Apache AS 20 Series 2011
SmarTrax™ Installation Manual

P/N 016-4001-104 Rev R 09/15 E17117

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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 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: Apache AS 20 Series
Year: MY2011
Serial Number:

FIGURE 1. Apache AS 1020

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
- 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 node kit is required to complete installation of the SmarTrax system. Contact your local Raven dealer for available kits and ordering information.

TABLE 1. Apache AS 20 Series SmarTrax Installation Kit (P/N 117-4001-104)

Picture	Item Description	Part Number	Qty
Not pictured	Manual - SmarTrax Installation	016-4001-104	1
Not pictured	Manual - SmarTrax Operation	016-0171-277	1
	Cable - SmarTrax Deutsch Node	115-4001-045	1
	Cable - SmarTrax Valve Harness	115-4001-046	1
	Bracket - Hydraulic Valve Mounting	107-0171-953	1
	Transducer - SmarTrax Pressure	422-0000-086	1

TABLE 1. Apache AS 20 Series SmarTrax Installation Kit (P/N 117-4001-104)

Picture	Item Description	Part Number	Qty
	Foot Switch - SmarTrax Assembly	063-0172-470	1
	Valve - SmarTrax Hydraulic	063-0131-139	1
	Bolt - 5/16” Hex Head	311-0052-104	4
	Bolt - 3/8-16” Hex Head	311-0054-106	2
	Nut - 3/8-16” Zinc Lock	312-1001-164	2
	Washer - 3/8” Flat	313-2300-013	2
	Washer - 5/16” Split Lock	313-1000-019	4

TABLE 2. Apache AS 20 Series SmarTrax Hydraulic Kit (P/N 117-0199-104)

Picture	Item Description	Part Number	Qty
	Fitting - -6 JIC (M/M/F) Swivel Run Tee Adapter	333-0012-043	2
	Fitting - -8 JIC (M) to -6 SAE O-RING Straight Adapter	333-0012-055	2

TABLE 2. **Apache AS 20 Series SmarTrax Hydraulic Kit (P/N 117-0199-104)**

Picture	Item Description	Part Number	Qty
	Fitting - -8 JIC (M) to -10 SAE O-RING Straight Adapter	333-0012-056	1
	Fitting - -8 JIC (M/F/M) Swivel Run Tee Adapter	333-0012-318	1
	Fitting - -10 JIC (M) to -10 SAE O-RING Straight Adapter	333-0012-246	2
	Fitting - -10 JIC (M/F) 90° Swivel Elbow	333-0012-108	2
	Hose - -6 JIC (F) to -8 JIC 90° L (F), 30”	214-1000-763	2
	Hose - -10 JIC (F) to -10 JIC (F), 32”	214-1000-732	1
	Hose - -8 JIC (F) to -8 JIC 90° (F), 44”	214-1000-733	1

CHAPTER 3

Mounting the SmarTrax Hydraulic Valve

Mount the SmarTrax Hydraulic Valve

Install Fittings on the SmarTrax Valve

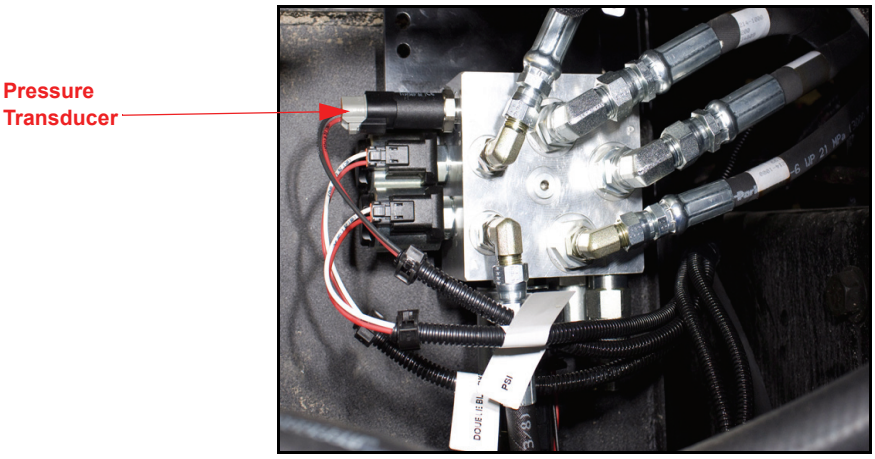
Before mounting the SmarTrax valve on the machine, install the proper fittings in the valve. This prepares the valve for installation and simplifies the hose connection process later in the procedure. Refer to the following table to install the fittings in the appropriate ports of the SmarTrax valve.

Fitting	Part Number	Port
-8 JIC (M) to -6 SAE O-RING Straight Adapter	333-0012-055	A and B
-10 JIC (M) to -10 SAE O-RING Straight Adapter	333-0012-246	P and EF
-8 JIC (M) to -10 SAE O-RING Straight Adapter	333-0012-164	T

Install Pressure Transducer

Install the pressure transducer directly to the ‘PS’ Port on the SmarTrax hydraulic valve.

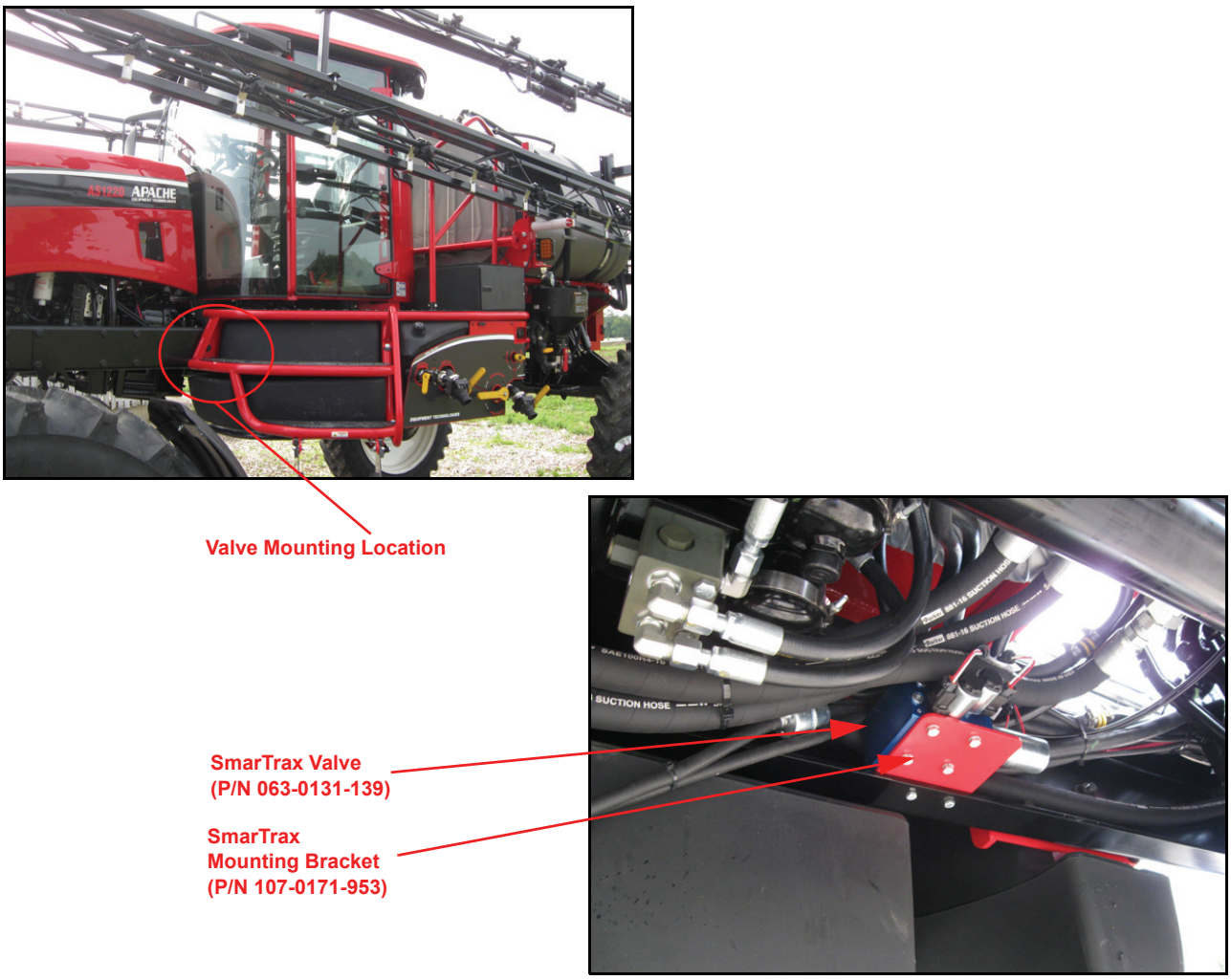
FIGURE 1. Pressure Transducer Connected to SmarTrax Hydraulic Valve



Mount the SmarTrax Hydraulic Valve

1. Mount the SmarTrax hydraulic valve (P/N 063-0131-139) to the mounting bracket (P/N 107-0171-953) using the supplied 5/16” bolts (P/N 311-0052-104) and 5/16” lock washers (P/N 313-1000-019).
2. Mount the mounting bracket to the bottom of the catwalk behind the fuel tank and fill station controls using the supplied 3/8” bolts (P/N 311-0054-106), 3/8” flat washers (P/N 313-2300-013), and 3/8” lock nuts (P/N 312-1001-164).

FIGURE 2. Valve Mounting Location



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.

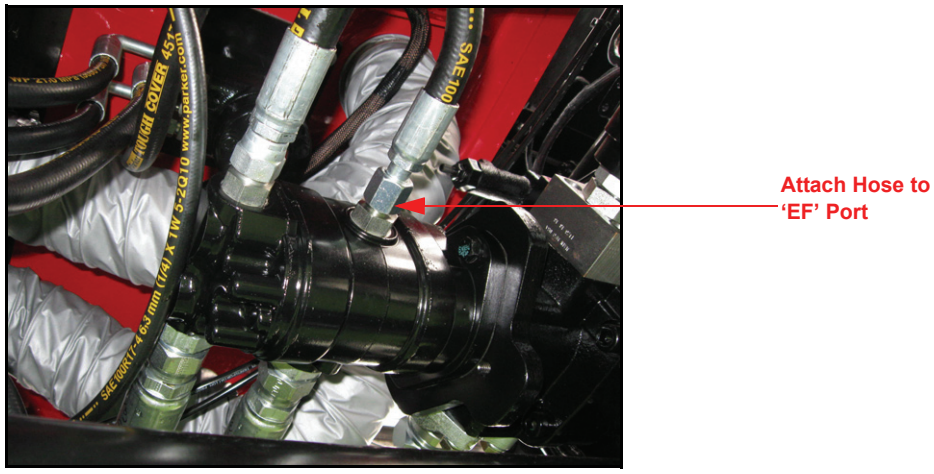
⚠ CAUTION

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

Install the Pressure and the Excess Flow Hoses

1. Locate the steering pump on the back of the transmission below the cab.
2. Disconnect the existing pressure hose from the steering pump.
3. Reroute the hose to the SmarTrax hydraulic valve and attach to the ‘EF’ Port.

FIGURE 1. ‘EF’ Port on Autosteer Valve



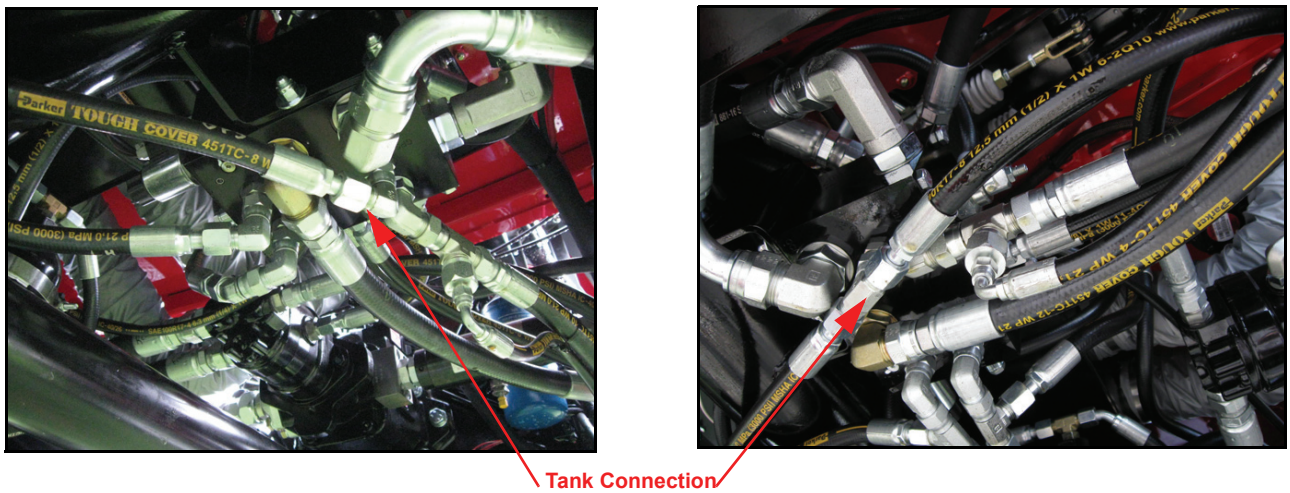
4. Connect the supplied -10 JIC (F) hose (P/N 214-1000-732) to the open port on the steering pump.
5. Route the other end hose to the SmarTrax hydraulic valve and attach to the ‘P’ Port.

FIGURE 2. SmarTrax Hydraulic Valve

Install the Tank Hose

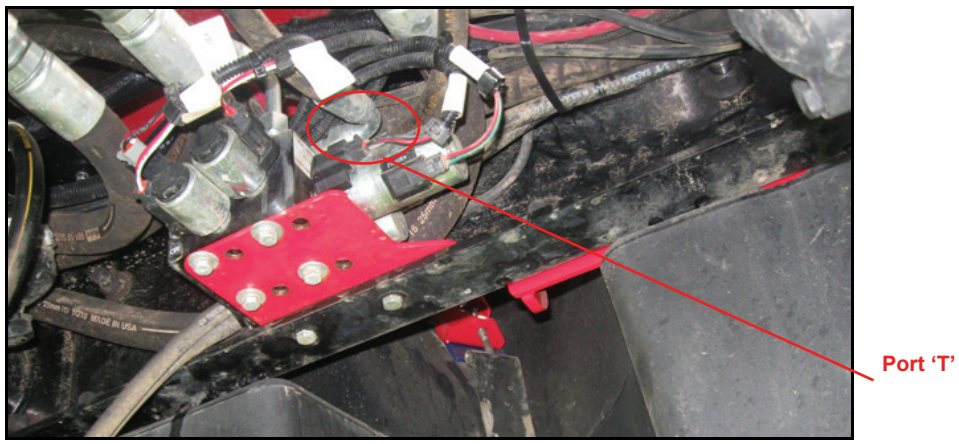
1. Disconnect the existing tank hose from the ‘GPS’ port on the valve block under the cab.
2. Install the -8 JIC (M/F/M) supplied run tee (P/N 333-0012-318) and reconnect the original tank hose to the fitting.

FIGURE 3. Tank Connection



3. Connect the -8 JIC (F) end of the supplied hose (P/N 214-1000-733) to the remaining branch of the tee fitting.
4. Route the other end of the hose to the SmarTrax hydraulic valve and attach to Port ‘T’.

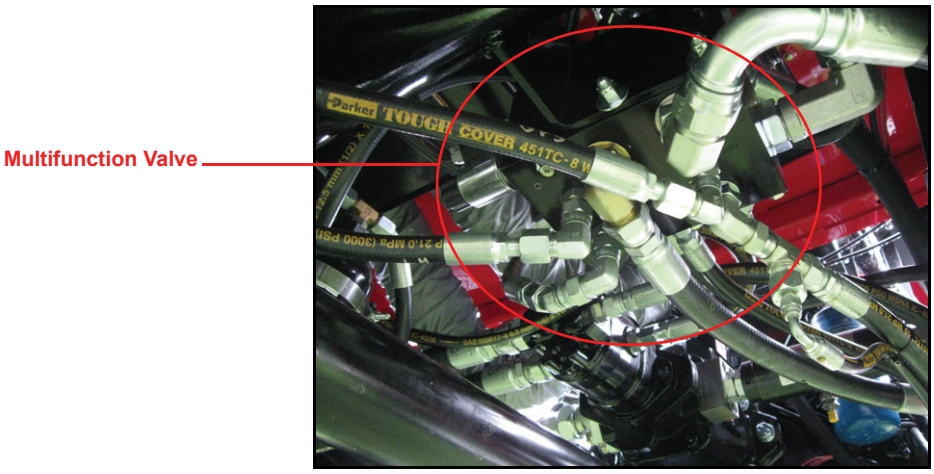
FIGURE 4. SmarTrax Hydraulic Valve



Install the Left and Right Steer Hoses

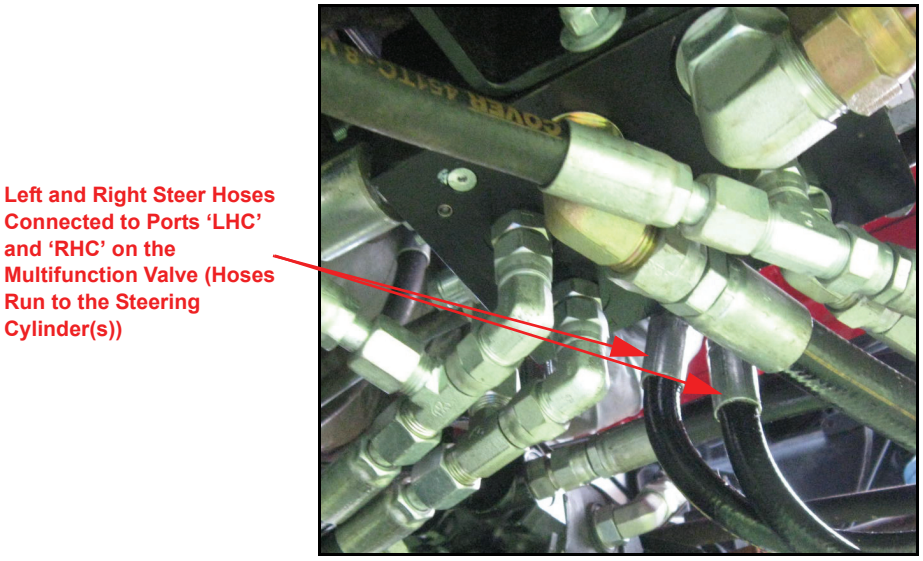
The left and right steer hoses connect to the Multifunction valve just behind the hydraulic pump above the drive shaft.

FIGURE 5. Multifunction Valve



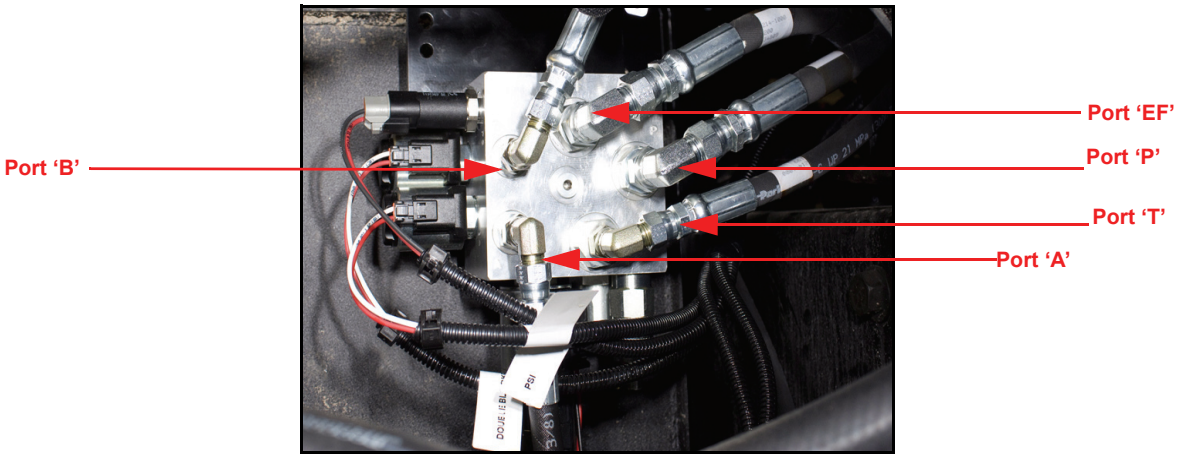
5. Disconnect the existing -6 JIC left and right steer hoses labeled LHC and RHC respectively.
6. Install the supplied -6 JIC (M/M/F) run tee fittings (P/N 333-0012-043) and reconnect the original hoses to the fittings.

FIGURE 6. Left and Right Steer Connection (Hoses Go To The Steering Cylinder(s))



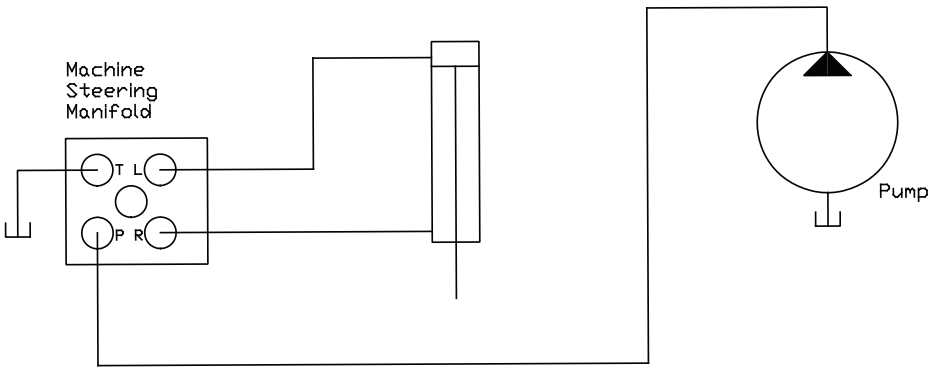
7. Connect the supplied -6 JIC (F) hoses (P/N 214-1000-763) to the remaining branch of the tee fittings and route the other end of the hoses to the SmarTrax hydraulic valve. Connect the left steer hose to Port ‘A’ and right steer to Port ‘B’.

FIGURE 7. Top View of SmarTrax Hydraulic Valve

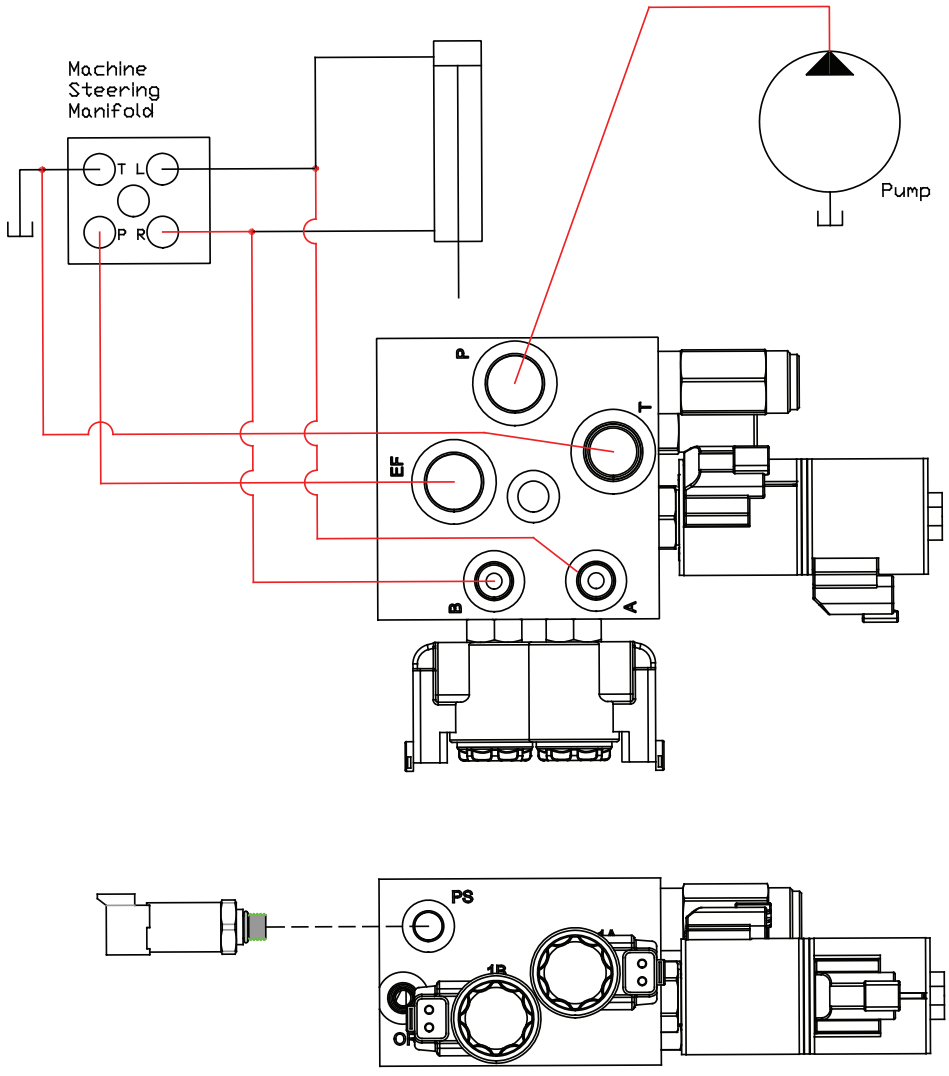


Hydraulic Connection Diagram

Before Smartrax Installation

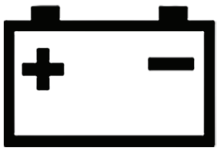


After Smartrax Installation



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. Locate the connector labeled ‘LEFT Inner’ on the SmarTrax valve cable harness (P/N 115-4001-046).
2. Insert the connector labeled ‘LEFT Inner’ to the bottom solenoid installed in port ‘2’ on the SmarTrax hydraulic valve. See Figure 9, “Cable Harness Installation Schematic,” on page 22.
3. Repeat step 1 and step 2 to connect the ‘RIGHT Outer’ connector to the top solenoid on port ‘2’.
4. Locate the connector labeled ‘Port 1A and Port 1B’ on the SmarTrax valve cable harness. Insert the connectors into the ‘1A and 1B’ solenoids.

Connecting the Pressure Transducer

1. On the valve cable harness (P/N 115-4001-046), identify the connector labeled ‘PSI’.
2. Connect the ‘PSI’ connector to the pressure transducer using the provided di-electric if necessary.

Route the Valve Cable Harness

1. Once the SmarTrax hydraulic valve and pressure transducer are connected to the valve cable harness, route the remaining 12 pin duestch connector to the capped 12 pin duestch connector under the cab (located off of one of the main bulkhead connections).
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 valve cable harness, follow the path of other hoses or cables to avoid potential wear areas.*

FIGURE 1. Hose Routing Example

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 node cable harness (P/N 115-4001-045) and connect it to the foot switch cable.

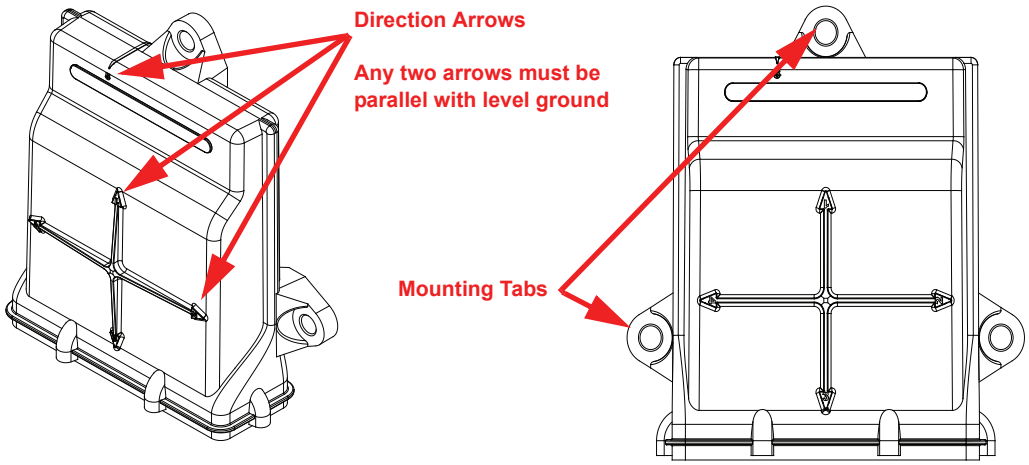
FIGURE 2. Foot Switch Mounting Example

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.
- 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. Remove the side face cover panel on the machine.

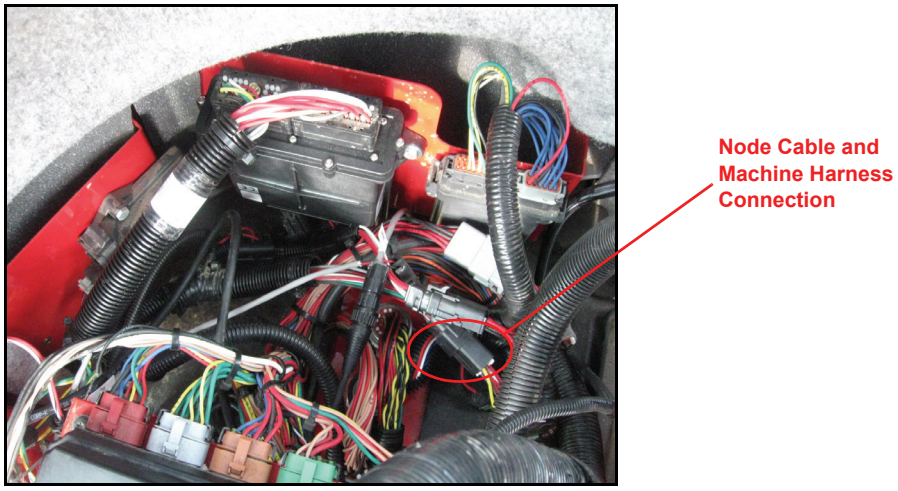
FIGURE 4. Side Panel

2. Next, line up the mounting tabs on the node to the holes on the back wall of the cab.

FIGURE 5. Node Installed

3. Connect the rectangular 12 pin connector on the node cable (P/N 115-4001-045) for Viper Pro/Envizio Pro to the machine cable harness.

FIGURE 6. Node Cable Connection



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 DB-9 connector.

7. Connect the 4-pin deutsch plug to the vehicle's CANbus system (Viper Pro/Envizio Pro).

FIGURE 7. 4-Pin Deutsch Plug

8. Electrical hookup is a 4 pin weather pack connector.

FIGURE 8. 4 Pin Weather Pack Connector

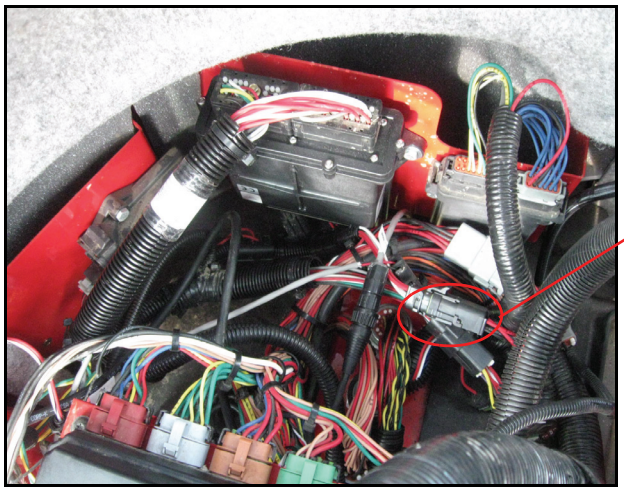
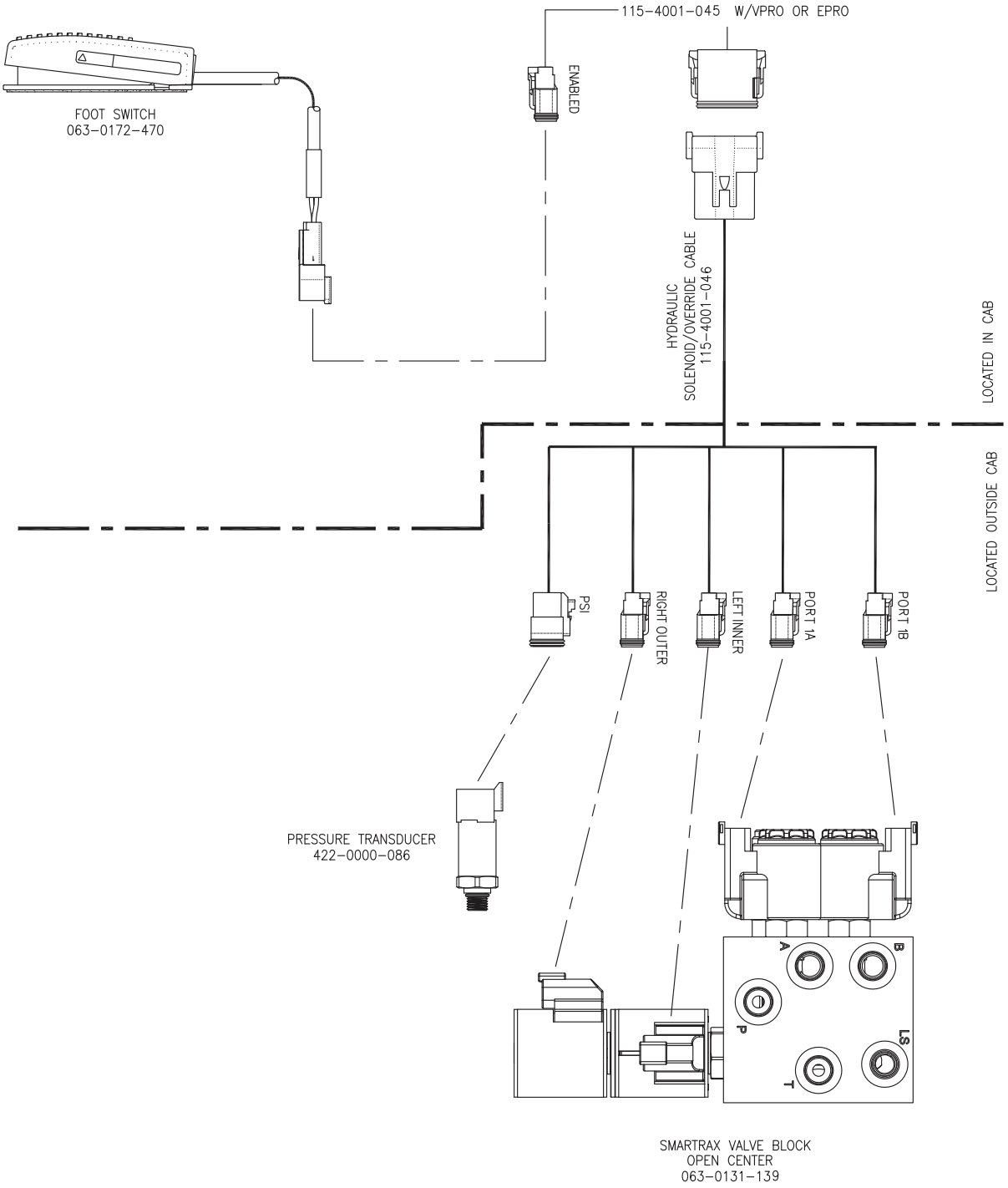


FIGURE 9. Cable Harness Installation Schematic



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.

CHAPTER 7

System Drawings

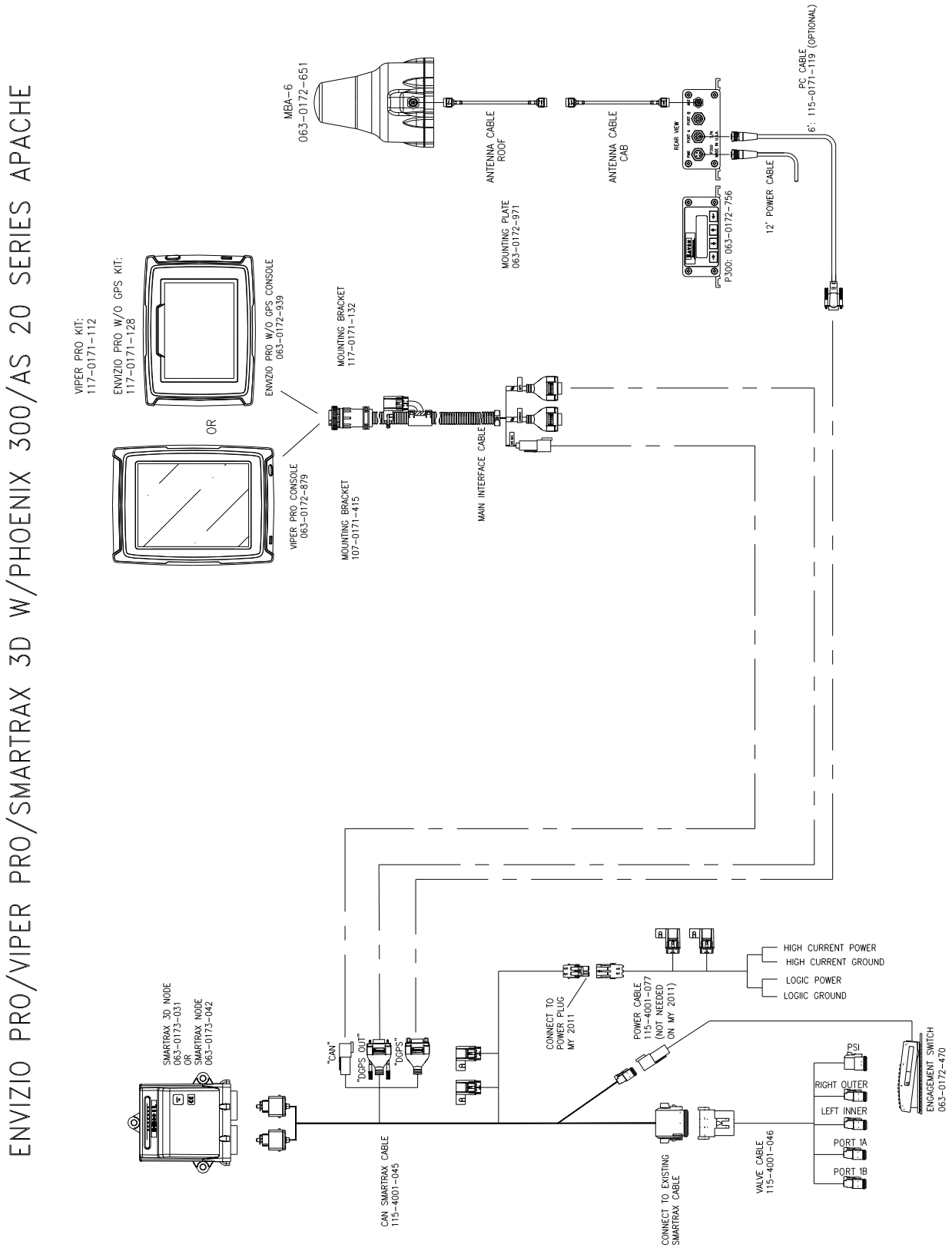
The following diagrams may be helpful for installing or troubleshooting the SmarTrax system. The following diagrams may show optional features or components not required for operation and will not apply to your system if the required hardware has not been installed.

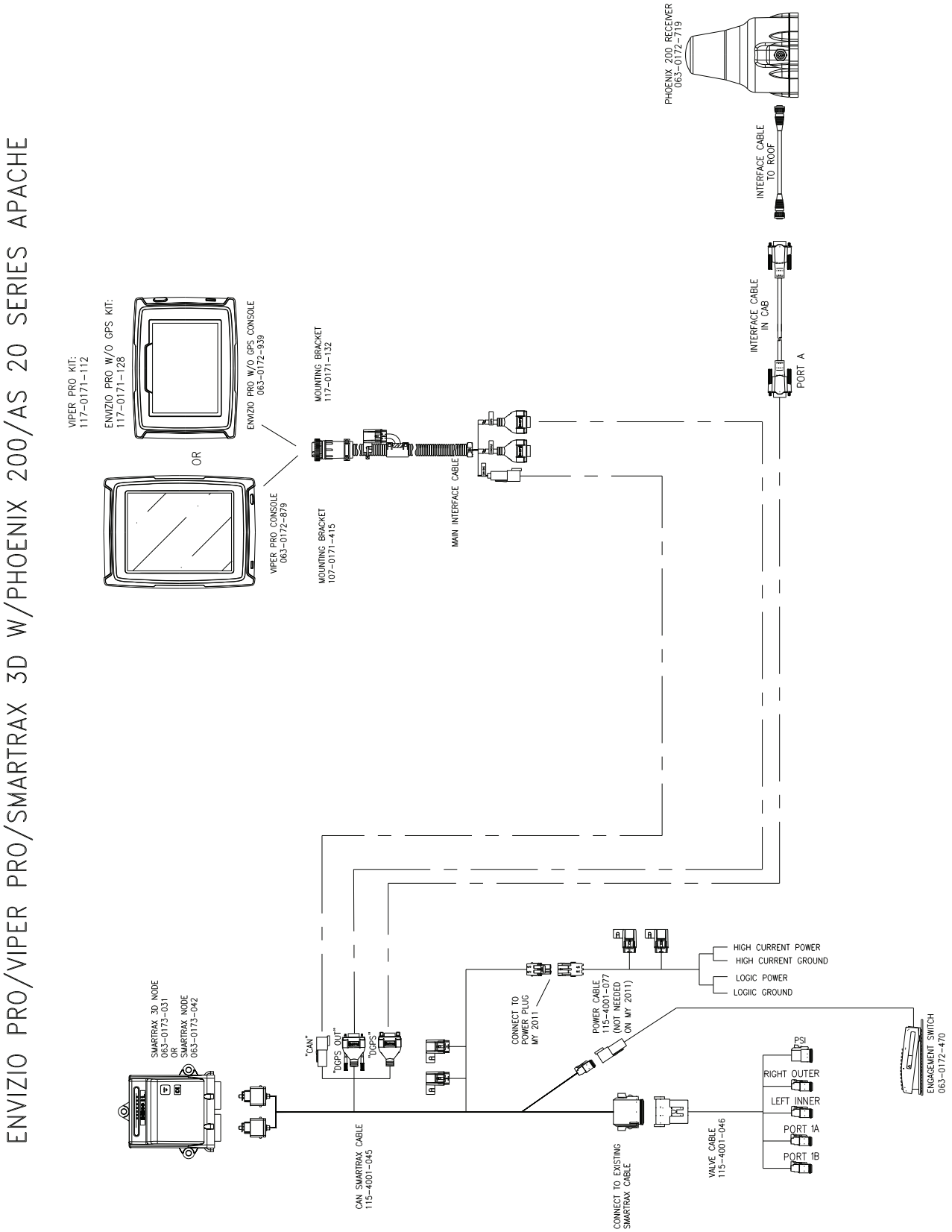
Contact your local dealer for purchasing or more information on components shown in the following diagrams.

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

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

Envizio Pro/ Viper Pro




ENVIZIO PRO/VIPER PRO/SMARTRAX 3D W/PHOENIX 200/AS 20 SERIES APACHE
PHOENIX 200 RECEIVER
063-0172-719
INTERFACE CABLE
TO ROOF
INTERFACE CABLE
IN CAB
PORT A
VIPER PRO KIT:
117-0171-112
ENVIZIO PRO W/O GPS KIT:
117-0171-128
OR
ENVIZIO PRO W/O GPS CONSOLE
063-0172-939
VIPER PRO CONSOLE
063-0172-879
MOUNTING BRACKET
117-0171-132
MOUNTING BRACKET
107-0171-415
MAIN INTERFACE CABLE
SMARTRAX 3D NODE
063-0173-031
OR
SMARTRAX NODE
063-0173-042
"CAN"
"DGPS OUT"
"DGPS"
CAN SMARTRAX CABLE
115-4001-045
CONNECT TO
POWER PLUG
MY 2011
POWER CABLE
115-4001-077
(NOT NEEDED
ON MY 2011)
HIGH CURRENT POWER
HIGH CURRENT GROUND
LOGIC POWER
LOGIC GROUND
CONNECT TO EXISTING
SMARTRAX CABLE
VALVE CABLE
115-4001-046
PSI
RIGHT OUTER
LEFT INNER
PORT 1A
PORT 1B
ENGAGEMENT SWITCH
063-0172-470

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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 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.