INTRODUCTION

The specifications given in this book are on the basis of information available at the time the book was written. These specifications give the torques, operating pressure, measurements of new parts, adjustments and other items that will affect the service of the product.

When the words “use again” are in the description, the specification given can be used to determine if a part can be used again. If the part is equal to or within the specification given, use the part again.

When the word “permissible” is in the description, the specification given is the “maximum or minimum” tolerance permitted before adjustment, repair and/or new parts are needed.

A comparison can be made between the measurements of a worn part, and the specifications of a new part to find the amount of wear. A part that is worn can be safe to use if an estimate of the remainder of its service life is good. If a short service life is expected, replace the part.

NOTE: The specifications given for “use again” and “permissible” are intended for guidance only and Caterpillar Tractor Co. hereby expressly denies and excludes any representation, warranty or implied warranty of the reuse of any component.

INDEX

Air Compressor .................................. 29
Air Inlet Manifold ................................ 15
Allison Transmission (Mounting Group) ....... 23
Alternators ....................................... 27
Automatic Timing Advance Unit .................. 8
Camshaft .......................................... 10
Connecting Rod ................................... 20
Crankshaft ........................................ 21
Cylinder Block .................................... 19
Cylinder Head .................................... 14
Drive Gear for the Injection Pump ................ 8
Engine Design ..................................... 4
Fan Drive ......................................... 22
Flywheel .......................................... 23
Flywheel Housing Bore ............................ 26
Flywheel Housing Runout .......................... 25
Flywheel Runout ................................... 24
Fuel Filter Base .................................... 7
Fuel Injection Pump ............................... 5
Fuel Transfer Pump ................................ 7
Governor .......................................... 6
Injection Nozzle ................................... 6
Lubrication System ................................ 16
Manifold and Ventilation Valve .................... 15
Oil Level Gauge .................................... 16
Oil Pump ........................................... 17
Piston ................................................ 20
Pulley and Damper ................................. 22
Shutoff Solenoid ................................... 29
Starter Solenoids ................................... 28
Starting Motors .................................... 27
V-Belt Tension Chart ............................... 18
Valves .............................................. 11
Valve Covers ....................................... 9
Valve Rocker Arms and Cam Followers .......... 9
Valve Seats and Inserts ............................ 12-15
Water Pump ........................................ 18
Water Temperature Regulator ..................... 18
<table>
<thead>
<tr>
<th>SYSTEMS OPERATION</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Inlet and Exhaust System</td>
<td>10-11</td>
</tr>
<tr>
<td>Automatic Timing Advance Unit</td>
<td>8</td>
</tr>
<tr>
<td>Basic Block</td>
<td>17</td>
</tr>
<tr>
<td>Constant Bleed Valve</td>
<td>7</td>
</tr>
<tr>
<td>Cooling System</td>
<td>14-16</td>
</tr>
<tr>
<td>Electrical System</td>
<td>18</td>
</tr>
<tr>
<td>Alternator (Delco-Remy)</td>
<td>18</td>
</tr>
<tr>
<td>Solenoid</td>
<td>18</td>
</tr>
<tr>
<td>Starting Motor</td>
<td>18</td>
</tr>
<tr>
<td>System Components</td>
<td>18</td>
</tr>
<tr>
<td>Flow of Fuel Using the Priming Pump</td>
<td>7</td>
</tr>
<tr>
<td>Fuel System</td>
<td>4-9</td>
</tr>
<tr>
<td>Function of Fuel Junction Block</td>
<td>9</td>
</tr>
<tr>
<td>Lubrication System</td>
<td>12-13</td>
</tr>
<tr>
<td>Operation of 9L6969 Fuel Injection Nozzle</td>
<td>8</td>
</tr>
<tr>
<td>Operation of Fuel Injection Pumps</td>
<td>7</td>
</tr>
<tr>
<td>Vibration Damper</td>
<td>17</td>
</tr>
<tr>
<td>Water Separator</td>
<td>9</td>
</tr>
</tbody>
</table>
the chart. If the opening pressure is less than 2200 psi (15 200 kPa), do not use the fuel injection nozzle again.

NOTE: The valve in the fuel injection nozzle can be good and still not make a noise (chatter), or not have a very fine vapor (spray) from the orifices in the tip of the fuel injection nozzle during Step 2.

<table>
<thead>
<tr>
<th>VALVE NO.</th>
<th>OPENING PRESSURE</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>9L6969</td>
<td>Used</td>
<td>2400 to 2900 psi</td>
<td>(16 545 to 19 980 kPa)</td>
</tr>
<tr>
<td></td>
<td>New</td>
<td>2750 to 2900 psi</td>
<td>(18 945 to 19 980 kPa)</td>
</tr>
</tbody>
</table>

NOTE: The correct setting of the opening pressure for used nozzles that have been cleaned is 2700 to 2900 psi (18 600 to 19 980 kPa).

3. To make an adjustment to the opening pressure, use the following procedure:
   a. Remove the fuel injection nozzle (5) from the 5P4150 Nozzle Tester and put it in the 8S2250 Nozzle Holding Tool (11). Loosen locknut (9) holding the lift adjustment screw. Turn the lift adjustment screw (10) counterclockwise one turn.

   b. Hold the lift adjustment screw (10) with a 5/64" hex wrench (13) and remove the locknut (9).

   c. Loosen the locknut (6) that holds the pressure adjustment screw (7).

   d. Put the fuel injection nozzle (5) on the nozzle tester (2). Turn the pressure adjustment screw (7) clockwise using a 5P4813 Socket (15). Each one-fourth of a turn will increase the opening pressure approximately 250 psi (1720 kPa). Do not turn more than one-half of a turn to increase the opening pressure.

CAUTION: If the lift adjustment screw is not turned counterclockwise one turn, the valve can be bent or the seat for the valve can be damaged when the pressure adjustment screw is turned.
INDEX

Cooling System (above normal heating; below normal heating) ........ 24
Difficult Starting (engine crankshaft turns freely) .................. 20
Difficult Starting (engine crankshaft will not turn; engine crankshaft turns too slowly) .................. 22
Fuel in Crankcase Oil ............................................ 30
Loss of Coolant .................................................. 28
Low Power .......................................................... 4
Misfiring and Running Rough ....................................... 12
Problem With Vehicle or Vehicle Operation ............................ 8
Too Much Exhaust Smoke (Black or Gray) ............................ 14
Too Much Exhaust Smoke (White Smoke; Blue Smoke) ................ 18
Introduction To The Troubleshooting Guide ............................ 2
# GENERAL INSTRUCTIONS

## DISASSEMBLY AND ASSEMBLY

### INDEX

<table>
<thead>
<tr>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Batteries</td>
<td>7</td>
</tr>
<tr>
<td>Bearings</td>
<td>6</td>
</tr>
<tr>
<td>Anti-Friction</td>
<td>6</td>
</tr>
<tr>
<td>Double Row, Tapered Roller</td>
<td>6</td>
</tr>
<tr>
<td>Heating Bearings</td>
<td>7</td>
</tr>
<tr>
<td>Installation</td>
<td>7</td>
</tr>
<tr>
<td>Preload</td>
<td>7</td>
</tr>
<tr>
<td>Sleeve Bearings</td>
<td>7</td>
</tr>
<tr>
<td>Bolts and Bolt Torque</td>
<td>5</td>
</tr>
<tr>
<td>Torque Wrench Extension</td>
<td>5</td>
</tr>
<tr>
<td>T-T-T Procedure</td>
<td>5</td>
</tr>
<tr>
<td>Cleanliness</td>
<td>2</td>
</tr>
<tr>
<td>Disassembly and Assembly</td>
<td>2</td>
</tr>
<tr>
<td>First Operation of a Rebuilt Engine</td>
<td>3</td>
</tr>
<tr>
<td>Fractions, Decimals and Millimeters Chart</td>
<td>8</td>
</tr>
<tr>
<td>Gaskets</td>
<td>7</td>
</tr>
<tr>
<td>Lines and Wires</td>
<td>6</td>
</tr>
<tr>
<td>Locks</td>
<td>6</td>
</tr>
<tr>
<td>Lubrication</td>
<td>6</td>
</tr>
<tr>
<td>Pressing Parts</td>
<td>4</td>
</tr>
<tr>
<td>Removal and Installation</td>
<td>2</td>
</tr>
<tr>
<td>Rust Preventive Compound</td>
<td>6</td>
</tr>
<tr>
<td>Safety</td>
<td>2</td>
</tr>
<tr>
<td>Seals (Lip-Type)</td>
<td>7</td>
</tr>
<tr>
<td>Service Tools</td>
<td>3</td>
</tr>
<tr>
<td>Bearing Cup Pulling Attachment</td>
<td>3</td>
</tr>
<tr>
<td>Bearing Pulling Attachment</td>
<td>3</td>
</tr>
<tr>
<td>Puller Assembly (2 or 3 arm)</td>
<td>3</td>
</tr>
<tr>
<td>Push Pullers</td>
<td>4</td>
</tr>
<tr>
<td>Shims</td>
<td>4</td>
</tr>
<tr>
<td>Tool Safety</td>
<td>4</td>
</tr>
<tr>
<td>Torque Wrench Extension</td>
<td>5</td>
</tr>
</tbody>
</table>
CHECK VALVE AND BYPASS VALVE

INSTALL CHECK VALVE AND BYPASS VALVE

1. Install the bypass valve (2) and spring (1) in the pump housing.

2. Install the cover (3) on the pump housing. Be sure the spring (1) is in the bore in the lever.

3. Install the seven bolts that hold the cover to the pump housing.

4. Install a new gasket (5) on the cover. Install a new check valve (4) in the flange assembly (6). Put the flange assembly in position on the cover.

5. Install a new gasket (7) on the flange assembly. Install flange (8) on the flange assembly with the bolts that hold them to the cover.

end by:

a) install fuel injection pump housing and governor
INDEX

Basic Block ......................................................... 4-15
Cleaning Procedure ............................................... 5
Cylinder Block Honing ............................................. 4
Line Boring Main Bearing Bores ................................. 11
Line Boring Main Bearing Cap ..................................... 9
Main Bearing Bores .................................................. 9
Main Bearing Cap Guide Width ................................. 9
Specifications and Tolerances ................................... 7
Sunnen CK-10 Machining Data .................................. 6
Tightening Procedure For the Bolts For Main Bearing Caps 8
Transit Preparation ................................................ 5

Camshaft .......................................................... 26-28
Camshaft Bearings Removal and Installation .................. 27
Camshaft Followers ................................................ 26
Camshaft Gears ..................................................... 26
Cylinder Head and Valve Components ......................... 16-19
Cylinder Head and Valve Components ......................... 16
Valve Grinding Specifications ................................... 18
Valve Spring Specifications ....................................... 19
Valve Springs ....................................................... 19
Connecting Rod .................................................... 20
Crankshaft .......................................................... 22-25
Crankshaft Front Oil Seal Installation ......................... 25
Crankshaft Front Oil Seal Removal .............................. 24
Crankshaft Gear Installation ..................................... 23
Crankshaft Gear Removal ......................................... 23
Crankshaft Grinding Specifications ............................. 22
Crankshaft Pulley Installation .................................... 25
Crankshaft Pulley Removal ....................................... 25
Crankshaft Rear Oil Seal Installation ......................... 24
Crankshaft Rear Oil Seal Removal .............................. 24
Crankshaft Wear Sleeve Installation ......................... 24
Crankshaft Wear Sleeve Removal .............................. 23

Engine Test Procedure ........................................... 29, 30
Dynamometer Test Precaution .................................... 29
Initial Operation After Engine Reconditioning ............... 30
Lubrication For a Rebuilt Engine ............................... 29
Procedure For Pressure Lubrication ............................ 29

Oil Pump ............................................................ 21

Sunnen CK-10 Owners By States ................................ 31-47
INDEX

CLICK ANYWHERE FOR MORE DETAILS

SYSTEMS OPERATION

EGR Actuator and Solenoids .................................. 6, 7
EGR Switch and Cover Assembly ................................. 5, 6
EGR Valve .................................................................. 7

General Information .................................................. 4

TESTING AND ADJUSTING

Adjustment of Linkage From Actuator to EGR Valve ........ 14
Checking EGR Switch .................................................. 10
Fuel Setting .................................................................. 9, 10

Troubleshooting .......................................................... 8
Voltage Check With EGR Switch In Place ....................... 11, 12

SPECIFICATIONS

Air Inlet Manifold ...................................................... 17
Automatic Timing Advance Unit .................................. 20
Breather ..................................................................... 17
EGR Actuator ............................................................... 18
EGR Actuator and Valve (linkage adjustment) ................. 19
EGR Valve .................................................................... 19
Fuel Setting ................................................................. 20

General Tightening Torque ......................................... 15

DISASSEMBLY AND ASSEMBLY

Actuator, Disassembly and Assembly ......................... 24-26
Actuator and EGR Valve .............................................. 23
Air Inlet Manifold ....................................................... 27
Crankcase Breather ...................................................... 28
EGR Switch Assembly .................................................. 21, 22
EGR Valve, Disassembly and Assembly ....................... 26
ADJUSTMENT OF LINKAGE FROM ACTUATOR TO EGR VALVE

Tools Needed: 5P7345 Calibration Gauge

1. Disconnect EGR tube from EGR valve. Disconnect other end of EGR tube from air inlet manifold. Remove EGR tube.

2. Install 5P7345 Calibration Gauge (5) in small opening in EGR valve (6). Turn lever (1) clockwise and put calibration gauge (5) into opening. Stud on valve (6) goes in hole in calibration gauge (5). Install nut on stud to hold calibration gauge (5) in place.

3. Loosen locknut (3) on rod (4). Turn rod (4) out of rod end (2) several turns. Then turn rod (4) into rod end (2) until resistance is felt.

4. Tighten locknut (3) to a torque of 31.2 ± 4.5 lb.in. (3.5 ± 0.5 N·m).

5. Remove calibration gauge (5) and install EGR tube.