

TECHNICAL MANUAL

OPERATOR'S, ORGANIZATIONAL,

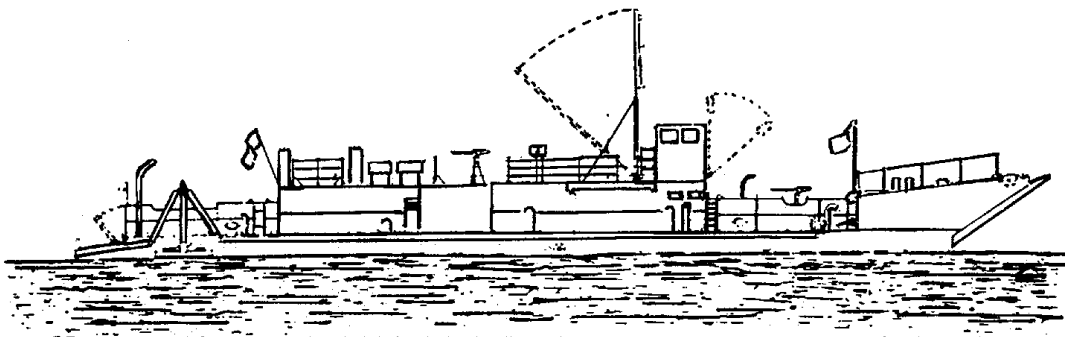
DIRECT SUPPORT AND

GENERAL SUPPORT

MAINTENANCE MANUAL

OPERATOR / CREW
MAST-CENTRALIZED HYDRAULIC SYSTEM-
STEERING SYSTEM
ANCHOR HANDLING SYSTEM
MAINTAINANCE INSTRUCTIONS

LANDING CRAFT UTILITY
LCU 1667-1670
NSN 1905-00-168-5764



*This manual supersedes TM55-1905-219-14-7, 25 September 1980

HEADQUARTERS, DEPARTMENT OF THE ARMY

21 MAY 1984

CHANGE
NO. 2

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 21 MAY 1984

Operator's, Organizational,
Direct Support and General
Support Maintenance Manual

LANDING CRAFT UTILITY
LCU 1667-1670 (1905-00168-5764)

REPORTING OF 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 028 (Recommended Changes to Publications and Blank Forms) or DA Form 028-2 located in the back of this manual direct to: Commander, U.S. Army Troop support Command, ATTN: DRSTR-MPS, 4300 Goodfellow Blvd., St. Louis, MO 3120. A reply will be furnished to you.

TABLE OF CONTENTS

	Page
CHAPTER 3.	
Section V	
OPERATOR MAINTENANCE INSTRUCTIONS (con't)	
Maintenance Procedures (con't)	3-2911
APPENDIX A	
REFERENCES	A-1
APPENDIX B	
MAINTENANCE ALLOCATION CHART	
Section I	
Introduction	B-1
INDEX	Index-1

CHAPTER 3 (CONTINUED)

SECTION V. MAINTENANCE PROCEDURES (Continued).

3-171. PISTONS, CONNECTING RODS, AND CYLINDER LINERS.

The following is an index to the piston connecting rods and cylinder liner maintenance instructions.

<u>DESCRIPTION</u>	<u>PARAGRAPH</u>
Piston	3-171.1
Connecting Rods	3-171.2
Connecting Rod Bearings	3-171.3
Cylinder Liner	3-171.4

REPORTING OF 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, U.S. Army Troop Support Command, ATTN: DRSTR-MPSD, 4300 Goodfellow Blvd., St. Louis, MO 63120. A reply will be furnished to you.

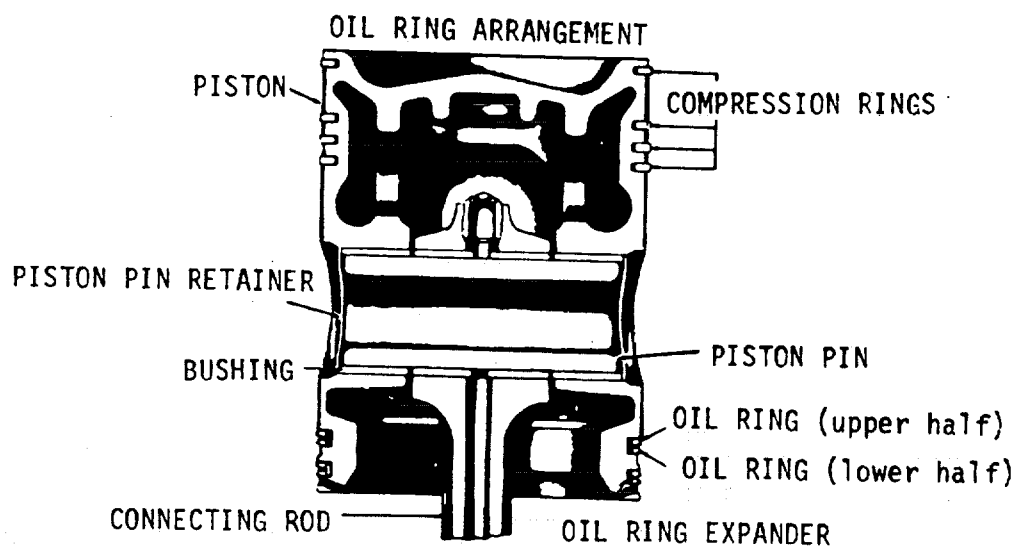
3-171.1. PISTON - MAINTENANCE INSTRUCTIONS.

a. The trunk-type malleable iron piston is plated with a protective coating of tin which permits close fitting, reduces scuffing and prolongs piston life. The top of the piston forms the combustion chamber bowl and is designed to compress the air into close proximity to the fuel spray.

b. Each piston is internally braced with fin-shaped ribs and circular struts, scientifically designed to draw heat rapidly from the piston crown and transfer it to the lubricating oil spray to ensure better control of piston ring temperature.

3-171.1. PISTON - MAINTENANCE INSTRUCTIONS (Continued).

c. The piston is cooled by a spray of lubricating oil directed at the underside of the piston head from a nozzle in the top of the connecting rod, by fresh air from the blower to the top of the piston and indirectly by the water jacket around the cylinder.



d. Each piston is balanced to close limits by machining a balancing rib, provided on the inside at the bottom of the piston skirt.

e. Two bushings, with helical grooved oil passages, are pressed into the piston to provide a bearing for the hardened, floating piston pin. After the piston pin has been installed, the hole in the piston at each end of the pin is sealed with a steel retainer. Thus, lubricating oil returning from the sprayed underside of the piston head, and working through the grooves in the piston pin bushings, is prevented from reaching the cylinder walls.

f. Each piston is fitted with compression rings and oil control rings. Eight equally spaced drilled holes just below each oil control ring groove permit excess oil, scraped from the cylinder walls, to return to the crankcase.

3-171.1. PISTON - MAINTENANCE INSTRUCTIONS (Continued).

g. When an engine is hard to start, runs rough or lacks power, worn or sticking compression rings may be the cause. Replacing the rings will aid in restoring the engine to normal.

h. The compression rings may be inspected through the ports in the cylinder liners after the air box covers have been removed. If the rings are free and are not worn to the extent that the plating or grooves are gone, compression should be within operating specifications.

i. Excessively worn or scored pistons, rings or cylinder liners may be an indication of abnormal maintenance or operating conditions which should be corrected to avoid a recurrence of the failure. The use of the correct types and proper maintenance of the lubricating oil filters and air cleaners will reduce to a minimum the amount of abrasive dust and foreign material introduced into the cylinders and will reduce the rate of wear.

j. Long periods of operation at idle speed and the use of improper lubricating oil or fuel must be avoided, otherwise a heavy formation of carbon may result and cause the rings to stick.

k. Keep the lubricating oil and engine coolant at the proper levels to prevent overheating of the engine.

3-171.1. PISTON - MAINTENANCE INSTRUCTIONS (Continued).

This task covers:

- | | | |
|-------------------|---------------|-----------------|
| a. Pre-Inspection | d. Cleaning | f. Reassembly |
| b. Removal | e. Inspection | g. Installation |
| c. Disassembly | | |

INITIAL SETUPTest Equipment

Feeler gage

References

None

Special Tools

Assembly tool piston
ring J8128
Pump, hand
NSN 4930-00-263-9886
Installer and remover
piston and connecting
rod bushings-J1513-02
(part J7032 and J7632)

Equipment
Condition
Paragraph

Condition Description

3-163 Oil Pan Removal
3-164 Cylinder Head Removal
3-169 Lube Oil Pump Removal
3-170 Oil Inlet Pipe Removal

Material/Parts

Cylinder kit
P/N 5149265

Special Environmental Conditions

Do not drain oil in bilges.
Use the oil/water separation
and recovery system to collect
drained oil.

Personnel Required

2

General Safety Instructions

Observe WARNING in procedure.

LOCATION

ITEM

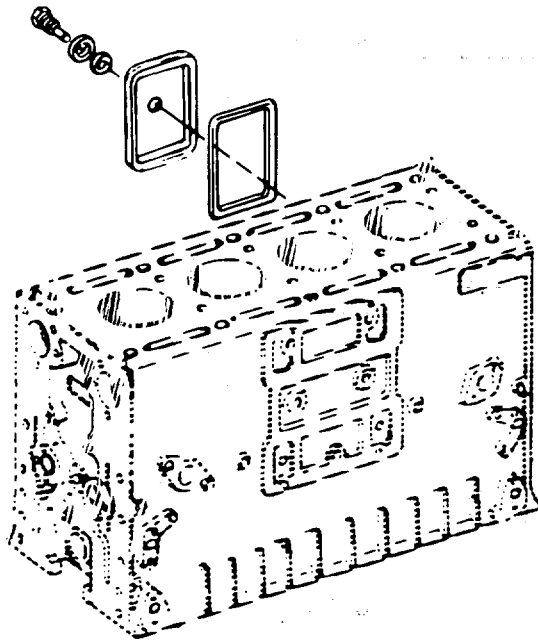
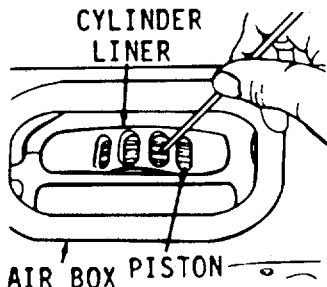
ACTION

REMARKS

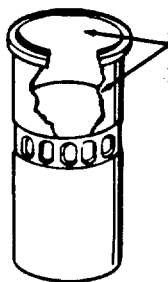
PRE-INSPECTION

- | | | | |
|------------------------------|--------------------|--|------------------|
| 1. Piston-compression, rings | a. Air box covers | Remove screws flat-washers, lockwashers, covers, and gaskets
Check that piston rings are free, and are not worn to the extent that plating or grooves are gone. | Discard gaskets. |
| | b. Cylinder liners | | |

3-171.1. PISTON - MAINTENANCE INSTRUCTIONS (Continued).

LOCATION	ITEM	ACTION	REMARKS
PRE-INSPECTION (Cont)			
			
REMOVAL			
2. Piston and connecting rod	a. Cooling system	Drain.	
	b. Oil pan	1. Remove oil.	Pump oil into a suitable container.
		2. Remove pan.	Refer to paragraph 3-163.
	c. Oil inlet pipe	Remove.	Refer to paragraph 3-170.
	d. Lube oil pump	Remove.	Refer to paragraph 3-169.

3-171.1. PISTON - MAINTENANCE INSTRUCTIONS (Continued).

LOCATION	ITEM	ACTION	REMARKS
REMOVAL (Cont)			
	e. Cylinder head	Remove.	Refer to paragraph 3-164.
	f. Cylinder liner	1. Remove the carbon deposits from the upper inner surface of the cylinder liner 2. Use a ridge cutter to remove any ridges in the cylinder liner at the top of the piston ring travel.	
			
	NOTE Move the piston to the bottom of its travel and place a cloth over the top of the piston to collect the cuttings. After the ridge has been removed, turn the crankshaft to bring the piston to the top of its stroke and carefully remove the cloth with the cuttings.		
	g. Nut (1), bearing cap (2), and lower bearing shell (3)	Remove.	

3-171.1. PISTON - MAINTENANCE INSTRUCTIONS (Continued).

LOCATION	ITEM	ACTION	REMARKS
REMOVAL (Cont)			
	h. Piston and connecting rod assembly	Push the piston and rod assembly out thru the top of the cylinder block.	The piston cannot be removed from the bottom of the cylinder block.
	i. Lower bearing shell (3), bearing cap (2), and nuts (1)	Reassemble to connecting rod.	

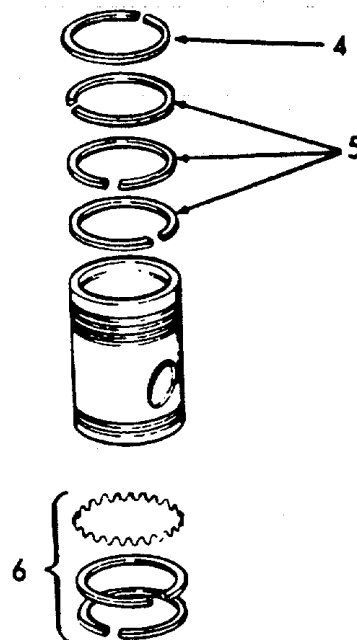
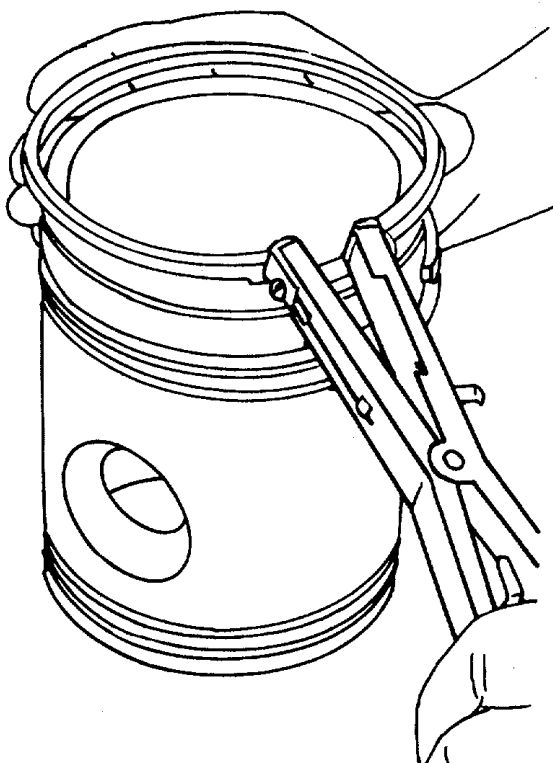


3-171.1. PISTON - MAINTENANCE INSTRUCTIONS (Continued).

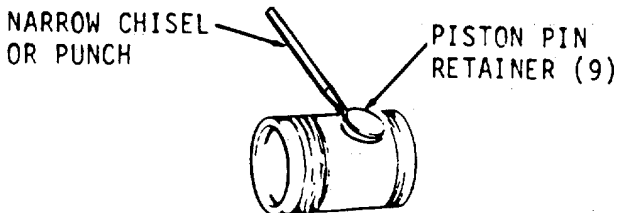
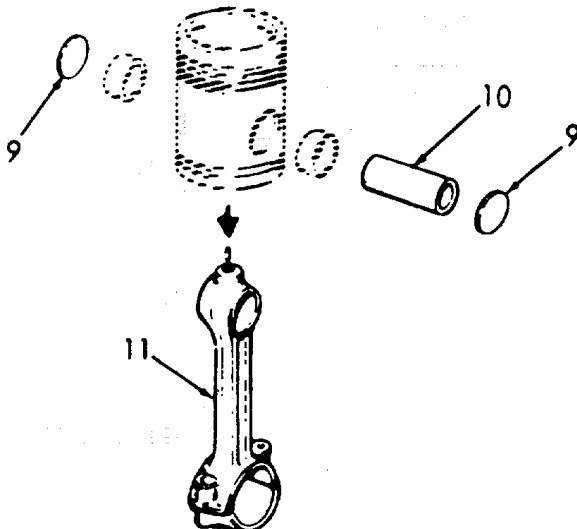
LOCATION	ITEM	ACTION	REMARKS
----------	------	--------	---------

DISSASSEMBLY

- | | | | |
|------------------------------|---------------------------------------|--|-----------------|
| 3. Piston and connecting rod | a. Piston and connecting rod assembly | Place connecting rod in a vise with soft jaws. | |
| | b. Rings (compression fire) (4) | Remove. | Use tool J8128. |
| | c. Rings (compression) (5) | Remove three rings. | Use tool J8128. |
| | d. Oil rings (6) | Remove. | Use tool J8128. |



3-171.1. PISTON - MAINTENANCE INSTRUCTIONS (Continued).

LOCATION	ITEM	ACTION	REMARKS
DISASSEMBLY (Cont)			
e.	Piston pin retainer (9)	Punch a hole thru the center of one of the piston pin retainers with a narrow chisel or punch, and pry the retainer from the piston.	Be careful not to damage the piston or bushings.
 NARROW CHISEL OR PUNCH PISTON PIN RETAINER (9)			
f.	Piston pin (10)	Remove.	
g.	Connecting rod (11)	Remove.	
h.	Piston pin retainer (9)	Drive out remaining retainer.	Use a brass rod or a suitable tool.
			

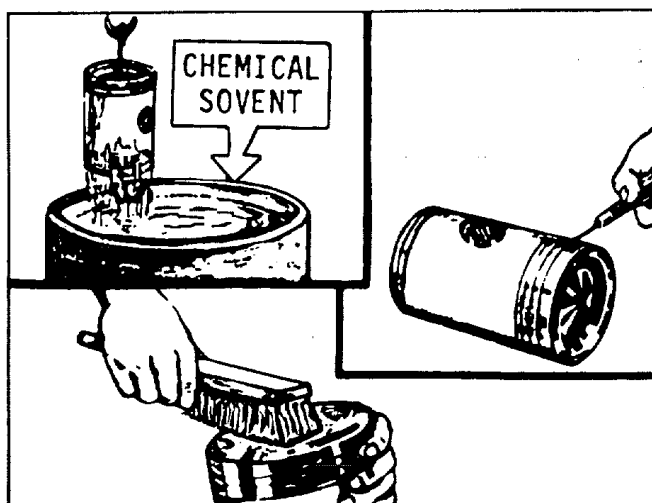
3-171.1. PISTON - MAINTENANCE INSTRUCTIONS (Continued).

LOCATION	ITEM	ACTION	REMARKS
----------	------	--------	---------

CLEANING**WARNING**

Wear protective eye goggles when using compressed air.

4. Piston components
 - a. Clean the piston components with fuel oil and dry them with compressed air. If fuel oil does not remove the carbon deposits, use a chemical solvent that will not harm the piston pin bushings or the tin-plate on the piston.
 - b. The upper part of the piston, including the compression ring lands and grooves, is not tin-plated and may be wire-brushed to remove any hard carbon. However, use care to avoid damage to the tin-plating on the piston skirt. Clean the ring grooves with a suitable tool or a piece of an old compression ring that has been ground to a bevel edge.
 - c. Clean the inside surfaces of the piston and the oil drain holes in the piston skirt. Exercise care to avoid enlarging the holes while cleaning them.

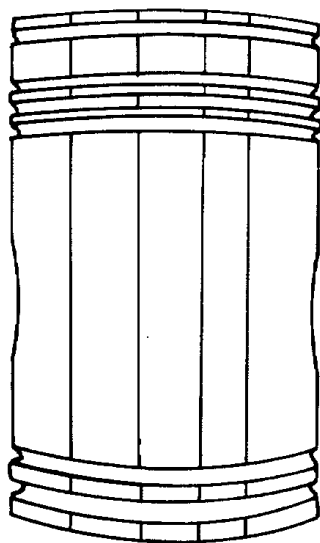


3-171.1. PISTON - MAINTENANCE INSTRUCTIONS (Continued).

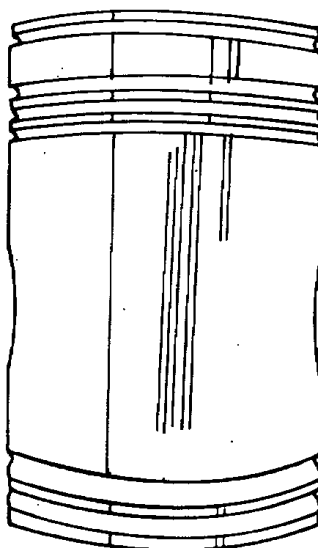
LOCATION	ITEM	ACTION	REMARKS
----------	------	--------	---------

INSPECTION

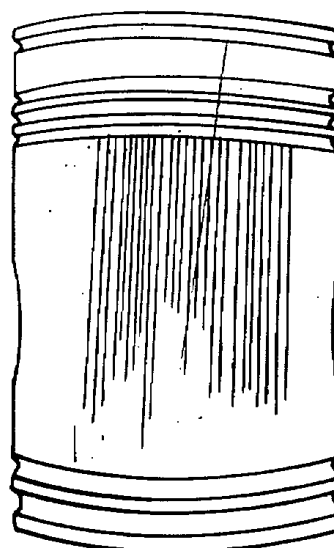
5. Piston
- If the tin-plate on the piston and the original grooves in the piston rings are intact, it is an indication of very little wear.
 - Examine the piston for score marks, cracks, damaged ring groove lands or indications of overheating. A piston with light score marks which can be cleaned up may be reused. Any piston that has been severely scored or overheated must be replaced. Indications of overheating or burned spots on the piston may be the result of an obstruction in the connecting rod oil passage.
 - Replace the piston if cracks are found across the internal struts. Use the magnetic particle inspection method for locating cracks in the piston.



**THIS PISTON SUITABLE FOR
INSTALLATION AS IS**



**SLIGHTLY SCORED, USE ONLY
AFTER REMOVING SCORE MARKS
BY POLISHING WITH CROCUS
CLOTH OR HARD INDIA STONE**



**BADLY SCORED UNFIT
FOR USE**

3-171.1. PISTON - MAINTENANCE INSTRUCTIONS (Continued).

LOCATION	ITEM	ACTION	REMARKS
INSPECTION			
6. Cylinder liner and block bore	Inspect.	Check the cylinder liner and block bore for excessive out-of-round, taper, or high spots which could cause failure of the piston.	Refer to paragraph 3-171.4.
7. Connecting rod, and piston pin	Inspect.		Refer to paragraph 3-171.2.
8. Piston pin bushing	Inspect and measure the piston pin bushings. The piston pin-to-bushing clearance with new parts is .0025 to .0034 inch (0.0064 to 0.0086 cm). A maximum clearance of .010 inch (0.025 cm) is allowable with worn parts. The piston pin bushings in the connecting rod are covered in paragraph 3-171.2.		
9. Other	Other factors that may contribute to piston failure include oil leakage into the air box, oil pull-over from the air cleaner, dribbling injectors, combustion blow-by and low oil pressure (dilution of the lubricating oil).		

REASSEMBLY**CAUTION**

Do not remove the bushings from the piston. They are not serviced separately.

10. Piston	a. Piston and cylinder liner fitting	1. Measure the piston skirt diameter lengthwise and crosswise of the piston pin bore. Measurements should be taken at a room temperature of 70°F (21°C). The taper and out-of-round must not exceed .0005 inch (.0013 cm).
------------	--------------------------------------	--

3-171.1. PISTON - MAINTENANCE INSTRUCTIONS (Continued).

LOCATION

ITEM

ACTION

REMARKS

REASSEMBLY (Cont)

Refer to the Table for
piston diameter spec-
ifications.

ENGINE PARTS (Standard Size, New)	MINIMUM		MAXIMUM		LIMITS	
	(inches)	(cm)	(inches)	(cm)	(inches)	(cm)
Piston:						
Height (centerline of bushing to top)	3.5430	8.9992	3.5480	9.0119		
Diameter (above compres- sion rings)	4.2225	10.7252	4.2255	10.7328		
Diameter (at skirt).....	4.2428	10.7767	4.2450	10.7823		
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	.0070	.0178	.0180	.0457
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

2. A new cylinder liner has an inside diameter of 4.2495 to 4.2511 inch (10.7937-10.7978 cm). Piston-to-liner clearance, with new parts, will vary with the particular piston diameter. A maximum clearance of .012 inch (0.030 cm) is allowed with used parts.

3-171.1. PISTON - MAINTENANCE INSTRUCTIONS (Continued).

LOCATION	ITEM	ACTION	REMARKS
REASSEMBLY (Cont)			
		3. With the cylinder liner installed in the cylinder block, hold the piston upside down in the liner and check the clearance in four places 90° apart.	
		4. Use a feeler gage set to check the clearance. The spring scale attached to the proper feeler gage is used to measure the force in pounds required to withdraw the feeler gage.	
		5. Select a feeler gage with a thickness that will require a pull of six pounds (26.7 N) to remove. The clearance will be .001 inch (.003 cm) greater than the thickness of the gage used, i.e., a .004 inch (.010 cm) feeler gage will indicate a clearance of .005 inch (.013 cm) when it is withdrawn. The feeler gage must be perfectly flat and free of nicks and bends.	

3-171.1. PISTON - MAINTENANCE INSTRUCTIONS (Continued).

LOCATION

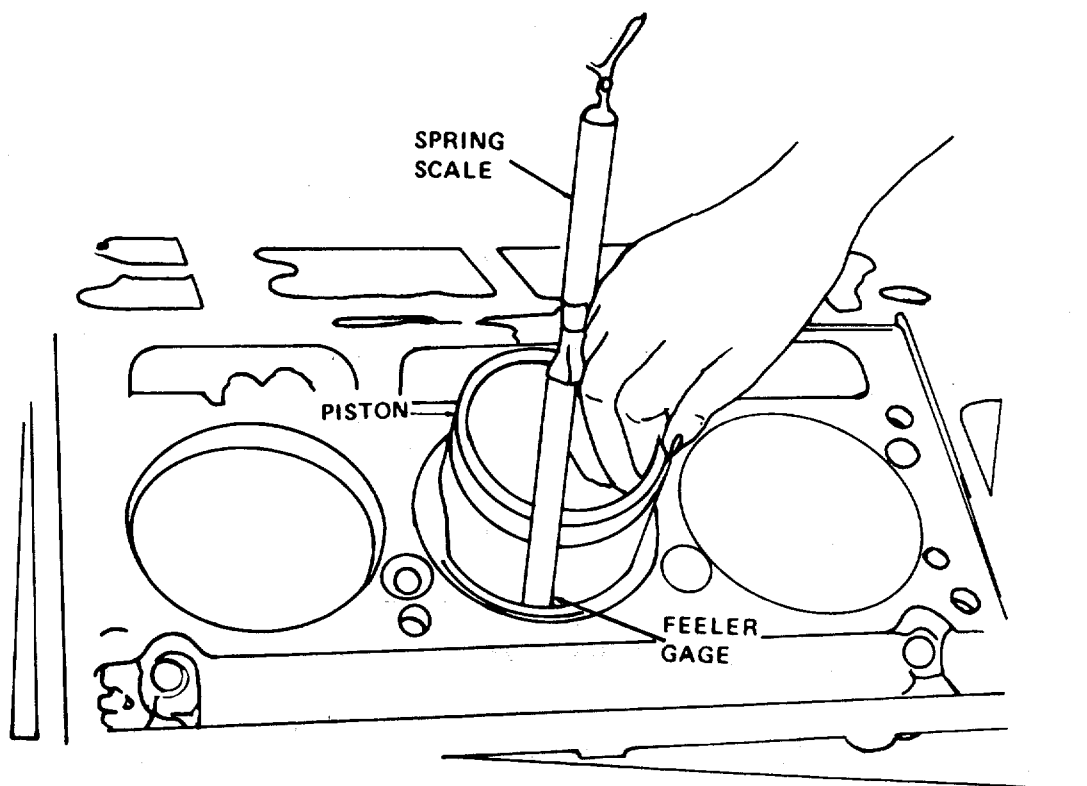
ITEM

ACTION

REMARKS

REASSEMBLY (Cont)

6. If any bind occurs between the piston and liner, examine the piston and liner for burrs. Remove burrs with a fine hone (a flat one is preferred), and recheck the clearance.



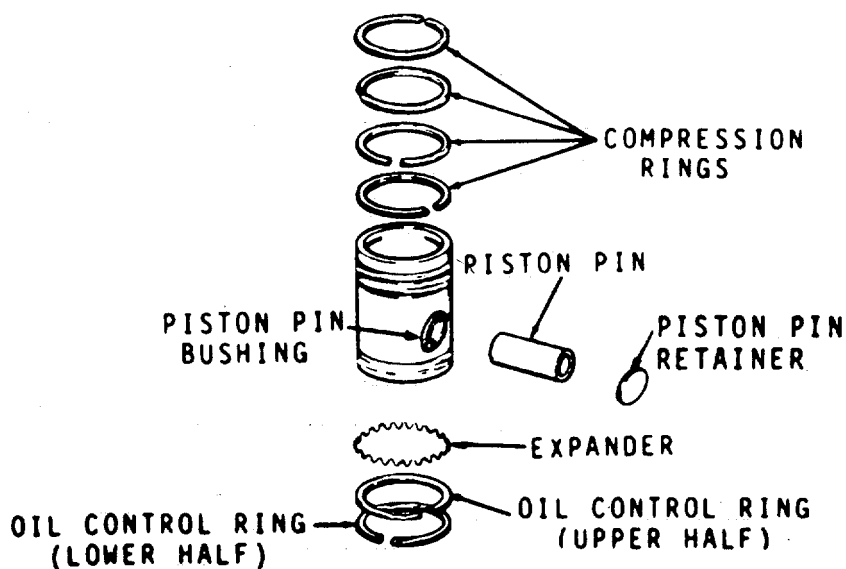
3-171.1. PISTON - MAINTENANCE INSTRUCTIONS (Continued).

LOCATION	ITEM	ACTION	REMARKS
----------	------	--------	---------

REASSEMBLY (Cont)

b. Piston
ring
fitting

1. Each piston is fitted with a fire ring, three compression rings and two oil control rings.
2. The top compression (fire) ring can be identified by the bright chrome on the bottom side and black oxide or copper color on the top. The pre-stressed fire ring is further identified by an oval mark.

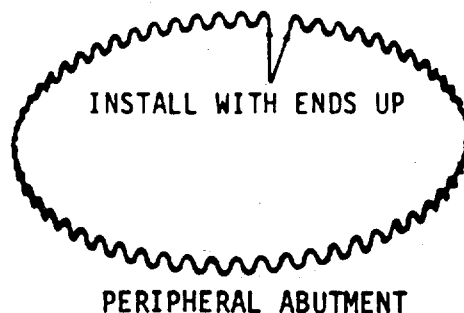


3-171.1. PISTON - MAINTENANCE INSTRUCTIONS (Continued).

LOCATION	ITEM	ACTION	REMARKS
----------	------	--------	---------

REASSEMBLY (Cont)

3. A pre-stressed compression ring is also used in the ring groove immediately below the fire ring.
4. A two-piece oil control ring is used in both oil ring grooves in the piston, and a peripheral abutment type oil ring is used in the expander.



5. All new piston rings must be installed whenever a piston is removed, regardless of whether a new or used piston or cylinder liner is installed.

3-171.1. PISTON - MAINTENANCE INSTRUCTIONS (Continued).

LOCATION

ITEM

ACTION

REMARKS

REASSEMBLY (Cont)

6. Insert one ring at a time inside the cylinder liner and far enough down to be within the normal area of ring travel. Use a piston to push the ring down, to be sure it is parallel with the top of the liner. Then measure the ring gap with a feeler gage. Refer to ring gap specifications.

