

RAVEN

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SmarTrax™ Installation Manual



Miller Condor

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CHAPTER

1

Important Safety Information

NOTICE

Read this manual and the operation and safety instructions included with your implement and/or controller carefully before installing the SmarTrax™ system.

- Follow all safety information presented within this manual
- If you require assistance with any portion of the installation or service of your Raven equipment, contact your local Raven dealer for support.
- Follow all safety labels affixed to the SmarTrax 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: Miller

Model: Condor

Year:

Serial Number:

FIGURE 1. Miller Self Propelled Sprayer



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.

TABLE 1. Miller Condor SmarTrax Installation Kit (P/N 117-0195-083 or 117-0295-083)


Picture	Item Description	Part Number	Qty
(No Picture)	Manual - Miller Condor SmarTrax Installation	016-0190-083	1
	Sensor - Yaw - (not included with 117-0295-083 kit)	063-0172-684	1
	Cable - SmarTrax Console Harness	115-0171-775	1
	Bracket - Hydraulic Valve Mounting	116-0159-527	1
	Switch - SmarTrax Hydraulic Override (with Hardware)	422-0000-074	1
	Valve - SmarTrax Hydraulic	334-0003-064	1
	Label - Tampering Warning	041-0159-689	1
	Bolt - 5/16" Hex Head	311-0052-104	4
	Bolt - 3/8" UNC	311-0054-106	2

TABLE 1. Miller Condor SmarTrax Installation Kit (P/N 117-0195-083 or 117-0295-083)





Picture	Item Description	Part Number	Qty
	Nut - 3/8" Flanged Lock	312-1001-164	2
	Washer - 5/16" Split Lock	313-1000-019	4
	Washer - 3/8" Flat	313-2300-013	2

TABLE 2. Miller Condor SmarTrax Hydraulic Kit (P/N 117-0194-083)

Picture	Item Description	Part Number	Qty
	Fitting - 13/16" ORFS (M/M/F) Swivel Run Tee	333-0012-028	1
	Fitting - 9/16" JIC (M/F) 90° Swivel Elbow	333-0012-042	3
	Fitting - 3/4" JIC (M/F) 90° Swivel Elbow	333-0012-064	2
	Fitting - 13/16" ORFS (M/F) 90° Swivel Elbow	333-0012-067	2
	Fitting - 11/16" ORFS (M/M/F) Swivel Run Tee	333-0012-069	2
	Fitting - 13/16" ORFS (M/M) Adapter	333-0012-070	1

TABLE 2. Miller Condor SmarTrax Hydraulic Kit (P/N 117-0194-083)

Picture	Item Description	Part Number	Qty
	Hose - 9/16" ORFS (F) to 3/4" JIC (F), 27"	214-1000-069	2
	Hose - 11/16" ORFS 90° (F) to 9/16" JIC (F), 80"	214-1000-485	1
	Hose - 13/16" ORFS (F) to 9/16" JIC (F), 20"	214-1000-486	1
	Hose - 11/16" ORFS (F) 90° to 9/16" JIC (F), 70"	214-1000-487	1

CHAPTER

3

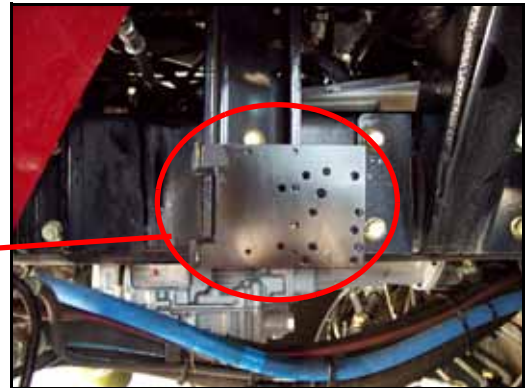
*Mounting the
SmarTrax Hydraulic
Valve*

Install the Hydraulic Valve Mounting Bracket

1. The hydraulic valve mounting bracket (P/N 116-0159-527) should be mounted to the cab support on the right side of the machine in front of the hydraulic tank.

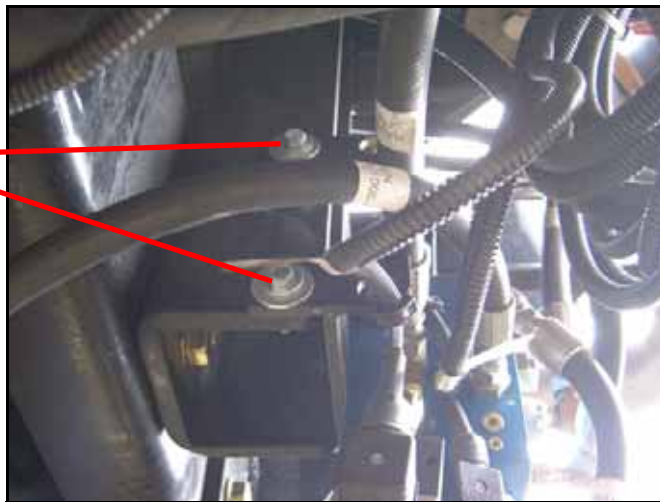


SmarTrax
Hydraulic valve
mounting location



2. Holes will need to be drilled in the cab support to bolt the mounting bracket.

Holes Drilled in
Cab Support



3. Use the supplied 3/8" bolts (P/N 311-0054-106), flat washers (P/N 313-2300-013), and lock nuts (P/N 312-1001-164) to secure the mounting bracket to the cab support.

Mount the SmarTrax Hydraulic Valve

Mount the SmarTrax hydraulic valve (P/N 334-0003-064) to the mounting bracket using the supplied 5/16" bolts (P/N 311-0052-104) and lock washers (P/N 311-1000-019).

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 block 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 tamper 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 are 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.



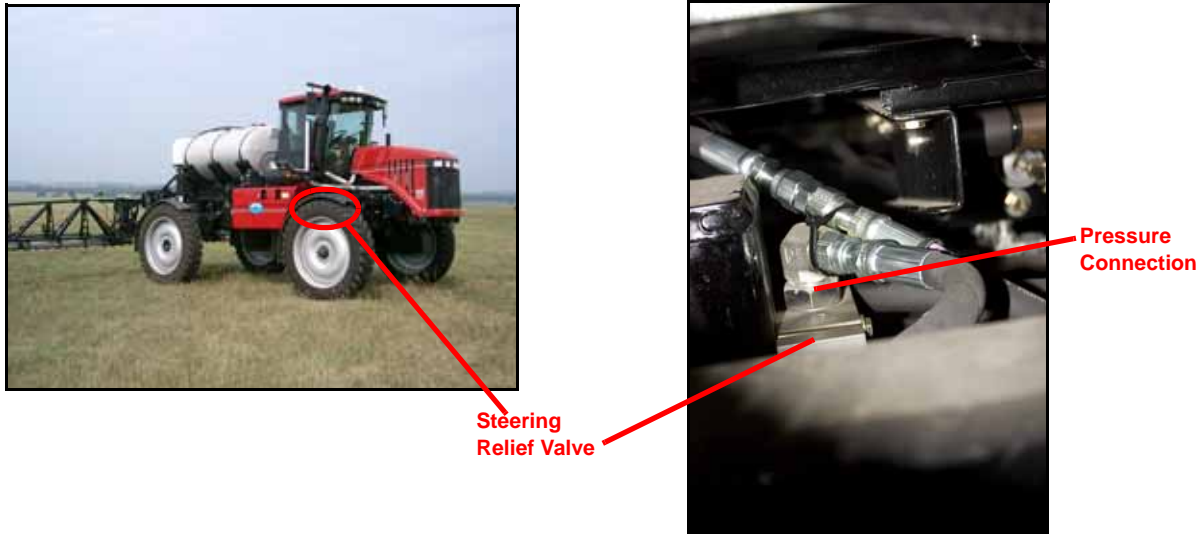
⚠ CAUTION

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.

Install the Pressure Hose

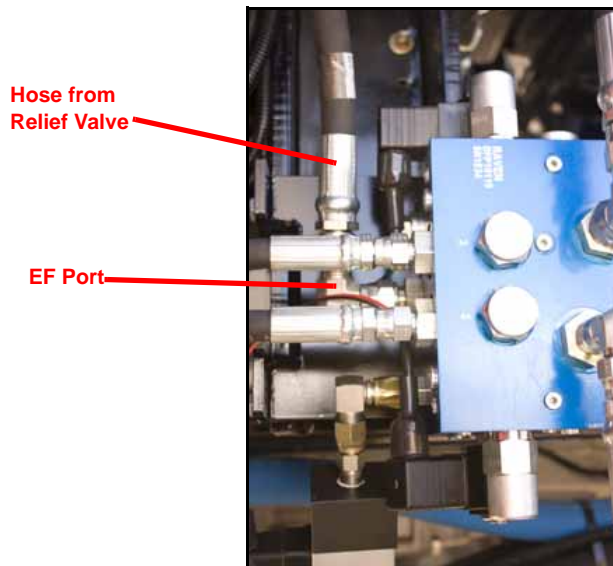
1. Locate the relief valve mounted on the back side of the cab support to which the SmarTrax Valve is mounted.

FIGURE 1. Existing Relief Valve Location



2. Disconnect the existing pressure hose from the top of the relief valve.
3. Install the supplied fitting (P/N 333-0012-070) to the hose disconnected in step 2.
4. Connect the supplied hose (P/N 214-1000-069) to the installed fitting and route to the 'EF' port on the SmarTrax valve using the supplied 90° elbow fitting (P/N 333-0012-064).

FIGURE 2. SmarTrax Block Hydraulic Connections

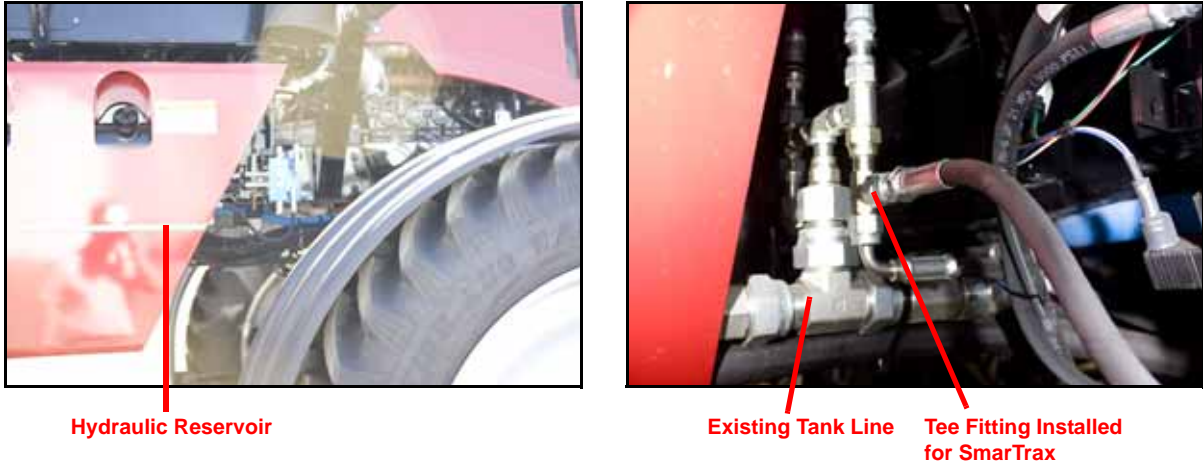


5. Insert a supplied 90° elbow fitting (P/N 333-0012-067) to the port on the relief valve from which the hose was disconnected in step 2.
6. Connect the supplied hose (P/N 214-1000-069) to the installed elbow fitting and route to the 'P' port on the SmarTrax valve. A supplied elbow fitting (P/N 333-0012-064) may be installed on the SmarTrax block for hose routing purposes.

Install the Tank Hose

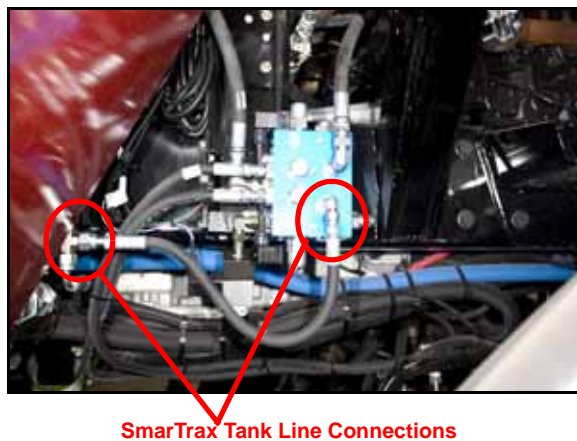
1. Locate the hydraulic reservoir on the right side of the machine and the existing tank line.

FIGURE 3. Hydraulic Reservoir



2. Disconnect one of the tank lines feeding into the reservoir.
3. Connect the supplied tee fitting (P/N 333-0012-028) onto the existing line and reconnect the existing machine hose to the installed tee fitting. Use the supplied elbow fitting (P/N 333-0012-067) if necessary to help with hose routing.
4. Connect the supplied hose (P/N 214-1000-486) to the remaining connector on the installed tee fitting and route to the 'T' port on the SmarTrax valve block. A supplied elbow fitting (P/N 333-0012-042) may be installed on the SmarTrax block for hose routing purposes.

FIGURE 4. SmarTrax Tank Line



Install the Left & Right Steer Hoses

1. Locate the base end of the left steering cylinder.
2. Disconnect the hose connected to the base of the hydraulic steering cylinder.

3. Install a supplied tee fitting (P/N 333-0012-069) to the base of the steering cylinder and reconnect the existing hose to the installed tee fitting.

FIGURE 5. Steering Cylinder Connections

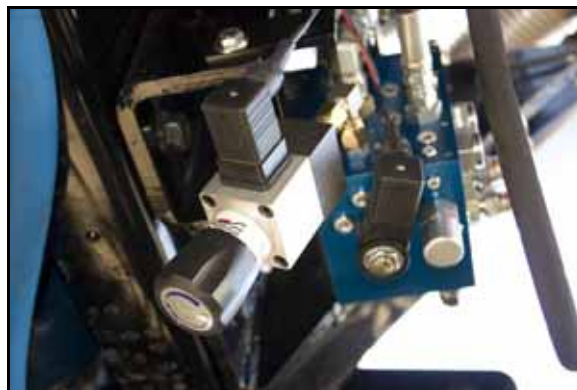


4. Connect the supplied hose (P/N 214-1000-487) to the installed tee fitting and route to the 'A' port on the SmarTrax valve. A supplied elbow fitting (P/N 333-0012-042) may be installed on the SmarTrax block for hose routing purposes.
5. Repeat step 1 through step 4 to connect the right steering cylinder to port 'B' on the SmarTrax valve using the supplied hose (P/N 214-1000-485).

Install the Pressure Switch

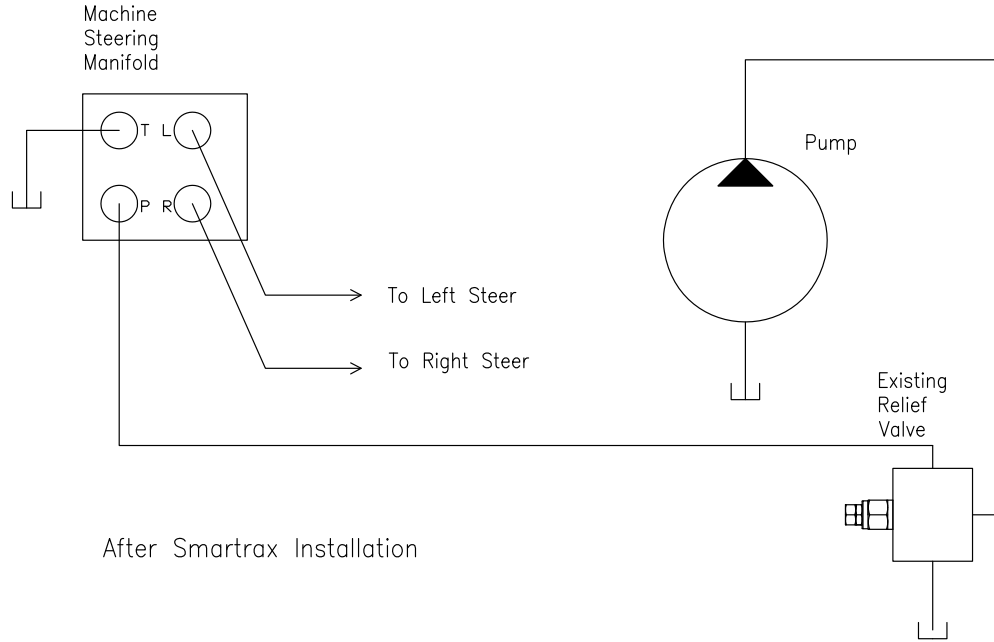
Install the steering override pressure switch (P/N 422-0000-074) on the 'PS' port of the SmarTrax valve.

FIGURE 6. Steering Override Pressure Switch

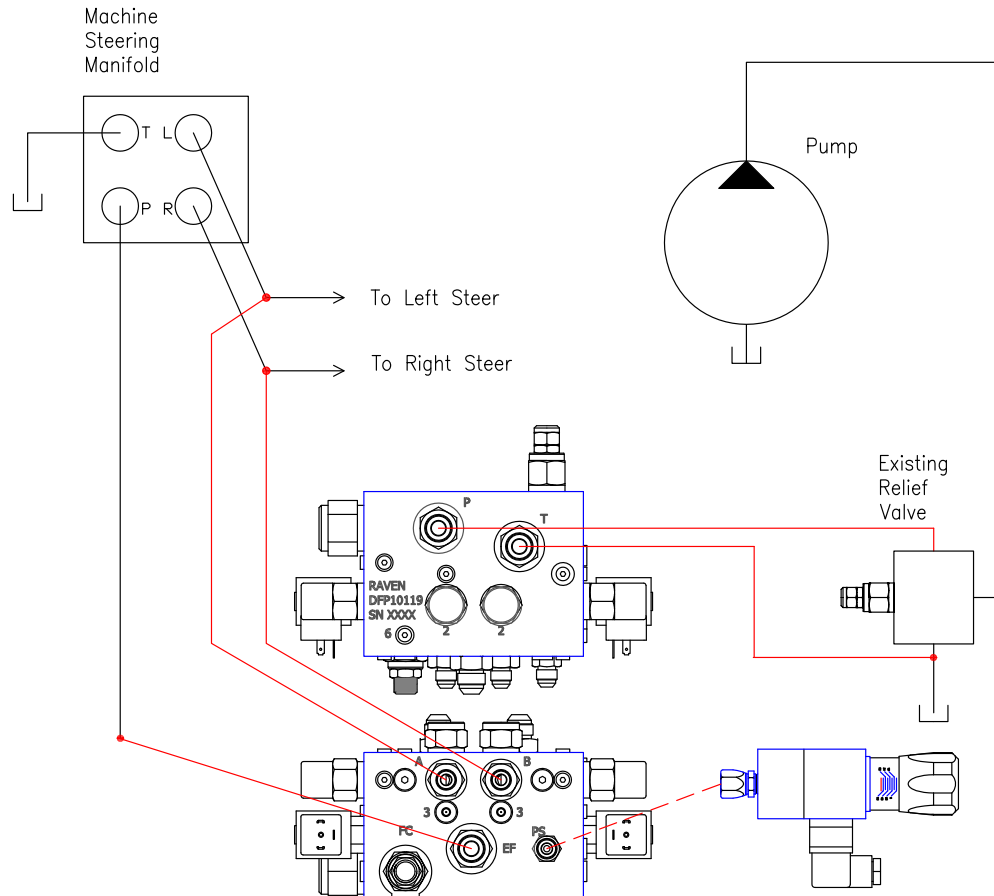


SmarTrax Hydraulic Installation Schematic

Before Smartrax Installation



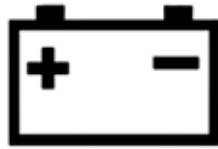
After Smartrax Installation



CHAPTER

5

Wiring & Electrical Connections



⚠ CAUTION

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

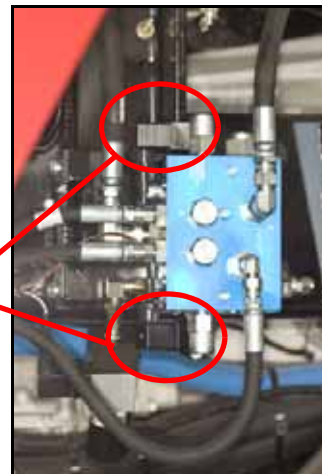
Connect the SmarTrax Hydraulic Valve

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 334-0003-064).
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 screw on the connector to secure the solenoid connection.
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



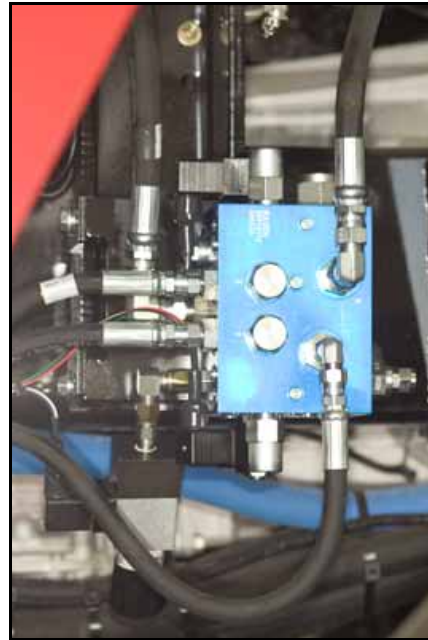
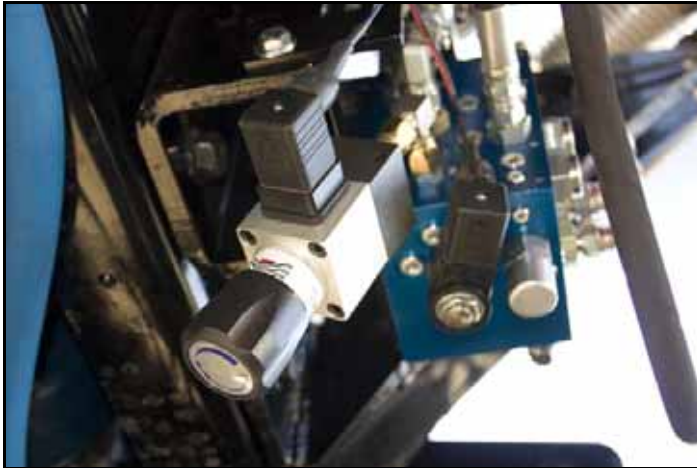
Solenoid Connections



Connect the Pressure Override Switch

1. On the console cable harness (P/N 115-0171-775), identify the connector labeled 'OVERRIDE.'
2. Connect that 'OVERRIDE' connector to the pressure override switch.
3. Tighten the screw on the connector to secure the solenoid connection.

FIGURE 2. Pressure Override Switch Connection



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 3. Foot Switch Mounting Example



Mount the SmarTrax Controller

Note: This section does not apply to the 117-0295-083 SmarTrax kit.

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

- 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 115-0171-775) 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

Note: This section does not apply to the 117-0295-083 SmarTrax kit.

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

- 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 115-0171-775).
4. Insert this connector to the yaw sensor cable connection.

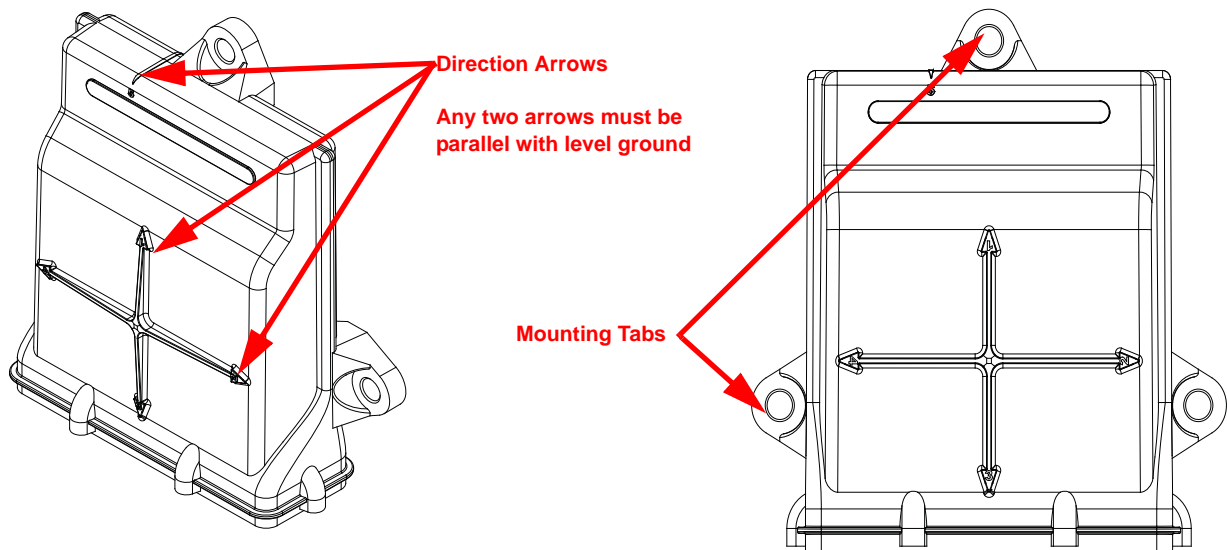
Install the SmarTrax Node

Note: The following procedure applies only to the 117-0295-083 SmarTrax installation kit.

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 pointing straight in the direction of forward travel and one arrow must point straight up. Note the number of the arrow corresponding to forward travel for SmarTrax calibration.
- 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 4. 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 in the floor. 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) and SmarTrax console cable harness (P/N 115-0171-775).
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.
8. Route the power leads to the vehicle's battery and connect.
 - a. Connect the red power leads on the positive battery terminal.
 - b. Connect the black power leads on the negative battery terminal.

FIGURE 5. Valve Harness Installation Schematic for 117-0195-083 Kits

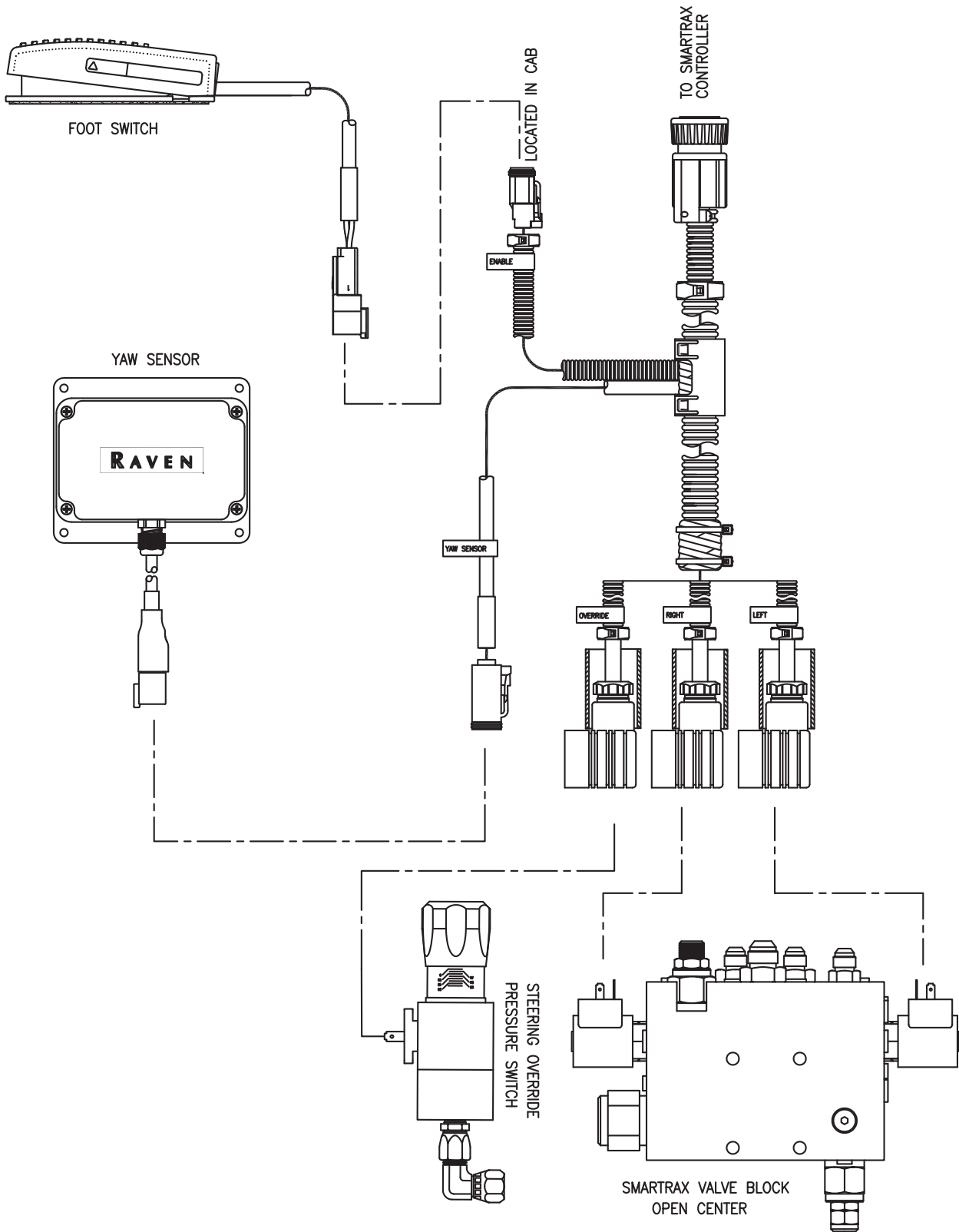
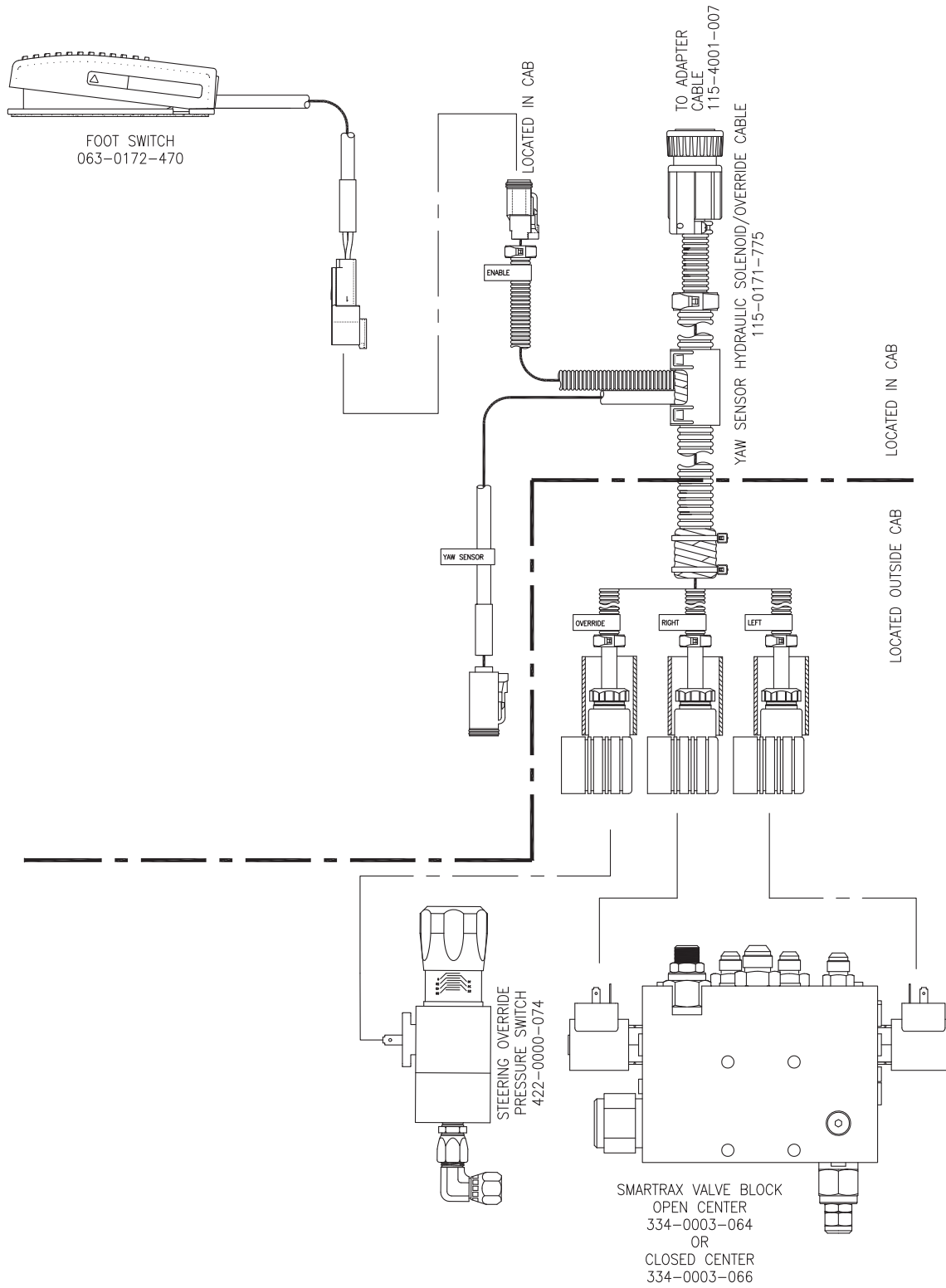


FIGURE 6. Valve Harness Installation Schematic for 117-0295-083 Kits



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 on 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.

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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

Miller Condor
SmarTrax™ Installation Manual
(P/N 016-0190-083 Rev D 9/09)

Simply improving your position.™



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