Genie® Z-45/22
Service Manual

Second Edition, First Printing
Part No. 32960
Important

Read, understand and obey the safety rules and operating instructions in the Genie Z-45/22 Operator’s Manual before attempting any maintenance or repair procedure.

This service manual covers the Genie Z-45/22 2WD and 4WD models introduced in 1994.

This manual provides detailed scheduled maintenance information for the machine owner and user. It also provides troubleshooting and repair procedures for qualified service professionals.

Basic mechanical, hydraulic and electrical skills are required to perform most procedures. However, several procedures require specialized skills, tools, lifting equipment and a suitable workshop. In these instances, we strongly recommend that maintenance and repair be performed at a Genie dealer service center.

Genie Industries has endeavored to deliver the highest degree of accuracy possible. However, continuous improvement of our products is a Genie policy. Therefore product specifications are subject to change without notice.

Readers are encouraged to notify Genie of errors and send in suggestions for improvement. All communications will be carefully considered for future printings of this and other manuals. Please write to the technical publications team in care of Genie Industries, PO Box 69, Redmond WA 98073-0069 USA.

If you have any questions, call Genie Industries.

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Important

Verify Correct Manual

Do not read any further until you have verified that this is the correct manual for this machine. Contact Genie Industries if you have any questions.

This manual covers the Genie Z-45/22 2WD and 4WD models produced from May 1994, starting with serial number Z-45-001523.

The serial number plate is located under the engine side turntable cover. It is secured to the bulkhead near the hydraulic pump.


Do not use this manual with the Genie Z-45/22 DC, Bi-fuel, Tri-fuel, Diesel and Gas/LPG models. Compare turntable cover size and shape.
Safety Rules

Danger
Failure to obey the instructions and safety rules in this manual, and the Genie Z-45/22 Operating Instruction Manual will result in death or serious injury.

Many of the hazards identified in the operating instruction manual are also safety hazards when maintenance and repair procedures are performed.

Do Not Perform Maintenance Unless:

☑ You are trained and qualified to perform maintenance on this machine.

☑ You read, understand and obey:
  - manufacturer’s instructions and safety rules
  - employer’s safety rules and worksite regulations
  - applicable governmental regulations

☑ You have the appropriate tools, lifting equipment and a suitable workshop.
SAFETY RULES

Personal Safety

Any person working on or around a machine must be aware of all known safety hazards. Personal safety and the continued safe operation of the machine should be your number one priority.

Read each procedure thoroughly. This manual and the decals, on the machine, use signal words to identify the following:

**DANGER** Indicates the presence of a hazard that *will* cause death or serious injury.

**WARNING** Indicates the presence of a hazard that *may* cause death or serious injury.

**CAUTION** Indicates the presence of a hazard that *will* or *may* cause serious injury or damage to the machine.

**NOTICE** Indicates special operation or maintenance information.

Be sure to wear protective eye wear and other protective clothing if the situation warrants it.

Be aware of potential crushing hazards such as moving parts, free swinging or unsecured components, and lifting or placing loads. Always wear approved steel-toed shoes.

Workplace Safety

Be sure to keep sparks, flames and lighted tobacco away from flammable and combustible materials like battery gases and engine fuels. Always have an approved fire extinguisher within easy reach.

Be sure that all tools and working areas are properly maintained and ready for use. Keep work surfaces clean and free of debris that could get into machine components and cause damage.

Be sure that your workshop or work area is properly ventilated and well lit.

Be sure any forklift, overhead crane or other lifting or supporting device is fully capable of supporting and stabilizing the weight to be lifted. Use only chains or straps that are in good condition and of ample capacity.

Be sure that fasteners intended for one time use (i.e., cotter pins and self-locking nuts) are not reused. These components may fail if they are used a second time.

Be sure to properly dispose of old oil or other fluids. Use an approved container. Please be environmentally safe.
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<th>Stowed dimension</th>
<th>2WD</th>
<th>4WD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Length</strong></td>
<td>17 ft 8 1/2 in, 5.4m</td>
<td>17 ft 10 3/4 in, 5.45m</td>
</tr>
<tr>
<td>Width</td>
<td>6 ft 8 1/4 in, 203.8cm</td>
<td>6 ft 4 5/8 in, 194.6cm</td>
</tr>
<tr>
<td>Rough terrain</td>
<td>5 ft 9 9/16 in, 176.8cm</td>
<td></td>
</tr>
<tr>
<td>Industrial</td>
<td>8 @ 5/8 -18</td>
<td></td>
</tr>
<tr>
<td>Height</td>
<td>6 ft 6 in, 1.98m</td>
<td>7 ft 4 in, 2.23m</td>
</tr>
<tr>
<td>Weight</td>
<td>13860 lbs, 6287kg</td>
<td>14410 lbs, 6536kg</td>
</tr>
<tr>
<td>Ground clearance</td>
<td>8 in, 20.3cm</td>
<td>11 in, 27.9cm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Platform dimensions</th>
<th>2WD</th>
<th>4WD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Length</strong></td>
<td>6 ft, 182.8cm</td>
<td>6 ft, 182.8cm</td>
</tr>
<tr>
<td>Width</td>
<td>30 in, 76.2cm</td>
<td>30 in, 76.2cm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Operational dimensions</th>
<th>2WD</th>
<th>4WD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum platform height</td>
<td>45 ft, 13.72m</td>
<td>45 ft, 13.72m</td>
</tr>
<tr>
<td>Maximum horizontal reach</td>
<td>23 ft, 7m</td>
<td>23 ft, 7m</td>
</tr>
<tr>
<td>Maximum up-and-over clearance</td>
<td>21 ft 7 in, 6.58m</td>
<td>21 ft 7 in, 6.58m</td>
</tr>
<tr>
<td>Maximum turntable tailswing</td>
<td>1 inch, 2.54cm</td>
<td>none</td>
</tr>
<tr>
<td>Wheelbase</td>
<td>6 ft 3 in, 190.5cm</td>
<td>6 ft 3 in, 190.5cm</td>
</tr>
<tr>
<td>Minimum turning circle, outside</td>
<td>14 ft 4 in, 4.37m</td>
<td>14 ft 9 in, 4.49m</td>
</tr>
<tr>
<td>Minimum turning circle, inside</td>
<td>7 ft, 2.13m</td>
<td>6 ft 8 in, 2.03m</td>
</tr>
<tr>
<td>Turntable rotation</td>
<td>359°</td>
<td>359°</td>
</tr>
<tr>
<td>Platform rotation</td>
<td>180°</td>
<td>180°</td>
</tr>
</tbody>
</table>

### Tires and wheels

<table>
<thead>
<tr>
<th>Rough terrain</th>
<th>Industrial</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Wheel diameter</strong></td>
<td>17.5 inches</td>
</tr>
<tr>
<td><strong>Wheel width</strong></td>
<td>10.5 inches</td>
</tr>
<tr>
<td><strong>Wheel lugs - 4WD</strong></td>
<td>9 @ 5/8-18</td>
</tr>
<tr>
<td><strong>Wheel lugs - 2WD</strong></td>
<td>8 @ 5/8 -18, 9 @ 5/8 -18</td>
</tr>
<tr>
<td><strong>Lug nut torque</strong></td>
<td>125 ft-lbs, 380 Nm</td>
</tr>
<tr>
<td><strong>Tire size</strong></td>
<td>14-17.5NHS</td>
</tr>
<tr>
<td><strong>Tire ply rating</strong></td>
<td>8</td>
</tr>
<tr>
<td><strong>Tire contact area</strong></td>
<td>59 sq in, 380sq cm</td>
</tr>
<tr>
<td><strong>Overall tire diameter</strong></td>
<td>35.8 inches, 91cm</td>
</tr>
<tr>
<td><strong>Tire pressure</strong></td>
<td></td>
</tr>
<tr>
<td>2WD</td>
<td>40 psi, 2.76 bar</td>
</tr>
<tr>
<td>4WD</td>
<td>28 psi, 1.93 bar</td>
</tr>
</tbody>
</table>

### Fluid capacities

| **Fuel tank** | 15 gallons | 56.8 liters |
| **Propane tank** | 33.5 pounds | 15.2kg |
| **Hydraulic tank** | 25 gallons | 95 liters |
| **Hydraulic system (including tank)** | 30 gallons | 114 liters |
| **Torque hubs** | 17 ounces | 0.5 liters |

Continuous improvement of our products is a Genie policy. Product specifications are subject to change without notice.
## SPECIFICATIONS

### Performance Specifications

<table>
<thead>
<tr>
<th>Drive speeds, maximum</th>
<th>2WD</th>
<th>4WD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boom lowered, high range</td>
<td>5.0 mph</td>
<td>4.8 mph</td>
</tr>
<tr>
<td></td>
<td>8.0km/h</td>
<td>7.7km/h</td>
</tr>
<tr>
<td>Boom lowered, low range</td>
<td>1.1 mph</td>
<td>0.9 mph</td>
</tr>
<tr>
<td></td>
<td>1.8km/h</td>
<td>1.4km/h</td>
</tr>
<tr>
<td></td>
<td>or 5 feet in 3 sec.</td>
<td>or 4 feet in 3 sec.</td>
</tr>
<tr>
<td>Boom raised, high range</td>
<td>0.68 mph / 1km/h or 1 foot per second</td>
<td></td>
</tr>
<tr>
<td>Boom raised, low range</td>
<td>0.68 mph / 1km/h or 1 foot per second</td>
<td></td>
</tr>
</tbody>
</table>

### Gradeability (stowed)

| Gradeability (stowed) | 30% | 40% |

### Boom function speeds, maximum from platform controls

<table>
<thead>
<tr>
<th>Function</th>
<th>2WD</th>
<th>4WD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary boom extend</td>
<td>29 seconds</td>
<td></td>
</tr>
<tr>
<td>Primary boom retract</td>
<td>25 seconds</td>
<td></td>
</tr>
<tr>
<td>Primary boom up</td>
<td>27 seconds</td>
<td></td>
</tr>
<tr>
<td>Primary boom down</td>
<td>35 seconds</td>
<td></td>
</tr>
<tr>
<td>Secondary boom up</td>
<td>25 seconds</td>
<td></td>
</tr>
<tr>
<td>Secondary boom down</td>
<td>25 seconds</td>
<td></td>
</tr>
<tr>
<td>Turntable rotate (359°)</td>
<td>73 seconds</td>
<td></td>
</tr>
<tr>
<td>Platform rotate (180°)</td>
<td>15 seconds</td>
<td></td>
</tr>
<tr>
<td>Platform level up</td>
<td>25 seconds</td>
<td></td>
</tr>
<tr>
<td>Platform level down</td>
<td>15 seconds</td>
<td></td>
</tr>
<tr>
<td>Multiple function stowed to full raised</td>
<td>60 seconds</td>
<td></td>
</tr>
<tr>
<td>Multiple function full raised to stowed</td>
<td>60 seconds</td>
<td></td>
</tr>
</tbody>
</table>

### Hydraulic Specifications

<table>
<thead>
<tr>
<th>Hydraulic fluid</th>
<th>Dexron II equivalent</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Drive pump</th>
<th>bi-directional variable displacement piston pump</th>
</tr>
</thead>
<tbody>
<tr>
<td>Displacement</td>
<td>0 - 25 gpm 0 - 1.6 liters/second</td>
</tr>
<tr>
<td>Maximum drive pressure</td>
<td>3800 psi 262 bar</td>
</tr>
<tr>
<td>Charge pressure Eskridge brake</td>
<td>360 psi 24.8 bar</td>
</tr>
<tr>
<td>Mico brake</td>
<td>290 psi 20 bar</td>
</tr>
<tr>
<td>Medium pressure filter</td>
<td>3 micron</td>
</tr>
<tr>
<td>Medium pressure filter bypass pressure</td>
<td>50 psi 345 kPa</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Drive manifold</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor shift/brake relief pressure Eskridge brake</td>
<td>320 psi 22 bar</td>
</tr>
<tr>
<td>Mico brake</td>
<td>250 psi 17.2 bar</td>
</tr>
<tr>
<td>4WD front motor flow regulators</td>
<td>3.0 gpm 11.4 liters/minute</td>
</tr>
<tr>
<td>4WD rear motor flow regulators</td>
<td>4.5 gpm 17.0 liters/minute</td>
</tr>
<tr>
<td>2WD rear motor flow regulators</td>
<td>7.0 gpm 26.5 liters/minute</td>
</tr>
</tbody>
</table>
### Front drive motors - 4WD models

| Displacement per revolution | 2.1 cu in | 34.4cc |

### Rear drive motor

| Displacement per revolution | High - 2.8 cu in / 45.9cc | Low - 0.15 cu in / 2.5cc |

### Function pump

<table>
<thead>
<tr>
<th>Type</th>
<th>fixed displacement gear pump</th>
</tr>
</thead>
<tbody>
<tr>
<td>Displacement</td>
<td>6.4 gpm @ 2150 rpm</td>
</tr>
<tr>
<td></td>
<td>0.4 liters/second</td>
</tr>
<tr>
<td>Function circuit return</td>
<td>10 micron with line filter</td>
</tr>
<tr>
<td></td>
<td>25 psi / 172kPa bypass</td>
</tr>
</tbody>
</table>

### Function manifold

| Function relief                          | 2200 psi                     |
|                                          | 152 bar                      |
| Secondary down relief                    | 1200 psi                     |
|                                          | 83 bar                       |
| Primary down relief                      | 1200 psi                     |
|                                          | 83 bar                       |
| Primary extend relief                    | 1200 psi                     |
|                                          | 83 bar                       |
| Steer/oscillate flow regulator           | 1.5 gpm                      |
|                                          | 5.7 liters/minute            |

### Steer/oscillate manifold

| Sequencing valve pressure                | 1800 psi                     |
|                                          | 123 bar                      |
| Accumulator                              | 1600 psi                     |
| pre-charge pressure                      | 110 bar                      |

### Auxiliary pump

<table>
<thead>
<tr>
<th>Type</th>
<th>fixed displacement gear pump</th>
</tr>
</thead>
<tbody>
<tr>
<td>Displacement</td>
<td>0.85 gpm</td>
</tr>
<tr>
<td></td>
<td>3.2 liters/minute</td>
</tr>
<tr>
<td>Auxillary pump</td>
<td>2030 psi</td>
</tr>
<tr>
<td>relief pressure</td>
<td>138 bar</td>
</tr>
</tbody>
</table>
BOLT TORQUE SPECIFICATIONS

Bolt Torque Specifications

<table>
<thead>
<tr>
<th>Size</th>
<th>Threads</th>
<th>SAE Grade 5 Bolts</th>
<th>SAE Grade 8 Bolts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Torque - Dry inch-pounds</td>
<td>Torque - Dry foot-pounds</td>
</tr>
<tr>
<td>No. 10</td>
<td>24</td>
<td>43</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>32</td>
<td>49</td>
<td>6</td>
</tr>
<tr>
<td>1/4 inch</td>
<td>20</td>
<td>96</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>28</td>
<td>120</td>
<td>14</td>
</tr>
<tr>
<td>5/16 inch</td>
<td>18</td>
<td>17</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>24</td>
<td>19</td>
<td>28</td>
</tr>
<tr>
<td>3/8 inch</td>
<td>16</td>
<td>30</td>
<td>41</td>
</tr>
<tr>
<td></td>
<td>24</td>
<td>35</td>
<td>48</td>
</tr>
<tr>
<td>7/16 inch</td>
<td>14</td>
<td>50</td>
<td>68</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>55</td>
<td>75</td>
</tr>
<tr>
<td>1/2 inch</td>
<td>13</td>
<td>75</td>
<td>102</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>90</td>
<td>122</td>
</tr>
<tr>
<td>9/16 inch</td>
<td>12</td>
<td>110</td>
<td>149</td>
</tr>
<tr>
<td></td>
<td>18</td>
<td>120</td>
<td>163</td>
</tr>
<tr>
<td>5/8 inch</td>
<td>11</td>
<td>150</td>
<td>204</td>
</tr>
<tr>
<td></td>
<td>18</td>
<td>170</td>
<td>231</td>
</tr>
<tr>
<td>3/4 inch</td>
<td>10</td>
<td>260</td>
<td>353</td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>300</td>
<td>407</td>
</tr>
<tr>
<td>7/8 inch</td>
<td>9</td>
<td>430</td>
<td>583</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>470</td>
<td>637</td>
</tr>
<tr>
<td>1 inch</td>
<td>8</td>
<td>640</td>
<td>868</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>700</td>
<td>949</td>
</tr>
</tbody>
</table>

Torque specification for lubricated bolts is 25% less than dry torque specification for bolt size.

These bolt torque specifications are for general use only. Specification may vary depending on application of bolt.
### Ford Engine LSG-423

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Displacement</td>
<td>140 cu in / 2.3 liters</td>
</tr>
<tr>
<td>Number of cylinders</td>
<td>4</td>
</tr>
<tr>
<td>Bore and stroke</td>
<td>3.780 x 3.126 inches / 96 x 79.4 mm</td>
</tr>
<tr>
<td>Horsepower</td>
<td>63 @ 4000 rpm</td>
</tr>
<tr>
<td>Firing order</td>
<td>1 - 3 - 4 - 2</td>
</tr>
<tr>
<td>High idle</td>
<td>2150 rpm</td>
</tr>
<tr>
<td>Low idle</td>
<td>1400 rpm</td>
</tr>
<tr>
<td>Governor</td>
<td>electronic</td>
</tr>
<tr>
<td>Compression pressure</td>
<td>psi of lowest cylinder must be at least 75% of highest cylinder</td>
</tr>
<tr>
<td>Valve clearances</td>
<td></td>
</tr>
<tr>
<td>Intake</td>
<td>0.0010 - 0.0027 inches / 0.025 - 0.068mm</td>
</tr>
<tr>
<td>Exhaust</td>
<td>0.0015 - 0.0032 inches / 0.038 - 0.081mm</td>
</tr>
<tr>
<td>Lubrication System</td>
<td></td>
</tr>
<tr>
<td>Oil pressure (operating temp. @ 2150 rpm)</td>
<td>40-60 psi / 276-414 kPa</td>
</tr>
<tr>
<td>Oil capacity (including filter)</td>
<td>5 quarts / 4.71 liters</td>
</tr>
<tr>
<td>Oil viscosity requirements</td>
<td></td>
</tr>
<tr>
<td>Below 60°F / 15.5°C</td>
<td>5W - 30</td>
</tr>
<tr>
<td>-10 to 90°F / -23 to 32°C</td>
<td>10W - 30</td>
</tr>
<tr>
<td>above -10°F / -23°C</td>
<td>10W - 40 or 10W - 50</td>
</tr>
<tr>
<td>above 25°F / -4°C</td>
<td>20W - 40 or 20W - 50</td>
</tr>
<tr>
<td>Use oils meeting API classification SF (labeled SF/CC or SF/CD) as they offer improved wear protection.</td>
<td></td>
</tr>
</tbody>
</table>

### Starter motor

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal engine cranking speed</td>
<td>110 rpm</td>
</tr>
<tr>
<td>Current draw, normal load</td>
<td>150A</td>
</tr>
<tr>
<td>Current draw, maximum load</td>
<td>460A</td>
</tr>
<tr>
<td>Current draw, no load</td>
<td>70A</td>
</tr>
<tr>
<td>Maximum circuit voltage drop (normal temp)</td>
<td>0.5V DC</td>
</tr>
<tr>
<td>Brush length, new</td>
<td>0.50 inches</td>
</tr>
<tr>
<td></td>
<td>12.7mm</td>
</tr>
<tr>
<td>Brush length, wear limit</td>
<td>0.25 inches</td>
</tr>
<tr>
<td></td>
<td>6.35mm</td>
</tr>
<tr>
<td>Brush spring tension</td>
<td>40 ounces</td>
</tr>
<tr>
<td>Bolt torque through brush</td>
<td>55 - 75 inch-pounds / 98 - 134gm-cm</td>
</tr>
<tr>
<td>Brush mounting bolt torque</td>
<td>15 - 20 foot-pounds / 2.1 - 2.7kg-m</td>
</tr>
<tr>
<td>Maximum commutator run out</td>
<td>0.005 inches</td>
</tr>
<tr>
<td></td>
<td>0.127mm</td>
</tr>
</tbody>
</table>

### Battery

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>12V, Group 24</td>
</tr>
<tr>
<td>Ampere hour</td>
<td>75A</td>
</tr>
<tr>
<td>Cold Cranking Ampere</td>
<td>875A</td>
</tr>
<tr>
<td>Reserve capacity @ 25A rate</td>
<td>125 minutes</td>
</tr>
</tbody>
</table>

### Fuel Pump

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Static pressure</td>
<td>5.0 - 7.0 psi</td>
</tr>
<tr>
<td>Minimum volume flow</td>
<td>1 pint / 473cc in 25 seconds</td>
</tr>
</tbody>
</table>
## Ignition System

<table>
<thead>
<tr>
<th>Item / Size</th>
<th>Torque (ft-lbs)</th>
<th>Torque (Nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ignition spark advance</td>
<td>10° BTDC</td>
<td></td>
</tr>
<tr>
<td>Ignition coil primary resistance</td>
<td>1.13 - 1.25W (75°F)</td>
<td></td>
</tr>
<tr>
<td>Ignition coil secondary resistance</td>
<td>7700 - 9300W (75°F)</td>
<td></td>
</tr>
<tr>
<td>Spark plug type</td>
<td>Motorcraft AWSF-52</td>
<td></td>
</tr>
<tr>
<td>Spark plug gap</td>
<td>0.042 - 0.046 inches [1.07 - 1.18mm]</td>
<td></td>
</tr>
</tbody>
</table>

## Coolant capacity

- 11.5 quarts (10.9 liters)

## Alternator output

- 35A, 14.5V

## Fan belt deflection

- 3/8 to 1/2 inch (9 to 12 mm)

## Bolt torque specifications

<table>
<thead>
<tr>
<th>Item / Size</th>
<th>Torque (ft-lbs)</th>
<th>Torque (Nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auxiliary shaft gear bolt / M-10</td>
<td>28-40</td>
<td>38-54</td>
</tr>
<tr>
<td>Auxiliary shaft thrust plate bolt / M-6</td>
<td>6-9</td>
<td>8-12</td>
</tr>
<tr>
<td>Belt tensioner (timing) pivot bolt / M-10</td>
<td>28-40</td>
<td>38-54</td>
</tr>
<tr>
<td>Belt tensioner (timing) adjusting bolt / M-8</td>
<td>14-21</td>
<td>19-28</td>
</tr>
<tr>
<td>Camshaft gear bolt / M-12</td>
<td>50-71</td>
<td>68-96</td>
</tr>
<tr>
<td>Camshaft thrust plate bolt / M-6</td>
<td>6-9</td>
<td>8-12</td>
</tr>
<tr>
<td>Carburetor to spacer stud / M-8</td>
<td>7.5-15</td>
<td>10-20</td>
</tr>
<tr>
<td>Carburetor spacer to manifold bolt / M-8</td>
<td>10-14</td>
<td>14-19</td>
</tr>
<tr>
<td>Crankshaft damper bolt / M-14</td>
<td>103-133</td>
<td>140-180</td>
</tr>
<tr>
<td>Cylinder head bolt / M-12</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
  torque in sequence:
  first step 50-60 68-81
  second step 80-90 108-122
| Distributor clamp bolt / M-10 | 14-21 | 19-28 |
| Distributor vacuum tube to manifold adaptor | 5-8 | 7-11 |
| Exhaust manifold to cylinder head bolt or nut / M-10 | 
  torque in sequence:
  first step 14-19 19-26
  second step 20-30 27-41
| Flywheel to crankshaft bolt / M-10 | 56-64 | 76-87 |
| Fuel pump to cylinder block / M-8 | 14-21 | 19-28 |
| Intake manifold to cylinder head bolt or nut / M-8 | 14-21 | 19-28 |
| Oil pressure sending unit to block | 8-18 | 11-24 |
| Oil pan drain plug to pan / M-14 | 15-25 | 20-34 |
| Oil pan to block / M-6 | 10-13.5 | 14-18 |
| Oil filter insert to block | 20-35 | 27-47 |
| Rocker arm cover to cylinder head / M-6 | 5-8 | 7-11 |
| Spark plug to cylinder head / M-14 | 5-10 | 7-14 |
| Temperature sending unit to block / M-14 | 8-18 | 11-24 |
| Water jacket drain plug to block | 23-28 | 31-38 |
| Water pump to block bolt | 14-21 | 19-28 |
| Auxiliary shaft cover bolt / M-6 | 6-9 | 8-12 |
| Water outlet connection bolt / M-8 | 14-21 | 19-28 |
| Cylinder front cover bolt / M-6 | 6-9 | 8-12 |
| Inner timing belt cover stud / M-8 | 14-21 | 19-28 |
| Outer timing belt cover bolt / M-6 | 6-9 | 8-12 |
Deutz Engine F3L 1011

**Displacement**
- 125.02 cu in
- 2.049 liters

**Number of cylinders**
- 3

**Bore and stroke**
- 3.58 x 4.13 inches
- 91 x 105 mm

**Horsepower**
- 36 @ 2300 rpm

**Firing order**
- 1 - 2 - 3

**Compression ratio**
- 18.5:1

**Compression pressure**
- 362 to 435 psi
- 25 to 30 bar

Pressure (psi) of lowest cylinder must be at least 85% of highest cylinder

**Low idle**
- 1300 rpm

**High idle**
- 2300 rpm

**Governor**
- centrifugal mechanical

**Valve clearance, cold**

<table>
<thead>
<tr>
<th>Component</th>
<th>Intake</th>
<th>Exhaust</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value</td>
<td>0.012 in</td>
<td>0.020 in</td>
</tr>
<tr>
<td></td>
<td>0.3 mm</td>
<td>0.5 mm</td>
</tr>
</tbody>
</table>

**Lubrication system**

**Oil pressure**
- 26 to 87 psi
- 1.8 to 6.0 bar

**Oil capacity**
- 8.5 quarts
- 8 liters

**Oil viscosity requirements**

- Temperature below 60°F / 15.5°C (synthetic) 5W-30
- -10°F to 90°F / -23°C to 32°C 10W-40
- Temperature above -4°F / -24°C 15W-40

**Engine oil should have properties of API classification CC/SE, CD/SE, CC/SF or CD/SF grades.**

**Injection system**

**Injection pump make**
- OMAP

**Injection pump pressure**
- 4351 psi
- 300 bar

**Injector opening pressure**
- 3626 psi
- 250 bar

**Fuel requirement**
- diesel number 2-D

**Alternator output**
- 55A, 14V

**Starter motor**

<table>
<thead>
<tr>
<th>Component</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current draw, no load</td>
<td>90A</td>
</tr>
<tr>
<td>Brush length, new</td>
<td>0.7480 in</td>
</tr>
<tr>
<td>Brush length, minimum</td>
<td>0.5 in</td>
</tr>
</tbody>
</table>

**Battery**

<table>
<thead>
<tr>
<th>Component</th>
<th>Type</th>
<th>Quantity</th>
<th>Cold cranking ampere</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>12V, Group 31</td>
<td>1</td>
<td>1000A</td>
</tr>
</tbody>
</table>

**Reserve capacity @ 25A rate**
- 200 minutes

**Fan belt deflection**
- 3/8 to 1/2 inch
- 9 to 12 mm

**Bolt tightening specifications**

<table>
<thead>
<tr>
<th>Bolt description</th>
<th>Torque (ft-lbs)</th>
<th>Torque (Nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Camshaft/thrust bearing bolt (M-8 x 35, 8.8)</td>
<td>15 to 18</td>
<td>20 to 24</td>
</tr>
<tr>
<td>Rocker arm bolts (M-8 x 45, 8.8)</td>
<td>15 to 18</td>
<td>20 to 24</td>
</tr>
<tr>
<td>Rocker arm set screw nut</td>
<td>15 to 18</td>
<td>20 to 24</td>
</tr>
<tr>
<td>Cylinder head cover</td>
<td>6 to 7</td>
<td>8 to 10</td>
</tr>
<tr>
<td>Blower rotor nut (M-17 Valeo or M-18 Bosch)</td>
<td>33 to 41</td>
<td>45 to 55</td>
</tr>
<tr>
<td>Blower carrier bolts (M-8 x 50 Torx, 8.8)</td>
<td>15 to 18</td>
<td>20 to 24</td>
</tr>
<tr>
<td>V-belt pulley bolts (M-10 x 16, 8.8)</td>
<td>28 to 34</td>
<td>38 to 46</td>
</tr>
</tbody>
</table>
## Bolt tightening specifications, continued

<table>
<thead>
<tr>
<th>Bolt description (size, grade)</th>
<th>Torque (first step)</th>
<th>Torque (second step)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Idler pulley/V-belt pulley bolt (M-10 x 25, 8.8)</td>
<td>27 to 32</td>
<td>36 to 44</td>
</tr>
<tr>
<td>Idler pulley for toothed belt (M-10 x 50, 8.8)</td>
<td>30 to 36</td>
<td>41 to 49</td>
</tr>
<tr>
<td>Oil pump bolts (M-8 x 35 Torx)</td>
<td>15 to 18</td>
<td>20 to 24</td>
</tr>
<tr>
<td>Oil filter bracket bolts (M-8 x 20 Torx, 8.8)</td>
<td>7 to 8</td>
<td>9 to 11</td>
</tr>
<tr>
<td>Oil intake housing bolts (M-8 x 75 Torx)</td>
<td>15 to 18</td>
<td>20 to 24</td>
</tr>
<tr>
<td>Fuel pump bolts</td>
<td>15 to 18</td>
<td>20 to 24</td>
</tr>
<tr>
<td>Injection pump bolts</td>
<td>15 to 18</td>
<td>20 to 24</td>
</tr>
<tr>
<td>Injector cap nut</td>
<td>30 to 37</td>
<td>40 to 50</td>
</tr>
<tr>
<td>Injector fastening bolt</td>
<td>15 to 18</td>
<td>20 to 24</td>
</tr>
<tr>
<td>Injection line</td>
<td>10 to 12</td>
<td>13.5 to 16.5</td>
</tr>
<tr>
<td>Air intake manifold bolts (M-8 x 30, 8.8)</td>
<td>15 to 18</td>
<td>20 to 24</td>
</tr>
<tr>
<td>Air intake manifold, 3-hole flange bolts (M-8 x 35 Torx, 8.8)</td>
<td>15 to 18</td>
<td>20 to 24</td>
</tr>
<tr>
<td>Exhaust manifold bolts (M-10 x 30 Torx, 10.9)</td>
<td>27 to 32</td>
<td>36 to 44</td>
</tr>
<tr>
<td>Starter fastening bolts (M-10 x 28, 8.8)</td>
<td>28 to 34</td>
<td>38 to 46</td>
</tr>
<tr>
<td>Starter carrier bolts (M-12 x 28, 8.8)</td>
<td>50 to 60</td>
<td>68 to 82</td>
</tr>
<tr>
<td>Oil pan bolts (M-8 x 16 Torx, 8.8)</td>
<td>15 to 18</td>
<td>20 to 24</td>
</tr>
<tr>
<td>Oil drain bolts (M-8 x 16 Torx, 8.8)</td>
<td>37 to 44</td>
<td>50 to 60</td>
</tr>
</tbody>
</table>

### Main bearing bolts

<table>
<thead>
<tr>
<th>Description</th>
<th>Torque (first step)</th>
<th>Torque (second step)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main bearing bolts</td>
<td>37 to 50</td>
<td>60° 45°</td>
</tr>
</tbody>
</table>

### Big end bolts

<table>
<thead>
<tr>
<th>Description</th>
<th>Torque (first step)</th>
<th>Torque (second step)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Big end bolts</td>
<td>22 to 30</td>
<td>60° 60°</td>
</tr>
</tbody>
</table>

### Flywheel bolts

<table>
<thead>
<tr>
<th>Description</th>
<th>Torque (first step)</th>
<th>Torque (second step)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flywheel bolts</td>
<td>22 to 30</td>
<td>60° 30°</td>
</tr>
</tbody>
</table>

### Cylinder head studs

<table>
<thead>
<tr>
<th>Description</th>
<th>Torque (first step)</th>
<th>Torque (second step)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cylinder head studs</td>
<td>22 to 30</td>
<td>80</td>
</tr>
</tbody>
</table>

### Camshaft/central bolt

<table>
<thead>
<tr>
<th>Description</th>
<th>Torque (first step)</th>
<th>Torque (second step)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Camshaft/central bolt</td>
<td>22 to 30</td>
<td>150° NA</td>
</tr>
</tbody>
</table>

### Crankshaft/central bolt

<table>
<thead>
<tr>
<th>Description</th>
<th>Torque (first step)</th>
<th>Torque (second step)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crankshaft/central bolt</td>
<td>96 to 130</td>
<td>210° NA</td>
</tr>
</tbody>
</table>
Scheduled Maintenance Inspections

Observe and Obey:

- Maintenance inspections shall be completed by a person trained and qualified on the maintenance of this machine.
- Scheduled maintenance inspections shall be completed daily, quarterly, annually and every 2 years as specified on the Maintenance Inspection Report.

- Failure to properly complete each inspection when required may cause death, serious injury or substantial damage.
- Immediately tag and remove from service a damaged or malfunctioning machine.
- Repair any machine damage or malfunction before operating machine.
- Keep records on all inspections for three years.
- Machines that have been out of service for a period longer than 3 months must complete the quarterly inspection.

About This Section

The Schedule

There are four types of maintenance inspections that must be performed according to a schedule—daily, quarterly, annual, two year. To account for repeated procedures, the Maintenance Tables and the Maintenance Inspection Report have been divided into four subsections—A, B, C, D. Use the following chart to determine which group(s) of procedures are required to perform a scheduled inspection.

<table>
<thead>
<tr>
<th>Inspection</th>
<th>Table or Checklist</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily</td>
<td>A</td>
</tr>
<tr>
<td>Quarterly</td>
<td>A + B</td>
</tr>
<tr>
<td>Annual</td>
<td>A + B + C</td>
</tr>
<tr>
<td>Two year</td>
<td>A + B + C + D</td>
</tr>
</tbody>
</table>

Maintenance Tables

The maintenance tables contained in this section provide summary information on the specific physical requirements for each inspection.

Complete step-by-step instructions for each scheduled maintenance procedure are provided in section 4, Scheduled Maintenance Procedures.

Maintenance Inspection Report

The maintenance inspection report contains checklists for each type of scheduled inspection.

Make copies of the Maintenance Inspection Report to use for each inspection. Store completed forms for three years.
## Maintenance Tables

### Table A

<table>
<thead>
<tr>
<th></th>
<th>Tools are required</th>
<th>New parts required</th>
<th>Warm engine required</th>
<th>Cold engine required</th>
<th>Dealer service suggested</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-1</td>
<td>Inspect the Manuals</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A-2</td>
<td>Inspect the Decals and Placards</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A-3</td>
<td>Inspect for Damage, Loose or Missing Parts</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A-4</td>
<td>Check the Engine Oil Level</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A-5</td>
<td>Check the Engine Coolant Level</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A-6</td>
<td>Check for Fuel Leaks</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A-7</td>
<td>Check the Hydraulic Oil Level</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A-8</td>
<td>Check for Hydraulic Leaks</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A-9</td>
<td>Check Tire Pressure</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A-10</td>
<td>Test the Platform and Ground Controls</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A-11</td>
<td>Test Auxiliary Power Operation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A-12</td>
<td>Test the Tilt Level Sensor</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A-13</td>
<td>Test the Limit Switches</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Every 100 hours, perform the following two engine maintenance procedures.

<table>
<thead>
<tr>
<th></th>
<th>Tools are required</th>
<th>New parts required</th>
<th>Warm engine required</th>
<th>Cold engine required</th>
<th>Dealer service suggested</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-14</td>
<td>Replace the Engine Oil and Filter - Gasoline/LPG Models</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A-15</td>
<td>Change the Engine Air Filter</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# Table B

<table>
<thead>
<tr>
<th>B-1</th>
<th>Check the Engine Belt(s)</th>
<th>Tools are required</th>
<th>New parts required</th>
<th>Warm engine required</th>
<th>Cold engine required</th>
<th>Dealer service suggested</th>
</tr>
</thead>
<tbody>
<tr>
<td>B-2</td>
<td>Check the Radiator</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Gasoline/LPG Models</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B-3</td>
<td>Check the Oil Cooler and Cooling Fins</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Deutz Diesel Models</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B-4</td>
<td>Check the Exhaust System</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B-5</td>
<td>Check the Battery</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B-6</td>
<td>Check the Hydraulic Tank Filter Condition Indicator</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B-7</td>
<td>Inspect Electrical Wiring</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B-8</td>
<td>Inspect the Tires and Wheels including lug nut torque</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B-9</td>
<td>Confirm Proper Brake Configuration</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B-10</td>
<td>Check the Oil Level in the Torque Hubs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B-11</td>
<td>Check and Adjust the Engine Idle Mixture - Gasoline/LPG Models</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B-12</td>
<td>Check and Adjust the Engine RPM</td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>B-13</td>
<td>Test the Key Switch</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B-14</td>
<td>Test the Emergency Stop Buttons</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>B-15</td>
<td>Test the Ground Control Override</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
### Table B, continued

<table>
<thead>
<tr>
<th>B-16</th>
<th>Test the Oscillate Lock-out oscillating axle equipped models</th>
<th>Tools are required</th>
<th>New parts required</th>
<th>Warm engine required</th>
<th>Cold engine required</th>
<th>Dealer service suggested</th>
</tr>
</thead>
<tbody>
<tr>
<td>B-17</td>
<td>Test Platform Self-leveling</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B-18</td>
<td>Test the Service Horn</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>B-19</td>
<td>Test the Foot Switch</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B-20</td>
<td>Test the Engine Idle Select</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B-21</td>
<td>Test Fuel Select Operation - Gasoline/LPG Models</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B-22</td>
<td>Test the Turntable Rotation Stop</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>B-23</td>
<td>Test the Drive Enable System</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>B-24</td>
<td>Test the Drive Brakes</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>B-25</td>
<td>Test Drive Speed - Stowed Position</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B-26</td>
<td>Test the Alarm Package (optional equipment) travel alarm, descent alarm, flashing beacon</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B-27</td>
<td>Perform Hydraulic Oil Analysis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>See D-1, Test or Replace the Hydraulic Oil</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Every 500 hours, perform the following engine maintenance procedure.**

<table>
<thead>
<tr>
<th>B-28</th>
<th>Replace the Engine Oil and filter - Deutz Diesel Models</th>
<th>Tools are required</th>
<th>New parts required</th>
<th>Warm engine required</th>
<th>Cold engine required</th>
<th>Dealer service suggested</th>
</tr>
</thead>
</table>
### MAINTENANCE TABLES

#### Table C

<table>
<thead>
<tr>
<th>C-1</th>
<th>Check the Primary Boom Wear Pads</th>
<th>Tools are required</th>
<th>New parts required</th>
<th>Warm engine required</th>
<th>Cold engine required</th>
<th>Dealer service suggested</th>
</tr>
</thead>
<tbody>
<tr>
<td>C-2</td>
<td>Check the Turntable Rotation Bearing Bolts</td>
<td>Tools are required</td>
<td>New parts required</td>
<td>Warm engine required</td>
<td>Cold engine required</td>
<td>Dealer service suggested</td>
</tr>
<tr>
<td>C-3</td>
<td>Check the Free-wheel Feature</td>
<td>Tools are required</td>
<td>New parts required</td>
<td>Warm engine required</td>
<td>Cold engine required</td>
<td>Dealer service suggested</td>
</tr>
<tr>
<td>C-4</td>
<td>Grease the Worm Drive Gear including turntable rotation bearing</td>
<td>Tools are required</td>
<td>New parts required</td>
<td>Warm engine required</td>
<td>Cold engine required</td>
<td>Dealer service suggested</td>
</tr>
<tr>
<td>C-5</td>
<td>Replace the Torque Hub Oil</td>
<td>Tools are required</td>
<td>New parts required</td>
<td>Warm engine required</td>
<td>Cold engine required</td>
<td>Dealer service suggested</td>
</tr>
<tr>
<td>C-6</td>
<td>Replace the Hydraulic Tank Filter</td>
<td>Tools are required</td>
<td>New parts required</td>
<td>Warm engine required</td>
<td>Cold engine required</td>
<td>Dealer service suggested</td>
</tr>
<tr>
<td>C-7</td>
<td>Replace the Drive Loop Hydraulic Filter</td>
<td>Tools are required</td>
<td>New parts required</td>
<td>Warm engine required</td>
<td>Cold engine required</td>
<td>Dealer service suggested</td>
</tr>
<tr>
<td>C-8</td>
<td>Replace the Diesel Fuel Filter</td>
<td>Tools are required</td>
<td>New parts required</td>
<td>Warm engine required</td>
<td>Cold engine required</td>
<td>Dealer service suggested</td>
</tr>
<tr>
<td>C-9</td>
<td>Replace the Gasoline Fuel Filter</td>
<td>Tools are required</td>
<td>New parts required</td>
<td>Warm engine required</td>
<td>Cold engine required</td>
<td>Dealer service suggested</td>
</tr>
<tr>
<td>C-10</td>
<td>Replace the PCV Valve - Gasoline/LPG Models</td>
<td>Tools are required</td>
<td>New parts required</td>
<td>Warm engine required</td>
<td>Cold engine required</td>
<td>Dealer service suggested</td>
</tr>
<tr>
<td>C-11</td>
<td>Clear or Replace the Distributor Cap and Rotor - Gasoline/LPG Models</td>
<td>Tools are required</td>
<td>New parts required</td>
<td>Warm engine required</td>
<td>Cold engine required</td>
<td>Dealer service suggested</td>
</tr>
<tr>
<td>C-12</td>
<td>Replace the Spark Plugs - Gasoline/LPG Models</td>
<td>Tools are required</td>
<td>New parts required</td>
<td>Warm engine required</td>
<td>Cold engine required</td>
<td>Dealer service suggested</td>
</tr>
<tr>
<td>C-13</td>
<td>Check and Adjust the Air/Propane Mixture - Gasoline/LPG Models</td>
<td>Tools are required</td>
<td>New parts required</td>
<td>Warm engine required</td>
<td>Cold engine required</td>
<td>Dealer service suggested</td>
</tr>
<tr>
<td>C-14</td>
<td>Check and Adjust the Ignition Timing - Gasoline/LPG Models</td>
<td>Tools are required</td>
<td>New parts required</td>
<td>Warm engine required</td>
<td>Cold engine required</td>
<td>Dealer service suggested</td>
</tr>
<tr>
<td>C-15</td>
<td>Check the Engine Valve Clearances - Deutz Diesel Models</td>
<td>Tools are required</td>
<td>New parts required</td>
<td>Warm engine required</td>
<td>Cold engine required</td>
<td>Dealer service suggested</td>
</tr>
</tbody>
</table>
MAINTENANCE TABLES

<table>
<thead>
<tr>
<th>Table D</th>
<th>Tools are required</th>
<th>New parts required</th>
<th>Warm engine required</th>
<th>Cold engine required</th>
<th>Dealer service suggested</th>
</tr>
</thead>
<tbody>
<tr>
<td>D-1 Test or Replace the Hydraulic Oil</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>includes cleaning the suction strainers</td>
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<tr>
<td>D-2 Change or Recondition the Engine Coolant</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>including all coolant hoses and clamps</td>
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</tr>
<tr>
<td>D-3 Change the Fuel Lines</td>
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</tr>
<tr>
<td>D-4 Check Engine Valve Clearance - Gasoline/LPG Models</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>D-5 Check Engine Cylinder Compression - Gasoline/LPG Models</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>D-6 Clean PCV Hoses and Fittings - Gasoline/LPG Models</td>
<td></td>
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<tr>
<td>D-7 Check the Fuel Injection Pumps and Injectors - Diesel Models</td>
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<tr>
<td>D-8 Check the Toothed Belt - Diesel Models</td>
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</tr>
<tr>
<td>D-9 Replace the Timing Belt - Ford</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# Maintenance Inspection Report

**Model**  
**Serial number**  
**Date**  
**Hour meter**  
**Machine owner**

## Instructions
- Make copies of this page to use for each inspection.
- Select the appropriate checklist(s) for the type of inspection to be performed.
- Place a check in the appropriate box after each inspection procedure is completed.
- Use the maintenance tables in this section and the step-by-step procedures in section 4 to learn how to perform these inspections.
- If any inspection receives an “N”, remove the machine from use, repair and re-inspect it. After repair, place a check in the “R” box.

## Legend
- Y = yes, acceptable
- N = no, unacceptable
- R = repaired

## Comments

### Checklist A

Refer to Table A

<table>
<thead>
<tr>
<th>Y</th>
<th>N</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-1 Manuals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A-2 Decals and placards</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A-3 Damage, loose or missing parts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A-4 Engine oil</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A-5 Engine coolant</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A-6 Fuel leaks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A-7 Hydraulic oil</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A-8 Hydraulic leaks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A-9 Tire pressure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A-10 Platform and ground controls</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A-11 Auxiliary power</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A-12 Tilt alarm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A-13 Limit switches</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Perform every 100 hours:

<table>
<thead>
<tr>
<th>Y</th>
<th>N</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-14 Change engine oil and filter - Gas/LPG</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A-15 Change engine air filter</td>
<td></td>
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### Checklist B

Refer to Table B

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<thead>
<tr>
<th>Y</th>
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<tbody>
<tr>
<td>B-1 Engine belt(s)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B-2 Engine radiator</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B-3 Oil cooler and fins-Deutz</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B-4 Exhaust system</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B-5 Battery</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B-6 Hydraulic tank filter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B-7 Electrical wiring</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B-8 Tires and wheels</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B-9 Brake configuration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B-10 Drive torque hubs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B-11 Idle mixture-gasoline</td>
<td></td>
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<tr>
<td>B-12 Engine RPM</td>
<td></td>
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</tr>
<tr>
<td>B-13 Key switch</td>
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<tr>
<td>B-14 Emergency Stop button</td>
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<td></td>
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<tr>
<td>B-15 Ground control override</td>
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<tr>
<td>B-16 Oscillate lock-out</td>
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<tr>
<td>B-17 Platform leveling</td>
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<tr>
<td>B-18 Service horn</td>
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<td>B-19 Foot switch</td>
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### Checklist C

Refer to Table C

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<tr>
<th>Y</th>
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<tbody>
<tr>
<td>C-1 Wear pads</td>
<td></td>
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</tr>
<tr>
<td>C-2 Turntable bolts</td>
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<td></td>
</tr>
<tr>
<td>C-3 Free-wheel configuration</td>
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<td></td>
</tr>
<tr>
<td>C-4 Worm drive gear</td>
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<td></td>
</tr>
<tr>
<td>C-5 Drive torque hubs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C-6 Hydraulic tank filter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C-7 Drive loop hydraulic filter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C-8 Fuel filter-diesel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C-9 Fuel filter-gasoline</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C-10 PCV valve-gasoline</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C-11 Distributor cap-gasoline</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C-12 Spark plugs</td>
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<td></td>
</tr>
<tr>
<td>C-13 Propane adjustments</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C-14 Ignition timing-gasoline</td>
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<td></td>
</tr>
<tr>
<td>C-15 Valves - Deutz</td>
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<td></td>
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</tbody>
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### Checklist D

Refer to Table D

<table>
<thead>
<tr>
<th>Y</th>
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</thead>
<tbody>
<tr>
<td>D-1 Hydraulic oil</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D-2 Engine coolant, hoses and clamps</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D-3 Fuel lines and clamps</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D-4 Engine valve clearance-gasoline</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D-5 Cylinder compression</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D-6 PCV hoses and fittings-gasoline</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D-7 Fuel injection - Deutz</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D-8 Toothed belt - Deutz</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D-9 Timing belt-Ford</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Scheduled Maintenance Procedures

Observe and Obey:

- Maintenance inspections shall be completed by a person trained and qualified on the maintenance of this machine.
- Scheduled maintenance inspections shall be completed daily, frequently (every 3 months), annually and every 2 years as specified on the mainentance report.
- Failure to properly complete each inspection when required may result in death, serious injury or substantial machine damage.
- Immediately tag and remove from service a damaged or malfunctioning machine.
- Repair any machine damage or malfunction before operating machine.
- Keep records on all inspections for three years.
- Unless otherwise specified, perform each repair procedure with the machine in the following configuration:
  - machine parked on a flat, level surface
  - boom in stowed position
  - turntable rotated with the boom between the non-steering wheels
  - key switch in the OFF position with the key removed
  - wheels chocked

About This Section

This section contains detailed procedures for each scheduled maintenance inspection.

Each procedure includes a description, safety warnings and step-by-step instructions.

Symbols Legend

- **DANGER** Indicates the presence of a hazard that *will* cause death or serious injury.
- **WARNING** Indicates the presence of a hazard that *may* cause death or serious injury.
- **CAUTION** Indicates the presence of a hazard that *will* or *may* cause serious injury or damage to the machine.
- **NOTICE** Indicates special operation or maintenance information.
- ✨ Indicates that a specific result is expected after performing a series of steps.
A-1
Inspect the Manuals

Maintaining the Operator’s and Safety manuals in good condition is essential to safe machine operation. Manuals are included with each machine and should be stored in the box provided in the platform. An illegible or missing manual will not provide safety and operational information necessary for a safe operating condition.

1. Check to be sure that the storage container is present and in good condition.

2. Check to make sure that the operator’s, responsibilities and safety manuals are present and complete in the storage container in the platform.

3. Examine the pages of each manual to be sure that they are legible and in good condition.

4. Always return the manuals to the storage container after use.

A-2
Inspect the Decals and Placards

Maintaining all of the safety and instructional decals and placards in good condition is mandatory for safe machine operation. Decals alert operators and ground personnel to the many possible hazards associated with using this machine. They also provide users with operation and maintenance information. An illegible decal will fail to alert personnel of a procedure or hazard and could result in unsafe operating conditions.

1. Refer to the Decals section in the Genie Z45/22 Operator's Manual and use the decal list and illustrations to determine that all decals and placards are in place.

2. Inspect all decals for damage or illegibility. Replace any illegible decal immediately.

A-3
Inspect for Damage, Loose or Missing Parts

Daily machine condition inspections are essential to safe machine operation and good machine performance. Failure to locate and repair damage, and discover loose or missing parts may result in an unsafe operating condition.

1. Inspect the entire machine for damage and improperly installed or missing parts including:
   - electrical components, wiring and electrical cables
   - hydraulic hoses, fittings, cylinders and manifolds
   - fuel and hydraulic tanks
   - drive and turntable rotation motors and gear boxes
   - boom components and wear pads
   - dents or damage to machine
   - tires and wheels
   - engine and related components
   - limit switches, alarms, horns and beacon
   - nuts, bolts and other fasteners
   - platform entry mid-rail or gate
   - cracks in welds or structural components
   - compartment covers and latches

NOTICE Contact your Genie distributor or Genie Industries if replacement decals are needed.
A-4
Check the Engine Oil Level

Maintaining proper engine oil level is essential to good engine performance and service life. Operating the machine at an improper oil level can damage engine components.

**NOTICE** Check the oil level with the engine off.

1. Check the oil level dipstick. Add oil as needed.

- Result: The oil level should be in the “safe” zone.

<table>
<thead>
<tr>
<th>Ford Engine LSG-423</th>
<th>5 quarts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil capacity (including filter)</td>
<td>4.7 liters</td>
</tr>
</tbody>
</table>

**Ford Engine LSG-423 Oil viscosity requirements**

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Viscosity</th>
</tr>
</thead>
<tbody>
<tr>
<td>below 60°F / 15.5°C</td>
<td>5W-30</td>
</tr>
<tr>
<td>-10°F to 90°F / -23°C to 32°C</td>
<td>10W-30</td>
</tr>
<tr>
<td>above -10°F / -23°C</td>
<td>10W-40 or 10W-50</td>
</tr>
<tr>
<td>above 25°F / -4°C</td>
<td>20W-40 or 20W-50</td>
</tr>
</tbody>
</table>

Use oils meeting API classification SF (labeled SF/CC or SF/CD) as they offer improved wear protection.

<table>
<thead>
<tr>
<th>Deutz Engine F3L 1011</th>
<th>8.5 quarts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil capacity (including filter)</td>
<td>8 liters</td>
</tr>
</tbody>
</table>

**Deutz Engine F3L 1011 Oil viscosity requirements**

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Viscosity</th>
</tr>
</thead>
<tbody>
<tr>
<td>below 60°F / 15.5°C (synthetic)</td>
<td>5W-30</td>
</tr>
<tr>
<td>-10°F to 90°F / -23°C to 32°C</td>
<td>10W-40</td>
</tr>
<tr>
<td>above -4°F / -34°C</td>
<td>15W-40</td>
</tr>
</tbody>
</table>

Engine oil should have properties of API classification CC/SE, CD/SE, CC/SF or CD/SF grades.

A-5
Check the Engine Coolant Level - Gasoline/LPG Models

Maintaining engine coolant at the proper level is essential to engine life. Improper coolant level will affect the engines cooling capability and damage engine components. Daily checks will allow the inspector to identify dramatic changes in coolant level that might indicate cooling system problems.

1. Check the fluid level in the coolant recovery tank. Add water as needed.

- Result: The fluid level should be in the normal range.

A-6
Check for Fuel Leaks

Failure to detect and correct fuel leaks will result in an unsafe condition. An explosion or fuel fire may cause death or serious injury.

**DANGER** Engine fuels are combustible. Inspect the machine in an open, well-ventilated area away from heaters, sparks, flames and lighted tobacco. Always have an approved fire extinguisher within easy reach.

1. Open the shutoff valve on the liquid propane gas (LPG) tank by turning it counterclockwise.
TABLE A PROCEDURES

2 Perform a visual inspection around the following areas. An LPG detector may be necessary to locate propane leaks.

**Gasoline/LPG models:**
- LPG tank, hoses and fittings, solenoid shutoff valve, LPG regulator, and carburetor
- gasoline tank, shutoff valve, solenoid shutoff valve, hoses and fittings, fuel pump and carburetor

**Deutz Diesel models:**
- fuel tank, shutoff valve, hoses and fittings, fuel pump, fuel filter, fuel injection pumps and fuel injectors

If a fuel leak is discovered, keep any additional personnel from entering the area and do not operate the machine. Repair the leak immediately.

A-7 Check the Hydraulic Oil Level

Maintaining hydraulic oil at the proper level is essential to machine operation. Improper hydraulic oil levels can damage hydraulic components. Daily checks allow the inspector to identify changes in oil level that might indicate the presence of hydraulic system problems.

1 Be sure that the machine is in the fully stowed position, then visually inspect the sight gauge located on the side of the hydraulic oil reservoir.

☐ Result: The hydraulic oil level should be within the top 2 inches (5cm) of the sight gauge.

<table>
<thead>
<tr>
<th>Hydraulic oil specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydraulic oil type</td>
</tr>
<tr>
<td>Tank capacity</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Hydraulic system (including tank)</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

A-8 Check for Hydraulic Leaks

Detecting hydraulic fluid leaks is essential to operational safety and good machine performance. Undiscovered leaks can develop into hazardous situations, impair machine functions and damage machine components.

1 Inspect for hydraulic oil puddles, dripping or residue on or around the following areas:

- hydraulic tank—filter, fittings, hoses and turntable surface
- engine compartment—fittings, hoses, auxiliary power unit, main pump and turntable surface
- all hydraulic cylinders
- all hydraulic manifolds
- primary and secondary booms
- the underside of the chassis
- ground area under the machine
A-9
Check the Tire Pressure

**NOTICE** This procedure does not need to be performed on machines equipped with the foam-filled tire option.

**WARNING** An over-inflated tire can explode and may cause death or serious injury.

To safeguard maximum stability, achieve optimum machine handling and minimize tire wear, it is essential to maintain proper pressure in all air-filled tires.

1. Check each tire with an air pressure gauge and add air as needed.

<table>
<thead>
<tr>
<th>Tire Specifications</th>
<th>2WD Models</th>
<th>4WD Models</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industrial tire</td>
<td>9-14.5LT</td>
<td>14-17.5NHS</td>
</tr>
<tr>
<td></td>
<td>100 psi / 6.89 bar</td>
<td>40 psi / 2.76 bar</td>
</tr>
<tr>
<td>Rough terrain tire</td>
<td>14-17.5NHS</td>
<td>14-17.5NHS</td>
</tr>
<tr>
<td></td>
<td>28 psi / 1.93 bar</td>
<td></td>
</tr>
</tbody>
</table>

A-10
Test the Platform and Ground Controls

Testing machine functions and the Emergency Stop buttons for malfunctions is essential for safe machine operation. An unsafe working condition exists if any function fails to operate properly or either Emergency Stop button fails to stop all the machine functions and shut off the engine. Each function should activate, operate smoothly and be free of hesitation, jerking and unusual noise.

1. Start the engine from the ground controls, and then operate each machine function through a full cycle.

2. Push in the Emergency Stop button to the **off** position.
   - Result: No function should operate, the engine should stop.

3. Start the engine from the platform controls, and then operate each machine function through a full cycle.
   - Result: All machine functions should activate and operate smoothly.

4. Push in the Emergency Stop button to the **off** position.
   - Result: No function should operate, the engine should stop.

   **NOTICE** Diesel models: All functions should stop immediately. The engine will shut off after 2 or 3 seconds.

As a safety feature, selecting and operating the ground controls can override the platform controls, including the Emergency Stop button.

A-11
Test Auxiliary Power Operation

Detection of auxiliary power system malfunctions is essential for safe machine operation. An unsafe working condition exists if the auxiliary powered functions do not operate in the event of a main power loss. Auxiliary power is designed for short term emergency use only, and excessive use will result in battery drain and pump damage.

**NOTICE** Oscillating axle equipped machines only: From the stowed position, auxiliary power can not raise the boom above the drive limit switch. Auxiliary power can raise the boom if it is already raised above the drive limit switch.

1. Start the engine from the ground controls, and then operate each machine function through a full cycle.

2. Turn the key switch to ground control and pull out the ground control Emergency Stop button to the **on** position.
TABLE A PROCEDURES

2 Simultaneously hold the auxiliary power switch on while activating the following functions through a partial cycle:
   · primary boom up/down
   · extend and retract
   · secondary boom up/down
   · turntable rotate right/left

☐ Result: Each function should operate smoothly.

3 Turn the key switch to platform control.

4 At the platform controls, pull out the Emergency Stop button to the on position, press down the foot switch.

5 Simultaneously hold the auxiliary power switch on while activating the following functions through a partial cycle:
   · primary boom up/down
   · extend and retract
   · secondary boom up/down
   · turntable rotate right/left
   · steer left/right

A-12
Test the Tilt Level Sensor

The tilt sensor sounds an alarm in the platform when the incline of the chassis exceeds 4.5°.

 NOTICE Select a level test area.

1 Start the engine from the ground controls.

2 Open the engine side cover and press down on one side of the tilt sensor.

☐ Result: After a 1.5 second delay, the alarm in the platform should sound.

A-13
Test the Limit Switches

Detecting limit switch malfunctions is essential to safe machine operation. The drive enable limit switch activates a signal light to inform the operator that the platform is past the non-steer wheels, and stops drive movement unless the drive enable override switch is used. The drive limit switch is used to restrict drive speed when the boom is raised and signal the oscillate cylinder to extend the lock-out wedges (oscillating axle equipped machines). Also, on oscillating axle equipped machines, there are two limit switches to stop the boom from being raised unless the lock out wedges are extended. Improperly functioning limit switches will allow the boom to raise and/or drive into an unsafe position.

Drive Limit Switch

1 With the engine off and the machine in the stowed position, visually inspect the drive limit switch for the following:
   · broken or missing rollers or arms
   · missing fasteners
   · loose wiring
2 Start the engine from the ground controls.
3 Raise the primary boom above the drive limit switch and turn the machine off.
4 Manually activate the drive limit switch.

![Drive Limit Switch](image)

- **Result:** The drive limit switch arm should move freely and spring return to center. A distinct click should be felt and heard.

5 Restart the engine and lower the boom into the fully stowed position.
6 Move the key switch to platform control, and then start the engine from the platform controls.
7 Slowly move the drive control handle off center.
- **Result:** The machine should move at normal drive speeds.
8 Raise the primary boom above the drive limit switch.
9 Slowly move the drive control handle off center.
- **Result:** The machine should move at a reduced drive speed.

### Drive speed, maximum, raised

| All models | 1 foot/0.3 meters per second |

### Drive Enable Limit Switch

1 With the engine off and the machine in the stowed position, visually inspect the drive enable limit switch for the following:
- broken or missing rollers or arms
- missing fasteners
- loose wiring
2 Manually activate the drive enable limit switch.

![Drive Enable Limit Switch](image)

- **Result:** The drive enable limit switch roller should move freely and spring return to center. A distinct click should be felt and heard.

3 Start the engine from the platform controls and then rotate the turntable to the left until the platform is positioned over the left non-steer wheel.
- **Result:** The platform over steer wheels indicator light should be on. Drive movement should stop until the drive enable override switch is activated.
4 Rotate the turntable to the right until the platform is positioned over the right non-steer wheel.
- **Result:** The platform over steer wheels indicator light should be on. Drive movement should stop until the drive enable override switch is activated.
TABLE A PROCEDURES

Oscillating Axle Limit Switches

1. With the engine off and the machine in the stowed position, visually inspect the oscillate lock-out switch for the following:
   - broken or missing rollers or arms
   - missing fasteners
   - loose wiring

2. Start the engine from the ground controls and raise the primary boom above the drive speed limit switch.

Result: The oscillation cylinder should extend the lock-out wedges. The boom should stop moving until the wedges are fully extended.

---

A-14

Replace the Engine Oil and Filter - Gasoline/LPG Models

**NOTICE**
Ford engine specifications require that this procedure be performed every 100 hours. Perform this procedure more often if dusty conditions exist or the machine is subjected to extended low idle operation.

Periodic replacement of the engine oil and filter is essential to good engine performance. Operating the machine with an improper oil level or neglecting periodic oil and filter changes can damage engine components. A daily check of elapsed machine hours against the hours noted on the oil filter will allow the inspector to anticipate and perform oil and filter changes at the 100 hour interval.

**NOTICE**
Perform this procedure after warming the engine to normal operating temperature.

**CAUTION**
Beware of hot engine parts and oil. Contact with hot engine oil and/or engine parts may cause severe burns.

1. Remove the oil filler cap located on the valve cover.
2 Pull the end of the oil drain hose out from under the engine.

3 Remove the plug from the end of the drain hose and allow all of the oil from the engine to drain into a suitable container.

4 Install the plug into the drain hose.

5 Remove the 3 bolts from the engine pivot plate. Swing the engine pivot plate away from the machine to access the oil filter.

6 Use an oil filter wrench and remove the filter.

7 Apply a thin layer of oil to the new oil filter gasket (filter part no. 28656). Then install the filter and tighten it securely by hand.

8 Use a permanent ink marker to write the date and number of hours from the hour meter on the oil filter.

9 Fill the engine with new oil per specifications and install the filler cap.

10 Start the engine from the ground controls. Allow the engine to run for 30 seconds, then turn the engine off.

11 Check the oil filter and the oil drain hose for leaks.

12 Swing the engine pivot plate back to its original position and replace the three retaining bolts.

13 Check the engine oil level dipstick. Add oil if needed.

**TABLE A PROCEDURES**

<table>
<thead>
<tr>
<th>Ford Engine LSG-423</th>
<th>5 quarts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil capacity (including filter)</td>
<td>4.7 liters</td>
</tr>
</tbody>
</table>

**Ford Engine LSG-423 Oil viscosity requirements**

<table>
<thead>
<tr>
<th>Temperature Range</th>
<th>Viscosity</th>
</tr>
</thead>
<tbody>
<tr>
<td>below 60F / 15.5C</td>
<td>5W-30</td>
</tr>
<tr>
<td>-10 to 90F / -23 to 32C</td>
<td>10W-30</td>
</tr>
<tr>
<td>above -10F / -23C</td>
<td>10W-40 or 10W-50</td>
</tr>
<tr>
<td>above 25F / -4C</td>
<td>20W-40 or 20W-50</td>
</tr>
</tbody>
</table>

Use oils meeting API classification SF (labeled SF/CC or SF/CD) as they offer improved wear protection.
Replace the Engine Air Filter

**NOTICE** Engine specifications require that this procedure be performed every 100 hours. Perform this procedure more often if dusty conditions exist.

Maintaining the engine air filter in good condition is essential to good engine performance and service life. Failure to perform this procedure can lead to poor engine performance and component damage.

**NOTICE** Perform this procedure with the engine off.

1. Remove the end cap from the air cleaner canister.
2. Remove the mounting fastener from the air filter, then remove the filter.
3. Clean the inside of the canister and the gasket with a dry cloth.
4. Insert the new filter and replace the mounting fastener.
5. Replace the end cap on the canister.

**Air filters - Genie part numbers**
- Ford LSG-423 Engine 27916
- Deutz F3L 1011 29553
## Table B Procedures

### B-1

**Check the Engine Belt(s)**

Maintaining the engine belt(s) is essential to good engine performance and service life. The machine will not operate properly with a loose or defective belt and continued use may cause component damage.

*WARNING* Do not inspect while the engine is running. Remove the key to secure from operation.

*CAUTION* Beware of hot engine components. Contact with hot engine components may cause severe burns.

1. **Deutz Diesel models**: Remove front engine cover to access belt.
2. **All models**: Inspect the engine belt(s) for:
   - cracking
   - glazing
   - separation
   - breaks
3. Check the engine belt(s) for proper tension.

### B-2

**Check the Radiator - Gasoline/LPG Models**

Maintaining the radiator in good condition is essential for good engine performance. Operating a machine with a damaged or leaking radiator may result in engine damage. Also, restricting air flow through the radiator (i.e., dirt or debris) will affect the performance of the cooling system. A frequent check allows the inspector to identify changes in the condition of the radiator that might indicate cooling system problems.

*WARNING* Do not inspect while the engine is running. Remove the key to secure from operation.

*CAUTION* Beware of hot engine components. Contact with hot engine components may cause severe burns.

1. Inspect the radiator for leaks and physical damage.
2. Clean the radiator fins of debris and foreign materials.

### B-3

**Check the Oil Cooler and Cooling Fins - Deutz Diesel Models**

Maintaining the oil cooler in good condition is essential for good engine performance. Operating a machine with a damaged oil cooler may result in engine damage. Also, restricting air flow through the oil cooler will affect the performance of the cooling system.

*WARNING* Do not inspect while the engine is running. Remove the key to secure from operation.

*CAUTION* Beware of hot engine components. Contact with hot engine components may cause severe burns.

---

<table>
<thead>
<tr>
<th>Belt deflection - all models</th>
<th>3/8 inch to 1/2 inch</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>9 mm to 12 mm</td>
</tr>
</tbody>
</table>
TABLE B  PROCEDURES

Oil Cooler

1 Remove the cover from the side of the engine, then remove the oil cooler top cover.

2 Inspect the oil cooler for leaks and physical damage. a oil cooler  
   b cylinder head cooling fins  
   c blower fins

3 Clean the oil cooler of debris and foreign material.

Cooling and Blower Fins

4 Inspect the blower fins for physical damage.

5 Clean the blower fins of debris and foreign material.

6 Inspect the head cooling passages and fins for physical damage or foreign material, using a flashlight.

7 Clean the cylinder head cooling passages of debris and foreign material.

B-4

Check the Exhaust System

Maintaining the exhaust system is essential to good engine performance and service life. Operating the machine with a damaged or leaking exhaust system can cause component damage and unsafe operating conditions.

WARNING
Do not inspect while the engine is running. Remove the key to secure from operation.

CAUTION
Beware of hot engine components. Contact with hot engine components may cause severe burns.

1 Be sure that all nuts and bolts are tight.

2 Inspect all welds for cracks.

3 Inspect for exhaust leaks; i.e., carbon buildup around seams and joints.

B-5

Check the Battery

The factory ships each machine with a sealed battery; checking the water level is not necessary. If the battery is replaced with another type, the battery acid level and specific gravity should be checked at this time.

Proper battery condition is essential to good engine performance and operational safety. Improper fluid levels or damaged cables and connections can result in engine component damage and extremely hazardous conditions.

WARNING
Batteries contain acid. Avoid spilling or contacting battery acid. Neutralize battery acid spills with baking soda and water.

1 Put on protective clothing and eye wear if batteries are to be opened.

2 Be sure that the battery cable connections are free of corrosion.

3 Be sure that the battery hold down and cable connections are tight.
**B-6**

**Check the Hydraulic Tank Filter Condition Indicator**

Maintaining the hydraulic reservoir filter in good condition is essential to good system performance and safe machine operation. The filter condition indicator will show when the hydraulic flow is bypassing a clogged filter. If the filter is not frequently checked and replaced, impurities will remain in the hydraulic system and cause component damage.

1. Start the engine from the platform controls.
2. Switch the engine speed control to high idle (rabbit symbol).
3. Inspect the filter condition indicator.

Result: The filter should be operating in the green area. If the display shows red, this indicates that the hydraulic filter is being bypassed and the filter should be replaced.

**B-7**

**Inspect the Electrical Wiring**

Maintaining electrical wiring in good condition is essential to safe operation and good machine performance. Failure to find and replace burnt, chafed, corroded or pinched wires could result in unsafe operating conditions and may cause component damage.

**WARNING** Electrocutation hazard. Contact with hot or live circuits may result in death or serious injury. Remove all rings, watches and other jewelry.

1. Inspect the following areas for burnt, chafed, corroded and loose wires:
   - engine compartment relay panel
   - engine wiring harness
   - inside of the ground control box
   - turntable manifold wiring
2. Start the engine from the ground controls, and then raise the secondary boom until the upper pivot is above the turntable covers.
3. Inspect the upper pivot area for burnt, chafed and pinched cables.
4. Fully lower the boom into the stowed position and turn the engine off.
5. Inspect the following areas for burnt, chafed, corroded, pinched and loose wires:
   - cable track on the primary and secondary booms
   - primary boom to platform cable harness
   - inside of the platform control box
### TABLE B PROCEDURES

#### B-8 Inspect the Tires and Wheels

Maintaining the tires and wheels in good condition is essential to safe operation and good performance. Tire and/or wheel failure could result in a machine tip-over. Component damage may also result if problems are not discovered and repaired in a timely fashion.

**WARNING** An over-inflated tire can explode and may cause death or serious injury.

1. Check all tire treads and sidewalls for cuts, cracks, punctures and unusual wear.
2. Check each wheel for damage, bends and cracked welds.
3. Check every lug nut for proper torque.
4. Check the pressure in each air-filled tire.

<table>
<thead>
<tr>
<th>Tires and wheels</th>
<th>Rough terrain</th>
<th>Industrial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tire size</td>
<td>14-17.5NHS</td>
<td>9-14.5 LT</td>
</tr>
<tr>
<td>Tire ply rating</td>
<td>8</td>
<td>Tread 8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sidewall 6</td>
</tr>
<tr>
<td>Tire pressure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2WD</td>
<td>40 psi</td>
<td>100 psi</td>
</tr>
<tr>
<td></td>
<td>2.76 bar</td>
<td>6.89 bar</td>
</tr>
<tr>
<td>4WD</td>
<td>28 psi</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.93 bar</td>
<td></td>
</tr>
<tr>
<td>Lug nut torque</td>
<td>125 ft-lbs</td>
<td>125 ft-lbs</td>
</tr>
<tr>
<td></td>
<td>169.5 Nm</td>
<td>169.5 Nm</td>
</tr>
<tr>
<td>Wheel diameter</td>
<td>17.5 inches</td>
<td>14.5 inches</td>
</tr>
<tr>
<td>Wheel width</td>
<td>10.5 inches</td>
<td>7 inches</td>
</tr>
<tr>
<td>Wheel lugs - 4WD</td>
<td>9 @ 5/8-18</td>
<td></td>
</tr>
<tr>
<td>Wheel lugs - 2WD</td>
<td>8 @ 5/8-18</td>
<td>8 @ 5/8-18</td>
</tr>
<tr>
<td></td>
<td>9 @ 5/8-18</td>
<td>9 @ 5/8-18</td>
</tr>
</tbody>
</table>

#### B-9 Confirm Proper Brake Configuration

Proper brake configuration is essential to safe operation and good machine performance. Hydrostatic brakes and hydraulically released, spring applied individual wheel brakes can appear to operate normally when they are actually not fully operational.

1. Check the torque hub disconnect caps to be sure they are in the engaged position.

![Brake Configuration Diagram](image)

2. On 4WD models, be sure the free-wheel valve on the drive pump is closed (clockwise).

![Free-wheel Valve Diagram](image)
TABLE B PROCEDURES

B-10
Check the Oil Level in the Torque Hubs

Failure to maintain proper torque hub oil levels may cause the machine to perform poorly and continued use may cause severe component damage.

1 Drive the machine to rotate the hub until the side plugs are located one on top and the other at 90 degrees.

2 Remove the plug located at 90 degrees and check the oil level.
Result: The oil level should be even with the bottom of the plug hole.

3 If necessary, remove the top plug and add oil until the oil level is even with the bottom of the side plug hole.

4 Apply pipe thread sealant to the plug, and then install it in the torque hub.

5 Repeat this procedure for each torque hub.

Drive torque hub oil

<table>
<thead>
<tr>
<th>Capacity</th>
<th>17 fluid ounces</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.51 liters</td>
</tr>
</tbody>
</table>

Type: SAE 90 multipurpose hypoid gear oil - API service classification GL5

B-11
Check and Adjust the Engine Idle Mixture - Gasoline/LPG Models

Complete information to perform this procedure is available in the Ford LSG-423 2.3 Litre Industrial Engine Service Manual (Ford number: 194-216). Genie part number 29586.

B-12
Check and Adjust the Engine RPM

Maintaining the engine rpm at the proper setting for both low and high idle is essential to good engine performance and service life. The machine will not operate properly if the rpm is incorrect and continued use may cause component damage.

**Gasoline/LPG Models**

**NOTICE** Perform this procedure in gasoline mode with the engine at normal operating temperature.

1 Disconnect the blue/black wire from the governor actuator.

2 Connect an rpm gauge to the engine, then start the engine from the ground controls.
Result: Carburetor low idle should be 900 rpm.

**Skip to step 4 if the low idle rpm is correct.**
TABLE B PROCEDURES

3 Turn the idle adjustment screw on the carburetor clockwise to increase rpm or counterclockwise to decrease rpm.

4 Turn the engine off and reconnect the blue/black wire to the governor actuator.

5 Start the engine from the ground controls.

6 Move the engine idle control switch to high idle (rabbit symbol) from the ground controls.

7 Turn the engine off.

If low and high idle rpm’s are correct, disregard adjustment steps 8 and 9.

8 Remove the mounting fasteners from the electronic governor located on the engine side bulkhead, then remove the back panel from the governor.

9 Restart the engine, turn the low or high speed set screw clockwise to increase the rpm or counterclockwise to decrease the rpm.

Do not adjust any trimpot other than specified in this procedure.

10 Re-assemble the governor and recheck low and high idle.

<table>
<thead>
<tr>
<th>Gasoline/LPG models</th>
<th>Gasoline/LPG idle adjustment</th>
<th>Deutz Diesel models</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low idle - carburetor</td>
<td>900 rpm</td>
<td>Connect an rpm gauge to the engine, and then start the engine from the ground controls.</td>
</tr>
<tr>
<td>Low idle - electronic governor</td>
<td>1400 rpm</td>
<td>Result: Low idle should be 1300 rpm.</td>
</tr>
<tr>
<td>High idle</td>
<td>2150 rpm</td>
<td>Skip to step 3 if the low idle rpm is correct.</td>
</tr>
</tbody>
</table>
2. Loosen the lock nut, then turn the adjustment screw clockwise to increase the rpm or counterclockwise to decrease the rpm. Tighten the lock nut and recheck the rpm.

3. Move the engine idle control switch to high idle (rabbit symbol) from the ground controls.

Result: High idle should be 2300 rpm.

If high idle rpm is correct, disregard adjustment step 4.

4. Loosen the yoke lock nut, then turn the adjustment nut and solenoid boot counterclockwise to increase the rpm or clockwise to decrease the rpm. Tighten the yoke lock nut and recheck the rpm.

Deutz Diesel models

<table>
<thead>
<tr>
<th></th>
<th>rpm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low idle</td>
<td>1300</td>
</tr>
<tr>
<td>High idle</td>
<td>2300</td>
</tr>
</tbody>
</table>

**B-13 Test the Key Switch**

Proper key switch action and response is essential to safe machine operation. The machine can be operated from the ground or platform controls and the activation of one or the other is accomplished with the key switch. Failure of the key switch to activate the appropriate control panel could cause a hazardous operating situation.

1. Pull out the Emergency Stop button to the on position at both the ground and platform controls.

2. Turn the key switch to ground control, start the engine and then turn the key switch to platform control.

3. Operate each machine function from the ground controls.

○ Result: The machine functions should not operate.

4. Turn the key switch to ground control.

5. Operate each machine function from the platform controls.

○ Result: The machine functions should not operate.

6. Turn the key switch to the off position.

○ Result: The engine should stop and no functions should operate.

**NOTICE** Deutz Diesel models: All functions should stop immediately. The engine will shut off after 2 to 3 seconds.
B-14
Test the Emergency Stop Buttons

Properly functioning Emergency Stop buttons are essential for safe machine operation. An improperly operating Emergency Stop button will fail to shut off power and stop all machine functions resulting in a hazardous situation for ground and platform personnel.

As a safety feature, selecting and operating the ground controls can override the platform controls, including the Emergency Stop button.

1. Start the engine from the ground controls.
2. Push down the Emergency Stop button to the off position.
   - Result: The engine should be off and no machine functions should operate.

Diesel models: All functions should stop immediately. The engine will shut off after 2 or 3 seconds.

3. Start the engine from the platform controls.
4. Push down the Emergency Stop button to the off position.
   - Result: The engine should be off and no machine functions should operate.

The ground Emergency Stop button will stop all machine operation, even if the key switch is switched to platform control.

B-15
Test the Ground Control Override

A properly functioning ground control override is essential to safe machine operation. The ground control override function is intended to allow ground personnel to operate the machine from the ground controls whether or not the Emergency Stop button on the platform controls is in the on or off position. This function is particularly useful if the operator at the platform controls can not return the boom to the stowed position.

1. Push in the platform Emergency Stop button to the off position.
2. Start the engine from the ground controls.
3. Operate each boom function through a partial cycle.
   - Result: All boom functions should operate.

B-16
Test the Oscillate Lock-out

Perform this test on oscillating axle equipped machines only.

Proper axle oscillate lock-out when the boom is raised is essential to safe machine operation. If the lock-out wedges do not extend when the boom is raised, the stability of the machine is compromised and it may tip over.
1 From the ground controls, raise the primary boom above the drive speed limit switch.

![Oscillating axle limit switch]

**Oscillating axle limit switch**
- a limit switch
- b oscillating lock out wedge

Φ Result: The oscillate cylinder should extend the lock-out wedges 3 inches (7.6cm) past the chassis frame. The boom should stop moving until the wedges are fully extended.

2 Lower the primary boom onto its resting pad.

Φ Result: The oscillate lock-out wedges should fully retract.

**NOTICE**
When the primary and secondary booms are fully lowered into the stowed position and the engine is turned off, the oscillate lock-out wedges may partially extend. This should not be mistaken for the full lock-out position.

### TABLE B PROCEDURES

#### B-17
**Test Platform Self-leveling**

Precise automatic platform self-leveling throughout the full cycle of boom raising and lowering is essential for safe machine operation. The platform is maintained at level by a hydraulic cylinder (leveling slave cylinder) which is controlled by the master cylinder located at the base of the primary boom. A platform self-leveling failure creates an unsafe working condition for platform and ground personnel.

1 Start the engine from the ground controls, then fully lower the boom into the stowed position.

2 Adjust the platform to a level position using the manual platform leveling switch.

3 Raise and lower the primary boom through a full cycle.

Φ Result: The platform should remain level at all times to within ±5 degrees.

#### B-18
**Test the Service Horn**

A functional service horn is essential to safe machine operation. The service horn is activated at the platform controls and sounds at the ground as a warning to ground personnel. An improperly functioning horn will prevent the operator from alerting ground personnel of hazards or unsafe conditions.

1 Turn the key switch to platform control and pull out the Emergency Stop button to the *on* position.

2 Push down the service horn button at the platform controls.

Φ Result: The service horn should sound.
TABLE B PROCEDURES

B-19
Test the Foot Switch

A properly functioning foot switch is essential to safe machine operation. Machine functions should activate and operate smoothly as long as the foot switch is pressed down, and promptly stop when the foot switch is released. The foot switch will also shift the engine into high idle mode if the idle select is switched to the rabbit and foot switch symbol. An improperly functioning foot switch can cause an unsafe working condition and endanger platform and ground personnel.

The engine should not start if the foot switch is pressed down.

1. Start the engine from the platform controls.
2. Without pressing down the foot switch, operate the machine functions.
   - Result: The machine functions should not operate.
3. Press down the foot switch and operate the machine functions.
   - Result: The machine functions should operate.

B-20
Test the Engine Speed Select

A properly operating engine idle select switch is essential to good engine performance and safe machine operation. There are three settings.

- Low idle (turtle symbol) allows the operator to control individual boom functions only. Drive functions do not operate at low idle.
- High idle (rabbit symbol) allows the operator to control multiple boom and/or drive functions simultaneously. This setting maintains a consistent high idle and is usually selected only when the generator option is being used.
- Foot switch activated high idle (rabbit and foot switch symbols) should be used for normal machine operation. This selection activates high idle only when the foot switch is pressed down.

1. Pull out the Emergency Stop button to the on position at both the ground and platform controls.
2. Start the engine from the ground controls. Then move the engine speed control switch to high idle (rabbit symbol) and hold in the on position.
   - Result: The engine should change to high idle.
3. Release the engine speed control switch.
   - Result: The engine should return to low idle.
4. Turn the key switch to platform controls.
5. At the platform controls, move the engine speed control switch to high idle (rabbit symbol).
   - Result: The engine should change to high idle.
6. Move the engine speed control switch to low idle (turtle symbol).
   - Result: The engine should change to low idle.
7. Move the engine speed control switch to foot switch activated high idle (rabbit and foot switch symbol).
   - Result: The engine should not change to high idle.
8. Press down the foot switch.
   - Result: The engine should change to high idle.

### Gasoline/LPG models

<table>
<thead>
<tr>
<th>Setting</th>
<th>RPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low idle</td>
<td>1400</td>
</tr>
<tr>
<td>High idle</td>
<td>2150</td>
</tr>
</tbody>
</table>

### Deutz Diesel models

<table>
<thead>
<tr>
<th>Setting</th>
<th>RPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low idle</td>
<td>1300</td>
</tr>
<tr>
<td>High idle</td>
<td>2300</td>
</tr>
</tbody>
</table>
B-21
Test Fuel Select Operation - Gasoline/LPG Models

The ability to select and switch between gasoline and LP fuels as needed is essential to safe machine operation. A fuel selection can be made when the engine is running or not. Switching malfunctions and/or the failure of the engine to run properly in both fuel modes and through all idle speeds can indicate fuel system problems that could develop into a hazardous situation.

Perform this test after checking the gasoline and propane gas fuel levels, and warming the engine to normal operating temperature.

1 Move the fuel select switch to gasoline and then move the engine speed control switch to foot switch activated high idle (rabbit and foot switch symbol).
2 Start the engine from the platform controls and allow it to run at low idle.
3 Press down the foot switch to allow the engine to run at high idle.
4 Release the foot switch and stop the engine.
5 Move the fuel select switch to propane gas.
6 Restart the engine and allow it to run at low idle.
7 Press down the foot switch to allow the engine to run at high idle.

The engine should start promptly and operate smoothly in low and high idle.

The engine may hesitate momentarily and then continue to run on the selected fuel if the fuel source is switched while the engine is running.

B-22
Test the Turntable Rotation Stop

The turntable is capable of rotating the boom 359 degrees and is stopped midpoint between the steering wheels by the rotation stop. Detecting a rotation stop malfunction is essential to safe operation and good machine performance. If the turntable rotates past the rotation stop, component damage may result.

1 Start the engine from the platform controls.
2 Rotate the turntable to the left as far as it will go.
   ○ Result: Movement should stop when the boom reaches mid-point between the steer tires.
3 Rotate the turntable to the right full circle as far as it will go.
   ○ Result: Movement should stop when the boom reaches mid-point between the steer tires.

B-23
Test the Drive Enable System

Proper drive enable system operation is essential to safe machine operation. When the platform is over the non-steering wheels, drive movement is stopped and the indicator light turns on and the drive enable switch must be used to reactivate the drive function. This should inform the operator that the machine will move in the opposite direction that the drive and steer controls are moved. An improperly functioning drive enable system may allow the boom to be moved into an unsafe position.

1 Start the engine from the platform controls.
2 Rotate the turntable to the right until the platform is positioned over the right non-steer wheel.
   ○ Result: Platform over non-steer wheel indicator light should turn on.
### TABLE B PROCEDURES

3. Slowly move drive control handle off center.

**CAUTION** Always use the color coded direction arrows on the platform control panel and the drive chassis to identify which direction the machine will travel.

- Result: Drive function should not operate.

4. Hold drive enable toggle switch to either side and slowly move the drive control handle off center.

- Result: Drive function should operate.

5. Rotate the turntable to the left until platform is positioned over the left non-steer tire.

- Result: Platform over steer wheel indicator light should come on.

6. Repeat steps 3 and 4.

---

**B-24**

**Test the Drive Brakes**

Proper brake action is essential to safe machine operation. The Brake function should operate smoothly, free of hesitation, jerking and unusual noise. Hydrostatic brakes and hydraulically released individual wheel brakes can appear to operate normally when not fully operational.

**NOTICE** Be sure that the machine is not in free-wheel or partial free-wheel configuration. Refer to B-8 in this section, Confirm Proper Brake Configuration.

**NOTICE** Select a test area that is firm, level and free of obstructions.

1. Mark a test line on the ground for reference.

2. Start the engine from the platform controls, and then select high drive mode (machine on flat ground).

3. Fully lower the boom into the stowed position.

4. Choose a point on the machine; i.e., contact patch of a rear tire, as a visual reference for use when crossing the test line.

5. Bring the machine to top drive speed before reaching the test line. Release the drive joystick when your reference point on the machine crosses the test line.

6. Measure the distance between the test line and your machine reference point.

**NOTICE** The brakes must be able to hold the machine on any slope it is able to climb.

**Specifications: high range, paved surface**

| Stopping distance, | 5.5 to 6 feet | 1.67 to 1.82 m |
B-25

Test Drive Speed - Stowed Position

Proper drive function movement is essential to safe machine operation. The drive function should respond quickly and smoothly to operator control. Drive performance should also be free of hesitation, jerking and unusual noise over the entire proportionally controlled speed range.

**NOTICE** Select a test area that is firm, level and free of obstructions.

1 Create start and finish lines by marking two lines on the ground 20 feet (6m) apart.
2 Start the engine from the platform controls, and then select high drive mode (machine on flat ground).
3 Move the engine speed control switch to high idle (rabbit & foot switch), and then fully lower the boom into the stowed position.
4 Choose a point on the machine; i.e., contact patch of a rear tire, as a visual reference for use when crossing the start and finish lines.
5 Bring the machine to top drive speed before reaching the start line. Begin timing when your reference point on the machine crosses the start line.
6 Continue at full speed and note the time when the machine reference point passes over the finish line.

**Specifications:** stowed position, high range

<table>
<thead>
<tr>
<th>Distance: 20 feet / 6 meters</th>
</tr>
</thead>
<tbody>
<tr>
<td>4WD</td>
</tr>
<tr>
<td>2WD</td>
</tr>
</tbody>
</table>

B-26

Test the Alarm Package (optional equipment)

The alarm package includes:
- travel alarm
- descent alarm
- flashing beacon

Alarms and beacons are installed to alert operators and ground personnel of machine proximity and motion. The alarm package components are installed on the right side, on top of the turntable cover.

**NOTICE** The alarm and beacons will operate with the engine running or not.

1 At the ground controls pull out the Emergency Stop button to the on position and turn the key switch to ground control.
○ Result: The flashing beacon should be on and flashing.
2 Move the primary boom switch to the down position, hold for a moment and then release it. Now move the secondary boom switch to the down position, hold for a moment and then release it.
○ Result: The descent alarm should sound when each switch is held down.
3 Turn the key switch to platform control, then from the platform controls, pull out the Emergency Stop button to the on position.
○ Result: The flashing beacon should be on and flashing.
TABLE B PROCEDURES

4 Press down the foot switch. Move the primary boom control handle to the down position, hold for a moment and then release it. Move the secondary boom control handle to the down position, hold for a moment and then release it.

○ Result: The descent alarm should sound when each control handle is held down.

6 Press down the foot switch. Slowly move the drive control handle off center, hold for a moment and then release it. Slowly move the drive control handle off center in the opposite direction, hold for a moment and then release it.

○ Result: The travel alarm should sound when the drive control handle is moved off center in either direction.

B-27

Perform Hydraulic Oil Analysis

See D-1, Test or Replace the Hydraulic Oil.

B-28

Replace the Engine Oil and Filter - Deutz Diesel Models

Engine specifications require that this procedure be performed every 500 hours. Perform this procedure more often if dusty conditions exist.

Periodic replacement of the engine oil and filter is essential to good engine performance. Operating the machine with an improper oil level or neglecting periodic oil and filter changes can damage engine components. A frequent check of elapsed machine hours against the hours noted on the oil filter will allow the inspector to anticipate and perform oil and filter changes at the 500 hour interval.

NOTICE

Perform this procedure after warming the engine to normal operating temperature.

CAUTION

Beware of hot engine parts and oil. Contact with hot engine oil and/or engine parts may cause severe burns.

1 Remove the oil filler cap located on the valve cover.

2 Pull the end of the drain hose out from under the engine.

3 Remove the plug from the end of the drain hose and allow all of the oil from the engine to drain into a suitable container.
4 Install the plug into the drain hose.
5 Use an oil wrench and remove the oil filter.

6 Apply a thin layer of oil to the new filter gasket (filter part no. 29561). Then install the filter and tighten it securely by hand.

7 Use a permanent ink marker to write the date and number of hours from the hour meter on the oil filter.

8 Fill the engine with new oil per specifications and replace the oil filler cap.

9 Start the engine from the ground controls. Allow the engine to run for 30 seconds then turn the engine off.

10 Check the oil filter and oil pan for leaks.
11 Check the engine oil level dipstick. Add oil if needed.

### TABLE B PROCEDURES

<table>
<thead>
<tr>
<th>Deutz Engine F3L 1011</th>
<th>8.5 quarts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil capacity (including filter)</td>
<td>8 liters</td>
</tr>
</tbody>
</table>

### Deutz Engine F3L 1011 Oil viscosity requirements

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Viscosity</th>
</tr>
</thead>
<tbody>
<tr>
<td>-10°F to 90°F / -23°C to 32°C</td>
<td>10W-40</td>
</tr>
<tr>
<td>Temperature above -4°F / -34°C</td>
<td>15W-40</td>
</tr>
</tbody>
</table>

Engine oil should have properties of API classification CC/SE, CD/SE, CC/SF or CD/SF grades.
C-1
Check the Primary Boom Wear Pads

Maintaining the primary boom wear pads in good condition is essential to safe machine operation. Wear pads are placed on boom surfaces to provide a low friction, replaceable wear pad between moving parts. Improperly shimmed wear pads or continued use of worn out wear pads may result in component damage and unsafe operating conditions.

1 Start the engine from the ground controls and raise the end of the primary boom to a comfortable working height (chest high).

2 Extend the extension boom 10 inches (25 cm).

3 Measure each wear pad. Replace the pad if it is less than 0.41 inches (1 cm) thick. If the pad is more than 0.41 inches (1 cm) thick, shim as necessary to obtain zero clearance and zero drag.

4 Extend and retract through the entire range of motion to check for tight spots that could cause binding or scraping.

**NOTICE** Always maintain squareness between the primary boom outer and inner tubes.

C-2
Check the Turntable Rotation Bearing Bolts

Maintaining proper torque on the turntable bearing bolts is essential to safe machine operation. Improper bolt torque could result in an unsafe operating condition and component damage.

1 Raise the secondary boom and place a 4x4x31 inch (78 cm) block between the chassis counterweight and the upper mid-pivot. Carefully lower the secondary boom onto the block.

2 Raise the primary boom until the end of the boom is approximately 7 feet (2 m) off the ground.

3 Be sure that each turntable bolt is torqued in sequence to 190 foot-pounds (258 Newton meters).

**WARNING** Crushing hazard. Keep hands away from the block and all moving parts when lowering the secondary boom.

4 Remove the support block and then lower the primary and secondary booms to the stowed position.

5 Use a forklift to support the chassis counterweight, directly below the turntable bearing.
4 Disengage the torque hubs by turning over the torque hub disconnect caps on each non-steering wheel hub.

5 Manually rotate each non-steering wheel.

Result: Each non-steering wheel should rotate with minimum effort.

6 Re-engage the torque hubs by turning over the hub disconnect caps. Carefully remove the jack stands, lower the machine and remove the jack.

**WARNING** Collision hazard. Failure to re-engage the torque hubs may result in death or serious injury and property damage.

**C-3**

**Check the Free-wheel Feature**

Proper use of the free-wheel configuration is essential to safe machine operation. The free-wheel configuration is used primarily for towing. A machine configured to free-wheel without operator knowledge may result in death or serious injury and property damage.

**WARNING** Collision hazard. Select a work site that is firm and level.

**Non-steering wheels: All models**

1 Chock the steer wheels to prevent the machine from rolling.

2 Center a lifting jack of ample capacity (5000 lbs / 2268 kg) under the chassis between the rear drive wheels.

3 Lift the wheels off the ground and then place jack stands under the chassis for support.

7 Chock the drive wheels to prevent the machine from rolling.

8 Position the lifting jack under the steering axle and center it between the steering wheels.

9 Lift the wheels off the ground and then place jack stands under the chassis for support.

10 Open the free wheel valve, located on the drive pump, by turning it counterclockwise two turns.
TABLE C PROCEDURES

11 Manually rotate each steer wheel.
  ☑ Result: Each steer wheel should rotate with minimal effort.

12 Close the free wheel valve (clockwise).
  Carefully remove the jack stands, lower the machine and remove the jack.

⚠️ WARNING
Collision hazard. Failure to re-engage the torque hubs may cause death or serious injury and property damage.

C-4
Grease the Turntable Rotation Bearing and Worm Drive Gear

Yearly application of lubrication to the turntable bearing and worm drive gear is essential to good machine performance and service life. Continued use of an improperly greased gear will result in component damage.

1 Raise the secondary boom and place a 4x4x31 (78 cm) block between the chassis counterweight and the upper mid-pivot. Carefully lower the secondary boom onto the block.

2 Raise the primary boom until the end of the boom is approximately 7 feet (2 m) off the ground. Then shut off the engine.

3 Locate the grease fitting on the inside of the bearing in the middle of the turntable.

4 Pump grease into the rotation bearing until you see it coming out of the bearing seal gap. Repeat this step with the platform in the following locations.
  · platform over the drive wheels
  · platform over the left side
  · platform over the drive wheels
  · platform over the right side

⚠️ WARNING
Crushing hazard. Turn the key switch to the off position and remove the key while pumping grease.

5 Locate the grease fitting on the worm drive housing.

6 Pump grease into the gear until you see it coming out of the side of the gear housing.

Specification

Multipurpose grease

⚠️ WARNING
Crushing hazard. Keep hands away from the block and all moving parts when lowering the secondary boom.
C-5  
Replace the Torque Hub Oil

Replacing the torque hub oil is essential for good machine performance and service life. Failure to replace the torque hub oil at yearly intervals may cause the machine to perform poorly and continued use may cause component damage.

1. Select the torque hub to be serviced. Then drive the machine until one of the two plugs is at the lowest point.

2. Remove both plugs and drain the oil.

3. Drive the machine until one plug is at the top and the other is at 90 degrees.

4. Fill the hub with oil from the top hole until the oil level is even with the bottom of the side hole. Apply pipe thread sealant to the plugs, and then install the plugs.

5. Repeat steps 1 through 4 for all the other drive torque hubs.

C-6  
Replace the Hydraulic Tank Filter

Replacement of the hydraulic tank filter is essential for good machine performance and service life. A dirty or clogged filter may cause the machine to perform poorly and continued use may cause component damage. Extremely dirty conditions may require that the filter be replaced more frequently.

Beware of hot oil. Contact with hot oil may cause severe burns.

Perform this procedure with the engine off.

1. Remove the filter with an oil filter wrench.

2. Apply a thin layer of oil to the new filter gasket.

3. Install the new filter (part no. 20293) and tighten it securely by hand. Clean up any oil that may have spilled during the installation procedure.

4. Start the engine from the ground controls.

5. Inspect the filter and related components to be sure that there are no leaks.

Specifications

| Capacity       | 17 fluid ounces  
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.5 liters</td>
</tr>
</tbody>
</table>

| Type            | SAE 90 multipurpose hypoid gear oil. API classification GL5 |
C-7
Replace the Drive Loop Hydraulic Filter

Replacing the drive loop hydraulic filter is essential to good machine performance and service life. A dirty or clogged filter may cause the machine to perform poorly and continued use may cause component damage. Extremely dirty conditions may require that the filter be replaced more frequently.

**CAUTION** Beware of hot oil. Contact with hot oil may cause severe burns.

**NOTICE** Perform this procedure with the engine off.

1. Rotate the filter housing counterclockwise and remove the housing.
2. Remove the filter element from the housing.
3. Inspect the housing seal and replace it if necessary.
4. Install the new filter (part no. 20880) and hand tighten the housing onto the filter head. Clean up any oil that may have spilled during the installation procedure.
5. Start the engine from the ground controls.
6. Inspect the filter assembly to ensure that there are no leaks.

C-8
Replace the Diesel Fuel Filter - Deutz Diesel Models

Replacing the diesel fuel filter is essential to good engine performance and service life. A dirty or clogged filter may cause the engine to perform poorly and continued use may cause component damage. Extremely dirty conditions may require that the filter be replaced more often.

**DANGER** Engine fuels are combustible. Replace the fuel filter in an open, well-ventilated area away from heaters, sparks, flames and lighted tobacco. Always have an approved fire extinguisher within easy reach.

**NOTICE** Perform this procedure with the engine off.

1. Turn the manual fuel shutoff valve, located at the fuel tank, to the CLOSED position.
2. Remove the fuel filter with a filter wrench.
3. Apply a thin layer of oil or diesel fuel to the new fuel filter gasket.
4 Install the new filter (part no. 29560) and tighten it securely by hand. Clean up any diesel fuel that might have spilled during the procedure.

5 Turn the manual fuel shutoff valve, located at the fuel tank, to the OPEN position.

6 Start the engine from the ground controls, then inspect the fuel filter for leaks.

⚠️ DANGER If a fuel leak is discovered, keep any additional personnel from entering the area and do not operate the machine. Repair the leak immediately.

C-9 Replace the Gasoline Fuel Filter

Replacing the gasoline fuel filter is essential to good engine performance and service life. A dirty or clogged filter may cause the engine to perform poorly and continued use may cause component damage. Extremely dirty conditions may require that the filter be replaced more frequently.

⚠️ DANGER Engine fuels are combustible. Replace the fuel filter in an open, well-ventilated area away from heaters, sparks, flames and lighted tobacco. Always have an approved fire extinguisher within easy reach. Perform this procedure with the engine off.

1 Remove the 3 bolts from the engine pivot plate. Swing the engine pivot plate away from the machine to access the fuel filter, located near the carburetor.

2 Loosen the filter bracket mounting bolt. Disconnect the fuel hoses from the filter, then slide the filter out of the bracket.

3 Install the new fuel filter in the bracket with the flow direction arrow, on the filter, pointing toward the carburetor. Tighten the bracket mounting bolt, then reconnect the fuel hoses to the filter.

4 Clean up any fuel that may have spilled during the installation procedure.

5 Swing the engine pivot plate back to its original position and replace the three retaining bolts.

6 Start the machine from the ground controls, then inspect the fuel filter and hoses for leaks.

⚠️ DANGER If a fuel leak is discovered, keep any additional personnel from entering the area and do not operate the machine. Repair the leak immediately.
TABLE C PROCEDURES

C-10
Replace the PCV Valve - Gasoline/LPG Models

Yearly replacement of the PCV valve is essential to good engine performance. A malfunctioning valve can impair crankcase ventilation and may cause engine damage.

Perform this procedure with the engine off.

1. Remove the 3 bolts from the engine pivot plate. Swing the engine pivot plate away from the machine to access the PCV valve.
2. Remove the hoses from the valve, then remove the valve.
3. Install the new valve.
4. Swing engine pivot plate back to its original position and replace the three retaining bolts.

C-11
Clean or Replace the Distributor Cap and Rotor - Gasoline/LPG Models

Distributor caps and rotors that are clean and free of damage, wear and corrosion are essential to good engine performance and service life. A dirty or worn cap and rotor may cause the engine to perform poorly and continued use may cause component damage. Extremely dirty conditions may require that the cap and rotor be replaced more frequently.

Perform this procedure with the engine off.

1. Remove the 3 bolts from the engine pivot plate. Swing the engine pivot plate away from the machine to access the distributor.
2. Label and remove the coil and spark plug wires from the distributor cap.
3. Remove the cap and rotor from the distributor.
4. Clean the cap and rotor using electrical contact cleaner or a damp cloth.
5. Completely dry the cap and rotor.
6. Inspect the cap and rotor for corrosion, cracks and abrasion. Replace the cap and rotor if they are damaged.
C-12
Replace the Spark Plugs - Gasoline/LPG Models

Periodic replacement of the spark plugs is essential to good engine performance and service life. Worn, loose or corroded spark plugs will cause the engine to perform poorly and may result in component damage.

**NOTICE** Perform this procedure with the engine turned off.

1. Label, then disconnect the plug wires from the spark plugs by grasping the molded boot. Do not pull on the plug wire.
2. Blow out any debris around spark plugs.
3. Remove all the spark plugs from the engine.
4. Adjust the gap on each new spark plug.
5. Install the new plugs, reconnect the plug wires. Be sure that each spark plug wire is attached to the correct spark plug.

### Specifications

<table>
<thead>
<tr>
<th>Spark Plugs (Motorcraft)</th>
<th>AWSF-42</th>
</tr>
</thead>
</table>
| Gap                      | 0.032 - 0.036 inches  
|                           | 0.81 - 0.91mm |
| Torque specs             | 5 - 10 foot-pounds  
|                           | 6.8 - 13.6 Nm |

### C-13
Check and Adjust the Air/Propane Mixture

Maintaining the proper air-to-fuel mixture during propane operation is essential to good engine performance.

**DANGER** Engine fuels are combustible. Perform this procedure in an open, well-ventilated area away from heaters, sparks, flames and lighted tobacco. Always have an approved fire extinguisher within easy reach.

**NOTICE** The engine rpm needs to be preset for gasoline fuel operation before adjusting the propane idle mixture.

**NOTICE** The engine should be warmed to normal operating temperature before performing this procedure.

1. Move the fuel select switch to propane fuel and start the engine from the ground controls.
2. Loosen the high idle mixture adjustment lock nut.
3 Load the system by pressing the primary boom extension retract switch, and then move the engine speed control switch to high idle (rabbit symbol).

4 Adjust the high idle adjustment nut to obtain an air-to-fuel mixture ratio of 13.0:1 to 13.2:1, using an exhaust gas analyzer.

   NOTICE If an exhaust gas analyzer is not available, adjust to obtain peak or optimum rpm.

5 Hold the adjustment screw and tighten the lock nut.

6 Move the engine speed control switch to low idle (turtle symbol) and adjust the low idle screw to obtain an air-to-fuel mixture ratio of 13.0:1 to 13.2:1.

C-14
Check and Adjust the Ignition Timing - Gasoline/LPG Models

Complete information to perform this procedure is available in the Ford LSG-423 2.3 Litre Industrial Engine Service Manual (Ford number: 194-216). Genie part number 29586.

C-15
Check the Engine Valve Clearances - Deutz Diesel Models

Complete information to perform this procedure is available in the Deutz FL 1011 Workshop Manual (Deutz Number 02611642). Genie part number 29789.
D-1
Test or Replace the Hydraulic Oil

Replacement or testing of the hydraulic oil is essential for good machine performance and service life. Dirty oil and suction strainers may cause the machine to perform poorly and continued use may cause component damage. Extremely dirty conditions may require oil changes to be performed more often.

The machine uses Dexron II equivalent hydraulic oil. Before replacing the hydraulic oil, the oil may be tested by an oil distributor for specific levels of contamination to verify that changing the oil is necessary. If the hydraulic oil is not replaced at the two year inspection, quarterly testing (B-27) thereafter should be completed.

Perform this procedure with the boom in the stowed position.

1 Close the two hydraulic shutoff valves located at the hydraulic tank.

Component damage hazard. The engine must not be started with the hydraulic tank shutoff valves in the closed position or component damage will occur. If the tank valves are closed, remove the key from the key switch and tag the machine to inform personnel of the condition.

2 Remove the drain plug from the hydraulic tank.

3 Completely drain the tank into a suitable container. See capacity specifications listed below.

4 Disconnect and cap the two suction hoses that are attached to the hydraulic tank shutoff valves.

5 Remove the strainer assemblies from the tank.

6 Carefully clean any foreign material from the strainers. Clean the strainers from the inside out.

7 Apply pipe thread sealant to the strainer mounting threads, and then install them.

8 Apply pipe thread sealant to the drain plug, and then install it in the tank.

9 Install the two suction hoses.

10 Fill the tank with hydraulic oil until the level is within the top 2 inches (5 cm) of the sight gauge. Do not overfill.

11 Clean up any oil that may have spilled and open the hydraulic tank valves.

12 Prime the pump by doing the following:

   Connect a 0 to 600 psi (0 to 41 bar) pressure gauge to the test port on the drive pump.

   **Gasoline/LPG models:**

   Remove the high tension lead from the center of the ignition coil.

   **WARNING** Electrocuton hazard. Contact with electrically charged circuits may cause death or serious injury. Remove all rings, watches and other jewelry.
D-2
Change or Recondition the Engine Coolant - Gasoline/LPG Models

Replacing or reconditioning the engine coolant is essential to good engine performance and service life. Old or dirty coolant may cause the engine to perform poorly and continued use may cause engine damage. Extremely dirty conditions may require coolant to be changed more frequently.

⚠️ CAUTION
Beware of hot engine parts and coolant. Contact with hot engine parts and/or coolant will cause severe burns.

⚠️ NOTICE
Perform this procedure with the engine off and cooled.

1. Put on protective clothing and eye wear.
2. Disconnect the coolant return hose at the radiator and drain the coolant return tank.
3. Remove the radiator cap from the radiator.

---

Deutz Diesel models:
Hold the manual fuel shutoff valve counterclockwise to the CLOSED position.

All models:
Crank the engine with the starter motor for 15 seconds, wait 15 seconds, then crank the engine an additional 15 seconds or until the pressure reaches 320 psi (22 bar).

13 Connect the wiring and start the engine from the ground controls. Check the hydraulic tank for leaks.

---

Hydraulic system

<table>
<thead>
<tr>
<th>Description</th>
<th>Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydraulic tank capacity</td>
<td>25 gallons</td>
</tr>
<tr>
<td></td>
<td>95 liters</td>
</tr>
<tr>
<td>Hydraulic system capacity (including tank)</td>
<td>30 gallons</td>
</tr>
<tr>
<td></td>
<td>114 liters</td>
</tr>
<tr>
<td>Hydraulic fluid</td>
<td>Dexron II equivalent</td>
</tr>
</tbody>
</table>
4 Remove the 3 bolts from the engine pivot plate. Swing the engine pivot plate away from the machine to access the radiator petcock.

5 Open the petcock on the radiator and allow all the coolant to drain into a container.

6 After all the coolant has drained, close the petcock. Connect the coolant return hose to the radiator.

7 Open the petcock on the engine block and allow the coolant to drain into a container. After the fluid is drained, close the petcock.

8 Replace all coolant hoses and clamps.

9 Pour the proper coolant mixture (anti-freeze and water) for your climate into the radiator until it is full.

10 Disconnect hose A from hard line B and hold until coolant starts to pour out of the open hose. Then immediately reconnect the hose.

11 Fill the radiator and then fill the coolant recovery tank to the NORMAL range.

12 Clean up any coolant spilled during this procedure.

13 Start the engine from the ground controls, run it for 30 seconds, and then turn it off.

14 Inspect for leaks and then check the fluid level in the coolant recovery tank. Add water if needed.

15 Start the engine from the ground controls and run it until reaching normal operating temperature.

16 Allow engine to cool and check the fluid level in the coolant recovery tank. Add water if needed.

---

**TABLE D PROTOCOLS**

<table>
<thead>
<tr>
<th>Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Remove the 3 bolts from the engine pivot plate. Swing the engine pivot plate away from the machine to access the radiator petcock.</td>
</tr>
<tr>
<td>5</td>
<td>Open the petcock on the radiator and allow all the coolant to drain into a container.</td>
</tr>
<tr>
<td>6</td>
<td>After all the coolant has drained, close the petcock. Connect the coolant return hose to the radiator.</td>
</tr>
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<td>Open the petcock on the engine block and allow the coolant to drain into a container. After the fluid is drained, close the petcock.</td>
</tr>
<tr>
<td>8</td>
<td>Replace all coolant hoses and clamps.</td>
</tr>
<tr>
<td>9</td>
<td>Pour the proper coolant mixture (anti-freeze and water) for your climate into the radiator until it is full.</td>
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<tr>
<td>12</td>
<td>Clean up any coolant spilled during this procedure.</td>
</tr>
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<td>Start the engine from the ground controls, run it for 30 seconds, and then turn it off.</td>
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<td>14</td>
<td>Inspect for leaks and then check the fluid level in the coolant recovery tank. Add water if needed.</td>
</tr>
<tr>
<td>15</td>
<td>Start the engine from the ground controls and run it until reaching normal operating temperature.</td>
</tr>
<tr>
<td>16</td>
<td>Allow engine to cool and check the fluid level in the coolant recovery tank. Add water if needed.</td>
</tr>
</tbody>
</table>

**Ford Engine LSG-423**

- Coolant capacity: 11.5 quarts / 10.9 liters
TABLE D PROCEDURES

D-3 Change the Fuel Lines

Maintaining the fuel lines in good condition is essential to safe operation and good engine performance. Failure to detect a worn, cracked or leaking fuel line may cause an unsafe operating condition.

⚠️ DANGER ⚠️
Engine fuels are combustible. Replace the fuel lines in an open, well-ventilated area away from heaters, sparks, flames and lighted tobacco. Always have an approved fire extinguisher within easy reach.

⚠️ NOTICE ⚠️
Perform this procedure with the engine off.

1. Close the manual fuel shutoff valve, located next to the fuel tank.

2. Remove and replace the fuel line hoses and clamps according to the following illustrations:

Fuel may be expelled under pressure. Wrap a cloth around fuel hoses to absorb leaking fuel before disconnecting them.

Deutz Diesel models
a hose from the injector to the fuel tank
b hoses connecting injectors
c hose from the fuel shutoff valve to the fuel pump
d hose from the fuel pump to the fuel filter
e hose from the fuel filter to the injection pump
f hose from the injection pump to the injectors
**TABLE D PROCEDURES**

**D-4**
Check the Engine Valve Clearance - Gasoline/LPG Models

Complete information to perform this procedure is available in the *Ford LSG-423 2.3 Liter Industrial Engine Service Manual* (Ford number: 194-216). Genie part number 29586.

**D-5**
Check the Engine Cylinder Compression - Gasoline/LPG Models

Complete information to perform this procedure is available in the *Ford LSG-423 2.3 Liter Industrial Engine Service Manual* (Ford number: 194-216). Genie part number 29586.

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Gasoline/LPG models
a  fuel filter
b  hose from the fuel filter to the carburetor
c  hose from the fuel pump to the fuel filter
d  hose from the fuel shut off valve to the fuel pump

3  Clean up any fuel that may have spilled during this procedure.

4  Start the engine from the ground controls, then inspect the fuel filter and hoses for leaks.

**DANGER** If a fuel leak is discovered, keep any additional personnel from entering the area and do not operate the machine. Repair the leak immediately.
D-6
Clean the PCV Hoses and Fittings - Gasoline/LPG Models

Maintaining PCV hoses is essential to good engine performance. Improperly functioning PCV hoses will fail to ventilate the crankcase and continued use of neglected hoses could result in component damage.

NOTICE Perform this procedure with the engine off.

1. Remove the 3 bolts from the engine pivot plate. Swing the engine pivot plate away from the machine to access the PCV hoses.

2. Disconnect the hoses from the PCV valve, then disconnect the hoses from the engine.

3. Clean the hoses with a mild cleaning solvent.

4. Dry both hoses and inspect them for cracks and damage. Replace the hoses if they are damaged.
D-7
Check the Fuel Injection Pumps and Injectors
- Deutz Diesel Models

Complete information to perform this procedure is available in the Deutz FL 1011 Workshop Manual (Deutz number: 0291 1942). Genie part number 29789.

D-8
Check the Toothed Belt
- Deutz Diesel Models

Complete information to perform this procedure is available in the Deutz FL 1011 Operation Manual (Deutz number: 0297 4706 EN). Genie part number 29790.

D-9
Replace the Timing Belt
- Gasoline/LPG Models

Complete information to perform this procedure is available in the Ford LSG-423 2.3 Liter Industrial Engine Service Manual (Ford number: 194-216). Genie part number 29586.
Observe and Obey:

- Troubleshooting and repair procedures shall be completed by a person trained and qualified on the repair of this machine.
- Immediately tag and remove from service a damaged or malfunctioning machine.
- Repair any machine damage or malfunction before operating the machine.
- Unless otherwise specified, perform each repair procedure with the machine in the following configuration:
  - machine parked on a flat level surface
  - boom in stowed position
  - turntable rotated with the boom between the non-steering wheels
  - turntable secured with the turntable rotation lock pin
  - key switch in the OFF position with the key removed
  - wheels chocked

Before Troubleshooting:

- Be sure that all necessary tools and test equipment are available and ready for use.
- Read each appropriate flow chart thoroughly. Attempting shortcuts may produce hazardous conditions.
- Be aware of the following hazards and follow generally accepted safe workshop practices.

**DANGER** Crushing hazard. When testing or replacing any hydraulic component, always support the structure and secure it from movement.

**DANGER** Electrocution hazard. Contact with electrically charged circuits may result in death or serious injury. Remove all rings, watches and other jewelry.

**WARNING** Bodily injury hazard. Spraying hydraulic oil can penetrate and burn skin. Loosen hydraulic connections very slowly to allow the oil pressure to dissipate gradually. Do not allow oil to squirt or spray.

**NOTICE** Perform all troubleshooting on a firm level surface.

**NOTICE** Two persons will be required to safely perform some troubleshooting procedures.
TROUBLESHOOTING FLOW CHARTS

About This Section

When a malfunction is discovered, the flow charts in this section will help a service professional pinpoint the cause of the problem. To use this section, basic hand tools and certain pieces of test equipment are required—voltmeter, ohmmeter, pressure gauges.

The location of terminals mentioned in this section can be found on the appropriate electrical or hydraulic schematics provided in Section 6, Schematics.

Since various degrees of a particular function loss may occur, selecting the appropriate flow chart may be troublesome. When a function will not operate with the same speed or power as a machine in good working condition, refer to the flow chart which most closely describes the problem.
Engine Will Not Crank Over

Be sure the key switch is in the appropriate position.

Be sure the emergency stop buttons are pulled up into the on position.

Be sure the circuit breaker(s) are not tripped.
CHART 1

Continued from the previous page.

Hold start switch and check voltage at terminal #86 on CR1. 0V
- Repair open in blk wire from terminal #1 on start lockout module to CR1.

12V
Check voltage at terminal #30 on CR1. 0V
- Repair red wire circuit from battery to CB1 to CR1 terminal #30.

12V
Hold start switch and check voltage at terminal #87 on CR1. 0V
- Check ground to terminal #85 on CR1.

bad
- Repair open in ground to CR1.

good
- Replace CR1 relay.

12V
Check voltage at initiate terminal starter solenoid. 0V
- Repair open in blk wire circuit from CR1 to starter solenoid.

12V
- Check, repair or replace starter or starter solenoid.
Engine Cranks Over But Will Not Start - Gasoline/LPG Models

Be sure to check the engine oil level and fill as needed.

Be sure to check fuel levels and engine coolant level.

Be sure the gasoline shut-off valve is in the on position.

Be sure that automatic choke is not sticking closed.

Perform following tests in gasoline mode only.

- Hold start switch and check battery voltage while engine is cranking.
  - less than 11V
  - more than 11V

- Check if engine coolant over-temperature sending signal post has continuity to ground.
  - no continuity
  - continuity

- Check if radiator and/or engine block feels excessively hot.
  - not hot
  - hot

- Remove wire/d wire from temperature sending unit, check continuity to ground.
  - no continuity
  - continuity

- Remove wire from TB26 and check continuity to ground.
  - no continuity

- Repair short in wire from circuit from terminal #10 start lock out module to TB24 OR consult Genie Industries Service Department.

- Repair short in wire from circuit from terminal #10 start lock out module to TB24 OR consult Genie Industries Service Department.

- See Ford service manual for troubleshooting ignition system.

- Go to Chart 2A, page 5 - 8.

- Continued on the next page.
CHART 2

1. Hold start switch and check voltage at wht #21 on terminal #87 of CR2.
   - 12V: Repair open in wht #21 wire to ignition coil.
   - 0V: Check voltage at red wire on terminal #30 of CR2.

2. Check voltage at red wire on terminal #30 of CR2.
   - 12V: Hold start switch and check voltage at terminal #9 on start lockout module.
   - 0V: Repair open in red wire circuit from battery to CB1 to CR1 to CR2.

3. Hold start switch and check voltage at terminal #9 on start lockout module.
   - 12V: Repair open in blk wire from terminal #86 on CR2 to terminal #9 on start lockout module.
   - 0V: Check voltage at terminal #6 on start lockout module.

4. Check voltage at terminal #6 on start lockout module.
   - 12V: Check ground wire, terminal #5 on start lockout module.
     - bad: Repair open in ground circuit to start lockout module.
     - good: Replace the start lockout module OR consult Genie Industries Service Department.
   - 0V: Repair open in power supply wires to terminal #6 on start lockout module.

5. Check ground wire, terminal #5 on start lockout module.
   - bad: Repair open in ground circuit to start lockout module.
   - good: Replace the start lockout module OR consult Genie Industries Service Department.

6. Check ground to terminal #85 on CR2.
   - no good: Repair open in ground wire to CR2.
   - good: Continued on the next page.

Continued from the previous page.
CHART 2

Continued from the previous page.

Hold start switch and check voltage at wht on terminal #87 of CR8.

12V

Repair open in brn #R8 wire to ignition coil.

0V

Check voltage at wht wire on terminal #30 of CR8.

0V

Repair open in wht wire circuit from terminal #87 on CR1 to terminal #30 on CR8.

12V

Hold start switch and check voltage at terminal #86 of CR8.

0V

Repair open in blk wire from terminal #86 on CR1 to #86 on CR8.

12V

Check ground to terminal #85 on CR8.

no good

Repair open in ground wire to CR8.

good

If weak spark still exists, contact Genie Industries Service Department.
Chart 2A

Engine Cranks Over But Will Not Start - Gasoline/LPG Models or Engine Runs While Cranking Then Dies

Continuation of “good spark” fault path.

Perform these tests in gasoline mode only.
With keyswitch on and both mushroom switches pulled out, check voltage at center terminal on fuel select switch in platform control box.

12V

With keyswitch on and both mushroom switches pulled out, check voltage on gasoline side (blue/white wire) of fuel select switch.

12V

With keyswitch on and both mushroom switches pulled out, check voltage at terminal TB38.

12V

With keyswitch on and both mushroom switches pulled out, check voltage at blue/white wire at terminal #30 on CR6.

12V

With keyswitch on and both mushroom switches pulled out. Crank engine and check voltage at terminal #87 on CR6.

12V

Check ground wire on terminal #85 of CR6.

no good

Repair open in ground wire.

good

Replace CR6.

Repair open in blu/whit wire circuit from toggle switch to TP38 to TB38.

Repair open in blu/white wire circuit from TB38 to terminal #30 on CR6.

0V

0V

0V

0V

0V

Repair open in red power wire circuit.

Replace toggle switch.

With the previous page.
CHART 2A

Continued from the previous page.

- Hold start switch and check voltage at blu/wht wire on anti-diesel valve (on engine carburetor).
  - 0V → Repair open in blu/wht #38 wire circuit CR6 to anti-diesel valve.
  - 12V → Hold start switch and check voltage at blu/wht #38 wire on gasoline solenoid (at gasoline tank).
    - 0V → Repair open in blu/wht #38 wire circuit from anti-diesel valve to gasoline solenoid.
    - 12V → Hold start switch, does engine fire?
      - no → Go to chart 2B, page 5 - 11.
      - yes → Reconnect the two wires to vacuum switch and check for fuel line blockage OR replace anti-diesel valve OR see Ford service manual for troubleshooting fuel pump and/or carburetor OR Consult Genie Industries Service Department.
Engine Runs While Cranking Then Dies

- Crank engine and check voltage at terminal #2 on start lockout module.
  
  \[0V\]  
  
- Repair or replace alternator OR contact Genie Industries Service Department.
  
  \[6 to 7V\]  
  
- Repair open in org/blk #41 wire circuit from alternator to TB41 to terminal #2 on start lockout module.
  
- Check oil level OR replace oil pressure sending unit OR refer to Ford service manual for troubleshooting low oil pressure.
  
- While cranking engine for 15 seconds, check continuity to ground on terminal #10 start lockout module. Is continuity maintained?
  
  \[yes\]  
  
  - Disconnect wht #24 wire from oil pressure sender and check continuity to ground on signal post of sender, while cranking the engine. Is continuity maintained?
    
    \[yes\]  
    
    - Repair short to ground in wht #24 wire from sender to TB24 to start lockout module terminal #10.
      
      \[12V\]  
      
- Replace start lockout module OR consult Genie Industries Service Department.
  
  \[0V\]  
  
- Check voltage at terminal #4 on start lockout module.
  
  \[12V\]  
  
- Disconnect red wire from terminal #4 on start lockout module and check voltage at terminal #4.
  
  \[0V\]  
  
- Repair short to power in red wire circuit from TB27.
  
- Replace start lockout module OR consult Genie Industries Service Department.
Chart 3

Engine Cranks Over But Will Not Start - Deutz Diesel Models

Be sure to check the engine oil level and fill as needed.

Be sure to check fuel level.

Be sure the diesel shut-off valve is in the on position.

- Hold start switch and check battery voltage while engine is cranking.
- Check battery condition OR check alternator OR check for short circuits OR check battery cables OR replace the battery.
- Check engine oil level OR oil cooler fins for clogging OR check engine fan belts OR see Deutz service manual for troubleshooting an overheating engine.

- Check if engine coolant over-temperature sending signal post has continuity to ground.
- Check if oil cooler and/or engine block feels excessively hot.
- Check if oil cooler and/or engine block feels excessively hot.

- Remove white/red wire from temperature sending unit, check continuity to ground (on wire).
- Replace temperature switch sender.

- Remove white/red wire from TB26.
- Repair short in white/red wire circuit from TB26 to temperature sender.

- Repair short in white/red wire circuit from start lock out module to TB24 OR consult Genie Industries Service Department.

- Disable starter by removing black wire at the starter solenoid, hold start switch and check voltage at positive terminal on fuel solenoid.
- Turn machine off and isolate the fuel solenoid. Check the resistance of the solenoid.

- See Deutz service manual for troubleshooting fuel system.

- 12V
- 0 or infinite ohms
- 3.50 ohms
CHART 3

Hold start switch and check voltage at wht #21 wire on terminal #37 of CR2.

Repair open in wht #21 wire from CR2 to fuel solenoid.

Check voltage at red wire on terminal #30 of CR2.

Repair open in red wire circuit from battery to CB1 to CR1 to CR2.

Hold start switch and check voltage at terminal #86 of CR2.

Hold start switch and check voltage at terminal #9 on start lockout module.

Repair open in blk wire from terminal #86 on CR2 to terminal #9 on start lockout module.

Check voltage at terminal #6 and 7 on start lockout module.

Repair open in power supply wires to terminal #6 and 7 on start lockout module.

Check ground wire, terminal #5 on start lockout module.

Repair open in ground circuit to terminal #5 on start lockout module.

Replace the start lockout module OR consult Genie Industries Service Department.

Check ground to terminal #85 on CR2.

Repair open in ground wire to CR2.

Continued from the previous page.

12V

0V

12V

0V

12V

0V

Continued on the next page.
CHART 3

Continued from the previous page.

Crank engine and check voltage at terminal #2 on start lockout module.

0V

Repair or replace alternator OR contact Genie Industries Service Department.

6 to 7V

Repair open in org/blk #41 wire circuit from alternator to TB41 to terminal #2 on start lockout module.

While cranking engine for 15 seconds, check continuity to ground on terminal #10 on start lockout module. Is continuity maintained?

yes

Disconnect wht/blk #25 wire from oil pressure sender and check continuity to ground on signal post of sender, while cranking the engine. Is continuity maintained?

no

Repair short to ground wht/blk #25 wire from sender to TB25 to start terminal #10 on lockout module.

Check voltage at terminal #4 on start lockout module.

12V

0V

Replace start lockout module OR consult Genie Industries Service Department.

12V

Disconnect red wire from terminal #4 on start lockout module and check voltage at terminal #4.

0V

Repair positive short in red wire circuit from TB27.

Replace start lockout module OR consult Genie Industries Service Department.

Check oil level OR replace oil pressure sending unit OR refer to Deutz service manual for troubleshooting low oil pressure.
Engine Will Not Start On LPG, But Will Start On Gasoline - Gasoline/LPG Models

Be sure fuel select switch is switched to LPG.

Be sure to check LPG fuel level.

Chart 4
CHART 4

- Hold start switch and check voltage at terminal #87 on CR7.
  - 0V: Replace CR7 relay.
  - 12V:
    - Hold start switch and check voltage at blu/red wire on LPG solenoid.
      - 0V: Repair open in blu/red wire circuit from CR7 terminal #87 to LPG solenoid.
      - 12V:
        - Check resistance of LPG solenoid.
          - 0 or infinite ohms: Replace LPG solenoid.
          - 9 to 10 ohms: Reconnect LPG tank and starter then see Maintenance section for LPG adjustments OR consult Genie Industries Service Department.

Continued from the previous page.
Engine Will Not Start On Gasoline, But Will Start On LPG - Gasoline/LPG Models

Be sure fuel select switch is switched to gasoline.

Be sure to check gasoline fuel level.

Be sure that engine choke is operating properly.

With keyswitch on and both mushroom switches pulled out, check voltage at gasoline side (blu/wht wire) of fuel select switch.

12V

With keyswitch on and both mushroom switches pulled out, check voltage at terminal #30 on CR6.

12V

Crank engine for 15 seconds and check voltage at terminal #86 on CR6.

12V

Check ground wire to terminal #85 on CR6.

12V

Hold start switch and check voltage at blu/wht wire on anti-diesel valve (on carburetor).

12V

Replace fuel select switch.

12V

Repair open in blu/wht wire circuit from fuel select switch to TP38 to TB38.

12V

Repair open in blu/wht wire circuit from TB38 to terminal #30 on CR6.

12V

Repair open in red/blk wire circuit from vacuum switch to CR6.

12V

Repair open in ground wire to terminal #85 on CR6.

12V

Repair open in blu/wht wire circuit from CR6 terminal #87 to anti-diesel valve OR replace CR6.

Continued on the next page.
Hold start switch and check voltage at blu/wht wire on gasoline solenoid (at fuel tank).

12V
- 0V
  Repair open in blu/wht wire circuit from CR6 to fuel solenoid.

Check resistance of gasoline solenoid.

18 to 19 ohms
- 0 or infinite ohms
  Replace gasoline solenoid.

Check ground wire to gas solenoid.

bad
- Repair ground wire.

good

Check resistance of anti-diesel valve.

24 to 25 ohms
- 0 or infinite ohms
  Replace anti-diesel valve.

Reconnect starter, check anti-diesel and fuel valve for defects OR see Ford service manual for carburetor troubleshooting.
Engine

High Idle

Inoperative - Gasoline/LPG Models

If high idle operates on LPG but not on gasoline, see Ford service manual for carburetor troubleshooting.

If high idle operates on gasoline but not on LPG, see Repair section for LPG regulator adjustments.

Be sure throttle linkage from governor to carburetor is not binding, see Repair section.

Be sure high idle can be achieved by grasping the governor actuator arm and momentarily pulling to throttle the carburetor.

Start engine and switch rpm select to high idle (rabbit symbol) for following checks. Check voltage at blk/red wire on rpm switch.

Check voltage at TB35.

Check voltage at terminal #30 on CR3.

Check voltage at terminal #86 on CR3.

Check ground wire to terminal #85 on CR3.

Check voltage to terminal #87 on CR3.

Check voltage at terminal #86 (blk/red) of CR4.

Check ground wire to terminal #85 on CR4.

Repair open in circuit supplying 12V to center terminal of switch.

Replace rpm select toggle switch.

Repair open in blk/red wire circuit from toggle switch to TP35 to TB35.

Repair open in blk/red wire circuit from TB35 to CR3.

Repair open in white wire circuit from CR2 terminal #67 to terminal #86 on CR3.

Repair open in ground wire to terminal #85 on CR3.

Replace CR3 relay.

Repair open in blk/red wire circuit from CR3 to CR4.

Repair open in ground wire to terminal #85 on CR4.

Continued on the next page.
CHART 6

Continued from the previous page.

Check voltage on terminal #30 at CR4.

0V
12V

Repair open in wire circuit from CR3 terminal #66 to terminal #30 on CR4.

Check voltage at terminal #87a on CR4.

12V

Replace CR4 relay.

0V

Check voltage at terminal 5 on electronic governor.

12V

Repair short in blk/red wire circuit from CR4 to terminal #5 on governor OR consult Genie Industries Service Department.

0V

Check voltage at terminal 1 (red/wht wire) on electronic governor.

12V

Repair open in red/wht wire circuit from TB23 to electronic governor.

0V

Check voltage at terminal 1 (red/wht wire) on governor actuator.

12V

Repair open in red/wht wire circuit from electronic governor to governor actuator.

0V

Turn engine off, then turn machine on but do not start engine. Check voltage at terminal 4 on electronic governor.

12V

Repair open in blu/blk wire circuit from governor actuator to electronic governor OR check and/or replace governor actuator.

Continued on the next page.
CHART 6

Continued from the previous page.

Turn machine off, remove both wires from governor actuator and check resistance across governor actuator terminals.

0 or infinite ohms
Replace governor actuator.

2 to 3 ohms

Reconnect governor wires and restart engine and check voltage at electronic governor terminal 3 (yellow wire).

0V
Repair open in yellow wire circuit from ignition coil to electronic governor.

6 to 7V

See Maintenance section for governor adjustments OR replace electronic governor.
Engine Low Idle Inoperative - Gasoline/LPG Models

If low idle operates on LPG but not on gasoline, see Ford service manual for carburetor troubleshooting.

If low idle operates on gasoline but not on LPG, see Repair section for LPG regulator adjustments.

Be sure throttle linkage from governor to carburetor is not binding, see Repair section.
**Engine**
**High Idle Inoperative - Deutz Diesel Models**

Be sure mechanical linkage is not binding or defective.

Be sure 2-speed solenoid grounding wires are free of corrosion and have full continuity to ground.

- Start engine, switch rpm select switch to high idle (rabbit symbol) and check if 2-speed solenoid pulls in.
- Check high idle adjustment (see Maintenance section) or see Deutz workshop manual to troubleshoot fuel injection system.

**Flow Chart**

1. Check voltage at blk/red wire on rpm select switch.
   - 12V
   - 0V
2. Check voltage at TB35.
   - 12V
   - 0V
3. Check voltage at terminal #30 on CR3.
   - 12V
   - 0V
4. Check voltage to terminal #86 on CR3.
   - 12V
   - 0V
5. Check ground wire to terminal #85 on CR3.
   - good
   - bad
6. Check voltage to terminal #87 on CR3.
   - 12V
   - 0V
7. Check voltage at initiate terminal #86 on CR4.
   - 12V
   - 0V

Repair open in circuit supplying 12V to center terminal of switch.
Replace toggle switch
Repair open in blk/red wire circuit from toggle switch to TP35 to TB35.
Repair open in blk/red wire circuit from TB35 to terminal #30 on CR3.
Repair open in wht #21 wire circuit from terminal #67 CR2 to terminal #86 on CR3.
Repair open in ground wire to terminal #85 on CR3.
Replace CR3 relay.
Repair open in blk/red wire circuit from CR3 to CR4.

Continued on the next page.
CHART 8

Continued from the previous page.

Check ground wire to terminal #85 on CR4.  
- bad: Repair ground wire to terminal #85 on CR4.  
- good:
  - Check voltage to terminal #30 on CR4.  
    - 0V: Repair open in wht #21 wire circuit from CR2 to CR3 to CR4.  
    - 12V: Continue.

Check voltage at the blk/red wire on the 2-speed solenoid.  
- 0V: Replace CR4 relay OR repair open in blk/red wire circuit from terminal #87 on CR4 to 2-speed solenoid.  
- 12V: Check if 2-speed solenoid moves in and out freely.  
  - solenoid binds: Check linkage or replace solenoid.  
  - moves freely: Replace 2-speed solenoid. Note: resistance across solenoid terminals should be approximately 0.3 ohms.
Engine
Low Idle
Inoperative - Deutz Diesel Models

Check if mechanical linkage from 2-speed solenoid to fuel injection system is binding or defective.

At platform controls, start engine and switch rpm select switch to maintained low idle (turtle symbol). Check volts at blk/red wire on rpm select switch.

12V

Isolate the platform and ground rpm switches, check individually and replace defective switch.

0V

Check voltage at the red wire on the 2-speed solenoid.

12V

Replace CR4 relay.

0V

Check if 2-speed solenoid moves in and out freely.

solenoid binds

Check linkage or replace solenoid.

Check adjustment of linkage and fuel injection system low idle. See Maintenance section.

ok

See Deutz workshop manual to troubleshoot fuel injection system OR consult Genie Industries Service Department.
Chart 10

All Functions Inoperative, Engine Starts and Runs

Check hydraulic fluid level. low

Fill with Dexron II equivalent hydraulic fluid.

Check pump suction line shutoff valves. Valve handles should be parallel with hose. closed

Open valves. If engine has been run with valves closed, it may have damaged one or both pumps.

Disconnect center coil wire from distributor cap and isolate from grounding (Deutz models, hold manual fuel shutoff lever counterclockwise). Remove function pump from main pump but leave all hoses connected. Hold start switch and crank engine over while observing spline drive at rear of main pump. open

Troubleshoot inoperative boom functions and inoperative drive functions separately. spline turns

Engine to pump flex plate coupling is defective. See Repair section. spline does not turn
All Lift and Steer Functions Inoperative, Drive Functions Operational

Be sure the hydraulic suction line shutoff valve for the lift/steer pump is in the open position.

Be sure all grounding wires for the hydraulic manifold valves are free of corrosion and have full continuity to ground.

Install a 0 to 3000 PSI pressure gauge on the function manifold. Start engine, hold the boom retract function and check the hydraulic pressure.

less than 2400 psi

Adjust the function manifold relief valve (item AB) all the way in (clockwise) counting the number of turns. Hold the boom retract switch and recheck the pressure.

less than 2400 psi

Check the function pump, see Repair section.

ok

bad

Replace the pump.

2400 psi

Troubleshoot each function individually or consult Genie Industries Service Department.

2400 psi or more

Hold the boom retract switch and readjust the relief pressure to 2400 psi.

Replace the relief valve OR manifold has internal defects, consult Genie Industries Service Department.
Chart 12

Ground Controls Inoperative, Platform Controls Operate Normally

Be sure all other functions operate normally, including platform controls.

- Does the engine start from the ground controls? yes
  - Start the engine from the ground controls and check the voltage on the center pole (red wire) of the platform level switch.
  - 0V Repair open in red wire circuit from key switch to function switches.

  no
  - 12V Troubleshoot the functions individually.
  - 0V Repair open in red wire circuit from emergency stop button to the key switch.

- Check voltage at red wire on ground controls contact of the key switch (the red wire checked should originate at the emergency stop button).
  - 12V
  - 0V Check if key switch internal cam is activating ground contact.
    - yes Replace key switch contact for ground controls.
    - no Replace key switch.
Platform Controls

Inoperative, Ground Controls Operate Normally

Be sure all cables are in good condition with no kinks or abrasions.

Chart 13

- **Does engine start from the platform controls?**
  - **Yes**: Start engine from the platform, then press down the foot switch and check voltage at TP24.
  - **No**:
    - **Check voltage at TB22**: 0V -> Repair open in wire circuit from TB22 to function controllers.
    - **12V**: Check for open in red wire circuit from key switch to TB22 OR Replace the key switch platform contacts.
    - **Check voltage at TP22**: 0V -> Repair open in 2 wire circuit from TB22 to TP22.
    - **12V**: Check voltage at blk wire on platform emergency stop button.
      - **0V**: Replace contact on emergency stop button.
      - **12V**: Check voltage at TP23.
        - **0V**: Repair open in blk wire circuit from emergency stop button to TP23.
        - **12V**: Repair open in blk wire circuit from TP23 to foot switch OR replace foot switch.
    - **12V**: Test and replace foot switch OR repair open in wht wire circuit from foot switch to TP24.

- **Test and replace foot switch OR repair open in wht wire circuit from foot switch to TP24.**
Secondary Boom Up Function Inoperative

Be sure all other functions operate normally.

If boom up function operates normally from the ground controls but not from the platform controls, troubleshoot the platform controller. See Repair section.

If boom up function operates normally from the platform controls but not from the ground controls, troubleshoot the ground control toggle switch. See Repair section.

Hold ground control function switch up and check volts at red/wht wire on boom function proportional valve.

3 to 6V

Remove both wires from valve coil and check resistance across the coil terminals.

0 or infinite ohms

Replace coil

4.5 to 5.5 ohms

Hold toggle switch up and manually override proportional valve (push in button on end of valve spool). Note: Overriding the valve will require two people. If a helper is not available, interchange the valve (item AA) with a like valve (item ZZ).

function operates

Replace defective proportional valve.

function inoperative

Hold ground control function switch up. Check volts at blu wire on secondary boom function directional valve.

12V

Remove both wires from valve coil. Check resistance across coil terminals.

0 or infinite ohms

Replace coil.

4 to 5 ohms

Interchange flow regulator valve (item YY) with a like valve (item XX).

function operates

Replace defective flow regulator valve.

function inoperative

Repair open circuit in blu wire from TB10 to boom function directional valve.

Repair open in red/wht wire circuit (with diode) from TB3 to proportional valve.

Continued on the next page.
Continued from the previous page.

Hold toggle switch up and manually override directional valve (push in button on end of valve spool). Note: Overriding the valve will require two people. If a helper is not available, interchange the valve (Item R) with a like valve (Item S).

Function inoperative

Interchange check valve (Item M) with a like valve (Item K).

Function inoperative

Install a 0 to 3000 PSI pressure gauge at the quick disconnect coupling on the function manifold and hold the function switch.

2400 psi

Check for mechanical restrictions keeping boom from moving OR repair cylinder OR cylinder counterbalance valve.

less than 2400 psi

Repair cylinder OR replace cylinder counterbalance valve OR manifold has internal defect, consult Genie Industries Service Department.

Function operates

Check the resistance of the directional valve coils.

0 or infinite ohms

Replace the defective valve coil(s).

4 to 5 ohms

Replace the valve.
Secondary Boom Down Function Inoperative

Be sure all other functions operate normally including boom up function.

If boom down function operates normally from the ground controls but not from the platform controls, troubleshoot the platform controller. See Repair section.

If boom down function operates normally from the platform controls but not from the ground controls, troubleshoot the ground control toggle switch. See Repair section.

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Continued on the next page.
CHART 15

Continued from the previous page.

Adjust the boom down relief valve (item F) in one turn clockwise. Then, with pressure gauge still attached, operate the function down.

1800 psi or more

With boom fully lower, hold the function down switch. Adjust the relief valve to read 1800 psi.

less than 1800 psi

Remove the boom down high pressure line from the manifold and cap the port. Hold down function and recheck pressure.

1800 psi

Repair the boom lift cylinder.

less than 1800 psi

Internal defect in manifold OR one of the previous tests involving the pump or manifold components was possibly overlooked or diagnosed incorrectly. Recheck and/or consult Genie Industries Service Department.
Primary
Boom Up
Function
Inoperative

Be sure all other functions operate normally.

If boom up function operates normally from the ground controls but not from the platform controls, troubleshoot the platform controller. See Repair section.

If boom up function operates normally from the platform controls but not from the ground controls, troubleshoot the ground control toggle switch. See Repair section.
CHART 16

Continued from the previous page.

Hold toggle switch up and manually override directional valve (push in button on end of valve spool). Note: Overriding the valve will require two people. If a helper is not available, interchange the valve (item R) with a like valve (item S).

function operates

Check the resistance of the directional valve coils.

0 or infinite ohms

Replace the defective valve coil(s).

function inoperative

Interchange check valve (item M) with a like valve (item K).

function operates

Replace defective shuttle valve.

function inoperative

Install a 0 to 3000 PSI pressure gauge at the quick disconnect coupling on the function manifold and hold the function switch.

2400 psi

Check for mechanical restrictions keeping boom from moving OR repair cylinder OR cylinder counterbalance valve.

less than 2400 psi

Repair cylinder OR replace cylinder counterbalance valve OR manifold has internal defect, consult Genie Industries Service Department.
Section 5 - Troubleshooting Flow Charts

Chart 17

Primary Boom Down Function Inoperative

Be sure all other functions operate normally including boom up function.

If boom down function operates normally from the ground controls but not from the platform controls, troubleshoot the platform controller. See Repair section.

If boom down function operates

- Hold ground control function switch and check volts at red/blk wire on boom function directional valve. 0V
  - Repair open in red/blk wire circuit from TB2 to directional valve.

- Hold toggle switch down and manually override the down directional valve (push in button on end of valve spool). Note: overriding the valve will require two people. If a helper is not available, interchange the valve (item R) with a like valve (item S). 12V
  - Check the resistance of the down directional valve coil. 0 or infinite ohms
    - Replace the coil.
    - 4 to 5 ohms
      - Replace the valve.

- Install a 0 to 3000 PSI pressure gauge at the quick disconnect coupling on the function manifold and hold the function switch. 1800 psi
  - Counting the turns, adjust the boom down relief valve (item F) in all the way. Then operate the function down.
  - With boom fully lowered, hold the function down switch. Adjust the relief valve to read 1800 PSI and replace the cylinder counterbalance valve.

- less than 1800 psi

Continued on the next page.
Continued from the previous page.

Adjust the boom down relief valve (item F) in one turn clockwise. Then, with pressure gauge still attached, operate the function down.

1800 psi or more

With boom fully lower, hold the function down switch. Adjust the relief valve to read 1800 psi.

less than 1800 psi

Remove the boom down high pressure line from the manifold and cap the port. Hold down function and recheck pressure.

1800 psi

Repair the boom lift cylinder.

less than 1800 psi

Internal defect in manifold OR one of the previous tests involving the pump or manifold components was possibly overlooked or diagnosed incorrectly. Recheck and/or consult Genie Industries Service Department.
Primary Boom Extend Function Inoperative

Be sure all other functions operate normally.

If boom extend function operates normally from the ground controls but not from the platform controls, troubleshoot the platform controller. See Repair section.

If boom extend function operates normally from the platform controls but not from the ground controls, troubleshoot the ground control toggle switch. See Repair section.

- Hold ground control function switch and check volts at white/red wire on proportional valve.
  - 0V → Repair open white/red wire circuit from TB6 to proportional valve.
  - 3 to 6V → Remove both wires from valve coil and check resistance across the coil terminals.
  - 0 or infinite ohms → Replace coil.
  - 4.5 to 5.5 ohms → Hold toggle switch in extend position and manually override proportional valve (push in button on end of valve spool). Note: overriding the valve will require two people. If a helper is not available, interchange the valve (item Z) with a like valve (item AA).
  - Replace the defective proportional valve.

- Function inoperative
  - Interchange flow regulator valve (item X) with a like valve (item Y).
  - Function operates → Replace defective flow regulator valve.
  - Function inoperative
  - Hold toggle switch and manually override extend directional valve (push in button on end of valve spool). Note: overriding the valve will require two people. If a helper is not available, interchange the valve (item S) with a like valve (item P).
  - Check the resistance of the directional valve coil.
    - 0 or infinite ohms → Replace the defective valve coil.
    - 4 to 5 ohms → Replace the valve.

Continued on the next page.
Continued from the previous page.

Install a 0 to 3000 PSI pressure gauge at the quick disconnect coupling on the function manifold and hold the function switch.

1200 psi

Counting the turns, adjust the boom extend relief valve (item D) in all the way. Then operate the extend function.

With boom fully extended, hold the extend function switch. Adjust the relief valve to read 1200 PSI and replace the cylinder counterbalance valve.

function inoperative

less than 1200 psi

Check for mechanical restrictions and/or the cylinder has internal defects. Please consult Genie Industries Service Department.

1200 psi

With boom fully extended, hold the extend function switch. Adjust the relief valve to read 1200 psi.

less than 1200 psi

Adjust the boom extend relief valve (item D) in one turn clockwise. Then, with pressure gauge still attached, operate the function.

1200 psi

With boom fully extended, hold the extend function switch. Adjust the relief valve to read 1200 psi.

less than 1200 psi

Remove the extend function pressure line from the manifold and cap the port. Then, with pressure gauge still attached, operate the function.

1200 psi

Repair the cylinder and/or replace cylinder counterbalance valves.

less than 1200 psi

Internal defect in manifold OR one of the previous tests involving the pump or manifold components was possibly overlooked or diagnosed incorrectly. Recheck and/or consult Genie Industries Service Department.
Chart 19

Primary Boom Retract Function Inoperative

Be sure all other functions operate normally including boom extend function.

If primary boom retract function operates normally from the ground controls but not from the platform controls, troubleshoot the platform controller. See Repair section.

If primary boom retract function operates normally from the platform controls but not from the ground controls, troubleshoot the ground control toggle switch. See Repair section.

12V

Hold toggle switch down and manually override the retract directional valve (push in button on end of valve spool). Note: overriding the valve will require two people. If a helper is not available, interchange the valve (item S) with a like valve (item P).

Repair open in blk/wht wire circuit from TB8 to directional valve.

0V

Hold ground control function switch and check volts at blk/wht wire on extend/retract function valve.

Check the resistance of the retract directional valve coil.

4 to 5 ohms

Replace the coil.

0 or infinite ohms

Replace the valve.

2400 psi

Install a 0 to 3000 psi pressure gauge at the quick disconnect coupling on the function manifold and hold the function switch.

Check for mechanical restrictions keeping boom from retracting OR repair cylinder OR replace cylinder counterbalance valve.

less than 2400 psi

Repair cylinder OR replace cylinder counterbalance valve OR manifold has internal defect, consult Genie Industries Service Department.
**Turntable Rotate Function Inoperative**

Be sure all other functions operate normally.

If turntable rotate function operates normally from the ground controls but not from the platform controls, troubleshoot the platform controller. See Repair section.

If turntable rotate function operates normally from the platform controls but not from the ground controls, troubleshoot the ground control toggle switch. See Repair section.

- **Hold ground control function switch and check volts at white/red wire on turntable rotate function proportional valve.**
  - If 0V, repair open in white/red wire circuit from TB6 to proportional valve.
  - If 4 to 7V, remove both wires from valve coil and check resistance across the coil terminals.
    - If 0 or infinite ohms, replace the coil.
    - If 4.5 to 5.5 ohms, hold toggle switch and manually override proportional valve (push in button on end of valve spool). Note: overriding the valve will require two people. If a helper is not available, interchange the valve (item Z) with a like valve (item AA).
      - If function inoperative, interchange rotation function flow regulator valve (item X) with a like valve (item Y).
      - If function inoperative, hold toggle switch to left and manually override rotate left directional valve (push in button on end of valve spool). Note: overriding the valve will require two people. If a helper is not available, interchange the valve (item P) with a like valve (item S).
        - If function inoperative, continue on the next page.
CHART 20

Interchange check valve (item K) with a like valve (item M).

- Function operates
- Function inoperative

Install a 0 to 3000 psi pressure gauge at the quick disconnect coupling on the function manifold and hold the function switch.

- 2400 psi
- Less than 2400 psi

Check for mechanical restrictions keeping turntable from rotating OR check rotation motor OR check rotation brake OR check rotation torque hub.

Repair rotation motor OR manifold has internal defect, consult Genie Industries Service Department.
Turntable
Rotate Left
Function
Inoperative

Be sure all other functions operate normally including turntable rotate right function.

If turntable rotate left function operates normally from the ground controls but not from the platform controls, troubleshoot the platform controller. See Repair section.

If turntable rotate left function operates normally from the platform controls but not from the ground controls, troubleshoot the ground control toggle switch. See Repair section.

- Hold ground control function switch and check volts at wht/blk wire on rotate function directional valve.
- Repair open in wht/blk wire circuit from TBS to directional valve.

- Remove both wires from rotate left valve coil and check resistance across the coil terminals.
- Replace the valve coil.

- Hold toggle switch left and manually override rotate left directional valve (push in button on end of valve spool).
- Replace the rotate directional valve.

- Install a pressure gauge at the quick-disconnect coupling on the function manifold and hold the function switch.
- Interchange the rotate left and right counterbalance valves (item M and item N on turntable rotation motor).
- Replace defective counterbalance valve.

- Check for mechanical restrictions keeping turntable from rotating left OR replace directional valve OR repair rotation motor.

- Remove the rotate left function pressure line from the manifold and cap the port (S2). Then, with pressure gauge still attached, operate the function.
- Replace the directional valve OR the manifold has internal defects OR Consult Genie Industries Service Department.
Chart 22

**Turntable Rotate Right Function Inoperative**

Be sure all other functions operate normally including turntable rotate right function.

If turntable rotate right function operates normally from the ground controls but not from the platform controls, troubleshoot the platform controller. See Repair section.

If turntable rotate right function operates normally from the platform controls but not from the ground controls, troubleshoot the ground control toggle switch. See Repair section.

**Chart 22 Diagram:**

- **Hold ground control function switch and check volts at wht wire on rotate function directional valve.**
  - 0V: Repair open in wht wire circuit from TB4 to directional valve.
  - 12V: Remove both wires from rotate right valve coil and check resistance across the coil terminals.
  - 0 or infinite ohms: Replace the valve coil.
  - 4 to 5 ohms: Hold toggle switch right and manually override rotate right directional valve (push in button on end of valve spool). Note: overriding the valve will require two people. If a helper is not available, interchange the valve (item P) with a like valve (item S).
  - Function operates: Replace the rotate directional valve.
  - Function inoperative:
    - Install a pressure gauge at the quick-disconnect coupling on the function manifold and hold the function switch.
    - Interchange the rotate right and left counterbalance valves (item M and item N on turntable rotation motor).
    - Check for mechanical restrictions keeping turntable from rotating right OR repair directional valve OR repair rotation motor.
    - Replace defective counterbalance valve.
    - Replace the directional valve OR the manifold has internal defects.
      - OR: Consult Genie Industries Service Department.

- **Remove the rotate right function pressure line from the manifold and cap the port (S1). Then, with pressure gauge still attached, operate the function.**
  - 2400 psi
    - Function operates: Replace defective counterbalance valve.
    - Function inoperative:
      - Replace the directional valve OR the manifold has internal defects.
        - OR: Consult Genie Industries Service Department.

- **Consult Genie Industries Service Department.**
All Platform Leveling Functions Inoperative

Be sure all other functions operate normally.

Be sure both automatic and manual platform leveling do not operate.

If automatic leveling operates but manual leveling does not, troubleshoot Platform Leveling Up Function Inoperative.

1. Hold ground control function switch and check voltage at org/red wire on platform level flow control valve.
   - 0V: Repair org/red wire circuit from TB16 to flow control valve.
   - 12V:
     1. Remove both wires from valve coil and check resistance across coil terminals.
        - 0 or infinite ohms: Replace the coil.
        - 4 to 8 ohms:
          1. Remove both hydraulic hoses from the manifold (ports PL1 & PL2). Plug the hoses and cap the manifold fittings. Operate boom up function and check if platform levels.
             - yes: Replace the counterbalance valves, items B & C or valve block A.
             - no:
               1. Plumb a pressure gauge into the master cylinder barrel-end hydraulic hose using a tee fitting. Operate boom up function and read the pressure.
                  - less than 2400 psi:
                    1. Deadhead the pressure gauge into the barrel-end hydraulic hose from the master cylinder and raise the boom one inch at a time. Continually monitor the pressure gauge during boom up. Do not allow the pressure to exceed 2500 psi.
                       - less than 2400 psi: Repair or replace the master cylinder.
                       - 2400 psi or more:
                         1. Repair or replace the slave cylinder.
Chart 24

Platform Level Up Function Inoperative

Be sure all other functions operate normally.

If platform level up function operates normally from the ground controls but not from the platform controls, troubleshoot the platform control toggle switch. See Repair section.

If platform level up function operates normally from the platform controls but not from the ground controls, troubleshoot the ground control toggle switch. See Repair section.
Platform Level Down Function Inoperative

Be sure all other functions operate normally.

If platform level down function operates normally from the ground controls but not from the platform controls, troubleshoot the platform control toggle switch. See Repair section.

If platform level down function operates normally from the platform controls but not from the ground controls, troubleshoot the ground control toggle switch. See Repair section.

- **Hold ground control function switch and check voltage at orgblk wire on platform level down function directional valve.**
  - 0V: Repair open in orgblk wire circuit from TB15 to directional valve.
  - 12V: Remove both wires from valve coil and check resistance across the coil terminals.
    - 0 or infinite ohms: Replace the coil.
    - 4 to 5 ohms: Hold toggle switch and manually override the level down directional valve (push in button on end of valve spool). Note: overriding the valve will require two people. If a helper is not available, interchange the valve (Item O) with a like valve (Item N).
      - Function inoperative: Interchange check valve (Item L) with like valve (Item K).
        - Function operates: Replace defective check valve.
        - Function inoperative: Install a pressure gauge at the quick disconnect coupling on the function manifold and hold the function switch.
          - 2400 psi or more: Interchange the level up and down counterbalance valves (items B & C).
            - Function operates: Replace defective counterbalance valve.
            - Less than 2400 psi: Replace the directional valve OR the manifold has internal defects OR one of the previous tests was possibly overlooked or diagnosed incorrectly. Recheck and/or consult Genie Industries Service Department.
          - 2400 psi or more: Disconnecting hydraulic lines or adjusting the cylinder counterbalance valves in this situation can be very dangerous. Please consult Genie Industries Service Department.
Chart 26

Platform Rotate Left Function Inoperative

Be sure all other functions operate normally.

If platform rotate left function operates normally from the ground controls but not from platform controls, troubleshoot the platform control toggle switch. See Repair section.

If platform rotate left function operates normally from the platform controls but not from the ground controls, troubleshoot the ground control toggle switch. See Repair section.
Platform Rotate Right Function Inoperative

Be sure all other functions operate normally.

If platform rotate right function operates normally from the ground controls but not from platform controls, troubleshoot the platform control toggle switch. See Repair section.

If platform rotate right function operates normally from the platform controls but not from the ground controls, troubleshoot the ground control toggle switch. See Repair section.

Chart 27

1. Hold ground control function switch and check voltage at grn wire on platform rotate right function directional valve.
   - 0V: Repair open in grn wire circuit from TB17 to directional valve.
   - 12V:
     2. Remove both wires from valve coil and check resistance across coil terminals.
        - 0 or infinite ohms: Replace the coil.
        - 4 to 5 ohms:
          3. Hold toggle switch right and manually override rotate left directional valve (push in button on end of valve spool). Note: overriding valve will require two people. If a helper is not available, interchange the valve (item N) with a like valve (item O).

Function Inoperative

4. Install a pressure gauge at quick disconnect coupling on rotate function manifold and hold function switch.
   - 2400 psi or more: Check for mechanical restrictions OR hydraulic rotator or function manifold has internal defect. Consult Genie Industries Service Department.
   - 2400 psi:
     5. Interchange check valve (item I) with like valve (item L).

Function Inoperative

6. Replace directional valve OR manifold has internal defects OR consult Genie Industries Service Department.
Chart 28

Oscillate Lock-out Function Inoperative

- Raise the primary boom until it is above the drive limit switch and measure the oscillate lock-out wedges. See Maintenance Procedures B-17.
  - Wedges extend 3 inches: Check voltage at blk #R10 wire on CR10 and CR11. 12V
  - Wedges do not extend 3 inches: Check CR10 and CR11 green grounding wire OR replace CR10 or CR11 relay(s) or socket(s).
  - 0V: Check voltage at blk #R9 on CR9.
  - 0V: Drive limit switch shorted, repair or replace.
  - 12V: Replace CR9 relay or relay socket OR repair short in wht #R9 wire circuit from CR9 to oscillate valve.
  - 0V: Remove machine from service and please consult Genie Industries Service Department.

Open in red #23 wire (12V supply) to oscillate limit switches OR one or both oscillate limit switches is defective.
Steer Left Function Inoperative

Be sure all other functions operate normally.

- Start the engine from the platform, press down foot switch, hold the steer switch left and check voltage at terminal 8 on the drive controller (blu wire).
  - 0V: Repair or replace the steer microswitch in controller handle.
  - 12V: Hold the steer switch left and check voltage at TB36.
    - 0V: Repair open in blu wire circuit from steer switch to TP36 to TB36.
    - 12V: Hold the steer switch left and check voltage at blu wire on steer valve.
      - 0V: Repair open in blu wire circuit from TB36 to steer valve.
      - 12V: Remove both wires from steer left coil and check resistance across coil terminals.
        - 0 or infinite ohms: Replace steer left valve coil.
        - 4 to 8 ohms: Replace steer valve OR consult Genie Industries Service Department.
Chart 30

Steer Right Function Inoperative

Be sure all other functions operate normally.

Start the engine from the platform, press down foot switch, hold the steer switch right and check voltage at terminal 7 on the drive controller (blu/blk wire).

12V

Hold the steer switch right and check voltage at TB37.

12V

Hold the steer switch right and check voltage at blu/blk wire on steer valve.

12V

Remove both wires from steer right coil and check resistance across coil terminals.

4 to 8 ohms

Replace steer valve OR consult Genie Industries Service Department.

0V

Repair or replace the steer microswitch in controller handle.

0V

Repair open in blu/blk wire circuit from steer switch to TP37 to TB37.

0V

Repair open in blu/blk wire circuit from TB37 to steer valve.

0 or infinite ohms

Replace steer right valve coil.
All Drive Functions Inoperative, All Other Functions Operate Normally

Be sure the hydraulic suction line valve is in the open position.

Be sure machine not in the free wheel configuration.

Be sure the drive speed select switch is set to machine on level surface position (maximum drive speed).

Start engine from ground controls and standing clear of the tires, momentarily move pump control override lever in each direction.

Machine moves

Move to platform, press down foot switch, hold drive enable switch to either side and try to drive.

Machine drives

Place a jumper wire between TB30 and TB12 and test drive without holding drive enable switch.

Machine drives

Replace drive enable limit switch OR repair open in wire circuits from terminal TB30 to limit switch and from limit switch to TB12.

0 or infinite ohms

Replace EDC.

20 to 24 ohms

Press down foot switch and check voltage at horsepower limiter board terminal 1.

Less than 12V

Correct insufficient voltage supply (alternator or battery) OR repair open in wire circuit supplying 12V to terminal 1.

12V or more

Continued on the next page.
CHART 31

Switch rpm select switch to rabbit with foot switch, press down foot switch and check voltage at terminal 3 on horsepower limiter. 

Check voltage at TB41. 

Repair open in org/blk wire circuit from TB41 to horsepower limiter terminal 3.

Repair open in org/blk wire circuit from alternator to TB41.

Check voltage at org/blk wire on engine alternator.

6 to 7V

Press down foot switch and check voltage at terminal 10 on horsepower limiter.

6 to 7V

0V

Repair or replace alternator.

Replace horsepower limiter board.

9 to 12V

Press down foot switch and check voltage at terminal 6 on drive controller.

9 to 12V

0V

Repair open in red wire circuit from horse power limiter board to drive control terminal 6.

Continued on the next page.

Continued from the previous page.
CHART 31

- Disconnect drive pump EDC wires, press down foot switch, hold drive controller in full forward position and check voltage across terminals 4 and 5 on drive controller.
  - 0V → Repair or replace drive controller.
  - 4 to 7V → Press down foot switch, hold drive controller in full forward position and check voltage across terminals TP30 and TP31.
    - 0V → Repair open in either wht or wht/blk wire circuit from drive controller to TP30 and TP31 respectively.
    - 4 to 7V → Press down foot switch, hold drive controller in full forward position and check voltage across terminals TB30 and TB31.
      - 0V → Repair open in either wht or wht/blk wire circuit from TB30 and TB31 respectively.
      - 4 to 7V → Press down foot switch, hold drive controller in full forward position and check voltage across the two wires at EDC quick disconnect.
        - 0V → Repair open in wht/blk wire circuit from TB31 to EDC quick disconnect OR repair open in wht wire circuit from TB30 to EDC quick disconnect.
        - 4 to 7V → Replace drive pump EDC OR consult Genie Industries Service Department.

Continued from the previous page.
Chart 32

Drive
Forward Or
Reverse
Function
Inoperative

Be sure all other functions operate normally including drive in opposite direction of malfunction.

Disconnect the EDC wire connector from the drive pump, start engine, move the drive controller to full forward position and note the voltage across terminals TB30 and TB31. Reverse the volt meter leads and move the drive controller to full reverse position and note the voltage.

Voltage readings different → Repair or replace the drive controller.

Voltage readings the same → Adjust the drive pump null (neutral). See Sundstrand Series 40 Service Manual.

No improvement → Defective Sundstrand drive pump, contact Sundstrand authorized repair facility.

Symptoms improve → Check all drive speeds and monitor for recurring symptoms. Possible contamination in hydraulic system.
High Range Drive Function Inoperative

Be sure all other functions operate normally including drive low range (four wheel symbol).

Be sure all drive manifold solenoid valve grounding wires are free of corrosion and have full continuity to ground.

- Start engine from platform controls, switch drive mode to high range and press down on foot switch. Be sure engine rpm switch is on high idle (foot switch activated). Check voltage at terminal #10 on horsepower limiter board.
  - less than 8V
    - Check voltage at terminal #1 on horsepower limiter board.
      - 0V
        - Repair open in wht wire circuit from foot switch to horsepower limiter board.
      - 12V
        - Check voltage at terminal #3 on horsepower limiter board.
          - 6 to 7V
            - Re-adjust OR replace horsepower limiter board OR Consult Genie Industries Service Department.
          - 0V
            - Repair open in org/blk wire circuit from TB41 to horsepower limiter board.
    - more than 8V
      - Check voltage at TB41.
        - 6 to 7V
          - Repair open in org/blk #41 wire circuit from alternator to TB41.
        - 0V
          - Repair or replace alternator OR Consult Genie Industries Service Department.

- Check voltage at red wire on center terminal of the drive speed select switch.
  - 0V
    - Repair open in red wire circuit from horsepower limiter board terminal #10 to center terminal on drive speed select switch.
  - more than 8V
    - Check voltage at red wire terminal #6 on drive controller.
      - 0V
        - Repair open in red wire circuit from drive speed select switch OR replace drive speed select switch.
      - more than 8V
        - Continued on the next page.
Continued from the previous page.

1. Press down the foot switch and check voltage at terminal TB29.
   - 0V
   - 12V

2. Press down foot switch and check voltage at TP29.
   - 0V
   - 12V

3. Repair open in red/wht wire circuit from TP29 to TB29.

4. Press down foot switch and check voltage at red/wht wire on drive mode select switch.
   - 0V
   - 12V

5. Repair open in red/wht wire circuit from toggle switch to TP29.

6. Press down foot switch and check voltage at wire supplying 12V to drive mode select switch.
   - 0V

7. Replace toggle switch.

8. Repair open in wire circuit supplying 12V to toggle switch.

9. Press down foot switch and check voltage at red/wht #29 wire on the motor stroke solenoid valve (item N).
   - 0V
   - 12V

10. Repair open in red/wht #29 wire circuit from TB29 to stroke solenoid valve.

11. Press down foot switch and check voltage at red/wht #29 wire on terminal 6 of time delay relay (TR1).
    - 0V
    - 12V

12. Repair open in red/wht #29 wire circuit from TB29 to time delay relay.

13. Press down foot switch and check voltage at blk #TR1 wire on terminal 1 of time delay relay.
    - 0V
    - 12V

14. Check voltage at wht #21 wire on terminal 3 of time delay relay.
    - 0V
    - 12V

15. Repair open in wht #21 wire circuit.

16. Check ground wire to time delay relay.
    - bad
    - good

17. Replace time delay relay.

Continued on the next page.
CHART 33

Continued from the previous page.

Press down foot switch and check voltage at blk #TR1 wire on traction bypass solenoid valve (item Q).

0V

Repair open in blk #TR1 wire circuit from time delay relay to traction bypass valve.

12V

Interchange traction bypass valve (item Q) with new solenoid valve and check high drive.

no high drive

Replace traction bypass and interchange new valve with motor stroke valve (item Q) and check high drive.

no high drive

Replace traction bypass shuttle valve (item Q) and check high drive.

no high drive

Consult Genie Industries Service Department.
Chart 34

Low Range Drive Function Inoperative

Be sure all other functions operate normally including drive high range (two wheel symbol).

1. Turn key switch to platform controls, pull both emergency stop buttons on, switch drive mode to low range (machine on incline symbol), press down foot switch and check voltage at red/wht wire on drive mode switch.

2. Press down foot switch and check voltage at TB29.

3. Press down foot switch and check voltage at blk #TR1 on traction bypass valve (item Q).

4. Interchange bypass valve (item Q) with brake release valve (item S).

5. Check drive mode toggle switch. See Repair section.

6. Check drive resistors in platform control box. See repair section.

7. Replace defective resistor(s).
Chart 35

Traction Function Inoperative

Be sure all other functions operate normally.

Any type of traction problem, consult Genie Industries Service Department.
Chart 36

Machine Will Not Drive At Full Speed

Be sure all other functions operate normally.

Be sure the free-wheel valve is closed on the drive pump.

With boom fully stowed, check TB40 for continuity to ground.
- Full continuity
  - No continuity
    - With boom fully stowed, check horsepower limiter board terminal 6 for continuity to ground.
      - Full continuity
        - No continuity
          - Re-adjust or replace horsepower limiter board. See Repair section OR consult Genie Industries Service Department.

  - Repair or replace boom lift drive limit switch or boom extend limit switch.

Orange wire shorted to ground, repair orange wire circuit from TB40 to horsepower limiter board.
Machine Drives At Full Speed With Platform Raised or Extended

Remove machine from service immediately.

Be sure boom lift drive limit switch is not being held down or up.

Be sure wiring to limit switches is intact and show no sign of tampering.

Be sure orange wire (cable1) is properly attached to horsepower limiter.

1. Raise boom off drive limit switch, turn machine off and check continuity between ground and terminal 6 on horsepower limiter board.
   - Full continuity
   - No continuity

2. Check continuity between ground and TB40.
   - Full continuity
   - No continuity

3. Repair limit switch wiring OR replace boom lift drive limit switch OR replace boom extend drive limit switch.

4. Disconnect electronic displacement controller (EDC) wires on drive pump, move drive controller to full forward position and check voltage between terminals 4 and 5 on drive controller.
   - 0 to 3V
   - 4 to 7V

5. Replace horsepower limiter board.

6. Repair open in org wire circuit from TB40 to horsepower limiter board terminal 6.

7. Defective Sundstrand drive pump. Replace or repair at authorized Sundstrand repair facility.
Chart 38

Drive Enable System is Malfunctioning

Do not hold the drive enable switch and check if machine will drive in the stowed position with boom over non-steer wheels?  

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Troubleshoot horsepower limit board, drive controller or drive pump. See chart 30.</td>
<td>Repair or replace drive enable limit switch.</td>
</tr>
</tbody>
</table>

Will holding the drive enable switch allow boom to drive in stowed position over non-steer wheels?  

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repair or replace drive enable limit switch.</td>
<td>Troubleshoot horsepower limit board, drive controller or drive pump. See chart 30.</td>
</tr>
</tbody>
</table>

Do not hold the drive enable switch and check if machine will drive in the stowed position with boom over the steer wheels?  

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repair or replace drive enable limit switch.</td>
<td>Troubleshoot horsepower limit board, drive controller or drive pump. See chart 30.</td>
</tr>
</tbody>
</table>

Will holding the drive enable switch allow boom to drive in stowed position over steer wheels?  

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repair or replace drive enable limit switch.</td>
<td>Troubleshoot horsepower limit board, drive controller or drive pump. See chart 30.</td>
</tr>
</tbody>
</table>
Auxiliary Functions Inoperative

Be sure all other functions operate normally.

Be sure key switch is in the appropriate position and the Emergency Stop buttons are pulled up to the on position.

Be sure engine is not running when using auxiliary power.

Note: Operating auxiliary power with engine running should immediately kill the engine.

- With engine not running lift switch cover, hold auxiliary switch and listen for sound of auxiliary pump running.
- Deadhead a pressure gauge into the pressure line of the auxiliary pump and hold the auxiliary power switch.
- If pump runs, less than 2000 psi, hold auxiliary switch and adjust pump relief valve or replace pump.
- If pump does not run, reconnect pressure line and check battery condition. There is possibly not enough battery capacity to operate both aux. pump and function valves.
- Hold the auxiliary power switch and check the voltage at terminal TB27.
- Replace defective auxiliary power toggle switch.
- If voltage is 0V, repair open in red wire circuit from TB27 to PR1.
- Hold the auxiliary power switch and check the voltage at positive power cable on auxiliary power unit.
- Replace PR1 relay.
- Check auxiliary power unit grounding cable OR repair or replace electric motor.
NOTES:

1) DIODE WAS IN CIRCUIT FROM SERIAL #Z45-001524 TO Z45-002460.

2) TR1, TRACTION DELAY RELAY, WAS ELIMINATED @ SERIAL #Z45-002535
   BECAUSE OF DIVIDER/COMBINER DRIVE TRACTION MANIFOLD WHICH ALSO
   ELIMINATES THE TRACTION BY-PASS SOLENOID VALVE.
Observe and Obey:

☑ Repair procedures shall be completed by a person trained and qualified on the repair of this machine.
☑ Immediately tag and remove from service a damaged or malfunctioning machine.
☑ Repair any machine damage or malfunction before operating the machine.

Before Repairs Start

☑ Be sure that all necessary tools and parts are available and ready for use.
☑ Read each procedure completely and adhere to the instructions. Attempting shortcuts may produce hazardous conditions.
☑ Unless otherwise specified, perform each procedure with the machine in the following configuration:
  - machine parked on a flat, level surface
  - boom in the stowed position
  - turntable rotated with the boom between the non-steering wheels
  - key switch in the off position with the key removed
  - wheels chocked

Symbols Legend

⚠️ DANGER Indicates the presence of a hazard that will cause death or serious injury.
⚠️ WARNING Indicates the presence of a hazard that may cause death or serious injury.
⚠️ CAUTION Indicates the presence of a hazard that will or may cause serious injury or damage to the machine.
_notice NOTICE Indicates special operation or maintenance information.
⚠️ Indicates that a specific result is expected after performing a series of steps.
Platform Controls

1-1 Joystick Controllers

Maintaining joystick controllers at the proper settings is essential to safe machine operation. Every joystick controller should operate smoothly and provide proportional speed control over its entire range of motion.

Primary Boom Up/Down Controller Adjustments

Do not adjust the joystick controllers unless the static battery voltage is above 12V DC and the alternator is operating properly with 12.5 to 15.4V DC output.

Electrocution hazard. Contact with electrically charged circuits may result in death or serious injury. Remove all rings, watches and other jewelry.

1. Check the battery condition with a volt meter. The reading should be 12V DC or more to accurately adjust the controller.

2. Turn the key switch to platform control and pull out the red Emergency Stop button to the on position. Do not start the engine.

3. Open the platform control box lid and locate the boom up/down controller.

4. Set the ramp rate: Turn the trimpot adjustment screw clockwise 15 turns or until you hear a click, then turn the screw counterclockwise 5 turns.

5. Connect the red lead(+) from a volt meter to the “A” terminal on the controller PC board. Connect the black lead(-) to ground.

6. Set the threshold: Press down the foot switch, then slowly move the control handle off center until the moment a voltage reading appears. Adjust the voltage to 2.50V DC. Turn the threshold trimpot adjustment screw clockwise to increase the voltage or counterclockwise to decrease the voltage.
7 Set the max-out: Press down the foot switch, then move the control handle all the way to the up position. Adjust the voltage to 5.02V DC. Turn the max-out trimpot adjustment screw clockwise to increase the voltage or counterclockwise to decrease the voltage.

8 Set the dual (lo) range: Press down the foot switch, then move the control handle all the way to the down position. Adjust the voltage to 4.33V DC. Turn the dual range trimpot adjustment screw clockwise to increase the voltage or counterclockwise to decrease the voltage.

9 Start the engine and move the engine speed control switch to foot switch activated high idle (rabbit and foot switch symbol). Raise the primary boom 1 inch (2.5 cm) above the drive limit switch.

**NOTICE** Engine should be at normal operating temperature.

10 Start a timer and record how long it takes for the primary boom to reach the full up position. Adjust the max-out trimpot to achieve a 25 to 29 second cycle time.

11 Start a timer and record how long it takes for the primary boom to lower into the full down position. Adjust the dual range trimpot to achieve a 33 to 37 second cycle time.

### Secondary Boom Up/Down Controller Adjustments

**NOTICE** Do not adjust the joystick controllers unless the static battery voltage is above 12V DC and the alternator is operating properly with 12.5 to 15.4V DC output.

**WARNING** Electrocution hazard. Contact with electrically charged circuits may result in death or serious injury. Remove all rings, watches and other jewelry.

1 Check the battery condition with a volt meter. The reading should be 12V DC or more to accurately adjust the controller.

2 Turn the keyswitch to platform control and pull the Emergency Stop button to the on position at both the ground and platform controls. Do not start the engine.

3 Open the platform control box lid and locate the secondary boom up/down controller.

---

### Primary boom up/down specifications

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Threshold</strong></td>
<td>2.50V DC</td>
</tr>
<tr>
<td><strong>Primary boom up - Max-out</strong></td>
<td>5.02V DC</td>
</tr>
<tr>
<td><strong>Cycle time</strong></td>
<td>25 to 29 seconds</td>
</tr>
<tr>
<td><strong>Primary boom down - Dual range</strong></td>
<td>4.33V DC</td>
</tr>
<tr>
<td><strong>Cycle time</strong></td>
<td>33 to 37 seconds</td>
</tr>
</tbody>
</table>

---

<table>
<thead>
<tr>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>e</th>
<th>f</th>
<th>g</th>
<th>h</th>
<th>i</th>
<th>j</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>dual (lo) adjustable trimpot</td>
<td>b</td>
<td>ramp rate adjustable trimpot</td>
<td>c</td>
<td>terminal &quot;R&quot; - activates max-out range</td>
<td>d</td>
<td>terminal unused</td>
<td>e</td>
<td>terminal &quot;X&quot; auxiliary</td>
</tr>
</tbody>
</table>
4 Set the ramp rate: Turn the trimpot adjustment screw clockwise 15 turns or until you hear a click, then turn the screw counterclockwise 5 turns.

5 Connect the red lead(+) from a volt meter to the “A” terminal on the controller PC board. Connect the black lead(-) to ground.

6 Set the threshold: Press down the foot switch, then slowly move the control handle off center until the moment a voltage reading appears. Adjust the voltage to 2.50V DC. Turn the threshold trimpot adjustment screw clockwise to increase the voltage or counterclockwise to decrease the voltage.

7 Set the max-out: Press down the foot switch, then move the control handle all the way to the up position. Adjust the voltage to 5.01V DC. Turn the max-out trimpot adjustment screw clockwise to increase the voltage or counterclockwise to decrease the voltage.

8 Set the dual range: Press down the foot switch, then move the control handle all the way to the down position. Adjust the voltage to 4.05V DC. Turn the dual range trimpot adjustment screw clockwise to increase the voltage or counterclockwise to decrease the voltage.

Engine should be at normal operating temperature.

9 Start the engine and move the engine speed control switch to foot switch activated high idle (rabbit and foot switch symbol). Raise the primary boom 1 inch (2.5cm) above the drive limit switch.

10 Start a timer and record how long it takes for the secondary boom to reach the full up position. Adjust the max-out trimpot to achieve a 23 to 27 second cycle time.

11 Start a timer and record how long it takes for the secondary boom to lower into the full down position. Adjust the dual range trimpot to achieve a 23 to 27 second cycle time.

**Secondary boom up/down specifications**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Threshold</td>
<td>2.50V DC</td>
</tr>
<tr>
<td>Secondary boom up - Max-out</td>
<td>5.01V DC</td>
</tr>
<tr>
<td>Cycle time</td>
<td>23 to 27 seconds</td>
</tr>
<tr>
<td>Secondary boom down - Dual Range</td>
<td>4.05V DC</td>
</tr>
<tr>
<td>Cycle time</td>
<td>23 to 27 seconds</td>
</tr>
</tbody>
</table>

**Turntable Rotation Controller Adjustments**

**NOTICE**

Do not adjust the joystick controllers unless the static battery voltage is above 12V DC and the alternator is operating properly with 12.5 to 15.4V DC output.

**WARNING**

Electrocution hazard. Contact with electrically charged circuits may result in death or serious injury. Remove all rings, watches and other jewelry.

1 Check the battery condition with a volt meter. The reading should be 12V DC or more to accurately adjust the controller.

2 Turn the key switch to platform control and pull the Emergency Stop button to the on position at both the ground and platform controls. Do not start the engine.
3. Open the platform control box lid and locate the turntable rotate controller.

4. Set the ramp rate: Turn the trimpot adjustment screw clockwise 15 turns or until you hear a click, then turn the screw counterclockwise 5 turns.

5. Connect the red lead(+) from a volt meter to the “A” terminal on the controller PC board. Connect the black lead(-) to ground.

6. Set the threshold: Press down the foot switch then slowly move the control handle off center until the moment a voltage reading appears. Adjust the voltage to 3.35V DC. Turn the threshold trimpot adjustment screw clockwise to increase the voltage or counterclockwise to decrease the voltage.

7. Set the max-out: Press down the foot switch then move the control handle all the way to the full right or full left position. Adjust the voltage to 6.26V DC. Turn the max-out trimpot adjustment screw clockwise to increase the voltage or counterclockwise to decrease the voltage.

8. Set the dual (lo) range: Turn the trimpot adjustment screw clockwise 15 turns or until you hear a click. This is the only dual range adjustment for this controller.

9. Start the engine and move the engine speed control switch to foot switch activated high idle (rabbit and foot switch symbol). Rotate the turntable to the full right position.

10. Start a timer and record how long it takes the turntable to rotate to the full left position. Adjust the max-out trimpot to achieve a 71 to 75 second cycle time.

---

**Notice**: Engine should be at normal operating temperature.

---

**Turntable rotation specifications**

<table>
<thead>
<tr>
<th>Threshold</th>
<th>3.35V DC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turntable rotation - Max-out</td>
<td>6.26V DC</td>
</tr>
<tr>
<td>Cycle time</td>
<td>71 to 75 seconds</td>
</tr>
</tbody>
</table>
1-2
Horsepower Limiter Board

The horsepower limiter board is responsible for governing drive pump output. It reads engine rpm from the alternator. The horsepower limiter board senses drops in rpm normally due to increased drive resistance (rough terrain or incline) and decreases voltage to the drive controller which in turn decreases voltage to the drive pump thereby reducing pump output to keep the engine from stalling. Three adjustments are required for optimum performance.

How to Adjust the Horsepower Limiter Board

1. Remove the fasteners from the platform control box lid.
2. Open the control box lid and locate the horsepower limiter board.

**WARNING**
Electrocution hazard. Contact with hot or live circuits may result in death or serious injury. Remove all rings, watches and other jewelry.

3. Connect the black lead(-) from a DC volt meter to the number 2 terminal, and the red lead(+) to the number 10 terminal.

4. Start the engine from the platform controls.
5. Move the engine speed control switch to foot switch activated high idle (rabbit and foot switch symbol).
6 Press down the foot switch and adjust the "A" potentiometer counterclockwise to increase voltage or clockwise to decrease voltage.

"A" potentiometer specifications

<table>
<thead>
<tr>
<th>Voltage setting</th>
<th>2WD model</th>
<th>4WD model</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.0V DC</td>
<td>9.0V DC</td>
<td></td>
</tr>
</tbody>
</table>

7 Move the engine speed control switch to low idle (turtle symbol).

8 Press down the foot switch and then adjust the "C" potentiometer to obtain a 0.01V DC to 0.03V DC voltage reading.

9 Move the engine speed control switch to foot switch activated high idle (rabbit and foot switch symbol).

10 Press down the foot switch and re-adjust the "A" potentiometer to the previous voltage setting.

11 Be sure that the boom is in the fully stowed position, then drive the boom and observe how the engine rpm reacts to drive control handle movement. If the machine surges or hunts, adjust the "C" potentiometer counterclockwise until surging is minimized.

Under an extreme load, an excessive counterclockwise adjustment to the "C" potentiometer will cause the engine to stall. The "C" potentiometer adjustment is a compromise between engine stability and engine droop.

12 Disconnect the volt meter.

13 Raise the primary boom above the drive limit switch.

14 Drive the boom for 20 feet (6.1 m) and record the elapsed time. Do this again in the opposite direction.

15 Adjust the "B" potentiometer to obtain the correct elevated drive speed of 1 foot per second (30.5 cm per second).

16 Close the platform control box lid and re-install the fasteners.

Drive speed specifications

<table>
<thead>
<tr>
<th>Condition</th>
<th>2WD</th>
<th>4WD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stowed position, high range, distance: 20 ft / 6 m</td>
<td>2.85 seconds (±0.25 seconds)</td>
<td>2.75 seconds (±0.25 seconds)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Condition</th>
<th>2WD and 4WD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boom raised, high range, distance: 20 ft / 6 m</td>
<td>1 foot per second 30.5 cm per second</td>
</tr>
</tbody>
</table>
PLATFORM CONTROLS

1-3
Foot Switch

How to Test the Foot Switch

1. Turn the keyswitch to the off position and disconnect the wiring quick disconnect plug from the platform toe board.

2. Do not press down the foot switch. Connect the leads from an ohmmeter or continuity tester to each wire connector combination listed below and check for continuity.

<table>
<thead>
<tr>
<th>Test</th>
<th>Desired result</th>
</tr>
</thead>
<tbody>
<tr>
<td>red to black</td>
<td>continuity (zero Ω)</td>
</tr>
<tr>
<td>red to white</td>
<td>no continuity (infinite Ω)</td>
</tr>
<tr>
<td>black to white</td>
<td>no continuity</td>
</tr>
</tbody>
</table>

3. Press down the foot switch. Connect the leads from an ohmmeter or continuity tester to each wire connector combination listed below and check for continuity.

<table>
<thead>
<tr>
<th>Test</th>
<th>Desired result</th>
</tr>
</thead>
<tbody>
<tr>
<td>red to black</td>
<td>no continuity (infinite Ω)</td>
</tr>
<tr>
<td>red to white</td>
<td>no continuity</td>
</tr>
<tr>
<td>black to white</td>
<td>continuity (zero Ω)</td>
</tr>
</tbody>
</table>

1-4
Resistors

Two resistors are used to maintain proper control of drive speeds. Both resistors are located in the platform control box.

How to Test the Resistors

1. Turn the keyswitch to the off position and set the drive mode select switch to high range (two-wheel symbol).

2. Connect the leads from an ohmmeter to each end of the resistor being tested.

3. Compare the ohmmeter reading with the resistance rating printed on the resistor.

**NOTICE**
Do not use the colors of the connector as a guide for these tests. Use the actual wire color to identify which contact to use for testing.
1-5

Toggle Switches

Toggle switches used for single function switching are single pole double throw (SPDT) switches. Two function switching requires a double pole double throw (DPDT) switch.

How to Test a Toggle Switch

This procedure covers fundamental switch testing and does not specifically apply to all varieties of toggle switches.

1. Turn the keyswitch to the off position and disconnect all wiring from the toggle switch to be tested.

2. Connect the leads of an ohmmeter to the switch terminals in the following combinations listed below to check for continuity.

<table>
<thead>
<tr>
<th>Test</th>
<th>Desired result</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Left Position</strong></td>
<td></td>
</tr>
<tr>
<td>terminal 1 to 2, 3, 4, 5, &amp; 6</td>
<td>no continuity (infinite Ω)</td>
</tr>
<tr>
<td>terminal 2 to 3</td>
<td>continuity (zero Ω)</td>
</tr>
<tr>
<td>terminal 2 to 4, 5 &amp; 6</td>
<td>no continuity</td>
</tr>
<tr>
<td>terminal 3 to 4, 5 &amp; 6</td>
<td>no continuity</td>
</tr>
<tr>
<td>terminal 4 to 5 &amp; 6</td>
<td>no continuity</td>
</tr>
<tr>
<td>terminal 5 to 6</td>
<td>continuity</td>
</tr>
<tr>
<td><strong>Center position</strong></td>
<td>There are no terminal combinations that will produce continuity (infinite Ω)</td>
</tr>
<tr>
<td><strong>Right Position</strong></td>
<td></td>
</tr>
<tr>
<td>terminal 1 to 2</td>
<td>continuity</td>
</tr>
<tr>
<td>terminal 1 to 3, 4, 5 &amp; 6</td>
<td>no continuity</td>
</tr>
<tr>
<td>terminal 2 to 3, 4, 5 &amp; 6</td>
<td>no continuity</td>
</tr>
<tr>
<td>terminal 3 to 4, 5 &amp; 6</td>
<td>no continuity</td>
</tr>
<tr>
<td>terminal 4 to 5</td>
<td>continuity</td>
</tr>
<tr>
<td>terminal 4 to 6</td>
<td>no continuity</td>
</tr>
<tr>
<td>terminal 5 to 6</td>
<td>no continuity</td>
</tr>
</tbody>
</table>
Platform Components

2-1
Platform

How to Remove the Platform

1. Remove the cable harness from the cable clamps located under the platform and disconnect the foot switch wiring plug.

2. Remove the platform control box mounting bolts, then lift it out and set it aside.

3. Tilt the platform with the ground controls manual platform leveling switch until the platform lays horizontal.

4. Place blocks under the platform railing for support. Then carefully rest the platform on the blocks.

5. Remove the platform mounting bolts and remove the platform.

2-2
Platform Leveling Slave Cylinder

The slave cylinder and the rotator pivot are the two primary supports for the platform. The slave cylinder keeps the platform level through the entire range of primary boom motion. It operates in a closed-circuit hydraulic loop with the master cylinder. The slave cylinder is equipped with counterbalance valves to prevent movement in the event of a hydraulic line failure.

How to Remove the Slave Cylinder

Notice: Before cylinder removal is considered, bleed the slave cylinder to be sure there is no air in the closed loop.

1. Tilt the platform with the ground controls platform leveling switch until the platform is horizontal.

2. Place blocks under the platform railing for support. Then carefully rest the platform on the blocks.

3. Disconnect the hydraulic hoses from the slave cylinder and connect them together with a straight line connector.

Caution: Bodily injury hazard. Spraying hydraulic oil can penetrate and burn skin. Loosen hydraulic connections very slowly to allow the oil pressure to dissipate gradually. Do not allow oil to squirt or spray.

4. Remove the rod ends from both the barrel and rod end pins.

5. Use a soft metal drift and drive the pins out.
How to Bleed the Slave Cylinder

Do not start the engine. Use auxiliary power for all machine functions in this procedure.

1. Raise the primary boom 6 inches (15cm) above the primary boom rest.
2. Move the manual platform level switch to the right until the slave cylinder is fully extended. Continue to hold the platform level switch for 10 seconds.
3. Connect a clear hose to the bleed valve on the cylinder barrel. Place the other end of the hose in a container to collect any discharge.
4. Open the bleed valve, but do not remove it.
5. Hold the platform level switch to the right for 5 seconds, then release it.
6. Close the bleed valve, then remove the hoses.
7. Hold the platform level switch to the left until the slave cylinder is fully retracted.
8. Connect the clear hose to the bleed valve on the slave cylinder block.
9. Open the bleed valve and allow the slave cylinder to extend using gravity, until the cylinder is fully extended. Close the bleed valve.

2-3

Platform Rotator

The platform rotator is a hydraulically activated helical gear assembly used to rotate the platform 180 degrees. It is equipped with external counterbalance valves to hold platform in place and to provide pressure relief.

How to Remove the Platform Rotator

1. Remove the platform. See 2-1, How to Remove the Platform.
2. Disconnect the hydraulic hoses from the platform rotator and cap them. Bodily injury hazard. Spraying hydraulic oil can perforate and burn skin. Loosen hydraulic connections very slowly to allow the oil pressure to dissipate gradually. Do not allow oil to squirt or spray.
3. Remove the 6 mounting bolts from the platform pivot weldment.
4. Remove the top nut from the threaded rod. Then pull the rod out the bottom of the platform rotator and remove the platform pivot weldment.
5. Support the platform rotator, but do not apply any lifting pressure.
6. Remove the pin retainer from the slave cylinder rod-end pivot pin and the rotator pivot pin.
7. Use a soft metal drift to drive the pins out, then remove the platform rotator.
How to Bleed the Platform Rotator

1. Connect a clear hose to the top bleed valve. Place the other end of the hose in a container to collect any discharge.

2. Open the top bleed valve, but do not remove it.

3. Start the engine from the ground controls.

4. Hold the platform rotate switch to the right for approximately 5 seconds, then release it. Repeat 3 times.

5. Hold the platform rotate switch to the left for approximately 5 seconds, then release it.

6. Fully rotate the platform to the left and continue holding the platform rotate switch until air stops coming out of the bleed valve. Immediately release the platform rotate switch and close the bleed valve.

7. Rotate the platform to the right until it is centered.

8. Connect the clear hose to the bottom bleed valve and open the valve.

9. Rotate the platform to the right and continue holding the platform rotate switch until air stops coming out of the bleed valve. Crushing hazard. Keep hands clear of the platform pivot weldment during rotation.

10. Close the bleed valve and remove the hose.

11. Turn off the engine and clean up any hydraulic oil that may have spilled.

12. Restart the engine from the ground controls. Then rotate the platform full left and right and inspect the bleed valves for leaks.
Primary Boom Components

3-1 Plastic Cable Track

The primary boom cable track guides cables and hoses running up the boom. It can be repaired link by link without removing the cables and hoses that run through it. Removing the entire primary boom cable track is only necessary when performing major repairs that involve removing the primary boom.

How to Repair the Plastic Cable Track

Component damage hazard. The primary boom cable track can be damaged if it is twisted.

1 Use a slotted screwdriver to pry down on the lower clip.
2 Repeat step 1 for each link.
3 To remove a single link, open the lower clip and then use a screwdriver to pry the link to the side.

3-2 Primary Boom

How to Shim the Primary Boom Wear Pads

NOTICE Measure each wear pad. Replace the pad if it is less than 0.41 inches (1cm) thick. If the pad is more than 0.41 inches (1cm) thick, perform the following procedure.

1 Raise the primary boom above the drive limit switch.
2 Extend the primary boom 10 inches (25.4 cm).
3 Remove the wear pad mounting fasteners.
4 Install the new shims under the wear pad to obtain zero clearance and zero drag.
5 Using a round punch, align the holes in the shim to the wear pad and install the mounting fasteners.
6 Extend and retract through the entire range of motion to check for tight spots that could cause binding.

Always maintain squareness between the primary boom outer and inner tubes.
How to Remove the Primary Boom

**WARNING** This procedure requires specific repair skills, lifting equipment and a suitable workshop. Attempting this procedure without these skills and tools may result in death or serious injury and significant component damage. Dealer service is strongly recommended.

1. Remove the platform. See 2-1, *How to Remove the Platform*.

2. Disconnect and plug the hydraulic hoses at the slave cylinder and the platform rotator counterbalance valve.

   **CAUTION** Bodily injury hazard. Spraying hydraulic oil can penetrate and burn skin. Loosen hydraulic connections very slowly to allow the oil pressure to dissipate gradually. Do not allow oil to squirt or spray.

3. Remove the fasteners that secure the upper cable track tray to the primary boom.

4. Loosen the fasteners that secure the lower cable track tray. Tie the upper and lower cable tracks together with wire ties. Remove the cable track assembly from the primary boom.

5. Raise the secondary boom and place a 4x4x31 inch (78 cm) block between the chassis counterweight and upper mid-pivot. Carefully lower the secondary boom onto the block.

   **WARNING** Component damage hazard. The primary boom cable track can be damaged if it is twisted.

6. Raise the end of the primary boom 8 feet (2.5 m) off the ground, then extend the primary boom 5 inches (12.5 cm).

7. Attach an overhead crane to the primary boom. Do not lift the primary boom.

   **WARNING** Crushing hazard. If the overhead crane is not properly attached, the primary boom may become unbalanced and fall when it is disconnected from the upper mid-pivot.
8 Disconnect and plug the extension cylinder and the platform leveling master cylinder hydraulic hoses. Cap the extension cylinder fittings.

**CAUTION** Bodily injury hazard. Spraying hydraulic oil can penetrate and burn skin. Loosen hydraulic connections very slowly to allow the oil pressure to dissipate gradually. Do not allow oil to squirt or spray.

9 Remove the pin retainer from the master cylinder barrel-end pivot pin. Use a soft metal drift and remove the pin.

**NOTICE** Leave the master cylinder attached to the primary boom.

10 Remove the retaining fastener from the primary boom pivot pin. Do not remove the pin.

11 Remove the hose clamp bolt on the primary boom, next to the upper mid-pivot.

12 Support the lift cylinder with a lifting device.

13 Remove the pin retainer from the lift cylinder rod-end pivot pin. Use a soft metal drift to remove the pin.

**CAUTION** The lift cylinder will fall unless it is supported.

14 Remove the hose and cable clamps from the underside of the primary boom.

15 Use a slide hammer to remove the primary boom pivot pin, then carefully lift the primary boom off the machine.

---

**How to Disassemble the Primary Boom**

**NOTICE** Complete disassembly of the primary boom is only necessary if the outer or inner primary boom tube must be replaced. The extension cylinder can be removed without completely disassembling the primary boom. See 3-4, How to Remove the Extension Cylinder.

1 Remove the primary boom. See above, How to Remove the Primary Boom.

2 Remove the pin retainer from the slave cylinder rod-end pivot pin. Use a soft metal drift to remove the pin.

3 Remove the pin retainer from the slave cylinder barrel-end pivot pin. Use a soft metal drift to remove the pin, then remove slave cylinder from the primary boom.

4 Support the platform rotator with a lifting device.

5 Remove the pin retainer from the platform rotator pivot pin. Use a soft metal drift to remove the pin, then remove the platform rotator from primary boom.

6 Support the master cylinder with a lifting device.

7 Remove the retaining fastener bolt from the master cylinder pivot pin. Use a soft metal drift to remove the pin, then remove the master cylinder from the primary boom.

8 Remove the fasteners from the extension cylinder pivot pin. Use a soft metal drift to remove the pin.

9 Support and slide the extension boom out of the primary boom weldment.

**CAUTION** Crushing hazard. The extension tube will fall when it is removed from the primary boom if it is not properly supported.
PRIMARY BOOM COMPONENTS

10 Remove the extension boom end cap.

11 Remove the fasteners from the extension cylinder rod-end weldment, then support and slide the extension cylinder out of the extension boom.

**NOTICE**

The bolts that secure the cylinder rod-end weldment are installed with Loctite® removable thread sealant. It may be necessary to heat the bolts and the surrounding area to remove them. Do not reuse the bolts.

12 Remove and label the wear pads from the primary boom weldment and the extension tube.

**NOTICE**

Pay careful attention to the location and amount of shims used with each wear pad.

---

3-3

**Primary Boom Lift Cylinder**

The lift cylinder raises and lowers the primary boom.

**How to Remove the Primary Boom Lift Cylinder**

**WARNING**

This procedure requires specific repair skills, lifting equipment and a suitable workshop. Attempting this procedure without these skills and tools may result in death or serious injury and significant component damage. Dealer service is strongly recommended.

1 Raise the secondary boom and place a 4x4x31 inch (78cm) block between the chassis counterweight and the upper mid-pivot. Carefully lower the secondary boom onto the block.

**WARNING**

Crushing hazard. Keep hands away from the block and all moving parts when lowering the secondary boom.
2 Raise the primary boom until the end of the boom is 8 feet (2.5 m) off the ground.
3 Support the primary boom with an overhead crane. Do not lift the primary boom.
4 Disconnect and plug the primary lift cylinder hydraulic hoses.

**CAUTION** Bodily injury hazard. Spraying hydraulic oil can penetrate and burn skin. Loosen hydraulic connections very slowly to allow the oil pressure to dissipate gradually. Do not allow oil to squirt or spray.

5 Remove the pin retainer from the pivot pin at the barrel-end of the primary lift cylinder.
6 Use an overhead crane to lift the primary boom 1 inch (2.5 cm). This will relieve pressure on the barrel-end pivot pin.
7 Support the primary lift cylinder with straps or ropes to restrict it from swinging freely.
8 Place a rod through the barrel-end pivot pin and twist to remove the pin.

---

9 Carefully loosen the straps and allow the primary lift cylinder to slowly swing down. Now attach the rod of the primary lift cylinder to an overhead crane or similar lifting device.
10 Remove the pin retainer from the remaining pivot pin, then use a soft metal drift to remove the pin.

**WARNING** Crushing hazard. The primary lift cylinder will fall if it is not properly supported.

---

**CAUTION** Crushing hazard. When the barrel-end pivot pin is removed, the primary lift cylinder will swing down if it is not properly supported.
3-4 Extension Cylinder

The extension cylinder extends and retracts the primary boom steel extension tube. It can only be removed from the platform end of the primary boom. The extension cylinder is equipped with counterbalance valves to prevent movement in the event of a hydraulic line loss.

How to Remove the Extension Cylinder

**WARNING** This procedure requires specific repair skills, lifting equipment and a suitable workshop. Attempting this procedure without these skills and tools may result in death or serious injury and significant component damage. Dealer service is strongly recommended.

1. Raise the secondary boom and place a 4x4x31 inch (78 cm) block between the chassis counterweight and the upper mid-pivot. Carefully lower the secondary boom onto the block.

2. Raise the primary boom until the extension boom end cap is 5 feet (1.5 m) off the ground.

3. Extend the extension tube to the primary boom tube 17 inches (43 cm). Then secure to prevent any additional movement.

4. Remove the extension boom end cap.

5. Remove the fasteners from the cylinder rod-end weldment.

**NOTICE** The bolts that secure the cylinder rod-end weldment are installed with Loctite® removable thread sealant. It may be necessary to heat the bolts and the surrounding area to remove them. Do not reuse the bolts.

6. If the function is operational, extend the extension cylinder until the rod-end weldment clears the end of the extension tube.

**WARNING** Crushing hazard. Keep hands away from the block and all moving parts when lowering the secondary boom.
7 Disconnect and plug the extension cylinder hydraulic hoses. Cap the fittings on the cylinder.

**CAUTION** Bodily injury hazard. Spraying hydraulic oil can penetrate and burn skin. Loosen hydraulic connections very slowly to allow the oil pressure to dissipate gradually. Do not allow oil to squirt or spray.

8 Remove the fasteners from the extension cylinder pivot pin, then use a soft metal drift to remove the pin.

9 Carefully pull out and properly support the extension cylinder from the platform end of the primary boom.

**CAUTION** Crushing hazard. The cylinder will fall if it is not properly supported when it is pulled out of the extension tube.

**NOTICE** To make installation the extension cylinder easier, be sure that the cylinder rod is extended 3 to 4 feet (1 m).

### 3-5 Platform Leveling Master Cylinder

The master cylinder acts as a pump for the slave cylinder. It’s part of the closed circuit hydraulic loop that keeps the platform level through the entire range of primary boom motion. The master cylinder is located inside the upper mid-pivot at the base of the primary boom.

### How to Remove the Platform

**WARNING** This procedure requires specific repair skills, lifting equipment and a suitable workshop. Attempting this procedure without these skills and tools may result in death or serious injury and significant component damage. Dealer service is strongly recommended.

**NOTICE** Before cylinder removal is considered, bleed the cylinder to be sure that there is no air in the closed loop. See 2-2, *How to Bleed the Slave Cylinder.*

1 Remove the end cover from the turntable.

2 Raise the secondary boom and place a 4x4x31 inch (78 cm) block between the chassis counterweight and the upper mid-pivot. Carefully lower the secondary boom onto the block.

3 Extend the primary boom 6 inches (15 cm), then raise the primary boom until it is level.
PRIMARY BOOM COMPONENTS

4 Disconnect and plug the extension cylinder hydraulic hoses. Cap the ports on the extension cylinder.

**CAUTION** Bodily injury hazard. Spraying hydraulic oil can penetrate and burn skin. Loosen hydraulic connections very slowly to allow the oil pressure to dissipate gradually. Do not allow oil to squirt or spray.

5 Fully lower the primary boom and support it with an overhead crane.

6 Disconnect and plug the primary lift cylinder hydraulic hoses. Cap the ports on the primary lift cylinder.

**CAUTION** Bodily injury hazard. Spraying hydraulic oil can penetrate and burn skin. Loosen hydraulic connections very slowly to allow the oil pressure to dissipate gradually. Do not allow oil to squirt or spray.

7 Support the barrel-end of the primary lift cylinder with a strap.

8 Remove the pin retainer from the primary lift cylinder barrel-end pivot pin.

9 Place a rod through the barrel-end pivot pin and twist to remove the pin.

10 Carefully lower and rest the barrel-end of the primary lift cylinder on the turntable counterweight.

11 Disconnect and plug the platform leveling master cylinder hydraulic hoses. Cap the fittings on the master cylinder.

**CAUTION** Bodily injury hazard. Spraying hydraulic oil can penetrate and burn skin. Loosen hydraulic connections very slowly to allow the oil pressure to dissipate gradually. Do not allow oil to squirt or spray.

12 Remove the retaining fastener from the platform leveling master cylinder rod-end pivot pin, then use a slide hammer to remove the pin.

13 Attach a strap to the rod-end of the platform leveling master cylinder.

14 Remove the pin retainer from the platform leveling master cylinder barrel-end pivot pin. Then support the cylinder with the strap.

15 Place a rod through the barrel-end pivot pin and twist to remove the pin.

**CAUTION** Crushing hazard. The cylinder will fall if it is not supported when the pivot pin is removed.

16 Carefully lower the platform leveling master cylinder down and out of the upper mid-pivot.
How to Disassemble the Secondary Boom

The procedures in this section require specific repair skills, lifting equipment and a suitable workshop. Attempting this procedure without these skills and tools may result in death or serious injury and significant component damage. Dealer service is required.

Follow the disassembly steps to the point required to complete the repair. Then re-assemble the secondary boom by following the disassembly steps in reverse order.

Secondary Boom Components

- a upper secondary boom (number 1 arm)
- b upper tension link (number 2 arm)
- c lower tension link (number 3 arm)
- d lower secondary boom (number 4 arm)
- e secondary lift cylinder
- f pin retainer
- g compression link
- h lower mid-pivot
- i drive limit switch
- j primary boom rest
- k turntable pivot
- l upper mid-pivot rest
- m upper mid-pivot
SECONDARY BOOM COMPONENTS

1 Remove the platform. See 2-1, How to Remove the Platform.

2 Remove the primary boom. See 3-2, How to Remove the Primary Boom.

**WARNING** Crushing hazard. Do not remove the 4x4x31 inch (78 cm) support block installed during primary boom removal.

3 Use an overhead crane to attach a lifting strap to the rod-end of the primary lift cylinder. Then raise the primary lift cylinder with the crane, to a vertical position.

4 Remove the pin retainer from the pivot pin at the barrel-end of the primary lift cylinder.

5 Place a rod through the barrel-end pivot pin and twist to remove the pin. Remove the primary lift cylinder from the machine.

**WARNING** Crushing hazard. The primary lift cylinder will fall if it is not properly supported when the barrel-end pivot pin is removed.

6 Remove the turntable end cover.

7 Be sure that the upper mid-pivot rest is in the industrial tire position.

Machines equipped with:

- **Rough terrain tires.** Move the upper mid-pivot rest up into the industrial tire position on the mid-pivot.

- **Industrial tires.** No modification is necessary.

8 Attach the lifting strap from an overhead crane to the number 1 arm at the end nearest the upper mid-pivot and lift to support.

9 Remove the pin retainers from the two secondary lift cylinder rod-end pivot pins.

10 Place a rod through each rod-end pivot pin and twist to remove the pins.
11 Lift the number 1 arm until the secondary lift cylinders can swing forward to rest on the lower mid-pivot.

12 Remove the block between the counterweight and the upper mid-pivot.

13 Lower the arms enough to relieve the pressure on the compression link upper pivot pin.

**Specification: to remove pressure on the compression link**

<table>
<thead>
<tr>
<th>Tires</th>
<th>Upper mid-pivot rest should be approximately</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industrial tires</td>
<td>1 inch (2.5 cm) above the rest block</td>
</tr>
<tr>
<td>Rough terrain tires</td>
<td>4 inches (10 cm) above the rest block.</td>
</tr>
</tbody>
</table>

14 Remove the pin retaining fastener from the compression link to number 1 arm pivot pin. Use a soft metal drift to remove the pin.

15 Lower the arms to full rest and re-position the lifting strap to the center of the number 1 arm.

16 Remove the pin retaining fastener from the lower mid-pivot to number 1 arm pivot pin. Use a soft metal drift to remove the pin.

17 Remove the pin retaining fastener from the upper mid-pivot to number 1 arm pivot pin. Use a slide hammer to remove the pin.

**WARNING** Crushing hazard. If the overhead crane is not properly attached, the number 1 arm may become unbalanced and fall when it is disconnected from the upper mid-pivot.

18 Carefully remove the number 1 arm from the machine.

19 Number each electrical cable and its entry location at the platform control box.

20 Open the platform control box and label each wire termination from the cables. Disconnect all control cable wiring from the platform control box.

21 Pull all of the electrical cables out of the plastic cable track. Do not pull out the hydraulic hoses.

22 Disconnect and plug the platform rotator hydraulic hoses at the union, located near the upper mid-pivot. Remove the cable track assembly from the machine.

**CAUTION** Bodily injury hazard. Spraying hydraulic oil can penetrate and burn skin. Loosen hydraulic connections very slowly to allow the oil pressure to dissipate gradually. Do not allow oil to squirt or spray.

23 Remove the upper and lower cable trays from the number 2 arm. Also remove the upper cable tray from the number 3 arm.

24 Pull all of the cables and hoses down through the upper mid-pivot.

**CAUTION** Component damage hazard. Cables and hoses can be irreparably damaged if they are kinked or pinched.

25 Attach a lifting strap from an overhead crane to the upper mid-pivot. Then place a hydraulic jack between arm numbers 2 and 3 at the end nearest the upper mid-pivot end of the arms.

26 Adjust the hydraulic jack and overhead crane to relieve the pressure on the pivot pin connecting the number 2 arm to the upper mid-pivot.

27 Remove the pin retaining fastener from the upper mid-pivot to number 2 arm pivot pin. Use a slide hammer to remove the pin.

**WARNING** Crushing hazard. The upper mid-pivot will fall if it is not properly supported when the pivot pin is removed.
SECONDARY BOOM COMPONENTS

28 Carefully lift and remove the upper mid-pivot from the machine.

29 Position the lifting strap from an overhead crane at the center of the number 2 arm.

30 Remove the pin retaining fastener from the lower mid-pivot to number 2 arm pivot pin. Use a soft metal drift to remove the pin.

**WARNING** Crushing hazard. If the overhead crane is not properly attached, the number 2 arm may become unbalanced and fall when it is disconnected from the mid-pivot.

31 Carefully remove the number 2 arm from the machine.

32 Remove the two cable clamps from the inside of the lower mid-pivot.

33 Disconnect and remove the drive speed limit switch from the primary boom rest.

34 Disconnect and plug the hydraulic hoses at the secondary lift cylinders.

**CAUTION** Bodily injury hazard. Spraying hydraulic oil can penetrate and burn skin. Loosen hydraulic connections very slowly to allow the oil pressure to dissipate gradually. Do not allow oil to squirt or spray.

35 Remove the pin retainers from each secondary lift cylinder barrel-end pivot pin.

36 Place a rod through each barrel-end pivot pin and twist to remove the pin. Remove each secondary lift cylinder from the machine.

37 Remove the lower cable tray from the number 3 arm.

38 Pull all of the cables and hoses through the lower mid-pivot and out of the turntable pivot.

**CAUTION** Component damage hazard. Cables and hoses can be irreparably damaged if they are kinked or pinched.

39 Attach the strap from an overhead crane to the top tube of the lower mid-pivot. Then place a hydraulic jack between arm numbers 3 and 4 at the end nearest the lower mid-pivot.

40 Remove the pin retaining fastener from the lower mid-pivot to number 3 arm pivot pin. Use a soft metal drift to remove the pin.

41 Carefully lower the lower mid-pivot and compression link away from the machine to a resting position.

42 Position the lifting strap from an overhead crane at the center of the number 3 arm.
43 Remove the pin retaining fastener from the turntable pivot to number 3 arm pivot pin. Use a slide hammer to remove the pin.

**WARNING** Crushing hazard. If the overhead crane is not properly attached, the number 3 arm may become unbalanced and fall when it is disconnected from the turntable pivot.

44 Carefully remove the number 3 arm from the machine.

45 Position the strap from an overhead crane around the top tube of the lower mid-pivot and then carefully lift the lower mid-pivot until it is vertical.

46 Remove the pin retaining fastener from the lower mid-pivot to number 4 arm pivot pin. Use a soft metal drift to remove the pin.

47 Support the compression link by hand, then carefully lift the lower mid-pivot up and over the compression link and off of the machine.

48 Lower the compression link to a resting position. Then attach the lifting strap from an overhead crane to the compression link and raise it to a vertical position.

49 Remove the pin retaining fastener from the compression link to number 4 arm pivot pin. Use a soft metal drift to remove the pin.

50 Remove the compression link.

51 Position the lifting strap from an overhead crane at the center of the number 4 arm.

52 Remove the pin retaining fastener from the turntable pivot to number 4 arm pivot pin. Use a slide hammer to remove the pin.

**WARNING** Crushing hazard. If the overhead crane is not properly attached, the number 4 arm may become unbalanced and fall when it is disconnected from the turntable pivot.

53 Carefully remove the number 4 arm.
SECONDARY BOOM COMPONENTS

4-2
Secondary Boom Lift Cylinders

There are two boom lift cylinders incorporated in the structure of the secondary boom assembly. These cylinders operate in parallel and require hydraulic pressure to extend and retract. Each secondary boom lift cylinder is equipped with a counterbalance valves to prevent movement in the event of a hydraulic line failure. A 1200 psi (83 bar) relief valve for the down function is located on the boom function manifold.

How to Remove the Secondary Lift Cylinders

This procedure requires specific repair skills, lifting equipment and a suitable workshop. Attempting this procedure without these skills and tools may result in death or serious injury and significant component damage. Dealer service is strongly recommended.

1. Lower the secondary boom to full rest, then raise the primary boom just above the drive limit switch.

2. Disconnect and plug the hydraulic hose and steel lines for each secondary lift cylinder.

3. Remove the pin retainers from each secondary lift cylinder rod-end pivot pin.

4. Place a rod through the rod-end pivot pin and twist to remove the pin.

5. Loosen, but do not remove, the counterbalance valve to fully retract the cylinder.

6. Remove the pin retainer from the pivot pins at the barrel-ends of each secondary lift cylinder.

7. Place a rod through each barrel-end pivot pin and twist to remove the pins. Remove the secondary lift cylinders from the machine.

Crushing hazard. The secondary lift cylinders will fall when the barrel-end pivot pins are removed if they are not properly supported.

Prior to removing the secondary lift cylinder, mark the location of the hydraulic fitting with a special internal orifice. Be sure to install the fitting into the same location during re-assembly.

CAUTION: Bodily injury hazard. Spraying hydraulic oil can penetrate and burn skin. Loosen hydraulic connections very slowly to allow the oil pressure to dissipate gradually. Do not allow oil to squirt or spray.
5-1

Turntable Covers

How to Remove a Turntable Cover

1. Raise the turntable cover. Support the open cover with an overhead crane or forklift. Do not lift.

   **CAUTION** Crushing hazard. Due to its heavy weight, do not attempt to support the cover by hand.

2. Remove the upper and lower retaining clips from the gas strut.

3. Gently pry the strut pivot sockets off of the ball studs and remove the strut.

4. Remove the fasteners from the cover hinge pins.

5. Raise the cover slightly to relieve the pressure on the cover hinge pins.

6. Remove the cover hinge pins.

7. Carefully lift and remove the cover from the machine.

   **WARNING** If a turntable cover must be replaced, be sure that all appropriate safety and instructional decals are applied to the new cover.

   **NOTICE** Some adjustment may be necessary when a new cover is installed.
RPM Adjustment

Refer to Maintenance Procedures, B-12, Check and Adjust the Engine RPM.

Flex Plate

The flex plate acts as a coupler between the engine and the pump. It is bolted to the engine flywheel and has a splined center to drive the pump.

How to Remove the Flex Plate

1. Disconnect the wiring plug at the electronic displacement controller (EDC), located on the drive pump.
2. Support the drive pump with an appropriate lifting device. Then remove all of the pump mounting plate to engine bell housing bolts.
3. Carefully pull the pump away from the engine and secure it from moving.
4. Remove the flex plate mounting fasteners, then remove the flex plate from the engine.

How to Install the Flex Plate

1. Install the flex plate onto the flywheel with the flat side of the spline against the flywheel. Torque the flex plate mounting bolts to 34 ft-lbs (46 Nm).
2. Install the coupler onto the pump shaft with the set screw toward the pump. Leave a \( \frac{3}{16} \) inch (4.7 mm) gap between the coupler and pump end plate.
3. Apply Loctite® removable thread sealant to the coupler set screw. Torque the set screw to 45 ft-lbs (61 Nm).

**CAUTION** Component damage hazard. Do not force the drive pump during installation or the flex plate teeth may become damaged.
4. Assemble the engine and torque the pump mounting plate to 34 ft-lbs (46 Nm).
# Governor Actuator

## How to Set Up the Governor Actuator and Linkage

Adjustment of the governor actuator is only necessary when the governor actuator or the linkage has been replaced.

1. Connect the linkage rod to the throttle plate shaft, then tighten the lock nut.

2. Fasten the lock nut and clevis yoke to the linkage rod. Do not tighten the lock nut against the clevis yoke.

3. Loosen the fastener on the actuator arm. Rotate the actuator arm until it is at a 110 degree angle to the linkage rod.

4. Position the linkage rod so that the throttle is in the idle position. Then adjust the clevis yoke on the linkage rod to obtain the proper length. Install the yoke onto the actuator arm and tighten the lock nut.

5. With the throttle in the idle position and the actuator arm at a 110 degree angle to the linkage, rotate the actuator shaft slightly counterclockwise to pre-load the spring. Tighten the fastener on the actuator arm without releasing the shaft.
FORD LSG 423 ENGINE

6 Manually pull the actuator arm through a full cycle to be sure that the linkage moves freely. Be sure that the linkage activates the throttle shaft to approximately half throttle.

**NOTICE** The linkage must be free of friction and obstruction. Do not let it rub against the engine, brackets or hoses.

**CAUTION** If the throttle linkage is improperly adjusted and allowed to reach full throttle, the engine will over-rev and cause component damage.

7-2 
**Choke Adjustments**

This engine is equipped with an electrically heated automatic choke. The choke has a poppet valve to enhance cold starting ability on LPG fuel.

**NOTICE** Choke adjustments are affected by climate. Richer adjustment will be necessary in colder climates, leaner adjustment in warmer climates.

**Automatic Choke With Poppet Valve**

This choke functions in both gasoline and propane mode. The choke butterfly may be adjusted to a fully closed (rich) position for colder climates and the poppet valve will provide a flow path during propane fueled operation.

7-3

**Timing Adjustment**

Complete information to perform this procedure is available in the *Ford LSG-423 2.3 Liter Industrial Engine Service Manual* (Ford number: 194-216). Genie part number 29586.

7-4

**Carburetor Adjustment**

Complete information to perform this procedure is available in the *Ford LSG-423 2.3 Liter Industrial Engine Service Manual* (Ford number: 194-216). Genie part number 29586.

7-5

**RPM Adjustment**

See the scheduled maintenance procedure B-13, *Check and Adjust the Engine RPM*. 
Flex Plate

The flex plate acts as a coupler between the engine and the pump. It is bolted to the engine flywheel and has a splined center to drive the pump.

Flex Plate Removal

1. Disconnect and remove the hose between the carburetor venturi and the air cleaner.
2. Disconnect and remove the muffler support bracket.
3. Disconnect the linkage from the governor, then remove the governor linkage from the carburetor. Do not alter the length of the linkage.
4. Disconnect the wiring plug at the electronic displacement controller (EDC), located on the drive pump.
5. Remove the mounting fasteners from the regulator mounting bracket, then pull the bracket up past the bell housing. Secure the bracket before continuing.
6. Support the drive pump with an appropriate lifting device. Then remove all of the pump mounting plate to engine bell housing bolts.
7. Carefully pull the pump away from the engine and secure it from moving.
8. Remove the flex plate mounting fasteners, then remove the flex plate from the engine.

How to Install the Flex Plate

1. Install the flex plate onto the flywheel with the flat side of the spline against the flywheel. Torque the flex plate mounting bolts to 34 ft-lbs (46 Nm).
2. Install the coupler onto the pump shaft with the set screw towards the pump. Leave a 1/32 inch (0.031 mm) gap between the coupler and pump end plate.
3. Apply removable Loctite® thread sealant to the coupler set screw. Torque the set screw to 45 ft-lbs (61 Nm).

CAUTION Component damage hazard. Do not force the drive pump during re-installation or the flex plate teeth may become damaged.
7-7
Water Temperature and Oil Pressure Switches

The water temperature switch is a normally open switch that closes at approximately 230° F (112° C). When this switch closes, the engine is shut off to prevent damage and will not restart until the temperature drops below the switch point. An over-temperature indicator light at the ground and platform controls should turn on when the switch closes.

⚠️ CAUTION ⚠️ Component damage hazard. Do not crank the engine with the over-temperature on.

The oil pressure switch is a normally closed switch that opens at approximately 3 to 5 psi (0.21 to 0.34 bar). If the oil pressure drops below the switch point, the switch closes and shuts off the engine. A low oil pressure indicator light at the ground controls should turn on when the switch closes.

⚠️ CAUTION ⚠️ Component damage hazard. Do not start or continue to run the engine with the low oil pressure light on.

How to Remove the Water Temperature and Oil Pressure Switches

Perform this procedure with the engine off.

1. Remove the 3 bolts from the engine pivot plate. Swing the engine pivot plate away from the machine to access both switches.
2. Disconnect the wiring from the desired switch.
3. Remove the switch from the engine block, and then install the new switch. Do not over tighten.

⚠️ CAUTION ⚠️ Burn hazard. Contact with hot engine fluids or components may cause severe burns

NOTICE Always use pipe thread sealant when installing a switch.

Water temperature switch specifications

<table>
<thead>
<tr>
<th>Torque</th>
<th>8-18 ft-lbs</th>
<th>11-24 Nm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hex size</td>
<td>13/16 inch</td>
<td></td>
</tr>
<tr>
<td>Temperature switch point</td>
<td>230° F (112° C)</td>
<td></td>
</tr>
</tbody>
</table>

Oil pressure switch

<table>
<thead>
<tr>
<th>Torque</th>
<th>8-18 ft-lbs</th>
<th>11-24 Nm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hex size</td>
<td>1-1/16 inch</td>
<td></td>
</tr>
<tr>
<td>Oil pressure switch point</td>
<td>3-5 psi</td>
<td>0.21-0.34 bar</td>
</tr>
</tbody>
</table>
7-8 Vacuum Switch

How to Test the Vacuum Switch

1. Connect the leads from an ohmmeter or continuity tester to the common and normally open terminals.

   - Result: There should be no continuity (infinite Ω).

2. Apply mild suction to the vacuum port.

   - Result: The switch should close and show full continuity (zero Ω).

   **CAUTION** Component damage hazard. Do not short vacuum switch terminals to ground.
Ground Controls

8-1 Control Relays

Relays used for single function switching are single pole double throw (SPDT) relays.

How to Test a Single Pole Double Throw Relay

**WARNING** Electrocuton hazard. Contact with electrically charged circuits may result in death or serious injury. Remove all rings, watches and other jewelry.

1. Label and then disconnect all the wiring from the relay to be tested.

2. Connect the leads from an ohmmeter or continuity tester to each terminal combination and check for continuity. Terminals 85 to 86 represent the coil and should not be tested in any other combination.

3. Connect 12V DC to terminal 85 and a ground wire to terminal 86, then test the following terminal combinations.

<table>
<thead>
<tr>
<th>Test</th>
<th>Desired result</th>
</tr>
</thead>
<tbody>
<tr>
<td>terminal 85 to 86</td>
<td>85 to 95Ω</td>
</tr>
<tr>
<td>terminal 87 to 87a &amp; 30</td>
<td>no continuity (infinite Ω)</td>
</tr>
<tr>
<td>terminal 87a to 30</td>
<td>continuity (zero Ω)</td>
</tr>
<tr>
<td>terminal 87a to 87 &amp; 30</td>
<td>no continuity (infinite Ω)</td>
</tr>
<tr>
<td>terminal 87 to 30</td>
<td>continuity (zero Ω)</td>
</tr>
</tbody>
</table>
8-2
Toggle Switches

See 1-4, Toggle Switches.

8-3
Wago® Components

How to Remove a Wago® Component

**WARNING** Electrocutation hazard. Contact with hot or live circuits may result in death or serious injury. Remove all rings, watches and other jewelry.

**NOTICE** A small standard screw driver is provided and should be used when removing a Wago® component. This screwdriver is located in the instruction manual storage box in the platform.

1. Label and then disconnect the wiring from the component to be removed.
2. Locate the removal tab on the bottom or top side of the component.
3. Use the provided screwdriver to gently pry up on the tab of the component and remove it.

8-4
Resistors

How to Test the Resistors

Two resistors are used to maintain proper control of boom function speeds. A 10 ohm resistor reduces voltage to all the boom function switches. A 15 ohm resistor parallels the 10 ohm resistor to reduce the voltage to the turntable rotate switch.

**NOTICE** Turn the key switch to the off position and remove the key.

1. Disconnect one of the resistor wires from the resistor or the opposite end terminal.
2. Connect the leads from an ohmmeter to each end or wiring of the resistor being tested.
3. Compare the ohmmeter reading with the resistance rating printed on the resistor.
GROUNDED CONTROLS

8-5
Power Relay

**WARNING** Electrocutation hazard. Contact with hot or live circuits may result in death or serious injury. Remove all rings, watches and other jewelry.

How to Test the Power Relay

**WARNING** Electrocutation hazard. Disconnect the ground cable from the battery before performing this procedure.

1. Connect the leads from an ohmmeter to each terminal combination and check for continuity.

<table>
<thead>
<tr>
<th>Test</th>
<th>Desired result</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 small posts</td>
<td>13 to 17Ω</td>
</tr>
<tr>
<td>2 large posts</td>
<td>no continuity (infinite Ω)</td>
</tr>
<tr>
<td>Any small post to any large post</td>
<td>no continuity (infinite Ω)</td>
</tr>
</tbody>
</table>

2. Connect 12V DC to one of the small posts and ground to the other small post, then test the following terminal combination.

<table>
<thead>
<tr>
<th>Test</th>
<th>Desired result</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 large posts</td>
<td>continuity (zero Ω)</td>
</tr>
</tbody>
</table>

- a high amp power contact terminals (large posts)
- b solenoid activate coil terminals (small posts)
Hydraulic Pumps

9-1 Lift/Steer Pump

How to Test the Lift/Steer Pump

1 Disconnect and plug the high pressure hydraulic hose from the lift/steer pump.

**CAUTION** Bodily injury hazard. Spraying hydraulic oil can penetrate and burn skin. Loosen hydraulic connections very slowly to allow the oil pressure to dissipate gradually. Do not allow oil to squirt or spray.

2 Connect a 0 to 5000 psi (0 to 350 bar) pressure gauge to the high pressure port.

3 **Gasoline/LPG models:** Remove the high tension lead from the center of the ignition coil.

**WARNING** Electrocution hazard. Contact with electrically charged circuits may cause death or serious injury. Remove all rings, watches and other jewelry.

4 Turn the key switch to ground control and pull out the Emergency Stop button to the ON position.

5 **Deutz Diesel models:** Hold the manual fuel shutoff valve counterclockwise to the CLOSED position.

**All models:** Observe the pressure gauge while cranking the engine. Immediately stop cranking if the pressure reaches or exceeds 3000 psi (206 bar).

**CAUTION** Component damage hazard. Hydraulic pressure in excess of 3000 psi (206 bar) will cause damage to the machine.

○ Result: If the pressure gauge reads 3000 psi (206 bar), immediately stop cranking the engine. The pump is good.

○ Result: If the pressure fails to reach 3000 psi (206 bar), the pump is bad and will need to be serviced or replaced.

6 **Gasoline/LPG models:** Reconnect the high tension lead to the ignition coil.
HYDRAULIC PUMPS

How to Remove the Lift/Steer Pump

1. Close the two hydraulic tank valves located at the hydraulic tank.

2. Disconnect and plug the lift/steer pump hydraulic hoses. Cap the fittings.

3. Remove the pump mounting bolts. Carefully remove the pump.

9-2

Drive Hydraulic Pump

The drive hydraulic pump is a bi-directional variable displacement piston pump. The pump output is controlled by the electronic displacement controller (EDC), located on the pump. The only adjustment that can be made to the pump is the neutral or null adjustment. Any internal service to the pump should only be performed at an authorized Sundstrand-Sauer service center.

How to Remove the Drive Hydraulic Pump

1. Disconnect the electrical connection at the electronic displacement controller (EDC) located on the drive pump.

2. Close the two hydraulic tank valves located at the hydraulic tank.
3 Disconnect the hydraulic hoses from the pumps and cap them.

**CAUTION** Bodily injury hazard. Spraying hydraulic oil can penetrate and burn skin. Loosen hydraulic connections very slowly to allow the oil pressure to dissipate gradually. Do not allow oil to squirt or spray.

4 Support the pump and remove the two drive pump mounting bolts. Carefully remove the pump.

**CAUTION** Component damage hazard. Be sure to open the two hydraulic tank valves and prime the pump after installing the pump.

**How to Prime the Pump**

1 Connect a 0 to 600 psi (0 to 41 bar) pressure gauge to the test port on the drive pump.

2 **Gasoline/LPG models:** Remove the high tension lead from the center of the ignition coil.

**WARNING** Electrocuton hazard. Contact with electrically charged circuits may cause death or serious injury. Remove all rings, watches and other jewelry.

**Deutz Diesel models:** Hold the manual fuel shut off valve counterclockwise to the **CLOSED** position.

3 Crank the engine with the starter motor for 15 seconds, wait 15 seconds, then crank the engine an additional 15 seconds or until the pressure reaches 320 psi (22 bar).
# Function Manifold

## 10-1
### Function Manifold Components

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Schematic Item</th>
<th>Function</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3 position 4 way D01 valve</td>
<td>N</td>
<td>Platform rotate</td>
<td>30-35 in-lbs / 3-4 Nm</td>
</tr>
<tr>
<td>2</td>
<td>Counterbalance valve</td>
<td>B</td>
<td>Platform level up</td>
<td>35-40 ft-lbs / 47-54 Nm</td>
</tr>
<tr>
<td>3</td>
<td>Sandwich valve manifold</td>
<td>A</td>
<td>Platform level counterbalance valves</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>3 position 4 way D01 valve</td>
<td>O</td>
<td>Platform level</td>
<td>30-35 in-lbs / 3-4 Nm</td>
</tr>
<tr>
<td>5</td>
<td>Counterbalance valve</td>
<td>BB</td>
<td>Turntable rotate right</td>
<td>35-40 ft-lbs / 47-54 Nm</td>
</tr>
<tr>
<td>6</td>
<td>Sandwich valve manifold</td>
<td>AAA</td>
<td>Turntable rotate counterbalance valves</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>3 position 4 way D01 valve</td>
<td>P</td>
<td>Turntable rotate</td>
<td>30-35 in-lbs / 3-4 Nm</td>
</tr>
<tr>
<td>8</td>
<td>3 position 4 way D01 valve</td>
<td>Q</td>
<td>Secondary boom up/down</td>
<td>30-35 in-lbs / 3-4 Nm</td>
</tr>
<tr>
<td>9</td>
<td>3 position 4 way D01 valve</td>
<td>R</td>
<td>Primary boom up/down</td>
<td>30-35 in-lbs / 3-4 Nm</td>
</tr>
<tr>
<td>10</td>
<td>3 position 4 way D01 valve</td>
<td>S</td>
<td>Primary boom extend/retract</td>
<td>30-35 in-lbs / 3-4 Nm</td>
</tr>
<tr>
<td>11</td>
<td>Counterbalance valve</td>
<td>CC</td>
<td>Turntable rotate left</td>
<td>35-40 ft-lbs / 47-54 Nm</td>
</tr>
<tr>
<td>12</td>
<td>Counterbalance valve</td>
<td>C</td>
<td>Platform level down</td>
<td>35-40 ft-lbs / 47-54 Nm</td>
</tr>
<tr>
<td>13</td>
<td>Check valve</td>
<td>K</td>
<td>Turntable rotate - differential sensing</td>
<td>11-13 ft-lbs / 15-18 Nm</td>
</tr>
<tr>
<td>14</td>
<td>Check valve</td>
<td>M</td>
<td>Primary and secondary boom - differential sensing</td>
<td>11-13 ft-lbs / 15-18 Nm</td>
</tr>
<tr>
<td>15</td>
<td>Flow regulator valve</td>
<td>Y</td>
<td>Primary boom/secondary boom</td>
<td>10-12 ft-lbs / 14-16 Nm</td>
</tr>
<tr>
<td>16</td>
<td>Relief valve, 1200 psi (83 bar)</td>
<td>D</td>
<td>Primary boom extend</td>
<td>25-30 ft-lbs / 34-41 Nm</td>
</tr>
<tr>
<td>17</td>
<td>Relief valve, 1200 psi (83 bar)</td>
<td>F</td>
<td>Primary boom down</td>
<td>25-30 ft-lbs / 34-41 Nm</td>
</tr>
<tr>
<td>18</td>
<td>Relief valve, 1200 psi (83 bar)</td>
<td>E</td>
<td>Secondary boom down</td>
<td>25-30 ft-lbs / 34-41 Nm</td>
</tr>
<tr>
<td>19</td>
<td>Proportional solenoid valve</td>
<td>AA</td>
<td>Primary boom/secondary boom</td>
<td>10-12 ft-lbs / 14-16 Nm</td>
</tr>
<tr>
<td>20</td>
<td>Flow regulator valve</td>
<td>X</td>
<td>Turntable rotate/ Primary boom extend/retract</td>
<td>10-12 ft-lbs / 14-16 Nm</td>
</tr>
<tr>
<td>21</td>
<td>Normally closed poppet valve</td>
<td>J</td>
<td>Platform level</td>
<td>25-30 ft-lbs / 34-41 Nm</td>
</tr>
<tr>
<td>22</td>
<td>Proportional solenoid valve</td>
<td>Z</td>
<td>Turntable rotate/ Primary boom extend/retract</td>
<td>10-12 ft-lbs / 14-16 Nm</td>
</tr>
<tr>
<td>23</td>
<td>Flow regulator valve</td>
<td>V</td>
<td>Platform level</td>
<td>10-12 ft-lbs / 14-16 Nm</td>
</tr>
<tr>
<td>24</td>
<td>Differential sensing valve</td>
<td>AC</td>
<td>All functions</td>
<td>10-12 ft-lbs / 14-16 Nm</td>
</tr>
<tr>
<td>25</td>
<td>Flow regulator valve</td>
<td>U</td>
<td>Platform rotate/jib boom</td>
<td>10-12 ft-lbs / 14-16 Nm</td>
</tr>
<tr>
<td>26</td>
<td>Flow regulator valve</td>
<td>W</td>
<td>Differential sensing circuit</td>
<td>10-12 ft-lbs / 14-16 Nm</td>
</tr>
<tr>
<td>27</td>
<td>Diagnostic fitting</td>
<td></td>
<td>Testing</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Relief valve, 2200 psi (152 bar)</td>
<td>AB</td>
<td>System relief</td>
<td>35-40 ft-lbs / 47-54 Nm</td>
</tr>
<tr>
<td>29</td>
<td>Priority flow regulator valve</td>
<td>T</td>
<td>Steering</td>
<td>10-12 ft-lbs / 14-16 Nm</td>
</tr>
<tr>
<td>30</td>
<td>Check valve</td>
<td>I</td>
<td>Platform rotate right - differential sensing</td>
<td>11-13 ft-lbs / 15-18 Nm</td>
</tr>
<tr>
<td>31</td>
<td>Check valve</td>
<td>H</td>
<td>Platform rotate left - differential sensing</td>
<td>11-13 ft-lbs / 15-18 Nm</td>
</tr>
<tr>
<td>32</td>
<td>Check valve</td>
<td>L</td>
<td>Platform level - differential sensing</td>
<td>11-13 ft-lbs / 15-18 Nm</td>
</tr>
</tbody>
</table>
FUNCTION MANIFOLD
FUNCTION MANIFOLD

Plug Torque Specifications

<table>
<thead>
<tr>
<th>Description</th>
<th>Hex Size</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAE No. 2</td>
<td>1/8</td>
<td>50 in-lbs / 6 Nm</td>
</tr>
<tr>
<td>SAE No. 4</td>
<td>3/16</td>
<td>13 ft-lbs / 18 Nm</td>
</tr>
<tr>
<td>SAE No. 6</td>
<td>1/4</td>
<td>18 ft-lbs / 24 Nm</td>
</tr>
<tr>
<td>SAE No. 8</td>
<td>5/16</td>
<td>50 ft-lbs / 68 Nm</td>
</tr>
<tr>
<td>SAE No. 10</td>
<td>9/16</td>
<td>55 ft-lbs / 75 Nm</td>
</tr>
<tr>
<td>SAE No. 12</td>
<td>5/8</td>
<td>75 ft-lbs / 102 Nm</td>
</tr>
</tbody>
</table>

10-2 Valve Adjustments - Function Manifold

How to Adjust the Main Relief Valve

1 Connect a 0 - 3000 psi (0 to 206 bar) pressure gauge to the diagnostic nipple on the function manifold.
2 Start the engine from the ground controls and then completely retract the primary boom.
3 Hold the retract switch and observe the pressure reading on the pressure gauge.
4 Turn the engine off. Hold the relief valve and remove the cap (item 28).
5 Adjust the internal hex socket. Turn it clockwise to increase the pressure or counterclockwise to decrease the pressure. Then reinstall the relief valve cap.

**WARNING** Tip-over hazard. Do not adjust the relief valves higher than recommended. They are set to prevent a tip-over or damage to lift linkage.

6 Restart the engine. Hold the retract switch and recheck the valve pressure.

Specifications

| Main relief valve pressure | 2200 psi / 152 bar |

How to Adjust the Primary or Secondary Boom Down Relief Valve

1 Connect a 0 - 3000 psi (0 to 206 bar) pressure gauge to the diagnostic nipple on the function manifold.
2 Start the engine from the ground controls and then fully lower the boom to be adjusted.
3 Hold the primary or secondary boom up/down switch in the down position and observe the pressure reading on the pressure gauge.
4 Turn the engine off. Hold the relief valve and remove the cap (item 17 for primary boom, item 18 for secondary boom).
5 Adjust the internal hex socket. Turn it clockwise to increase the pressure or counterclockwise to decrease the pressure. Then reinstall the relief valve cap.

**WARNING** Tip-over hazard. Do not adjust the relief valves higher than recommended. They are set to prevent a tip-over or damage to lift linkage.

6 Restart the engine. Hold the primary or secondary boom up/down switch in the down position and recheck the valve pressure.

Specifications

| Relief valve pressure | 1200 psi / 83 bar |
How to Override a Valve

A hydraulic valve may need to be manually overridden to troubleshoot a malfunction. Each proportional boom function uses a variable position proportional valve and a three position directional valve. Example: one position for boom up, one position for neutral and one position for boom down. The platform rotate and level functions use a three position valve and a two position poppet valve. The three position valves and the proportional valves can be manually overridden. To identify the manifold valves see 10-1 Function Manifold Components in this section.

1 Push the button on the end of the valve in ¼ inch (6 mm).
2 Move the ground control function switch for the function being overridden to operate function.

**WARNING** Collision Hazard. Impact with moving boom components may cause death or serious injury. Use extreme caution when overriding a boom function and know the direction of intended travel.

How to Check the Resistance of a Valve Coil

1 Turn the keyswitch to the off position and disconnect the wires from the valve coil to be tested.
2 Connect the leads from an ohmmeter to the valve coil terminals.

<table>
<thead>
<tr>
<th>Valve</th>
<th>Resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proportional solenoid valve</td>
<td>5Ω</td>
</tr>
<tr>
<td>3 pos 4 way directional valve</td>
<td>4.5Ω</td>
</tr>
<tr>
<td>Normally closed poppet valve</td>
<td>7Ω</td>
</tr>
</tbody>
</table>
Fuel and Hydraulic Tanks

11-1 Hydraulic Tank

The primary functions of the hydraulic tank are to cool, clean and deaerate the hydraulic fluid during operation. This tank has a 25 gallon (94.5 liters) capacity and an oil level gauge with temperature indicator. It utilizes internal suction strainers for the pump supply suction lines and has an external return line filter.

How to Remove the Hydraulic Tank

The work area and surfaces where this procedure will be performed must be clean and free of debris that could get into the hydraulic system and cause severe component damage.

1 Raise the primary boom until it is horizontal to access the anchor hook.
2 Close the two hydraulic tank valves located at the main pump.
3 Completely drain the oil from the tank by removing the drain plug located in the bottom front of tank.
4 Disconnect the hydraulic hoses from the tank.
5 Remove the tank anchor hook from the back of the tank.
6 Remove the mounting fasteners from the bottom of the tank.
7 Use an appropriate lifting device to remove the tank from the machine.

CAUTION Burn hazard. Contact with hot oil may cause severe burns.

How to Prime the Pump

1 Gasoline/LPG models: Disconnect the ignition coil wire and isolate it from ground.
2 Diesel models: Disconnect the wiring to the injection pump fuel-on solenoid
3 Crank the engine with the starter motor for 15 seconds.

NOTICE Always use pipe thread sealant when re-installing the drain plug.

NOTICE Use only Dexron II equivalent hydraulic fluid.

CAUTION Be sure to open the two hydraulic tank valves and prime the pump after installing the pump.
Fuel Tank

How to Remove the Fuel Tank

Engine fuels are combustible. Remove the fuel tank in an open, well-ventilated area away from heaters, sparks, flames and lighted tobacco. Always have an approved fire extinguisher within easy reach.

Explosion hazard. When transferring fuel, connect a grounding wire between the machine and pump or container.

1. Raise the secondary boom enough to access the back of the fuel tank.
2. Turn the manual fuel shutoff valve to the closed position.
3. **Gasoline/LPG models:** Disconnect the electrical collectors from the fuel shutoff solenoid. Disconnect, drain and plug the fuel hose.

   **Diesel models:** Disconnect, drain and plug the supply and return fuel hoses. Cap the fuel return fitting on the fuel tank.

4. Remove the tank anchor hook from the back of the tank.
5. Remove the mounting fasteners from the bottom of the tank.
6. Use an appropriate lifting device to remove the tank from the machine.

Clean the fuel tank and inspect for rust and corrosion before it is installed.
Turntable Rotation Components

12-1 Rotation Hydraulic Motor

The rotation hydraulic motor is the only serviceable component of the turntable rotation assembly. The worm gear may not be removed from the housing. In order to remove the housing, the turntable has to be removed.

**How to Remove the Turntable Rotation Motor**

1. Remove the hydraulic hoses attached to the turntable rotation motor and plug them.

   **CAUTION** Bodily injury hazard. Spraying hydraulic oil can penetrate and burn skin. Loosen hydraulic connections very slowly to allow the oil pressure to dissipate gradually. Do not allow oil to squirt or spray.

2. Remove the turntable rotation motor mounting bolts, then remove the motor.

   **NOTICE** Do not allow the turntable to rotate until the hydraulic motor is installed.

12-2 Rotation Bearing and Worm Drive

How to Remove the Rotation Bearing or Worm Drive

The turntable and all components above it must be removed prior to removing the rotation bearing or worm drive.

**WARNING** This procedure requires specific repair skills, lifting equipment and a suitable workshop. Attempting this procedure without these skills and tools may result in death or serious injury and significant component damage. Dealer service is required.

**NOTICE** Be sure that the chassis is level.

1. Remove the platform. See 2-1, *How to Remove the Platform*.

2. Remove the primary boom. See 3-2, *How to Remove the Primary Boom*.

   **WARNING** Crushing hazard. Do not remove the 4x4x31 inch (78 cm) support block installed during primary boom removal.

   ![Diagram of turntable rotation components]

   - a upper mid-pivot
   - b 4x4x31 inch block
   - c counterweight
3 Use an overhead crane to attach a lifting strap to the rod-end of the primary lift cylinder. Then raise the primary lift cylinder with the crane, to a vertical position.

4 Remove the pin retainer from the pivot pin at the barrel-end of the primary lift cylinder.

5 Place a rod through the barrel-end pivot pin and twist to remove the pin. Remove the primary lift cylinder from the machine.

   ![Diagram of primary lift cylinder being removed](image)

   a 10 to 12 inch (30 cm) rod
   b pivot pin

**WARNING** Crushing hazard. The primary lift cylinder will fall when the barrel-end pivot pin is removed if it is not properly supported.

6 Raise the secondary boom. Remove the block from the turntable counterweight and lower the secondary boom to the stowed position.

7 Close the two hydraulic tank valves located at the main pump.

   ![Diagram of hydraulic tank valves](image)

   a open
   b closed

8 Disconnect the three 3/4 inch hydraulic hoses from the main pump and plug them.

**CAUTION** Bodily injury hazard. Spraying hydraulic oil can penetrate and burn skin. Loosen hydraulic connections very slowly to allow the oil pressure to dissipate gradually. Do not allow oil to squirt or spray.

9 Disconnect the same three 3/4 inch hydraulic hoses from the drive traction manifold and plug them. Pull these hoses up through the turntable and remove them from the machine.

10 Disconnect the “in” and “return” hydraulic hoses from the steer/oscillate manifold and plug them. Pull these hoses up through the turntable.

11 Disconnect the hydraulic hoses from the turntable rotation motor and plug them. Pull these hoses up through the turntable.

12 Label and then disconnect all the wiring from the traction manifold and the steer/oscillate manifold.

13 Disconnect and remove the oscillating axle limit switches from the oscillation cylinder.

   ![Diagram of oscillating axle limit switch](image)

   a oscillating axle limit switch
   b oscillate lock-out wedge
**TURNTABLE ROTATION COMPONENTS**

14 Disconnect and remove the drive enable limit switch.

15 Pull the wiring harness along with the limit switches up through the turntable.

16 Remove the turntable end cover.

17 Loosen the lug nuts on both steer tires. Do not remove them.

18 Center a lifting jack under the steering axle. Lift the machine until the tires are just off the ground.

19 Support the chassis on blocks, then remove both steer tires and wheel assemblies to improve access when removing the turntable.

20 Prepare a forklift with a minimum rating of 18,000 pounds (8165 kg) by spreading the forks to an inside width of 3 feet (0.9 m).

21 Position the forklift at the counterweight end of the turntable. Center the forks underneath the turntable and above the chassis. Do not lift.

22 Place a 5 inch (13cm) tall block near the end of the forks for support.

23 Raise the forks up against the turntable. Do not lift. Be sure that the support block is still in its proper location.

24 Place a safety strap around the upper mid-pivot, then secure the strap to the forklift carriage.

25 Remove the turntable mounting bolts.

26 Carefully lift the turntable off the chassis. Set the turntable on blocks for support.

27 Place reference marks on the chassis to note the position of the worm drive housing for proper re-alignment during re-installation.

28 Remove the fasteners from the worm drive, then remove the worm drive.

29 Center the forklift forks under the chassis counterweight for support.

30 Loosen the counterweight positioning bolt.

31 Remove the fasteners from the counterweight.

32 Carefully lower the counterweight from the machine.

33 Remove the fasteners from the underside of the rotate bearing, then remove the rotate bearing.
How to Install the Rotation Bearing and Worm Drive

The rotation bearing is a structural component. It attaches the chassis to the turntable. The turntable is bolted to the inner race, with the worm gear housing sandwiched in-between. This housing has to be exactly positioned to provide the correct gear lash between the worm gear and the ring gear. The outside bearing race is bolted to the chassis from the underside.

**WARNING**

This procedure requires specific repair skills, lifting equipment and a suitable workshop. Attempting this procedure without these skills and tools may result in death or serious injury and significant component damage. Dealer service is required.

**NOTICE**

If a repair requires that the turntable be removed from the chassis, installing a new rotation bearing is recommended. Consider the service life of the rotation bearing before installing a used bearing.

1. Position the rotation bearing on the chassis.
2. Locate the “red” mark on the outside bearing race. Align the mark with the rotation stop block on the chassis.
3. Install the mounting fasteners from underneath the chassis. Use a torque wrench to tighten the fasteners in sequence to specifications.

### Specifications - torque

<table>
<thead>
<tr>
<th>Description</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>First rotation</td>
<td>95 ft-lbs 129 Nm</td>
</tr>
<tr>
<td>Second rotation</td>
<td>190 ft-lbs 258 Nm</td>
</tr>
</tbody>
</table>
TURNTABLE ROTATION COMPONENTS

4 Locate the “0” mark stamped in the outside bearing and the dowel on the inside bearing.

5 Position the inside bearing dowel 90 degrees counterclockwise from the “0” mark on the outside bearing.

6 Install a grease fitting on the inside bearing and apply grease until it comes out of the inner seal.

7 Apply grease to 10 gear teeth on each side of the “0” mark on the outside bearing.

8 Center the worm drive over the “0” mark on the outside bearing and install the two 5/16 inch fasteners. Hand tighten the bolts.

9 Push the worm drive towards the rotation bearing to be as close as possible.

10 Position a dial indicator to measure the worm drive in relation to the ring gear. Pull the worm drive away from the rotate bearing 0.035 inches (0.889mm) ±0.020 inches (0.508mm).

11 Tighten the two 5/16 fasteners. Observe the dial indicator to be sure that the worm drive does not move.

12 Locate the 1 inch hex head on the end of the worm gear housing. Turn the hex head to rotate the worm drive until it is positioned within the original reference marks on the chassis.

13 Position the turntable so that the flat side of the turntable is parallel with the worm drive gear.

14 While lowering the turntable onto the chassis, be sure that the milled area on the bottom surface of the turntable does not contact the top of the worm drive gear housing. If it is, remove the turntable and grind the worm drive gear housing until clearance is established.

15 Install the turntable mounting fasteners. Use a torque wrench to tighten the fasteners in sequence to specifications.

<table>
<thead>
<tr>
<th>Specifications - torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>First rotation</td>
</tr>
<tr>
<td>Second rotation</td>
</tr>
</tbody>
</table>

**NOTICE** After re-assembly, the turntable should swing smoothly without jerking or grinding.
How to Remove the Yoke/Hub Assembly

1. Remove the cotter pin, and the clevis pin from both the steering cylinder and tie rod weldment.

2. Break loose the wheel lug nuts. Do not remove them.

3. Block the non-steering wheels and place a lifting jack under the steering axle.

4. Raise the machine and place blocks under the chassis.

5. Remove the lug nuts, then the tire and wheel assembly.

6. Remove the pin retainer attached to the king pin.

7. Place a second jack under the yoke/hub assembly.

8. Use a soft metal drift to drive the king pin down and out.

**WARNING** Crushing hazard. The yoke/hub assembly will fall when the king pin is removed if it is not properly supported.

**NOTICE** Always use a new cotter pin when re-installing a clevis pin.

How to Remove the Hub and Bearing

1. Loosen the wheel lug nuts. Do not remove them.

2. Place a lifting jack under the steering axle.

3. Raise the machine and place blocks under the chassis.

4. Remove the lug nuts, then the tire and wheel assembly.

5. Remove the dust cap, cotter pin and slotted nut.

6. Pull the hub from the spindle. The washer and outer bearing should fall loose from the hub.

7. Place the hub on a flat surface and gently pry the bearing seal out of the hub. Remove the rear bearing.
2WD STEERING AXLE COMPONENTS

How to Install the Hub and Bearing

1. Be sure that the bearing is packed with grease.
2. Place the large inner bearing into the rear of the hub.
3. Press the bearing seal into the hub. Rest the seal on the hub, then press the seal evenly into the hub until it is flush.
4. Slide the hub onto the yoke spindle.
   - **CAUTION**: Component damage hazard. Do not apply excessive force or damage to the lip of the seal may result.
5. Be sure that the outer bearing is packed with grease, and place it into the hub.
6. Install the washer and slotted nut.
7. Tighten the slotted nut to 35 foot-pounds (47Nm).
8. Loosen the slotted nut and then re-tighten to 8 foot-pounds (11Nm).
9. Install a new cotter pin. Bend the pin to lock it in.
10. Install the dust cap, then the tire and wheel assembly. Torque the wheel lug nuts to 125 foot-pounds (169Nm).

13-2

Steering Cylinders

How to Remove a Steering Cylinder

There are two identical steering cylinders that work in parallel. They are part of the same hydraulic circuit, but move in opposite directions. The tie rod maintains equal movement of the tires. Bushings are used at both ends of each steering cylinder clevis.

1. Disconnect the hydraulic hoses from the steering cylinder and plug them.
   - **CAUTION**: Bodily injury hazard. Spraying hydraulic oil can penetrate and burn skin. Loosen hydraulic connections very slowly to allow the oil pressure to dissipate gradually. Do not allow oil to squirt or spray.
2. Remove the cotter pin, then the clevis pin from each end of the steering cylinder.
3. Remove the steering cylinder.
   - **NOTICE**: Always use a new cotter pin when re-installing a clevis pin.
**13-3**

**Tie Rod**

**How to Remove the Tie Rod Weldment**

1. Remove the cotter pins, then the clevis pins from the ends of the tie rod.

2. Remove the tie rod weldment.

   **NOTICE** Always use a new cotter pin when re-installing a clevis pin.

**How to Perform the Tie Rod Toe-in Adjustment**

   **NOTICE** Perform this procedure on a firm level surface. Block the non-steering tires and be sure that the machine is in the fully stowed position.

1. Measure 15 inches (38 cm) up from the ground on the front and rear of each steer tire and make a reference mark at the center of the tire.

2. Measure the distance from the reference points on each tire: Front to front and back to back.

3. Center a jack under the steering axle, then raise the machine.

4. Loosen the jam nut on the adjustable end of the tie rod.

5. Remove the cotter pin, then remove the clevis pin from the adjustable end of the tie rod.

6. Slide the tie rod off the yoke and adjust it by turning the end.

   **NOTICE** One half turn on the adjustable end equals a 3/16 inch (5 mm) change in the front to rear measurement.

7. Slide the tie rod onto the yoke. Install the clevis pin, then a new cotter pin.

8. Tighten the jam nut against the tie rod.

9. Lower the machine and recheck the front and back measurements (step 2). If further adjustment is needed, repeat steps 3 through 8.

**Specifications**

| Tie rod adjustment | 1/4 inch (0.635 mm) toe-in to 1/4 inch (0.635 mm) toe-out |
14-1
Yoke and Hub

How to Remove the Yoke and Hub

The yoke installation utilizes bushings and a thrust washer that require periodic replacement depending upon the application. The yoke must be removed before the torque hub can be removed. The wheel motor is an integral part of the torque hub.

1. Remove the cotter pin, then the clevis pin from both the steering cylinder and the tie rod weldment.

2. Disconnect the hydraulic hoses from the wheel motor and plug them. Cap the wheel motor hydraulic fittings.

   **CAUTION** Bodily injury hazard. Spraying hydraulic oil can penetrate and burn skin. Loosen hydraulic connections very slowly to allow the oil pressure to dissipate gradually. Do not allow oil to squirt or spray.

3. Loosen the wheel lug nuts. Do not remove them.

4. Block the non-steering wheels, and then center a lifting jack under the steering axle.

5. Raise the machine 6 inches (15 cm) and place blocks under the chassis.

6. Remove the lug nuts, then the tire and wheel assembly.

7. Remove the pin retainer from the king pin.

8. Place a block between the oscillate cylinder lock-out wedge and the chassis on the same side as the yoke/torque hub being serviced.

---

**Diagram:**

- a. axle
- b. pin retainer
- c. king pin
- d. yoke
- e. torque hub
- f. cotter and clevis pin
- g. steering cylinder
- h. tie rod

---

- a. block
- b. torque hub
- c. yoke
- d. axle
- e. lock-out wedge
- f. chassis
4WD STEERING AXLE COMPONENTS

9. Attach a strap from a lifting device to the yoke/torque hub assembly and support it.
10. Use a soft metal drift to drive the king pin down and out.

**WARNING** Crushing hazard. The yoke/torque hub assembly will fall when the king pin is removed if it is not properly supported.

11. Place the yoke/torque hub assembly on a flat surface with the torque hub down. Remove the bolts that secure the yoke to the torque hub.

**Specifications**

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lug nut torque</td>
<td>125 ft-lbs 169 Nm</td>
</tr>
</tbody>
</table>

**14-3 Tie Rod**

**How to Remove the Tie Rod Weldment**

This procedure is the same as the 2WD procedure. See repair procedure 13-3, *How to Remove the Tie Rod Weldment*.

**How to Perform the Tie Rod Toe-in Adjustment**

This procedure is the same as the 2WD procedure. See repair procedure 13-3, *How to Perform the Tie Rod Toe-in Adjustment*.

**14-2 Steering Cylinders**

**How to Remove the Steering Cylinder**

This procedure is the same as the 2WD procedure. See repair procedure 13-2, *How to Remove the Steering Cylinder*. 
Oscillating Axle Components

15-1 Oscillating Axle Lock-out Cylinder

The oscillating axle lock-out cylinder extends the lock-out wedges between the chassis and the axle when the boom is raised above the drive limit switch. When the lock-out wedges are fully extended, the oscillation lock-out limit switches release and allow the primary boom to continue to raise above the drive limit switch.

How To Remove The Oscillating Axle Lock-out Cylinder

The oscillating axle lock-out cylinder is held in place by the same pin that retains the axle. Therefore, the axle must be removed as part of this procedure.

This procedure requires specific repair skills, lifting equipment and a suitable workshop. Attempting this procedure without these skills and tools may result in death or serious injury and significant component damage. Dealer service is strongly recommended.

Perform this procedure on a firm level surface.

1 Disconnect and plug the oscillating axle lock-out cylinder hydraulic hoses. Disconnect and plug the steer and accumulator hoses from the steer-oscillate manifold to provide clearance for pin removal.

Bodily injury hazard. Spraying hydraulic oil can penetrate and burn skin. Loosen hydraulic connections very slowly to allow the oil pressure to dissipate gradually. Do not allow oil to squirt or spray.

2 Remove the oscillation lock-out limit switches from the oscillating axle lock-out cylinder.

3 Block the non-steering wheels, then center a jack under the oscillating axle and lift the machine 6 inches (15 cm).

4 Support the raised machine with blocks, then carefully lower the chassis onto the blocks. Leave the jack under the axle to support it. Do not lift.

Crushing hazard. If the jack is not centered, the axle may tip when the pivot pin is removed.

5 Remove the pin retainer from the axle pivot pin. Use a soft metal drift to remove the axle pivot pin.

6 Remove the oscillate cylinder.
### Steer and Oscillate Manifold Components

<table>
<thead>
<tr>
<th>Index No.</th>
<th>Description</th>
<th>Schematic Item</th>
<th>Function</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3 position 4 way DO1 valve</td>
<td>F</td>
<td>Steering</td>
<td>30-35 in-lbs / 3-4 Nm</td>
</tr>
<tr>
<td>2</td>
<td>Pilot operated unloader valve, 1900 psi / (131 bar)</td>
<td>C</td>
<td>Sequencing</td>
<td>10-12 ft-lbs / 14-16 Nm</td>
</tr>
<tr>
<td>3</td>
<td>Sensing valve</td>
<td>B</td>
<td>Differential sensing</td>
<td>10-12 ft-lbs / 14-16 Nm</td>
</tr>
<tr>
<td>4</td>
<td>Normally closed poppet valve</td>
<td>A</td>
<td>Steering dump</td>
<td>25-30 ft-lbs / 34-41 Nm</td>
</tr>
<tr>
<td>5</td>
<td>2 position 4 way valve</td>
<td>D</td>
<td>Oscillate</td>
<td>10-12 ft-lbs / 14-16 Nm</td>
</tr>
<tr>
<td>6</td>
<td>Check valve</td>
<td>E</td>
<td>Oscillate check</td>
<td>35-40 ft-lbs / 47-54 Nm</td>
</tr>
</tbody>
</table>
STEER AND OSCILLATE MANIFOLD

Plug Torque Specifications

<table>
<thead>
<tr>
<th>Description</th>
<th>Hex Size</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAE No. 2</td>
<td>1/8</td>
<td>50 in-lbs / 6 Nm</td>
</tr>
<tr>
<td>SAE No. 4</td>
<td>9/16</td>
<td>13 ft-lbs / 18 Nm</td>
</tr>
<tr>
<td>SAE No. 6</td>
<td>1/4</td>
<td>18 ft-lbs / 24 Nm</td>
</tr>
<tr>
<td>SAE No. 8</td>
<td>5/16</td>
<td>50 ft-lbs / 68 Nm</td>
</tr>
<tr>
<td>SAE No. 10</td>
<td>9/16</td>
<td>55 ft-lbs / 75 Nm</td>
</tr>
<tr>
<td>SAE No. 12</td>
<td>5/8</td>
<td>75 ft-lbs / 102 Nm</td>
</tr>
</tbody>
</table>

16-2
Valve Adjustments

How to Adjust the Sequencing Unloader Valve

**CAUTION** Bodily injury hazard. Spraying hydraulic oil can penetrate and burn skin. Loosen hydraulic connections very slowly to allow the oil pressure to dissipate gradually. Do not allow oil to squirt or spray.

1 Start the engine and raise the primary boom above the drive limit switch. Do not lift the primary boom above the secondary boom.

2 Connect a 0 to 3000 psi (0 to 206 bar) pressure gauge to the diagnostic nipple on the function manifold.

3 Manually hold down the drive limit switch. When the oscillate cylinder fully retracts, the pressure will spike. Note the maximum pressure reading. Do not release the drive limit switch.

4 Release the drive limit switch. When the oscillate cylinder fully extends, the pressure will spike. Note the maximum pressure reading.

5 Hold the unloader valve and remove the cap (index 2).

6 Adjust the internal hex socket by turning it clockwise to increase the pressure or counterclockwise to decrease the pressure. Then reinstall the relief valve cap.

7 Manually hold down the drive limit switch and recheck the valve pressure.

Specifications

| Unloader valve | 1900 psi 131 bar |
Non-steering Axle Components

17-1
Drive Motor

⚠️ CAUTION ⚠️ Repairs to the motor should only be performed by an authorized Sundstrand-Sauer dealer.

How to Remove a Drive Motor

A drive motor can only be removed from the inside of the chassis. Access on older machines is even more restricted. The brake and motor must be removed together and then separated for repair.

The work area and surfaces where this procedure will be performed must be clean and free of debris that could get into the hydraulic system and cause severe component damage. Dealer service is recommended.

1. Disconnect the hydraulic hoses from the drive motor and plug them.

⚠️ CAUTION ⚠️ Bodily injury hazard. Spraying hydraulic oil can penetrate and burn skin. Loosen hydraulic connections very slowly to allow the oil pressure to dissipate gradually. Do not allow oil to squirt or spray.

2. Remove the drive motor mounting bolts.

3. Slide the drive motor shaft out of the brake and then remove.

Notice On older machines, the drive motor and brake must be removed together.

17-2
Torque Hub

How to Remove a Drive Torque Hub

The drive motor and brake must be removed in order to access the torque hub mounting bolts.

1. Remove the drive motor and brake. See 18-1, How to Remove a Drive Motor.

2. Loosen the wheel lug nuts. Do not remove them.

3. Center a jack under the non-steering axle. Raise the machine and place blocks under the chassis to support it.

4. Remove the wheel lug nuts, then the tire and wheel assembly.

5. Place a second jack under the torque hub for support.

6. Remove the bolts that attach the brake to the hub.

7. Remove the bolts that attach the torque hub to the chassis, then remove the torque hub.

⚠️ CAUTION ⚠️ Crushing hazard. The torque hub will fall if it is not properly supported when the mounting bolts are removed.

Specifications

| Lug nut torque | 125 ft-lbs 169 Nm |
## 2WD Drive Manifold Components

<table>
<thead>
<tr>
<th>Index No.</th>
<th>Description</th>
<th>Schematic Item</th>
<th>Function</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Check valve</td>
<td>M</td>
<td>Brake check</td>
<td>25-30 ft-lbs / 34-41 Nm</td>
</tr>
<tr>
<td>2</td>
<td>2 position 3 way valve</td>
<td>O</td>
<td>Brake release</td>
<td>8-10 ft-lbs / 11-14 Nm</td>
</tr>
<tr>
<td>3</td>
<td>2 position 3 way valve</td>
<td>N</td>
<td>2-Speed wheel motors, (energized in high range to destroke the rear motor swash plates)</td>
<td>8-10 ft-lbs / 11-14 Nm</td>
</tr>
<tr>
<td>4</td>
<td>Orifice 0.036 in (0.914mm)</td>
<td>P</td>
<td>Motor shift / brake release circuit</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Pilot to open check valve</td>
<td>E</td>
<td>Right check in forward</td>
<td>85-90 ft-lbs / 115-122 Nm</td>
</tr>
<tr>
<td>6</td>
<td>Pilot to open check valve</td>
<td>G</td>
<td>Right check in reverse</td>
<td>85-90 ft-lbs / 115-122 Nm</td>
</tr>
<tr>
<td>7</td>
<td>Shuttle valve 3 position 3 way</td>
<td>K</td>
<td>Low pressure flow path for brake release and 2-speed motor shift</td>
<td>15-18 ft-lbs / 20-24 Nm</td>
</tr>
<tr>
<td>8</td>
<td>Pilot to open check valve</td>
<td>D</td>
<td>Left check in reverse</td>
<td>85-90 ft-lbs / 115-122 Nm</td>
</tr>
<tr>
<td>9</td>
<td>Pilot to open check valve</td>
<td>B</td>
<td>Left check in forward</td>
<td>85-90 ft-lbs / 115-122 Nm</td>
</tr>
<tr>
<td>10</td>
<td>2 position 3 way valve</td>
<td>J</td>
<td>Energized in high range to pilot open check valves 5, 6, 8 &amp; 9 to bypass flow regulators and allow full flow to front wheel motors</td>
<td>8-10 ft-lbs / 11-14 Nm</td>
</tr>
<tr>
<td>11</td>
<td>Shuttle valve 2 position 3 way</td>
<td>I</td>
<td>High pressure flow path for flow regulator bypass</td>
<td>10-13 ft-lbs / 14-18 Nm</td>
</tr>
<tr>
<td>12</td>
<td>Flow regulator valve</td>
<td>A</td>
<td>Left flow control in forward</td>
<td>10-12 ft-lbs / 14-16 Nm</td>
</tr>
<tr>
<td>13</td>
<td>Flow regulator valve</td>
<td>C</td>
<td>Left flow control in reverse</td>
<td>10-12 ft-lbs / 14-16 Nm</td>
</tr>
<tr>
<td>14</td>
<td>Relief valve, 320 psi (22 bar)</td>
<td>L</td>
<td>Charge pressure</td>
<td>10-12 ft-lbs / 14-16 Nm</td>
</tr>
<tr>
<td>15</td>
<td>Flow regulator valve</td>
<td>H</td>
<td>Right flow control in reverse</td>
<td>10-12 ft-lbs / 14-16 Nm</td>
</tr>
<tr>
<td>16</td>
<td>Flow regulator valve</td>
<td>F</td>
<td>Right flow control in forward</td>
<td>10-12 ft-lbs / 14-16 Nm</td>
</tr>
</tbody>
</table>

### Plug Torque Specifications

<table>
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<th>Hex Size</th>
<th>Torque</th>
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<td>3/16</td>
<td>13 ft-lbs / 18 Nm</td>
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<tr>
<td>SAE No. 6</td>
<td>1/4</td>
<td>18 ft-lbs / 24 Nm</td>
</tr>
<tr>
<td>SAE No. 8</td>
<td>5/16</td>
<td>50 ft-lbs / 68 Nm</td>
</tr>
<tr>
<td>SAE No. 10</td>
<td>9/16</td>
<td>55 ft-lbs / 75 Nm</td>
</tr>
<tr>
<td>SAE No. 12</td>
<td>5/8</td>
<td>75 ft-lbs / 102 Nm</td>
</tr>
</tbody>
</table>
18-2
Valve Adjustments

How to Adjust the Charge Pressure Relief Valve

1. Connect a 0 to 600 psi (0 to 41 bar) pressure gauge in between one of the medium pressure hydraulic hoses and the medium pressure hydraulic oil filter.

   **CAUTION** Bodily injury hazard. Spraying hydraulic oil can penetrate and burn skin. Loosen hydraulic connections very slowly to allow the oil pressure to dissipate gradually. Do not allow oil to squirt or spray.

2. Start the engine from the platform controls.

3. Drive the machine in either direction and observe the pressure reading on the pressure gauge.

4. Turn the engine off. Hold the relief valve and remove the cap (index 14).

5. Adjust the internal hex socket. Turn it clockwise to increase the pressure or counterclockwise to decrease the pressure. Then reinstall the valve cap.

6. Restart the engine. Drive the machine in either direction and recheck the valve pressure.

7. Turn the engine off, then remove the pressure gauge.

**Specifications**

| Relief valve | 320 psi / 22 bar |
# 4WD Drive Manifold Components

<table>
<thead>
<tr>
<th>Index No.</th>
<th>Description</th>
<th>Schematic Item</th>
<th>Function</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Check valve</td>
<td>W</td>
<td>Brake check</td>
<td>25-30 ft-lbs / 34-41 Nm</td>
</tr>
<tr>
<td>2</td>
<td>2 position 3 way valve</td>
<td>S</td>
<td>Brake release</td>
<td>8-10 ft-lbs / 11-14 Nm</td>
</tr>
<tr>
<td>3</td>
<td>2 position 3 way valve</td>
<td>R</td>
<td>2-speed wheel motors (energized in high range to destroke the rear motor swash plates)</td>
<td>8-10 ft-lbs / 11-14 Nm</td>
</tr>
<tr>
<td>4</td>
<td>Check valve</td>
<td>K</td>
<td>RR check in forward</td>
<td>35-40 ft-lbs / 47-54 Nm</td>
</tr>
<tr>
<td>5</td>
<td>Orifice 0.025 in (0.635 mm)</td>
<td>X</td>
<td>Motor shift / brake release circuit</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Check valve</td>
<td>L</td>
<td>RR check in reverse</td>
<td>35-40 ft-lbs / 47-54 Nm</td>
</tr>
<tr>
<td>7</td>
<td>Relief valve, 320 psi (22 bar)</td>
<td>V</td>
<td>Charge pressure</td>
<td>10-12 ft-lbs / 14-16 Nm</td>
</tr>
<tr>
<td>8</td>
<td>Shuttle valve 3-position 3 way</td>
<td>U</td>
<td>Low pressure flow path for brake release and 2 speed motor shift</td>
<td>15-18 ft-lbs / 20-24 Nm</td>
</tr>
<tr>
<td>9</td>
<td>Pilot to open check valve</td>
<td>O</td>
<td>RF check in forward</td>
<td>85-90 ft-lbs / 115-122 Nm</td>
</tr>
<tr>
<td>10</td>
<td>Pilot to open check valve</td>
<td>P</td>
<td>RF check in reverse</td>
<td>85-90 ft-lbs / 115-122 Nm</td>
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<tr>
<td>11</td>
<td>Check valve</td>
<td>J</td>
<td>LR check in reverse</td>
<td>35-40 ft-lbs / 47-54 Nm</td>
</tr>
<tr>
<td>12</td>
<td>Check valve</td>
<td>I</td>
<td>LR check in forward</td>
<td>35-40 ft-lbs / 47-54 Nm</td>
</tr>
<tr>
<td>13</td>
<td>Pilot to open check valve</td>
<td>N</td>
<td>LF check in reverse</td>
<td>85-90 ft-lbs / 115-122 Nm</td>
</tr>
<tr>
<td>14</td>
<td>Pilot to open check valve</td>
<td>M</td>
<td>Energized in high range to pilot open check valves 9, 10, 13 &amp; 14 to bypass flow regulators and allow full flow to front wheel motors</td>
<td>8-10 ft-lbs / 11-14 Nm</td>
</tr>
<tr>
<td>15</td>
<td>2 position 3 way valve</td>
<td>Q</td>
<td>High pressure flow path for flow regulator bypass</td>
<td>10-13 ft-lbs / 14-18 Nm</td>
</tr>
<tr>
<td>16</td>
<td>Shuttle valve 2 position 3 way</td>
<td>T</td>
<td>High pressure flow path for flow regulator bypass</td>
<td>10-13 ft-lbs / 14-18 Nm</td>
</tr>
<tr>
<td>17</td>
<td>Flow regulator valve</td>
<td>D</td>
<td>LR flow control in reverse</td>
<td>10-12 ft-lbs / 14-16 Nm</td>
</tr>
<tr>
<td>18</td>
<td>Flow regulator valve</td>
<td>B</td>
<td>LR flow control in forward</td>
<td>10-12 ft-lbs / 14-16 Nm</td>
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<tr>
<td>19</td>
<td>Flow regulator valve</td>
<td>H</td>
<td>RR flow control in reverse</td>
<td>10-12 ft-lbs / 14-16 Nm</td>
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<td>21</td>
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<td>LF flow control in forward</td>
<td>10-12 ft-lbs / 14-16 Nm</td>
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<tr>
<td>22</td>
<td>Flow regulator valve</td>
<td>C</td>
<td>LF flow control in reverse</td>
<td>10-12 ft-lbs / 14-16 Nm</td>
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<td>23</td>
<td>Flow regulator valve</td>
<td>G</td>
<td>RF flow control in reverse</td>
<td>10-12 ft-lbs / 14-16 Nm</td>
</tr>
<tr>
<td>24</td>
<td>Flow regulator valve</td>
<td>E</td>
<td>RF flow control in forward</td>
<td>10-12 ft-lbs / 14-16 Nm</td>
</tr>
</tbody>
</table>
4WD DRIVE MANIFOLD

1 2 3 4 5 6 7 8 9 10 11 12 13 14

24 23 22 21

20 19

18 17

16
4WD DRIVE MANIFOLD

19-2 Valve Adjustments

How to Adjust the Charge Pressure Relief Valve

1 Connect a 0 to 600 psi (0 to 41 bar) pressure gauge in between one of the medium pressure hydraulic hoses and the medium pressure hydraulic oil filter.

   Bodily injury hazard. Spraying hydraulic oil can penetrate and burn skin. Loosen hydraulic connections very slowly to allow the oil pressure to dissipate gradually. Do not allow oil to squirt or spray.

2 Start the engine from the platform controls.

3 Drive the machine in either direction and observe the pressure reading on the pressure gauge.

4 Turn the engine off. Hold the relief valve and remove the cap.

5 Adjust the internal hex socket. Turn it clockwise to increase the pressure or counterclockwise to decrease the pressure. Then reinstall the valve cap.

6 Restart the engine. Drive the machine in either direction and recheck the valve pressure.

7 Turn the engine off, then remove the pressure gauge.

Specifications

| Relief valve | 320 psi / 22 bar |

Plug Torque Specifications

<table>
<thead>
<tr>
<th>Description</th>
<th>Hex Size</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAE No. 2</td>
<td>1/8</td>
<td>50 in-lbs / 6 Nm</td>
</tr>
<tr>
<td>SAE No. 4</td>
<td>3/16</td>
<td>13 ft-lbs / 18 Nm</td>
</tr>
<tr>
<td>SAE No. 6</td>
<td>1/4</td>
<td>18 ft-lbs / 24 Nm</td>
</tr>
<tr>
<td>SAE No. 8</td>
<td>5/16</td>
<td>50 ft-lbs / 68 Nm</td>
</tr>
<tr>
<td>SAE No. 10</td>
<td>9/16</td>
<td>55 ft-lbs / 75 Nm</td>
</tr>
<tr>
<td>SAE No. 12</td>
<td>5/8</td>
<td>75 ft-lbs / 102 Nm</td>
</tr>
</tbody>
</table>