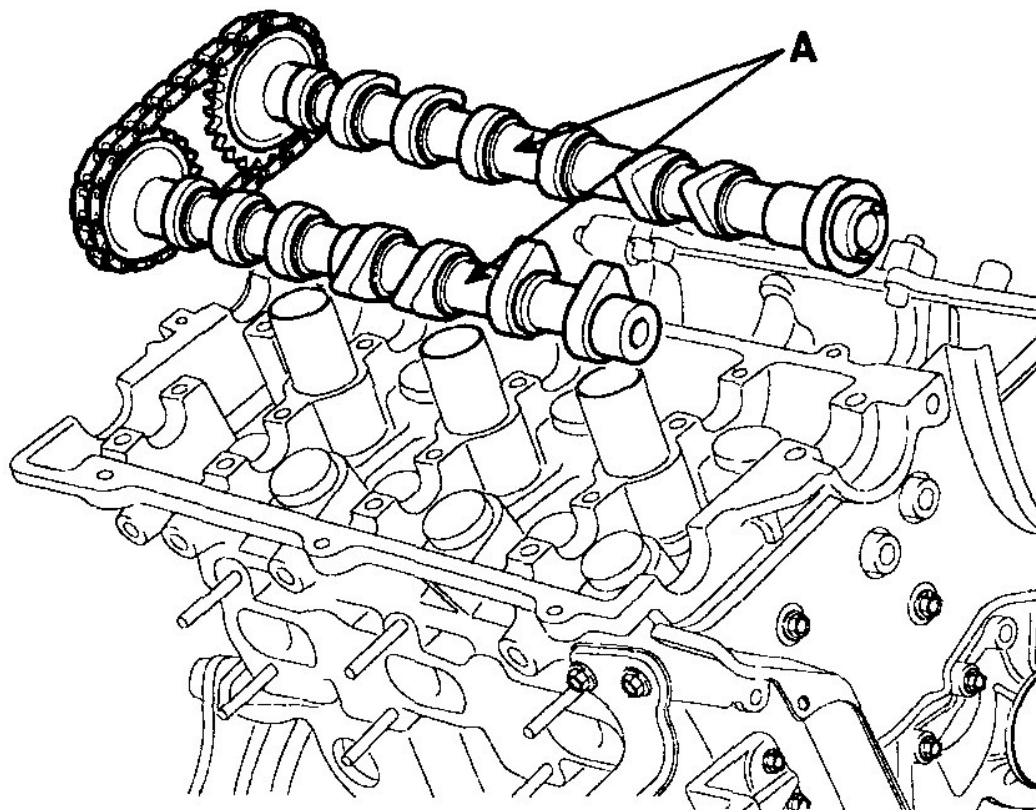


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Fig. 72: Aligning Camshaft Timing Chain With Intake Timing Chain Sprocket And Exhaust Timing Chain Sprocket

Courtesy of HYUNDAI MOTOR CO.

2. Install the camshaft (A).



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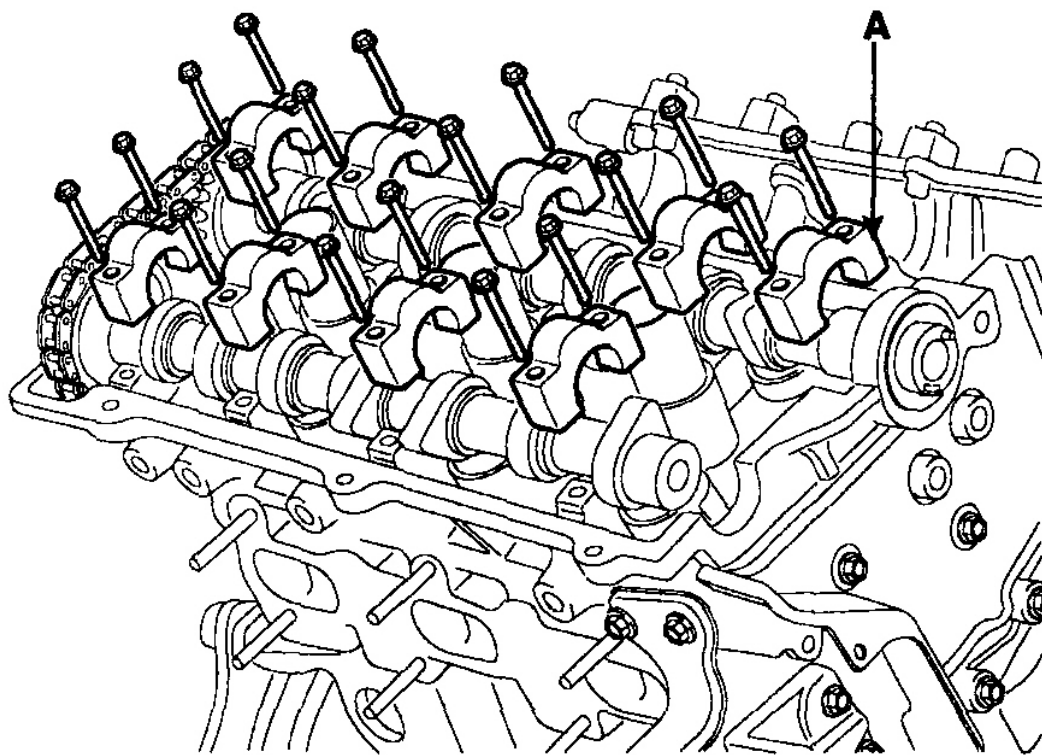
Fig. 73: Installing Camshaft
Courtesy of HYUNDAI MOTOR CO.

3. Install the camshaft bearing caps (A).

Tightening torque

M6 (38mm): 10 ~ 12Nm (100 ~ 120kgf.cm, 7 ~ 9lbf.ft)

M6 (50mm): 14 ~ 16Nm (140 ~ 160kgf.cm, 10 ~ 12lbf.ft)



G03848883

Fig. 74: Installing Camshaft Bearing Caps
Courtesy of HYUNDAI MOTOR CO.

NOTE:

- Apply new engine oil to the thrust portion and journal of the camshafts.
- Apply a light coat of engine oil on the threads and under the heads of the bearing cap bolts.

7. Using the SST (09214-21000), install the camshaft bearing oil seal.

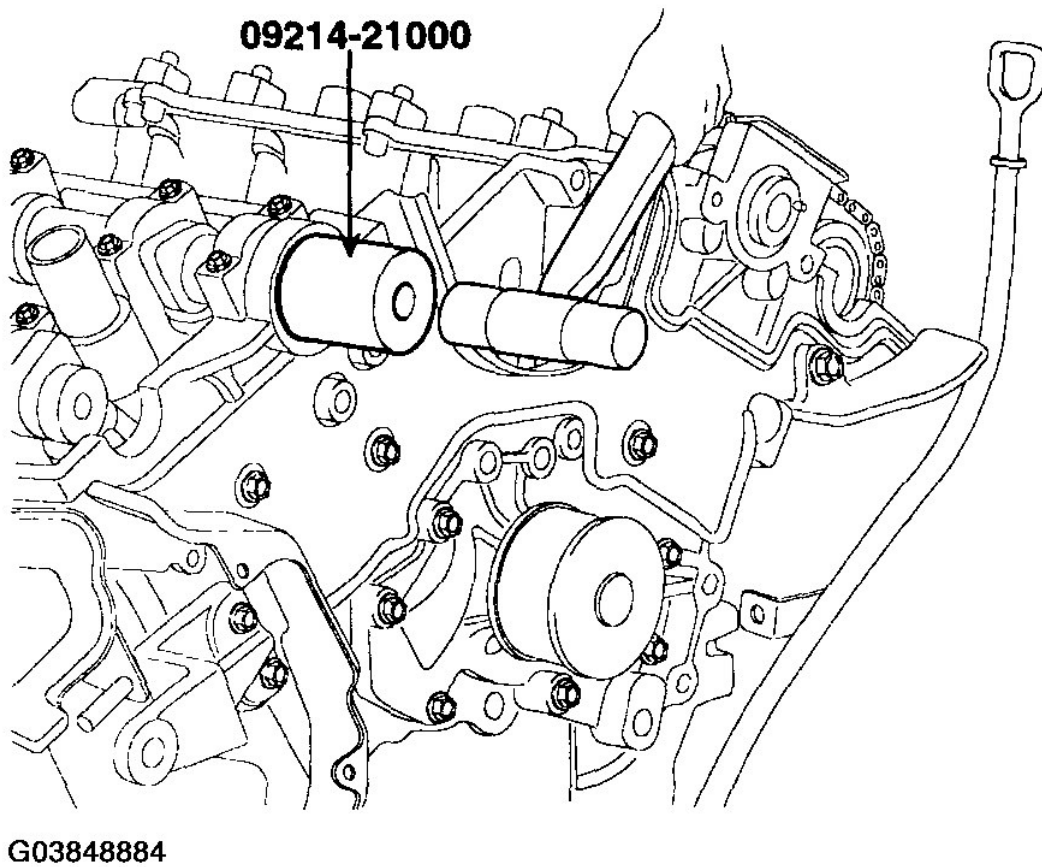


Fig. 75: Using SST (09214-21000) To Install Camshaft Bearing Oil Seal
Courtesy of HYUNDAI MOTOR CO.

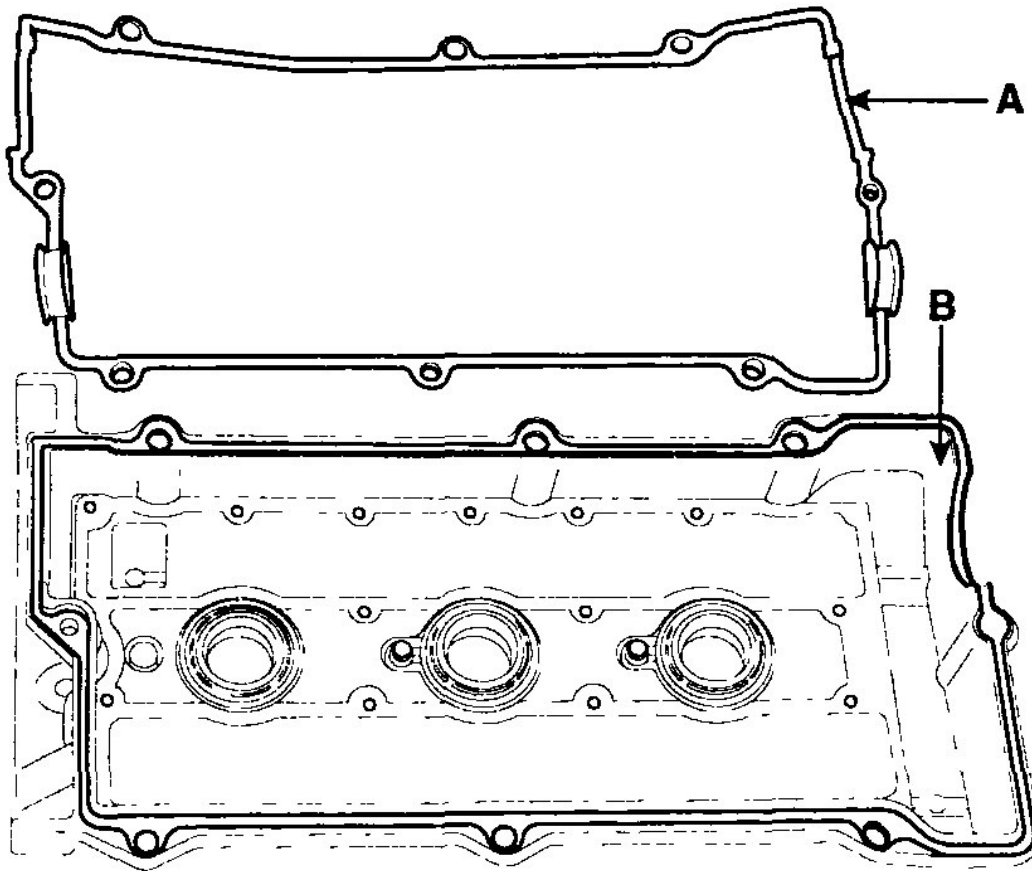
8. Install the camshaft sprocket.
 1. Temporarily install the camshaft sprocket bolts.
 2. Hold the hexagonal head wrench portion of the camshaft with a wrench, and tighten the camshaft sprocket bolts.

Tightening torque

Camshaft sprocket bolt

90 ~ 110Nm (900 ~ 1100kgf.cm, 65 ~ 80lbf.ft)

9. Install semi-circular packing.
10. Install the cylinder head cover.
 1. Install the cylinder head cover gasket (A) in the groove of the cylinder head cover (B).



G03848885

Fig. 76: Installing Cylinder Head Cover Gasket In The Groove Of The Cylinder Head Cover
Courtesy of HYUNDAI MOTOR CO.

NOTE:

- Before installing the head cover gasket, thoroughly clean the head cover gasket and the groove.
- When installing, make sure the head cover gasket is seated securely in the corners of the recesses with no gap.

2. Apply liquid gasket to the head cover gasket at the corners of the recess.

NOTE:

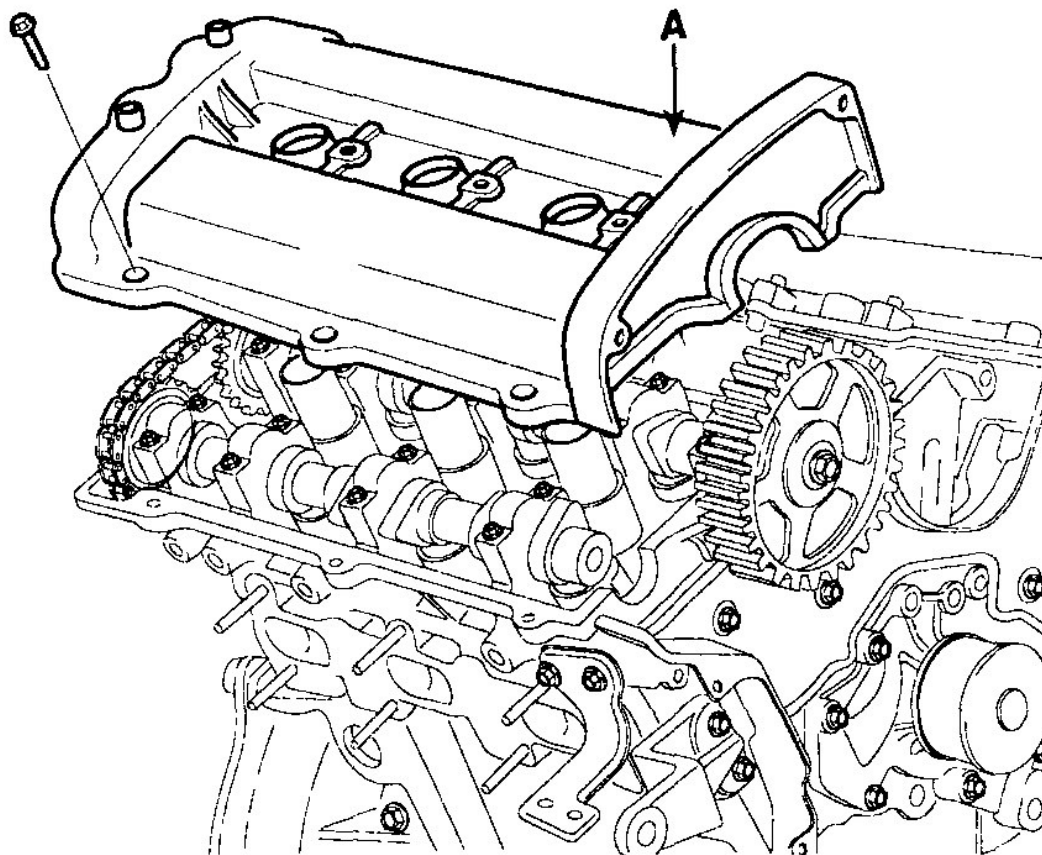
- Use liquid gasket, LOCTITE No.5699.
- Check that the mating surfaces are clean and dry before applying liquid gasket.
- After assembly, wait at least 30 minutes before filling the engine

with oil.

3. Install the cylinder head covers (A) with the 16 bolts. Uniformly tighten the bolts in several passes.

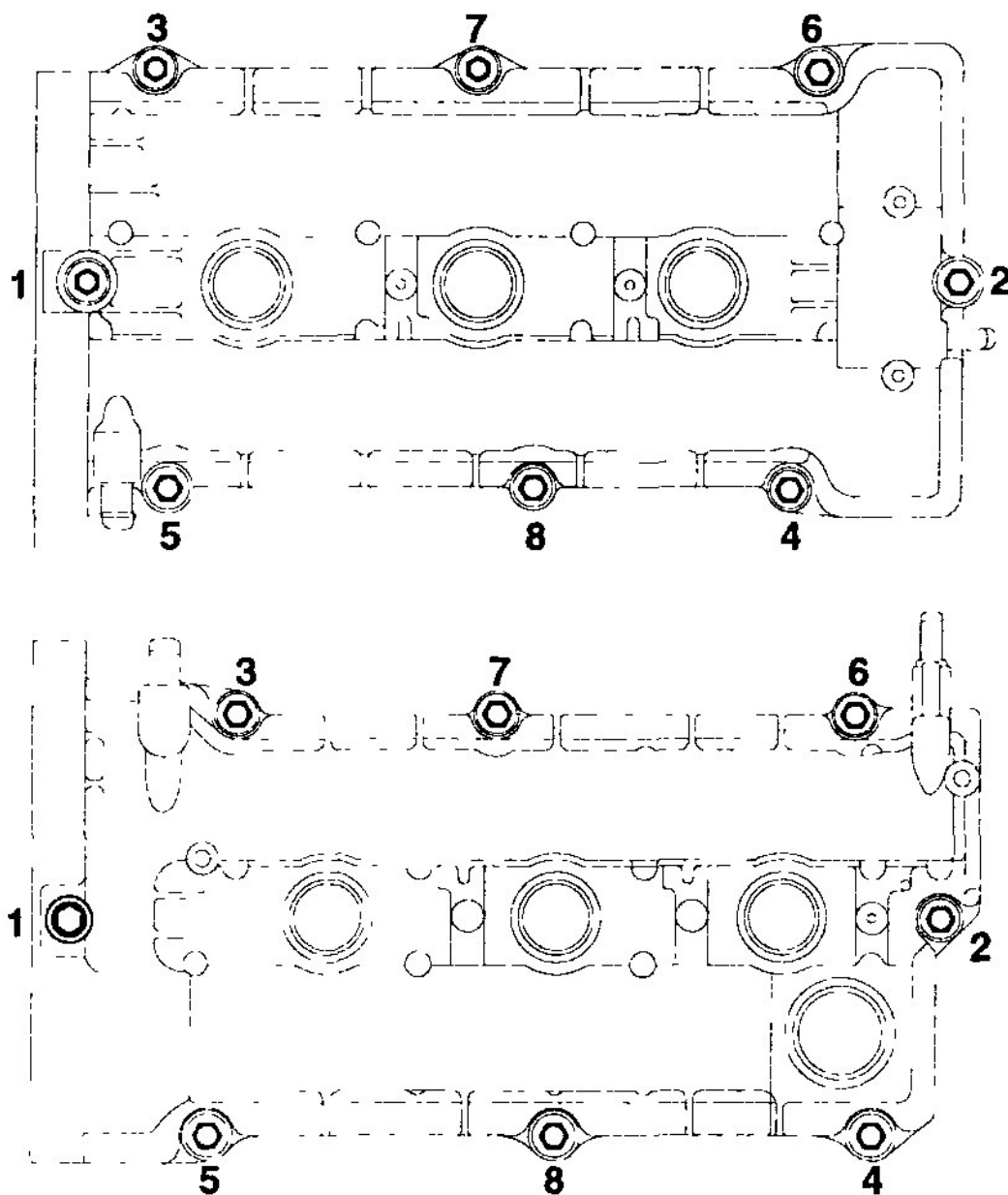
Tightening torque

8 ~ 10Nm (80 ~ 100kgf.cm, 6 ~ 7.4lbf.ft)



G03848886

Fig. 77: Installing Cylinder Head Covers With 16 Bolts
Courtesy of HYUNDAI MOTOR CO.



G03848887

Fig. 78: Identifying Tightening Sequence Of Cylinder Head Covers Bolts
 Courtesy of HYUNDAI MOTOR CO.

11. Install the spark plug cable. (See INSPECT SPARK PLUG AND SPARK PLUG CABLE)
12. Install the timing belt. (See INSTALLATION).
13. Install the exhaust manifold. (See EXHAUST MANIFOLD)

14. Install the power steering pump. (See **POWER STEERING OIL PUMP**)
15. Install the intake manifold. (See **INTAKE MANIFOLD**)
16. Install the PCV hose (A).

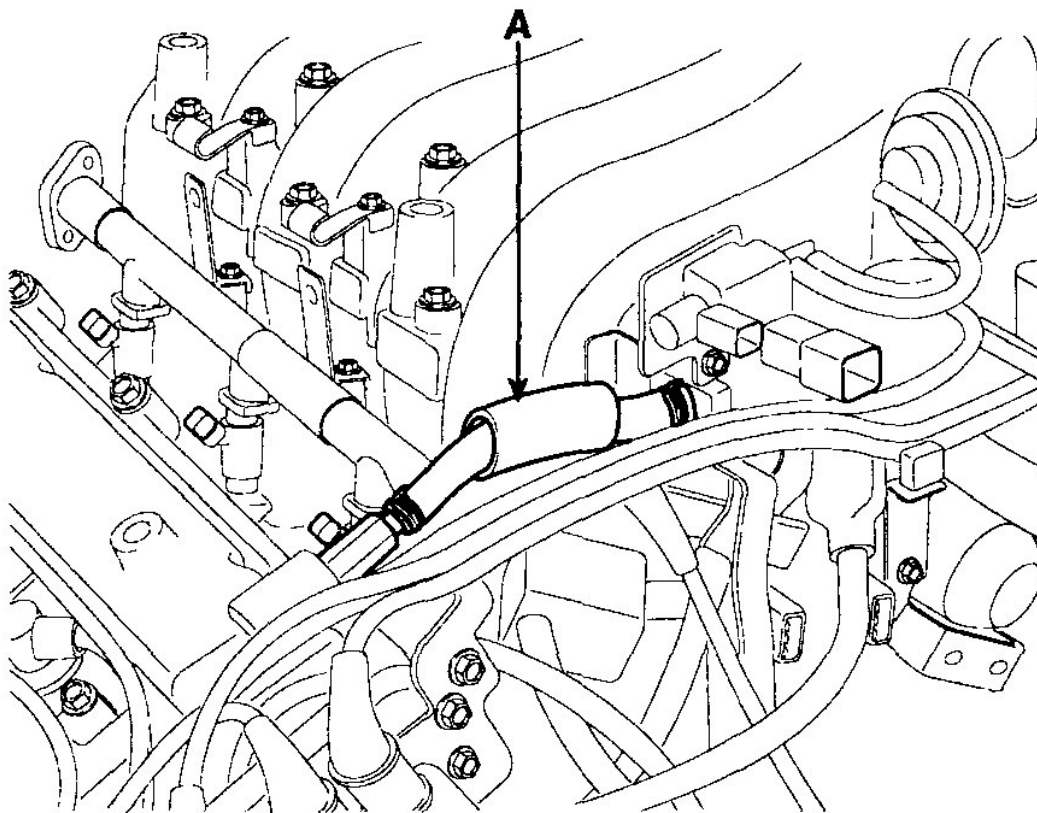
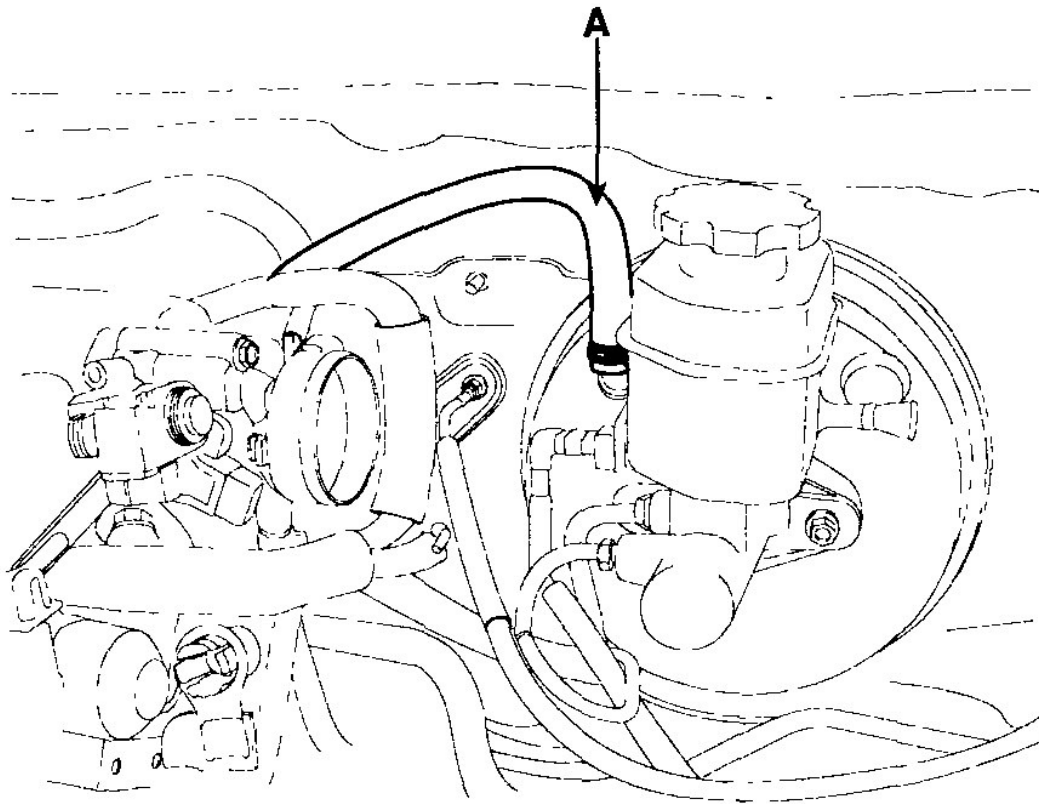
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Fig. 79: Installing PCV Hose
Courtesy of HYUNDAI MOTOR CO.

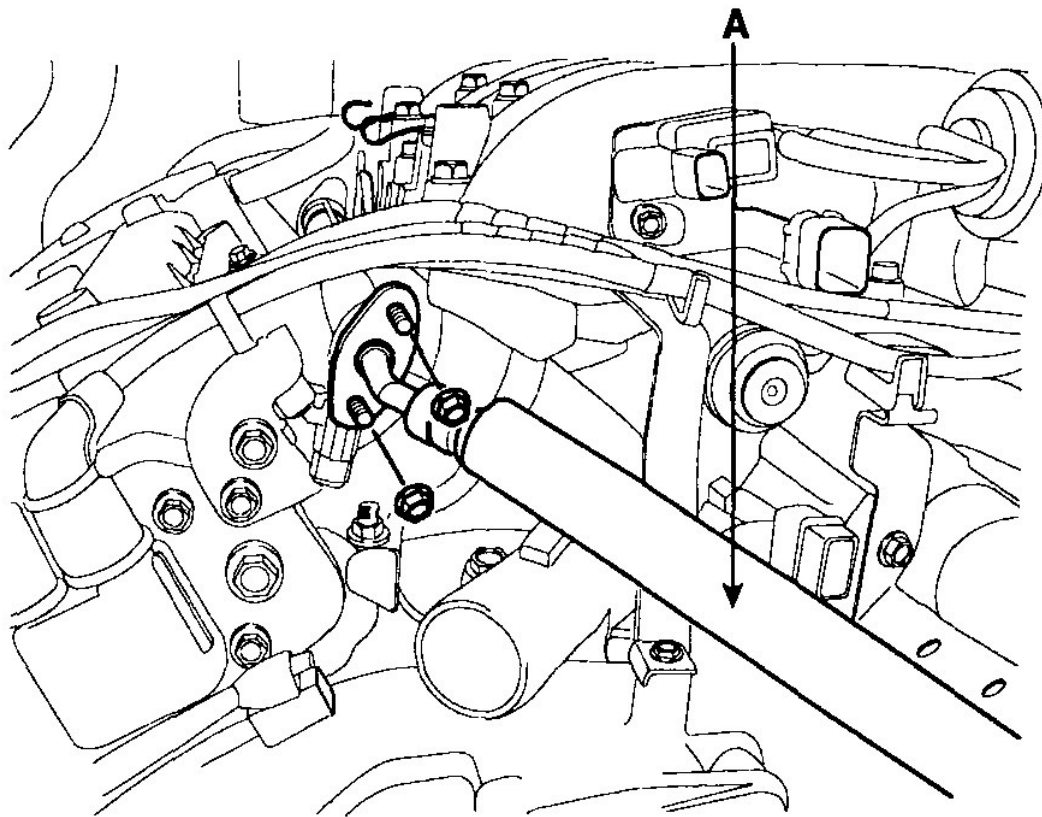
17. Install the accelerator cable.
18. Install the brake booster vacuum hose (A).



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Fig. 80: Installing Brake Booster Vacuum Hose
Courtesy of HYUNDAI MOTOR CO.

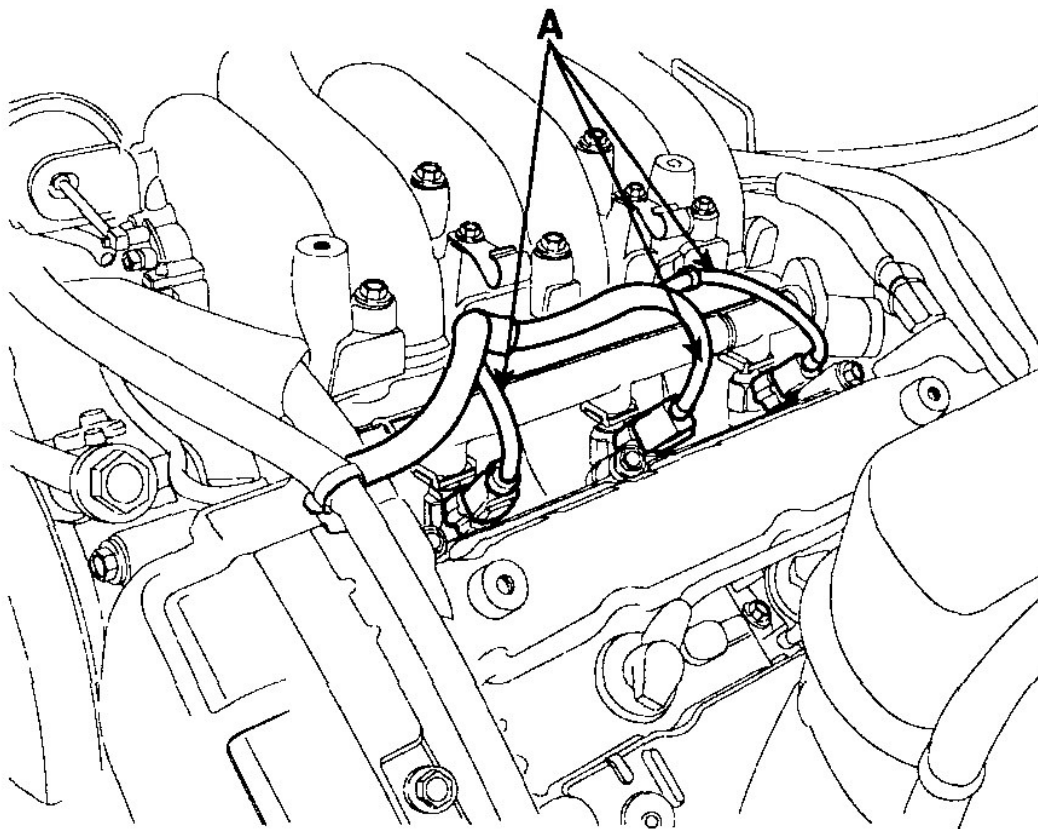
19. Install the PCSV hose.
20. Install the fuel inlet hose (A).



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Fig. 81: Installing Fuel Inlet Hose
Courtesy of HYUNDAI MOTOR CO.

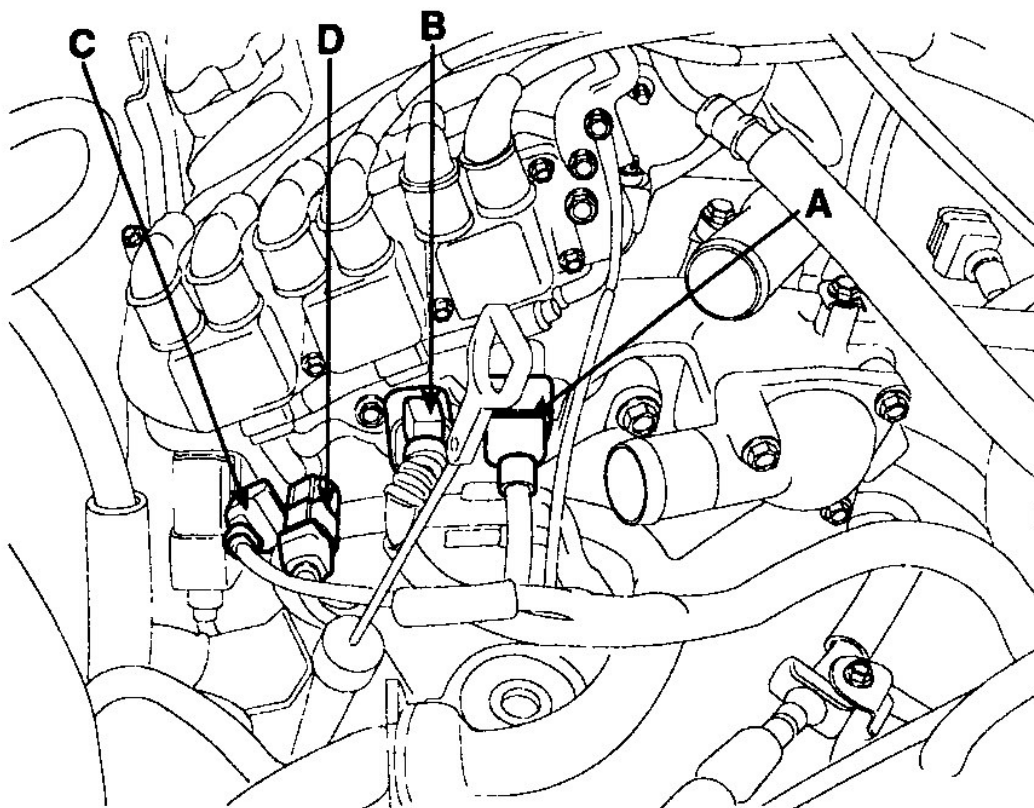
21. Install the engine wire harness connectors and wire harness clamps to the cylinder head and the intake manifold.
 1. Three fuel injector connectors (A).



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Fig. 82: Installing Fuel Injector Connectors
Courtesy of HYUNDAI MOTOR CO.

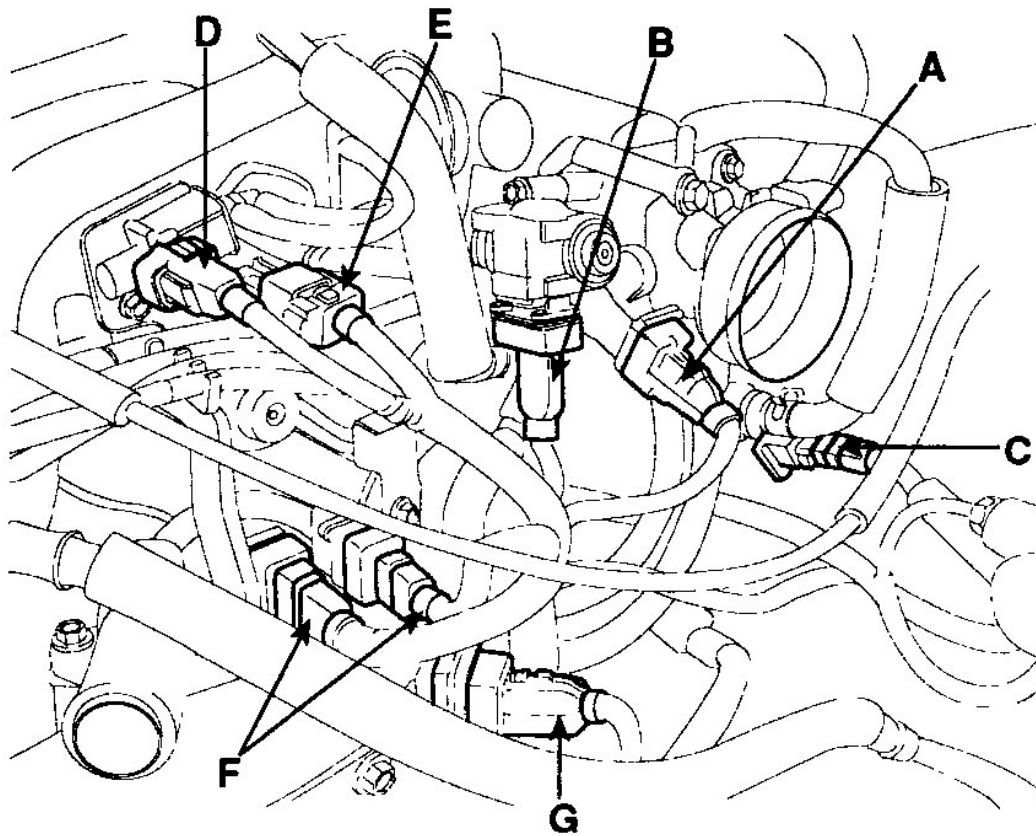
2. Oxygen sensor connector (D).
3. Crankshaft position sensor connector (C).
4. Ignition coil connector (B).
5. ECT sensor connector (A).



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Fig. 83: Installing Oxygen Sensor Connector, Crankshaft Position Sensor Connector, ECT Sensor Connector And Ignition Coil Connector
 Courtesy of HYUNDAI MOTOR CO.

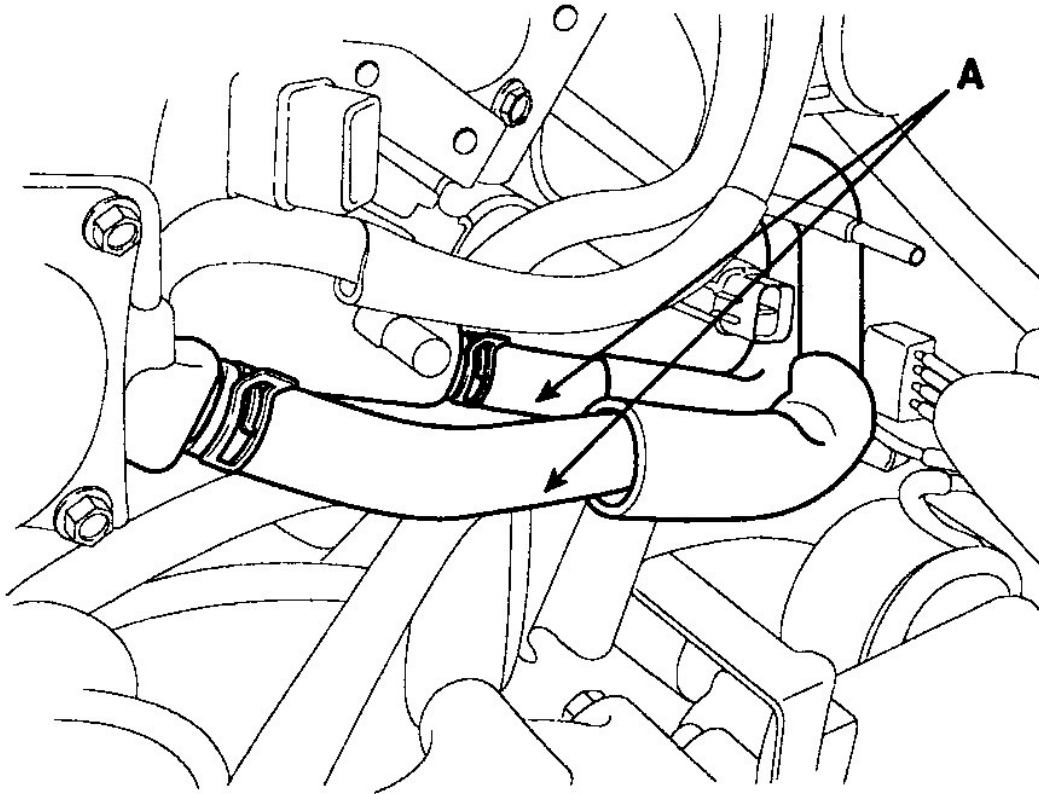
6. CMP (Camshaft position sensor) connector (G).
7. Knock sensor connector (F).
8. Injector connector (E).
9. PCSV (Purge Control Solenoid Valve) connector (C).
10. ISA connector (B).
11. TPS connector (A).



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Fig. 84: Installing ISA Connector, TPS Connector, PCSV Connector, Injector Connector, Knock Sensor Connector & CMP Connector
Courtesy of HYUNDAI MOTOR CO.

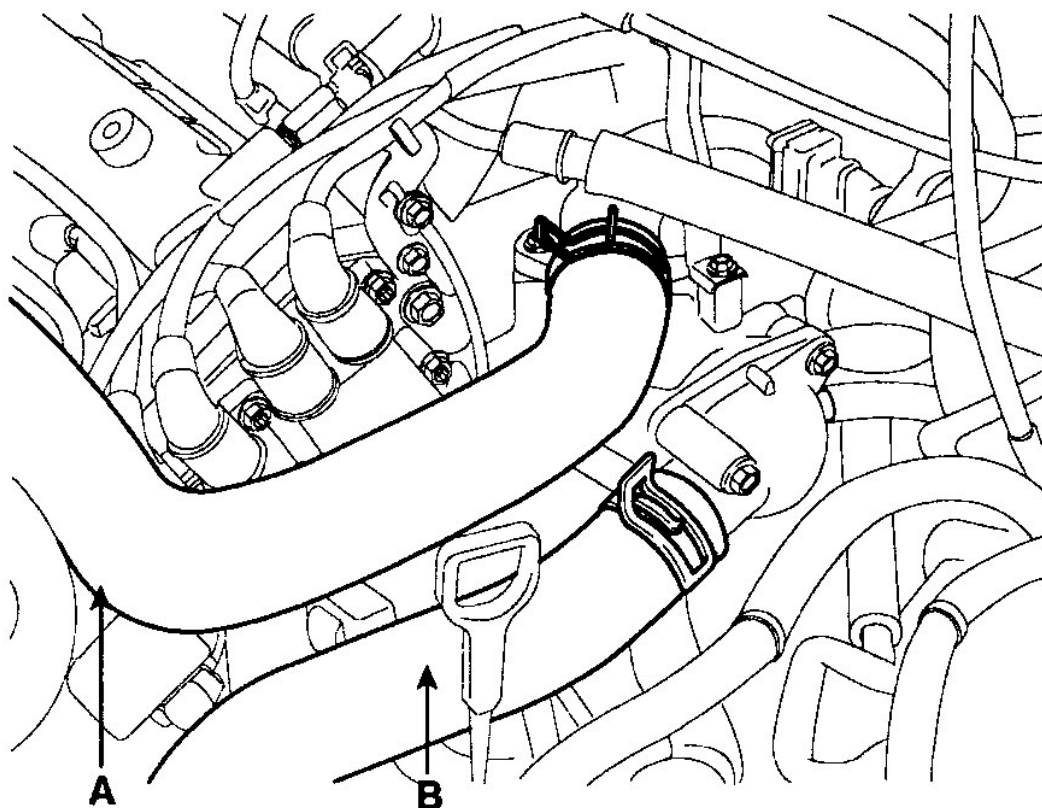
22. Install the heater hoses (A).



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Fig. 85: Installing Heater Hoses
Courtesy of HYUNDAI MOTOR CO.

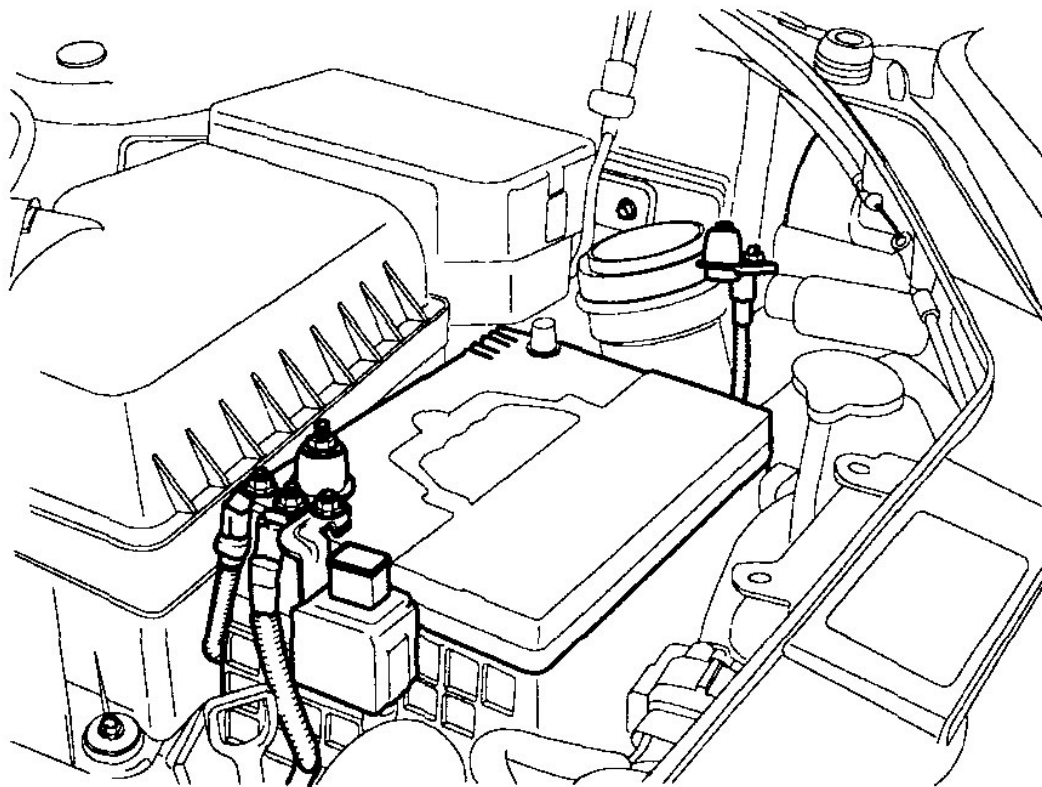
23. Install the upper radiator hose (A) and lower radiator hose (B).



G03848895

Fig. 86: Installing Upper Radiator Hose And Lower Radiator Hose
Courtesy of HYUNDAI MOTOR CO.

24. Install the intake air hose and air cleaner assembly.
 1. Install the intake air hose and air cleaner assembly.
 2. Connect the breather hose from air cleaner hose.
 3. Connect the AFS connector.
25. Install the engine cover.
26. Connect the negative terminal to the battery.



G03848896

Fig. 87: Connecting Negative Terminal To Battery
Courtesy of HYUNDAI MOTOR CO.

27. Fill with engine coolant.
28. Start the engine and check for leaks.
29. Recheck engine coolant level and oil level.

ENGINE AND TRANSAXLE ASSEMBLY

REMOVAL

CAUTION:

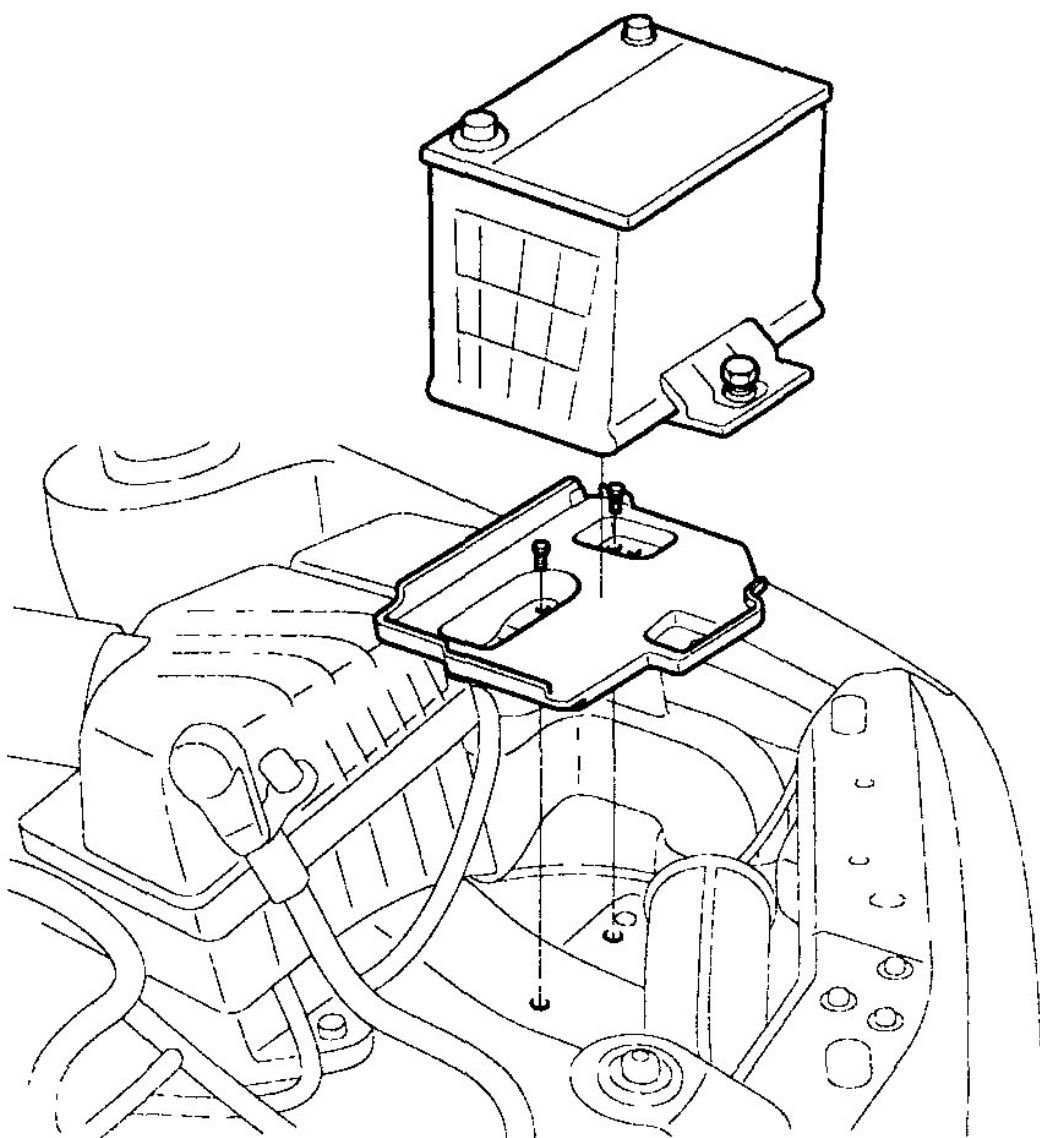
- Use fender covers to avoid damaging painted surfaces.
- To avoid damage, unplug the wiring connectors carefully while holding the connector portion.

NOTE:

- Mark all wiring and hoses to avoid misconnection.
- Inspection the timing belt before removing the cylinder head.

- Turn the crankshaft pulley so that the No. 1 piston is at top dead center.
(See **REMOVAL**)

1. Disconnect the negative terminal from the battery.



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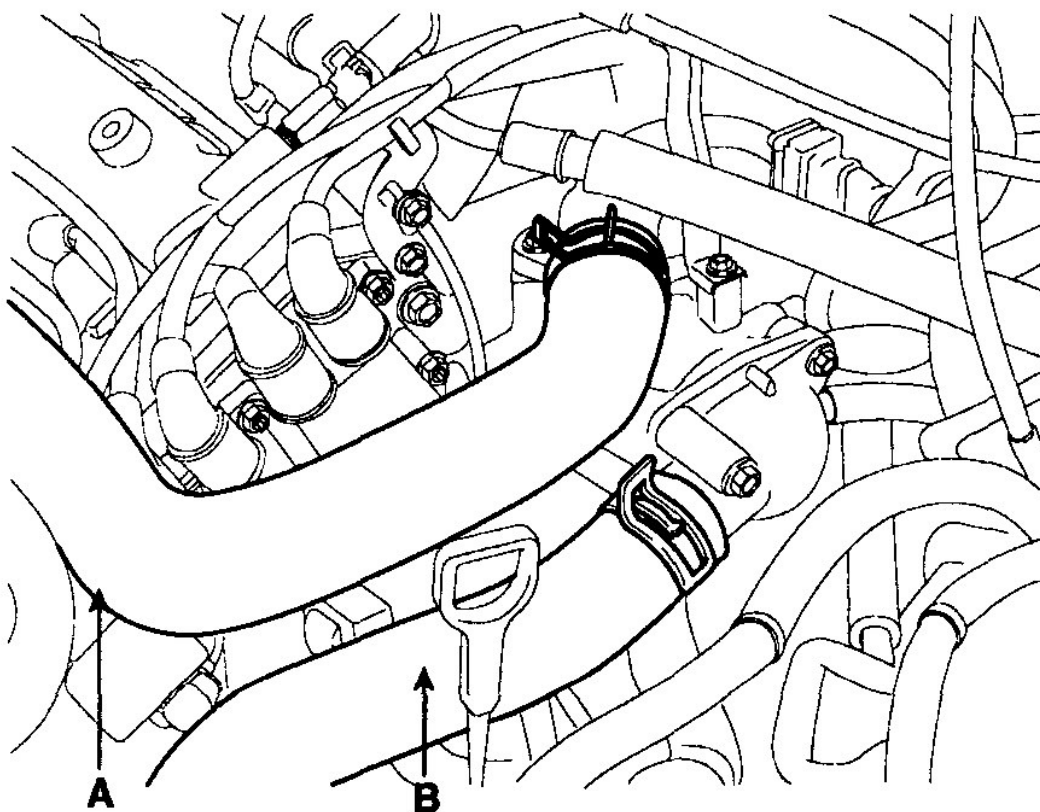
Fig. 88: Disconnecting Negative Terminal From Battery
Courtesy of HYUNDAI MOTOR CO.

2. Remove the engine cover.

3. Drain the engine coolant.

Remove the radiator cap to speed draining.

4. Remove the intake air hose and air cleaner assembly.
 1. Disconnect the AFS connector.
 2. Disconnect the breather hose from air cleaner hose.
 3. Remove the intake air hose and air cleaner assembly.
5. Remove the upper radiator hose (A) and lower radiator hose (B).



G03848898

Fig. 89: Removing Upper Radiator Hose And Lower Radiator Hose
Courtesy of HYUNDAI MOTOR CO.

6. Remove the heater hoses (A).

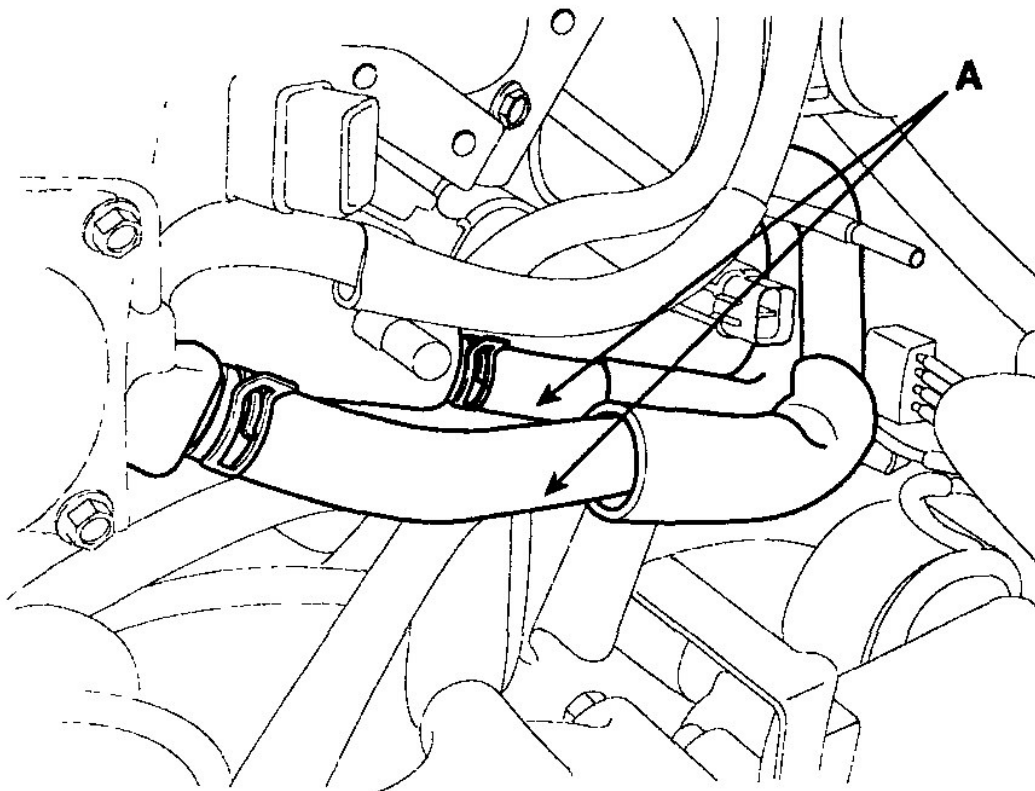
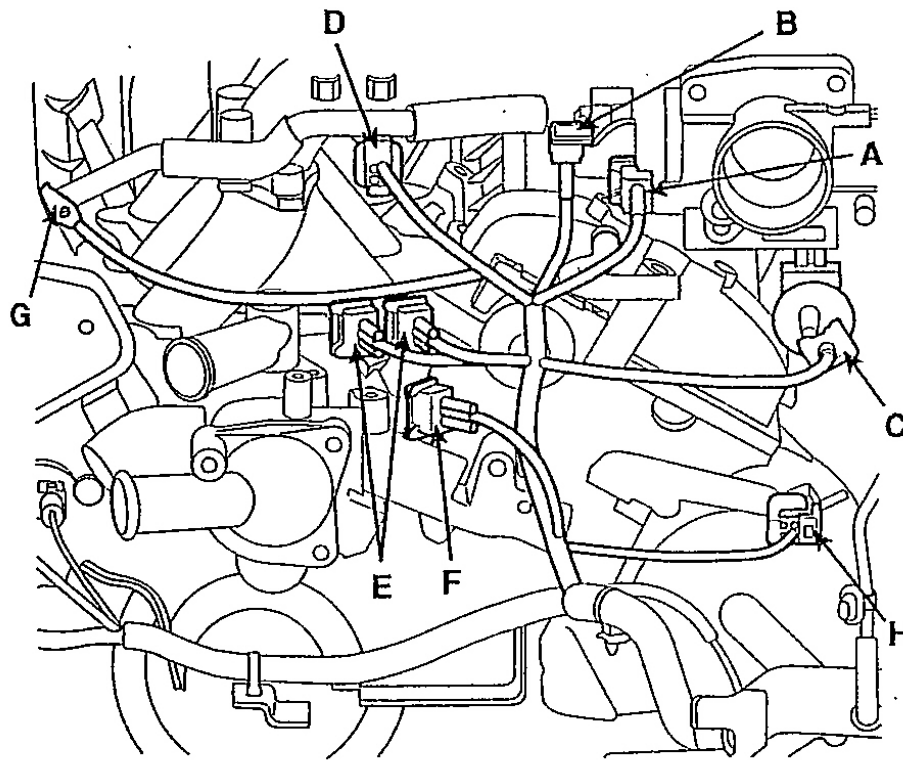
**G03848899**

Fig. 90: Removing Heater Hoses
Courtesy of HYUNDAI MOTOR CO.

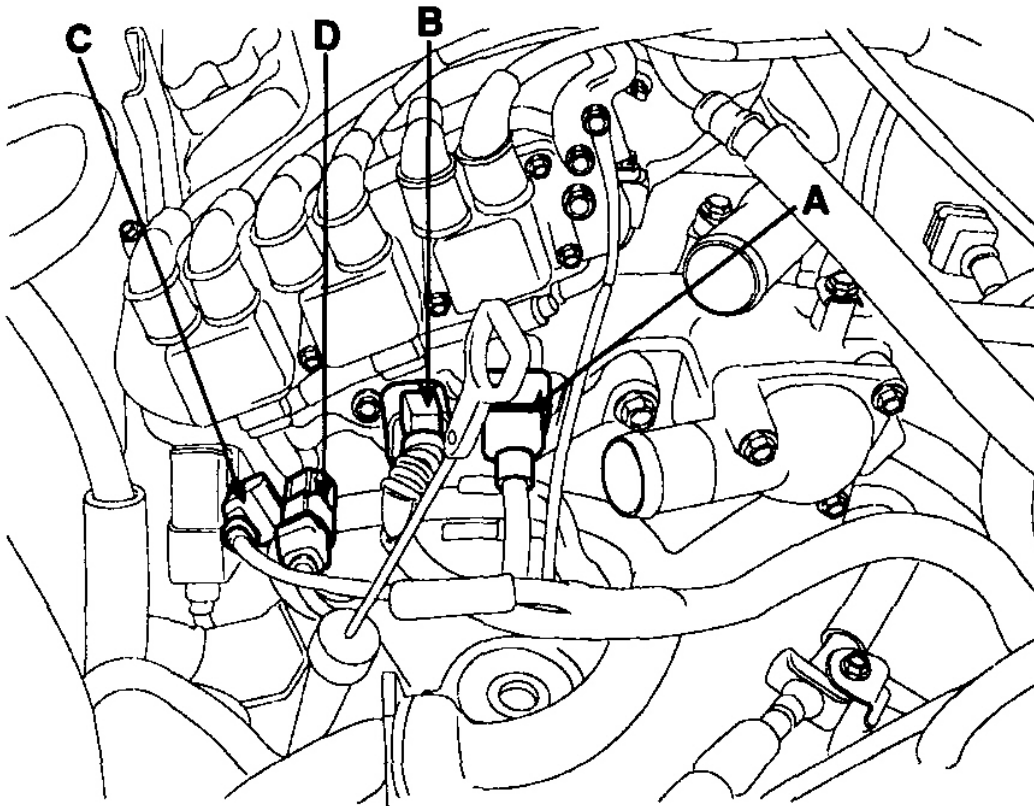
7. Remove the engine wire harness connectors and wire harness clamps from the cylinder head and the intake manifold.
 1. TPS (Throttle Position Sensor) connector (A).
 2. ISA (Idle Speed Actuator) connector (B).
 3. PCSV (Purge Control Solenoid Valve) connector (C).
 4. Injector connector (E).
 5. Knock sensor connector (F).
 6. CMP (Camshaft Position Sensor) connector (G).



SGKM17004N

Fig. 91: Removing TPS, ISA, PCSV, CMP, Injector And Knock Sensor Connectors
Courtesy of HYUNDAI MOTOR CO.

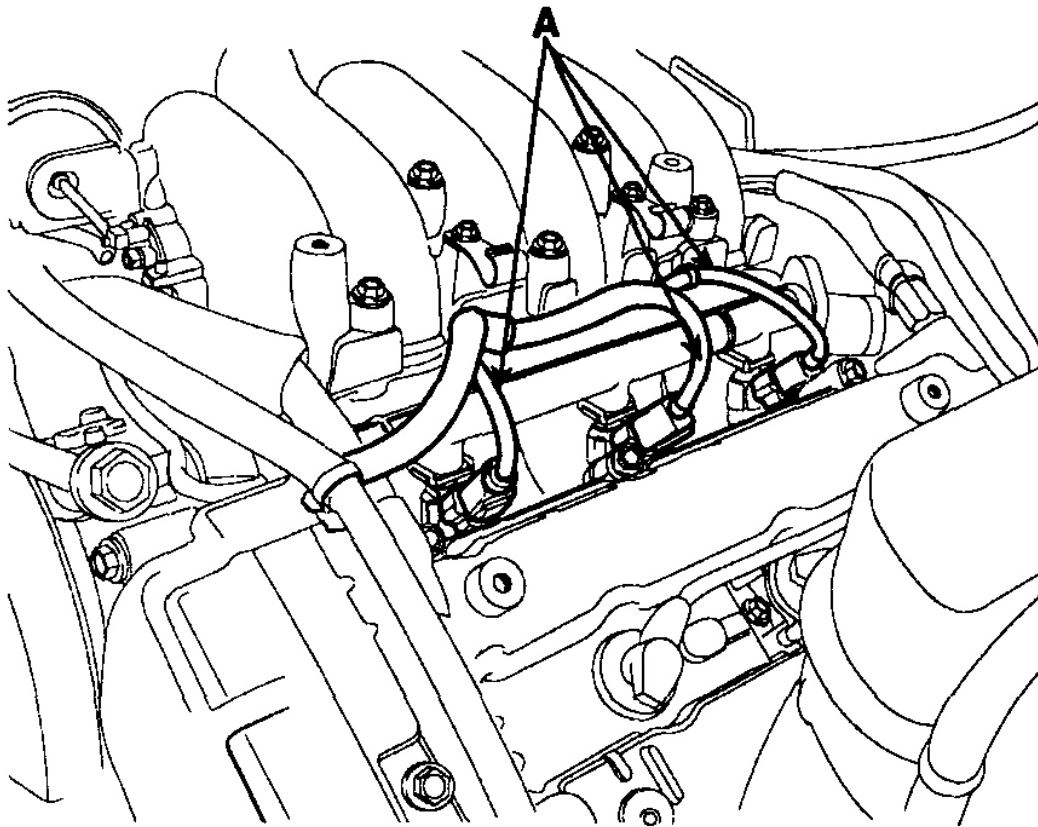
7. ECT (Engine Coolant Temperature) sensor (A) connector.
8. Ignition coil connector (B).
9. Crankshaft position sensor connector (C).
10. Rear oxygen sensor connector (D).



G03848901

Fig. 92: Removing ECT Sensor, Ignition Coil, Crankshaft Position Sensor And Rear Oxygen Sensor Connectors
Courtesy of HYUNDAI MOTOR CO.

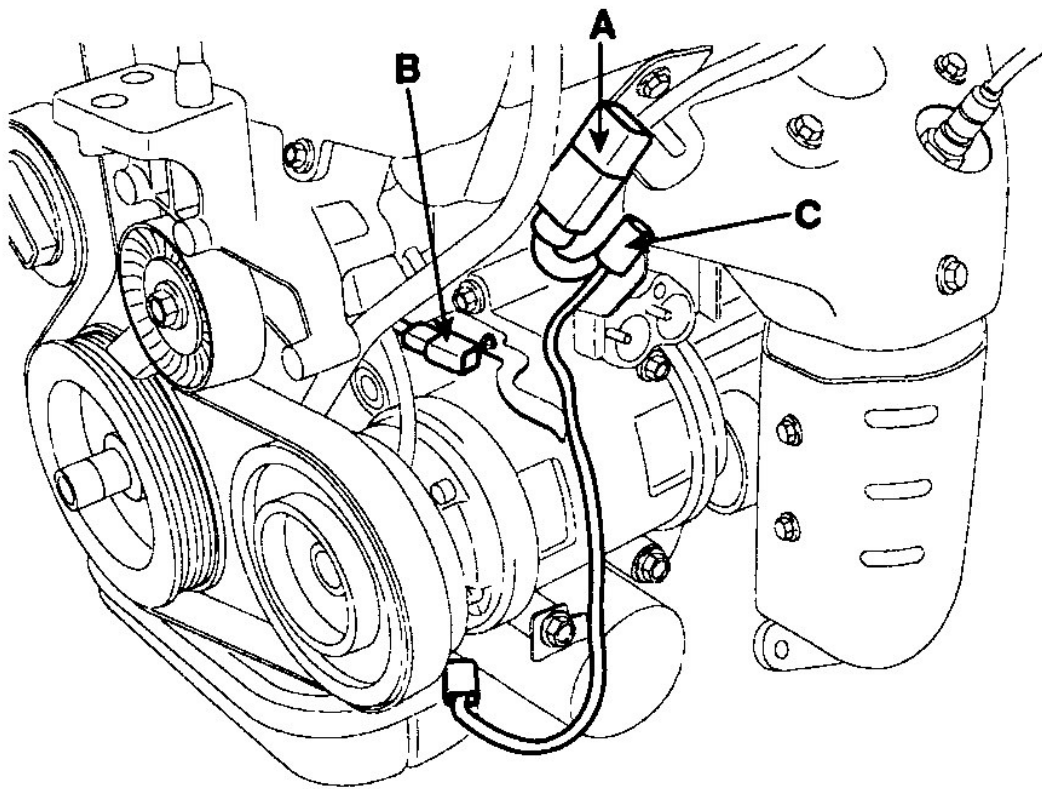
11. Three fuel injector connectors (A).



G03848902

Fig. 93: Removing Fuel Injector Connectors
Courtesy of HYUNDAI MOTOR CO.

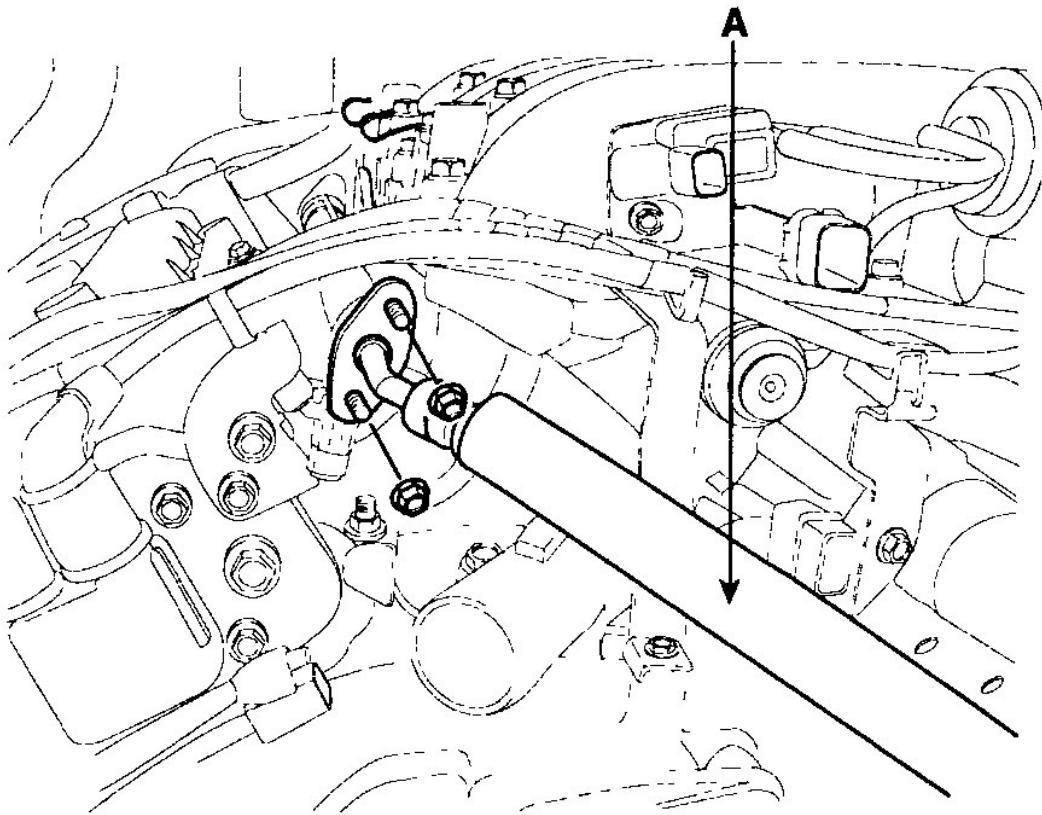
8. Disconnect front heated oxygen sensor (LH) connector (A), air compressor switch connector (B) and oil pressure sensor connector (C).



G03848903

Fig. 94: Disconnecting Front Heated Oxygen Sensor, Air Compressor Switch And Oil Pressure Sensor Connectors
Courtesy of HYUNDAI MOTOR CO.

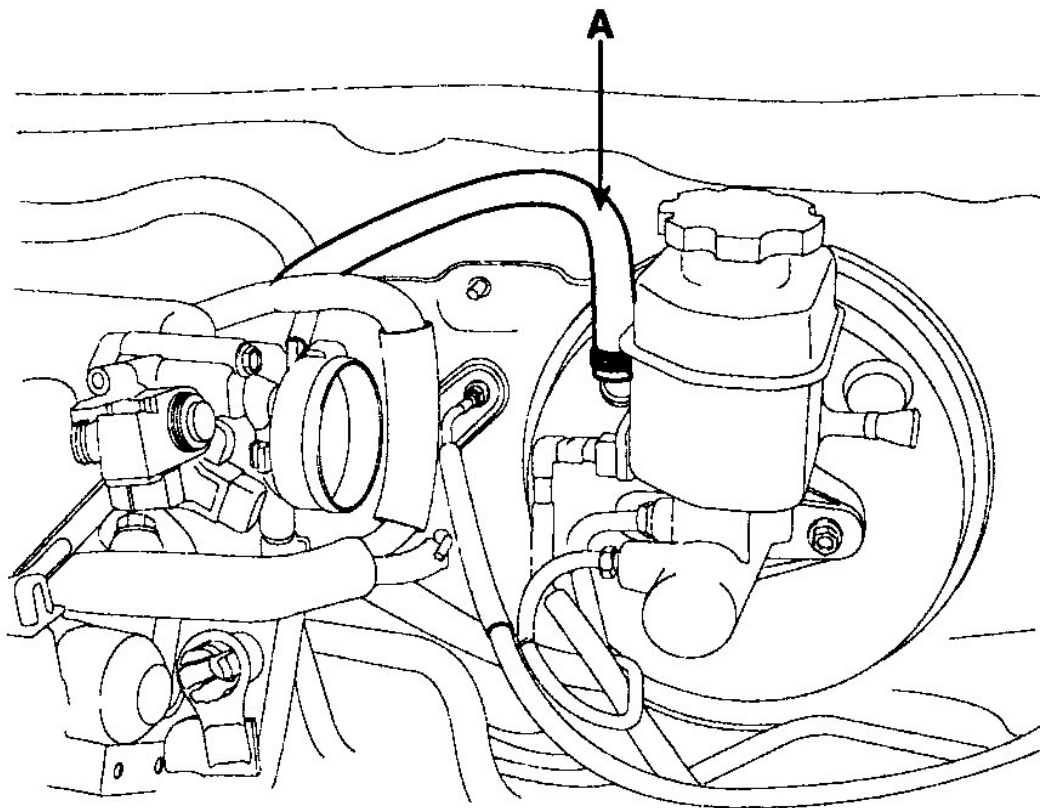
9. Disconnect rear heated oxygen sensor (RH) connector.
10. Remove the fuel inlet from delivery pipe (A).



G03848904

Fig. 95: Removing Fuel Inlet From Delivery Pipe
Courtesy of HYUNDAI MOTOR CO.

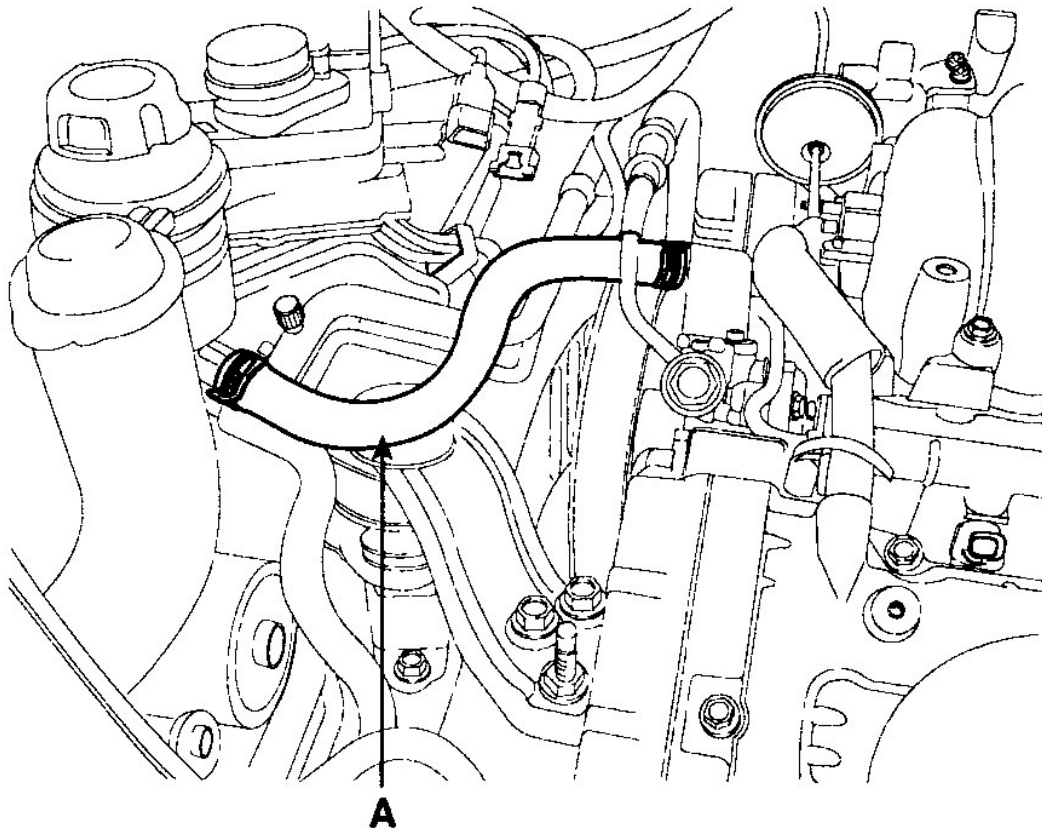
11. Remove the PCSV hose.
12. Remove the brake booster vacuum hose (A).



G03848905

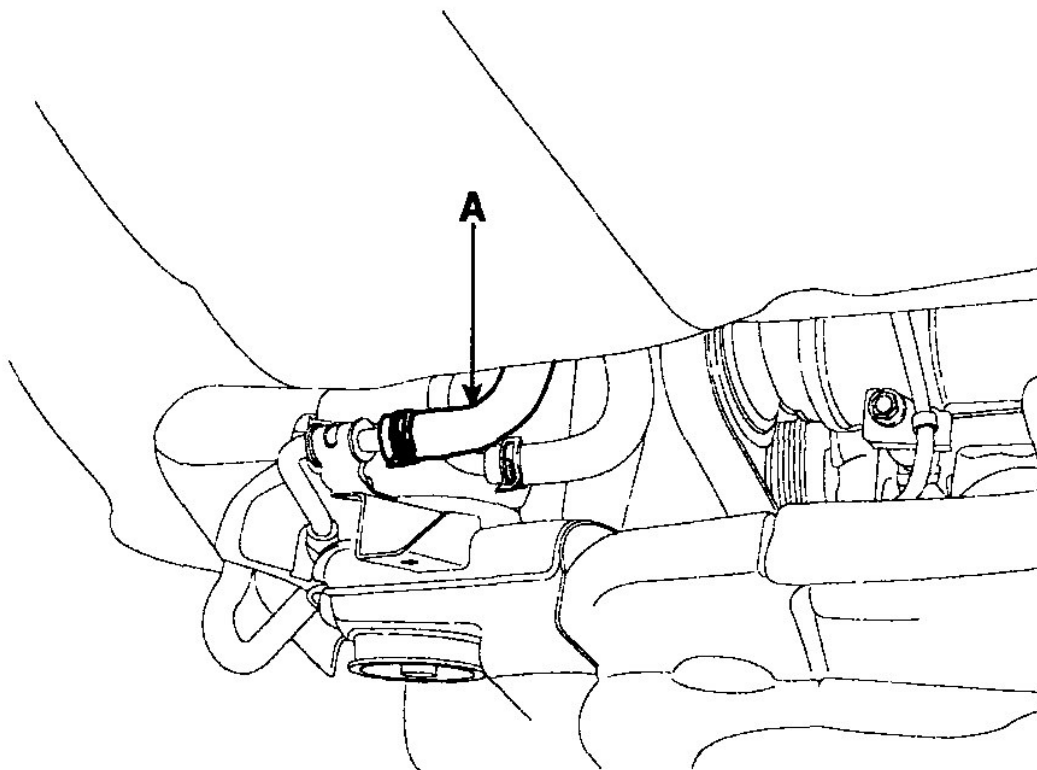
Fig. 96: Removing Brake Booster Vacuum Hose
Courtesy of HYUNDAI MOTOR CO.

13. Remove the accelerator cable by loosening the lock-nut, then slip the cable end out of the throttle linkage.
14. Remove the power steering pump hose (A).



G03848906

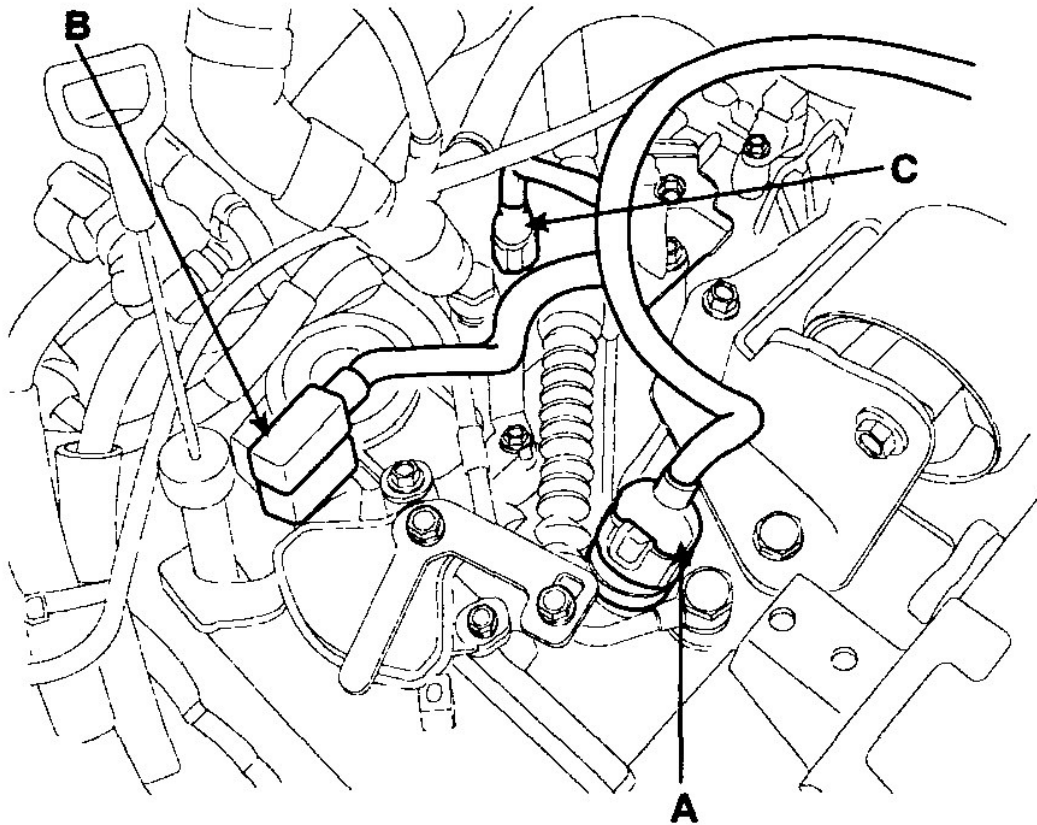
Fig. 97: Removing Power Steering Pump Hose (1 Of 2)
Courtesy of HYUNDAI MOTOR CO.



G03848907

Fig. 98: Removing Power Steering Pump Hose (2 Of 2)
Courtesy of HYUNDAI MOTOR CO.

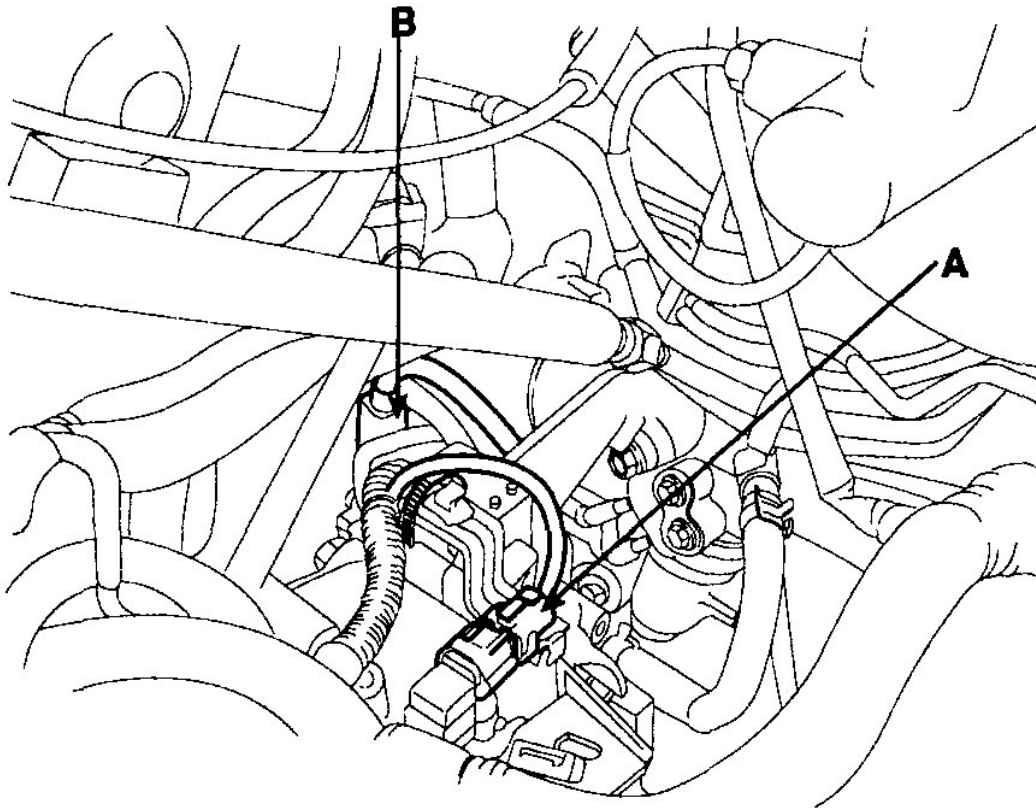
15. Remove the battery body bracket.
16. Disconnect the transaxle wire harness connector.
 - a. Disconnect the inhibitor switch connector (A).
 - b. Disconnect the transaxle range connector (B).
 - c. Disconnect the input shaft speed connector (C).



G03848908

Fig. 99: Disconnecting Transaxle Range, Inhibitor Switch And Input Shaft Speed Connectors
Courtesy of HYUNDAI MOTOR CO.

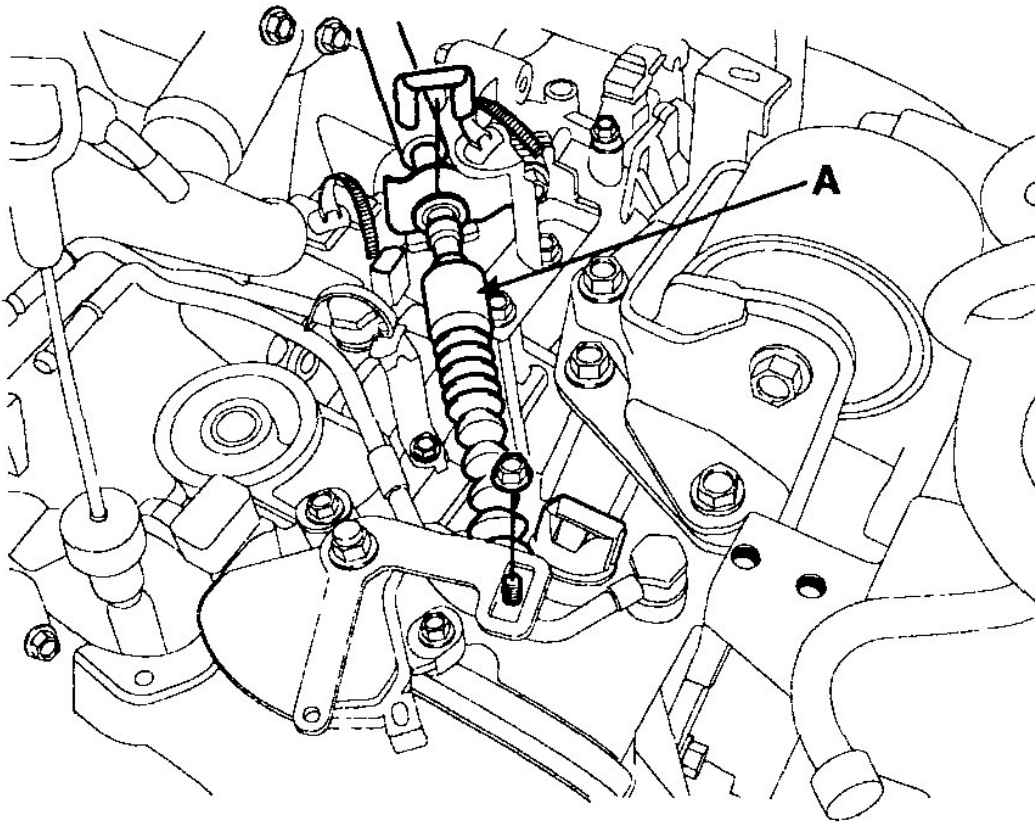
- d. Disconnect the output shaft speed connector (A).
- e. Disconnect the vehicle speed sensor connector (B).



G03848909

Fig. 100: Disconnecting Output Shaft Speed Connector And Vehicle Speed Sensor Connector
Courtesy of HYUNDAI MOTOR CO.

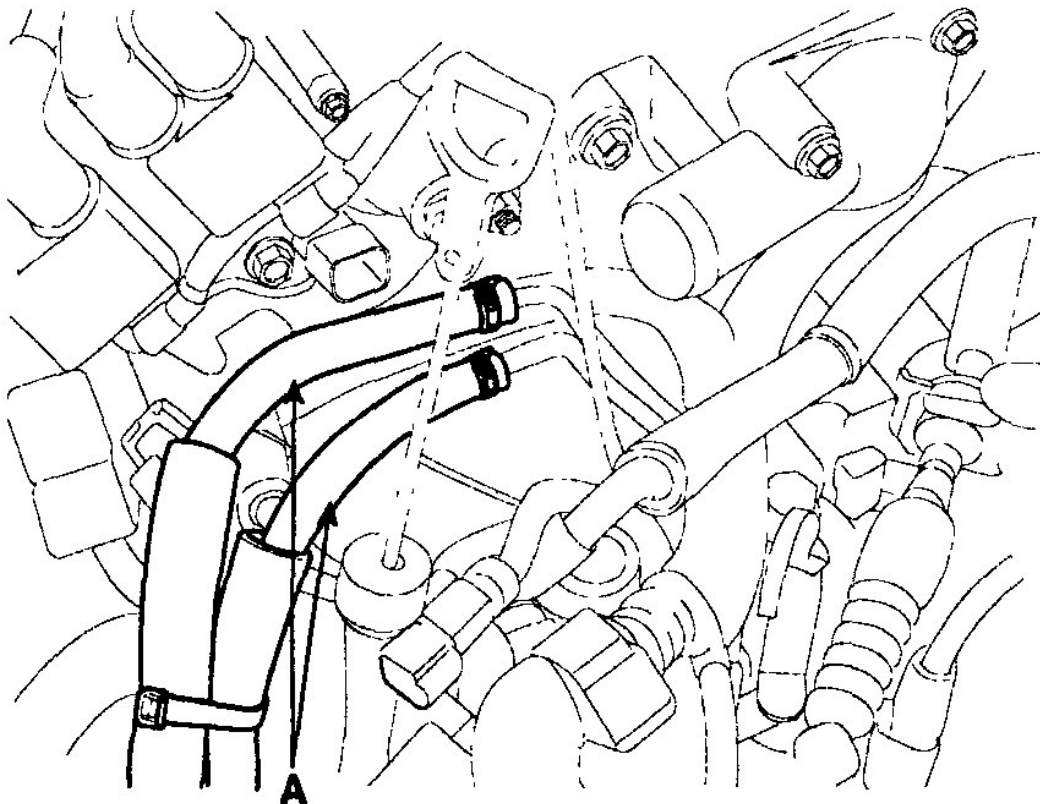
17. Remove the control cable (A) transaxle range switch.



G03848910

Fig. 101: Removing Control Cable Transaxle Range Switch
Courtesy of HYUNDAI MOTOR CO.

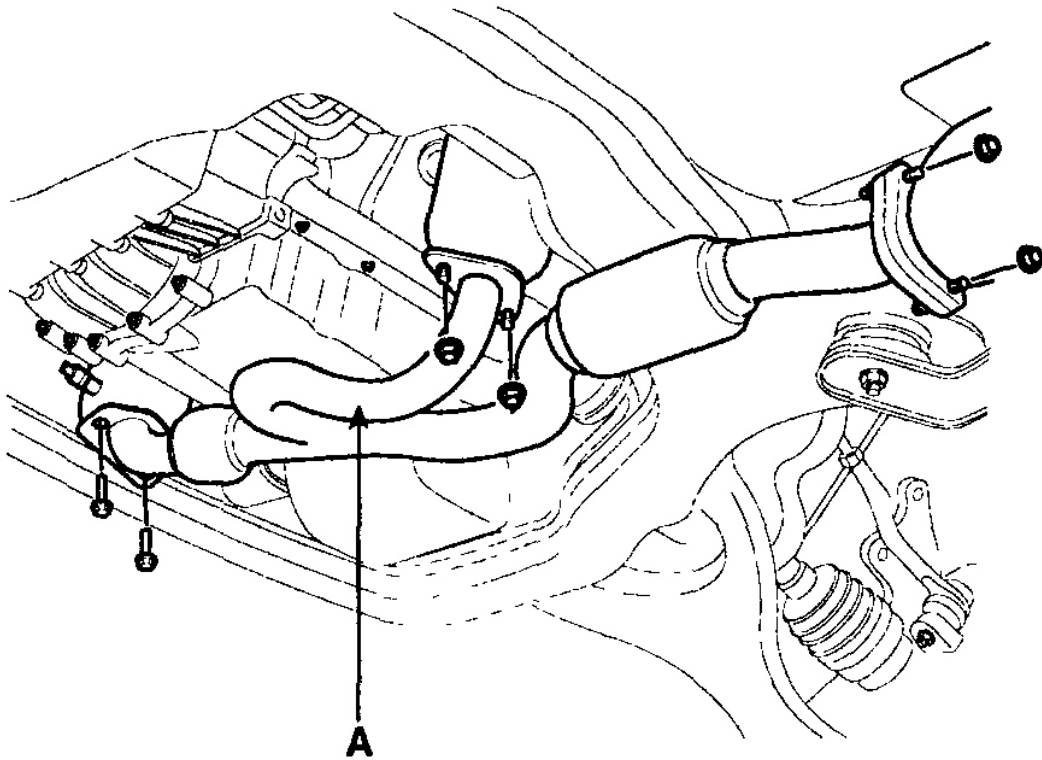
18. Remove the transaxle oil cooler hoses (A/T) (A).



G03848911

Fig. 102: Removing Transaxle Oil Cooler Hoses (A/T)
Courtesy of HYUNDAI MOTOR CO.

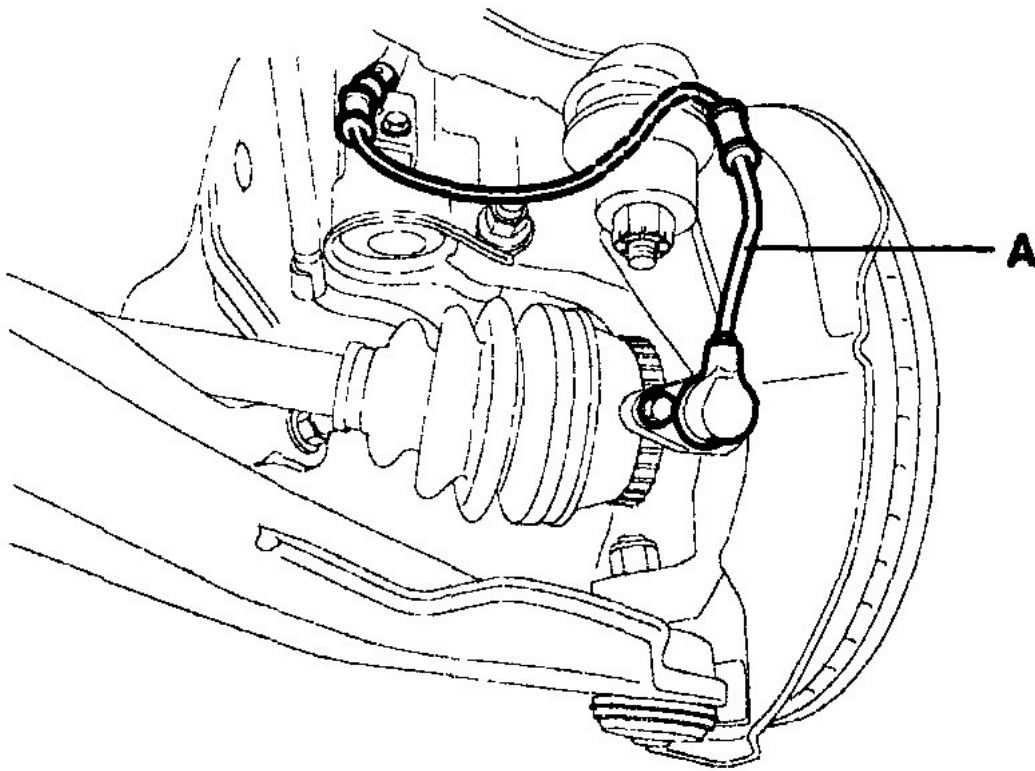
19. Remove the under cover.
20. Remove the front exhaust pipe (A).



G03848912

Fig. 103: Removing Front Exhaust Pipe
Courtesy of HYUNDAI MOTOR CO.

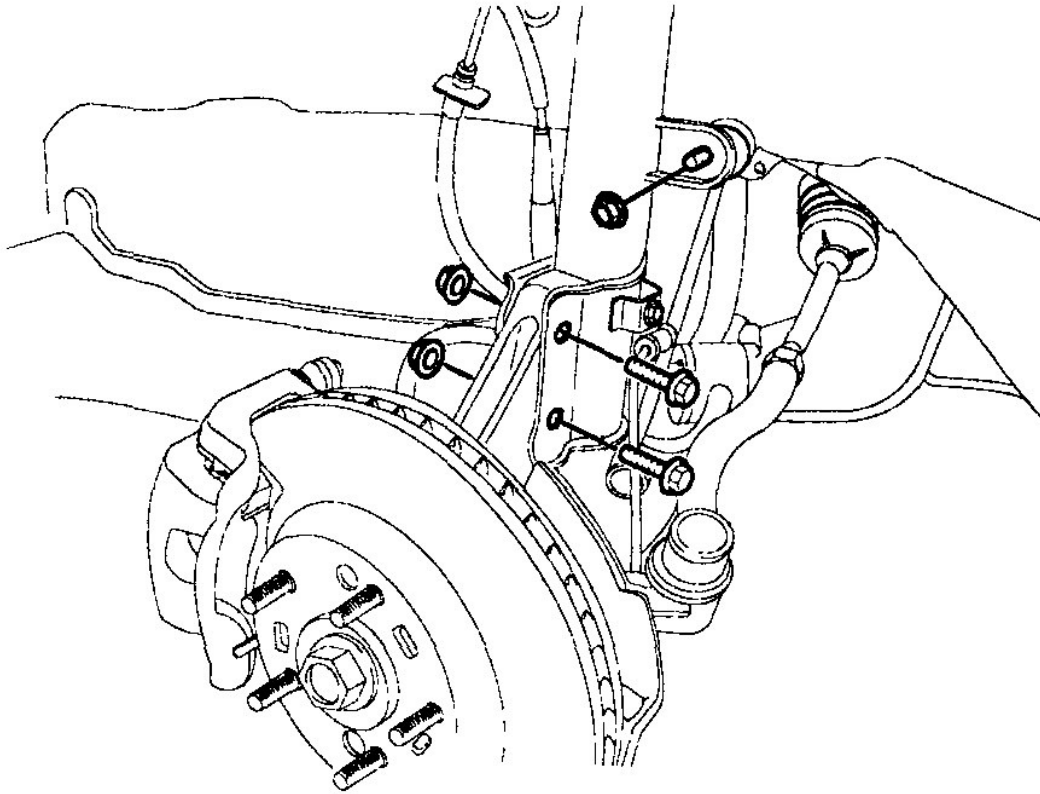
21. Disconnect the ABS wheel speed sensor (A) from both front knuckles. (See **FRONT AXLE**).



G03848913

Fig. 104: Disconnecting ABS Wheel Speed Sensor From Both Front Knuckles
Courtesy of HYUNDAI MOTOR CO.

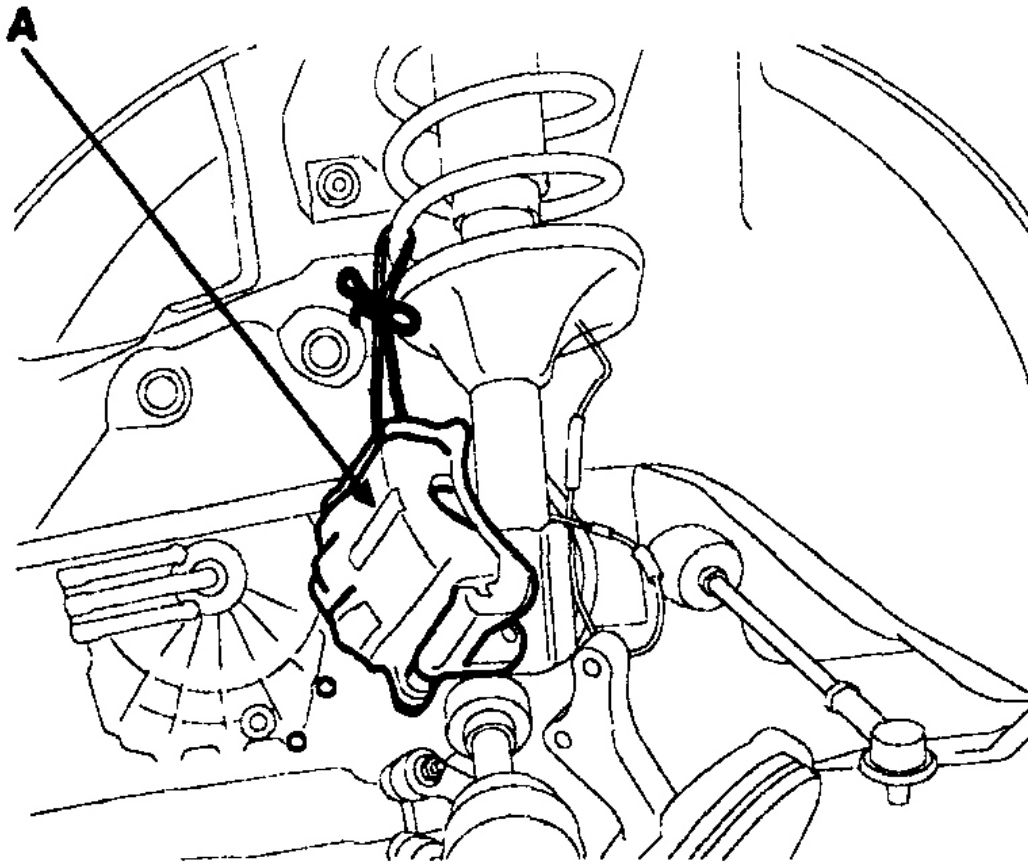
22. Remove the front strut lower mounting bolts and nuts. (See **FRONT STRUT ASSEMBLY**).



G03848914

Fig. 105: Removing Front Strut Lower Mounting Bolts And Nuts
Courtesy of HYUNDAI MOTOR CO.

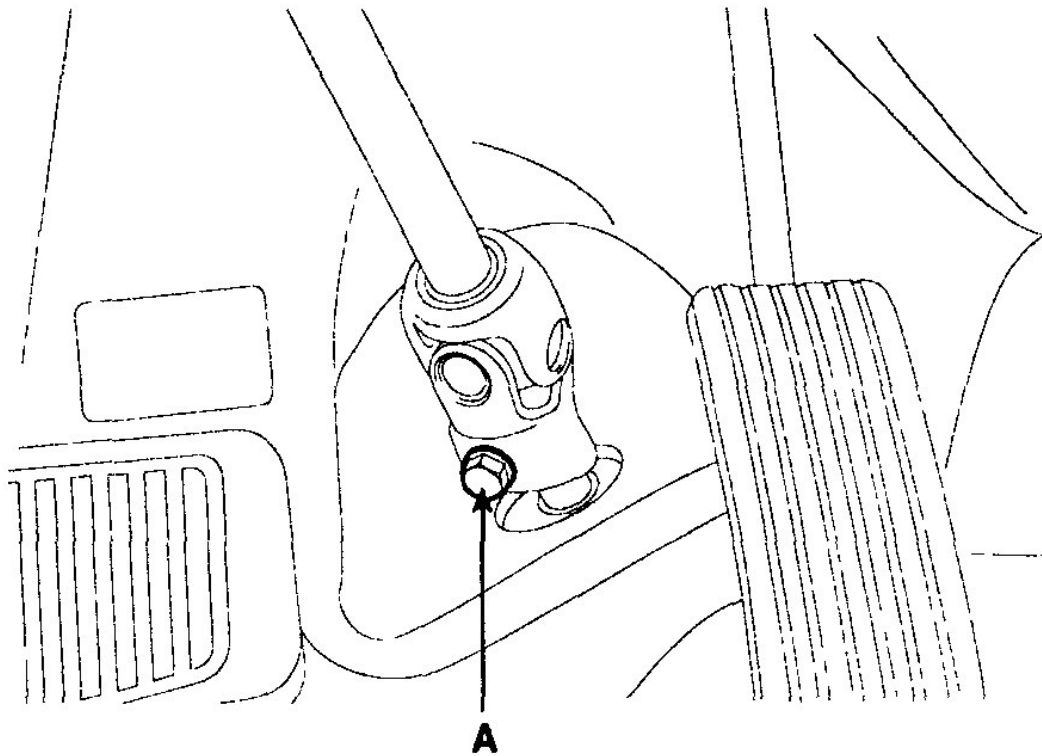
23. Remove the caliper and hang the caliper assembly (A).



G03848915

Fig. 106: Removing Caliper And Hanging Caliper Assembly
Courtesy of HYUNDAI MOTOR CO.

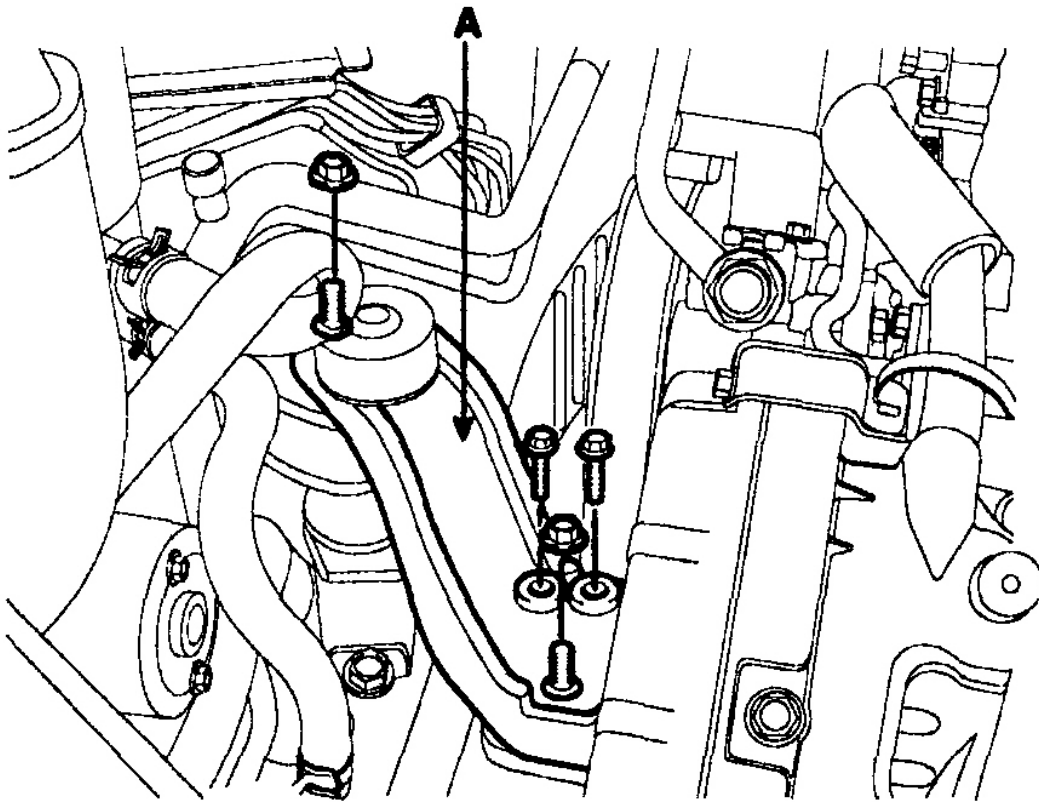
24. Remove the steering U-joint mounting bolt (A). (See **STEERING COLUMN AND SHAFT**)



G03848916

Fig. 107: Removing Steering U-Joint Mounting Bolt
Courtesy of HYUNDAI MOTOR CO.

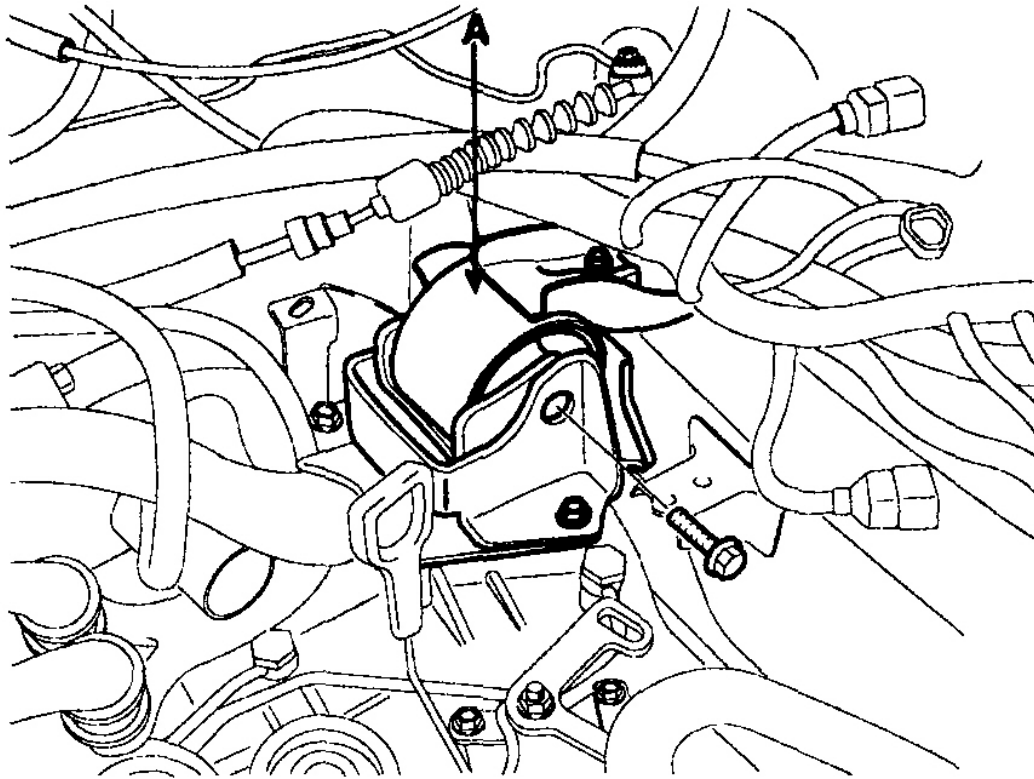
25. Install the jack for supporting engine and transaxle assembly.
26. Remove the engine mounting bracket (A).



G03848917

Fig. 108: Removing Engine Mounting Bracket
Courtesy of HYUNDAI MOTOR CO.

27. Remove the transaxle mounting bracket (A).



G03848918

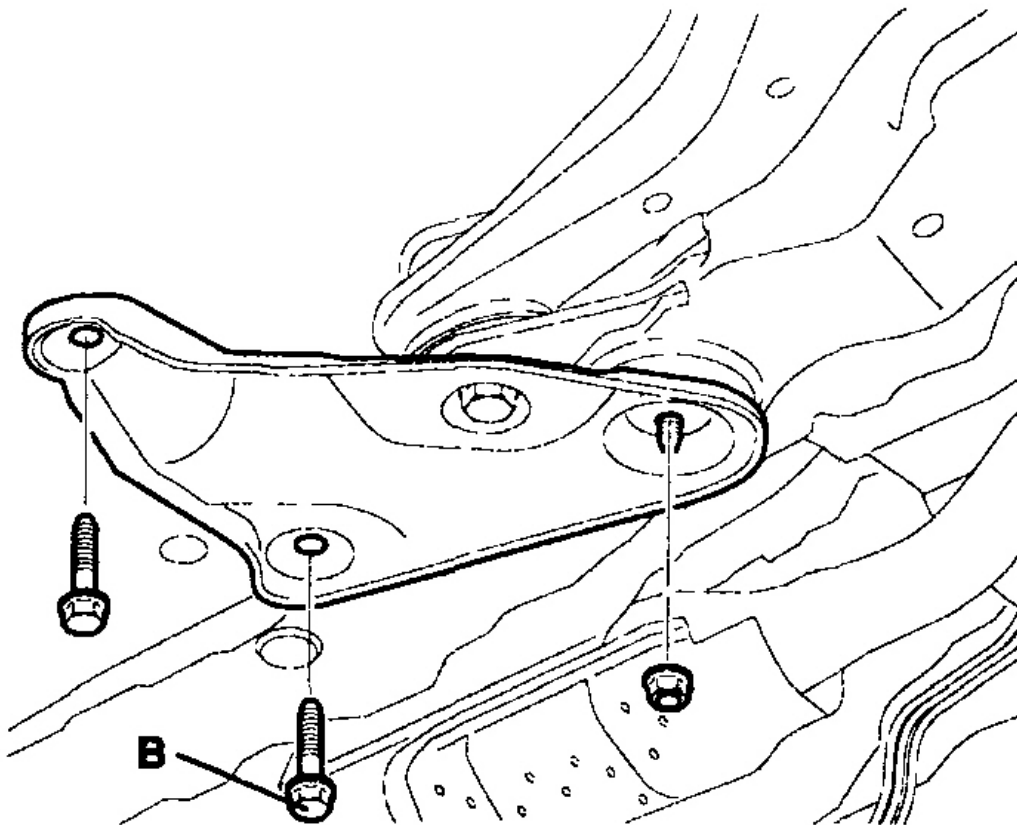
Fig. 109: Removing Transaxle Mounting Bracket
Courtesy of HYUNDAI MOTOR CO.

28. Remove the sub frame mounting bolts and nuts.

Tightening torque

A: 160 ~ 180Nm (1600 ~ 1800kgf.cm, 118 ~ 133lb.ft)

B: 70 ~ 90Nm (700 ~ 900kgf.cm, 52 ~ 66lb.ft)



G03848919

Fig. 110: Removing Sub Frame Mounting Bolts And Nuts (1 Of 2)
Courtesy of HYUNDAI MOTOR CO.

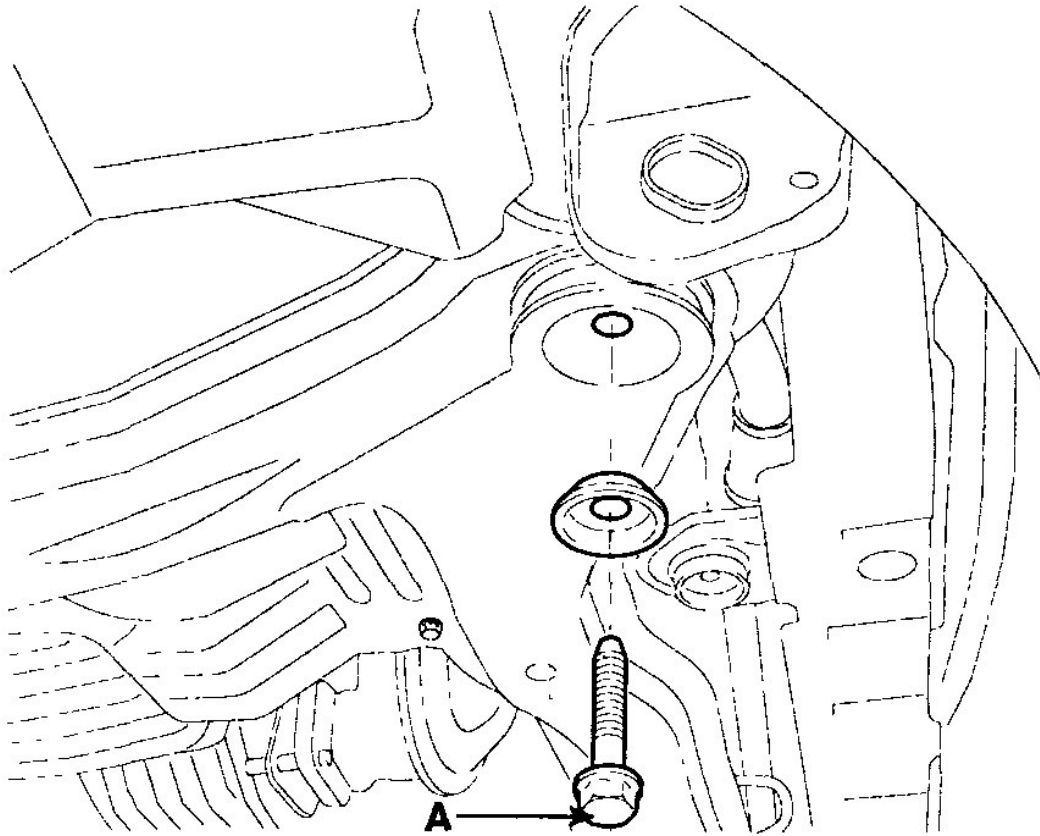
**G03848920**

Fig. 111: Removing Sub Frame Mounting Bolts And Nuts (2 Of 2)
Courtesy of HYUNDAI MOTOR CO.

29. Jack up the vehicle.

INSTALLATION

Installation is in the reverse order of removal.

Perform the following:

- Adjust the shift cable.
- Adjust the throttle cable.
- Refill the engine with engine oil.
- Refill the transaxle with fluid.
- Refill the radiator with engine coolant.

- Bleed air from the cooling system with the heater valve open.
- Clean the battery posts and cable terminals with sandpaper assemble them, then apply grease to prevent corrosion.
- Inspect for fuel leakage.

After assembling the fuel line, turn on the ignition switch (do not operate the starter) so that the fuel pump runs for approximately two seconds and fuel line pressurizes.

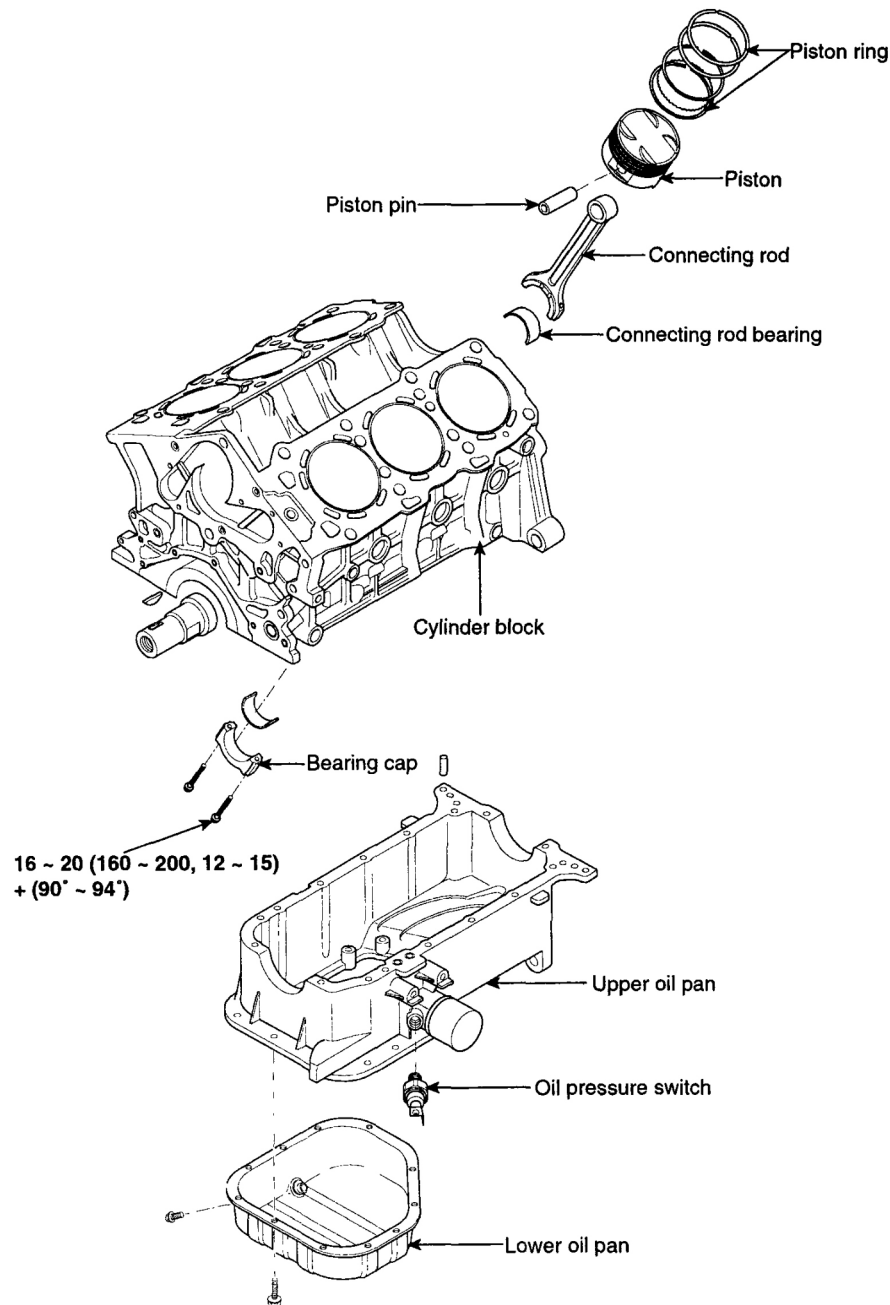
Repeat this operation two or three times, then check for fuel leakage at any point in the fuel line.

ENGINE BLOCK

COMPONENT

2005 Hyundai Tiburon GT

2005 ENGINE Engine Mechanical System (G6BA-GSL 2.7L) - Tiburon



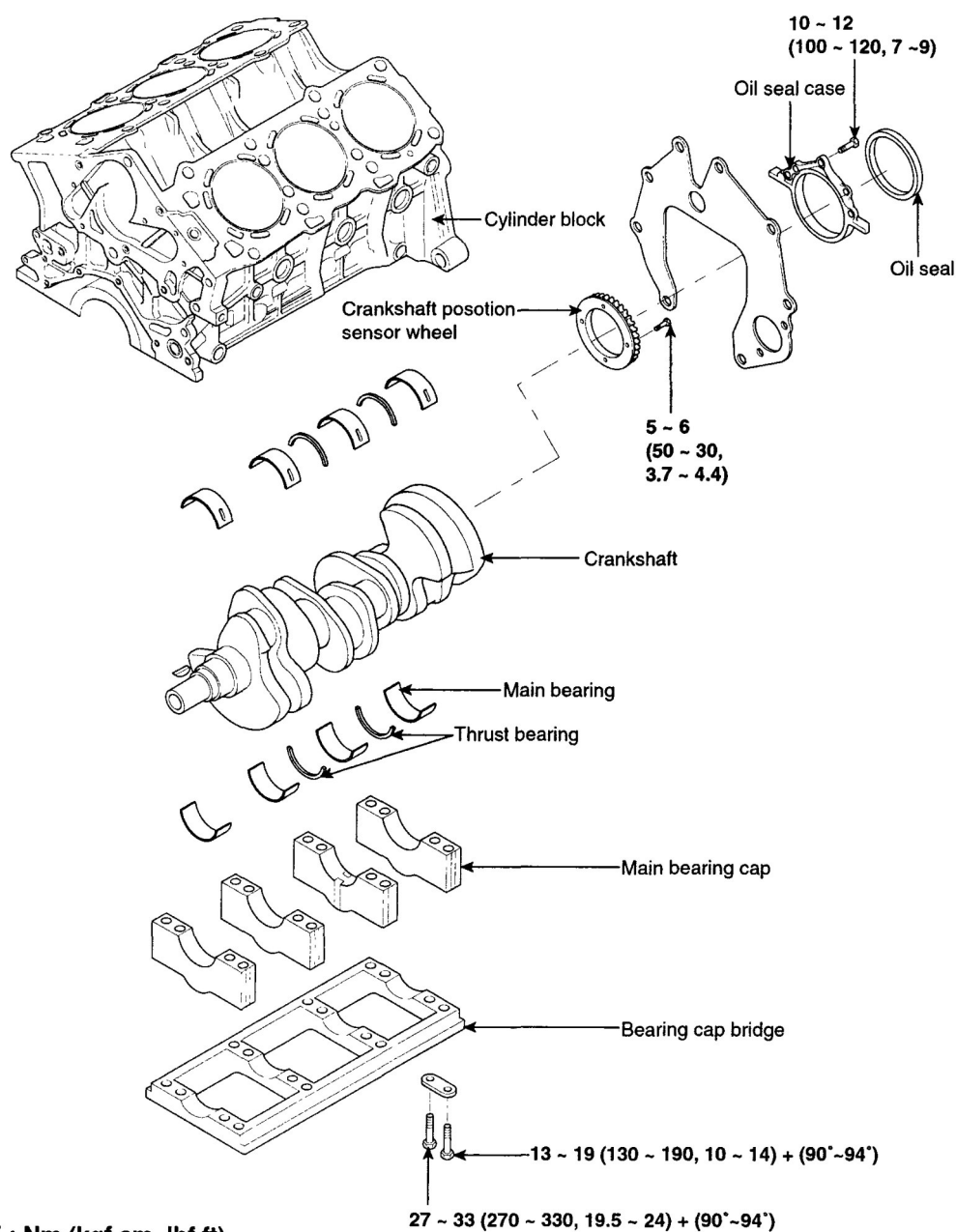
TORQUE : Nm (kgf.cm, lbf.ft)

G03848921

Fig. 112: Identifying Engine Block Components And Torque Specifications (1 Of 2)
Courtesy of HYUNDAI MOTOR CO.

2005 Hyundai Tiburon GT

2005 ENGINE Engine Mechanical System (G6BA-GSL 2.7L) - Tiburon



TORQUE : Nm (kgf.cm, lbf.ft)

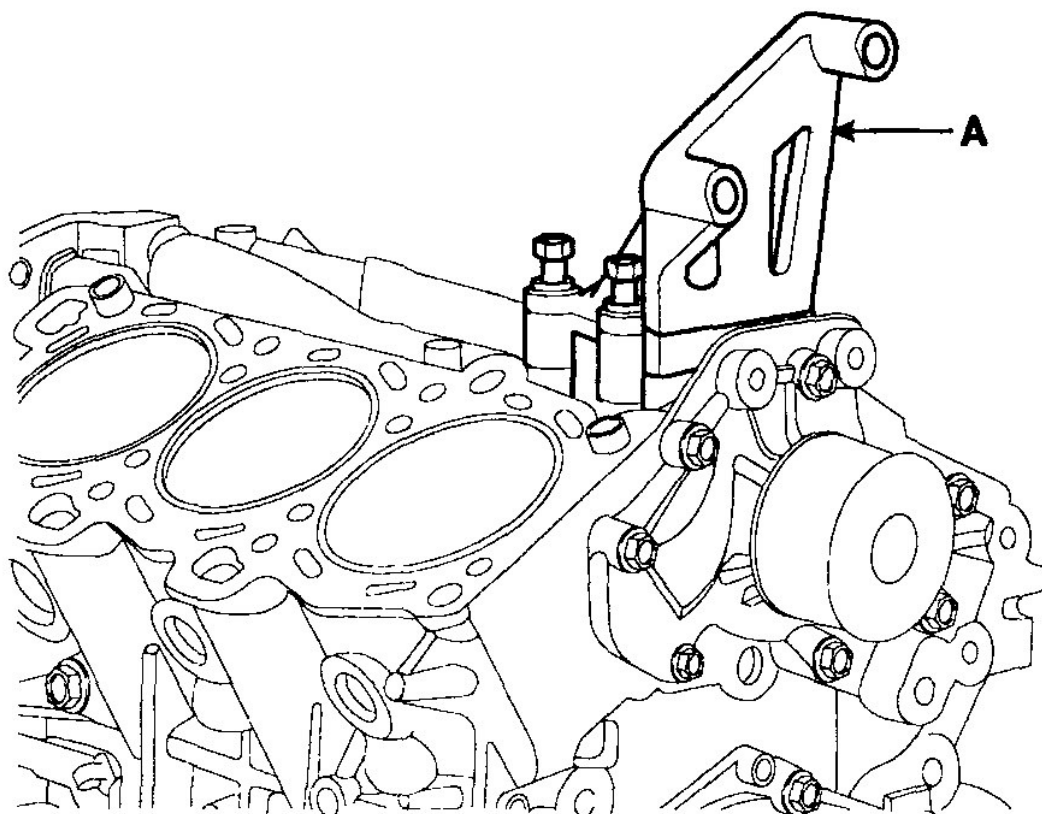
G03848922

Fig. 113: Identifying Engine Block Components And Torque Specifications (2 Of 2)
Courtesy of HYUNDAI MOTOR CO.

DISASSEMBLY

1. A/T: remove drive plate.
2. Install engine to engine stand for disassembly (A).
3. Remove timing belt. (See **REMOVAL**)

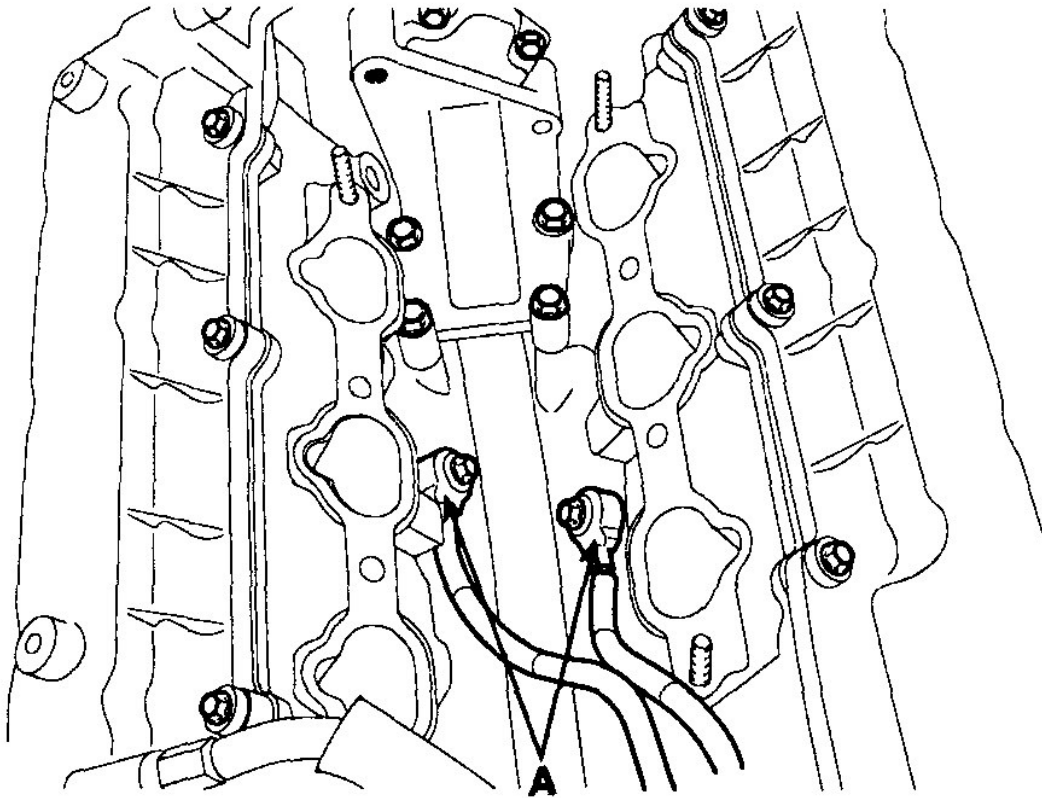
4. Remove cylinder head. (See **REMOVAL**)
5. Remove oil level gauge assembly.
6. Remove the alternator. (See **GENERATOR**).
7. Remove the air compressor. (See **A/C COMPRESSOR CONTROLS (MANUAL)**)
8. Remove the power steering pump bracket (A).



G03848923

Fig. 114: Removing Power Steering Pump Bracket
Courtesy of HYUNDAI MOTOR CO.

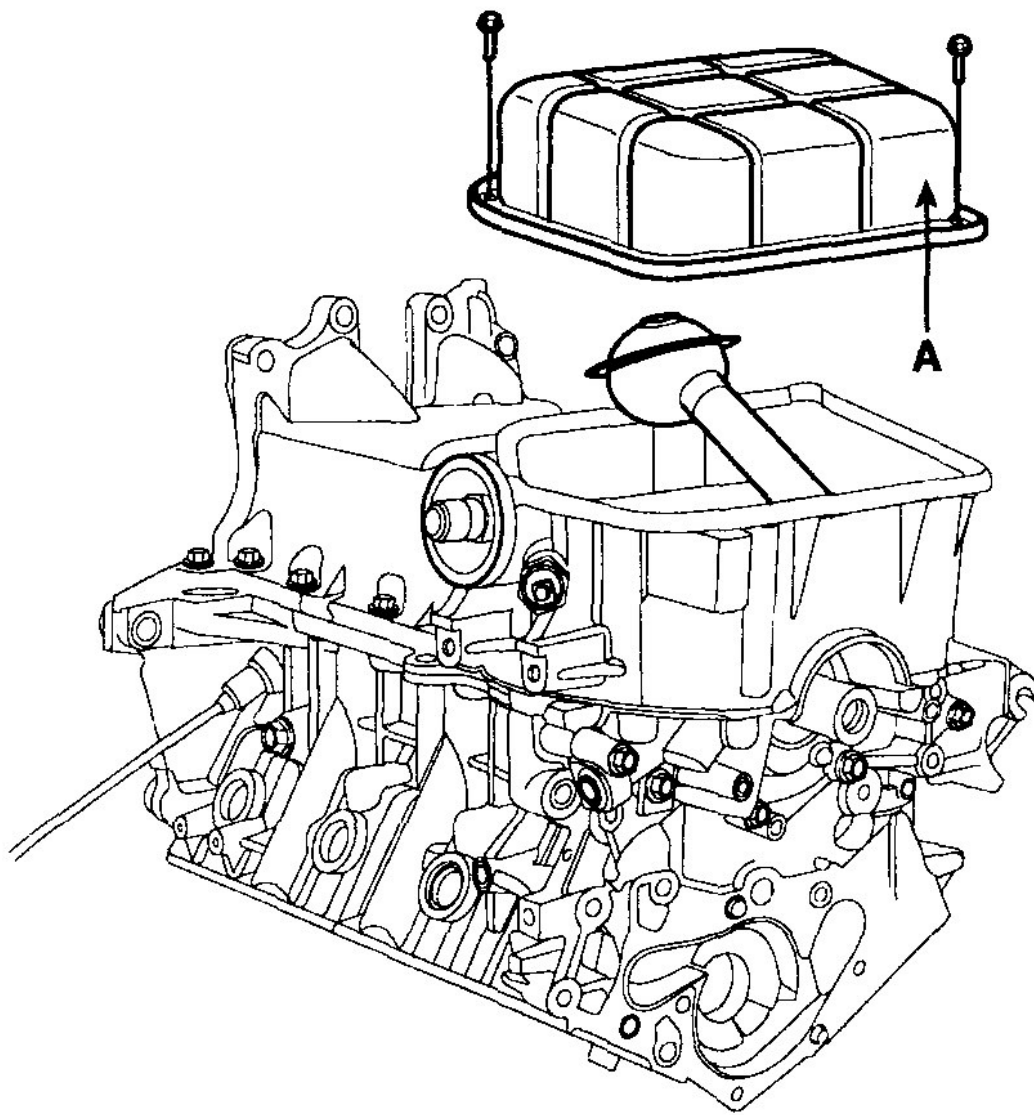
9. Remove water pump. (See **WATER PUMP**)
10. Remove knock sensors (A).



G03848924

Fig. 115: Removing Knock Sensors
Courtesy of HYUNDAI MOTOR CO.

11. Remove the lower oil pan (A).

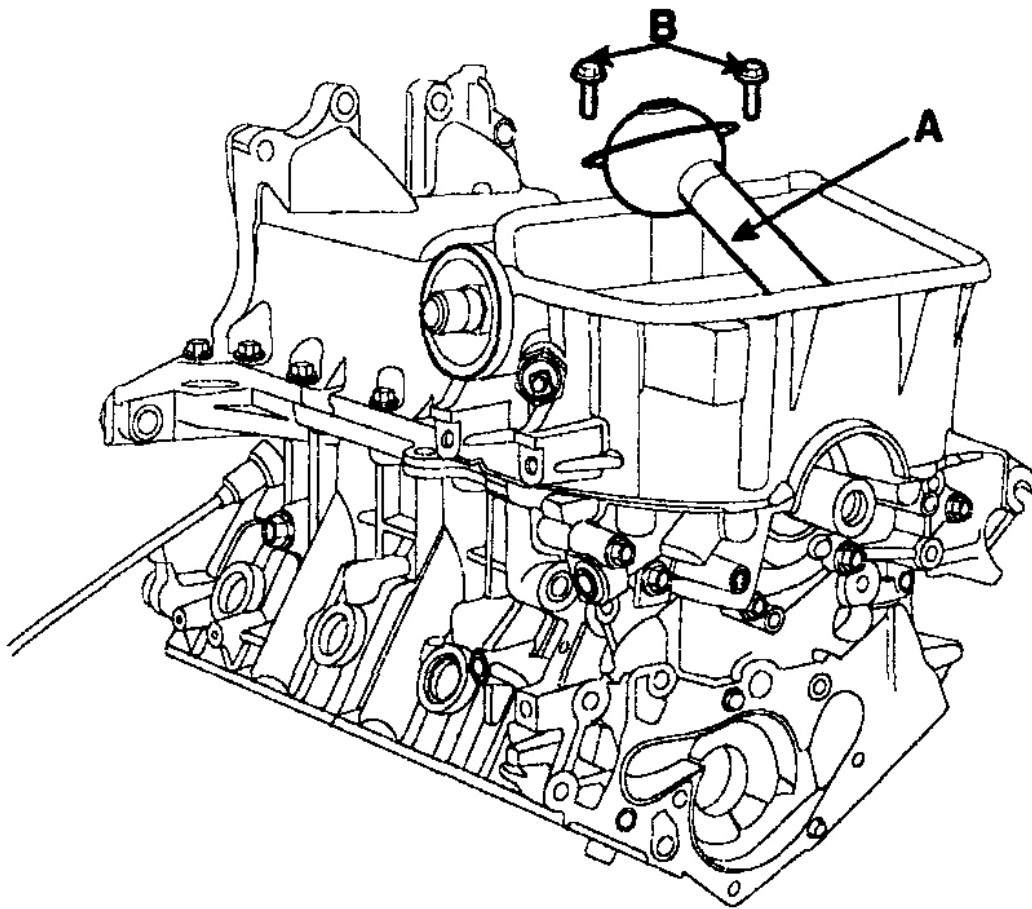


G03848925

Fig. 116: Removing Lower Oil Pan
Courtesy of HYUNDAI MOTOR CO.

12. Remove oil screen.

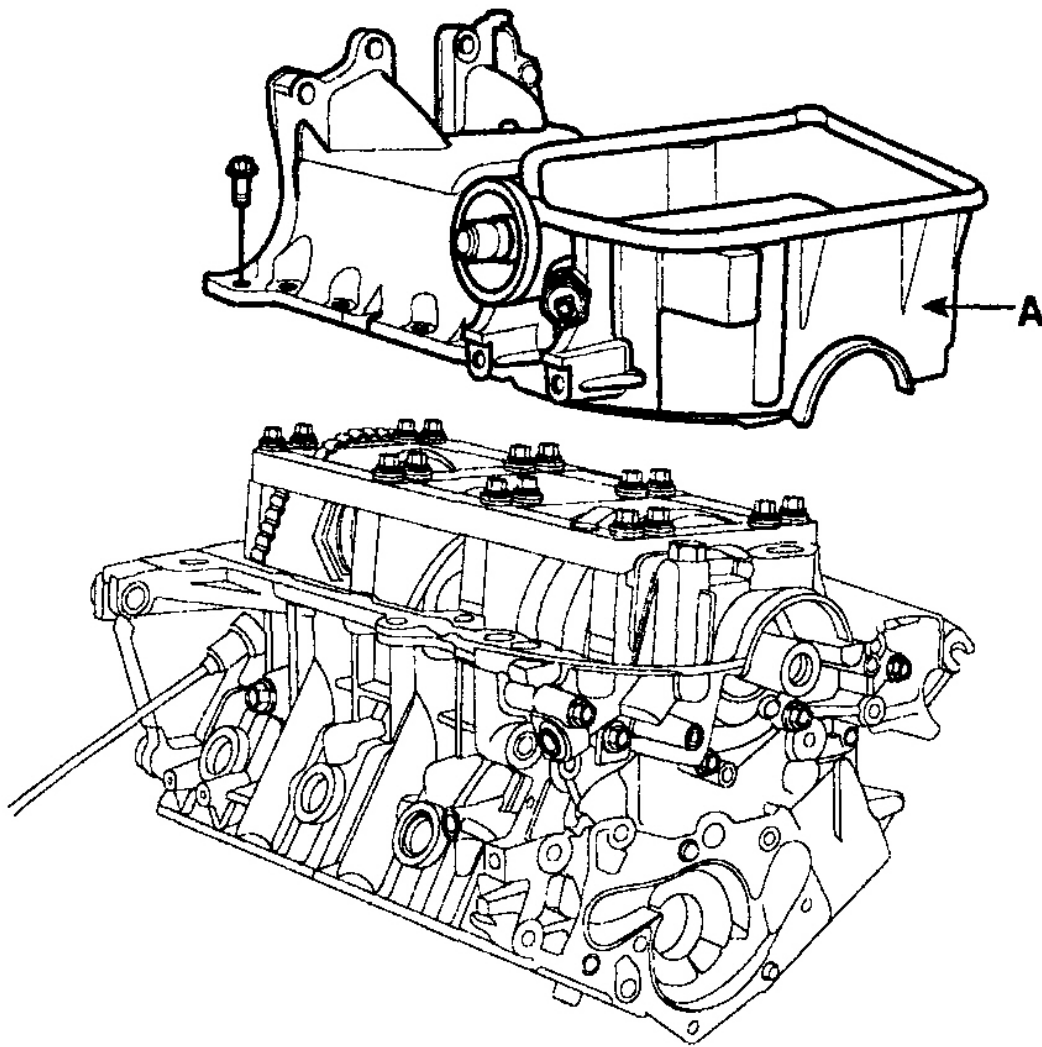
Remove the 2 bolts (B), oil screen (A) and gasket.



G03848926

Fig. 117: Removing 2 Bolts, Oil Screen And Gasket
Courtesy of HYUNDAI MOTOR CO.

13. Remove the upper oil pan (A).



G03848927

Fig. 118: Removing Upper Oil Pan
Courtesy of HYUNDAI MOTOR CO.

14. Check the connecting rod end play. (See **INSPECTION**)
15. Remove the connecting rod caps and check oil clearance. (See **INSPECTION**)
16. Remove piston and connecting rod assemblies.
 1. Using a ridge reamer, remove all the carbon from the top of the cylinder.
 2. Push the piston, connecting rod assembly and upper bearing through the top of the cylinder block.

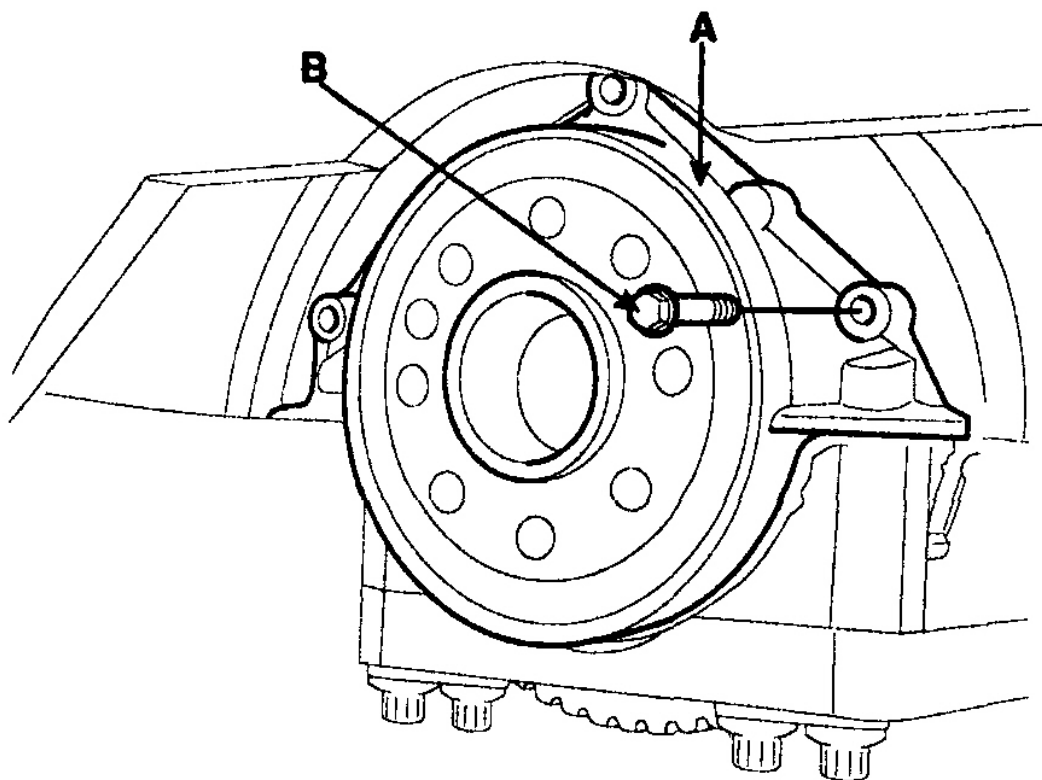
NOTE:

- Keep the bearings, connecting rod and cap together.

- **Arrange the piston and connecting rod assemblies in the correct order.**

17. Remove front case. (See **REMOVAL**)
18. Remove oil seal case.

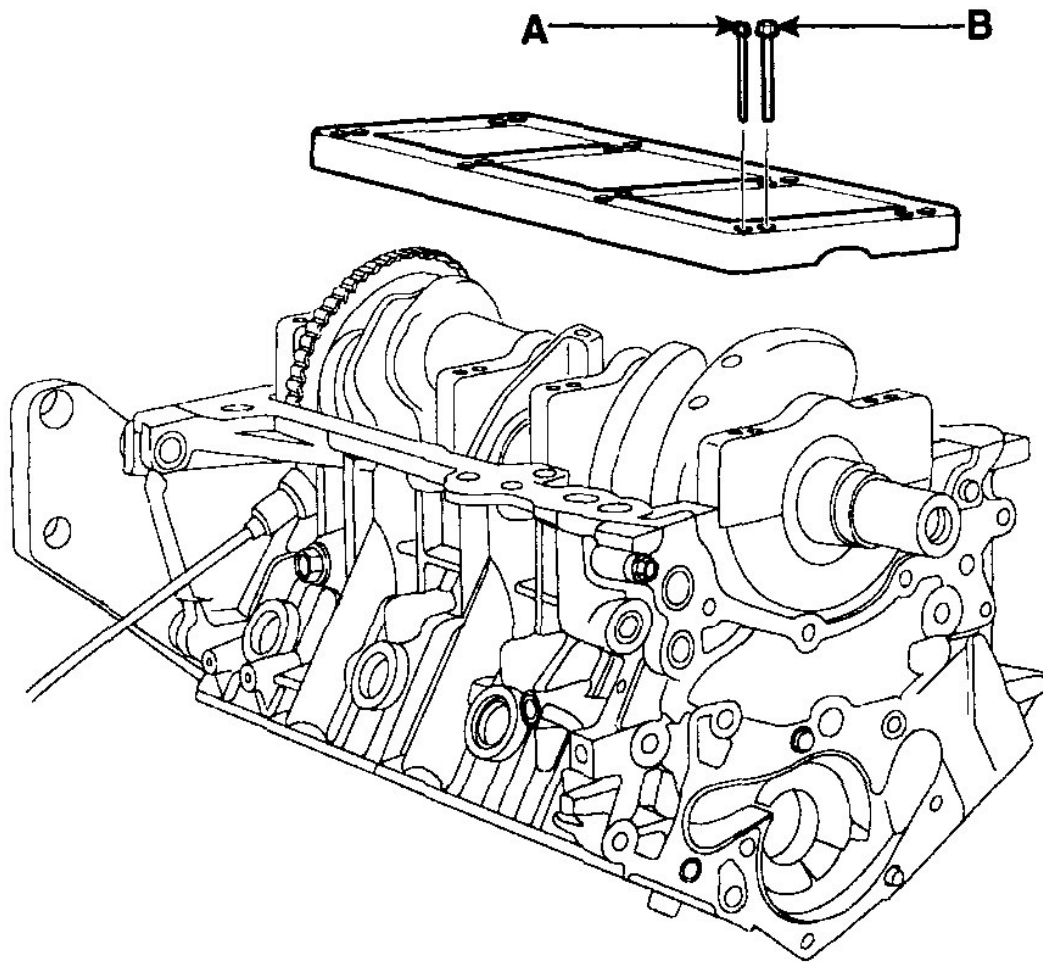
Remove the 3 bolts (B) and oil seal case (A).



G03848928

Fig. 119: Removing 3 Bolts And Oil Seal Case
Courtesy of HYUNDAI MOTOR CO.

19. Check the crankshaft end play. (See step 4)
20. Remove crankshaft bearing cap and check oil clearance. (See step 3)



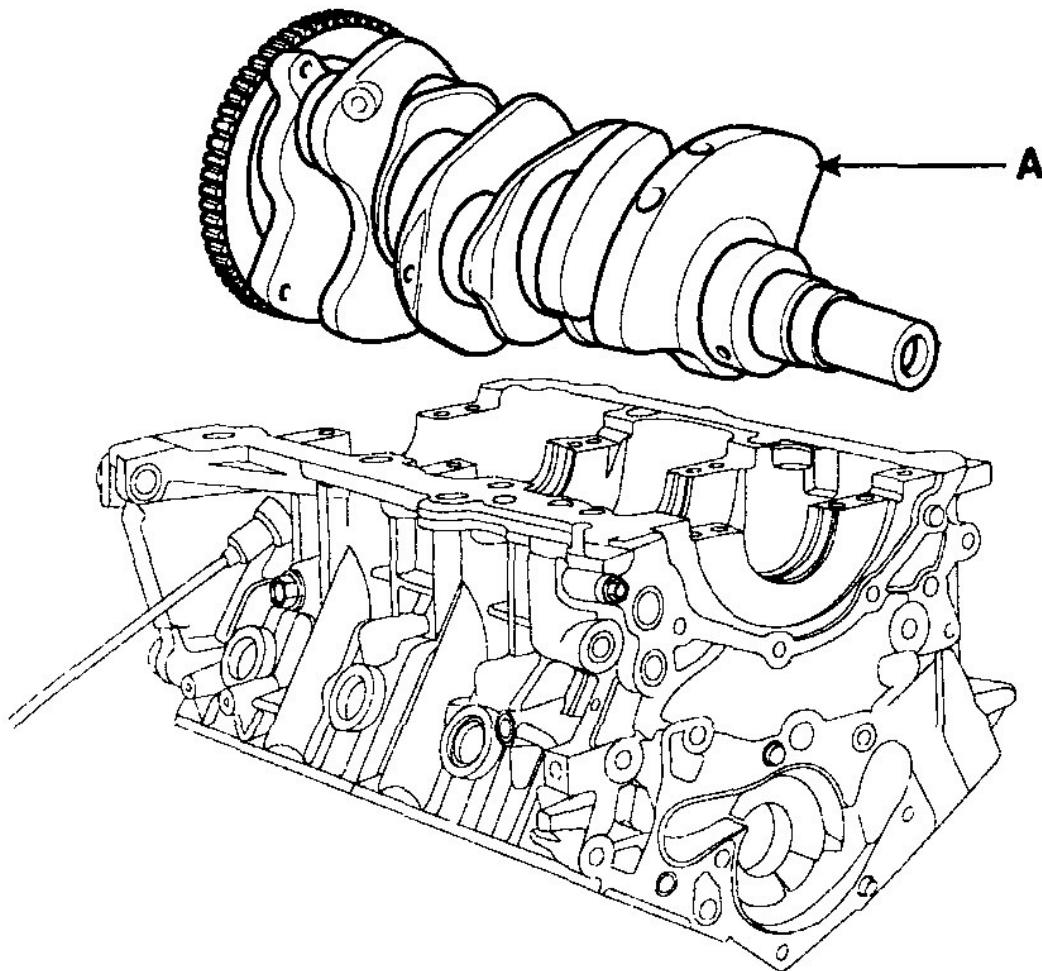
G03848929

Fig. 120: Removing Bolts

Courtesy of HYUNDAI MOTOR CO.

21. Lift the crankshaft (A) out of the engine, being careful not to damage journals.

NOTE: Arrange the main bearings and trust washers in the correct order.



G03848930

Fig. 121: Lifting Crankshaft Out Of Engine
Courtesy of HYUNDAI MOTOR CO.

22. Check fit between piston and piston pin.

Try to move the piston back and forth on the piston pin. If any movement is felt, replace the piston and pin as a set.

23. Remove piston rings.
1. Using a piston ring expander, remove the 2 compression rings.
 2. Remove the 2 side rails and oil ring by hand.

NOTE: Arrange the piston rings in the correct order only.

24. Disconnect connecting rod from piston.

INSPECTION

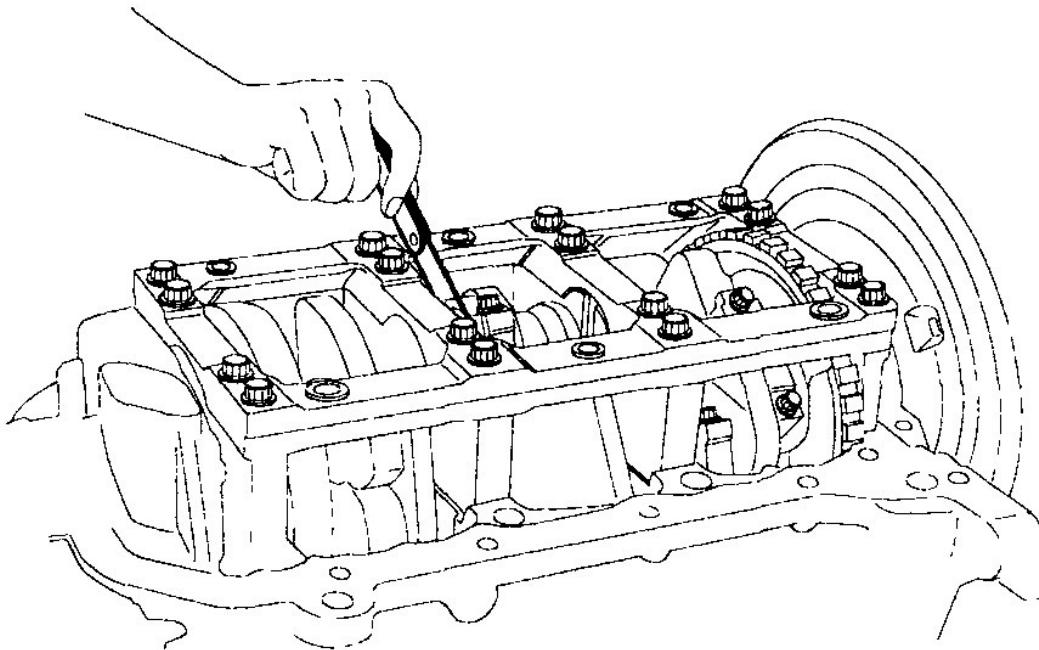
CONNECTING ROD AND CRANKSHAFT

1. Check the connecting rod end play.

Using a dial indicator, measure the end play while moving the connecting rod back and forth.

Standard end play: 0.1 ~ 0.25mm (0.004 ~ 0.010 in.)

Maximum end play: 0.4mm (0.016 in.)



G03848931

Fig. 122: Using Dial Indicator To Measure The End Play While Moving Connecting Rod Back And Forth

Courtesy of HYUNDAI MOTOR CO.

- If out-of-tolerance, replace the connecting rod assembly.
 - If still out-of-tolerance, replace the crankshaft.
2. Check the connecting rod bearing oil clearance.
 1. Check the matchmarks on the connecting rod and cap are aligned to ensure correct reassembly.

2. Remove the 2 connecting rod cap bolts.
3. Remove the connecting rod cap and bearing half.
4. Clean the crank pin and bearing.
5. Place plastigage across the crank pin.
6. Reinstall the bearing half and cap, and torque the bolts.

Tightening torque

16 ~ 20Nm (160 ~ 200kgf.cm, 12 ~ 15lbf.ft) + 90°

NOTE: Do not turn the crankshaft.

7. Remove the 2 bolts, connecting rod cap and bearing half.
8. Measure the plastigage at its widest point.

Standard oil clearance

0.018 ~ 0.036mm (0.0007 ~ 0.0014 in.)

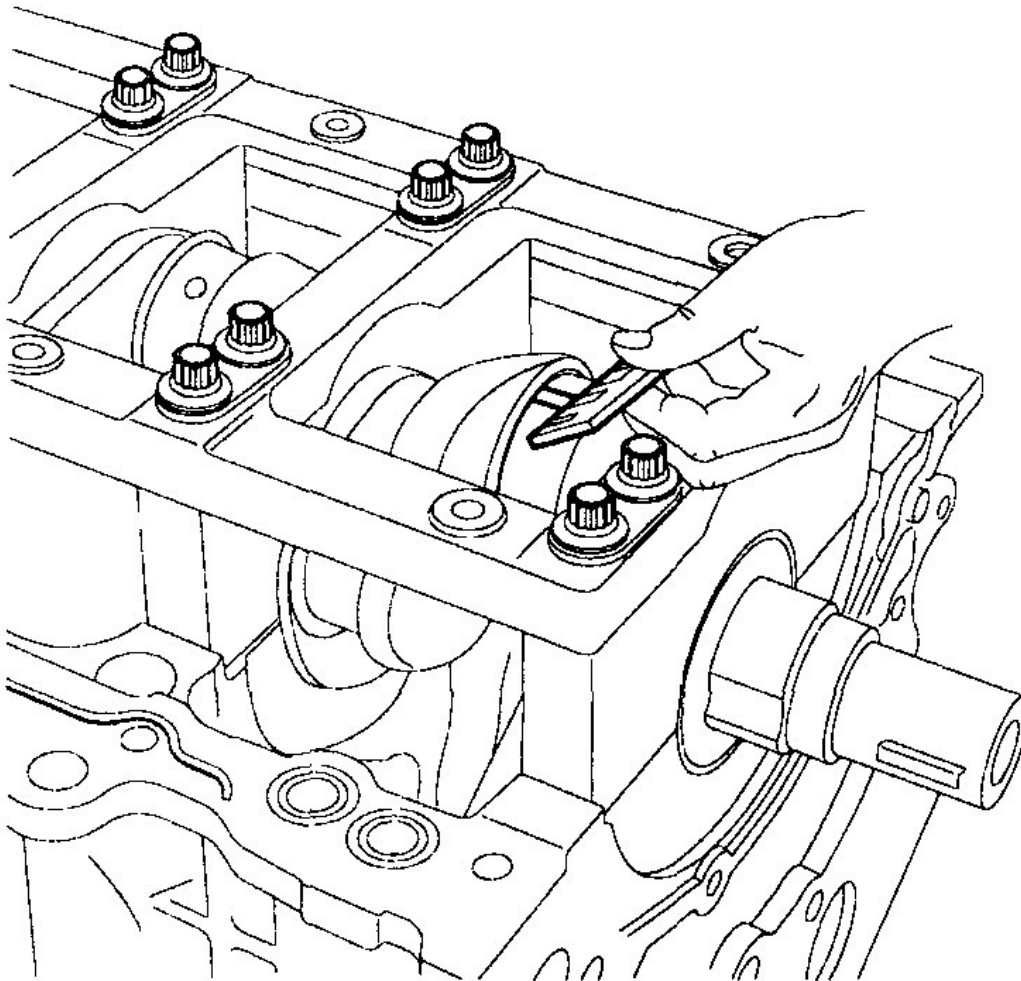
**G03848932**

Fig. 123: Measuring Plastigage At Its Widest Point
Courtesy of HYUNDAI MOTOR CO.

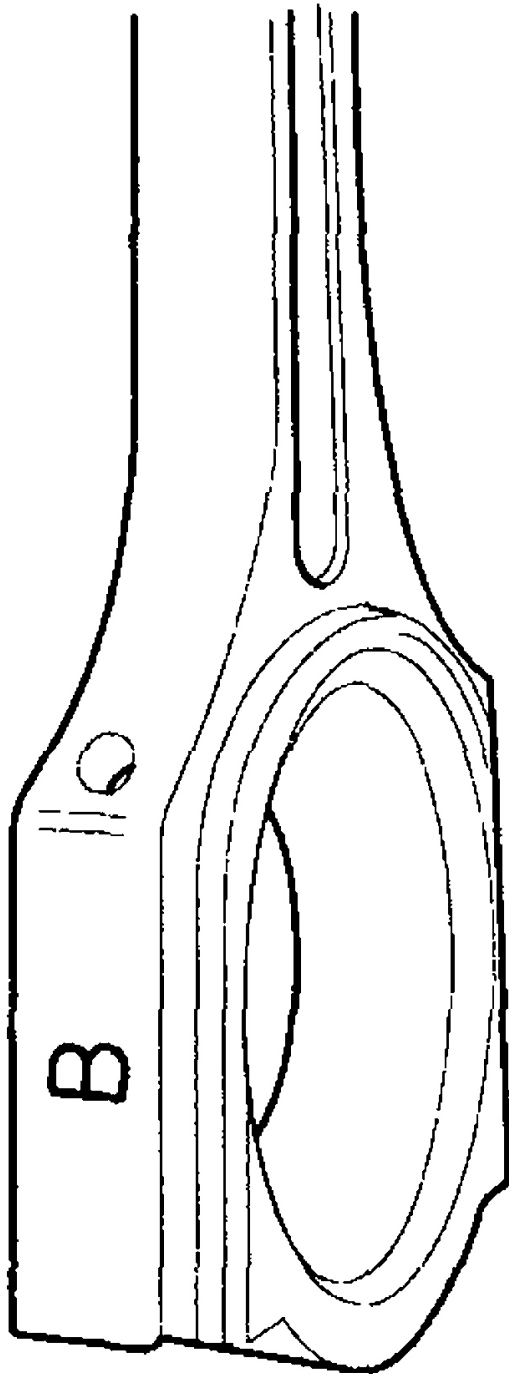
9. If the plastigage measures too wide or too narrow, remove the upper half of the bearing, install a new, complete bearing with the same color mark (select the color as shown in the next column), and recheck the clearance.

CAUTION: Do not file, shim, or scrape the bearings or the caps to adjust clearance.

10. If the plastigage shows the clearance is still incorrect, try the next larger or smaller bearing (the color listed above or below that one), and check clearance again.

NOTE: If the proper clearance cannot be obtained by using the appropriate larger or smaller bearings, replace the crankshaft and start over.

CAUTION: If the marks are indecipherable because of an accumulation of dirt and dust, do not scrub them with a wire brush or scraper. Clean them only with solvent or detergent.



G03848933

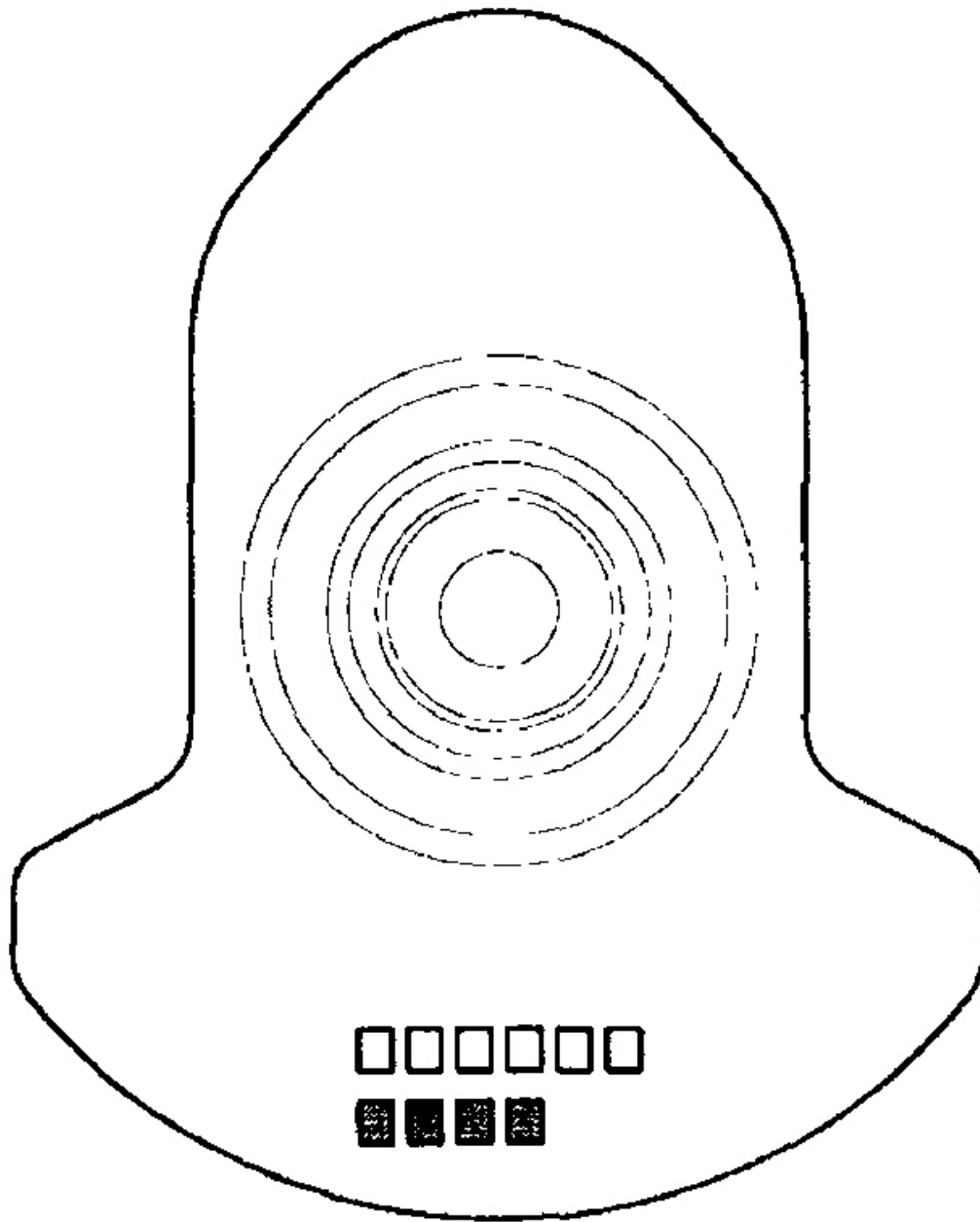
Fig. 124: Identifying Connecting Rod Mark Location
Courtesy of HYUNDAI MOTOR CO.

CONNECTING ROD INSIDE DIAMETER SPECIFICATIONS

2005 Hyundai Tiburon GT

2005 ENGINE Engine Mechanical System (G6BA-GSL 2.7L) - Tiburon

CLASS	MARK	INSIDE DIAMETER
0	A	51.000 ~ 51.006mm (2.0079 ~ 2.0081in.)
1	B	51.006 ~ 51.012mm (2.0081 ~ 2.0083in.)
2	C	51.012 ~ 51.018mm (2.0083 ~ 2.0086in.)



G03848934

Fig. 125: Identifying Crankshaft Pin Mark Location
Courtesy of HYUNDAI MOTOR CO.

CRANKSHAFT PIN OUTSIDE DIAMETER SPECIFICATIONS

2005 Hyundai Tiburon GT

2005 ENGINE Engine Mechanical System (G6BA-GSL 2.7L) - Tiburon

CLASS	MARK	OUTSIDE DIAMETER OF PIN
I	A	47.994 ~ 48.000mm (1.8895 ~ 1.8898in.)
II	B	47.988 ~ 47.994mm (1.8893 ~ 1.8895in.)
III	C	47.982 ~ 47.988mm (1.8890 ~ 1.8893in.)

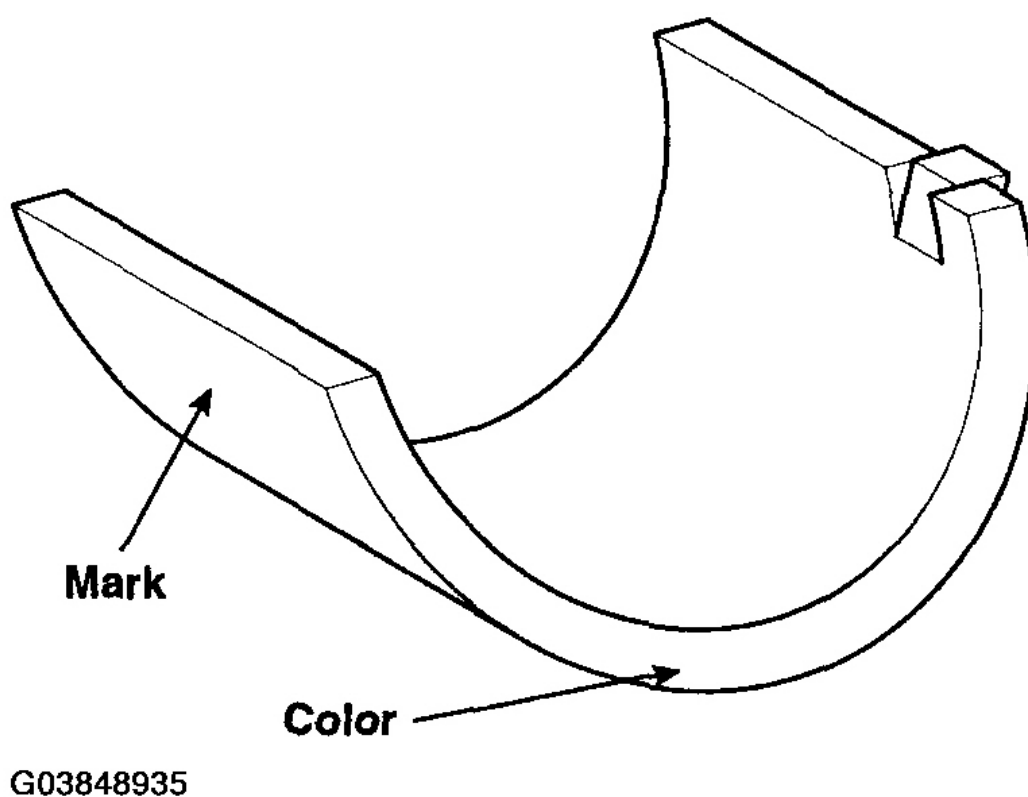


Fig. 126: Identifying Connecting Rod Bearing Identification Mark Location
Courtesy of HYUNDAI MOTOR CO.

CONNECTING ROD BEARING THICKNESS SPECIFICATIONS

CLASS	MARK	THICKNESS OF BEARING
A	BLUE	1.500 ~ 1.503mm (0.0590 ~ 0.0591in.)
B	BLACK	1.497 ~ 1.500mm (0.0589 ~ 0.0590in.)
C	NONE	1.494 ~ 1.497mm

2005 Hyundai Tiburon GT

2005 ENGINE Engine Mechanical System (G6BA-GSL 2.7L) - Tiburon

		(0.0588 ~ 0.0589in.)
D	GREEN	1.491 ~ 1.494mm (0.0587 ~ 0.0588in.)
E	YELLOW	1.488 ~ 1.491mm (0.0586 ~ 0.0587in.)

11. Selection

CONNECTING ROD IDENTIFICATION MARK AND ASSEMBLING CLASSIFICATION OF BEARING

CRANKSHAFT IDENTIFICATION MARK	CONNECTING ROD IDENTIFICATION MARK	ASSEMBLING CLASSIFICATION OF BEARING
I (A)	0 (A)	E (YELLOW)
	1 (B)	D (GREEN)
	2 (C)	C (NONE)
II (B)	0 (A)	D (GREEN)
	1 (B)	C (NONE)
	2 (C)	B (BLACK)
III (C)	0 (A)	C (NONE)
	1 (B)	B (BLACK)
	2 (C)	A (BLUE)

3. Check the crankshaft bearing oil clearance.

1. To check main bearing-to-journal oil clearance, remove the main caps and bearing halves.
2. Clean each main journal and bearing half with a clean shop towel.
3. Place one strip of plastigage across each main journal.
4. Reinstall the bearings and caps, then torque the bolts.

Tightening torque

M8

13 ~ 19Nm (130 ~ 190kgf.cm, 10 ~ 14lbf.ft) + 90°

M10

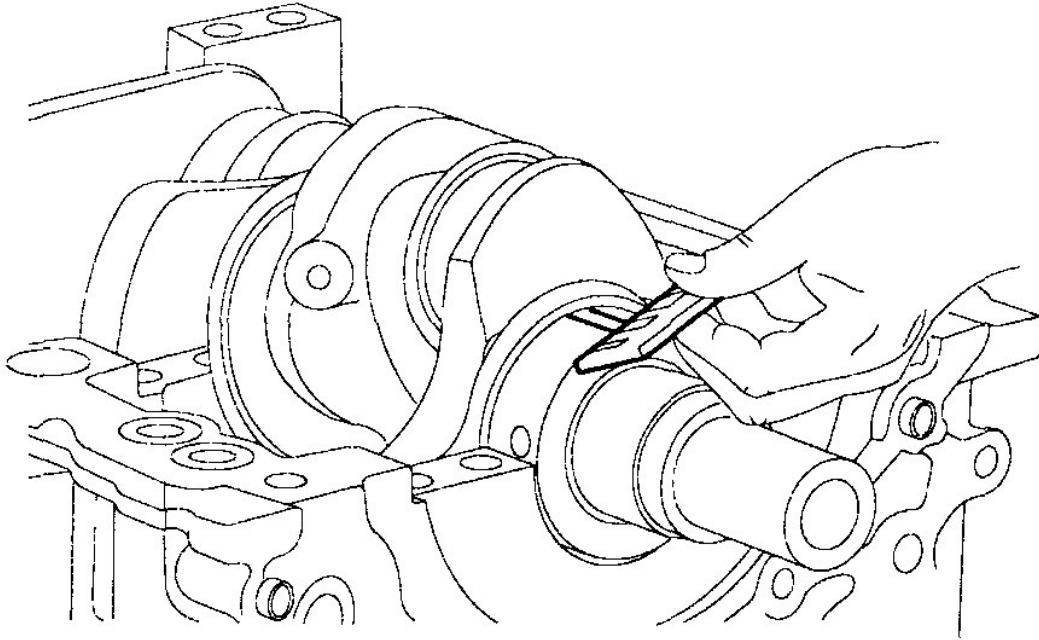
27 ~ 33Nm (270 ~ 330kgf.cm, 19.5 ~ 24lbf.ft) + 90°

NOTE: Do not turn the crankshaft.

5. Remove the cap and bearing again, and measure the widest part of the plastigage.

Standard oil clearance

0.004 ~ 0.022mm (0.00016 ~ 0.00087in.)



G03848936

Fig. 127: Measuring Widest Part Of Plastigage
Courtesy of HYUNDAI MOTOR CO.

6. If the plastigage measures too wide or too narrow, remove the upper half of the bearing, install a new, complete bearing with the same color mark (select the color as shown in the next column), and recheck the clearance.

CAUTION: Do not file, shim, or scrape the bearings or the caps to adjust clearance.

7. If the plastigage shows the clearance is still incorrect, try the next larger or smaller bearing (the color listed above or below that one), and check clearance again.

NOTE: If the proper clearance cannot be obtained by using the appropriate larger or smaller bearings, replace the crankshaft and start over.

CAUTION: If the marks are indecipherable because of an accumulation of dirt and dust, do not scrub them with a wire brush or scraper. Clean them only with solvent or detergent.

CONNECTING RODS

1. When reinstalling, make sure that cylinder numbers put on the connecting rod and cap at disassembly match. When a new connecting rod is installed, make sure that the notches for holding the bearing in place are on the same side.
2. Replace the connecting rod if it is damaged on the thrust faces at either end. Also if step wear or a severely rough surface of the inside diameter of the small end is apparent, the rod must be replaced as well.
3. Using a connecting rod aligning tool, check the rod for bend and twist. If the measured value is close to the repair limit, correct the rod by a press. Any connecting rod that has been severely bent or distorted should be replaced.

Allowable bend of connecting rod

0.05mm/100mm (0.0020 in./3.94 in.) or less

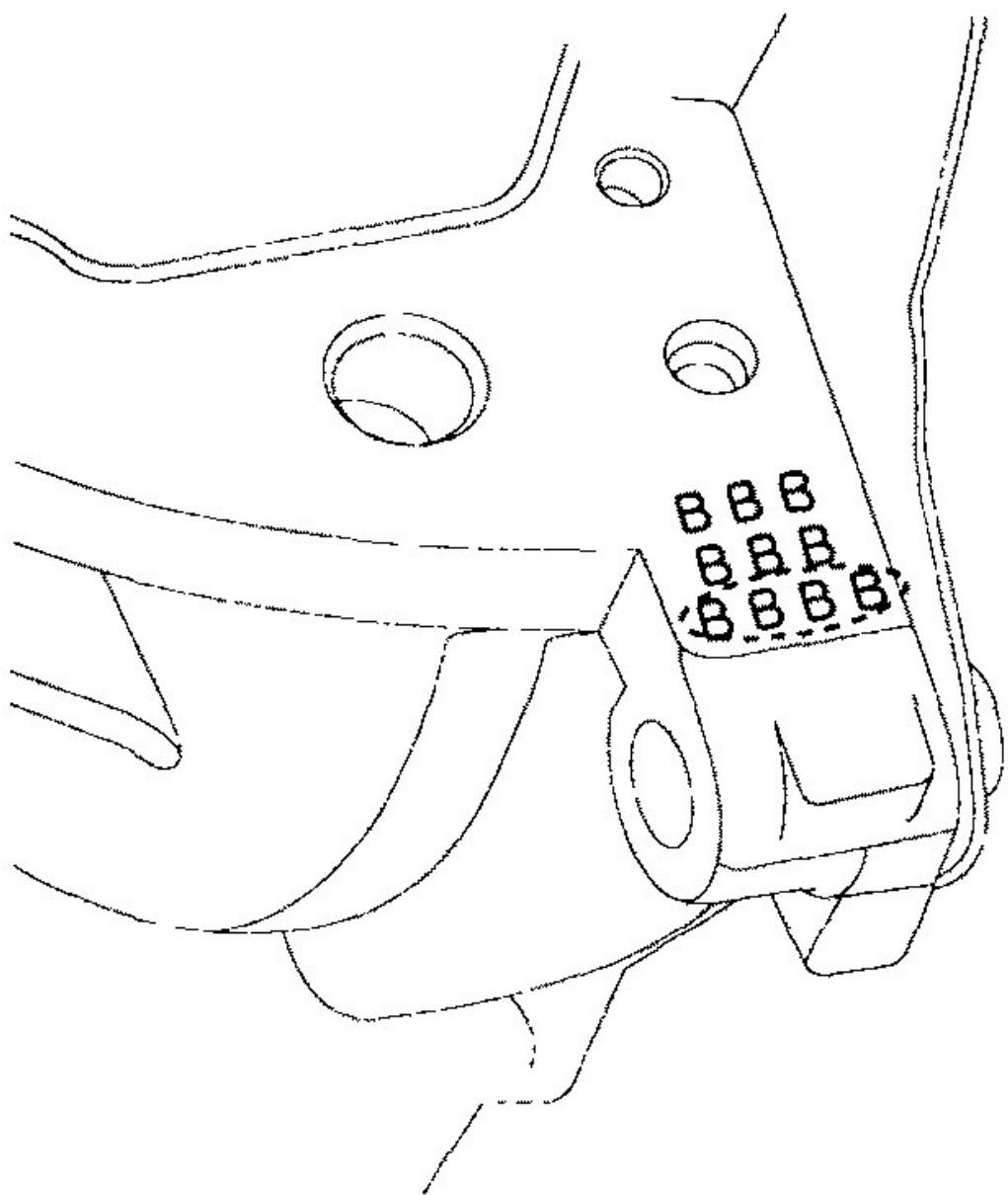
Allowable twist of connecting rod

0.1mm/100mm (0.0039 in./3.94 in.) or less

Crankshaft bore mark location

Letters have been stamped on the end of the block as a mark for the size of each of the 4 main journal bores.

Use them, and the numbers or bar stamped on the crank (marks for main journal size), to choose the correct bearings.



G03848937

Fig. 128: Identifying Crankshaft Bore Mark Location
Courtesy of HYUNDAI MOTOR CO.

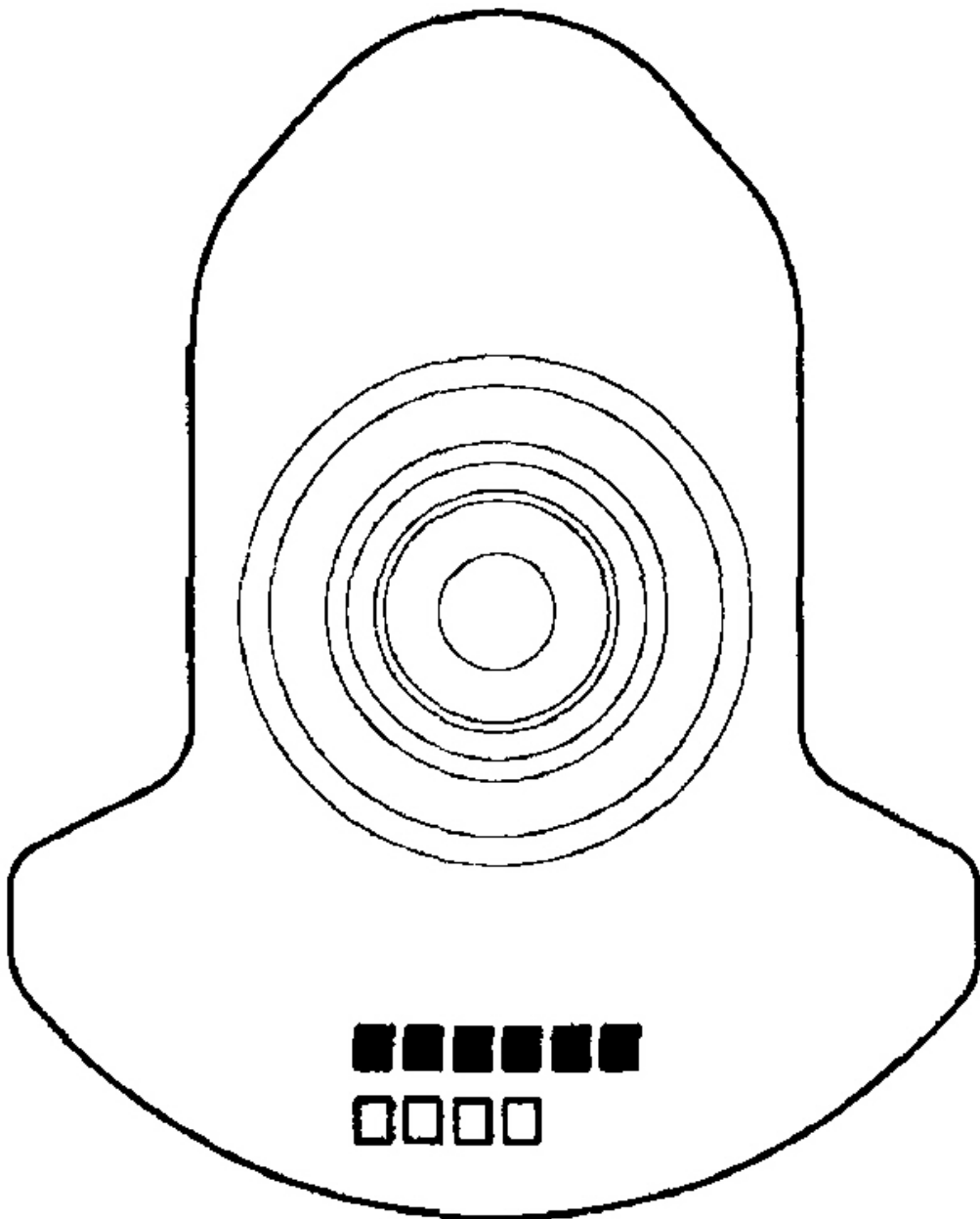
CRANKSHAFT BORE INSIDE DIAMETER SPECIFICATIONS

CLASS	MARK	INSIDE DIAMETER
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2005 Hyundai Tiburon GT

2005 ENGINE Engine Mechanical System (G6BA-GSL 2.7L) - Tiburon

a	A	66.000 ~ 66.006mm (2.5984 ~ 2.5986in.)
b	B	66.006 ~ 66.012mm (2.5986 ~ 2.5989in.)
c	C	66.012 ~ 66.018mm (2.5989~2.5991 in.)



G03848938

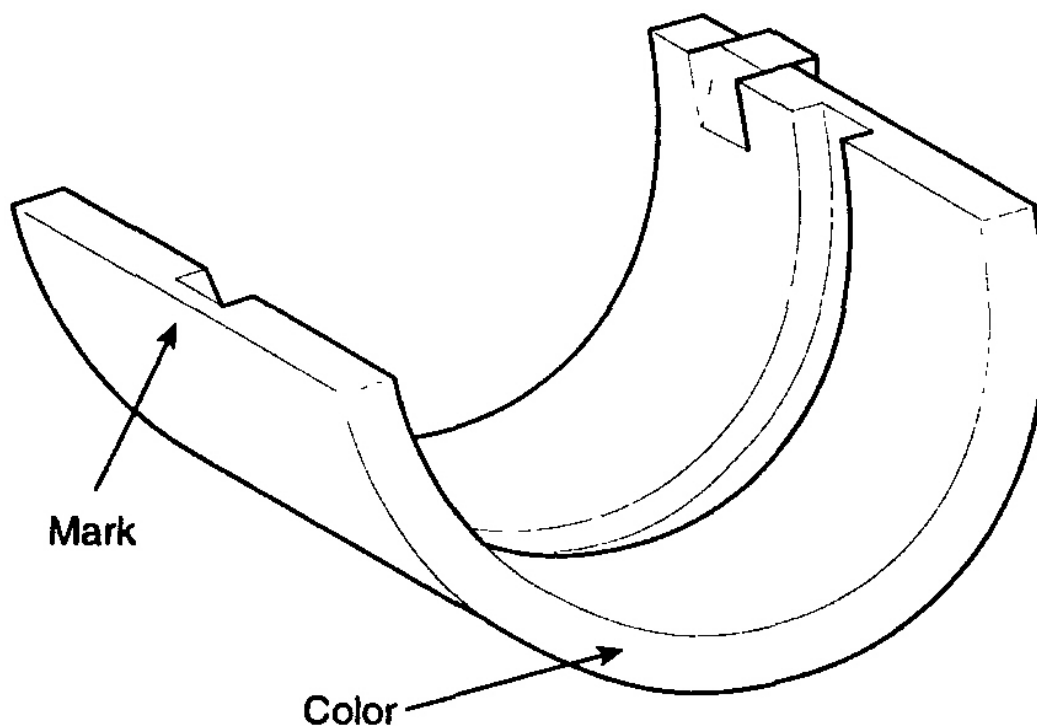
Fig. 129: Identifying Crankshaft Journal Mark Location
Courtesy of HYUNDAI MOTOR CO.

CRANKSHAFT JOURNAL OUTSIDE DIAMETER SPECIFICATIONS

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CLASS	MARK	OUTSIDE DIAMETER OF JOURNAL
I	A	61.994 ~ 62.000mm (2.4407 ~ 2.4409in.)
II	B	61.988 ~ 61.994mm (2.4405 ~ 2.4407in.)
III	C	61.982 ~ 61.988mm (2.4402 ~ 2.4405in.)



G03848939

Fig. 130: Identifying Crankshaft Bearing Identification Mark Location
Courtesy of HYUNDAI MOTOR CO.

CRANKSHAFT BEARING THICKNESS SPECIFICATIONS

CLASS	MARK	THICKNESS OF BEARING
A	BLUE	2.007 ~ 2.010mm (0.0790 ~ 0.0791in.)
B	BLACK	2.004 ~ 2.007mm (0.0789 ~ 0.0790in.)
C	NONE	2.001 ~ 2.004mm

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		(0.0788 ~ 0.0789in.)
D	GREEN	1.998 ~ 2.001mm (0.0787 ~ 0.788in.)
E	YELLOW	1.995 ~ 1.998mm (0.0785 ~ 0.0787in.)

CRANKSHAFT BORE IDENTIFICATION MARK AND ASSEMBLING CLASSIFICATION OF BEARING

CRANKSHAFT IDENTIFICATION MARK	CRANKSHAFT BORE IDENTIFICATION MARK	ASSEMBLING CLASSIFICATION OF BEARING
I (A)	a (A)	E (YELLOW)
	b (B)	D (GREEN)
	c (C)	C (NONE)
II (B)	a (A)	D (GREEN)
	b (B)	C (NONE)
	c (C)	B (BLACK)
III (C)	a (A)	C (NONE)
	b (B)	B (BLACK)
	c (C)	A (BLUE)

4. Check crankshaft end play.

Using a dial indicator, measure the thrust clearance while prying the crankshaft back and forth with a screwdriver.

Standard end play

0.07 ~ 0.25mm (0.0027 ~ 0.0098in.)

Limit: 0.30mm (0.0118in.)

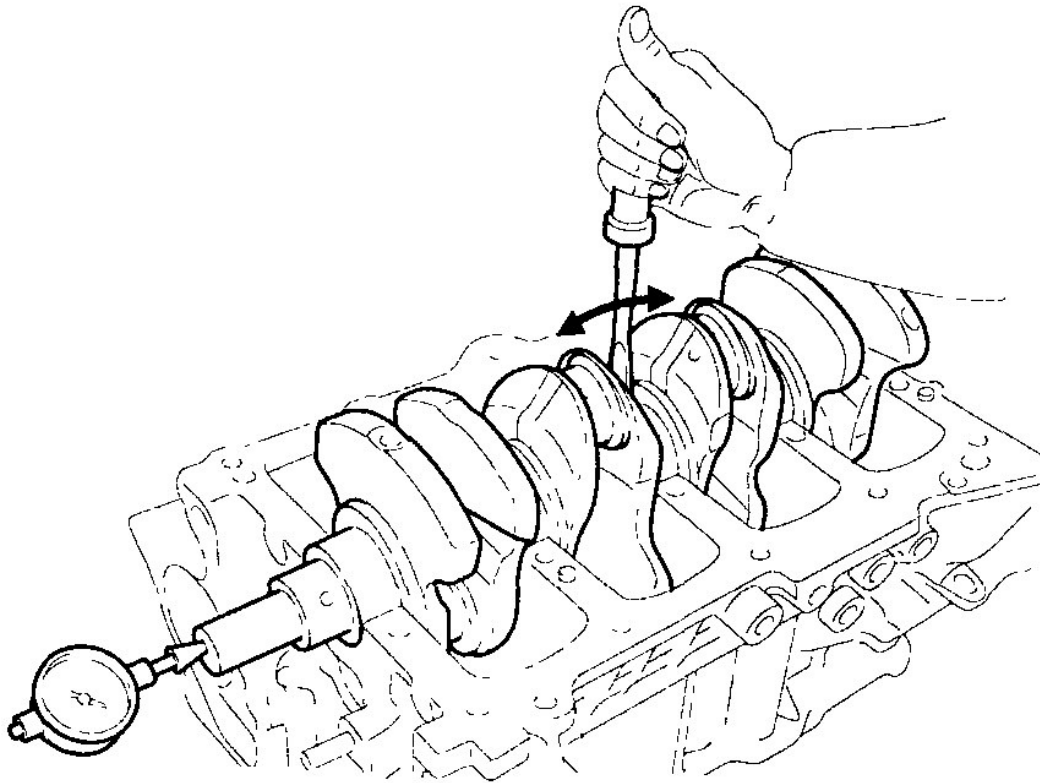
**G03848940**

Fig. 131: Using Dial Indicator To Measure Crankshaft End Play
Courtesy of HYUNDAI MOTOR CO.

If the end play is greater than maximum, replace the thrust bearings as a set.

Thrust bearing thickness

1.925 ~ 1.965mm (0.076 ~ 0.077in.)

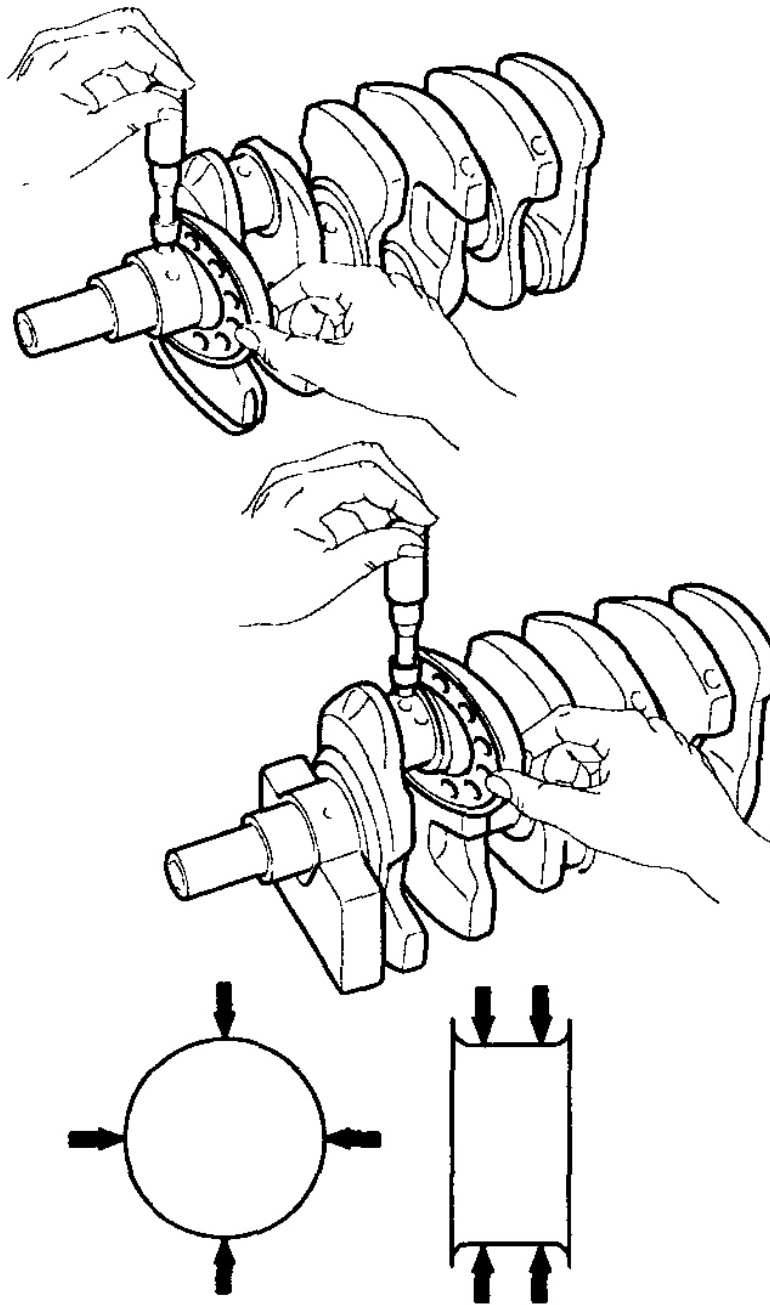
5. Inspect main journals and crank pins Using a micrometer, measure the diameter of each main journal and crank pin.

Main journal diameter

61.982 ~ 62.000mm (2.4402 ~ 2.4409in.)

Crank pin diameter

47.982 ~ 48.000mm (1.8890 ~ 1.8898in.)



G03848941

Fig. 132: Measuring Diameter Of Each Main Journal And Crank Pin Using Micrometer
 Courtesy of HYUNDAI MOTOR CO.

CYLINDER BLOCK

1. Remove gasket material.

Using a gasket scraper, remove all the gasket material from the top surface of the cylinder block.

2. Clean cylinder block

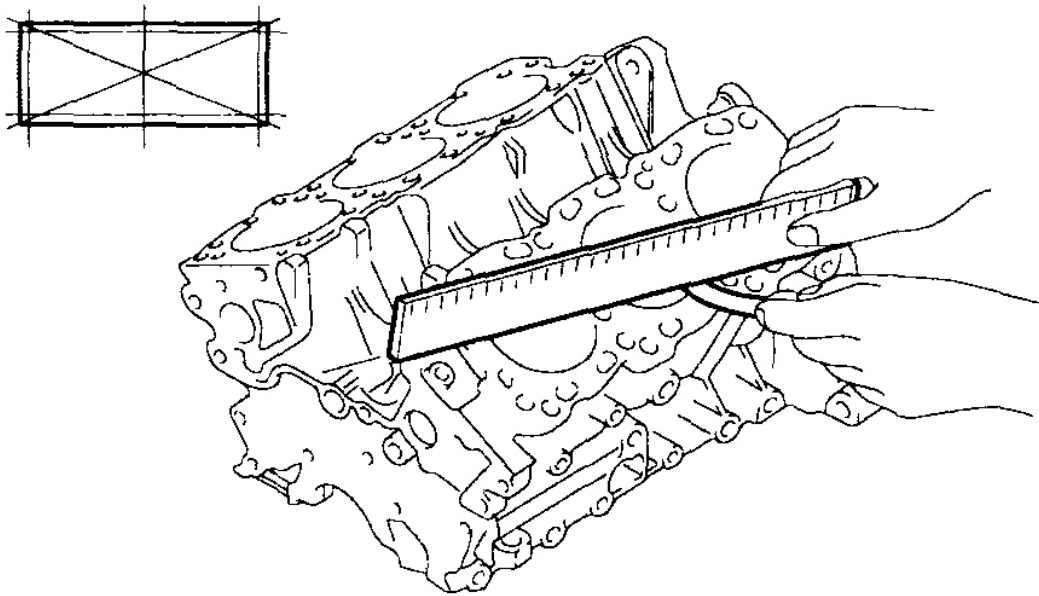
Using a soft brush and solvent, thoroughly clean the cylinder block.

3. Inspect top surface of cylinder block for flatness. Using a precision straight edge and feeler gauge, measure the surface contacting the cylinder head gasket for warpage.

Flatness of cylinder block gasket surface

Standard: Less than 0.03mm (0.0012 in.)

Limit: 0.05 mm (0.0020 in.)



G03848942

Fig. 133: Measuring Surface Contacting Cylinder Head Gasket For Warpage Using Precision Straight Edge And Feeler Gauge
Courtesy of HYUNDAI MOTOR CO.

4. Inspect cylinder bore diameter

Visually check the cylinder for vertical scratches.

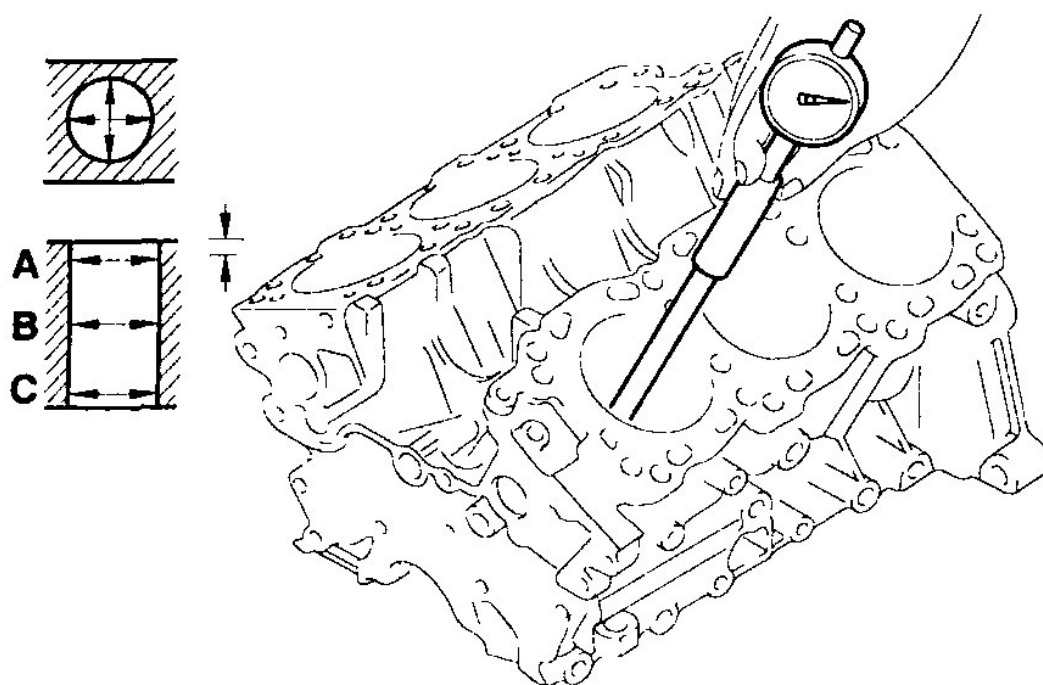
If deep scratches are present, replace the cylinder liner.

5. Inspect cylinder bore diameter

Using a cylinder bore gauge, measure the cylinder bore diameter at position A, B and C in the thrust and axial directions.

Standard diameter

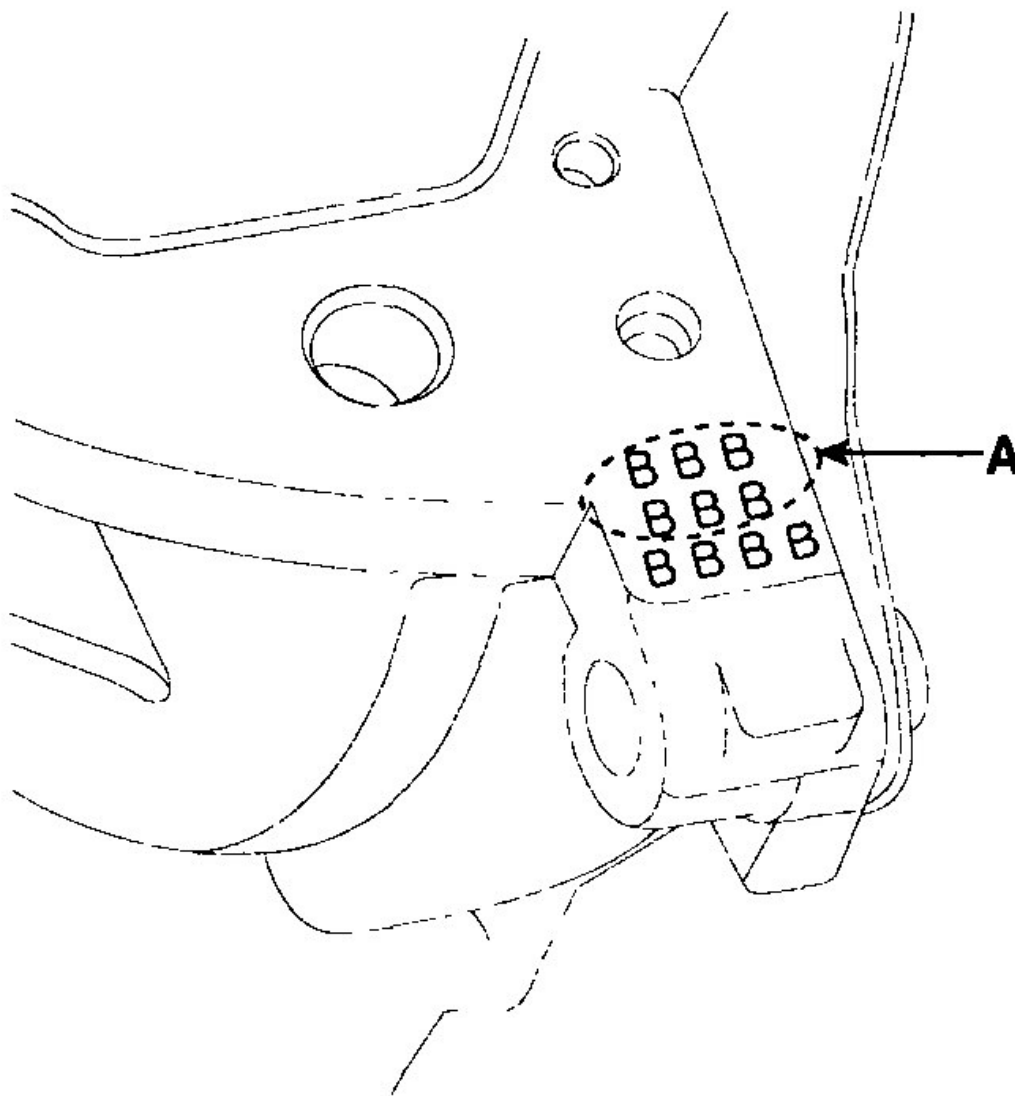
86.70 ~ 86.73mm (3.4134 ~ 3.4145in.)



G03848943

Fig. 134: Measuring Cylinder Bore Diameter Using Cylinder Bore Gauge
Courtesy of HYUNDAI MOTOR CO.

6. Check the cylinder bore size code (A) on the cylinder block bottom face.



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Fig. 135: Checking Cylinder Bore Size Code On Cylinder Block Bottom Face
 Courtesy of HYUNDAI MOTOR CO.

CYLINDER BORE INNER DIAMETER SPECIFICATION

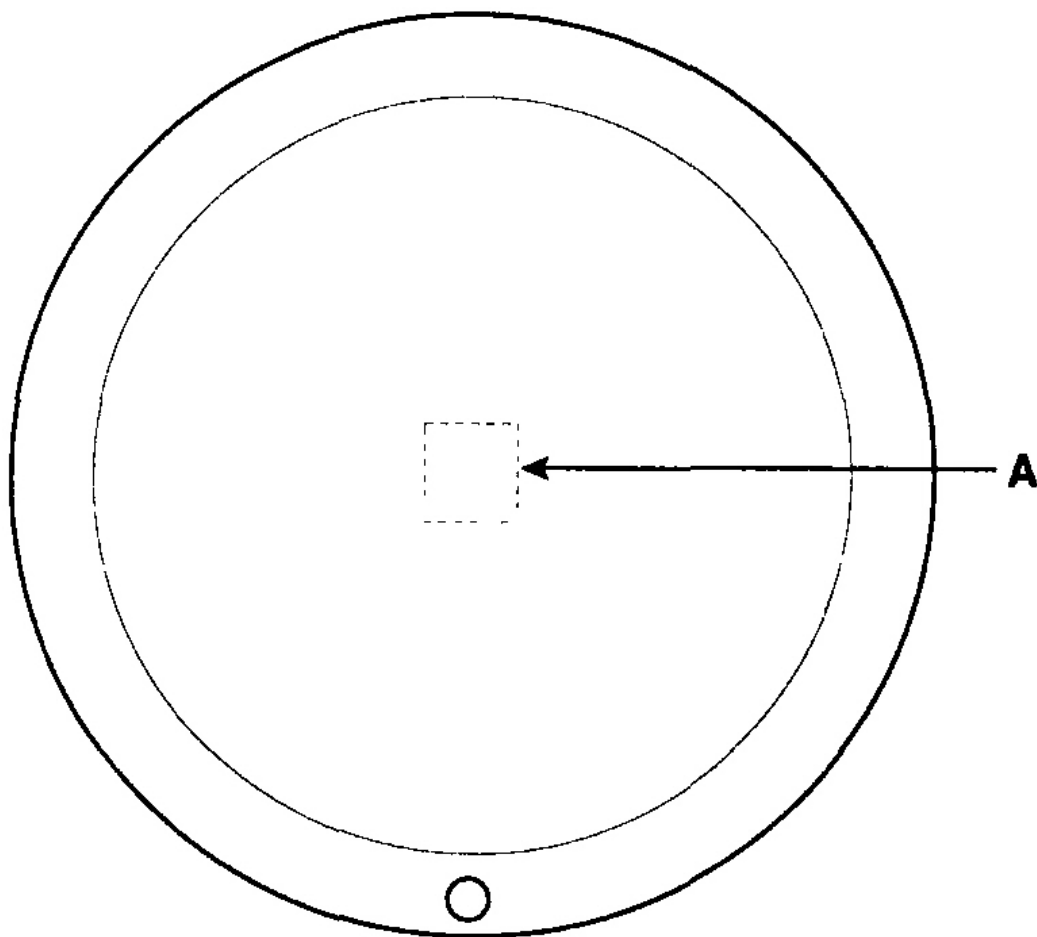
Class	Cylinder bore inner diameter	Size code
A	86.70 ~ 86.71mm (3.4133 ~ 3.4137in.)	A
B	86.71 ~ 86.72mm (3.4137-3.4141	B

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	in.)	
C	86.72 ~ 86.73mm (3.4141 ~ 3.4145in.)	C

7. Check the piston size code (A) on the piston top face.



G03848945

Fig. 136: Checking Piston Size Code On Piston Top Face
Courtesy of HYUNDAI MOTOR CO.

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

PISTON DIAMETER SPECIFICATIONS

Class	Piston diameter	Size code
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A	86.68 ~ 86.69mm (3.4126 ~ 3.4130in.)	A
B	86.69 ~ 86.70mm (3.4130 ~ 3.4133in.)	None
C	86.70 ~ 86.71 mm (3.4133 ~ 3.4137in.)	C

8. Select the piston related to cylinder bore class.

Clearance: 0.01 ~ 0.03mm (0.0004 ~ 0.0012in.)

BORING CYLINDER

1. Oversize pistons should be selected according to the largest bore cylinder.

CYLINDER BORE SIZE SPECIFICATIONS

Identification Mark	Size
0.25	0.25mm (0.010in.)
0.50	0.50mm (0.0250in.)

NOTE: The size of piston is stamped on top of the piston.

2. Measure the outside diameter of the piston to be used.
3. According to the measured O.D., calculate the new bore size.

New bore size = Piston O.D + 0.01 to 0.03mm (0.0004 to 0.0012 in.) (clearance between piston and cylinder) - 0.01 mm (0.0004 in.) (honing margin.)

4. Bore each of the cylinders to the calculated size.

CAUTION: To prevent distortion that may result from temperature rise during honing, bore the cylinder holes in the firing order.

5. Hone the cylinders, finishing them to the proper dimension (piston outside diameter + gap with cylinder).
6. Check the clearance between the piston and cylinder.

Standard: 0.01 ~ 0.03mm (0.0004 ~ 0.0012 in.)

NOTE: When boring the cylinders, finish all of the cylinders to the same oversize. Do not bore only one cylinder to the oversize.

PISTON AND RINGS

1. Clean piston

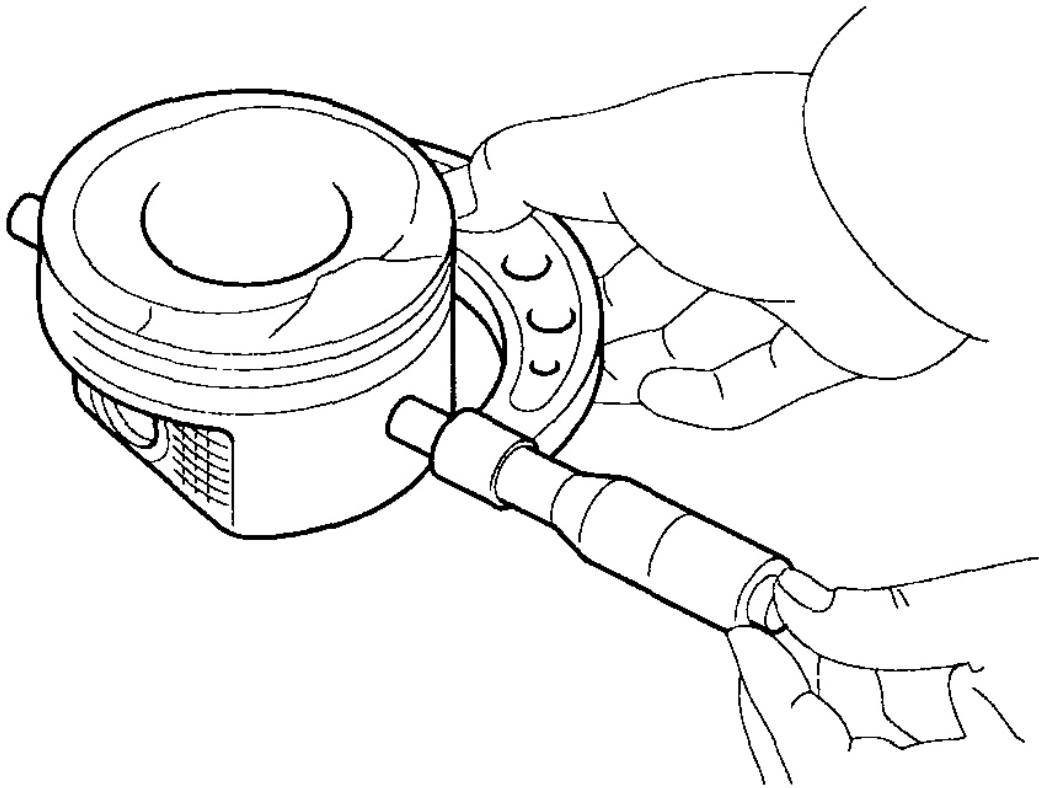
1. Using a gasket scraper, remove the carbon from the piston top.
2. Using a groove cleaning tool or broken ring, clean the piston ring grooves.
3. Using solvent and a brush, thoroughly clean the piston.

NOTE: **Do not use a wire brush.**

2. The standard measurement of the piston outside diameter is taken 38.5mm (1.516in.) from the top land of the piston.

Standard diameter

86.68 ~ 86.71mm (3.4126 ~ 3.4138in.)



G03848946

Fig. 137: Measuring Piston Outside Diameter
Courtesy of HYUNDAI MOTOR CO.

3. Calculate the difference between the cylinder bore diameter and the piston diameter.

Piston-to-cylinder clearance

0.01 ~ 0.03mm (0.0004 ~ 0.0012in.)

4. Inspect the piston ring side clearance.

Using a feeler gauge, measure the clearance between new piston ring and the wall of the ring groove.

Piston ring side clearance

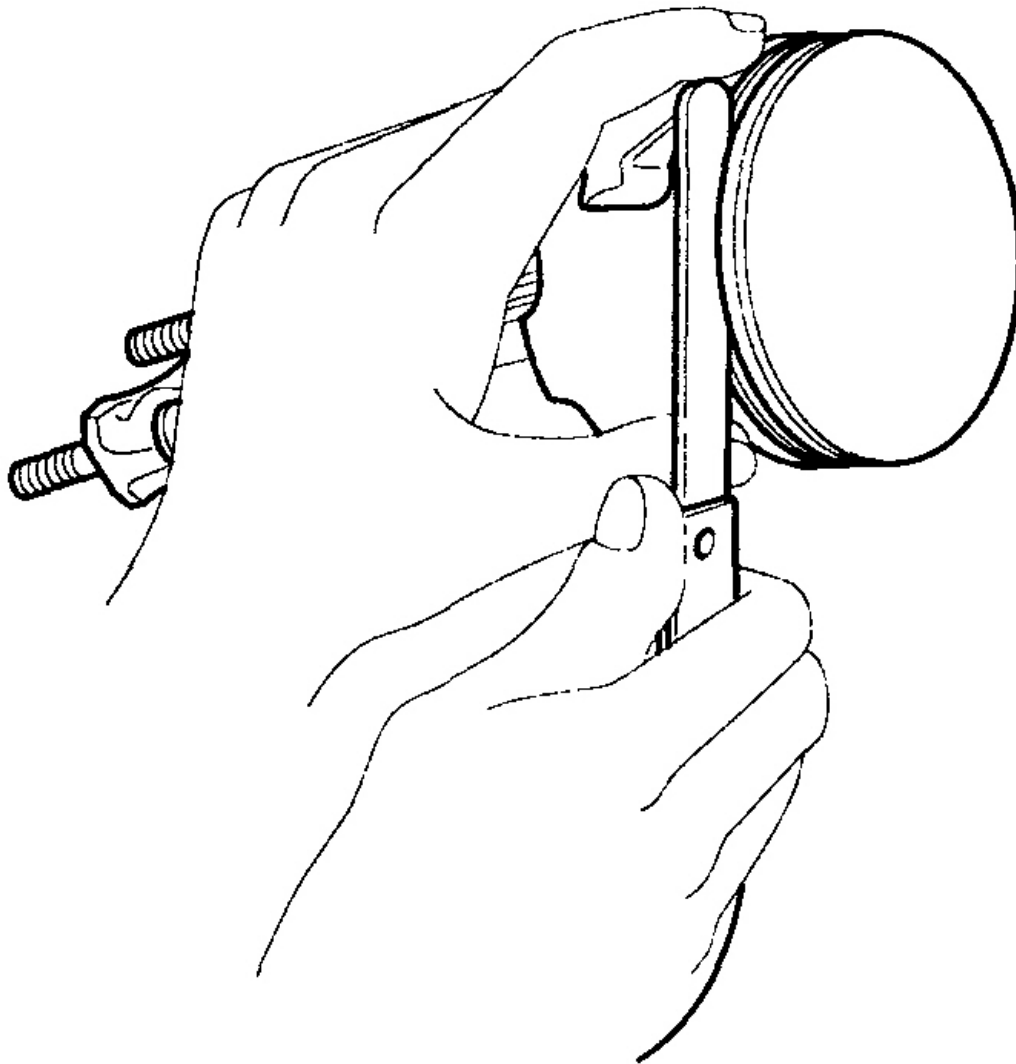
No. 1: 0.04 ~ 0.08 mm (0.0016 ~ 0.0031 in.)

No. 2: 0.03 ~ 0.07 mm (0.0012 ~ 0.0028 in.)

Limit

No. 1: 0.1mm (0.004in.)

No. 2: 0.1mm (0.004in.)



G03848947

Fig. 138: Using Feeler Gauge To Measure Clearance Between New Piston Ring And Wall Of Ring Groove

Courtesy of HYUNDAI MOTOR CO.

If the clearance is greater than maximum, replace the piston.

5. Inspect piston ring end gap.

To measure the piston ring end gap, insert a piston ring into the cylinder bore. Position the ring at right angles to 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. If the gap is too large, recheck the cylinder bore diameter against the wear limits on **BORING CYLINDER**. If the bore is over the service limit, the cylinder block must be rebored. (See **BORING CYLINDER**).

Piston ring end gap

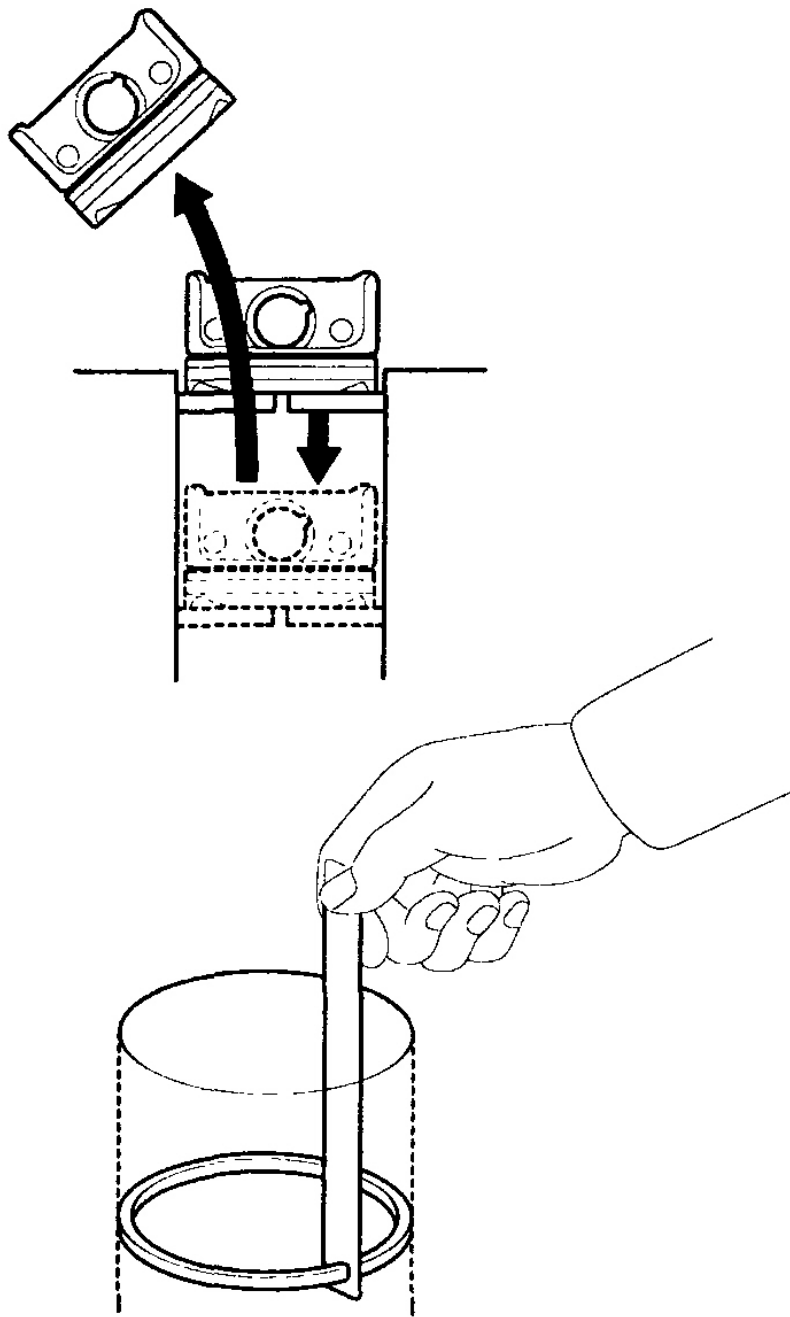
Standard

No.1: 0.20 ~ 0.35mm (0.0079 ~ 0.0138in.)

No.2: 0.37 ~ 0.52mm (0.0146 ~ 0.0205in.)

Limit

Oil ring: 0.2 ~ 0.7mm (0.0079 - 0.0276in.)



G03848948

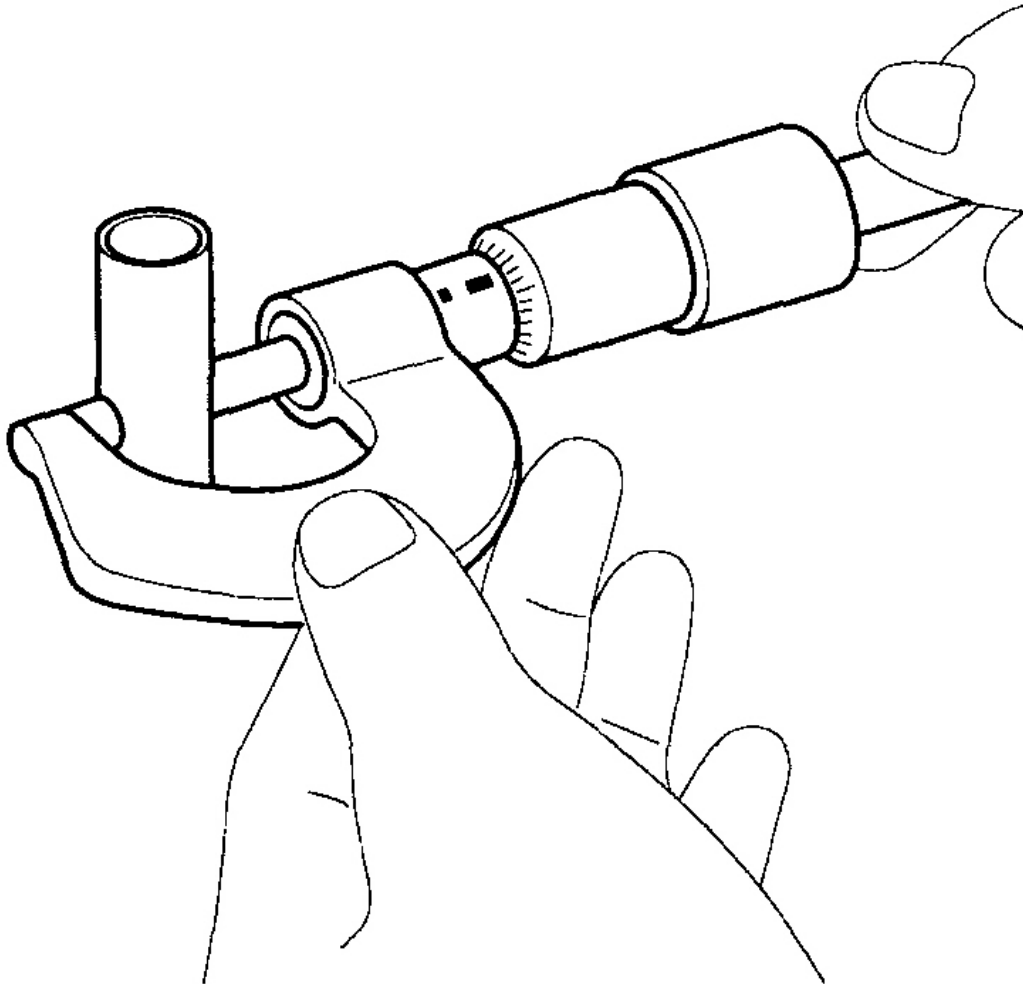
Fig. 139: Measuring Piston Ring End Gap
Courtesy of HYUNDAI MOTOR CO.

PISTON PINS

1. Measure the diameter of the piston pin.

Piston pin diameter

21.001 ~ 21.007mm (0.8268 ~ 0.8270in.)



G03848949

Fig. 140: Measuring Diameter Of Piston Pin
Courtesy of HYUNDAI MOTOR CO.

2. Measure the piston pin-to-piston clearance.

Piston pin-to-piston clearance

0.011 ~ 0.018mm (0.00043 ~ 0.00071 in.)

3. Check the difference between the piston pin diameter and the connecting rod small end diameter.

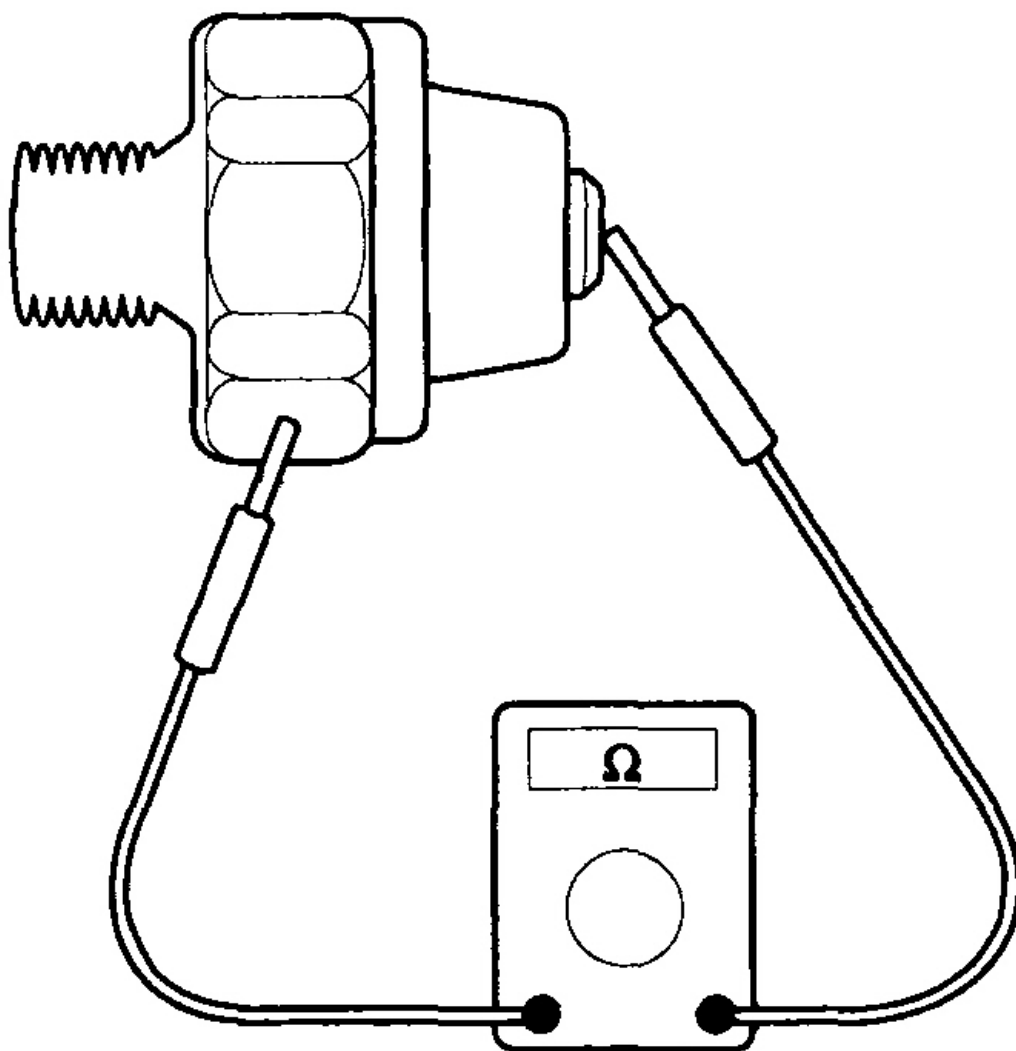
Piston pin-to-connecting rod interference

0.016 ~ 0.033mm (0.00063 ~ 0.00130in.)

OIL PRESSURE SWITCH

1. Check the continuity between the terminal and the body with an ohmmeter.

If there is no continuity, replace the oil pressure switch.

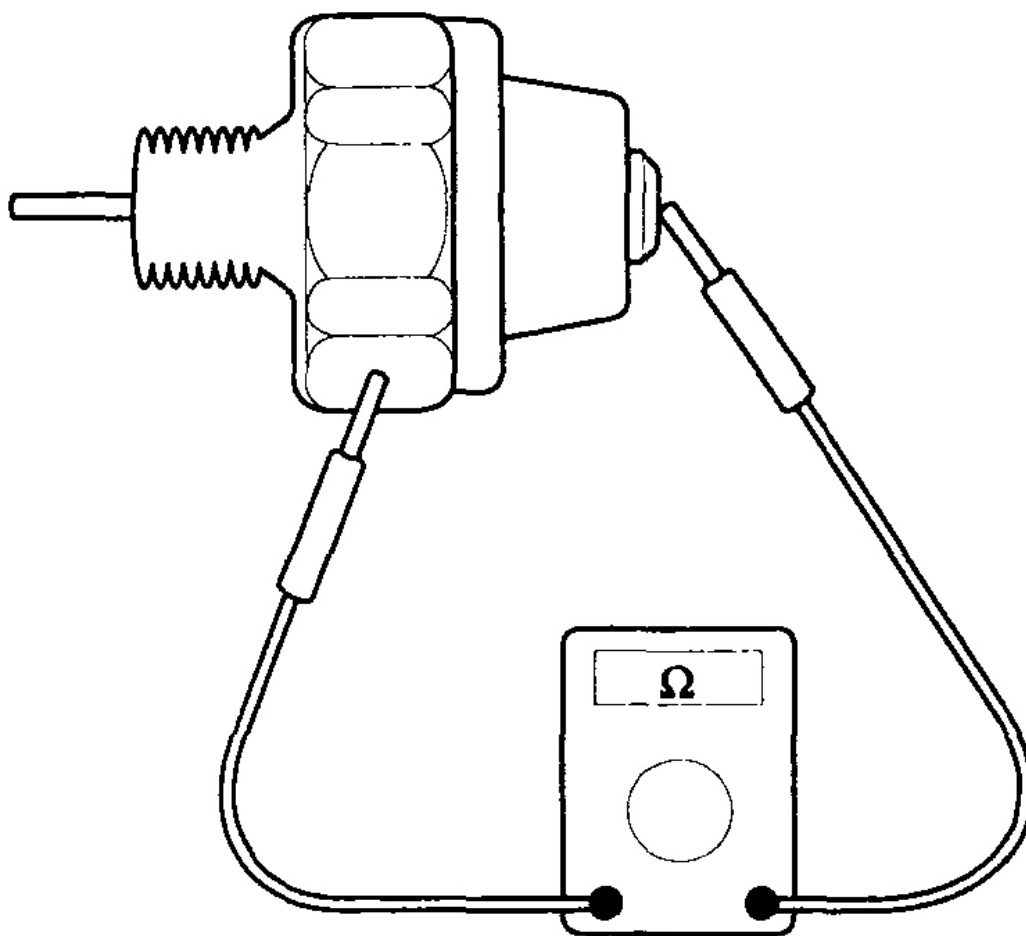


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Fig. 141: Checking Continuity Between Terminal And Body With An Ohmmeter
Courtesy of HYUNDAI MOTOR CO.

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 50kpa (7psi) vacuum is applied through the oil hole, the switch is operating properly.

Check for air leakage. If air leaks, the diagram is broken. Replace it.



G03848951

Fig. 142: Checking Continuity Between Terminal And Body When Fine Wire Is Pushed
Courtesy of HYUNDAI MOTOR CO.

REASSEMBLY

NOTE:

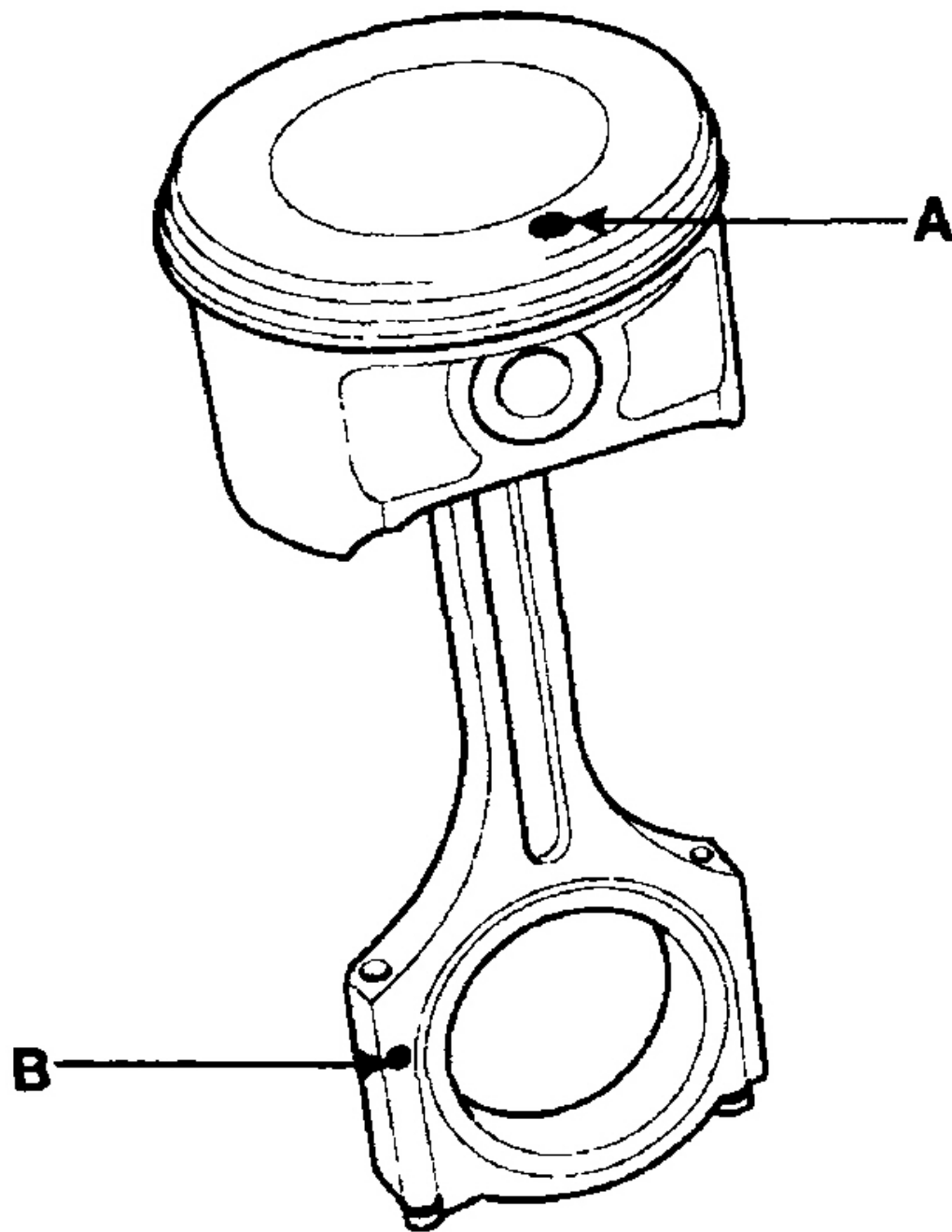
- Thoroughly clean all parts to assembled.
- Before installing the parts, apply fresh engine oil to all sliding and rotating surfaces.
- Replace all gaskets, O-rings and oil seals with new parts.

1. Assemble piston and connecting rod.
 1. Use a hydraulic press for installation.

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2. The piston front mark (A) and the connecting rod front mark (B) must face the timing belt side of the engine.



G03848952

Fig. 143: Identifying Piston Front Mark And Connecting Rod Front Mark
Courtesy of HYUNDAI MOTOR CO.

2. Install piston rings.

1. Install the oil ring expander and 2 side rails by hand.
2. Using a piston ring expander, install the 2 compression rings with the code mark facing upward.
3. Position the piston rings so that the ring ends are as shown.

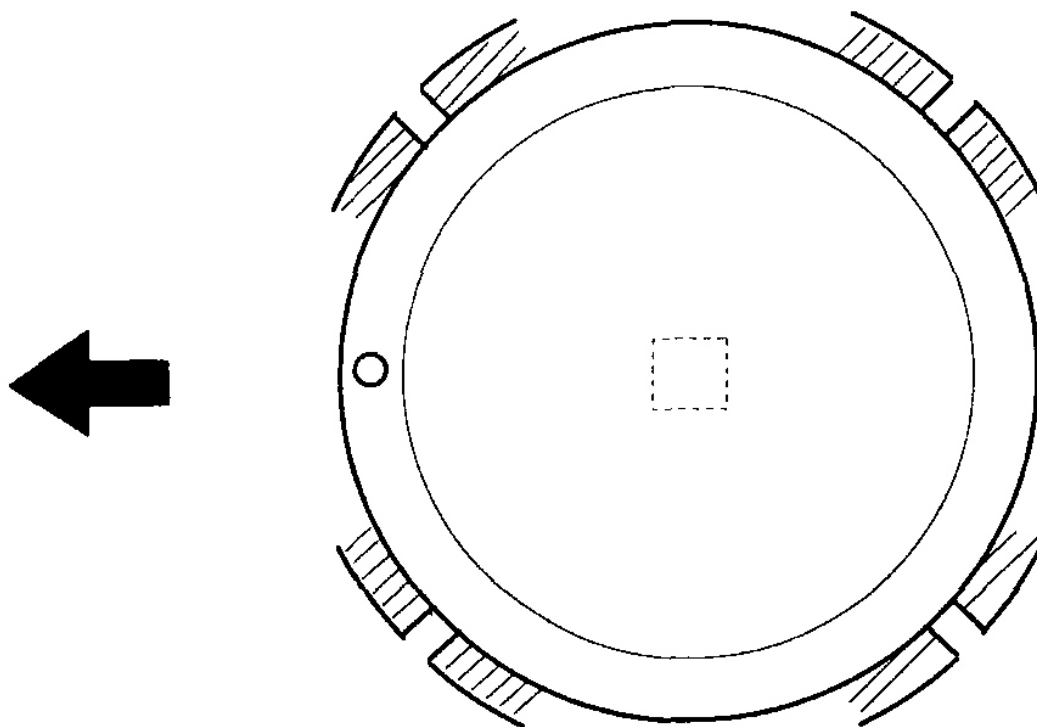
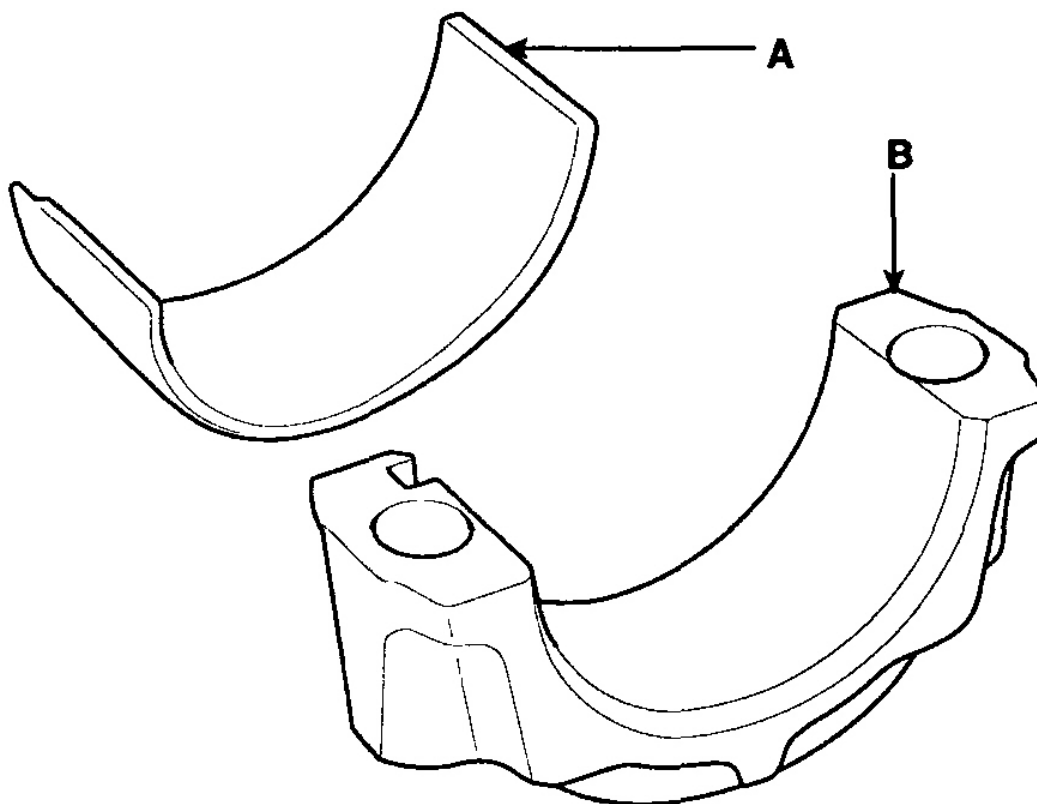
**G03848953**

Fig. 144: Identifying Piston Ring Ends Position
Courtesy of HYUNDAI MOTOR CO.

3. Install connecting rod bearings.

1. Align the bearing claw with the groove of the connecting rod or connecting rod cap.
2. Install the bearings in the connecting rod and connecting rod cap.



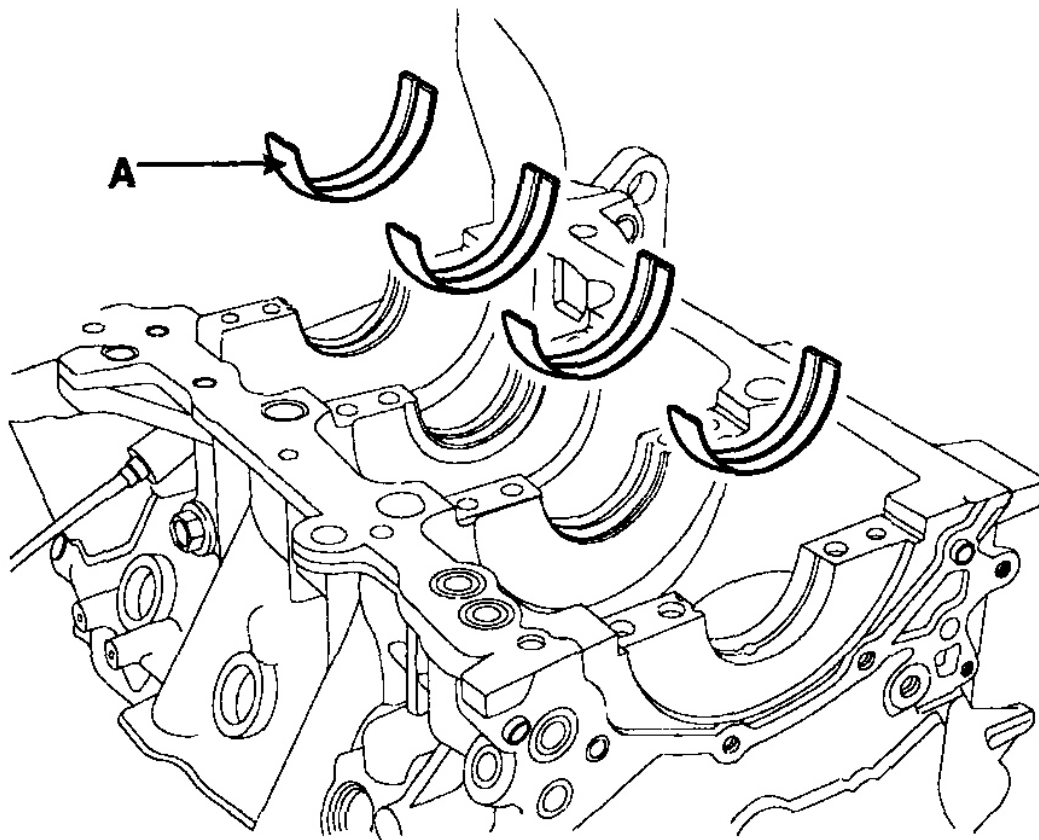
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Fig. 145: Installing Connecting Rod Bearings
Courtesy of HYUNDAI MOTOR CO.

4. Install main bearings.

NOTE: Upper 1, 2, 3, 4 bearings have an oil groove or oil holes; Lower bearings do not.

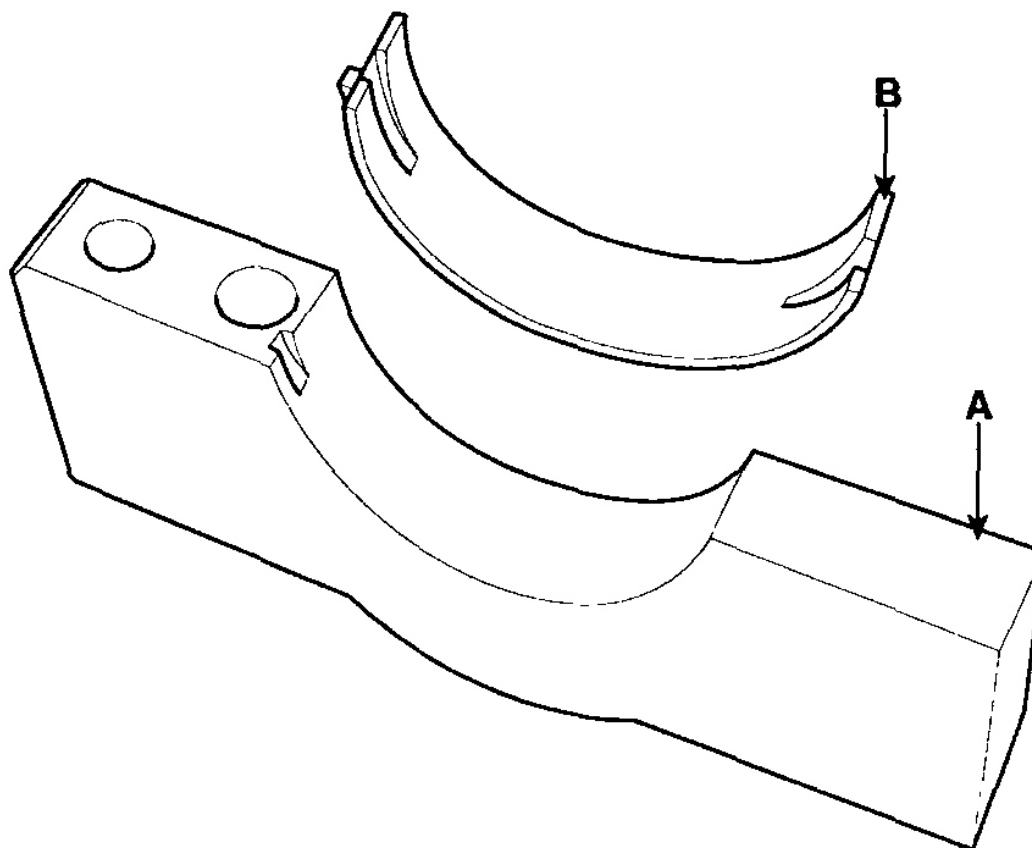
1. Align the bearing claw with the claw groove of the cylinder block, push in the 4 upper bearings (A).



G03848955

Fig. 146: Pushing In 4 Upper Bearings
Courtesy of HYUNDAI MOTOR CO.

2. Align the bearing claw with the claw groove of the main bearing cap (A), and push in the 4 lower bearings (B).

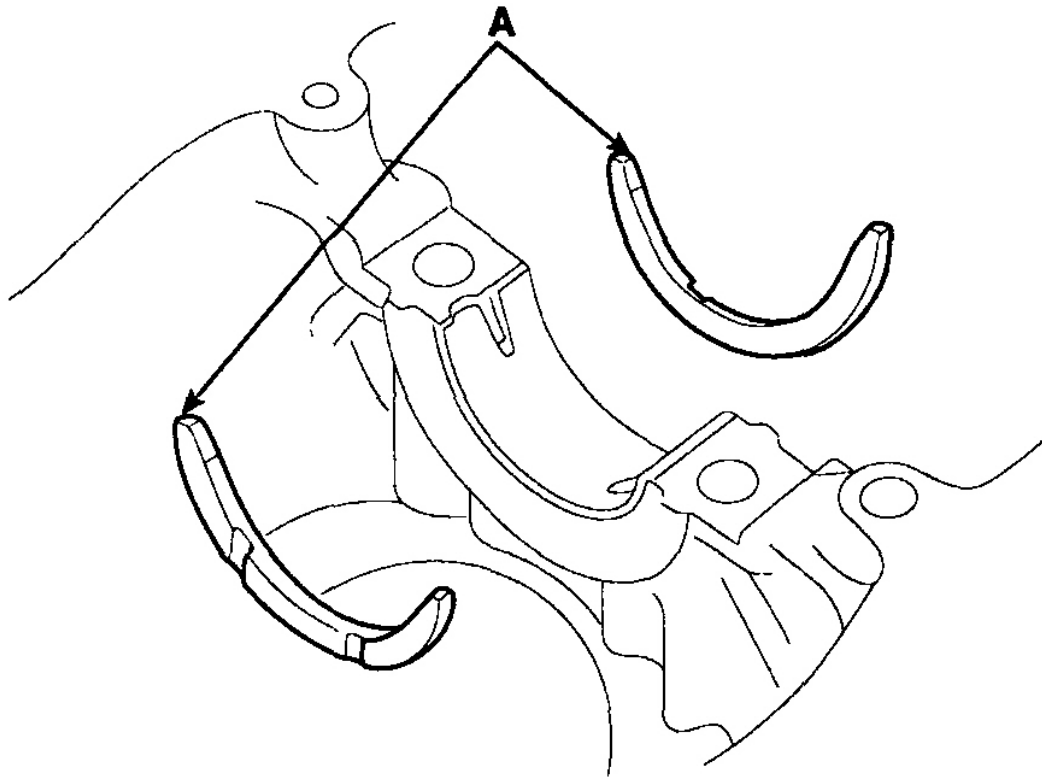


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Fig. 147: Aligning Bearing Claw With The Claw Groove Of The Main Bearing Cap And Push In 4 Lower Bearings
Courtesy of HYUNDAI MOTOR CO.

5. Install thrust bearings.

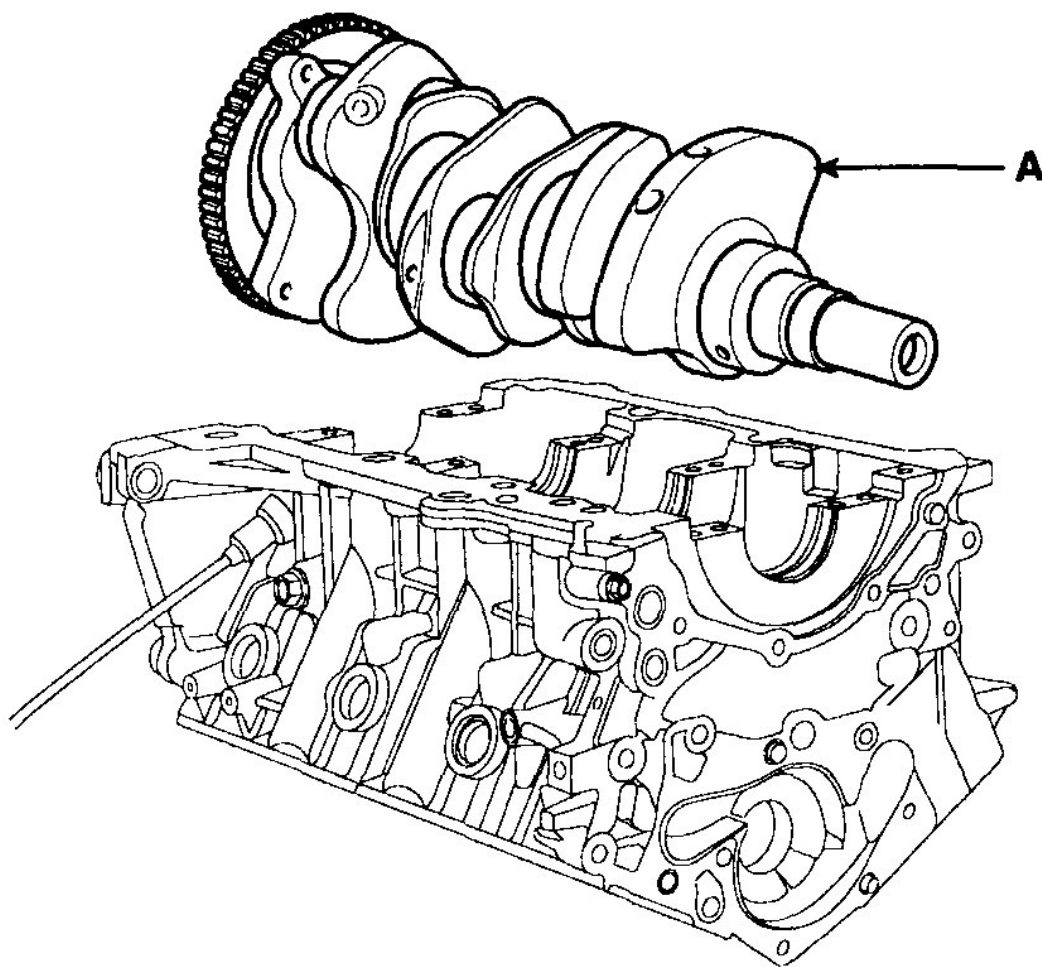
Install the 2 thrust bearings (A) under the No. 3 journal position of the cylinder block with the oil grooves facing outward.



G03848957

Fig. 148: Installing 2 Thrust Bearings Under No. 3 Journal Position Of Cylinder Block With Oil Grooves Facing Outward
Courtesy of HYUNDAI MOTOR CO.

6. Place crankshaft (A) on the cylinder block.



G03848958

Fig. 149: Placing Crankshaft On Cylinder Block
Courtesy of HYUNDAI MOTOR CO.

7. Place main bearing caps on cylinder block.
8. Install main bearing cap bolts.

NOTE:

- The main bearing cap bolts are tightened in 2 progressive steps.
- If any of the bearing cap bolts is broken or deformed, replace it.

Tightening torque

Main bearing cap bolt

M8

13 ~ 19Nm (130 ~ 190kgf.cm, 10 ~ 14lbf.ft) + 90° ~ 94°

M10

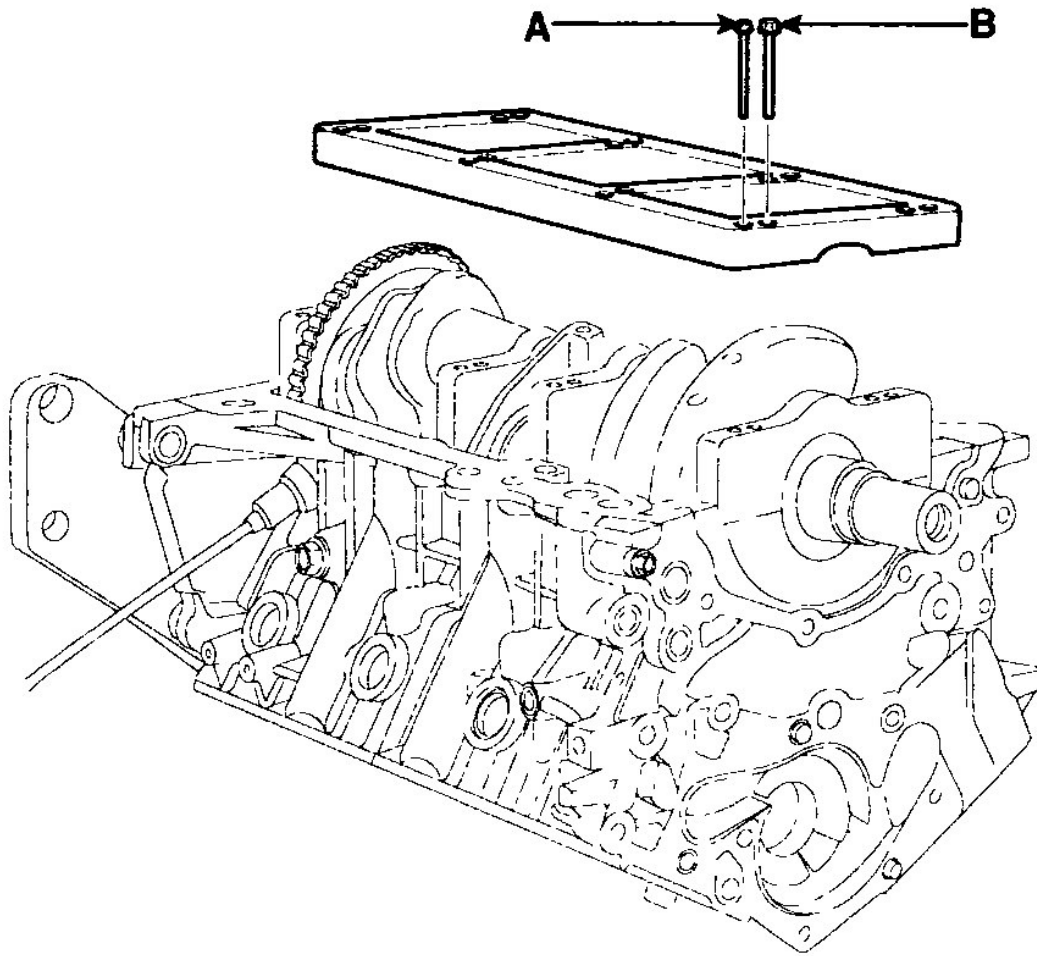
27 ~ 33Nm (270 ~ 330kgf.cm, 19.5 ~ 24lbf.ft) + 90° - 94°

1. Apply a light coat of engine oil on the threads and under the bearing cap bolts.
2. Install and uniformly tighten the 16 bearing cap bolts, in several passes, in the sequence shown.

Tightening torque

M8 (A): 13 ~ 19Nm (130 ~ 190kgf.cm, 10 ~ 14lbf.ft)

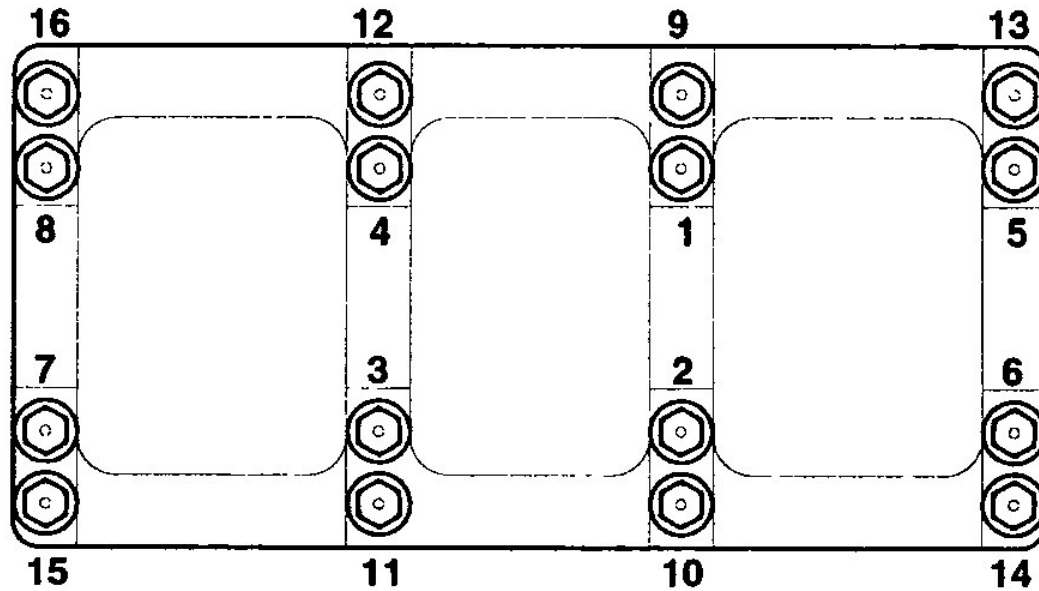
M10 (B): 27 ~ 33Nm (270 ~ 330kgf.cm, 19.5 ~ 24lbf.ft)



G03848959

Fig. 150: Installing Bearing Cap Bolts
Courtesy of HYUNDAI MOTOR CO.

3. Retighten the bearing cap bolts by 90° - 94° in the numerical order shown.



G03848960

Fig. 151: Identifying Retightening Sequence Of Bearing Cap Bolts
 Courtesy of HYUNDAI MOTOR CO.

4. Check that the crankshaft turns smoothly.
9. Check crankshaft end play. (See 4)
10. Install piston and connecting rod assemblies.

NOTE: Before installing the pistons, apply a coat of engine oil to the ring grooves and cylinder bores.

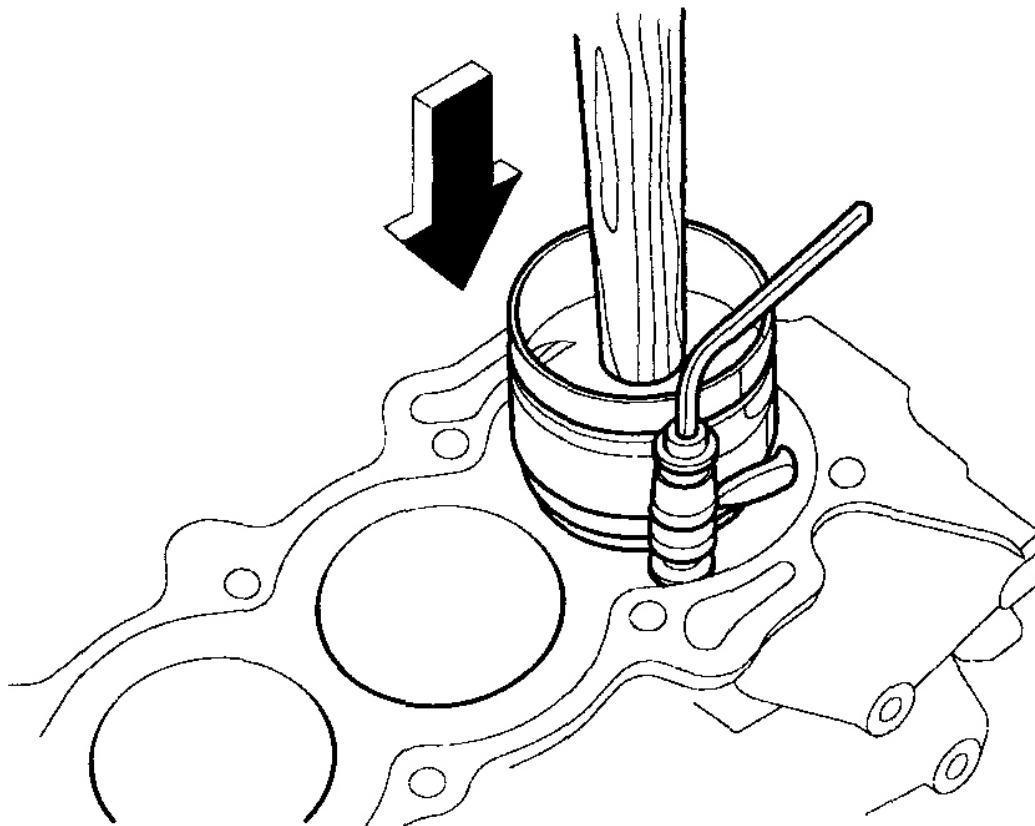
1. Remove the connecting rod caps, and slip short sections of rubber hose over the threaded ends of the connecting rod bolts.
2. Install the ring compressor, check that the bearing is securely in place, then position the piston in the cylinder, and tap it in using the wooden handle of a hammer.
3. Stop after the ring compressor pops free, and check the connecting rod-to-check journal alignment before pushing the piston into place.
4. Apply engine oil to the bolt threads. Install the rod caps with bearings, and torque the bolts.

Tightening torque

16 ~ 20Nm (160 ~ 200kgf.cm, 12 ~ 15lbf.ft) + 90° ~ 94°

NOTE: Maintain downward force on the ring compressor to prevent the rings from

expanding before entering the cylinder bore.



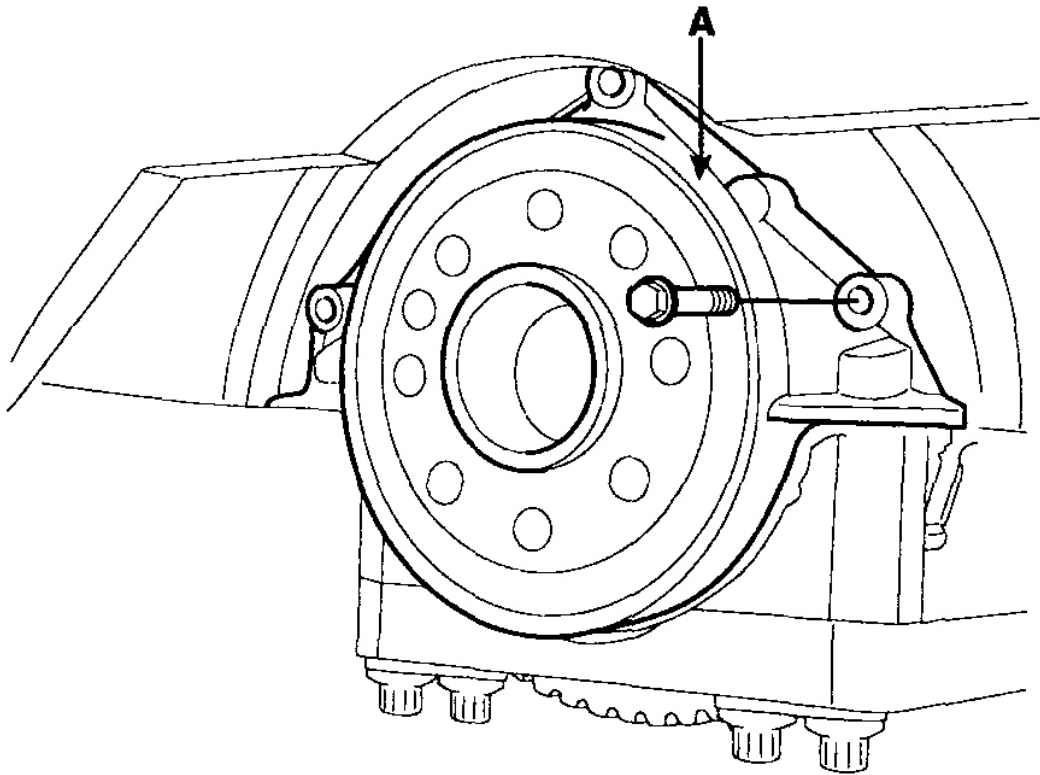
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Fig. 152: Installing Piston And Connecting Rod Assemblies
Courtesy of HYUNDAI MOTOR CO.

11. Apply liquid gasket to the oil seal case and install the oil seal case (A).

Tightening torque

10 ~ 12Nm (100 ~ 120kgf.cm, 7.3 ~ 8.8lbf.ft)



G03848962

Fig. 153: Install The Oil Seal Case
Courtesy of HYUNDAI MOTOR CO.

NOTE:

- Use liquid gasket MS721-40A or equivalent
- Check that the mating surfaces are clean and dry.

12. Install rear oil seal.

1. Apply engine oil to a new oil seal lip.
2. Using SST (09231 -33000) and a hammer, tap in the oil seal until its surface is flush with the rear oil seal retainer edge.

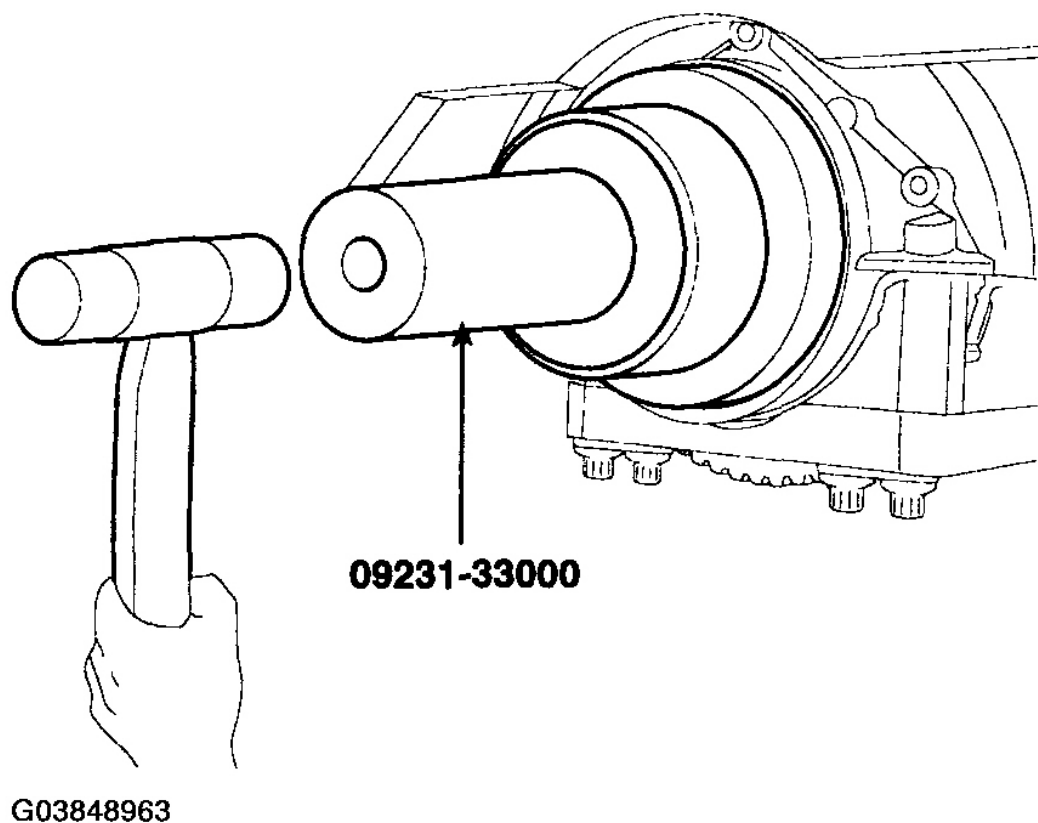


Fig. 154: Using SST (09231 -33000) And Hammer To Tap In The Oil Seal Until Its Surface Is Flush With Rear Oil Seal Retainer Edge
Courtesy of HYUNDAI MOTOR CO.

13. Install front case. (See **INSTALLATION**)
14. Install the upper oil pan.
 1. Using a razor blade and gasket scraper, remove all the old packing material from the gasket surfaces.

NOTE: Check that the mating surfaces are clean and dry before applying liquid gasket.

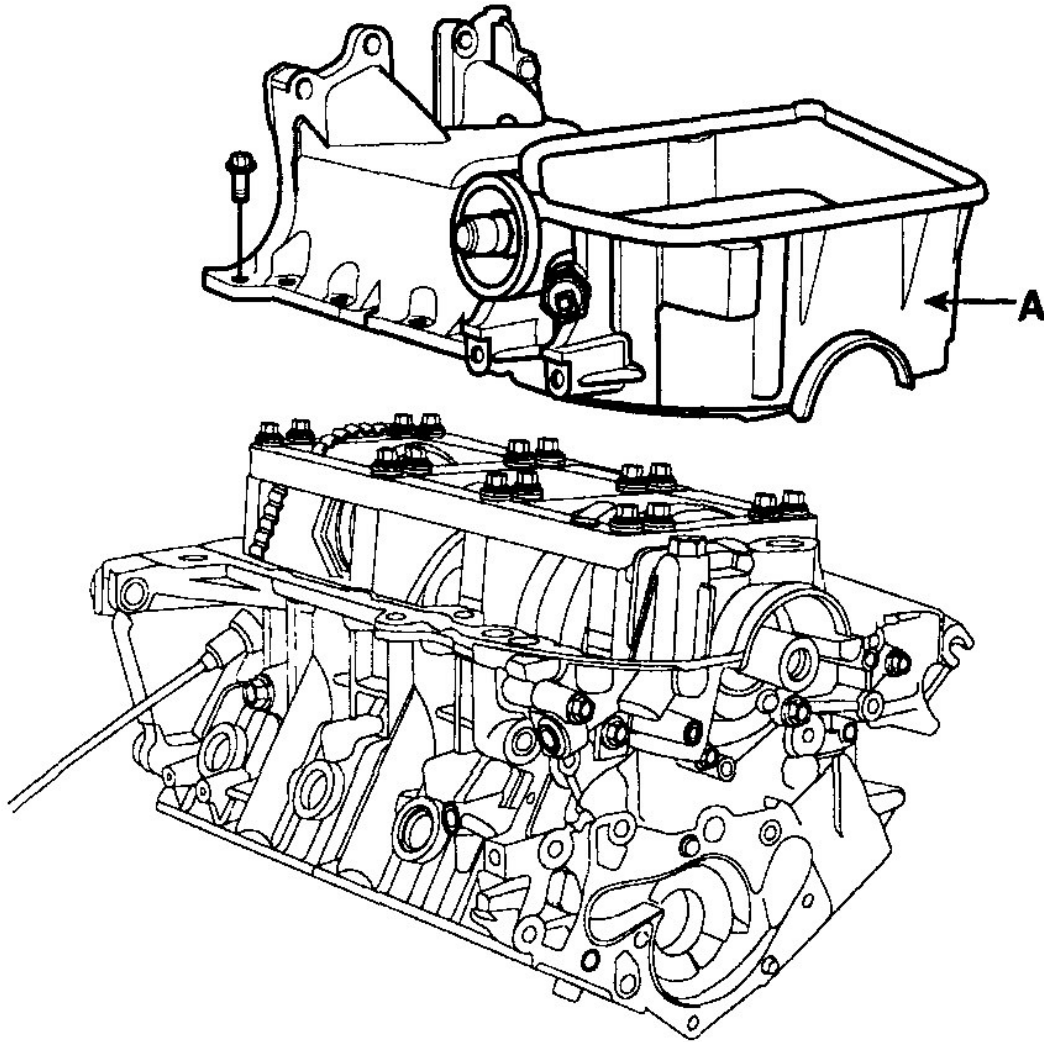
2. Install the oil pan (A) with the 17 bolts.

Uniformly tighten the bolts in several passes.

Tightening torque

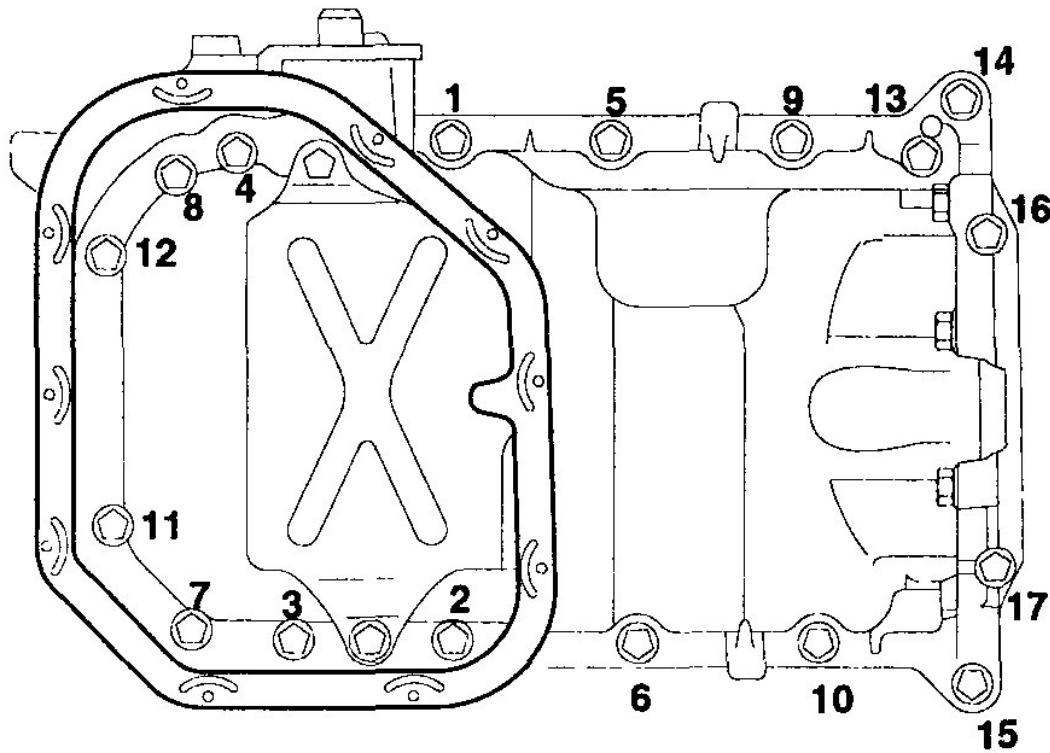
19 ~ 28Nm (190 ~ 280kgf.cm, 14 ~ 20lbf.ft): (bolts 1 ~ 15)

5 ~ 7Nm (50 ~ 70kgf.cm, 4 ~ 5lbf.ft): (bolts 16 & 17)



G03848964

Fig. 155: Installing Upper Oil Pan
Courtesy of HYUNDAI MOTOR CO.



G03848965

Fig. 156: Identifying Tightening Sequence Of Upper Oil Pan Bolts
 Courtesy of HYUNDAI MOTOR CO.

NOTE:

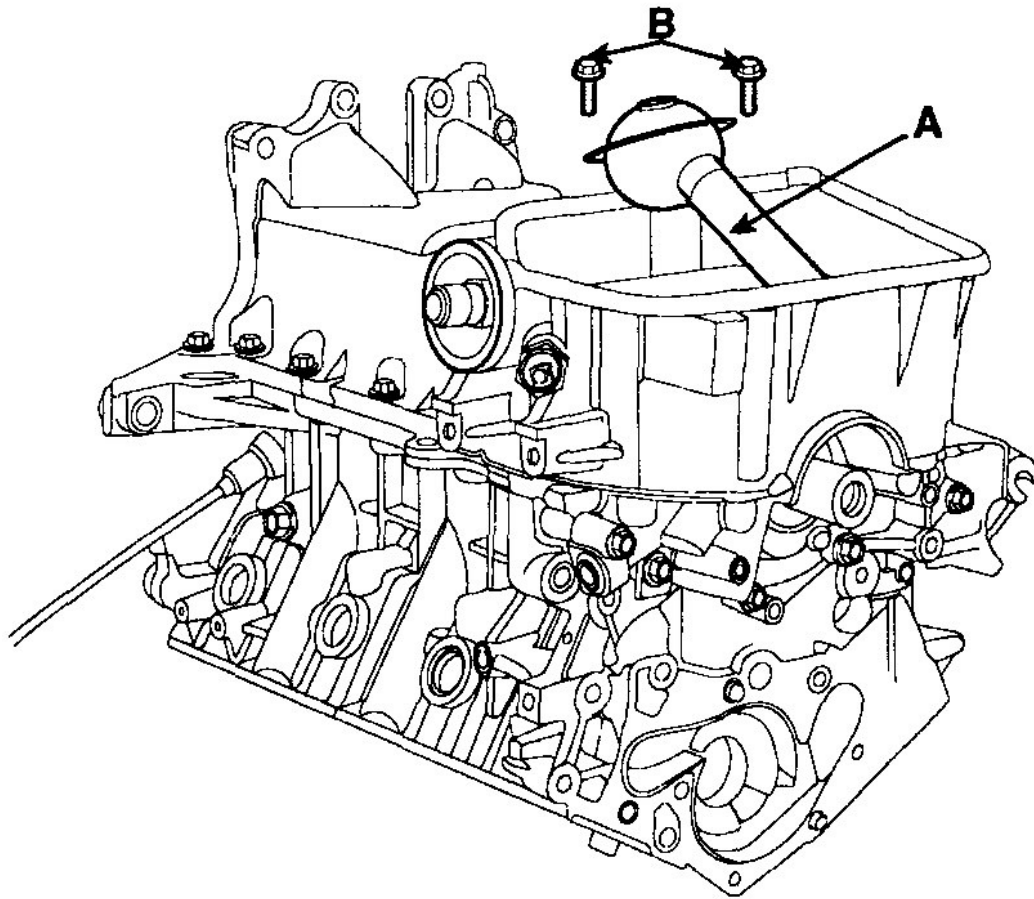
- To prevent leakage of oil, apply liquid gasket to the inner threads of the bolt holes.
- Do not install the parts if five minutes or more have elapsed since applying the liquid gasket. Instead, reapply liquid gasket after removing the residue.
- After assembly, wait at least 30 minutes before filling the engine with oil.

15. Install oil screen.

Install a new gasket and oil screen (A) with 2 bolts (B).

Tightening torque

15 ~ 22Nm (150 ~ 220kgf.cm, 11 ~ 16lbf.ft)



G03848966

Fig. 157: Installing New Gasket And Oil Screen With 2 Bolts
Courtesy of HYUNDAI MOTOR CO.

16. Install the lower oil pan.

1. Apply liquid gasket as an even bead, centered between the edges of the mating surface. Use liquid gasket MS 721-40A or equivalent.

NOTE:

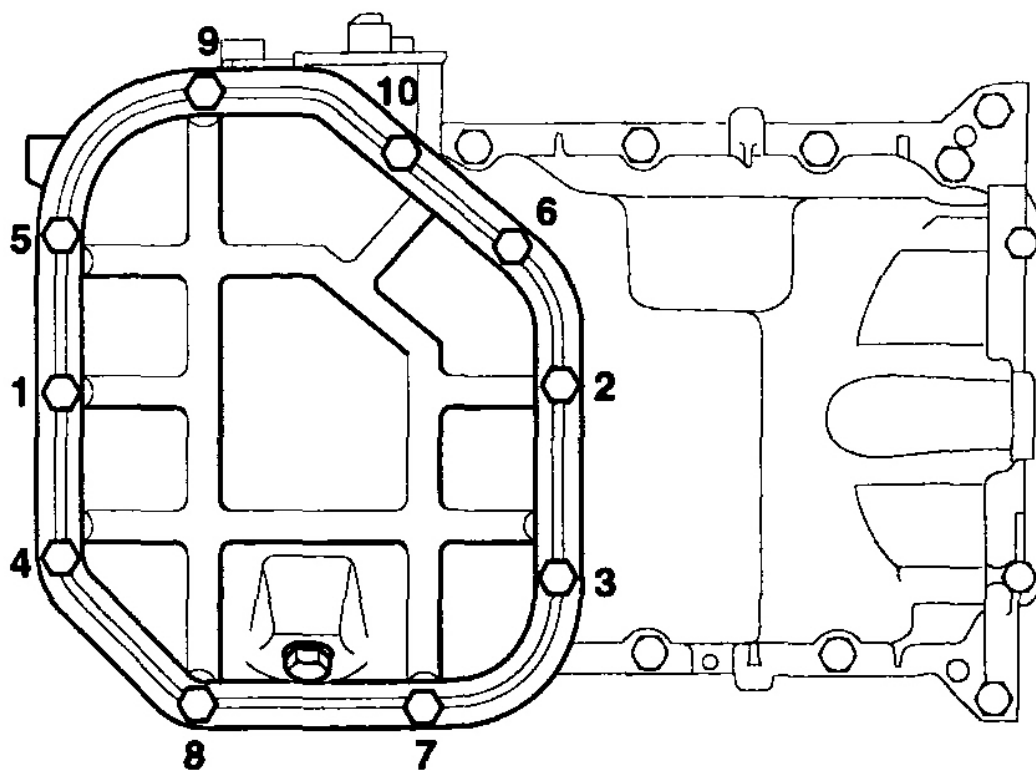
- To prevent leakage of oil, apply liquid gasket to the inner threads of the bolt holes.
- Do not install the parts if five minutes or more have elapsed since applying the liquid gasket. Instead, reapply liquid gasket after removing the residue.
- After assembly, wait at least 30 minutes before filling the engine with oil.

2. Install the lower oil pan 10 bolts.

Uniformly tighten the bolts several passes

Tightening torque

10 ~ 12Nm (100 ~ 120kgf.cm, 7.3 ~ 8.8lbf.ft)



G03848967

Fig. 158: Identifying Tightening Sequence Of Lower Oil Pan Bolts
Courtesy of HYUNDAI MOTOR CO.

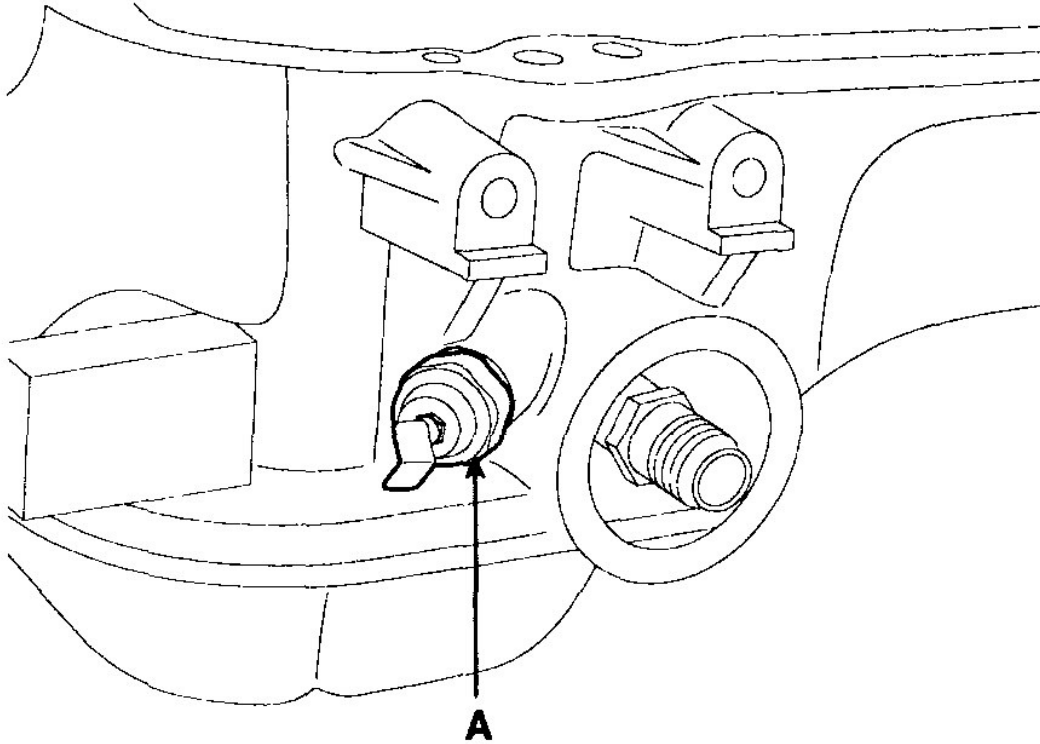
17. Install oil pressure sensor.
 1. Apply adhesive to 2 or 3 threads.

Adhesive: THREE BOND TB2403 or equivalent.

2. Install the oil pressure sensor (A).

Tightening torque

15 ~ 22Nm (150 ~ 220kgf.cm, 11 ~ 16lbf.ft)



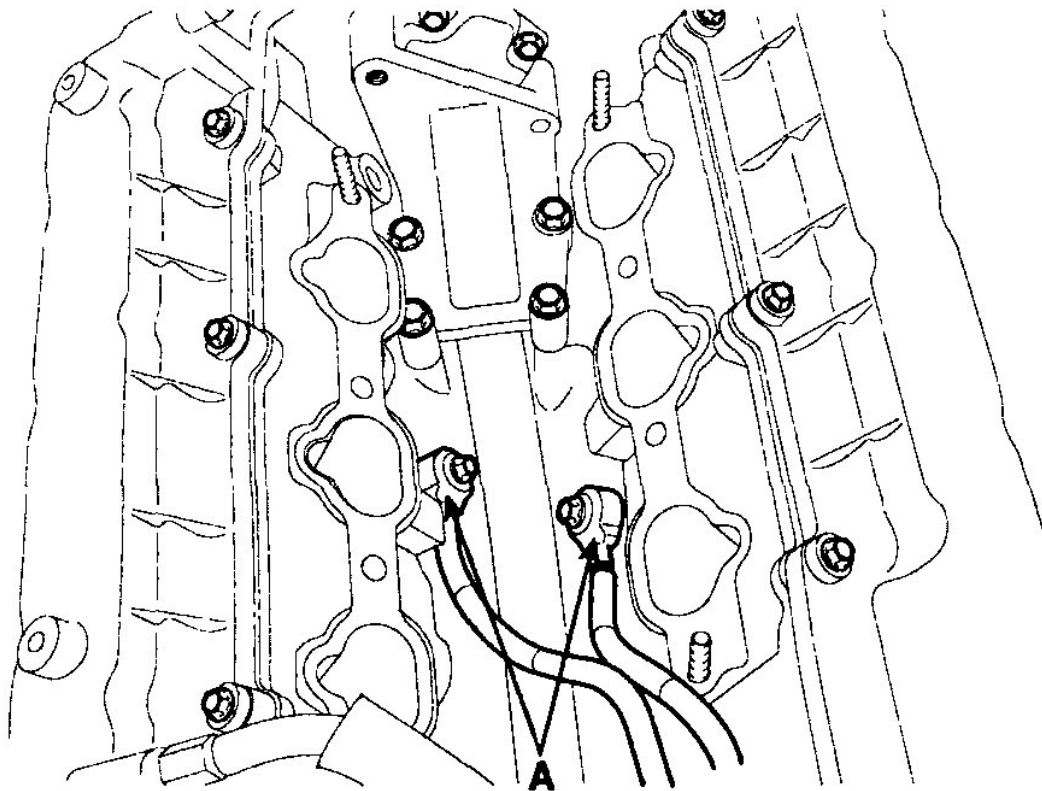
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Fig. 159: Installing Oil Pressure Sensor
Courtesy of HYUNDAI MOTOR CO.

18. Install knock sensor (A).

Tightening torque

17 ~ 26Nm (170 ~ 260kgf.cm, 12.5 ~ 19lbf.ft)



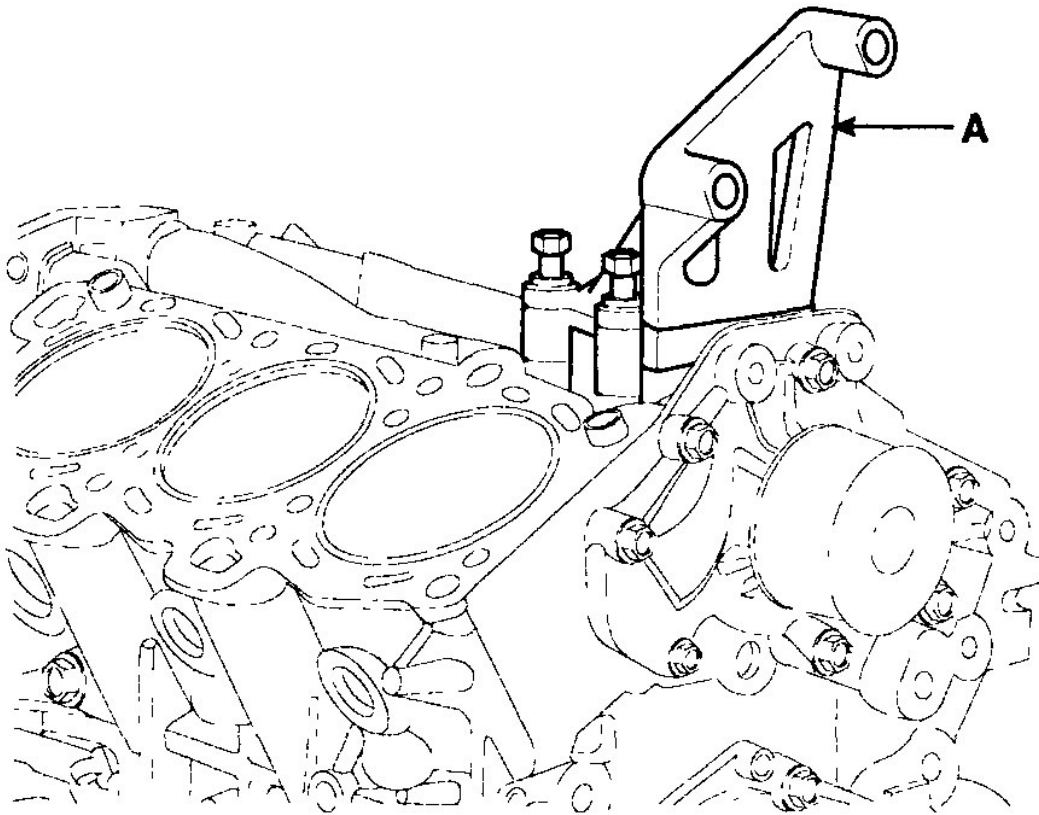
G03848969

Fig. 160: Installing Knock Sensor
Courtesy of HYUNDAI MOTOR CO.

19. Install water pump. (See **WATER PUMP**)
20. Install the power steering pump bracket (A).

Tightening torque

35 ~ 55Nm (350 ~ 550kgf.cm, 25.8 ~ 40.6lbf.ft)



G03848970

Fig. 161: Installing Power Steering Pump Bracket
Courtesy of HYUNDAI MOTOR CO.

21. Install the air compressor. (See A/C COMPRESSOR CONTROLS (MANUAL))
22. Install the alternator. (See ALTERNATOR BELT INSPECTION AND ADJUSTMENT)
23. Install oil level gauge assembly.
 1. Install a new O-ring on the oil level gauge.
 2. Apply engine oil on the O-ring.
 3. Install the oil level gauge assembly (A) with the bolt.

Tightening torque

12 ~ 15Nm (120 ~ 150kgf.cm, 9 ~ 11lbf.ft)

24. Install cylinder head. (See INSTALLATION)
25. Install timing belt. (See INSTALLATION)
26. Remove engine stand.

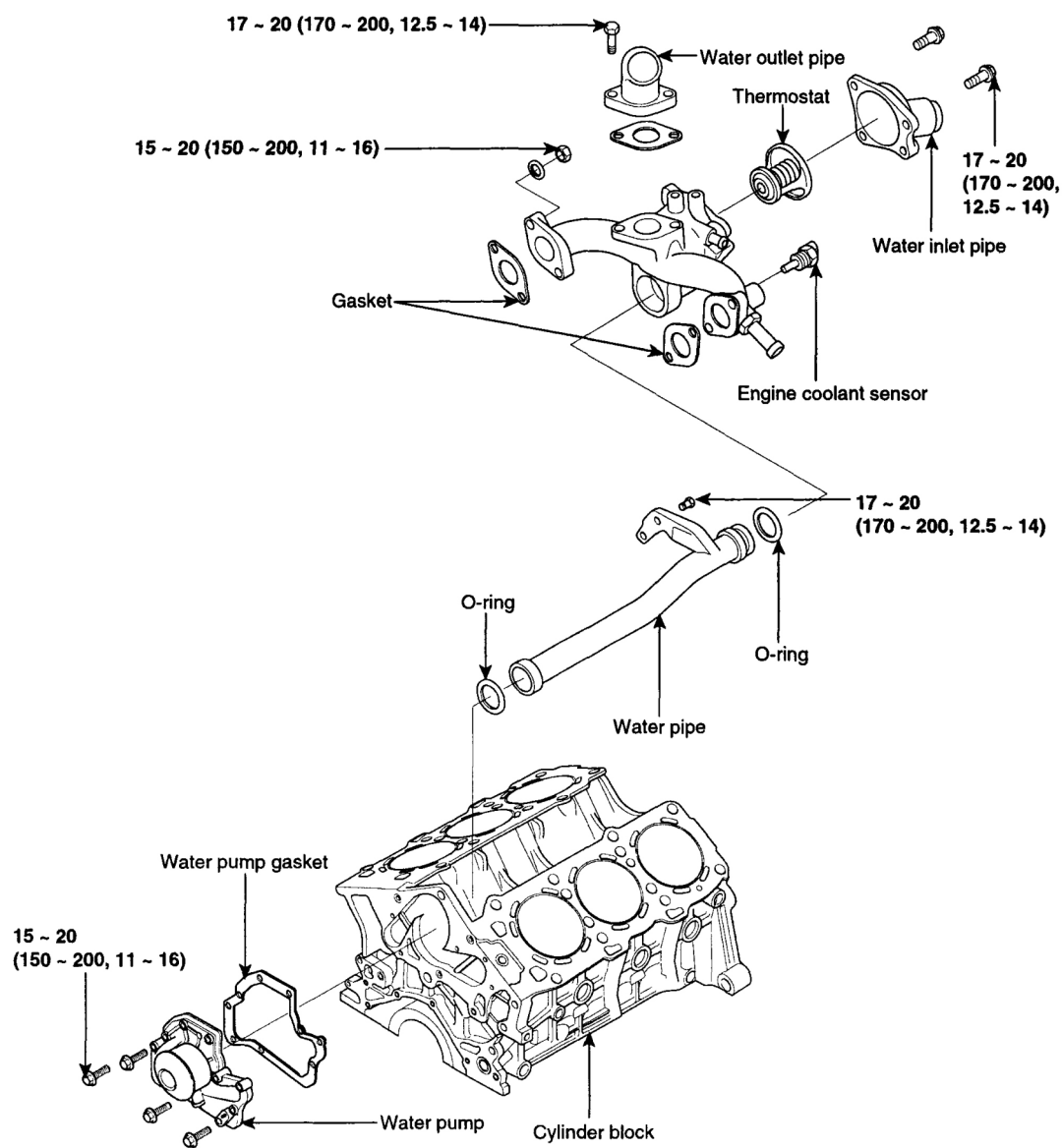
27. Install drive plate.

Tightening torque

73 ~ 77 Nm (730 ~ 770kgf.cm, 53 ~ 56lbf.ft)

COOLING SYSTEM

COMPONENT



TORQUE : Nm (kgf.cm, lbf.ft)

G03848971

Fig. 162: Identifying Cooling System Components And Torque Specifications
Courtesy of HYUNDAI MOTOR CO.

ENGINE COOLANT REFILLING AND BLEEDING

WARNING: Never remove the radiator cap when the engine is hot. Serious scalding could be caused by hot fluid under high pressure escaping from the radiator.

CAUTION: When pouring engine coolant, be sure to shut the relay box lid and not to let coolant spill on the 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 radiator cap.
3. Loosen the drain plug, and drain the coolant.
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. Fill fluid mixture with coolant and water slowly through the radiator cap. Gently squeeze the upper/lower hoses of the radiator so as to bleed air easily.

NOTE:

- Use only genuine antifreeze/coolant.
- For best corrosion protection, the coolant concentration must be maintained year-round at 50% minimum. Coolant concentrations less than 50% may not provide sufficient protection against corrosion or freezing.
- Coolant concentrations greater than 60% will impair cooling efficiency and are not recommended.

CAUTION:

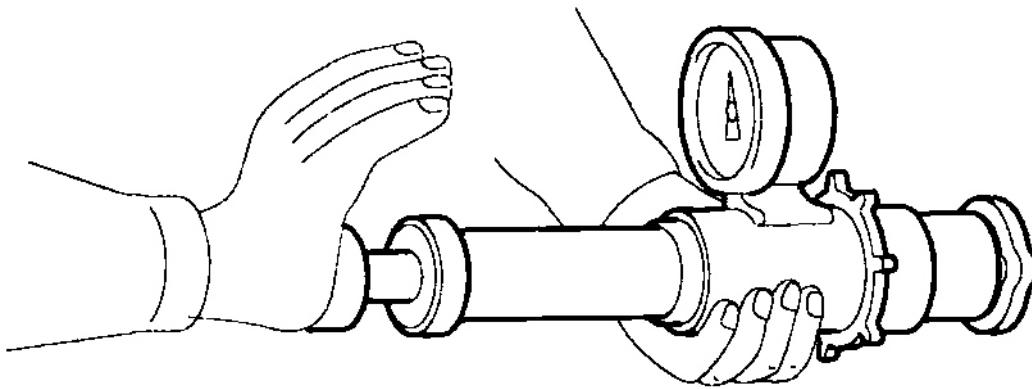
- Do not mix different brands of antifreeze/coolants.
- Do not use additional rust inhibitors or anti-rust products; they may not be compatible with the coolant.

7. Start the engine and allow coolant to circulates. When the cooling fan operates and coolant circulates, refill coolant through the radiator cap.
8. Repeat 7 until the cooling fan 3 ~ 5 times and bleed air sufficiently out of the cooling system.
9. Install the radiator cap and fill the reservoir tank to the "MAX" line with coolant.
10. Run the vehicle under idle until the cooling fan operates 2-3 times.
11. Stop the engine and allow coolant to cool.
12. Repeat steps 6 to 11 until the coolant level stays constant and all air is bleed out of the cooling system.

NOTE: **Recheck the coolant level in the reservoir tank for 2-3 days after replacing coolant.**

CAP TESTING

1. Remove the radiator cap, wet its seal with engine coolant, then install it on the pressure tester.



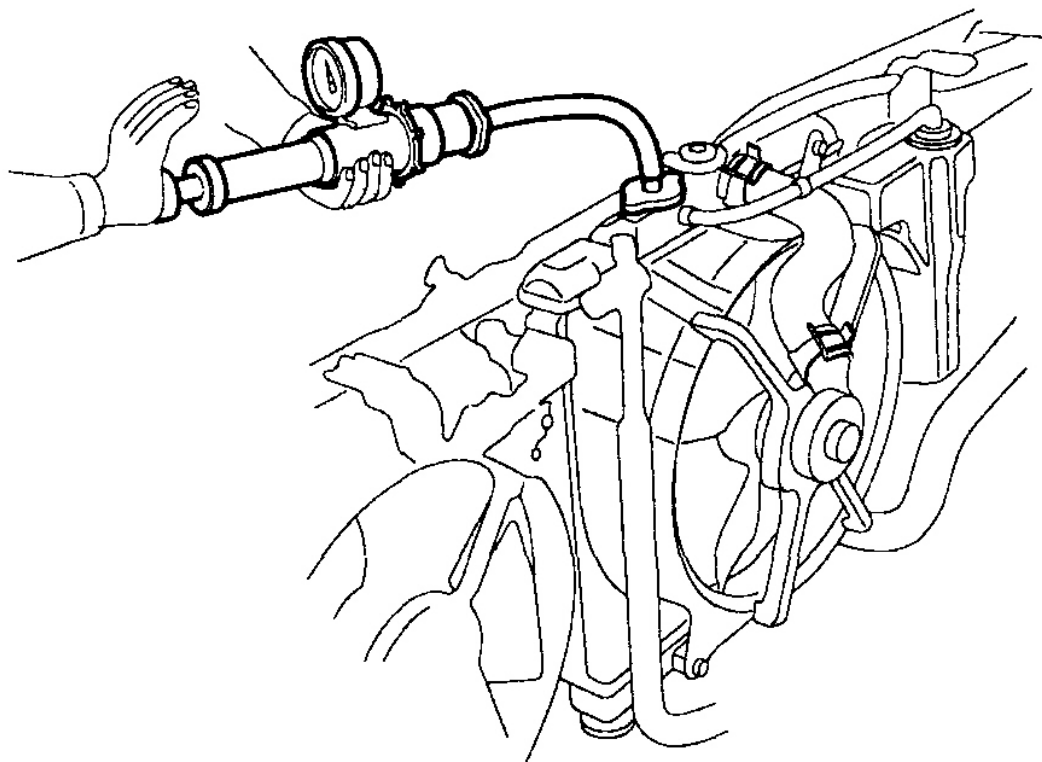
G03848972

Fig. 163: Installing Radiator Cap On Pressure Tester
Courtesy of HYUNDAI MOTOR CO.

2. Apply a pressure of 93 ~ 123kPa (0.95 ~ 1.25kgf/cm² , 14 ~ 19psi)
3. Check for a drop in pressure.
4. If the pressure drops, replace the cap.

TESTING

1. Wait until engine is cool, then carefully remove the radiator cap and fill the radiator with engine coolant, then install it on the pressure tester.
2. Apply a pressure tester to the radiator and apply a pressure of 93 ~ 123kPa (0.95 ~ 1.25kgf/cm² 14 ~ 19psi).



G03848973

Fig. 164: Applying Pressure Tester To The Radiator And Applying Pressure
Courtesy of HYUNDAI MOTOR CO.

3. Inspect for engine coolant leaks and a drop in pressure.
4. Remove the tester and reinstall the radiator cap.

NOTE: Check for engine oil in the coolant and/or coolant in the engine oil.

REMOVAL

WATER PUMP

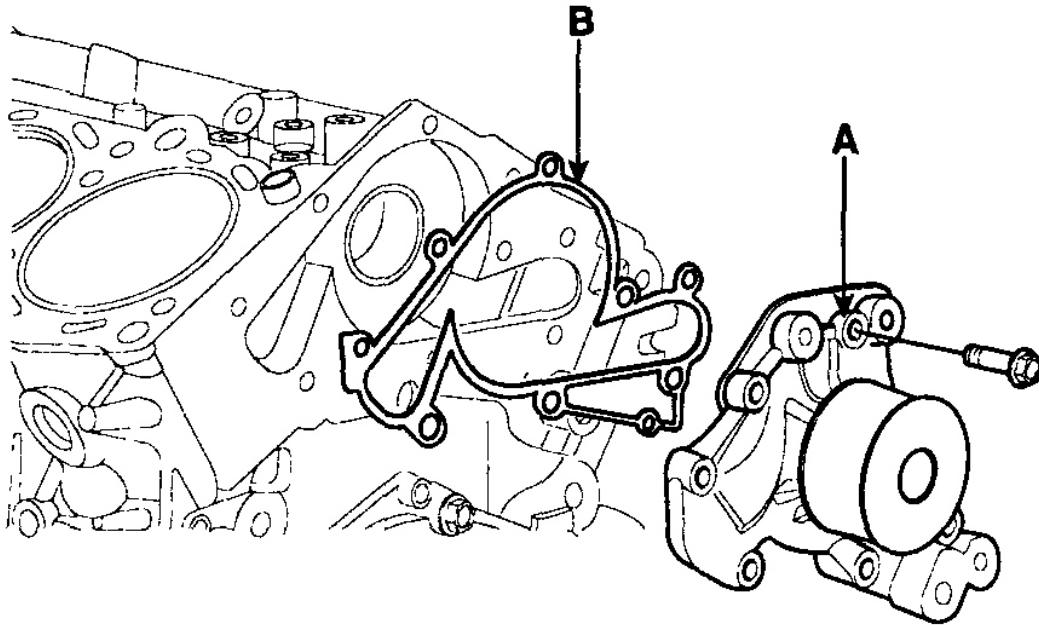
1. Drain the engine coolant.

WARNING: System is under high pressure when the engine is hot. To avoid danger of releasing scalding engine coolant, remove the cap only when the engine is cool.

2. Remove drive belts. (See **REMOVAL**)

3. Remove the timing belt. (See **REMOVAL**)
4. Remove the timing belt idler. (See **INSPECTION**)
5. Remove the water pump.

Remove the water pump (A) and gasket (B).



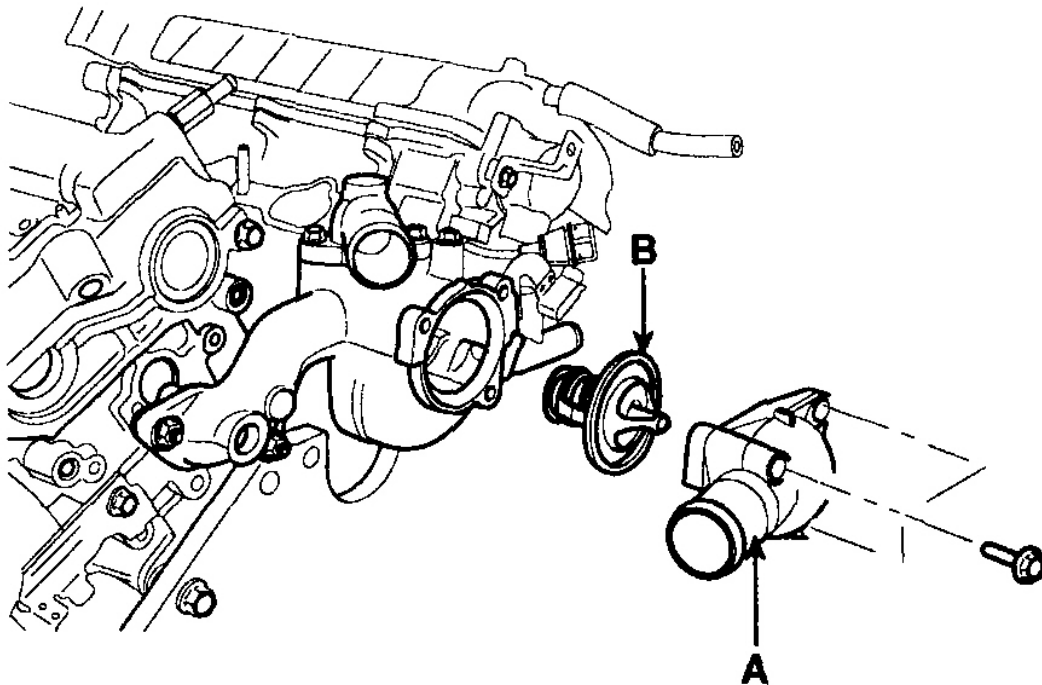
G03848974

Fig. 165: Removing Water Pump And Gasket
Courtesy of HYUNDAI MOTOR CO.

THERMOSTAT

NOTE: Removal of the thermostat would have an adverse effect, causing a lowering of cooling efficiency. Do not remove the thermostat, even if the engine tends to overheat.

1. Remove the engine cover.
2. Drain engine coolant so its level is below thermostat.
3. Remove the lower hose.
4. Remove water inlet (A) and thermostat (B).



G03848975

Fig. 166: Removing Water Inlet And Thermostat
Courtesy of HYUNDAI MOTOR CO.

INSPECTION

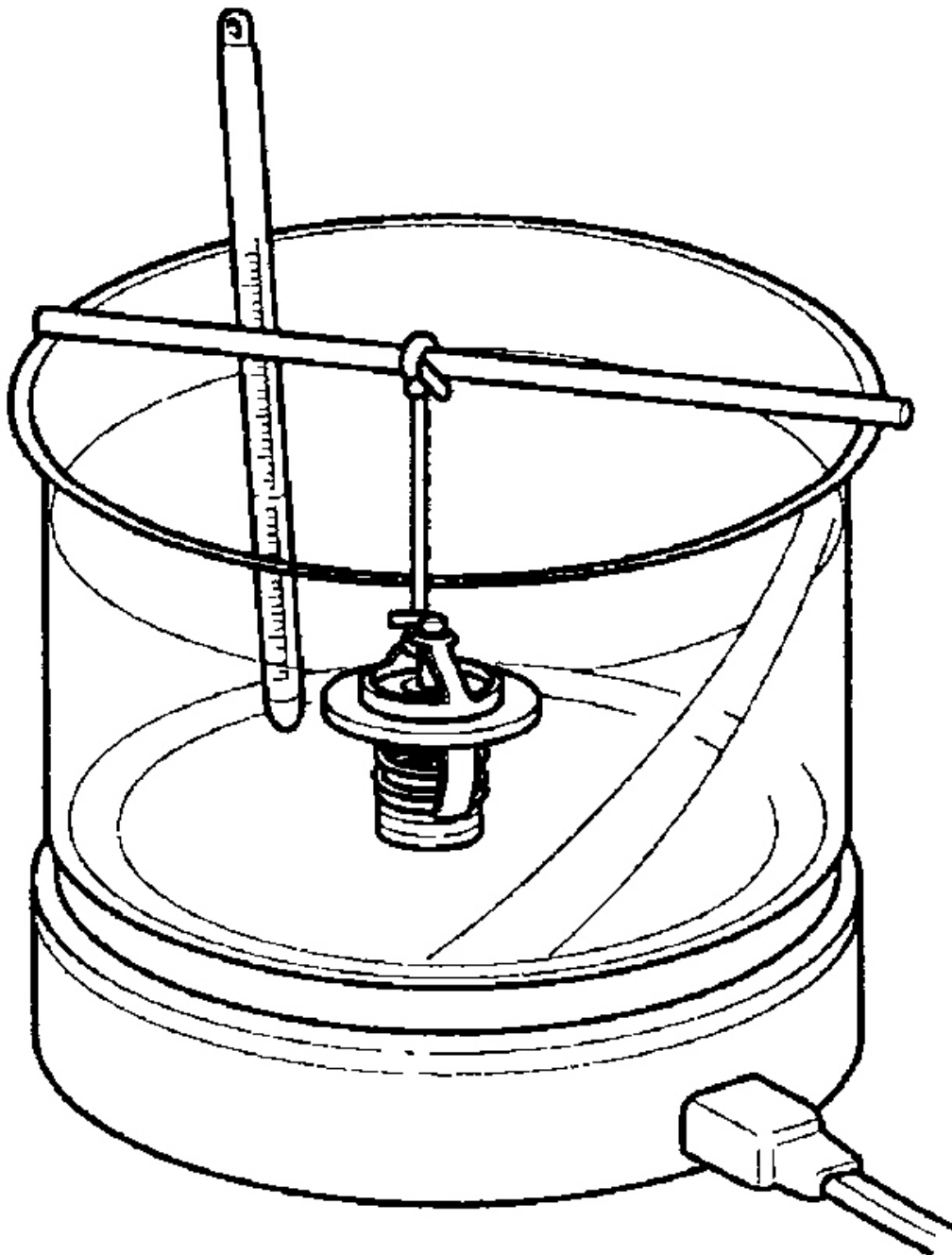
WATER PUMP

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 from hole, the seal is defective. Replace the coolant pump assembly

NOTE: A small amount of "weeping" from the bleed hole is normal.

THERMOSTAT

1. Immerse the thermostat in water and gradually heat the water.



G03848976

Fig. 167: Immersing Thermostat In Water
Courtesy of HYUNDAI MOTOR CO.

2. Check the valve opening temperature.

Valve opening temperature: 82°C (177°F)

Full opening temperature: 95°C (205°F)

If the valve opening temperature is not as specified, replace the thermostat.

3. Check the valve lift.

Valve lift: 10mm (0.4in.) or more at 95°C (205°F)

If the valve lift is not as specified, replace the thermostat.

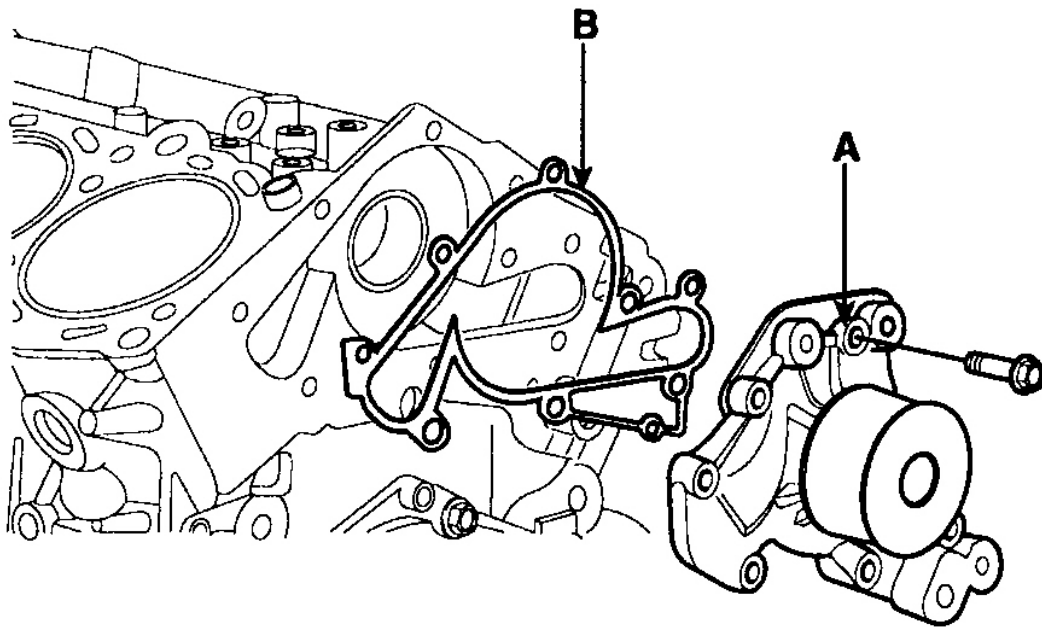
INSTALLATION

WATER PUMP

1. Install the water pump (A) and a new gasket (B) with the 8 bolts.

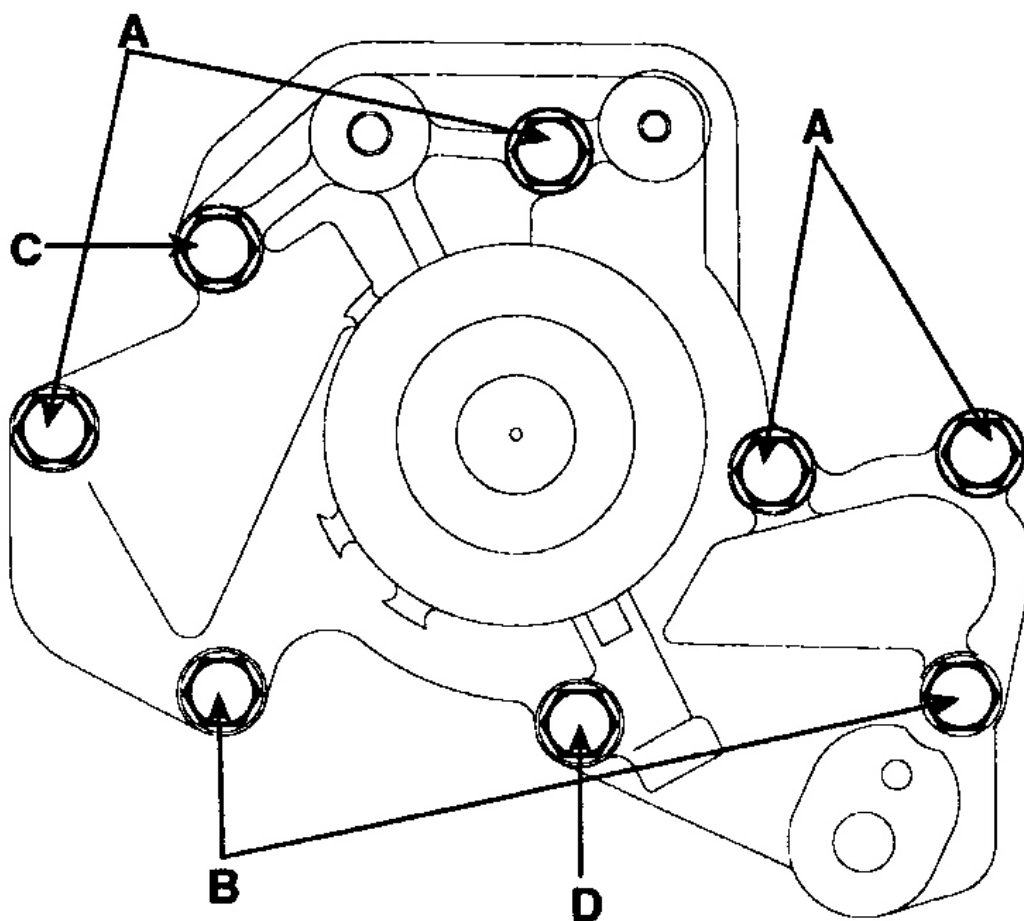
Tightening torque

15 ~ 22Nm (150 ~ 220kgf.cm, 11 ~ 16lbf.ft)



G03848977

Fig. 168: Installing Water Pump And New Gasket
Courtesy of HYUNDAI MOTOR CO.



G03848978

Fig. 169: Installing Water Pump Bolts
 Courtesy of HYUNDAI MOTOR CO.

WATER PUMP BOLTS NUMBER AND SIZE SPECIFICATION

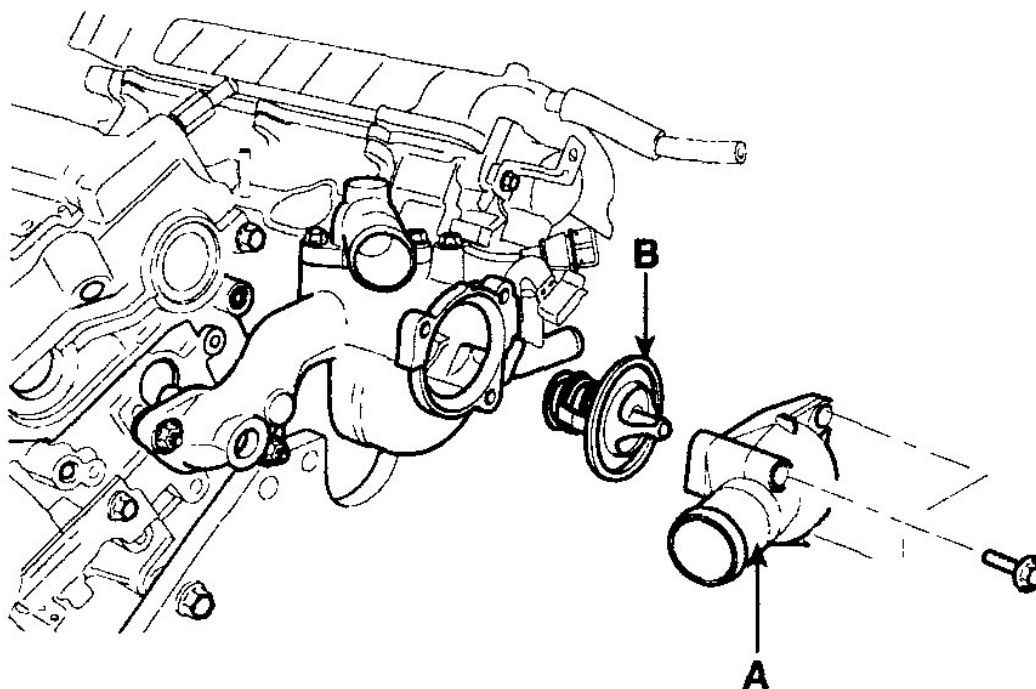
Bolt	Size	Number
A	8 x 25	4
B	8 x 30	2
C	8 x 32	1
D	8 x 40	1

2. Install the timing belt idler. (See **INSTALLATION**)
3. Install the timing belt. (See **INSTALLATION**)
4. Install drive belt.

5. Fill with engine coolant. (See **ENGINE COOLANT REFILLING AND BLEEDING**)
6. Start engine and check for leaks.
7. Recheck engine coolant level.

THERMOSTAT

1. Place thermostat in thermostat housing.
 1. Install the thermostat with the jiggle valve upward.
 2. Install a new to the thermostat (B).



G03848979

Fig. 170: Installing Water Inlet And Thermostat
Courtesy of HYUNDAI MOTOR CO.

2. Install water inlet (A).

Tightening torque

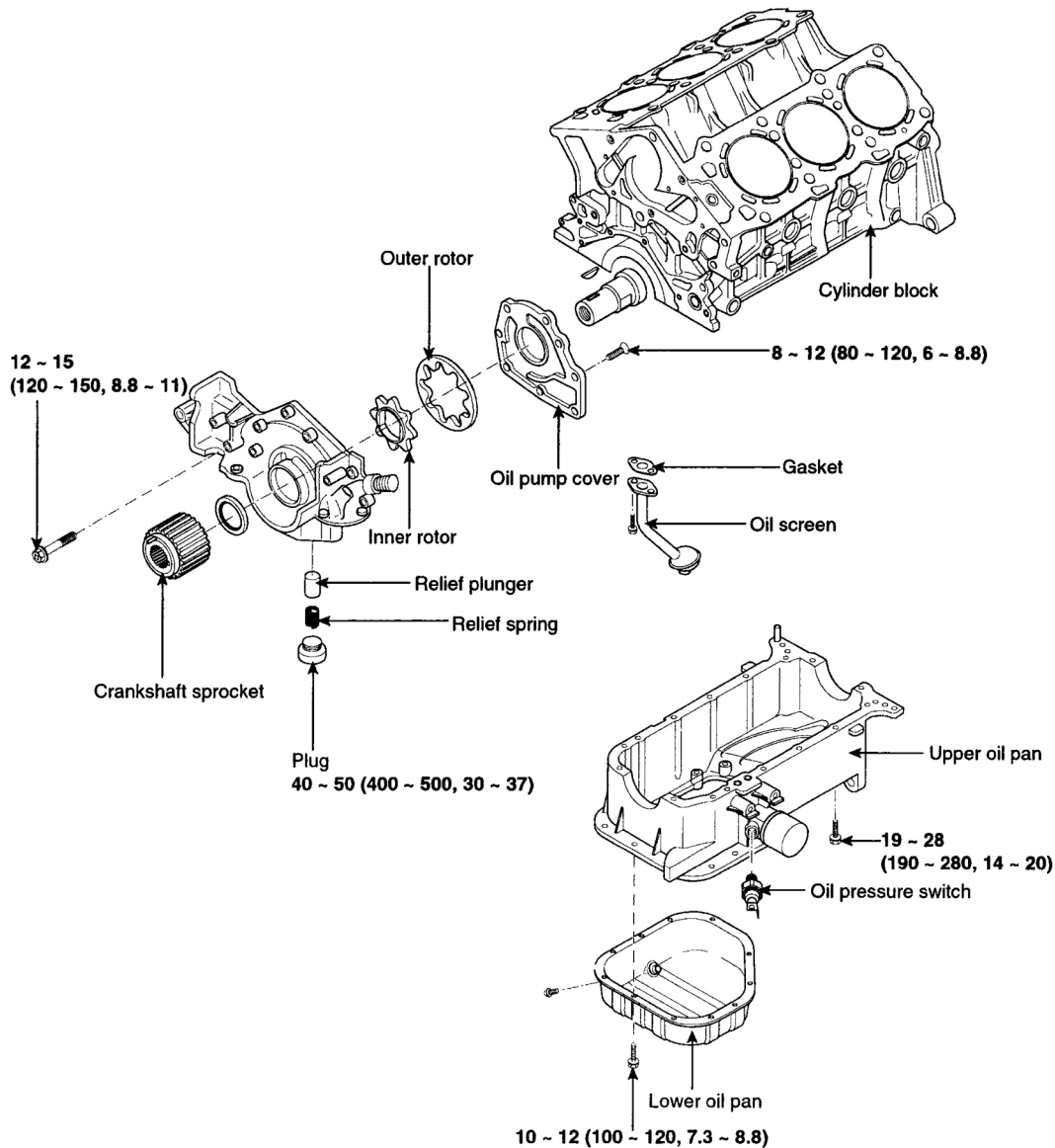
17 ~ 20Nm (170 ~ 200kgf.cm, 12.5 ~ 14lbf.ft)

3. Install the lower hose.

4. Fill with engine coolant.
5. Start engine and check for leaks.

LUBRICATION SYSTEM

COMPONENT



TORQUE : Nm (kgf.cm, lbf.ft)

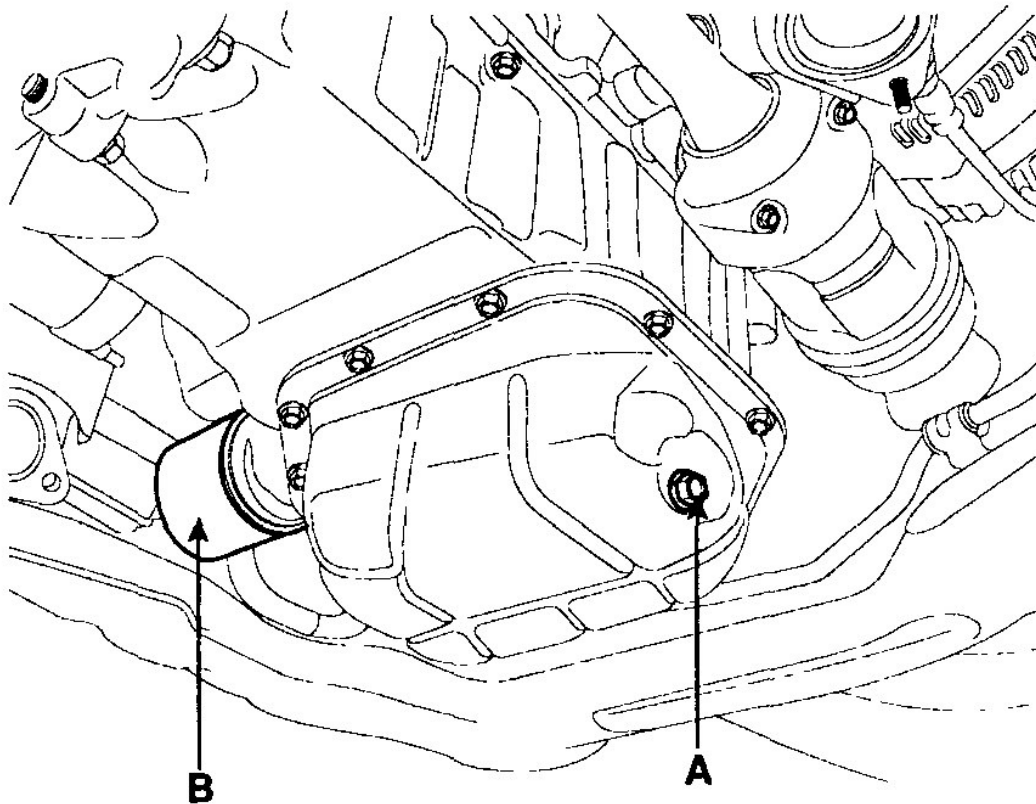
G03848980

Fig. 171: Identifying Lubrication System Components And Torque Specifications
 Courtesy of HYUNDAI MOTOR CO.

OIL AND FILTER**CAUTION:**

- Prolonged and repeated contact with mineral oil will result in the removal of natural fats from the skin, leading to dryness, irritation and dermatitis. In addition, used engine oil contains potentially harmful contaminants which may cause skin cancer.
- Exercise caution in order to minimize the length and frequency of contact of your skin to used oil. Wear protective clothing and gloves. Wash your skin thoroughly with soap and water, or use waterless hand cleaner, to remove any used engine oil. Do not use gasoline, thinners, or solvents.
- In order to preserve the environment, used oil and used oil filter must be disposed of only at designated disposal sites.

1. Drain engine oil.
 - a. Remove the oil filter cap.
 - b. Remove the oil drain plug (A), and drain the oil into a container.



G03848981

Fig. 172: Removing Oil Drain Plug And Oil Filter
Courtesy of HYUNDAI MOTOR CO.

2. Replace oil filter.
 - a. Remove the oil filter (B).
 - b. Check and clean the oil filter installation surface.
 - c. Check the part number of the new oil filter is as same as old one.
 - d. Apply clean engine oil to the gasket of a new oil filter.
 - e. Lightly screw the oil filter into place, and tighten it until the gasket contacts the seat.
 - f. Tighten it an additional 3/4 turn.
3. Refill with engine oil filter.
 - Clean and install the oil drain plug with a new gasket.

Tightening torque

35 ~ 45Nm (350 ~ 450kgf.cm, 26 ~ 33lbf.ft)

- Fill with fresh engine oil

Capacity

Drain and refill

W/Oil filter change: 4.5I (4.74U.S.qts, 3.95Imp qts)

W/O Oil filter change: 4.2I (4.30U.S.qts, 3.65Imp qts)

- Install the oil filter cap.
4. Start engine and check for oil leaks.
 5. Recheck engine oil level.

INSPECTION

1. Check engine oil quality

Check the oil for deterioration, entry of water, discoloring or thinning.

If the quality is visibly poor, replace the oil.

2. Check engine oil level.

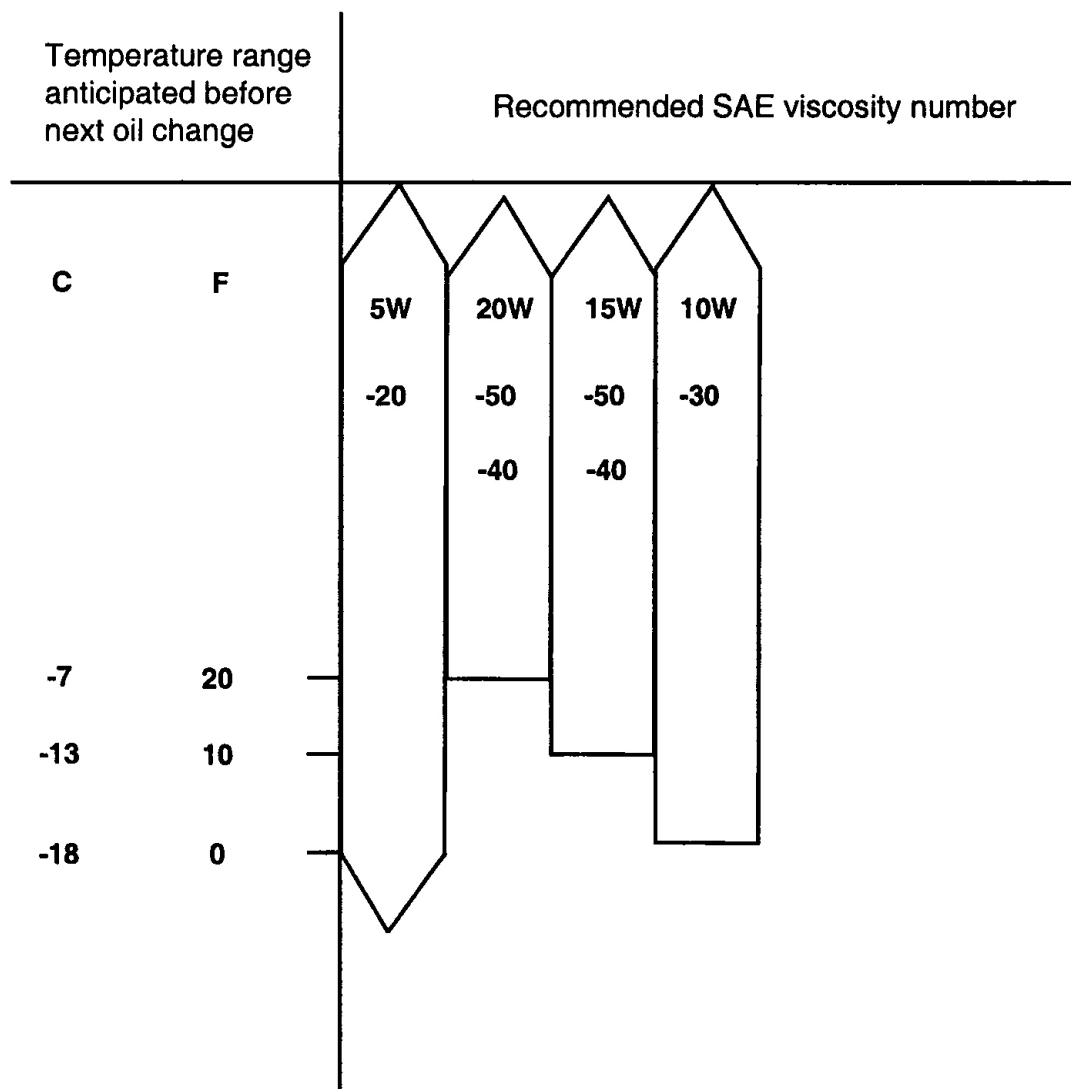
After warming up the engine and then 5 minutes after the engine stop, oil level should be between the "L" and "F" marks on the dipstick.

If low, check for leakage and add oil up to the "F" mark.

NOTE: Do not fill with engine oil above the "F" mark.

SELECTION OF ENGINE OIL

Recommended API classification: SH OR ABOVE



G03848982

Fig. 173: Recommended SAE Viscosity Grades Chart
 Courtesy of HYUNDAI MOTOR CO.

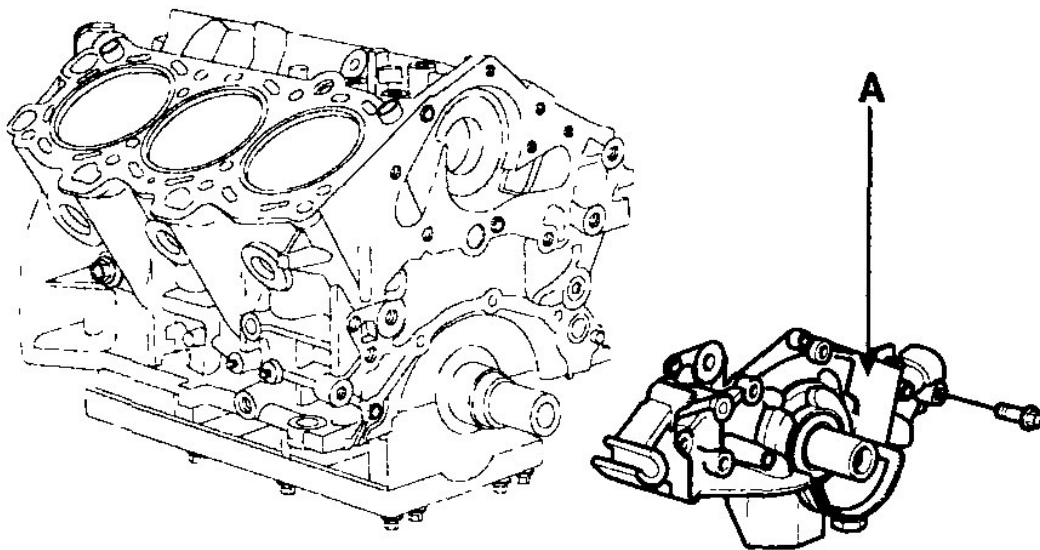
NOTE: For best performance and maximum protection of all types of operation, select only those lubricants which:

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

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

REMOVAL

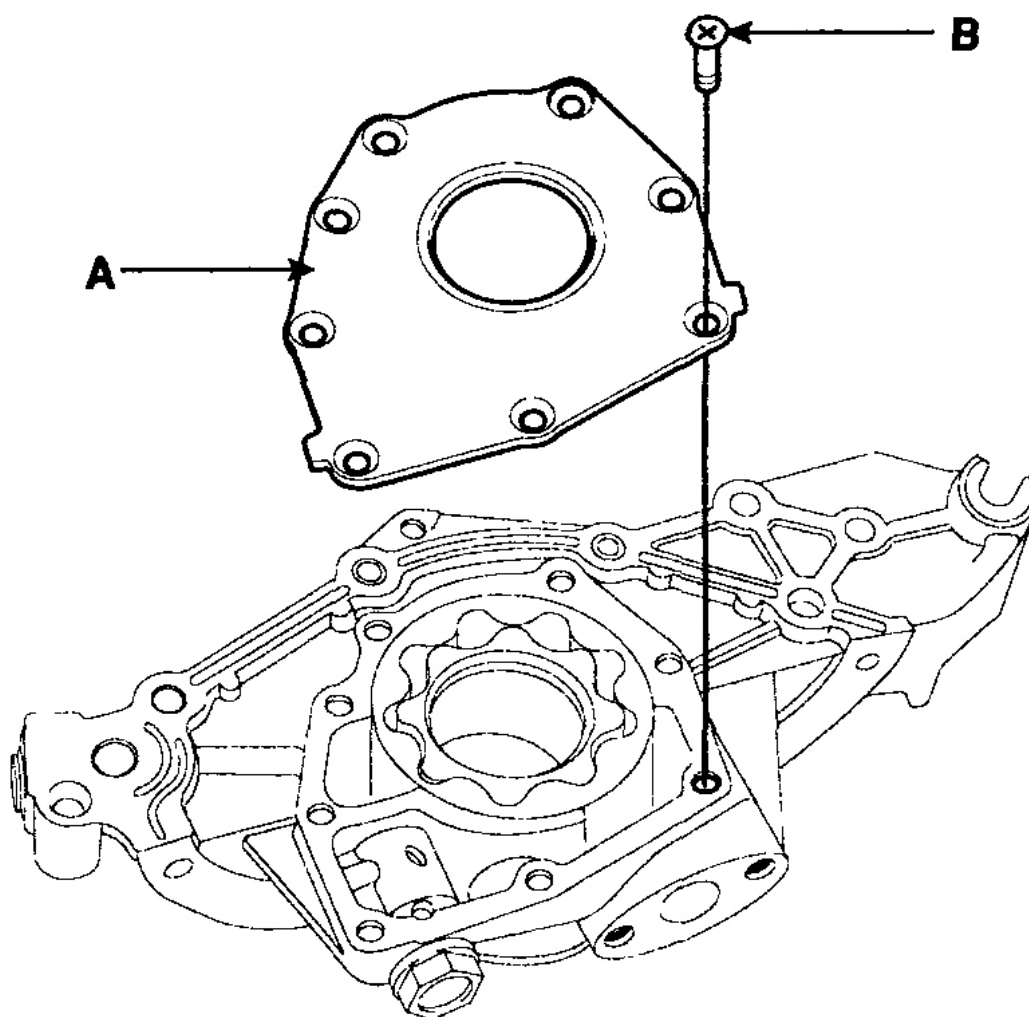
1. Drain engine oil.
2. Remove RH front wheel.
3. Remove RH side cover.
4. Remove the front exhaust pipe. (See step 20)
5. Remove the alternator from engine. (See **ALTERNATOR BELT INSPECTION AND ADJUSTMENT**)
6. Remove the drive belt. (See **REMOVAL**)
7. Turn the crankshaft and align the white groove on the crankshaft pulley with the pointer on the lower cover. (See step 4)
8. Remove the timing belt. (See **REMOVAL**)
9. Remove the oil pan and oil screen. (See **DISASSEMBLY**)
10. Remove the oil pump case (A).



G03848983

Fig. 174: Removing Oil Pump Case
Courtesy of HYUNDAI MOTOR CO.

1. Remove the screws (B) from the pump housing, then separate the housing and cover (A).



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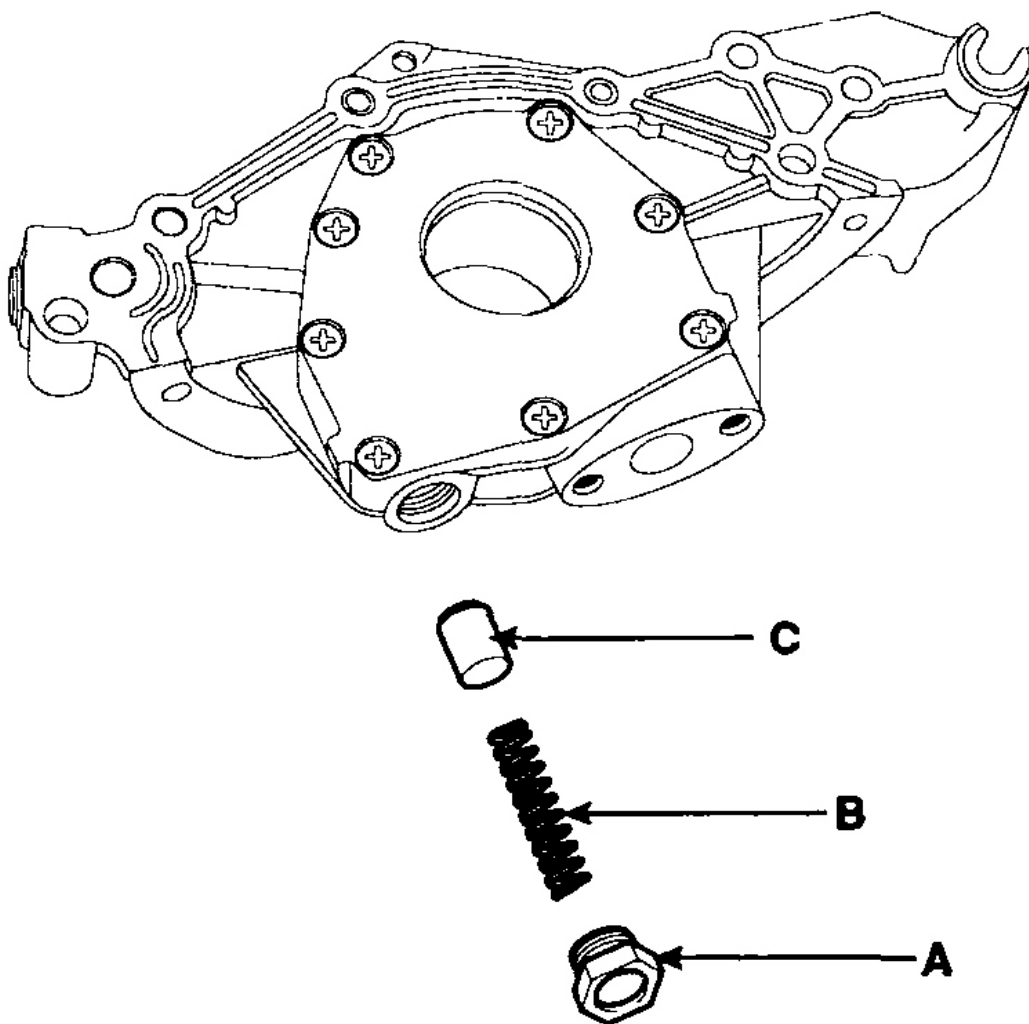
Fig. 175: Removing Screws From Pump Housing And Separating Housing And Cover
Courtesy of HYUNDAI MOTOR CO.

2. Remove the inner and outer rotors.

DISASSEMBLY

1. Remove the relief plunger.

Remove the plug (A), spring (B) and relief plunger (C).



G03848985

Fig. 176: Removing Plug, Spring And Relief Plunger
Courtesy of HYUNDAI MOTOR CO.

INSPECTION

1. Inspect relief plunger.

Coat the valve with engine oil and check that it falls smoothly into the plunger hole by its own weight. If it does not, replace the relief plunger. If necessary, replace the front case.

2. Inspect relief valve spring.

Inspect for distorted or broken relief valve spring.

Standard value

Free height: 43.8mm (91.724in.)

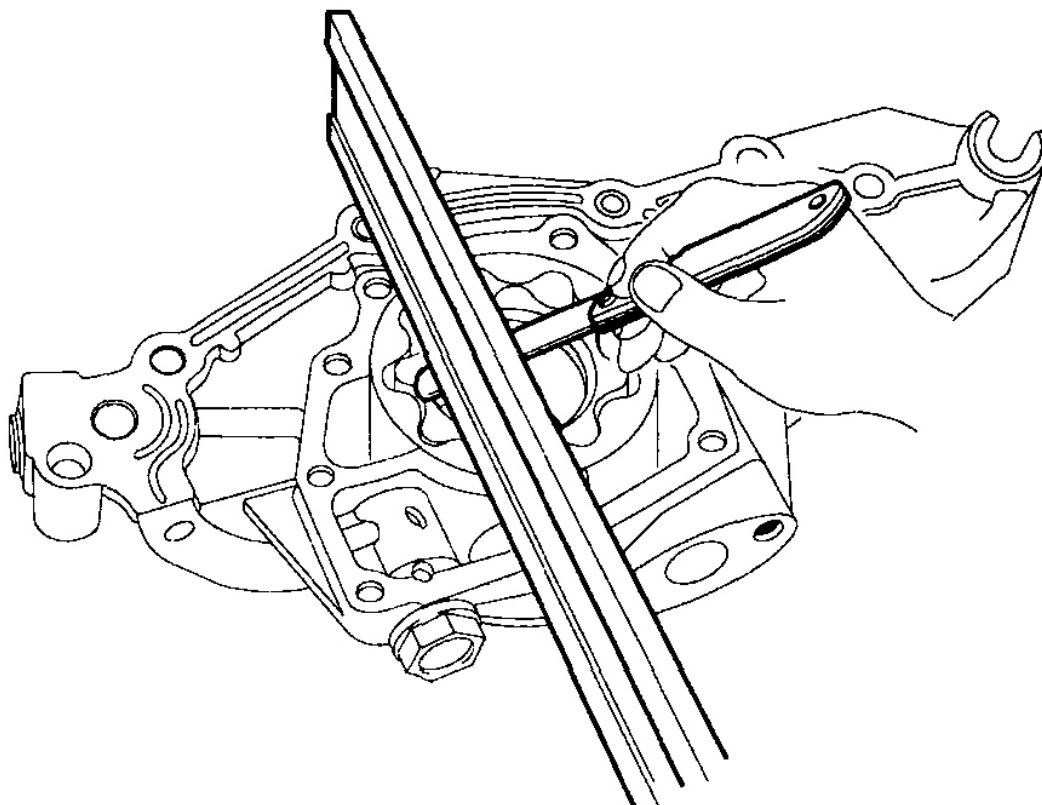
Load: 4.6kg/39.1mm (10lb/1.547in.)

3. Inspect rotor side clearance.

Using a feeler gauge and precision straight edge, measure the clearance between the rotors and precision straight edge.

Side clearance

0.040 ~ 0.095mm (0.0016 ~ 0.0037in.)



G03848986

Fig. 177: Using Feeler Gauge And Precision Straight Edge To Measure The Clearance Between The

Rotors And Precision Straight Edge
Courtesy of HYUNDAI MOTOR CO.

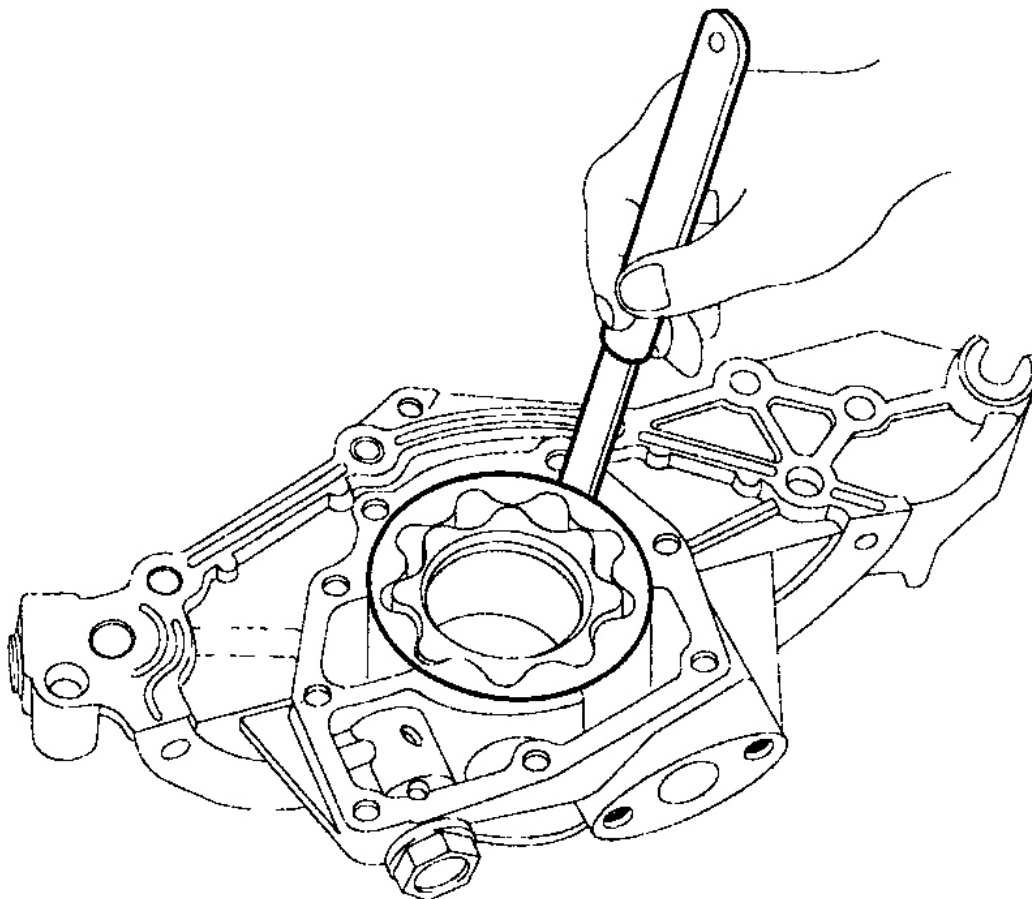
If the side clearance is greater than maximum, replace the rotors as a set. If necessary, replace the front case.

4. Inspect rotor body clearance.

Using a feeler gauge, measure the clearance between the outer rotor and body.

Body clearance

0.100 ~ 0.181mm (0.0039 ~ 0.0071 in.)



G03848987

Fig. 178: Using Feeler Gauge To Measure The Clearance Between The Outer Rotor And Body

Courtesy of HYUNDAI MOTOR CO.

If the body clearance is greater than maximum, replace the rotors as a set. If necessary, replace the front case.

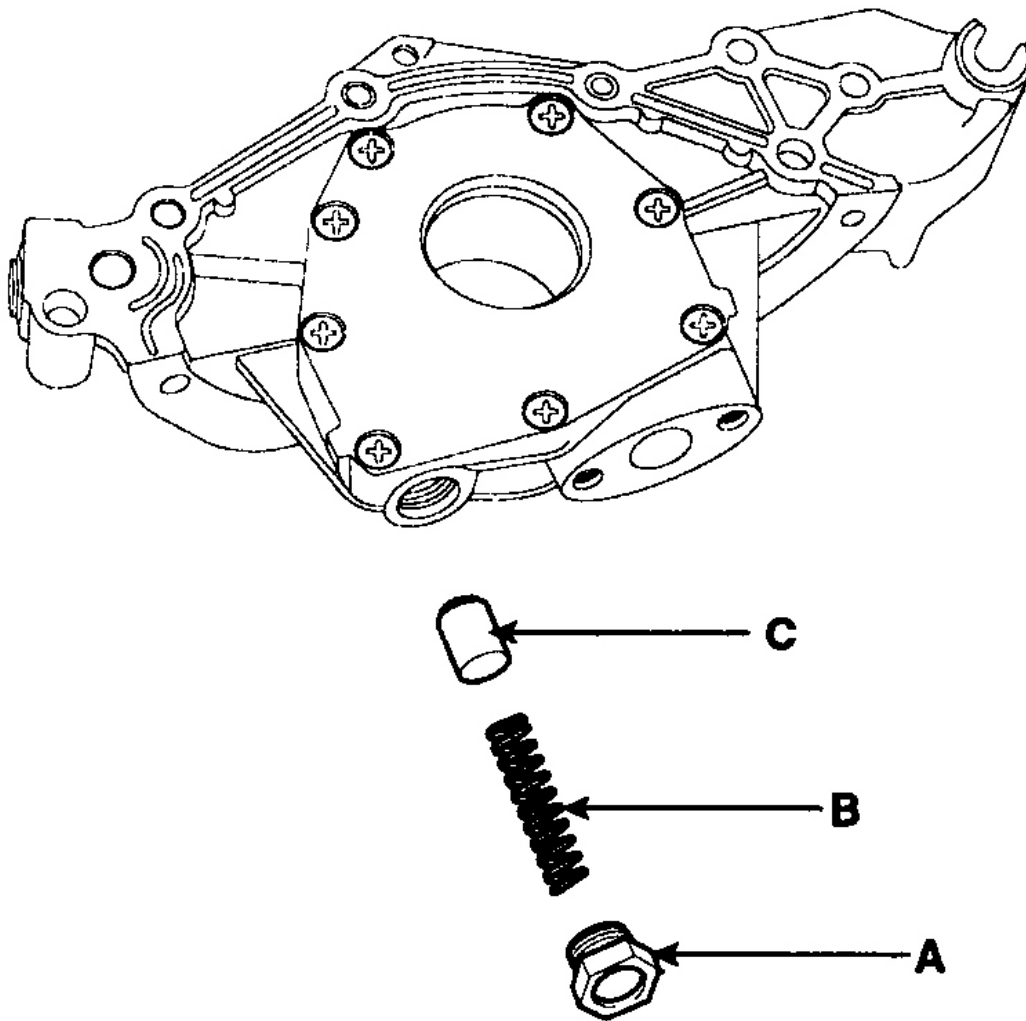
REASSEMBLY

1. Install relief plunger.

Install relief plunger (C) and spring (B) into the front case hole, and install the plug (A).

Tightening torque

40 ~ 50Nm (400 ~ 500kgf.cm, 30 ~ 37lb.ft)



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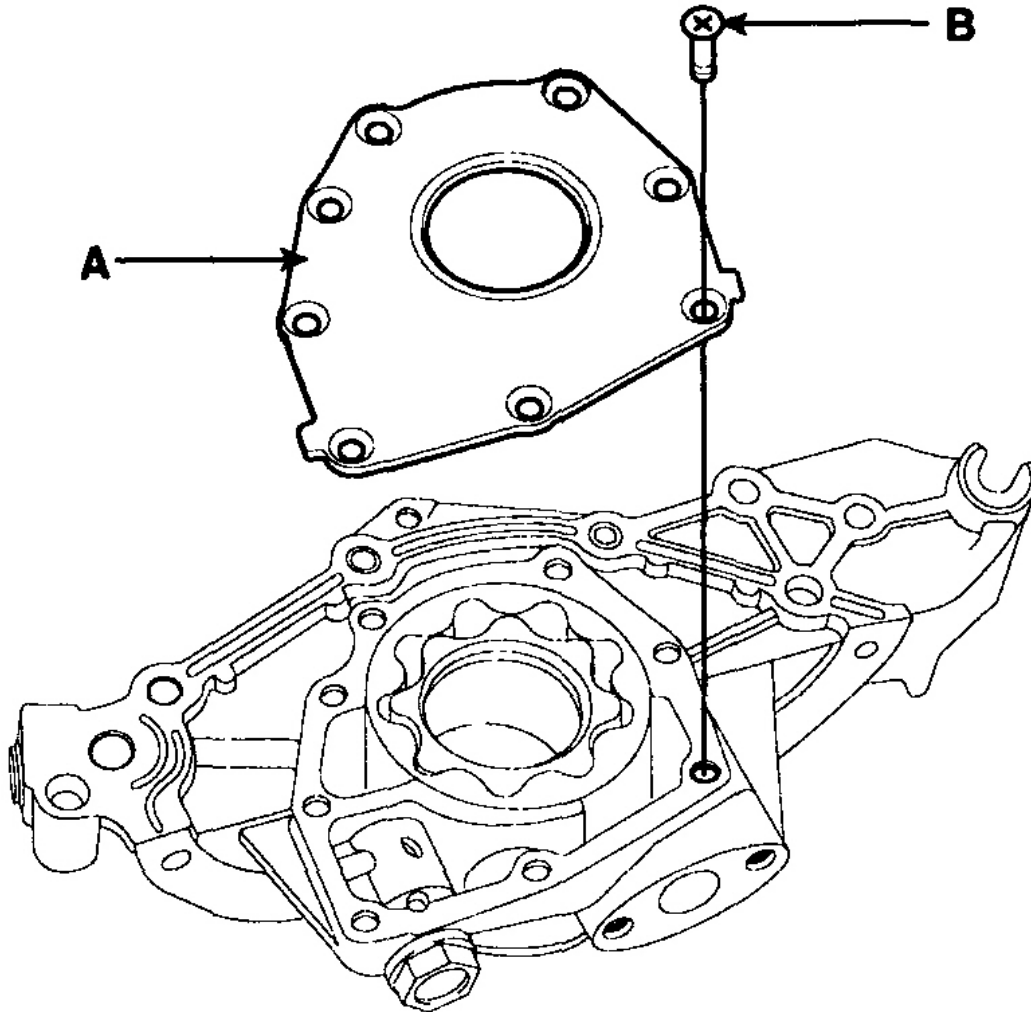
Fig. 179: Installing Relief Plunger, Spring And Plug
Courtesy of HYUNDAI MOTOR CO.

INSTALLATION

1. Install oil pump.
 1. Place the inner and outer rotors into front case with the marks facing the oil pump cover side.
 2. Install the oil pump cover (A) to front case with the 8 screws (B).

Tightening torque

8 ~ 12Nm (80 ~ 120kgf.cm, 6 ~ 8.8lbf.ft)



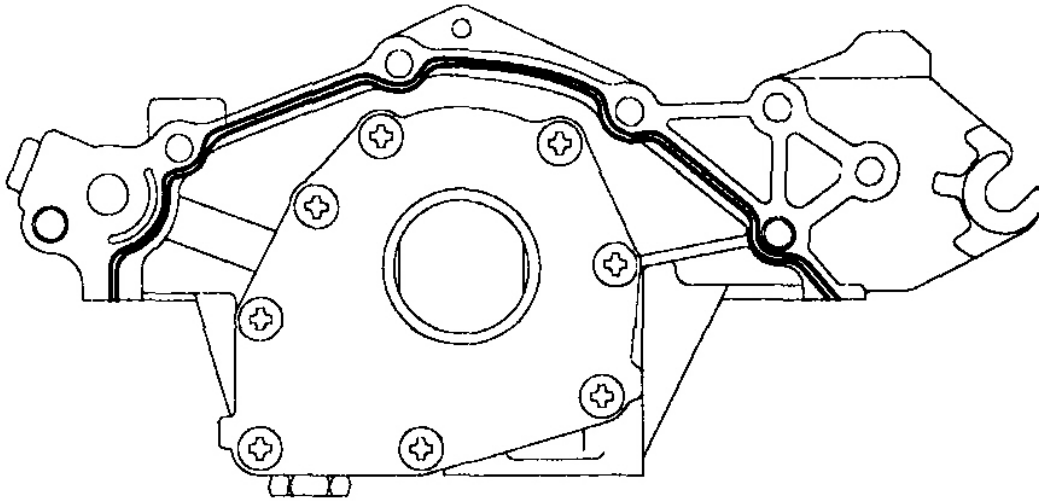
G03848989

Fig. 180: Installing Oil Pump Cover To Front Case With 8 Screws
 Courtesy of HYUNDAI MOTOR CO.

2. Check that the oil pump turns freely.
3. Install the oil pump on the cylinder block.
 1. Remove any old liquid gasket and be careful not to drop any oil on the contact surfaces of the oil pump and cylinder block.
 - Using a razor blade and gasket scraper, remove all the old liquid gasket from the gasket surfaces and sealing grooves.

- Using a non-residue solvent, clean both sealing surfaces.
2. Apply liquid gasket to the oil pump as shown in the illustration.

Use liquid gasket MS 721-40A.



G03848990

Fig. 181: Applying Liquid Gasket To Oil Pump
Courtesy of HYUNDAI MOTOR CO.

NOTE:

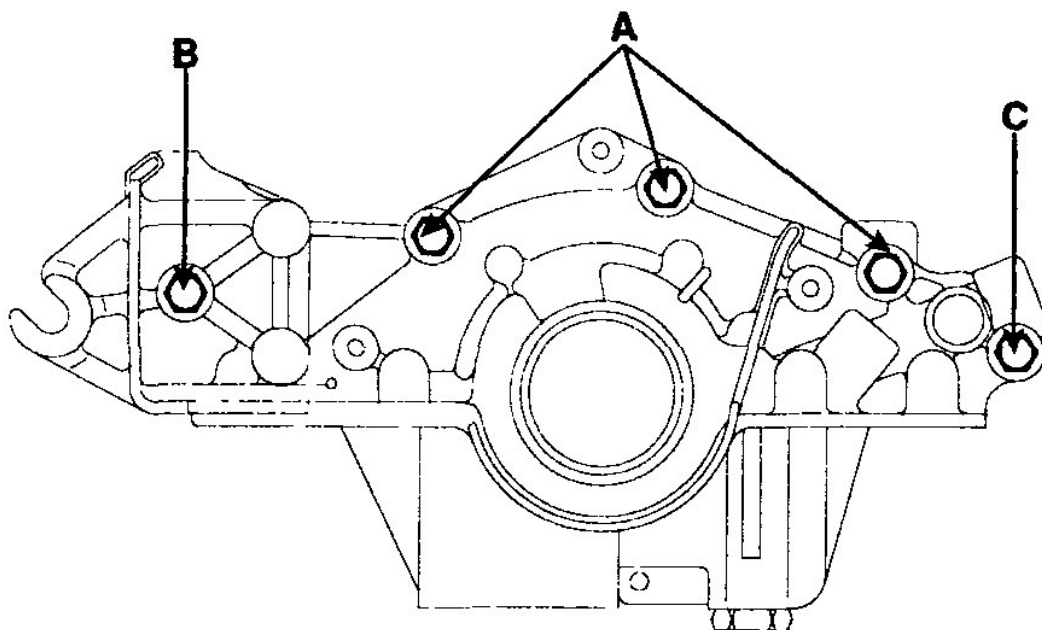
- To prevent leakage of oil, apply liquid gasket to the inner threads of the bolt holes.
- Do not install the parts if five minutes or more have elapsed since applying the liquid gasket. Instead, reapply liquid gasket after removing the residue.
- After assembly, wait at least 30 minutes before filling the engine with oil.

3. Place a new O-ring on the cylinder block.
4. Engage the spline teeth of the oil pump drive gear with large teeth of the crankshaft, and slide the oil pump on the crankshaft.
5. Install the oil pump with 5 bolts.

Uniformly tighten the bolts in several passes.

Tightening torque

12 ~ 15Nm (120 ~ 150kgf.cm, 8.8 ~ 11lb.ft)



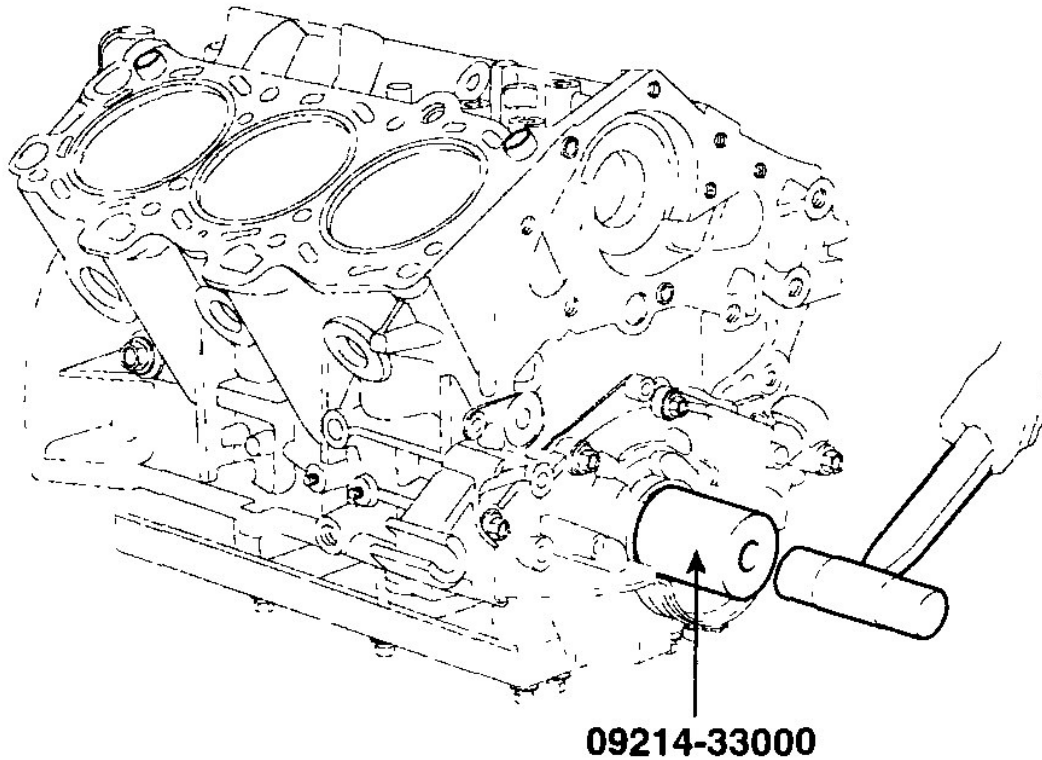
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Fig. 182: Installing Oil Pump Bolts
Courtesy of HYUNDAI MOTOR CO.

OIL PUMP BOLT SIZE AND NUMBER SPECIFICATIONS

Bolt	Size	Number
A	8 x 25	3
B	8 x 35	1
C	8 x 45	1

4. Apply a light coat of oil to the seal lip.
5. Using the special tool (09214-33000), install the oil seal.



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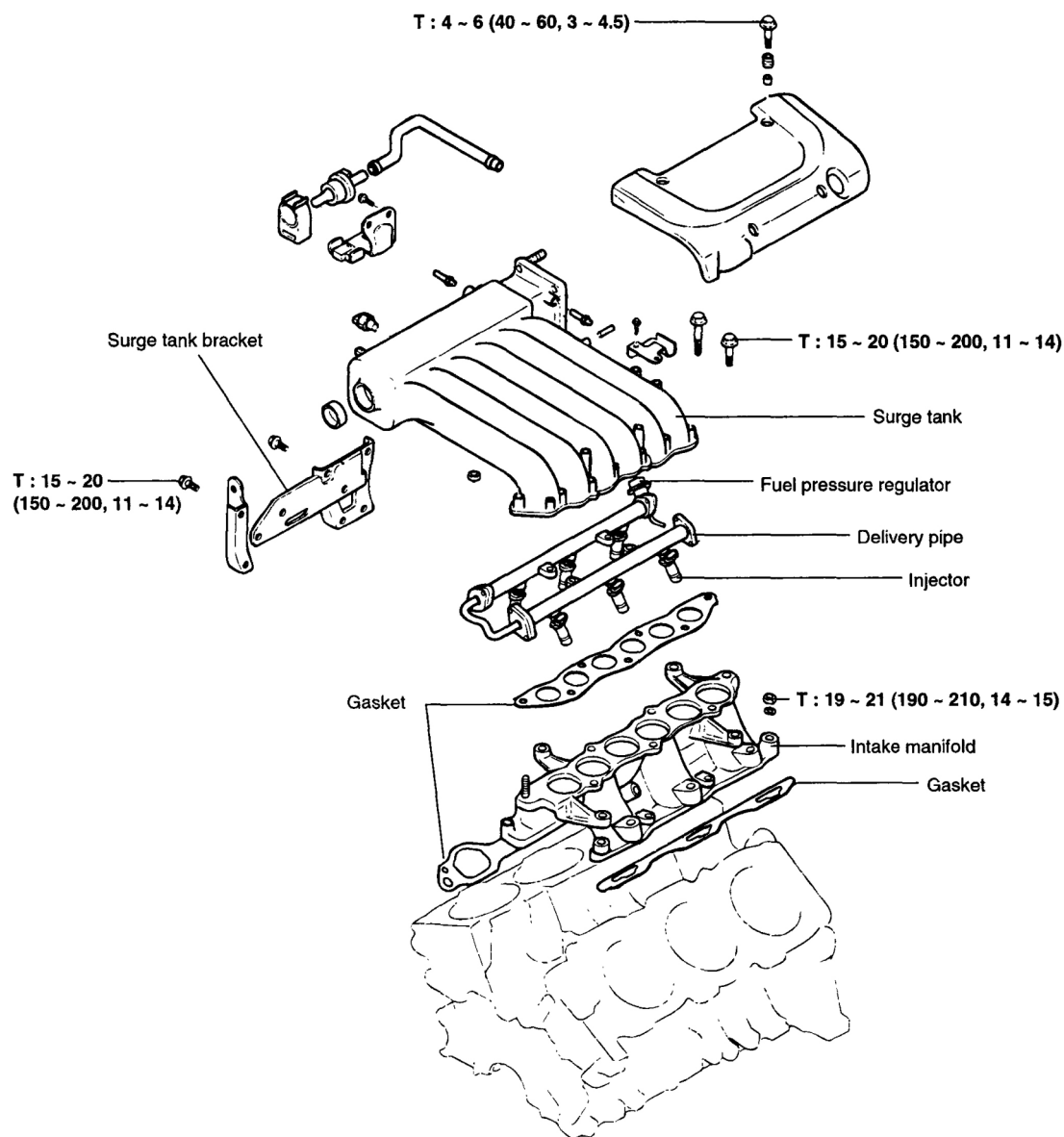
Fig. 183: Installing Oil Seal Using Special Tool (09214-33000)
Courtesy of HYUNDAI MOTOR CO.

6. Install the oil pan and oil screen. (See step 15 for oil screen and 16 for oil pan)
7. Install the timing belt. (See **INSTALLATION**)
8. Install the drive belt.
9. Install the alternator. (See **ALTERNATOR BELT INSPECTION AND ADJUSTMENT**)
10. Install the front exhaust pipe. (See **EXHAUST MANIFOLD**)
11. Install the RH front wheel.
12. Fill engine with oil.
13. Start engine and check for leaks.
14. Recheck engine oil level.

INTAKE AND EXHAUST SYSTEM

COMPONENT

INTAKE MANIFOLD

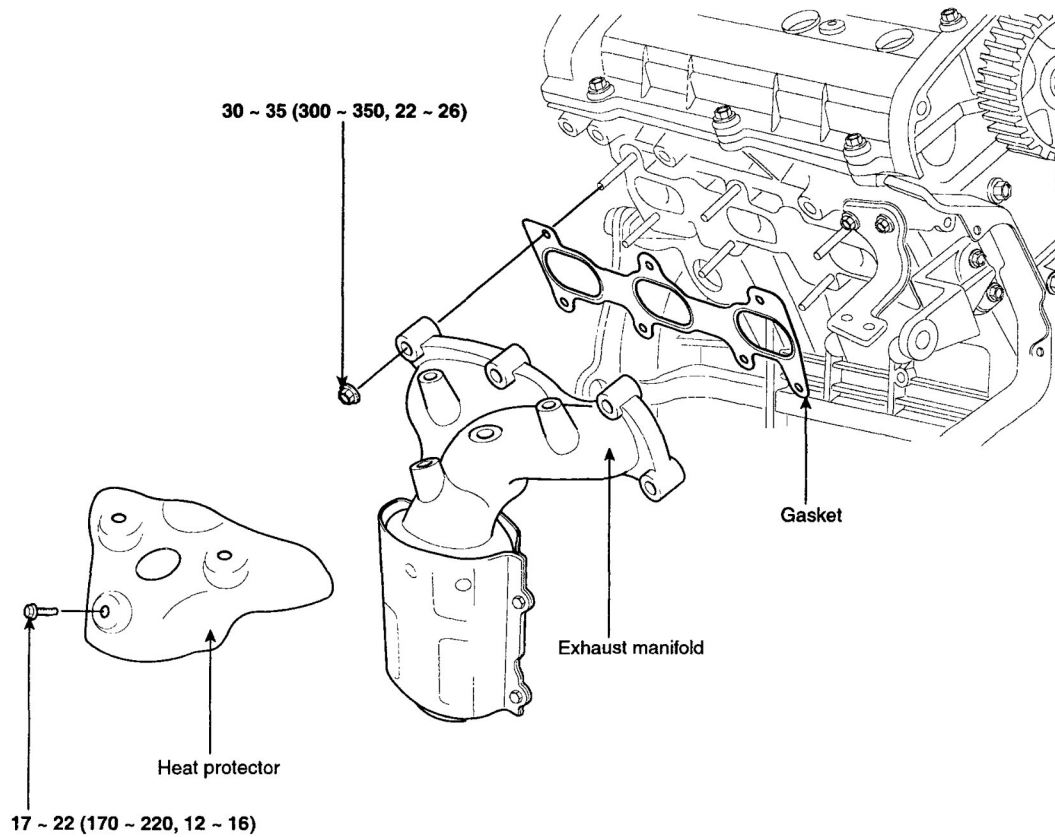


TORQUE : Nm (kg·cm, lb·ft)

G03848993

Fig. 184: Identifying Intake Manifold Components And Torque Specifications
 Courtesy of HYUNDAI MOTOR CO.

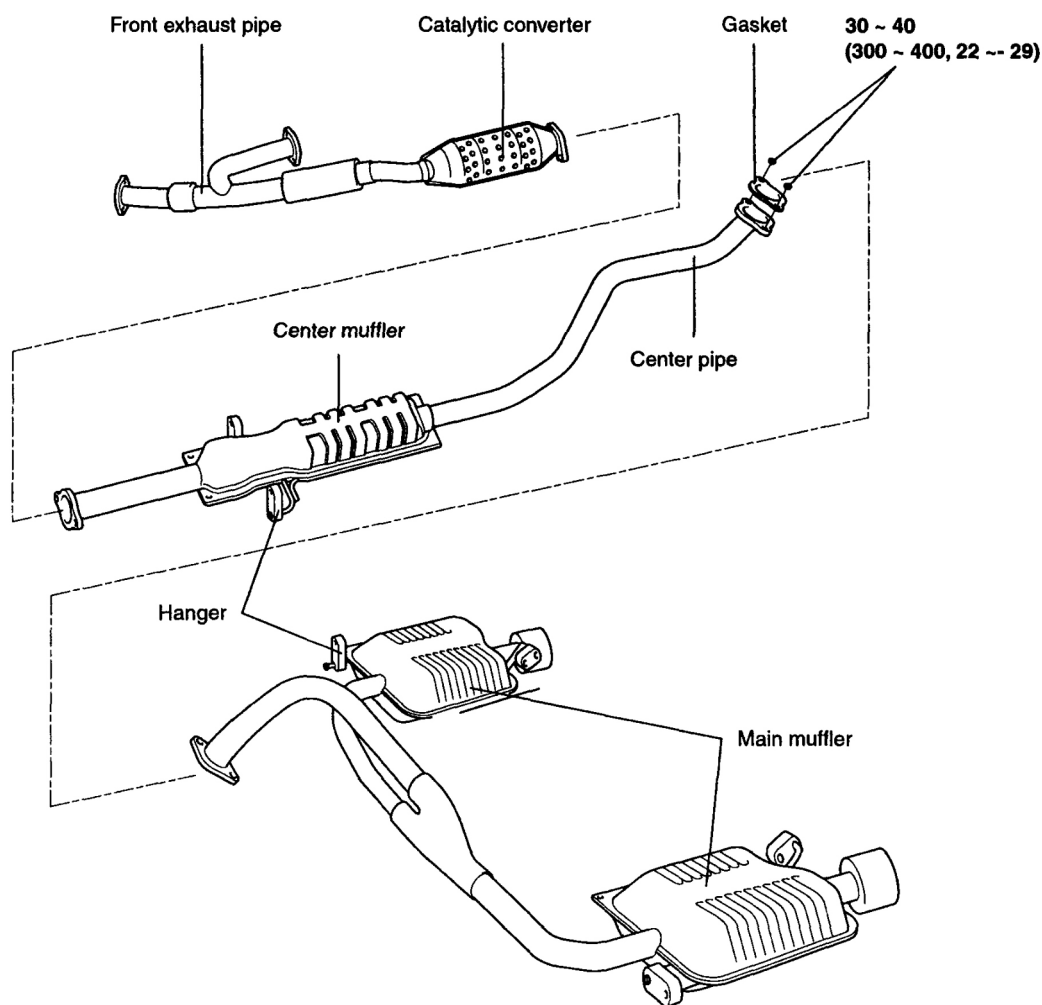
EXHAUST MANIFOLD

**TORQUE : Nm (kgf.cm, lbf.ft)**

G03848994

Fig. 185: Identifying Exhaust Manifold Components And Torque Specifications
Courtesy of HYUNDAI MOTOR CO.

MUFFLER



TORQUE : Nm (kg-cm, lb.ft)

G03848995

Fig. 186: Identifying Muffler Components And Torque Specifications
Courtesy of HYUNDAI MOTOR CO.

REMOVAL

INTAKE MANIFOLD

1. Remove the engine cover.
2. Remove air cleaner hose.
3. Remove surge tank assembly.
 1. Disconnect the accelerator cable.
 2. Disconnect the TPS connector.

3. Disconnect the ISA connector.
4. Disconnect the injector connector.
5. Disconnect the PCSV connector.
6. Disconnect the PCSV hose.
7. Disconnect the brake booster vacuum hose (A).

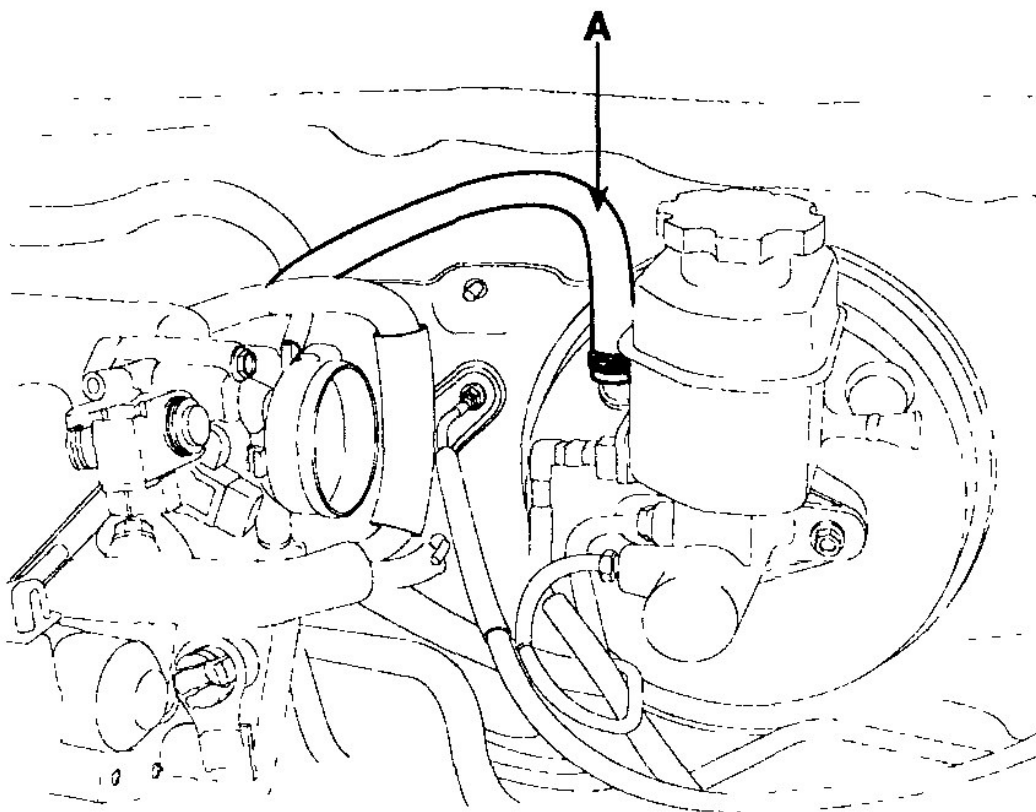
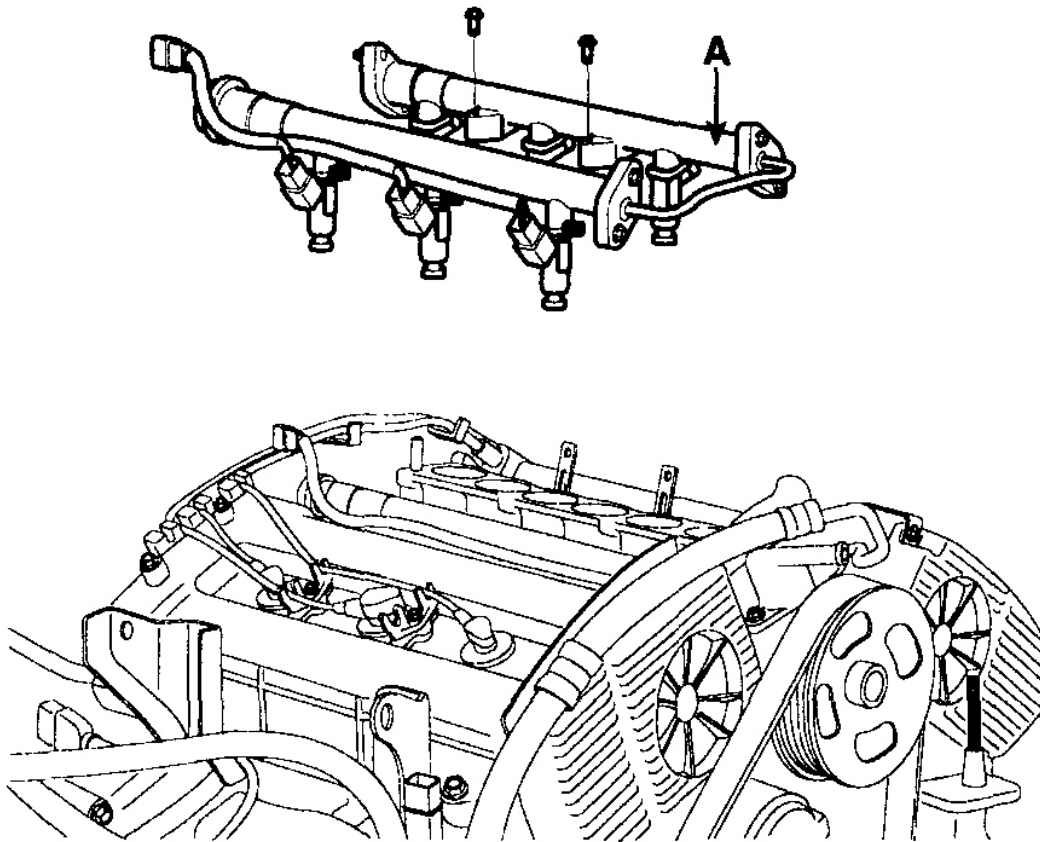
**G03848996**

Fig. 187: Disconnecting Brake Booster Vacuum Hose
Courtesy of HYUNDAI MOTOR CO.

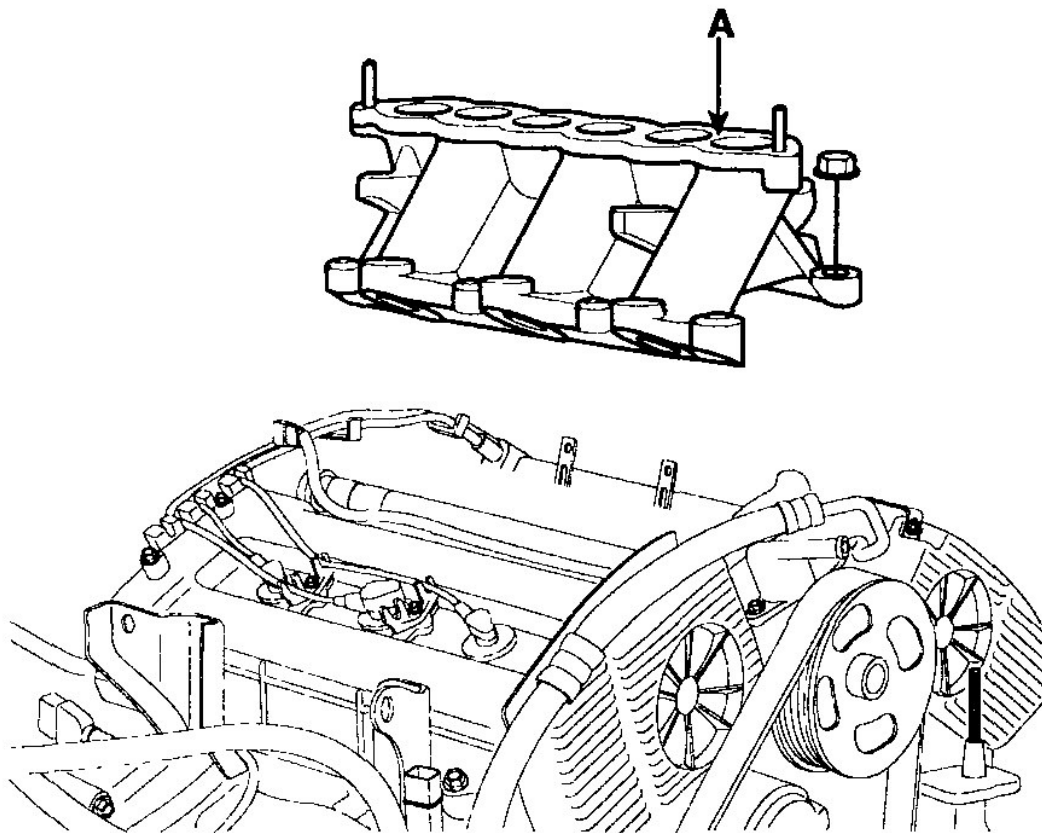
8. Disconnect the PCV hose.
9. Disconnect the IAT sensor connector.
10. Remove the surge tank stay.
11. Remove the surge tank assembly.
4. Remove the injector assembly (A).



G03848997

Fig. 188: Removing Injector Assembly
Courtesy of HYUNDAI MOTOR CO.

5. Remove the intake manifold (A) and gasket.

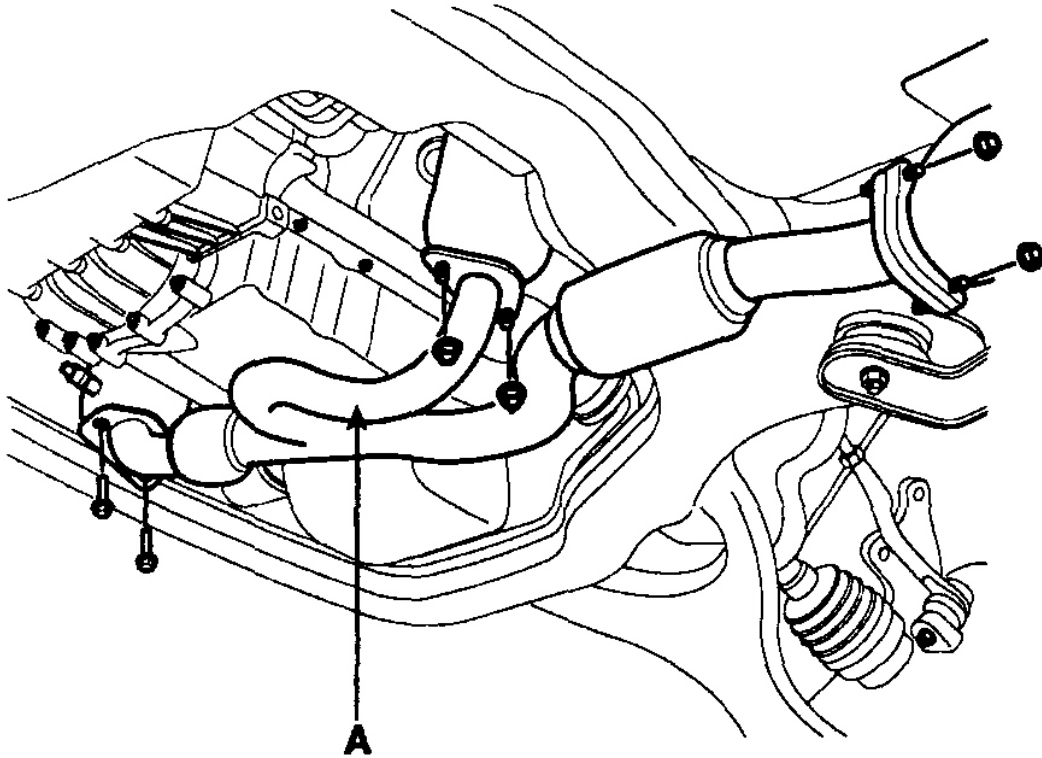


G03848998

Fig. 189: Removing Intake Manifold And Gasket
Courtesy of HYUNDAI MOTOR CO.

EXHAUST MANIFOLD

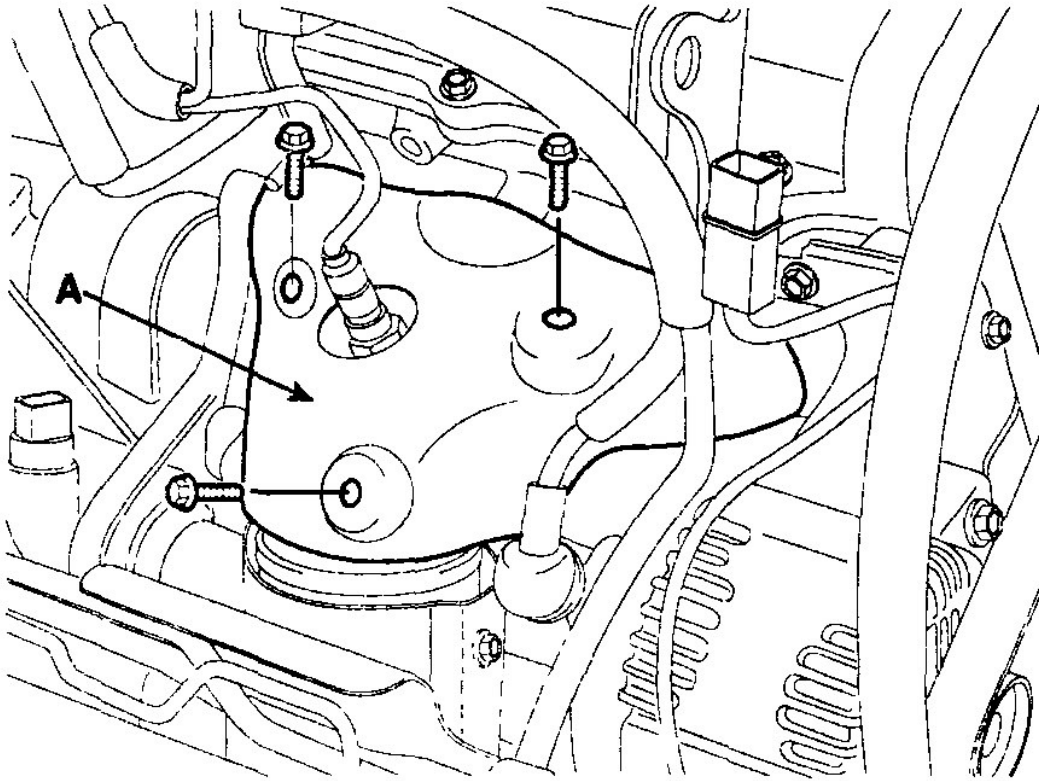
1. Remove the under cover.
2. Remove the front exhaust pipe (A).



G03848999

Fig. 190: Removing Front Exhaust Pipe
Courtesy of HYUNDAI MOTOR CO.

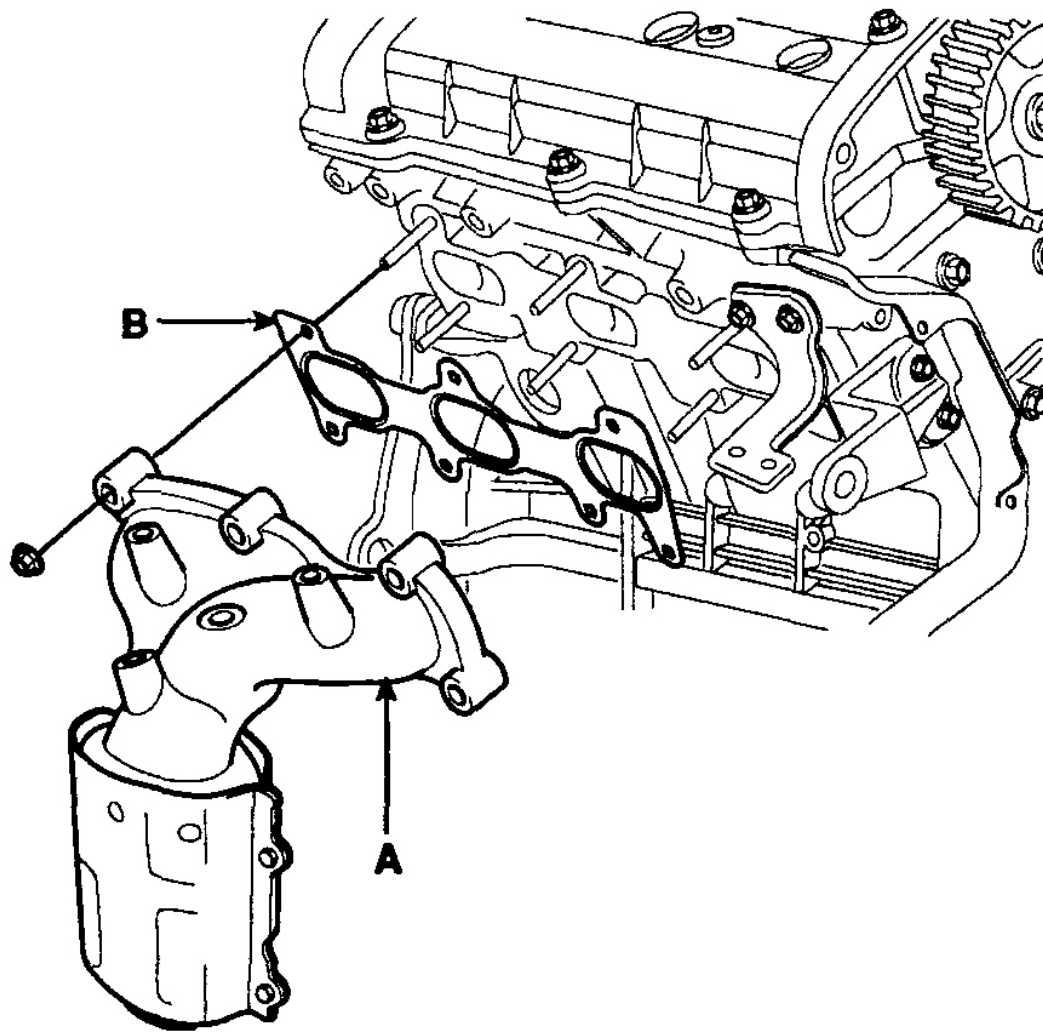
3. Disconnect the oxygen sensor connector.
4. Remove the heat protector (A).



G03849000

Fig. 191: Removing Heat Protector
Courtesy of HYUNDAI MOTOR CO.

5. Remove the exhaust manifold (A) and gasket (B).



G03849001

Fig. 192: Removing Exhaust Manifold And Gasket
Courtesy of HYUNDAI MOTOR CO.

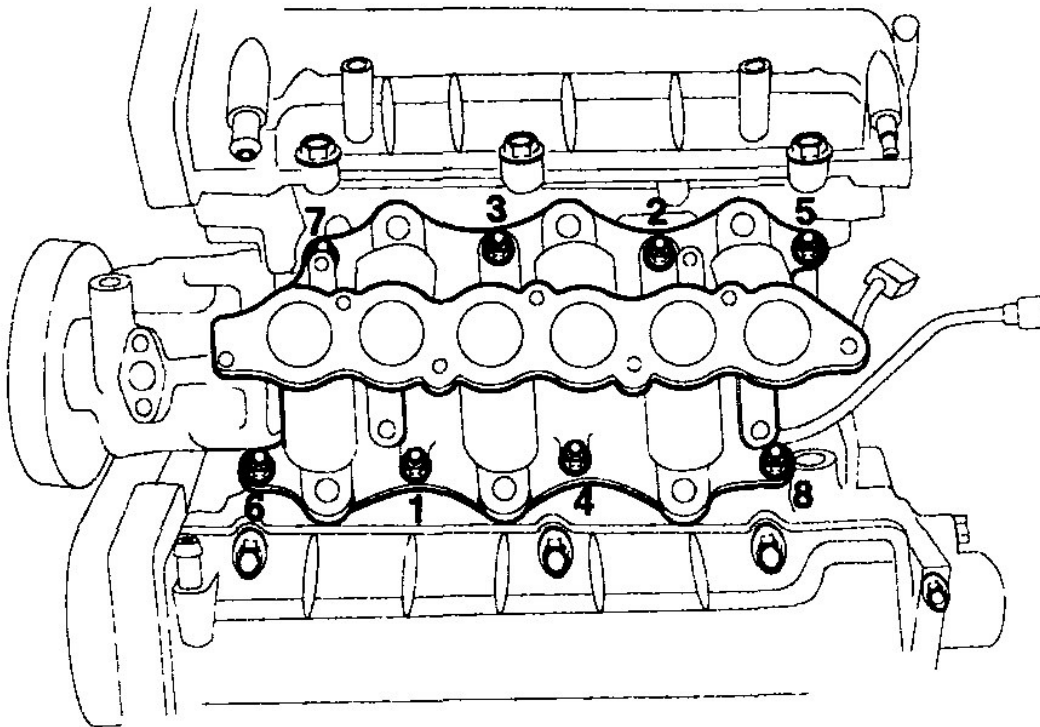
INSTALLATION

INTAKE MANIFOLD

1. Install the intake manifold and gasket.

Tightening torque

19 ~ 21 Nm (190 ~ 210kgf.cm, 14 ~ 15lb.ft)



G03849002

Fig. 193: Installing Intake Manifold And Gasket
 Courtesy of HYUNDAI MOTOR CO.

2. Install the injector assembly. (See **FUEL SYSTEM (G6BA-GSL 2.7)**)
3. Install the surge tank assembly.
 1. Install the surge tank assembly.

Tightening torque

15 ~ 20Nm (150 ~ 200kgf.cm, 11 ~ 15lbf.ft)

2. Install the surge tank stay.

Tightening torque

15 ~ 20Nm (150 ~ 200kgf.cm, 11 ~ 15lbf.ft)

3. Install the ground cable.
4. Connect the IAT sensor connector.
5. Connect the PCV hose.

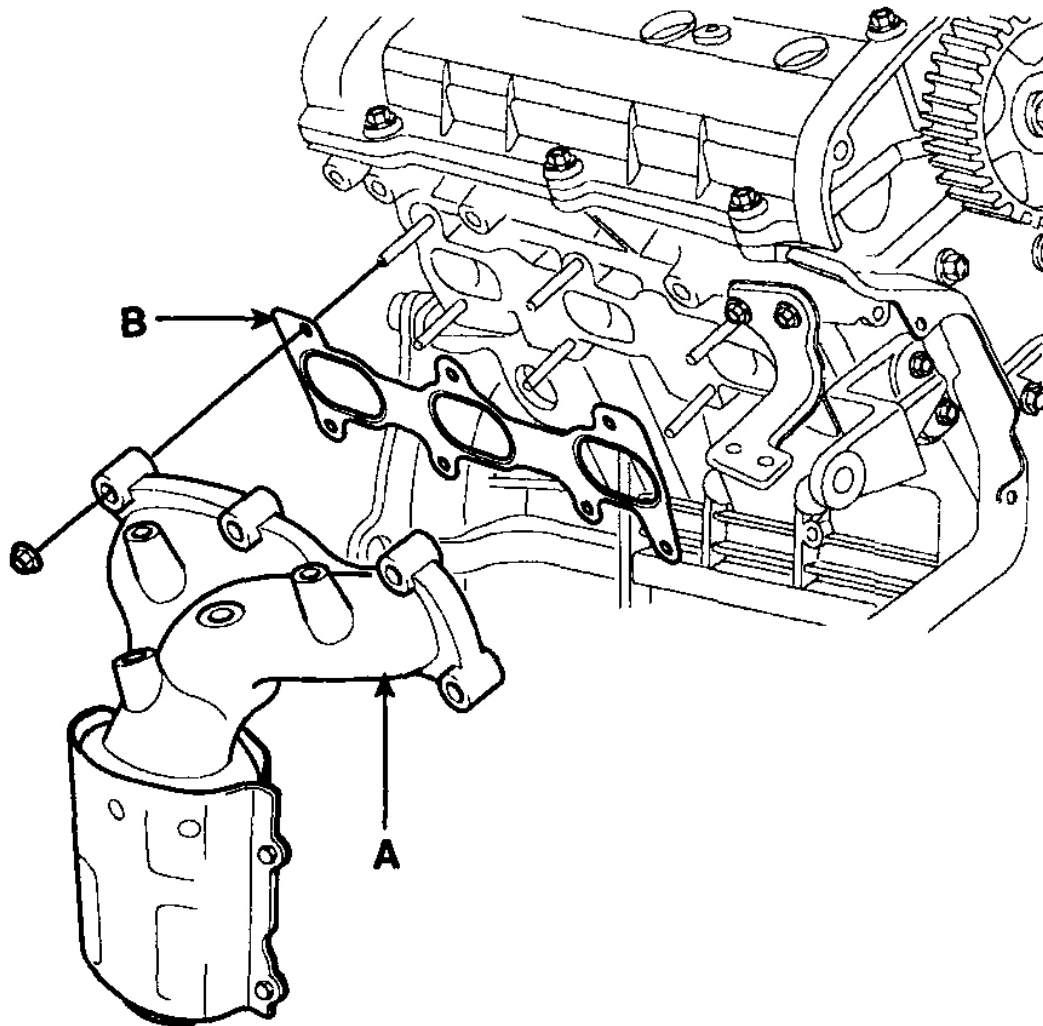
6. Connect the brake booster vacuum hose.
7. Connect the PCSV hose.
8. Connect the PCSV connector.
9. Connect the injector connector.
10. Connect the ISA connector.
11. Connect the TPS connector.
12. Connect the actuator cable.
4. Install the air cleaner hose.
5. Install the engine cover.

EXHAUST MANIFOLD

1. Install the exhaust manifold (A) and gasket (B).

Tightening torque

30 ~ 35Nm (300 ~ 350kgf.cm, 22 ~ 26lbf.ft)



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Fig. 194: Installing Exhaust Manifold And Gasket
Courtesy of HYUNDAI MOTOR CO.

2. Install the heat protector (A).

Tightening torque

17 ~ 22Nm (170 ~ 220kgf.cm, 12 ~ 16lbf.ft)

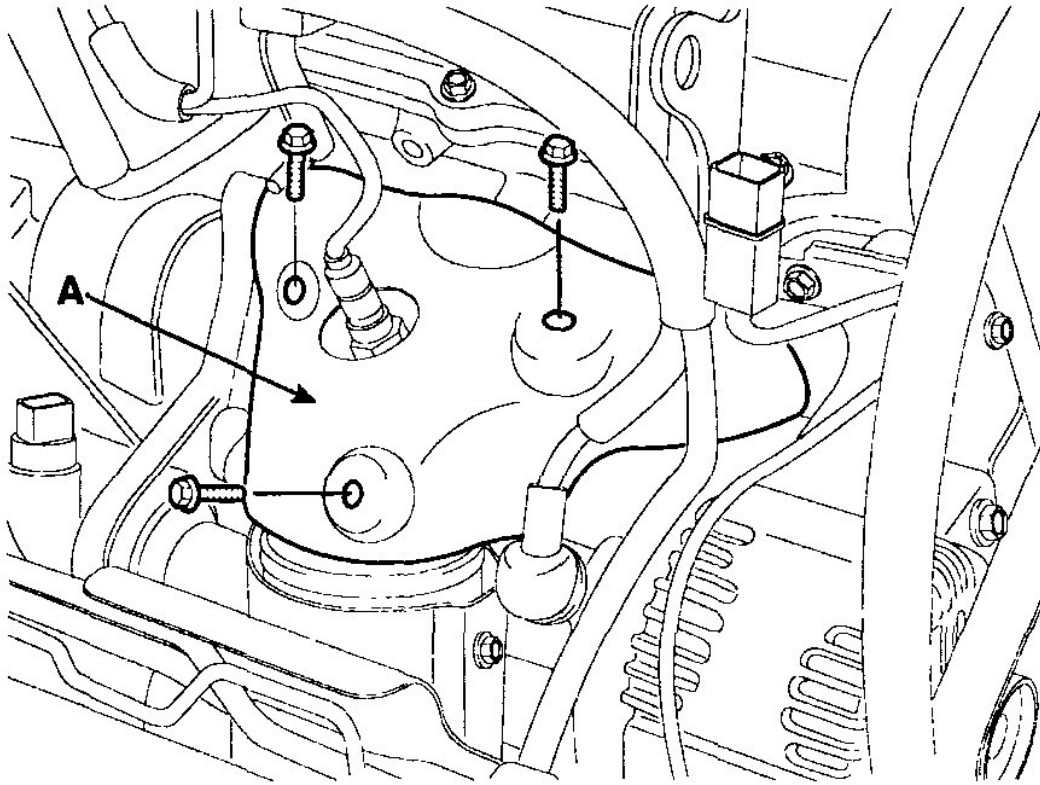
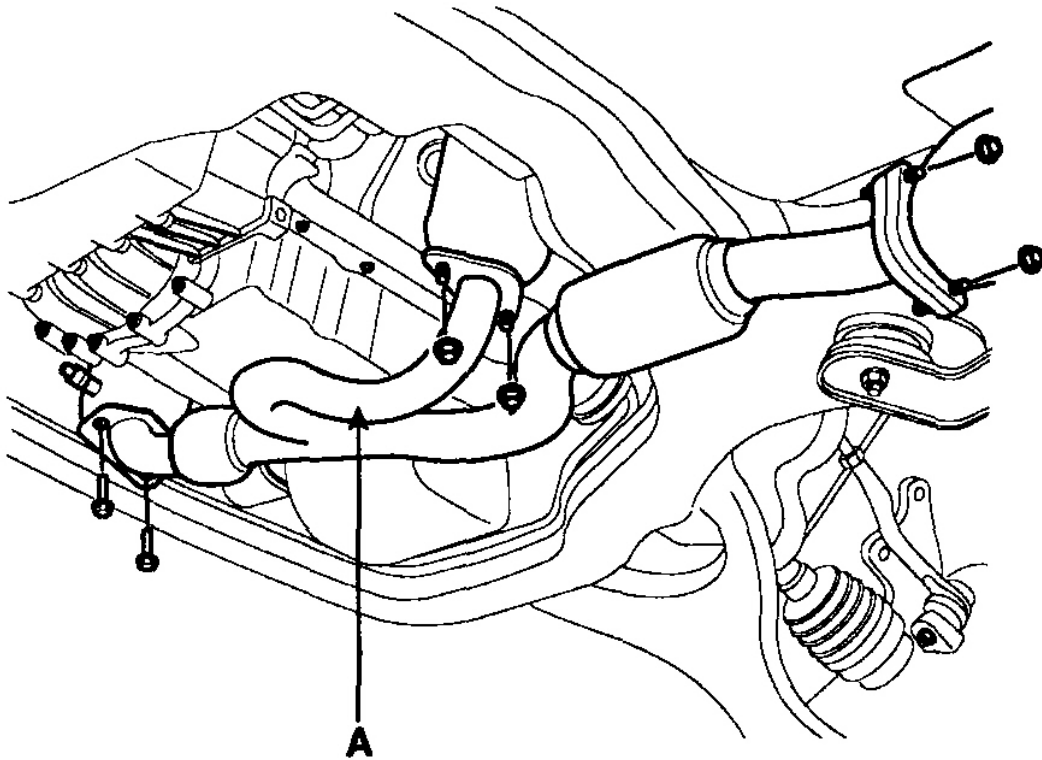
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Fig. 195: Installing Heat Protector
Courtesy of HYUNDAI MOTOR CO.

3. Connect the oxygen sensor connector.
4. Install the front exhaust pipe (A).

Tightening torque

30 ~ 40Nm (300 ~ 400kgf.cm, 22 ~ 30lbf.ft)



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Fig. 196: Installing Front Exhaust Pipe
Courtesy of HYUNDAI MOTOR CO.

5. Install the under cover.