

680B AND 680C LOADER BACKHOE

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NOTE: Powrcel Engines were on units with SN 9102281 to 9103966. "Open Chamber" engines on all units thereafter. First Series C unit was SN 9106000.		

SECTION

C

**SPECIFICATIONS FOR
CASE A267 DIESEL
ENGINE**

A267 ENGINE SPECIFICATIONS

NOTE ALL DIMENSIONS GIVEN IN INCHES

Type ----- CASE Full Diesel, 4 Cylinder 4 Stroke Cycle
Valve-in-Head Engine.

Cylinder Heads ----- Multiple Cylinder Heads can be removed indi-
vidually for Servicing (2 cylinders per head).

Firing Order ----- 1-3-4-2

Bore ----- 4-1/8 Inches

Stroke ----- 5 Inches

Piston Displacement ----- 267 Cubic Inches

Compression Ratio ----- 15 to 1

Full Load Rated Engine Speed ----- 2000 RPM

No Load Governed Engine Speed ----- 2150 RPM

Engine Idle Speed ----- 750 RPM

Oil Filter, Crankcase ----- Replaceable Full Flow Element

Method of Starting Diesel Engine ----- Engine Starts on Diesel Fuel
(Electric Starting Motor).

MAXIMUM COMPRESSION PRESSURES

(At Cranking Speed of 200 RPM -- Injectors Removed from Engine)

Altitude	Sea Level	1000 ft.	2000 ft.	3000 ft.	4000 ft.	5000 ft.
Compression Pressure	480 to 510 PSI	455 to 485 PSI	435 to 465 PSI	415 to 445 PSI	395 to 425 PSI	375 to 405 PSI

Allowable Variance Between Cylinders ----- 25 Pounds Pressure

CYLINDER SLEEVES

Type ----- Replaceable Wet Type: Two Rubber O-ring
Seals carried on each sleeve.

Inside Diameter of Sleeve Bore ----- 4.125 to 4.126 Inches. Replace
Sleeve when inside Diameter below
Top Ring Ridge Exceeds 4.133 Inches.

Piston Clearance in Sleeve (At Skirt) ----- .0045 to .0055 Inch

Cylinder Sleeve Out-of-Round ----- Max. .002 Inch

PISTON AND PISTON PINS

Piston Material ----- Aluminum

Piston Weight (Less Pin) ----- 54.4 oz. Pounds

Diameter of Piston at Top of Skirt
(Below Oil Ring) ----- 4.1144 to 4.1154 Inches

Diameter of Piston at Bottom of Skirt ----- 4.1195 to 4.1205 Inches

Piston Pins ----- Full Floating Type: Held in Position
with Snap Rings in Piston. Replaceable Bronze
Bushing in Connecting Rod.

Piston Pin Length ----- 3.485 to 3.490 Inches

Piston Pin Diameter ----- 1.4994 to 1.4995 Inches

Piston Pin Fit in Piston ----- .0003 to .0008 Inch

Piston Pin bore in piston ----- 1.4997 to 1.4999 Inches

Piston Pin Fit in Connecting Rod Bushing ----- .0004 to .0011 Inch

PISTON RINGS

Rings Per Piston ----- 4-(3 Compression and 1 oil).

Compression Rings

Width of Ring (All 3) ----- .0930 to .0935 Inch

Ring End Gap (All 3)when Compressed in
4.125 Inch Cylinder ----- .013 to .023 Inch

Side Clearance in Groove of 1st (Top) Ring ----- .0035 to .0050 Inch

Side Clearance in Groove of 2nd and 3rd Ring -- .0025 to .0040 Inch

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Oil Ring----- To install Replacement Ring, Follow
Instructions Packed with Rings.
Width of Rings ----- .2485 to .2490 Inch
Side Clearance in Groove ----- .0025 to .0040 Inch
Ring End Gap ----- .013 to .028 Inch

CONNECTING RODS

Connecting Rod Bushing----- Replaceable Bronze Bushing
Replacement Bushing Must Be Reamed.
Piston Pin Hole Diameter in Rod(Without Bushing)--1.686-1.688 Inches
Inside Diameter of Piston
Pin Bushing in Rod ----- 1.5004 - 1.5008 Inches: Install New Bushing
if inside Diameter Exceeds 1.504 Inches.
Connecting Rod Bearing ----- Replaceable, Precision, Steel Backed
Copper Lead Alloy Liners.
Connecting Rod Capscrews ----- Self Locking Type, No Lock Wires
Required - May Be used More Than Once.
Connecting Rod Length (Center to Center
Between Pin Hole and Bearing Journal Hole) --- 10.499 to 10.501 Inches
Bearing Liner Width ----- 1.625 Inches
Diameter of Crankshaft Journal Hole
in Rod (Without Liner) ----- 2.9005 to 2.9010 Inches
Inside Diameter of Bearing Liner (Standard
Liner in Place in Rod and Capscrews Tight) -- 2.7503 to 2.7518 Inches
Diameter of Crankshaft Rod Journal ----- 2.748 to 2.749 Inches
Clearance Between Rod Bearing and
Crankshaft Journal----- .0013 to .0038 Inch; Install
New Bearing Liners When Clearance Exceeds
.006 Inch
Undersize Bearing Liners Available
for Service ----- .002,.010,.020,.030 Inch
Allowable Connecting Rod Bearing End Play ----- .005 to .012 Inch

CRANKSHAFT AND MAIN BEARINGS

Crankshaft ----- Balanced; Drilled to Provide Pressure
Lubrication to Main and Connecting Rod Bearings.
Type Main Bearings ----- Replaceable, Precision Steel
Backed Copper - Lead Alloy Liners.
Bearing Capscrews ----- Self Locking Type, No Lock
Wires Required May Be Used More Than Once.
Bearing Taking End Thrust ----- Center (Two Replaceable Bronze
Thrust Bearings.)
Crankshaft End Play (Measured
at Center Main Bearing)----- .004 to .012 Inch; Install New
Thrust Bearings If End Play Exceeds .020 Inch.
Thrust Bearing Thickness Std. ----- .155 to .157
Oversize Thrust Bearings
Available for Service
Thrust Bearing Thickness Oversize----- .161 to .163
Connecting Rod Bearing Journal Diameter ----- 2.748 to 2.749 Inches
Main Bearing Journal Diameter ----- 2.998 to 2.999 Inches
Crankshaft Main and Connecting
Rod Journal Bearings out of Round ----- Maximum .001 Inch
Maximum Allowable Taper on
Crankshaft Rod Journal ----- .002 Inch
Inside Diameter of Main Bearing Liners
(In Place and Capscrews Tight)----- 3.0006 to 3.0026 Inches
Clearance Between Main
Bearing Liner and Journal ----- .0016 to .0046 Inch; Install
New Bearing Liner When Clearance Exceeds
.0065 Inches.

Width of 1st, 3rd, 5th

Main Bearing Liners ----- 2.2135 to 2.2235 Inches

Width of 2nd, 4th

Bearing Liners ----- 1.51 to 1.61 Inches

Width Between Crankshaft Main Bearing Cheeks

2nd and 4th ----- 1.5575 to 1.5675 Inches

3rd (Center) ----- 2.624 to 2.626 Inches

5th ----- 2.620 to 2.630 Inches

Width Between Crankshaft Rod

Bearing Journal Cheeks ----- 1.9975 to 2.0025 Inches

Undersize Main Bearing Liners

Available for Service ----- .002,.010,.020,.030 Inch

Crankshaft Main Bearing Journals Should

Be Ground to ----- 2.988-2.989 Inches for .010 Inch Undersize Bearing

2.978-2.979 Inches for .020 Inch Undersize Bearing

2.968-2.969 Inches for .030 Inch Undersize Bearing

Undersize Connecting Rod Bearing

Shells Available for Service ----- .002,.010,.020,.030 Inch

Connecting Rod Crankshaft Journals Should

Be Ground to ----- 2.738-2.739 Inches for .010 Inch Undersize Bearing

2.728-2.729 Inches for .020 Inch Undersize Bearing

2.718-2.719 Inches for .030 Inch Undersize Bearing

CAMSHAFT AND BUSHINGS

Number of Bearing Surfaces on Camshaft ----- 4

Type Bushing ----- Replaceable, Precision, Steel Backed Babbitt

Bushings Lubrication ----- Pressure Lubricated from Oil Pump; Cam-

shaft Drilled to Provide Pressure Lubrication to

Valve Rocker Arm Assembly, and to Timing Gear

Train.

Diameter of Camshaft at Each Bearing Surface -- 2.246 to 2.247 Inches

Inside Diameter of Each Bushing

(Measured when in Place in Block) ----- 2.2484 to 2.2514 Inches

No. 1 (Front) Bushing Length ----- 1.646 to 1.666 Inches

No. 2 and 3 Bushing Lengths ----- 1.4275 to 1.4475 Inches

No. 4 Bushing Length ----- 1.146 to 1.166 Inches

Camshaft End Play ----- Automatically Taken Up by Spring

Loaded Thrust Button in Front end of

Camshaft. Washer Provided Between Drive

Gear and Front Bearing.

Camshaft Thrust Washer Thickness ----- .1225 to .1275

Maximum Backlash at tightest

Point (All timing gears) ----- .002 to .005

Maximum Backlash at

Loosest Point (All timing gears) ----- .006

VALVE PUSH ROD LIFTERS

Type ----- Mushroom

Outside Diameter of End that Projects into Block-- .8097 to .8102 Inches

Diameter of Bore in Block for Lifter ----- .8115 to .8130 Inch

Oversize Lifter Available for Service ----- .010 In. Oversize Lifter

Bore in Block Must Be Reamed to ---- .8215 to .8225 Inch for .010 Inch

Oversize Lifter.

VALVE TAPPET CLEARANCE

Intake and Exhaust ----- .025 Inch, Engine Cold

Intake and Exhaust ----- .025 Inch, Engine Hot

Hot Settings Are Made At Low Idle After The Engine Has Operated At

Thermostat Control Temperature For At Least Fifteen Minutes

EXHAUST VALVES

Angle of Valve Face ----- 44 Degrees
 Valve Length ----- 6.116 Inches
 Maximum Valve Face Runout ----- .002 Inch as Determined
 with a Dial Indicator.

Diameter of Valve Stem ----- .401 to .402 Inch Install New Valve if there
 is More than .002 Inch Difference in Diameter at any Point on Stem.

Diameter of Valve Head ----- 1.479 to 1.489 Inches
 Valve Stem Clearance in Guide ----- .0035 to .0055 Inch

INTAKE VALVES

Angle of Valve Face ----- 44 Degrees
 Valve Length ----- 7.243 Inches
 Maximum Valve Face Runout ----- .002 Inch as Determined
 with a Dial Indicator.

Diameter of Valve Stem ----- .402 to .403 Inch Install New Valve
 if there is More than .002 Inch Difference in
 Diameter at any Point on Stem.

Diameter of Valve Head ----- 1.731 Inches
 Stem Clearance in Guide ----- .0015 to .0035 Inch

EXHAUST VALVE SEAT INSERT

Seat Angle ----- 45 Degrees
 Seat Contact Width ----- .073 to .084 Inch
 Outside Diameter of Insert ----- 1.640 to 1.641 Inches
 Inside Diameter of Insert ----- 1.323 to 1.333 Inches
 Maximum Allowable Seat Runout ----- .002 Inch as Determined
 with a Dial Indicator.

INTAKE VALVE SEAT

Seat Angle ----- 45 Degrees
 Seat Contact Width ----- .086 to .096 Inch
 Maximum Allowable Seat Runout ----- .002 Inch as Determined
 with a Dial Indicator.

EXHAUST VALVE GUIDES

Length ----- 3.218 Inches
 Outside Diameter ----- .7510 to .7515 Inch
 Inside Diameter ----- .4045 to .4055 Inch (After Assembly)
 Valve Stem Clearance in Guide ----- .0035 to .0055 Inch
 Distance Above Head Guide Must Protrude ----- 1.062 Inches, Press Fit

INTAKE VALVE GUIDES

Length ----- 4.375 Inches
 Outside Diameter ----- .7510 to .7515 Inch
 Inside Diameter ----- .4045 to .4055 Inch (After Assembly)
 Valve Stem Clearance in Guide ----- .0015 to .0035 Inch
 Distance Above Head
 Guide Must Protrude ----- 1.062 Inches, Press Fit

VALVE SPRINGS

Free Length ----- Approximately 2.438 Inches
 Spring Pressure at Compressed Height of
 1.484 Inches (Valve Open) ----- 97 to 107 Pounds; Install New Spring if
 Pressure is Less than 92 Pounds.
 Spring Pressure at Compressed Height of
 1.937 Inches (Valve Closed) ----- 43.5 to 46.5 Pounds; Install New Spring if
 Pressure is Less than 41 Pounds.

ROCKER ARM ASSEMBLY

Lubrication ----- Pressure Lubricated; Crankcase Oil to
 Rocker Arms Metered by Camshaft.

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Oil Holes in Rocker Arm Shaft ----- Oil Holes must Face Push Rod
Side of Engine Only. Shaft Cannot Be Rotated.

Positioning of Exhaust

Valve Rocker Arms ----- Spacer Washers Position Exhaust Valve
Rocker Arm and Eliminate End Play without Binding.

Outside Diameter of

Rocker Arm Shaft ----- .872 to .873 Inch
Inside Diameter of Rocker

Arm ----- .8745 to .8760 Inch
Rocker Arm Shaft Spring

Spring Pressure at Compressed Height of

1.562 Inches ----- 8.5 to 11.5 Pounds; Install
New Spring If Pressure is Less than 8.5 Pounds

OIL PUMP

Type --- Positive Displacement, Gear Type Pump Driven off balancer.
Pressure Relief Valve ----- Maintains 40 to 45 Pounds Full Pressure
(Oil Warm, Engine Operating at Full Governed Speed)
Relief Valve is Adjustable.

WATER PUMP AND THERMOSTAT

Type of System ----- Pressurized Thermostat - Continuous
By-Pass Type; Forced Circulation (Pump).

Type Pump ----- Impeller Vane Type
Radiator ----- Heavy Duty Fin and Tube Type
Temperature Control ----- By Pass Type Thermostat
temp. range 185° to 200° F

FUEL SYSTEM

Injection Pump ----- Robert Bosch, Type PES Multiple Plunger Pump
Direction of Pump Rotation ----- Counter-Clockwise
Pump Mounting ----- Right Hand Side of Engine
Pump Drive ----- Gear Driven from Camshaft Gear at Camshaft Speed
Injection Pump Drive Lubrication ----- Pressure Lubricated From
Front Camshaft Bearing.

Injection Pump Drive Shaft Diameter ----- 1.3700 to 1.3705 Inches
Drive Shaft to Bushing Clearance ----- .001 to .002 Inch
Number of Drive

Shaft Bushings ----- (2) These Bushings are Not Replaceable.
A Replacement Drive Housing with Bushings
in Place Aligned and Fine Bored is Provided.

Injection Pump Drive

Shaft End Play ----- Automatically Taken Up By a Spring
Loaded Thrust Button on Front End Of Drive Shaft.
Thrust Washers Provided Between Front Drive Gear
and Drive Shaft Housing.

Thrust Washer

Outside Diameter ----- 2.085 to 2.105 Inches

Inside Diameter ----- 1.3725 to 1.3825 Inches

Thickness ----- .1225 to .1275 Inch

Timing Marks on Engine ----- Timing Marks Located on Crankshaft
Pulley Flange. Pointer Located on
Timing Gear Cover.

Fuel Injectors ----- Robert Bosch Pintle Type: Opening
Governor ----- Mechanical Variable Speed Fly-Weight
Centrifugal Type; Integral Part of Injection Pump,

Fuel Filters

1st Stage Fuel Filter ----- Full Flow Spin on Type

2nd Stage Fuel Filter ----- Full Flow Spin on Type







SPECIAL TORQUES

	Torque in Ft. Lbs.
Camshaft Nut -----	95 to 105
Connecting Rod Bolts -----	95 to 105
Crankshaft Pulley Bolt -----	100 to 110
(Valve Cover) Stud Nuts -----	5 to 6
Cylinder Head Bolts (Grade 8) -----	145 to 155
Flywheel to Crankshaft Bolts 5/8 inch -----	180 to 190
9/16 inch -----	100 to 110
Fuel Injector Clamp Stud Nut -----	18 to 22
Injector Cap Nut -----	50 to 55
Manifold Clamp Stud Nuts -----	25 to 30
Oil Pan Bolts -----	15 to 20
Powrcel Clamp Screws -----	100 to 110
Water Pump Fan Shaft Nut -----	60 to 70
Oil Pump Suction Tube Nut -----	95 to 105

GENERAL TORQUE SPECIFICATION TABLE (Revised 6-67)

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.	5		8 *			
Bolt head identification marks as per grade Note: Manufacturing Marks Will Vary						
	Torque Foot Pounds			Torque Foot Pounds		
Bolt Size	Min.	Max.	Min.	Max.		
1/4"	9	11	12	15		
5/16	17	20.5	24	29		
3/8	35	42	45	54		
7/16	54	64	70	84		
1/2	80	96	110	132		
9/16	110	132	160	192		
5/8	150	180	220	264		
3/4	270	324	380	456		
7/8	400	480	600	720		
1"	580	696	900	1080		
1-1/8	800	880	1280	1440		
1-1/4	1120	1240	1820	2000		
1-3/8	1460	1680	2380	2720		
1-1/2	1940	2200	3160	3560		
* Thick nuts must be used with Grade 8 bolts						

TIMING CHART

ENGINE	FULL LOAD GOVERNED ENGINE SPEED	NUMBER OF DEGREES
A267D	2000	33°

VALVE TIMING

With valve clearance set correctly, dial indicator mounted above the No. 1 intake valve stem and the reading taken with valve .040" off its seat.

A267D Inlet Opening (No. 1 Cyl.)----- 3° BTDC

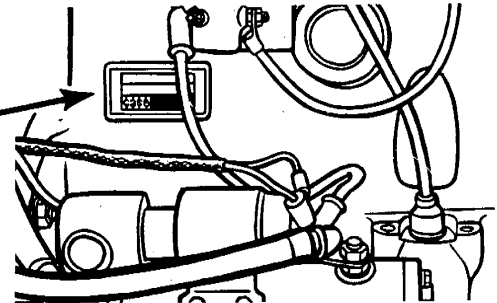
NOTE "Inlet Opening" is the only position on these engines that can be checked by the crankshaft pulley marks. If this position is correct, it can be assumed that the timing gears are correctly marked and properly assembled.

NOTE The CASE CORPORATION 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.

Section 11

GENERAL ENGINE SPECIFICATIONS W7E Loaders

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



DIESEL ENGINES

General

Type	4 Cylinder, 4 Stroke Cycle, Valve-in-Head
Firing Order	1-3-4-2
Bore	4-3/8 Inches
Stroke	5 Inches
Piston Displacement	301 Cubic Inches
Compression Ratio	16.5 to 1
No Load Governed	Speed 2100 to 2150 RPM
Rated Engine Speed	2000 RPM
Engine Idling Speed	725 to 775 RPM
*Valve Tappet Clearance (Exhaust	(Hot) .020 Inch
(Intake)	(Cold) .025 Inch
	(Hot and Cold) .015 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 Alloy Liners

Main Bearings

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

Engine Lubricating System

Oil Pressure	45 to 55 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

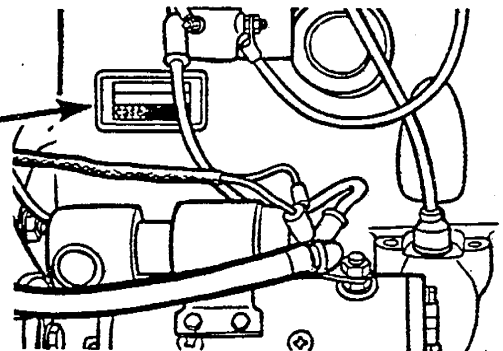
Fuel System

Fuel Injection Pump	Robert Bosch, Type PES, Multiple Plunger
Pump Timing	30 Degrees Before Top Dead Center (Port Closing)
Fuel Injectors	Pencil Type (Opening Pressure 2800 PSI)
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 Spin on Type
2nd Stage Fuel Filter	Full Flow Spin on Type

Section 11

GENERAL ENGINE SPECIFICATIONS 680 CK Series C Loaders

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



DIESEL ENGINES

General

Type	4 Cylinder, 4 Stroke Cycle, Valve-in-Head
Firing Order	1-3-4-2
Bore	4-3/8 Inches
Stroke	5 Inches
Piston Displacement	301 Cubic Inches
Compression Ratio	16.5 to 1
No Load Governed Speed	2360 RPM
Rated Engine Speed	2200 RPM
Engine Idling Speed	725 to 775 RPM
*Valve Tappet Clearance (Exhaust)	(Hot) .020 Inch (Cold) .025 Inch
(Intake)	(Hot and Cold) .015 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 Alloy Liners

Main Bearings

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

Engine Lubricating System

Oil Pressure	45 to 55 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	Robert Bosch, Type PES Multiple Plunger
Pump Timing	31 Degrees Before Top Dead Center (Port Closing)
Fuel Injectors	Pencil Type (Opening Pressure 2800 PSI)
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 Spin on Type
2nd Stage Fuel Filter	Full Flow Spin on Type

SECTION

CC

**LUBRICATION,
MAINTENANCE, AND
TORQUE CHARTS**

RUN-IN PERIOD

Items listed in this section are supplementary to the normal maintenance and lubrication during the run-in period only.

Component	Type of Service	Capacity or Measurement	Type of Lubricant
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Check Every 2 Hours Until Torque Remains Stable

Wheel Bolt Torque	Front 170 ft. lbs. Rear 250 ft. lbs.	_____ _____ _____	_____ _____ _____
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After First 20 Hours Of Operation

Engine Oil	Drain and Refill	9 Quarts With Filter Change	See Page 3
Engine Oil Filter	Replace Element	_____	A21475 Element
Hydraulic Suction Screen	Clean	_____	_____
Hydraulic Return Line Filter	Replace Element	_____	D35995 Element

MAINTENANCE AND LUBRICATION

Every 10 Hours Or Daily

1. Front Axle Pivot and King Pins	Grease	5 Fittings	Lithium "Soap Base" Grease
2. Steering Cylinders	Grease	2 Fittings	Lithium "Soap Base" Grease
3. Air Cleaner	Clean Dust Cup	_____	_____
4. Engine Oil	Check Level	_____	See Page 3
5. Power Shuttle Transmission Oil	Check Level	_____	Case Hi-Lo TCH Oil
6. 4 Speed Transmission and Final Drive Oil	Check Level	_____	See Page 3
7. Hydraulic Reservoir Oil	Check Level	_____	Case Hi-Lo TCH Oil
8. Air Intake Weather Cap	Clean	_____	_____
9. Fuel Water Trap.	Drain Water	_____	_____
10. Radiator	Check Level	_____	_____
11. Loader Pivot Points	Grease	18 Fittings	Lithium "Soap Base" Grease
12. Loader Pivot Points - With Drott Bucket	Grease	22 Fittings	Lithium "Soap Base" Grease
13. Backhoe Pivot Points	Grease	19 Fittings	Lithium "Soap Base" Grease

Every 60 Hours Or Weekly

14. Power Shuttle Transmission Shift Lever	Oil	Few Drops	Engine Oil (SAE 30)
15. Brake Pedals	Grease	2 Fittings	Lithium "Soap Base" Grease
16. Brake Bellcrank (Right Side)	Grease	1 Fitting	Lithium "Soap Base" Grease
17. Brake Cross Shaft	Grease	2 Fittings	Lithium "Soap Base" Grease
18.			
19. Throttle Linkage Shaft Pivot	Grease	1 Fitting	Lithium "Soap Base" Grease
20. Power Steering Reservoir Oil	Check Level	_____	_____
21. Batteries	Check Liquid Level	_____	_____
22. Fan Belts	Check Tension	_____	_____
23. Steering Pump Drive Belt	Check Tension	_____	_____

Every 120 Hours Of Operation

24. Starting Motor	Oil	Few Drops	Engine Oil (SAE 30)
25. Engine Oil	Drain and Refill	8 Quarts without Filter Change	See Page 3
26. Water Pump	Grease	1 Fitting	Lithium "Soap Base" Grease

Component	Type of Service	Capacity or Measurement	Type of Lubricant
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Every 240 Hours Of Operation

27. Engine Oil Filter	Replace Element	Add one Quart Oil	A21475 Element
28. Transmission and Final Drive Breather	Clean	_____	_____

Every 500 Hours Of Operation

29. Power Shuttle Transmission Torque Converter	Drain and Refill	11 Quarts	Case Hi-Lo TCH Oil
30. Front Wheel Bearings	Repack with Grease	_____	Wheel Bearing Grease
31. Hydraulic Suction Screen	Clean	_____	_____
32. Hydraulic Return Line Filter	Replace Element	_____	D35995 Element
33. Hydraulic System Oil	Drain and Refill	9 Gallons	Case Hi-Lo TCH Oil
34. Cooling System	Drain, Flush and Refill	18 Quarts	_____

Every 1000 Hours Of Operation

35. Transmission and Final Drive Oil	Drain and Refill	28 Quarts	_____
36. Power Steering Reservoir Filter	Change Element	_____	A18061 Element

LUBRICANTS AND CAPACITIES

ALL CAPACITIES GIVEN IN U.S. MEASURE

LUBRICATION POINTS	APPROXIMATE CAPACITIES	AIR TEMPERATURE RANGES			
		Above 80° F.	80° F. to 32° F.	32° F. to -20° F.	-20° F. or Lower
Engine Crankcase	8 Quarts	SAE 30 Engine Oil Service DS Series 3	SAE 20W Engine Oil Service DS Series 3	SAE 10W Engine Oil Service DS Series 3	SAE 5W-20 Engine Oil Service DS Series 3
Engine Crankcase (Including Oil Filter)	9 Quarts				
Forward-Reverse Transmission Shift Lever Bearing	Few Drops				
Four-speed Transmission and Final Drive	28 Quarts (Refill)	Multi-Purpose Gear Lubricant API-GL-4, SAE 90			
Forward-Reverse Transmission and Torque Converter	11 Quarts (Refill)	Case Hi-Lo TCH Oil			
Hydraulic System Reservoir	36 Quarts (Refill)				
Hydraulic Power Steering Reservoir	1 Quart				
Water Pump	2 Strokes	*Lithium Soap-Base Grease Below 32° F. No. 1 32° F. to 90° F. No. 2 Above 90° F. No. 3			
Wheel Bearings	Use As Required (No. 2 Grade)				
All Pressure Fittings	As Many Strokes As Required				

STANDARD TORQUES

Torque values listed are to be used under normal conditions.

quire tightening to a special torque for proper installation. These torques are shown in the servicing instructions and illustrations for each component.

Many capscrews, bolts, nuts etc. re-

Grade 5 Capscrews, Nuts, Studs

S.A.E. Grade 5 Bolts (A.S.T.M. A325 and A.S.T.M. A449) are made from quenched and tempered medium carbon steel - Grade 5 bolts are identified by three (3) equally spaced radial lines embossed on the head of the bolt.



Coarse Thread (N.C.)

Fine Thread (N.F.)

	Torque (ft. lbs.)		Torque (ft. lbs.)
1/4" - 20 N.C.	5-10	9/16" - 12 N.C.	100-120
1/4" - 28 N.F.	10-15	9/16" - 18 N.F.	110-130
5/16" - 18 N.C.	15-20	5/8" - 11 N.C.	135-165
5/16" - 24 N.F.	15-20	5/8" - 18 N.F.	160-200
3/8" - 16 N.C.	25-35	3/4" - 10 N.C.	235-285
3/8" - 24 N.F.	30-40	3/4" - 16 N.F.	270-330
7/16" - 14 N.C.	45-55	7/8" - 9 N.C.	360-440
7/16" - 20 N.F.	50-60	7/8" - 14 N.F.	395-490
1/2" - 13 N.C.	65-85	1" - 8 N.C.	520-640
1/2" - 20 N.F.	80-100	1" - 12 N.F.	575-705

Grade 8 Capscrews, Nuts, Studs

S.A.E. Grade 8 Bolts (A.S.T.M. A354, Grade BD), are made from quenched and tempered medium carbon alloy steel. Grade 8 Bolts are identified by six (6) equally spaced radial lines embossed on the head of the bolt.



Coarse Thread (N.C.)

Fine Thread (N.F.)

	Torque (ft. lbs.)		Torque (ft. lbs.)
1/4" - 20 N.C.	10-15	9/16" - 12 N.C.	135-165
1/4" - 28 N.F.	15-20	9/16" - 18 N.F.	155-190
5/16" - 18 N.C.	20-30	5/8" - 11 N.C.	200-240
5/16" - 24 N.F.	25-30	5/8" - 18 N.F.	215-265
3/8" - 16 N.C.	40-50	3/4" - 10 N.C.	340-420
3/8" - 24 N.F.	45-55	3/4" - 16 N.F.	380-460
7/16" - 14 N.C.	60-80	7/8" - 9 N.C.	540-660
7/16" - 20 N.F.	70-90	7/8" - 14 N.F.	595-725
1/2" - 13 N.C.	100-120	1" - 8 N.C.	810-990
1/2" - 20 N.F.	110-130	1" - 12 N.F.	900-1100

TORQUES FOR HYDRAULIC FITTINGS

The following are torque specifications for installation of 37° flare female swivel fittings, straight thread "O"ring boss fittings,

and the locking nut on adjustable style "O"ring fittings. These torque values apply to steel fittings only.

Dash Size	Tube O.D. (Ref.)	Thread Size	37° Flare Female Swivel Ft. Lbs. Torque	Straight Thd. "O"Ring Ft. Lbs. Torque
4	1/4	7/16-20	6-12	12-19
5	5/16	1/2-20	8-16	16-25
6	3/8	9/16-18	10-25	25-40
8	1/2	3/4-16	15-42	42-67
10	5/8	7/8-14	25-58	58-92
12	3/4	1-1/16-12	40-80	80-128
14	7/8	1-3/16-12	60-100	100-160
16	1	1-5/16-12	75-117	117-187

SECTION
13
MAINTENANCE
AND
LUBRICATION

MAINTENANCE CHART

INTERVAL	TYPE OF SERVICE	FLUIDS AND LUBRICANTS
Run-in Every 2 hours	Check wheel bolt torque until stabilized. Front 170 ft. lbs. Rear 220-240 ft. lbs.	
Run-in After first 20 hours	Change engine oil. Replace engine oil filter. Check drive belts for pro- per tension.	See chart, page 4.
Every 10 hours or daily	Grease loader pivot points. Grease backhoe pivot points. Check engine oil level. Check radiator coolant level. Empty air cleaner dust cup.	See chart, page 4. See chart, page 4.
Every 60 hours or weekly	Grease front axle pivot and king pins. Grease steering cylinders. Grease anti-rollback link Grease parking brake pivots Check battery electrolyte level. Clean Hydrovac breather Check hydraulic oil level.	See chart, page 4. See chart, page 4. See chart, page 4. See chart, page 4. Distilled water
Every 150 hours	Grease drive line. Change engine oil.	See chart, page 4. See chart, page 4.
Every 300 hours	Grease brake pedal pivots. Grease backhoe control levers. Check tire pressures. Lubricate power shuttle control lever. Replace engine oil filter.	See chart, page 4. See chart, page 4. Few drops engine oil

INTERVAL	TYPE OF SERVICE	FLUIDS AND LUBRICANTS
Every 300 hours (Con'td)	<p>Check brake master cylinder fluid level (two).</p> <p>Check power shuttle/torque converter oil level.</p> <p>Check mechanical transmission oil level.</p> <p>Drain water from fuel tank water trap, 1st stage filter and sediment bowl.</p> <p>Check rear axle oil level.</p> <p>Check drive belts for proper tension.</p>	SAE J1703 fluid
Every 500 hours	<p>Grease drive line spline.</p> <p>Replace hydraulic oil filter.</p> <p>Replace 1st and 2nd stage fuel filters.</p> <p>Clean or replace electric fuel pump filter.</p> <p>Repack front wheel bearings with grease.</p> <p>Clean Hydrovac filter.</p>	<p>See chart, page 4.</p> <p>See chart, page 4.</p>
Every 1000 hours	<p>Lubricate Hydrovac cylinders.</p> <p>Change power shuttle/torque converter oil.</p> <p>Change mechanical transmission oil.</p> <p>Change hydraulic oil.</p> <p>Clean hydraulic suction screen.</p> <p>Change Hydrovac filter.</p> <p>Change Hydrovac breather.</p> <p>Change rear axle oil.</p> <p>Lubricate starter motor.</p>	<p>See chart, page 4.</p> <p>Case TCH fluid</p> <p>See chart, page 4.</p> <p>Case TCH fluid</p> <p>See chart, page 4.</p> <p>Few drops engine oil</p>
As required	Service air cleaner element when indicator red band is showing	