

RAVEN

# SmarTrax™ Installation Manual



**Case IH Steiger and  
New Holland TJ/T90X0**

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## CHAPTER

# 1

# *Important Safety Information*

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## 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.

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## CHAPTER

# 2

## *Introduction*

Congratulations on your purchase of the Steering Ready 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: Steiger 335/385/435/485/535 and STX 280/330/380/430/480/530**

**MAKE: New Holland**

**MODEL: TJ 280/330/380/430/480/530 and T9010/9020/9030/9040/9050/9060**

**FIGURE 1. New Holland T9050 and Case IH Steiger 535**



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## *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.

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

**TABLE 1. SmarTrax Installation Kit (P/N 117-5032-004)**

Picture	Item Description	Part Number	Qty.
Not Pictured	Manual - Case IH Steiger and New Holland TJ SmarTrax Installation	016-5032-004	1
Not Pictured	Manual - SmarTrax and SmartSteer Calibration & Operation	016-0171-277	1
	Valve - PVES Control	334-0002-162	1
	Valve - PVES Shuttle	334-0002-163	2
	Switch - Flow	334-0003-085	1
	Bracket - Node Mounting	107-0172-084	1
	Cable - Valve Harness	115-4001-104	1
	Cable - Node Harness	115-4001-126	1

**TABLE 1. SmarTrax Installation Kit (P/N 117-5032-004)**

Picture	Item Description	Part Number	Qty.
	Assembly - SmarTrax Enable Foot Switch	063-0172-470	1
	Bolt - M6 x 1.00 x 20 mm Hex	311-0070-010	4
	Bolt - M8 x 1.25 x 50 mm Hex	311-0070-044	1
	Nut - 3/8"-16 Nylon Insert Lock	312-4000-061	3
	Nut - M6 Nylon Insert Lock	312-4000-207	4
	Washer - 5/16" Split Lock	313-1000-019	1
	Washer - 0.250" ID x 0.562" OD x 0.065" Thick	313-2300-009	4

**TABLE 2. Hydraulic Installation Kit (P/N 117-0199-109)**

Picture	Item Description	Part Number	Qty.
	Fitting - -6 ORFS (M) to -6 SAE O-Ring (M) Straight Adapter	333-0012-084	2
	Hydraulic Hose - -6 ORFS (F) to -8 ORFS (F) 90° - 24"	214-1000-775	1

TABLE 2. Hydraulic Installation Kit (P/N 117-0199-109)

Picture	Item Description	Part Number	Qty.
	Hydraulic Hose - -6 ORFS (M) to -6 ORFS (F) 90° - 13"	214-1000-776	1
	Hydraulic Hose - -6 ORFS (F) to -6 ORFS (F) 90° - 24"	214-1000-779	1



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.

## Install the Proportional Valve (PVE)

FIGURE 1. Steering Valve Location



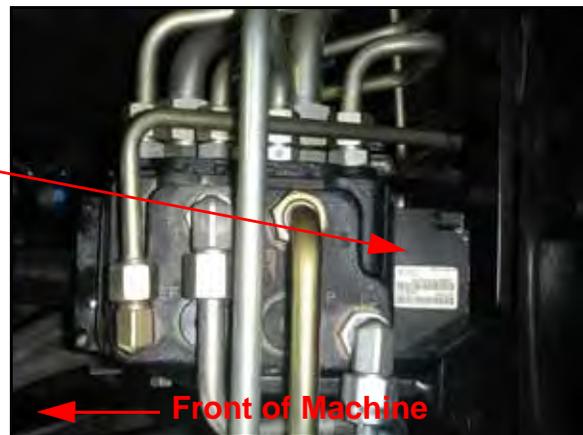
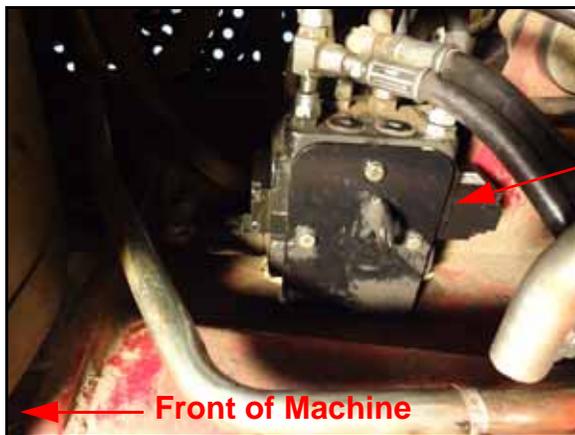
1. Locate the steering valve.

**Note:** On smaller models, the steering valve is located under the hood, directly in front of the cab. On all larger models, the steering valve is located behind the front axle on the right side of the tractor frame.

FIGURE 2. Large End Cap Location

Valve Located Behind the Axle

Valve Located by the Cab



2. Remove the large end cap from the steering valve.

**Note:** It may be necessary to remove valve mounting bolts, hoses, and/or tubes to access the end cap.

FIGURE 3. Shuttle Valve Installed in End Cap



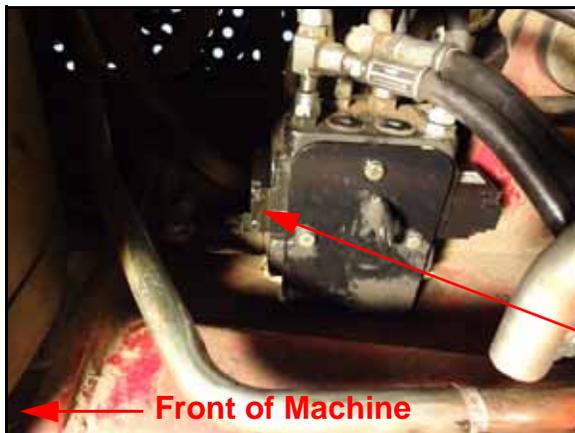
3. Install the tapered end of a shuttle valve (P/N 334-0002-163) into the end cap.
4. Reinstall the end cap on the steering valve.

**Note:** Ensure the O-rings remain seated during installation.

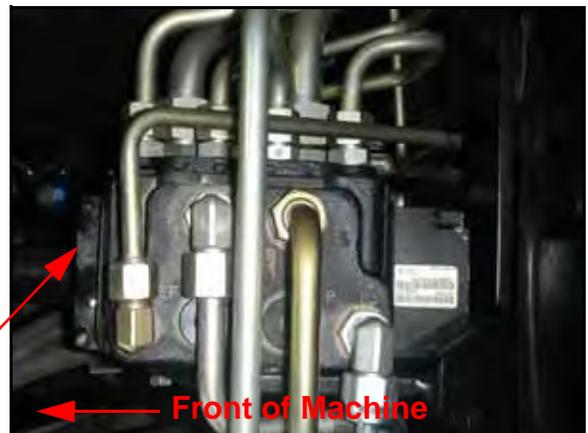
5. Reinstall and tighten any previously removed mounting bolts, hoses, and/or tubes.

FIGURE 4. Small End Cap Location

Valve Located Behind the Axle



Valve Located by the Cab



Small End Cap

Front of Machine

Front of Machine

6. Remove the opposite end cap from the steering valve.

**Note:** The second, smaller end cap is not used in the SmarTrax system. Store the end cap in a safe place for future use in case the SmarTrax system is removed from the machine.

FIGURE 5. Shuttle Valve Installed in the PVE



7. Install the tapered end of the remaining shuttle valve into the supplied PVE (P/N 334-0002-162).

FIGURE 6. PVE Installed on Steering Valve



8. Install the PVE in the removed end cap location.

**Note:** *Ensure the O-rings remain seated during installation.*

## Install the Override Flow Switch

FIGURE 7. Fittings and Transducers Installed in the Flow Switch

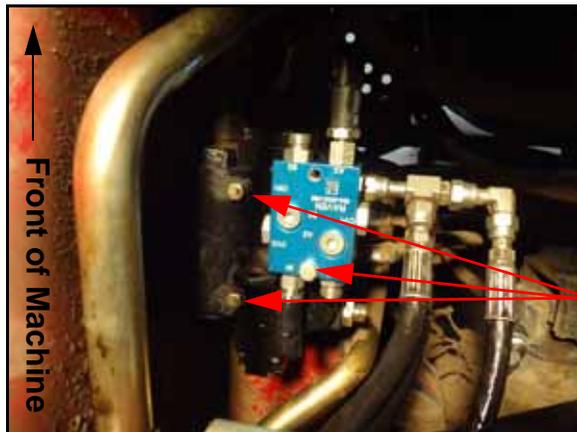


1. Install the -6 ORFS (M) to -6 SAE O-Ring (M) straight adapter fittings in the ends of the flow switch (P/N 334-0003-085), one in an A port and one in a B port.
2. Install pressure transducers into the remaining A and B ports.

**Note:** It makes no difference in which ports the adapter fittings and pressure transducers are installed as long as one of each is installed in an A port and the other is installed in a B port.

FIGURE 8. Flow Switch Mounted on the Machine

Axle Mounting Location  
(Bottom View)



Cab Mounting Location  
(Left Side View)



Valve  
Mounting  
Bolts

3. Mount the flow switch to the valve mounting bracket using the supplied M8 hex head bolt (P/N 311-0070-044) and the 5/16" lock washer (P/N 313-1000-019).

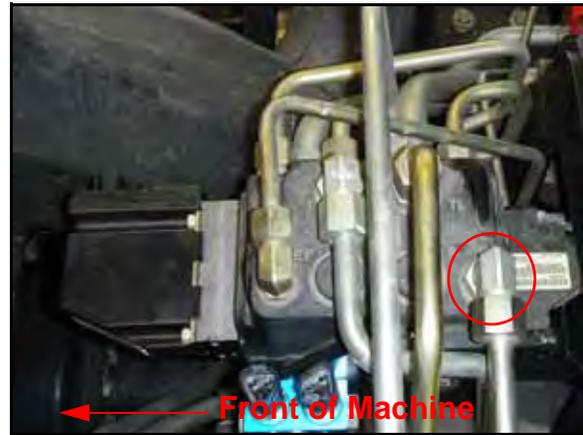
**Note:** The existing bolt in the selected mounting location will need to be removed.

FIGURE 9. Pressure Hose Removed from the Steering Valve

PS Port Circled at the Axle Mounting Location  
(Bottom View)



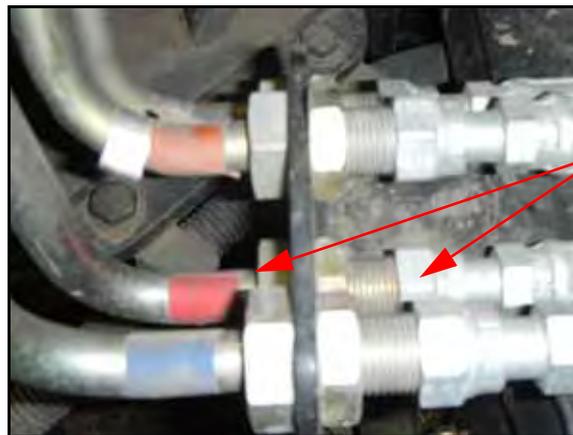
PS Port Circled at the Cab Mounting Location  
(Top View)



4. Remove the pressure hose from the fitting installed in port PS of the steering valve fitting as shown in the figure below.

**Note:** On smaller models, the pressure line is a steel tube. On larger models, the pressure line is a hose.

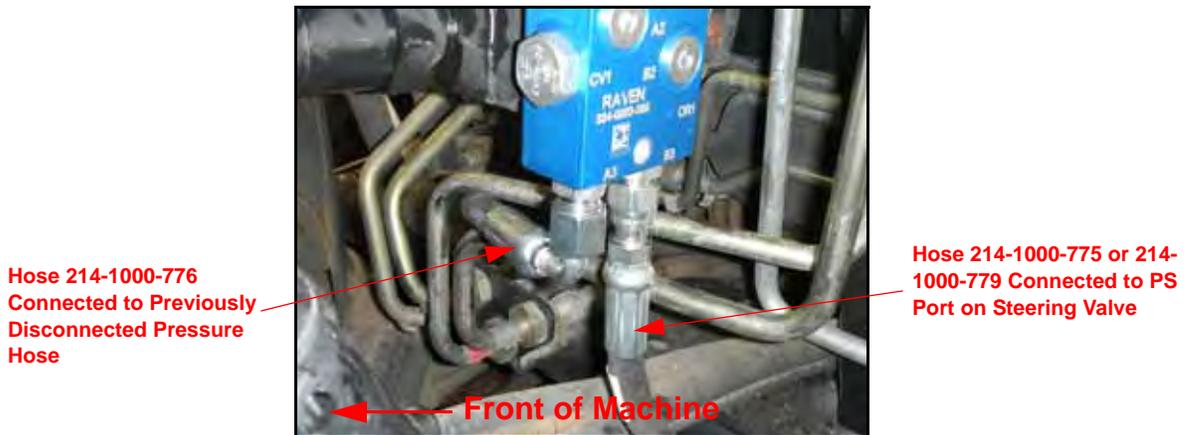
FIGURE 10. Pressure Hose Removed from the Bulkhead (If Applicable)



5. Smaller Models Only - Disconnect the pressure tube and hydraulic hose from the bulkhead fitting as shown in the figure below.

**Note:** Store the disconnected pressure tube in a safe place for future use in case the SmarTrax system is removed from the machine.

FIGURE 11. Hoses Installed on Flow Switch



6. Install the supplied 24" hydraulic hose on the pressure port of the steering valve.

**Note:** Two 24" hydraulic hoses were included in the installation kit - one (214-1000-775) for smaller models and another (214-1000-779) for larger models. Only one hose properly connects to the pressure port. The other hose will not be used and may be discarded.

7. Connect the other end of the installed hydraulic hose to one of the fittings on the flow switch.
8. Install the supplied 13" hydraulic hose (214-1000-776) on the remaining fitting on the flow switch.
9. Connect the other end of the installed 13" hydraulic hose to the machine's pressure hose that was previously disconnected from the steering valve.

**Note:** For smaller models, connect the other end of the installed 13" hydraulic hose to the machine's hose that was disconnected from the back side of the bulkhead.

10. Verify the hydraulic connections are tight.

	<p><b>WARNING</b></p> <p>Do not use hands to check for leaks in the hydraulic system. Hydraulic fluid under pressure can penetrate the skin and cause serious injury or death.</p>
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11. Start the machine's engine and ensure the hydraulic connections are not leaking and hoses are not rubbing on or interfering with other moving parts.
12. Turn the wheels fully from side to side several times to purge air from the hydraulic system.



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## CHAPTER

# 4

## *Cab Component Installation*

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### *Install the SmarTrax Node*

#### Mount the SmarTrax Node

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

**FIGURE 1. SmarTrax Node Installed**

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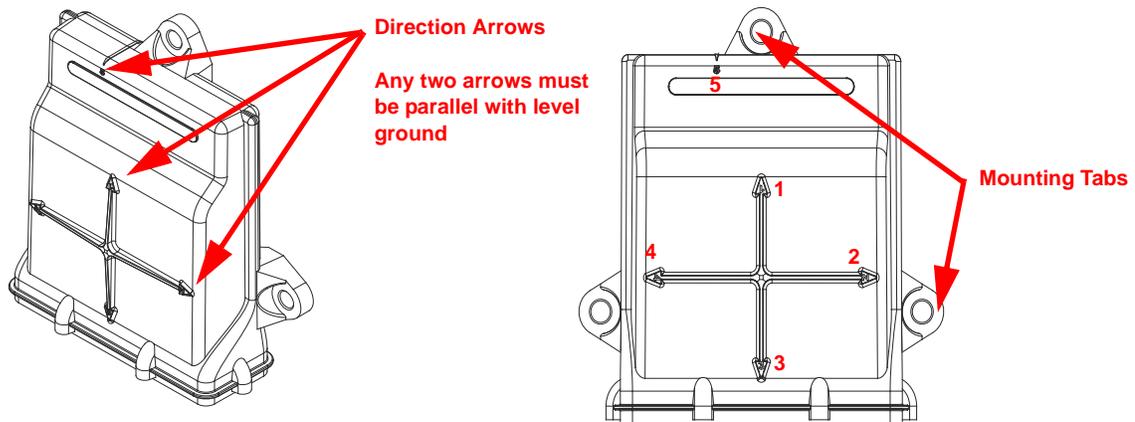
1. Mount the SmarTrax node to the node mounting bracket (P/N 107-0172-084) using three 3/8"-16 nylon insert lock nuts (P/N 312-4000-061).
2. Install the two large, rectangular connectors of the node harness (P/N 115-4001-126) into the correct ports of the node.
3. Tighten the bolts on the harness connectors to secure the connections.
4. Place the node mounting bracket under the instructional seat, aligning the holes in the mounting bracket with the existing holes in the cab floor.

**Note:** The node connectors should be pointing toward the operator's seat.

5. Secure the node mounting bracket to the floor using four M6 x 1.00 x 20 mm bolts (P/N 311-0070-010), four 1/4" flat washers (P/N 313-2300-009), and four M6 lock nuts (P/N 312-4000-207).

## 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.

## Route the Node Harness

1. Route the remainder of the node harness (P/N 115-4001-126) through the opening in the front of the instructional seat and behind the operator's seat.
2. Locate the opening in the plastic shroud behind the operator's seat.
3. Route the node harness through the opening, under the shroud, and into the fuse box located in the rear-right corner of the cab.

---

## 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 115-4001-126) and connect it to the foot switch cable connector.

---

## Install the Valve Harness

1. From outside the cab, route the 6-pin and 12-pin connectors of the valve harness (P/N 115-4001-104) into the cab through the opening in the floor at the fuse box.
2. Plug the 12-pin connector of the valve harness into the VALVE connector of the node harness (P/N 115-4001-126).
3. Coil the WAS cable connector and store it in the in the fuse box.

**Note:** *The WAS connection is not used in the SmarTrax system.*

4. Route the valve harness under the cab and toward the PVE.

FIGURE 4. Valve Harness Connected to PVE

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5. Plug the PVES connector from the valve harness into the PVE.

FIGURE 5. Valve Harness Connected to Flow Switch

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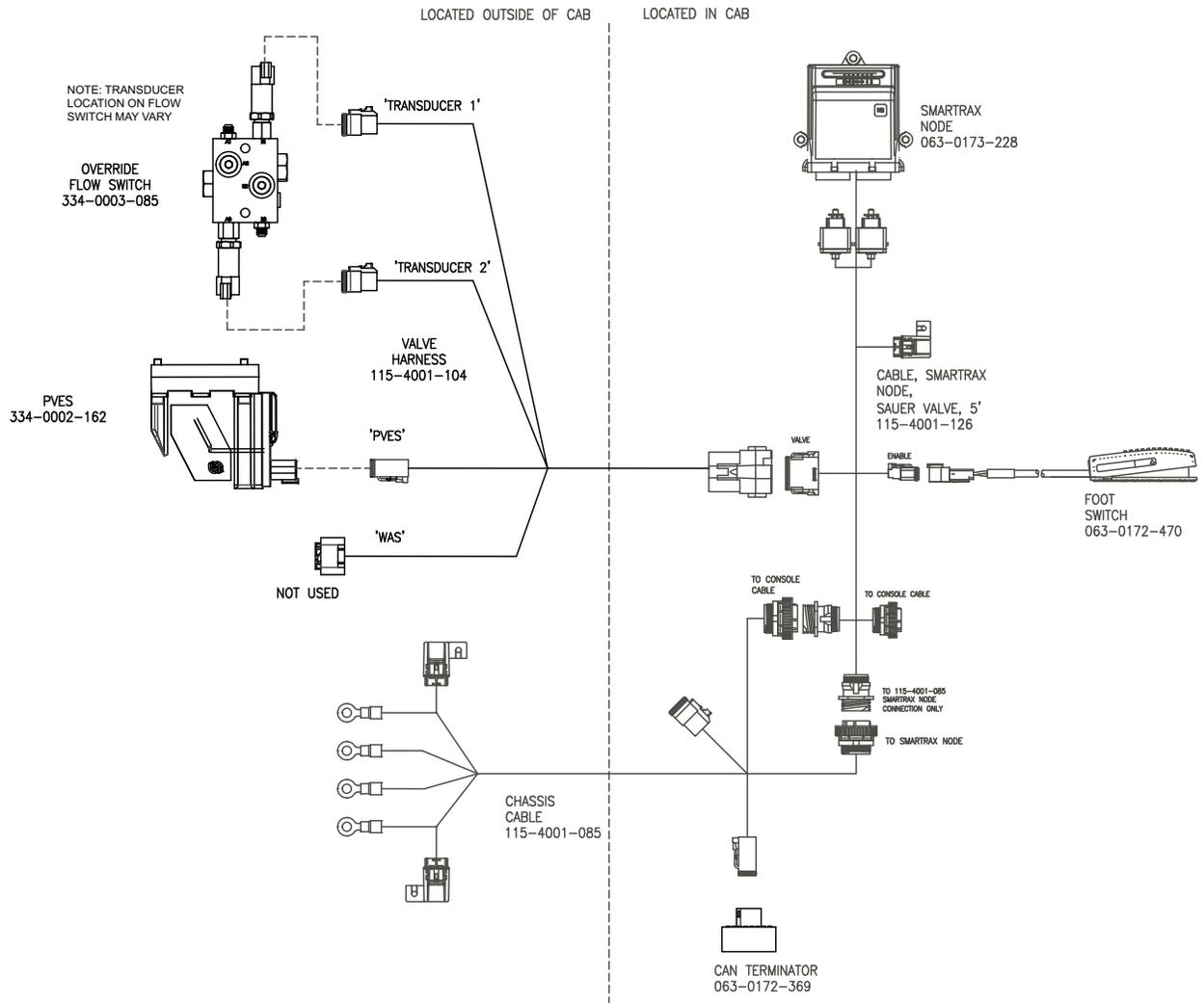


6. Plug the 3-pin TRANSDUCER 1 and TRANSDUCER 2 connectors from the valve harness into the pressure transducers installed on the flow switch.

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

7. Use plastic cable ties to secure the valve harness to the machine's frame, hoses, and/or cables, ensuring the cable is not in contact with moving parts or heat sources.

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 the 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 TO 115-4001-085 SMARTRAX NODE CONNECTION connector on the node harness (P/N 115-4001-126).
3. Connect the TO CONSOLE CABLE connector to the node harness.
4. Connect the remaining connector on the node harness to the Raven console cable.
5. Install a terminator (P/N 063-0172-369) on the CAN cable connector.
6. 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.*

7. Connect the ring terminals to the battery.

**Note:** *The positive connectors are fused.*

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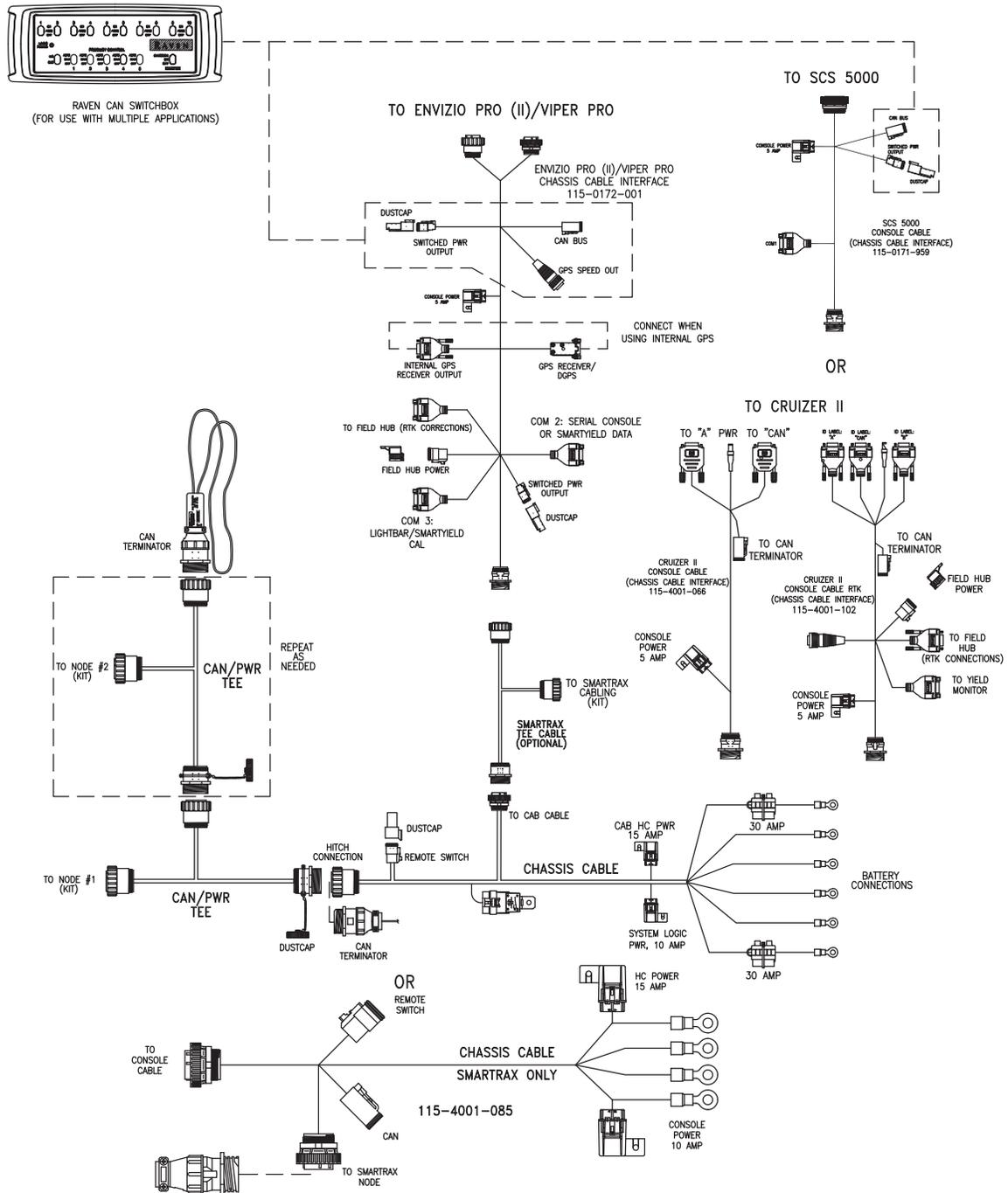
## *Connect SmarTrax to an Existing Chassis Cable (If Applicable)*

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 node harness (P/N 115-4001-126) between the chassis and Raven console harness.
3. Loop and tie-off the TO 115-4001-085 SMARTRAX NODE CONNECTION ONLY cable connection, securing it with plastic cable ties as necessary.

**Note:** *The TO 115-4001-085 SMARTRAX NODE CONNECTION ONLY connector is not used in systems containing existing chassis cables.*

# System Diagrams

FIGURE 7. Existing Chassis System 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 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.*

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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**

# **RAVEN INDUSTRIES**

## **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.

### ***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

Case IH Steiger and New Holland TJ/T90X0  
SmarTrax™ Installation Manual  
(P/N 016-5032-004 Rev A 03/12 E19256)



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