

## 480C LOADER BACKHOE TABLE OF CONTENTS AND SERVICE MANUAL INTRODUCTION

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### Service Manual Introduction

#### Safety Rules



**This Safety Alert Symbol Indicates Important Safety Messages In This Manual. When You See This Symbol, Carefully Read The Message That Follows and Be Alert To The Possibility Of Personal Injury Or Death.**

1-1



**WARNING:** Read operator's manual to familiarize yourself with control lever functions. 35-1



**WARNING:** When working in the area of the fan belt with the engine running, avoid loose clothing if possible, and use extreme caution. 35-4



**WARNING:** Whenever the loader bucket must be raised to aid in servicing, block the bucket in place with lift cylinder stops or a suitable safety stand. 40-11



**WARNING:** Operate controls from the operator's seat only. 35-7



**WARNING:** When performing checks and tests on the equipment hydraulic system or steering system, DO NOT deviate from the written procedure. 40-13



**WARNING:** Whenever cycling the loader or backhoe to bleed air from circuits or to check operation, be sure area is clear of fellow workers. 40-12

**WARNING:** After installing tire on rim (wheel), place wheel in a safety cage before inflating tires. If proper equipment is not available, have a tire repair shop do the work. 40-5

**CAUTION:** Use suitable floor (service) jacks or chain hoists to raise wheels off the floor. Always block machine in place with suitable safety stands. 40-7

**WARNING:** This is a one man machine, no riders allowed. 35-8

**CAUTION:** Pin sized and smaller streams of hydraulic oil under pressure can penetrate the skin and result in serious infection. Maintain all hoses and tubes in good condition. Make sure all connections are tight. Replace any hose or tube that is faulty or thought to be faulty. DO NOT use your hand to check for leaks; use a piece of cardboard or wood. 40-6

**CAUTION:** When using a hammer to remove and install pivot pins or separate parts, using compressed air or using a grinder, wear eye protection that completely encloses the eyes (approved goggles or other approved eye protectors). 46-13

**CAUTION:** Some components of this machine are very heavy. Use suitable lifting equipment or additional help as instructed in this service manual. 40-10

**CAUTION:** When removing hardened pins such as a pivot pin, or a hardened shaft, use a soft head (brass or bronze) hammer or use a driver made from brass or bronze and a steel head hammer. 47-16

**CAUTION:** When servicing or repairing the machine, keep the shop floor and operator's compartment and steps free of oil, water, grease, tools, etc. Use an oil absorbing material and/or shop cloths as required. Use safe practices at all times. 40-8

**General**

This service manual has been prepared with the latest service information available. Trouble shooting, removal, disassembly, inspection and installation procedures coupled with complete specifications and tightening references can be found in most sections.

Continued on next page

**Engine Oil**  
The SAE number in the chart indicates the grade of engine oil for example, SAE 10W-30. The SAE number is the viscosity grade of the oil. Engine oils are classified by SAE numbers. SAE 10W-30 is a multi-grade oil.

If this manual covers more than one machine, or different models of component parts (alternator, gear box, control valves, etc.) the procedures will apply to all unless otherwise noted.

**Oil**  
The API classification (S, C, CA) defines oil performance for engines. Only oils specified in the manual should be used. These oils contain detergent additives to provide maximum engine protection. Both the SAE and API designations must be followed.

**Illustrations**  
Where possible, illustrations are placed as close as possible to the accompanying text and should be used as part of the text.

**Gear Lubricant and**  
Gear lubricant and grease are specified in Section 10B.

**Serial and Model Numbers**  
When reconditioning repair or replace parts it may be necessary to furnish the parts department with one or both numbers. Serial and model numbers will be

Some sections will have exploded views without accompanying text due to the simplicity of the procedure. This service manual is one of the most important tools available to the service technician. It is an invaluable aid in properly performing any phase of service.

The terms right-hand and left-hand as used in this manual indicate the right and left sides of the machine as viewed from the operator's seat for proper operation of the machine or attachment.

The information contained in this manual is current at the time of printing.

## Table of Contents

The preceding pages contain a Table of Contents which list the Series number and title, and the sections contained in each series. The individual sections, where required, will have a Table of Contents on the second page of that section.

## Page Numbers

All page numbers consist of two sets of digits separated by a dash, such as 4002-9. The digits preceding the dash identify the section. The digits following the dash represent the consecutive page number within that section. Page numbers will be found at the upper right or left of each page.

## Text

If this manual covers more than one machine, or different models of component parts (planetary axles, gear boxes, control valves, etc.) the procedures will apply to all unless otherwise noted.

## Illustrations

Where possible, illustrations are placed as close as possible to the accompanying text and should be used as part of the text.

## Serial and Model Numbers

When requisitioning repair or replacement parts it may be necessary to furnish the parts department with one or both numbers. Serial and model numbers will be

found in the following locations.

Machine - Plate fastened to left front cab or canopy mounting bracket. Also stamped on top of chassis behind left-hand hydraulic reservoir.

Engine - Right-hand side of block below starter.

Component parts - plate attached to part or number stamped in part.

## Torque References

Essentially two grades of fasteners (bolts, nuts and screws) are used on Case machinery. They are grade 5 and grade 8. Refer to Section 1051 for torque specifications and means of identification.

The specifications in Section 1051 are standard torque values and should be used on all fasteners during assembly and installation unless special torque values are noted in a particular section.

## Classification of Lubricants

Oils, lubricants, and grease are classified and graded according to standards recommended by the Society of Automotive Engineers (SAE), the American Petroleum Institute (API), and the National Lubricating Grease Institute (NLGI).

## Engine Oil

The SAE number indicates the viscosity of engine oils, for example, SAE 30, a single grade oil. Engine oils are also identified by dual numbers, SAE 10W30, a multigrade oil.

The API classification (MS DS SD CA) defines oil performance in terms of engine usage. Only oils specified in Section 1050 should be used. These oils contain sufficient chemical additives to provide maximum engine protection. Both the SAE grade and API designation must be found on the container.

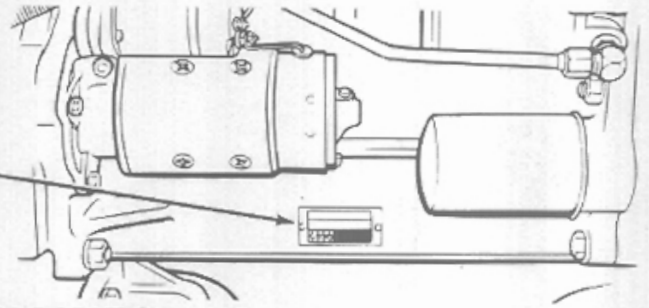
## Gear Lubricant and Grease

Gear lubricant and grease must be that specified in Section 1050.

# Section 1010

## GENERAL ENGINE SPECIFICATIONS 480C TRACTORS

THE MODEL AND ENGINE SERIAL NUMBER IS STAMPED ON A PLATE, LOCATED ON THE RIGHT SIDE OF THE ENGINE, BELOW THE CRANKING MOTOR.



### DIESEL ENGINES

#### General

Type .....	Case Open Chamber, 4 Cylinder, 4 Stroke Cycle, Valve-in-Head
Firing Order .....	1-3-4-2
Bore .....	3-13/16 Inches
Stroke .....	4-1/8 Inches
Piston Displacement .....	188 Cubic Inches
Compression Ratio .....	16-1/2 to 1
No Load Governed Speed .....	2000 to 2040 RPM
Rated Engine Speed .....	1900 RPM
Engine Idling Speed .....	625 to 675 RPM
*Valve Tappet Clearance (Exhaust) .....	(Hot and Cold) .014 Inch
(Intake) .....	(Hot and Cold) .012 Inch

\*Hot Settings Are Made After the Engine Has Operated At Thermostat Controlled Temperature For At Least Fifteen Minutes.

#### Piston and Connecting Rods

Rings per Piston .....	4
Number of Compression Rings .....	2
Number of Oil Rings .....	2
Type Pins .....	Full Floating Types
Type Bearing .....	Replaceable Precision, Steel Back, Copper-Lead or Aluminum Alloy Liners

#### Main Bearings

Number of Bearings .....	5
Type Bearings .....	Replaceable Precision, Steel Back, Copper-Lead or Aluminum Alloy Liners

#### Engine Lubricating System

Crankcase Capacity (Without Filter) .....	4
(With Filter Change) .....	5
Oil Pressure .....	50 to 70 Pounds with Engine Warm and Operating at Rated Engine Speed
Type System .....	Pressure and Spray Circulation
Oil Pump .....	Gear Type
Oil Filter .....	Full Flow Spin-on Type

#### Fuel System

Fuel Injection Pump .....	Roosa-Master
Pump Timing .....	8 Degrees Before Top Dead Center
Fuel Injectors .....	Pencil Type (Opening Pressure 2800 PSI)
Fuel Transfer Pump .....	Vane Type, Integral Part of Injection Pump
Governor .....	Variable Speed, Fly-Weight Centrifugal Type, Integral Part of Injection Pump
Fuel Filters .....	Full Flow Spin on Type

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# Section 1027

## DETAILED SPECIFICATIONS

### 188 Diesel Engines

#### FRACTION to DECIMAL to MILLIMETER CONVERSION TABLE

Fraction	Decimal	MM	Fraction	Decimal	MM	Fraction	Decimal	MM
1/64	.0156	0.397	23/64	.3593	9.128	45/64	.7031	17.859
1/32	.0312	0.794	3/8	.3750	9.525	23/32	.7187	18.256
3/64	.0468	1.191	25/64	.3906	9.922	47/64	.7343	18.653
1/16	.0625	1.587	13/32	.4062	10.319	3/4	.7500	19.050
5/64	.0781	1.984	27/64	.4218	10.716	49/64	.7656	19.447
3/32	.0937	2.381	7/16	.4375	11.113	25/32	.7812	19.844
7/64	.1093	2.778	29/64	.4531	11.509	51/64	.7968	20.240
1/8	.1250	3.175	15/32	.4687	11.906	13/16	.8125	20.637
9/64	.1406	3.572	31/64	.4843	12.303	53/64	.8281	21.034
5/32	.1562	3.969	1/2	.5000	12.700	27/32	.8437	21.431
11/64	.1718	4.366	33/64	.5156	13.097	55/64	.8593	21.828
3/16	.1875	4.762	17/32	.5312	13.494	7/8	.8750	22.225
13/64	.2031	5.159	35/64	.5468	13.890	57/64	.8906	22.622
7/32	.2187	5.556	9/16	.5625	14.287	29/32	.9062	23.019
15/64	.2343	5.953	37/64	.5781	14.684	59/64	.9218	23.415
1/4	.2500	6.350	19/32	.5937	15.081	15/16	.9375	23.812
17/64	.2656	6.747	39/64	.6093	15.478	61/64	.9531	24.209
9/32	.2812	7.144	5/8	.6250	15.875	31/32	.9687	24.606
19/64	.2968	7.541	41/64	.6406	16.272	63/64	.9843	25.003
5/16	.3125	7.937	21/32	.6562	16.669	1	1.0000	25.400
21/64	.3281	8.334	43/64	.6718	17.065			
11/32	.3437	8.731	11/16	.6875	17.462			

#### INCH to MILLIMETER CONVERSION TABLE

Inch	MM	Inch	MM	Inch	MM	Inch	MM
1	25.400	6	152.000	10	254.000	60	1,524.000
2	50.800	7	177.800	20	508.000	70	1,778.000
3	76.200	8	203.200	30	762.000	80	2,032.000
4	101.600	9	228.600	40	1,016.000	90	2,286.000
5	127.000	10	254.000	50	1,270.000	100	2,540.000



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    Pil Pump ..... 8

    Cylinder Head ..... 8

    Intake Valve ..... 8

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	MM	Fraction	Decimal	MM	MM
11	25.4	1	0.100	25.4	25.4
12	25.4	1	0.100	25.4	25.4
13	25.4	1	0.100	25.4	25.4
14	25.4	1	0.100	25.4	25.4
15	25.4	1	0.100	25.4	25.4
16	25.4	1	0.100	25.4	25.4
17	25.4	1	0.100	25.4	25.4
18	25.4	1	0.100	25.4	25.4
19	25.4	1	0.100	25.4	25.4
20	25.4	1	0.100	25.4	25.4
21	25.4	1	0.100	25.4	25.4
22	25.4	1	0.100	25.4	25.4
23	25.4	1	0.100	25.4	25.4
24	25.4	1	0.100	25.4	25.4
25	25.4	1	0.100	25.4	25.4
26	25.4	1	0.100	25.4	25.4
27	25.4	1	0.100	25.4	25.4
28	25.4	1	0.100	25.4	25.4
29	25.4	1	0.100	25.4	25.4
30	25.4	1	0.100	25.4	25.4
31	25.4	1	0.100	25.4	25.4
32	25.4	1	0.100	25.4	25.4
33	25.4	1	0.100	25.4	25.4
34	25.4	1	0.100	25.4	25.4
35	25.4	1	0.100	25.4	25.4
36	25.4	1	0.100	25.4	25.4
37	25.4	1	0.100	25.4	25.4
38	25.4	1	0.100	25.4	25.4
39	25.4	1	0.100	25.4	25.4
40	25.4	1	0.100	25.4	25.4
41	25.4	1	0.100	25.4	25.4
42	25.4	1	0.100	25.4	25.4
43	25.4	1	0.100	25.4	25.4
44	25.4	1	0.100	25.4	25.4
45	25.4	1	0.100	25.4	25.4
46	25.4	1	0.100	25.4	25.4
47	25.4	1	0.100	25.4	25.4
48	25.4	1	0.100	25.4	25.4
49	25.4	1	0.100	25.4	25.4
50	25.4	1	0.100	25.4	25.4

**INCH to MILLIMETER CONVERTER**

MM	Inch	MM	Inch	MM	Inch
25.4	1	127.000	5	254.000	10
38.1	1.5	190.500	7.5	381.000	15
50.8	2	254.000	10	508.000	20
63.5	2.5	317.500	12.5	635.000	25
76.2	3	381.000	15	762.000	30
88.9	3.5	444.500	17.5	889.000	35
101.6	4	508.000	20	1016.000	40
114.3	4.5	571.500	22.5	1143.000	45
127.0	5	635.000	25	1270.000	50



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## RUN-IN-INSTRUCTIONS

### Engine Lubrication

When the engine rebuild is complete, fill the engine crankcase with Case HDM oil and install new engine oil filter. **NOTE:** If Case HDM oil is not used, use only a Series 3 DS or CD Service Classification oil that has the proper viscosity rating for prevailing air temperature. Refer to vehicle Operator's Manual.

After the first 20 hours of operation, change the engine oil while the engine is hot and replace the engine oil filter. **DO NOT DRAIN OIL UNTIL THE ENGINE HAS BEEN OPERATED 20 HOURS.**

Change the engine oil and filter at the recommended intervals thereafter as outlined in the Operator's Manual.

### Break-In Procedure for Rebuilt Engines (With a Dynamometer)

The following procedure must be implemented when using a PTO dynamometer to break-in the engine. The dynamometer will insure control of the engine load at each speed and will eliminate over stressing new parts during break-in.

During the break-in, continually check the oil pressure, coolant level, and coolant temperature.

STEP	TIME	ENGINE SPEED	DYNAMOMETER SCALE LOAD*
1	**10 Minutes	1000 RPM	None
2	**10 Minutes	1800 RPM	None
3	20 Minutes	1800 RPM	1/3
4	20 Minutes	1800 RPM	1/2
5	***30 Minutes	100 RPM below rated speed	3/4
6	Retorque the cylinder head bolts using the procedure described in Section 2015 of this service manual.		

\*Based upon normal dynamometer scale load at rated speed for the particular vehicle model. Reduce this scale load as indicated.

\*\*The most ideal break-in procedure would be to constantly vary the throttle between 750 to 1000 RPM for the first 10 minutes and from 1000 RPM to 1800 RPM for the next 10 minutes. The purpose of this changing RPM is to vary the lubrication and coolant flow.

\*\*\*30 minutes at 3/4 load is a minimum amount of time the engine should be run. It is recommended that whenever possible the engine (especially turbocharged diesels) should be run for four (4) hours or more at the above speed and load before checking the full engine horsepower or before using the engine for heavy field work.

### Break-In Procedure for Rebuilt Engines (Without a Dynamometer)

STEP	TIME	ENGINE SPEED	LOAD
1	*10 Minutes	1000 RPM	None
2	*10 Minutes	1800 RPM	None
3	30 Minutes	2/3 Rated RPM	Light Load
4	1 Hour	Full RPM (not over 2000 RPM)	80 to 90%
5	Retorque the cylinder head bolts using the procedure described in Section 2015 of this service manual.		

\*If engine must then run at or near full load to operate the machine - for first hour remove load and run at high idle for a few minutes at 15 minute intervals.



### Run-In Procedure (Agricultural Tractors)

For the first 8 hours of field operation stay one gear lower than normal. For the next 12 hours DO NOT "lug" the engine. Prevent "lugging" by shifting to a lower gear. The engine must not be "lugged" below its Rated Engine RPM during the early hours of life.

### Run-In Procedure (Construction Equipment)

For the first 8 hours, operate the engine at full throttle maintaining a normal load. DO NOT baby the engine, but avoid prolonged converter or hydraulic stall. Engine must not be "lugged" below its Rated Engine RPM (Do not exceed 10 seconds of stall).

### Run-In Procedure (Power Units)

For the first 1/2 hour, operate engine at 2/3 rated RPM with a light load or no load. For the next (1) hour, run engine at 80 to 90% load at rated RPM (but not over 2000 RPM). Then full load and rated RPM as required in application.

During break-in, constantly check the oil pressure, coolant temperature, and engine vibration.

ENGINE SPEED	TIME
1000 RPM	10 minutes
1200 RPM	10 minutes
1400 RPM	10 minutes
1600 RPM	10 minutes
1800 RPM	10 minutes
2000 RPM	10 minutes

After the break-in procedure, the engine should be run at rated RPM for a minimum of 10 minutes. The purpose of this change is to allow the engine to reach its normal operating temperature. The most ideal break-in procedure would be to consist of 10 minutes at 1000 RPM for the first 10 minutes and then 10 minutes at 2000 RPM for the next 10 minutes. The purpose of this change is to allow the engine to reach its normal operating temperature. The most ideal break-in procedure would be to consist of 10 minutes at 1000 RPM for the first 10 minutes and then 10 minutes at 2000 RPM for the next 10 minutes. The purpose of this change is to allow the engine to reach its normal operating temperature.

Procedure for Rebuilt Engines (With New Parts)

ENGINE SPEED	TIME
1000 RPM	10 minutes
1200 RPM	10 minutes
1400 RPM	10 minutes
1600 RPM	10 minutes
1800 RPM	10 minutes
2000 RPM	10 minutes

After the break-in procedure, the engine should be run at rated RPM for a minimum of 10 minutes. The purpose of this change is to allow the engine to reach its normal operating temperature. The most ideal break-in procedure would be to consist of 10 minutes at 1000 RPM for the first 10 minutes and then 10 minutes at 2000 RPM for the next 10 minutes. The purpose of this change is to allow the engine to reach its normal operating temperature.

## DETAILED ENGINE SPECIFICATIONS

### Cylinder Sleeves

	U.S. Value	Metric Value
Type .....	Replaceable Wet	
Material .....	Cast Iron	
I.D. of sleeve .....	3.8125 to 3.8115"	96.838 to 96.812mm
Maximum Serviceable Limit .....	3.8165"	96.939mm
Sleeve out-of-round (installed in block) .....	.001" max.	.025mm
Maximum Serviceable Limit .....	.004"	.102mm
Taper (installed in block) .....	.001"	.025mm
Maximum Serviceable Limit .....	.004"	.102mm
Clearance to bottom of piston skirt, 90° to piston pin ..	.0035 to .0055"	.090 to .140mm
Maximum Serviceable Limit .....	.0100"	.254mm
Sleeve Protrusion above cylinder block (Max.) .....	.005"	.127mm

### Piston

Type .....	Cam ground	
Material .....	Aluminum Alloy	
O.D. at bottom of skirt, 90° to piston pin .....	3.807 to 3.808"	96.698 to 96.723mm
Minimum Serviceable Limit .....	3.806"	96.672mm
I.D. of piston pin bore including wear .....	1.2500 to 1.2508"	31.750 to 31.770mm
Width of 2nd ring groove .....	.097 to .098"	2.464 to 2.489mm
Maximum Serviceable Limit .....	.100"	2.540mm
Width of 3rd ring groove .....	.1885 to .1895"	4.788 to 4.813mm
Maximum Serviceable Limit .....	.1915"	4.864mm

### Piston Rings

No. 1 Compression .....	Chrome Grooved Keystone	
End gap in 3.8125 I.D. (96.838mm I.D.) sleeve .....	.015 to .025"	.381 to .635mm
Maximum Serviceable Limit .....	.035"	.889mm
No. 2 Compression .....	Rectangular Grooved Back	
End gap in 3.8125 I.D. (96.838mm I.D.) sleeve .....	.015 to .025"	.381 to .635mm
Maximum Serviceable Limit .....	.035"	.899mm
Side Clearance .....	.0035 to .0055"	.090 to .140mm
Maximum Serviceable Limit .....	.008"	.203mm

**Piston Rings (Cont'd)**

U.S. Value

Metric Value

No. 3 Oil Control Ring .....	Three Piece	
End gap in 3.8125 I.D. (.96.838mm I.D.) sleeve .....	.015 to .055"	.381 to 1.397mm
Maximum Serviceable Limit .....	.065"	1.651mm
Side clearance .....	.000 to .008"	.000 to .203mm
Maximum Serviceable Limit .....	.010"	.254mm

**Piston Pin**

Type .....	Full Floating	
O.D. of pin .....	1.2495 to 1.2498"	31.737 to 31.745mm
Fit in piston .....	.0002 to .0010"	.005 to .025mm
Fit in rod bushing .....	.0004 to .0015"	.010 to .038mm

**Connecting Rod**

Bushing .....	Replaceable Bronze	
Bushing I.D. installed (ream to size) .....	1.2502 to 1.2504"	31.755 to 31.760mm
Maximum Serviceable Limit .....	1.2510"	31.775mm
Bearing liners .....	Replaceable	
Rod width at crank end .....	1.3035 to 1.3055"	33.109 to 33.160mm
Journal I.D. without bearing liners .....	2.1870 to 2.1875"	55.550 to 55.563mm
Bearing oil clearance .....	.0010 to .0040"	.025 to .102mm
Undersize bearings for service .....	.002, .010, .020, .030"	.051, .254, .508, .762mm
Side clearance .....	.005 to .011"	.127 to .279mm

**Crankshaft**

Type .....	Hardened Steel Balanced	
Main bearing liners .....	Replaceable	
End play, center main bearing cap .....	.001 to .015"	.025 to .381mm
Center main bearing thrust surface thickness .....	.1025 to .1045"	2.603 to 2.654mm
Connecting rod journal std. O.D. ....	2.0605 to 2.0615"	52.337 to 52.362mm
.002" (.051mm) O.D. undersize, grind to .....	2.0585 to 2.0595"	52.286 to 52.311mm
.010" (.254mm) O.D. undersize, grind to .....	2.0505 to 2.0515"	52.083 to 52.108mm
.020" (.508mm) O.D. undersize, grind to .....	2.0405 to 2.0415"	51.289 to 51.854mm
.030" (.762mm) O.D. undersize, grind to .....	2.0305 to 2.0315"	51.575 to 51.600mm
Connecting rod journal maximum taper .....	.001"	.025mm
Journals out-of-round .....	.0005"	.013mm
Undersize main bearing liners for service .....	.002, .010, .020, .030"	.051, .254, .508, .762mm
Main bearing oil clearance .....	.0012 to .0042"	.031 to .107mm

**Crankshaft (Cont'd)**

	U.S. Value	Metric Value
Main bearing journal std. O.D. ....	2.8730 to 2.8740"	72.974 to 73.000mm
.002" (.051mm) O.D. undersize, grind to .....	2.8710 to 2.8720"	72.923 to 72.949mm
.010" (.254mm) O.D. undersize, grind to .....	2.8630 to 2.8640"	72.720 to 72.746mm
.020" (.508mm) O.D. undersize, grind to .....	2.8530 to 2.8540"	72.466 to 72.492mm
.030" (.762mm) O.D. undersize, grind to .....	2.8430 to 2.8440"	72.212 to 72.238mm
Main bearing journal bore I.D. without liners .....	3.066 to 3.067"	77.876 to 77.902mm
Main journal width between cheeks:		
2nd and 4th .....	1.185 to 1.189"	30.099 to 30.201mm
3rd .....	1.3740 to 1.3770"	34.900 to 34.976mm
5th .....	1.745 to 1.755"	44.32 to 44.58mm
Connecting rod journals width between cheeks .....	1.3105 to 1.3145"	33.287 to 33.388mm

**Camshaft**

Type .....	Parabolic	
Bushings .....	5, Replaceable	
Bushing Lubrication:		
Front bushing .....	Pressure lubricated from oil pump	
Intermediate bushing .....	Gravity flow lubricated	
Rear bushing .....	Pressure lubricated with rear oil metering.	
Oil clearance .....	.002 to .007"	.051 to .178mm
I.D. of bushing installed .....	1.752 to 1.753"	44.501 to 44.526mm
Maximum Serviceable Limit .....	1.755"	44.577mm
Bushing width:		
1st (front) .....	1.213 to 1.223"	30.810 to 31.064mm
2nd, 3rd and 4th .....	.490 to .500"	12.446 to 12.700mm
5th (rear).....	1.213 to 1.223"	30.810 to 31.064mm
O.D. of each bearing surface .....	1.749 to 1.750"	44.425 to 44.450mm
Minimum Serviceable Limit .....	1.748"	44.399mm
Thrust washer thickness .....	.147 to .149"	3.734 to 3.785mm
Minimum Serviceable Limit .....	Maintain end clearance	
Camshaft end play .....	Taken up by thrust washer	
Camshaft end clearance .....	.003 to .007"	.076 to .178mm
<b>Valve Push Rod Lifters</b>		
Material .....	Hardened Steel	
Type .....	Mushroom	
O.D. of lifter stem .....	.5605 to .5610"	14.237 to 14.249mm
I.D. of block bore, including wear .....	.5625 to .5650"	14.287 to 14.351mm

**Gear Train**

U.S. Value

Metric Value

## Backlash:

Crankshaft gear to camshaft gear .....	.0002 to .006"	.005 to .152mm
Camshaft gear to idler gear .....	.0004 to .006"	.010 to .152mm
Idler gear to fuel pump gear .....	.0005 to .007"	.013 to .178mm
Crankshaft gear to oil pump gear .....	.002 to .008"	.051 to .203mm
Crankshaft gear to fuel pump gear .....	.0005 to .019"	.013 to .483mm
O.D. of idler gear shaft .....	1.3745 to 1.3755"	34.912 to 34.938mm
Minimum Serviceable Limit .....	1.3740"	34.900mm
I.D. of idler gear with bushing .....	1.376 to 1.377"	34.950 to 34.976mm
Maximum Serviceable Limit .....	1.377"	34.976mm
Idler gear thrust washer shims .....	.005, .006, .007, .009"	.127, .152, .178, .229mm
Idler gear end play .....	.003"	.076mm

**Oil Pump**

Positive displacement pump .....	Gear Type	Type
Backlash, pump gear to crankshaft gear .....	.002 to .008"	.051 to .203mm
Drive gear to pump body maximum clearance .....	.0035 to .010"	.089 to .254mm
Pump gears to body radial maximum clearance .....	.002 to .008"	.051 to .203mm
Pump gears to pump cover maximum clearance .....	.0015 to .008"	.038 to .203mm
Oil pressure .....	50 to 75 PSI	344.7 to 482.6 kPa
Relief valve spring:		
Free length .....	2.125"	53.975mm
Compressed 1.44" (36.58mm) .....	18 to 19 lbs.	8.16 to 8.62 kg

**Cylinder Head**

Warpage (Max.) .....	.006"	.152mm
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**Intake Valve**

Tappet clearance (COLD and HOT) .....	.012"	.305mm
Face angle .....	44°	44°
Face run-out (max.) .....	.002"	.051mm
Length .....	6.339 to 6.364"	161.011 to 161.646mm
O.D. of stem .....	.3409 to .3419"	8.659 to 8.684mm
Minimum Serviceable Limit .....	.3399"	8.634mm
O.D. of head .....	1.599 to 1.609"	40.615 to 40.869mm
Seat angle .....	45°	45°
Seat contact width .....	.0704" to .1057"	1.788 to 2.685mm
Seat run-out (max.) .....	.002"	.051mm

**Exhaust Valve**

	U.S. Value	Metric Value
Tappet clearance (COLD and HOT) .....	.014"	.356mm
Face angle .....	44°	44°
Face run-out (max.) .....	.002"	.051mm
O.D. of head .....	1.398 to 1.408"	35.509 to 35.763mm
O.D. of stem .....	.3399 to .3409"	8.634 to 8.659mm
Minimum Serviceable Limit .....	.3389"	8.608mm
Length .....	6.340 to 6.364"	161.036 to 161.646mm
Insert seat angle .....	45°	45°
Seat contact width .....	.0608 to .0962"	1.544 to 2.443mm
Seat run-out (max.) .....	.002"	.051mm
Insert height .....	.2475 to .2525"	6.286 to 6.413mm
O.D. of insert .....	1.4495 to 1.4505"	36.817 to 36.843mm
I.D. of insert .....	1.245 to 1.255"	31.623 to 31.877mm

**Intake Valve Guides**

Length .....	3.250"	82.550mm
O.D. ....	.6565 to .6575"	16.675 to 16.701mm
I.D. (installed and reamed) .....	.3429 to .3439"	8.710 to 8.735mm
Maximum Serviceable Limit .....	.3449"	8.761mm
Protrusion above cylinder head .....	.875"	22.225mm
Valve stem clearance in guide .....	.001 to .003"	.025 to .076mm
Maximum Serviceable Limit .....	.004"	.102mm

**Exhaust Valve Guides**

Length .....	3.125"	79.375mm
O.D. ....	.6565 to .6575"	16.675 to 16.701mm
I.D. (installed and reamed) .....	.3429 to .3439"	8.710 to 8.735mm
Maximum Serviceable Limit .....	.3449"	8.761mm
Protrusion above cylinder head .....	.875"	22.225mm
Valve stem clearance in guide .....	.002 to .004"	.051 to .102mm
Maximum Serviceable Limit .....	.005"	.127mm

**Valve Spring**

Free length .....	2.375"	60.325mm
Total coils .....	8.25	
Wire diameter .....	.162"	4.115mm
I.D. ....	.958 to .978"	24.333 to 24.841mm
Compressed to 1.521" (38.63mm) (valve open) .....	110 to 118 lbs.	49.90 to 53.52 kg
Compressed to 1.875" (47.63mm) (valve closed) .....	53 to 59 lbs.	24.04 to 26.76 kg

	U.S. Value	Metric Value
<b>Rocker Arm Assembly</b>		
O.D. of shaft .....	.622 to .623"	15.799 to 15.824mm
I.D. of arm bore .....	.624 to .626"	15.850 to 15.900mm
Shaft spring:		
Free length .....	2.5"	63.500mm
Compressed to 1.75" (44.45mm) .....	7.5 to 8.5 lbs.	3.40 to 3.86 kg
Lubrication .....	Engine oil, camshaft metering	
Shaft oil holes .....	Toward valve side of engine. Shaft cannot be rotated.	

## SPECIAL TORQUES




Engine	U.S. Value	Metric Value
Camshaft nut .....	80 to 90 ft. lbs.	109 to 122 Nm
Camshaft thrust plate mounting bolt .....	17 to 20 ft. lbs.	23 to 27 Nm
Connecting rod nuts .....	45 to 50 ft. lbs.	61 to 68 Nm
Crankshaft nut .....	125 to 135 ft. lbs.	169 to 183 Nm
Crankshaft pulley bolt .....	54 to 64 ft. lbs.	73 to 87 Nm
Cylinder head studs w/flange nuts (1/2") .....	90 to 100 ft. lbs.	122 to 136 Nm
Cylinder head cover stud nuts (3/8") .....	4 to 6 ft. lbs.	5 to 8 Nm
Cylinder head bolts (Gr. 8, 12 pt. hd.) .....	105 to 115 ft. lbs.	142 to 156 Nm
Cylinder head stud nuts (1/2") .....	95 to 105 ft. lbs.	129 to 142 Nm
Engine oil filter .....	Install until gasket contacts filter head, then hand tighten 1/2 turn. Loosen filter approximately 1 full turn and retighten until gasket contact is made, then hand tighten an additional 1/2 to 3/4 turn.	
Fan mounting bolts .....	35 to 42 ft. lbs.	48 to 57 Nm
Fuel pump drive gear nut .....	40 to 50 ft. lbs.	54 to 68 Nm
Flywheel to crankshaft bolt .....	65 to 70 ft. lbs.	88 to 95 Nm
Idler gear journal mounting bolts .....	35 to 42 ft. lbs.	48 to 57 Nm
Intake manifold (Aluminum) stud nuts .....	30 to 35 ft. lbs.	41 to 48 Nm
Intake and Exhaust Manifold stud nuts .....	25 to 30 ft. lbs.	34 to 41 Nm
Main bearing cap bolts .....	90 to 100 ft. lbs.	122 to 136 Nm
Oil pan capscrews (stamped steel) .....	10 to 12 ft. lbs.	14 to 16 Nm
Oil pan capscrews (cast iron) .....	24 to 28 ft. lbs.	33 to 38 Nm
Oil pan to seal retainer .....	15 to 20 ft. lbs.	20 to 27 Nm
Oil pan drain plug .....	29 to 31 ft. lbs.	39 to 42 Nm
Oil pump cover capscrews .....	6 to 8 ft. lbs.	8 to 11 Nm
Oil seal retainer bolts (Grade 8) .....	12 to 15 ft. lbs.	16 to 20 Nm
Oil pump suction tube nut .....	95 to 105 ft. lbs.	129 to 142 Nm
Rocker arm bracket bolts .....	25 to 30 ft. lbs.	34 to 41 Nm
Timing gear housing bolts .....	25 to 30 ft. lbs.	34 to 41 Nm
Water pump mounting bolts .....	25 to 30 ft. lbs.	34 to 41 Nm
Water pump body-to-cyl. mounting bolts .....	35 to 42 ft. lbs.	48 to 57 Nm



SPECIAL TORQUES

**GENERAL TORQUE SPECIFICATION TABLE (Revised 2-74)**  
**USE THE FOLLOWING TORQUES WHEN SPECIAL TORQUES ARE NOT GIVEN**

**NOTE:** These values apply to fasteners as received from supplier, dry, or when lubricated with normal engine oil. They do not apply if special graphited or moly-disulphide greases or other extreme pressure lubricants are used. This applies to both UNF and UNC threads.

SAE Grade No.		2				5				8 *			
Bolt head identification marks as per grade NOTE: Manufacturing Marks Will Vary													
Bolt Size		Torque		Torque		Torque		Torque		Torque		Torque	
Inches	Millimeters	Foot Pounds		Newton-Meters		Foot Pounds		Newton-Meters		Foot Pounds		Newton-Meters	
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
1/4	6.35	5	6	6.8	8.13	9	11	12.2	14.9	12	15	16.3	20.3
5/16	7.94	10	12	13.6	16.3	17	20.5	23.1	27.8	24	29	32.5	39.3
3/8	9.53	20	23	27.1	31.2	35	42	47.5	57.0	45	54	61.0	73.2
7/16	11.11	30	35	40.7	47.4	54	64	73.2	86.8	70	84	94.9	113.9
1/2	12.70	45	52	61.0	70.5	80	96	108.5	130.2	110	132	149.2	179.0
9/16	14.29	65	75	88.1	101.6	110	132	149.2	179.0	160	192	217.0	260.4
5/8	15.88	95	105	128.7	142.3	150	180	203.4	244.1	220	264	298.3	358.0
3/4	19.05	150	185	203.3	250.7	270	324	366.1	439.3	380	456	515.3	618.3
7/8	22.23	160	200	216.8	271.0	400	480	542.4	650.9	600	720	813.6	976.3
1	25.40	250	300	338.8	406.5	580	696	786.5	943.8	900	1080	1220.4	1464.5
1-1/8	25.58					800	880	1084.8	1193.3	1280	1440	1735.7	1952.6
1-1/4	31.75					1120	1240	1518.7	1681.4	1820	2000	2467.9	2712.0
1-3/8	34.93					1460	1680	1979.8	2278.1	2380	2720	3227.3	3688.3
1-1/2	38.10					1940	2200	2630.6	2983.2	3160	3560	4285.0	4827.4

\* Thick nuts must be used with Grade 8 bolts

**NOTE:** The JI Case Company reserves the right to make improvements in design or changes in specifications at any time without incurring any obligation to install them on units previously sold.

FLUIDS AND LUBRICANTS

COMPONENT	CAPACITY	
	U.S.	Metric
Fuel tank	22 gallons	83 litres
Engine oil	6 quarts	5.7 litres
	7 quarts	6.6 litres
Hydraulic system	15 gallons	57 litres
	19 gallons	72 litres
Power steering system	1 quart	0.9 litre
	4 quarts	3.8 litres
Mechanical parts	2 quarts	1.9 litres
Transmission	20 quarts	19 litres
Grease fittings	As required	
Front wheel bearings	As required	
Cooling system	21 quarts	19.8 litres
Battery	As required	
Brake master cylinders	As required	

# Section 1050

## MAINTENANCE AND LUBRICATION



### FLUIDS AND LUBRICANTS

COMPONENTS	CAPACITY		SPECIFICATIONS
	U.S.	Metric	
Fuel tank	22 gallons	83 litres	Refer to Operator's Manual.
Engine crankcase Without filter change	6 quarts	5.7 litres	Case HDM oil Engine oil, class CD, Above 32° F (0° C) . . . . . SAE 30 10°-50° F (-12°-10° C) . . . SAE 20W Below 32° F (0° C) . . . . . SAE 10W
With filter change	7 quarts	6.6 litres	
Hydraulic system (approx.) Loader/backhoe	23 gallons	87 litres	Case TCH Fluid  Alternate oil Engine oil, SD or CA  Above 32° F (0° C) . . . . SAE 10W Below 32° F (0° C) . . . . SAE 5W Type C-2 transmission/hydraulic fluid such as Tenneco Hytrans Fluid.
Loader only	15 gallons	57 litres	
Loader/three point hitch	19 gallons	72 litres	
Three point hitch only	14 gallons	53 litres	
Reservoir refill	11.5 gallons	43 litres	
Power steering system Reservoir refill	3 quarts 1 quart	2.8 litres 0.9 litre	Case TCH Fluid.
Mechanical shuttle	2 quarts	1.9 litres	Case TCH Fluid.
Transaxle	20 quarts	19 litres	Case FDL gear lubricant or lubri- cant meeting API-GL-4, specification Above 0° F (-18° C) . . . . . SAE 90 Below 0° F (-18° C) . . . . . SAE 80
Grease fittings	As required		No. 2 moly disulfide grease.
Front wheel bearings	As required		No. 2 wheel bearing grease.
Cooling system	21 quarts	19.8 litres	Mix ethylene glycol type antifreeze and water for lowest anticipated temperature.
Battery	As required		Add colorless, odorless drinking water.
Brake master cylinders	As required		DOT 3 brake fluid.



**MAINTENANCE CHART**

**NOTE:** This chart is based on maximum service intervals. If operating in severe working conditions, service more often.

INTERVAL	SERVICE	INSTRUCTIONS
Run-in period, Every two hours until stable	<p>Torque front and rear wheel bolts to 115-130 foot-pounds (157-176 N m).</p> <p>Torque transaxle mounting bolts to 250-300 foot-pounds (339-407 N m).</p> <p>Torque swing cylinder trunnion plate mounting bolts to 520-640 foot-pounds (732-867 N m).</p> <p>Torque drive shaft cap screws to 20-24 foot-pounds (27-32 N m).</p>	
Run-in period after first 20 hours	<p>Change engine oil and filter.</p> <p>Change hydraulic oil filter.</p> <p>Check fan belt tension.</p>	<p>Section 4002</p> <p>Section 8007</p>
Every 10 hours of operation or daily, whichever occurs first	<p>Grease loader pivot points.</p> <p>Grease backhoe pivot points.</p> <p>Grease extendable dipper, if so equipped.</p> <p>Grease three point hitch, if so equipped.</p> <p>Grease front axle pivot.</p> <p>Grease front axle king pins.</p> <p>Grease shuttle control bellcrank.</p> <p>Check engine oil level.</p> <p>Check hydraulic oil level.</p> <p>Check radiator coolant level.</p>	<p>Every 300 hrs</p> <p>Every 500 hrs</p>
	<p>Clean air cleaner dust cup.</p> <p>Check the machine and the ground under it for signs of leaks.</p> <p>Check injection pump sediment bowl for water. If bowl has water, drain fuel tank, first stage fuel filter and sediment bowl.</p>	<p>Section 2051</p>