Raven Cart Automation™
Provisioning and Operation Manual

10162612002

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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™ 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™ 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™ 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.

⚠ CAUTION

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 multi-path 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:

Field Provisioning Overview

The field provisioning procedures configures the components of the Raven Cart Automation™ system to the tractor and combine for proper machine-to-machine communication.

Complete the following task to provision the components of the Raven Cart Automation™ system.

Raven Cart Automation™ Tractor

- Raven Cart Automation™ Setup-Tractor
    - CNH Guidance Calibrations (Must be completed by a CNH dealer)
        - Wheel Angle Sensor Cal
        - Steering Valve Cal
        - Roll Calibration (If not already completed)
    - "Setup the AFS Vector Pro Output to the RS Lite" on page 40
    - "Setup the Tractor RCU" on page 56
    - "Setup the Tractor Vehicle Navigation" on page 60
    - "Raven Cart Automation™ Tractor Calibration" on page 72

Raven Cart Automation™ Combine

- Provision the GPS Receiver
- "Setup the Combine RCU" on page 128
- "Setup the Combine Vehicle Navigation" on page 134
- "Raven Cart Automation™ Combine Calibration" on page 142

Raven Cart Automation™ Tractor Provisioning Overview

The following procedures are required to complete the tractor provisioning.

CVT Transmission	PST Transmission
UCM Unlock	UCM Unlock
UCM Update	UCM Update
Set up GPS	DEC Update
Raven Cart Automation™ Tractor Calibration	Update APM Field Sensitivity
Set the Transmission Aggressiveness	Update APM Engine Speed Minimum and Maximum
	Set up GPS
	Raven Cart Automation™ Tractor Calibration
	Set the Constant Engine Speed to Off

Unlock Propulsion and Steering on the Universal Control Module (UCM)
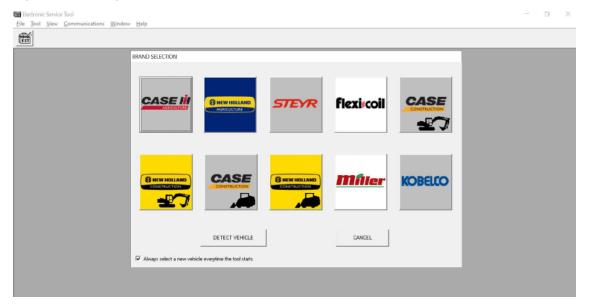
The UCM will be required to be unlocked for both CVT and PST tractors.

Required Tools:
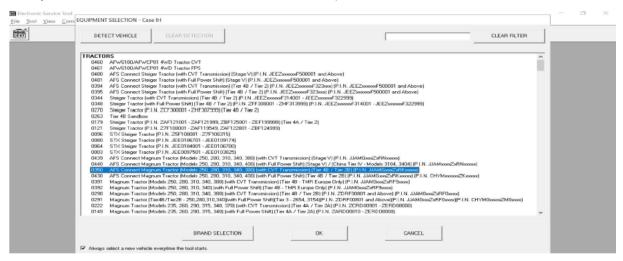
- Laptop with CNH EST Tool

Locate the Universal Control Module (UCM) Serial Number

1. Locate the UCM serial number in the Pro 1200 display.

2. Navigate to by pressing the Menu>System>CAN Status>UCM>Drop down lists S/N and current software version.

3. Send the serial number information to the CNH contact requesting Class 3 steering and speed unlocks.

4. Turn the machine on.

5. Plug the laptop into the machine's primary port.

6. Open EST and press the **Detect Vehicle** button.

7. Verify that the correct machine is selected and press **OK**.
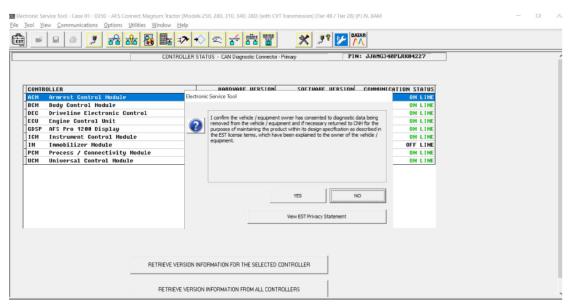
8. Verify that the correct Vehicle Pin is displayed.

   Note: *If the Vehicle Pin is not populated you should be able to move onto the next step.*
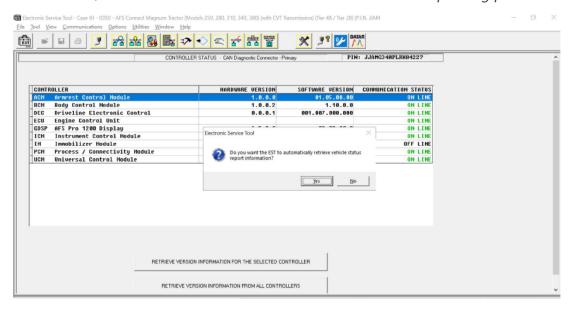
9. A window will open asking if you are authorized to make changes to this vehicle. Select **Yes**.
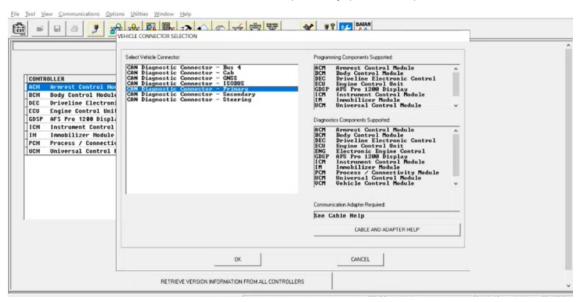
10. A window will open asking if you want EST to automatically retrieve vehicle status report information. Select **No**.
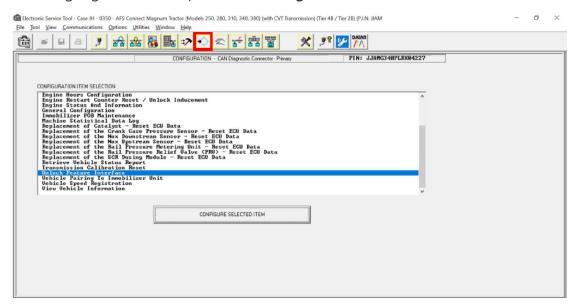
   Note: *Yes, can be selected but it will add more time to the updating process.*
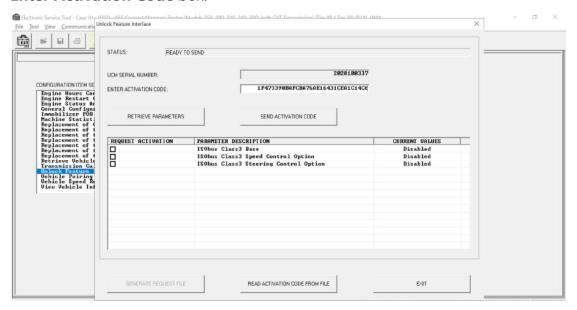
11. Confirm that the EST is connected to the primary port and press **OK**.
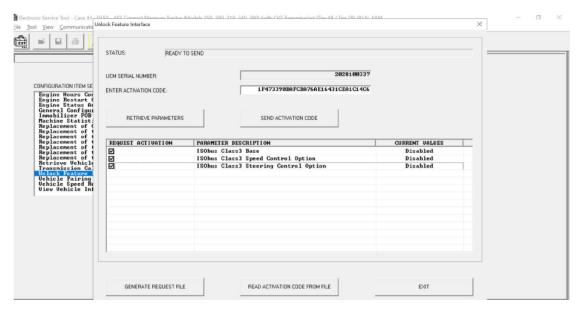
12. Press the **Configuration Button** in the top row.

13. Navigate to the Unlock Features Interface option.

14. Once highlighted in blue press the **Configure Selected Item** button.

15. Enter the activation key that was received from the CNH contact and enter it into the **Enter Activation Code** box.
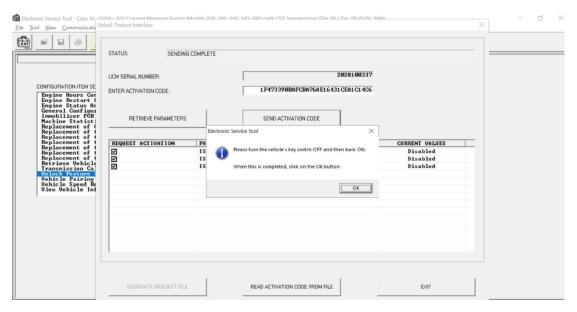
16. Check all three boxes by each unlock option.

17. Press the **Send Activation Code** button.
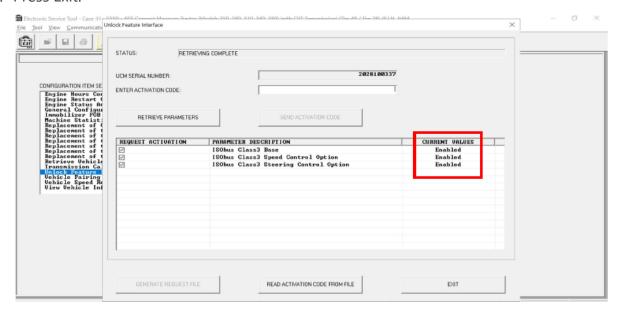
18. A window will open and complete with instructions that need to be completed.

19. Turn the machine off.

20. After all of the controllers are powered down turn the machine to On.

21. Select **Ok**.

22. The current values for the unlock options should have changed from Disabled to Enabled.

23. Press Exit.
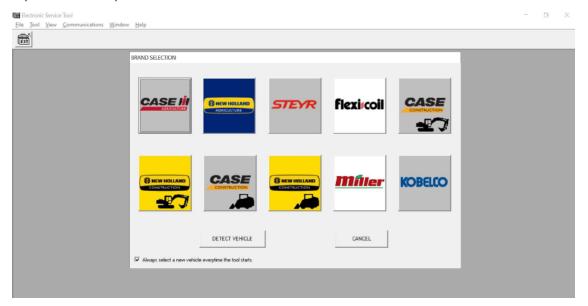
Update the Universal Control Module (UCM)
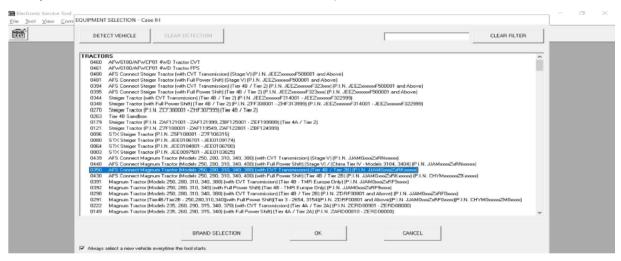
The UCM will be required to be updated for both CVT and PST tractors.

Required Tools:

- Laptop with CNH EST Tool
- UCM Software

1. Turn the machine on.
2. Plug the laptop into the machine's primary port.
3. Open EST and press the **Detect Vehicle** button.
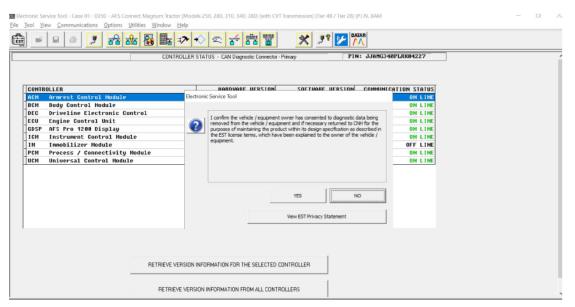
4. Verify that the correct machine is selected and press **OK**.

5. Verify that the correct Vehicle PIN is displayed.

> **Note:** If the Vehicle PIN is not populated you should be able to move onto the next step.

6. A window will open asking if you are authorized to make changes to this vehicle. Select **Yes**.
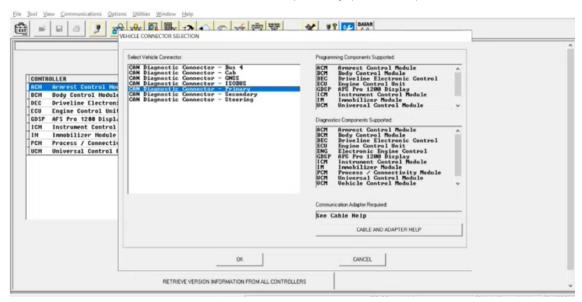

7. A window will open asking if you want EST to automatically retrieve vehicle status report information. Select **No**.
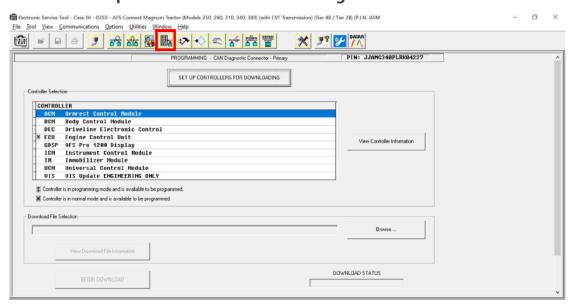
> **Note:** *Yes, can be selected but it will add more time to the updating process.*

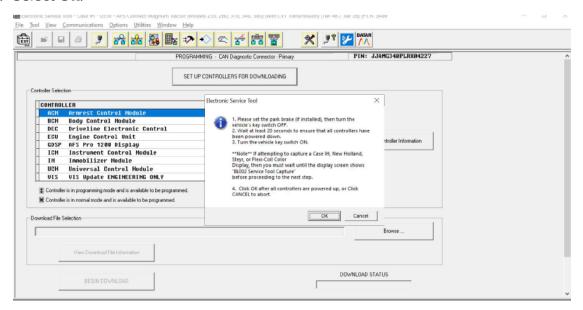8. Confirm that the EST is connected to the primary port and press **OK**.

9. Press the **Programming Button** in the top row.

10. Press the **Set Up Controllers for Downloading** button.

11. Follow the on screen instructions.

12. Turn off the vehicle and let the Pro 1200 display shut down completely.

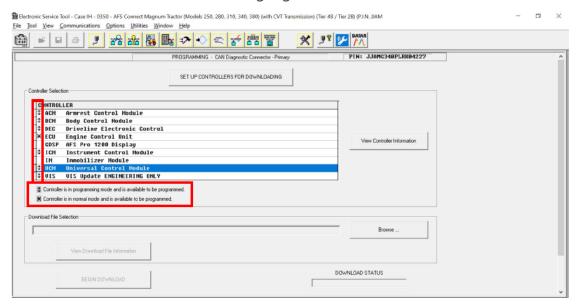13. Once all the controllers are completely shut down, turn key switch to on but do not start the engine.

14. Select **Ok**.
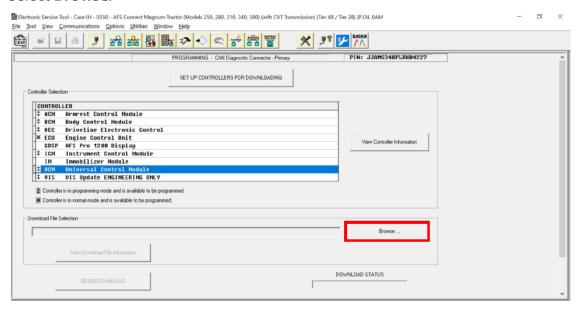

15. Look for vertical arrows next to the UCM to confirm that the controller is in the programing mode.

16. The Pro1200 screen will display the following message once it enters programming mode.

Either the device is in capture mode or the VIS is in the boot code.

17. Select UCM and confirm that it is highlighted in blue.
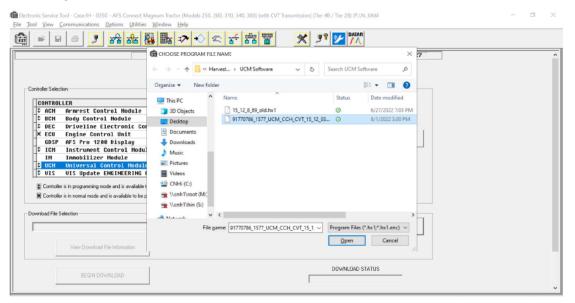

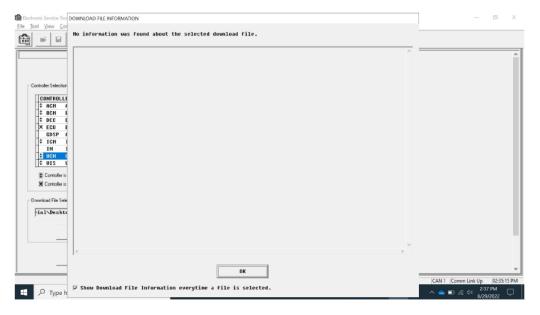
18. Select **Browse**.
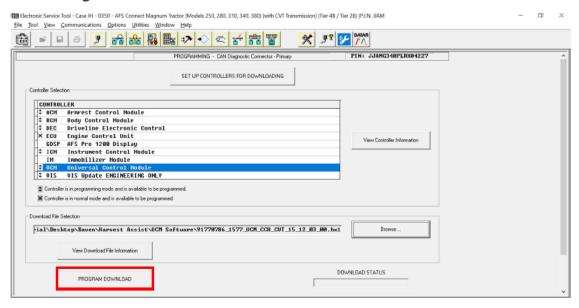

19. Select the UCM software.

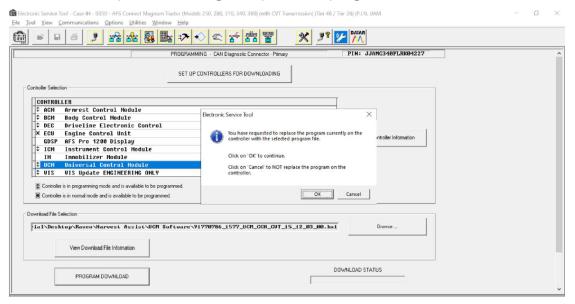20. Select **Open** for the selected software.

21. Select **Ok**.
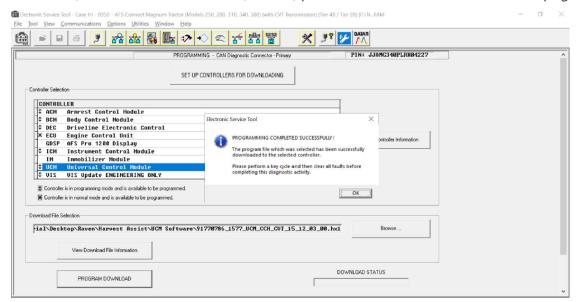
22. Select **Program Download**.

23. A window will open confirming to replace the program file. Select **Ok**.

24. A window will open when the programming is completed. Select **Ok**.

25. Turn the vehicle off.

> **Note:** *If the vehicle does not shift out of park return to the "Controller Test" page.*
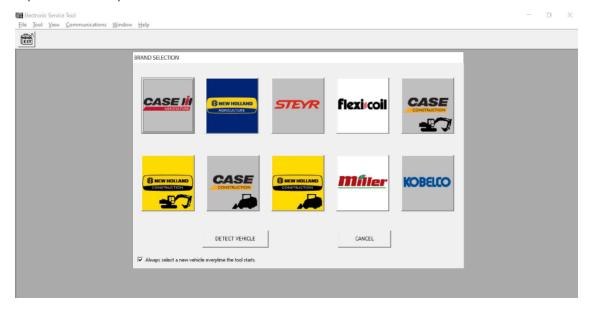
Update the Driveline Electronic Control (DEC)
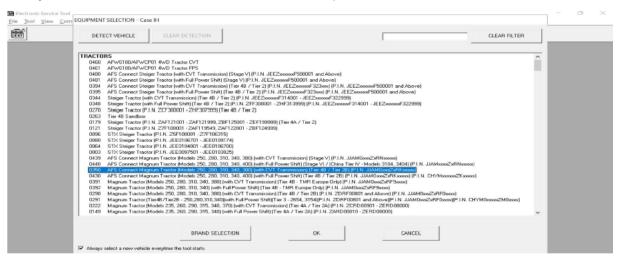
The DEC will be required to be updated for PST tractors.

Required Tools:

- Laptop with CNH EST Tool
- DEC Software

1. Turn the machine on.
2. Plug the laptop into the machine's primary port.
3. Open EST and press the **Detect Vehicle** button.

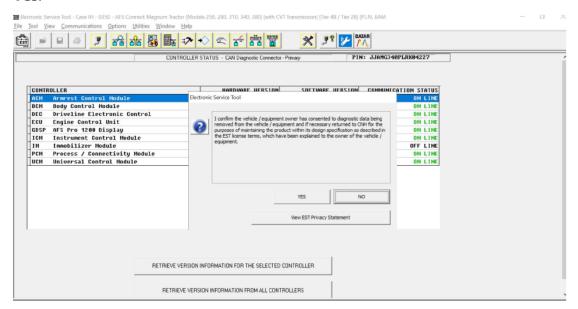4. Verify that the correct machine is selected and press **OK**.

5. Verify that the correct Vehicle PIN is displayed.

   Note: *If the Vehicle PIN is not populated you should be able to move onto the next step.*
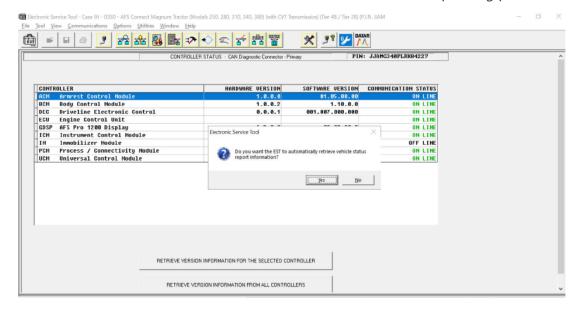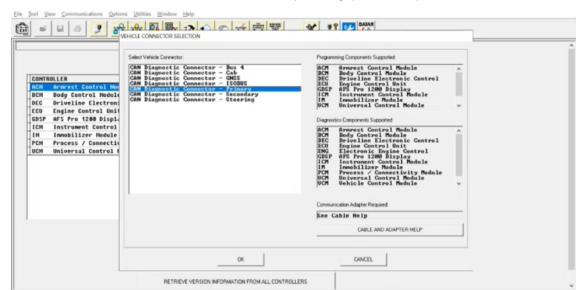
6. A window will open asking if you are authorized to make changes to this vehicle. Select **Yes**.

7. A window will open asking if you want EST to automatically retrieve vehicle status report information. Select **No**.

   Note: *Yes, can be selected but it will add more time to the updating process.*

8. Confirm that the EST is connected to the primary port and press **OK**.

9. Press the **Programming Button** in the top row.

10. Press the **Set Up Controllers for Downloading** button.

11. Follow the on screen instructions.

12. Turn off the vehicle and let the Pro 1200 display shut down completely.

13. Once all the controllers are completely shut down, turn key switch to on but do not start the engine.

14. Select **Ok**.

15. Look for vertical arrows next to the DEC to confirm that the controller is in the programing mode.

16. Select DEC and confirm that it is highlighted in blue.
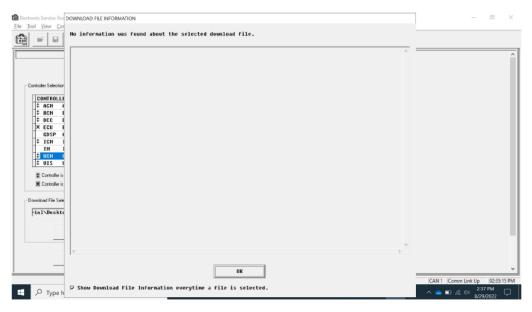
17. Select **Browse**.
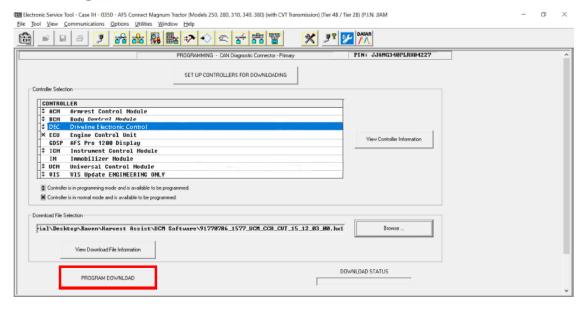
18. Select the DEC software.

19. Select **Open** for the selected software.
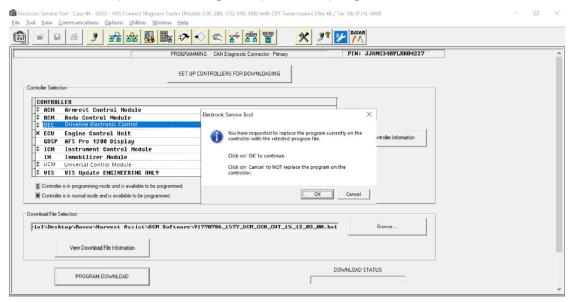
20. Select **Ok**.
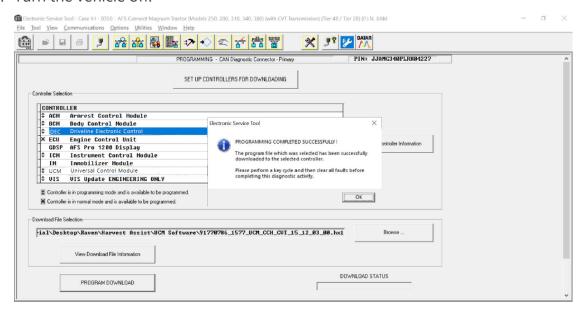
21. Select **Program Download**.

22. A window will open confirming to replace the program file. Select **Ok**.

23. A window will open when the programming is completed. Select **Ok**.

24. Turn the vehicle off.
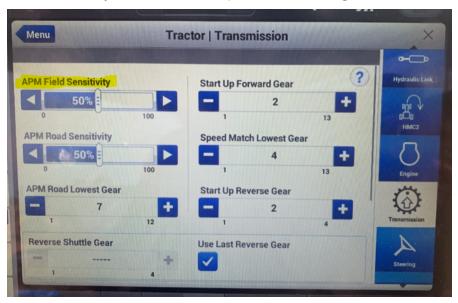
Update the APM Field Sensitivity Setting

The APM field sensitivity setting will be required to be updated for PST tractors.

1. Locate the APM Field Sensitivity setting in the Pro 1200.

2. Navigate to the field sensitivity settings by pressing the Menu>Tractor Settings>Transmission.

3. Set the APM Field Sensitivity to 50%.

   Note: *The APM sensitivity toggles in the background at propulsion engagement automatically and does not require a user change.*

Update the APM Engine Speed Minimum and Maximum

The APM engine speed minimum and maximum will be required to be updated for PST tractors.

1. Locate the APM Engine Speed settings in the Pro 1200.

2. Navigate to the engine speed settings by pressing the Menu>Tractor Settings.

3. Set the APM Engine Speed Min to 850 RPM.

4. Set the APM Engine Speed Max to 2200 RPM.

Set the Constant Engine Speed to Off

The Constant Engine Speed needs to be turned off for PST tractors.

1. Locate the constant engine speed button on the armrest.

2. Turn both 1 and 2 constant engine speed buttons to off.

   Note: *The LED lights on the buttons will be turned off when the constant engine speed has been turned off.*

Set the Tractor Transmission Aggressiveness
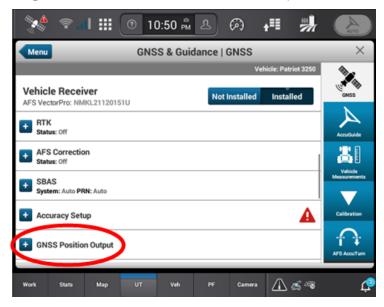
The transmission aggressiveness only needs to be set for tractors with a CVT transmission.

1. Set the transmission aggressiveness to 3. Press the button on the armrest until 3 led lights are displayed.
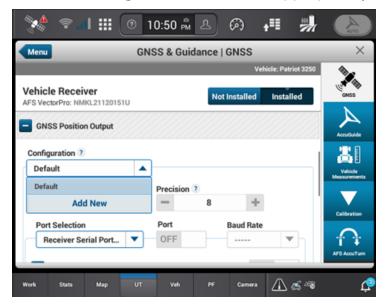
Setup the AFS Vector Pro Output to the RS Lite

1. Navigate to the GNSS and Guidance setup screen under the UT tab.

2. Add a new configuration and name it appropriately.
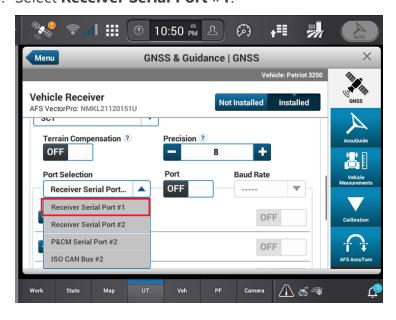
3. Turn off the ISO Can messages.

4. Set the port selection to ISO CAN BUS #2 and NMEA ISO Bus to OFF.

5. Select **Receiver Serial Port #1**.
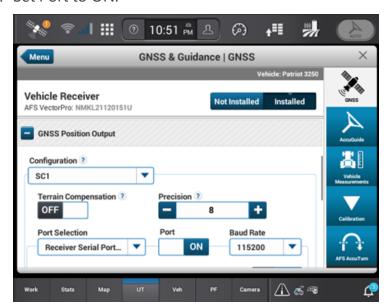
6. Turn Terrain Compensation Off and turn the Port On. Set the Baud Rate to 115200.

   Note: *If the Baud Rate appears to be stuck at 38400, leave the setting at 115200 and reboot the system. After reboot verify the baud rate is set to 115200.*

7. Set Precision to 8.
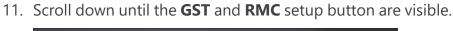
8. Set Port to ON.
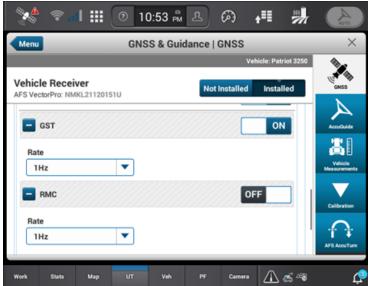
9. Scroll down until the **GGA** and **GSA** setup buttons are visible.

10. Set the following settings:

- **GGA** - 10Hz
- **GSA** - .1Hz

11. Scroll down until the **GST** and **RMC** setup button are visible.

12. Set the following settings:

- **GST** - 1Hz

- **RMC** - Off

- Scroll down the **VTG** and **ZDA** setup are visible.
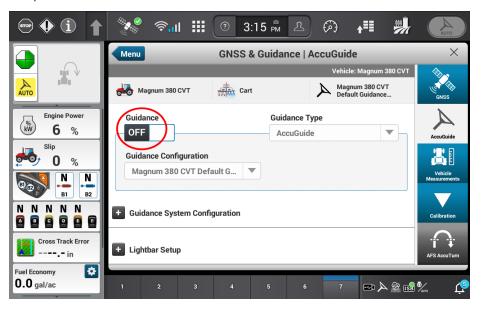
13. Set the following settings:

- **VTG** - .1Hz
- **ZDA** - 1Hz

Turn off Guidance

1. Press the AccuGuide tab.
2. Set the AccuGuide Guidance to Off.
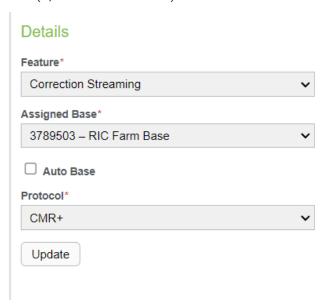
   Note: *Guidance will need to be turned on again if a user wants to return to factory guidance. Refer to "Return the Tractor to Factory Guidance" on page 186 for more information.*

Configure RTK Corrections into the AFS Vector Pro from the Raven Field Hub

Note: *This procedure is only necessary if receiving RTK corrections for the tractor from the Slingshot® Field Hub. Both vehicles should be using the same RTK/RTX network.*
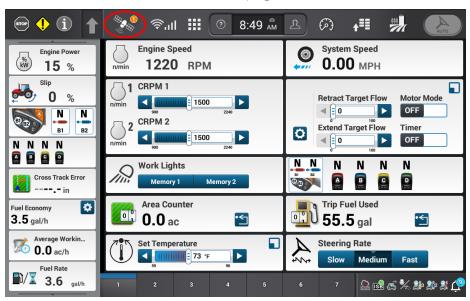
Make sure that the Field Hub is set up to the correct field base station and on CMR+ protocol. Make sure that the serial port of the Field Hub is connected to the RTK In port on the (P/N 115-2612-001) cable.
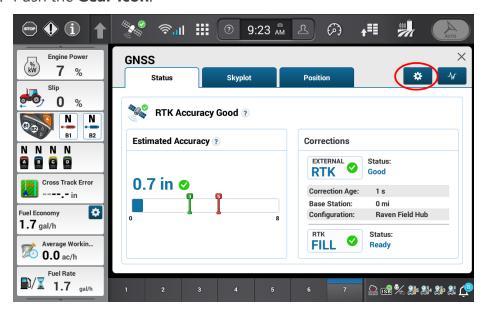
Setup the Field Hub Correction Profile
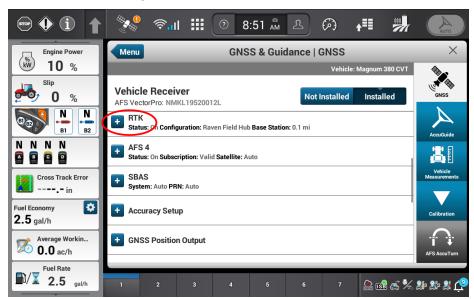
1. Push the **GNSS Icon** on the home page.
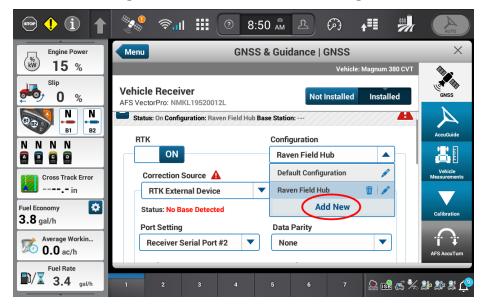
2. Push the **Gear Icon**.
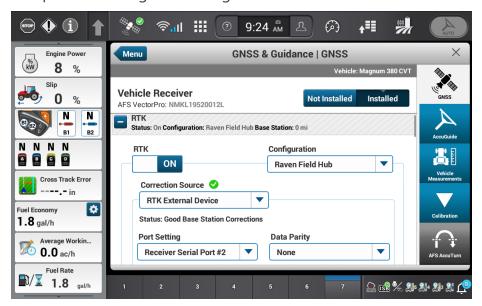
3. Push the **RTK Setup Tab**.
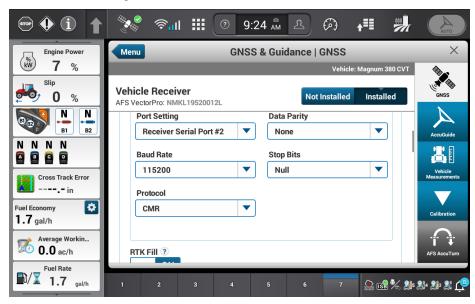
4. Add a new configuration or edit the current configuration.

5. Setup the following RTK settings.

- **RTK** - On

- **Configuration** - Raven Field Hub

- **Correction Source** - RTK External Device

- **Port Setting** - Receiver Serial Port #1

- **Data Parity** - None
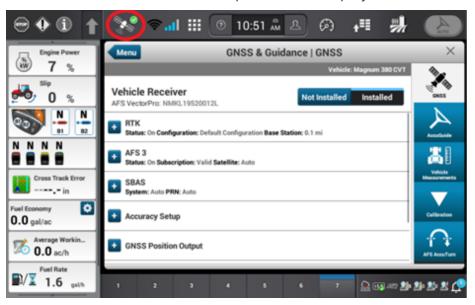
- **Baud Rate** - 115200

- **Stop Bits** - Null

- **Protocol** - CMR

- **RTK Fill** - On

6. Return to the GNSS page and make sure that the CGR is receiving RTK.
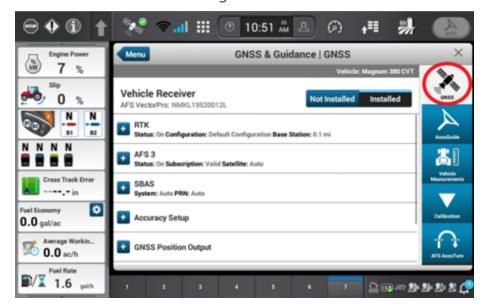
Verify / Update the Tractor to the Correct Datum

Note: *All tractors and combines being used for Raven Cart Automation™ need to be referencing the same datum. NAD83 (NSRS2011) is the default datum for RTX in North America. If you are going to run Raven Cart Automation™ in a different region, you will need to look up the default RTX datum and switch to that datum in the field computer.*
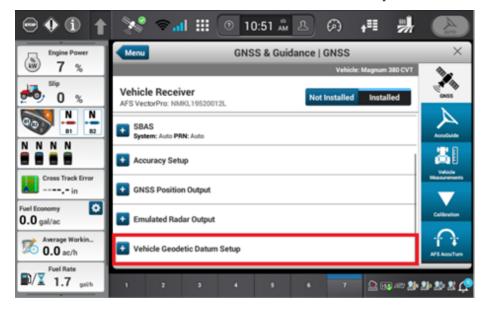
1. Select the **Satellite** icon in the top left of the display.

2. Select the **GNSS** tab on the right side of the screen.
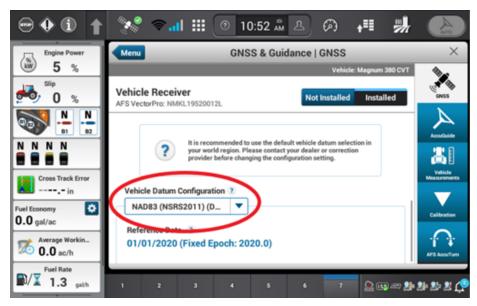
3. Scroll down until the **Vehicle Geodetic Datum Setup** bar and select it.
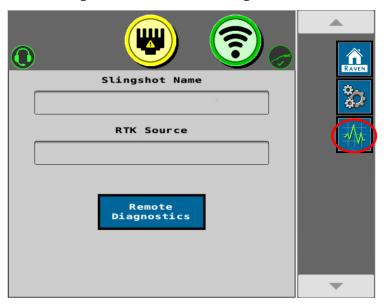
4. After the Vehicle Geodetic Datum Setup is selected a drop down labeled Vehicle Datum Configuration should be visible.

5. Verify the machine is on **NAD83 (NSRS2011)** Datum. If not selected press the drop down and select NAD83 (NSRS2011) Datum.

6. If using RTK and RTK or AFS3/PLM3 verify that the streaming source is the same.

- Base Station, Datum, Satellite
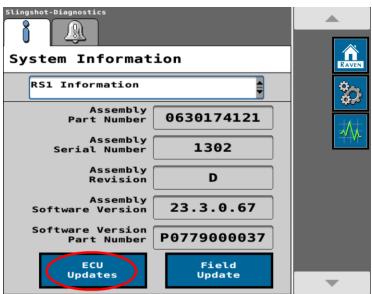
Update the Tractor RCU

1. Navigate to the Slingshot® object pool.

2. Select the gear icon on the right side of the screen.

3. Select the **System Information** tab.

4. Select **RS1™ Information** from the drop-down menu.

5. Press the **ECU Updates** Prompt.

6. Select the desired software version and press **Download and Install**.

> **Note:** *If no update is needed the screen will display that **All ECUs are at the correct software version***.

7. The Data Usage Warning window will open confirming to download the update.

8. Press the **Check Mark**.

9. A Notice window will open to notify to not turn off power during the update process.
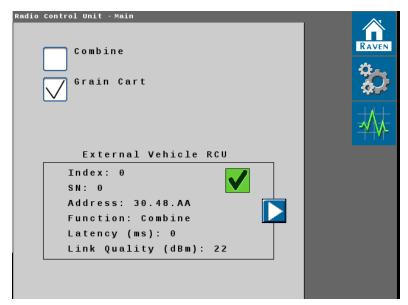
10. Press the **Check Mark**.

Setup the Tractor RCU

1. Press the Raven Cart Automation™ tab at the bottom of the screen.

2. Select the **RCU** tab.

3. Select **Grain Cart**.
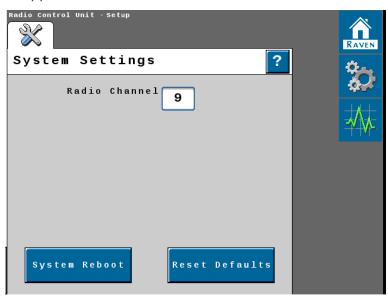
   Note: *Press the arrows in the External Vehicle RCU window to see the other vehicles in the area that are on the same channel.*
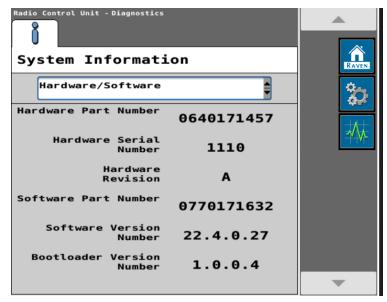
4. Press the **Gears** button ⚙.

5. Set the **Radio Channel**. The default channel is 9. Refer to "Scan for the Optimal Tractor RCU Channel" on the next page on how to search for the optimal channel.

> **Note:** *All machines must be set to the same radio channel. Up to six machines are supported.*

6. Press the **Diagnostic** button to verify the software version.
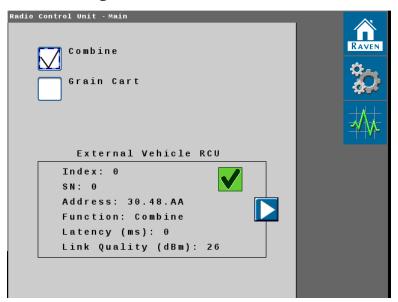
Scan for the Optimal Tractor RCU Channel

It is recommended to perform a scan for the optimal RCU channel with the lowest interference levels.

Note: *The default channel is 9.*

1. Open the RCU object pool.

2. Press the **Diagnostic** button .

3. Press the **RCU Test** tab.
4. Select **Channel Scan** from the drop down.

5. Press the **Play** button.

6. Run the channel scan for 2 to 5 minutes and select the recommended channel.

- The black bars are an average of background noise.
- The red lines are spikes (large spikes can drop messages ultimately causing kick outs).
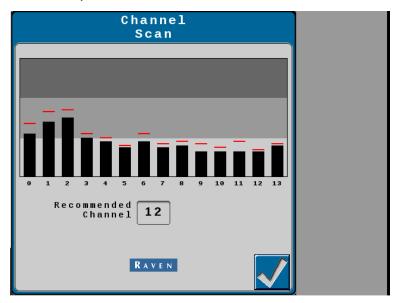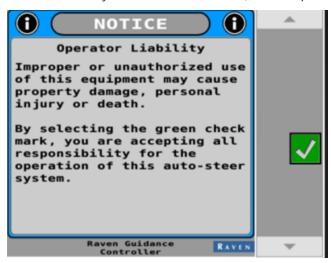
7. Set the RCU to the recommended channel.

Setup the Tractor Vehicle Navigation

1. Press the Raven Cart Automation™ tab at the bottom of the screen.

2. Select the **Vehicle Navigation** tab.

3. Press the Green Check Mark to accept the Operator Liability Notice.

    Note: *The system will not work if this step is not completed.*
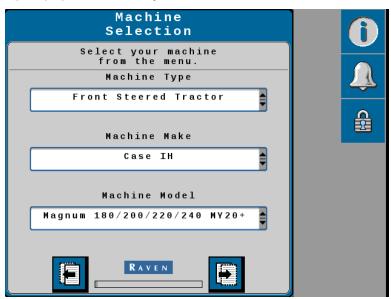
4. Select the correct tractor information.

5. Make sure to use model year 2020 and greater model numbers.

> **Note:** *If the machine model is selected the dimensions for vehicle navigation will be pre-populated. Verify that all dimensions are correct.*

6. Set the Navigation System:

- Automation Level - Drive Assist
- Guidance Mode - Follower Mode
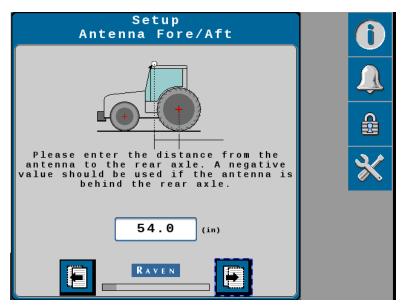
7. Verify that **CNH UCM** is set as the Steering Partner.

8. Press the **Next** button.
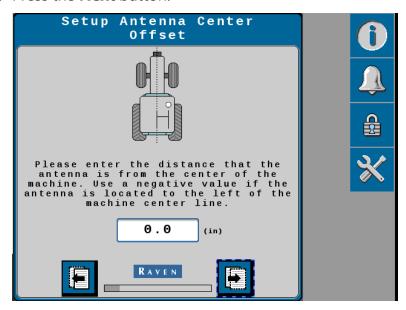
9. Set the Antenna Fore / Aft dimensions.

10. Press the **Next** button.
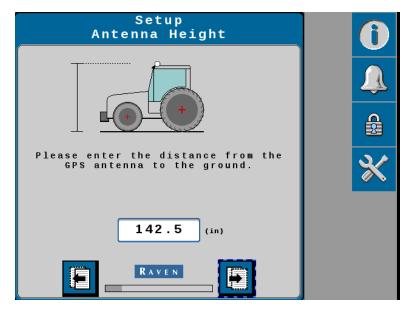
11. Set the Antenna Center Offset dimension.

12. Press the **Next** button.
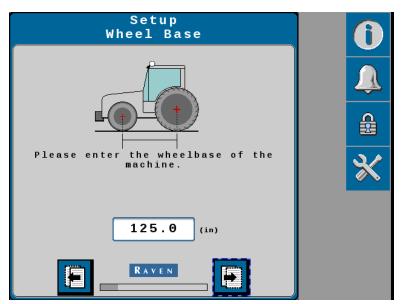
13. Set the Antenna Height dimension.

14. Press the **Next** button.

15. Set the Wheel Base dimension.

16. Press the **Next** button.
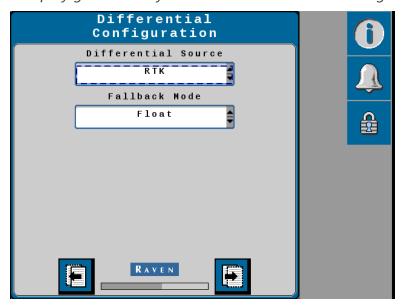
17. Set the Differential Source and Fallback Mode based on the GPS source being used.
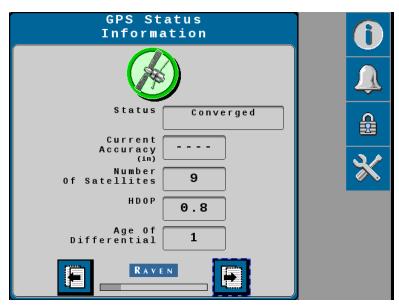
Differential Source	FallBack Mode
RTK	Float
L-Band	Float

18. Press the **Next** button.
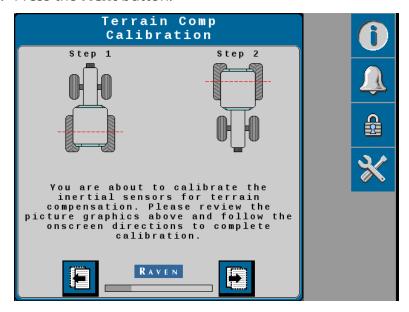
> **Note:** *The RTK correction source is not working correctly if the GPS status does not display green. It may take several minutes to converge the RTK correction type.*
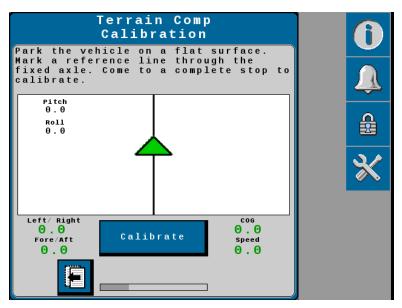
19. Wait for the GPS Status to change to **Converged**.

20. Press the **Next** button.
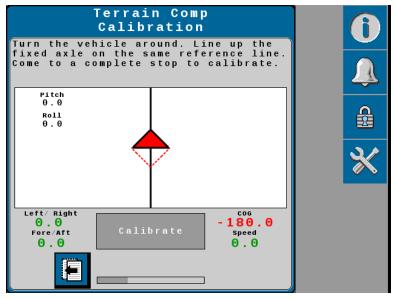
21. Perform the Terrain Compensation Calibration.

22. Press the **Next** button.

23. Press the **Calibrate** button and follow the on screen instructions.
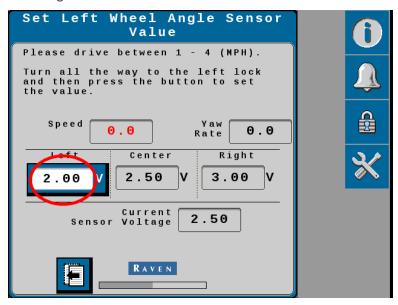
24. Drive forward between 1.6 - 6.4 km/h [1 - 4 mph]

25. Turn the steering wheel all the way to the left steering lock.
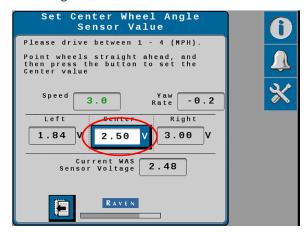
26. Press the **Left** button to set the left WAS value.

> **Note:** *Do not turn the steering wheel until the WAS page advances to the Center WAS setting.*
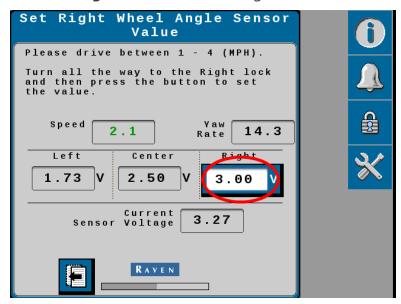
27. Drive forward between 1.6 - 6.4 km/h [1 - 4 mph] with the machine wheels pointing straight ahead.

28. Press the **Center** button to set the center WAS value.

> **Note:** *Do not turn the steering wheel until the WAS page advances to the Right WAS setting.*

29. Drive forward between 1.6 - 6.4 km/h [1 - 4 mph].

30. Turn the steering wheel all the way to the right steering lock.
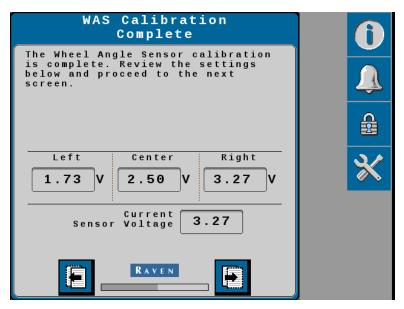
31. Press the **Right** button to set the right WAS value.

32. Review the WAS calibration information.

> **Note:** *Do not turn the steering wheel until the following Calibration Complete page is displayed.*

33. Press the **Next** arrow.

Calibrate the Machine Steering System

The steering control calibration process allows the system to learn the hydraulic capabilities of the machine for optimal steering performance in the field.

Note: *During calibration, the machine will make several hard left and right turns. Adjust the vehicle speed and location as necessary.*
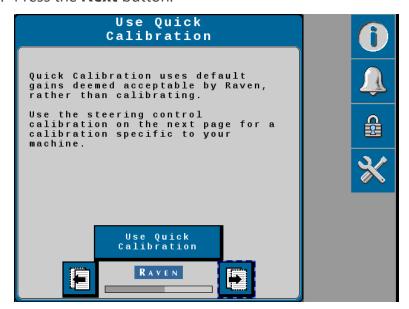
⚠️ **WARNING**
The machine will steer automatically. Be sure the area around the vehicle is clear of people and obstacles before engaging the auto-steer system. To disengage auto-steering at any time, turn the steering wheel or select the on-screen Stop button.

1. Do not use the quick calibration to calibrate the steering system.

2. Press the **Next** button.
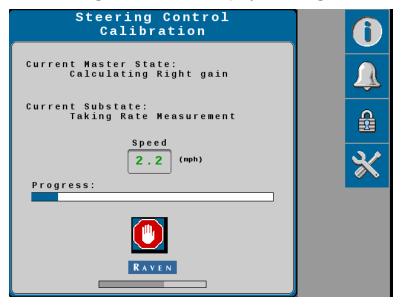
3. Begin driving forward at a speed between 1.6 and 6.4 km/h [1 and 4 mph].

4. Press the resume switch or use the on-screen arrow to begin calibration.

5. The following information is displayed during the calibration process:

6. Allow the auto-steer calibration to complete. Once complete, select the **Next** page button to proceed.

7. Review the steering effort information shown on the page. Select the **Next** page button to proceed.

8. Review the information presented on the Calibration Wizard Summary page.

Raven Cart Automation™ Tractor Calibration

1. Press the Raven Cart Automation™ tab at the bottom of the screen.

2. Press the **Raven Cart Automation™** tab.

3. Press the gears icon on the right side of the page.

   Note: *On new installations a pop up window will open asking to configure the system.*

4. Verify that **Tractor** is set as the machine type.

5. Press **Grain Cart Dimensions** button.

6. Enter the **Grain Cart Length**.

> **Note:** *This dimension is the length of the interior opening of the grain cart. The tarp end caps should not be included in this measurement.*

7. Set the Sync Point.

NOTICE
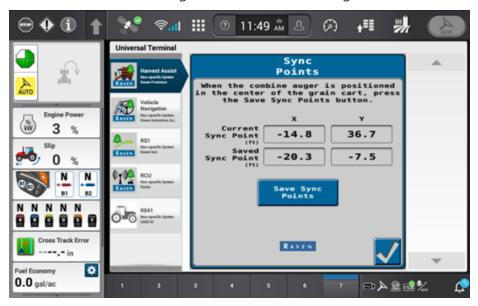
Important! For any configuration change, including but not limited to changing the auger extension, changing a header, tire configuration, or changing a grain cart, operator must review and consider whether a sync point reset is needed.

Note: *Setting the sync point does not have to be completed during the calibration. The sync point can be set during crop harvesting to align the tractor's tires between the crop rows to avoid stubble damage.*

- Requirements to save a Sync Point

  - Combine in radio range

  - Combine has RTK GPS Mode

  - Tractor has RTK GPS Mode

  - Combine and Tractor have a Heading within 5 degrees of each other

  - Grain Cart is inside the Sync Window

Note: *Required sync point minimum distance between vehicles is 1 m [3.3 ft].*

8. Position the combine auger in the center of the grain cart.
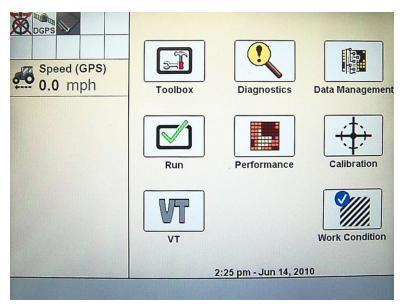
9. Press the **Save Sync Points** button. The X and Y fields will be updated to indicate that the sync point has been saved.

Raven Cart Automation™ Combine Provisioning Overview
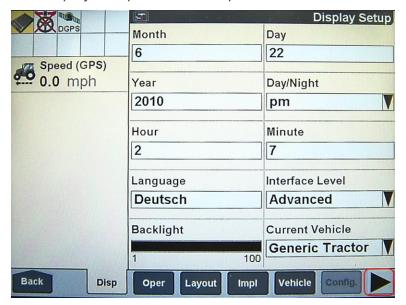
Provision the Trimble 372 Receiver

Note: *The following settings are made through the AFS® Pro700 or Trimble AgRemote™ software. The screenshots appearance will vary depending on which application is used.*

1. From the AFS Pro700 main menu select **Toolbox**.
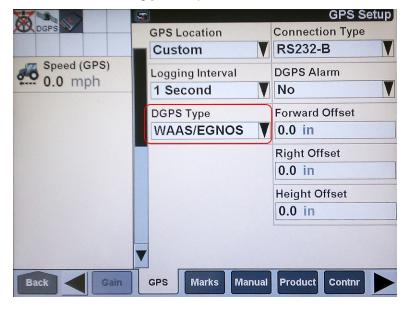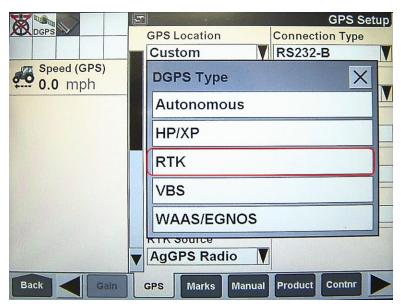
2. The Display Setup Screen will open.

3. Select ▶ .

4. Select **GPS**.

5. Select the **DGPS Type** drop-down box.

6. Select **RTK**.

7. Verify that the Chanel ID field displays **No Radio** and that the RTK/RTX Source is set to **AgGPS Radio**.

8. Press the **Back** button on the GPS Setup screen.
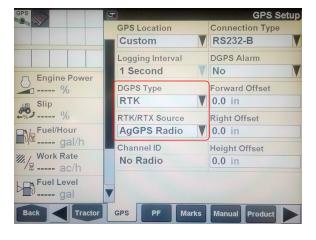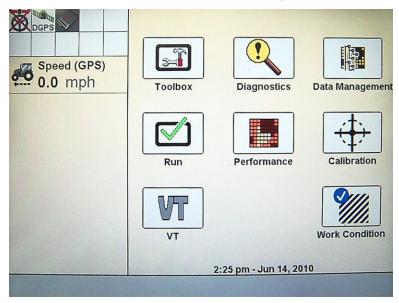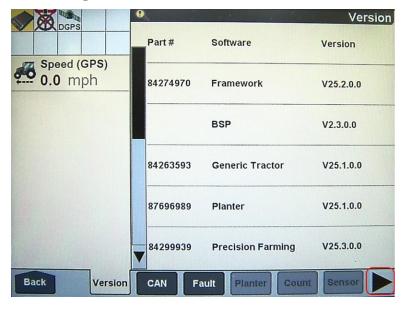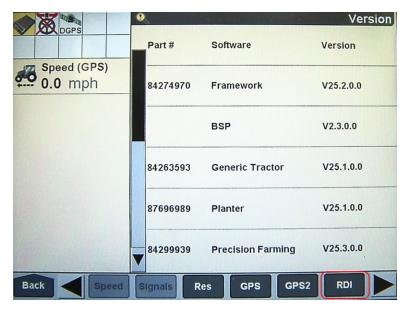
9. Select **Diagnostics**.

10. Select ▶.

11. Select **RDI**. The following screen will appear.

NOTICE

The settings contained in the text below have been thoroughly tested and verified. The change in settings resulted in improved RTK availability in real field conditions when used with the Slingshot® system. However, Raven Industries in no way guarantees or warranties the equipment configuration of non-Raven equipment. Please contact your Trimble customer support for further details.
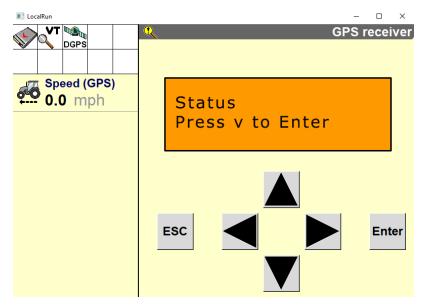
To ensure optimal RTK signal availability with the AgGPS 262/AG-372 receiver, it may be necessary to adjust the DOP mask settings. While a low RTK DOP mask setting provides high confidence in GPS position, GPS constellation settings often drop RTK fix in some geographic regions.

Trimble provides a DOP predictor tool that assists in determining acceptable settings for specific geographical areas. Adjust the receiver settings as indicated below to change the "to fix" and "when fixed" conditions.

If the settings do not match what is shown, toggle through the options until the settings change to match the settings shown. To change the settings.

1. Press the ▶ until the item to be changed flashes.

2. Select the ▲ or ▼ button to change the setting.

3. Select Enter.

12. Select ▶ . The following screen will appear:
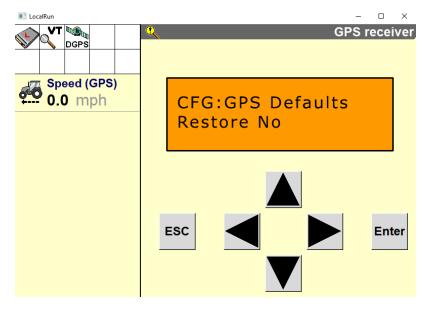
13. Select ▶ . The following screen will appear:

14. Select ▼ . The following screen will appear:

15. Select ▼ . The following screen will appear:

16. Select ▼ . The following screen will appear.

17. Select ▼ . The following screen will appear (AG-372 Only):

18. Select ▼ . The following screen will appear:

> **Note:** *A lower Elevation Mask setting offers a better view of satellites, which can improve RTK availability.*

19. Select ▼ . The following screen will appear:

20. Select ▼ . One of the following screens will appear depending on which receiver is installed:
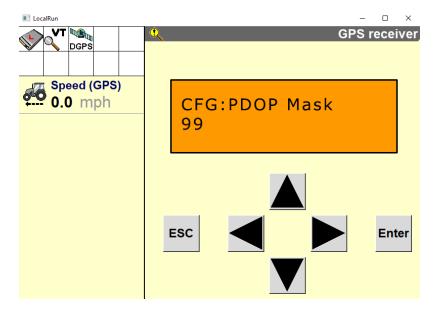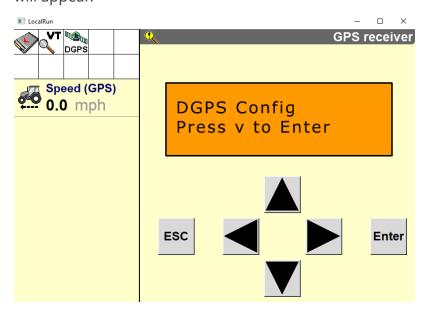
AgGPS 262
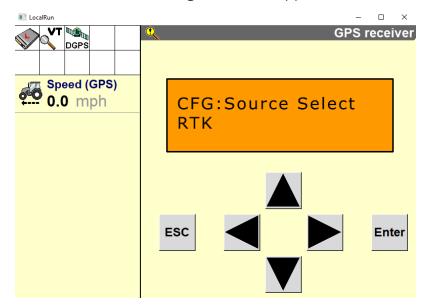
AG-372
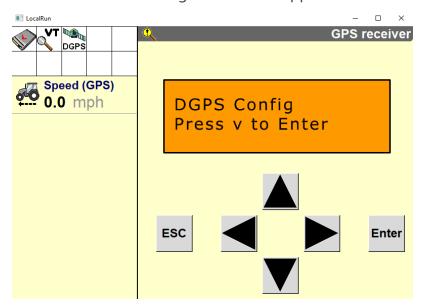
21. Select **ESC**. When the GPS Config screen reappears, select ▶ . The following screen will appear:

22. Select ▼ . The following screen will appear:

23. Select **ESC**. The following screen will reappear:

24. Select . The following screen will appear.

25. Select ▼ . The following screen will appear:

26. Select ▼ . The following screen will appear:

27. Select ▼ . The following screen will appear:

Note: *Selecting the Favor Avail setting will result in improved RTK availability.*

28. Select ▼ . One of the following screens will appear depending on which receiver is installed:

AgGPS 262

AG-372

29. Select ▼ . The following screen will appear:

30. Select ▼ . The following screen will appear:
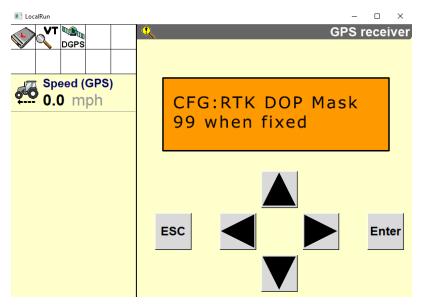
31. Select ▼ . The following screen will appear:

32. Select ▼ . The following screen will appear:

33. Select ▼ . The following screen will appear:
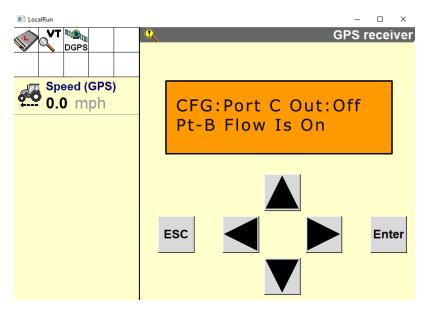
34. Select **ESC**.

Port C Configuration
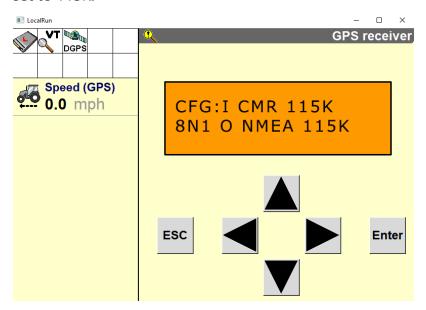
1. Arrow over to the Port C Configuration screen. Arrow down until the screen below is shown. If Port C Out is on, turn it off.

    Note: *If using an Ag450 radio or similar configure Port C per the device manufacture's recommendations.*

Port B Configuration
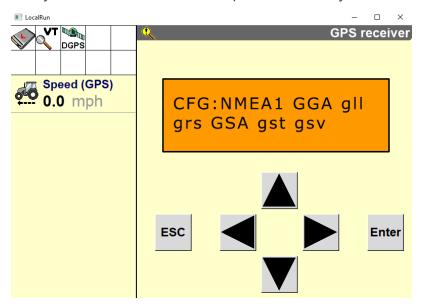
1. Press the right button until "Configuration" displays on the screen.

2. Press the down button to select "Configuration".

3. Press the right button until "Port B Config" displays.

4. Press the down button to select "Port B Config".

5. Ensure the input (I) messages are set to CMR and the baud rate is set to 115K.

6. Verify the Output (O) messages are set to 8N1 and that the NEMA and baud rates are set to 115K.

7. Press Enter to save the settings.

8. Press the Down button until **NEMA1** displays.

9. Verify that **GGA** and **GSA** are capitalized so they are on.

10. Press Enter to save the settings.

11. Press the Down button until **NEMA2** displays.

12. Verify that **VTG** and **ZDA** are capitalized so they are turned on.

13. Press the down button to continue configuring Port B.

14. Press the down button until **CFG: Port B Out RTS_CTS** displays.

15. Verify **CFG: Port B Out RTS_CTS** is off.

16. Press Enter to save the settings.

17. Press the Down button to continue configuring Port B.

18. Press Enter to save the settings.

19. Press the Down button until **NEMA** out displays.

20. Ensure that **NEMA** out and **TSIP** out are set to **ASAP**. This will require arrowing over a second time once the "s" field is underlined.

21. Press Enter to save the settings.

22. Press the Down button until **CFG: NEMA Quality** displays.

23. Verify the setting is **Report True Mode**.

24. Press Enter to save the settings.

Provision the Trimble 392 Receiver
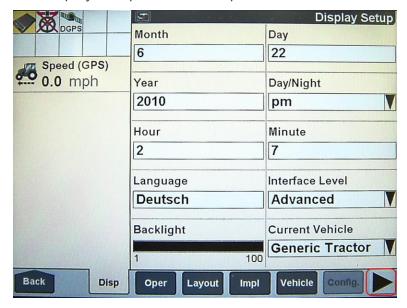
Note: *The Trimble 392 receiver is commercially known as the Nav-900 Guidance Controller.*

Note: *RDI screen configuration is the same as a Trimble 372 with the following difference: You must configure through port C NOT port B.*

1. From the AFS Pro700 main menu select **Toolbox**.
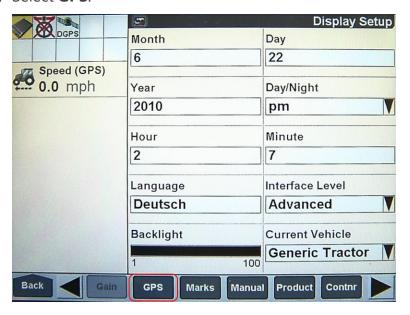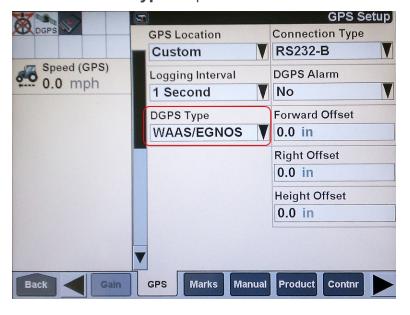
2. The Display Setup Screen will open.

3. Select ▶.

4. Select **GPS**.

5. Select the **DGPS Type** drop-down box.

6. Select **RTK**.

7. Verify that the Chanel ID field displays **No Radio** and that the RTK/RTX Source is set to **AgGPS Radio**.

8. Press the **Back** button on the GPS Setup screen.
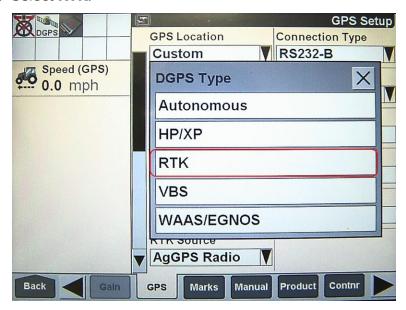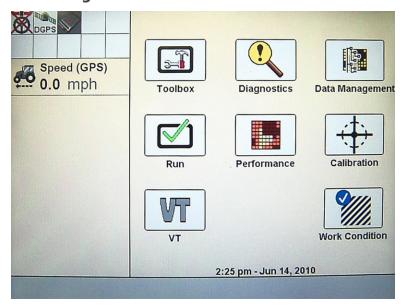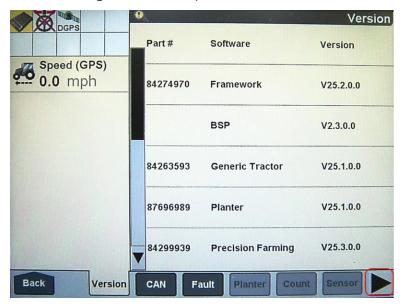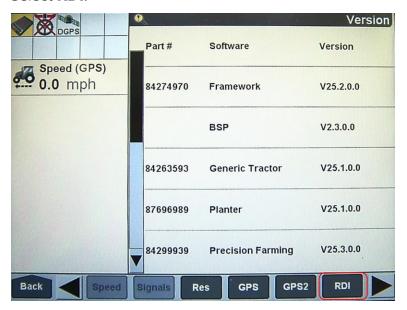
9. Select **Diagnostics**.

10. The following screen will open and select ▶.

11. Select **RDI**.

12. The following screen will appear.

NOTICE

The settings contained in the text below have been thoroughly tested and verified. The change in settings resulted in improved RTK availability in real field conditions when used with the Slingshot® system. However, Raven Industries in no way guarantees or warranties the equipment configuration of non-Raven equipment. Please contact your Trimble customer support for further details.
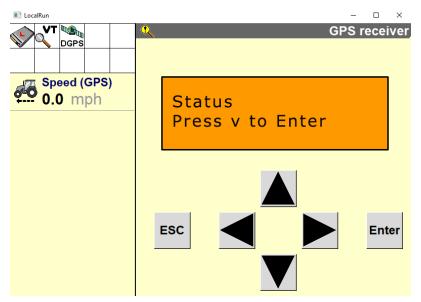
To ensure optimal RTK signal availability with the AG-392 receiver, it may be necessary to adjust the DOP mask settings. While a low RTK DOP mask setting provides high confidence in GPS position, GPS constellation settings often drop RTK fix in some geographic regions.

Trimble provides a DOP predictor tool that assists in determining acceptable settings for specific geographical areas. Adjust the receiver settings as indicated below to change the "to fix" and "when fixed" conditions.

If the settings do not match what is shown, toggle through the options until the settings change to match the settings shown. To change the settings.

1. Press the ▶ until the item to be changed flashes.

2. Select the ▲ or ▼ button to change the setting.

3. Select Enter.

13. Select ▶. The following screen will appear:
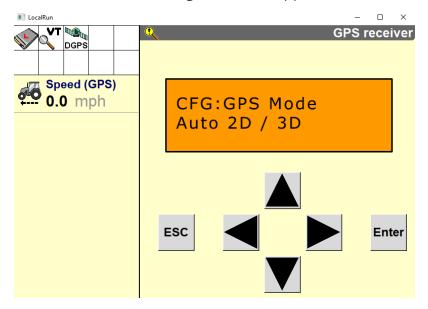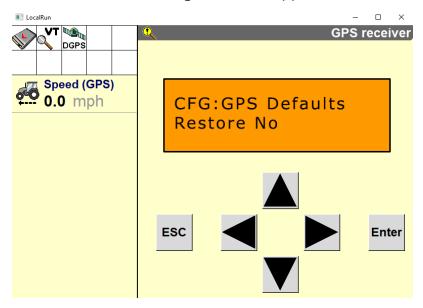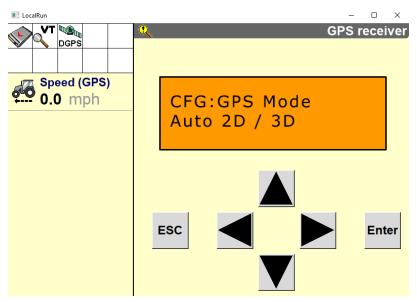

14. Select ▶. The following screen will appear:

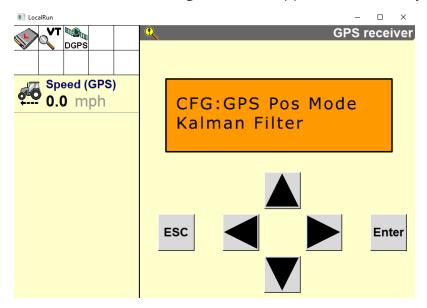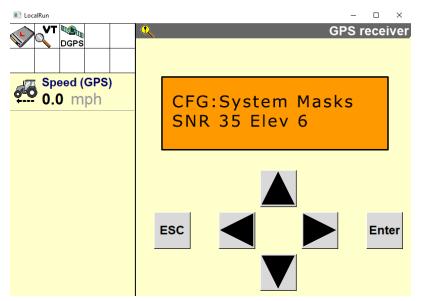15. Select ▼ . The following screen will appear:

16. Select ▼ . The following screen will appear:
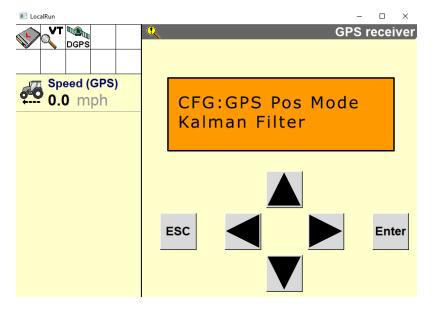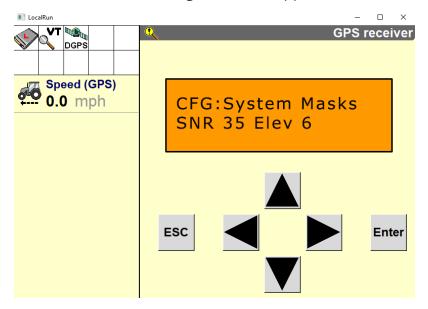
17. Select ▼ . The following screen will appear.

18. Select ▼ . The following screen will appear (AG-372 Only):
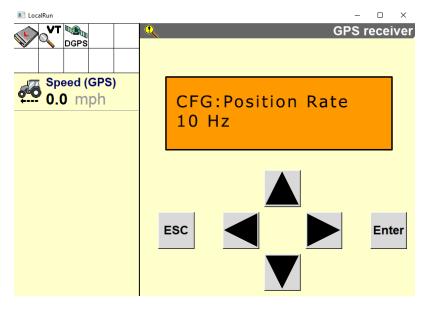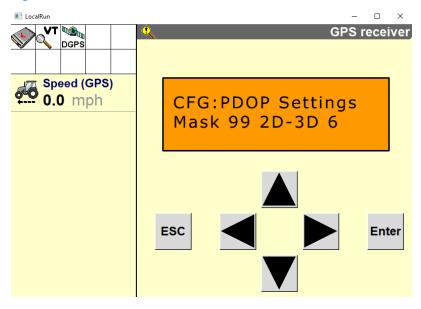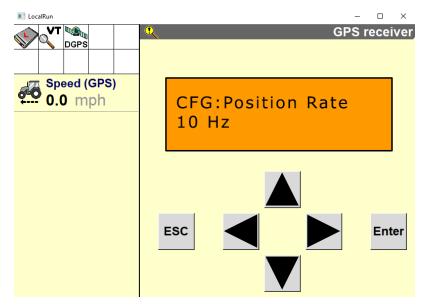
19. Select ▼ . The following screen will appear:
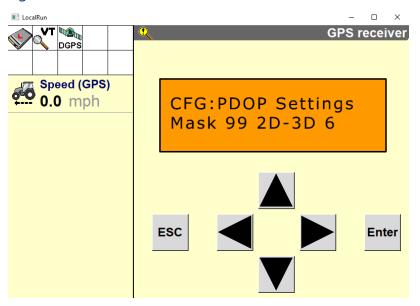
> **Note:** *A lower Elevation Mask setting offers a better view of satellites, which can improve RTK availability.*

20. Select ▼ . The following screen will appear:
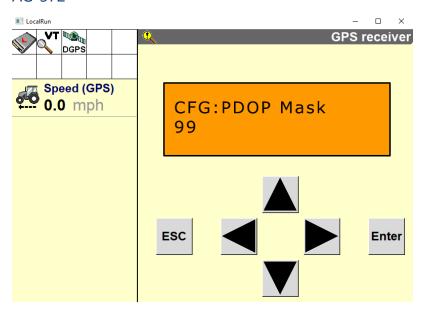
21. Select ▼ . One of the following screens will appear depending on which receiver is installed:
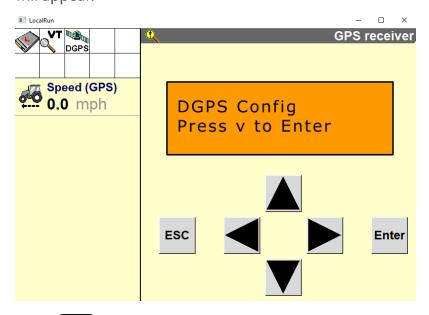
AgGPS 262
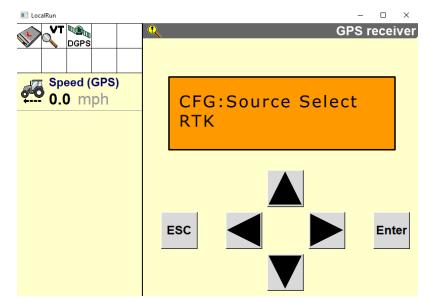
AG-372
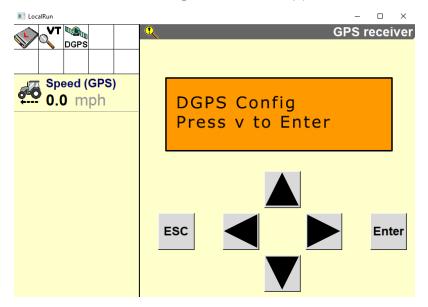
22. Select **ESC**. When the GPS Config screen reappears, select ▶. The following screen will appear:
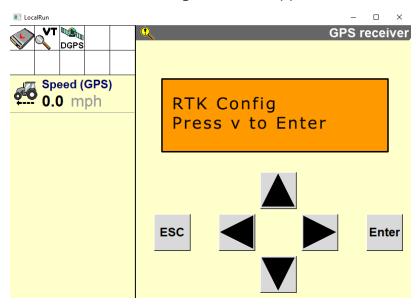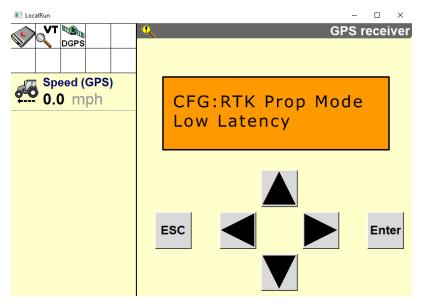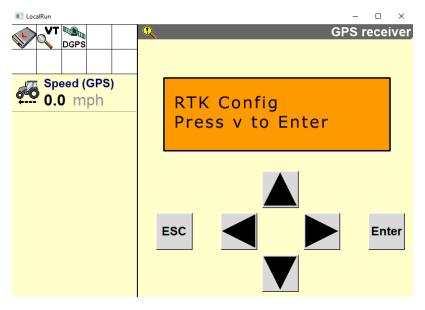

23. Select ▼. The following screen will appear:
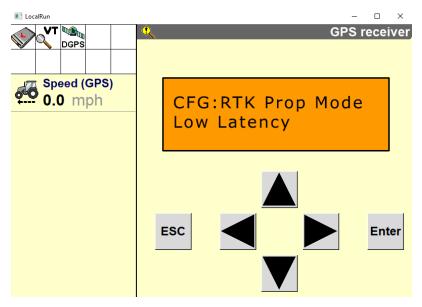
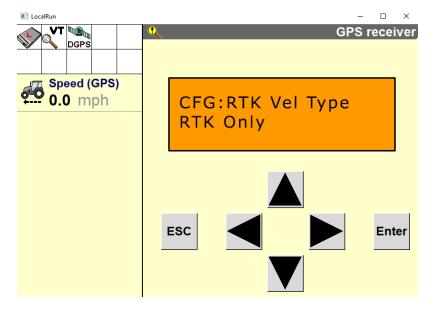24. Select **ESC**. The following screen will reappear:
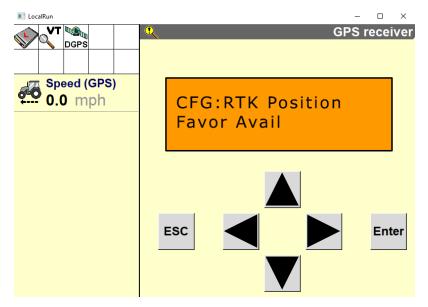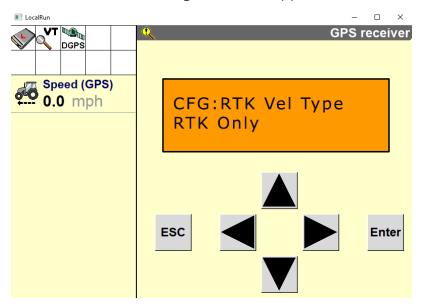

25. Select ▶. The following screen will appear.

26. Select ▼ . The following screen will appear:
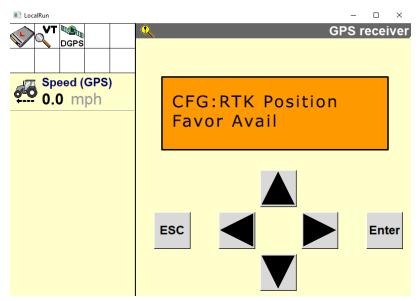
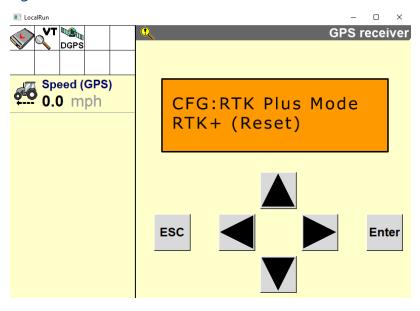27. Select ▼ . The following screen will appear:

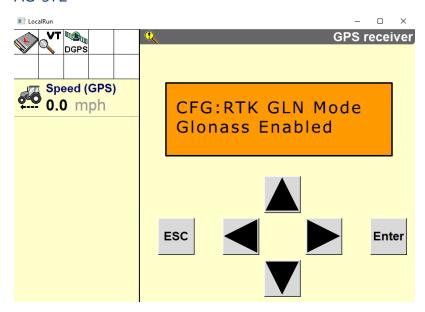28. Select ▼ . The following screen will appear:
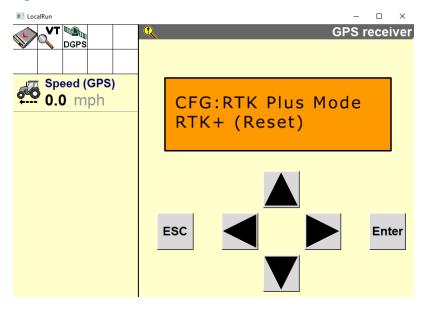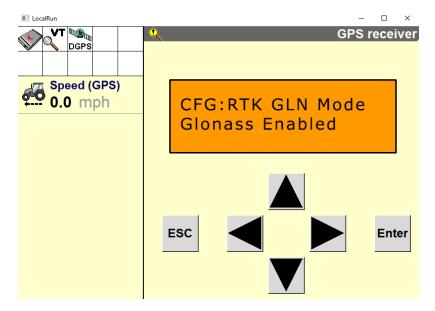
Note: *Selecting the Favor Avail setting will result in improved RTK availability.*

29. Select ▼ . One of the following screens will appear depending on which receiver is installed:
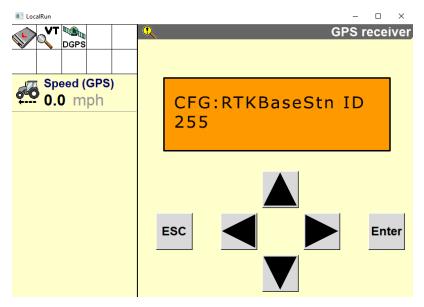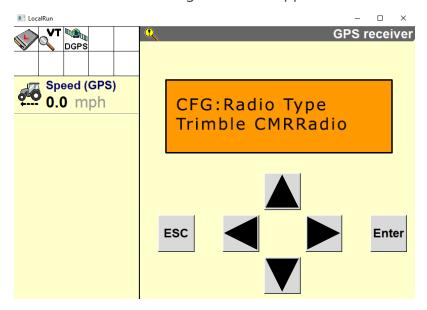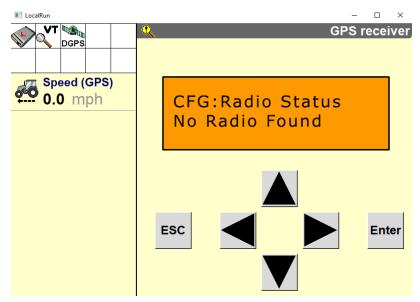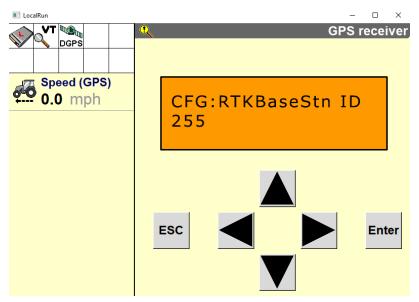
AgGPS 262

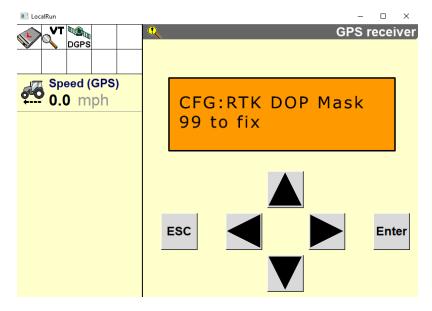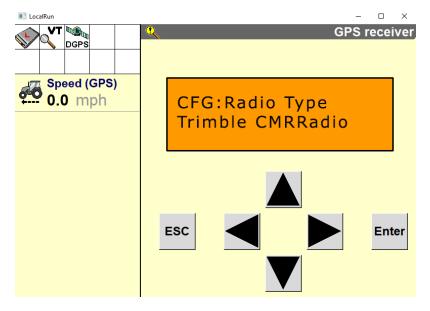AG-372

30. Select ▼ . The following screen will appear:
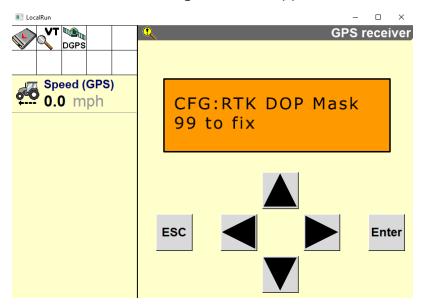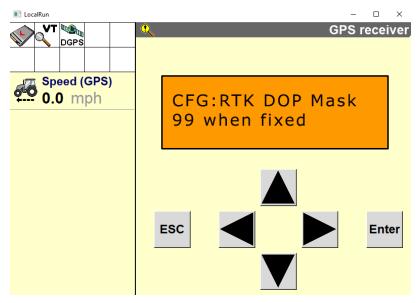
31. Select ▼ . The following screen will appear:

32. Select ▼ . The following screen will appear:

33. Select ▼ . The following screen will appear:

34. Select ▼ . The following screen will appear:
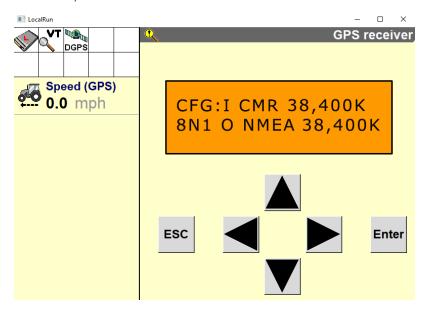
35. Select **ESC**.
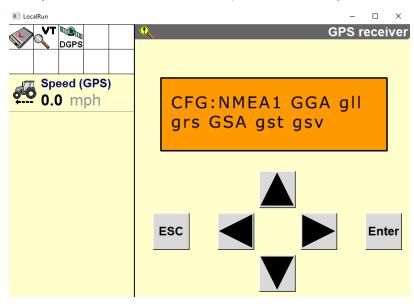
Port B Configuration

1. Press the right button until "Configuration" displays on the screen.

2. Press the down button to select "Configuration".

3. Press the right button until "Port B Config" displays.

4. Press the down button to select "Port B Config".

5. Ensure the input (I) messages are set to CMR and the baud rate is set to 38,400K.
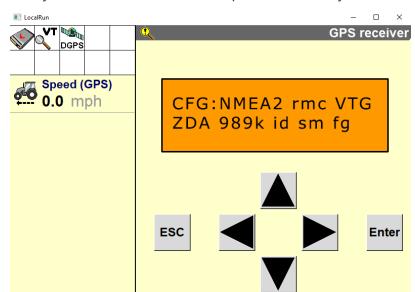
6. Verify the Output (O) messages are set to 8N1 and that the NEMA and baud rates are set to 38,400K.

7. Press Enter to save the settings.

8. Press the Down button until **NEMA1** displays.

9. Verify that **GGA** and **GSA** are capitalized so they are on.

10. Press **Enter** to save the settings.

11. Press the Down button until **NEMA2** displays.

12. Verify that **VTG** and **ZDA** are capitalized so they are turned on.

13. Press the Down button to continue configuring Port B.

14. Press the Down button until **CFG: Port B Out RTS/CTS** displays.

15. Verify CFG: Port B Out RTS/CTS is off.

16. Press Enter to save the settings.

17. Press the Down button to continue configuring Port B.

18. Press **Enter** to save the settings.

19. Press the Down button until **NEMA** out displays.

20. Ensure that **NEMA** out and **TSIP** out are set to **ASAP**. This will require arrowing over a second time once the "s" field is underlined.

21. Press **Enter** to save the settings.

22. Press the Down button until **CFG: NEMA Quality** displays.

23. Verify the setting is **Report True Mode**.

24. Press **Enter** to save the settings.

Port C Configuration (If Streaming RTK Corrections)

1. If inputting RTK Corrections into the Trimble 392, configure Port C using the same settings as Port B.

   Note: *Refer to the specific instructions for your modem if you are streaming RTK corrections to confirm port configuration.*

Confirm GPS Status

1. Select the **VT** button to bring up the object pool.
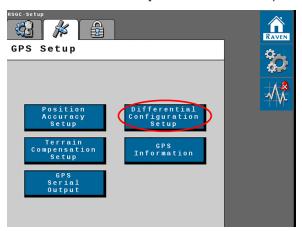
2. Select the RS Lite **UT** working set.
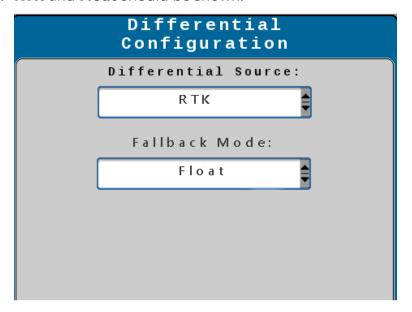
3. Select the **Settings** button on the right side of the screen.

4. Select the **GPS Setup** Button at the top of the screen.
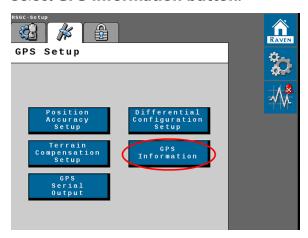
5. Select the **Differential Configuration Setup** button.

6. **RTK** and **Float** should be shown.
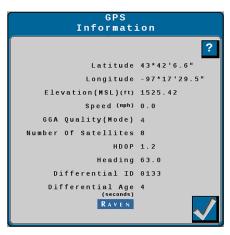
7. Select the check mark button.

8. Select **GPS Information button**.

9. A **4** should be displayed in the **GGA Quality (Mode)** section in the center of the screen.

Verify / Update the Combine to the Correct Datum
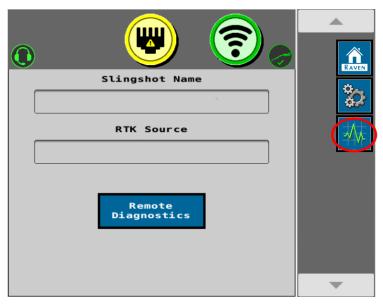
Note: *All tractors and combines being used for Raven Cart Automation™ need to be referencing the same datum. NAD83 (NSRS2011) is the default datum for RTX in North America. If you are going to run Raven Cart Automation™ in a different region, you will need to look up the default RTX datum and switch to that datum in the field computer.*

RTX datums are hard coded in the Trimble 372 and 392. Even if the datum is changed in the combine display, the actual datum will not be changed. Verify the combine datum and if it is for some reason not NAD83, update the tractor datum to match what is being used on the combine.
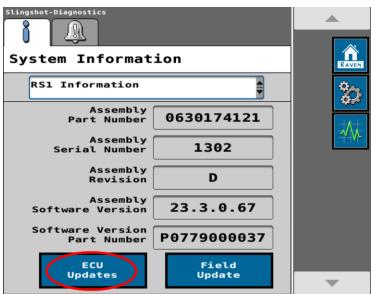
1. Check the combine datum.

2. If the combine datum is not set to NAD83 (NSRS2011), update the tractor datum to match that of the combine. Refer to "Verify / Update the Tractor to the Correct Datum" on page 50 for more information.

Update the Combine RCU

1. Navigate to the Slingshot® object pool.

2. Select the gear icon on the right side of the screen.

3. Select the **System Information** tab.

4. Select **RS1™ Information** from the drop-down menu.

5. Press the **ECU Updates** Prompt.

6. Select the desired software version and press **Download and Install**.

> **Note:** *If no update is needed the screen will display that **All ECUs are at the correct software version**.*

7. The Data Usage Warning window will open confirming to download the update.

8. Press the **Check Mark**.

9. A Notice window will open to notify to not turn off power during the update process.

10. Press the **Check Mark**.

Setup the Combine RCUChapter 2

Setup the Combine RCU

1. Enter the **VT Menu** and select the **RCU** page if it does not automatically open.

2. Select **Combine**.

   Note: *Press the arrows in the External Vehicle RCU window to see the other vehicles in the area that are on the same channel.*
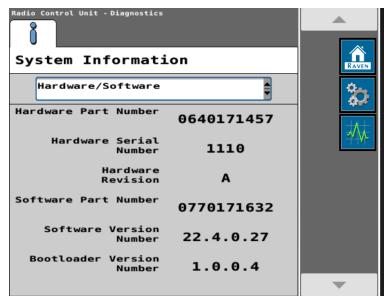
3. Press the **Gears** button .

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4. Set the **Radio Channel**. The default channel is 9. Refer to "Scan for the Optimal Combine RCU Channel" on the next page on how to search for the optimal channel.

   Note: *All machines must be set to the same radio channel. Up to six machines are supported.*

5. Press the **Diagnostic** button to verify the software version.
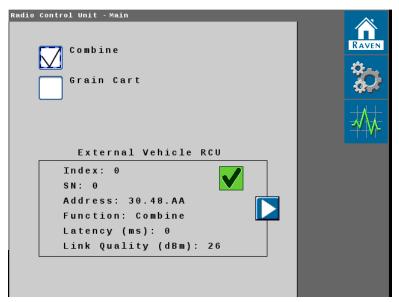
Scan for the Optimal Combine RCU Channel

It is recommended to perform a scan for the optimal RCU channel with the lowest interference levels.

Note: *The default channel is 9.*

1. Open the RCU object pool.

2. Press the **Diagnostic** button .

3. Press the **RCU Test** tab.

4. Select **Channel Scan** from the drop down.

5. Press the **Play** button.

6. Run the channel scan for 2 to 5 minutes and select the recommended channel.

- The black bars are an average of background noise.
- The red lines are spikes (large spikes can drop messages ultimately causing kick outs).
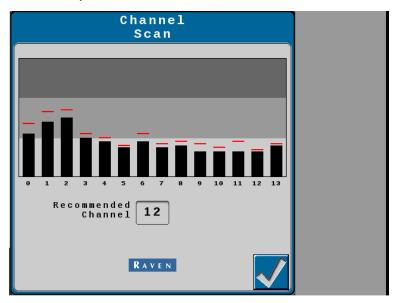
7. Set the RCU to the recommended channel.

Combine Slingshot® Communication Settings (If Equipped)

1. Enter the **VT Menu** and select the Slingshot® page.
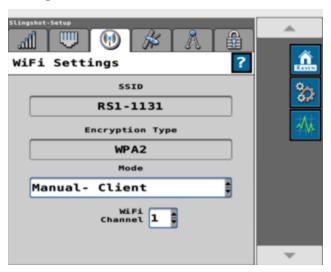
2. Press the **Gear Icon** on the right side.

3. Select the **Ethernet Settings** tab.

4. Set the RS Lite to **Field Hub Client Mode**.

5. Select the **WiFi Settings** tab.

6. Change the mode to **Manual-Client**.

7. Press the **Home Icon** and select the **WiFi Symbol**.

8. Find the combineField Hub and select it in the available WiFi signal list.

9. Enter the Field Hub password and verify that there is a green check mark after it is entered.

   Note: *The password is located on the card taped to the bottom of the Field Hub.*

Setup the Combine Vehicle Navigation

Note: *The following steps describe the settings required for the Raven Cart Automation™ system. Refer to the RS1™ and RS Lite Calibration and Operation Manual (P/N 016-4010-001) for additional information when completing the profile wizard.*

1. Enter the **VT Menu** and select the **Vehicle Navigation** tab.

2. Select **Combine/Rear Steered** as the Machine Type, select the Machine Make and the Machine Model.

   Note: *If the machine model is selected the dimensions for vehicle navigation will be pre-populated. Verify that all dimensions are correct.*
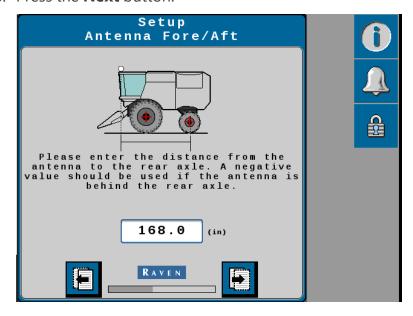
3. Press the **Next** button.

4. Press the **GPS Only Configuration** button.
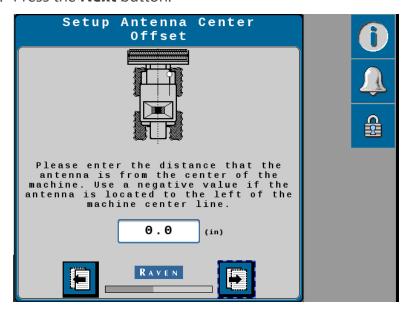
5. Set the Antenna Fore / Aft dimensions.

6. Press the **Next** button.
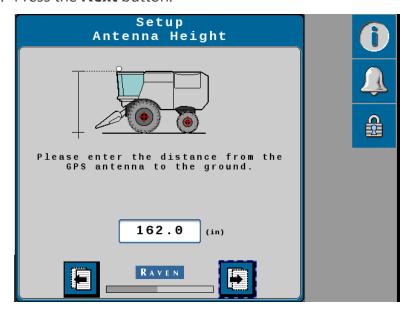
7. Set the Antenna Center Offset dimension.

8. Press the **Next** button.

9. Set the Antenna Height dimension.

10. Press the **Next** button.
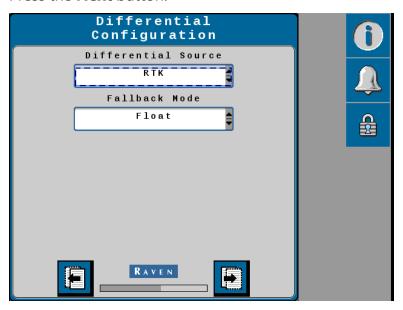
11. Set the Wheel Base dimension.

12. Press the **Next** button.
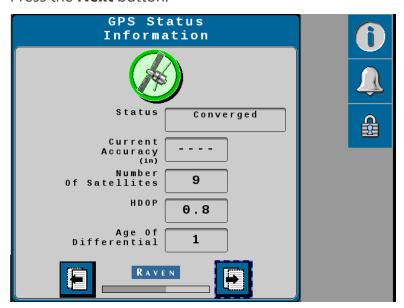
13. Setup the Differential Configuration.

   - Differential Source - **RTK** or **RTX**

   - Fallback Mode - **Float**

14. Press the **Next** button.

15. Wait for the GPS Status to change to **Converged**.

16. Press the **Next** button.

17. Perform the Terrain Compensation Calibration.

18. Press the **Next** button.
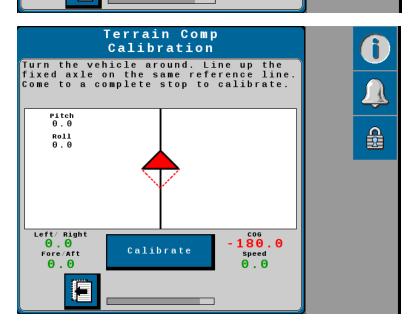
19. Press the **Calibrate** button and follow the on screen instructions.
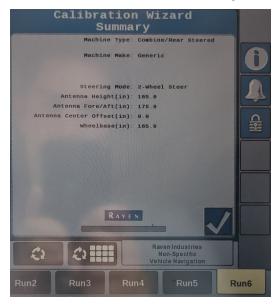
20. The Terrain Compensation Calibration Completion screen will open after the Terrain Compensation Calibration has been completed.

21. Press the **Next** button.
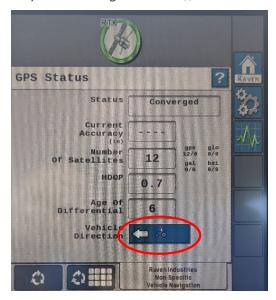
22. The Calibration Wizard Summary screen will open.

23. Return to the **Vehicle Navigation** home page.

24. Drive the machine forward and verify the vehicle direction icon of the bottom of the page.

> **Note:** *On software version 22.4.0105 and prior the vehicle direction can be flipped around and not auto correct on a sudden stop of the machine or if the machine backs up and then gets shut off.*

Raven Cart Automation™ Combine Calibration

1. Enter the **VT Menu** and select the **Raven Cart Automation™** tab.
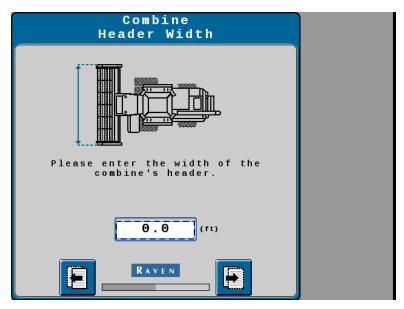
2. Press the **Gears** button .

3. Press **Combine** as the machine type.

4. Press the **Next** button.

5. Enter the width of the combine header.

   Note: *The entire width of the combine header is measured.*

6. Press the **Next** button.
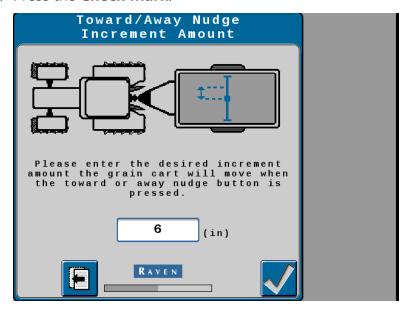
7. Enter the Toward / Away Nudge Increment Amount.

    Note: *The maximum allowed configurable nudge distance set is 38 cm [15 in] the default is 15 cm [6 in].*

    Note: *The maximum distance that can be nudge away from the combine is 152 cm [60 in]. The maximum distance that can be nudge towards combine is 38 cm [15 in].*

8. Press the **Check Mark**.

Chapter 3:

Raven Cart Automation™ Operation
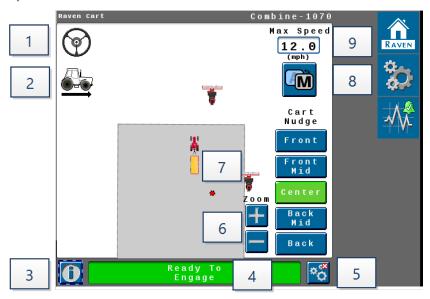
NOTICE

Important Safety: Operator should always use this system in connection with all safety systems in the machine, including without limitation using a seatbelt.

The following section describes the operation of the Raven Cart Automation™ system.

Tractor Run Screen Overview

Open the Raven Cart Automation™ user interface.

1. **Steering Status**

- Blue - Engaged
- Gray - Disengaged

2. **Propulsion Status**

- Blue - Engaged
- Gray - Disengaged
- Green - Speed Hold State
- Amber - Speed Freeze State

Note: *Speed Hold is a user-initiated hold while the cart is in sync while speed freeze is the propulsion behavior for user override behaviors.*

3. Information ⓘ

- If only one tractor is being used for Raven Cart Automation™ select the **Information** icon to view directional information.

- In Multi-Machine mode select the **Information** icon to view the other vehicles on the same radio channel.

4. System Status

- Error State - An error is preventing engagement.

- Not Ready - System is not ready to engage.

- Steering Not Ready (SC1™ not ready) - There is an SC1™ issue preventing engagement.

- Ready to Engage - System is ready to engage.

- Acquiring Sync Point - Currently driving to the sync point.

- Synced - Synced with the combine +/- 1 meter [3.3 feet].

5. Sync Commands ⚙

- Select the **Sync Commands** icon to view the sync options.

6. Zoom Commands

- The +/- command zooms in and out of sync window.

7. Sync Point

- This is the position offset from the combine that the tractor will target when it enters a sync.

8. Automatic/Manual Mode

- Changes to automatic or manual sync mode when used with multi-machines.
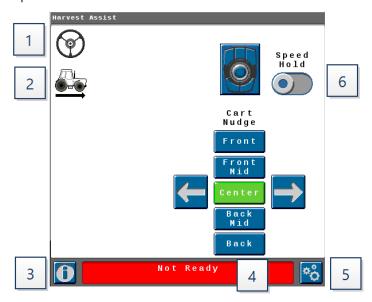
9. **Max Speed**

- Used to set the tractor's max speed. Max speed allowed is 24.14 km/h [15 mph]. Default is 19.31 km/h [12 mph].

Combine Run Screen Overview

Open the Raven Cart Automation™ user interface.

1. Steering Status

- Blue - Engaged
- Gray - Disengaged

2. Propulsion Status

- Blue - Engaged
- Gray - Disengaged
- Green - Speed Hold State
- Amber - Speed Freeze State

Note: *Speed Hold is a user-initiated hold while the cart is in sync while speed freeze is the propulsion behavior for user override behaviors.*

3. **Information**
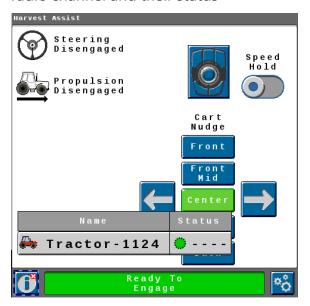
- The information button brings up a detailed list of all other machines on your radio channel and their status

- Press the machine name for more detailed information

  Note: *Machine name can be changed by clicking into the header text box.*

  - Synced With - Displays the synced machine.

  - Sync Status - Displays the sync status.

  - Cart Status - If the cart has UHarvest® Pro installed, the cart status will display the weight. If UHarvest® Pro is not installed, it will display there is no grain cart scale connected.

4. ## System Status

- Error State - An error is preventing engagement.

- Not Ready - System is not ready to engage.

- Steering Not Ready (SC1™ not ready) - There is an SC1™ issue preventing engagement.

- Ready to Engage - System is ready to engage.

- Acquiring Sync Point - Currently driving to the sync point.

- Synced - Synced with the combine +/- 1 meter [3.3 feet].

5. ## Sync Commands
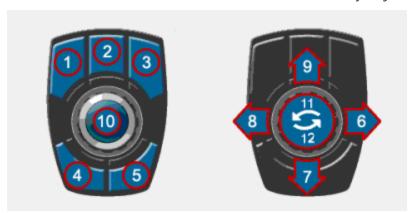
   - Select the **Sync Commands** icon to view the sync options.

6. ## Speed Hold

   - When engaged the tractor and grain cart will maintain it's current speed regardless of the combine movement.

   - When disengaged the tractor and grain cart will return to previously selected Sync Nudge Location.

Combine Cart Remote Overview

The combine Cart Remote can be used to manually adjust the sync point of the grain cart.

Note: *Required sync point minimum distance between vehicles is 1 m [3.3 ft].*

Default Functions for the Cart Remote

Input ID	Function
1	Call Grain Cart
2	Notify Cart to Unload
3	Save Sync Point
4	Combine Auger to the Rear Section of the Cart
5	Combine Auger to the Front Section of the Cart
6	Nudge Towards the Combine
7	Nudge Auger One Position Towards the Front Section of the Cart
8	Nudge Away from the Combine
9	Nudge Auger One Position Towards the Rear Section of the Cart
10	No Function Assigned
11	No Function Assigned
12	No Function Assigned
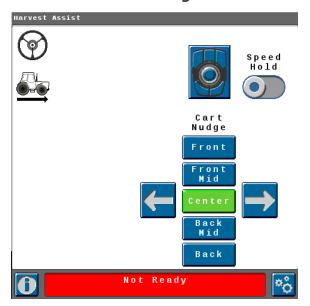
NOTICE

Important! For any configuration change, including but not limited to changing the auger extension, changing a header, tire configuration, or changing a grain cart, operator must review and consider whether a sync point reset is needed.

Configure the Cart Remote

The Cart Remote can be configured for the individual user preferences.

1. Press the **Remote Configuration Button** on the combine UI.

2. Press the button to be configured and select the desired corresponding function from the drop down window.

   Available Function Options:

   - Front Nudge
   - Center Nudge
   - Back Nudge
   - Mid-Front Nudge
   - Mid-Back Nudge
   - Left Nudge
   - Right Nudge
   - Speed Hold
   - Back One
   - Front One
   - Unload Notification
   - Set Sync Point
   - Grain Cart Request

3. Toggle the Invert Switch to flip the default nudge directions.

   Note: *Nudges will then become relative to the cart position.*
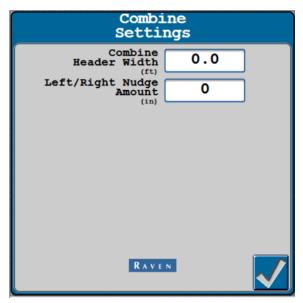
Set the Left/Right Nudge Amount
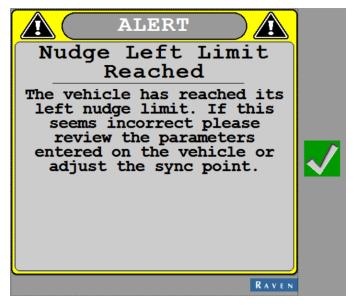
1. Position the grain cart in the desired position.

2. Press the **Tools Icon** on the combine UI.

3. Navigate to the Combine Settings window.

4. Set the Combine Header Width.

5. Set the Left/Right Nudge Amount.
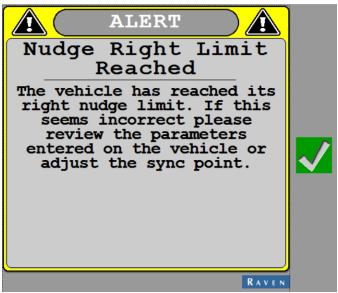
    Note: *The maximum allowed configurable nudge distance set is 38 cm [15 in] the default is 15 cm [6 in].*

    Note: *The maximum distance that can be nudge away from the combine is 152 cm [60 in]. The maximum distance that can be nudge towards combine is 38 cm [15 in].*

6. If the nudge limit is reached an alert will be displayed.
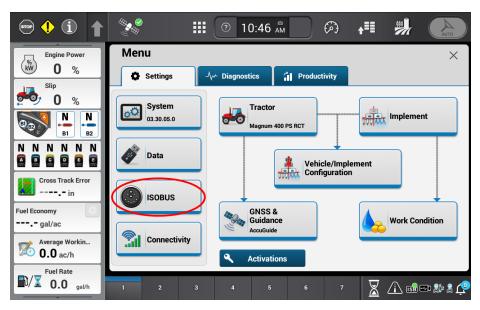
Turn On the ISOBUS Switch

Note: *There may be some occurrences when the ISOBUS switch needs to be turned on in the terminal. Complete the following steps to turn it on.*
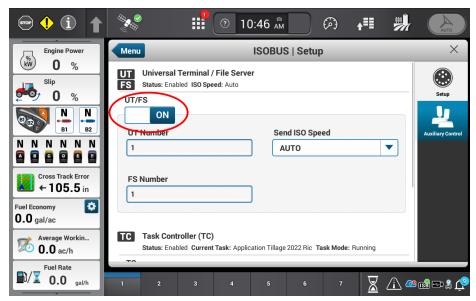
1. Press the icon in the upper right corner of the screen.

2. Press the ISOBUS icon.

3. Toggle the Universal Terminal / File Server button to On.

Sync the Grain Cart with the Combine

NOTICE

Important: It is recommended to use auto guidance at all times on the combine while operating Raven Cart Automation™.

   Note: *It is important operator can hear machine alarms at all times during operation.*

1. Locate the ISOBUS switch in the upper right of the headliner.

2. Enable the ISOBUS switch by pressing the **Tractor AUTO** icon.

3. The ISB icon in the terminal will turn green.

4. Drive the tractor and grain cart into the sync window.

   Note: *The 3 pie icon will turn green in the upper left hand corner of the screen.*

5. Engage Auto-Steering by pressing the Auto-Steer button on the Multi-Function Handle.

> **Note:** *The tractor must be moving, within the Sync Window and have a heading that is within 90° of the combine to allow auto-steer engagement.*
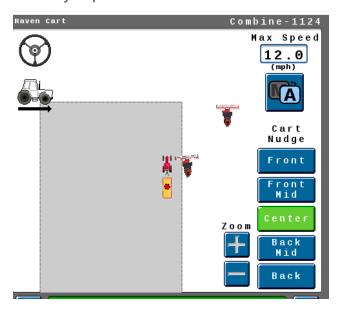
6. Engage propulsion by pressing the button on the back hand side of Multi-Function Handle.

> **Note:** *Propulsion can only be engaged after steering has been engaged.*

7. The tractor will sync with the combine by positioning the cart under the combine auger at the sync point.

8. The icon in the upper left hand corner will turn solid when the system is engaged.

Nudge the Grain Cart

Note: *After the grain cart has synced it can be manually nudged ahead or behind and left or right in the terminal or by the Cart Remote.*

The grain cart can be filled in 5 different locations.

- Front
- Front Mid
- Center
- Back Mid
- Back
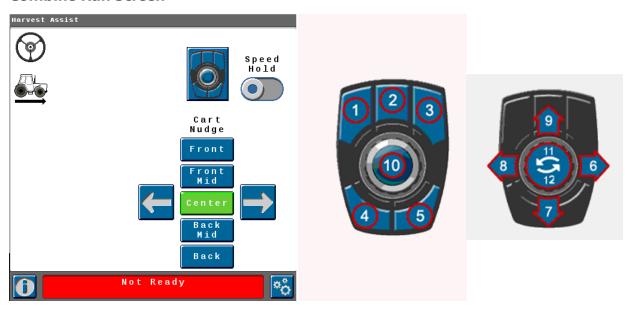
1. The grain cart fill position can be adjusted by selecting nudge presets on the Cart Remote or by pressing the Cart Nudge buttons in the terminal.

   Note: *The grain cart can also be nudge ahead or behind by pushing the Cart Remote knob forward or rearward.*

Tractor Run Screen

Combine Run Screen

The color of the cart nudge button will changed based on the sync command.

- Green - Active

- Blue - Inactive

- Yellow - Command has been sent but not acknowledged by the tractor/combine.

2. Once the system is disengaged the sync point will automatically return to the center sync point next time the system is reengaged.

User Override Behavior
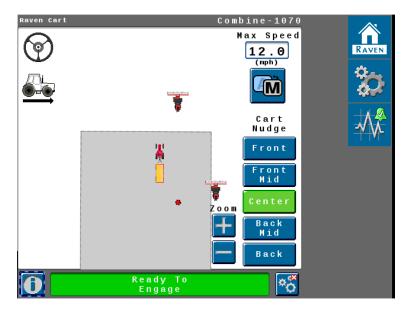
User Action	Steering	Speed/Propulsion	Automation Icons
No Action (Steering and propulsion active)	Steering controls, based on Harvester orientation	Speed controls based on the Harvester position.	
MFH Handle Movement or Foot Throttle Movement	Maintain Auto Steering	Speed will return to the MFH set speed.	
Steering Wheel Movement	Disengage Auto Steering	Propulsion no longer automated, will maintain last speed until there is a user-initiated change.	
Brakes Pressed	Maintain Auto Steering	Propulsion no longer automated on brake release, will maintain last speed until there is a user initiated change.	
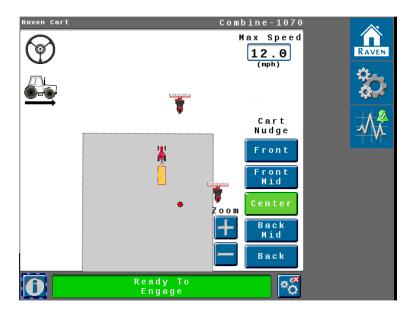
User Action	Steering	Speed/Propulsion	Automation Icons
Auto Steer or Propulsion But-ton Pressed	No change in function	No change in function.	
Neutral Switch Pressed	Maintain Auto Steering	Speed control goes inactive.	
Engine Brake-Push Button (floor)	Maintain Auto Steering	Speed control stays active, however engine performance is degraded until the engine brake is released.	

Multi-Machine Operation

- There can be up to six machines on one radio channel.

- If there are multiple combines on the same radio channel there are two modes for tractor operators:

    - Automatic Mode - Automatically selects the closest combine with the same heading

    - Manual Mode - User manually selects the combine to sync with

    - If there are not multiple combines the auto/manual button will not be present in the UI

Automatic Mode

1. Toggle the auto/manual button to auto.

2. The tractor will automatically select the closest available combine.

Manual Mode
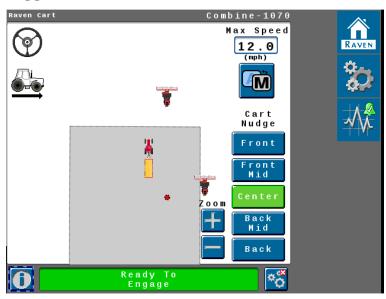
There are two methods to enter the manual mode.

- Auto/Manual Button
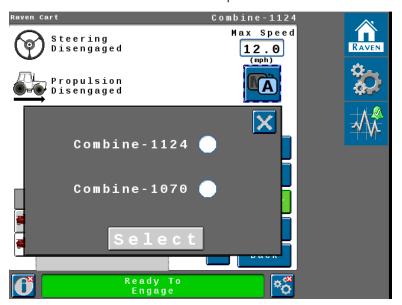
- Vehicle Information Button

Auto/Manual Button
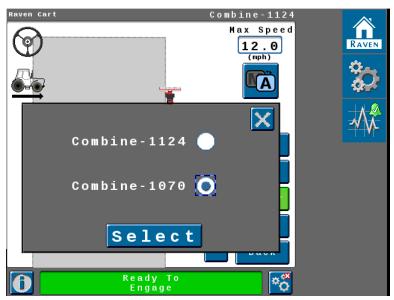
1. Toggle the auto/manual button to manual.

2. A list of available vehicles will open.

3. Choose the desired machine and press **Select**.
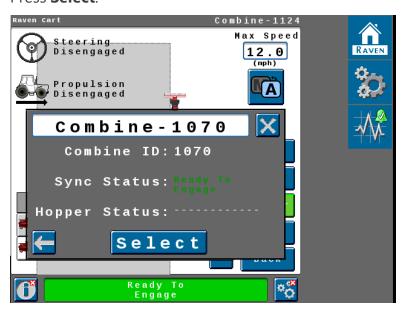
Vehicle Information Button

1. Press the vehicle information button in the bottom left side corner.

2. Select the desired machine.

3. Press **Select**.

Adjust the Sync Point

NOTICE
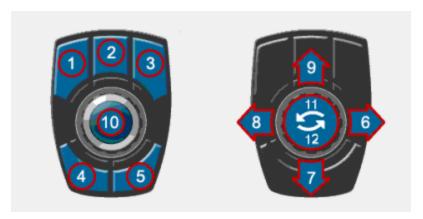
Important! For any configuration change, including but not limited to changing the auger extension, changing a header, tire configuration, or changing a grain cart, operator must review and consider whether a sync point reset is needed.

Note: *Required sync point minimum distance between vehicles is 1 m [3.3 ft].*

The sync point can be set from the combine while moving from the Cart Remote. The sync point can be set from the tractor while moving from the UI.

Cart Remote

1. Position the grain cart in the desired position.

2. Press number 10 on the Cart Remote.
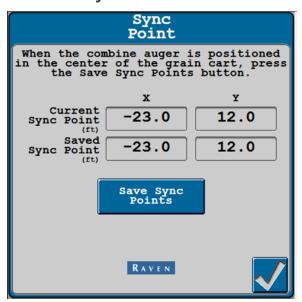
User Interface

1. Position the grain cart in the desired position.

2. Press the **Tools Icon** on the combine UI.

3. Navigate to the Sync Point window (Machine Settings > Sync Point).

4. Press **Save Sync Points**.

Message the Grain Cart

The combine can send messages to the grain cart to request certain function.
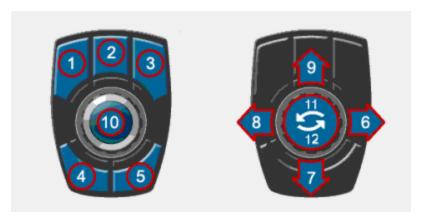
Note: *The Cart Remote is customizable so any changes made to the Cart Remote can affect the functionality. The default settings are shown.*

- Combine Request: Go Unload
- Grain Cart Full
- Combine Requesting Grain Cart
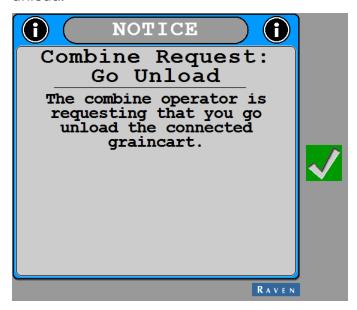
Combine Request: Go Unload

The combine operator can request the grain cart to go unload. This function is only available when the combine and tractor are in sync.

1. Press the number 2 button on the Cart Remote to notify the grain cart drive to go unload.

2. A window will open in the grain cart terminal requesting the cart operator to go unload.
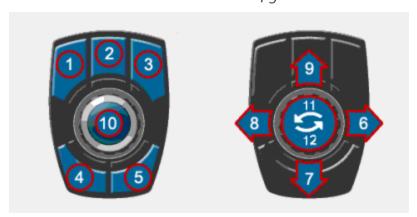
Grain Cart Full
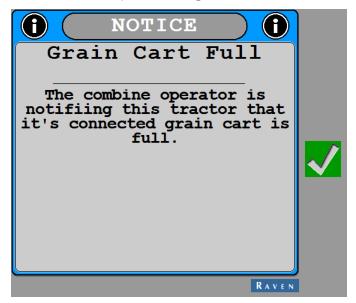
The combine operator can notify the grain cart when the grain cart is full. This function is only available when the combine and tractor are in sync.

1. Press the programmed number on the Cart Remote to notify the grain cart that it is full.

   Note: *There is no default number set to notify the grain cart that it is full. This must be customized in the Cart Remote configuration.*
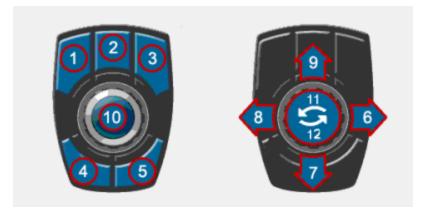
2. A window will open in the grain cart terminal notifying the cart operator that it is full.
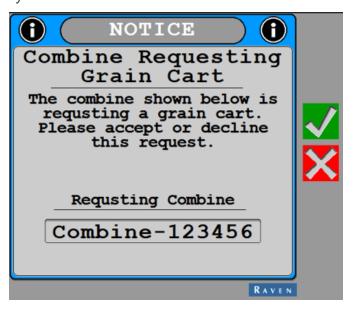
Combining Requesting Grain Cart

The combine operator can send a request a grain cart to perform a sync. This function is only available when the combine and tractor are not in sync.

1. Press the number 1 on the Cart Remote to request the grain cart to perform a sync.
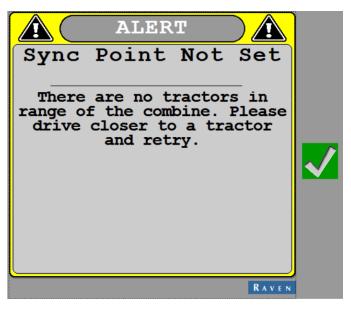
2. A window will open in the grain cart terminal requesting the grain cart to perform a sync.
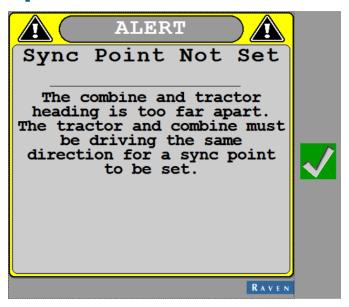
Raven Cart Automation™ Sync Point Error Windows

The following is a list of error windows that are possible when trying to sync the Raven Cart Automation™ system.
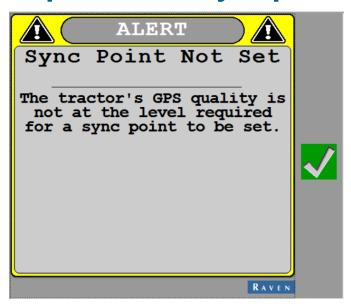
There are no tractors in range of the combine
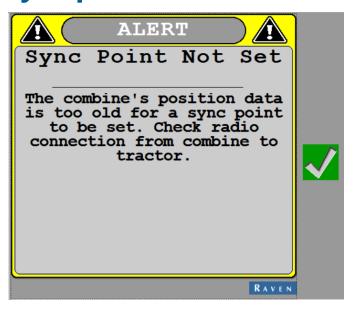
The combine and tractor heading is too far apart
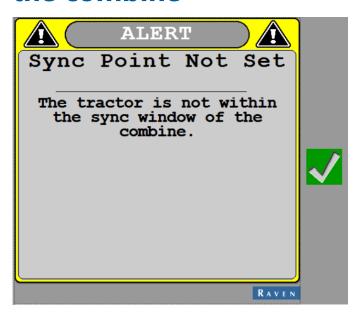
The tractor's GPS quality is not the level required for a sync point to be set
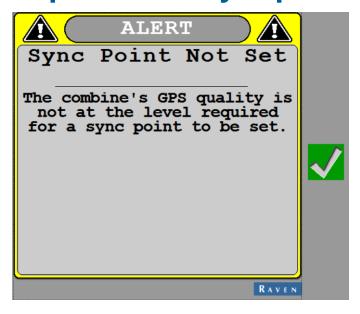
The combine's position data is too old for a sync point to be set

The tractor is not within the sync window of the combine

The combine's GPS quality is not at the level required for a sync point to be set

Machine Storage and Transport

The Intended Purpose for Raven Cart Automation™ is in-field use only during the unload process on straight swaths. Do not operate Raven Cart Automation™ on any public roads or outside of the intended purpose.

Perform the following procedure to prepare the tractor for storage/transport.

1. Disable the ISOBUS switch in the upper right of the headliner.
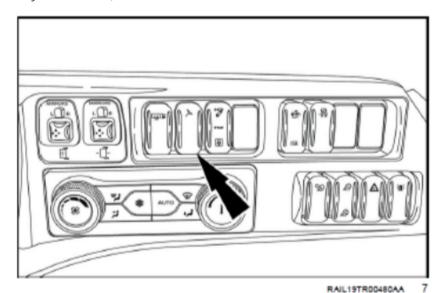
2. After the ISOBUS has been disabled the pie icon in the upper left-hand corner will disappear.

3. Press the bottom of the auto guidance/steering mode switch for On-Road mode to disable autoguidance functionality before driving on the road.
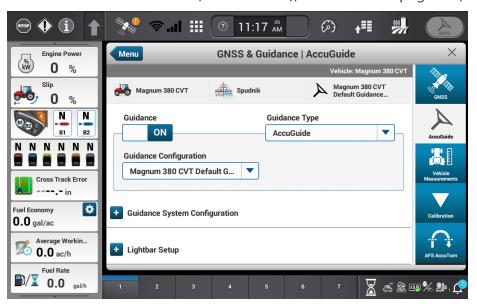
   Note: Operator must follow all steps for operation and use of the machine as outlined by the manufacturer.

RAIL19TR00480AA   7

Return the Tractor to Factory Guidance

1. Press the AccuGuide tab.

2. Set the AccuGuide Guidance to On.

> **Note:** *Guidance will need to be turned off again if a user wants to return to Raven Cart Automation™ use. Refer to "Turn off Guidance" on page 44 for more information.*

Chapter 4:

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 https://ravenind.force.com/ATDSupport/s/.

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 016-2612-002-A
- Raven Cart Automation™ Provisioning and Operation 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 **Product Service and Repair** 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 EDGE.RavenPrecision.com.

Raven Slingshot®

Information regarding Slingshot® products and services may be found at RavenSlingshot.com.

Social Media and Raven Podcast

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

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

Activate or Register a New Raven Product

Activate full agricultural automation capabilities with Raven. Completing product activations for each new Raven product ensures that Raven technology is operating at full capability with full warranty protection.

Hardware Key Activation

Activate hardware to use unlocks and advanced features. To complete Hardware Key Activation:
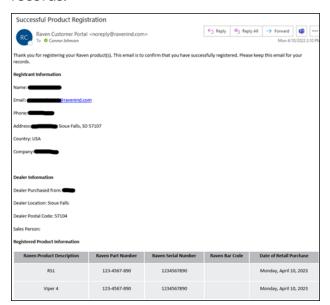
1. Visit the **Activation Key Request** website.
2. Select the product that you're using.
3. Enter in your registration code information from your product/dealer.
4. Download the activation key.
5. Enter the activation key back into your Raven product, activating it.

Warranty Registration

Register the Raven product to ensure you are covered in case of product faults or defects.

1. Visit the **Product Registration** website.
2. Fill out the form with your product information.

3. You will be emailed a confirmation of warranty registration. Save this email for your records.

Slingshot® Hardware Activation

Activate Slingshot® on your Field Hub 2.1, Viper® 4, CRX field computer, and/or RS1™ to get the most out of your subscriptions.

1. Visit the Slingshot® Activation website. Alternatively, on the Slingshot® Portal homepage, go to **Manage** > **Activations** > **New Hardware Activation**.

   Note: *If you are not already logged in, you will be redirected to the Slingshot® account login page.*

2. Assign your device to a company.

3. Enter product information, including the barcode and information about the device.

4. Select a Slingshot® system to add the device to or create a new system.

5. Configure your device.

Further Product Configuration and Updates

Further instructions can be found on the https://portal.ravenprecision.com. Visit the portal to download the most up-to-date documentation, manuals, and software for your product.

Raven Cart Automation™ Troubleshooting

Tractor Troubleshooting

Tractor Sync

Problem	Probable Cause	Actions to Confirm and/or Resolve
Unable to Sync	RCU not powered on	Verify that the RCU is plugged in, has power, and the LED is on.
	RCU not in range	Verify that the RCU is in range and powered on.
	Sync point not set	Verify a sync point has been set and saved for the Combine desiring to sync with. View in the Raven Cart Automation™ Run screen, settings, 'Sync Points'.
	Tractor and/or Combine not moving	Verify that the Tractor and Combine are in motion at a speed above 1.6 kph [1 mph] when attempting to sync
	Auto Steer switch has not been flipped on	Verify the autoguidance switch has been flipped to on to enable autoguidance.
	ISOBUS Class 3 switch hasn't been flipped	Confirm the ISOBUS Class 3 switch has been toggled to the tractor icon refer to "Sync the Grain Cart with the Combine" on page 160 for more information.
	Tractor not in sync window	Verify that the tractor is in the sync window
	Combine not moving	Verify that the combine is moving 'Raven Cart Automation™ Tractor Calibration'
Unable to Set Sync Point	Tractor not in sync window	Verify the tractor is inside the sync window, the sync window is displayed in the Raven Cart Automation™ home screen
	Tractor heading is not inline with the combine	Verify that the tractor and combine are facing the same direction
	RCU not in range	Verify that the RCU is in range and powered on. Verify that the RCU LED is on and has power.
	RCU's are on dif-	Verify RCU turbo mode is on and radio channel is the

Problem	Probable Cause	Actions to Confirm and/or Resolve
	ferent channels	same as the radio channel on vehicle attempting to sync with refer to "Setup the Tractor RCU" on page 56 for more information.
	RCU firmware not compatible	
	RCU Vehicle Profile not set up.	Verify the RCU is correctly configured. Refer to "Setup the Tractor RCU" on page 56 for more information.
	Vehicle Navigation Application not set up	Verify in the 'Vehicle Navigation' Application that the 'Setup the Tractor Vehicle Navigation' steps have been followed and a machine selection has been completed.
	Raven Cart Automation™ Application not set up	Verify the vehicle profile has been set up in the UT. Refer to "Raven Cart Automation™ Tractor Calibration" on page 72 and verify the Vehicle type, and Usable grain cart length.
	Both vehicles are not on a Valid RTK correction source.	Verify in the 'Vehicle Navigation' Application in both vehicles are using an RTK correction source
Sync Point Offset	The machines operating in sync are on different correction source datums	In the display verify that the correction datum is on NAD83 (NSRS2011) and that the syncing machine is running on the matching correction source datum.

Tractor GNSS Connectivity

Problem	Probable Cause	Actions to Confirm and/or Resolve
Not Receiving GPS Signal	The CGR is not receiving power	Is the CGR plugged in to port B and receiving power. Unplug, wait 20 seconds, then plug back in. Verify plug and wiring harness are in tact and free of any corrosion and/or damages.
	Incorrect GPS configuration.	Verify corrections are set up to send correction data to the RS Lite via serial. Refer to "Setup the AFS Vector Pro Output to the RS Lite" on page 40for more information.
Not receiv-	Slingshot®	Verify the serial plug is plugged into the Slingshot®

Problem	Probable Cause	Actions to Confirm and/or Resolve
ing RTK Signal (Slingshot®)	modem connections not connected	modem and the other end is plugged into 'RTK In' connector found on the roof close to the RS Lite. Verify the 'Cell antennas' and 'Antenna Patch' are plugged into the Slingshot® modem, mounted on the roof, and have have a clear view of the sky. Refer to Install the Tractor Cables for more information.
	Slingshot® modem is not powered on	Verify the cabling connections are correctly attached to the Slingshot® modem: plugging into power (are the LEDs on?)
	Slingshot® hasn't been set up to send correction to Slingshot® modem	Verify correction source in Slingshot® is active and set up to send corrections to the Slingshot® Modem.
	RTK source not configured to receive corrections from Slingshot®	Verify the Vehicle receiver is configured to receive the corrections from the modem. Refer to "Configure RTK Corrections into the AFS Vector Pro from the Raven Field Hub" on page 45 for more information.
Not receiving RTK (Slingshot®)	Slingshot® modem doesn't have an active cellular plan	Verify that there is an active cellular plan for the Slingshot® modem.
	RTK correction not configured to base station in Slingshot® cloud	Verify The modem is connected to a base station and the correction setting is set to active in the cloud. Make sure your base station is set up to send and receive GNSS data.
	Problem with serial connector plug	Check the end of the serial plug on the roof of the machine and verify the pins are not pushed in. Check serial gound in Pin 5, PIN 10 High current power, PIN 11 High current ground. 'RTK' Connector .

Problem	Probable Cause	Actions to Confirm and/or Resolve
Not receiving RTK (N-Trip)	GNSS Receiver not configured to receive signal	Keep GNSS receiver at the default setting for receiving RTK correction or refer to "Configure RTK Corrections into the AFS Vector Pro from the Raven Field Hub" on page 45 and undue all of the steps to set configuration back to default Enter in User name and password to set up profile.
	RTK subscription is not valid	Contact a dealer to set up reciever to receiver RTK corrections
Not receiving RTK (Satalite RTX Novatel)	GNSS Receiver not configured to receive signal	Keep GNSS receiver at the default setting for receiving RTK correction or refer to "Configure RTK Corrections into the AFS Vector Pro from the Raven Field Hub" on page 45 and undue all of the steps to set configuration back to default.
	RTK subscription is not valid	Contact a dealer to set up receiver to receiver RTK corrections

Radio Control Unit (RCU Connectivity

Problem	Probable Cause	Actions to Confirm and/or Resolve
RCU not receiving signal	RCU antenna loose or disconnect	Verify the antenna cable for the RCU is connected and cabling is in tact. (Cabling is free of cuts, breaks, kinks or frays)
	RCU is not in range or on wrong channel	Verify the RCU attempting to connect with is in range and on the same channel
	RCU not receiving power	Verify the power plug and cable for the RCU is connected and cabling/plug is in tact. (Cabling is free of cuts, breaks, kinks or frays) and plug is free of corrosion and pins are not loose or pushed into the plug.

Object Pool Not Loading/Missing

Problem	Probable Cause	Actions to Confirm and/or Resolve
RCU Object pool not loading	RCU ECU not receiving power	Verify the RCU is plugged in and receiving power (Verify the LED in on)
		Verify the plug is receiving power High current power PIN 7 High current ground PIN 6
Raven Cart Automation™ Object Pool not loading	RCU antenna not connected	Verify the RCU is plugged in and receiving power (Verify the LED in on) Verify the RCU antenna is connected, cable and antenna are intact.
	RS Lite not receiving power	Verify the RS Lite is plugged in and receiving power (Verify the LED is on) Verify the plug and cables are not damaged (free of any pinches, breaks, cuts, corrosion, and cracking)
	RS Lite ECU not receiving power	Verify the plug is receiving power High current power PIN 1 and 3 High current ground PIN 2
RS1™ (Slingshot®) Object pool not loading	RS Lite not receiving Power	Verify the RS Lite is plugged in and receiving power (Verify the LED is on) Verify the plug and cables are not damaged (free of any pinches, breaks, cuts, corrosion, and cracking)
The RS1™ (Slingshot®) object pool populates but others are missing	Missing object pool(s) but have the slingshot object pool.	If the slingshot pool is active preform system reboot. Slingshot setting-> dropdown-> System options-> Reboot system
RS1™ Object pool not loading	RS Lite ECU not receiving power	Verify the plug is receiving power High current power PIN 1 and 3 High current ground PIN 2

Problem	Probable Cause	Actions to Confirm and/or Resolve
No object pools at all.	System did not load properly	Verify the RCU and RS Lite are receiving power. (Look for the LEDs, if power is on they should be emitting light). Unplug the main plug from the RS Lite, wait 20 seconds then plug back in.
	System not receiving power	Verify all the cable connectors are correctly and firmly connects to the appropriate connections. Refer to Install the Tractor Cables -> 'Raven Cart Automation™ System Diagrams - Tractor' for more information.
	System did not load properly	Run a power cycle by turning the Key, wait for system to power down (3-5 minutes) power back on by starting the tractor. Power Cycle can also be preformed by turning off the key, flipping the battery disconnect switch (if applicable) then flipping the batter disconnect back on, then starting the tractor.

ECU Not Getting Power

Problem	Probable Cause	Actions to Confirm and/or Resolve
RS Lite	RS Lite not plugged in/ Plug is damaged	Verify the LED is emitting light and the RS Lite is plugged in. Check plug for loose or missing pins
	Cabling not connected to bulkhead connection	Verify The cabling has been connected to the appropriate locations and plugs. Refer to Install the Combine Cables -> 'Raven Cart Automation™ System Diagrams for more information
	Not getting power at the pins of the plug	Go to the RS Lite plug and check pin 1 and 3 for high current power and pins 2 for high current ground, 'RS Lite' Connector.
RCU	Cabling not connected to bulkhead con-	Verify The cabling has been connected to the appropriate locations and plugs. Refer to Install the Combine Cables -> 'Raven Cart Automation™ System Diagrams for more

Problem	Probable Cause	Actions to Confirm and/or Resolve
	nection	information
	RCU is not plugged in/Plug is dam-aged	Verify the LED is emitting light and the RCU is plugged in. Check plug for loose or missing pins
	Not getting power at the pins of the plug	Check pin 7 for high current power and pin 6 for high current ground. 'RCU' Connector
Slingshot® (if Applic-able)	Slingshot® not Plugged into power inside the cab	Verify the modem is plugged into a power source and the LEDs are lighting up
	Power source is faulty	Verify the power source it functioning properly and that it is supplying power (verify with something you have on hand. Ex. phone car charger)
CGR	Not receiving power to the CGR	Verify the pins in the plug going into the CGR are not pushed in and verify power and ground at the PINS 11 high current power, PIN 12 High current ground. 'CGR' Port B connector

Combine Troubleshooting

Combine Sync

Problem	Probable Cause	Actions to Confirm and/or Resolve
Unable to Sync	RCU not powered on	Verify that the RCU is plugged in, has power, and the LED is on.
	RCU not in range	Verify that the RCU is in range and powered on.
	Sync point not set	Verify a sync point has been set and saved for the Combine desiring to sync with. View in the Raven Cart Automation™ Run screen, settings, 'Sync Points'.
	Tractor and/or Com-	Verify that the Tractor and Combine are in motion at a

Problem	Probable Cause	Actions to Confirm and/or Resolve
	bine not moving	speed above 1.6 kph [1 mph] when attempting to sync
	Auto Steer switch has not been flipped on in the tractor	Verify the autoguidance switch has been flipped to on to enable autoguidance.
	ISOBUS Class 3 switch hasn't been flipped in the tractor	Confirm the ISOBUS Class 3 switch has been toggled to the tractor icon refer to "Sync the Grain Cart with the Combine" on page 160 for more information.
	Tractor not in sync window	Verify that the tractor is in the sync window
	Combine not moving	Verify that the combine is moving 'Raven Cart Automation™ Tractor Calibration'
Unable to Set Sync Point	Tractor not in sync window	Verify the tractor is inside the sync window, the sync window is displayed in the Raven Cart Automation™ home screen
	Tractor heading is not inline with the combine	Verify that the tractor and combine are facing the same direction
	RCU not in range	Verify that the RCU is in range and powered on. Verify that the RCU LED is on and has power.
	RCU's are on different channels	Verify RCU turbo mode is on and radio channel is the same as the radio channel on vehicle attempting to sync with refer to "Setup the Tractor RCU" on page 56 for more information.
	RCU firmware not compatible	
	RCU Vehicle Profile not set up.	Verify the RCU is correctly configured. Refer to "Setup the Combine RCU" on page 128 for more information.
	Vehicle Navigation Application not set up	Verify in the 'Vehicle Navigation' Application that the 'Setup the Combine Vehicle Navigation' steps have been followed and a machine selection has been completed.
	Raven Cart Automation™ Application	Verify the vehicle profile has been set up in the UT through the RDI screens. Refer to "Raven Cart Auto-

Problem	Probable Cause	Actions to Confirm and/or Resolve
	not set up	mation™ Combine Calibration" on page 142 (Vehicle type, Usable grain cart length)
	Both vehicles are not on a Valid RTK correction source.	Verify in the 'Vehicle Navigation' Application in both vehicles are using an RTK correction source
Sync Point Offset	The machines operating in sync are on different correction source datums	In the display verify that the correction datum is on NAD83 (NSRS2011) and that the syncing machine is running on the matching correction source datum.

Combine GNSS Connectivity

Problem	Probable Cause	Actions to Confirm and/or Resolve
Not receiving GPS Signal	Incorrect GPS configuration	Verify corrections are set up to send correction data to the RS-Lite via serial, this can be set up through the RDI screens. Refer to "Provision the Trimble 372 Receiver" on page 76 for more information.
	Open Hopper	GNSS receiver is inside the hopper so it needs to be open in order to receiver a signal.
Not receiving RTK Signal (Slingshot®)	Slingshot® not activated in the cloud	If using Slingshot®, verify a base station has been selected and correction source is active for your modem via Slingshot® portal.
Not receiving GPS Signal	The CGR is not receiving power	Is the CGR plugged in to port B and receiving power. Unplug, wait 20 seconds, then plug back in. Verify plug and wiring harness are in tact and free of any corrosion and/or damages.
Not receiving RTK Signal (Slingshot®)	Slingshot® modem connections not connected	Verify the serial plug is plugged into the Slingshot® modem and the other end is plugged into 'RTK In' connector found on the roof close to the RS Lite. Verify the 'Cell antennas' and 'Antenna Patch' are plugged into the Slingshot® modem, mounted on the roof, and have a clear view of the sky. Refer to the Install the Combine Cables -> 'Raven Cart Automation™ System Diagrams.

Problem	Probable Cause	Actions to Confirm and/or Resolve
	Slingshot® modem is not powered on	Verify the cabling connections are correctly attached to the Slingshot® modem: plugging into power (are the LEDs on?)
	Slingshot® hasn't been set up to send correction to Slingshot® modem.	Verify correction source in Slingshot® is active and set up to send corrections to the Slingshot® Modem.
	RTK source not configured to receive corrections from Slingshot®	Verify the Vehicle receiver is configured to receive the corrections from the modem. Refer to "Provision the Trimble 372 Receiver" on page 76 for more information.
Not receiving RTK (Slingshot®)	Slingshot® modem doesn't have an active cellular plan	
	RTK correction not configured to base station in Slingshot® cloud	Verify The modem is connected to a base station and the correction setting is set to active in the cloud. Make sure your base station is set up to send and receive GNSS data

Problem	Probable Cause	Actions to Confirm and/or Resolve
Not receiving RTK (N-Trip)	GNSS Receiver not configured to receive signal	Keep GNSS receiver at the default setting for receiving RTK correction or refer to "Provision the Trimble 372 Receiver" on page 76 and undue all of the steps to set configuration back to default Enter in User name and password to set up profile.
	RTK subscription is not valid	Contact a dealer to set up receiver to receiver RTK corrections
Not receiving RTK (Satalite RTX Novatel)	GNSS Receiver not configured to receive signal	Keep GNSS receiver at the default setting for receiving RTK correction or refer to"Provision the Trimble 372 Receiver" on page 76 and undue all of the steps to set configuration back to default.

Radio Control Unit (RCU Connectivity

Problem	Probable Cause	Actions to Confirm and/or Resolve
RCU not receiving signal	RCU antenna loose or disconnected	Verify the antenna cable for the RCU is connected and cabling is in tact. (Cabling is free of cuts, breaks, kinks or frays)
	RCU is not in range or on wrong channel	Verify the RCU attempting to connect with is in range and on the same channel
	RCU not receiving power	Verify the power plug and cable for the RCU is connected and cabling/plug is in tact. (Cabling is free of cuts, breaks, kinks or frays) and plug is free of corrosion and pins are not loose or pushed into the plug.
RCU has poor signal	More then 2 vehicles are on the same radio channel	Verify that each tractor combine pair are on their own separate RCU radio channels and that there are no more then one combine and one tractor on the same channel.

Object Pool Not Loading/Missing

Problem	Probable Cause	Actions to Confirm and/or Resolve
RCU Object pool not loading	RCU ECU not receiving power	Verify the RCU is plugged in and receiving power (Verify the LED in on)
		Verify the plug it receiving power High current power PIN 7 high current ground PIN 6
Raven Cart Automation™ Object Pool not loading	RCU antenna not connected	Verify the RCU is plugged in and receiving power (Verify the LED in on) Verify the RCU antenna is connected, cable and antenna are intact.
	RS Lite not receiving Power	Verify the RS Lite is plugged in and receiving power (Verify the LED is on) Verify the plug and cables are not damaged (free of any pinches, breaks, cuts, corrosion, and cracking)
	RS Lite ECU not receiving power	Verify the plug is receiving power High current power PIN 1 and 3 High current ground PIN 2
RS1™ (Slingshot®) Object pool not loading	RS Lite not receiving Power	Verify the RS Lite is plugged in and receiving power (Verify the LED is on) Verify the plug and cables are not damaged (free of any pinches, breaks, cuts, corrosion, and cracking)
The RS1™ (Slingshot®) object pool populates but others are missing	Missing object pool (s) but have the Slingshot® object pool.	If the Slingshot® pool is active preform system reboot. Slingshot® setting-> dropdown-> System options-> Reboot system
RS1™ Object pool not loading	RS Lite ECU not receiving power	Verify the plug is receiving power High current power PIN 1 and 3 High current ground PIN 2
No object pools at all	System did not load properly	Verify the RCU and RS Lite are receiving power. (Look for the LEDs, if power is on they should be emitting light). Unplug the main plug from the RS Lite, wait 20 seconds then plug back in.
	System not	Verify all the cable connectors are correctly and firmly con-

Problem	Probable Cause	Actions to Confirm and/or Resolve
	receiving power	nects to the appropriate connections. Refer to the Install the Combine Cables -> 'Raven Cart Automation™ System Diagrams.
	System did not load properly	Unplug the main plug from the RS Lite and wait 20 seconds then plug back in or turn off combine, flip the battery disconnect to power off the combine, wait 20 seconds then power back on.
		Run a power cycle by turning the Key, wait for system to power down (3-5 minutes) power back on by starting the Combine. Power Cycle can also be preformed by turning off the key, flipping the battery disconnect switch (if applicable) then flipping the batter disconnect back on, then starting the tractor.
No VT	The Pro 700 needs to be unlocked	Contact dealer for VT unlock, If dealer is doing VT load, load only VT software unlock. Do not delete customers data. "Do you want to delete existing program files from display?" Answer 'No". " Do you want to delete existing data base files and internal storage data from the display?' answer "No". 'Do you want to start download from memory device to the display?" answer "Yes".
At Bootup the UT Memory is too Full	Some files need to deleted off the Pro 700	Go to Diagnostics > VT > NVM > Delete or clear files. Power cycle monitor and object pools should load into the UT
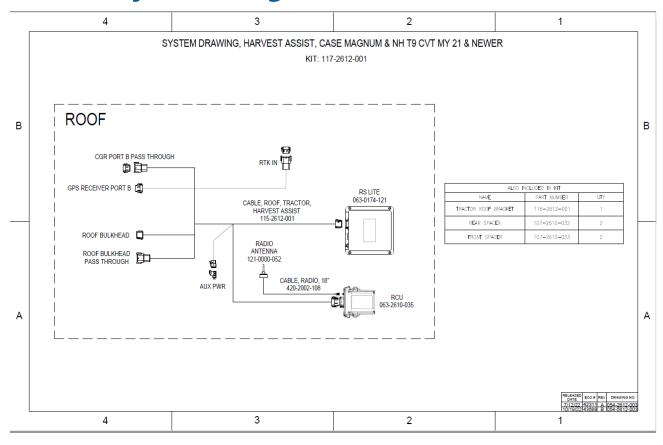
ECU Not Getting Power
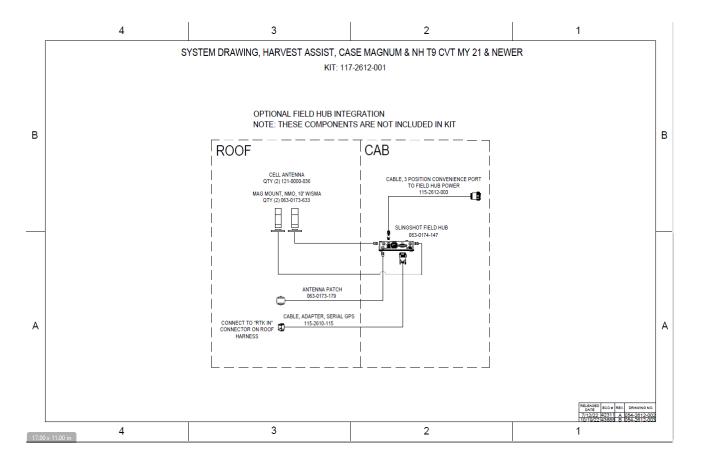
Problem	Probable Cause	Actions to Confirm and/or Resolve
RS Lite	RS Lite not plugged in/ Plug is damaged	Verify the LED is emitting light and the RS Lite is plugged in. Check plug for loose or missing pins
	Cabling not connected to bulkhead connection	Verify The cabling has been connected to the appropriate locations and plugs. Refer to the Install the Combine Cables -> 'Raven Cart Automation™ System Diagrams.
	Not getting power at the pins of the plug	Check pin 1 and 3 for high current power and pins 2 for high current ground
RCU	Cabling not connected to bulkhead connection	Verify The cabling has been connected to the appropriate locations and plugs. Refer to the Install the Combine Cables -> 'Raven Cart Automation™ System Diagrams.
	RCU is not plugged in/Plug is damaged	Verify the LED is emitting light and the RCU is plugged in. Check plug for loose or missing pins
	Not getting power at the pins of the plug	Check pin 7 for high current power and pin 6 for high current ground
Slingshot® (if Applicable)	Slingshot® not Plugged into power inside the cab	Verify the modem is plugged into a power source and the LEDs are lighting up

Problem	Probable Cause	Actions to Confirm and/or Resolve
	Power source is faulty	Verify the power source it functioning properly and that it is supplying power (verify with something you have on hand. Ex. phone car charger)
372/CGR	Not receiving power to the CGR	Verify the pins in the plug going into the CGR are not pushed in and verify power and ground at the PINS 11 high current power, PIN 12 High current ground. 'CGR' Port B connector
Bulk head cable plug	Power and ground pins not getting signal	Verify the pins in the plug going into the CGR are not pushed in and verify power and ground at the PINS 11 high current power, PIN 12 High current ground. 'CGR' Port B connector

Raven Cart Automation™ System Diagrams

Tractor System Diagram

SYSTEM DRAWING, HARVEST ASSIST, CASE MAGNUM & NH T9 CVT MY 21 & NEWER
KIT: 117-2612-001

OPTIONAL FIELD HUB INTEGRATION
NOTE: THESE COMPONENTS ARE NOT INCLUDED IN KIT

Combine System Diagrams

SYSTEM DRAWING, HARVEST ASSIST - 7250,8250,& 9250 CASE COMBINES

KIT: 117-2612-002

CAB

HARVEST ASSIST JOYSTICK
321-8000-033

5 AMPS

MACHINE X085 CONNECTOR

MACHINE X085 CONNECTOR

CABLE, 50 SERIES CASE COMBINE, GRAYHILL CAN KEYPAD, 115-2612-004

ROOF

RTK IN

MACHINE X499 CONNECTOR
MACHINE X499 CONNECTOR

5 AMPS

MACHINE X010 CONNECTOR
MACHINE X010 CONNECTOR

CABLE, ROOF, COMBINE, HARVEST ASSIST 115-2612-002

RS LITE 063-0174-121

AUX PWR

RADIO ANTENNA 121-0000-052

CABLE, RADIO, 25' 420-2002-129

RCU 063-2610-035

GRAIN TANK

372 PORT B PASS THROUGH

TRIMBLE 372 GPS RECEIVER PORT B

ALSO INCLUDED IN KIT		
NAME	PART NUMBER	QTY
COMBINE ROOF BRACKET	116-2612-002	1
COMBINE ROOF SPACER	107-2612-002	4
GRAYHILL REMOTE BRACKET	107-2612-001	1
CLAMP, UPPER, CNH CONSOLE RAIL	107-2612-003	1
CLAMP, LOWER, CNH CONSOLE RAIL	107-2612-004	1
RADIO ANTENNA BRACKET	107-2610-063	1

RELEASED DATE	ECO #	REV.	DRAWING NO.
7/12/22	42311	A	D54-2612-002
10/19/22	43688	B	D54-2612-002

| 4 | 3 | 2 | 1 |

SYSTEM DRAWING, HARVEST ASSIST - 7250,8250,& 9250 CASE COMBINES
KIT: 117-2612-002

OPTIONAL FIELD HUB INTEGRATION
NOTE: THESE COMPONENTS ARE NOT INCLUDED IN KIT

ROOF

CELL ANTENNA
QTY (2) 121-0000-036

MAG MOUNT, NMO, 10' W/SMA
QTY (2) 063-0173-633

ANTENNA PATCH
063-0173-179

CONNECT TO "RTK IN"
CONNECTOR ON ROOF
HARNESS

CAB

CABLE, 3 POSITION CONVENIENCE PORT
TO FIELD HUB POWER
115-2612-003

SLINGSHOT FIELD HUB
063-0174-147

CABLE, ADAPTER, SERIAL GPS
115-2610-115

RELEASED DATE	ECO #	REV.	DRAWING NO.
7/12/22	42311	A	054-2612-002
10/19/22	43688	B	054-2612-002

| 4 | 3 | 2 | 1 |