

**Case IH SPX 3230, 3320, and 3330  
SmartTrax™ Installation Manual**

*P/N 016-5032-081 Rev A*

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## ***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: Case IH**

**MODEL: SPX 3230, 3320, and 3330**

**FIGURE 1. Case IH SPX 3320**



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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.

Machine Preset	Antenna X Position (left to right)	Antenna Y Position (fore/aft offset)	Antenna Z Position (ground to bottom of antenna)
CaseIH SPX 33 44x0 120	Centered	14 ft. 6 in/4.419 m	12 ft./3.657 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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*-Case IH SPX 3230, 3320, and 3330 SmarTrax™ Installation Manual*

*-Manual No. 016-5032-081 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.*




## 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.

**Note:** The SmarTrax node (P/N 063-0173-228) is sold separately. Contact your local Raven dealer for ordering information.

**TABLE 1. Case IH Patriot 3320/3230/3330 SmarTrax Installation Kit (P/N 117-5032-081)**

Picture	Item Description	Part Number	Qty.
Not Pictured	Manual - SmarTrax and SmartSteer Calibration & Operation	016-0171-277	1
Not Pictured	Manual - Case IH SPX 3230, 3320, and 3330 SmarTrax Installation	016-5032-081	1
	Valve - SmarTrax Hydraulic	334-0003-088	1
	Switch - Flow	334-0003-085	1
	Bracket - Hydraulic Valve Mounting	107-0171-705	1
	Cable - Node	115-4001-110	1
	Cable - Hydraulic Valve	115-4001-111	1
	Assembly - SmarTrax Enable Switch	063-0172-470	1

**TABLE 1. Case IH Patriot 3320/3230/3330 SmarTrax Installation Kit (P/N 117-5032-081)**

Picture	Item Description	Part Number	Qty.
	Screw - 1/4"-20 x 2" Socket Head	311-0050-109	2
	Bolt - 5/16" Hex Head	311-0052-104	4
	Nut - 1/4"-20 Hex	312-1001-074	2
	Washer - 1/4" Split Lock	313-1000-016	2
	Washer - 5/16" Split Lock	313-1000-019	4
	Washer - 1/4" Flat	313-2300-009	2

**TABLE 2. Hydraulic Installation Kit (P/N 117-0199-081)**





Picture	Item Description	Part Number	Qty.
	Fitting - -8 ORFS M/M/F Swivel Run Tee Adapter	333-0012-028	1
	Fitting - -4 SAE O-Ring Plug	333-0012-051	1
	Fitting - -6 ORFS M/M/F Swivel Run Tee Adapter	333-0012-069	3
	Fitting - -6 ORFS (M) to -6 SAE O-Ring (M) Straight Adapter	333-0012-084	6

TABLE 2. Hydraulic Installation Kit (P/N 117-0199-081)

Picture	Item Description	Part Number	Qty.
	Fitting -6 SAE O-Ring Plug	333-0012-104	2
	Fitting -6 ORFS (M) to -8 SAE O-Ring (M) Straight Adapter	333-0012-199	2
	Fitting -6 ORFS (M) to -10 SAE O-Ring (M) Straight Adapter	333-0012-233	2
	Hydraulic Hose -6 ORFS (F) 90° to -6 ORFS (F) - 84"	214-1000-318	1
	Hydraulic Hose -8 ORFS (F) to -6 ORFS (F) - 84"	214-1000-630	1
	Hydraulic Hose -6 ORFS (F) 90° to -6 ORFS (F) - 128"	214-1000-671	2
	Hydraulic Hose -6 ORFS (F) to -6 ORFS (F) - 128"	214-1000-672	1

TABLE 3. Node Mounting Kit (P/N 117-0197-078)






Picture	Item Description	Part Number	Qty.
	Plate - SmarTrax Node Mounting	107-0171-924	1
	Standoff - M6 x 40mm M/F x 13 mm Hex	305-8000-008	2
	Bolt - 1/4"-20 x 7/8: Flat Head	311-0002-308	3

TABLE 3. Node Mounting Kit (P/N 117-0197-078)

Picture	Item Description	Part Number	Qty.
	Nut - 1/4"-20 UNC Nylon Insert Lock	312-4000-057	3
	Washer - .312 ID x .734 OD x .065 Thick	312-2300-011	3

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.

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 cause damage to the SmarTrax hydraulic valve.

	<b>NOTICE</b>
<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 on 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 on the SmarTrax Valve**



Fitting	Part Number	Port
Fitting - -6 SAE O-Ring Plug	333-0012-104	LSPV, LS STEER
Fitting - -4 SAE O-Ring Plug	333-0012-051	PS
Fitting - -6 ORFS (M) to -8 SAE O-Ring (M) Straight Adapter	333-0012-199	P, T
Fitting - -6 ORFS (M) to -10 SAE O-Ring (M) Straight Adapter	333-0012-233	A, B

## Install Fittings on the Flow Switch

FIGURE 2. Fittings Installed on the Flow Switch



1. Install a -6 ORFS (M) to -6 SAE O-ring (M) straight adapter fitting (P/N 333-0012-084) in Ports A2 and B2 of the flow switch (P/N 334-003-085).
2. Install the pressure transducers in Ports A1 and B1 of the flow switch.

**Note:** Depending on the model of the machine, the transducer may need to be installed in Port A3 instead of Port A1 to avoid interference.

## Mount the SmarTrax Valve

FIGURE 3. Mounting Plate Installed



1. Remove the bolts used to secure the machine's radar bracket (beneath the cab).

FIGURE 4. SmarTrax Valve Installed on Mounting Plate

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2. Mount the SmarTrax valve (P/N 334-0003-088) to the hydraulic valve mounting bracket (P/N 107-0171-705) using four 5/16" hex bolts (P/N 311-0052-104) and four 5/16" lock washers (P/N 313-1000-019).
3. Mount the flow switch (P/N 334-0003-085) to the valve mounting bracket using two 1/4"-20 x 2" screws (P/N 311-0050-109), two 1/4" flat washers (P/N 313-2300-009), two 1/4" split lock washers (P/N 313-1000-016), and two 1/4"-20 hex nuts (P/N 312-1001-074).

FIGURE 5. SmarTrax Valve Mounted on the Machine

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4. Mount the hydraulic valve mounting bracket (P/N 107-0171-705) to the machine's radar bracket using the bolts removed in step 1.

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## Install the Pressure Hose

1. Locate the machine's steel pressure line.

**Note:** The pressure line runs on the inside of the frame from the rear of the machine. The line bends 45° just before the hydraulic hose connection. Trace it to the P port on the steering orbital if necessary.

2. Disconnect the machine's pressure hose from the steel pressure line.



FIGURE 6. Pressure Hose Installed



3. Install a -6 ORFS M/M/F swivel run tee adapter fitting (P/N 333-0012-069) on the steel pressure line.
4. Connect the machine's pressure hose to the opposite end of the installed tee fitting.
5. Install the 90° end of the supplied hydraulic hose (P/N 214-1000-318) on the 90° end of the installed tee fitting.
6. Connect the straight end of the installed hydraulic hose to Port P of the SmarTrax valve.

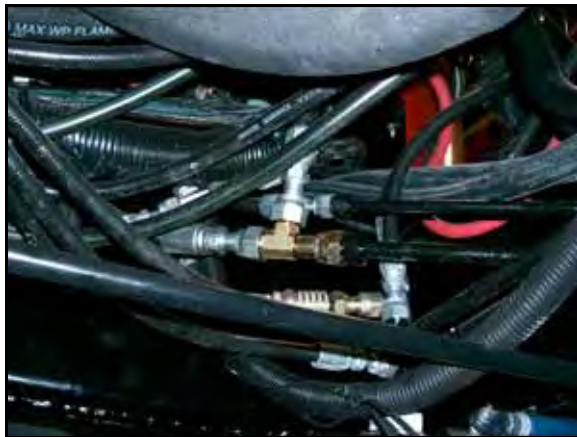
## Install the Tank Hose

1. Locate the machine's steel tank line.

**Note:** *The pressure line runs on the inside of the frame from the rear of the machine. Trace it to the T port on the steering orbital if necessary.*

2. Disconnect the machine's tank hose from the steel tank line.

FIGURE 7. Tank Hose Installed



3. Install a -8 ORFS M/M/F swivel run tee adapter fitting (P/N 333-0012-028) on the machine's steel tank line.
4. Connect the machine's tank hose to the opposite end of the installed tee fitting.

5. Install the -8 end of the supplied hydraulic hose (P/N 214-1000-630) on the 90° end of the installed tee fitting.
6. Connect the other end of the installed hydraulic hose to Port T of the SmarTrax valve.

### *Install the Left and Right Steering Hoses*

1. Locate and disconnect the machine's left steering hose from the left steering cylinder.

**Note:** *The left steering hose is connected to the fitting located closest to the center of the machine.*

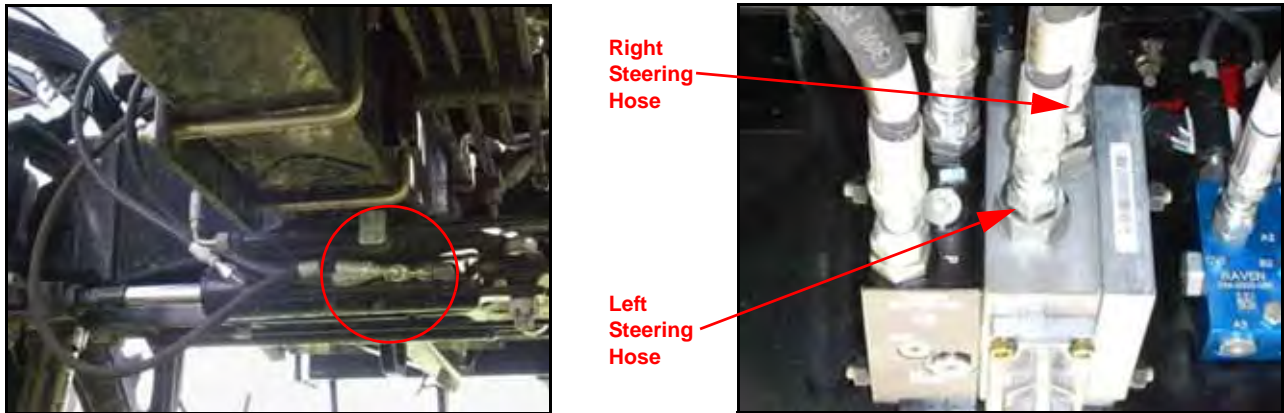
2. Route and connect the left steering hose to the Port A2 of the installed flow switch (P/N 334-0003-085).

**FIGURE 8. Installed Left Steering Hose**



3. Install a -6 ORFS M/M/F swivel run tee adapter fitting (P/N 333-0012-069) on the open steering cylinder port.
4. Install the straight end of the supplied hydraulic hose (P/N 214-1000-672) on the opposite end of the installed tee fitting.
5. Connect the other end of the installed hydraulic hose to the fitting installed in Port B3 of the installed flow switch.
6. Install the 90° end of the supplied hydraulic hose (P/N 214-1000-671) on the 90° end of the installed tee fitting.
7. Connect the straight end of the installed hydraulic hose to Port A of the SmarTrax valve.

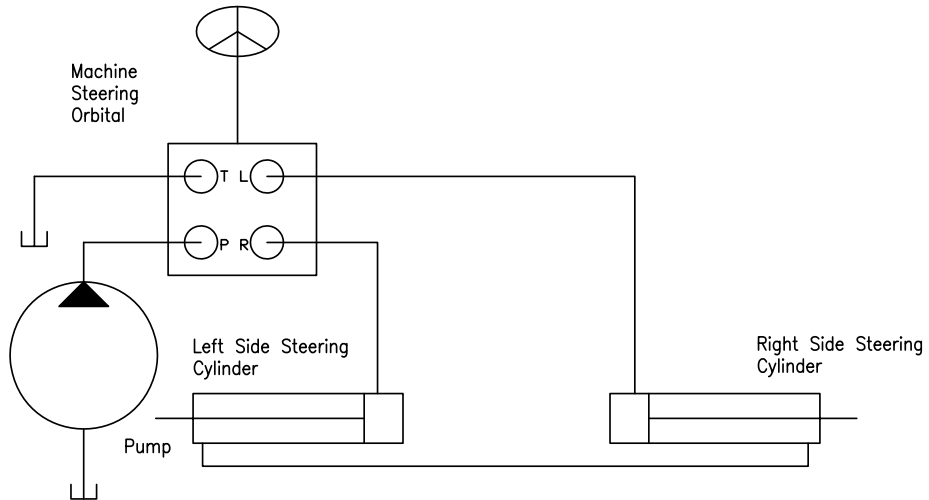
FIGURE 9. Installed Right Steering Hose



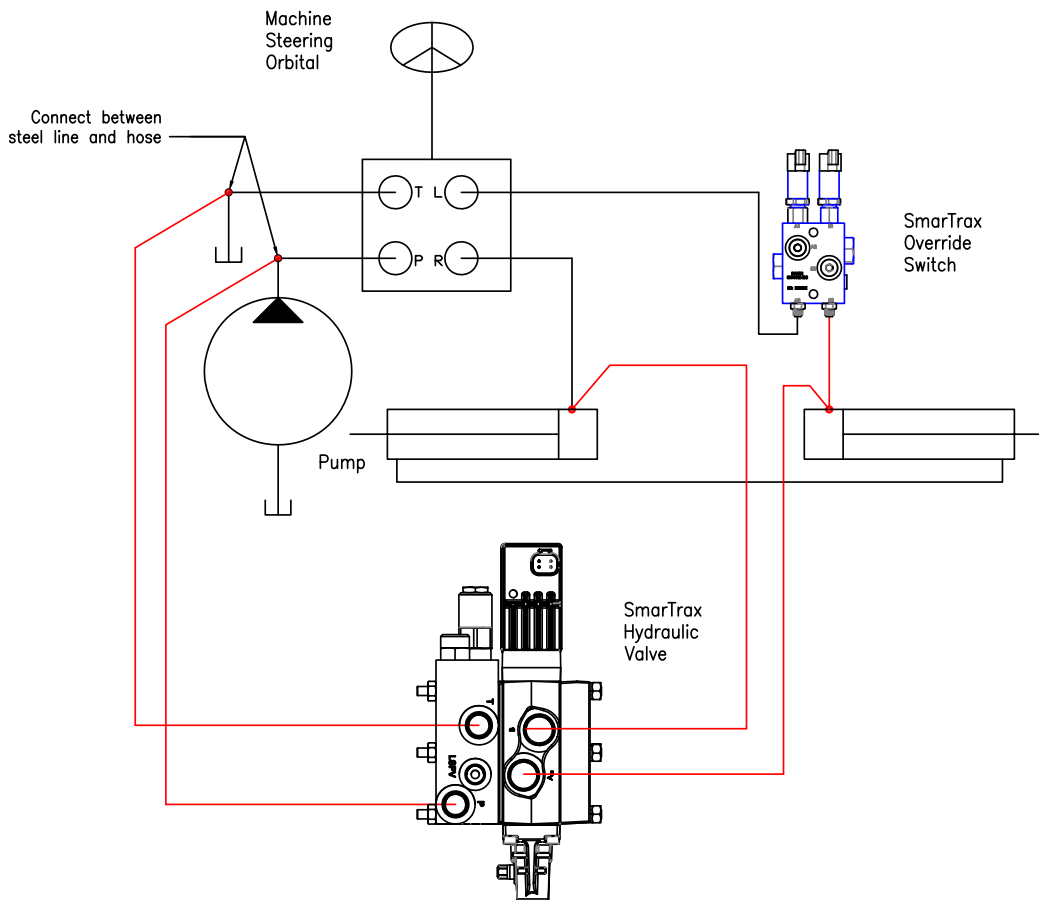
8. Locate and disconnect the machine's right steering hose from the right steering cylinder.
9. Install a -6 ORFS M/M/F swivel run tee adapter fitting (P/N 333-0012-069) in the open steering cylinder port.
10. Connect the machine's right steering hose to the opposite end of the installed tee fitting.
11. Install the 90° end of the supplied hydraulic hose (P/N 214-1000-671) on the 90° end of the installed tee fitting.
12. Connect the straight end of the installed hydraulic hose to Port B of the SmarTrax valve (P/N 334-0003-088).

# Hydraulic System Diagram

Before SmarTrax Installation



After SmarTrax Installation



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*Install the SmarTrax Node*

Mount the SmarTrax Node

**FIGURE 1. Node Mounted to the Mounting Plate**



1. Mount the SmarTrax node (P/N 063-0173-228) to the node mounting plate (P/N 107-0171-924) using three 1/4"-20 x 7/8" flat head bolts (P/N 311-0002-308), three washers (P/N 313-2300-011), and three 1/4"-20 UNC nylon insert lock nuts (P/N 312-4000-057).

FIGURE 2. Standoffs Installed on Mounting Plate

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2. Remove the nuts from the machine's mounting plate.

**Note:** *The machine's mounting plate is located behind the operator's seat.*

3. Screw the M6 x 40 mm M/F to 13mm hex standoffs (P/N 305-8000-008) onto the two studs of the machine's mounting plate.

FIGURE 3. Node Installed

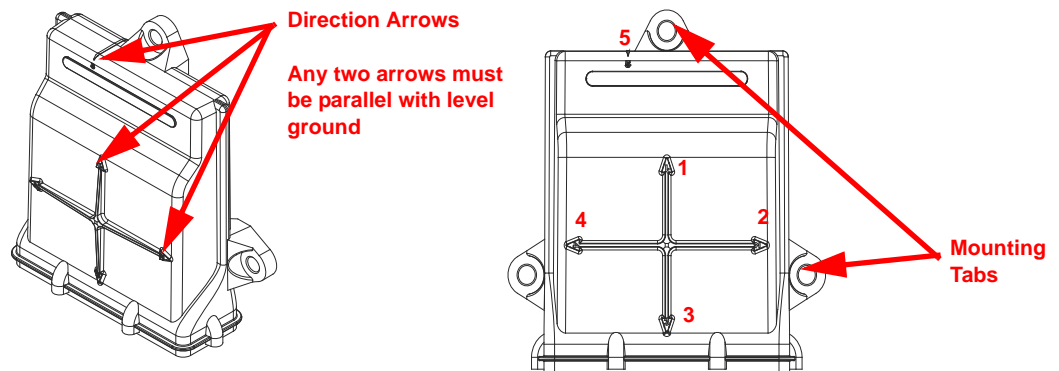
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4. Mount the node mounting plate on the installed standoffs and secure with the machine's existing nuts that were previously removed.

## Node Mounting Locations

FIGURE 4. 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 Node Harness

FIGURE 5. Node Cable Installed on Node





1. Install the two large, rectangular connectors of the node cable (P/N 115-4001-110) into the correct ports of the node, tightening the bolts on the harness connectors to secure the connections.

**FIGURE 6. CAN Connector Installed on Machine's CAN System**

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2. Connect the CAN connector to the machine's existing CAN system.
3. Connect the round 3-pin power connector of the node cable into the convenience power port on the instructional seat.

**Note:** *High current power, which is used to run the steering operations, should be connected to a power source separate from logic power, which is used to facilitate processing and communication between the node and the console.*

4. Connect the DGPS connector to the GPS receiver.

**FIGURE 7. DGPS OUT Connector Routed Under Operator's Seat**

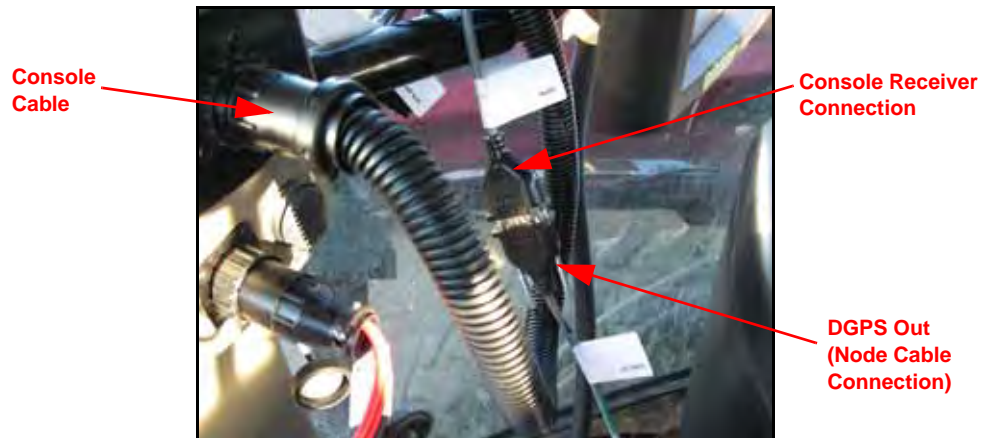
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5. Route the DGPS OUT connector out the right corner of the operator's seat base and under the right arm rest.



FIGURE 8. DGPS OUT Connected to Console Receiver Connection



6. Connect the DGPS OUT connector to the Viper Pro or Envizio Pro receiver connection.

## *Install the Valve Harness*

FIGURE 9. Valve Cable Routed Through Access Point



1. Route the valve cable through the right-rear corner cable access grommet under the window.
2. Connect the rectangular 12-pin connector on the valve harness (P/N 115-4001-111) into the mating connection on the node harness (P/N 115-4001-110).

FIGURE 10. Valve Harness Connected to Flow Switch



3. Plug the PS1 and PS2 connectors from the valve cable into the pressure transducers installed on the flow switch (P/N 334-0003-085).

**Note:** These connections can be plugged into either transducer.

4. Plug the VALVE connector from the valve cable into the open port at the end of the SmarTrax valve (P/N 334-0003-088).

## Install the Foot Switch

FIGURE 11. Foot Switch Installed



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

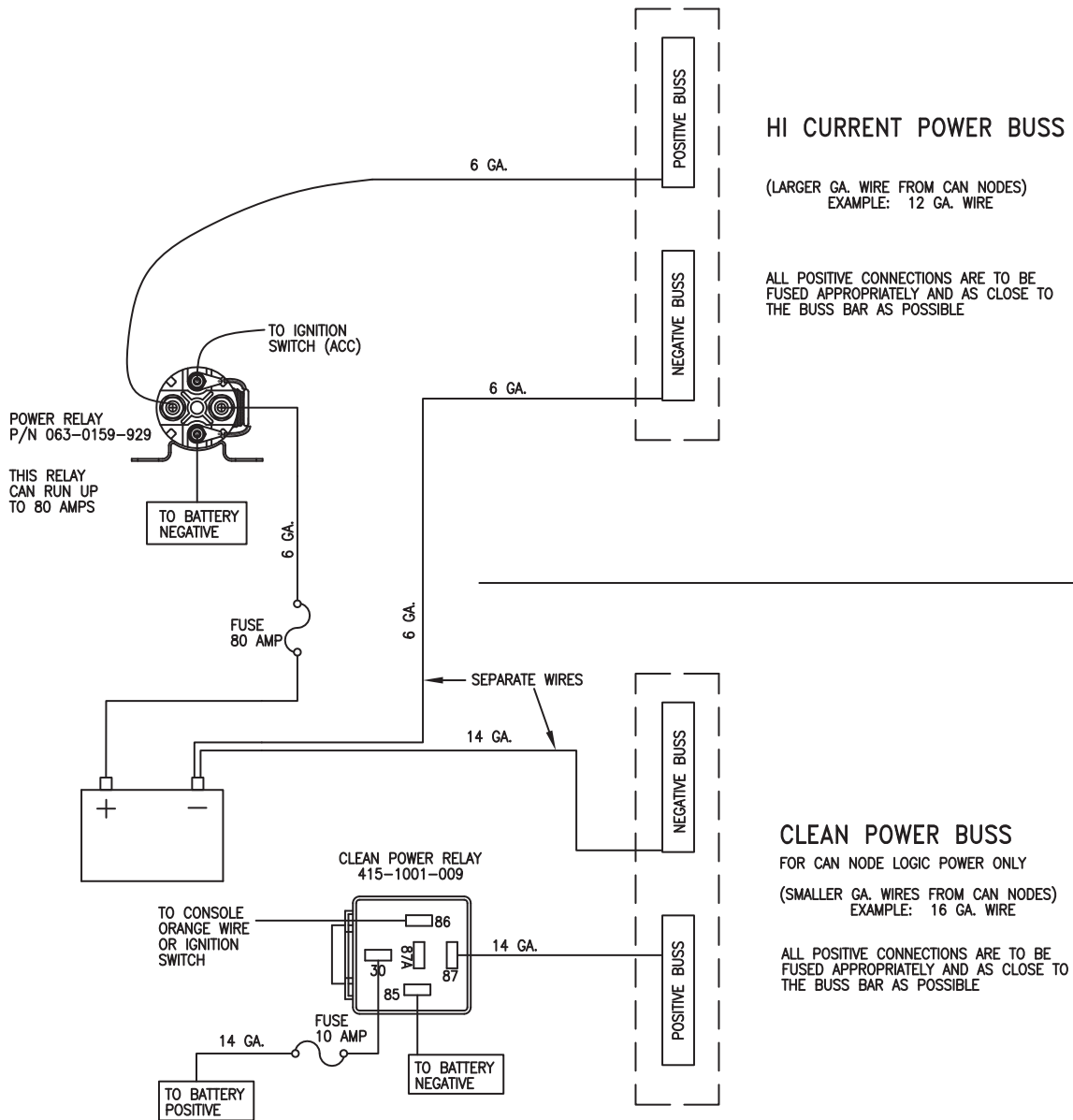
**Note:** The foot switch should be installed in a location where the operator has easy access to it and is able to fully press the pedal.

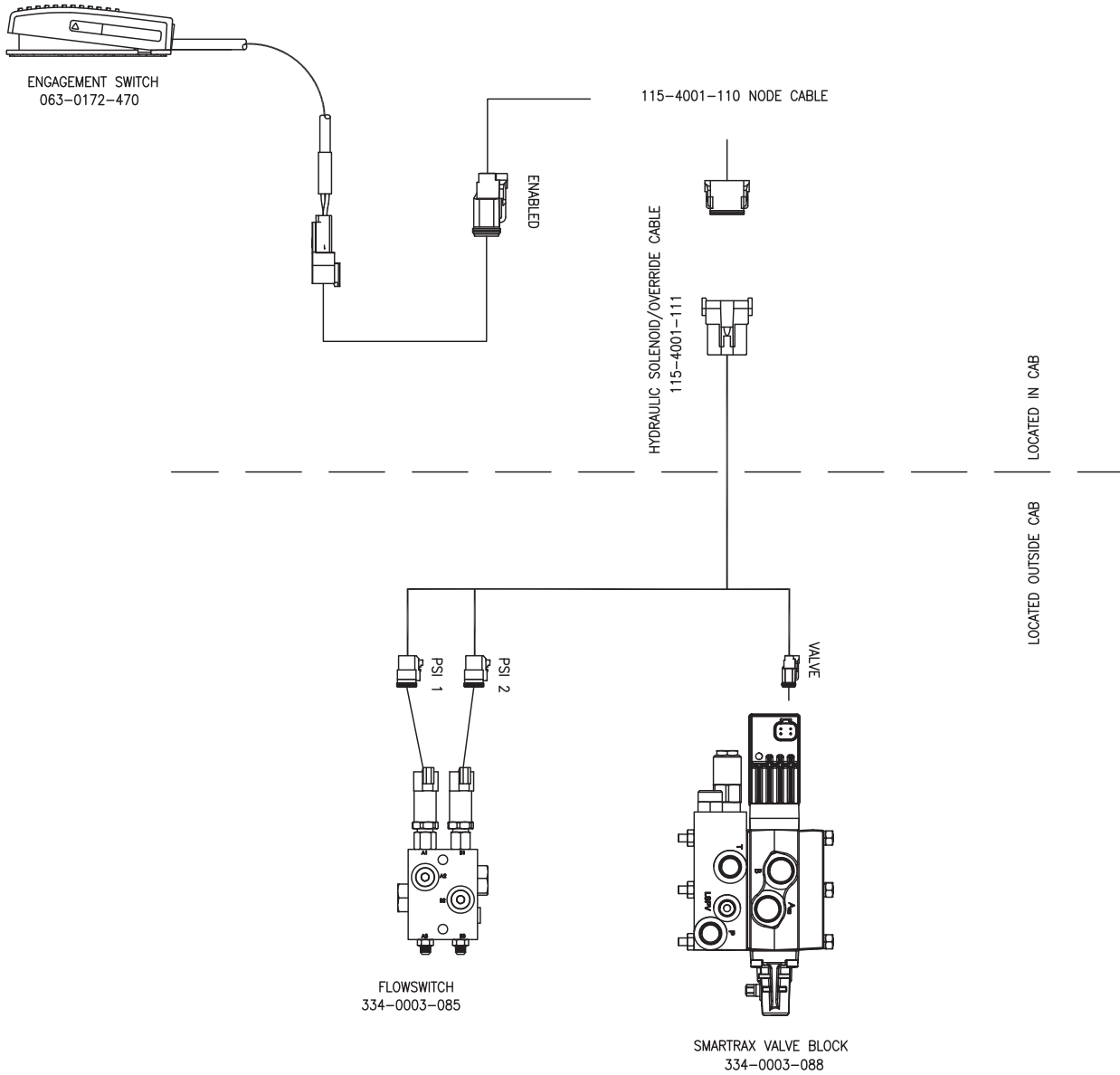
2. Using the holes in the foot switch as a template, drill holes in the floor of the cab.
3. Secure the foot switch to the floor by installing the supplied screws in each of the mounting holes.
4. Locate the ENABLE connector on the node harness and connect it to the foot switch cable connector behind the operator's seat.

# System Diagrams

## Node Wiring Diagram

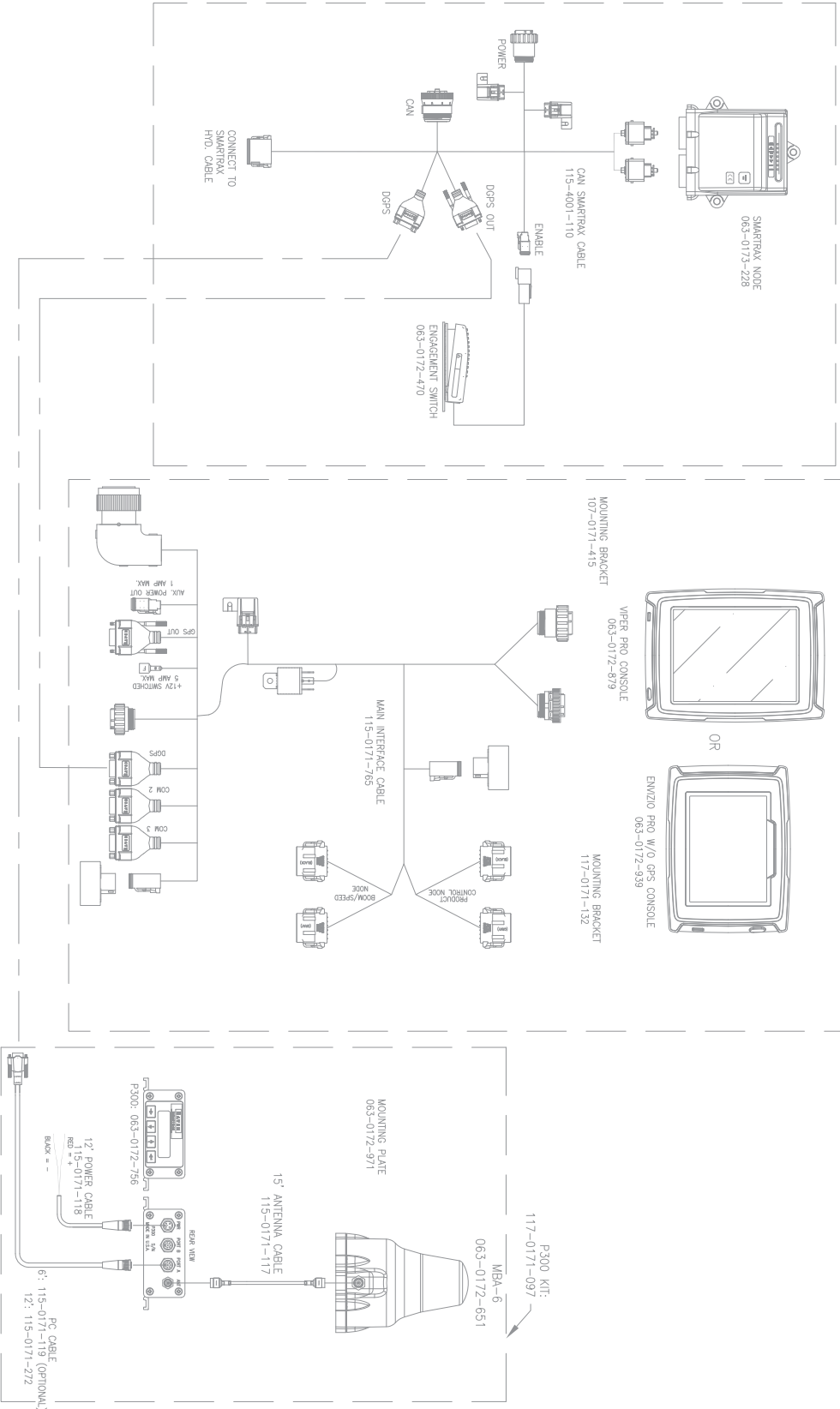
### CAN NODE WIRING







ENVIZIO PRO/VIPER PRO/SMARTRAX 3D W/PHOENIX 300/CIH





**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.

### *Remove Air from the Hydraulic System*

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. To remove air from the hydraulic system and to ensure proper operation of the SmarTrax system:

1. Turn the machine's wheels fully from side to side repeatedly.

**Note:** *If air pockets are present, the wheels may not move consistently when the steering wheel is turned.*

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

## *Verify the Hydraulic 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.

**Note:** *If there are issues with the SmarTrax system, turn off the machine and correct them immediately. For additional assistance, contact your local Raven dealer.*

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## *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

## 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.**