

**Spra-Coupe 3000/4000 Series
SmarTrax™ Installation Manual**

P/N 016-0190-032 Rev G 09/15

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Chapter 1	<i>Important Safety Information</i>	1
	Important Safety Information	1
Chapter 2	<i>Introduction</i>	3
	Updates	4
	Preparing for Installation	4
	Hydraulic Fittings	5
	Kit Contents	5
Chapter 3	<i>Mounting the SmarTrax Hydraulic Valve and Counterbalance Valve</i>	9
	Mount the SmarTrax Hydraulic Valve	9
	Mount the Counterbalance Valve	10
	Affixing the SmarTrax Tampering Warning Label	11
Chapter 4	<i>Hydraulic Connections</i>	13
	Populating the Priority Valve	14
	Install the Pressure Hose	15
	Install the LS-Steer and LS-PV Hoses	16
	Install the Excess Flow Hose	17
	Install the Tank Hose	18
	Install the Left and Right Steer Hose	19
	Spra-Coupe Tow Bypass Valve Installation (Optional Kit Sold Separately) (P/N 117-0198-001) ...	21
	Operation	21
	Hydraulic Connection Diagram	22
Chapter 5	<i>Wiring and Electrical Connections</i>	23
	Connecting the SmarTrax Hydraulic Valve	23
	Connecting the Pressure Override Switch	23
	Route the Console Cable Harness	24
	Install the Foot Switch	24
	Mount the SmarTrax Controller	25
	Install the Yaw Sensor	26
	Installing the SmarTrax Node	27
Chapter 6	<i>Start-Up Procedures</i>	29
	Remove Air from the Hydraulic System	29
	Verify the SmarTrax Installation	30
Chapter 7	<i>System Drawings</i>	31

CHAPTER

1

Important Safety Information

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 components. Be sure to keep safety labels in 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 from the operator's seat and machine.
- Do not drive the machine with SmarTrax enabled on any public thorough-fare or main 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.

Please review the operation and safety instructions included with your implement and/or controller.

WARNING

- Always wear appropriate protective equipment when working on hydraulics.
- This machine must remain stationary and switched off with the booms unfolded and supported while installation or maintenance is conducted.
- Before starting the hydraulic installation, be sure to bleed pressure from the hydraulic system.
- Hydraulic fluid may be hot or under high pressure. When starting the machine for the first time after installing the SmarTrax system, be sure that all persons stand clear of the machine in case a hose or fitting has not been completely tightened.

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 first opening a system that has previously been pressurized.
- When disconnecting the hydraulic hoses or purging is required, be aware that the hydraulic oil may be extremely hot and under high pressure. Caution must be exercised.
- Any work carried out on the hydraulic system must be performed in accordance with the machine manufacturer's approved maintenance instructions.
- When installing SmarTrax hydraulics or performing diagnostics, maintenance, or routine service, ensure precautions are taken to prevent any foreign material or contaminants from being introduced in the machine's hydraulic system. Objects or materials that are able to bypass the machine's hydraulic filtration system will adversely reduce performance and possibly damage the SmarTrax hydraulic valves.

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 Raven SmarTrax system. This system is designed to provide cutting-edge, hands-free steering of agricultural equipment via GPS (Global Positioning System) coordinates.

This manual applies to the following machines. For future reference, write your serial number in the space below.

Make: Spra-Coupe

Year:

Serial Number: 3000/4000 Series

FIGURE 1. Spra-Coupe Self Propelled Sprayer



Updates

Updates for Raven manuals as well as software updates for Raven consoles are available at the Applied Technology Division web site:

<http://www.ravenprecision.com/Support/index2.jsp>

Sign up for e-mail alerts and we will notify you when updates for your Raven products are available on the Raven web site.

<http://www.ravenprecision.com>

Preparing for Installation

Before installing SmarTrax, park the machine where the ground is level, clean, and dry. Be sure to follow proper safety practices and procedures during the SmarTrax installation procedure. Bleed pressure from the hydraulic system and leave the machine turned off for the duration of the installation process. Carefully read and follow the instructions in this manual to properly complete the installation process.

Recommendations

Observe the following recommendations while installing the SmarTrax system:

- Use part numbers to identify parts.
- Do not remove the plastic wrapping from a part until it is necessary for installation.
- Do not remove plastic caps from a part until it is necessary for installation.

Tools Needed

Before beginning the installation process, it is a good idea to gather all the tools that you will need. These tools include the following items:

- Screwdrivers of various sizes
- SAE Standard-sized wrenches
- Allen wrenches
- Utility knife
- Drill
- Drill bits
- Side Cutters
- Pliers

Point of Reference

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

Hydraulic Fittings

The following fitting types may be referenced in this manual:

FIGURE 2. Hydraulic Fitting Types

JIC Fitting (M)



SAE O-Ring Fitting (M)



ORFS Fitting (M)



Kit Contents

This section contains a list of the kit contents that you should have received with this SmarTrax kit. Before you begin assembling the kit, compare the items in your SmarTrax kit with this list. If you have questions about your kit, contact your local Raven dealer or the Raven Customer Support Center.

In addition to the following kits, a SmarTrax Controller or Node kit is required to complete installation of the SmarTrax system. Contact your local Raven dealer for available kits and ordering information.

TABLE 1. Spra-Coupe 3000/4000 Series SmarTrax Installation Kit (P/N 117-0195-032)

Picture	Item Description	Part Number	Qty
Not pictures	Manual - SmarTrax Installation	016-0190-032	1
	Sensor - Yaw	063-0172-684	1
	Cable - SmarTrax Console Harness	115-0171-777	1
	Bracket - Counterbalance Valve Mounting	107-0171-801	1
	Bracket - Hydraulic Valve Mounting	116-0159-527	1

TABLE 1. Spra-Coupe 3000/4000 Series SmarTrax Installation Kit (P/N 117-0195-032)

Picture	Item Description	Part Number	Qty
	Valve - SmarTrax Hydraulic	334-0003-066	1
	Label - Tampering Warning	041-0159-689	1
	Manifold, Hydraulic Override	334-0003-024	1
	Valve, Hydraulic Motor Mount	334-0003-026	1
	Valve, Hydraulic Priority	334-0003-072	1
	Bolt - 5/16" Hex Head	311-0052-104	4
	Bolt - 1/4" Hex Head	311-0049-111	2
	Bolt - 3/8" Hex Head	311-0054-105	4
	Nut - 3/8" Hex	312-1001-037	4
	Nut - 1/4" -20 UNC Lock Nylon Insert	312-4000-057	2
	Washer - 3/8" Split Lock	313-1000-022	4

TABLE 1. Spra-Coupe 3000/4000 Series SmarTrax Installation Kit (P/N 117-0195-032)

Picture	Item Description	Part Number	Qty
	Washer - 3/8" Flat	313-2300-013	4
	Washer - 5/16" Split Lock	313-1000-019	4

TABLE 2. Spra-Coupe 3000/4000 Series SmarTrax Hydraulic Kit (P/N 117-0194-032)

Picture	Item Description	Part Number	Qty
	Fitting - 9/16" JIC (M/F) 45° Swivel Elbow	333-0012-027	6
	Fitting - 9/16" JIC (M/F) 90° Swivel Elbow	333-0012-042	8
	Fitting - 9/16" JIC (M/M/F) Swivel Run Tee Adapter	333-0012-043	4
	Fitting - 9/16" JIC (M) to 7/16" SAE O-Ring (M) Adapter	333-0012-050	2
	Fitting - 7/16" SAE O-Ring Plug	333-0012-051	1
	Fitting - 3/4" JIC (M/F) 90° Swivel Elbow	333-0012-064	2
	Fitting - 3/4" JIC (M) to 7/8" SAE O-Ring (M) Adapter	333-0012-056	1
	Fitting - 3/4" SAE O-Ring (M) to 9/16" JIC(F) Adapter	333-0012-140	1



TABLE 2. Spra-Coupe 3000/4000 Series SmarTrax Hydraulic Kit (P/N 117-0194-032)

Picture	Item Description	Part Number	Qty
	Fitting - 3/4" JIC (M) to 7/8" SAE O-Ring (M) 90° Elbow	333-0012-263	1
	Hose - 9/16" JIC (F) 90° to 3/4" JIC (F), 84"	214-1000-126	1
	Hose - 9/16" JIC (F) to 9/16" JIC (F), 20"	214-1000-127	5
	Hose - 9/16" JIC (F) to 9/16" JIC (F), 48"	214-1000-128	1
	Hose - 3/4" JIC (F) to 9/16" JIC (F), 60"	214-1000-129	1
	Hose - 9/16" JIC (F) to 9/16" JIC (F), 18"	214-1000-259	2

CHAPTER

3

Mounting the SmarTrax Hydraulic Valve and Counterbalance Valve

Mount the SmarTrax Hydraulic Valve



NOTICE

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.

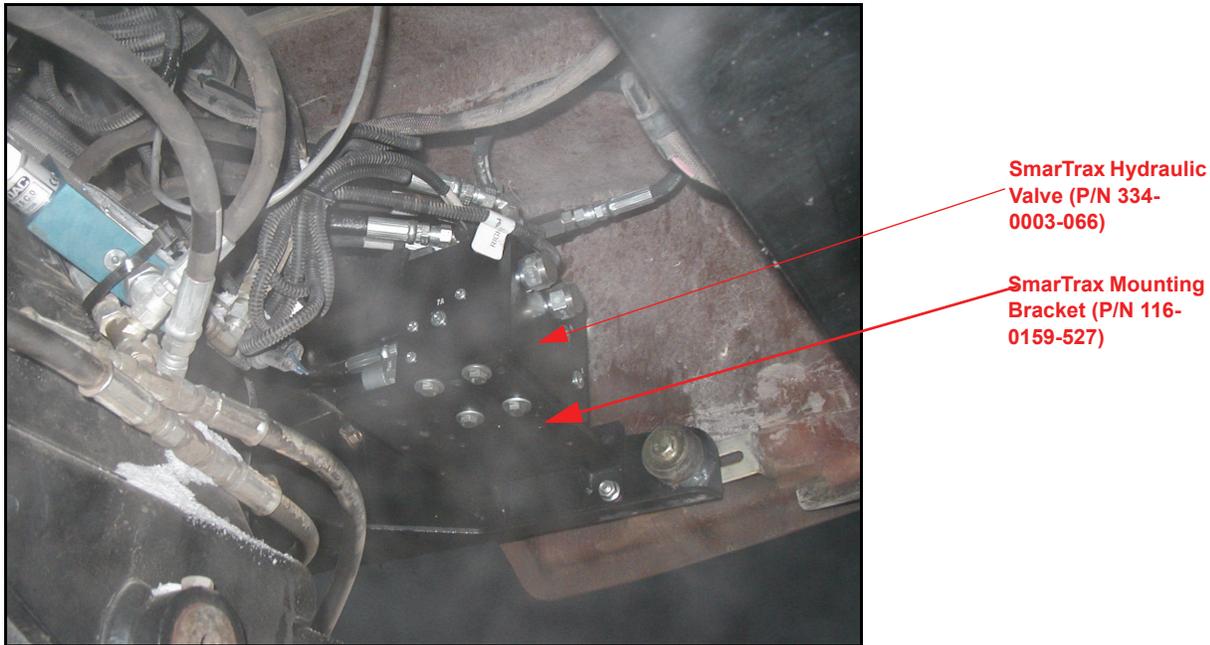
1. Mount the valve mounting bracket (P/N 116-0171-527) to the hood support on the left side of the machine using the supplied bolts (P/N 311-0054-105), lock washers (P/N 313-1000-022), nuts (P/N 312-1001-037) and flat washers (P/N 313-2300-013).

FIGURE 1. SmarTrax Valve Mounting Location



2. Mount the SmarTrax hydraulic valve (P/N 334-0003-066) to the mounting bracket (P/N 116-0159-527) using the supplied bolts (P/N 311-0052-104) and lock washers (P/N 313-1000-019).

FIGURE 2. SmarTrax Valve Mounting Location



Mount the Counterbalance Valve

FIGURE 3. Counterbalance Valve



1. Remove the fitting from the brake port on the Pilot Operated Check (POC) valve (P/N 334-0003-026) and install the supplied plug (P/N 333-0012-051).
2. Mount the POC valve to the hood hinge mounting bolts on the right side of the machine, above the front axle, using the supplied bracket (P/N 107-0171-801), bolts (P/N 311-0049-111) and nuts (P/N 312-4000-057).

Affixing the SmarTrax Tampering Warning Label

Raven Industries supplies a tampering warning label (P/N 041-0159-689) with all SmarTrax kits. This label should be applied on or near the SmarTrax hydraulic valve or mounting bracket and in a location where anyone working on the machine is able to clearly see and read the label.

1. Thoroughly clean and dry the surface to which the label will be affixed.
2. Remove the protective backing from the tampering warning label (P/N 041-0159-689).
3. Carefully apply the label to the cleaned area and rub with a dry cloth to ensure the label is firmly applied.



CHAPTER

4

***Hydraulic
Connections***



⚠ WARNING

Hydraulics may be under pressure. Never attempt to open or work on a hydraulic system with the equipment running. Care should always be taken when working on a system that has previously been pressurized. When disconnecting or purging hydraulic connections, be aware that hydraulic oil within the system may be extremely hot and under high pressure.



⚠ CAUTION

Ensure 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 adversely reduce performance and possibly damage the SmarTrax hydraulic valves.



⚠ CAUTION

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

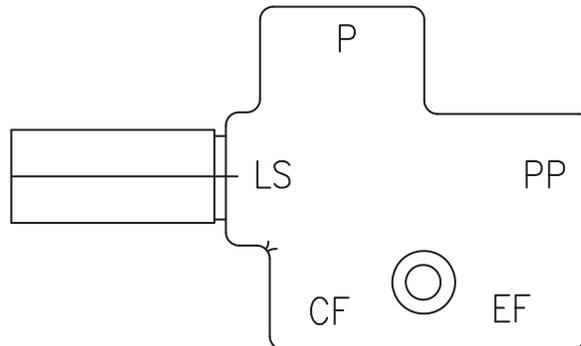


NOTICE

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.

Populating the Priority Valve

FIGURE 1. Priority Valve



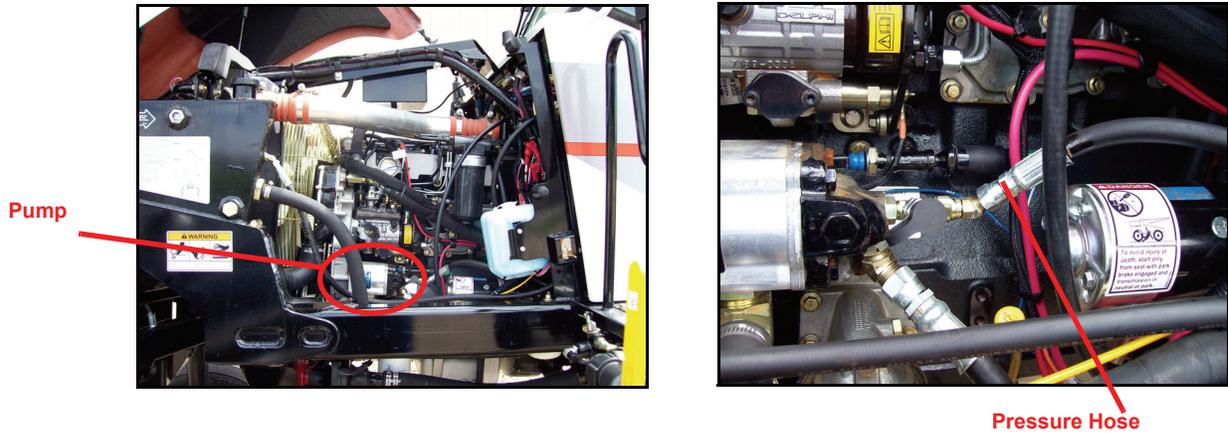
Refer to the following figure and table to install the fittings in the appropriate ports of the priority valve (P/N 334-0003-072).

Fitting	Part Number	Port
Fitting - 9/16" JIC (M) to 7/16" SAE O-Ring (M) Adapter	333-0012-050	LS
Fitting - 3/4" JIC (M) to 7/8" SAE O-Ring (M) Adapter	333-0012-056	EF
Fitting - 3/4" JIC M/F 90° Swivel Elbow	333-0012-064	EF (If Necessary)
Fitting - 3/4" JIC (M) to 7/8" SAE O-Ring (M) 90° Elbow	333-0012-263	P
Fitting - 3/4" SAE O-Ring (M) to 9/16" JIC(F) Adapter	333-0012-140	CF

Install the Pressure Hose

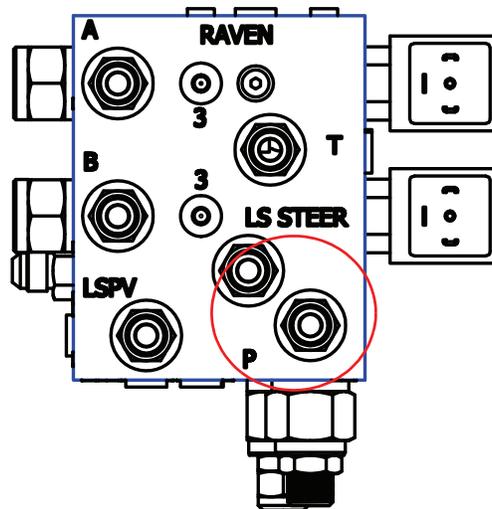
1. Locate the hydraulic pump on the left side of the engine and disconnect the pressure line from the pump.
2. Disconnect the other end of the pressure hose from the charge valve (some machines may not have a charge valve in which case the hose connects to the steering orbitrol).
3. Attach the supplied pressure hose (P/N 214-1000-126) to the hydraulic pump.
4. Route the hose back up and over the top of the radiator to the priority valve and attach to the 'P' Port.

FIGURE 2. Pressure Connection



5. Attach the priority valve directly to the SmarTrax hydraulic valve by connecting the priority valve 'CF' Port to Port 'P' of the SmarTrax hydraulic valve.

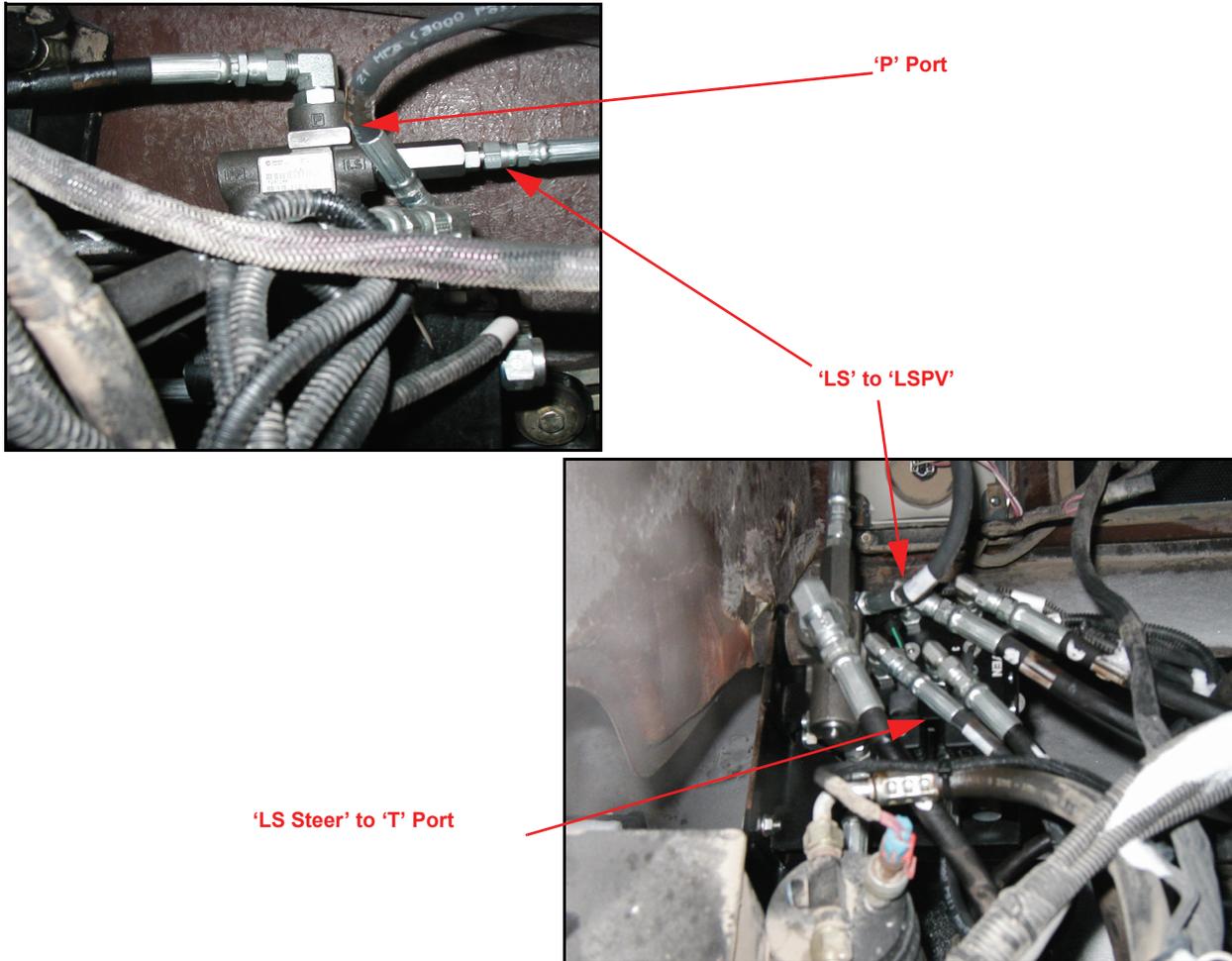
FIGURE 3. SmarTrax Hydraulic Valve



Install the LS-Steer and LS-PV Hoses

1. Connect the supplied hydraulic hose (P/N 214-1000-127) to 'LS' Port of the priority valve and to the 'LSPV' Port on the SmarTrax hydraulic valve.

FIGURE 4. Load Sense Connection



2. Install a tee fitting (P/N 333-0012-050) on the 'T' Port of the SmarTrax hydraulic valve.
3. Connect the other supplied hydraulic hose (P/N 214-1000-127) from the 'LS Steer' Port to the installed tee fitting on the 'T' Port.

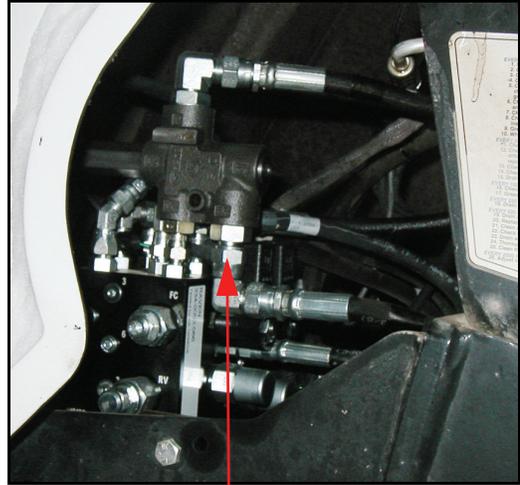
Install the Excess Flow Hose

1. Connect the supplied hose (P/N 214-1000-129) to the 'EF' Port on the priority valve and to the charge valve where the original pressure hose was disconnected.

FIGURE 5. Excess Flow Line



Charge Valve
Connection

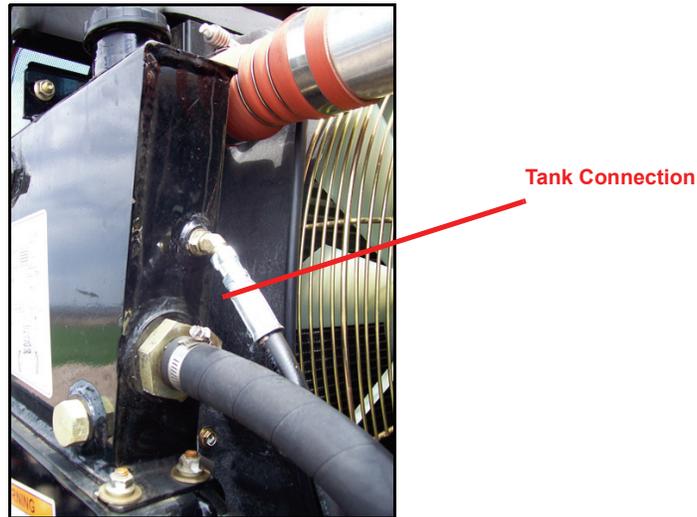


'EF' Port

Install the Tank Hose

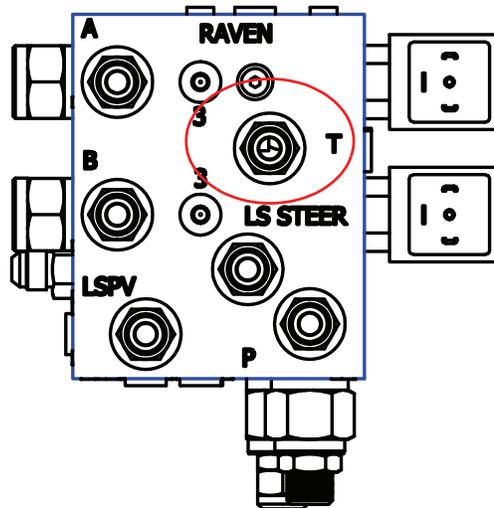
1. Locate and disconnect the existing 3/8" tank hose on the rear of the hydraulic reservoir.
2. Install the supplied run tee fitting (P/N 333-0012-043) and reconnect the original tank hose to the fitting.
3. Connect a 9/16" JIC (M/F) 45° swivel elbow (P/N 333-0012-027) to the remaining branch of the run tee.

FIGURE 6. Tank Connection.



4. Connect the supplied tank hose (P/N 214-1000-128) to the swivel elbow.
5. Route the other end of the hose to Port 'T' of the SmarTrax hydraulic valve.

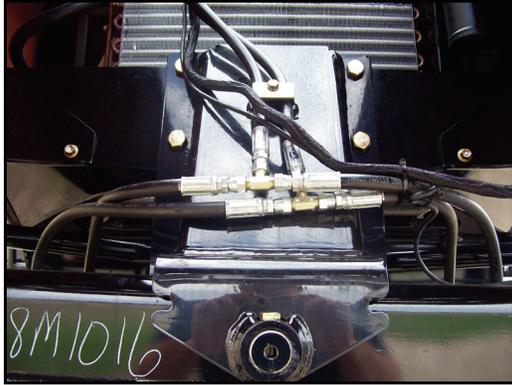
FIGURE 7. SmarTrax Hydraulic Valve



Install the Left and Right Steer Hose

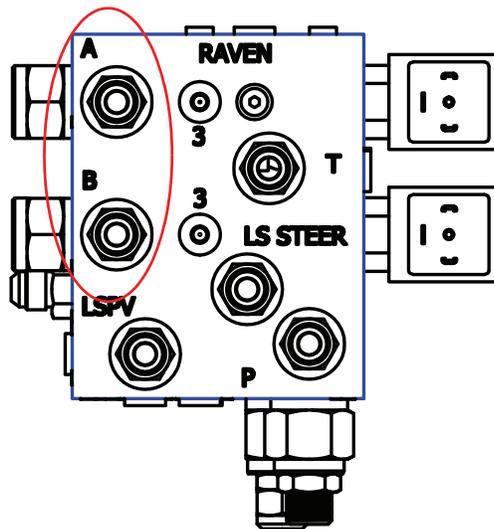
1. Disconnect the right and left steering hoses that run over the top of the engine down to the tees above the front axle (shown in figure below).

FIGURE 8. Left and Right Steer Connections



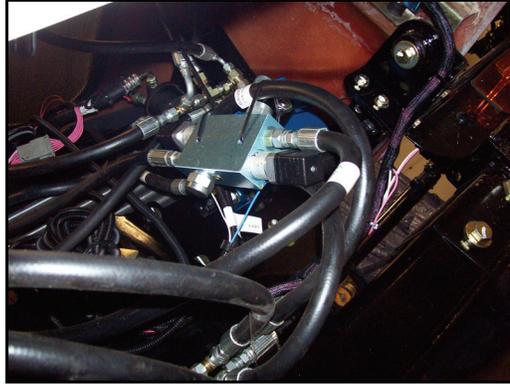
2. Connect an additional tee (P/N 333-0012-043) to the existing tees. Do not reconnect the original left and right hoses.
3. Connect the supplied hydraulic hoses (P/N 214-1000-127) to the tee fittings
4. Route the hoses to the SmarTrax hydraulic valve. Connect the supplied left steer hose to Port 'A' and the supplied right steer hose to Port 'B'.

FIGURE 9. SmarTrax Hydraulic Valve



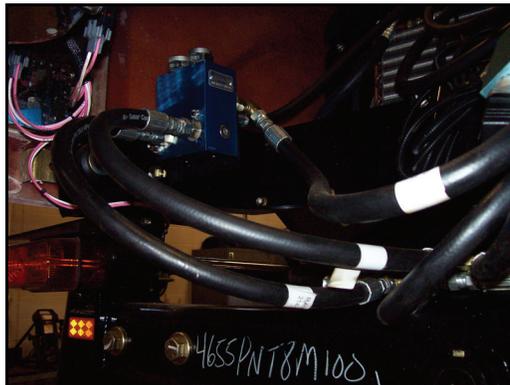
5. Attach the original left steer hose to the 'A' port on the Pilot Operated Check (POC) valve.
6. Attach the original right steer hose to the 'B' Port on the flow switch.
7. Connect the supplied hose (P/N 214-1000-127) to the 'A' Port on the flow switch (P/N 334-0003-024) and the 'B' Port on the POC valve.

FIGURE 10. Pilot Operated Check Valve Connection



8. Attach the supplied hose (P/N 214-1000-127) to the port opposite the 'A' port on the POC valve and to the remaining branch of the left steer hose tee. Repeat for 'B' Port and the right steer connection.

FIGURE 11. CB Valve Connection



Spra-Coupe Tow Bypass Valve Installation (Optional Kit Sold Separately) (P/N 117-0198-001)

Steering bypass valve is installed in the steering lines as shown in the figure shown below.

1. Thread the 9/16" JIC to 3/4" O-ring (M) and straight fittings into the valve.
2. Attach the provided run tees to the outer end of the original steering line tees; one on the left steer and one on the right steer. The original lines are then reconnected.
3. Using the 90° JIC elbow, the valve assembly is then attached to the previously installed tees.

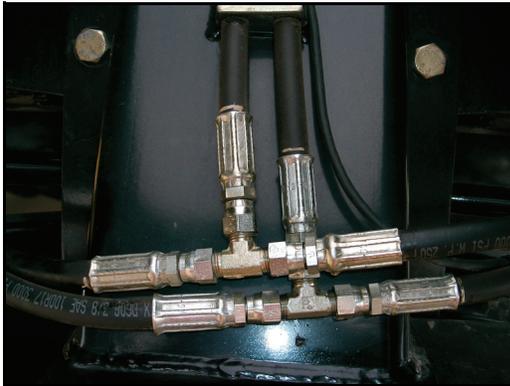
Note: *It may be necessary to loosen the clamp located directly above the tees to allow the hoses to move into the desired position.*

4. Tighten all fittings.

Operation

1. When the valve is in the open or ON position, steering is in tow bypass mode.
2. When valve is in closed or OFF position, steering is in standard operation mode.

FIGURE 12. Steering Bypass Valve



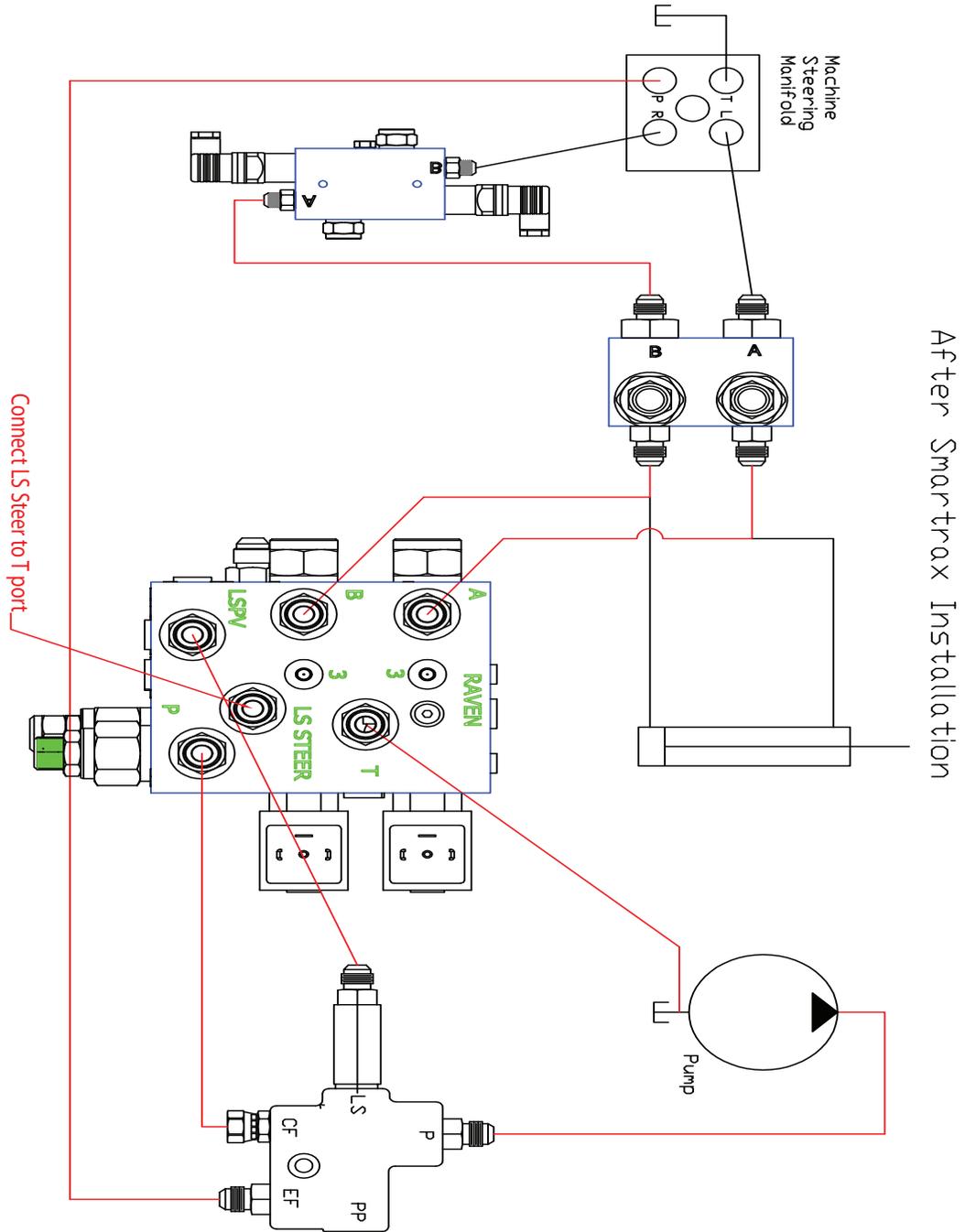
Before Installation



After Installation

4

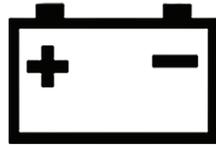
Hydraulic Connection Diagram



CHAPTER

5

Wiring and Electrical Connections



⚠ CAUTION

Ensure that the power cable is the last cable connected.
Do not reverse the power leads. Doing so will cause severe damage to the equipment.
Ensure the leads are connected to the correct polarity.

Connecting the SmarTrax Hydraulic Valve

1. Place a solenoid gasket (included in the packet with the console cable harness) on the solenoid installed in port '1A' on the SmarTrax hydraulic valve (P/N 334-0003-066).
2. Locate the connector labeled 'LEFT' on the SmarTrax console cable harness (P/N 115-0171-777).
3. Insert the connector labeled 'LEFT' to the solenoid installed in port '1A' on the SmarTrax hydraulic valve.
4. Tighten the bolt on the solenoid connector to secure the connection and to help prevent moisture penetration.
5. Repeat step 1 through step 4 to connect the 'RIGHT' connector to the solenoid on port '1B'.

Connecting the Pressure Override Switch

1. On the console cable harness (P/N 115-0171-777), identify the connector labeled 'OVERRIDE'.
2. Connect the 'OVERRIDE' connector to the pressure override switch.
3. Tighten the bolt on the connector to secure the connection and to help prevent moisture penetration.

Route the Console Cable Harness

Once the SmarTrax hydraulic valve and pressure override switch are connected to the console cable harness, the remaining connectors must be routed into the cab.

1. Locate an access point through which the console cable harness (P/N 115-0171-777) may be routed into the cab.
2. Route the cable to the access point and use the provided cable ties to secure the cable to avoid catching or damaging the cable during normal equipment operation.

Note: *When routing the SmarTrax console cable harness, follow the path of other hoses or cables to avoid potential wear areas.*

3. Feed enough of the cable into the cab to allow each cab control component to be connected.
4. Spool and secure any excess cable.

Install the Foot Switch

1. Select a location for the SmarTrax foot switch (P/N 063-0172-470) within easy reach of the operator to fully press the front of the pedal.
2. Use the SmarTrax foot switch as a template and pre-drill holes in the floor.
3. Secure the foot switch to the floor with four screws or bolts through each of the mounting holes.
4. Locate the connector labeled 'ENABLE' on the SmarTrax console cable harness (P/N 115-0171-777) and connect it to the foot switch cable.

FIGURE 1. Foot Switch Mounting Example



Mount the SmarTrax Controller

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

- The controller is not weatherproof. Mount the controller in the vehicle's cab within easy reach of the operator.
- Mount the controller in a location where it will not impede the operator's ability to control the vehicle and where other components within the cab will not strike or jar the controller during normal operation.
- Ensure that all cabling is routed to avoid tripping hazards and prevent crimping or breaking the cables during normal operation.

To Install the SmarTrax Controller

1. Select the preferred location for the controller using the previous recommendations and mount the controller.
2. Connect the large, round connector on the SmarTrax console cable harness (P/N 115-0171-777) to the back of the controller box.
3. Connect your receiver or source of DGPS to the connector labeled 'DGPS.'
4. Connect the console or lightbar providing machine guidance to the connector labeled 'LIGHTBAR.'
5. Insert the power cable (P/N 115-0171-465) to the Power connector on the controller box.
6. Route the power leads to the vehicle's battery and connect.
 - a. Connect the red power lead on the positive battery terminal.
 - b. Connect the black power lead on the negative battery terminal.



Install the Yaw Sensor

When choosing the location for the yaw sensor, consider the following points:

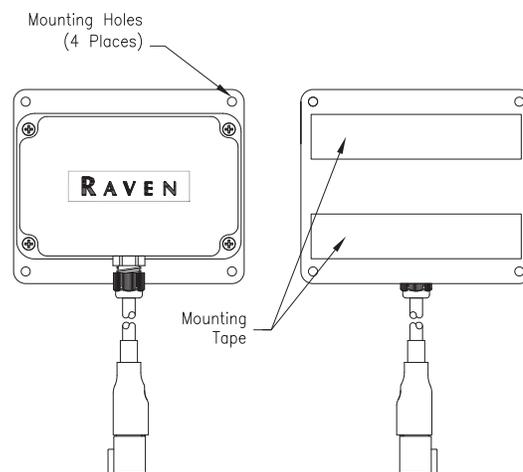
- The yaw sensor is not weatherproof. Mount the sensor inside the cab.
- Mount the yaw sensor in a location away from foot traffic.
- Mount the yaw sensor to a flat, level surface. The floor of the cab is generally ideal.
- Mount the yaw sensor so that the Raven logo faces up.
- The SmarTrax yaw sensor does not need to be oriented toward the direction of vehicle travel.

Note: *If you are going to use the double-sided tape to mount the SmarTrax yaw sensor, be sure to thoroughly clean and dry the mounting location first.*

To Install the Yaw Sensor

1. Select the preferred location for the SmarTrax yaw sensor (P/N 063-0172-684). See the recommendations for choosing a mounting location above.
2. Mount the yaw sensor using one of the following methods:
 - Remove the protective covering from the double-sided tape and affix the yaw sensor to the floor.
 - Using the yaw sensor as a template, mark and pre-drill holes in the floor. Using bolts or screws (not supplied), secure the yaw sensor in position.
3. Locate the connector labeled 'YAW SENSOR' on the SmarTrax console cable harness (P/N 115-0171-777).
4. Insert this connector to the yaw sensor cable connection.

FIGURE 2. Yaw sensor Model

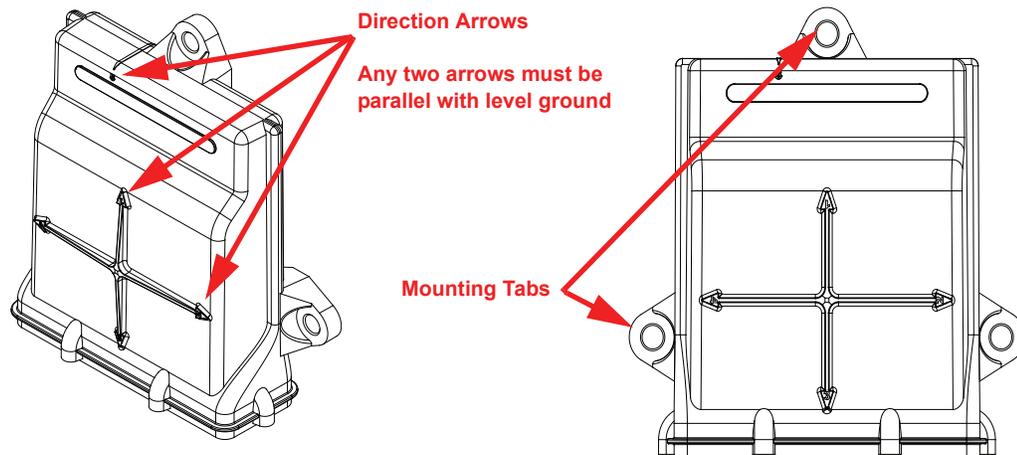


Installing the SmarTrax Node

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

- The node is not weatherproof. Mount the SmarTrax node inside the machine's cab or driver's compartment.
- The node mounting location must not create tripping hazards and allow cable routing to avoid crimping or damaging the cables or the node connections.
- Mount the SmarTrax node to a flat surface with two of the arrows on the node parallel to the ground and in a location where it will not be kicked or jarred during normal equipment operation.
- One of the six numbered direction arrows on the node must be oriented in the direction of forward vehicle travel. Note the number of the arrow corresponding to forward travel for SmarTrax calibration. One arrow must also point straight up.
- Mount the node to a flat, level surface. The floor of the cab is generally ideal.
- 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.

FIGURE 3. Node Mounting



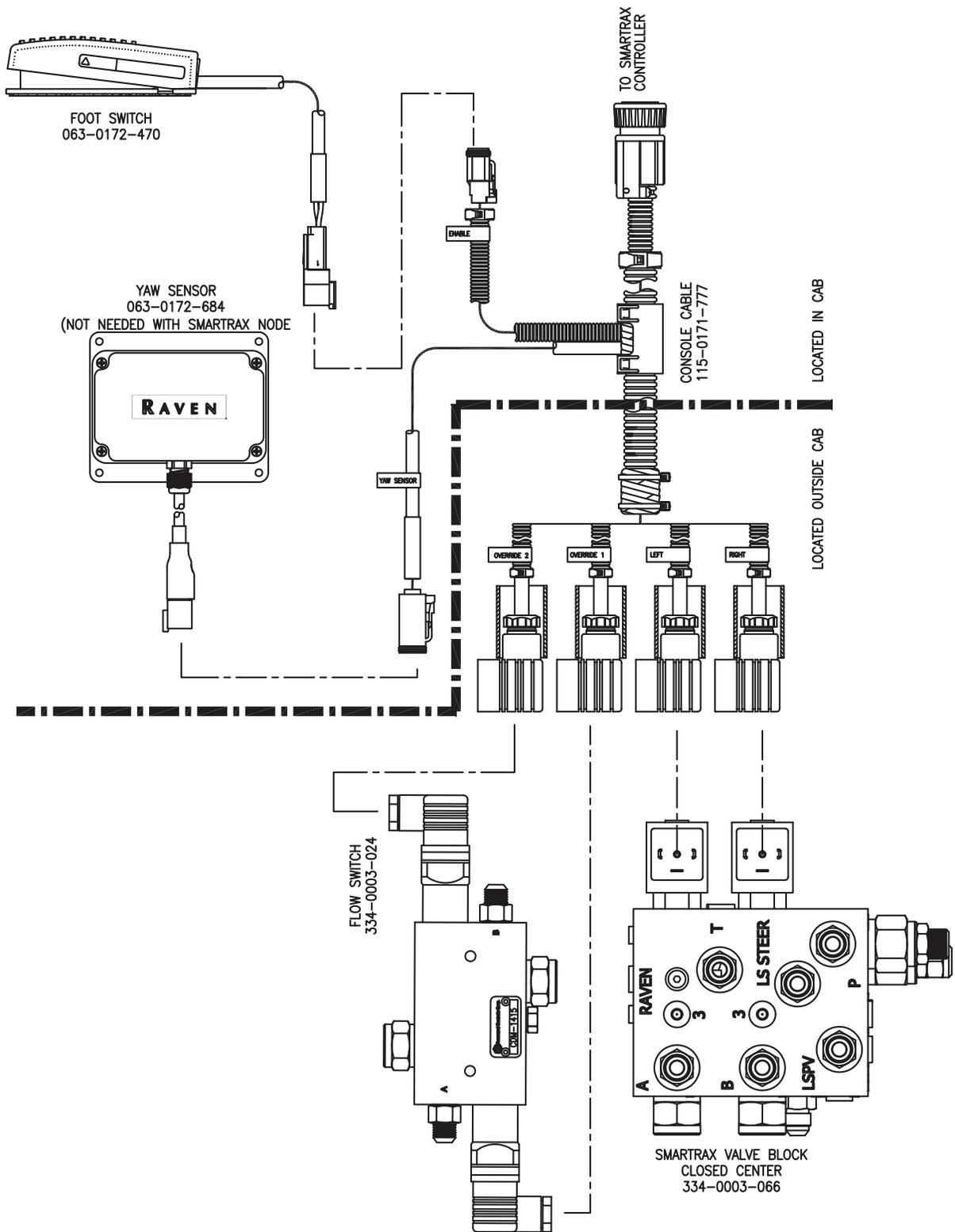
To Install the Node

1. Select the preferred location for the node. See the recommendations for choosing a mounting location above.
2. Using the mounting tabs on the node as a template, mark and pre-drill holes. Using bolts or screws (not supplied), secure the node in position.
3. Connect the large, round connectors on the node adapter cable (P/N 115-4001-007) for Viper Pro/Envizio Pro or (P/N 115-4001-018) for Cruiser to the SmarTrax console cable harness (P/N 115-0171-777).
4. Connect the large, rectangular connectors to the SmarTrax node.
5. Connect your receiver or source of DGPS to the connector labeled 'DGPS' on the node adapter cable.
6. Connect the console providing machine guidance to the remaining small, round connector.
7. Connect the 4-pin deutsch plug to the vehicle's CANbus system (Viper Pro/ Envizio Pro) or the DB-9 display cable (Cruizer).
8. Electrical hookup is recommended as shown in the *Can Node Wiring Diagram on page 32*.

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 the guidance console.*



FIGURE 4. Cable Harness Installation Schematic



CHAPTER

6

Start-Up Procedures



! WARNING

When starting the machine for the first time, keep the area around the machine clear of people or bystanders in case a fitting or hose has not been fully tightened.



! WARNING

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

Always wear appropriate protective equipment when working with the hydraulic system.

Remove Air from the Hydraulic System

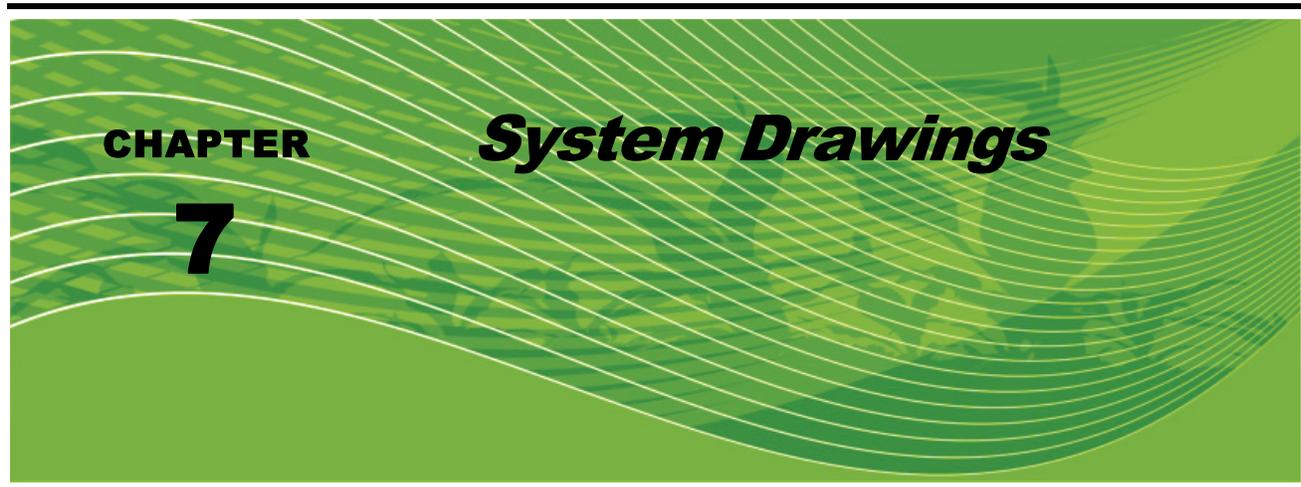
Anytime a hydraulic system is purged for maintenance, or during the SmarTrax system installation, air is introduced into the hydraulic lines. Anytime the system is purged or fittings are loosened or disconnected, it is important to remove air pockets from the hydraulic system to avoid unwanted operation of the hydraulic system.

To remove air from the hydraulic system, turn the wheels fully from side to side repeatedly. If air pockets are present, the wheels may not move consistently while the steering wheel is operated. Continue turning the wheels until the wheels move steadily and smoothly with the steering wheel.

Verify the SmarTrax Installation

1. Turn on the machine.
2. With the machine running, double-check all fitting and hose connections to ensure that:
 - Hoses are not rubbing or interfering with other moving parts.
 - Hydraulic fluid is not leaking.
3. If there are any problems, shutdown the machine and correct problems immediately.

If you need additional assistance, contact your local Raven dealer or the Raven Customer Support Center at 1-800-243-5435.

The header graphic features a green background with white wavy lines and a faint gear icon. The text 'CHAPTER 7' is on the left and 'System Drawings' is on the right.

CHAPTER 7

System Drawings

The following diagrams may be helpful for installing or troubleshooting the SmarTrax system. The following diagrams may show optional features or components not required for operation and will not apply to your system if the required hardware has not been installed.

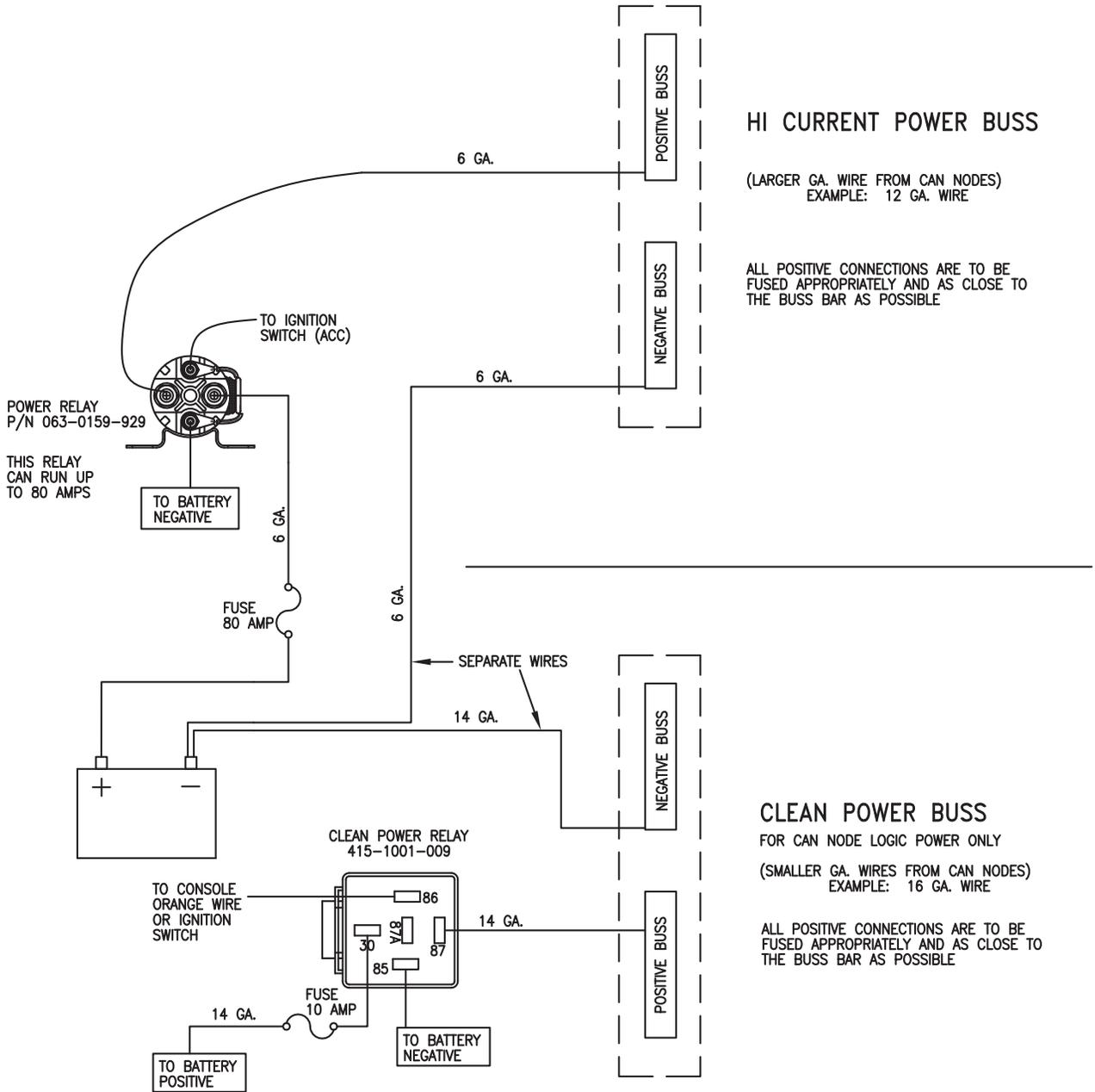
Contact your local dealer for purchasing or more information on components shown in the following diagrams.

Additional system diagrams are available from the Raven Industries web site:

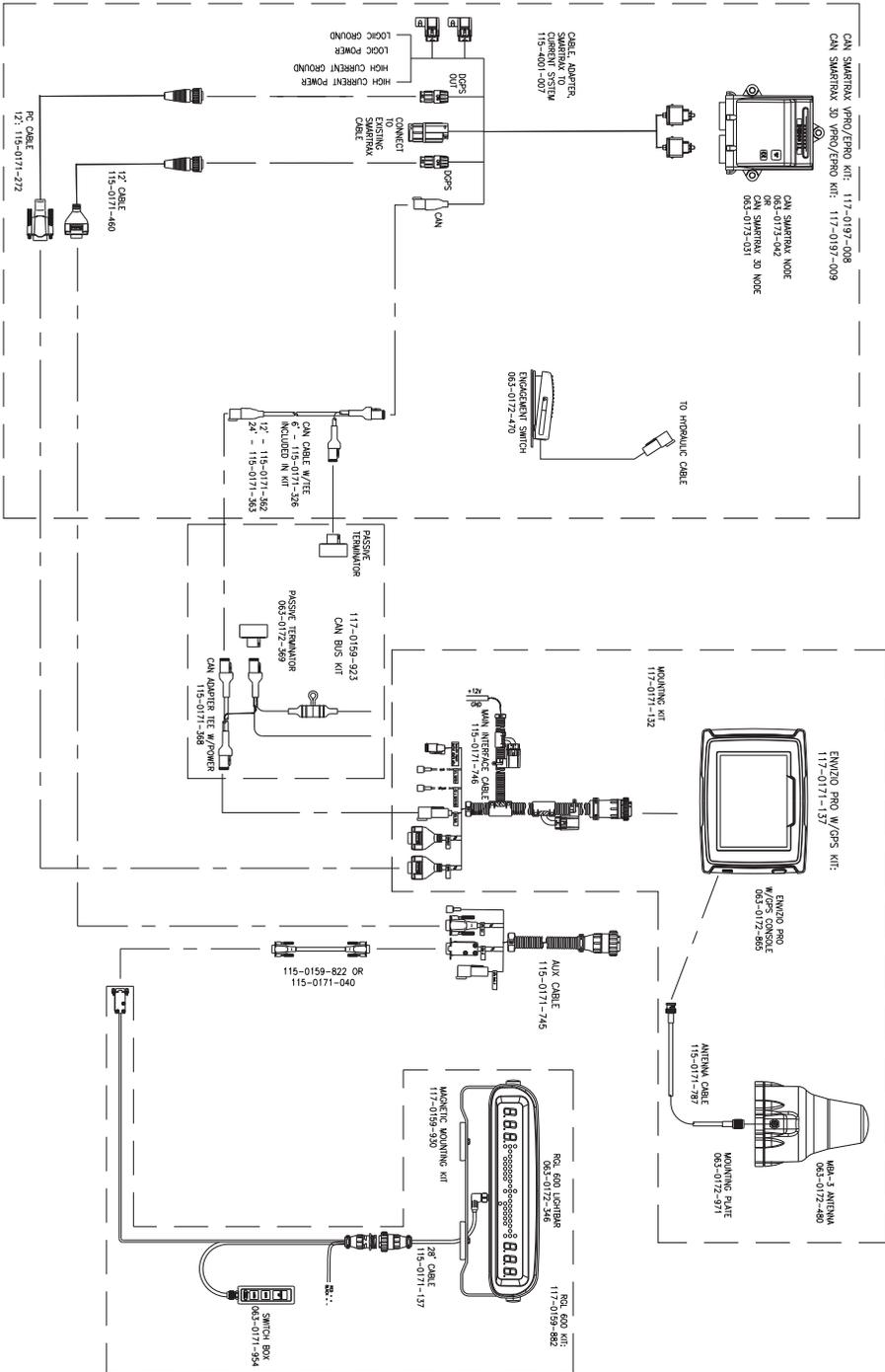
<http://www.ravenprecision.com/Support/ApplicationDrawings/index2.jsp>

Can Node Wiring Diagram

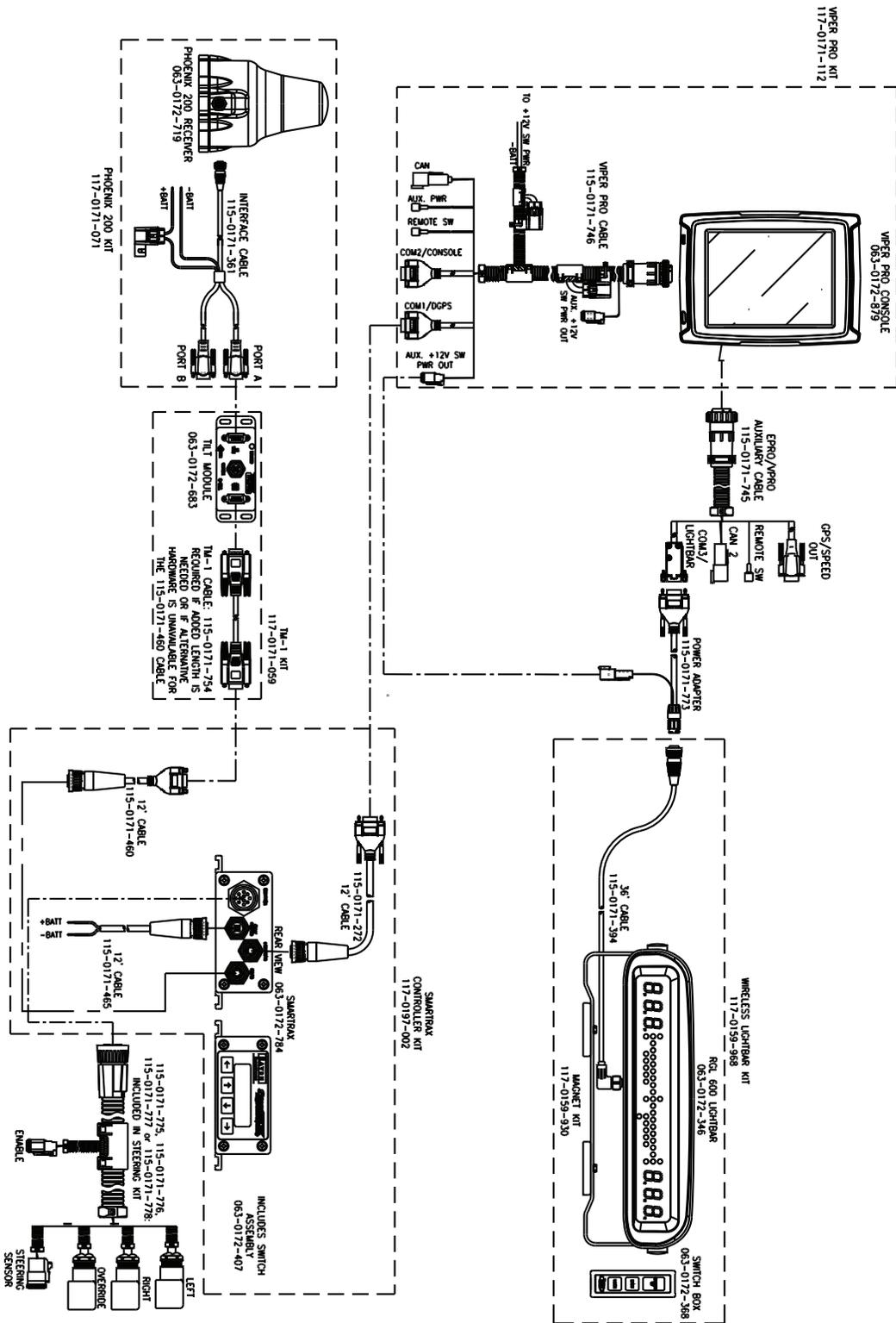
CAN NODE WIRING



ENVIZIO PRO W/GPS/RGL 600 CAN SMARTRAX/SMARTRAX 3D

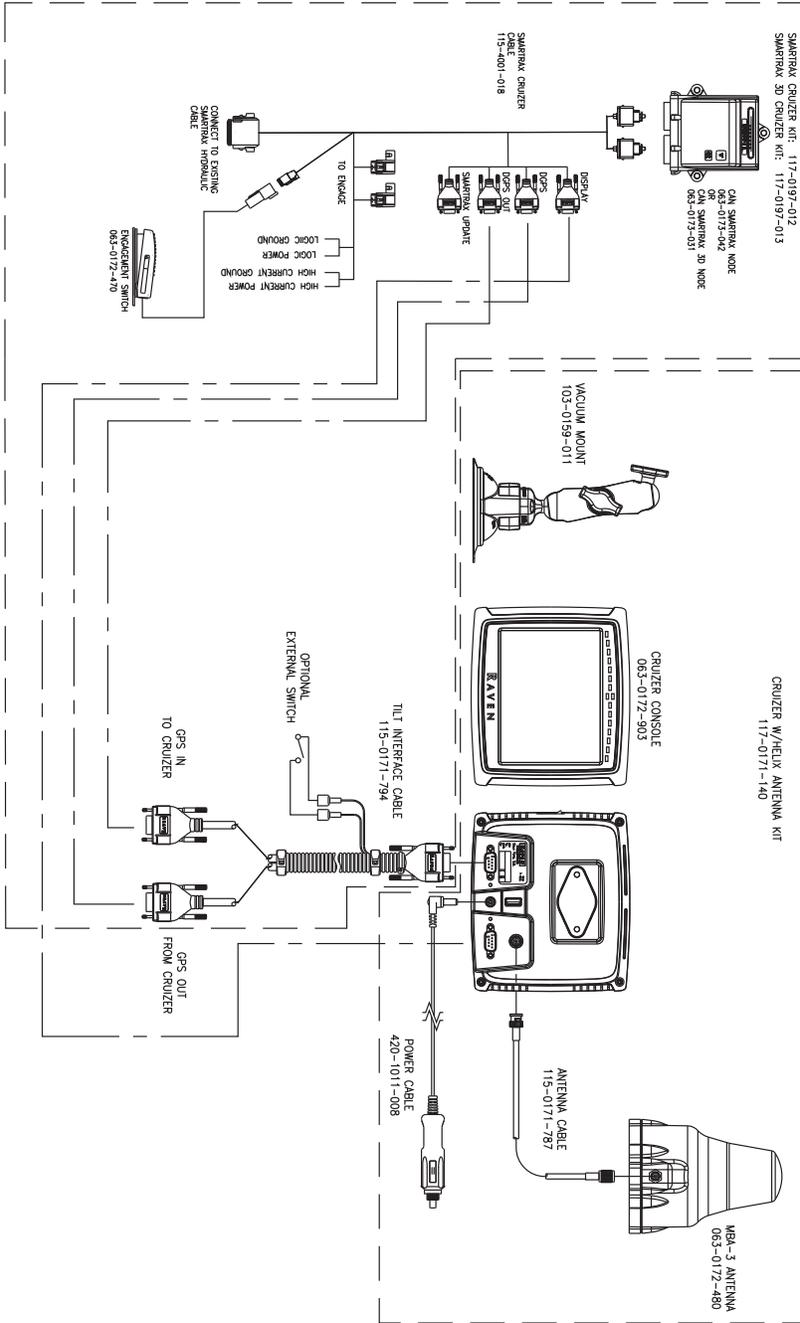


VIPER PRO WITH GPS, SMARTRAX, TM-1 AND EXTERNAL LIGHTBAR



Cruizer

CRUIZER WITH HELIX ANTENNA, SMARTRAX/SMARTRAX 3D



A

Affixing the SmarTrax Tampering Warning Label 10

C

CAN Node Wiring Diagram 27
Console Cable Harness Routing 24

E

Excess Flow Hose- Installation 17

H

Hydraulic Connection Diagram 22
Hydraulic Connections 13

I**Installation**

Foot Switch 24
Recommendations
 SmarTrax Controller 25, 27
 Yaw Sensor 26
Yaw Sensor 26

K

Kit Contents 5

L

Left and Right Steer Hose- Installation 19
Left Steer Hose- Installation 19

M

Mount the SmarTrax Hydraulic Valve 9

P

Preparing for Installation 4
 Point of Reference 4
 Recommendations 4
 Tools Needed 4
Pressure Hose- Installation 15
Priority Valve 14
Priority Valve- Populating 14

S

Safety Information 1
 Electrical Safety 2
 Hydraulic Safety 2
Spra-Coupe Tow Bypass Valve- Installation 21
Start-Up Procedures
 Verify the SmarTrax Installation 30
System Drawings 31

T

Tank Hose- Installation 18

W

Wiring & Electrical Connections
 Pressure Override Switch 23
 SmarTrax Hydraulic Valve 23
Wiring and Electrical Connections 23

RAVEN

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Limited Warranty

What Does this Warranty Cover?

This warranty covers all defects in workmanship or materials in your Raven Applied Technology Product under normal use, maintenance, and service.

How Long is the Coverage Period?

Raven Applied Technology 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.