

Sequence IIIF Engine Oil Certification Test
Engine Assembly Manual

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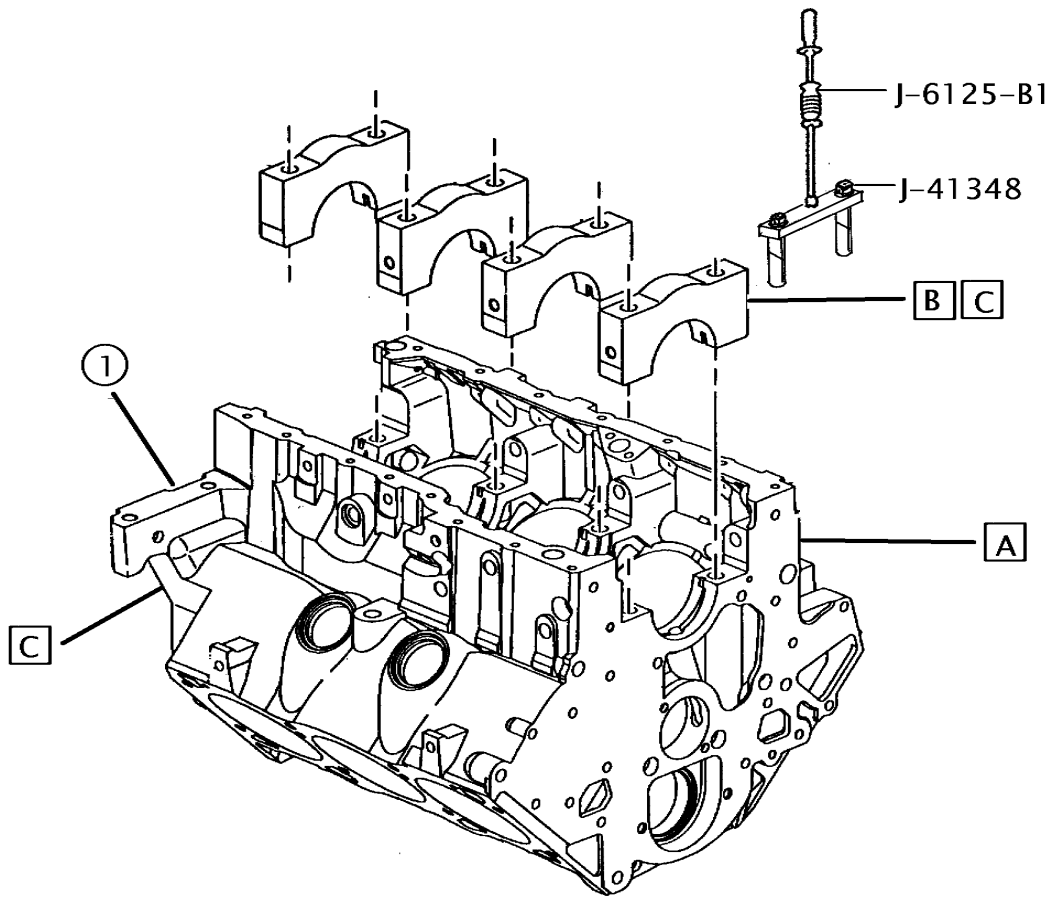
MC 480-106-160

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Section 1
Cleaning and Pre Hone Preparation



Description of Operation

- A Upon introduction of a new block into the system, check for any damage to machined surfaces which might have occurred during shipping or handling.
- B Remove main cap side & main bolts. Use Kent-Moore J-41348 main bearing cap puller (12Nm) & J-6125-1B slide hammer to remove main caps. **Note: Main bearing caps are press fit. Do not hammer caps back and forth during removal. Damage to the caps may result in damage to engine bearings during test.**
- C Record engine serial number and or assign a laboratory number and mark necessary identification on engine block and crankshaft main caps. **Note: Do not use stamped tool set for marking identification on main caps.**

Specification

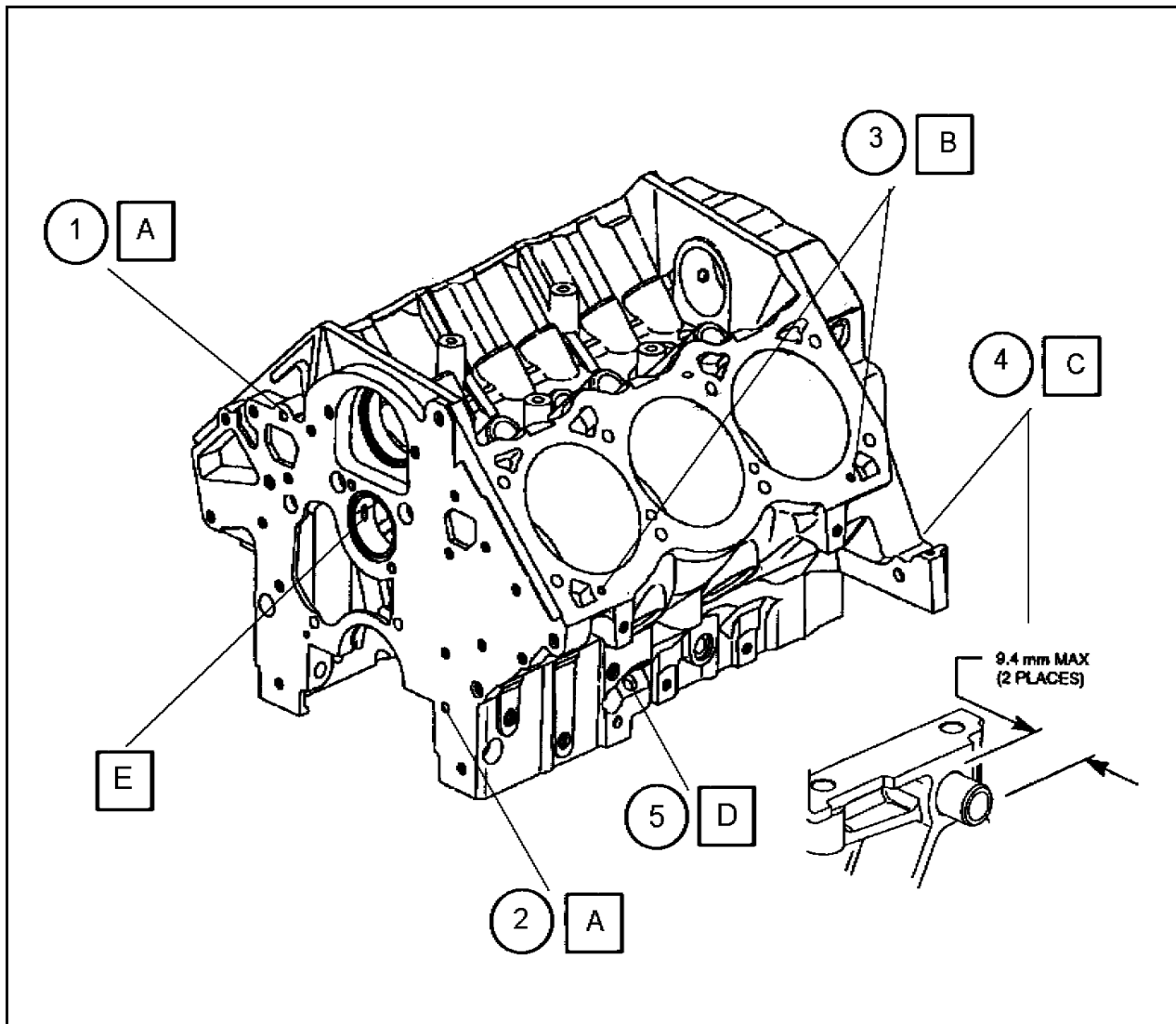
1 24506028 Block Assembly

REV	Date	Revision History
1	12/31/97	Block-1

View	
Engine Block	
New block and pre-hone prep	
Serial Number Locations	

New Block and Pre-Hone Prep	Sequence III F
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Section	Sheet
1	1



Description of Operation	
A	Install locating pins on front face.
B	Install locating pins on cylinder deck
C	Install locating pins on rear transmission mount face.
D	Use OHT3F-071-1 reamer to size dip stick hole for calibrated dip stick
E	Deburr all leading edges of camshaft tunnel bores and oil gallery cross drilled intersections through tunnel bores using emery cloth and wire wheel as necessary to remove sharp edges.

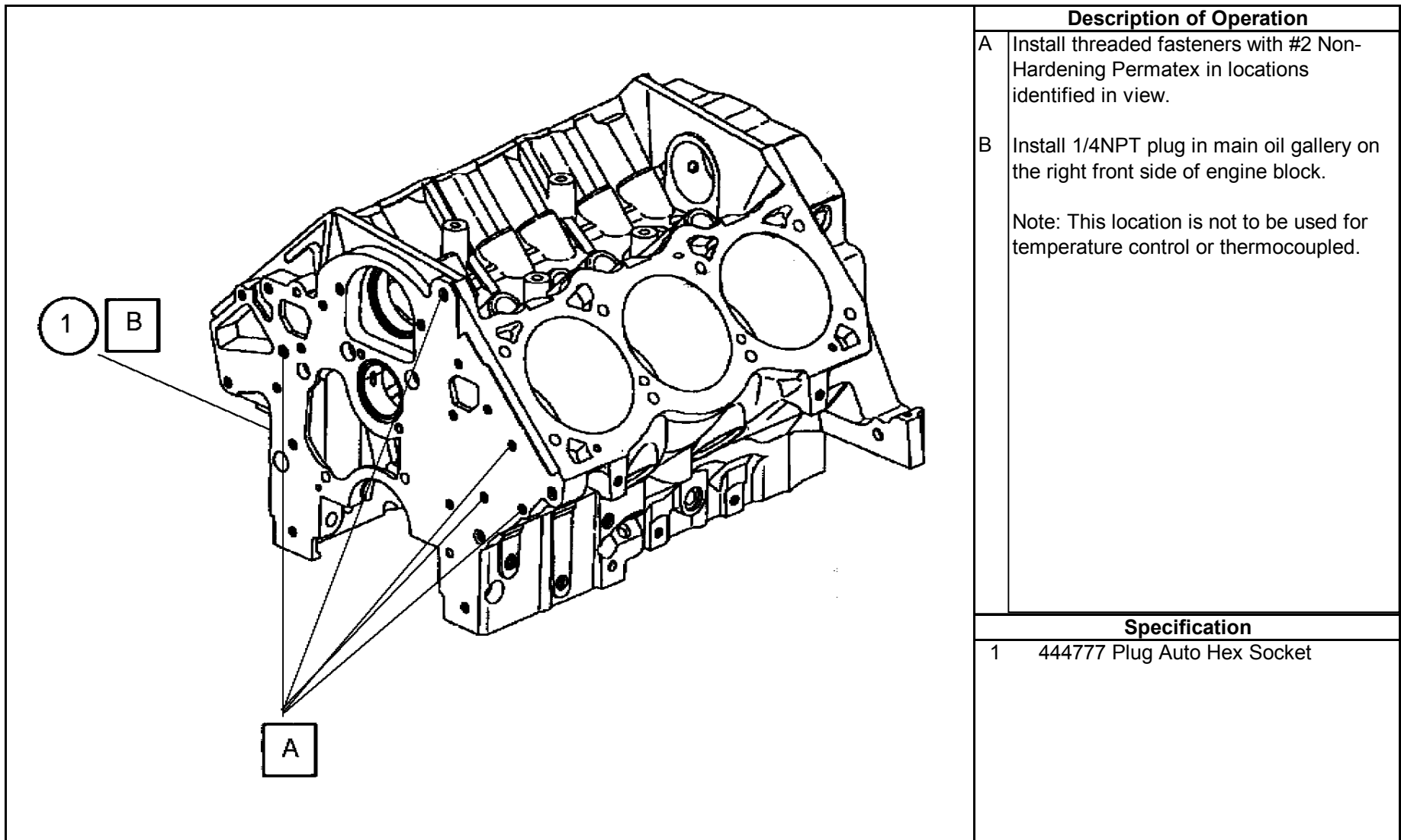
Specification	
1	24501162 Pin Front Cover Upper
2	25536323 Pin Front Cover Lower
3	25536320 Pin Cyl. Head Location
4	12338076 Pin Trans. Location
5	OHT3F--071-1 Reamer

REV	Date	Revision History
1	12/31/97	Block-2
2	11/6/99	Add Operation "D" & "E" and OHT3F-071

View
Engine Block
New block and pre-hone prep
Locating pin installation
Camshaft tunnel and dip stick prep

New Block and Pre-Hone Prep	Sequence III F
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Section	Sheet
1	2



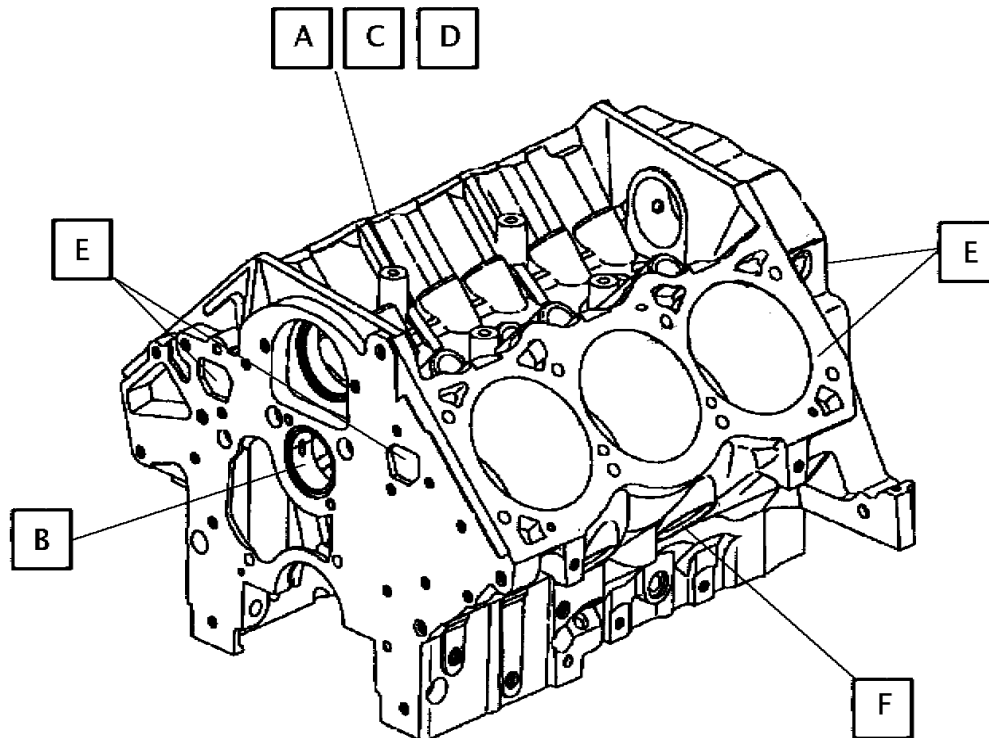
Description of Operation	
A	Install threaded fasteners with #2 Non-Hardening Permatex in locations identified in view.
B	Install 1/4NPT plug in main oil gallery on the right front side of engine block.
Note: This location is not to be used for temperature control or thermocoupled.	

Specification	
1	444777 Plug Auto Hex Socket

REV	Date	Revision History
1	12/31/97	Block-3
2	11/6/99	Change location in group "A"

View
Engine Block
New block and pre-hone prep
Plugged holes in front of engine

New Block and Pre-Hone Prep	Sequence III F	Section	Sheet
		1	3



Description of Operation	
A	Remove all casting slag and core sand deposits from the coolant passages on new blocks and check for core sand deposits on used blocks
B	Remove all camshaft bearings and oil gallery plugs.
C	Clean all gasket surfaces.
D	Chase all threaded holes for the main caps and cylinder head fasteners.
E	Install block-off plates over the coolant passages on the front face, rear face, and cylinder deck. (Fabricate in-house)
F	Install coolant Welch plugs.

Specification

View
Engine Block
New block and pre-hone prep

Section	Sheet
1	4

REV	Date	Revision History
1	12/31/97	Block-4

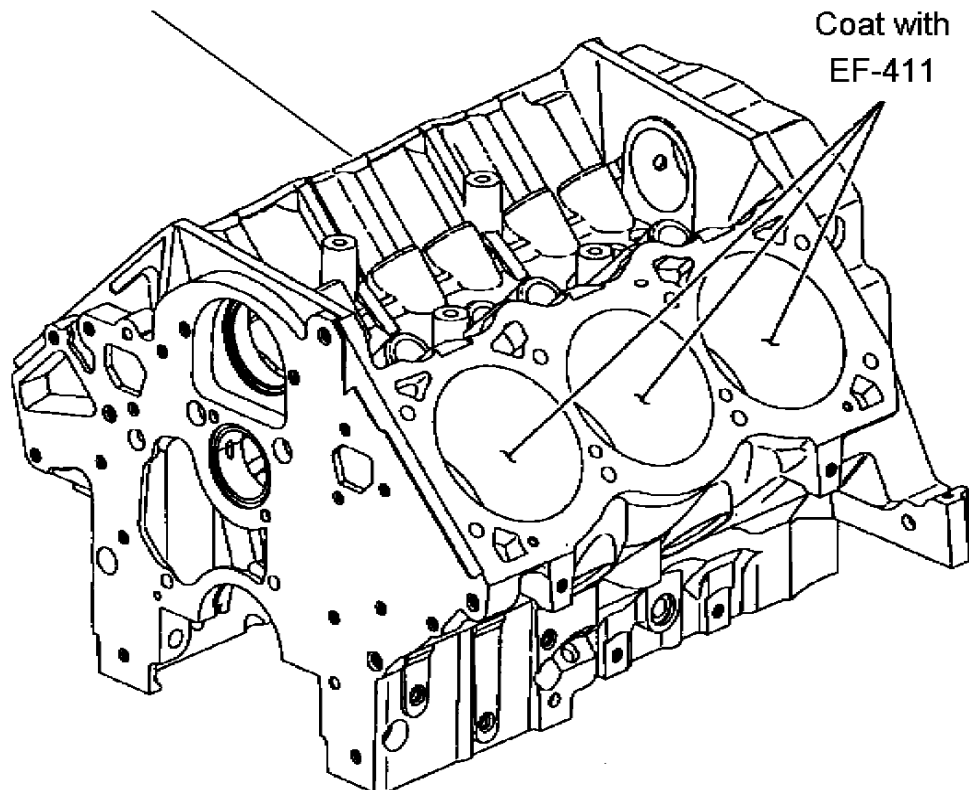
New Block and Pre-Hone Prep

Sequence III F

Spray engine with 50/50 Solution EF-411 / Alipahtic Naphtha

A B

Coat with EF-411



Description of Operation

- A The engine may be cleaned using an automated washing device, however, caution should be used to prevent oxidation flash over of the ferrous surfaces. Note: Do not use caustic chemicals or acid type baths.
- B The block must be thoroughly cleaned using brushes through the oil galleries, camshaft tunnel, and cylinder bores with aliphatic naphtha to remove any detergent residue before honing.
- ? (Step Sec. 1 sheet 6)
Repeat step "A & B" after honing.
- Note: If this is the final cleaning after honing, spray the entire engine block using a 50/50 solution of EF-411 and aliphatic naphtha. Air dry to remove excess solution.
- ? (Step Sec. 3 sheet 1)

Specification

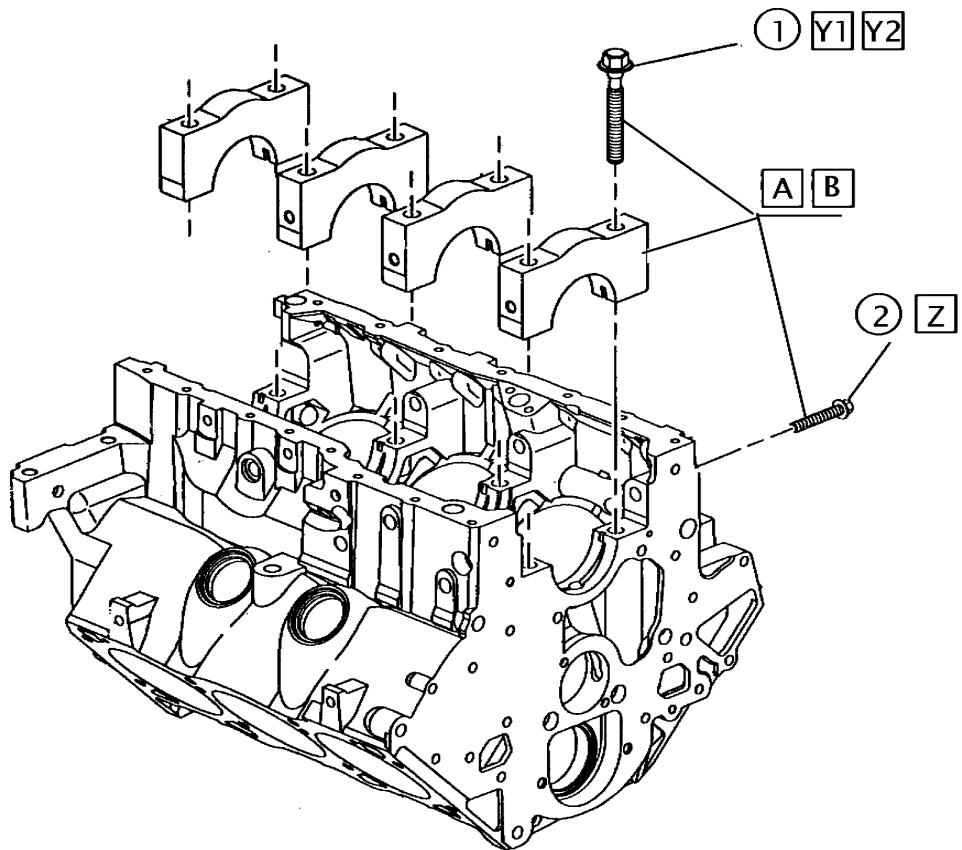
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REV	Date	Revision History
1	12/31/97	Block-5
2	11/6/99	View update

View
Engine Block
Engine block cleaning

New Block and Pre-Hone Prep	Sequence III F	
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Section	Sheet
1	5



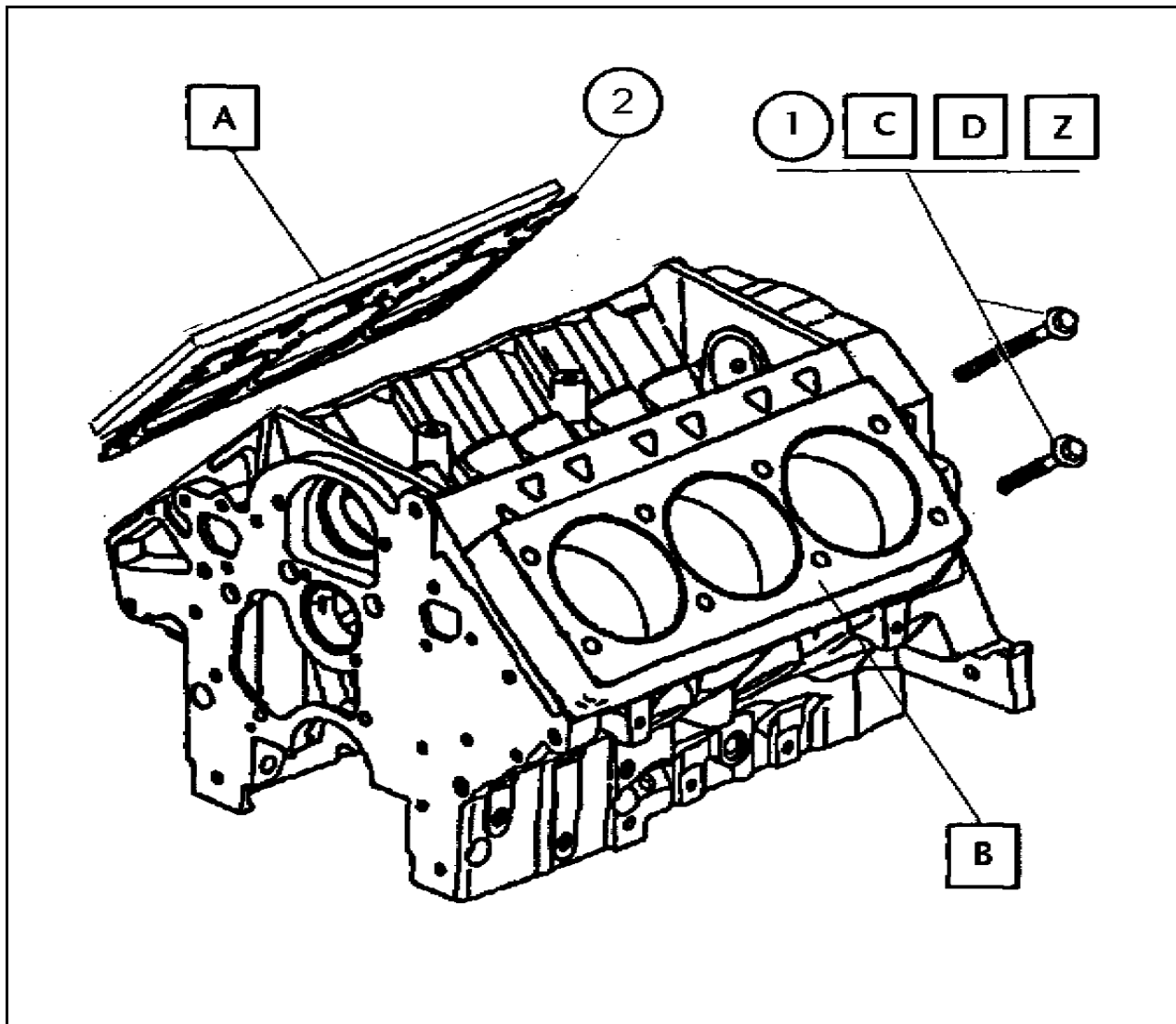
Description of Operation	
A	Clean and oil all main cap bolts (EF-411) and install main caps. Note: Do not use air tools to run main caps down.
B	Install main cap with fasteners as guides and tap into position with plastic mallet or use very light pressure by hand with speed handle and socket in crisscross pattern to draw the main cap down.
Y1	Tighten all main bolts to 70 Nm to fully seat main caps and then loosen the bolts 360° counterclockwise.
Y2	Torque & Angle 20Nm then 40Nm + 35°+35°+35° (repeat 3 times from center out)
Z	Torque & Angle 15Nm + 45°

Specification	
1	24503056 Bolt (8) see note Y (Tighten before Z)
2	24505576 Bolt (6) see note Z (Tighten after Y)

View	
Engine Block	
Main cap installation	

Section	Sheet
1	6

REV	Date	Revision History
1	1/10/98	Block-6
New Block and Pre-Hone Prep		Sequence III F



Description of Operation	
A	Remove cylinder deck block off plates.
B	Install B-H-J Torque Plates w/gaskets (GM-3.8/3E-R-S-T-HT)
C	Note: When installing torque plates, 1) move the bottom row of fasteners to the top, 2) discard the top row of fasteners, 3) use the post test fasteners from the last teardown in the bottom row on the torque plates.
D	Use the Torque Sensor 1 wrench set on soft joint for gasketed applications.
Z	30Nm-50Nm-80Nm - JCS-TEL to yield. (Step Sec.2 sheet 1)

Specification	
1	25527831 Bolt Cyl. Head (8)(Long) See note Z Use in upper and lower position with double hardened washers on lower row. Obtain washers from B-H-J.
2	24503801 Gasket RH. 24503802 Gasket LH.

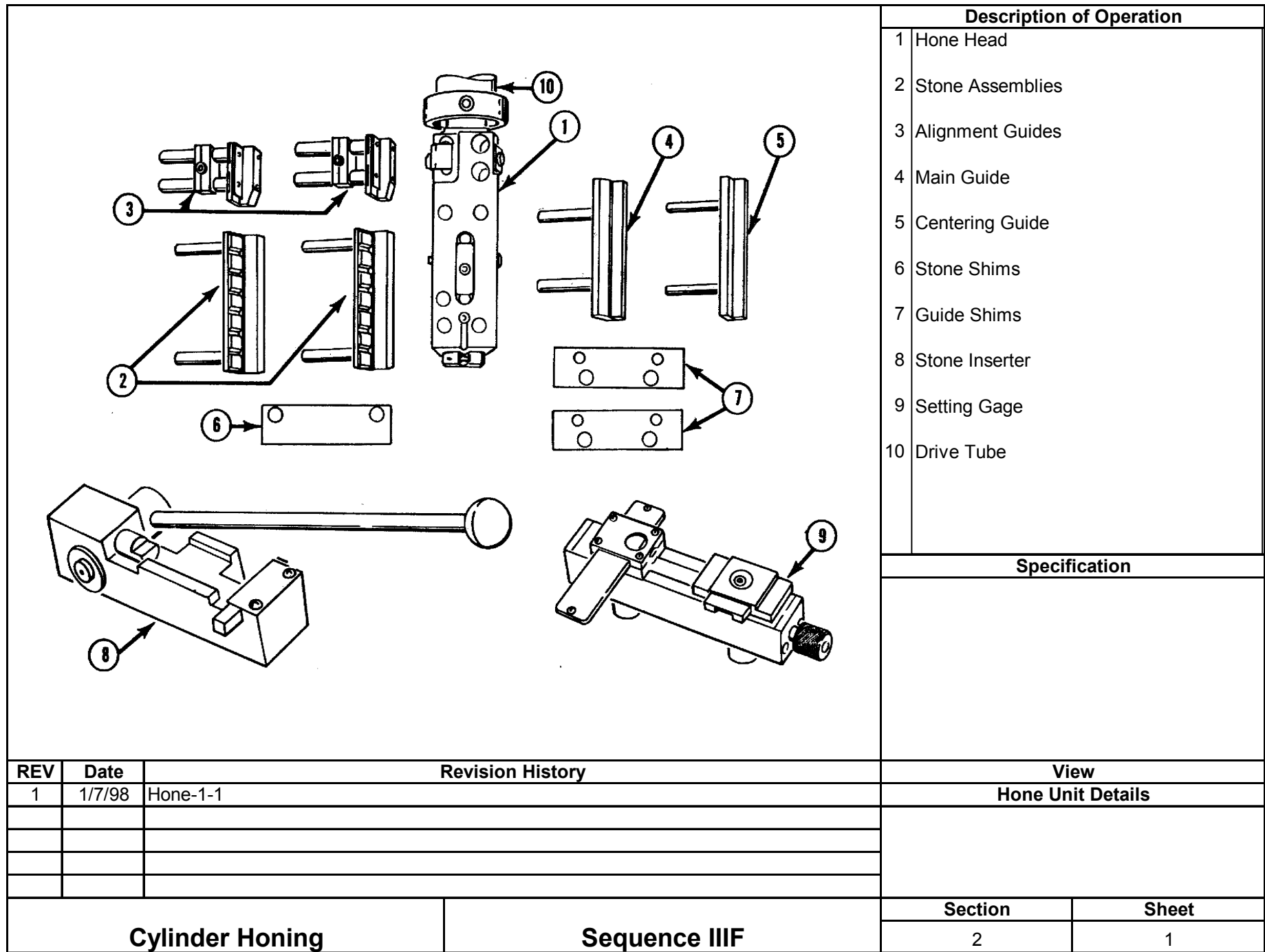
REV	Date	Revision History
1	1/1/98	Block-7
2	11/6/99	Add head gasket part numbers

View	
Engine Block	
B-H-J Torque Plate installation	

New Block and Pre-Hone Prep	Sequence III F
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Section	Sheet
1	7

Section 2
Cylinder Block Honing



Description of Operation	
1	Hone Head
2	Stone Assemblies
3	Alignment Guides
4	Main Guide
5	Centering Guide
6	Stone Shims
7	Guide Shims
8	Stone Inserter
9	Setting Gage
10	Drive Tube

Specification

REV	Date	Revision History
1	1/7/98	Hone-1-1

View
Hone Unit Details

Cylinder Honing	Sequence III F

Section	Sheet
2	1

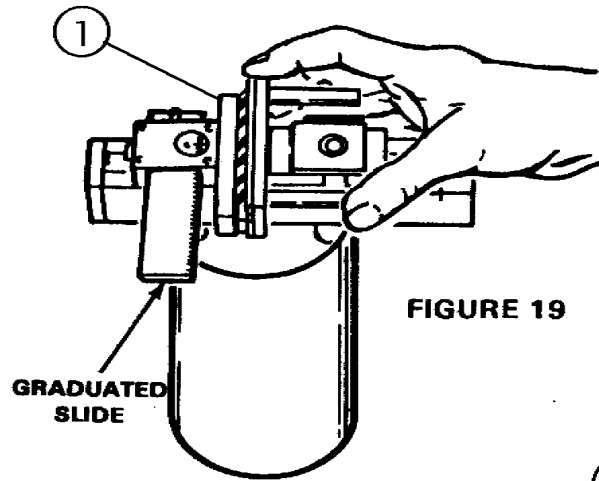


FIGURE 19

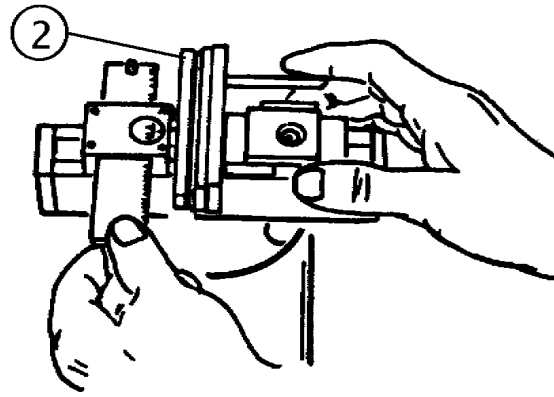


FIGURE 20

Description of Operation

- Set the turret block to the standard position and adjust the setting block snugly in the cylinder bore.
- 19 Place the stone assembly in the setting gage with the slide scale set at "0". Add shims as necessary to adjust to 1 - 2 on the slide scale for the stone and guide assemblies.
- 20 Place the plateau honing tool in the setting gage with the slide scale set at "0". Add shims as necessary to adjust to 3 - 4 on the slide scale.
- Note: The alignment guides are not used during honing of IIIF blocks.

Specification

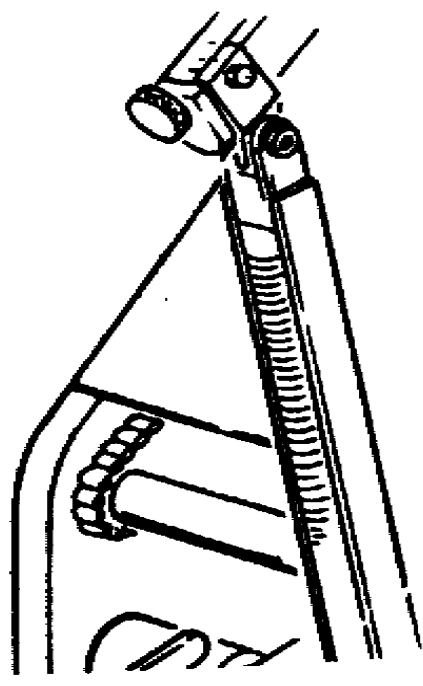
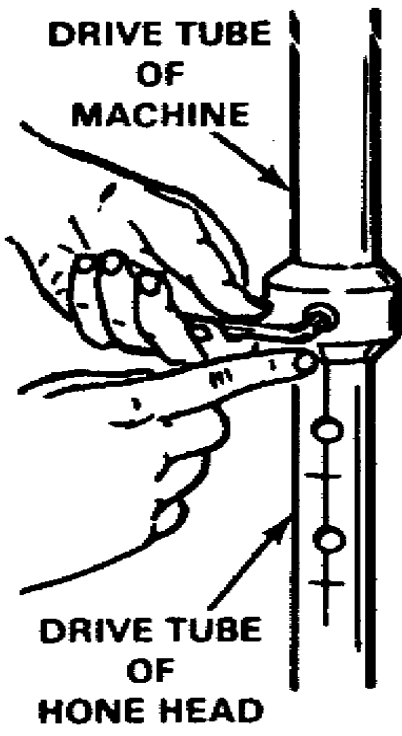
- 1 EHU 512 Stone
- 2 C30-PHT-731 Plateau Honing Tool

REV	Date	Revision History
1	1/7/98	Hone-3-1 & 3-2

View
Stones & Guides
Stone and guide adjustment

Cylinder Honing	Sequence IIIF
------------------------	----------------------

Section	Sheet
2	2



Description of Operation

Slip the Drive Tube of the Hone Head into the Drive Tube of the CV-616-46 and tighten the set screw with the first set of index marks in line.

Specification

REV	Date	Revision History
1	1/7/98	Hone-2-2

View
Drive Tube
Drive tube adjustment

Cylinder Honing	Sequence III F
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Section	Sheet
2	3

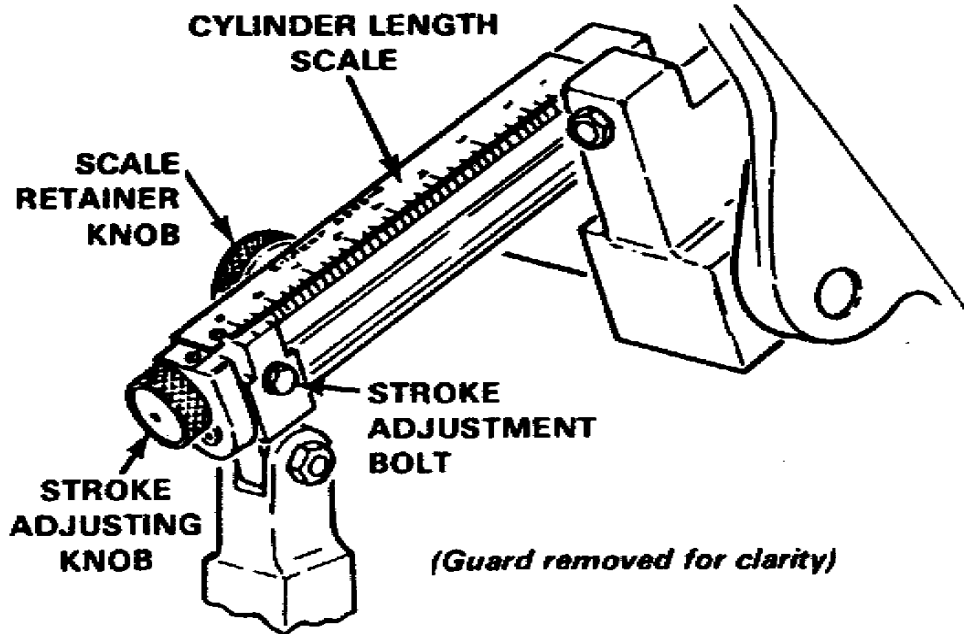


FIGURE 23

Description of Operation

Loosen stroke adjustment bolt and set stroke length at 5 3/8"

Note; to change the Stroke Scale to Metric, order PNP 1275M.

Specification

View

Stroke Length

Section

Sheet

2

4

REV	Date	Revision History
1	1/7/98	Hone-4

Cylinder Honing

Sequence III F

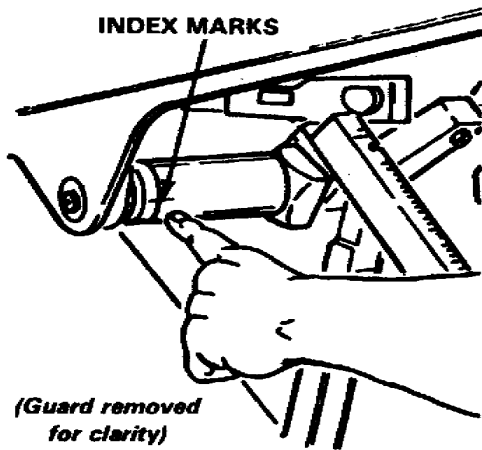


FIGURE 24

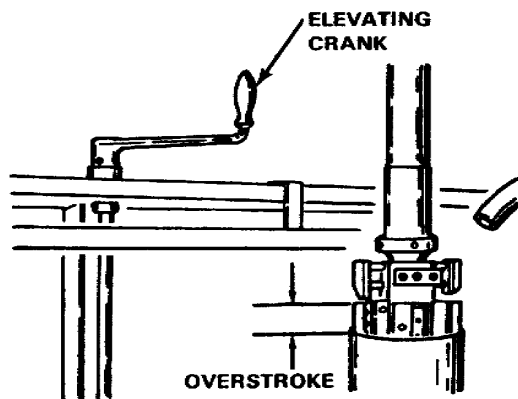


FIGURE 25

Stone Length		Top Overstroke Setting	
Inches	mm	Inches	mm
2-3/4"	70 mm	3/8"	9,5 mm
3-1/2"	89 mm	5/8"	16 mm
4-1/2"	115 mm	13/16"	21 mm
6"	152 mm	1-1/16"	27 mm

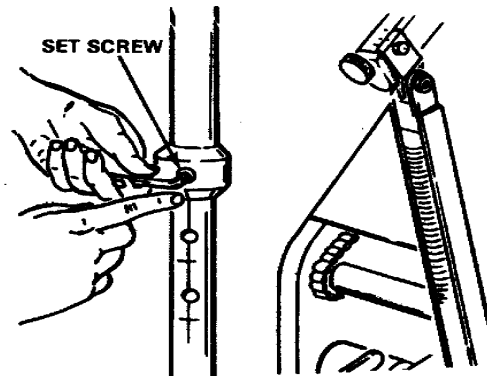


FIGURE 26

Description of Operation

With the hone head in the cylinder and the index marks lined up as shown in figure 24, use the elevating crank to adjust the overstroke length to 3/8" as indicated in figure 26 for 2 3/4" stone length.

Note: Drive tube should be set at first set of index marks.

Specification

REV	Date	Revision History
1	1/7/98	Hone 4 & 5

View
Overstroke
Overstroke adjustment

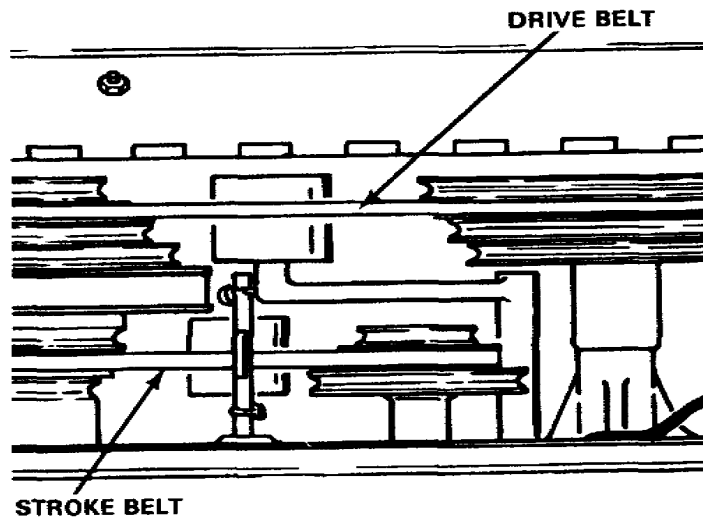
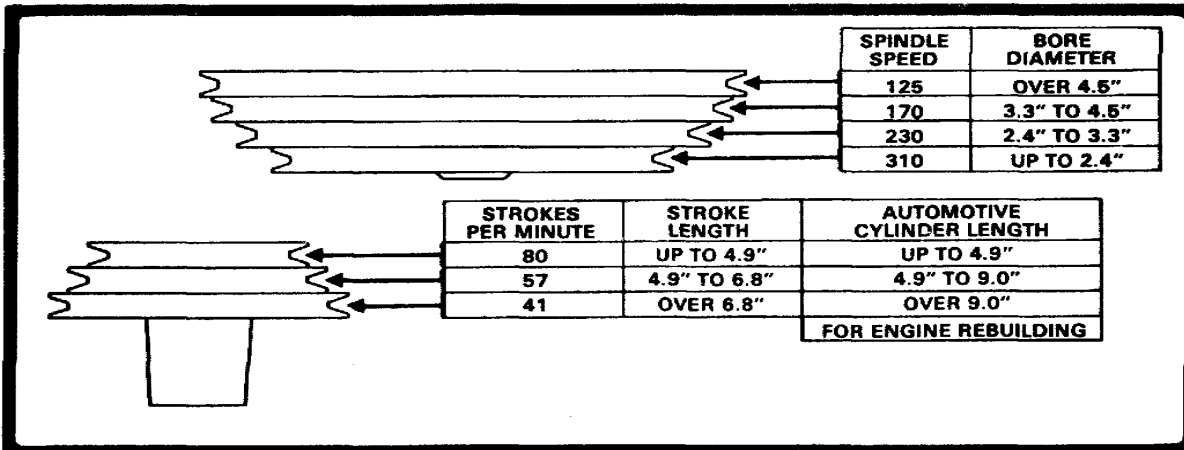


FIGURE 28

Description of Operation

Open the left side of the belt cover and set the spindle speed at 170 and the strokes per minute at 57.

Specification

REV	Date	Revision History
1	1/7/98	Hone-6

View
Speed & Stroke

Cylinder Honing

Sequence III F

Section

2

Sheet

6

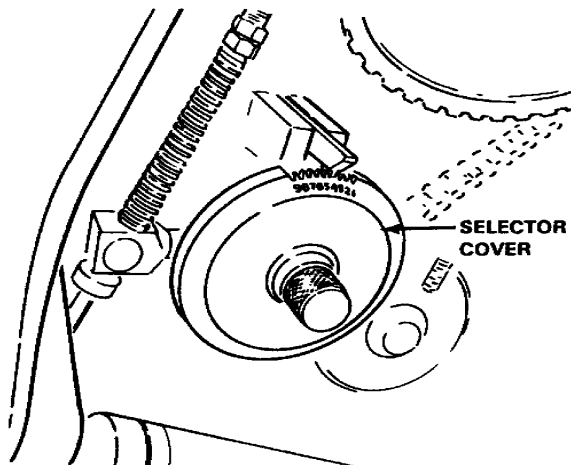


FIGURE 29

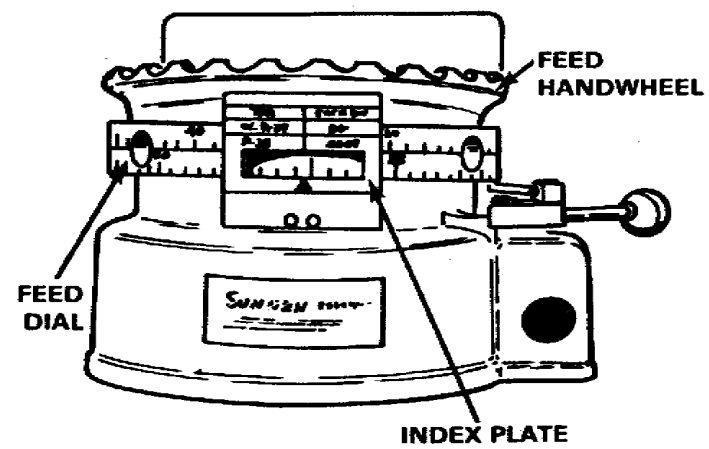


FIGURE 30

Description of Operation

Set the ratchet feed rate on the selector cover to 4. See figure 29

Use the index plate for the lower scale identified as P28 .005 per division.

Note: to change the Hand Wheel Assembly and Stroke Plate to Metric, order CV-215MA.

Specification

REV	Date	Revision History
1	1/7/98	Hone-7
2	12/1/99	Change note from .0005 to .005

View	
Ratchet Feed & Index Plate	

Cylinder Honing

Sequence III F

Section	Sheet
2	7

<p style="text-align: center;">Honing Operations Guide</p> <p>Rough Cut to Size (EHU-512 Stones)</p> <ol style="list-style-type: none"> 1 Insert hone head into cylinder and rotate feed handle to the left while shaking the hone head until a slight resistance is felt. 2 Adjust the feed dial for the amount of stock to be removed. (See supplemental section IV.C. honing to size. 3 Set mode switch to zero shutoff. 4 Start honer and watch control panel for unit load and taper indication. Unit load should be between 20 and 30 units during operation. Adjust table for overstroke or dwell as necessary to eliminate taper. <p>Plateau or Finish Hone (C30-PHT-731 Plateau Honing Tool)</p> <ol style="list-style-type: none"> 1 Insert hone head into cylinder and rotate feed handle to the left while shaking the hone head until a slight resistance is felt. 2 Adjust feed dial so it will not shut the machine off before the control panel timer. 3 Set mode switch to timed mode and set controller to 45 seconds. 4 Start honer and increase unit load to 20 to 30 units and allow to run until system shuts off. <p style="text-align: center;">SEE SUPPLEMENTAL SECTION IV. HOW TO HONE</p>			Description of Operation	
SEE SUPPLEMENTAL SECTION IV. HOW TO HONE			Specification	
REV	Date	Revision History	View	
1	1/7/98		Fluid and Operations Guide	
Cylinder Honing		Sequence III F	Section	Sheet
			2	8

Cylinder Sizing Specifications			Description of Operation	
First Run Target Bore Size Hone with EHU-512 @ 20 to 30 units load to Hone with C30-PHT-731 @ 20 to 30 units load for 45 sec.	Metric mm	Inch		
	96.52	3.8000		
	96.515	3.7998		
96.52	3.8000			
96.54	3.8008			
96.535	3.8006			
Second run Target Bore Size Hone with EHU-512 @ 20 to 30 units load to Hone with C30-PHT-731 @ 20 to 30 units load for 45 sec.	96.54	3.8008		
	96.535	3.8006		
	96.54	3.8008		
Third Run Target Bore Size Hone with EHU-512 @ 20 to 30 units load to Hone with C30-PHT-731 @ 20 to 30 units load for 45 sec.	96.56	3.8016		
	96.555	3.8014		
	96.56	3.8016		
Fourth Run Target Bore Size Hone with EHU-512 @ 20 to 30 units load to Hone with C30-PHT-731 @ 20 to 30 units load for 45 sec.	96.58	3.8024		
	96.575	3.8022		
	96.58	3.8024		
Fifth Run Target Bore Size Hone with EHU-512 @ 20 to 30 units load to Hone with C30-PHT-731 @ 20 to 30 units load for 45 sec.	96.60	3.8031		
	96.595	3.8030		
	96.60	3.8031		
Sixth Run Target Bore Size Hone with EHU-512 @ 20 to 30 units load to Hone with C30-PHT-731 @ 20 to 30 units load for 45 sec.	96.62	3.8039		
	96.615	3.8037		
	96.62	3.8039		
			Specification	
Revision History			View	
REV	Date		Cylinder Size	
1	1/8/98	Cylinder sizing chart		
Cylinder Honing		Sequence III F	Section	Sheet
			2	9

Honer Calibration

- 1 Setup the hone head and stroke length according to steps 1 through 7.
- 2 Insert the hone head into the cylinder and tighten the feed handwheel while shaking the drive tube until resistance is encountered.
- 3 Back off the handwheel until hone head is free and can be turned easily by hand in the cylinder.
- 4 Open the control panel to gain access to the adjustment pots, i.e., zero & gain.
- 5 Start the honer and engage the hone head.
- 6 Adjust the load meter to read 10 units load using the gain adjustment.
- 7 The load unit watt meter is now ready for IIF operations.

Description of Operation

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Specification

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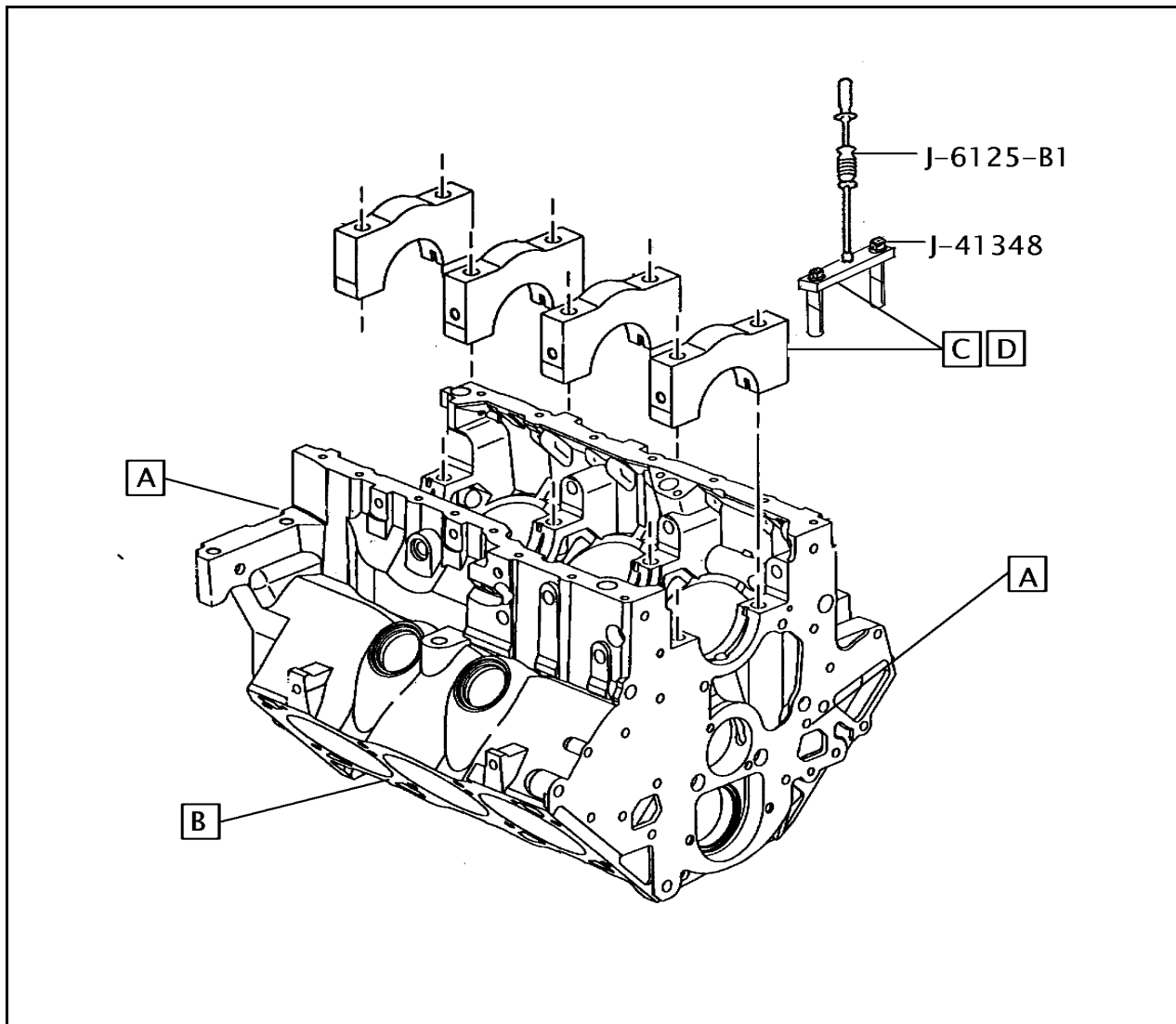
REV	Date	Revision History
1	1/1/98	Hone-10

View
Honer Calibration

Cylinder Honing	Sequence IIF
------------------------	---------------------

Section	Sheet
2	10

Section 3
Short Block Assembly



Description of Operation	
A	Remove all block off plates
B	Remove torque plates
C	Remove main cap side & main bolts.
D	Use Kent-Moore J-41348 main bearing cap puller & J-6125-1B slide hammer to remove main caps.
<p>Note: Main bearing caps are press fit. Do not hammer caps back and forth during removal. Damage to the caps may result in damage to engine bearings during test.</p>	

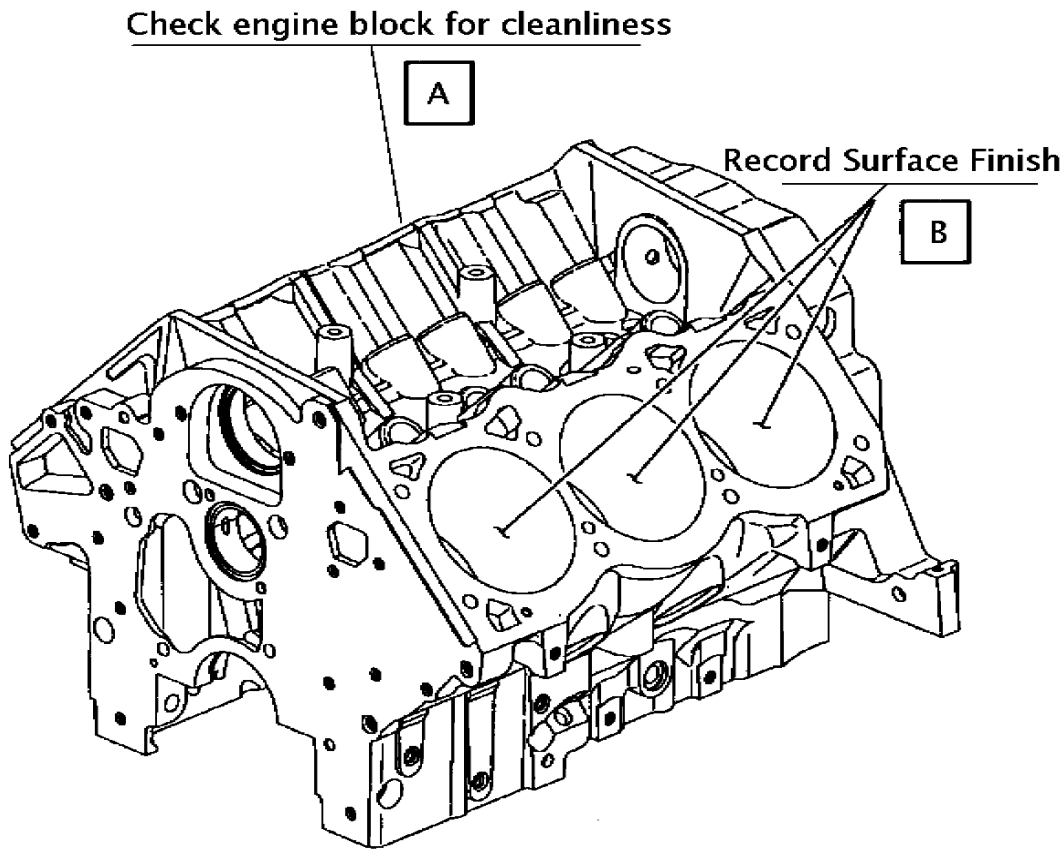
Specification

REV	Date	Revision History
1	1/1/98	Block-8

View
Short Block
Block off plate, torque plate and main cap removal

Short Block Assembly	Sequence III F
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Section	Sheet
3	1



Description of Operation	
A	Check engine block, camshaft tunnel, lifter bores, oil galleries, gasket surfaces, and cylinder bores for cleanliness.
B	Check and record cylinder bore surface finish Ra and confirm bore diameters / run number.

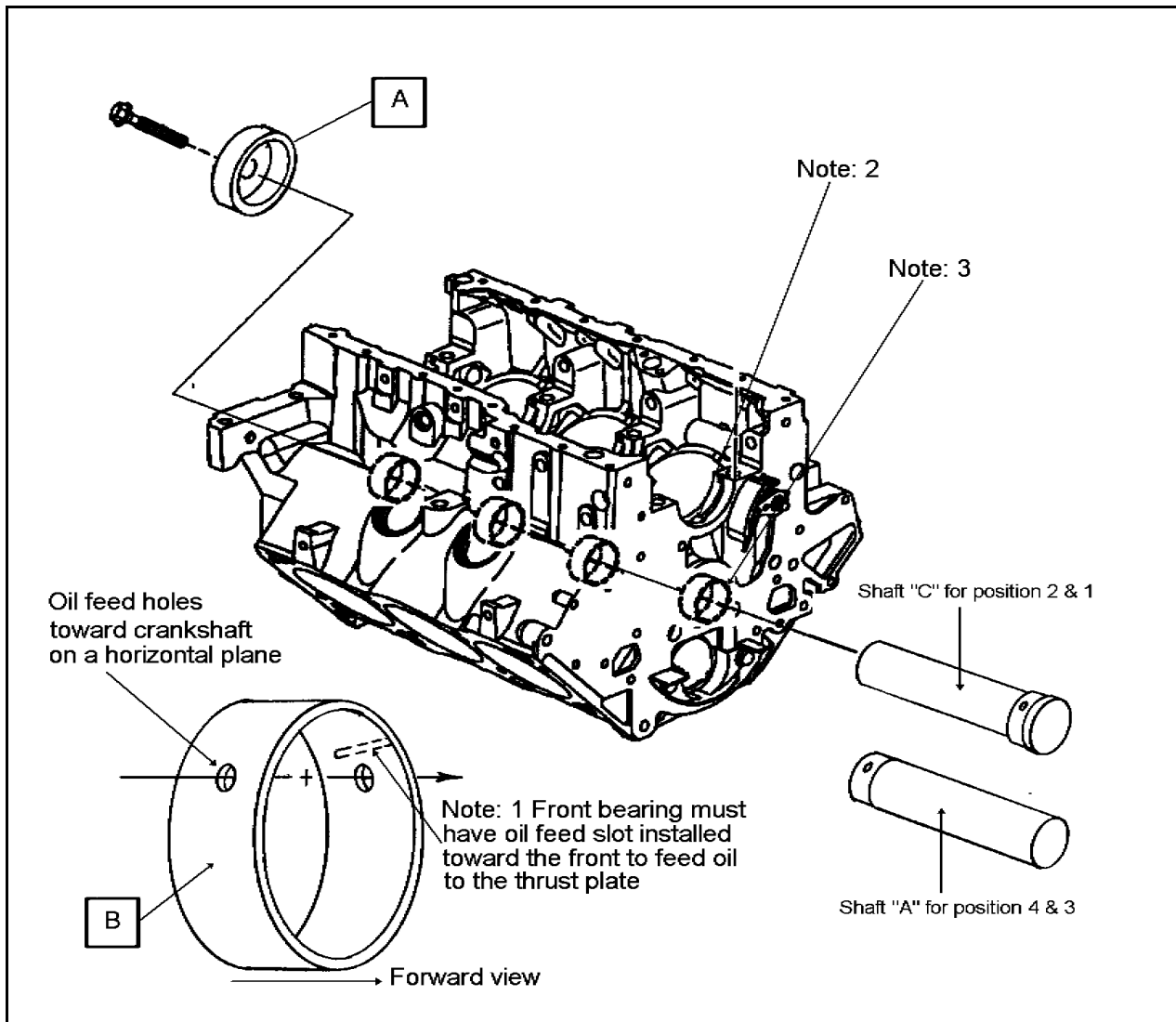
Specification

View
Engine block cleanliness inspection and cylinder surface finish/size recording

Section	Sheet
3	2

REV	Date	Revision History
1	1/2/98	Block-9

Short Block Assembly	Sequence III F
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Description of Operation	
A	Install camshaft bearings using OHT3F-019-1 camshaft bearing installation tool. Sections: A for #4 rear & #3 intermediate C for #2 intermediate and #1 front
B	Lubricate bearing bore and bearing OD. with EF-411. Install bearings with the oil feed holes positioned toward the crankshaft on a horizontal plane. See view "B" and Note: 1
	Note: 2 Use a pen light to check intersection of oil feed hole when viewed through main bearing oil gallery.
	Note: 3 Check bearing bores to remove sharp edge or burrs in leading edge and/or bore before installation. See Sec.1 Sheet 2

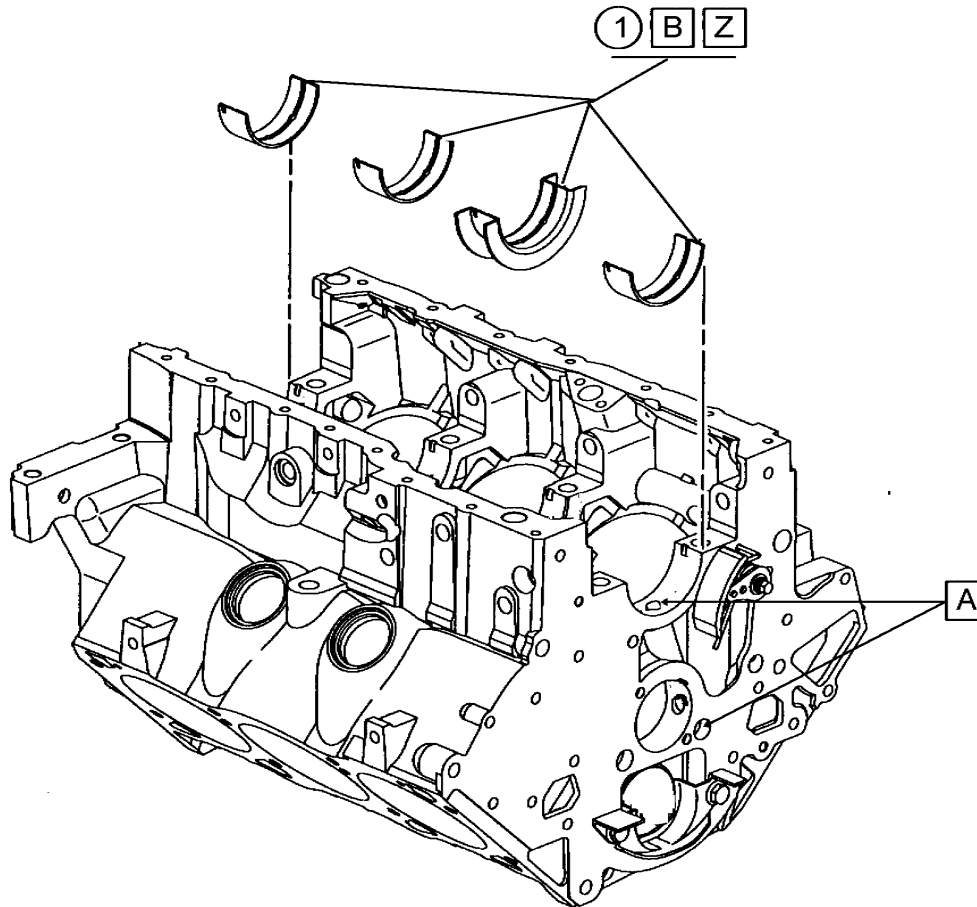
Specification	
1	19581 Bearing camshaft #1 & #4 3F028-07
2	19582 Bearing camshaft #2 & #3 3F028-08
	Both bearings are included in OHT3F-042-2

REV	Date	Revision History
1	1/2/98	Block-10
2	10/12/98	Update 2nd design block requires bearings 19581 & 19582
3	11/7/99	Update part numbers and note 3

View	
Short Block	
Camshaft bearing positioning and installation	

Short Block Assembly	Sequence III F
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Section	Sheet
3	3



Description of Operation

- A Using compressed air, blow through each oil gallery feed from the main bearing support through the camshaft bearings to dislodge any babbitt material that might have come off the camshaft bearings during installation. Use an inspection light to ensure proper alignment of the camshaft bearings and that all debris has been removed from the main and lifter oil galleries.
- B Check the upper main bearing bores for cleanliness and install the upper main bearings in the engine block.
- Z Lubricate with EF-411

Specification

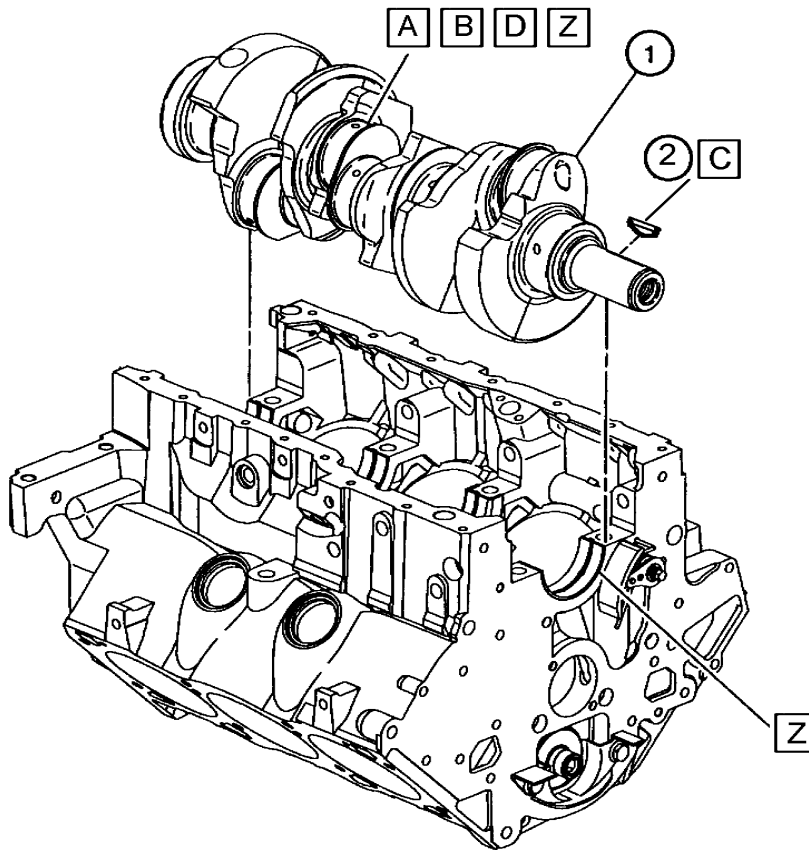
- 1 OHT3F-042-1
 OH-101 (1,3,4, Upper)
 OH-102 (1,3, Lower)
 OH-103 (4 Lower)
 OH-104 (2 Lower)
 OH-105 (2 Upper)

REV	Date	Revision History
1	1/3/98	Block-11
2	11/7/99	Revise drawing, add to "A"

View
Short Block
Upper main bearing inspection and installation

Short Block Assembly	Sequence III F
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Section	Sheet
3	4



Description of Operation

- A Clean the crankshaft using an approved commercial cleaning agent followed by aliphatic naphtha and Mylar strip polishing cloth. The final step should be aliphatic naphtha and nylon bristle brushing of the oil galleries. Spray crankshaft with 50/50 solution and blow excess with compressed air.
- B Check journal diameters.
Mains 63.470 - 63.495mm
Rods 57.1170 - 57.1475mm
- C Install key
- D Install crankshaft in engine block using care to not move the upper main bearings.
- Z Lubricate with EF-411

Specification

- 1 24502168 Crankshaft
- 2 25534912 Key

REV	Date	Revision History
1	1/3/98	Block-12
2	11/6/99	Update for polishing with mylar tape and add key

View
Short Block
Crankshaft cleaning, inspection, and installation

Short Block Assembly	Sequence III F
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Section	Sheet
3	5

			Description of Operation																			
			A	Install lower main bearings into main caps. Clean and oil all main cap bolts (EF-411) and install main caps. Note: Do not use air tools to run main caps down.																		
			B	Install main cap with fasteners as guides and tap into position with plastic mallet or use very light pressure by hand with speed handle and socket in crisscross pattern to draw the main cap down.																		
			Y1	Tighten all main bolts to 70 Nm to fully seat main caps and then loosen the bolts 360° counterclockwise. Check crankshaft end play 0.076 - 0.276mm																		
			Y2	Torque & Angle 20Nm then 40Nm + 35°+35°+35° (repeat 3 times from center out)																		
			Z	Torque & Angle 15Nm + 45° (See note on sealer usage)																		
			Specification																			
			1	OHT3F-042-1 Bearing kit																		
			2	24505576 Bolt side (6) See note on sealer usage																		
			3	24503056 Bolt main cap (8)																		
<table border="1"> <thead> <tr> <th>REV</th> <th>Date</th> <th>Revision History</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>1/10/98</td> <td>Block-13</td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>			REV	Date	Revision History	1	1/10/98	Block-13													View	
			REV	Date	Revision History																	
1	1/10/98	Block-13																				
			Short Block																			
			Lower main bearing and crankshaft final test installation																			
Short Block Assembly		Sequence IIIF		Section	Sheet																	
				3	6																	

Description of Operation

- A Confirm run number and proper grade piston selections.
- B Lubricate piston pin and connecting rod with EF-411. Install one piston pin retainer clip into the retaining groove. Install the con rod with the dimple to the rear and piston pin. Install the second retainer clip. Make sure both retainer clips are properly seated in their grooves.

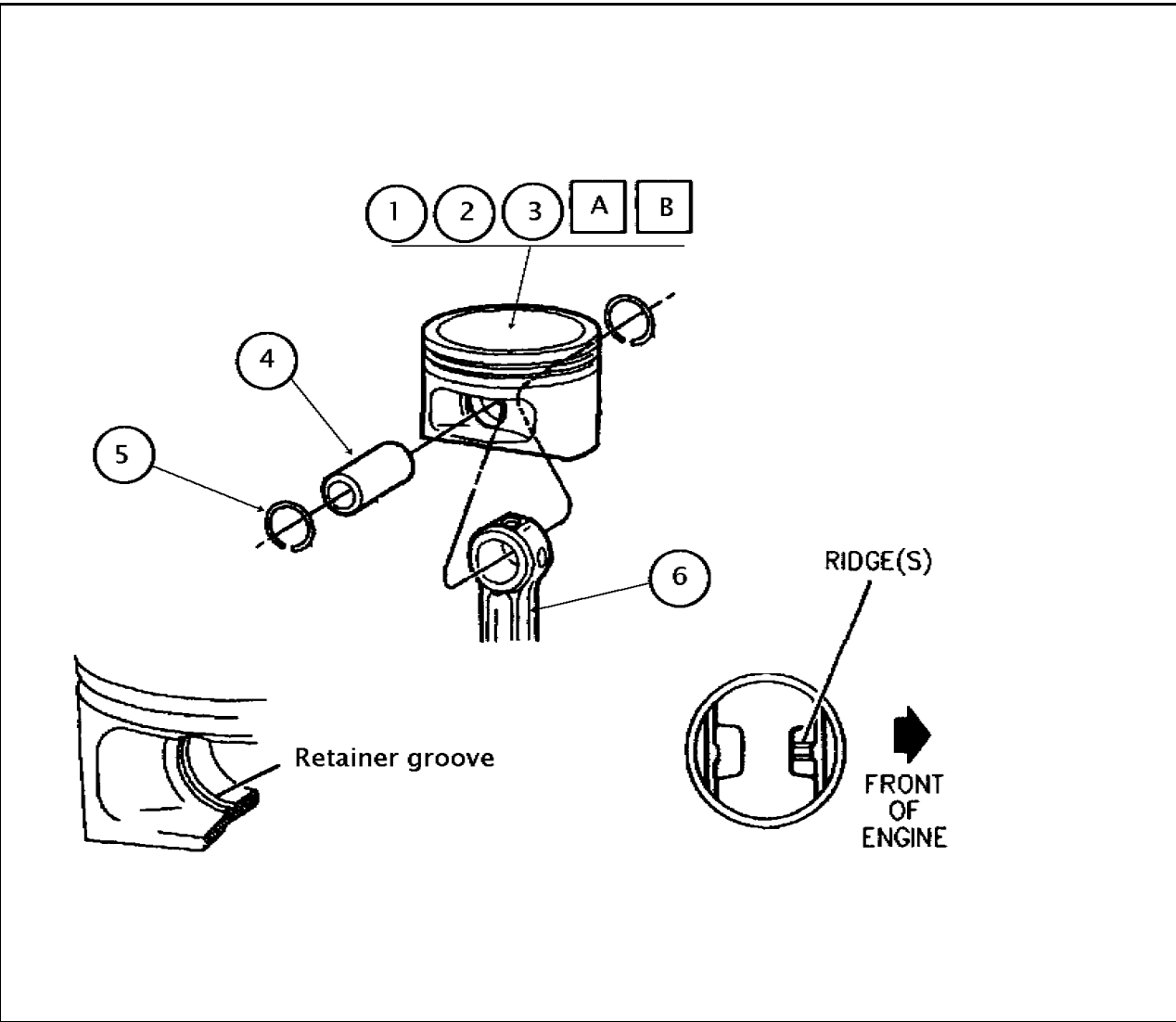
Specification

1	OHT3F-053-1 Grade 12 test piston set
2	OHT3F-054-1 Grade 34 test piston set
3	OHT3F-055-1 Grade 56 test piston set
4	OHT3F-014-1Piston pin set
5	OHT3F-012-1 Retainer clip set
6	24501696 Connecting rod

View

Piston, Pin and Connecting Rod	
Piston pin and Connecting Rod assembly	

Section	Sheet
3	7



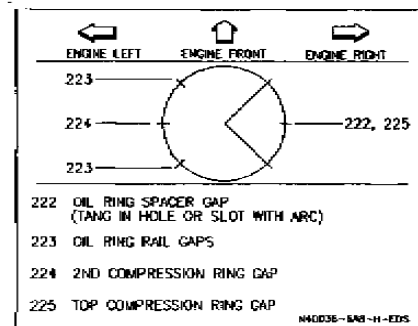
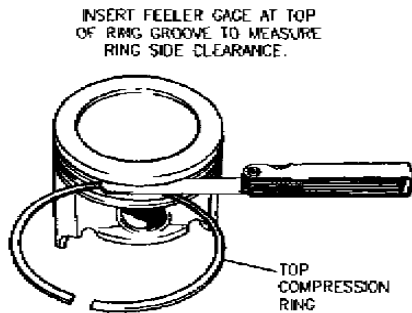
REV	Date	Revision History
1	1/3/98	Block-14

Short Block Assembly	Sequence III F
-----------------------------	-----------------------

Hard Metric Piston & Ring Sizes

Grade/Run	Bore Size	Gage	+/-0.0254mm		Piston Size
			Target Ring Gap		
12/1st	96.52	96.53	Top 1.10	2nd 0.64	96.482 - 96.497
12/2nd	96.54	96.53	Top 1.10	2nd 0.64	96.482 - 96.497
34/3rd	96.56	96.57	Top 1.10	2nd 0.64	96.522 - 96.537
34/4th	96.58	96.57	Top 1.10	2nd 0.64	96.522 - 96.537
56/5th	96.60	96.61	Top 1.10	2nd 0.64	96.562 - 96.577
56/6th	96.62	96.61	Top 1.10	2nd 0.64	96.562 - 96.577

All gaps to be +/- 0.0254mm, (End gap chamfer 0.127mm MAX (0.0762mm typical))



- 222 OIL RING SPACER GAP (TANG IN HOLE OR SLOT WITH ARC)
- 223 OIL RING RAIL GAPS
- 224 2ND COMPRESSION RING GAP
- 225 TOP COMPRESSION RING GAP

Figure 84 - Piston Ring Gap Location

Description of Operation

Confirm correct ring grade and gaps for the engine run / piston grade. Use the OHT supplied ring gage to confirm the correct ring kit according to the chart.

Check for proper ring side clearance.
Top & 2nd. 0.033 - 0.079mm
Oil control 0.023 - 0.201mm

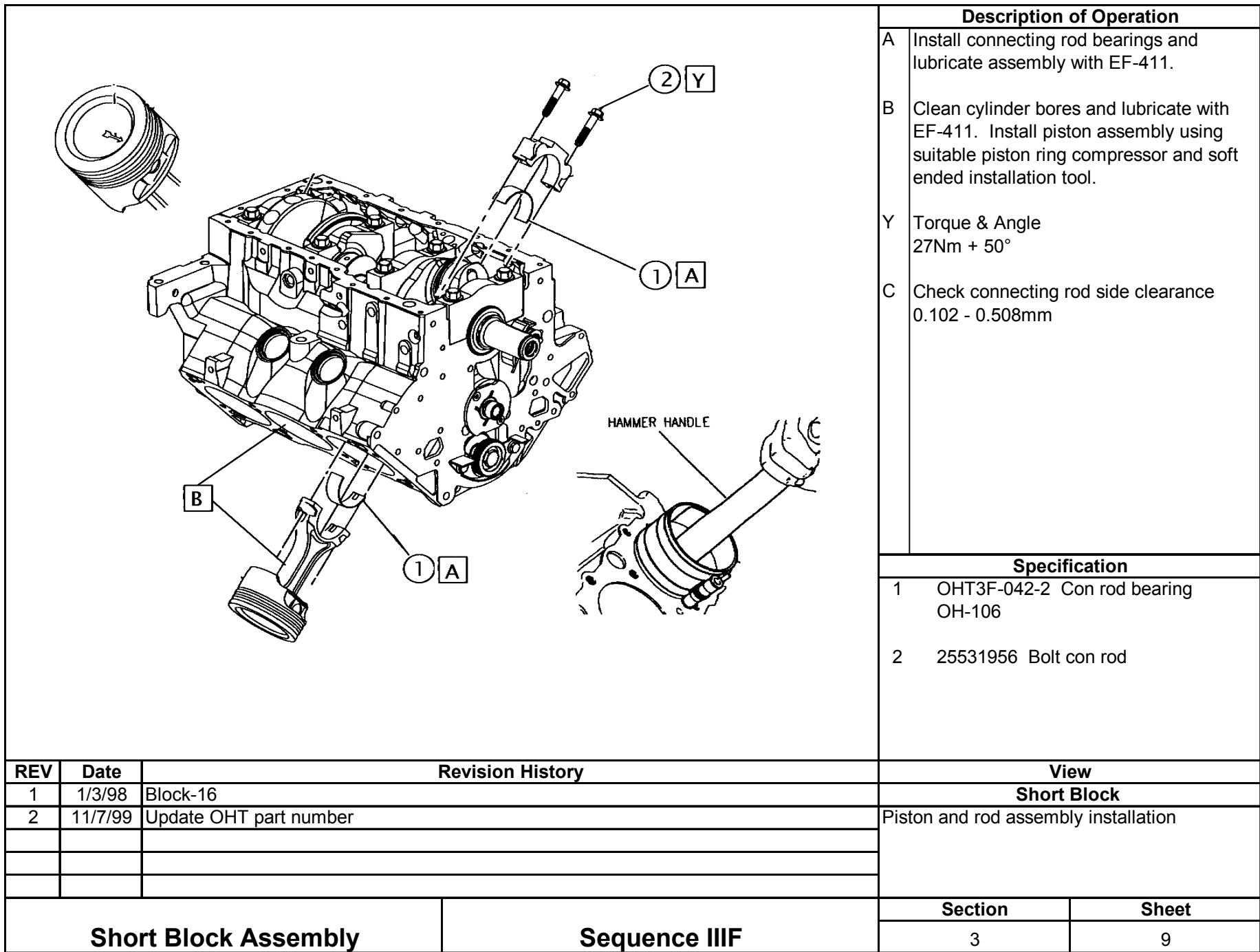
Position rings on piston according to ring stagger chart.

Lubricate assembly with EF-411

Specification

- 1 OHT3F-050-1 Ring set grade 12
- 2 OHT3F-051-1 Ring set grade 34
- 3 OHT3F-052-1 Ring set grade 56

REV	Date	Revision History	View	
1	1/3/98	Block-15	Piston Ring	
2	11/13/99	Update reverse ring gap dimensions	Piston ring installation and clearance	
		Section	Sheet	
Short Block Assembly		Sequence III F	3	8



Description of Operation	
A	Install connecting rod bearings and lubricate assembly with EF-411.
B	Clean cylinder bores and lubricate with EF-411. Install piston assembly using suitable piston ring compressor and soft ended installation tool.
Y	Torque & Angle 27Nm + 50°
C	Check connecting rod side clearance 0.102 - 0.508mm

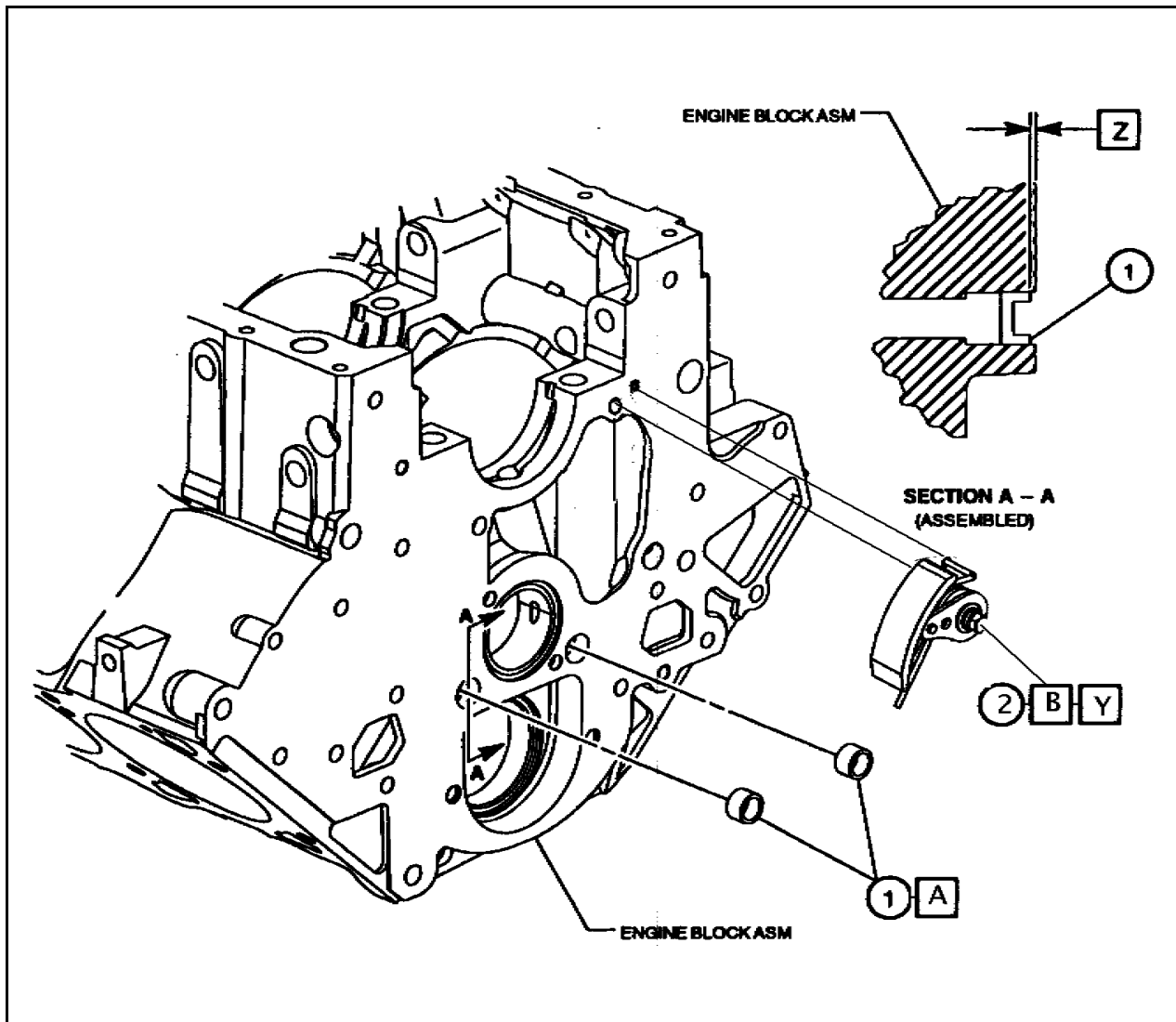
Specification	
1	OHT3F-042-2 Con rod bearing OH-106
2	25531956 Bolt con rod

REV	Date	Revision History
1	1/3/98	Block-16
2	11/7/99	Update OHT part number

View
Short Block
Piston and rod assembly installation

Short Block Assembly	Sequence III F
-----------------------------	-----------------------

Section	Sheet
3	9



Description of Operation	
A	Install oil gallery plugs, see cross section A - A.
B	Install damper assembly
Y	Torque 22Nm
Z	Locate cup plug 1.5 +/- 0.75mm below front face of block.

Specification	
1	3835577 Plug, oil gallery
2	24503893 Damper assembly

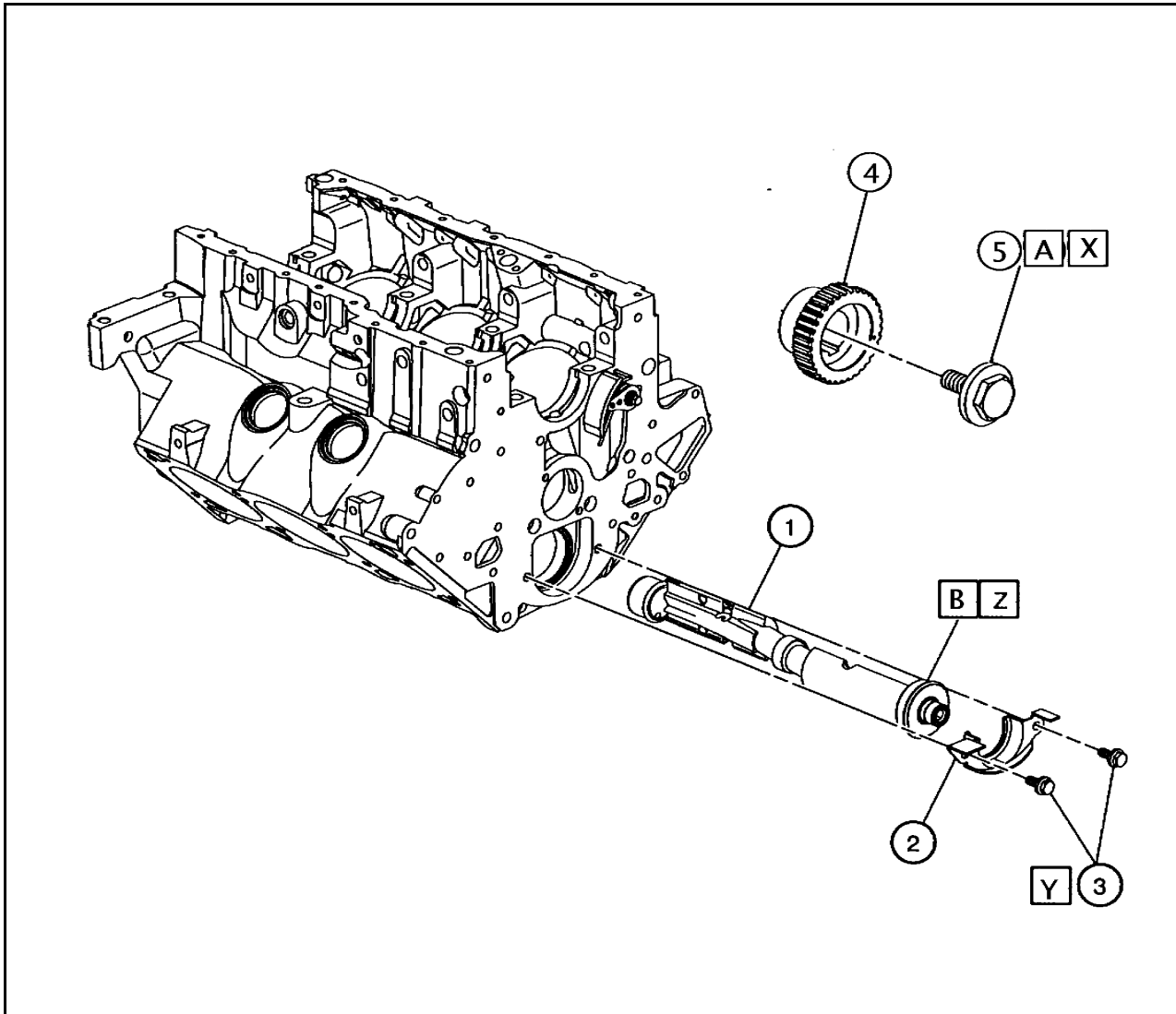
REV	Date	Revision History
1	1/3/98	Block-17

View
Short Block
Oil gallery plugs and timing chain damper

Short Block Assembly	Sequence III F
-----------------------------	-----------------------

Section	Sheet
3	10

			Description of Operation		
			A	De-burr camshaft lobes using a fine oil stone with light pressure 360 deg. around front and rear edge of all lobes. Clean camshaft with alipahitic naphtha and very clean shop towel. Note: make sure all grinding residue is removed before continuing.	
			B	Make pre-test measurements at the rear side of each lobe and record to the nearest 0.001mm.	
			D	If the test oil is known during assembly, you can lubricate the camshaft and install it into the block.	
			E	If the test oil is not known at this time, lubricate the camshaft journals only with EF-411 and continue installation.	
Y	Lubricate thrust plate and install Torque 15Nm				
			Specification		
			1	OHT3F-008-1 Camshaft	
			2	24500618 Key	
			3	OHT3F-011-1 Thrust plate	
			4	25519242 Bolt/screw	
			View		
			Short Block		
			Camshaft cleaning, measurement, and installation		
Section		Sheet			
3		11			
Short Block Assembly		Sequence III F			



Description of Operation	
A	Secure balance shaft in a smooth jawed vice and install drive gear and bolt.
B	Inspect balance shaft and roller bearing for cleanliness and install.
X	Torque & Angle 22Nm + 70°
Y	Torque 30Nm
Z	Lubricate with EF-411

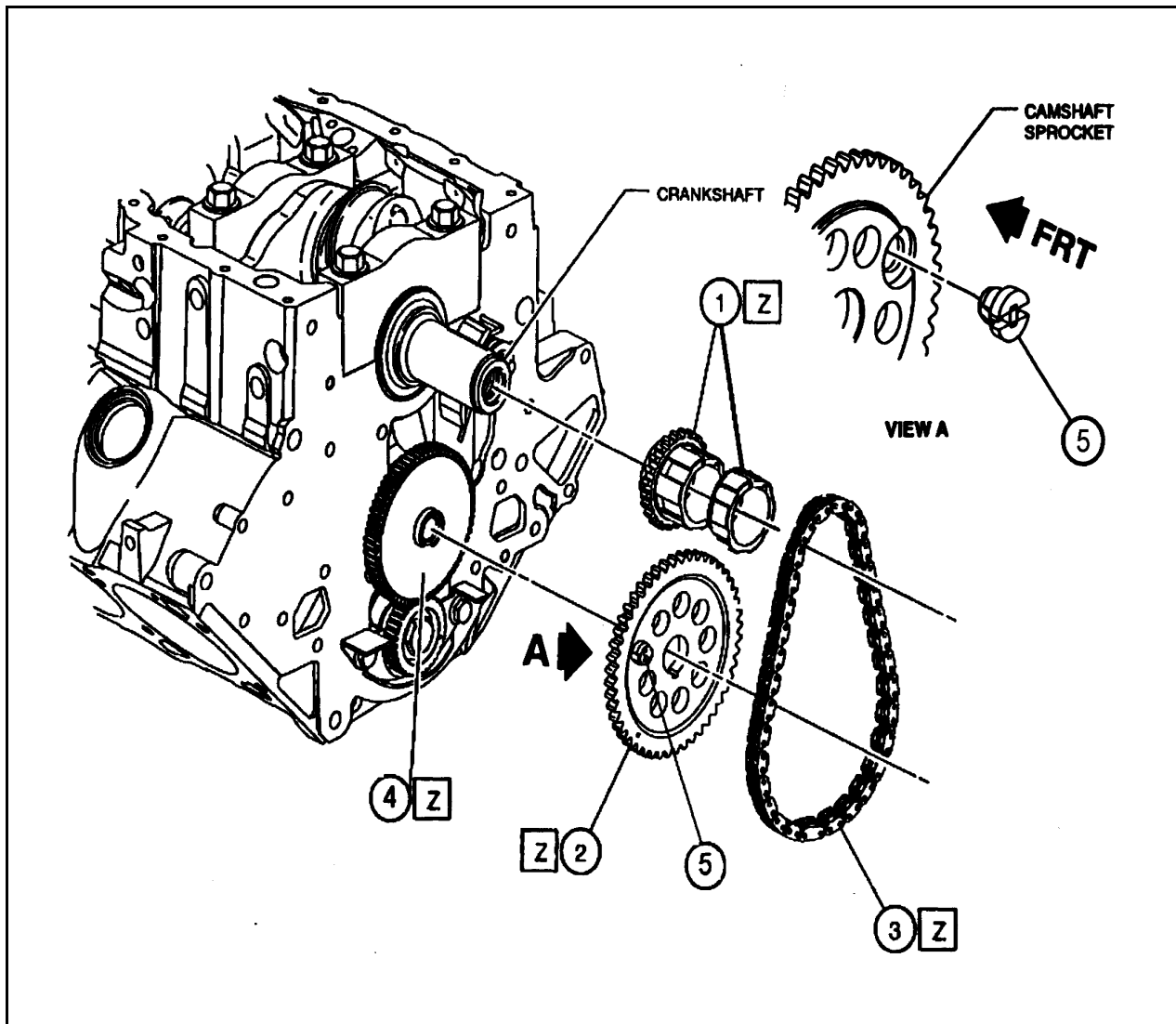
Specification	
1	24502388 Shaft Assembly
2	24500374 Retainer
3	2450055 Bolt
4	24503524 Gear
5	24501367 Bolt

REV	Date	Revision History
1	1/5/98	Block-19

View
Short Block
Balance shaft inspect & install

Short Block Assembly	Sequence III F
-----------------------------	-----------------------

Section	Sheet
3	12



Description of Operation	
	Timing gear set. See part number information.
A	Install magnet See view "A"
Z	Lubricate with EF-411

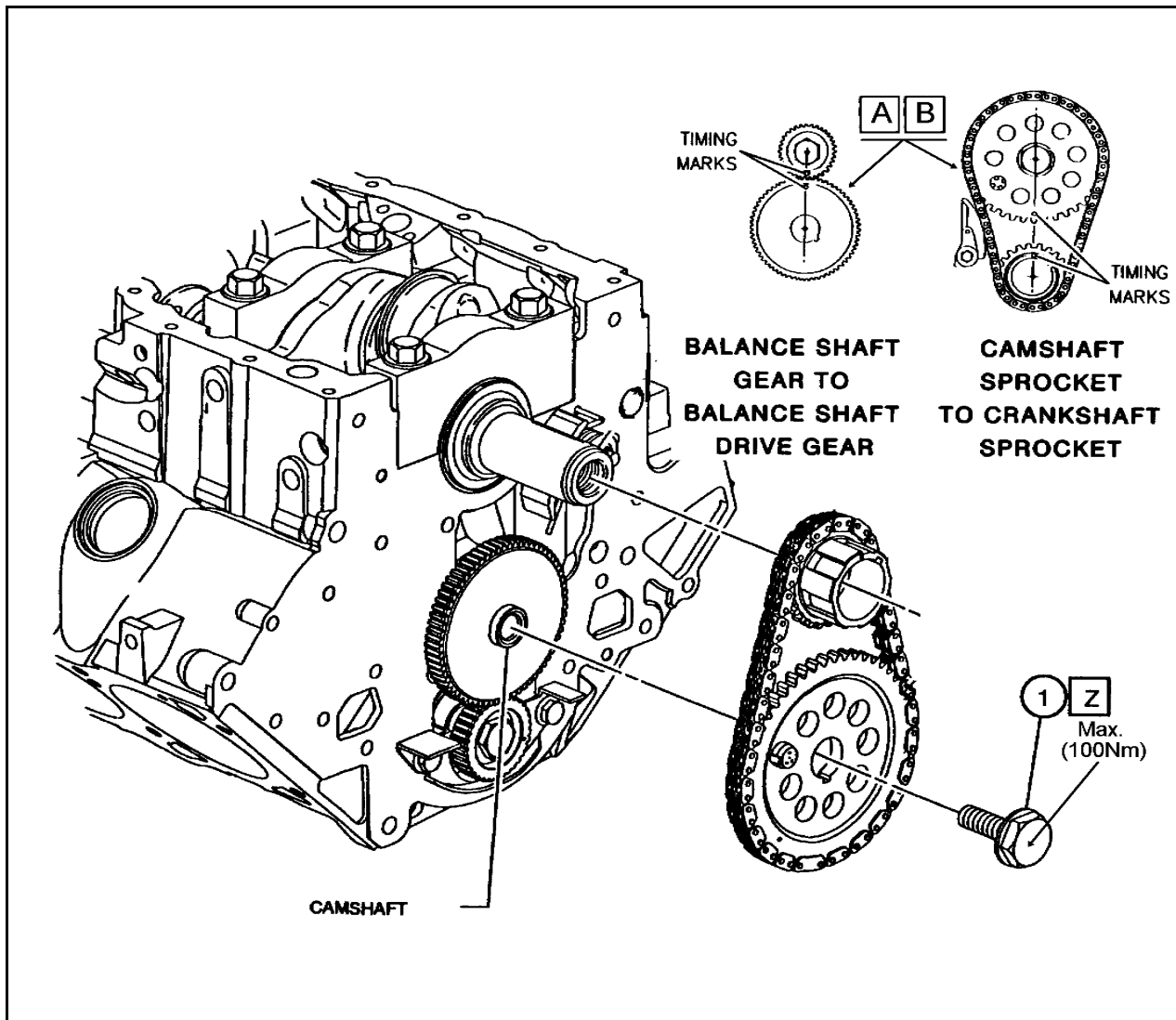
Specification	
1	OHT3F-036-1 Sprocket, 2pc.
2	24505306 Sprocket, camshaft
3	24504668 Chain
4	24504792 Gear
5	10456195 Magnet

REV	Date	Revision History
1	1/5/98	Block-20
2	11/7/99	Update view "A"

View
Short Block
Timing gear set

Short Block Assembly	Sequence III F
----------------------	----------------

Section	Sheet
3	13



Description of Operation	
A	Lubricate all gear sets and chain with EF-411
B	Align timing marks on balance drive and driven gears. Align timing marks on camshaft and crankshaft sprockets.
Z	Torque 100Nm Caution, Do not use torque & angle specification from service manual.

Specification	
1	24501366 Bolt, camshaft sprocket (See precaution Z)

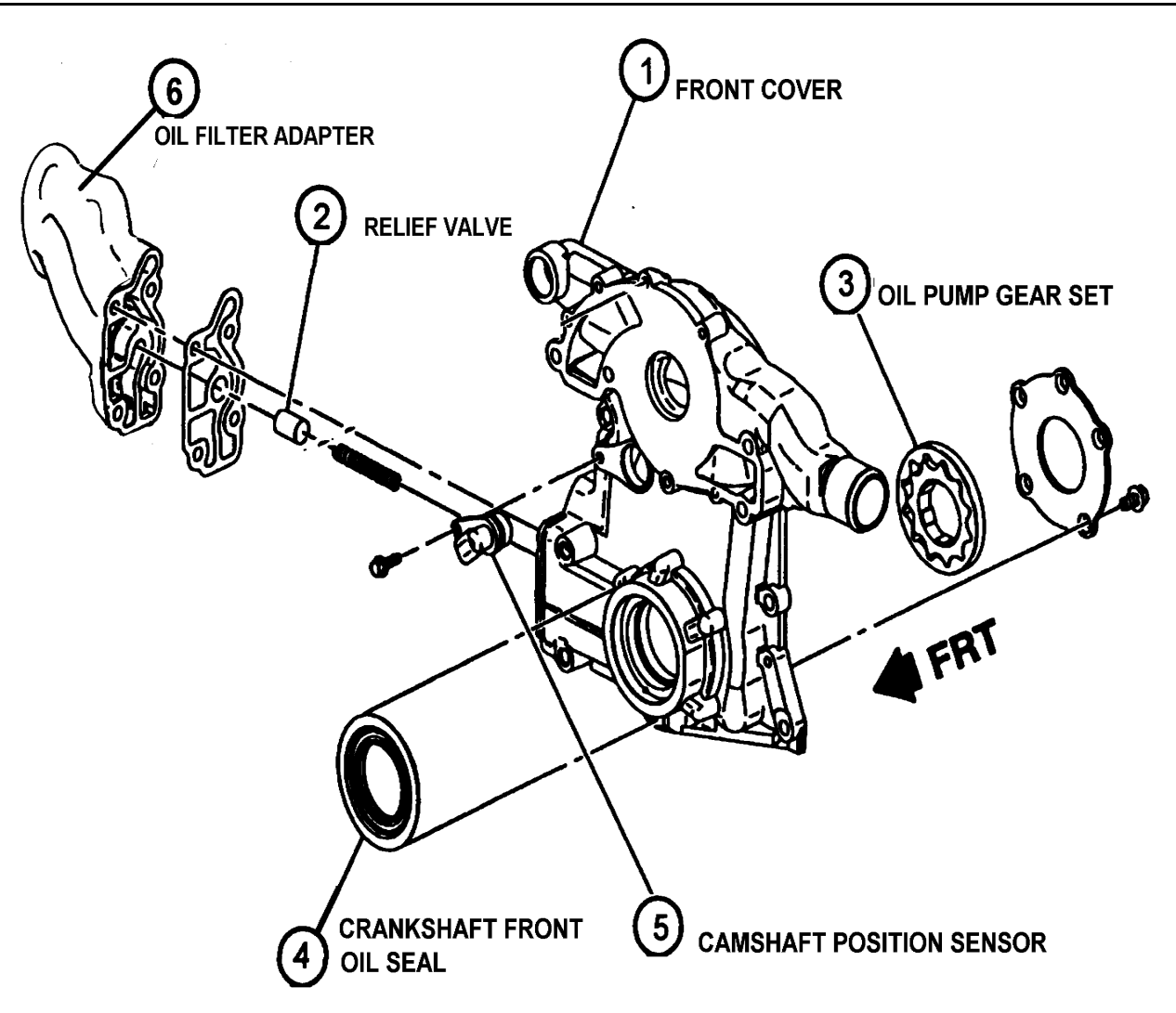
REV	Date	Revision History
1	1/5/98	Block-21
2	11/7/99	Update view "A,B,Z"

View
Short Block
Timing gear set alignment & torque

Short Block Assembly	Sequence III F
-----------------------------	-----------------------

Section	Sheet
3	14

Section 4
Front Cover, Rear Cover, Sump



Description of Operation

Assembly view

Specification

1	24502241 Cover assembly
2	25530949 Valve, oil pressure relief
3	24505433 Oil pump gear set
4	24504098 Seal
5	10456148 Camshaft position sensor
6	24501300 Adapter, oil filter

REV	Date	Revision History
1	1/5/98	Block-22
2	11/6/99	Update view, add 24501300 Adapter

View

Front Cover

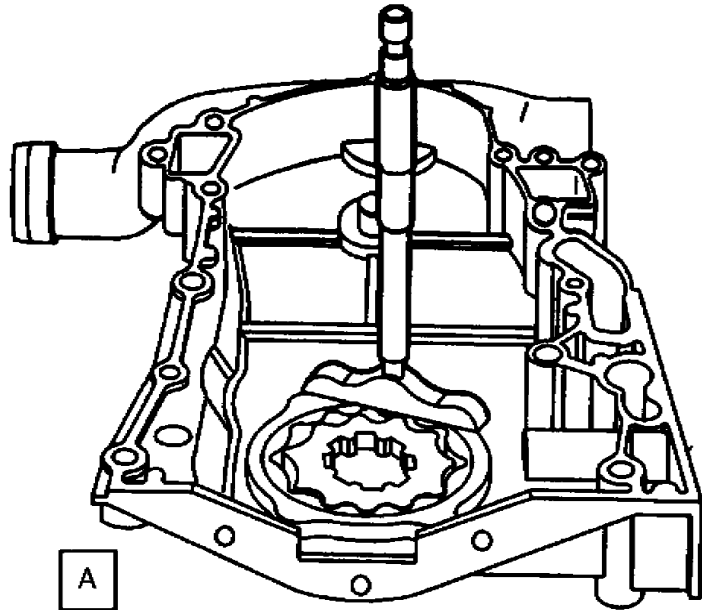
Front cover assembly view

Front Cover, Rear Cover, & Sump

Sequence III F

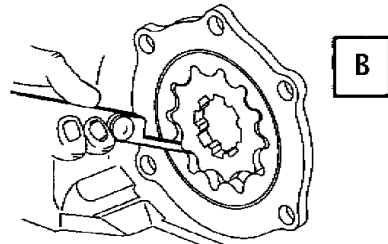
Section	Sheet
4	1

Description of Operation	
A	Measure gear drop in housing 0.025 - 0.089mm
B	Measure gear tip clearance 0.152mm
C	Measure outer gear diameter clearance 0.203 - 0.381mm



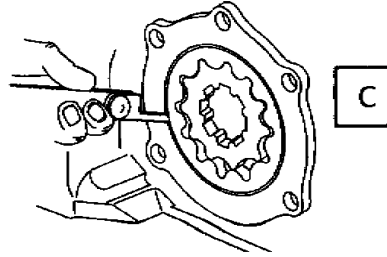
A

Measuring gear end clearance drop in housing



B

Measuring gear tip clearance



C

Measuring outer gear dia. clearance

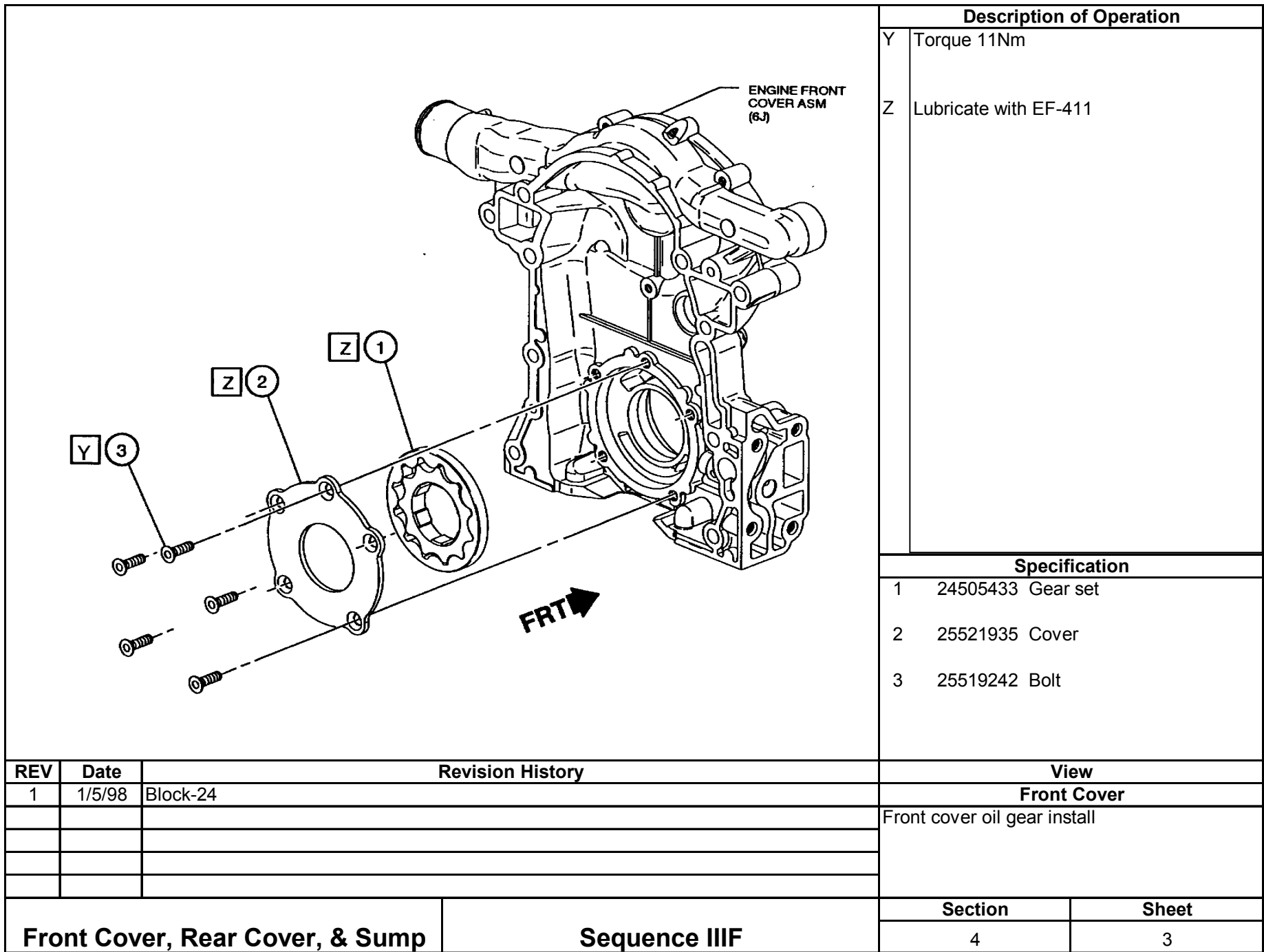
Specification	

View	
Front Cover	
Oil pump gear clearance	

Section	Sheet
4	2

REV	Date	Revision History
1	1/5/98	Block-23

Front Cover, Rear Cover, & Sump	Sequence III F
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Description of Operation	
Y	Torque 11Nm
Z	Lubricate with EF-411

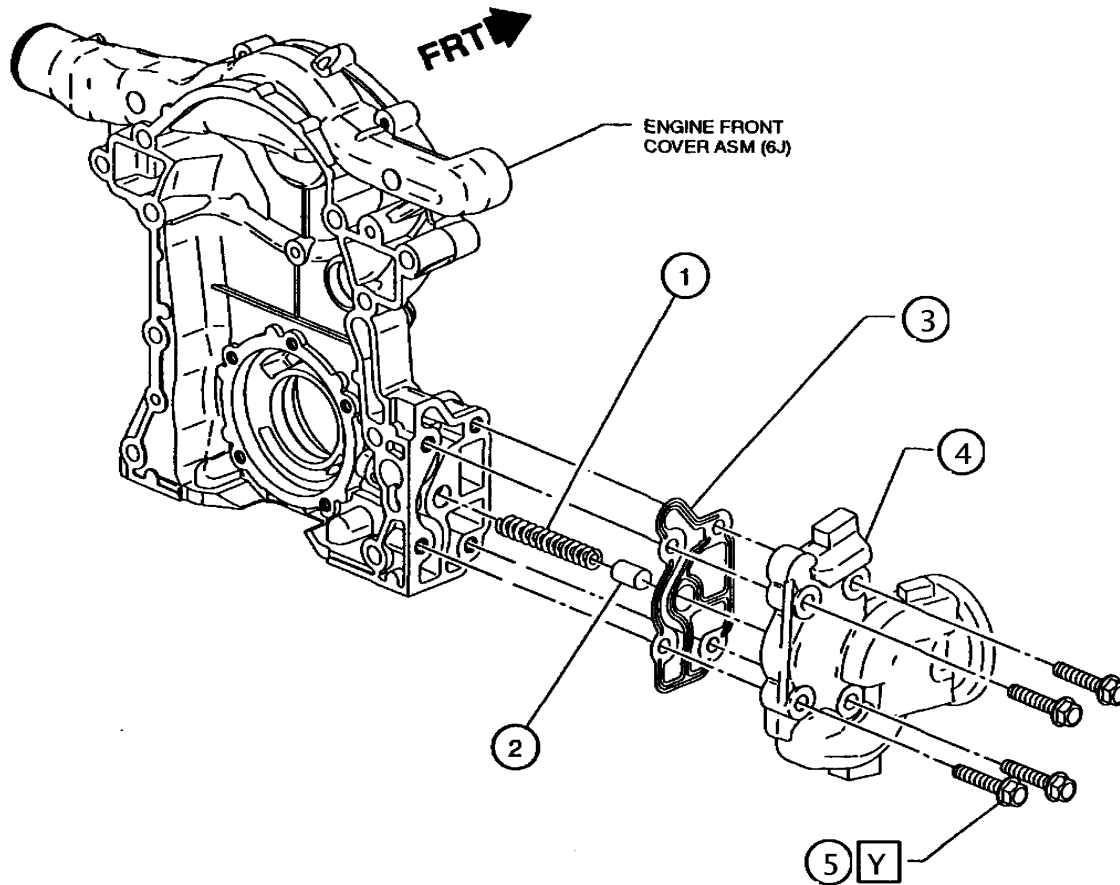
Specification	
1	24505433 Gear set
2	25521935 Cover
3	25519242 Bolt

REV	Date	Revision History
1	1/5/98	Block-24

View
Front Cover
Front cover oil gear install

Front Cover, Rear Cover, & Sump	Sequence III F
---------------------------------	----------------

Section	Sheet
4	3



Description of Operation

- A Front cover oil filter adapter assembly
- Y Torque 30Nm
- May use sealer on threads of fasteners

Specification

- 1 1262505 Spring
- 2 25530949 Valve
- 3 25534742 Gasket
- 4 24501300 Adapter, oil filter
- 5 24504713 Bolt

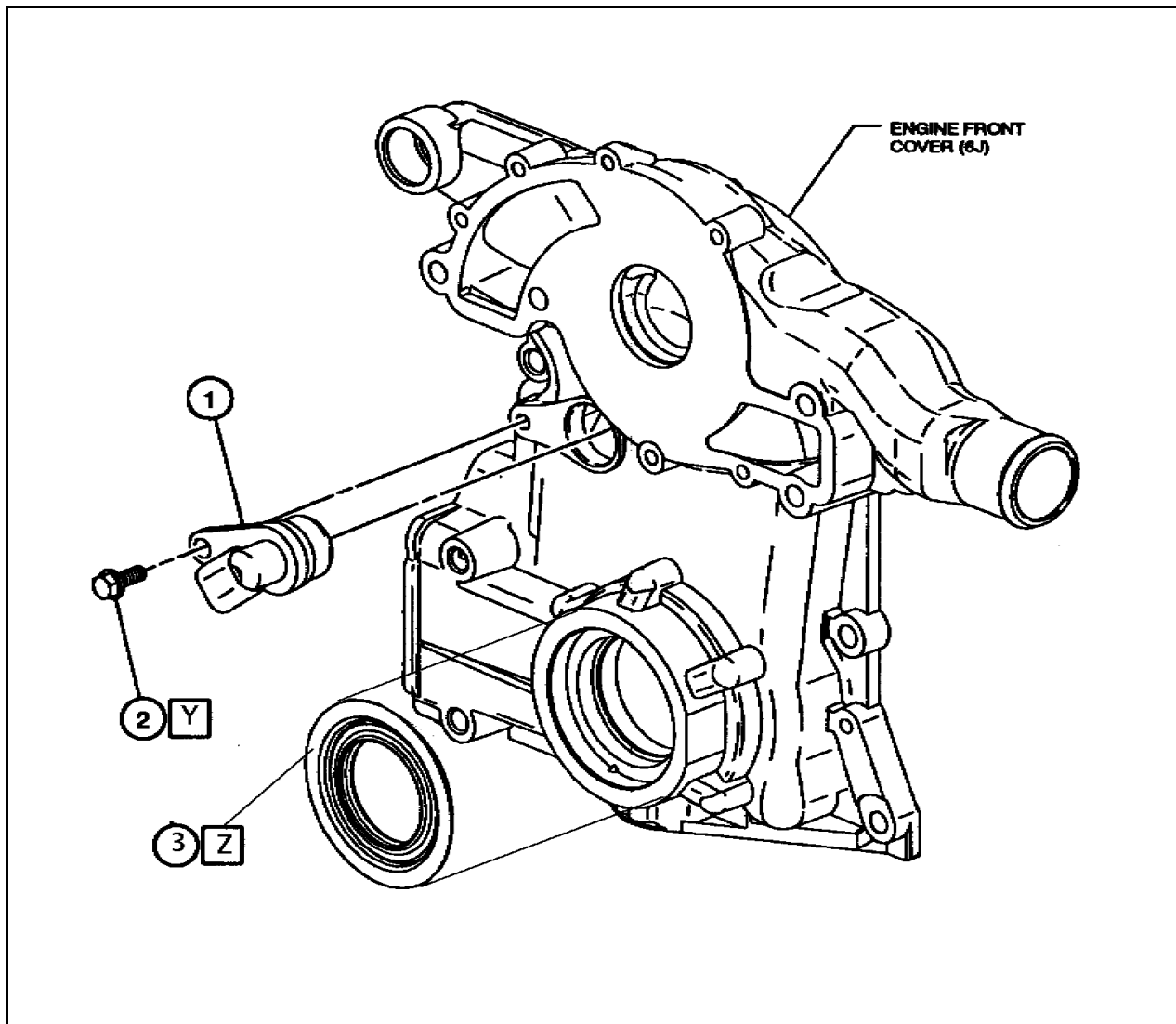
REV	Date	Revision History
1	1/5/98	Block-25
2	12/1/99	Add sealer usage

View
Front Cover
Front cover oil filter adapter assembly

Front Cover, Rear Cover, & Sump

Sequence III F

Section	Sheet
4	4



Description of Operation	
Y	Torque 30Nm
Z	Use a light application of #4 Permatex around the rear side of the seal where it contacts the front cover.

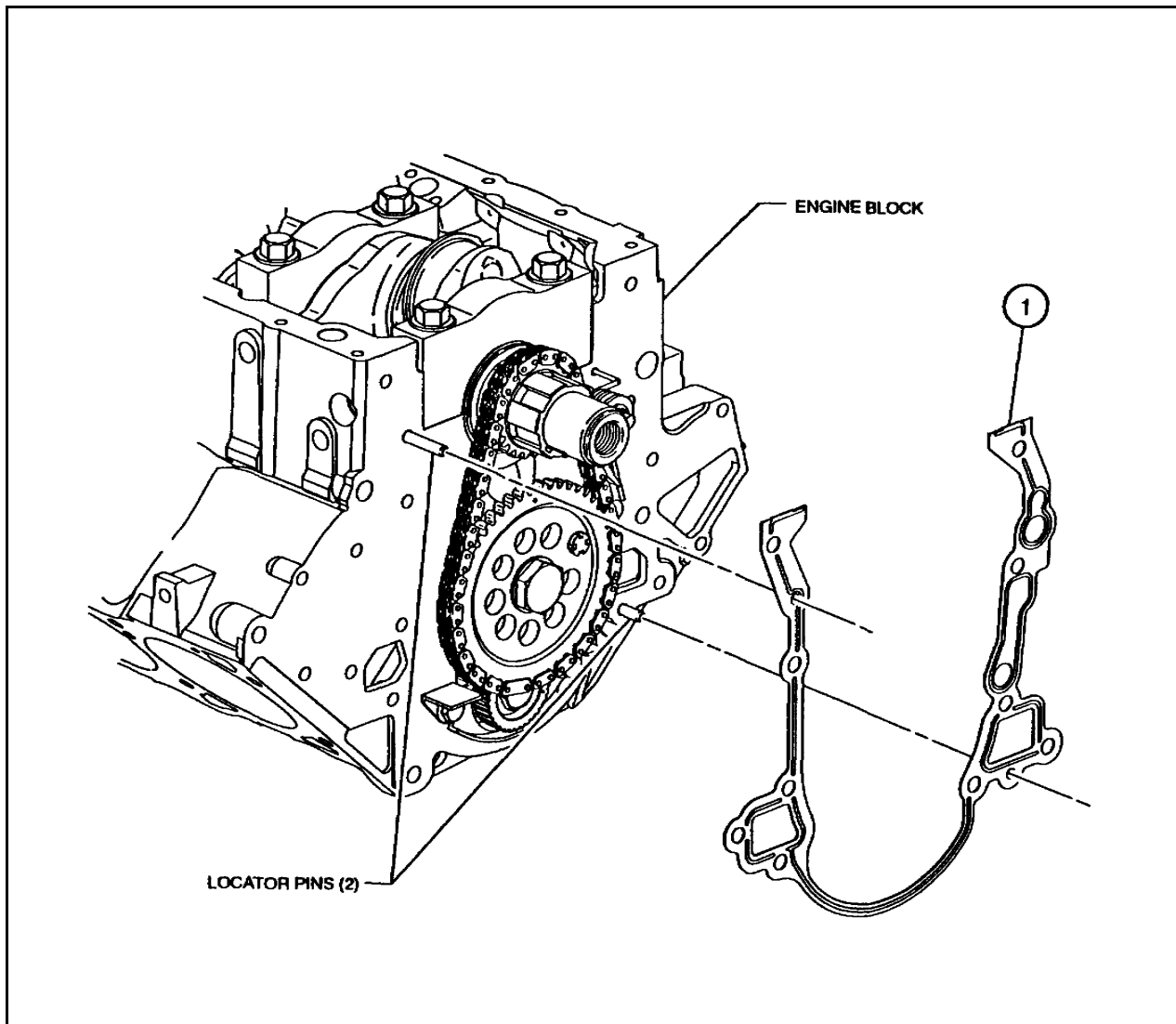
Specification	
1	10456148 Camshaft sensor
2	25526395 Bolt
3	24504098 Seal

REV	Date	Revision History
1	1/5/98	Block-29

View	
Front Cover	
Front cover camshaft sensor and seal install	

Front Cover, Rear Cover, & Sump	Sequence III F
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Section	Sheet
4	5



Description of Operation

Note:
Perfect seal #4 may be used around coolant passages on gasket.

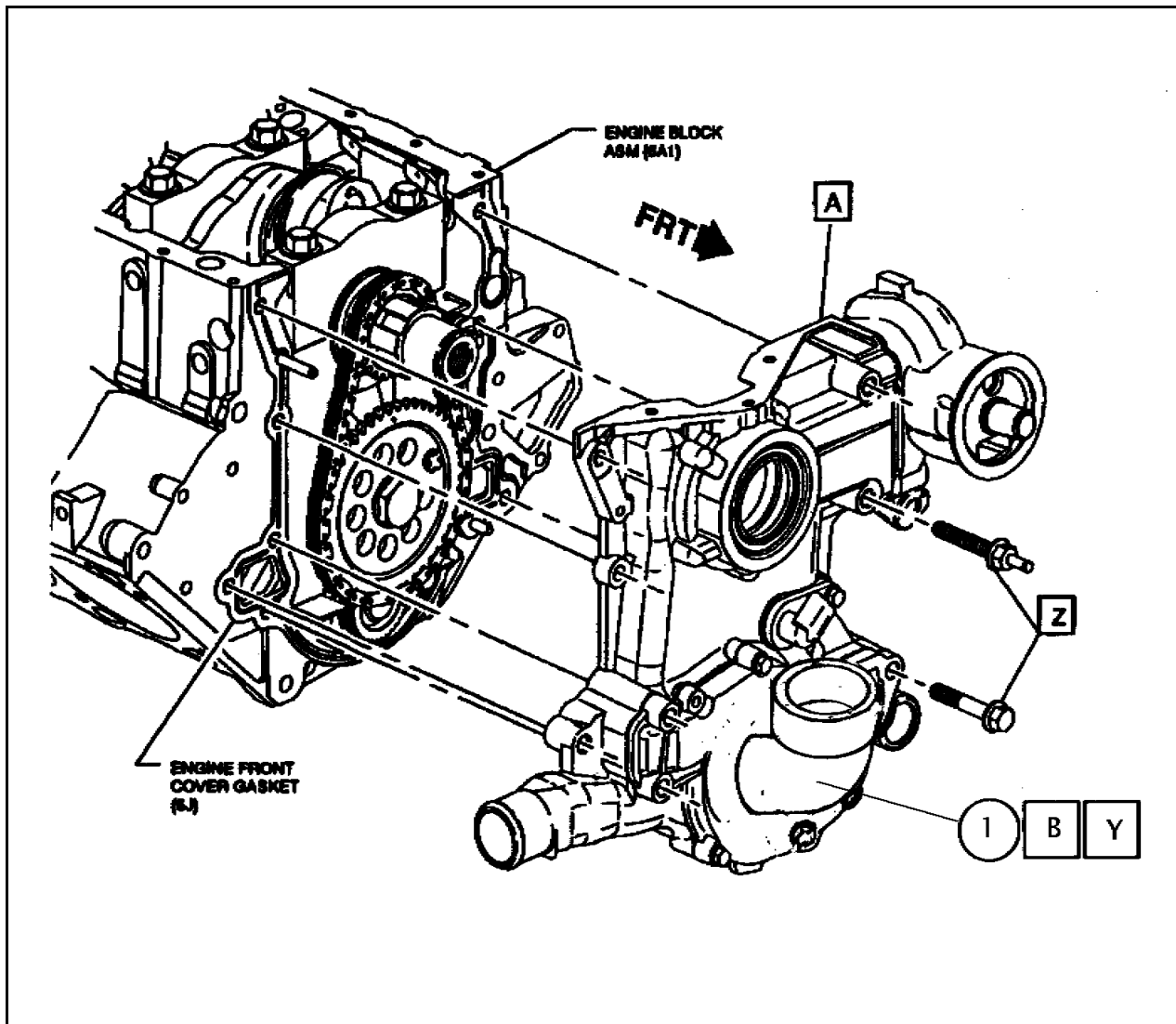
Specification	
1	24502252 Gasket

REV	Date	Revision History
1	1/5/98	Block-26
2	12/1/99	Add Note on Perfect seal

View
Front Cover
Front cover gasket install

Front Cover, Rear Cover, & Sump	Sequence III F
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Section	Sheet
4	6

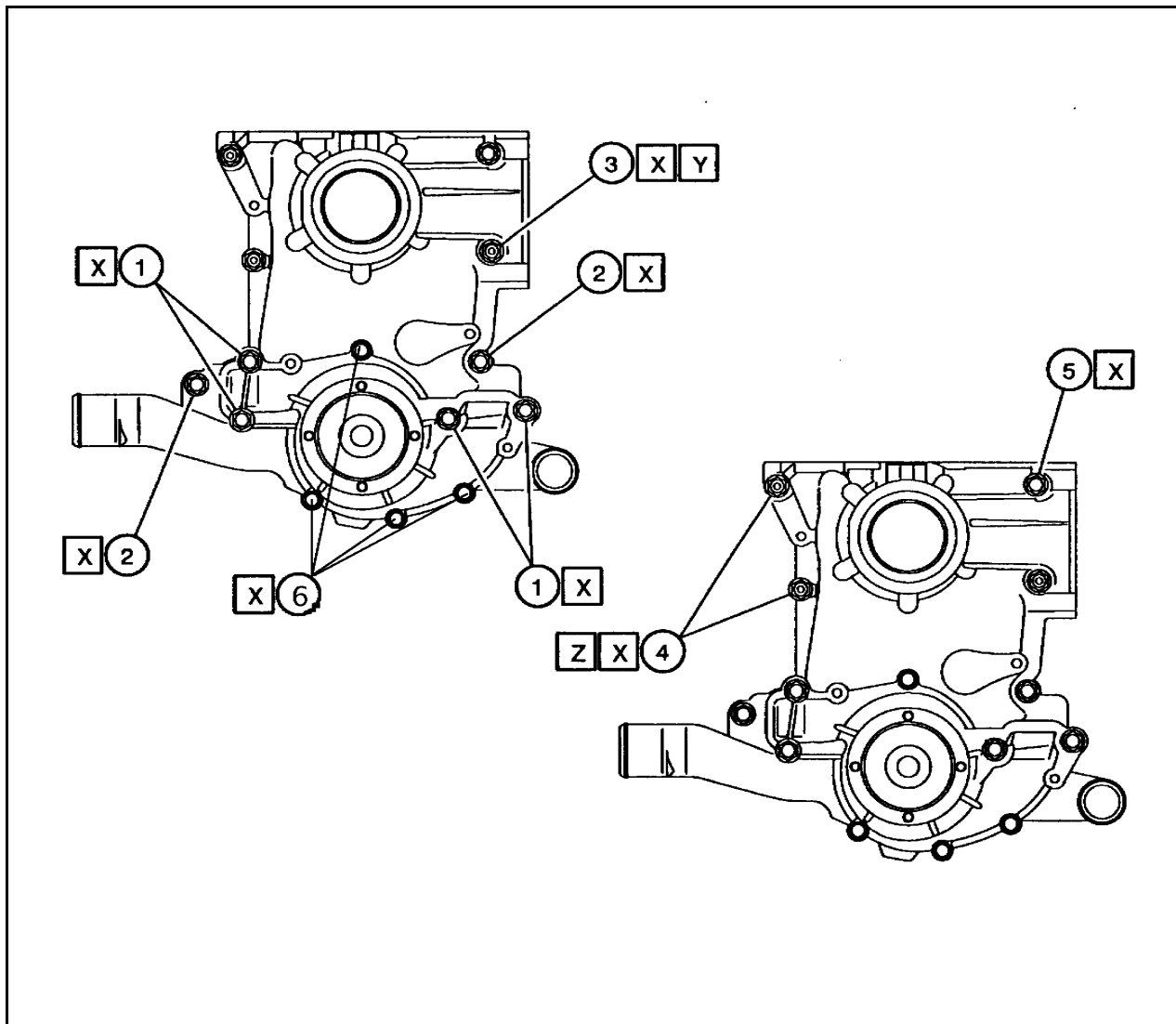


Description of Operation	
A	Front cover assembly
B	Install coolant inlet adapter with front cover
Y	Torque 30Nm
	Install thermocouple in OHT3F-031 with sensing tip centered in flow.

Specification	
1	OHT3F-031-3 Bolts included on print

REV	Date	Revision History
1	1/5/98	Block-30
2	12/1/99	Add thermocouple information

View
Front Cover
Front cover install



Description of Operation	
X	Torque 30Nm
Y	Stud also holds crankshaft sensor shield
Z	Studs also hold crankshaft sensor shield and sensor

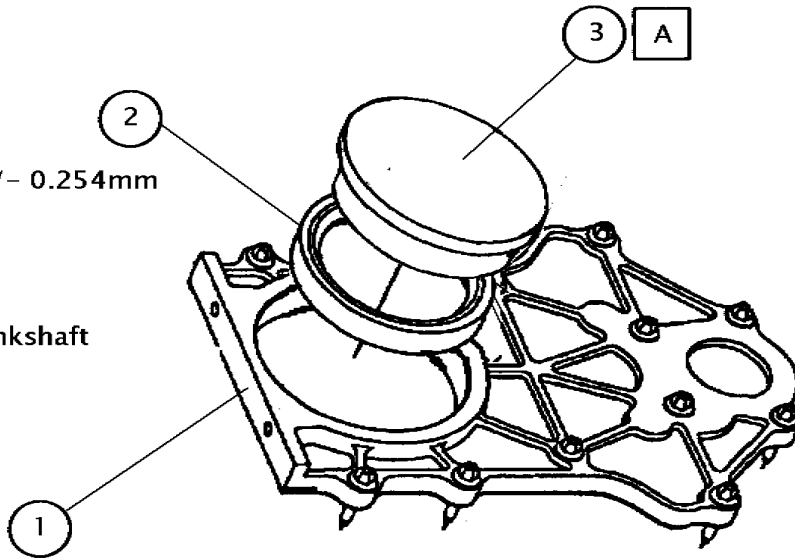
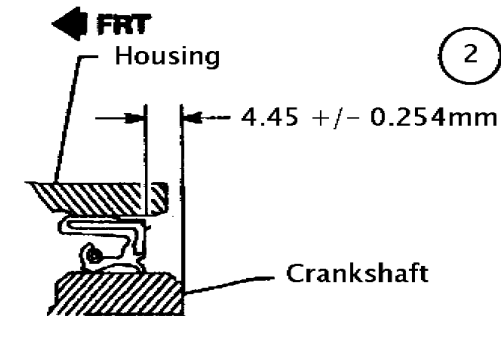
Specification	
1	OHT Kit
2	24504713 Bolt (2)
3	24504718 Stud (2)
4	24504717 Stud (2)
5	24504712 Bolt
6	OHT Kit

REV	Date	Revision History
1	1/5/98	Block-28

View	
Front Cover	
Front cover bolt placement	

Front Cover, Rear Cover, & Sump	Sequence III F
---------------------------------	----------------

Section	Sheet
4	8



Description of Operation

A Install rear main lip seal using GM R&D supplied installation tool and a light duty bench press until seal bottoms in housing.

Specification

- 1 24502297 Rear cover housing
- 2 25534760 Seal
- 3 GM R&D Seal Installation Tool

REV	Date	Revision History
1	1/5/98	Block-31

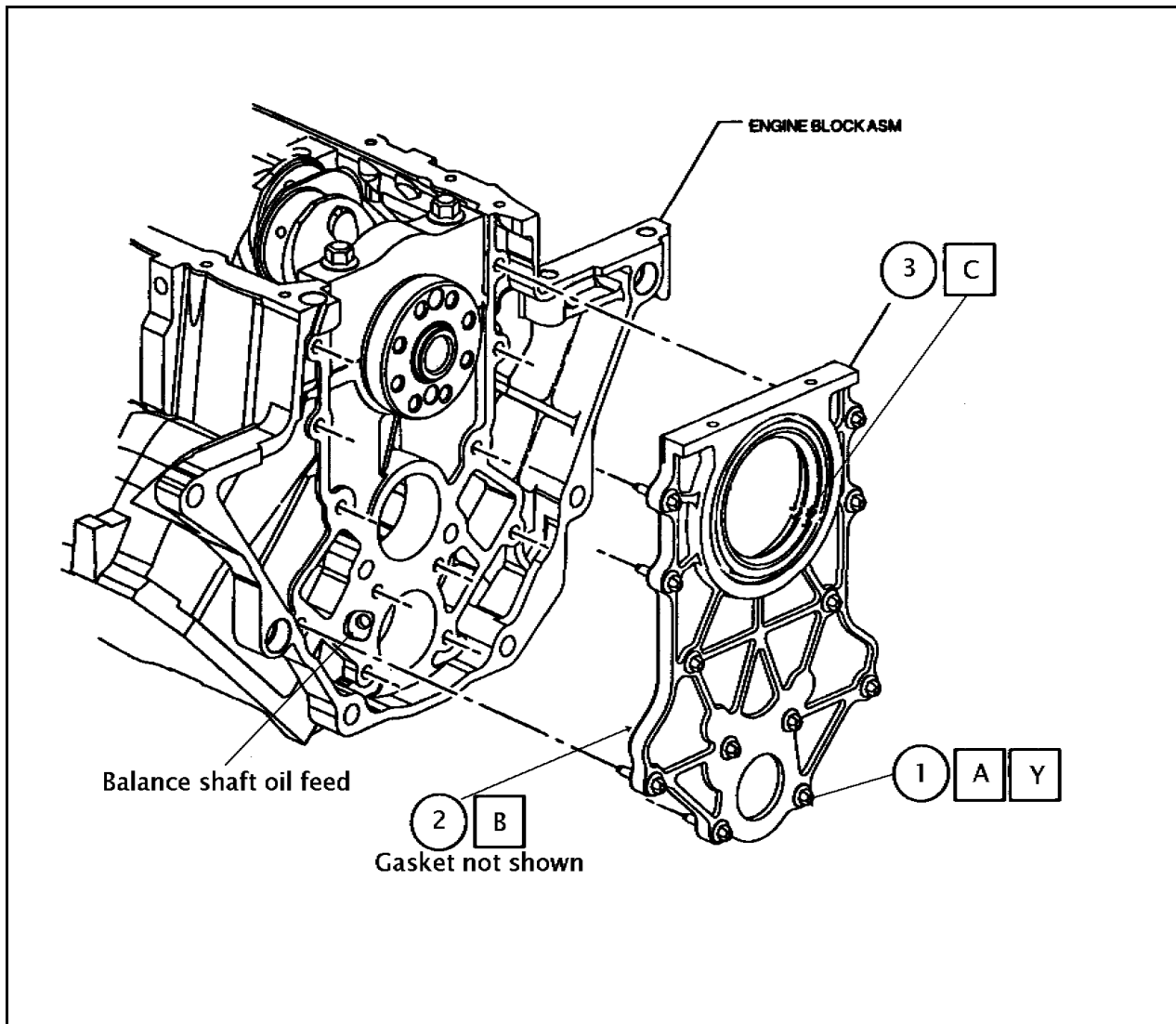
View

Rear Cover

Rear seal installation

Front Cover, Rear Cover, & Sump	Sequence III F
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Section	Sheet
4	9



Description of Operation	
A	Install new bolts with nylon positioning collar for each run.
B	Install gasket (not shown in view) Note: Position rear cover plate gasket so that rear balance shaft oil feed is lined up with correct side of cover plate.
C	Lubricate rear lip seal with EF-411 and use extreme care not to damage rear lip seal during rear cover plate installation.
Y	Torque & Angle 15Nm + 50° Note: Perfect Seal #4 sealer may be used around coolant passages on gasket.

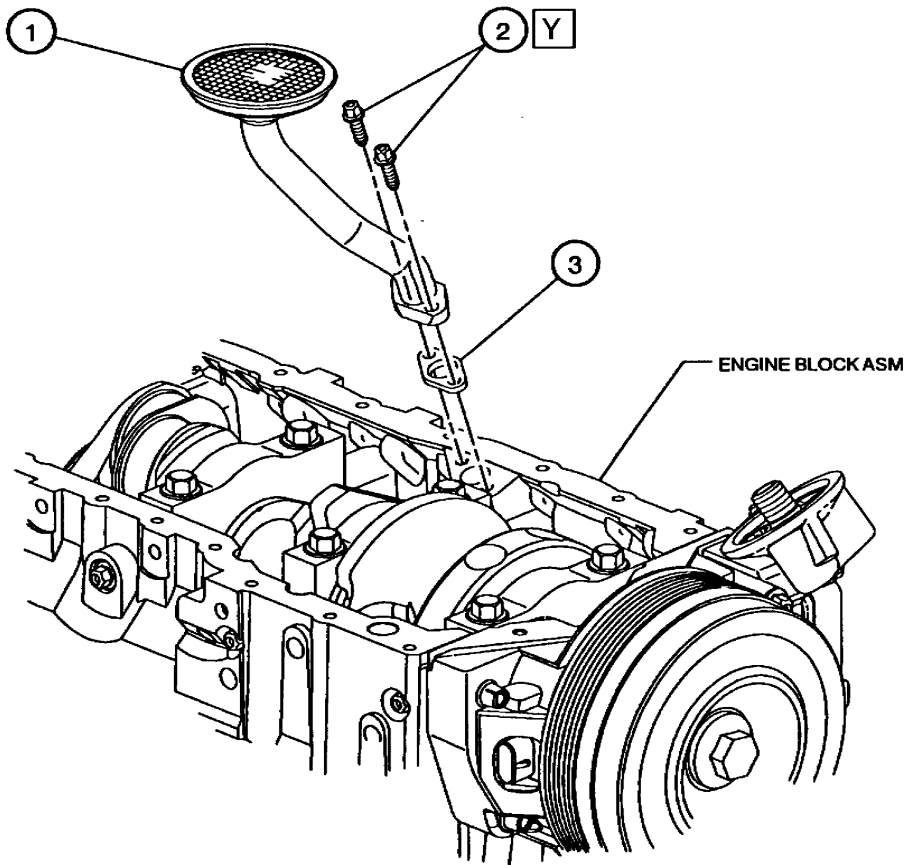
Specification	
1	24503970 Bolt
2	24506644 Gasket
3	24502297 Housing assembly

REV	Date	Revision History
1	1/5/98	Block-32
2	12/1/99	Add Perfect seal note.

View
Rear Cover
Rear cover installation

Front Cover, Rear Cover, & Sump	Sequence III F
---------------------------------	----------------

Section	Sheet
4	10



Description of Operation

Install oil screen assembly

Y Torque 15Nm

Specification

- 1 24505569 Screen assembly
- 2 24505570 Bolt
- 3 24501259 Gasket

REV	Date	Revision History
1	1/5/98	Block-33

View

Sump

Oil pickup tube

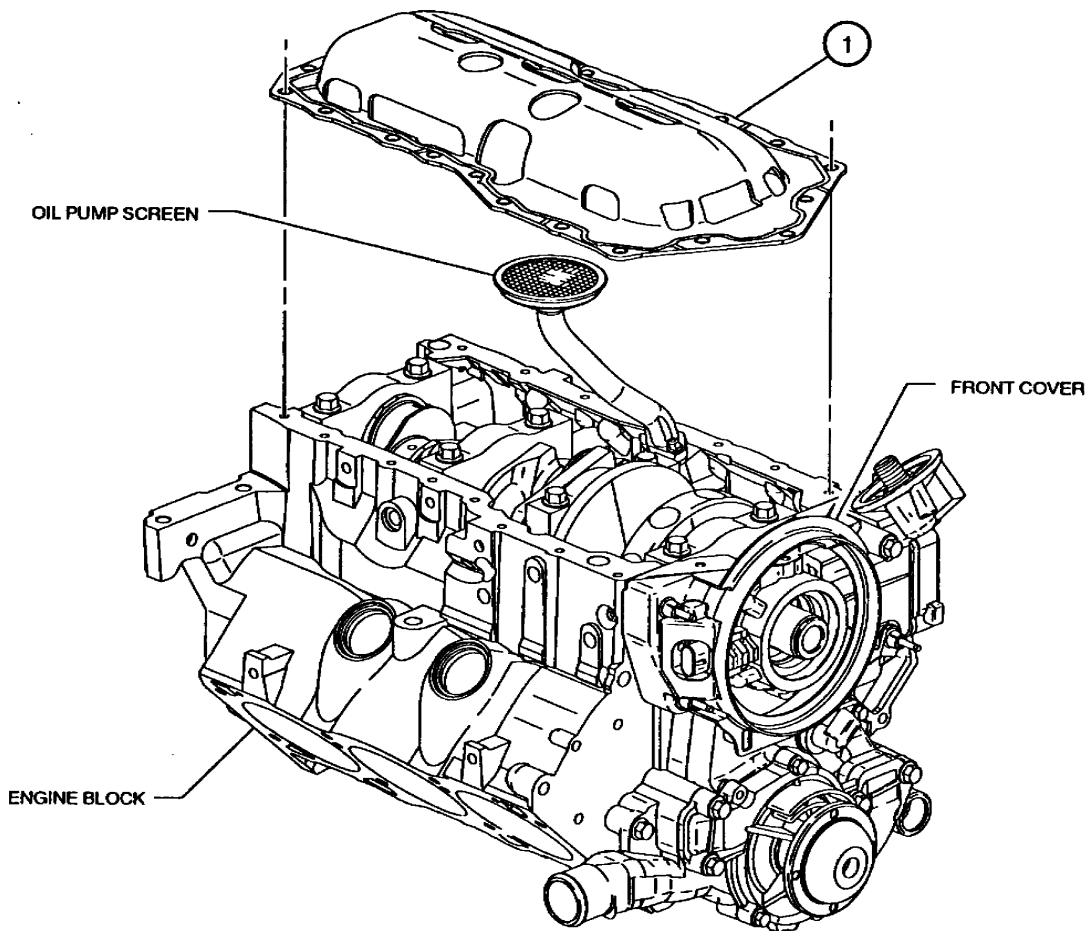
Front Cover, Rear Cover, & Sump	Sequence III F
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Section	Sheet
4	11

Description of Operation

Install oil pan gasket

Note: RTV may be used at corners of front and rear covers to aid in sealing.



Specification

1 24502397 Gasket

View

Sump

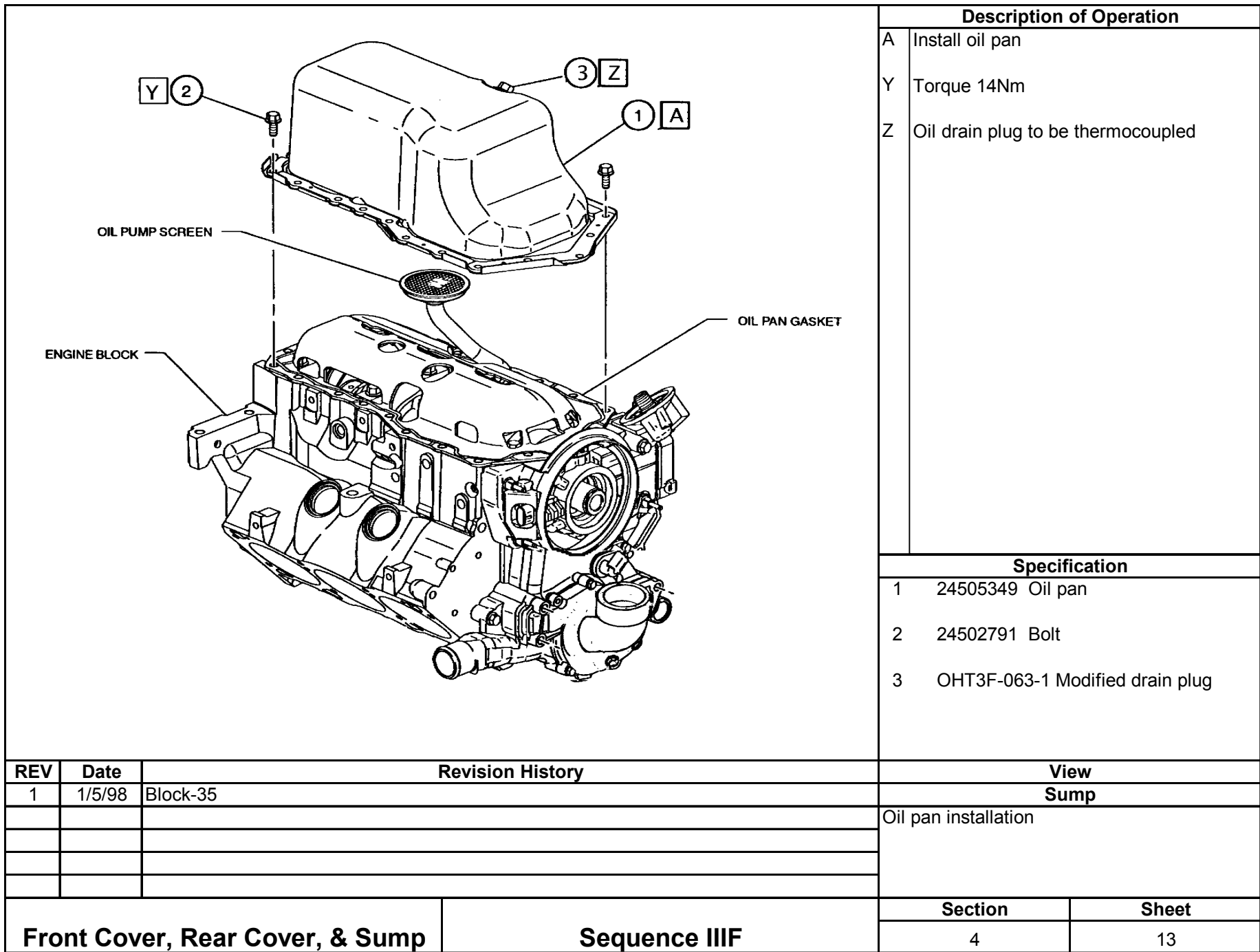
Oil pan gasket install

Section **Sheet**

4 12

REV	Date	Revision History
1	1/5/98	Block-34
2	12/1/99	Revise description, allow use of RTV

Front Cover, Rear Cover, & Sump **Sequence III F**



Description of Operation	
A	Install oil pan
Y	Torque 14Nm
Z	Oil drain plug to be thermocoupled

Specification	
1	24505349 Oil pan
2	24502791 Bolt
3	OHT3F-063-1 Modified drain plug

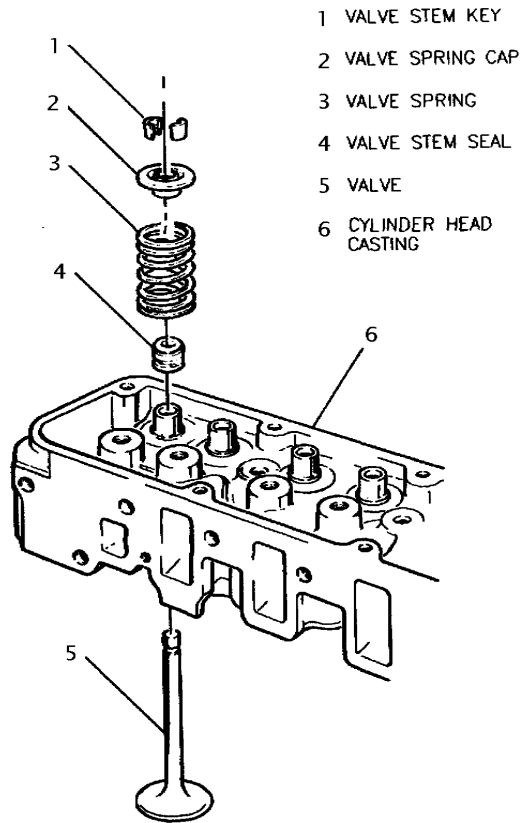
REV	Date	Revision History
1	1/5/98	Block-35

View
Sump
Oil pan installation

Front Cover, Rear Cover, & Sump	Sequence III F
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Section	Sheet
4	13

Section 5
Heads and Valves



- 1 VALVE STEM KEY
- 2 VALVE SPRING CAP
- 3 VALVE SPRING
- 4 VALVE STEM SEAL
- 5 VALVE
- 6 CYLINDER HEAD CASTING

Description of Operation

Clean cylinder head with aliphatic naphtha and spray with 50/50 solution of EF-411 and aliphatic naphtha. Remove excess solution using compressed air.

Lubricate valve stems and guides with EF-411 during assembly. Ensure valve stem moves freely in guide before installing valve seal. Use a protective sheath over the valve stem that extends downward past the keeper grooves when installing the valve stem seals.

Install the valve springs, retainers, and keepers.

Calibrate the valve spring load to 81.64kg @ 9.525mm +/- 0.38mm (180lb @ 0.375in. +/- 0.015in.) travel.

Specification

- 1 1016634 Valve stem key
- 2 24502257 Valve spring cap
- 3 OHT3F-059-5 Valve spring (Yellow)
- 4 OHT3F-060-1 Seal int.
OHT3F-061-1 Seal exh. White stripe
- 5 24502254 Valve int.(STD)
24504195 Valve exh.(STD)
- 6 24502259 Head, GM Motorsports

View

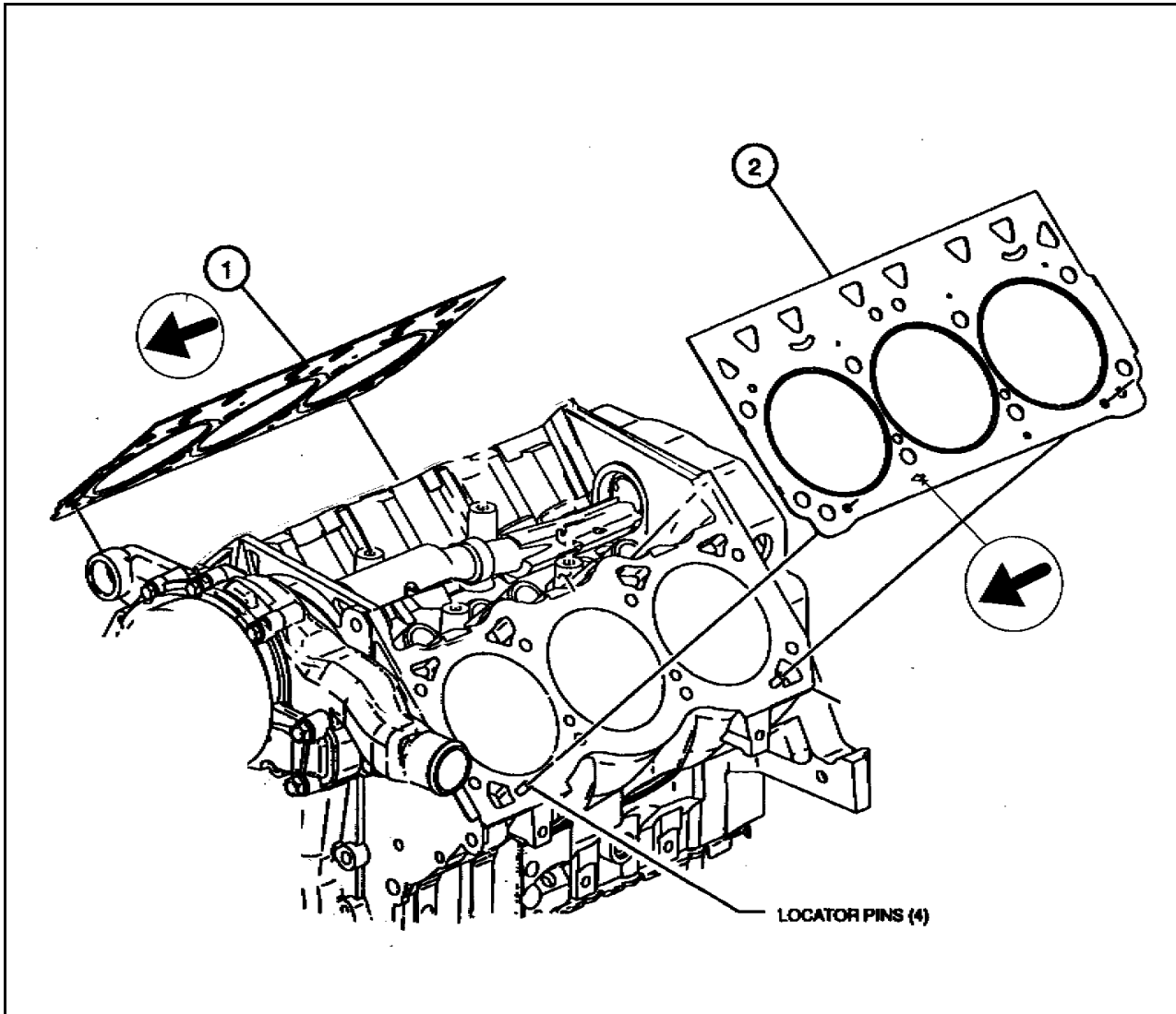
Head Assembly

Valve & spring assembly

Section	Sheet
5	1

REV	Date	Revision History
1	1/6/98	Block-36
2	11/13/99	Update valve spring part number
3	12/1/99	Update valve spring calibration

Head Assembly	Sequence III F
----------------------	-----------------------



Description of Operation

Head gaskets are not interchangeable. Installing the head gasket with the arrow pointing to the rear will cause gasket failure and possible engine failure.

Install the head gasket with the arrow pointing toward the front of the engine.

Do not use any sealers on the head gaskets.

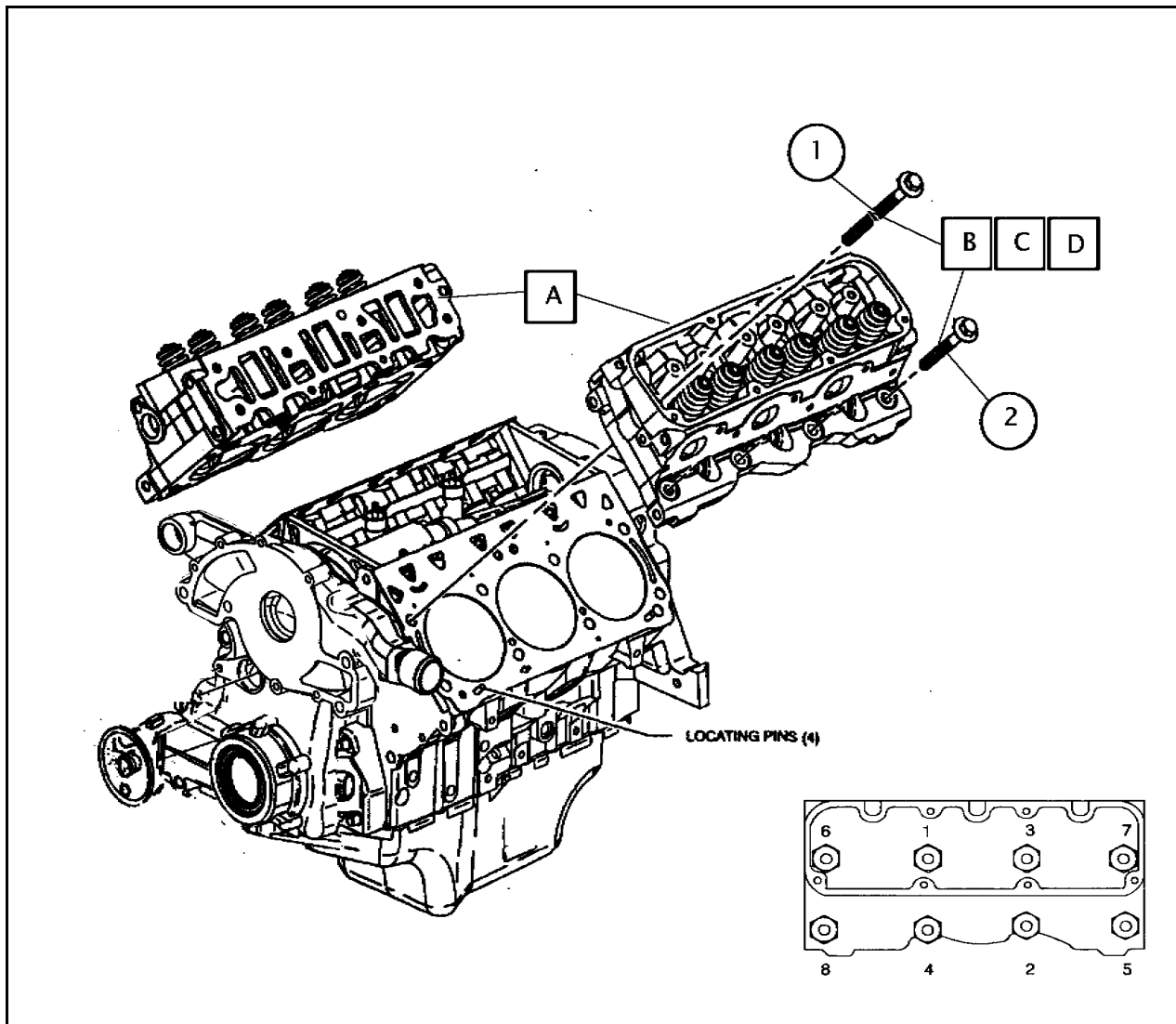
Specification		
1	24503801	Gasket RH
2	24503802	Gasket LH

REV	Date	Revision History
1	1/6/98	Block-37

View
Head Gaskets
Head gasket install

Head Assembly	Sequence III F
----------------------	-----------------------

Section	Sheet
5	2



Description of Operation	
A	Carefully install cylinder heads.
B	Clean all Teflon type sealer from new bolt threads and underside of head.
C	Install #2 Permatex on threads and underside of fastener head.
D	Torque fasteners from center out using a crisscross pattern with the Torque Sensor 1 wrench set on soft joint for gasketed applications.
30Nm-50Nm-80Nm - JCS-TEL to yield.	

Specification	
1	25527831 Bolt Cyl. Head (8) Long
2	25533811 Bolt Cyl. Head (8) Short

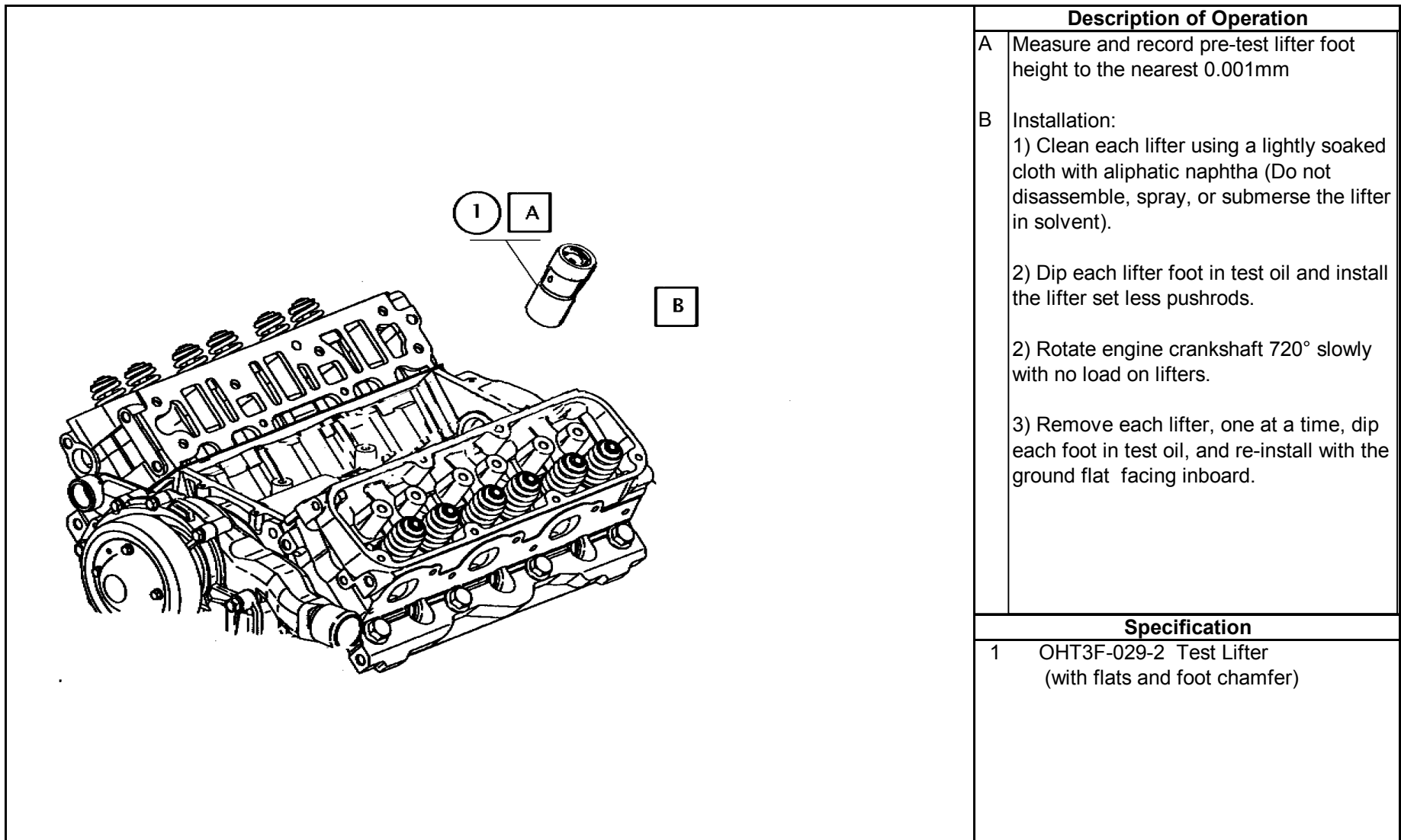
REV	Date	Revision History
1	1/6/98	Block-38 & 50

View
Cylinder Head
Cylinder head installation

Head Assembly	Sequence III F
---------------	----------------

Section	Sheet
5	3

Section 6
Long Block



Description of Operation	
A	Measure and record pre-test lifter foot height to the nearest 0.001mm
B	Installation: 1) Clean each lifter using a lightly soaked cloth with aliphatic naphtha (Do not disassemble, spray, or submerge the lifter in solvent). 2) Dip each lifter foot in test oil and install the lifter set less pushrods. 2) Rotate engine crankshaft 720° slowly with no load on lifters. 3) Remove each lifter, one at a time, dip each foot in test oil, and re-install with the ground flat facing inboard.

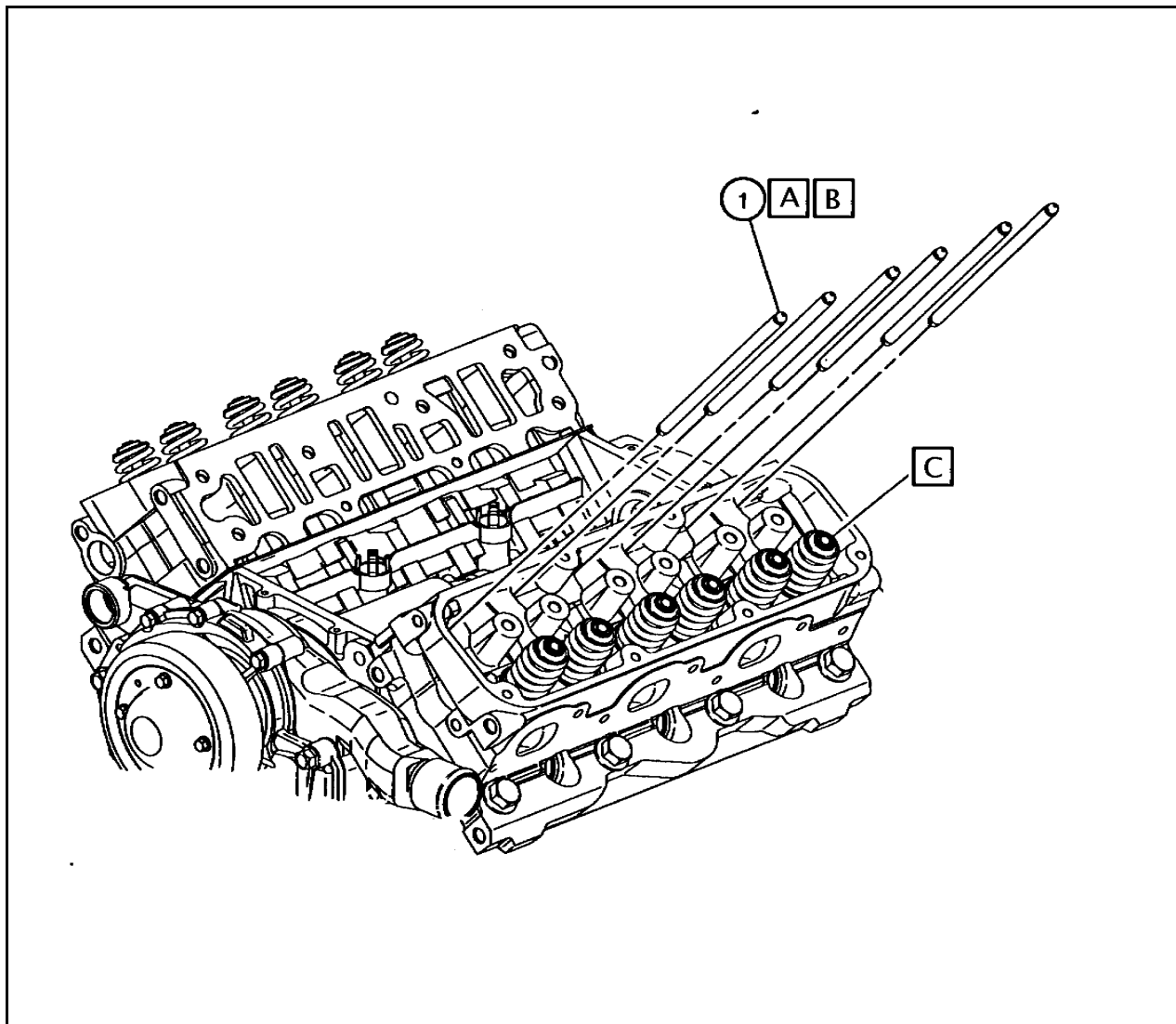
Specification	
1	OHT3F-029-2 Test Lifter (with flats and foot chamfer)

REV	Date	Revision History
1	1/6/98	Block-39
2	11/13/99	Update lifter part number, description, and installation instructions

View	
Lifter Installation	
Lifter pre-oiling and installation	

Long Block Assembly	Sequence III F
----------------------------	-----------------------

Section	Sheet
6	1



Description of Operation	
A	Clean all pushrods with aliphatic naphtha and spray with a 50/50 solution of EF-411 and aliphatic naphtha. Remove excess with compressed air.
B	Install pushrods
C	Lubricate each valve stem seal and tip with EF-411.

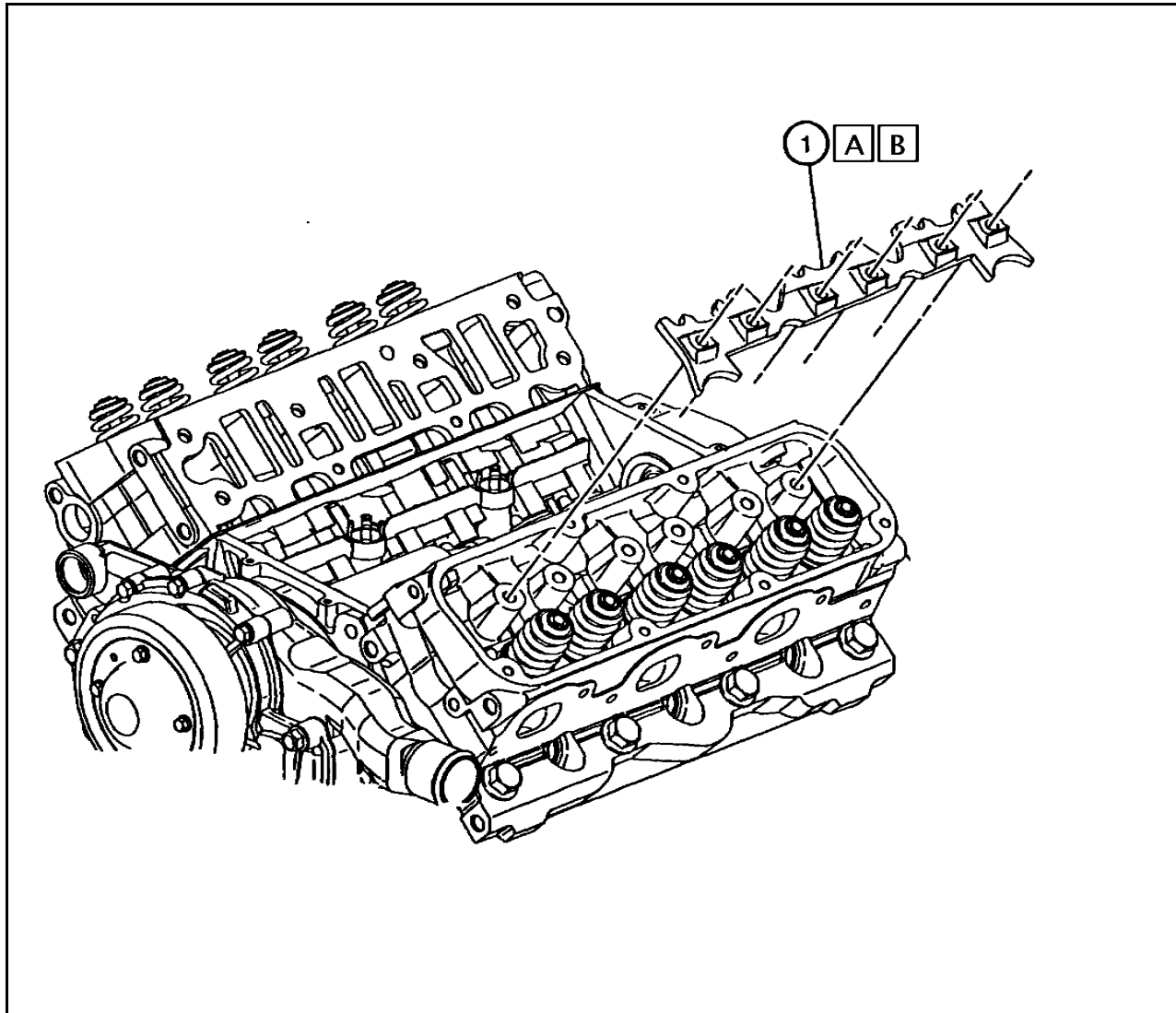
Specification	
1	OHT3F-007-1 Pushrod (Special Length)

REV	Date	Revision History
1	1/6/98	Block-40

View
Pushrods
Pushrod installation

Long Block Assembly	Sequence III F
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Section	Sheet
6	2



Description of Operation	
A	Clean and inspect for wear.
B	Install pushrod guide / rocker bearing retainer.

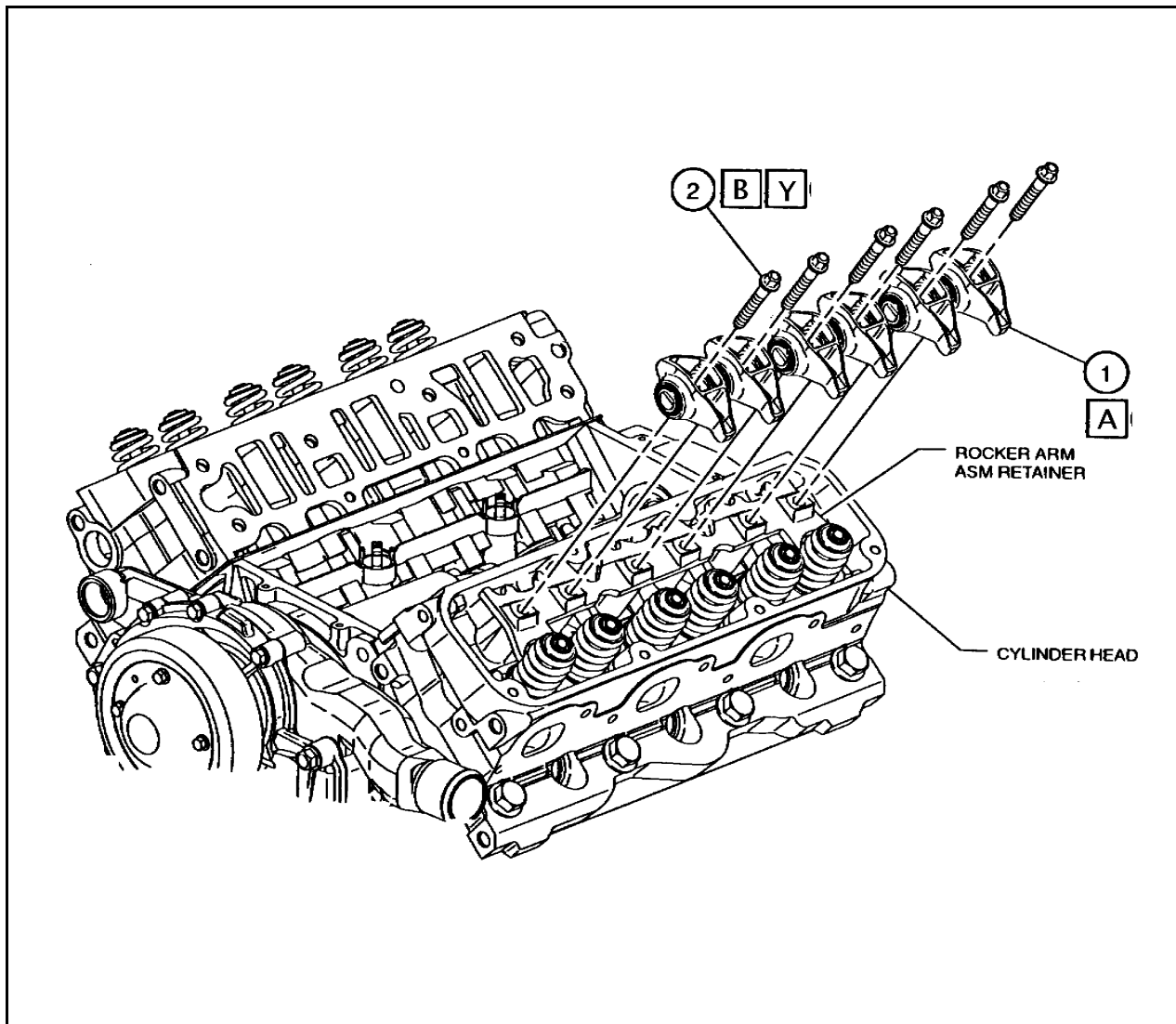
Specification	
1	24502278 Retainer

REV	Date	Revision History
1	1/6/98	Block-41

View
Retainer
Rocker bearing retainer installation

Long Block Assembly	Sequence III F
---------------------	----------------

Section	Sheet
6	3



Description of Operation	
A	Lubricate rocker arms with EF-411 and install. Note: Rocker arm assemblies are replaced every test. Do not dip or spray with aliphatic naphtha. Needle roller bearings will retain solvents.
B	Lubricate bolts with EF-411 and install.
C	Torque & Angle 25Nm + 70° Note: Do not rotate engine after final valvetrain loading.

Specification	
1	OHT3F-058-1 Rocker Arm Assembly
2	Furnished less sealers with OHT Kit

REV	Date	Revision History
1	1/6/98	Block-42
2	11/13/99	Remove SPO part number for furnished rocker arm bolts
3	12/1/99	Add note on rotation

View	
Rocker Arm	
Rocker arm installation	

Long Block Assembly	Sequence III F
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Section	Sheet
6	4

Description of Operation

Install rocker covers
 Y Torque 10Nm

Specification

- 1 25534751 Cover, Valve Lt (2)
- 2 24502164 Bolt
25534748 Bolt w/washer

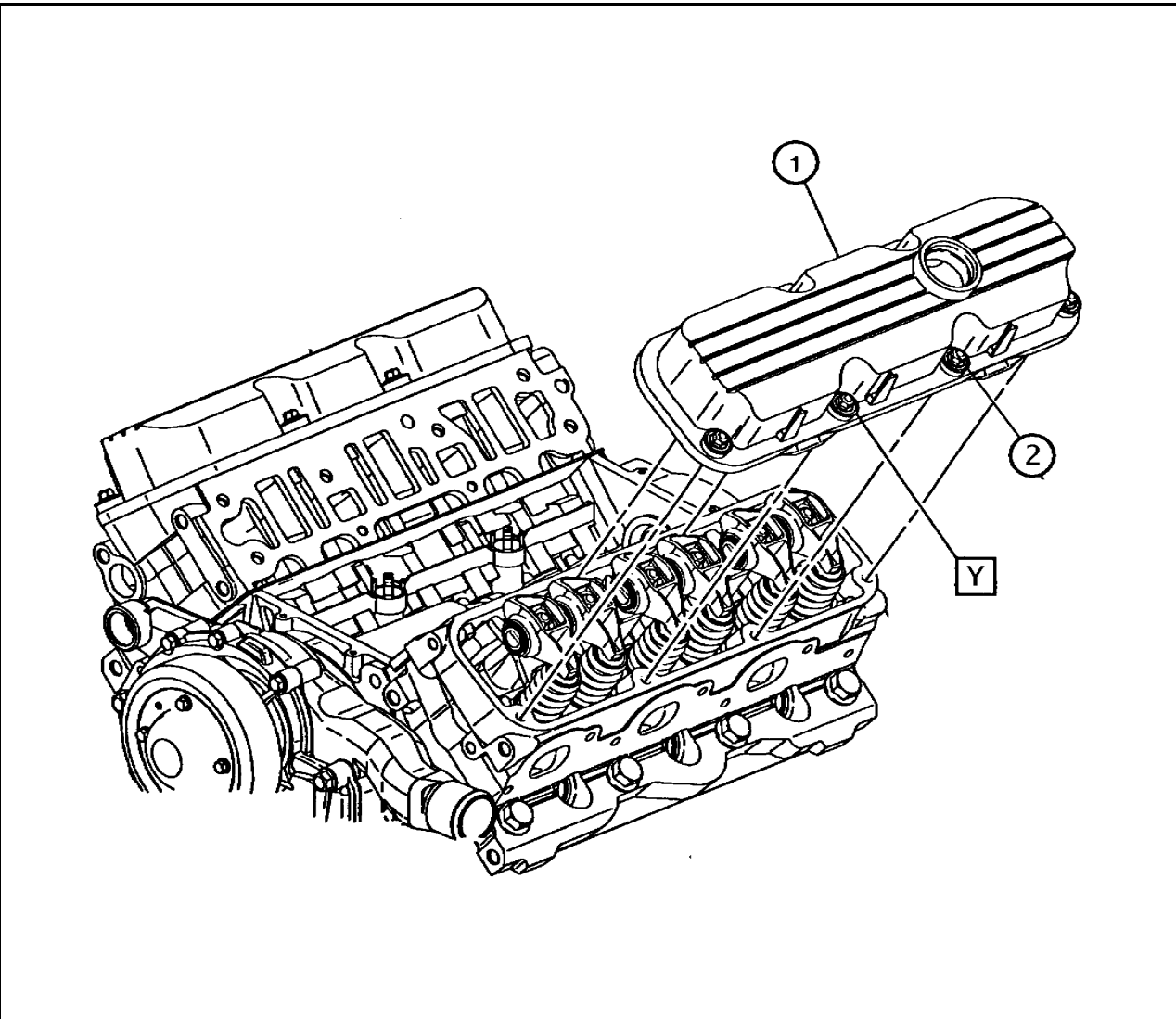
View

Rocker Cover

Rocker cover installation

Section **Sheet**

6 5



Revision History

REV	Date	
1	1/6/98	Block-43

Long Block Assembly

Sequence IIIF

Description of Operation

1st design kit cross seals are less locating pins

2nd design kit has locating pins

Z Apply GM RTV Sealer at both ends part # 12346193

Specification

- 1 12537196 Gskt. Kit 1st design
12539093 Gskt. Kit 2nd design
- 2 Seal / part of kit
- 3 Sealant (see note Z)

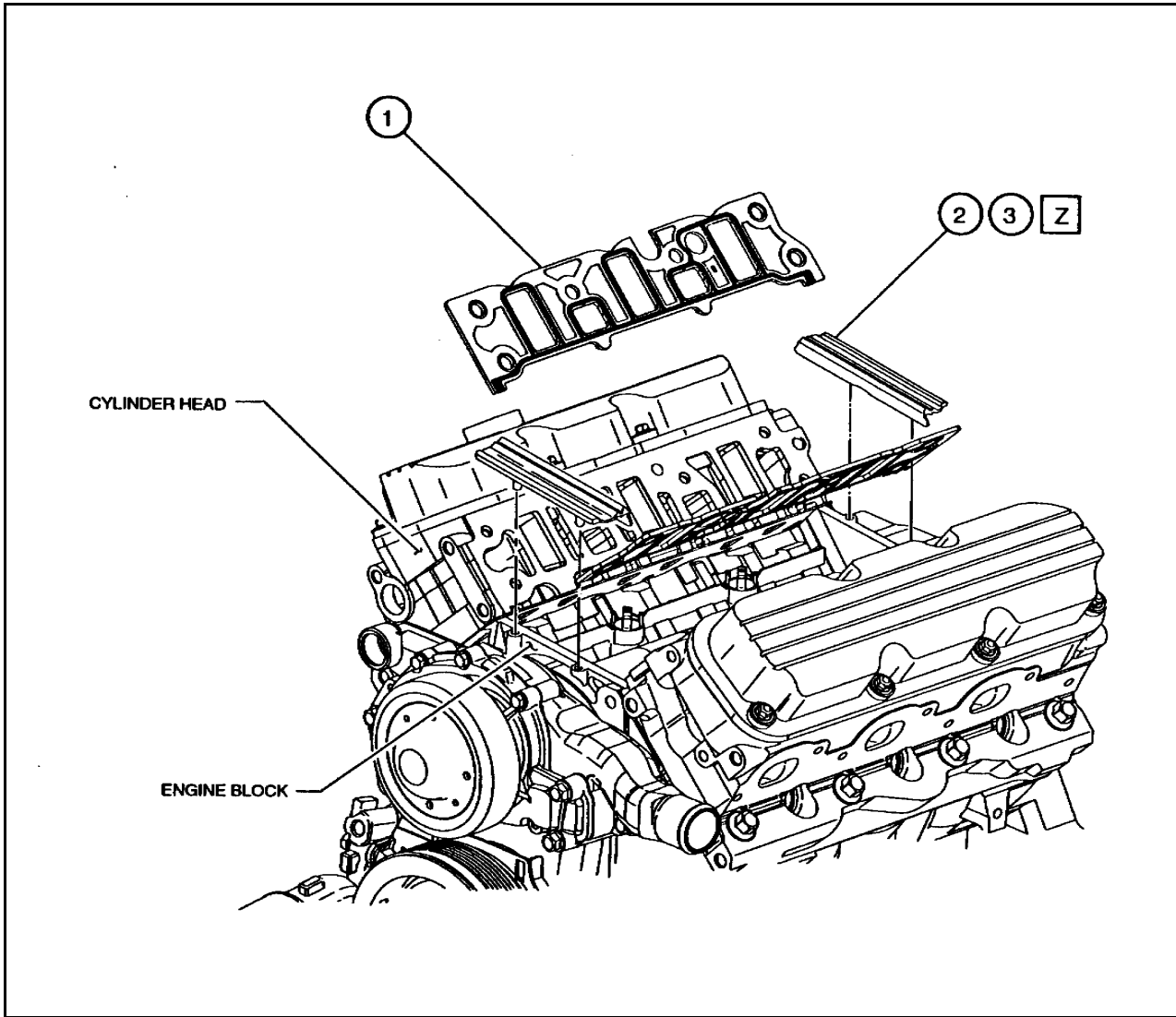
View

Intake Gaskets

Intake gasket installation

Section **Sheet**

6 6

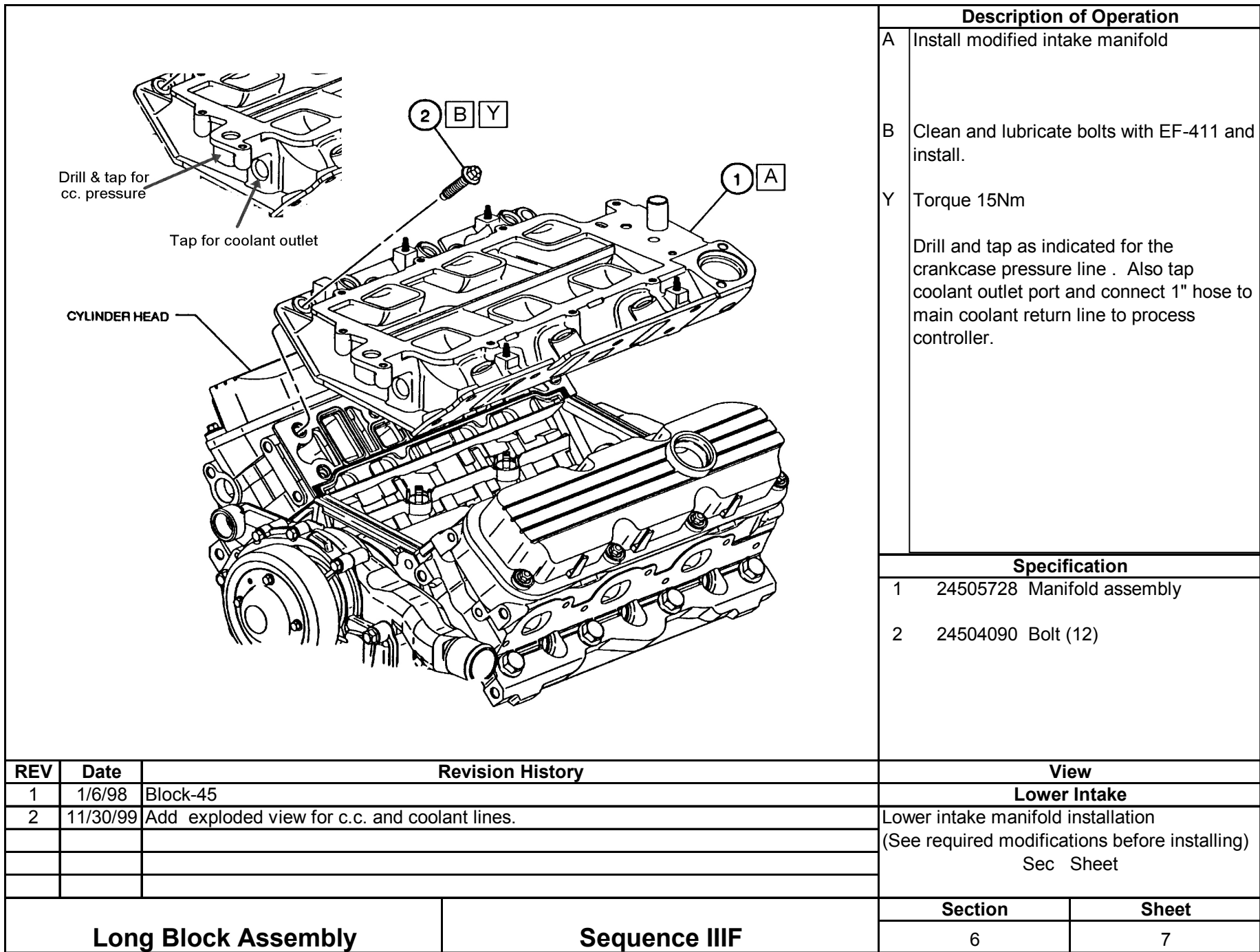


Revision History

REV	Date	Description
1	1/6/98	Block-44
2	12/1/99	Add sealant part number

Long Block Assembly

Sequence III F



Description of Operation	
A	Install modified intake manifold
B	Clean and lubricate bolts with EF-411 and install.
Y	Torque 15Nm
Drill and tap as indicated for the crankcase pressure line . Also tap coolant outlet port and connect 1" hose to main coolant return line to process controller.	

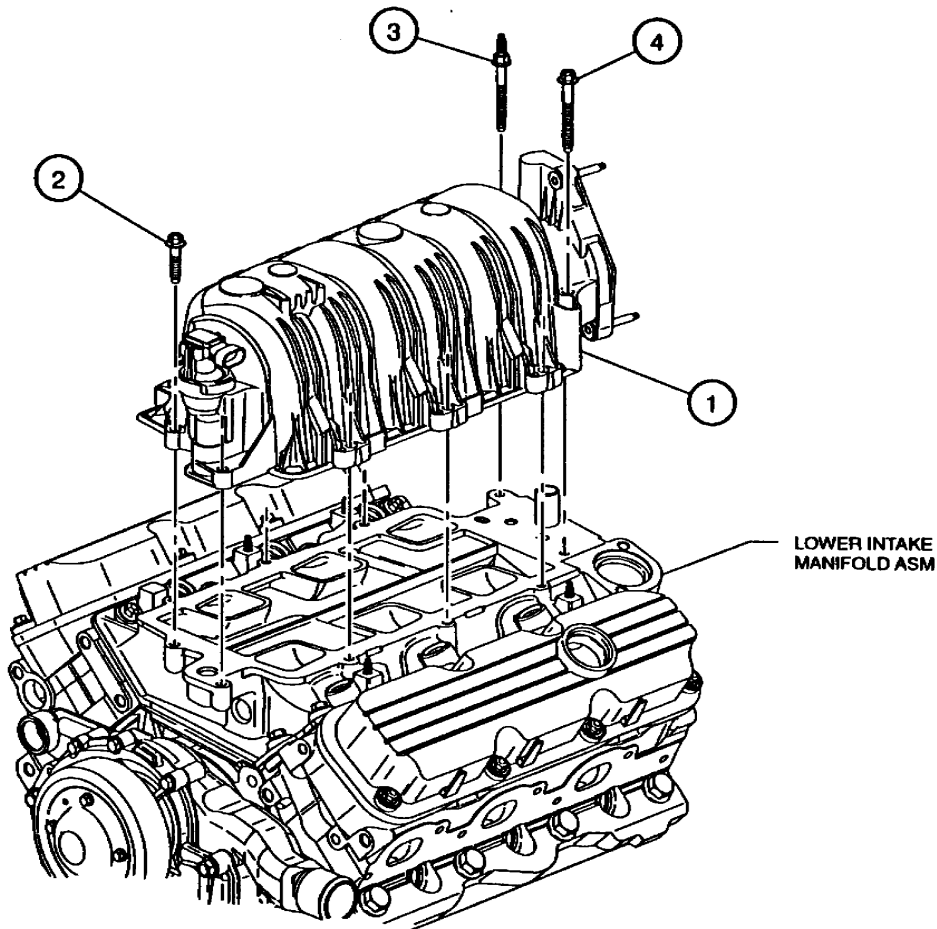
Specification	
1	24505728 Manifold assembly
2	24504090 Bolt (12)

REV	Date	Revision History
1	1/6/98	Block-45
2	11/30/99	Add exploded view for c.c. and coolant lines.

View
Lower Intake
Lower intake manifold installation (See required modifications before installing) Sec Sheet

Long Block Assembly	Sequence III F
----------------------------	-----------------------

Section	Sheet
6	7



Description of Operation

Install upper intake and gasket assembly.

Y Torque 10Nm

Specification

- 1 17096162 Manifold assembly
17113137 Gasket Kit
- 2 24506498 Bolt (8)
- 3 24502453 Stud
- 4 24505205 Bolt

See note Y for torque

View

Upper Intake

Upper intake installation

REV	Date	Revision History
1	1/6/98	Block-46

Long Block Assembly

Sequence III F

Section

6

Sheet

8

Description of Operation

Install modified throttle body

Note: See section 7 sheet 5 for modifications

Y Torque 10Nm

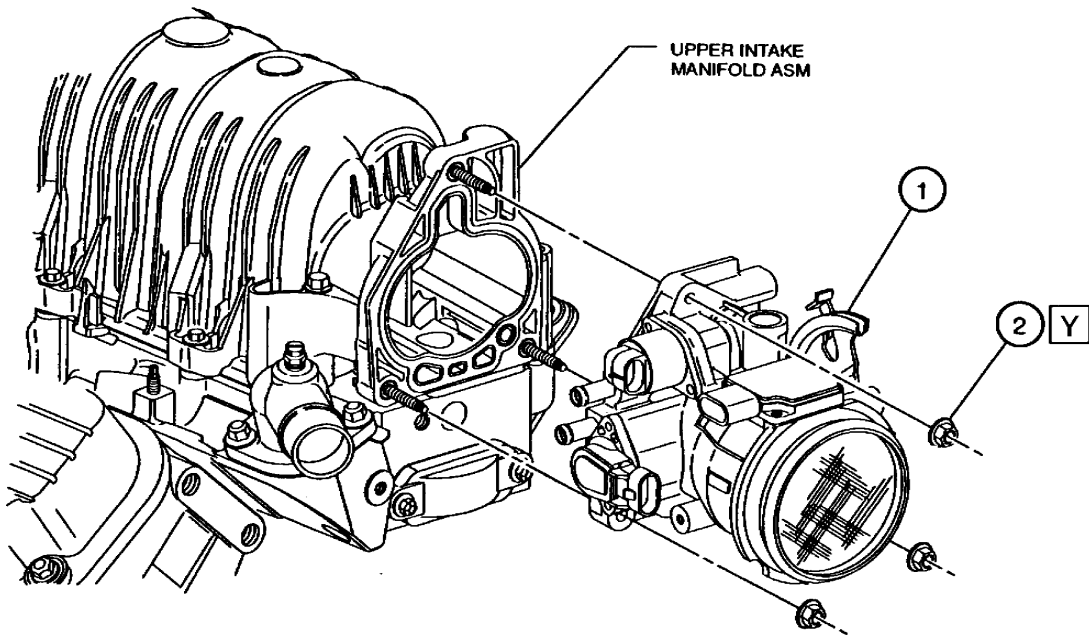
Specification

1	24507235 Throttle Body
2	24506469 Nut

View

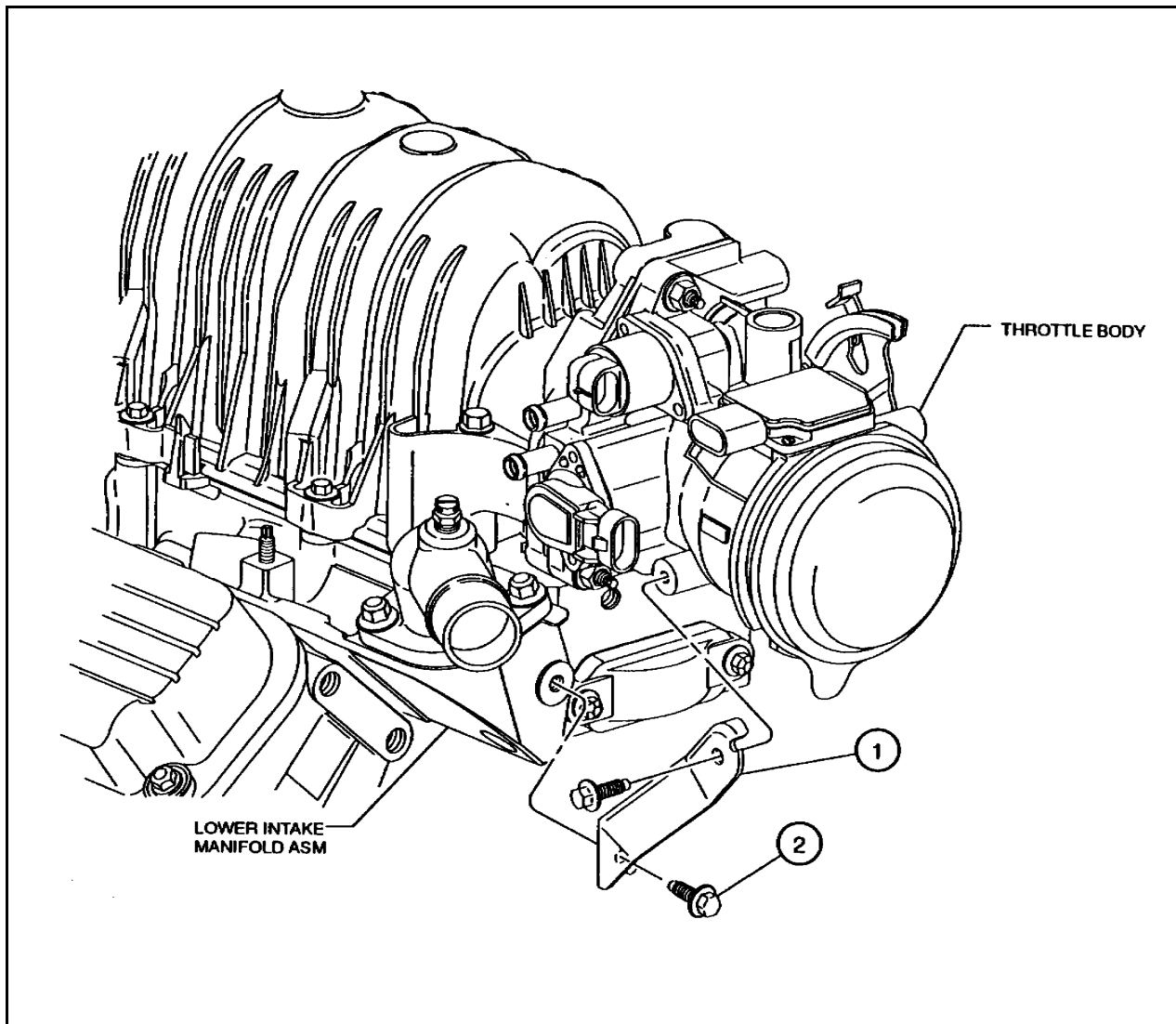
Throttle Body
Throttle body installation

Section	Sheet
6	9



REV	Date	Revision History
1	1/6/98	Block-47
2	11/13/99	Update part number and add note for modification see section 7 sheet 5

Long Block Assembly	Sequence III F
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Description of Operation	
	Install support bracket
Y	Torque 10Nm

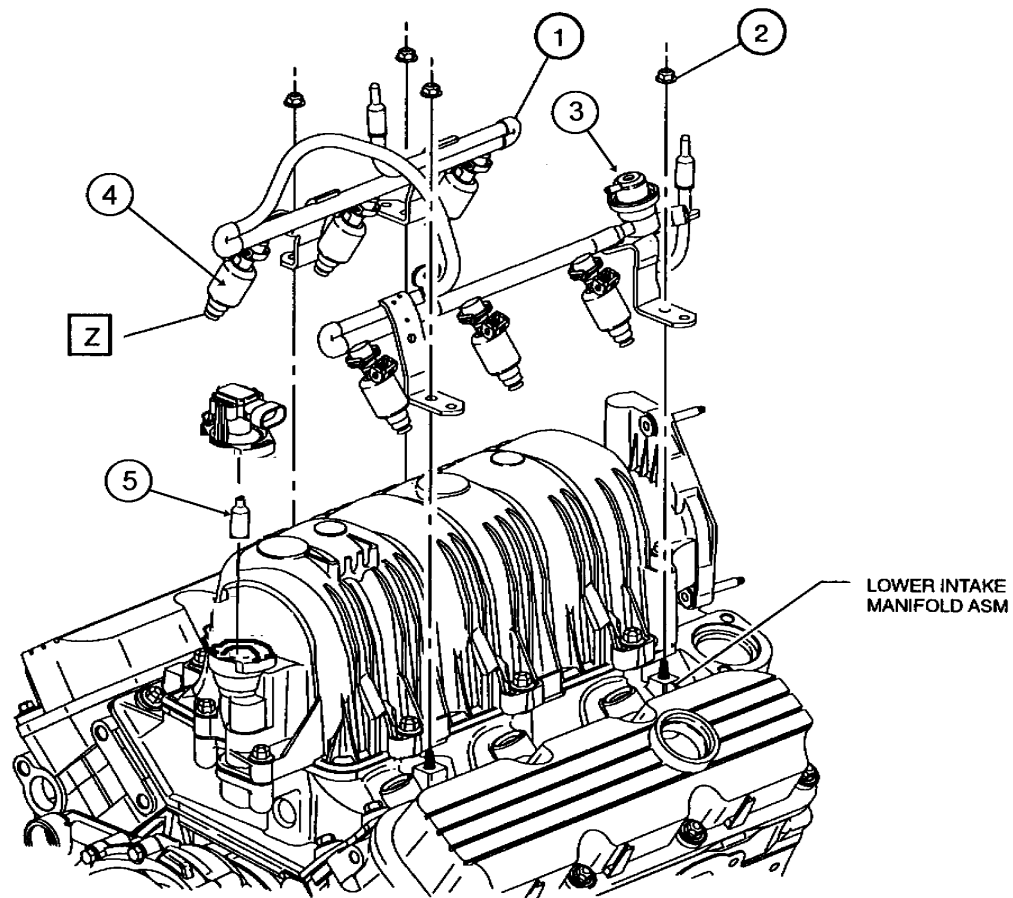
Specification	
1	24504697 Support
2	24503644 Bolt (2) See note Y for torque

REV	Date	Revision History
1	1/6/98	Block-48

View
Throttle Body Support
Throttle body support installation

Long Block Assembly	Sequence III F
----------------------------	-----------------------

Section	Sheet
6	10



Description of Operation

	Install injector assembly
Y	Torque 10Nm
Z	Lubricate O-ring with EF-411

Specification

1	17098211 Fuel Rail
2	24506469 Nut
3	17113346 Regulator
4	17120601 Injector
5	OHT3F-002-1 PCV Dummy

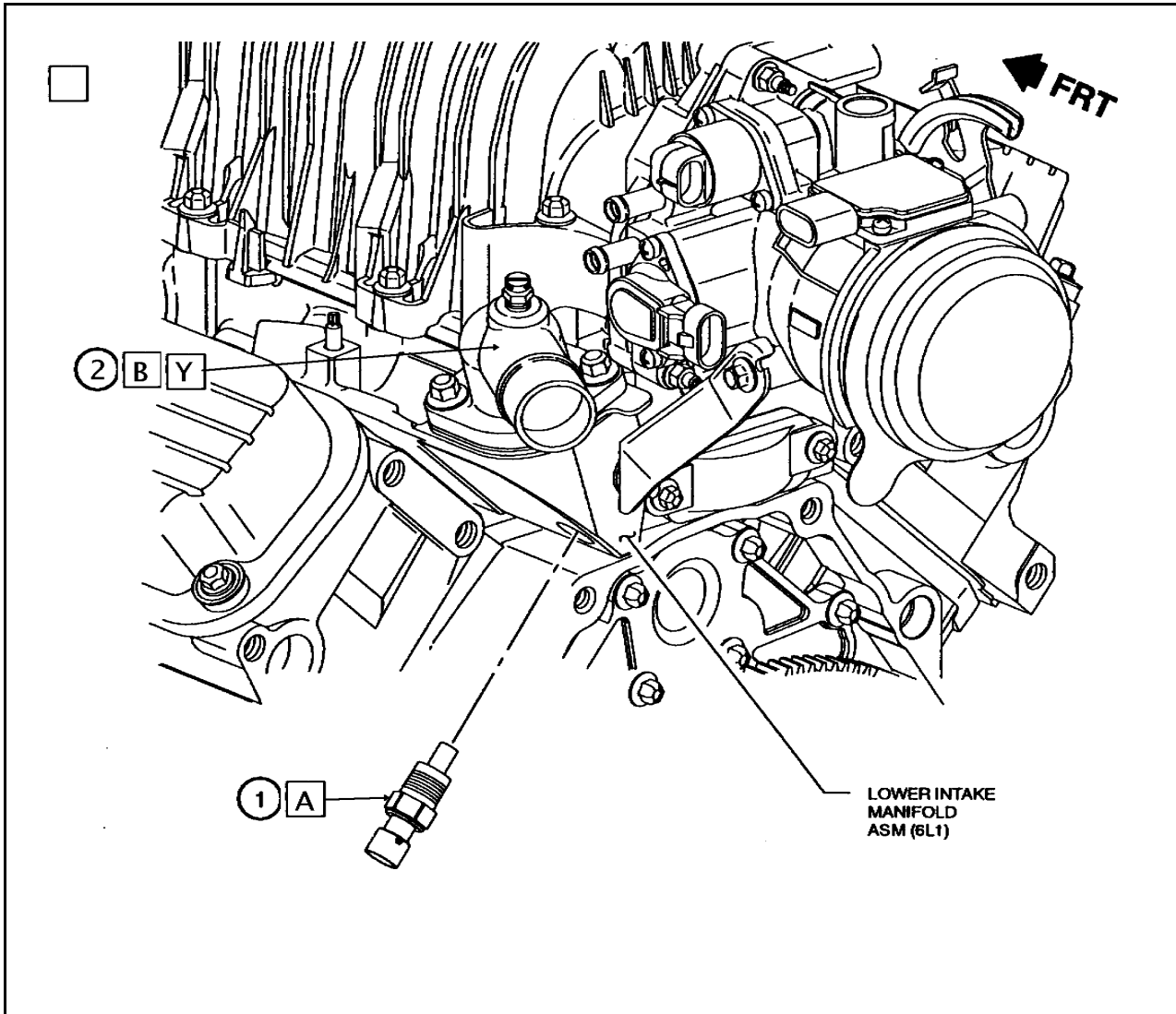
REV	Date	Revision History
1	1/6/98	Block-49
2	11/13/99	Update part numbers and view

View
Injector Assembly
Injector assembly installation

Long Block Assembly	Sequence III F
----------------------------	-----------------------

Section	Sheet
6	11

Section 7
Final Dress



Description of Operation	
A	Install production sensor as a plug only. Do not use for connection to harness. Disable connector.
B	Install coolant outlet
Y	Torque 27Nm

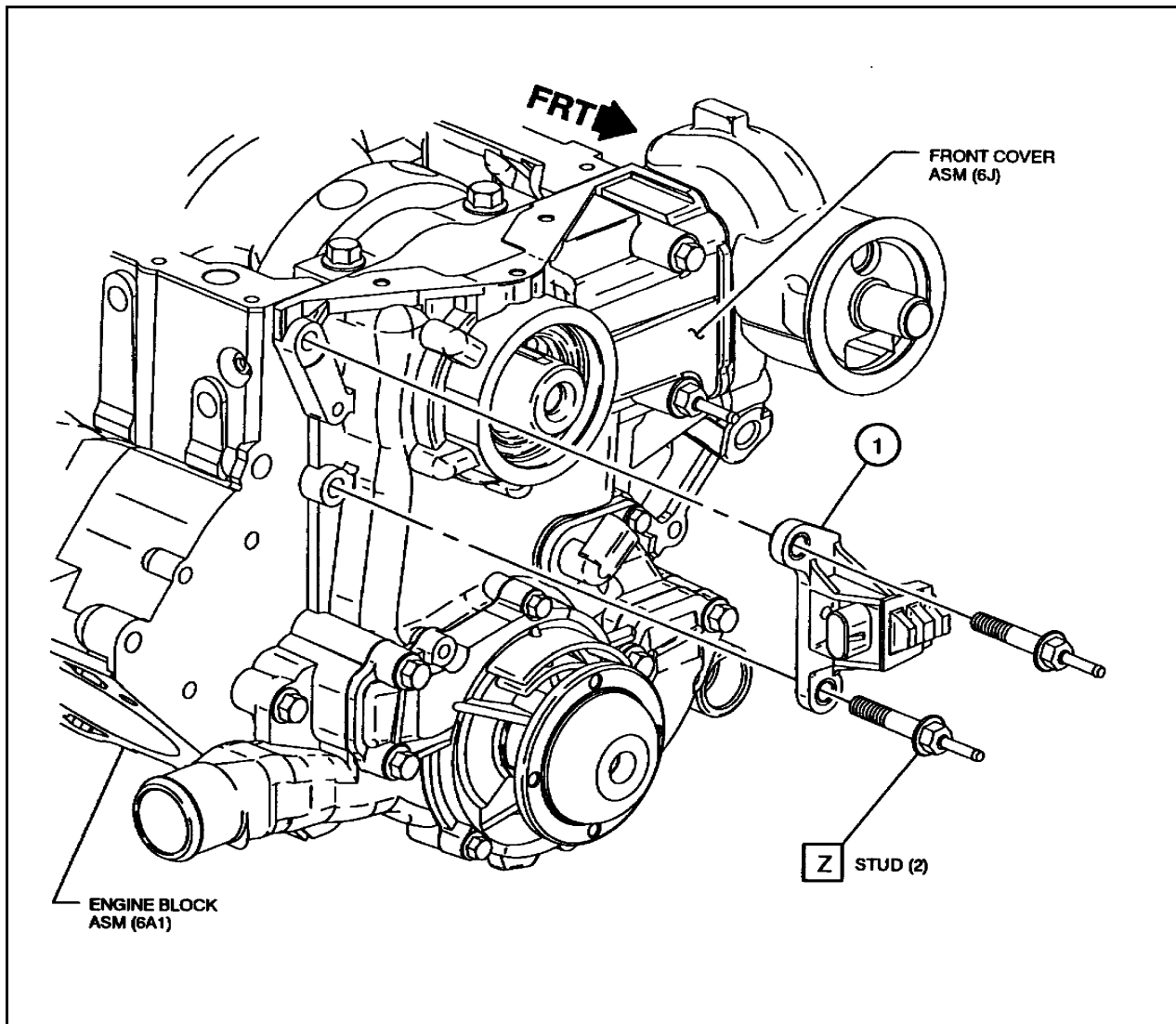
Specification	
1	10096181 Sensor (Used for plug only, disable connector)
2	OHT3F-034-1 Coolant Outlet (Not to detail on sheet)

REV	Date	Revision History
1	1/10/98	Block-51

View	
Coolant Out & Sensor	

Final Dress	Sequence III F
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Section	Sheet
7	1



Description of Operation

Z See front cover section for blot part numbers and torque.

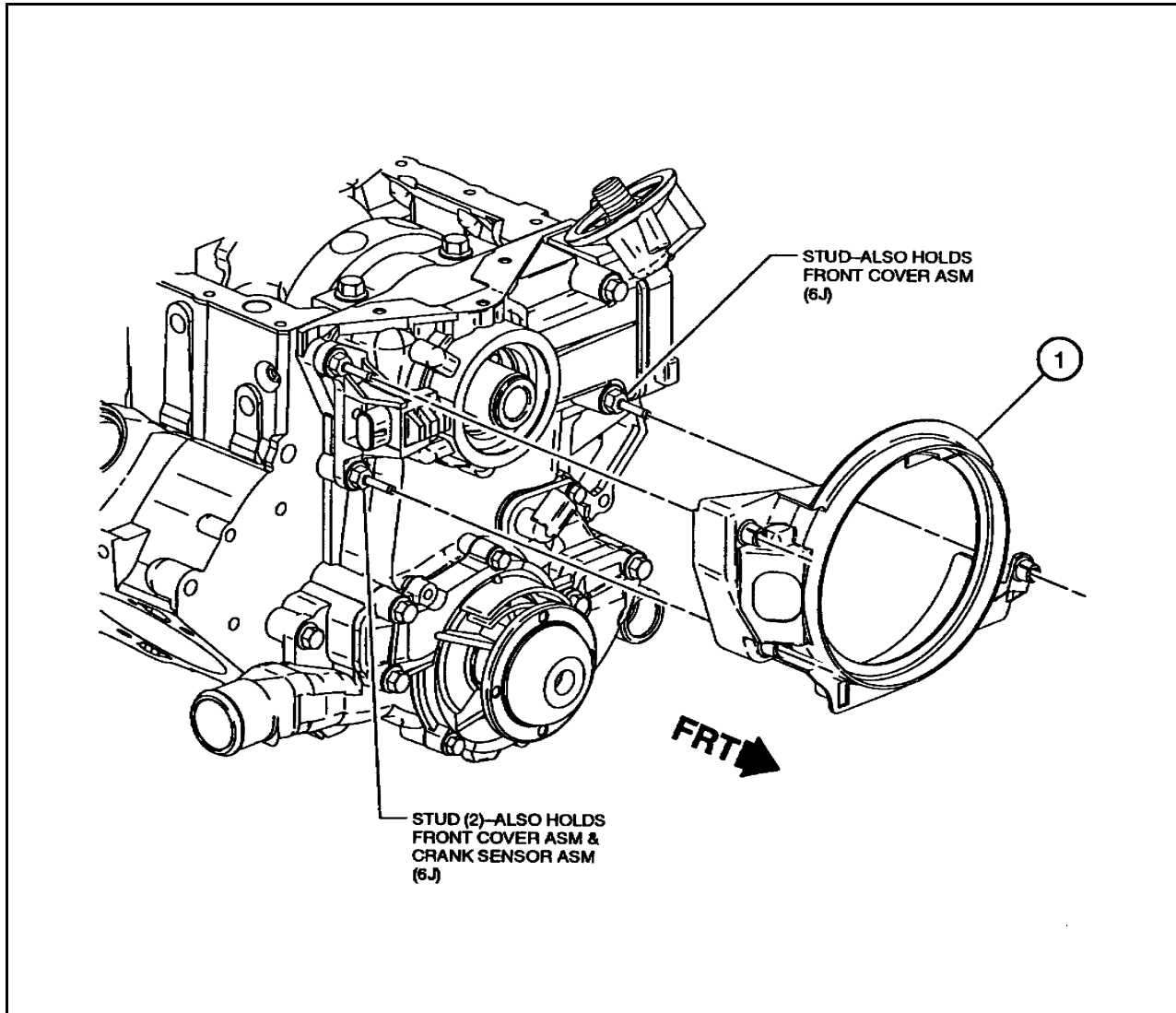
Specification	
1	10456161 Sensor

REV	Date	Revision History
1	1/10/98	Block-53

View	
Crankshaft Sensor	

Final Dress	Sequence III F
--------------------	-----------------------

Section	Sheet
7	2



Description of Operation

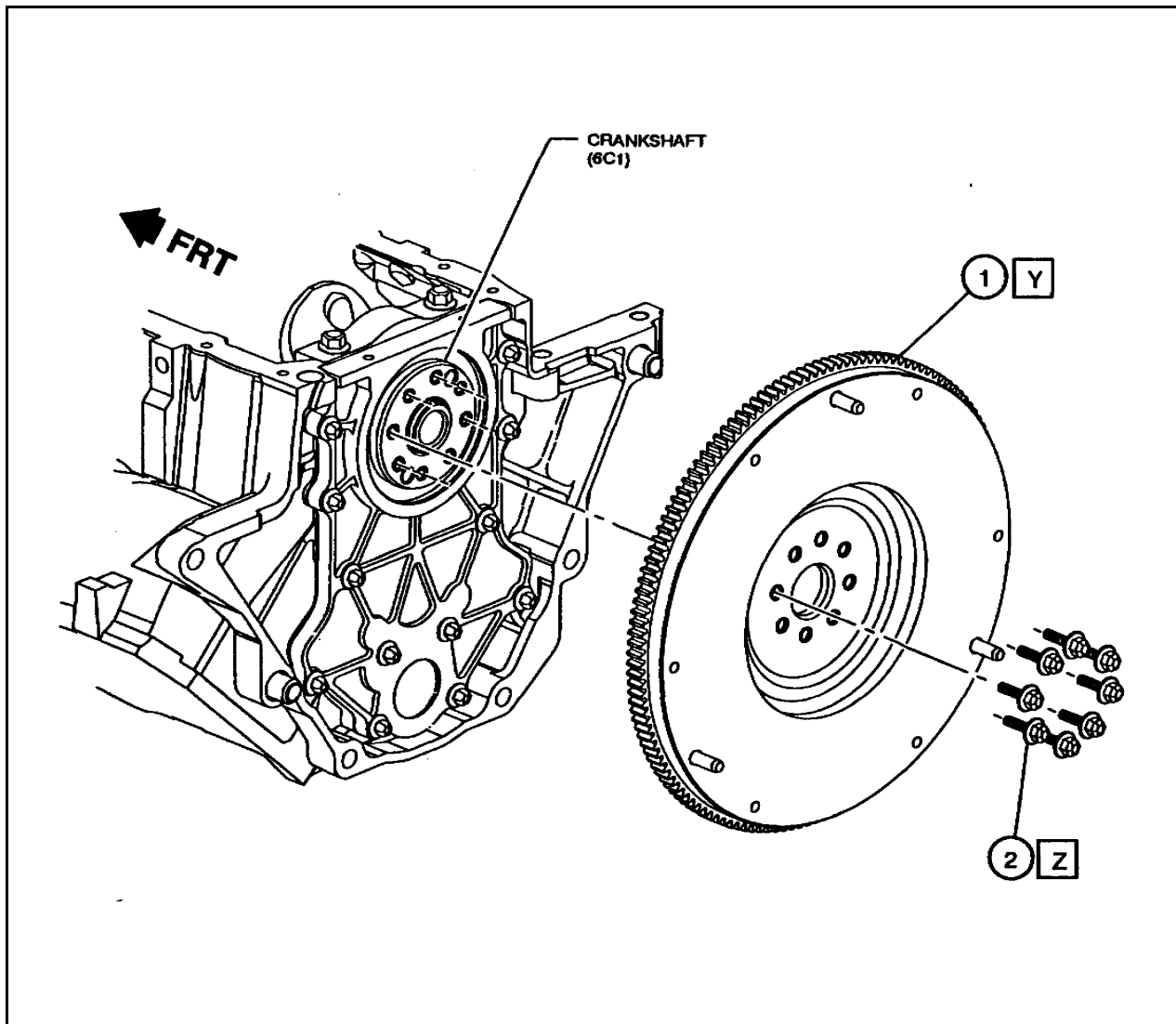
Specification	
1	24506440 Shield

REV	Date	Revision History
1	1/10/98	Block-54

View	
Crankshaftv Sensor Shield	

Final Dress	Sequence III F
--------------------	-----------------------

Section	Sheet
7	3



Description of Operation	
Y	OHT-020-2 modified to fit offset balance and adapter plate for Dana 1550 four bolt yoke.
Z	Torque & Angle 15Nm + 50°

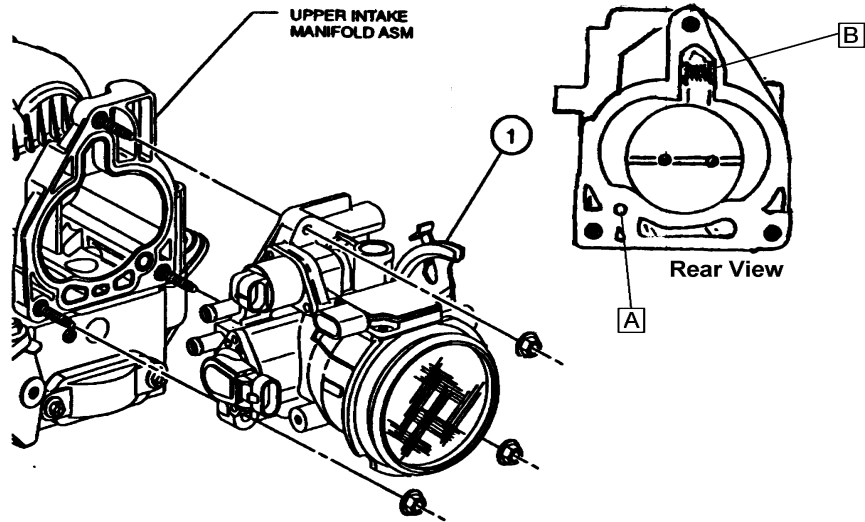
Specification	
1	OHT3F-020-2 Flywheel (Modified 24503285)
2	24505092 Bolt

REV	Date	Revision History
1	1/10/98	Block-55

View	
Flywheel	

Final Dress	Sequence III F
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Section	Sheet
7	4



Description of Operation

- A Drill and tap to receive a hex head plug

 - B Use power to PCM with engine not running and throttle blade open to drive Idle Air Control motor closed. Disconnect harness connector and adjust idle screw to obtain 800 RPM base idle.
- As an alternative, the IAC may be removed and both ports plugged using epoxy and welch type plugs.

Specification

1 24507235 Throttle Body

REV	Date	Revision History
1	11/13/99	Block-48

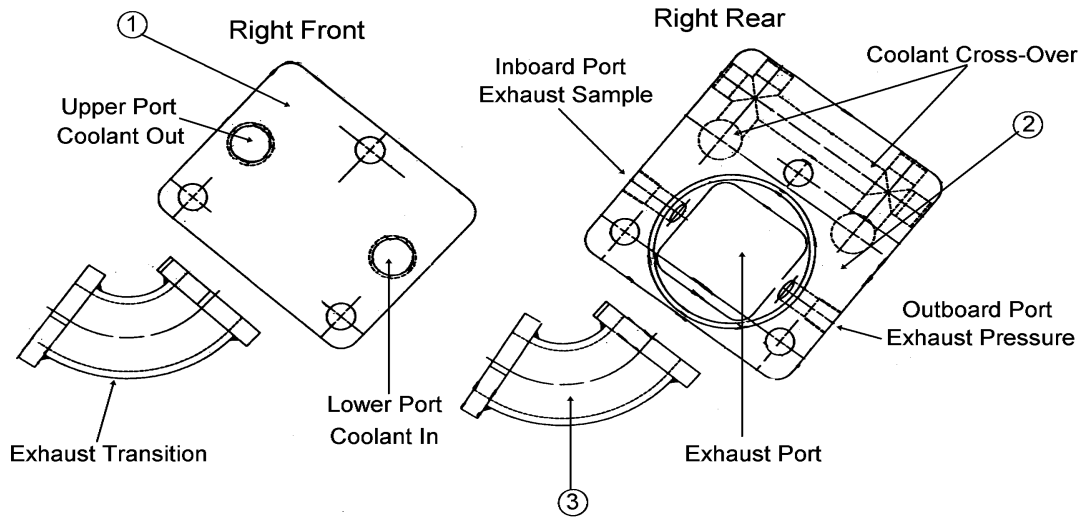
View	
Throttle Body Modification	

Final Dress	Sequence III F
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Section	Sheet
7	5

Section 8

OH Technologies
Illustrations and Parts List



Description of Operation

Water cooled exhaust manifold end plates and exhaust manifold transitions. Note: both views are right side showing the cooling water inlet is the lower port and the outlet is the higher port. Also, the inboard exhaust sample port is for the gas analysis and the outboard is for the back pressure connection.

The transition should be connected with shielded gaskets not shown but identified by part number. Two required per side.

Thermocouples for exhaust coolant in and out should be installed in the fittings attached to the front plate and centered in the coolant flow.

Specification

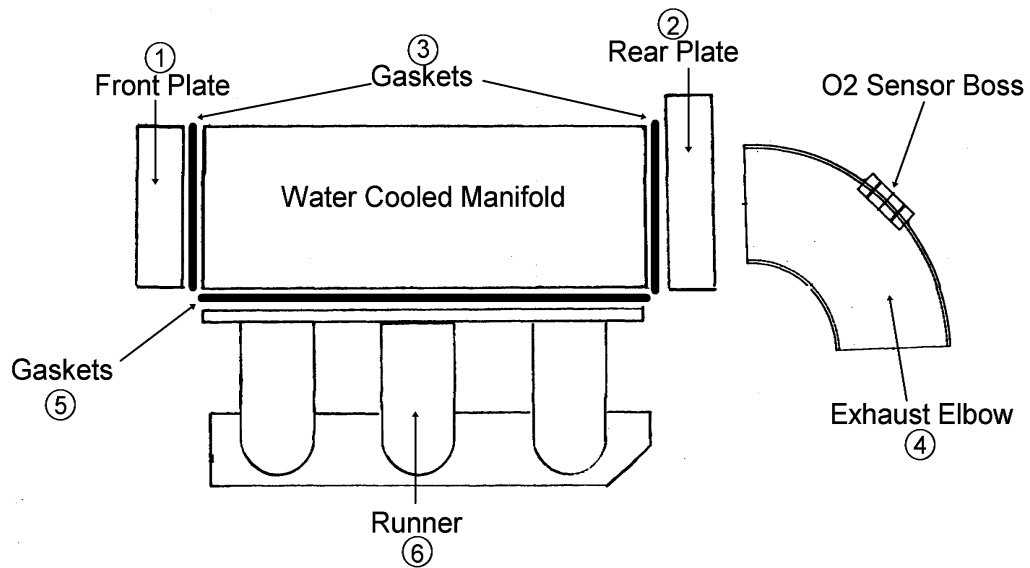
- 1 OHT3F-006-1 Plate, Rear Exhaust
- 2 OHT3F-005-1 Plate, Front Exhaust
- 3 OHT3F-004-1 Runner, Exh. Man.

REV	Date	Revision History
1	11/13/99	Block-60

View	
Water Cooled Exh. Man. End Plates	

OHT	Sequence III F
------------	-----------------------

Section	Sheet
8	1



Description of Operation

Water cooled exhaust manifold

Not to scale

Specification

- 1 OHT3F-005-1 Plate, Front Exhaust
- 2 OHT3F-006-1 Plate, Rear Exhaust
- 3 OHT3F-009-1 Gasket, End Plate
- 4 OHT3F-005A-1 Elbow, Exh. Modified
- 5 OHT3F-018-1 Gasket Flange, Metal
- 6 OHT3F-004-1 Runner, Exh. Man.

REV	Date	Revision History
1	11/13/99	Block-61

View

Water Cooled Exh. Man. & Elbow

OHT	Sequence III F
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Section	Sheet
8	2

Description of Operation

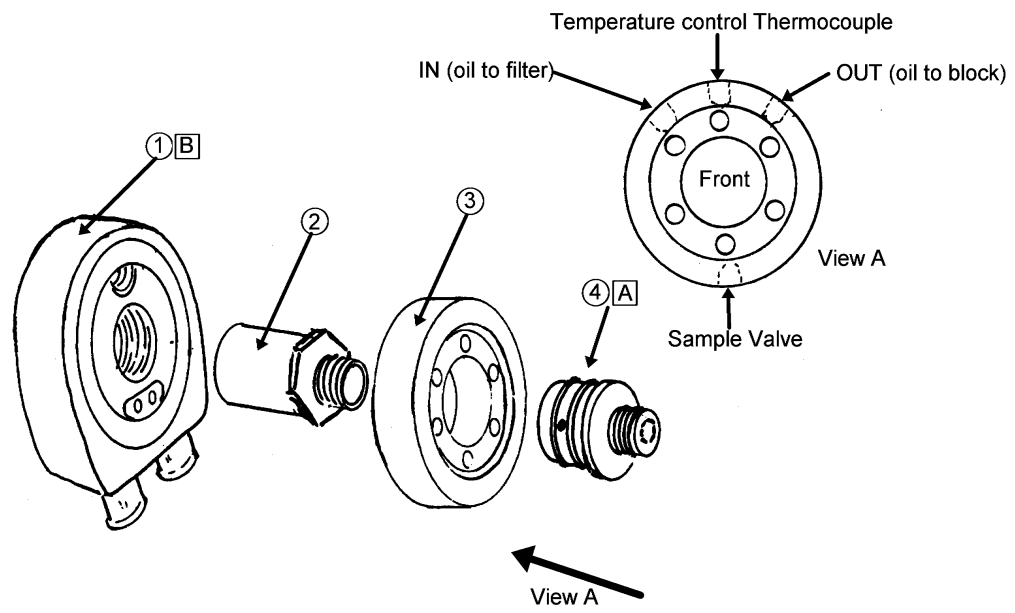
A Replace "o"-rings every test.

Note: View A
Viewed from front or oil filter side, passages are, IN (oil press. To filter), center port for temperature control thermocouple, OUT (oil press. to engine block), and lower port is for oil sample valve.

B Replace oil cooler every test

Specification

- 1 OHT3F-030-1 Cooler Nickel Plated
- 2 OHT3F-039-1 Connector Special Cut
- 3 OHT3F-035-1 Adapter, Oil Filter
- 4 OHT3F-043-1 Fitting, Oil Filter Adapter

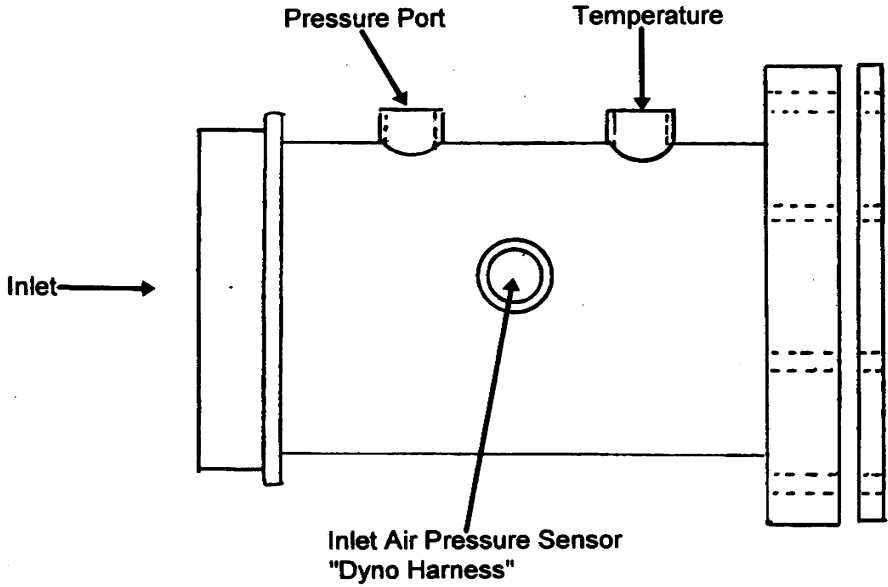


REV	Date	Revision History
1	11/30/99	Block 62

View
Oil Cooler Assembly

Description of Operation

Inlre air adapter
 Use pressure port for hookup to transducer, temperature for thermocouple (centered in flow), and inlet air pressure sensor port for Dyno Harness sensor.



Specification

OHT3F-001-2 Adapter, Throttle Body

View

Adapter, Throttle Body

Section	Sheet
8	4

REV	Date	Revision History
1	11/30/99	Block-63

OHT	Sequence IIIF
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SEQUENCE IIIF
DATE: 18 OCT 99
REVISION: 991018

<u>DESCRIPTION</u>	<u>PART NUMBER</u>
ADAPTER, BLOWBY BREATHER TUBE	OHT3F-040-1
ADAPTER, OIL FILTER	OHT3F-035-1
ADAPTER, THROTTLE BODY	OHT3F-001-2
BEARING, CAM BUSHING, POSITIONS 1 & 4	3F028-07
BEARING, CAM BUSHING, POSITIONS 2 & 3	3F028-08
BEARING, CONNECTING ROD, KIT, UPPER AND LOWER	OH-106
BEARING, KIT, ENGINE	OHT3F-042-2
BEARING, MAIN, KIT	OH101A
BEARING, MAIN, LOWER, #1 AND 3	OH-102
BEARING, MAIN, LOWER, #4	OH-103
BEARING, MAIN, LOWER, FLANGE, #2	OH-104
BEARING, MAIN, UPPER, #1, 3, AND 4	OH-101
BEARING, MAIN, UPPER, FLANGE, #2	OH-105
BRACKET, BREATHER TUBE	OHT3F-041-1
BUSHINGS, ROCKER COVER	OHT3F-028-1
CAMSHAFT, SPECIAL TEST	OHT3F-008-6
CONNECTOR, GM PN 24502883	OHT3F-039-1
COOLER, OIL, NICKEL PLATED	OHT3F-030-1
DIP STICK, METRIC	OHT3F-064-1
ELBOW, EXHAUST, MODIFIED	OHT3F-005A-1
FILTER, OIL PF-47	OHT3F-057-1
FITTING, OIL FILTER ADAPTER	OHT3F-043-1
FLYWHEEL, MANUAL, MODIFIED P.N. 24503285	OHT3F-020-2
GAGE, BORE, GR12, 96.53mm	OHT3F-066-1
GAGE, BORE, GR34, 96.57mm	OHT3F-067-1
GAGE, BORE, GR56, 96.61mm	OHT3F-068-1
GAGE, RING, GR12, 96.53mm	3F050-03
GAGE, RING, GR34, 96.57mm	3F051-03
GAGE, RING, GR56, 96.61mm	3F052-03
GASKET, EXHAUST, END PLATE	OHT3F-009-1
GASKET, EXHAUST, FLANGE, METAL	OHT3F-018-1
GASKET, OIL FILTER, PKG. OF 50	OHT3F-062-1
HARNESS, FUEL INJECTOR SEGMENT	3F022-1
HARNESS, WIRING, DYNO W/ OHT3F-056-1 SENSOR	OHT3F-022-1
KIT, ENGINE TEST (SIX RUN KIT / 2 EA. GR12, GR34, AND GR56)	OHT3F-100-1
KIT, GRADE 12 ENGINE TEST (ONE GRADE 12 ENGINE BUILD KIT)	OHT3F-100-12
KIT, GRADE 34 ENGINE TEST (ONE GRADE 34 ENGINE BUILD KIT)	OHT3F-100-34
KIT, GRADE 56 ENGINE TEST (ONE GRADE 56 ENGINE BUILD KIT)	OHT3F-100-56
KIT, STAND SETUP	OHT3F-101-1
LIFTER, TEST W/O.D. FLATS & FOOT CHAMFER	OHT3F-029-2

MANIFOLD, CAST IRON	OHT3F-003-0
MANIFOLD, EXHAUST, WATER COOLED ASSY (ONE BANK)	OHT3F-003-1
MOUNT FRONT ENGINE W/ BOLT PATTERN FOR COIL PACK	OHT3F-026-1
MOUNT, REAR ENGINE HOUSING W/ AIR STARTER, MUFFLER & SHIM PACK	OHT3F-025-1
MUFFLER, STARTER, AIR OUTLET, COOLANT PCM, SPECIAL	3F025-04
PCV, DUMMY	OHT3F-034-1
PIN, PISTON WRIST, PKG. OF 6	OHT3F-021-1
PISTON, TEST, GRADE 12	OHT3F-002-1
PISTON, TEST, GRADE 34	OHT3F-014-1
PISTON, TEST, GRADE 56	OHT3F-014-1
PLATE, CAMSHAFT THRUST	OHT3F-053-1
PLATE, EGR BLOCKOFF	OHT3F-054-1
PLATE, FRONT, EXHAUST MANIFOLD	OHT3F-055-1
PLATE, REAR, EXHAUST MANIFOLD	OHT3F-011-1
PLATE, WATER PUMP HOUSING	OHT3F-011-1
PLUG, DIP STICK	OHT3F-024-1
PLUG, DRAIN, MODIFIED	OHT3F-006-1
PUSHROD, SPECIAL LENGTH, PKG. OF 12	OHT3F-005-1
REAMER, DIP STICK AND DIP STICK HOLE PLUG	OHT3F-031-1
RETAINER CLIP, PISTON PIN PKG. OF 12	OHT3F-065-1
RING, PISTON, GRADE 12, ENGINE SET	OHT3F-063-1
RING, PISTON, GRADE 34, ENGINE SET	OHT3F-063-1
RING, PISTON, GRADE 56, ENGINE SET	OHT3F-007-1
ROCKER ARM ASSEMBLY	OHT3F-071-1
RUNNER, EXHAUST MANIFOLD	OHT3F-012-1
SEAL, EXHAUST VALVE STEM	OHT3F-012-1
SEAL, INTAKE VALVE STEM	OHT3F-050-1
SENSOR, MODIFIED COOLANT TEMPERATURE	OHT3F-051-1
SHIM PACK, STARTER, AIR	OHT3F-052-1
SLEEVE, VALVE STEM PROTECTORS (PKG. OF 100)	OHT3F-058-1
SPRING, VALVE (COLOR CODE YELLOW)	OHT3F-004-1
SPROCKET, CRANKSHAFT, SPECIAL 2 PC	OHT3F-061-1
STARTER, AIR	OHT3F-060-1
TOOL, CAMSHAFT BUSHING INSTALLATION	OHT3F-056-1
TOOL, OIL PUMP PRIMER	OHT3F-056-1
SHIM, STEEL, .005" THICK, 10 PER PKG.	3F025-05
SHIM, STEEL, .010" THICK, 10 PER PKG.	OHT3F-070-1
SHIM, STEEL, .015" THICK, 10 PER PKG.	OHT3F-070-1
SHIM, STEEL, .020" THICK, 10 PER PKG.	OHT3F-059-5
	OHT3F-036-1
	3F025-03
	OHT3F-019-1
	OHT3F-038-1
	OHT3F-072-005
	OHT3F-072-010
	OHT3F-072-015
	OHT3F-072-020

Section 9

Alphabetical Parts Listing

Alphabetical listing

Item #	View	Part Number	Description	Group
424	D	24501300	ADAPTER, OIL FLTR(W/BYPASS VLV)	1.840
231	B	OHT3F-058-1	ARM, ROCKER WITH PIVOT BRG.	OHT
	F	12537403	ATTACHMENT KIT, THROT BODY(SCREWS & CLIP	3.336
10	G		BACKUP, SEAL(O-RING)(*KIT4,KIT5)	NS.
124	A	24507558	BALANCER, CR/SHF	0.659
109	A	OHT3F-042-1	BEARING KIT, CONNECTING ROD	OHT
123	A	OHT3F-042-1	BEARING KIT, CRANKSHAFT MAIN	OHT
151	A		BEARING, BAL SHF FRT(PART OF 151)	NS.
159	A	24503193	BEARING, BAL SHF RR	0.539
5	F		BEARING, BALL(*KIT1)	NS.
132	A	OHT3F-042-1	BEARING, CAMSHAFT(#1,4)	OHT
132	A	OHT3F-042-1	BEARING, CAMSHAFT(#2,3)	OHT
156	B		BLOCK, ENG	NS.
156	D		BLOCK, ENG	NS.
156	A	24502286	BLOCK, ENGINE, SPECIAL TEST (OPT.24506028)	GMMS
	F	24503390	BODY, THROT(INCL'S #1 THRU 30.)(3.725)(A	3.335
561	E	24507230	BODY, THROT(SEE 3.000 "THROTTLE BODY"	3.335
146	A	24501367	BOLT, BAL SHF GR(HEX W/WA,3/16-18X1.15)	0.659
149	A	24500055	BOLT, BAL SHF RET(W/FLAT WASH 5/16-18X)	0.659
312	C	25526395	BOLT, CM/SHF POSN SEN(TO FRT CVR)	2.383
137	A	24501366	BOLT, CM/SHF SPKT(HEX W/WASHER,1/2-20)	0.738
142	A	25519242	BOLT, CM/SHF THR PLT(1/4-20X.88)	0.533
108	A	25531956	BOLT, CONNECTING ROD(3/8-24X1.68)	0.623
126	A	24504736	BOLT, CR/SHF BAL	0.662
119	A	24505576	BOLT, CR/SHF BRG CAP SIDE (8X1.25X47.8)	0.056
121	A	24503056	BOLT, CR/SHF BRG CAP(HFH,7/16-14)	0.056
120	A	24503970	BOLT, CR/SHF RR OIL SEAL HSG	0.137
214	B	25527831	BOLT, CYLINDER HEAD	0.293
213	B	25533811	BOLT, CYLINDER HEAD	0.293
512	E	24503261	BOLT, ENG COOL MANIFOLD TRANSFER PLATE	1.097
333	C	24504712	BOLT, ENG FRT COVER	0.206
335	C	24504712	BOLT, ENG FRT COVER	0.206
334	C	24504713	BOLT, ENG FRT COVER	0.206
117	A	24505092	BOLT, FLYWHEEL(MANUAL)	0.669
544	E	9440227	BOLT, HFH 5-16-18X1.25 280M POR .66 OD D	8.900
3	H	10498731	BOLT, IGN COIL WIRE RET(M5.0X0.8X44,5.5H	2.251
554	E	24505205	BOLT, INT MANIF(M6X1X86.8 W/ADH)	3.275
551	E	24505013	BOLT, INT MANIFOLD	3.275
416	D	25519242	BOLT, O/PMP CVR(1/4-20X.88 280/275)	1.723
414	D	24505570	BOLT, O/PMP SCR(N)(HFH 1/4-20 X .80"LG)	1.656

423	D	24504713	BOLT, OIL FLTR ADAP(0.206)	1.840
405	D	24502791	BOLT, OIL PAN(TO CYL BLK)(HFH,1/4-20X.85	1.428
508	E	24503644	BOLT, THROT BODY(TO SUPT)(TO SUPPORT)	3.336
233	B	24503515	BOLT, VLV RKR ARM BRG	0.429
205	B	24502164	BOLT, VLV RKR ARM CVR(W/WASHER(25534748)	0.413
314	C	25535660	BOLT, W/PMP(1/4-20X1.17,1.03 THD)(W/ SEAL)	1.079
302	C	10118698	BOLT, WAT OTLT(M8X1.25X25)(3.671)	1.153
5	H	10476155	BRACKET, ELEK ICM(AC-DELCO #10476155)	2.383
144	A	OHT3F-008-1	CAMSHAFT, SPECIAL TEST	OHT
14	G		CAP, ,FUEL PRESSURE CONNECTOR(*KIT1,KIT3	NS.
122	A		CAP, CR/SHF BRG(PART OF 156)	NS.
204	B	24504599	CAP, OIL FILL	1.758
208	B	24502257	CAP, VLV SPRING(ALSO PART OF 211)	0.309
2	G		CARTRIDGE REGULATOR, FUEL PRESSURE(*KIT2	NS.
138	A	24504668	CHAIN, CM/SHF TMG	0.724
12	G		CLIP, FUEL INJECTOR RETAINER(*KIT4,KIT6)	NS.
1	G		CLIP, MPI INJECTOR(*KIT2,KIT7)	NS.
1	H	10472401	COIL, IGN(AC-DELCO #D555)	2.170
12	J	12101937	CONNECTOR, COIL-A/C CLU(PART OF 13)(2-WA	9.186
4	J	12117361	CONNECTOR, GEN(PART OF 13)(4-WAY F)(W/LE	2.313
1	J	12085491	CONNECTOR, INJR-FUEL(PART OF 13)(2-WAY F	3.300
2	J	12117271	CONNECTOR, INLINE-TO ELEK IGN(W/LEADS)(P	2.530
20	J	12101763	CONNECTOR, INLINE-TO KNOCK SEN(PART OF 1	2.530
15	J	12102741	CONNECTOR, INLINE-TO OXY SEN(PART OF 13)	3.682
5	J	12126487	CONNECTOR, MOT-IDLE AIR C/VLV(PART OF 13	3.338
16	J	12102748	CONNECTOR, SEN-ENG COOL TEMP(PART OF 13)	3.682
10	J	12167116	CONNECTOR, SEN-ENG OIL LVL(PART OF 13)(3	1.516
10	J	12102747	CONNECTOR, SEN-ENG OIL LVL(PART OF 13)(B	1.516
9	J	12176800	CONNECTOR, SEN-KNOCK(PART OF 13)(1-WAY F	2.383
6	J	12085495	CONNECTOR, SEN-MASS AIRFLOW(PART OF 13)(3.682
19	J	12102747	CONNECTOR, SEN-P/S PRESS(PART OF 13)(BLA	6.670
7	J	12117025	CONNECTOR, SEN-THROT POSN(PART OF 13)(BL	3.339
18	J	12101899	CONNECTOR, SEN-VEH SPD(PART OF 13)(BLACK	3.682
18	J	12126469	CONNECTOR, SEN-VEH SPD(PART OF 13)(BLACK	3.682
8	J	12126477	CONNECTOR, SOL-EGR VLV(PART OF 13)(5-WAY	3.670
14	J		CONNECTOR, SOL-EVAP EMIS CNSTR PURGE VLV	NS.
11	J		CONNECTOR, SW-A/C CMPR HIGH PRESS CUTOFF	NS.
17	J	12085539	CONNECTOR, SW-ENG OIL PRESS IND(PART OF	1.800
13	G		CORE, FUEL PRESSURE CONNECTOR(*KIT1,KIT3	NS.
330	C	24502241	COVER, ENG FRT	GMMS
330	D	24502241	COVER, ENG FRT	GMMS
417	D	25521935	COVER, O/PMP	1.723
550	E		COVER, PCV VLV(*KIT5)	NS.
202	B	25534753	COVER, VLV RKR ARM(LEFT SIDE PLASTIC)	0.386
127	A	24502168	CRANKSHAFT,	GMMS

134	A	24503893	DAMPENER, TMG CHAIN(INCLS BOLT,RET RING)	0.724
419	D	OHT3F-057-1	FILTER, OIL,SPECIAL TEST	OHT
5	G		FILTER, REGULATOR(*KIT2,KIT7)	NS.
116	A	OHT3F-020-1	FLYWHEEL, ENG(INCL RING GEAR)	OHT
111	A	24507388	GASKET, CR/SHF RR OIL SEAL HSG	0.137
227	B		GASKET, CYL HEAD (SEE GSKTS&SEALS)	NS.
514	E	24505049	GASKET, ENG COOL MANIFOLD TRANSFER	1.097
331	C	24502252	GASKET, ENG FRT CVR	0.207
545	E		GASKET, INT MANIF(ALSO PART OF 555)	NS.
556	E		GASKET, INT MANIF(ALSO PART OF 555)	NS.
515	E		GASKET, INT MANIF(SEE GSKTS&SEALS)	NS.
415	D	24501259	GASKET, O/PMP SCRNR	1.657
426	D	25534742	GASKET, OIL FLTR ADAP(*KIT1)	1.840
409	D	24502397	GASKET, OIL PAN	1.429
536	E	5617102	GASKET, OXY SEN(3.670)	3.682
560	E		GASKET, THROT BODY(ALSO PART OF 555)	NS.
201	B	25532619	GASKET, VLV RKR ARM CVR(*KIT1)	0.423
328	C	24501565	GASKET, W/PMP CVR	1.079
304	C	24502433	GASKET, WAT OTLT	1.154
418	D	24505433	GEAR SET, O/PUMP	1.639
147	A	24503524	GEAR, BAL SHF DRIVEN	0.659
141	A	24504792	GEAR, BAL SHF DRV	0.659
206	B	25534749	GROMMET, VLV RKR ARM CVR BOLT	0.413
13	J	12171412	HARNESS, ENG WRG(INCLS 1,2,4-12,15-20)(C	2.525
13	J	12179209	HARNESS, ENG WRG(INCLS 1,2,4-12,15-20)(C	2.525
13	J	12187380	HARNESS, ENG WRG(INCLS 1,2,4-12,15-20)(C	2.525
228	B	24502259	HEAD, CYLINDER SPECIAL TEST	GMMS
110	A	24507386	HOUSING, CR/SHF RR OIL SEAL(MACHINED)	0.137
9	G	17103146	INJECTOR, FUEL(*KIT4)	NS.
	G	17103146	INJECTOR, M/PORT FUEL(INCL #8,9,10,11,12)	3.300
553	E	17103146	INJECTOR, SEQ M/PORT FUEL(W/FUEL RL)(SEE	NS.
317	C	OHT3F-031-1	INLET, WATER, SPECIAL TEST	OHT
KIT#6	E	17113169	INSERT KIT, UPR INT MANIF THD(W/STUDS)	3.275
558	E		INSERT, UPR INT MANIF THD(ALSO PART OF 555)	NS.
145	A	24500618	KEY, CM/SHF SPKT	0.529
128	A	25534912	KEY, CR/SHF BAL(TO CR/SHF)	0.662
207	B	10166345	KEY, VLV STEM	0.310
30	F		LEVER, THROTTLE(*KIT1)	NS.
104	A	17121905	LIFTER, TEST VALVE	0.459
235	B	OHT3F-029-1	LIFTER, VALVE, SPECIAL TEST	OHT
139	A	10456195	MAGNET, CM/SHF POSN SEN(2.383)	0.736
555	E	17113136	MANIFOLD KIT, UPR INT(INCL 545,556,558,559,560)	3.265
513	E	24503123	MANIFOLD, ENG COOL TRANSFER	1.097
535	E	OHT3F-003-1	MANIFOLD, EXH, WATER COOLED	OHT
542	E	24505728	MANIFOLD, LWR INTAKE	3.265

564	E	24506013	MANIFOLD, VAC SCE	3.278
4	H	10475225	MODULE, ELEK IGN CONT(W/O COIL)(AC-DELCO	2.383
13	F		NUT, (IDLE ADJUST)(*KIT1)	NS.
25	F		NUT, (SHAFT)(*KIT1)	NS.
552	E	24505611	NUT, F/INJR(TO STUDS)	3.300
301	C	OHT3F-034-1	OUTLET, WATER, SPECIAL TEST	OHT
408	D	24505349	PAN, OIL	1.426
408	D	24505348	PAN, OIL(24502783 OR 24503536 STAMPED ON	1.426
148	A		PIN, BAL SHF GR(PART OF 151)	NS.
113	A	25536320	PIN, CYL HD LOC(DWL 1/4X9X9/16)	0.293
215	B	25536320	PIN, CYL HD LOC(LWR ROW)(DWL 1/4X9X9/16)	0.293
339	C	24501162	PIN, ENG FRT CVR LOC	0.206
340	C	25536321	PIN, ENG FRT CVR LOC	0.206
338	C	25536323	PIN, ENG FRT CVR LOC	0.206
130	A	25536323	PIN, ENG FRT CVR LOC(DWL 1/4X1 3/8)	0.206
152	A	24501162	PIN, ENG FRT CVR LOC(UPPER)(DWL PIN)	0.206
11	F		PIN, TPS(DRIVE)(*KIT1)	NS.
114	A	12338076	PIN, TRANS LOC(19.5 MM X 18.5 MM)	0.685
106	A	OHT3F-053-1	PISTON KIT, GRADE 12	OHT
106	A	OHT3F-054-1	PISTON KIT, GRADE 34	OHT
106	A	OHT3F-055-1	PISTON KIT, GRADE 56	OHT
143	A	OHT3F-011-1	PLATE, CM/SHF THR	OHT
8	F		PLATE, THROTTLE(*KIT1)	NS.
112	A	444777	PLUG, AUTO HEX SOC	8.971
226	B	9427698	PLUG, CYL HD CORE HOLE	0.293
115	A	24504119	PLUG, ENG BLK COOL DRN HOLE	0.034
129	A	24500867	PLUG, ENG BLK CORE HOLE(STAINLESS STEEL)	0.034
153	A	12338136	PLUG, HEX SOC.	8.971
2	F		PLUG, IDLE AIR(*KIT1)	NS.
412	D	24100042	PLUG, OIL PAN DRAIN	1.453
131	A	3835577	PLUG, SPECIAL FRT OIL GALLERY DIA .587	8.970
3	F		PLUG, VACUUM(*KIT1)	NS.
13	J	12059168	PLUG, WRG HARN CONN(1-WAY M)(USED TO PLU	2.530
229	B	OHT3F-007-1	PUSHROD, SPECIAL TEST	OHT
	G	17098211	RAIL KIT, SEQ M/PORT F/INJN FUEL(INCL #7	3.330
7	G	17098211	RAIL, FUEL(*KIT1)	NS.
	G	17113346	REGULATOR, FUEL PRESS(INCL #1,2,3,4,5,6)	3.330
	G	17111800	RETAINER KIT, F/INJR(FUEL RAIL)(INCL #12	3.332
150	A	24500374	RETAINER, BAL SHF	0.659
230	B	24502278	RETAINER, VLV RKR ARM BRG	0.334
105	A	OHT3F-050-1	RING KIT, GRADE 12	OHT
105	A	OHT3F-051-1	RING KIT, GRADE 34	OHT
105	A	OHT3F-052-1	RING KIT, GRADE 56	OHT
29	F		RING, (LEVER)(*KIT1,KIT2)	NS.
20	F	24503676	RING, THROT BODY AIR INL SCR N RET(*KIT1)	3.335

107	A	24501696	ROD, CONNECTING	GMMS
413	D	24505569	SCREEN, O/PMP(W/SUC PIPE)	1.656
19	F	24503677	SCREEN, THROT BODY AIR INL(*KIT1)(AC-DEL	3.337
28	F		SCREW, (AFS,TPS)(*KIT1,KIT2)	NS.
12	F		SCREW, (IDLE ADJUST)(*KIT1)	NS.
15	F		SCREW, IAC MOTOR(*KIT1,KIT2)	NS.
9	F		SCREW, PLATE(*KIT1,KIT2)	NS.
18	F		SCREW, THROTTLE VALVE(*KIT1,KIT2)	NS.
	G	17113544	SEAL KIT, F/INJR(O RING)(INCL #8,10,11)(3.331
	G	17113199	SEAL KIT, FUEL PRESS REG(INCL #1,3,4,5,6	3.330
313	C	24504098	SEAL, CR/SHF FRT OIL	0.213
118	A	25534760	SEAL, CR/SHF RR OIL(LIP SEAL)	0.137
7	F		SEAL, DUST(*KIT1)	NS.
210	B	OHT3F-061-1	SEAL, EXH VLV STEM OIL(ID-WHITE STRIPE)	OHT
2	H	1989579	SEAL, IGN COIL(TYPE II-DELCO REMY-2 TERM	2.183
541	E		SEAL, INT MANIF(SEE GSKTS&SEALS)	NS.
209	B	OHT3F-060-1	SEAL, INT VLV STEM OIL	OHT
11	G		SEAL, LOWER INJECTOR (O-RING)(*KIT4,KIT5	NS.
203	B	24100002	SEAL, OIL FIL CAP(O RING)	1.758
430	D	3536966	SEAL, OIL PAN DRN PLUG(O RING)	1.456
546	E		SEAL, PCV VLV(*KIT#5 P.N. 17113220)	NS.
549	E		SEAL, PCV VLV(*KIT5)	NS.
4	G		SEAL, REGULATOR FILTER (O-RING)(*KIT2,KI	NS.
3	G		SEAL, REGULATOR(O-RING)(*KIT2,KIT7)	NS.
6	G		SEAL, REGULATOR(O-RING)(*KIT2,KIT7)	NS.
6	F		SEAL, RING(*KIT1)	NS.
8	G		SEAL, UPPER INJECTOR(O-RING)(*KIT4,KIT5)	NS.
565	E	24502964	SEAL, VAC SCE MANIF(O RING)(O-RING SEAL-	3.278
311	C	10456148	SENSOR, CM/SHF POSN(AC-DELCO #213-346)	2.383
307	C	10456161	SENSOR, CR/SHF POSN(4 PIN)	2.383
568	E	16187556	SENSOR, MAP(AT ENGINE)(AC-DELCO #213-259	3.682
27	F	24503983	SENSOR, MASS AIRFLOW	3.682
16	F	24504798	SENSOR, THROT BODY THROT POSN(*KIT1)(AC-	3.339
151	A	24506557	SHAFT, BAL(INCL 148)	0.659
10	F		SHAFT, LEVER(DRIVE)(*KIT1)	NS.
4	F		SHAFT, THROTTLE(*KIT1)	NS.
309	C	24506440	SHIELD, CR/SHF POSN SEN(MOLDED 1 PC)	2.383
21	F		SLEEVE, (MAIN SPRING)(*KIT1)	NS.
22	F		SLEEVE, (SUB SPRING)(*KIT1)	NS.
212	B	5614197	SPARK PLUG, R42LTSM	2.270
211	B	OHT3F-059-1	SPRING KIT, VALVE, SPECIAL TEST	OHT
23	F		SPRING, (MAIN)(*KIT1)	NS.
24	F		SPRING, (SUB)(*KIT1)	NS.
26	F		SPRING, (WASHER CLIP)(*KIT1)	NS.
428	D	1262505	SPRING, OIL PRESS RLF VLV	1.609

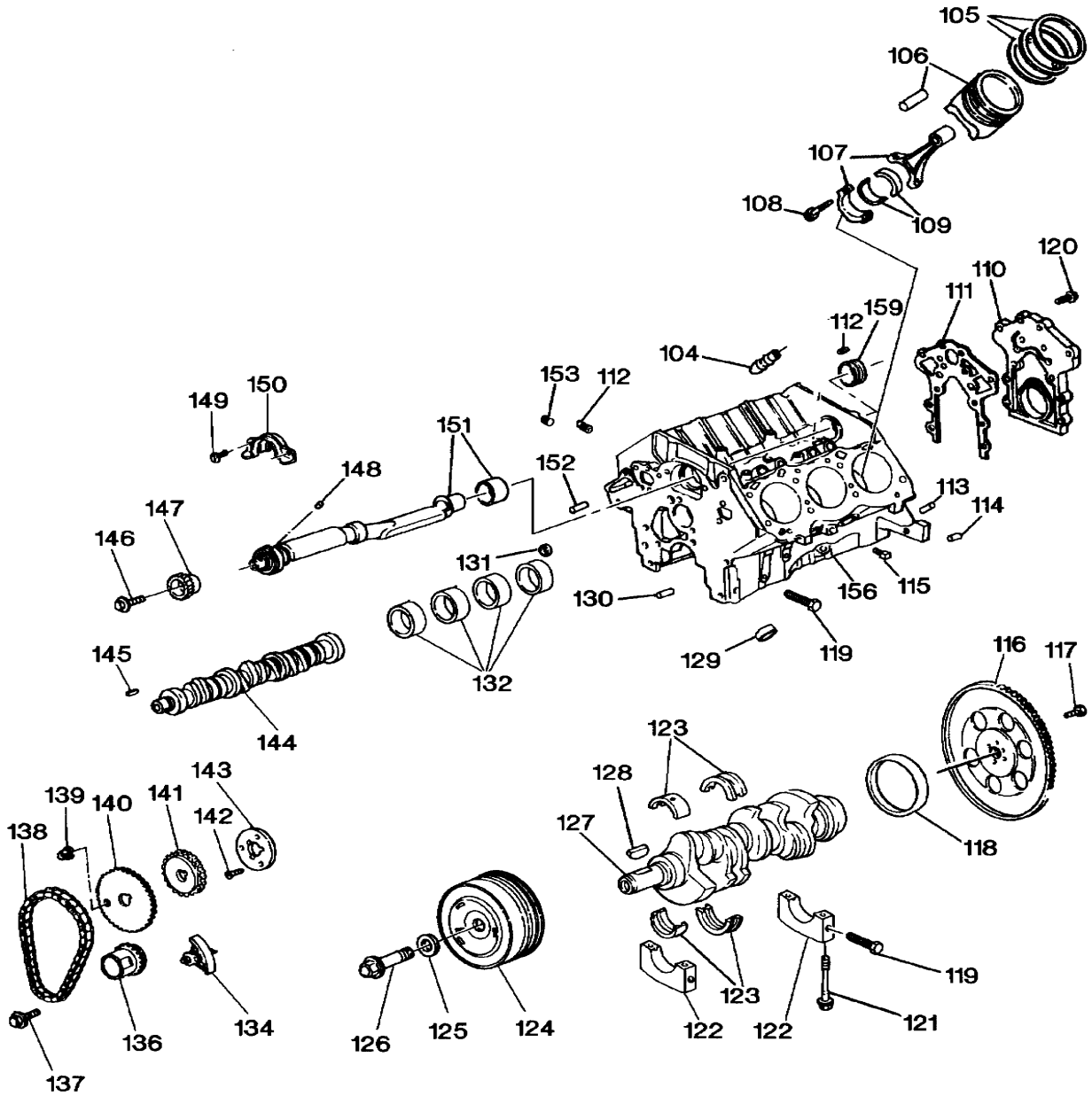
548	E		SPRING, PCV VLV(*KIT5)	NS.
140	A	24505306	SPROCKET, CM/SHF	0.736
136	A	OHT3F-036-1	SPROCKET, CR/SHF	OHT
310	C	24502251	STUD, ENG FRT CVR	0.206
332	C	24502251	STUD, ENG FRT CVR(5/16-18X2.75)	0.206
522	E	24505733	STUD, F/INJR	3.300
563	E	24502453	STUD, INT MANIF(UPR TO LWR)(STUD..6X1X86	3.275
559	E		STUD, THROT BODY(ALSO PART OF 555)	NS.
510	E	24504697	SUPPORT, THROT BODY	3.335
1	F	24507235	THROTTLE, BODY(*KIT1)	NS.
218	B	24503946	TUBE, OIL FIL	1.745
	G	17112556	VALVE KIT, FUEL PRESS SERV(INCL #13,14)	3.330
KIT#5	E	17113515	VALVE KIT, PCV(INCL'S 546,547,548,549,550)	1.745
217	B	24507423	VALVE, EXH(STD)	0.297
14	F	17112929	VALVE, IDLE AIR CONT(*KIT1)(AC-DELCO #17	3.820
216	B	24507422	VALVE, INT(STD)	0.296
427	D	25530949	VALVE, OIL PRESS RLF	1.609
547	E	OHT3F-002-1	VALVE, PCV PLUG, SPECIAL TEST	OHT
17	F		VALVE, THROTTLE(*KIT1)	NS.

Section 10

Illustrated Parts

Sequence III F Illustrated Parts

View A

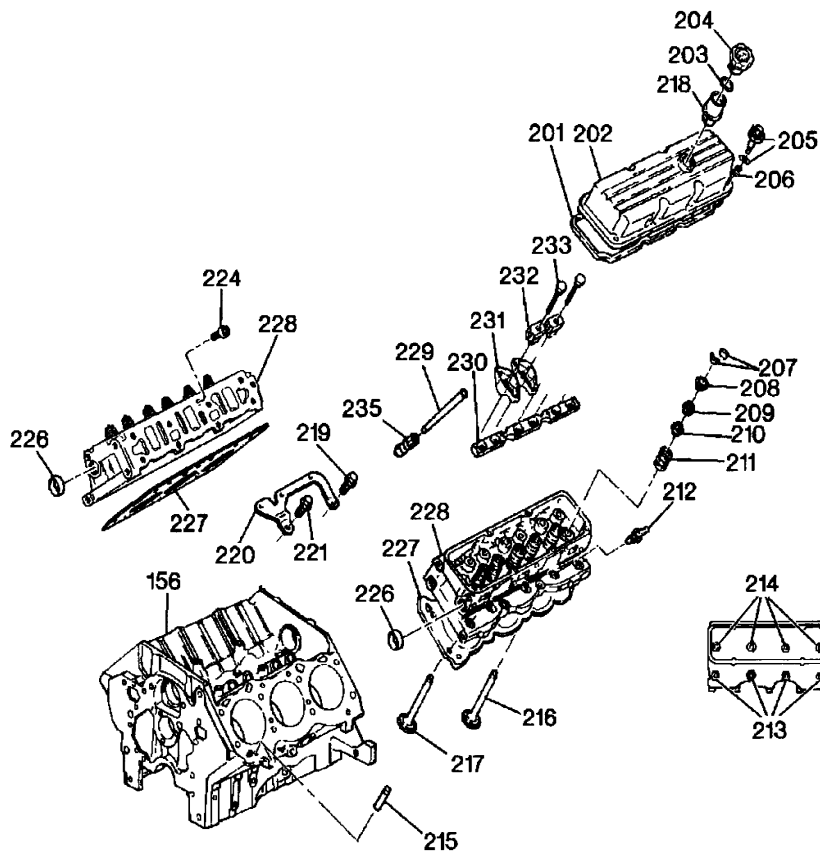


**Sequence IIF Illustrated Parts List
View A**

Item #	View	Part Number	Description	Group
104	A	OHT3F-029-1	LIFTER, TEST VALVE	0.459
105	A	OHT3F-050-1	RING KIT, GRADE 12	OHT
105	A	OHT3F-051-1	RING KIT, GRADE 34	OHT
105	A	OHT3F-052-1	RING KIT, GRADE 56	OHT
106	A	OHT3F-053-1	PISTON KIT, GRADE 12	OHT
106	A	OHT3F-054-1	PISTON KIT, GRADE 34	OHT
106	A	OHT3F-055-1	PISTON KIT, GRADE 56	OHT
107	A	24501696	ROD, CONNECTING	0.603
108	A	25531956	BOLT, CONNECTING ROD(3/8-24X1.68)	0.623
109	A	OHT3F-042-1	BEARING KIT, CONNECTING ROD	OHT
110	A	24502297	HOUSING, CR/SHF RR OIL SEAL(MACHINED)	0.137
111	A	24506644	GASKET, CR/SHF RR OIL SEAL HSG	0.137
112	A	444777	PLUG, AUTO HEX SOC	8.971
113	A	25536320	PIN, CYL HD LOC(DWL 1/4X9X9/16)	0.293
114	A	12338076	PIN, TRANS LOC(19.5 MM X 18.5 MM)	0.685
115	A	24504119	PLUG, ENG BLK COOL DRN HOLE	0.034
116	A	OHT3F-020-1	FLYWHEEL, ENG(INCL RING GEAR)	OHT
117	A	24505092	BOLT, FLYWHEEL(MANUAL)	0.669
118	A	25534760	SEAL, CR/SHF RR OIL(LIP SEAL)	0.137
119	A	24503968	BOLT, CR/SHF BRG CAP SIDE (8X1.25X47.8)	0.056
120	A	24503970	BOLT, CR/SHF RR OIL SEAL HSG	0.137
121	A	24503056	BOLT, CR/SHF BRG CAP(HFH,7/16-14)	0.056
122	A		CAP, CR/SHF BRG(PART OF 156)	NS.
123	A	OHT3F-042-1	BEARING KIT, CRANKSHAFT MAIN	OHT
124	A	24504737	BALANCER, CR/SHF	0.659
126	A	24504736	BOLT, CR/SHF BAL	0.662
127	A	24502168	CRANKSHAFT,	0.646
128	A	25534912	KEY, CR/SHF BAL(TO CR/SHF)	0.662
129	A	24500867	PLUG, ENG BLK CORE HOLE(STAINLESS STEEL)	0.034
130	A	25536323	PIN, ENG FRT CVR LOC(DWL 1/4X1 3/8)	0.206
131	A	3835577	PLUG, SPECIAL FRT OIL GALLERY DIA .587	8.970
132	A	OHT3F-042-1	BEARING, CAMSHAFT(#1,4)	OHT
132	A	OHT3F-042-1	BEARING, CAMSHAFT(#2,3)	OHT
134	A	24503893	DAMPENER, TMG CHAIN(INCLS BOLT,RET RING)	0.724
136	A	OHT3F-036-1	SPROCKET, CR/SHF	OHT
137	A	24501366	BOLT, CM/SHF SPKT(HEX W/WASHER,1/2-20)	0.738
138	A	24504668	CHAIN, CM/SHF TMG	0.724

139	A	10456195	MAGNET, CM/SHF POSN SEN(2.383)	0.736
140	A	24505306	SPROCKET, CM/SHF	0.736
141	A	24504792	GEAR, BAL SHF DRV	0.659
142	A	25519242	BOLT, CM/SHF THR PLT(1/4-20X.88)	0.533
143	A	OHT3F-011-1	PLATE, CM/SHF THR	OHT
144	A	OHT3F-008-1	CAMSHAFT, SPECIAL TEST	OHT
145	A	24500618	KEY, CM/SHF SPKT	0.529
146	A	24501367	BOLT, BAL SHF GR(HEX W/WA,3/16-18X1.15)	0.659
147	A	24504792	GEAR, BAL SHF DRV	0.659
148	A		PIN, BAL SHF GR(PART OF 151)	NS.
149	A	24500055	BOLT, BAL SHF RET(W/FLAT WASH 5/16-18X)	0.659
150	A	24500374	RETAINER, BAL SHF	0.659
151	A	24502388	SHAFT, BAL(INCL 148)	0.659
152	A	24501162	PIN, ENG FRT CVR LOC(UPPER)(DWL PIN)	0.206
153	A	12338136	PLUG, HEX SOC.	8.971
156	A	24502286	BLOCK, ENGINE, SPECIAL TEST (OPT.24506028)	GMMS
159	A	24503193	BEARING, BAL SHF RR	0.539
151	A		BEARING, BAL SHF FRT(PART OF 151)	NS.

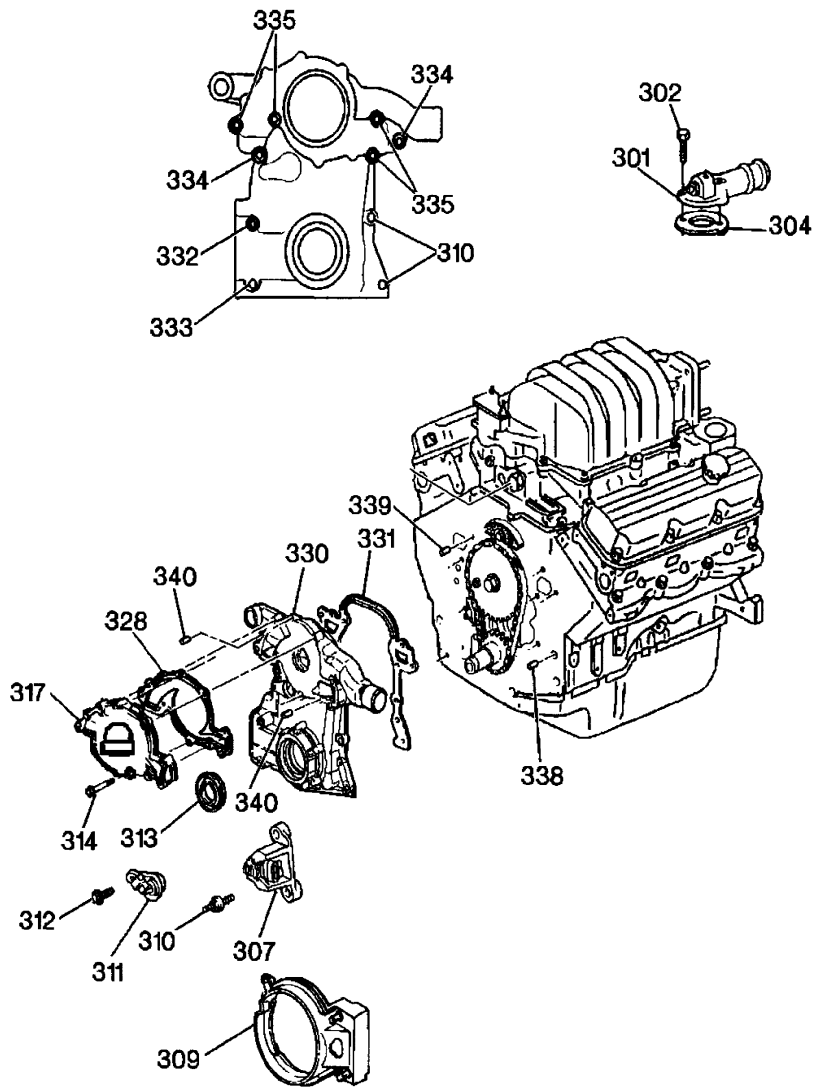
Sequence III F Illustrated Parts
View B



**Sequence IIF Illustrated Parts List
View B**

Item #	View	Part Number	Description	Group
156	B		BLOCK, ENG	NS.
201	B	25532619	GASKET, VLV RKR ARM CVR(*KIT1)	0.423
202	B	25534751	COVER, VLV RKR ARM(LEFT SIDE PLASTIC)	0.386
203	B	24100002	SEAL, OIL FIL CAP(O RING)	1.758
204	B	24504599	CAP, OIL FILL	1.758
205	B	24502164	BOLT, VLV RKR ARM CVR(W/WASHER(25534748)	0.413
206	B	25534749	GROMMET, VLV RKR ARM CVR BOLT	0.413
207	B	10166345	KEY, VLV STEM	0.310
208	B	24502257	CAP, VLV SPRING(ALSO PART OF 211)	0.309
209	B	OHT3F-060-1	SEAL, INT VLV STEM OIL	OHT
210	B	OHT3F-061-1	SEAL, EXH VLV STEM OIL(ID-WHITE STRIPE)	OHT
211	B	OHT3F-059-1	SPRING KIT, VALVE, SPECIAL TEST	OHT
212	B	5614197	SPARK PLUG, R42LTSM	2.270
213	B	25533811	BOLT, CYLINDER HEAD	0.293
214	B	25527831	BOLT, CYLINDER HEAD	0.293
215	B	25536320	PIN, CYL HD LOC(LWR ROW)(DWL 1/4X9X9/16)	0.293
216	B	24502254	VALVE, INT(STD)	0.296
217	B	24504195	VALVE, EXH(STD)	0.297
218	B	24503946	TUBE, OIL FIL	1.745
226	B	9427698	PLUG, CYL HD CORE HOLE	0.293
227	B		GASKET, CYL HEAD (SEE GSKTS&SEALS)	NS.
228	B	24502259	HEAD, CYLINDER SPECIAL TEST	GMMS
229	B	OHT3F-007-1	PUSHROD, SPECIAL TEST	OHT
230	B	24502278	RETAINER, VLV RKR ARM BRG	0.334
231	B	OHT3F-058-1	ARM, ROCKER WITH PIVOT BRG.	OHT
233	B	24503515	BOLT, VLV RKR ARM BRG	0.429
235	B	OHT3F-029-1	LIFTER, VALVE, SPECIAL TEST	OHT

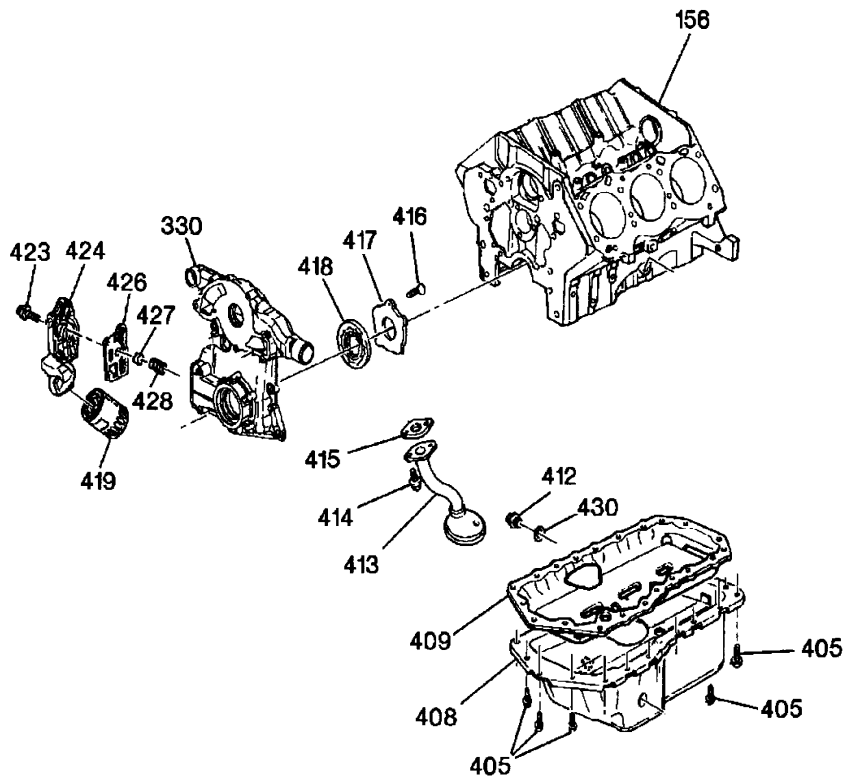
Sequence IIF Illustrated Parts
View C



**Sequence III F Illustrated Parts List
View C**

Item #	View	Part Number	Description	Group
301	C	OHT3F-034-1	OUTLET, WATER, SPECIAL TEST	OHT
302	C	10118698	BOLT, WAT OTLT(M8X1.25X25)(3.671)	1.153
304	C	24502433	GASKET, WAT OTLT	1.154
307	C	10456161	SENSOR, CR/SHF POSN(4 PIN)	2.383
309	C	24506440	SHIELD, CR/SHF POSN SEN(MOLDED 1 PC)	2.383
310	C	24502251	STUD, ENG FRT CVR	0.206
311	C	10456148	SENSOR, CM/SHF POSN(AC-DELCO #213-346)	2.383
312	C	25526395	BOLT, CM/SHF POSN SEN(TO FRT CVR)	2.383
313	C	24504098	SEAL, CR/SHF FRT OIL	0.213
314	C	25535660	BOLT, W/PMP(1/4-20X1.17,1.03 THD)(W/ SEAL)	1.079
317	C	OHT3F-031-1	INLET, WATER, SPECIAL TEST	OHT
328	C	24501565	GASKET, W/PMP CVR	1.079
330	C	24502241	COVER, ENG FRT	0.206
331	C	24502252	GASKET, ENG FRT CVR	0.207
332	C	24502251	STUD, ENG FRT CVR(5/16-18X2.75)	0.206
333	C	24504712	BOLT, ENG FRT COVER	0.206
334	C	24504713	BOLT, ENG FRT COVER	0.206
335	C	24504712	BOLT, ENG FRT COVER	0.206
338	C	25536323	PIN, ENG FRT CVR LOC	0.206
339	C	24501162	PIN, ENG FRT CVR LOC	0.206
340	C	25536321	PIN, ENG FRT CVR LOC	0.206

Sequence III F Illustrated Parts
View D

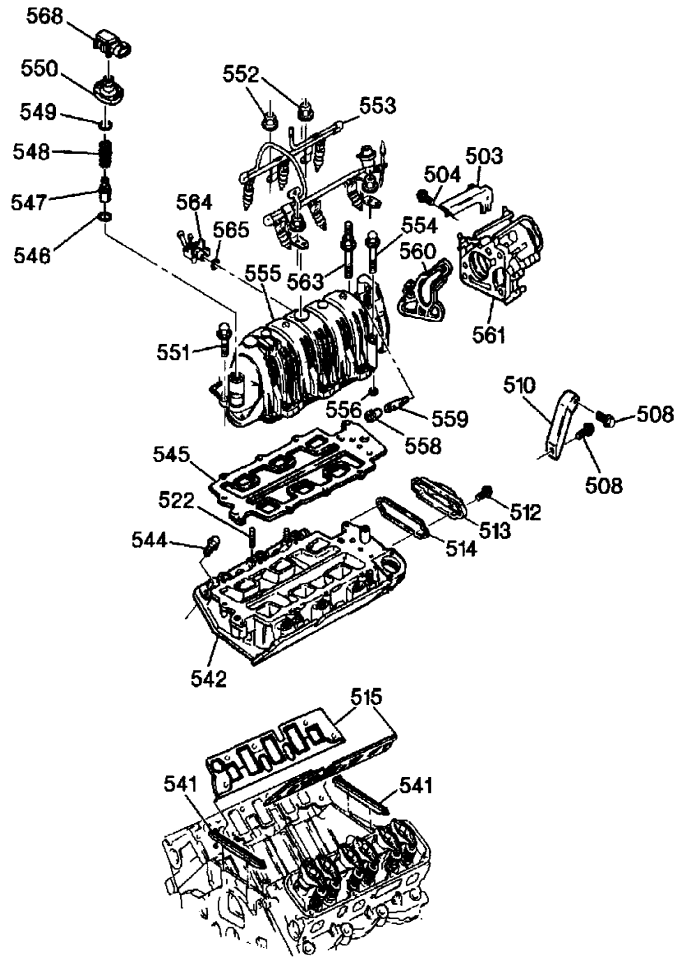


**Sequence III F Illustrated Parts List
View D**

Item #	View	Part Number	Description	Group
156	D		BLOCK, ENG	NS.
330	D	24502241	COVER, ENG FRT	0.206
405	D	24502791	BOLT, OIL PAN(TO CYL BLK)(HFH,1/4-20X.85	1.428
408	D	24507902	PAN, OIL	1.426
409	D	24502397	GASKET, OIL PAN	1.429
412	D	24100042	PLUG, OIL PAN DRAIN	1.453
413	D	24505569	SCREEN, O/PMP(W/SUC PIPE)	1.656
414	D	24505570	BOLT, O/PMP SCR(N)(HFH 1/4-20 X .80"LG)	1.656
415	D	24501259	GASKET, O/PMP SCR(N)	1.657
416	D	25519242	BOLT, O/PMP CVR(1/4-20X.88 280/275)	1.723
417	D	25521935	COVER, O/PMP	1.723
418	D	24505433	GEAR SET, O/PUMP	1.639
419	D	OHT3F-057-1	FILTER, OIL,SPECIAL TEST	OHT
423	D	24504713	BOLT, OIL FLTR ADAP(0.206)	1.840
424	D	24501300	ADAPTER, OIL FLTR(W/BYPASS VLV)	1.840
426	D	25534742	GASKET, OIL FLTR ADAP(*KIT1)	1.840
427	D	25530949	VALVE, OIL PRESS RLF	1.609
428	D	1262505	SPRING, OIL PRESS RLF VLV	1.609
430	D	3536966	SEAL, OIL PAN DRN PLUG(O RING)	1.456

Sequence IIF Illustrated Parts

View E



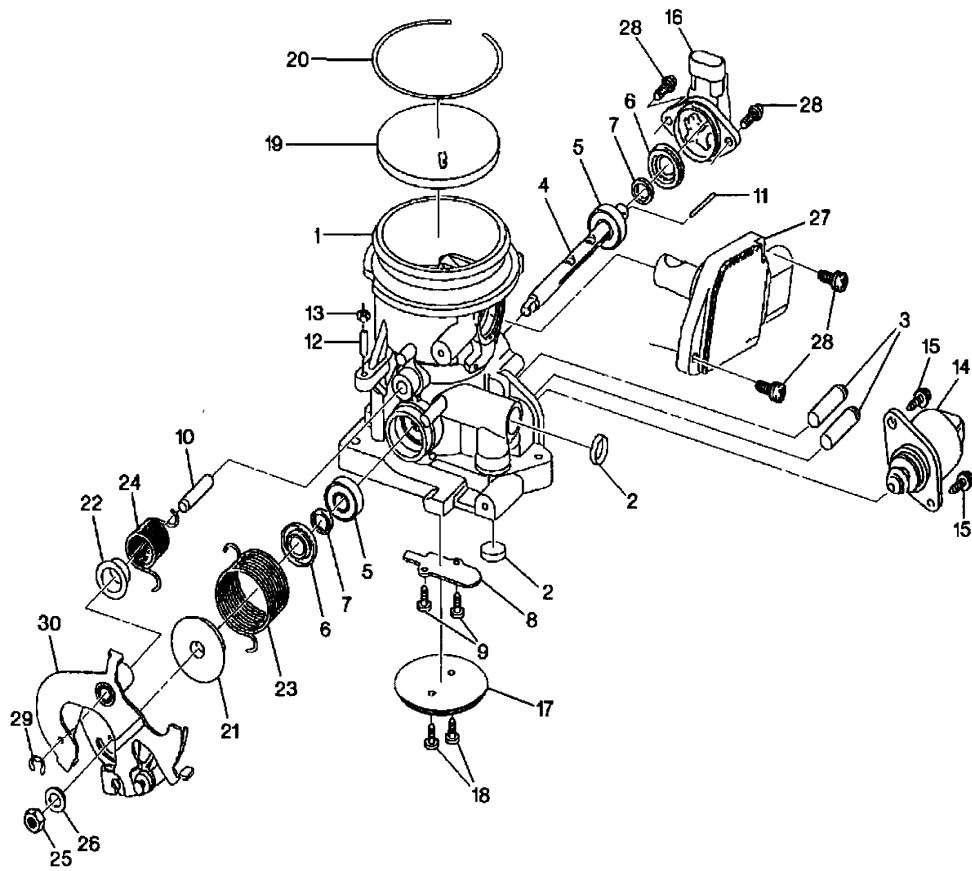
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**Sequence IIIF Illustrated Parts List
View E**

Item #	View	Part Number	Description	Group
508	E	24503644	BOLT, THROT BODY(TO SUPT)(TO SUPPORT)	3.336
510	E	24504697	SUPPORT, THROT BODY	3.335
512	E	24503261	BOLT, ENG COOL MANIFOLD TRANSFER PLATE	1.097
513	E	24503123	MANIFOLD, ENG COOL TRANSFER	1.097
514	E	24505049	GASKET, ENG COOL MANIFOLD TRANSFER	1.097
515	E		GASKET, INT MANIF(SEE GSKTS&SEALS)	NS.
522	E	24505733	STUD, F/INJR	3.300
535	E	OHT3F-003-1	MANIFOLD, EXH, WATER COOLED	OHT
536	E	5617102	GASKET, OXY SEN(3.670)	3.682
541	E		SEAL, INT MANIF(SEE GSKTS&SEALS)	NS.
542	E	24505728	MANIFOLD, LWR INTAKE	3.265
544	E	9440227	BOLT, HFH 5-16-18X1.25 280M POR .66 OD D	8.900
545	E		GASKET, INT MANIF(ALSO PART OF 555)	NS.
546	E		SEAL, PCV VLV(*KIT#5 P.N. 17113220)	NS.
547	E	OHT3F-002-1	VALVE, PCV PLUG, SPECIAL TEST	OHT
548	E		SPRING, PCV VLV(*KIT5)	NS.
549	E		SEAL, PCV VLV(*KIT5)	NS.
550	E		COVER, PCV VLV(*KIT5)	NS.
551	E	24505013	BOLT, INT MANIFOLD	3.275
552	E	24505611	NUT, F/INJR(TO STUDS)	3.300
553	E		INJECTOR, SEQ M/PORT FUEL(W/FUEL RL)(SEE	NS.
554	E	24505205	BOLT, INT MANIF(M6X1X86.8 W/ADH)	3.275
555	E	17113136	MANIFOLD KIT, UPR INT(INCL 545,556,558,559,560)	3.265
556	E		GASKET, INT MANIF(ALSO PART OF 555)	NS.
558	E		INSERT, UPR INT MANIF THD(ALSO PART OF 555)	NS.
559	E		STUD, THROT BODY(ALSO PART OF 555)	NS.
560	E		GASKET, THROT BODY(ALSO PART OF 555)	NS.
561	E	24503390	BODY, THROT(SEE 3.000 "THROTTLE BODY"	3.335
563	E	24502453	STUD, INT MANIF(UPR TO LWR)(STUD..6X1X86	3.275
564	E	24506013	MANIFOLD, VAC SCE	3.278
565	E	24502964	SEAL, VAC SCE MANIF(O RING)(O-RING SEAL-	3.278
568	E	16187556	SENSOR, MAP(AT ENGINE)(AC-DELCO #213-259	3.682
KIT#5	E	17113220	VALVE KIT, PCV(INCL'S 546,547,548,549,550)	1.745
KIT#6	E	17113169	INSERT KIT, UPR INT MANIF THD(W/STUDS)	3.275

Sequence III F Illustrated Parts

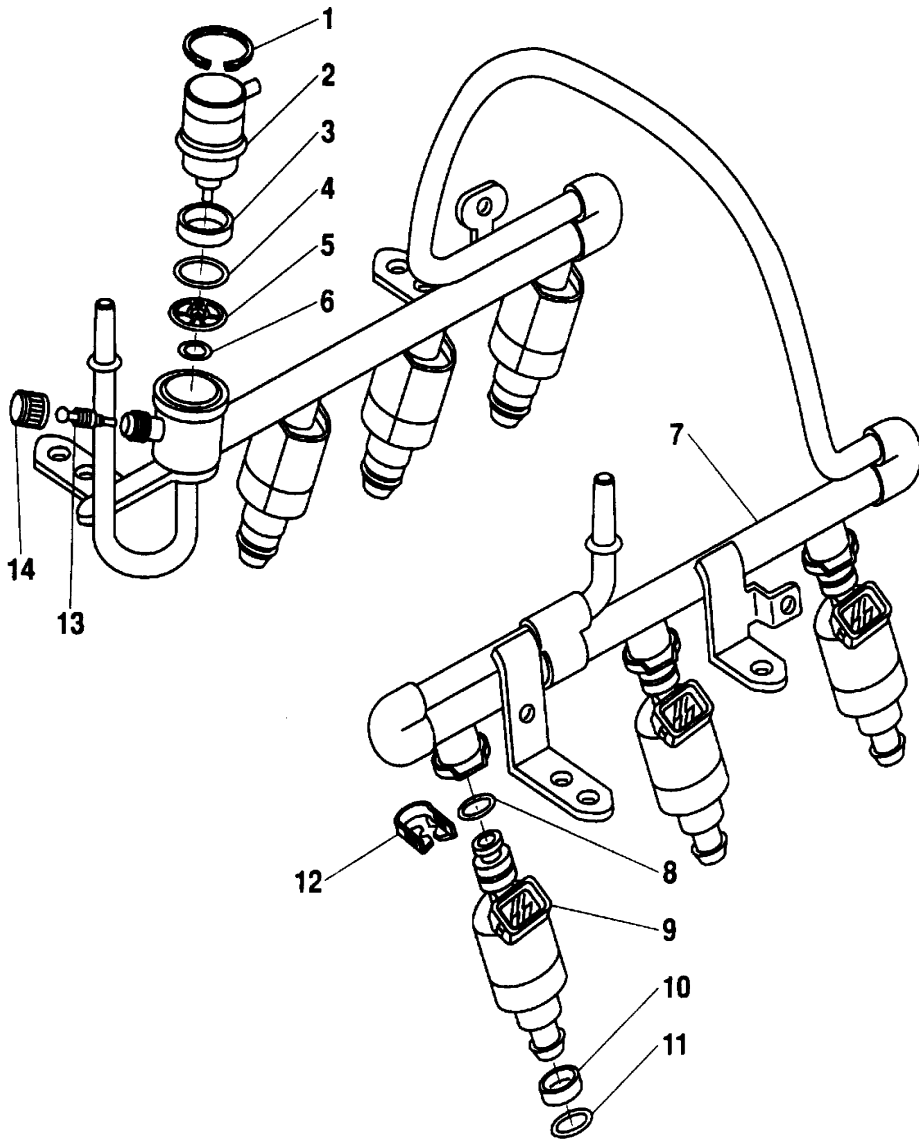
View F



**Sequence IIIF Illustrated Parts List
View F**

Item #	View	Part Number	Description	Group
1	F	24507235	THROTTLE, BODY(*KIT1)	NS.
2	F		PLUG, IDLE AIR(*KIT1)	NS.
3	F		PLUG, VACUUM(*KIT1)	NS.
4	F		SHAFT, THROTTLE(*KIT1)	NS.
5	F		BEARING, BALL(*KIT1)	NS.
6	F		SEAL, RING(*KIT1)	NS.
7	F		SEAL, DUST(*KIT1)	NS.
8	F		PLATE, THROTTLE(*KIT1)	NS.
9	F		SCREW, PLATE(*KIT1,KIT2)	NS.
10	F		SHAFT, LEVER(DRIVE)(*KIT1)	NS.
11	F		PIN, TPS(DRIVE)(*KIT1)	NS.
12	F		SCREW, (IDLE ADJUST)(*KIT1)	NS.
13	F		NUT, (IDLE ADJUST)(*KIT1)	NS.
14	F	17112929	VALVE, IDLE AIR CONT(*KIT1)(AC-DELCO #17	3.820
15	F		SCREW, IAC MOTOR(*KIT1,KIT2)	NS.
16	F	24504798	SENSOR, THROT BODY THROT POSN(*KIT1)(AC-	3.339
17	F		VALVE, THROTTLE(*KIT1)	NS.
18	F		SCREW, THROTTLE VALVE(*KIT1,KIT2)	NS.
19	F	24503677	SCREEN, THROT BODY AIR INL(*KIT1)(AC-DEL	3.337
20	F	24503676	RING, THROT BODY AIR INL SCRNR RET(*KIT1)	3.335
21	F		SLEEVE, (MAIN SPRING)(*KIT1)	NS.
22	F		SLEEVE, (SUB SPRING)(*KIT1)	NS.
23	F		SPRING, (MAIN)(*KIT1)	NS.
24	F		SPRING, (SUB)(*KIT1)	NS.
25	F		NUT, (SHAFT)(*KIT1)	NS.
26	F		SPRING, (WASHER CLIP)(*KIT1)	NS.
27	F	Call GMR&D	SENSOR, MASS AIRFLOW	3.682
28	F		SCREW, (AFS,TPS)(*KIT1,KIT2)	NS.
29	F		RING, (LEVER)(*KIT1,KIT2)	NS.
30	F		LEVER, THROTTLE(*KIT1)	NS.
	F	24503390	BODY, THROT(INCL'S #1 THRU 30.)(3.725)(A	3.335
	F	12537403	ATTACHMENT KIT, THROT BODY(SCREWS & CLIP	3.336

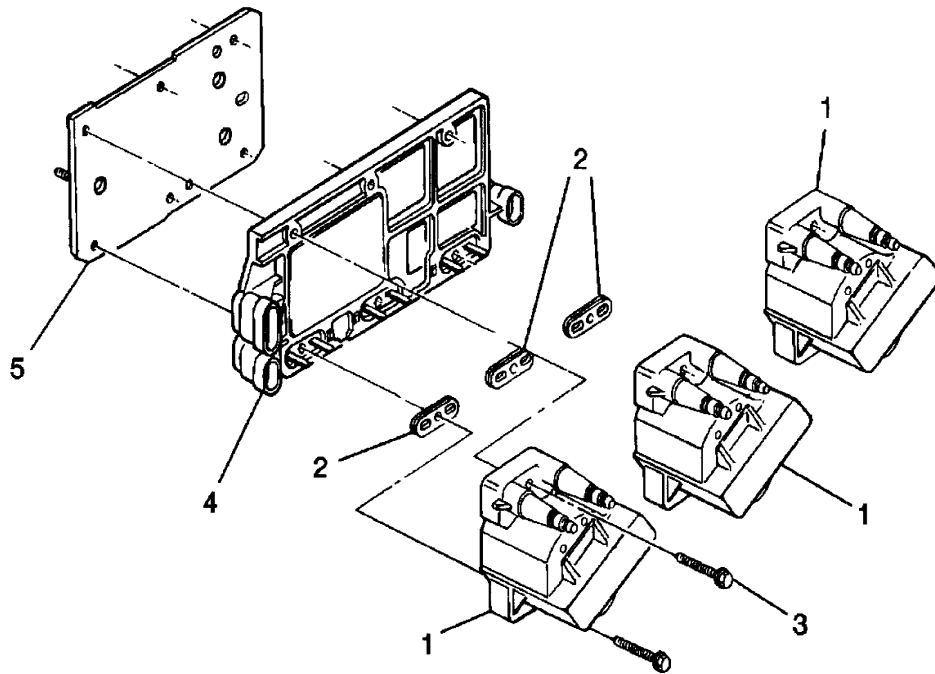
Sequence IIF Illustrated Parts
View G



**Sequence IIF Illustrated Parts List
View G**

Item #	View	Part Number	Description	Group
1	G		CLIP, MPI INJECTOR(*KIT2,KIT7)	NS.
2	G		CARTRIDGE REGULATOR, FUEL PRESSURE(*KIT2	NS.
3	G		SEAL, REGULATOR(O-RING)(*KIT2,KIT7)	NS.
4	G		SEAL, REGULATOR FILTER (O-RING)(*KIT2,KI	NS.
5	G		FILTER, REGULATOR(*KIT2,KIT7)	NS.
6	G		SEAL, REGULATOR(O-RING)(*KIT2,KIT7)	NS.
7	G		RAIL, FUEL(*KIT1)	NS.
8	G		SEAL, UPPER INJECTOR(O-RING)(*KIT4,KIT5)	NS.
9	G		INJECTOR, FUEL(*KIT4)	NS.
10	G		BACKUP, SEAL(O-RING)(*KIT4,KIT5)	NS.
11	G		SEAL, LOWER INJECTOR (O-RING)(*KIT4,KIT5	NS.
12	G		CLIP, FUEL INJECTOR RETAINER(*KIT4,KIT6)	NS.
13	G		CORE, FUEL PRESSURE CONNECTOR(*KIT1,KIT3	NS.
14	G		CAP, ,FUEL PRESSURE CONNECTOR(*KIT1,KIT3	NS.
	G	17098211	RAIL KIT, SEQ M/PORT F/INJN FUEL(INCL #7	3.330
	G	Call GMR&D	REGULATOR, FUEL PRESS(INCL #1,2,3,4,5,6)	3.330
	G	Call GMR&D	VALVE KIT, FUEL PRESS SERV(INCL #13,14)	3.330
	G	17103146	INJECTOR, M/PORT FUEL(INCL #8,9,10,11,12)	3.300
	G	17112981	SEAL KIT, F/INJR(O RING)(INCL #8,10,11)(3.331
	G	17111800	RETAINER KIT, F/INJR(FUEL RAIL)(INCL #12	3.332
	G	17113199	SEAL KIT, FUEL PRESS REG(INCL #1,3,4,5,6	3.330

Sequence III F Illustrated Parts
View H



**Sequence IIIF Illustrated Parts List
View H**

Item #	View	Part Number	Description	Group
1	H	10472401	COIL, IGN(AC-DELCO #D555)	2.170
2	H	1989579	SEAL, IGN COIL(TYPE II-DELCO REMY-2 TERM	2.183
3	H	10498731	BOLT, IGN COIL WIRE RET(M5.0X0.8X44,5.5H	2.251
4	H	10475225	MODULE, ELEK IGN CONT(W/O COIL)(AC-DELCO	2.383
5	H	10476155	BRACKET, ELEK ICM(AC-DELCO #10476155)	2.383
		12058496	SPARKPLUG WIRE	
		5614179	SPARKPLUG R42LTSM	

**Sequence IIIF Illustrated Parts List
Gaskets & Seals**

Item #	View	Part Number	Description	Group
111 A		24506644	GASKET, CR/SHF RR OIL SEAL HSG	0.137
118 A		25534760	SEAL, CR/SHF RR OIL(LIP SEAL)	0.137
201 B		25532619	GASKET, VLV RKR ARM CVR(*KIT1)	0.423
203 B		24100002	SEAL, OIL FIL CAP(O RING)	1.758
209 B		OHT3F-060-1	SEAL, INT VLV STEM OIL	OHT
210 B		OHT3F-061-1	SEAL, EXH VLV STEM OIL(ID-WHITE STRIPE)	OHT
227 B			GASKET, CYL HEAD RT(SEE 12537196, 12539093)	NS.
227 B			GASKET, CYL HEAD LT(SEE 12537196, 12539093)	NS.
304 C		24502433	GASKET, WATER OUTLET	1.154
313 C		24504098	SEAL, CR/SHF FRT OIL	0.213
328 C		24501565	GASKET, W/PMP CVR	1.079
331 C		24502252	GASKET, ENG FRT CVR	0.207
409 D		24502397	GASKET, OIL PAN	1.429
415 D		24501259	GASKET, O/PMP SCRN	1.657
426 D		25534742	GASKET, OIL FLTR ADAP	1.840
430 D		3536966	SEAL, OIL PAN DRN PLUG(O RING)	1.456
514 E		24505049	GASKET, ENG COOL MANIFOLD TRANSFER	1.097
536 E		5617102	GASKET, OXY SEN(3.670)	3.682
565 E		24502964	SEAL, VAC SCE MANIF(O RING)(O-RING SEAL)	3.278
E		12537196	GASKET KIT, CYL HD(INT-TO-BLK SEAL LESS 2 LOCATING PINS; (2nd DESIGN SEE 12539093 W/PINS), (INCL 201,227) (KIT ALSO INCL GASKETS CYL HD, INT MANIFOLD, VLV RKR ARM, SEAL INT-TO MANIFOLD)	0.289
E		12539093	GASKET KIT, CYL HD(INT-TO-BLK SEAL HAS 2 LOCATING PINS; (1st DESIGN SEE 12537196 LESS PINS), (INCL 201,227) (KIT ALSO INCL GASKETS CYL HD, INT MANIFOLD, VLV RKR ARM, SEAL INT-TO MANIFOLD)	0.289
E		12537197	GASKET KIT, INT MANIF(INT-TO-BLK SEAL LESS 2 LOCATING PINS) (2nd DESIGN SEE 12539094 W/PINS) (INCL'S 515,541)	3.270
E		12539094	GASKET KIT, INT MANIF(INT-TO-BLK SEAL HAS 2 LOCATING PINS) (1st DESIGN SEE 12537197 LESS PINS) (INCL'S 515,541)	3.270
E		17113137	GASKET KIT, UPR INT MAN(INCL'S 545,556,560)	3.270

Section 11

GM Raceshop Test Parts



IIIF OIL TEST PART PRICE LIST

EFFECTIVE JANUARY 1, 2000

<u>PART NUMBER</u>	<u>DESCRIPTION</u>	<u>PRICE EA.</u>
245022 41	V-6 Front Cover	\$115.00
245021 68	V-6 Crankshaft	\$375.00
245016 96	V-6 Connecting Rod	\$40.00
245022 60	V-6 Cylinder Head	\$375.00
245022 86	V-6 Cylinder Block	\$1,000.00