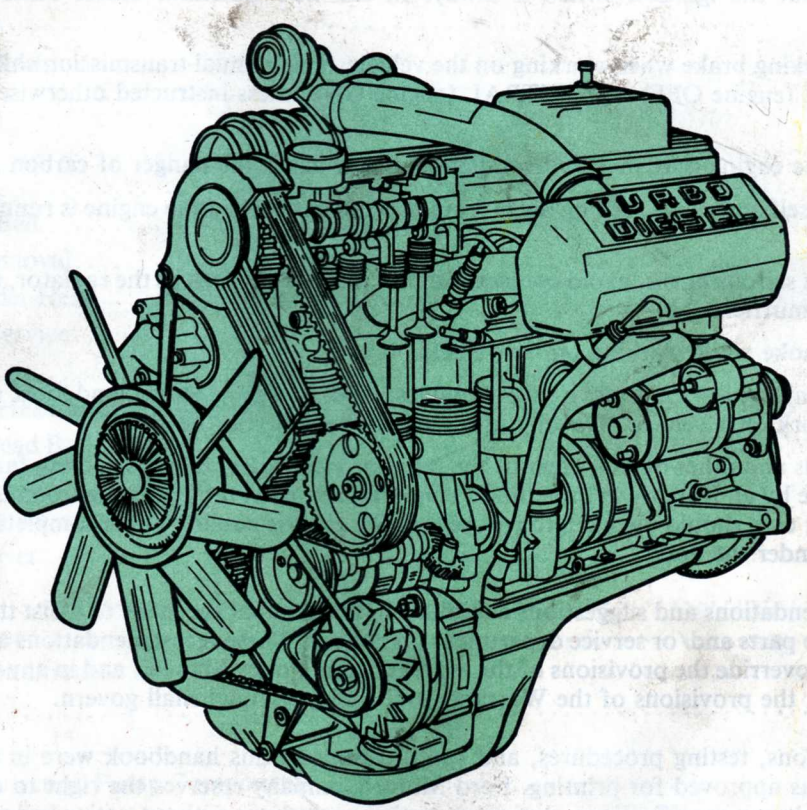
2.4L Diesel Engine



Ford Parts and Service Division
Training and Publications Department

IMPORTANT SAFETY NOTICE

Appropriate service methods and proper repair procedures are essential for the safe, reliable operation of all motor vehicles, as well as for the personal safety of the individual doing the work. This manual provides general directions for accomplishing service and repair work with tested, effective techniques. Following them will help assure reliability.

There are numerous variations in procedures, techniques, tools, and parts for servicing vehicles, as well as in the skill of the individual doing the work. This manual cannot possibly anticipate all such variations and provide advice or cautions as to each. Accordingly, anyone who departs from instructions provided in this manual must first establish that he compromises neither his personal safety nor the vehicle integrity by his choice of methods, tools, or parts.

As you read through the procedures, you will come across **NOTES, CAUTIONS, AND WARNINGS.** Each one is there for a specific purpose. **NOTES** give you added information that will help you to complete a particular procedure. **CAUTIONS** are given to prevent you from making an error that could damage the vehicle. **WARNINGS** remind you to be especially careful in those areas where carelessness can cause personal injury. The following list contains some general **WARNINGS** that you should follow when you work on a vehicle.

- Always wear safety glasses for eye protection.
- Use safety stands whenever a procedure requires you to be under the vehicle.
- Be sure that the ignition switch is always in the OFF position, unless otherwise required by the procedure.
- Set the parking brake when working on the vehicle. The manual transmission shifter lever should be in REVERSE (engine OFF) or NEUTRAL (engine ON) unless instructed otherwise for a specific service operation.
- Operate the engine only in a well-ventilated area to avoid the danger of carbon monoxide.
- Keep yourself and your clothing away from moving parts when the engine is running, especially the fan and belts.
- To prevent serious burns, avoid contact with hot metal parts such as the radiator, exhaust manifold, tail pipe, and muffler.
- Do not smoke while working on the vehicle.
- To avoid injury, always remove rings, watches, loose hanging jewelry, and loose clothing before beginning to work on a vehicle. Tie long hair securely behind your head.
- Keep hands and other objects clear of the radiator fan blades. Electric cooling fans can start to operate at any time by an increase in underhood temperatures, even though the ignition is in the OFF position. Therefore, care should be taken to ensure that the electric cooling fan is completely disconnected when working under the hood.

The recommendations and suggestions contained in this manual are made to assist the dealer in improving his dealership parts and/or service department operations. These recommendations and suggestions do not supersede or override the provisions of the Warranty and Policy Manual, and in any cases where there may be a conflict, the provisions of the Warranty and Policy Manual shall govern.

The descriptions, testing procedures, and specifications in this handbook were in effect at the time the handbook was approved for printing. Ford Motor Company reserves the right to discontinue models at any time, or change specifications, design, or testing procedures without notice and without incurring obligation. Any reference to brand names in this manual is intended merely as an example of the types of tools, lubricants, materials, etc. recommended for use. Equivalents, if available, may be used. The right is reserved to make changes at any time without notice.

CONTENTS

CONTENTS (Cont'd.)

OBJECTIVES

AFTER STUDYING THIS MANUAL, YOU SHOULD BE ABLE TO CORRECTLY:

- Identify and locate engine components and describe their function.
- Locate engine accessories and describe their function.
- Diagnose and correct fuel and glow plug system problems.
- Check and adjust valve clearance.
- Check cylinder compression.
- Check engine oil pressure.
- Replace and adjust drive belts.
- Describe the operation of the fuel injection system.
- Check and adjust fuel injection pump timing.
- Adjust engine idle speed.
- Diagnose, repair, and adjust the cold-start accelerator.
- Remove and install fuel injection nozzles.
- Clean, test, and adjust fuel injection nozzles.
- Remove and install air, oil, and fuel filters.
- Drain water from the fuel conditioner.
- Describe the glow plug system.
- Remove and install glow plugs.
- Check glow plugs and glow plug system.
- Describe the turbocharger system.
- Check turbocharger charging pressure.
- Determine the cause of incorrect charging pressure and replace the component(s) responsible for the incorrect reading.

WARNING: Never use ether or any other starting fluid in the 2.4L engine. The glow plugs may ignite the starting fluid causing an explosion which could result in severe engine damage or personal injury.

NOTE: Many of the illustrations in this book contain basic part numbers for the components shown. Use these numbers to assist in ordering parts.

INTRODUCTION

Beginning with the 1984 model year, Ford Motor Company will be offering the 2.4L diesel engine, built by BMW of Germany, as an option in some luxury automobiles. The 2.4L engine is an in-line six-cylinder, four-stroke cycle, overhead cam engine that incorporates many notable features such as:

- Turbocharging
- Mechanical lifters
- Dual, low restriction exhaust
- Mounting at a 20 degree lean to the right
- EGR
- Fuel conditioner containing a water/fuel separator and fuel heater
- Bosch fuel injection system
- Aluminum cross flow cylinder head
- Finger follower rocker arms
- Belt-driven fuel injection pump
- Engine-driven fan plus an auxiliary electric fan
- External engine oil cooler
- Canister-type oil filter with replaceable element
- Deep skirt block
- Camshaft-driven vacuum pump
- Glow plug system
- Electric fuel supply pump
- 110 volt electric block heater

You will find that this engine is one of the most heavily monitored diesel engines used by Ford Motor Company. This can be attributed mainly to the fact that this engine is turbocharged, has EGR, and a glow plug system. While the component layout beneath the hood is clean and functional (Fig. 1), it is rather compact. Therefore, in the service portions of this book, you are asked to pay particular attention to the directions on the best way to service the components.

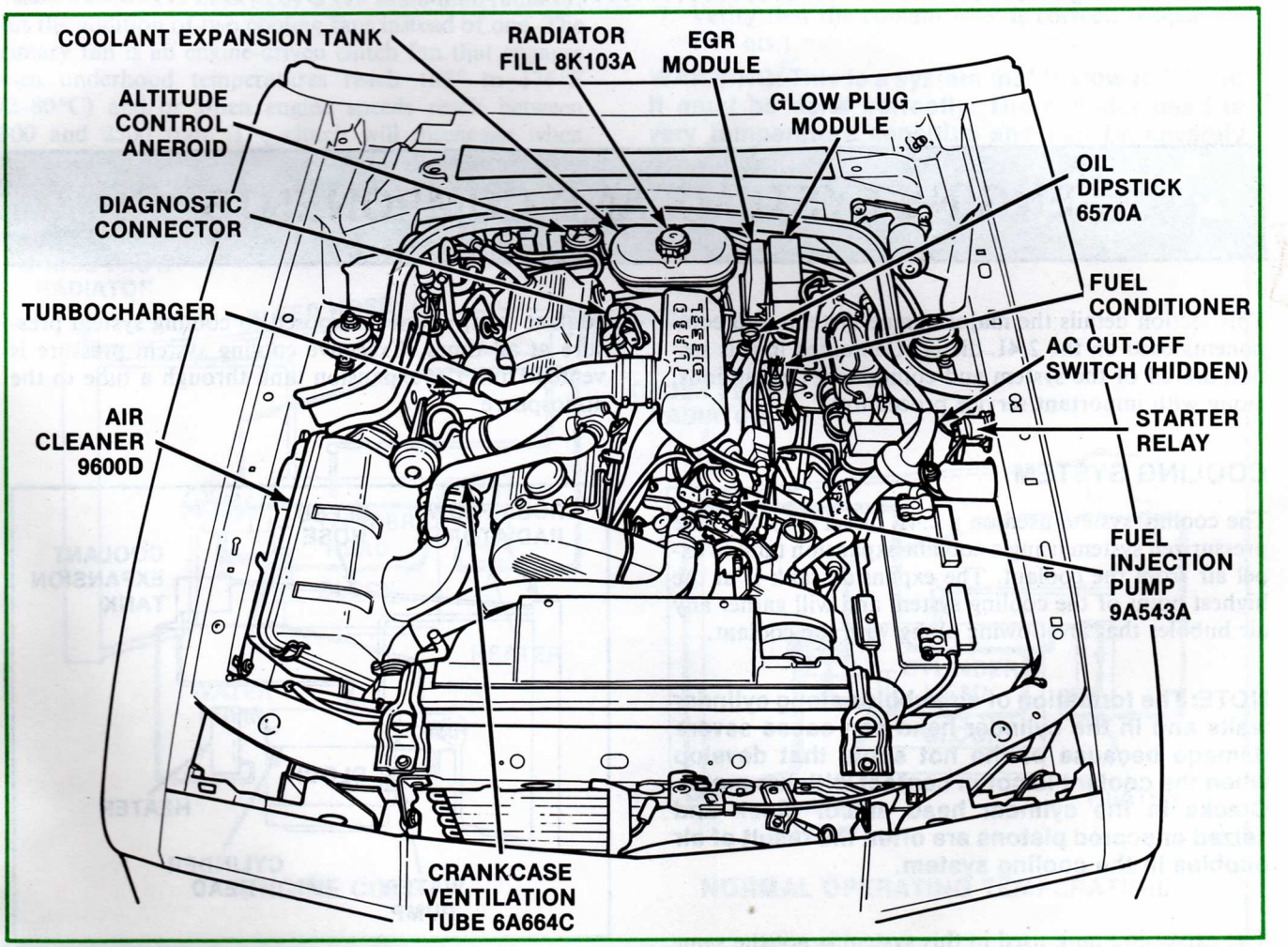


Figure 1. Underhood Component Layout

GENERAL SPECIFICATIONS

Engine Model	2.4L Turbo Diesel
Valve Arrangement	OHC
Cylinder Arrangement	In-line, 6 cylinders
Bore × Stroke	3.15 in × 3.19 in (80 × 81 mm)
Displacement	149 cu in (2442.9 cc)
Compression Ratio	22:1
Horsepower	114 (85 kw)
Maximum Engine Speed	5350 ± 100 rpm
Rated Engine Speed	4800 rpm
Minimum Torque	150 lb-ft (210 N·m) at 2400 rpm
Compression Pressure	Minimum 348 psi (2400 kPa) at 200 rpm
Combustion Chamber	Swirl type—Indirect injection
Fuel Injection Pump—49 State	Bosch VE—Distributor-type with Altitude and Boost Compensation
Fuel Injection Pump—California	Bosch VP-20 Distributor-type with Altitude and Boost Compensation
Firing Order	1-5-3-6-2-4
Engine Rotating Direction	Clockwise

ENGINE SYSTEMS AND COMPONENTS

This section details the major engine systems and components used on the 2.4L diesel. Contained in this section are all of the system and component descriptions, along with important service procedures.

COOLING SYSTEM

The cooling system used on a 2.4L diesel (Fig. 2) is the pressurized system using a coolant expansion tank to expel air from the coolant. The expansion tank is at the highest point of the cooling system and will gather any air bubbles that are flowing along with the coolant.

NOTE: The formation of air bubbles along cylinder walls and in the cylinder head can cause severe damage because of the hot spots that develop when the coolant is not in contact with the metal. Cracks in the cylinder head and/or block and seized or scored pistons are often the result of air bubbles in the cooling system.

The expansion tank used in this system is not the same as a coolant recovery tank because there is a flow of coolant to it, and it is exposed to cooling system pressure at all times. Excessive cooling system pressure is vented from the expansion tank through a tube to the atmosphere.

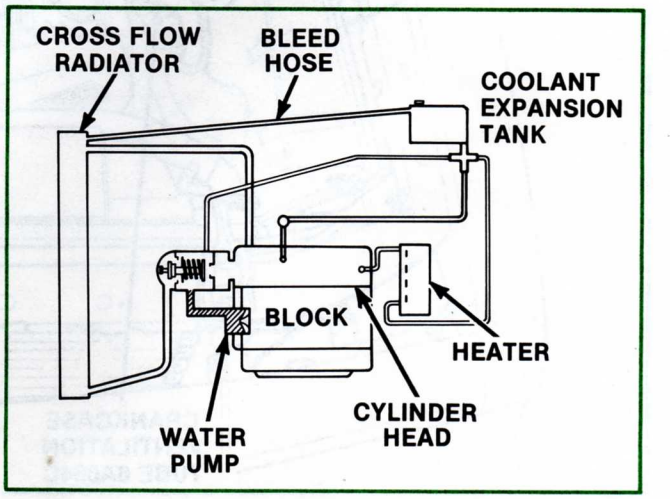


Figure 2. 2.4L Diesel Cooling System