CASE 580C LOADER BACKHOE SERVICE MANUAL

580C LOADER BACKHOE TABLE OF CONTENTS AND SERVICE MANUAL INTRODUCTION

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Service Manual Introduction

Safety Rules

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

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

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

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

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

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: 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

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. 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 preceeding 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 preceeding 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 as 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

The SAE grade number also indicates the viscosity of gear lubricants defined by MIL-L -2105B. An example is SAE 90, a medium viscosity lubricant.

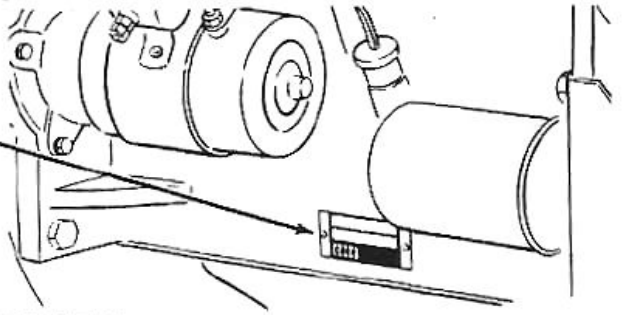
Grease

Semi-solid lubricants specified for pivot points must be that specified in Section 1050.

Section 1010

GENERAL ENGINE SPECIFICATIONS 580C 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	4 Inches
Stroke	4-1/8 Inches
Piston Displacement	207 Cubic Inches
Compression Ratio	16.5 to 1
No Load Governed Speed	2230 to 2270 RPM
Rated Engine Speed	2100 RPM
Engine Idling Speed	700 to 750 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	3
Number of Compression Rings	2
Number of Oil Rings	1
Type Pins	Full Floating Type
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)	6 Quarts
(With Filter Change)	7 Quarts
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

Section
1026

DETAILED SPECIFICATIONS

207 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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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.

DETAILED ENGINE SPECIFICATIONS

Cylinder Sleeves

	U.S. Value	Metric Value
Type	Replaceable, Wet	
Material	Chrome Plated Steel	
I.D. of sleeve	4.000 to 4.0010"	101.600 to 101.625mm
Maximum Serviceable Limit	4.0020"	101.651mm
Sleeve out-of-round (installed in block)	.001" max.	.025mm max.
Taper (installed in block)	.002" max.	.051mm max.
Clearance to bottom of piston skirt, 90° to piston pin	.0040 to .0060"	.102 to .152mm
Maximum Serviceable Limit	.0080"	.203mm

Piston

Type	Cam ground	
Material	Aluminum Alloy	
O.D. at bottom of skirt, 90° to piston pin	3.9950 to 3.9960"	101.473 to 101.498mm
Minimum Serviceable Limit	3.9940"	101.448mm
I.D. of piston pin bore including wear	1.2500 to 1.2508"	31.750 to 31.770mm
Width of 1st ring groove	Keystone Type	
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	Moly Faced Keystone	
End gap in 4.000 I.D. (101.600mm I.D.) sleeve	.015 to .025"	.381 to .635mm
Maximum Serviceable Limit	.035"	.889mm
Width	Not Measurable	
Side Clearance	Not Measurable	
No. 2 Compression	Rectangular Grooved Back	
End gap in 4.000 I.D. (101.600mm I.D.) sleeve	.013 to .023"	.330 to .584mm
Maximum Serviceable Limit	.033"	.838mm
Side clearance	.0035 to .0050"	.089 to .127mm
Maximum Serviceable Limit	.008"	.203mm

Piston Rings (Cont'd.)

	U.S. Value	Metric Value
No. 3 Oil Control Ring	Two Piece	
End gap in 4.000 I.D. (101.600mm I.D.) sleeve	.013 to .023"	.330 to .584mm
Maximum Serviceable Limit	.033"	.838mm
Side clearance	.0020 to .0035"	.051 to .089mm
Maximum Serviceable Limit	.005"	.127mm

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	
Journal I.D. without bearing liners	2.4002 to 2.4007"	60.965 to 60.978mm
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.	2.2480 to 2.2490"	57.099 to 57.125mm
.002" (.051mm) O.D. undersize, grind to	2.2460 to 2.2470"	57.048 to 57.074mm
.010" (.254mm) O.D. undersize, grind to	2.2380 to 2.2390"	56.845 to 56.871mm
.020" (.508mm) O.D. undersize, grind to	2.2280 to 2.2290"	56.591 to 56.617mm
.030" (.762mm) O.D. undersize, grind to	2.2180 to 2.2190"	56.337 to 56.363mm
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 & 4th	1.185 to 1.189"	30.099 to 30.201mm
3rd	1.374 to 1.377"	34.900 to 34.976mm
5th	1.745 to 1.755"	44.323 to 44.577mm
Connecting rod journals width between cheeks	1.3105 to 1.3145"	33.287 to 33.388mm

Camshaft

Type	Hardened Iron 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

Valve Push Rod Lifters

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	
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 70 PSI	344.74 to 482.63 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	.006" max.	.152mm max.

Intake Valve

Tappet clearance (COLD and HOT)	.012"	.305mm
Face angle	44°	44°
Face run-out	.002" max.	.051mm max.
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	.002" max.	.051mm max.

Exhaust Valve

	U.S. Value	Metric Value
Tappet clearance (HOT and COLD)	.014"	.356mm
Face angle	44°	44°
Face run-out	.002" max.	.051mm max.
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	.002" max.	.051mm max.
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 16.700mm
I.D. (installed and reamed)	.3429 to .3439"	8.710 to 8.735mm
Maximum Serviceable Limit	.3449"	8.760mm
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 16.702mm
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" (38.633mm) (valve open)	110 to 118 lbs.	49.90 to 53.52 kg.
Compressed to 1.875" (47.625mm) (valve closed)	53 to 59 lbs.	24.04 to 26.76 kg.

Rocker Arm Assembly

	U.S. Value	Metric Value
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" (44.450mm)	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

Camshaft nut	80 to 90 ft. lbs.	109 to 122 Nm
Camshaft thrust plate mtg. bolts	17 to 20 ft. lbs.	23 to 27 Nm
Connecting rod nuts	45 to 50 ft. lbs.	61 to 68 Nm
Crankshaft main bearing bolts	90 to 100 ft. lbs.	122 to 136 Nm
Crankshaft pulley nut	125 to 135 ft. lbs.	169 to 183 Nm
Cylinder head bolts (Gr. 8,12 pt. hd.)	105 to 115 ft. lbs.	122 to 137 Nm
Cylinder head stud nuts (1/2")	95 to 105 ft. lbs.	129 to 142 Nm
Cylinder head valve cover stud (3/8")	35 to 42 ft. lbs.	48 to 57 Nm
Cylinder head valve cover stud (1/2")	80 to 96 ft. lbs.	108 to 130 Nm
Cylinder head valve cover stud nuts (3/8")	4 to 6 ft. lbs.	5 to 8 Nm
Engine oil filter	Install until gasket contacts filter head, then hand tighten 1/2 turn. Loosen filter approximately one full turn and retighten until gasket contact is made, then hand tighten an additional 1/2 to 3/4 turn.	
Exhaust manifold stud nut	25 to 30 ft. lbs.	34 to 41 Nm
Fan mounting bolts	17 to 20 ft. lbs.	23 to 27 Nm
Flywheel to crankshaft bolts	65 to 70 ft. lbs.	88 to 95 Nm
Fuel pump drive gear nut	40 to 50 ft. lbs.	54 to 68 Nm
Idler gear journal mounting bolts	35 to 42 ft. lbs.	47 to 57 Nm
Intake manifold stud nut	30 to 35 ft. lbs.	41 to 48 Nm
Oil pan capscrews (stamped steel)	10 to 12 ft. lbs.	14 to 16 Nm
Oil pan drain plug	29 to 31 ft. lbs.	39 to 42 Nm
Oil pan to seal retainer	15 to 20 ft. lbs.	20 to 27 Nm
Oil pump cover capscrews	9 to 11 ft. lbs.	12 to 15 Nm
Oil pump suction tube nut	95 to 105 ft. lbs.	129 to 142 Nm
Oil seal retainer bolts	12 to 15 ft. lbs.	16 to 20 Nm
Rocker arm bracket bolts	25 to 30 ft. lbs.	34 to 41 Nm
Timing gear cover mounting bolts	25 to 30 ft. lbs.	34 to 41 Nm
Water pump body bolts	35 to 42 ft. lbs.	48 to 57 Nm

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 Foot Pounds		Torque Newton-Meters		Torque Foot Pounds		Torque Newton-Meters		Torque Foot Pounds		Torque Newton-Meters	
Inches	Millimeters	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

Section 1050

MAINTENANCE AND LUBRICATION

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FLUIDS AND LUBRICANTS

COMPONENTS	CAPACITY U.S.	CAPACITY Metric	SPECIFICATIONS
Fuel tank	22 gallons	83 liters	Refer to Operator's Manual.
Engine crankcase Without filter change With filter change	 6 quarts 7 quarts	 5.7 liters 6.6 liters	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
Hydraulic system (approx.) Loader/backhoe Loader only Loader/three point hitch Reservoir refill	 30 gallons 21 gallons 25 gallons 17 gallons	 113 liters 79 liters 94 liters 64 liters	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.
Power shuttle and converter	8 quarts	7.6 liters	Case TCH Fluid.
Power steering system Reservoir refill	3 quarts 1 quart	2.8 liters 0.9 liter	Case TCH Fluid.
Mechanical shuttle	2 quarts	1.9 liters	Case TCH Fluid.
Transaxle	20 quarts	19 liters	Case FDL gear lubricant or lubricant 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 moly disulfide grease.
Cooling system	21 quarts	19.8 liters	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	Torque front and rear wheel bolts to 115-130 foot-pounds (157-176 N m). Torque transaxle mounting bolts to 250-300 foot-pounds (339-407 N m). Torque swing cylinder trunnion plate mounting bolts to 520-640 foot-pounds (732-867 N m). Torque drive shaft cap screws to 20-24 foot-pounds (27-32 N m).	
Run-in period after first 20 hours	Change engine oil and filter. Change hydraulic oil filter. Check fan belt tension.	 Section 4002 Section 8007
Every 10 hours of operation or daily, whichever occurs first	Grease loader pivot points. Grease backhoe pivot points. Grease extendable dipper, if so equipped. Grease three point hitch, if so equipped. Grease front axle pivot. Grease front axle king pins. Grease power shuttle bellcrank. Check engine oil level. Check hydraulic oil level. Check radiator coolant level. Clean air cleaner dust cup. Check power shuttle oil level (if so equipped). Check the machine and the ground under it for signs of leaks. Check injection pump sediment bowl for water. If bowl has water, drain fuel tank, first stage fuel filter and sediment bowl.	 Section 2051 Section 6202

INTERVAL	SERVICE	INSTRUCTIONS
Every 100 hours of operation	Change engine oil.	
	Grease rear axle bearings.	
	Grease seat post.	
	Grease brake pedals and shaft bearings on power shuttle machines.	
	Grease brake pedals and clutch shaft on mechanical shuttle machines.	
	Check tire condition and pressure.	Section 6229
	Check battery fluid level.	Section 8005
	Check transaxle oil level.	
	Check mechanical shuttle oil level.	
	Check power steering oil level.	
	Clean spark arresting muffler if so equipped.	Section 2051
Every 200 hours of operation	Change engine oil filter.	Section 2555
	Check fan belt tension.	Section 8007
Every 500 hours of operation	Grease universal joints.	
	Lubricate hydraulic pump shaft.	Section 4005
	Replace fuel filters.	Section 3010
	Check brake master cylinder fluid level.	
	Repack front wheel bearings.	Section 5021
	Inspect Roll-Over Protection Structure.	Section 9061
	Change hydraulic oil filter.	Section 4002
	Clean hydraulic reservoir breather.	Section 4002
Every 1000 hours of operation or once a year, whichever occurs first	Change hydraulic oil.	Section 4002
	Change power shuttle oil, if so equipped.	Section 6202
	Replace power steering oil filter.	Section 5005
	Change mechanical shuttle oil, if so equipped.	
	Change transaxle oil.	
	Clean transaxle breather.	

INTERVAL	SERVICE	INSTRUCTIONS
Every 2000 hours of operation or once a year, whichever occurs first	Drain, flush and refill cooling system.	Section 2050
As required	After a wheel has been removed and installed, check bolt torque every two hours until stable.	
	Service air filter element whenever restriction warning light remains on with engine running at full throttle.	Section 2051
	Change hydraulic oil filter whenever restriction warning light remains lit.	Section 4002

Section 1051

TORQUE SPECIFICATIONS

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U.S. AND METRIC TORQUE SPECIFICATIONS

Grade 5 Bolts, Nuts and Studs (Dry Threads)

Thread size	Ft-lbs	N m
1/4"-20 NC	5-10	7-13
1/4"-28 NF	10-15	13-20
5/16"-18 NC	15-20	20-27
5/16"-24 NF	15-20	20-27
3/8"-16 NC	25-35	34-47
3/8"-24 NF	30-40	41-54
7/16"-14 NC	45-55	61-74
7/16"-20 NF	50-60	68-81
1/2"-13 NC	65-85	88-115
1/2"-20 NF	80-100	109-135
9/16"-12 NC	100-120	135-163
9/16"-18 NF	110-130	149-176
5/8"-11 NC	135-165	183-223
5/8"-18 NF	160-200	216-271

Thread size	Ft-lbs	N m
3/4"-10 NC	235-285	319-386
3/4"-16 NF	270-330	366-447
7/8"-9 NC	360-440	488-597
7/8"-14 NF	395-490	536-664
1"-8 NC	520-640	705-867
1"-12 NF	575-705	780-955
1-1/8"-7 NC	720-820	976-1111
1-1/8"-12 NF	790-970	1071-1315
1-1/4"-7 NC	1010-1240	1370-1681
1-1/4"-12 NF	1115-1365	1512-1850
1-3/8"-6 NC	1315-1610	1783-2182
1-3/8"-12 NF	1510-1850	2047-2508
1-1/2"-6 NC	1745-2135	2366-2894
1-1/2"-12 NF	1880-2420	2549-3281

Grade 8 Bolts, Nuts and Studs (Dry Threads)

Thread size	Ft-lbs	N m
1/4"-20 NC	10-15	13-20
1/4"-28 NF	15-20	20-27
5/16"-18 NC	20-30	27-40
5/16"-24 NF	25-30	34-40
3/8"-16 NC	40-50	54-67
3/8"-24 NF	45-55	61-74
7/16"-14 NC	60-80	82-102
7/16"-20 NF	70-90	95-122
1/2"-13 NC	100-120	136-162
1/2"-20 NF	110-130	149-176
9/16"-12 NC	135-165	183-223
9/16"-18 NF	155-190	210-257
5/8"-11 NC	200-240	271-325
5/8"-18 NF	215-265	292-359

Thread size	Ft-lbs	N m
3/4"-10 NC	340-420	461-569
3/4"-16 NF	380-460	515-623
7/8"-9 NC	540-660	732-894
7/8"-14 NF	595-725	807-982
1"-8 NC	810-990	1098-1342
1"-12" NF	900-1100	1220-1491
1-1/8"-7 NC	1150-1400	1559-1898
1-1/8"-12 NF	1295-1585	1756-2148
1-1/4"-7 NC	1640-2000	2224-2711
1-1/4"-12 NF	1800-2200	2440-2982
1-3/8"-6 NC	2140-2620	2901-3552
1-3/8"-12 NF	2450-3000	3322-4067
1-1/2"-6 NC	2845-3475	3857-4711
1-1/2"-12 NF	3200-3900	4339-4880

Figure 1

U.S. AND METRIC TORQUE SPECIFICATIONS

Hydraulic Fittings (Steel)

Dash Size	Tube O.D. Hose I.D.	Thread Size	37° Flare Torque		Straight Thread O-ring Torque	
			Ft-lbs	N m	Ft-lbs	N m
4	1/4"	7/16"-20	6-12	8-16	12-19	16-25
5	5/16"	1/2"-20	8-16	11-21	16-25	22-33
6	3/8"	9/16"-18	10-25	14-33	25-40	34-54
8	1/2"	3/4"-16	15-42	20-56	42-67	57-90
10	5/8"	7/8"-14	25-58	34-78	58-92	79-124
12	3/4"	1-1/16"-12	40-80	54-108	80-128	108-174
14	7/8"	1-3/16"-12	60-100	81-135	100-160	136-216
16	1"	1-5/16"-12	75-117	102-158	117-187	159-253
20	1-1/4"	1-5/8"-12	125-165	169-223	165-264	224-357
24	1-1/2"	1-7/8"-12	210-250	285-338	250-400	339-542

Split Flange Mounting Bolts (Grade 5, Dry Threads)

Flange Size	Thread Size	Torque	
		Ft-lbs	N m
1/2"	5/16"-18 NC	15-20	20-25
3/4"	3/8"-16 NC	20-25	26-33
1"	3/8"-16 NC	20-25	26-33
1-1/4"	7/16"-14 NC	35-45	47-61
1-1/2"	1/2"-13 NC	45-55	61-74
2"	1/2"-13 NC	55-65	74-88
2-1/2"	1/2"-13 NC	80-90	104-122
3"	5/8"-11 NC	140-150	190-203

740314

Figure 2

Section 1052

NOISE CONTROL

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NOISE PROTECTION

J I Case provides noise abatement kits that may be factory or field installed. Each kit is made up of an acoustical foam material. This material must be kept clean and intact to maintain the proper level of noise protection.

Cleaning

If the padding becomes contaminated with surface dust or dirt, hose down with water. Steam clean parts that have become contaminated with oil or grease. Squeeze out the excess water.

If the padding is saturated with oil or grease and does not clean up, replace the contaminated part.

Replacement

WARNING: Be sure the area has good ventilation before applying the adhesive. 39-10

When installing padding make sure the metal surfaces are clean of all oil, grease, excessive rust and traces of old material. It is very important that the new piece cover the same area as the old one.

Use a brand name contact cement according to manufacturer's instructions to hold padding in place.

Checking Noise Protection

The laws of some cities, states or provinces may require that your machine be checked and certified for a maximum noise level. Be sure to check with local authorities to determine what the requirements are.

Listed below are checks that must be performed to insure continuing noise protection.

1. Check that all exterior parts and sheet metal fasteners are tight. All rattles close to the operator's area must be eliminated.

2. Check that all sealing and barrier materials are whole and intact. A small hole can admit a large amount of noise.

3. Check noise isolators such as engine mounts, rubber shock mounts, hydraulic tube isolators, etc. Replace if defective.

4. Check that the full throttle - no load engine speed is checked with an accurate tachometer. The engine speed must be within the limits as listed in Section 1010.

5. Check the full range of engine speed for resonance (loud, undampened vibration). To check, increase the engine speed from low idle to full throttle slowly. If excessive resonance is found, eliminate the vibration of the suspected part.

NOTE: For your general information, see the SAE recommended practice on sound levels and measurements. Refer to SAE J919a, J87 and J88 in the SAE Handbook.

Section 2001

ENGINE DIAGNOSIS

188 and 207 Diesel Engines

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GENERAL INFORMATION

Before making any repairs or adjustments on an engine, a mechanic or technician must properly diagnose the trouble.

Locating the trouble and repairing it is only part of the job, a technician must find and eliminate the cause of the trouble as well. Too many repairs are made with no thought to removing the causes that made the repair necessary.

For any engine to start or perform properly, three main requirements must be present:

1. FUEL
2. COMPRESSION
3. COMBUSTION

When any of these requirements are not present or limited by some mechanical reason, the engine will not start and will fail to operate properly throughout the power range.

FUEL. Fuel system problems can be present anywhere from the fuel tank, through the filters and injection pump as well as the injectors. Correct injection pump timing is important in the overall fuel system performance.

COMPRESSION. Compression on an engine is related to the "breathing function". Proper compression is affected by the air cleaner condition, muffler restriction, valve condition and operation including proper valve adjustment, cylinder head gaskets, condition of sleeves, rings, pistons, camshaft, and camshaft timing.

COMBUSTION. Combustion is the result of adequate compression to develop enough heat in the air charge on the compression stroke to fire the fuel being injected into the engine cylinders. Proper spray pattern and atomization of the fuel by the injector is very important. Timing the fuel injection pump to the engine to a precise degree BTDC is a vital requirement for proper combustion.

The engine diagnosis contained in the following pages covers many trouble symptoms, the causes, and what will be necessary to repair or eliminate the problem. Under each symptom are listed the most common and reoccuring problems progessing to the not so common problems. Locate your problem symptom in the diagnosis chart and refer to the pages listed for the probable causes and remedies.