

850D/855D CRAWLERS

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Section 1001

SAFETY RULES, SERVICE MANUAL INTRODUCTION AND TORQUE SPECIFICATIONS

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| Safety Rules | 1001-2 | Torque Specifications | 1001-5 |
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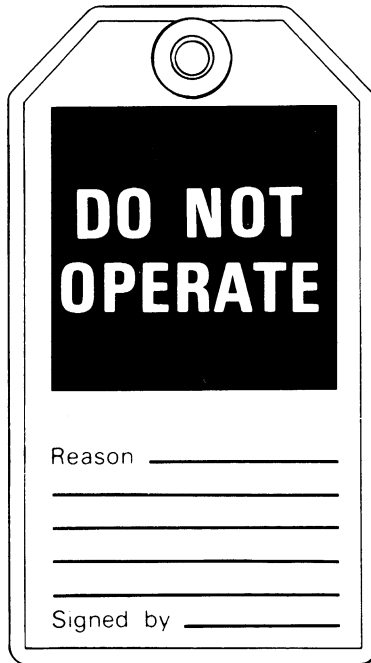
SAFETY RULES

 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


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

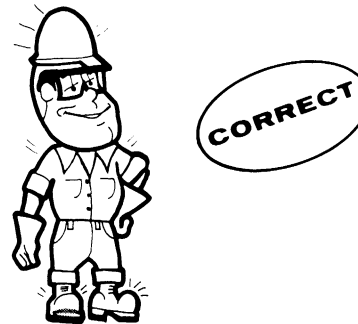
 **DANGER:** Before you move the backhoe boom to either side, make sure that all persons are out of the way. A swinging boom can crush. 48-54


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


 **WARNING:** Operate tractor and equipment controls from the seat position only. Any other method could result in serious injury. 48-55


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

 **WARNING:** 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



 **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

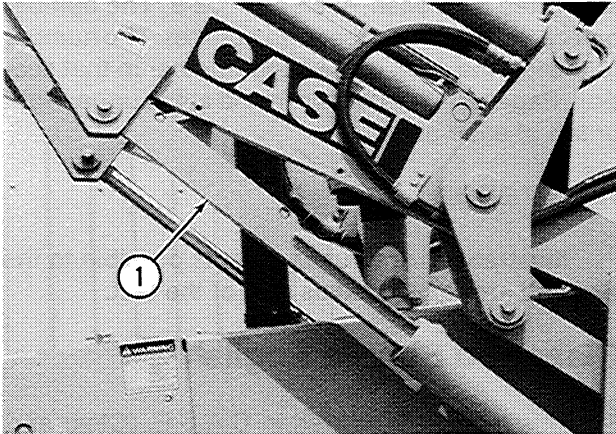
 **WARNING:** When working in the area of the fan belt with the engine running, avoid loose clothing if possible, and use extreme caution. 35-4

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



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

23-7-B



1. Lift Cylinder Support Strut

845081



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



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



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



WARNING: DO NOT, for any reason, weld the following parts.

Swing tower
Support for swing cylinders
Stabilizer leg
Cast stabilizer foot
Bucket links, loader or backhoe

Welding will cause failure of the part and result in personal injury. 48-93



CAUTION: Pin sized and smaller streams of hydraulic oil under pressure can penetrate the skin and result in serious infection. If hydraulic oil under pressure does penetrate the skin, seek medical treatment immediately. Maintain all hoses and tubes in good condition. Make sure all connections are tight. Make a replacement of any tube or hose that is damaged or thought to be damaged. DO NOT use your hand to check for leaks; use a piece of cardboard or wood. 40-6-A



CAUTION: When removing hardened pins such as a pivot pin, or a hardened shaft, use a soft head (brass or bronze) hammer or use a driver made from brass or bronze and a steel head hammer. 46-17



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



CAUTION: When servicing or repairing the machine, keep the shop floor and operator's compartment and steps free of oil, water, grease, tools, etc. Use an oil absorbing material and/or shop cloths as required. Use safe practices at all times. 40-8



CAUTION: Use suitable floor (service) jacks or chain hoists to raise wheels or track off the floor. Always block machine in place with suitable safety stands. 40-7-A



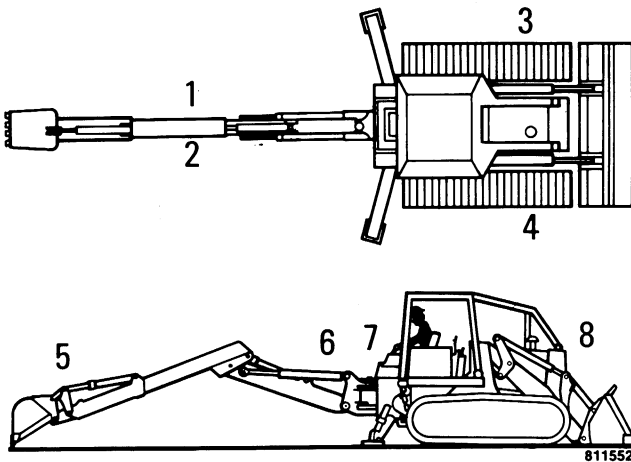
CAUTION: Some components of this machine are very heavy. Use suitable lifting equipment or additional help as instructed in this service manual. 40-10

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.



- | | |
|------------------------------|-------------------------|
| 1. <i>Right Side-Backhoe</i> | 5. <i>Front-Backhoe</i> |
| 2. <i>Left Side-Backhoe</i> | 6. <i>Rear-Backhoe</i> |
| 3. <i>Left Side-Machine</i> | 7. <i>Rear-Machine</i> |
| 4. <i>Right Side-Machine</i> | 8. <i>Front-Machine</i> |

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 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.

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 VL Churchill Ltd. in Europe. Use these tools according to the instructions in this service manual for your personal safety and to do the job correctly.

In the U.S. and Canada, order the tools from


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


In Europe order the tools from

VL Churchill Ltd.
P.O. Box 3, Daventry
Northants NN11 4NF
England

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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FLUIDS AND LUBRICANTS CHART AND MAINTENANCE CHART

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| Fluid and Lubricants Chart | 1002-2 |
| Maintenance Chart | 1002-3 |

Written In *Clear
And
Simple
English*

FLUIDS AND LUBRICANTS CHART

| COMPONENT | CAPACITY | | SPECIFICATION |
|-----------------------------|-------------|-------------|--|
| | U.S. | METRIC | |
| Fuel tank | 38 gallons | 144 litres | See Operators Manual |
| Crankcase | 16 quarts | 15.2 litres | <p>Multi-viscosity engine oil is specified for both engines. Single viscosity engine oil can be used if a multi-viscosity oil is not available.</p> <p>API classification: Without turbocharger CC or CC/CD With turbocharger CC/CD or CD</p> <p>Multi-viscosity engine oil Above 30° F (-1° C) SAE 20W-40 Above 10° F (-12° C) SAE 15W-40 Above 90° F (32° C) SAE 10W-30</p> <p>Single viscosity engine oil Above 50° F (10° C) SAE 40 Above 40° F (5° C) SAE 30 25 to 70° F (4 to 21° C) SAE 20W-20</p> |
| Reservoir for hydraulic oil | 12 gallons | 45 litres | Case TCH Fluid Alternate oil: Type C3 hydraulic oil |
| Transmission | 8.5 gallons | 32 litres | Case TCH Fluid Alternate oil Type C3 hydraulic oil |
| Final drive (each) | 7.5 quarts | 7.1 litres | Case FDL Alternate gear lubricant SAE 85/140 EP (API-GL-5) |
| Cooling system | 5 gallons | 19 litres | A mixture of half ethylene glycol (anti-freeze) and half water must be used at all times. If the coldest outside temperature will be less -34° F (-36° C), add antifreeze. |
| Winch | 9.5 quarts | 9 litres | Multipurpose gear lubricant, API-GL-4 Above 0° F (-18° C) SAE 90 Below 0° F (-18° C) SAE 75 |
| Batteries | As required | | Add drinking water or distilled water. |
| Master cylinders | As required | | Case TCH Fluid Alternate oil Type C3 hydraulic oil |
| Winch control | As required | | DOT 3 brake fluid |
| Grease fittings | As required | | Molydisulfide multipurpose grease |

MAINTENANCE CHART

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

| INTERVAL | SERVICE | INSTRUCTIONS |
|--|---|--|
| After the first 20 hours of operation for new machine | Tighten the tension rods for the backhoe, if equipped. Tighten again after every 50 hours until the turnbuckles stay tight. Do the After Delivery Check | Section 9100 Operators Manual |
| After first 10, 20, 50 100 and 200 hours of operation | If equipped with a backhoe, tighten the nut on the bottom pivot pin for the swing tower to the specified torque. | Section 9100 |
| After the first 100 hours of operation | Tighten all clamps on hoses at connecting points (radiator, suction line, etc.) | |
| After 10 hours of operation or daily, whichever occurs first | Check level of engine oil Check level of transmission oil. Check level of hydraulic oil. Clean or replace decals that cannot be read. | Operators Manual Section 6002 Operators Manual Operators Manual |
| After 50 hours of operation | Check dust valve and wing nut for cover for air cleaner. Check level of coolant in coolant reservoir. Drain water from primary fuel filter. Lubricate pivot points for loader and blade. | Operators Manual Operators Manual Operators Manual Operators Manual |
| After 100 hours of operation | Check adjustment of parking brake. Clean spark arresting muffler. Check level of oil in winch and adapter. Check level of fluid in winch control. Lubricate universal joints and slip spline (severe conditions). | Section 7001 Section 2001 Section 9300 Section 9300 Operators Manual |

| INTERVAL | SERVICE | INSTRUCTIONS |
|-------------------------------|--|---|
| After 250 hours of operation | <p>Check level of OIL in master cylinders.</p> <p>Change engine oil and replace oil filter.</p> <p>Check level of gear lubricant in final drives.</p> <p>Check tension of drive belt for air conditioner compressor.</p> <p>Check the level of the fluid in the batteries.</p> <p>Check coolant level in radiator.</p> <p>Lubricate pivot points for brake pedals.</p> <p>Lubricate pivot points for loader and blade control levers and backhoe control levers.</p> <p>Lubricate suspension seat.</p> | <p>Operators Manual</p> <p>Operators Manual</p> <p>Operators Manual</p> <p>Section 9003</p> <p>Section 4005</p> <p>Operators Manual</p> <p>Operators Manual</p> <p>Operators Manual</p> <p>Section 9065</p> |
| After 500 hours of operation | <p>Replace fuel filters.</p> <p>Replace filter in hydraulic reservoir.</p> <p>Replace transmission filter.</p> <p>Lubricate universal joints and slip point (normal conditions).</p> <p>Inspect ROPS canopy or cab.</p> | <p>Section 3410</p> <p>Section 8002</p> <p>Section 6002</p> <p>Operators Manual</p> <p>Section 9061</p> |
| After 1000 hours of operation | <p>Change the oil in the transmission.</p> <p>Change oil in hydraulic reservoir.</p> <p>Clean breather for hydraulic reservoir.</p> <p>Change gear lubricant in final drives.</p> <p>Check engine valve clearance.</p> <p>Clean breather and relief valve in filler for fuel tank.</p> <p>Change oil in winch and adapter.</p> <p>Clean batteries, battery carrier, and terminals on battery cables.</p> <p>Clean filter for ROPS cab.</p> | <p>Section 6002</p> <p>Section 8002</p> <p>Section 8002</p> <p>Operators Manual</p> <p>Section 2415</p> <p>Operators Manual</p> <p>Section 9300</p> <p>Section 4005</p> <p>Section 9061</p> |

| INTERVAL | SERVICE | INSTRUCTIONS |
|-------------------------------|---|---|
| After 2000 hours of operation | Drain, flush and fill cooling system. | Operators Manual |
| As required | <p>Check tension of track(s).</p> <p>Tighten bolts for track shoes to the specified torque.</p> <p>Adjust the brakes.</p> <p>Adjust the parking brake.</p> <p>Service the air cleaner.</p> <p>Clean precleaner for air cleaner, if equipped.</p> <p>If equipped with a winch, adjust the brake for the winch.</p> | <p>Section 5506</p> <p>Section 5506</p> <p>Section 7001</p> <p>Section 7001</p> <p>Section 2001</p> <p>Section 2001</p> <p>Section 9300</p> |

Section 1010

GENERAL ENGINE SPECIFICATIONS

Written In *Clear
And
Simple
English*

IMPORTANT: *This engine was made using the metric measurement system. All measurements and checks must be made with metric tools to make sure of an accurate reading when inspecting parts.*

ENGINE SPECIFICATIONS

General

| | |
|--|---|
| Type | 6 Cylinder, 4 Stroke Cycle, Valve-In-Head |
| Firing Order | 1,5,3,6,2,4 |
| Bore | 102 mm |
| Stroke | 120 mm |
| Piston Displacement | 5.88 Litres |
| Compression Ratio | 17.0 to 1 |
| No Load Governed Speed | 2130 to 2220 RPM |
| Rated Engine Speed | 2095 to 2175 RPM |
| Engine Idle Speed | 700 to 750 RPM |
| Valve Tappet Clearance (Exhaust)(Cold) | 0.508 mm |
| (Intake)(Cold) | 0.254 mm |
| Thermostat Operating Range | 181°F to 203°F (83°C to 95°C) |

Piston and Connecting Rods

| | |
|---------------------------------------|--------------------------|
| Rings Per Piston | 3 |
| Number of Compression Rings | 2 |
| Number of Oil Rings (two piece) | 1 |
| Type of Pins | Full Float |
| Type Bearings | Steel Back Leaded Bronze |

Main Bearings

| | |
|--------------------------|-------------|
| Number of Bearings | 7 |
| Type of Bearings | Replaceable |

Engine Lubricating System

| | |
|----------------------------------|---|
| Oil Pressure | 42 to 54 PSI (290 to 372 kPa)(2.90 to 3.72 bar) with Engine Warm at Rated Engine Speed |
| Type of System | Pressure and Spray Lubrication |
| Oil Pump | Rotor Type |
| Oil Filter | Full Flow Turn-on Type |
| Oil Capacity (with filter) | 16 Quarts (15 litres) |
| (without filter) | 15 Quarts (14.3 litres) |

Fuel System

| | |
|--------------------------------|---|
| Fuel Injection Pump | CAV |
| Pump Timing | Top Center |
| Fuel Injectors | Bosch 17 mm Opening Pressure (New) 3190 to 3310 PSI (21 994 to 22 822 kPa)(220 to 228 Bar) |
| Governor | Variable Speed, a Part of the Injection Pump |
| First Stage Fuel Filter | Turn on Type |
| Second Stage Fuel Filter | Turn on Type |
| Lift Pump | 5 to 7 PSI (34 to 48 kPa)(0.34 to 0.48 Bar) |

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 1024

SPECIFICATION DETAILS

Written In **Clear
And
Simple
English**

IMPORTANT: *This engine was made using the metric measurement system. All measurements and checks must be made with metric tools to make sure of an accurate reading when inspecting parts.*

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RUN-IN INSTRUCTIONS

Engine Lubrication

Fill the 6-590 engine crankcase with CC or CD service classification oil that has the correct viscosity rating for the ambient air temperature. Install new oil filters, after the engine has been rebuilt.

Fill the 6T-590 and the 6TA-590 engine crankcase with CD service classification oil that has the correct viscosity rating for the ambient air temperature. Install new oil filters, after the engine has been rebuilt.

Run-In Procedure For Rebuilt Engine

- Step 1 Disconnect the wire to the electric shut-off on the injection pump so that the engine will not start. Crank the engine for 30 seconds until there is oil pressure, then reconnect the wire.
- Step 2 Remove the air from the cooling system at the temperature sending unit for the 6-590 and 6T-590 engine. Loosen the upper plug on the aftercooler to remove the air from the cooling system for the 6TA-590 engine.
- Step 3 Run the engine at 1000 RPM minimum load for 5 minutes and check for oil leaks.
- Step 4 During the Run-In, continue to check the oil pressure, coolant level, and coolant temperature.

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 control 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 | 5 Minutes | 1000 RPM | 50 |
| 2 | 5 Minutes | 1100 RPM | 1/2 |
| 3 | 5 Minutes | 2200 RPM | Full |

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

| STEP | TIME | ENGINE SPEED | LOAD |
|------|-----------|--------------|------------|
| 1 | 5 Minutes | 1000 RPM | No Load |
| 2 | 5 Minutes | 1100 RPM | Light Load |
| 3 | 5 Minutes | 2200 RPM | Full |

Run-In Procedure (Agriculture 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 moving the lever to a lower gear. The engine must not be "lugged" below the rated engine RPM during 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 converter or hydraulic stall. The engine must not be "lugged" below the Rated Engine RPM (Do not stall the engine more than 10 seconds).

ENGINE SPECIFICATION DETAILS

| | Metric Value |
|---------------------------------------|-----------------------|
| Cylinder Block | |
| Type | Non-Sleeved |
| Material | Cast Iron |
| ID of Cylinder | 102.00 to 102.04 mm |
| Maximum Service Limit | 102.116 mm |
| Cylinder Out of Round (Maximum) | 0.038 mm |
| Cylinder Taper (Maximum) | 0.076 mm |
| 0.5 mm Oversize Piston | |
| Machine Cylinder Bore to | 102.40 to 102.44 mm |
| Hone Cylinder Bore to | 102.50 to 102.54 mm |
| 1.00 mm Oversize Piston | |
| Machine Cylinder Bore to | 102.900 to 102.960 mm |
| Hone Cylinder Bore to | 103.00 to 103.04 mm |

Service Cylinder Sleeve

| | |
|--------------------------------------|-----------------------|
| Type | Dry, Can Be Replaced |
| Material | Cast Iron |
| Machine Cylinder Block Bore to | 104.485 to 104.515 mm |
| Installation | Press Fit |
| Hone Cylinder Bore to | 102.00 to 102.10 mm |

Piston

| | |
|---|-----------------------|
| Type | Cam Ground |
| Material | Aluminum alloy |
| OD at 12 mm From the Bottom, 90 Degrees From Piston Pin | |
| Standard Size Piston | 101.873 to 101.887 mm |
| Minimum Service Limit | 101.823 mm |
| 0.5 mm Oversize Piston | 102.373 to 102.387 mm |
| Minimum Service Limit | 102.323 mm |
| 1.0 mm Oversize Piston | 102.873 to 102.887 mm |
| Minimum Service Limit | 102.823 mm |
| ID of Piston Pin Bore | 40.006 to 40.012 mm |
| Maximum Service Limit | 40.025 mm |
| Width of 1st Ring Groove (Top) | 2.465 to 2.485 mm |
| Width of 2nd Ring Groove (Intermediate) | 2.425 to 2.445 mm |
| Width of 3rd Ring Groove (Oil Ring) | 4.040 to 4.060 mm |
| Protrusion Above Cylinder Block (Maximum) | 0.660 mm |

Piston Pin

| | |
|-----------------------------|---------------------|
| Type | Full Float |
| OD of Pin | 39.997 to 40.003 mm |
| Minimum Service Limit | 39.990 mm |