Raven Cart Automation™ Installation Manual



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# Chapter 1:

# **Important Safety Information**

#### NOTICE

Follow the operation and safety instructions included with the implement and/or controller and read this manual carefully before installing, servicing, or operating this Raven system.

- Park the machine where the ground is level, clean, and dry.
- Bleed pressure from the hydraulic system and leave the machine turned off for the duration of the installation or maintenance process.

Follow the operation and safety instructions included with the implement and/or controller. Before installing or operating this Raven system, review and understand the information presented on this site.

- Failure to follow safety instructions may lead to equipment damage, personal injury, or death.
- Review equipment operation with your local dealer and follow all safety information presented on this site.
- Contact a local Raven dealer for assistance with any portion of the installation, service, or operation of Raven equipment.
- Follow all safety labels affixed to system components. Be sure to keep safety labels in good condition and replace any missing or damaged labels. Contact a local Raven dealer to obtain replacements for safety labels.

Observe the following safety measures when operating the implement after installing this Raven system:

• Do not operate this Raven system or any agricultural equipment while under the influence of alcohol or an illegal substance.

- Be alert and aware of surroundings while operating this Raven system.
  - Determine and remain a safe working distance from obstacles and bystanders. The operator is responsible for disabling the system when a safe working distance has diminished.
  - Do not operate the implement on any public road with this Raven system enabled.
  - Maintain control of the vehicle at all times during operation. For example,
    - Remain in the operator seat while the system is enabled and disable automated Raven controls before exiting the operator seat.
    - Maintain control of safety devices such as E-Stops at all times during operation.
  - Disable this Raven system prior to starting any maintenance work on the implement or components of this Raven system.
- Do not attempt to modify or lengthen any of the system control cables. Extension cables are available from a local Raven dealer.

### Field Computers, Displays, and Control Consoles

- If the display will not be used for an extended period, it is best to remove the display from the machine and store it in a climate controlled environment. This may help to extend the service life of electronic components.
- To prevent theft, secure the display and GNSS antenna when leaving the machine unattended.

### Autonomous Equipment

- Improper use of autonomous equipment, or faulty route planning, may cause property damage, personal injury, or death.
  - Instruct personnel working in the operational area and vicinity of the autonomous tractor of safety procedures and use of the tractor Lockout Switch.
  - As an autonomous vehicle, the machine may move without an operator in the seat. Maintain a safe distance from the machine while the OMNiDRIVE<sup>™</sup> system is enabled for autonomous operation.
  - Do not ride in the autonomous vehicle during autonomous operation. The vehicle may change direction, speed, or stop without warning.
- The OMNiDRIVE<sup>™</sup> system is a supervised autonomous system. It is the site supervisor or operator's responsibility to monitor the condition of the autonomous vehicle.
  - Daily inspections are required to ensure that the tractor and grain cart are in operational condition.
    - The OMNiDRIVE<sup>™</sup> system does not monitor mechanical systems on either the tractor or grain cart.
    - During autonomous operation, no one will be in the tractor to observe the tractor or grain cart. It is recommended to check the operational condition of the tractor and grain cart periodically over the course of daily autonomous operation.
  - Monitor field conditions and the operational area. Suspend autonomous operations when safe conditions or hazards exist for autonomous operations.
  - By accepting a planned route, you are accepting all responsibility for the operation of the autonomous equipment and the route which was planned.
    - Ensure there are no obstacles in the path of the equipment prior to movement.

### Hydraulic Safety

When installing or servicing a hydraulic system or hydraulic components, be aware that hydraulic fluid may be extremely hot and under high pressure. Caution must be exercised.

• Always wear appropriate personal protective equipment when installing or servicing hydraulic systems.

- Never attempt to open or work on a hydraulic system with the implement running.
- Always take care when servicing or opening a system that has been pressurized.
- The implement or machine must remain stationary and switched off with booms or implement sections unfolded and supported during installation or maintenance.
- Any work performed on the hydraulic system must be done in accordance with the machine manufacturer's approved maintenance instructions.
- Before installing hydraulic components, ensure there are no issues with the machine hydraulic system (e.g. pump issues, faulty hydraulic motors, fine metal deposits in the hydraulic lines, etc.).
- Take precautions to prevent foreign material or contaminants from being introduced into the implement hydraulic system. Contaminants that are able to bypass the hydraulic filtration system will reduce performance and may damage hydraulic components.
  - Verify that the hydraulic system is using fresh oil and the filters have been changed.
- Stand clear of the implement when starting the system for the first time after installing or servicing hydraulic components in case a hose has not been properly connected or tightened.

#### 

### **Electrical Safety**

- Always verify that power leads are connected to the correct polarity as marked. Reversing the power leads could cause severe damage to the Raven system or other components.
- To prevent personal injury or fire, replace defective or blown fuses with only fuses of the same type and amperage.
- Do not connect the system power cable to the vehicle ignition or battery until all system components are mounted and all electrical connections are completed.
- Always start the machine before initializing this Raven system to prevent power surges or peak voltage.
- To avoid tripping and entanglement hazards, route cables and harnesses away from walkways, steps, grab bars, and other areas used by the operator or service personnel when operating or servicing the equipment.

• Provided power leads may be shortened by properly trained individuals only. No other modifications to cabling are allowed e.g. increasing power lead lengths, or modifying any other aspect of cabling in the system. If power leads are shortened they must be terminated with provided spare ring terminals or with installer supplied ring terminals listed by the ring terminal manufacture as being compatible with the wire gauge being used.

### Machine Safety Systems

- Use all provided safety systems on the machine when operating the machine with the Raven system.
- Seat belts and restraints must be used when an operator is in the cab.
- Do not disable any machine-provided safety systems, including but not limited to audible alarms, alarm lights, etc.

### **Touch Screen**

- Only touch the touch-screen with your finger or by using a special touch-screen stylus or pen. Operating the touch-screen with sharp objects may cause permanent damage to the screen.
- Only clean the screen using a damp cloth. Never use caustic or other aggressive substances.

# **Recommendations and Best Practices**

## **Point of Reference**

Instructions provided generally assume you are standing behind the machine facing toward the cab. More specific orientation may be provided as necessary to complete procedures.

## **Preparing for Install**

- Ensure there are no issues with the machine hydraulic system (e.g., pump issues, faulty hydraulic motors, fine metal deposits in the hydraulic hoses, etc.).
- Verify that the machine hydraulic system is using fresh oil and that the filters have been recently changed.
- Ensure there are no issues with the steering system (e.g., worn bushings, faulty tie rod ends, improperly adjusted steering components, etc.)

# **Aerials and Signal Interference**

Due to the relatively low broadcast power from satellites, all GNSS receivers and aerials tend to be susceptible to sources of signal noise and interference as compared to terrestrial signals (i.e. radio or cellular).

**Note:** Poor GNSS signal reception may cause other systems which rely on GNSS solutions (e.g. auto-steer systems, rate control systems, etc.) to disengage or may cause undesired operation or results.

The following recommendations are intended to provide an optimal environment for GNSS systems and provide the best up-time results, even as sources of interference may spike throughout the day.

- Mount GNSS antennas with a clear, unobstructed view of the sky.
  - A minimum clearance of 1 m [39 in] is recommended around the GNSS antenna to help avoid common issues with signal interference. Do not mount cellular, radio, or other GNSS antennas within this area.
  - Mount the GNSS antenna to the tallest point of the machine. Avoid mounting the antenna in a location where obstructions (e.g. bins/hoppers, cab roof lines, equipment frame or structural elements, etc.) may rise into the antenna view.

**Note:** The antenna view typically starts 5° to 10° above horizontal from the base of the antenna and extends over the skyward face of the receiver/antenna.

- GNSS is a line-of-sight system. A clear path must exist between the satellite and the GNSS antenna.
  - Obstructions such as buildings, tree branches and limbs, as well as components of the vehicle such as a fiberglass or metal roof, and etc. may cause signal multipath or completely block the GNSS receiver.
- Electrical and magnetic fields can interfere with GNSS or L-Band signals.
  - Avoid mounting GNSS receivers or antennas near components such as radio or cellular antennas, electrical motors, generators, alternators, strobe lights, radio transmitters, radio or cellular antennas, etc.
  - Over-head power lines, microwave dishes, radar, other active antennas, etc. can interfere with GNSS signal.
- Mount the Field Hub cellular and diversity antennas at least 1 m [39 in] apart. Avoid mounting other cellular, radio, or GNSS aerials within this area.

### **Harness Routing**

The word "harness" is used to describe any electrical cables and leads, both bundled and unbundled. Use the following guidelines and recommendations when connecting and routing harnesses while installing or maintaining this Raven system:

- Leave protective caps/covers over harness connectors until needed to avoid dirt and moisture from contaminating electrical circuits.
- Secure the harness to the frame or solid structural members at least every 12 in [30 cm].

- Follow existing harness runs already routed on the implement as much as possible. Proper harness routing should:
  - Secure harnessing and prevent the harness from hanging below the implement.
  - Provide sufficient clearance from moving components and operational zones around shafts; universal joints and suspension components; pulleys, gears, belts, and chains; moving linkages, cylinders, articulation joints, etc.
  - Protect harnessing from field debris and surrounding hazards (e.g. tree limbs, fence posts, crop stubble, dirt clumps or rocks that may fall or be thrown by the implement).
  - Protect harnessing from sharp bends, twisting, or flexing over short distances and normal implement operation.
  - Connectors and splices should not be located at bending points or in harness sections that move.
  - Ensure sufficient length for free movement of the implement during normal operation and prevent pulling, pinching, catching, or rubbing, especially in articulation and pivot points. Clamp harnessing securely to force controlled movement of the harness.
  - Avoid abrasive surfaces and sharp edges such as sheared or flame cut corners, fastener threads or cap screw heads, hose clamp ends, etc.
- Do not connect, affix, or allow harnessing to come into contact with components with high vibration forces, hot surfaces, or components carrying hot fluids beyond the temperature rating of harness components.
  - Harnessing should be protected or shielded if routing requires the hose to be exposed to conditions beyond harnessing component specifications.
- Avoid routing harnesses in areas where damage may occur due to build up of material (e.g. dirt, mud, snow, ice, etc.).
- Avoid routing harnesses in areas where the operator or service personnel might step or use as a grab bar.

**Note:** Avoid applying direct spray or pressure washing of electrical components and connections. High pressure streams and sprays can penetrate seals, cause corrosion, or otherwise damage electrical components. When performing maintenance:

• Inspect electrical components and connectors for corrosion, damaged pins or housings, etc. Repair or replace components or harnessing as necessary.

- Ensure connectors are kept clean and dry. Apply dielectric grease to the sealing surfaces of all connections exposed to moisture, dirt, debris, and other contaminates. Repair or replace harnessing as necessary.
- Clean electrical components with pressurized air, aerosol electrical cleaning agent, or low pressure rinse.
- Remove visible surface water from electrical components and connections using pressurized air or an aerosol cleaning agent. Allow components to dry thoroughly before reconnecting cables.

# **Chapter 2:**

# **Installation Overview**

- 1. Review the "Important Safety Information" on page 1 and "Recommendations and Best Practices" on page 6 before starting any machine installation.
- 2. Review and complete the installation procedures on the tractor on which the Raven Cart Automation<sup>™</sup> system will be installed:

**Note:** Click the links below for more detailed steps to complete the installation on your tractor.

- a. "Tractor Kit Contents" on page 14
- b. "Assemble and Mount the Tractor Roof Bracket" on page 16
- c. "Install the Tractor Cables" on page 20
- 3. Review and complete the installation procedures on the combine on which the Raven Cart Automation<sup>™</sup> system will be installed:

**Note:** Click the links below for more detailed steps to complete the installation on your combine or harvester.

- a. "Combine Kit Contents" on page 24
- b. "Assemble and Mount the Combine Roof Bracket" on page 28
- c. "Install the Combine Cables" on page 34
- d. "Assemble the Bracket and Install the Cart Remote" on page 48
- Proceed to the field provisioning procedures to configure the Raven Cart Automation<sup>™</sup> system and link the tractor, and combine which will be present for field operations. Refer to the Field Provisioning Overview for additional assistance with starting the field provisioning procedures.

### **Tractor Requirements**

- Pro1200/IntelliView Display
- AFS3/PLM3 Vector Pro Receiver with RTK or RTK+ high level accuracy or AFS3 medium level accuracy. The converged accuracy must be less than 10 cm [4 in] or less. All vehicles should be using the same datum.
  - 2.0.0.0 minimum software requirement or higher
- Tractor Software Unlocks
  - ISO Class 3 Base Steering
  - ISO Class 3 Base Speed
- Display/PCM 3.33.0.0 minimum software requirement or higher
- UCM Software based on model
  - CCH Version Numbers
    - UCM2 Magnum/T8 CVT 15.20.00.00 minimum software requirement or higher
    - UCM2 Magnum/T8 FPS 16.20.00.00 minimum software requirement or higher
    - UCM3B Magnum/T8 CVT 31.20.00.00 minimum software requirement or higher
    - UCM3B Magnum/T8 FPS 32.20.00.00 minimum software requirement or higher
  - 4WD Version Numbers
    - UCM2 Steiger/T9 CVT 19.20.00.00 minimum software requirement or higher
    - UCM2 Steiger/T9 FPS 20.20.00.00 minimum software requirement or higher
    - UCM3B Steiger/T9 CVT 33.20.00.00 minimum software requirement or higher
    - UCM3B Steiger/T9 FPS 34.20.00.00 minimum software requirement or higher

- DEC Software Requirements
  - Steiger/T9 FPS 1.7.0.0 minimum software requirement or higher
  - CCH FPS 18/19 Speed 1.9.0.0 minimum software requirement or higher
  - CCH FPS 21 Speed 1.5.0.0 minimum software requirement or higher
- RCU 23.4.0.23 Software Version
- RS Lite 23.4.1.4 Software Version
- Raven Cart Automation<sup>™</sup> Aftermarket Kit
- Raven Field Hub (optional)

### **Combine Requirements**

- Pro700/IntelliView IV Display
  - ISO UT Unlocked
  - Corrections Pro 700 RTX datum is hard coded in the Trimble 372. Even if the datum is changed in the display it does not change the actual datum.
  - Pro700/Intelliview IV Display version 34 or higher is recommended.
    - For platforms not yet approved for this display software, v32.6 should be used.
- Trimble Nav-900 Controller (392) or a Trimble 372 Receiver with high or medium level accuracy.
  - Trimble Nav-900 Controller (392) 9.97.21.4 minimum software requirement or higher
  - Trimble 372 Receiver 9.55.005.4 minimum software requirement or higher
    - AFS/PLM 372 or 392 Receiver with RTK, or RTX Both vehicles should be using the same RTK/RTX network

*Note:* An adapter cable is needed for the 392 receiver (P/N 115-0172-668).

- RCU 23.4.0.23 Software Version
- RS Lite 23.4.1.4 Software Version
- Raven Cart Automation<sup>™</sup> Aftermarket Kit

# **Tractor Kit Contents**

**Note:** During the installation process, note the serial number and bar code of the RS Lite and the machine on which each device is installed:

This information will be required during device registration and field provisioning procedures and will help locate each device within the Slingshot® portal.

# KIT, Raven Cart Automation<sup>™</sup>, CIH Magnum & NH T8 (P/N 117-2612-001 Rev. E)

Part Number	Description	Qty.
107-2612-006	Bracket Cart Automation CIH Mag and NH T8 Roof Bar	1
116-2612-007	Bracket Cart Automation CIH Mag and NH T8 Device Plate	1
063-0174-121	Assembly, RS Lite	1
063-2610-035	Assembly, RCU, External Vehicle Module	1
121-0000-052	Antenna, 2.4-2.5 Direct MT	1
420-2002-108	Cable LMR-240 RPSMA Male to N Type Male Right Angle, 18 inch	1
115-2612-001	Harness, Cart Automation, Tractor, CGR	1
016-0171-649	Sheet, Warranty/Help	1
053-0159-074	Envelope Plastic 6x8x4 Mil	1
107-2610-032	Spacer, Rear	2
104-1000-291	Spacer, UNTHRD 0.218"ID x 3/8" OD x 1 1/2" LG BLK	2
311-4050-177N	Hex Bolt, DIN931, M8-1.25 x 16 MM	4
311-4050-138N	Hex Bolt, DIN931, M6-1 x 30 MM	6
313-6000-010N	Washer, Flat, M6	6
311-4050-099N	Hex Bolt, DIN931, M5-0.80 x 50 MM	2
313-6000-007N	Washer, Flat, M6	2
312-4003-006N	Hex Nut, Serrated Flange Lock, M5, Class 8	2
435-3001-049	Clamp Cable .625" Dia Insulated	3
435-1000-036	Cable Tie Holder, Adhesive Backed, Outdoor Use	5

# KIT, Raven Cart Automation<sup>™</sup>, CIH Steiger & NH T9 (P/N 117-2612-005 Rev. C)

Part Number	Description	Qty.
107-2612-008	BRKT Cart Automation CIH Steiger and NH T9 Roof Bar	1
107-2612-009	BRKT Cart Automation CIH Steiger and NH T9 Dev Plate	1
063-0174-121	Assembly, RS Lite	1
063-2610-035	Assembly, RCU, External Vehicle Module	1
121-0000-052	Antenna, 2.42.5 Direct MT	1
420-2002-108	Cable, LMR-240 RPSMA Male to N Type Male RT Angl 18"	1
115-2612-001	Harness, Cart Automation Tractor, CGR	1
016-0171-649	Sheet, Warranty/Help	1
107-2610-032	Spacer, Rear	2
104-1000-292	Spacer, UNTHRD 0.218"ID x 3/8"OD x 2" LG BLK Anodized	2
311-4050-177N	Hex Bolt, DIN931, M8-1.25 x 16 MM	4
311-4050-138N	Hex Bolt, DIN931, M6-1 x 30 MM	6
313-6000-010N	Washer, Flat, M6	6
311-4050-102N	Hex Bolt, DIN931, M5-1 x 65 MM	2
313-6000-007N	Washer, Flat, M5	2
312-4003-006N	Hex Nut, Serrated Flange Lock, M5, Class 8	2
435-3001-049	Clamp, Cable, 0.625" Dia. Insulated	3
435-1000-036	Cable Tie Holder, Adhesive Backed, Outdoor Use	5

# Assemble and Mount the Tractor Roof Bracket

### **Assemble the Tractor Roof Bracket**

#### **Recommended Tools**

- Metric size 10 wrench and socket
- Metric size 13 wrench and socket
- Metric size 19 wrench
- 1. Mount the device plate (Magnum P/N 107-2612-007) (Steiger P/N 107-2612-009) to the roof bar (Magnum P/N 107-2612-006) (Steiger P/N 107-2612-008) with the M8x16 bolts.
- 2. Mount the RS Lite (P/N 063-0174-121) to the device plate using the M6x30 bolts with washers. The connector on the RS Lite will face forward.
- 3. Install the RCU (P/N 063-2610-035) to the device plate using the M6x30 bolts with washers.
- 4. Install the radio antenna (P/N 121-0000-052) on the right hand side of the roof bar.

**Note:** A 19 mm or adjustable wrench can be used to aid in the installation of the radio antenna.

5. Install the radio cable (P/N 420-2002-108) to the RCU. Install the opposite end to the radio antenna.



# **Mount the Roof Bracket**

#### A WARNING



Use caution while working on the cab roof or standing on exterior surfaces. Surfaces may be uneven or slippery and hardware or harnesses may present tripping hazards. Contact a local equipment dealer for additional information or assistance with working on the roof or from an elevated position on a specific make and model machine.

- 1. Make sure to stay off the tractor roof, damage can occur to the roof from excessive weight.
- 2. Remove the rear cover from the CGR receiver to access the Port B connector.
- 3. Connect the tractor Raven Cart Automation<sup>™</sup> roof cable "CGR Port B" connector into port B on the CGR.
- 4. Install the rear cover on the CGR receiver.
- 5. Remove the two nuts from the cab roof studs.

**Note:** Secure the previously removed nuts with a tie strap to the roof bar.

- Loosely install the two rear standoffs (P/N 107-2610-033) to the cab roof studs.
  Note: The word Rear is etched on the standoff.
- 7. Mount the roof bar to the standoffs with M8x16 MM bolts.

Note: Tighten bolts on the tractor roof bar to a max torque of 4.97 Nm [44 in-lbs].



8. Mount the front of the device plate to the CGR bracket. Install a M5 flat washer on a M5x50 MM bolt. Route the bolts through the device plate, spacer (P/N 104-1000-291), and CGR bracket. Secure the bolts with a serrated M5 flange lock nut.

**Note:** If a RTK antenna is mounted to the CGR it will need to be relocated to the roof bracket.



# **Install the Tractor Cables**



#### **A** WARNING

Use caution while working on the cab roof or standing on exterior surfaces. Surfaces may be uneven or slippery and hardware or harnesses may present tripping hazards. Contact a local equipment dealer for additional information or assistance with working on the roof or from an elevated position on a specific make and model machine.

**Note:** Make sure to stay off the tractor roof, damage can occur to the roof from excessive weight.

- Raven Cart Automation<sup>™</sup> System Diagrams Tractor
- 1. Disconnect the factory cable from the roof bulkhead on the machine.



- 2. Connect the factory cable to the "Roof Bulkhead Pass Through" connector on the tractor Raven Cart Automation<sup>™</sup> roof cable (P/N 115-2612-001).
- 3. Connect the tractor Raven Cart Automation<sup>™</sup> roof cable "Roof Bulkhead" connector into the roof bulkhead on the machine.

4. If a Slingshot<sup>®</sup> Field Hub is used to transmit RTK corrections into the CGR, connect the Adapter Serial GPS Cable (P/N 115-2610-115) to the tractor Raven Cart Automation<sup>™</sup> roof cable (RTK) connector. Please refer to the Slingshot<sup>®</sup> User Assistance website for more information. Install the Slingshot<sup>®</sup> Field Hub

**Note:** If not used the "RTK" connector will remain capped.

- 5. Connect the tractor Raven Cart Automation<sup>™</sup> roof cable "RS Lite" connector to the RS Lite.
- 6. Connect the tractor Raven Cart Automation<sup>™</sup> roof cable "RCU" connector to the RCU.
- 7. The tractor Raven Cart Automation<sup>™</sup> roof cable "Aux Pwr" connector is available if other devices need to be installed on the roof. It is not required for normal operation. If not used the "Aux Pwr" connector will remain capped.
- 8. Install tie straps to secure the cable to the bracket.



# 2-Way Radio Setup

Raven recommends using an alternate 2-Way radio antenna, cabling and relocating the 2-Way radio antenna to a specific range of mounting locations for Raven Cart Automation<sup>™</sup> system. Raven advises to not use the OEM factory cabling for the 2-Way radio. Using the alternate 2-Way radio set up will help prevent ISO-CAN drop out.

#### Specification for 2-Way Radio Setup

- VHF 2-Way Radio
- High grain 2-Way radio antenna magnetic mount (MHB5800) with wire antenna cut to length for frequency



- Locate a suitable mounting location for the 2-Way radio antenna at the rear of the cab. Raven recommends a minimum distance of 20.32 cm [8 in] behind the RS Lite and RCU mounting bracket and a minimum radial distance of 61 cm [24 in] from the center of the RS Lite. The 2-Way radio antenna should be mounted as far back on the tractor roof as possible.
- 2. Clean the 2-Way radio antenna mounting location with an appropriate cleaner.
- 3. Install the metal mounting plate to the tractor roof with adhesive strips.
- 4. Install the 2-Way radio antenna to the metal plate.

5. Route the 2-Way radio antenna down the rear right corner of the cab and into the cab at a convenient location.



6. Route the 2-Way radio antenna and connect to the 2-Way radio.



# **Combine Kit Contents**

**Note:** During the installation process, note the serial number and bar code of the following devices and the machine on which each device is installed:

• RS Lite

This information will be required during device registration and field provisioning procedures and will help locate each device within the Slingshot® portal.

# KIT, Raven Cart Automation<sup>™</sup> CIH 7240 / 8240 / 9240 (P/N 117-2612-003 Rev. D)

Part Number	Description	Qty.
107-2612-005	BRKT, Cart Automation, Combine Roof, Mag Mount	1
063-0174-121	Assembly, RS Lite	1
063-2610-035	Assembly, RCU, External Vehicle Module	1
121-0000-052	Antenna, 2.4-2.5 Direct MT	1
321-8000-033	Assembly, RCU, External Vehicle Module	1
115-2612-002	Harness, Cart Automation, CIH Combine, 372	1
115-2612-005	Harness, CIH 40 Series Combine, Cart Remote	1
420-2002-129	Cable, LMR-240, RPSMA Male to N Type Male Right Angle	1
063-0172-971	Plate Assembly, Aerial Antenna Mount	6
107-2610-063	Bracket, Radio Antenna	1
418-0000-013	Magnet, Ceramic, Powder Coated, 3.20 O.D. x .45 Thick	6
107-2612-001	Bracket Remote	1
103-0001-035	Mount, RAM <sup>®</sup> , Double Socket Arm for 1.5" Ball	1
103-0001-034	Base, Diamond, RAM®, 1.5" Ball	1
107-0172-855	Bracket, Accessory Holder, PRO 700	1
103-0001-038	RAM Ball 1.5", 5.16"-18 UNC x .75" LG	1
115-0172-668	Cable, Adapter, Trimble 372 to 392	1

Part Number	Description	Qty.
016-0171-649	Sheet, Warranty/Help	1
311-4050-133N	Hex Bolt, M6-1 x 12 MM	4
311-4050-136N	Hex Bolt, M6-1 x 20 MM	2
311-4050-137N	Hex Bolt, M6-1 x 25 MM	6
312-6000-017N	Hex Nut, DIN934, M6-1	5
313-6000-010N	Washer, DIN125, M6	8
332-0000-044	Tape, Adhesive	2
435-3001-043	Clamp Cable 1" Dia Insulated	5
435-1000-036	Cable Tie Holder, Adhesive Backed, Outdoor Use	10
312-1005-011	Nut, Hex, Serrated Flange, SS, 5/16-18	1
311-4050-093K	Hex Bolt, M5-0.8 x 20 MM	2
312-6001-012K	Hex Nut, Nylock, DIN 985, M5-0.8	2
315-0000-033	Grommet, Plastic, Split, 1.50" Hole	1
315-0000-032	Grommet, Plastic, Split, 1.25" Hole	1
039-0159-080	Decal Card, Cart Remote	1

# KIT, Raven Cart Automation<sup>™</sup>, CIH 7250 / 8250 / 9250 (P/N 117-2612-002 Rev. F)

Part Number	Description	Qty.
107-2612-005	BRKT, Cart Automation, Combine Roof, Mag Mount	1
063-0174-121	Assembly, RS Lite	1
063-2610-035	Assembly, RCU, External Vehicle Module	1
121-0000-052	Antenna, 2.4-2.5 Direct MT	1
321-8000-033	Assembly, RCU, External Vehicle Module	1
115-2612-002	Harness, Cart Automation, CIH Combine, 372	1
115-2612-004	Harness, CIH 50 Series Combine, Cart Remote	1
420-2002-129	Cable, LMR-240, RPSMA Male to N Type Male Right Angle	1
063-0172-971	Plate Assembly, Aerial Antenna Mount	2

Part Number	Description	Qty.
107-2610-063	Bracket, Radio Antenna	1
418-0000-013	Magnet, Ceramic, Powder Coated, 3.20 O.D. x .45 Thick	6
107-2612-001	Bracket, Remote	1
103-0001-035	Mount, RAM®, Double Socket Arm for 1.5" Ball	1
103-0001-034	Base, Diamond, RAM®, 1.5" Ball	2
107-0172-855	Bracket, Accessory Holder, PRO 700	1
103-0001-038	RAM Ball 1.5", 5.16"-18 UNC x .75" LG	1
115-0172-668	Cable, Adapter, Trimble 372 to 392	1
016-0171-649	Sheet, Warranty/Help	1
311-4050-133N	Hex Bolt, M6-1 x 12 MM	4
311-4050-136N	Hex Bolt, M6-1 x 20 MM	2
311-4050-137N	Hex Bolt, M6-1 x 25 MM	6
312-6000-017N	Hex Nut, DIN934, M6-1	5
313-6000-010N	Washer, DIN125, M6	8
332-0000-044	Tape, Adhesive	2
435-3001-043	Clamp Cable 1" Dia Insulated	5
435-1000-036	Cable Tie Holder, Adhesive Backed, Outdoor Use	10
312-1005-011	Nut, Hex, Serrated Flange, SS, 5/16-18	1
311-4050-093K	Hex Bolt, M5-0.8 x 20 MM	2
312-6001-012K	Hex Nut, Nylock, DIN 985, M5-0.8	2
315-0000-033	Grommet, Plastic, Split, 1.50" Hole	1
315-0000-032	Grommet, Plastic, Split, 1.25" Hole	1
039-0159-080	Decal Card, Cart Remote	1

# KIT, Raven Cart Automation<sup>™</sup>, NH CR & CR Revelation Combines, MY15+ (P/N 117-2612-004 Rev. C)

Part Number	Description	Qty.
107-2612-005	BRKT, Cart Automation, Combine Roof, Mag Mount	1
063-0174-121	Assembly, RS Lite	1
063-2610-035	Assembly, RCU, External Vehicle Module	1
121-0000-052	Antenna, 2.4-2.5 Direct MT	1
321-8000-033	Assembly, RCU, External Vehicle Module	1
115-2612-006	Harness, Roof, Combine, NH Combine, 372	1
115-2612-007	Harness, NH Combine, Cart Remote	1
420-2002-129	Cable, LMR-240, RPSMA Male to N Type Male Right Angle	1
063-0172-971	Plate Assembly, Aerial Antenna Mount	6
107-2610-063	Bracket, Radio Antenna	1
418-0000-013	Magnet, Ceramic, Powder Coated, 3.20 O.D. x .45 Thick	6
107-2612-001	Bracket Cart Remote	1
103-0001-035	Mount, RAM®, Double Socket Arm for 1.5" Ball	1
103-0001-034	Base, Diamond, RAM, 1.5" Ball	1
107-0172-855	Bracket, Accessory Holder, PRO 700	1
103-0001-038	RAM Ball 1.5", 5.16"-18 UNC x .75" LG	1
016-0171-649	Sheet, Warranty/Help	1
312-1005-011	Nut, Hex, Serrated Flange, SS, 5/16-18	1
311-4050-093K	Hex Bolt, M5-0.8 x 20 MM	2
312-6001-012K	Hex Nut, Nylock, DIN 985, M5-0.8	2
311-4050-133N	Hex Bolt, M6-1 x 12 MM	4
311-4050-136N	Hex Bolt, M6-1 x 20 MM	2
311-4050-137N	Hex Bolt, M6-1 x 25 MM	6
312-6000-017N	Hex Nut, DIN 934, M6-1.0	5
313-6000-010N	Washer, DIN125, M6	8
315-0000-032	Grommet, Plastic, Split, 1 1/4" Hole	1
332-0000-044	Tape, Adhesive	2
435-1000-036	Cable Tie Holder, Adhesive Backed, Outdoor Use	10
039-0159-080	Decal Card, Cart Remote	1

# Assemble and Mount the Combine Roof Bracket

#### **Recommended Tools**

• Metric size 10 wrench and socket

#### **WARNING**

Use caution while working on the cab roof or standing on exterior surfaces. Surfaces may be uneven or slippery and hardware or harnesses may present tripping hazards. Contact a local equipment dealer for additional information or assistance with working on the roof or from an elevated position on a specific make and model machine.

- 1. Install the circular magnets (P/N 418-0000-013) to the roof bracket (P/N 107-2612-005) with the M6x12 mm bolts.
- Install the RS Lite (P/N 063-0174-121) to the roof bracket using the M6x25 mm bolts. The connectors on the RS Lite will face forward.
- 3. Install the RCU (P/N 063-2610-035) to the roof bracket to the left side of the RS Lite using the M6x25 mm bolts. The RCU connector direction does not matter.



- 4. Install the square magnetic plates (P/N 063-0172-971) on the roof using VHB double sided tape. Use a damp cloth to wipe down the area where the magnetic plates will be installed. Make sure no debris is present on the surface and that and that it is completely dry before installing the magnetic plates. Use the roof bracket as a reference for where to install the plates. The bracket should be centered left to right on the cab roof. See the image for the approximate fore / aft placement.
- 5. Mount the combine bracket on the magnetic plates.

**Note:** Remove the roof bracket assembly before trucking or transporting the machine in any capacity where it will be subjected to highway speeds.



6. Install the radio antenna (P/N 121-0000-052) to the radio antenna bracket (P/N 107-2610-063).

**Note:** A 20 mm or adjustable wrench can be used to aid in the installation of the radio antenna.



- 7. Mount the radio antenna bracket to two circle magnetic plates (P/N 418-0000-013) using provided M6x20 mm bolts, M6 washers, and M6 lock nuts.
- 8. Connect the antenna cable (P/N 420-2002-129) to the radio antenna.

**Note:** If a stronger mounting setup is desired, the bracket can be directly mounted to a surface without using the magnet plates by drilling mounting holes and bolting the bracket to the machine.

**Note:** If a suitable magnetic location is not available, the bracket can be attached to the two plate assemblies (P/N 063-0172-971). The plate assemblies can be attached to the machine with the pre-installed double-sided adhesive on the plates.

9. Install the RCU antenna to the side of the combine. Use a damp cloth to wipe down the area where the magnetic plates will be installed. Make sure no debris is present on the surface and that and that it is completely dry before installing the magnetic plates. The location of the RCU antenna may vary depending on the best reception.

Note: Make sure that the RCU antenna is pointed skyward and is firmly attached.

### **Preferred Mounting Location**



*Note:* Use the mag mounts to avoid scratches on the side of the machine.

• Route the antenna cable along the side of the machine and towards the RCU.

### **Alternate Location**



**Note:** Make sure that the RCU antenna does not come in contact with the grain tank extension when it is folded in and out.

• Route the antenna cable towards the RCU.

### 2nd Alternate Location



**Note:** At this location there is a chance of the antenna coming loose when the grain tank is open or closed and performance could be degraded.

• Route the antenna cable along the edge of the grain tank extension, around the pivot and towards the RCU.

**Note:** If the bracket is only held on with magnets, remove it before trucking or transporting the machine in any capacity where it will be subjected to highway speeds.

10. Connect the radio antenna cable to the RCU. Secure the cable with cable tie mounts and cable ties.

# **Install the Combine Cables**

#### Case IH Combine

#### **A** WARNING



Use caution while working on the cab roof or standing on exterior surfaces. Surfaces may be uneven or slippery and hardware or harnesses may present tripping hazards. Contact a local equipment dealer for additional information or assistance with working on the roof or from an elevated position on a specific make and model machine.

- Raven Cart Automation<sup>™</sup> System Diagram Case IH 40 Series Combine
- Raven Cart Automation<sup>™</sup> System Diagram Case IH 50 Series Combine
- 1. Route the RS Lite and RCU branch of the Combine Roof Cable (P/N 115-2612-002) to the mounting bracket.
- 2. Install the "RS Lite connector" to the RS Lite.
- 3. Install the "RCU connector" to the RCU.

*Note:* If not used the "RTK" connector will remain capped.

**Note:** Port 3 TX signal is sent to the "RTK" and "GPS Port B Pass" through connectors in case position data is needed for another device.

4. Lower the "X499" and "X010" branch of the Combine Roof Cable through the gap between the cab and grain tank. Install these connectors after the roof components are installed.



5. Route the "GPS Port B" branch along the roof towards and through the pass through into the grain tank. The cable can be routed through either side of the grain tank depending on the ease of installation and existing cable routing.

**Note:** The existing grommet will need to be cut to allow enough space for the cable to pass through or replace the grommet included in the kit. Follow existing cables and avoid potential pinch points.



6. Once the cable is inside the grain tank route it behind the gusset for the grain tank extension hinge and towards the existing cabling up to the receiver.



7. Route the cable up to the receiver.



8. Install the "GPS Port B" connector into port B on the receiver.

**Note:** If there is another device already connected to port B on the Trimble 372 disconnect it and install into the "Pass Thru GPS Port B" connector on the combine cable. Otherwise, the "Pass Thru GPS Port B" connector will remain capped.



9. Use tie straps as needed to secure the cable.

*Note:* Bundle any excess cable and use tie straps to secure it under the receiver.

- 10. Ensure all roof cables are properly installed and secured.
- 11. Locate the "X010" and "X499" connectors on the cab above the right front tire.



12. Disconnect the "X010" connector from the bulkhead. Tee into the connector with the corresponding connectors on the combine cable.



13. Follow the harness from the "X010" connector back until you find the "X499" 12-pin DTM connector.



14. Tee into the connector with corresponding connectors on the combine harness.

#### New Holland Combine

#### **A** WARNING



Use caution while working on the cab roof or standing on exterior surfaces. Surfaces may be uneven or slippery and hardware or harnesses may present tripping hazards. Contact a local equipment dealer for additional information or assistance with working on the roof or from an elevated position on a specific make and model machine.

- Raven Cart Automation<sup>™</sup> System Diagram New Holland Combine
- 1. Place the Combine Roof Cable (P/N 115-2612-006) on the cab roof.
- 2. Install the "RS Lite connector" to the RS Lite.
- 3. Install the "RCU connector" to the RCU.

Note: If not used the "RTK" connector will remain capped.

**Note:** Port 3 TX signal is sent to the "RTK" and "GPS Port B Pass" through connectors in case position data is needed for another device.

4. Route the cable towards the back right portion of the roof.

5. Disconnect the Port A and Port B section of the roof cable at the 6-pin DTM connection.

**Note:** This section of cable needs to be disconnected in order for it to be routed through the grain tank cutout.



6. Route the 6-pin DTM plug through the cutout and grommet located directly behind the back right section of the cab roof and into the grain tank. The factory grommet can be replaced with a split grommet (P/N 315-0000-032) if necessary.





7. The routing of the factory cabling up to the receiver can be replicated. The 6-pin DTM connector should be routed through the cutout on the gusset in the grain tank.



If it is not possible to route the 6-pin DTM connector through the gusset cutout the alternative is to route it under the gusset and secure it with a zip tie.



- 8. Route the cable up to the receiver.
- 9. Reinstall the Port A and Port B section of the roof cable that was previously removed at the 6-pin DTM connection.

- 10. Remove the 12-pin DTM connector from Port A of the receiver and connect it into the "Port A" receptacle on the roof harness.
- 11. Connect the "GPS Port A" connector from the roof cable into the into the open Port A connection on the receiver.
- 12. If Port B on the receiver is open, connect the "GPS Port B" connector from the roof cable into this connector and leave the dust cap on the "Port B" receptacle of the roof cable.
- 13. If Port B on the receiver is being used, remove the connector and install into the "Port B"receptacle on the roof cable. The dust cap can be discarded.
- 14. Connect the "GPS Port B" connector on the roof cable into Port B on the receiver.
- 15. Use tie straps as needed to secure the cable.
- 16. Ensure all roof cables are properly installed and secured before leaving the roof.

### **Locate the CAN Bus Connection**

Locate the X-702 connector. There are three possible locations depending on the machine configuration. The most common is on the bottom right side of the cab.

### Bottom Right Side of the Cab





### Right Side of the Machine above the Front Right Tire





### Back Right Side of the Cab

The easiest way to find this location is to stand behind the front right tire and look for the row of three bulkhead connectors.



# **Connect to the Combine CAN Bus**

1. Route the X-702P and X702R section of the roof harness between the grain tank and cab down to the X-702 connector.

- 2. There are two options for how to tie into the combine CAN Bus depending on how the machine is configured.
  - If the X-702 connector is plugged into the X-702A connector, break this connection and plug the X-702R and X-702P connectors from the roof cable into each of these new open machine connections. In this scenario, we are looping the CAN Bus up to our ECUs and back, so no termination is needed within our cable.
  - If the X-702 connector has a terminator plugged into it, remove the terminator and plug the terminator into the X-702P connector. Then plug the X-702R connector from the roof cable into the now open X-702 machine connection. In this scenario, we are extending the main trunk of the CAN Bus and need to terminate it.

# Install the Trimble 392 Adapter Cable (If Necessary)

**Note:** If a Trimble 392 receiver is being used an adapter cable (P/N 115-0172-668) will be needed. The Trimble 392 is commercially known as the Nav-900 Guidance Controller.

#### **WARNING**



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- 1. Connect the combine roof cable 12-pin DTM plug intended for Port A of the Trimble 372 receiver into the 12-pin DTM receptacle labeled "A" on the adapter cable.
- 2. Connect the 12-pin DTM plug from the combine roof cable into the the 12-pin DTM receptacle labeled "B" on the adapter cable.

**Note:** If there is already a connector on the machine intended for Port B of the 372, and plug it into the "PTB" connector on the combine roof cable.



- 3. Connect the 12-pin DTM plug labeled "Port 2" into the center connector in the Trimble 392 receiver.
- 4. Connect the M12 connector labeled "Port 3" into the right connector of the Trimble 392 receiver.



# Assemble the Bracket and Install the Cart Remote

1. Attach the RAM Diamond 1.5 Inch Ball Mount (P/N 103-0001-034) to the Mounting Bracket with two M5x20 bolts (P/N 311-4050-093K) and two M5 Lock Nuts (P/N 312-6001-012K).



2. Attach the Cart Remote (P/N 321-8000-033) to the Mounting Bracket with three M6 Nuts (P/N 312-6000-017N) to a max torque of 2.82 Nm [25 in-lbs].



3. Attach the Cart Remote mount to the rear of the terminal.



4. Attach the Cart Remote to the RAM 1.5 inch Ball Double Socket Arm and adjust as desired.



### **Install the Cart Remote Harness**

#### 240 Series Case IH Machines

- 1. Install the 4 pin DT plug to the Cart Remote.
- 2. Use the Cart Remote Cable (P/N 115-2612-005) to tee into the "X506" connector.



3. Use tie cables to secure the harness.

#### 250 Series Case IH Machines

- 1. Install the 4 pin DT plug to the Cart Remote.
- 2. Use the Cart Remote Cable (P/N 115-2612-004) to tee into the "X085" connector.



3. Use tie cables to secure the harness.

#### **New Holland Machines**

- 1. Install the 4 pin DT plug to the Cart Remote and route over to the fuse panel.
- 2. Remove the fuse panel cover from the rear right corner of the cab.



- 3. Locate the X-1003 and X-1111 connectors in the fuse box.
- 4. Break the X-1003 connection and tee the Cart Remote harness in with the X-1003P and X-1003R connectors.



5. Remove the dust plug from the X-1111 connector and plug it into the X-1111R connector. Plug the X-1111P into the now open X-1111 machine connection.



6. Use tie cables to secure the harness and reinstall the fuse panel cover.

# Chapter 3:

# **Support Resources**

**Note:** Please review the Raven Applied Technology product "Disclaimer" on page a as well as the Limited and Extended Warranties information.

### **Product Information and Support**

RavenPrecision.com offers:

- Product features and benefits
- compatibility guide for other Raven components and systems
- Resources to help find an authorized Raven dealer near you
- Dealer login options for various Raven portals including EDGE and Slingshot®.

#### Portal.RavenPrecision.com offers:

- Application drawings and replacement parts diagrams
- Online conversion calculators
- Software and firmware updates for Raven components
- User assistance and product documentation
- Product warranty registration and activation key requests
- Product documentation, application drawings, and updates

Or visit the Raven Public Knowledge Base (PKB) at <u>https://ravenind.force.com/ATDSupport/s/</u>.

### Updates

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

https://portal.ravenprecision.com

Sign up for email alerts and you will be automatically notified when updates for Raven products are available.

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

Your feedback will help shape the future of our product documentation and the overall service we provide. We want to see ourselves as our customers see us and are eager to learn how we have been helping you or how we could do better.

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

techwriting@ravenind.com

- P/N P/N 016-2612-001-A
- Raven Cart Automation<sup>™</sup> Installation Manual
- Any comments or feedback (please include URLs, chapter, or page numbers as 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.

We thank you for your time.

### Warranty Service and Repair

Review the <u>Product Service and Repair</u> page for additional details about what is not covered under warranty, general repair pricing, and locations of authorized repair centers as well as to complete a Return of Materials Authorization (RMA) form to return your Raven products for warranty or repair.

**Note:** An RMA must accompany all products returned to Raven for inspection or repair, including returns to authorized repair centers in North America. Returns received without a valid RMA may be returned at customer expense.

### **Training Tutorials and Videos**

Video tutorials and additional training content can be found on Raven EDGE at <u>EDGE.RavenPrecision.com</u>.

### **Raven Slingshot**®

Information regarding Slingshot® products and services may be found at <u>RavenSlingshot.com</u>.

### **Social Media and Raven Podcast**

Raven invites you to follow us on your favorite social media!



The Raven Precision Podcast may be found at <u>RavenPrecision.podbean.com</u> or on <u>Apple</u> <u>iTunes</u>, <u>Google Play</u>, and <u>Spotify</u>.

# **Raven Cart Automation™ System Diagrams**

### **Tractor System Diagram**





### **Combine System Diagrams**



