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SmarTrax™ Installation Manual



Buhler/Versatile Row Crop R2 Series

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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: Buhler/Versatile Row Crop R2 Series 250-305

Year:

Serial Number:

FIGURE 1. Versatile 280



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



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. Buhler/Versatile Row Crop R2 Series SmarTrax Installation Kit (P/N 117-0295-099)

Picture	Item Description	Part Number	Qty
Not pictures	Manual - SmarTrax Installation	016-0190-099	1
	Cable - SmarTrax Console Harness	115-0171-775	1
	Switch - SmarTrax Pressure	422-0000-065	1
	Valve - SmarTrax Hydraulic	334-0003-087	1
	Bolt - 5/16" Hex Head	311-0052-104	4

TABLE 1. Buhler/Versatile Row Crop R2 Series SmarTrax Installation Kit (P/N 117-0295-099)

Picture	Item Description	Part Number	Qty
	Bolt - 3/8" Hex Head	311-0054-108	3
	Nut - 3/8" Nylock	312-4000-061	3
	Washer - 5/16" Flat	313-2300-012	4
	Washer - 5/16" Split Lock	313-1000-019	4
	Washer - 3/8" Flat	313-2300-043	6

TABLE 2. Buhler/Versatile Row Crop R2 SmarTrax Hydraulic Kit (P/N 117-0194-099)

Picture	Item Description	Part Number	Qty
	Fitting - 13/16" ORFS (M/M/F) Swivel Run Tee	333-0012-028	4
	Fitting - 11/16" ORFS (M/F) 90° Swivel Elbow	333-0012-065	1
	Fitting - 11/16" ORFS (M) to 11/16" ORFS (F) 45° Swivel Elbow	333-0012-090	1
	Fitting - 11/16" ORFS (M) to 9/16" SAE O-RING (M) Straight Adapter	333-0012-084	6
	Fitting - 11/16" ORFS (M) to 7/16" SAE O-RING (M) Straight Adapter	333-0012-114	1
	Fitting - 11/16" ORFS (M) to 1/4" NPT (M) Straight Adapter	333-0012-293	1
	Hose - 11/16" ORFS (F) to 13/16" ORFS (F), 90°	214-1000-630	2
	Hose - 11/16" ORFS (F) to 11/16" ORFS (F) 90°, 76"	214-1000-628	1
	Hose - 11/16" ORFS (F) to 11/16" ORFS (F) 90°, 84"	214-1000-629	1
	Hose - 11/16" ORFS (F) 90° to 13/16" ORFS (F), 90°	214-1000-631	2

CHAPTER

3

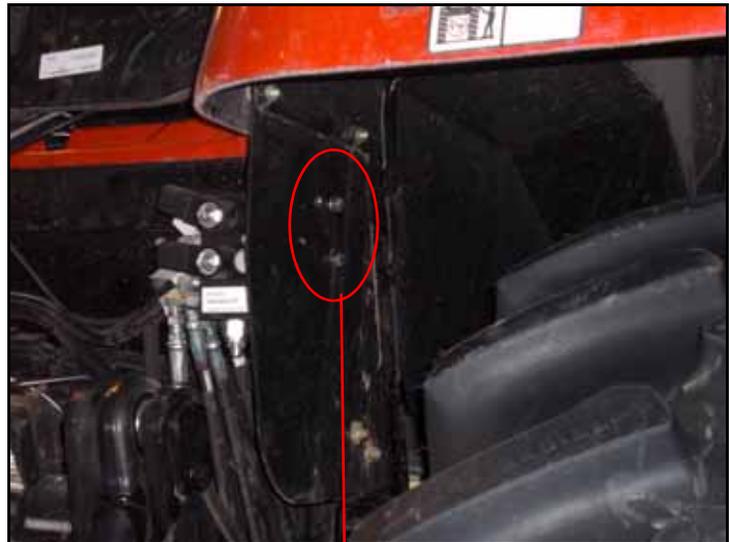
*Mounting the
SmarTrax Hydraulic
Valve*

Mount the SmarTrax Hydraulic Valve

FIGURE 1. Valve Mounting Location



Valve Mounting Location



Mounting Hole

1. Before mounting the SmarTrax hydraulic valve, install the supplied fittings (P/N 333-0012-084) to Ports P, T, A, B, LS-PV and LS-Steer and install the pressure switch directly to the 'PS' Port using the supplied fittings (P/N 333-0012-065) and (P/N 333-0012-293).

2. Mount the valve to the inside of the right fender by drilling a minimum of two holes using the supplied bolts (P/N 311-0054-104), flat washers (P/N 313-2300-012), split washers (P/N 333-1000-019).

FIGURE 2. SmarTrax Valve Mounted



**SmarTrax Valve
(P/N 334-0003-087)**

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.



⚠ WARNING

Tampering with hydraulic valves may cause serious injuries or death and will void warranty.



⚠ 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.

Install the Left and Right Steer Hose

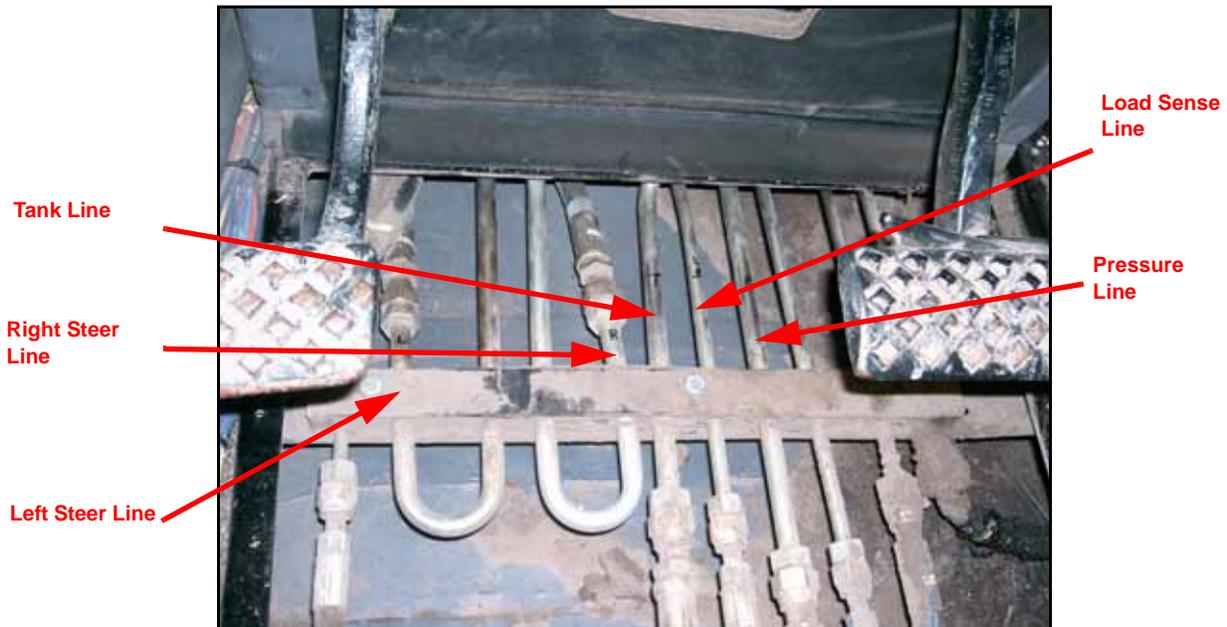
1. Remove the floor mat and the cover plate to gain access to the steering lines.

FIGURE 1. Access Point



2. Identify the hydraulic lines (shown in the picture below) needed for installation.

FIGURE 2. Steering Orbitrol Lines Under Floor Plate



3. Disconnect the existing left steer hose from the port on the steering orbitrol.

FIGURE 3. Left and Right Steer Connections

4. Install the supplied run tee fitting (P/N 333-0012-028) and reconnect the original left steer hose to the fitting.
5. Connect the supplied hose (P/N 214-1000-631) to the tee fitting.

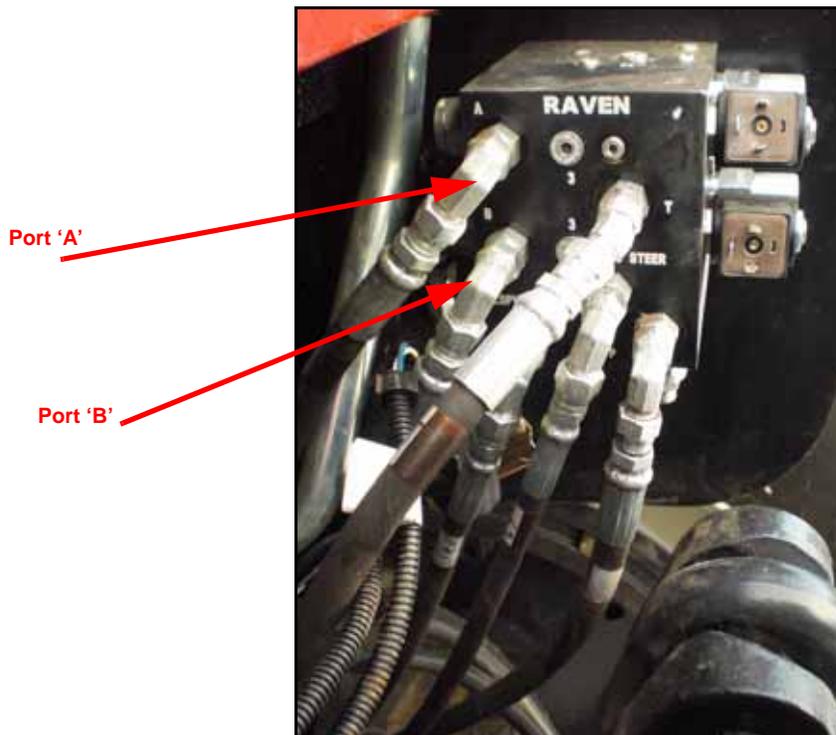
- Route all hydraulic hoses under the floor and along the inside of the right rear cab mount.

FIGURE 4. Hose Routing Example



- Route the other end of the hose to Port 'A' of the SmarTrax hydraulic valve.
- Repeat the procedure for the right steer line and connect the other supplied hose (P/N 214-1000-631) to Port 'B' on the SmarTrax hydraulic valve.

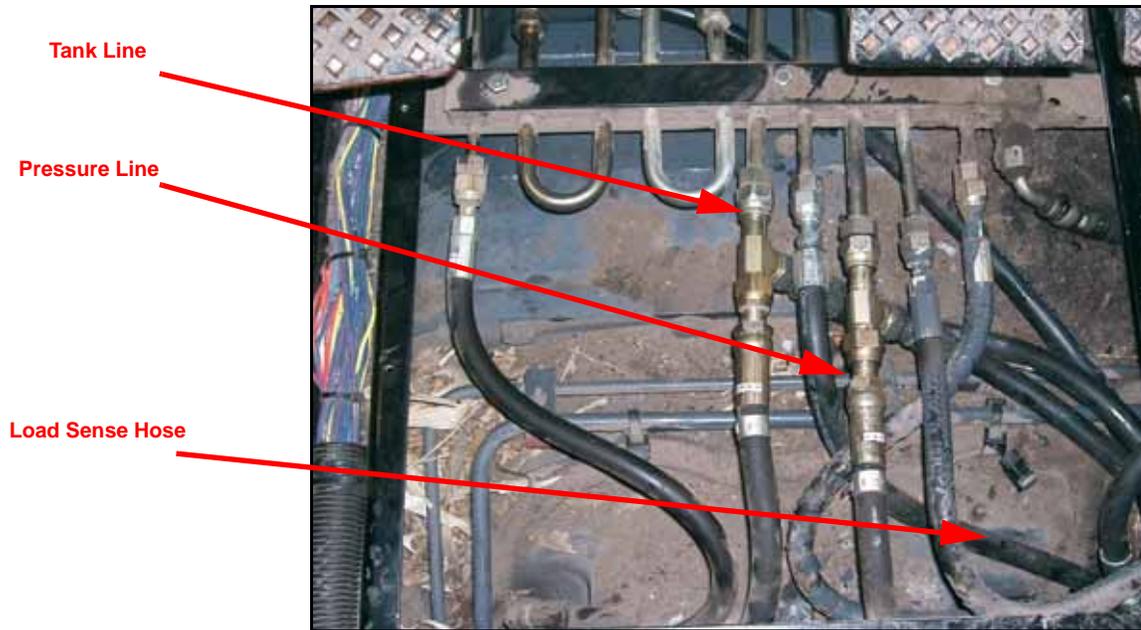
FIGURE 5. Left and Right Steer Hoses Connected to SmarTrax Hydraulic Valve



Install the Pressure Hose

1. Disconnect the existing pressure hose from the steering orbitrol.
2. Install the supplied run tee fitting (P/N 333-0012-028) and reconnect the original pressure hose to the straight portion of the fitting.
3. Connect the supplied hose (P/N 214-1000-630) to the tee fitting.

FIGURE 6. Pressure and Tank Connections



4. Route the other end of the hose to Port 'P' of the SmarTrax hydraulic valve using a the supplied 90° elbow (P/N 333-012-065) if necessary.

Install the Tank Hose

1. Disconnect the existing tank hose from the steering orbitrol.
2. Install the supplied run tee fitting (P/N 333-0012-028) and reconnect the original hose to the straight portion of the fitting.
3. Connect the supplied hose (P/N 214-1000-630) to the fitting.
4. Route the other end of the hose to Port 'T' of the SmarTrax hydraulic valve using supplied 45° elbow (P/N 333-0012-090) if necessary.

Install the LS-Steer and LS-PV Hoses

5. Begin by disconnecting the original load sense hose from the steering orbitrol and priority valve. Discard hose.
6. Connect the supplied hose (P/N 214-1000-629) to the steel line from the orbitrol.
7. Route the other end of the hose to the 'LS-Steer' Port on the SmarTrax hydraulic valve.
8. Connect the supplied hose (P/N 214-1001-628) to the steel vertical load sense line from which the existing short load sense hose was removed in step 5.
9. Route the hose to the to the 'LS-PV' Port on the SmarTrax hydraulic valve.

FIGURE 7. 'LS-Steer' and 'LS- PV' Connection

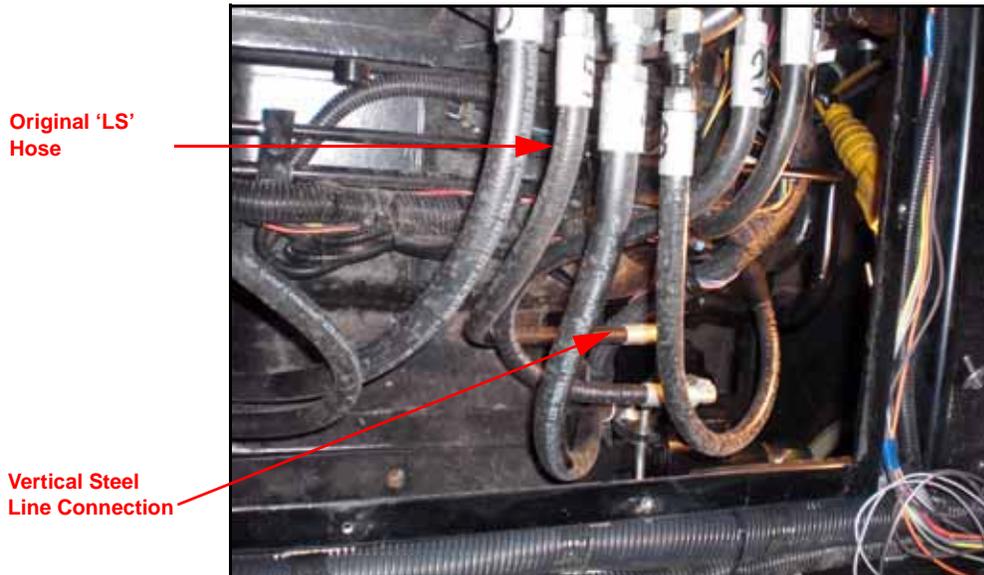
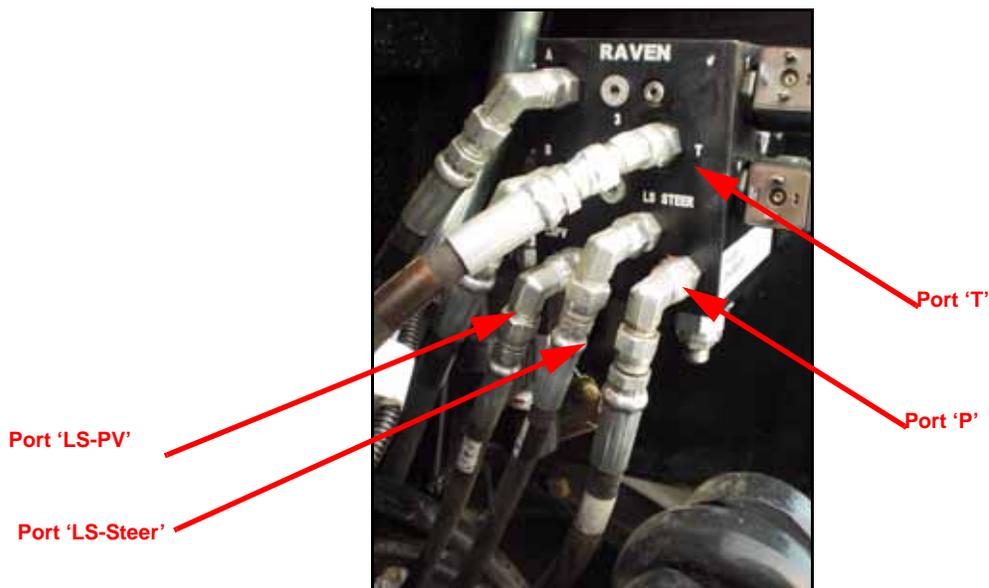
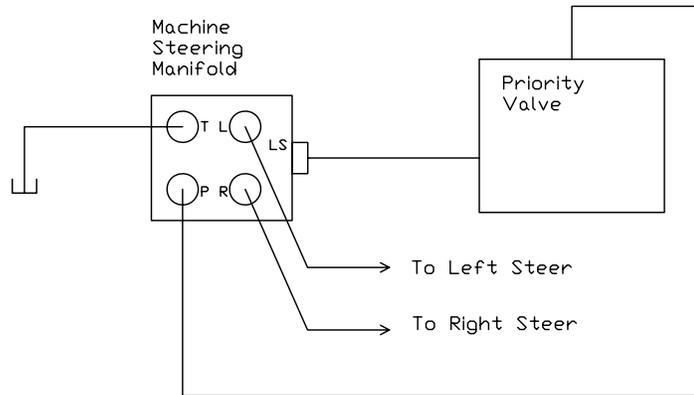


FIGURE 8. SmarTrax Hydraulic Valve Connection

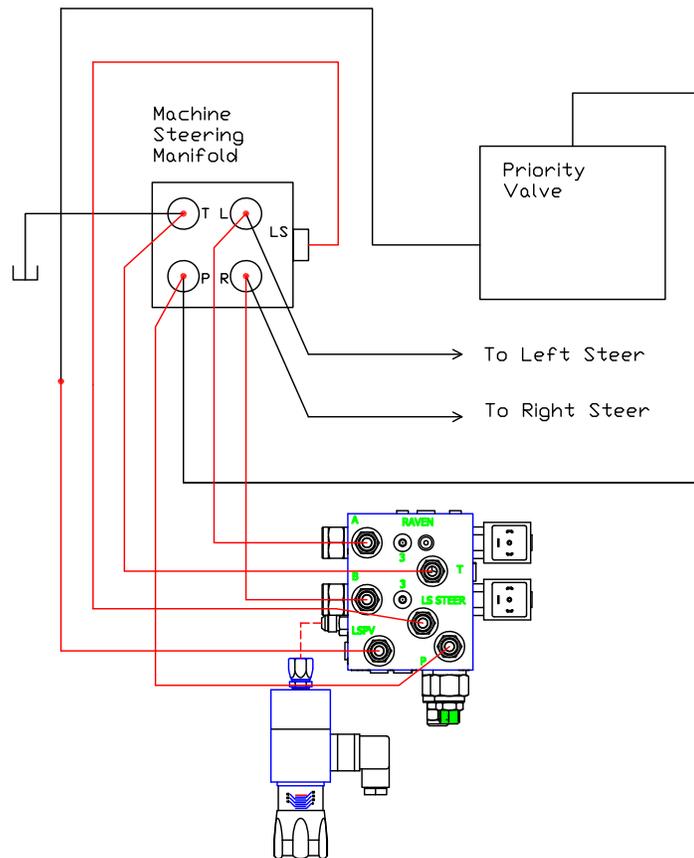


Hydraulic Connection Diagram

Before Smartrax Installation



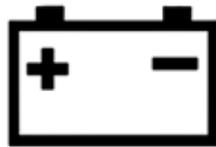
After Smartrax Installation



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 334-0003-087).
2. Locate the connector labeled 'LEFT' on the SmarTrax console cable harness (P/N 115-0171-775).
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'.

FIGURE 1. Solenoid Connections on the SmarTrax Valve



Connecting the Pressure Override Switch

1. On the console cable harness (P/N 115-0171-775), 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 115-0171-775) 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 115-0171-775) and connect it to the foot switch cable.

FIGURE 2. Foot Switch Mounting Example

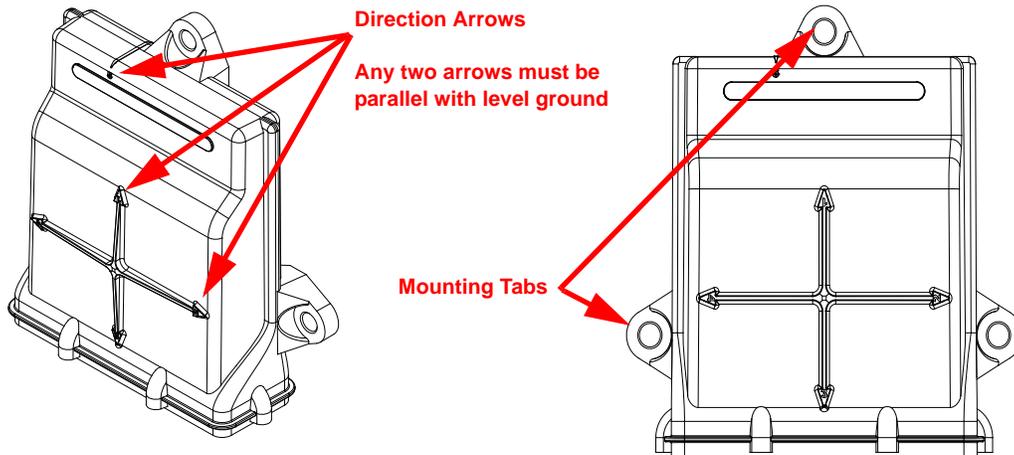


Install the SmarTrax Node

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.

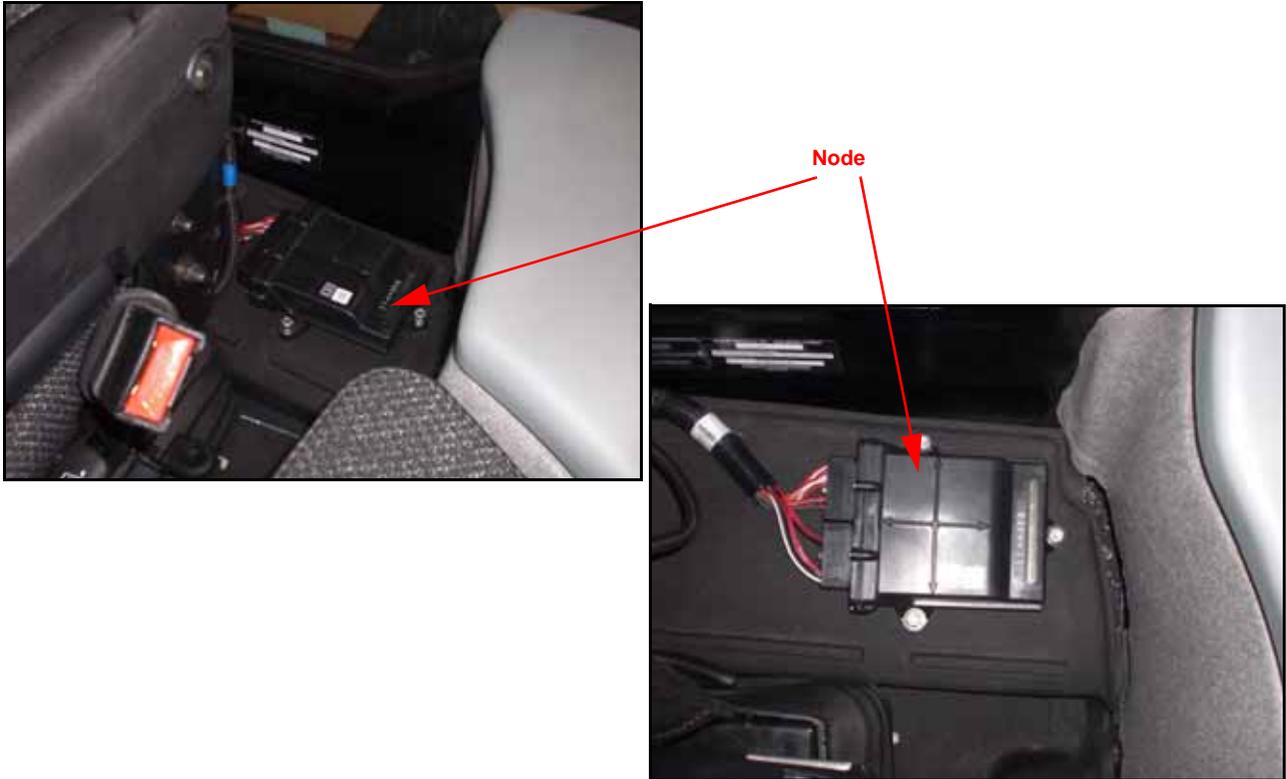
FIGURE 3. Node Mounting



To Install the Node:

1. The preferred location for the node is behind the seat bolted through the floor mat and plate.

FIGURE 4. Node Installation



2. Connect the large, rectangular connectors to the SmarTrax node.
3. Place node on floor mat to mark holes.
4. Drill holes through mat to mark plate.
5. Drill holes in plate.

Note: Plate may need to be removed in order to avoid drilling into electrical components below plate.

6. Assemble node to mat and plate with supplied bolt (PN 311-0054-108), washer (PN 313-2300-043) and nut (PN 312-4000-061)

Chapter 5

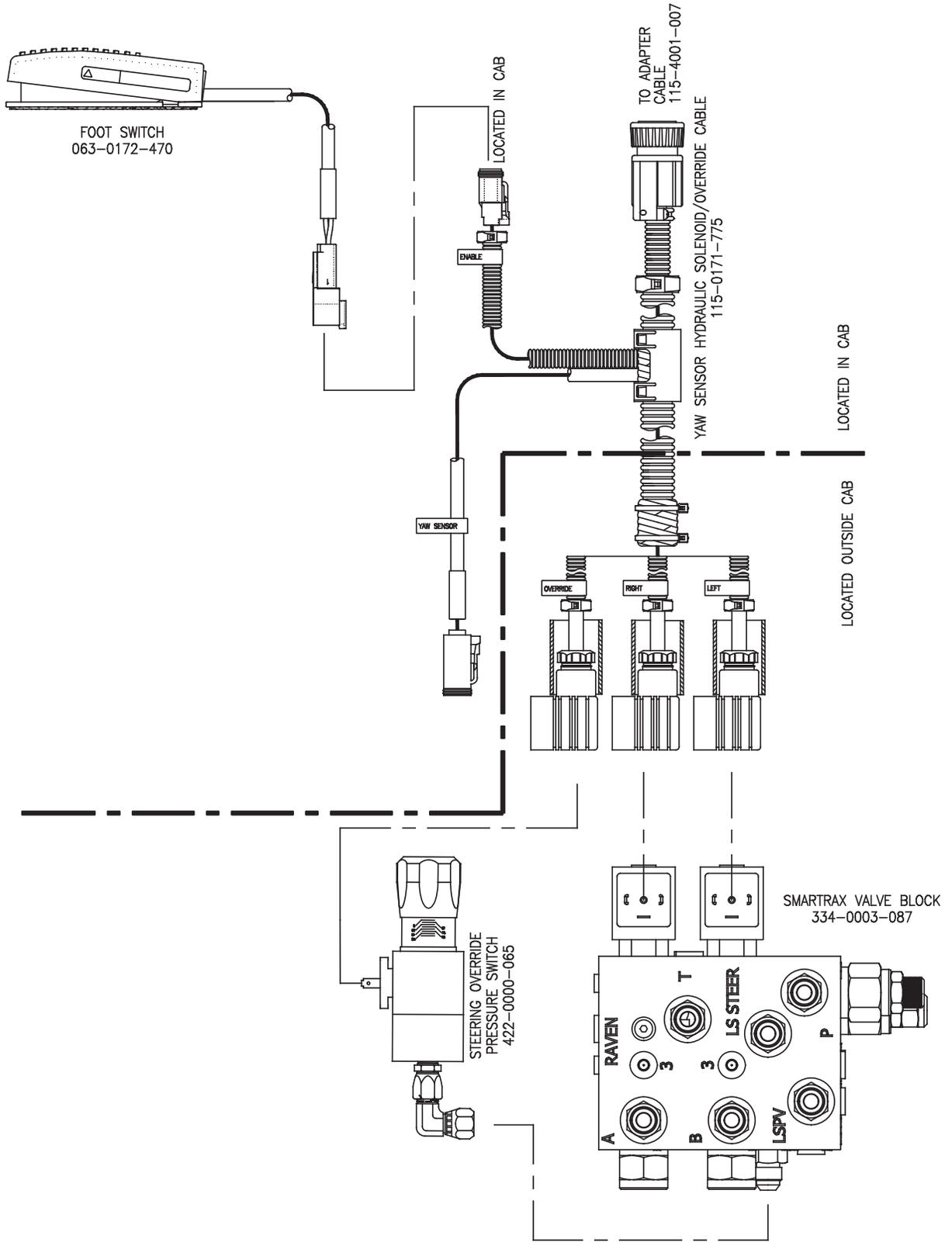
7. Connect the large, round connectors on the node adapter cable (P/N 115-4001-007) for Viper Pro/Envizio Pro or (P/N 115-4001-018) for Cruiser to the SmarTrax console cable harness (P/N 115-0171-775).
8. Connect your receiver or source of DGPS to the connector labeled 'DGPS' on the node adapter cable.
9. Connect the console providing machine guidance to the remaining small, round connector.
10. Connect the 4-pin deutsch plug to the vehicle's CANbus system (Viper Pro/Envizio Pro) or the DB-9 display cable (Cruizer).
11. Electrical hookup is recommended as shown in the *Can Node Wiring Diagram* on page 30.

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 5. Power and Ground



FIGURE 6. Cable Harness Installation Schematic



**⚠ 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

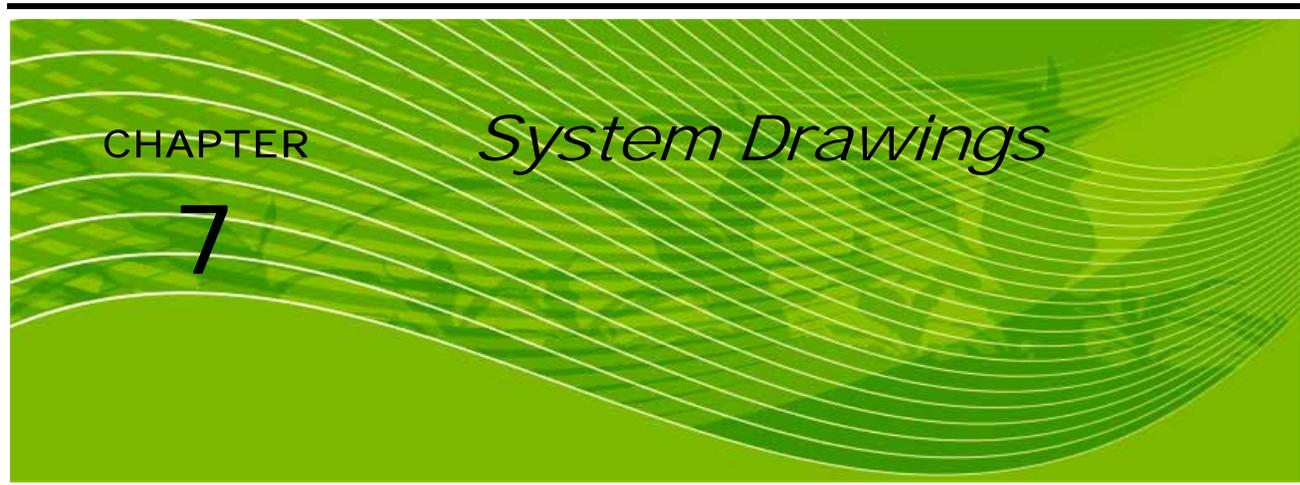
Anytime a hydraulic system is purged for maintenance, or during the SmarTrax system installation, air is introduced into the hydraulic lines. Anytime the system is purged or fittings are loosened or disconnected, it is important to remove air pockets from the hydraulic system to avoid unwanted operation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

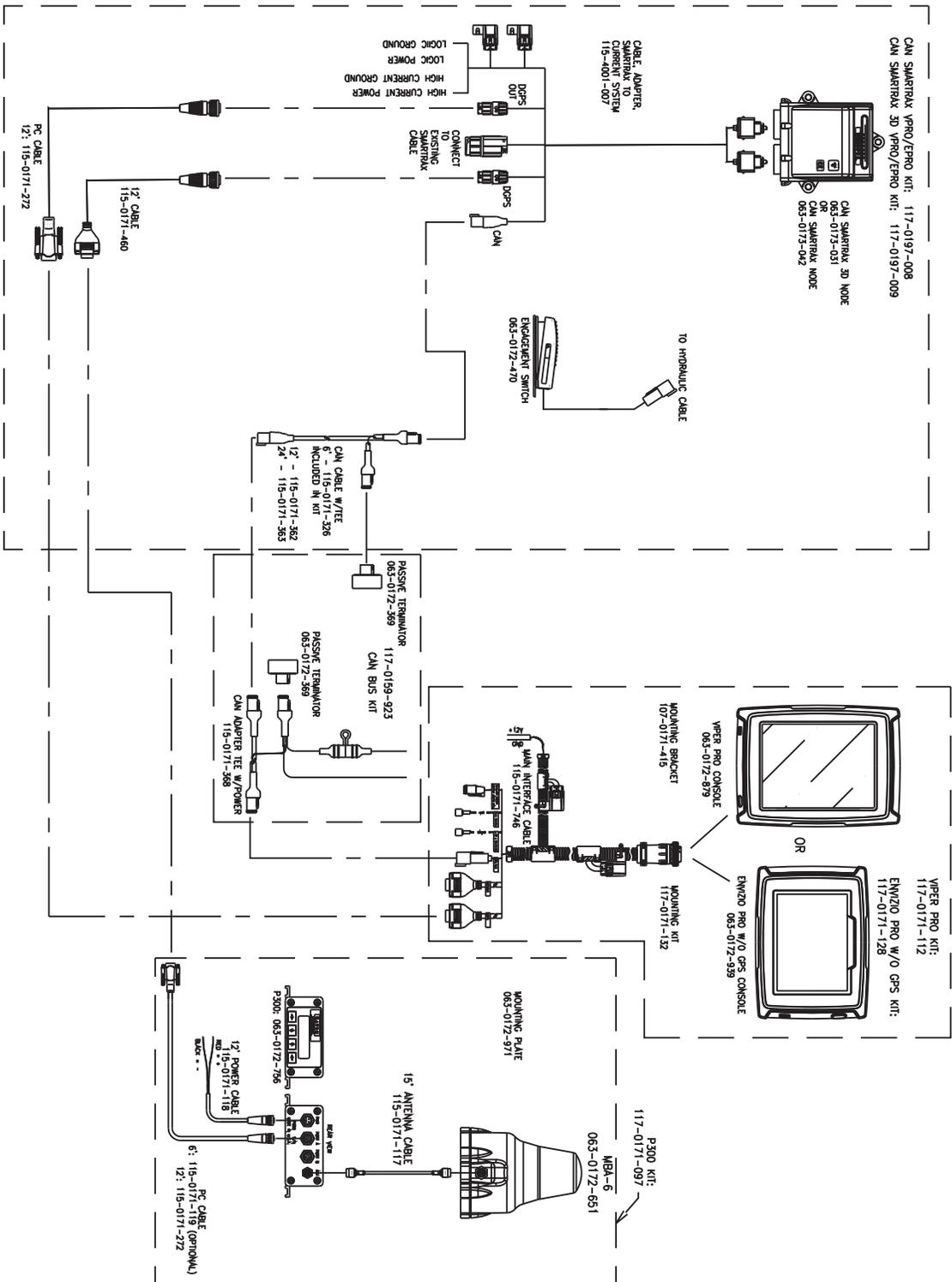
Contact your local dealer for purchasing or more information on components shown in the following diagrams.

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

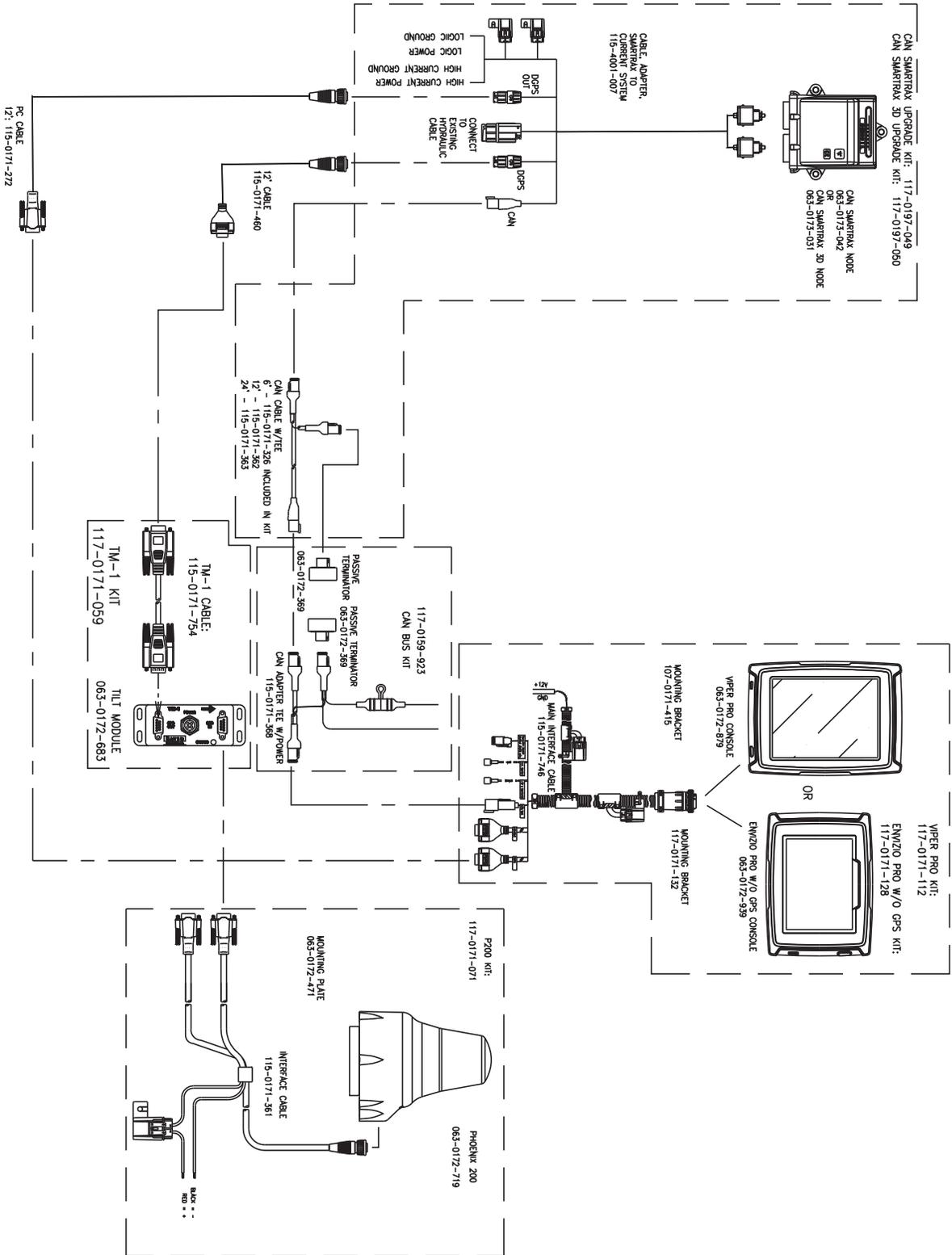
<http://www.ravenprecision.com/Support/ApplicationDrawings/index2.jsp>

Envizio Pro/ Viper Pro

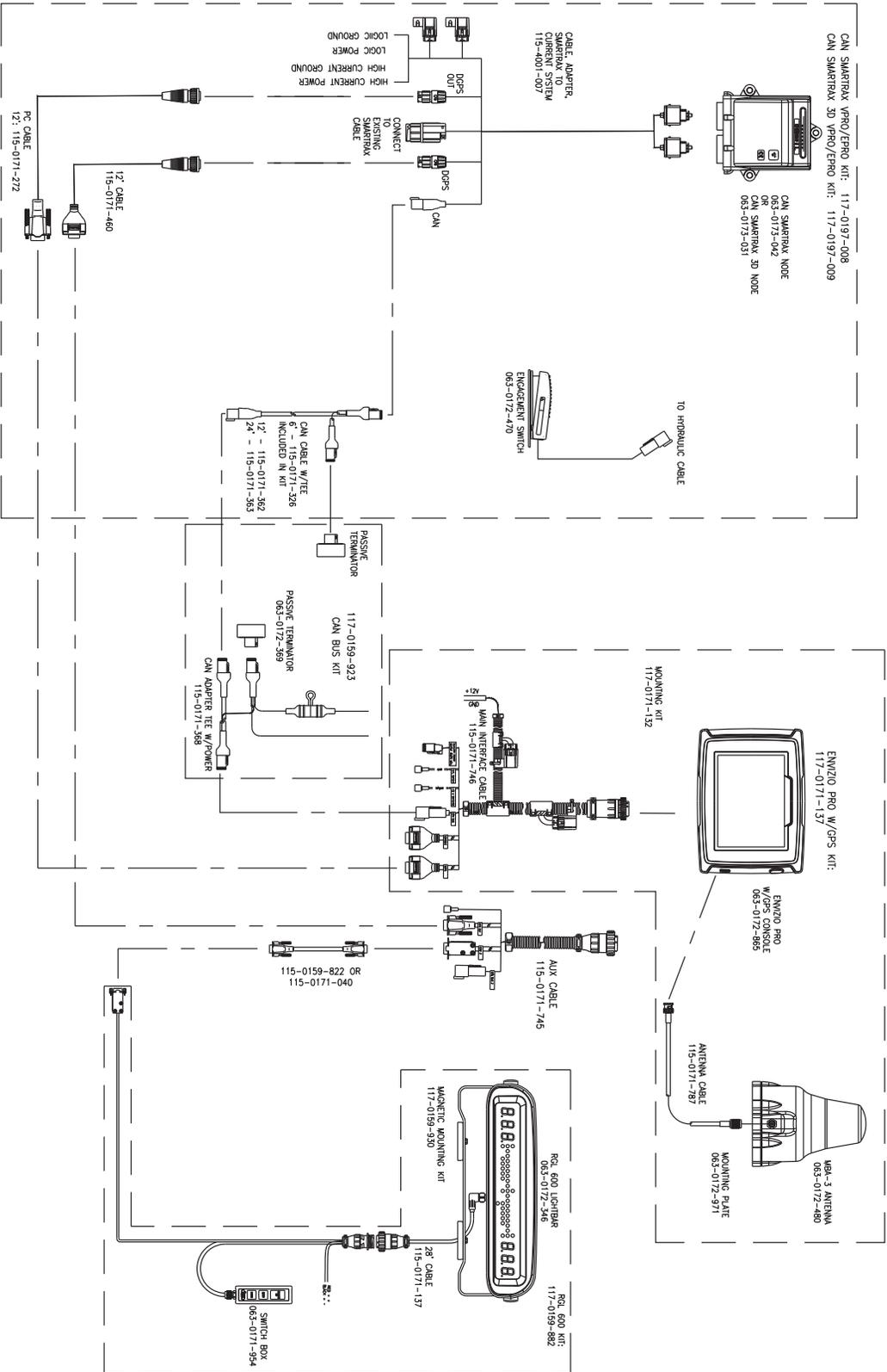
ENVIZIO PRO/VIPER PRO CAN SMARTRAX/SMARTRAX 3D W/PHONEIX 300



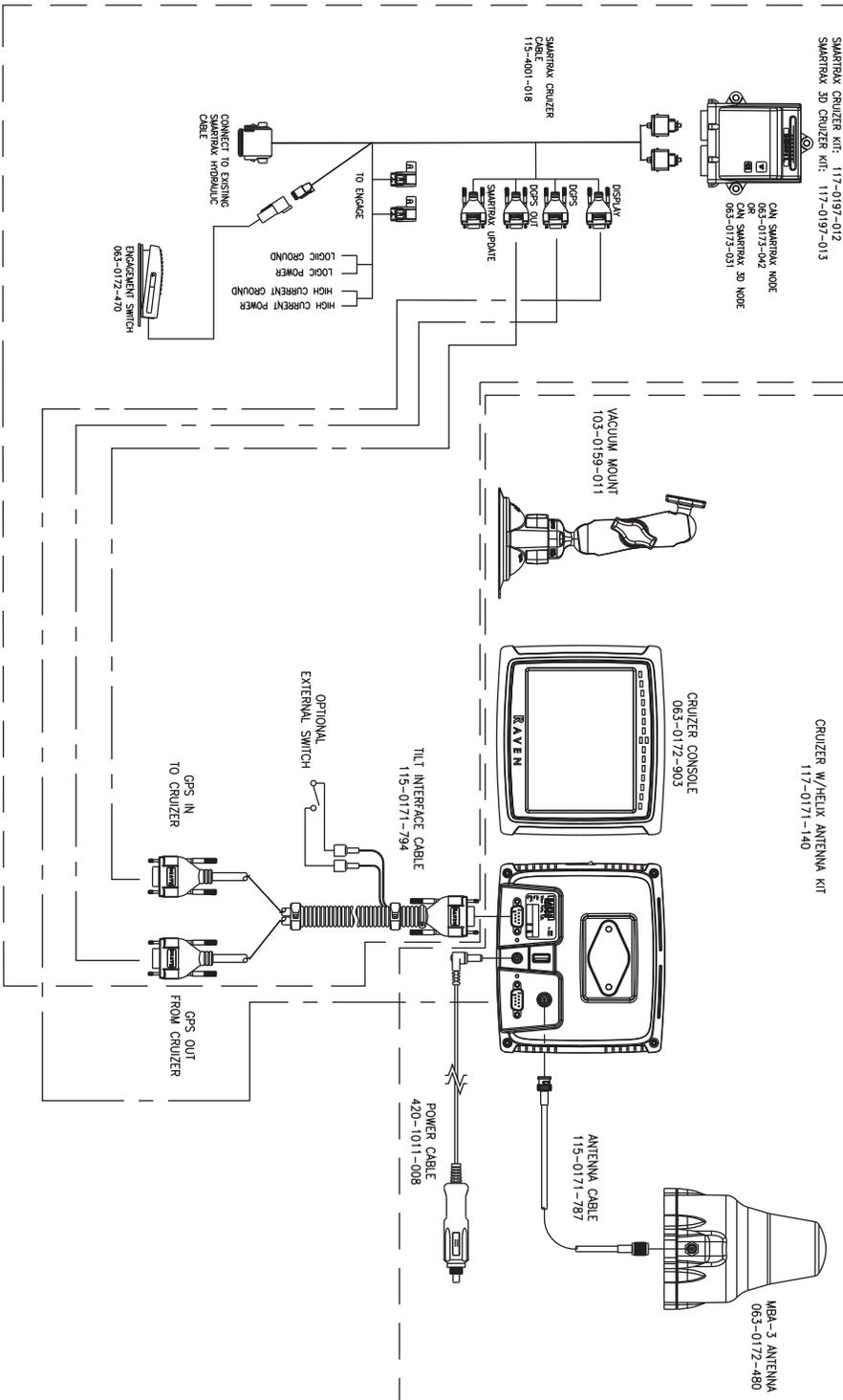
ENVIZIO PRO/VIPER PRO CAN SMARTRAX/SMARTRAX 3D UPGRADE W/PHOENIX 200, TM-1



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



CRUIZER WITH HELIX ANTENNA, SMARTRAX/SMARTRAX 3D



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RAVEN

RAVEN INDUSTRIES

Limited Warranty

What Does this Warranty Cover?

This warranty covers all defects in workmanship or materials in your Raven Applied Technology 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.

R A V E N

Buhler/Versatile Row Crop R2 Series
SmarTrax™ Installation Manual
(P/N 016-0190-099 Rev A 2/10 E15655)

Simply improving your position.™



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