TECHNICAL MANUAL

OPERATOR'S, ORGANIZATIONAL, DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL (INCLUDING REPAIR PARTS INFORMATION AND SUPPLEMENTAL MAINTENANCE AND REPAIR PARTS INSTRUCTIONS) FOR PAVING MACHINE BITUMINOUS MATERIEL CRAWLER MOUNTED DED MODEL BSF-400 (NSN 3895-01-063-7891) WITH DETROIT DIESEL ENGINE (SERIES 53) IOWA MANUFACTURING COMPANY This manual contains copyright material and published with permission of Detroit Diesel Allison, Division of General Motors Corporation: and Iowa Manufacturing Company.

TM 5-3895-355-14&P

TECHNICAL MANUAL

No. 5-3895-355-14&P

HEADQUARTERS DEPARTMENT OF THE ARMY WASHINGTON, DC, 26 January 1981

Operator's,. Organizational, Direct Support and General Support Maintenance Manual (Including Repair Parts Information and Supplemental 'Maintenance and Repair Parts Instructions) For PAVING MACHINE BITUMINOUS MATERIEL CRAWLER MOUNTED DED MODEL BSF-400 (NSN 3895-01-063-7891) WITH DETROIT DIESEL ENGINE (SERIES 53) IOWA MANUFACTURING COMPANY

REPORTING OF ERRORS

You can help improve this manual. If you find any mistake or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual direct to: Commander, US Army Tank-Automotive Command, ATTN: DRSTA-MB, Warren, MI 48090. A reply will be furnished to you.

NOTE

This manual is published for the purpose of identifying an authorized commercial manual for the use of the personnel to whom the paving machine is issued. Manufactured by: Detroit Diesel Allison, Division of General Motors Corp.

Iowa Manufacturing Company

Procured under Contract Nos: DSA 700-77-C-8481 and DAAE07-79-C5795

This technical manual is an authentication of the manufacturers' commercial literature and does not conform with the format and content specified in AR 310-3, Military Publications. This technical manual does, however, contain available information that is essential to the operation and maintenance of the equipment.

Part I. Operators Instructions for Series 53 Engine

- II. Parts Listing for Detroit Diesel Engine
- III. Equipment Operation and Maintenance Instructions
- IV. Vane Pumps
- V. Service Instructions for Cyclopac Series Air Cleaners
- VI. Parts Listing for Paving Machine, Bituminous Material, Crawler Mounted, Model BSF-400
- VII, Supplemental Operating, Maintenance and Repair Parts Instructions

PART I. OPERATOR'S INSTRUCTIONS For Series 53 Engines TABLE OF CONTENTS

PAGE

SUBJECT

DESCRIPTION	
Principles of Operation	
General Description	
Model Description	
General Specifications	
Engine Model and Serial Number -Designation	
Built-In Parts Book	
Cross Section Views of Engine	
ENGINE SYSTEMS	
Fuel System	
Air System	
Lubricating System.	
Cooling System	
Instrument Panel Instruments and Controls	
Engine Distostive Systems	
Engline Protective Systems	
Electrical Starting System	
Hydraulic Starting System	
Cold Weather Starting Aids	
Governors	
I ransmissions	
OPERATING INSTRUCTIONS	
Engine Operating Instructions	
A. C. Power Generator Set Operating Instructions	
LUBRICATION AND PREVENTIVE MAINTENANCE	
Lubrication and Preventive Maintenance	
Fuel. Lubricants and Coolants	
ENGINE TUNE-UP PRO)CEDURES	
Engine Tune-Up Procedures	
Exhaust Valve Clearance Adjustment	
Timing Fuel Injector	
Limiting Speed Mechanical Governor (In-Line Engines)	
Limiting Speed Mechanical Governor (6V-53 Engine)	
Variable Speed Mechanical Governor (In-Line Open Linkage)	
Variable Speed Mechanical Governor (In-Line Enclosed Linkage)	
Variable Speed Mechanical Governor (6V-53 Engine)	
Supplementary Governing Device Adjustment	
Hydraulic Governor (In-Line Engine)	
Hydraulic Governor (6V-53 Engine)	
STORAGE	
BUILT-IN PARTS BUOK	
OWNER ASSISTANCE	
ALPH ABETICAL INDEX	

DESCRIPTION

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 pons.

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 injected fuel 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 halfway down, allowing the burned gases to escape into the exhaust manifold as shown in Fig. I (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 have the same bore and stroke and many of the major working parts such as injectors, pistons, connecting rods, cylinder liners and other parts are interchangeable.

The In-line engines, including the inclined marine models, include standard accessories such as the blower, water pump, governor and fuel pump, which, on some models, may be located on either side of the engine regardless of the direction the crankshaft rotates. Further flexibility in meeting installation requirements is achieved with the cylinder head which can be installed to accommodate the exhaust manifold on either side of the engine.

The V-type engine uses many In-line engine parts, including the 3-53 cylinder head. The blower is mounted on top of the engine between the two banks of cylinders and is driven by the gear train. The governor is mounted on the rear end of the 6V-53 blower.

The meaning of each digit in the model numbering system is shown in Figs. 2 and 3. 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 blower and exhaust manifold location on the In-line engines as viewed from the rear of the engine while the letter A or C designates the location of the oil cooler and starter on the 6V-53 engine.

Each engine is equipped with an oil cooler, replaceable element type lubricating oil filter, fuel oil strainer, fuel oil filter, an air cleaner or air silencer, a governor, a heat exchanger and raw water pump or a fan and radiator, and a starting motor.

Full pressure lubrication is supplied to all main bearings, connecting rod bearings, and camshaft bearings, and to other moving parts.

Oil is drawn by suction from the oil pan through the intake screen and pipe to the oil pump where it is pressurized and delivered to the oil filter and the oil cooler. From the oil cooler, the oil enters oil galleries in the cylinder block and cylinder head for distribution to the main bearings, connecting rod bearings, camshaft bearings, rocker arm mechanism and other functional parts.

The cooling system has a centrifugal water pump which circulates the engine coolant through the oil cooler and water jackets. The engine temperature is regulated by a thermostat(s).

Fuel is drawn from the supply tank through the fuel strainer and enters a gear type fuel pump at the inlet side. Upon leaving the pump under pressure, the fuel is forced through the fuel filter into the inlet manifold where it passes through fuel pipes into the inlet side of the fuel injectors. The fuel is filtered through elements in the injectors and then atomized through small spray tip orifices into the combustion chamber. Excess fuel is returned to the fuel tank through the fuel outlet galleries and connecting lines.

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 or air silencer.

The engine may be started by either a hydraulic or an electric starting system.

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



Fig. 2 - In-Line Engine Model Description, Rotation and Accessory Arrangement



ALL ABOVE VIEWS FROM REAR FLYWHEEL END OF ENGINE

11783

Fig. 3 · 6V Engine Model Description, Rotation and Accessory Arrangement