

**Spra-Coupe 7X60, Model Year 2010 &
Newer
AutoBoom™ Installation Manual**

P/N 016-0230-098 Rev C 04/16

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CHAPTER

1

Important Safety Information

NOTICE

Read this manual and the operation and safety instructions included with your implement and/or controller carefully before installing the AutoBoom[®] system.

- Follow all safety information presented within this manual.
- If you require assistance with any portion of the installation or service of your Raven equipment, contact your local Raven dealer for support.
- Follow all safety labels affixed to the AutoBoom system components. Be sure to keep safety labels in good condition and replace any missing or damaged labels. To obtain replacements for missing or damaged safety labels, contact your local Raven dealer.

When operating the machine after installing AutoBoom, observe the following safety measures:

- Be alert and aware of surroundings.
- Do not operate AutoBoom or any agricultural equipment while under the influence of alcohol or an illegal substance.
- Remain in the operator's position in the machine at all times when AutoBoom is engaged.
- Disable AutoBoom when exiting from the operator's seat and machine.
- Do not drive the machine with AutoBoom enabled on any public road.
- Determine and remain a safe working distance from other individuals. The operator is responsible for disabling AutoBoom when the safe working distance has been diminished.
- Ensure AutoBoom is disabled prior to starting any maintenance work on AutoBoom or the machine.

WARNING

- When starting the machine for the first time after installing AutoBoom, be sure that all persons stand clear, in case a hose has not been properly tightened.
- The machine must remain stationary and switched off, with the booms unfolded and supported while installation or maintenance is conducted.

CAUTION

Hydraulic Safety

- Raven Industries recommends that appropriate protective equipment be worn at all times when working on the hydraulic system.
- Never attempt to open or work on a hydraulic system with the equipment running. Care should always be taken when opening a system that has been previously pressurized.
- When disconnecting the hydraulic hoses or purging is required, be aware that the hydraulic fluid may be extremely hot and under high pressure. Caution must be exercised.
- Any work performed on the hydraulic system must be done in accordance with the machine manufacturer's approved maintenance instructions.
- When installing AutoBoom hydraulics or performing diagnostics, maintenance, or routine service, ensure that precautions are taken to prevent any foreign material or contaminants from being introduced into the machine's hydraulic system. Objects or materials that are able to bypass the machine's hydraulic filtration system will adversely reduce performance and possibly damage the AutoBoom hydraulic valves.

Electrical Safety

- Always verify that the power leads are connected to the correct polarity as marked. Reversing the power leads could cause severe damage to the equipment.
- Ensure that the power cable is the last cable to be connected.

CHAPTER

2

Introduction

Introduction

Congratulations on your purchase of the Raven AutoBoom system! This system is designed to provide automated boom height adjustment for agricultural equipment.

This manual applies to the following machines. For future reference, write your serial number in the space below.

MAKE: SpraCoupe
MODEL: 7x60
YEAR: 2010 & Newer

FIGURE 1. SpraCoupe 7660



Note: *This manual contains the installation instructions for the PowerGlide Plus and UltraGlide systems. Be sure to identify which system you have and follow only the instructions for that system.*

Preparing for Installation

Before installing AutoBoom, park the machine where the ground is level, clean, and dry. Leave the machine turned off for the duration of the installation process.

During the installation process, follow good safety practices. Be sure to carefully read the instructions in this manual as you complete the installation process.

Recommendations

Raven Industries recommends the following best practices before installing or operating the AutoBoom system for the first time, at the start of the season, or when moving the AutoBoom system to another machine:

- Ensure the machine's hydraulic filters have been recently changed and there are no issues with the machine's hydraulic system (e.g., pump issues, faulty hydraulic motors, fine metal deposits in the hydraulic hoses, etc.).
- Operate each of the machine's boom hydraulic functions (i.e., tilt, fold, center rack, tongue extension, or other hydraulic valve functions) three times to ensure the machine's hydraulic valve is using fresh oil and debris is flushed from the hydraulic hoses, valves, and filters.
- Upon installation of the AutoBoom system, operate the boom and center rack raise/lower functions through the machine's manual control functions first before operating them via the AutoBoom controller/field computer to ensure the hydraulic system has been installed correctly and air is released from the system.

Raven Industries recommends the following best practices when installing the AutoBoom system.

- Use part numbers to identify the parts.
- Do not remove the plastic wrap from a part until it is necessary for installation.
- Do not remove plastic caps from a part until it is necessary for installation.

Tools Needed

The following tools are recommended for installation of the AutoBoom system:

- SAE standard-sized wrenches
- Cable ties
- Set of tools

Point of Reference

The instructions in this manual assume that you are standing behind the machine, looking toward the cab.

Hydraulic Fittings

This manual may reference the following types of hydraulic fittings:

- SAE O-ring fittings
- ORFS (O-Ring Face Seal) fittings
- JIC fittings

SAE O-ring fitting



ORFS fitting



JIC fitting (M)



Updates

Software and manual updates are available on the Raven Applied Technology website:

<http://www.ravenhelp.com>

At Raven Industries, we strive to make your experience with our products as rewarding as possible. One way to improve this experience is to provide us with feedback on this manual.

Your feedback will help shape the future of our product documentation and the overall service we provide. We appreciate the opportunity to see ourselves as our customers see us and are eager to gather ideas on how we have been helping or how we can do better.

To serve you best, please send an email with the following information to

techwriting@ravenind.com

-Spra-Coupe 7X60 (2010 & Newer) AutoBoom® Installation Manual

-Manual No. 016-0230-098 Rev. C

-Any comments or feedback (include chapter or page numbers if applicable).

-Let us know how long have you been using this or other Raven products.

We will not share your email or any information you provide with anyone else. Your feedback is valued and extremely important to us.

Thank you for your time.

CHAPTER

3

PowerGlide Plus

PowerGlide Plus Kit Contents

This section contains a list of the components that are included in the PowerGlide Plus AutoBoom kit. Before beginning the AutoBoom installation, compare the items in the AutoBoom kit with the components on this list. If you have questions about the kit, contact your Raven dealer.

Important: *In addition to the following kit components, a node mounting kit (P/N 117-0171-342) is required for the operation of the AutoBoom system.*

TABLE 1. PowerGlide Plus Installation Kit (P/N 117-0231-098)




Picture	Item Description	Part Number	Qty.
Not Pictured	Manual - SpraCoupe 7x60 (2010 & Newer)	016-0230-098	1
Not Pictured	Manual - AutoBoom Calibration & Operation	016-0130-062	1
	Valve - PowerGlide Plus AutoBoom	063-0131-125	1
	Valve - Spool A Pilot to Close Spool-Type Logic	334-0003-075	1
	Plate - Hydraulic Block Mounting	107-0171-619	1

TABLE 1. PowerGlide Plus Installation Kit (P/N 117-0231-098)

Picture	Item Description	Part Number	Qty.
	Node - PowerGlide Plus AutoBoom	063-0130-010	1
	Cable - SpraCoupe 7000 Series CAN AutoBoom Harness	115-0230-079	1
	U-Bolt - 2-9/16" W x 3-1/2" L x 3/8" Thread	107-0171-616	2
	Bolt - 5/16"-18 x 7/8" Zinc Hex	311-0052-104	4
	Bolt - 5/16"-18 x 1" Zinc Hex	311-0052-105	2
	Nut - 3/8"-16 Zinc Flanged Lock	312-1001-164	4
	Nut - 5/16"-18 Nylon Lock	312-4000-059	2
	Washer - 5/16" Zinc Plated Lock	313-1000-019	4
	Washer - 5/16" Flat	313-2300-011	4

TABLE 2. Hydraulic Kit (P/N 117-0134-098)

Picture	Item Description	Part Number	Qty.
	Fitting - 3/4" JIC M/M/F Swivel Run Tee	333-0012-039	2
	Fitting - 9/16" JIC (M) to 9/16" SAE O-Ring (M) Straight Adapter	333-0012-045	3
	Fitting - 3/4" JIC (M) TO 9/16" SAE O-Ring (M) Straight Adapter	333-0012-055	2
	Fitting - 3/4" JIC M/F 90° Swivel Elbow	333-0012-064	4
	Fitting - 3/4" JIC (M) to 3/4" SAE O-Ring (M) Straight Adapter	333-0012-093	2
	Fitting - 7/16" JIC (M) to 7/16" SAE O-Ring (M) 90° Elbow	333-0012-176	2
	Fitting - 1-1/16" SAE O-Ring (M) to 1-1/16" SAE O-Ring (M) Straight Adapter	333-0012-234	2
	Fitting - 7/16" SAE O-Ring (F) to 3/4" SAE O-Ring (M) Straight Adapter	333-0012-297	2
	Fitting - 7/16" SAE O-Ring (M) to 7/16" JIC (F) Straight Adapter	333-0012-298	1
	Hydraulic Hose - 3/4" JIC (F) TO 3/4" JIC (F) - 275"	214-1000-383	1
	Hydraulic Hose - 3/4" JIC (F) to 3/4" JIC (F) 90° - 228"	214-1000-385	1

TABLE 2. Hydraulic Kit (P/N 117-0134-098)



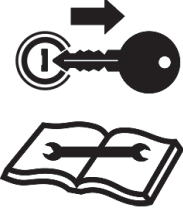

Picture	Item Description	Part Number	Qty.
	Hydraulic Hose - 3/4" JIC (F) to 9/16" JIC (F) 90° - 92"	214-1000-540	2
	Hydraulic Hose - 7/16" JIC (F) to 9/16" JIC (F) - 275"	214-1000-639	1


TABLE 3. PowerGlide Plus Wheel Kit (P/N 117-0133-049)

Picture	Item Description	Part Number	Qty.
	Axle Assembly - Right Cushioned AutoBoom	063-0131-585	1
	Axle Assembly - Left Cushioned AutoBoom	063-0131-590	1
	Bracket - Spracoupe Wheel	116-0159-608	2
	Wheel	322-0131-003	2
	U-Bolt - 1-9/16" W x 2-1/2" L x 3/8" Thread	107-0171-611	8
	Bolt - 1/2"-13 UNC x 1-1/2" SS Hex	311-0058-186	4
	Nut - 1/2"-13 Zinc Hex	312-1001-043	4
	Nut - 3/8"-16 Zinc Flanged Lock	312-1001-164	16

Install the PowerGlide Plus Hydraulic System

	<div style="background-color: #e67e22; color: white; padding: 5px;">⚠ WARNING</div> <p>The machine must remain stationary and switched off, with the booms unfolded and supported, during installation or maintenance.</p>
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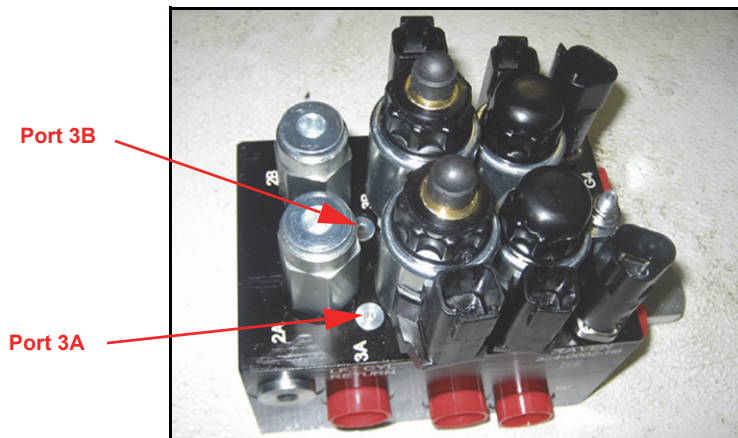
	<div style="background-color: #f1c40f; color: black; padding: 5px;">⚠ CAUTION</div> <p>When installing AutoBoom hydraulics or performing diagnostics, maintenance, or routine service, ensure precautions are taken to prevent any foreign material from being introduced into the machine's hydraulic system.</p> <p>Objects or materials that are able to bypass the machine's hydraulic filtration system will reduce performance and possibly cause damage to the AutoBoom hydraulic valve.</p>
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	<div style="background-color: #2980b9; color: white; padding: 5px;">NOTICE</div> <p>The appearance of the AutoBoom hydraulic valve may vary slightly from the images contained in this manual. However, the fittings, hose connections, and cable connections remain the same.</p>
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Remove the Orifice Fittings

Before populating the hydraulic fittings on the AutoBoom valve, it is necessary to remove orifice fittings from the valve in the PowerGlide Plus system. Failure to remove these fittings from the valve will restrict the down speed of the booms when the system is enabled.

FIGURE 1. Port 3A and 3B Location



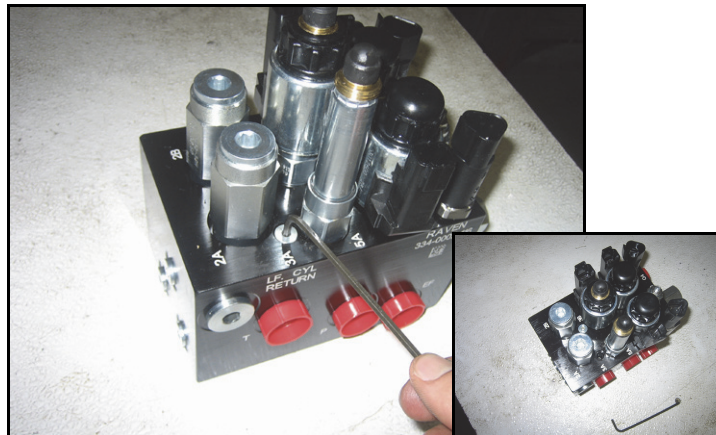
1. Locate Ports 3A and 3B on the AutoBoom valve (P/N 063-0131-125).

FIGURE 2. Coil Removed from the AutoBoom Valve



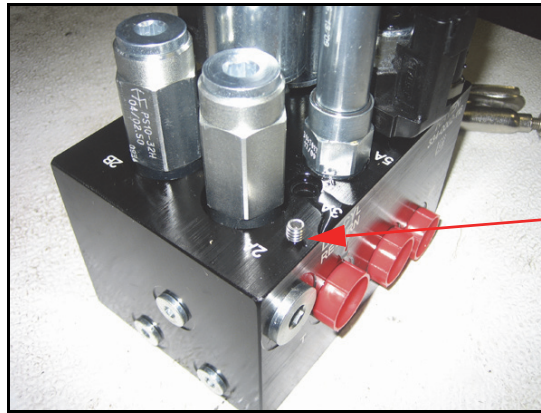
2. Remove the coils from the solenoids near Ports 3A and 3B to gain easy access to those ports.

FIGURE 3. Port Plugs Removed from the AutoBoom Valve



3. Use an Allen wrench to remove the plugs from Ports 3A and 3B.

FIGURE 4. Orifice Fitting Removed from the AutoBoom Valve



Orifice Fitting
Removed - Keep for
Future Use

4. Remove the orifice fittings from Ports 3A and 3B.

Important: *Tip the AutoBoom valve on its side and use the Allen wrench to remove the orifice from the cavity, taking care not to let the fitting fall into the valve.*

FIGURE 5. Port Plug Reinstalled on the AutoBoom Valve



5. Use the Allen wrench to reinstall the port plugs on Ports 3A and 3B of the AutoBoom valve.

FIGURE 6. Coil Reinstalled on the AutoBoom Valve



6. Reinstall the coils on the solenoids of the AutoBoom valve.

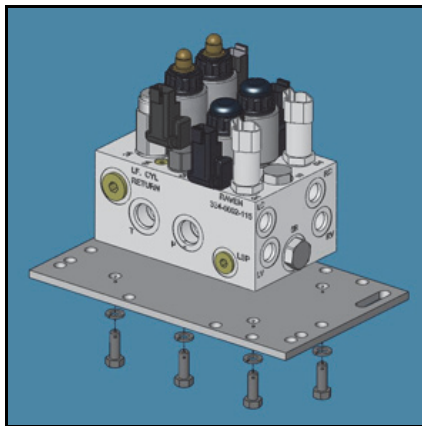
Install Fittings on the AutoBoom Valve

Before mounting the AutoBoom valve on the machine, install the proper fittings in the valve. This prepares the valve for installation and simplifies the hose connection process later in the procedure. Refer to the following table to install the fittings in the appropriate ports of the AutoBoom valve.

Fitting	Part Number	Port
Fitting - 9/16" JIC (M) to 9/16" SAE O-Ring (M) Straight Adapter	333-0012-045	LC, RC, LSP
Fitting - 3/4" JIC (M) TO 9/16" SAE O-Ring (M) Straight Adapter	333-0012-055	LV, RV
Fitting - 3/4" JIC (M) to 3/4" SAE O-Ring (M) Straight Adapter	333-0012-093	P, Right T
Fitting - 3/4" JIC M/F 90° Swivel Elbow	333-0012-064	P, Right T LV, RV

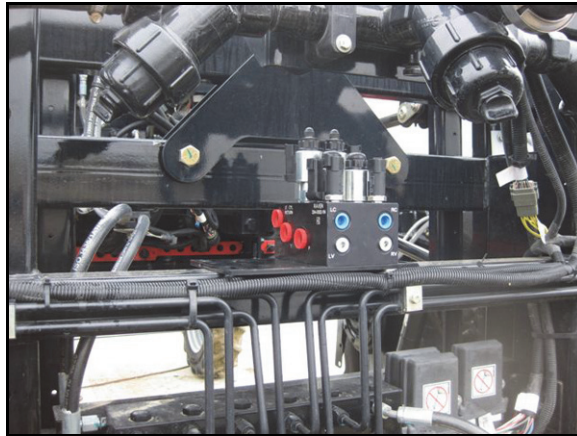
Mount the AutoBoom Valve

FIGURE 7. AutoBoom Valve Mounted on the Valve Mounting Plate




1. Secure the AutoBoom valve (P/N 063-0131-125) to the mounting plate (P/N 107-0171-619) using four 5/16"-18 x 7/8" hex bolts (P/N 311-0052-104) and four 5/16" zinc lock washers (P/N 313-1000-019).

FIGURE 8. AutoBoom Valve Mounted to the Machine



2. Secure the mounting plate to the machine's center rack using two 2-9/16" W x 3-1/2" L x 3/8" thread U-bolts (P/N 107-0171-616) and four 3/8"-16 zinc flanged lock nuts (P/N 312-1001-164).

Install the Pressure and Tank Hoses

	<p>! WARNING</p> <p>Hydraulics are under pressure. Care should always be taken with a system that has been pressurized. When disconnecting or purging hydraulic hoses, be aware that the hydraulic fluid within the machine's system may be extremely hot and under high pressure.</p>
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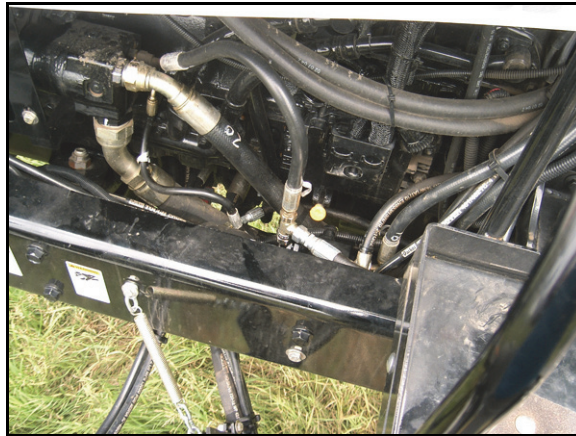
	<p>! CAUTION</p> <p>When installing AutoBoom hydraulics or performing diagnostics, maintenance, or routine service, ensure precautions are taken to prevent any foreign material from being introduced into the machine's hydraulic system.</p> <p>Objects or materials that are able to bypass the machine's hydraulic filtration system will reduce performance and possibly cause damage to the AutoBoom hydraulic valve.</p>
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FIGURE 9. Pressure Hoses Installed



1. Locate the auxiliary pump in the engine compartment.
2. Trace the machine's pressure hose from the auxiliary pump to the pressure manifold.
3. Disconnect the pressure hose from the machine's pressure manifold.
4. Install a 3/4" JIC M/M/F swivel run tee fitting (P/N 333-0012-039) on the machine's pressure manifold.
5. Connect the machine's pressure hose to the opposite end of the installed tee fitting.
6. Install the supplied hydraulic hose (P/N 214-1000-383) on the 90° end of the installed tee fitting.
7. Route and connect the other end of the installed hydraulic hose to the fittings installed in Port P of the AutoBoom valve.

FIGURE 10. Tank Hose Installed



8. Locate the machine's tank manifold near the fuel/water separator.
9. Disconnect the machine's tank hose and fitting from port T of the tank manifold.
10. Install a 3/4" JIC M/M/F swivel run tee fitting (P/N 333-0012-039) on the machine's tank manifold.
11. Connect the machine's tank hose to the opposite end of the installed tee fitting.
12. Install the supplied hydraulic hose (P/N 214-1000-385) on the 90° end of the installed tee fitting.
13. Route and connect the other end of the installed hydraulic hose to the fittings installed in Port T of the AutoBoom valve.

Install the Left and Right Cylinder Hoses

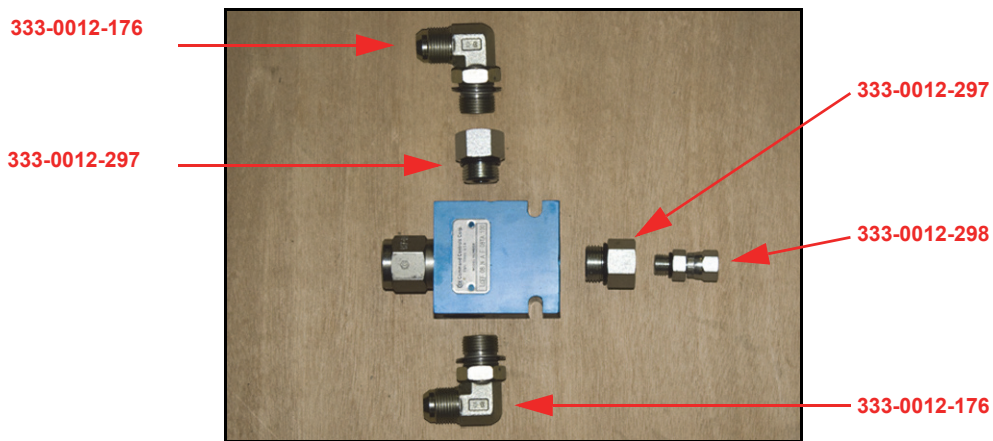
FIGURE 11. Left and Right Cylinder Hoses Installed



1. Disconnect the cylinder raise hose from the rod-end of the left tilt cylinder.
2. Route and connect the machine's left tilt cylinder raise hose to the installed fittings in Port LV of the AutoBoom valve.
3. Install the 90° end of the supplied hydraulic hose (P/N 214-1000-540) on the installed fittings in Port LC of the AutoBoom valve.
4. Connect the straight end of the installed hydraulic hose to the machine's left tilt cylinder raise port in the rod-end of the left tilt cylinder.
5. Disconnect the cylinder raise hose from the rod-end of the right tilt cylinder.
6. Route and connect the machine's right tilt cylinder raise hose to the installed fittings in Port RV of the AutoBoom valve.
7. Install the 90° end of the supplied hydraulic hose (P/N 214-1000-540) on the installed fittings in Port RC of the AutoBoom valve.
8. Connect the straight end of the installed hydraulic hose to the machine's right tilt cylinder raise port in the rod-end of the right tilt cylinder.
9. Remove the accumulator manifold from the left tilt cylinder.
10. Remove the machine's cylinder-to-accumulator fitting from the rod-end of the left tilt cylinder.
11. Install a 1-1/16" SAE O-ring (M) to 1-1/16" SAE O-ring (M) straight adapter fitting (P/N 333-0012-234) in the open port.
12. Install the accumulator manifold on the installed adapter fitting.
13. Remove the accumulator manifold from the right tilt cylinder.
14. Remove the machine's cylinder-to-accumulator fitting from the rod-end of the right tilt cylinder.
15. Install a 1-1/16" SAE O-ring (M) to 1-1/16" SAE O-ring (M) straight adapter fitting (P/N 333-0012-234) in the open port.
16. Install the accumulator manifold on the installed adapter fitting.

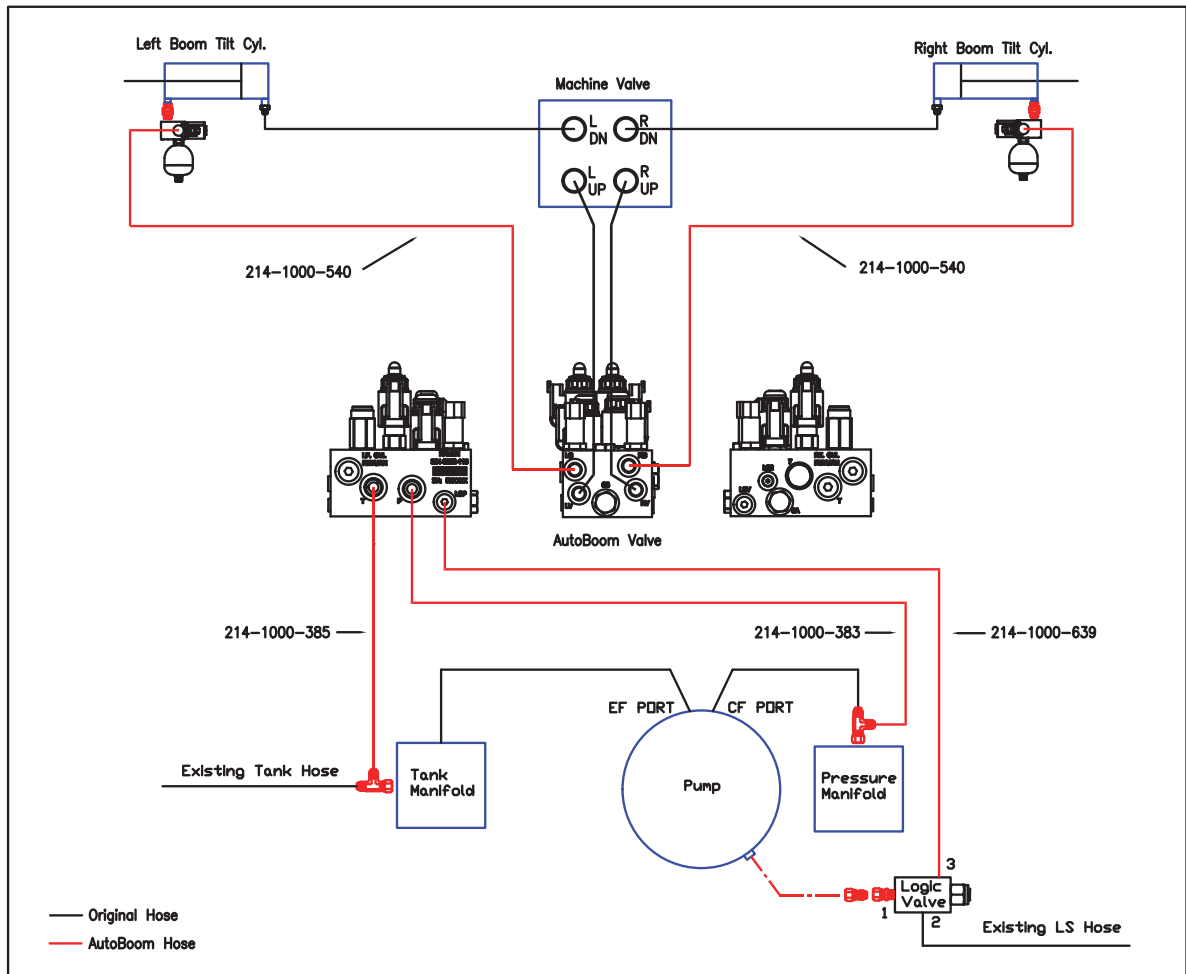
Install the Load Sense Hose

FIGURE 12. Fittings Installed on the Logic Valve



1. Install the fittings in the appropriate ports of the logic valve (P/N 334-0003-075) as illustrated above.
2. Tighten all fittings installed on the logic valve.
3. Locate the machine's auxiliary pump in the engine compartment.
4. Disconnect the machine's priority valve load sense hose from the auxiliary pump.
5. Install Port 1 of the logic valve in the port from which the priority valve load sense hose was disconnected.
6. Connect the machine's priority valve load sense hose that was previously disconnected to Port 2 of the logic valve.
7. Install one end of the supplied hydraulic hose (P/N 214-1000-639) to Port 3 of the logic valve.
8. Connect the other end of the supplied hydraulic hose to Port LSP on the AutoBoom valve.

PowerGlide Plus Hydraulic Schematic



117-0232-098, 117-0231-098 HYD SCHEMATIC 125

Install the Gauge Wheels

Gauge Wheel Mounting Locations

Wheel mounting locations may be influenced by the boom configuration. Determine the appropriate location for mounting the wheels on the boom, ensuring the wheels will not interfere with or be damaged while folding or unfolding the booms.

Mount the Gauge Wheels

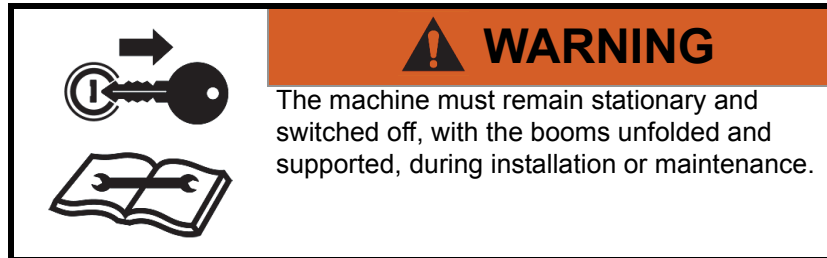


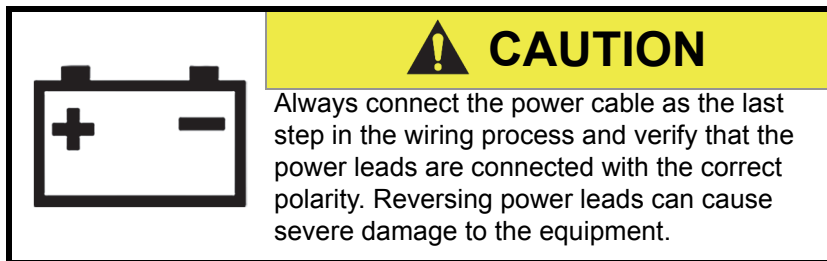
FIGURE 13. Wheel Mounting Bracket Installed



1. Remove the nuts from the right wheel axle (P/N 063-0131-585).
2. Place the wheel (P/N 322-0131-003) on the right wheel axle.
3. Align and place the hub retainer bracket (P/N 107-0171-617) on the wheel.
4. Reinstall the lug nuts on the wheel axle to secure the wheel and hub retainer bracket.
5. Secure the right wheel mounting bracket (P/N 116-0159-608) to the front of the right boom by installing four 1-9/16" W x 2-1/2" L x 3/8" thread U-bolts (P/N 107-0171-611) and eight 3/8"-16 zinc flanged lock nuts (P/N 312-1001-164).
6. Insert the right wheel axle into the right wheel mounting bracket, positioning it so that the bottom of the wheel touches the ground (or nearly so) and the wheel faces away from the machine.
7. Secure the gauge wheel assembly in the wheel mounting bracket by installing two 1/2"-13 x 1-1/2" SS hex bolts (P/N 311-0058-186) and two 1/2" zinc hex nuts (P/N 312-1001-043).
8. Repeat the steps above to install the left wheel.

Install the PowerGlide Plus Wiring

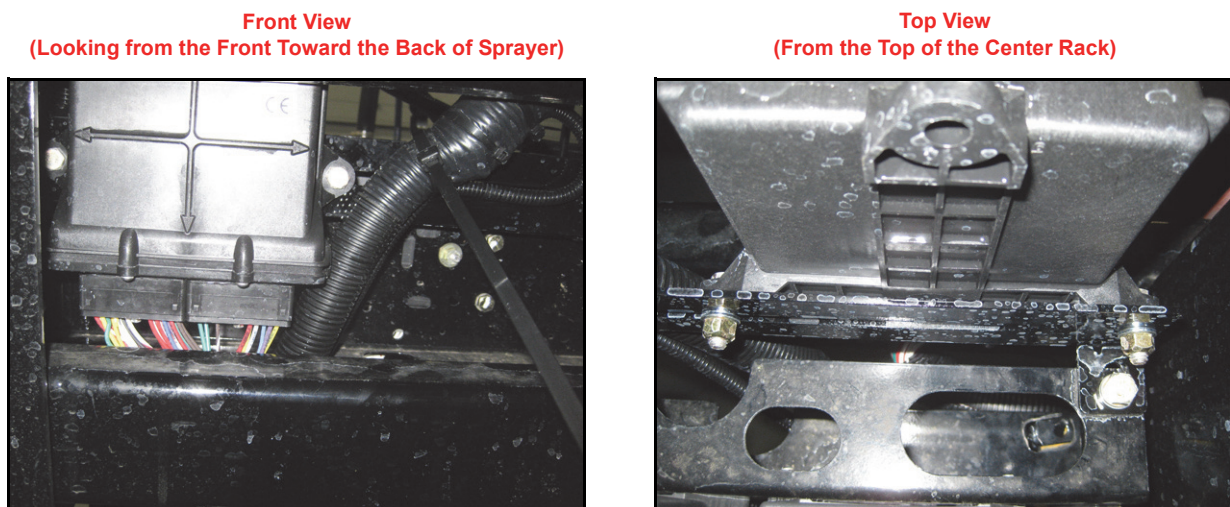
Wiring Connections



Note: For wiring connections made outside the cab, apply dielectric silicone grease (P/N 222-0000-006) generously on both the male and female ends of the connectors. Application of the grease will prevent corrosion to the pins and wires.

Install the AutoBoom Node

FIGURE 14. AutoBoom Node Installed



1. Locate the node mounting bracket on the right-inside cover of the center rack, in front of the existing CAN node bank.

Note: The node bracket may be present if the machine is already equipped with the AccuBoom system. If it is not, refer to the mounting instructions in the 7460/7660 SpraCoupe AccuBoom/AutoBoom Power Cable/Node Mounting Kit Installation Procedure (P/N 016-0171-396) included in the node mounting kit (P/N 117-0171-342).

2. Mount the AutoBoom node (P/N 063-0130-010) to the mounting bracket using two 5/16"-18 x 1" hex bolts (P/N 311-0054-105), two 5/16" flat washers (P/N 313-2300-011), and two 5/16"-18 nylon lock nuts (P/N 312-4000-059).

Note: Mount the node so that the node connector ports face down.

3. Insert the large, rectangular node connectors on the AutoBoom harness cable (P/N 115-0230-079) into the corrector ports of the AutoBoom node.
4. Tighten the bolts on the node connectors to secure the connections.

Connect the Harness to the Boom Function Controls

1. Locate the LEFT PRESS and RIGHT PRESS connectors on the AutoBoom harness cable (P/N 115-0230-045 or 115-0230-085).
2. Route the connectors to the AutoBoom valve (P/N 063-0131-125).
3. Connect the LEFT PRESS connector to Port G1 on the AutoBoom valve.
4. Connect the RIGHT PRESS connector to Port G4 on the AutoBoom valve.
5. Locate the LEFT SOLENOID and RIGHT SOLENOID connectors on the harness cable.
6. Connect the LEFT SOLENOID connector to Port 4A on the AutoBoom valve.
7. Connect the RIGHT SOLENOID connector to Port 4B on the AutoBoom valve.
8. Locate the LEFT PROP and RIGHT PROP connectors on the harness cable.
9. Connect the LEFT PROP connector to Port 5A on the AutoBoom valve.
10. Connect the RIGHT PROP connector to Port 13A on the AutoBoom valve.

FIGURE 15. Machine's Boom Function Controls



11. Locate the machine's boom function coils near the machine's hydraulic valve.
12. Disconnect the connector from the left tilt up coil.
13. On the harness cable, locate the LEFT SOLENOID SENSE connectors.
14. Isolate the connector labeled UP and connect it to the left tilt up coil via the installed boom sense adapter cable.
15. Connect the down LEFT SOLENOID SENSE connector to the left tilt down coil via the installed boom sense adapter cable.
16. Connect the RIGHT SOLENOID SENSE connectors to the machine's right tilt up and right tilt down coils via the installed boom sense adapter cables.

Install the Power Connection

1. Locate or install the CAN/Power extension harness cable.

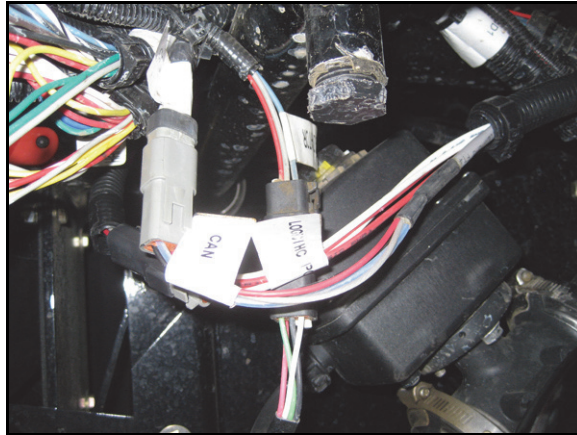
Note: *The CAN/Power extension harness cable may be present if the machine is already equipped with the AccuBoom system. If it is not, refer to the mounting instructions in the 7460/7660 SpraCoupe AccuBoom/AutoBoom Power Cable/Node Mounting Kit Installation Procedure (P/N 016-0171-396) included in the node mounting kit (P/N 117-0171-342) to install it.*

2. Locate the Logic/HC Power 4-pin Deutsch connector on the AutoBoom harness cable and remove the dust cap.

3. Connect the Logic/HC Power connector to the CAN/Power extension harness cable.

Install the CAN Connections

FIGURE 16. AccuBoom Harness Power Connection



1. Locate the CAN terminator on the CAN/Power extension harness or the previously installed AccuBoom harness cable (if applicable).
2. Remove the CAN terminator and connect it to the CAN Bus connector on the AutoBoom harness cable.
3. Connect the AutoBoom harness to the receptacle from which the CAN terminator was previously removed.



CHAPTER

4

UltraGlide

UltraGlide Kit Contents

This section contains a list of the components that are included in the UltraGlide AutoBoom kit. Before beginning the AutoBoom installation, compare the items in the AutoBoom kit with the components on this list. If you have questions about the kit, contact your Raven dealer.

Important: *In addition to the following kit components, a node mounting kit (P/N 117-0171-342) is required for the operation of the AutoBoom system.*

TABLE 1. UltraGlide Installation Kit (P/N 117-0232-098)




Picture	Item Description	Part Number	Qty.
Not Pictured	Manual - SpraCoupe 7x60 (2010 & Newer)	016-0230-098	1
Not Pictured	Manual - AutoBoom Calibration & Operation	016-0130-062	1
	Valve - PowerGlide Plus AutoBoom	063-0131-125	1
	Valve - 2-Way Normally Open Solenoid Hydraulic	334-0002-082	2
	Valve - Spool A Pilot to Close Spool-Type Logic	334-0003-075	1

TABLE 1. UltraGlide Installation Kit (P/N 117-0232-098)

Picture	Item Description	Part Number	Qty.
	Sensor - Right Ultrasonic	063-0130-012	N/A
	Sensor - Left Ultrasonic	063-0130-014	N/A
	Sensor - Center Ultrasonic	063-0130-018	N/A
	Plate - Hydraulic Block Mounting	107-0171-619	1
	Node - UltraGlide AutoBoom	063-0130-013	1
	Cable - 60' Ultrasonic Sensor Extension	115-0230-051	2
	Cable - Spracoupe 7000 Series CAN AutoBoom Harness	115-0230-079	1
	U-Bolt - 1-9/16" W x 2-1/2" L x 3/8" Thread	107-0171-611	6
	U-Bolt - 2-9/16" W x 3-1/2" L x 3/8" Thread	107-0171-616	2
	Bolt - 5/16" - 18 x 7/8" Zinc	311-0052-104	4
	Bolt - 5/16" x 1" Zinc Hex	311-0052-105	2

TABLE 1. UltraGlide Installation Kit (P/N 117-0232-098)



Picture	Item Description	Part Number	Qty.
	Nut - 3/8"-16 Zinc Flanged Lock	312-1001-164	16
	Nut - 5/16"-18 Nylon Lock	312-4000-059	2
	Washer - 5/16" Zinc Plated Lock	313-1000-019	4
	Washer - 5/16" Flat	313-2300-011	4

TABLE 2. Hydraulic Kit (P/N 117-0134-098)

Picture	Item Description	Part Number	Qty.
	Fitting - 3/4" JIC M/M/F Swivel Run Tee	333-0012-039	2
	Fitting - 9/16" JIC (M) to 9/16" SAE O-Ring (M) Straight Adapter	333-0012-045	3
	Fitting - 3/4" JIC (M) TO 9/16" SAE O-Ring (M) Straight Adapter	333-0012-055	2
	Fitting - 3/4" JIC M/F 90° Swivel Elbow	333-0012-064	4
	Fitting - 3/4" JIC (M) to 3/4" SAE O-Ring (M) Straight Adapter	333-0012-093	2
	Fitting - 7/16" JIC (M) to 7/16" SAE O-Ring (M) 90° Elbow	333-0012-176	2

TABLE 2. Hydraulic Kit (P/N 117-0134-098)

Picture	Item Description	Part Number	Qty.
	Fitting - 1-1/16" SAE O-Ring (M) to 1-1/16" SAE O-Ring (M) Straight Adapter	333-0012-234	2
	Fitting - 7/16" SAE O-Ring (F) to 3/4" SAE O-Ring (M) Straight Adapter	333-0012-297	2
	Fitting - 7/16" SAE O-Ring (M) to 7/16" JIC (F) Straight Adapter	333-0012-298	1
	Hydraulic Hose - 3/4" JIC (F) TO 3/4" JIC (F) - 275"	214-1000-383	1
	Hydraulic Hose - 3/4" JIC (F) to 3/4" JIC (F) 90° - 228"	214-1000-385	1
	Hydraulic Hose - 3/4" JIC (F) to 9/16" JIC (F) 90° - 92"	214-1000-540	2
	Hydraulic Hose - 7/16" JIC (F) to 9/16" JIC (F) - 275"	214-1000-639	1

TABLE 3. Optional Wheel Kit (P/N 117-0133-049)









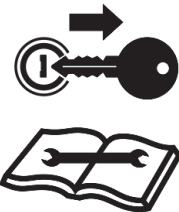
Picture	Item Description	Part Number	Qty.
	Axle Assembly - Right Cushioned AutoBoom	063-0131-585	1
	Axle Assembly - Left Cushioned AutoBoom	063-0131-590	1
	Bracket - SpraCoupe Wheel	116-0159-608	2

TABLE 3. Optional Wheel Kit (P/N 117-0133-049)


Picture	Item Description	Part Number	Qty.
	Wheel	322-0131-003	2
	U-Bolt - 1-9/16" W x 2-1/2" L x 3/8" Thread	107-0171-611	8
	Bolt - 1/2"-13 UNC x 1-1/2" SS Hex	311-0058-186	4
	Nut - 1/2"-13 Zinc Hex	312-1001-043	4
	Nut - 3/8"-16 Zinc Flanged Lock	312-1001-164	16

Install the UltraGlide Hydraulic System



! WARNING


The machine must remain stationary and switched off, with the booms unfolded and supported, during installation or maintenance.



! CAUTION

When installing AutoBoom hydraulics or performing diagnostics, maintenance, or routine service, ensure precautions are taken to prevent any foreign material from being introduced into the machine's hydraulic system.

Objects or materials that are able to bypass the machine's hydraulic filtration system will reduce performance and possibly cause damage to the AutoBoom hydraulic valve.



NOTICE

The appearance of the AutoBoom hydraulic valve may vary slightly from the images contained in this manual. However, the fittings, hose connections, and cable connections remain the same.

Install Fittings on the AutoBoom Valve

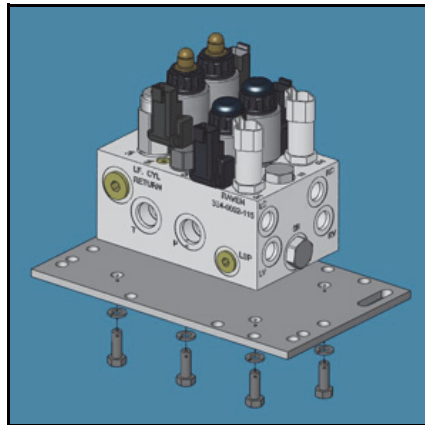
Before mounting the AutoBoom valve on the machine, install the proper fittings in the valve. This prepares the valve for installation and simplifies the hose connection process later in the procedure. Refer to the following table to install the fittings in the appropriate ports of the AutoBoom valve.

Fitting	Part Number	Port
Fitting - 9/16" JIC (M) to 9/16" SAE O-Ring (M) Straight Adapter	333-0012-045	LC, RC, LSP
Fitting - 3/4" JIC (M) TO 9/16" SAE O-Ring (M) Straight Adapter	333-0012-055	LV, RV

Fitting	Part Number	Port
Fitting - 3/4" JIC (M) to 3/4" SAE O-Ring (M) Straight Adapter	333-0012-093	P, Right T
Fitting - 3/4" JIC M/F 90° Swivel Elbow	333-0012-064	P, Right T LV, RV

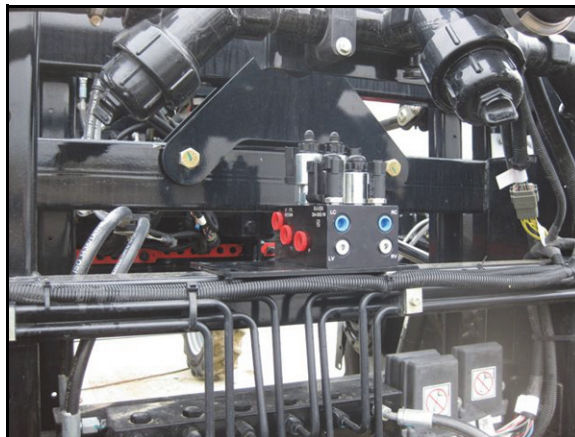
Mount the AutoBoom Valve

FIGURE 1. AutoBoom Valve Mounted on the Valve Mounting Plate




1. Secure the AutoBoom valve (P/N 063-0131-125) to the mounting plate (P/N 107-0171-619) using four 5/16"-18 x 7/8" hex bolts (P/N 311-0052-104) and four 5/16" zinc lock washers (P/N 313-1000-019).

FIGURE 2. AutoBoom Valve Mounted to the Machine



2. Secure the mounting plate to the machine's center rack using two 2-9/16" W x 3-1/2" L x 3/8" thread U-bolts (P/N 107-0171-616) and four 3/8"-16 zinc flanged lock nuts (P/N 312-1001-164).

Install the Pressure and Tank Hoses

	<p>! WARNING</p> <p>Hydraulics are under pressure. Care should always be taken with a system that has been pressurized. When disconnecting or purging hydraulic hoses, be aware that the hydraulic fluid within the machine's system may be extremely hot and under high pressure.</p>
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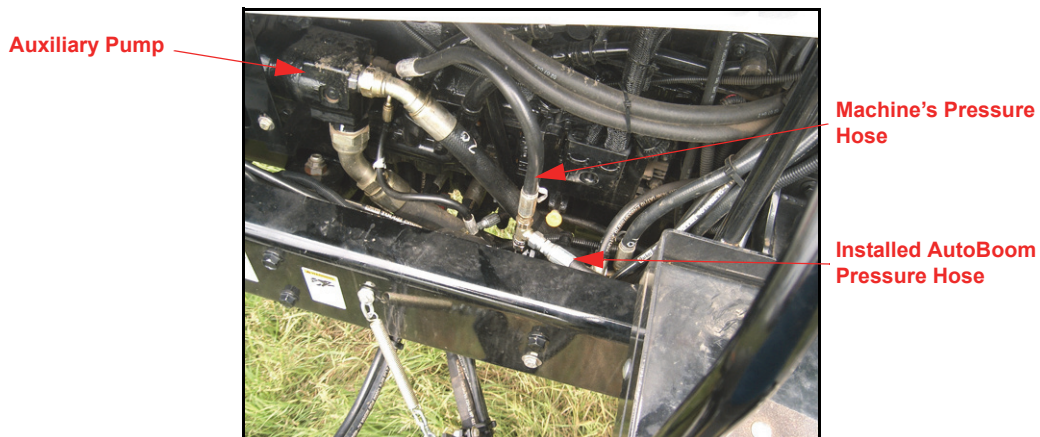
	<p>! CAUTION</p> <p>When installing AutoBoom hydraulics or performing diagnostics, maintenance, or routine service, ensure precautions are taken to prevent any foreign material from being introduced into the machine's hydraulic system.</p> <p>Objects or materials that are able to bypass the machine's hydraulic filtration system will reduce performance and possibly cause damage to the AutoBoom hydraulic valve.</p>
---	---

FIGURE 3. Pressure Hoses Installed



1. Locate the auxiliary pump in the engine compartment.
2. Trace the machine's pressure hose from the auxiliary pump to the pressure manifold.
3. Disconnect the pressure hose from the machine's pressure manifold.
4. Install a 3/4" JIC M/M/F swivel run tee fitting (P/N 333-0012-039) on the machine's pressure manifold.
5. Connect the machine's pressure hose to the opposite end of the installed tee fitting.
6. Install the supplied hydraulic hose (P/N 214-1000-383) on the 90° end of the installed tee fitting.
7. Route and connect the other end of the installed hydraulic hose to the fittings installed in Port P of the AutoBoom valve.

FIGURE 4. Tank Hose Installed



8. Locate the machine's tank manifold near the fuel/water separator.
9. Disconnect the machine's tank hose and fitting from port T of the tank manifold.
10. Install a 3/4" JIC M/M/F swivel run tee fitting (P/N 333-0012-039) on the machine's tank manifold.
11. Connect the machine's tank hose to the opposite end of the installed tee fitting.
12. Install the supplied hydraulic hose (P/N 214-1000-385) on the 90° end of the installed tee fitting.
13. Route and connect the other end of the installed hydraulic hose to the fittings installed in Port T of the AutoBoom valve.

Install the Left and Right Cylinder Hoses

FIGURE 5. Left and Right Cylinder Hoses Installed



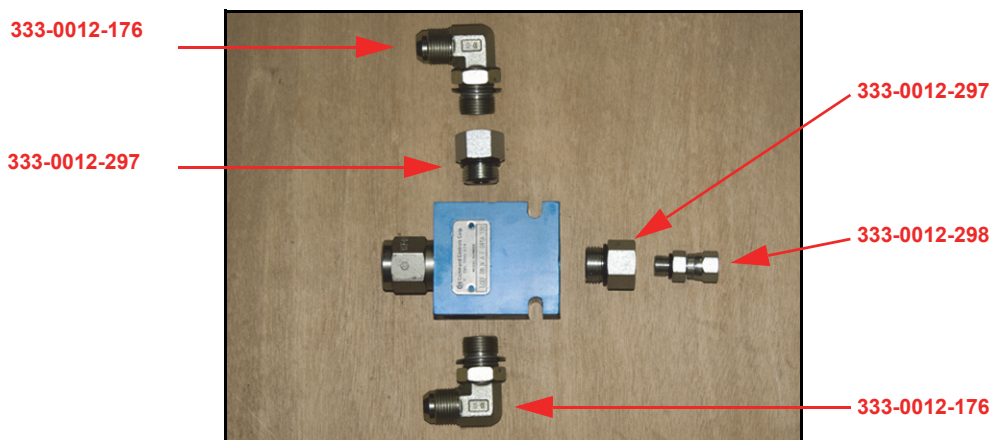
Two-way Valve (P/N 334-0002-082) Installed in the Accumulator On/Off Valve with Cable (P/N 115-0230-079) Connected

1. Disconnect the cylinder raise hose from the rod-end of the left tilt cylinder.
2. Route and connect the machine's left tilt cylinder raise hose to the installed fittings in Port LV of the AutoBoom valve.
3. Install the 90° end of the supplied hydraulic hose (P/N 214-1000-540) on the installed fittings in Port LC of the AutoBoom valve.
4. Connect the straight end of the installed hydraulic hose to the machine's left tilt cylinder raise port in the rod-end of the left tilt cylinder.
5. Disconnect the cylinder raise hose from the rod-end of the right tilt cylinder.

- Route and connect the machine's right tilt cylinder raise hose to the installed fittings in Port RV of the AutoBoom valve.
- Install the 90° end of the supplied hydraulic hose (P/N 214-1000-540) on the installed fittings in Port RC of the AutoBoom valve.
- Connect the straight end of the installed hydraulic hose to the machine's right tilt cylinder raise port in the rod-end of the right tilt cylinder.
- Remove the accumulator manifold from the left tilt cylinder.
- Remove the machine's cylinder-to-accumulator fitting from the rod-end of the left tilt cylinder.
- Install a 1-1/16" SAE O-ring (M) to 1-1/16" SAE O-ring (M) straight adapter fitting (P/N 333-0012-234) in the open port.
- Install the 2-way normally open solenoid hydraulic valve (P/N 334-0002-082) in the accumulator manifold.
- Install the accumulator manifold on the installed adapter fitting.
- Remove the accumulator manifold from the right tilt cylinder.
- Remove the machine's cylinder-to-accumulator fitting from the rod-end of the right tilt cylinder.
- Install a 1-1/16" SAE O-ring (M) to 1-1/16" SAE O-ring (M) straight adapter fitting (P/N 333-0012-234) in the open port.
- Install the 2-way normally open solenoid hydraulic valve (P/N 334-0002-082) in the accumulator manifold.
- Install the accumulator manifold on the installed adapter fitting.

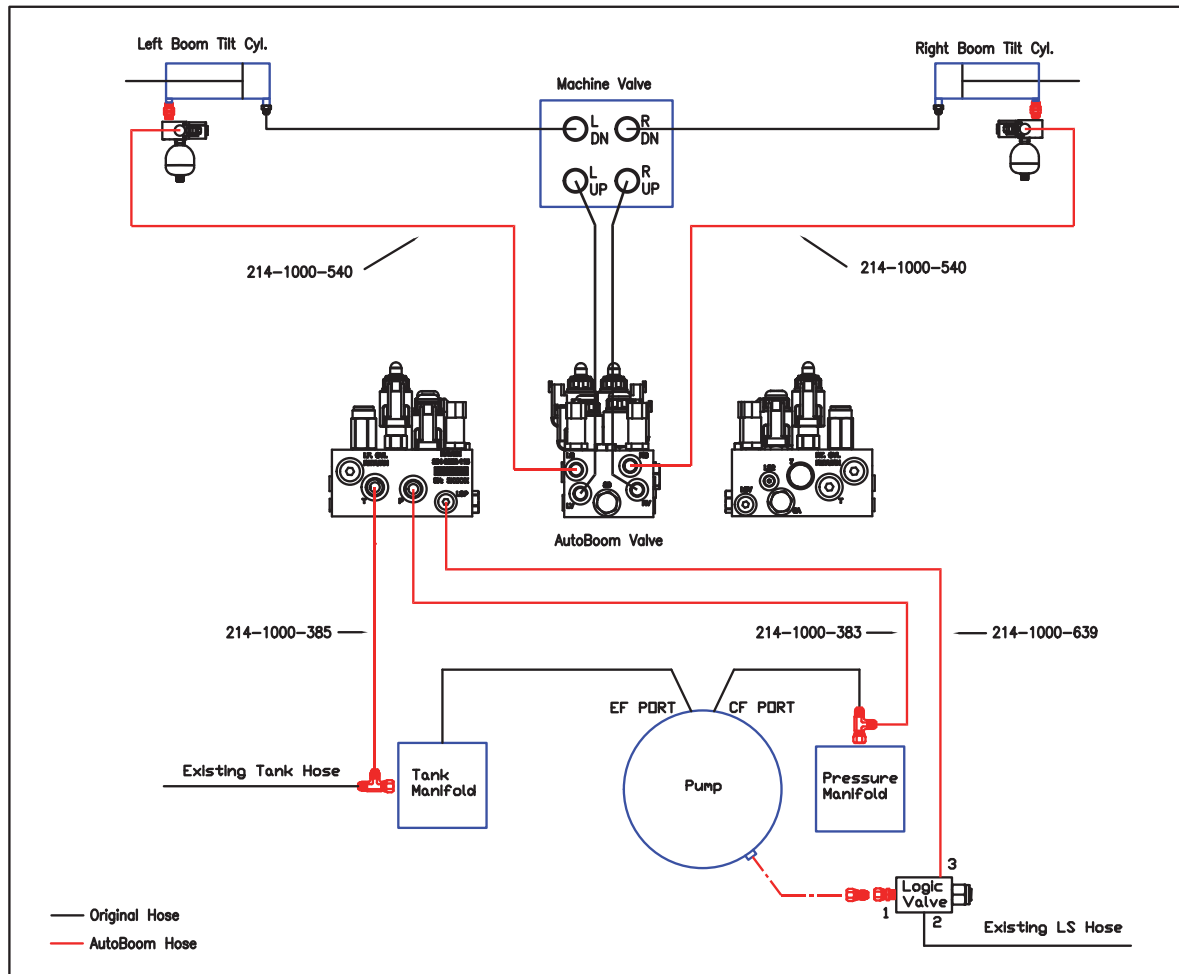
Install the Load Sense Hose

FIGURE 6. Fittings Installed on the Logic Valve



- Install the fittings in the appropriate ports of the logic valve (P/N 334-0003-075) as illustrated above.
- Tighten all fittings installed on the logic valve.
- Locate the machine's auxiliary pump in the engine compartment.
- Disconnect the machine's priority valve load sense hose from the auxiliary pump.
- Install Port 1 of the logic valve in the port from which the priority valve load sense hose was disconnected.
- Connect the machine's priority valve load sense hose that was previously disconnected to Port 2 of the logic valve.
- Install one end of the supplied hydraulic hose (P/N 214-1000-639) to Port 3 of the logic valve.
- Connect the other end of the supplied hydraulic hose to Port LSP on the AutoBoom valve.

UltraGlide Hydraulic Schematic



117-0232-098, 117-0231-098 HYD SCHEMATIC 125

Install the UltraGlide Sensors

Boom Sensor Mounting Locations

Sensor mounting locations may be influenced by the boom configuration. Determine the appropriate location for mounting the sensors on the boom, ensuring the sensors will not interfere with or be damaged while folding or unfolding the booms. The sensors should be mounted outside of the boom fold, but inside the boom breakaway.

Mount the Boom Sensors

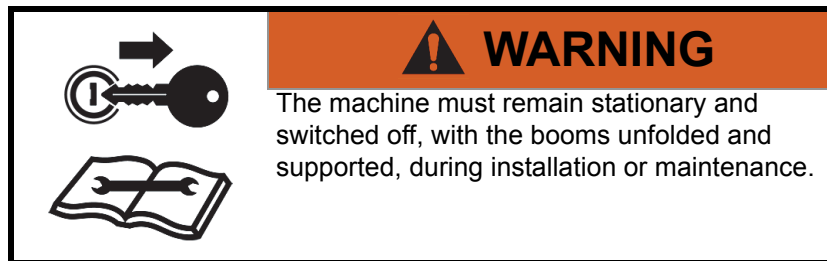
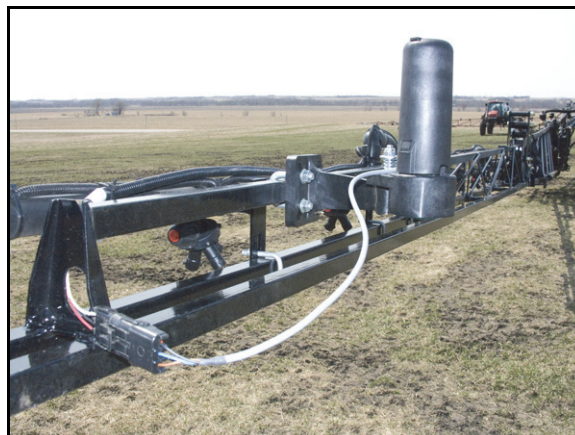


FIGURE 7. Mounted Boom Sensor



1. Secure the right sensor (P/N 063-0130-012) to the front of the right boom using two 1-9/16" W x 2-1/2" L x 3/8" thread U-bolts (P/N 107-0171-611) and four 3/8"-16 zinc flanged lock nuts (P/N 312-1001-164).
2. Tighten the nuts to ensure the sensor is mounted securely.
3. Repeat the steps above to mount the remaining boom sensor(s).

Mount the Center Rack Sensor

FIGURE 8. Mounted Center Rack Sensor



1. Mount the center sensor (P/N 063-0130-018) to the machine's center rack using two 1-9/16" W x 2-1/2" L x 3/8" thread U-bolts (P/N 107-0171-611) and four 3/8"-16 zinc flanged lock nuts (P/N 312-1001-164).
2. Tighten the nuts to ensure the sensor is mounted securely.

Connect the Sensor Cables

1. Connect the left sensor cable (P/N 115-0230-051) to the connector on the left outer sensor.
2. Route the left sensor cable toward the AutoBoom valve.
3. Loop and tie-off any excess cable, allowing enough cable for boom folding and extension.
4. Repeat the steps above to connect the remaining sensor cables.

Note: The sensor cables will be connected to the AutoBoom system in the wiring phase of installation.

Install the Gauge Wheels - Optional

Gauge Wheel Mounting Locations

Wheel mounting locations may be influenced by the boom configuration. Determine the appropriate location for mounting the wheels on the boom, ensuring the wheels will not interfere with or be damaged while folding or unfolding the booms.

Mount the Gauge Wheels

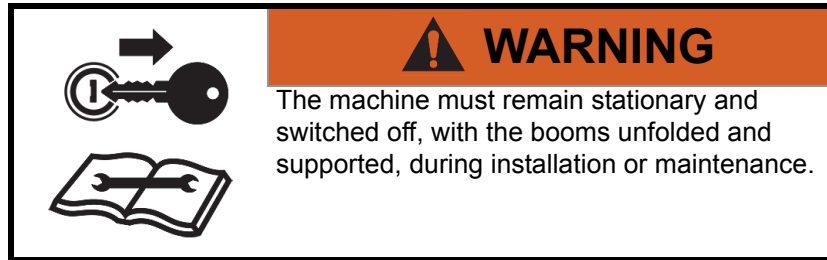


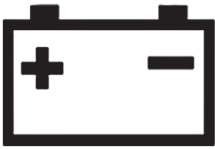
FIGURE 9. Wheel Mounting Bracket Installed



1. Remove the nuts from the right wheel axle (P/N 063-0131-585).
2. Place the wheel (P/N 322-0131-003) on the right wheel axle.
3. Align and place the hub retainer bracket (P/N 107-0171-617) on the wheel.
4. Reinstall the lug nuts on the wheel axle to secure the wheel and hub retainer bracket.
5. Secure the right wheel mounting bracket (P/N 116-0159-608) to the front of the right boom by installing four 1-9/16" W x 2-1/2" L x 3/8" thread U-bolts (P/N 107-0171-611) and eight 3/8"-16 zinc flanged lock nuts (P/N 312-1001-164).
6. Insert the right wheel axle into the right wheel mounting bracket, positioning it so that the bottom of the wheel touches the ground (or nearly so) and the wheel faces away from the machine.
7. Secure the gauge wheel assembly in the wheel mounting bracket by installing two 1/2"-13 x 1-1/2" SS hex bolts (P/N 311-0058-186) and two 1/2" zinc hex nuts (P/N 312-1001-043).
8. Repeat the steps above to install the left wheel.

Install the UltraGlide Wiring

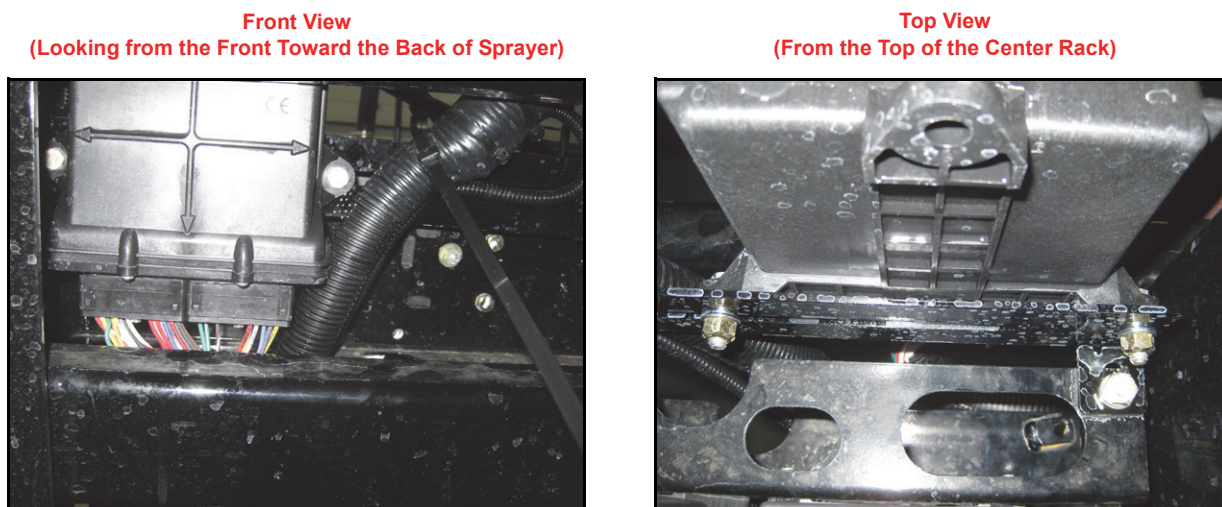
Wiring Connections

	<p>⚠ CAUTION</p>
<p>Always connect the power cable as the last step in the wiring process and verify that the power leads are connected with the correct polarity. Reversing power leads can cause severe damage to the equipment.</p>	

Note: For wiring connections made outside the cab, apply dielectric silicone grease (P/N 222-0000-006) generously on both the male and female ends of the connectors. Application of the grease will prevent corrosion to the pins and wires.

Install the AutoBoom Node

FIGURE 10. AutoBoom Node Installed



1. Locate the node mounting bracket on the right-inside cover of the center rack, in front of the existing CAN node bank.

Note: The node bracket may be present if the machine is already equipped with the AccuBoom system. If it is not, refer to the mounting instructions in the 7460/7660 SpraCoupe AccuBoom/AutoBoom Power Cable/Node Mounting Kit Installation Procedure (P/N 016-0171-396) included in the node mounting kit (P/N 117-0171-342).

2. Mount the AutoBoom node (P/N 063-0130-013) to the mounting bracket using two 5/16"-18 x 1" hex bolts (P/N 311-0054-105), two 5/16" flat washers (P/N 313-2300-011), and two 5/16"-18 nylon lock nuts (P/N 312-4000-059).

Note: Mount the node so that the node connector ports face down.

3. Insert the large, rectangular node connectors on the AutoBoom harness cable (P/N 115-0230-079) into the corrector ports of the AutoBoom node.
4. Tighten the bolts on the node connectors to secure the connections.

Connect the Harness to the Boom Function Controls

AutoBoom Valve Connections

1. Locate the LEFT PRESS and RIGHT PRESS connectors on the AutoBoom harness cable (P/N 115-0230-045 or 115-0230-085).
2. Route the connectors to the AutoBoom valve (P/N 063-0131-125).
3. Connect the LEFT PRESS connector to Port G1 on the AutoBoom valve.
4. Connect the RIGHT PRESS connector to Port G4 on the AutoBoom valve.
5. Locate the LEFT SOLENOID and RIGHT SOLENOID connectors on the harness cable.
6. Connect the LEFT SOLENOID connector to Port 4A on the AutoBoom valve.
7. Connect the RIGHT SOLENOID connector to Port 4B on the AutoBoom valve.
8. Locate the LEFT PROP and RIGHT PROP connectors on the harness cable.
9. Connect the LEFT PROP connector to Port 5A on the AutoBoom valve.
10. Connect the RIGHT PROP connector to Port 13A on the AutoBoom valve.

Boom Function Coil Connections

FIGURE 11. Machine's Boom Function Controls



11. Locate the machine's boom function coils near the machine's hydraulic valve.
12. Disconnect the connector from the left tilt up coil.
13. On the harness cable, locate the LEFT SOLENOID SENSE connectors.
14. Isolate the connector labeled UP and connect it to the left tilt up coil via the installed boom sense adapter cable.
15. Connect the down LEFT SOLENOID SENSE connector to the left tilt down coil via the installed boom sense adapter cable.
16. Connect the RIGHT SOLENOID SENSE connectors to the machine's right tilt up and right tilt down coils via the installed boom sense adapter cables.

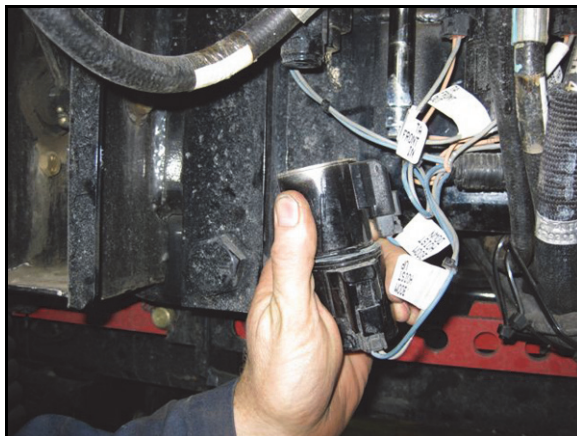
Accumulator Power Connections

1. On the AutoBoom harness cable (P/N 115-0230-079), locate the RIGHT ACCUMULATOR cable connection.
2. Connect the RIGHT ACCUMULATOR connection to the accumulator shut-off assembly coil connector located on the rod-end of the right tilt cylinder.
3. On the AutoBoom harness cable, locate the LEFT ACCUMULATOR cable connection.

4. Connect the LEFT ACCUMULATOR connection to the accumulator shut-off assembly coil connector located on the rod-end of the left tilt cylinder.

Install the Center Rack Control

FIGURE 12. Machine's Center Boom Function Coils



1. Locate the machine's center boom function coils on the left side of the machine's hydraulic valve.

Note: The center boom function coils are the two coils stacked together, second from the end.

2. Unplug the coil connector from the boom hoist up coil.

Note: It may be necessary to remove the coils to access the coil connectors.

3. Install the BOOM HOIST UP connectors from the AutoBoom harness cable on the coil and the machine's harness cable connection.
4. Unplug the coil connector from the boom hoist down coil.
5. Install the BOOM HOIST DOWN connectors from the AutoBoom harness cable on the coil and the machine's harness cable connection.
6. Locate the machine's master open center valve.
7. Unplug the coil connector from the master open center valve coil.
8. Install the DUMP VALVE connectors from the AutoBoom harness cable on the coil and the machine's harness cable connection.

Connect the Harness Cable to the Sensors

1. Locate the CENTER SENSOR connector on the AutoBoom harness cable.
2. Connect the CENTER SENSOR connector to the installed center sensor (P/N 063-0130-018).
3. Locate the LEFT OUTER SENSOR connector on the AutoBoom harness cable.
4. Connect the LEFT OUTER SENSOR connector to the installed left sensor cable (P/N 115-0171-527).
5. Locate the RIGHT OUTER SENSOR connector on the AutoBoom harness cable.
6. Connect the RIGHT OUTER SENSOR connector to the installed right sensor cable.
7. If optional inside boom sensors are installed, repeat the steps above to connect the sensor cables.

Install the Power Connection

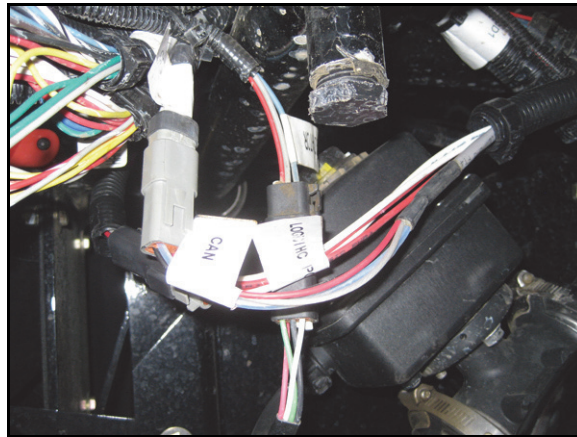
1. Locate or install the CAN/Power extension harness cable.

Note: *The CAN/Power extension harness cable may be present if the machine is already equipped with the AccuBoom system. If it is not, refer to the mounting instructions in the 7460/7660 SpraCoupe AccuBoom/AutoBoom Power Cable/Node Mounting Kit Installation Procedure (P/N 016-0171-396) included in the node mounting kit (P/N 117-0171-342) to install it.*

2. Locate the Logic/HC Power 4-pin Deutsch connector on the AutoBoom harness cable and remove the dust cap.
3. Connect the Logic/HC Power connector to the CAN/Power extension harness cable.

Install the CAN Connections

FIGURE 13. AccuBoom Harness Power Connection



1. Locate the CAN terminator on the CAN/Power extension harness or the previously installed AccuBoom harness cable (if applicable).
2. Remove the CAN terminator and connect it to the CAN Bus connector on the AutoBoom harness cable.
3. Connect the AutoBoom harness to the receptacle from which the CAN terminator was previously removed.

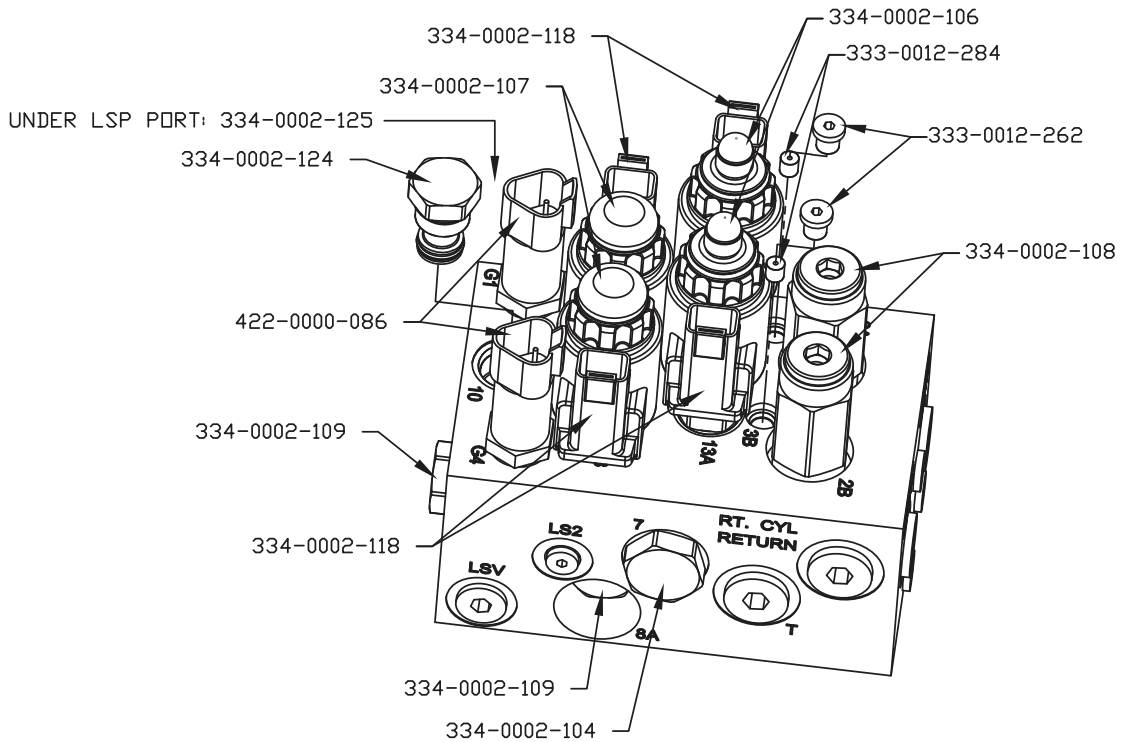
CHAPTER

5

Replacement Parts

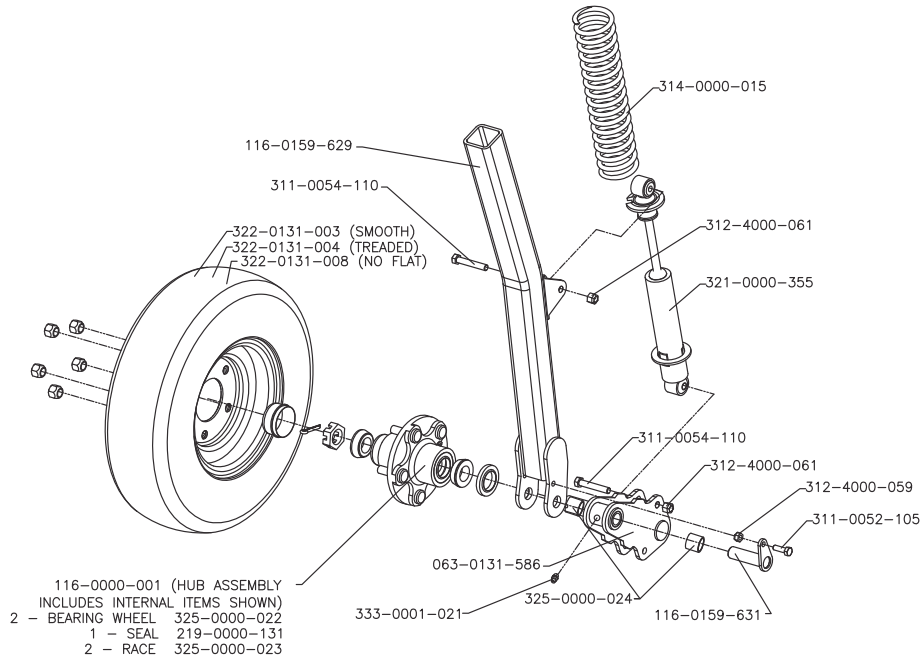
This section contains replacement part diagrams for PowerGlide Plus and UltraGlide systems. Please refer to these diagrams when calling to request replacement parts.

Valves

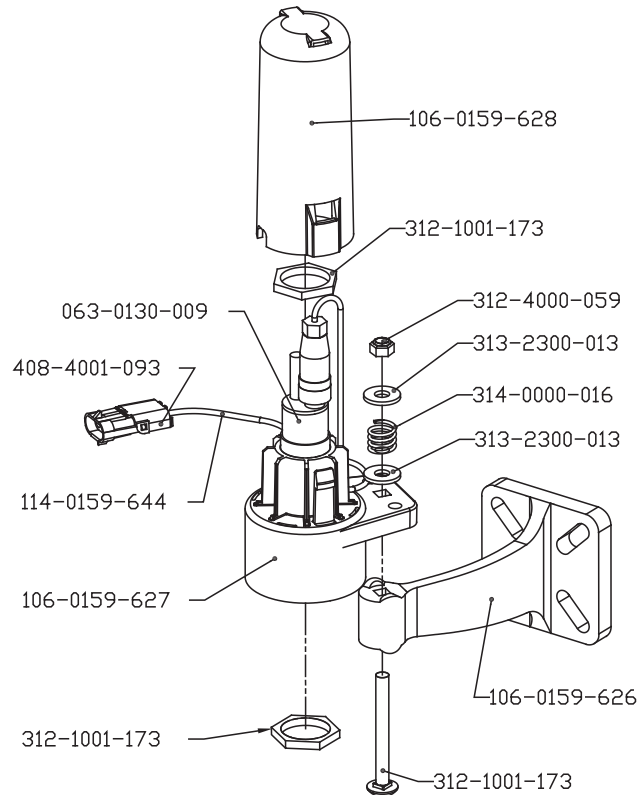


063-0131-125
VALVE, HYDRAULIC POWERGLIDE
PLUS/ULTRAGLIDE, DYNAMIC LS, AUTOBOOM

Wheels



Sensors



E**Electrical**

Safety 2

H**Hydraulic**

Fittings 4

Safety 2

I**Important Safety Information**

Electrical 2

Hydraulics 2

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Hydraulic Fittings 4

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K**Kit Contents**

PowerGlide Plus 7

UltraGlide 25

P**Point of Reference 4****PowerGlide Plus 7**

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RAVEN

Limited Warranty

What Does this Warranty Cover?

This warranty covers all defects in workmanship or materials in your Raven Applied Technology Division product under normal use, maintenance, and service when used for intended purpose.

How Long is the Coverage Period?

Raven Applied Technology products are covered by this warranty for 12 months from the date of retail sale. In no case will the Limited Warranty period exceed 24 months from the date the product was issued by Raven Industries Applied Technology Division. This warranty coverage applies only to the original owner and is non-transferable.

How Can I Get Service?

Bring the defective part and proof of purchase to your Raven dealer. If the dealer approves the warranty claim, the dealer will process the claim and send it to Raven Industries for final approval. The freight cost to Raven Industries will be the customer's responsibility. The Return Materials Authorization (RMA) number must appear on the box and all documentation (including proof of purchase) must be included inside the box to be sent to Raven Industries.

What Will Raven Industries Do?

Upon confirmation of the warranty claim, Raven Industries will (at our discretion) repair or replace the defective product and pay for the standard return freight, regardless of the inbound shipping method. Expedited freight is available at the customer's expense.

What is not Covered by this Warranty?

Raven Industries will not assume any expense or liability for repairs made outside our facilities without written consent. Raven Industries is not responsible for damage to any associated equipment or products and will not be liable for loss of profit, labor, or other damages. The obligation of this warranty is in lieu of all other warranties, expressed or implied, and no person or organization is authorized to assume any liability for Raven Industries.

Damages caused by normal wear and tear, misuse, abuse, neglect, accident, or improper installation and maintenance are not covered by this warranty.



Extended Warranty

What Does this Warranty Cover?

This warranty covers all defects in workmanship or materials in your Raven Applied Technology Division product under normal use, maintenance, and service when used for intended purpose.

Do I Need to Register My Product to Qualify for the Extended Warranty?

Yes. Products/systems must be registered within 30 days of retail sale to receive coverage under the Extended Warranty. If the component does not have a serial tag, the kit it came in must be registered instead.

Where Can I Register My Product for the Extended Warranty?

To register, go online to www.ravenhelp.com and select Product Registration.

How Long is the Extended Warranty Coverage Period?

Raven Applied Technology products that have been registered online are covered for an additional 12 months beyond the Limited Warranty for a total coverage period of 24 months from the date of retail sale. In no case will the Extended Warranty period exceed 36 months from the date the product was issued by Raven Industries Applied Technology Division. This Extended Warranty coverage applies only to the original owner and is non-transferable.

How Can I Get Service?

Bring the defective part and proof of purchase to your Raven dealer. If the dealer approves the warranty claim, the dealer will process the claim and send it to Raven Industries for final approval. The freight cost to Raven Industries will be the customer's responsibility. The Return Materials Authorization (RMA) number must appear on the box and all documentation (including proof of purchase) must be included inside the box to be sent to Raven Industries. In addition, the words "Extended Warranty" must appear on the box and all documentation if the failure is between 12 and 24 months from the retail sale.

What Will Raven Industries Do?

Upon confirmation of the product's registration for the Extended Warranty and the claim itself, Raven Industries will (at our discretion) repair or replace the defective product and pay for the standard return freight, regardless of the inbound shipping method. Expedited freight is available at the customer's expense.

What is Not Covered by the Extended Warranty?

Raven Industries will not assume any expense or liability for repairs made outside our facilities without written consent. Raven Industries is not responsible for damage to any associated equipment or products and will not be liable for loss of profit, labor, or other damages. Cables, hoses, software enhancements, and remanufactured items are not covered by this Extended Warranty. The obligation of this warranty is in lieu of all other warranties, expressed or implied, and no person or organization is authorized to assume any liability for Raven Industries.

Damages caused by normal wear and tear, misuse, abuse, neglect, accident, or improper installation and maintenance are not covered by this warranty.