Momenter

Svingskjøt - 80 stk = 11 kpm

Veilager 8,5 - 9 kpm

Rammelager 12 kpm

Topp 225 Lpm / 15

Ventil klaring (0,13 Vamm) = 0,33 mm

0,33

G. M. BEDFORD
220-330 SERIES

Bedford Power and Industrial Engines
Service Manual BD/SE/2

Month of: July 1975
Release No: 220/330-6
No. of Sheets: 31

POWER AND INDUSTRIAL DIVISION
GENERAL MOTORS LIMITED
LONDON ROAD
WELLINGBOROUGH
NORTHANTS
ENGLAND.

Please replace the following:

Introduction pages – complete

Section 3 complete

Section 4 complete

Please mark off the appropriate block on the updating record sheet provided at the front of the Service Manual.

SERVICE MANUAL

220 and 330 cu. in.
BEDFORD
INDUSTRIAL DIESEL ENGINES

GENERAL MOTORS
POWER PRODUCTS EUROPE
DIVISION OF GENERAL MOTORS LIMITED

P.O. Box No. 6, London Road, Wellingborough,
Northamptonshire, England, NN8 2DL

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BD/SE/2

JULY 1975

Updating Service Check Sheet

Replacement sheets will be issued at intervals. Insert the pages in your manual and record the date of release on this check sheet.

220/330–1	220/330–9	220/330–17	220/330–25	220/330–33
220/330–2	220/330–10	220/330–18	220/330–26	220/330–34
220/330–3	220/330–11	220/330–19	220/330–27	220/330–35
220/330–4	220/330–12	220/330–20	220/330–28	220/330–36
220/330–5	220/330–13	220/330–21	220/330–29	220/330–37
220/330–6	220/330–14	220/330–22	220/330–30	220/330–38
220/330–7	220/330–15	220/330–23	220/330–31	220/330–39
220/330–8	220/330–16	220/330–24	220/330–32	220/330–40

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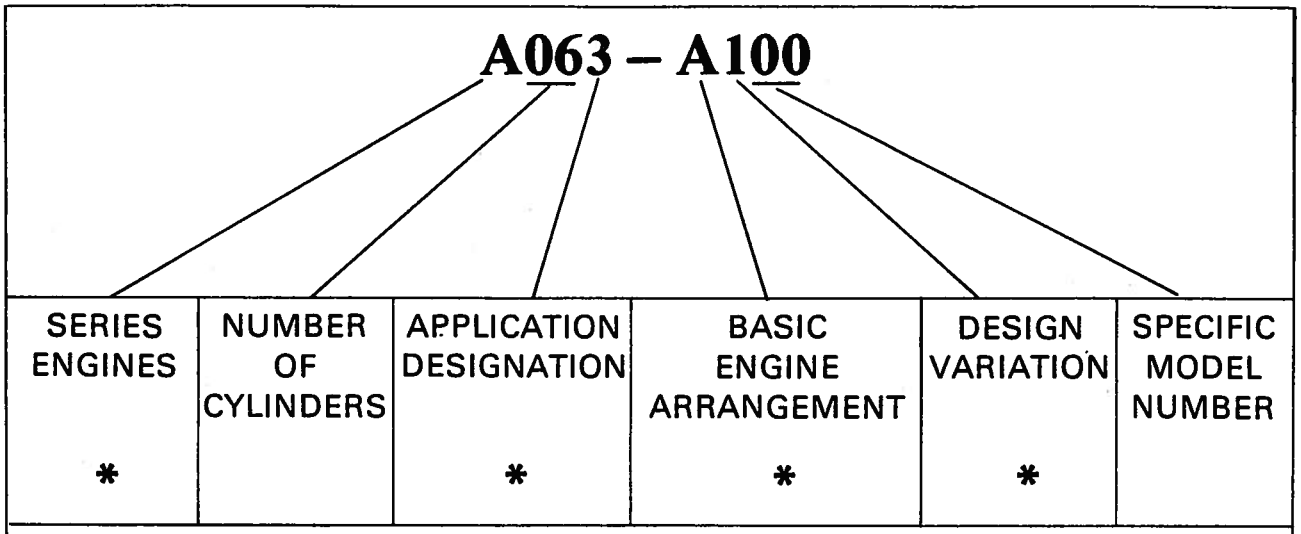
BEDFORD
MODEL DESCRIPTION CHART



* **SERIES ENGINE**

A—220/330 cu. in.
B—466 cu. in.
C—500 cu. in.

* **APPLICATION DESIGNATION**

A062-A100. MARINE
A063-A100. FAN TO FLYWHEEL INDUSTRIAL
A064-A100. POWER-BASE
A065-A100. GENERATOR
A067-A100. FAN TO FLYWHEEL AUTOMOTIVE
A068-A100. SPECIAL

* **BASIC ENGINE ARRANGEMENT**

A063-A100. STANDARD CRANKSHAFT
A063-B100. LARGE PALM CRANKSHAFT
A063-C100. EXTENDED NOSE CRANKSHAFT
B063-D100. INDUSTRIAL CRANKSHAFT

* **DESIGN VARIATION**

A063-A100. 2 VALVE HEAD
A063-A300. TURBOCHARGED

After determining which group a part is in, refer to the option plate and read the type number. From this information it will be possible to locate the parts required in the Parts Catalogue.

PRINCIPLES OF OPERATION

The Diesel Principle

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

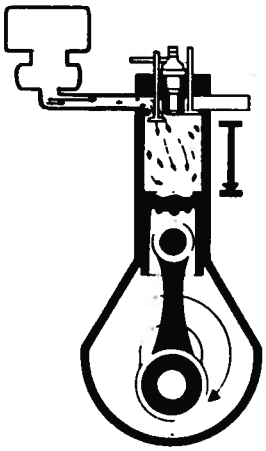
In this type of engine, air alone is compressed in the cylinder. Then, after the air has been compressed, a charge of fuel is sprayed into the cylinder and ignition is accomplished by the heat of compression.

The Four Stroke Principle (Otto Cycle)

The four stroke principle was conceived by Bear de Rochas and was first successfully applied to an engine in 1876 by Doctor Otto, hence it is sometimes known as the OTTO CYCLE.

In the four stroke engine the crankshaft has to complete two revolutions in order that the complete firing sequence of the engine can be completed. The four phases of the complete cycle are Induction, Compression, Explosion, Exhaust.

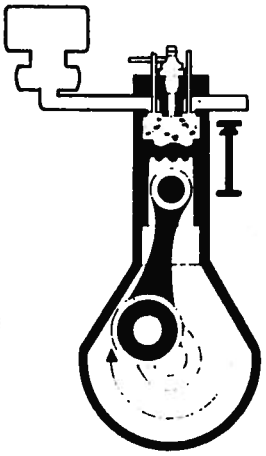
On the induction stroke the inlet valve is open, the piston moves down the bore and as it does so would reduce the pressure in the cylinder but for the air which enters via the inlet valve, this being open to the atmosphere. The inlet valve will close when the piston reaches the bottom of its stroke.



INTAKE STROKE

The piston will compress air which is now trapped within the combustion chamber as it travels up the bore, this is the compression stroke. When a gas is compressed it causes the temperature to rise. This can be understood by considering a car tyre after a journey. If the pressure is checked before and after a long journey it will be found to have increased. The temperature of the tyre will have increased during the journey, but the size of the tyre, or the volume of air will not have increased.

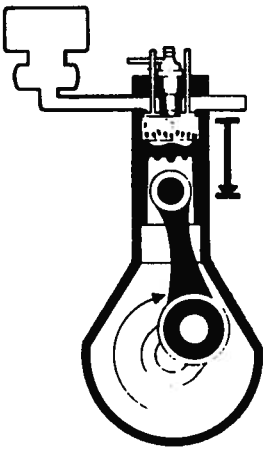
The rise of temperature of car tyres is caused by the flexing of the carcass as it passes over the road surface.



COMPRESSION STROKE

We have therefore a simple proof that if the volume remains constant and the temperature is increased the pressure will rise. The air in the cylinder has its pressure increased by the piston as the volume is reduced which will cause the temperature to rise. These facts were discovered by two scientists, Charles & Boyle, who have had two laws of physics named after them.

Just before the piston reaches the top of its stroke a quantity of fuel is injected into the cylinder via the injector, the heat already generated within the combustion chamber causes ignition of the atomized fuel. The fuel is burnt and this causes a rapid increase in pressure within the combustion chamber, the maximum expansion of the gases being timed to coincide with a point just after top dead centre. The piston is now being forced down the bore due to the pressure generated when the fuel was burnt.



EXPANSION OR POWER STROKE

GENERAL PROCEDURES

In many cases, a mechanic 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, valves and other parts are in this category. For example, if a cylinder is only slightly worn and within usable limits, a honing operation to remove the glaze may make it suitable for reuse with a standard size piston and new piston rings, thereby saving the expense of new parts.

Various factors such as type of operation of the unit, 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, the various subassemblies 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 be drained from any power transmission attached to the engine.

To perform a major overhaul or other extensive repairs, the complete engine assembly, after removal from the engine base and driven mechanism, should be mounted on an engine overhaul stand; then the various subassemblies should be removed from the unit. When only a few items need replacement, it is not always necessary to mount the engine on an overhaul stand.

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 removal of subassemblies from the engine (but after removal of the electrical equipment) the exterior of the engine should be thoroughly cleaned, ensure that exhaust and air intake are suitably sealed, if steam cleaning is used. Then after each subassembly is removed and disassembled, the individual parts should be cleaned.

Thorough cleaning of each part is absolutely necessary before a part can be satisfactorily inspected. Below are listed various items of equipment needed for general cleaning.

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

Steam Cleaning

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 subassemblies.

Solvent Tank Cleaning

A tank of sufficient size to contain the largest part which will require cleaning (usually the cylinder block) must be provided and provisions made for heating the cleaning solution to 180 degs. F.

This tank is filled with a commercial heavy-duty solvent which is heated to the above temperature. Large parts are lowered directly into the tank with a hoist; small parts are placed in a wire mesh basket and lowered into the tank. The parts are immersed in the cleaning tank long enough to loosen all grease and dirt.

When lowering components into the tank manilla rope slings should not be used as the chemicals used in degreasing tank will rot the rope causing a possibility that units could be dropped, it is advised that wire rope slings are used.

WARNING: Caustic based solvents should not be used for parts containing Aluminium. Check before using.

Rinsing Bath

Another tank of similar size containing hot water should be provided for rinsing the parts.

Drying

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

Rust Inhibiting

If parts are not to be used immediately after cleaning, they should be dipped in suitable inhibiting compound. Remove the rust proofing compound before instaling the part in an engine.

INSPECTION

The purpose of parts inspection is to determine which parts can be used and which must be replaced. Although the engine overhaul specifications given throughout the text will provide measurable data with limits which will determine which parts should be replaced, considerable judgement must be exercised by the inspector to examine the parts for wear and damage not in the specification.

The guiding factors in determining the usability of worn parts which are otherwise in good condition is the clearance between the mating parts and the rate of wear on each of the parts. If it is determined that the rate of wear will maintain the clearances within the specified maximum allowable until the next overhaul period, the reinstallation of the used parts may be justified. Rate of wear of a part is determined by dividing the amount the part has worn by the hours it has operated.

Many service replacement parts are available in various undersize and oversize as well as standard sizes. Also available are service kits for reconditioning certain parts and service sets which include all of the parts necessary to complete a particular repair job.

A complete discussion of the proper methods of precision measuring and inspection are outside the scope of this manual. However, every shop should be equipped with standard gauges, such as dial bore guages, dial indicators, and inside and outside micrometers.

In addition to measuring the used parts after cleaning, the parts should be carefully inspected for cracks, scoring, chipping, and other defects.

ASSEMBLY

Following cleaning and inspection, the engine should be assembled using new parts as determined by the inspection.

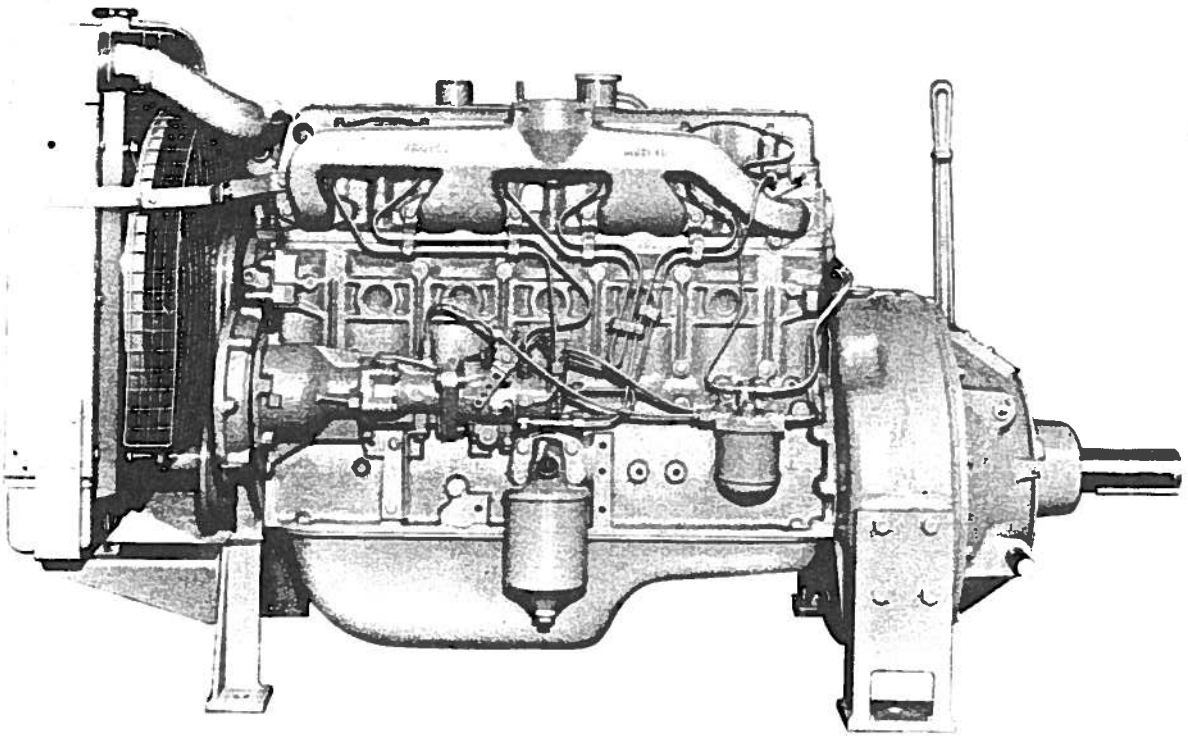
Use of the proper equipment and tools makes the job progress faster and produces better results. Likewise, a suitable working space with proper lighting must be provided. The time and money invested in providing the proper tools, equipment, and space will be repaid many times.

Keep the working space, the equipment, tools and engine assemblies and parts clean at all times. The area where assembly operations take place should if possible be located away from the disassembly and cleaning operation. Also, any machining operations should be removed as far as possible from the assembly area.

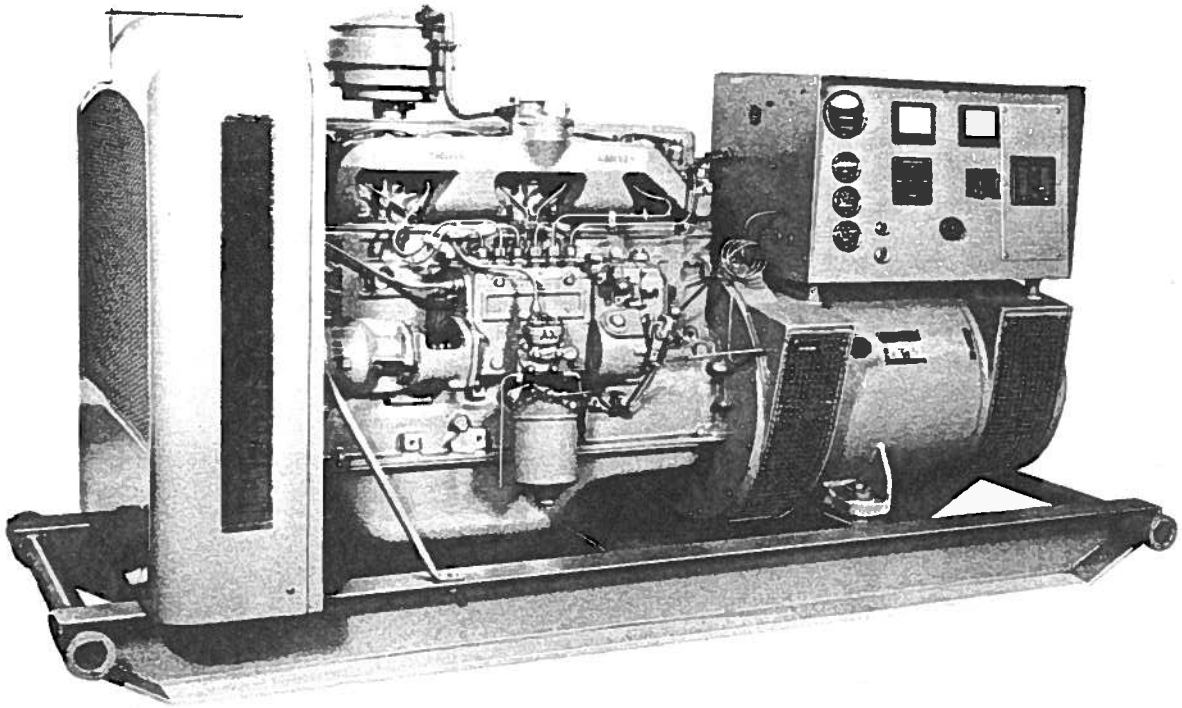
Particular attention should be paid to storing parts and subassemblies after removal and cleaning, and prior to assembly, in such a place or manner as to keep them clean. In case there is any doubt as to the cleanliness of such parts, they should be recleaned.

When assembling an engine or any part thereof, refer to the table or torque specifications at the end of each section for proper bolt, nut and stud torques.

An overhaul inspection check sheet will aid the mechanic in keeping a written record of the parts replaced and the repairs as they are made on the unit. It may also serve as a permanent record of the maintenance performed on a particular unit. A check sheet may be made similar to the one on pages 21 and 22.



External view of a 330 cu. in. engine.



External view of 330 cu. in. generator set.

OVERHAUL INSPECTION CHECK SHEET

NO.	INSPECT	OK	REPLACEMENT AND REMARKS
	CYLINDER BLOCK		
	Machined Surfaces & Tapped Holes		
	Dowels		
	Oil & Water Plugs		
	End Plates & Gaskets – Clean Surface		
	Bolts Tightened to Specified Torque		
	CYLINDER HEAD		
	Head Gasket & Seals		
	Injectors		
	Injector Securing Nuts, Tightened to Specified Torque		
	Rocker Arm Bolts Tight		
	Valve Clearance Checked		
	Inlet Valves		
	Exhaust Valves		
	CRANKSHAFT		
	Cleaned		
	Smooth Surfaces – Journals, Fillets and Seal Surfaces		
	Thrust Bearings Installed		
	Main Bearings Installed Including Seals		
	End Play		
	Front Keyway – Key		
	Seal Spacer or Cone, Pulley or Cap Installed. Front Cover, and Oil Seal Crank timing Gear, Oil Slingers		
	Bolts Tightened to Specified Torque		
	Front Cover Gaskets		
	CRANKSHAFT DAMPER		
	Check and Clean Damper		
	FLYWHEEL & FLYWHEEL HOUSING		
	Oil Seal Gaskets & Housing Installed		
	Flywheel Housing Clearance & Run Out		
	Bolts Tightened to Specified Torque		
	Flywheel Interference		
	CONNECTING RODS & PISTONS		
	Cylinder Bore & Piston O.D. Checked		
	Compression Rings		
	Oil Rings		
	Conn. Rod Bearing		
	Nuts Tightened – Conn. Rod Bolts		
	OIL PAN		
	Pan Gasket & Sealer		
	Pan Bolts Installed & Tightened		
	Drain Plugs & Gaskets		
	Oil Filter, Tube assembly – Tight		
	FRESH WATER PUMP		
	Water Pump Inlet & Outlet Packing		
	Thermo. Housing, Gaskets & Thermostats, Bypass Tube & Gaskets		

OVERHAUL INSPECTION CHECK SHEET (Cont'd)

NO.	INSPECT	OK	REPLACEMENT AND REMARKS
	CAMSHAFT		
	End Bearings		
	Intermediate Bearings Fitted in Place		
	Gear Lock Nut Tightened		
	Gear Timing & Markings Checked		
	End Play & Back Lash		
	Bolts Tightened		
	Tachometer Drive Nut & Accessory Drive Lock Nut		
	ROCKER SHAFT AND COVERS		
	Valve Rocker Cover & Gaskets		
	FUEL SYSTEM		
	Injection Pump Timing		
	Injection Pump, Drive Shaft Coupling, Check Tightness of Clamp Bolts		
	Injection Pump Carrier to Exhauster, Compressor or Housing		
	Check Tightness of All High Pressure Fuel Lines and Unions		
	Fuel Lift Pump, Operating Lever on Correct Face of Cam		
	Fuel Pipes from Lift Pump to Filter		
	Fuel Lift Pump Torque		
	Fuel Filter Connections		
	AIR CLEANER		
	Air Cleaner Inspection		
	Air Manifold Inspection		
	LUBRICATION OIL PUMP		
	Lube Oil Pump Overhauled		
	Outlet Pipe & Inlet Pipe, Screen & Gaskets		
	Filter Adaptor, Oil Cooler Housing & Gaskets		
	Oil Pressure Regulator		
	Bolts Tightened to Specified Torque		
	Check Suction Lines for Leak		
	ELECTRICAL SYSTEM		
	Starter		
	Generator		
	Voltage Regulator		
	MISCELLANEOUS		
	Inspection Approved		
	Lube Oil in Engine		
	Water Connected		
	Fuel Connected		
	Approved For Run In		