Hydraulic Kit Installation Guide
<table>
<thead>
<tr>
<th>Item</th>
<th>Component</th>
<th>Part Number</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>HOSE ASSY. 3/8&quot; X 20&quot; -8F ORFS X -12L FEMALE 90 DEG.</td>
<td>F451TC-JCC5081206-20</td>
<td>1</td>
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<tr>
<td>2.</td>
<td>HOSE ASSY. 3/8&quot; X 20&quot; -6F ORFS X -12L FEMALE 90 DEG.</td>
<td>F451TC-JCC5061206-20</td>
<td>1</td>
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<tr>
<td>3.</td>
<td>HOSE ASSY. 1/4&quot; X 20&quot; -4F ORFS X 8L FEMALE 90 DEG.</td>
<td>F451TC-JCC5040804-20</td>
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<td>4.</td>
<td>HOSE ASSY. 3/8&quot; X 110&quot; -6F ORFS X -12L FEMALE</td>
<td>F451TC-JCC3061206-110</td>
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<td>5.</td>
<td>HOSE ASSY. 1/4&quot; X 110&quot; -4F X -4F ORFS</td>
<td>F471TC-JCJC040404-110</td>
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<td>6.</td>
<td>HOSE ASSY. 3/8&quot; X 70&quot; 12L FEMALE X 12L MALE</td>
<td>F451TC-C3DO121206-70</td>
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<td>7.</td>
<td>REDUCER 18L X 12L METRIC</td>
<td>RED18_12LA3C</td>
<td>2</td>
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<td>8.</td>
<td>REDUCER 10L X 8L METRIC</td>
<td>RED10_08LA3C</td>
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<td>9.</td>
<td>ADAPTER RUN TEE 12L M18 24 DEG.</td>
<td>EL12LA3C</td>
<td>2</td>
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<td>10.</td>
<td>ADAPTER RUN TEE 8L M14 24 DEG.</td>
<td>EL08LA3C</td>
<td>1</td>
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<td>11.</td>
<td>ADAPTER ELBOW 12L SWIVEL NUT METRIC</td>
<td>EW12LA3C</td>
<td>2</td>
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<tr>
<td>12.</td>
<td>CAP 12L METRIC</td>
<td>VKA12_A3C</td>
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<td>13.</td>
<td>ORIFICE INLINE 0.031&quot; -4M X -4F ORFS</td>
<td>4 LOHL6 0.031&quot;</td>
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<td>14.</td>
<td>ADAPTER 8L X -4M ORFS</td>
<td>4-8L LOHU86</td>
<td>1</td>
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<tr>
<td>15.</td>
<td>ADAPTER SWIVEL NUT ELBOW 8L</td>
<td>EW08LA3C</td>
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<td>16.</td>
<td>KIT CABLE TIE HOSE ID</td>
<td>200-0467-01</td>
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<td>17.</td>
<td>ADAPTER, S-LK, F-M, NUT ELBOW #8</td>
<td>8 C6LO</td>
<td>1</td>
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<td>18.</td>
<td>INSTRUCTIONS HOSE KIT MT-600B</td>
<td>602-0478-01</td>
<td>1</td>
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</table>
### 200-0457-02 Hydraulic Valve Kit

<table>
<thead>
<tr>
<th>Item</th>
<th>Component</th>
<th>Part Number</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Valve Assembly</td>
<td>500-0287-02</td>
<td>1</td>
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<tr>
<td>2.</td>
<td>Harness Pressure Transducer</td>
<td>201-0404-01</td>
<td>1</td>
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<tr>
<td>3.</td>
<td>Pressure Transducer</td>
<td>500-0274-02</td>
<td>1</td>
</tr>
</tbody>
</table>
Tools

This list consists of special tools required to complete the installation. A complete set of common installation tools is assumed.

<table>
<thead>
<tr>
<th>Tool Description</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Allen Hex Key 1/4”</td>
<td>11/16” open wrench</td>
<td>16mm open wrench</td>
</tr>
<tr>
<td>Allen Hex Key 3/16”</td>
<td>5/8” open wrench</td>
<td>17mm open wrench</td>
</tr>
<tr>
<td>Allen Key 5/32”</td>
<td>9/16” open wrench (2x)</td>
<td>18mm open wrench</td>
</tr>
<tr>
<td>Allen Hex Key 1/8”</td>
<td>1/2” open wrench</td>
<td>19mm open wrench</td>
</tr>
<tr>
<td>15/16” open wrench</td>
<td>7/16” open wrench</td>
<td>22mm open wrench</td>
</tr>
<tr>
<td>7/8” open wrench</td>
<td>1/2” 12 point ratcheting wrench</td>
<td>24mm open wrench</td>
</tr>
<tr>
<td>13/16” open wrench</td>
<td>15/16” socket wrench</td>
<td>18mm socket wrench</td>
</tr>
<tr>
<td>3/4” open wrench</td>
<td>13mm open wrench</td>
<td>22mm socket wrench</td>
</tr>
<tr>
<td>Breaker bar for 24mm socket</td>
<td>Hacksaw with steel cutting blade</td>
<td>24mm socket wrench</td>
</tr>
<tr>
<td>Torque wrench for 18/24/30mm sockets</td>
<td>Wire cutter small</td>
<td>30mm socket wrench</td>
</tr>
<tr>
<td>#1 Phillips screwdriver</td>
<td>Cleaning brush</td>
<td>5000 psi Pressure Gauge with a Short Hose and 1/8” Test Port Coupler that meets the SAE J1502 standard.</td>
</tr>
<tr>
<td>#2 Phillips screwdriver</td>
<td>Ten foot (3 meter) ladder</td>
<td>Tape measure (12ft minimum)</td>
</tr>
<tr>
<td>Cleaning rags</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Supported Vehicles

The following models have been confirmed to be compatible with this Hydraulic Installation Kit:

**Supported Make, Models, and Year Model**

- Challenger MT525B, MT535B, MT545B, MT555B, MT565B, MT575B, MT635B, MT645B, MT655B, MT665B
- Massey Ferguson 7465, 7475, 7480, 7465, 7485, 7490, 7495, 8450, 8460, 8470, 8480
Overview

These instructions provide the procedure for installing the Novariant hydraulic system for the supported vehicles listed below. There may be some variations in the vehicles depending on the vehicles options.

**Note:** Only technicians trained for hydraulic valve installations should perform the installation procedures in this guide. If the vehicle requires a hydraulic steering valve to be installed, ensure a trained technician is available for the installation.

Steering Valve Installation Procedure Overview

1. Verify a Power Beyond kit has been installed on the vehicle.
2. Prepare the Steering Valve for a Power Beyond installation.
3. Install the Steering Valve bracket and Steering Valve on the vehicle.
4. Connect the six hoses between the Steering Valve and the vehicle.
5. Check for oil leaks.
6. Perform a manual functional test to confirm correct Steering Valve operation.
Verify a Power Beyond Kit Has Been Installed

This installation requires that a Power Beyond kit be installed on the vehicle prior to installing the Steering Valve. The Power Beyond kit provides the required ports for Pressure, Return, and Load Sense. The Power Beyond kit should be installed from the factory. The small frame models and large frame models have a slightly different configuration. The illustration below on the left shows an example of the ports on the back of the small frame model. The illustration below and the right shows an example of the ports on the back of a large frame model. On some vehicles the Load Sense port will also have a special fitting that connects it to another port on the back of the vehicle. An example of this is also shown below on the right.

If the Power Beyond kit has not been installed on the vehicle, contact the vehicle’s service provider to have the kit installed prior to continuing with this installation.

Prepare the Steering Valve for a Power Beyond Installation

Prior to installing the Steering Valve on the vehicle, the Steering Valve must be configured for use on a Power Beyond system. This requires the installer verify the proper plugs and orifices have been installed in the access ports on the Steering Valve itself. This installation also requires a bleed down orifice be installed in the Steering Valve, which allows the Load Sense pressure to bleed down after the Steering Valve no longer requires oil flow. This procedure can be performed after the Steering Valve has been installed on the vehicle; however it is much easier to do this prior to the installation.

Steering Valve Ports Overview

The illustrations below show the ports on the front and side of the Steering Valve that will be accessed after the front cover has been removed. There are other ports and orifices on the Steering Valve, but the ones described here are the only ones that will need to be modified for this installation. A 0.022” Orifice is installed in Port 13A to allow the Load Sense to bleed down. A plug is inserted into Port 13B to allow the Steering Valve to work in a Power Beyond installation.

Table 1 shows the factory default positions of all the access ports and the positions they should be in for a Power Beyond installation. Port 13C is not accessed in this installation and thus not identified in the illustration below.
Table 1 shows the factory default positions of all the access ports and the positions they should be in for this installation. Prior to installing the Steering Valve, refer to this table and verify that all the access ports are configured properly.

**Table 1**  Plug and Orifice Configuration Summary

<table>
<thead>
<tr>
<th>Configuration</th>
<th>13A</th>
<th>13B</th>
<th>13C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory Default Configuration</td>
<td>Plug</td>
<td>Open</td>
<td>Plug</td>
</tr>
<tr>
<td>Configuration for this Installation</td>
<td>0.022” Orifice</td>
<td>Plug</td>
<td>Plug</td>
</tr>
</tbody>
</table>

**Note:** Valves manufactured after November 2013 do not have plug 13C

**Steering Valve Preparation Procedure**

**Note:** Valves manufactured after November 2013 do not have plug 13C

Steering Valve Preparation Procedure
1. Place the Steering Valve on a flat surface. Remove the four cover screws with a 3/16” Allen wrench.

2. Remove the front cover and screws and save them for the final reassembly after the Steering Valve has been installed on the vehicle and the Load Sense Pressure Relief Valve has been adjusted.

Note: Valves manufactured after November 2013 do not have plug 13C
3. Locate the Plug stored in the parked position on the Steering Valve body and remove it with a 1/8” Allen wrench.

**Note:** The plugs, orifices, and port access plugs are very tight. Loosening them could take a considerable amount of force. Verify that your tools are in good shape prior to attempting this procedure.

4. Locate the **13B** port on the top of the Steering Valve and remove the access port with a 1/4” Allen wrench.
5. Install the Plug removed in Step 3 into the bottom of port 13B and tighten it with a 1/8" Allen wrench.

6. Replace the access port plug into Port 13B and tighten with a 1/4" Allen wrench.

7. Locate the 13A port on the side of the Steering Valve and remove the access port with a 1/4" Allen wrench.
Note: Valves manufactured after November 2013 do not have plug 13C

Preparation Procedure

8. Identify the plug already installed in the bottom of this port.

9. Remove the existing plug with a 1/8” Allen wrench.

10. Locate the 0.022” Orifice stored in the parked position on the Steering Valve body and remove it with a 1/8” Allen wrench.
Note: Valves manufactured after November 2013 do not have plug 13C

Steering Valve Preparation Procedure

11. Install the 0.022” Orifice removed in Step 10 into the bottom of Port 13A and tighten it with a 1/8” Allen wrench.

12. Replace the access port plug into Port 13A and tighten with a 1/4” Allen wrench.

13. Place the plug that was removed from Port 13A in the parked position on the Steering Valve block marked Plug.
**Preparation Procedure**

**Note:** Valves manufactured after November 2013 do not have plug 13C

**Steering Valve Preparation Procedure**

14. Remove the plug from the TRANS port and attach the Pressure Transducer. Tighten the Pressure Transducer with a 3/4” wrench.

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**Install the Steering Valve**

The Steering Valve is installed on the rear of the vehicle above the hydraulic remote connections. A universal valve bracket is secured to the vehicle. The small and large frame vehicles have different brackets available so the Steering Valve is mounted differently. The small frame vehicles also have two cab options: a low profile and a high profile, which causes the distance between the cab and the mounting area to be different. On low-profile installations, the installer must also ensure there is enough clearance between the cab and the Steering Valve after the installation to prevent any damage.

This section contains the following sub-sections:

- Small Frame Modules
- Large Frame Modules
1. Locate the metal bracket on top of the hydraulic remote connections. There are two long slotted holes on the far left side of the bracket where the Steer Valve will be mounted.

2. Attach the Steering Valve bracket to the top-left side of the Power Beyond bracket using two M10 x 40mm bolts, washers, and nuts. The bracket will point down. Tighten the bolts with a 17mm wrench and 17mm socket and ratchet.
3. Start two of the 5/16” bolts for mounting the Steering Valve to the Steering Valve block.

**Note:** Tightened the two bolts on the right to hold the cover firmly on the Steering Valve block while installing. Prior to tightening the bolts, verify the cover is centered so the other holes on the cover will allow a bolt to screw in easily.

4. Attach the Steering Valve to the Steering Valve Bracket with the four 5/16” x 3/4” bolts.

5. Tighten the four bolts using a 1/2” ratchet wrench.
1. Locate the top of the metal bracket holding the Power Beyond ports on the back of the vehicle.

2. Remove the three-point linkage arm bracket from the top of the Power Beyond bracket by removing the two bolts with a 13mm socket and ratchet. The next illustration shows the bracket removed.

3. Place the Steering Valve bracket to the top of the Power Beyond bracket and over the holes that remain after the three-point linkage arm bracket is removed.
4. Place the three-point linkage arm bracket on top of the Steering Valve bracket. Secure both the three-point linkage arm bracket and Steering Valve to the Power Beyond bracket with the previously removed bolts. Tighten the bolts with a 13mm socket and ratchet. The illustration shows the Steering Valve bracket attached.

5. Start two of the 5/16” bolts for mounting the Steering Valve to the Steering Valve block. Allow enough space for the bolt heads to slide into the slots on the mounting bracket shown in the previous illustration.

Note: Tighten the two bolts on the left to hold the cover firmly on the Steering Valve block while installing. Prior to tightening the bolts, verify the cover is centered so the other holes on the cover will allow a bolt to screw in easily.
6. Slide the Steering Valve into the mounted position.
7. Secure the Steering Valve to the bracket with the other two 5/16” bolts.
8. Tighten the four bolts using a 1/2” ratchet wrench.
Hydraulic Hose Overview

This section contains the following sub-sections:

- Identifying Steering Valve Ports
- Hose Connection Overview

Identify Steering Valve Ports

The Steering Valve has six ports that need to be connected to the vehicle. The ports are shown in Figure 3 and the connection for each is described in Table 2.

**Figure 1  Steering Valve Ports**

![Steering Valve Ports Diagram]

**Table 2  Steering Valve Port Functions and Fitting Sizes**

<table>
<thead>
<tr>
<th>Valve Label</th>
<th>Function</th>
<th>Fitting Type/Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRESS</td>
<td>Provides pressurized oil to the Steering Valve</td>
<td>-8 ORFS</td>
</tr>
<tr>
<td>TANK</td>
<td>Releases oil back to the tank</td>
<td>-6 ORFS</td>
</tr>
<tr>
<td>LS ORBITROL</td>
<td>Load Sense line from Orbitrol for kick out detection</td>
<td>-4 ORFS</td>
</tr>
<tr>
<td>LS OUT</td>
<td>Load Sense line out to signal the pump to spool up</td>
<td>-4 ORFS</td>
</tr>
<tr>
<td>LEFT</td>
<td>Steering Line to turn vehicle Left</td>
<td>-6 ORFS</td>
</tr>
<tr>
<td>RIGHT</td>
<td>Steering Line to turn vehicle Right</td>
<td>-6 ORFS</td>
</tr>
<tr>
<td>GP</td>
<td>Diagnostics Port showing pressure at the Pressure Port</td>
<td>1/8” Coupler Nipple (SAE J1502)</td>
</tr>
<tr>
<td>TRANS</td>
<td>Pressure Transducer for kick out</td>
<td>-4 SAE ORB</td>
</tr>
</tbody>
</table>

Hose Connection Overview

Figure 4 and Figure 5 show overviews of how the hose connections are to be attached.

- The PRESS, TANK, and LS OUT ports will be connected to the Power Beyond connections.
- The LS ORBITROL port will be connected to the Load Sense line that detects when the Orbitrol is enabled.
- The LEFT and RIGHT ports will be teed into the corresponding lines near the Orbitrol or the steering cylinders that cause the vehicle to turn left or right.

Figure 4 shows an overview of the hose connections when the system is teed into the steer lines at the Orbitrol. Figure 5 shows an overview of the hose connections when the system is teed into the steer lines at the front axle. Table 3 shows the list of...
hoses provided by the installation kit. The kit also provides colored cable ties. To ensure the correct hose is attached to the correct port on both sides, attach the colored cable tie shown in Table 3 to each end of the hose listed.

The numbers in Figure 4, Figure 5, and Table 3 correspond to the Item Numbers for each hose provided in the table on the cover of this guide. If the number has a “- #” after it, it means that there are multiple hoses with the same length and fittings.

Figure 2  Hose Connections Overview when Connecting to Orbitrol

Table 3  Color Codes for Hydraulic Hoses

<table>
<thead>
<tr>
<th>Valve Port Hose</th>
<th>Color</th>
<th>Item Number</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRESSURE</td>
<td>Red</td>
<td>1</td>
<td>Hose, 3/8” x 20” -8F ORFS x -12LFM 90</td>
</tr>
<tr>
<td>TANK</td>
<td>Green</td>
<td>2</td>
<td>Hose, 3/8” x 20” -6F ORFS x 12L FM 90</td>
</tr>
<tr>
<td>LS ORBITROL</td>
<td>Blue</td>
<td>5</td>
<td>Hose, 1/4” x 110” -4F ORFS x -4F ORFS</td>
</tr>
<tr>
<td>LS OUT</td>
<td>Gray</td>
<td>3</td>
<td>Hose, 1/4” x 20” -4F ORFS x 8L FM 90</td>
</tr>
<tr>
<td>RIGHT</td>
<td>Yellow</td>
<td>4-1</td>
<td>Hose, 3/8” x 110” -6 ORFS x -12L FM</td>
</tr>
<tr>
<td>LEFT</td>
<td>Orange</td>
<td>4-2</td>
<td>Hose, 3/8” x 110” -6 ORFS x -12L FM</td>
</tr>
<tr>
<td>EXTENSION RIGHT</td>
<td>Yellow</td>
<td>6-1</td>
<td>Hose, 3/8” x 70” 12L FM x 12L M</td>
</tr>
<tr>
<td>EXTENSION LEFT</td>
<td>Orange</td>
<td>6-2</td>
<td>Hose, 3/8” x 70” 12L FM x 12L M</td>
</tr>
</tbody>
</table>
Hydraulic Hose Connection Procedure

Note: Due to limited space in the Steering Valve port area, the hoses should be connected in the order provided by this installation manual to reduce installation problems. Refer to the hose diagrams in Figure 2 and Figure 3 and Table 3 for information on connecting the correct hydraulic hose to the correct ports on the vehicle and Steering Valve.

The Power Beyond connections for the small frame and large frame vehicles are slightly different. Follow the instructions for the vehicle type where the system is being installed.

The small frame models also have more than one type of Load Sense Orbitrol connection. The Option 1 installation has the Orbitrol Load Sense hose connected to the steering Orbitrol with a 90 Degree fitting. The Option 2 installation has the Orbitrol Load Sense hose connected to the steering Orbitrol with a straight connection. The procedure for connecting to this line is slightly different. Check the Orbitrol connection on the vehicle the system is being installed on and follow the procedure for that installation. Large frame models will use the Option 2 installation.

The steering lines can either be teed in at the steering Orbitrol Option 1) or they can be teed in near the steering cylinders (Option 2). Use whichever option makes the installation easier.
1. Locate the Power Beyond ports on the rear of the vehicle.

*Note:* On some vehicles the Load Sense and Return lines have a fitting that joins the two ports together. If this fitting is present, remove it from the vehicle and store it in a safe place in case it is required in the future.

2. Remove the cap from the Load Sense line with a 19mm wrench. Remove the caps from the Pressure and Return lines with a 32mm or 1-1/4” wrench.

*Note:* Ensure there is an oil catch container prepared to collect oil before the caps are removed to prevent oil spills.
3. Attach a 10L to 8L Reducer to the Load Sense port and an 18L to 12L Reducer to the Pressure and Return ports. Tighten the Load Sense Reducer with a 19mm wrench. Tighten the Pressure and Return Reducers with a 32mm or 1-1/4” wrench.

4. Connect the Load Sense hose to the LS OUT port on the Steering Valve. Leave connection loose for now.

5. Connect the Return hose to the TANK port on the Steering Valve. Leave connection loose for now.

6. Connect a -8 90 Degree Elbow to the PRESS port on the Steering Valve. Point the elbow to the right.

7. Attach the Pressure hose to the -8 90 Degree Elbow. Leave connections loose for now. This illustration shows the final assembly.

8. Connect the 90 Degree end of the Load Sense hose to the Load Sense port. Tighten the hose with 14mm and 19mm wrenches.

9. Connect the 90 Degree end of the Return hose to the Return port. Tighten the hose with 22mm and 24mm wrenches.

10. Connect the 90 Degree end of the Pressure hose to the Pressure port. Tighten the hose with 22mm and 24mm wrench. The illustration shows the final assembly.

11. Tighten the Load Sense connection on the Steering Valve with an 11/16” stubby wrench.

12. Tighten the Return hose connection on the Steering Valve with a 13/16” stubby wrench.

13. Tighten the -8 90 Degree Elbow and Pressure hose connections on the Steering Valve with a 15/16” stubby wrench.
1. Locate the Power Beyond ports on the rear of the vehicle.

**Note:** On some vehicles the Load Sense and Drain lines have a fitting that joins the two ports together. If this fitting is present, remove it from the vehicle and store it in a safe place in case it is required in the future. When this fitting is removed, the Drain port is now exposed. Attach a 12L cap provided with the kit to the port and tighten it with a 22mm wrench.

2. Remove the cap from the Load Sense line with a 19mm or wrench. Remove the caps from the Pressure and Return lines with a 32mm or 1-1/4” wrench.

**Note:** Ensure there is an oil catch container prepared to collect oil before the caps are removed to prevent oil spills.
3. Attach a 10L to 8L Reducer to the Load Sense port and an 18L to 12L Reducer to the Pressure and Return ports. Tighten the Load Sense Reducer with a 19mm wrench. Tighten the Pressure and Return Reducers with a 1-1/4” or 32mm wrench.

4. Connect the 90 Degree end of the Load Sense hose to the Load Sense port. Point the hose to the right and tighten the hose with 14mm and 19mm wrenches.

5. Connect the 90 Degree end of the Return hose to the Return port. Point the hose to the right and tighten the hose with 22mm and 24mm wrenches.

6. Connect the 90 Degree end of the Pressure hose to the Pressure port. Point the hose to the right and tighten the hose with 22mm and 24mm wrenches. The illustration shows the final assembly.

7. Connect the Load Sense hose to the LS OUT port on the Steering Valve. Tighten the connection with an 11/16” wrench.

8. Connect the Return hose to the TANK port on the Steering Valve. Tighten the connection with a 13/16” wrench.

9. Connect the Pressure hose to the PRESS port on the Steering Valve. Tighten the connection with a 15/16” wrench. The illustration shows the final assembly.
Open Small Frame Vehicle Hood

1. Locate the hood release button at the front-left corner of the hood s. Press the button and lift the hood up.

2. Pull the engine side panels off the vehicle. They are held in place by clips on all four corners.

3. This illustration shows the hood in the completely open position.
Open Large Frame Vehicle Hood

1. Locate the two buttons that allow the hood to swing up and then forward.

2. To open the hood, first press the button on the front-left side of the hood shown in the illustration and then raise the front of the hood.
3. Once the hood has been raised, a second button at the left-rear side of the engine compartment will become visible as shown in the illustration. Press this button to release the rear of the hood and swing it up and forward to gain access to the Orbitrol area.

4. The illustration shows the hood in the completely open position.
1. Locate the bolt holding the plastic molding to the front of the cab shown in the illustration. Remove the bolt with a 13mm socket and ratchet. Be prepared to catch the spacer that will fall out when the bolt is removed as shown in the second illustration.

2. Locate the Orbitrol Load Sense line connected to the Orbitrol by a 90 Degree connector on the end of the hose on the left side of the Orbitrol. Disconnect the line from the port with a 17mm stubby wrench.
3. Attach the 8L Run Tee to the 8L 90 Degree Elbow. Leave this connection loose for now.

4. Attach the 8L x -4M ORFS Adapter to the straight through port of the 8L Run Tee. Tighten the connection with 17mm and 12mm wrenches.

5. Attach the 0.031” -4M ORFS x 4F ORFS In-Line Orifice to the 8L x -4M ORFS Adapter. Tighten the connection with 17mm and 11/16” wrenches. The illustration shows an example of how these parts are to be assembled.

6. Attach the 8L 90 Degree Elbow of the adapter assembly to the Load Sense port on the steering Orbitrol. Tighten the connection with a 17mm stubby wrench with the Run Tee pointing to the right and forward side of the vehicle.

7. Attach the LS Orbitrol hose to the 8L x -4M ORFS Adapter. Tighten the hose connection with 5/8” and 11/16” wrenches.

8. Attach the original Orbitrol Load Sense hose to the other port of the 8L Run Tee. Tighten the connection with a 17mm stubby wrench. Verify that all the fittings in the adapter assembly are now tight. The illustration shows an example of the final assembly.

9. Route the LS Orbitrol hose under the cab along the left side of the vehicle to the rear of the machine where the Steering Valve is located.

10. Attach the hose to the LS ORBITROL port on the Steering Valve and tighten with an 11/16” stubby wrench.
1. Locate the steering Orbitrol at the top-rear part of the engine compartment right ahead of the cab.

2. Locate the Load Sense port on the left side of the Orbitrol shown in the illustration. Disconnect the line from the port with a 17mm stubby wrench.

3. Use colored cable ties to mark the existing Left, Right, and Load Sense lines.

4. Attach the 8L x -4M ORFS Adapter to the 0.031” -4M ORFS x 4F ORFS In-Line Orifice. Tighten the connection with 11/16” and 17mm wrenches.

5. Attach the 8L 90 Degree Elbow to the 8L x -4M ORFS Adapter. Tighten the connection with 17mm and 12mm wrenches.

6. Attach the 8L Run Tee to the 8L 90 Degree Elbow. Leave loose for the time being. The illustration shows an example of how these parts are to be assembled.
7. Attach the 8L Run Tee of the adapter assembly to the Load Sense port on the steering Orbitrol. Tighten the connection with a 17mm stubby wrench with the Run Tee pointing to the right side of the vehicle.

8. Attach the original Load Sense hose to the other port of the 8L Run Tee. Tighten the connection with a 17mm stubby wrench.

9. Attach the LS Orbitrol hose to the 0.031” -4M ORFS x 4F ORFS In-Line Orifice. Tighten the connection with 11/16” and 5/8” wrenches. The illustration shows an example of the final assembly.

10. Route the LS Orbitrol hose under the cab along the left side of the vehicle to the rear of the machine where the Steering Valve is located.

11. Attach the hose to the LS ORBITROL port on the Steering Valve and tighten with an 11/16” wrench. Step 10 of the last procedure shows the connection on a small frame install. This illustration shows the connection on a large frame install.

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**Steering Line Hose Connections at Orbitrol (Option 1)**

1. Disconnect the Left and Right Steer lines from the Orbitrol with a 22mm stubby wrench.

**Note:** The hose connections for the small and large frame are very similar in this section. The photos show examples of the connections being made on a large frame vehicle. Follow the same procedure for small frame vehicles.
2. Attach a 12L Run Tee to the Steer Right port of the Orbitrol.
3. Attach the original Steer Right hose to the end of the 12L Run Tee.
4. Attach a 12L 90 Degree Elbow to the tee port of the 12L Run Tee and point it upwards.
5. Attach the Steer Right hose to the 12L 90 Degree Elbow. Tighten all connections with a 22mm stubby wrench. The illustration shows an example of all of these connections.

6. Attach a 12L Run Tee to the Steer Left port of the Orbitrol.
7. Attach the original Steer Left hose to the end of the 12L Run Tee.
8. Attach a 12L 90 Degree Elbow to the tee port of the 12L Run Tee and point it to the left side of the vehicle.
9. Attach the Steer Left hose to the 12L 90 Degree Elbow. Tighten all connections with a 22mm stubby wrench. The illustration shows an example of all of these connections.

10. Run the Steer Right hose down the right side of the engine compartment and then under the cab on the right side of the vehicle back to the Steering Valve.
11. Run the Steer Left hose down the left side of the engine compartment and then under the cab on the left side of the vehicle back to the Steering Valve.
12. Attach the Steer Right hose to the RIGHT port on the Steering Valve and tighten with a 13/16” wrench.
13. Attach the Steer Left hose to the LEFT port on the Steering Valve and tighten with a 13/16” wrench. The illustration shows the connections to a large frame model. The illustration shows the valve hose connections on a large frame installation.
Steering Line Hose Connections at Front Axle (Option 2)

**Note:** The small and large frame vehicles come with different versions of front axles. These vehicles also have a variety of options available that connect to the front axle. Due to this variability, the photos provided with this installation procedure may not match with what is seen on the installation; however, the procedure remains the same in all situations.

1. Connect the extension hose to the Steer Right and Steer Left hoses and tighten connections with 19mm and 22mm wrenches.

2. Locate the steering line hose connection at the steering cylinder on the right side of the vehicle.

3. Loosen the connection on the existing 12L 45 Degree Elbow fitting with 17mm and 22mm wrenches.

4. Disconnect the existing steering line from the steering cylinder with a 22mm wrench.

5. Attach a 12L Run Tee to the steering line on the steering cylinder with the tee pointing down.

6. Attach a 12L 90 Degree Elbow to the end of the 12L Run Tee and point it down.

7. Attach the original Steer Right hose to the tee port of the 12L Run Tee. Adjust the angle as needed.

8. Attach the Steer Right hose to the 12L 90 Degree Elbow. Tighten all connections with 17mm and 22mm wrenches. The illustration shows an example of all of these connections.
9. Locate the steering line hose connection at the steering cylinder on the left side of the vehicle.

10. Loosen the connection on the existing 12L 45 Degree Elbow fitting with 17mm and 22mm wrenches.

11. Disconnect the existing steering line from the steering cylinder with a 22mm wrench.

12. Attach a 12L Run Tee to the steering line on the steering cylinder with the Run Tee pointing down.

13. Attach a 12L 90 Degree Elbow to the end of the 12L Run Tee and point it down.

14. Attach the original Steer Left hose to the tee port of the 12L Run Tee. Adjust the angle as needed.

15. Attach the Steer Left hose to the 12L 90 Degree Elbow. Tighten all connections with 17mm and 22mm wrenches. The illustration shows an example of all of these connections.

16. Run the Steer Right hose along the existing steer line and then under the cab on the right side of the vehicle back to the Steering Valve.

17. Run the Steer Left hose along the existing steer line and then under the cab on the left side of the vehicle back to the Steering Valve.

18. Attach the Steer Right hose to the RIGHT port on the Steering Valve and tighten with a stubby 13/16” wrench.

19. Attach the Steer Left hose to the LEFT port on the Steering Valve and tighten with a stubby 13/16” wrench. This illustration shows the valve hose connections on a small frame installation.
1. If the Pressure Transducer was not installed originally, attach it now with a 3/4” stubby wrench.

2. Attach the Pressure Transducer jumper harness to the Pressure Transducer.

3. Coil the excess harness between the Steering Valve and the outer cover and secure with a cable tie.

4. Cable tie the 4-pin and 10-pin connector together. The first illustration shows the connection on a small frame installation. The second illustration shows the connections on a large frame installation.
Pressure Relief Valve Adjustment

The Steering Valve has a built-in Load Sense Pressure Relief Valve that limits the maximum pump pressure in using the AutoSteer system. The Pressure Relief Valve must be adjusted after the entire AutoSteer system has been installed and the system has been checked for hydraulic leaks. The Display, Roof Module, and all harnesses must be connected prior to performing this procedure. This procedure is provided in the Final Hardware Installation Checklist chapter after the rest of the installation has been completed. Do not forget to set this Pressure Relief Valve or system damage could occur.

Steering Valve Installation Checklist

1. Steering Valve Bracket bolts are tight.
2. Mounting bolts that secure the Steering Valve are tight.
3. Pressure Hose is connected to the correct port on the Steering Valve and Power Beyond Pressure port.
4. Tank Hose is connected to the correct port on Steering Valve and Power Beyond Return port.
5. LS-OUT Hose is connected to the correct port on Steering Valve and the Power Beyond Load Sense port.
6. LS ORBITROL Hose is connected to the correct ports on the Steering Valve and the Orbitrol Load Sense port.
7. Right Steer Hose is connected to the correct port on the Steering Valve and teed into the Steer Right line.
8. Left Steer Hose is connected to the correct port on the Steering Valve and teed into the Steer Left line.
9. Pressure Transducer has been installed and tightened.
10. All other hose fittings are tight.
11. All hose and cables have been routed so they will not be damaged by moving parts or foreign objects.
12. After the entire system has been installed.

Post System Installation Procedures

This section provides information in the following sub-sections:

- Hydraulic Leak Test
- Create New Vehicle
- Pressure Relief Valve Adjustment Procedure

Once the entire AutoSteer system, including the Display and Display Harnesses, have been installed on the vehicle, the procedures and notes provided in this section must be followed to complete the installation and prepare the vehicle for full AutoSteer capabilities.

Note: Always perform these steps after the complete installation or system damage may occur and/or poor performance may occur. DO NOT START THE VEHICLE BEFORE PERFORMING A LEAK TEST.

Hydraulic Leak Test

On completion of installing the entire AutoSteer system including the Roof Module and Display, the system needs to be checked for leaks. Follow the procedure below to check for leaks.

⚠️ WARNING

High-Pressure Fluid Hazard
Read and understand the vehicle’s user manual before installation. Wear hand and eye protection while performing hydraulic system maintenance. Relieve hydraulic system pressure before servicing the hydraulic system.
Prior to starting the vehicle, verify all people and equipment are clear from around the vehicle and the AutoSteer system is powered down. The vehicle could move unexpectedly and cause injury or death to bystanders.

**Note:** The following steps need to be performed after the complete AutoSteer system has been installed, the AutoSteer System has powered up (BUT NOT THE VEHICLE), and the vehicle has been created in the AutoSteer system.

### Hydraulic Leak Test

After the entire AutoSteer system installation has been completed, the system needs to be checked for leaks. Follow the procedure below to check for leaks.

**Note:** If an oil leak is noticed during any part of this test, immediately shut down the vehicle and repair the leak.

1. Clear any bystanders away from the vehicle.
2. Put the vehicle into Park and/or set the park brake to prevent the vehicle from moving.
3. Turn the vehicle over for a few seconds and if the vehicle starts, immediately shut it down.
4. Walk around the vehicle and check all the hydraulic fittings that were opened. Look for any oil leaks.
5. Once any leaks have been repaired, or if none are found, start the vehicle again and let it run at a low idle.
6. Take the vehicle out of Park and/or remove the parking brake. Turn the steering wheel manually to the right and left stops two or more times to get any air out of the hoses.
7. Confirm the vehicle turns in the correct direction when the steering wheel is turned manually.
8. Confirm the steering system behaves the same as it did prior to installing the AutoSteer System. Measure the times it takes to manually turn the steering wheel from full left to right and full right to left and compare to the times recorded before the installation. If the times are different, determine why there is a difference and repair.
9. Put the vehicle back into Park and/or reset the parking brake. Shut down the vehicle, walk around it again, and check for any hydraulic leaks.
10. Once any leaks have been repaired, or if none are found, start the vehicle again and let it run at a low idle.
11. Take the vehicle out of Park and/or remove the parking brake and leave the vehicle running.
12. Power up the AutoSteer system and navigate to the steering components test screen. If the safety screen requirements have been met, press the **Continue** or **Accept** button.
13. Press the **Hard Right** and the **Hard Left** buttons several times to force the Steering Valve to turn the steering wheels or steering mechanism to the full right and full left positions and get the air out of the lines.
14. Verify that the vehicle turns in the correct direction it is commanded. Measure the time it takes the AutoSteer System to turn the steering wheel from full left to right and full right to left and compare to the times recorded to the times for manual movement. It should not take more than 3 to 4 seconds to go from lock to lock.
Note: If the wheels turn in the wrong direction, the hoses were attached to the wrong ports on the Steering Valve or to the incorrect steer lines. The steer hoses need to be switched.

15. Power down the Display, put the vehicle into Park and/or reset the parking brake, and shutdown the vehicle.  
16. Once again check the vehicle for hydraulic leaks and repair any that are found.

Load Sense Pressure Relief Valve Adjustment

Note: Do not start the vehicle until after the Hydraulic Leak Test has been performed on the vehicle.

The Steering Valve has a built-in Load Sense Pressure Relief Valve that limits the maximum pump pressure when using the AutoSteer system. The Load Sense Pressure Relief Valve must be adjusted after the entire AutoSteer system has been installed and the system has been checked for hydraulic leaks.

Note: Always shut down the vehicle prior to adjusting the Load Sense Pressure Relief Valve adjustment screw.

Load Sense Pressure Relief Valve Adjustment

Note: The pressure relief valve is shown without the hydraulic hoses connected for ease of viewing the pressure relief valve and pressure test port. When actually adjusting the relief valve, it must be performed with the valve mounted on the vehicle, the hydraulic hoses connected, and the rest of the AutoSteer system installed and operational.

1. Ensure that the vehicle is still in Park and/or the park brake is set to prevent the vehicle from moving and the engine is off.
2. Clear any bystanders from around the vehicle to prevent anyone getting injured when the steering wheels are moved in the following steps.
3. Attach a short extension hose to the diagnostics port labeled GP on the Steering Valve. Attach a 5000 psi pressure gauge to the extension hose.

4. With a 1/2” wrench and 5/32” Allen wrench, loosen the jam nut holding the pressure relief valve adjustment screw.

   Note: This illustration shows the Steering Valve with the hoses disconnected for clarity. The Steering valve must be fully connected to the vehicle to adjust the pressure relief valve.

   1. Turn the adjustment screw counter-clockwise two turns.
   2. Start the vehicle and leave the engine at a low idle.
   3. Check the standby pump pressure shown on the pressure gauge. The standby pressure should be around 350 PSI (24 Bar).

   Note: If the standby pump pressure is zero or less than 100 PSI (7 Bar), the Pressure and Return/Tank hoses may have been inverted. Confirm the hoses have been attached properly before continuing.

   If the standby pump pressure is above 1000 PSI (69 Bar), it is too high. Determine what is causing the pressure to spool up and repair before moving on. Two most likely causes are that some of the hoses have been inverted or an incorrect orifice or plug has been installed in the Steering Valve.

   4. Record the actual standby pressure: ____________________ PSI (Bar).
   5. Power up the Display.
   6. Follow the instructions in the Display user manual to navigate to the Vehicle window from the AutoSteer Setup screen. Select Steering Components; then select Hydraulic Valve. If the safety screen requirements have been met, press the Continue button.
   7. Press the Steer Right button to command the wheels to turn to the right. Allow the steering axle to reach the right stop and hold it there.
   8. The maximum pump pressure allowed by the Steering Valve will be displayed on the pressure gauge.
   9. Adjust the pressure relief valve with a 5/32” Allen wrench until the pressure reads 2400 PSI (165 Bar) while the
AutoSteer system is commanding a Right turn.

**Note:** Turn off the engine before adjusting the pressure relief valve. Do not adjust the pressure relief valve with the engine running as there is a chance that a person could get injured if the steering wheels move while working on the valve.

**Note:** Turn the adjustment screw clockwise to increase the pressure and counter-clockwise to reduce the pressure.

10. Once the pressure relief valve has been adjusted properly, retighten the jam nut with a 1/2” wrench while holding the adjustment screw with a 5/32” Allen wrench to lock it into place.

11. Record the final maximum pressure the pressure relieve valve is set to: _________________________ PSI (Bar).

12. Press the Stop button and confirm that the pressure drops back to the standby pressure within a second.

**Note:** If the pump pressure remains high after pressing the Stop button, the pump is remaining stroked up. Confirm that the Orifice has been installed in port 13A and that the Orifice hole is not plugged.

13. Shut down the Display, turn off the engine, and remove the pressure gauge from the Steering Valve by sliding the sleeve on the quick release coupler

14. Replace the Steering Valve cover on the valve and tighten the four Allen screws with 3/16” Allen wrench.