

CAUTION

To reduce the chance of personal injury and/or property damage, the following instructions must be carefully understood.

Proper service and repair are important to the safety of the service technician and the safe, reliable operation of the engine. If part replacement is necessary, the part must be replaced with one of the same part number or with an equivalent part. Do not use a replacement part of lesser quality.

The service procedures recommended by Detroit Diesel Corporation and described in this service manual are effective methods of performing service and repair. Some of these procedures require the use of tools specially designed for this purpose.

Accordingly, anyone who intends to use a replacement part, service procedure or tool, which is not recommended by Detroit Diesel Corporation, must first determine that neither his safety nor the safe operation of the engine will be jeopardized by the replacement part, service procedure or tool selected.

It is important to note that this manual contains various "Cautions" and "Notices" that must be carefully observed in order to reduce the risk of personal injury during service or repair or the possibility that improper service or repair may damage the engine or render it unsafe. It is also important to understand that these "Cautions" and "Notices" cannot cover all circumstances, because it is impossible for Detroit Diesel Corporation to warn of all the possible hazardous conditions that might result from failure to follow these instructions.

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SERIES 40 SERVICE MANUAL

ABSTRACT

This manual is part of a series of manuals intended to assist service technicians in maintaining engines, produced by Detroit Diesel Corporation, in accordance with the latest technical advancements.

Due to a commitment of continuous research and development, some procedures, specifications and parts may be altered to improve Detroit Diesel products and introduce technological advances.

Service diagnosis is a systematic procedure of investigation to be followed in order to locate and correct an engine problem. The engine is first considered as a complete unit in its specific application and then the problem is localized to components or systems; intake, exhaust, cooling, lubrication or injection. Testing procedures will then help analyze the source of the problem.

HOW TO USE THIS MANUAL

This manual is arranged in sections, with the pages numbered consecutively in each section. Any photos or artist renderings are also numbered consecutively in each section. Included at the top of each page is the Section Title. The page number and the literature distribution number (6SE44) are found at the bottom of each page.

This manual is divided into four basic parts:

- ☐ The Introductory Section
- ☐ The Component Sections
- ☐ The Diagnostic Sections
- ☐ The Appendix

The **Introductory Section** addresses the following general subjects which should be read prior to engine repair or overhaul:

- ☐ Safety Suggestions
- ☐ Engine Identification
- ☐ Engine Description
- ☐ Engine Systems

The **Component Sections** address the actual service procedures for each engine component. Each component section is arranged as follows:

- ☐ Section Index
- ☐ Exploded View(s)
- ☐ Specifications
- ☐ Special Torques
- ☐ Special Tools
- ☐ Removal and Reassembly (where applicable)
 - Removal
 - Cleaning
 - Inspection
 - Installation
- ☐ Engine Component Identification (where applicable)
- ☐ Removal and Reassembly (where applicable)
 - Removal
 - Cleaning
 - Inspection
 - Installation

- ☐ Reconditioning
 - ☐ Disassembly
 - ☐ Cleaning
 - ☐ Inspection
 - ☐ Repair
 - ☐ Reassembly

The **Diagnostics Sections** addresses the systematic procedure of investigation to be followed in order to locate and correct an engine problem. These sections include testing procedures to help analyze the source of the problem. The **Diagnostic Sections** cover:

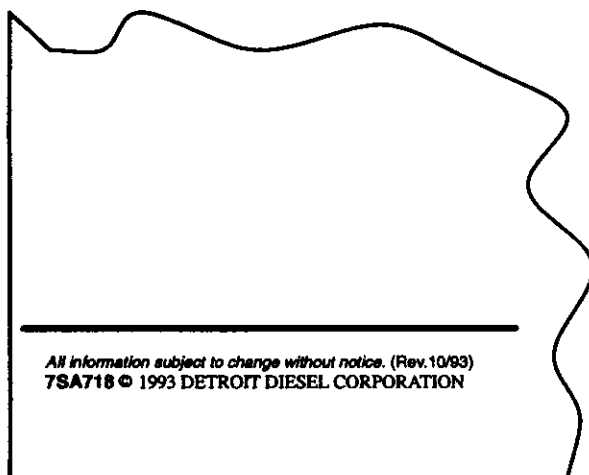
- ☐ Diagnostic Analysis
- ☐ Engine Performance Analysis
- ☐ Engine Diagnostic Tools
- ☐ Engine Diagnostic Test Procedures

The **Appendix** is located at the end of the manual and consists of the following:

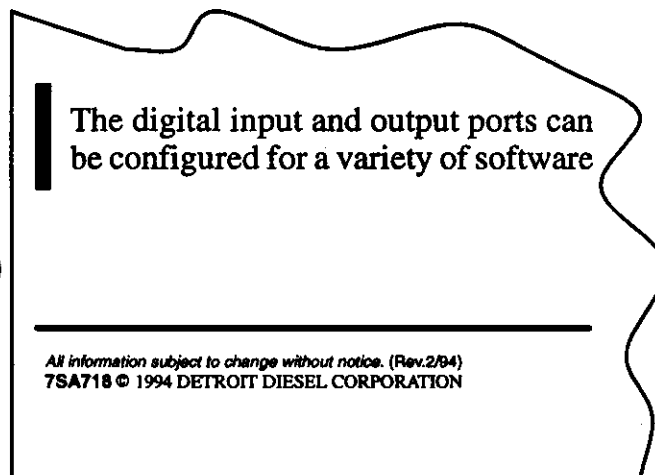
- ☐ General Engine Specifications
- ☐ Component Specifications
- ☐ Torque Data
- ☐ Special Service Tool List
- ☐ English/Metric Conversion Chart

MANUAL REVISIONS

Revisions to this manual will be sent to bookholders on a quarterly basis. Information changes will be marked with a revision bar (see Example 2) and the pages with the revision bars will have a new revision date in the footer. The pages that have not changed will retain the original revision date. (See Example 1)



Example 1—Unchanged Pages



Example 2— Changed Pages

If a page has a new revision date, but does not have a revision bar, this means pagination was affected.

TABLE OF CONTENTS

INTRODUCTION

1 SAFETY SUGGESTIONS	1-1
2 ENGINE IDENTIFICATION	2-1
2.1 INJECTION PUMP IDENTIFICATION	2-2
2.1.1 Model PES6P (7100) Fuel Injection Pump	2-2
2.1.2 Model PES6P (3000) Fuel Injection Pump	2-3
2.2 TURBOCHARGER IDENTIFICATION	2-4
3 GENERAL FEATURES	3-1
3.1 CHASSIS MOUNTED AIR-TO-AIR INTERCOOLER	3-2
3.2 COOLING SYSTEM	3-3
3.2.1 Coolant Flow System	3-3
3.2.1.1 Thermostat Operation	3-4
3.3 LUBRICATION SYSTEM	3-5
3.3.1 Location	3-5
3.3.2 Oil Flow	3-5
3.3.3 Oil Pressure Regulator Valve and Oil Pressure Relief Valve	3-8
3.4 FUEL SYSTEM	3-9
3.4.1 Negative Pressure	3-9
3.4.2 Intermediate Pressure	3-10
3.4.3 High Pressure	3-10
3.4.4 Low Pressure	3-10
3.5 AIR INDUCTION AND EXHAUST SYSTEMS	3-11
3.5.1 Air Flow	3-11
3.6 MAJOR COMPONENT LOCATION (FRONT)	3-13
3.7 MAJOR COMPONENT LOCATION (LEFT SIDE)	3-14
3.8 MAJOR COMPONENT LOCATION (REAR)	3-15
3.9 MAJOR COMPONENT LOCATION (RIGHT SIDE)	3-17

SERVICE

4 MOUNTING ENGINE ON STAND	4-1
4.1 SPECIFICATIONS	4-3
4.2 MOUNTING ENGINE ON STAND	4-5
5 TURBOCHARGERS	5-1
5.1 TURBOCHARGER EXPLODED VIEWS	5-3
5.2 SPECIFICATIONS	5-11
5.2.1 Special Torques	5-11
5.2.2 Turbocharger A/R	5-11
5.3 GENERAL OPERATION	5-13
5.3.1 Component Identification	5-13
5.4 REMOVAL	5-14
5.4.1 Cleaning	5-18
5.4.1.1 Turbocharger	5-18
5.4.1.2 Pre-disassembly Visual Inspection	5-18

5.4.1.3	Check For Free Rotation	5-19
5.4.1.4	Check For Turbine/Compressor Housing Rub	5-19
5.4.1.5	Check Axial End Play	5-20
5.4.1.6	Check Wastegate Actuator (If Equipped)	5-20
5.5	DISASSEMBLY	5-21
5.6	REASSEMBLY	5-26
5.7	INSTALLATION	5-30
6	MANIFOLDS	6-1
6.1	MANIFOLD AND MANIFOLD COVER	6-3
6.2	PIPING COMPONENT LOCATION	6-5
6.3	SPECIFICATIONS	6-7
6.3.1	Special Torque Values	6-7
6.3.2	Special Service Tools	6-7
6.4	EXHAUST MANIFOLD REMOVAL	6-9
6.4.1	Cleaning	6-9
6.4.2	Exhaust Manifold Inspection	6-10
6.5	EXHAUST MANIFOLD INSTALLATION	6-11
6.6	VALVE COVER/INTAKE MANIFOLD REMOVAL	6-11
6.6.1	Cleaning	6-12
6.7	VALVE COVER/INTAKE MANIFOLD INSTALLATION	6-13
7	CYLINDER HEAD AND VALVES	7-1
7.1	CYLINDER HEAD AND RELATED PARTS EXPLODED VIEW	7-3
7.2	SPECIFICATIONS	7-5
7.2.1	Special Torque Values	7-8
7.2.2	Special Service Tools And Materials	7-9
7.3	CYLINDER HEAD REMOVAL	7-11
7.3.1	Valve Removal	7-13
7.3.2	Cylinder Head Removal	7-15
7.3.3	Cleaning	7-16
7.4	CYLINDER HEAD INSPECTION	7-17
7.4.1	Inspect For Cracks	7-19
7.4.2	Pressure Check Cylinder Head	7-21
7.5	CYLINDER HEAD RECONDITIONING	7-23
7.5.1	Nozzle Liner Replacement	7-23
7.5.2	Valve And Valve Guide Reconditioning	7-25
7.5.2.1	Remove Valves	7-25
7.5.2.2	Clean Valve Guides	7-26
7.5.2.3	Inspect Valve Guides	7-27
7.5.2.4	Replace Valve Guides	7-28
7.5.2.5	Clean Valves	7-29
7.5.2.6	Inspect Valves	7-29
7.5.2.7	Reface Valves	7-30
7.5.2.8	Valve Seat Grinding	7-33
7.5.2.9	Valve Seat Replacement	7-36
7.5.3	Cleaning and Inspecting Valve Springs	7-38
7.5.3.1	Installing the Valve Seat	7-38
7.5.4	Cleaning and Inspecting Valve Rotators	7-39
7.5.4.1	Cleaning and Inspecting Valve Spring Locks	7-40
7.6	CYLINDER HEAD REASSEMBLY	7-41
7.6.1	Cylinder Head Installation	7-43

7.6.1.1	Valve Lash Adjustment Sequence	7-48
8	ROCKER ARM ASSEMBLY, CAMSHAFT, TAPPETS & PUSH RODS	8-1
8.1	ROCKER ARM ASSEMBLY, CAMSHAFT, TAPPETS AND PUSH RODS EXPLODED VIEW	8-3
8.2	SPECIFICATIONS	8-5
8.2.1	Special Service Tools	8-6
8.2.2	Special Torque Values	8-6
8.3	ROCKER ARM REMOVAL, DISASSEMBLY AND REASSEMBLY	8-7
8.3.1	Measure Camshaft Lobe Lift	8-8
8.3.2	Disassembly	8-10
8.3.2.1	Cleaning and Inspection	8-10
8.3.3	Reassembly	8-13
8.4	CAMSHAFT, TAPPETS AND PUSH RODS	8-15
8.4.1	Camshaft Disassembly	8-18
8.4.2	Camshaft Cleaning and Inspection	8-18
8.4.3	Camshaft Reassembly	8-19
8.4.4	Camshaft Bushing Inspection	8-20
8.4.5	Camshaft Bushing Removal	8-21
8.4.6	Crankcase Bushing Bore Inspection	8-23
8.4.7	Camshaft Bushing Installation	8-24
8.4.8	Tappet Inspection	8-26
8.4.9	Push Rod Cleaning And Inspection	8-26
8.5	CAMSHAFT, TAPPET AND PUSH ROD ASSEMBLY AND INSTALLATION	8-27
8.5.1	Tappets	8-27
8.5.2	Push Rods	8-27
9	CONNECTING RODS, PISTONS, RINGS AND SLEEVES	9-1
9.1	CONNECTING RODS, PISTONS, RINGS AND LINERS EXPLODED VIEW	9-3
9.2	SPECIFICATIONS	9-5
9.2.1	Special Torque Values	9-7
9.2.2	Special Tools	9-8
9.3	CONNECTING RODS, PISTONS, RINGS AND LINERS DISASSEMBLY	9-9
9.3.1	Piston and Rod Assembly Removal	9-9
9.3.2	Cylinder Liner Removal	9-12
9.3.3	CONNECTING ROD, PISTON & RING DISASSEMBLY	9-12
9.3.4	Cylinder Liner Disassembly	9-13
9.3.5	Cleaning Connecting Rod, Piston & Rings	9-13
9.3.6	Inspect Cylinder Liners & Pistons	9-14
9.3.7	Inspect Connecting Rods	9-16
9.3.7.1	Out-of-round Check	9-17
9.3.7.2	Connecting Rod Bend and Twist	9-18
9.3.8	Inspect Pistons Pins	9-19
9.3.9	Inspect Cylinder Liners	9-19
9.3.10	Method One - Telescoping Gauge Method	9-20
9.3.11	Method Two - Dial Bore Gauge Method	9-21
9.3.12	Method Three - Feeler Gauge Method	9-22
9.3.13	Bearing Fitting Procedure	9-23
9.3.14	Cylinder Liner Fitting Procedure	9-26
9.3.14.1	Surface Gauge Method	9-26

9.3.14.2 Depth Micrometer Method	9-26
9.3.15 Setting the Depth of the Cut	9-28
9.3.15.1 Method One - Use Graduated Marks On Tool	9-28
9.3.15.2 Method Two - Use Feeler Gauge	9-29
9.4 REASSEMBLY OF CONNECTING RODS, PISTONS & RINGS	9-32
9.4.1 Cylinder Liners	9-34
9.4.2 Piston & Rod Assembly	9-35
9.4.3 Connecting Rod Bearing Inserts & Caps	9-36
9.4.4 Priming The Lubricating System	9-37
9.4.4.1 Preferred Method	9-37
9.4.4.2 Alternate Method	9-38
9.4.5 Engine Run-in Procedure	9-38
10 VIBRATION DAMPER, CRANKSHAFT, MAIN BEARINGS, FLYWHEEL & CRANKCASE	10-1
10.1 CRANKSHAFT, BEARINGS, FLYWHEEL AND RELATED COMPONENTS EXPLODED VIEW	10-3
10.2 SPECIFICATIONS	10-9
10.2.1 Special Torque Values	10-11
10.2.2 Special Service Tools	10-12
10.3 REAR OIL SEAL AND WEAR LINER REMOVAL AND REASSEMBLY	10-13
10.3.1 In-Chassis Procedure	10-13
10.3.2 Checking Flywheel Housing Bore Concentricity And Face Runout	10-13
10.3.3 Flywheel Housing Removal	10-14
10.3.4 Rear Oil Seal Carrier Removal	10-15
10.3.5 Installing Rear Oil Seal Carrier	10-15
10.3.6 Oil Seal Removal	10-17
10.3.7 Wear Liner Removal - In-chassis	10-18
10.3.8 Wear Liner Removal - Out-of-Chassis	10-19
10.3.9 Rear Oil Seal and Wear Liner Installation	10-20
10.4 FLYWHEEL RECONDITIONING AND REASSEMBLY	10-20
10.4.1 Cleaning and Inspection	10-20
10.4.2 Ring Gear Replacement	10-21
10.4.3 Flywheel Housing Installation	10-21
10.4.4 Flywheel Installation	10-22
10.5 OIL LEVEL GAUGE TUBE REMOVAL AND REASSEMBLY	10-23
10.5.1 Cleaning And Inspection	10-23
10.5.2 Reassembly	10-23
10.5.3 Oil Pan Removal	10-24
10.6 DAMPER, CRANKSHAFT AND MAIN BEARINGS RECONDITIONING	10-25
10.6.1 Pulley Damper Assembly Removal	10-25
10.6.2 Oil Pick-up Tube Removal	10-27
10.6.3 Removal Of Miscellaneous Components	10-28
10.6.4 Removal of Crankshaft and Main Bearings	10-28
10.6.5 Cleaning the Vibration Damper	10-30
10.6.6 Cleaning the Crankshaft and Main Bearings	10-30
10.6.7 Pulley Damper Assembly Inspection and Repair	10-31
10.6.8 Crankshaft and Main Bearings	10-31
10.6.9 GEAR REPLACEMENT	10-35
10.6.10 CLEANING	10-36

10.6.11 Inspection And Repair	10-37
10.6.11.1 Check Crankcase Integrity	10-38
10.7 INSTALLATION	10-40
10.7.1 Bearing Fitting Procedure	10-40
10.7.2 Main Bearing and Cap	10-41
10.7.3 Oil Pickup Tube Reassembly	10-43
10.7.4 Oil Pan	10-44
10.7.5 Vibration Damper and Pulley Assembly	10-46
10.7.6 Miscellaneous Installation	10-47
11 TIMING GEAR TRAIN AND FRONT COVER	11-1
11.1 CRANKCASE FRONT COVER AND RELATED PARTS EXPLODED VIEW	11-3
11.2 SPECIFICATIONS	11-7
11.2.1 Special Torques	11-7
11.2.2 Special Service Tools	11-7
11.3 ENGINE GEAR TRAIN TIMING	11-8
11.3.1 Checking Engine Gear Train Timing Without Removing Front Cover And/ Or Engine Tear Down.	11-8
11.3.1.1 Method One -- Using A Feeler Gauge	11-8
11.3.1.2 Method Two -- Using A Dial Indicator	11-8
11.4 FRONT COVER	11-10
11.4.1 Removal	11-10
11.4.2 Cleaning	11-17
11.4.3 Inspection	11-17
11.5 TIMING GEAR TRAIN	11-18
11.5.1 Inspection Prior To Removal	11-18
11.5.2 Removal of Idler Gear Assemblies	11-22
11.5.3 Removal of Camshaft Gear and Crankshaft Gear	11-23
11.5.4 Removal of the Front Cover (Rear Half)	11-23
11.5.5 Cleaning and Inspecting the Front Cover	11-23
11.5.6 Cleaning and Inspecting the Idler Gear Assemblies	11-24
11.6 INSTALLATION	11-24
11.6.1 Installation of Lower and Upper Idler Gear	11-25
11.6.2 Installation of Front Cover (Front Half)	11-27
11.6.3 Installation of Injection Pump Drive Gear Access Cover	11-27
11.6.4 Installation of Air Compressor/Power Steering Pump (If Applicable) ..	11-28
11.6.5 Installation of Fan Hub and Pulley	11-31
11.6.6 Installation of Serpentine Belt	11-32
11.6.7 Component Installation	11-32
12 LUBRICATING OIL PUMP, OIL FILTERS & COOLER	12-1
12.1 LUBRICATION SYSTEM EXPLODED VIEWS	12-3
12.2 SPECIFICATIONS	12-9
12.2.1 Special Torques	12-10
12.2.2 Special Service Tools	12-10
12.3 LUBRICATING OIL PUMP	12-11
12.3.1 Removal	12-11
12.3.2 Cleaning	12-13
12.3.3 Inspection and Repair	12-13
12.3.4 Reassembly	12-14
12.4 OIL FILTER AND HEADER	12-18
12.4.1 Removal	12-18

12.4.1.1 Leakage Test	12-21
12.4.2 Disassembly	12-22
12.4.3 Cleaning	12-22
12.4.4 Inspection and Repair	12-23
12.4.5 Reassembly	12-23
12.4.6 Installation	12-23
13 WATER PUMP AND THERMOSTAT	13-1
13.1 FAN DRIVE, THERMOSTAT AND WATER PUMP EXPLODED VIEW	13-3
13.2 SPECIFICATIONS	13-5
13.2.1 Special Torque Values	13-5
13.2.2 Special Service Tools	13-5
13.3 WATER PUMP	13-7
13.3.1 Removal	13-7
13.3.2 Inspection	13-8
13.3.3 Installation	13-8
13.4 THERMOSTAT	13-9
13.4.1 Removal	13-9
13.4.2 Inspection	13-9
13.4.3 Installation	13-12
13.5 COOLANT FILTER	13-12
13.5.1 Removal	13-12
13.5.2 Installation	13-13
13.6 WATER INLET ELBOW	13-14
13.6.1 Removal	13-14
13.6.2 Installation	13-14
14 FUEL INJECTION PUMP	14-1
14.1 FUEL INJECTION PUMP EXPLODED VIEW	14-3
14.2 SPECIFICATIONS	14-13
14.2.1 Special Torques	14-14
14.3 FUEL INJECTION PUMP REMOVAL	14-15
14.3.1 Set Injection Pump to Engine Timing Prior to Pump Removal	14-15
14.3.2 Verify Injection Pump to Engine Timing	14-16
14.3.3 Removing the Fuel Filter	14-17
14.4 FUEL INJECTION PUMP REASSEMBLY	14-28
14.4.1 In-Chassis	14-28
14.4.1.1 Installation Of Electric Shut-off Solenoid	14-31
14.4.1.2 Adjustment Of Electric Shut-off Solenoid Injection Pump	14-31
14.4.2 In-Chassis (continued)	14-32
14.4.3 Priming Fuel Injection System	14-39
15 NOZZLES	15-1
15.1 FUEL INJECTION NOZZLE EXPLODED VIEW	15-3
15.2 SPECIFICATIONS	15-5
15.2.1 Special Torques	15-5
15.3 TROUBLESHOOTING	15-7
15.4 IDENTIFICATION	15-9
15.5 REMOVAL	15-11
15.6 PRE-RECONDITIONING INSPECTION	15-14
15.7 DISASSEMBLY	15-17
15.8 CLEANING, COMPONENT INSPECTION AND REPAIR	15-19

15.8.1 Component Inspection and Repair	15-20
15.9 FLAT LAPPING PROCEDURES	15-21
15.9.1 Dry Lapping	15-22
15.10 CARE AND RECONDITIONING LAPPING BLOCKS	15-23
15.10.1 Inspection	15-23
15.11 REASSEMBLY	15-24
15.12 RETESTING AND ADJUSTING CLEAN NOZZLE ASSEMBLIES ...	15-25
15.13 INSTALLATION	15-27

DIAGNOSTICS

16 DIAGNOSTIC ANALYSIS	16-1
16.1 DEFINITION	16-3
16.2 DIAGNOSTIC ANALYSIS PROCEDURES	16-3
16.2.1 Oil Consumption	16-3
16.2.2 Fuel Consumption	16-4
16.2.3 High Coolant Temperature Or Loss	16-4
16.2.4 Combustion Leakage - The Pop Bottle Test	16-5
16.2.5 Excessive Exhaust Smoke	16-5
16.2.6 Low Power	16-6
16.2.7 Fuel Dilution	16-7
16.2.8 Coolant In Lubricating Oil Or Lubricating Oil In Coolant	16-7
16.2.9 Pressure (Leakage) Test Procedure Engine Crankcase	16-7
16.2.10 High Intake Manifold Pressure (Excessive Fuel Consumption)	16-8
16.2.11 Excessive Crankcase Pressure	16-8
16.2.12 Low Fuel Supply Pressure	16-8
16.2.13 Excessive Engine Speed	16-8
16.2.14 Excessive Air Inlet Restriction	16-9
16.2.15 Short Fuel Filter Life	16-9
17 ENGINE PERFORMANCE ANALYSIS GUIDES	17-1
17.1 INTRODUCTION	17-3
17.2 INSTRUCTIONS FOR PERFORMANCE ANALYSIS GUIDES	17-4
17.3 ENGINE TEST NOMENCLATURE	17-5
17.3.1 Injection Pump Timing	17-5
17.3.2 Engine Speed	17-6
17.3.3 Intake Manifold Pressure - Boost	17-6
17.3.3.1 Definition Of A/R Number	17-6
17.3.4 Exhaust Back Pressure	17-7
17.3.5 Smoke Level Test	17-7
17.3.6 Crankcase Pressure	17-7
17.3.7 Fuel Pressure	17-7
17.3.8 Air Cleaner Restriction	17-7
18 ENGINE DIAGNOSTIC TOOLS	18-1
18.1 NECESSARY DIAGNOSTIC TOOLS	18-3
18.2 DESIGN TECHNOLOGY "TECH TIME"	18-6
18.2.1 Transducer Installation	18-6
18.2.2 Operation	18-6
18.3 HANDHELD ELECTRONIC TACHOMETER	18-7
18.3.1 Operation	18-7
18.4 TIMING PINS	18-8

18.4.1 Timing Pin	18-8
18.4.2 Plunger Timing Pin	18-8
18.5 BEYERS MODEL 200 PRESSURE TEST KIT	18-9
18.5.1 Maintenance and Gauge Accuracy Test	18-10
18.5.2 Operating Instructions	18-10
18.6 DWYER SLACK TUBE MANOMETER	18-11
18.6.1 Filling	18-11
18.6.2 Installing and Reading	18-11
18.6.3 Cleaning	18-12
18.7 WAGER PORTABLE SMOKE METER - MODEL 650A	18-13
18.7.1 Installation and Operation	18-13
18.8 ROBERT BOSCH SMOKE SAMPLING KIT (SE-2580)	18-14
18.8.1 Operation	18-14
18.9 CRANKCASE PRESSURE ORIFICED RESTRICTOR	18-15
18.9.1 Operation	18-15
18.10 COOLING SYSTEM AND RADIATOR CAP TESTER	18-16
18.10.1 Operation	18-16
18.11 INJECTOR NOZZLE TESTER	18-17
18.11.1 Operation	18-17
19 ENGINE DIAGNOSTIC TEST PROCEDURES	19-1
19.1 DIAGNOSTIC ANALYSIS GUIDE FOR THE SERIES 40	19-3
19.2 SUFFICIENT CLEAN FUEL - TEST 1	19-5
19.2.1 Fuel Quality	19-5
19.3 EXTERNAL LEAKAGE - TEST 2	19-6
19.3.1 Engine Coolant Leakage Test	19-6
19.3.2 Air Induction System Pressure Test	19-6
19.3.2.1 Test Procedure	19-6
19.3.2.2 Visual Inspection	19-8
19.4 SHUTOFF CABLE/ELECTRIC SHUTOFF - TEST 3	19-9
19.4.1 Shutoff Cable (Manual Shutoff)	19-9
19.4.1.1 Adjustment	19-9
19.4.2 Electric Shutoff (Automatic Shutoff) 12 or 24 Volt	19-10
19.4.2.1 Adjustment Procedure	19-11
19.4.2.2 Worn Solenoid	19-12
19.5 INJECTION PUMP STATIC TIMING (ENGINE STOPPED) - TEST 4	19-13
19.5.1 (Static) Timing Check	19-13
19.6 THROTTLE CABLE CHECK - TEST 5	19-15
19.6.1 Throttle Cable Adjustment Procedure	19-15
19.7 LOW IDLE SPEED - TEST 6	19-17
19.7.1 Low Idle Speed Adjustment	19-17
19.8 HIGH IDLE SPEED (NO LOAD) - TEST 7	19-18
19.8.1 High Idle Adjustment	19-19
19.9 AIR CLEANER MAXIMUM RESTRICTION - TEST 8	19-20
19.9.1 Inspect Air Intake Restriction Indicator	19-20
19.9.2 Single Element Air Cleaner	19-20
19.9.3 Dual Element Cleaner	19-21
19.9.4 Visual Check Procedure	19-22
19.10 TRANSFER PUMP PRESSURE AND INLET RESTRICTION CHECK - TEST 9	19-24
19.10.1 Test Transfer Pump Pressure	19-24
19.10.2 Inlet Restriction Test	19-25
19.11 INTAKE MANIFOLD PRESSURE - TEST 10	19-26

18.4.1 Timing Pin	18-8
18.4.2 Plunger Timing Pin	18-8
18.5 BEYERS MODEL 200 PRESSURE TEST KIT	18-9
18.5.1 Maintenance and Gauge Accuracy Test	18-10
18.5.2 Operating Instructions	18-10
18.6 DWYER SLACK TUBE MANOMETER	18-11
18.6.1 Filling	18-11
18.6.2 Installing and Reading	18-11
18.6.3 Cleaning	18-12
18.7 WAGER PORTABLE SMOKE METER - MODEL 650A	18-13
18.7.1 Installation and Operation	18-13
18.8 ROBERT BOSCH SMOKE SAMPLING KIT (SE-2580)	18-14
18.8.1 Operation	18-14
18.9 CRANKCASE PRESSURE ORIFICED RESTRICTOR	18-15
18.9.1 Operation	18-15
18.10 COOLING SYSTEM AND RADIATOR CAP TESTER	18-16
18.10.1 Operation	18-16
18.11 INJECTOR NOZZLE TESTER	18-17
18.11.1 Operation	18-17
19 ENGINE DIAGNOSTIC TEST PROCEDURES	19-1
19.1 DIAGNOSTIC ANALYSIS GUIDE FOR THE SERIES 40	19-3
19.2 SUFFICIENT CLEAN FUEL - TEST 1	19-5
19.2.1 Fuel Quality	19-5
19.3 EXTERNAL LEAKAGE - TEST 2	19-6
19.3.1 Engine Coolant Leakage Test	19-6
19.3.2 Air Induction System Pressure Test	19-6
19.3.2.1 Test Procedure	19-6
19.3.2.2 Visual Inspection	19-8
19.4 SHUTOFF CABLE/ELECTRIC SHUTOFF - TEST 3	19-9
19.4.1 Shutoff Cable (Manual Shutoff)	19-9
19.4.1.1 Adjustment	19-9
19.4.2 Electric Shutoff (Automatic Shutoff) 12 or 24 Volt	19-10
19.4.2.1 Adjustment Procedure	19-11
19.4.2.2 Worn Solenoid	19-12
19.5 INJECTION PUMP STATIC TIMING (ENGINE STOPPED) - TEST 4	19-13
19.5.1 (Static) Timing Check	19-13
19.6 THROTTLE CABLE CHECK - TEST 5	19-15
19.6.1 Throttle Cable Adjustment Procedure	19-15
19.7 LOW IDLE SPEED - TEST 6	19-17
19.7.1 Low Idle Speed Adjustment	19-17
19.8 HIGH IDLE SPEED (NO LOAD) - TEST 7	19-18
19.8.1 High Idle Adjustment	19-19
19.9 AIR CLEANER MAXIMUM RESTRICTION - TEST 8	19-20
19.9.1 Inspect Air Intake Restriction Indicator	19-20
19.9.2 Single Element Air Cleaner	19-20
19.9.3 Dual Element Cleaner	19-21
19.9.4 Visual Check Procedure	19-22
19.10 TRANSFER PUMP PRESSURE AND INLET RESTRICTION CHECK - TEST 9	19-24
19.10.1 Test Transfer Pump Pressure	19-24
19.10.2 Inlet Restriction Test	19-25
19.11 INTAKE MANIFOLD PRESSURE - TEST 10	19-26

19.11.1 Intake Manifold Pressure Check	19-26
19.12 CRANKCASE PRESSURE – TEST 11	19-27
19.13 WASTEGATE ACTUATOR CONDITION – TEST 12	19-28
19.14 ANEROID DIAPHRAGM – TEST 13	19-29
19.15 TEST INJECTION NOZZLES – TEST 14	19-30
19.16 EXHAUST BACK PRESSURE – TEST 15	19-33
19.17 MEASURE SMOKE INTENSITY – TEST 16	19-34
19.17.1 Smokemeter Table For Service	19-36
19.18 INTAKE AND EXHAUST VALVE CLEARANCE – TEST 17	19-38
20 PERFORMANCE DATA GUIDELINES	20-1
20.1 6.7LTA PERFORMANCE DATA GUIDELINES	20-3
20.2 7.6LTA PERFORMANCE DATA GUIDELINES	20-11
20.3 8.7LTA PERFORMANCE DATA GUIDELINES	20-21

APPENDIX

APPENDIX A: GENERAL ENGINE SPECIFICATIONS	A-1
A.1 6.7L ENGINE SPECIFICATION	A-1
A.2 7.6L ENGINE SPECIFICATION	A-2
A.3 8.7L ENGINE SPECIFICATION	A-3
A.4 ENGINE POWER RATINGS CHART	A-4
A.5 POWER RATINGS & SPEED SETTINGS	A-5
APPENDIX B: COMPONENT SPECIFICATIONS	B-1
B.1 TURBOCHARGER	B-1
B.1.1 INTAKE MANIFOLD	B-1
B.1.2 EXHAUST MANIFOLD	B-1
B.1.3 EXHAUST VALVES	B-1
B.1.4 INTAKE VALVES	B-1
B.2 CYLINDER HEAD	B-2
B.3 CYLINDER LINER	B-3
B.3.1 VALVE SPRINGS	B-4
B.4 CAMSHAFT	B-4
B.4.1 VALVE LEVER AND SHAFT ASSEMBLY	B-5
B.4.2 TAPPETS ROLLER	B-5
B.4.3 PUSH ROD	B-6
B.4.4 VALVE LEVER SHAFT SPRINGS	B-6
B.5 CONNECTING RODS	B-6
B.6 PISTONS	B-7
B.6.1 PISTON RINGS – COMPRESSION	B-8
B.6.2 PISTON RINGS – OIL CONTROL	B-8
B.6.3 PISTON PINS	B-9
B.7 CRANKSHAFT	B-9
B.8 CRANKCASE	B-10
B.9 OIL PUMP:	B-11
B.9.1 ENGINE OIL FILTER	B-11
B.9.2 COOLANT FILTER	B-11
B.9.3 BYPASS VALVE SPRING	B-12
B.9.4 PRESSURE REGULATOR VALVE SPRING	B-12
B.9.5 PRESSURE REGULATOR VALVE ASSEMBLY	B-12
B.10 THERMOSTAT	B-12
B.11 INJECTION PUMP	B-13

TABLE OF CONTENTS

B.11.1 FUEL FILTER	B-13
B.12 NOZZLES	B-13
APPENDIX C: TORQUE DATA	C-1
C.1 TENSION VALUES FOR STANDARD FASTENERS	C-1
C.2 FASTENER THREAD CONDITION	C-1
C.3 SPECIAL NUT AND BOLT TORQUE DATA	C-2
APPENDIX D: SPECIAL TOOLS	D-1
APPENDIX E: CONVERSION TABLES	E-1
E.1 METRIC CONVERSION FACTOR	E-1
E.2 CONVERSION TO MILLIMETER EQUIVALENTS	E-3
APPENDIX F: STANDARD UNITS OF MEASUREMENT	F-1

1 SAFETY SUGGESTIONS

Keep work area organized and clean. Wipe up oil spills of any kind. Keep tools and parts off floor. Eliminate the possibility of a fall which could result in a serious injury.

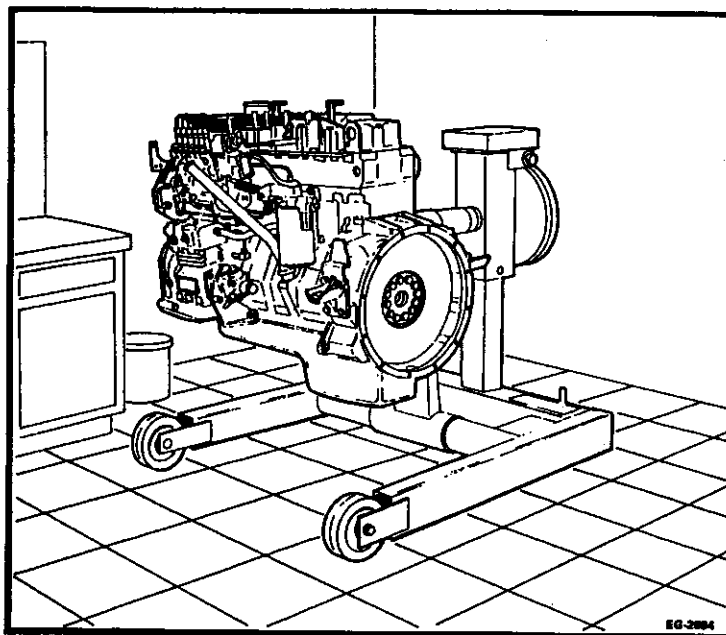


FIGURE 1-1 A Clean and Organized Work Space

Be sure to reinstall safety devices, guards or shields after adjusting and/or servicing the engine.



FIGURE 1-2 Safe Work Clothing

After servicing, be sure all tools, parts, or servicing equipment are removed from the vehicle or engine.

Be sure to wear safe work clothing. It should be well fitted and in good condition.

Do not wear rings, wrist watches or loose fitting clothing, when working on machinery, they could catch on moving parts causing serious injury. Wear sturdy, rough-soled work shoes. Never adjust and/or service a machine in bare feet, sandals or sneakers.

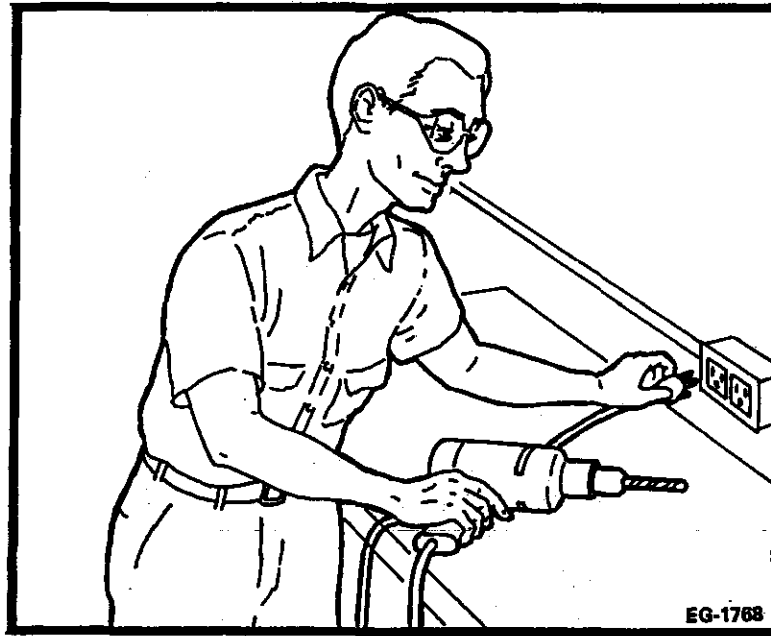


FIGURE 1-3 Using Safe Power Tools

Do not use defective portable power tools. Check for frayed cords prior to using the tool. Be sure all electric tools are grounded. Severe injury can occur if electrical equipment is defective or not used properly.

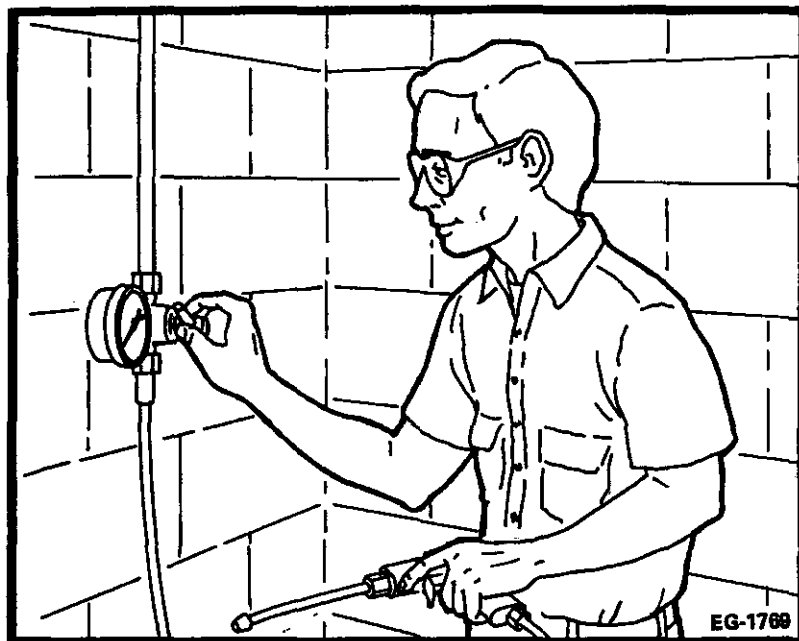


FIGURE 1-4 Using Compressed Air Safely

Be careful when using compressed air. Never apply compressed air to any part of the body or clothing, severe injury can occur.

Use approved air blow guns, do not exceed recommended pressure. Wear safety glasses or goggles and use proper shielding to protect everyone in the work area.

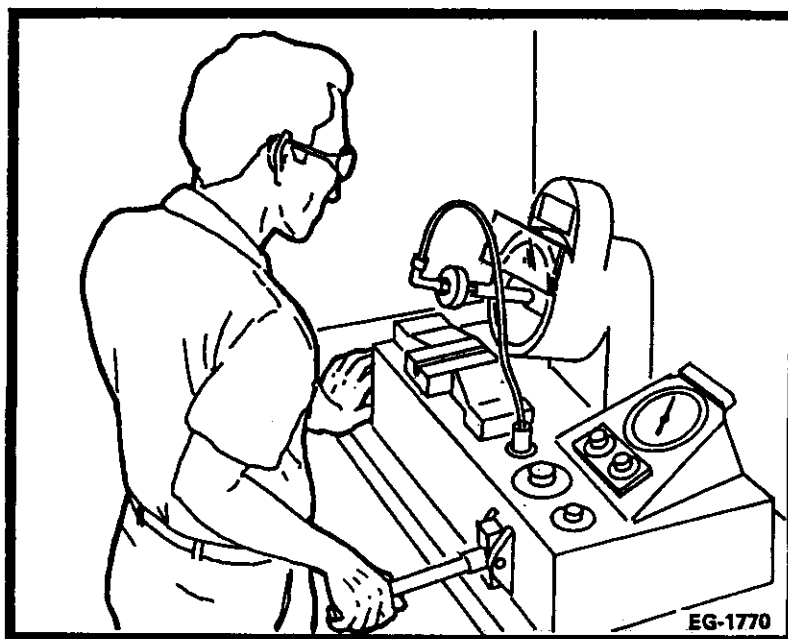


FIGURE 1-5 Dealing with Fluids Under Pressure

Be extremely careful when dealing with fluids under pressure.

Fluid under pressure can have enough force to penetrate the skin. These fluids may also infect a minor cut or opening the skin. If injured by escaping fluid, see a doctor at once. Serious infection or reaction can result if medical treatment is not given immediately.

Never put your hands in front of fluid under pressure.



FIGURE 1-6 Refueling

When refueling, keep the hose and nozzle or the funnel and container in contact with the metal of the fuel tank to avoid the possibility of an electric spark igniting the fuel.

Do not over fill the fuel tank – overflow creates a fire hazard.

Do not smoke when refueling and never refuel when the engine is running.

Electric storage batteries give off highly flammable hydrogen gas when charging and continue to do so for some time after receiving a steady charge.

Do not under any circumstances allow an electric spark or open flame near the battery or explosion may occur.

Always disconnect a battery cable before working on the electrical system.

Keep a “charged” fire extinguisher within reach whenever you work in an area where fire may occur.

Also, be sure you have the correct type of extinguisher for the situation:

Type A: Wood, Paper, Textile and Rubbish

2 ENGINE IDENTIFICATION

The permanent engine serial number is stamped on the left side of engine (FIGURE 2-1).

The Engine Emission Label identifies engine model code and year manufactured. The Emission Label is located on the top of the valve cover/intake manifold (FIGURE 2-1).

Other nameplates are located on the turbocharger fuel injection pump and starter. These nameplates show manufacturer and specifications and are important to assist operator or maintenance personnel as to what equipment is on the engine and its operating conditions.

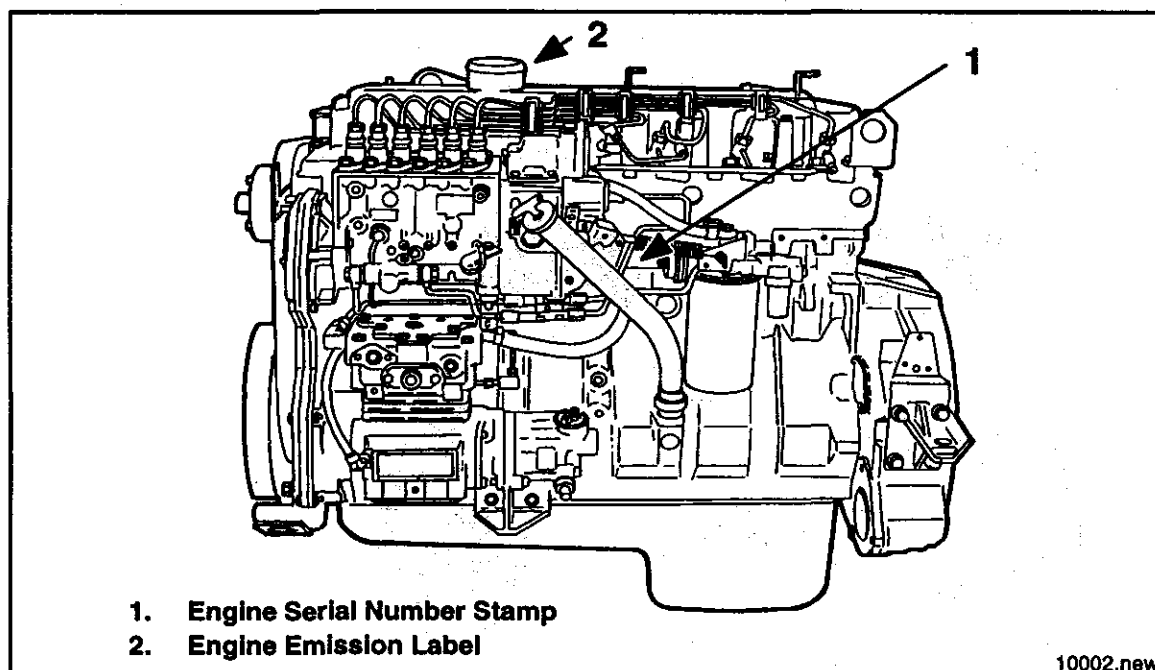


FIGURE 2-1 Location of the Engine Serial Number Stamp and the Engine Emission Label

Build List	Country Of Origin	Serial Sequence Number
W (Alphanumeric) _ _ _ _ _	N	000000

Build List	Country of Origin	Serial Sequence Number
WD _ _ _ _ 6.7 TA	N = USA	000000
WE _ _ _ _ 6.7 TA		
WF _ _ _ _ 7.6 T		
WG _ _ _ _ 7.6 TA		
WH _ _ _ _ 8.7 T		
WJ _ _ _ _ 8.7 TA		

TABLE 2-1 Engine Serial Number Chart

2.1 INJECTION PUMP IDENTIFICATION

Identification of the injection pump and governor assemblies can be made by referring to the I.D. plates as follows:

2.1.1 Model PES6P (7100) Fuel Injection Pump

INJECTION PUMP HOUSING I.D. PLATE – is located on the left side of the pump housing (**FIGURE 2-2**). The pump serial number and Bosch combination number are found at this location.

GOVERNOR I.D. PLATE – is located on the rear of governor housing (**FIGURE 2-2**). The Navistar/DDC Part No. for the complete injection pump and governor assembly, as well as the Bosch governor number, size and rating are found at this location.

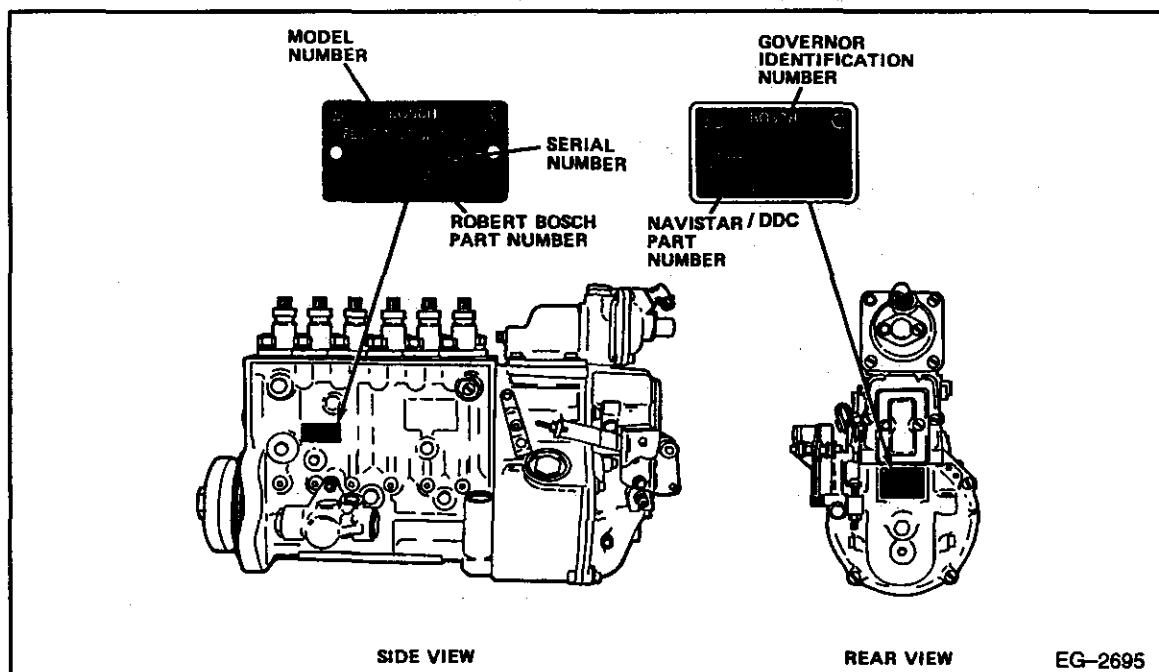


FIGURE 2-2 The Injection Pump Housing I.D. Plate and the Governor I.D. Plate

Code for Bosch Combination Number

PES 6P 100 A 320L 63309
PE = Inline injection pump
S = flange mounted
6 = Number of cylinders
P = "P" size pump
100 = Plunger diameter in 1/10 mm
A = Pump model
320 = Number code for location of feed pump and governor
L = Rotation of pump as seen from drive end (right hand clockwise)
63309 = Application number
RR = Reverse rotation of pump as seen from drive end (right hand clockwise)

Code for Bosch Governor Number

RQV-K 350-1300 PA 1042-BK
R = Flywheel governor
Q = Fulcrum lever model
V = Variable speed governing (all-speed)
350 = Low idle pump speed
1300 = Full load rated speed
PA = Fits on "P" size pump
1042 = Application number

2.1.2 Model PES6P (3000) Fuel Injection Pump

Identification of the injection pump and governor assemblies can be made by referring to the I.D. plates as follows:

INJECTION PUMP HOUSING I.D. PLATE – is located on the left side of the pump housing (FIGURE 2–3). The manufacturer's serial number, Bosch combination number and pump part number are found at this location.

GOVERNOR I.D. PLATE – is located on the rear of the governor housing (FIGURE 2–3). The Navistar/DDC Part No. for the complete injection pump and governor assembly, as well as the Bosch governor identification number, size and rating are found at this location.

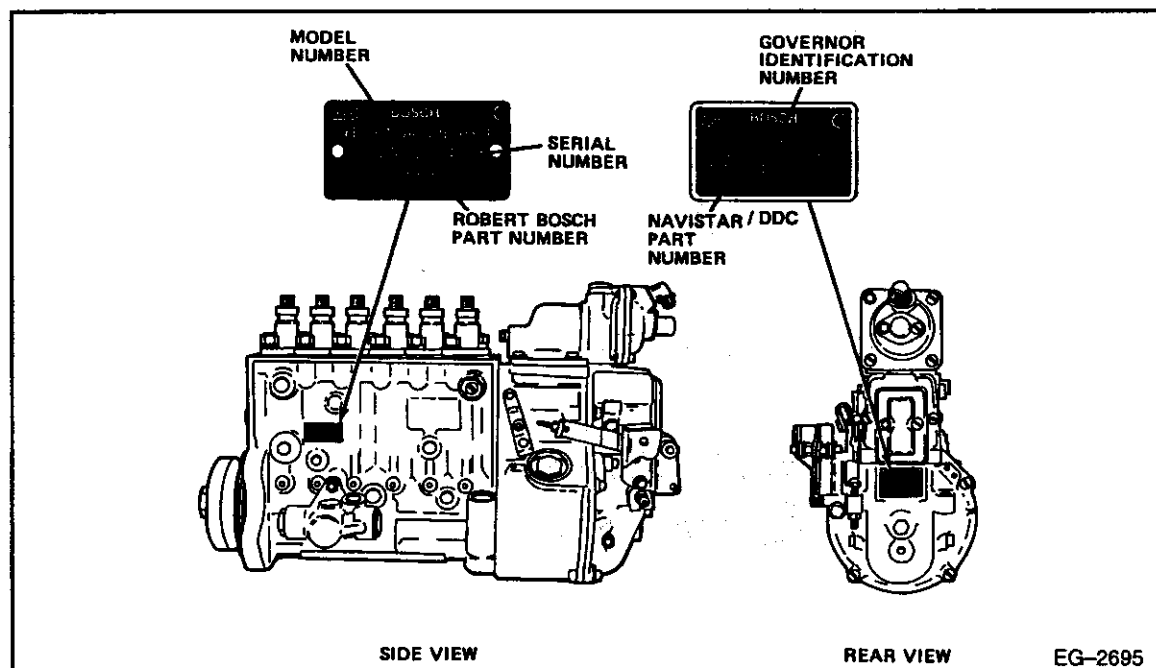


FIGURE 2–3 The Injection Pump Housing I.D. Plate and the Governor I.D. Plate

Code for Bosch combination number

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PE = Inline injection pump
S = flange mounted
6 = Number of cylinders
P = "P" size pump
100 = Plunger diameter in 1/10 mm
A = Pump model
320 = Number code for location of feed pump and governor
L = Rotation of pump as seen from drive end (right hand clockwise)
63309 = Application number

Code for Bosch governor number

RQV-K 350-1300 PA 1042-BK
R = Flywheel governor
Q = Fulcrum lever model
V = Variable speed governing (all-speed)
350 = Low idle pump speed
1300 = Full load rated speed
PA = Fits on "P" size pump
1042 = Application number

2.2 TURBOCHARGER IDENTIFICATION

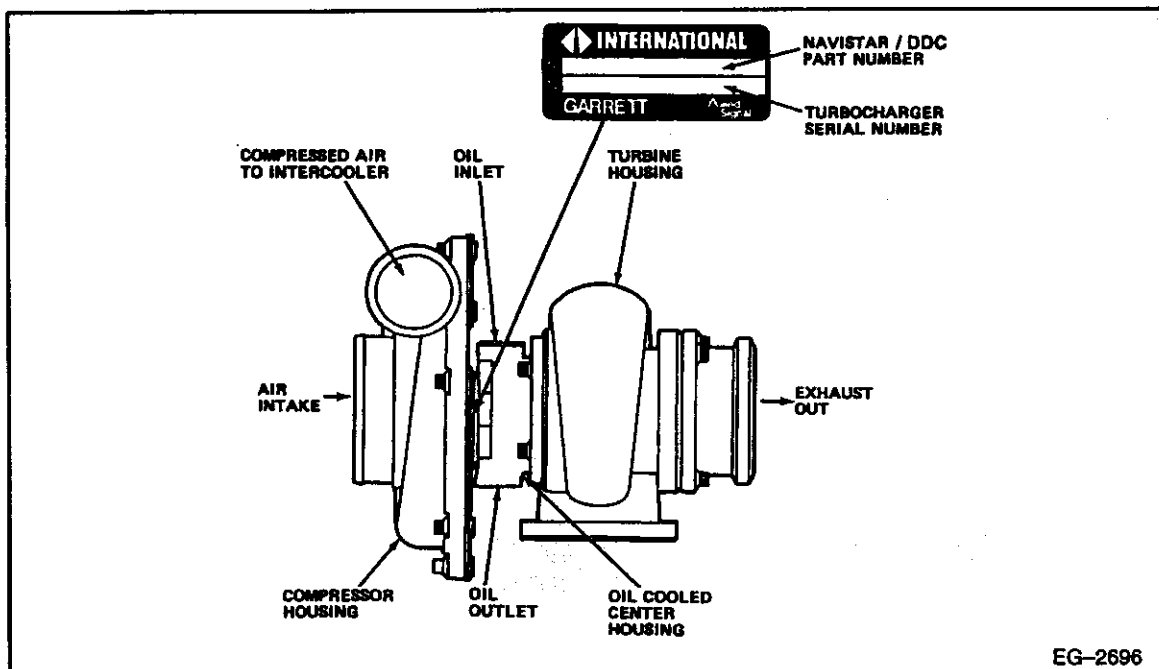


FIGURE 2-4 I.D. Plate on the Non Wastegated Turbocharger

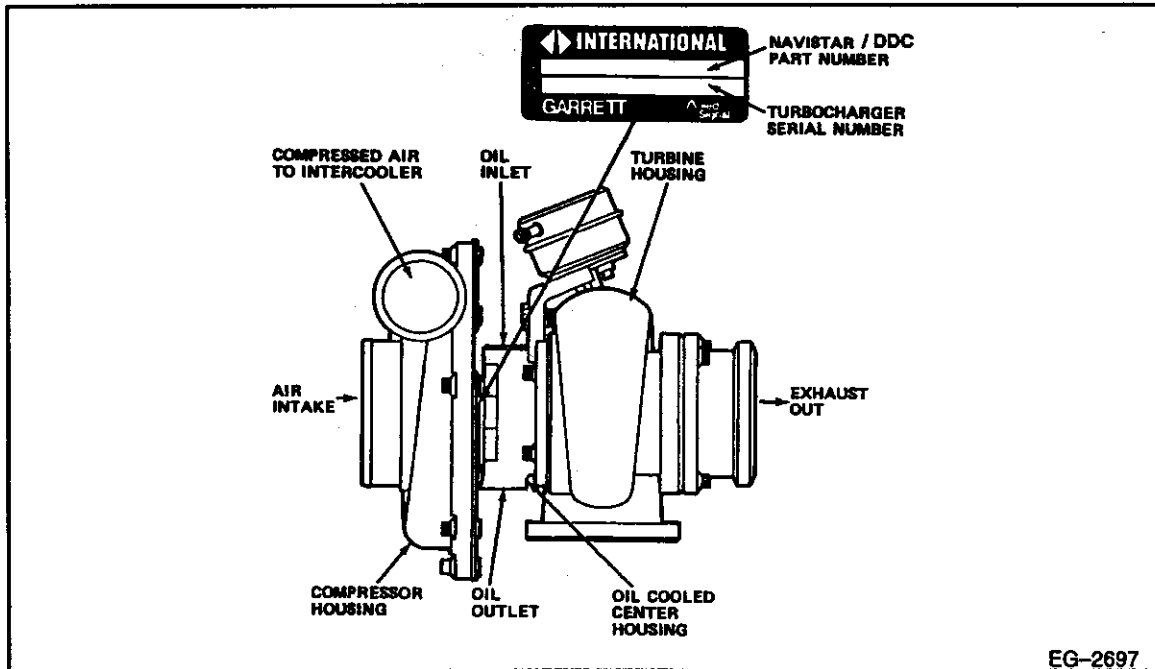


FIGURE 2-5 I.D. Plate on the Wastegated Turbocharger

3 GENERAL FEATURES

Series 40 engines are inline six cylinder, four cycle, water-cooled, direct injection diesel engines.

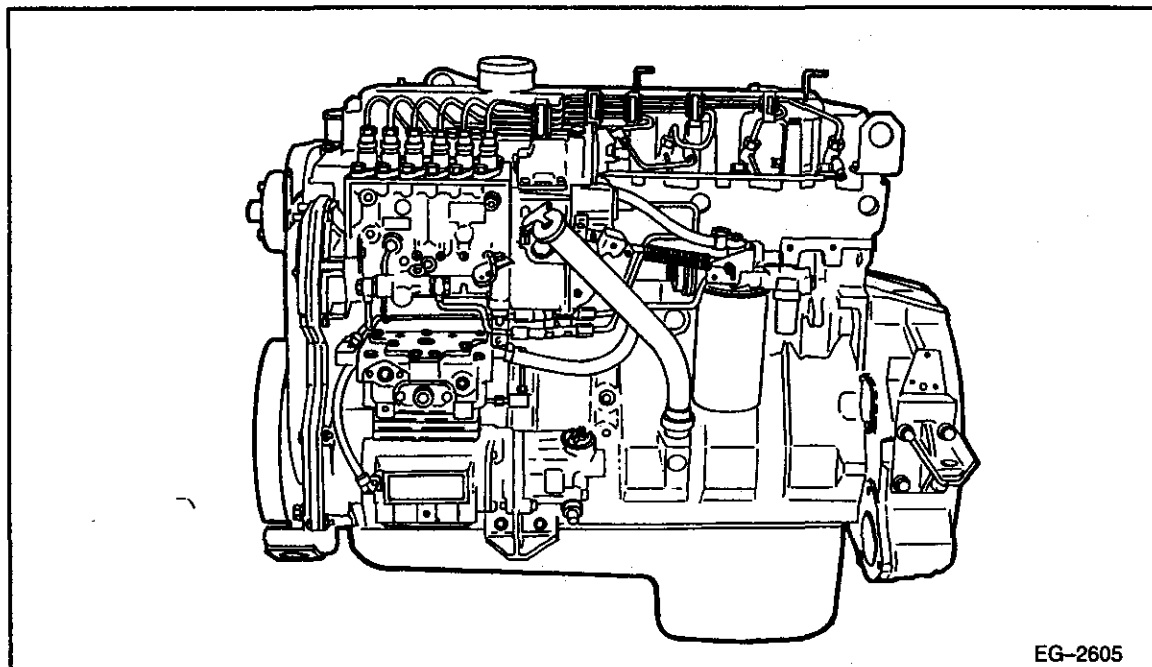


FIGURE 3-1 A Series 40 Engine

Proven premium features have been designed into this series of engines such as a GEROTOR type lube oil pump with cast water and oil passages in the crankcase and front cover. Replaceable wet type cylinder sleeves, one piece cylinder head, cast aluminum alloy pistons, forged tee pee connecting rods and a forged steel crankshaft with induction hardened journals and undercut fillets are used. A single spin-on type lube oil filter and one fuel filter and fuel strainer are engine mounted.

All models of the engine come equipped with an oil cooler. The GEROTOR lube oil pump is mounted to the front cover and driven directly by the crankshaft at engine speed. With the exception of the air compressor, fuel injection pump and turbocharger oil supply, there is no external lube oil piping used.

The crankshaft is supported on seven precision insert bearings and camshaft on four pre-reamed bushings. The rod and main bearing caps are mated parts and are stamped for identification and are not interchangeable.

Each engine main bearing web has angled, drilled holes which are fitted with jet tubes that direct lube oil, under pressure, to the underside of each piston.

3.1 CHASSIS MOUNTED AIR-TO-AIR INTERCOOLER

The air-to-air intercooler is chassis mounted in front or next to radiator. Air from the turbocharger is pushed through a network of heat exchanger tubes prior to entering the intake manifold. Outside air flowing over the tubes and fins serves to cool the charge air.

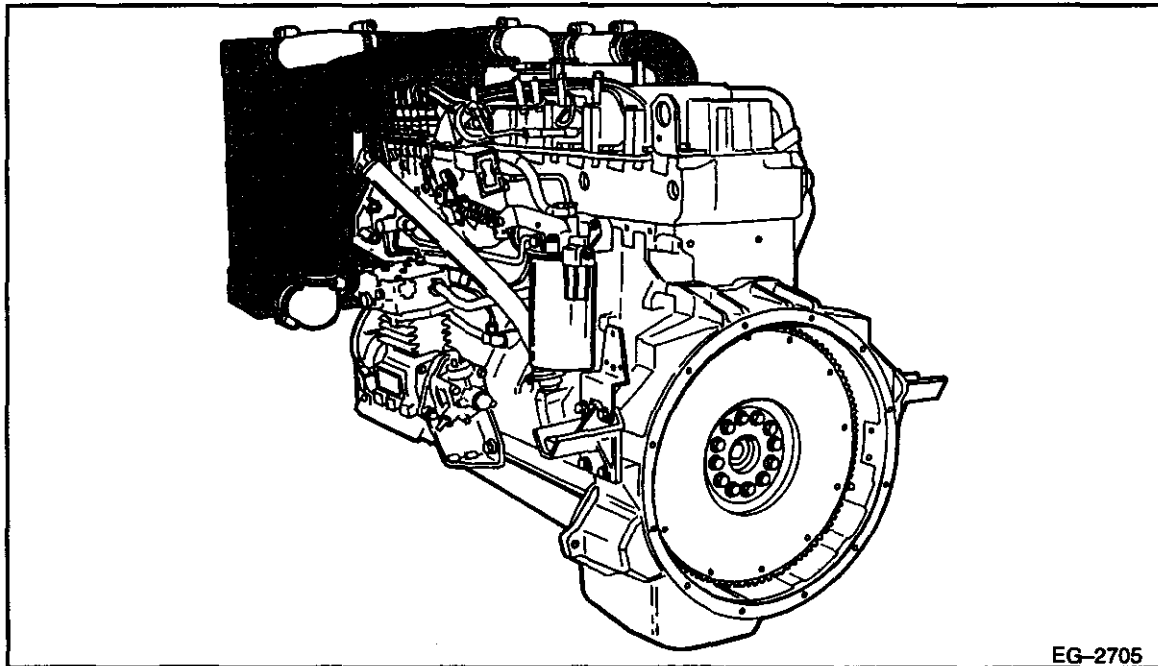


FIGURE 3-2 Air Intake Piping

3.2 COOLING SYSTEM

The function of the cooling system is to keep the engine within a designated temperature range. Major components of most cooling systems include a radiator and fan combination with a coolant (water) pump, thermostat, oil cooler, and coolant filter. On these engines, the water pump is a belt-driven centrifugal type, which is set into the front cover.

This front cover incorporates two separate passages. One passage to channel coolant to the crankcase from the water pump, the other is a by pass to route coolant back to the water pump when the thermostat is closed.

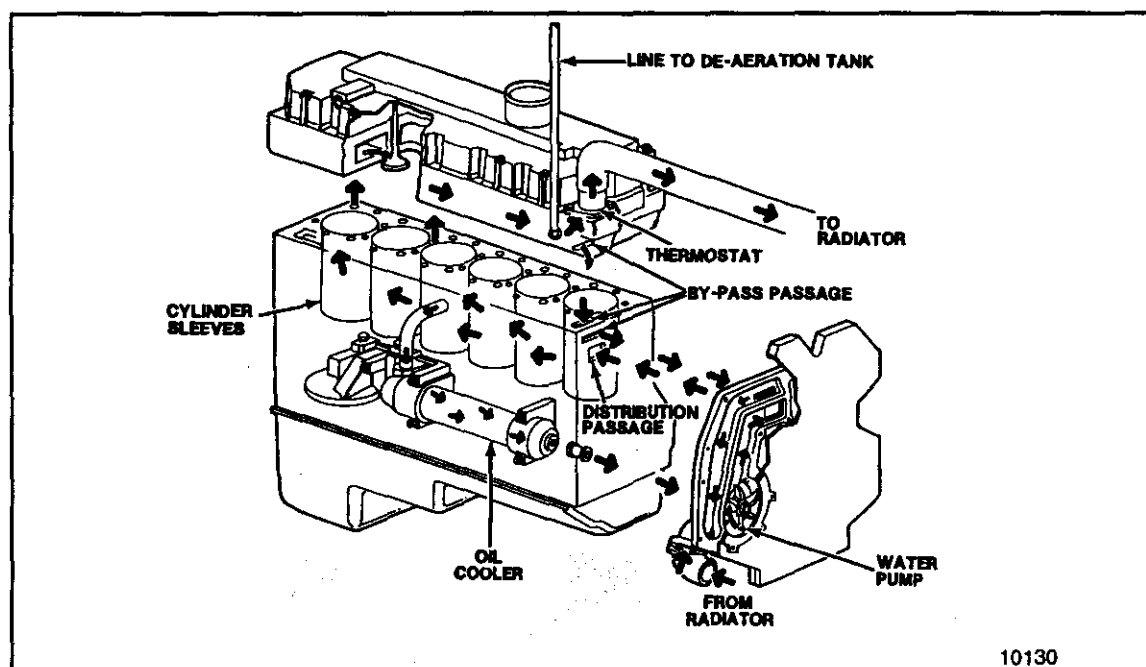


FIGURE 3-3 The Cooling System

3.2.1 Coolant Flow System

Coolant flows from the bottom of the radiator into the inlet tube of the front cover and onto the water pump. The coolant is pushed by the impeller of the water pump, through an internal passage in the front cover and out to the crankcase.

An internal passageway located in the crankcase directs coolant from front to rear, evenly distributing coolant to the lower sections of the cylinder sleeves. The coolant flow is directed toward each cylinder sleeve on a tangent causing a swirling motion upward towards the cylinder head. This swirling action improves heat dissipation.

Coolant leaves the area around the cylinder sleeves in the following two ways:

1. The coolant is directed to the oil cooler via an exterior tube leading to the rear oil cooler header. Coolant flows through passages in the oil cooler

and exits at the water pump to be re-mixed with incoming coolant from the radiator.

Coolant is supplied to rear of air compressor from left side of crankcase. After coolant exists at front of air compressor, it is returned via passage.

2. Coolant exits from the crankcase through two cored holes at the top of each cylinder sleeve bore.

Coolant then flows through the cylinder head to the thermostat. The thermostat housing incorporates two outlets to direct coolant either to the radiator when the engine is at operating temperature, or directly back to the water pump when the engine has not yet reached operating temperature.

3.2.1.1 Thermostat Operation

See FIGURE 3-4.

When the engine coolant temperature is below specified thermostat opening temperature, the coolant flows through the bypass passage to the water pump because the radiator outlet port is blocked. As the engine reaches operating temperature, the thermostat opens, directing coolant towards the radiator; this also restricts the bypass opening.

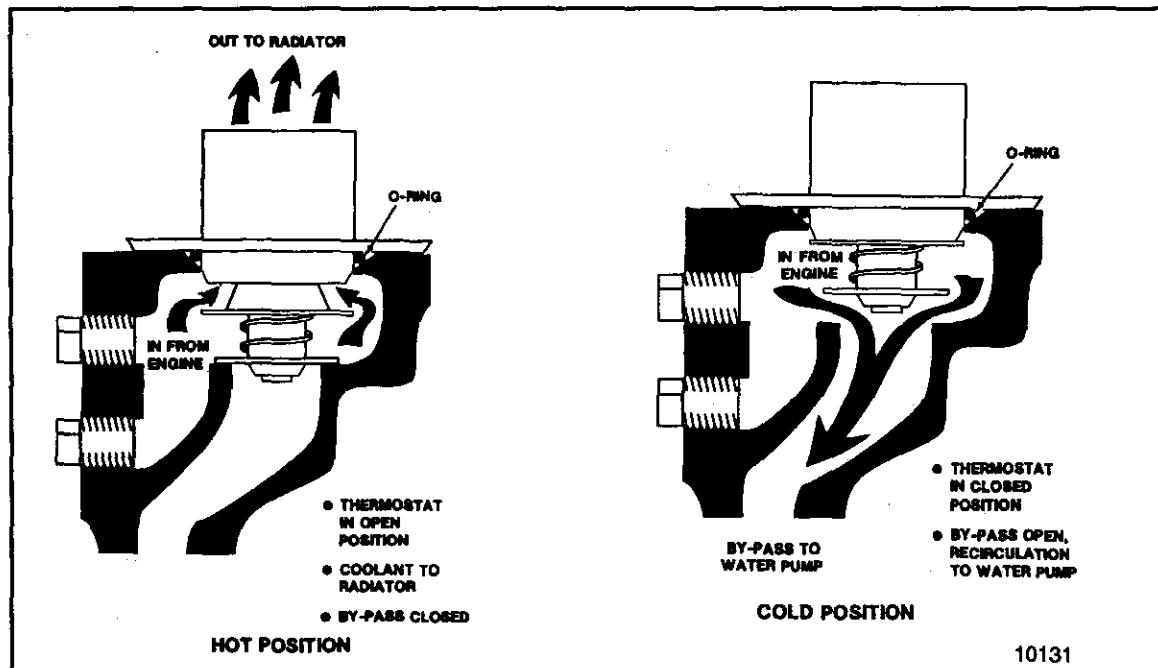


FIGURE 3-4 The Thermostated in Open and Closed Position

3.3 LUBRICATION SYSTEM

The pressurized lubricating oil system is a full flow filtered and cooled type with filter bypass valve and pressure regulation. External oil piping is kept to a minimum to avoid oil psi relief.

3.3.1 Location

The GEROTOR oil pump is mounted on front cover and is driven by the engine crankshaft at the front of the engine, at engine speed. The right side of the engine has an oil cooler, replaceable full flow oil filter, turbocharger oil line, and crankcase breather tube. The left side of the engine has the oil filler tube, oil level gauge, and oil supply line for the fuel injection pump.

3.3.2 Oil Flow

Refer to **FIGURE 3-5** and **FIGURE 3-6**.

Unfiltered oil is drawn from the oil pan, through the oil pick-up tube and to the front cover assembly to the oil pump. Leaving the oil pump, the unfiltered oil travels (under pressure) back through the front cover assembly, passing the high pressure oil relief valve and into the crankcase unfiltered oil galley. Any excess oil is dumped by the relief valve back into the oil pan.

NOTE:

The high pressure oil relief controls unfiltered oil pressure at 80 lb/in.² maximum.

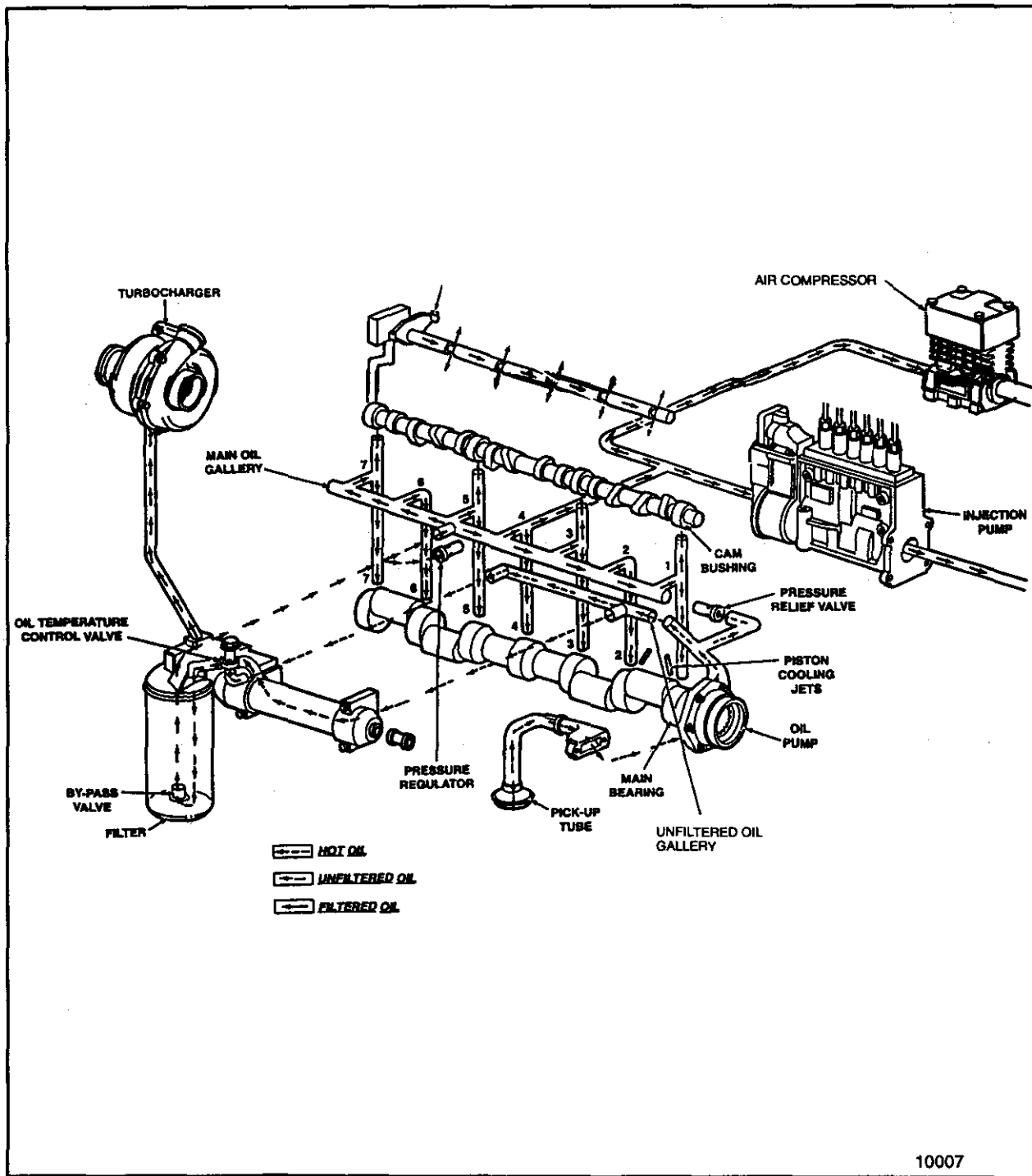


FIGURE 3-5 The Lubrication System

There are two oil galleries in the crankcase. The unfiltered oil travels down the unfiltered oil galley on the lower right hand side of the crankcase and the filtered oil galley runs above it. Unfiltered oil travels from the oil pump, through the front cover assembly and into the unfiltered oil galley. The oil pressure relief valve controls unfiltered oil pressure at 80 lb/in.². When oil pressure exceeds 80 lb/in.², the oil pressure relief valve opens and excess

oil is dumped back to the oil sump. There are two exit ports in the unfiltered oil galley. One exits to the front header of the oil cooler and one exits to the rear header of the oil cooler. Depending upon the position of the oil thermostat, located in the rear header, unfiltered oil can bypass the oil cooler core and go directly to the oil filter or can flow through the oil cooler core into the rear header.

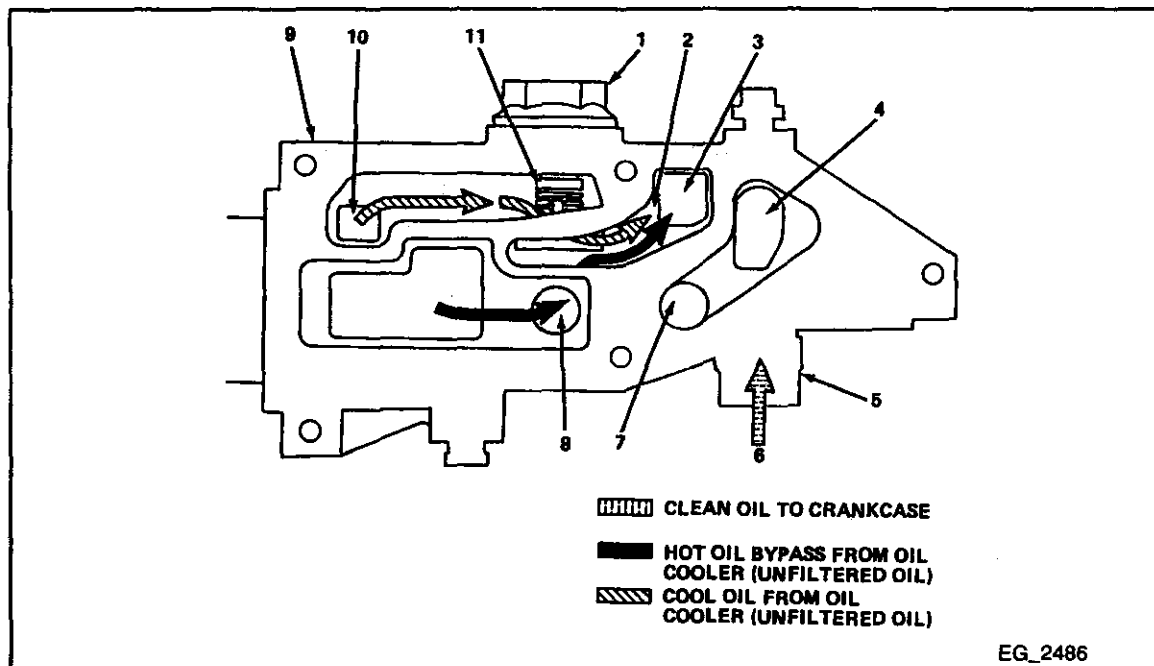


FIGURE 3-6 Oil Cooler Header Oil Flow Schematic

- | | |
|---|--------------------------------------|
| 1. Thermostat Cap | 7. Pressure Regulator Valve Location |
| 2. Hot/Cold Oil Mixing Chamber | 8. From Oil Cooler ByPass Galley |
| 3. Internal Passage To Oil Filter | 9. Oil Cooler Header |
| 4. Internal Passage Oil Filter To Crankcase | 10. Unfiltered Oil From Oil Cooler |
| 5. Oil Filter Stud | 11. Oil Cooler Thermostat |
| 6. Clean Oil Flow From Oil Filter | |

The oil cooler thermostat opens or closes by sensing oil temperature in the unfiltered galley. Oil is directed from the unfiltered galley to the filter, where it enters from the outside of the element and exits from the center. Oil bypass valve is located within the filter can and operates at a pressure differential of 1b/in.². Oil filter element bypass is effected from within the filter can. Clean engine oil flows out of the filter and goes back into the oil cooler header, then out the header and into the crankcase clean oil galley. The clean oil enters the crankcase, passes the oil cooler regulator valve and is directed through various ports of the crankcase. Excess oil is dumped back into the crankcase by the regulator valve.

NOTE:

The oil cooler pressure regulator valve controls filtered oil pressure at 50 lb/in.².

The turbocharger receives filtered oil through an external tube connected at the rear oil cooler header. The fuel injection pump and air compressor (if equipped) also receive oil

through external lines which are connected at a common fitting on the right side of the crankcase main filtered oil gallery. This fitting is supplied with oil directly from the main gallery. The front gear train is splash lubricated by oil draining from the injection pump and air compressor (if equipped).

3.3.3 Oil Pressure Regulator Valve and Oil Pressure Relief Valve

The unique design of the lubricating oil pressure relief valve, (80 lb/in.²) located in the front cover and the oil pressure regulating valve (50 lb/in.²), located by the rear oil cooler header, extends the life of the engine because it controls the volume and pressure of oil supplied to the engine. The volume of oil supplied by the pump is always in excess of what is needed to lubricate the engine. The oil pressure relief valve is located in the front cover and is used to protect the oil cooler and oil filter from extremely high pressures encountered during cold starts and cold starts in cold weather. If oil pressure exceeds 80 lb/in.² on the valve face, it moves the valve body inward allowing oil to travel through the valve and back to the oil pan, thus relieving pressure in the lubrication system.

The oil pressure regulator valve is located on the right side of the block, between oil filter header and block. When all points of lubrication within the engine are satisfied, restriction to flow causes pressure to build on the case of the valve causing it to move inward. This action allows excess oil to go directly back to the oil pan, through the ports uncovered by the movement of the regulator valve body.

3.4 FUEL SYSTEM

The fuel system consists of a fuel tank, fuel filter strainer, fuel filter, hand primer pump, fuel supply pump, fuel injection pump, high pressure fuel lines, fuel injection nozzle assemblies, and low pressure lines. All of these items are located on the left side of engine.

As fuel travels through the fuel system, it will be under negative pressure, high pressure (injection pressure) and low pressure (FIGURE 3-7).

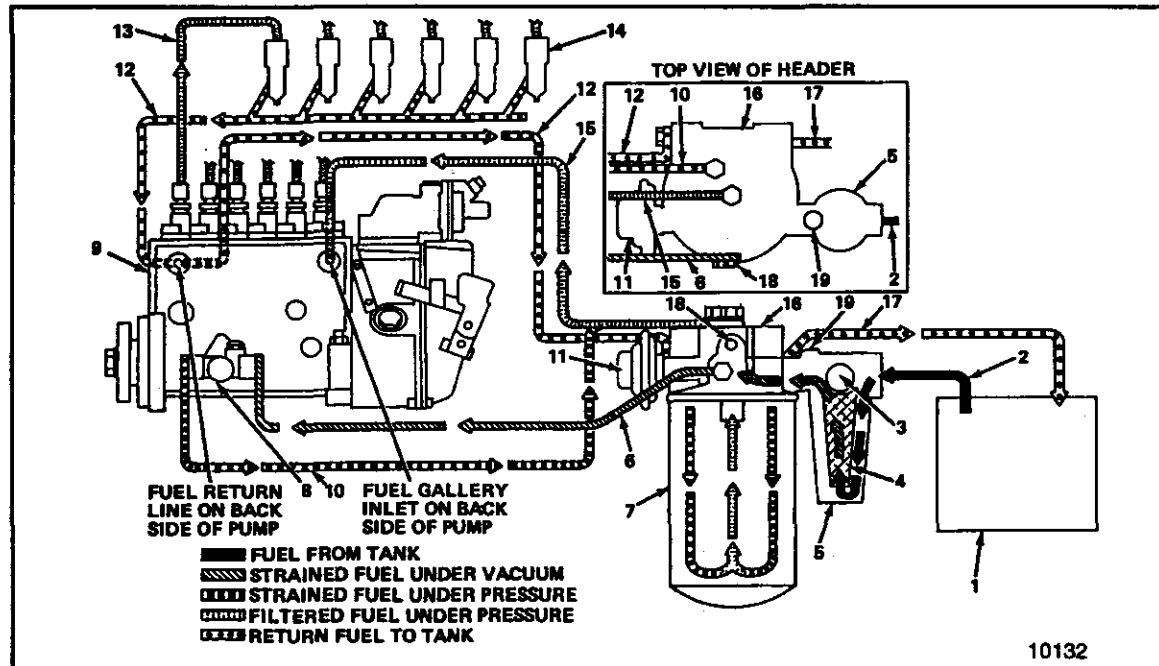


FIGURE 3-7 Fuel System Flow

- | | |
|--|---|
| 1. Fuel Tank | 11. Priming Pump |
| 2. Fuel From Fuel Tank | 12. Fuel Return Line From Fuel Injection Pump to Fuel Filter Header |
| 3. Check Ball | 13. High Pressure Fuel Lines |
| 4. Fuel Strainer | 14. Fuel Injection Nozzles |
| 5. Fuel Strainer Housing | 15. Fuel Supply Line From Fuel Filter Header to Fuel Injection Pump |
| 6. Fuel Filter Header To Fuel Transfer Pump Fuel Line | 16. Fuel Filter Header |
| 7. Fuel Filter | 17. Return Fuel to Fuel Tank |
| 8. Fuel Transfer Pump | 18. Bleeder Valve |
| 9. Fuel Injection Pump | 19. Priming Pump Alternate Location |
| 10. Fuel Transfer Pump to Fuel Filter Header Fuel Line | |

3.4.1 Negative Pressure

When the priming pump is pushed down, the check ball is seated onto the fuel strainer. Releasing the priming pump unseats the check ball, draws fuel from the fuel tank, through the inlet port of the fuel filter header and into the fuel strainer assembly. Fuel exits the strainer, flows through the internal passage of the fuel filter header, via a fuel line to the transfer pump located on the fuel injection pump.

Once the engine has been primed, the fuel transfer pump keeps the fuel line under negative pressure with a constant supply of fuel.

3.4.2 Intermediate Pressure

The transfer pump produces an intermediate pressure on the fuel. Fuel now flows from the transfer pump to the inside port of the fuel filter header. Fuel then travels through an internal passage into the fuel filter. Fuel passes through the fuel filter and out the fuel filter header, through a fuel line to the fuel supply port of the fuel injection pump.

3.4.3 High Pressure

The fuel injection pump meters and delivers fuel at high pressure through the injection lines to the injection nozzle assemblies. This high pressure fuel causes the nozzle valve to open and fuel flows through the nozzle orifices into the combustion chamber. The amount of fuel delivered is controlled by the injection pump governor.

3.4.4 Low Pressure

A small amount of low pressure fuel returns from the nozzle assemblies to the fuel tank through the return/leakoff line.

The return line is teed with the fuel return line connected to the fuel injection pump. Fuel flows back to the fuel filter header, through the fuel filter header and back to the fuel tank.

3.5 AIR INDUCTION AND EXHAUST SYSTEMS

The intake and exhaust systems consist of those components that flow filtered air to the engine cylinders and exhaust gases to the atmosphere. The intake system includes an air cleaner, turbocharger, air piping, air-to-air intercooler, valve cover/intake manifold and intake valves.

3.5.1 Air Flow

The intake system consists of an air cleaner, air piping, the compressor side of the turbocharger, valve cover/intake manifold and intake valves. Refer to **FIGURE 3-8**. During start up, the air is forced through the air cleaner by the atmospheric pressure.

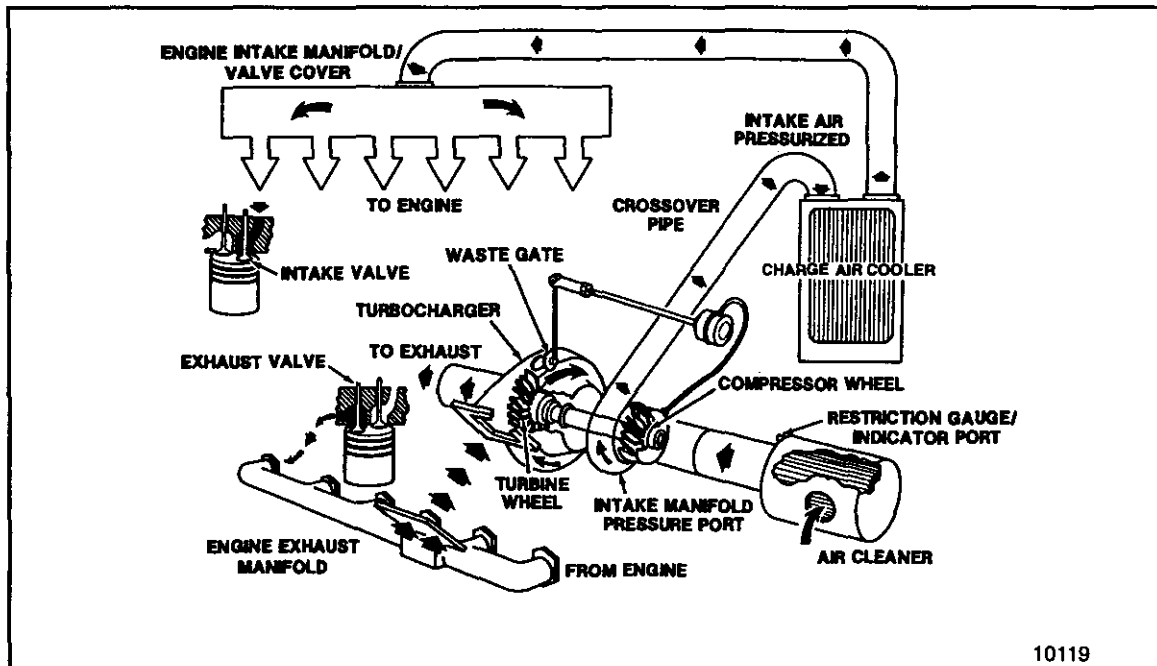


FIGURE 3-8 Air Induction and Exhaust Systems Turbocharged and Charged Air Cooled Engine

The turbocharger is used to increase engine power output by increasing air supply to the engine. It provides uniform performance at various operating altitudes. It is an exhaust driven centrifugal air compressor; that allows filtered air to enter at the center of the compressor housing and is forced under pressure to the combustion chamber. After combustion, hot and expanding exhaust gases move through the turbine housing causing the turbine wheel to spin. The turbine wheel drives the compressor wheel through a common shaft. The turbocharger responds directly to engine loads. During heavy load, increased flow of exhaust gases turn the turbine wheel faster causing the compressor impeller to turn faster and supply more air (greater boost) to the intake manifold. Conversely, with light engine load, flow of exhaust gases decrease and less air is pumped into the intake manifold.

The exhaust system includes exhaust valves, exhaust manifold, muffler and exhaust piping. The turbocharger compressor side is part of the intake system and turbine side is part of the exhaust system.

The air is cooled by a air-to-air intercooler prior to entering the intake manifold. Air then flows into the combustion chamber where it is mixed with the proper amount of fuel and burned. Exhaust gases leave the cylinders through exhaust ports and the exhaust manifold. From the exhaust manifold, the expansion of exhaust gases on the exhaust turbine drive the turbocharger and are released through the exhaust pipe to the atmosphere.

3.6 MAJOR COMPONENT LOCATION (FRONT)

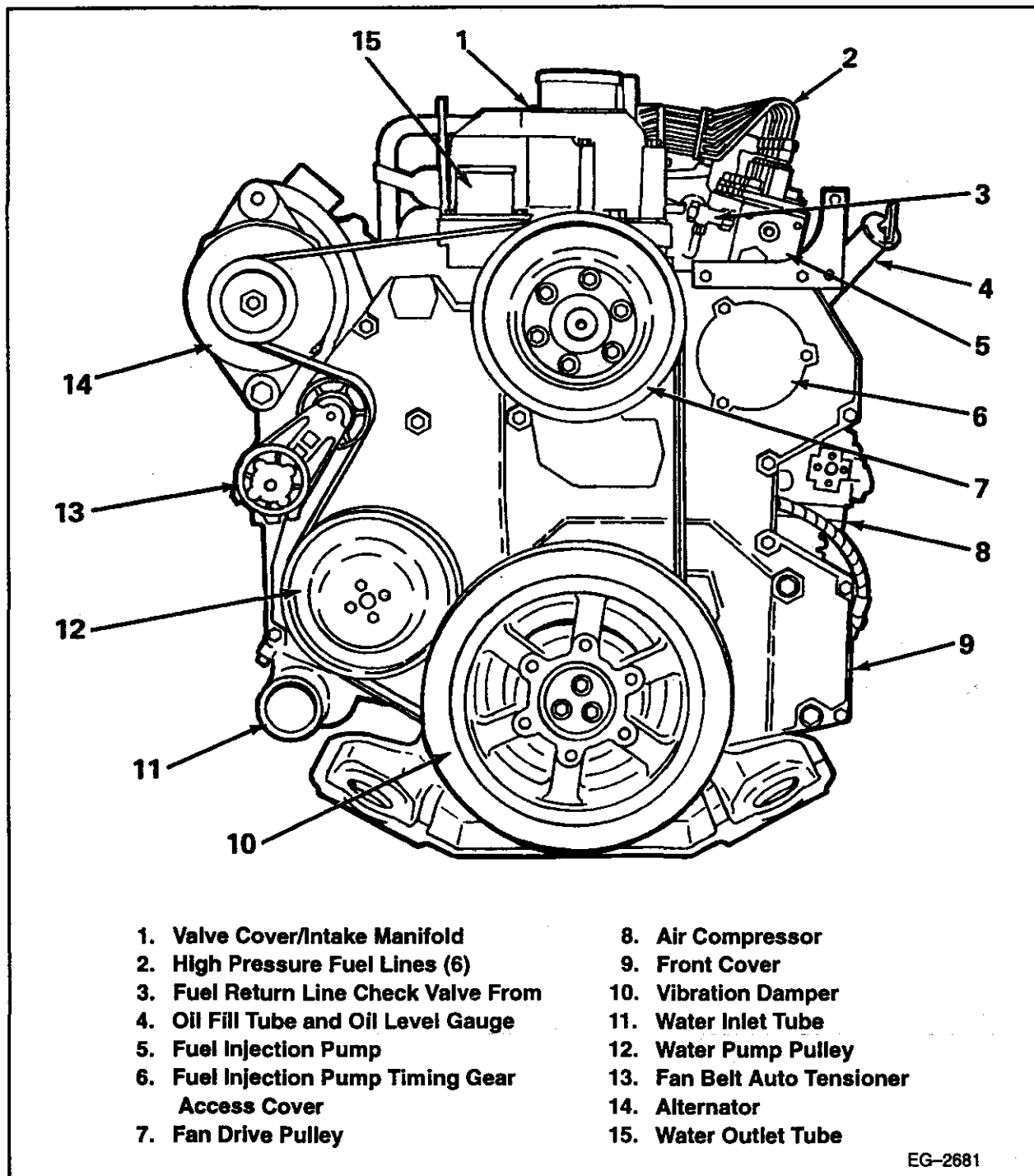


FIGURE 3-9 Major Component Location (Front)

3.7 MAJOR COMPONENT LOCATION (LEFT SIDE)

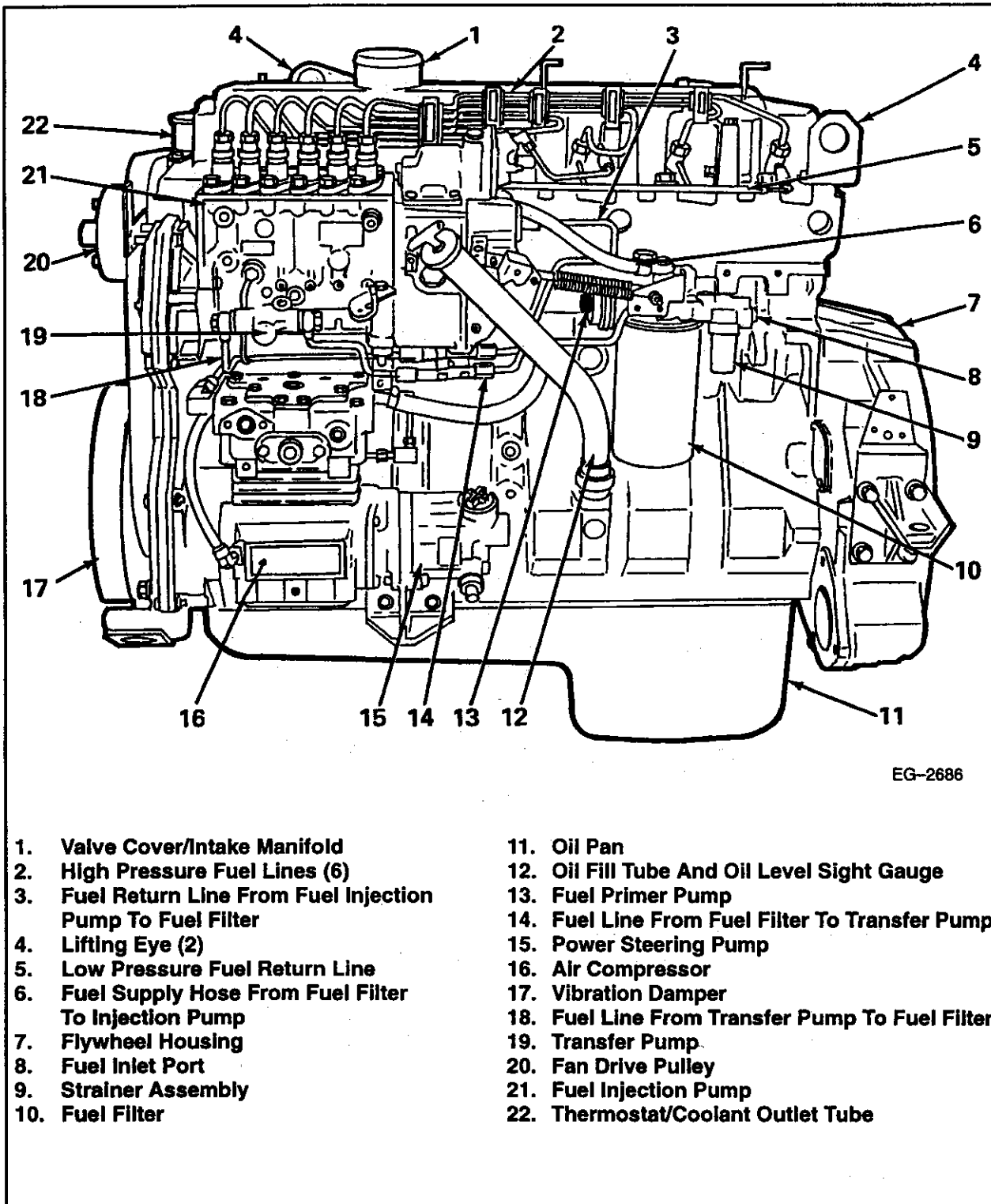


FIGURE 3-10 Major Component Location (Left Side)

3.8 MAJOR COMPONENT LOCATION (REAR)

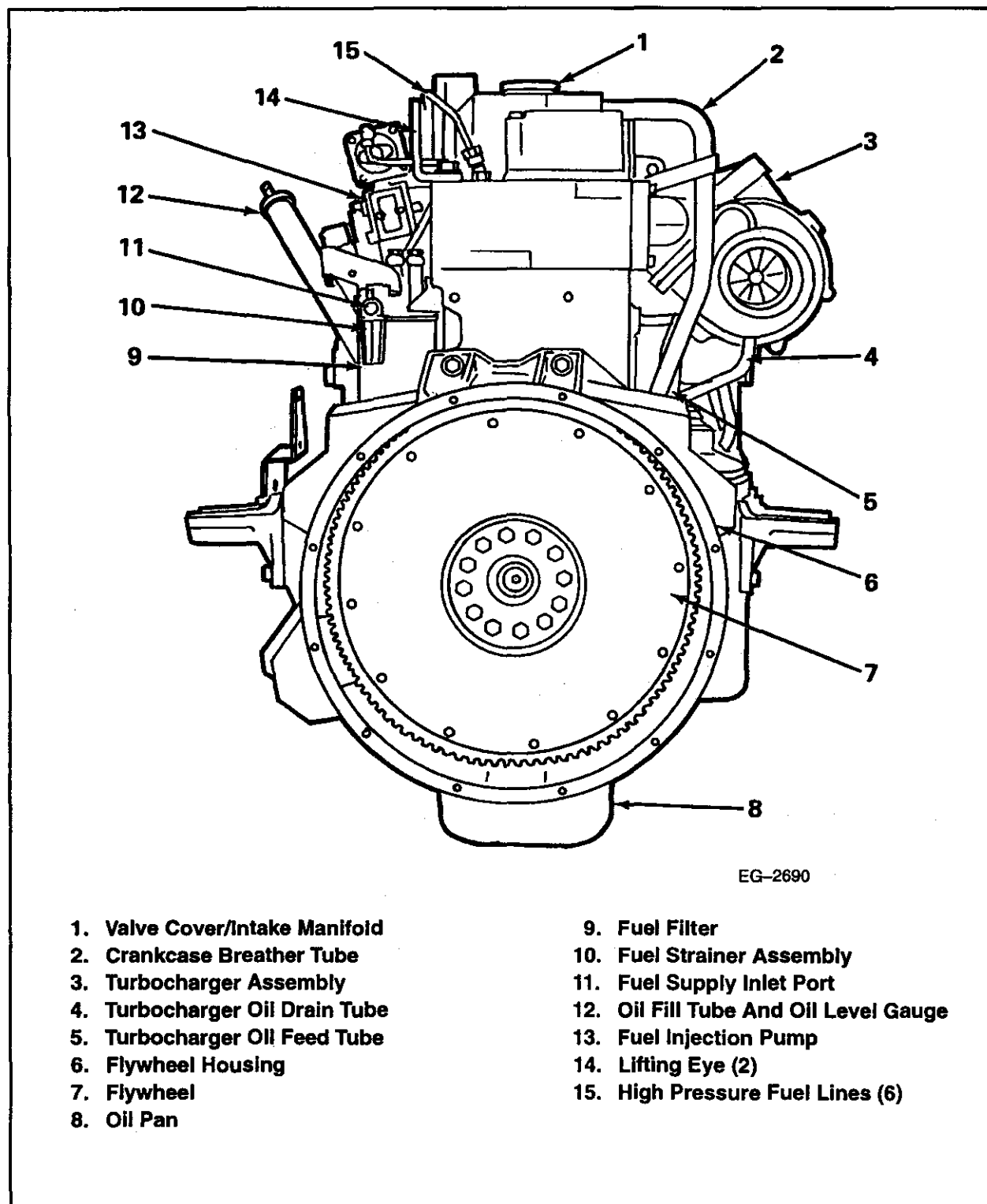
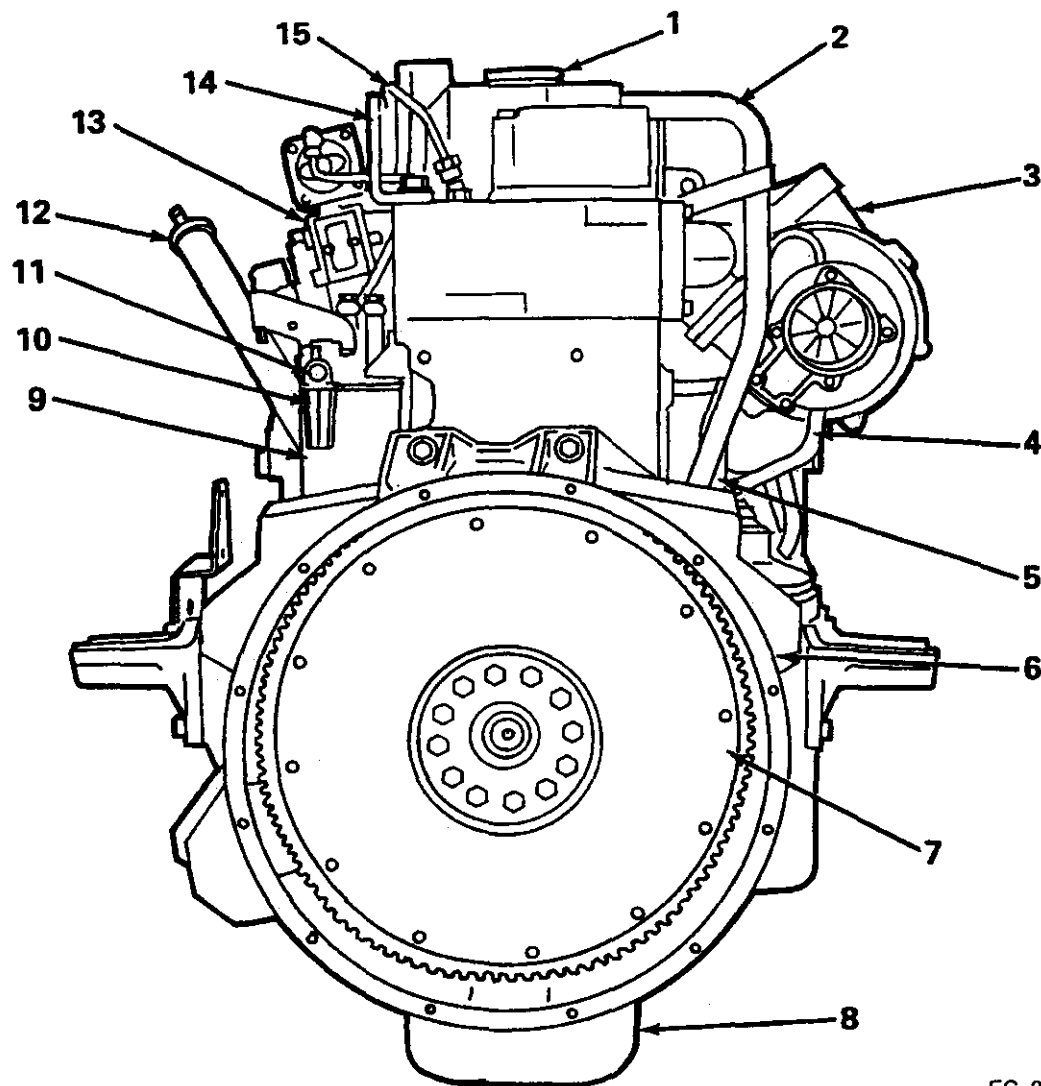


FIGURE 3-11 Major Component Location (Rear) – Non Wastegate Turbocharger



EG-2691

- | | |
|--------------------------------|--|
| 1. Valve Cover/Intake Manifold | 9. Fuel Filter |
| 2. Crankcase Breather Tube | 10. Fuel Strainer Assembly |
| 3. Turbocharger Assembly | 11. Fuel Supply Inlet Port |
| 4. Turbocharger Oil Drain Tube | 12. Oil Fill Tube And Oil Level Gauge |
| 5. Turbocharger Oil Feed Tube | 13. Fuel Injection Pump (Bosch
Model P7100 Shown) |
| 6. Flywheel Housing | 14. Lifting Eye (2) |
| 7. Flywheel | 15. High Pressure Fuel Lines (6) |
| 8. Oil Pan | |

FIGURE 3-12 Major Component Location (Rear) – Wastegate Turbocharger

3.9 MAJOR COMPONENT LOCATION (RIGHT SIDE)

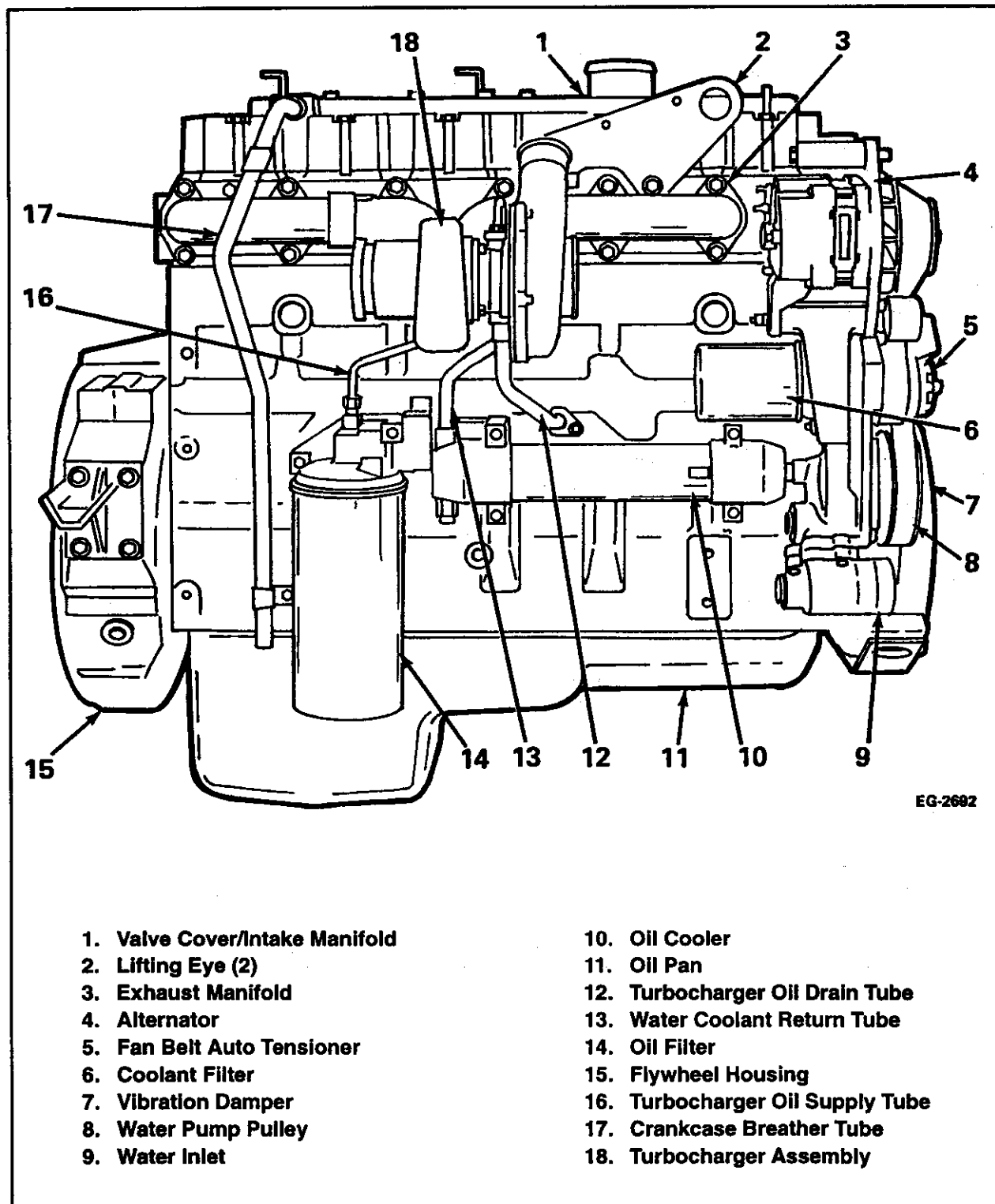


FIGURE 3-13 Major Component Location (Right Side) Non Wastegate

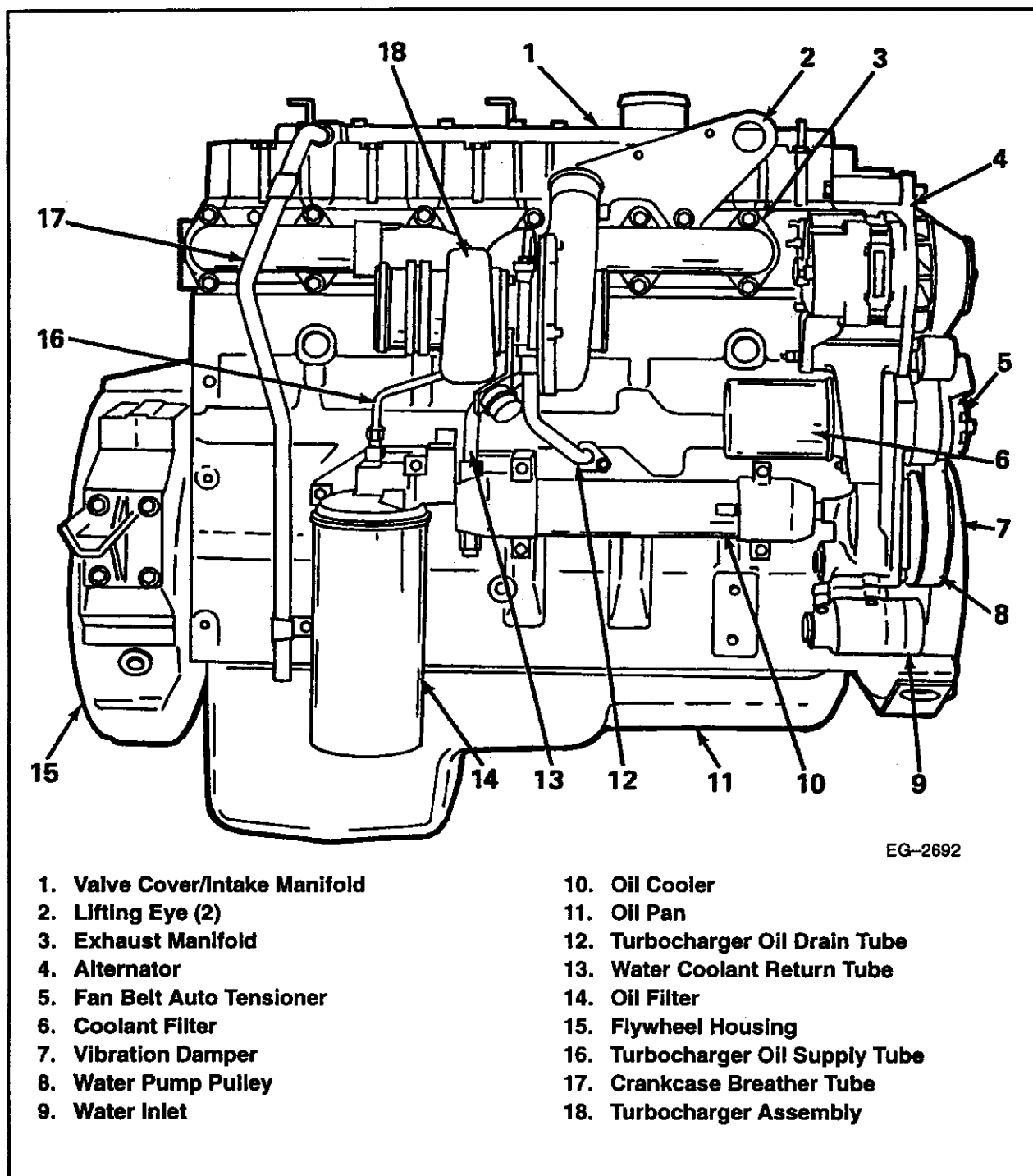


FIGURE 3-14 Major Component Location (Right Side) Waste Gate

4 MOUNTING ENGINE ON STAND

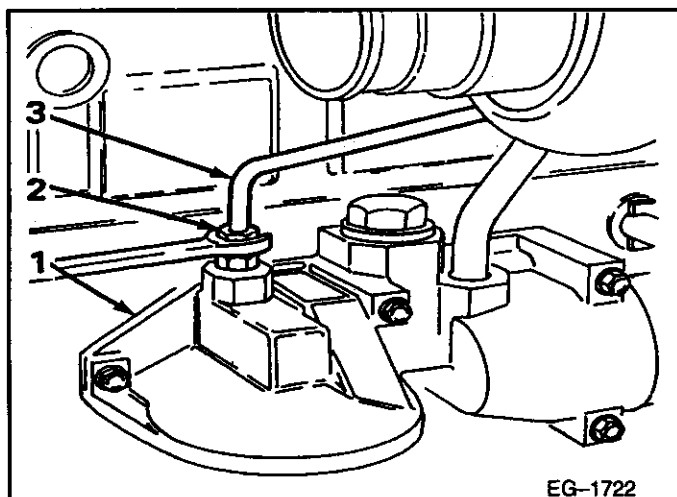
4.1	SPECIFICATIONS	4-3
4.2	MOUNTING ENGINE ON STAND	4-5

4.1 SPECIFICATIONS

SPECIAL TORQUE VALUES

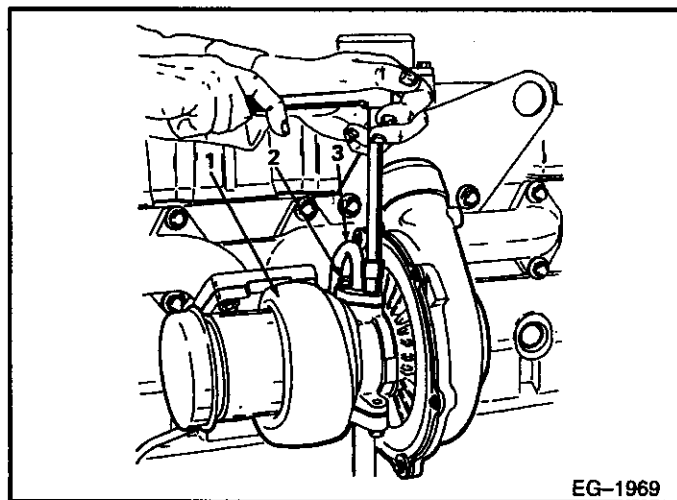
Oil Pan Drain Plug 50 lb·ft (68 N·m)

4.2 MOUNTING ENGINE ON STAND



1. Oil Filter Header
2. Oil Feed Supply Tube Nut
3. Oil Feed Supply Tube

FIGURE 4-1



1. Turbocharger Assembly
2. Mounting Bolts
3. Oil Feed Supply Tube

FIGURE 4-2

Perform the following steps before installing engine to mounting stand:

1. Remove oil pan drain plug and plug gasket. Drain all engine oil and discard gasket.

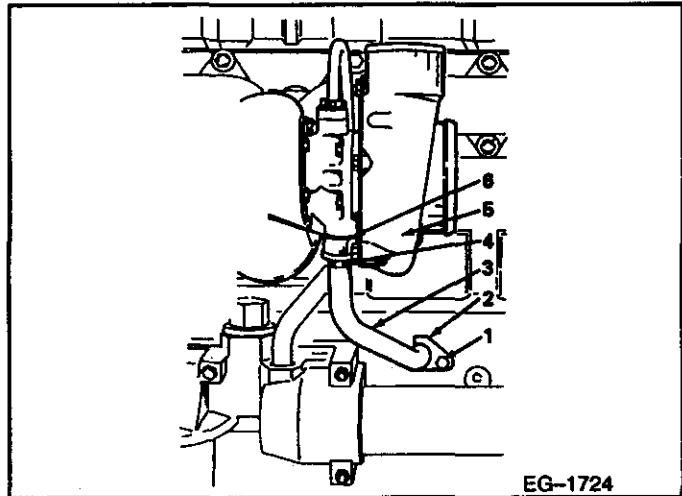
NOTE:

Discard oil according to EPA standards.

2. Reinstall oil pan drain plug together with new plug gasket. Refer to "Special Torque Value."
3. Using an open end wrench, loosen oil feed supply tube nut located on top of oil filter header. Remove and discard tube nut liner. Refer to **FIGURE 4-1**.
4. Remove two (2) mounting bolts securing oil feed supply tube to top of turbocharger housing. Remove oil feed supply tube and tube flange gasket. Discard flange gasket. Refer to **FIGURE 4-2**.

MOUNTING ENGINE ON STAND

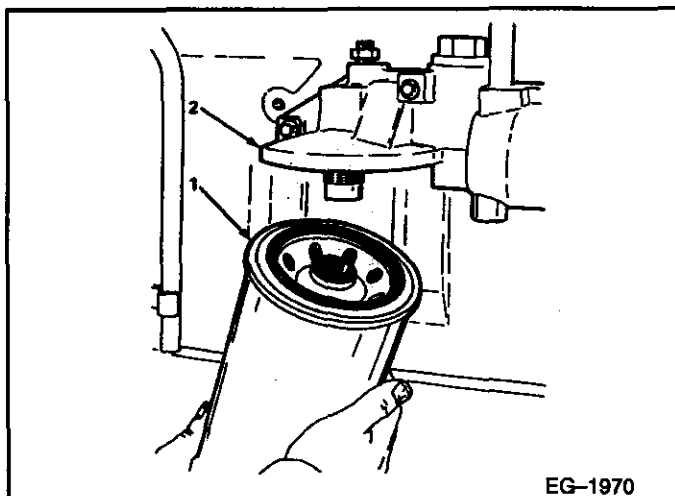
5. Remove turbocharger oil drain tube as follows: (Refer to **FIGURE 4-3**)
 - a. Remove one bolt securing turbocharger oil drain tube retaining plate to crank-case.
 - b. Remove two (2) capscrews securing turbocharger oil drain tube to bottom of turbocharger housing.
 - c. Remove turbocharger oil drain tube retaining plate together with turbocharger oil drain tube, tube flange, two tube O-rings and tube flange gasket from bottom of turbocharger assembly.
 - d. Discard both drain tube O-rings (one on each end of drain tube) and flange gasket.



1. Oil Drain Tube Mounting Bolt
2. Turbocharger Oil Drain Tube Retaining Plate
3. Turbocharger Oil Drain Tube
4. Oil Drain Tube Mounting Bolts (2)
5. Turbocharger Assembly
6. Turbocharger Oil Drain Tube Flange Gasket

FIGURE 4-3

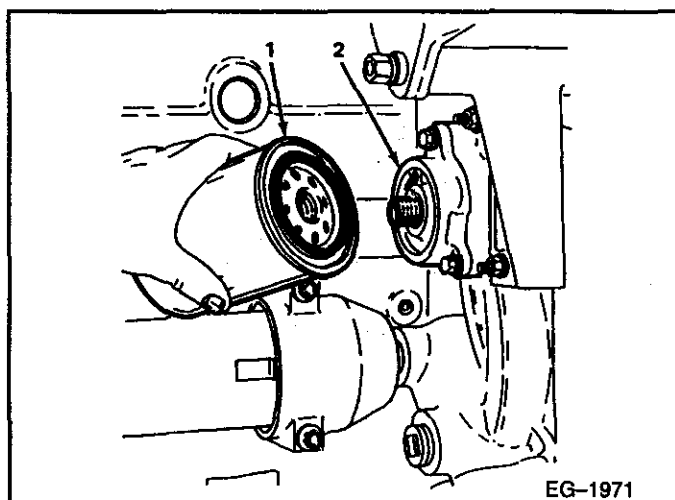
MOUNTING ENGINE ON STAND



- 1. Oil Cooler Filter
- 2. Oil Filter Header

FIGURE 4-4

- 6. Remove oil filter from oil cooler filter header. Discard oil filter. (Refer to **FIGURE 4-4**)
- 7. Remove coolant filter from header. Discard old coolant filter. (Refer to **FIGURE 4-5**)



- 1. Coolant Filter
- 2. Coolant Filter Header

FIGURE 4-5