ENGINE OVERHAUL <2.0L (420A)>

CONTENTS

11309000159

SPECIFICATIONS

11300030119

SERVICE SPECIFICATIONS

Items		Standard value	Limit
Ignition coil system			
Spark plug cable resistence Ω		3000– 12000	–
Ignition coil resistence Ω	Primary	0.51–0.61	
	Secondary	11500–13500	–
Camshaft and cam follower			
Cam wear amount mm (in.)		0.0254 (.001)	0.254 (.01)
Camshaft bearing bore diameter mm (in.)		26.020–26.041 (1.024–1.025)	–
Camshaft diameter bearing clearance mm (in.)		0.069–0.071 (.0027–.0028)	–
Camshaft end play mm (in.)		0.15 (.006)	–
Camshaft bearing journal diameter mm (in.)		25.951–25.970 (1.0217–1.0224)	–
Camshaft lift mm (in.)	Intake	8.22 (.324)	
	Exhaust	7.00 (.276)	–
Hydraulic lash adjuster mm (in.)	Body diameter	22.949-22.962 (.9035–.9040)	–
	Plunger travel minimum (dry)	4.24 (.167)	
Cylinder head and valve			
Flatness of gasket surface mm (in.)		–	0.1 (.004)
Valve seat angle		44.5" -45"	–
Valve seat runout (max) mm (in.)		0.050 (.002)	–
Valve seat width (Finish) mm (in.)		0.9–1.3 (.035–.051)	–
Valve seat guide bore diameter mm (in.)		11.00–11.02 (.4330–.4338)	–
Intake valve seat diameter mm (in.)		34.50 (1.358)	–
Exhaust valve diameter mm (in.)		29.50 (1.161)	–
Valve face angle		45°–45.5°	–
Valve head diameter mm (in.)	Intake	34.67-34.93 (1.364–1.375)	–
	Exhaust	30.37–30.63 (1.195–1.205)	–

TSB Revision 1

SPECIAL TOOLS

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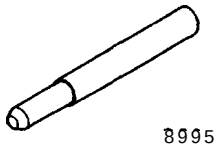
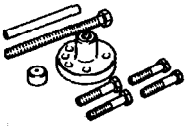
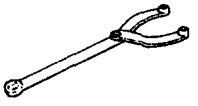
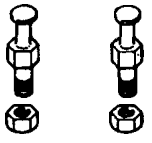
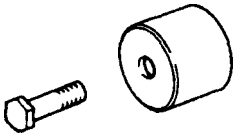
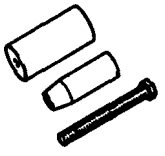
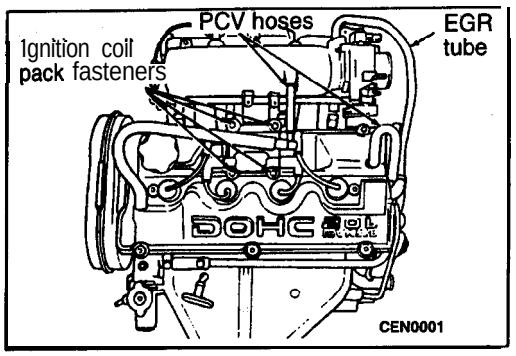
Tool	Tool number and name	Supersession	Application
 8995057	MB995057 Removal crankshaft damper/sprocket	6827-A	Removal of crankshaft damper and crankshaft sprocket.
	MB995055 Removal puller damper	1026	Removal of crankshaft damper.
	MB995035 Installer crankshaft damper/sprocket	C-4685-C	Installation of crankshaft damper and crankshaft sprocket.
	MB990767 End yoke holder	MB990767-01	Holding camshaft sprocket when loosening or torquing bolt.
	MD998719 Pin (2)		
	MB995026 Installer crankshaft sprocket	6792	Installation of crankshaft sprocket.
	MB995027 Installer crankshaft sprocket	6793	
	MD998713 Installer camshaft oil seal		Installation of crankshaft seal.
	MB995022 Installer crankshaft seal	6780-1	

TSB Revision



IGNITION SYSTEM

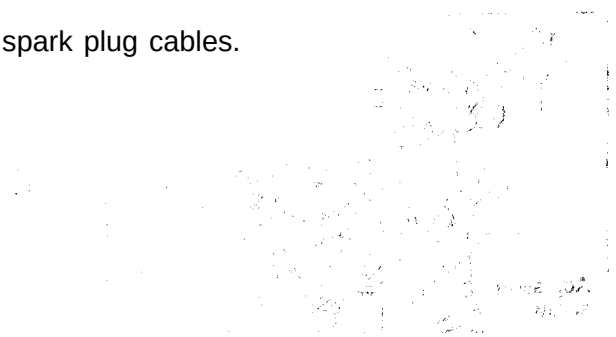
11301840018

REMOVAL

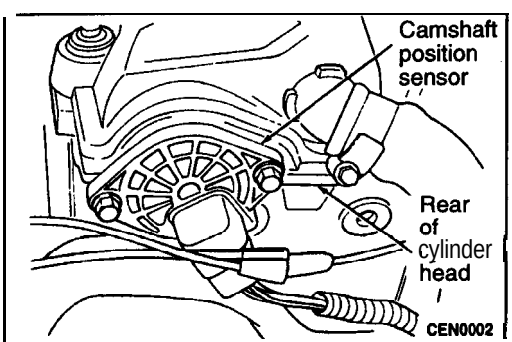
The electronic ignition coil pack attaches to the cylinder head cover.

(1) Disconnect electrical connector from coil pack.
(2) Remove coil pack mounting nuts.
(3) Remove coil.

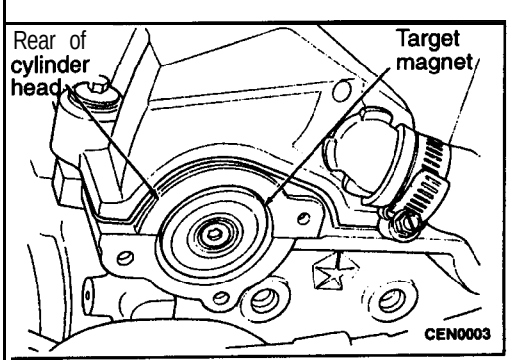
(4) Remove spark plug cables.



(5) 'Remove the spark plug using a **quality** socket with 'a rubber or foam insert.
(6) Inspect the spark plug condition.. Refer to Spark Plug Condition in this section.

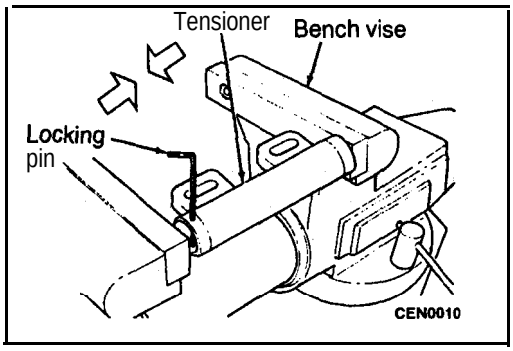


(7) Remove camshaft position sensor mounting screws on the rear of the cylinder head.
Remove sensor.



(8) Loosen screw attaching target magnet to rear of camshaft.

TSB Revision

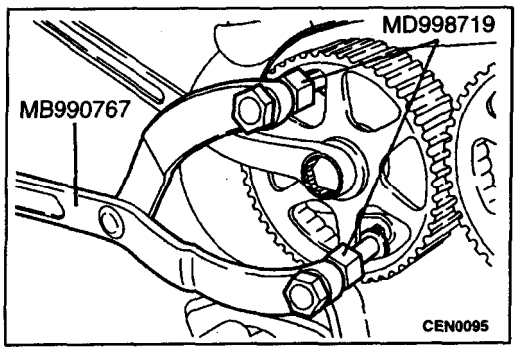


(9) When tensioner is removed from the engine, it is necessary to compress the plunger into the tensioner body.

(10) Place the tensioner into a vise and slowly compress the plunger.

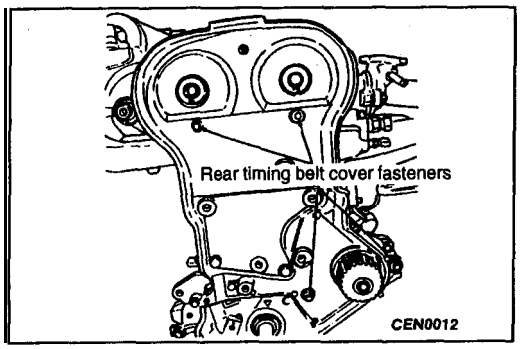
Caution
Index the tensioner in the vise the same way it is installed on the engine. This is to ensure proper pin orientation when tensioner is installed on the engine.

(11) When plunger is compressed into the tensioner body install a pin through the body and plunger to retain plunger in place until tensioner is installed.

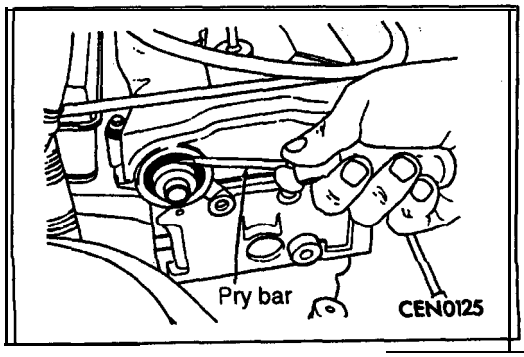


(12) Hold camshaft sprocket with Special Tools MB990767 and MD998719 while removing bolt.

(13) Remove support bracket.



(14) Remove rear timing belt cover fasteners. Remove cover.



(15) Remove camshaft seal.

TSB Revision

INSTALLATION

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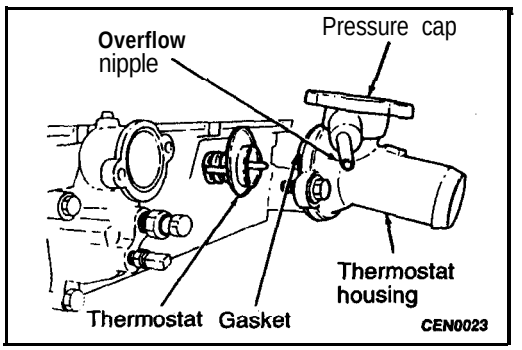
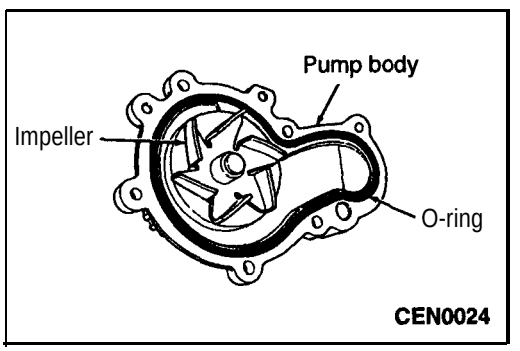
(1) Install thermo switch.
(2) Install engine coolant temperature sensor. lighten sensor to 7 Nm (5 ft.lbs.) torque.



(3) Place a new gasket (dipped in clean water) on water box surface, center thermostat in water box on gasket. Place housing over gasket and thermostat; making sure thermostat is in the thermostat housing. Bolt housing to water box. Tighten bolts to 22 Nm (16 ft.lbs.).

(4) Install O-ring.
(5) Install water pipe.
(6) Install water hose.
(7) Install exhaust manifold cover:
(8) Install oil level gauge.



(9) Install new O-ring gasket in water pump body O-ring groove.

Caution
Make sure O-ring is properly seated in water pump groove before tightening screws. An improperly located O-ring may cause damage to the O-ring and cause a coolant leak.

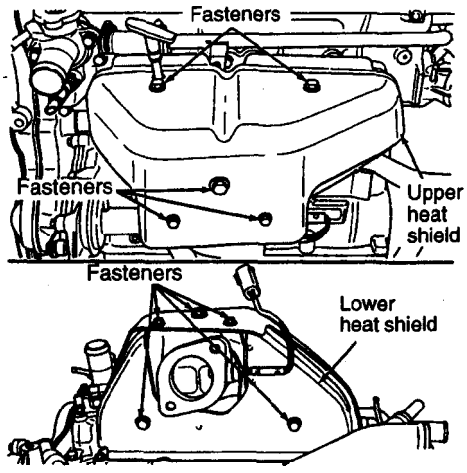
(10) Assemble pump body to block and tighten screws to 12 Nm (9 ft.lbs.)
(ll) Rotate pump by hand to check for freedom of movement.

INSPECTION

11301890013

Replace water pump body assembly if it has any of these defects:
(1) Cracks or damage on the body.
(2) Coolant leaks from the shaft seal, evident by coolant traces on the pump body.
(3) Loose or rough turning bearing.
(4) Impeller rubs either the pump body or the engine block.
(5) Impeller loose or damaged.
(6) Sprocket or sprocket flange loose or damaged.

TSB Revision



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EXHAUST MANIFOLD

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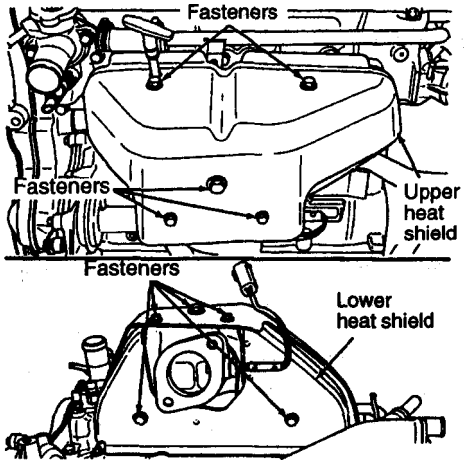
REMOVAL

(1) Remove oil level gauge.
(2) Remove exhaust manifold. heat shield,.
(3) Remove 8 exhaust manifold retaining fasteners and remove exhaust manifold.



CEN0032

INSTALLATION

11301980017

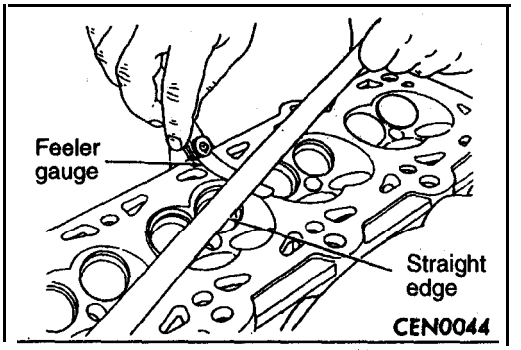
(1) Install new manifold gasket. DO NOT APPLY-SEALER.
(2) Set exhaust manifold in place. Tighten retaining nuts and bolt, starting at center and progressing outward in both directions to 23 Nm (17 ft.lbs.) torque. Repeat this procedure until all fasteners are at specified torque.
(3) Install exhaust manifold heat shield, ,
(4) Install oil level gauge.

CLEANING AND INSPECTION

11301970014

(1) Discard gasket and clean all gasket surfaces of manifolds and cylinder head.
(2) Test manifold gasket surfaces for flatness with straight edge. Surface must be flat within 0.15 mm per 300 mm (.006 in. per foot) of manifold length.
(3) Inspect manifolds for cracks or distortion. Replace manifold if necessary.

TSB Revision



INSPECTION

11390790119

CYLINDER HEAD

(1) Check the cylinder head gasket surface for flatness by using a straightedge and feeler gauge.

Limit: 0.1 mm (.004 in.)

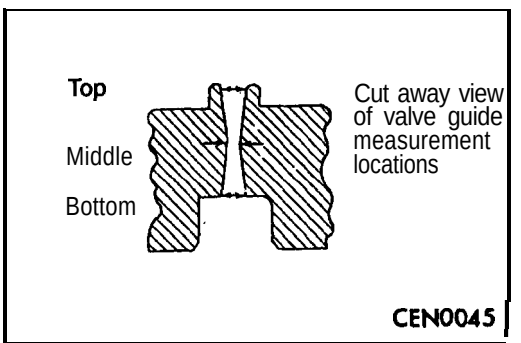
VALVE

(1) Clean valves thoroughly and discard burned, warped and cracked valves.
(2) Measure valve stems for wear.
(3) If valve stems are worn more than 0.05 mm (.002 in.), replace valve.

Standard value:
Intake 5.934–5.952 mm (.233 –.234 in.)
Exhaust 5.906–5.924 mm (.233–.233 in.)

VALVE GUIDES

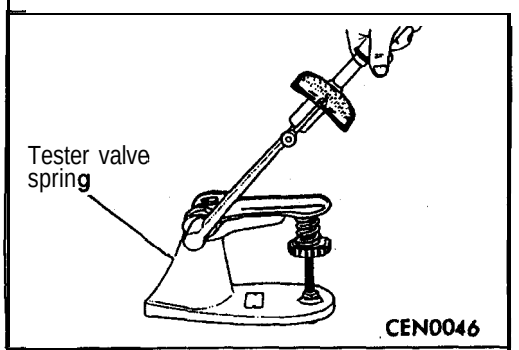
(1) Remove carbon and varnish deposits from inside of valve guides with a reliable guide cleaner.



(2) Using a small hole gauge and a micrometer, measure valve guides in 3 places top, middle and bottom. Replace guides if they are not within specification.

Standard value:
Intake 0.048–0.066 mm (.0019 –.0026 in.)
Exhaust 0.074–0.094 mm (.0029–.0037 in.)

Limit:
Intake 0.076 mm (.003 in.)
Exhaust 0.101 mm (.004 in.)



TESTING VALVE SPRINGS

(1) Whenever valves have been removed for inspection, reconditioning or replacement, valve springs should be tested. As an example, the compression length of the spring to be tested is 33.34 mm (1.313 in.).
Turn table of Tool until surface is in line with the 33.34 mm (1.313 in.) mark on the threaded stud and the zero mark on the front. Place spring over stud on the table and lift compressing lever to set tone device. Pull on torque wrench until ping is heard. Take reading on torque

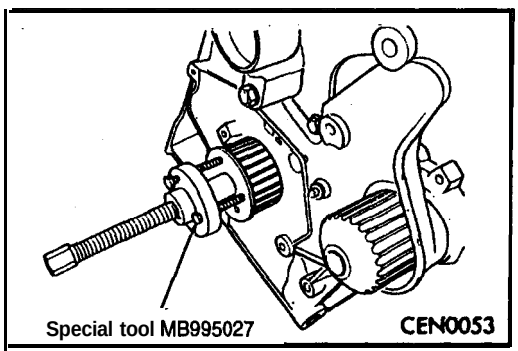
OIL PAN AND OIL PUMP

11302060017

REMOVAL

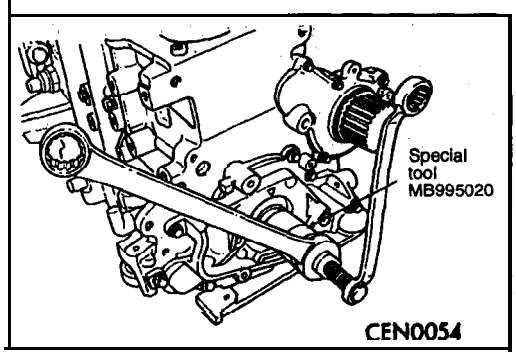
(1) Remove flywheel or drive plate:
(2) Remove rear plate.
(3) Remove oil filter.
(4) Remove adapter.

(5) Drain engine oil and remove oil pan.
(6) Clean oil pan and all gasket surfaces.
(7) Remove oil pick-up tube.



(8) Remove crankshaft sprocket using Special Tool, MB995027.

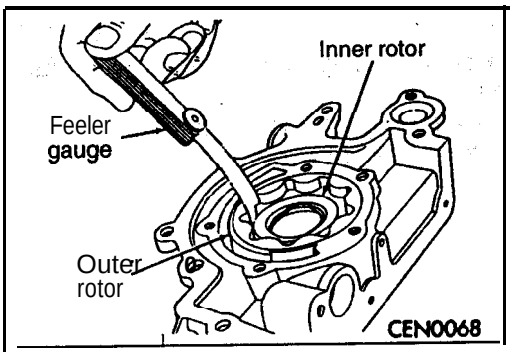
Caution
Do not nick shaft seal surface or seal bore.



(9) Use Tool MB995020 to remove front, crankshaft oil seal. Be careful not damage the seal surface of cover.

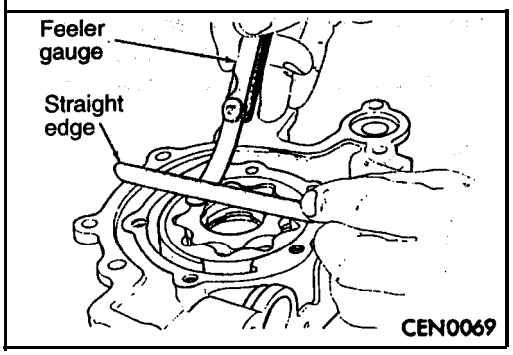
(10) Remove oil pump.

TSB Revision



(7) Install inner rotor into pump housing. If clearance between inner and outer rotors exceeds the limit, replace both rotors.

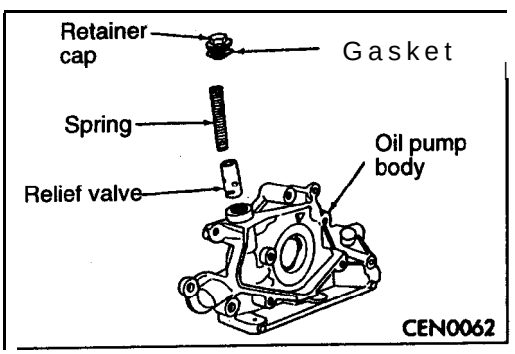
Limit: 0.203 mm (.008 in.)



(8) Place a straightedge across the face of the pump housing, between bolt holes. If a feeler gauge of 0.102 mm (.004 in.) or more can be inserted between rotors and the straightedge, replace pump assembly.

Limit: 0.102 mm (.004 in.)

(9) Inspect oil pressure relief valve plunger for scoring-and. free operation in its bore. Small marks may. be removed, with 400-grit wet or dry sandpaper.



(10) The relief valve spring has a free length of approximately 60.7 mm (2.39 in.). It should test between 80 -and 84 N when compressed to 40.5 mm (1.60 in.). , Replace spring that fails to meet specifications.

(11) If oil pressure is low and pump is within specifications, inspect for worn engine bearings, or other reasons for oil pressure loss.

TSB Revision

INSTALLATION

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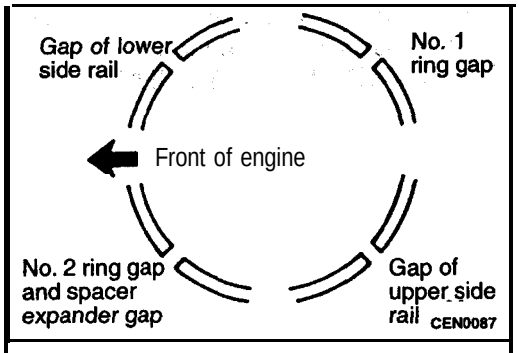
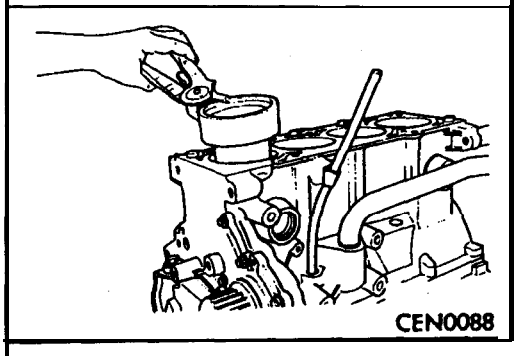
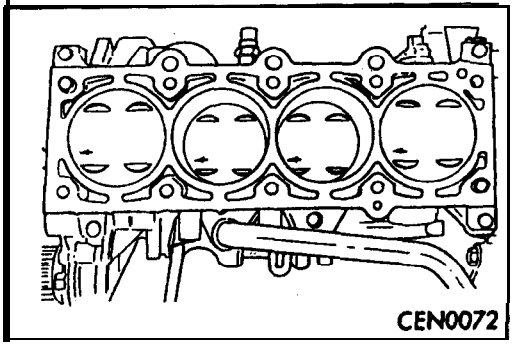
(1) Before installing pistons and connecting rod assemblies into the bore, be sure that compression ring gaps are staggered so that neither is in line with oil ring rail gap.



(2) Before installing the ring compressor, make sure the oil ring expander ends are butted and the rail gaps located as shown in the figure.



(3) Immerse the piston head and rings in clean engine oil, slide the ring compressor, over the piston. Be sure that position of rings does not change during this operation.



(4) The arrow should face toward the front of the engine. Install the pistons.

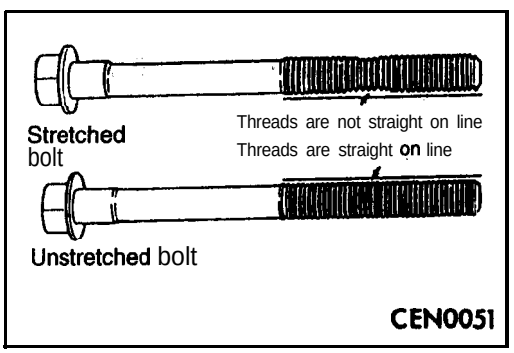
(5) Rotate crankshaft so that the connecting rod journal is on the center of the cylinder bore. Insert rod and piston assembly into cylinder bore and guide rod over the crankshaft journal.

CONNECTING ROD BEARING CLEARANCE

(1) Place a piece of Plastigage across the entire width of the bearing shell in the bearing cap approximately 6.35 mm off center and away from the oil hole. In addition, suspect areas can be checked, by placing Plastigage in the suspect area.
(2) Before assembling the rod cap with Plastigage in place; the crankshaft must be rotated until the connecting rod being checked starts moving toward the top of the engine. Only then should the cap be assembled and torqued to the specification.
Do not rotate the crankshaft while assembling the cap or the Plastigage may be smeared, giving inaccurate results.
(3) Remove the bearing cap and compare the width of the flattened Plastigage with the metric scale provided on the package.

Standard value: 0.026–0.059 mm (.001–.0023 in.)

Limit: 0.075 mm (.003 in.)



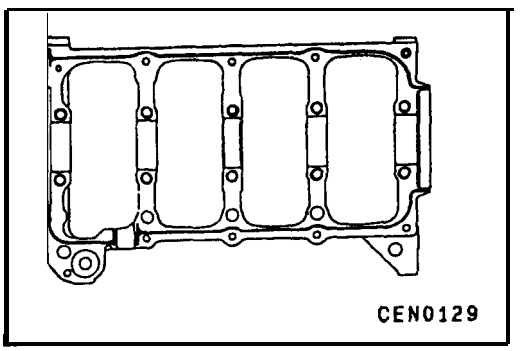
CONNECTING ROD BEARING CAP BOLT

(1) Since the connecting rod bearing cap bolts are torqued using a new procedure, they should be examined BEFORE reuse. If the threads are necked down, replace the bolts.
(2) Necking can be checked by holding a scale or straight edge against the threads. If all the threads do not contact the scale, the bolt should be replaced.

NOTE
All upper bearing shells in the crankcase have oil grooves. All lower bearing shells installed in the (bedplate) main bearing caps are plain. Crankshaft end play is controlled by a flanged bearing on the number three main bearing journal.

(6) Make certain oil holes in block line up with oil hole in bearings and bearing tabs seat in the block tab slots.
(7) Oil the bearings and, journals and install crankshaft.

Caution
Do not get oil on bedplate mating surface. If may effect the sealer ability to seal the bedplate to cylinder block.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(8) Apply 1.5 to 2.0 mm (.059 to .078 in.) bead of Loctite 19614 to cylinder block as shown in the figure.
(9) Install main bearing cap bedplate together with lower' bearing shells.

Caution
Use only the specified anaerobic sealer "on the bedplate or damage may occur to the engine.

INSPECTION

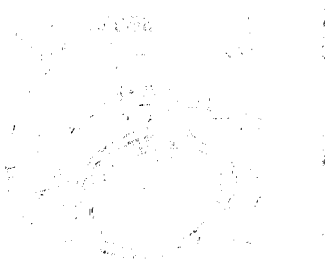
11302160010

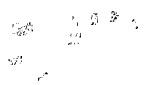
CRANKSHAFT MAIN JOURNALS

(1) The crankshaft journals should be checked for excessive wear, taper and scoring. Limits of taper or out-of-round on any crankshaft journals should be held. to 0.025 mm. (.001 in.). Journal grinding should not exceed 0.305 mm (.012 in.) under the standard journal diameter. Do NOT grind thrust faces of Number 3 main journal. Do NOT nick crank pin or journal fillets. After grinding, remove rough edges from crankshaft oil holes and clean out all passages.

Caution

With the nodular cast iron crankshafts used it is important that the final paper or cloth polish after any journal regrind be in the same direction as normal rotation' in the engine.





CRANKSHAFT BEARING CLEARANCE

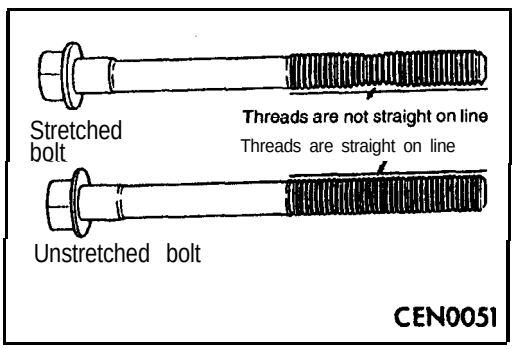
(1) The. total: clearance of the main bearings can only be determined by removing the weight of the crankshaft. This is accomplished by having the engine turned upside down on the engine stand. This will remove all the crankshaft weight off the bearing surface.

(2) Place, a piece of Plastigage across the entire width of the bearing shell in the bedplate approximately 6.35 mm (.25 in.) off center and away from the oil holes. In addition, suspect areas can be checked by placing the Plastigage in the suspect area.
Torque the bedplate bolts of the bearing being checked to the proper specifications.

Caution
Do not rotate crankshaft, or the Plastigage may be smeared.

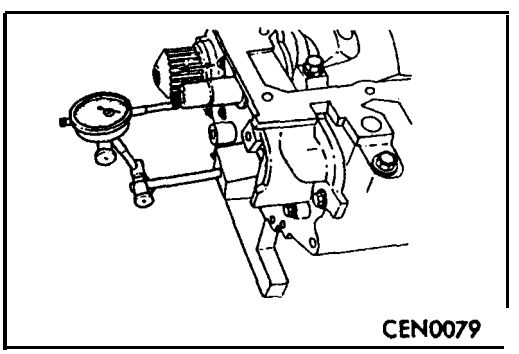
(3) Remove the bedplate and compare the width of the flattened Plastigage with the metric scale provided on the package.

Standard value: 0.022–0.062 mm (.0009–.0024 in.)



MAIN BEARING BOLTS

(1) Since the main bearing bolts are torqued using a new procedure, they should be examined BEFORE reuse. If the threads are necked down, replace the bolts.
(2) Necking can be checked by holding a scale or straight edge against the threads. If all the threads do not contact the scale, the bolt should be replaced.



CHECKING CRANKSHAFT END PLAY

(1) Mount a dial indicator to front of engine, locating probe on nose of crankshaft.
(2) Move crankshaft all the way to the rear of its travel using a lever inserted between a main bearing cap and a crankshaft cheek, using care not to damage any bearing surface, Do not loosen main bearing cap.
(3) Zero the dial indicator.
(4) Move crankshaft all the way to the front and read the dial indicator.

Standard value: 0.09–0.24 mm (.0035–.0094 in.)

Limit: 0.37 mm (.015 in.)

(5) Replace No. 3 main bearing if limit is exceeded and remeasure.
(6) Replace crankshaft if limit is still exceeded.