

1835 UNI-LOADER TABLE OF CONTENTS AND SERVICE MANUAL INTRODUCTION

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Service Manual Introduction



This Symbol Shows Important Information About Safety In This Manual. When You See This Symbol, Carefully Read The Information That Follows and Understand The Possible Causes of Injury Or Death. 1-1-A

Safety Rules

It is recommended that the warning tag shown in Figure 1 be put on the key for the key switch when a person is working on the machine. A warning tag comes with the machine. Additional warning tags, part number 331-4614, are available from Service Parts Supply.

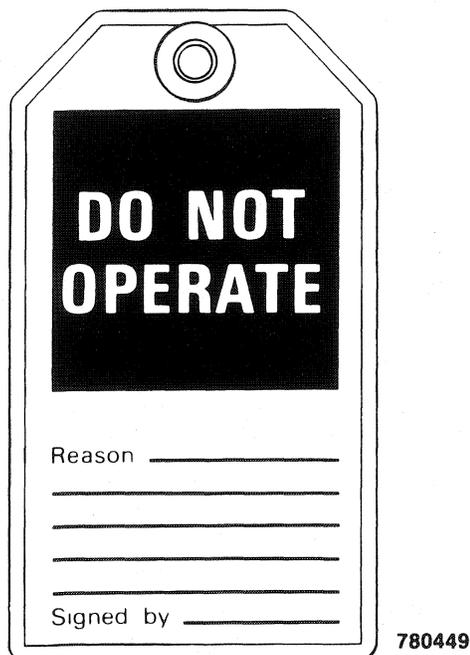


Figure 1



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

46-27



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

35-7



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: Whenever the bucket must be raised to aid in servicing, block the loader arms in place with lift cylinder safety strut or a suitable safety stand.

23-7-A



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

35-8



CAUTION: Pin sized and smaller streams of hydraulic oil under pressure can penetrate the skin and result in serious infection. 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



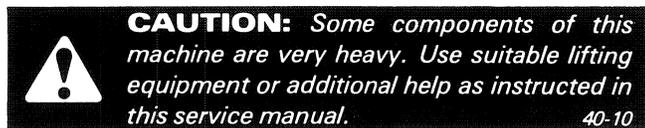
CAUTION: When servicing or repairing the machine, keep the shop floor and operator's compartment and steps free of oil, water, grease, tools, etc. Use an oil absorbing material and/or shop cloths as required. Use safe practices at all times.

40-8



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

40-7



General Information

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 will have drawings without a written procedure because the job is easily done. This service manual is one of the most important tools available to the service technician.

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 will have steps that are for a specific component.

Table of Contents

The first two pages of this section are a Table of Contents which show the series number and title, and the sections that are in each series. The individual sections, where necessary, will have a Table of Contents on the second page of that section.

Page Numbers

All page numbers are made of two sets of numbers separated by a dash, such as 4002-9. The numbers before the dash are the section numbers. The numbers following the dash are the page numbers 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.

Torque References

Most of the time two grades of fasteners (bolts, nuts and screws) are used on Case machines. The grades of the fasteners are grade 5 and grade 8. See Section 1051 for torque specifications and identification marks.

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

Serial and Model Numbers

When replacement parts are needed, it can be necessary to give the parts department one or all of the numbers. The model number is normally found on the Product Identification Number plate or Serial Number plate.

The Product Identification Number and Serial Numbers will be found in the following locations.

Machine - Product Identification Number plate fastened to the instrument panel.

Engine - serial number plate on the right-hand side of the engine above the starter.

Other Component parts - Serial Number plate or a stamped serial number is on the part.

NOTE: A part number plate will be found on some parts.

Classification of Lubricants

The Society of Automotive Engineers (SAE), the American Petroleum Institute (API), and the National Lubricating Grease Institute (NLGI) put oil and grease in classifications and grades according to temperature and use.

Engine Oil

The SAE number is the viscosity of engine oils; for example, SAE 30, a single viscosity oil. SAE 10W30 is a variable viscosity oil.

The API classification (SD, CD, etc.) is the oil performance in terms of engine usage. Only oil specified in Section 1050 can be used. These oils have the needed chemical additives to give maximum engine protection. Both the SAE grade and API classification must be found on the container.

Gear Lubricant and Grease

Gear lubricant and grease for each application is specified in Section 1050.

Special Tools

There are some special tools that are needed to remove and install, disassemble and assemble, check and adjust the component parts of this ma-

chine. Some special tools are 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.

Special tools are no longer available from Case Service Parts Supply. Special tools are available from:

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

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

Section 1010

GENERAL ENGINE SPECIFICATIONS

1835 UNI-LOADER (188 Diesel Engine)

Written In *Clear
And
Simple
English*

188 DIESEL ENGINES

General

Type	Case Open Chamber, 4 Cylinder, 4 Stroke Cycle, Valve-in-Head
Firing Order	1-3-4-2
Bore	3-13/16 Inches (96.8 mm)
Stroke	4-1/8 Inches (104.8 mm)
Piston Displacement	188 Cubic Inches (3 081 cm ³)
Compression Ratio	17 to 1
No Load Governed Speed	2250 RPM
Rated Engine Speed	2100 RPM
Engine Idling Speed	800 to 850 RPM
Valve Tappet Clearance (Exhaust)	(Cold) 0.014 Inch (0.356 mm)
(Intake)	(Cold) 0.012 Inch (0.305 mm)

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

Crankcase Capacity	6 Quarts (5.7 litres)
With Filter Change	7 Quarts (6.7 litres)
Oil Pressure	50 to 70 PSI (345 to 483 kPa)(3.45 to 4.83 bar) with Engine Warm and Operating at Rated Engine Speed
Type System	Pressure and Spray Circulation
Oil Pump	Gear Type
Oil Filter	Full Flow Spin on Type

Fuel System

Fuel Injection Pump	Roosa-Master
Pump Timing	4 Degrees Before Top Center
Fuel Injectors	Pencil Type Opening Pressure 3200 PSI (22 063 kPa)
Fuel Transfer Pump	Vane Type, Integral Part of Injection Pump
Governor	Variable Speed, Fly-Weight Centrifugal Type, Integral Part of Injection Pump
1st Stage Fuel Filter	Spin on Type
2nd Stage Fuel Filter	Spin on Type

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.

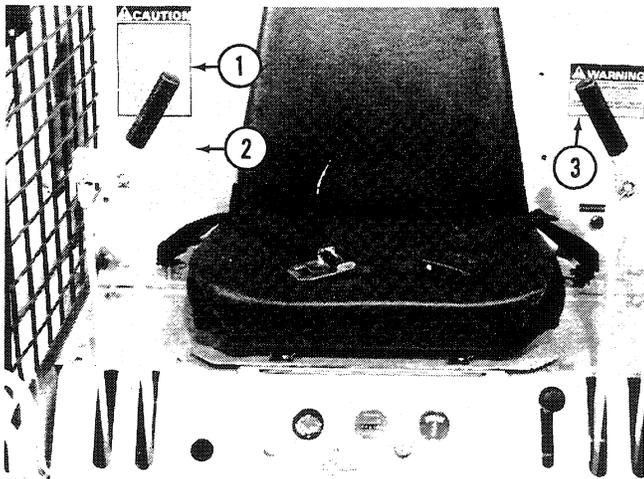
Section 1012

DECALS

Written In *Clear
And
Simple
English*

GENERAL INFORMATION

1. All decals about the operation of the machine must be in a condition so that you can read the decals easily. Replace any decal that is damaged or cannot be read.
2. All decals that start with the words WARNING, CAUTION, or DANGER must be in a condition so that you can read the decals easily. Replace any decal that is damaged or cannot be read.
3. When you paint the machine or attachment, put covers over the good decals and remove the decals which have damage or cannot be read easily. Use enamel thinner to make the decal easier to remove.
4. Remove the old decal before you install a new decal. Use enamel thinner to make the old decal easier to remove.
5. The following pages show decals installed on the machine or attachments. Part numbers of the decals are also shown. When replacement decals are needed, check the parts catalog to make sure that the part numbers are correct.



1. 321-3059, See Figure 2
 2. 321-2996, See Figure 3
 3. 321-3705, See Figure 4
- Figure 1

CAUTION

REVIEW OPERATORS MANUAL BEFORE OPERATING THIS MACHINE

ALWAYS:

- 1 FASTEN SEAT BELT SECURELY BEFORE STARTING ENGINE
- 2 KEEP BOTH HANDS ON CONTROLS AT ALL TIMES WHILE OPERATING VEHICLE
- 3 CARRY LOAD LOW
- 4 USE LOW SPEED FOR HILLSIDE OR RAMP OPERATION
- 5 BLOCK ELEVATED COMPONENTS BEFORE SERVICING EQUIPMENT

NEVER:

- 1 LEAVE MACHINE WITH LOADER ARMS RAISED
- 2 PLACE ANY PART OF OPERATORS BODY UNDER LOADER ARMS OR ATTACHMENTS
- 3 ALLOW RIDERS
- 4 LEAVE MACHINE WHILE ENGINE IS RUNNING
- 5 LEAVE MACHINE WITHOUT SETTING PARKING BRAKE

1

800626

1 321-3059, SEE FIGURE 1 FOR LOCATION

Figure 2

POISON / DANGER

BATTERY ACID CAUSES SEVERE BURNS

Batteries contain sulfuric acid. Avoid contact with skin, eyes or clothing. Antidote: EXTERNAL-Flush with water. INTERNAL-Drink large quantities of water or milk. Follow with milk of magnesia, beaten egg or veg. oil. Call physician immediately. Eyes: Flush with water for 15 minutes and get prompt medical attention.

BATTERIES PRODUCE EXPLOSIVE GASES.

Keep sparks, flame, and cigarettes away. Ventilate when charging or using in enclosed space. Always shield eyes when working near batteries.

KEEP OUT OF REACH OF CHILDREN

1

800627

1 321-2996, SEE FIGURE 1 FOR LOCATION

Figure 3

WARNING

BEFORE STARTING ENGINE STUDY OPERATOR'S MANUAL SAFETY MESSAGES READ ALL SAFETY SIGNS ON MACHINE CLEAR THE AREA OF OTHER PERSONS

LEARN & PRACTICE SAFE USE OF CONTROLS BEFORE OPERATING

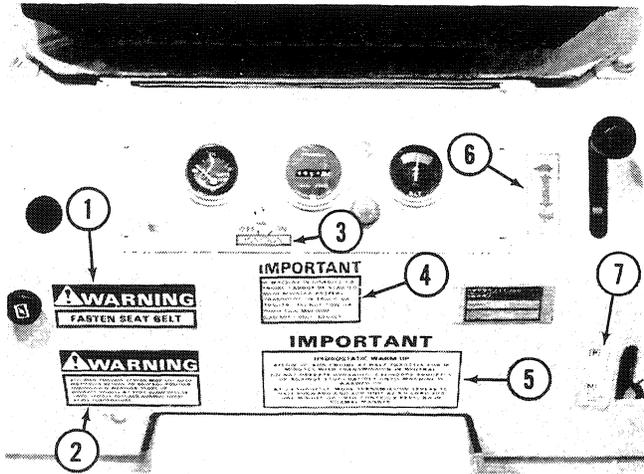
IT IS YOUR RESPONSIBILITY TO UNDERSTAND AND FOLLOW MANUFACTURER'S INSTRUCTIONS ON MACHINE OPERATION, SERVICE, AND TO OBSERVE PERTINENT LAWS AND REGULATIONS. OPERATOR AND SERVICE MANUALS MAY BE OBTAINED FROM YOUR EQUIPMENT DEALER.

1

321-3705
800628

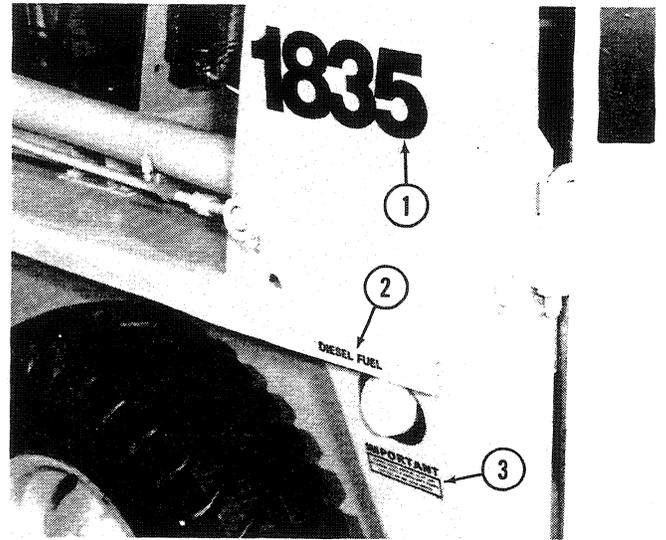
1 321-3705, SEE FIGURE 1 FOR LOCATION

Figure 4



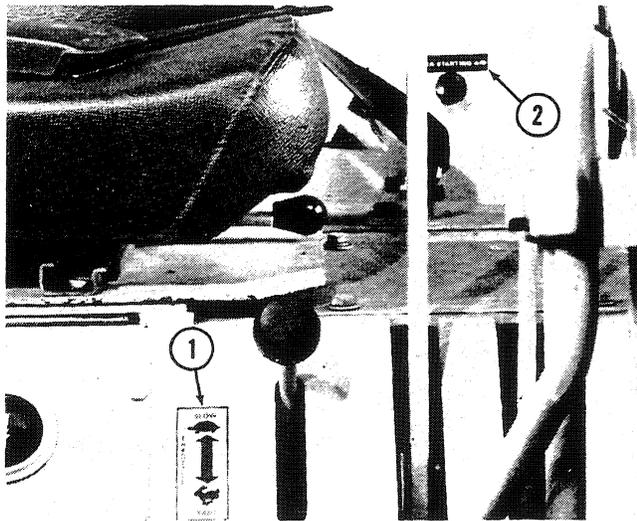
- 1. 321-3060
- 2. 321-3062 - steering control levers
- 3. 321-2507 - ignition
- 4. 321-3385 - disabled machine
- 5. 321-4197 - hydrostatic warm-up
- 6. 321-5847 - throttle
- 7. 321-5848 - parking latch

Figure 5



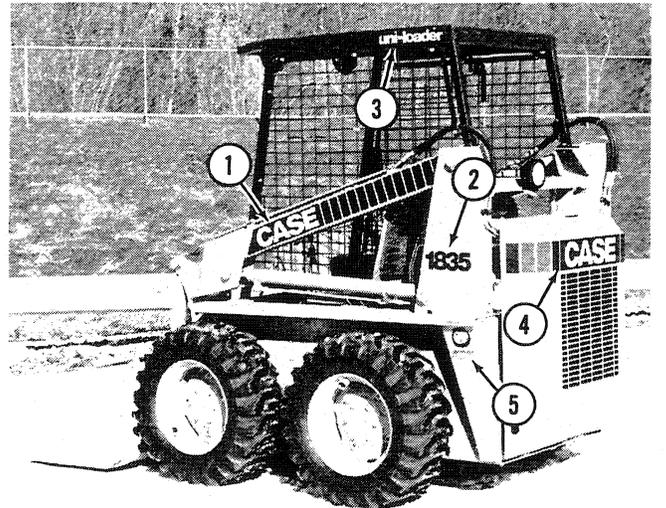
- 1. 321-5835
- 2. 321-230 Diesel, 321-18 Gasoline
- 3. 321-2973 - torque wheel nuts

Figure 8



- 1. 321-5847
- 2. 321-2435, See Figure 7.

Figure 6



- 1. 321-5113
- 2. 321-5835
- 3. 321-3150
- 4. 321-5846
- 5. 321-2973, See Figure 8.

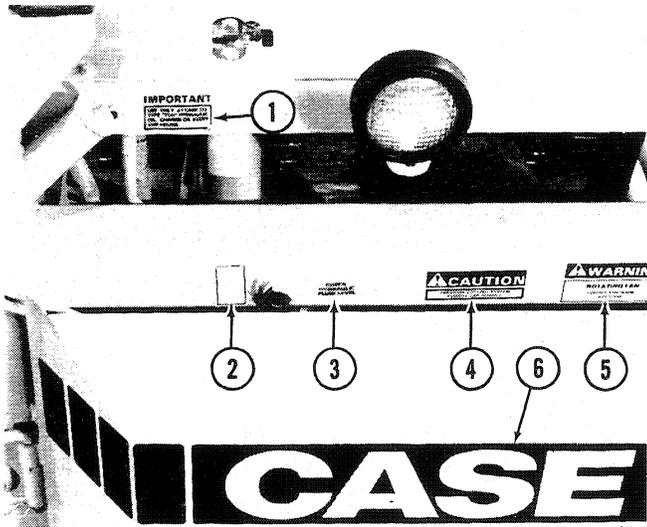
Figure 9

ETHER STARTING AID ①

800629

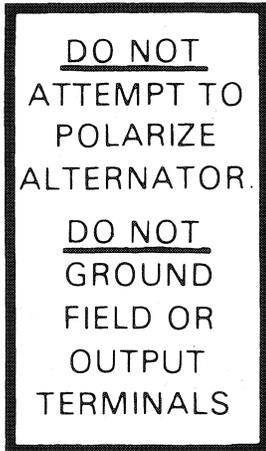
- 1. 321-2435, SEE FIGURE 6 FOR LOCATION

Figure 7



- 1. 321-3386 - TCH hydraulic oil
- 2. 321-1061, See Figure 11
- 3. 321-2733, See Figure 12
- 4. 321-3061, See Figure 13
- 5. 321-4346, See Figure 14
- 6. 321-5846

Figure 10



800630

- 1. 321-1061, SEE FIGURE 10 FOR LOCATION

Figure 11

CHECK HYDRAULIC FLUID LEVEL

800631

- 1. 321-2733, SEE FIGURE 10 FOR LOCATION

Figure 12

IMPORTANT

USE ONLY J I CASE CO. TYPE "TCH" HYDRAULIC OIL. CHANGE OIL EVERY 1000 HOURS

①

- 1. 321-3386, SEE FIGURE 10 FOR LOCATION
Figure 12A



800632

- 1. 321-3061, SEE FIGURE 10 FOR LOCATION

Figure 13



800633

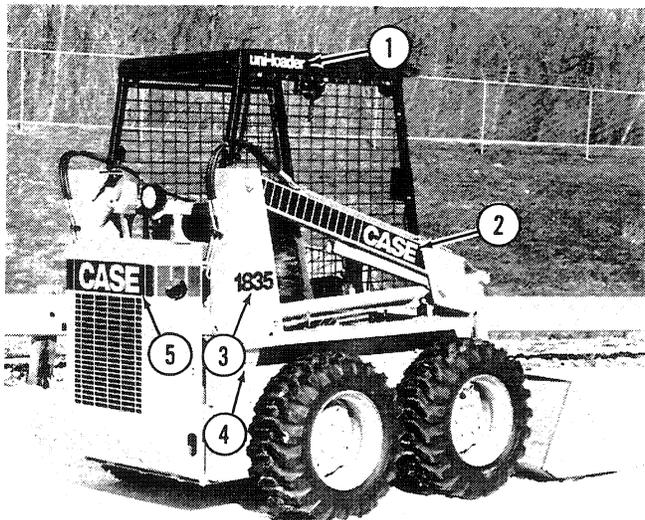
- 1. 321-4346, SEE FIGURE 10 FOR LOCATION

Figure 14



- 1. 321-5846
- 2. 321-3386, See Figure 10

Figure 15



- 1. 321-3150
- 2. 321-5112
- 3. 321-5835
- 4. 321-2973, See Figure 17
- 5. 321-5846

Figure 16

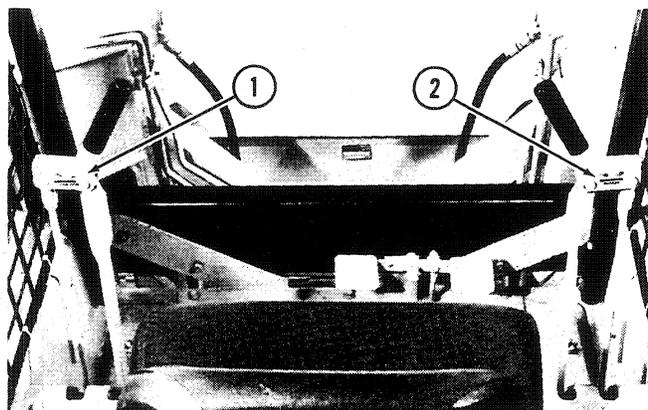
IMPORTANT

**TORQUE WHEEL NUTS 80-90 FT. LBS.
RETORQUE EVERY 2 HOURS UNTIL STABLE.
CAUTION: DO NOT OVER TORQUE**

800634

- 1 321-2973, SEE FIGURE 16 FOR LOCATION

Figure 17



- 1. 321-5849, See Figure 19
- 2. 321-5850, See Figure 20

Figure 18



LOADER ARM

800635

- 1. 321-5849, SEE FIGURE 18 FOR LOCATION

Figure 19

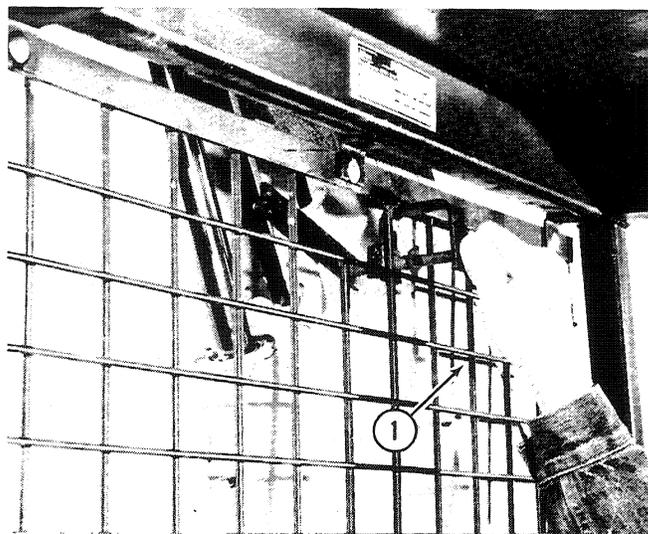


BUCKET

800636

- 1 321-5850, SEE FIGURE 18 FOR LOCATION

Figure 20

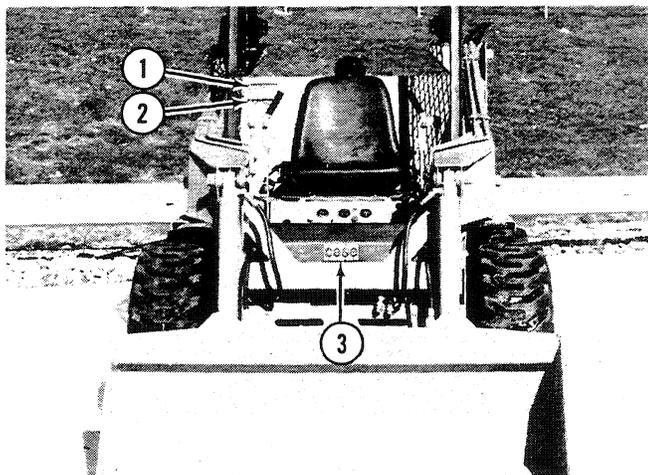


- 1. 321-6214, See Figure 22
- Figure 21

<p>WARNING</p> <p>IF YOU SERVICE THE MACHINE WITH THE LOADER LIFT ARMS RAISED ALWAYS USE THE SAFETY STRUT FAILURE TO FOLLOW THIS PROCEDURE CAN CAUSE SERIOUS INJURY OR DEATH IF THE LOADER LIFT ARMS ARE LOWERED BY ACCIDENT</p>	<p>PROCEDURE TO USE THE SAFETY STRUT</p> <ol style="list-style-type: none"> 1 MAKE SURE THE LOADER BUCKET IS EMPTY. LOWER THE LOADER BUCKET TO THE GROUND AND STOP THE ENGINE. 2 REMOVE THE REAR PIN FROM THE SAFETY STRUT AND LOWER THE SAFETY STRUT ONTO THE LIFT CYLINDER. 3 START THE ENGINE AND SLOWLY RAISE THE LOADER LIFT ARMS UNTIL THE SAFETY STRUT IS ON THE LIFT CYLINDER ROD. SLOWLY LOWER THE LOADER LIFT ARMS UNTIL THE SAFETY STRUT MAKES CONTACT WITH THE LIFT CYLINDER TUBE. 4 INSTALL THE REAR PIN IN THE SAFETY STRUT. 	<p>PROCEDURE TO PUT THE SAFETY STRUT IN STORAGE</p> <ol style="list-style-type: none"> 1 REMOVE THE REAR PIN FROM THE SAFETY STRUT. 2 START THE ENGINE AND RAISE THE LOADER LIFT ARMS APPROXIMATELY ONE OR TWO INCHES (25 TO 50 mm). 3 USE THE RELEASE LEVER TO RAISE THE SAFETY STRUT ABOVE THE LIFT CYLINDER. 4 SLOWLY LOWER THE LOADER LIFT ARMS UNTIL THE SAFETY STRUT IS ABOVE THE LIFT CYLINDER TUBE. 5 PUT THE RELEASE LEVER IN THE STORAGE POSITION. 6 LOWER THE LIFT ARMS TO THE GROUND AND STOP THE ENGINE. HOLD THE SAFETY STRUT IN THE STORAGE POSITION WITH THE REAR PIN.
	<p>800637</p>	

1. 321-6214, SEE FIGURE 21 FOR LOCATION

Figure 22



1. 321-5855, See Figure 24
2. 321-3059, See Figure 1
3. 321-4739

Figure 23

WARNING

IF YOU CONNECT JUMPER CABLES WRONG TO THE STARTER MOTOR SOLENOID THE ENGINE CAN BE STARTED WITH THE TRANSMISSION IN GEAR TO PREVENT PERSONAL INJURY OR DAMAGE TO THE MACHINE USE THE FOLLOWING PROCEDURE

- 1 TWO PERSONS ARE REQUIRED FOR JUMP STARTING
- 2 CONNECT THE POSITIVE JUMPER CABLE TO THE BATTERY TERMINAL OF THE STARTER MOTOR SOLENOID
- 3 CONNECT THE NEGATIVE JUMPER CABLE TO A GOOD ENGINE GROUND. SEE THE OPERATOR'S MANUAL FOR THIS MACHINE. SIT IN THE OPERATOR'S SEAT AND THEN START THE ENGINE.
- 4 HAVE THE OTHER PERSON DISCONNECT THE JUMPER CABLES.

IF YOU DO NOT USE THE ABOVE PROCEDURE THE MACHINE CAN MOVE OUT OF CONTROL AND YOU OR OTHER PERSONS CAN BE SERIOUSLY INJURED

321 6244

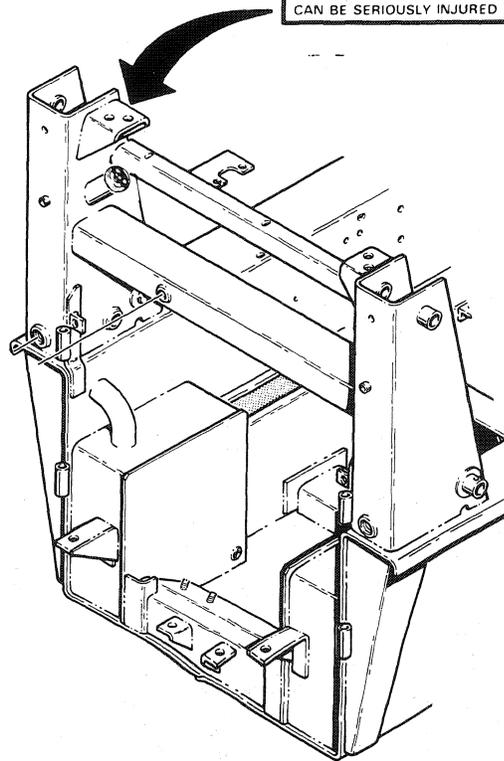
WARNING

DO NOT REMOVE ANY SAFETY EQUIPMENT, SUCH AS ROLLOVER PROTECTIVE STRUCTURE OR SIDE SCREENS (OR SIDE WINDOWS) EXCEPT FOR SERVICING. PROPERLY REINSTALL BEFORE USING MACHINE.

321 5855

1 321-5855, SEE FIGURE 23 FOR LOCATION

Figure 24



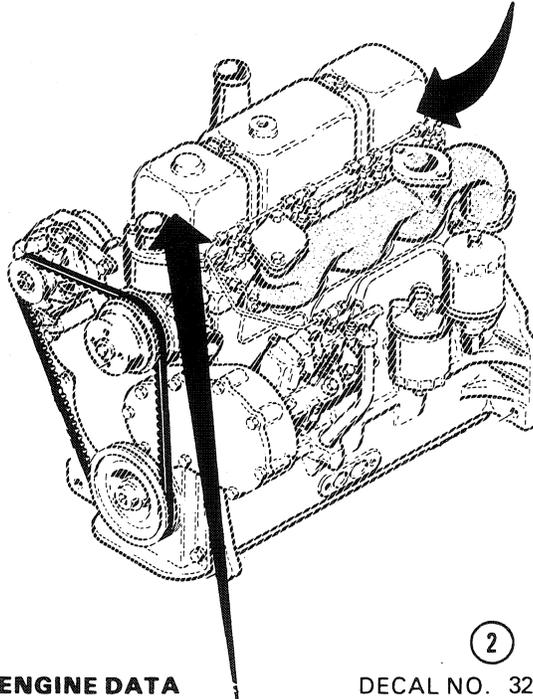
1 321-6244

Figure 25

800640

ENGINE DATA		DECAL NO. 321 5845
MODEL	-----	148G
FULL LOAD R P M	-----	2100
NO LOAD R P M	-----	2250
VALVE TAPPET	-----	INTAKE 014 COLD
CLEARANCE	-----	EXHAUST 020 COLD
DISTRIBUTOR TIMING AT 2100 ENGINE R P M	-----	35 BTC
DISTRIBUTOR POINT GAP	-----	020
SPARK PLUG GAP	-----	025

1



2

ENGINE DATA

DECAL NO. 321-4291

MODEL	-----	G188D
FULL LOAD R.P.M.	-----	2100
NO LOAD R.P.M.	-----	2250
VALVE TAPPET	_INTAKE	_.012 COLD
CLEARANCE	_ EXHAUST	_.014 COLD
FUEL PUMP TIMING	-----	4° B.T.C.
NOZZLE OPENING PRESS.	-----	3000 P.S.I.

1. 321-5845 GASOLINE ENGINE
2. 321-4291 DIESEL ENGINE

800641

Figure 26

Section

1027

DETAILED SPECIFICATIONS

188 Diesel Engines

FRACTION to DECIMAL to MILLIMETER CONVERSION TABLE

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

INCH to MILLIMETER CONVERSION TABLE

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

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RUN-IN-INSTRUCTIONS

Engine Lubrication

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

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

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

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

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

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

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

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

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

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

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

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

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

Run-In Procedure (Agricultural Tractors)

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

Run-In Procedure (Construction Equipment)

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

Run-In Procedure (Power Units)

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

DETAILED ENGINE SPECIFICATIONS

Cylinder Sleeves

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

Piston

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

Piston Rings

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

Piston Rings (Cont'd)

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

Piston Pin

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

Connecting Rod

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

Crankshaft

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

Crankshaft (Cont'd)

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

Camshaft

Type	Parabolic	
Bushings	5, Replaceable	
Bushing Lubrication:		
Front bushing	Pressure lubricated from oil pump	
Intermediate bushing	Gravity flow lubricated	
Rear bushing	Pressure lubricated with rear oil metering.	
Oil clearance .....	.002 to .007"	.051 to .178mm
I.D. of bushing installed	1.752 to 1.753"	44.501 to 44.526mm
Maximum Serviceable Limit	1.755"	44.577mm
Bushing width:		
1st (front)	1.213 to 1.223"	30.810 to 31.064mm
2nd, 3rd and 4th .....	.490 to .500"	12.446 to 12.700mm
5th (rear).....	1.213 to 1.223"	30.810 to 31.064mm
O.D. of each bearing surface	1.749 to 1.750"	44.425 to 44.450mm
Minimum Serviceable Limit	1.748"	44.399mm
Thrust washer thickness .....	.147 to .149"	3.734 to 3.785mm
Minimum Serviceable Limit	Maintain end clearance	
Camshaft end play	Taken up by thrust washer	
Camshaft end clearance .....	.003 to .007"	.076 to .178mm

Valve Push Rod Lifters

Material	Hardened Steel	
Type	Mushroom	
O.D. of lifter stem .....	.5605 to .5610"	14.237 to 14.249mm
I.D. of block bore, including wear .....	.5625 to .5650"	14.287 to 14.351mm

Gear Train

U.S.Value

Metric Value

Backlash:

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

Oil Pump

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

Cylinder Head

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

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

Exhaust Valve

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

Intake Valve Guides

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

Exhaust Valve Guides

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

Valve Spring

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

Rocker Arm Assembly

U.S. Value

Metric Value

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

SPECIAL TORQUES

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

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

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

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

* Thick nuts must be used with Grade 8 bolts

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 1050

MAINTENANCE AND LUBRICATION

Written In *Clear
And
Simple
English*

FLUIDS AND LUBRICANTS

COMPONENT	CAPACITY		SPECIFICATIONS
	U.S.	Metric	
Fuel tank	14.5 gallons	55 litres	See the Operators Manual
Engine crankcase With filter change Without filter change	7 quarts 6 quarts	6.6 litres 5.7 litres	Case HDM Oil Alternate oil: gasoline engines SD Service Class D oil 40° F (4° C) and above SAE 30 32° F (0° C) to 90° F (32° C) SAE 20W -10° F (-23° C) to 60° F (16° C) SAE 10W Alternate oil: diesel engines SD Service Class D oil 32° F (0° C) and above SAE 30 10° F (-12° C) to 50° F (-10° C) SAE 20W 32° F (0° C) and below SAE 10W
Hydraulic reservoir	25 quarts	24 litres	Case TCH Fluid Alternate oil: Type C-2 transmission and hydraulic fluid such as Tenneco Hytrans Fluid NOTE: When you change the oil in the hydraulic reservoir, add one quart of oil additive, Case part number B17508.
Cooling system	16 quarts	15 litres	A mixture of 50% ethylene glycol and 50% water must be used for temperatures above -34° F (-37° C). If it is possible that the temperature will be lower, adjust the mixture. Install 1/2 of a pint of cooling system conditioner, part number 331- 508, in the cooling system when the cooling system is drained and new coolant is installed. Install 1/4 of a pint of cooling system conditioner after every 300 hours of operation.
Grease fitting	as required		Number 2 molydisulfide grease
Chain compartments (each side)	4 quarts	3.8 litres	Case HDM Oil. SAE 30
Battery	as required		Clean water or distilled water