

1080/1080B EXCAVATOR

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SECTION NO.

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1001

SAFETY RULES, SERVICE MANUAL INTRODUCTION, AND TORQUE SPECIFICATIONS

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SAFETY RULES

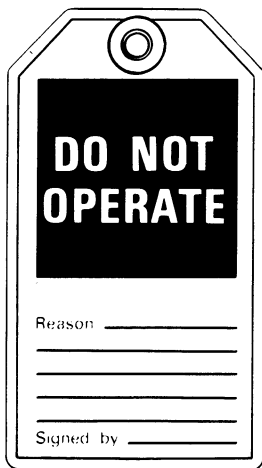


This symbol means ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED. The message that follows the symbol contains important information about safety. Carefully read the message. Make sure you fully understand the causes of possible injury or death. 1-1-C

NOTE: To prevent injury on job, follow the Warning, Caution, and Danger notes in this section and other sections throughout this manual. Follow the instructions carefully.

The procedures recommended and shown in this manual are good, effective service methods. However, all possible procedures and service hazards may not be covered. Therefore, if you use a tool or procedure not recommended, you must make sure that the method you select is a safe method.

Put the warning tag shown below on the key for the key switch when you are servicing or repairing this machine. One warning tag is on every new machine. You can buy additional warning tags, part number 331-4614, from Service Parts Supply.



780449



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

46-27



WARNING: Operate tractor and equipment controls from the seat position only. Any other method could result in serious injury.

48-55



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

35-8



WARNING: Before starting engine, study operator's manual safety messages. Read all safety signs on machine. Clear the area of other persons. Learn and practice safe use of controls before operating.

It is your responsibility to understand and follow manufacturer's instructions on machine operation, service, and to observe pertinent laws and regulations. Operator's and service manuals may be obtained from your J I Case dealer.

45-2



WARNING: If you wear clothing that is too loose or do not use the correct safety equipment for your job, you can be injured. Always wear clothing that will not catch on objects. Extra safety equipment that can be required includes hard hat, safety shoes, ear protection, eye or face protection, heavy gloves and reflector clothing.

45-3-A



CORRECT



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: When doing checks and tests on the equipment hydraulics, follow the procedures as they are written. **DO NOT** change the procedure. 47-44



WARNING: When putting the hydraulic cylinders on this machine through the necessary cycles to check operation or to remove air from a circuit, make sure all people are out of the way. 47-45



WARNING: Use insulated gloves or mittens when working with hot parts.

47-41A



CAUTION: Lower all attachments to the ground or use stands to safely support the attachments before you do any maintenance or service.

49-11



CAUTION: Pin sized and smaller streams of hydraulic oil under pressure can penetrate the skin and result in serious infection. If hydraulic oil under pressure does penetrate the skin, seek medical treatment immediately. Maintain all hoses and tubes in good condition. Make sure all connections are tight. Make a replacement of any tube or hose that is damaged or thought to be damaged. **DO NOT** use your hand to check for leaks; use a piece of cardboard or wood.

40-6-A



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.

46-17



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: 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



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

40-7-A



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

40-10



DANGER: Engine exhaust fumes can cause death. If it is necessary to start the engine in a closed place, remove the exhaust fumes from the area with an exhaust pipe extension. If you do not have an exhaust pipe extension, open the doors and get outside air into the area.

48-56

SERVICE MANUAL INTRODUCTION

This service manual has been prepared with the latest service information available. Troubleshooting, removal, disassembly, inspection and installation procedures, and complete specifications and tightening references can be found in most sections. Some sections have drawings but no written procedure because the job is so easily done. This service manual is one of the most important tools available to the service technician.

Right, Left, Front, and Rear

The terms right-hand and left-hand and front and rear as used in this manual indicate the right and left sides, and front and rear of the machine as seen from the operator's seat for correct operation of the machine or attachment.

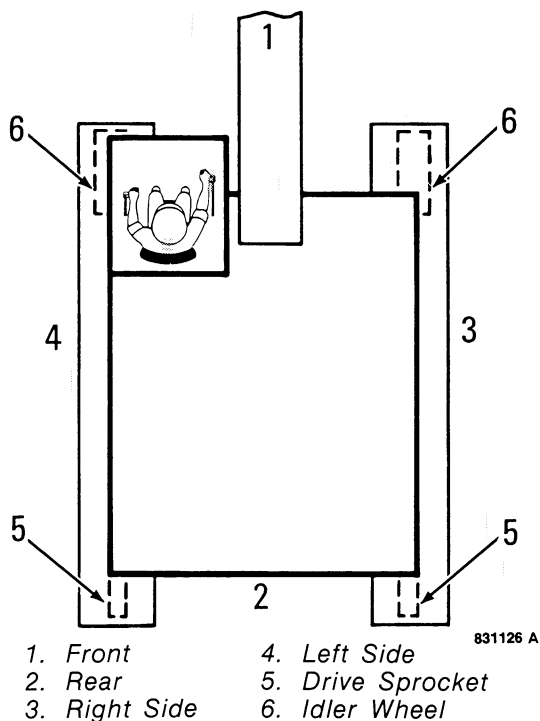


Table of Contents

A Table of Contents is in the front of this manual. The Table of Contents shows the main divisions and the sections that are in each division. The individual sections, where necessary, also have a Table of Contents.

Page Numbers

All page numbers are made of two numbers separated by a dash, such as 4002-9. The number before the dash is the section number. The number following the dash is the page number in that section. Page numbers will be found at the upper right or left of each page.

Illustrations

Illustrations are put as near as possible to the text and are to be used as part of the text.

Clear and Simple English

This manual is written in C.A.S.E. (Clear and Simple English). C.A.S.E. is easier to read than "regular" English because C.A.S.E. uses a small number of common words and has special rules for writing.

All sections written in C.A.S.E. are indicated by the symbol below.

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And
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English*

Special Tools

Special tools are needed to remove and install, disassemble and assemble, check and adjust some component parts of this machine. Some special tools can be easily made locally and the necessary information to make the tool is in this service manual. Other special tools are more difficult to make locally and are available from Service Tools in the U.S. and from Jobborn Manufacturing in Canada. Use these tools according to the instructions in this service manual for your personal safety and to do the job correctly.




Order special tools from either of the following companies.




Service Tools
P.O. Box 314
Owatonna, Minnesota 55060

Jobborn Manufacturing Co.
97 Frid Street
Hamilton, Ontario L8P 4M3
Canada

TORQUE SPECIFICATIONS - U.S. HARDWARE

Use the torques in this chart when special torques are not given. These torques apply to fasteners with both UNC and UNF threads as received from suppliers, dry, or when lubricated with engine oil. Not applicable if special graphites, moly-disulfide greases, or other extreme pressure lubricants are used.


Grade 5 Bolts, Nuts, and Studs			
  			
Size	Pound-Feet	Newton metres	Kilogram metres
1/4 in 6.4 mm	9-11	12-15	1.2-1.5
5/16 in 7.9 mm	17-21	23-28	2.4-2.9
3/8 in 9.5 mm	35-42	48-57	4.8-5.8
7/16 in 11.1 mm	54-64	73-87	7.5-8.8
1/2 in 12.7 mm	80-96	109-130	11.1-13.3
9/16 in 14.3 mm	110-132	149-179	15.2-18.2
5/8 in 15.9 mm	150-180	203-244	20.8-24.9
3/4 in 19.0 mm	270-324	366-439	37.3-44.8
7/8 in 22.2 mm	400-480	542-651	55.3-66.4
1.0 in 25.4 mm	580-696	787-944	80.2-96.2
1-1/8 in 28.6 mm	800-880	1085-1193	111-122
1-1/4 in 31.8 mm	1120-1240	1519-1681	155-171
1-3/8 in 34.9 mm	1460-1680	1980-2278	202-232
1-1/2 in 38.1 mm	1940-2200	2631-2983	268-304


Grade 8 Bolts, Nuts, and Studs			
  			
Size	Pound-Feet	Newton metres	Kilogram metres
1/4 in 6.4 mm	12-15	16-20	1.7-2.1
5/16 in 7.9 mm	24-29	33-39	3.3-4.0
3/8 in 9.5 mm	45-54	61-73	6.2-7.5
7/16 in 11.1 mm	70-84	95-114	9.7-11.6
1/2 in 12.7 mm	110-132	149-179	15.2-18.2
9/16 in 14.3 mm	160-192	217-260	22.1-26.5
5/8 in 15.9 mm	220-264	298-358	30.4-36.5
3/4 in 19.0 mm	380-456	515-618	52.5-63.0
7/8 in 22.2 mm	600-720	814-976	83.0-99.5
1.0 in 25.4 mm	900-1080	1220-1465	124-149
1-1/8 in 28.6 mm	1280-1440	1736-1953	177-199
1-1/4 in 31.8 mm	1820-2000	2468-2712	252-277
1-3/8 in 34.9 mm	2380-2720	3227-3688	329-376
1-1/2 in 38.1 mm	3160-3560	4285-4827	437-492

TORQUE SPECIFICATIONS - METRIC HARDWARE

Use the following torques when special torques are not given.

These values apply to fasteners with coarse threads as received from supplier, plated or unplated, or when lubricated with engine oil. These values do not apply if graphite or moly-disulfide grease or oil is used.

Grade 8.8 Bolts, Nuts, and Studs 			
Size	Pound-Feet	Newton metres	Kilogram metres
M4 0.15 in	2-3	3-4	0.3-0.4
M5 0.19 in	5-6	6.5-8	0.7-0.8
M6 0.23 in	8-9	10.5-12	1.1-1.2
M8 0.31 in	19-23	26-31	2.6-3.2
M10 0.39 in	38-45	52-61	5.3-6.2
M12 0.46 in	66-79	90-107	9.1-10.9
M14 0.55 in	106-127	144-172	14.7-17.6
M16 0.62 in	160-200	217-271	22.1-27.7
M20 0.78 in	320-380	434-515	44.2-52.5
M24 0.94 in	500-600	675-815	69.1-83.0
M30 1.17 in	920-1100	1250-1500	127-152
M36 1.40 in	1600-1950	2175-2600	221-270

Grade 10.9 Bolts, Nuts, and Studs 			
Size	Pound-Feet	Newton metres	Kilogram metres
M4 0.15 in	3-4	4-5	0.4-0.5
M5 0.19 in	7-8	9.5-11	1.0-1.1
M6 0.23 in	11-13	15-17.5	1.5-1.8
M8 0.31 in	27-32	37-43	3.7-4.4
M10 0.39 in	54-64	73-87	7.5-8.8
M12 0.46 in	93-112	125-150	12.9-15.5
M14 0.55 in	149-179	200-245	20.6-24.7
M16 0.62 in	230-280	310-380	31.8-38.7
M20 0.78 in	450-540	610-730	62.2-74.7
M24 0.94 in	780-940	1050-1275	108-130
M30 1.17 in	1470-1770	2000-2400	203-245
M36 1.40 in	2580-3090	3500-4200	357-427

Grade 12.9 Bolts, Nuts, and Studs



Usually the torque values specified for grade 10.9 fasteners can be used satisfactorily on grade 12.9 fasteners.

TORQUE SPECIFICATIONS - STEEL HYDRAULIC FITTINGS

Tube OD Hose ID	Thread Size	Pound- Feet	Newton metres	Kilogram metres
37 Degree Flare Fittings				
1/4 in 6.4 mm	7/16-20	6-12	8-16	0.8-1.7
5/16 in 7.9 mm	1/2-20	8-16	11-21	1.1-2.2
3/8 in 9.5 mm	9/16-18	10-25	14-33	1.4-3.5
1/2 in 12.7 mm	3/4-16	15-42	20-56	2.1-5.8
5/8 in 15.9 mm	7/8-14	25-58	34-78	3.5-8.0
3/4 in 19.0 mm	1-1/16-12	40-80	54-108	5.5-11.1
7/8 in 22.2 mm	1-3/16-12	60-100	81-135	8.3-13.9
1.0 in 25.4 mm	1-5/16-12	75-117	102-158	10.4-16.2
1-1/4 in 31.8 mm	1-5/8-12	125-165	169-223	17.3-22.8
1-1/2 in 38.1 mm	1-7/8-12	210-250	285-338	29.0-34.6

Tube OD Hose ID	Thread Size	Pound- Feet	Newton metres	Kilogram metres
Straight Threads with O-ring				
1/4 in 6.4 mm	7/16-20	12-19	16-25	1.7-2.6
5/16 in 7.9 mm	1/2-20	16-25	22-33	2.2-3.5
3/8 in 9.5 mm	9/16-18	25-40	34-54	3.5-5.5
1/2 in 12.7 mm	3/4-16	42-67	57-90	5.8-9.3
5/8 in 15.9 mm	7/8-14	58-92	79-124	8.0-12.7
3/4 in 19.0 mm	1-1/16-12	80-128	108-174	11.1-17.8
7/8 in 22.2 mm	1-3/16-12	100-160	136-216	13.8-22.1
1.0 in 25.4 mm	1-5/16-12	117-187	159-253	16.2-25.9
1-1/4 in 31.8 mm	1-5/8-12	165-264	224-357	22.8-36.5
1-1/2 in 38.1 mm	1-7/8-12	250-400	339-542	34.6-55.3

Split Flange Mounting Bolts			
Size	Pound- Feet	Newton metres	Kilogram metres
5/16-18	15-20	20-27	2.1-2.8
3/8-16	20-25	26-33	2.8-3.5
7/16-14	35-45	47-61	4.7-6.2
1/2-13	55-65	74-88	7.6-9.0
5/8-11	140-150	190-203	19.4-20.7

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MAINTENANCE AND LUBRICATION

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Run-in Maintenance Schedule	1002-2		

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SYSTEMGARD™ TESTING SCHEDULE

Get samples of lubricants for Systemgard™ analysis at the intervals shown below. Follow the instructions with the Systemgard™ kits.

	Every 100 hours of operation	Every 500 hours of operation (at least three times yearly)
Engine	X	
Hydraulic System		X
Swing Gearbox		X
Final Drive Transmission		X

RUN-IN PERIOD

During the first 20 hours of operation for a new machine, or a machine with a rebuilt engine, make sure you do the following:


- 1. Operate the machine with normal loads for the first 8 hours.
- 2. Keep the engine at normal operating temperatures.
- 3. Do not run the engine at idle speeds for long periods of times.
- 4. See the Run-In Maintenance Schedule on this page for additional information.

RUN-IN MAINTENANCE SCHEDULE

The following items are to be done during the Run-In Period and are in addition to the items in the Maintenance Schedule on the following page.

After First 20 Hours of Operation

Do the After Delivery Check See the Operators Manual



WARNING: *When you adjust or service the machine, always follow the instructions in the operator's or service manual. If the engine must be running, always have an extra person help you. Do not leave the operator's seat while the engine is running. Failure to follow these instructions can cause injury.*

47-51-A

MAINTENANCE SCHEDULE

The items in this maintenance schedule are at maximum intervals. If you are operating the machine under severe conditions (high temperatures, mud, dust, water, etc.), shorten the intervals.

Every 10 Hours of Operation or Each Day Whichever Occurs First

Clean and replace all safety decals and instruction decals that cannot be read	Section 9221.
Check the restriction indicator for the air cleaner	See Operators Manual
Check the engine oil level	See Operators Manual
Check the fuel sediment bowl for water or sediment (Case engine)	See Operators Manual
Check the radiator coolant level	See Operators Manual
Check the hydraulic reservoir oil level	Section 8201
Check the swing gearbox oil level	Section 9210
Check the drive brakes for correct operation	See Operators Manual
Check the swing brake for correct operation	See Operators Manual
Lubricate the turntable ring gear	Section 9216
Lubricate the boom, arm, and bucket pivots	See Operators Manual
Lubricate the Wrist-O-Twist pivot points (If equipped)	See Operators Manual

Every 50 Hours of Operation

Drain water from the fuel tank	See Operators Manual
Clean the air cleaner dust valve	See Operators Manual
Clean the remote reservoir breather for the swing gearbox	See Operators Manual
Lubricate the drive sprocket pillow blocks	See Operators Manual
Lubricate the turntable pivot pins and cylinder pivot pins	See Operators Manual
Lubricate the turntable bearing	See Operators Manual
Lubricate the fan belt pulley hub (Detroit Diesel only)	See Operators Manual

Every 100 Hours of Operation

Change the engine oil and replace the engine oil filter/s See Operators Manual

Every 250 Hours of Operation

Check the drive belt tension See Operators Manual

Check the torque of the turntable bearing mounting bolts Section 9216

Check the battery fluid level Section 4005

Check the final drive oil level (each side) See Operators Manual

Lubricate the center swivel See Operators Manual

Lubricate the control lever pivots See Operators Manual

Every 500 Hours of Operation

Replace the fuel filters See Operators Manual

Clean the hydraulic reservoir breather See Operators Manual

Replace the hydraulic filters Section 8201

Clean the 140 mesh screen or change the 25 micron filter Section 8201

Every 1000 Hours of Operation

Change the oil of each final drive transmission Section 6317

Change the swing gearbox oil Section 9210

Clean the batteries and the battery area Section 4005

Every 2000 Hours of Operation or Each Year

Drain, flush, and fill the cooling system See Operators Manual

Change the hydraulic oil and clean the screens Section 8201

Check the blower screen and clean if required (Detroit Diesel engine only) See Detroit Diesel operators manual.

As Required

Check the radiator for leaks and trash. Clean as required ---

Service the air cleaner if the red band in the restriction indicator is in full view See Operators Manual

Replace the hydraulic oil filters if the warning lamp illuminates Section 8201

Check the track tension Section 5503

Fill windshield washer (if equipped) ---

FLUIDS AND LUBRICANTS CHART

ITEM	CAPACITY	SPECIFICATIONS
Fuel tank	75 gallons (284 litres)	See Operators Manual.
Cooling system	8.5 gallons (32 litres)	Mix ethylene glycol antifreeze and water according to manufacturers instructions.
Engine crankcase:		Engineward (Case HDM oil)
Case engine Without filter change	19 quarts (18 litres)	SAE 30 CC/CD 32° F and above (0° F and above)
With filter change	23 quarts (21.8 litres)	SAE 20W20 CC/CD 10° to 50° F (-12° to 10° C)
Engine crankcase Detroit Diesel Without filter change	14 quarts (13.3 litres)	SAE 30 CD/SF, SAE 40 CD/SF, or SAE 15W40 CD/SF
With filter change	16 quarts (15 litres)	See Detroit Diesel service manual for additional information.
Hydraulic system System total	55 gallons (208 litres)	Powergard TCH (Case TCH Fluid) Alternate oil: C3 Hydraulic fluid
Reservoir refill	25 gallons (95 litres)	
Swing Gearbox	17 quarts (16.1 litres)	Loadgard GL-5 (Case FDL) or SAE 85W-140 API-GL-5 Gear Lubricant
Transmission Final drives (each)	12 quarts (11.4 litres)	
Turntable Ring Gear	As required	Symquip Spray Lube for Open gears (OGLD-20) Case Part No. 331-437
Batteries	As required	Add drinking or distilled water.
Grease fittings	As required	Weargard molydisulfide grease.

Section

1010

GENERAL ENGINE SPECIFICATIONS

1080 Crawler Excavator

(504 DIESEL TURBOCHARGED ENGINE)

Written In *Clear
And
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504 DIESEL TURBOCHARGED ENGINE

General

Type	6 Cylinder, 4 Stroke Cycle, Valve-In-Head, Turbocharged
Firing Order	1-5-3-6-2-4
Bore	4-5/8 Inch (117.48 mm)
Stroke	5 Inch (127.00 mm)
Piston Displacement	504 Cubic Inch (8 259 cm ³)
Compression Ratio	15.8 to 1
No Load Governed Speed	2280 to 2320 RPM
Rated Engine Speed	2100 RPM
Engine Idle Speed	700 to 750 RPM
Valve Tappet Clearance (Exhaust)	(Cold) 0.025 Inch (0.635 mm)
(Intake)	(Cold) 0.015 Inch (0.381 mm)
Intake and Exhaust Valve Rotators	Positive Type
Thermostat Operating Range	175°F to 202°F (79°C to 94°C)

Piston and Connecting Rods

Rings Per Piston	3
Number of Compression Rings	2
Number of Oil Rings	1
Type Pins	Full Floating
Type Bearing	Replaceable, Precision Steel Back Liners

Main Bearings

Number of Bearings	7
Type Bearings	Replaceable, Precision Steel Back Liners

Engine Lubricating System

Oil Pressure	45 to 60 PSI (310 to 414 kPa)(3.10 to 4.14 bar) with Engine Warm and Operating at Rated Engine Speed
Type System	Pressure and Spray Circulation
Oil Pump	Gear Type
Oil Filter	Full Flow Turn On Type
Oil Capacity (With Filter)	23 Quarts (21.77 Litres)
(Without Filter)	19 Quarts (17.98 Litres)

Fuel System

Fuel Injection Pump	Robert Bosch
Pump Timing	27 Degrees Before Top Center
Fuel Injectors	Pencil Type, Opening Pressure (New) 3950 to 4100 PSI (27 235 to 28 270 kPa)(272 to 283 bar)
Fuel Transfer Pump	Plunger Type, Integral Part of Injection Pump
Governor	Variable Speed, Fly-Weight Centrifugal Type, Integral Part of Injection Pump
First Stage Fuel Filter	Full Flow Turn On Type
Second Stage Fuel Filter	Full Flow Turn On Type

Section

1010

GENERAL ENGINE SPECIFICATIONS 1080B EXCAVATOR

504BDT DIESEL ENGINE

General

Type	6 Cylinder, 4 Stroke Cycle, Valve-In-Head
Firing Order	1-5-3-6-2-4
Bore	4-5/8 Inches (117.48 mm)
Stroke	5 Inches (127 mm)
Piston Displacement	504 Cubic Inches (8 259 cm ³)
Compression Ratio	15.8 to 1
No Load Governed Speed	2335 to 2365 RPM
Rated Engine Speed	2100 RPM
Engine Idling Speed	725 to 775 RPM
Exhaust Valve Rotators	Positive Type
Valve Tappet Clearance (Exhaust)	(Cold) 0.025 Inch (0.635 mm)
(Intake)	(Cold) 0.015 Inch (0.381 mm)
Thermostat Operating Range	175°F to 202°F (79°C to 94°C)

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 Liners

Main Bearings

Number of Bearings	7
Type Bearings	Replaceable Precision, Steel Back, Copper-Lead Liners

Engine Lubricating System

Crankcase Capacity (Without Filter Change)	19 Quarts (18.0 Litres)
(With Filter Change)	23 Quarts (21.8 Litres)
Oil Pressure	45 to 60 PSI (310 to 414 kPa)(3.10 to 4.14 bar)
	With Engine Warm and Operating At Rated Engine Speed
Type System	Pressure And Spray Circulation
Oil Pump	Gear Type
Oil Filters	Full Flow Turn On Type

Fuel System

Fuel Injection Pump	Robert Bosch, Type PES Multiple Plunger
Pump Timing	27 Degrees Before Top Center
Fuel Injectors	17 mm Type, Opening Pressure (New)
	3950 to 4100 PSI (27 235 to 28 270 kPa)
Fuel Transfer Pump	Plunger Type, Integral Part Of Injection Pump
Governor	Variable Speed, Fly-Weight Centrifugal Type, Integral Part Of Injection Pump
1st Stage Fuel Filter	Full Flow Turn On Type
2nd Stage Fuel Filter	Full Flow Turn On Type

Section 1020

SPECIFICATION DETAILS

504BDT Engine

Written In <i>Clear And Simple English</i>
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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

RUN-IN INSTRUCTIONS

Engine Lubrication

Fill the engine crankcase with CASE HDM oil and install new engine oil filters, after an engine has been rebuilt.

NOTE: Use a *SERIES 3 DS or CD SERVICE CLASSIFICATION* oil that has the correct viscosity rating for ambient air temperature, if CASE HDM oil is not used.

Change the engine oil while the engine is hot and replace the engine oil filters, after the first 20 hours of operation.

Change the engine oil and filters at the given intervals, after the 20 hours, as found in the Operator's Manual.

Run-In Procedure For Rebuilt Engines (With A Dynamometer)

The following procedure must be followed when using a PTO dynamometer to run-in the engine. The dynamometer will make sure of the control of the engine load at each speed and will remove stress on new parts during run-in.

During the run-in, continue to check the oil pressure, coolant level and coolant temperature.

STEP	TIME	ENGINE SPEED	DYNAMOMETER SCALE LOAD*
1	**10 Minutes	1000 RPM	Not Any
2	**10 Minutes	1800 RPM	Not Any
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	Tighten the cylinder head bolts to the torque that is found in Section 2015 of the service manual.		

* According to normal dynamometer scale load at rated speed for the specific vehicle model. Decrease this scale load as shown.

** For the best run-in procedure you will constantly change the throttle between 750 to 1000 RPM, for the first 10 minutes and from 1000 to 1800 RPM, for the next 10 minutes. The purpose of this changing RPM is to change the lubrication and coolant flow.

*** 30 minutes at 3/4 load is a minimum amount of time the engine can be run. It is best that when possible, the engine (especially a turbocharged diesel) must 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.

Run-In Procedure For Rebuilt Engines (Without A Dynamometer)

STEP	TIME	ENGINE SPEED	LOAD
1	*10 Minutes	1000 RPM	Not Any
2	*10 Minutes	1800 RPM	Not Any
3	30 Minutes	2/3 Rated RPM	Light Load
4	1 Hour	Full RPM (not over 2000 RPM)	80 to 90%
5	Tighten the cylinder head bolts to the torque that is found in Section 2215 of the service manual.		

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

Run-In Procedure

Run the engine at full throttle for the first 8 hours. Keep a normal load on the engine. Prevent too much converter or hydraulic stall. DO NOT lug the engine below its Rated Engine RPM. A stall must not last more than 10 seconds.

ENGINE SPECIFICATION DETAILS

Cylinder Sleeves

	U.S. Value	Metric Value
Type	Wet, Can Be Replaced	
Material	Cast Iron	
I.D. of Sleeve	4.6250 to 4.6263"	117.475 to 117.508 mm
Maximum Service Limit	4.6283"	117.559 mm
Sleeve Out of Round (Installed in Block)	0.002"	0.0508 mm
Maximum Service Limit	0.002"	0.0508 mm
Taper (Installed in Block)	0.001"	0.0254 mm
Maximum Service Limit	0.002"	0.0508 mm
Clearance at Bottom of Piston,		
90 Degrees to Piston Pin	0.0052 to 0.0075"	0.1321 to 0.1905 mm
Maximum Service Limit	0.0100"	0.2540 mm

Piston

Type	Cam Ground	
Material	Aluminum Alloy	
OD At Bottom, 90 Degrees to Piston Pin	4.6188 to 4.6198"	117.3175 to 117.3429 mm
Minimum Service Limit	4.6178"	117.2921 mm
ID of Piston Pin Bore	1.8001 to 1.8005"	41.723 to 45.733 mm
Maximum Service Limit	1.8010"	45.745 mm
Width of 1st Ring Groove	Can Not Be Measured	
Width of 2nd Ring Groove	Can Not Be Measured	
Width of 3rd Ring Groove	0.188 to 0.189"	4.775 to 4.801 mm
Maximum Service Limit	0.1895"	4.813 mm

Piston Rings

Number One Compression (Top)	Keystone Type With Chrome Face	
End Gap in 4.625" (117.475 mm) ID Sleeve	0.015 to 0.025"	0.381 to 0.635 mm
Maximum Service Limit	0.030"	0.762 mm
Number Two Compression		
(Intermediate)	Keystone Type With Tapered Face	
End Gap in 4.625" (117.475 mm) ID Sleeve	0.015 to 0.025"	0.381 to 0.635 mm
Maximum Service Limit	0.0350"	0.762 mm
Number Three Oil Control Ring (Bottom)	Two Piece	
Width	0.1860 to 0.1865"	4.7244 to 4.7371 mm
End Gap in 4.625" (117.475 mm) ID Sleeve	0.016 to 0.026"	0.406 to 0.660 mm
Maximum Service Limit	0.031"	0.787 mm
Side Clearance	0.0015 to 0.003"	0.038 to 0.076 mm
Maximum Service Limit	0.0035"	0.089 mm

Piston Pin

U.S. Value

Metric Value

Type	Floats	
OD of Pin	1.7994 to 1.7996"	45.705 to 45.710 mm

Connecting Rod

Bushing	Replaceable	
Bushing ID , Installed (Ream to Size)	1.8004 to 1.8008"	45.730 to 45.740 mm
Maximum Service Limit	1.8018"	45.766 mm
Bearing Liners	Replaceable	
Bearing Liner Width	1.586 to 1.596"	40.284 to 40.538 mm
Bore ID Without Bearing Liners	3.1503 to 3.1513"	80.018 to 80.043 mm
Bearing Oil Clearance	0.0011 to 0.0041"	0.028 to 0.104 mm
Maximum Service Limit	0.0046"	0.117 mm
Undersize Bearings for Service	0.002, 0.010, 0.020, 0.030"	0.051, 0.254, 0.508, 0.762 mm
Side Clearance	0.007 to 0.016"	0.178 to 0.406 mm

Crankshaft

Type	Forged, Heat Treated and Balanced	
Main Bearing Liners	Replaceable	
Crankshaft End Play	0.003 to 0.015"	0.076 to 0.381 mm
Thrust Bearing, Standard Thickness	0.155 to 0.157"	3.937 to 3.988 mm
Thrust Bearing, Oversize Thickness for Service	0.161 to 0.163"	4.089 to 4.140 mm
Connecting Rod Journal, Standard OD	2.998 to 2.999"	76.149 to 76.175 mm
0.010" (0.254 mm) OD Undersize, Grind to	2.988 to 2.989"	75.895 to 75.921 mm
0.020" (0.508 mm) OD Undersize, Grind to	2.978 to 2.979"	75.641 to 75.667 mm
0.030" (0.762 mm) OD Undersize, Grind to	2.968 to 2.969"	75.387 to 75.413 mm
Connecting Rod Journal Maximum Taper	0.0005"	0.013 mm
Journals Out of Round	0.0005"	0.013 mm
Main Bearing Liner Width, 1st, 3rd, 5th and 7th	2.1515 to 2.1615"	54.648 to 54.902 mm
Main Bearing Liner Width, 2nd, 4th and 6th	1.214 to 1.224"	30.836 to 31.090 mm
Undersize Main Bearing Liners for Service	0.002, 0.010, 0.020, 0.030"	0.051, 0.254, 0.508, 0.762 mm
Main Bearing Oil Clearance	0.0016 to 0.0046"	0.041 to 0.117 mm
Maximum Service Limit	0.005"	0.127 mm
Main Bearing Journal, Standard OD	3.498 to 3.499"	88.849 to 88.875 mm
0.010" (0.254 mm) OD Undersize, Grind to	3.488 to 3.489"	88.595 to 88.621 mm
0.020" (0.508 mm) OD Undersize, Grind to	3.478 to 3.479"	88.341 to 88.367 mm
0.030" (0.762 mm) OD Undersize, Grind to	3.468 to 3.469"	88.087 to 88.113 mm
Main Bearing Journal Bore ID Without Liners	3.691 to 3.692"	93.751 to 93.777 mm
Main Journal Width		
2nd, 4th and 6th	1.618 to 1.633"	41.097 to 41.478 mm
3rd	2.555 to 2.570"	64.897 to 65.278 mm
5th	2.561 to 2.565"	65.049 to 65.151 mm
7th	2.5855 to 2.6005"	65.672 to 66.053 mm
Connecting Rod Journal Width	1.9975 to 2.0025"	50.737 to 50.864 mm

Camshaft

	U.S. Value	Metric Value
Type	Parabolic	
Bushing	Five, Replaceable	
Bushing Lubrication	Under Pressure	
ID of Bushing	2.2484 to 2.2514"	57.109 to 57.186 mm
Maximum Service Limit	2.2524"	57.211 mm
Bushing Width		
1st (Front)	1.6460 to 1.6660"	41.808 to 42.316 mm
2nd, 3rd and 4th	1.4275 to 1.4475"	36.259 to 36.767 mm
5th	1.1462 to 1.1662"	29.113 to 29.622 mm
OD of Each Bearing Surface	2.2460 to 2.2470"	57.048 to 57.074 mm
Minimum Service Limit	2.2455"	57.036 mm
Thrust Washer Thickness	0.1225 to 0.1275"	3.1115 to 3.2385 mm
Minimum Service Limit	0.1215"	3.086 mm
Thrust Plunger Spring		
Free Length	3.6250"	92.075 mm
OD of Spring	0.406"	10.312 mm
Compress to 2.750" (69.85 mm)	45 to 55 lbs.	200 to 245 N

Valve Push Rod Lifters

OD of Lifter Stem, Standard	0.8097 to 0.8102"	20.566 to 20.579 mm
OD of Lifter Stem, Oversize for Service	0.8190 to 0.8195"	20.803 to 20.815 mm
ID of Block Bore, Standard	0.8118 to 0.8130"	20.620 to 20.650 mm
Maximum Service Limit	0.8135"	20.663 mm
ID of Block Bore, Oversize for Service	0.8215 to 0.8225"	20.866 to 20.892 mm

Gear Train

Backlash		
Crankshaft Gear to Camshaft Gear	0.004 to 0.011"	0.1016 to 0.2794 mm
Crankshaft Idler Drive Gear to Idler Gear	0.003 to 0.010"	0.0762 to 0.2540 mm
Idler Gear to Fuel Pump Gear	0.004 to 0.012"	0.1016 to 0.3048 mm
Crankshaft Gear to Oil Pump Gear	0.006 to 0.011"	0.1524 to 0.2794 mm
Crankshaft Gear to Fuel Pump Gear	0.027" Max.	0.6858 mm Max.
OD of Fuel Pump Idler Gear Shaft	1.7325 to 1.7330"	44.0055 to 44.0182 mm
ID of Fuel Pump Idler Gear Bushing	1.7345 to 1.7355"	44.0563 to 44.0817 mm
Maximum Service Limit	1.7375"	44.133 mm
Idler Gear Thrust Washer Thickness	0.061 to 0.063"	1.5494 to 1.6002 mm
Idler Gear End Play	0.002 to 0.012"	0.051 to 0.305 mm

Oil Pump

	U.S. Value	Metric Value
Positive Displacement Pump	Gear Type	
Backlash		
Pump Gear To Crankshaft Gear	0.006 to 0.011"	0.1524 to 0.2794 mm
Pump Gears To Body Radial Clearance	0.009"	0.229 mm
Pump Gears To Pump Cover Clearance	0.008"	0.203 mm
Oil Pressure at High Idle, Hot Oil	48 to 55 PSI	331 to 379 kPa
Relief Valve Spring		
Number of Coils	11	11
Wire Diameter	0.080"	2.032 mm
Minimum ID	0.469"	11.913 mm
Free Length	2.00"	50.80 mm
Compress to 1.252" (31.801 mm)	23.8 to 25.6 lbs.	106 to 114 N

Cylinder Head

Warpage	0.005"	0.127 mm
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Exhaust Valve

Tappet Clearance	0.025"	0.635 mm
Face Angle	44 Degrees	44 Degrees
Face Run-Out	0.002"	0.051 mm
OD of Head	1.745 to 1.755"	44.323 to 44.577 mm
OD of Stem	0.402 to 0.403"	10.211 to 10.236 mm
Minimum Service Limit	0.4018"	10.206 mm
OD of Taper at 4.2675" (108.395 mm)	0.401 to 0.402"	10.185 to 10.211 mm
Minimum Service Limit	0.4008"	10.180 mm
Length	6.4195 to 6.4405"	163.055 to 163.589 mm
Insert Seat Angle	45 Degrees	45 Degrees
Seat Contact Width	0.0800 to 0.1000"	2.032 to 2.5400 mm
Seat Run-Out	0.002" max.	0.051 mm
Insert Height	0.313 to 0.316"	7.950 to 8.026 mm
OD of Insert	1.9455 to 1.9465"	49.4157 to 49.4411 mm
ID of Insert	1.571 to 1.577"	39.903 to 40.056 mm

Intake Valve

	U.S. Value	Metric Value
Tappet Clearance	0.015"	0.381 mm
Face Angle	44 Degrees	44 Degrees
Face Run-Out	0.002" max.	0.051 mm
OD of Stem	0.402 to 0.403"	10.211 to 10.236 mm
Minimum Service Limit	0.4018"	10.206 mm
OD of Head	1.995 to 2.005"	50.673 to 50.927 mm
Length	6.4195 to 6.4405"	163.055 to 163.589 mm
Seat Angle	45 Degrees	45 Degrees
Seat Contact Width	0.0775 to 0.0975"	1.969 to 2.477 mm
Seat Run-Out	0.002" max.	0.051 mm
Insert Height	0.2775 to 0.2825"	7.049 to 7.176 mm
OD of Insert	2.0990 to 2.1000"	53.315 to 53.340 mm
ID of Insert	1.805 to 1.815"	45.847 to 46.101 mm

Intake and Exhaust Valve Guides

Length	3.219"	81.763 mm
OD of Guide	0.7510 to 0.7515"	19.075 to 19.088 mm
ID of Guide (Installed and Reamed)	0.4045 to 0.4055"	10.274 to 10.300 mm
Maximum Service Limit	0.4065"	10.325 mm
Height Above Cylinder Head	0.953"	24.206 mm

Valve Spring

Free Length	2.18"	55.372 mm
Number of Coils	7-1/4	7-1/4
Wire Diameter	0.192"	4.877 mm
Compress Spring to 1.484" (37.694 mm), Valve Open	153 to 167 lbs.	681 to 743 N
Compress Spring to 1.937" (49.200 mm), Valve Closed	50.5 to 60.5 lbs.	225 to 269 N

Rocker Arm Assembly

OD of Shaft	0.872 to 0.873"	22.149 to 22.174 mm
ID of Arm Bore	0.8745 to 0.8755"	22.212 to 22.238 mm
Shaft Assembly Lateral Movement (Both Ends)	0.010" to 0.030"	0.254 to 0.762 mm
Shaft Spring		
Number of Working Coils	4	4
Wire Diameter	0.080"	2.032 mm
Compress Spring to 1.562" (39.675 mm)	8.5 to 11.5 lbs.	38 to 51 N
Lubrication	Engine Oil, Camshaft Metering	
Shaft Oil Holes	Toward Valve Side of Engine	
	Shaft Can Not Be Turned	

Intake Valve Timing

Valve Timing	With the Number One Intake Valve to Rocker Arm Clearance Set at 0.015" (0.381 mm) and the Dial Indicator on the Number One Valve Retainer, 0.053" (1.346 mm) Movement of the Valve From the Seat (Clockwise Pulley Rotation) Will Give 7 Degrees after TDC Timing Indication on the Crank Pulley.
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