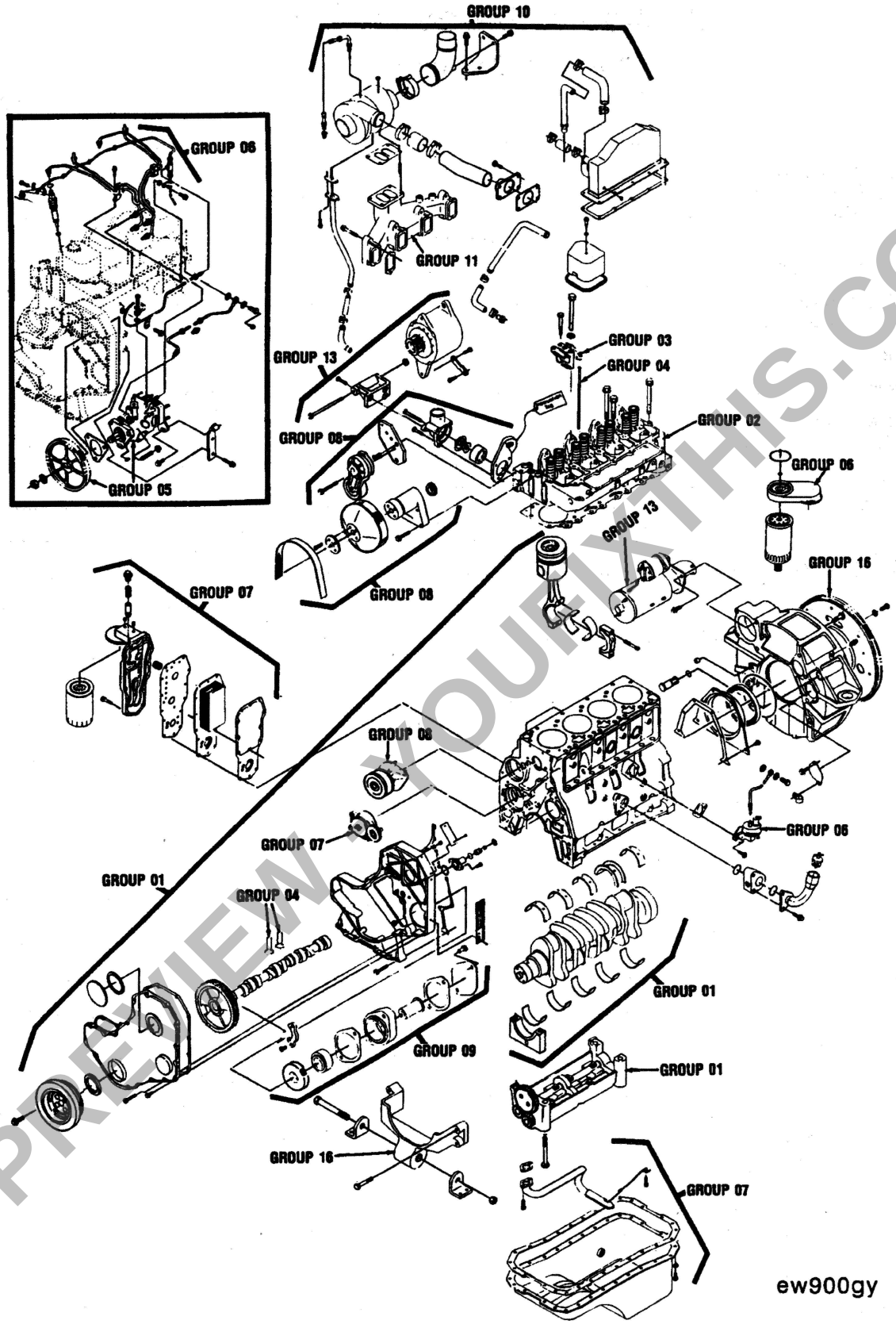
Cummins 22-Group System Exploded Diagram



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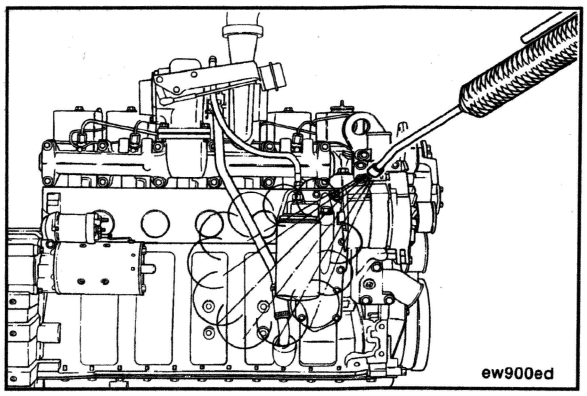
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Engine Component Torque Values

Ref. No.	Socket or Wrench Size MM[Inch]		Torque N•m	[Ft-lb]
1	10	Aftercooler Mounting	24	[18]
2	[5/16]	Aftercooler Water Hose Clamp	5	[4]
3	[15/16]	Alternator Pulley	80	[59]
4	13 or [3/4]	Alternator Link (Delco 15-20-27 SI)	43	[32]
5	16	Alternator Mounting Bolt 15 SI	43	[32]
5	18	Altenator Mounting Bolt and Nut 20-27 SI	77	[57]
6	13	Alternator Support (Upper)	24	[18]
7	23	Balancer Mounting....Step 1	50	[36]
		(Alternately Tighten....Step 2	80	[58]
		in Three Steps)....Step 3	175	[129]
8	Allen 8mm	Balancer Idler Gear	43	[32]
9	Allen 5mm	Belt Tensioner Flat Bracket	24	[18]
10	15	Belt Tensioner Mounting	43	[32]
		Camshaft Bolt....Step 1	27	[20]
		....Step 2	Rotate 180 Degrees	
11	13	Cam Thrust Plate	24	[18]
	[3/8]	Coolant Heater	12	[9]
12	12	Connecting Rod Bolt....Step 1	35	[26]
		(Alternately Tighten....Step 2	70	[51]
		in Three Steps)....Step 3	100	[73]
13	15	Crankshaft Damper & Pulley	125	[92]
14	18	Cylinder Head Mounting....Step 1 (All)	90	[66]
		....Step 2 (All) Recheck to	90	[66]
		....Step 3 (Long Capscrews)	120	[90]
		....Step 4 Recheck (Long Capscrews Only)	120	[90]
		....Step 5 (All) Rotate 90°		
15	[5/16]	Crossover Clamp	5	[4]
16	13	Exhaust Manifold	43	[32]
17	13	Exhaust Outlet Pipe Brkt. Mounting	43	[32]
18	13	Exhaust Outlet Pipe, Flanged	24	[18]
19	[7/16]	Exhaust Outlet Pipe, V Band Clamp	8	[6]
20	10	Fan Bracket Mounting	24	[18]
21	13	Fan Pulley	24	[18]
22	19	Flywheel	137	[101]
23	15	Flywheel Housing	77	[57]
24	13	Flywheel Housing Access Cover	24	[18]
15	[1/2]	Flywheel Housing Plug	36	[25]
26	--	Front Cover Cap	----Hand Tighten----	
27	18	Front Engine Support Mounting	77	[57]
28	[1 1/8]	Front Engine Support (Barrel)	350	[257]
29	17	Fuel Banjo Screw (In Fuel Pump)	32	[24]
30	17	Fuel Banjo Screw (In Head)	24	[18]
31	10	Fuel Banjo Screw (In Injector)	9	[7]
32	10	Fuel Vent Screw (In Banjo)	9	[7]
33	80-95	Fuel Filter	3/4 Turn After Contact	
34	14	Fuel Low Pressure Supply (Lift Pump Outlet)	24	[18]
35	24	Fuel Filter Adapter Nut	32	[24]
36	17	Fuel Line Fitting (High Press)	24	[18]

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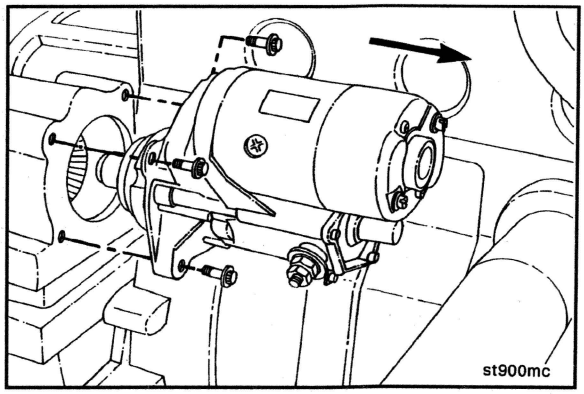
Engine Disassembly (0-1)

Steam Cleaning The Engine (0-2)

Warning: When using a steam cleaner, wear protective clothing and safety glasses or a face shield. Hot steam can cause serious personal injury.

NOTE: Cover all engine openings and electrical components. This will prevent water damage.

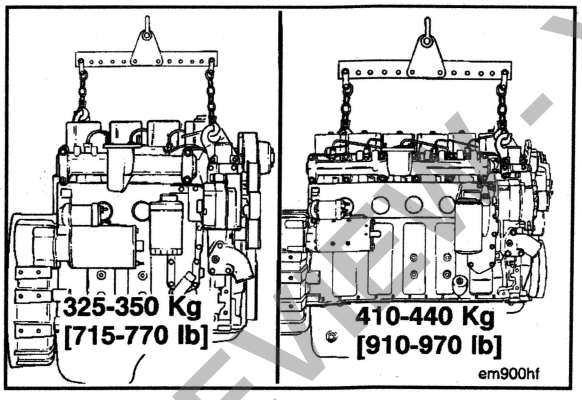
Steam clean the heavy dirt from the exterior of the engine.



Starter - Removal (0-3)

10 mm

Remove the starting motor.

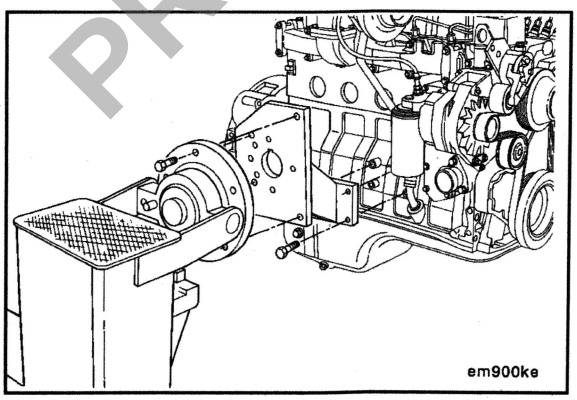


Engine Weight (0-4)

3822512 Engine Lifting Fixture

4B Engine (Wet) Weight: 325-350 Kg [715-770 lb]

6B Engine (Wet) Weight: 410-440 Kg [910-970 lb]



Rollover Stand - Engine Mounting (0-5)

18 mm, 3375194 Engine Rebuild Stand, 3376975 Adapter Plate

Mount the engine on the rebuild stand.

Torque Value: 77 N•m [57 ft-lb].

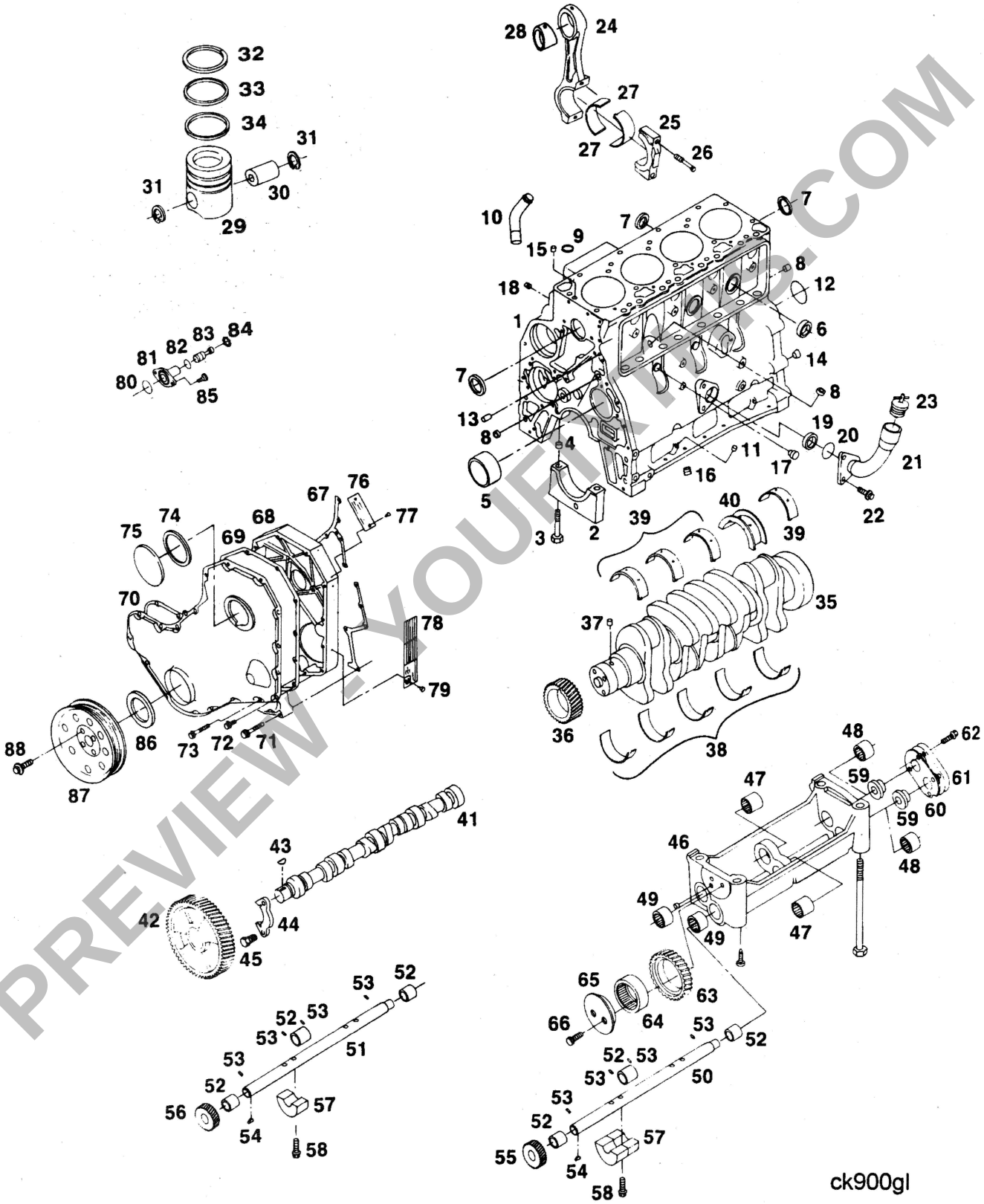
Mounting Hardware:

M12 x 1.75

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Cylinder Block - Exploded View



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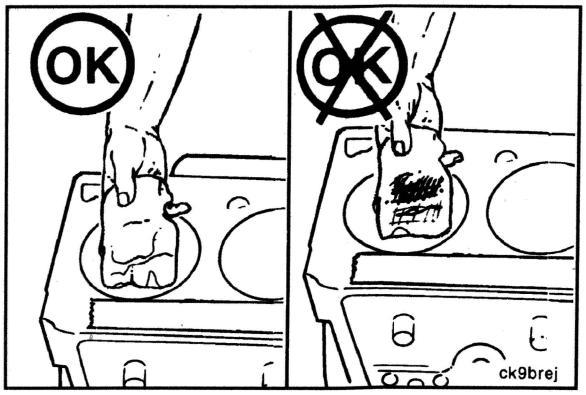
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Engine Component Torque Values

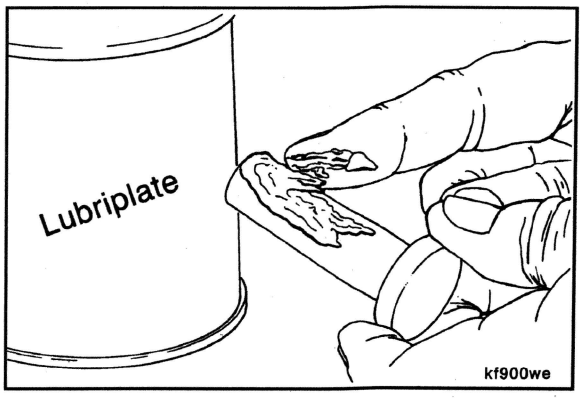
Ref. No.	Socket or Wrench Size MM[Inch]		Torque N•m	[Ft-lb]
37	22	Fuel Pump Drive Gear (With Pump Unlocked)		
		Bosch (Rotary), Lucas CAV, Stanadyne DB4	65	[48]
		Nippondenso	123	[92]
		Bosch (P3000, P7100)	165	[122]
	10	Fuel Pump Lock (Bosch)	30	[22]
		Fuel Pump Unlock (Bosch	13	[10]
	[9/16]	Fuel Pump Lock (CAV) (Stanadyne DB4)	12	[9]
		Fuel Pump Unlock (CAV) (Stanadyne DB4)	12	[9]
38	13	Fuel Pump Mounting Nut (Bosch Rotary) (Stanadyne DB4)	24	[18]
		Fuel Pump Mtg. Nut (Nippondenso)	43	[32]
		Fuel Pump Mtg. Nut (Lucas CAV)	30	[22]
		Fuel Pump Mtg. Nut (Bosch In-Line)	43	[32]
		Fuel Pump Solenoid		
	24	(Bosch VE)	43	[32]
	22	(CAV)	15	[11]
39	10	Fuel Pump Support Bracket	24	[18]
40	10	Gear Cover	24	[18]
41	10	Gear Housing-to-Block	24	[18]
42	24	Injector Retaining Nut	60	[44]
43	10	Intake Manifold Cover	24	[18]
	[5/8]	Intake Heater Plug	125	[90]
44	10	Lift Pump Mounting/Cover Plate	24	[18]
45	18	Lifting Bracket (Rear)	77	[57]
46	23	Main Bearing Cap Step 1	60	[44]
		Step 2	119	[88]
		Step 3	176	[129]
47	15	Oil Fill Tube Mounting	43	[32]
48	75-85	Oil Filter	3/4 Turn After Contact	
49	10	Oil Cooler Assembly	24	[18]
50	17	Oil Pan Drain Plug	80	[60]
51	17	Oil Pan Heater Plug	80	[60]
52	10	Oil Pan Mounting	24	[18]
53	19	Oil Pressure Regulator Plug	80	[60]
54	13	Oil Pump Mounting	24	[18]
55	13	Oil Suction Tube (Flange)	24	[18]
56	10	Oil Suction Tube Brace	24	[18]
57	15	PTO Adapter	77	[57]
58	13	PTO Adapter Cover Plate (A Drive)	43	[32]
	15	PTO Adapter Cover Plate (B Drive)	77	[57]
59	[3/4]	PTO Gear Nut A Drive	100	[74]
	[15/16]	PTO Gear Nut B Drive	134	[100]
60	8	Rear Seal Mounting	9	[7]
61	13	Rocker Support	24	[18]
62	[14]	Rocker Lever Nut	34	[25]
63	10	Starter Mounting	43	[32]
64	10	Tach Drive Retainer	3	[2]
65	10	Tappet Cover/Fuel Drain Line Supports	24	[18]
66	10	Thermostat Housing	24	[18]
67	T-25 Torx	Timing Pin Flange Mounting	5	[4]
	10	Turbocharger Compressor Housing V-Band	8.5	[6]
68	15	Turbocharger Mounting Nut	43	[32]

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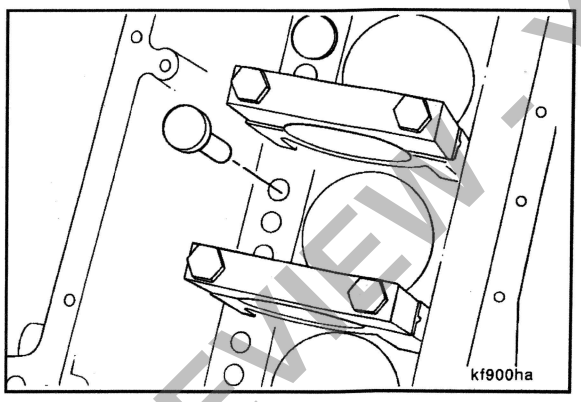


Caution: Be sure the cylinder bores are clean.

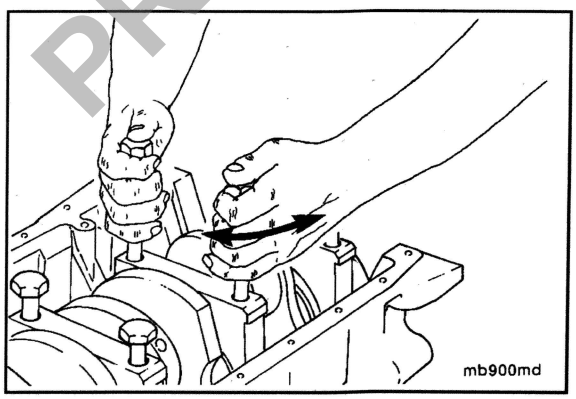


Valve Tappets - Installation (0-70)

Lubricate the tappets with Lubriplate 105®.



Install the valve tappets.



Crankshaft - Installation (0-71)

23 mm

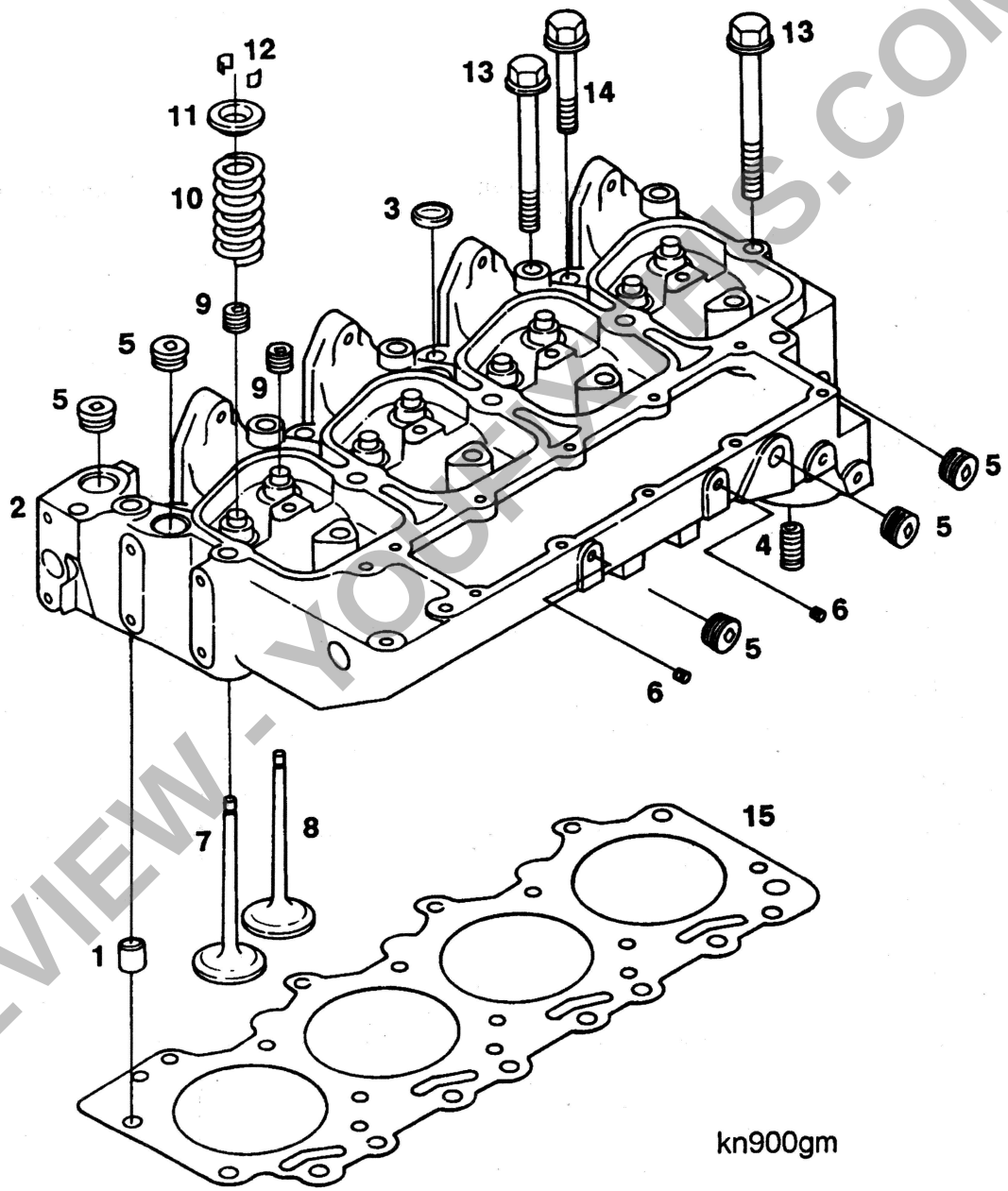
Remove the main bearing caps.

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Cylinder Head - Group 2

Exploded View



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Engine Component Torque Values

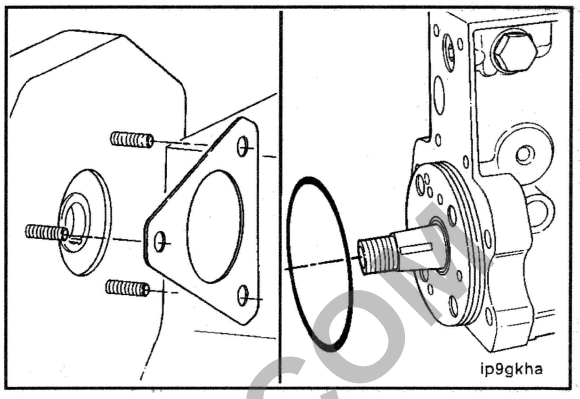
Ref. No.	Socket or Wrench Size MM[Inch]		Torque N•m	[Ft-lb]
69	13	Turbocharger Oil Drain Tube	24	[18]
70	[5/8]	Turbocharger Oil Supply (Both Ends)	35	[26]
	13	Turbocharger Turbine Housing	20	[15]
		Water Hose Clamps	4-5	[4]
71	13	Water Inlet Connection	43	[32]
	[3/8]	Water Inlet Plugs	24	[18]
72	13	Water Pump Mounting	24	[18]
73	15	Valve Cover	24	[18]
	--	Valve Cover Oil Fill	Hand Tighten	

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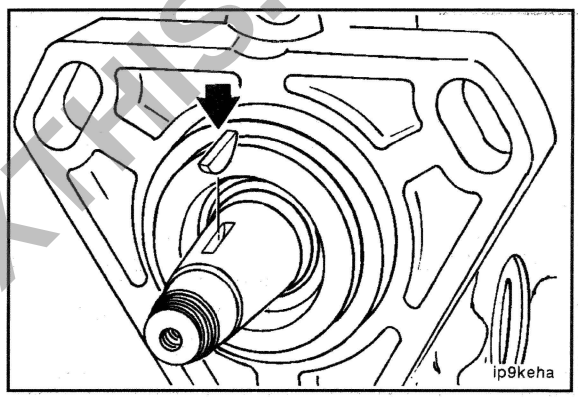
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Injection Pump - Installation (0-88)

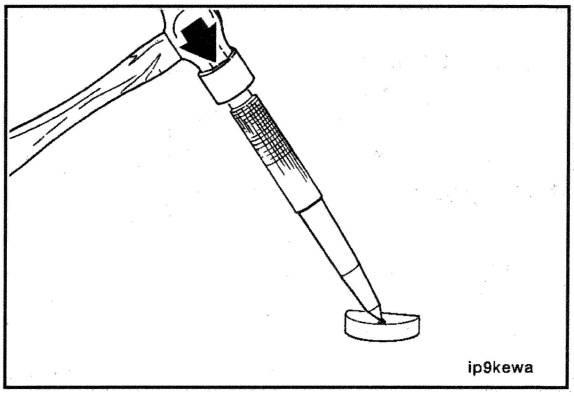
Install the injection pump gasket. The Nippondenso EP9 and the Bosch P7100 injection pump use a sealing o-ring instead of a sealing gasket. Make sure the o-ring is positioned properly and not damaged. Lubricate with clean engine oil.



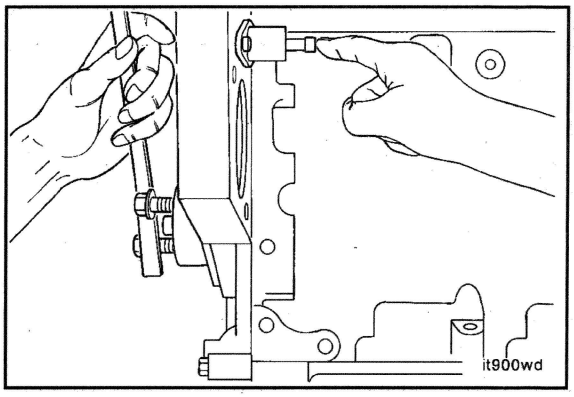
Install the key in the keyway of the Bosch and CAV injection pump shafts. The Nippondenso EP9 and the Bosch P7100 pumps do not require a key.



Service Tip: To prevent the key from falling out of the keyway in the shaft, use a small punch to swell one side of the key. When adequately expanded, it should require a hammer to lightly tap the key into posiiton in the keyway.



Locate top dead center (TDC) for Cylinder Number 1 by barring the engine while pushing in on the engine timing pin until it engages.



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Foreword

This manual contains complete rebuild specifications and information for the B Series engines, and all associated components manufactured by Cummins Engine Company, Inc. A listing of accessory and component suppliers' addresses and telephone numbers is located in Section C. Suppliers can be contacted directly for any information **not** covered in this manual.

Read and follow all safety instructions. Refer to the WARNING in the General Safety Instructions in this section.

The repair procedures in this manual are based on the engine being installed on an approved engine stand. Some rebuild procedures require the use of special service tools. Make sure the correct tools are used as described in the procedures.

When a specific brand name, number, or special tool is referenced in this manual, an equivalent product can be used in place of the recommended item.

A series of specific service manuals (Troubleshooting and Repair, Specifications, Alternative Repair, and so on.) are available and can be ordered by filling out and mailing the Literature Order Form located in the Service Literature Section L.

Reporting of errors, omissions, and recommendations for improving this publication by the user is encouraged. Please use the postage paid, self-addressed Literature Survey Form in the back of this manual for communicating your comments.

The specifications and rebuild information in this manual is based on the information in effect at the time of printing. Cummins Engine Company, Inc. reserves the right to make any changes at any time without obligation. If differences are found between your engine and the information in this manual, contact a Cummins Authorized Repair Location, a Cummins Division Office, or the factory.

The latest technology and the highest quality components are used to manufacture Cummins engines. When replacement parts are needed, we recommend using only genuine Cummins or ReCon® exchange parts. These parts can be identified by the following trademarks:

Cummins

Cummins ReCon

HOLSET®

Fleetguard®

Premium Blue®

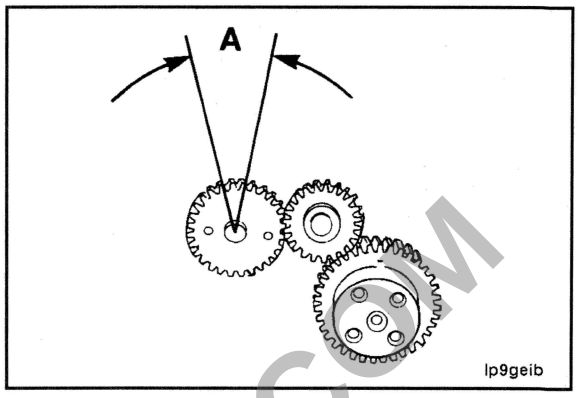
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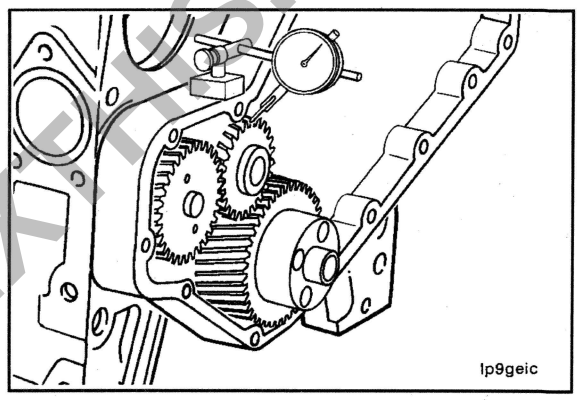
Note the lube pump gear backlash. Mark the lube pump gear and idler gear for additional analysis if the limits are exceeded.

Lube Pump Gear Backlash Limits (A)		
mm		in
0.076	MIN	0.003
0.330	MAX	0.013

NOTE: Prevent movement of the adjoining gear when checking backlash or the reading will be the total of both gears.



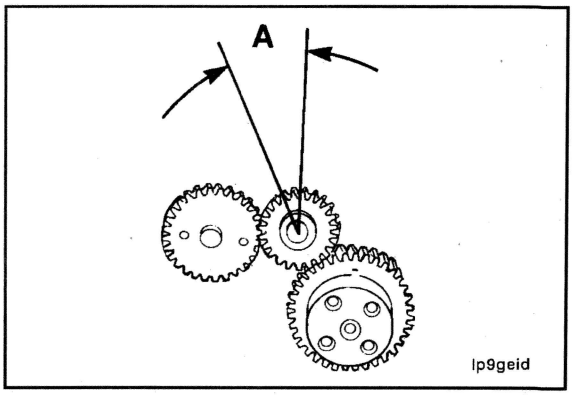
Position the indicator on a tooth of the lube pump idler gear.



Note the idler gear backlash. Mark the idler gear and crankshaft gear for additional analysis if the limits are exceeded.

Lube Pump Idler Gear Backlash Limit (A)		
mm		in
0.076	MIN	0.003
0.330	MAX	0.013

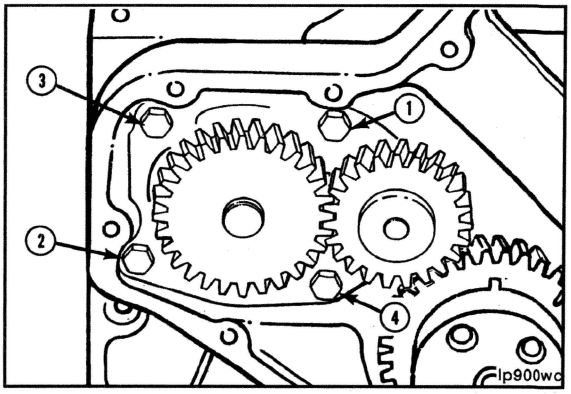
NOTE: Prevent movement of the adjoining gear when checking backlash or the reading will be the total of both gears.



13 mm

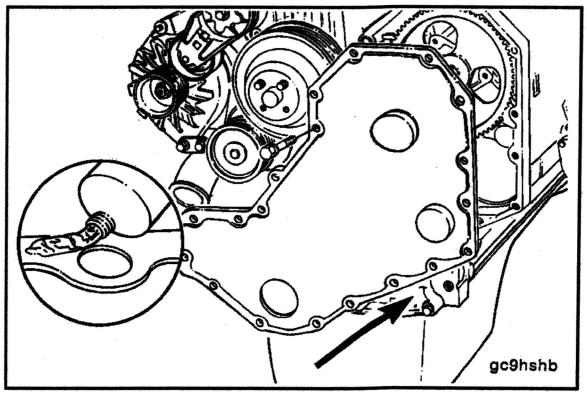
Remove the lube pump.

NOTE: Refer to Component Section 7 for inspection.



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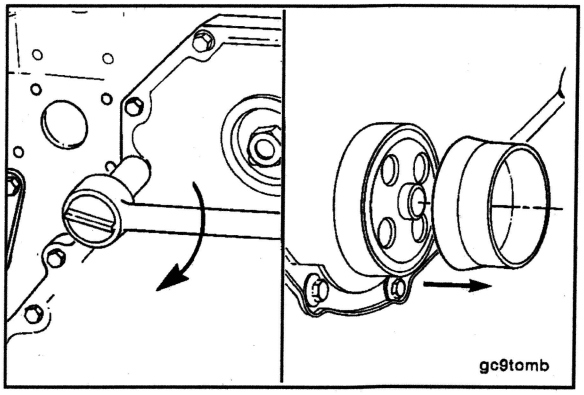
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Apply a thin bead of Three Bond™ to the cover side of the front cover gasket only.

NOTE: Do not remove the plastic seal pilot tool from the lubricating oil seal at this time. Use the plastic seal pilot tool to guide the seal on the crankshaft.

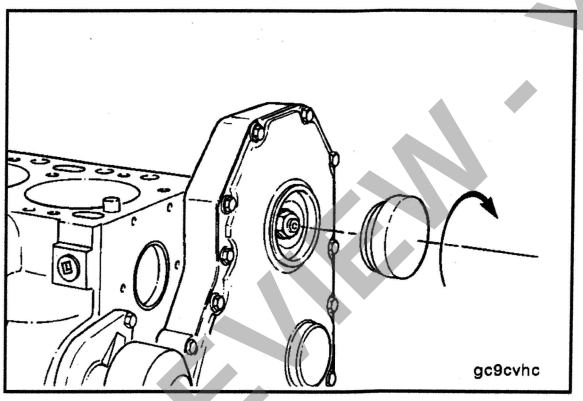
Install the gasket and front cover on the engine.



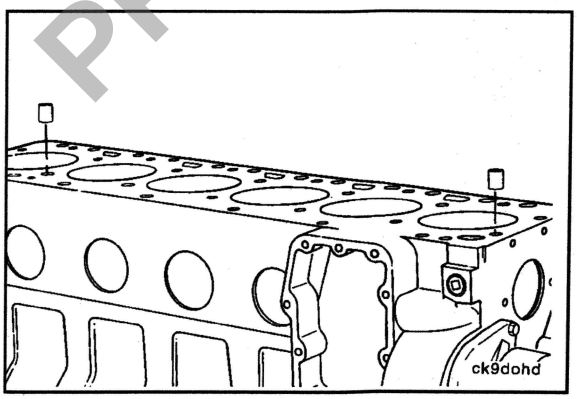
10 mm

Remove the alignment/installation tool after tightening the capscrews.

Torque Value: 24 N•m [18 ft-lb]



Install the front cover access cap and seal.



Cylinder Head - Installation (0-99)

Caution: Make sure the cylinder head and block surface are clean and not nicked or gouged.

Mallet

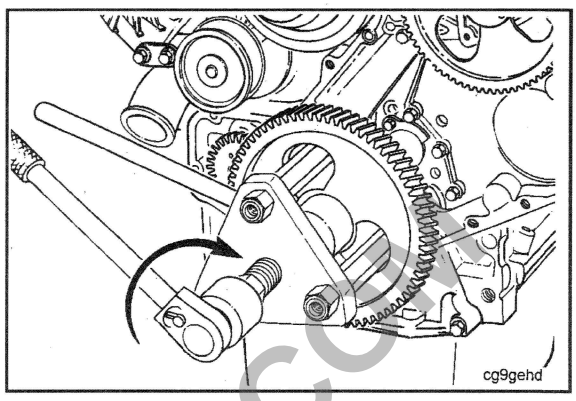
If removed, install the two cylinder head dowels. Drive the dowels to the bottom of the dowel bore.

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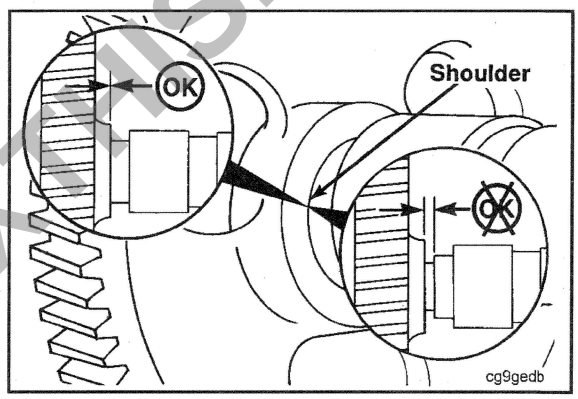
Once the gear is properly started on the camshaft, insert the torque arm into the screw press and, using a wrench with the screw press, install the camshaft gear.

NOTE: Do not exceed 100 ft-lb of torque while installing the gear. Do not use an impact wrench with this or any other Cummins special tool. It can damage the engine parts or the tool.

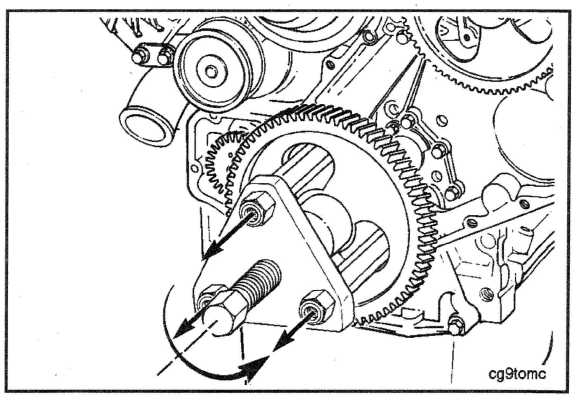


While turning the screw, the effort required should increase steadily until the gear seats against the camshaft shoulder.

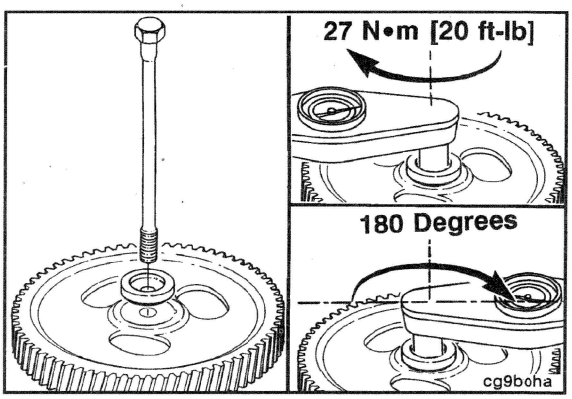
When the gear is properly installed, the gear is in contact with the shoulder on the camshaft.



Disassemble the camshaft gear installation tool and remove the camshaft retainer.



Automotive 1991 engines with Bosch P7100 inline injection require a camshaft capscrew be installed. Refer to procedure (1-22).



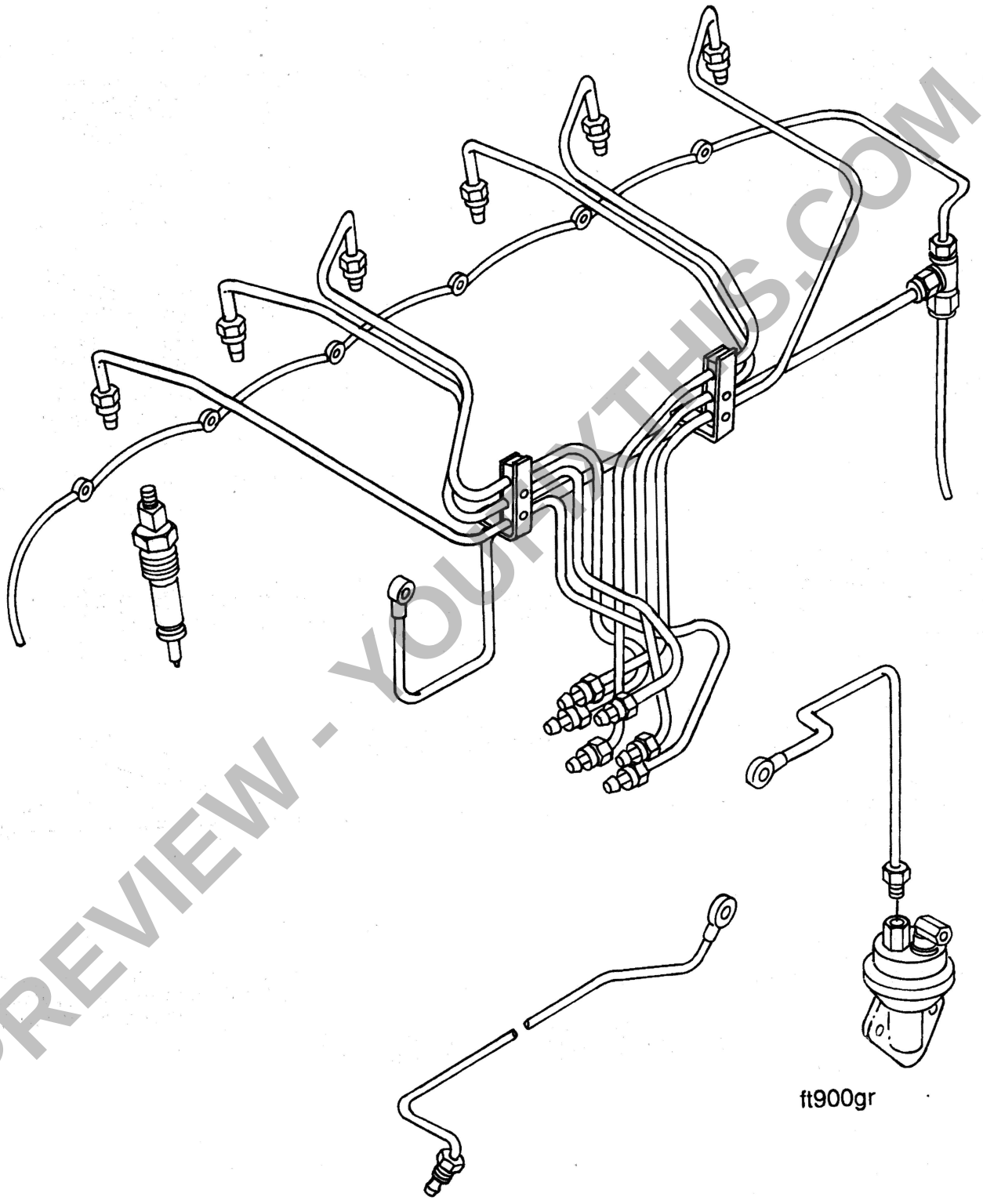
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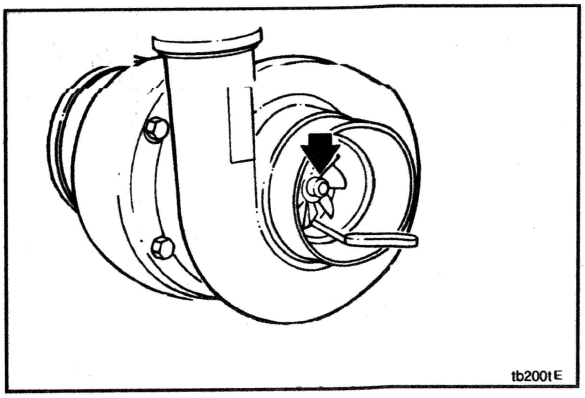
Injector Group - Exploded View



ft900gr

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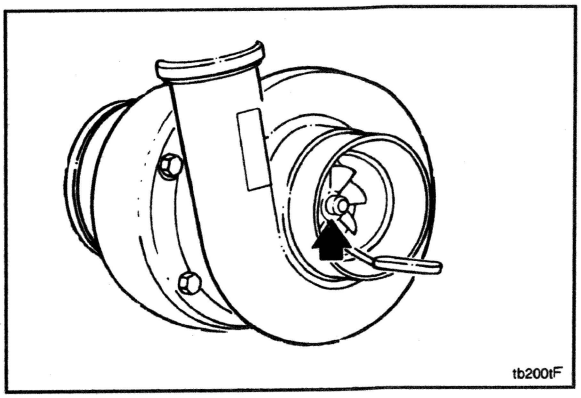
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Push the compressor impeller by hand toward the compressor housing.

Install a wire feeler gauge, at the minimum clearance point, between the impeller and the housing to measure the clearance.

Record this clearance.



With the feeler gauge in the same location, push the turbine wheel by hand away from the compressor housing.

Install a wire feeler gauge, at the same point.

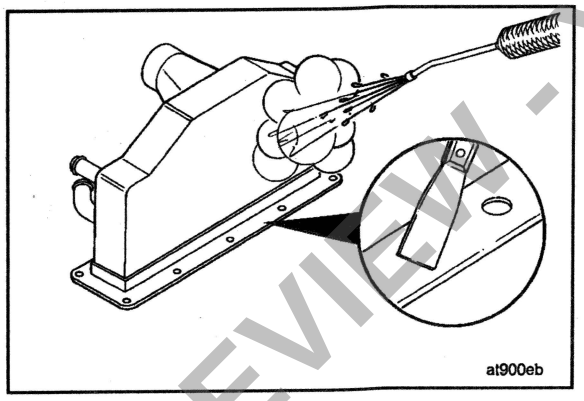
Record this clearance.

Subtract the smaller from the larger clearance.

Radial Clearance

mm		in
0.30	MIN	[0.012]
0.46	MAX	[0.018]

If the radial clearance does **not** meet the above specifications, the turbocharger **must** be rebuilt. Refer to Turbocharger Components Shop Manual, Bulletin No. 3810321, for rebuild instructions.

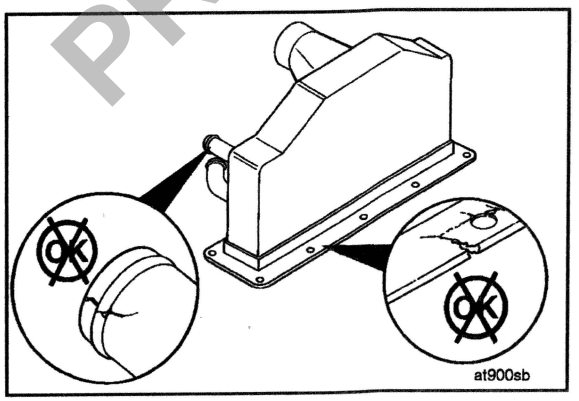


Aftercooler Assembly - Cleaning and Inspection for Reuse (10-02)

Remove all gasket material from the mounting surfaces.

Warning: When using a steam cleaner, wear protective clothing and safety glasses or a face shield. Hot steam will cause serious personal injury.

Use solvent or steam to clean the aftercooler assembly. Dry with compressed air.



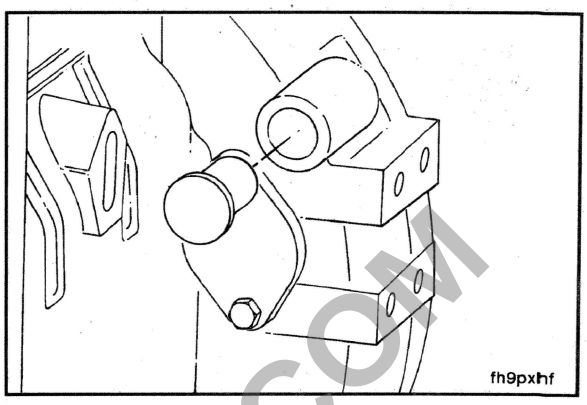
Inspection

Visually inspect the aftercooler assembly for cracks or damage. Replace if damaged.

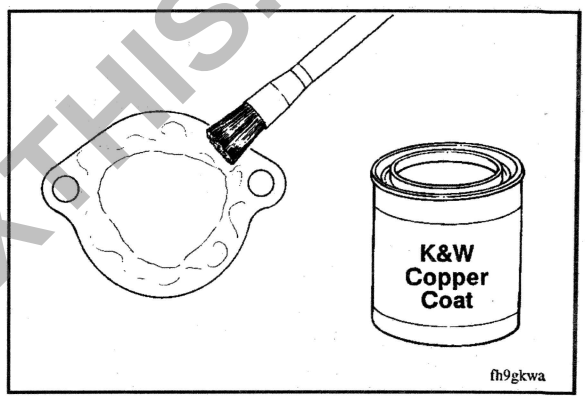
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Install the expanding plug in the barring tool hole.



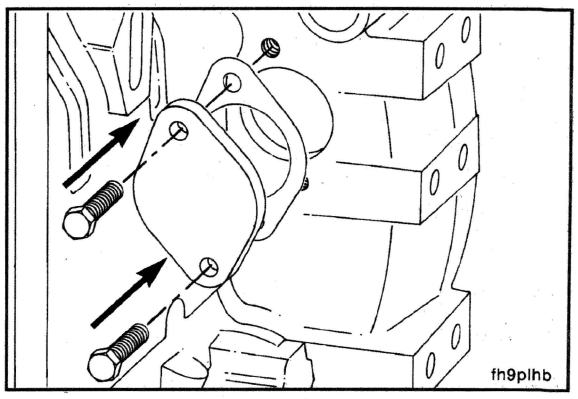
Coat both sides of the inspection plate gasket with KW Copper Coat™.



13 mm

Install the inspection plate.

Tighten to 24 N•m [18 ft-lbs].



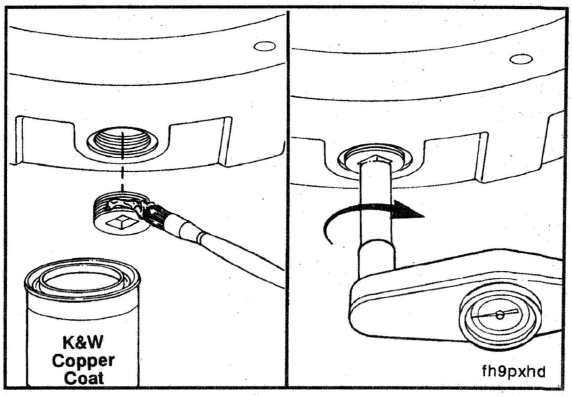
Wet Clutch Application

Perform all the steps in the procedure for dry clutch installation in addition to the following:

Coat the flywheel housing drain plug with pipe sealant and install in the hole in the bottom of the flywheel housing.

Tighten the plug.

Refer to the pipe plug torque values in Section 10 for different plug sizes.



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