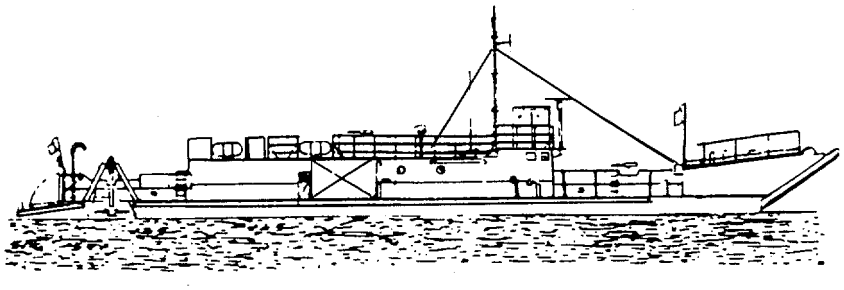
TECHNICAL MANUAL
OPERATOR'S, ORGANIZATIONAL, AND DIRECT SUPPORT MAINTENANCE MANUAL

OPERATOR/CREW ELECTRIC POWER GENERATION AND DISTRIBUTION MAINTENANCE INSTRUCTIONS

LANDING CRAFT UTILITY
LCU 1671-1679
NSN 1905-01-009-1056



HEADQUARTERS, DEPARTMENT OF THE ARMY

11 OCTOBER 1983

Technical Manual

No. 55-1905-220-14-5

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 11 October 1983

OPERATORS, ORGANIZATIONAL, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE MANUAL

LANDING CRAFT UTILITY

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REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help 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 Troop Support and Aviation Materiel Readiness Command, ATTN: DRSTS-MPSD, 4300 Goodfellow Blvd., St. Louis, MO 63120. A reply will be furnished directly to you.

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*This manual supersedes TM 55-1905-220-14-5, 11 July 1980.

CHAPTER 3 (CONTINUED)

SECTION V. MAINTENANCE PROCEDURES (CONTINUED).

3-58. ELECTRIC POWER GENERATION AND DISTRIBUTION.

The electric power generation and distribution maintenance procedures are as follows:

3-58. ELECTRIC POWER GENERATION AND DISTRIBUTION (Cont).

a. General Description

(1) The Generator engine covered in this manual is a 3 cylinder Detroit Diesel. The engine is equipped with an oil cooler, lubricating oil filter, fuel oil strainer, fuel oil filter, air cleaner, governor, heat exchanger, raw water pump, and a starting motor.

(2) Fuel is drawn from the supply tank through a strainer by a gear - type fuel pump, and then forced through the filter and fuel inlet gallery in the cylinder head and to the injectors. Excess fuel is returned to the supply tank via the fuel outlet gallery and connecting lines. Since fuel is constantly circulating through the injectors, it serves to cool the injectors and carry off any air in the fuel system.

(3) 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.

(4) Full-pressure lubrication is supplied to all main, connecting rod and camshaft bearings, and to other moving parts of the engine. A gear-type pump draws oil from the oil pan through an intake screen and delivers it to the oil filter and then to the oil cooler. From the oil cooler, the oil enters a longitudinal oil

3-58. ELECTRIC POWER GENERATION AND DISTRIBUTION (Cont).

gallery in the cylinder block where the supply divides; a portion entering the by-pass filter 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.

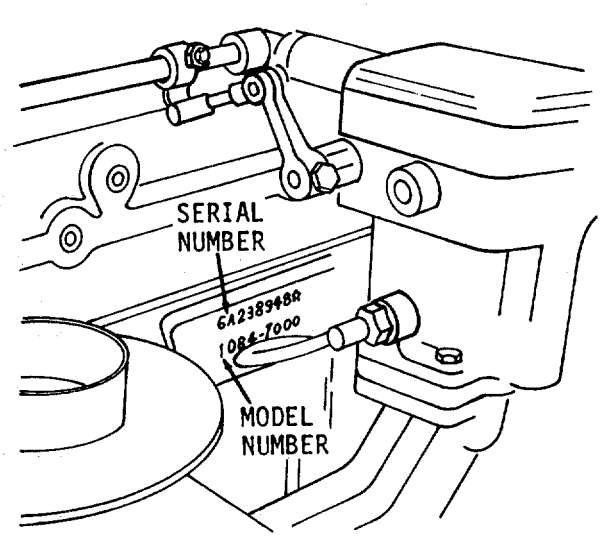
(5) Coolant is circulated through the engine by a centrifugal- type water pump. Heat is removed from the coolant, which circulates in a closed system, by a heat exchanger. Control of the engine temperature is accomplished by thermostats that regulate the flow of the coolant within the cooling system.

(6) Engine starting is provided by an hydraulic starting system.

(7) Engine speed is controlled by an hydraulic type engine governor.

b. Engine Model and Serial Number Designation

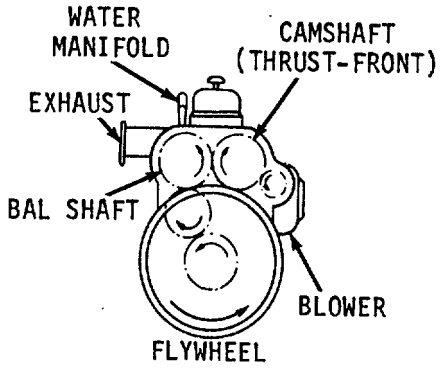
The engine serial number and model number are stamped on the cylinder block. The engine and model numbers are also stamped on the Option Plate attached to the valve rocker cover.



Engine Serial Number and Model Number as Stamped on Cylinder Block

3-58. ELECTRIC POWER GENERATION AND DISTRIBUTION (Cont).

c. Engine Rotation and Firing Order



Rotation Viewed from Rear of Engine

GENERAL SPECIFICATIONS

3-71

Number of Cylinders	3
Bore..	4 1/4 in.(10.8 cm)
Stroke	5 in. (12.7 cm)
Compression Ratio .	18.7 to 1
Total Displacement - Cubic Inches	213
Firing Order - R.H. Rotation	1-3-2
Number of Main Bearings	4

3-58. ELECTRIC POWER GENERATION AND DISTRIBUTION (Cont).

d. General Information - Detroit Diesel N-71

(1) In many cases, the maintenance technician is justified in replacing parts with new material rather than attempting repair. However, there are times when a slight amount of reworking or reconditioning may save time. 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. Exchange assemblies such as injectors, fuel pumps and blowers are also desirable service items.

(2) 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.

(3) 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.

e. Disassembly

(1) 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 must be drained.

NOTE

Do not drain oil into the bilges. Use the oil separation system to collect drained oil.

(2) 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 should be stored on suitable wooden racks or blocks.

f. Cleaning

(1) Before removing any of the subassemblies from the engine (but after removal of the electrical equipment), the exterior of the engine should be thoroughly cleaned. Then, after each subassembly is removed and disassembled, the individual parts should be cleaned. Thorough cleaning of each part is absolutely necessary before it can be satisfactorily inspected.

(2) If parts are not to be used immediately after cleaning, dip them in a rust preventive compound. The rust preventive compound should be removed before installing the parts in an engine.

3-58. ELECTRIC POWER GENERATION AND DISTRIBUTION (Cont).

g. Inspection

(1) 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 aid in determining which parts should be replaced, considerable judgement must be exercised.

(2) 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 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.

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

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

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

h. Assembly

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

(2) 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.

(3) 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.

3-58. ELECTRIC POWER GENERATION AND DISTRIBUTION (Cont).

(4) Particular attention should be paid to storing of parts and sub-assemblies, after removal and cleaning and prior to assembly, in such a place or manner as to keep them clean. If there is any doubt as to the cleanliness of such parts, they should be recleaned.

(5) When assembling an engine or any part thereof, refer to the table of torque specifications for proper bolt, nut and stud torques.

i. Work Safety

(1) A maintenance technician can be severely injured if caught in the pulley or belts of an engine that is accidentally started. To avoid such a misfortune, take these precautions before starting to work on an engine: Tag all electrical switches so that the electrical circuit is disrupted. Accidental contact with the starter button will not produce an engine start.

(2) Make sure the mechanism provided at the governor for stopping the engine is in the STOP position. This will mean the governor is in the NO-FUEL position. The possibility of the engine firing by accident is minimized.

j. Some Safety Precautions to Observe when Working on the Engine:

(1) Consider the hazards of the job and wear protective gear such as safety glasses, safety shoes, hard hat, etc., to provide adequate protection.

(2) When lifting an engine component, make sure the lifting device is fastened securely. Be sure the item to be lifted does not exceed the capacity of the lifting device.

(3) Always use caution when using power tools.

(4) When using compressed air to clean a component, such as an air silencer, use a safe amount of air. Recommendations regarding the use of air are indicated throughout the manual. Too much air can rupture or in some other way damage a component and create a hazardous situation that can lead to personal injury.

(5) Avoid the use of carbon tetrachloride as a cleaning agent because of the harmful vapors that it releases. Use perchlorethylene or trichlorethylene. However, while less toxic than other chlorinated solvents, use these cleaning agents with caution. Be sure the work area is adequately ventilated and use protective gloves, goggles or face shield and apron.

Exercise caution against burns when using oxalic acid to clean the cooling passages of the engine.

3-58. ELECTRIC POWER GENERATION AND DISTRIBUTION (Cont).

(6) Avoid excessive injection of ether into the engine during start attempts. Follow the instructions on the container of the starting aid.

(7) When working on an engine that is running, accidental contact with the hot exhaust manifold can cause severe burns. Remain alert to the location of the rotating pulleys and belts.

k. Engine Specifications (Less Major Assemblies)

Specifications, clearances and wear limits are listed below. It should be specifically noted that the 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" in this chart lists the amount of wear or increase in clearance which can be tolerated in used engine parts and still ensure satisfactory performance. It should be emphasized that the figures given as "Limits" must be qualified by the judgement of the 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 text.

3-58. ELECTRIC POWER AND DISTRIBUTION (Cont).

Table of Specifications, NEW CLEAREANCES AND WEAR LIMITS

These limits also apply to oversize and undersize parts.

ENGINE PARTS (Standard Size, New)	MINIMUM (inches)	MINIMUM (cm)	MAXIMUM (inches)	MAXIMUM (cm)	LIMITS (inches)	LIMITS (cm)
CYLINDER BLOCK						
Block bore:						
Diameter	4.6260	11.7500	4.6270	11.7526		
Out-of-round			.0010	.0025	.0020	.0051
Taper			.0010	.0025	.0020	.0051
Cylinder liner counterbore:						
Diameter	5.0460	12.8168	5.0485	12.8000		
Depth	4770	1.2116	.4795	1.2179		
Main bearing bore:						
Inside diameter (vertical axis)	3.8120	9.6700	3.8130	9.6700		
Top surface of block:						
Centerline of main bearing bore to top of block	16.1840	41.1074	16.1890	41.1201	16.176 min.	41.0870 min.
Flatness-transverse					.0030	.0076
Flatness-longitudinal					.0060	.0152
Depth of counterbores (top surface):						
Cylinder head seal strip groove	.0920	.2337	.1070	.2718		
Large water holes (between cylinders)	.1090	.2769	.1200	.3048		
Small water holes (at ends)	.0870	.2210	.0980	.2489		
Combination water and oil holes	.0870	.2210	.0980	.2489		
CYLINDER LINER						
Outside diameter	4.6250	11.7475	4.6260	11.7500		
Inside diameter	4.2495	10.7937	4.2511	10.7978		
Clearance-liner-to-block:	.0000	.0000	.0020	.0051	.0025	.0064
Cast iron block	.0000	.0000	.0020	.0051	.0025	.0064

3-58. ELECTRIC POWER GENERATION AND DISTRIBUTION (Cont).

TABLE OF SPECIFICATIONS, NEW CLEARANCES AND WEAR LIMITS (Cont)

ENGINE PARTS (Standard Size, New)	MINIMUM (inches)	MINIMUM (cm)	MAXIMUM (inches)	MAXIMUM (cm)	LIMITS (inches)	LIMITS (cm)
Out-of-round-inside diameter			.0020	.0051	.0025	.0064
Taper-inside diameter			.0010	.0025	.0020	.0051
Depth of flange	.0450	.1143	.0500	.1270	.0500	.1270
Variation in depth between adjacent liners			.0020	.0051	.0020	.0051
Insert thickness	.1795	.4559	.1800	.4572		
PISTON						
Height (centerline of bushing to top)	3.5430	8.9992	3.5480	9.0119		
Diameter (above compression rings)	4.2225	10.7252	4.2255	10.7328		
Diameter (at skirt)	4.2428	10.7767	4.2450			
Clearance-piston skirt-to-liner	.0045	.0114	.0083	.0211	.0120	.0305
Out-of-round			.0005	.0013		
Taper			.0005	.0013		
COMPRESSION RINGS						
Gap (top-fire ring)	.0230	.0584	.0380	.0965	.0600	.1524
Gap (No. 2, 3 and 4)	.0180	.0457	.0430	.1092	.0600	.1524
Clearance-ring-to-groove:						
No. 1 (top-fire ring)	.0040	.0102	.0060	.0152	.0100	.0254
No. 2	.0100	.0254	.0130	.0330	.0220	.0559
No. 3 and 4	.0040	.0102	.0070	.0178	.0130	.0330
OIL CONTROL RINGS						
Gap	.0080	.0203	.0230	.0584	.0430	.1092
Clearance	.0015	.0038	.0055	.0140	.0080	.0203
PISTON PINS (Trunk Pistons)						
Length	3.6050	9.1570	3.6200	9.1950		
Diameter	1.4996	3.8090	1.5000	3.8100	1.4980	3.8050
Clearance-pin to piston bearing	.0025	.0064	.0034	.0086	.0100	.0254
Clearance-pin to conn. rod bushing	.0015	.0038	.0024	.0061	.0100	.0254

3-58. ELECTRIC POWER GENERATION AND DISTRIBUTION (Cont).

TABLE OF SPECIFICATIONS, NEW CLEARANCES AND WEAR LIMITS (Cont)

ENGINE PARTS (Standard Size, New)	MINIMUM (inches)	MINIMUM (cm)	MAXIMUM (inches)	MAXIMUM (cm)	LIMITS (inches)	LIMITS (cm)
Clearance-end (pin-to-retainer-retainer with lock ring	.0160	.0406	.0640	.1626	.0640	.1626
Piston bushing-inside diameter	1.5025	3.8164	1.5030	3.8176	1.5050	3.8227
CONNECTING ROD						
Length-center-to-center of upper and lower bores	10.1240	25.7150	10.1260	25.7200		
Inside diameter (upper bushing)	1.5025	3.8164	1.5030	3.8176	1.5080	3.8303
Normal side clearance	.0060	.0152	.0120	.0305		
CRANKSHAFT						
Journal diameter-main bearing	3.4990	8.8875	3.5000	8.8900		
Journal diameter-conn. rod bearing	2.7490	6.9825	2.7500	6.9850		
Journal out-of-round			.00025	.00064	.0010	.0025
Journal taper			.0005	.0013	.0015	.0038
*Runout on journals-total indicator reading:						
3 cylinder (mounted on No.1 and No. 4 journals): At No. 2 and No. 3 journals			.0020	.0051		
Thrust washer thickness	.1190	.3023	.1220	.3099		
End play (end thrust clearance)	.0040	.0102	.0140	.0356	.0180	.0457

3-58. ELECTRIC POWER GENERATION AND DISTRIBUTION (Cont).

TABLE OF SPECIFICATIONS, NEW CLEARANCES AND WEAR LIMITS (Cont)

ENGINE PARTS (Standard Size, New)	MINIMUM (inches)	MINIMUM (cm)	MAXIMUM (inches)	MAXIMUM (cm)	LIMITS (inches)	LIMITS (cm)
*Runout tolerance given for guidance when regrinding crankshaft. When the runout on adjacent journals is in the OPPOSITE direction, the sum must not exceed .003 inches, (.008 cm) total indicator reading. When the runout on adjacent journals is in the SAME direction, the difference must not exceed .003 inch (.008 cm) total indicator reading. When high spots of the runout on adjacent journals are at RIGHT ANGLES to each other, the sum must not exceed .004 inches (.010 cm) total indicator reading or .002 inches (.005 cm) on each journal.						
CONNECTING ROD BEARINGS						
Inside diameter (vertical axis)	2.7514	6.9886	2.7534	6.9936		
Bearing-to-journal clearance	.0014	.0036	.0044	.0112	.0060	.0152
Bearing thickness 90º from parting line	.1548	.3932	.1553	.3945	.153 min	.388 min
MAIN BEARINGS						
Inside diameter (vertical axis)	3.5014	8.8936	3.5034	8.8986		
Bearing-to-journal clearance	.0014	.0036	.0044	.0112	.0060	.0152
Bearing thickness 90º from parting line	.1548	.3932	.1553	.3945	.153 min	.389 min
CAMSHAFT						
Diameter (at bearing journals): Front and rear	1.4970	3.8024	1.4975	3.8037		
Center and intermediate	1.4980	3.8049	1.4985	3.8062		
Runout at center bearing (when mounted on end bearings)			.0020	.0051		
Shaft diameter at gear	1.1875	3.0162	1.1880	3.0175		
Length-thrust bearing end journal	2.8740	7.3000	2.8760	7.3050		
End thrust	.0040	.0102	.0120	.0305	.0180	.0457
Thrust washer thickness	.1190	.3023	.1220	.3099		

3-58. ELECTRIC POWER GENERATION AND DISTRIBUTION (Cont).

TABLE OF SPECIFICATIONS, NEW CLEARANCES AND WEAR LIMITS (Cont)

ENGINE PARTS (Standard Size, New)	MINIMUM (inches)	MINIMUM (cm)	MAXIMUM (inches)	MAXIMUM (cm)	LIMITS (inches)	LIMITS (cm)
CAMSHAFT BEARINGS						
Inside diameter:						
Front and rear	1.5000	3.8100	1.5010	3.8125		
Center and intermediate	1.5010	3.8125	1.5030	3.8176		
Clearance-bearing-to-shaft:						
Front and rear	.0025	.0064	.0040	.0102	.0060	.0152
Center and intermediate	.0025	.0064	.0050	.0127	.0090	.0229
Outside diameter:						
Front and rear	2.1880	5.5575	2.1885	5.5588		
Center and intermediate	2.1840	5.5474	2.1860	5.5524		
Diameter of cylinder block bore	2.1875	5.5563	2.1885	5.5588		
Clearance-bearings-to-block:						
Front and rear	.001 press	.0025 press	.0005 loose	.0013 loose		
Intermediate (extruded)	.0015	.0038	.0065	.0165		
Intermediate (die cast)	.0015	.0038	.0105	.0267		
CAMSHAFT and BALANCE SHAFT GEARS						
Inside diameter	1.1865	3.0137	1.1875	3.0163		
Clearance-gear-to-shaft	0015 press	.0038 press	.0000	.0000		
Backlash	.0030	.0076	.0080	.0203	.0100	.0254
IDLER GEAR						
Backlash	.0030	.0076	.0080	.0203	.0100	.0254
Pre-load-variation on pull 2 lbs. 11 oz (1.219 kg)	1.2500	.5675	6.7500	3.0645		
CRANKSHAFT TIMING GEAR						
Inside diameter	4.7490	12.0625	4.7500	12.0650		
Clearance-gear-to-shaft	.001 press	.0025 press	.001 loose	.0025 loose		
Backlash	.0030	.0076	.0080	.0203	.0100	.0254