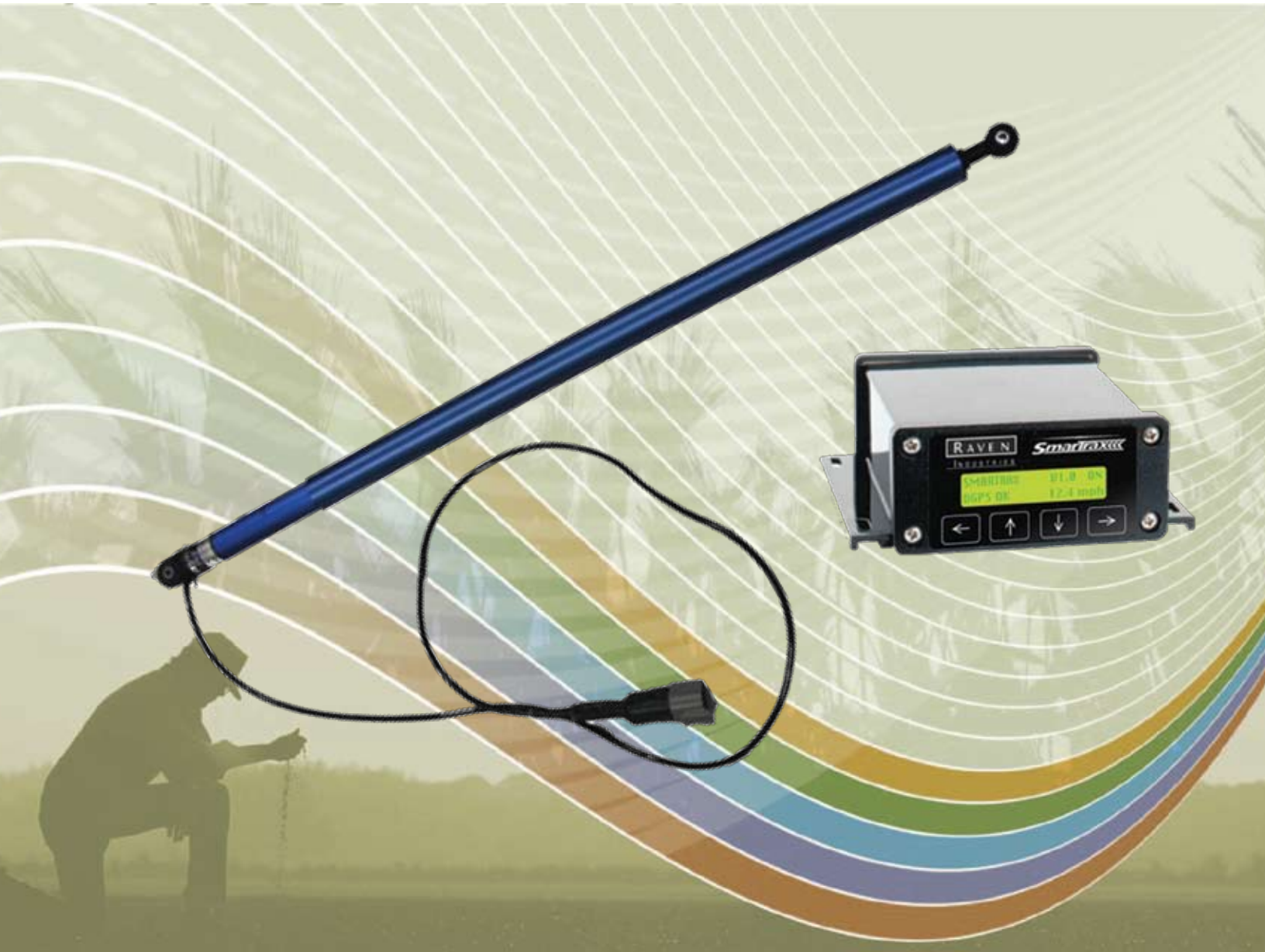


RAVEN

Simply improving your position.SM

SmarTrax™ Installation Manual



Close Center Hydraulic Systems
Load Sense & Pressure Compensated Systems

Disclaimer

While every effort has been made to ensure the accuracy of this document, Raven Industries assumes no responsibility for omissions and errors. Nor is any liability assumed for damages resulting from the use of information contained herein.

Raven Industries shall not be held responsible or liable for the effects of atmospheric conditions and sunspot activity on the performance of our products.

Raven Industries cannot guarantee the accuracy, integrity, continuity, or availability of the GPS signal from the U.S. Department of Defense/NAVSTAR GPS satellites, the OmniSTAR correction service or the WAAS correction service.

Raven Industries accepts no responsibility for the use of the signal for other than the stated purpose. Raven Industries shall not be responsible or liable for incidental or consequential damages or a loss of anticipated benefits or profits, work stoppage or loss or impairment of data arising out of the use, or inability to use, the SmarTrax or any of its components.

CHAPTER

1

INTRODUCTION

Congratulations on your purchase of the Raven SmarTrax system! This system is designed to provide cutting-edge, hands-free steering of your machine via GPS coordinates.

Safety Warning Labels

Safety Warning Labels have been provided to highlight to users the importance of:

- Being aware not to damage the wheel angle sensor.
- Not tampering with the SmarTrax hydraulics valves.

These warning labels are to be placed in the specified locations as indicated below.

Steering Position Sensor Warning Label

It is essential that the Steering Position Sensor (SPS) is not damaged. Therefore Raven Industries has provided a '**Do Not Step**' warning label. This label is placed on the top surface of the Steering Position Sensor (as shown below in **Figure 1**) with the label facing up where it should be visible to the operator.

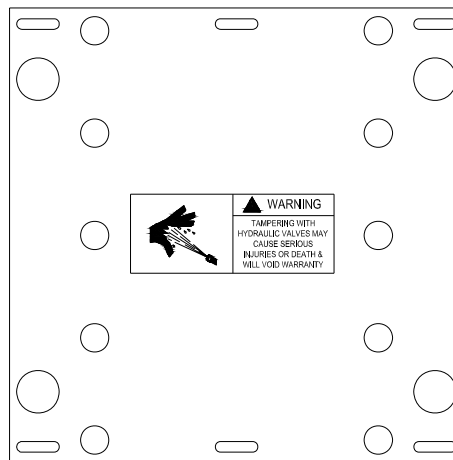
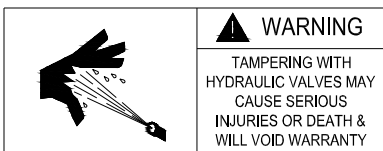


Steering Position Sensor Warning label

Hydraulic Warning Label

This label should be placed on the steering assist manifold or on the Hydraulic Valve Mounting Bracket as shown below in **Figure 2**. '**Tampering with hydraulic valves may cause serious injuries or death & will void warranty**'.

NOTE: That the picture shown below is only an example on where the hydraulic warning label is to be positioned on the steering assist manifold. Placement will vary depending on the valve used.



Hydraulic Warning label

CHAPTER

2

SAFETY

Hydraulic Safety Requirements



Important: Hydraulics are under pressure. 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 was previously pressurized.

When disconnecting the hydraulic hoses or when purging is required, be aware that the hydraulic oil within the machine system 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. Raven Industries recommends that appropriate protective equipment be worn when working on the hydraulic system. Objects or materials that are able to bypass the machine's hydraulic filtration system will adversely reduce performance and possibly damage the hydraulic valves.

Electrical Safety Requirements

Do not reverse the power leads. Doing so will cause severe damage to the equipment. Always check to make sure that the power leads are connected to the right polarity as marked. Ensure that the power cable is the last cable to be connected.

Contacting Raven Industries

We welcome your feedback about this manual. If you have any comments or suggestions for improvement, please let us know by contacting our Customer Support Center by any of the following methods:

- ◆ **Via phone:** 1-800-243-5435

- ◆ **Via mail:**
Raven Industries
Flow Control Division
205 E. 6th St.
Sioux Falls, SD 57104

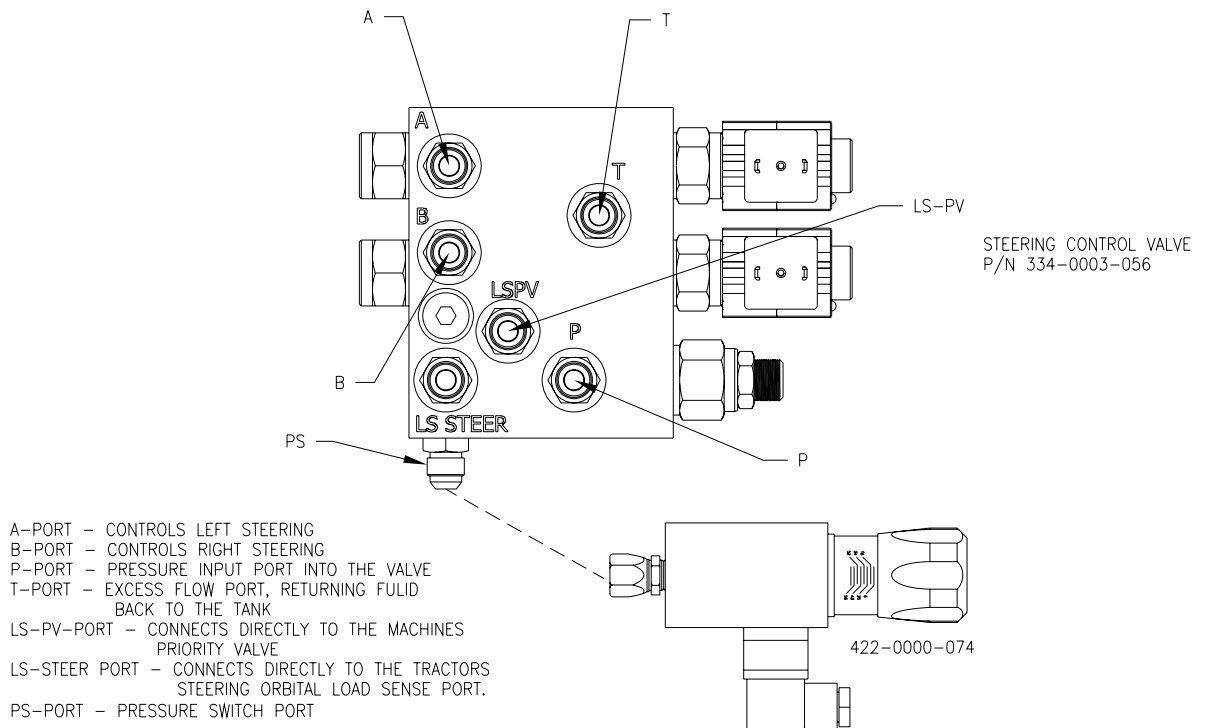
- ◆ **Via email:** fcdinfo@ravenind.com

CHAPTER

3

INSTALLING HYDRAULIC COMPONENTS FOR LOAD-SENSE SYSTEMS

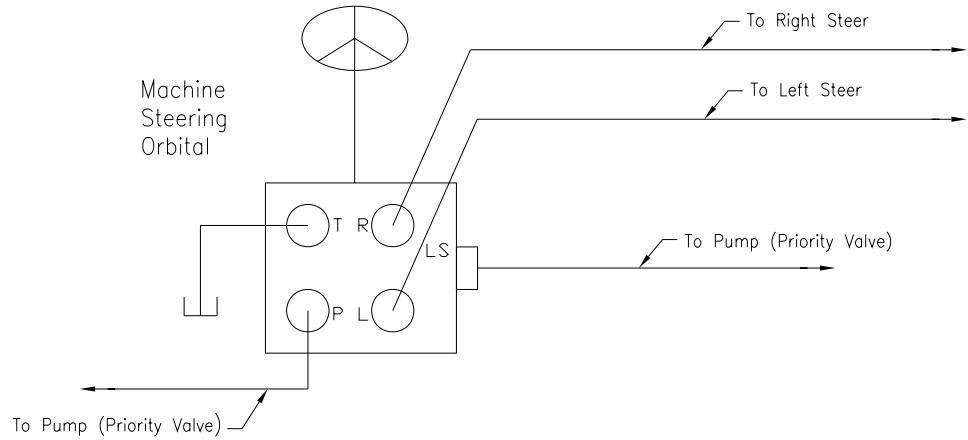
The Raven universal steering kit does not come supplied with hoses. It is important that when new hoses are made, that every effort is made to properly clean out the new hose, to prevent any contamination to the vehicles hydraulic system.



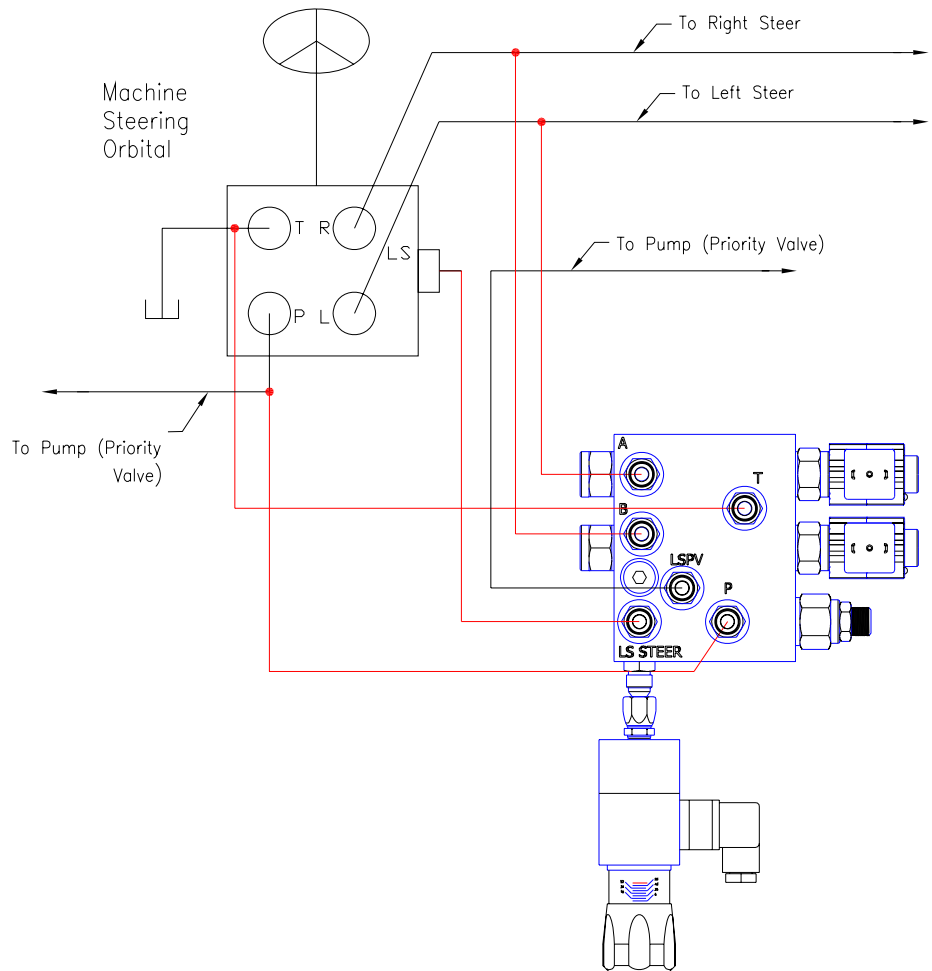
Hydraulic Steering Setup Before and After Installation

The following diagrams show how to setup the hydraulic steering setup before and after installation, including all hydraulic hose connections leading to each of their specified ports.

Before Smartrax Installation



After Smartrax Installation



Installing the Steering Control Valve Hoses

See the diagram on pages 10 and 11 for hydraulic system layout.

Left Steer Hose

1. Identify the left steer port on the tractor steering orbital. Hoses may need to be traced to the hydraulic cylinders for proper identification. Once the port has been identified, remove the hose from the tractor steering orbital. Once the tee fitting is installed, reattach the original hose.
2. Construct a new hose to run from the A-Port on the Raven steering control valve to the open branch on the installed tee fitting.
3. An additional 45° or 90° elbow may be installed on the Raven valve to help hose routing. These elbows will be found in the hydraulic fitting kit.

Right Steer Hose

1. Identify the right steer port on the tractor steering orbital. Hoses may need to be traced to the hydraulic cylinders for proper identification. Once the port has been identified, remove the hose from the tractor steering orbital and install an appropriate tee fitting, found in the Raven adapter kit, to the steering orbital. Once the tee fitting is installed, reattach the original hose.
2. Construct a new hose to run from the B-port on the Raven steering control valve to the open branch on the installed tee fitting.
3. An additional 45° or 90° elbow may be installed on the Raven valve to help hose routing. These elbows will be found in the hydraulic fitting kit.

Pressure Hose

1. Identify the pressure port on the tractor steering orbital. Hose may need to be traced to the hydraulic pump for proper identification. Once the port has been identified, remove the hose from the tractor steering orbital and install an appropriate tee fitting, found in the Raven adapter kit, to the steering orbital. Once the tee fitting is installed, reattach the original hose.
2. Construct a new hose to run from the P-port on the Raven steering control valve to the open branch on the installed tee fitting.
3. It is extremely important that the pressure line running to the Raven steering control valve goes to the port designated "P". Failure to do so will result in internal o-ring failure on the valve.
4. An additional 45° or 90° elbow may be installed on the Raven valve to help hose routing. These elbows will be found in the hydraulic fitting kit.

Tank Hose

1. Identify the tank port on the tractor steering orbital. Hose may need to be traced to the hydraulic reservoir for proper identification. Once the port has been identified, remove the hose from the tractor steering orbital and install an appropriate tee fitting, found in the Raven adapter kit, to the steering orbital. Once the tee fitting is installed, reattach the original hose.
2. Construct a new hose to run from the T-Port on the Raven steering control valve to the open branch on the installed tee fitting.
3. It is extremely important that the tank line running to the Raven steering control valve goes to the port designated "T". Failure to do so will result in internal o-ring failure on the valve.
4. An additional 45° or 90° elbow may be installed on the Raven valve to help hose routing. These elbows will be found in the hydraulic fitting kit.

LS-PV Hose

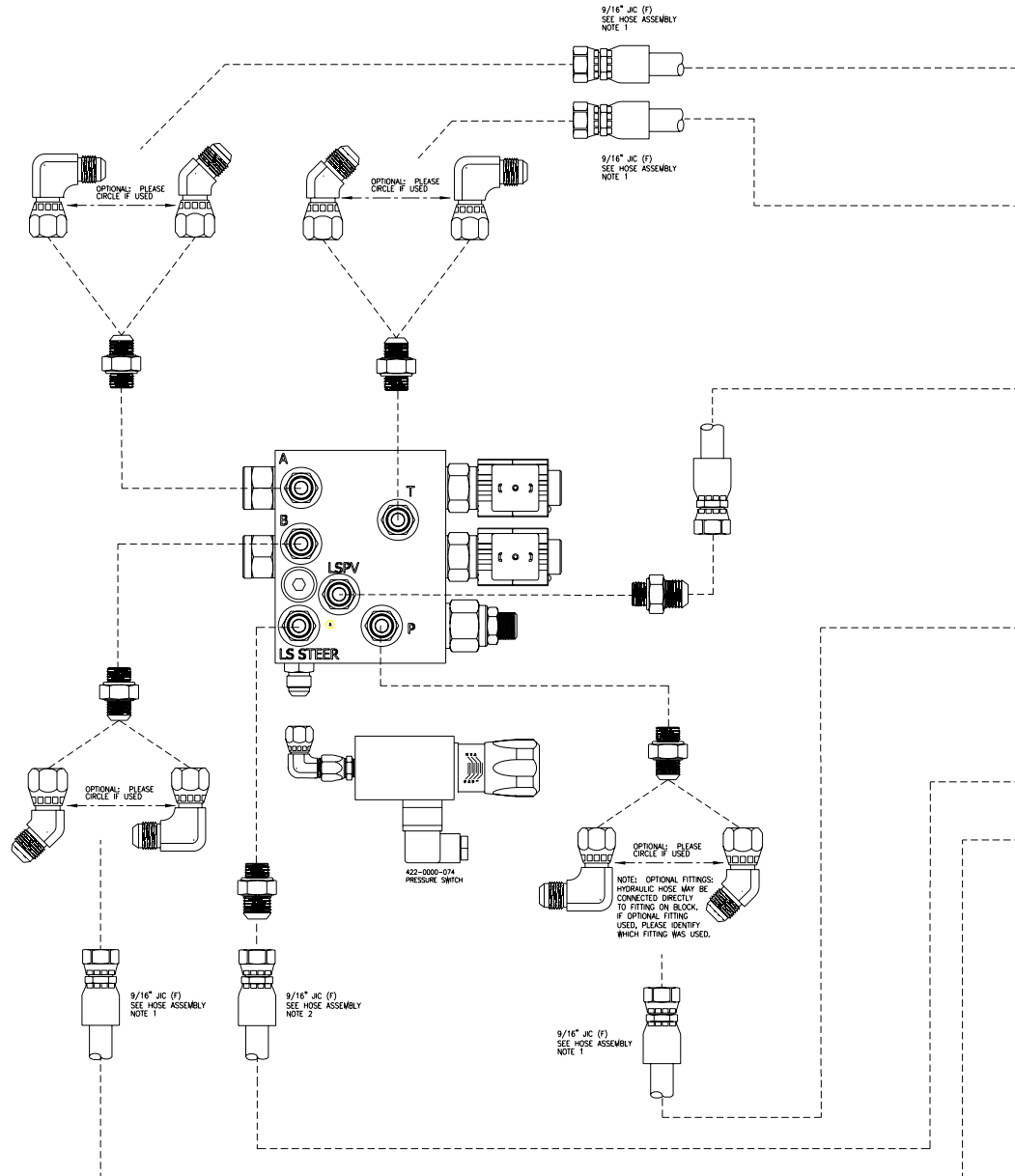
1. Remove the load sense hose from the tractors steering orbital and connect the hose directly to the port labeled “LS-PV” on the Raven steering control valve. To identify the load sense port on the valve, a general rule of thumb is that the smallest hose on the orbital is the load sense hose. Once the hose is identified, follow the hose to its origin and verify that the hose is running from the tractors priority valve.
2. In some cases, an extension hose may need to be used to reach the Raven steering control valve. If an extension hose is made, be sure that the extension hose is the same inside diameter as the original hose. If the hose inside diameter is too large or too small, the vehicles hydraulic system will not perform as expected.

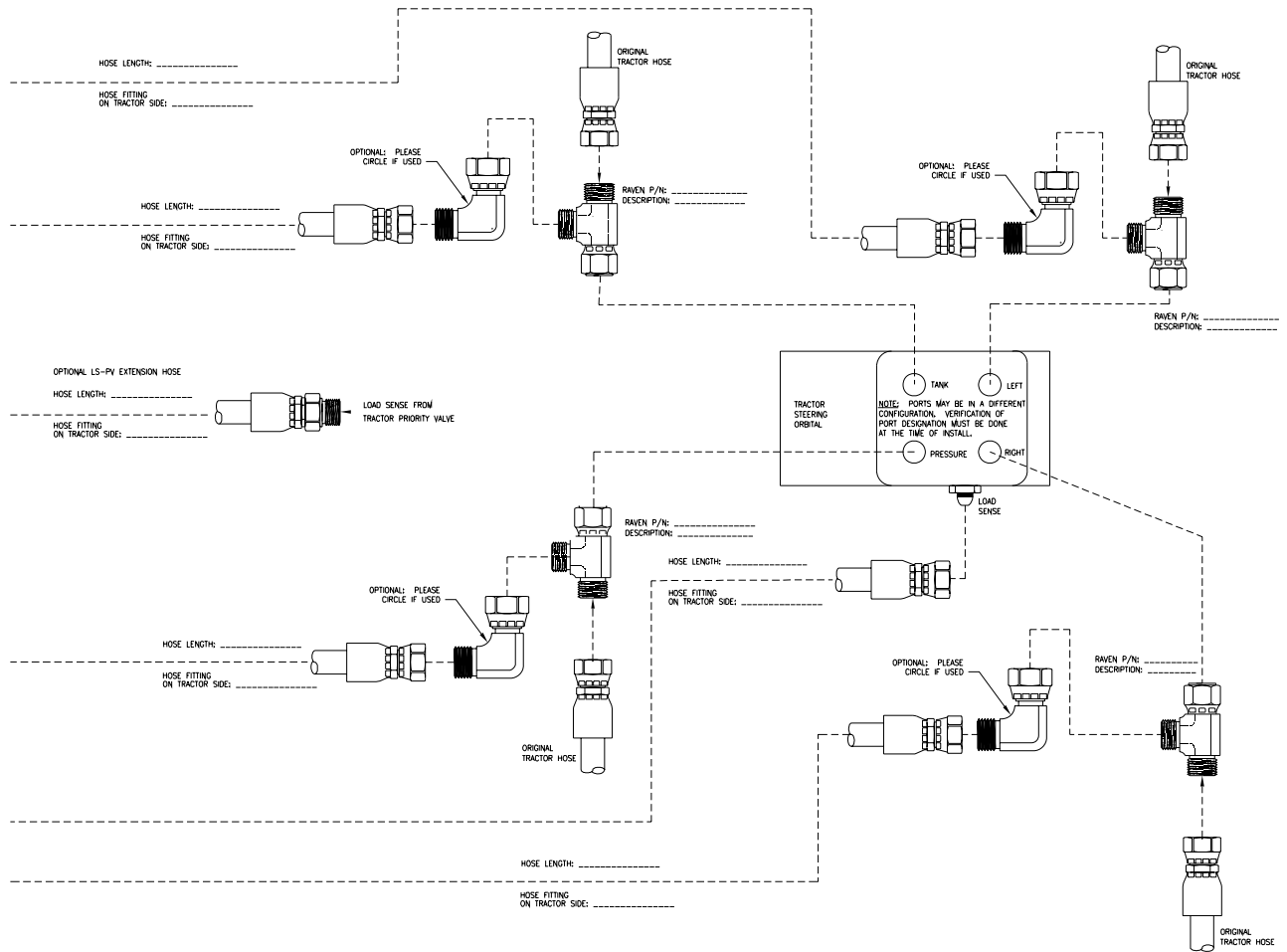
LS-Steer Hose

1. Run a new hose from the LS-Steer port on the Raven control valve to the load sense port on the tractors steering orbital. This port should be open as the original hose was removed and run to the LS-PV port in the previous step.
2. When making the hose for this connection, it is important to use hose with the same inside diameter as the original load sense hose. Failure to use identical size hose will affect the vehicles hydraulic system.

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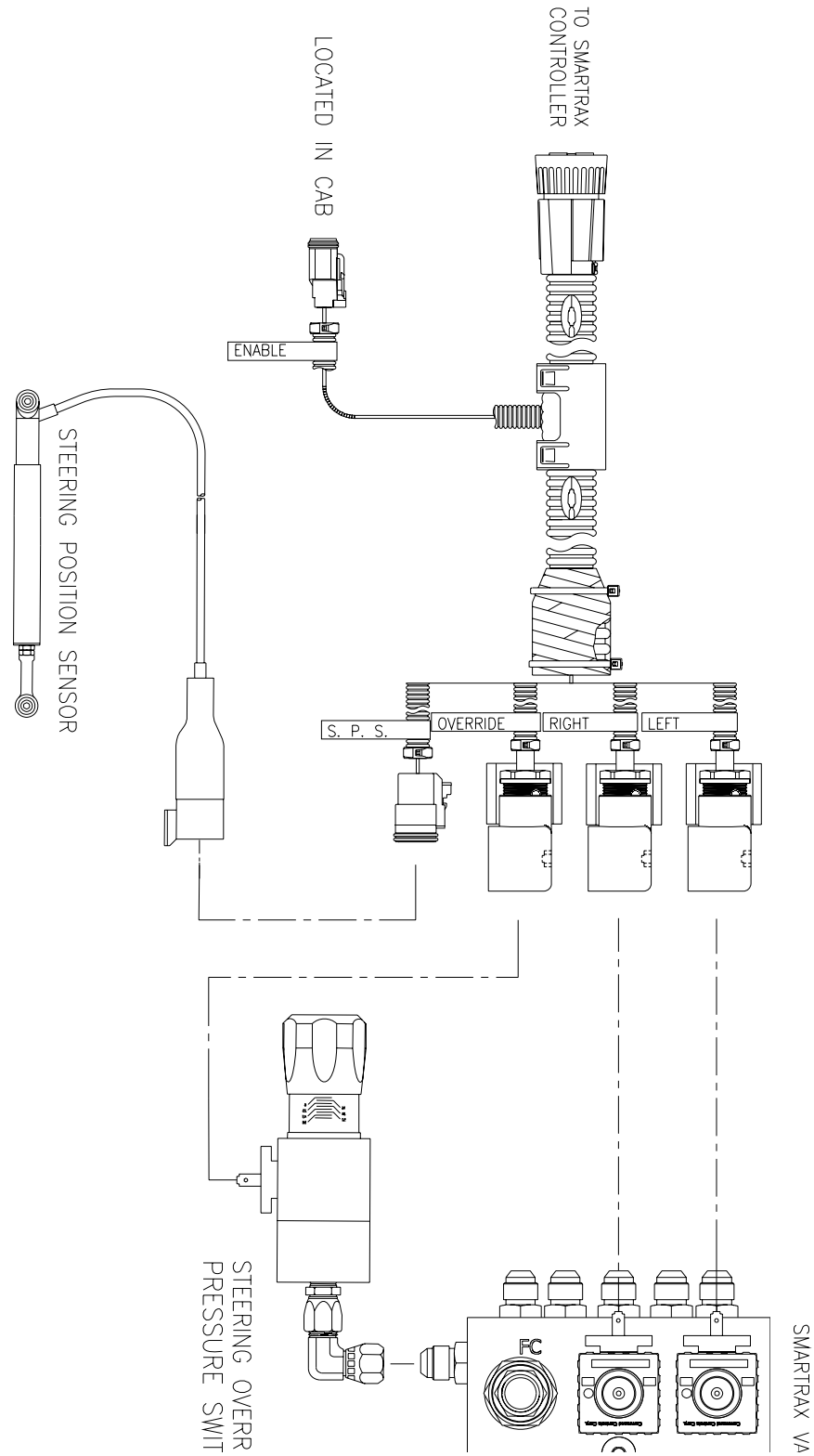
Universal Hydraulic Steering Kit Installation Guide for Closed Center, Load -Sensing & Pressure Compensated Systems





Wiring Harness Installation

NOTE: Left & Right connections are interchangeable if steering is backwards after installation.



CHAPTER

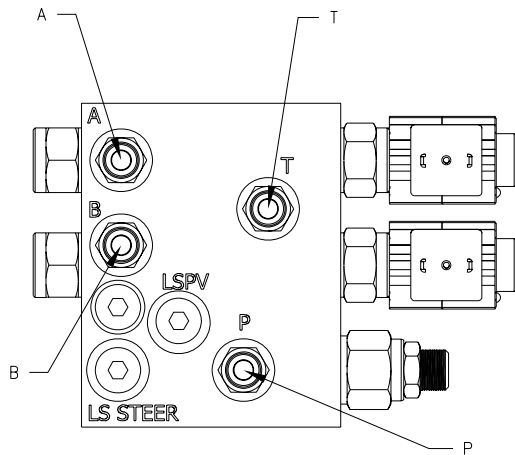
4

INSTALLING HYDRAULIC COMPONENTS FOR PRESSURE-COMPENSATED SYSTEMS

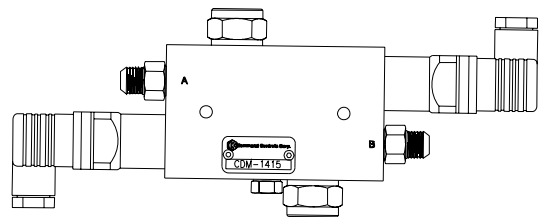
Raven Part #'s
 334-0003-056 - Hydraulic Valve
 334-0003-024 - Override Switch

- ◆ The Raven universal steering kit does **NOT** come supplied with hoses. It is important that when new hoses are made, that every effort is made to properly clean out the new hose to prevent any contamination to the vehicles hydraulic system.

Raven Steering Control Valve Configuration



P/N 334-0003-056



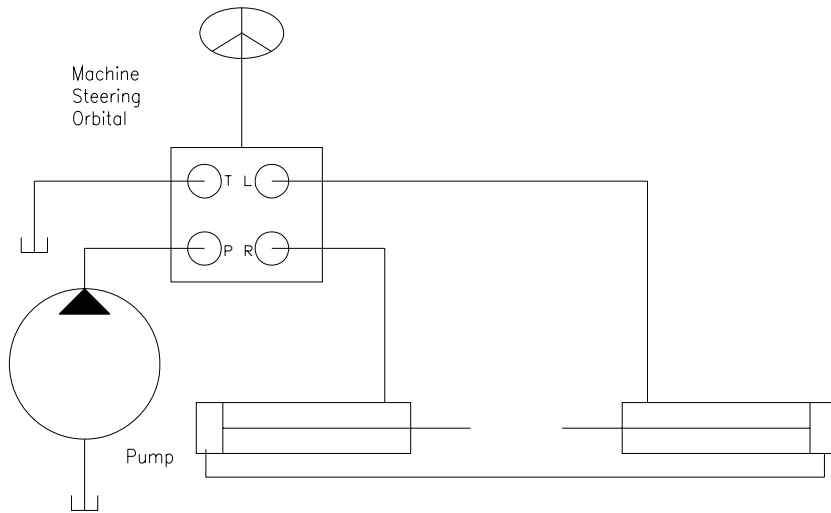
P/N 334-0003-024

A-PORT - CONTROLS LEFT STEERING
 B-PORT - CONTROLS RIGHT STEERING
 P-PORT - PRESSURE INPUT PORT INTO THE VALVE
 T-PORT - EXCESS FLOW PORT, RETURNING FLUID BACK TO THE TANK

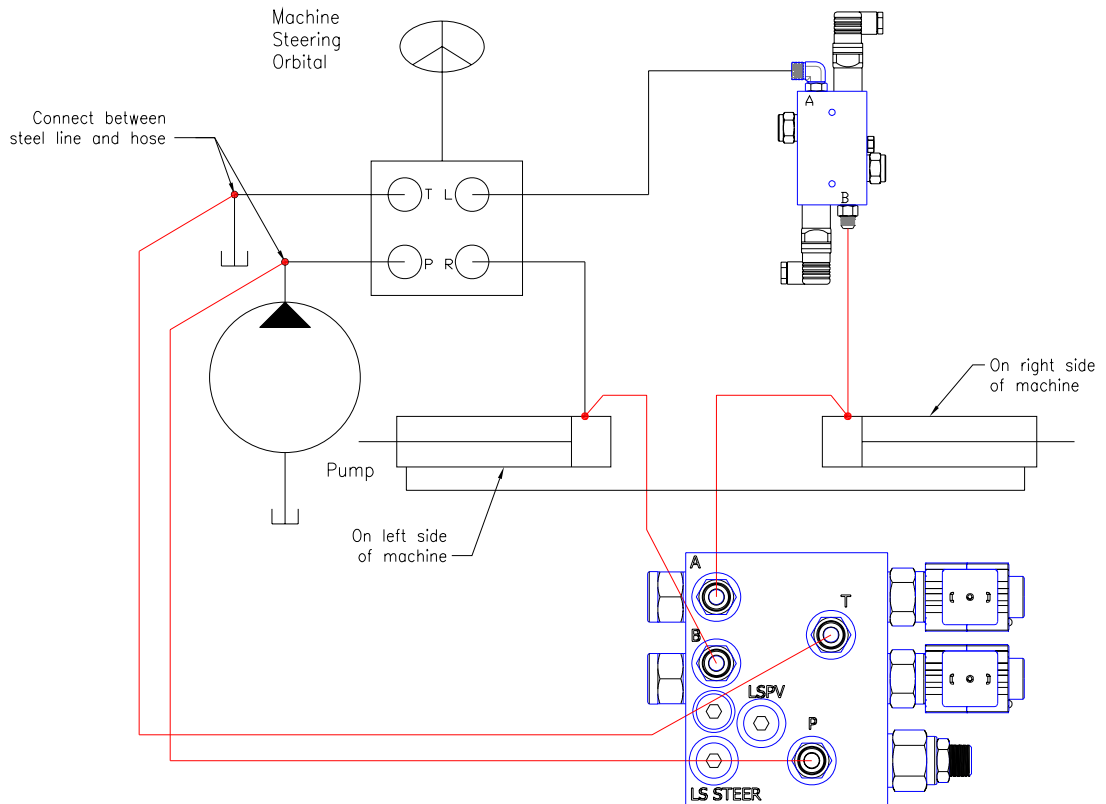
A-PORT - HOOKED TO LEFT STEER PORT ON TRACTOR ORBITAL
 B-PORT - HOOKED TO TEE FITTING CONNECTING LEFT STEER ON AUTO STEER VALVE TO LEFT STEER LINE ON TRACTOR

Hydraulic Steering Setup Before & After Installation

Before Smartrax Installation



After Smartrax Installation



Installing the Steering Control Valve and Flow Monitor Hoses

1. Left, Right, Pressure, & Tank connections are the same for pressure compensated systems as they are for load sense systems. (See page 7)
2. LS-PV, LS-Steer, & PS ports on valve need to be plugged for pressure compensated situations.

Installing the Hydraulic Override Switch (Pressure Compensated Systems Only)

Hydraulic Override Switch



"A" Port connects directly to the left (right) steer port on orbital

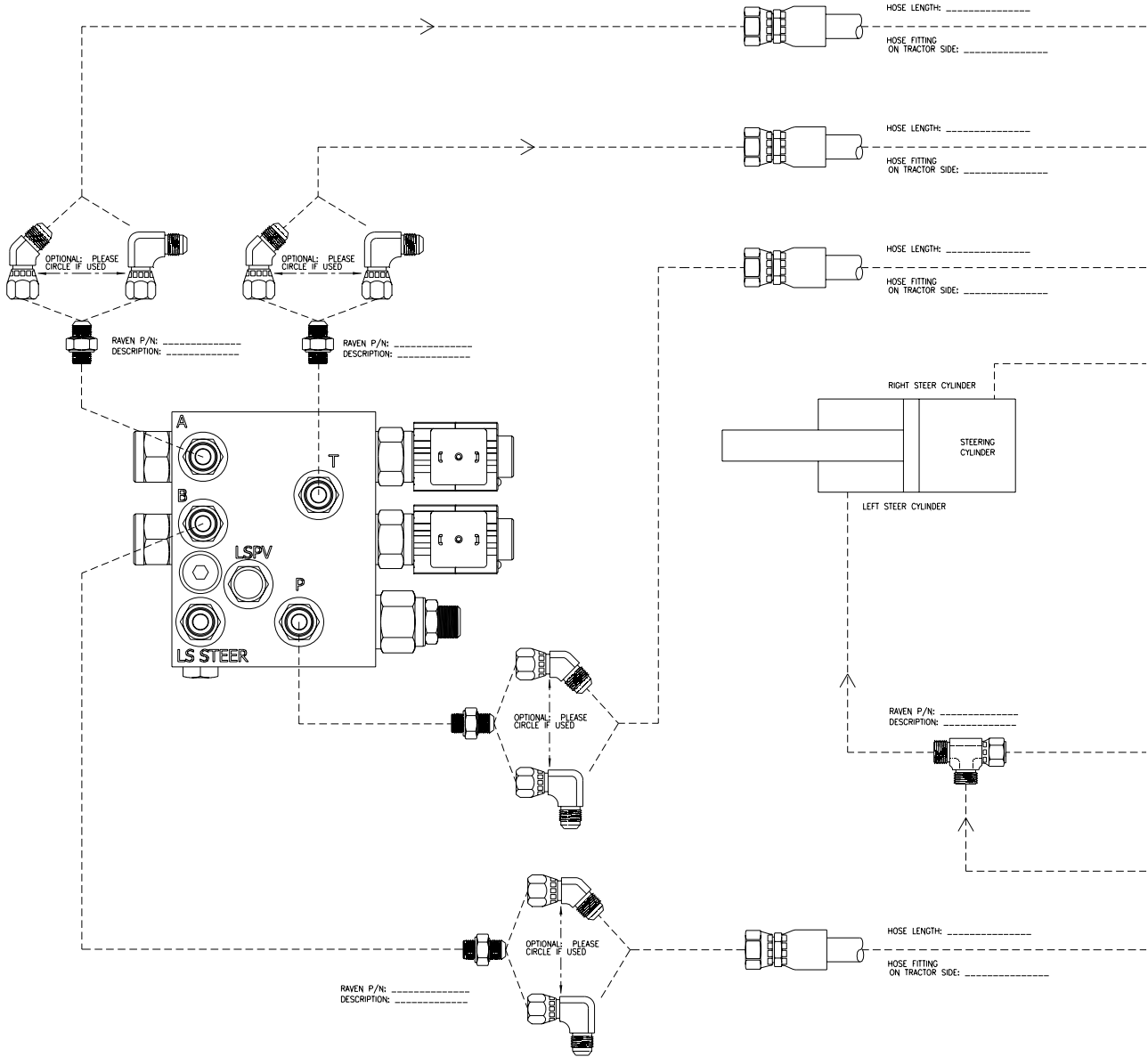
1/4" mounting holes

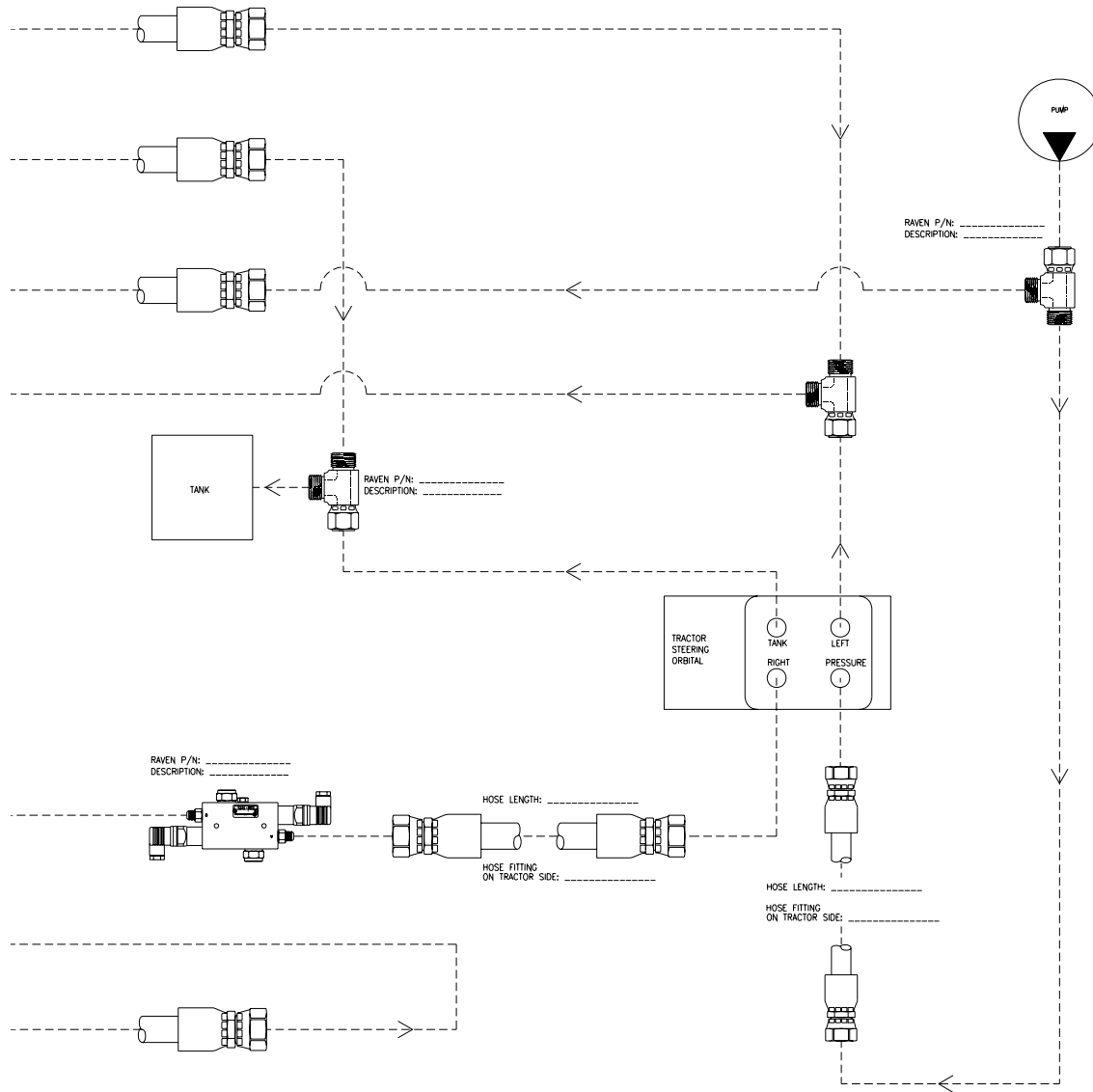
"B" port to tee connection to left (right) steer cylinder

Override switch installs in line in the Left (or Right) steering line coming from the machine steering orbital before the tee connection for the SmarTrax valve Left (A) or Right (B) steering line.

NOTE: There is no adjustment necessary for the override switch.

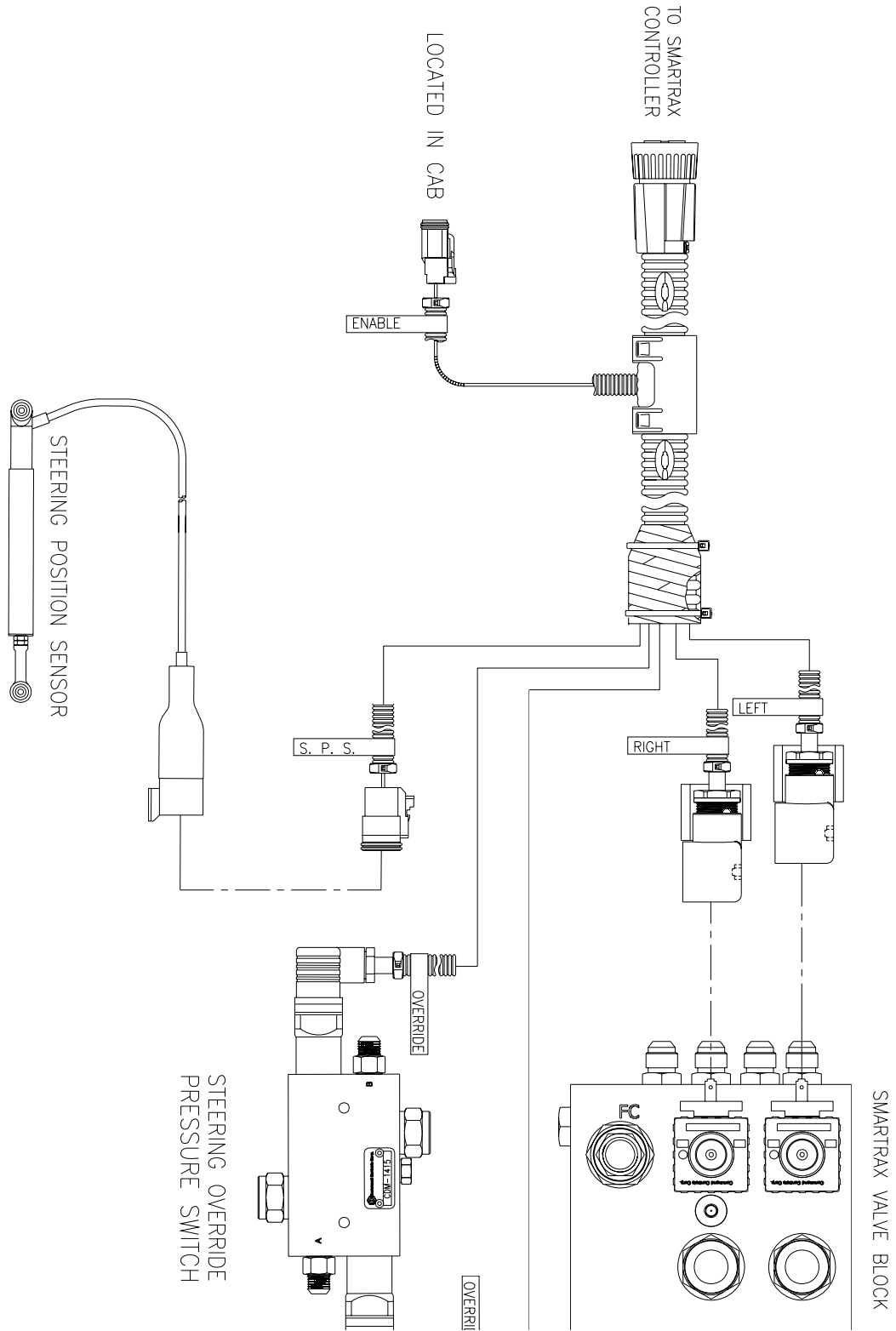
Universal Hydraulic Steering Kit Installation Guide for Closed Center, Load -Sensing & Pressure Compensated Systems





Wiring Harness Installation

NOTE: Left & Right connections are interchangeable if steering is backwards after installation.



CHAPTER

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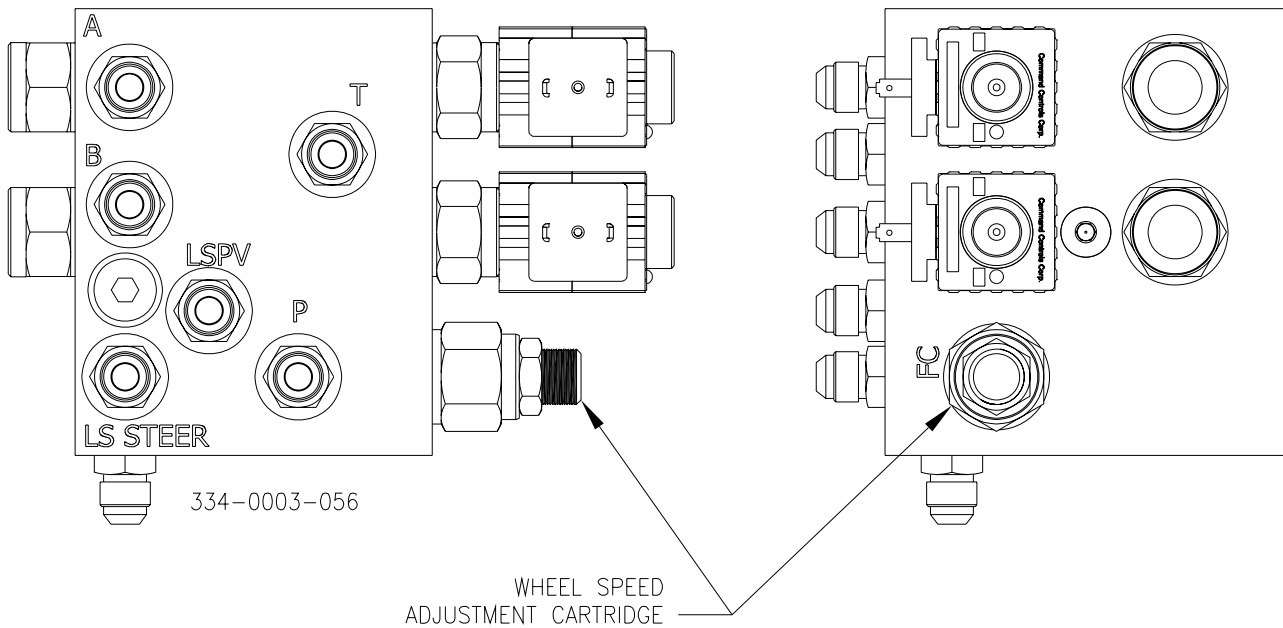
START-UP PROCEDURES

After installing the SmarTrax on your machine, follow these start-up procedures.

- ◆ Make sure the Steering Position Sensor does not over-extend or over-compress when turning the wheels.
- ◆ Turn the wheels fully from side to side numerous times to remove air from the hydraulic system.

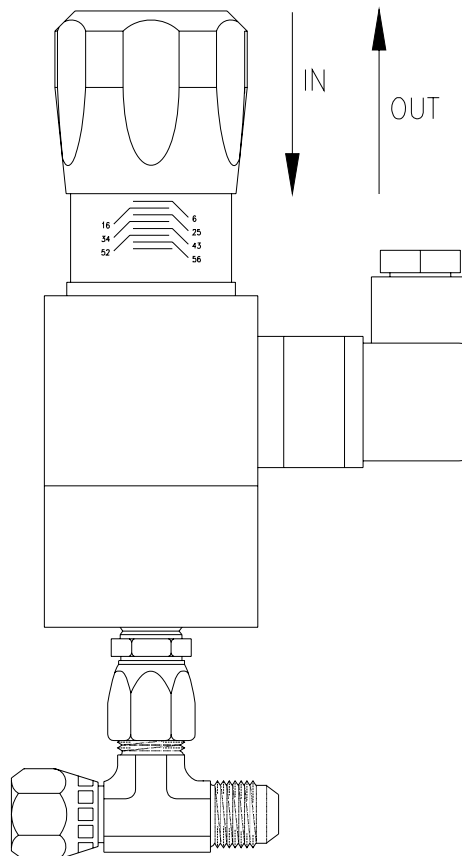
Setting the Valve Timing

- ◆ The steering control valve will come from the factory preset, however, flow rates to the cylinders may need to be adjusted to optimize the steering system.
- ◆ It is recommended that the lock-to-lock turning time should be approximately 15 seconds when running in direct mode. For PWM modes, time wheels to a lock-to-lock time of approximately 6 seconds or the max speed you desire the wheels to turn at when the machine is moving at typical spraying speeds.
- ◆ To change the valve timing, the cartridge in the “FC” port needs to be adjusted. First loosen the jam nut and then turn the adjustment screw in (clockwise) to slow the wheels down and out (counterclockwise) to speed up the wheels.
NOTE: Very small adjustments may need to be made to achieve the desired wheel timing.
- ◆ Retighten the jam nut when finished adjusting the wheel timing.



Setting the Override Pressure Switch (Load Sense Systems Only)

- ◆ The Override Pressure Switch must be set in order for the Auto-Steer system to disengage when the operator moves the steering wheel. Stopping the machine or pressing the remote activation switch can also disengage the Auto-Steer system.
- ◆ The pressure switch can not be set until the SmarTrax Controller is wired and all wiring to the hydraulic system is complete.
- ◆ To set the pressure switch, go to the Solenoid Configuration Menu on the SmarTrax Controller. Once at this menu, arrow down to the “<Les R>” screen. Refer to the SmarTrax Controller quick start guide for help on locating this screen.
- ◆ With the tractor running and no movement of the steering wheel, the “s” should display as lower case. If the “S” is capital, the pressure switch knob must be turned in until a lower case “s” is displayed.
- ◆ Once the display reads lower case “s” while the vehicle is running and stationary, begin to turn the steering wheel. When the wheel is turned, the “s” should turn into a capital “S” indicating that the system is deactivated. If this does not happen, the pressure switch knob must be turned out to the point where, when the wheel is turned, the “s” is displayed as a capital letter when turning the steering wheel.



NOTES:

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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.

R A V E N

SmarTrax™ Universal Hydraulic Steering Kit
(Closed Center, Load Sense & Pressure
Compensated Systems)
Installation Manual
(P/N 016-9001-021 Rev A 7/09)

Simply improving your position.™



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