

VSN/RDR Installation  
Manual for NH SP370,  
SP410 / Miller 7370, 7410  
Front Boom Sprayers  
MY19+

*016-2022-015 Rev. A*

*10/2020*

*E35986*



## 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 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, this system or any of its components. Raven Industries shall not be held responsible for any modifications or repairs made outside our facilities, nor damages resulting from inadequate maintenance of this system.

As with all wireless and satellite signals, several factors may affect the availability and accuracy of wireless and satellite navigation and correction services (e.g. GPS, GNSS, SBAS, etc.). Therefore, Raven Industries cannot guarantee the accuracy, integrity, continuity, or availability of these services and cannot guarantee the ability to use Raven systems, or products used as components of systems, which rely upon the reception of these signals or availability of these services. Raven Industries accepts no responsibility for the use of any of these signals or services for other than the stated purpose.

---

<b>Chapter 1</b>	<b>Important Safety Information.....</b>	<b>1</b>
General .....		2
Instructions for Wire Routing .....		2
<b>Chapter 2</b>	<b>Introduction.....</b>	<b>5</b>
Preparing for Installation .....		5
Prerequisites .....		5
Recommendations .....		5
Point of Reference .....		5
Updates .....		6
Kit Contents .....		7
<b>Chapter 3</b>	<b>Installation .....</b>	<b>9</b>
Mount VSN .....		9
Install Radar .....		12
System Diagram .....		14
Route the Cables .....		15
Cabling and Connection .....		19
Optional Ethernet Cable .....		19
Install Standalone Height Sensor (If Applicable) .....		20



---

# 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 VSN 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 VSN system components. Be sure to keep safety labels in good 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 VSN, observe the following safety measures:

- Be alert and aware of surroundings.
- Do not operate VSN or any agricultural equipment while under the influence of alcohol or an illegal substance.
- Remain in the operator's position or a safe working distance away from the booms at all times when VSN is engaged.
- Disable VSN when exiting from the operator's seat and machine.
- Do not drive the machine with VSN enabled on any public road.
- Determine and remain a safe working distance from other individuals. The operator is responsible for disabling VSN when the safe working distance has diminished.
- Ensure VSN is disabled prior to starting any maintenance work on VSN or the machine.

## WARNING

- The machine must remain stationary and switched off, with the booms unfolded and supported, during installation or maintenance.

## CAUTION

---

### GENERAL

- 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.
- A minimum of 12 VDC is required for system operation with a maximum of 15 VDC.

---

### INSTRUCTIONS FOR WIRE ROUTING

The word “harness” is used to mean all electrical leads and cables, bundled and unbundled. When installing harness, secure it at least every 30 cm (12in) to the frame. Follow existing harness as much as possible and use these guidelines:

Harness should not contact or be attached to:

- Lines and hoses with high vibration forces or pressure spikes
- Lines and hoses carrying hot fluids beyond harness component specifications

Avoid contact with any sharp edge or abrading surfaces such as, but not limited to:

- Sheared or flame cut edges
- Edges of machined surfaces
- Fastener threads or cap screw heads
- Ends of adjustable hose clamps
- Wire exiting conduit without protection, either ends or side of conduit
- Hose and tube fittings

Routing should not allow harnesses to:

- Hang below the unit
- Have the potential to become damaged due to exposure to the exterior environment. (i.e. tree limbs, debris, attachments)
- Be placed in areas of or in contact with machine components which develop temperatures higher than the temperature rating of harness components
- Wiring should be protected or shielded if it needs to route near hot temperatures beyond harness component specifications

Harnessing should not have sharp bends

Allow sufficient clearance from machine component operational zones such as:

- Drive shafts, universal joints and hitches (i.e. 3-point hitch)
- Pulleys, gears, sprockets
- Deflection and backlash of belts and chains
- Adjustment zones of adjustable brackets

- Changes of position in RS1 HD and suspension systems
- Moving linkages, cylinders, articulation joints, attachments
- Ground engaging components

For harness sections that move during machine operation:

- Allow sufficient length for free movement without interference to prevent: pulling, pinching, catching or rubbing, especially in articulation and pivot points
- Clamp harnesses securely to force controlled movement to occur in the desired harness section
- Avoid sharp twisting or flexing of harnesses in short distances
- Connectors and splices should not be located in harness sections that move

Protect harnesses from:

- Foreign objects such as rocks that may fall or be thrown by the unit
- Buildup of dirt, mud, snow, ice, submersion in water and oil
- Tree limbs, brush and debris
- Damage where service personnel or operators might step or use as a grab bar
- Damage when passing through metal structures

**IMPORTANT:**

- Avoid directly spraying electrical components and connections with high pressure water. High pressure water sprays can penetrate seals and cause electrical components to corrode or otherwise become damaged. When performing maintenance:
- Inspect all electrical components and connections for damage or corrosion. Repair or replace components, connections, or cable as necessary.
- Ensure connections are clean, dry, and not damaged. Repair or replace components, connections, or cable as necessary.
- Clean components or connections using low pressure water, pressurized air, or an aerosol electrical component cleaning agent.
- Remove visible surface water from components, connections, or seals using pressurized air or an aerosol electrical component cleaning agent. allow components to dry completely before reconnecting cables.



Congratulations on your purchase of the VSN system!

The following instructions are designed to assist with the proper installation of the VSN system. Refer to the VSN Calibration & Operation Manual (P/N 016-2020-001) for assistance with calibrating and using the VSN system.

---

### PREPARING FOR INSTALLATION

Before installing the VSN system, park the machine where the ground is level, clean, and dry. Turn off the machine and leave it turned off for the duration of the installation process.

During the installation process, follow good safety practices. Be sure to carefully read the instructions in this manual to complete the installation process.

### PREREQUISITES

The following components must be installed with the VSN system.

- VSN version 20.4 or newer
- RS1™
- Viper® 4 with ROS version 3.4 or newer

Follow the installation instructions provided with these components before installing VSN.

### RECOMMENDATIONS

Raven Industries recommends the following best practices when installing or operating the VSN system for the first time or at the start of the season:

- Install the VSN unit in the recommended location.
- Use part numbers to help identify parts.
- Do not remove the plastic wrap from a part until it is necessary for installation.

### POINT OF REFERENCE

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

## UPDATES

Software and manual updates are available on the Raven Applied Technology website:

<http://www.ravenprecision.com>

At Raven Industries, we strive to make your experience with our products as rewarding as possible. One way to improve this experience is to provide us with feedback on this manual.

Your feedback will help shape the future of our product documentation and the overall service we provide. We appreciate the opportunity to see ourselves as our customers see us and are eager to gather ideas on how we have been helping or how we can do better.

To serve you best, please send an email with the following information to

[techwriting@ravenind.com](mailto:techwriting@ravenind.com)

-VSN/RDR Installation Manual for NH SP370, SP410 / Miller 7370, 7410 Front Boom Sprayers MY19+

-016-2022-015 Rev. A

-Any comments or feedback (include chapter or page numbers if applicable).

-Let us know how long have you been using this or other Raven products.

We will not share your email or any information you provide with anyone else. Your feedback is valued and extremely important to us.

Thank you for your time.

## KIT CONTENTS

This section contains a list of the components that are included in the VSN kit. Before beginning the system installation, compare the items in the kit with the components on this list. If you have questions about the kit, contact your Raven dealer.

FIGURE 1. VSN Installation Kit for NH/Miller Front Boom Sprayers MY19+ (P/N 117-2022-013 Rev. A)

QTY	PART #	DESCRIPTION
1	053-0159-087	BOX, SHIPPING
1	016-0171-649	SHEET, WARRANTY/HELP (016-2022-013)
1	107-0172-642	SHIELD, DEBRIS, VSN
1	107-0172-700	BRACKET, VSN BOTTOM, NH/MILLER FRONT BOOM SPRAYERS
1	107-0172-701	BRACKET, VSN SPACER, NH/MILLER FRONT BOOM SPRAYERS,
1	115-2020-008	CABLE, VSN, CAB
1	115-2020-018	CABLE, VSN, NH/MILLER, MY 19 and NEWER
1	116-0159-835	WELDMENT, VSN, CRADLE MOUNT, GENERIC
1	116-0159-837	WELDMENT, VSN MOUNT
1	116-0159-849	WELDMENT, VSN TOP BRACKET, NH/MILLER FRONT BOOM SP
1	053-0159-074	ENVELOPE, PLASTIC
18	311-4055-180N	BOLT, M8-1.25 X 25MM, CLASS V COATING
1	311-4056-183N	BOLT, M8-1.25 X 40MM, CLASS V COATING
3	311-4056-226N	BOLT, M10-1.50 X 40, 10.9, CLASS V COATING
15	312-6001-027N	NUT, NYLOC, M8-1.25, CLASS V COATING
3	312-6001-041N	NUT, M10-1.50, CLASS 6, CLASS V COATING
4	313-5001-007	GASKET, VITON, .29 I.D. x .688 O.D. x .062 THK
34	313-6000-013N	WASHER, M8, CLASS V COATING
6	313-6000-016N	WASHER, M10, CLASS V COATING
4	313-6001-013N	WASHER, LOCK, M8, CLASS V COATING



FIGURE 2. (Optional) Radar Row Guidance Kit for NH 370, 410 / Miller 7370, 7410 (P/N 117-2022-011 Rev. C)

QTY	PART #	DESCRIPTION
1	053-0159-180	BOX, SHIPPING
2	063-0174-125	RADAR, MULTI OBJECT DISTANCE SENSOR
2	107-0172-690	BRACKET, MULTI OBJECT DISTANCE SENSOR, BASE *REMOVED
2	107-0172-692	BRACKET, NH/MILLER FRONT BOOM, MOUNT, MULTI OBJECT
1	115-2020-019	CABLE, FULL CANOPY, FRONT BOOM
1	016-0171-649	SHEET, WARRANTY/SHEET (016-2022-011)
2	116-0159-860	WELDMENT, MULTI-OBJECT DISTANCE SENSOR, COVER
2	107-0172-721	SHIELD, PLASTIC, MULTI-OBJECT DISTANCE SENSOR
2	107-0172-722	BRACKET, SHIELD, MULTI-OBJECT DISTANCE SENSOR
1	053-0159-074	ENVELOPE, PLASTIC
14	311-4056-224N	HEX, BOLT, DIN 933, M10 X 1.5 X 30MM
4	311-4056-137N	HEX, BOLT, DIN 933, M6 X 1 X 25MM
20	313-6000-016N	WASHER, M10, STEEL, CLASS V
8	313-6000-010N	WASHER, M6, STEEL, CLASS V
8	313-6001-016N	WASHER, SPRING LOCK, DIN 127-M10
4	312-6001-016N	HEX NUT, NYLOC, DIN 985, M6
6	312-6001-041N	HEX NUT, NYLOC, DIN 985, M10
4	311-4055-444N	HEX, BOLT, DIN 933, M20 X 2.5 X 55MM
8	313-6000-031N	WASHER, M20, STEEL, CLASS V
4	312-6001-106N	HEX NUT, NYLOC, DIN 985, M20
8	311-4055-180N	BOLT, M8-1.25X25MM, CLASS V COATING
8	313-6000-013N	WASHER, M8, CLASS V COATING
8	313-6001-013N	WASHER, LOCK, M8, CLASS V COATING

### MOUNT VSN

1. Locate and tilt down the front plastic trim.

FIGURE 1. Frame



2. Locate the center trim bracket and the two bolts securing the bracket.
3. Remove the rubber socket from the steel bracket.

FIGURE 2. Two Bolts to be Removed



NOTE: Keep the rubber socket and bolt as they will be reinstalled on the new bracket.

4. Install the previously removed rubber socket in the slotted hole on the rear bracket so the plastic trim piece is secured as it was before removal.

FIGURE 3. Rubber Bumper Installed on Installed Bracket with Front Trim Secured



5. Secure the mounting bracket

FIGURE 4. Securing Bolts for Mounting Bracket

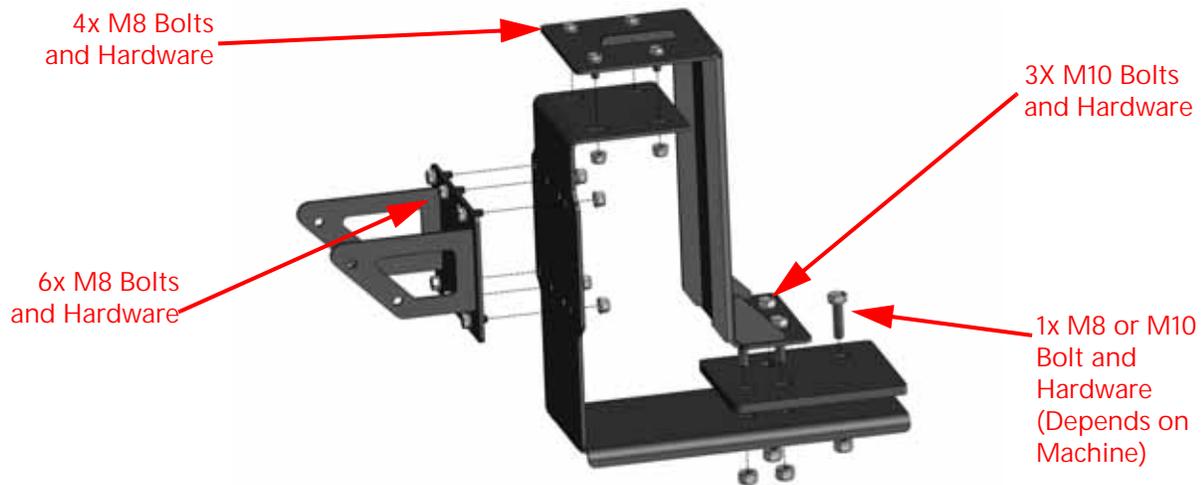


FIGURE 5. Mounting Bracket Installed



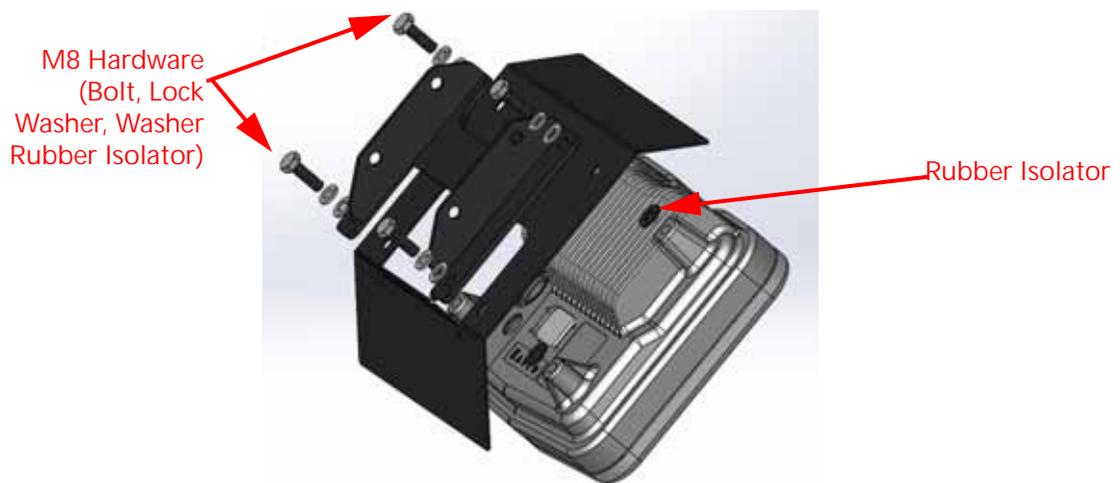
- Tighten all bolts and ensure no hoses are rubbing on the new bracket.

FIGURE 6. Tightened Bolts and Hoses



- Assemble the VSN subassembly as pictured in Figure 7, "VSN Subassembly," below.

FIGURE 7. VSN Subassembly



- Secure the VSN subassembly to the machine brackets with the included M8 hardware.

FIGURE 8. Installed VSN



## INSTALL RADAR

1. Remove the wheel motor covers on both front axles.

FIGURE 9. Removed Wheel Motor Covers



2. Install the brackets and radar sensors to each side, orientating the sensors at a 45 degree angle forward. The mounting holes will ensure the proper angle is achieved.

FIGURE 10. Lower Assembly and Small Frame Assembly



**NOTE:** Prior to installing the sensor cover, record the serial number and whether the sensor is installed on the right or left side of the machine.

The sensor covers should be installed after the cabling is routed.

3. Make note of the serial number listed on the radar sensor.

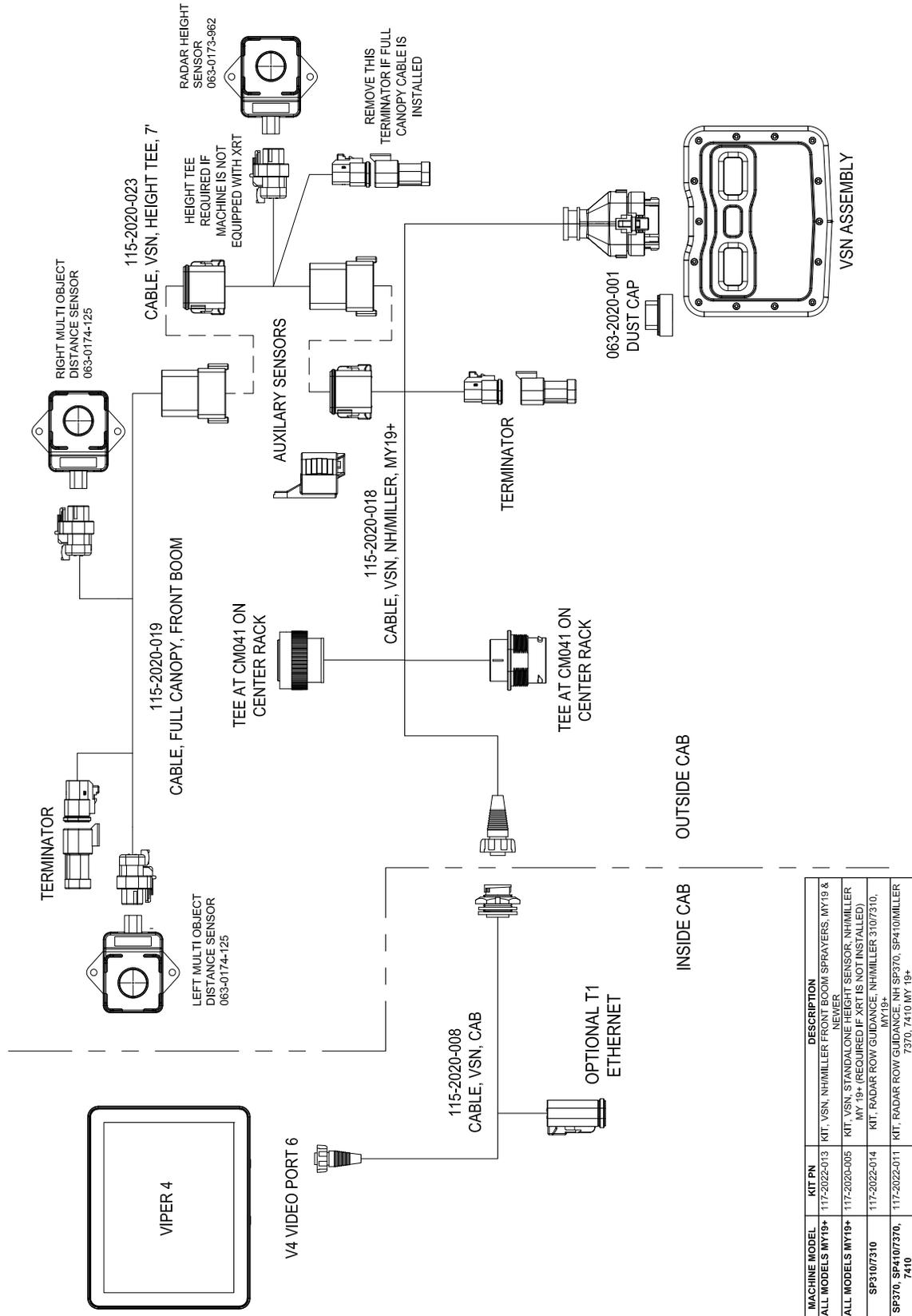
FIGURE 11. Serial Number Location



NOTE: It is important to record the serial number. The radar device will be covered by a cover plate.

SYSTEM DIAGRAM

FIGURE 12. VSN for NH/Miller Front Boom Sprayers MY 19+ (P/N 054-2022-013 Rev. B)



## ROUTE THE CABLES

1. Identify the VSN Visual Guidance cable (P/N 115-2020-018)
2. Disconnect the CM041 connection on the boom.

FIGURE 13. CM041 Connection



**IMPORTANT:** Ensure to route the cables along all of the hoses that lead to the drive motor to allow for the machine to change tread width without damaging cables.

Do not allow the cables to hang anywhere under the machine to prevent cable damage from crops.

3. Tee in the 115-2020-018 cable into this connection by removing the factory connector nut and making the tee connection on the front side of the center rack.
4. Route the VSN connector up and along the boom between the boom frame and front blue cover.
5. Plug the VSN connector into the VSN from below.

FIGURE 14. VSN Connection



6. Route the analog video cable down the lift arms, following hoses and ensuring plenty of slack in the cable near the boom main frame.

7. Route the analog video cable under the cab to the preferred place to drill a hole in the floor of the cab.

NOTE: Failure to properly route cabling will result in premature cable wear in high-crop conditions.

8. Safely and carefully drill a hole in the preferred location in the floor of the cab.

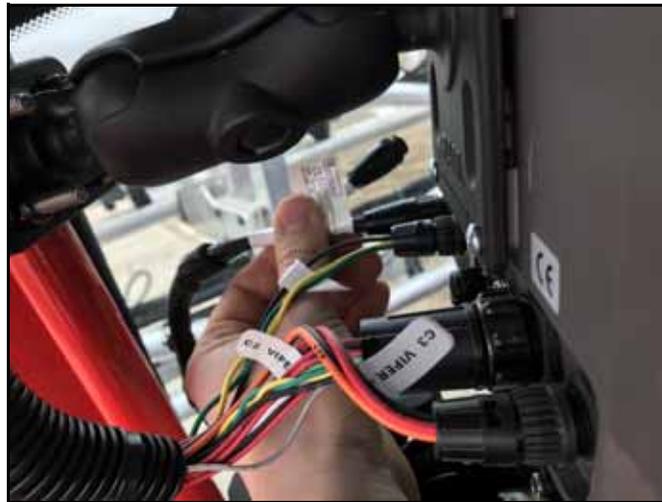
NOTE: Ensure there is enough slack in the cable to be routed next to the drilled hole in the floor of the cab.

Ensure the drilled hole does not interfere with other cables or electronics in the cab.

9. Connect the analog video end of the 115-2020-008 cable to port 6 on the Viper 4.

FIGURE 15. Viper 4 Connection

---



10. Route the bulkhead end of the cable through the hole in the floor and connect to the analog video breakout previously routed on the 115-220-018 cable.

11. Connect the 115-2020-019 radar sensor cable to the 12-pin Aux Sensor connector on the 115-2020-018 cable.

12. Route the cable down the lift arms and first to the front right tire, making sure to follow hydraulic hoses to account for suspension travel, steering movement, and change in width if applicable.

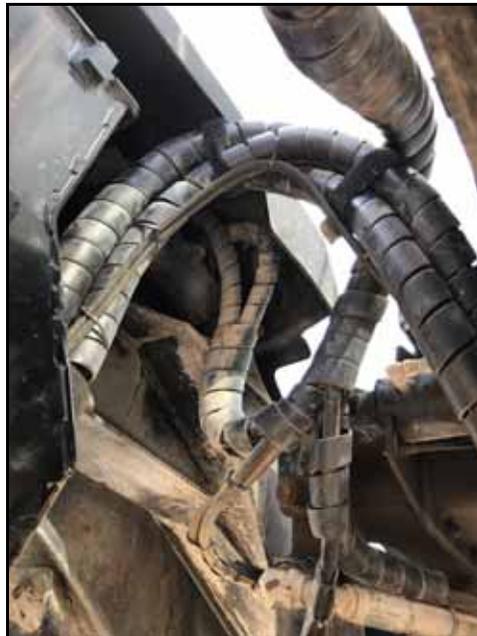
13. Route the remaining cabling to the other side of the machine and it will be connected to the front left sensor.

FIGURE 16. Cable Routing



14. Once connected, use zipties to secure the cabling and replace the factory shields.

FIGURE 17. Cables Ziptied



15. Install the sensor covers.

16. Install the protective covers using the hold-down bracket and M8 hardware.

FIGURE 18. Protective Covers Installed



17. Connect the 23-pin connection to the VSN.

18. Verify proper steering clearance is achieved by turning the tires back and forth and ensure no cables are tight.

19. Continue to verify proper steering clearance by raising and lowering the boom and ensure no cables are tight.

**NOTE:** Ensure the installed radar brackets will not interfere with the valve stem of the tire when the wheel rotates.

---

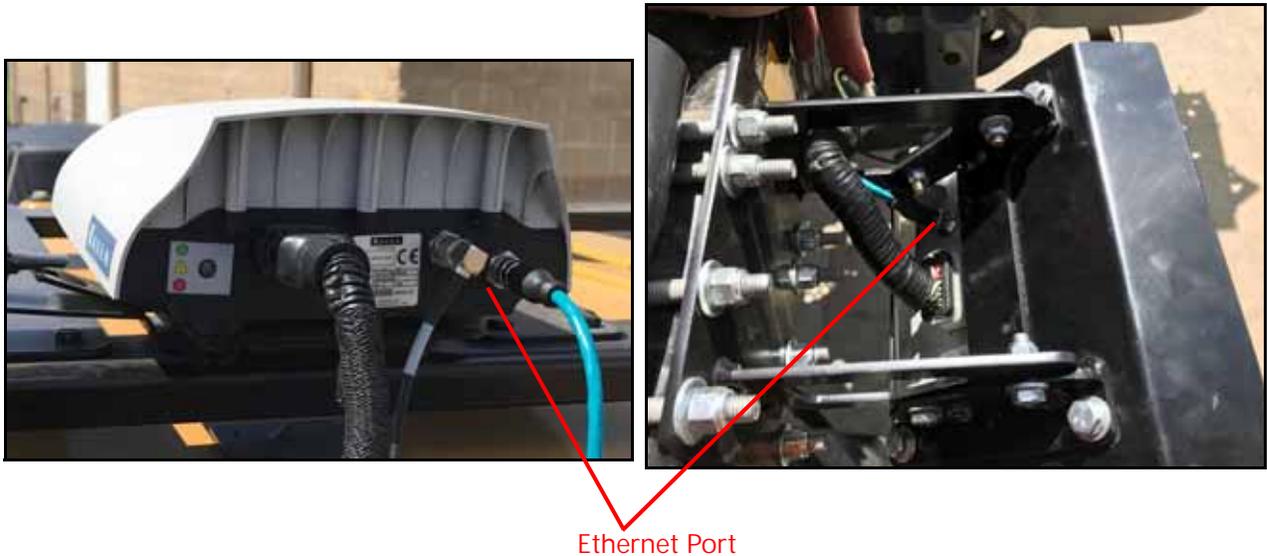
## CABLING AND CONNECTION

### OPTIONAL ETHERNET CABLE

1. Connect the blue/green Ethernet cable to the back of the VSN camera.
2. Route the Ethernet cable along the frame and up to the RS1.
3. Connect remaining end to the RS1.

FIGURE 19. RS1 Connection

---



## INSTALL STANDALONE HEIGHT SENSOR (IF APPLICABLE)

If the machine does not have XRT boom height control, the optional standalone XRT bracket and hardware (P/N 117-2020-005) will need to be installed on the center rack on the right side near the sprayer boom mount.

FIGURE 20. Standalone Height Sensor

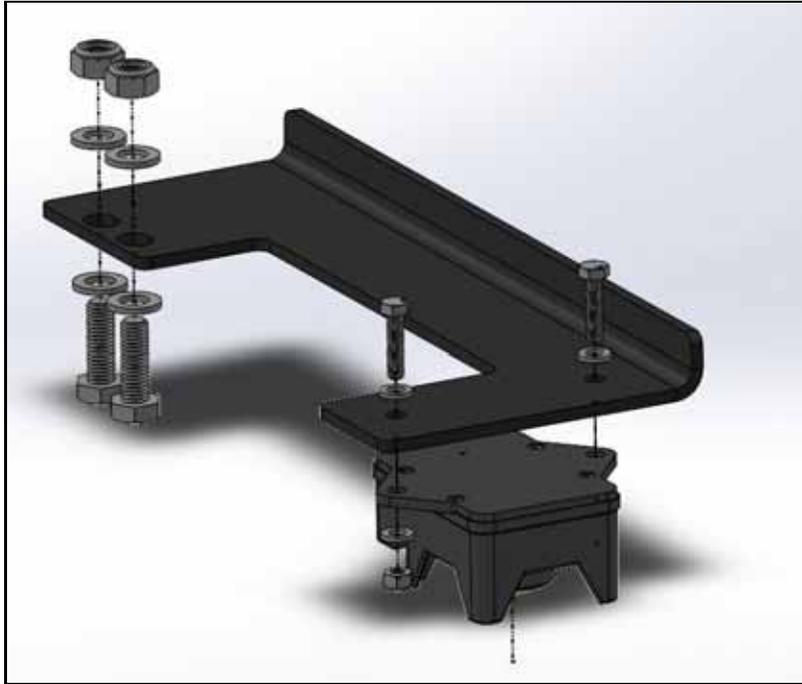


FIGURE 21. Standalone XRT Bracket



**NOTE:** If row sensors are used in conjunction with the standalone height sensor, the terminator on the 115-2020-023 cable will need to be removed and replaced with the dust cap as shown in the system diagram.

## I

Important Safety Information	
Electrical Safety	
General	2
Instructions for Wire Routing	2
Introduction	5
Kit Contents	7
Preparing for Installation	5
Point of Reference	5
Recommendations	5
Updates	6

## K

Kit Contents	7
--------------	---



# 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 when used for intended purpose.

## HOW LONG IS THE COVERAGE PERIOD?

Raven Applied Technology products are covered by this warranty for 12 months from the date of retail sale. In no case will the Limited Warranty period exceed 24 months from the date the product was issued by Raven Industries Applied Technology Division. This warranty coverage applies only to the original owner and is non-transferable.

## HOW CAN I GET SERVICE?

Bring the defective part and proof of purchase to your Raven dealer. If the dealer approves the warranty claim, the dealer will process the claim and send it to Raven Industries for final approval. The freight cost to Raven Industries will be the customer's responsibility. The Return Materials Authorization (RMA) number must appear on the box and all documentation (including proof of purchase) must be included inside the box to be sent to Raven Industries.

## WHAT WILL RAVEN INDUSTRIES DO?

Upon confirmation of the warranty claim, Raven Industries will (at our discretion) repair or replace the defective product and pay for the standard return freight, regardless of the inbound shipping method. Expedited freight is available at the customer's expense.

## 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, labor, or other 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.**

# EXTENDED 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 when used for intended purpose.

## DO I NEED TO REGISTER MY PRODUCT TO QUALIFY FOR THE EXTENDED WARRANTY?

Yes. Products/systems must be registered within 30 days of retail sale to receive coverage under the Extended Warranty. If the component does not have a serial tag, the kit it came in must be registered instead.

## WHERE CAN I REGISTER MY PRODUCT FOR THE EXTENDED WARRANTY?

To register, go online to [www.ravenhelp.com](http://www.ravenhelp.com) and select Product Registration.

## HOW LONG IS THE EXTENDED WARRANTY COVERAGE PERIOD?

Raven Applied Technology products that have been registered online are covered for an additional 12 months beyond the Limited Warranty for a total coverage period of 24 months from the date of retail sale. In no case will the Extended Warranty period exceed 36 months from the date the product was issued by Raven Industries Applied Technology division. This Extended Warranty coverage applies only to the original owner and is non-transferable.

## HOW CAN I GET SERVICE?

Bring the defective part and proof of purchase to your Raven dealer. If the dealer approves the warranty claim, the dealer will process the claim and send it to Raven Industries for final approval. The freight cost to Raven Industries will be the customer's responsibility. The Return Materials Authorization (RMA) number must appear on the box and all documentation (including proof of purchase) must be included inside the box to be sent to Raven Industries. In addition, the words "Extended Warranty" must appear on the box and all documentation if the failure is between 12 and 24 months from the retail sale.

## WHAT WILL RAVEN INDUSTRIES DO?

Upon confirmation of the product's registration for the Extended Warranty and the claim itself, Raven Industries will (at our discretion) repair or replace the defective product and pay for the standard return freight, regardless of the inbound shipping method. Expedited freight is available at the customer's expense.

## WHAT IS NOT COVERED BY THE EXTENDED 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, labor, or other damages. Cables, hoses, software enhancements, and remanufactured items are not covered by this Extended Warranty. 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.**