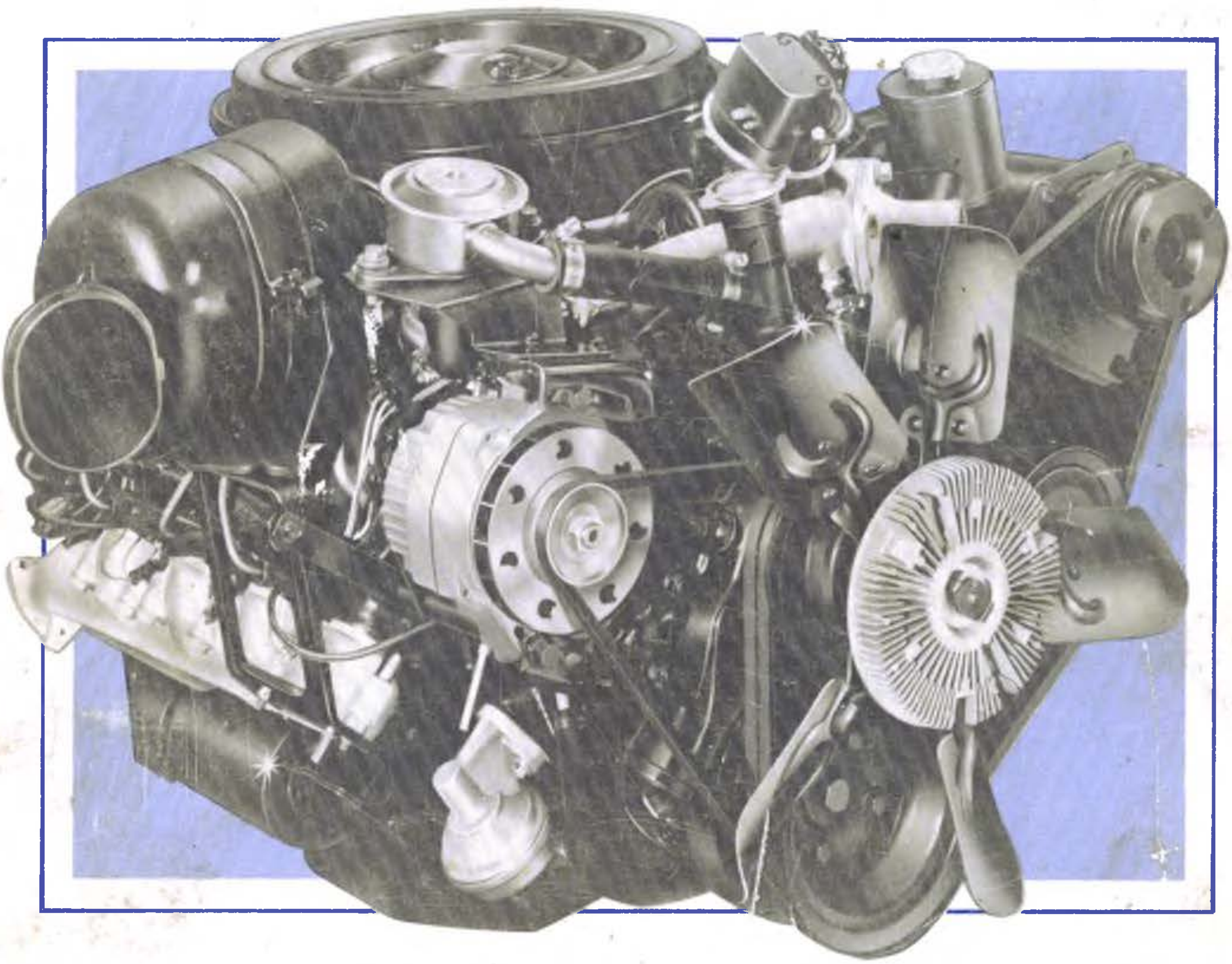
THE 6.2 LITER DIESEL ENGINE



GM

Product Service Training

16015.05-1C

6.2 Liter Diesel Engine

Foreword

This booklet is supplied by GM Product Service Training to GM dealer service personnel upon their completion of the subject course conducted at GM Training Centers.

While this booklet will serve as an excellent review of the extensive program presented in the training center session, it is not intended to substitute for the various service manuals normally used on the job. The range of specifications and variation in procedures between carlines and models requires that the division service publications be referred to, as necessary, when performing these operations.

Portions of this book were produced using information provided by Detroit Diesel Allison Division, Stanadyne Diesel Systems and Robert Bosch Corporation.

— NOTE —

Many of the words and terms in this section are explained in the "glossary" section at the back of this book. If the meaning of a new or confusing word or term isn't clear, always take the time to look it up.

Table of Contents

1. General Information and Maintenance

General Description

The 6.2L Diesel Engine is a 90° V-8 configuration using conventional push rods. It is a four stroke cycle operation and naturally aspirated; it does not use a turbocharger for air induction.

This is an engine designed, engineered, and tested for demanding light truck applications — with emphasis on fuel efficiency and emissions control see Fig. 1-1.

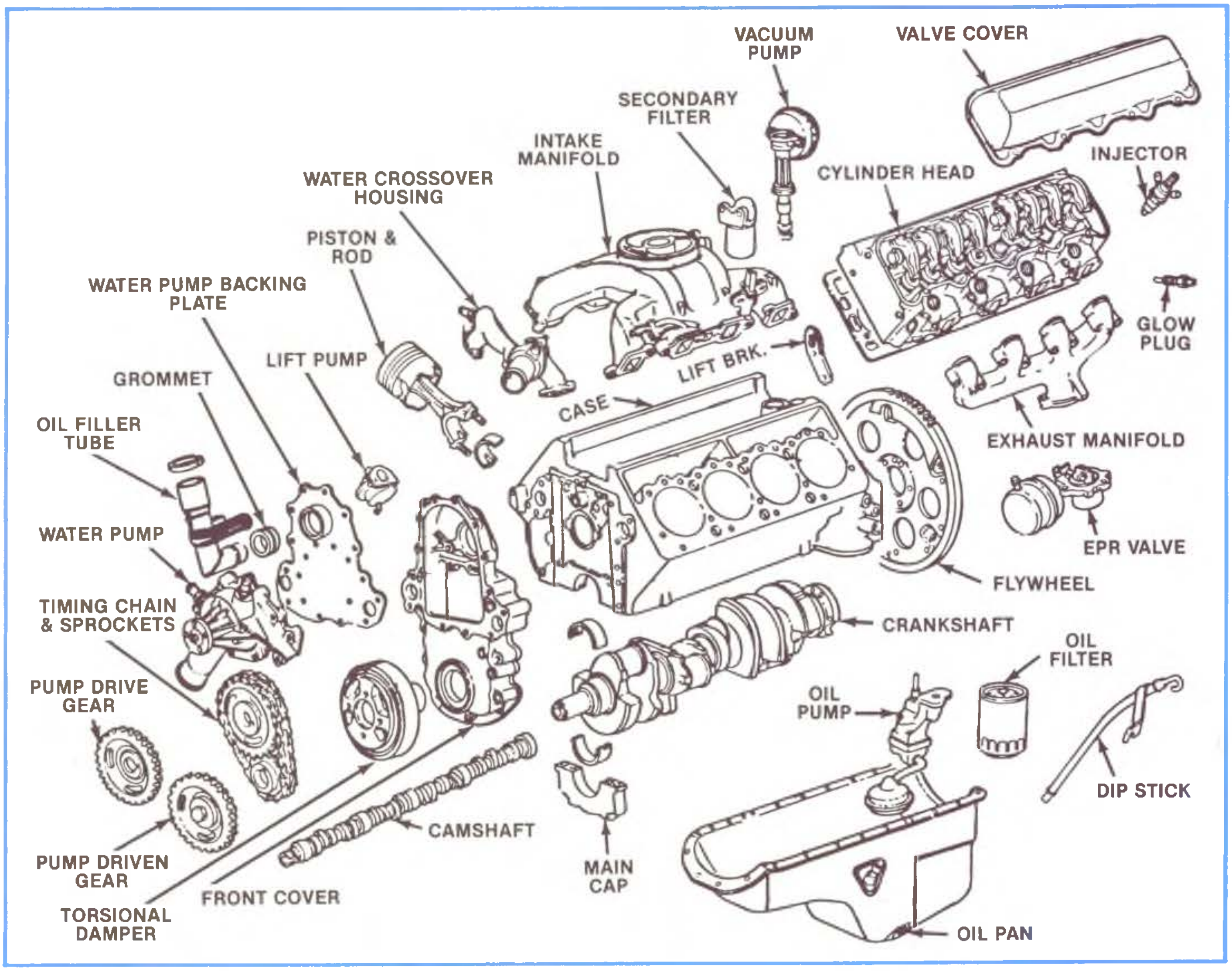


Figure 1-1, 6.2L Major Components

Engine Identification

A. #1 CYLINDER INTAKE RUNNER — A steel stamp placed on the engine part way through the assembly process, is located on the block under the #1 inlet runner. The stamp identifies the broadcast code, which essentially defines the engine configuration, plus the month and date of build. A typical marking would be a broadcast code UHH0311, indicating the engine was built on March 11.

B. THE TRACEABILITY LABEL glued to the engine contains two bar codes. The #1 code would include the number 10, indicating an "engine", plus the broadcast code, which could be 1 of 37 codes presently released (i.e., UHH). The #2 bar code would contain a computer letter, plus component identification, component manufacturing location, Julian date and a serial number. As an example, the first piece of information on the bar code would be a letter "T", which is simply for programming in the computer. The next information would be a number 10 to define the component as being an engine. The next bit of information would be the letter "R" to signify the product was made at the Moraine Engine Plant and the Julian date follows, which for March the 11th, the 70th day of the year, would be 070. After the date the serial number of the engine appears, which is started new for each broadcast code at the beginning of the Model Year. For each of the 36 broadcast codes there will be a separate set of serial numbers starting with #1 for the 1983 M.Y. and continuing until the last product of the current Model Year is manufactured.

BROADCAST CODE	SUFFIX CODES	
UHH 03 11	T — 1982	D — 1985
↑ ↑ ↑	U — 1983	H — 1986
SUFFIX MONTH DAY	F — 1984	J — 1987

C. ENGINE PLANT IN-PROCESS BAR CODE IDENTIFICATION — Top of left-hand rocker cover consists of numerical codes to identify type of engine and in-plant serial number for internal use only. Cannot be used to reference engine in communication with the engine plant.

D. WATER PUMP — Cast identification on front of water inlet tube, depressed cast numbers. Cast date alpha and 3 numbers. Pattern number alpha and 1 number.

E. CYLINDER HEAD — Drill points on end of head to identify internal machining changes and type of head.

F. INLET MANIFOLD — Cast identification on top of #4 inlet runner (right side—rear). Raised cast numbers. Cast date and shift underneath.

G. CYLINDER CASE — Casting plant pattern identification. Raised cast in clock to show time of casting. Pattern number in valley under inlet manifold.

H. CYLINDER CASE — Cast identification on top of left-hand flywheel housing surface. Raised cast numbers with cast date underneath. Pattern number to right of cast number. (CFD) Central Foundry Defiance.

I. EXHAUST MANIFOLD — Cast identification on outside face. Raised cast numbers. Pattern number and date cast clock casting plant ID.

J. INJECTION PUMP — Printed plate riveted to left side of pump body. Model number and serial number.

K. (TPS) 6 DIGIT IDENTIFIER —
Throttle
Position
Switch

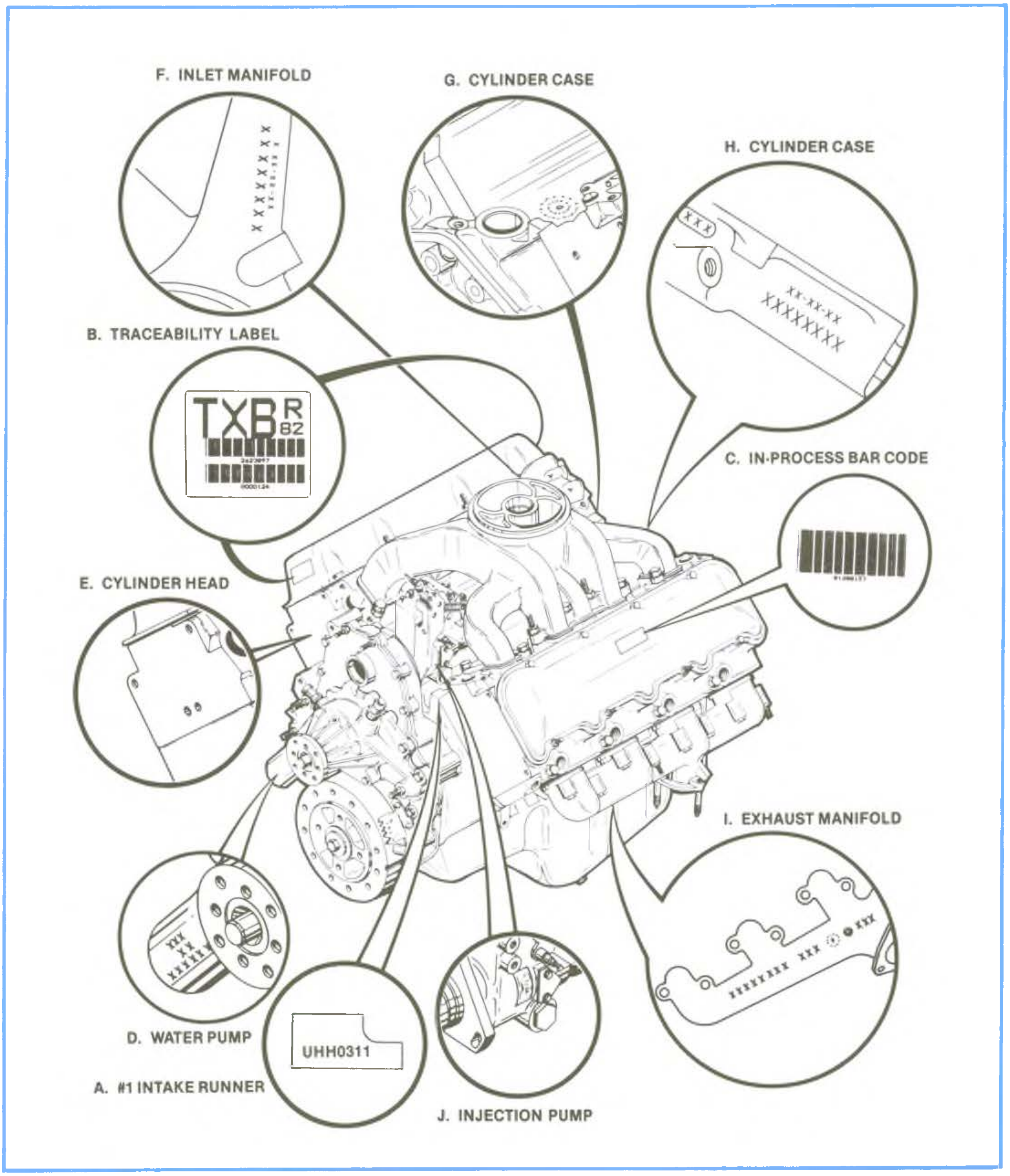


Figure 1-2, Engine Identification.

LH6 (C) Engine Specifications

General Engine Description

- **MODEL** **LH6**
- **REGULAR PRODUCTION OPTION (RPO) CODE < 8500 LBS. GVWR** **LH6**
- **VEHICLE IDENTIFICATION NUMBER (VIN) CODE** . . . . . **C**
- **ENGINE TYPE** . . . . . **4-STROKE CYCLE 90° V-8 NORMALLY ASPIRATED**
- **COMBUSTION CHAMBER TYPE** . . . . . **TURBULENCE SWIRL PRE-CHAMBER (RICARDO COMET V)**

Firing Order	1-8-7-2-6-5-4-3
Cylinder Block	Cast Iron with Combined Cylinders
Valve Timing	Chain and Sprockets (Overhead Valves)
Bore and Stroke	(101mm (3.98") x 97mm (3.80")
Displacement	6.2L (6217 cc) (379.4 cu. in.)
Horsepower LH6	130 Net H.P. (97 Kw) @ 3600 RPM
Torque LH6	240 lb. ft. (325.4 N·m) @ 2000 RPM
Volume of Acyl. at BDC	815.4048 cc (49.756 cu. in.)
Volume of Acyl. at TDC	37.8148 (2.3075 cu. in.)
Compression Ratio LH6	21.5 to 1
Dimensions & weight (approx.)	
Length — mm (in.)	750 (29.5)
Width — mm (in.)	692 (27.2)
Height — mm (in.)	696 (27.4)
Weight — kg (lbs.)	318 (701)

Technical Engine Specifications

Injector nozzle	BOSCH DNOSD 248
Bmep — kPa ($lb/in.^2$)	579 (83.9)
Fuel consumption — kg/hr (lb/hr)	30.6 (67.6)
Specific fuel cons. — g/kW·hr (lb/bhp·hr)	283.5 (.466)
Fuel pump suction at pump inlet	
Maximum — kPa (in. Hg)	
Clean system	20 (6)
Dirty system	41 (12)
Airflow — m^3/min (ft^3/min)	9.9 (350)
Air intake restriction, max. — kPa (in. H_2O)	
(Dry type air cleaner)	
Full load — dirty	5.0 (20)
clean	2.5 (10)
Exhaust temp. — °C (°F)	657 (1230)
Exhaust flow — m^3/min (ft^3/min)	30.9 (1090)
Exhaust back press., max. — kPa (in. Hg) Full load	9 (2.5)
Coolant flow — litre/min (gal/min)	249 (66)
Max. top tank temp. allowed — °C (°F)	99 (210)
Heat rejection — kW (Btu/min)	123.1 (7000)
Coolant inlet restriction, max. — kPa (in. Hg)	10 (3)
Lubricating oil press., normal — kPa ($lb/in.^2$)	275-345 (40-50)
Lubricating oil temp., in-pan — °C (°F)	82-127 (180-260)
Cooling index — Min air to boil	
With 24 km/h (15 mph) maximum ram air — °C (°F)	40 (104)
Deaeration — Air injection capacity (corrected — m^3/min. (cfm)	0.0085 (0.3)
Drawdown — Min requirement or 10% of total cooling system capacity — whichever is larger — litre (qts)	3.8 (4.0)

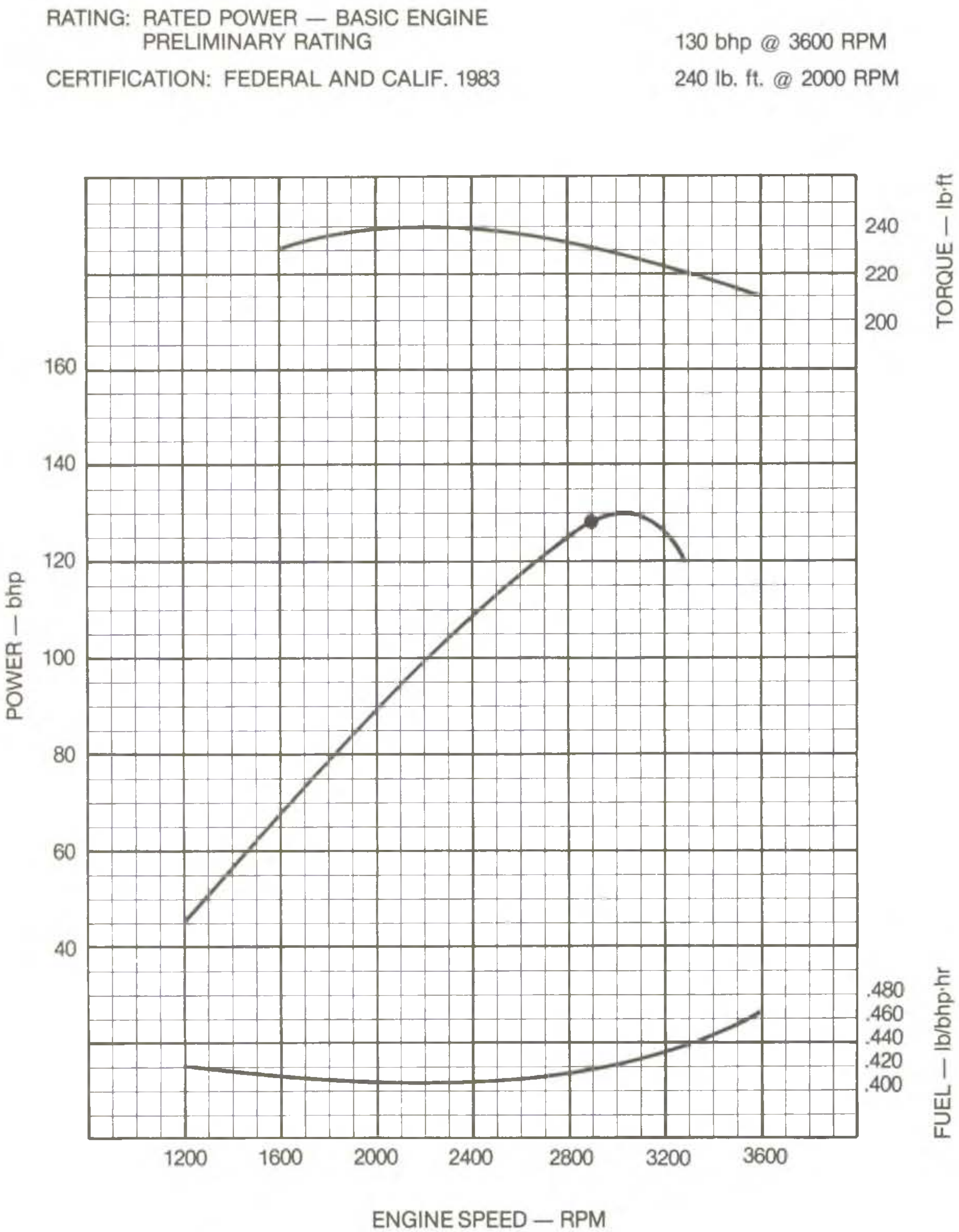


Figure 1-3, Engine Performance Curve, 6.2L — Light Duty (LH6).

LL4 (J) Engine Specifications

General Engine Description

• **MODEL**	**LL4**
• **REGULAR PRODUCTION OPTION (RPO) CODE > 8500 LBS. GVWR**	**LL4**
• **VEHICLE IDENTIFICATION NUMBER (VIN) CODE**	**J**
• **ENGINE TYPE**	**4-STROKE CYCLE 90° V-8 NORMALLY ASPIRATED**
• **COMBUSTION CHAMBER TYPE**	**TURBULENCE SWIRL PRE-CHAMBER (RICARDO COMET V)**
Firing Order	1-8-7-2-6-5-4-3
Cylinder Block	Cast Iron with Combined Cylinders
Valve Timing	Chain and Sprockets (Overhead Valves)
Bore and Stroke	(101mm (3.98") x 97mm (3.80")
Displacement	6.2L (6217 cc) (379.4 cu. in.)
Horsepower 1982-84 LL4	135 Net H.P. (101 Kw) @ 3600 RPM
1983 LL4 Industrial	145 Net H.P. (108 Kw) @ 3600 RPM
1985 LL4	160 Net H.P. (119 Kw) @ 3600 RPM
Torque 1982-84 All LL4	240 Lb. Ft. (325.4 N·m) @ 2000 RPM
1985 LL4	275 Lb. Ft. (373 N·m) @ 2000 RPM
Compression Ratio 1982	20.3 to 1
1982-85	21.3 to 1
Dimensions & weight (approx.)	
Length — mm (in.)	750 (29.5)
Width — mm (in.)	692 (27.2)
Height — mm (in.)	696 (27.4)
Weight — kg (lbs.)	318 (701)

Technical Engine Specifications

Injection pump (timing)	STANADYNE DB2
Injector nozzle	BOSCH DNOSD 248
Engine speed — r/min	3600
Brake horsepower — kW (bhp)	108 (145)
Bmep — kPa ($lb/in.^2$)	579 (83.9)
Peak torque — N·m (lb·ft) @ r/min	325.4 (240) @ 2000
Fuel consumption — kg/hr (lb/hr)	30.6 (67.6)
Specific fuel cons. — g/kW·hr (lb/bhp·hr)	283.5 (.466)
Fuel pump suction at pump inlet	
Maximum — kPa (in. Hg)	
Clean system	20 (6)
Dirty system	41 (12)
Airflow — m^3/min (ft^3/min)	9.9 (350)
Air intake restriction, max. — kPa (in. H_2O)	
(Dry type air cleaner)	
Full load — dirty	5.0 (20)
— clean	2.5 (10)
Exhaust temp. — °C (°F)	657 (1230)
Exhaust flow — m^3/min (ft^3/min)	30.9 (1090)
Exhaust back press., max. — kPa (in. Hg) Full load	9 (2.5)
Coolant flow — litre/min (gal/min)	249 (66)
Max. top tank temp. allowed — °C (°F)	99 (210)
Heat rejection — kW (Btu/min)	123.1 (7000)
Coolant inlet restriction, max. — kPa (in. Hg)	10 (3)
Lubricating oil press., normal — kPa ($lb/in.^2$)	275-345 (40-50)
Lubricating oil temp., in-pan — °C (°F)	82-127 (180-260)
Cooling index — Min air to boil	
With 24 km/h (15 mph) maximum ram air — °C (°F)	40 (104)
Deaeration — Air injection capacity (corrected — m^3/min. (cfm)	0.0085 (0.3)
Drawdown — Min requirement or 10% of total cooling system capacity — whichever is larger — litre (qts)	3.8 (4.0)

RATING: RATED POWER — BASIC ENGINE
PRELIMINARY RATING

CERTIFICATION: FEDERAL AND CALIF. 1985

1982-84 LL4
145 bhp @ 3600 RPM
240 lb. ft. @ 2000 RPM

1985 LL4
160 bhp @ 3600 RPM
275 lb. ft. @ 2000 RPM

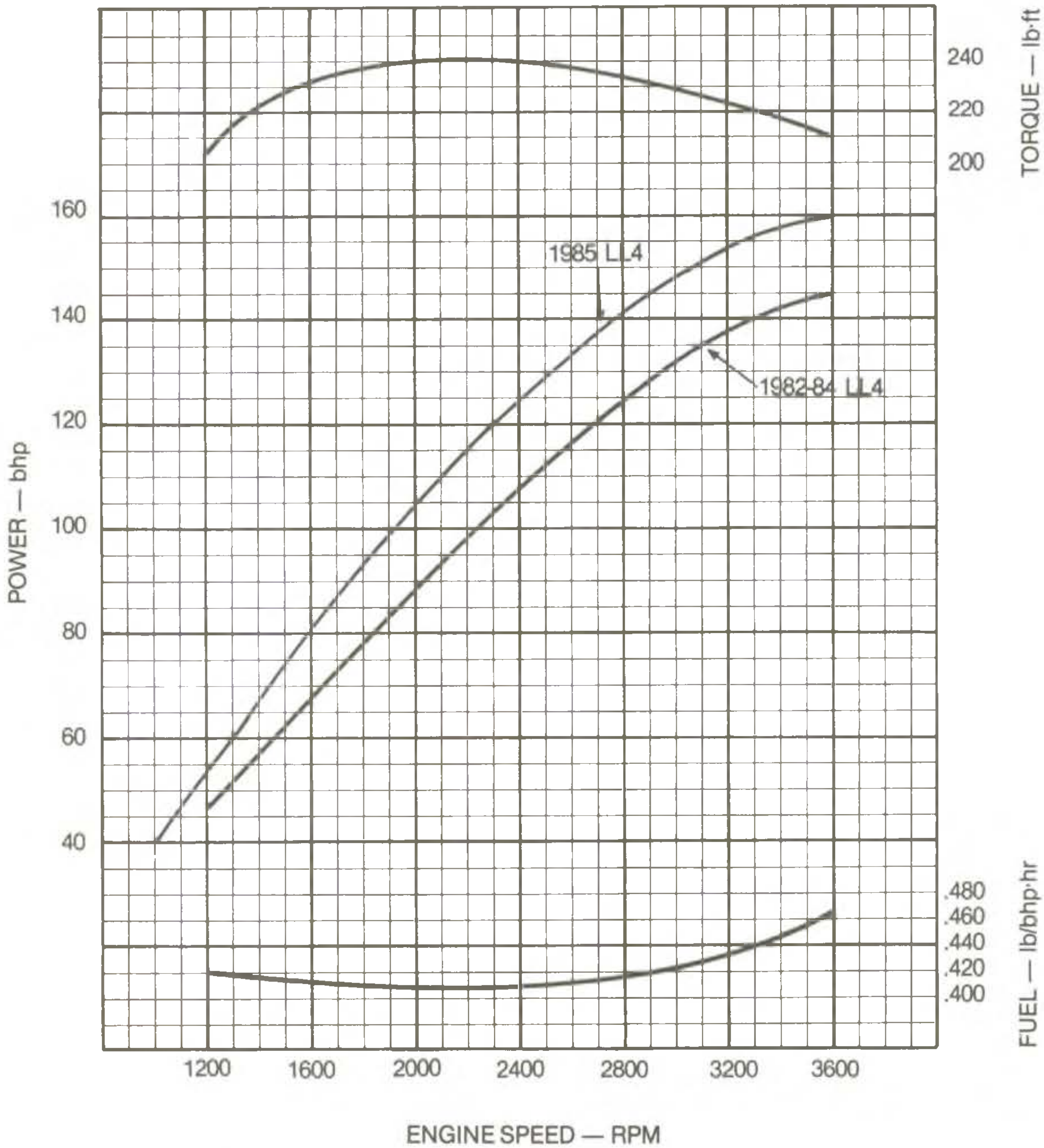


Figure 1-4, Engine Performance Curve, 6.2L — Heavy Duty (LL4)

GENERAL DATA:

Type	90° V8 Diesel
Displacement	6.2 Liter
RPO	LH6, LL4
Bore	101 mm
Stroke	97 mm
Compression Ratio	21.5:1
Firing Order	1-8-7-2-6-5-4-3

CYLINDER BORE:

Diameter	100.987-101.065
Out of Round	.02 Max.
Taper-Thrust Side	.02 Max.

PISTON:

(Bores 1-6) Clearance *	B	.089-.115
(Bores 1-6) Clearance *	Z	.112-.138

Bores 7 & 8 to be fit .013 Looser
*BOHN PISTONS *ZOLLNER PISTONS

PISTON RING:

Compression	Groove Clearance	Top	.076-.178
		2nd	.039-.080
	Gap	Top	.3-.55
		2nd	.75-1.0
Oil	Groove Clearance		.040-.096
	Gap		0.25-0.51

PISTON PIN:

Diameter	30.9961-31.0039
Clearance	.0101-.0153
Fit in Rod	.0081-.0309

CAMSHAFT:

± Lift .05	In	7.133
	Ex	7.133
Journal Diameter	#1, 2, 3, 4	55.025-54.975
	#5	51.025-50.975
Journal Clearance		.026-.101
Camshaft End Play		.051-.305

CRANKSHAFT:

Main Journal	Diameter	#1, 2, 3, 4	74.917-74.941
		#5	74.912-74.936
	Taper		.005 Max.
	Out Of Round		.005 Max.
Main Bearing Clearance		#1, 2, 3, 4	.045-.083
		#5	.055-.093
Crankshaft End Play			0.10-0.25
Crank-pin	Diameter		60.913-60.939
	Taper		.005 Max.
	Out Of Round		.005 Max.
	Rod Bearing Clearance		.045-.100
	Rod Side Clearance		.17-.63

VALVE SYSTEM:

Lifter			Hydraulic Roller
Rocker Arm Ratio			1.5 to 1
Face Angle (All)			45°
Seat Angle (All)			46°
Seat Runout			.05
Seat Width		In	.89-1.53
		Ex	1.57-2.36
Stem Clearance		In	.026-.069
		Ex	.026-.069
Valve Spring			
	Pressure N @ mm	Closed	356 @ 46.0
		Open	1025 @ 35.3
	Installed Height		46

TIMING CHAIN DEFLECTION:

New Chain	.500″ Max.
Used Chain	.800″ Max.

NOTICE: All dimensions are in millimetres (mm)
unless otherwise specified.

Torque Specifications

ENGINE

ENGINE	N·m	FT. LBS.
Baffle to block and stud	34-50	25-37
Bell or clutch housing	34-48	25-35
Camshaft sprocket bolt (pump drive gear)	75-90	55-66
Camshaft thrust bearing	18-27	13-20
Connecting rod nuts	60-70	44-52
Cylinder head bolts	(torque angle method)	
Cylinder head temperature switch	10-12	7-9
Cylinder head water cover plate	34-50	25-37
Exhaust manifold	25-35	18-26
Fast idle support to injection pump	18-27	13-20
Front cover to block	34-50	25-37
Fuel delivery (lift) pump to block	27-40	20-30
Fuel delivery (lift) pump plate to block	6-10	4-7
Fuel injection pump (driven) gear to pump	18-27	13-20
Fuel injection pump to front cover	34-50	25-37
Fuel line bracket to rocker cover studs	18-27	13-20
Fuel lines to brackets	3-4	2-3
Fuel lines to injection pump	20-32	15-24
Fuel lines to nozzle	20-32	15-24
Fuel lines to secondary filter and lift pump	24-26	17-19
Flywheel to crankshaft	80-95	60-70
Glow plugs	11-16	08-12
Glow plugs controller	18-27	13-20
Glow plugs temperature switch	10-12	7-9
HPCA and fast idle temperature switch	10-12	7-9
Intake manifold to head	34-50	25-37
Lifting brackets	45-60	33-44
Main brg. cap bolts inner	141-160	104-118
Main brg. cap bolts outer	126-145	93-107
Nozzle to head	60-80	44-60
Oil fill tube nuts	18-27	13-20
Oil pan bolts (except two rear)	6-14	4-10
Oil pan bolts two rear	18-27	13-20
Oil pump to main brg. cap	80-100	60-74
Pressure plate to flywheel	34-48	25-35
Rocker arm cover bolts	18-35	13-25
Rocker arm shaft	50-60	37-44
Sec. filter adapter to manifold	34-50	25-37
Thermostat to crossover	34-50	25-37
Torsional damper	190-220	140-162
TPS and VRV to injection pump	5-7	4-5
Vacuum pump clamp	34-50	25-37
Valve lifter guide clamp	18-35	13-25
Water outlet crossover	34-50	25-37
Water pump to front cover to block	34-50	25-37
Water pump plate to front cover	18-27	13-20
Water pump plate to water pump	18-27	13-20

SPECIAL TOOLS			
J-6098-10	Camshaft Brg Rem & Inst	J-33043-5	T.P.S. Gage Block
J-26999-10	Compression Gage Adapter	(.751-.773)	LL4 (700R4 Transmission)
J-29134	Piston Pin Retaining Ring	J-7049	Valve Guide Reamer Set
J-29664	Manifold Cover	J-5830	Valve Guide Reamer Set
J-29666	Airline Adapter	J-8037	Piston Ring Compressor
J-29873	Nozzle Socket	J-22102	Front Cover Seal Installer
J-33042	Static Timing Gage	J-23523-D	Harmonic Balancer Remover
J-33153	Rear Main Seal Installer	J-8089	Wire Brush, Combustion Chamber
J-33154	Rear Main Seal Packer	J-8101	Valve Guide Cleaner
J-26513	Valve Spring Compressor	J-8056	Spring Tester
J-6098.01	Camshaft Brg Rem & Inst	J-8062	Valve Spring Compressor
	Used With J-6098-10)	J-29834	Valve Lifter Remover
J-33043-2	T.P.S. And Vacuum	J-6098-11, -12	Camshaft Brg Rem & Inst
(.646-.668)	Regulator Valve Gage Block		(No's. 2, 3, 4, No. 5, No. 1)
J-33043-4	T.P.S. Gage Block	J-34352	Diesel Fuel Hydrometer
(.602-.624)		J-29872	Pump Adjusting Tool
J-33888	G-Van Engine Lifting Fixture	J-29843	Torx Bit Set
J-33300-100	Tach-N-Time	J-34029	DVOM
J-29075B	Diesel Nozzle	J-29125	DVOM
J-29079-125	Adapter Tester Set	J-34520	DVOM With Probes And Sockets
J-29079-95	6.2L Nozzle Adapter Kit	J33081	Advance Piston Hole Plug (Spring Side) Seal Installer
J-34116	Cylinder Balance Rough Idle Test Harness	J-9553-01	Drive Shaft Retaining Ring Remover
J-28552	Pressure Gage and Hose Assy. 0-15 PSI	J-29692-B	Injection Pump Holding Fixture
J-26999-12	Compression Gage	J-33198	Synkut Oil
J-34151	Housing Pressure Adapter	J-29601	Face Cam Setting Tool
J-34750	DECS — DDC Tool	J-29135	Cap Plug Set
J-29745-A	Injection Pump Drive Shaft Seal Protector		

Reference Information
6.2L DIESEL ENGINES

CYLINDER BORE AND PISTON SKIRT SIZES

METAL STAMP GRADE #	BOHN METRIC (mm)	BOHN ENGLISH (in.)	ZOLLNER METRIC (mm)	ZOLLNER ENGLISH (in.)	**CYLINDER BORE METRIC (mm)	**CYLINDER BORE ENGLISH (in.)
A	100.885 / 100.898	3.9719 / 3.9724	100.862 / 100.875	3.9709 / 3.9719	100.987 / 101.000	3.97585 / 3.97635
B	100.898 / 100.911	3.9724 / 3.9729	100.875 / 100.888	3.9719 / 3.9720	101.000 / 101.013	3.97635 / 3.97685
C	100.911 / 100.924	3.9729 / 3.9734	100.888 / 100.901	3.9720 / 3.9725	101.013 / 101.026	3.97685 / 3.97735
D	100.924 / 100.937	3.9734 / 3.9739	100.901 / 100.914	3.9725 / 3.9730	101.026 / 101.039	3.97735 / 3.97785
E	100.937 / 100.950	3.9739 / 3.9744	100.914 / 100.927	3.9730 / 3.9735	101.039 / 101.052	3.97785 / 3.97835
G	100.950 / 100.963	3.9744 / 3.9749	100.927 / 100.940	3.9735 / 3.9740	101.052 / 101.065	3.97835 / 3.97885

**Cylinder bores #7 and #8 are marked one size class smaller than actual size, i.e. a bore measuring "B" class is stamped "A" class.

OVERSIZED PISTONS (PLANT USE ONLY)

SIZE	BOHN METRIC	BOHN ENGLISH	ZOLLNER METRIC	ZOLLNER ENGLISH	**CYLINDER BORE METRIC	**CYLINDER BORE ENGLISH
X	101.029 / 101.041	3.9775 / 3.9780	101.009 / 101.022	3.9767 / 3.9772	101.130 / 101.143	3.98149 / 3.98200
Y	101.041 / 101.054	3.9780 / 3.9785	101.022 / 101.035	3.9772 / 3.9777	101.143 / 101.156	3.98200 / 3.98251
Z	101.054 / 101.067	3.9785 / 3.9790	101.035 / 101.048	3.9777 / 3.9782	101.156 / 101.169	3.98251 / 3.98303

— NOTE —

Service replacement pistons are fitted by measuring cylinder bores and honing as outlined in the Service Manual for a piston fit.

Reference Information

6.2L DIESEL ENGINES

	PISTON TO CYLINDER BORE CLEARANCE (Except Bores #7 & #8)		CLEARANCE CYLINDER BORES (#7 and #8 only)	
	METRIC	ENGLISH		
Bohn	.085mm .115mm	.0035″ .0045″	.102mm .128mm	.0040″ .0050″
Zollner	.112mm .138mm	.0044″ .0054″	.125mm .151mm	.0049″ .0059″

CASE, CAMSHAFT, AND CAMSHAFT BEARINGS (mm)					
	#1	#2	#3	#4	#5
Camshaft Journal Dia.	55.025 54.975	55.025 54.975	55.025 54.975	55.025 54.975	47.025 46.975
Finished Cam Bearing I.D.	55.088 55.063	55.088 55.063	55.088 55.063	55.088 55.063	47.076 47.051
Camshaft Brg. Clearance	.113 .038	.113 .038	.113 .038	.113 .038	.101 .026
Cam Bore Dia. (Case)	59.17 59.12	58.92 58.87	58.67 58.62	58.42 58.37	50.42 50.37
Cam Bearing O.D.	59.30 59.25	59.05 59.00	58.80 58.75	58.55 58.50	50.55 50.50
Press Fit (Bearing to Case)	.18 .08	.18 .08	.18 .08	.18 .08	.18 .08

FUEL PUMP PUSH ROD			
Pushrod O.D.	12.662/12.649	(.4985″/.4980″)	Clearance .025mm-.064mm
Pushrod Guide	12.713/12.687	(.5005″/.4995″)	(.001″-.0025″)

SURFACE FINISHES			
CRANKSHAFT	**SURFACE FINISH MICROMETERS**	**HEAD**	**SURFACE FINISH MICROMETERS**
Oil Seal Diameter Main Journals Pin Journals Thrust Face (front) (rear)	.40 max. .32 max. .32 max. .50 max. .32 max.	Mating Face **CAMSHAFT** Lobes Journals	1.60-2.80 .50 max. .50 max.
CASE		**CONNECTING ROD**	
Crank Bores Cylinder Bores Deck Face	1.50-3.0 .40- .90 1.60-2.80	Wrist Pin Bore Crank Bore Joint Face (rod & cap) Side Face (both sides)	.20-.50 2.00 max. 1.25 max. 2.00 max.

Reference Information
6.2L DIESEL ENGINES

CAMSHAFT BEARINGS			
BEARING #	**DELCO MORAINE PART #**	**GOULD PART #**	**BEARING COLOR CODE**
1	18007491	14028905	Plain (no color)
2	18007492	14028906	Pink
3	18007493	14028907	Yellow
4	18007494	14028908	Green
5	18007495	14028909	Orange

LIFTERS				
	DIAMETER		**LIFTER TO CLEARANCE**	
Hydraulic Valve Lifter	23.41mm / 23.39mm	.9217″ / .9209″	.040mm / .080mm	.0015″ / .0031″
Case Lifter Bore	23.47mm / 23.45mm	.9240 / .9232		

MAIN BEARINGS						
CYLINDER CASE MAIN BRG. #1-#5	**METAL STAMP CODE**	**UPPER BEARINGS**	**CRANKSHAFT MAIN BRGS. #1-#4**	**MAIN BRG. #5**	**LOWER BRGS.**	**COLOR CODES FOR CASE, CRANK & ALL BEARINGS**
79.850mm / 79.842mm	3	.026 U.S.	74.917mm / 74.925mm	74.912mm / 74.920mm	.026 U.S.	Blue
79.842mm / 79.834mm	2	.013 U.S.	4.925mm / 74.933mm	74.920mm / 74.928mm	.013 U.S.	Red
79.834mm / 79.826mm	1	Std.	74.933mm / 74.941mm	74.928mm / 74.936mm	Std.	White (plain for Std. Bearings)

BEARING CLEARANCES				
MAIN BEARING CLEARANCES	**(CALCULATED CLEARANCE)**		***(ACTUAL CLEARANCE)**	
Bearings #1, 2, 3, & 4	.035mm / .073mm	.0014″ / .0029″	.045mm / .083mm	.0018″ / .0033″
Bearing #5	.040mm / .078mm	.0016″ / .0031″	.055mm / .093mm	.0022″ / .0037″

*Actual clearance is based upon estimated bearing distortion for bearings #1, 2, 3, & 4 (.01mm) and bearing #5 (.015mm).

Reference Information

6.2L DIESEL ENGINES

CRANKSHAFT PIN JOURNALS AND CON. ROD BEARINGS			
CRANKSHAFT PIN JOURNAL DIA.	**CONNECTING ROD BEARINGS**	**ROD & CAP BEARINGS COLOR CODES**	**CONNECTING ROD BEARING I.D.**
60.913mm / 60.926mm Green	Std. in Rod / .026 U.S. in Cap	.026 U.S. (Green)	64.150mm / 64.124mm
60.926mm / 60.939mm Yellow	Std. in Rod / Std. in Cap	Std. (Yellow)	

CONNECTING ROD TO CRANKSHAFT JOURNAL BEARING CLEARANCE			
(Calculated Clearance)		***(Actual Clearance)**	
.035mm / .090mm	.0014″ / .0035″	.045mm / .100mm	.0018″ / .0039″

*Actual Clearance based upon estimated bearing distortion of 0.01 mm.

PISTON AND ROD PINS						
PISTON PIN BORE SIZES		**PISTON PIN O.D.**		**ROD PIN BUSHING BORE**		**COLOR CODE**
METRIC	**ENGLISH**	**METRIC**	**ENGLISH**	**METRIC**	**ENGLISH**	
31.0088 / 31.0114	1.2208 / 1.2209	30.9961 / 30.9987	1.2203 / 1.2204	31.012 / 31.027	1.2209 / 1.2215	Green
31.0114 / 31.0140	1.2209 / 1.2210	30.9987 / 31.0013	1.2204 / 1.2205	31.012 / 31.027	1.2209 / 1.2215	Orange
31.0140 / 31.0166	1.2210 / 1.2211	31.0013 / 31.0039	1.2205 / 1.2206	31.012 / 31.027	1.2209 / 1.2215	Blue

PIN CLEARANCES			
PIN TO PISTON BORE CLEARANCE		***PISTON PIN TO ROD PIN BUSHING CLEARANCE**	
METRIC	**ENGLISH**	**METRIC**	**ENGLISH**
.0101mm / .0153mm	.0004″ / .0006″	.0081mm / .0309mm	.0003″ / .0012″

Piston Pin P/N 14025530
Connecting Rod Assembly P/N 14025523

— *NOTE —

No selective assembly for wrist pin to rod bushing.

Reference Information

6.2L DIESEL ENGINES

PRECHAMBER SELECT FIT TO CYLINDER HEAD				
C-BORE DEPTH IN HEAD (mm)	DEPTH OF PRECHAMBER TOP FLANGE (mm)	RELATIONSHIP OF TOP PRECHAMBER TO HEAD MATING FACE (mm)	1982-84 PRECHAMBER PLUG CLASS DESIGNATION	1985
4.989 (.1964″) / 5.014 (.1974″)	5.039 (.1984″) / 5.014 (.1974″)	−.000 (−.000″) / +.050 (+.002″)	M	W
4.963 (.1954″) / 4.9988 (.1964″)	5.013 (.1974″) / 4.988 (.1964″)	−.000 (−.000″) / +.050 (−.002″)	N	X
4.937 (.1944″) / 4.962 (.1954″)	4.987 (.1964″) / 4.962 (.1954″)	−.000 (−.000″) / +.050 (−.002″)	P	Y

C-BORE DIA. IN HEAD	FLANGE DIA. OF PRECHAMBER	PRESS FIT—PRECHAMBER INTO PRECHAMBER BORE
39.675 (1.5620″) / 39.650 (1.5610″)	39.701 (1.5630″) / 39.676 (1.5620″)	0.051mm (.002″) / 0.001mm (.000″)

	VALVE STEM DIA. (mm)		VALVE GUIDE (mm)		CLEARANCE (mm)	
Int.	8.679 / 8.661	.3417″ / .3410″	8.730 / 3.705	.3437″ / .3427″	.026 / .069	.0010″ / .0027″
Exh.	9.454 / 9.436	.3722″ / .3715″	9.505 / 9.480	.3742″ / .3732″	.026 / .069	.0010″ / .0027″

Piston Protrusion Above Block	.049″ ± .010″
Valve Protrusion	(max.) Exhaust — .035″, Intake — .045″
Cylinder Head Thickness (Firedeck to rocker cover seat)	3.858″ ± .005″
Cam Lobe Lift	.280″ ± .002″

6.2 Liter Diesel Service Information

Operation In Snow (Diesel Engines)

Driving in a heavy snow storm or in dry loose snow that may swirl around the front of the vehicle, will cause snow to be drawn into the air intake system. Continuing to operate your vehicle under these conditions may cause the air cleaner to plug causing excessive black smoke and loss of power. Should the air cleaner become plugged with snow in extreme conditions the air cleaner element can be removed to allow the vehicle to be driven to a place of safety.

Starting the Diesel Engine

The following procedure is recommended for starting your diesel engine. Please note that a diesel engine starts differently from a gasoline engine.

1. Apply the parking brake.
2. Automatic Transmissions — Shift the transmission to "P" (Park) or "N" (Neutral) ("P" preferred). A starter safety device is designed to keep the starter from operating if the shift lever is in any drive position. (If you need to re-start the engine while the vehicle is moving, move the shift lever to "N").

   Manual Transmission — Press the clutch pedal to the floor and shift the transmission to Neutral. Hold the clutch pedal to the floor while you are starting the engine. A starter safety device is designed to keep the starter from operating if the clutch pedal is not pushed down all the way.
3. Turn the ignition key to "RUN." DO NOT TURN IT TO "START." With the ignition in "Run," the "GLOW PLUGS" light will come on. This tells you that small heating elements, called "glow plugs," are warming part of the engine for improved starting. When the engine is ready to start, the "GLOW PLUGS" light will go out.

   If the engine is warm, the "GLOW PLUGS" light may not come on. This is normal.

   During cranking, and/or after starting, the "GLOW PLUGS" light may cycle on and off a few times. This is normal; however, if the light cycles continuously, you should contact your authorized dealer as soon as practical.
4. With the "GLOW PLUGS" light out, if the temperature is more than 0°C (32°F), press down the accelerator pedal halfway and hold; if the temperature is less than 0°C (32°F), press the accelerator pedal to the floor and hold; then crank the engine by turning the ignition key to "Start." Release the key when the engine starts.

Pumping the accelerator pedal before or during cranking will not aid in starting, and could keep the engine from starting.

If the engine does not start after cranking 10 to 15 seconds, release the ignition key. Wait 10 to 15 seconds; then repeat Step 4. If attempting to start the engine after running out of fuel, refer to the "Notice" under "Fuel Requirements" in this section.

Do NOT use starting "aids" in the air intake system. Such "aids" can cause immediate engine damage.

When the engine is cold, let it run for a few seconds before moving the vehicle. This will allow oil pressure to build up. Increased operating noise and light smoke are normal when the engine is cold.

5. Apply the regular brakes and shift into the proper gear. Release the parking brake and drive off.

   NOTICE: Do not leave your vehicle unattended with the engine running. If the engine should overheat, you would not be there to react to the "TEMP" warning light or gage. This could result in costly damage to your vehicle and its contents.

While you are waiting for the "GLOW PLUGS" light to go out, fasten your seat belt and ask your passengers to do the same.

COLD WEATHER STARTING (DIESEL ENGINES)

If you plan ahead for cold weather, starting and driving your vehicle should be no problem. The following tips will help assure good starting in cold weather.

Oil gets thicker as it gets colder, which slows down the engine cranking speed. Your diesel engine runs through the heat of compression (and glow plugs when cold), rather than through the use of spark plugs as in a gasoline engine. So, your engine must crank faster than a gasoline engine before it will start.

To be sure the engine can turn fast enough to start, use the proper viscosity engine oil when prevailing temperatures drop below 0°C (32°F). (See the oil quality and oil viscosity recommendations in this section.) Using the proper viscosity oil will make starting easier down to –18°C (0°F). When prevailing temperatures drop below –18°C (0°F), the engine block heater may be needed for starting.

If you park your vehicle in a garage, you should not need to use the block heater until the GARAGE temperature drops below −18°C (0°F), regardless of outside temperatures.

The engine block heater is designed to warm the block area, which will let the engine turn faster. To use the block heater:

1. Open the hood.
2. Unwrap the electrical cord located in the engine compartment. (After using the block heater, be sure to properly restow the cord, to help keep it away from moving engine parts.)
3. Plug the cord into any three-prong 110 volt outlet (normal household current).

NOTICE: If the cord is too short, use a heavy-duty, three-prong extension cord. Do not use an extension cord such as you would use for a lamp because the cord may overheat.

- Use the block heater in accordance with the chart shown in Figure 1-5.

FIGURE 1-5, ENGINE BLOCK HEATER USAGE*

Viscosity Grade Oil	32° to 0°F (0° to −18°C)	Below 0°F (Below −18°C)
30	2 HOURS MINIMUM	8 HOURS MINIMUM
15W-40	NOT REQUIRED	8 HOURS MINIMUM
10W-30	NOT REQUIRED	8 HOURS MINIMUM

*The times listed are minimum times. It will not harm either the block heater or the vehicle to leave it plugged in longer than the times stated.

In cold weather when the vehicle is to be parked for an extended period of time (overnight), the engine-block heater may be used to reduce the engine warm-up time, and consequently, reduce the heater warm-up time.

At temperatures below −7°C (20°F), Number 2-D diesel fuel may clog the fuel filter. This is normally caused by paraffin in the fuel turning into wax as it gets colder. If the engine starts but stalls out after a short time and will not re-start, the fuel filter may be clogged. For best results in cold weather, use Number 1-D diesel fuel or a "winterized" Number 2-D fuel. (For more information, see "Diesel Fuel Requirements and Fuel System" in Section 4 of this manual.

IF ENGINE FAILS TO START

1. Do NOT use starting "aids," such as ether or gasoline, in the air intake. Such "aids" can cause immediate engine damage.
2. Turn the ignition key to "Run." Check to be sure the "GLOW PLUGS" light is out before turning the ignition key to "Start."
3. If the "GLOW PLUGS" light fails to go out, there may be a system malfunction. If this happens, you can usually still start the engine after waiting a few seconds, but you should contact your authorized dealer as soon as practical for a starting system check.
4. Be sure you have the proper viscosity oil and that you have changed it at the recommended intervals. Using oil of improper viscosity may make starting more difficult.
5. If your batteries do not have enough charge to start the engine, see "Emergency Starting" in this section on page 1-18.
6. If the "GLOW PLUGS" light is out and your batteries are sufficiently charged, but the engine will not start, contact your authorized dealer.

7. If the engine starts, runs a short time, then stops, wax forming in the fuel could be plugging the filter. (This can happen if you use the improper fuel at colder temperatures.) If this happens, contact your authorized dealer. (For more information, see "Diesel Fuel Requirements and Fuel System" in Section 4 of this manual.)

Emergency "Jump Starting"

Vehicles equipped with diesel engines use two 12-volt batteries to provide the electrical energy needed for the glow plugs and the starter. If the batteries become discharged, the diesel engine can be "jump started" using another vehicle. The procedure for "jump starting" is the same as for a vehicle with a single battery. Jumper cables may be connected to either battery. However, it is suggested that the connection be made to the battery on the right side since it is closer to the starter and the resistance is less.

Diesel Maintenance

ENGINE OIL AND OIL FILTER

Oil and filter change intervals depend upon truck usage. Figure 1-6 should assist in determining the proper oil and filter change intervals.

Diesel fuel is really oil, thus it creates a lot of soot when it burns. A considerable amount of this soot goes past the rings into the crankcase. This dirties the lubricating oil. The only way to get rid of it is to change the oil and oil filter at the recommended intervals.

After driving in a dust storm, change oil and filter as soon as you can.

The capacity when changing the oil and filter is 7 quarts.

The oil filter used for both LH6 and LL4 is the AC model PF35.

Diesel engines have an oil cooler which is located in the radiator outlet tank with the transmission cooler.

TYPE OF USE	CHANGE INTERVAL
• FREQUENT LONG RUNS AT HIGH SPEEDS AND HIGH AMBIENT TEMPERATURES. • OPERATING IN DUSTY AREAS. • TOWING A TRAILER. • IDLING FOR EXTENDED PERIODS AND/OR LOW SPEED OPERATION SUCH AS FOUND IN POLICE, TAXI OR DOOR-TO-DOOR DELIVERY SERVICE. • OPERATING WHEN OUTSIDE TEMPERATURES REMAIN BELOW FREEZING AND WHEN MOST TRIPS ARE LESS THAN 4 MILES (6 KILOMETERS).	• CHANGE ENGINE OIL AND FILTER EVERY 2,500 MILES (4,000 KILOMETERS) or 3 MONTHS, WHICHEVER COMES FIRST.
• OPERATING ON A DAILY BASIS, AS A GENERAL RULE, FOR SEVERAL MILES AND WHEN NONE OF THE ABOVE CONDITIONS APPLY.	• CHANGE ENGINE OIL AND FILTER EVERY 5,000 MILES (8,000 KILOMETERS) OR 12 MONTHS WHICHEVER COMES FIRST.

Figure 1-6, Oil Change Interval.

— NOTE —

Always change oil and filter as soon as possible after driving in a dust storm. Also, always use SF/CD or SF/CC quality oils of the proper viscosity.

OIL VISCOSITY

Engine oil viscosity (thickness) has a noticeable effect on fuel economy. Lower viscosity grade engine oils can provide increased fuel economy; however, higher temperature weather conditions require higher viscosity grade engine oils for satisfactory lubrication. The chart shown in Figure 1-4 lists the engine oil viscosities that will provide the best balance of fuel economy, engine life and oil economy.

Engine Oil Additives

— CAUTION —

DO NOT USE ANY SUPPLEMENTAL OIL ADDITIVES. USING OIL ADDITIVES MAY CAUSE ENGINE DAMAGE.

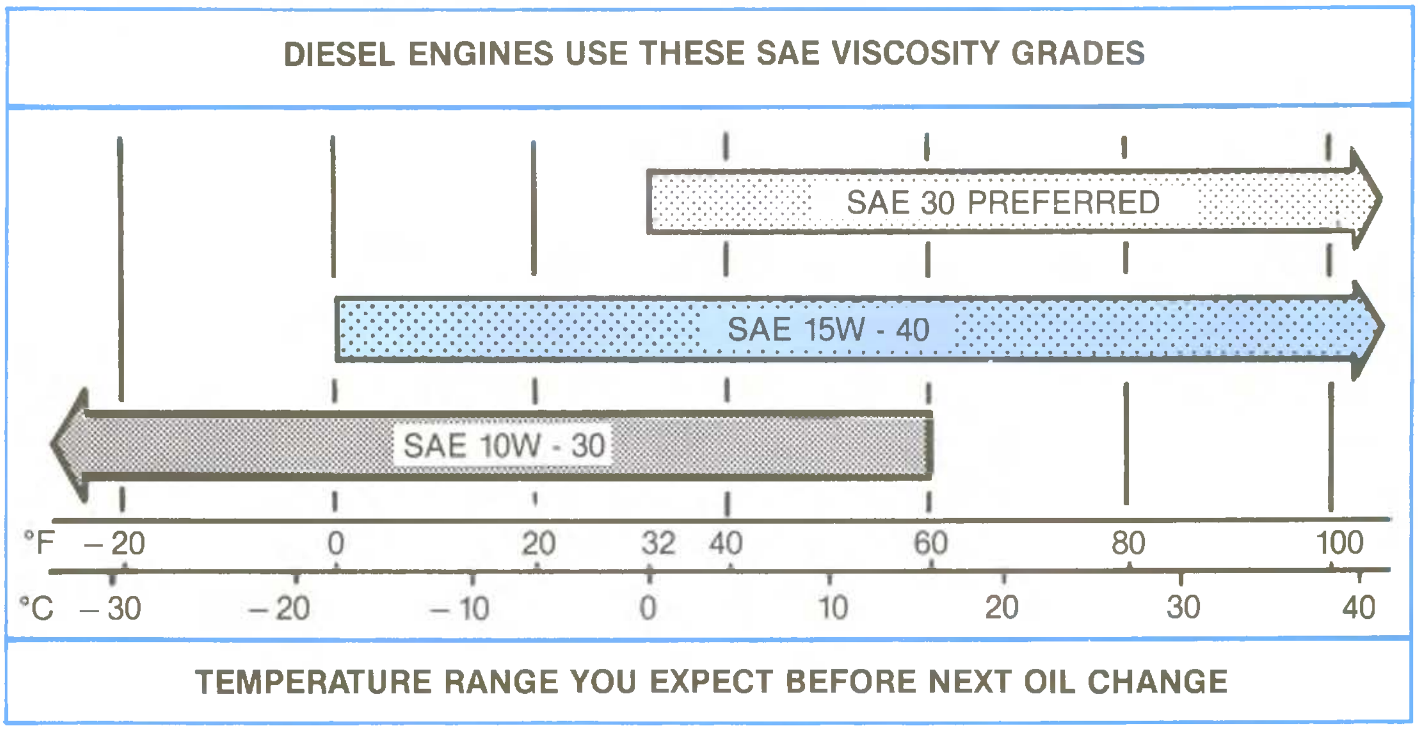


Figure 1-7, Ambient Temperature Range For Engine Oil.

Diesel Engine Oil Usage

A.P.I. OIL CLASSIFICATIONS

A.P.I., the American Petroleum Institute, has devised a service classification system based on ten classes. Gasoline engine oils are described in six and diesel engines are described in four. Generally, the higher the letters in a class, the more an oil is required to do.

A.P.I. service classifications of engine oils refer to the performance characteristics of the oils and types of services they can be used in.

RECOMMENDED OIL

Use engine oils labeled with the A.P.I. (American Petroleum Institute) designations SF/CC and CD. The A.P.I. designations are listed somewhere on the oil can, usually on the top or label.

Several different designations may appear on the can. Be sure the oil has BOTH the SF and the CC or CD designations, regardless of the order in which they appear on the oil can.

SF/CD (best choice) and SF/CC (acceptable) oils combine excellent film strength with the best available additive package to prevent wear and protect against piston ring sticking at higher mileages. DO NOT USE SAE 10W-40 OILS IN THE 6.2L DIESEL ENGINES.

Used Lube Oil Analysis Warning Values

FREQUENCY OF LUBE OIL SAMPLES FOR ANALYSIS

The interval at which used lube oil samples may be obtained for analysis can be scheduled for the same period as when other preventative maintenance is conducted. For example, in highway vehicle applications, a sample may be obtained every 2,500 miles when engines are brought in for fuel and coolant filter replacement.

USED LUB OIL ANALYSIS PROGRAM

A used lube oil analysis program is useful for monitoring the condition of the crankcase oil in all engines.

Primarily, used lube oil analyses indicate the condition of the oil but not necessarily the condition of the engine. Never tear down an engine based solely on the analysis results obtained from a single used oil sample. However, the condition of the engine should be investigated using conventional mechanical and/or electronic diagnostic instruments. Frequently, visual inspections are all that is required to detect problem areas related to engine wear. It is also prudent to obtain another oil sample from the suspected distressed unit for analysis.

Abnormal concentrations of some contaminants such as diesel fuel, coolant, road salt, or airborne dirt cannot be tolerated for prolonged periods. Their presence will be reflected in accelerated engine wear, which can result in less than optimum engine life. The oil should be changed immediately if any contamination is present in concentrations exceeding the warning limits given.

Experience in specific engine applications operating specific model engines is a prerequisite for proper interpretation of laboratory used lube oil sample analysis results. It is imperative to remember, in scrutinizing laboratory used lube oil sample results, that it is the change in value or deviation from baseline data obtained from the new oil (same brand or mixture of brands) that is significant. This is especially important to remember in investigations such as wear metal analysis, total base number and viscosity determinations.

NOTES

2. Engine Systems and Construction

Engine Design Features

The 6.2L Diesel engine features overhead valves & stainless steel swirl pre-chambers. It is an over square design; that is the bore is larger than the stroke. This provides higher RPM for heavy duty usage. The 6.2L is built in 2 versions. The LH6 Lt-duty is for use in 6,000-8,500 GVW Lt. Duty trucks and has 46mm diameter intake valves and 42mm diameter exhaust valves. The LL4 Heavy duty version is for use in trucks in the 8500-10,000 GVW range and has 50mm diameter intake valves and 42mm diameter exhaust valves in 1982 and 1983. The 1984 and later LL4 versions will use 46mm diameter intake valves and 38mm diameter exhaust valves. The 1985 Calif. LH6 uses 46mm intake and 39mm exhaust valves. The firing order is 1-8-7-2-6-5-4-3 and #1 cylinder is left bank forward.

Cylinders #1, 3, 5, 7 are on the left bank and cylinders #2, 4, 6, 8 are on the right bank.

This engine is similar to a V-8 gasoline engine in many ways but major differences occur in the cylinder heads, combustion chamber, fuel distribution system, air intake manifold and the method of ignition. The cylinder case, crankshaft, main bearings, rods, pistons and wrist pins are a heavy duty design, because of the high compression ratio required in the diesel engine to ignite fuel. Ignition of the fuel in a diesel engine occurs because of heat developed in the combustion chamber during the compression stroke. Thus, no spark plugs or high voltage ignition are necessary for a diesel engine.

Intake and exhaust valves in the cylinder heads operate the same as in a gasoline engine but are of special design and material for diesel operation. The special alloy steel pre-chamber inserts in the cylinder head combustion chambers are serviced separately from the head. With the cylinder head removed, they can be pushed out after removing the glow plugs and injection nozzles. Glow plugs and injector nozzles are threaded for assembly into the head. The nozzles are spring loaded and calibrated to open at a specified p.s.i. of fuel pressure.

Because the intake manifold is always open to atmospheric pressure, there is no vacuum supply and a vacuum pump is required to operate accessories such as air conditioning, door diaphragms and cruise control.

The engine is designed with a 101mm (3.98 inch) bore and a 97mm (3.8 inch) stroke, which produces 6217 CC (379.4 cubic inches). The compression ratio is 21.5 to 1. The cylinder head incorporates a 17 bolt head design which locates 5 bolts around each cylinder. This helps gasket durability, by increasing clamping load.

The cylinder head includes a high swirl pre-combustion chamber which mixes fuel and air to provide an efficient fuel burn and low emissions. A glow plug is used to assist in starting this system. A special cavity in the piston top further assists in mixing the combustion products for complete burning.

The main bearing caps all use 4 bolts to provide a rigid support for the crankshaft and minimize stress.

The rolled fillet nodular iron crankshaft utilizes a torsional damper, tuned to reduce vibrations.

This engine uses roller hydraulic valve lifters running on a forged steel camshaft.

The fuel system includes a water sensor, which signals high water levels and a need for service. Additional water separation, and a drain valve is provided at the filter.

A block heater is standard equipment to aid starting in severe weather.

Cylinder Case

The cylinder case is made of one piece cast iron comprised of a special alloy containing carbon, silicon, and chromium. This mixture provides good elasticity, and thermal expansion. The 6.2L is designed to match fit the cylinder bore with the piston. This is done by dividing the total diameter tolerance size range of 100.987-101.065 mm (3.975-3.979) into 6 size ranges. Each of the bore sizes is identified by a code letter A-B-C-D-E-G. This identification is metal stamped on the cylinder case pan rail adjacent to the proper cylinder, "A" size pistons for "A" size cylinder bores etc., by using this select fit method, the clearance is controlled to .089-.138mm (.0035 in.-.005 in.). See Figure 2-2.

There are 5 main bearings numbering 1 through 5 from the front of the engine. There is an arrow on the cap which points toward the front of the engine.

Each main bearing cap is retained with 4 bolts in order to provide a more rigid support for the crankshaft and minimize stress. The caps are made of nodular cast iron, and are torque driven in place on the machine line before boring, just the same as they are finally torque driven at assembly.

The center or number 3 bearing is the thrust bearing.

The main bearings are select-fitted to each of the 5 main bearing bores. The proper size code is stamped on the pan rail at the corresponding main bearing bulk head. The total diameter size range of the main bearing bores #1 through 5 is 79.826 - 79.850mm. The spread of .024mm (.0096″) is divided into 3 sizes. It will be stamped 1-2 or 3 on the pan rail. Each of the sizes is matched to the corresponding size of split bearing insert in the case half only. The split bearing insert for the main cap is match fitted to the crankshaft main journal.

Figure 2-3 shows the plant chart for main bearing installation. This matches the main bearing journal diameter with the case bore to come up with the proper size inserts.

These numbers 1, 2 & 3 are primarily for plant use in selecting the inserts of the standard, .013mm (.0005 in.) U.S., and .026mm (.001 in.) U.S.

These three bearings will be used in the field to obtain proper clearance on a crankshaft.

— NOTE —

All values in Figure 2-3 are metric and the undersize specification refers to the change in running clearance when a pair of bearings are fitted e.g. .001″ U.S. half fitted with a std. half would give a total change in running clearance of .0005″.

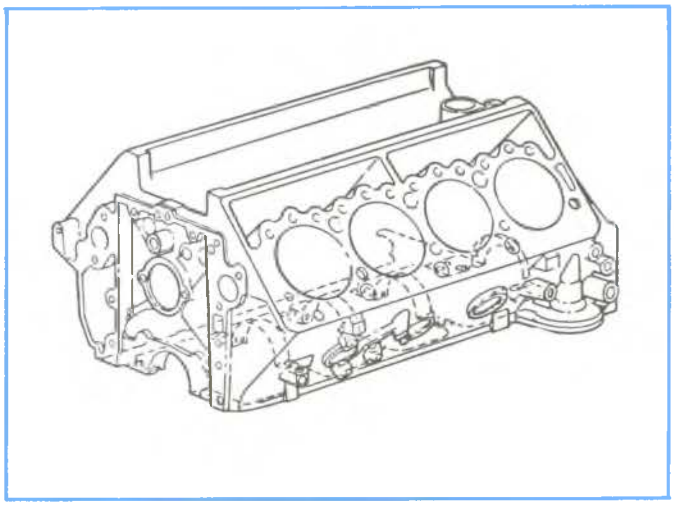


Figure 2-1, **Cylinder Case.**

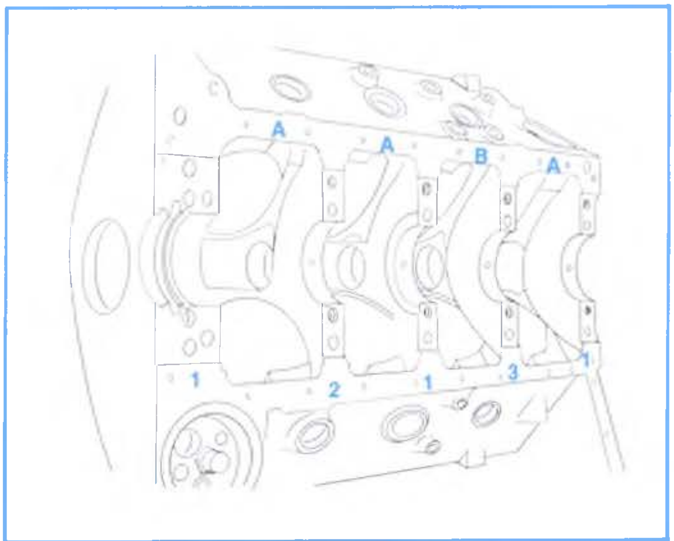


Figure 2-2, **Bottom of Case.**

CRANKSHAFT MAIN JOURNAL DIAMETER		CYLINDER & CASE MAIN BEARING BORE DIAMETER		
		79.850 79.842 (3)	79.842 79.834 (2)	79.834 79.826 (1)
FRONT, FRONT INTERMEDIATE CENTER & REAR INTERMEDIATE MAIN BEARINGS	74.917 74.925 BLUE	1-.026 U.S. IN CASE 1-.026 U.S. IN CAP	1-.013 U.S. IN CASE 1-.026 U.S. IN CAP	1-STD IN CASE 1-.026 U.S. IN CAP
	74.925 74.933 ORANGE	1-.026 U.S. IN CASE 1-.013 U.S. IN CAP	1-.013 U.S. IN CASE 1-.013 U.S. IN CAP	1-STD IN CASE 1-.013 U.S. IN CAP
	74.933 74.941 WHITE	1-.026 U.S. IN CASE 1-STD IN CAP	1-.013 U.S. IN CASE 1-STD IN CAP	1-STD IN CASE 1-STD IN CAP
REAR MAIN BEARING	74.912 74.920 BLUE	1-.026 U.S. IN CASE 1-.026 U.S. IN CAP	1-.013 U.S. IN CASE 1-.026 U.S. IN CAP	1-STD IN CASE 1-.026 U.S. IN CAP
	74.920 74.928 ORANGE	1-.026 U.S. IN CASE 1-.013 U.S. IN CAP	1-.013 U.S. IN CASE 1-.013 U.S. IN CAP	1-STD IN CASE 1-.013 U.S. IN CAP
	74.928 74.936 WHITE	1-.026 U.S. IN CASE 1-STD IN CAP	1-.013 U.S. IN CASE 1-STD IN CAP	1-STD IN CASE 1-STD IN CAP

Figure 2-3, **Bearing Chart.**

Service will continue to selectively fit bearing halves in the field by using plastigage, trying to obtain a clearance of .045-.083mm (.0018-.0032 in.) on #'s 1 thru 4, and .055-.093mm (.002-.0036 in.) on #5. The standard, .013mm (.0005 in.) U.S. and .026mm (.001 in.) U.S., bearings are for dealer service in selecting those clearances.

6.2L Valve Train

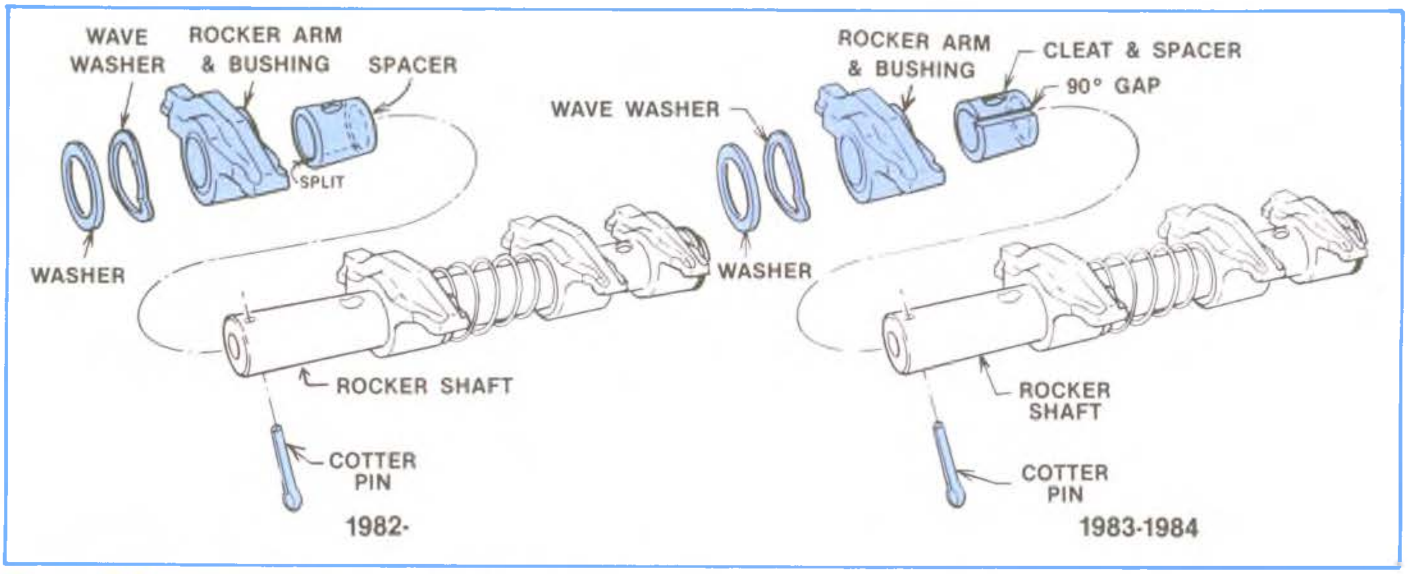


Figure 2-4, **1982-1984 Rocker Arm Assembly.**

VALVE TRAIN

1982-1984 ROCKER ARM & SHAFT DESIGN

With the high compression ratio of the pre-chamber diesel, there is minimal valve-to-piston clearance. Because it is important to have a rigid valve train that insures a precise valve train motion through the speed range, a shaft supported valve rocker arm design is used. Nodular iron rocker arms with a steel backed bushing are used. The shafts are bolted to case stanchions on the cylinder head. The design has a steel backed bronze alloy bushing in the rocker arm which is final bored after being press fit into the cast arm. This bushing uses a performed circumferential oil groove and 2 cross oil grooves for directing lubrication to the mating shaft surface. Oil is supplied to the rocker arm via the hollow push rod and the arm in turn has drilled passages that provide a flow path for oil to the bushing.

The 1982 engine used a hardened steel spacer and a metric washer at the rocker shaft attachment. The 1983-84 engine uses an unhardened spacer and a steel cleat. The steel cleat has a large gap 90° to the bolt. This prevents any closure, and the cleat spreads the load.

Spacer part # — New 14057297
— Old 14028990

1983-84 Cleat — 14057296

1983-84 Rocker Arm Assembly 14061505

1985 and Later Rocker Arm Assembly

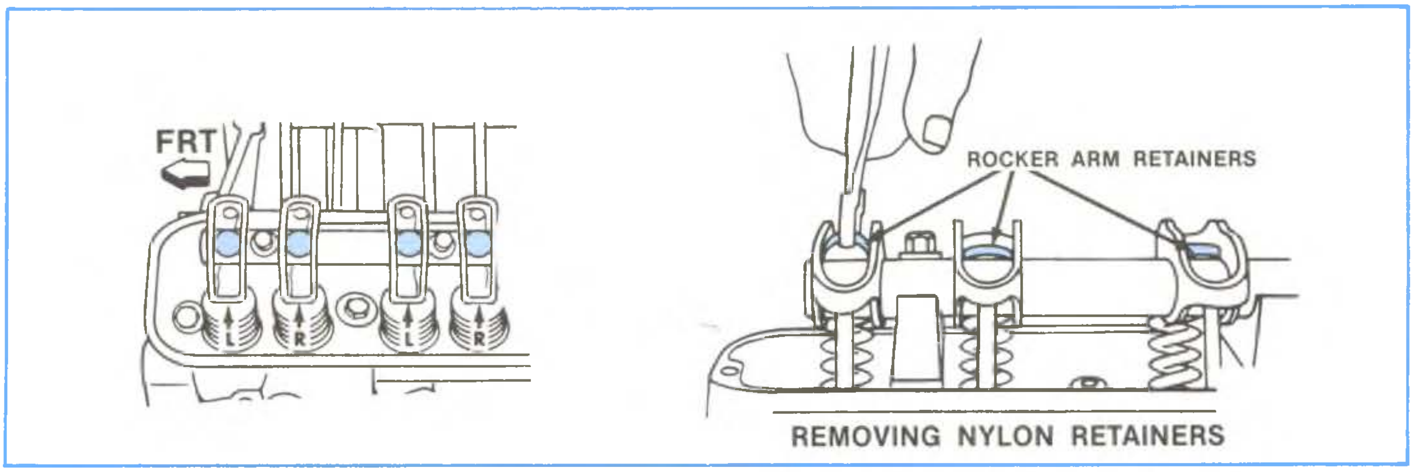


Figure 2-5, **1985 and Later Rocker Arm Assembly.**

- THE 1985 AND LATER ROCKER ARM ASSEMBLY CONSISTS OF:

1. Steel stamped rocker arms.
2. A large diameter steel shaft bolted directly to the cylinder head pedestals.
3. Individual plastic locater buttons for each arm.

The rocker arm is open-topped permitting splash lubrication of the bearing surface.

- TO REMOVE THE ROCKER ARMS IT IS NECESSARY TO DO THE FOLLOWING:

1. Remove rocker arm assembly from the cylinder head.
2. Insert a screwdriver in the bore of the rocker shaft, breaking off the ends of the nylon rocker arm retainers.
3. Using a pair of pliers, pry up on the flat tops of the retainers, removing them.
4. Remove the rocker arms.

- TO INSTALL THE ROCKER ARMS IT IS NECESSARY TO DO THE FOLLOWING:

1. Install the rocker arm or arms on the rocker shaft, lubricating them with engine oil. One common rocker arm (Part #23500073) is used in all locations.
2. Center each arm on the ¼ inch hole in the shaft. Install a **new** nylon rocker arm retainer (Part #23500076) in each ¼ inch hole, using a drift of at least ½ inch diameter.

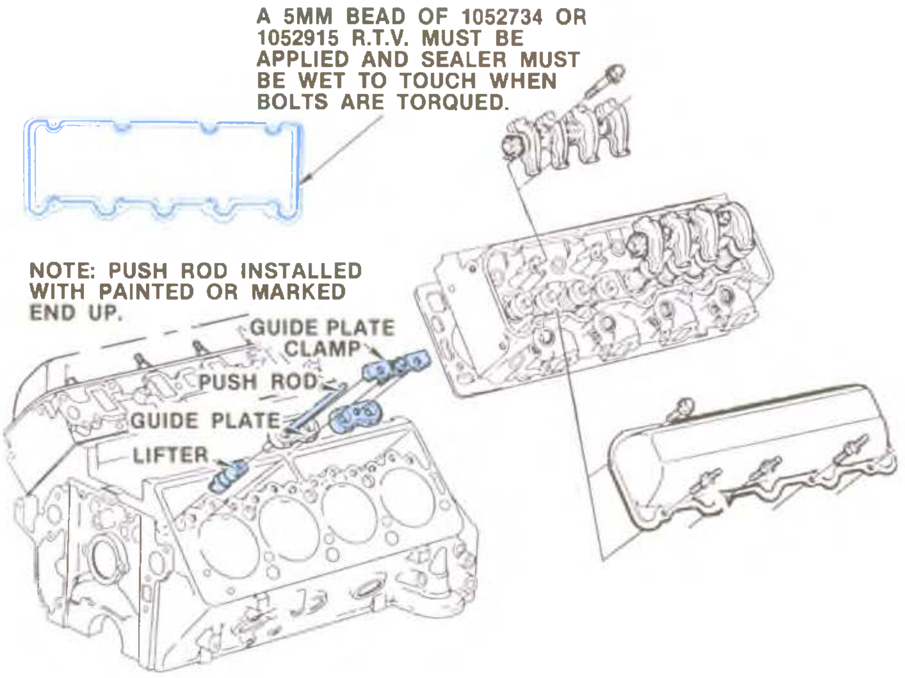


Figure 2-6, **Valve Train.**

Roller Hydraulic Lifters

Roller hydraulic lifters are used to reduce the amount of friction between the valve lifter and the camshaft lobe. See Figure 2-6. A requirement with the use of a roller lifter is a positive guide device to insure the roller will track consistently. First; the line of action of lifter motion is offset from the camshaft center line, to reduce the skewing motion of the lifter during the cam opening and closing. Second, a lifter guide plate is used, to restrain lifter motion to less than two degrees about its axis. A guide plate clamp holds 2 of the guide plates in position. The clamp is a self-contained bolt attached to a bracket. And there are 4 lifters and 2 guide plates to every guide plate clamp. 1982-1983 guide plates are stamped steel. 1984 and later guide plates are sintered iron.

— NOTE —

It is important that the lifter guide plates and retaining brackets are properly installed to prevent lifter rotation; so it is suggested that after installing the guide plates and retainers, to rotate the crankshaft by hand 720° which will cycle the camshaft 360° or one full revolution. Make sure while doing this, that the lifters move up and down in the guide plate. If the engine will not turn over by hand, then one of the lifters is not free to move up & down in the guide plate.

OPERATION

Oil is supplied to the lifter through a hole in the side of the lifter body which indexes with a groove and hole in the lifter plunger. Oil is then metered past the oil metering valve in the lifter, through the push-rods to the rocker arms. (Figure 2-7)

When the lifter begins to roll up the cam lobe, the ball check is held against its seat in the plunger by the ball check spring which traps the oil in the base of the lifter body below the plunger. The plunger and lifter body then raise as a unit, opening the valve. The force of the valve spring which is exerted on the plunger through the rocker arm and push-rod causes a slight amount of leakage between the plunger and lifter body. This "leak-down" allows a slow escape of trapped oil in the base of the lifter body. As the lifter rolls down the other side of the cam lobe and reaches the base circle or "valve closed" position, the plunger spring quickly moves the plunger back up to its original position. This movement causes the ball check to open against the ball spring and oil from within the plunger is drawn into the base of the lifter. This restores the lifter to zero lash.

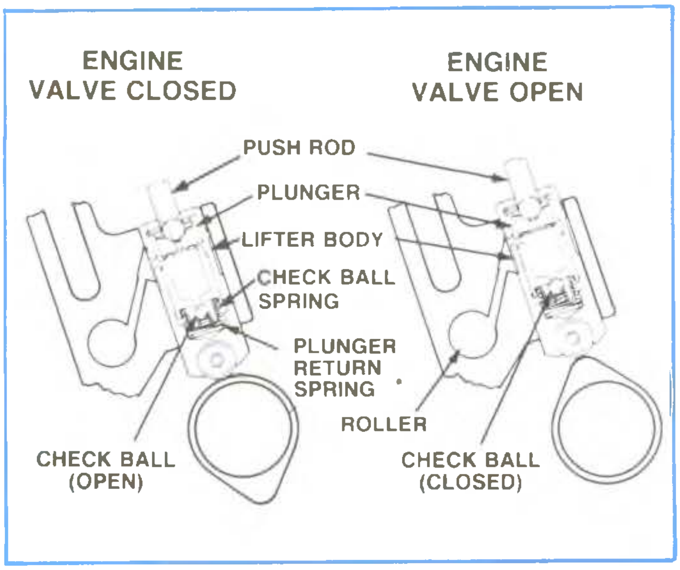


Figure 2-7, **Roller Valve Lifter Operation.**

VALVE LIFTER SERVICE REMOVAL

Valve lifters and push rods should be kept in order so they can be re-installed in their original position. The push rods must be installed with painted end up. This is necessary as the premium ball is located on the upper end only.

1. Remove rocker arm covers.
2. Remove rocker arms.
3. Remove guide clamps and guide plates. It may be necessary to use mechanical fingers to remove the guide plates.
4. Remove lifters using Tool J-29834 and a magnet through access holes in cylinder head.

• DISASSEMBLY (Figure 2-8)

1. Remove the retainer ring with a small screwdriver.
2. Remove push-rod seat and oil metering valve.
3. Remove plunger and plunger spring.
4. Remove check valve retainer from plunger, then remove valve and spring.

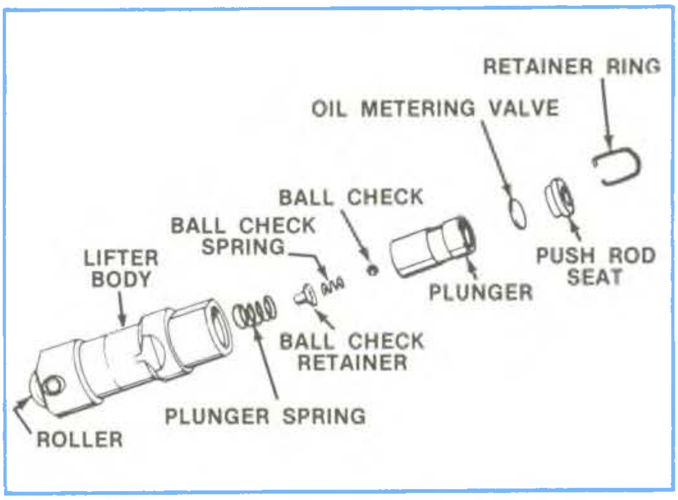


Figure 2-8, **Valve Lifter Disassembled.**

CLEANING AND INSPECTION

After lifters are disassembled, all parts should be cleaned in clean solvent. A small particle of foreign material under the check valve will cause malfunctioning of the lifter. Close inspection should be made for nicks, burrs or scoring of parts. If either the roller body or plunger is defective, replace with a new lifter assembly.

ROLLER LIFTER INSPECTION

1. Roller should rotate freely, but without excessive play.
2. Check for missing or broken needle bearings.
3. Roller should be free of pits or roughness. If present, check camshaft for similar condition. If pits or roughness are evident replace the lifter and camshaft.

LIFTER ASSEMBLY

1. Assemble ball check spring and retainer into plunger, (Figure 2-6). Make sure retainer flange is pressed tight against bottom of recess in plunger.
2. Install plunger spring over check retainer.
3. Hold plunger with spring up and insert into lifter body. Hold plunger vertically to prevent cocking spring.
4. Assemble oil metering valve and push rod seat and seat retaining ring in groove.

Lifters must be assembled while submerged in kerosene or diesel fuel and leak-down tested before placing into service.

INSTALLATION

Prime new lifters by working lifter plunger while submerged in new kerosene or diesel fuel. Lifter could be damaged if dry when starting engine.

Coat the roller and bearings of lifter with 1052365 lubricant or equivalent.

1. Install the lifters into the original position in the cylinder block.
2. Install valve lifter guide plate.
3. Install guide plate clamp. Crankshaft must be manually rotated 720° after assembly of lifter guide plate clamp to insure free movement of lifters in guide plates.

• PUSHROD

The pushrods have a different degree of hardness at each end. A paint mark at the hard end identifies it.

The reason for the additional hardness on the rocker arm end, is because the lifter no longer rotates and consequently neither does the pushrod increasing wear spots. The pushrods could be installed the wrong way, so mark the top of the pushrods as soon as you remove them from the engine.

ROCKER ARM SHAFT INSTALLATION, 6.2L DIESEL

Rocker arm shafts may break if installed improperly. Uneven torquing causes stress at bolt holes.

The proper method to install rocker shafts is as follows:

1. Set engine balancer timing mark at TDC mark on engine.
2. Rotate engine 3½" counter clockwise (measured on balancer) or to first lower water pump bolt (See Figure 2-9). This procedure will position the engine so that no valves are close to a piston head. This is 30° BTDC.
3. Before installing bolts through shaft be certain that ring around shaft is installed with "split" at bottom (See Figure 2-10) on 1982 models. On 1983 and later the split is 90° to the right. On 1985 and later no split ring is used.
4. Snug both bolts on each shaft.
5. Tighten bolts evenly to 55 N.m. (40 lb. ft.) torque.

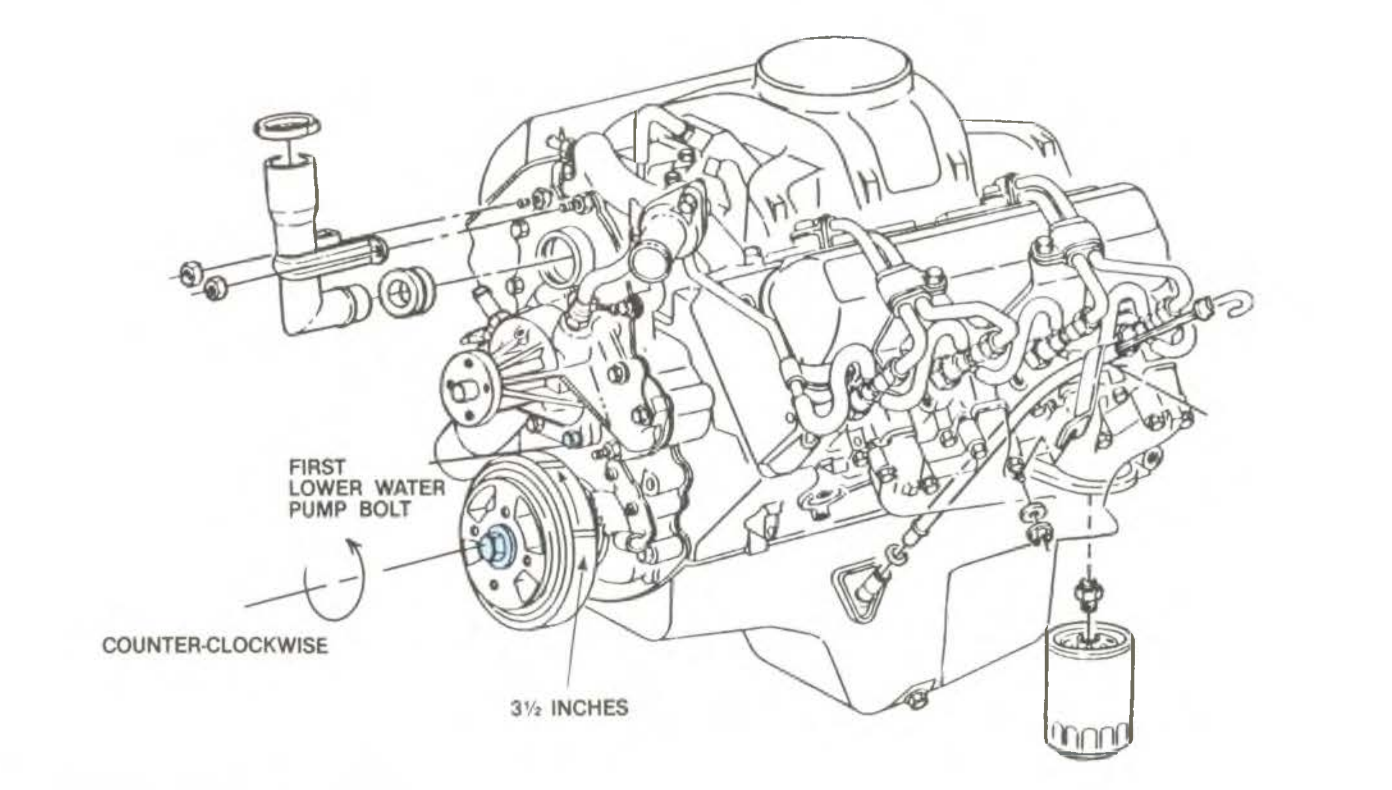


Figure 2-9, Balancer Position.

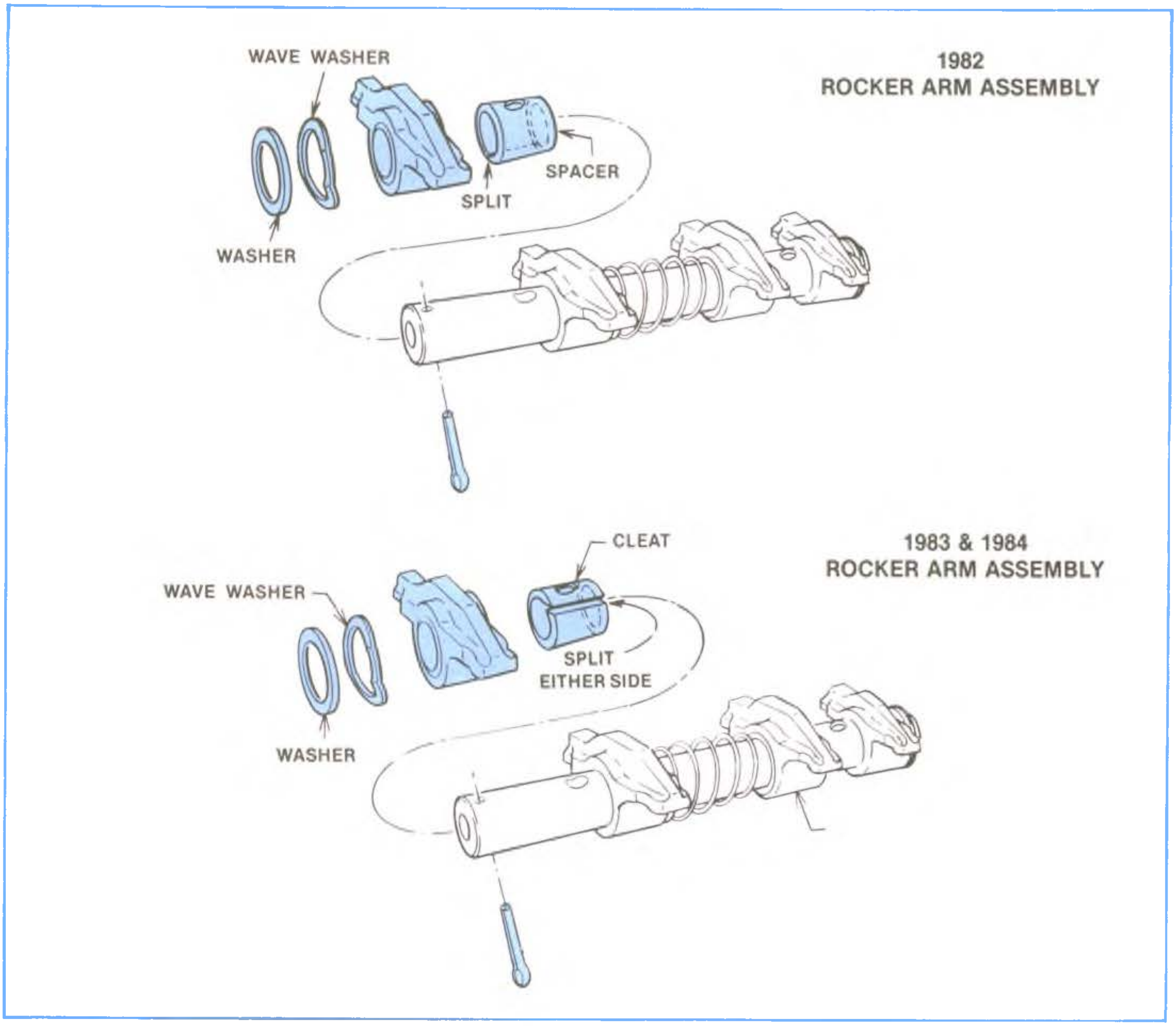


Figure 2-10, 1982-84 Rocker Shafts.

Roller Lifter Wear — Diesel Engines

Roller lifter wear, sticking, or looseness can be caused by high carbon content in the engine oil, which is the product of combustion and can be caused by a malfunctioning EGR and/or EPR system.

When you encounter this type of condition, be sure the EGR and EPR systems are functioning properly and that there are no exhaust leaks in the air inlet system. If the above systems are found to be OK, the operator of the vehicle involved should be questioned about driving conditions and driving habits. Extended idle periods and/or low speed operation will necessitate more frequent oil changes. Refer to the appropriate Owner's Manual for recommended oil change intervals for severe service driving conditions.

Valve Lifter Diagnosis

1. MOMENTARILY NOISY WHEN CAR IS STARTED:

This condition is normal. Oil drains from the lifters which are holding the valves open when the engine is not running. It will take a few seconds for the lifter to fill after the engine is started.

2. INTERMITTENTLY NOISY ON IDLE ONLY, DISAPPEARING WHEN ENGINE SPEED IS INCREASED:

Intermittent clicking may be an indication of a pitted check valve ball, or it may be caused by dirt.

Correction: Clean the lifter and inspect. If check valve ball is defective, replace lifter.

3. NOISY AT SLOW IDLE OR WITH HOT OIL, QUIET WITH COLD OIL OR AS ENGINE SPEED IS INCREASED:

High leak down rate. Replace suspect lifter.

4. NOISY AT HIGH CAR SPEEDS AND QUIET AT LOW SPEEDS:

a. High oil level — Oil level above the "Full" mark allows crankshaft counterweights to churn the oil into foam. When foam is pumped into the lifters, they will become noisy since a solid column of oil is required for proper operation.

   Correction: Drain oil until proper level is obtained. See PERIODIC MAINTENANCE Section.

b. Low oil level — Oil level below the "Add" mark allows the pump to pump air at high speeds which results in noisy lifters.

   Correction: Fill until proper oil level is obtained. See PERIODIC MAINTENANCE Section.

c. Oil pan bent on bottom or pump screen cocked or loose; replace or repair as necessary.

5. NOISY AT IDLE BECOMING LOUDER AS ENGINE SPEED IS INCREASED TO 1500 RPM:

This noise is not connected with lifter malfunction. It becomes most noticeable in the car at 10 to 15 mph "L" range, or 30 to 35 mph "D" range and is best described as a hashy sound. At slow idle, it may be entirely gone or appear as a light ticking noise in one or more valves. It is caused by one or more of the following:

a. Badly worn or scuffed valve tip and rocker arm pad.

b. Excessive valve stem to guide clearance.

c. Excessive valve seat runout.

d. Off square valve spring.

e. Excessive valve face runout.

f. Valve spring damper clicking on rotator.

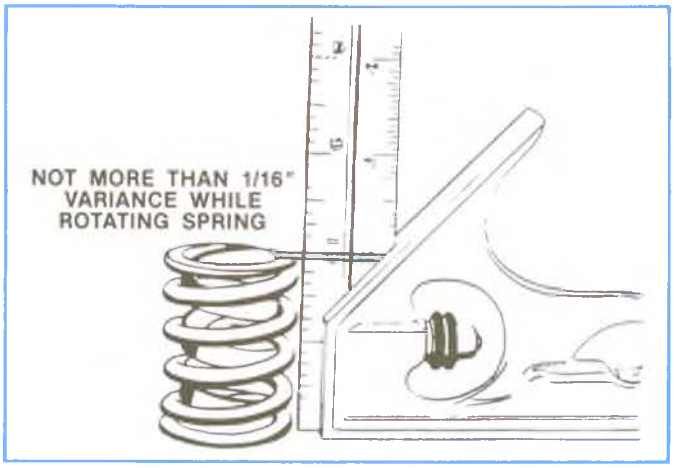


Figure 2-11, **Checking Valve Spring.**

To check valve spring and valve guide clearance, remove the valve covers:

a. Occasionally this noise can be eliminated by rotating the valve spring and valve. Crank engine until noisy valve is off its seat. Rotate spring. This will also rotate valve. Repeat until valve becomes quiet. If correct is obtained, check for an off square valve spring. If spring is off square more than 1/16″ in free position, replace spring. (Figure 2-11).

b. Check for excessive valve stem to guide clearance. If necessary, correct as required.

6. VALVES NOISY REGARDLESS OF ENGINE SPEED:

This condition can be caused by foreign particles or excessive valve lash.

Check for valve lash by turning the engine so the piston in that cylinder is on top dead center of firing stroke. If valve lash is present, the push-rod can be freely moved up and down a certain amount with rocker arm held against valve. If OK, clean suspected valve lifters.

Valve lash indicates one of the following:

a. Worn push-rod.

b. Worn rocker arm and/or shaft.

c. Lifter plunger stuck in down position due to dirt or carbon.

d. Defective lifter.

Checking of the above four items:

1. Look at the upper end of push-rod. Excessive wear of the spherical surface indicates one of the following conditions.
   a. Improper hardness of the push-rod ball. The push-rod and rocker arm must be replaced.
   b. Improper lubrication of the push-rod. The push-rod and rocker arm must be replaced. The oiling system to the push-rod should be checked.
2. If the push-rod appears in good condition and has been properly lubricated, replace rocker arm and recheck valve lash.
3. If valve lash exists and push-rod and rocker arm are okay, trouble is in the lifter. Lifter should be replaced.

Cylinder Head

The cylinder head (Figure 2-12) is a very heavy design and made of cast gray iron. It is a 17 bolt design that has 5 bolts positioned around each cylinder, to provide a more effective seal, and improve gasket retention.

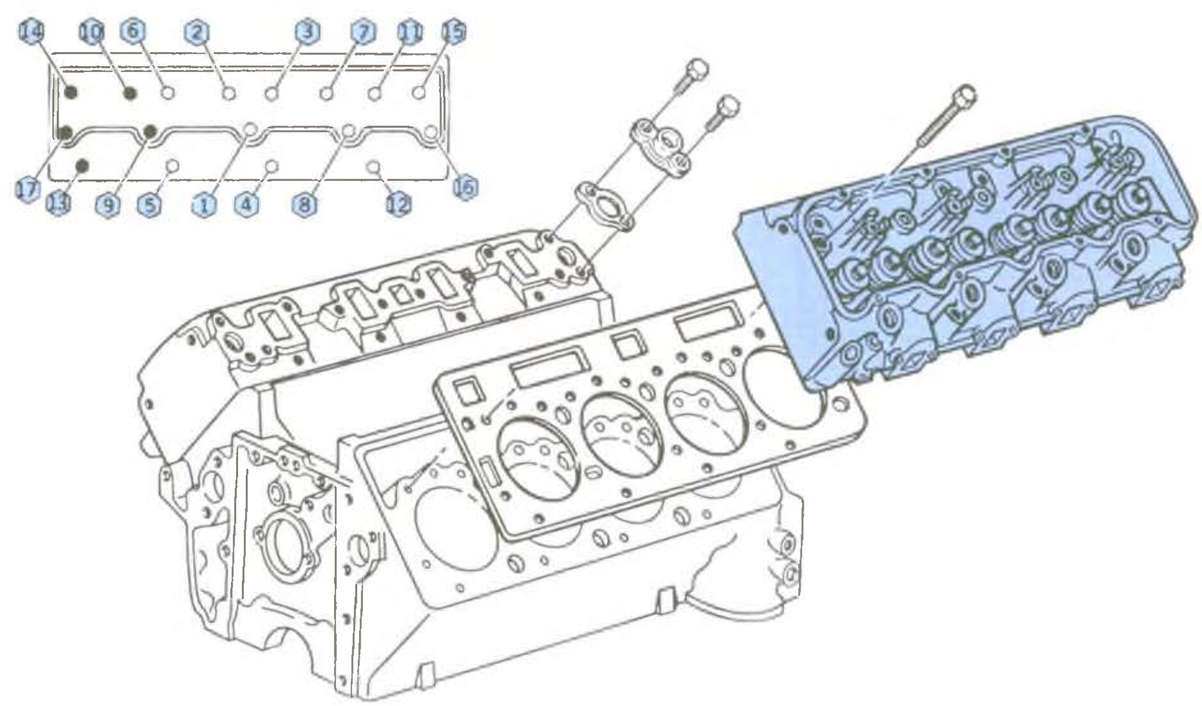


Figure 2-12, Cylinder Head.

— NOTE —

The cylinder heads for the LH6, LL4 and different model years are different. This is because of different; pre-chambers, nozzles, compression ratios, and valve sizes. Consult a G.M. Parts Book or Fiche, to determine the proper cylinder head.

Cylinder heads for 6.2L engines should be checked to verify the correct part for the application before installation on the block. The following information is provided for determining that the correct part number head has been received.

YEAR	PART #	MODELS	ENGINE CODE	NOZZLE THREAD	INTAKE VALVE	EXHAUST VALVE
1982	14079354	C,K-1,2,3	C	M24x2	46mm	42mm
1982	14079335	C,K,P-2,3	J	M24x2	50mm	42mm
1983-84	14079336	C,K,G-1,2,3	C	M24x1.5	46mm	42mm
1983	14079337	C,K,G,P	J	M24x1.5	50mm	42mm
1984	14079304	C,K,G,P	J	M24x1.5	46mm	38mm

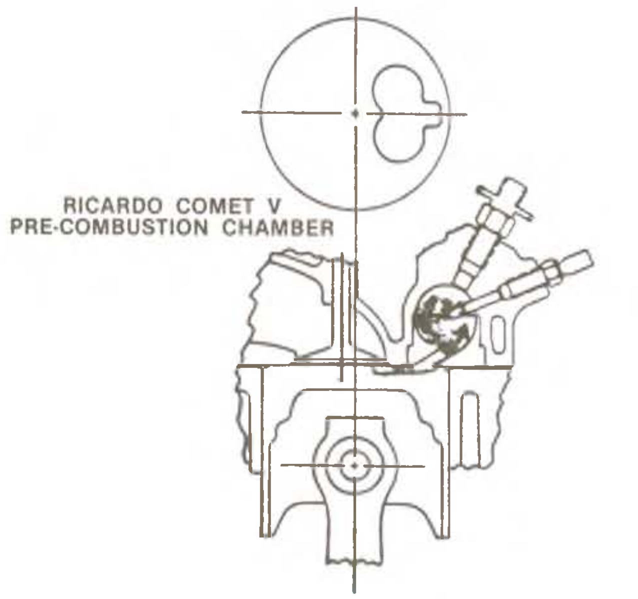


Figure 2-13, Pre-Combustion Chamber.

Pre-Combustion Chambers

A design feature is the Ricardo Comet V pre-combustion chamber which has a spherical chamber which mixes the air and fuel by air swirl (Figure 2-13). This assists in promoting high turbulence. This is an ante-or divided combustion chamber, having the major chamber in the cylinder head and only a small space between the piston and the cylinder head. Close piston clearance produces high turbulence in the ante chamber and promotes rapid combustion. The charge is forced out of the throat area, agitating the entire mixture and resulting in more complete combustion. This design has a broad speed operating range. It also provides low noise and effective emission control. The pre-chamber is installed in the cylinder head flush to +- .050 mm (.002 in.).

Broken Glow Plug Tip

A burned out glow plug tip may bulge then break off and drop into the pre-chamber when the glow plug is removed. When this occurs the nozzle should be removed and the broken tip removed through the nozzle hole. It may be necessary to remove the cylinder head.

Servicing Cylinder Head and Gasket

For removal, see the Service Manual.

V-8 Diesel Head Gasket Leakage

There are various reasons why a cylinder head may not seal, that should be detected before a head gasket is replaced. Some may not be readily apparent to the technician because the theory of sealing is not fully understood.

First get an understanding of what is going on in the engine and what the gasket must accomplish. The pressure within the diesel engine cylinder is much higher than a gasoline engine, 1000 vs 600 psi.

The sealing concept is to use most of the clamping load, about 75%, to seal the compression. This is accomplished by placing a round wire ring inside of a thin metal shield that surrounds the cylinder bore. When the bolts are tightened we literally have line contact around the bore between the cylinder head and the block. Because it is line contact the pressure exerted by the ring to the head and block is extremely high. The clamping load is used to compress the metal ring. The body of the gasket is a few thousands of an inch thinner than the ring after it is crushed. Therefore none of the clamping load is used to crush the body. The colored rings around the various holes in the gasket are a cured RTV sealer. The sealer is about .005 inches in thickness, on each side. It is thick enough so that it gets crushed between the head and block. The sealer keeps the combustion gases from going into the coolant and obviously keeps the coolant from leaking out through the gasket.

The gasket has another feature that needs explanation. The wire ring must cross over the pre-chamber which should be flush with the head. If the pre-chamber is recessed the clamping load in that area will not be as great. If it is exposed, the clamping load beside the pre-chamber will not be as great.

Now it should be better understood that the sealing surface is the wire ring in the gasket where it contacts the block and head. Any damage to these surfaces will result in gasket leaks. Use of the motorized wire brush or grinder could remove a few thousands of metal. The head may then clamp the body of the gasket rather than the sealing ring.

While the cylinder heads are off the engine, they should be carefully inspected for a number of possible conditions, one of which is warpage. If any cylinder head is warped more than .006″ longitudinally, .003″ transversely, it should be replaced; resurfacing is not recommended.

Minor surface cracks in the valve port area of the cylinder head, especially between the intake and exhaust valve ports, are not a normal condition. These surface cracks may affect the function of the cylinder heads and they may require replacement for this condition. The use of magnaflux or dye check is recommended as cracks in the cylinder head that affect performance are not always readily visible to the naked eye, therefore magnafluxing is necessary.

There is an indentation in the block and head surface where the sealing ring contacts both parts. While this appears to be quite deep, actual measurements have shown that the groove is only one or two thousands deep and does not affect sealing. There are gaskets available that are used with .030 inch oversize pistons. Use of these head gaskets will move the sealing bead outboard of the existing groove. These gaskets will be used in the various kits.

Another condition is one that is evident by looking at the gasket once it is located on the dowel pins on the block. The sealing bead is only slightly larger in diameter than the bore. The bead may extend into the chamfer at the top of the cylinder which results in an uneven crush of the wire and after a few miles will result in a leak.

To check for this lay the old gasket on the block. Look at each cylinder, the gasket should be concentric with the bore. It may help to pull the metal ring out of the gasket so the block is more readily visible.

Make sure that the bolt holes in the cylinder block are drilled and tapped deep enough. The head should be placed on the block without a head gasket. Then run a .005 feeler gage around the edge of the head. There should be no clearance, this indicates that dowel pins are not holding the head off the block. Then by hand, screw each of the bolts in. The bolts should screw in far enough to contact the head. This will indicate that the holes are drilled deep enough.

The bolt threads should be wire brushed to clean them and then coated with a sealant lubricant (1052080). This should be on the threads and under the heads of the bolts. This is critical so that the friction on the bolt is reduced during installation. Do not put the oil in the bolt hole, an excessive amount of oil could cause a hydraulic lock and prevent the bolt from tightening up. Do not paint the head gasket with a sealant. Sealants will sometimes attack the RTV sealer which results in a leak.

V-8 Diesel Head Gasket Installation Checklist

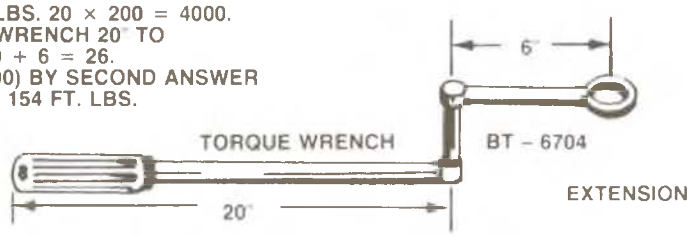
- Wire brush head bolts to clean threads.
- Apply P/N 1052080 sealant to bolt threads.
- Oil underneath head of bolts.
- Dowel pins hold head off block.
- Dowel pins off location.
- No dowel pins.
- Cylinder heads warped more than .006 inches longitudinally and .003″ transversely.
- Pre-chamber +.002″ inches from head (.004″ maximum)
- No damage in sealing ring area.
- No stamps in seal area around water passage.
- Water passage seal surrounds all water passages.
- No chips in bolt holes.
- Bolt holes in cylinder block drilled and tapped deep enough.
- Follow torque sequence and installation torque procedure.

USING TORQUE WRENCH WITH ADAPTER

When using a torque wrench with an adapter, the reading on the torque wrench will not reflect the actual torque of the bolt due to the extra length of the combined torque wrench and adapter. To obtain the correct torque readings in these cases use the following formula: Multiply the length of the torque wrench by the number of pounds of the desired torque. Then add the length of the torque wrench to the length of the adapter. Divide the first answer by the second answer and the result will be the correct torque reading. (Figure 2-14)

EXAMPLE:

1. MULTIPLY LENGTH OF TORQUE WRENCH 20" BY DESIRED TORQUE 200 FT. LBS. 20 × 200 = 4000.
2. ADD LENGTH OF TORQUE WRENCH 20" TO LENGTH OF ADAPTER 6" 20 + 6 = 26.
3. DIVIDE FIRST ANSWER (4000) BY SECOND ANSWER (26). 4000 ÷ 26 = APPROX. 154 FT. LBS.



154 FT. LBS. WILL BE THE READING ON THE TORQUE WRENCH WHEN THE DESIRED TORQUE OF 200 FT. LBS. IS ACHIEVED AT THE NUT.

TORQUE WRENCH IS MEASURED FROM CENTER OF SOCKET END TO PIVOT POINT IN HANDLE OR IF SOLID TO END OF HANDLE.

TORQUE WRENCH AND ADAPTER MUST BE USED ONLY IN A STRAIGHT LINE.

Figure 2-14, **Computing Actual Torque With Adapter.**

Leaking Cylinder Head Gasket

Pre-chambers **must not** be recessed into the cylinder head or protrude out of the cylinder head by more than .004" or a head gasket leak may result.

This measurement should be made at two or more points on the pre-chamber where the pre-chamber seats on the head gasket heat shield and sealing ring. Using a straight edge and a thickness gage or dial indicator, measure the difference between the flat of the pre-chamber and the flat surface of the cylinder head. A slight variance from one side of the pre-chamber to the other provided both sides are within the tolerance will result in a good seal.

* New head bolts are being used on 1984 6.2L engines in production. The bolt is available from WDDGM as P/N 14077193. Whenever a head is removed from a 1982-83 engine, replace the head bolts with this new bolt. The new bolt provides an increased and more even clamp load. Install bolts according to the below procedure, using the "torque-and-turn" method. Also be sure to use a sealing compound, such as P/N 1052080 or equivalent, on the bolt threads. New bolts have approximately 1¾" of thread.

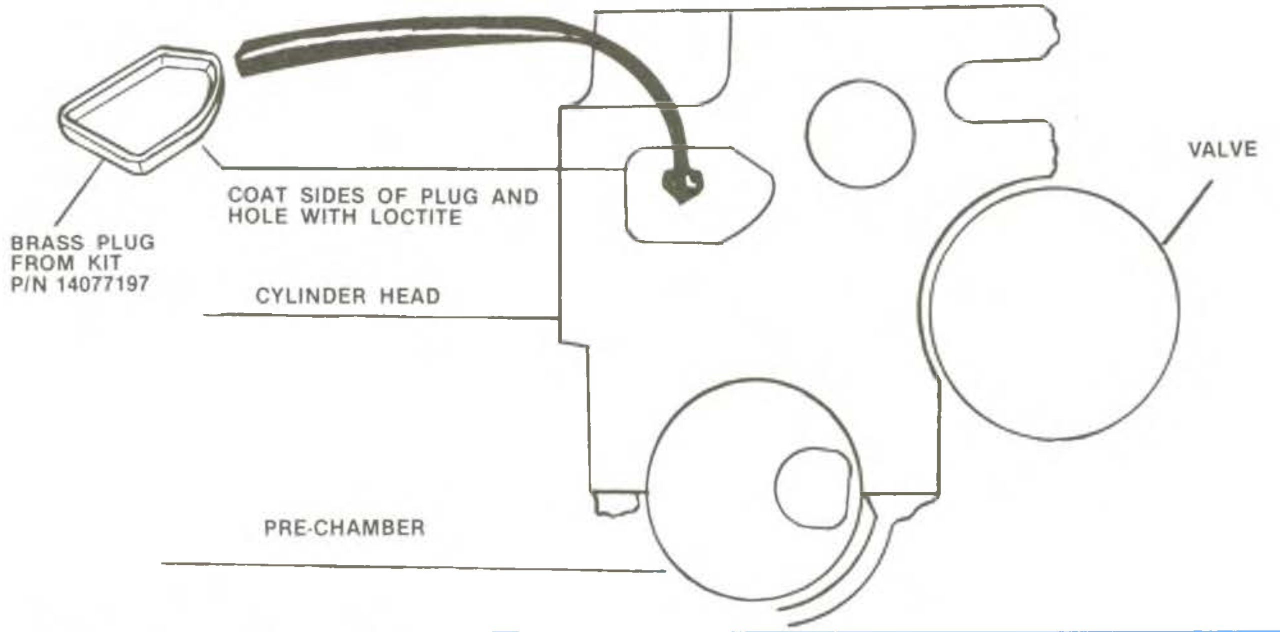


Figure 2-15, **Installing Brass Plug.**

External engine coolant loss on the 6.2L Diesel has generally been from the rear lower corner on the left hand cylinder head and the front lower corner on the right hand cylinder head. This coolant loss condition is the result of inadequate sealing around the core cleanout hole in the cylinder head. (Figure 2-15)

A contour shaped brass plug, P/N 14079353, has been developed to seal this core hole. In 1983 mid-year, the core cleanout hole will be machined and a plug installed in production. 1985 and later units will have this hole eliminated.

To reduce cylinder head gasket coolant leakage conditions, the following procedure should be adhered to whenever a cylinder head is removed for service:

TORQUE AND ANGLE TURN CONTROL TORQUING PROCEDURE FOR CYLINDER BOLTS.

This new torquing procedure is to be used on all 6.2L Diesel engines. It is to correct external and internal leak conditions.

1. After the removal of the cylinder head and gasket, all cylinder head bolts and bolts holes must be cleaned of all sealer (e.g. wire brush).
2. Check head and block for warpage overall .006 in. (.15mm) or .003 in. (.075mm) within 6 inches and .003" transversely.
3. Wipe all surfaces clean.
4. Install new head gasket, either use: Victor (green) 14066260 (internal combustion leaks) or, Fel-Pro (red) 14066246 (external coolant leaks). Install the gasket over the dowel pins. The pre-chamber shields must be up.
5. **INSTALLATION OF BRASS PLUG IN CYLINDER HEAD COOLANT CORE HOLE. (See Figure 2-15).**
   a. Check if a plug has been previously installed. If a plug is present, visually check condition. If plug appears questionable, remove and replace.
   b. Check cored hole for excessive roughness or casting irregularities. Use a file to remove burrs and break sharp edges. Clean with a wire brush and wash with solvent.
   c. Coat the sides of brass plug and the hole with Loctite 620; or 271, (GM #1052624 kit).

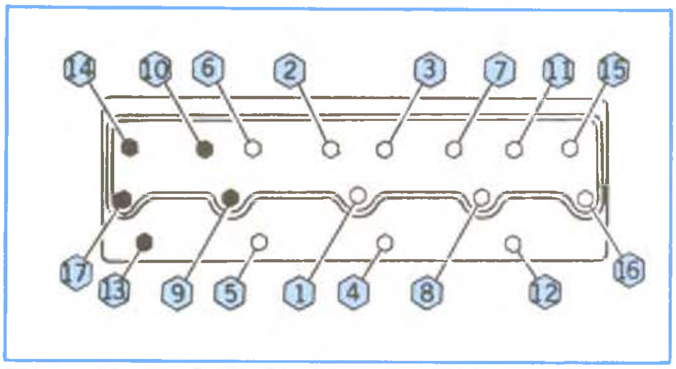


Figure 2-16, Cylinder Head Bolt Tightening Sequence.

Using an Arbor Press or vice, slowly press brass plug into the hole using a flat steel plate or the plastic installation tool from kit #14077197 to squarely load the plug. Press in until plug is flush with head surface. Do not use a hammer as plug may be damaged. Allow Loctite to set 30 minites.

— NOTE —

If the plastic installation tool is available, you may use a hammer along with the plastic tool. Install the plug until it is flush.

6. REPLACE ALL HEAD BOLTS WITH PART #14077193.
7. Due to clearance on C-K vehicles, the left rear cylinder head bolt must be installed into the head prior to installation. (Refer to Step 9 for sealing of bolt).
8. Carefully guide the cylinder head into place.
9. Coat the thread and bottom of the bolt head of the cylinder head bolts with sealing compound 1052080 or equivalent, and install bolts finger tight.
10. In sequence, torque all bolts to 25 N.m. (20 ft. lb.). (Figure 2-16).
11. In sequence, re-torque all bolts to 65 N.m. (50 ft. lb.). (Figure 2-16).
12. In sequence, turn each bolt an additional 90 degrees (¼ turn). This is to assure a more uniform bolt tension. (Figure 2-16).

— NOTE —

All four steps (10, 11, and 12) must be done in sequence each time.

— NOTE —

There is a new head bolt released. Part #14077193. It has more threads. This was done to improve bolt stretch for improved clamp load retension. The above procedure can be done with either the old or the new bolt. But the new bolt (14077193) is preferred.

— NOTE —

Part #14077197 is a brass plug kit. It contains the following:
2 - 14079353 brass plugs
1 - plastic driver installation tool

Valve Stem Clearance

NOTICE: Excessive valve stem to bore clearance will cause excessive oil combustion and may cause valve breakage. Insufficient clearance will result in noisy and sticky functioning of the valve and disturb engine smoothness.

1. Measure valve stem clearance as follows:
   a. Clamp a dial indicator on one side of the cylinder head rocker arm cover gasket rail.
   b. Locate the indicator so that movement of the valve stem from side to side (crosswise to the head) will cause a direct movement of the indicator stem. The indicator stem must contact the side of the valve stem just above the valve guide.
   c. Drop the valve head about 1/16″ (1.6mm) off the valve seat.
   d. Move the stem of the valve from side to side using light pressure to obtain a clearance reading. If clearance exceeds specifications, it will be necessary to ream valve guides for oversize valves as outlined.

Valve Spring Tension

1. Check valve spring tension with Tool J-8056 spring tester. Springs should be compressed to the specified height and checked against the specifications chart. Springs should be replaced if not with 44 N (10 lbs.) of the specified load (without dampers).

Inspection (Timing Chain)

The timing chain on the 6.2L engine will have slack or deflection. It can be measured whenever the front cover is removed from the engine. This is done by using a dial indicator mounted to the front of the cylinder block with the plunger contacting the timing chain between the two sprockets. The chain can be deflected outward a maximum amount with finger pressure on the internal side of the chain. The dial indicator can then be set at zero. The chain can then be deflected inward using finger pressure on the external side of the chain. The total indicator travel can be noted. On a used engine, the deflection cannot exceed .800″. If it does, the sprockets and chain must be examined for wear and replaced as necessary. The timing chain deflection with new parts cannot exceed .500″.

Valve Guide Bores

Valves with oversize stems are available (see specifications). To ream the valve guide bores for oversize valves use Tool Set J-7049.

Valve Seats

Reconditioning the valve seats is very important, because the seating of the valves must be perfect for the engine to deliver the power and performance built into it.

Another important factor is the cooling of the valve heads. Good contact between each valve and its seat in the head is imperative to insure that the heat in the valve head will be properly carried away.

Several different types of equipment are available for reseating valves seats. The recommendations of the manufacturer of the equipment being used should be carefully followed to attain proper results.

Regardless of what type of equipment is used, however, it is essential that valve guide bores be free from carbon or dirt to ensure proper centering of pilot in the guide.

— NOTE —

Valve seats are induction hardened. Excessive stock removal could cause damage to the seat.

Valves

Valves that are pitted can be refaced to the proper angle, insuring correct relation between the head and stem on a valve refacing mechanism. Valve stems which show excessive wear, or valves that are warped excessively should be replaced. When a valve head which is warped excessively is refaced, a knife edge will be ground on part or all of the valve head due to the amount of metal that must be removed to completely reface. Knife edges lead to breakage, burning or pre-ignition due to heat localizing on this knife edge. If the edge of the valve head is less than 1/32″ (.80mm) thick after grinding, replace the valve. Several different types of equipment are available for refacing valves. The recommendation of the manufacturer of the equipment being used should be carefully followed to attain proper results.

ASSEMBLY

1. Insert a valve in the proper port.
2. Assemble the valve spring and related parts as follows:
   a. Install valve spring shim on valve spring seat then install a new valve stem oil seal.

Valve Stem Oil Seal/Or Valve Spring

To replace a worn or broken valve spring without removing the cylinder head proceed as follows:

REMOVAL

1. Remove rocker arm assemblies.
2. Rotate engine so piston is at top dead center for each cylinder, or install air line adapter to glow plug port and apply compressed air to hold valves in place.
3. Install Tool J-5892-1 or J-26513 and compress the valve spring until valve keys are accessible; then remove keys, valve cap or rotator, springs and seals. If valve spring does not compress, tap tool with a mallet to break bind at rotator and keys.

INSTALLATION

1. Install seal, valve spring and cap rotator. Using Tool J-5892-1 or J-26513, compress the valve spring until the valve keys can be installed.
2. Install rocker arm assemblies.

Piston Construction (Figure 2-17)

Pistons (See Figure 2-17) are cast aluminum with:

- A ni-resist full top ring groove.
- 2-piece oil control ring.
- "Full floating piston pin".

The full ni-resist insert-molded cast iron full groove protector is for high temperature strength and improved fatigue life. Ni-resist is a metallurgical term describing a cast iron consisting of graphite in a matrix of austenite. Austenite is a non-magnetic solid solution of carbon in gamma-iron. This version contains significant amounts of nickel and chromium. It has high resistance to growth, oxidation and corrosion. It has a high bonding ability to aluminum, and thermal ability (high dissipation rate of aluminum).

The "full-floating' piston pin concept is used to eliminate pin-to-boss scuffing and to promote uniform pin loading through pin rotation. This happens by using the film thickness of the oil, that the pin is suspended by, and rotating in to increase loading and surface area. The film thickness is also used to absorb some of the downward thrust.

PISTON RINGS

The top ring (See Figure 2-18) is a compression ring made of keystone high strength iron with a molybdenum face.

It is a keystone design, which is a tapered ring fitting into the tapered land of the Ni-resist insert-molded cast iron full groove insert.

The second ring is also a compression ring; cast iron construction and chrome faced. Two rings are used to reduce the pressure drop across each ring. The third ring is an oil control ring and two types are utilized depending on emissions application: Lt. duty (under 8,500 lbs. GVWR) uses a 3-piece. Heavy duty (over 8,500 lbs. GVWR) uses a 2-piece. The 3-piece design is made up of 2 segment rails which wipe the cylinder wall and one expander which controls the 2 segment rails.

In 1983 and later both Lt. and Heavy duty will use the two 2-piece. This improves high mileage durability.

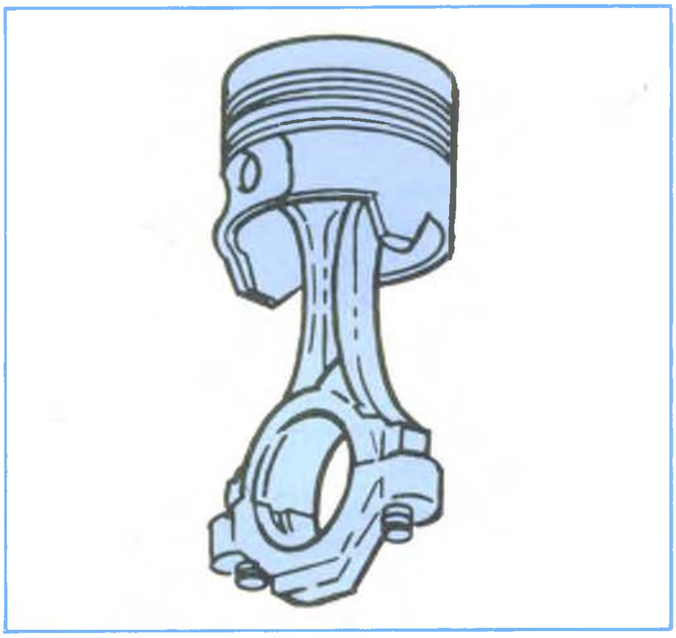


Figure 2-17, 6.2L Piston.

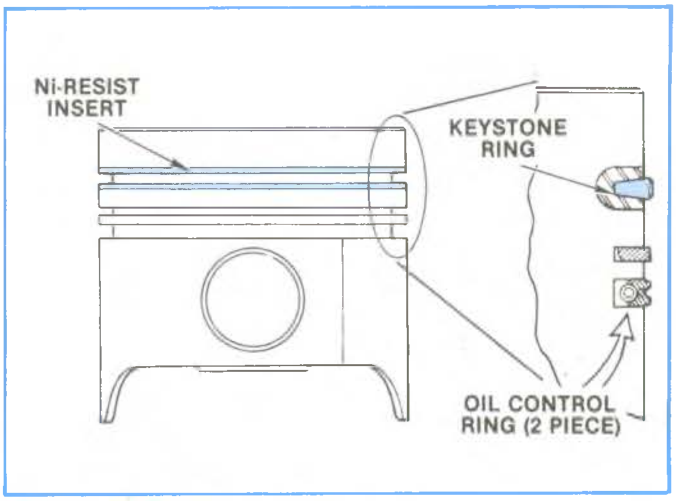


Figure 2-18, Piston Rings.

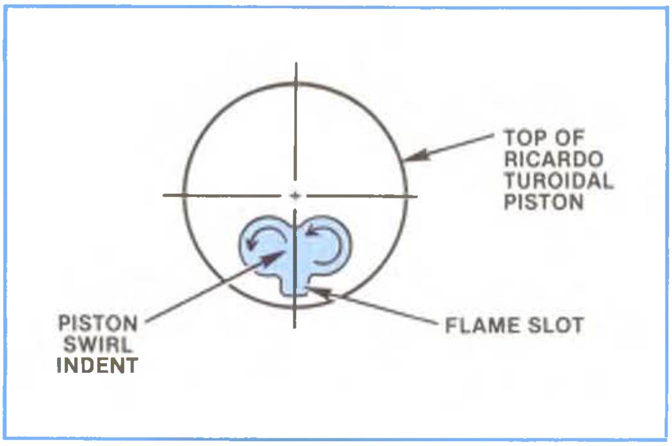


Figure 2-19, Piston Top.

This piston has a half-clover shaped identation on the piston face, which at T.D.C. outlets to the pre-chamber, Figure 2-19. As the piston rises during the compression stroke, the air swirl begins in these two indentations. When the piston reaches the pre-chamber opening, the air swirl is increased in the spherical pre-chamber. This is a Ricardo Turoidal Piston design and is used with the Ricardo COMET V Pre-Chamber for more complete mixing of the air and fuel.

The 6.2L piston is match fitted to each cylinder bore of the engine. This is accomplished by measuring the internal diameter of the cylinder bore and stamping the corresponding size code on the pan rail of the case. The piston outside diameter is measured and the size code stamped on the piston face. When the piston is assembled to the cylinder case, these size codes are matched to insure that proper fit and clearance between the cylinder and piston is maintained. There are six matching cylinder bore sizes. Size codes A, B, C, D, E, G are used to match the piston and cylinder bore. "A" size pistons are assembled to "A" size cylinder bores, "B" size pistons to "B" size cylinder bores and so forth.

Piston Selection

A. The size codes (A, B, C, D, E, G) are stamped on the cylinder case pan rail and beside the proper cylinder.

B. Service pistons will be available in std., high limit std., and .030 in. (.75mm) O.S. An "S6" or "S7" will be stamped on the piston face.

C.

Stamped Size	Part #
S6-100.914-100.940mm	14053377 Standard
S7-100.914-100.965mm	14053378 High Limit Standard
.030 in. (.75mm) O.S.	14053379 Oversize

— NOTE —

Pistons in cylinders number 7 and 8 are fit .013mm (.0005 in.) looser.
This is done because #7 and #8 run hotter, and piston scuff may occur.

1. Check USED piston to cylinder bore clearance as follows:
   a. Measure the "Cylinder Bore Diameter" with a telescope gage 2½" (64mm) from the top of cylinder bore.
   b. Measure the "Piston Diameter" (at skirt across center line of piston pin). (Fig. 2-10).
   c. Subtract piston diameter from cylinder bore diameter to determine "Piston to Bore Clearance".
   d. For Bohn Pistons #1 thru 6 .089-.115mm (.0035-.0045 in.)
   For Zollner Pistons #1 thru 6 .112-.138mm (.004-.005 in.)
   For Bohn Pistons #7 and 8 .102-.128mm (.004-.005 in.)
   For Zollner Pistons #7 and 8 .125-.151mm (.0049-.0059 in.)
2. If used piston is not acceptable, determine if a new piston can fit cylinder bore.
3. If cylinder bore must be reconditioned, measure new piston diameter (across center line of piston pin) then hone cylinder bore to correct clearance.
4. Mark the piston to identify the cylinder for which it was fitted.

There will be two different suppliers of pistons used in the 6.2L; and you may encounter either one, they differ in finish on the exterior of the piston, so there are two different piston to bore clearance values. **Bohn Pistons** identified by the word "Bohnna Lite" near the pin boss, will have a clearance of .089-.115mm (.0035-.0045 in.).

Zollner Pistons identified by the letter Z with a circle around it, also near the pin boss. It carries a clearance of .112-.138mm (.004-.005 in.)

Piston Inspection

Clean the varnish from piston skirts and pins with a cleaning solvent. DO NOT WIRE BRUSH ANY PART OF THE PISTON. Clean the ring grooves with a groove cleaner and make sure oil ring holes and slots are clean.

Inspect the piston for cracked ring lands, skirts or pin bosses, wavy or worn ring lands, scuffed or damaged skirts, corroded areas at top of the piston. Replace pistons that are damaged or show signs of excessive wear.

Inspect the grooves for nicks or burrs that might cause the rings to hang up.

Measure piston skirt (across center line of piston pin) and check clearance.

PISTON PINS

The piston pin is a free floating piston pin. It is important that the piston and rod pin hole be clean and free of oil when checking pin fit.

Whenever the replacement of a piston pin is necessary, remove the ring retaining the pin. Then remove pin. Using tool J-29134 install piston pin retaining ring.

It is very important that after installing the piston pin retaining rings, that the rings be rotated to make sure they are fully seated in their grooves.

RING GAP

All compression rings are marked on the upper side of the ring. When installing compression rings, make sure the marked side is toward the top of the piston. The top ring is treated with molybdenum for maximum life.

1. Select rings comparable in size to the piston being used.
2. Slip the compression ring in the cylinder bore; then press the ring down into the cylinder bore about ¼" (6.5mm) (above ring travel). Be sure ring is square with cylinder wall.
3. Measure the space or gap between the ends of the ring with a feeler gage.
4. If the gap between the ends of the ring is below specifications, remove the ring and try another for fit.
5. Fit each compression ring to the cylinder in which it is going to be used.
6. If the pistons have not been cleaned and inspected as previously outlined, do so.
7. Slip the outer surface of the top and second compression ring into the respective piston ring groove and roll the ring entirely around the groove to make sure that the ring is free. If binding occurs at any point, the cause should be determined. If binding is caused by ring groove, correct by dressing with a fine cut file. If the binding is caused by a distorted ring, check a new ring.

RING INSTALLATION

For service ring specifications and detailed installation instructions, refer to the instructions furnished with the parts package.

Piston Related Cylinder Case Operations

CLEANING AND INSPECTION

1. Wash cylinder block thoroughly in cleaning solvent and clean all gasket surfaces.
2. Remove oil gallery plugs and clean all oil passages.
3. Clean and inspect water passages in the cylinder block.
4. Inspect the cylinder block for cracks in the cylinder walls, water jacket, valve lifter bores and main bearing webs.
5. Measure the cylinder walls for taper, out-of-round or excessive ridge at top of ring travel. This should be done with a dial indicator. Set the gage so that the thrust pin must be forced in about ¼″ (6.5mm) to enter gage in cylinder bore. Center gage in cylinder and turn dial to "0". Carefully work gage up and down cylinder to determine taper, and turn it to different points around cylinder wall to determine the out-of-round condition. If cylinders were found to exceed specifications, honing or boring will be necessary.

CONDITIONING

The performance of the following operation is contingent upon engine condition at time of repair.

If the cylinder block inspection indicated that the block was suitable for continued use except for out-of-round or tapered cylinders, they can be conditioned by honing or boring.

If the cylinders were found to have less than .005″ taper or wear, they can be conditioned with a hone and fitted with the high limit standard size piston. A cylinder bore of less than .005″ wear or taper may not entirely clean up when fitted to a high limit piston. If it is desired to entirely clean up the bore in these cases, it will be necessary to rebore for an oversize piston. If more than .005″ taper or wear, they should be bored and honed to the smallest oversize that will permit complete resurfacing of all cylinders.

When pistons are being fitted and honing is not necessary, cylinder bores may be cleaned with a hot water and detergent wash. After cleaning, the cylinder bores should be swabbed several times with light engine oil and a clean cloth and then wiped with a clean dry cloth.

BORING

If boring is necessary, an oversize gasket will be required.

1. Before using any type boring bar, the top of the cylinder block should be filed off to remove any dirt or burrs. This is very important. If not checked, the boring bar may be tilted which would result in the rebored cylinder wall not being at right angles to the crankshaft.
2. The piston to be fitted should be measured with a micrometer, measuring at the center of the piston skirt and at right angles to the piston pin. The cylinder should be bored to the same diameter as the piston and honed to give the specified clearance.
3. The instructions furnished by the manufacturer of the equipment being used should be carefully followed.

HONING

1. When cylinders are to be honed, follow the hone manufacturer's recommendations for the use of the hone and cleaning and lubrication during honing.
2. Occasionally during the honing operation, the cylinder bore should be thoroughly cleaned and the piston selected for the individual cylinder checked for correct fit.
3. When finished honing a cylinder bore to fit a piston, the hone should be moved up and down at a sufficient speed to obtain very fine uniform surface finish marks, in a cross-hatch pattern of approximately 45° to 65° included angle. The finish marks should be clean but not sharp, free from imbedded particles, and torn or folded metal.
4. Permanently mark the piston for the cylinder to which it has been fitted and proceed to hone cylinders and fit the remaining pistons.

— NOTE —

Handle the pistons with care and do not attempt to force them through the cylinder until the cylinder has been honed to correct size as this type piston can be distorted through careless handling.

5. Thoroughly clean the bores with hot water and detergent. Scrub well with a stiff bristle brush and rinse thoroughly with hot water. It is extremely essential that a good cleaning operation be performed. If any of the abrasive material is allowed to remain in the cylinder bores, it will rapidly wear the new rings and cylinder bores in addition to the bearings lubricated by the contaminated oil, the bores should be swabbed and then wiped with a clean dry cloth. The cylinder should not be cleaned with a kerosene or gasoline. Clean the remainder of the cylinder block to remove the excess material spread during the honing operation.

Rod and Piston

INSTALLATION

1. Install the connecting rod bolt guide hose over rod bolt threads.
2. Lightly coat pistons, rings and cylinder walls with light engine oil. Depression on top of piston to be assembled toward outside of engine.
3. Install each connecting rod and piston assembly in its respective bore. Install with connecting rod bearing tang slots on side opposite camshaft. Use Tool J-8037 to compress the rings. Guide the connecting rod into place on the crankshaft journal. Use a hammer handle and light blows to install the piston into the bore. Hold the ring compressor firmly against the cylinder block until all piston rings have entered the cylinder bore.
4. Install the bearing caps and torque nuts to specifications 65 N.m. (45 ft. lbs.). Be sure to install new pistons in the cylinders for which they were fitted and used pistons in the cylinder from which they were removed. Each connecting rod and bearing cap should be marked, beginning at the front of the engine. Cylinders 1, 3, 5 and 7 in the left bank and, 2, 4, 6 and 8 in the right bank. The numbers on the connecting rod and bearing cap must be on the same side when installed in the cylinder bore. If a connecting rod is ever transposed from one block or cylinder to another, new bearings should be fitted and the connecting rod should be numbered to correspond with the new cylinder number.

Crankshaft

The 6.2L crankshaft (Figure 2-20) is made of nodular iron with deep rolled fillets. Nodular iron, also called ductile iron, is one of three common types of cast iron. The others are grey iron and malleable iron.

Nodular iron is made by treating a low-sulfur, grey-iron-like alloy with magnesium. Addition of the magnesium forms the free carbon into the spheroids — or nodules — which give nodular iron the best combination of ductility and strength of the three common cast irons. Depending on the application, nodular iron castings can be used as cast (without heat treatment), annealed for greater ductility as required or heat-treated to higher hardness for greater strength and wear resistance.

It has 5 main bearing journals. These main bearing journals are classed by O.D. into 3 classes so that the main bearing can be matched to the proper size bearing insert in the main bearing cap. The diameter of the main journals is controlled to the following total range #1 through 4 — 74.917/74.941 mm and #5 — 74.912/74.936 mm. Each of these ranges is divided into 3 sizes. The pin journal diameter range is 60.913/60.939 mm. This range is divided into 2 sizes.

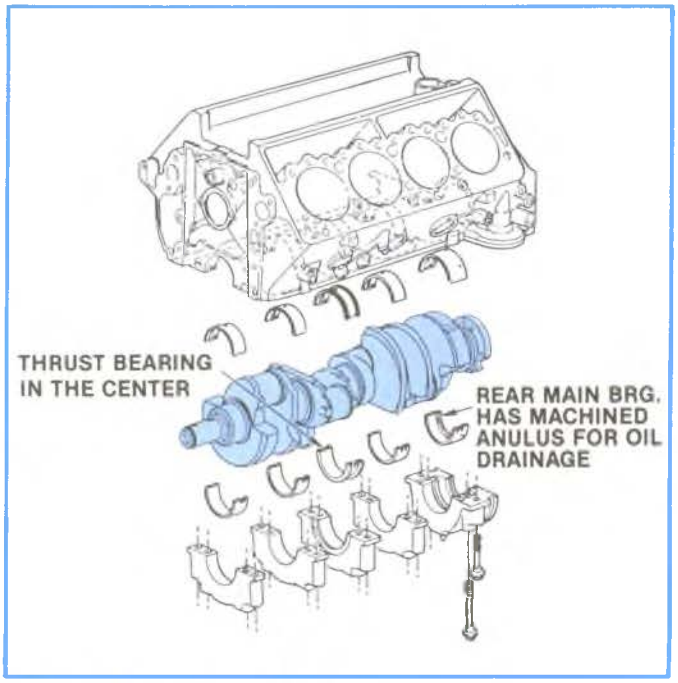


Figure 2-20, **Crankshaft.**

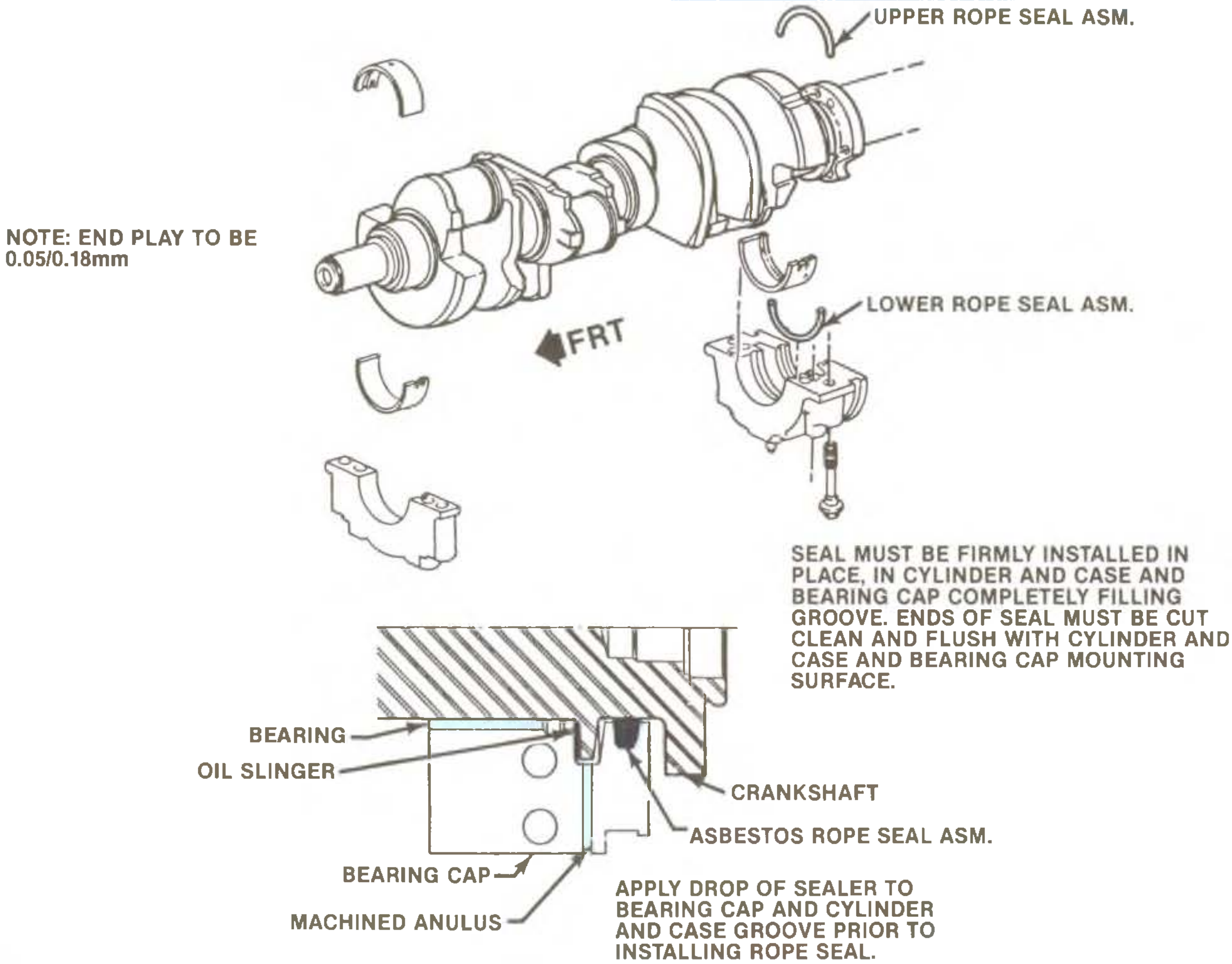


Figure 2-21, **Rear Mainseal.**

Crankshaft Rear Main Seal

The crankshaft rear main seal is an asbestos "rope" seal. A slot is machined the bearing at the rear which bleeds off excess oil. An oil slinger is part of the crankshaft. It prevents excessive oil from going past this area. (Figure 2-21).

Immediately behind the slinger is a knurled surface which is positioned in a way to push oil away from the rope seal during engine rotation. The rope seal is at the rear of the sealing system.

Upper Rear Main Seal Repair

Tools are available to provide a means of correcting engine rear main bearing upper seal leaks without the necessity of removing the crankshaft. The procedure for seal leak correction is listed below.

1. Drain oil and remove oil pan and rear main bearing cap.
2. Insert Packing Tool J33154-2 against one end of seal in cylinder block and drive the old seal gently into the groove until it is packed tight. This varies from ¼″ to ¾″, depending on the amount of pack required. (Figure 2-22).
3. Repeat this on the other end of the seal in the cylinder block.
4. Measure the amount the seal was driven up on one side; add 1/16″, then cut this length from the old seal removed from the main bearing cap with a single edge razor blade. Measure the amount the seal was driven up on the other side. Add 1/16″ and cut another length from old seal. Use main bearing cap as a holding fixture when cutting seal as shown in Figure 2-23.
5. Place a drop of 1052621 sealer or equivalent on each end of seal and cap as indicated.

   (Equivalents are Loctite 414 or Fel-Pro 361.)

— IMPORTANT —

Install the seal pieces within one minute, as this material sets up very quickly.

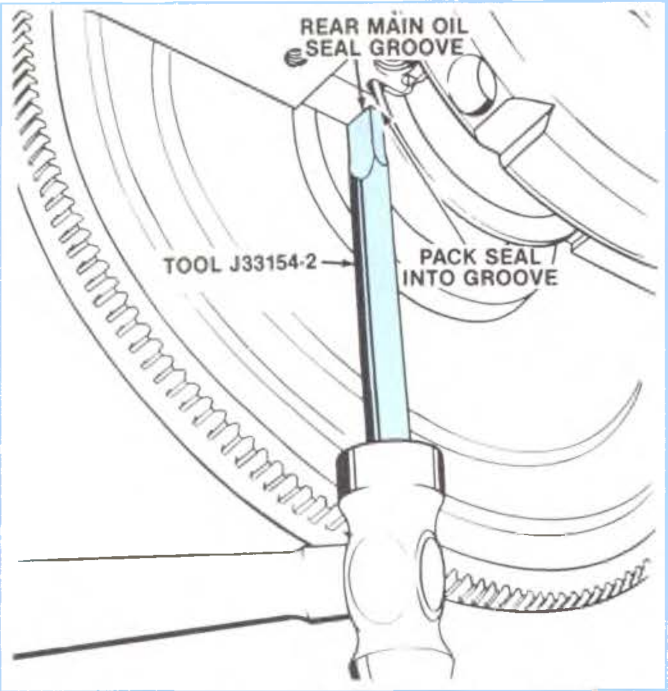


Figure 2-22, **Packing Rear Main Upper Seal.**

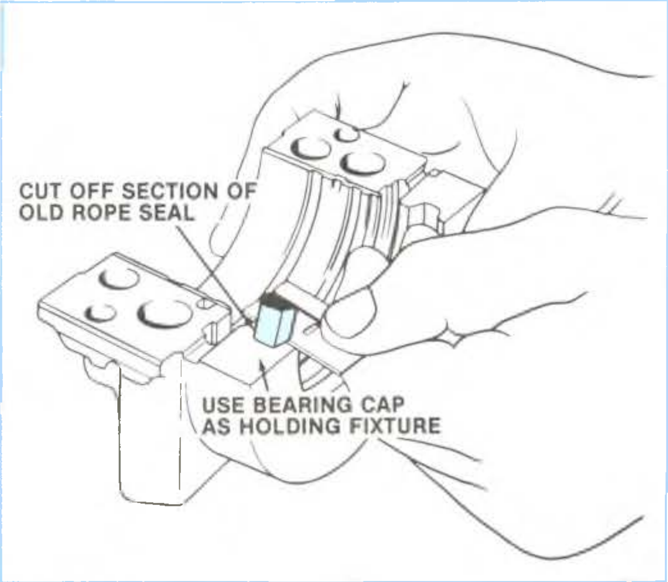


Figure 2-23, **Cutting Section of Rope Seal.**

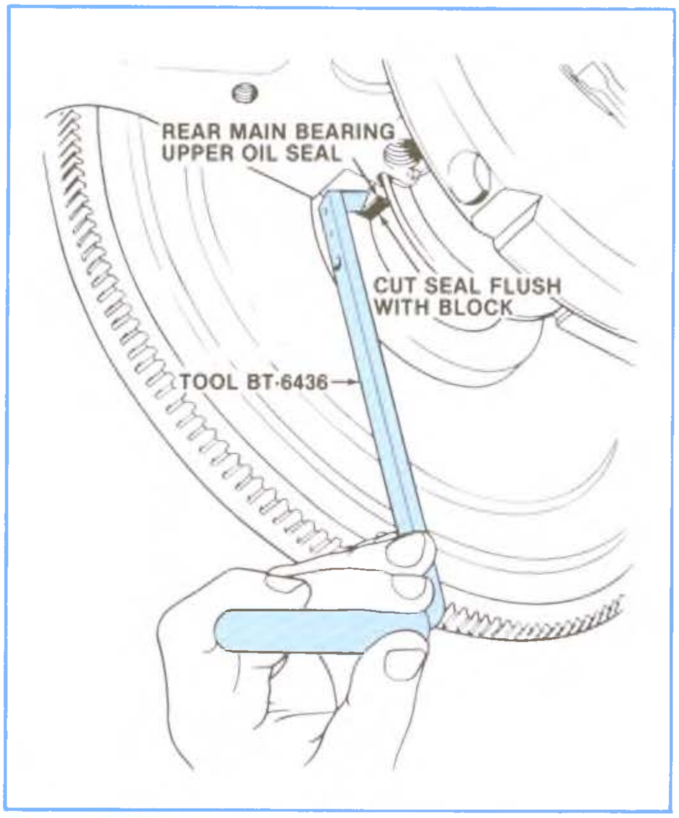


Figure 2-24, **Cutting Seal In-Vehicle.**

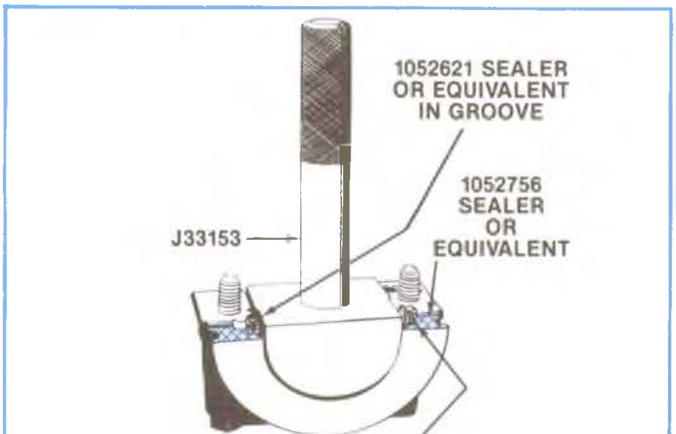


Figure 2-25, **Installing Rear Main Lower Oil Seal.**

6. Work these two pieces of seal into the cylinder block (one piece on each side) with two small screwdrivers. Using Packing Tool, pack these short pieces up into the block. Use Seal Trimming Tool BT-6436 or sharp blade to trim seal flush with block as shown in Figure 2-24.

   Place a piece of shim stock between seal and crankshaft to protect bearing surface before trimming.
7. Form a new rope seal in the rear main bearing cap.

— NOTE —

In order to prevent the possibility of cylinder block and/or main bearing cap damage, the main bearing caps are to be tapped into their cylinder block cavity using a brass or leather mallet before attaching bolts are installed. Do not use attaching bolts to pull main bearing caps into their seats. Failure to observe this information may damage a cylinder block or bearing cap.

8. Lubricate the cap bolts with engine oil.
9. Assemble the cap to the block and torque to specifications.

Lower Rear Main Oil Seal Replacement

REMOVAL

1. Remove oil pan.
2. Remove the rear main bearing cap.
3. Remove rear main bearing insert and old seal.
4. Clean bearing cap and seal grooves and inspect for cracks.

INSTALLATION

1. Coat seal groove with 1052621 sealer or equivalent (Loctite 414 or Fel-Pro 361).
2. Within one minute, install seal into bearing cap, packing by hand. Using seal installer J33153, drive seal into groove. (Figure 2-25).

   To check if seal is fully seated in the bearing cap, slide the tool away from seal. With tool fully seated in the bearing cap, slide tool against the seal. If undercut area of tool slides over the seal, the seal is fully seated. If tool butts against the seal, the seal must be driven further into the seal groove. Rotate tool before cutting off excess seal packing.
3. With tool slightly rotated, cut seal flush with mating surface. With screwdriver, pack seal end fibers towards center, away from edges. Rotate seal installer when cutting seal to avoid damage to tool.
4. Clean bearing insert and install in bearing cap.
5. Place a piece of plastic gaging material on the rear main journal. Install the rear main bearing cap and torque to 95 N·m (70 ft. lbs.).
6. Remove the rear cap and check the plastigage for bearing clearance (.0022″-.0037″). If it is out of specification, recheck the ends of the seal for fraying, that may be preventing the cap from fully seating.
7. Clean crankshaft bearing journal and seal contact. Install sealer 1052756 or equivalent on cap as shown in Figure 2-25.

— NOTE —

In order to prevent the possibility of cylinder block and/or main bearing cap damage, the main bearing caps are to be tapped into their cylinder block cavity using a brass or leather mallet before attaching bolts are installed. Do not use attaching bolts to pull main bearing caps into their seats. Failure to observe this information may damage a cylinder block or bearing cap.

8. Install bearing caps, lubricate bolt threads with engine oil and install. Torque bolts to inner 135 N·m (100 Ft. Lbs.), outer 150 N·m (110 Ft. Lbs.).
9. Install pan with new gaskets.
10. Install flywheel lower cover.

Main Bearings

Main bearings are of the precision insert type and do not utilize shims for adjustment. If clearances are found to be excessive, a new bearing for both the upper and lower halves, will be required. Service bearings are available in standard size, .013mm (.0005 in.) U.S. and .026mm (.001 in.) U.S.

Selective fitting of main bearing inserts is necessary in production in order to obtain close tolerances. For this reason you may find one half of a standard insert with one half of a .001″ (.026mm) undersize insert which will decrease the clearance .0005″ (.013mm) from using a full standard bearing.

INSPECTION

In general, the lower half of the bearing (except #1 bearing) shows a greater wear and the most distress from fatigue. If upon inspection the lower half is suitable for use, it can be assumed that the upper half is also satisfactory. If the lower half shows evidence of wear or damage, both upper and lower halves should be replaced. Never replace one half without replacing the other half.

CHECKING CLEARANCE

To obtain the most accurate results with "Plastigage" (or its equivalent) a wax-like plastic material which will compress evenly between the bearing and journal surfaces without damaging either surface, certain precautions should be observed.

If the engine is out of the vehicle and upside down, the crankshaft will rest on the upper bearings and the total clearance can be measured between the lower bearing and journal. If the engine is to remain in the vehicle, the crankshaft must be supported upward to remove the clearance from the upper bearing. The total clearance can then be measured between the lower bearing and journal.

To assure the proper seating of the crankshaft, all bearing cap bolts should be at their specified torque. In addition, preparatory to checking fit of bearings, the surface of the crankshaft journal and bearing should be wiped clean of oil.

1. With the oil pan and oil pump removed, and starting with the rear main bearing, remove bearing cap and wipe oil from journal and bearing cap.
2. Place a piece of gaging plastic the full width of the bearing (parallel to the crankshaft) on the journal. Do not rotate the crankshaft while the gaging plastic is between the bearing and journal.
3. Install the bearing cap and evenly torque the retaining bolts to specifications. Bearing cap MUST be torqued to specifications in order to assure proper reading. Variations in torque affect the compression of the plastic gage.
4. Remove bearing cap. The flattened gaging plastic will be found adhering to either the bearing shell or journal.
5. On the edge of gaging plastic envelope there is a graduated scale which is correlated in thousandths of an inch. Without removing the gaging plastic, measure its compressed width (at the widest point) with the graduations on the gaging plastic envelope. Normally main bearing journals wear evenly and are not out-of-round. However, if a bearing is being fitted to an out-of-round (.001″ max.), be sure to fit to the maximum diameter of the journal. If the bearing is fitted to the minimum diameter and the journal is out-of-round .001″, interference between the bearing and journal will result in rapid bearing failure. If the flattened gaging plastic tapers toward the middle or ends, there is a difference in clearance indicating taper, low spot or other irregularity of the bearing or journal. Be sure to measure the journal with a micrometer if the flattened gaging plastic indicates more than .001″ difference.
6. If the bearing clearance is within specifications #1, 2, 3, 4 (.0018″-.0032″) and #5 (.0022″-.0037″), the bearing insert is satisfactory. If the clearance is not within specifications, replace the insert. Always replace both upper and lower inserts as a unit.
7. A standard, .013mm (.0005″), or .026mm (.001″) undersize bearing may produce the proper clearance. If not, the crankshaft may be ground up to .010″. But bearings in that size range are not available at this writing.
8. Proceed to the next bearing. After all bearings have been checked rotate the crankshaft to see that there is no excessive drag. When checking #1 main bearing, loosen accessory drive belts so as to prevent tapered reading with plastic gage.
9. Measure crankshaft end play (.05-.18mm) by forcing the crankshaft to the extreme front position. Measure at the front end of the rear main bearing with a feeler gage.
10. Install a new rear main bearing oil seal in the cylinder block and main bearing cap.

REPLACEMENT

Main bearings may be replaced with or without removing the crankshaft.

— NOTE —

Main bearing cap bolt torque instruction: With crankshaft, bearing and bearing caps installed and bolts started, thrust crankshaft rearward to set and align bearing caps. Then thrust crankshaft forward to align rear faces of center main bearings. Torque bolts as specified. The above procedure is mandatory.

Connecting Rod Bearings

The connecting rod bearings are of the precision insert type and do not utilize shims for adjustment. DO NOT INTERCHANGE RODS OR ROD CAPS. If clearances are found excessive a new bearing will be required.

Service bearings are available in standard size and .013mm (.0005″) and .026mm (.001″) under size for use with new and used standard size crankshafts.

INSPECTION AND REPLACEMENT

1. With oil pan and oil pump removed, remove connecting rod cap and bearing. Before removing connecting rod cap, mark the side of the rod and cap with the cylinder number to assure matched reassembly of rod and cap.
2. Inspect the bearing for evidence of wear or damage. (Bearings showing the above should not be installed.)
3. Wipe both upper and lower bearing shells and crankpin clean of oil.
4. Measure the crankpin for out-of-round or taper with micrometer. If not within specifications replace or recondition the crankshaft. If within specifications and a new bearing is to be installed, measure the maximum diameter of the crankpin to determine new bearing size required.
5. If within specifications measure new or used bearing clearances with Plastigage or its equivalent. If a bearing is being fitted to an out-of-round crankpin, be sure to fit to the maximum diameter of the crankpin. If the bearing is fitted to the minimum diameter and the crankpin is out-of-round .001″ interference between the bearing and crankpin will result in rapid bearing failure.
   a. Place a piece of gaging plastic, the length of the bearing (parallel to the crankshaft), on the crankpin or bearing surface.

      Plastic gage should be positioned in the middle of upper or lower bearing shell. (Bearings are eccentric and false readings could occur if placed elsewhere.)

   b. Install the bearing in the connecting rod and cap.

      Install the bearing cap and evenly torque nuts to specifications. Do not turn the crankshaft with the gaging plastic installed.

      Remove the bearing cap and using the scale on the gaging plastic envelope, measure the gaging plastic width at the widest point.
6. If the clearance exceeds specification (.0018″-.0039″), select a new, correct size, bearing and remeasure the clearance. Be sure to check what size bearing is being removed in order to determine proper replacement size bearing. If clearance cannot be brought to within specifications, the crankpin will have to be ground undersize. If the crankpin is already at maximum undersize, replace crankshaft.
7. Coat the bearing surface with oil, install the rod cap and torque nuts to specifications 65 N·m (45 ft. lbs.).
8. When all connecting rod bearings have been installed tap each rod lightly (parallel to the crankpin) to make sure they have clearance.
9. Measure all connecting rod side clearances (.063-.17mm) between connecting rod caps.

Rod Assembly

If a rod is twisted or bent, a new rod must be installed. NO ATTEMPT SHOULD BE MADE TO STRAIGHTEN CONNECTING RODS.

The connecting rods are forged heat-treated steel. They are balanced to within ±10 grams to avoid engine imbalance.

The connecting rod wrist pin bronze bushing is not serviced. If the clearance between the wrist pin bushing and the wrist pin exceeds .030mm (.0012″) the rod must be replaced.

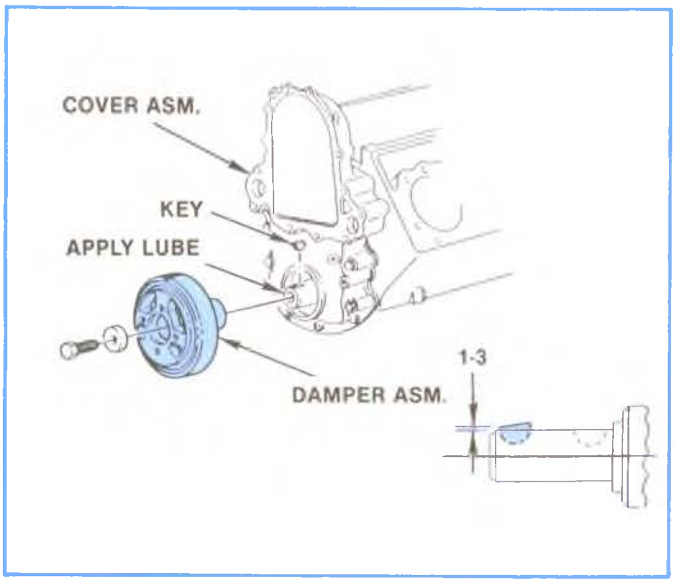


Figure 2-26, Torsional Damper.

Torsional Damper 6.2L

The 6.2L damper is made of nodular iron. It is press-fit assembled to the front end of the crankshaft and bolted on. (Figure 2-26).

The function of the torsional damper is to counteract the twisting or torsional vibration caused by force variations on the piston and thus on the crankshaft. Torsional vibration is an oscillation which occurs within every power stroke. The application of force and its removal a split second later causes the crankshaft to be alternately twisted out of alignment and snapped back in place. If a preventive measure is not taken against this action, the engine will run rough and the crankshaft may break.

The damper consists of two parts: A small inertia inner ring, or damper flywheel, and an outer ring. These are bonded together by a rubber insert that is approximately seven mm thick. It is mounted to the front end of the crankshaft. As the engine tends to speed up or slow down, it acts much like a flywheel by imposing a dragging effect due to its inertia. This effect slightly flexes the rubber insert and tends to hold the crankshaft at a constant speed. Thus, it tends to check the twist, untwist or torsional vibration of the crankshaft. This twist might be as much as 10 tons and without a damper, the crankshaft could break.

The vibration damper, like the crankshaft and flywheel, must be properly balanced prior to assembly to the engine.

Since torsional vibration differs with engine design, vibration dampers are designed to suit specific engines.

Also on the outer diameter is a timing groove. We use this groove to statically time the diesel engine during assembly. This groove can also be used with a mag-tach to measure RPM's during engine operation. Remove torsional damper using tool J-23523 and suitable pilot. Install damper using a mallet. Assemble key as shown in Figure 2-26. Tap damper far enough on crankshaft so attaching bolt may be installed. Torque bolt to specifications 205 N·m (150 ft. lbs.).

Camshaft

The 6.2L has a forged steel carburized camshaft for durability. (Figure 2-27). There are 5 bearing journals which position and support the camshaft. The camshaft has 16 lobes. There is an eccentric lobe immediately rear of the number one journal. This eccentric changes rotary motion of the camshaft to linear motion of the fuel pump push rod, thus the mechanical fuel pump is operated through a push rod off the camshaft.

There is also a helical gear at the rear of the camshaft, this gear mates with another gear which drives the vacuum pump and the oil pump.

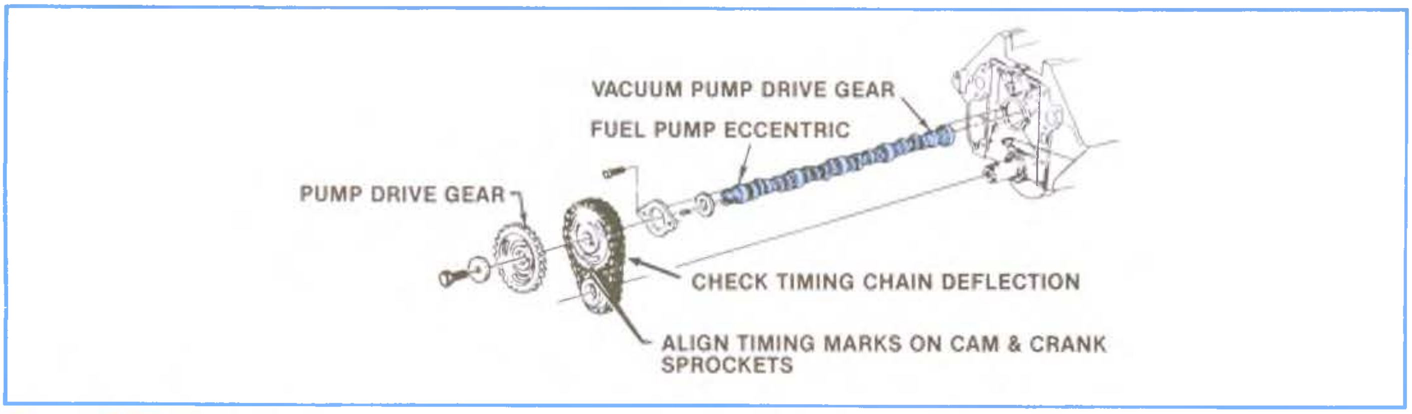


Figure 2-27, Camshaft.

Camshaft Bearings

CK TRUCK, G VAN

- **REMOVAL (FIGURE 2-28)**

Camshaft bearings can be replaced while engine is disassembled for overhaul.

1. With camshaft and crankshaft removed, drive camshaft rear plug from cylinder block.
2. Using Tool J-6098 with nut and thrust washer installed to end of threads, index pilot in camshaft front bearing and install puller screw through pilot.
3. Install remover and installer tool J-6098-11 for #2, 3, 4 bearing with shoulder toward bearing, making sure a sufficient amount of threads are engaged.
4. Using two wrenches, hold puller screw while turning nut. When bearing has been pulled from bore, remove remover and installer tool and bearing from puller screw (Figure 2-28).
5. Remove remaining bearings (except front and rear) in the same manner. It will be necessary to index pilot in camshaft rear bearing to remove the rear intermediate bearing.
6. Assemble remover and installer tool J-6098-11 for #1 and J-6098-12 for #5 bearing on driver handle and remove camshaft front and rear bearings by driving towards center of cylinder block (Figure 2-29).

- **INSTALLATION**

The camshaft front and rear bearings should be installed first. These bearings will act as guides for the pilot and center the remaining bearings being pulled into place.

1. Assemble remover and installer tool on driver handle and install camshaft front and rear bearings by driving towards center of cylinder block.
2. Using Tool Set J-6098 with nut then thrust washer installed to end of threads, index pilot in camshaft front bearing and install puller screw through pilot.
3. Index camshaft bearing in bore (with oil hole aligned as outlined below), then install remover and installer tool on puller screw with shoulder toward bearing.

All five bearings must have an oil hole at the approximate 4 o'clock position when viewed from the front with the block in an upright position.

The seam in the bearing must always be located in the upper half of the block face.

The front bearing has an additional oil hole which will be located between the 12 and 1 o'clock position. This bearing also has a notch which must be positioned towards the front of the block.

This procedure will ensure that the oil supply to the bearings will enter prior to the high load zone which is near the bottom of the bore.

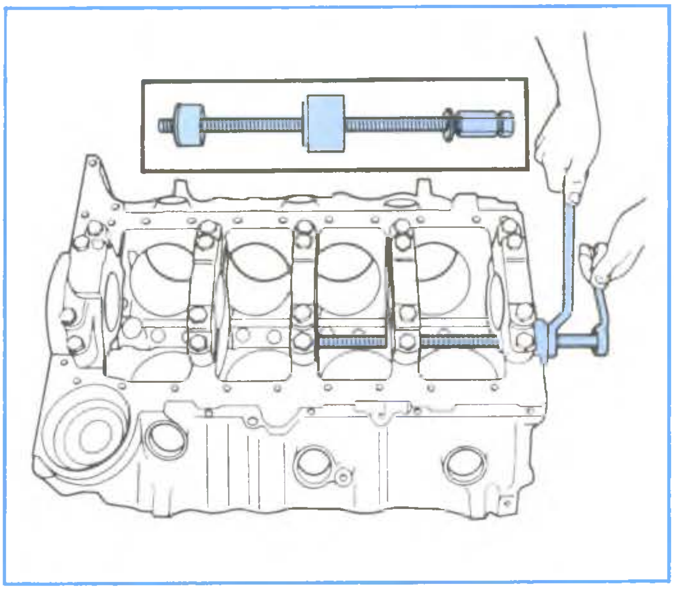


Figure 2-28, Removing or Replacing Camshaft Bearings

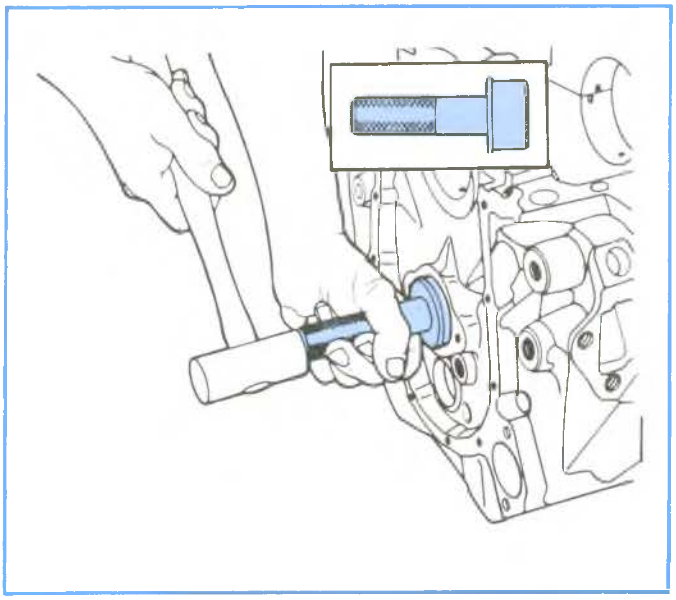


Figure 2-29, Replacing Camshaft Front Bearing

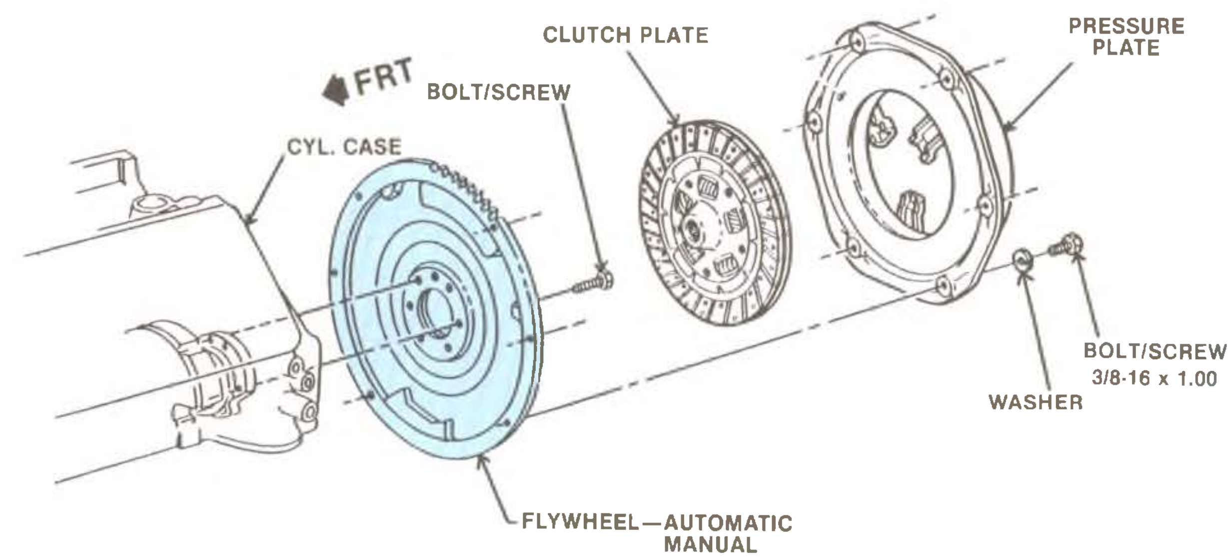


Figure 2-30, **Flywheel.**

Flywheel

The 6.2L diesel engine has 2 flywheels, one to be used for automatic transmissions and one for manual transmissions. The automatic flywheel is made of a heavy steel stamping and the manual flywheel is made of cast iron. See Figure 2-30.

It reduces vibration by smoothing out the power strokes of multi-cylinder engines. Each cylinder delivers power only every fourth stroke. It is absorbing power the other 3 strokes. During the other 3 strokes, the engine tends to slow down. The flywheel resists any effort of the engine to change its speed of rotation because of its inertia. Thus, the flywheel minimizes the effect of the engine trying to slow down or to speed up by absorbing power during the power stroke and then gives it back to the engine during the outer 3 strokes. Thus, the flyweel acts to smooth out the peaks and valleys of power from the engine.

The automatic flywheel (flex plate) should be examined for any signs of cracking. And the ring gear should be checked for worn or broken teeth.

Front Cover

See Figure 2-31. The 6.2L diesel engine front cover is a die cast of aluminum. This compares with the metal stamped front covers of most gasoline engines. This front cover:

- Covers timing gears and chain.
- Retains front crankshaft seal.
- Covers injection pump drive and driven gears.
- Provides mounting for injection pump and drive components.
- Mounts T.D.C. timing pointer.
- Sealed to cylinder case with anaerobic sealant to prevent oil leaks. Pt. #1052357 or 1052756
- Provides mounting for water pump and backing plate.

There is a baffle in the upper half of the timing cover, and the purpose of baffle is, to keep the oil in the bottom of the cover area and not allow too large a quantity to accumulate in the gear and chain area. This prevents oil aeration. Also the upper half of the cover contains the oil fill pipe where venting blow-by gases go to the CDR valve. This area must have a baffle to prevent oil from being drawn into the CDR valve.

It is necessary to maintain .040 in clearance between the baffle and the pump drive gear, or noise could result.

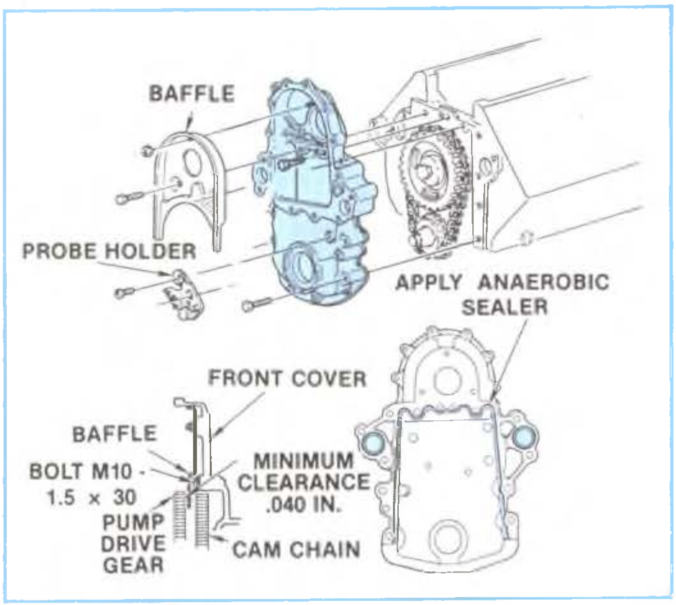


Figure 2-31, **Front Cover.**

Exhaust Manifolds

The 6.2L diesel has 2 exhaust manifolds made of nodular cast iron, Figure 2-32. Exhaust gases are forced out when a lobe on the camshaft causes the exhaust valve to open and the piston forces the exhaust gases through this opening to the exhaust manifold. Using dual exhaust improves efficiency of the engine by allowing freer exhaust of gases, thus leaving less burned gases for the cylinder at the beginning of the intake stroke.

The mounting flanges are machined to seal the exhaust ports to the cylinder head. It is extremely important that these surfaces be flat, since no gasket is used.

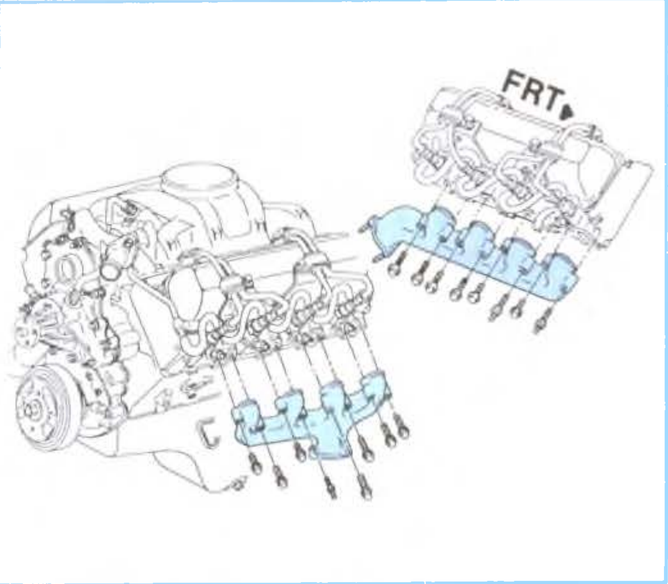


Figure 2-32, **Exhaust Manifolds.**

Lubrication System

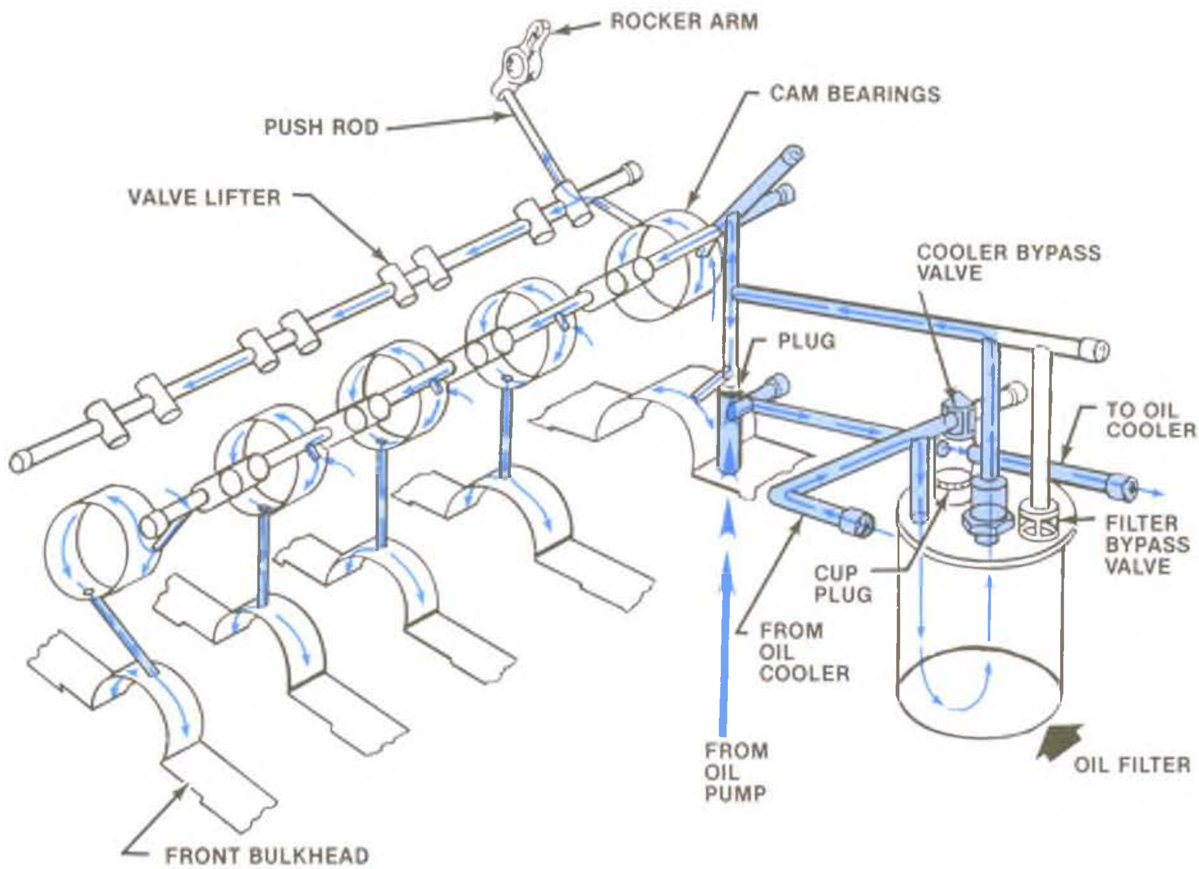


Figure 2-33, **Lubrication System.**

Lubrication System

See Figure 2-33. The lubrication system of the 6.2L diesel engine is composed of:

- Oil pan reservoir
- Filter
- Pump
- Galleries

Seven quarts of oil are required for this engine. The oil pan acts as a reservoir for holding the oil waiting to be circulated through the engine. The oil pan is attached to the bottom side or pan rail of the engine.

The lubricating system of this engine is a pressure feed type which means that a pump forces oil through the galleries to the necessary parts. The pump is mounted to the bottom side of the number five main bearing cap. Extending down from the pump and into the oil is a pick-up tube with a screen cover to filter out foreign material. Oil is picked up by this tube and pumped through the oil pump. The pump is a gear type which uses 2 meshing gears. As these gears rotate in opposite directions, the spaces between the gear teeth and the housing fill with oil from the inlet side of the pump. Then as the teeth mesh, the oil is forced out through the outlet tube. The pump is driven from the engine camshaft by means of an intermediate shaft. The oil is next pumped through a cooler located in the radiator (Figure 2-34) which cools the oil and thus helps to remove engine heat.

From the cooler the oil passes through a filter. This filter is a cartridge type and all oil going to the engine should pass through this filter. The cartridge is made of materials that trap foreign materials to prevent it getting to engine components. The filter used in this engine is called a full flow filter, because all engine oil normally flows through it. If this full flow filter becomes clogged, the engine is equipped with a by-pass valve which is spring loaded. This valve protects the engine from oil starvation by opening when increased pump pressure tries to pump oil through a clogged filter. When the pressure causes the by-pass valve to open, the oil by-passes the filter and the engine continues to receive lubrication. Replacement of the filter periodically will prevent damage to the engine due to a clogged filter.

From the filter the oil is pumped through the drilled galleries in the crankcase to the various moving metal parts in the engine. The rear crankshaft bearing is fed by a hole drilled from the rear main bearing bore to main gallery from filter to cylinder case. Oil is pumped further through the main gallery to a drilled oil gallery which has been drilled the full length of the left side of the case. Oil from this gallery feeds the camshaft babbit bearings and another gallery which runs the full length of the right side of the case. All other engine components are provided lubrication by these 2 oil galleries. Holes are drilled from camshaft bore to provide oil for main bearings #1 through #4. Lifters on the right side receive oil from the right side main oil gallery and lifters on the left side receive oil from the left side oil gallery. The lifters contain a check ball which meters oil through the hollow push rods and to the rocket arm and valve stem in the cylinder head. After a small accumulation of oil is in the head, it begins to drain back to the crank case. As mentioned before, the first four main bearings receive oil from vertical holes drilled from the cam bores to crank bores. This oil flows onto the crankshaft main bearings and provides lubrication for the crankshaft to rotate freely in its bearings. This oil also flows around the groove in each bearing to holes drilled in the crankshaft to the crankpin journals to provide lubrication there, to allow the crankpins to rotate freely in the connecting rod bearings. As the crankshaft rotates, it slings oil off the crankpins to cover cylinder walls, pistons, piston pin and piston rings. Oil drains off these parts and back to the engine.

There is also one other by-pass valve which has not yet been discussed. This is the oil cooler by-pass valve. It works much the same as the oil filter by-pass valve and opens to allow an alternate route for the oil if the cooler should become clogged.

There is an oil pressure switch which is assembled to the top rear of the cylinder case to sense oil pressure in the oil cavity.

OIL PRESSURE
Hot idle 10 PSI
Max. Cold Start 80 PSI
Average Pressure at stable
Conditions 40-45 PSI @ 2000 RPM

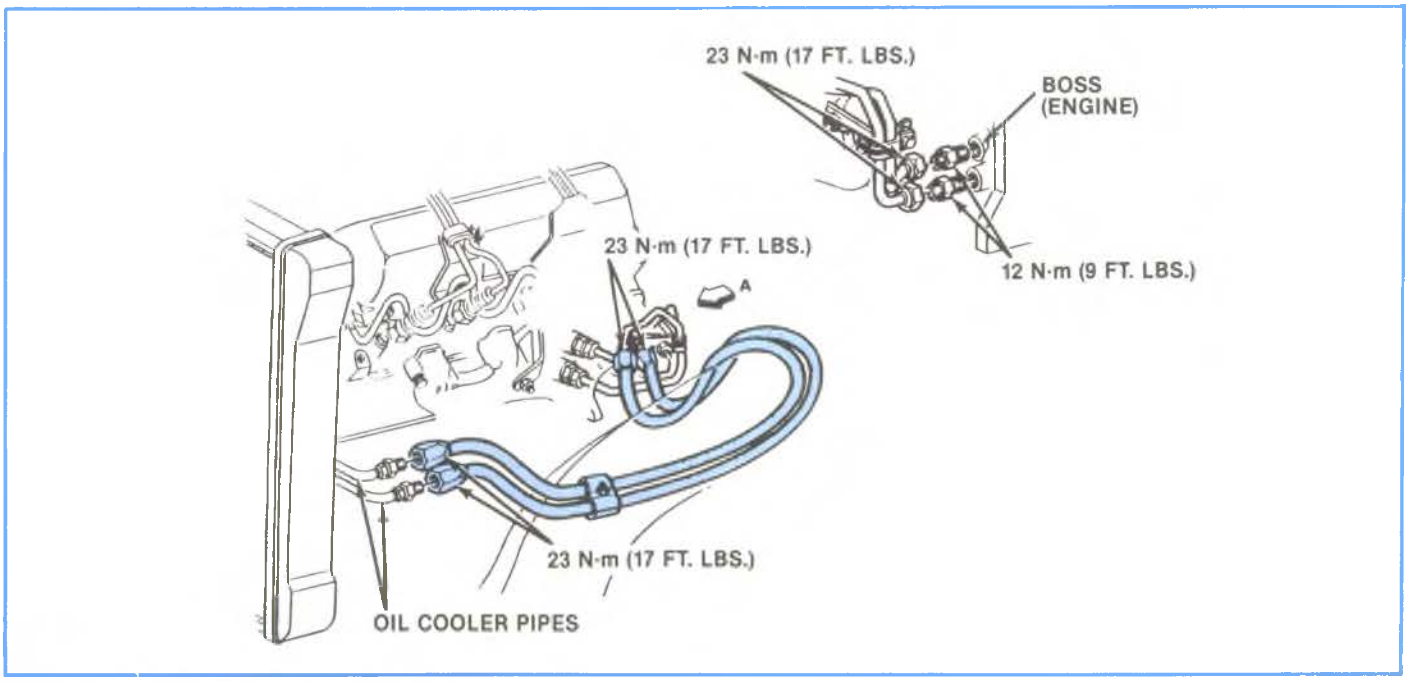


Figure 2-34, 6.2L Oil Cooler Lines.

Engine and Transmission Oil Cooler Diagnosis, All Models

When radiator oil coolers are suspected of leaking, they should be thoroughly checked before the radiator is removed for repair. This can be done by testing the cooler with air pressure while the radiator is still in the vehicle. BT-8316-A or J-34111 are available tools that can be used to test the oil coolers.

TESTING

1. Allow the engine to cool down.
2. Disconnect the negative battery cable(s).
3. Remove the radiator cap. Check coolant level in the radiator and add as necessary.

— CAUTION —

Never remove the radiator cap on a warm engine. Removing the cap immediately lowers the boiling point of the liquid and can cause violent overflow. The result could be a large coolant loss and possible personal injury.

4. Place a drain pan under the vehicle to catch lost oil.
5. Disconnect the lower pipe or hose from the oil cooler to be tested. Install the correct plug from the Tool Kit into the open radiator fitting.
6. Disconnect the upper pipe or hose from the oil cooler. Install the correct adapter from the Tool Kit into the radiator oil cooler fitting.
7. Apply 345 kPa (50 psi) adapter valve.
8. Watch for bubbles in the coolant. If bubbles appear, remove radiator for repair.
9. If no bubbles, increase the air pressure to 690 kPa (100 psi) and watch for bubbles. If still no bubbles, increase the air pressure to 1,034 kPa (150 psi) and again watch for bubbles.

   If no bubbles appeared, the oil cooler is not leaking. If bubbles did appear, remove the radiator for repair.
10. Reconnect the cooler lines (or hoses using new "O" rings) and torque to specifications.
11. Connect the negative battery cable(s).
12. Start the engine and check for leaks.
13. Check and add coolant, engine oil, or transmission fluid as necessary.

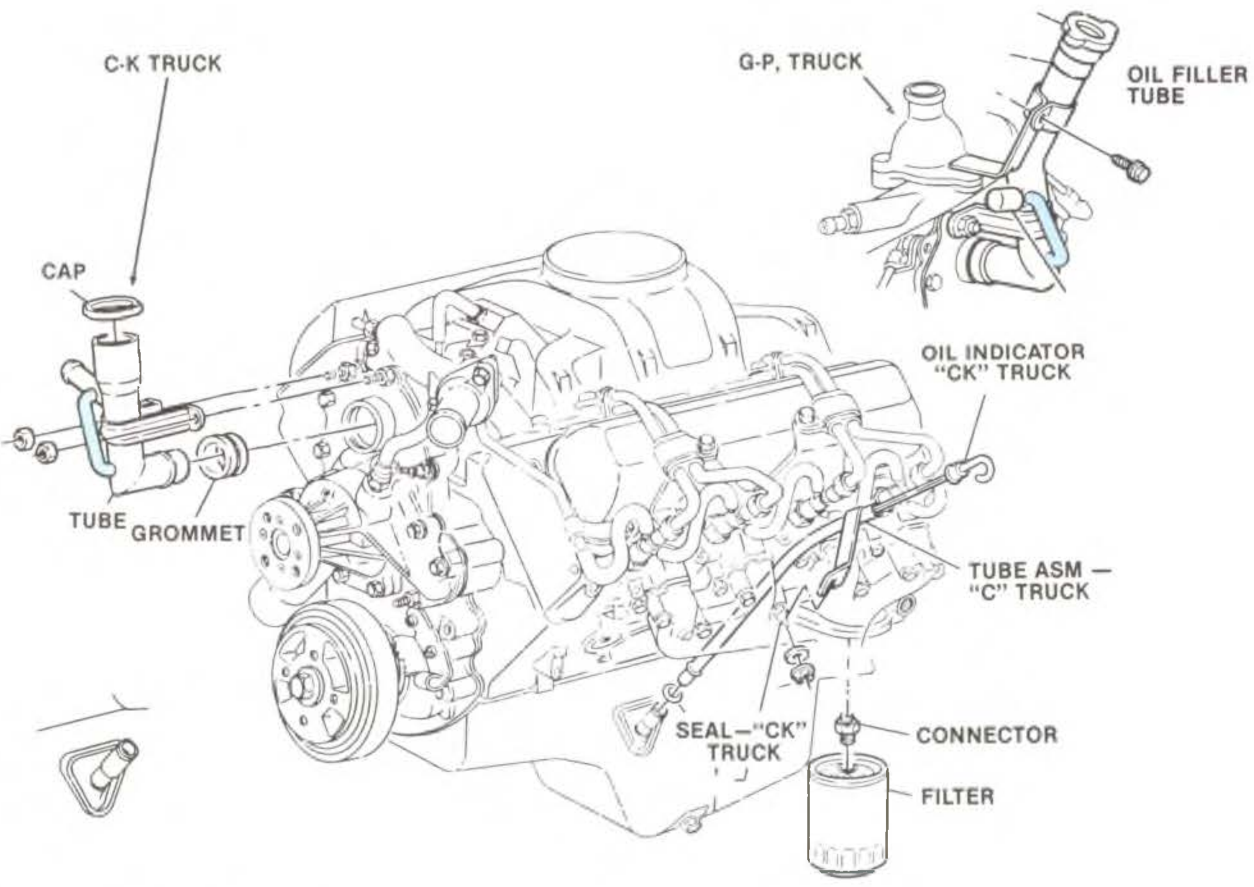


Figure 2-35, **Oil Filler Tube.**

Oil Filler Tube (Figure 2-35)

During late 1983 Model Year production, a vented oil fill tube (14071059) replaced the non-vented tube (Figure 2-35).

The vented tube will prevent the possibility of some oil entering the air intake system during oil additions. This vented oil fill tube is available through service as P/N 14071059.

Oil which has entered the intake manifold can cause damage if the amount is sufficient to cause hydraulic lock-up of a piston.

The vented tube should **always** be used in service when replacing the tube for any reason.

When replacing the fill tube on vehicles equipped with air-conditioning, a clearance modification must be made to the A/C hose support bracket (or use new P/N 14074317).

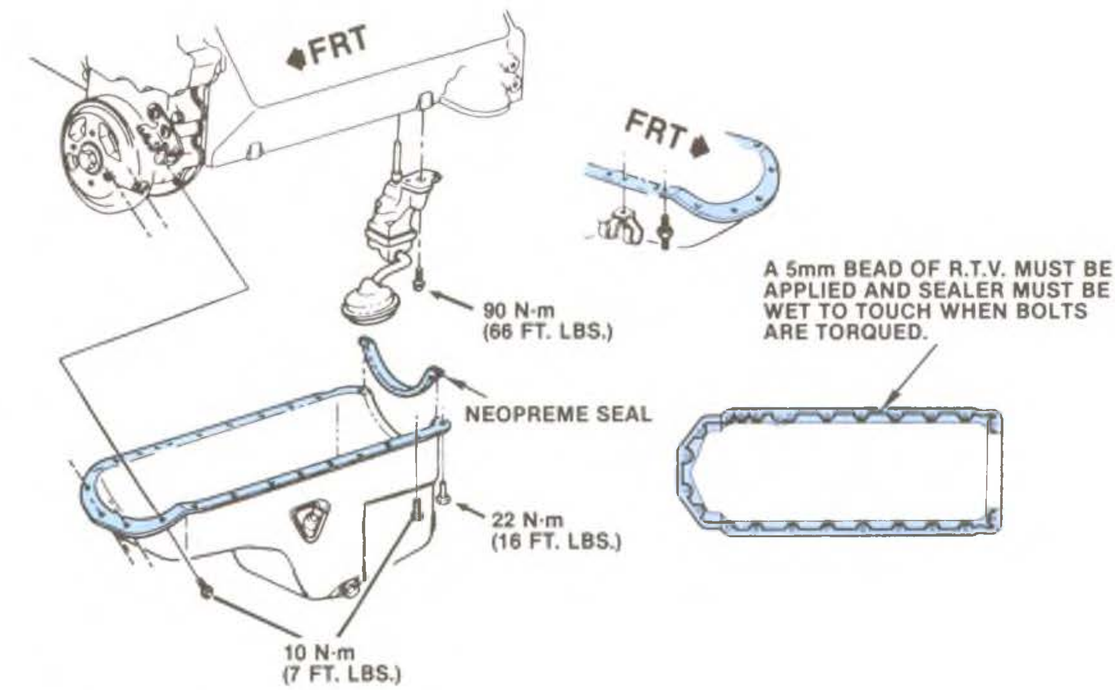


Figure 2-36, Oil Pan Seal.

OIL PAN SEAL

6.2L diesel uses R.T.V. around most of the perimeter of the pan, except at the rear, where a neoprene seal is used. See Figure 2-36.

RTV part #1052734, 1052914, or 1052915.

DIRECTIONS FOR RTV APPLICATION

1. Surface must be clean and dry. Remove all traces of oil and old gasket material. Clean with a chlorinated solvent such as carburetor spray cleaner. Don't use petroleum cleaners such as mineral spirits. They leave a film which R.T.V. won't stick to.
2. Cut the tube extension to approximately 1/8″.
3. Apply R.T.V. (1052734 or 1052915) to one of the clean surfaces. Circle all bolt holes.
4. Assemble while R.T.V. is still wet. Don't wait for R.T.V. to skin over (within 3 minutes).
5. Torque bolts to 10 N·m (7 Ft. Lbs.) except the 2 rear bolts (2 rear bolts 22 N·m 16 Ft. Lbs.). Don't over torque.
6. R.T.V. will skin over in 15 minutes, which is sufficient to allow for testing and operation of vehicle. No need to wait for the R.T.V. to cure.

Vacuum Pump

The vacuum pump (Figure 2-37) is required because the diesel engine does not develop vacuum in the unrestricted air intake manifold.

Since the air crossover and intake manifold are unrestricted, no vacuum source is available as found in gasoline engines. To provide vacuum, a vacuum pump is mounted in the location occupied by the distributor in the gasoline engine. This vacuum pump supplies the air conditioning servos, cruise control servo, and transmission vacuum modulator where required.

It is a diaphragm pump which needs no periodic maintenance. It is driven by a cam inside the drive assembly to which it mounts. The pump's diaphragm moves back and forth causing air to flow into the inlet tube, through the pump, and exhaust out the rear port.

The drive housing assembly has a drive gear on the lower end which meshes with the camshaft gear in the engine. This drive gear causes the cam in the drive housing to rotate. The drive gear also powers the engine oil lubricating pump.

Figure 2-38 illustrates the vacuum pump in sectional view. Lubrication of the vacuum pump is via a passage from the rear of the right lifter oil gallery.

See Figure 2-39 for removal and installation of the assembly and Figure 2-40 for general diagnosis.

— NOTE —

The engine will run without the vacuum pump installed, but in that case, there would be no oil circulation in the engine since the oil pump shaft has no gear to the camshaft. So, you should never run the engine without the vacuum pump installed.

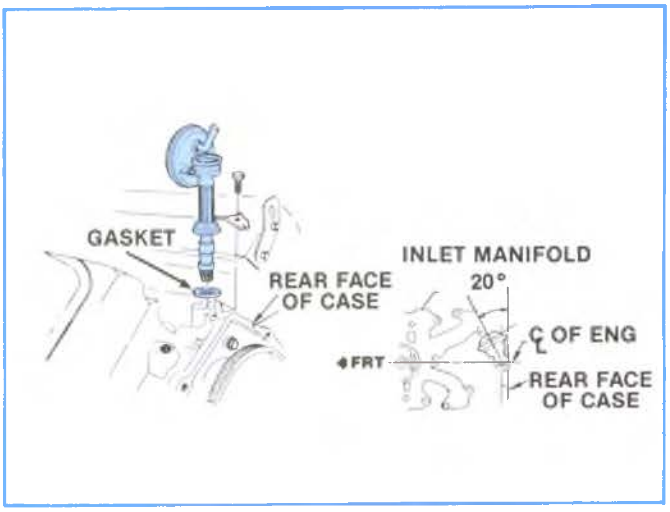


Figure 2-37, Vacuum Pump.

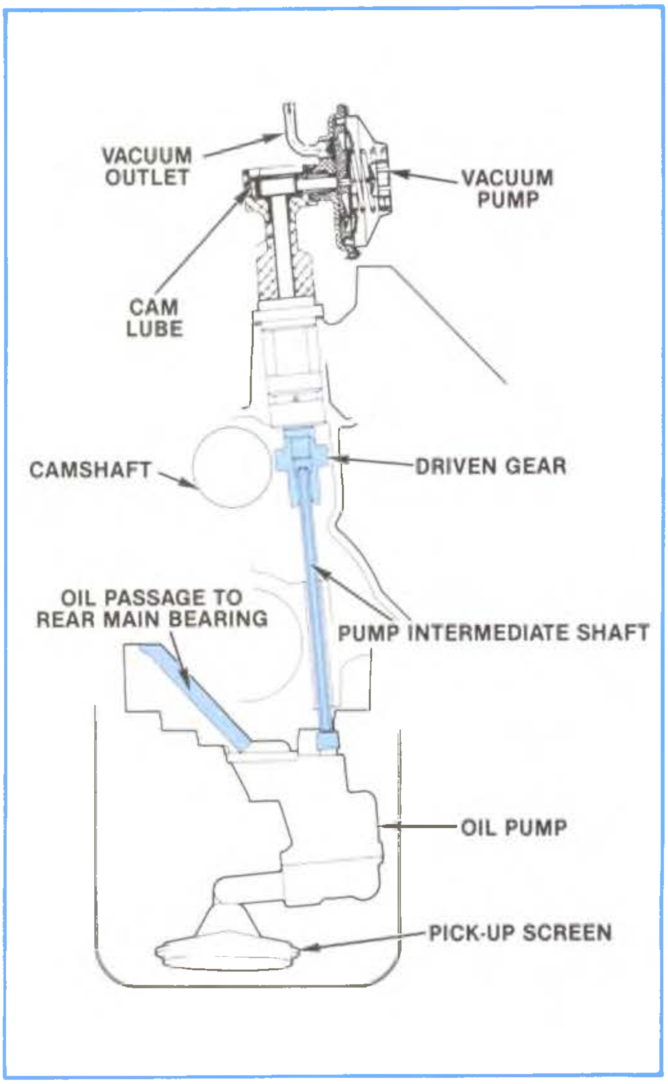


Figure 2-38, Vacuum Pump Drive.

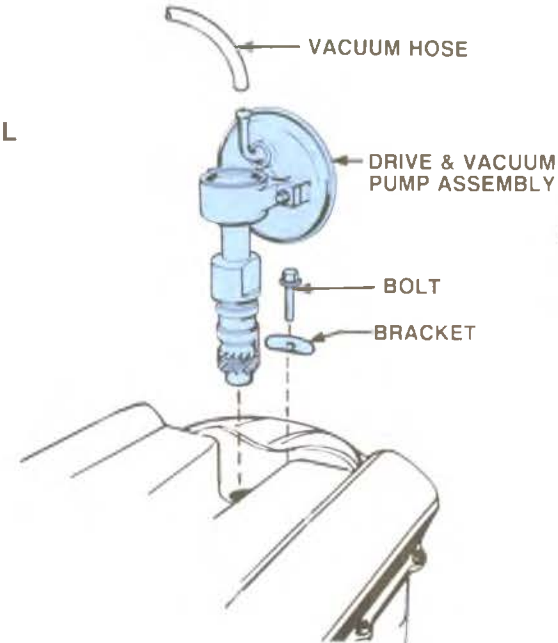
1. REMOVE AND INSTALL

REMOVE

1. Remove hose from pump inlet.
2. Remove bolt and bracket holding pump to engine block.
3. Remove pump.

INSTALL

1. Insert pump in engine, making sure the gears on the pump mesh with the gears on the engine camshaft.
2. Rotate the pump into position so the bracket and bolt can be installed.
3. Install vacuum hose.



Removing assembly from engine.

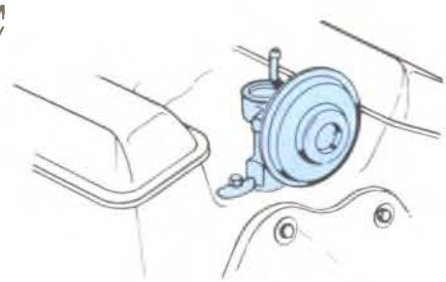

View showing assembly from rear of engine.

Figure 2-39, Repair Procedures.

CONDITION	POSSIBLE CAUSE	CORRECTION
Excessive noise or clattering noise.	1. Loose screws between pump assy. and drive assy. 2. Loose tube on pump assy.	1. A – Tighten screws to spec. B – Replace pump assy. 2. Replace pump assy.
Hooting noise.	Valves not functioning properly.	Replace pump assy.
Pump assy. loose on drive assy.	Stripped threads	Replace pump assy.
Oil around end plug.	Loose plug.	1. Seat plug. 2. Replace drive assy.
Oil leaking out crimp.	Bad crimp.	Replace pump assy.
Install hose and vacuum gage to pump, engine running, gage should have reading of 20 inches vacuum minimum. With engine off, vacuum level loss should not drop from 20 inches to 19 inches in less than 1½ seconds.	1. Defective valves. 2. Defective diaphragm. 3. Worn push rod seal. 4. Loose tube.	Replace pump assy.

Figure 2-40, Vacuum Pump Diagnosis.

EXCESSIVE BRAKE PEDAL EFFORT, BRAKE WARNING LIGHT ON (BRAKES WITH VACUUM ASSIST).

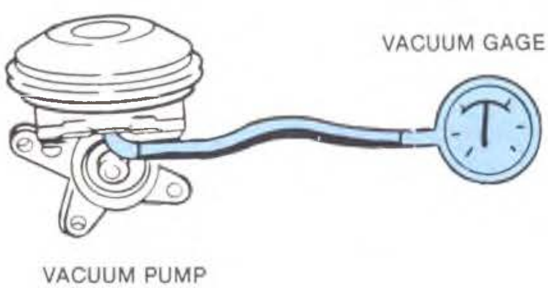
AUTOMATIC TRANSMISSION (VACUUM MODULATED) WILL NOT SHIFT OUT OF FIRST (LOW) GEAR

STEP 1

CONNECT VACUUM GAGE TO VACUUM PUMP INLET. AT ENGINE IDLE, VACUUM SHOULD REACH 70 kPA (21″ Hg) MINIMUM AT SEA LEVEL WITHIN 30 SECONDS (SEE GRAPH FOR VACUUM AT OTHER ELEVATIONS).

- CHECKS OKAY. LEAK IN SYSTEM OTHER THAN VACUUM PUMP
  - GO TO STEP 2
- LOW VACUUM OR FLUCTUATING GAGE READING
  1. CHECK GAGE AND CONNECTIONS FOR LEAKS.
  2. IF BELT DRIVEN, CHECK BELT TENSION AND PULLEY FIT TO SHAFT.
  3. CHECK IDLE RPM.
  - RECHECK VACUUM GAGE
    - VACUUM O.K.
      - GO TO STEP 2
    - LOW VACUUM REPLACE PUMP
      - GO TO STEP 1

VACUUM PUMP DIAGNOSIS



VACUUM PUMP, NO-LEAK VACUUM MINIMUM ACCEPTABLE vs. ALTITUDE

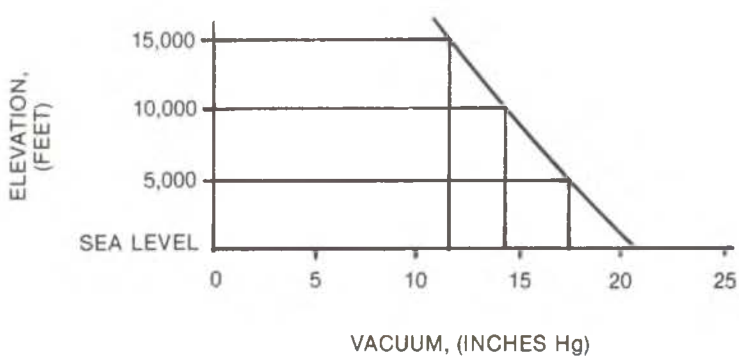


Figure 2-40, Vacuum Pump Diagnosis.

STEP 2

RECONNECT VEHICLE VACUUM HOSE TO PUMP WITH A TEE AND A VACUUM GAGE LOCATED NEAR PUMP INLET AS SHOWN BELOW. AT ENGINE IDLE, VACUUM CAN BE 3″ Hg MAXIMUM LOWER THAN MEASURED IN STEP 1 AFTER 1 MINUTE.

- CHECKS OKAY. ANY REMAINING PROBLEMS ARE NOT WITH VACUUM SYSTEM.
- LOW VACUUM — UNACCEPTABLE.
  - CHECK ALL ATTACHING HOSES FOR LEAKS — REPAIR AS REQUIRED.
  - IF STILL LOW VACUUM, CHECK ALL VACUUM ACCESSORIES FOR OUT OF SPECIFICATION LEAKS. REPAIR OR REPLACE AS REQUIRED.

VEHICLE VACUUM SYSTEM DIAGNOSIS

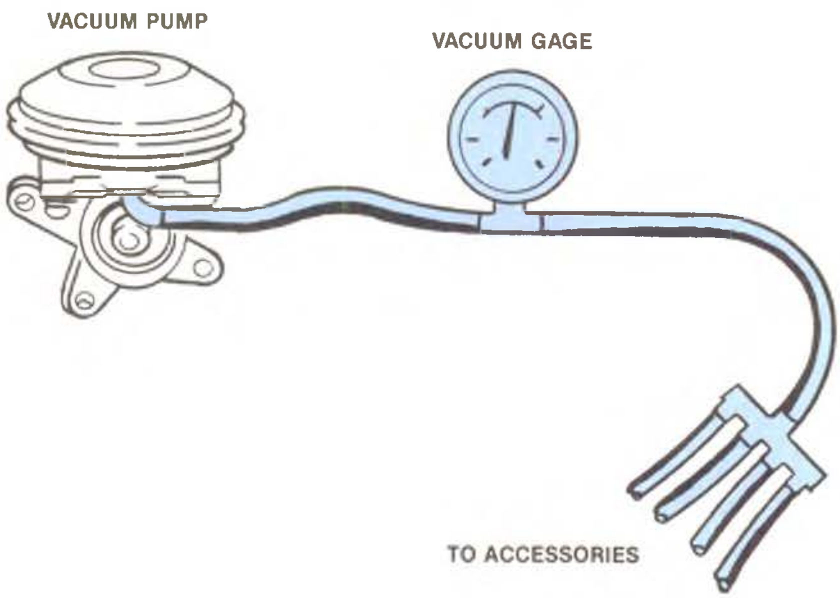


Figure 2-40 Cont'd, Vacuum Pump Diagnosis.

On applications with an engine mounted Model 80 fuel filter, a belt driven vacuum pump is used. This appears on 1984 and later units. See Figure 2-41.

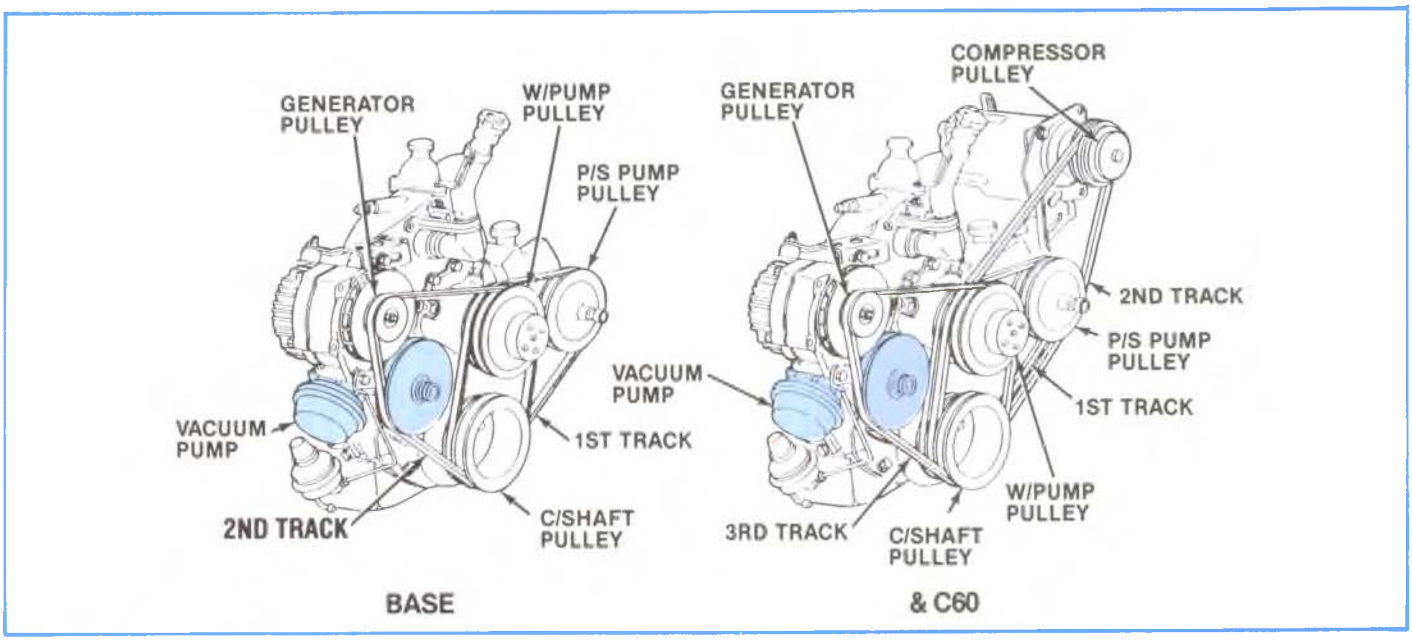


Figure 2-41, Belt Driven Vacuum Pump.

Units with belt driven vacuum pump use an oil pump drive in place of the gear driven vacuum pump. See Figure 2-42.

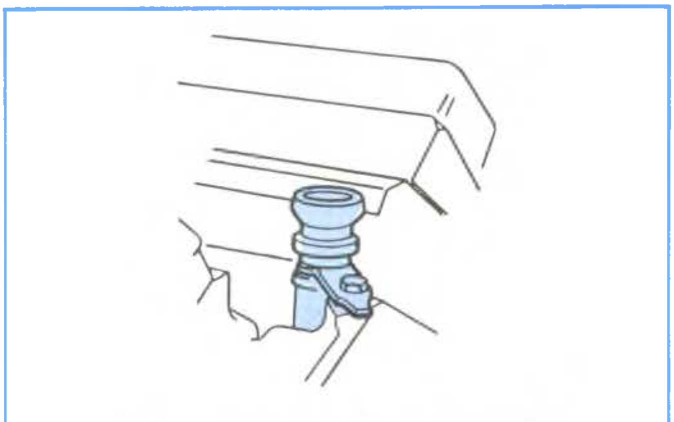


Figure 2-42, Oil Pump Drive.

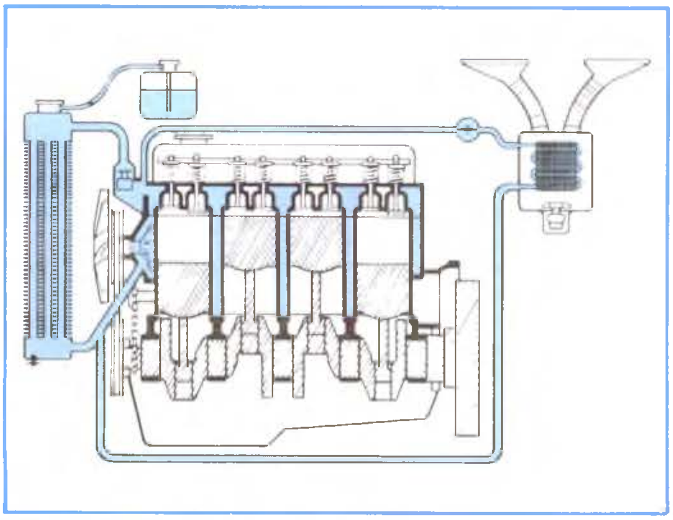


Figure 2-43, **Cooling System.**

Cooling System

The engine cooling system is similar to that used in a gasoline engine, except that it is larger capacity. (See Figure 2-43).

The purpose of the cooling system is to dissipate heat arising from combustion and to keep the engine at its most efficient operating temperature at all engine speeds and all driving conditions. During combustion of the air fuel mixture in engine cylinder, the burning gases may reach temperature as high as 4,000 °F. Some of this heat is absorbed by the wall of the cylinder, the heads and the pistons. These parts must be cooled so that they are not damaged from excessive temperature.

While it is critical that the engine not overheat, it is desirable that the engine operate as close as possible to the limits. This is because the engine is less efficient when it is cold. Therefore, the cooling system includes devices that prevent normal cooling action during warm-up of the engine. These devices are called thermostats and only allow flow of the coolant after the engine reaches normal operating temperature.

The cooling system in most all automobile and truck applications is a liquid coolant system. The liquid coolant system is made up of water jackets in both the cylinder head and in the cylinder case, a pump, an engine fan and a radiator.

GM 1825 M Spec. Coolant is used in the 6.2L Diesel. It is a new specification with modified formulations to lessen aluminum transport deposition (cavitation erosion). When engines with aluminum components are used with coolants not formulated for aluminum, plugging of radiators and engine overheating has been observed. Aluminum compounds in the radiator tubes caused the plugging.

Both service and owners manuals call for GM 1825 M Spec. Coolant. The new coolant (1052753) conforms to GM 1825 M.

Cooling System Diagnosis

A. PROBLEMS NOT REQUIRING DISASSEMBLY OF COOLING SYSTEM —
   1. LARGE OBSTRUCTIONS BLOCKING RADIATOR OR CONDENSER
      a. AUXILIARY OIL COOLERS — RELOCATE
      b. LICENSE PLATES — RELOCATE
      c. SPARE TIRES — RELOCATE
      d. ICE, MUD OR SNOW OBSTRUCTING GRILLE — REMOVE
   2. ENGINE OIL OVERFILL — CHECK ENGINE OIL DIPSTICK
   3. WRONG RADIATOR FOR APPLICATION
   4. LOOSE, DAMAGED OR MISSING AIR SEALS
   5. MISSING OR DAMAGED LOWER AIR BAFFLE
   6. WRONG TIMING

B. PROBLEMS REQUIRING DISASSEMBLY OF COOLING SYSTEM —
   1. INCORRECT OR DAMAGED FAN
   2. PRESSURE CHECK COOLING SYSTEM
   3. DEFECTIVE WATER PUMP
      a. ERODED OR BROKEN IMPELLER VANES
      b. FAILED BEARING OR SEAL — CHECK FOR SHAFT OR BEARING PLAY
   4. PLUGGED RADIATOR TUBES — SEND TO RADIATOR REPAIR SHOP FOR FLOW CHECK
   5. INTERNAL SYSTEM LEAKS
      a. HEAD GASKET
      b. CRACKED BLOCK
      c. TIMING CHAIN COVER
   6. PLUGGED COOLANT PASSAGES IN CYLINDER HEADS — REMOVE HEADS AND CHECK VISUALLY

Figure 2-44, Cooling System Diagnosis Check List.

VISCOUS FAN DRIVE

The 6.2L Coolant Fan is not directly driven. The engine fan is mounted on the water pump shaft and is driven by the same belt that drives the pump. The purpose of this fan is to provide a flow of air thru the radiator. It incorporates a thermostatically operated fluid clutch in the fan hub. This allows the fan to turn less slowly when the engine is cold or when down-the-road driving supplies enough cooling air to control coolant temperature. As coolant temperature rises, the hot air passing through the radiator causes the bimetallic spring at the front of the hub to expand. The spring moves a plate, allowing the working fluid to pass into the working chamber. The fluid resists the free rotation of the fan hub and the fan turns faster. See Figure 2-45.

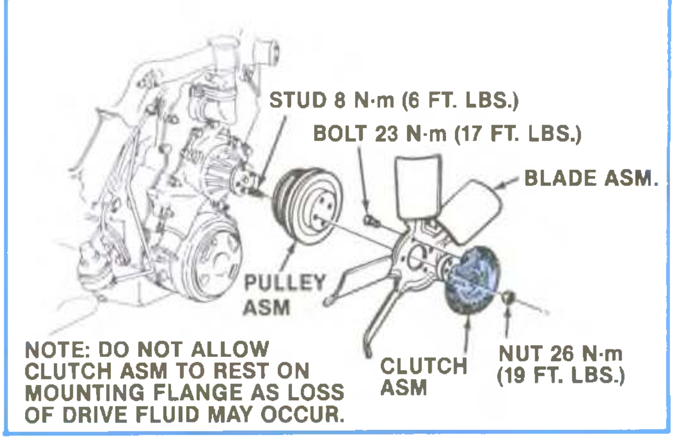


Figure 2-45, Viscous Fan Drive.

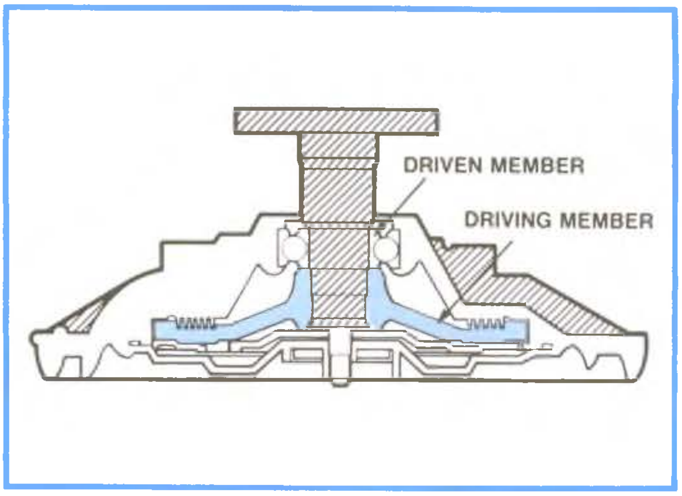


Figure 2-46, Fan Drive Members.

DRIVING AND DRIVEN MEMBERS

There are two viscous clutch members (Figure 2-46). The clutch plate is splined to the pulley shaft and becomes the driving member.

The driven member is integral with the drive housing, which is bolted to the fan. Both members have circular grooves that are closely mated.

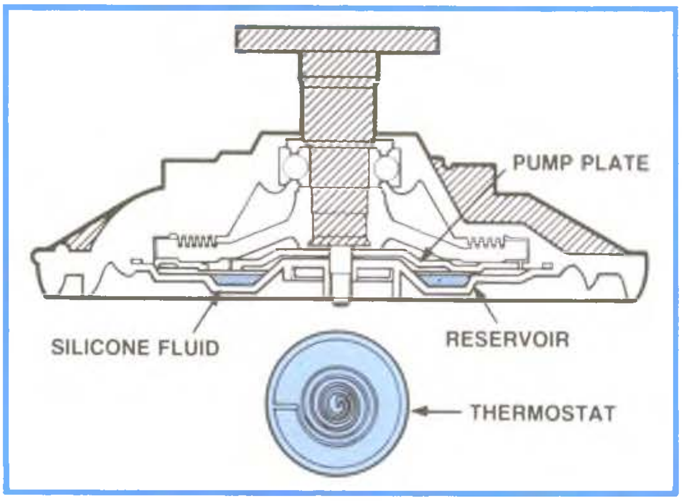


Figure 2-47, Fluid Reservoir and Thermostat.

SILICONE FLUID

The viscous drive medium is silicone fluid, which is stored in a reservoir chamber in front of the pump plate (Figure 2-47). A bi-metallic coil or thermostat controls the fluid flow.

BI-METAL CONTROL

The bi-metallic coil senses the air temperature directly behind the radiator to engage or disengage the drive as required.

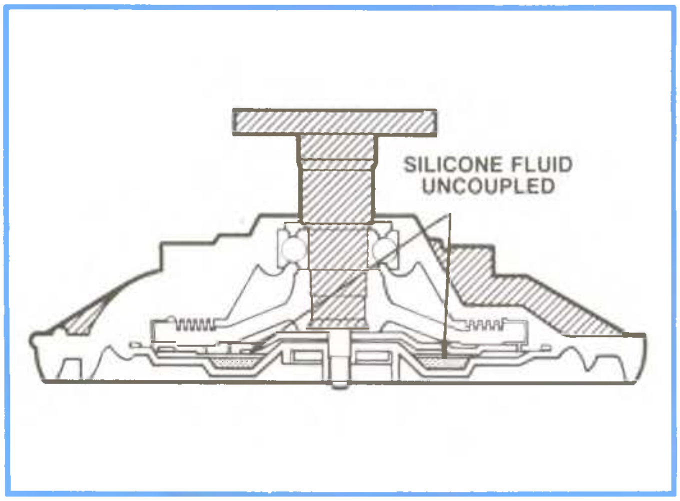


Figure 2-48, Drive Uncoupled.

DRIVE UNCOUPLED

When the radiator air stream is cold, the silicone fluid remains trapped in the reservoir. With little or no fluid in the working chamber, the clutch members are uncoupled, and there is little or no fan rotation (Figure 2-48).

DRIVE COUPLED

As the bi-metallic coil gets hot (around 165 degrees), it moves an arm to uncover an opening in the pump plate and let the fluid flow into the working chamber.

The fluid viscosity causes the members to couple and drive the fan, whenever there is enough fluid to fill the spaces between the grooves.

When the drive is in the coupling phase, the fluid continually circulates between the reservoir and the working chamber. It is again trapped in the reservoir when the bi-metallic coil cools and the fan is uncoupled. See Figure 2-49.

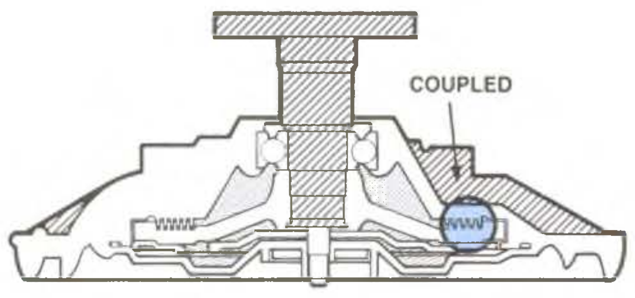


Figure 2-49, Drive Coupled.

Fan Clutch Diagnosis

1. NOISE

Fan noise is sometimes evident under the following normal conditions:

a. When clutch is engaged for maximum cooling.

b. During first few minutes after start-up until the clutch can re-distribute the silicone fluid back to its normal disengaged operating condition.

2. LOOSENESS

Under various temperature conditions, there is a visible lateral movement that can be observed at the tip of the fan blade. This is a normal condition due to the type of bearing used. Approximately 1/4″ maximum lateral movement measured at the fan tip is allowable. This is not cause for replacement.

3. SILICONE FLUID LEAK

The operation of the unit is generally not affected by small fluid leaks which may occur in the area around the bearing assembly. However, if the degree of leakage appears excessive, proceed to item 4.

4. ENGINE OVERHEATING

a. Start with a cool engine to insure complete fan clutch disengagement.

b. If the fan and clutch assembly free-wheels with no drag (revolves over 5 times when spun by hand), the clutch should be replaced. If clutch performs properly with a slight drag go to Step C.

Testing a fan clutch by holding the small hub with one hand and rotating the aluminum housing in a clockwise/counterclockwise motion will cause the clutch to free-wheel, which is a normal condition when operated in this manner. This should not be considered a test by which replacement is determined.

c. Position thermometer so that it is located between the fan blades and radiator. This can be achieved by inserting the sensor through one of the existing holes in the fan shroud or fan guard, or by placing between the radiator and the shroud. On some models, it may be necessary to drill a 3/16″ hole in the fan shroud to insert thermometer.

— NOTE —

Check for adequate clearance between fan blades and thermometer sensor before starting engine, to prevent damage to thermometer, fan or radiator.

d. with thermometer in position, cover radiator grille sufficiently to induce a high engine temperature. Start engine and turn on A/C if equipped, operate at 2,000 rpm.

e. Observe thermometer reading when clutch engages. It will take approximately 5 to 10 minutes for the temperature to become high enough to allow engagement of the fan clutch. This will be indicated by an increase or roar in fan air noise and by a drop in the thermometer reading of approximately 5-15 °F (3-9 °C). If the clutch did not engage between 150-195 °F (66-91 °C) the unit should be replaced. Be sure fan clutch was disengaged at beginning of test.

   If no sharp increase in fan noise or temperature drop was observed and the fan noise level was constantly high from start of test to 190 °F (88 °C), the unit should be replaced.

f. As soon as the clutch engages, remove the radiator grille cover and turn off the A/C to assist in engine cooling. The engine should be run at approximately 1500 rpm.

g. After several minutes the fan clutch should disengage, as indicated by a reduction in fan speed and roar.

   If the fan clutch fails to function as described, it should be replaced.

— CAUTION —

If a fan blade is bent or damaged in any way, no attempt should be made to repair and reuse the damaged part. A bent or damaged fan assembly should always be replaced with a new assembly.

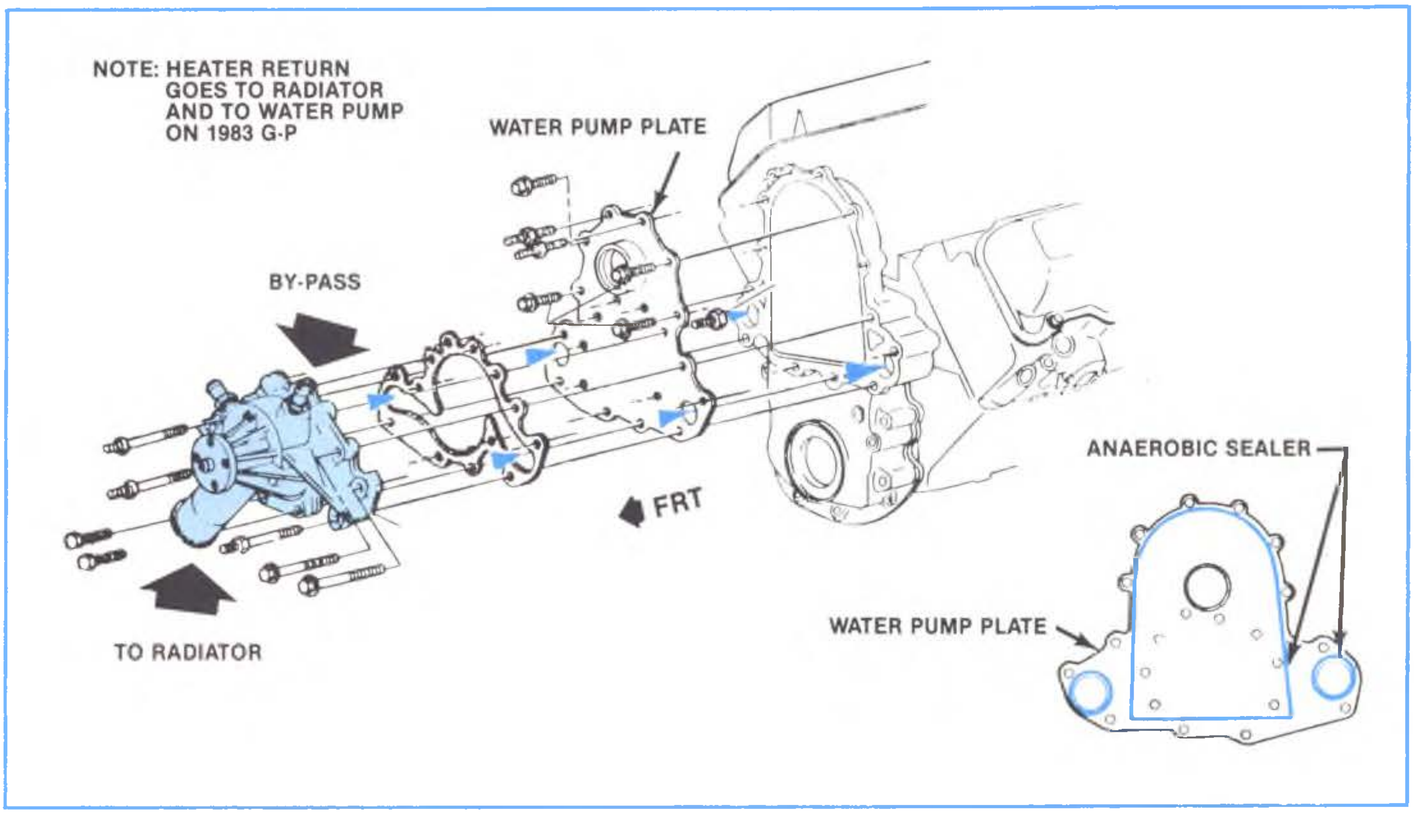


Figure 2-50, Water Pump.

Water Pump

The water pump (Figure 2-50) is mounted at the front end of the engine between the block and the radiator. The pump consists of a housing, with a water inlet and water outlet. Internally there is an impeller which rotates, forcing the coolant through the pump. The inlet of the pump is connected by a hose to the bottom of the radiator and coolant from the radiator is drawn thru the pump. The impeller shaft is supported on bearings and a ceramic type seal prevents coolant from leaking out around the bearing. The pump is driven by a belt on the drive pulley mounted on the front end of the end of the engine crankshaft.

The water pump discharge (flow) rate is 70 G.P.M. and the average coolant capacity is 6.2 gallons with 3.2 gallons in the engine.

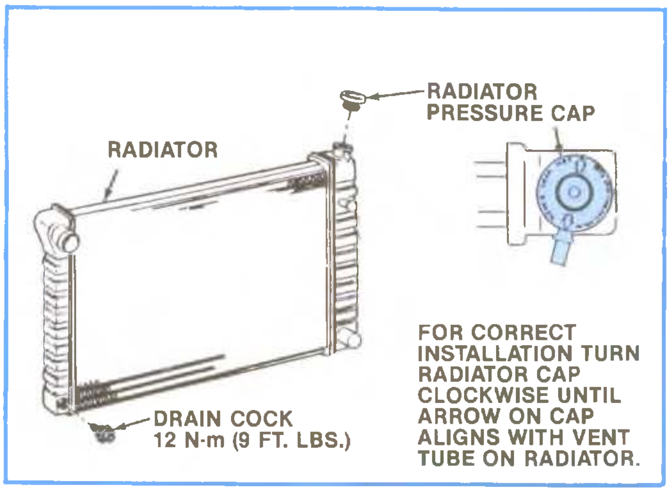


Figure 2-51.

Radiator

See Figure 2-51. The radiator holds a large volume of coolant in close contact with flowing air. This allows the radiator to transfer heat from the coolant to outside air. Many cooling systems today have a separate expansion tank outside the radiator. The expansion tank is partly filled with coolant and is connected to the radiator cap. The coolant expands in the engine as it heats up. This sends part of the coolant into the expansion tank. Then when the engine reaches operating temperature a valve in the radiator cap closes which seals the coolant system. The pressure in the cooling system increases and thus prevents boiling. This increased pressure allows a higher coolant temperature and thus a more efficient cooling system.

RADIATOR CAP

A pressure-vent cap is used on the cross-flow radiator to allow a buildup of 103 kPa (15 psi) in the cooling system. This pressure raises the boiling point of coolant to approximately 125°C (262°F) at sea level.

DO NOT REMOVE RADIATOR CAP TO CHECK ENGINE COOLANT LEVEL; CHECK COOLANT VISUALLY AT THE SEE-THROUGH COOLANT RESERVOIR. COOLANT SHOULD BE ADDED ONLY TO THE RESERVOIR.

The pressure-type radiator filler cap contains a blow off or pressure valve (Figure 2-52) and a vacuum or atmospheric valve (Figure 2-53).

The pressure valve is held against its seat by a spring of pre-determined strength which protects the radiator by relieving the pressure if an extreme case of internal pressure should exceed that for which the cooling system is designed.

A vacuum valve is used which permits opening of the valve to relieve vacuum created in the system when it cools off and which otherwise might cause the radiator to collapse. It also permits transfer of coolant from the reservoir.

The design of the radiator cap is to discourage inadvertent removal. The finger grips have been removed so the cap is round in shape. It must be pushed downward before it can be removed. A rubber asbestos gasket is added to the diaphragm spring at the top of the cap. Also, embossed on the cap is a caution against its being opened, and arrows indicating the proper closed position.

TEMPERATURE SWITCH

A temperature switch (Figure 2-54) activates a warning lamp in the instrument cluster should excessive coolant temperatures prevail in the engine. With optional instrumentation, a temperature gage replaces the warning lamp and the temperature switch is replaced with a transducer.

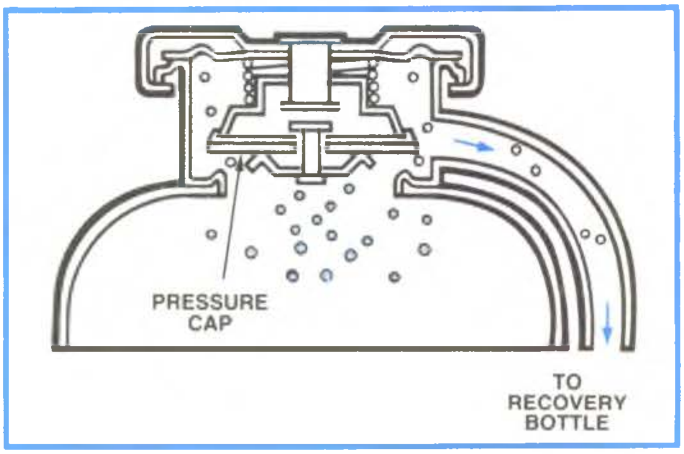


Figure 2-52, **Radiator Cap With Pressure Valve Open.**

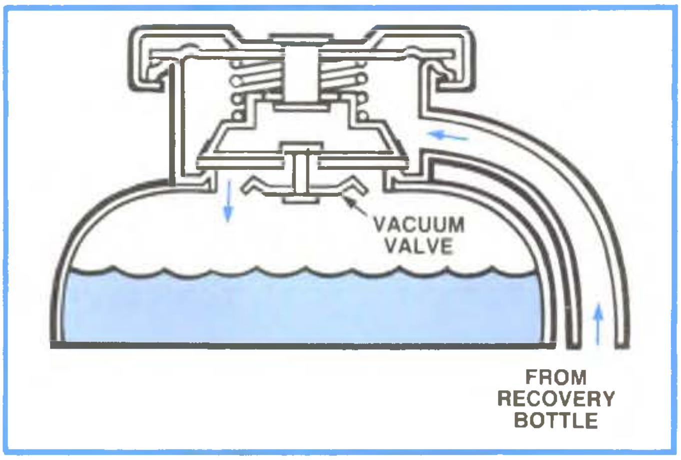


Figure 2-53, **Radiator Cap With Vacuum Valve Open.**

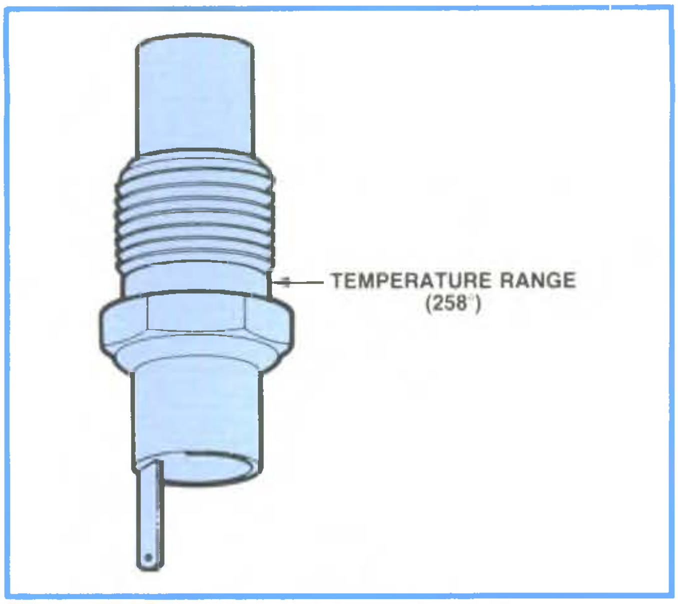


Figure 2-54, **Temperature Switch.**

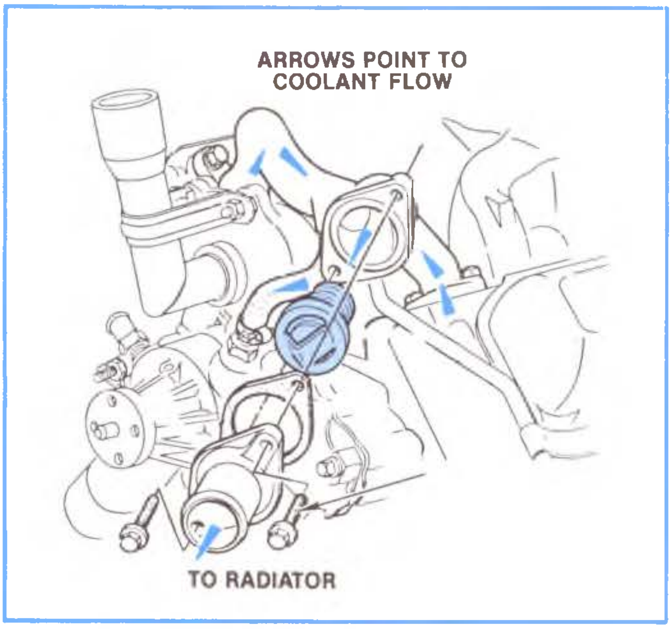


Figure 2-55, Thermostat.

THERMOSTAT

The thermostat Figure 2-55 is placed in the coolant passage between the cylinder head and the top of the radiator. Its purpose is to close off this passage when the engine is cold so that coolant circulation is restricted. This allows the engine to reach normal operating temperature more rapidly. The thermostat is designed to open at a specific temperature (180 °F). When the engine is cold and the thermostat is closed and coolant recirculates thru the cylinder head and case. When the thermostat opens, the coolant circulates through the radiator.

1982 - Early 1983 Engines 180°

1983 and Later 190°

THERMOSTAT RANGE CHART		
190 °F Stat.	Temperature Range 187 °F to 194 °F	Fully Open @212 °F
180 °F Stat.	Temperature Range 175 °F to 182 °F	Fully Open @202 °F

THERMOSTAT OPERATION

A pellet-type thermostat (Figure 2-56) is used in the coolant outlet passage to control the flow of engine coolant, to provide fast engine warm-up and to regulate coolant temperatures. A wax pellet element in the thermostat expands when heated and contracts when cooled. The pellet is connected through a piston to a valve. When the pellet is heated, pressure is exerted against a rubber diaphragm which forces the valve to open. As the pellet is cooled, the contraction allows a spring to close the valve. Thus, the valve remains closed while the coolant is cold, preventing circulation of coolant through the radiator. At this point, coolant is allowed to circulate only throughout the engine to warm it quickly and evenly.

As the engine warms, the pellet expands and the thermostat valve opens, permitting coolant to flow through the radiator where heat is passed through the radiator walls. This opening and closing of the thermostat permits enough coolant to enter the radiator to keep the engine within operating limits.

See Figure 2-57 for thermostat diagnosis and Figure 2-61 for general cooling system diagnosis.

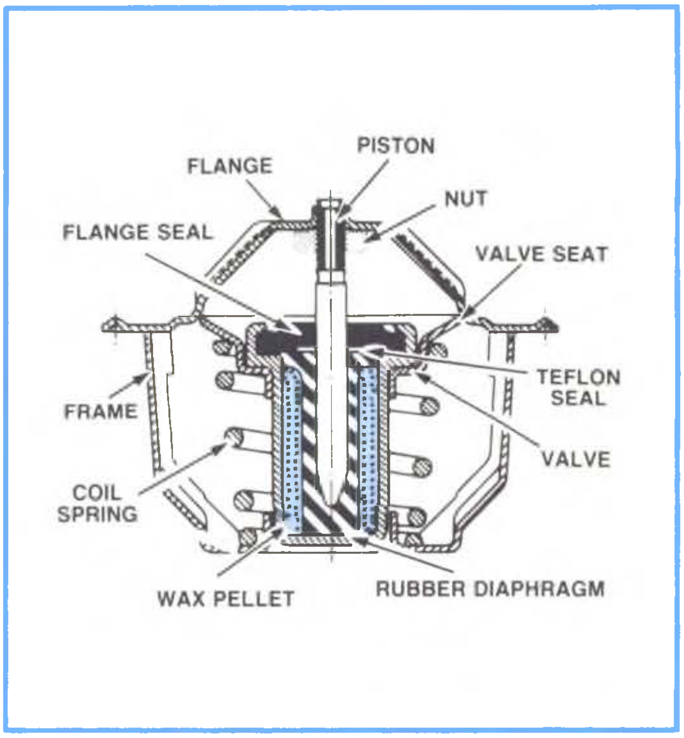


Figure 2-56, **Thermostat Construction.**

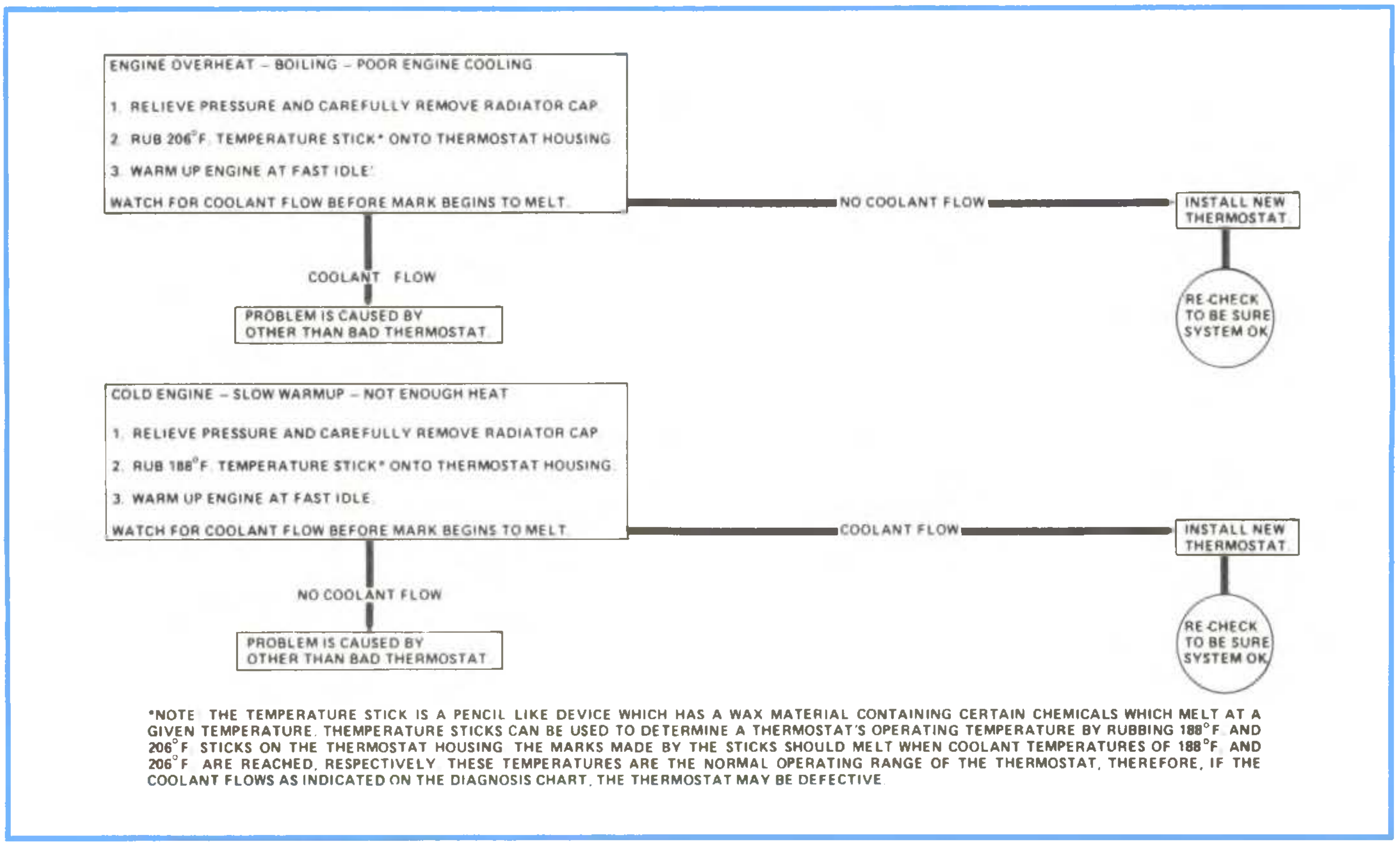


Figure 2-57, **Thermostat Diagnosis.**

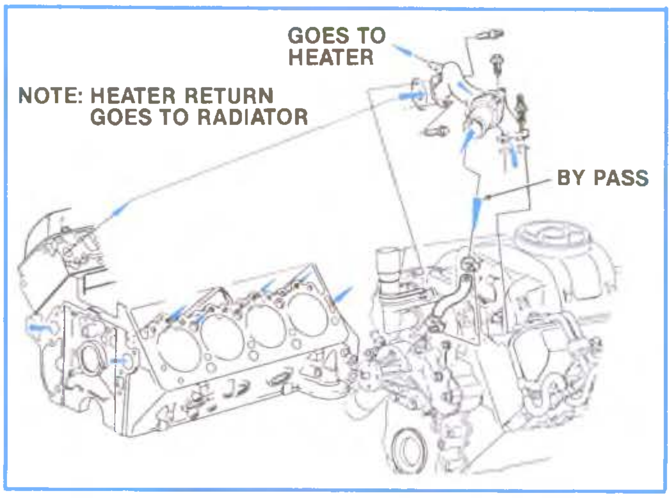


Figure 2-58, **Cooling System Flow.**

Cooling System Schematic

- **COOLANT FLOW**

A. Coolant is drawn from the radiator by the water pump.

B. The pump pushes the coolant into both sides of the block.

C. Coolant flows around the cylinders and up into:

D. The heads where it circulates around the exhaust passages and fire deck areas of the head and flows out the front into:

E. The thermostat housing which stops the main flow when the temperature is below about 180°F directing a small portion (bypass) back to the pump. When the thermostat is open the coolant flows to the top tank of the radiator to be cooled.

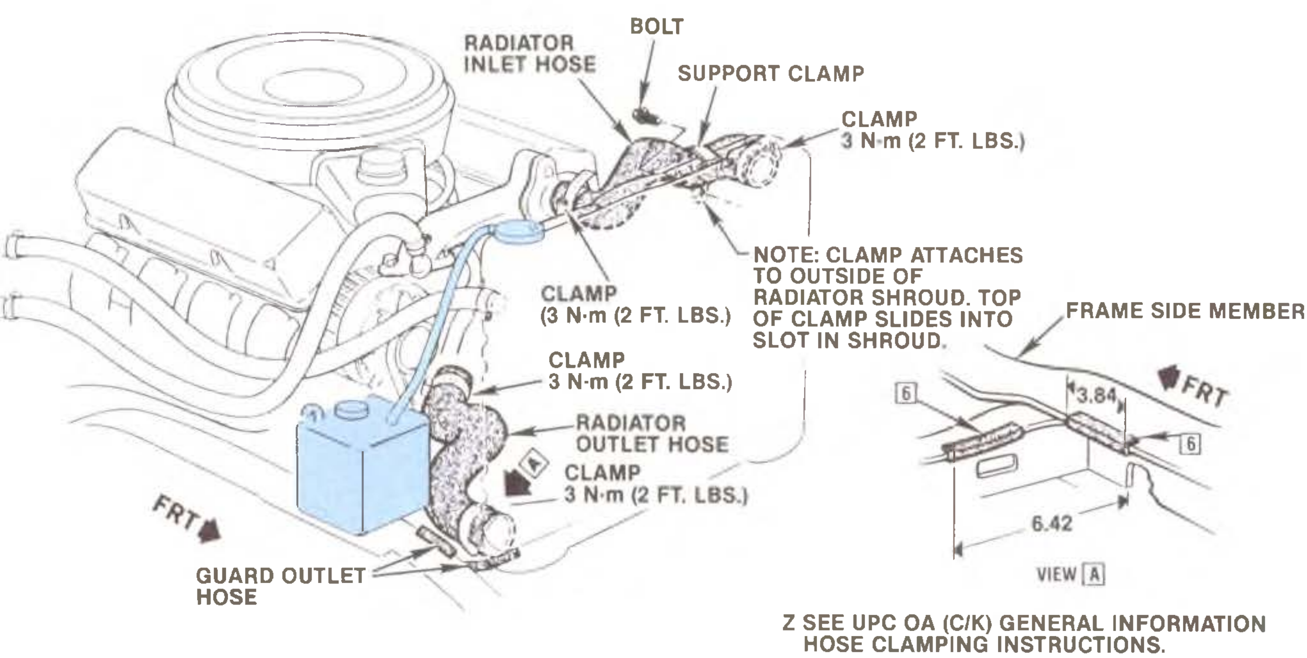


Figure 2-59, **Pressure Coolant Recovery Tank (Bottle).**

1985 Cooling System

- The 1985 6.2L cooling system has a pressurized coolant recovery tank.

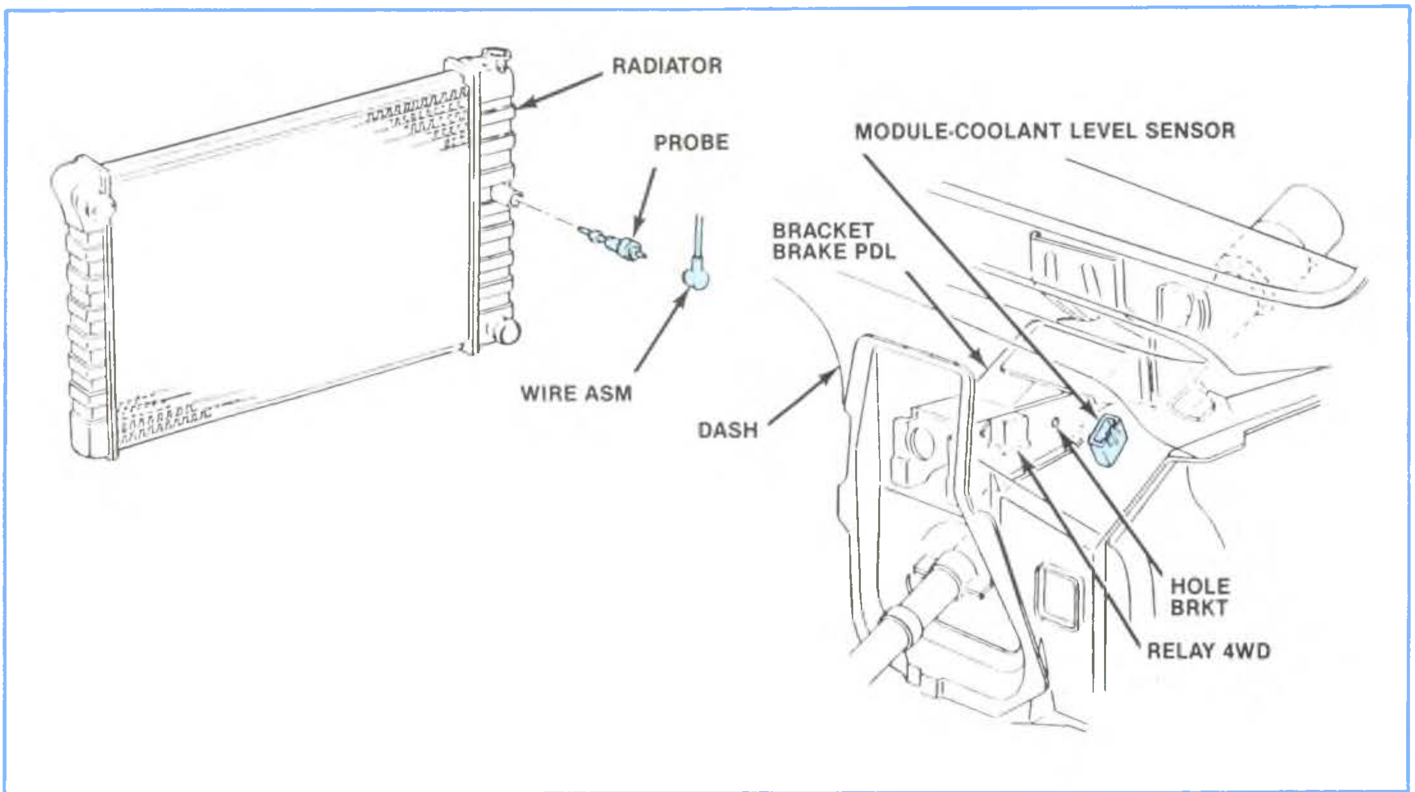


Figure 2-60.

LOW COOLANT INDICATOR

A low coolant indicator system is used in 6.2L applications. See Figure 2-60. This system consists of a:

- Module
- Probe
- Low coolant dash light
- Related wiring

There is an electronic module located in the cab. It will turn on a light in the I.P. when the coolant drops below a specified level. The probe which signals low coolant level is located in the right side of the radiator. The module is located on the upper left side of the pedal bracket.

Low Coolant Lamp Inoperative

NO TEST AT KEY ON OR DOES NOT INDICATE LOW COOLANT

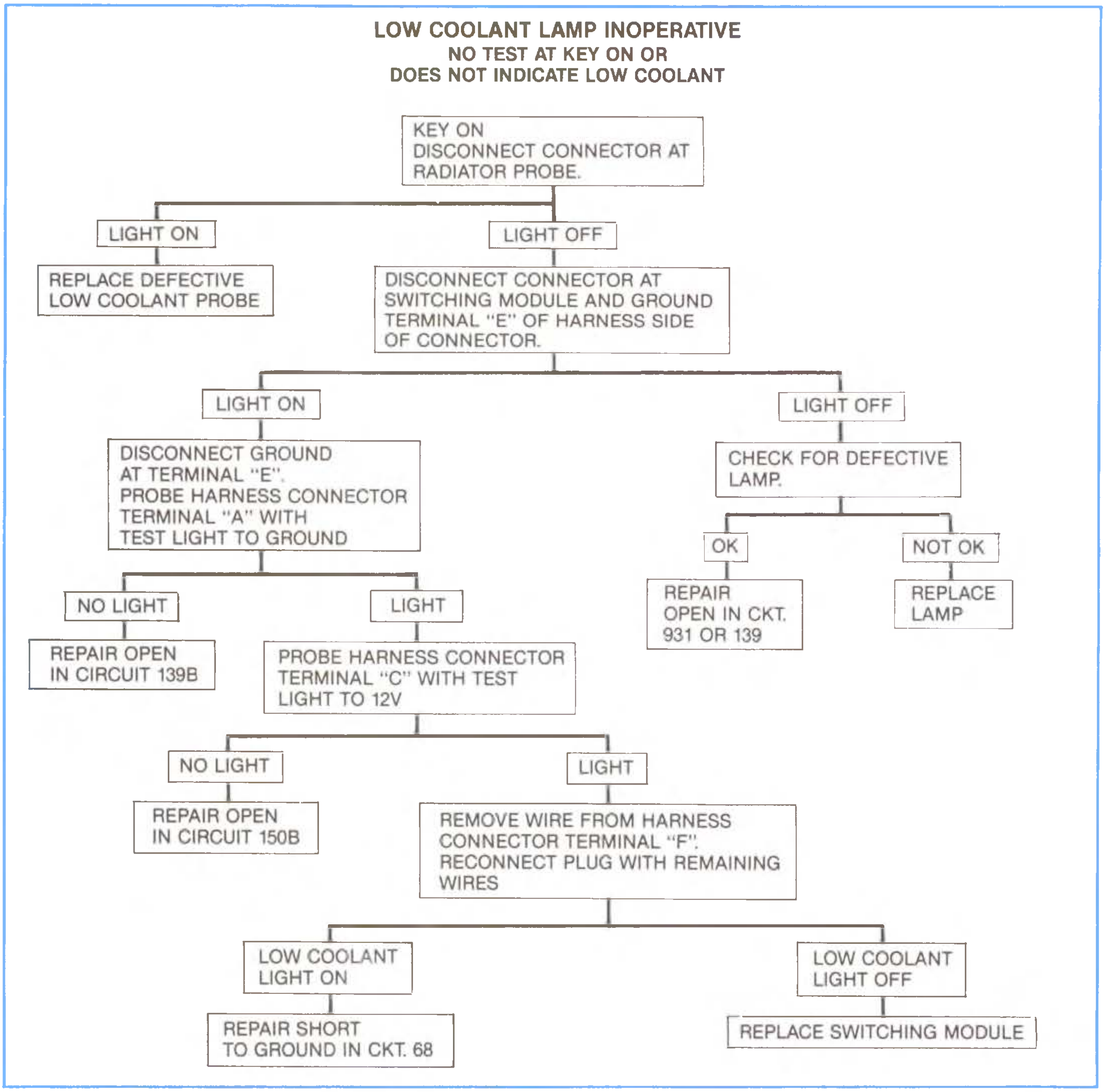


Figure 2-61, Low Coolant Lamp Inoperative.

Low Coolant Lamp "On" All the Time

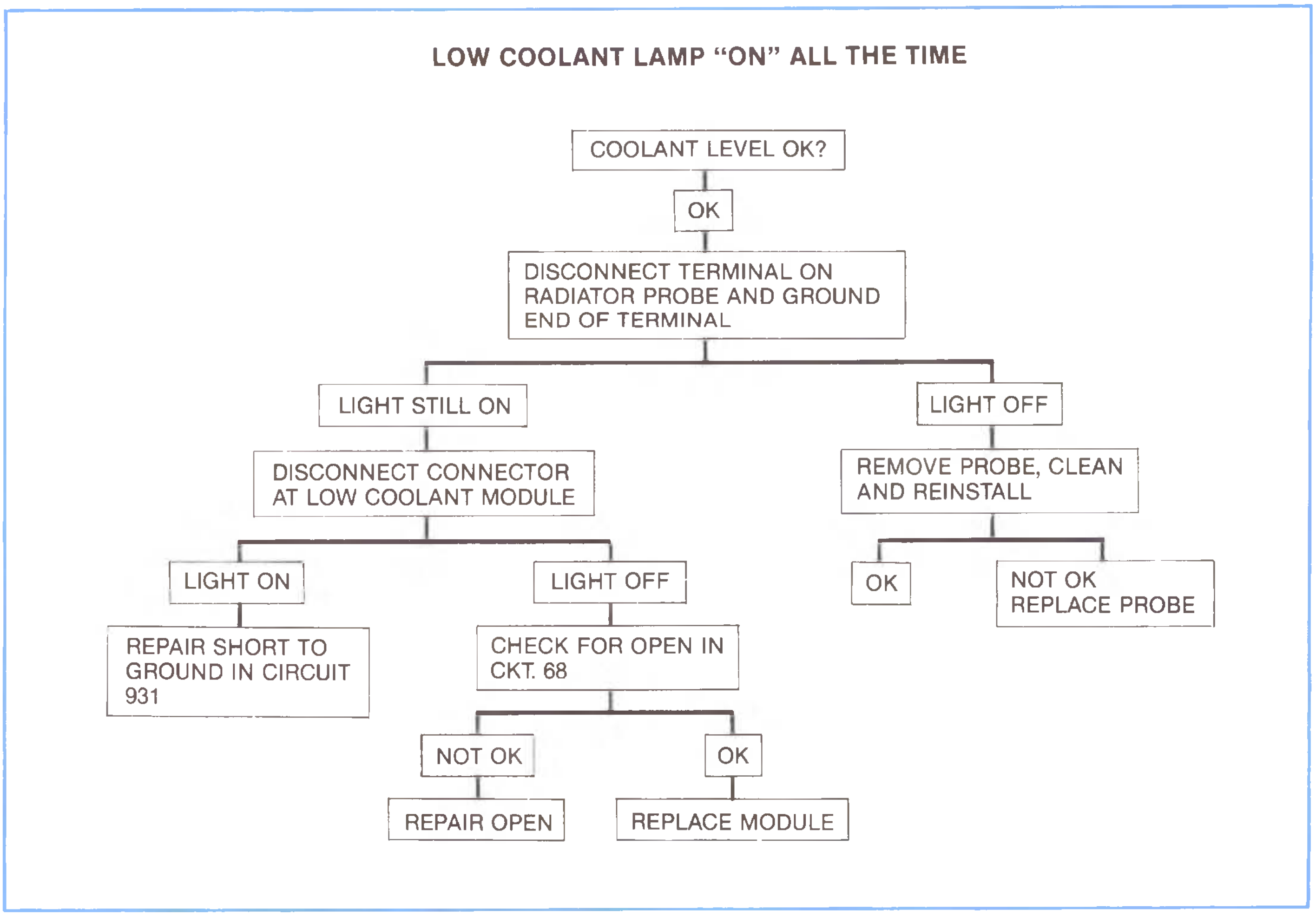


Figure 2-62, **Low Coolant Lamp Remains "On".**

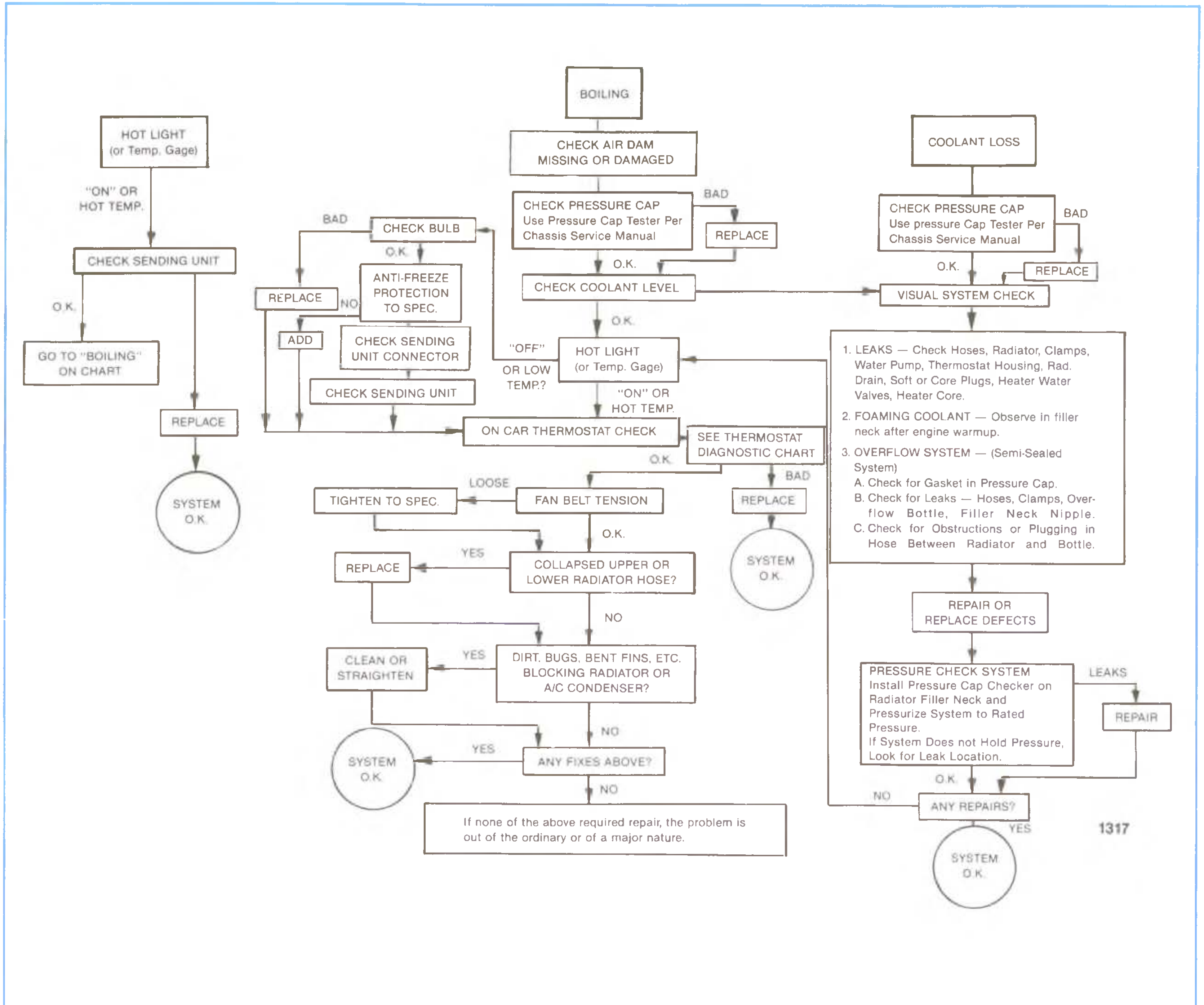


Figure 2-63, Cooling System Diagnosis Chart.

Base Engine Troubleshooting

COMPRESSION TEST — DIESEL ENGINES

To determine if the valves or rings are the cause of low compression, a test should be made to determine the cylinder compression pressure.

When checking compression, the cranking speed must be at least 180 RPM and the engine fully warmed-up (Engine Oil Hot). The lowest reading should not be less than 80% of the highest and no cylinder reading should be less than 2622 KPA (380 PSI)

1. Remove air cleaner then install intake manifold cover J29664-1.
2. Disconnect the wire from the fuel solenoid terminal of the injection pump.
3. Disconnect wires from glow plugs then remove all glow plugs.
4. Screw the compression gage J-26999-10 into the glow plug hole of the cylinder that is being checked.
5. Crank engine.

   Allow six "puffs" per cylinder.

   NORMAL — Compression builds up quickly and evenly to specified compression on each cylinder.
   LEAKING — Compression low on first stroke tends to build up on following strokes but does not reach normal.

— NOTE —

Do not add oil to any cylinder during a compression test as extensive engine damage can result.

— NOTE —

6.2L V-8 Diesel compression should be in the 380-400 PSI Range.

DIESEL ENGINE NOISE

A noise is possible in diesel engines that is throttle conscious. It is most noticeable when the engine is warm. The cause of the noise may be a worn wrist pin pushing in the connecting rod.

DIESEL ENGINE WITH STUCK PISTON RINGS

If you encounter a diesel engine that exhibits excessive oil consumption, low compression or excessive blowby and you suspect stuck piston rings as the cause, the following procedure may be an effective correction:

1. Remove the glow plugs from all 8 cylinders.
2. Equally divide the contents of one can of top engine cleaner, part number 1050002, into each cylinder. (Allow the engine to soak for 24 hours).
3. Crank the engine with the glow plugs removed to expell the top engine cleaner.
4. Reinstall the glow plugs and start the engine.

DIESEL ENGINE HOT HARD START

Diesel engines may exhibit hard starting characteristics when they are shut down for some period of time after being fully warmed up. The cause is almost always lack of fuel or lack of heat to ignite the fuel.

The first step is to determine if it is a heat related condition or a fuel related condition. Normally this can be determined by looking at the exhaust when the engine is being cranked.

Large quantities of white or light blue smoke coming out the exhaust is fuel vapor that did not ignite. If you see lots of fuel vapor, the condition is most likely insufficient heat. If there is little or no white or black smoke, there is insufficient fuel.

The Service Manuals contain information regarding the diagnosis of diesel engines that are hard to start. Review the appropriate manual for diagnosis information. The following are items that are the most often overlooked. This listing is by no means a comprehensive list of all items that affect starting.

• INSUFFICIENT HEAT

The following items affect the heat and must be correct. Refer to the Service Manual for procedures:

1. Cranking speed is extremely critical for a diesel to start, either hot or cold. Some tachometers may not be accurate at cranking speeds. A way to determine cranking speed and check tachometer accuracy is to perform the following procedures:
   a. Install J-26999-10 compression gage into any cylinder.
   b. Disconnect the injection pump fuel shut off solenoid lead at the injection pump or harness connector.
   c. Install a tachometer.
   d. Depress the pressure release valve on the compression gage.
   e. With the aid of an assistant, crank the engine for two or three (2 or 3) seconds to get the starter up to speed, then without stopping, count the number of "puffs" at the compression gage that occur in the next 10 seconds. Multiply the number of "puffs" in the 10 second period by 12 and that will be the cranking RPM (speed).

   Example — 10 seconds = 1/6 of a minute
   1 "puff" = 2 RPM
   RPM = (x) "puffs" × 2 × 6 or
   RPM = (x) "puffs" × 12

   Tests conducted show that diesel engines start hot at around 180 RPM which is below the 240 specified in the Service Manual.
2. Dynamic Timing — If time is retarded beyond specifications, hard starting may be experienced.
3. Compression — Low compression may be experienced as a result of stuck rings. Stuck rings can be freed up with the use of a top engine cleaner. Refer to "Diesel Engine With Stuck Piston Rings".

• INSUFFICIENT FUEL

1. Cranking speed — If it cranks too slowly, high injection pressures will not be reached.

ENGINE OIL CONDITIONS TROUBLESHOOTING

CONDITION	POSSIBLE CAUSE	CORRECTION
Excessive oil loss.	A. External oil leaks.	1. Tighten bolts and/or replace gaskets and seals as necessary.
	B. Improper reading of dipstick.	1. Check oil with car on a level surface and allow adequate drain down time.
	C. Improper oil viscosity.	1. Use recommended S.A.E. viscosity for prevailing temperatures.
	D. Continuous high speed driving and/or severe usage such as trailer hauling.	1. Continuous high speed operation and/or severe usage will normally cause decreased oil mileage.
	E. Crankcase ventilation.	1. Service as necessary.
	F. Valve guides and/or valve stem seals worn, or seals omitted.	1. Ream guides and install oversize service valves and/or new valve stem seals.
	G. Piston rings not seated, broken or worn.	1. Allow adequate time for rings to seat. 2. Replace broken or worn rings as necessary.
	H. Piston improperly installed or misfitted.	1. Replace piston or repair as necessary.

ENGINE OIL CONDITIONS TROUBLESHOOTING (CONT'D)

CONDITION	POSSIBLE CAUSE	CORRECTION
Low oil pressure.	A. Slow idle speed.	1. Set idle speed to specs.
	B. Incorrect or malfunctioning oil pressure switch.	1. Replace with proper switch.
	C. Incorrect or malfunctioning oil pressure gage.	1. Replace with proper gage.
	D. Improper oil viscosity or diluted oil.	1. Install oil of proper viscosity for expected temperature. 2. Install new oil if diluted with moisture or unburned fuel mixtures.
	E. Oil pump worn or dirty.	1. Clean pump and replace worn parts as necessary.
	F. Plugged oil filter.	1. Replace filter and oil.
	G. Oil pickup screen loose or plugged.	1. Clean or replace screen as necessary.
	H. Hole in oil pickup tube.	1. Replace tube.
	I. Excessive bearing clearance.	1. Replace as necessary.
	J. Cracked, porous or plugged oil galleys.	1. Repair or replace block.
	K. Galley plugs missing or misinstalled.	1. Install plugs or repair as necessary.
	L. Excessive valve lifter to bore clearance caused by wear. Wear is in the upper end of the bore, and towards the center line of the engine.	1. Measure the lifter in 2 spots, where it contacts the bore parallel with the roller and 90° to the roller. 2. Wear in the area of .005-.008" can cause low oil pressure. The lifter should be replaced. 3. Measure the lifter bore in the block. Any wear not exceeding .003" should be satisfactory. If necessary to replace lifters, stone the sharp edges on the bearing shoulder area of the new lifters.

NOISE TROUBLESHOOTING

CONDITION	POSSIBLE CAUSE	CORRECTION
Valve train noise.	A. Low oil pressure.	1. Repair as necessary. (See diagnosis for low oil pressure.)
	B. Loose rocker arm shaft attachments.	1. Inspect and repair as necessary.
	C. Worn rocker arm and/or pushrod.	1. Replace as necessary.
	D. Broken valve spring.	1. Replace spring.
	E. Sticking valves.	1. Free valves.
	F. Lifters worn, dirty or defective.	1. Clean, inspect, test and replace as necessary.
	G. Camshaft worn or poor machining.	1. Replace camshaft
	H. Worn valve guides.	1. Repair as necessary.
Engine knocks on initial start up but only lasts a few seconds.	A. Fuel pump.	1. Replace pump.
	B. Improper oil viscosity.	1. Install proper oil viscosity for expected temperatures.
	C. Hydraulic lifter bleed down.	1. Clean, test and replace as necessary.
	D. Excessive crankshaft end clearance.	1. Replace crankshaft thrust bearing.
	E. Excessive main bearing clearance.	1. Replace worn parts.

NOISE TROUBLESHOOTING (CONT'D)

CONDITION	POSSIBLE CAUSE	CORRECTION
Engine knocks cold and continues for two to three minutes. Knock increases with torque.	A. Flywheel contacting splash shield.	1. Reposition splash shield.
	B. Loose or broken balancer or drive pulleys.	1. Tighten or replace as necessary.
	C. Overfueling.	1. With the engine off to assist in the diagnosis, retard the injection pump timing as far as the slot in the pump flange will allow. This will quiet down a combustion knock. If the knocking is not substantially reduced, the noise is most likely a mechanical problem.
	D. Improper timing.	1. Adjust pump timing.
	E. No fuel.	1. See Section 4, Fuel System.
	F. Air leak.	1. See Section 4, Fuel System.
	G. Excessive piston to bore clearance.	1. Replace piston.
	H. Bent connecting rod.	1. Replace bent connecting rod.

NOISE TROUBLESHOOTING (CONT'D)

CONDITION	POSSIBLE CAUSE	CORRECTION
Engine has heavy knock hot with torque applied.	A. Broken balancer or pulley hub.	1. Replace parts as necessary.
	B. Loose torque converter bolts.	1. Tighten bolts.
	C. Accessory belts too tight or nicked.	1. Replace and/or tension to specs as necessary.
	D. Exhaust system grounded.	1. Reposition as necessary.
	E. Flywheel cracked.	1. Replace flywheel.
	F. Excessive main bearing clearance.	1. Replace as necessary.
	G. Excessive rod bearing clearance.	1. Replace as necessary.
Engine has light knock hot in light load conditions.	A. Air leak.	1. See Section 4.
	B. Improper timing.	1. Check engine timing.
	C. Loose torque converter bolts.	1. Tighten bolts.
	D. Exhaust leak at manifold.	1. Tighten bolts and/or replace gasket.
	E. Excessive rod bearing clearance.	1. Replace bearings as necessary.

NOISE TROUBLESHOOTING (CONT'D)

CONDITION	POSSIBLE CAUSE	CORRECTION
Engine knocks at idle hot.	A. Loose or worn drive belts.	1. Tension and/or replace as necessary.
	B. Compressor or generator bearing.	1. Replace as necessary.
	C. Fuel Pump.	1. Replace pump.
	D. Valve train.	1. Replace parts as necessary.
	E. Improper oil viscosity.	1. Install proper viscosity oil for expected temperature.
	F. Excessive piston pin clearance.	1. Replace as necessary.
	G. Connecting rod alignment.	1. Check and replace rods as necessary.
	H. Insufficient piston to bore clearance.	1. Hone and fit new piston.
	I. Loose crankshaft balancer.	1. Torque any or replace worn parts.

3. Charge Air System

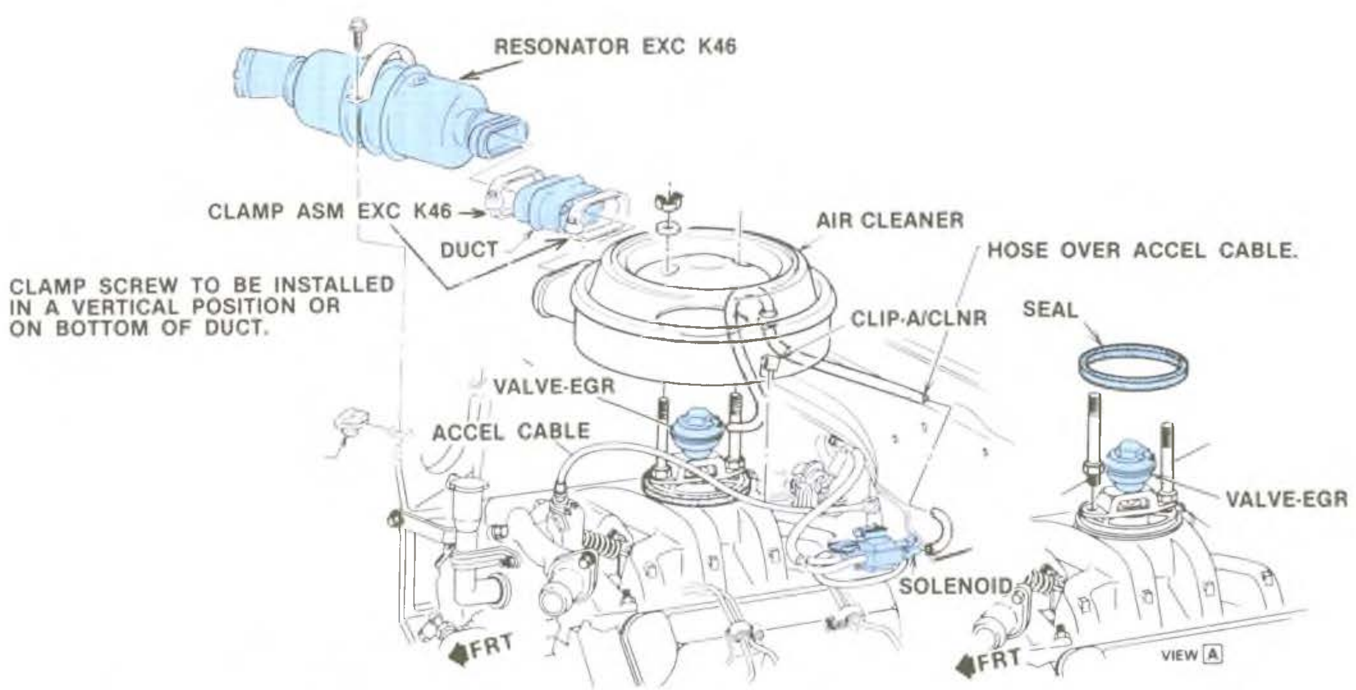


Figure 3-1, LH6 Air Intake System With EGR Valve

Air Flow To Combustion Chamber

Air moves without restriction through the air cleaner and intake manifold (Figure 3-1 and 3-2) to the combustion chamber. The chamber is filled with air, then the air is compressed to a temperature that will ignite the diesel fuel when it is injected.

The intake manifold provides a mount for the air cleaner and EGR valve. Since the intake "bridges" the injection pump, it must be removed when the injection pump requires removal.

The air cleaner assembly has a tuning chamber on the air inlet snorkel, called a resonator. It reduces air intake noise.

Figure 3-3 shows the available option K46 pre-cleaner chamber.

— NOTE —

Whenever the air cleaner assembly is removed, manifold cover J29664-1 should be installed. Manifold covers J29664-2 should be installed when the intake manifold is removed.

Figure 3-4 shows the air cleaner arrangement on the G-Van.

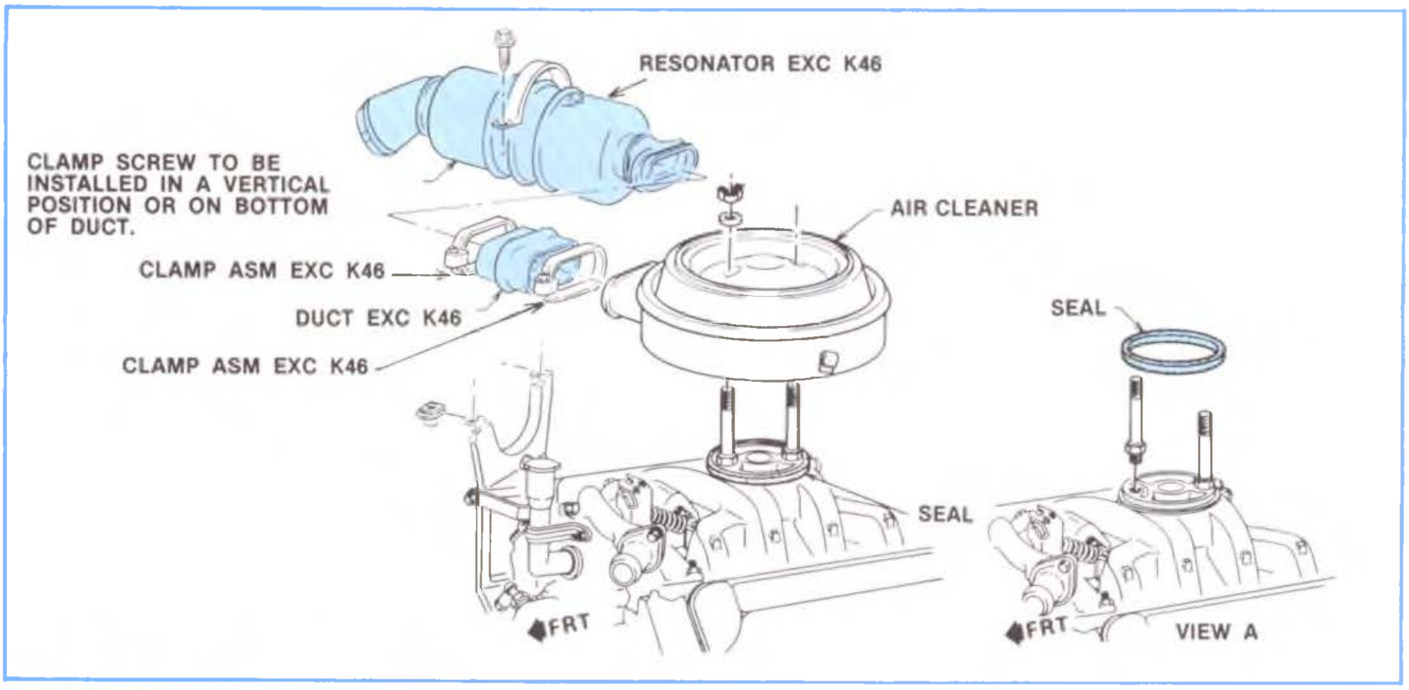


Figure 3-2. LL4 Air Intake System.

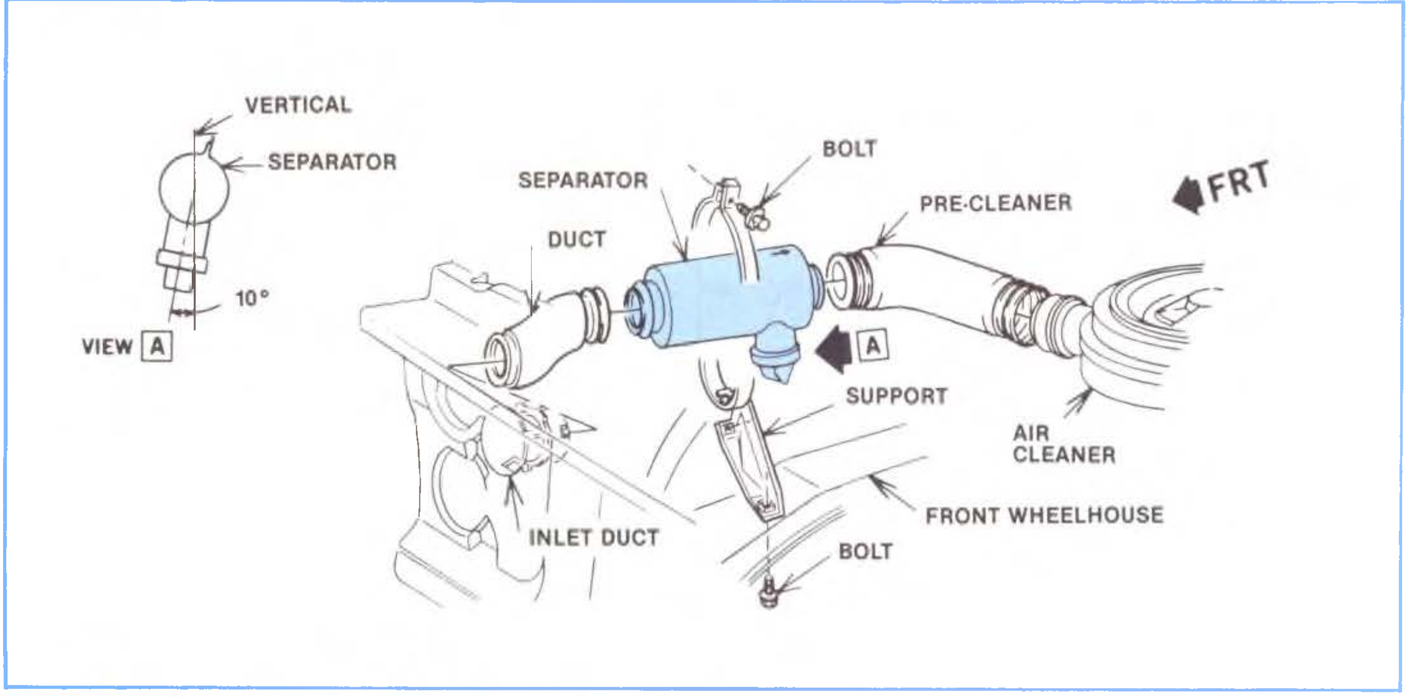


Figure 3-3. RPO K46 Air Pre-Cleaner Chamber.

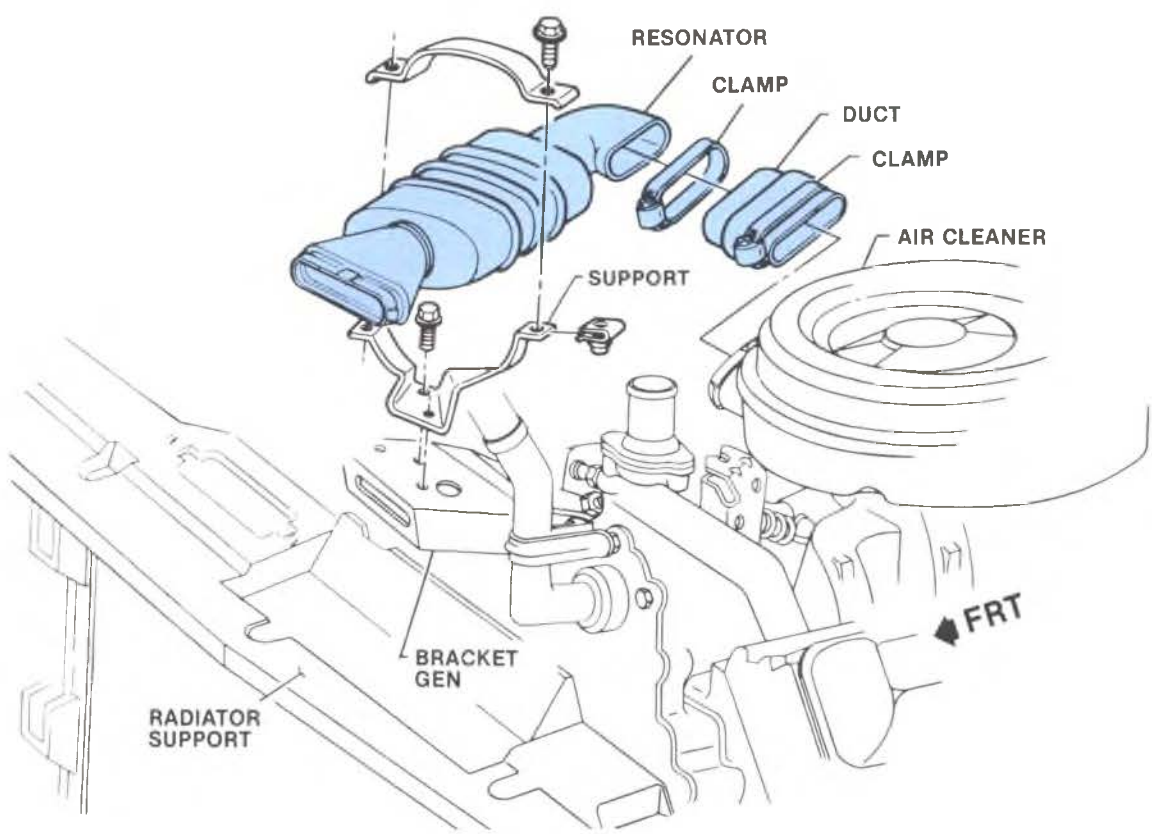


Figure 3-4, G-Van Air Cleaner LH6/LL4.

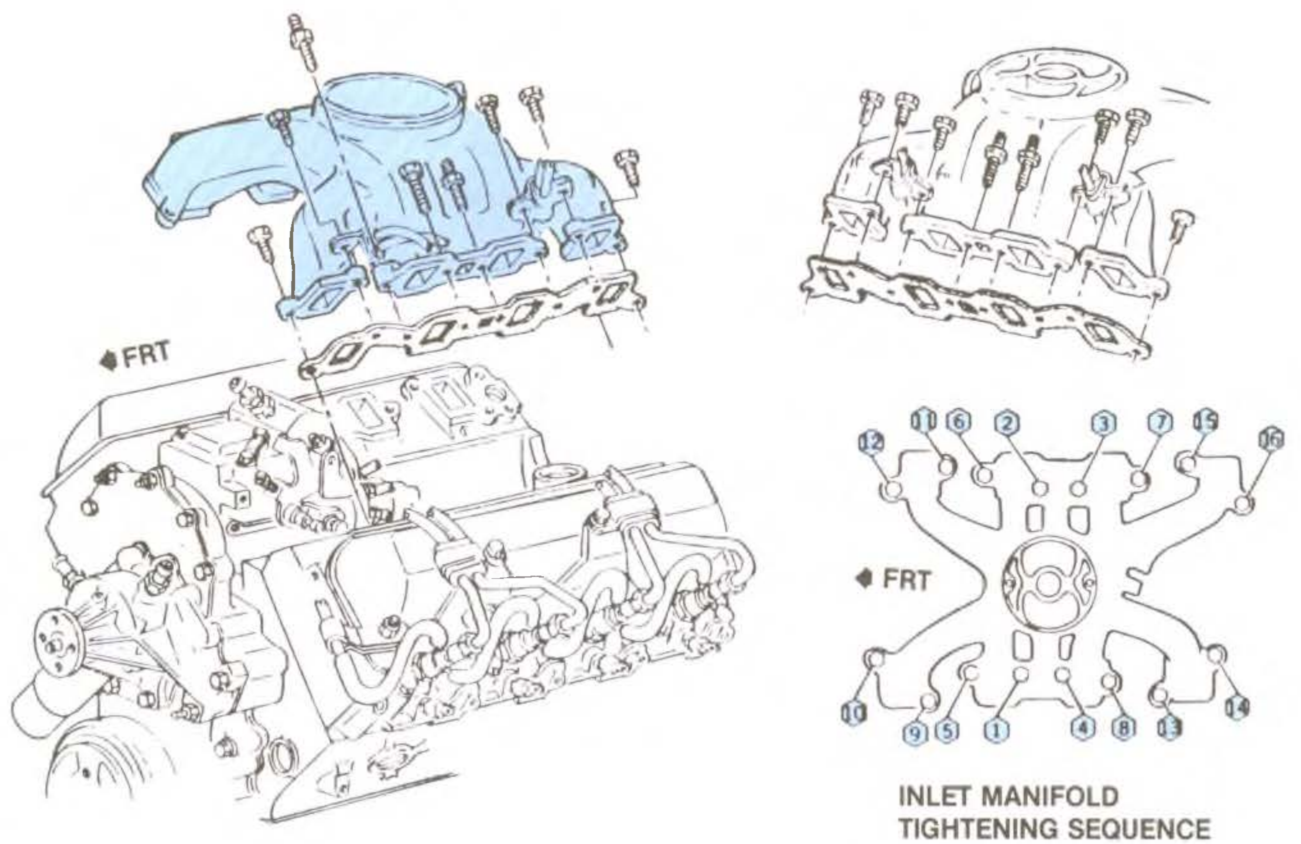


Figure 3-5, **6.2L Intake Manifold.**

INTAKE MANIFOLD

See Figure 3-5. A combination intake manifold and cross over is used. It is a splider air plenum type which allows it to be completely separated from the coolant system. This permits removing the intake manifold without disturbing the coolant system.

The intake manifold is symmetrical, meaning it is proportionally the same, either from the front or the rear, so it is possible to install the intake manifold backwards. The engine would run, however the mounting boss for the secondary fuel filter would be in the wrong location for filter installation. The secondary fuel filter is at the rear of the intake manifold at the cowl.

This manifold is free standing and doesn't see any oil splash or heat from the crankcase. Also it contains no coolant passages. This feature adds 5 to 10 lb. ft. of torque to the performance.

PRE-COMBUSTION CHAMBERS

See Figure 3-6. A design feature is the Ricardo Comet V pre-combustion chamber which has a spherical chamber which mixes the air and fuel by air swirl. This assists in promoting high turbulence. This is an ante-or divided combustion chamber, having the major chamber in the cylinder head and only a small space between the piston and the cylinder head. Close piston clearance produces high turbulence in the ante chamber and promotes rapid combustion. The charge is forced out of the throat area, agitating the entire mixture and resulting in more complete combustion. This design has a broad speed operating range. It also provides low noise and effective emission control. The pre-chamber is installed in the cylinder head flush to +.050mm (.002 in.).

See Figure 3-7. The 1982-1984 LH6 and LL4 pre-chamber was cast from nichol base (nimonic 80 alloy) stainless steel and is nonmagnetic and marked M, N, P. The late 1984 and 1985 LH6 pre-chamber is cast from iron base high carbon alloy and is magnetic and marked W, X, Y on the outer area.

The 1985 LL4 pre-chamber is a reversed throat type, with a different locating notch.

The pre-chamber is pressed into the cylinder head. Orientation is provided by a locating tab on the pre-chamber and a mating slot in the cylinder head. Figure 3-7 provides a detailed view of the pre-chamber.

BROKEN GLOW PLUG TIP

A burned out glow plug tip may bulge then break off and drop into the pre-chamber when the glow plug is removed. When this occurs the nozzle should be removed, and the broken tip removed through the nozzle hole. In some cases, it may be necessary to remove the cylinder head.

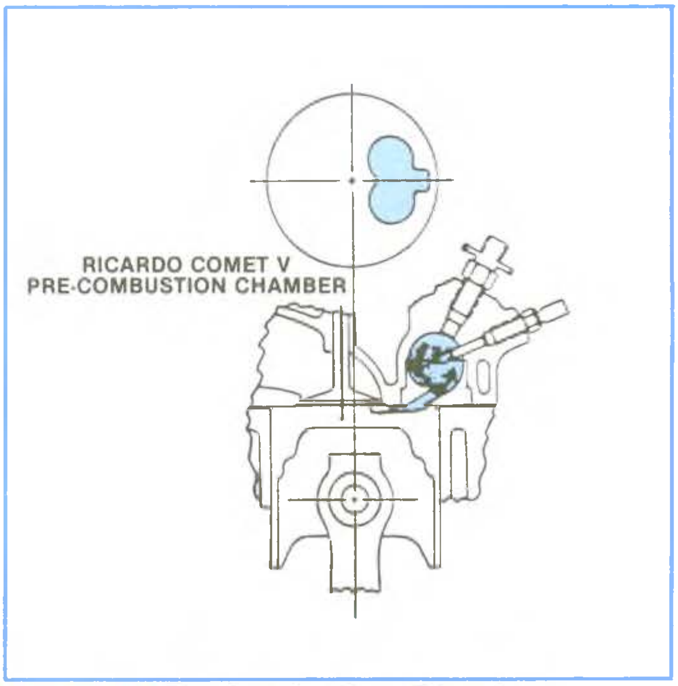


Figure 3-6, **Pre-Combustion Chamber.**

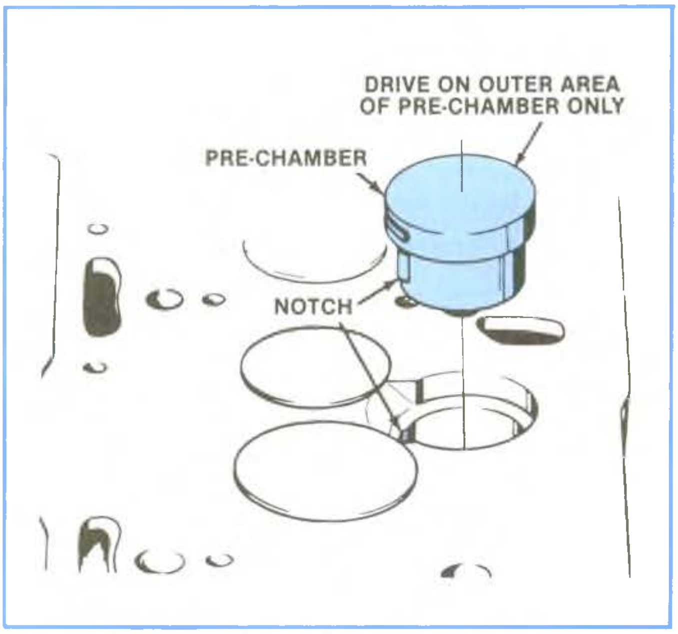


Figure 3-7, **Pre-Chamber Installation in Cylinder Head.**

PRE-CHAMBER CRACKS

During the service of 6.2L diesel cylinder heads, the observance of hairline cracks may be noted in the pre-chamber area.

Cracks on the face of the pre-chamber start at the edge of the fire slot. From the edge, the cracks proceed toward the circular impression of the head gasket bead.

These cracks are a form of stress relief and are completely harmless up to a length of 5mm (3/16″). Cracks longer than this are approaching the head gasket sealing bead and should be replaced with the proper part number.

See Figure 3-8. This illustration of a pre-chamber displays both acceptable and nonacceptable cracks.

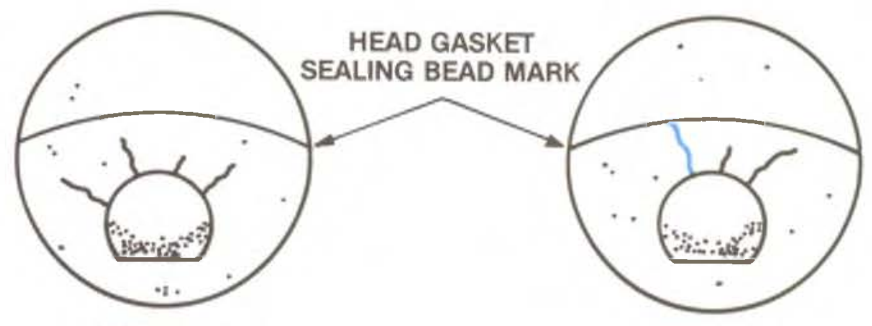


Figure 3-8. Pre-Chamber Cracks.

SERVICE PRE-CHAMBERS

Service pre-chambers are available for the 6.2L diesel engine. If replacement pre-chambers are required, the correct pre-chamber for the specific application should be procured per the following parts information:

Application	Standard	.010 Over-Size O.D.
1982 Light Duty LH6-Vin Code C	14067526	14069540
1982 Heavy Duty LL4-Vin Code J	14067527	14069541
1983-84 All 62L	14067526	14069540
1984-85 LH6-Vin Code C	23500082	
1985 LL4 Vin Code J Reverse Throat	23500250	

— NOTE —

Oversize pre-chambers are stamped "OS".

It should be noted that all 1983 and 1984 6.2L diesel engines, both light duty and heavy duty emission, use a common pre-chamber which is the same part number used in the 1982 light duty application.