### Chapter 6

**Hydraulics**

<table>
<thead>
<tr>
<th>Specifications</th>
<th>6-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Specifications</td>
<td>6-3</td>
</tr>
<tr>
<td>Repair Specifications</td>
<td>6-4</td>
</tr>
</tbody>
</table>

**Hydraulic Hose, Tube, and Fitting General Instructions**

<table>
<thead>
<tr>
<th>Specifications</th>
<th>6-5</th>
</tr>
</thead>
<tbody>
<tr>
<td>O-Ring Installation</td>
<td>6-5</td>
</tr>
<tr>
<td>Hydraulic Hose Installation</td>
<td>6-5</td>
</tr>
</tbody>
</table>

**Hydraulic Service Tools**

<table>
<thead>
<tr>
<th>Specifications</th>
<th>6-6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portable In-Line Filter</td>
<td>6-6</td>
</tr>
<tr>
<td>Digital Hydraulic Tester</td>
<td>6-6</td>
</tr>
<tr>
<td>Hydraulic Flowmeter</td>
<td>6-6</td>
</tr>
<tr>
<td>Digital Pressure Gauge Kit</td>
<td>6-7</td>
</tr>
<tr>
<td>Hydraulic Hose Kit</td>
<td>6-7</td>
</tr>
<tr>
<td>Flow Lock Tool</td>
<td>6-7</td>
</tr>
<tr>
<td>Hydraulic Test Fitting Kit</td>
<td>6-7</td>
</tr>
<tr>
<td>Blocking Disk Set</td>
<td>6-7</td>
</tr>
</tbody>
</table>

**Component Location**

<table>
<thead>
<tr>
<th>Specifications</th>
<th>6-8</th>
</tr>
</thead>
</table>

**Hydraulic Schematic**

<table>
<thead>
<tr>
<th>Specifications</th>
<th>6-10</th>
</tr>
</thead>
</table>

**Theory of Operation and Sub-Circuit Schematics**

<table>
<thead>
<tr>
<th>Specifications</th>
<th>6-16</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steering Circuit Schematic and Theory of Operation</td>
<td>6-16</td>
</tr>
<tr>
<td>Steering Circuit Schematic</td>
<td>6-17</td>
</tr>
<tr>
<td>Raise Circuit Schematic and Theory of Operation</td>
<td>6-18</td>
</tr>
<tr>
<td>Raise Circuit Schematic</td>
<td>6-19</td>
</tr>
<tr>
<td>Lower Circuit Schematic and Theory of Operation</td>
<td>6-20</td>
</tr>
<tr>
<td>Lower Circuit Schematic</td>
<td>6-21</td>
</tr>
<tr>
<td>Mower Deck Float Circuit Schematic and Theory of Operation</td>
<td>6-22</td>
</tr>
<tr>
<td>Mower Deck Float Circuit Schematic</td>
<td>6-23</td>
</tr>
<tr>
<td>Mow Circuit (On) Schematic and Theory of Operation</td>
<td>6-24</td>
</tr>
<tr>
<td>Mow Circuit (On) Schematic</td>
<td>6-25</td>
</tr>
<tr>
<td>Mow Circuit (Off) Schematic and Theory of Operation</td>
<td>6-26</td>
</tr>
<tr>
<td>Mow Circuit (Off) Schematic</td>
<td>6-27</td>
</tr>
</tbody>
</table>

**Field Test Procedures**

<table>
<thead>
<tr>
<th>Specifications</th>
<th>6-28</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preliminary Checks</td>
<td>6-28</td>
</tr>
<tr>
<td>Front Lift Cylinders Leakage Test</td>
<td>6-28</td>
</tr>
<tr>
<td>Wing Lift Cylinders Leakage Test</td>
<td>6-29</td>
</tr>
<tr>
<td>Steering Leakage Test</td>
<td>6-30</td>
</tr>
<tr>
<td>Cutting Unit Motor Case Drain Test</td>
<td>6-31</td>
</tr>
</tbody>
</table>
HYDRAULICS

Instrument Test Procedures ........................................ 6-32
   Instrument Test Overview ........................................ 6-32
   Right Front Cutting Units Circuit Test .......................... 6-33
   Right Front Cutting Units Pump Test ............................. 6-35
   Right Front Deck Valve Test ...................................... 6-37
   Right Front Deck Valve System Relief Valve Pressure Adjustment 6-38
   Right Front Cutting Units Motors Test ............................ 6-39
   Left Front Cutting Units Circuit Test .............................. 6-42
   Left Front Cutting Units Pump Test ................................. 6-44
   Left Front Deck Valve Test ....................................... 6-46
   Left Front Deck Valve System Relief Valve Pressure Adjustment 6-48
   Left Front Cutting Units Motors Test .............................. 6-49
   Right Wing Cutting Units Circuit Test ............................. 6-51
   Right Wing Cutting Units Pump Test ................................. 6-53
   Right Wing Deck Valve Test ...................................... 6-55
   Right Wing Deck Valve System Relief Valve Pressure Adjustment 6-57
   Right Wing Cutting Units Motors Test .............................. 6-58
   Left Wing Cutting Units Circuit Test .............................. 6-61
   Left Wing Cutting Units Pump Test ................................. 6-63
   Left Wing Deck Valve Test ...................................... 6-65
   Left Wing Deck Valve System Relief Valve Pressure Adjustment 6-67
   Left Wing Cutting Units Motors Test .............................. 6-68
   Lift/Steering Relief Valve Pressure Test ............................. 6-71
   Lift/Steer Pump Test ........................................ 6-73
   Steering Relief Valve Adjustment .................................. 6-74

Repair .............................................................. 6-76
   Hydraulic Oil Tank—Drain Procedure ............................... 6-76
   2-Section Pump .................................................. 6-77
   3-Section Pump .................................................. 6-81
   Deck Motors ...................................................... 6-85
   Weight Transfer Valve ........................................ 6-85
   Control Panel ..................................................... 6-87
   Lift Valve ........................................................ 6-87
   Right Wing Deck Valve ........................................... 6-91
   Left Wing Deck Valve ............................................... 6-93
   Front Deck Valves ................................................ 6-95
   Hydraulic Oil Return Filter Assembly .............................. 6-99
   Hydraulic Oil Charge Filter Assembly .............................. 6-99
   Front Lift Cylinders .............................................. 6-101
   Wing Lift Cylinders ............................................. 6-104
   Return Canisters ................................................ 6-108
   Hydraulic Oil Tank ............................................... 6-109
   Hydraulic Oil Cooler ........................................... 6-110
Specifications

Test Specifications

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Specification Details</th>
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<tbody>
<tr>
<td>Cutting Unit Pumps Flow</td>
<td>gpm (lpm) 13.3 (57) at 2400 rpm</td>
</tr>
<tr>
<td>Lift/Steer Pump Flow</td>
<td>gpm (lpm) 5.7 (22) at 2700 rpm</td>
</tr>
<tr>
<td>Hydraulic Leakage Percentage Ranges</td>
<td>0–10% = Good</td>
</tr>
<tr>
<td></td>
<td>11–20% = Marginal</td>
</tr>
<tr>
<td></td>
<td>21% and Beyond = Bad</td>
</tr>
<tr>
<td>Steering Relief Valve Pressure Setting</td>
<td>psi (bar) 1500 ± 10% (103 ± 10%)</td>
</tr>
<tr>
<td>Lift System Relief Valve Pressure Setting</td>
<td>psi (bar) 1500 ± 10% (103 ± 10%)</td>
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<tr>
<td>Cutting Unit Deck Valve System Relief Valve Pressure Setting</td>
<td>psi (bar) 3000 ± 10% (207 ± 10%)</td>
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<tr>
<td>Cutting Unit Motor Case Drain Rate</td>
<td>Less than 1 Pint (0.47 L) per Minute</td>
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## Repair Specifications

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<tr>
<th>Specifications</th>
<th>lb-ft (N·m)</th>
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<tr>
<td>2-Section Pump—Stud Bolt and Retaining Bolt Torque</td>
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<tr>
<td>2-Section Pump—Outlet Port Elbow Fitting Torque</td>
<td>60 (81)</td>
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<tr>
<td>2-Section Pump—Outlet Port Fitting Torque</td>
<td>30 (41)</td>
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<tr>
<td>3-Section Pump—Hub Screw Torque</td>
<td>42 (57)</td>
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<tr>
<td>3-Section Pump—Mounting Screw Torque</td>
<td>80 (108)</td>
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<tr>
<td>3-Section Pump—Stud Bolt and Retaining Bolt Torque</td>
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<tr>
<td>3-Section Pump—Outlet Port Fitting Torque</td>
<td>110 (149)</td>
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<tr>
<td>Lift Valve—Plunger Detent Plug Torque</td>
<td>4–5 (5–7)</td>
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<tr>
<td>Lift Valve—Hex Plug Torque</td>
<td>10–12 (14–16)</td>
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<tr>
<td>Lift Valve—Cap Torque</td>
<td>20–25 (27–34)</td>
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<tr>
<td>Lift Valve—Port Adapter Plug Torque</td>
<td>30–35 (41–47)</td>
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<tr>
<td>Lift Valve—IN Port Fitting Torque</td>
<td>60 (81.4)</td>
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<tr>
<td>Lift Valve—OUT Port Fitting Torque</td>
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<tr>
<td>Lift Valve—Ports “A,” “B,” “D,” and “E” Fitting Torque</td>
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<tr>
<td>Deck Valves—Relief Valve Torque</td>
<td>24–26 (32.5–35.3)</td>
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<td>Deck Valves—Blade Brake Relief Valve Torque</td>
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<tr>
<td>Deck Valves—Solenoid Valve Torque</td>
<td>24–26 (32.5–35.3)</td>
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<tr>
<td>Deck Valves—Coil Nut Torque</td>
<td>5 (6.8) Maximum</td>
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<tr>
<td>Right and Left Wing Deck Valves—Port “D” Diagnostic Fitting Torque</td>
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<tr>
<td>Right and Left Wing Valves—Ports “A,” “B,” “P,” and “T” Fitting Torque</td>
<td>60 (81.4)</td>
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<tr>
<td>Front Deck Valves—Port “D” Fitting Torque</td>
<td>17 (23)</td>
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<td>Front Deck Valves—Diagnostic Fitting Torque</td>
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<td>Front Deck Valves—Ports “A,” “B,” “P,” and “T” Fitting Torque</td>
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<tr>
<td>Hydraulic Oil Tank Capacity</td>
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<tr>
<td>Lift Cylinder Rod Nut Torque</td>
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<tr>
<td>Return Canister Fill Capacity—(ISO 46 Hydraulic Oil)</td>
<td>132 (3.9)</td>
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</tbody>
</table>
Hydraulic Hose, Tube, and Fitting General Instructions

O-Ring Installation
- Always install new O-rings.
- On hoses with O-ring fittings, make sure O-rings are properly seated before tightening.
- O-rings should be lubricated with the fluid to be used in the system prior to assembly.

Boss Fitting O-Ring Installation

O-Ring Seal Kits
- SAE Boss O-Ring Kit Jacobsen PN 5002452
- O-Ring Face Seal (ORS) O-Ring Kit PN 5002454
- Common O-Ring Sizes Kit PN 5002453

Replacement O-Rings for ORS (Face Seal) Fittings

<table>
<thead>
<tr>
<th>ORS (Face Seal) Tube Size</th>
<th>ORS (Face Seal) O-Ring Size</th>
<th>Jacobsen Part Number</th>
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<tbody>
<tr>
<td>4</td>
<td>11</td>
<td>339908</td>
</tr>
<tr>
<td>6</td>
<td>12</td>
<td>339909</td>
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<td>8</td>
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<td>339910</td>
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<td>16</td>
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<td>12</td>
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<tr>
<td>24</td>
<td>29</td>
<td>339915</td>
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Replacement O-Rings for O-Ring Boss Fittings

<table>
<thead>
<tr>
<th>Tubing O.D. or Hose I.D.</th>
<th>Thread Size</th>
<th>Jacobsen Part Number</th>
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</thead>
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<tr>
<td>1/8</td>
<td>5/16-24</td>
<td>459290</td>
</tr>
<tr>
<td>3/16</td>
<td>3/8-24</td>
<td>459291</td>
</tr>
<tr>
<td>1/4</td>
<td>7/16-20</td>
<td>339896</td>
</tr>
<tr>
<td>5/16</td>
<td>1/2-20</td>
<td>459293</td>
</tr>
<tr>
<td>3/8</td>
<td>9/16-18</td>
<td>339897</td>
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<tr>
<td>1/2</td>
<td>3/4-16</td>
<td>339898</td>
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<td>7/8-14</td>
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<td>2</td>
<td>2-1/2-12</td>
<td>459300</td>
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Hydraulic Hose Installation
Hold the fixed portion of the hose coupling with one wrench; use a second wrench to tighten or loosen the hose nut. This will avoid damaging the fitting seal. When tightening a hose, do not permit the hose to twist; hold the hose in a normal straight position.

When installing hoses, place fittings at angles to avoid contact with fixed parts when turning. Make sure hoses are assembled to proper “A” and “B” ports on components.

Hydraulic Hose and Tube Torque Values

<table>
<thead>
<tr>
<th>Size</th>
<th>Ib-ft</th>
<th>N-m</th>
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<tbody>
<tr>
<td>Dash Fractional</td>
<td>Min</td>
<td>Max</td>
</tr>
<tr>
<td>-4</td>
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<td>10</td>
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<td>-6</td>
<td>3/8</td>
<td>18</td>
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<td>-8</td>
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<td>3/4</td>
<td>65</td>
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<td>-16</td>
<td>1</td>
<td>92</td>
</tr>
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<td>1-1/4</td>
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<td>-24</td>
<td>1-1/2</td>
<td>150</td>
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4263110-Rev B
Hydraulic Service Tools

**NOTE**
The hydraulic service tools listed here can be obtained from K-Line Industries at http://klineind.com.

**Portable In-Line Filter**
Part Number JAC5097

When hydraulic components fail internally, debris from the failed component can spread throughout the hydraulic system and cause additional damage. This situation can be magnified when dealing with a closed-loop traction system, where oil is not filtered. In the event of a traction system component failure, it is recommended that all traction system components be disassembled and cleaned, or filtered using a portable in-line filter available through your Jacobsen Dealer. The portable in-line filter should also be used when testing hydraulic systems or after replacing a failed component.

**IMPORTANT**
Always install the in-line filter so oil flows through the filter before entering a component. Once filtering has begun, never reverse the flow of oil, or debris will re-enter the system.

**Digital Hydraulic Tester**
Part Number AT40031

#### Features
- Flow up to 100 gpm (379 lpm)
- Pressure up to 6000 psi (414 bar)
- Temperature up to 250° F (120° C)
- Digital display for flow and temperature
- Analog display for pressure
- Flow accuracy 1% of full scale

**Hydraulic Flowmeter**
Part Number AT40002

#### Features
- Glycerin filled pressure gauge
- Precision needle-type load valve
- 4–40 gpm (15–15 lpm) flow range
- Pressure up to 5000 psi (345 bar)
- -12 port size
Digital Pressure Gauge Kit
Part Number JAC5106

Features
• Quick disconnect fittings
• Pressure up to 5000 psi (345 bar)
• Includes one 5 ft (152 cm) hose

Hydraulic Hose Kit
Part Number JAC5001H

NOTE
This hydraulic hose kit is intended to be used with the JAC5001A Hydraulic Test Fitting Kit.

Contents
• Two 8 ft (244 cm) 12 ORFS (F) x 10 ORFS (F) hoses
• Four 8 ft (244 cm) 10 ORFS (F) x 10 ORFS (F) hoses
• Two 8 ft (244 cm) 8 ORFS (F) x 10 ORFS (F) hoses

Flow Lock Tool
Part Number JAC5102

This adjustable flow lock tool is specifically designed for use with the HR-9016T mower.

Hydraulic Test Fitting Kit
Part Number JAC5001A

NOTE
For detailed component descriptions and sizes, please see the K-Line Industries website at http://klineind.com.

Contents
• Twenty ORFS tee fittings in five sizes
• Eight ORFS 90° elbow fittings in four sizes
• Forty ORFS caps in five sizes
• Forty ORFS plugs in five sizes
• Six ORS reducer adapters in three sizes
• Sixteen ORS adapters in four sizes
• Eight blocking disks in four sizes
• Three JIC tee fittings in three sizes
• Three 4 in. (102 mm) jumper hoses in three sizes
• One ORS/male NPTF adapter
• One vented bushing adapter
• One copper tube assembly

Blocking Disk Set
Part Number JAC5001-1

NOTE
This blocking disk set is part of the JAC5001A Hydraulic Test Fitting Kit.

Contents
• Two -6 blocking disks
• Two -8 blocking disks
• Two -10 blocking disks
• Two -12 blocking disks
Component Location
See Figure 6-1.

Figure 6-1: Component Location—Left Side

1 2-Section Pump 7 Left Wing Deck Center Motor 13 Front Deck Left Center Motor
2 Hydraulic Oil Return Filter 8 Left Wing Deck Inside Motor 14 Front Deck Center Motor
3 Left Wing Deck Valve 9 Left Wing Deck Return Canister 15 Front Deck Right Center Motor
4 Hydraulic Oil Charge Filter 10 Front Deck Left Winglet Motor 16 Front Deck Right Winglet Motor
5 Left Wing Deck Lift Cylinder 11 Left Front Deck Valve 17 Control Panel
6 Left Wing Deck Outside Motor 12 Right Front Deck Valve 18 Instrument Panel
Figure 6-2: Component Location—Right Side

1. 3-Section Pump
2. Right Wing Deck Valve
3. Weight Transfer Valve
4. Hydraulic Oil Tank
5. Right Wing Deck Return Canister
6. Right Wing Deck Inside Motor
7. Right Wing Deck Outside Motor
8. Right Wing Deck Center Motor
9. Right Wing Deck Lift Cylinder
Hydraulic Schematic

See Figures 6-3 through 6-7.
Hydraulic Schematic, Continued

Figure 6-4

TN3568
Hydraulic Schematic, Continued

Figure 6-6
Hydraulic Schematic, Continued

Figure 6-7
Theory of Operation and Sub-Circuit Schematics

Steering Circuit Schematic and Theory of Operation

System Conditions:
- Engine running
- Steering wheel turned to the right or left (left turn shown)

Oil Supply to Steering Valve
Hydraulic oil is drawn from the hydraulic oil tank by section 1 of the 2-section pump. Before entering the 2-section pump, the inlet oil is filtered by a 100-mesh screen to remove any debris. Operating pressure oil from section 1 of the 2-section pump is routed to port “P” of the steering unit.

Steering Circuit
Operating pressure oil enters the steering unit at port “P,” and is routed against the relief valve, against the check valve, and to the steering valve.

With the steering wheel in the neutral (straight ahead) position, the steering valve routes all of the operating pressure oil out of the steering unit through port “E” to the IN port of the lift valve assembly.

With the steering wheel turned to the left, the steering valve is moved, allowing oil to flow through the valve to the gerotor metering section. Oil is then routed through port “L” of the steering unit to the piston side of the steering cylinder, extending the rod and moving the rear wheels in the desired direction.

Oil from the rod end of the steering cylinder flows back into the steering unit through port “R,” through the steering valve, and through port “T.” Oil exiting the steering unit is routed to the return manifold and then to the hydraulic tank.

Circuit Relief
The steering system is protected by the 1500 psi (103 bar) relief valve in the steering unit. If the pressure on the pilot line of the relief valve reaches 1500 psi (103 bar), the valve will open, dumping operating pressure oil through port “T” of the steering unit to the return manifold and then to the hydraulic tank.
Steering Circuit Schematic

See Figure 6-8.

Figure 6-8

1. Operating Pressure Oil from 2-Section Pump (Section 1)
2. Operating Pressure Oil to Lift Valve (IN Port)
3. Return Oil to Return Manifold

4. Steering Unit
5. Relief Valve
6. Check Valve
7. Steering Valve
8. Steering Cylinder
9. Operating Pressure Oil
10. Metered Oil
11. Return Oil

TN4017
Raise Circuit Schematic and Theory of Operation

System Conditions:
- Engine running at fast idle
- Right, left, and/or front lift/lower lever(s) in the raise position

NOTE
The cutting unit motors will automatically shut off as the cutting units are raised. (See “Mow Circuit—Theory of Operation” on page 4-42 for more information.)

Oil Supply to the Lift Valve Assembly
Hydraulic oil is drawn from the hydraulic oil tank by section 1 of the 2-section pump. Before entering the 2-section pump, the inlet oil is filtered by a 100-mesh screen to remove any debris. Operating pressure oil from section 1 of the 2-section pump is routed through the steering unit. The steering unit will supply oil flow from port “E” of the steering unit to the IN port of the lift valve assembly.

Raise Circuit
Operating pressure oil supplied by section 1 of the 2-section pump enters the lift valve assembly at the IN port, and is routed to the 1500 psi (103 bar) relief valve and to each of the lift valves. With the lift/lower levers in the raise position, operating pressure oil flows through the lift valves and is routed to the pilot line of the detent valves, causing the detent valves to shift. The oil then flows through the check valves.

Oil from the wing detent valves is routed through the 0.060 in. (1.5 mm) fitting orifices to the piston side of the wing lift cylinders, lifting the wing decks. Oil from the rod side of the wing lift cylinders is routed back through the lift valve assembly, through the weight transfer valve, back to the return manifold, and then to the hydraulic tank.

Oil from the front detent valve is routed to the rod side of the front lift cylinders, lifting the front deck. Oil from the piston side of the front lift cylinders is routed back to the return manifold, and then to the hydraulic tank.

Circuit Relief
The lift system is protected by the 1500 psi (103 bar) relief valve in the lift valve assembly. If the pressure on the pilot line of the relief valve reaches 1500 psi (103 bar), the valve will open, dumping operating pressure oil through the OUT port of the lift valve assembly, through the weight transfer valve, to the return manifold, and then to the hydraulic tank.
Raise Circuit Schematic
See Figure 6-9.

1. Return Oil to Return Manifold
2. Return Oil to Return Manifold
3. Return Oil to Return Manifold
4. Operating Pressure Oil from Steering Unit (Port E)
Lower Circuit Schematic and Theory of Operation

System Conditions:
- Engine running
- Right, left, and/or front lift/lower lever(s) in the lower position

Oil Supply to the Lift Valve Assembly
Hydraulic oil is drawn from the hydraulic oil tank by section 1 of the 2-section pump. Before entering the 2-section pump, the inlet oil is filtered by a 100-mesh screen to remove any debris. Operating pressure oil from section 1 of the 2-section pump is routed through the steering unit. The steering unit will supply oil flow from port “E” of the steering unit to the IN port of the lift valve assembly.

Lower Circuit
Operating pressure oil supplied by section 1 of the 2-section pump enters the lift valve assembly at the IN port, and is routed to the 1500 psi (103 bar) relief valve and to each of the lift valves. With the lift/lower levers in the lower position, operating pressure oil flows through the lift valves and is routed to the pilot line of the detent valves, causing the detent valves to shift and allow trapped oil from the cylinders to flow to the lift valves.

Gravity pulls the front deck down, pulling against the front lift cylinders. Oil from the rod side of the front lift cylinders flows into the lift valve assembly at port “D,” through the front detent valve and front lift valve. The oil then exits the lift valve assembly through the OUT port, through the weight transfer valve, back to the return manifold, and then to the hydraulic tank.

Operating pressure oil from the wing lift valves is routed to the rod end of the wing lift cylinders, lowering the wing decks. Oil from the piston side of the wing lift cylinders flows through the 0.060 in. (1.5 mm) fitting orifices, and is routed through the wing detent valves and then through the wing lift valves. The oil exits the lift valve assembly through the OUT port, back to the return manifold, and then to the hydraulic tank.

Circuit Relief
The lift system is protected by the 1500 psi (103 bar) relief valve in the lift valve assembly. If the pressure on the pilot line of the relief valve reaches 1500 psi (103 bar), the valve will open, dumping operating pressure oil through the OUT port of the lift valve assembly, through the weight transfer valve, to the return manifold, and then to the hydraulic tank.
Lower Circuit Schematic
See Figure 6-10.

1. Return Oil to Return Manifold
2. Return Oil from Return Manifold
3. Return Oil from Return Manifold
4. Operating Pressure Oil from Steering Unit (Port E)

Figure 6-10
Mower Deck Float Circuit Schematic and Theory of Operation

System Conditions:
- Engine running
- Right, left, and/or front cutting units lowered to the ground
- Right, left, and/or front cutting units lift/lower lever(s) in the neutral position

Oil Supply to Lift Valve Assembly
Hydraulic oil is drawn from the hydraulic oil tank by section 1 of the 2-section pump. Before entering the 2-section pump, the inlet oil is filtered by a 100-mesh screen to remove any debris. Operating pressure oil from section 1 of the 2-section pump is routed through the steering unit. The steering unit will supply oil flow from port “E” of the steering unit to the IN port of the lift valve assembly.

Float Circuit
With the decks lowered, and the lift/lower levers in the neutral position, oil from the lift cylinders can flow freely in both directions through the detent and lift valves. As the decks move along the ground, they rise and fall with the contour of the ground.

As the wing decks rise, operating pressure oil from the rod side of the wing lift cylinders flows into the lift valve assembly. As the decks drop to follow the ground contour, operating pressure oil from the valves supply make-up oil to the rod side of the wing lift cylinders.

As the wing decks drop, oil from the piston side of the wing lift cylinders flows through the 0.060 in. (1.5 mm) fitting orifices and is routed back into the lift valve assembly. As the wing decks rise, operating pressure oil from the valves flows through the 0.060 in. (1.5 mm) fitting orifices to supply make-up oil to the piston side of the wing lift cylinders.

As the front deck rises, oil from the piston side of the front lift cylinders flows into the return lines between the front lift cylinders and the return manifold. As the front deck drops to follow the ground contour, oil from the return lines supply make-up oil to the piston side of the front lift cylinders.

As the front deck drops, oil flows into the lift valve assembly. As the front deck rises, operating pressure oil from the valves supply make-up oil to the rod side of the front lift cylinders.

Operating pressure oil exits the lift valve at the OUT port and flows to the weight transfer valve, opening the valve and allowing the excess oil to dump to the hydraulic tank.

Slight upward pressure (up to 275 psi) is maintained against the lift cylinders. This is accomplished with an adjustable weight transfer valve located in the hydraulic return line between the lift valve assembly and the return manifold. This valve can be adjusted to increase or decrease the amount of cutting unit weight being transferred to the ground, thus increasing or decreasing weight transfer to the machine’s drive wheels.

This allows the machine to retain traction while allowing the cutting units to adapt to variations in ground contour.
Mower Deck Float Circuit Schematic
See Figure 6-11.

1 Return Oil to Return Manifold
2 Return Oil to Return Manifold
3 Return Oil to Return Manifold
4 Operating Pressure Oil from Steering Unit (Port E)
HYDRAULICS

Mow Circuit (On) Schematic and Theory of Operation

System Conditions:
- Engine running
- Cutting units lowered
- Mow switch in the on position
- 4WD switch in the on position

NOTES
- See "Mow Circuit—Theory of Operation" on page 4-42 for the electrical operation of this circuit.
- The function of each deck valve is the same, except where noted.

Oil Supply to Deck Valves
Hydraulic oil is drawn from the hydraulic oil tank by section 2 of the 2-section pump and sections 1, 2, and 3 of the 3-section pump. Before entering the pumps, the inlet oil is filtered by 100-mesh screens to remove any debris. Section 2 (front deck left motors) of the 2-section pump and sections 1 (right wing motors), 2 (left wing motors), and 3 (front deck right motors) of the 3-section pump, supply operating pressure oil to port “P” of the corresponding cutting unit deck valves.

Mow Circuit
Operating pressure oil entering port “P” flows against the 3000 psi (207 bar) relief valve, to the solenoid valve, and to the 630 psi (43 bar) blade brake relief valve pilot port. With the 4WD switch and mow switch in the on position, the solenoid valve shifts, applying pressure against the check valve, stopping oil flow through the solenoid valve. Operating pressure oil increases and opens the 630 psi (43 bar) blade brake relief valve. Operating pressure oil then flows through the blade brake relief valve and out of the deck valve through port “A,” driving the motors.

Circuit Relief
The mow circuit is protected by the 3000 psi (207 bar) relief valve. The relief valve will open if the oil pressure in the circuit reaches 3000 psi (207 bar), allowing oil to bypass the circuit and return to the hydraulic tank.

Oil Return
Oil returning from the motors enters the deck valve at port “B,” and flows through the blade brake relief valve, exiting the deck valve at port “T.”

Left Front Deck Valve: The oil exiting this deck valve is routed to the charge filter to remove debris from the oil. If the charge filter becomes plugged, a 25 psi (1.7 bar) pressure differential switch will activate the “Hydraulic Filter” light on the instrument panel warning light gauge and the charge filter will be bypassed. Charge pressure oil from the charge filter is routed to port “CP” of the traction pump to fill the closed-loop traction circuit. Once filled, the 313 psi (21.6 bar) charge pressure relief valve will open, allowing oil to return to the return manifold, and then to the hydraulic tank.

Right Front Deck Valve and Wing Deck Valves: The oil exiting these deck valves is routed through the oil cooler and through the 10-micron return oil filter to remove debris from the oil.

Hydraulic oil is used to lubricate the internal components of the deck motors. This oil is returned via the case drain lines back to the return manifold and then to the hydraulic tank.
Mow Circuit (On) Schematic

See Figure 6-12.

---

1. Operating Pressure Oil from 2-Section Pump (Section 2)
2. Charge Pressure Oil to Charge Filter
3. Operating Pressure Oil from 3-Section Pump (Section 1)
4. Return Oil to Oil Cooler and Return Oil Filter
5. Deck Motors Case Drain Oil to Return Manifold
6. Deck Motors Case Drain Oil to Return Manifold
7. Operating Pressure Oil from 3-Section Pump (Section 3)
8. Operating Pressure Oil from 3-Section Pump (Section 2)
Mow Circuit (Off) Schematic and Theory of Operation

System Conditions:
• Engine running
• Cutting units lowered
• Mow switch in the off position

NOTES
• See “Mow Circuit—Theory of Operation” on page 4-42 for the electrical operation of this circuit.
• The function of each deck valve is the same, except where noted.

Oil Supply to Deck Valves
Hydraulic oil is drawn from the hydraulic oil tank by section 2 of the 2-section pump and sections 1, 2, and 3 of the 3-section pump. Before entering the pumps, the inlet oil is filtered by 100-mesh screens to remove any debris. Section 2 (front deck left motors) of the 2-section pump and sections 1 (right wing motors), 2 (left wing motors), and 3 (front deck right motors) of the 3-section pump, supply operating pressure oil to port “P” of the corresponding cutting unit deck valves.

Motor Shutdown/Blade Braking
Operating pressure oil entering port “P” flows against the 3000 psi (207 bar) relief valve, to the solenoid valve, and to the 630 psi (43 bar) blade brake relief valve pilot port. With the mow switch in the off position, the solenoid valve is de-energized, opening the valve. Oil can then flow through the valve, exiting the deck valve at port “T.” With the oil pressure/flow diverted to port “T,” the 630 psi (43 bar) blade brake relief valve closes, preventing oil flow through the motors.

The blade brake relief valve has a second pilot line on the motor side. As oil flow is stopped to the motors, the motors will act as pumps, opening the motor check valves as the motors rotate during shutdown. This pilot line allows the blade brake relief valve to close slowly, acting as a deck motor brake. This prevents a sudden shutdown of the motors.

Circuit Relief
The mow circuit is protected by the 3000 psi (207 bar) relief valve. The relief valve will open if the oil pressure in the circuit reaches 3000 psi (207 bar), allowing oil to bypass the circuit and return to the hydraulic tank.

Oil Return

Left Front Deck Valve
The oil exiting this deck valve is routed to the charge filter to remove debris from the oil. If the charge filter becomes plugged, a 25 psi (1.7 bar) pressure differential switch will activate the “Hydraulic Filter” light on the instrument panel warning light gauge and the charge filter will be bypassed. Charge pressure oil from the charge filter is routed to port “CP” of the traction pump to fill the closed-loop traction circuit. Once filled, the 313 psi (21.6 bar) charge pressure relief valve will open, allowing oil to return to the return manifold, and then to the hydraulic tank.

Right Front Deck Valve and Wing Deck Valves
The oil exiting these deck valves is routed through the oil cooler and through the 10-micron return oil filter to remove debris from the oil. Hydraulic oil is used to lubricate the internal components of the deck motors. This oil is returned via the case drain lines back to the return manifold and then to the hydraulic tank.
Mow Circuit (Off) Schematic

See Figure 6-13.
Field Test Procedures

When a hydraulic system failure occurs, some simple tests can be performed prior to using test instruments. The results of these tests can lead you to the suspected component failure. More extensive test procedures, using test instruments, are presented later in this section. (See “Instrument Test Procedures” on page 6-32.)

Preliminary Checks

Perform the following checks prior to beginning any tests.

1. Check the hydraulic oil reservoir for proper fluid level, the presence of air or water, and unusual odor.
2. Check all hoses, tubes, and fittings for leaks. Tighten as necessary.

Eliminate all mechanical issues prior to starting hydraulic tests.

Front Lift Cylinders Leakage Test

See Figure 6-14.

NOTE

Right front lift cylinder is shown; left front lift cylinder is similar.

![Figure 6-14](image)

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
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<tbody>
<tr>
<td>The hydraulic system is under pressure, and the oil will be hot.</td>
</tr>
<tr>
<td>• Always relieve pressure in the hydraulic system before performing service.</td>
</tr>
<tr>
<td>• Failure to follow appropriate safety precautions may result in death or serious injury.</td>
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</tbody>
</table>

5. Disconnect hose (1) from both left and right front lift cylinder rod end elbow fittings (2).
6. Install plugs in hoses (1) on both left and right front lift cylinders.
7. Install caps on fitting (2) on both left and right front lift cylinders.
8. Remove support from front deck.

After 15 minutes, does left or right side of front deck drift down?

**YES** Cylinder is bypassing oil. Repair or replace left or right lift cylinder that has drifted down. (See “Front Lift Cylinders” on page 6-101.)

**NO** If both cylinders pass test, the problem will be in the lift valve assembly. Proceed to step 9.

10. Connect hose (1) to fitting (2) on both front lift cylinders.
11. Start engine and lower the decks.
12. Stop engine.
Wing Lift Cylinders Leakage Test

See Figure 6-15.

NOTE

Right wing lift cylinder is shown; left wing lift cylinder is similar.

![Figure 6-15](TN4110)

1. Start engine. Operate hydraulic system until oil temperature is at 120–150° F (49–65° C).
2. Raise wing deck 1 foot off the ground.
3. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
4. Support wing deck to be tested.
5. Disconnect hose (2) from wing lift cylinder piston end elbow fitting (1).
6. Install plug in hose (2).
7. Install cap on fitting (1).
8. Remove support from wing deck.

After 15 minutes, does wing deck drift down?

**YES** Cylinder is bypassing oil. Repair or replace lift cylinder. (See “Wing Lift Cylinders” on page 6-104.)

**NO** Repeat the test for other wing lift cylinder. If both cylinders pass test, the problem may be in the lift valve. Proceed to step 9.
10. Connect hose (2) to fitting (1).
11. Start engine and lower the decks.
12. Stop engine.
Steering Leakage Test

See Figure 6-16.

1. Operate hydraulic system until oil temperature is 120–150°F (49–65°C).
2. Turn steering wheel fully left against stop.
3. Park the mower safely. (See “Park Mower Safely” on page 1-6.)

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4. Disconnect hose (1) from steering cylinder rod end fitting (3). Plug hose.
5. Place a suitable container under steering cylinder rod end fitting (3).

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<table>
<thead>
<tr>
<th>WARNING</th>
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</thead>
<tbody>
<tr>
<td>Do not turn steering wheel to the right. Failure to follow appropriate safety precautions may result in death or serious injury.</td>
</tr>
</tbody>
</table>

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6. With engine off, turn steering wheel fully left against stop.
7. Check for oil leakage in the drain pan.

Is steering cylinder leakage a nominal amount of oil or less?

- **YES** Go to step 8.
- **NO** Repair or replace steering cylinder. (See “Steering Cylinder” on page 7-16.)

8. Disconnect and plug hose (2).
9. Start engine and set engine speed to 2400 rpm ± 50.
10. Turn the steering wheel fully left, then fully right.

**Does the steering wheel continue to turn past stop with little or no resistance?**

- **YES** Steering unit is faulty. Replace steering unit. (See “Steering Unit” on page 7-8.)
- **NO** Steering unit is good.
Cutting Unit Motor Case Drain Test

The cutting units system consists of four circuits: the left front cutting units circuit, the right front cutting units circuit, the left wing cutting units circuit, and the right wing cutting units circuit. The left front cutting units circuit consists of the 2-section pump, left front deck valve, left center cutting unit motor, and left winglet motor. The right front cutting units circuit consists of the 3-section pump, right front deck valve, right winglet cutting unit motor, right center cutting unit motor, and center cutting unit motor. The left wing cutting units circuit consists of the 3-section pump, left wing deck valve, left wing outside cutting unit motor, left wing center cutting unit motor, and left wing inside cutting unit motor. The right wing cutting units circuit consists of the 3-section pump, right wing deck valve, right wing inside cutting unit motor, right wing center cutting unit motor, and right wing outside cutting unit motor. This test determines if one of the cutting unit motors is faulty. An instrument test must be performed to isolate the performance of the cutting unit pumps and deck valves.

**NOTES**

- Perform test on only one cutting unit motor at a time.
- The case drain on a hydraulic motor is used to return lubrication or bypassed hydraulic oil back to the hydraulic tank.

1. Operate the machine until hydraulic oil reaches operating temperature, 120–150° F (49–65° C).
2. Stop engine and remove ignition key.
3. Remove the case drain hose from the cutting unit motor. Immediately plug the hose.
4. Position a drain pan with a minimum capacity of 1 gal (3.8 L) near the cutting unit motor.
5. Install a separate hose on the case drain fitting and place the free end in the container. Secure the hose to prevent spills.

**WARNING**

Safely block cutting unit from rotating using a suitable device or tool. Failure to follow appropriate safety precaution may result in death or serious injury.

6. Install suitable blocking device or tool in cutting unit, preventing cutting unit from turning.
7. Set park brake, start the engine, and place the 4WD switch and the mow switch in the on position for 15 seconds.
8. Stop engine and remove ignition key.
9. Measure the amount of oil that flowed from the case drain. The amount $\times 4 = \text{amount per minute}$.

**Is the amount of oil captured from the case drain about a half pint (0.24 L) per minute or less?**

**YES** The motor shaft and/or bearings are not faulty; proceed with an instrument test. (See “Instrument Test Procedures” on page 6-32.)

**Is the oil captured from the case drain more than 1 pint (0.47 L) per minute?**

**YES** The motor may be faulty; repair or replace as necessary. (See “Deck Motors” on page 6-85.)

10. Disconnect and remove test equipment. Install all hoses, fittings, and components as noted prior to removal.
Instrument Test Procedures

Instrument Test Overview

The following tests are specifically designed to approach hydraulic testing on a system level. Each component within the system represents a portion of the total system leakage. An internal leakage percentage for each component will be calculated and recorded, enabling the technician to view the system performance issue more completely. The test results will help the technician to decide which repairs will best remedy the performance issue experienced by the operator.

The internal leakage percentage ranges are as follows:
0–10% = Good
11–20% = Marginal
21% and Beyond = Bad

Testing should be performed with oil temperature at 120–150° F (49–65° C).

Each flow test should be performed at approximately 75% (2250 psi or 155 bar) of system relief valve setting.

Example: Cutting Unit System Performance Complaint

The machine operator reports the mower is not cutting correctly.

Troubleshooting must first be performed to rule out a cutting unit adjustment issue. Once the issue is known to be component related, the entire cutting unit system is tested as outlined. The calculated system leakage is 28%, a result that requires the testing of individual components. This result can also be interpreted as system efficiency of 72%.

The remaining components in question are as follows: right front cutting units pump, right front deck valve, right front cutting unit right winglet motor, right front cutting unit right center motor, and right front cutting unit center motor. Following the procedures as outlined, test each individual component, then calculate and record leakage percentages.

The results from this test reveal leakage of 5% in the right front cutting units pump, 5.3% in the right front deck valve, 20% in the right front cutting unit right winglet motor, 5.6% in the right front cutting unit right center motor, and 4.4% in the right front cutting unit center motor. Although all the components lend to the overall circuit leakage, only the right front cutting unit right winglet motor, which is at the extreme end of the marginal range, would be considered for repair/replacement.

Formulas:

**Cutting Units Circuit and Cutting Units Pump**

No Load Flow – Loaded Flow / No Load Flow x 100 = Leak Percentage

**Cutting Unit Motor and Deck Valve**

Loaded Flow from previous component – Loaded Flow from current component / Loaded Flow from previous component x 100 = Leak Percentage

Calculations:

**NOTE**

Gallons per minute numbers (gpm) used in this example are not representative of this product. See specifications on page 6-3.

**Right Front Cutting Units Circuit Test**

No Load Flow = 10 gpm
Loaded Flow = 7.2 gpm
10 – 7.2 / 10 x 100 = Total Circuit Leakage 28%

**Right Front Cutting Units Pump Test**

No Load Flow = 10 gpm
Loaded Flow = 9.5 gpm
10 – 9.5 / 10 x 100 = Right Front Cutting Units Pump Leakage 5%

**Right Front Deck Valve Test**

Loaded Flow from right front cutting units pump test = 9.5 gpm
9.5 – 9 / 9.5 x 100 = Right Front Deck Valve Leakage 5.3%

**Right Front Cutting Unit Right Winglet Motor Test**

Loaded Flow from right front deck valve test = 9 gpm
9 – 7.2 / 9 x 100 = Right Front Cutting Unit Right Winglet Motor Leakage 20%

**Right Front Cutting Unit Right Center Motor Test**

Loaded Flow from right front cutting unit right winglet motor test = 7.2 gpm
7.2 – 6.8 / 7.2 x 100 = Right Front Cutting Unit Right Center Motor Leakage 5.6%
Right Front Cutting Unit Center Motor Test
Loaded Flow from right front cutting unit right center motor test = 6.8 gpm
Loaded Flow from right front cutting unit center motor test = 6.5 gpm
6.8 – 6.5 / 6.8 x 100 = Right Front Cutting Unit Center Motor Leakage 4.4%

Right Front Cutting Units Circuit Test
See Figures 6-17 through 6-19.

[IMPORTANT]
- This test works together with the right front cutting units pump test, right front deck valve test, and right front cutting units motors test to isolate a problem with the right front cutting units circuit.
- Performing this test will reflect the total system leakage of the right front cutting units hydraulic circuit. The results of this test will determine if circuit component level testing is required.

[WARNING]
The hydraulic system is under pressure, and the oil will be hot.
- Always relieve pressure in the hydraulic system before performing service.
- Failure to follow appropriate safety precautions may result in death or serious injury.

<table>
<thead>
<tr>
<th>Required Tools and Materials</th>
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<tbody>
<tr>
<td>• Flow Meter</td>
</tr>
<tr>
<td>• -10 ORFS Test Hose 5000 psi (345 bar)</td>
</tr>
<tr>
<td>• -10 ORFS Tee Fitting</td>
</tr>
<tr>
<td>• Blocking Device or Tool</td>
</tr>
</tbody>
</table>

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Raise hood and remove left side skirt.

3. Disconnect hydraulic hose (2) from fitting (1).

4. Install tee fitting (5) to fitting (2).
5. Connect test hose (6) of flow meter inlet and hydraulic hose (1) to tee fitting (5).

[NOTE]
Make sure hose end is under oil level in hydraulic tank to prevent aeration of oil.

6. Secure flow meter outlet hose (3) to the hydraulic tank fillneck.

[WARNING]
Safely block cutting unit from rotating using a suitable device or tool. Failure to follow appropriate safety precaution may result in death or serious injury.

7. Install suitable blocking device or tool in center front cutting unit, preventing the center motor from turning.
8. Open flow meter valve (4) completely.
Figure 6-19: Right Front Cutting Units Circuit Test—Center Motor Blocked


**NOTE**

*Verify engine rpm is within specification (2400 rpm ± 50) to ensure accurate hydraulic test results.*

10. Start engine and run at 2400 rpm ± 50.
11. Engage 4WD switch and mow switch.
12. Use the flow meter to warm the hydraulic oil. Turn the flow meter valve until a reading of 1500 psi (103 bar) or 50% of the relief valve rating is reached. Warm oil to 120–150° F (49–65° C); open valve fully after operating temperature is reached.
13. Read and record the right front cutting units circuit no load flow.
14. Slowly close flow meter valve until pressure reaches 2250 psi (155 bar) or 75% of the relief valve rating is reached. Read and record the right front cutting units circuit loaded flow.
15. Open flow meter valve, disengage switches, and stop engine.

16. Calculate right front cutting units circuit leakage.
   (Step 13 – Step 14 / Step 13 x 100 = Leak Percentage)
   
   **Is right front cutting units circuit leakage 10% or less?**
   
   **YES** The right front cutting units circuit is good. Proceed to step 17.
   
   **NO** Proceed to next question.

**Is right front cutting units circuit leakage 11% to 20%?**

**YES** The right front cutting units circuit is marginal. Additional testing is required. Proceed to “Right Front Cutting Units Pump Test” on page 6-35.

**NO** Proceed to next question.

**Is right front cutting units circuit leakage 21% or more?**

**YES** Test individual components in right front cutting units circuit for leakage. Proceed to “Right Front Cutting Units Pump Test” on page 6-35.

17. Remove device or tool from center motor.
18. Disconnect and remove test equipment. Install all hoses, lines, and fittings as noted prior to removal.
19. Install and connect all components as noted prior to test.
20. Check hydraulic oil level. Add oil as necessary. (Refer to “Parts and Maintenance Manual” for correct oil specifications.)
Right Front Cutting Units Pump Test

See Figures 6-20 through 6-22.

**IMPORTANT**

- This test works together with the right front cutting units circuit test, right front deck valve test, and right front cutting units motors test to isolate a problem with the right front cutting units circuit.
- Performing this test will isolate the right front cutting units pump from the rest of the right front cutting units circuit.

**WARNING**

The hydraulic system is under pressure, and the oil will be hot.

- Always relieve pressure in the hydraulic system before performing service.
- Failure to follow appropriate safety precautions may result in death or serious injury.

**Required Tools and Materials**

- Flow Meter
- -10 ORFS Test Hose 5000 psi (345 bar)
- -10 ORFS Tee Fitting
- -10 ORFS Blocking Disk

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Before performing this test, perform “Right Front Cutting Units Circuit Test,” leaving flow meter connected as outlined. (See “Right Front Cutting Units Circuit Test” on page 6-33.)
3. Install blocking disk between hydraulic hose (1) and tee fitting (3).
4. Open flow meter valve (2) completely.
5. Bypass seat switch and set park brake.

**NOTE**

Verify engine rpm is within specification (2400 rpm ± 50) to ensure accurate hydraulic test results.

6. Start engine and run at 2400 rpm ± 50.

**CAUTION**

Do not exceed 3350 psi (231 bar) when testing pump or equipment damage may occur.

7. Use the flow meter to warm the hydraulic oil. Turn the flow meter valve until a reading of 1500 psi (103 bar) or 50% of the relief valve rating is reached. Warm oil to 120–150°F (49–65°C); open valve fully after operating temperature is reached.

8. Read and record no load flow.

9. Slowly close flow meter valve until pressure reaches 2250 psi (155 bar) or 75% of the relief valve rating is reached. Read and record the right front cutting units pump loaded flow.

10. Open flow meter valve and stop engine.

11. Calculate right front cutting units pump leakage. 
   (Step 8 – Step 9 / Step 8 x 100 = Leak Percentage)
   
   **Is right front cutting units pump leakage 10% or less?**
   
   **YES** The right front cutting units pump is good. Proceed to step 12.
   
   **NO** Proceed to next question.
   
   **Is right front cutting units pump leakage 11% to 20%?**
   
   **YES** The right front cutting units pump is marginal. Additional testing is required. Proceed to step 12.
   
   **NO** Proceed to next question.
   
   **Is right front cutting units pump leakage 21% or more?**
   
   **YES** Repair or replace right front cutting units pump. See “3-Section Pump” on page 6-81, then repeat this test and proceed to step 12. If pump is not repaired or replaced, proceed to step 12 to continue testing.

12. (See Figures 6-20 and 6-21.) Disconnect hose (1) at tee fitting (3) and remove blocking disk. Reconnect hydraulic hose to tee fitting.

13. Proceed to “Right Front Deck Valve Test” on page 6-37.
Right Front Deck Valve Test
See Figures 6-23 through 6-25.

**IMPORTANT**
- This test works together with the right front cutting units circuit test, right front cutting units pump test, and right front cutting units motors test to isolate a problem with the right front cutting units circuit.
- Performing this test will isolate the right front deck valve from the rest of the right front cutting units circuit.

**WARNING**
The hydraulic system is under pressure, and the oil will be hot.
- Always relieve pressure in the hydraulic system before performing service.
- Failure to follow appropriate safety precautions may result in death or serious injury.

**Required Tools and Materials**
- Flow Meter
- -10 ORFS Test Hose 5000 psi (345 bar)
- -10 ORFS Tee Fitting
- -10 ORFS Blocking Disk

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Before performing this test, perform “Right Front Cutting Units Pump Test,” leaving flow meter connected as outlined. (See “Right Front Cutting Units Pump Test” on page 6-35.)

3. Install blocking disk at fitting (1) on right winglet motor, blocking oil flow from entering right winglet motor.

4. Open flow meter valve (2) completely.

5. Bypass seat switch and set park brake.

**NOTE**
Verify engine rpm is within specification (2400 rpm ± 50) to ensure accurate hydraulic test results.
6. Start engine and run at 2400 rpm ± 50.
7. Engage 4WD switch and mow switch.
8. Use the flow meter to warm the hydraulic oil. Turn the flow meter valve until a reading of 1500 psi (103 bar) or 50% of the relief valve rating is reached. Warm oil to 120–150° F (49–65° C); open valve fully after operating temperature is reached.

9. Slowly close flow meter valve until pressure reaches 2250 psi (155 bar) or 75% of the relief valve rating is reached. Read and record the right front deck valve loaded flow.

10. Open flow meter valve, disengage switches, and stop engine.

11. Calculate right front deck valve leakage.
   (Step 9 from previous test – Step 9 / Step 9 from previous test x 100 = Leak Percentage)

   Is right front deck valve leakage 10% or less?
   YES The right front deck valve is good. Proceed to step 12.
   NO Proceed to next question.

   Is right front deck valve leakage 11% to 20%?
   YES The right front deck valve is marginal. Additional testing is required. Proceed to step 12.
   NO Proceed to next question.

   Is right front deck valve leakage 21% or more?
   YES Repair or replace right front deck valve. See “Front Deck Valves” on page 6-95, then repeat this test and proceed to step 12. If right front deck valve is not repaired or replaced, proceed to step 12 to continue testing.
   NO Proceed to next question.

15. Open flow meter valve, disengage switches, and stop engine.

   Is right front deck valve system relief valve pressure 2700–3300 psi (186–228 bar)?
   YES Right front deck valve system relief valve is good. Proceed to step 6 on page 6-39.
   NO Adjust right front deck valve system relief valve pressure. (See “Right Front Deck Valve System Relief Valve Pressure Adjustment” on page 6-38.)

Right Front Deck Valve System Relief Valve Pressure Adjustment

See Figure 6-26.

**WARNING**

The hydraulic system is under pressure, and the oil will be hot.

- Always relieve pressure in the hydraulic system before performing service.
- Failure to follow appropriate safety precautions may result in death or serious injury.

**Required Tools and Materials**

- Flow Meter
- -10 ORFS Test Hose 5000 psi (345 bar)
- -10 ORFS Tee Fitting
- -10 ORFS Blocking Disk

**NOTE**

This adjustment should be done in conjunction with right front deck valve test.

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Perform right front deck valve test. (See “Right Front Deck Valve Test” on page 6-37.)

----

**NOTE**

Verify engine rpm is within specification (2400 rpm ± 50) to ensure accurate hydraulic test results.

12. Start engine and run at 2400 rpm ± 50.
14. Continue to close flow meter valve until zero flow is obtained. Record right front deck valve system relief valve pressure.
3. Loosen nut (1).
4. Rotate screw (2) to adjust the relief valve pressure setting.
   - To increase the pressure setting: Turn the screw in (clockwise).
   - To decrease the pressure setting: Turn the screw out (counterclockwise).
5. Tighten nut (1).

Could relief valve be adjusted to achieve 2700–3300 psi (186–228 bar)?

**YES**  
Right front deck valve system relief valve is good. Proceed to “Right Front Cutting Units Motors Test” on page 6-39.

**NO**  
Repair or replace right front deck valve system relief valve. (See “Front Deck Valves” on page 6-95.)

6. (See Figure 6-23.) Disconnect hydraulic hose at fitting (1) on right winglet motor and remove blocking disk.
7. Reconnect hydraulic hose to right winglet motor.
8. Proceed to “Right Front Cutting Units Motors Test” on page 6-39.

---

**Right Front Cutting Units Motors Test**

See Figures 6-27 through 6-30.

**IMPORTANT**
- This test works together with the right front cutting units circuit test, right front cutting units pump test, and right front deck valve test to isolate a problem with the right front cutting units circuit.
- Performing this test will isolate the right front cutting units motors from the rest of the right front cutting units circuit.

**WARNING**
The hydraulic system is under pressure, and the oil will be hot.
- Always relieve pressure in the hydraulic system before performing service.
- Failure to follow appropriate safety precautions may result in death or serious injury.

**Required Tools and Materials**
- Flow Meter
- -10 ORFS Test Hose 5000 psi (345 bar)
- -10 ORFS Tee Fitting
- Blocking Device or Tool

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Before performing this test, perform “Right Front Deck Valve Test,” leaving flow meter connected as outlined. (See “Right Front Deck Valve Test” on page 6-37.)
3. Bypass seat switch and set park brake.

**WARNING**
Safely block cutting unit from rotating using a suitable device or tool. Failure to follow appropriate safety precaution may result in death or serious injury.

4. Install suitable blocking device or tool in right winglet motor, preventing right winglet motor from turning.
5. Open flow meter valve (1) completely.

9. Slowly close flow meter valve until pressure reaches 2250 psi (155 bar) or 75% of the relief valve rating is reached. Read and record the right winglet motor loaded flow.

10. Open flow meter valve, disengage switches, and stop engine.

11. Calculate right winglet motor leakage.
   (Step 9 on page 38 from “Right Front Deck Valve Test” – Step 9 / Step 9 on page 38 from “Right Front Deck Valve Test” x 100 = Leak Percentage)

   **Is right winglet motor leakage 10% or less?**
   
   **YES**  The right winglet motor is good. Proceed to step 12.
   **NO**  Proceed to next question.

   **Is right winglet motor leakage 11% to 20%?**
   
   **YES**  The right winglet motor is marginal. Additional testing is required. Proceed to step 12.
   **NO**  Proceed to next question.

   **Is right winglet motor leakage 21% or more?**
   
   **YES**  Repair or replace right winglet motor. See “Deck Motors” on page 6-85, then proceed to step 12.
   **NO**  Proceed to next question.

12. Remove device or tool from right winglet motor.

13. Install suitable blocking device or tool in right center motor, preventing right center motor from turning.

14. Open flow meter valve completely.

---

**NOTE**

*Verify engine rpm is within specification (2400 rpm ± 50*) to ensure accurate hydraulic test results.*

6. Start engine and run at 2400 rpm ± 50.

7. Engage 4WD switch and mow switch.

8. Use the flow meter to warm the hydraulic oil. Turn the flow meter valve until a reading of 1500 psi (103 bar) or 50% of the relief valve rating is reached. Warm oil to 120–150° F (49–65° C); open valve fully after operating temperature is reached.
15. Bypass seat switch and set park brake.

**NOTE**

*Verify engine rpm is within specification (2400 rpm ± 50) to ensure accurate hydraulic test results.*

16. Start engine and run at 2400 rpm ± 50.

17. Engage 4WD switch and mow switch.

18. Use the flow meter to warm the hydraulic oil. Turn the flow meter valve until a reading of 1500 psi (103 bar) or 50% of the relief valve rating is reached. Warm oil to 120–150°F (49–65°C); open valve fully after operating temperature is reached.

19. Slowly close flow meter valve until pressure reaches 2250 psi (155 bar) or 75% of the relief valve rating is reached. Read and record the right center motor loaded flow.

20. Open flow meter valve, disengage switches, and stop engine.

21. Calculate right center motor leakage.
   
   \[
   \text{Leak Percentage} = \frac{(\text{Step 9} - \text{Step 19})}{\text{Step 9}} \times 100
   \]

   Is right center motor leakage 10% or less?
   
   **YES**  The right center motor is good. Proceed to step 22.

   **NO**  Proceed to next question.

   Is right center motor leakage 11% to 20%?
   
   **YES**  The right center motor is marginal. Additional testing is required. Proceed to step 22.

   **NO**  Proceed to next question.

   Is right center motor leakage 21% or more?
   
   **YES**  Repair or replace right center motor. See “Deck Motors” on page 6-85, then proceed to step 22.

   **NO**  Proceed to next question.

22. Remove device or tool from right center motor.

**WARNING**

*Safely block cutting unit from rotating using a suitable device or tool. Failure to follow appropriate safety precaution may result in death or serious injury.*

23. Install suitable blocking device or tool in center motor, preventing center motor from turning.

24. Open flow meter valve completely.

25. Bypass seat switch and set park brake.
**NOTE**
Verify engine rpm is within specification (2400 rpm ± 50) to ensure accurate hydraulic test results.

26. Start engine and run at 2400 rpm ± 50.
27. Engage 4WD switch and mow switch.
28. Use the flow meter to warm the hydraulic oil. Turn the flow meter valve until a reading of 1500 psi (103 bar) or 50% of the relief valve rating is reached. Warm oil to 120–150°C (49–65°C); open valve fully after operating temperature is reached.
29. Slowly close flow meter valve until pressure reaches 2250 psi (155 bar) or 75% of the relief valve rating is reached. Read and record the center motor loaded flow.
30. Open flow meter valve, disengage switches, and stop engine.
31. Calculate center motor leakage.
   (Step 19 – Step 29 / Step 19 x 100 = Leak Percentage)

**Is center motor leakage 10% or less?**
- **YES** The center motor is good. Proceed to step 32.
- **NO** Proceed to next question.

**Is center motor leakage 11% to 20%?**
- **YES** The center motor is marginal. Determine component(s) with greatest leakage and repair or replace as necessary.
- **NO** Proceed to next question.

**Is center motor leakage 21% or more?**
- **YES** Repair or replace center motor. (See “Deck Motors” on page 6-85.)

32. Remove device or tool from center motor.
33. Disconnect and remove test equipment. Install all hoses, lines, and fittings as noted prior to removal.
34. Install and connect all components as noted prior to test.
35. Check hydraulic oil level. Add oil as necessary. (Refer to “Parts and Maintenance Manual” for correct oil specifications.)

---

**Left Front Cutting Units Circuit Test**
See Figures 6-31 through 6-33.

**IMPORTANT**
- This test works together with the left front cutting units pump test, left front deck valve test, and left front cutting units motors test to isolate a problem with the left front cutting units circuit.
- Performing this test will reflect the total system leakage of the left front cutting units hydraulic circuit. The results of this test will determine if circuit component level testing is required.

---

**WARNING**
The hydraulic system is under pressure, and the oil will be hot.
- Always relieve pressure in the hydraulic system before performing service.
- Failure to follow appropriate safety precautions may result in death or serious injury.

---

**Required Tools and Materials**
- Flow Meter
- -8 ORFS Test Hose 5000 psi (345 bar)
- -8 ORFS Tee Fitting
- Blocking Device or Tool

---

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Remove seat and seat pan.

---

**Figure 6-31**

3. Disconnect hydraulic hose (1) from fitting (2).
4. Install tee fitting (5) to fitting (2).
5. Connect test hose (6) of flow meter inlet and hydraulic hose (1) to tee fitting (5).

NOTE
Make sure hose end is under oil level in hydraulic tank to prevent aeration of oil.

6. Secure flow meter outlet hose (3) to the hydraulic tank fillneck.

7. Install suitable blocking device or tool in left front cutting unit, preventing the left winglet motor from turning.
8. Open flow meter valve (4) completely.

WARNING
Safely block cutting unit from rotating using a suitable device or tool. Failure to follow appropriate safety precaution may result in death or serious injury.


NOTE
Verify engine rpm is within specification (2400 rpm ± 50) to ensure accurate hydraulic test results.

10. Start engine and run at 2400 rpm ± 50.
11. Engage 4WD switch and mow switch.
12. Use the flow meter to warm the hydraulic oil. Turn the flow meter valve until a reading of 1500 psi (103 bar) or 50% of the relief valve rating is reached. Warm oil to 120–150° F (49–65° C); open valve fully after operating temperature is reached.
13. Read and record the left front cutting units circuit no load flow.
14. Slowly close flow meter valve until pressure reaches 2250 psi (155 bar) or 75% of the relief valve rating is reached. Read and record the left front cutting units circuit loaded flow.
15. Open flow meter valve, disengage switches, and stop engine.
16. Calculate left front cutting units circuit leakage.
   (Step 13 – Step 14 / Step 13 x 100 = Leak Percentage)
   
   **Is left front cutting units circuit leakage 10% or less?**
   **YES** The left front cutting units circuit is good. Proceed to step 17.
   **NO** Proceed to next question.

   **Is left front cutting units circuit leakage 11% to 20%?**
   **YES** The left front cutting units circuit is marginal. Additional testing is required. Proceed to "Left Front Cutting Units Pump Test" on page 6-44.
   **NO** Proceed to next question.

   **Is left front cutting units circuit leakage 21% or more?**
   **YES** Test individual components in left front cutting units circuit for leakage. Proceed to "Left Front Cutting Units Pump Test" on page 6-44.

17. Remove device or tool from left winglet motor.
18. Disconnect and remove test equipment. Install all hoses, lines, and fittings as noted prior to removal.
19. Install and connect all components as noted prior to test.
20. Check hydraulic oil level. Add oil as necessary. (Refer to "Parts and Maintenance Manual" for correct oil specifications.)

### Left Front Cutting Units Pump Test

See Figures 6-34 through 6-36.

**IMPORTANT**
- This test works together with the left front cutting units circuit test, left front deck valve test, and left front cutting units motors test to isolate a problem with the left front cutting units circuit.
- Performing this test will isolate the left front cutting units pump from the rest of the left front cutting units circuit.

**WARNING**

The hydraulic system is under pressure, and the oil will be hot.
- Always relieve pressure in the hydraulic system before performing service.
- Failure to follow appropriate safety precautions may result in death or serious injury.

### Required Tools and Materials

- Flow Meter
- -8 ORFS Test Hose 5000 psi (345 bar)
- -8 ORFS Tee Fitting
- -8 ORFS Blocking Disk

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Before performing this test, perform “Left Front Cutting Units Circuit Test,” leaving flow meter connected as outlined. (See “Left Front Cutting Units Circuit Test” on page 6-42.)
3. Install blocking disk between hydraulic hose (1) and tee fitting (3).
4. Open flow meter valve (2) completely.

5. Bypass seat switch and set park brake.

**NOTE**
Verify engine rpm is within specification (2400 rpm ± 50) to ensure accurate hydraulic test results.

6. Start engine and run at 2400 rpm ± 50.

**CAUTION**
Do not exceed 3350 psi (231 bar) when testing pump or equipment damage may occur.

7. Use the flow meter to warm the hydraulic oil. Turn the flow meter valve until a reading of 1500 psi (103 bar) or 50% of the relief valve rating is reached. Warm oil to 120–150°F (49–65°C); open valve fully after operating temperature is reached.

8. Read and record no load flow.

9. Slowly close flow meter valve until pressure reaches 2250 psi (155 bar) or 75% of the relief valve rating is reached. Read and record the left front cutting units pump loaded flow.

10. Open flow meter valve and stop engine.
11. Calculate left front cutting units pump leakage. 
   (Step 8 – Step 9 / Step 8 x 100 = Leak Percentage)

   Is left front cutting units pump leakage 10% or less?
   
   YES  The left front cutting units pump is good. Proceed to step 12.
   
   NO   Proceed to next question.

   Is left front cutting units pump leakage 11% to 20%?
   
   YES  The left front cutting units pump is marginal. Additional testing is required. Proceed to step 12.
   
   NO   Proceed to next question.

   Is left front cutting units pump leakage 21% or more?
   
   YES  Repair or replace left front cutting units pump. See “2-Section Pump” on page 6-77, then repeat this test and proceed to step 12. If pump is not repaired or replaced, proceed to step 12 to continue testing.

12. (See Figures 6-34 and 6-35.) Disconnect hose (1) at tee fitting (3) and remove blocking disk. Reconnect hydraulic hose to tee fitting.

13. Proceed to “Left Front Deck Valve Test” on page 6-46.

---

 mass=Left Front Deck Valve Test

See Figures 6-37 through 6-39.

**IMPORTANT**

- This test works together with the left front cutting units circuit test, left front cutting units pump test, and left front cutting units motors test to isolate a problem with the left front cutting units circuit.
- Performing this test will isolate the left front deck valve from the rest of the left front cutting units circuit.

---

**WARNING**

The hydraulic system is under pressure, and the oil will be hot.

- Always relieve pressure in the hydraulic system before performing service.
- Failure to follow appropriate safety precautions may result in death or serious injury.

---

**Required Tools and Materials**

<table>
<thead>
<tr>
<th>Tool/Component</th>
<th>Description</th>
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<tbody>
<tr>
<td>Flow Meter</td>
<td></td>
</tr>
<tr>
<td>-8 ORFS Test Hose 5000 psi (345 bar)</td>
<td></td>
</tr>
<tr>
<td>-8 ORFS Tee Fitting</td>
<td></td>
</tr>
<tr>
<td>-8 ORFS Blocking Disk</td>
<td></td>
</tr>
<tr>
<td>-10 ORFS Blocking Disk</td>
<td></td>
</tr>
</tbody>
</table>

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)

2. Before performing this test, perform “Left Front Cutting Units Pump Test,” leaving flow meter connected as outlined. (See “Left Front Cutting Units Pump Test” on page 6-44.)

---

**Figure 6-37**
3. Install blocking disk at fitting (1) on left center motor, blocking oil flow from entering left center motor.

4. Open flow meter valve (2) completely.

5. Bypass seat switch and set park brake.

NOTE
Verify engine rpm is within specification (2400 rpm ± 50) to ensure accurate hydraulic test results.

6. Start engine and run at 2400 rpm ± 50.

7. Engage 4WD switch and mow switch.

8. Use the flow meter to warm the hydraulic oil. Turn the flow meter valve until a reading of 1500 psi (103 bar) or 50% of the relief valve rating is reached. Warm oil to 120–150°F (49–65°C); open valve fully after operating temperature is reached.

9. Slowly close flow meter valve until pressure reaches 2250 psi (155 bar) or 75% of the relief valve rating is reached. Read and record the left front deck valve loaded flow.

10. Open flow meter valve, disengage switches, and stop engine.

11. Calculate left front deck valve leakage.

(Step 9 from previous test – Step 9 / Step 9 from previous test × 100 = Leak Percentage)

- Is left front deck valve leakage 10% or less?
  - YES The left front deck valve is good. Proceed to step 12.
  - NO Proceed to next question.

- Is left front deck valve leakage 11% to 20%?
  - YES The left front deck valve is marginal. Additional testing is required. Proceed to step 12.
  - NO Proceed to next question.

- Is left front deck valve leakage 21% or more?
  - YES Repair or replace left front deck valve. See “Front Deck Valves” on page 6-95, then proceed to step 12.

CAUTION
Do not exceed 3350 psi (231 bar) when testing system relief valve or equipment damage may occur.

NOTE
Verify engine rpm is within specification (2400 rpm ± 50) to ensure accurate hydraulic test results.

12. Start engine and run at 2400 rpm ± 50.


14. Continue to close flow meter valve until zero flow is obtained. Record left front deck valve system relief valve pressure.
15. Open flow meter valve, disengage switches, and stop engine.

Is left front deck valve system relief valve pressure 2700–3300 psi (186–228 bar)?

**YES**  Left front deck valve system relief valve is good. Proceed to step 6 on page 6-48.

**NO**  Adjust left front deck valve system relief valve pressure. (See “Left Front Deck Valve System Relief Valve Pressure Adjustment” on page 6-48.)

### Left Front Deck Valve System Relief Valve Pressure Adjustment

See Figure 6-40.

![Figure 6-40](TN4013)

**WARNING**

The hydraulic system is under pressure, and the oil will be hot.

- Always relieve pressure in the hydraulic system before performing service.
- Failure to follow appropriate safety precautions may result in death or serious injury.

**NOTE**

This adjustment should be done in conjunction with left front deck valve test.

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Perform left front deck valve test. (See “Left Front Deck Valve Test” on page 6-46.)

3. Loosen nut (1).
4. Rotate screw (2) to adjust the relief valve pressure setting.
   - To increase the pressure setting: Turn the screw in (clockwise).
   - To decrease the pressure setting: Turn the screw out (counterclockwise).
5. Tighten nut (1).

**Could relief valve be adjusted to achieve 2700–3300 psi (186–228 bar)?**

**YES**  Left front deck valve system relief valve is good. Proceed to “Left Front Cutting Units Motors Test” on page 6-49.

**NO**  Repair or replace left front deck valve system relief valve. (See “Front Deck Valves” on page 6-95.)

6. (See Figure 6-37.) Disconnect hydraulic hose at fitting (1) on left center motor and remove blocking disk.
7. Reconnect hydraulic hose to left center motor.
8. Proceed to “Left Front Cutting Units Motors Test” on page 6-49.

<table>
<thead>
<tr>
<th>Required Tools and Materials</th>
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<td>• Flow Meter</td>
</tr>
<tr>
<td>• -8 ORFS Test Hose 5000 psi (345 bar)</td>
</tr>
<tr>
<td>• -8 ORFS Tee Fitting</td>
</tr>
<tr>
<td>• -8 ORFS Blocking Disk</td>
</tr>
<tr>
<td>• -10 ORFS Blocking Disk</td>
</tr>
</tbody>
</table>

**Required Tools and Materials**

- Flow Meter
- -8 ORFS Test Hose 5000 psi (345 bar)
- -8 ORFS Tee Fitting
- -8 ORFS Blocking Disk
- -10 ORFS Blocking Disk
Left Front Cutting Units Motors Test

See Figures 6-41 through 6-43.

**IMPORTANT**
- This test works together with the left front cutting units circuit test, left front cutting units pump test, and left front deck valve test to isolate a problem with the left front cutting units circuit.
- Performing this test will isolate the left front cutting units motors from the rest of the left front cutting units circuit.

**WARNING**

The hydraulic system is under pressure, and the oil will be hot.
- Always relieve pressure in the hydraulic system before performing service.
- Failure to follow appropriate safety precautions may result in death or serious injury.

### Required Tools and Materials

- Flow Meter
- -8 ORFS Test Hose 5000 psi (345 bar)
- -8 ORFS Tee Fitting
- -8 ORFS Blocking Disk
- -10 ORFS Blocking Disk
- Blocking Device or Tool

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Before performing this test, perform “Left Front Deck Valve Test,” leaving flow meter connected as outlined. (See “Left Front Deck Valve Test” on page 6-46.)
3. Bypass seat switch and set park brake.

**WARNING**

Safely block cutting unit from rotating using a suitable device or tool. Failure to follow appropriate safety precaution may result in death or serious injury.

4. Install suitable blocking device or tool in left center motor, preventing left center motor from turning.

5. Open flow meter valve (1) completely.

**NOTE**

Verify engine rpm is within specification (2400 rpm ± 50) to ensure accurate hydraulic test results.

6. Start engine and run at 2400 rpm ± 50.
7. Engage 4WD switch and mow switch.
8. Use the flow meter to warm the hydraulic oil. Turn the flow meter valve until a reading of 1500 psi (103 bar) or 50% of the relief valve rating is reached. Warm oil to 120–150°F (49–65°C); open valve fully after operating temperature is reached.
9. Slowly close flow meter valve until pressure reaches 2250 psi (155 bar) or 75% of the relief valve rating is reached. Read and record the left center motor loaded flow.

10. Open flow meter valve, disengage switches, and stop engine.

11. Calculate left center motor leakage.
   (Step 9 on page 47 from “Left Front Deck Valve Test” – Step 9 / Step 9 on page 47 from “Left Front Deck Valve Test” x 100 = Leak Percentage)

**Is left center motor leakage 10% or less?**

- **YES** The left center motor is good. Proceed to step 12.
- **NO** Proceed to next question.

**Is left center motor leakage 11% to 20%?**

- **YES** The left center motor is marginal. Additional testing is required. Proceed to step 12.
- **NO** Proceed to next question.

**Is left center motor leakage 21% or more?**

- **YES** Repair or replace left center motor. See “Deck Motors” on page 6-85, then proceed to step 12.

12. Remove device or tool from left center motor.

**WARNING**

Safely block cutting unit from rotating using a suitable device or tool. Failure to follow appropriate safety precaution may result in death or serious injury.

13. Install suitable blocking device or tool in left winglet motor, preventing left winglet motor from turning.

14. Open flow meter valve completely.

15. Bypass seat switch and set park brake.

**NOTE**

Verify engine rpm is within specification (2400 rpm ± 50) to ensure accurate hydraulic test results.

16. Start engine and run at 2400 rpm ± 50.

17. Engage 4WD switch and mow switch.

18. Use the flow meter to warm the hydraulic oil. Turn the flow meter valve until a reading of 1500 psi (103 bar) or 50% of the relief valve rating is reached. Warm oil to 120–150°F (49–65°C); open valve fully after operating temperature is reached.

19. Slowly close flow meter valve until pressure reaches 2250 psi (155 bar) or 75% of the relief valve rating is reached. Read and record the left winglet motor loaded flow.

20. Open flow meter valve, disengage switches, and stop engine.
21. Calculate left winglet motor leakage.
   (Step 9 – Step 19 / Step 9 x 100 = Leak Percentage)
   **Is left winglet motor leakage 10% or less?**
   **YES** The left winglet motor is good. Proceed to step 22.
   **NO** Proceed to next question.
   **Is left winglet motor leakage 11% to 20%?**
   **YES** The left winglet motor is marginal. Additional testing is required. Proceed to step 22.
   **NO** Proceed to next question.
   **Is left winglet motor leakage 21% or more?**
   **YES** Repair or replace left winglet motor. See “Deck Motors” on page 6-85, then proceed to step 22.

22. Remove device or tool from left winglet motor.
23. Disconnect and remove test equipment. Install all hoses, lines, and fittings as noted prior to removal.
24. Install and connect all components as noted prior to test.
25. Check hydraulic oil level. Add oil as necessary.
   (Refer to “Parts and Maintenance Manual” for correct oil specifications.)

---

**Right Wing Cutting Units Circuit Test**

See Figures 6-44 through 6-46.

**IMPORTANT**
- This test works together with the right wing cutting units pump test, right wing deck valve test, and right wing cutting units motors test to isolate a problem with the right wing cutting units circuit.
- Performing this test will reflect the total system leakage of the right wing cutting units hydraulic circuit. The results of this test will determine if circuit component level testing is required.

**WARNING**
The hydraulic system is under pressure, and the oil will be hot.
- Always relieve pressure in the hydraulic system before performing service.
- Failure to follow appropriate safety precautions may result in death or serious injury.

**Required Tools and Materials**
- Flow Meter
- -10 ORFS Test Hose 5000 psi (345 bar)
- -10 ORFS Tee Fitting
- Blocking Device or Tool

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Raise hood and remove left side skirt.

3. Disconnect hydraulic hose (1) from fitting (2).

---

**Figure 6-44**

TN4113
4. Install tee fitting (5) to fitting (2).
5. Connect test hose (6) of flow meter inlet and hydraulic hose (1) to tee fitting (5).

**NOTE**
Make sure hose end is under oil level in hydraulic tank to prevent aeration of oil.

6. Secure flow meter outlet hose (3) to the hydraulic tank fillneck.

**WARNING**
Safely block cutting unit from rotating using a suitable device or tool. Failure to follow appropriate safety precaution may result in death or serious injury.

7. Install suitable blocking device or tool in right wing cutting unit, preventing the right wing outside motor from turning.
8. Open flow meter valve (4) completely.


**NOTE**
Verify engine rpm is within specification (2400 rpm ± 50) to ensure accurate hydraulic test results.

10. Start engine and run at 2400 rpm ± 50.
11. Engage 4WD switch and mow switch.
12. Use the flow meter to warm the hydraulic oil. Turn the flow meter valve until a reading of 1500 psi (103 bar) or 50% of the relief valve rating is reached. Warm oil to 120–150°F (49–65°C); open valve fully after operating temperature is reached.
13. Read and record the right wing cutting units circuit no load flow.
14. Slowly close flow meter valve until pressure reaches 2250 psi (155 bar) or 75% of the relief valve rating is reached. Read and record the right wing cutting units circuit loaded flow.
15. Open flow meter valve, disengage switches, and stop engine.
16. Calculate right wing cutting units circuit leakage.
   (Step 13 – Step 14 / Step 13 x 100 = Leak Percentage)

   **Is right wing cutting units circuit leakage 10% or less?**
   - **YES** The right wing cutting units circuit is good. Proceed to step 17.
   - **NO** Proceed to next question.

   **Is right wing cutting units circuit leakage 11% to 20%?**
   - **YES** The right wing cutting units circuit is marginal. Additional testing is required. Proceed to “Right Wing Cutting Units Pump Test” on page 6-53.
   - **NO** Proceed to next question.

   **Is right wing cutting units circuit leakage 21% or more?**
   - **YES** Test individual components in right wing cutting units circuit for leakage. Proceed to “Right Wing Cutting Units Pump Test” on page 6-53.

17. Remove device or tool from right wing outside motor.
18. Disconnect and remove test equipment. Install all hoses, lines, and fittings as noted prior to removal.
19. Install and connect all components as noted prior to test.
20. Check hydraulic oil level. Add oil as necessary. (Refer to “Parts and Maintenance Manual” for correct oil specifications.)

**Right Wing Cutting Units Pump Test**
See Figures 6-47 through 6-49.

**IMPORTANT**
- This test works together with the right wing cutting units circuit test, right wing deck valve test, and right wing cutting units motors test to isolate a problem with the right wing cutting units circuit.
- Performing this test will isolate the right wing cutting units pump from the rest of the right wing cutting units circuit.

**WARNING**
The hydraulic system is under pressure, and the oil will be hot.
- Always relieve pressure in the hydraulic system before performing service.
- Failure to follow appropriate safety precautions may result in death or serious injury.

<table>
<thead>
<tr>
<th><strong>Required Tools and Materials</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow Meter</td>
</tr>
<tr>
<td>-10 ORFS Test Hose 5000 psi (345 bar)</td>
</tr>
<tr>
<td>-10 ORFS Tee Fitting</td>
</tr>
<tr>
<td>-10 ORFS Blocking Disk</td>
</tr>
</tbody>
</table>

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Before performing this test, perform “Right Wing Cutting Units Circuit Test,” leaving flow meter connected as outlined. (See “Right Wing Cutting Units Circuit Test” on page 6-51.)
3. Install blocking disk between hydraulic hose (1) and tee fitting (3).
4. Open flow meter valve (2) completely.

5. Bypass seat switch and set park brake.

**NOTE**
Verify engine rpm is within specification (2400 rpm ± 50) to ensure accurate hydraulic test results.

6. Start engine and run at 2400 rpm ± 50.

**CAUTION**
Do not exceed 3350 psi (231 bar) when testing pump or equipment damage may occur.

7. Use the flow meter to warm the hydraulic oil. Turn the flow meter valve until a reading of 1500 psi (103 bar) or 50% of the relief valve rating is reached. Warm oil to 120–150° F (49–65° C); open valve fully after operating temperature is reached.

8. Read and record no load flow.

9. Slowly close flow meter valve until pressure reaches 2250 psi (155 bar) or 75% of the relief valve rating is reached. Read and record the right wing cutting units pump loaded flow.

10. Open flow meter valve and stop engine.
11. Calculate right wing cutting units pump leakage.
   (Step 8 – Step 9 / Step 8 x 100 = Leak Percentage)

   Is right wing cutting units pump leakage 10% or less?
   YES  The right wing cutting units pump is good.
         Proceed to step 12.
   NO    Proceed to next question.

   Is right wing cutting units pump leakage 11% to 20%?
   YES  The right wing cutting units pump is marginal. Additional testing is required.
         Proceed to step 12.
   NO    Proceed to next question.

   Is right wing cutting units pump leakage 21% or more?
   YES  Repair or replace right wing cutting units pump. See “3-Section Pump” on page 6-81,
         then repeat this test and proceed to step 12. If pump is not repaired or replaced, proceed
         to step 12 to continue testing.
   NO    Proceed to next question.

12. (See Figures 6-47 and 6-48.) Disconnect hose (1) at tee fitting (3) and remove blocking disk. Reconnect
    hydraulic hose to tee fitting.

13. Proceed to “Right Wing Deck Valve Test” on page 6-55.

Right Wing Deck Valve Test
See Figures 6-50 through 6-52.

IMPORTANT
- This test works together with the right wing cutting units circuit test, right wing cutting units pump test, and right wing cutting units motors test to isolate a problem with the right wing cutting units circuit.
- Performing this test will isolate the right wing deck valve from the rest of the right wing cutting units circuit.

WARNING
The hydraulic system is under pressure, and the oil will be hot.
- Always relieve pressure in the hydraulic system before performing service.
- Failure to follow appropriate safety precautions may result in death or serious injury.

Required Tools and Materials
- Flow Meter
- -10 ORFS Test Hose 5000 psi (345 bar)
- -10 ORFS Tee Fitting
- -10 ORFS Blocking Disk

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Before performing this test, perform “Right Wing Cutting Units Pump Test,” leaving flow meter
   connected as outlined. (See “Right Wing Cutting Units Pump Test” on page 6-53.)

Figure 6-50
3. Install blocking disk at fitting (1) on right wing inside motor, blocking oil flow from entering right wing inside motor.

8. Use the flow meter to warm the hydraulic oil. Turn the flow meter valve until a reading of 1500 psi (103 bar) or 50% of the relief valve rating is reached. Warm oil to 120–150° F (49–65° C); open valve fully after operating temperature is reached.

9. Slowly close flow meter valve until pressure reaches 2250 psi (155 bar) or 75% of the relief valve rating is reached. Read and record the right wing deck valve loaded flow.

10. Open flow meter valve, disengage switches, and stop engine.

11. Calculate right wing deck valve leakage. (Step 9 from previous test – Step 9 from previous test x 100 = Leak Percentage)

   Is right wing deck valve leakage 10% or less?
   YES  The right wing deck valve is good. Proceed to step 12.
   NO   Proceed to next question.

   Is right wing deck valve leakage 11% to 20%?
   YES  The right wing deck valve is marginal. Additional testing is required. Proceed to step 12.
   NO   Proceed to next question.

   Is right wing deck valve leakage 21% or more?
   YES  Repair or replace right wing deck valve. (See “Right Wing Deck Valve” on page 6-91, then proceed to step 12.

   CAUTION
   Do not exceed 3350 psi (231 bar) when testing system relief valve or equipment damage may occur.

   NOTE
   Verify engine rpm is within specification (2400 rpm ± 50) to ensure accurate hydraulic test results.

   12. Start engine and run at 2400 rpm ± 50.
   14. Continue to close flow meter valve until zero flow is obtained. Record right wing deck valve system relief valve pressure.

   NOTE
   Verify engine rpm is within specification (2400 rpm ± 50) to ensure accurate hydraulic test results.

   6. Start engine and run at 2400 rpm ± 50.
   7. Engage 4WD switch and mow switch.
15. Open flow meter valve, disengage switches, and stop engine.

Is right wing deck valve system relief valve pressure 2700–3300 psi (186–228 bar)?

**YES** Right wing deck valve system relief valve is good. Proceed to step 6 on page 6-57.

**NO** Adjust right wing deck valve system relief valve pressure. (See “Right Wing Deck Valve System Relief Valve Pressure Adjustment” on page 6-57.)

### Right Wing Deck Valve System Relief Valve Pressure Adjustment

See Figure 6-53.

#### WARNING

The hydraulic system is under pressure, and the oil will be hot.

- Always relieve pressure in the hydraulic system before performing service.
- Failure to follow appropriate safety precautions may result in death or serious injury.

### Required Tools and Materials

- Flow Meter
- -10 ORFS Test Hose 5000 psi (345 bar)
- -10 ORFS Tee Fitting
- -10 ORFS Blocking Disc

### NOTE

This adjustment should be done in conjunction with right wing deck valve test.

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Perform right wing deck valve test. (See “Right Wing Deck Valve Test” on page 6-55.)

3. Loosen nut (1).

4. Rotate screw (2) to adjust the relief valve pressure setting.
   - To increase the pressure setting: Turn the screw in (clockwise).
   - To decrease the pressure setting: Turn the screw out (counterclockwise).

5. Tighten nut (1).

**Could relief valve be adjusted to achieve 2700–3300 psi (186–228 bar)?**

**YES** Right wing deck valve system relief valve is good. Proceed to “Right Wing Cutting Units Motors Test” on page 6-58.

**NO** Repair or replace right wing deck valve system relief valve. (See “Right Wing Deck Valve” on page 6-91.)

6. (See Figure 6-50.) Disconnect hydraulic hose at fitting (1) on right wing inside motor and remove blocking disk. Reconnect hydraulic hose to right wing inside motor.

7. Proceed to “Right Wing Cutting Units Motors Test” on page 6-58.
Right Wing Cutting Units Motors Test

See Figures 6-54 through 6-57.

**IMPORTANT**
- This test works together with the right wing cutting units circuit test, right wing cutting units pump test, and right wing deck valve test to isolate a problem with the right wing cutting units circuit.
- Performing this test will isolate the right wing cutting units motors from the rest of the right wing cutting units circuit.

**WARNING**
The hydraulic system is under pressure, and the oil will be hot.
- Always relieve pressure in the hydraulic system before performing service.
- Failure to follow appropriate safety precautions may result in death or serious injury.

**Required Tools and Materials**
- Flow Meter
- -10 ORFS Test Hose 5000 psi (345 bar)
- -10 ORFS Tee Fitting
- Blocking Device or Tool

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Before performing this test, perform “Right Wing Deck Valve Test,” leaving flow meter connected as outlined. (See “Right Wing Deck Valve Test” on page 6-55.)
3. Bypass seat switch and set park brake.

**WARNING**
Safely block cutting unit from rotating using a suitable device or tool. Failure to follow appropriate safety precaution may result in death or serious injury.

4. Install suitable blocking device or tool in right wing inside motor, preventing right wing inside motor from turning.

5. Open flow meter valve (1) completely.

**NOTE**
Verify engine rpm is within specification (2400 rpm ± 50) to ensure accurate hydraulic test results.
6. Start engine and run at 2400 rpm ± 50.
7. Engage 4WD switch and mow switch.
8. Use the flow meter to warm the hydraulic oil. Turn the flow meter valve until a reading of 1500 psi (103 bar) or 50% of the relief valve rating is reached. Warm oil to 120–150° F (49–65° C); open valve fully after operating temperature is reached.
9. Slowly close flow meter valve until pressure reaches 2250 psi (155 bar) or 75% of the relief valve rating is reached. Read and record the right wing inside motor loaded flow.

10. Open flow meter valve, disengage switches, and stop engine.

11. Calculate right wing inside motor leakage.
   (Step 9 on page 56 from “Right Wing Deck Valve Test” – Step 9 / Step 9 on page 56 from “Right Wing Deck Valve Test” x 100 = Leak Percentage)

Is right wing inside motor leakage 10% or less?
   YES  The right wing inside motor is good. Proceed to step 12.
   NO   Proceed to next question.

Is right wing inside motor leakage 11% to 20%?
   YES  The right wing inside motor is marginal. Additional testing is required. Proceed to step 12.
   NO   Proceed to next question.

Is right wing inside motor leakage 21% or more?
   YES  Repair or replace right wing inside motor. See “Deck Motors” on page 6-85, then proceed to step 12.
   NO   Proceed to next question.

12. Remove device or tool from right wing inside motor.

13. Install suitable blocking device or tool in right wing center motor, preventing right wing center motor from turning.

14. Open flow meter valve completely.

15. Bypass seat switch and set park brake.

   **NOTE**
   Verify engine rpm is within specification (2400 rpm ± 50) to ensure accurate hydraulic test results.

16. Start engine and run at 2400 rpm ± 50.

17. Engage 4WD switch and mow switch.

18. Use the flow meter to warm the hydraulic oil. Turn the flow meter valve until a reading of 1500 psi (103 bar) or 50% of the relief valve rating is reached. Warm oil to 120–150° F (49–65° C); open valve fully after operating temperature is reached.

19. Slowly close flow meter valve until pressure reaches 2250 psi (155 bar) or 75% of the relief valve rating is reached. Read and record the right wing center motor loaded flow.

20. Open flow meter valve, disengage switches, and stop engine.
21. Calculate right wing center motor leakage.
   (Step 9 – Step 19 / Step 9 x 100 = Leak Percentage)
   
   **Is right wing center motor leakage 10% or less?**
   
   **YES**  The right wing center motor is good. Proceed to step 22.
   
   **NO**  Proceed to next question.
   
   **Is right wing center motor leakage 11% to 20%?**
   
   **YES**  The right wing center motor is marginal. Additional testing is required. Proceed to step 22.
   
   **NO**  Proceed to next question.
   
   **Is right wing center motor leakage 21% or more?**
   
   **YES**  Repair or replace right wing center motor. See “Deck Motors” on page 6-85, then proceed to step 22.
   
   22. Remove device or tool from right wing center motor.

![WARNING](image)

**WARNING**

Safely block cutting unit from rotating using a suitable device or tool. Failure to follow appropriate safety precaution may result in death or serious injury.

23. Install suitable blocking device or tool in right wing outside motor, preventing right wing outside motor from turning.

24. Open flow meter valve completely.

25. Bypass seat switch and set park brake.

**NOTE**

*Verify engine rpm is within specification (2400 rpm ± 50) to ensure accurate hydraulic test results.*

26. Start engine and run at 2400 rpm ± 50.

27. Engage 4WD switch and mow switch.

28. Use the flow meter to warm the hydraulic oil. Turn the flow meter valve until a reading of 1500 psi (103 bar) or 50% of the relief valve rating is reached. Warm oil to 120–150°F (49–65°C); open valve fully after operating temperature is reached.

29. Slowly close flow meter valve until pressure reaches 2250 psi (155 bar) or 75% of the relief valve rating is reached. Read and record the right wing outside motor loaded flow.

30. Open flow meter valve, disengage switches, and stop engine.
31. Calculate right wing outside motor leakage. (Step 19 – Step 29 / Step 19 x 100 = Leak Percentage)

Is right wing outside motor leakage 10% or less?

YES  The right wing outside motor is good. Proceed to step 32.

NO  Proceed to next question.

Is right wing outside motor leakage 11% to 20%?

YES  The right wing outside motor is marginal. Determine component(s) with greatest leakage and repair or replace as necessary.

NO  Proceed to next question.

Is right wing outside motor leakage 21% or more?

YES  Repair or replace right wing outside motor. (See “Deck Motors” on page 6-85.)

32. Remove device or tool from right wing outside motor.

33. Disconnect and remove test equipment. Install all hoses, lines, and fittings as noted prior to removal.

34. Install and connect all components as noted prior to test.

35. Check hydraulic oil level. Add oil as necessary. (Refer to “Parts and Maintenance Manual” for correct oil specifications.)


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**Left Wing Cutting Units Circuit Test**

See Figures 6-58 through 6-60.

**IMPORTANT**

- This test works together with the left wing cutting units pump test, left wing deck valve test, and left wing cutting units motors test to isolate a problem with the left wing cutting units circuit.
- Performing this test will reflect the total system leakage of the left wing cutting units hydraulic circuit. The results of this test will determine if circuit component level testing is required.

**WARNING**

The hydraulic system is under pressure, and the oil will be hot.

- Always relieve pressure in the hydraulic system before performing service.
- Failure to follow appropriate safety precautions may result in death or serious injury.

**Required Tools and Materials**

- Flow Meter
- -10 ORFS Test Hose 5000 psi (345 bar)
- -10 ORFS Tee Fitting
- Blocking Device or Tool

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Raise hood and remove left side skirt.
3. Disconnect hydraulic hose (1) from fitting (2).
4. Install tee fitting (5) to fitting (2).
5. Connect test hose (6) of flow meter inlet and hydraulic hose (1) to tee fitting (5).

**NOTE**
Make sure hose end is under oil level in hydraulic tank to prevent aeration of oil.

6. Secure flow meter outlet hose (3) to the hydraulic tank fillneck.

**WARNING**
Safely block cutting unit from rotating using a suitable device or tool. Failure to follow appropriate safety precaution may result in death or serious injury.

7. Install suitable blocking device or tool in left wing cutting unit, preventing the left wing inside motor from turning.
8. Open flow meter valve (4) completely.


**NOTE**
Verify engine rpm is within specification (2400 rpm ± 50) to ensure accurate hydraulic test results.

10. Start engine and run at 2400 rpm ± 50.
11. Engage 4WD switch and mow switch.
12. Use the flow meter to warm the hydraulic oil. Turn the flow meter valve until a reading of 1500 psi (103 bar) or 50% of the relief valve rating is reached. Warm oil to 120–150°F (49–65°C); open valve fully after operating temperature is reached.
13. Read and record the left wing cutting units circuit no load flow.
14. Slowly close flow meter valve until pressure reaches 2250 psi (155 bar) or 75% of the relief valve rating is reached. Read and record the left wing cutting units circuit loaded flow.
15. Open flow meter valve, disengage switches, and stop engine.
16. Calculate left wing cutting units circuit leakage.  
   (Step 13 – Step 14 / Step 13 x 100 = Leak Percentage)  
   
   **Is left wing cutting units circuit leakage 10% or less?**  
   **YES**  The left wing cutting units circuit is good.  Proceed to step 17.  
   **NO**  Proceed to next question.  
   
   **Is left wing cutting units circuit leakage 11% to 20%?**  
   **YES**  The left wing cutting units circuit is marginal.  Additional testing is required.  Proceed to “Left Wing Cutting Units Pump Test” on page 6-63.  
   **NO**  Proceed to next question.  
   
   **Is left wing cutting units circuit leakage 21% or more?**  
   **YES**  Test individual components in left wing cutting units circuit for leakage.  Proceed to “Left Wing Cutting Units Pump Test” on page 6-63.  
   
17. Remove device or tool from left wing inside motor.  
18. Disconnect and remove test equipment. Install all hoses, lines, and fittings as noted prior to removal.  
19. Install and connect all components as noted prior to test.  
20. Check hydraulic oil level. Add oil as necessary.  (Refer to “Parts and Maintenance Manual” for correct oil specifications.)  

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### Left Wing Cutting Units Pump Test

See Figures 6-61 through 6-63.  

**IMPORTANT**  
- This test works together with the left wing cutting units circuit test, left wing deck valve test, and left wing cutting units motors test to isolate a problem with the left wing cutting units circuit.  
- Performing this test will isolate the left wing cutting units pump from the rest of the left wing cutting units circuit.  

**WARNING**  
The hydraulic system is under pressure, and the oil will be hot.  
- Always relieve pressure in the hydraulic system before performing service.  
- Failure to follow appropriate safety precautions may result in death or serious injury.  

**Required Tools and Materials**  
- Flow Meter  
- -10 ORFS Test Hose 5000 psi (345 bar)  
- -10 ORFS Tee Fitting  
- -10 ORFS Blocking Disk  

1. Park the mower safely.  (See “Park Mower Safely” on page 1-6.)  
2. Before performing this test, perform “Left Wing Cutting Units Circuit Test,” leaving flow meter connected as outlined.  (See “Left Wing Cutting Units Circuit Test” on page 6-61.)
3. Install blocking disk between hydraulic hose (1) and tee fitting (3).
4. Open flow meter valve (2) completely.

5. Bypass seat switch and set park brake.

**NOTE**
Verify engine rpm is within specification (2400 rpm ± 50) to ensure accurate hydraulic test results.

6. Start engine and run at 2400 rpm ± 50.

**CAUTION**
Do not exceed 3350 psi (231 bar) when testing pump or equipment damage may occur.

7. Use the flow meter to warm the hydraulic oil. Turn the flow meter valve until a reading of 1500 psi (103 bar) or 50% of the relief valve rating is reached. Warm oil to 120–150°F (49–65°C); open valve fully after operating temperature is reached.

8. Read and record no load flow.

9. Slowly close flow meter valve until pressure reaches 2250 psi (155 bar) or 75% of the relief valve rating is reached. Read and record the left wing cutting units pump loaded flow.

10. Open flow meter valve and stop engine.
11. Calculate left wing cutting units pump leakage.  
(Step 8 – Step 9 / Step 8 x 100 = Leak Percentage)

Is left wing cutting units pump leakage 10% or less?
YES  The left wing cutting units pump is good.  
Proceed to step 12.
NO  Proceed to next question.

Is left wing cutting units pump leakage 11% to 20%?
YES  The left wing cutting units pump is marginal.  
Additional testing is required.  Proceed to step 12.
NO  Proceed to next question.

Is left wing cutting units pump leakage 21% or more?
YES  Repair or replace left wing cutting units pump.  See “3-Section Pump” on page 6-81,  
then repeat this test and proceed to step 12.  
If pump is not repaired or replaced, proceed to step 12 to continue testing.

12. (See Figures 6-61 and 6-62.) Disconnect hose (1) at tee fitting (3) and remove blocking disk.  Reconnect hydraulic hose to tee fitting.

13. Proceed to “Left Wing Deck Valve Test” on page 6-65.

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**Left Wing Deck Valve Test**

See Figures 6-64 through 6-66.

**IMPORTANT**

- This test works together with the left wing cutting units circuit test, left wing cutting units pump test, and left wing cutting units motors test to isolate a problem with the left wing cutting units circuit.
- Performing this test will isolate the left wing deck valve from the rest of the left wing cutting units circuit.

**WARNING**

The hydraulic system is under pressure, and the oil will be hot.
- Always relieve pressure in the hydraulic system before performing service.
- Failure to follow appropriate safety precautions may result in death or serious injury.

**Required Tools and Materials**

- Flow Meter
- -10 ORFS Test Hose 5000 psi (345 bar)
- -10 ORFS Tee Fitting
- -10 ORFS Blocking Disk

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)

2. Before performing this test, perform “Left Wing Cutting Units Pump Test,” leaving flow meter connected as outlined. (See “Left Wing Cutting Units Pump Test” on page 6-63.)
3. Install blocking disk at fitting (1) on left wing outside motor, blocking oil flow from entering left wing outside motor.

4. Open flow meter valve (2) completely.

5. Bypass seat switch and set park brake.

6. Start engine and run at 2400 rpm ± 50.
7. Engage 4WD switch and mow switch.

8. Use the flow meter to warm the hydraulic oil. Turn the flow meter valve until a reading of 1500 psi (103 bar) or 50% of the relief valve rating is reached. Warm oil to 120–150°C (49–65°C); open valve fully after operating temperature is reached.

9. Slowly close flow meter valve until pressure reaches 2250 psi (155 bar) or 75% of the relief valve rating is reached. Read and record the left wing deck valve loaded flow.

10. Open flow meter valve, disengage switches, and stop engine.

11. Calculate left wing deck valve leakage.
   (Step 9 from previous test – Step 9 from previous test x 100 = Leak Percentage)

   Is left wing deck valve leakage 10% or less?
   YES The left wing deck valve is good. Proceed to step 12.
   NO Proceed to next question.

   Is left wing deck valve leakage 11% to 20%?
   YES The left wing deck valve is marginal. Additional testing is required. Proceed to step 12.
   NO Proceed to next question.

   Is left wing deck valve leakage 21% or more?
   YES Repair or replace left wing deck valve. (See “Left Wing Deck Valve” on page 6-93, then proceed to step 12.

   CAUTION
   Do not exceed 3350 psi (231 bar) when testing system relief valve or equipment damage may occur.

   NOTE
   Verify engine rpm is within specification (2400 rpm ± 50) to ensure accurate hydraulic test results.

   12. Start engine and run at 2400 rpm ± 50.
   14. Continue to close flow meter valve until zero flow is obtained. Record left wing deck valve system relief valve pressure.
15. Open flow meter valve, disengage switches, and stop engine.

**Is left wing deck valve system relief valve pressure 2700–3300 psi (186–228 bar)?**

**YES**  Left wing deck valve system relief valve is good. Proceed to step 6 on page 6-67.

**NO**  Adjust left wing deck valve system relief valve pressure. (See “Left Wing Deck Valve System Relief Valve Pressure Adjustment” on page 6-67.)

### Left Wing Deck Valve System Relief Valve Pressure Adjustment

See Figure 6-67.

#### WARNING

The hydraulic system is under pressure, and the oil will be hot.
- Always relieve pressure in the hydraulic system before performing service.
- Failure to follow appropriate safety precautions may result in death or serious injury.

#### Required Tools and Materials

- Flow Meter
- -10 ORFS Test Hose 5000 psi (345 bar)
- -10 ORFS Tee Fitting
- -10 ORFS Blocking Disk

#### NOTE

This adjustment should be done in conjunction with left wing deck valve test.

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Perform left wing deck valve test. (See “Left Wing Deck Valve Test” on page 6-65.)

3. Loosen nut (1).
4. Rotate screw (2) to adjust the relief valve pressure setting.
   - To increase the pressure setting: Turn the screw in (clockwise).
   - To decrease the pressure setting: Turn the screw out (counterclockwise).
5. Tighten nut (1).

**Could relief valve be adjusted to achieve 2700–3300 psi (186–228 bar)?**

**YES**  Left wing deck valve system relief valve is good. Proceed to “Left Wing Cutting Units Motors Test” on page 6-68.

**NO**  Repair or replace left wing deck valve system relief valve. (See “Left Wing Deck Valve” on page 6-93.)

6. (See Figure 6-64.) Disconnect hydraulic hose at fitting (1) on left wing outside motor and remove blocking disk. Reconnect hydraulic hose to left wing outside motor.
7. Proceed to “Left Wing Cutting Units Motors Test” on page 6-68.
Left Wing Cutting Units Motors Test

See Figures 6-68 through 6-71.

**IMPORTANT**

- This test works together with the left wing cutting units circuit test, left wing cutting units pump test, and left wing deck valve test to isolate a problem with the left wing cutting units circuit.
- Performing this test will isolate the left wing cutting units motors from the rest of the left wing cutting units circuit.

**WARNING**

The hydraulic system is under pressure, and the oil will be hot.
- Always relieve pressure in the hydraulic system before performing service.
- Failure to follow appropriate safety precautions may result in death or serious injury.

**NOTE**

Verify engine rpm is within specification (2400 rpm ± 50) to ensure accurate hydraulic test results.

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Before performing this test, perform “Left Wing Deck Valve Test,” leaving flow meter connected as outlined. (See “Left Wing Deck Valve Test” on page 6-65.)
3. Bypass seat switch and set park brake.
4. Install suitable blocking device or tool in left wing outside motor, preventing left wing outside motor from turning.
5. Open flow meter valve (1) completely.
6. Start engine and run at 2400 rpm ± 50.
7. Engage 4WD switch and mow switch.
8. Use the flow meter to warm the hydraulic oil. Turn the flow meter valve until a reading of 1500 psi (103 bar) or 50% of the relief valve rating is reached. Warm oil to 120–150° F (49–65° C); open valve fully after operating temperature is reached.

**Required Tools and Materials**

- Flow Meter
- -10 ORFS Test Hose 5000 psi (345 bar)
- -10 ORFS Tee Fitting
- Blocking Device or Tool

Safely block cutting unit from rotating using a suitable device or tool. Failure to follow appropriate safety precaution may result in death or serious injury.
9. Slowly close flow meter valve until pressure reaches 2250 psi (155 bar) or 75% of the relief valve rating is reached. Read and record the left wing outside motor loaded flow.

10. Open flow meter valve, disengage switches, and stop engine.

11. Calculate left wing outside motor leakage.
   (Step 9 on page 66 from “Left Wing Deck Valve Test” – Step 9 / Step 9 on page 66 from “Left Wing Deck Valve Test” x 100 = Leak Percentage)

   **Is left wing outside motor leakage 10% or less?**
   - **YES**  The left wing outside motor is good. Proceed to step 12.
   - **NO**  Proceed to next question.

   **Is left wing outside motor leakage 11% to 20%?**
   - **YES**  The left wing outside motor is marginal. Additional testing is required. Proceed to step 12.
   - **NO**  Proceed to next question.

   **Is left wing outside motor leakage 21% or more?**
   - **YES**  Repair or replace left wing outside motor. See “Deck Motors” on page 6-85, then proceed to step 12.

12. Remove device or tool from left wing outside motor.

13. Install suitable blocking device or tool in left wing center motor, preventing left wing center motor from turning.

14. Open flow meter valve completely.

15. Bypass seat switch and set park brake.

   **NOTE**
   Verify engine rpm is within specification (2400 rpm ± 50) to ensure accurate hydraulic test results.

16. Start engine and run at 2400 rpm ± 50.

17. Engage 4WD switch and mow switch.

18. Use the flow meter to warm the hydraulic oil. Turn the flow meter valve until a reading of 1500 psi (103 bar) or 50% of the relief valve rating is reached. Warm oil to 120–150° F (49–65° C); open valve fully after operating temperature is reached.

19. Slowly close flow meter valve until pressure reaches 2250 psi (155 bar) or 75% of the relief valve rating is reached. Read and record the left wing center motor loaded flow.

20. Open flow meter valve, disengage switches, and stop engine.
21. Calculate left wing center motor leakage. 
   (Step 9 – Step 19 / Step 9 x 100 = Leak Percentage)

   **Is left wing center motor leakage 10% or less?**
   - **YES** The left wing center motor is good. Proceed to step 22.
   - **NO** Proceed to next question.

   **Is left wing center motor leakage 11% to 20%?**
   - **YES** The left wing center motor is marginal. Additional testing is required. Proceed to step 22.
   - **NO** Proceed to next question.

   **Is left wing center motor leakage 21% or more?**
   - **YES** Repair or replace left wing center motor. See “Deck Motors” on page 6-85, then proceed to step 22.

22. Remove device or tool from left wing center motor.

**WARNING**

Safely block cutting unit from rotating using a suitable device or tool. Failure to follow appropriate safety precaution may result in death or serious injury.

23. Install suitable blocking device or tool in left wing inside motor, preventing left wing inside motor from turning.

24. Open flow meter valve completely.

25. Bypass seat switch and set park brake.

**NOTE**

*Verify engine rpm is within specification (2400 rpm ± 50) to ensure accurate hydraulic test results.*

26. Start engine and run at 2400 rpm ± 50.

27. Engage 4WD switch and mow switch.

28. Use the flow meter to warm the hydraulic oil. Turn the flow meter valve until a reading of 1500 psi (103 bar) or 50% of the relief valve rating is reached. Warm oil to 120–150°F (49–65°C); open valve fully after operating temperature is reached.

29. Slowly close flow meter valve until pressure reaches 2250 psi (155 bar) or 75% of the relief valve rating is reached. Read and record the left wing inside motor loaded flow.

30. Open flow meter valve, disengage switches, and stop engine.
31. Calculate left wing inside motor leakage.
   (Step 19 – Step 29 / Step 19 x 100 = Leak Percentage)

   **Is left wing inside motor leakage 10% or less?**
   
   **YES**  The left wing inside motor is good. Proceed to step 32.
   
   **NO**  Proceed to next question.

   **Is left wing inside motor leakage 11% to 20%?**
   
   **YES**  The left wing inside motor is marginal. Determine component(s) with greatest leakage and repair or replace as necessary.
   
   **NO**  Proceed to next question.

   **Is left wing inside motor leakage 21% or more?**
   
   **YES**  Repair or replace left wing inside motor. (See “Deck Motors” on page 6-85.)
   
32. Remove device or tool from left wing inside motor.
33. Disconnect and remove test equipment. Install all hoses, lines, and fittings as noted prior to removal.
34. Install and connect all components as noted prior to test.
35. Check hydraulic oil level. Add oil as necessary. (Refer to “Parts and Maintenance Manual” for correct oil specifications.)

### Lift/Steering Relief Valve Pressure Test

See Figures 6-72 through 6-74.

**NOTE**

Before performing this test, perform field test procedures. (See “Field Test Procedures” on page 6-28.)

**WARNING**

The hydraulic system is under pressure, and the oil will be hot.

- Always relieve pressure in the hydraulic system before performing service.
- Failure to follow appropriate safety precautions may result in death or serious injury.

#### Required Tools and Materials

- Pressure Gauge 5000 psi (345 bar)
- -8 ORFS Test Hose 5000 psi (345 bar)
- -8 ORFS Tee Fitting

1. Operate hydraulic system until oil temperature is at 120–150° F (49–65° C).
2. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
3. Remove seat and seat pan.
4. Install tee fitting between fitting (2) and hose (1).
5. Connect test hose from tee fitting to pressure gauge (3).

7. Start engine and run at full throttle (2700 rpm ± 50).

**CAUTION**
Do not run mower lift relief valve over relief longer than 10 seconds or damage may occur to hydraulic system.

8. Raise the front deck and hold lever in the raise position.
9. Record pressure reading.
10. Stop engine.

**Is lift relief pressure 1500 ± 10% (103 ± 10%)?**

**YES** Lift relief valve is good. Proceed to step 11.

**NO** Test lift/steer pump. (See “Lift/Steer Pump Test” on page 6-73.) Test lift cylinders. (See “Front Lift Cylinders Leakage Test” on page 6-28.) Replace lift relief valve. (See “Lift Valve” on page 6-87.)

**NOTE**
Verify engine rpm is within specification (2700 rpm ± 50) to ensure accurate hydraulic test results.

11. Start engine and run at full throttle (2700 rpm ± 50).

**CAUTION**
Do not run mower steering relief valve over relief longer than 10 seconds or damage may occur to hydraulic system.

12. Turn the steering wheel fully right against stop.
13. Record pressure reading.

**Is steering relief pressure 1500 ± 10% (103 ± 10%)?**

**YES** Steering relief valve is good. Proceed to step 15.

**NO** Test lift/steer pump. (See “Lift/Steer Pump Test” on page 6-73.) Test steering cylinder. (See “Steering Leakage Test” on page 6-30.) Adjust steering relief valve. (See “Steering Relief Valve Adjustment” on page 6-74.)

15. Disconnect and remove test equipment. Install all hoses and fittings as noted prior to removal.
16. Install and connect all components as noted prior to test.
17. Check hydraulic oil level. Add oil as necessary. (Refer Parts and Maintenance Manual for correct oil specifications.)

**Lift/Steer Pump Test**
See Figures 6-75 through 6-77.

**WARNING**
The hydraulic system is under pressure, and the oil will be hot.
- Always relieve pressure in the hydraulic system before performing service.
- Failure to follow appropriate safety precautions may result in death or serious injury.

**Required Tools and Materials**
- Flow Meter
- -8 ORFS Test Hose 5000 psi (345 bar)
- -8 ORFS Tee Fitting
- -8 ORFS Blocking Disk

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Remove seat and seat pan.

3. Disconnect hydraulic hose (1) from fitting (2).

4. Install tee fitting (5) to fitting (2).
5. Connect test hose (6) of flow meter inlet and hydraulic hose (1) to tee fitting (5).
6. Install blocking disk between hydraulic hose (1) and tee fitting (5) and connect hose to tee fitting.

**NOTE**
Make sure hose end is under oil level in hydraulic tank to prevent aeration of oil.
7. Secure flow meter outlet hose (3) to the hydraulic tank fillneck.
8. Open flow meter valve (4) completely.

**NOTE**
Verify engine rpm is within specification (2700 rpm ± 50) to ensure accurate hydraulic test results.

10. Start engine and run at 2700 rpm ± 50.

11. Use the flow meter to warm the hydraulic oil. Turn the flow meter valve until a reading of 750 psi (52 bar) or 50% of the relief valve rating is reached. Warm oil to 120–150°F (49–65°C); open valve fully after operating temperature is reached.

12. Read and record no load flow.

13. Slowly close flow meter valve until pressure reaches 1125 psi (78 bar) or 75% of the relief valve rating is reached. Read and record the lift/steer pump loaded flow.

14. Open flow meter valve and stop engine.

15. Calculate lift/steer pump leakage.

   \((\text{Step 12} – \text{Step 13} / \text{Step 12} \times 100 = \text{Leak Percentage})\)

   - **Is lift/steer pump leakage 10% or less?**
     - **YES** The lift/steer pump is good. Proceed to step 16.
     - **NO** Proceed to next question.

   - **Is lift/steer pump leakage 11% to 20%?**
     - **YES** The lift/steer pump is marginal. Proceed to step 16.
     - **NO** Proceed to next question.

   - **Is lift/steer pump leakage 21% or more?**
     - **YES** Repair or replace lift/steer pump. See “2-Section Pump” on page 6-77, then proceed to step 16.

16. Disconnect and remove test equipment. Install all hoses and fittings as noted prior to removal.

17. Install and connect all components as noted prior to test.

18. Check hydraulic oil level. Add oil as necessary. (Refer Parts and Maintenance Manual for correct oil specifications.)


### Steering Relief Valve Adjustment

See Figures 6-78 and 6-79.

**WARNING**
The hydraulic system is under pressure, and the oil will be hot.
- Always relieve pressure in the hydraulic system before performing service.
- Failure to follow appropriate safety precautions may result in death or serious injury.

**Required Tools and Materials**
- Pressure Gauge 5000 psi (345 bar)
- -8 ORFS Test Hose 5000 psi (345 bar)
- -8 ORFS Tee Fitting
- 8 mm Allen Wrench
NOTE
This adjustment should be done in conjunction with lift/steering relief valve pressure test.
1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Perform lift/steering relief valve pressure test. (See “Lift/Steering Relief Valve Pressure Test” on page 6-71.)
3. Remove steering column. (See “Steering Column” on page 7-7.)
4. Support steering unit (4).
5. Remove four screws (1), four lock washers (2), four spacers (3), and steering unit (4).
6. Remove plastic plug (5).
7. Using 8 mm Allen wrench (6), adjust steering relief valve.
   Turning adjusting screw (7) clockwise increases pressure.
   Turning adjusting screw (7) counterclockwise decreases pressure.
8. Place steering unit and steering column in place and check steering relief pressure. (See “Lift/Steering Relief Valve Pressure Test” on page 6-71.)
9. Repeat Steps 7 and 8 as required to achieve steering relief pressure of 1500 ± 10% psi (103 ± 10% bar).
   Could relief valve be adjusted to achieve 1500 ± 10% psi (103 ± 10% bar)?
   YES Steering relief valve is good. Proceed to step 10.
   NO Repair or replace steering relief valve. See “Steering Unit” on page 7-8, then proceed to step 10.
10. Insert plastic plug.
11. Install steering unit and steering column.
12. Disconnect and remove test equipment. Install all hoses and fittings as noted prior to removal.
13. Install and connect all components as noted prior to test.
14. Check hydraulic oil level. Add oil as necessary. (Refer Parts and Maintenance Manual” for correct oil specifications.)
Repair

Hydraulic Oil Tank—Drain Procedure

See Figure 6-80.

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)

**NOTE**
The hydraulic oil tank capacity is 45 gal (170 L). Have suitable container(s) that can hold up to 55 gal (208 L) when draining hydraulic oil.

2. Place a suitable container beneath hydraulic oil tank (2).

3. Remove plug (1).

4. Loosen the hydraulic oil tank cap to provide a vent for draining oil.

**Installation Notes**

- Ensure new O-ring is in place before installing plug.
- Replace hydraulic oil return filter. (See “Hydraulic Oil Return Filter Assembly” on page 6-99.)
- Replace hydraulic oil charge filter. (See “Hydraulic Oil Charge Filter Assembly” on page 6-99.)
- Refill hydraulic tank. (Refer to “Parts and Maintenance Manual” for correct oil specifications.)
- Start engine. Check hydraulic system for leaks. Repair as necessary.
- Check hydraulic oil level. Add oil as necessary.

**Required Materials**

<table>
<thead>
<tr>
<th>O-Ring (Jacobsen PN 339899)</th>
<th></th>
</tr>
</thead>
</table>

Figure 6-80
2-Section Pump

Removal and Installation

See Figure 6-81.

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Drain hydraulic oil tank. (See “Hydraulic Oil Tank—Drain Procedure” on page 6-76.)
3. Remove seat and seat pan. (See “Seat and Seat Pan” on page 9-14.)

![Figure 6-81](image)

Installation Notes

- Install 2-section pump by reversing the order of removal.
- Adjust brackets (12 and 15) as necessary so that the 2-section pump is securely supported without stress on the brackets.
- Ensure new O-rings are in place before installing hoses on fittings.
- Replace hydraulic oil return filter. (See “Hydraulic Oil Return Filter Assembly” on page 6-99.)
- Replace hydraulic oil charge filter. (See “Hydraulic Oil Charge Filter Assembly” on page 6-99.)
- Refill hydraulic tank. (Refer to “Parts and Maintenance Manual” for correct oil specifications.)
- Start engine. Check hydraulic system for leaks. Repair as necessary.
- Check hydraulic oil level. Add oil as necessary.

NOTES

- Label all hydraulic hoses and tubes before disconnecting to ensure correct installation.
- Close all openings with caps or plugs to prevent contamination.

4. Disconnect hoses (6 and 7).
5. Loosen hose clamp (2) and disconnect hose (1).
6. Remove two nuts (8), lock washers (9), flat washers (10), and screws (11).
7. Support 2-section pump (16).
8. Remove two screws (4) and lock washers (5), and disengage 2-section pump from traction pump.
9. Remove 2-section pump (16).
10. Remove O-ring (3).
11. Remove two nuts (13), lock washers (14), and bracket (15) from 2-section pump (16).
Disassembly, Inspection, and Assembly

See Figures 6-82 through 6-84.

**Figure 6-82**

**NOTE**

Record the location and orientation of fittings before removing to ensure correct installation.

1. Remove four screws (1) and lock washers (2), and remove, inspect, and replace flange fitting (3) and O-ring (4) as necessary.

2. Remove, inspect, and replace outlet port elbow fitting (5) and outlet port fitting (6) as necessary.
Disassembly Notes

- Do not disassemble pump for repair unless test procedures indicate internal leakage.
- Never pry components apart. Use a soft-faced hammer, and gently tap housing and shaft to separate pump bodies.
- Scribe or mark the pump bodies and end covers before disassembly to aid in assembly. Recommended method of marking body sections is to use a fine point metal punch, making one indentation for section #1, two indentations for section #2, etc.
3. After removing bolts, disassemble pump, one section at a time. Before removing gear set, mark a line across meshing teeth to ensure that gears are reassembled in the same position.

4. Place parts, in assembly order, on a clean work area as they are removed.

5. Discard seals as they are removed.

**NOTICE**

<table>
<thead>
<tr>
<th>Inspection Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Keeping parts in assembly order, clean all parts using clean solvent, and dry using compressed air.</td>
</tr>
<tr>
<td>• Look for metal chips or slivers during cleaning (an indication of damage to pump or other hydraulic component).</td>
</tr>
<tr>
<td>• Inspect all parts for cracks, nicks, burrs, and excessive wear. Inspect for scoring, galling, and scratches on surfaces. Damage or excessive wear to pump components other than seal kit components (13, 14, 15, and 23) requires pump replacement.</td>
</tr>
</tbody>
</table>

**NOTICE**

<table>
<thead>
<tr>
<th>Assembly Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>It is important that all pump parts are absolutely clean, as contamination can result in serious damage and/or improper operation.</td>
</tr>
<tr>
<td>Never use shop towels or rags to dry parts after cleaning, as lint may clog passages. Dry parts using compressed air.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Required Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Front Section Seal Kit (Jacobsen PN 5003165)</td>
</tr>
<tr>
<td>• Rear Section Seal Kit (Jacobsen PN 5003166)</td>
</tr>
</tbody>
</table>

- Assemble 2-section pump by reversing the order of disassembly.
- Use new seal kits during assembly.
- Apply a coat of clean hydraulic oil to all parts to ease assembly.
- Assemble pump one, section at a time, building up from flange section.
- Remove alignment mark from gear sets after gears have been installed with teeth in proper mesh.
- Make sure that bushing sets are correctly installed to properly position the high-pressure seals.
- Rotate drive shaft by hand after assembling each section to make sure there is no binding between parts; do not force.
- Use extreme care when installing shaft seal. Seal must seat squarely in seal bore. Use caution not to damage seal when installing cover over pump shaft.
- Install stud bolts and nuts (9 and 7) and retaining bolts (10) finger tight and rotate drive shaft to make sure it turns freely. Tighten stud bolts and nuts (9 and 7) and retaining bolts (10) evenly in steps to a final torque of 32–36 lb-ft (43–49 N·m) and check rotation of pump drive shaft.
- Tighten outlet port elbow fitting (5) to 60 lb-ft (81 N·m).
- Tighten outlet port fitting (6) to 30 lb-ft (41 N·m).
3-Section Pump

Removal and Installation
See Figures 6-85 through 6-87.

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Drain hydraulic oil tank. (See “Hydraulic Oil Tank—Drain Procedure” on page 6-76.)
3. Remove left side skirt. (See “Skirts” on page 9-9.)
4. Remove batteries and battery tray. (See “Batteries and Battery Tray” on page 4-98.)

5. Loosen hose clamps (1 and 3) and disconnect hoses (2 and 4).
6. Disconnect hoses (9–11).
7. Support 3-section pump (8).
8. Remove four screws (5), lock washers (6), and flat washers (7), and remove 3-section pump.

9. Loosen hub screw (12) and remove hub (13) from 3-section pump shaft.

Installation Notes
- Install 3-section pump by reversing the order of removal.
- Ensure new O-rings are in place before installing hoses on fittings.
- Assemble hub (13) onto pump shaft 2.25 ± 0.03 in. (57 ± 0.8 mm) from front of hub to pump flange (14).
- Tighten hub screw (12) to 42 lb-ft (57 N·m).
- Tighten mounting screws (5) to 80 lb-ft (108 N·m).
- Replace hydraulic oil return filter. (See “Hydraulic Oil Return Filter Assembly” on page 6-99.)
- Replace hydraulic oil charge filter. (See “Hydraulic Oil Charge Filter Assembly” on page 6-99.)
- Refill hydraulic tank. (Refer to “Parts and Maintenance Manual” for correct oil specifications.)
- Start engine. Check hydraulic system for leaks. Repair as necessary.
- Check hydraulic oil level. Add oil as necessary.

NOTES
- Label all hydraulic hoses and tubes before disconnecting to ensure correct installation.
- Close all openings with caps or plugs to prevent contamination.
5. Loosen hose clamps (1 and 3) and disconnect hoses (2 and 4).
Disassembly, Inspection, and Assembly

See Figures 6-88 through 6-90.

Figure 6-88

![Diagram of components](image)

**NOTE**
Record the location and orientation of fittings before removing to ensure correct installation.

1. Remove eight screws (3) and lock washers (4), and remove, inspect, and replace two flange fittings (2) and O-rings (5) as necessary.
2. Remove, inspect, and replace outlet port fittings (1) as necessary.
Disassembly Notes

- Do not disassemble pump for repair unless test procedures indicate internal leakage.
- Never pry components apart. Use a soft-faced hammer, and gently tap housing and shaft to separate pump bodies.
- Scribe or mark the pump bodies and end covers before disassembly to aid in assembly. Recommended method of marking body sections is to use a fine point metal punch, making one indentation for section #1, two indentations for section #2, etc.

Figure 6-89
3. After removing bolts, disassemble pump, one section at a time. Before removing gear set, mark a line across meshing teeth to ensure that gears are reassembled in the same position.

4. Place parts, in assembly order, on a clean work area as they are removed.

5. Discard seals as they are removed.

NOTICE

Inspection Notes
- Keeping parts in assembly order, clean all parts using clean solvent, and dry using compressed air.
- Look for metal chips or slivers during cleaning (an indication of damage to pump or other hydraulic component).
- Inspect all parts for cracks, nicks, burrs, and excessive wear. Inspect for scoring, galling, and scratches on surfaces. Damage or excessive wear to pump components other than seal kit components (11, 12, 13, and 23) requires pump replacement.

Assembly Notes

NOTICE

It is important that all pump parts are absolutely clean, as contamination can result in serious damage and/or improper operation. Never use shop towels or rags to dry parts after cleaning, as lint may clog passages. Dry parts using compressed air.

Required Materials

- Front Section Seal Kit (Jacobsen PN 5003163)
- Mid and Rear Section Seal Kit (Jacobsen PN 5003164)
- Assemble 3-section pump by reversing the order of disassembly.
- Use new seal kits during assembly.
- Apply a coat of clean hydraulic oil to all parts to ease assembly.
- Assemble pump one, section at a time, building up from flange section.
- Remove alignment mark from gear sets after gears have been installed with teeth in proper mesh.
- Make sure that bushing sets are correctly installed to properly position the high-pressure seals.
- Rotate drive shaft by hand after assembling each section to make sure there is no binding between parts; do not force.
- Use extreme care when installing shaft seal. Seal must seat squarely in seal bore. Use caution not to damage seal when installing cover over pump shaft.
- Install stud bolts and nuts (8 and 6) and retaining bolts (9) finger tight and rotate drive shaft to make sure it turns freely. Tighten stud bolts and nuts (8 and 6) and retaining bolts (9) evenly in steps to a final torque of 32–36 lb-ft (43–49 N·m) and check rotation of pump drive shaft.
- Tighten outlet port fittings (1) to 110 lb-ft (149 N·m).
Deck Motors

Removal and Installation

**NOTE**
- See Chapter 8—Cutting Units for deck motor service information. (See “Deck Motors” on page 8-15.)

Weight Transfer Valve

Removal and Installation

See Figures 6-91 through 6-94.

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Move seat to rear position.
3. Disconnect battery negative (−) cables from batteries.

**NOTE**
The weight transfer valve is located under the control panel.

4. Remove heat shield. (See “Heat Shield” on page 9-12.)

5. Disconnect wire connector (6).
6. Loosen two set screws (7) and remove weight transfer valve knob (1).
7. Lift and remove raise/lower lever knobs (2).
8. Lift and remove throttle lever knob (4).
9. Raise instrument panel (5).

10. Remove three screws (9), lock washers (10), flat washers (11), nuts (12), and dash panel stop (3).

**NOTE**
When moving the instrument panel, use caution to prevent stretching or pinching the wires.

11. Carefully move and secure instrument panel (5) toward rear of machine.

**NOTES**
- Label hydraulic hoses and tubes to ensure correct installation.
- Close all openings with caps or plugs to prevent contamination.

12. Disconnect hydraulic hose (13).
13. Remove roll pin (8).

**NOTE**
14. Two spacers (15) are installed on pin (14). Note the location of the spacers and recover the spacers when removing pin.
15. Remove pin (14) and two spacers (15).
NOTES

- Label hydraulic hoses and tubes to ensure correct installation.
- Close all openings with caps or plugs to prevent contamination.

17. Remove control panel mounting screws (16), lock washers (17), and flat washers (18).
18. Remove lift valve mounting screws (19), lock washers (20), and nuts (21).
19. Remove control panel mounting screw (23), lock washer (24), and flat washer (25).

20. Disconnect hydraulic tube (31).
21. Remove two screws (26), two lock washers (27), four flat washers (28), and two nuts (29).
22. Remove weight transfer valve (30).

Installation Notes

- Install weight transfer valve by reversing the order of removal.
- Ensure new O-rings are in place before installing hoses and tubes on fittings.
- Apply dielectric grease (Jacobsen PN 365422) to any wire connectors disconnected.
- Replace hydraulic oil return filter. (See “Hydraulic Oil Return Filter Assembly” on page 6-99.)
- Replace hydraulic oil charge filter. (See “Hydraulic Oil Charge Filter Assembly” on page 6-99.)
- Connect battery negative (−) cables to batteries.
- Start engine. Check hydraulic system for leaks. Repair as necessary.
- Check hydraulic oil level. Add oil as necessary.
Control Panel

**Removal and Installation**

See Figure 6-95.

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Move seat to rear position.
3. Remove throttle lever. (See “Throttle Lever” on page 3-14.)
4. Remove weight transfer valve. (See “Weight Transfer Valve” on page 6-85.)

5. Remove two screws (7), flat washers (5), lock washers (3), nuts (2), and control panel support (8) from control panel (1).

6. Remove screw (6), flat washer (5), lock washer (3), nut (2), and throttle stop (4) from control panel (1).

**Installation Notes**

- Install control panel by reversing the order of removal.
- Adjust position of control panel support (8) as necessary for proper alignment of control panel to heat shield.

---

Lift Valve

**Removal and Installation**

See Figures 6-96 through 6-101.

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Move seat to rear position.
3. Drain hydraulic tank. (See “Hydraulic Oil Tank—Drain Procedure” on page 6-76.)
4. Disconnect battery negative (–) cables from batteries.

**NOTE**
The lift valve is located under the control panel.

5. Remove heat shield. (See “Heat Shield” on page 9-12.)

6. Disconnect wire connector (6).

7. Loosen two set screws (7) and remove weight transfer valve knob (1).

8. Lift and remove raise/lower lever knobs (2).

9. Lift and remove throttle lever knob (4).

10. Raise instrument panel (5).

**NOTE**
Label wire connectors before disconnecting to ensure correct installation.

---

Figure 6-95

Figure 6-96
11. Remove three screws (9), lock washers (10), flat washers (11), nuts (12), and dash panel stop (3).

**NOTE**

When moving the instrument panel, use caution to prevent stretching or pinching the wires.

12. Carefully move and secure instrument panel (5) toward rear of machine.

**NOTES**

- Label hydraulic hoses and tubes to ensure correct installation.
- Close all openings with caps or plugs to prevent contamination.

13. Disconnect hydraulic hose (13).

14. Remove roll pin (8).

**NOTE**

15. Two spacers (15) are installed on pin (14). Note the location of the spacers and recover the spacers when removing pin.

16. Remove pin (14) and two spacers (15).


18. Disconnect hydraulic tube (24).

19. Remove control panel mounting screws (16), lock washers (17), and flat washers (18).

20. Remove control panel mounting screw (21), lock washer (22), and flat washer (23).

**NOTES**

- Label hydraulic hoses and tubes to ensure correct installation.
- Close all openings with caps or plugs to prevent contamination.

22. Disconnect hydraulic tube (29).

Figure 6-100

23. Support lift valve assembly (33).
24. Remove lift valve mounting screws (30), lock washers (31), and nuts (32).
25. Remove lift valve assembly (33).

Figure 6-101

26. Disconnect three master links (35) from lift valve (34).

Installation Notes
- Install lift valve by reversing the order of removal.
- Ensure new O-rings are in place before installing hoses and tubes on fittings.
- Apply dielectric grease (Jacobsen PN 365422) to any wire connectors disconnected.
- Replace hydraulic oil return filter. (See “Hydraulic Oil Return Filter Assembly” on page 6-99.)
- Replace hydraulic oil charge filter. (See “Hydraulic Oil Charge Filter Assembly” on page 6-99.)
- Refill hydraulic tank. (Refer to “Parts and Maintenance Manual” for correct oil specifications.)
- Connect battery negative (–) cables to batteries.
- Start engine. Check hydraulic system for leaks. Repair as necessary.
- Check hydraulic oil level. Add oil as necessary.

Disassembly, Inspection, and Assembly
See Figures 6-102 and 6-103.

Figure 6-102

NOTE
Record the location and orientation of fittings before removing to ensure correct installation.
1. Remove, inspect, and replace fittings (1) for IN and OUT ports as necessary.
2. Remove, inspect, and replace fittings (2) for ports “B” and “D” as necessary.
3. Remove, inspect, and replace fittings (3) for ports “F,” “A,” and “E” as necessary.
Figure 6-103

4. Clean all parts using clean solvent, and dry using compressed air.
5. Inspect all parts for wear or damage. Replace parts as necessary.

Assembly Notes

NOTICE

It is important that all component parts are absolutely clean, as contamination can result in serious damage and/or improper operation. Never use shop towels or rags to dry parts after cleaning, as lint may clog passages. Dry parts using compressed air.

Required Materials

- Detent Repair Kit (Jacobsen PN 5001612)
- Seal Kit (Jacobsen PN 558010)

- Assemble lift valve by reversing the order of disassembly.
- Use a new detent repair kit and seal kit during assembly.
- Lubricate all O-rings prior to assembly.
- Tighten plunger detent plugs (4) to 4–5 lb-ft (5–7 N·m).
- Tighten hex plugs (5) to 10–12 lb-ft (14–16 N·m).
- Tighten caps (16) to 20–25 lb-ft (27–34 N·m).
- Tighten port adapter plugs (20) to 30–35 lb-ft (41–47 N·m).
- Tighten fittings (1) for IN and OUT ports to 60 lb-ft (81 N·m).
- Tighten fittings (2) for ports “B” and “D” to 35 lb-ft (47 N·m).
- Tighten fittings (3) for ports “F,” “A,” and “E” to 35 lb-ft (47 N·m).
**Right Wing Deck Valve**

**Removal and Installation**

See Figure 6-104.

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Drain hydraulic oil tank. (See “Hydraulic Oil Tank—Drain Procedure” on page 6-76.)

**NOTE**

The right wing deck valve is located at the outside of the right radiator bracket.

3. Thoroughly clean the valve, especially the area surrounding the hydraulic hoses, tubes, and fittings.

4. Disconnect wire connector (10) from solenoid.

**NOTES**

- Label all hydraulic hoses and tubes before disconnecting to ensure correct installation.
- Close all openings with caps or plugs to prevent contamination.

5. Disconnect hydraulic tubes (1 and 2).
6. Disconnect hydraulic hoses (7 and 8).
7. Support the right wing deck valve (9).
8. Remove two mounting screws (3), flat washers (4), lock washers (5), and nuts (6).
9. Remove right wing deck valve (9).

**Installation Notes**

- Install right wing deck valve by reversing the order of removal.
- Make sure new O-rings are in place before installing hoses and tubes on fittings.
- Apply dielectric grease (Jacobsen PN 365422) to any wire connectors disconnected.
- Replace hydraulic oil return filter. (See “Hydraulic Oil Return Filter Assembly” on page 6-99.)
- Replace hydraulic oil charge filter. (See “Hydraulic Oil Charge Filter Assembly” on page 6-99.)
- Refill hydraulic tank. (Refer to “Parts and Maintenance Manual” for correct oil specifications.)
- Start engine. Check hydraulic system for leaks. Repair as necessary.
- Check hydraulic oil level. Add oil as necessary.

**Disassembly, Inspection, and Assembly**

See Figures 6-105 and 6-106.
Figure 6-106

**NOTE**

Plug (9) is located opposite diagnostic port “D.”

4. Clean all parts using clean solvent, and dry using compressed air.

5. Inspect all parts for wear or damage. Replace parts as necessary.

---

**Assembly Notes**

**NOTICE**

It is important that all component parts are absolutely clean, as contamination can result in serious damage and/or improper operation. Never use shop towels or rags to dry parts after cleaning, as lint may clog passages. Dry parts using compressed air.

**Required Materials**

- Relief Valve Seal Kit (Jacobsen PN 5003579)
- Blade Brake Relief Valve Seal Kit (Jacobsen PN 5003554)
- Plug O-Ring (Jacobsen PN 339897)
- Solenoid Valve Seal Kit (Jacobsen PN 5003579)

- Assemble the right wing deck valve by reversing the order of disassembly.
- Use a new relief valve seal kit, blade brake relief valve seal kit, solenoid valve seal kit, and plug O-ring during assembly.
- Lubricate all O-rings prior to assembly.
- Tighten blade brake relief valve (5) to 33–37 lb·ft (45–50 N·m).
- Tighten relief valve (6) to 24–26 lb·ft (32.5–35.3 N·m).
- Tighten solenoid valve (8) to 24–26 lb·ft (32.5–35.3 N·m).
- Tighten coil nut (7) to 5 lb·ft (6.8 N·m) maximum.
- Tighten port “D” diagnostic fitting (2) to 17 lb·ft (23 N·m).
- Tighten fittings (3) for ports “A,” “B,” and “P” to 60 lb·ft (81.4 N·m).
- Tighten port “T” fitting (4) to 60 lb·ft (81.4 N·m).
- Apply dielectric grease (Jacobsen PN 365422) to any wire connectors disconnected.
Left Wing Deck Valve

Removal and Installation

See Figure 6-107.

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Drain hydraulic oil tank. (See “Hydraulic Oil Tank—Drain Procedure” on page 6-76.)

**NOTE**
The left wing deck valve is located at the outside of the left radiator bracket.

3. Thoroughly clean the valve, especially the area surrounding the hydraulic hoses, tubes, and fittings.

4. Disconnect wire connector (1) from solenoid.

**NOTES**
- Label all hydraulic hoses and tubes before disconnecting to ensure correct installation.
- Close all openings with caps or plugs to prevent contamination.
5. Disconnect hydraulic tubes (9 and 10).
6. Disconnect hydraulic hoses (3 and 4).
7. Support the left wing deck valve (2).
8. Remove two mounting screws (5), flat washers (6), lock washers (7), and nuts (8).
9. Remove left wing deck valve (2).

**Installation Notes**
- Install left wing deck valve by reversing the order of removal.
- Make sure new O-rings are in place before installing hoses and tubes on fittings.
- Apply dielectric grease (Jacobsen PN 365422) to any wire connectors disconnected.
- Replace hydraulic oil return filter. (See “Hydraulic Oil Return Filter Assembly” on page 6-99.)
- Replace hydraulic oil charge filter. (See “Hydraulic Oil Charge Filter Assembly” on page 6-99.)
- Refill hydraulic tank. (Refer to “Parts and Maintenance Manual” for correct oil specifications.)
- Start engine. Check hydraulic system for leaks. Repair as necessary.
- Check hydraulic oil level. Add oil as necessary.

Disassembly, Inspection, and Assembly

See Figures 6-108 and 6-109.

**NOTE**
Record the location and orientation of fittings before removing to ensure correct installation.

1. Remove, inspect, and replace dust cap (3) and port “D” diagnostic fitting (2) as necessary.
2. Remove, inspect, and replace fittings (1) for ports “A,” “B,” and “P” as necessary.
3. Remove, inspect, and replace port “T” fitting (4) as necessary.
NOTE

Plug (9) is located opposite diagnostic port “D.”

4. Clean all parts using clean solvent, and dry using compressed air.

5. Inspect all parts for wear or damage. Replace parts as necessary.

Assembly Notes

NOTICE

It is important that all component parts are absolutely clean, as contamination can result in serious damage and/or improper operation. Never use shop towels or rags to dry parts after cleaning, as lint may clog passages. Dry parts using compressed air.

Required Materials

- Relief Valve Seal Kit (Jacobsen PN 5003579)
- Blade Brake Relief Valve Seal Kit (Jacobsen PN 5003554)
- Plug O-Ring (Jacobsen PN 339897)
- Solenoid Valve Seal Kit (Jacobsen PN 5003579)

- Assemble left wing deck valve by reversing the order of disassembly.
- Use a new relief valve seal kit, blade brake relief valve seal kit, solenoid valve seal kit, and plug O-ring during assembly.
- Lubricate all O-rings prior to assembly.
- Tighten blade brake relief valve (5) to 33–37 lb-ft (45–50 N·m).
- Tighten relief valve (8) to 24–26 lb-ft (32.5–35.3 N·m).
- Tighten solenoid valve (6) to 24–26 lb-ft (32.5–35.3 N·m).
- Tighten coil nut (7) to 5 lb-ft (6.8 N-m) maximum.
- Tighten port “D” diagnostic fitting (2) to 17 lb-ft (23 N-m).
- Tighten fittings (1) for ports “A,” “B,” and “P” to 60 lb-ft (81.4 N-m).
- Tighten port “T” fitting (4) to 60 lb-ft (81.4 N-m).
- Apply dielectric grease (Jacobsen PN 365422) to any wire connectors disconnected.
Front Deck Valves

Removal and Installation
See Figures 6-110 and 6-111.

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Drain hydraulic oil tank. (See “Hydraulic Oil Tank—Drain Procedure” on page 6-76.)

**NOTE**
The front deck valves are located on the front of the front axle.

3. Thoroughly clean the valve, especially the area surrounding the hydraulic hoses, tubes, and fittings.

**NOTES**
- Label all hydraulic hoses and tubes before disconnecting to ensure correct installation.
- Close all openings with caps or plugs to prevent contamination.

4. Disconnect hydraulic hoses (1 and 2) and hydraulic tubes (3 and 4).

**NOTE**
Label wire connectors before disconnecting to ensure correct installation.

5. Disconnect wire connectors (6 and 7) from solenoids.

**NOTES**
- Label all hydraulic hoses and tubes before disconnecting to ensure correct installation.
- Close all openings with caps or plugs to prevent contamination.

6. Disconnect hydraulic hoses (5, 8, 15, and 16).
7. Support the front deck valves (14 and 17).
8. Remove two nuts (9), two lock washers (10), four flat washers (11), two mounting screws (12), and two hose clamps (13).
9. Remove front deck valves (14 and 17).
Installation Notes

- Install front deck valves by reversing the order of removal.
- Make sure new O-rings are in place before installing hoses and tubes on fittings.
- Apply dielectric grease (Jacobsen PN 365422) to any wire connectors disconnected.
- Replace hydraulic oil return filter. (See “Hydraulic Oil Return Filter Assembly” on page 6-99.)
- Replace hydraulic oil charge filter. (See “Hydraulic Oil Charge Filter Assembly” on page 6-99.)
- Refill hydraulic tank. (Refer to “Parts and Maintenance Manual” for correct oil specifications.)
- Start engine. Check hydraulic system for leaks. Repair as necessary.
- Check hydraulic oil level. Add oil as necessary.
Disassembly, Inspection, and Assembly

See Figures 6-112 and 6-113.

**Figure 6-112**

![Diagram of hydraulic components]

**NOTE**

Record the location and orientation of fittings before removing to ensure correct installation.

1. Remove, inspect, and replace dust caps (1) and diagnostic fittings (2) as necessary.
2. Remove, inspect, and replace fittings (3) for ports “D” as necessary.
3. Remove, inspect, and replace fittings (4) for ports “A” and “B” as necessary.
4. Remove, inspect, and replace fittings (5) for ports “P” and “T” as necessary.
NOTES

• Left front deck valve is shown in Figure 6-113; right front deck valve has plug (10) on opposite side.
• Plug (10) is located opposite diagnostic port “D.”

Assembly Notes

NOTICE

It is important that all component parts are absolutely clean, as contamination can result in serious damage and/or improper operation.

Never use shop towels or rags to dry parts after cleaning, as lint may clog passages. Dry parts using compressed air.

Required Materials

• Relief Valve Seal Kit (Jacobsen PN 5003579)
• Blade Brake Relief Valve Seal Kit (Jacobsen PN 5003554)
• Plug O-Ring (Jacobsen PN 339897)
• Solenoid Valve Seal Kit (Jacobsen PN 5003579)

• Assemble front deck valves by reversing the order of disassembly.
• Use a new relief valve seal kit, blade brake relief valve seal kit, solenoid valve seal kit, and plug O-ring during assembly.
• Lubricate all O-rings prior to assembly.
• Tighten blade brake relief valve (6) to 33–37 lb-ft (45–50 N·m).
• Tighten relief valve (7) to 24–26 lb-ft (32.5–35.3 N·m).
• Tighten solenoid valve (9) to 24–26 lb-ft (32.5–35.3 N·m).
• Tighten coil nut (8) to 5 lb-ft (6.8 N·m) maximum.
• Tighten fittings (3) for ports “D” to 17 lb-ft (23 N·m).
• Tighten diagnostic fittings (2) to 33 lb-ft (44.7 N·m).
• Tighten fittings (4) for ports “A” and “B” to 60 lb-ft (81.4 N·m).
• Tighten fittings (5) for ports “P” and “T” to 60 lb-ft (81.4 N·m).
• Apply dielectric grease (Jacobsen PN 365422) to any wire connectors disconnected.
Hydraulic Oil Return Filter Assembly

Removal and Installation
See Figure 6-114.

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Remove caps. (See “Caps” on page 9-10.)
3. Remove radiator screen and shield. (See “Radiator Screen and Shield” on page 3-10.)
4. Drain hydraulic oil tank. (See “Hydraulic Oil Tank—Drain Procedure” on page 6-76.)

NOTES
• Label all hydraulic hoses and tubes to ensure correct installation.
• Close all openings with caps or plugs to prevent contamination.
5. Disconnect hydraulic hose (9).
6. Loosen hose clamp (6) and disconnect hydraulic hose (5) and fitting (4).
7. Support the hydraulic oil return filter assembly (8).
8. Remove three screws (1), lock washers (2), and flat washers (3).
9. Remove hydraulic oil return filter assembly (8).

Installation Notes
• Install hydraulic oil return filter assembly by reversing the order of removal.
• Replace hydraulic oil return filter (7).
• Refill hydraulic tank. (Refer to “Parts and Maintenance Manual” for correct oil specifications.)
• Start engine. Check hydraulic system for leaks. Repair as necessary.
• Check hydraulic oil level. Add oil as necessary.
NOTE

Label wire connectors before disconnecting to ensure correct installation.

8. Remove nut (15), washer (16), and wire (17).
9. Remove screw (19) and wire (20).
10. Support the left wing deck valve assembly (7) and the hydraulic oil charge filter assembly (18).

NOTES

- Label all hydraulic hoses and tubes to ensure correct installation.
- Close all openings with caps or plugs to prevent contamination.

11. Disconnect hydraulic tubes (10 and 13).
12. Remove four screws (11) and lock washers (12).
13. Remove hydraulic oil charge filter assembly (18).

Installation Notes

- Install hydraulic oil charge filter assembly by reversing the order of removal.
- Apply dielectric grease (Jacobsen PN 365422) to any wire connectors disconnected.
- Replace hydraulic oil charge filter (14).
- Refill hydraulic tank. (Refer to “Parts and Maintenance Manual” for correct oil specifications.)
- Start engine. Check hydraulic system for leaks. Repair as necessary.
- Check hydraulic oil level. Add oil as necessary.
Front Lift Cylinders

Removal and Installation
See Figure 6-117.

**NOTE**
Left front lift cylinder is shown; right front lift cylinder is similar.

**CAUTION**
Care must be taken to avoid damaging the surface of the cylinder rod during removal and installation.

1. Lower cutting units.
2. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
3. Remove floorboard. (See “Floorboard” on page 9-12.)

4. Disconnect hydraulic hose (15) from fitting (2).
5. Disconnect hydraulic hose (10) from fitting (5).

**NOTE**
When disconnecting the front ends of both front lift cylinders from the lift arms, remove only nuts (6), lock washers (7), flat washers (8), and pins (4). Leave screws (9) in place to retain the front deck latch assembly on the left lift arm and the stand up bracket on the right lift arm.

6. Remove nut (6), lock washer (7), and flat washer (8). Leave screw (9) in place.

7. Support front lift cylinder (3).
8. Remove pin (4).
9. Remove nut (11), lock washer (12), flat washer (13), and screw (14).
10. Remove pin (16) and spacers (1).
11. Remove front lift cylinder (3).

**Installation Notes**
- Install front lift cylinder by reversing the order of removal.
- Make sure new O-rings are in place before installing hoses on fittings.
- Lubricate grease fittings with grease that meets or exceeds NLGI Grade 2 LB specifications.
- Replace hydraulic oil return filter. (See “Hydraulic Oil Return Filter Assembly” on page 6-99.)
- Replace hydraulic oil charge filter. (See “Hydraulic Oil Charge Filter Assembly” on page 6-99.)
- Refill hydraulic tank. (Refer to “Parts and Maintenance Manual” for correct oil specifications.)
- Start engine. Check hydraulic system for leaks. Repair as necessary.
- Check hydraulic oil level. Add oil as necessary.

**NOTES**
- Label all hydraulic hoses before disconnecting to ensure correct installation.
- Close all openings with caps or plugs to prevent contamination.
4. Disconnect hydraulic hose (15) from fitting (2).
5. Disconnect hydraulic hose (10) from fitting (5).
Disassembly, Inspection, and Assembly—Front Lift Cylinders

See Figure 6-118.

**NOTE**

The machine has four lift cylinders. The left and right front lift cylinders are the same and the left and right wing lift cylinders are the same.

![Figure 6-118](image)

1. Barrel
2. Bushing
3. Rod Nut
4. Piston Seal
5. Piston
6. O-Ring
7. O-Ring
8. Backup Ring
9. Rod Guide
10. Rod Seal
11. Wiper
12. Grease Fitting (3)
13. Bushing
14. Rod
15. O-Ring
16. Backup Ring
17. Loaded U-Cup
18. Internal Snap Ring
19. External Snap Ring
20. Rod Guide
21. Wiper

**Figure 6-118**
Disassembly Notes

NOTICE

During repair of the cylinder, use extreme care not to damage the barrel, piston, rod, and sealing surfaces of the cylinder.

It is important that all component parts are absolutely clean, as contamination can result in serious damage and/or improper operation.

Never use shop towels or rags to dry parts after cleaning, as lint may clog passages. Dry parts using compressed air.

- Drain oil from lift cylinder.
- For lift cylinder with threaded gland, use a spanner wrench to remove rod guide (9) and pull assembled rod (14) out of barrel (1).
- For lift cylinder with snap ring gland, remove external snap ring (19), internal snap ring (18), and pull assembled rod (14) out of barrel (1).
- Remove rod nut (3).
- For lift cylinder with threaded gland, remove piston seal (4), piston (5), O-ring (6), O-ring (7), backup ring (8), rod guide (9), rod seal (10), and wiper (11) from rod (14).
- For lift cylinder with snap ring gland, remove piston seal (4), piston (5), O-ring (6), O-ring (7), rod guide (20), O-ring (15), backup ring (16), loaded U-cup (17), and wiper (21) from rod (14).
- Clean all parts using clean solvent, and dry using compressed air.
- Inspect all parts for excessive wear, cracks, broken parts, and scoring of the cylinder barrel, piston, and rod.
- Replace parts as necessary.

Assembly Notes

NOTICE

It is important that all component parts are absolutely clean, as contamination can result in serious damage and/or improper operation.

Never use shop towels or rags to dry parts after cleaning, as lint may clog passages. Dry parts using compressed air.

- Use a new seal kit during assembly.
- Lubricate O-rings, seals, loaded U-cup, and wiper with clean hydraulic oil before assembly.
- Assemble lift cylinder by reversing the order of disassembly.
- Tighten rod nut (3) to 95 lb-ft (129 N·m).

Required Materials

Seal Kit (Jacobsen PN 4138621)
Wing Lift Cylinders

Removal and Installation

See Figures 6-119 through 6-121.

**NOTE**
Left wing lift cylinder is shown; right wing lift cylinder is similar.

![Figure 6-119](TN4182)

**CAUTION**
Care must be taken to avoid damaging the surface of the cylinder rod during removal and installation.

1. Lower cutting units.
2. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
3. Disconnect hydraulic hoses (2 and 3) from fittings (1 and 4).
4. Remove nut (5), lock washer (6), flat washer (7), and screw (8).
5. Support wing lift cylinder (10).
6. Remove pin (9).
7. Remove nut (11), lock washer (12), flat washer (13), and screw (14).
8. Remove pin (15) and two spacers (16).
9. Remove wing lift cylinder.

**NOTES**
- Label all hydraulic hoses before disconnecting to ensure correct installation.
- Close all openings with caps or plugs to prevent contamination.

![Figure 6-120](TN4181)

![Figure 6-121](TN4182)
Installation Notes

• Install wing lift cylinder by reversing the order of removal.

• Make sure that hydraulic fitting with 0.060 in. (1.5 mm) orifice is installed on the barrel end of the wing lift cylinder.

• Make sure new O-rings are in place before installing hoses on fittings.

• Lubricate grease fittings with grease that meets or exceeds NLGI Grade 2 LB specifications.

• Replace hydraulic oil return filter. (See “Hydraulic Oil Return Filter Assembly” on page 6-99.)

• Replace hydraulic oil charge filter. (See “Hydraulic Oil Charge Filter Assembly” on page 6-99.)

• Refill hydraulic tank. (Refer to “Parts and Maintenance Manual” for correct oil specifications.)

• Start engine. Check hydraulic system for leaks. Repair as necessary.

• Check hydraulic oil level. Add oil as necessary.
Disassembly, Inspection, and Assembly—Wing Lift Cylinders

See Figure 6-122.

**NOTE**

The machine has four lift cylinders. The left and right front lift cylinders are the same and the left and right wing lift cylinders are the same.

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**Figure 6-122**

Threaded Gland

Snap Ring Gland
Disassembly Notes

NOTICE

During repair of the cylinder, use extreme care not to damage the barrel, piston, rod, and sealing surfaces of the cylinder.

It is important that all component parts are absolutely clean, as contamination can result in serious damage and/or improper operation.

Never use shop towels or rags to dry parts after cleaning, as lint may clog passages. Dry parts using compressed air.

- Drain oil from lift cylinder.
- For lift cylinder with threaded gland, use a spanner wrench to remove rod guide (5) and pull assembled rod (12) out of barrel (2).
- For lift cylinder with snap ring gland, remove external snap ring (17), internal snap ring (16), and pull assembled rod (12) out of barrel (2).
- Remove rod nut (11).
- For lift cylinder with threaded gland, remove piston seal (10), piston (9), O-ring (8), O-ring (7), backup ring (6), rod guide (5), rod seal (4), and wiper (3) from rod (12).
- For lift cylinder with snap ring gland, remove piston seal (10), piston (9), O-ring (8), O-ring (7), rod guide (18), O-ring (13), backup ring (14), loaded U-cup (15), and wiper (19) from rod (12).
- Clean all parts using clean solvent, and dry using compressed air.
- Inspect all parts for excessive wear, cracks, broken parts, and scoring of the cylinder barrel, piston, and rod.
- Replace parts as necessary.

Assembly Notes

NOTICE

It is important that all component parts are absolutely clean, as contamination can result in serious damage and/or improper operation.

Never use shop towels or rags to dry parts after cleaning, as lint may clog passages. Dry parts using compressed air.

<table>
<thead>
<tr>
<th>Required Materials</th>
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<tr>
<td>Seal Kit (Jacobsen PN 4138592)</td>
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</table>

- Use a new seal kit during assembly.
- Lubricate O-rings, seals, loaded U-cup, and wiper with clean hydraulic oil before assembly.
- Assemble the lift cylinder by reversing the order of disassembly.
- Make sure that hydraulic fitting with 0.060 in. (1.5 mm) orifice is installed on the barrel end of the wing lift cylinder.
- Tighten rod nut (11) to 95 lb-ft (129 N·m).
Return Canisters

Removal and Installation
See Figure 6-123.

**NOTE**
Right wing return canister is shown; left wing return canister is similar.

**CAUTION**
Care must be taken to avoid damaging the surface of the return canister rod during removal and installation.

1. Lower cutting units.
2. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
3. Remove retaining ring (5), pin (6), and two flat washers (8), and disengage rod end of return canister (4) from lift arm (7).
4. Support return canister (4) and remove screw (2), flat washer (3), and canister mount pin (1).
5. Remove return canister (4).

**Installation Notes**
- **Install return canister by reversing the order of removal.**
- **Lubricate grease fittings with grease that meets or exceeds NLGI Grade 2 LB specifications.**

Disassembly and Assembly
See Figures 6-124 and 6-125.

**NOTE**
Repairs for return canister are limited to replacing seals and O-rings.

**NOTICE**
It is important that all component parts are absolutely clean, as contamination can result in serious damage and/or improper operation. Never use shop towels or rags to dry parts after cleaning, as lint may clog passages. Dry parts using compressed air.

**Required Materials**
- Seal Kit (Jacobsen PN 5003427)—Gold Star
- Seal Kit (Jacobsen PN 5003662)—HDM
- Seal Kit (Jacobsen PN 4129285)—Energy
- Perma-Lok® HM128 Threadlocking Adhesive

**Figure 6-123**

**Figure 6-124**

**NOTE**
Return canister fill capacity is 132 oz (3.9 L). Have a suitable container available that can hold up to 1.5 gal (6 L).
1. Remove plug (1) and drain hydraulic oil from return canister (2) into a suitable container.
2. Remove rod end (8) and nut (7).
3. Remove four screws (10) and rod guide (9).

**NOTES**
- Use a new seal kit during assembly.
- Lubricate new O-ring, backup ring, loaded U-cup, and rod wiper with clean hydraulic oil before assembly.

4. Remove and discard O-ring (3), backup ring (4), loaded U-cup (5), and rod wiper (6).
5. Assemble new O-ring, backup ring, loaded U-cup, and rod wiper on rod guide (9).
6. Assemble rod guide (9) to return canister and install four screws (10).
7. Fill return canister with 132 oz (3.9 L) ISO 46 hydraulic oil and install plug (1).

---

**Hydraulic Oil Tank**

**Removal and Installation**

See Figures 6-126 through 6-128.

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Disconnect battery negative (–) cables from batteries.
3. Drain hydraulic oil tank. (See “Hydraulic Oil Tank—Drain Procedure” on page 6-76.)
4. Remove seat and seat pan. (See “Seat and Seat Pan” on page 9-14.)
5. Remove control panel. (See “Control Panel” on page 6-87.)

**NOTES**
- Label all hydraulic hoses before disconnecting to ensure correct installation.
- Close all openings with caps or plugs to prevent contamination.

6. Loosen hose clamps (2 and 3) and disconnect hoses (1 and 4) from hydraulic oil tank (5).
Installation Notes

- Install hydraulic oil tank by reversing the order of removal.
- Replace hydraulic oil return filter. (See “Hydraulic Oil Return Filter Assembly” on page 6-99.)
- Replace hydraulic oil charge filter. (See “Hydraulic Oil Charge Filter Assembly” on page 6-99.)
- Refill hydraulic oil tank. (Refer to “Parts and Maintenance Manual” for correct oil specifications.)
- Start engine. Check hydraulic oil tank for leaks and repair as necessary.
- Check hydraulic oil level. Add oil as necessary.

Hydraulic Oil Cooler

Removal and Installation

NOTE
The hydraulic oil cooler is combined with the radiator and uses the engine cooling fan to cool the hydraulic oil. Removal and installation of the radiator/hydraulic oil cooler is described in Chapter 3—Engine. (See “Radiator/Hydraulic Oil Cooler” on page 3-10.)

7. Disconnect wire connector (6) from hydraulic oil level switch (7).

8. Loosen hose clamp (13) and disconnect hose (12) from hydraulic oil tank.

9. Support hydraulic oil tank and remove two carriage bolts (9), two flat washers (10), and four nuts (11).

10. Carefully move instrument panel and hose retainer bracket assembly (8) aside.

11. Using a suitable lifting device, lift and remove hydraulic oil tank.

NOTE
Label wire connectors before disconnecting to ensure correct installation.