

VSN Installation Manual  
for NH SP 310F / Miller  
7310 Front Boom Sprayers  
MY19+

016-2022-013 Rev. A

9/2020

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# CHAPTER

# 1

# IMPORTANT SAFETY INFORMATION

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## 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

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### 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.

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### 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.

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### 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.

- 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 Installation Manual for NH SP 310F / Miller 7310 Front Boom Sprayers MY19+
- 016-2022-013 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/Miller 310/7310 (P/N 117-2022-014 Rev. C)

<b>QTY</b>	<b>PART #</b>	<b>DESCRIPTION</b>
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
4	107-0172-702	BRACKET, SPACER, MULTI OBJECT DISTANCE SENSOR, NH/MIL
1	115-2020-019	CABLE, FULL CANOPY, FRONT BOOM
2	107-0172-723	BRACKET, NH/MILLER FRONT BOOM SMALL FRAME, MOUNT,
1	016-0171-649	SHEET, WARRANTY/SHEET (016-2022-014)
2	116-0159-860	WELDMENT, MULTI-OBJECT DISTANCE SENSOR, COVER
2	107-0172-721	SHIELD, PLASTIC MULTI-OBJECT DISTANCE SENSOR BRACKET,
2	107-0172-722	SHIELD, MULTI-OBJECT DISTANCE SENSOR
1	053-0159-074	ENVELOPE, PLASTIC
4	311-4055-444N	HEX, BOLT, DIN 933, M20 X 2.5 X 55MM
4	311-4056-137N	HEX, BOLT, DIN 933, M6 X 1 X 25MM
14	311-4056-224N	HEX, BOLT, DIN 933, M10 X 1.5 X 30MM
4	312-6001-016N	HEX NUT, NYLOC, DIN 985, M6
6	312-6001-041N	HEX NUT, NYLOC, DIN 985, M10
4	312-6001-106N	HEX NUT, NYLOC, DIN 985, M20
8	313-6000-010N	WASHER, M6, STEEL, CLASS V
20	313-6000-016N	WASHER, M10, STEEL, CLASS V
8	313-6000-031N	WASHER, M20, STEEL, CLASS V
8	313-6001-016N	WASHER, SPRING LOCK, DIN 127-M10
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

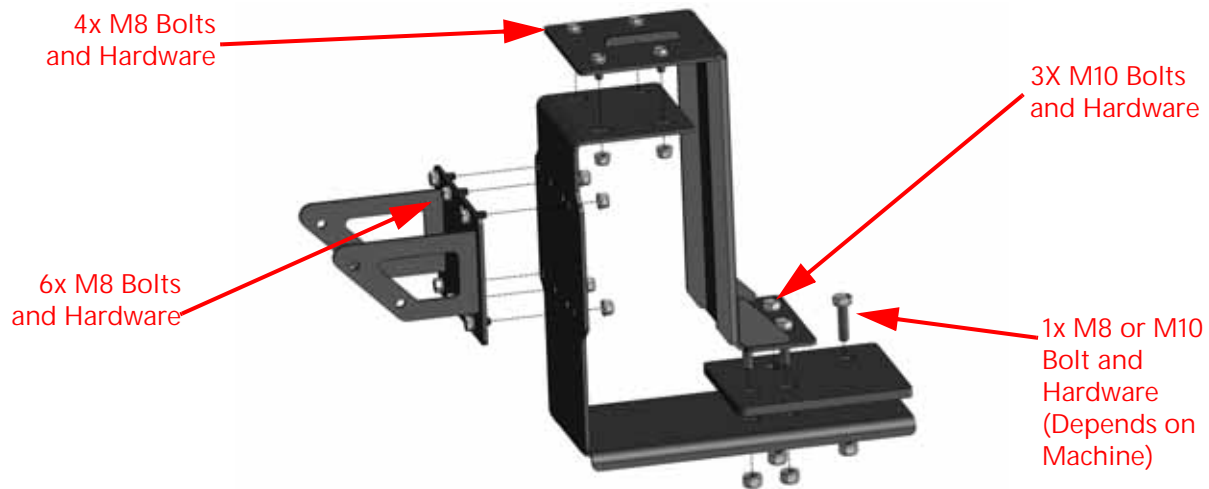


FIGURE 5. Mounting Bracket Installed



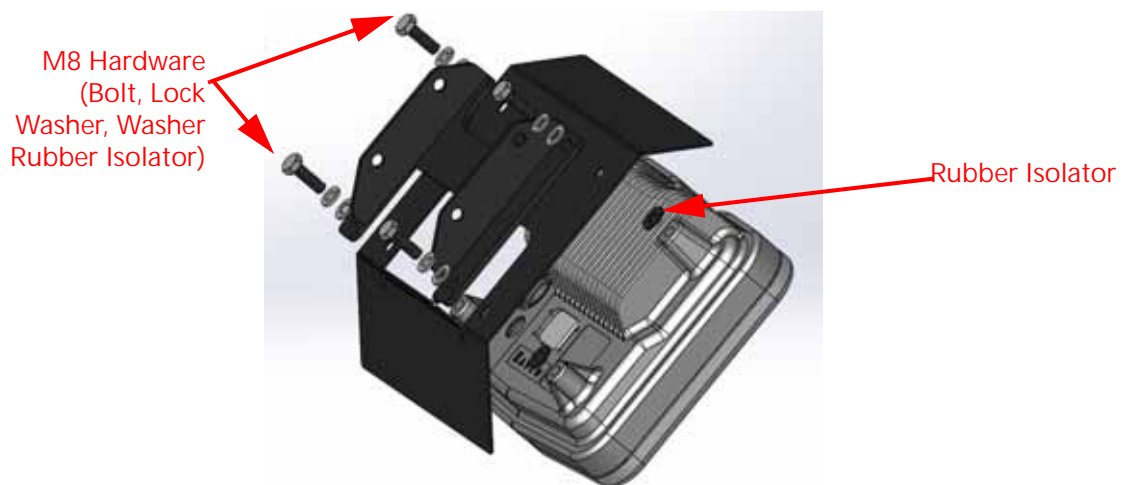
- Tighten all bolts and ensure no hoses are rubbing on the new bracket.

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

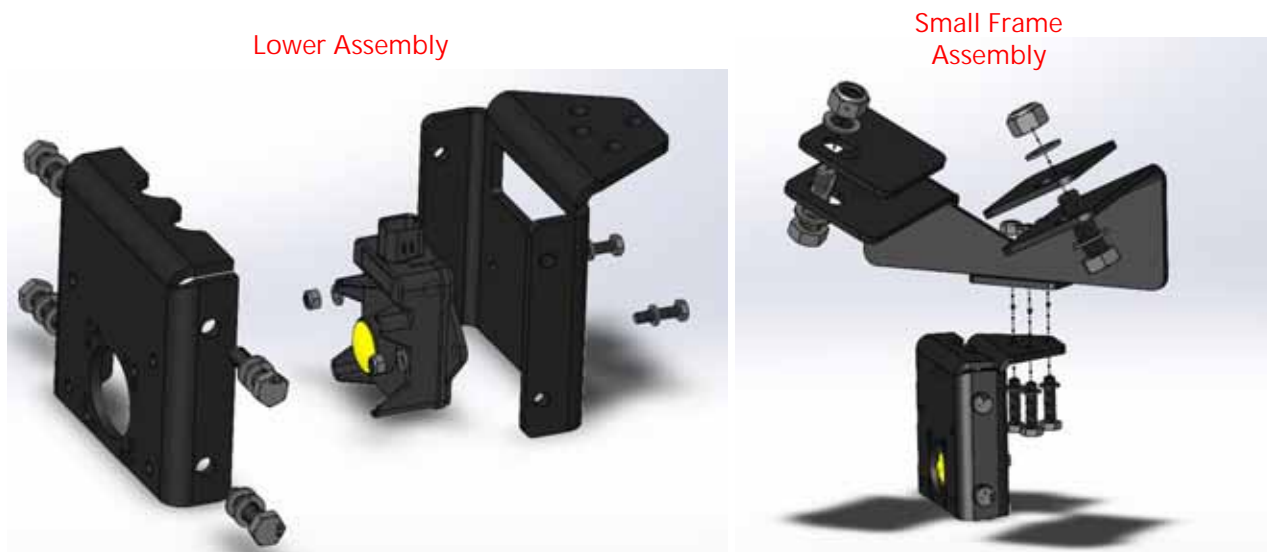
1. Remove the wheel motor covers on both front axles.

FIGURE 9. Removed Wheel Motor Covers



2. Install the spacers, 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.



FIGURE 11. Bracket Loosely Installed



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

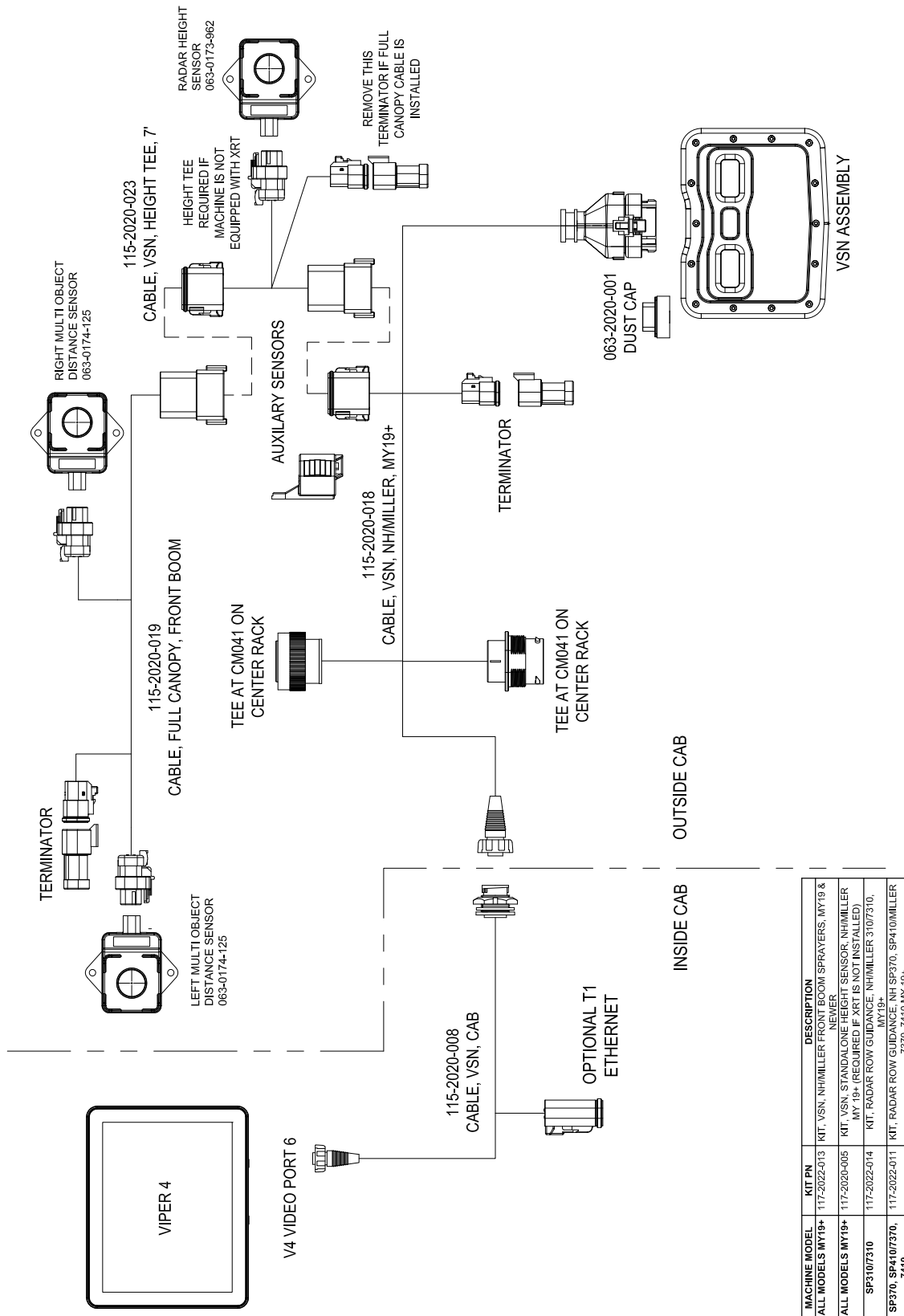
FIGURE 12. Serial Number Location



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

SYSTEM DIAGRAM

FIGURE 13. VSN for NH/Miller Front Boom Sprayers MY 19+ (P/N 054-2022-013 Rev. B)



MACHINE MODEL	KIT P/N	DESCRIPTION
ALL MODELS MY19+	117-2022-013	KIT, VSN, NH/MILLER FRONT BOOM SPRAYERS, MY19 & V4 VIDEO PORT 6
ALL MODELS MY19+	117-2020-005	KIT, VSN, STANDARD ONE-HEIGHT SENSOR, NH/MILLER MY 19+ (REQUIRED IF XRT IS NOT INSTALLED)
SP310/7310	117-2022-014	KIT, RADAR ROW GUIDANCE, NH/MILLER 310/7310, MY19+
SP370, SP410/7370, 7410	117-2022-011	KIT, RADAR ROW GUIDANCE, NH SP370, SP410/MILLER 7370, 7410 MY 19+

## ROUTE THE CABLES

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

FIGURE 14. CM041 Connection



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 15. 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 16. Viper 4 Connection

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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.

NOTE: Ensure proper cable routing by following hydraulic hoses and routing the cables through the protective covering around the hydraulic hoses for maximum protection.

FIGURE 17. Proper and Improper Cable Routing

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Proper



Improper



NOTE: Ensure the cable is routed away from hinge/pinch points under the machine bottom covers.

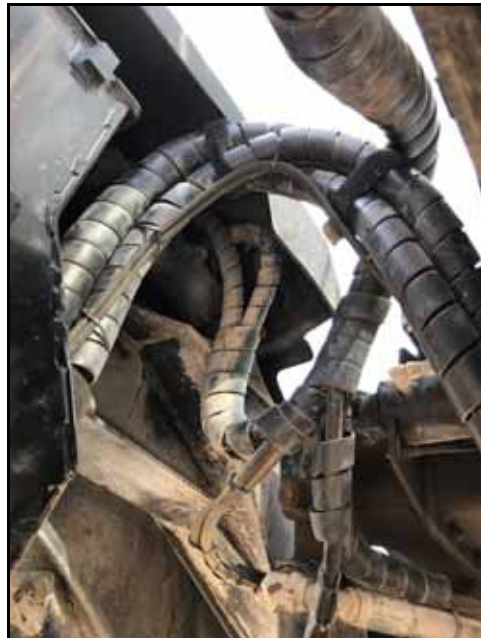
13. Route the remaining cabling to the other side of the machine and it will be connected to the front left sensor.

FIGURE 18. Cable Routing



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

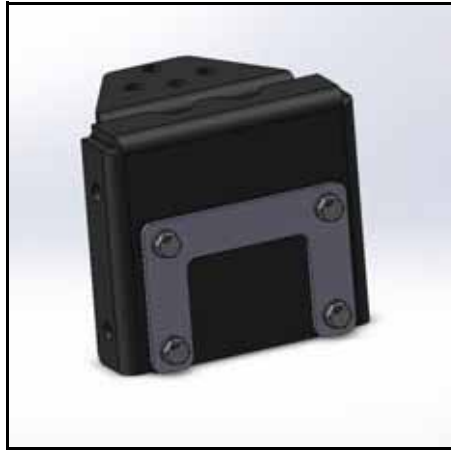
FIGURE 19. Cables Ziptied



15. Install the sensor covers.

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

FIGURE 20. 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.

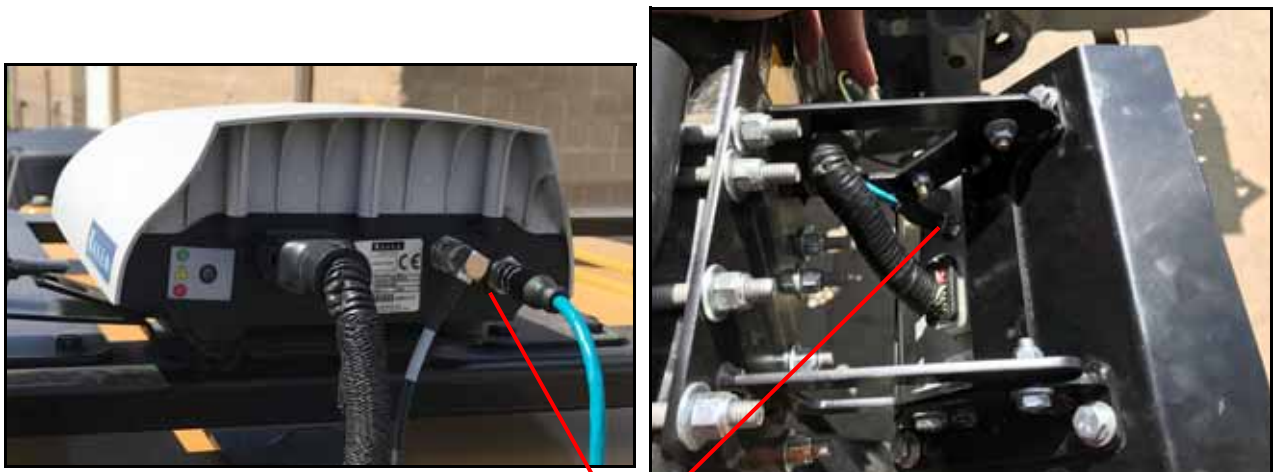
**NOTE:** Ensure the installed radar brackets will not interfere with the valve stem of the tire when the wheel rotates.

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### OPTIONAL ETHERNET CABLE (FOR USE IN THE EVENT OF WI-FI FAILURE OR RESTRICTION)

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 21. RS1 Connection



Ethernet Port

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## 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 22. Standalone Height Sensor

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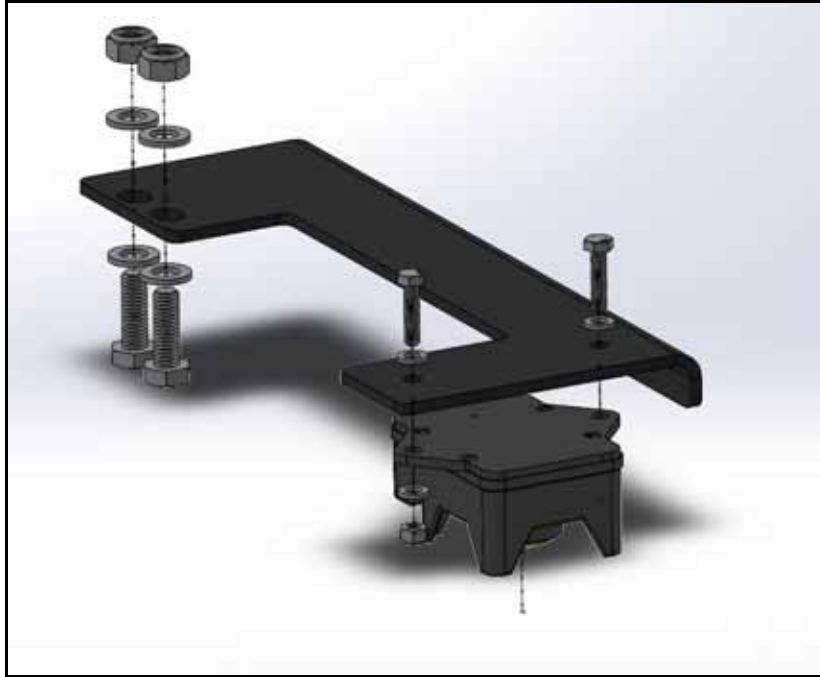


FIGURE 23. Standalone XRT Bracket

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**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.





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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 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.**