

ENGINE - 5.7L SERVICE INFORMATION

TABLE OF CONTENTS

	page		page
ENGINE - 5.7L SERVICE INFORMATION		INSTALLATION	1472
DESCRIPTION	1442	ROCKER ARM	
DIAGNOSIS AND TESTING		REMOVAL	1473
DIAGNOSIS AND TESTING - ENGINE		INSTALLATION	1473
DIAGNOSIS - INTRODUCTION	1443	SEALS-VALVE GUIDE	
DIAGNOSIS AND TESTING - ENGINE		DESCRIPTION	1473
DIAGNOSIS - PERFORMANCE	1443	SPRINGS-VALVE	
DIAGNOSIS AND TESTING - ENGINE		REMOVAL	1474
DIAGNOSIS - MECHANICAL	1445	INSTALLATION	1475
DIAGNOSIS AND TESTING - CYLINDER		ENGINE BLOCK	
COMPRESSION PRESSURE	1446	CLEANING	1475
DIAGNOSIS AND TESTING - CYLINDER		INSPECTION	1476
COMBUSTION PRESSURE LEAKAGE	1446	CAMSHAFT-ENGINE	
DIAGNOSIS AND TESTING - ENGINE		REMOVAL	
DIAGNOSIS - LUBRICATION	1447	REMOVAL - CAMSHAFT CORE	
DIAGNOSIS AND TESTING - ENGINE		HOLE PLUG	1476
DIAGNOSIS - MECHANICAL	1449	REMOVAL - CAMSHAFT	1476
STANDARD PROCEDURE		INSPECTION	1477
STANDARD PROCEDURE - REPAIR		INSTALLATION	
DAMAGED OR WORN THREADS	1451	INSTALLATION - CAMSHAFT CORE HOLE	
STANDARD PROCEDURE - HYDROSTATIC		PLUG	1477
LOCK	1451	INSTALLATION - CAMSHAFT	1477
REMOVAL	1452	CRANKSHAFT	
INSTALLATION	1452	REMOVAL	1478
SPECIFICATIONS		INSTALLATION	1478
5.7L ENGINE	1454	BEARINGS-CRANKSHAFT MAIN	
TORQUE	1460	STANDARD PROCEDURE - CRANKSHAFT	
SPECIAL TOOLS		MAIN BEARING - FITTING	1480
5.7L ENGINE	1462	INSPECTION	1480
AIR INTAKE SYSTEM		SEAL-CRANKSHAFT OIL-FRONT	
REMOVAL	1466	REMOVAL	1481
INSTALLATION	1467	INSTALLATION	1481
CYLINDER HEAD		SEAL-CRANKSHAFT OIL-REAR	
OPERATION—CYLINDER HEAD	1467	DIAGNOSIS AND TESTING - REAR SEAL	
DIAGNOSIS AND TESTING - CYLINDER HEAD		AREA LEAKS	1481
GASKET FAILURE	1467	REMOVAL	1482
REMOVAL	1468	INSTALLATION	1482
CLEANING	1468	RETAINER-CRANKSHAFT REAR OIL SEAL	
INSPECTION	1469	REMOVAL	1482
INSTALLATION	1469	INSTALLATION	1483
COVER(S)-CYLINDER HEAD		PLATE-TORQUE CONVERTER DRIVE	
REMOVAL	1470	REMOVAL	1483
INSTALLATION	1470	INSTALLATION	1483
SEATS-INTAKE/EXHAUST VALVES		TAPPETS-HYDRAULIC ROLLER	
DESCRIPTION		DIAGNOSIS AND TESTING - HYDRAULIC	
DESCRIPTION - VALVE GUIDES	1471	TAPPETS	1483
DESCRIPTION	1471	REMOVAL	1484
STANDARD PROCEDURE - REFACING	1471	INSTALLATION	1484
REMOVAL	1472		

PISTON & CONNECTING ROD

DESCRIPTION	1485
STANDARD PROCEDURE -	
PISTON FITTING	1485
REMOVAL	1486
CLEANING	1487
INSPECTION	1487
INSTALLATION	1487

RINGS-PISTON

STANDARD PROCEDURE - PISTON RING	
FITTING	1488

DAMPER-CRANKSHAFT

REMOVAL	1491
INSTALLATION	1491

COVER-STRUCTURAL

DESCRIPTION	1492
OPERATION	1492
REMOVAL	1492
INSTALLATION	1492

ENGINE MOUNTING-FRONT

REMOVAL	1493
INSTALLATION	1494

ENGINE MOUNTING-REAR

REMOVAL	1496
INSTALLATION	1496

LUBRICATION

DESCRIPTION	1497
DIAGNOSIS AND TESTING	
DIAGNOSIS AND TESTING - CHECKING	
ENGINE OIL PRESSURE	1497
DIAGNOSIS AND TESTING - ENGINE OIL	
LEAK	1498

OIL

STANDARD PROCEDURE - ENGINE OIL	
SERVICE	1499

FILTER-ENGINE OIL

REMOVAL	1500
INSTALLATION	1500

PAN-ENGINE OIL

REMOVAL	1501
INSTALLATION	1502

PUMP-ENGINE OIL

REMOVAL	1502
CLEANING	1502
INSPECTION	1502
INSTALLATION	1504

INTAKE MANIFOLD

DESCRIPTION	1504
DIAGNOSIS AND TESTING - INTAKE	
MANIFOLD LEAKAGE	1504
REMOVAL	1504
CLEANING	1505
INSPECTION	1505
INSTALLATION	1505

EXHAUST MANIFOLD

DESCRIPTION	1505
OPERATION	1505
REMOVAL	1505
CLEANING	1506
INSPECTION	1506
INSTALLATION	1506

COVER-TIMING CASE

REMOVAL	1506
INSTALLATION	1507

TIMING/CHAIN AND SPROCKETS

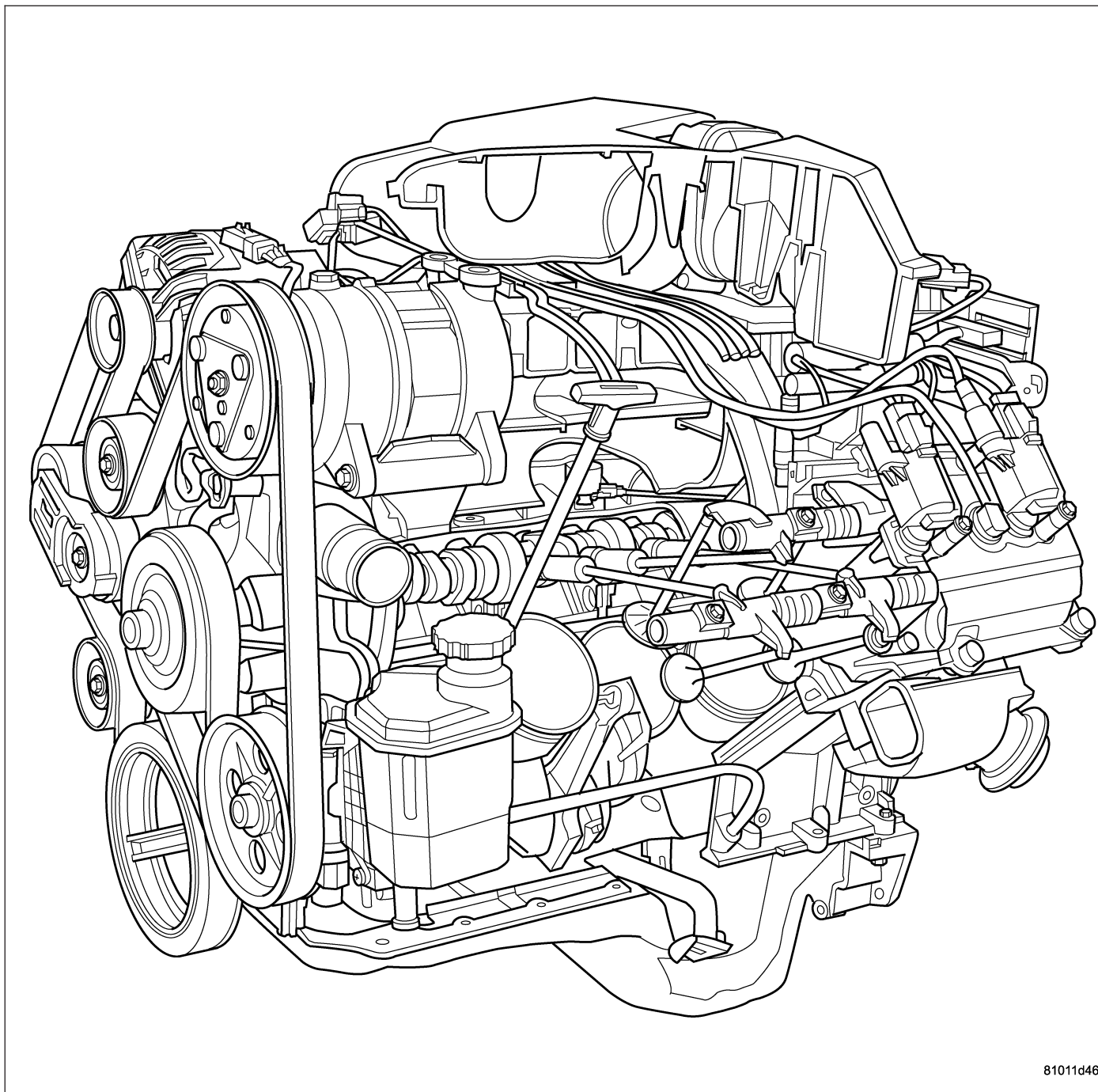
REMOVAL	1508
INSTALLATION	1508

TIMING CHAIN/TENSIONER

DESCRIPTION	1509
OPERATION	1509

ENGINE - 5.7L SERVICE INFORMATION

DESCRIPTION



81011d46

The 5.7L engine (345 CID) eight-cylinder engine is a 90° V-Type lightweight, deep skirt cast iron block, aluminum heads, single cam, overhead valve engine with hydraulic roller tappets. The heads incorporate splayed valves with a hemispherical style combustion chamber and dual spark plugs. The cylinders are numbered from front to rear; 1, 3, 5, 7 on the left bank and 2, 4, 6, 8 on the right bank. The firing order is 1-8-4-3-6-5-7-2.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - ENGINE DIAGNOSIS - INTRODUCTION

Engine diagnosis is helpful in determining the causes of malfunctions not detected and remedied by routine maintenance.

These malfunctions may be classified as either performance (e.g., engine idles rough and stalls) or mechanical (e.g., a strange noise).

(Refer to 9 - ENGINE - DIAGNOSIS AND TESTING) - PERFORMANCE and (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING)—MECHANICAL for possible causes and corrections of malfunctions. (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - DIAGNOSIS AND TESTING) and (Refer to 14 - FUEL SYSTEM/FUEL INJECTION - DIAGNOSIS AND TESTING) for the fuel system diagnosis.

Additional tests and diagnostic procedures may be necessary for specific engine malfunctions that can not be isolated with the Service Diagnosis charts. Information concerning additional tests and diagnosis is provided within the following diagnosis:

- Cylinder Compression Pressure Test (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).
- Cylinder Combustion Pressure Leakage Test (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING).
- Engine Cylinder Head Gasket Failure Diagnosis (Refer to 9 - ENGINE/CYLINDER HEAD - DIAGNOSIS AND TESTING).
- Intake Manifold Leakage Diagnosis (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - DIAGNOSIS AND TESTING).

DIAGNOSIS AND TESTING - ENGINE DIAGNOSIS - PERFORMANCE

CONDITION	POSSIBLE CAUSE	CORRECTION
ENGINE WILL NOT START	1. Weak battery 2. Corroded or loose battery connections. 3. Faulty starter. 4. Faulty coil or control unit. 5. Incorrect spark plug gap. 6. Dirt or water in fuel system. 7. Faulty fuel pump, relay or wiring.	1. Charge or replace as necessary. 2. Clean and tighten battery connections. Apply a coat of light mineral grease to the terminals. 3. (Refer to 8 - ELECTRICAL/STARTING - DIAGNOSIS AND TESTING). 4. (Refer to 8 - ELECTRICAL/IGNITION CONTROL/IGNITION COIL - REMOVAL). 5. (Refer to 8 - ELECTRICAL/IGNITION CONTROL/SPARK PLUG - CLEANING). 6. Clean system and replace fuel filter. 7. Repair or replace as necessary.

CONDITION	POSSIBLE CAUSE	CORRECTION
ENGINE STALLS OR ROUGH IDLE	- Idle speed set to low. - Idle mixture too lean or too rich. - Vacuum leak. - Faulty coil. - Incorrect engine timing.	(Refer to 14 - FUEL SYSTEM/ FUEL INJECTION/IDLE AIR CONTROL MOTOR - REMOVAL). - Refer to Powertrain Diagnosis Information. - Inspect intake manifold and vacuum hoses, repair or replace as necessary. (Refer to 8 - ELECTRICAL/ IGNITION CONTROL/IGNITION COIL - REMOVAL). (Refer to 9 - ENGINE/VALVE TIMING - STANDARD PROCEDURE).
1. ENGINE LOSS OF POWER	- Dirty or incorrectly gapped spark plugs. - Dirt or water in fuel system. - Faulty fuel pump. - Blown cylinder head gasket. - Low compression. - Burned, warped or pitted valves. - Plugged or restricted exhaust system. - Faulty coil.	(Refer to 8 - ELECTRICAL/ IGNITION CONTROL/SPARK PLUG - CLEANING). - Clean system and replace fuel filter. (Refer to 14 - FUEL SYSTEM/ FUEL DELIVERY/FUEL PUMP - DIAGNOSIS AND TESTING). - Replace cylinder head gasket. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING). - Replace as necessary. - Inspect and replace as necessary. (Refer to 8 - ELECTRICAL/ IGNITION CONTROL/IGNITION COIL - REMOVAL).
1. ENGINE MISSES ON ACCELERATION	- Spark plugs dirty or incorrectly gapped. - Dirt in fuel system. - Burned, warped or pitted valves. - Faulty coil.	(Refer to 8 - ELECTRICAL/ IGNITION CONTROL/SPARK PLUG - CLEANING). - Clean fuel system. - Replace as necessary. (Refer to 8 - ELECTRICAL/ IGNITION CONTROL/IGNITION COIL - REMOVAL).
1. ENGINE MISSES AT HIGH SPEED	- Spark plugs dirty or incorrectly gapped. - Faulty coil. - Dirt or water in fuel system.	(Refer to 8 - ELECTRICAL/ IGNITION CONTROL/SPARK PLUG - CLEANING). (Refer to 8 - ELECTRICAL/ IGNITION CONTROL/IGNITION COIL - REMOVAL). - Clean system and replace fuel filter.

DIAGNOSIS AND TESTING - ENGINE DIAGNOSIS - MECHANICAL

CONDITION	POSSIBLE CAUSES	CORRECTIONS
NOISY VALVES	1. High or low oil level in crankcase. 2. Thin or diluted oil. 3. Low oil pressure. 4. Dirt in lash adjusters. 5. Worn rocker arms. 6. Worn lash adjusters 7. Worn valve guides. 8. Excessive runout of valve seats on valve faces.	1. (Refer to LUBRICATION & MAINTENANCE - SPECIFICATIONS) 2. Change oil and filter. 3. Check oil pump, if Ok, check rod and main bearings for excessive wear. 4. Replace as necessary. 5. Replace as necessary. 6. Replace as necessary. 7. (Refer to 9 - ENGINE/CYLINDER HEAD/INTAKE/EXHAUST VALVES & SEATS - STANDARD PROCEDURE) 8. (Refer to 9 - ENGINE/CYLINDER HEAD/INTAKE/EXHAUST VALVES & SEATS - STANDARD PROCEDURE)
CONNECTING ROD NOISE	1. Insufficient oil supply. 2. Low oil pressure. 3. Thin or diluted oil. 4. Excessive bearing clearance. 5. Connecting rod journal out-of-round. 6. Misaligned connecting rods.	1. (Refer to LUBRICATION & MAINTENANCE - SPECIFICATIONS) 2. Check oil pump, if Ok, check rod and main bearings for excessive wear. 3. Change oil and filter. 4. Replace as necessary. 5. Service or replace crankshaft. 6. Replace bent connecting rods.
MAIN BEARING NOISE	1. Insufficient oil supply. 2. Low oil pressure. 3. Thin or diluted oil. 4. Excessive bearing clearance. 5. Excessive end play. 6. Crankshaft journal out-of round. 7. Loose flywheel or torque converter.	1. (Refer to LUBRICATION & MAINTENANCE - SPECIFICATIONS) 2. Check oil pump, if Ok, check rod and main bearings for excessive wear. 3. Change oil and filter. 4. Replace as necessary. 5. Check thrust washers for wear. 6. Service or replace crankshaft. 7. Tighten to correct torque

DIAGNOSIS AND TESTING - CYLINDER COMPRESSION PRESSURE

The results of a cylinder compression pressure test can be utilized to diagnose several engine malfunctions.

Ensure the battery is completely charged and the engine starter motor is in good operating condition. Otherwise the indicated compression pressures may not be valid for diagnosis purposes.

1. Clean the spark plug recesses with compressed air.
2. Remove the spark plugs.
3. Disable the fuel system (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - DESCRIPTION).
4. Remove the ASD relay (Refer to 8 - ELECTRICAL/IGNITION CONTROL/AUTO SHUT DOWN RELAY - REMOVAL).
5. Insert a compression pressure gauge and rotate the engine with the engine starter motor for three revolutions.
6. Record the compression pressure on the 3rd revolution. Continue the test for the remaining cylinders.
7. (Refer to 9 - ENGINE - SPECIFICATIONS) for the correct engine compression pressures.

DIAGNOSIS AND TESTING - CYLINDER COMBUSTION PRESSURE LEAKAGE

The combustion pressure leakage test provides an accurate means for determining engine condition.

Combustion pressure leakage testing will detect:

- Exhaust and intake valve leaks (improper seating).
- Leaks between adjacent cylinders or into water jacket.
- Any causes for combustion/compression pressure loss.

1. Check the coolant level and fill as required. DO NOT install the radiator cap.
2. Start and operate the engine until it attains normal operating temperature, then turn the engine OFF.
3. Remove the spark plugs.
4. Remove the oil filler cap.
5. Remove the air cleaner hose.
6. Calibrate the tester according to the manufacturer's instructions. The shop air source for testing should maintain 483 kPa (70 psi) minimum, 1,379 kPa (200 psi) maximum and 552 kPa (80 psi) recommended.
7. Perform the test procedures on each cylinder according to the tester manufacturer's instructions. Set piston of cylinder to be tested at TDC compression, While testing, listen for pressurized air escaping through the throttle body, tailpipe and oil filler cap opening. Check for bubbles in the radiator coolant.

All gauge pressure indications should be equal, with no more than 25% leakage.

FOR EXAMPLE: At 552 kPa (80 psi) input pressure, a minimum of 414 kPa (60 psi) should be maintained in the cylinder.

Refer to CYLINDER COMBUSTION PRESSURE LEAKAGE DIAGNOSIS CHART .

CYLINDER COMBUSTION PRESSURE LEAKAGE DIAGNOSIS CHART

CONDITION	POSSIBLE CAUSE	CORRECTION
AIR ESCAPES THROUGH THROTTLE BODY	Intake valve bent, burnt, or not seated properly	Inspect valve and valve seat. Reface or replace, as necessary. Inspect valve springs. Replace as necessary.
AIR ESCAPES THROUGH TAILPIPE	Exhaust valve bent, burnt, or not seated properly	Inspect valve and valve seat. Reface or replace, as necessary. Inspect valve springs. Replace as necessary.
AIR ESCAPES THROUGH RADIATOR	Head gasket leaking or cracked cylinder head or block	Remove cylinder head and inspect. Replace defective part
MORE THAN 50% LEAKAGE FROM ADJACENT CYLINDERS	Head gasket leaking or crack in cylinder head or block between adjacent cylinders	Remove cylinder head and inspect. Replace gasket, head, or block as necessary
MORE THAN 25% LEAKAGE AND AIR ESCAPES THROUGH OIL FILLER CAP OPENING ONLY	Stuck or broken piston rings; cracked piston; worn rings and/or cylinder wall	Inspect for broken rings or piston. Measure ring gap and cylinder diameter, taper and out-of-round. Replace defective part as necessary

DIAGNOSIS AND TESTING - ENGINE DIAGNOSIS - LUBRICATION

CONDITION	POSSIBLE CAUSES	CORRECTION
OIL LEAKS	- Gaskets and O-Rings. - Misaligned or damaged. - Loose fasteners, broken or porous metal parts. - Crankshaft rear seal - Crankshaft seal flange. Scratched, nicked or grooved. - Oil pan flange cracked. - Front cover seal, damaged or misaligned. - Scratched or damaged vibration damper hub. - Crankshaft Rear Flange Microporosity	- Replace as necessary. - Tighten fasteners, Repair or replace metal parts. - Replace as necessary. - Polish or replace crankshaft. - Replace oil pan. - Replace seal. - Polish or replace damper. - Replace Crankshaft

CONDITION	POSSIBLE CAUSES	CORRECTION
OIL PRESSURE DROP	1. Low oil level. 2. Faulty oil pressure sending unit. 3. Low oil pressure. 4. Clogged oil filter. 5. Worn oil pump. 6. Thin or diluted oil. 7. Excessive bearing clearance. 8. Oil pump relief valve stuck. 9. Oil pickup tube loose or damaged.	1. Check and correct oil level. 2. Replace sending unit. 3. Check pump and bearing clearance. 4. Replace oil filter. 5. Replace as necessary. 6. Change oil and filter. 7. Replace as necessary. 8. Replace oil pump. 9. Replace as necessary.
OIL PUMPING AT RINGS; SPARK PLUGS FOULING	1. Worn or damaged rings. 2. Carbon in oil ring slots. 3. Incorrect ring size installed. 4. Worn valve guides. 5. Leaking intake gasket. 6. Leaking valve guide seals.	1. Hone cylinder bores and replace rings. 2. Replace rings. 3. Replace rings. 4. Ream guides and replace valves. 5. Replace intake gaskets. 6. Replace valve guide seals.

DIAGNOSIS AND TESTING - ENGINE DIAGNOSIS - MECHANICAL**ENGINE MECHANICAL DIAGNOSIS CHART**

CONDITION	POSSIBLE CAUSES	CORRECTION
NOISY VALVES/LIFTERS	1. High or low oil level in crankcase 2. Thin or diluted oil 3. Low oil pressure 4. Dirt in tappets/lash adjusters 5. Bent push rod(s) 6. Worn rocker arms 7. Worn tappets/lash adjusters 8. Worn valve guides 9. Excessive runout of valve seats or valve faces	1. Check for correct oil level. Adjust oil level by draining or adding as needed 2. Change oil. (Refer to 9 - ENGINE/LUBRICATION/OIL - STANDARD PROCEDURE) 3. Check engine oil level. If ok, Perform oil pressure test. (Refer to 9 - ENGINE/LUBRICATION - DIAGNOSIS AND TESTING) for engine oil pressure test/specifications 4. Clean/replace hydraulic tappets/lash adjusters 5. Install new push rods 6. Inspect oil supply to rocker arms and replace worn arms as needed 7. Install new hydraulic tappets/lash adjusters 8. Inspect all valve guides and replace as necessary 9. Grind valves and seats
CONNECTING ROD NOISE	1. Insufficient oil supply 2. Low oil pressure 3. Thin or diluted oil 4. Excessive connecting rod bearing clearance 5. Connecting rod journal out of round 6. Misaligned connecting rods	1. Check engine oil level. 2. Check engine oil level. If ok, Perform oil pressure test. (Refer to 9 - ENGINE/LUBRICATION - DIAGNOSIS AND TESTING) engine oil pressure test/specifications 3. Change oil to correct viscosity. (Refer to 9 - ENGINE/LUBRICATION/OIL - STANDARD PROCEDURE) for correct procedure/engine oil specifications 4. Measure bearings for correct clearance with plasti-gage. Repair as necessary 5. Replace crankshaft or grind journals 6. Replace bent connecting rods

CONDITION	POSSIBLE CAUSES	CORRECTION
MAIN BEARING NOISE	1. Insufficient oil supply 2. Low oil pressure 3. Thin or diluted oil 4. Excessive main bearing clearance 5. Excessive end play 6. Crankshaft main journal out of round or worn 7. Loose flywheel or torque converter	1. Check engine oil level. 2. Check engine oil level. If ok, Perform oil pressure test. (Refer to 9 - ENGINE/LUBRICATION - DIAGNOSIS AND TESTING) 3. Change oil to correct viscosity. 4. Measure bearings for correct clearance. Repair as necessary 5. Check crankshaft thrust bearing for excessive wear on flanges 6. Grind journals or replace crankshaft 7. Inspect crankshaft, flexplate/ flywheel and bolts for damage. Tighten to correct torque
LOW OIL PRESSURE	1. Low oil level 2. Faulty oil pressure sending unit 3. Clogged oil filter 4. Worn oil pump 5. Thin or diluted oil 6. Excessive bearing clearance 7. Oil pump relief valve stuck 8. Oil pickup tube loose, broken, bent or clogged 9. Oil pump cover warped or cracked	1. Check oil level and fill if necessary 2. Install new sending unit 3. Install new oil filter 4. Replace oil pump assembly. 5. Change oil to correct viscosity. 6. Measure bearings for correct clearance 7. Remove valve to inspect, clean and reinstall 8. Inspect oil pickup tube and pump, and clean or replace if necessary 9. Install new oil pump
OIL LEAKS	1. Misaligned or deteriorated gaskets 2. Loose fastener, broken or porous metal part 3. Front or rear crankshaft oil seal leaking 4. Leaking oil gallery plug or cup plug	1. Replace gasket 2. Tighten, repair or replace the part 3. Replace seal 4. Remove and reseal threaded plug. Replace cup style plug

CONDITION	POSSIBLE CAUSES	CORRECTION
EXCESSIVE OIL CONSUMPTION OR SPARK PLUGS OIL FOULED	1. CCV System malfunction 2. Defective valve stem seal(s) 3. Worn or broken piston rings 4. Scuffed pistons/cylinder walls 5. Carbon in oil control ring groove 6. Worn valve guides 7. Piston rings fitted too tightly in grooves	1. (Refer to 25 - EMISSIONS CONTROL/EVAPORATIVE EMISSIONS - DESCRIPTION) for correct operation 2. Repair or replace seal(s) 3. Hone cylinder bores. Install new rings 4. Hone cylinder bores and replace pistons as required 5. Remove rings and de-carbon piston 6. Inspect/replace valve guides as necessary 7. Remove rings and check ring end gap and side clearance. Replace if necessary

STANDARD PROCEDURE

STANDARD PROCEDURE - REPAIR DAMAGED OR WORN THREADS

CAUTION: Be sure that the tapped holes maintain the original center line.

Damaged or worn threads can be repaired. Essentially, this repair consists of:

- Drilling out worn or damaged threads.
- Tapping the hole with a special Heli-Coil Tap, or equivalent.
- Installing an insert into the tapped hole to bring the hole back to its original thread size.

STANDARD PROCEDURE - HYDROSTATIC LOCK

CAUTION: DO NOT use the starter motor to rotate the crankshaft. Severe damage could occur.

When an engine is suspected of hydrostatic lock (regardless of what caused the problem), follow the steps below.

1. Perform the Fuel Pressure Release Procedure (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - STANDARD PROCEDURE).
2. Disconnect the negative cable(s) from the battery.
3. Inspect air cleaner, induction system, and intake manifold to ensure system is dry and clear of foreign material.
4. Place a shop towel around the spark plugs to catch any fluid that may possibly be under pressure in the cylinder head. Remove the spark plugs.
5. With all spark plugs removed, rotate the crankshaft using a breaker bar and socket.
6. Identify the fluid in the cylinders (coolant, fuel, oil, etc.).
7. Be sure all fluid has been removed from the cylinders.
8. Repair engine or components as necessary to prevent this problem from occurring again.
9. Squirt a small amount of engine oil into the cylinders to lubricate the walls. This will prevent damage on restart.
10. Install new spark plugs. Tighten the spark plugs to 41 N·m (30 ft. lbs.) torque.
11. Drain engine oil. Remove and discard the oil filter.
12. Install the drain plug. Tighten the plug to 34 N·m (25 ft. lbs.) torque.
13. Install a new oil filter.

14. Fill engine crankcase with the specified amount and grade of oil. (Refer to LUBRICATION & MAINTENANCE - SPECIFICATIONS).
15. Connect the negative cable(s) to the battery.
16. Start the engine and check for any leaks.

REMOVAL

1. Perform the Fuel System Pressure Release procedure (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - STANDARD PROCEDURE).
2. Disconnect the battery negative cable.
3. Remove the air cleaner resonator and duct work as an assembly.
4. Remove the wiper module (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WIPER MODULE - REMOVAL).
5. Drain cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
6. Remove the accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).
7. Remove the viscous fan/drive (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - REMOVAL).
8. Remove the upper crossmember and top core support.
9. Remove the condenser (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/A/C CONDENSER - REMOVAL).
10. Remove radiator (Refer to 7 - COOLING/ENGINE/RADIATOR - REMOVAL).
11. Evacuate the refrigerant (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE).
12. Remove the A/C compressor with the lines attached. Secure compressor out of the way.
13. Remove generator assembly (Refer to 8 - ELECTRICAL/CHARGING/GENERATOR - REMOVAL).
14. Remove the intake manifold and IAFM as an assembly (Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - REMOVAL).
15. Disconnect the heater hoses.

Note: It is not necessary to disconnect P/S hoses from pump, for P/S pump removal.

16. Remove the power steering pump and set aside.
17. Disconnect the fuel supply line (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/QUICK CONNECT FITTING - STANDARD PROCEDURE).
18. Raise and support the vehicle on a hoist and drain the engine oil.
19. Remove engine front mount thru-bolt nuts.
20. Disconnect the transmission oil cooler lines from their retainers at the oil pan bolts.
21. Disconnect exhaust pipe at manifolds.
22. Disconnect the starter wires. Remove starter motor (Refer to 8 - ELECTRICAL/STARTING/STARTER MOTOR - REMOVAL).
23. Remove the structural dust cover and transmission inspection cover, (Refer to 9 - ENGINE/ENGINE BLOCK/STRUCTURAL COVER - REMOVAL).
24. Remove drive plate to converter bolts (Automatic transmission equipped vehicles).
25. Remove transmission bell housing to engine block bolts.
26. Lower the vehicle.
27. Install engine lift fixture, special tool # 8984.
28. Separate engine from transmission, remove engine from vehicle, and install engine assembly on a repair stand.

INSTALLATION

1. Install engine lift fixture Special tool # 8984.
2. Position the engine in the engine compartment.
3. Lower engine into compartment and align engine with transmission:

- Manual Transmission: Align clutch disc assembly (if disturbed). Install transmission input shaft into clutch disc while mating engine and transmission surfaces. Install two transmission to engine block mounting bolts finger tight.
 - Automatic Transmission: Mate engine and transmission and install two transmission to engine block mounting bolts finger tight.
4. Position the thru-bolt into the support cushion brackets.
 5. Lower engine assembly until engine mount through bolts rest in mount perches.
 6. Install remaining transmission to engine block mounting bolts and tighten.
 7. Tighten engine mount through bolts.
 8. Install drive plate to torque converter bolts. (Automatic transmission models)
 9. Install the structural dust cover and transmission dust cover,(Refer to 9 - ENGINE/ENGINE BLOCK/STRUCTURAL COVER - INSTALLATION).
 10. Install the starter and connect the starter wires (Refer to 8 - ELECTRICAL/STARTING/STARTER MOTOR - INSTALLATION).
 11. Install exhaust pipe to manifold.
 12. Lower the vehicle.
 13. Remove engine lift fixture, special tool # 8984.
 14. Connect the fuel supply line (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/QUICK CONNECT FITTING - STANDARD PROCEDURE).
 15. Reinstall the power steering pump.
 16. Connect the heater hoses.
 17. Install the intake manifold.
 18. Using a new gasket, install throttle body (Refer to 14 - FUEL SYSTEM/FUEL INJECTION/THROTTLE BODY - INSTALLATION).
 19. Install the generator and wire connections (Refer to 8 - ELECTRICAL/CHARGING/GENERATOR - INSTALLATION).
 20. Install a/c compressor and lines (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/A/C COMPRESSOR - INSTALLATION).
 21. Install the accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).
 22. Install radiator (Refer to 7 - COOLING/ENGINE/RADIATOR - INSTALLATION).
 23. Connect the radiator lower hose.
 24. Connect the transmission oil cooler lines to the radiator.
 25. Install the fan shroud.
 26. Install the fan (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - INSTALLATION).
 27. Connect the radiator upper hose.
 28. Install the condenser (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING/A/C CONDENSER - INSTALLATION).
 29. Install upper radiator support crossmember.
 30. Install the washer bottle.
 31. Charge the refrigerant (Refer to 24 - HEATING & AIR CONDITIONING/PLUMBING - STANDARD PROCEDURE).
 32. Install the air cleaner resonator and duct work..
 33. Add engine oil to crankcase (Refer to LUBRICATION & MAINTENANCE/FLUID TYPES - SPECIFICATIONS).
 34. Fill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
 35. Install the wiper module (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WIPER MODULE - INSTALLATION).
 36. Connect battery negative cable.
 37. Start engine and inspect for leaks.
 38. Road test vehicle.

SPECIFICATIONS

5.7L ENGINE

GENERAL DESCRIPTION

DESCRIPTION	SPECIFICATION
Engine Type	90° V-8 OHV
Displacement	5.7 Liters 345 (Cubic Inches)
Bore	99.5 mm (3.91 in.)
Stroke	90.9 mm (3.58 in.)
Compression Ratio	9.6:1
Firing Order	1-8-4-3-6-5-7-2
Lubrication	Pressure Feed - Full Flow Filtration
Cooling System	Liquid Cooled - Forced Circulation
Cylinder Block	Cast Iron
Cylinder Head	Aluminum
Crankshaft	Nodular Iron
Camshaft	Hollow Assembled Camshaft
Pistons	Aluminum Alloy
Connecting Rods	Powdered Metal

CYLINDER BLOCK

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Cylinder Bore Diameter	99.50 mm	3.917 in.
Out of Round (MAX)	0.0076 mm	0003 in.
Taper (MAX)	0.0127 mm	0.0005 in.
Lifter Bore Diameter	21.45 - 21.425 mm	0.8444 - 0.8435 in.

PISTONS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Clearance at Top of Skirt Measured at 45.0 mm (1.77 in.) Below Deck	0.0215 - 0.0485 mm	0.0008 - 0.0019 in.
Land Clearance Diameter		
Groove #1	0.6715 - 0.7105 mm	0.0264 - 0.0279 in.
Groove #2	0.5455 - 0.6245 mm	0.0214 - 0.0245 in.
Weight	413 grams	14.56 oz
Piston Length	54.70 - 55.30	2.153 - 2.177 in.
Ring Groove Width		
No. 1	1.51 - 1.54 mm	0.0594 - 0.0606 in.
No. 2	1.51 - 1.53 mm	0.0594 - 0.0602 in.
No. 3	3.030 - 3.055 mm	0.1192 - 0.1202 in.

PISTON PINS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Clearance In Piston	0.009 - 0.018 mm	0.00035 - 0.0007 in.
Diameter	24.0 - 24.003 mm	0.9448 - 0.9449 in.
Length	70.53 - 71.03 mm	2.78 - 2.80 in.

PISTON RINGS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Ring Gap		
Top Compression Ring	0.23 - 0.38 mm	0.0090 - 0.0149 in.
Second Compression Ring	0.35 - 0.60 mm	0.0137 - 0.0236 in.
Oil Control (Steel Rails)	0.15 - 0.66 mm	0.0059 - 0.0259 in.
Side Clearance		
Top Compression Ring	.02 - .068 mm	0.0007 - 0.0026 in.
Second Compression Ring	0.02 - 0.058 mm	0.0007 - 0.0022 in.
Oil Ring (Steel Ring)	.019 - .229 mm	.0007 - .0091 in.
Ring Width		
Top Compression Ring	1.472 - 1.490 mm	0.0579 - 0.0586 in.
Second Compression Ring	1.472 - 1.490 mm	0.0579 - 0.0586 in.
Oil Ring (Steel Rails)	0.447 - 0.473 mm	0.0175 - 0.0186 in.

CONNECTING RODS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Piston Pin Bore Diameter	23.955 - 23.975 mm	0.9431 - 0.9438 in.
Side Clearance	0.10 - 0.35 mm	0.003 - 0.0137 in.

CRANKSHAFT

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Main Bearing Journal Diameter	64.988 - 65.012 mm	2.5585 - 2.5595 in.
Bearing Clearance	0.023 - 0.051 mm	0.0009 - 0.002 in.
Out of Round (MAX)	0.005 mm	0.0002 in.
Taper (MAX)	0.003 mm	0.0001 in.
End Play	0.052 - 0.282 mm	0.002 - 0.011 in.
End Play (MAX)	0.282 mm	0.011 in.
Connecting Rod Journal Diameter	53.992 - 54.008 mm	2.125 - 2.126 in.
Bearing Clearance	0.020 - 0.060 mm	0.0007 - 0.0023 in.
Out of Round (MAX)	0.005 mm	0.0002 in.
Taper (MAX)	0.003 mm	0.0001 in.

CAMSHAFT

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Bearing Journal Diameter		
No. 1	58.2 mm	2.29 in.
No. 2	57.8 mm	2.27 in.
No. 3	57.4 mm	2.26 in.
No. 4	57.0 mm	2.24 in.
No. 5	43.633 mm	1.72 in.
Bearing To Journal Clearance		
Standard		
No. 1	0.040 - 0.080 mm	.0015 - .003 in.
No. 2	0.050 - 0.090 mm	0.0019 - .0035 in.
No. 3	0.040 - 0.080 mm	.0015 - .003 in.
No. 4	0.050 - 0.090 mm	0.0019 - .0035 in.
No. 5	0.040 - 0.080 mm	.0015 - .003 in.
Camshaft End Play	.080 - 0.290mm	0.0031 - 0.0114 in.

VALVE TIMING

DESCRIPTION	SPECIFICATION
Intake	
Opens (BTDC)	7.0°
Closes (ATDC)	253.0°
Exhaust	
Opens (BTDC)	233°
Closes (ATDC)	27°
Duration	253.70°
Valve Overlap	34°

CYLINDER HEAD

DESCRIPTION	SPECIFICATION
Valve Seat Angle	44.5° - 45.0°
Valve Seat Runout (MAX)	0.05 mm (0.0019 in.)
Valve Seat Width (Finish)	
Intake	1.018 - 1.62 mm (0.0464 - 0.0637 in.)
Exhaust	1.48 - 1.92 mm (0.0582 - 0.0755 in.)
Guide Bore Diameter (Std.)	7.975 - 8.00 mm (0.313 - 0.314 in.)

HYDRAULIC TAPPETS

DESCRIPTION	SPECIFICATION	
	Metric	Standard
Body Diameter	21.387 - 21.405 mm	0.8420 - 0.8427 in.
Clearance (To Bore)	0.020 - 0.063 mm	0.0007 - 0.0024 in.
Dry Lash	3.0 mm (at the valve)	0.1181 in.

VALVES

DESCRIPTION		SPECIFICATION
Face Angle		45.0° - 45.5°
Head Diameter	Intake	50.67 - 50.93 mm (1.99 - 2.00 in.)
	Exhaust	39.27 - 39.53 mm (1.54 - 1.55 in.)
Length (Overall)	Intake	123.38 - 123.76 mm (4.857 - 4.872 in.)
	Exhaust	120.475 - 120.855 mm (4.743 - 4.758 in.)
Stem Diameter	Intake	7.935 - 7.953 mm (0.312 - 0.313 in.)
	Exhaust	7.905 - 7.925 mm (0.311 - 0.312 in.)
Stem - to - Guide Clearance	Intake	0.022 - 0.065 mm (0.0008 - 0.0025 in.)
	Exhaust	0.050 - 0.095 mm (0.0019 - 0.0037 in.)
Valve Lift (@ Zero Lash)	Intake	12.0 mm (0.472 in.)
	Exhaust	11.70 mm (0.460 in.)

VALVE SPRING

DESCRIPTION	SPECIFICATION
Spring Force (Valve Closed) Intake and Exhaust	422.0 N @ 46.0 mm (95lbs. @ 1.81 in.)
Spring Force (Valve Open) Intake and Exhaust	@ 33.5 mm
Number of Coils Intake and Exhaust	7.4
Wire Diameter Intake and Exhaust	5.39 × 4.52 mm (0.212 - 0.177 in.)
Installed Height (Spring Seat to Bottom of Retainer) Intake and Exhaust	46.0 mm (1.81 in.)

OIL PUMP

DESCRIPTION	SPECIFICATION
Clearance Over Rotors (MAX)	0.095 mm (0.0038 in.)
Outer Rotor to Pump Body Clearance (MAX)	.235 mm (.009 in.)
Tip Clearance Between Rotors (MAX)	0.150 mm (0.006 in.)

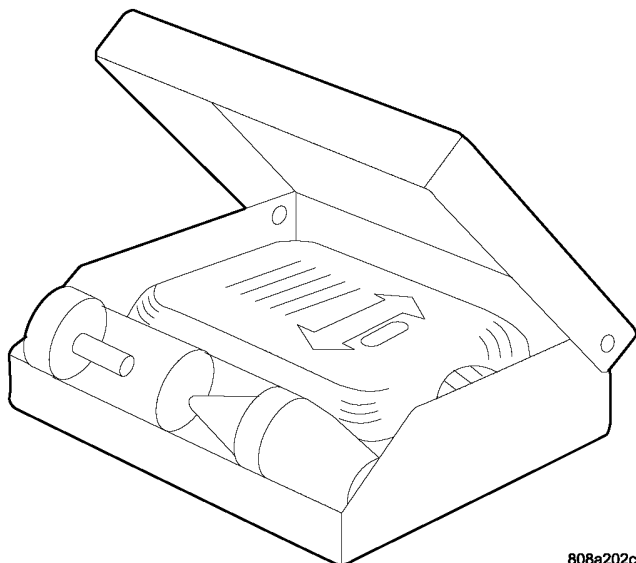
OIL PRESSURE

SPECIFICATION	SPECIFICATION
At Curb Idle Speed (MIN)*	25 kPa (4 psi)
@ 3000 rpm	170 - 758 kPa (25 - 110 psi)
* CAUTION: If pressure is zero at curb idle, DO NOT run engine	

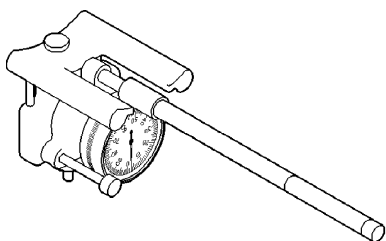
TORQUE**TORQUE CHART 5.7L ENGINE**

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Block Pipe Plugs (1/4 NPT)	20	—	177
(3/8 NPT)	27	—	240
Camshaft Sprocket—Bolt	122	90	—
Camshaft Tensioner Plate—Bolts	28	—	250
Timing Chain Case Cover—Bolts	28	—	250
Lifting Stud	55	40	—
Connecting Rod Cap—Bolts	21 plus 90° Turn	15 plus 90° Turn	—
Main Bearing Cap—Bolts M-12	27 plus 90° Turn	—	—
Crossbolts M-8	28	—	—
Cylinder Head—Bolts M-12 Bolts			
Step 1	34	25	—
Step 2	54	40	—
Step 3	Turn 90°	Turn 90°	—
M-8 Bolts			—
Step 1	20	15	—
Step 2	34	25	—
Cylinder Head Cover—Bolts	8	—	70
Exhaust Manifold to Cylinder Head	25	—	220
Flexplate to crankshaft—Bolts	95	70	—
Flywheel to crankshaft—Bolts	75	55	—
Front Insulator—Through bolt/nut	95	70	—
Front Insulator to Support Bracket			
—Stud Nut (4WD)	41	30	—
—Through Bolt/Nut (4WD)	102	75	—
Front Insulator to Block—Bolts (2WD)	95	70	—
Generator—Mounting Bolt	55	40	—
Intake Manifold—Bolts	Refer to Procedure		
Lifter Guide Holder	12	—	106
Oil Pan Bolts	12	-	105
Oil Dipstick Tube	12	—	105
Oil Pan—Drain Plug	34	25	—
Oil Pump—Attaching Bolts	28	—	250
Oil Pump Pickup Tube – Bolt and Nut	28	—	250
Rear Seal Retainer Attaching Bolts	15	—	132

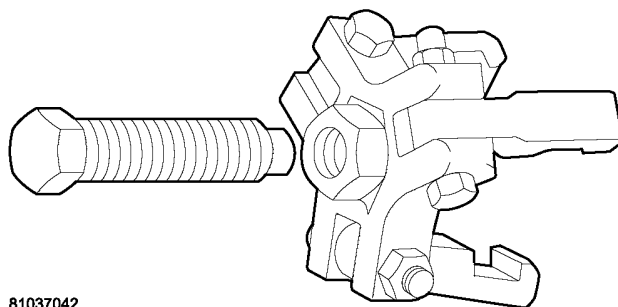
DESCRIPTION	N·m	Ft.	In.
Rear Insulator to Bracket— Through-Bolt (2WD)	68	50	—
Rear Insulator to Crossmember Support Bracket—Nut (2WD)	41	30	—
Rear Insulator to Crossmember— Nuts (4WD)	68	50	—
Rear Insulator to Transmission— Bolts (4WD)	68	50	—
Rear Insulator Bracket—Bolts (4WD Automatic)	68	50	—
Rear Support Bracket to Crossmember Flange—Nuts	41	30	—
Rear Support Plate to Transfer Case—Bolts	41	30	—
Rocker Arm—Bolts	22	—	195
Spark Plugs	—	—	—
Thermostat Housing—Bolts	28	—	250
Throttle Body—Bolts	12	—	105
Transfer Case to Insulator Mounting Plate—Nuts	204	105	—
Transmission Support Bracket— Bolts (2WD)	68	50	—
Vibration Damper—Bolt	176	129	—
Water Pump to Timing Chain Case Cover—Bolts	28	—	250

SPECIAL TOOLS**5.7L ENGINE**

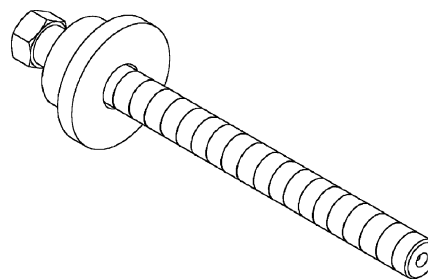
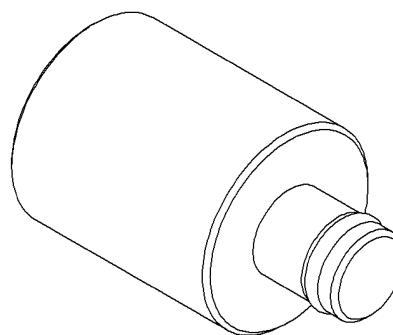
808a202c

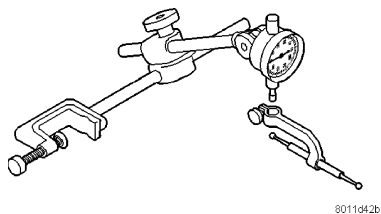
BLOC-CHEK KIT C-3685

8011c9fa

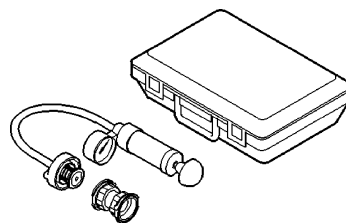
Bore Size Indicator C-119

81037042

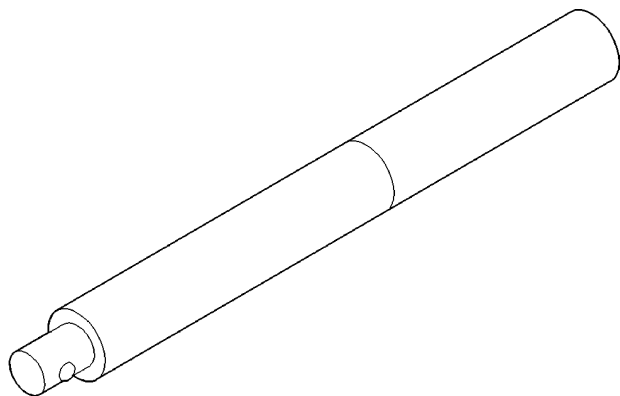
Puller 8454**Crankshaft Damper Installer 8512****CRANKSHAFT DAMPER REMOVER INSERT - 8513-A**



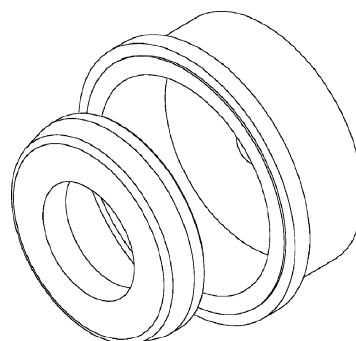
Dial Indicator C-3339



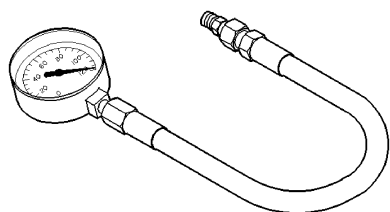
Pressure Tester Kit 7700



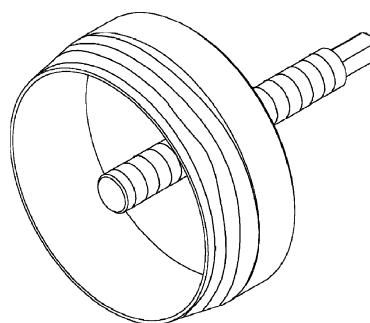
Handle C-4171



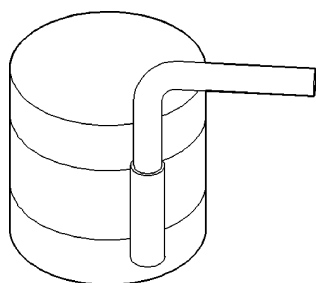
Rear Crankshaft Seal Installer 8349



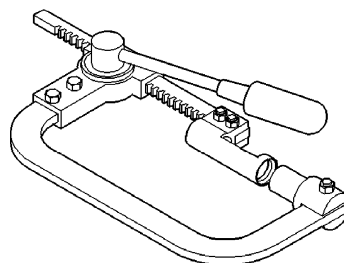
Oil Pressure Gauge C-3292



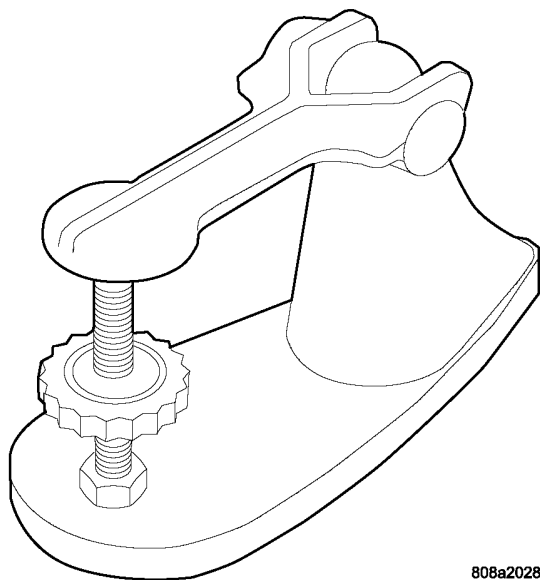
Rear Crankshaft Seal Remover 8506



Piston Ring Compressor C-385

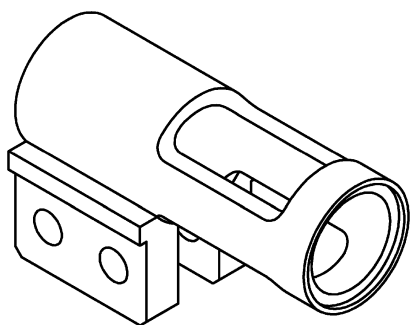


Valve Spring Compressor C-3422-B

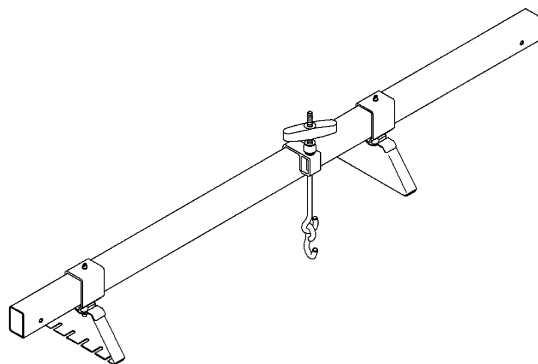


808a2028

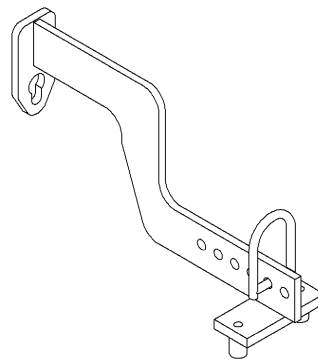
Valve Spring Tester C-647



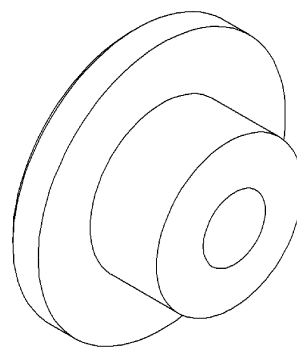
Adapter, Valve Spring Compressor Off-vehicle 8464



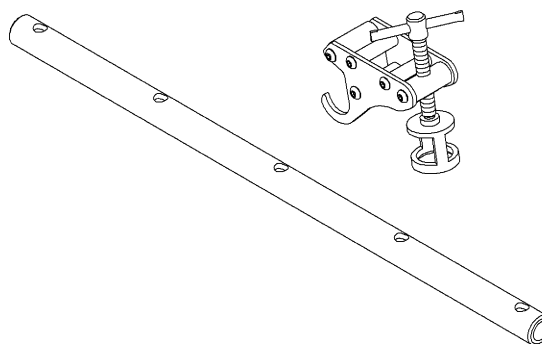
ENGINE SUPPORT FIXTURE 8534



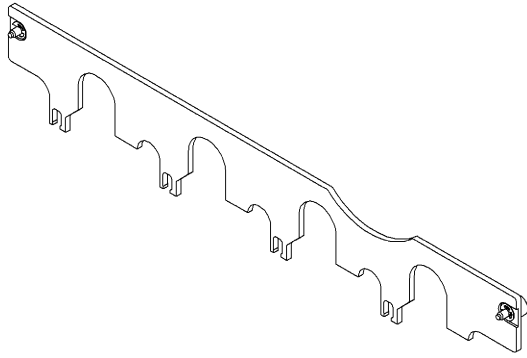
ENGINE LIFT FIXTURE 8984



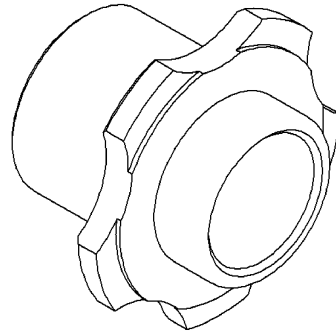
REAR CAM PLUG INSTALLER 9048



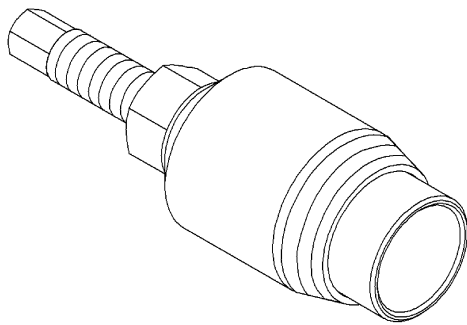
VALVE SPRING COMPRESSOR - 9065



PUSHROD RETAINING PLATE - 9070



FRONT CRANK SEAL INSTALLER 9072



FRONT CRANK SEAL REMOVER - 9071

AIR INTAKE SYSTEM

REMOVAL

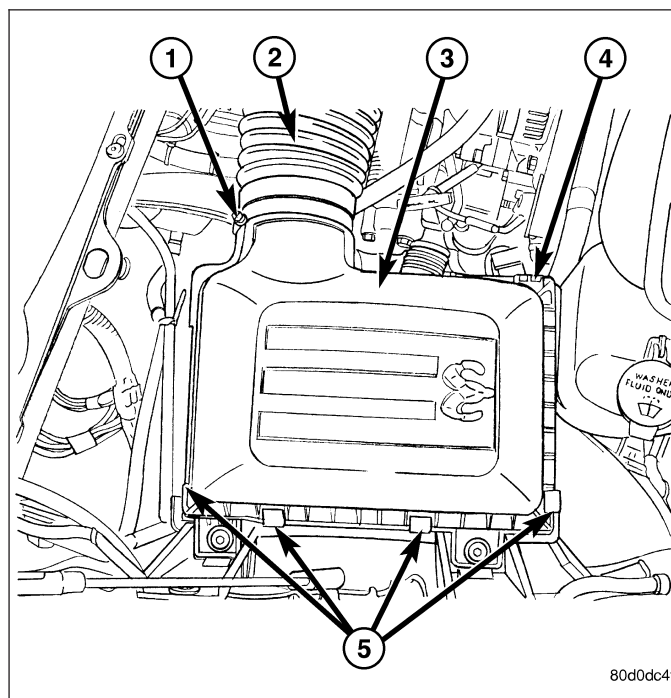
Filter Element Only

Housing removal is not necessary for element (filter) replacement.

1. Loosen clamp and disconnect air duct at air cleaner cover.
2. Pry over 4 spring clips from housing cover (spring clips retain cover to housing).
3. Release housing cover from locating tabs on housing and remove cover.
4. Remove air cleaner element (filter) from housing.
5. Clean inside of housing before replacing element.

Housing Assembly

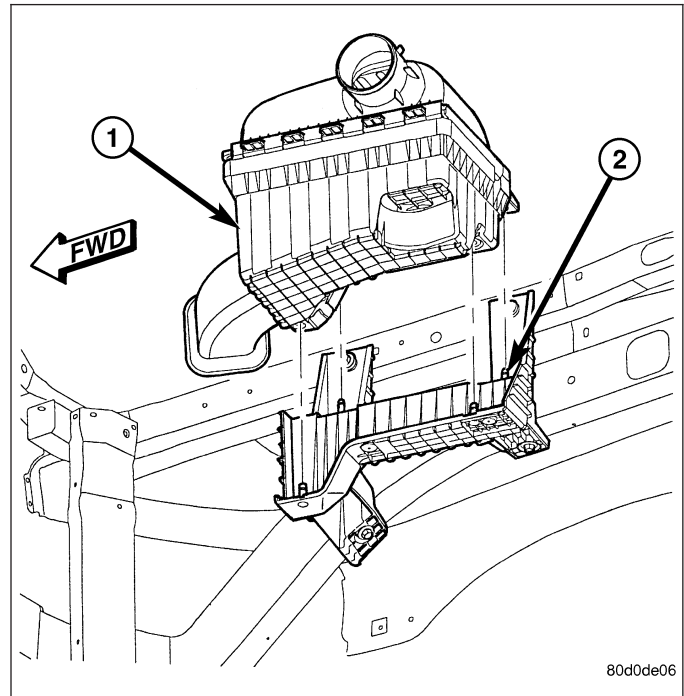
1. Loosen clamp and disconnect air duct at air cleaner cover.
2. Lift entire housing assembly from 4 locating pins.



80d0dc4f

INSTALLATION

1. Install filter element into housing.
2. Position housing cover into housing locating tabs.
3. Pry up 4 spring clips and lock cover to housing.
4. Install air duct to air cleaner cover and tighten hose clamp to 3 N·m (30 in. lbs.) torque.
5. If any other hose clamps were removed from air intake system, tighten them to 3.4 N·m (30 in. lbs.) torque.
6. If any bolts were removed from air resonator housing or air intake tubing, tighten them to 4.5 N·m (40 in. lbs.) torque.



CYLINDER HEAD

OPERATION—CYLINDER HEAD

The cylinder head closes the combustion chamber allowing the pistons to compress the air fuel mixture to the correct ratio for ignition. The valves located in the cylinder head open and close to either allow clean air into the combustion chamber or to allow the exhaust gases out, depending on the stroke of the engine.

DIAGNOSIS AND TESTING - CYLINDER HEAD GASKET FAILURE

A cylinder head gasket leak can be located between adjacent cylinders or between a cylinder and the adjacent water jacket.

- Possible indications of the cylinder head gasket leaking between adjacent cylinders are:
 - Loss of engine power
 - Engine misfiring
 - Poor fuel economy
- Possible indications of the cylinder head gasket leaking between a cylinder and an adjacent water jacket are:
 - Engine overheating
 - Loss of coolant
 - Excessive steam (white smoke) emitting from exhaust
 - Coolant foaming

CYLINDER-TO-CYLINDER LEAKAGE TEST

To determine if an engine cylinder head gasket is leaking between adjacent cylinders, follow the procedures in Cylinder Compression Pressure Test in this section. An engine cylinder head gasket leaking between adjacent cylinders will result in approximately a 50–70% reduction in compression pressure.

CYLINDER-TO-WATER JACKET LEAKAGE TEST

WARNING: USE EXTREME CAUTION WHEN THE ENGINE IS OPERATING WITH COOLANT PRESSURE CAP REMOVED.

VISUAL TEST METHOD

With the engine cool, remove the coolant pressure cap. Start the engine and allow it to warm up until thermostat opens.

If a large combustion/compression pressure leak exists, bubbles will be visible in the coolant.

COOLING SYSTEM TESTER METHOD

WARNING: WITH COOLING SYSTEM TESTER IN PLACE, PRESSURE WILL BUILD UP FAST. EXCESSIVE PRESSURE BUILT UP, BY CONTINUOUS ENGINE OPERATION, MUST BE RELEASED TO A SAFE PRESSURE POINT. NEVER PERMIT PRESSURE TO EXCEED 138 kPa (20 psi).

Install Cooling System Tester 7700 or equivalent to pressure cap neck. Start the engine and observe the tester's pressure gauge. If gauge pulsates with every power stroke of a cylinder a combustion pressure leak is evident.

CHEMICAL TEST METHOD

Combustion leaks into the cooling system can also be checked by using Bloc-Chek Kit C-3685-A or equivalent. Perform test following the procedures supplied with the tool kit.

REMOVAL

1. Perform the Fuel System Pressure Release procedure (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - STANDARD PROCEDURE). Disconnect the fuel supply line (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY/QUICK CONNECT FITTING - STANDARD PROCEDURE).
2. Disconnect the battery negative cable.
3. Remove the wiper module (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WIPER MODULE - REMOVAL).
4. Drain cooling system.
5. Remove the air cleaner resonator and duct work.
6. Remove the generator.
7. Remove closed crankcase ventilation system.
8. Disconnect the evaporation control system.
9. Disconnect heater hoses.
10. Remove cylinder head covers and gaskets.
11. Remove intake manifold and throttle body as an assembly.
12. Remove rocker arm assemblies and push rods. Identify to ensure installation in original locations.
13. Remove the head bolts from each cylinder head and remove cylinder heads. Discard the cylinder head gasket.

CLEANING

Clean all surfaces of cylinder block and cylinder heads.

Clean cylinder block front and rear gasket surfaces using a suitable solvent.

INSPECTION

1. Inspect the cylinder head for out-of-flatness, using a straightedge and a feeler gauge. If tolerances exceed 0.0508 mm (0.002 in.) replace the cylinder head.
2. Inspect the valve seats for damage. Service the valve seats as necessary.
3. Inspect the valve guides for wear, cracks or looseness. If either condition exist, replace the cylinder head.
4. Inspect pushrods. Replace worn or bent pushrods.

INSTALLATION

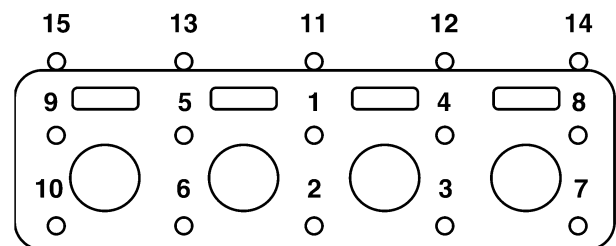
1. Clean all surfaces of cylinder block and cylinder heads.
2. Clean cylinder block front and rear gasket surfaces using a suitable solvent.

CAUTION: The head gaskets are not interchangeable between left and right sides. They are marked "L" and "R" to indicate left and right sides.

3. Position new cylinder head gaskets onto the cylinder block.

CAUTION: The head gaskets are marked "TOP" to indicate which side goes up.

4. Position cylinder heads onto head gaskets and cylinder block.
5. Tighten the cylinder head bolts in three steps :
 - Step 1— Snug tighten M12 cylinder head bolts, in sequence, to 34 N·m (25 ft. lbs.) and M8 bolts to 20 N·m (15 ft. lbs.) torque.
 - Step 2— Tighten M12 cylinder head bolts, in sequence, to 54 N·m (40 ft. lbs.) and verify M8 bolts to 20 N·m (15 ft. lbs.) torque..
 - Step 3— Turn M12 cylinder head bolts, in sequence, 90 degrees and tighten M8 bolts to 34 N·m (25 ft. lbs.) torque.



8100fa03

6. Install push rods and rocker arm assemblies in their original position.
7. Install the intake manifold and throttle body assembly.
8. If required, adjust spark plugs to specifications. Install the plugs.
9. Connect the heater hoses.

10. Install the fuel supply line.
11. Install the generator and drive belt.
12. Install cylinder head covers(Refer to 9 - ENGINE/
CYLINDER HEAD/CYLINDER HEAD COVER(S) -
INSTALLATION).
13. Connect the evaporation control system.
14. Install the wiper module (Refer to 8 - ELECTRI-
CAL/WIPERS/WASHERS/WIPER MODULE -
INSTALLATION).
15. Install the air cleaner.
16. Fill cooling system.
17. Connect the negative cable to the battery.
18. Start engine check for leaks.

COVER(S)-CYLINDER HEAD

REMOVAL

1. Disconnect battery negative cable.
2. Disconnect coil on plug connectors.

CAUTION: The ground straps must be installed in the same location as removed. The covers are machined to accept the ground straps in those locations only.

3. Remove cylinder head cover retaining bolts, and ground straps.
4. Remove cylinder head cover.

Note: The gasket may be used again, provided no cuts, tears, or deformation has occurred.

INSTALLATION

CAUTION: Do not use harsh cleaners to clean the cylinder head covers. Severe damage to covers may occur.

CAUTION: DO NOT allow other components including the wire harness to rest on or against the engine cylinder head cover. Prolonged contact with other objects may wear a hole in the cylinder head cover.

1. Clean cylinder head cover and both sealing surfaces. Inspect and replace gasket as necessary.
2. Install cylinder head cover and hand start all fasteners. Verify that all double ended studs are in the correct location and install left and right ground straps.

CAUTION: The ground straps must be installed in the same location as removed. The covers are machined to accept the ground straps in those locations only.

Note: The right hand ground strap is located on the front inboard stud. The left hand ground strap is located on the rear inboard stud.

3. Tighten cylinder head cover bolts and double ended studs to 8 N·m (70 in. lbs). Begin torque sequence in the middle of head cover and torque bolts moving outward in a crisscross pattern from top to bottom.
4. Install ignition coil on plug, and torque fasteners to 12 N·m (105 in. lbs)
5. Connect, ignition coil electrical connectors.
6. Install PCV hose.
7. Connect battery negative cable.

SEATS-INTAKE/EXHAUST VALVES

DESCRIPTION

DESCRIPTION - VALVE GUIDES

The valve guides are made of powdered metal and are pressed into the cylinder head. The guides are not replaceable or serviceable, and valve guide reaming is not recommended. If the guides are worn beyond acceptable limits, replace the cylinder heads.

DESCRIPTION

Both the intake and exhaust valves are made of steel. The intake valve is 50.93 mm (2.00 inches) in diameter and the exhaust valve is 39.53 mm (1.55 inches) in diameter. All valves use three bead lock keepers to retain the springs and promote valve rotation.

STANDARD PROCEDURE - REFACING

Note: Valve seats that are worn or burned can be reworked, provided that correct angle and seat width are maintained. Otherwise the cylinder head must be replaced.

Note: When refacing valves and valve seats, it is important that the correct size valve guide pilot be used for reseating stones. A true and complete surface must be obtained.

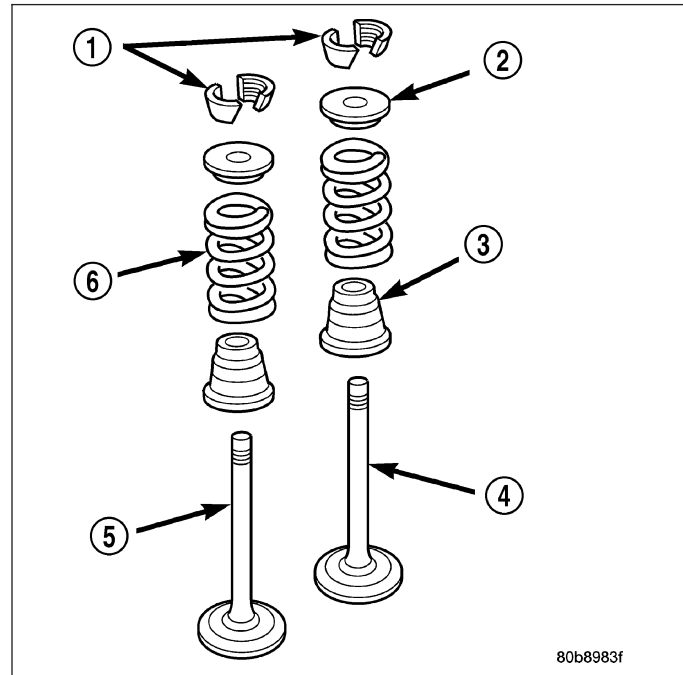
1. Using a suitable dial indicator measure the center of the valve seat. Total run out must not exceed 0.051 mm (0.002 in.).
2. Apply a small amount of Prussian blue to the valve seat, insert the valve into the cylinder head, while applying light pressure on the valve rotate the valve. Remove the valve and examine the valve face. If the blue is transferred below the top edge of the valve face, lower the valve seat using a 15 degree stone. If the blue is transferred to the bottom edge of the valve face, raise the valve seat using a 65 degree stone.
3. When the seat is properly positioned the width of the intake seat must be 1.018 - 1.62 mm (0.0464 - 0.0637 in.) and the exhaust seat must be 1.48 - 1.92 mm (0.058 - 0.075 in.).
4. Check the valve spring installed height after refacing the valve and seat. The installed height for both intake and exhaust valve springs must not exceed 46.0 mm (1.81 in.).

VALVE FACE AND VALVE SEAT ANGLE CHART

DESCRIPTION	SPECIFICATION
SEAT WIDTH	
INTAKE	1.018 - 1.62 mm (0.0464 - 0.0637 in.)
EXHAUST	1.48 - 1.92 mm (0.058 - 0.075 in.)
FACE ANGLE (INT. AND EXT.)	45° - 45½°
SEAT ANGLE (INT. AND EXT.)	44½° - 45°

5. The valve seat must maintain an angle of 44.5 – 45.0 degrees angle.

6. The valve face must maintain a face angle of 45.0 – 45.5 degrees angle.



REMOVAL

1. Remove the cylinder head (Refer to 9 - ENGINE/CYLINDER HEAD - REMOVAL).
2. Compress valve springs using Valve Spring Compressor Tool special tool # C-3422 and adapter 8464.
3. Remove valve retaining locks, valve spring retainers, valve stem seals and valve springs.
4. Before removing valves, remove any burrs from valve stem lock grooves to prevent damage to the valve guides. Identify valves to ensure installation in original location.

INSTALLATION

1. Clean valves thoroughly. Discard burned, warped and cracked valves.
2. Remove carbon and varnish deposits from inside of valve guides with a reliable guide cleaner.
3. Measure valve stems for wear. If wear exceeds 0.051 mm (0.002 inch), replace the valve.
4. Coat valve stems with lubrication oil and insert them in cylinder head.
5. If valves or seats are reground, check valve stem height. If valve is too long, replace cylinder head.
6. Install new seals on all valve guides. Install valve springs and valve retainers.
7. Compress valve springs with Valve Spring Compressor Tool special tool # C- 3422 and adapter 8464, install locks and release tool. If valves and/or seats are ground, measure the installed height of springs. Make sure the measurement is taken from bottom of spring seat in cylinder head to the bottom surface of spring retainer.
8. Install cylinder head (Refer to 9 - ENGINE/CYLINDER HEAD - INSTALLATION).

ROCKER ARM

REMOVAL

1. Remove cylinder head cover.(Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL)
2. Loosen the rocker shafts using the following sequence: **Center, center-left, center-right, left, right,.**

CAUTION: The rocker shaft assemblies are not interchangeable between intake and exhaust. The intake rocker arms are marked with an "I".

3. Remove the rocker shafts. Note location for reassembly.

CAUTION: The longer push rods are for the exhaust side, and the shorter push rods are for intake side.

4. Remove the pushrods. Note pushrod location for reassembly.

INSTALLATION

CAUTION: The longer push rods are for the exhaust side, and the shorter push rods are for intake side.

1. Install the push rods in the same order as removed.

CAUTION: Verify that pushrod is installed into rocker arm and lifter correctly while installing rocker shaft assembly. Recheck after rocker shaft has been torqued to specification.

CAUTION: The rocker shaft assemblies are not interchangeable between intake and exhaust. The intake rocker arms are marked with the letter "I".

2. Install rocker shaft assemblies in the same order as removed.

CAUTION: Ensure that hold downs and rocker arms are not overlapped when torquing bolts.

3. Tighten the rocker shaft bolts to 22 N·m (195 in. lbs.) torque,using the following sequence: **Center, center-right, center-left, right, left.**

CAUTION: DO NOT rotate or crank the engine during or immediately after rocker arm installation. Allow the hydraulic roller tappets adequate time to bleed down (about 5 minutes).

4. Install cylinder head cover (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).

SEALS-VALVE GUIDE

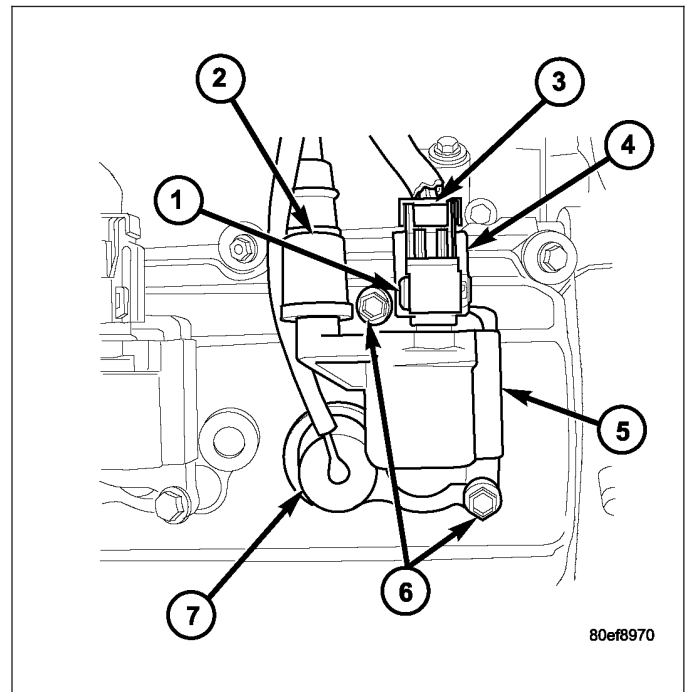
DESCRIPTION

The valve guide seals are made of rubber and incorporate an integral steel valve spring seat. The integral garter spring maintains consistent lubrication control to the valve stems.

SPRINGS-VALVE

REMOVAL

1. Disconnect negative battery cable.
2. Remove air cleaner assembly.
3. Remove air intake resonator.
4. Remove spark plug cables.
5. Remove ignition coil connectors.
6. Remove ignition coils.



7. Remove one spark plug.
8. Remove valve cover.

CAUTION: The piston must be at TDC, and both valves closed on the cylinder to be serviced.

Note: If removing intake valve spring, install special tool# 9070, pushrod retaining plate, to retain the intake pushrods.

9. Remove exhaust/intake rocker arm shafts.
10. Install spring compressor, special tool# 9065.

Note: All valve springs and seals are removed in the same manner.

11. Charge cylinder with air.

Note: Tap the top of the valve spring retainer to loosen the spring retainers locks.

12. Compress valve spring and remove valve retainer locks.
13. Release spring compressor and remove valve spring.

Note: The valve springs are interchangeable between intake and exhaust.

14. Remove valve seal.

INSTALLATION

1. Install valve seal.
2. Install valve spring.
3. Using special tool# 9065, compress valve spring and install valve spring retainer and locks.
4. Release air charge in cylinder.
5. Remove spring compressor tool # 9065.

CAUTION: Verify that the pushrods are fully seated into lifter and rocker arm. Recheck after rocker arm shaft has been torqued to specification.

6. Install rocker arm shaft and pushrods(Refer to 9 - ENGINE/CYLINDER HEAD/ROCKER ARM / ADJUSTER ASSY - INSTALLATION).
7. Tighten the rocker shaft bolts to 22 N·m (195 in. lbs.) torque,using the following sequence: **Center, center-right, center-left, right, left.**
8. Remove special tool# 9070, pushrod retaining plate, if used.
9. Install cylinder head cover.
10. Tighten cylinder head cover bolts and double ended studs(Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION) .
11. Install spark plugs.
12. Install ignition coil on plug, and torque fasteners to 12 N·m (105 in. lbs)
13. Install ignition coil connectors.
14. Install spark plug cables.
15. Install air intake resonator.
16. Install air cleaner assembly.
17. Connect negative battery cable.

ENGINE BLOCK

CLEANING

Thoroughly clean the oil pan and engine block gasket surfaces.

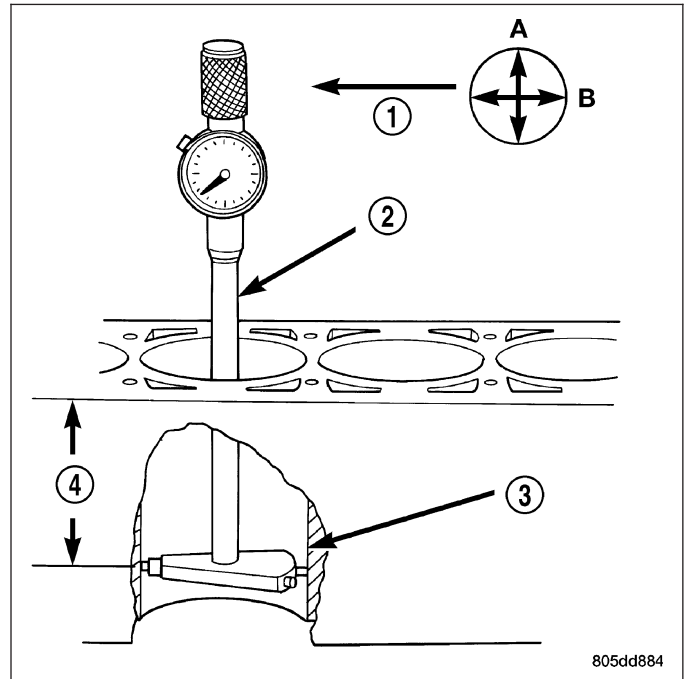
Use compressed air to clean out:

- The galley at the oil filter adaptor hole.
- The front and rear oil galley holes.
- The feed holes for the crankshaft main bearings.

Once the block has been completely cleaned, apply Loctite PST pipe sealant with Teflon 592 to the threads of the front and rear oil galley plugs. Tighten the 1/4 inch NPT plugs to 20 N·m (177 in. lbs.) torque. Tighten the 3/8 inch NPT plugs to 27 N·m (240 in. lbs.) torque.

INSPECTION

1. It is mandatory to use a dial bore gauge to measure each cylinder bore diameter. To correctly select the proper size piston, a cylinder bore gauge, capable of reading in 0.003 mm (.0001 in.) INCREMENTS is required. If a bore gauge is not available, do not use an inside micrometer.
2. Measure the inside diameter of the cylinder bore at three levels below top of bore. Start perpendicular (across or at 90 degrees) to the axis of the crankshaft and then take two additional reading.
3. Measure the cylinder bore diameter crosswise to the cylinder block near the top of the bore. Repeat the measurement near the middle of the bore, then repeat the measurement near the bottom of the bore.
4. Determine taper by subtracting the smaller diameter from the larger diameter.
5. Rotate measuring device 90° and repeat steps above.
6. Determine out-of-roundness by comparing the difference between each measurement.
7. If cylinder bore taper does not exceed 0.025 mm (0.001 inch) and out-of-roundness does not exceed 0.025 mm (0.001 inch), the cylinder bore can be honed. If the cylinder bore taper or out-of-round condition exceeds these maximum limits, the cylinder block must be replaced. A slight amount of taper always exists in the cylinder bore after the engine has been in use for a period of time.



CAMSHAFT-ENGINE

REMOVAL

REMOVAL - CAMSHAFT CORE HOLE PLUG

CAUTION: Do not damage the rear surface of the camshaft or the core plug sealing surface, when removing the core plug.

1. Remove the rear cam bearing core plug.

REMOVAL - CAMSHAFT

1. Remove the battery negative cable.
2. Remove the air cleaner assembly.
3. Drain coolant.
4. Remove the accessory drive belt.
5. Remove the generator.
6. Remove the A/C compressor, and set aside
7. Remove the radiator (Refer to 7 - COOLING/ENGINE/RADIATOR - REMOVAL).
8. Remove intake manifold(Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - REMOVAL).
9. Remove cylinder head covers(Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).
10. Remove both left and right cylinder heads(Refer to 9 - ENGINE/CYLINDER HEAD - REMOVAL).

11. Remove the oil pan(Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL).
12. Remove timing case cover(Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - REMOVAL).
13. Remove the oil pick up tube.
14. Remove the oil pump(Refer to 9 - ENGINE/LUBRICATION/OIL PUMP - REMOVAL).
15. Remove timing chain(Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL).
16. Remove camshaft tensioner/thrust plate assembly.

Note: Identify lifters to ensure installation in original location.

17. Remove the lifters and retainer assembly.
18. Install a long bolt into front of camshaft to aid in removal of the camshaft. Remove camshaft, being careful not to damage cam bearings with the cam lobes.

INSPECTION

1. The cam bearings are not serviceable. Do not attempt to replace cam bearings for any reason.

INSTALLATION

INSTALLATION - CAMSHAFT CORE HOLE PLUG

CAUTION: The new core hole plug must be installed to the proper depth or camshaft damage could develop. The plug must be installed squarely in the bore.

1. Install a new core hole plug at the rear of camshaft, using special tool # 9048. Clean plug and apply mopar® lock and seal adhesive to the edge of the plug, before installing. The plug must be installed to a depth of + / - 0.25mm from the end of the machined bevel, that is the end of the bevel that is closest to the cam bearing.

INSTALLATION - CAMSHAFT

1. Lubricate camshaft lobes and camshaft bearing journals and insert the camshaft
2. Install camshaft Tensioner plate assembly. Tighten bolts to 28 N-m (250 in. lbs.) torque.
3. Install timing chain and sprockets(Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION).
4. Measure camshaft end play(Refer to 9 - ENGINE - SPECIFICATIONS). If not within limits install a new thrust plate.
5. Install the oil pump(Refer to 9 - ENGINE/LUBRICATION/OIL PUMP - INSTALLATION).
6. Install the oil pick up tube.
7. Each lifter reused must be installed in the same position from which it was removed. **When camshaft is replaced, all of the lifters must be replaced.**
8. Install lifters and retainer assembly.
9. Install both left and right cylinder heads(Refer to 9 - ENGINE/CYLINDER HEAD - INSTALLATION).
10. Install pushrods
11. Install rocker arms(Refer to 9 - ENGINE/CYLINDER HEAD/ROCKER ARM / ADJUSTER ASSY - INSTALLATION).
12. Install timing case cover(Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - INSTALLATION).
13. Install the oil pan(Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION).
14. Install cylinder head covers(Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).
15. Install intake manifold(Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - INSTALLATION).

16. Install the A/C compressor, and set aside
17. Install the generator.
18. Install the accessory drive belt.
19. Install the radiator (Refer to 7 - COOLING/ENGINE/RADIATOR - INSTALLATION).
20. Install the air cleaner assembly.
21. Install the battery negative cable.
22. Refill coolant.
23. Refill engine oil.
24. Start engine and check for leaks.

CRANKSHAFT

REMOVAL

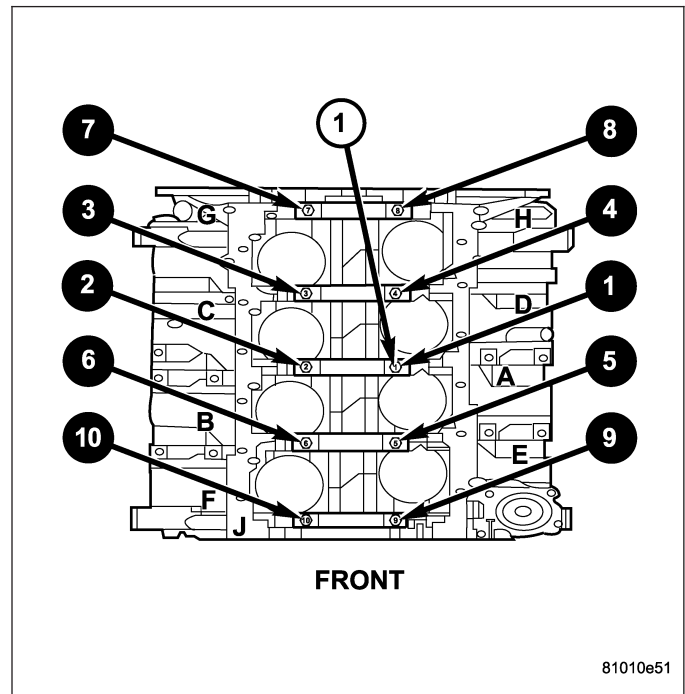
1. Remove the vibration damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - REMOVAL).
2. Remove the oil pan(Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL).
3. Remove the oil pump pickup.
4. Remove the windage tray/oil pan gasket.
5. Remove the timing chain cover(Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - REMOVAL).
6. Remove the oil pump(Refer to 9 - ENGINE/LUBRICATION/OIL PUMP - REMOVAL).
7. Remove the timing drive(Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - REMOVAL).
8. Identify rod bearing caps before removal. Remove rod bearing caps with bearings.
9. Identify main bearing caps before removal. Remove main bearing caps and bearings one at a time.
10. Remove the thrust washers.
11. Remove the rear oil seal retainer(Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT REAR OIL SEAL RETAINER - REMOVAL).
12. Remove the crankshaft out of the block.
13. Remove and discard the crankshaft rear oil seal.
14. Remove and discard the front crankshaft oil seal.

INSTALLATION

1. Select the proper main bearings(Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT MAIN BEARINGS - STANDARD PROCEDURE).
2. Install main bearings in block and caps, and lubricate bearings.
3. Position the crankshaft into the cylinder block.
4. Install the thrust washers.

Note: The main cap crossbolts are torqued after final torque of the main cap bolts. Always use a new washer/seal on crossbolts.

5. Clean and oil all cap bolts. Install all main bearing caps. Install all cap bolts and alternately tighten in two steps using the following sequence.
 - Step 1 – 27 N·m (20ft. lbs.) torque.
 - Step 2 – Turn main cap bolts an additional 90°.
6. Install the crossbolts with new washer/gasket. Starting with crossbolt A torque each crossbolt to 28 N·m (21ft. lbs.)torque.
7. Repeat crossbolt torque procedure.



8. Measure crankshaft end play(Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT MAIN BEARINGS - STANDARD PROCEDURE).
9. Position the connecting rods onto the crankshaft and install the rod bearing caps(Refer to 9 - ENGINE/ENGINE BLOCK/PISTON & CONNECTING ROD - INSTALLATION).
10. Install timing drive(Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT/CHAIN AND SPROCKETS - INSTALLATION).
11. Install oil pump (Refer to 9 - ENGINE/LUBRICATION/OIL PUMP - INSTALLATION).
12. Install the timing chain cover(Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - INSTALLATION).
13. Install the rear main seal and retainer(Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT REAR OIL SEAL RETAINE - INSTALLATION).
14. Install the windage tray/oil pan gasket.
15. Install the oil pick up tube.
16. Install the oil pan(Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION).
17. Install the vibration damper(Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - INSTALLATION).
18. Install the engine(Refer to 9 - ENGINE - INSTALLATION).

BEARINGS-CRANKSHAFT MAIN

STANDARD PROCEDURE - CRANKSHAFT MAIN BEARING - FITTING

MAIN BEARING JOURNAL DIAMETER (CRANKSHAFT REMOVED)

Crankshaft removed from the cylinder block.

Clean the oil off the main bearing journal.

Determine the maximum diameter of the journal with a micrometer. Measure at two locations 90° apart at each end of the journal.

The maximum allowable taper is 0.008mm (0.0004 inch.) and maximum out of round is 0.005mm (0.0002 inch). Compare the measured diameter with the journal diameter specification (Main Bearing Fitting Chart). Select inserts required to obtain the specified bearing-to-journal clearance.

CRANKSHAFT MAIN BEARING SELECTION

The main bearings are "select fit" to achieve proper oil clearances. For main bearing selection, the crankshaft counterweight has grade identification marks stamped into it. These marks are read from left to right, corresponding with journal number 1, 2, 3, 4 and 5.

Note: Service main bearings are coded. These codes identify what size (grade) the bearing is.

MAIN BEARING SELECTION CHART - 5.7L

GRADE MARKING	SIZE mm (in.)	FOR USE WITH JOURNAL SIZE
A	0.008 mm U/S (0.0004 in.) U/S	64.988–64.995 mm (2.5585– 2.5588in.)
B	NOMINAL	64.996–65.004 mm (2.5588–2.5592 in.)
C	0.008 mm O/S (0.0004 in.) O/S	65.005–65.012 mm (2.5592–2.5595 in.)

INSPECTION

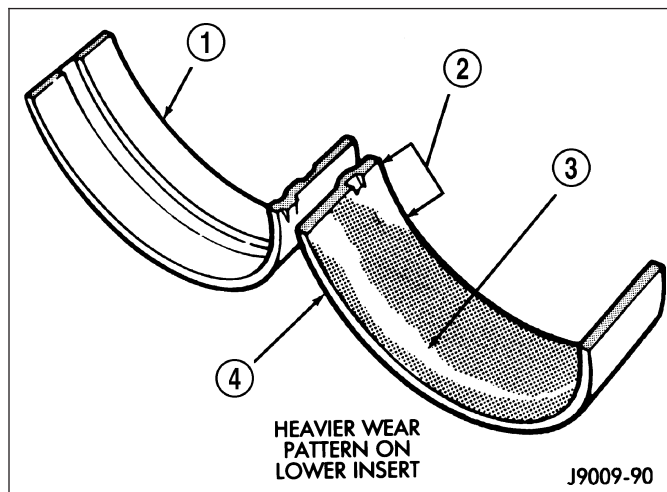
Wipe the inserts clean and inspect for abnormal wear patterns and for metal or other foreign material imbedded in the lining. Normal main bearing insert wear patterns are illustrated.

Note: If any of the crankshaft journals are scored, the crankshaft must be repaired or replaced.

Inspect the back of the inserts for fractures, scrapings or irregular wear patterns.

Inspect the upper insert locking tabs for damage.

Replace all damaged or worn bearing inserts.



SEAL-CRANKSHAFT OIL-FRONT

REMOVAL

1. Disconnect negative cable from battery.
2. Remove accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).
3. Drain cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
4. Remove upper radiator hose.
5. Remove radiator shroud attaching fasteners.
6. Remove radiator cooling fan and shroud (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - REMOVAL).
7. Remove crankshaft damper bolt.
8. Remove damper using Special Tools 8513A Insert and 8454 Three Jaw Puller.
9. Using Special Tool 9071, remove crankshaft front seal.

INSTALLATION

CAUTION: The front crankshaft seal must be installed dry. Do not apply lubricant to sealing lip or to outer edge.

1. Using Special Tool 8348 and 8512A, install crankshaft front seal.

CAUTION: To prevent severe damage to the Crankshaft or Damper, thoroughly clean the damper bore and the crankshaft nose before installing Damper.

2. Install vibration damper (Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - INSTALLATION).
3. Install radiator cooling fan and shroud (Refer to 7 - COOLING/ENGINE/RADIATOR FAN - INSTALLATION).
4. Install upper radiator hose.
5. Install accessory drive belt refer (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).
6. Refill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
7. Connect negative cable to battery.

SEAL-CRANKSHAFT OIL-REAR

DIAGNOSIS AND TESTING - REAR SEAL AREA LEAKS

Since it is sometimes difficult to determine the source of an oil leak in the rear seal area of the engine, a more involved inspection is necessary. The following steps should be followed to help pinpoint the source of the leak.

If the leakage occurs at the crankshaft rear oil seal area:

1. Disconnect the battery.
2. Raise the vehicle.
3. Remove torque converter or clutch housing cover and inspect rear of block for evidence of oil. Use a black light to check for the oil leak:
 - a. Circular spray pattern generally indicates seal leakage or crankshaft damage.
 - b. Where leakage tends to run straight down, possible causes are a porous block, camshaft bore cup plugs, oil galley pipe plugs, oil filter runoff, and main bearing cap to cylinder block mating surfaces. See Engine, for proper repair procedures of these items.
4. If no leaks are detected, pressurized the crankcase as outlined in the section, Inspection (Engine oil Leaks in general)

CAUTION: Do not exceed 20.6 kPa (3 psi).

5. If the leak is not detected, very slowly turn the crankshaft and watch for leakage. If a leak is detected between the crankshaft and seal while slowly turning the crankshaft, it is possible the crankshaft seal surface is damaged. The seal area on the crankshaft could have minor nicks or scratches that can be polished out with emery cloth.

CAUTION: Use extreme caution when crankshaft polishing is necessary to remove minor nicks or scratches. The crankshaft seal flange is specially machined to complement the function of the rear oil seal.

6. For bubbles that remain steady with shaft rotation, no further inspection can be done until disassembled. (Refer to 9 - ENGINE - DIAGNOSIS AND TESTING), under the Oil Leak row, for components inspections on possible causes and corrections.
7. After the oil leak root cause and appropriate corrective action have been identified, (Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT OIL SEAL - REAR - REMOVAL).

REMOVAL

Note: This procedure can be performed in vehicle.

1. If being performed in vehicle, remove the transmission.
2. Remove the flexplate (Refer to 9 - ENGINE/ENGINE BLOCK/FLEX PLATE - REMOVAL).

Note: The crankshaft oil seal **CAN NOT** be reused after removal.

Note: The crankshaft rear oil seal remover Special Tool 8506 must be installed deeply into the seal. Continue to tighten the removal tool into the seal until the tool can not be turned farther. Failure to install tool correctly the first time will cause tool to pull free of seal without removing seal from engine.

3. Using Special Tool 8506, remove the crankshaft rear oil seal.

INSTALLATION

CAUTION: The rear seal must be installed dry for proper operation. Do not lubricate the seal lip or outer edge.

1. Position the plastic seal guide onto the crankshaft rear face. Then position the crankshaft rear oil seal onto the guide.
2. Using Special Tools 8349 Crankshaft Rear Oil Seal Installer and C-4171 Driver Handle, with a hammer, tap the seal into place. Continue to tap on the driver handle until the seal installer seats against the cylinder block crankshaft bore.
3. Install the flexplate.
4. Install the transmission.

RETAINER-CRANKSHAFT REAR OIL SEAL

REMOVAL

1. Disconnect negative cable from battery.
2. Remove the transmission.
3. Remove the drive plate / flywheel.
4. Remove the oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL).
5. Remove the rear oil seal retainer mounting bolts.
6. Carefully remove the retainer from the engine block.

INSTALLATION

1. Thoroughly clean all gasket residue from the engine block.
2. Use extreme care and clean all gasket residue from the retainer.
3. Position the gasket onto the retainer.
4. Position the retainer onto the engine block.
5. Install the retainer mounting bolts. Tighten the bolts to 15 N·m (132 in. lbs.) using a crisscross pattern, starting with the bolt on the lower right.
6. Install a new rear seal (Refer to 9 - ENGINE/ENGINE BLOCK/CRANKSHAFT OIL SEAL - REAR - INSTALLATION).
7. Install the oil pan (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION).
8. Install the drive plate / flywheel.
9. Install the transmission.
10. Check and verify engine oil level.
11. Start engine and check for leaks.

PLATE-TORQUE CONVERTER DRIVE

REMOVAL

1. Remove the transmission.
2. Remove the bolts and flexplate.

INSTALLATION

1. Position the flexplate or flywheel onto the crankshaft and install the bolts hand tight.
2. **For automatic transmissions:** Tighten the flexplate retaining bolts to 95 N·m (70 ft. lbs.).
3. **For manual transmissions:** Tighten the flywheel retaining bolts to 75 N·m (55 ft. lbs.).
4. Install the transmission.

TAPPETS-HYDRAULIC ROLLER

DIAGNOSIS AND TESTING - HYDRAULIC TAPPETS

Before disassembling any part of the engine to correct tappet noise, check the oil pressure. If vehicle has no oil pressure gauge, install a reliable gauge at the pressure sending-unit. The pressure should be between 207-552 kPa (30-70 psi) at 3,000 RPM.

Check the oil level after the engine reaches normal operating temperature. Allow 5 minutes to stabilize oil level, check dipstick. The oil level in the pan should never be above the FULL mark or below the ADD OIL mark on dipstick. Either of these two conditions could be responsible for noisy tappets.

OIL LEVEL

HIGH

If oil level is above the FULL mark, it is possible for the connecting rods to dip into the oil. With the engine running, this condition could create foam in the oil pan. Foam in oil pan would be fed to the hydraulic tappets by the oil pump causing them to lose length and allow valves to seat noisily.

LOW

Low oil level may allow oil pump to take in air. When air is fed to the tappets, they lose length, which allows valves to seat noisily. Any leaks on intake side of oil pump through which air can be drawn will create the same tappet action. Check the lubrication system from the intake strainer to the pump cover, including the relief valve retainer

cap. When tappet noise is due to aeration, it may be intermittent or constant, and usually more than one tappet will be noisy. When oil level and leaks have been corrected, operate the engine at fast idle. Run engine for a sufficient time to allow all of the air inside the tappets to be bled out.

TAPPET NOISE DIAGNOSIS

1. To determine source of tappet noise, operate engine at idle with cylinder head covers removed.
2. Feel each valve spring or rocker arm to detect noisy tappet. The noisy tappet will cause the affected spring and/or rocker arm to vibrate or feel rough in operation.

Note: Worn valve guides or cocked springs are sometimes mistaken for noisy tappets. If such is the case, noise may be dampened by applying side thrust on the valve spring. If noise is not appreciably reduced, it can be assumed the noise is in the tappet. Inspect the rocker arm push rod sockets and push rod ends for wear.

3. Valve tappet noise ranges from light noise to a heavy click. A light noise is usually caused by excessive leak-down around the unit plunger, or by the plunger partially sticking in the tappet body cylinder. The tappet should be replaced. A heavy click is caused by a tappet check valve not seating, or by foreign particles wedged between the plunger and the tappet body. This will cause the plunger to stick in the down position. This heavy click will be accompanied by excessive clearance between the valve stem and rocker arm as valve closes. In either case, tappet assembly should be removed for inspection and cleaning.
4. The valve train generates a noise very much like a light tappet noise during normal operation. Care must be taken to ensure that tappets are making the noise. If more than one tappet seems to be noisy, it's probably not the tappets.

REMOVAL

1. Disconnect the negative cable from the battery.
2. Remove the air cleaner(Refer to 9 - ENGINE/AIR INTAKE SYSTEM - REMOVAL).
3. Remove intake manifold(Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - REMOVAL).
4. Remove cylinder head cover(Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).
5. Remove rocker arm assembly and push rods(Refer to 9 - ENGINE/CYLINDER HEAD/ROCKER ARM / ADJUSTER ASSY - REMOVAL). Identify push rods to ensure installation in original location.
6. Remove the cylinder head(Refer to 9 - ENGINE/CYLINDER HEAD - REMOVAL).
7. Remove bolt from tappet guide holder.
8. Remove tappet guide holder.
9. Pull tappet out of bore with a twisting motion. If all tappets are to be removed and reused, identify tappets to ensure installation in original location.
10. Check camshaft lobes for abnormal wear.

INSTALLATION

1. Lubricate tappets.
2. Install tappets in their original positions.
3. Install tappet guide holder. Install the tappet guide holder bolt and tighten to 12 N·m (106 in. lbs.) torque.
4. Install cylinder head(Refer to 9 - ENGINE/CYLINDER HEAD - INSTALLATION).
5. Install pushrods and rocker arm assembly(Refer to 9 - ENGINE/CYLINDER HEAD/ROCKER ARM / ADJUSTER ASSY - INSTALLATION).
6. Install cylinder head cover(Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).
7. Install intake manifold(Refer to 9 - ENGINE/MANIFOLDS/INTAKE MANIFOLD - INSTALLATION).
8. Install the air cleaner(Refer to 9 - ENGINE/AIR INTAKE SYSTEM - INSTALLATION).
9. Connect the negative cable to the battery.

CAUTION: To prevent damage to valve mechanism, engine must not be run above fast idle until all hydraulic tappets have filled with oil and have become quiet.

10. Road test vehicle and check for leaks.

PISTON & CONNECTING ROD

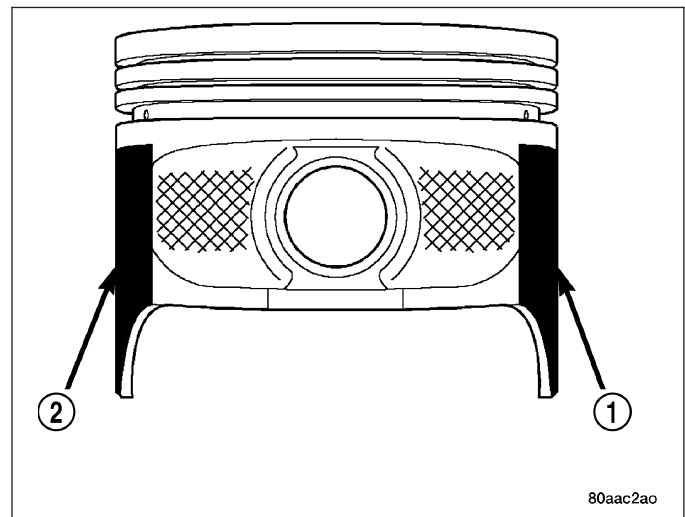
DESCRIPTION

CAUTION: Do not use a metal stamp to mark connecting rods as damage may result, instead use ink or a scratch awl.

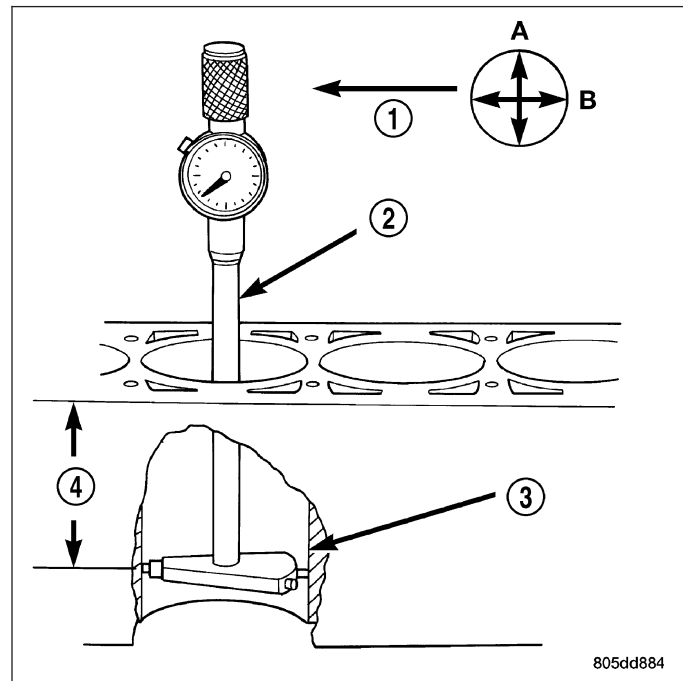
The pistons are made of a high strength aluminum alloy. Piston skirts are coated with a solid lubricant (Molykote) to reduce friction and provide scuff resistance. The piston top ring groove and land is anodized. The connecting rods are made of forged powdered metal, with a "fractured cap" design. A pressed fit piston pin is used to attach the piston and connecting rod.

STANDARD PROCEDURE - PISTON FITTING

1. To correctly select the proper size piston, a cylinder bore gauge, capable of reading in 0.003 mm (.0001 in.) INCREMENTS is required. If a bore gauge is not available, do not use an inside micrometer.
2. Measure the inside diameter of the cylinder bore at a point 38.0 mm (1.5 inches) below top of bore. Start perpendicular (across or at 90 degrees) to the axis of the crankshaft at point A and then take an additional bore reading 90 degrees to that at point B.
3. The coated pistons will be serviced with the piston pin and connecting rod pre-assembled. The piston-rod assembly is specific for the left cylinder bank (odd numbered) and the right cylinder bank (even numbered) and must not be interchanged.



4. The coating material is applied to the piston after the final piston machining process. Measuring the outside diameter of a coated piston will not provide accurate results. Therefore measuring the inside diameter of the cylinder bore with a dial Bore Gauge is **MANDATORY**. To correctly select the proper size piston, a cylinder bore gauge capable of reading in 0.003 mm (.0001 in.) increments is required.
5. Piston installation into the cylinder bore requires slightly more pressure than that required for non-coated pistons. The bonded coating on the piston will give the appearance of a line-to-line fit with the cylinder bore.



REMOVAL

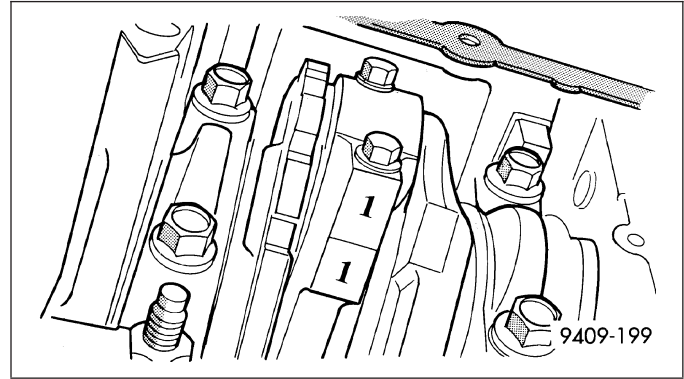
1. Disconnect negative cable from battery.
2. Remove the following components:
 - Oil pan and gasket/windage tray (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL).
 - Cylinder head covers (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL) and (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - REMOVAL).
 - Timing chain cover (Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - REMOVAL).
 - Cylinder head(s) (Refer to 9 - ENGINE/CYLINDER HEAD - REMOVAL) and (Refer to 9 - ENGINE/CYLINDER HEAD - REMOVAL).
3. If necessary, remove top ridge of cylinder bores with a reliable ridge reamer before removing pistons from cylinder block. **Be sure to keep tops of pistons covered during this operation.** Pistons and connecting rods must be removed from top of cylinder block. When removing piston and connecting rod assemblies from the engine, rotate crankshaft so the each connecting rod is centered in cylinder bore.

CAUTION: DO NOT use a number stamp or a punch to mark connecting rods or caps, as damage to connecting rods could occur

Note: Connecting rods and bearing caps are not interchangeable and should be marked before removing to ensure correct reassembly.

4. Mark connecting rod and bearing cap positions using a permanent ink marker or scribe tool.

CAUTION: Care must be taken not to damage the fractured rod and cap joint face surfaces, as engine damage may occur.



5. Remove connecting rod cap. Install Special Tool 8507 Connecting Rod Guides into the connecting rod being removed. Remove piston from cylinder bore. Repeat this procedure for each piston being removed.

CAUTION: Care must be taken not to nick crankshaft journals, as engine damage may occur

6. Immediately after piston and connecting rod removal, install bearing cap on the mating connecting rod to prevent damage to the fractured cap and rod surfaces.
7. Carefully remove piston rings from piston(s), starting from the top ring down.

CLEANING

CAUTION: DO NOT use a wire wheel or other abrasive cleaning device to clean the pistons or connecting rods. The pistons have a Moly coating, this coating must not be damaged.

1. Using a suitable cleaning solvent clean the pistons in warm water and towel dry.
2. Use a wood or plastic scraper to clean the ring land grooves.

CAUTION: DO NOT remove the piston pin from the piston and connecting rod assembly.

INSPECTION

Check the connecting rod journal for excessive wear, taper and scoring (Refer to 9 - ENGINE/ENGINE BLOCK/CONNECTING ROD BEARINGS - STANDARD PROCEDURE).

Check the connecting rod for signs of twist or bending.

Check the piston for taper and elliptical shape before it is fitted into the cylinder bore (Refer to 9 - ENGINE/ENGINE BLOCK/PISTON & CONNECTING ROD - STANDARD PROCEDURE).

Check the piston for scoring, or scraping marks in the piston skirts. Check the ring lands for cracks and/or deterioration.

INSTALLATION

1. Before installing piston and connecting rod assemblies into the bore, install the piston rings (Refer to 9 - ENGINE/ENGINE BLOCK/PISTON RINGS - STANDARD PROCEDURE).
2. Immerse the piston head and rings in clean engine oil. Position a ring compressor over the piston and rings. Tighten ring compressor. **Ensure position of rings do not change during this operation.**
3. Position bearing onto connecting rod. Lubricate bearing surface with clean engine oil.
4. Install Special Tool 8507 Connecting Rod Guides into connecting rod bolt threads.

5. The pistons are marked on the piston pin bore surface with an raised "F" or arrow on top of piston indicating installation position. This mark must be pointing toward the front of engine on both cylinder banks.
6. Wipe cylinder bore clean and lubricate with engine oil.
7. Rotate crankshaft until connecting rod journal is on the center of cylinder bore. Insert rod and piston into cylinder bore and carefully position connecting rod guides over crankshaft journal.
8. Tap piston down in cylinder bore using a hammer handle. While at the same time, guide connecting rod into position on rod journal.

CAUTION: Connecting Rod Bolts are Torque to Yield Bolts and Must Not Be Reused. Always replace the Rod Bolts whenever they are loosened or removed.

9. Lubricate rod bolts and bearing surfaces with engine oil. Install connecting rod cap and bearing. Tighten bolts to 21 N·m (15 ft. lbs.) plus a 90° turn.
10. Install the following components:
 - Cylinder head(s). (Refer to 9 - ENGINE/CYLINDER HEAD - INSTALLATION).
 - Cylinder head covers (Refer to 9 - ENGINE/CYLINDER HEAD/CYLINDER HEAD COVER(S) - INSTALLATION).
 - Install the intake manifold.
 - Oil pan and gasket/windage tray. (Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION).
11. Fill crankcase with proper engine oil to correct level.
12. Connect negative cable to battery.

RINGS-PISTON

STANDARD PROCEDURE - PISTON RING FITTING

Before reinstalling used rings or installing new rings, the ring clearances must be checked.

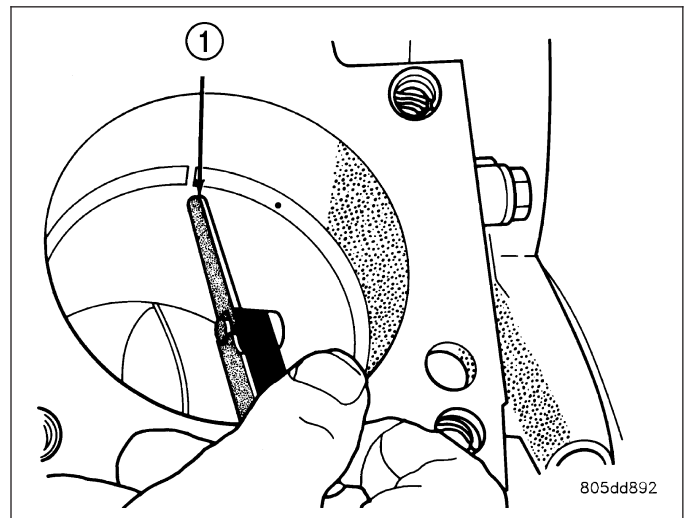
1. Wipe the cylinder bore clean.
2. Insert the ring in the cylinder bore.

Note: The ring gap measurement must be made with the ring positioned at least 12mm (0.50 inch.) from bottom of cylinder bore.

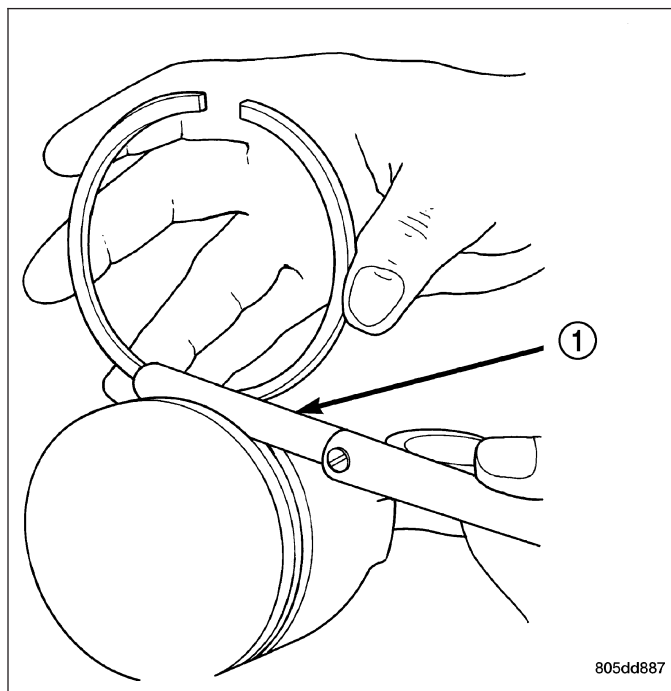
3. Using a piston, to ensure that the ring is squared in the cylinder bore, slide the ring downward into the cylinder.
4. Using a feeler gauge check the ring end gap. Replace any rings not within specification.

PISTON RING SIDE CLEARANCE

Note: Make sure the piston ring grooves are clean and free of nicks and burrs.



5. Measure the ring side clearance as shown make sure the feeler gauge fits snugly between the ring land and the ring. Replace any ring not within specification.
6. Rotate the ring around the piston, the ring must rotate in the groove with out binding.



PISTON RING SPECIFICATION CHART

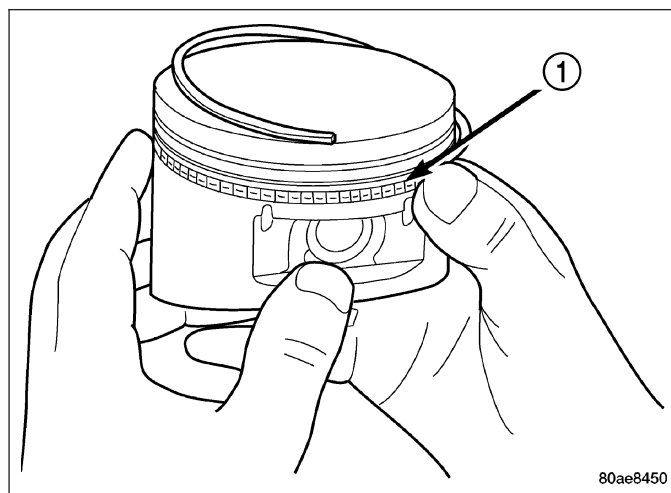
Ring Position	Groove Clearance	Maximum Clearance
Upper Ring	0.6715-.0.7105mm (0.0264- 0.0279 in.)	0.11mm (0.004 in.)
Intermediate Ring	0.5455-0.6245mm (0.0214-0.0245 in.)	0.10mm (0.004 in.)
Ring Position	Ring Gap	Wear Limit
Upper Ring	0.23-0.38mm (0.0090-0.0149 in.)	0.43mm (0.017 in.)
Intermediate Ring	0.35-0.60mm (0.0137-0.0236 in.)	0.74mm (0.029 in.)
Oil Control Ring (Steel Rail)	0.015-0.66mm (0.0059- 0.0259 in.)	1.55mm (0.061 in.)

7. The No. 1 and No. 2 piston rings have a different cross section. Ensure No. 2 ring is installed with manufacturers I.D. mark (Dot) facing up, towards top of the piston.

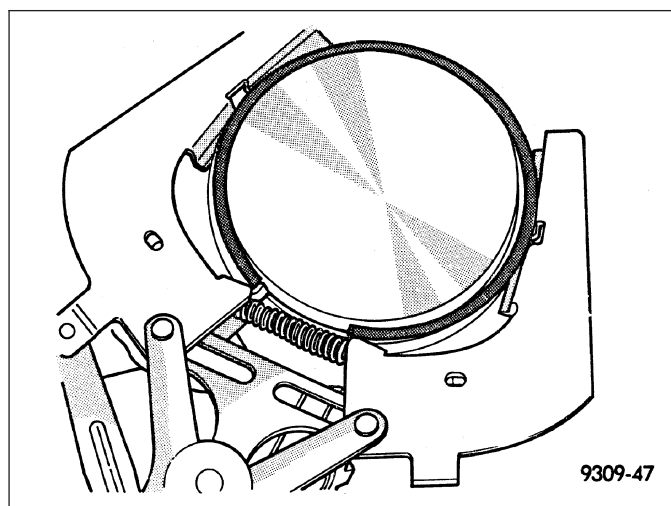
Note: Piston rings are installed in the following order:

- Oil ring expander.
- Lower oil ring side rail.
- Upper oil ring side rail.
- No. 2 Intermediate piston ring.
- No. 1 Upper piston ring.

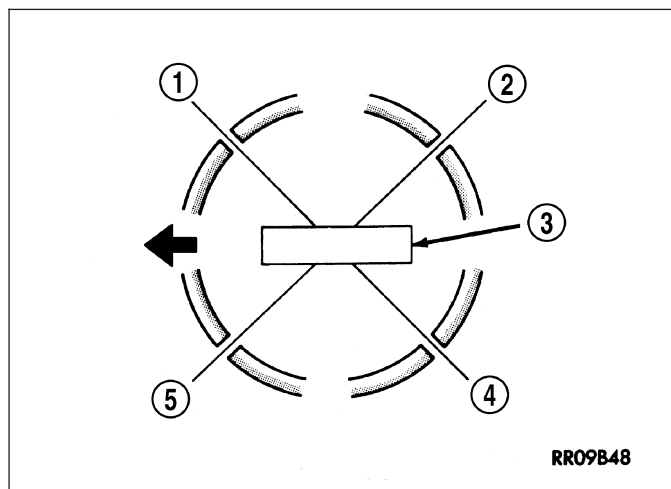
8. Install the oil ring expander.
9. Install upper side rail by placing one end between the piston ring groove and the expander ring. Hold end firmly and press down the portion to be installed until side rail is in position. Repeat this step for the lower side rail.



10. Install No. 2 intermediate piston ring using a piston ring installer.
11. Install No. 1 upper piston ring using a piston ring installer.



12. Position piston ring end gaps as shown in. It is important that expander ring gap is at least 45° from the side rail gaps, but not on the piston pin center or on the thrust direction.



DAMPER-CRANKSHAFT

REMOVAL

1. Disconnect negative cable from battery.
2. Remove accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - REMOVAL).
3. Drain cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
4. Remove radiator upper hose.
5. Remove upper fan shroud.
6. Using Special Tools 6958 Spanner with Adapter Pins 8346, loosen fan and viscous assembly from water pump.
7. Remove fan and viscous assembly.
8. Remove crankshaft damper bolt.
9. Remove damper using Special Tools 8513A Insert and 8454 Three Jaw Puller.

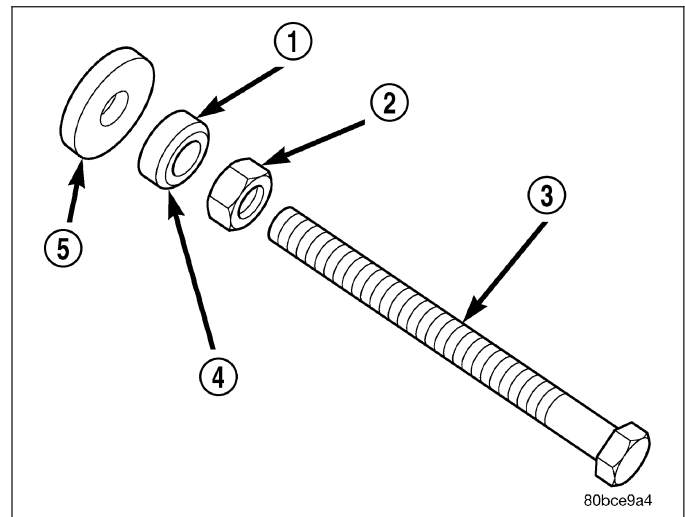
INSTALLATION

CAUTION: To prevent severe damage to the Crankshaft, Damper or Special Tool 8512-A, thoroughly clean the damper bore and the crankshaft nose before installing Damper.

1. Slide damper onto crankshaft slightly.

CAUTION: Special Tool 8512-A, is assembled in a specific sequence. Failure to assemble this tool in this sequence can result in tool failure and severe damage to either the tool or the crankshaft.

2. Assemble Special Tool 8512-A as follows, The nut is threaded onto the shaft first. Then the roller bearing is placed onto the threaded rod (The hardened bearing surface of the bearing **MUST** face the nut). Then the hardened washer slides onto the threaded rod. Once assembled coat the threaded rod's threads with Mopar® Nickel Anti-Seize or (Loctite No. 771).



3. Using Special Tool 8512-A, press damper onto crankshaft.
4. Install then tighten crankshaft damper bolt to 176 N·m (129 ft. lbs.).
5. Install fan blade assembly (Refer to 7 - COOLING/ENGINE/FAN DRIVE VISCOUS CLUTCH - INSTALLATION).
6. Install radiator upper shroud and tighten fasteners to 11 N·m (95 in. lbs.).
7. Install radiator upper hose.
8. Install accessory drive belt (Refer to 7 - COOLING/ACCESSORY DRIVE/DRIVE BELTS - INSTALLATION).

9. Refill cooling system (Refer to 7 - COOLING - STANDARD PROCEDURE).
10. Connect negative cable to battery.

COVER-STRUCTURAL

DESCRIPTION

The structural dust cover is made of die cast aluminum and joins the lower half of the transmission bell housing to the engine.

OPERATION

The structural cover provides additional powertrain stiffness and reduces noise and vibration.

REMOVAL

1. Raise vehicle on hoist.

CAUTION: On manual transmission vehicles, the 7/16 inch engine block to clutch housing bolts must be loosened before removal of the structural dust cover. Clutch housing distortion will occur if this procedure is not followed.

2. Remove the bolts retaining structural cover.
3. Remove the structural cover.

INSTALLATION

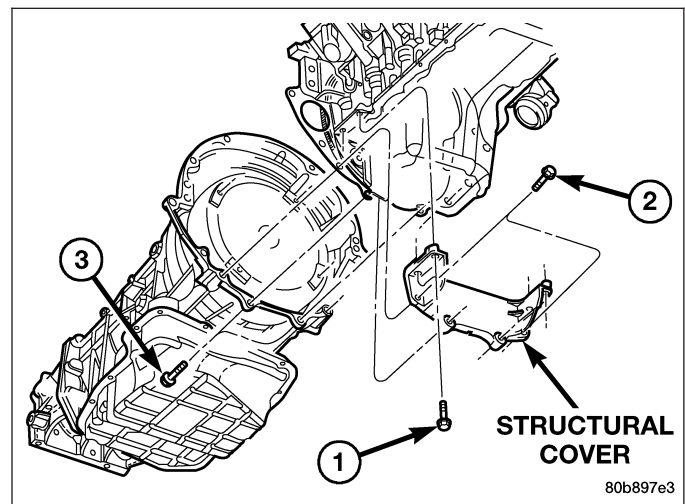
AUTOMATIC TRANSMISSION

CAUTION: The structural cover must be installed as described in the following steps. Failure to do so will cause severe damage to the cover.

1. Position the structural cover in the vehicle.
2. Install all four bolts retaining the cover-to-engine. DO NOT tighten the bolts at this time.
3. Install the four cover-to-transmission bolts. Do NOT tighten at this time.

CAUTION: The structural cover must be held tightly against both the engine and the transmission bell housing during tightening sequence. Failure to do so may cause damage to the cover.

4. Torque the (4) structural dust cover bolts that go into the transmission to 6-11 N·m (50-100 in.lbs.).
5. Torque the (4) structural dust cover bolts that go into the engine block to 6-11 N·m (50-100 in.lbs.).
6. Starting with the two rear cover-to-engine bolts, tighten bolts (1) to 54 N·m (40 ft. lbs.), then tighten bolts (2) and (3) to 54 N·m (40 ft. lbs.) in the sequence shown.



7. Install the exhaust pipe on left hand exhaust manifold.
8. Tighten exhaust manifold-to-exhaust pipe retaining bolts to 20–26 N·m (15–20 ft. lbs.).

MANUAL TRANSMISSION

CAUTION: The 7/16 inch engine block to clutch housing bolts must be loosened before removal/installation of the structural dust cover. Clutch housing distortion will occur if this procedure is not followed.

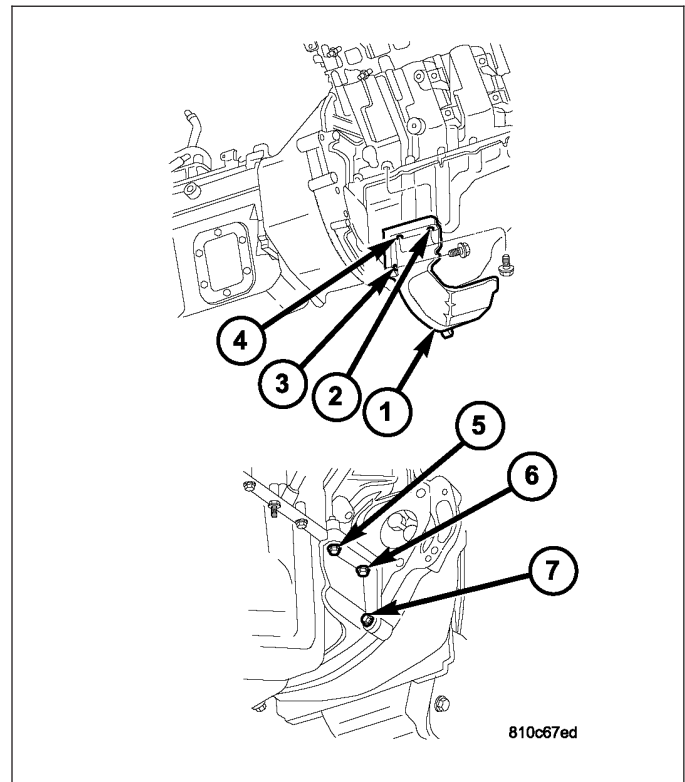
1. Position the structural cover in the vehicle.

CAUTION: The structural cover must be installed as described in the following steps. Failure to do so will cause severe damage to the cover, and engine noise.

2. Install all bolts retaining the cover-to-engine. DO NOT tighten the bolts at this time.
3. Install the cover-to-transmission bolts. Do NOT tighten at this time.

CAUTION: The structural cover must be held tightly against the corner formed by the engine and the transmission clutch housing during tightening sequence. Failure to do so may cause damage to the cover and engine noise.

4. Torque the (2) structural dust cover bolts that go into the clutch housing to 6-11 N·m (50-100 in.lbs.).
5. Torque the (4) structural dust cover bolts that go into the engine block to 6-11 N·m (50-100 in.lbs.).
6. Torque the structural cover bolt that is closest to the rear face of block on the passenger side of block to 54 N·m (40 ft. lbs.).
7. Torque the structural cover bolt that is closest to the front face of block on the drivers side to 54 N·m (40 ft. lbs.).
8. Torque the remaining (2) structural cover bolts that go into the **block** in an "X" pattern to 54 N·m (40 ft. lbs.).
9. Torque the structural cover bolts that go into the **clutch housing** to 54 N·m (40 ft. lbs.).
10. Torque the 7/16 inch engine block to clutch housing bolts to 68 N·m (50 ft. lbs.).



ENGINE MOUNTING-FRONT

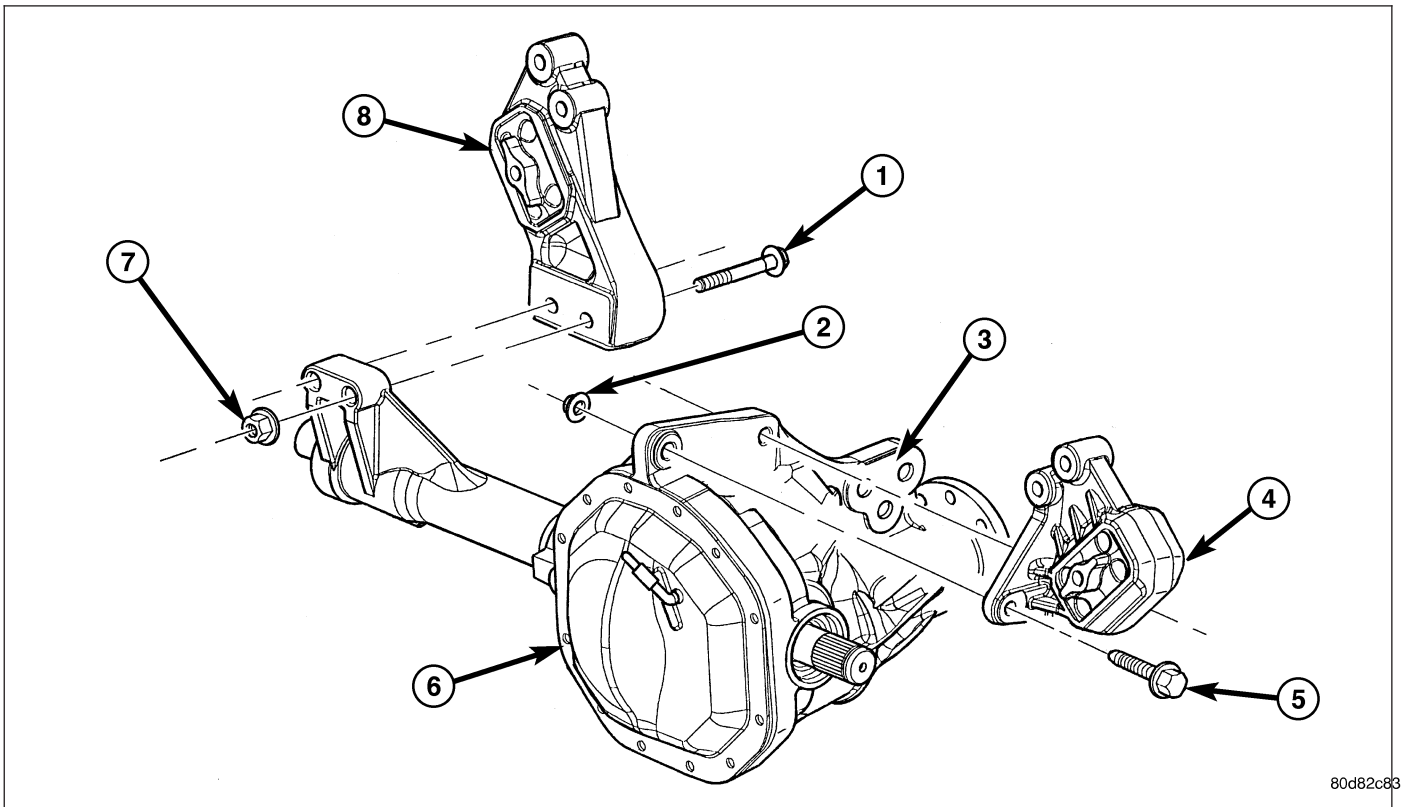
REMOVAL

2WD

1. Disconnect negative battery cable.
2. Raise vehicle.
3. Remove engine mount through bolts.
4. Raise engine using engine support fixture special tool # 8534.
5. Remove engine mount to insulator bolts.
6. Remove insulator from engine.

4WD

1. Disconnect the negative cable from the battery.
2. Raise the vehicle.
3. Remove the skid plate.
4. Remove the front crossmember(Refer to 13 - FRAME & BUMPERS/FRAME/FRONT CROSSMEMBER - REMOVAL).
5. Remove the engine oil filter.
6. Support the engine using engine support fixture, special tool # 8534.
7. Support the front axle with a suitable jack.
8. Remove the (4) bolts that attach the engine mounts to the front axle.



9. Remove the (3) bolts that attach the front axle to the left engine bracket.
10. Lower the front axle.
11. Remove the (6) through bolts
12. Raise the engine far enough to be able to remove the left and right engine mounts.
13. Remove the engine mounts.

INSTALLATION**2WD**

1. Install insulator on the engine.

Note: For mount to engine block and left engine bracket to front axle bolts, apply Mopar® Lock and Seal Adhesive, Medium Strength Threadlocker.

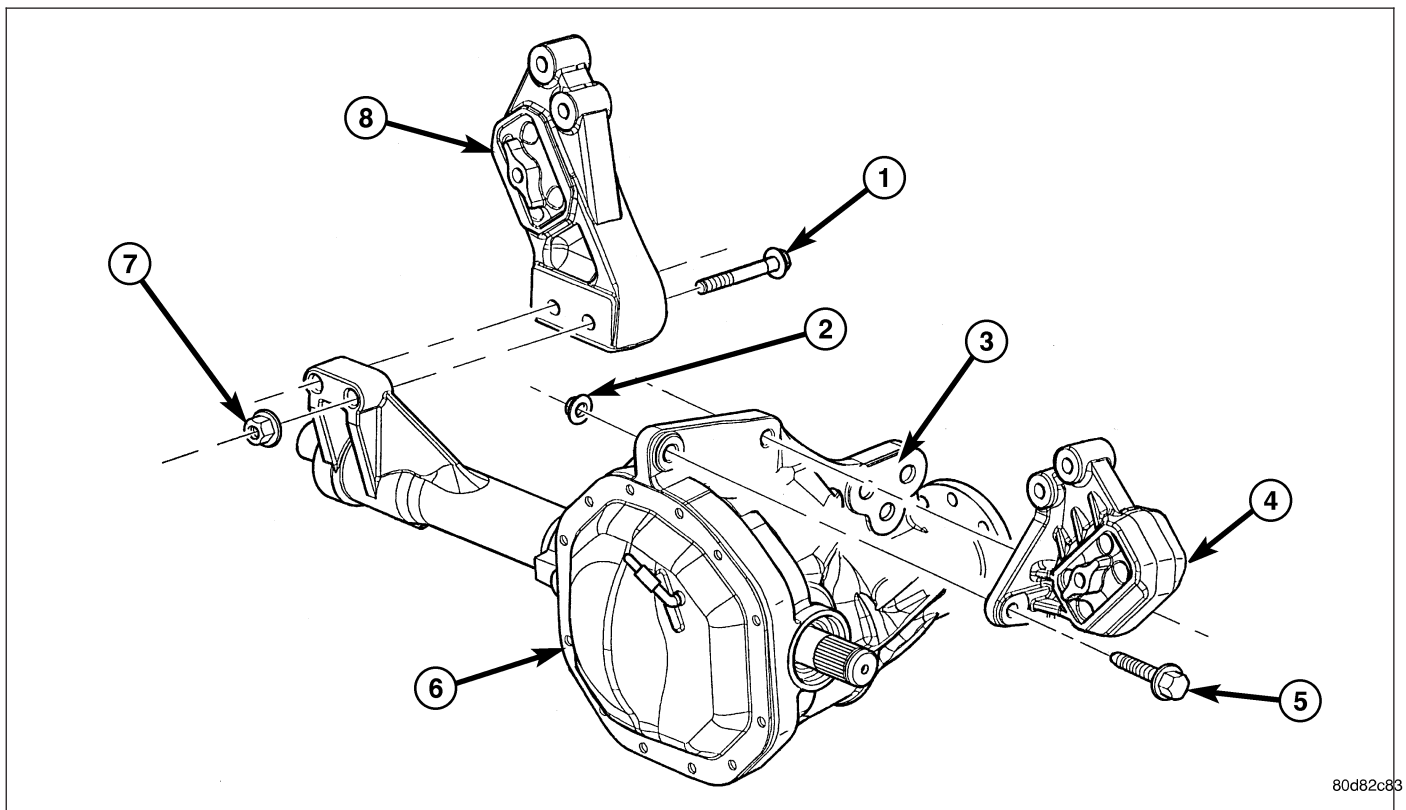
2. Install upper and lower mount mounting bolts. Tighten bolts to 61 N·m (45 ft. lbs.).
3. Lower the engine using engine support fixture special tool # 8534.
4. Install mount through bolts.

5. Tighten through bolts on both sides to 61 N·m (45 ft. lbs.).
6. Lower vehicle.
7. Connect negative battery cable.

4WD

Note: For mount to engine block and left engine bracket to front axle bolts, apply Mopar® Lock and Seal Adhesive, Medium Strength Threadlocker.

1. Install the right and left side engine mounts to the front axle. Torque nuts to 94 N·m (70 ft. lbs.).
2. Raise the front axle into the frame and install the left and right side through bolts. Torque nuts to 94 N·m (70 ft. lbs.).
3. Insert the two upper through bolts into the right and left side engine mounts and loose assemble the two nuts onto the through bolts.
4. Lower the engine using engine support fixture special tool # 8534, until the left and right side engine brackets rest on the through bolts, and the lower engine bracket through holes align with the engine mounts, and the left engine bracket holes align with the front axle slots.

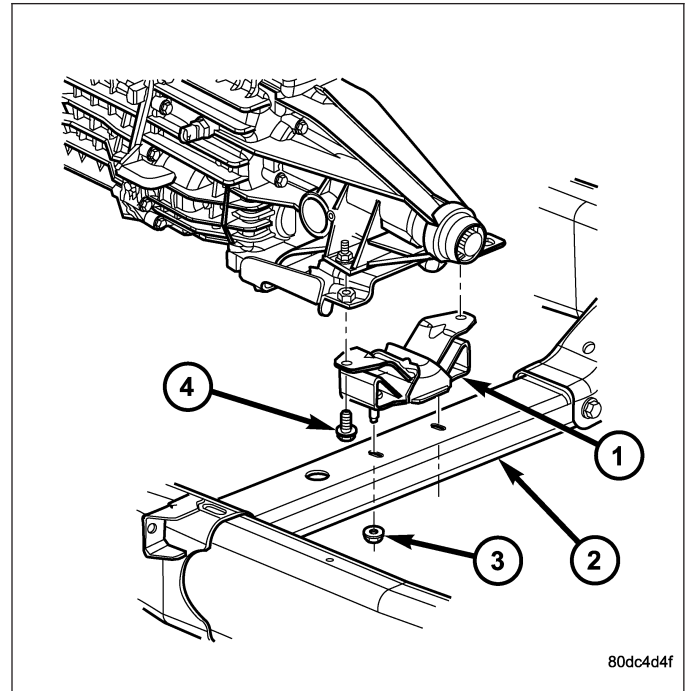


5. Loose assemble the (3) bolts that attach the front axle to the left engine bracket.
6. Loose assemble the lower through bolts.
7. Torque the nuts for the (4) through bolts to 101 N·m (75 ft. lbs.).
8. Torque the (3) bolts that attach the front axle to the left engine bracket to 101 N·m (75 ft. lbs.).
9. Install the engine oil filter, if removed.
10. Install the front crossmember(Refer to 13 - FRAME & BUMPERS/FRAME/FRONT CROSSMEMBER - INSTALLATION).
11. Install the skid plate.
12. Lower the vehicle.
13. Reconnect the negative battery cable.

ENGINE MOUNTING-REAR

REMOVAL

1. Raise the vehicle on a hoist.
2. Using a suitable jack, support transmission.
3. Remove the nuts from the transmission mount.
4. Remove the bolts that attach the transmission mount to the engine bracket.
5. Raise the transmission enough to remove the mount from the crossmember.
6. Remove the mount.



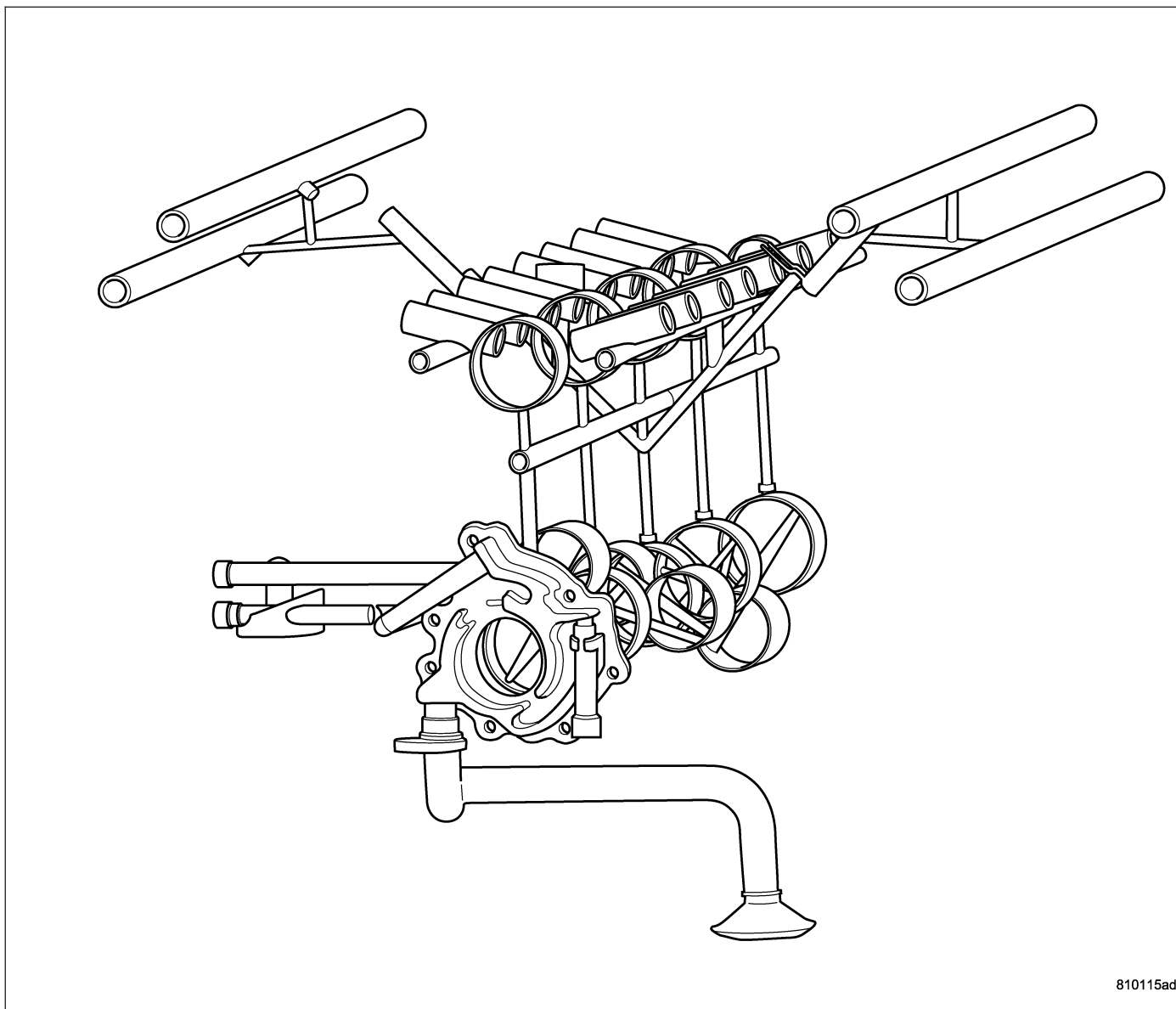
INSTALLATION

Note: Threadlocking compound must be applied to the bolts before installation.

1. Install the two bolts that attach the transmission mount to the transmission bracket.
2. Torque the bolts to 61N·m (45 ft.lbs.) torque.
3. Lower the transmission so the transmission mount rests on the crossmember, and the studs of the transmission mount are aligned in the slots in the crossmember.
4. Install the nuts onto the transmission mount studs through the crossmember access slot.
5. Torque the nuts to 54N·m (40 ft. lbs.).

LUBRICATION

DESCRIPTION



The lubrication system is a full flow filtration pressure feed type.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - CHECKING ENGINE OIL PRESSURE

1. Remove oil pressure sending unit and install gauge assembly C-3292.
2. Run engine until thermostat opens.
3. Oil Pressure:
 - Curb Idle—25 kPa (4 psi) minimum
 - 3000 rpm—170 - 758 kPa (25 - 110 psi)
4. If oil pressure is 0 at idle, shut off engine. Check for a clogged oil pick-up screen or a pressure relief valve stuck open.

DIAGNOSIS AND TESTING - ENGINE OIL LEAK

Begin with a thorough visual inspection of the engine, particularly at the area of the suspected leak. If an oil leak source is not readily identifiable, the following steps should be followed:

1. Do not clean or degrease the engine at this time because some solvents may cause rubber to swell, temporarily stopping the leak.
2. Add an oil soluble dye (use as recommended by manufacturer). Start the engine and let idle for approximately 15 minutes. Check the oil dipstick to make sure the dye is thoroughly mixed as indicated with a bright yellow color under a black light.
3. Using a black light, inspect the entire engine for fluorescent dye, particularly at the suspected area of oil leak. If the oil leak is found and identified, repair per service manual instructions.
4. If dye is not observed, drive the vehicle at various speeds for approximately 24 km (15 miles), and repeat inspection. **If the oil leak source is not positively identified at this time**, proceed with the air leak detection test method.

Air Leak Detection Test Method

1. Remove the PCV valve from the IAFM. Cap or plug the PCV valve grommet.
2. Attach an air hose with pressure gauge and regulator to the dipstick tube.

CAUTION: Do not subject the engine assembly to more than 20.6 kPa (3 PSI) of test pressure.

3. Gradually apply air pressure from 1 psi to 2.5 psi maximum while applying soapy water at the suspected source. Adjust the regulator to the suitable test pressure that provide the best bubbles which will pinpoint the leak source. If the oil leak is detected and identified, repair per service manual procedures.
4. If the leakage occurs at the rear oil seal area, refer to the section, Inspection for Rear Seal Area Leak.
5. If no leaks are detected, turn off the air supply and remove the air hose and all plugs and caps. Install the PCV valve.
6. Clean the oil off the suspect oil leak area using a suitable solvent. Drive the vehicle at various speeds approximately 24 km (15 miles). Inspect the engine for signs of an oil leak by using a black light.

INSPECTION FOR REAR SEAL AREA LEAKS

Since it is sometimes difficult to determine the source of an oil leak in the rear seal area of the engine, a more involved inspection is necessary. The following steps should be followed to help pinpoint the source of the leak.

If the leakage occurs at the crankshaft rear oil seal area:

1. Disconnect the battery.
2. Raise the vehicle.
3. Remove torque converter or clutch housing cover and inspect rear of block for evidence of oil. Use a black light to check for the oil leak:
 - a. Circular spray pattern generally indicates seal leakage or crankshaft damage.
 - b. Where leakage tends to run straight down, possible causes are a porous block, distributor seal, camshaft bore cup plugs oil galley pipe plugs, oil filter runoff, and main bearing cap to cylinder block mating surfaces.
4. If no leaks are detected, pressurize the crankcase as outlined in the, Inspection (Engine oil Leaks in general)

CAUTION: Do not exceed 20.6 kPa (3 psi).

5. If the leak is not detected, very slowly turn the crankshaft and watch for leakage. If a leak is detected between the crankshaft and seal while slowly turning the crankshaft, it is possible the crankshaft seal surface is damaged. The seal area on the crankshaft could have minor nicks or scratches that can be polished out with emery cloth.

CAUTION: Use extreme caution when crankshaft polishing is necessary to remove minor nicks and scratches. The crankshaft seal flange is especially machined to complement the function of the rear oil seal.

6. For bubbles that remain steady with shaft rotation, no further inspection can be done until disassembled.

OIL

STANDARD PROCEDURE - ENGINE OIL SERVICE

WARNING: NEW OR USED ENGINE OIL CAN BE IRRITATING TO THE SKIN. AVOID PROLONGED OR REPEATED SKIN CONTACT WITH ENGINE OIL. CONTAMINANTS IN USED ENGINE OIL, CAUSED BY INTERNAL COMBUSTION, CAN BE HAZARDOUS TO YOUR HEALTH. THOROUGHLY WASH EXPOSED SKIN WITH SOAP AND WATER. DO NOT WASH SKIN WITH GASOLINE, DIESEL FUEL, THINNER, OR SOLVENTS, HEALTH PROBLEMS CAN RESULT. DO NOT POLLUTE, DISPOSE OF USED ENGINE OIL PROPERLY.

ENGINE OIL SPECIFICATION

CAUTION: Do not use non-detergent or straight mineral oil when adding or changing crankcase lubricant. Engine failure can result.

API SERVICE GRADE CERTIFIED

Use an engine oil that is API Service Grade Certified. MOPAR® provides engine oils that conform to this service grade.

SAE VISCOSITY

An SAE viscosity grade is used to specify the viscosity of engine oil. Use only engine oils with multiple viscosities such as 5W-30 in the 5.7L engines. These are specified with a dual SAE viscosity grade which indicates the cold-to-hot temperature viscosity range. Select an engine oil that is best suited to your particular temperature range and variation.

ENERGY CONSERVING OIL

An Energy Conserving type oil is recommended for gasoline engines. The designation of ENERGY CONSERVING is located on the label of an engine oil container.

CONTAINER IDENTIFICATION

Standard engine oil identification notations have been adopted to aid in the proper selection of engine oil. The identifying notations are located on the label of engine oil plastic bottles and the top of engine oil cans.



9400-9

OIL LEVEL INDICATOR (DIPSTICK)

The engine oil level indicator is located at the left hand of the engine on the 5.7L engines.

CRANKCASE OIL LEVEL INSPECTION

CAUTION: Do not overfill crankcase with engine oil, pressure loss or oil foaming can result.

Inspect engine oil level approximately every 800 kilometers (500 miles). Unless the engine has exhibited loss of oil pressure, run the engine for about ten minutes before checking oil level. Checking engine oil level on a cold engine is not accurate.

To ensure proper lubrication of an engine, the engine oil must be maintained at an acceptable level. The acceptable levels are indicated between the ADD and SAFE marks on the engine oil dipstick.

1. Position vehicle on level surface.
2. With engine OFF, allow approximately five minutes for oil to settle to bottom of crankcase, remove engine oil dipstick.
3. Wipe dipstick clean.
4. Install dipstick and verify it is seated in the tube.
5. Remove dipstick, with handle held above the tip, take oil level reading.
6. Add oil only if level is below the ADD mark on dipstick.

ENGINE OIL CHANGE

Change engine oil at mileage and time intervals described in Maintenance Schedules(Refer to LUBRICATION & MAINTENANCE/MAINTENANCE SCHEDULES - DESCRIPTION).

Run engine until achieving normal operating temperature.

1. Position the vehicle on a level surface and turn engine off.
2. Hoist and support vehicle on safety stands.
3. Remove oil fill cap.
4. Place a suitable drain pan under crankcase drain.
5. Remove drain plug from crankcase and allow oil to drain into pan. Inspect drain plug threads for stretching or other damage. Replace drain plug if damaged.
6. Install drain plug in crankcase. Torque to 34 N·m (25 ft. lbs.).
7. Lower vehicle and fill crankcase with specified type and amount of engine oil described in this section.
8. Install oil fill cap.
9. Start engine and inspect for leaks.
10. Stop engine and inspect oil level.

USED ENGINE OIL DISPOSAL

Care should be exercised when disposing used engine oil after it has been drained from a vehicle engine. Refer to the WARNING at beginning of this section.

FILTER-ENGINE OIL

REMOVAL

All engines are equipped with a high quality full-flow, disposable type oil filter. DaimlerChrysler Corporation recommends a Mopar® or equivalent oil filter be used.

1. Position a drain pan under the oil filter.
2. Using a suitable oil filter wrench loosen filter.
3. Rotate the oil filter counterclockwise to remove it from the cylinder block oil filter boss.
4. When filter separates from cylinder block oil filter boss, tip gasket end upward to minimize oil spill. Remove filter from vehicle.

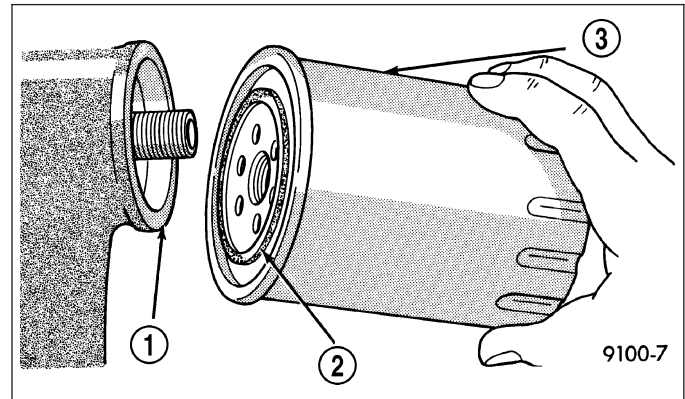
Note: Make sure filter gasket was removed with filter.

5. With a wiping cloth, clean the gasket sealing surface of oil and grime.

INSTALLATION

1. Lightly lubricate oil filter gasket with engine oil.

2. Thread filter onto adapter nipple. When gasket makes contact with sealing surface, hand tighten filter one half turn, or 180°, do not over tighten.



3. Add oil, verify crankcase oil level and start engine. Inspect for oil leaks.

PAN-ENGINE OIL

REMOVAL

4X2

1. Disconnect the negative battery cable.
2. Loosen both left and right side engine mount through bolts. Do not remove bolts.
3. Install engine support fixture special tool # 8534. **Do not raise engine at this time.**
4. Remove the structural dust cover, if equipped.
5. Remove fan and fan shroud.
6. Drain engine oil.
7. Remove the front crossmember (Refer to 13 - FRAME & BUMPERS/FRAME/FRONT CROSSMEMBER - REMOVAL).
8. Raise engine using special tool # 8534 to provide clearance to remove oil pan.

Note: Do not pry on oil pan or oil pan gasket. Gasket is integral to engine windage tray and does not come out with oil pan.

Note: If more clearance is needed to remove oil pan, the transmission mount can be removed, and the transmission raised to gain clearance.

9. Remove the oil pan mounting bolts and oil pan.
10. Unbolt oil pump pickup tube and remove tube.
11. Inspect the integral windage tray and gasket and replace as needed.

4X4

1. Follow all steps for 4X2 removal.
2. Unbolt and lower the steering rack, without disconnecting the lines.

Note: The front axle must be lowered to remove the oil pan on 4X4 vehicles.

3. Remove the front driveshaft at the axle. Mark for reassembly.
4. Support the front axle.
5. Remove the right and left axle to mount, bolts.
6. Lower axle.
7. Remove the oil pan mounting bolts and oil pan.

8. Unbolt oil pump pickup tube and remove tube.
9. Inspect the integral windage tray and gasket and replace as needed.

INSTALLATION

1. Clean the oil pan gasket mating surface of the block and oil pan.
2. Inspect the integral windage tray and gasket and replace as needed.
3. Reinstall the oil pump pickup tube with new o-ring. Tighten tube to pump fasteners to 28 N·m (250 in. lbs.).

Note: The double ended oil pan studs must be installed in the same location that they were removed from.

4. Position the oil pan and install the mounting bolts and studs.. Tighten the mounting bolts to 12 N·m (105 in.lbs.).
5. Lower the engine into mounts using special tool # 8534.
6. Install both the left and right side engine mount through bolts. Tighten the nuts to 68 N·m (50 ft. lbs.).
7. Reinstall the front axle, if removed.
8. Install the steering rack, if removed.
9. Install the rear transmission mount, if removed.
10. Remove special tool # 8534.
11. Install the front crossmember(Refer to 13 - FRAME & BUMPERS/FRAME/FRONT CROSSMEMBER - INSTALLATION).
12. Install the fan shroud and fan.
13. Fill engine oil.
14. Reconnect the negative battery cable.
15. Start engine and check for leaks.

PUMP-ENGINE OIL

REMOVAL

1. Remove the oil pan and pick-up tube(Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL).
2. Remove the timing chain cover(Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - REMOVAL).
3. Remove the four bolts, and the oil pump.

CLEANING

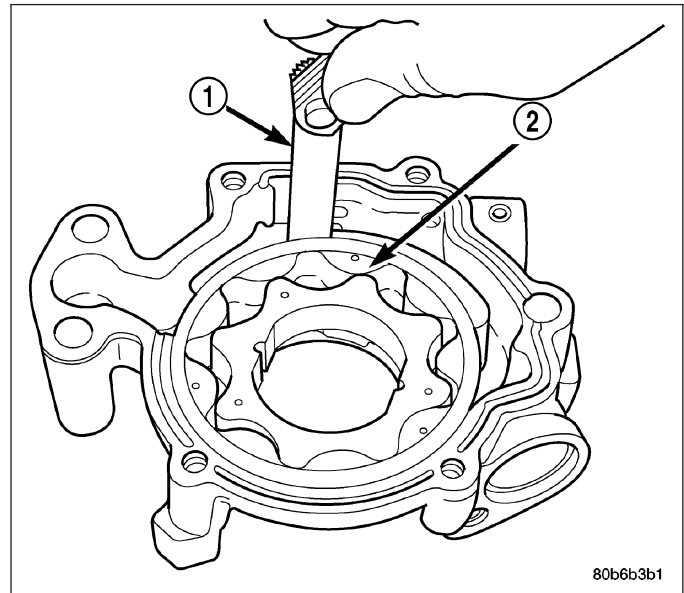
1. Wash all parts in a suitable solvent.

INSPECTION

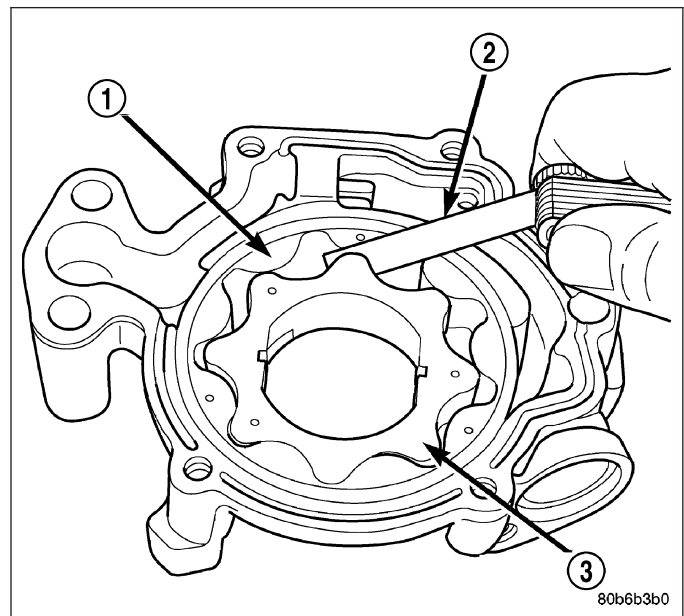
CAUTION: Oil pump pressure relief valve and spring should not be removed from the oil pump. If these components are disassembled and or removed from the pump the entire oil pump assembly must be replaced.

1. Remove the pump cover.
2. Clean all parts thoroughly. Mating surface of the oil pump housing should be smooth. If the pump cover is scratched or grooved the oil pump assembly should be replaced.

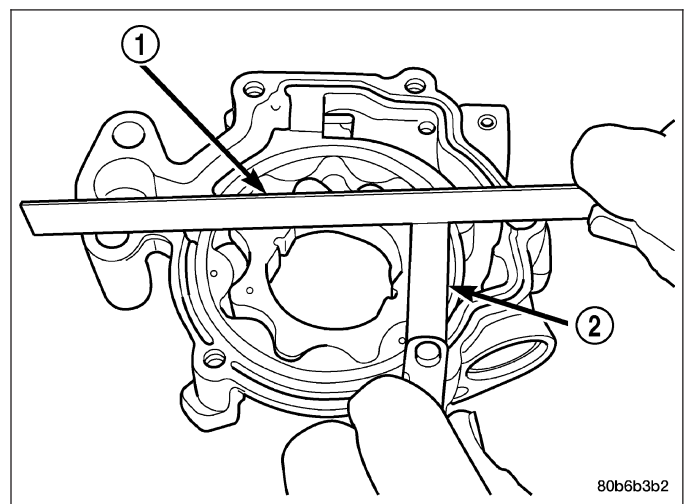
3. Slide outer rotor into the body of the oil pump. Press the outer rotor to one side of the oil pump body and measure clearance between the outer rotor and the body. If the measurement is 0.235mm (0.009 in.) or more the oil pump assembly must be replaced.



4. Install the inner rotor in the into the oil pump body. Measure the clearance between the inner and outer rotors. If the clearance between the rotors is .150 mm (0.006 in.) or more the oil pump assembly must be replaced.



5. Place a straight edge across the body of the oil pump (between the bolt holes), if a feeler gauge of .095 mm (0.0038 in.) or greater can be inserted between the straightedge and the rotors, the pump must be replaced.



6. Reinstall the pump cover. Torque fasteners to 15 N·m (132 in. lbs.).

Note: The 5.7 Oil pump is released as an assembly. There are no DaimlerChrysler part numbers for Sub-Assembly components. In the event the oil pump is not functioning or out of specification it must be replaced as an assembly.

INSTALLATION

1. Position the oil pump onto the crankshaft and install the 4 oil pump retaining bolts.
2. Tighten the oil pump retaining bolts to 28 N·m (250 in. lbs.).
3. Install the timing chain cover(Refer to 9 - ENGINE/VALVE TIMING/TIMING BELT / CHAIN COVER(S) - INSTALLATION).
4. Install the pick-up tube and oil pan(Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION).

INTAKE MANIFOLD

DESCRIPTION

The intake manifold is made of a composite material and features long runners which maximizes low end torque. The intake manifold uses single plane sealing which consist of eight individual press in place port gaskets to prevent leaks.

DIAGNOSIS AND TESTING - INTAKE MANIFOLD LEAKAGE

An intake manifold air leak is characterized by lower than normal manifold vacuum. Also, one or more cylinders may not be functioning.

WARNING: USE EXTREME CAUTION WHEN THE ENGINE IS OPERATING. DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR THE FAN. DO NOT WEAR LOOSE CLOTHING.

1. Start the engine.
2. Spray a small stream of water at the suspected leak area.
3. If a change in RPM is observed the area of the suspected leak has been found.
4. Repair as required.

REMOVAL

1. Disconnect negative cable from battery.
2. Remove the wiper module (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WIPER MODULE - REMOVAL).
3. Remove resonator assembly and air inlet hose.
4. Disconnect electrical connectors for the following components:
 - Manifold Absolute Pressure (MAP) Sensor
 - Intake Air Temperature (IAT) Sensor
 - Throttle Position (TPS) Sensor
 - Coolant Temperature (CTS) Sensor
5. Disconnect brake booster hose and positive crankcase ventilation (PCV) hose.
6. Remove generator and set aside.

Note: It is not necessary to remove lines or remove freon from A/C compressor.

7. Remove air conditioning compressor and set aside..
8. Bleed fuel system (Refer to 14 - FUEL SYSTEM/FUEL DELIVERY - STANDARD PROCEDURE).
9. Remove intake manifold retaining fasteners in a crisscross pattern starting from the outside bolts and ending at the middle bolts.
10. Remove intake manifold and IAFM as an assembly.

CLEANING

Note: There is **NO** approved repair procedure for the intake manifold. If severe damage is found during inspection, the intake manifold must be replaced.

Before installing the intake manifold thoroughly clean the mating surfaces. Use a suitable cleaning solvent, then air dry.

INSPECTION

1. Inspect the intake sealing surface for cracks, nicks and distortion.
2. Inspect the intake manifold vacuum hose fittings for looseness or blockage.
3. Inspect the manifold to throttle body mating surface for cracks, nicks and distortion.

INSTALLATION

1. Install intake manifold seals.
2. Position intake manifold and IAFM.
3. Install intake manifold retaining bolts, and tighten in sequence from the middle bolts towards the outside in a crisscross pattern. Torque fasteners to 12 N·m (105 in. lbs.).
4. Connect electrical connectors for the following components:
 - Manifold Absolute Pressure (MAP) Sensor
 - Intake Air Temperature (IAT) Sensor
 - Throttle Position (TPS) Sensor
 - Coolant Temperature (CTS) Sensor
 - Idle Air Control (IAC) Motor
5. Install generator.
6. Install A/C compressor.
7. Connect Brake booster hose and Positive crankcase ventilation (PCV) hose.
8. Install the wiper module (Refer to 8 - ELECTRICAL/WIPERS/WASHERS/WIPER MODULE - INSTALLATION).
9. Install resonator assembly and air inlet hose.
10. Connect negative cable to battery.

EXHAUST MANIFOLD

DESCRIPTION

The exhaust manifolds are log style with a patented flow enhancing design to maximize performance. The exhaust manifolds are made of high silicon molybdenum cast iron. A perforated core graphite exhaust manifold gasket is used to improve sealing to the cylinder head. The exhaust manifolds are covered by a three layer laminated heat shield for thermal protection and noise reduction. The heat shields are fastened with a torque prevailing nut that is backed off slightly to allow for the thermal expansion of the exhaust manifold.

OPERATION

The exhaust manifolds collect the engine exhaust exiting the combustion chambers, then channels the exhaust gases to the exhaust pipes attached to the manifolds.

REMOVAL

EXHAUST MANIFOLD

1. Disconnect negative battery cable.
2. Raise vehicle.

3. Remove exhaust pipe to manifold bolts.
4. Lower vehicle.
5. Install engine support fixture special tool #8534.
6. Raise engine enough to remove manifolds.

CAUTION: Do not damage engine harness while raising the engine.

7. Remove heat shield.
8. Remove manifold bolts.
9. Remove manifold and gasket.

CLEANING

Clean mating surfaces on cylinder head and manifold. Wash with solvent and blow dry with compressed air.

INSPECTION

Inspect manifold for cracks.

Inspect mating surfaces of manifold for flatness with a straight edge. Gasket surfaces must be flat within 0.2 mm per 300 mm (0.008 inch per foot).

INSTALLATION

EXHAUST MANIFOLD

1. Install manifold gasket and manifold.
2. Install manifold bolts and tighten to 25 N·m (18 ft. lbs.).
3. Install heat shield and tighten nuts to 15 N·m (11 ft. lbs.).
4. Lower engine.

CAUTION: Do not damage engine harness while lowering the engine.

5. Remove engine support fixture from engine.
6. Raise vehicle.
7. Tighten right and left side engine mount through bolts.
8. Install exhaust flange to pipe bolts.
9. Lower vehicle.
10. Connect negative battery cable.

COVER-TIMING CASE

REMOVAL

1. Disconnect the battery negative cable.
2. Remove air cleaner assembly.
3. Drain cooling system.
4. Remove accessory drive belt.
5. Remove fan and fan drive assembly (Refer to 7 - COOLING/ENGINE/FAN DRIVE VISCOUS CLUTCH - REMOVAL).
6. Remove coolant bottle and washer bottle.
7. Remove fan shroud.

Note: It is not necessary to disconnect A/C lines or discharge freon.

8. Remove A/C compressor and set aside.
9. Remove the generator.
10. Remove upper radiator hose.
11. Disconnect both heater hoses at timing cover.
12. Disconnect lower radiator hose at engine.
13. Remove accessory drive belt tensioner and both idler pulleys.
14. Remove crankshaft damper(Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - REMOVAL).

Note: Do not remove the hoses from the power steering pump.

15. Remove power steering pump and set aside.
16. Remove the dipstick support bolt.
17. Drain the engine oil.
18. Remove the oil pan and pick up tube(Refer to 9 - ENGINE/LUBRICATION/OIL PAN - REMOVAL).

Note: It is not necessary to remove water pump for timing cover removal.

19. Remove timing cover bolts and remove cover.

INSTALLATION

1. Clean timing chain cover and block surface.

Note: Always install a new gasket on timing cover.

2. Install cover and new gasket. Tighten fasteners to 28 N·m (250 in. lbs.).

Note: The large lifting stud is torqued to 55 N·m (40 ft. lbs.).

3. Install the oil pan and pick up tube(Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION).
4. Install the A/C compressor.
5. Install the generator.
6. Install power steering pump.
7. Install the dipstick support bolt.
8. Install the thermostat housing.
9. Install crankshaft damper(Refer to 9 - ENGINE/ENGINE BLOCK/VIBRATION DAMPER - INSTALLATION).
10. Install accessory drive belt tensioner assembly and both idler pulleys.
11. Install radiator lower hose.
12. Install both heater hoses.
13. Install radiator fan shroud.
14. Install the fan and fan drive assembly
15. Install the accessory drive belt.
16. Install the coolant bottle and washer bottle.
17. Install the upper radiator hose.
18. Install the air cleaner assembly.
19. Fill cooling system.
20. Refill engine oil.
21. Connect the battery negative cable.

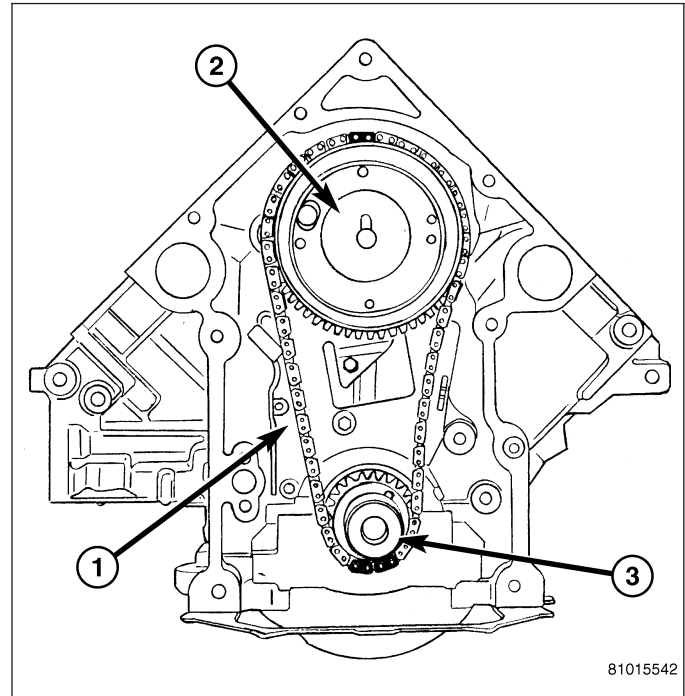
TIMING/CHAIN AND SPROCKETS

REMOVAL

1. Disconnect battery negative cable.
2. Drain cooling system.
3. Remove Timing Chain Cover.

CAUTION: The camshaft pin and the slot in the cam sprocket must be clocked at 12:00. The crankshaft keyway must be clocked at 2:00. The crankshaft sprocket must be installed so that the dots and or paint marking is at 6:00.

4. Re-install the vibration damper bolt finger tight. Using a suitable socket and breaker bar, rotate the crankshaft to align timing chain sprockets and keyways as shown.



5. Retract tensioner shoe until hole in shoe lines up with hole in bracket. Slide a suitable pin into the holes.
6. Remove camshaft sprocket attaching bolt and remove timing chain with crankshaft and camshaft sprockets.
7. If tensioner assembly is to be replaced, remove the tensioner to block bolts and remove tensioner assembly.

INSTALLATION

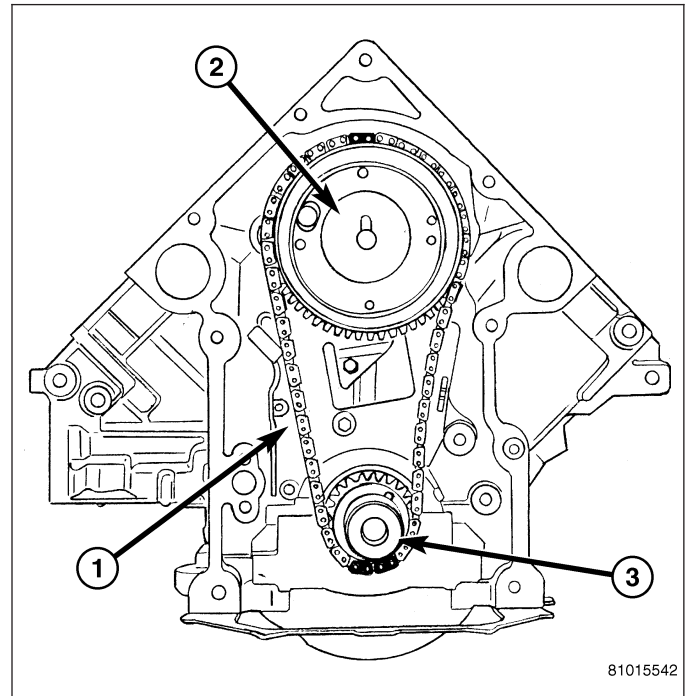
1. If tensioner assembly is being replaced, install tensioner and mounting bolts. Torque bolts to 28 N·m (250 in. lbs.).
2. Retract tensioner if required.

CAUTION: The camshaft pin and the slot in the cam sprocket must be clocked at 12:00. The crankshaft keyway must be clocked at 2:00. The crankshaft sprocket must be installed so that the dots and or paint marking is at 6:00.

3. Place both camshaft sprocket and crankshaft sprocket on the bench with timing marks on exact imaginary center line through both camshaft and crankshaft bores.

CAUTION: The timing chain must be installed with the single plated link aligned with the dot and or paint marking on the camshaft sprocket. The crankshaft sprocket is aligned with the dot and or paint marking on the sprocket between two plated timing chain links.

4. Place timing chain around both sprockets.
5. Lift sprockets and chain (keep sprockets tight against the chain in position as shown).
6. Slide both sprockets evenly over their respective shafts and check alignment of timing marks.



7. Install the camshaft bolt. Tighten the bolt to 122 N·m (90 ft. lbs.) torque.
8. **Remove tensioner pin.** Again, verify alignment of timing marks.
9. Install the oil pump(Refer to 9 - ENGINE/LUBRICATION/OIL PUMP - INSTALLATION).
10. Install the oil pan and pick up(Refer to 9 - ENGINE/LUBRICATION/OIL PAN - INSTALLATION).
11. Install the timing chain cover(Refer to 9 - ENGINE/ VALVE TIMING/TIMING BELT / CHAIN COVER(S) - INSTALLATION).
12. Fill cooling system(Refer to 7 - COOLING - STANDARD PROCEDURE).
13. Connect battery negative cable.
14. Start engine and check for oil and coolant leaks.

TIMING CHAIN/TENSIONER

DESCRIPTION

The timing chain tensioner is a stamped steel constant tension mechanical design. It is mounted to the front of the engine, behind the timing chain drive.

OPERATION

The timing chain tension is maintained by routing the timing chain through the tensioner assembly. A nylon covered spring steel arm presses on the timing chain maintaining the correct chain tension.