

TM 5-3895-359-14&P

TECHNICAL MANUAL

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

**MIXER, ROTARY TILLER, SOIL STABILIZATION
REWORKS MODEL HDS-E
DIESEL ENGINE DRIVEN (DED) NSN
3895-01-141-0882**

HEADQUARTERS DEPARTMENT OF THE ARMY

20 AUGUST 1985

Technical Manual

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REPORTING OF ERRORS

You can improve this manual. If you find any mistakes 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: AMSTA-MB, Warren, MI48397-5000. A reply will be furnished direct to you.

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.

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SECTION 1 OPERATION

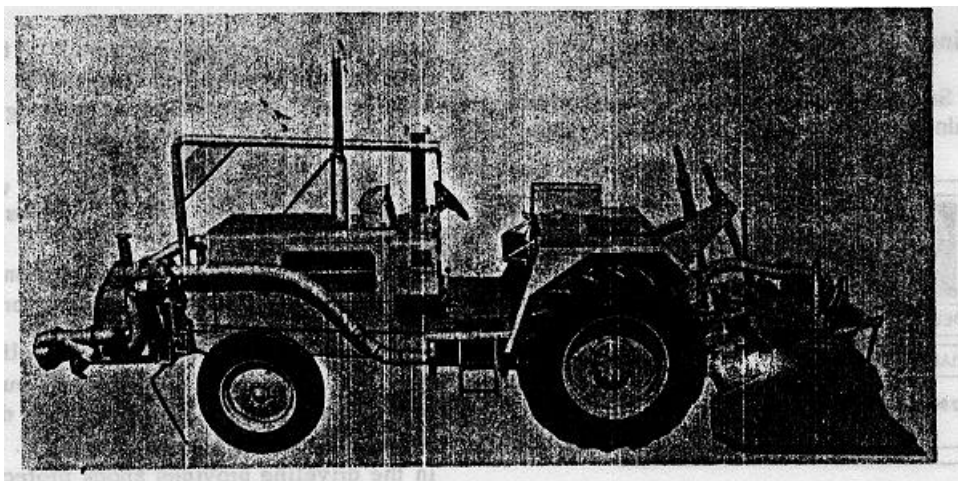


Figure 1-1. General View, Model HDS-E Standard Pulvi-Mixer With Asphalt Emulsion Handling System.

Warranty

We warrant to the original user that all construction machinery products of our manufacture will be free from defects in material and workmanship and will possess the characteristics represented in writing by us. Any claim under the above warranty must be made within a period of fifteen (15) months from date of delivery to the user. Upon satisfactory demonstration of the merits of the claim, we will, within a reasonable time, make any necessary repairs or corrections, or at our option, replace defective parts free of charge. Charges for correcting defects will not be allowed, nor can we accept goods returned for credit, unless we are notified in writing and the return or correction is authorized by us in writing. This warranty will not apply to any product which shall have been repaired or altered outside of our factory in any way so as, in our judgment, to affect its stability or reliability, nor which has been subjected to misuse, neglect or accident. NO FURTHER

WARRANTIES, INCLUDING WARRANTIES OF MERCHANTABILITY OR OF FITNESS FOR PURPOSE ARE MADE BY US, and this paragraph sets forth the full extent of our liability arising from the manufacture, use or sale of our products. No allowance will be made for delays or loss of profit, nor for any other consequential damages or injuries, whether based on tort or contract.

Damage Claims

REXWORKS Inc. assumes no responsibility for delays or damage to merchandise while in transit. Our responsibility ceases upon delivery of shipment to the transportation company, from whom a receipt is received showing that shipment was in good condition and properly packed when delivered to them; therefore, claims for parts lost or broken in transit should be made by you to the transportation company.

General Machine Description

The Model and Serial Number plate is affixed to the firewall of the machine and facing the operator. See Figure 1-2.

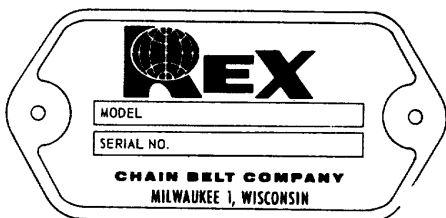


Figure 1-2. Number Plate

The Hydrostatic Self-Propelled Stabilizer is a machine designed specifically for use in pulverizing the subgrade prior to the addition of a suitable binder, or merely blending in the case of purely mechanical stabilization.

Stabilization means the mechanical mixing of the coarse and fine aggregate into a homogeneous mixture. This mixture is stable because the voids that normally exist where coarse materials are lying adjacent to one another separated from the fines, are eliminated.

The machine's performance accomplishes many functions such as:

- Mixing of the bituminous wearing surface.
- Stabilization of asphalt roads and shoulders.
- Stabilizing airport runways, taxiways, earth dams and embankments.
- Construction material reduction, moisture introduction, aeration of material and land clearing.
- Use in all types of road stabilization using bitumen, cement, lime, chlorides and other stabilizing additives.
- The mixing of additives at the most ideal location within the mixing chamber.

The machine consists of a series of major components each of which is dependent upon the others to perform the final function for which the machine was designed.

The engine is probably the most important component, since it is the source of all power for the machine. A 4 cylinder diesel engine is used as standard power.

The traction drive is accomplished hydrostatically. The engine drives a variable displacement hydraulic pump off the front of the engine crankshaft, which in turn drives a fixed displacement hydraulic motor. The hydraulic motor is mounted on a two speed transmission or nose box which is part of the planetary rear axle, thus

the speed of the vehicle is infinitely variable in two ranges. Low or working range 0-2 1/2 mph; high or traveling range 0-15 1/2 mph.

The planetary rear axle is equipped with brakes which are operated individually by two master cylinders. In addition to the hydraulic brakes on the axle, the hydrostatic system has inherent dynamic braking which will probably be used more than the brakes on the axle.

The work of pulverization is accomplished by the rotor which is driven by the engine through a clutch, two speed transmission and jack axle differential which evenly divides the power to the rotor. A shear coupling in the driveline provides shock protection for the drive train.

The standard tines, 103 1/2 bevel edge type, are arranged on the rotor to form a spiral pattern, and to overlap by 3/16" to insure the cutting of a flat bottom.

The spiral pattern allows four tines in any longitudinal row to cut simultaneously.

The maximum cutting width of the rotor is 6'-6 1/4".

Maximum cutting depth 0 10 1/2".

The mixing chamber or hood assembly is composed of the following components: hood, hydraulically operated tailboard, hood lift bar assembly, tailboard wear plate, skis and hood adjusting bolts. The hood confines the material while mixing to control pulverization and thoroughness of mixture or integration of materials. Raising the tailboard permits aeration of mixture to reduce moisture content. Hood adjusting bolts are provided to obtain the right angle of skis for floatation of hood assembly on the materials being mixed.

The wear plate attached to the tailboard provides strike-off of mixed material for proper contour and compaction. A lifting bar is attached to the hood for raising with the crane.

The crane is used to lift the rotor and/or hood assembly from material for turn-arounds or maneuvers during mixing passes, parking, loading and unloading the machine.

The crane is pivoted at the bottom and actuated by a double acting hydraulic cylinder which receives oil under pressure from the hydraulic pump through a control valve at the operator's location. The crane lifts the hood and rotor by means of the rotor and hood lifting bars.

The hydraulic system consists of the following components.

A. Hydraulic pump for power steering The pump is a vane type, and is mounted on the left front side of the engine and is belt driven. This pump supplies oil to the power steering ram only.

B. Hydraulic pump for crane, tailboard and spray bar This pump is a positive displacement, gear type and is mounted at the rear of the engine off the accessory drive opposite the engine tachometer. This pump supplies oil to the crane and tailboard rams, and to the spray bar ram.

C. Hydrostatic pump, traction drive Pump is located at the front of the engine and driven off the engine crankshaft. The pump is of variable displacement type and supplies oil under pressure to the hydrostatic motor.

D. Hydrostatic motor, fixed displacement Mounted on the 2 speed trans. or nose box of the rear axle differential, motor receives oil from the hydrostatic pump and drives the rear axle assembly.

E. Oil reservoir The oil reservoir is located to the left side of the engine dash assembly just below the hydraulic control valve and supplies and receives oil for the entire hydraulic system, except power steering.

F. Hydraulic control valve A two spool dual control valve is used. The valve spools are 4-way type and the valve has an "open center" or neutral position which permits the oil to be pumped unrestricted from the reservoir thru the pump and control valve back to the reservoir.

V.P.I. Fluid Handling System

The V.P.I. is an electrically instrumented system provisioned with gauges and a liquid control to visually indicate to the operator the performance of the fluid handling system.

It operates on an electrical balance principle that integrates the fluid rate of flow with the stabilizer travel speed, fulfilling the need for more accurate control and faster dispersion of liquid, (emulsified asphalt, water or asphalt cutbacks).

Volumes of liquid up to 500 gallons per minute can be obtained and controlled with extreme accuracy. This system minimizes the number of re-mix passes, advances the travel speeds, which also benefits the tank trucks resulting in fewer problems that otherwise might be encountered at slower travel speeds.

Diesel Engine 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. 1-3. 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 that 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 (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.

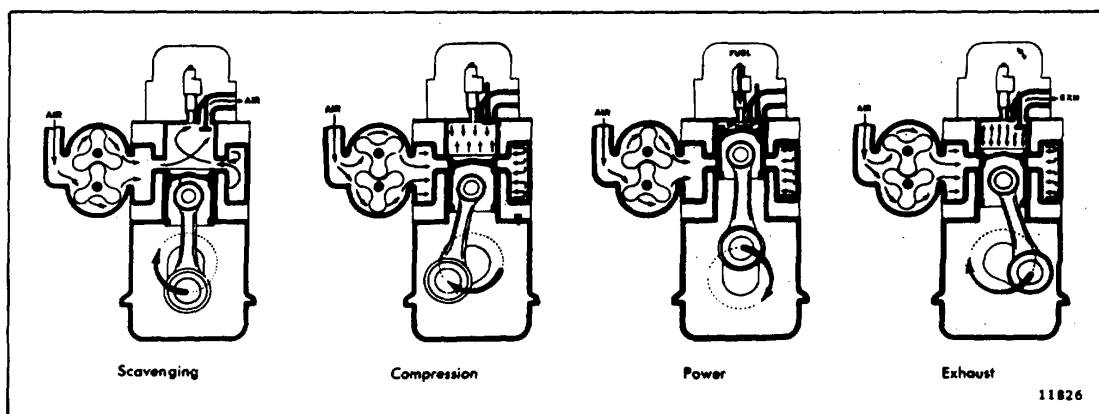


Figure 1-3. Two-Stroke Cycle Operation

As the piston continues on the upward stroke, the exhaust valves close and the charge of fresh air is subjected to compression (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 (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 halfway down, allowing the burned gases to escape into the exhaust manifold (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".

The two-cycle engines covered in this manual are produced in three, four and six-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 blower, water pump, governor and fuel pump form a group of standard accessories which can be located on either side of the engine, regardless of the direction of rotation. Further flexibility in meeting installation requirements can be had by placing the exhaust manifold and the water outlet manifold on either side of the engine (Fig. 1-4). This flexibility in the arrangement of parts is obtained by having both the cylinder block and the cylinder head symmetrical at both ends and with respect to each other.

The meaning of each digit in the model numbering system is shown in Fig. 1-4. 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 as viewed from the rear of the engine.

Each engine is equipped with an oil cooler, lubricating oil filter, fuel oil strainer, fuel oil filter, air cleaner, governor, 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 enters a longitudinal oil gallery in the cylinder block where the supply divides; a portion entering the by-pass filter, if used, and then draining back into the oil pan, part going to the cam and balance shaft end bearings and cylinder head, with the remainder going to the main bearings and connecting rod bearings via the drilled crankshaft.

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 heat exchanger or radiator. Control of the engine temperature is accomplished by a thermostat which regulates the flow of the coolant within the cooling system.

Fuel is drawn from the supply tank through a strainer by a gear-type fuel pump. It is then forced through a filter and into the fuel inlet gallery in the cylinder head and to the injectors. Excess fuel is returned to the supply tank through the fuel outlet gallery 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 or silencer.

Engine starting is provided by an electric starting system.

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

Engine speed is regulated by a mechanical type engine governor.

GENERAL SPECIFICATIONS

	4-71
Type	2 Cycle
Number of Cylinders	4
Bore (inches)	4.25
Bore (mm)	108
Stroke (inches)	5
Stroke (mm)	127
Compression Ratio (Nominal) ("N" Engines)	18.7 to 1
Total Displacement - cubic inches	284
Total Displacement - litres	4.66
Firing Order - R.H. Rotation	1-3-4-2
Number of Main Bearings	5

1 0 6 5 - 7 0 0 1

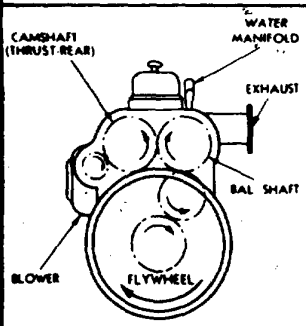
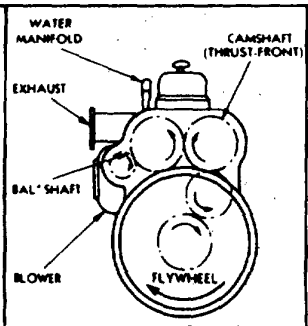
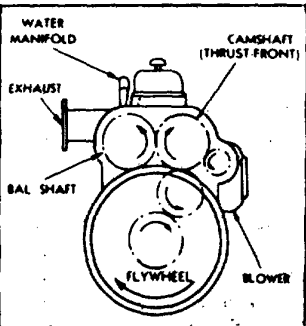
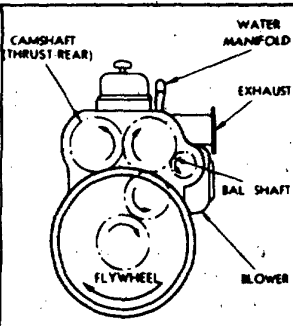
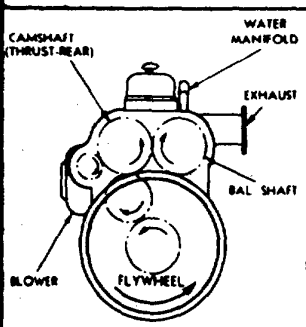
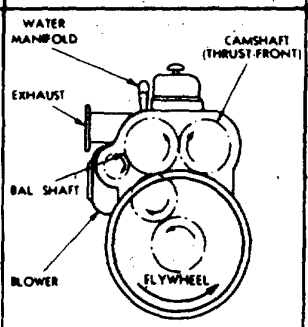
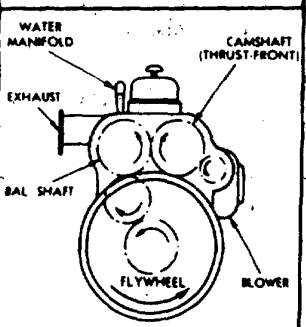
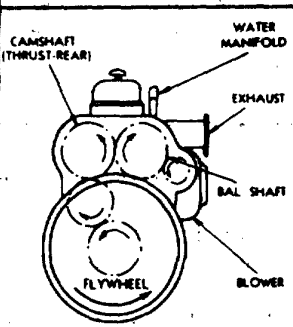
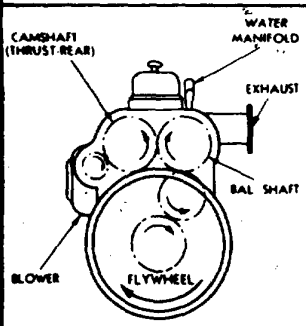
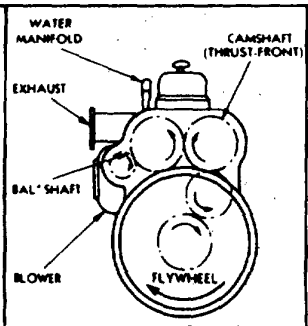
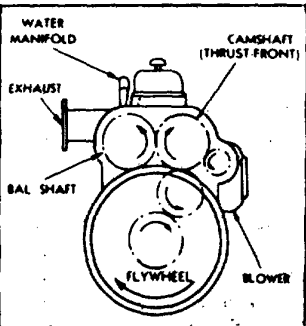
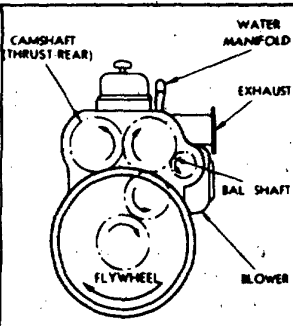
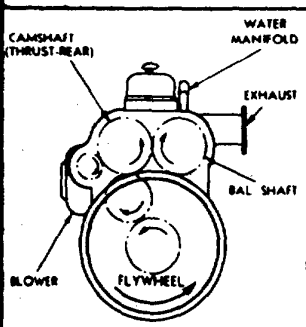
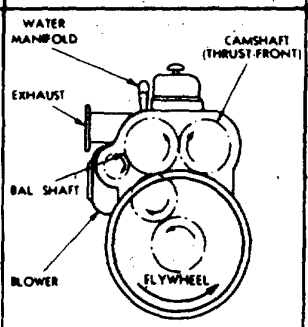
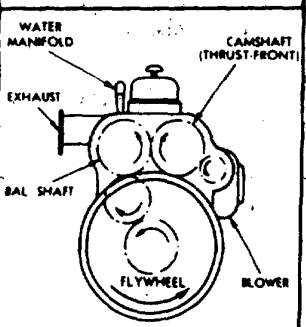
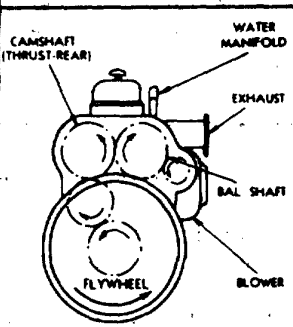
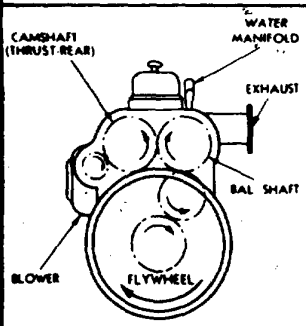
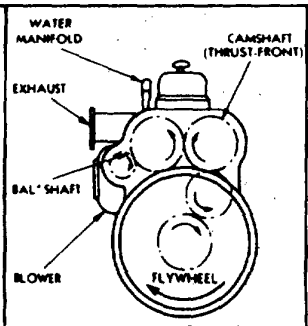
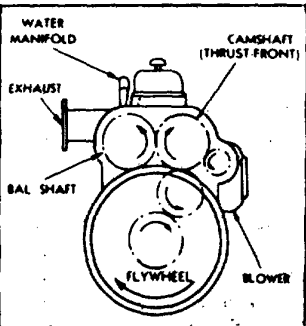
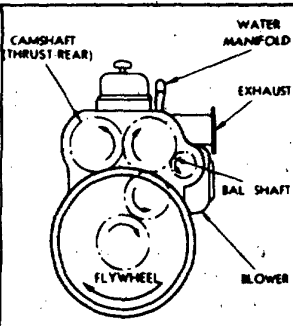
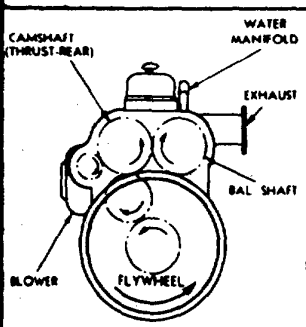
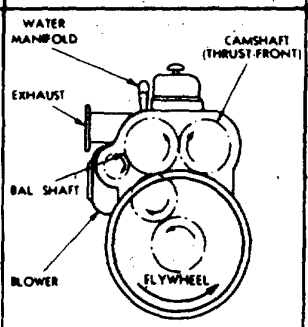
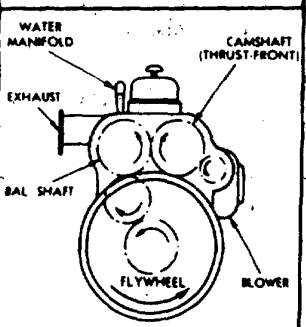
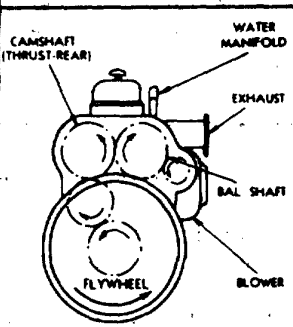
SERIES 71 IN-LINE ENGINE	NUMBER OF CYLINDERS	APPLICATION DESIGNATION (see below)	BASIC ENGINE ARRANGEMENT AND DRIVE SHAFT ROTATION (see below)	DESIGN VARIATION (see below)	SPECIFIC MODEL NUMBER								
APPLICATION DESIGNATION: 1062-7001 MARINE 1062-7001 INDUSTRIAL F-F 1064-7001 POWER-BASE 1065-7001 GENERATOR 1067-7001 VEHICLE F-F 1068-7001 SPECIAL			DESIGN VARIATIONS 1062-7001 4 VALVE HEAD ("N" ENGINE) 1062-7101 2 VALVE HEAD ENGINE 1062-7201 4 VALVE HEAD ("E" ENGINE) 1062-7301 TURBOCHARGED ENGINE 1062-7501 CUSTOMER SPEC. ENGINE										
BASIC ENGINE ARRANGEMENTS: Rotation: L (left) and R (right) designates rotation viewed from the front of the engine. Type A-B-C-D designates the accessory arrangements.			DRIVE SHAFT ROTATION 11220001 LEFT-HAND 11220001 RIGHT-HAND Shaft rotation on multiple units is determined from the rear of the unit.										
<table><tr><td> LA (XXXX-1XXX)</td><td> LB (XXXX-2XXX)</td><td> LC (XXXX-3XXX)</td><td> LD (XXXX-4XXX)</td></tr><tr><td> RA (XXXX-5XXX)</td><td> RB (XXXX-6XXX)</td><td> RC (XXXX-7XXX)</td><td> RD (XXXX-8XXX)</td></tr></table>						 LA (XXXX-1XXX)	 LB (XXXX-2XXX)	 LC (XXXX-3XXX)	 LD (XXXX-4XXX)	 RA (XXXX-5XXX)	 RB (XXXX-6XXX)	 RC (XXXX-7XXX)	 RD (XXXX-8XXX)
 LA (XXXX-1XXX)	 LB (XXXX-2XXX)	 LC (XXXX-3XXX)	 LD (XXXX-4XXX)										
 RA (XXXX-5XXX)	 RB (XXXX-6XXX)	 RC (XXXX-7XXX)	 RD (XXXX-8XXX)										
ALL VIEWS FROM FLYWHEEL REAR END OF ENGINE ENGINE ROTATION DETERMINED BY VIEWING ENGINE FROM BALANCE WEIGHT COVER (FRONT) END													

Figure 1-4. Model Number Coding

Diesel Engine Model and Serial Numbers

On all current Series 71 engines, the engine serial number and the engine model number are stamped on the cylinder block (Figs. 1-4 and 1-5). The engine serial number and model number are also stamped on the Option Plate (when used) attached to the valve rocker cover.

Diesel Engine Serial Number

The engine serial number is prefixed by numerals indicating the number of cylinders and the letter "A" which designates a Series 71 engine.

Diesel Engine Model Number

Current Series 71 engines are identified by an eight digit model number (Fig. 1-4). The engine model number 1065-7001 illustrated is interpreted as follows: Series 71 In-line engine (1), six-cylinder (06), generator set (5), right-hand rotation with "C" accessory arrangement (7), four-valve head "N" engine (0) and specific model variation No. 1 (01).

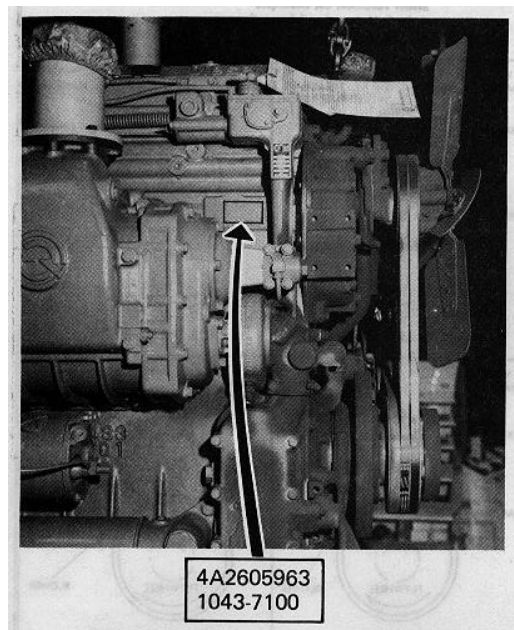


Figure 1-5. Typical Engine Serial Number and Model Number as Stamped on Cylinder Block Option Plate

An option plate, attached to the valve rocker cover (only one valve rocker cover of a multiple engine unit), is stamped with the engine serial number and model number and, in addition, lists any optional equipment used on the engine (Fig. 1-6).

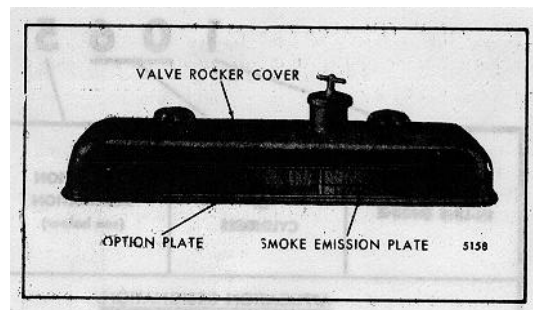


Figure 1-6. Option Plate

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.

Built-in Parts Book

The *Built -In Parts Book* is a photoetched aluminum plate (Option Plate) that fit into a holding channel on the engine valve rocker cover and contains the necessary Information required when ordering parts. It is recommended that the engine user read the section on the *Built -In Parts Book* in order to take full advantage of the information provided on the engine option plate.

Numerous exploded view type illustrations are included to assist the user in identifying and ordering service parts.

Pump Engine

Pump engines are of the four cycle type, in which each of the four operations of suction, compression, expansion and exhaust requires a complete stroke. This gives one power stroke per cylinder for each two revolutions of the crankshaft.

Cooling

Cooling is accomplished by a flow of air, circulated over the cylinders and heads of the engine, by a combination fan-flywheel encased in a sheet metal shroud. The air is divided and directed by ducts and baffle plates to insure uniform cooling of all parts.

Never operate an engine with any part of the shrouding removed- this will retard air cooling.