

TECHNICAL MANUAL

**ORGANIZATIONAL, DIRECT SUPPORT, AND
GENERAL SUPPORT MAINTENANCE MANUAL
(INCLUDING REPAIR PARTS AND
SPECIAL TOOLS LIST)**

FOR

**85' AERIAL LADDER
FIRE FIGHTING TRUCK**

NSN 4210-00-965-1254

Service Manual

Detroit Diesel Engines SERIES 92



Detroit Diesel Allison

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Detroit, Michigan 48228

NOTE:

Additional copies of this service manual may be purchased from Detroit Diesel Allison Distributors. See your yellow pages—under Engines, Diesel.

FOREWORD

This manual contains instructions on the overhaul, maintenance and operation of the basic V-92 Detroit Diesel Engines.

Full benefit of the long life and dependability built into these engines can be realized through proper operation and maintenance. Of equal importance is the use of proper procedures during engine overhaul.

Personnel responsible for engine operation and maintenance should study the sections of the manual pertaining to their particular duties. Similarly, before beginning a repair or overhaul job, the serviceman should read the manual carefully to familiarize himself with the parts or sub-assemblies of the engine with which he will be concerned.

The information, specifications and illustrations in this publication are based on the information in effect at the time of approval for printing. This publication is revised and reprinted periodically. It is recommended that users contact an authorized Detroit Diesel Allison Service Outlet for information on the latest revisions. The right is reserved to make changes at any time without obligation.

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SCOPE AND USE OF THE MANUAL

This manual covers the basic V-92 diesel engines built by the Detroit Diesel Allison Division of General Motors Corporation. Complete instructions on operation, adjustment (tune-up), preventive maintenance and lubrication, and repair (including complete overhaul) are covered. The manual was written primarily for persons servicing and overhauling the engine and, in addition, contains all of the instructions essential to the operators and users. Basic maintenance and overhaul procedures are common to all V-92 engines and therefore apply to all engine models.

The manual is divided into numbered sections. The first section covers the engine (less major assemblies). The following sections cover a complete system such as the fuel system, lubrication system or air system. Each section is divided into sub-sections which contain complete maintenance and operating instructions for a specific sub assembly on the engine. For example, Section 1, which covers the basic engine, contains sub-section 1.1 pertaining to the cylinder block, sub-section 1.2 covering the cylinder head, etc. The subjects and sections are listed in the Table of Contents on the preceding page. Pages are numbered consecutively, starting with a new Page 1 at the beginning of each sub-section. The illustrations are also numbered consecutively, beginning with a new Figure 1 at the start of each sub-section.

Information regarding a general subject, such as the lubrication system, can best be located by using the Table of Contents. Opposite each subject in the Table of Contents is a section number which registers with a tab printed on the first page of each section throughout the manual. Information on a specific sub-assembly or accessory can then be found by consulting the list of contents on the first page of the section. For example, the cylinder liner is part of the basic engine, therefore, it will be found in Section 1. Looking down the list of contents on the first page of Section 1, the cylinder liner is found to be in sub-section 1.6.3. An Alphabetical Index at the back of the manual has been provided as an additional aid for locating information.

SERVICE PARTS AVAILABILITY

Genuine Detroit Diesel Allison service parts are available from authorized Detroit Diesel Allison distributors and service dealers throughout the world. A complete list of all distributors and dealers is available in the World Wide Parts and Service Directory, 6SE280. This publication can be ordered from any authorized distributor.

CLEARANCES AND TORQUE SPECIFICATIONS

Clearances of new parts and wear limits on used parts are listed in tabular form at the end of each section throughout the manual. It should be specifically noted that the "New Parts" clearances apply only when all new parts are used at the point where the various specifications apply. This also applies to references within the text of the manual. The column entitled "Limits" lists the amount of wear or increase in clearance which can be tolerated in used engine parts and still assure satisfactory performance. It should be emphasized that the figures given as "Limits" must be qualified by the judgment of personnel responsible for installing new parts. These wear limits are, in general, listed only for the parts more frequently replaced in engine overhaul work. For additional information, refer to the paragraph entitled Inspection under General Procedures in this section.

Bolt, nut and stud torque specifications are also listed in tabular form at the end of each section.

PRINCIPLES OF OPERATION

The diesel engine is an internal combustion power unit, in which the heat of fuel is converted into work in the cylinder of the engine

In the diesel engine, air alone is compressed in the cylinder; then, after the air has been compressed, a charge of fuel is sprayed into the cylinder and ignition is accomplished by the heat of compression

The Two-Cycle Principle

In the two-cycle engine, intake and exhaust take place during part of the compression and power strokes respectively as shown in Fig. 1. In contrast, a four cycle engine requires four piston strokes to complete an operating cycle; thus, during one half of its operation, the four-cycle engine functions merely as an air pump.

A blower is provided to force air into the cylinders for expelling the exhaust gases and to supply the cylinders with fresh air for combustion. The cylinder wall contains a row of ports which are above the piston when it is at the bottom of its stroke. These ports admit the air from the blower into the cylinder as soon as the rim of the piston uncovers the ports as shown in Fig. 1 (scavenging).

The unidirectional flow of air toward the exhaust valves produces a scavenging effect, leaving the cylinders full of clean air when the piston again covers the inlet ports.

As the piston continues on the upward stroke, the exhaust valves close and the charge of fresh air is subjected to compression as shown in Fig. 1 (compression).

Shortly before the piston reaches its highest position, the required amount of fuel is sprayed into the combustion chamber by the unit fuel injector as shown in Fig. 1 (power). The intense heat generated during the high compression of the air ignites the fine fuel spray immediately. The combustion continues until the fuel injected has been burned.

The resulting pressure forces the piston downward on its power stroke. The exhaust valves are again opened when the piston is about half way down, allowing the burned gases to escape into the exhaust manifold as shown in Fig. 1 (exhaust). Shortly thereafter, the downward moving piston uncovers the inlet ports and the cylinder is again swept with clean scavenging air. This entire combustion cycle is completed in each cylinder for each revolution of the crankshaft, or, in other words, in two strokes; hence, it is a "two-stroke cycle".

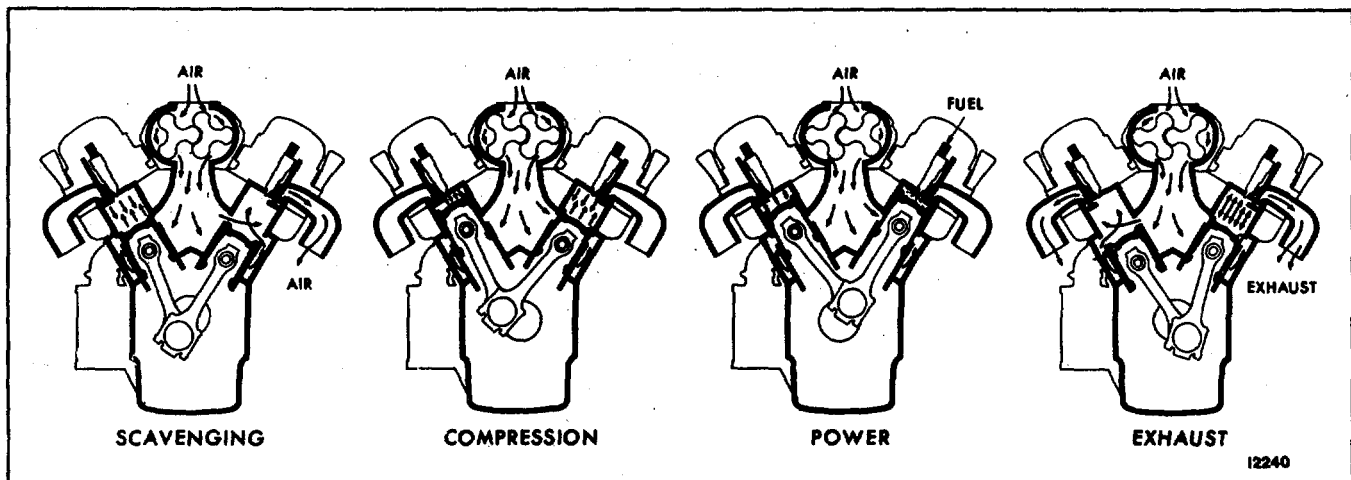


Fig. 1 - The Two-Stroke Cycle

GENERAL DESCRIPTION

The two-cycle diesel engines covered in this manual are produced in 6, 8 and 16 cylinder models having the same bore and stroke and many of the major working parts such as injectors, pistons, connecting rods, cylinder liners and other parts that are interchangeable.

The engines are built with right-hand or left-hand crankshaft rotation (Fig. 2). The oil cooler can be mounted only on the right side of the engine. On 6 and 8V engines the starter can be mounted on either the right or left side of the engine. The 16V engines have a starter on both the right and left side of the engine.

The meaning of each digit in the model numbering system is shown in Fig. 2. The letter L or R indicates left or right-hand engine rotation as viewed from the front of the engine. The letter A, B, C or D designates the location of the starter and oil cooler as viewed from the rear of the engine.

Each engine is equipped with oil coolers, lubricating oil filters, fuel oil strainer, fuel oil filter, air cleaners, governor, heat exchanger and raw water pump or fan and radiator, and starting motor.

Full pressure lubrication is supplied to all main, connecting rod and camshaft bearings, and to other moving parts within the engine. A gear-type pump draws oil from the oil pan through an intake screen, through the oil filter and then to the oil cooler. From the oil cooler, the oil flows through passages that connect with the oil galleries in the cylinder block and cylinder heads for distribution to the bearings, rocker arm mechanism and other functional parts.

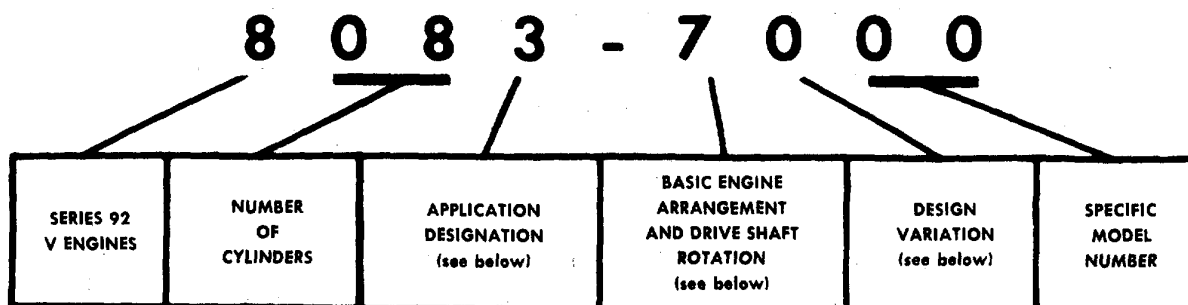
Coolant is circulated through the engine by a centrifugal-type water pump. Heat is removed from the coolant, which circulates in a closed system, by the radiator or heat exchanger. Control of the engine temperature is accomplished by thermostats which regulate the flow of the coolant within the cooling system.

Fuel is drawn from the supply tank through the fuel strainer by a gear-type fuel pump. It is then forced through a filter and into the fuel inlet manifolds in the cylinder heads and to the injectors. Excess fuel is returned to the supply tank through the fuel outlet manifolds and connecting lines. Since the fuel is constantly circulating through the injectors, it serves to cool the injectors and also carries off any air in the fuel system.

Air for scavenging and combustion is supplied by a blower which pumps air into the engine cylinders via the air box and cylinder liner ports. All air entering the blower first passes through an air cleaner.

Engine starting is provided by a electric starting system. The electric starting motor is energized by a storage battery. A battery-charging generator, with a suitable voltage regulator, serves to keep the battery charged.

Engine speed is regulated by a mechanical or hydraulic type engine governor, depending upon the engine application.



APPLICATION DESIGNATIONS:

8082-7000	MARINE
8083-7000	INDUSTRIAL F-F
8085-7000	GENERATOR
8087-7000	VEHICLE F-F
8088-7000	VEHICLE F-F

DESIGN VARIATIONS:

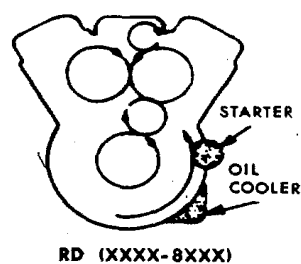
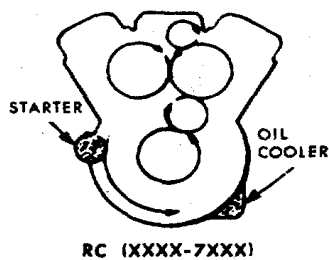
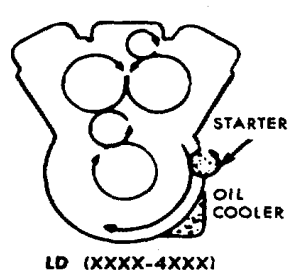
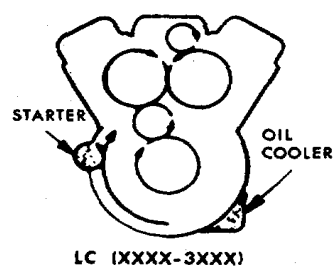
8083-7000	4 VALVE HEAD ENGINE
8083-7300	TURBOCHARGED ENGINE
8083-7400	AFTERCOOLED ENGINE
8083-7500	CUSTOMER SPECIAL ENGINE
8087-7700	CONSTANT HORSEPOWER (TT)
8087-7800	CONSTANT HORSEPOWER (TTA) (CALIFORNIA AND FEDERAL CERTIFIED)

BASIC ENGINE ARRANGEMENTS:

Rotation: L (left) and R (right) designates rotation viewed from the front of the engine.

Type: A-B-C-D designates location of starter and oil cooler as viewed from the rear (flywheel) end.

Cylinder Bank: Left and right cylinder banks are determined from rear of engine.



ALL ABOVE VIEWS FROM REAR OF ENGINE

Fig. 2 - Model Numbering, Rotation and Accessory Arrangements

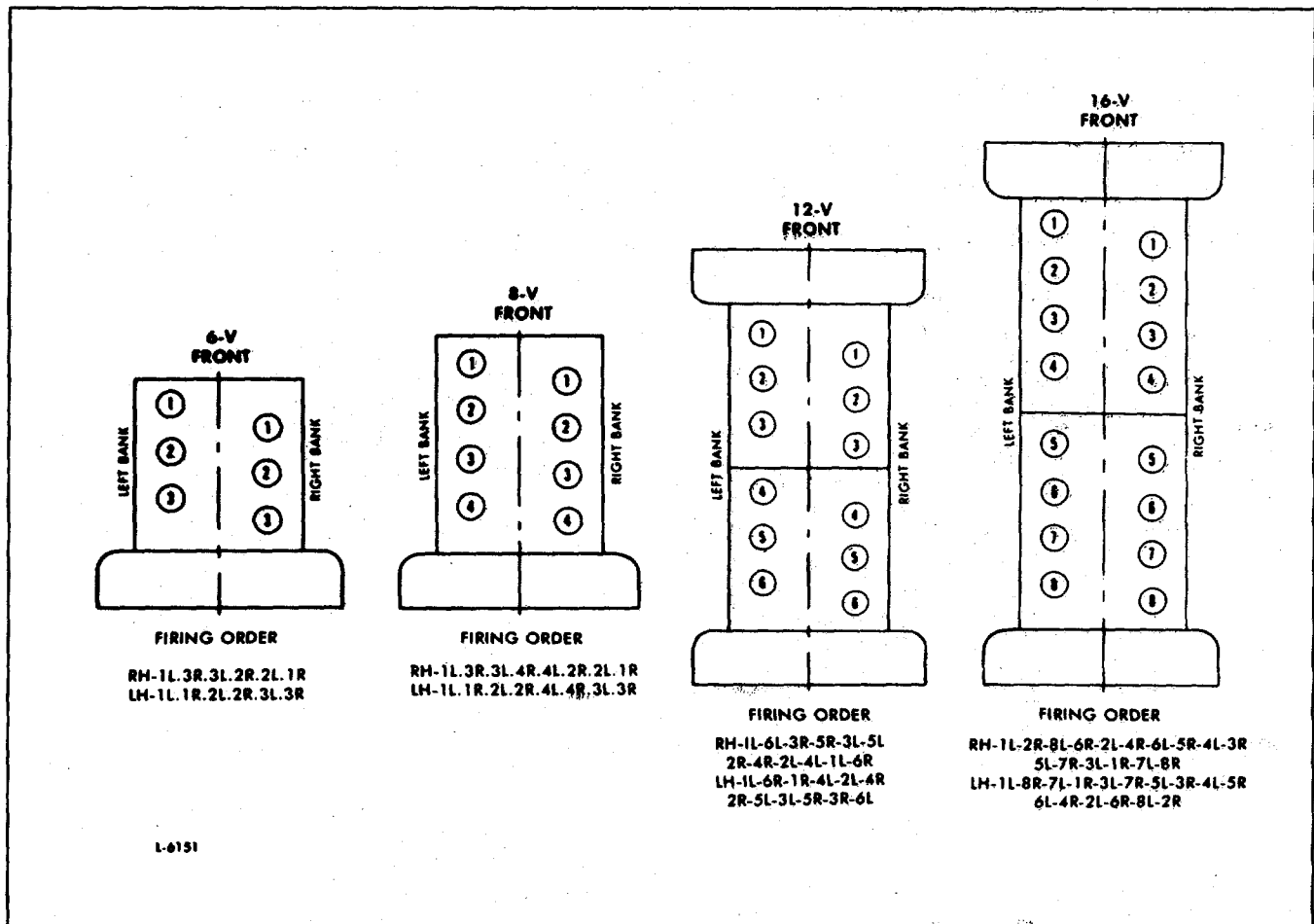


Fig. 3 - V-92 Engine Cylinder Designation and Firing Order

GENERAL SPECIFICATIONS

	6V	8V	12V	16V
Type.....	2 Cycle	2 Cycle	2 Cycle	2 Cycle
Number of Cylinders	6	8	12	16
Bore (inches).....	84	4.84	4.84	4.84
Bore (mm).....	123	123	123	123
Stroke (inches).....	5	5	5	5
Stroke (mm).....	127	127	127	127
Compression Ratio (Nominal) (Turbocharged Engines).....	17 to 1	17 to 1	17 to 1	17 to 1
Compression Ratio (Nominal) (Naturally Aspirated Engines).....	19 to 1	19 to 1	19 to 1	19 to 1
Total Displacement - cubic inches	552	736	1104	1472
Total Displacement - litres.....	9.05	12.07	18.10	24.14
Number of Main Bearings.....	4	5	7	10

ENGINE MODEL, SERIAL NUMBER AND OPTION PLATE

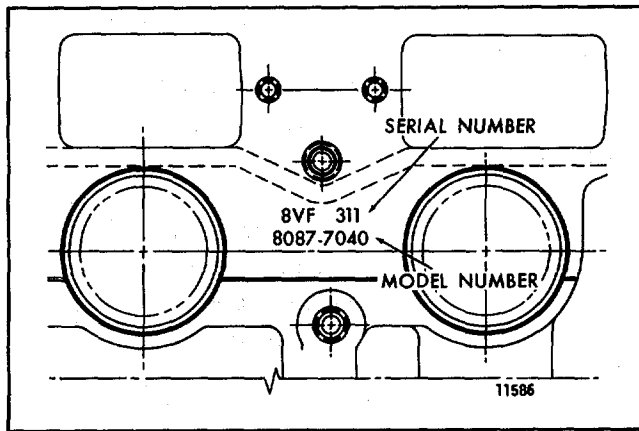


Fig. 4 - Typical Engine Serial Number and Model Number As Stamped on Cylinder Block

The engine serial number and the engine model number are stamped on the right rear side of the cylinder block (Fig. 4).

An option plate, attached to one of the valve rocker covers, carries the engine serial number and model number and, in addition, lists any optional equipment used on the engine (Fig. 5).

On-highway vehicle engines also carry an exhaust emission certification label next to the option plate. It is separate from the option plate and is mounted permanently in the option plate retainer. The current label includes information relating to an engine family for the maximum fuel injector size and maximum speed.

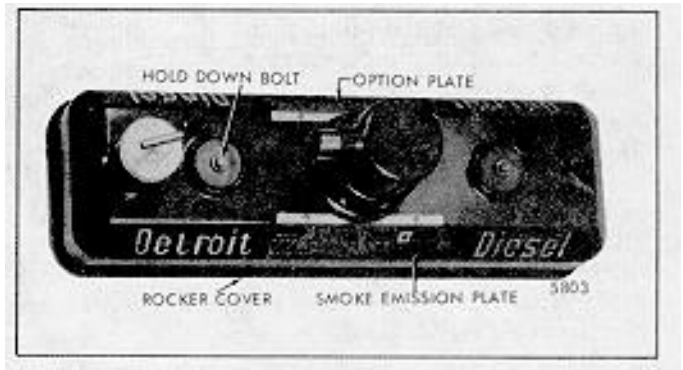


Fig. 5 - Option Plate

Due to Federal regulations, the exhaust emission plate should not be removed from the rocker cover. Refer to Section 14 for further information regarding emission regulations.

With any order for parts, the engine model number and serial number must be given. In addition, if a type number is shown on the option plate covering the equipment required, this number should also be included on the parts order.

All groups of parts used on a unit are standard for the engine model unless otherwise listed on the option plate.

Power take-off assemblies, torque converters, marine gears, etc. may also carry name plates. The information on these name plates is also useful when ordering replacement parts for these assemblies.

GENERAL PROCEDURES

In many cases, a serviceman is justified in replacing parts with new material rather than attempting repair.

However, there are times where a slight amount of reworking or reconditioning may save a customer considerable added expense. Crankshafts, cylinder liners and other parts are in this category. For example, if a cylinder liner is only slightly worn and within usable limits, a honing operation to remove the glaze may make it suitable for reuse, thereby saving the expense of a new part. Exchange assemblies such as injectors, fuel pumps, water pumps and blowers are also desirable service items.

Various factors such as the type of operation of the engine, hours in service and next overhaul period must be considered when determining whether new parts are installed or used parts are reconditioned to provide trouble-free operation.

For convenience and logical order in disassembly and assembly, the various sub-assemblies and other related parts mounted on the cylinder block will be treated as separate items in the various sections of the manual.

DISASSEMBLY

Before any major disassembly, the engine must be drained of lubricating oil, water and fuel. On engines cooled by a heat exchanger, the fresh water system and raw water system must both be drained. Lubricating oil should also be drained from any transmission attached to the engine.

assemblies should be removed from the engine. When only a few items need replacement, it is not always necessary to mount the engine on an overhaul stand.

To perform a major overhaul or other extensive repairs, the complete engine assembly, after removal from the engine base and drive mechanism, should be mounted on an engine overhaul stand; then the various sub-

Parts removed from an individual engine should be kept together so they will be available for inspection and assembly. Those items having machined faces, which might be easily damaged by steel or concrete, should be stored on suitable wooden racks or blocks, or a parts dolly.

CLEANING

Before removing any of the sub-assemblies from the engine (but after removal of the electrical equipment), the exterior of the engine should be thoroughly cleaned. Then, after each sub-assembly is removed and disassembled, the individual parts should be cleaned. Thorough cleaning of each part is absolutely necessary before it can be satisfactorily inspected. Various items of equipment needed for general cleaning are listed below.

A tank of sufficient size to accommodate the largest part; that will require cleaning (usually the cylinder block) should be provided and provisions made for heating the cleaning solution to 180-200 ° F (82-90 ° C).

The cleaning procedure used for all ordinary cast iron parts is outlined under Clean Cylinder Block in Section 1.1; any special cleaning procedures will be mentioned in the text wherever required.

Fill the tank with a commercial heavy-duty solvent which is heated to the above temperature. Lower large parts directly into the tank with a hoist. Place small parts in a wire mesh basket and lower them into the tank. Immerse the parts long enough to loosen all of the grease and dirt.

Steam Cleaning

Rinsing Bath

A steam cleaner is a necessary item in a large shop and is most useful for removing heavy accumulations of grease and dirt from the exterior of the engine and its sub-assemblies.

Provide another tank of similar size containing hot water for rinsing the parts.

Solvent Tank Cleaning

Drying

Parts may be dried with compressed air. The heat from the hot tanks will quite frequently complete the drying of the parts without the use of compressed air.