XJS V12

ENGINE CODING

ENGINE IDENTIFICATION

Engine number is stamped on cylinder block at rear of engine, between cylinder heads.

ENGINE, MANIFOLDS & CYLINDER HEAD

ENGINE

NOTE: Remove engine and transmission as an assembly. Engine and transmission may then be separated.

Removal

1) Remove hood and lower grille. Disconnect battery. Release pressure from fuel system. Drain cooling system, including block.

2) On air conditioned models, discharge air conditioning system. Disconnect suction and pressure hoses. Remove pressure and suction unions from rear of compressor and plug openings. Tie hoses back away from engine.

NOTE: All A/C hoses or fittings which are removed should be immediately sealed with clean dry plugs.

3) Remove fender well straps and air cleaners. Disconnect oil pump-to-cooler lines and remove radiator complete with oil cooler. On air conditioned models, remove compressor delivery hose from vehicle. Tie condenser/evaporator hose back away from engine.

4) Disconnect coolant hoses to remote header tank at engine. Remove nut and lock washer attaching engine mount-to-engine bracket. Remove oil from power steering reservoir. Disconnect lines from power steering pump.

5) Disconnect connectors from alternator and separate engine harness connector. Remove hose between servo unit and vacuum reservoir. Disconnect clips securing fuel lines to filter, and plug lines.

6) Disconnect operating line from heater vacuum reservoir non-return valve at manifold stub and heater water valve at valve inlet. Disconnect heater return line from water rail at firewall union. Remove coil and ballast resistor assembly.

7) Disconnect clips securing cold start relay harness from left hand fuel rail and cross-over pipe. Remove remaining clips on harness. Remove remaining clips on harness. Remove cover of cold start relay, disconnect cables. Remove harness from engine.

8) Disconnect cable from throttle switch and trigger unit. Remove connectors from kickdown switch. Remove starter cable from firewall terminal.

9) Install engine support tool (MS.53A) into drip channel directly above rear lifting eyes and tighten supporting bolts. Disconnect both exhaust pipes at manifolds. Remove front exhaust pipe which is not trapped by steering pinion housing.

10) Lower trapped front pipe and move rear end of pipe toward center line of vehicle. Slide pipe towards front of vehicle and draw flanges down past steering housing.

11) Remove attaching hardware from heat shields. Remove 4 screws, washers and spacers from engine mounting plate. Place a jack beneath mounting plate and remove nut attaching rear engine mount.

12) Lower jack and remove mounting plate. Disconnect propeller shaft and speedometer cable. Remove pinch bolt attaching transmission outer selector cable and disconnect inner cable from selector lever at transmission by removing nut and lock washer.

13) Remove ground strap from frame member. Place a jack beneath front suspension crossmember and remove engine support tool. Attach lifting sling to engine eyes.

NOTE: Chains of engine hoist must be of sufficient length to ensure that distance between lifting eyes and hook of hoist is 34.5" from front eyes to hook and 41" from rear eyes to hook.

14) Carefully lift engine with hoist, simultaneously raising jack to keep engine level. Lift only 2-3" (51-76 mm).

NOTE: Throughout lift, rear of engine must be kept as high as possible until oil pan is clear of steering housing.

15) Lift engine level, while observing forward corner of oil pan and steering housing. Apply side pressure to engine until it has been lifted clear of steering assembly and lines. Pull engine from subframe, allowing angle of tilt to increase until drive flange is clear of firewall. Lift engine to clear bumper.

Installation

To install, reverse removal procedure.

INTAKE MANIFOLDS

Removal

1) Remove air cleaner and drain cooling system. Release fuel system by removing connector from fuel pump relay switch and cranking engine for a few seconds. Remove fuel line from from overrun valves. Remove hose clip securing pressure regulator return hose to fuel rail.

2) Disconnect manifold pressure hose and electrical connectors from kickdown switch. Disconnect throttle cable from pedestal. Release throttle cross-rod from bell-crank. Disconnect electrical connectors from injectors and cold start injector. Disconnect brake vacuum hose.

3) Remove nuts securing manifold to cylinder head. Remove screws securing air rail clips to manifold ram tubes. Remove EGR valve from throttle housing flange. Remove manifold stud spacers. Remove intake manifold, Carefully moving air balance pipe and fuel lines out of the way. Plug intake ports.

Installation

To install, reverse removal procedure.

EXHAUST MANIFOLDS

Removal

1) Remove both exhaust pipes at manifolds. Remove front exhaust pipe which is not trapped by steering pinion housing. Lower trapped front pipe and move rear end of pipe toward center line of vehicle.

XJS V12 (Cont.)

2) Slide pipe towards front of vehicle and draw flanges down past steering housing. Remove attaching hardware from heat shields. Remove exhaust manifold retaining bolts, and remove manifold(s).

Installation

To install, reverse removal procedure.

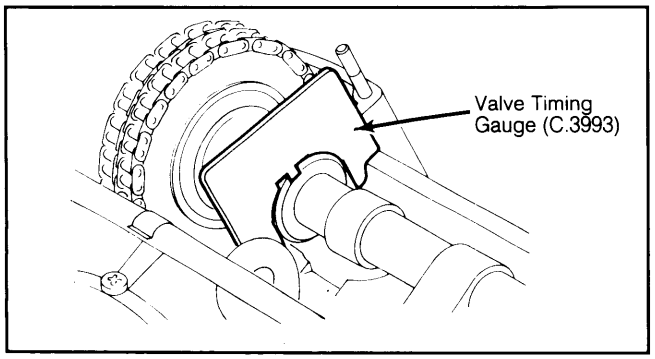
CYLINDER HEAD

NOTE: The following procedure may be used for removal of either right or left cylinder head.

Removal

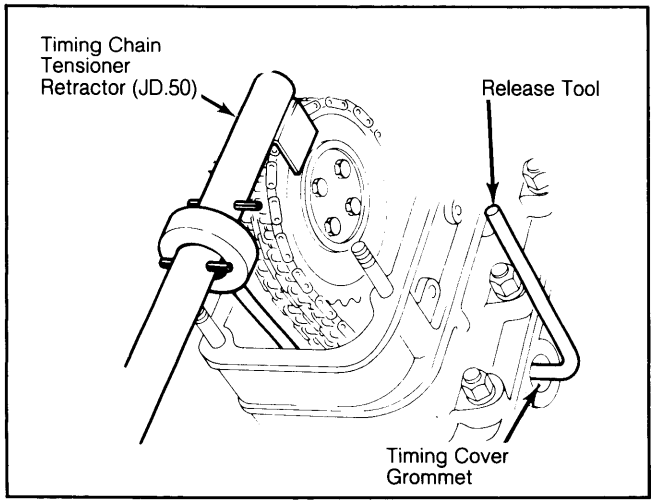
1) Disconnect battery, and drain cooling system. Remove right camshaft cover (required when either right or left cylinder head is removed). Remove rubber grommet from front of timing cover.

Fig. 1: Valve Timing Gauge in Position for Timing Chain Removal or Installation



2) Rotate crankshaft until valve timing gauge (C.3993) can be fitted in slot in camshaft front flange. Insert blade of release tool through timing cover grommet hole and release locking catch on timing chain tensioner. Using tension retractor tool (JD.50), retract timing chain tensioner. *See Fig.2.*

Fig. 2: Retracting Timing Chain Tensioner



Ensure timing chain retractor tool is in place before releasing chain tension.

3) If left cylinder head is to be removed, remove left camshaft cover. Disconnect camshaft sprocket from camshaft and attach a retaining tool (JD.40).

4) Remove heat shield from exhaust manifold and solenoid heat shield (right-hand head). Loosen screw clamp attaching heater return pipe-to-hose and ease cross pipe forward. Remove clamps attaching manifold coolant bleed pipe to front of cylinder head.

5) Remove camshaft oil feed banjo nut. Remove 3 nuts holding front of cylinder head to timing cover. Progressively loosen cylinder head nuts working from center outward. Remove cylinder head and place on wood blocks to prevent damage to valves. Discard old gasket.

NOTE: Do not rotate engine until cylinder liner retaining tools (JD.41) have been attached to cylinder head studs.

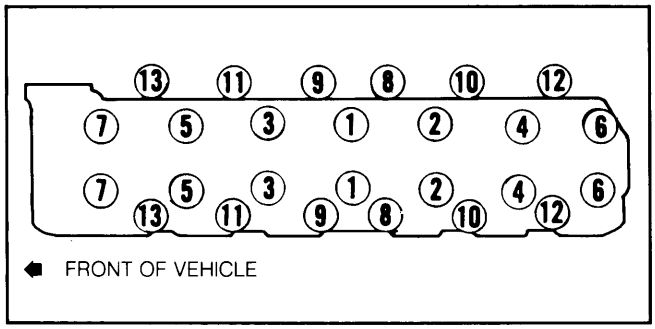
Installation

1) Attach dial indicator to a cylinder head stud and rotate crankshaft to set No. 1 piston on right bank at TDC. Turn camshaft until valve timing gauge (C.3993) can be attached to slot in camshaft front flange. Repeat for camshaft on left cylinder head. Remove cylinder liner retaining tool.

NOTE: Do not rotate crankshaft until cylinder head(s) are installed.

2) Install gasket making sure side marked "TOP" is up. Do not use jointing compound or grease. Install right cylinder head and nuts. Tighten nuts in order shown in *Fig. 3.*

Fig. 3: Cylinder Head Tightening Sequence



Tighten cylinder head nuts in 3 steps.

3) Tighten cylinder head-to-timing cover nuts. If camshaft and sprocket holes are not in alignment, remove circlip which holds camshaft coupling to sprocket and disengage coupling from splines.

4) Rotate coupling until access to retaining bolt holes can be obtained. Remove sprocket retaining tool (JD.40) and bolt coupling to camshaft.

5) Engage sprocket with coupling, then replace circlip and remove valve timing gauge (C.3993). Repeat procedures as outlined in steps **2)** through **6)** for left cylinder head.

6) Rotate engine until remaining camshaft sprocket retaining bolts can be installed; secure bolts with tab washers. Remove timing chain tensioner retracting tool (JD.42) and support plate (JD.42-1).

7) Insert blade of release tool through hole in timing cover and trip locking catch. Reinstall rubber grommet. Install exhaust pipes, and camshaft covers. Refill cooling system and connect battery.

XJS V12 (Cont.)

CAMSHAFT

ENGINE FRONT COVER & OIL SEAL

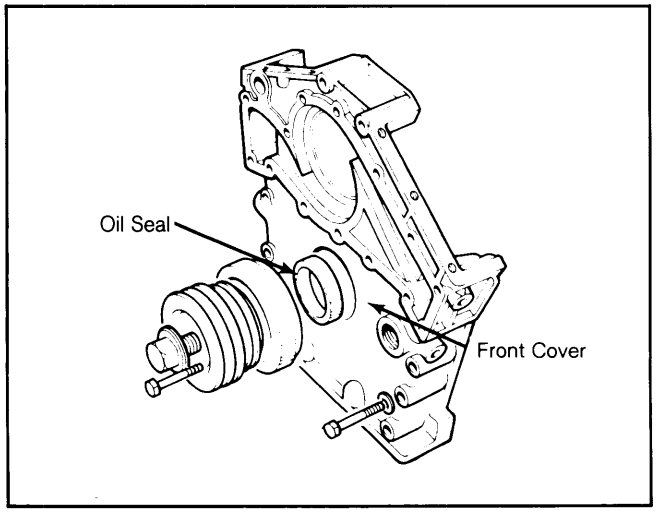
Removal

1) Drain cooling system and remove front subframe crossmember complete with expansion tank. Remove both cylinder heads and oil pan. Remove alternator and power steering pump. Remove air injection pump and water pump.

2) Remove bolts holding pulley to damper and remove pulley. Remove crankshaft damper bolt and strike damper sharply with leather mallet. Remove damper and cone.

3) Pry seal out of timing cover and discard. Remove spacer. Smear new seal with engine oil and install oil seal in recess, Taping lightly with a soft mallet. Reinstall spacer and reverse removal procedure, to complete installation.

Fig. 4: Detail of Front Cover & Oil Seal



Apply oil to oil seal lips before installing.

4) If front cover is to be removed, remove alternator and air pump mounting brackets and remove bolt and serrated washers, which hold timing cover to cylinder block. Note positions of bolts and dowel bolts. Remove timing cover.

Installation

To install, reverse removal procedure.

TIMING CHAIN

Removal

1) With timing cover removed, install retaining tool (JD.39), to retain intermediate shaft (jackshaft). Ensure timing marks are in correct alignment.

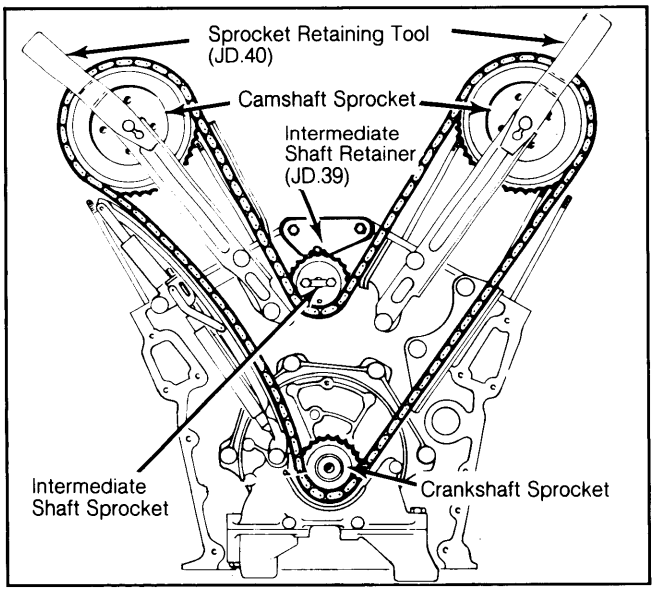
2) Disconnect timing chain from camshaft and intermediate shaft (jackshaft) sprockets. Remove crankshaft sprocket and chain.

NOTE: Do not rotate engine with timing chain removed.

Installation

To install, reverse removal procedure and note the following: Ensure valve timing is correct. *See Fig. 1 & 5.*

Fig. 5: View of Timing Chain Installation



Ensure valve timing gauge(s) are installed correctly.

VALVE TIMING

Rotate engine until number 1 piston on "A" (Right) bank is at TDC on it's compression stroke. The valve timing gauge (C.3993) should fit into the slot in the camshaft front flange. Repeat this procedure on "B" (Left) bank. See *Fig. 1.*

CAMSHAFT

Removal

1) With camshaft covers removed, bend back locking tabs and remove 2 camshaft sprocket retaining bolts. Rotate engine until valve timing gauge can be installed in slot in camshaft. Bend back locking tabs, and mark relative position of camshaft to sprocket.

2) Remove sprocket retaining bolts. Attach sprocket retaining tool (JD.40) Do not rotate engine with camshaft disconnected. Progressively loosen camshaft bearing cap nuts, starting with center cap and working outward. Remove bearing caps, lift camshaft out of tappet block.

Installation

To install, reverse removal procedure and ensure valve timing is correctly set. See Valve Timing in this section.

VALVES

VALVE ARRANGMENT

Right Side

E-I-I-E-E-I-I-E-E-I-I-E (Front-to-rear).

Left Side

E-I-I-E-E-I-I-E-E-I-I-E (Front-to-rear).

VALVE SPRINGS

Removal

With cylinder head removed from engine, support valves by means of a wooden block. Using a

valve spring compressor, compress valve spring. Remove collars, cotters and spring retaining plates.

Installation

To install, reverse removal procedure.

VALVE SPRING FREE LENGTH & INSTALLED HEIGHT

Outer valve spring free length is 2.10" (53.4 mm). Inner valve spring free length is 1.73" (44.0 mm). Imformation on valve spring installed height is not available from manufacturer.

VALVE STEM OIL SEALS

Install valve and place cylinder head on wooden blocks. Install valve spring seat, intake valve guide oil seal, spring and collar. Compress valve spring, using a valve spring compressor and install keepers.

NOTE: Valve guide oil seals are used on intake valves only.

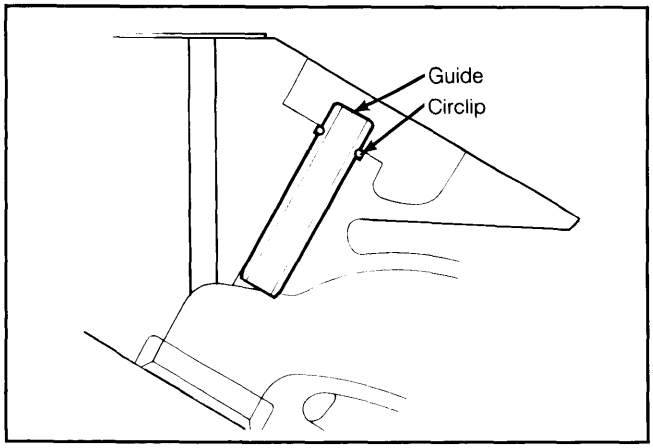
VALVE GUIDE SERVICING

1) With valves and valve springs removed, check clearance between valve guide and stem. Clearance should be within specification. See Valve Specification Table in this section.

2) To replace guides, immerse head in boiling water for 30 minutes. Using piloted drift, drive guide out of head from combustion chamber side. Coat new guide with graphite grease and attach circlip.

3) Heat cylinder head once again and drive guide in from top of cylinder head until circlip is seated in groove.

Fig. 6: View Showing Correct Valve Guide Installation



Drive valve guide in until circlip is seated in groove.

NOTE: When new guides are installed, always use next size larger than old guide. Ream guides to obtain proper valve stem clearance.

VALVE CLEARANCE ADJUSTMENT

1) Remove camshaft covers, and check that all camshaft bearing cap nuts are tight. Check and record clearance between heel of each cam lobe and its respective tappet.

2) If adjustment is necessary, bend back locking tabs and remove 2 camshaft sprocket retaining bolts. Rotate engine until valve timing gauge (C.3993) can be installed.

3) Remove remaining sprocket bolts. Separate sprocket from camshaft and use retainer (JD.40) to hold sprocket in place.

NOTE: Do not rotate crankshaft with camshaft sprockets disconnected.

4) Remove camshaft bearing caps and lift off camshaft. Remove each tappet that requires adjustment and note location for reinstallation in original position. Remove adjusting pad and measure thickness.

5) Use measured pad thickness and difference between measured valve clearance and specified clearance to calculate required thickness of new adjusting pad. Adjusting pads are available in increments of .001" (.03 mm) from .085" (2.16 mm) to .110" (2.79 mm), and are marked with letters from "A" to "Z" respectively.

6) Insert correct adjusting pads and install tappets. Install camshafts (using timing gauge). Tighten bearing cap nuts. Connect camshaft sprockets, and install camshaft covers.

PISTON, RINGS & PINS

OIL PAN

Removal

1) Complete oil pan removal is best accomplished with engine removed from vehicle. Lower oil sump pan removal procedure follows.

2) Drain engine oil. Remove sump pan retaining bolts, and remove oil sump pan. Clean gasket surfaces.

Coat new gasket lightly with sealant and install pan. Due to the different lengths of pan retaining bolts, it is essential that they be replaced in their proper location. Fill oil sump to its correct level, with engine oil.

PISTON & ROD ASSEMBLY

Removal

With cylinder head and oil pan removed, remove crankcase baffle plate. Remove nuts, bearing cap and bearing. Push connecting rod up cylinder bore, and remove piston/rod assembly.

NOTE: Cylinder liner retaining tools (JD.41) must be installed prior to disassembly or any movement of engine parts due to wet liner type cylinder sleeve.

Installation

1) Coat all parts with engine oil and make sure that piston ring gaps are evenly spaced around circumference of piston. Install ring compressor. Place piston into bore with word "Front" facing forward and chamber on rod big-end facing crank pin radius.

2) Push piston and rod assembly down into bore. Carefully install rod on crank journal, and install rod bearing cap. Install rod bearing cap nuts, and tighten.

FITTING PISTONS

No oversize pistons are available due to use of wet liner type cylinder sleeves. If liner or piston is damaged or worn, replacement must be of standard size.

XJS V12 (Cont.)

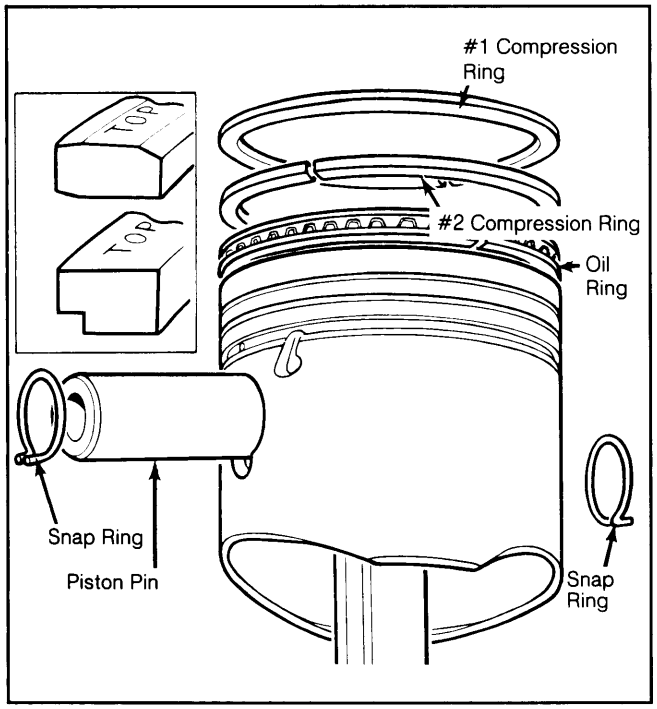
FITTING RINGS

1) Both top and second rings have tapered peripheries and second rings are marked "TOP" to ensure correct fitting. In addition, the top ring has a chromium plated periphery and is also cargraph coated. This coating is coloured "RED" and must not be removed.

2) The bottom ring consists of an expander sandwiched between 2 rails. Check the piston ring gap in the bore. Push the ring to a point midway down the bore. Check that the ring is square and measure the ring gap. See Pistons, Pins & Rings Specification Table in this section.

3) Fit the bottom ring, ensuring that the expander ends are not overlapping. Fit the second and top rings, ensuring that they are fitted the correct way up. Position the rings so that the gaps are in the positions shown in *Fig. 7.*

Fig. 7: Exploded View of Piston Assembly



Piston must be fitted so the word "FRONT" on piston faces toward front of engine.

PISTON PIN REPLACEMENT

With piston/rod assembly removed from engine, remove circlip. Push pin out of piston. When installing pin, piston must be fitted so the word "FRONT" on piston faces toward front of engine. *See Fig.7.*

NOTE: Pistons are supplied complete with pin. As pins and pistons are matched assemblies, it is not permissible to interchange component parts.

CYLINDER LINER REPLACEMENT

NOTE: If new liners are to be installed, they must be of same grade designation as old liners. Grade A-Red 3.543" (89.98 mm), or B-Green 3.544" (90.01 mm).

1) Remove cylinder head, piston/rod assemblys and crankshaft. Position a mandrel between cylinder liner and arbor press. Press out cylinder liners from below.

2) To install, smear liners with Hylomar and slip liners into cylinder block. Remove excessive sealant. Ensure liners are correctly seated and install retaining tools (JD.41).

CRANKSHAFT MAIN & CONNECTING ROD BEARINGS

CRANKSHAFT MAIN BEARINGS

NOTE: While it is possible to replace main bearing shells with engine in vehicle, this should only be done when it is certain that crankshaft is not damaged.

Removal

1) With engine removed from vehicle, remove cylinder head and oil pan. Remove piston and rod assemblies. Remove drive plate from crankshaft. Timing cover must be removed and timing chain disengaged from sprocket.

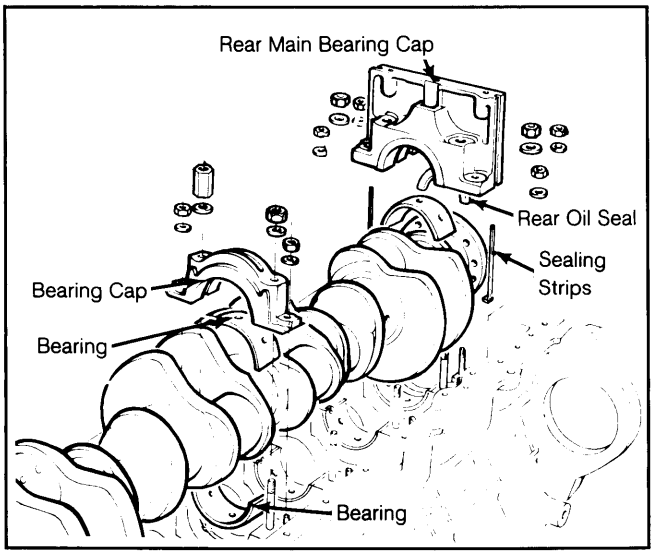
2) Remove small nuts from main bearing caps, starting from center bearing, and working outward. Remove pillar nuts and large nuts from caps in same sequence. Remove bearing caps and shells. Lift crankshaft from block and remove upper half of main bearing shells.

Installation

1) Ensure that all components are clean and replace all seals. Oil bearing shells, and place upper halves in block.

2) Replace crankshaft and lower bearing caps with shells. Beginning at center, tighten bearing caps one at a time.

Fig. 8: Exploded View of Main Bearing & Rear Oil Seal Assemblies



Starting at center, tighten bearing caps 1 at a time.

XJS V12 (Cont.)

NOTE: Bearings are available only in standard size. Due to extremely hard surface of crankshaft journals, it is not possible to grind crankshaft satisfactorily. Crankshafts are available on exchange basis and are supplied complete with matching bearings.

REAR MAIN OIL SEAL REPLACEMENT

1) With crankshaft removed from cylinder block, remove rear main bearing casting. Install new sealing strips in grooves of rear main bearing casting. Install bearing casting on cylinder block and tighten nuts.

2) Seat rear oil seal using driver tool. Remove rear main bearing casting. Coat upper main bearings with oil and install in cylinder block. Position crankshaft, install bearings in caps and install caps. Tighten cap nuts.

THRUST BEARING ALIGNMENT

Measure crankshaft end play. Remove bearing cap and install thrust washer(s) in groove of block. Select washers as necessary to bring end play within specifications. Grooved side of washer MUST face outward.

ENGINE OILING

CRANKCASE CAPACITY

12 qts. (11.4L) with filter.

OIL FILTER

Full-flow, replaceable element.

NORMAL OIL PRESSURE

Imformation not available from manufacturer.

OIL PRESSURE REGULATOR VALVE

Non-adjustable. Located at oil filter assembly.

ENGINE OILING SYSTEM

Lubrication is provided by a "Epicyclic" type pump. Oil from pump goes through a full-flow oil filter to all moving engine components. Oil is then passed through an oil cooler, and returned to the oil sump.

OIL PUMP

Oil pump is of "Epicyclic" type with internal and external gears and crescent type cut off. Drive gear is concentric around crankshaft nose.

Removal

Remove timing cover and timing chain tensioner. Remove spacer from crankshaft. Remove timing chain and sprocket from crankshaft. Remove Woodruff key. Remove oil pump.

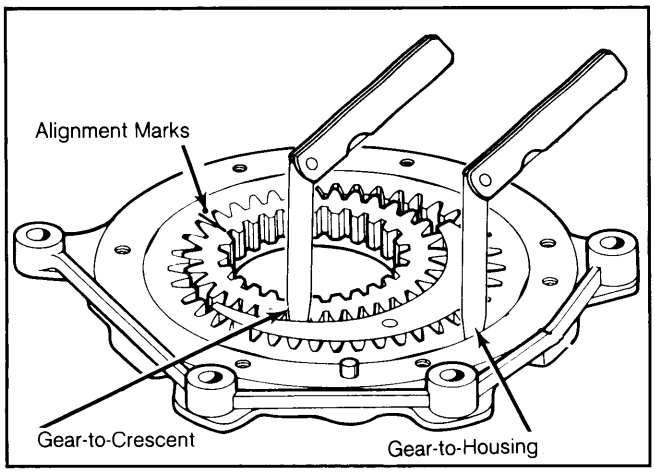
Disassembly

1) Remove 8 bolts and lock washers and remove pump cover from gear housing. Mark drive and driven gear faces for reassembly reference.

2) Remove both gears, and clean thoroughly. Check condition of all gears. Remove burrs with file. Reinstall driven gear and check radial clearance between gear and housing. Checks should not be taken at any of the 6 radial flats on the gear.

3) Reinstall drive gear and check radial clearance between gear and crescent. Check gear end play by placing straight edge across joint face of housing and measure clearance between straight edge and gear. See Oil Pump Specifications.

Fig. 9: Correct Procedure to Measure Oil Pump Clearances



Check condition of all gears in pump.

Reassembly

To reassemble, lubricate all gears with clean oil, check that surfaces are clean. Reverse disassembly procedure to complete assembly.

Installation

To install, reverse removal procedure.

OIL PUMP SPECIFICATIONS

Application	Clearance In. (mm)
Driven Gear-to-Housing	.005 (.127)
Drive Gear-to-Crescent	.006 (.152)
Gear End Play	.005 (.127)

[1] — Wear limit specifications given.

ENGINE COOLING

COOLANT CAPACITY

22 qts. (20.8L)

THERMOSTAT

Two thermostats are used. Opening temperature is 174-181°F (79-83°C).

WATER PUMP

Removal

NOTE: Exchange water pumps do not come with pulley, therefore pulley must be removed before sending in defective pump. Pulley must then be installed on pump before placing on engine.

XJS V12 (Cont.)

1) Drain and remove radiator. Remove lower cowl and mounting bracket and lay aside. Remove fan and fan drive unit. Remove fan belt.

2) Remove trunnion adjusting bolt and hardware attaching idler pulley housing. Unscrew 2 studs. Remove air pump and compressor pump belts.

3) Loosen steering pump pivot bolts enough to draw adjustment bolt from stud. Remove stud. Remove thermostat switch housing and bottom hose complete as an assembly. Remove crankshaft pulley and damper assembly.

4) Loosen upper hose clamp on engine cross pipe. Remove screw and washers attaching water pump. Pull pump out and downward to clear cross pipe hose.

Installation

To install, reverse removal procedure.

TIGHTENING SPECIFICATIONS

Application	Ft. Lbs. (N.m)
Cylinder Head	
7/16" Nuts	52 (71)
3/8" Nuts	28 (38)
Crankshaft Main Bearing Nuts	
1/2"	54 (73)
3/8"	28 (38)
Connecting Rod Nuts	40 (54)
Camshaft Cap Nuts	10 (14)
Crankshaft Pulley Bolts	125-150 (169-203)
Flywheel-to-Crankshaft Bolts	66 (89)
Union Block-to-Compressor	10-25 (14-34)

ENGINE SPECIFICATIONS

GENERAL SPECIFICATIONS

Year	DISPLACEMENT		Fuel System	HP@RPM	Torque Ft. Lbs.@RPM	Compr. Ratio	BORE		STROKE	
	Cu. In.	cc					In.	mm	In.	mm
1982	326	5343	Fuel Inj.	262@5000	290@3000	11.5:1	3.543	90	2.756	70

VALVES

Engine Size & Valve	Head Diam. In. (mm)	Face Angle	Seat Angle	Seat Width In. (mm)	Stem Diameter In. (mm)	Stem Clearance In. (mm)	Valve Lift In. (mm)
5343 cc							
Intake	1.620-1.630 (41.15-41.40)	45°	44.5°	.....	.3092-.3093 (7.854-7.856)	.001-.004 (.03-.10)	.375 (9.5)
Exhaust	1.355-1.365 (34.42-34.67)	45°	44.5°	.....	.3092-.3093 (7.854-7.856)	.001-.004 (.03-.10)	.375 (9.5)

PISTONS, PINS, RINGS

Engine	PISTONS	PINS		RINGS		
	Clearance In. (mm)	Piston Fit In. (mm)	Rod Fit In. (mm)	Ring No.	End Gap In. (mm)	Side Clearance In. (mm)
5343 cc	.0012-.0017 (.03-.04)	Push Fit	.0000-.0002 (.000-.005)	1	.014-.020 (.36-.51)	.0029 (.07)
				2	.010-.015 (.25-.38)	.0034 (.09)
				Oil	.015-.045 (.38-1.14)	[1]

[1] — Oil ring is self expanding.

Jaguar Engines

XJS V12 (Cont.)

ENGINE SPECIFICATIONS (Cont.)

CRANKSHAFT MAIN & CONNECTING ROD BEARINGS

Engine	MAIN BEARINGS				CONNECTING ROD BEARINGS		
	Journal Diam. In. (mm)	Clearance In. (mm)	Thrust Bearing	Crankshaft End Play In. (mm)	Journal Diam. In. (mm)	Clearance In. (mm)	Side Play In. (mm)
5343 cc	3.0007-3.0012 (76.218-76.231)	.0015-.003 (.04-.07)	Center	.004.006 (.10-.15)	2.2994-2.3000 (58.40-58.42)	.0015-.003 (.04-.07)	.007-.013 (.17-.33)

VALVE SPRINGS

Engine	Free Length In. (mm)	PRESSURE Lbs. @ In. (Kg @ mm)	
		Valve Closed	Valve Open
5343 cc			
Inner	1.734 (44)	.....	.....
Outer	2.103 (53.4)	.....	.....

CAMSHAFT

Engine	Journal Diam. In. (mm)	Clearance In. (mm)	Lobe Lift In. (mm)
5343 cc	1.0615-1.0620 (26.96-26.97)	.001-.003 (.03-.07)	.....

VALVE TIMING

Engine	INTAKE		EXHAUST	
	Open (BTDC)	Close (ABDC)	Open (BBDC)	Close (ATDC)
5343 cc	17°	59°	59°	17°