

R A V E N

SmarTrax™ Installation Manual



John Deere 7185J, 7205J, 7225J, 7715 & 7815

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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**

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.

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

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: John Deere

MODEL: 7185J, 7205J, 7225J, 7715 and 7815

FIGURE 1. John Deere 7205J



Updates

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

<http://www.ravenhelp.com>

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. Bleed pressure from the hydraulic system by loosening the hydraulic fittings slowly, where applicable.

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:

- 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 valve 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.

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 117-5034-009)

Picture	Item Description	Part Number	Qty.
Not Pictured	Manual - John Deere 7185J, 7205J, 7225J, 7715, and 7815 SmarTrax Installation	016-5034-009	1
	Valve - SmarTrax Hydraulic	334-0003-088	1

TABLE 1. SmarTrax Installation Kit (P/N 117-5034-009)

Picture	Item Description	Part Number	Qty.
	Bracket - Node Mounting	107-0172-084	1
	Bracket - Hydraulic Valve Mounting	107-0172-094	1
	Bracket - Sensor Cover	107-0172-110	1
	Sensor - Spring Loaded Hall Effect Rotary	416-0001-053	1
	Shaft - John Deere Axle Sensor	107-0172-111	1
	Cable - SmarTrax Valve Harness	115-4001-096	1
	Cable - 6 Pin Delphi to 6 Pin Amp 8" Adapter	115-4001-128	1
	Transducer - 0-3000 PSI Pressure	422-0000-086	1
	Clamp - .625 Diameter Insulated Cable	435-3001-049	2
	Coupler - Wheel Angle Sensor	307-0159-419	1
	Tape - 3.5" Double-Sided	332-0000-019	6

TABLE 1. SmarTrax Installation Kit (P/N 117-5034-009)

Picture	Item Description	Part Number	Qty.
	Bolt - 5/16"-18 x 7/8" Hex	311-0052-104	4
	Bolt - 3/4"-16 x 1"	311-0054-105	2
	Bolt - M8 x 15 Hex	311-0070-015	4
	Bolt - M4 x .7 x 35 mm	311-0070-038	2
	Nut - 3/8"-16 Nylock	312-4000-061	3
	Washer - 5/16" Lock	313-1000-019	4
	Washer - 3/4" Lock	313-1000-047	2
	O-Ring - 3/4" ID Viton	219-0002-018	1

TABLE 2. Hydraulic Installation Kit (P/N 117-0199-110)

Picture	Item Description	Part Number	Qty.
	Fitting - -8 ORFS M/M/F Swivel Run Tee Adapter	333-0012-028	3
	Fitting - -6 JIC M/F 90° Swivel Elbow	333-0012-042	5

TABLE 2. Hydraulic Installation Kit (P/N 117-0199-110)

Picture	Item Description	Part Number	Qty.
	Fitting - -6 JIC (M) to -6 SAE O-Ring (M) Straight Adapter	333-0012-045	2
	Fitting - -6 JIC (M) to -8 SAE O-Ring (M) Straight Adapter	333-0012-046	2
	Fitting - -6 JIC (M) to -10 SAE O-Ring (M) Straight Adapter	333-0012-106	2
	Fitting - M16 to -6 JIC (M) Straight Adapter	333-0012-365	1
	Hydraulic Hose - -6 JIC (F) 90° to -6 ORFS (M) - 54"	214-1000-807	1
	Hydraulic Hose - -6 JIC (F) to -6 ORFS (F) 90° - 54"	214-1000-808	1
	Hydraulic Hose - -6 JIC (F) 90° to -6 JIC (F) - 130"	214-1000-809	1
	Hydraulic Hose - -6 JIC (F) to -8 ORFS (F) 90° - 130"	214-1000-810	1
	Hydraulic Hose - -6 JIC (F) to -8 ORFS (F) 90° - 40"	214-1000-811	1
	Hydraulic Hose - -6 JIC (F) to -8 ORFS (F) 90° - 48"	214-1000-812	1

TABLE 3. Node Installation Kit (P/N 117-5030-005)

Picture	Item Description	Part Number	Qty.
Not Pictured	Manual - SmarTrax and SmartSteer Calibration & Operation	016-0171-277	1
	Node - SmarTrax 3D CAN Control	063-0173-228	1
	Cable - SmarTrax Sauer Valve Node	115-4001-109	1
	Assembly - SmarTrax Enable Foot Switch	063-0172-470	1

Note: The node installation kit is sold separately.

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 334-0003-088) 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.

FIGURE 1. Fittings Installed in the SmarTrax Valve



Fitting	Part Number	Port
Fitting - -6 JIC (M) to -6 SAE O-Ring (M) Straight Adapter	333-0012-045	LSPV, LS STEER
Fitting - -6 JIC (M) to -8 SAE O-Ring (M) Straight Adapter	333-0012-046	P, T
Fitting - -6 JIC (M) to -10 SAE O-Ring (M) Straight Adapter	333-0012-106	A, B
Transducer - 0-3000 PSI Pressure	422-0000-086	PS

Mount the SmarTrax Valve

FIGURE 2. SmarTrax Valve Mounting Location



1. Identify the valve mounting location on the right side of the machine.

FIGURE 3. Machine's Bolts Removed



2. Remove any existing bolts or plugs from the two holes indicated in Figure 3 above.

FIGURE 4. Mounting Plate Installed



3. Install the hydraulic valve mounting bracket (P/N 107-0172-094) to the machine using two 3/4"-16 x 1" bolts (P/N 311-0054-105) and two 3/4" lock washers (P/N 313-1000-047).

FIGURE 5. SmarTrax Valve Installed on Mounting Bracket



4. Install the SmarTrax valve (P/N 334-0003-088) on the mounting bracket using four 5/16"-18 x 7/8" hex bolts (P/N 311-0052-104) and four 5/16" lock washers (P/N 313-1000-019).

Install the Left and Right Steering Hoses

FIGURE 6. Left and Right Steering Hoses Installed



1. Locate the machine's left steering hose on the left side of the steering cylinder.
2. Disconnect the left steering hose from the steering cylinder.
3. Install a -8 ORFS M/M/F swivel run tee adapter fitting (P/N 333-0012-028) on the open port.
4. Connect the machine's left steering hose to the straight end of the installed tee fitting.
5. Install the 90° end of the supplied hydraulic hose (P/N 214-1000-812) on the 90° end of the installed tee fitting.
6. Connect the straight end of the installed hydraulic hose to the fitting installed in Port A of the SmarTrax valve.

Note: *It may be necessary to install a -6 JIC M/F 90° swivel elbow fitting (P/N 333-0012-042) on the fitting installed in the SmarTrax valve to achieve the connection.*

7. Locate the machine's right steering hose on the right side of the steering cylinder.
8. Disconnect the right steering hose from the steering cylinder.

9. Install a -8 ORFS M/M/F swivel run tee adapter fitting (P/N 333-0012-028) on the open port.
10. Connect the machine's right steering hose to the straight end of the installed tee fitting.
11. Install the 90° end of the supplied hydraulic hose (P/N 214-1000-811) on the 90° end of the installed tee fitting.
12. Connect the straight end of the installed hydraulic hose to the fitting installed in Port B of the SmarTrax valve.

Note: It may be necessary to install a -6 JIC M/F 90° swivel elbow fitting (P/N 333-0012-042) on the fitting installed in the SmarTrax valve to achieve the connection.

Install the Pressure Hose

FIGURE 7. Machine's Pressure Port



1. Locate the machine's pressure port on the machine's hydraulic valve, located at the rear of the tractor.
2. Disconnect the machine's steel pressure line from the 90° elbow fitting in the machine's pressure port.
3. Remove the existing 90° elbow fitting in the pressure port.

FIGURE 8. Tee Adapter Fitting Installed



4. Install a -8 ORFS M/M/F swivel run tee adapter fitting (P/N 333-0012-028) in the machine's open pressure port.

5. Install the machine's steel pressure line on the 90° end of the installed tee fitting.

FIGURE 9. Pressure Hose Installed

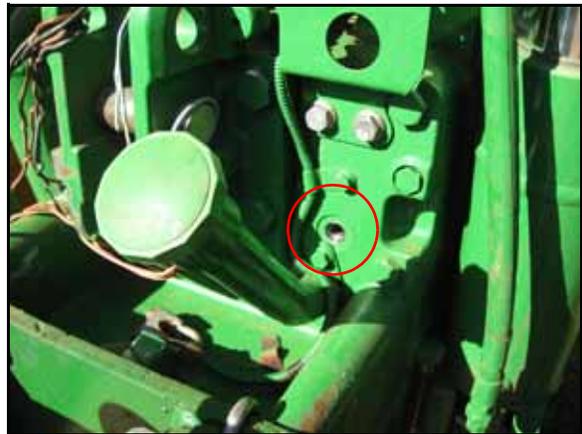


6. Install the 90° end of the supplied hydraulic hose (P/N 214-1000-810) on the straight end of the installed tee fitting.
7. Connect the straight end of the installed hydraulic hose to the fitting installed in Port P of the SmarTrax valve.

Note: It may be necessary to install a -6 JIC M/F 90° swivel elbow fitting (P/N 333-0012-042) on the fitting installed in the SmarTrax valve to achieve the connection.

Install the Tank Hose

FIGURE 10. Tank Return Location



1. Locate the tank return above the hydraulic fill tube at the rear of the tractor.
2. Remove the existing plug from the tank return port.
3. Install a M16 (M) to -6 JIC (M) straight adapter fitting (P/N 333-0012-365) in the tank return port.

FIGURE 11. Tank Hose Installed



4. Install the 90° end of the supplied hydraulic hose (P/N 214-1000-809) on the installed adapter fitting.

Note: It may be necessary to remove the oil filler tube bolts and turn the tube to achieve the connection. If the filler tube is adjusted, reinstall and tighten the tube bolts.

5. Connect the straight end of the installed hydraulic hose to the fitting installed in Port T of the SmarTrax valve.

Note: It may be necessary to install a -6 JIC M/F 90° swivel elbow fitting (P/N 333-0012-042) on the fitting installed in the SmarTrax valve to achieve the connection.

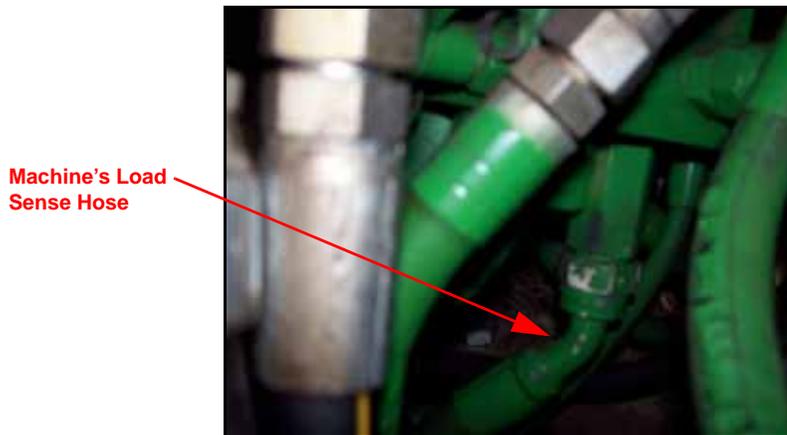
Install the Load Sense Hoses

FIGURE 12. Engine Compartment Access Point



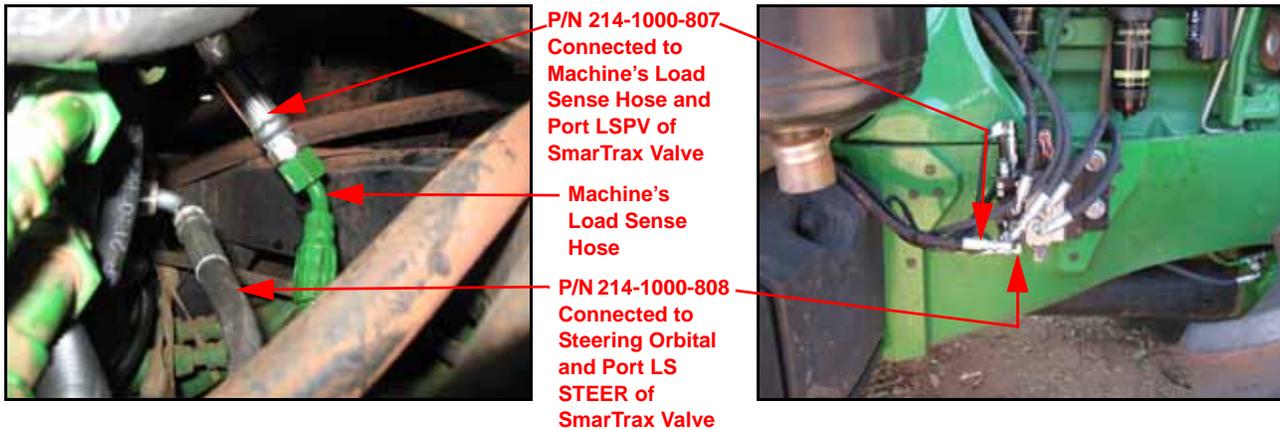
1. Remove the side panels from the engine compartment, located near the tractor's starter.

FIGURE 13. Machine's Existing Load Sense Hose



2. Disconnect the machine's existing load sense hose from the steering orbital.

FIGURE 14. Load Sense Hoses Installed

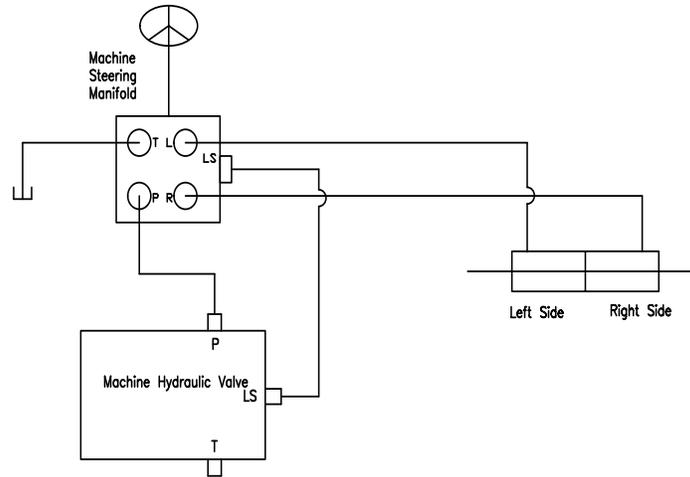


3. Install the male end of the supplied hydraulic hose (P/N 214-1000-807) on the end of the machine's load sense hose.
4. Connect the female end of the installed hydraulic hose to the fitting installed in Port LSPV of the SmarTrax valve.
5. Install the 90° end of the supplied hydraulic hose (P/N 214-1000-808) on the open steering orbital port.
6. Connect the straight end of the supplied hydraulic hose to the fitting installed in Port LS STEER of the SmarTrax valve.

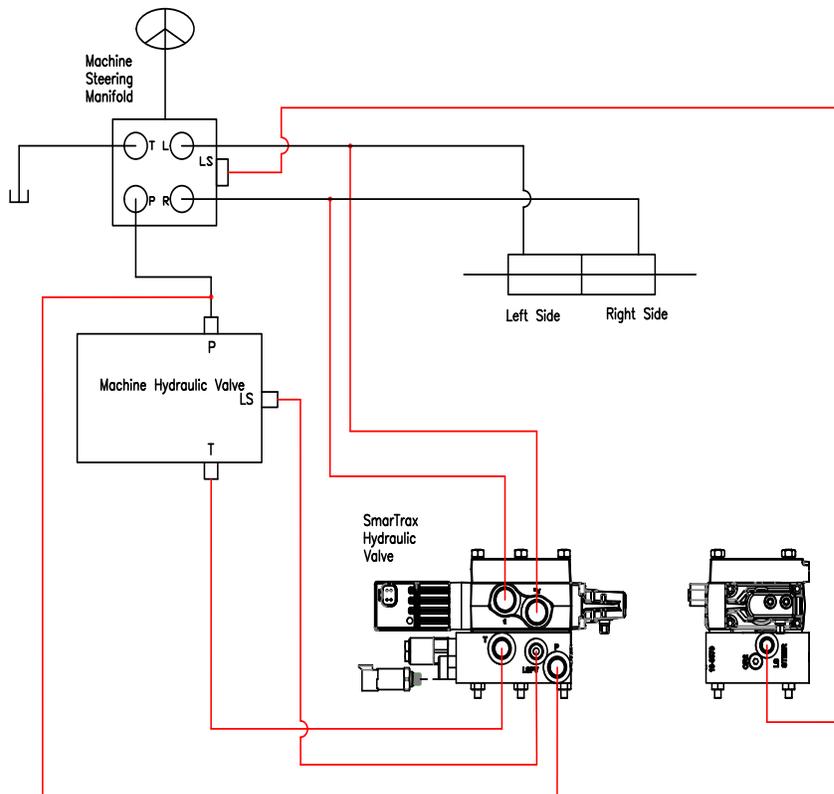
Note: It may be necessary to install a -6 JIC M/F 90° swivel elbow fitting (P/N 333-0012-042) on the fitting installed in the SmarTrax valve to achieve the connection.

Hydraulic Diagram

Before SmarTrax Installation



After SmarTrax Installation



CHAPTER

4

*Wheel Angle Sensor
(WAS) Installation*

FIGURE 1. WAS Mounting Location (Left Front Tire)



1. Turn the machine's front wheels fully to the right to access the WAS mounting location.
2. Remove two bolts from the round cover plate on the front-left tire and remove the cover plate.

Note: *The cover plate is not used in the SmarTrax system. Keep the part for future use.*

FIGURE 2. Sensor Shaft Mounting Location



3. Insert the sensor shaft (P/N 107-0172-111) into the wheel housing, aligning it with the connection groove.

4. Install the sensor coupler (P/N 307-0159-419) on the sensor shaft.
5. Install the 3/4" ID Viton O-ring (P/N 219-0002-018) onto the spring-loaded rotary sensor (P/N 416-0001-053).

FIGURE 3. Rotary Sensor Installed on Machine's Axle



6. Install the sensor onto the installed sensor coupler so that the sensor's connection points toward the engine.
7. Secure the rotary sensor using two M4 x 0.7 x 35 mm bolts (P/N 311-0070-038).
8. Connect the 6-pin Delphi to 6-pin Amp adapter cable (P/N 115-4001-128) to the rotary sensor.
9. Install the sensor cover bracket (P/N 107-0172-110) over the rotary sensor using two M8 x 15 hex bolts (P/N 311-0070-015).
10. Route the installed adapter cable through the cut-out in the cover bracket, orienting the cover so the cable is routed toward the back of the tractor.

CHAPTER

5

*Cab Component
Installation*

Install the SmarTrax Node

Mount the SmarTrax Node

FIGURE 1. SmarTrax Node Installed



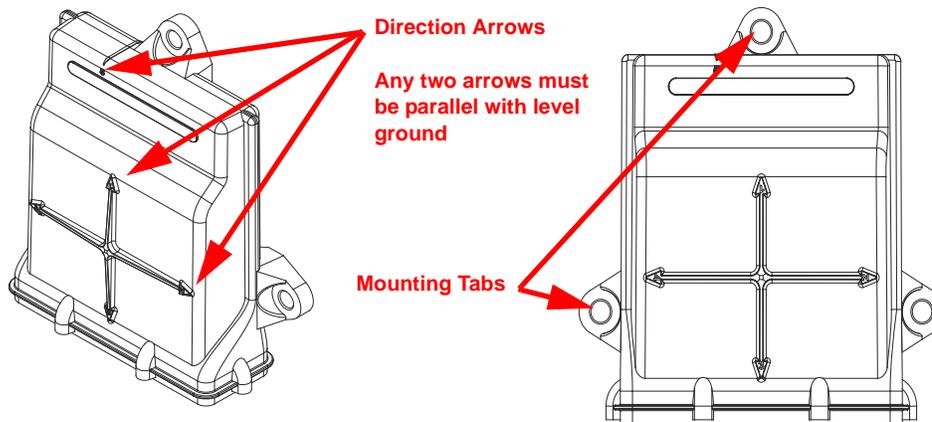
Note: The forward vehicle direction is 1 in the pictured node orientation.

1. Mount the node (P/N 063-0173-228) to the node mounting bracket (P/N 107-0172-084) using three 3/8"-16 nyloc nuts (P/N 312-4000-061).
2. Install the two large, rectangular connectors of the node harness (P/N 115-4001-109) into the correct ports of the node.
3. Tighten the bolts on the harness connectors to secure the connections.
4. Mount the node mounting plate to the left side of the operator's seat using six 3.5" strips of double-sided tape (P/N 332-0000-019) so that the connectors point to the back of the cab.

Note: Ensure the mounting plate and operator's seat are thoroughly cleaned before applying the tape.

Node Mounting Locations

FIGURE 2. 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 3. 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 115-4001-109) and connect it to the foot switch cable connector.

Install the Valve Harness

FIGURE 4. Valve Harness Connected to Node Harness



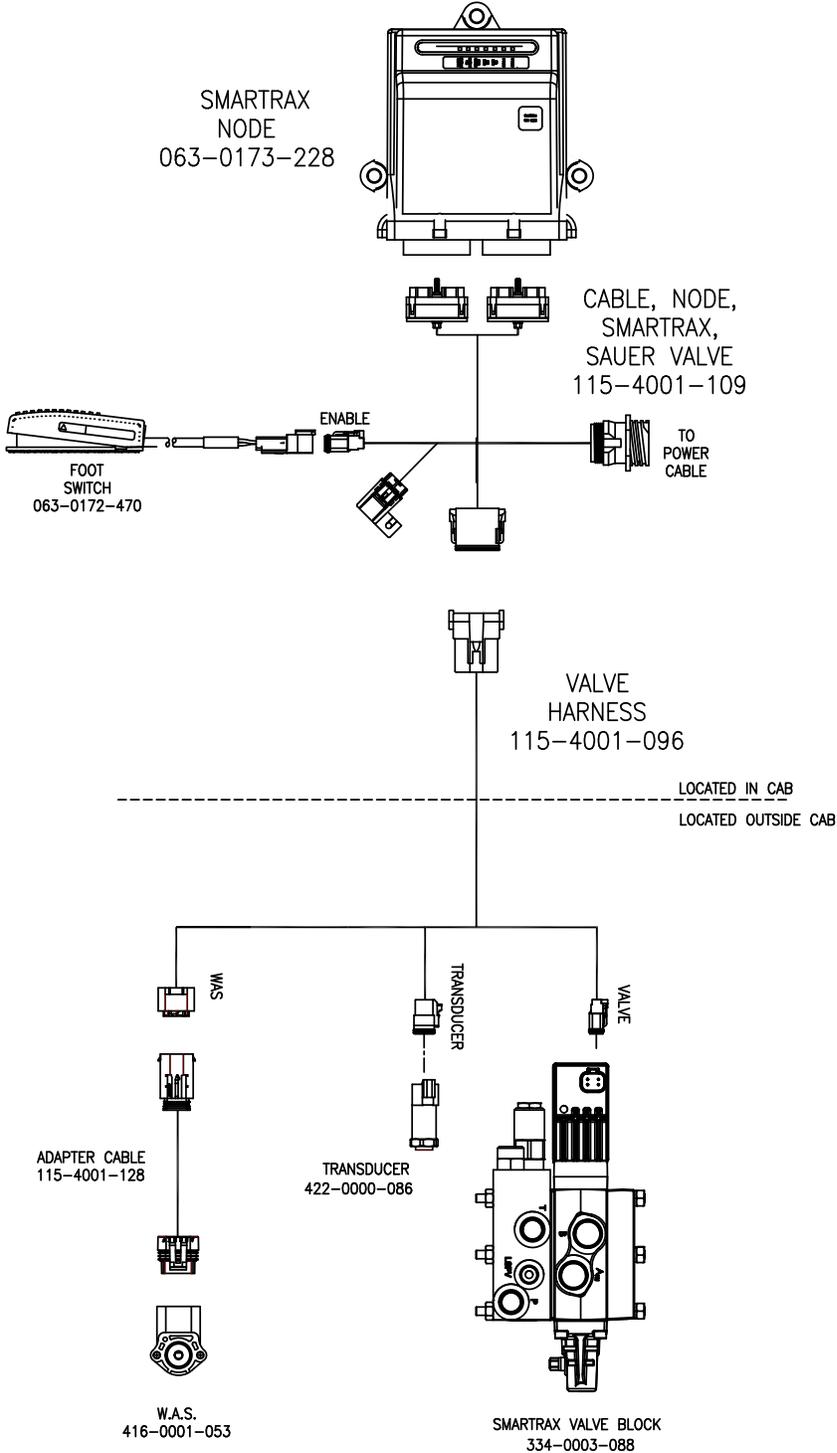
1. Connect the 12-pin connector of the valve harness (P/N 115-4001-096) into the mating connector of the node harness (P/N 115-4001-109).
2. Route the valve harness cable outside and under the cab, along the right frame rail to the SmarTrax valve (P/N 334-0003-088).
3. Connect the TRANSDUCER connector to the pressure transducer (P/N 422-0000-086) installed in Port PS of the SmarTrax valve.
4. Connect the VALVE connector to the open PVE port of the SmarTrax valve.
5. Route and connect the WAS connector to the installed 6-pin Delphi to 6-pin Amp adapter cable (P/N 115-4001-128) installed on the wheel angle sensor (P/N 416-0001-053).

FIGURE 5. Valve Cable Secured to Axle



6. Secure the valve cable to the machine's front axle using two insulated cable clamps (P/N 435-3001-049) and two M8 x 15 hex bolts (P/N 311-0070-015).

FIGURE 6. Valve Harness Wiring Diagram



Install the Chassis Cable - SmarTrax-Only Systems (If Applicable)

If the machine does not contain an existing chassis power system (such as AutoBoom, product control, etc.), it is necessary to install the chassis power cable to operate the SmarTrax system. If a CAN system already exists on the machine, refer to *Connect SmarTrax to an Existing Chassis Cable (If Applicable)* below to connect power to the SmarTrax system.

Note: *The chassis cable is sold separately. Contact your local Raven dealer for ordering information.*

1. Locate the SmarTrax chassis cable (P/N 115-4001-085).
2. Connect the TO SMARTRAX NODE connector from the chassis cable to the round 16-pin connector on the node harness (P/N 115-4001-109).
3. Connect the TO CONSOLE CABLE connector to the Raven console cable.
4. Install a terminator (P/N 063-0172-369) on the CAN cable connector.
5. Loop and tie-off the REMOTE SWITCH cable connection, securing it with plastic cable ties as necessary.

Note: *The REMOTE SWITCH connector is not used in the SmarTrax system. Ensure the cable is secured away from moving parts and heat sources.*

6. Connect the ring terminals to the battery.

Note: *The positive connectors are fused.*

Connect SmarTrax to an Existing Chassis Cable (If Applicable)

Note: *The SmarTrax interface tee is sold separately. Contact your local Raven dealer for ordering information.*

1. Locate and disconnect the connection between the Raven console cable and chassis cable on the machine's existing CAN system.
2. Install the SmarTrax interface tee cable (P/N 115-4001-070 or 115-4001-071) between the chassis and Raven console harness.
3. Connect the SmarTrax node cable (P/N 115-4001-109) to the remaining SmarTrax interface tee.

**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 fitting 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 016-0171-277) or contact your local Raven dealer.*

Calibrate the SmarTrax System

Refer to the SmarTrax & SmartSteer Calibration and Operation Manual (P/N 016-0171-277) for instructions on calibrating the SmarTrax system, adjusting system settings, and system operation.

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RAVEN

RAVEN INDUSTRIES

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.

How Long is the Coverage Period?

Raven Applied Technology Division products are covered by this warranty for 12 months after the date of purchase. This warranty coverage applies only to the original owner and is nontransferable.

How Can I Get Service?

Bring the defective part and proof of purchase to your Raven dealer. If your dealer agrees with the warranty claim, the dealer will send the part and proof of purchase to their distributor or to Raven Industries for final approval.

What Will Raven Industries Do?

Upon confirmation of the warranty claim, Raven Industries will, at our discretion, repair or replace the defective part and pay for return freight.

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 or other special 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.

RAVEN

John Deere 715J, 7205J, 7225J, 7715 & 7815
SmarTrax™ Installation Manual
(P/N 016-5034-009 Rev A 10/11 E18232)



Raven Industries

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