

RAVEN

SmarTrax™ Installation Manual



Case IH Patriot 350

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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: Case IH
MODEL: Patriot 350

FIGURE 1. Case IH Patriot 350



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 117-4001-107)


Picture	Item Description	Part Number	Qty.
Not Pictured	Manual - Case IH Patriot 350 SmarTrax Installation	016-4001-107	1
	Valve - SmarTrax Hydraulic	063-0131-129	1

TABLE 1. SmarTrax Installation Kit (P/N 117-4001-107)

Picture	Item Description	Part Number	Qty.
	Bracket - Hydraulic Valve Mounting	107-0171-705	1
	Cable - SmarTrax Valve Harness	115-4001-002	1
	Transducer - 0-3000 PSI Pressure	422-0000-086	1
	Magnet - Ceramic	418-0000-013	3
	Bolt - 1/4"-20 x 1" Hex	311-0050-105	3
	Bolt - 5/16"-18 x 7/8" Hex	311-0052-104	4
	Bolt - 3/8"-16 UNC x 1-1/4" Hex	311-0054-106	4
	Nut - 3/8"-16	312-1001-037	5
	Nut - 1/4"-20 Nylon Insert Lock	312-4000-164	3
	Washer - 5/16" Lock	313-1000-019	4
	Washer - 3/8" Split Lock	313-1000-022	5

TABLE 1. SmarTrax Installation Kit (P/N 117-4001-107)




Picture	Item Description	Part Number	Qty.
	Washer - 1/4" Flat	313-2300-009	3
	Washer - 3/8" Flat	313-2300-013	5
	Tape - 3.5" Double-Sided	332-0000-019	8

TABLE 2. Hydraulic Installation Kit (P/N 117-0199-107)

Picture	Item Description	Part Number	Qty.
	Fitting - -6 JIC M/F 45° Swivel Elbow	333-0012-027	2
	Fitting - -8 JIC M/M/F Swivel Run Tee Adapter	333-0012-039	4
	Fitting - -6 JIC M/F 90° Swivel Elbow	333-0012-042	4
	Fitting - -6 JIC (M) to -6 SAE O-Ring (M) Straight Adapter	333-0012-045	6
	Fitting - -8 JIC M/F 90° Swivel Elbow	333-0012-064	1
	Hydraulic Hose - -8 JIC (F) 45° to -6 JIC (F) - 52"	214-1000-744	4
	Hydraulic Hose - -4 JIC (F) to -6 JIC (F) - 52"	214-1000-745	1

TABLE 3. Node Kit (P/N 117-0197-079)






Picture	Item Description	Part Number	Qty.
Not Pictured	Manual - SmarTrax and SmartSteer Calibration & Operation	016-0171-277-	1
	Node - SmarTrax CAN	063-0173-031	1
	Cable - 6' CANbus with Tee	115-0171-326	1
	Cable - 10' RS232 Extension	115-0171-891	2
	Cable - SmarTrax Node Harness	115-4001-011	1
	Assembly - SmarTrax Enable Switch	063-0172-470	1

TABLE 4. Node Installation Kit (P/N 117-0197-044)







Picture	Item Description	Part Number	Qty.
	Bracket - Node Mounting	107-0172-084	1
	Bolt - M6 x 1" x 20 mm Hex	311-0070-010	4
	Nut - 3/8"-16 UNC-3B Nylon Insert Lock	312-4000-061	3
	Nut - M6 x 1" Lock	312-4000-207	4

TABLE 4. Node Installation Kit (P/N 117-0197-044)

Picture	Item Description	Part Number	Qty.
	Washer - 1/4" Split Lock	313-1000-016	4
	Washer - 0.250" ID x 0.562" OD x 0.065" Thick	313-2300-009	4

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 063-0131-129) 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 - -6 JIC (M) to -6 SAE O-Ring (M) Straight Adapter	333-0012-045	A, B, P, T, LSPV, LS STEER
Fitting - -6 JIC M/F 45° Swivel Elbow	333-0012-027	P, T
Transducer - 0-3000 PSI Pressure	422-0000-086	PS

Mount the SmarTrax Valve

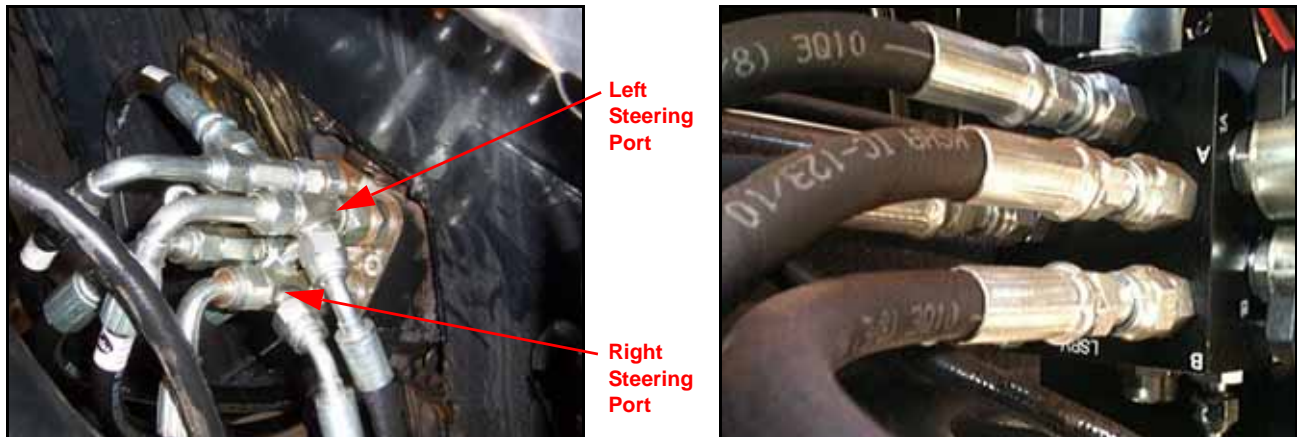
FIGURE 1. SmarTrax Valve Mounting Location



1. Identify the valve mounting location on the steel frame support that runs parallel with the machine, just below the cab and steering orbital.
2. Drill two 3/8" holes in the steel frame support beam using the holes on the end of the hydraulic valve mounting bracket (P/N 107-0171-705) as a guide.
3. Mount the SmarTrax valve (P/N 063-0131-129) to the valve 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).
4. Install the valve mounting bracket in the holes drilled in step 2 using two 3/8"-16 UNC x 1-1/4" hex bolts, four 3/8" flat washers (P/N 313-2300-013), and two 3/8"-16 nuts (P/N 312-1001-037).

Install the Left and Right Steering Hoses

FIGURE 2. Left and Right Steering Hoses Installed on Steering Orbital



1. Disconnect the machine's left steering hose from the steering orbital.
2. Install a -8 JIC M/M/F swivel run tee adapter fitting (P/N 333-0012-039) in the open steering port.
3. Connect the machine's left steering hose to the straight end of the installed tee fitting.
4. Install the 45° end of the supplied hydraulic hose (P/N 214-1000-744) on the 90° end of the installed tee fitting.
5. Connect the straight end of the installed hydraulic hose to the fitting installed in Port A of the SmarTrax valve.

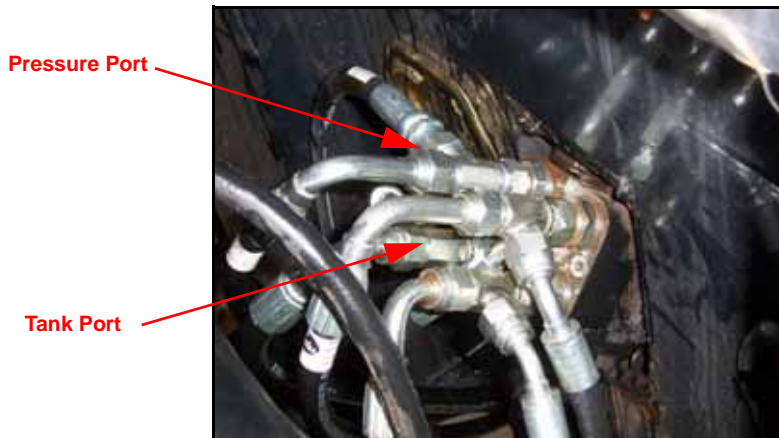
Note: It may be necessary to install a -6 JIC M/F 90° swivel elbow fitting (P/N 333-0012-042) on the fitting installed in Port A of the SmarTrax valve to achieve the connection.

6. Disconnect the machine's right steering hose from the steering orbital.
7. Install a -8 JIC M/M/F swivel run tee adapter fitting (P/N 333-0012-039) in the open steering port.
8. Connect the machine's right steering hose to the straight end of the installed tee fitting.
9. Install the 45° end of the supplied hydraulic hose (P/N 214-1000-744) on the 90° end of the installed tee fitting.
10. 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 Port B of the SmarTrax valve to achieve the connection.

Install the Pressure and Tank Hoses

FIGURE 3. Pressure and Tank Hoses Installed on Steering Orbital



1. Disconnect the machine's pressure hose from the steering orbital.
2. Install a -8 JIC M/M/F swivel run tee adapter fitting (P/N 333-0012-039) in the open pressure port.
3. Connect the machine's pressure hose to the opposite end of the installed tee fitting.
4. Install the 45° end of the supplied hydraulic hose (P/N 214-1000-744) on the 90° end of the installed tee fitting.
5. Connect the straight end of the installed hydraulic hose to the fitting installed in Port P of the SmarTrax valve.
6. Disconnect the machine's tank hose from the steering orbital.
7. Install a -8 JIC M/M/F swivel run tee adapter fitting (P/N 333-0012-039) in the open tank port.
8. Connect the machine's tank hose to the opposite end of the installed tee fitting.
9. Install the 45° end of the supplied hydraulic hose (P/N 214-1000-744) on the 90° end of the installed tee fitting.
10. Connect the straight end of the installed hydraulic hose to the fitting installed in Port T of the SmarTrax valve.

Install the Load Sense Hoses

FIGURE 4. Machine's Existing Load Sense Hose



1. Disconnect the machine's existing load sense hose from the side of the steering orbital.
2. Connect the load sense hose to the fitting installed in Port LSPV of the SmarTrax valve.

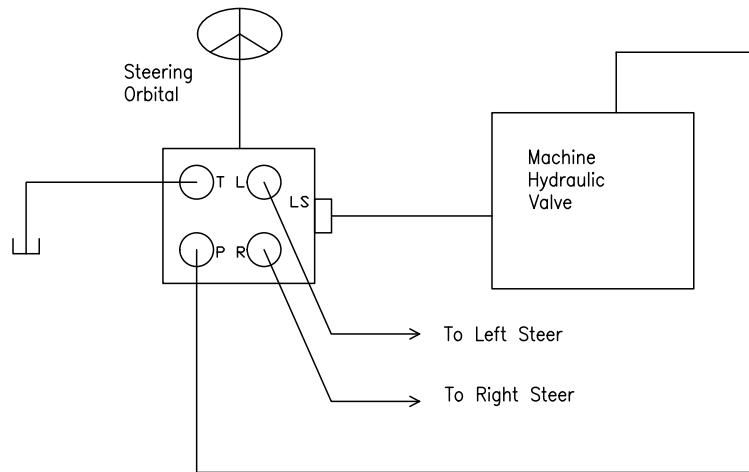
Note: It may be necessary to install a -6 JIC M/F 90° swivel elbow fitting (P/N 333-0012-042) on the fitting installed in Port LSPV of the SmarTrax valve to achieve the connection.

3. Install one end of the supplied hydraulic hose (P/N 214-1000-745) on the open load sense port on the steering orbital.
4. Connect the other end of the supplied hydraulic hose to the fitting installed in Port LS STEER of the SmarTrax valve.

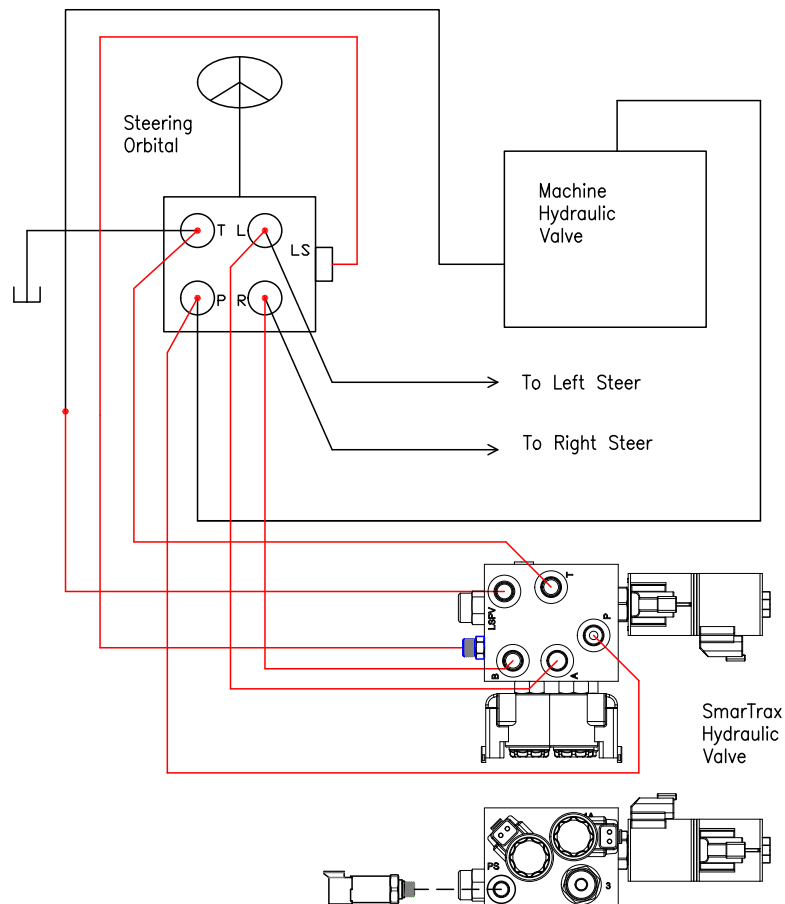
Note: It may be necessary to install a -6 JIC M/F 90° swivel elbow fitting (P/N 333-0012-042) on the fitting installed in Port LS STEER of the SmarTrax valve to achieve the connection.

Hydraulic Diagram

Before SmarTrax Installation



After SmarTrax Installation



CHAPTER

4

Cab Component Installation

Install the SmarTrax Node

Mount the SmarTrax Node

FIGURE 1. SmarTrax Node Mounting Location



1. Identify the node mounting location on the back wall of the cab, to the left of the operator's seat.
2. Drill four 1/4" holes in the back wall of the cab using the corner holes of the node mounting bracket (107-0172-084) as a guide.

Note: *If drilling holes in the wall of the cab is not an option, the node can be mounted in one of two ways: by installing the ceramic magnet (P/N 418-0000-013) on the back of the node mounting plate using the supplied M6 x 1" x 20 mm bolts and 1/4" split lock washers (P/N 313-1000-016), or by using the supplied double-sided tape (P/N 332-0000-019) to adhere the node mounting plate to the wall.*

3. Mount the node (P/N 063-0173-031) to the node mounting bracket (P/N 107-0172-084) using three 3/8"-16 nylon insert lock nuts (P/N 312-4000-061).
4. Install the two large, rectangular connectors of the node harness (P/N 115-4001-011) into the correct ports of the SmarTrax node.
5. Tighten the bolts on the harness connectors to secure the connections.

FIGURE 2. SmarTrax Node Installed

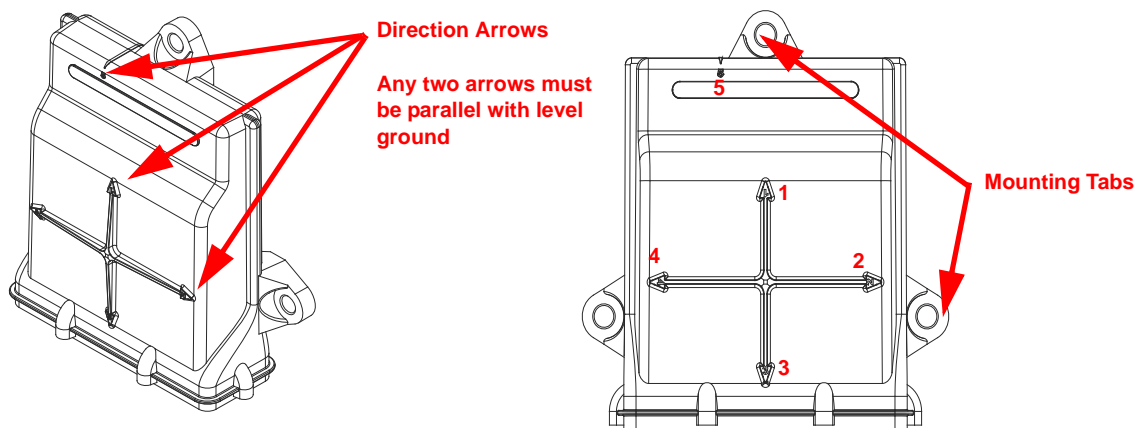


6. Mount the node mounting bracket to the holes in the back wall of the cab using four M6 x 1" x 20 mm hex bolts (P/N 311-0070-010) and four M6 x 1" lock nuts (P/N 312-4000-207).

Note: The forward vehicle direction is 5 in the pictured node orientation.

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.

Install the Node Harness

1. Locate the ENABLE connector on the node harness (P/N 115-4001-011) and connect it to the foot switch cable connector.
2. Connect the DGPS connector to the receiver or other GPS source.

FIGURE 5. DGPS OUT Connection



3. Connect the DGPS OUT connector to the DGPS connector on the Raven console cable.

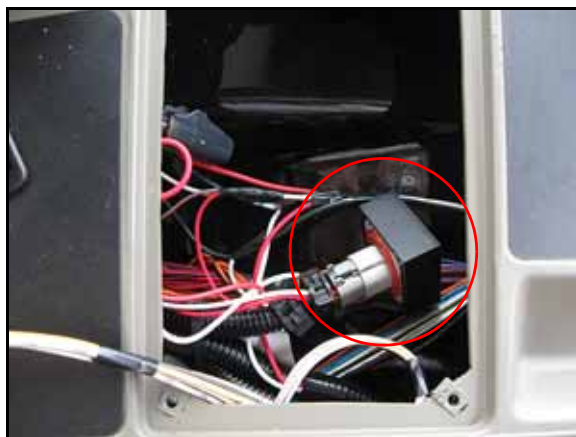
Note: It may be necessary to install a 10' RS232 extension cable (P/N 115-0171-891) between the DGPS OUT and DGPS connector on the Raven console cable to achieve the connection.

FIGURE 6. Console Cover Panel



4. Carefully remove the console cover panel in the front-left corner of the cab.

FIGURE 7. Machine's CAN Terminator



5. Locate and disconnect the terminator from the machine's existing CAN system.

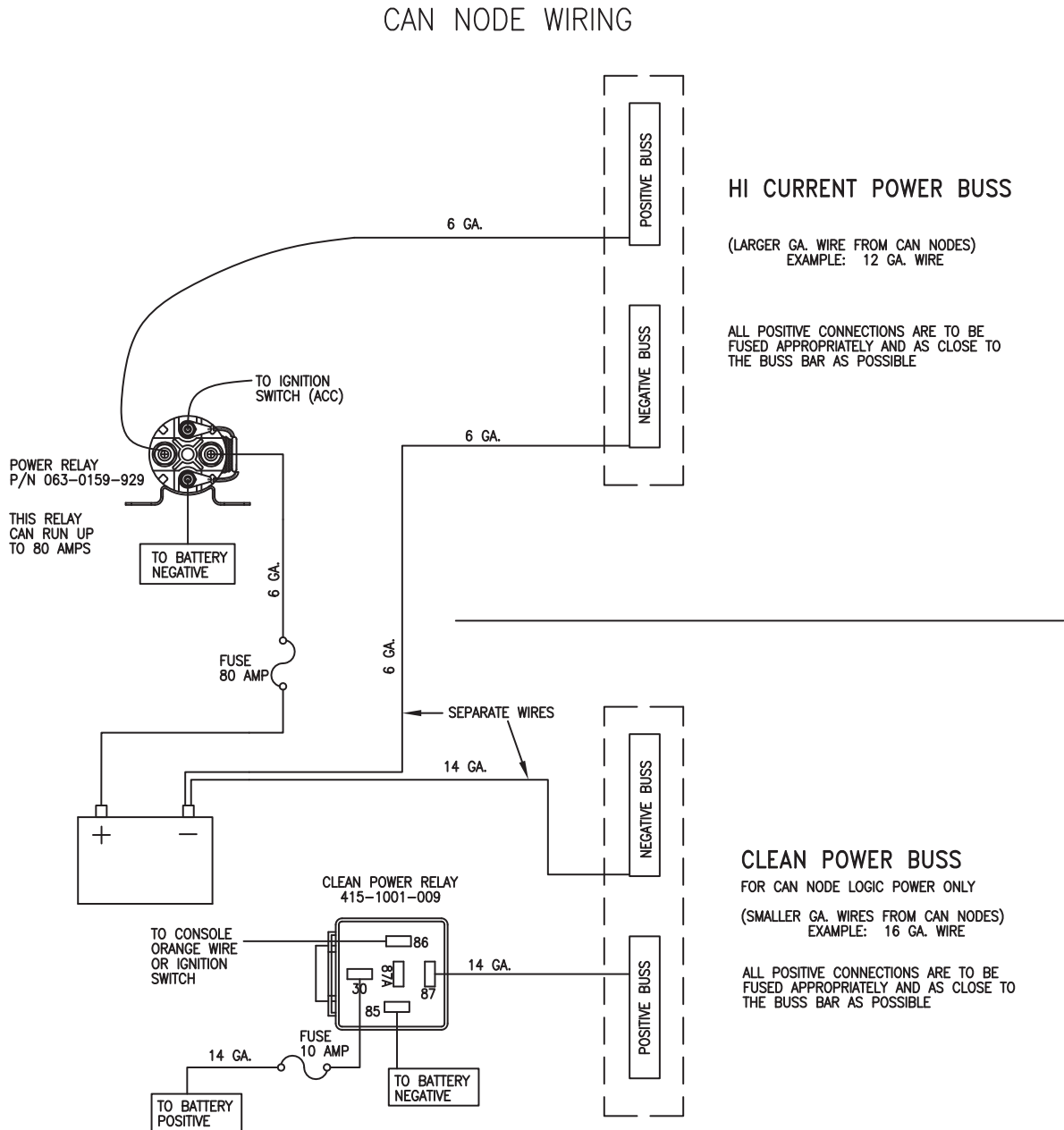
FIGURE 8. CANbus Cable Installed on Machine's CAN Connection



6. Install the 6' CANbus with tee cable (P/N 115-0171-326) on the open CAN connection.
7. Connect the CAN connector of the node harness on the installed CANbus cable.
8. Install the terminator on the remaining open CAN connection.
9. Connect the red and white power and ground connections as shown in Figure 9.

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

FIGURE 9. CAN Node Wiring



Install the Valve Harness

1. Connect the 12-pin connector of the valve harness (P/N 115-4001-002) to the mating connector of the node harness (P/N 115-4001-011).

FIGURE 10. Valve Harness Routed Outside of the Cab

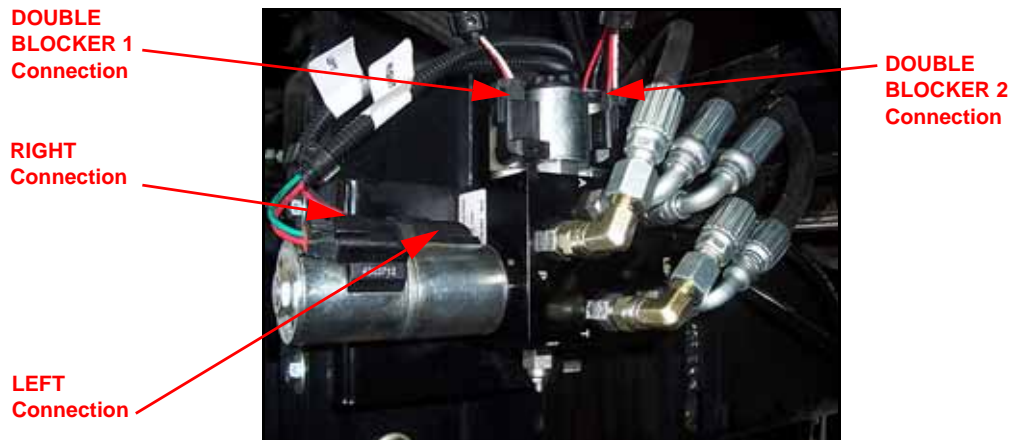


2. Route the valve harness cable outside through the hole in the cab (just below the propel handle of the sprayer) and under the cab to the SmarTrax valve.

Note: Route the cable along hydraulic hoses, using plastic cable ties to secure it away from moving parts and heat sources.

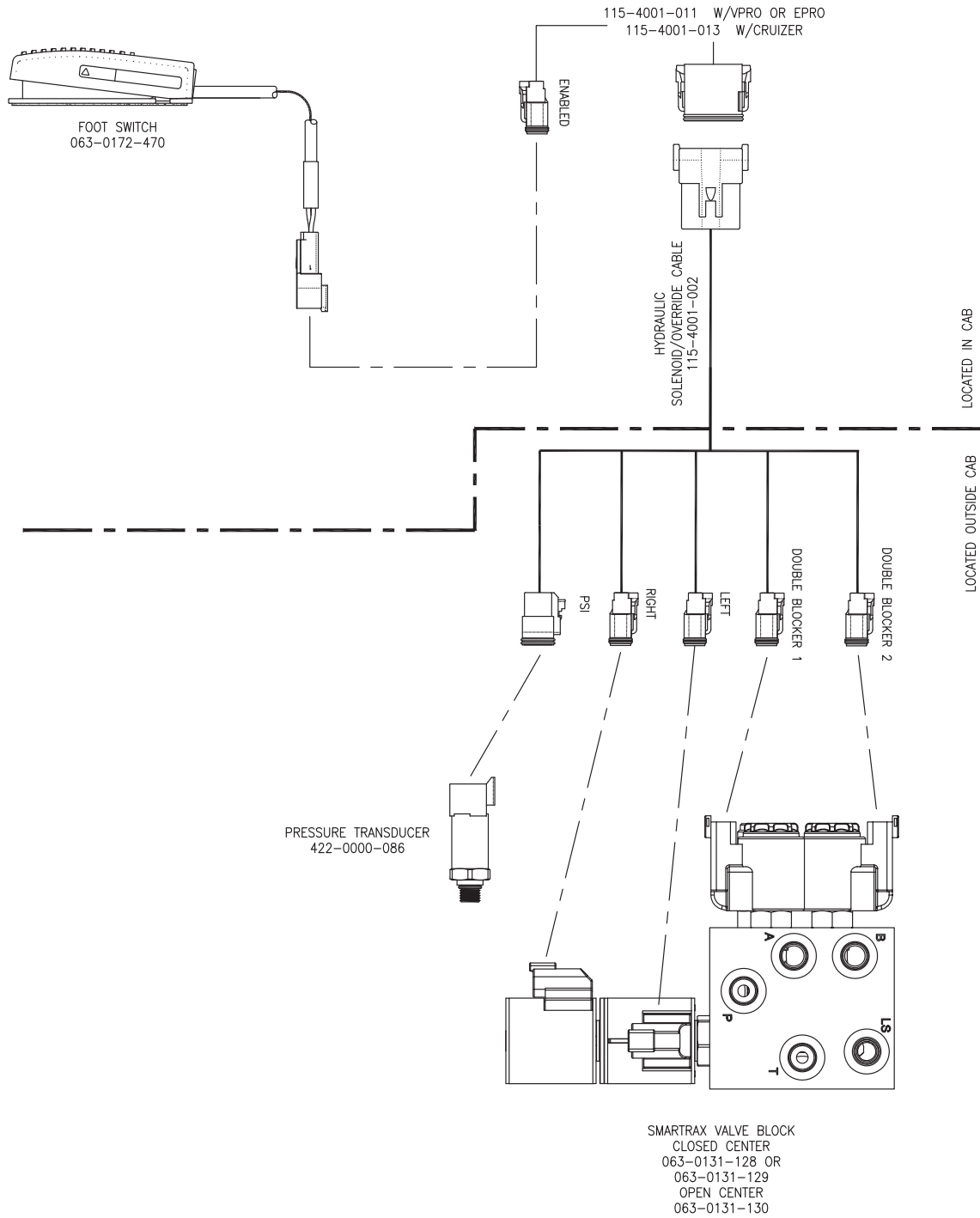
3. Plug the PSI connector to the transducer (P/N 422-0000-086) installed in Port PS of the SmarTrax valve.

FIGURE 11. Valve Harness Connected to SmarTrax Valve



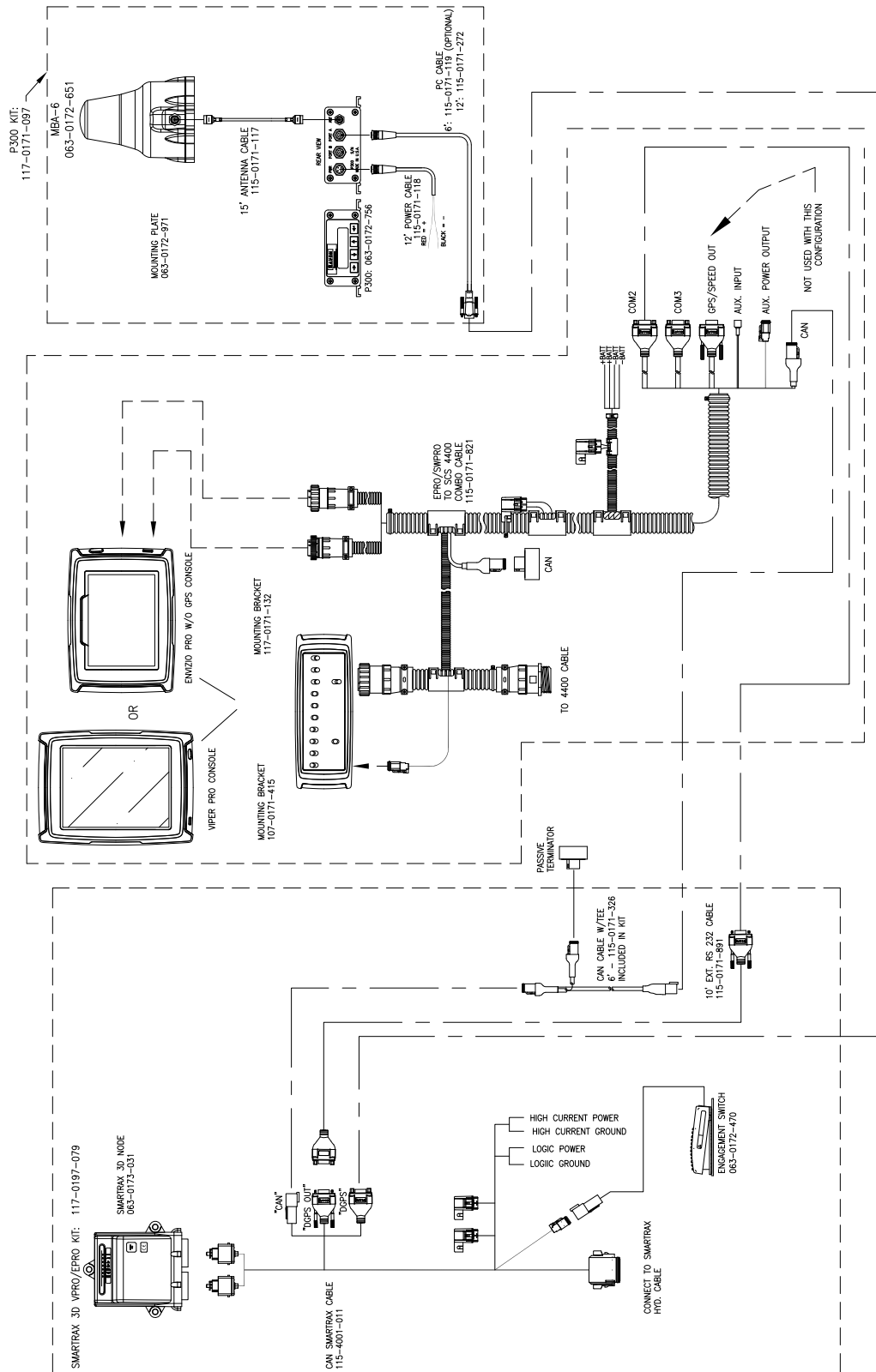
4. Connect the DOUBLE BLOCKER 1 connector to Port 1A of the SmarTrax valve.
5. Connect the DOUBLE BLOCKER 2 connector to Port 1B of the SmarTrax valve.
6. Connect the LEFT connector to the bottom coil of the stack on the SmarTrax valve.
7. Connect the RIGHT connector to the top coil of the sack on the SmarTrax valve.

FIGURE 12. Valve Harness Wiring Diagram



System Diagram

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



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

C

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