


DESCRIPTION AND OPERATION

Engine

 **WARNING: Do not operate the engine with the hood open until the fan blade has been first examined for possible cracks and separation.**

The 4.6L (4V) (281 CID) Cobra engine is a V-8 with the following features:

- intercooled supercharger
- dual overhead camshafts
- four valves per cylinder
- sequential multiport fuel injection (SFI)
- an aluminum intake manifold
- aluminum cylinder heads
- a cast aluminum, 90-degree V- cylinder block
- individually chain-driven camshafts with a hydraulic timing chain tensioner on each timing chain
- the electronic ignition system with eight ignition coils

Identification

Always refer to these labels when replacement parts are necessary or when checking engine calibrations. The engine parts often differ within a CID family. Verification of the identification codes will ensure that the correct parts are obtained. These codes contain all the pertinent information relating to the dates, optional equipment and revisions. The Ford Master Parts Catalog contains a complete listing of the codes and their application.

Code Information

The engine code information label, located on the side of the valve cover and the front side of the valve cover, contains the following:

- engine build date
- engine plant code
- engine code

Exhaust Emission Control System

Operation and necessary maintenance of the exhaust emission control devices used on this engine is covered in the [Powertrain Control/Emissions Diagnosis \(PC/ED\) manual](#).

Induction System

The sequential multiport fuel injection (SFI) provides the fuel/air mixture needed for combustion in the cylinders. The eight solenoid-operated fuel injectors:

- are mounted in the lower intake manifold.
- meter fuel into the air intake stream in accordance with engine demand.
- are positioned so that their tips direct fuel just ahead of the engine intake valves.
- are connected in series with the fuel pressure sensor.
- supply fuel from the fuel tank with a fuel pump mounted in the fuel tank.

A constant fuel pressure drop is maintained across the fuel injectors by the fuel pressure sensor. The fuel pressure sensor:

- is positioned upstream from the fuel injectors on the fuel injection supply manifold.

Valve Train

The valve train operates as follows:

- ball-tip hydraulic lash adjusters provide automatic lash adjustment.
- roller followers ride on the camshaft lobes, transferring the up-and-down motion of the camshafts to the valves in the cylinder heads.

Positive Crankcase Ventilation System

All engines are equipped with a closed-type positive crankcase ventilation system recycling the crankcase vapors to the upper intake manifold.

Lubrication System

The engine lubrication system operates as follows:

- oil is drawn into the oil pump through the oil pump screen cover and tube in the sump of the oil pan.
- oil is pumped through the oil bypass filter on the left front side of the cylinder block.
- oil enters the main oil gallery where it is distributed to the crankshaft main journals and to both cylinder heads.

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- From the main journals, the oil is routed through cross-drilled passages in the crankshaft to lubricate the connecting rod bearings. Controlled leakage through the crankshaft main bearings and connecting rod bearings is slung radially outward to cool and lubricate the cylinder walls as well as the entire connecting rod, piston and piston rings assembly.
- The left cylinder head is fed from a drilling into the supply passage feeding the main gallery at the front of the cylinder block. The right cylinder head is fed from a drilling into the rear of the main gallery. Main gallery pressure is reduced as it enters the cylinder head galleries through fixed serviceable orifices located at the upper part of the feed passages. It is this reduced pressure in the cylinder head galleries which feeds the camshaft journals, the hydraulic lash adjusters and the primary and secondary timing chain tensioners.
- The camshaft lobe and roller followers are lubricated by splash created through valve train operation.

Oil Pump

The lubrication system of the 4.6L (4V) engine is designed to provide optimum oil flow to critical components of the engine through its entire operating range. The heart of the system is a positive displacement internal gear oil pump using top seal rotors. Generically this design is known as a gerotor pump, which operates as follows.

- The oil pump is mounted on the front face of the cylinder block.
- The inner rotor is piloted on the crankshaft post and is driven through flats on the crankshaft.
- System pressure is limited by an integral, internally-vented relief valve which directs the bypassed oil back to the inlet side of the oil pump.

- Oil pump displacement has been selected to provide adequate volume to ensure correct oil pressure both at hot idle and maximum speed.
- The relief valve calibration protects the system from excessive pressure during high viscosity conditions.
- The relief valve is designed to provide adequate connecting rod bearing lubrication under high-temperature and high-speed conditions.

Cooling System

The engine cooling system includes the following:

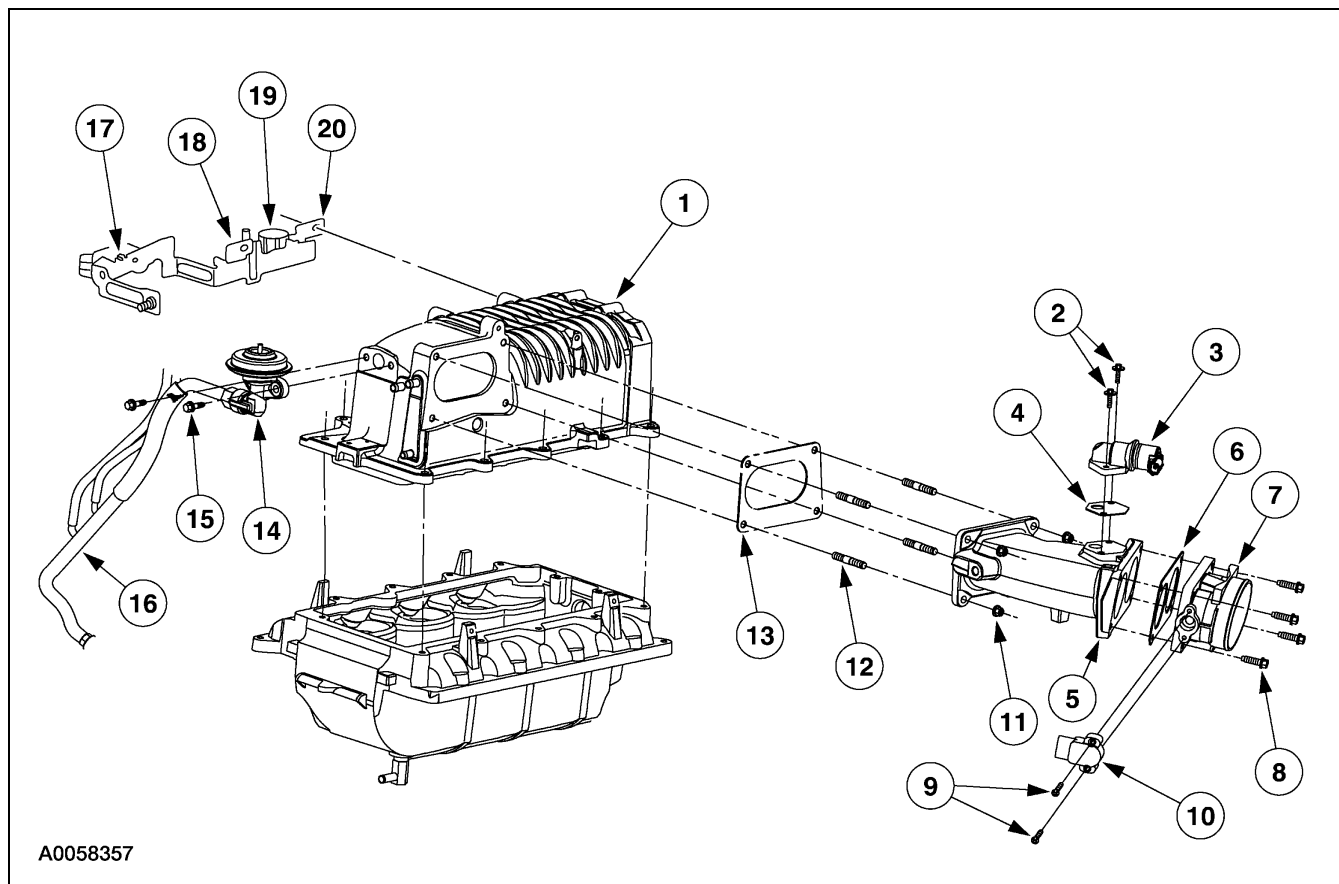
- radiator
- water pump
- the electric cooling fan motor and fan blade, activated by the variable control module
- the degas bottle, which aids in maintaining the correct volume of engine coolant
- water thermostat
- upper radiator hose
- lower radiator hose
- heater water hoses

Drive Belt System

The 4.6L (4V) DOHC engine is equipped with a serpentine drive belt. To ensure maximum life, a replacement drive belt should be of the same type as originally installed.

- The accessories mounted on the front of the engine are belt-driven by the crankshaft.
- The serpentine drive belt is routed over each accessory pulley, driven by the crankshaft pulley bolted to the crankshaft.

For service procedures, including tensioning, refer to Section 303-05.

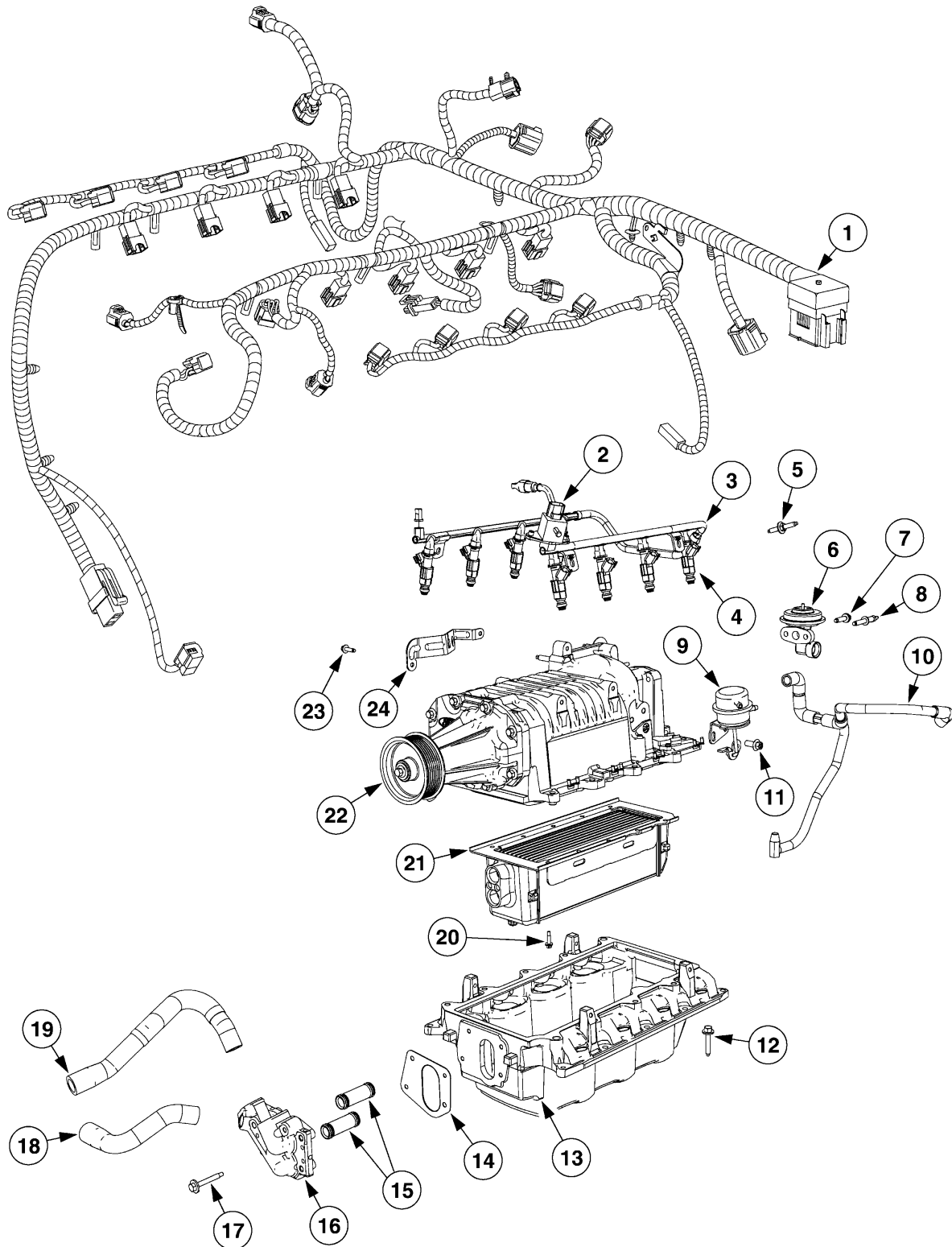
DESCRIPTION AND OPERATION (Continued)

Item	Part Number	Description
1	6F066	Supercharger assembly
2	N806154	Screws (2 req'd)
3	9F715	Idle air control valve
4	—	Idle air control valve gasket
5	9P697	Spacer assembly
6	9E936	Throttle body gasket
7	9E926	Throttle body
8	—	Bolts (4 req'd)
9	—	Bolts (2 req'd)
10	9E926	Throttle position sensor
11	N804178	Nuts (4 req'd)
12	—	Studs (4 req'd)

(Continued)

Item	Part Number	Description
13	—	Spacer assembly gasket
14	9D475	Exhaust gas recirculation valve
15	—	Stud
16	9D477	Exhaust gas recirculation tube
17	—	Manifold absolute pressure sensor
18	9J460	Differential pressure feedback EGR system
19	9J459	Exhaust gas recirculation vacuum regulator
20	9J472	Vacuum accessory bracket

DESCRIPTION AND OPERATION (Continued)



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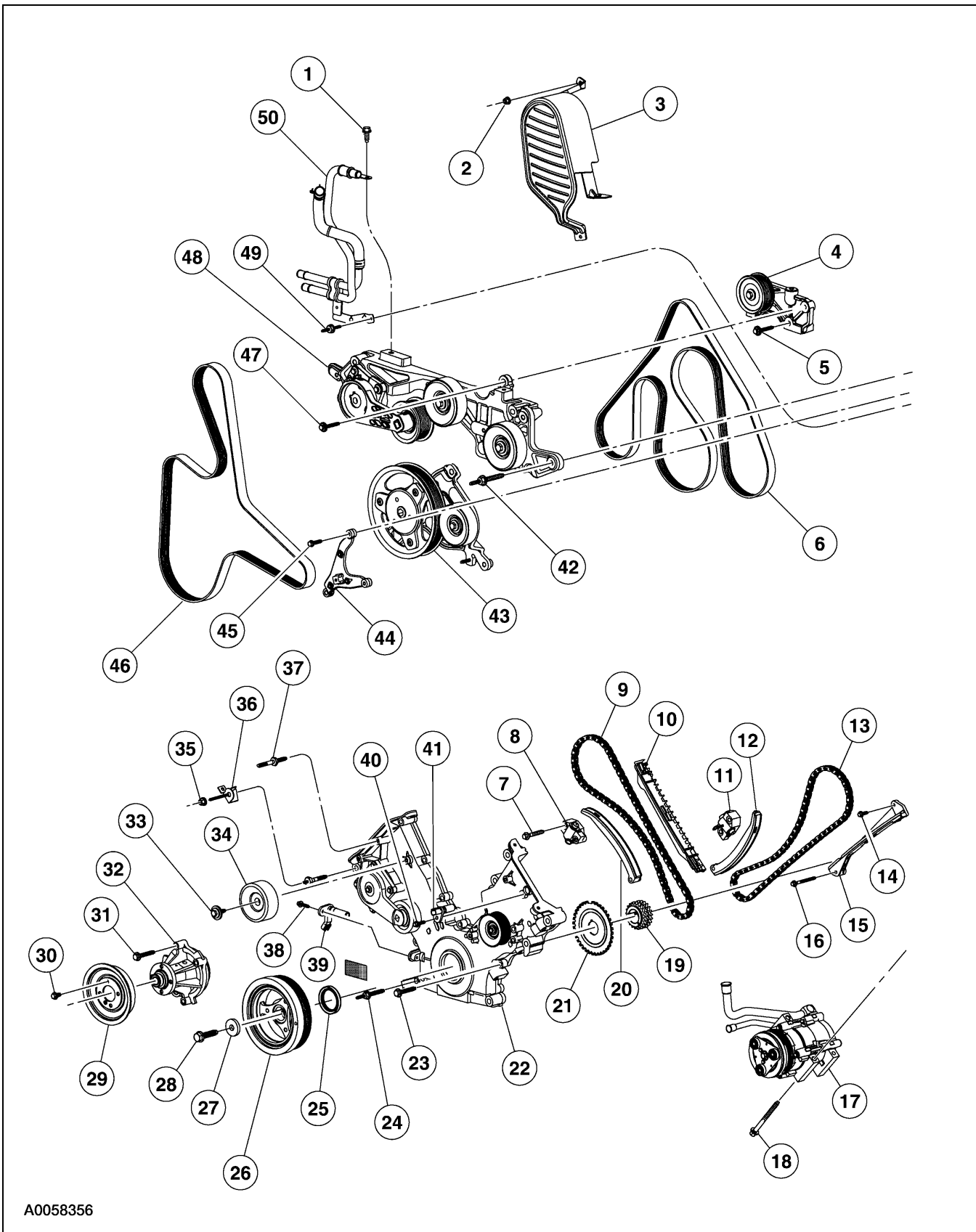
DESCRIPTION AND OPERATION (Continued)

Item	Part Number	Description
1	12B637	Wiring harness
2	9C986	Fuel pulse damper
3	9F792	Fuel injection supply manifold
4	9F593	Fuel injector
5	—	Stud
6	9D475	Exhaust gas recirculation valve
7	W701232	Bolt
8	N806979	Stud
9	—	EGR vacuum hoses
10	6F089	Vacuum actuator valve
11	N605892	Bolts (2 req'd)
12	—	Bolts (10 req'd)

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Item	Part Number	Description
13	9J447	Lower intake manifold
14	9L438	Coolant intake manifold gasket
15	—	Coolant tubes
16	9N491	Coolant intake manifold
17	W701592	Bolt
18	NL443	Inter cooler hose
19	NL443	Inter cooler hose
20	W506404	Bolts (10 req'd)
21	6K755	Charge air cooler
22	6F066	Supercharger assembly
23	N605892	Bolt
24	9726	Accelerator cable bracket

DESCRIPTION AND OPERATION (Continued)



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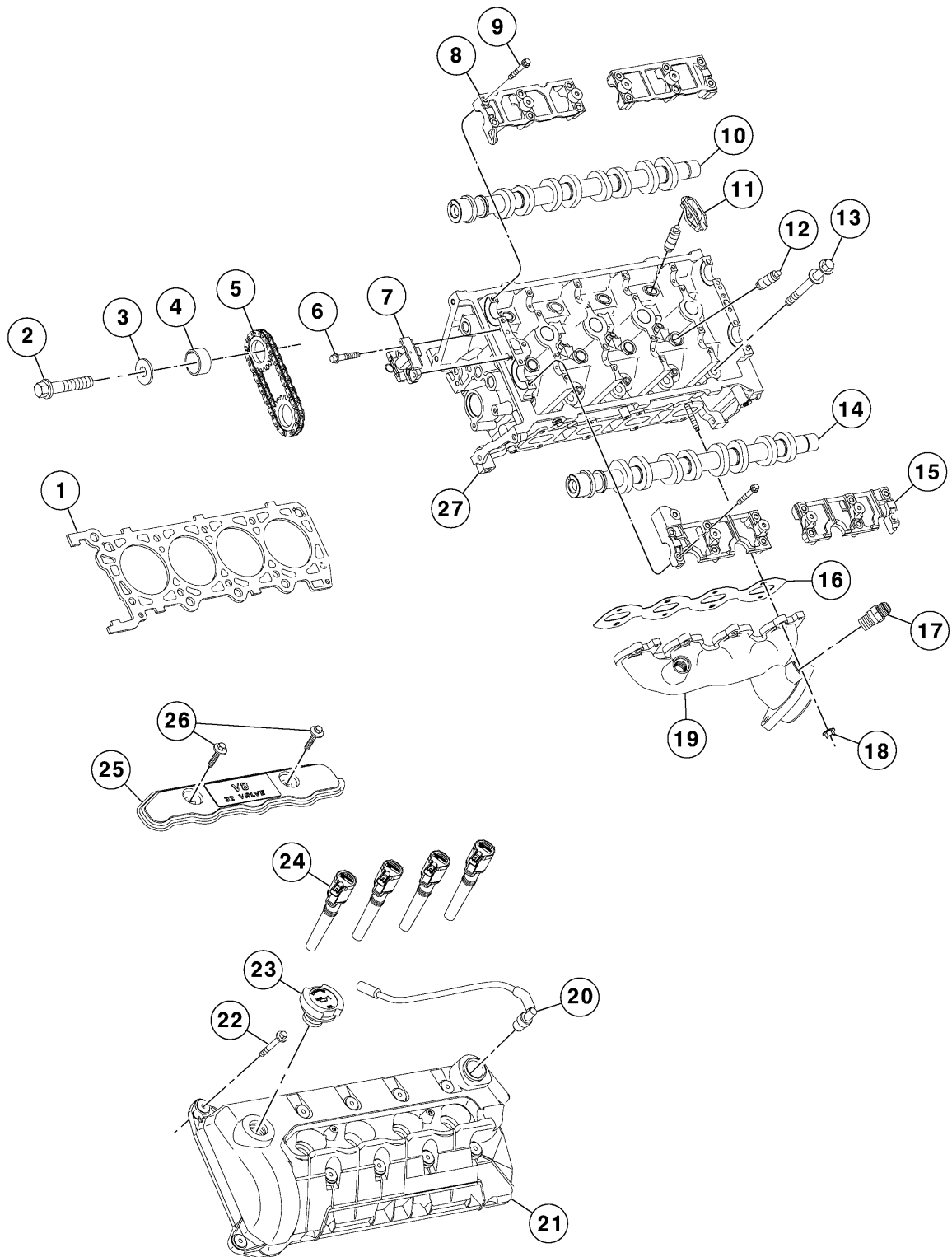
DESCRIPTION AND OPERATION (Continued)

Item	Part Number	Description
1	N605904	Bolt
2	N620480	Nut
3	6A946	Cover
4	17K814	Alternator bracket assembly
5	N811268	Bolts (2 req'd)
6	8620	Accessory drive belt
7	N606543	Bolt (4 req'd)
8	6L266	Timing chain tensioner
9	6268	Timing chain (2 req'd)
10	6M256	Timing chain guide
11	6L266	Timing chain tensioner
12	6L253	Timing chain tensioner arm
13	6268	Timing chain (2 req'd)
14	N804958	Bolt (2 req'd)
15	6B274	Timing chain guide
16	N606527	Bolt
17	19D269	A/C compressor
18	N806184	Bolts (3 req'd)
19	6306	Crankshaft sprocket
20	6L253	Timing chain tensioner arm
21	12A227	Ignition pulse ring
22	6C086	Engine front cover
23	N806177	Bolts (8 req'd)
24	N806300	Studs (5 req'd)
25	6700	Crankshaft front seal
26	6316	Crankshaft pulley

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Item	Part Number	Description
27	N806165	Washer
28	W701512	Stud
29	8A528	Water pump pulley
30	N806282	Bolts (4 req'd)
31	N806177	Bolts (4 req'd)
32	8501	Water pump
33	N808102	Bolt
34	19A216	Belt idler pulley
35	N804178	Nut
36	N806300	Harness support bracket
37	N806300	Stud
38	N806155	Bolt
39	6C315	Crankshaft position sensor
40	N806155	Bolt
41	6B288	Camshaft position sensor
42	N808920	Bolts (3 req'd)
43	6C254	Crankshaft extension support pulley
44	10153	Lower support bracket
45	N605909	Bolts (2 req'd)
46	8620	Accessory drive belt
47	N811268	Bolt
48	8B603	Belt idler bracket support
49	N808198	Stud
50	9N491	Hose and tube assembly

DESCRIPTION AND OPERATION (Continued)



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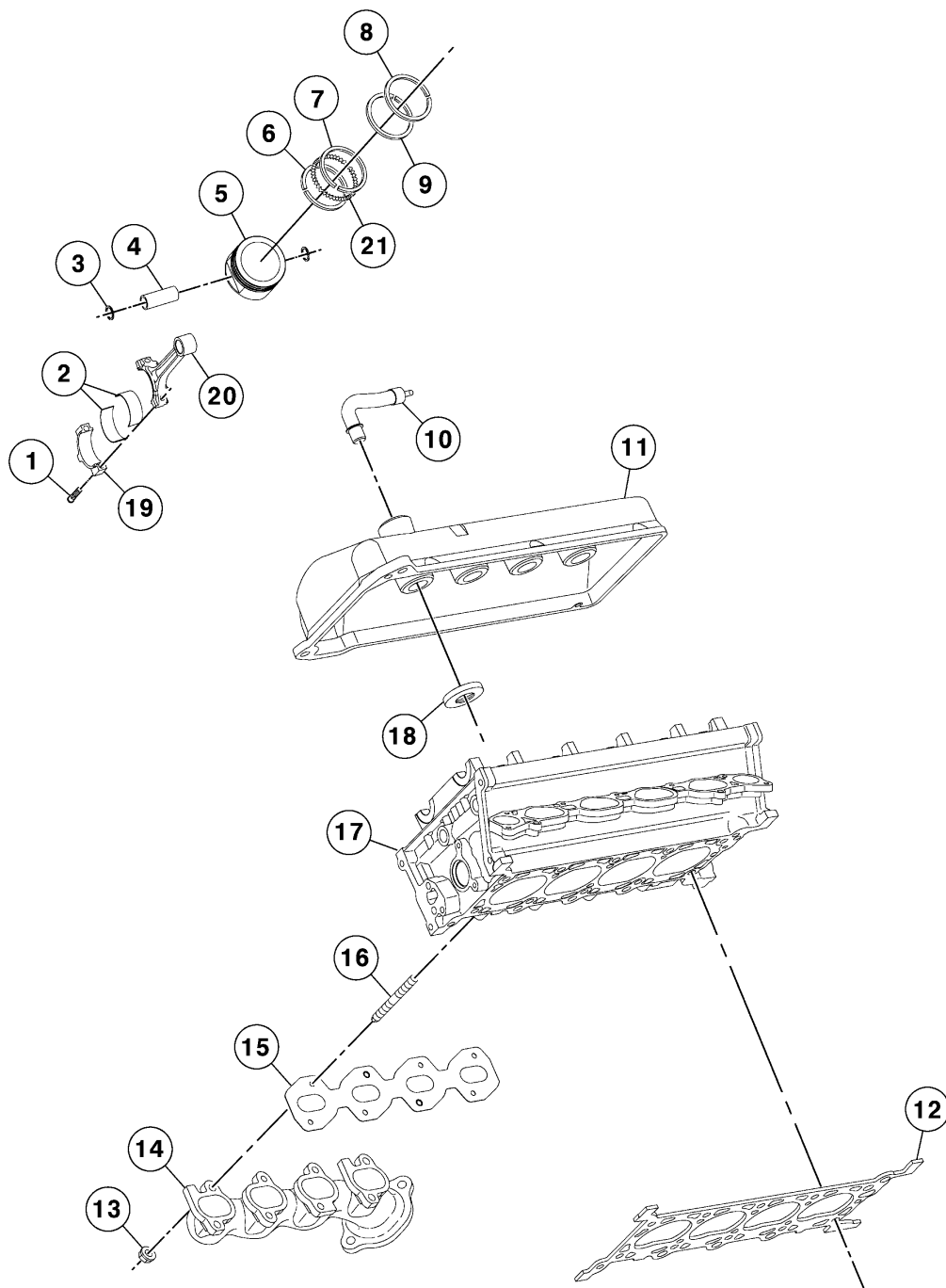
DESCRIPTION AND OPERATION (Continued)

Item	Part Number	Description
1	6083	Cylinder head gasket
2	—	Bolt (2 req'd)
3	—	Washer (2 req'd)
4	6255	Spacer
5	—	Secondary timing chain (2 req'd)
6	—	Screw and washer
7	6C271	Timing chain vibration damper
8	6B277	Camshaft bearing cap
9	—	Bolt (24 req'd)
10	6A271	Camshaft
11	6529	Roller follower (8 req'd)
12	6C501	Hydraulic lash adjuster
13	6065	Bolt (20 req'd)
14	6A273	Camshaft

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Item	Part Number	Description
15	6B278	Camshaft bearing cap (2 req'd)
16	9448	Exhaust manifold gasket
17	9F485	EGR valve tube to manifold connector
18	W701706	Nut (8 req'd)
19	9431	Exhaust manifold
20	6C324	PCV tube
21	6A505	Valve cover
22	N808199	Bolt (20 req'd)
23	6766	Oil filler cap
24	12A366	Ignition coils
25	6P068	Ignition coil cover
26	N807309	Bolt (4 req'd)
27	6050	Cylinder head

DESCRIPTION AND OPERATION (Continued)



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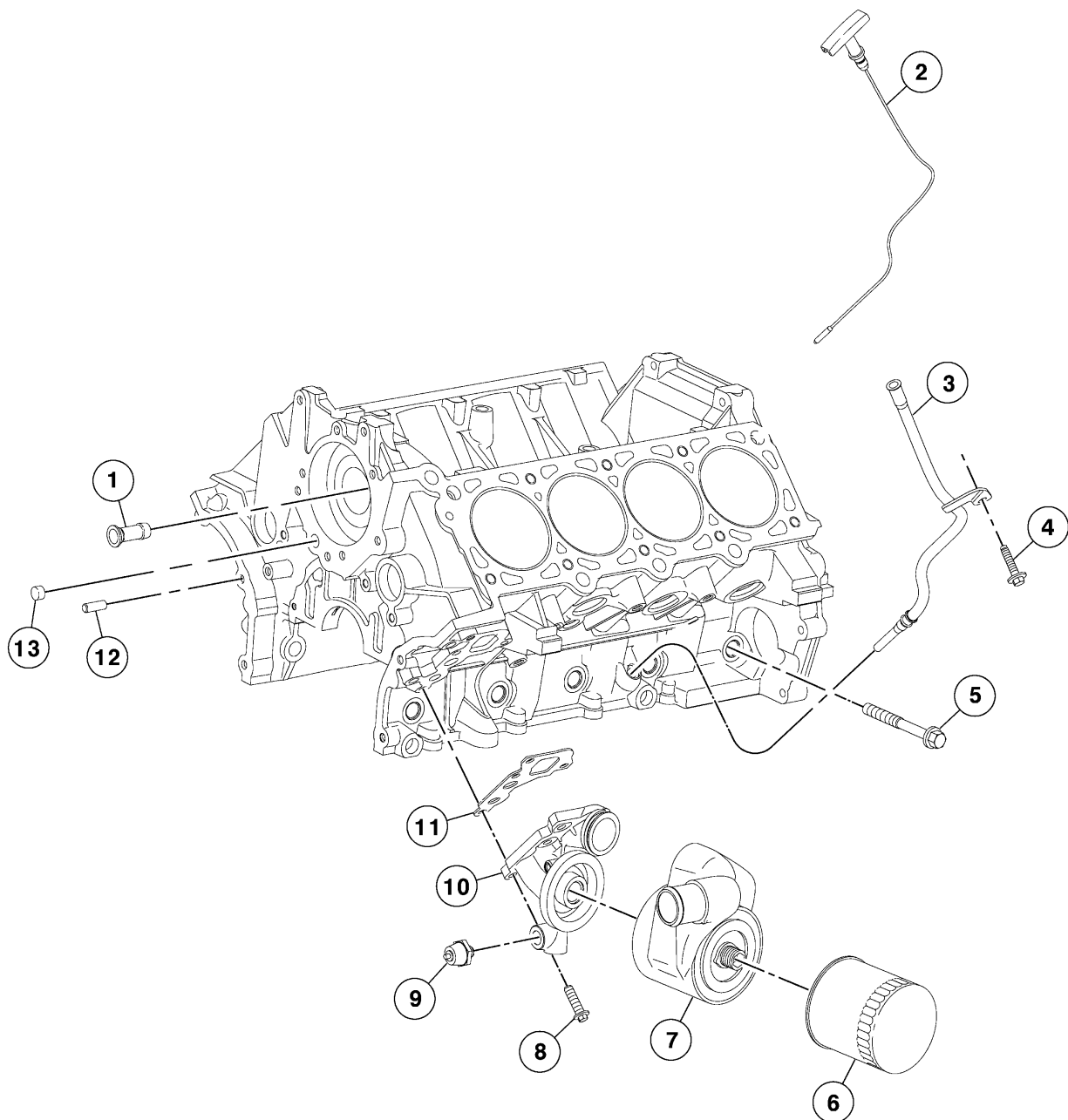
DESCRIPTION AND OPERATION (Continued)

Item	Part Number	Description
1	6214	Bolt (2 req'd)
2	6211	Connecting rod bearing (16 req'd)
3	6140	Piston pin retainer (16 req'd)
4	6135	Piston pin (8 req'd)
5	6110	Piston (8 req'd)
6	6159	Piston ring (8 req'd)
7	6159	Piston ring (8 req'd) (part of 6100)
8	6150	Piston ring (8 req'd) (part of 6100)
9	6152	Piston ring (8 req'd)
10	6758	Crankcase vent tube and connector

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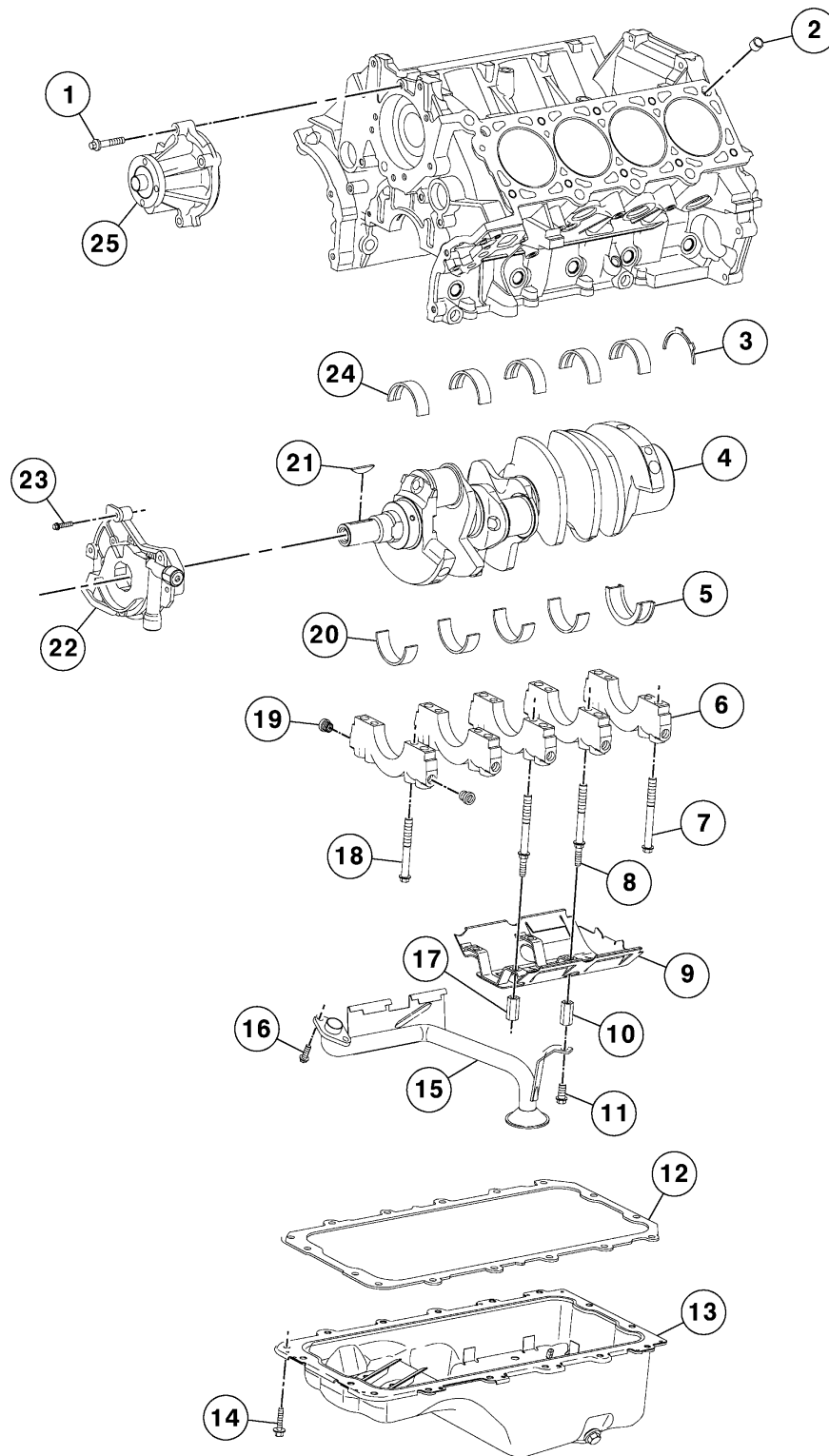
Item	Part Number	Description
11	6582	Valve cover
12	6051	Cylinder head gasket
13	W701706	Nut (8 req'd)
14	9430	Exhaust manifold
15	9448	Exhaust manifold gasket
16	W701681	Stud (8 req'd)
17	6049	Cylinder head
18	6C527	Spark plug gasket (8 req'd)
19	6200	Connecting rod (8 req'd)
20	6200	Connecting rod (8 req'd)
21	6161	Piston ring (8 req'd)

DESCRIPTION AND OPERATION (Continued)



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DESCRIPTION AND OPERATION (Continued)



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DESCRIPTION AND OPERATION (Continued)

Item	Part Number	Description
1	N806177	Bolt (4 req'd)
2	N806459	Dowel (4 req'd)
3	6A341	Thrust washer
4	6303	Crankshaft
5	6A339	Thrust bearing
6	6325	Main bearing cap (5 req'd)
7	6345	Bolt (10 req'd)
8	6K258	Stud (4 req'd)
9	6687	Oil pan baffle
10	N806180	Spacer
11	N605904	Bolt
12	6710	Oil pan gasket
13	6675	Oil pan
14	W701240	Bolt (16 req'd)

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Item	Part Number	Description
15	6622	Oil pump screen pickup and tube
16	N806155	Bolt (2 req'd)
17	N811280	Spacer (3 req'd)
18	6345	Bolt (6 req'd)
19	6C360	Main bearing cap adjusting screw (10 req'd)
20	6A338	Crankshaft main bearing (4 req'd)
21	N806201	Woodruff key
22	6621	Oil pump
23	N806183	Bolt (4 req'd)
24	6333	Crankshaft main bearing
25	8501	Water pump