

**Buhler Versatile RT490 Combines  
SmarTrax™ Installation Manual**

*P/N 016-5031-004 Rev A*

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*E22245*

## ***Disclaimer***

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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 SmarTrax™ 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 SmarTrax 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 SmarTrax, observe the following safety measures:

- Be alert and aware of surroundings.
- Do not operate SmarTrax 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 SmarTrax is engaged.
- Disable SmarTrax when exiting the operator's seat and machine.
- Do not drive the machine with SmarTrax enabled on any public road.
- Determine and remain a safe working distance from other individuals. The operator is responsible for disabling SmarTrax when the safe working distance has diminished.
- Ensure SmarTrax is disabled prior to starting any maintenance work on SmarTrax or the machine.

 **WARNING**

- When starting the machine for the first time after installing SmarTrax, be sure that all persons stand clear in case a hose has not been properly tightened.
- The machine must remain stationary and switched off during SmarTrax installation or maintenance.

 **CAUTION**

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## *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 SmarTrax 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 reduce performance and possibly damage the SmarTrax valve.

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## *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.

Congratulations on your purchase of the SmarTrax system! This system is designed to provide cutting-edge, hands-free steering of the machine via Global Positioning System (GPS) coordinates.

This manual applies to the following machines:

**MAKE: Buhler Versatile**  
**MODEL: RT490 Combine**

**FIGURE 1. Buhler Versatile RT490 Combine**

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## *Preparing for Installation*

Before installing the SmarTrax system, park the machine where the ground is level, clean, and dry. Turn off the machine and leave it 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 when installing or operating the SmarTrax system for the first time, at the start of the season, or when moving the SmarTrax system to another machine:

- Install the GPS antenna in the recommended location. Refer to the following table for the machine-specific antenna mounting location.

<b>Machine Preset</b>	<b>Antenna X Position (left to right)</b>	<b>Antenna Y Position (fore/aft offset)</b>	<b>Antenna Z Position (ground to bottom of antenna)</b>
Versatile 490 Combine	Centered	19 ft. 3 in./5.883 m	13 ft./3.962 m

- 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.).
- Ensure the machine's hydraulic system is using fresh oil and debris is flushed from the hydraulic hoses, valves, and filters.

Raven Industries recommends the following best practices when installing the SmarTrax 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.

### Point of Reference

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

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### 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](mailto:techwriting@ravenind.com)**

- Buhler Versatile RT490 Combine SmarTrax™ Installation Manual*
- Manual No. 016-5031-004 Rev. A*
- 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.*

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## Kit Contents

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

**TABLE 1. SmarTrax Installation Kit (P/N 117-5031-004)**



Picture	Item Description	Part Number	Qty.
Not Pictured	Manual - Versatile SmarTrax Calibration & Operation	016-0171-532	1
Not Pictured	Manual - Buhler Versatile RT490 SmarTrax Installation	016-5031-004	1
	Valve - SmarTrax Hydraulic	334-0003-090	1
	Valve - Dual POCI	334-0003-030	1





TABLE 1. SmarTrax Installation Kit (P/N 117-5031-004)

Picture	Item Description	Part Number	Qty.
	Node - SmarTrax	063-0173-228	1
	Bracket - Hydraulic Valve Mounting	107-0171-908	1
	Bracket - WAS Mounting (Small)	107-0172-030	1
	Bracket - Dual POCI Mounting	107-0172-136	1
	Bracket - WAS Mounting (Large)	107-0172-185	1
	Cable - Node Harness	115-4001-158	1
	Cable - Valve Harness	115-4001-171	1
	Assembly - Foot Switch Enable	063-0172-470	1
	Assembly - 250 mm Non-Contact Linear Wheel Angle	063-0181-017	1
	Transducer - 0-3000 PSI Pressure	422-0000-086	1
	Mount - M10 Ball Linear Sensor0001-029	103-0001-029	2

TABLE 1. SmarTrax Installation Kit (P/N 117-5031-004)

Picture	Item Description	Part Number	Qty.
	Clamp - 1-1/2" U-Bolt Muffler	435-3003-030	2
	Clamp - 2-3/4" U-Bolt Muffler	435-3003-060	1
	Bolt - 5/16"-18 x 3/4" Hex	311-0052-103	2
	Bolt - 3/8"-16 x 1" UNC Hex	311-0052-105	2
	Bolt - 5/16"-18 UNC x 2-1/2" Hex	311-0052-111	2
	Bolt - M10 x 1.5 Pitch x 60 mm Metric Hex	311-0070-025	2
	Bolt - M10 x 1.5 Pitch x 40 mm Metric Hex	311-0070-039	2
	Spacer - 0.406" ID x 0.750" OD x 1" Long	107-0172-038	2
	Nut - 3/8"-16 Flanged Lock	312-1001-164	2
	Nut - 5/16"-18 UNC Flanged Lock	312-1001-169	6
	Nut - M10 x 5 mm x 1.5 Pitch Jam	312-1002-038	2








**TABLE 1. SmarTrax Installation Kit (P/N 117-5031-004)**

Picture	Item Description	Part Number	Qty.
	Nut - M10 x 1.5 Pitch Nylon Insert Lock	312-4000-208	4
	Washer - 5/16" Split Lock	313-1000-019	4
	Washer - 0.344" ID x 0.688" OD x 0.065" Thick	313-2300-012	3
	Washer - 0.406" ID x 0.812" OD x 0.065" Thick	313-2300-014	48

**TABLE 2. Hydraulic Installation Kit (P/N 117-0199-136)**

Picture	Item Description	Part Number	Qty.
	Fitting - -4 SAE O-Ring (M) Plug	333-0012-051	1
	Fitting - -6 ORFS M/F 90° Swivel Elbow	333-0012-065	2
	Fitting - -6 ORFS (M) to -8 SAE O-Ring (M) Straight Adapter	333-0012-199	6
	Fitting - -6 ORFS (M) to -10 SAE O-Ring (M) Straight Adapter	333-0012-233	2
	Fitting - -8 ORFS (M) to -10 SAE O-Ring (M) Straight Adapter	333-0012-304	3
	Fitting - 22L, M30 x 2 M/M/F Swivel Run Tee Adapter	333-0012-379	1

TABLE 2. Hydraulic Installation Kit (P/N 117-0199-136)

Picture	Item Description	Part Number	Qty.
	Fitting - 22L, M30 x 2 (F) to 15L, M22 x 1.5 (M) Reducer	333-0012-380	1
	Hydraulic Hose - -8 ORFS (F) 90° to 15L, M22 x 1.5 (M) - 28"	214-1000-987	1
	Hydraulic Hose - -8 ORFS (F) 90° to 15L, M22 x 1.5 (F) - 36"	214-1000-979	1
	Hydraulic Hose - -8 ORFS (F) 90° to 15L, M22 x 1.5 (F) - 32"	214-1000-980	1
	Hydraulic Hose - -6 ORFS (F) 90° to 12L, M18 x 1.5 (F) - 34"	214-1000-981	2
	Hydraulic Hose - -6 ORFS (F) 90° to -6 ORFS (F) - 18"	214-1000-981	2
	Hydraulic Hose - -6 ORFS (F) 90° to 12L, M18 x 1.5 (M) - 21"	214-1000-983	2



CHAPTER

3

# Hydraulic System Installation



## WARNING

Hydraulics are under pressure. Care should always be taken with a system that has been pressurized.

Before beginning the SmarTrax hydraulic installation, turn off the machine and relieve pressure by turning the steering wheel left and right.

Never work on a hot machine. Always allow it to cool before performing diagnostics, maintenance, or routine service.

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.


Tampering with hydraulic valves may cause serious injury or death, and will void the warranty.



## CAUTION

When installing SmarTrax 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 damage the SmarTrax hydraulic valve.

	NOTICE
	<p>The appearance of the SmarTrax hydraulic valve may vary slightly from the images contained in this manual. However, the fittings, hose connections, and cable connections remain the same.</p>

## Install Fittings in the SmarTrax Valve

Before mounting the SmarTrax valve (P/N 334-0003-090) 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.

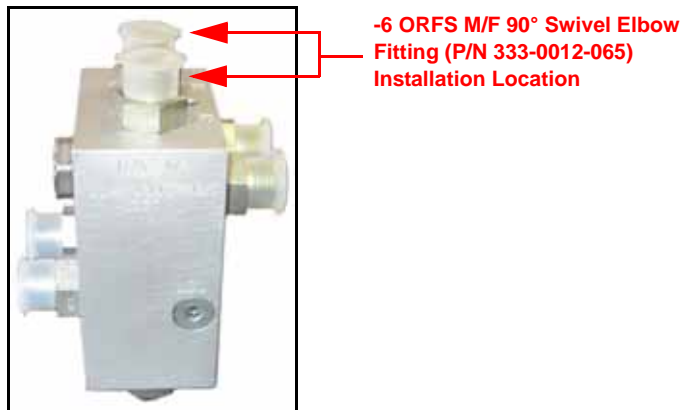
Fitting	Part Number	Port
Fitting - -8 ORFS (M) to -10 SAE O-Ring (M) Straight Adapter	333-0012-304	P, T, EF
Fitting - -6 ORFS (M) to -10 SAE O-Ring (M) Straight Adapter	333-0012-233	A, B
Transducer - 0-3000 PSI Pressure	422-0000-086	PS

## Install Fittings in the Dual POCI Valve

1. Remove the fitting that were pre-populated in the dual POCI valve (P/N 334-0003-030).

**Note:** *These fittings are not used in the SmarTrax system installation.*

**FIGURE 1. Fittings Installed in the Dual POCI Valve**





Fitting	Part Number	Port
Fitting - -4 SAE O-Ring (M) Plug	333-0012-051	PS
Fitting - -6 ORFS (M) to -8 SAE O-Ring (M) Straight Adapter	333-0012-233	A, B, A1 B1, A2, B2
Fitting - -6 ORFS M/F 90° Swivel Elbow	333-0012-065	A2, B2

- Refer to Figure 2 and the table above to install the proper fittings in the dual POCI valve.

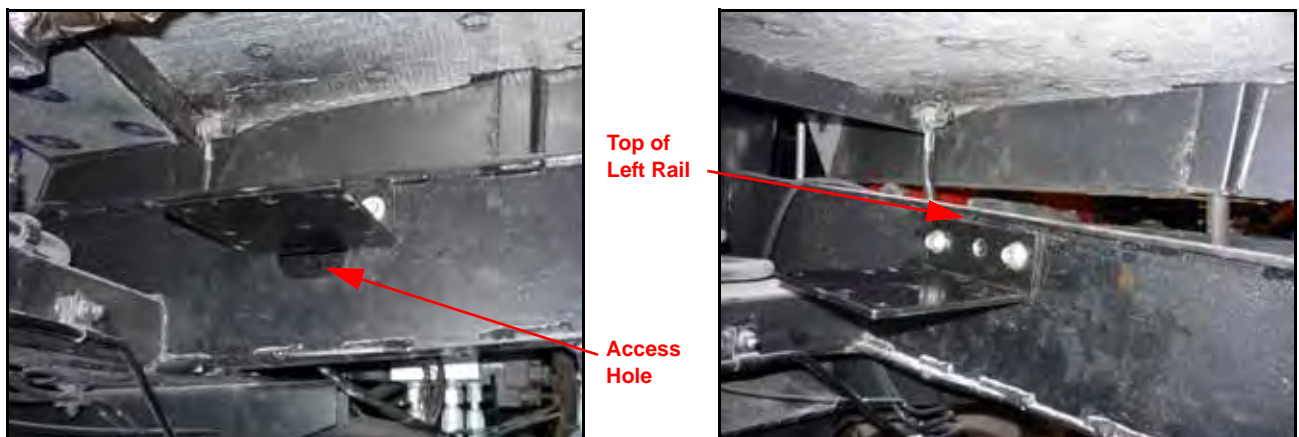
## Mount the SmarTrax Valve

FIGURE 2. Valve Mounting Location



- Identify the valve mounting location on the left frame rail under the machine's cab.

FIGURE 3. Valve Mounting Bracket Installed



2. Position the valve mounting bracket (P/N 107-0171-908) over the access hole, aligning it with the top of the frame rail.
3. Using the holes in the valve mounting bracket as a guide, drill two clearance holes large enough for an M10 bolt through the frame rail.
4. Install the hydraulic valve mounting bracket (P/N 107-0171-908) on the frame rail using two M10 x 1.5 x 40 mm metric hex bolts (P/N 311-0070-039), two 0.406" ID x 0.812" OD x 0.065" thick flat washers (P.N 313-2300-014), and two M10 x 1.5 nylon insert lock nuts (P/N 312-4000-208).

**FIGURE 4. SmarTrax Valve Installed**

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5. Secure the SmarTrax valve (P/N 334-0003-090) to the bottom of the valve mounting bracket by installing two 5/16"-18 UNC x 3/4" hex bolts (P/N 311-0052-103) and two 5/16" lock washers (P/N 313-1000-019) in the bracket holes closest to the frame rail.

## *Mount the Dual POCI Hydraulic Valve*

**FIGURE 5. Dual POCI Valve Mounting Bracket Installed**

---



1. Install the dual POCI valve mounting bracket (P/N 107-0172-136) on the remaining two holes of the valve mounting bracket (P/N 107-0171-908) using two 5/16"-18 UNC x 1" hex bolts (P/N 311-0052-105) and two 5/16" lock washers (P/N 313-1000-019).

**Note:** The bolts will secure the other side of the SmarTrax valve (P/N 334-0003-090) to the valve mounting bracket when installed.

FIGURE 6. Dual POCI Valve Installed



2. Secure the dual POCI valve (P/N 334-0003-030) to the bottom of the POCI valve mounting bracket using two 5/16"-18 UNC x 2" hex bolts (P/N 311-0052-111) and two 5/16"-18 flanged lock nuts (P/N 312-1001-169).

**Note:** The holes in the dual POCI valve mounting bracket should align with the -4 SAE O-ring (M) plug fitting (P/N 333-0012-051) installed in the POS port of the dual POCI valve.

## Install the Left and Right Steering Hoses

1. Disconnect the machine's right steering hose from the steering orbital and the steel line under the cab.

**Note:** This hose is not used in the SmarTrax system. Keep it for future use.

FIGURE 7. Hydraulic Hose Installed on Dual POCI Valve

Hydraulic Hose  
(P/N 214-1000-983)  
Connected to Port B1



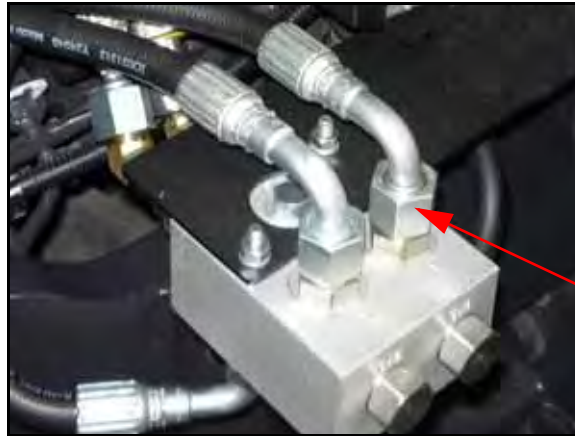
2. Connect the 90° end of the installed hydraulic hose to the fitting installed in Port B1 of the dual POCI valve (P/N 334-0003-030).
3. Install the male end of the supplied hydraulic hose (P/N 214-1000-983) on the open port of the steel line.
4. Disconnect the machine's left steering hose from the steering orbital and the steel line under the cab.

**Note:** This hose is not used in the SmarTrax system. Keep it for future use.

5. Connect the 90° end of the installed hydraulic hose to the fitting installed in Port A1 of the dual POCI valve.
6. Install the male end of the supplied hydraulic hose (P/N 214-1000-983) on the open port of the steel line.

**FIGURE 8. Hydraulic Hose Installed on Dual POCI Valve**

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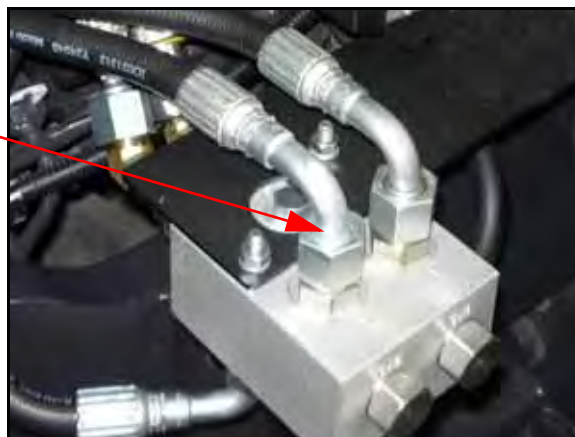
Hydraulic Hose  
(P/N 214-1000-981)  
Connected to Port A

7. Install the 90° end of the supplied hydraulic hose (P/N 214-1000-981) on the fitting installed in Port A of the dual POCI valve.
8. Connect the straight end of the installed hydraulic hose to port A on the steering orbital.

**FIGURE 9. Hydraulic Hose Installed on Dual POCI Valve**

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Hydraulic Hose  
(P/N 214-1000-981)  
Connected to Port B



9. Install the 90° end of the supplied hydraulic hose (P/N 214-1000-983) on the fitting installed in Port B of the dual POCI valve.

FIGURE 10. Hydraulic Hose Installed on Steering Orbital

Hydraulic Hose  
(P/N 214-1000-981)  
Installed in Right  
Steering Port of  
Steering Orbital



10. Connect the straight end of the installed hydraulic hose to port B of the steering orbital.

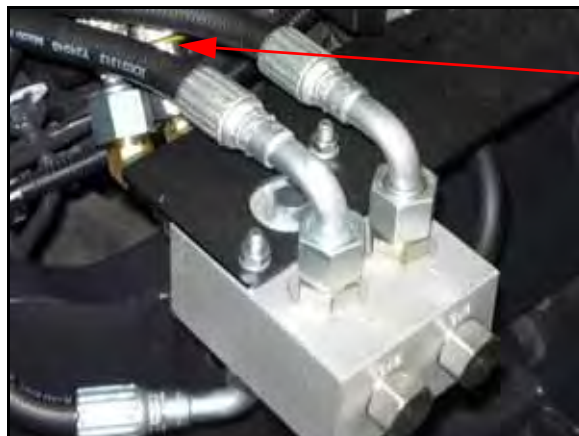
FIGURE 11. Hydraulic Hose Installed on SmarTrax Valve



11. Install the 90° end of the supplied hydraulic hose (P/N 214-1000-982) on the fitting installed in Port A of the SmarTrax valve (P/N 334-0003-090).

FIGURE 12. Hydraulic Hose Installed on Dual POCI Valve

Hydraulic Hose  
(P/N 214-1000-982)  
Connected to Port A2



12. Connect the straight end of the installed hydraulic hose to the fitting installed in Port A2 of the dual POCI valve.

FIGURE 13. Hydraulic Hose Installed on SmarTrax Valve

---



13. Install the 90° end of the supplied hydraulic hose (P/N 214-1000-982) on the fitting installed in Port B of the SmarTrax valve.

FIGURE 14. Hydraulic Hose Installed on Dual POCI Valve

---

Hydraulic Hose  
(P/N 214-1000-982)  
Connected to Port B2



14. Connect the straight end of the installed hydraulic hose to the fitting installed in Port B2 of the dual POCI valve.

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## *Install the Pressure and Tank Hoses*

1. Locate and disconnect the machine's pressure hose from the steering orbital and steel pressure line.

**Note:** This hose is not used in the SmarTrax system. Keep it for future use.

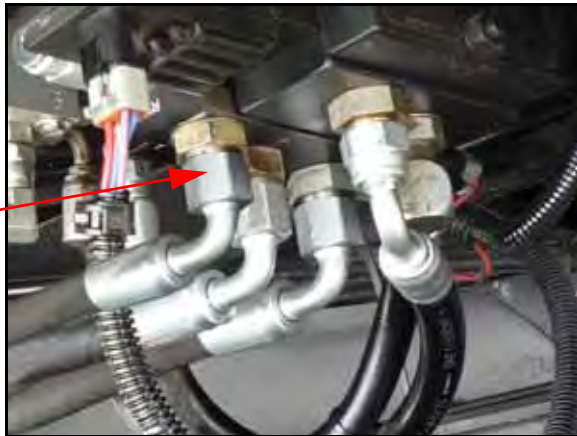
FIGURE 15. Tank Hose Installed on Steering Orbital



2. Disconnect the machine's tank hose from the steering orbital.
3. Install the 22L, M30 x 2.0 M/M/F swivel run tee adapter fitting (P/N 333-0012-379) in the open tank port.
4. Connect the machine's tank hose to the opposite end of the installed tee fitting.
5. Install the 22L, M30 x 2.0 (F) to 15L M22 x 1.5 (M) reducer fitting (P/N 333-0012-380) on the 90° end of the installed tee fitting.

FIGURE 16. Tank Hose Installed

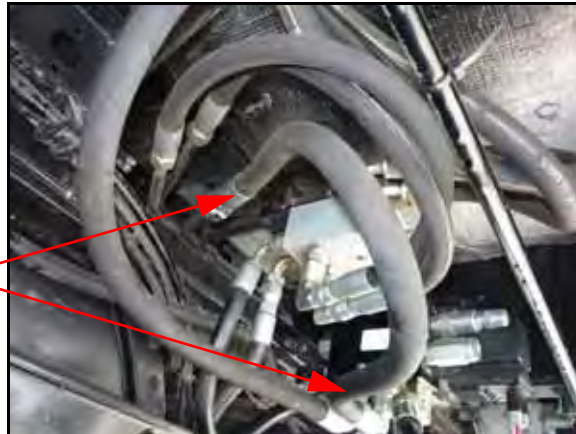
Hydraulic Hose  
(P/N 214-1000-980)  
Connected to Port T of  
SmarTrax Valve



6. Install the 90° end of the supplied hydraulic hose (P/N 214-1000-980) on the fitting installed in Port T of the SmarTrax valve (P/N 334-0003-090).
7. Connect the straight end of the installed hydraulic hose on the installed reducer fitting.

FIGURE 17. Pressure Hose Installed

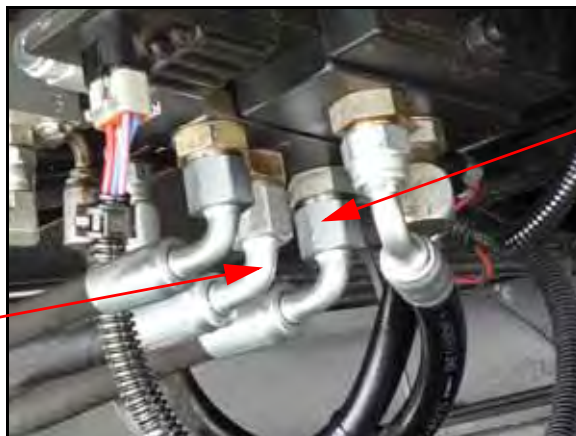
Hydraulic Hose  
(P/N 214-1000-978) Installed  
Between Steel Pressure Line  
and SmarTrax Valve  
(P/N 334-0003-090)



8. Install the 90° end of the supplied hydraulic hose on the fitting installed in Port P of the SmarTrax valve (P/N 334-0003-090).
9. Connect the straight end of the installed hydraulic hose (P/N 214-1000-978) to the open port of the steel line.

FIGURE 18. Pressure Hose Installed

Hydraulic Hose  
(P/N 214-1000-978)  
Connected to Port P of  
SmarTrax Valve



Hydraulic Hose  
(P/N 214-1000-979)  
Connected to Port EF  
of SmarTrax Valve

10. Install the 90° end of the supplied hydraulic hose (P/N 214-1000-979) on the fitting installed in Port EF of the SmarTrax valve.



FIGURE 19. Hydraulic Hose Installed on Steering Orbital

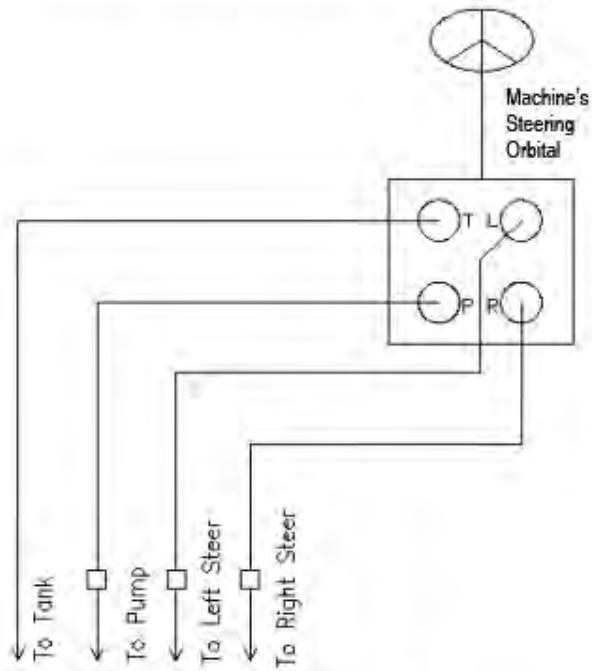
Hydraulic Hose  
(P/N 214-1000-979)  
Installed in Pressure  
Port of Steering  
Orbital



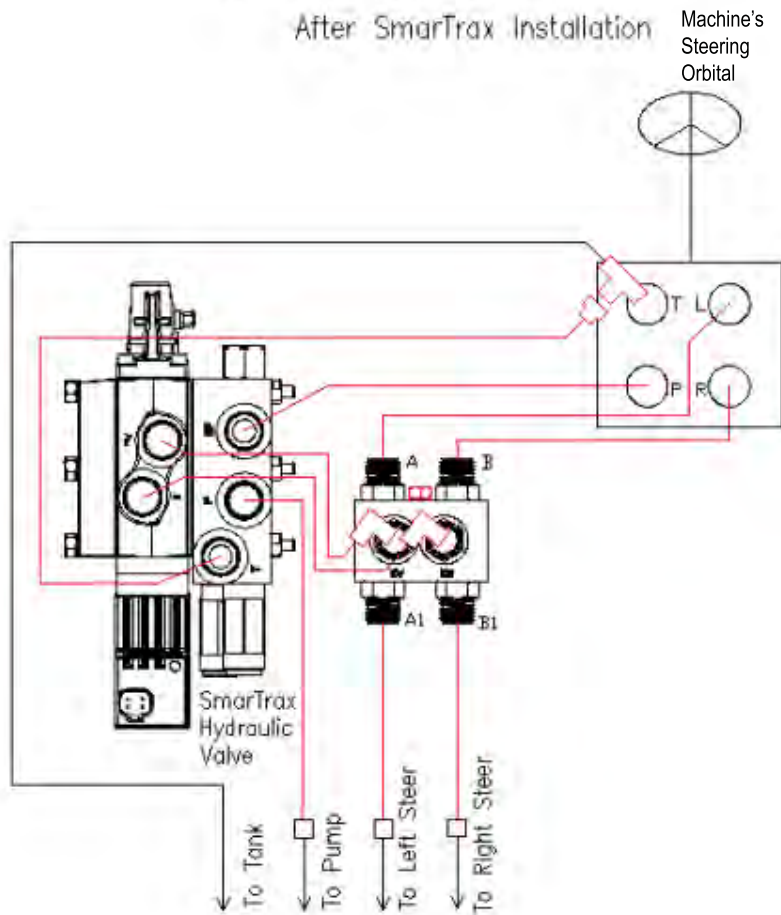
11. Connect the straight end of the installed hydraulic hose to the open pressure port on the steering orbital.

# Hydraulic Diagram

Before SmarTrax Installation

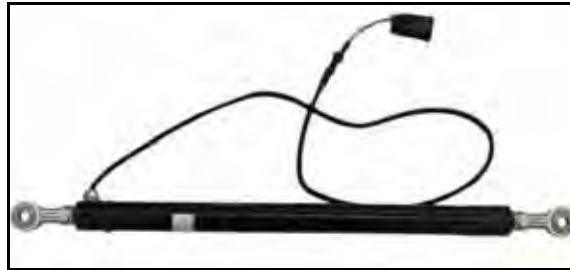


After SmarTrax Installation



## *Assemble the Wheel Angle Sensor (WAS)*

**FIGURE 1. WAS Assembly**



1. Install one M10 jam nut (P/N 312-1001-035) and one M10 ball linear sensor mount (P/N 106-0001-029) on the end of the 250 mm linear wheel angle assembly (P/N 063-0181-017).
2. Install the other M10 ball linear sensor mount on the other end of the WAS using the remaining M10 jam nut.

---

## *Install the WAS*

The hardware used to mount the WAS is determined by the machine type. Refer to the applicable section for the machine type to mount the WAS.

The vehicle should be parked on a level surface with the wheels pointing straight ahead during the WAS installation.

## Two Wheel Drive (2WD) Machines

**FIGURE 2. WAS Mounting Hardware Assembled**

---



1. Insert the M10 x 1.5 pitch x 60 mm bolt (P/N 311-0070-025) through the center hole in the WAS mounting bracket (P/N 107-0172-030).
2. Install a 0.406" ID x 0.750" OD x 1" long spacer (P/N 107-0172-038) on the end of the installed M10 bolt.
3. Insert the end of the M10 bolt through the hole in the M10 ball linear sensor mount installed on the rod-end of the WAS.
4. Secure the WAS mounting bracket to the WAS using one M10 x 1.5 pitch nylon insert lock nut (P/N 312-4000-208).
5. Repeat the steps above to install the WAS mounting bracket on the base-end of the WAS.

**FIGURE 3. Left Steering Cylinder Location**

---



6. Locate the left steering cylinder at the left-rear of the machine.

FIGURE 4. Clamps Installed on Steering Cylinder



7. Remove the nuts and clamp from the U-bolt muffer clamp (P/N 435-3003-030) and install the U-bolt around the ball joint shanks at each end of the cylinder with the legs of the U-bolt pointing up.

FIGURE 5. WAS Installed



8. Insert the legs of the installed U-bolt muffer clamps through the holes in the WAS mounting brackets.
9. Secure the WAS mounting brackets to the installed U-bolt muffer clamps using four 5/16"-18 flanged lock nuts (P/N 312-1001-169).

**Important:** Verify that the WAS cannot be overextended or compressed when the wheels are turned to their extremes. Also verify that the sensor moves freely and is not being damaged within its range of motion. The M10 ball mounts and jam nuts may need to be adjusted to prevent damage to the WAS.

10. Route the cable from the base-end of the WAS along the machine's frame, routing it so that it is not near moving parts or heat sources. Secure with plastic cable ties as necessary.

## Rear-Wheel Assist (RWA) Machines

FIGURE 6. WAS Mounting Hardware Assembled



1. Insert the M10 x 1.5 pitch x 60 mm bolt (P/N 311-0070-025) through the center hole in the small WAS mounting bracket (P/N 107-0172-030).

**Note:** Verify that the correct WAS mounting bracket is being used. The larger WAS mounting bracket will prevent the WAS from being installed correctly.

2. Install a 0.406" ID x 0.750" OD x 1" long spacer (P/N 107-0172-038) on the end of the installed M10 bolt.
3. Insert the end of the M10 bolt through the hole in the M10 ball linear sensor mount installed on the rod-end of the WAS.
4. Secure the WAS mounting bracket to the WAS using one M10 x 1.5 pitch nylon insert lock nut (P/N 312-4000-208).
5. Insert the M10 x 1.5 pitch x 60 mm bolt (P/N 311-0070-025) through the center hole in the large WAS mounting bracket (P/N 107-0172-185).
6. Install a 0.406" ID x 0.750" OD x 1" long spacer (P/N 107-0172-038) on the end of the installed M10 bolt.
7. Insert the end of the M10 bolt through the hole in the M10 ball linear sensor mount installed on the base-end of the WAS.
8. Secure the WAS mounting bracket to the WAS using one M10 x 1.5 pitch nylon insert lock nut (P/N 312-4000-208).

FIGURE 7. Left Steering Cylinder Location



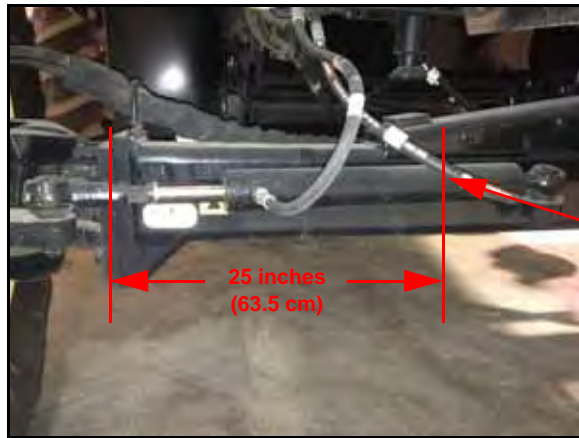
9. Locate the left steering cylinder at the left-rear of the machine.

**FIGURE 8. Clamps Installed on Rod-End of Steering Cylinder**



10. Remove the nuts and clamp from the U-bolt muffer clamp (P/N 435-3003-030) and install the U-bolt around the ball joint shank at rod-end of the cylinder with the legs of the U-bolt pointing up.

**FIGURE 9. Base-End Steering Clamp Installation Location**



11. Determine the base-end clamp installation location by measuring 25 inches [63.5 cm] from the U-bolt muffer clamp installed on the rod-end of the cylinder.
12. Remove the nuts and clamp from the U-bolt muffer clamp (P/N 435-3003-060) and install the U-bolt around the steering cylinder at the determined installation location.



FIGURE 10. WAS Installed

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13. Insert the legs of the installed U-bolt muffler clamps through the holes in the WAS mounting brackets.
14. Secure the WAS mounting brackets to the installed U-bolt muffler clamps using four 5/16"-18 flanged lock nuts (P/N 312-1001-169).

**Important:** *Verify that the WAS cannot be overextended or compressed when the wheels are turned to their extremes. Also verify that the sensor moves freely and is not being damaged within its range of motion. The position of the U-bolt muffler clamp installed around the body of the cylinder may have to be adjusted to prevent damage to the WAS.*

15. Route the cable from the base-end of the WAS along the machine's frame, routing it so that it is not near moving parts or heat sources. Secure with plastic cable ties as necessary.



---

*Install the SmarTrax Node*

Mount the SmarTrax Node

**FIGURE 1. Node Harness Connected to SmarTrax Node**



1. Insert the two large, rectangular connectors of the node harness (P/N 115-4001-158) into the correct ports of the SmarTrax node (P/N 063-0173-228).
2. Tighten the bolts on the harness connectors to secure the connections.

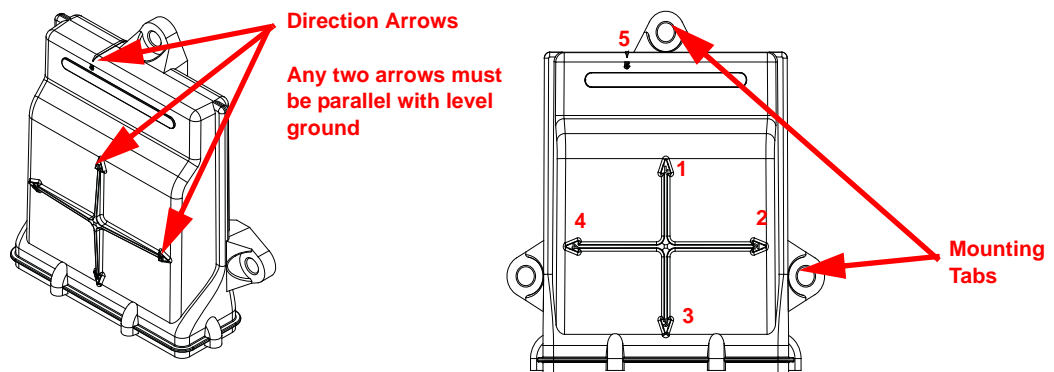
FIGURE 2. Node Mounting Bracket



3. Secure the node to the machine's existing node mounting bracket under the instructional seat in the cab using three M8 x 1.25 pitch x 25 mm hex bolts (P/N 311-0070-001) and three 0.344" ID x 0.688 " OD x 0.065 thick washers (P/N 313-2300-012).
4. Route the node harness behind the operator's seat and through the wall of the side console.

## Node Mounting Locations

FIGURE 3. Node Mounting



When choosing the location for the SmarTrax node, consider the following points:

- Mount the SmarTrax node inside the machine's cab on a flat, level surface for proper performance and cable connection.
- One of the six numbered direction arrows on the node must be oriented in the direction of forward vehicle travel, one arrow pointing straight up, and two of the arrows parallel to the ground.

**Note:** *Make a note of the number of the arrow that is oriented in the direction of forward vehicle travel. This number will be needed during the SmarTrax calibration process.*

- The node mounting location must not create tripping hazards.
- Mount the node in a location where it will not be kicked or jarred during normal equipment operation.
- The location must allow cable routing to avoid crimping or damaging the cables or the node connections.

- Securely fasten the node using bolts or screws through at least two of the three mounting holes. When mounted properly, the node should not become loose or rotate.

---

## Install the Foot Switch

FIGURE 4. Foot Switch Installed



1. Select a suitable location for the foot switch (P/N 063-0172-470) to be installed.

**Note:** *The foot switch should be installed in a location where the operator has easy access to it and is able to fully press the pedal.*

2. Using the holes in the foot switch as a template, drill holes in the floor of the cab.
3. Secure the foot switch to the floor by installing the supplied screws in each of the mounting holes.
4. Locate the ENABLE connector on the node harness (P/N 115-4001-158) and connect it to the foot switch cable connector.

---

## Install the Valve Harness

1. Route the CHASSIS connector of the valve harness (P/N 115-4001-171) into the cab through the access hole located in the right-rear corner of the cab.
2. Connect the CHASSIS of the valve harness to the mating connector of the node harness (P/N 115-4001-158).

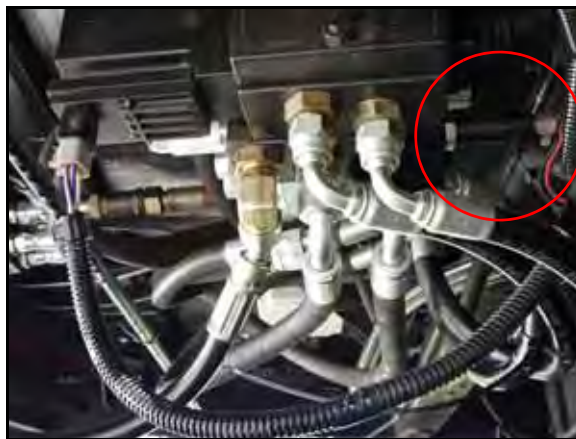


FIGURE 5. VALVE Connection



3. Route the valve harness under the cab and toward the SmarTrax valve (P/N 334-0003-090).
4. Connect the VALVE connector to the open 4-pin port of the SmarTrax valve.

FIGURE 6. TRANSDUCER Connection



5. Connect the TRANSDUCER connector to the pressure transducer (P/N 422-0000-086) installed in Port PS of the SmarTrax valve.

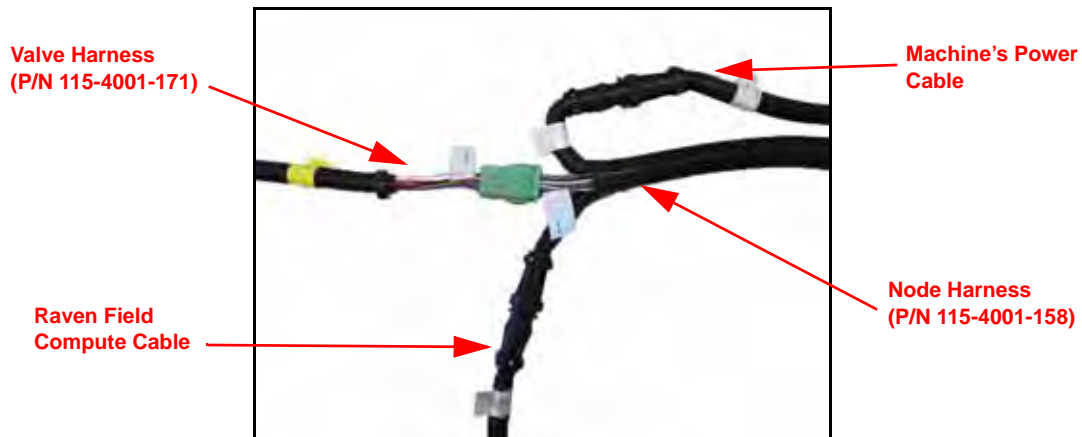
FIGURE 7. WAS Connection



6. Route the WAS connector along the left side of the machine and connect it to the WAS cable connection.
7. Route the WAS connector along the left side of the machine, securing it with plastic cable ties as necessary to keep it away from moving parts and heat sources.

## Connect the SmarTrax to the Machine's Power Cable

FIGURE 8. Power Cable Connections

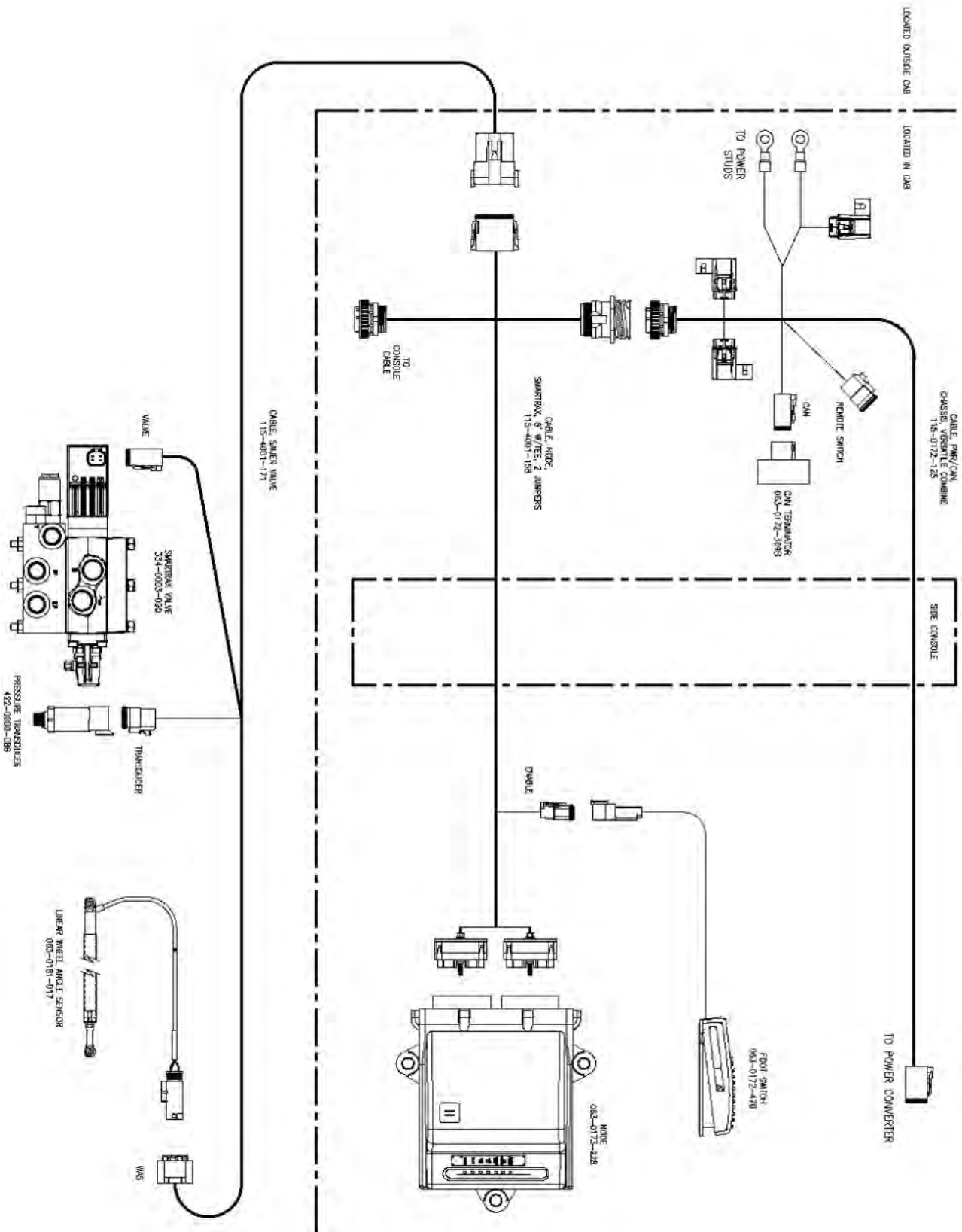


1. Locate and disconnect the connection between the Raven field computer cable and the machine's power cable.

**Note:** The cable connection should be located on the right side of the console.

2. Connect the male 16-pin connector of the node harness (P/N 115-4001-158) to the mating connector of the machine's power cable.
3. Connect the female 16-pin connector of the node harness to the Raven field computer cable.

FIGURE 9. Wiring Diagram



**WARNING**

When starting the machine for the first time after installing SmarTrax, be sure that all persons stand clear in case a hose has not been properly tightened.

**WARNING**

Do not use hands to check for leaks. Hydraulic fluid under pressure can penetrate the skin and cause serious injury or death.

### *Verify the SmarTrax System Installation*

1. Turn on the machine.
2. Double-check all fittings and hose connections to ensure that:
  - Hoses are not rubbing on or interfering with moving parts.
  - Hydraulic fluid is not leaking from the system.
3. Turn the machine's wheels fully from side to side repeatedly to remove air from the hydraulic system.

**Note:** *During the SmarTrax system installation, whenever the hydraulic system is purged for maintenance, or when fittings are loosened or disconnected, air is introduced into the lines of the hydraulic system. If air pockets are present, the wheels may not move consistently when the steering wheel is turned.*

4. Continue turning the wheels until they move steadily and smoothly when the steering wheel is turned.

5. Access the System Diagnostic screen by selecting the MACHINE TEST option on the Machine Type screen and turn the wheels using the Raven console.

**Note:** *If there are issues with the SmarTrax system, turn off the machine and correct them immediately. For additional assistance, refer to the SmarTrax and SmartSteer Calibration & Operation Manual (P/N 016-0171-532) or contact your local Raven dealer.*

6. Set the GPS Source to Internal via SmarTrax.

**Note:** *For more information on changing the GPS setting refer to the SmarTrax and SmartSteer Calibration & Operation Manual.*

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## *Calibrate the SmarTrax System*

Refer to the SmarTrax and SmartSteer Calibration & Operation Manual (P/N 016-0171-532) for instructions on calibrating the SmarTrax system, adjusting system settings, and system operation.



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# RAVEN

## Limited Warranty

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### ***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](http://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.**