TABLE OF CONTENTS

Reprinted

Printed in U.S.A.
Issued February 1988

1001

SAFETY RULES
SERVICE MANUAL INTRODUCTION
AND
TORQUE SPECIFICATIONS

TABLE OF CONTENTS

Written In *Clear And Simple English*

CASE CORPORATION

8-41150

Printed in U.S.A.
Issued July 1985

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

IMPORTANT: *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

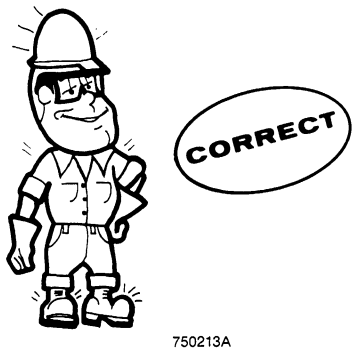
WARNING: *Read operator's manual to familiarize yourself with control lever functions.* 46-27

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

750143

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



750213A

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

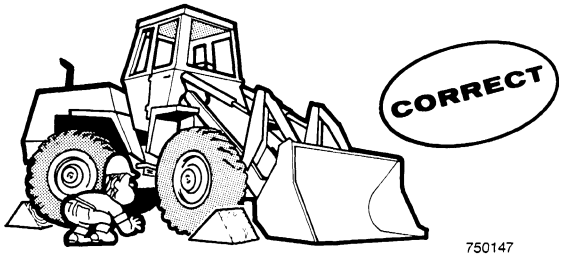
WARNING: ***If the bucket must be raised during servicing or repairs, use an acceptable stand to hold the loader frame in place.*** *48-94*

742679

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: *Locate the machine on level ground and block the wheels securely before working under the machine. Failure to follow the above procedure can result in personal injury.* *46-77*



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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*

WARNING: *Use insulated gloves or mittens when working with hot parts.* *47-41A*

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*

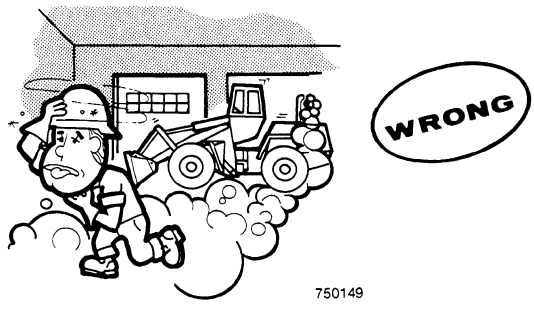
CAUTION: ***When using a hammer to remove and install pivot pins or separate parts, using compressed air or using a grinder, wear eye protection that completely encloses the eyes (approved goggles or other approved eye protectors).*** *46-13*

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*



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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.

Text

If the service manual is for more than one machine or different models of components (planetary axles, gear boxes, control valves, etc.) the procedures have the steps necessary to service each model.

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, have a Table of Contents on the cover or second page of that section.

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.

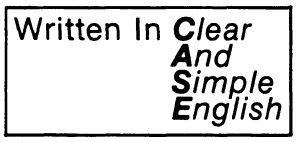
Illustrations

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 and understand 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.



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

PRODUCT IDENTIFICATION NUMBER (PIN) AND SERIAL NUMBERS

NOTE: *A serial number plate is also on many components such as the starter, alternator, pumps, etc.*

PRODUCT IDENTIFICATION NUMBER (PIN)
(Above left brake pedal)

MODEL NUMBER

ROPS SERIAL NUMBER
(Cab - Inside door on frame.
Canopy - Left rear of seat

BUCKET PART NUMBER

FRONT AXLE SERIAL NUMBER
(Plate on differential)

REAR AXLE SERIAL NUMBER
(Plate on differential)

TRANSMISSION SERIAL NUMBER
(Right side of machine)

ENGINE SERIAL NUMBER
(Above starter motor)

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 - 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	34-45	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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1002

MAINTENANCE AND LUBRICATION

TABLE OF CONTENTS

CASE CORPORATION 8-70340 Printed in U.S.A.
Issued February 1988

FLUIDS AND LUBRICANTS CHART

COMPONENT	CAPACITY	SPECIFICATIONS
Fuel tank	80 gallons (302.8 litres)	See Operators Manual
Cooling system	14.8 gallons (56 litres)	A mixture of half ethylene gylcol and water must be used at all times. If the coldest outside temperature will be less than -34° F (-36° C) add antifreeze.
Crankcase: Without filter change With filter change	 24 quarts (22.7 litres) 28 quarts (26.5 litres)	Case IH No. 1 Engine Oil Above 32° F (0° C) .....SAE 30 SF/CD Above 15° F (9.5° C) .....SAE 15W40 SF/CD Below 32° F (0° C) .....SAE 10W SF/CD
Hydraulic System System Reservoir	 48 gallons (181.7 litres) 28 gallons (106.4 litres)	Powergard TCH (Case TCH) Alternate hydraulic oil: Type C3 Fluid Above 32° F (0° C) ..... SAE 20 SC Below 32° F (0° C) ..... SAE 10W SC
Axles Center bowl Wheel end, each	 13 quarts (12.3 litres) 4 quarts (3.8 litres)	Case IH 135H EP Gear Lubricant Alternate gear lubricant SAE 85W - 140 API-GL-5
Transmission (Allison or Twin Disc) Before P.I.N. 9165563 System Transmission	 *See note below 8 gallons (30 litres) 6.5 gallons (25 litres)	Case TCH Fluid Alternate oil: Type C-3 transmission oil
Transmission (ZF) P.I.N. 9165563 and after except 9165564 System Transmission	 7 gallons (26.5 litres) 5.5 gallons (20.8 litres)	API CC, CD or SC, SD, SE, SF Engine oil Above 14° F (-10° C) .....SAE 20W20 -4 to 14° F (-20 to -10° C) .....SAE 10W Below -4° F (-20° C) .....ATF
Alcohol evaporator	1 pint (0.5 litre)	Clean methyl alcohol
Batteries	As required	Add drinking or distilled water.
Master cylinders	As required	DOT-3 Brake Fluid
Grease fittings	As required	Molydisulfide multipurpose grease.

*__NOTE:__ *Machines with P.I.N. 9163365, 9163366, 9163367, and 9163368 also have a ZF transmission.*

MAINTENANCE SCHEDULE

This schedule shows the maximum service intervals for the correct maintenance of the machine. Shorten the intervals when the operating conditions are severe.

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	X
Hydraulic System		X
Transmission		X
Differential		X
Final drive/planetary		X
Power shuttle		X

Run-In Period

After the first 100 hours of operation on a new machine or a machine with a new or repaired transmission, replace the transmission oil filter and change the transmission oil ..... Section 6101

EVERY 10 HOURS OF OPERATION OR EACH DAY, WHICHEVER OCCURS FIRST

Check level of engine oil ..... See Operators Manual

Check level of hydraulic oil ..... Section 8002

Check level of coolant in radiator ..... See Operators Manual

Check the tires for damage, rocks in tire(s), and correct air pressure ..... Section 6129

Check level of alcohol in alcohol evaporator ..... See Operators Manual

Check condition of drive belts (wear, damage, etc.) ..... See Operators Manual

Clean or replace all decals that cannot be read ..... Section 9201

Drain water from the air reservoir ..... See Operators Manual

EVERY 50 HOURS OF OPERATION

Check sediment bowl on transfer pump for water and sediment ..... See Operators Manual

Check level of transmission oil ..... Section 6012

Check level of fluid in batteries ..... Section 4005

Clean air filters for ROPS cab ..... Section 9061

Lubricate pivot points for the bucket ..... See Operators Manual

Lubricate chassis pivot points ..... See Operators Manual

Lubricate pivot points for steering cylinder rod ends ..... See Operators Manual

Lubricate center drive shaft slip joints ..... See Operators Manual

Lubricate rear axle trunnion pivots ..... See Operators Manual

EVERY 100 HOURS OF OPERATION

Change engine oil ..... See Operators Manual

Lubricate pivot points for loader, bucket, and clam control levers ..... See Operators Manual

Lubricate pivot points for steering cylinders closed ends ..... See Operators Manual

EVERY 200 HOURS OF OPERATION

Change engine oil filters ..... See Operators Manual

EVERY 250 HOURS OF OPERATION

Check level of gear lubricant in axles ..... Section 6126

Lubricate hinges for ROPS cab door ..... See Operators Manual

Lubricate pivot points for suspension seat ..... Section 9064

Actuate air conditioning system to lubricate compressor ..... See Operators Manual

EVERY 500 HOURS OF OPERATION

Check level of brake fluid in reservoir for master cylinders ..... See Operators Manual

Check tension of drive belts ..... Section 4007, 7103 and 9003

Replace fuel filters ..... Section 3010

Replace filter for transmission oil (Allison transmission) ..... Section 6101

Drain water and sediment from fuel tank ..... See Operators Manual

Lubricate universal joints and slip joints ..... See Operators Manual

Lubricate center bearing for center drive shaft ..... See Operators Manual

Inspect ROPS cab of ROPS canopy ..... Section 9061

EVERY 1000 HOURS OF OPERATION

Change gear lubricant in each axle ..... Section 6126

Clean the breather for each differential ..... Section 6126

Change transmission oil ..... Section 6101

Replace filter for transmission oil (ZF transmission) ..... Section 6101

Clean suction screen in transmission ..... Section 6101

Clean breather for transmission ..... Section 6101

Replace filters for hydraulic oil ..... Section 8002

Clean cylinder head for air compressor ..... Section 7103

EVERY 2000 HOURS OF OPERATION OR EACH YEAR

Clean the cooling system. Fill cooling system with new coolant ..... See Fluids and Lubricants Chart

Change hydraulic oil ..... Section 8002

Clean suction screen in reservoir for hydraulic oil ..... Section 8002

Check refrigerant charge in air conditioning system ..... Section 9003

Disassemble and clean alcohol evaporator ..... Section 7111

AS REQUIRED

Service the air cleaner ..... Section 2001

Replace filters for hydraulic oil when warning lamp is illuminated ..... Section 8002

Tighten wheel nuts to correct torque value after wheel is removed and installed ..... Section 6129

Section
1010

GENERAL ENGINE SPECIFICATIONS

W30 Loader

Written In *C*lear
*A*nd
*S*imple
*E*nglish

CASE CORPORATION

Rac 8-25790

Printed in U.S.A.
December, 1984

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	2330 to 2370 RPM
Rated Engine Speed	2200 RPM
Engine Idle Speed	725 to 775 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 202TF (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)	28 Quarts (21.77 Litres)
(Without Filter)	24 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

1320

SPECIFICATION DETAILS

504BDT ENGINE

Written In *Clear And Simple English*

CASE CORPORATION

Rac 8-20040

Printed in U.S.A.
August, 1978

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

TABLE OF CONTENTS

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 tbe 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.

** The best run-in procedure 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 2015 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

Keep in one gear lower than normal for the first 8 hours of field operation. DO NOT "lug" the engine for the next 12 hours. Prevent "lugging" by moving the shift lever to a lower gear. The engine must not be "lugged" below the Rated Engine RPM during the early hours of life.

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"	0.051 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	
O.D. 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
I.D. of Piston Pin Bore	1.6251 to 1.6253"	41.2775 to 41.2826 mm
Maximum Service Limit	1.6258"	41.295 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) I.D. 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) I.D. Sleeve	0.013 to 0.023"	0.330 to 0.584 mm
Maximum Service Limit	0.030"	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) I.D. 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	
O.D. of Pin	1.6244 to 1.6246"	41.260 to 41.625 mm

Connecting Rod

Bushing	Replaceable	
Bushing I.D., Installed (Ream to Size)	1.6254 to 1.6258"	41.285 to 41.295 mm
Maximum Service Limit	1.6265"	41.313 mm
Bearing Liners	Replaceable	
Bearing Liner Width	1.586 to 1.596"	40.284 to 40.538 mm
Bore I.D. Without Bearing Liners	2.9003 to 2.9013"	73.668 to 73.693 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, 0.012, 0.020, 0.030"	0.051, 0.254, 0.305, 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	
Lateral Movement, Number Five Main Bearing Cap	0.003 to 0.015"	0.076 to 0.381 mm
Thrust Bearing, Standard Thickness	0.184 to 0.186"	4.674 to 4.724 mm
Thrust Bearing, Oversize Thickness for Service	0.190 to 0.192"	4.826 to 4.877 mm
Connecting Rod Journal, Standard O.D.	2.748 to 2.749"	69.799 to 69.825 mm
0.010" (0.254 mm) O.D. Undersize, Grind to	2.738 to 2.739"	69.545 to 69.571 mm
0.020" (0.508 mm) O.D. Undersize, Grind to	2.728 to 2.729"	69.291 to 69.317 mm
0.030" (0.762 mm) O.D. Undersize, Grind to	2.718 to 2.719"	69.037 to 69.063 mm
Connecting Rod Journal Maximum Taper	0.0005"	0.0127 mm
Journals Out of Round	0.0005"	0.0127 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	1.151 to 1.161"	29.235 to 29.489 mm
Undersize Main Bearing Liners for Service	0.002, 0.010 ,0.012, 0.020, 0.030"	0.051, 0.254, 0.305, 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 O.D.	2.998 to 2.999"	76.149 to 76.175 mm
0.010" (0.254 mm) O.D. Undersize, Grind to	2.988 to 2.989"	75.895 to 75.921 mm
0.020" (0.508 mm) O.D. Undersize, Grind to	2.978 to 2.979"	75.641 to 75.667 mm
0.030" (0.762 mm) O.D. Undersize, Grind to	2.968 to 2.969"	75.387 to 75.413 mm
Main Bearing Journal Bore I.D. Without Liners	3.191 to 3.192"	81.051 to 81.077 mm
Main Journal Width		
2nd, 4th and 6th	1.555 to 1.570"	39.497 to 39.878 mm
3rd and 7th	2.6175 to 2.6325"	66.485 to 66.866 mm
5th	2.623 to 2.627"	66.624 to 66.726 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	
I.D. 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
O.D. of Each Bearing Surface	2.2460 to 2.2470"	57.048 to 57.074 mm
Minimum Service Limit	2.2455"	57.306 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
O.D. of Spring	0.406"	10.3175 mm
Compress to 2.750" (69.85 mm)	45 to 55 lbs.	200 to 245N

Valve Push Rod Lifters

O.D. of Lifter Stem, Standard	0.8097 to 0.8102"	20.566 to 20.579 mm
O.D. of Lifter Stem, Oversize for Service	0.8190 to 0.8195"	20.803 to 20.815 mm
I.D. of Block Bore, Standard	0.8118 to 0.8130"	20.620 to 20.650 mm
Maximum Service Limit	0.8135"	20.663 mm
I.D. of Block Bore, Oversize for Service	0.8215 to 0.8225"	20.866 to 20.891 mm

Gear Train

Backlash		
Crankshaft Gear to Camshaft Gear	0.004 to 0.011"	0.1016 to 0.2794 mm
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 Idler 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.
O.D. of Idler Gear Shaft	1.7325 to 1.7330"	44.0055 to 44.0182 mm
I.D. of Idler Gear Bushing	1.7345 to 1.7355"	44.0563 to 44.0817 mm
Maximum Service Limit	1.7375"	44.132 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	0.0005 to 0.004"	0.013 to 0.102 mm
Pump Gears to Pump Cover Clearance	0.0015 to 0.005"	0.038 to 0.127 mm
Oil Pressure at High Idle, Hot Oil	40 to 65 PSI	275 to 448 kPa
Relief Valve Spring		
Number of Coils	11	11
Wire Diameter	0.080"	2.03 mm
Minimum I.D.	0.469"	11.913 mm
Free Length	2.00"	50.8 mm
Compress to 1.252" (31.801 mm)	23.8 to 25.6 lbs.	106 to 114 N
Relief Valve Cup Plug Depth	0.450	11.43 mm

Cylinder Head

Warpage	0.005" max.	0.127 mm

Exhaust Valve

Tappet Clearance	0.025"	0.635 mm
Face Angle	44 Degrees	44 Degrees
Face Run-Out	0.002" max.	0.051 mm
O.D. of Head	1.745 to 1.755"	44.323 to 44.577 mm
O.D. of Stem	0.402 to 0.403"	10.211 to 10.236 mm
Minimum Service Limit	0.4018"	10.206 mm
O.D. 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	0.0775 to 0.1000"	1.9685 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
O.D. of Insert	1.9455 to 1.9465"	49.4157 to 49.4411 mm
I.D. 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
O.D. of Stem	0.402 to 0.403"	10.211 to 10.236 mm
Minimum Service Limit	0.4018"	10.206 mm
O.D. 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	0.0750 to 0.0975"	1.905 to 2.477 mm
Seat Run-Out	0.002" max.	0.051 mm

Intake and Exhaust Valve Guides

Length	3.219"	81.763 mm
O.D. of Guide	0.7510 to 0.7515"	19.075 to 19.088 mm
I.D. of Guide (Installed and Reamed)	0.4045 to 0.4055"	10.274 to 10.300 mm
Maximum Service Limit	0.4065"	10.325 mm
Protrusion 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

O.D. of Shaft	0.860 to 0.866"	21.844 to 21.996 mm
I.D. 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.

Special Torque

	U.S. Value	Metric Value
Camshaft Nut With Hardened Washer	195 to 205 Ft. Lbs.	264 to 278 Nm (26.4 to 27.8 kgm)
Connecting Rod Bolts (Add Lubrication to Threads and Under Bolt Heads With 30W Oil)	95 to 105 Ft. Lbs.	129 to 142 Nm (12.9 to 14.2 kgm)
Crankshaft Pulley Bolt	100 to 110 Ft. Lbs.	136 to 149 Nm (13.6 to 14.9 kgm)
Crankshaft Main Bearing Bolts With Hardened Washers	200 to 210 Ft. Lbs.	271 to 285 Nm (27.1 to 28.5 kgm)
Cylinder Block Oil Cooler Outlet Cover Screw	35 to 42 Ft. Lbs.	48 to 57 Nm (4.8 to 5.7 kgm)
Cylinder Head Bolts	200 to 210 Ft. Lbs.	271 to 285 Nm (27.1 to 28.5 kgm)
Cylinder Head Cover Stud Nut	8 to 10 Ft. Lbs.	11 to 14 Nm (1.1 to 1.4 kgm)
Flywheel to Crankshaft Bolts Without Hardened Washers	180 to 190 Ft. Lbs.	244 to 258 Nm (24.4 to 25.8 kgm)
With Hardened Washers	230 to 250 Ft. Lbs.	312 to 339 Nm (31.2 to 33.9 kgm)
Intake and Exhaust Manifold Studs	25 to 30 Ft. Lbs.	34 to 41 Nm (3.4 to 4.1 kgm)
Intake Manifold Hex Nuts (Heavy)	35 to 42 Ft. Lbs.	48 to 57 Nm (4.8 to 5.7 kgm)
Exhaust Manifold Hex Nuts	25 to 30 Ft. Lbs.	34 to 41 Nm (3.4 to 4.1 kgm)
Oil Pan Capscrews	15 to 20 Ft. Lbs.	20 to 27 Nm (2.0 to 2.7 kgm)
Oil Pan Drain Plug	29 to 31 Ft. Lbs.	39 to 42 Nm (3.9 to 4.2 kgm)
Oil Pump Idler Gear Shaft Bolt	40 to 45 Ft. Lbs.	54 to 61 Nm (5.4 to 6.1 kgm)
Oil Pump Suction Tube Nut	90 to 100 Ft. Lbs.	122 to 136 Nm (12.2 to 13.6 kgm)
Rocker Arm Adjusting Screw Locknut	20 to 25 Ft. Lbs.	27 to 34 Nm (2.7 to 3.4 kgm)
Rocker Arm Bracket Stud Nut or Bolt	40 to 45 Ft. Lbs.	54 to 61 Nm (5.4 to 6.1 kgm)

Special Torque (Continued)

	U.S. Value	Metric Value
Water Pump and Fan Shaft Nut (Standard)	60 to 70 Ft. Lbs.	81 to 95 Nm (8.1 to 9.5 kgm)
Water Pump and Fan Shaft Nut (Crownlock)	45 to 50 Ft. Lbs.	61 to 68 Nm (6.1 to 6.8 kgm)

Engine Oil Filter ..... Install Until Gasket Contacts Filter Head, Then Hand Tighten an Extra 1/2 Turn. Loosen Filter Approximately 1 Full Turn, Then Tighten Again Until Gasket Contact Is Made and Hand Tighten an Extra 1/2 to 3/4 Turn.

GENERAL TORQUE SPECIFICATION TABLE (Revised 11-73)

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									
Bolt Size		Torque Foot Pounds		Torque Newton-Meters		Torque Foot Pounds		Torque Newton-Meters	
Inches	Millimeters	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
1/4	6.35	9	11	12.2	14.9	12	15	16.3	20.3
5/16	7.94	17	20.5	23.1	27.8	24	29	32.5	39.3
3/8	9.53	35	42	47.5	57.0	45	54	61.0	73.2
7/16	11.11	54	64	73.2	86.8	70	84	94.9	113.9
1/2	12.70	80	96	108.5	130.2	110	132	149.2	179.0
9/16	14.29	110	132	149.2	179.0	160	192	217.0	260.4
5/8	15.88	150	180	203.4	244.1	220	264	298.3	358.0
3/4	19.05	270	324	366.1	439.3	380	456	515.3	618.3
7/8	22.23	400	480	542.4	650.9	600	720	813.6	976.3
1	25.40	580	696	786.5	943.8	900	1080	1220.4	1464.5
1-1/8	25.58	800	880	1084.8	1193.3	1280	1440	1735.7	1952.6
1-1/4	31.75	1120	1240	1518.7	1681.4	1820	2000	2467.9	2712.0
1-3/8	34.93	1460	1680	1979.8	2278.1	2380	2720	3227.3	3688.3
1-1/2	38.10	1940	2200	2630.6	2983.2	3160	3560	4285.0	4827.4

* Thick nuts must be used with Grade 8 bolts

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