

ROS SmarTrax™ Calibration & Operation Manual

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CHAPTER

1

IMPORTANT SAFETY INFORMATION

NOTICE

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

- Follow all safety information presented within this manual.
- If you require assistance with any portion of the installation or service of your Raven equipment, contact your local Raven dealer for support.
- Follow all safety labels affixed to the SmarTrax system components. Be sure to keep safety labels in good condition and replace any missing or damaged labels. To obtain replacements for missing or damaged safety labels, contact your local Raven dealer.

When operating the machine after installing SmarTrax, observe the following safety measures:

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

WARNING

- Carefully read and follow all safety requirements and precautions contained in this manual and the machine-specific Installation Manual. Failure to follow safety instructions may lead to equipment damage, personal injury, or death.
- When starting the machine for the first time after installing SmarTrax, be sure that all persons stand clear in case a hose has not been properly tightened.
- The machine must remain stationary and switched off during SmarTrax installation or maintenance.

 **CAUTION**

HYDRAULIC SAFETY

- Raven Industries recommends that appropriate protective equipment be worn at all times when working on the hydraulic system.
- Never attempt to open or work on a hydraulic system with the equipment running. Care should always be taken when opening a system that has been previously pressurized.
- When disconnecting the hydraulic hoses or purging is required, be aware that the hydraulic fluid may be extremely hot and under high pressure. Caution must be exercised.
- Any work performed on the hydraulic system must be done in accordance with the machine manufacturer's approved maintenance instructions.
- When installing SmarTrax hydraulics or performing diagnostics, maintenance, or routine service, ensure that precautions are taken to prevent any foreign material or contaminants from being introduced into the machine's hydraulic system. Objects or materials that are able to bypass the machine's hydraulic filtration system will reduce performance and possibly damage the SmarTrax valve.

ELECTRICAL SAFETY

- Always verify that the power leads are connected to the correct polarity as marked. Reversing the power leads could cause severe damage to the equipment.
- Ensure that the power cable is the last cable to be connected.

Congratulations on your purchase of the Raven SmarTrax system! This system is designed to provide cutting-edge, hands-free steering of the machine via Global Positioning System (GPS) coordinates.

The instructions in this manual are designed to assist in the proper calibration and operation of the SmarTrax system when used with the Viper 4 field computer.

IMPORTANT: Installation of the SmarTrax system must be completed before calibrating the system. If you have questions regarding the installation of the SmarTrax system, refer to the machine-specific SmarTrax Installation Manual provided with the installation kit.

IMPORTANT: The Raven field computer must be calibrated specifically for the vehicle before being used to operate the SmarTrax system. For questions about the field computer, refer to the Installation & Operation Manual provided with the field computer.

INSTALLATION



WARNING

Carefully read and follow all safety requirements and precautions contained in this manual and the machine-specific Installation Manual. Failure to follow safety instructions may lead to equipment damage, personal injury, or death.

RECOMMENDATIONS

Before installing the SmarTrax 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 process.

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

Raven Industries recommends the following best practices when installing or operating the SmarTrax system for the first time, at the start of the season, or when moving the SmarTrax system to another machine:

- Verify that the machine's hydraulic system is using fresh oil and that the filters have been recently changed
- Ensure there are no issues with the machine's hydraulic system (e.g., pump issues, faulty hydraulic motors, fine metal deposits in the hydraulic hoses, etc.) .

ANTENNA INSTALLATION

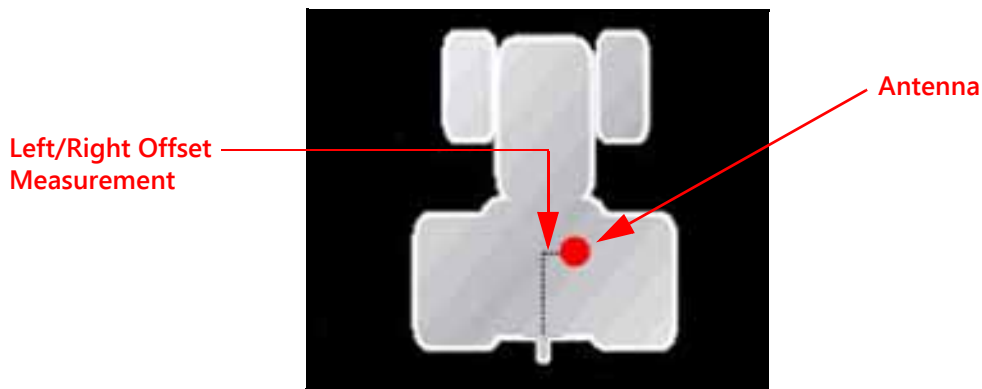
The machine presets loaded into the SmarTrax system software are based on the location of the antenna at the time the SmarTrax system was developed for your particular machine. If the antenna is not positioned exactly in the position configured in the software, the system will not acquire and remain on the desired path and/or system performance may degrade over time.

ANTENNA LEFT/RIGHT OFFSET (ANTENNA X POSITION)

The antenna left/right offset position is the distance from the antenna to the center of the machine. The antenna left/right offset position is measured parallel to the machine's axle. Refer to Figure 1 below.

NOTE: It may be necessary to make adjustments to the left/right offset if the implement being used does not align or track properly with the machine.

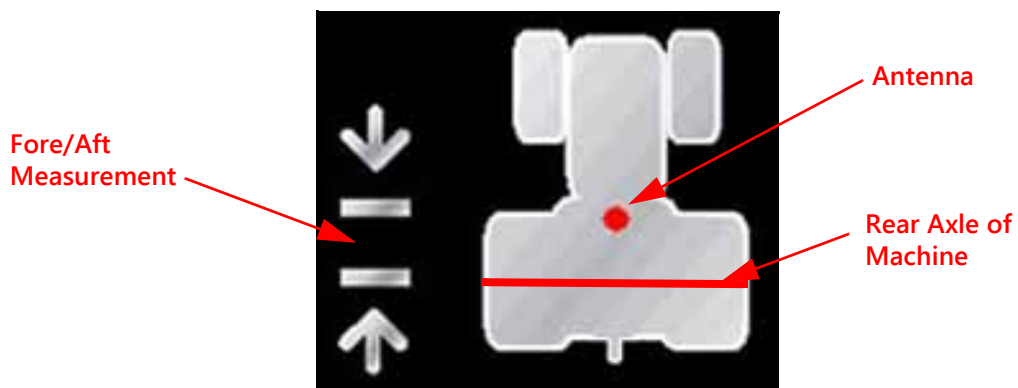
FIGURE 1. Antenna Left/Right Offset Measurement



ANTENNA FORE/AFT OFFSET (ANTENNA Y POSITION)

The antenna fore/aft offset position is the distance from the GPS antenna to the rear axle of the machine. The antenna fore/aft offset position is measured perpendicularly from the antenna to the machine's rear axle. Refer to Figure 2 below.

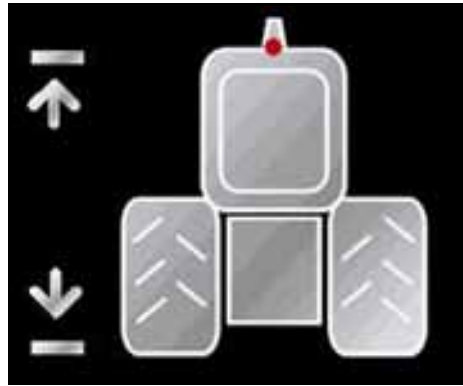
FIGURE 2. Antenna Fore/Aft Offset Measurement



ANTENNA HEIGHT (ANTENNA Z POSITION)

The antenna height value is the measurement from the ground to the base of the antenna.

FIGURE 3. Antenna Height Measurement



POINT OF REFERENCE

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

UPDATES

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

<http://www.ravenhelp.com>

Sign up for email alerts, and you will be automatically notified when updates for your Raven products are available on the website!

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

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

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

techwriting@ravenind.com









- ROS SmarTrax™ Calibration & Operation Manual
- P/N 016-9001-022 Rev. D
- Any comments or feedback (include chapter or page numbers if applicable).
- Let us know how long have you been using this or other Raven products.



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

Thank you for your time.

WIDGET AND BUTTON DEFINITIONS

The following are common status or mode information which may be while the SmarTrax system is engaged:

Display	Message
	<p>The SmarTrax node is detected, but the operator must accept responsibility for the operation of the SmarTrax system.</p>
	<p>No A-B path or guidance line has been met.</p>
	<p>SmarTrax is detected, turned on, and calibrated.</p>
	<p>SmarTrax is detected and in operation in the Online mode. Adjusting the Online Sensitivity will affect performance while in this mode. Press and hold to determine in which mode the system is operating.</p>
	<p>SmarTrax is detected and in operation in the Line Acquisition mode. Adjusting the Line Acquisition will affect performance while in this mode. Press and hold to determine in which mode the system is operating.</p>
	<p>Vehicle speed is too fast or too slow for SmarTrax operation and the system will disengage.</p>
	<p>Previous - Returns the Viper 4 display to the previous screen in the setup process.</p>
	<p>Next - Saves the changes made to the SmarTrax system and proceeds to the next step in the setup process.</p>

Display	Message
	Accept - Saves the changes made to the SmarTrax system at the end of the setup process and returns the to the Tools Menu.
	Exit - Exits from the current screen without saving any changes made to the system.

NOTE: Refer to Error Messages section on page 42 for additional status conditions which may be displayed in the SmarTrax on-screen widget.

INITIAL STARTUP

DATA TRANSFER

During the initial startup of the SmarTrax system, language data must transfer from the SmarTrax node to the Viper 4. Allow several minutes for data transfer to complete before calibrating SmarTrax.

NOTE: The Rx and Tx diagnostic LEDs on the SmarTrax node will flash rapidly during the data transfer. The Rx and TX lights will flash slowly or turn off when the data transfer is complete. Attempting to access the SmartTrax configuration screen while language data is transferring will open a message asking the user to try again later.

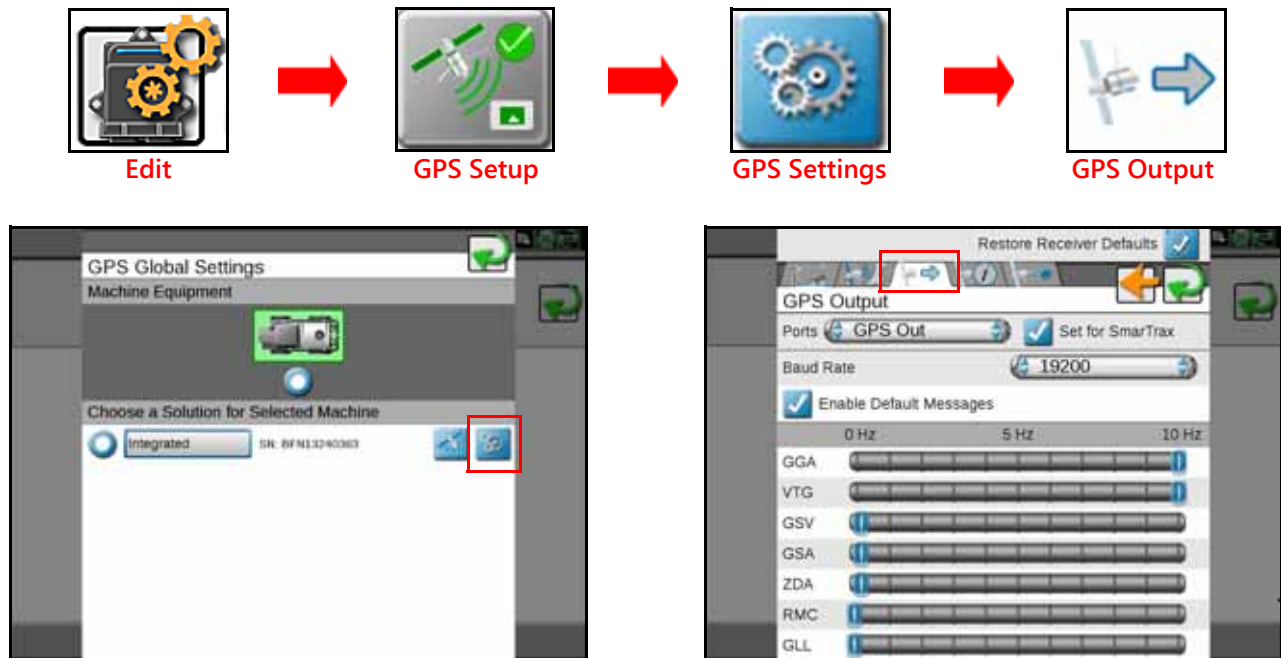
GPS CONFIGURATION

NOTE: The SmarTrax system will automatically attempt to detect GPS position information and will proceed with the calibration wizard if GPS is present. If GPS messages cannot be detected, a GPS error message will be displayed. Check any external receiver connections and verify settings in any external GPS equipment. Contact your local Raven dealer for additional assistance if the SmarTrax system still does not detect a GPS message.

INTERNAL GPS RECEIVER

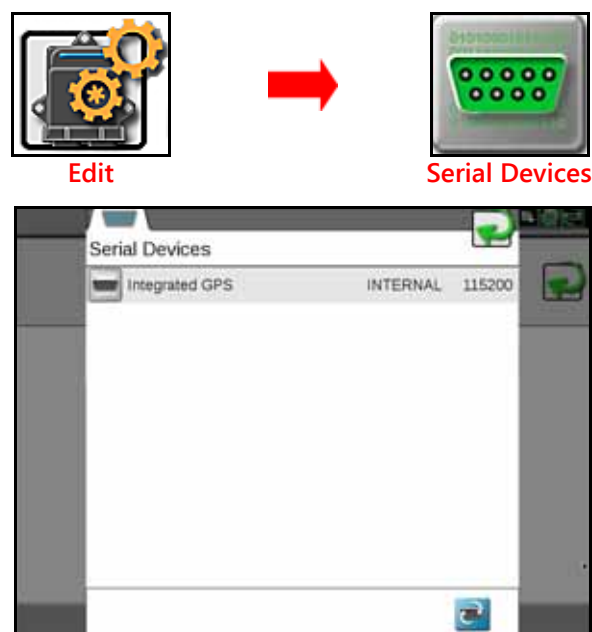
NOTE: The steps below apply only to Viper 4 computers with an internal GPS receiver that is being used as the primary GPS source.

FIGURE 1. GPS Setup Screen



1. Press **Edit**.
2. Press **GPS Setup**.
3. Select **GPS Settings**.
4. Select the **GPS Output** tab.
5. Select **GPS Out** from the Ports drop-down box.
6. Select the **Set for SmartTrax** box so that the blue check mark is present.
7. Verify that the GPS settings match the settings shown in the right picture in Figure 1 above.

FIGURE 2. Serial Device Setup Screen



8. Select **Edit**.
9. Select **Serial Devices**. The following screen will be displayed:

FIGURE 3. Serial Device Detection Screen




NOTE: If Integrated, SmarTrax, and SmarTrax GPS are not listed, press the Retry icon  on the bottom-right corner of the screen. If these devices still do not appear, inspect cable connections to ensure they are installed securely, then press the Retry icon again. If the devices still do not appear, refer to Chapter 4, Troubleshooting for further information.

FIGURE 4. GPS Global Settings Screen



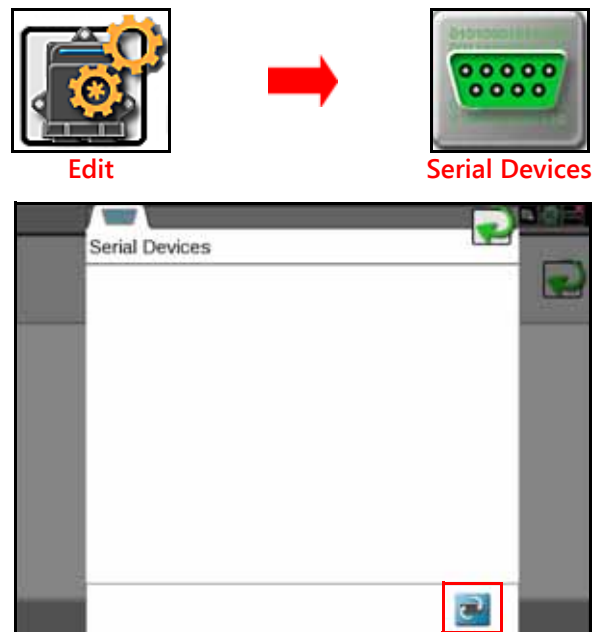
10. Verify that SmarTrax GPS on DGPS is displayed and selected as shown in Figure 4 above.

NOTE: If SmarTrax GPS on DGPS is not visible in the list, inspect cable connections to ensure they are installed securely, then press the Retry icon again. Refer to Chapter 4, Troubleshooting beginning on page 41 for further information.

EXTERNAL 600S GPS RECEIVER

The steps below apply only to Viper 4 computers utilizing an external 600S GPS receiver.

FIGURE 5. Serial Device Setup Screen



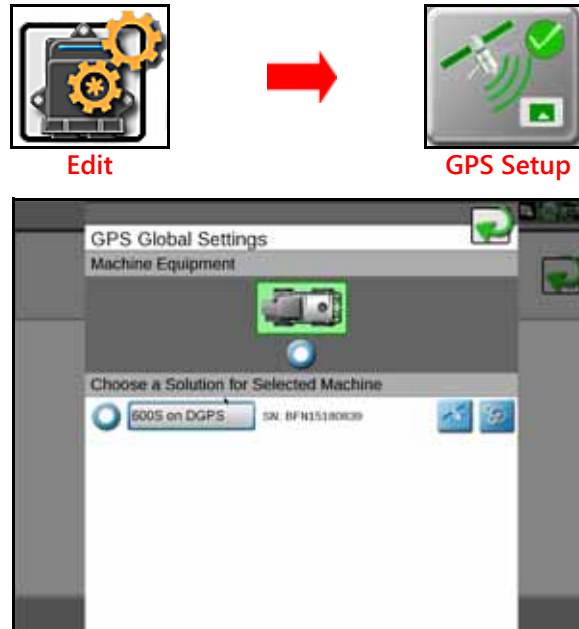
1. Select **Edit**.
2. Select **Serial Devices**.
3. Press the **Retry** button in the bottom-right corner of the screen. The following screen will appear:



4. Verify that the SmarTrax and 600S are listed in the Serial Device Setup screen.

NOTE: If SmarTrax and 600S is not visible in the list, inspect cable connections to ensure they are installed securely, then press the Retry icon again. Refer to Chapter 4, Troubleshooting beginning on page 41 for further information.

5. Press **Accept**.



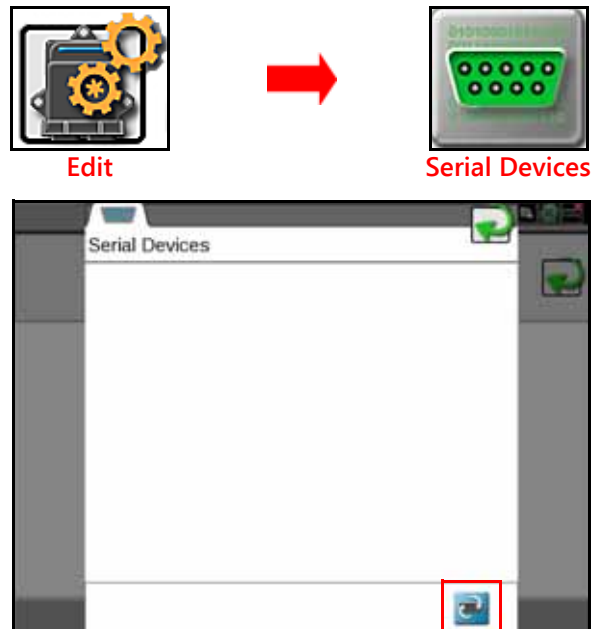
6. Select **GPS Setup**.
7. Verify that 600S on DGPS is visible and selected.

NOTE: If 600S on DGPS is not visible or selected in the list, inspect cable connections to ensure they are installed securely. Refer to Chapter 4, Troubleshooting beginning on page 41 for further information.

EXTERNAL GPS RECEIVER

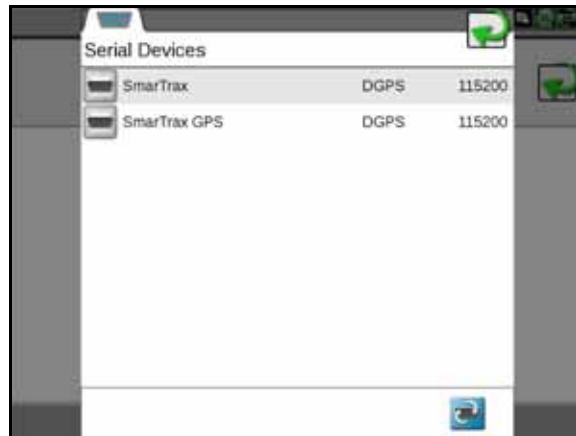
The steps below apply only to Viper 4 computers with an external GPS receiver other than model 600S.

FIGURE 6. Serial Device Setup Screen




1. Select **Edit**.

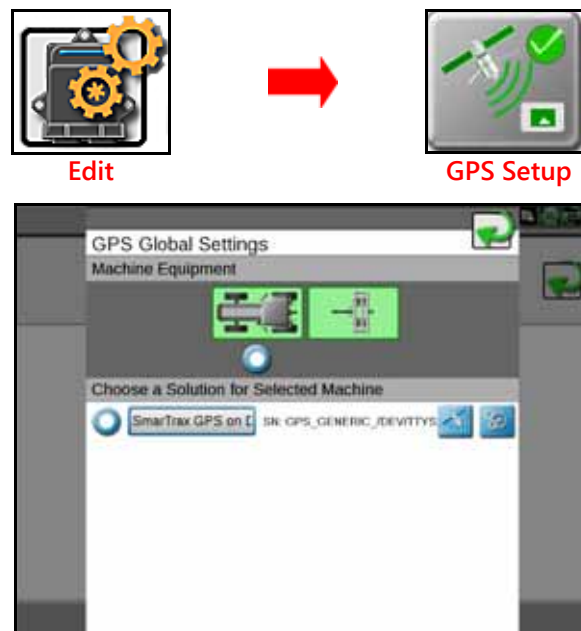
2. Select **Serial Devices**.



3. Verify that the SmarTrax and SmarTrax GPS are listed in the Serial Device Setup screen.

NOTE: If SmarTrax and SmarTrax GPS are not listed, press the Retry icon  on the bottom-right corner of the screen. If these devices still do not appear, inspect cable connections to ensure they are installed securely, then press the Retry icon again. If the devices still do not appear, refer to Chapter 4, Troubleshooting for further information.

4. Press **Accept**.



5. Select **GPS Setup**.
6. Verify that SmarTrax on DGPS is visible and selected.

NOTE: If SmarTrax GPS on DGPS is not visible and selected in the list, refer to Chapter 4, Troubleshooting beginning on page 41 for further information.

SMARTRAX TERMS OF USE

FIGURE 7. Operator Liability Warning Screen



Read and accept the Operator Liability Warning. If the operator does not accept liability, the SmarTrax system will disable and cannot be reengaged until the liability warning is accepted. The Operator Liability Warning screen will appear each time the Viper 4 is turned on or rebooted.

MACHINE CONFIGURATION

SET UP MACHINE PROFILE(S) - OPTIONAL

FIGURE 8. Machine Configuration Menu



1. Select one of the **Profile** options from the bottom of the Machine Type list.
2. Select **Next**.
3. Select **New, Load,** or **Reset**.
 - New creates a new machine profile.

- Load allows the operator to select an existing profile. Load will not be displayed as an option until a machine calibration has been performed and a new profile has been set up.
 - If the profile chosen has previously been calibrated on the machine, the calibration process is complete.
 - If the profile chosen has not been calibrated on the machine, the calibration process must be completed as outlined in the following sections in this manual.
- Reset clears the previous profile settings. Once Reset is selected, the operator must select the machine from the Machine Type list and the calibration process must be completed as outlined in the following sections in this manual. Reset will not be displayed as an option until a machine calibration has been performed and a new profile has been set up.

4. Select **Next**.

MACHINE-SPECIFIC CONFIGURATION

NOTE: It may be necessary to configure the GPS com port in the field computer to allow GPS communication with the SmarTrax. Refer to the Viper/Viper 4+ Installation and Operation Manual (P/N 016-0171-539) for information on com port configuration and additional machine measurements (such as guidance width) that must be entered into the field computer.

Before the SmarTrax system may be enabled, the SmarTrax system must be calibrated for the specific vehicle being used. Complete the following steps to configure the machine specifications in the Viper 4 and the SmarTrax system.

FIGURE 9. Vehicle Selection Screen



1. Select the specific machine type from the Machine Type list. If the specific machine is not listed, choose the generic machine type that best fits the machine:
 - SP Sprayer RBoom - Self-propelled sprayer with a rear boom
 - SP Sprayer FBoom - Self-propelled sprayer with a front boom
 - FS Tractor - Front-steered tractor
 - Articulated
 - Rear Steered - Rear-steered machine
2. Select **Next**.

FIGURE 10. Steering Control Device Selection Screen



NOTE: The steering control device selection screen will display a (-) until a steering control device is selected from the drop-down box.

3. Select the device being used to control the SmarTrax system.
 - Raven Hydraulic - SmarTrax hydraulic valve is controlling the vehicle steering.
 - Steer-Ready - SmarTrax is connected to an optional steering control system that was installed at the factory.
4. Select **Next**.

CALIBRATE THE SMARTRAX SYSTEM

NOTE: The calibration wizard will be displayed the first time the SmarTrax module is accessed after installation or any time the Reset SmarTrax option is selected. Refer to Reset Calibration section on page 37 for additional information about resetting the SmarTrax system.

1. Park the machine on a level surface.
2. Locate and select the SmarTrax module. The calibration wizard will start automatically if the SmarTrax system requires calibration.

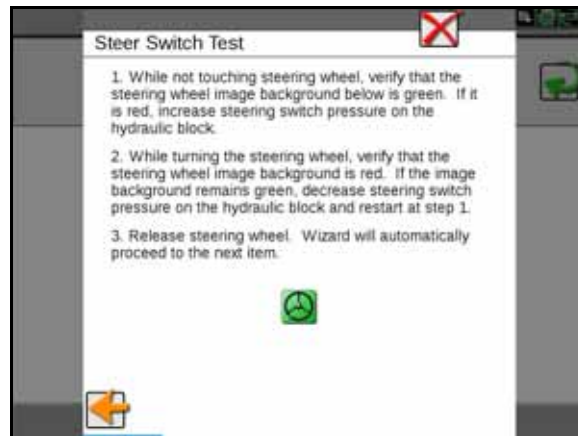
SYSTEM DISENGAGE CALIBRATION

SMARTRAX SYSTEMS WITH A PRESSURE OR FLOW SWITCH INSTALLED

IMPORTANT: This section applies only to SmarTrax systems utilizing a pressure or flow switch to disengage the SmarTrax system when the steering wheel is turned. If a pressure transducer is installed in the SmarTrax system, refer to the SmarTrax Systems with a Pressure Transducer Installed section on page 17 to calibrate the SmarTrax system.

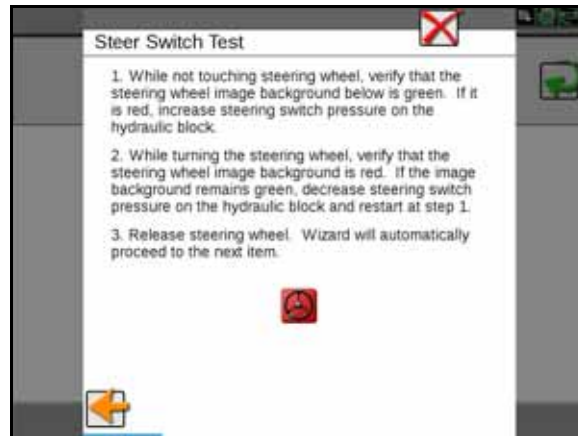
1. Select **Next** in the SmarTrax Setup Wizard. The following screen will appear:

FIGURE 11. Disengage Calibration Screen



2. Turn the steering wheel. The following screen will appear:

FIGURE 12. Disengage Calibrating Screen



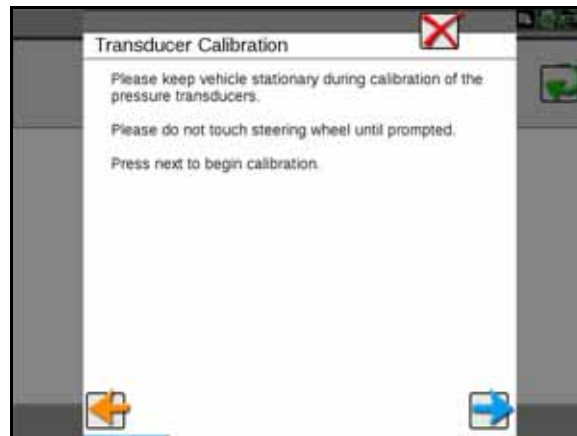
- NOTE:** It may be necessary to increase the disengage setting on the pressure switch to require more steering input to disengage SmarTrax and to decrease the disengage setting to require less steering input. This adjustment can be made during the hydraulic system calibration or after the SmarTrax system calibration. On flow switch systems, the system is either on or off and cannot be adjusted.

3. Proceed to the Engage Switch and Node Orientation section on page 19 continue with the SmarTrax system calibration.

SMARTRAX SYSTEMS WITH A PRESSURE TRANSDUCER INSTALLED

- IMPORTANT:** This section applies only to SmarTrax systems utilizing pressure transducers to disengage the SmarTrax system when the steering wheel is turned. If a pressure or flow switch is installed in the SmarTrax system, refer to the SmarTrax Systems with a Pressure or Flow Switch Installed section on page 16 to calibrate the SmarTrax system.

FIGURE 13. Transducer Calibrating Screen



1. Select **Next**. The following screen will appear:

FIGURE 14. Transducer Calibrating Screen



2. When prompted, turn the steering wheel 90° to allow the SmarTrax system to detect the hydraulic pressure change. Once the system has detected the static and differential pressures, a screen displaying the steering wheel status will appear.

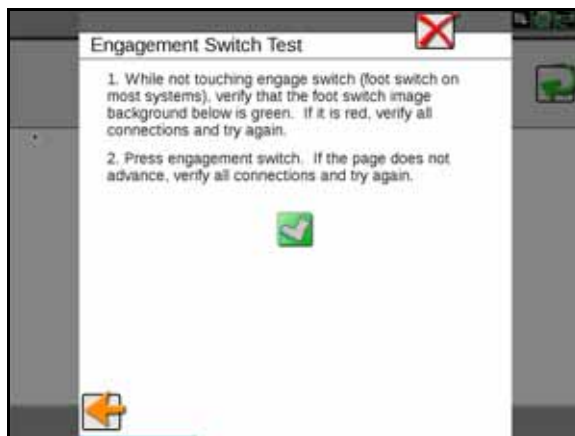
NOTE: The steering wheel icon should appear green until the wheel is manually turned, at which point the icon should turn red.

3. Verify the Viper 4 displays the correct steering operation.

NOTE: It may be necessary to increase the disengage setting to require more steering input to disengage SmarTrax or to decrease the disengage setting to require less steering input.

4. If the system setting is correct, select **Next**.
5. Proceed Engage Switch and Node Orientation section on page 19 to continue with the SmarTrax system calibration.

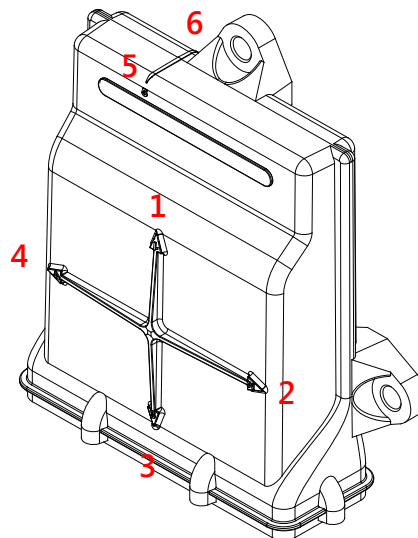
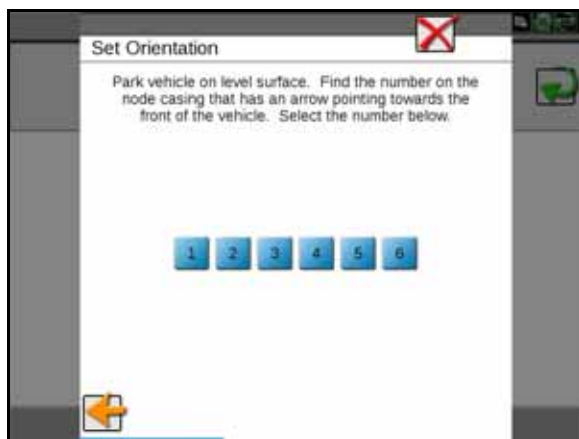
ENGAGE SWITCH AND NODE ORIENTATION



1. Review the on-screen instructions.
2. Press and release the foot switch or engage switch.

NOTE: The SmarTrax Setup Wizard will automatically advance to the next step in the calibration process when the engage switch is detected.

FIGURE 15. Node Orientation Screen



3. Ensure that the machine is parked on a level surface.
4. Select the number that corresponds with the node arrow number pointing toward the front of the machine.

IMPORTANT: Selecting the incorrect node arrow number may cause poor steering performance!

NOTE: The SmarTrax calibration wizard will perform an initial calibration on the SmarTrax tilt sensors. The wizard will automatically advance to the next step in the calibration process once the node calibration is complete.

WHEEL ANGLE SENSOR (SPS) CALIBRATION - IF APPLICABLE

IMPORTANT: The range of the SPS/WAS values is limited to 10-1010 to prevent damage to certain types of sensors. Ensure the sensor is mounting securely to prevent damage during operation. The difference between the Left and Center values and Center and Right values must exceed 100.

The SPS/WAS calibration is required only if a SPS/WAS is installed in the SmarTrax system. If no SPS/WAS is detected by SmarTrax, the system calibration wizard will proceed to the next step in the calibration process. If a SPS/WAS is installed, the following screen will be displayed:

FIGURE 16. SPS/WAS Calibration Screen




1. While driving slowly, turn the steering wheel fully to the left wheel lock.
2. Select **Left**.
3. Continue driving slowly and straighten the wheel until the machine is driving straight forward.
4. Select **Center**.
5. Turn the steering wheel fully to the right wheel lock.
6. Select **Right**.
7. Select **Next**.

CONFIGURING WHEEL BASE AND ANTENNA OFFSETS

If a generic machine profile was selected during the machine configuration process, the Wheel Base, Antenna Position, and Antenna Height values must be entered into the SmarTrax system.

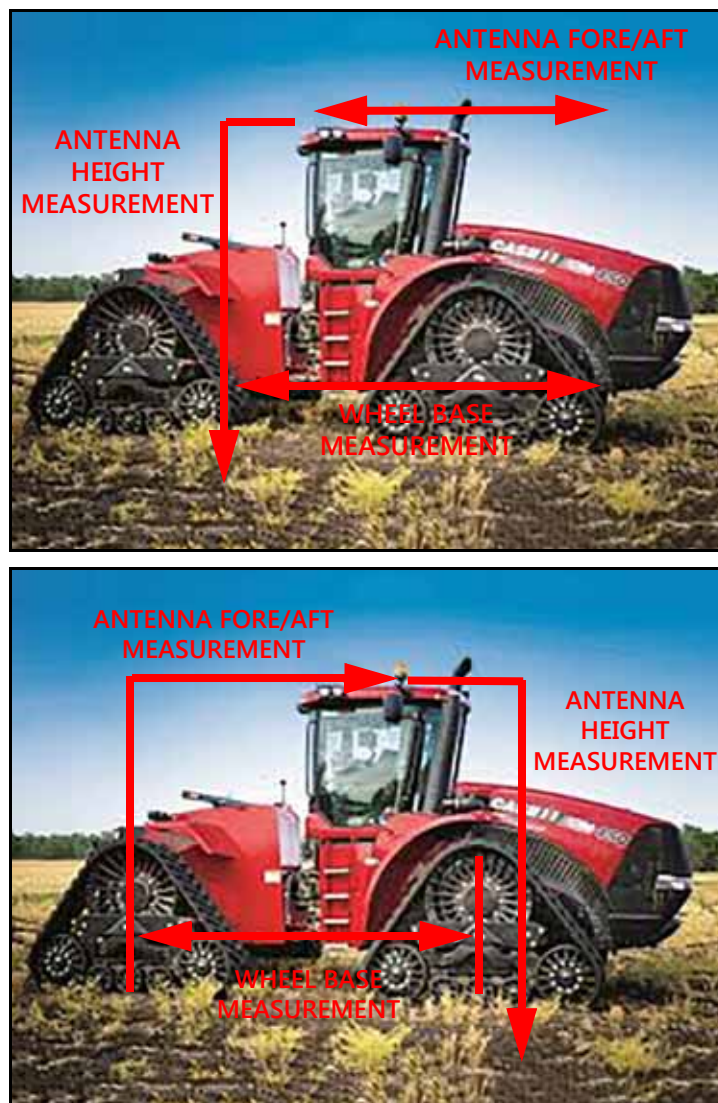
IMPORTANT: If a specific machine profile was selected during the machine configuration process, the Wheel base, Antenna Position, and Antenna Height measurements will be automatically populated in the screen. However, the antenna mounting position may vary on the machine, so it is important to re-measure the Antenna Position and Antenna Height to verify that the setting in the Viper 4 is correct. The Wheel Base value cannot be changed.



NOTICE

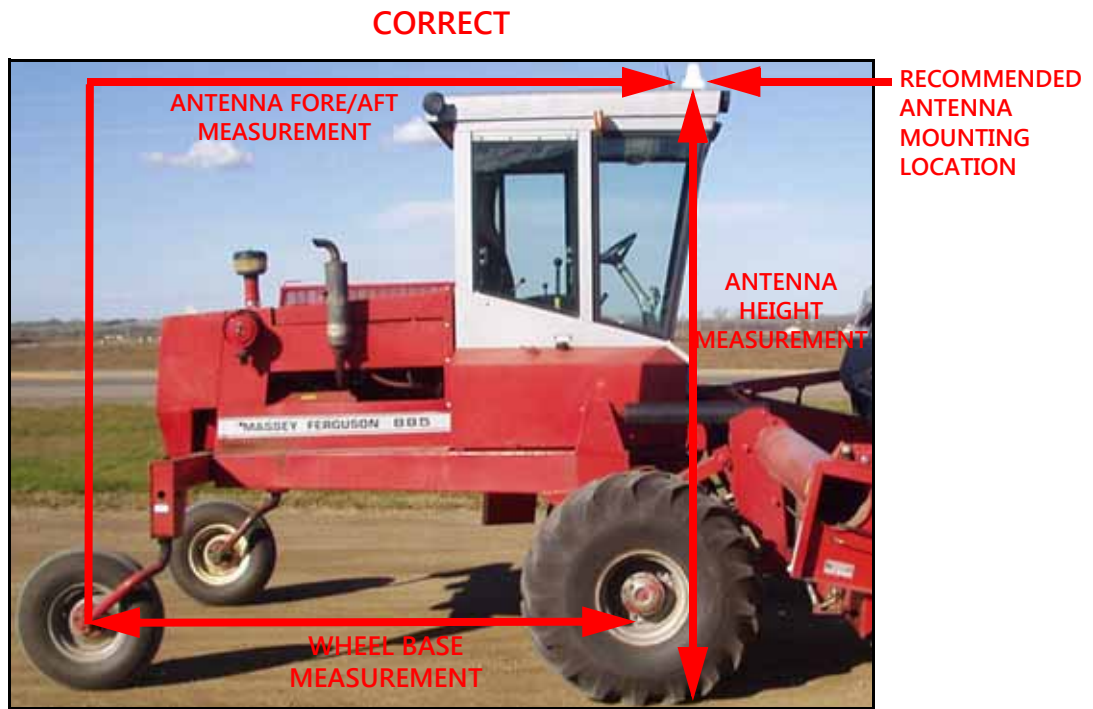
The Wheel Base, Antenna Position, and Antenna Height values are critical to the operation of the SmarTrax system. Measure these dimensions accurately to ensure optimal SmarTrax system performance!

FIGURE 17. Articulated Machine Measurements



NOTE: For articulated machines, measure from the center of the front tire to the center of the rear tire on both sides of the machine. Add the values together and divide the number by two to find the average.

FIGURE 18. Swather Machine Measurements



INCORRECT WHEEL BASE MEASUREMENT




Wheel base measurement taken from pivot point instead of the center of the front wheel.



Wheel base measurement taken with wheels reversed and not in the straight line operation position.

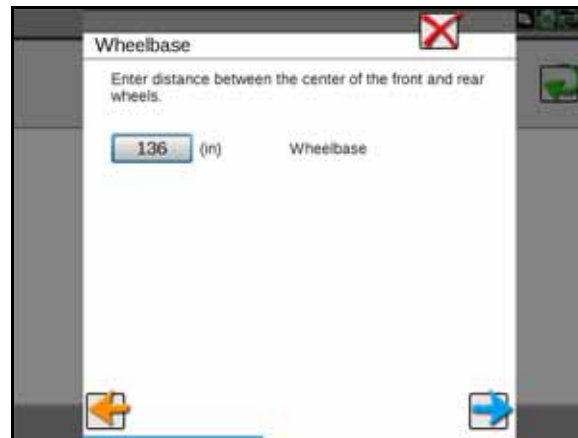
NOTE: For swather machines, the rear wheels **MUST** be positioned behind the pivot point and pointing forward to reflect the tire position during normal, straight line operation. To figure the wheelbase distance, measure from the center of the rear tire to the center of the front tire.



NOTICE

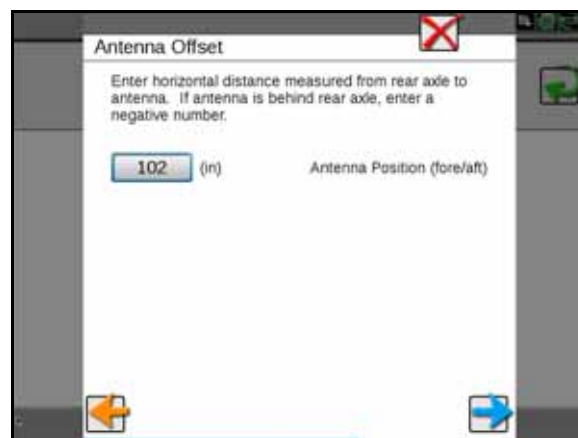
The Wheel Base, Antenna Position, and Antenna Height values are critical to the operation of the SmarTrax system. Measure these dimensions accurately to ensure optimal SmarTrax system performance!

FIGURE 19. Wheel Base Configuration Screen



1. To figure the machine's wheel base, measure the distance from the center of the machine's front axle to the center of the rear axle.
2. Select the value box to enter the Wheel Base measurement using the on-screen keypad.
3. Select **Next**.
4. To figure the GPS Antenna Position, measure the distance from the antenna to the center of the rear axle.

FIGURE 20. Antenna Position Configuration Screen



5. Select the value box to enter the Antenna Position measurement using the on-screen keypad.

IMPORTANT: If the antenna is in front of the rear axle, the number entered must be positive. If the antenna is behind the rear axle, the number must be entered as negative using a " - " before the number. For example, if the

antenna is located 3 feet behind the rear axle, the value would be entered as -3. Raven Industries recommends mounting the antenna in front or even with the rear axle.

6. Select **Next**.
7. To figure the Antenna Height, measure the distance from the ground to the antenna base mounting plate.

FIGURE 21. Antenna Height Configuration Screen

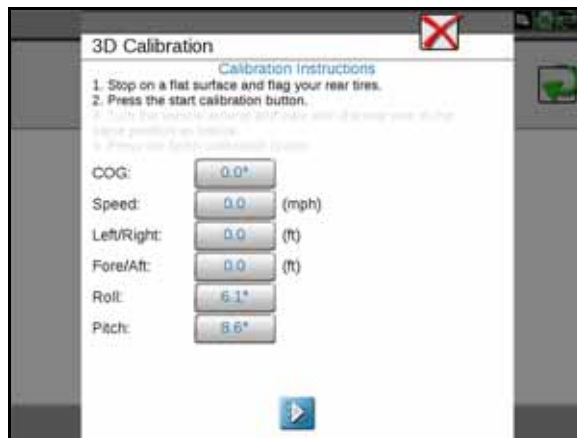


8. Select the value box to enter the Antenna Height measurement using the on-screen keypad.
9. Select **Next**.

ENHANCED TILT CALIBRATION

NOTE: The calibration may take a few minutes to complete.

FIGURE 22. Enhanced Tilt Calibration Wizard

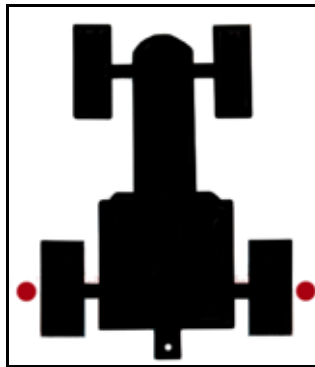


1. Drive the machine forward 33 feet and park on a flat surface.

NOTE: The machine must detect a forward motion prior to calibration to determine which direction it is facing.

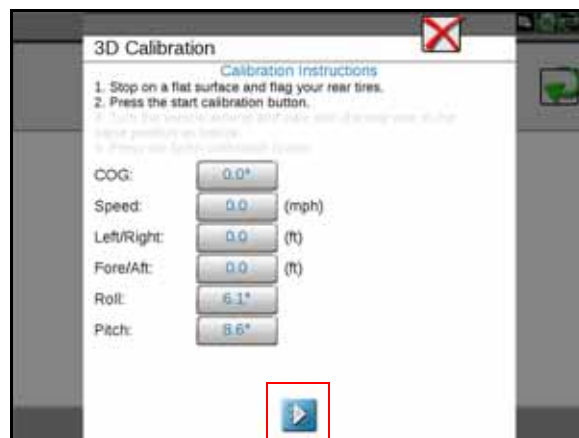
2. Follow the on-screen instructions to begin the calibration process.

FIGURE 23. Machine's Rear Axle Marked Before Enhanced Tilt Calibration



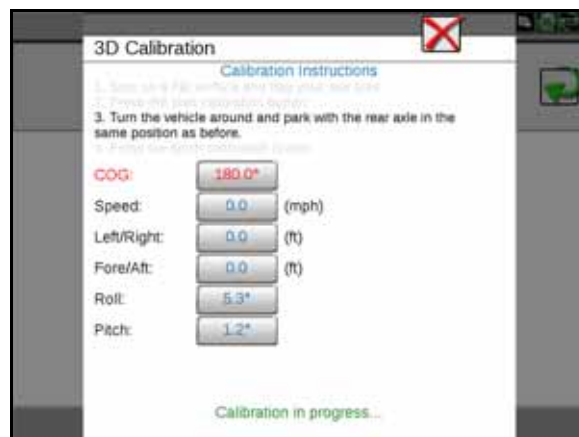
- Place flags or markers on the outside of each rear wheel aligned with the axle.

FIGURE 24. Tilt Calibration Screen



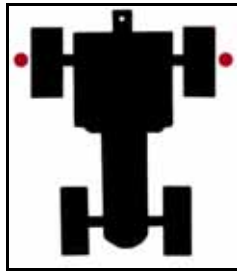
- Select the arrow at the bottom of the screen to begin calibration. The following screen will appear:

FIGURE 25. Calibration in Progress Screen



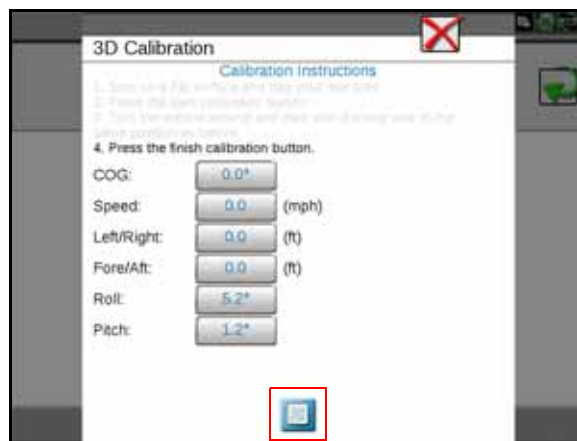
- Wait for the calibration process to be completed.

FIGURE 26. Machine Orientation After Tilt Calibration



- Turn the machine around 180° and park with the machine facing the opposite direction and the rear axle in between the flags or markers.

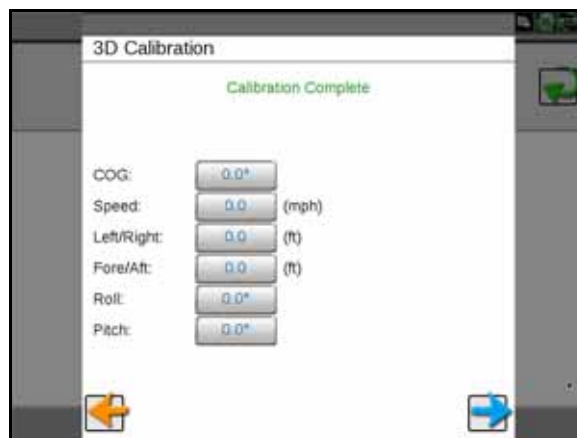
FIGURE 27. Finish Calibration



- After the calibration is complete and the values on the screen have turned blue, select **Finish Calibration**.

NOTE: In order for the values to turn blue, the COG value must be less than 10°, the Left/Right must be less than 3 ft, and the Fore/Aft must be less than 3 ft. The rear wheels will not necessarily end up aligned exactly with the markers to get the Fore/Aft number to turn black.

FIGURE 28. Calibration Complete



- Select **Next**.


CALIBRATE THE MACHINE'S STEERING SYSTEM


NOTE: On certain machines, it may not be necessary to calibrate the steering system. If calibration is not required for the machine's configuration, proceed to Advanced Setup Tools and System Diagnostics section on page 30.

After the initial calibration of the SmarTrax system is complete, it is necessary to calibrate the machine's steering system. This allows the SmarTrax to learn the hydraulic capabilities of the machine for optimal steering performance in the field.

Before beginning the machine's steering system calibration, ensure:

- The booms are racked on self-propelled units.
- There are no implements connected to the hitch.
- The machine's engine is running at the normal operating RPM.
- The machine's measurements are correctly entered into the Viper 4.

	<p style="text-align: center;">WARNING</p> <p>The machine's wheels will turn automatically. Be sure the area around the vehicle is clear of people and equipment before engaging the steering system.</p>
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	<p style="text-align: center;">NOTICE</p> <p>The calibration of the machine's steering system should be performed in a field or other large, open space and during conditions similar to normal vehicle operation.</p> <p>If the ground or surface is slippery, muddy, or freshly tilled, the SmarTrax system may learn incorrect steering responses for normal operating conditions.</p> <p>Ensure the machine's hydraulics are operating properly and there are no other mechanical issues that may affect the performance of the SmarTrax system.</p>
---	---

NOTE: To ensure the calibration is successful, the number of starts and stops during the calibration process should be limited. If it is necessary to pause the calibration process, turn the steering wheel or tap the foot/enable switch. Tap the foot/enable switch again to resume calibration.

FIGURE 29. Steering Calibration Screen



1. Position the machine in an open space with several acres of smooth ground available to perform the machine's steering calibration.
2. Press the foot/engage switch to begin calibration.

NOTE: During calibration, the machine will turn hard to the left or right and progressively turn in the opposite direction, then turn hard in that direction and progressively turn back in the opposite direction. Adjust the speed and vehicle location as necessary.

NOTE: If an error message is displayed during calibration, refer to the "Error Messages" section on page 42 for possible causes and corrective action to complete the calibration process.

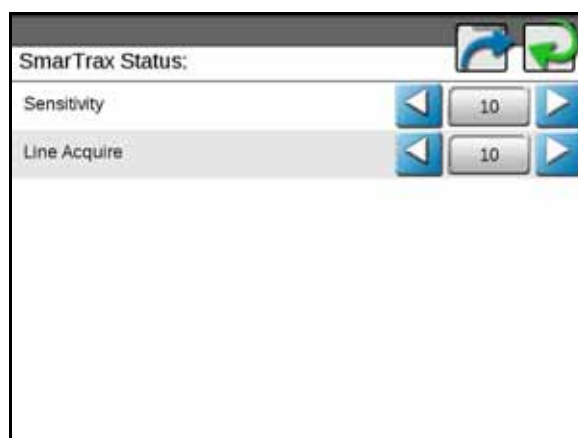
START A JOB

Refer to the ROS (Raven Operating System) Basic Operation Manual (P/N 016-0171-539) for instructions on starting a job and setting guidance lines.

SYSTEM ADJUSTMENTS

System tools allow fine-tuning of the system to adjust for operating conditions and improve steering accuracy. To adjust the steering response in the field computer, press and hold the SmarTrax widget while within a job. The following screen will appear:

FIGURE 30. SmarTrax Adjustments Screen



LINE ACQUISITION (LA) MODE AND AGGRESSIVENESS

NOTE: The speed of the LA mode is often limited by the speed of the machine's hydraulic and steering system. Increasing the LA value at the maximum vehicle speed may degrade performance of the SmarTrax system.

FIGURE 31. LA Mode



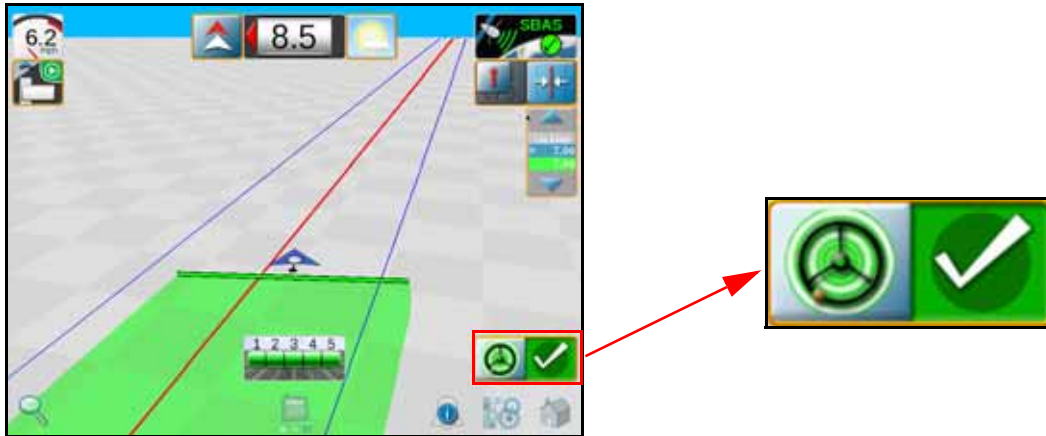
NOTE: The screen in the figure above illustrates an example of a situation in which SmarTrax is operating in LA mode. This mode will remain active until the machine steers within 24 inches [60 cm] of the displayed guidance line.

The LA Aggressiveness value affects how quickly the machine steers toward a displayed guidance line when it is traveling further than 24 inches [60 cm] from the desired path. If the machine does not approach the guidance line as quickly as desired, increase the LA Aggressiveness value one increment at a time, allowing SmarTrax at least 30 seconds between adjustments to adjust to the change in the value.

Setting the LA Aggressiveness value too high may cause the machine to steer into the guidance line too quickly and weave around the guidance line. Lowering the value in these situations will allow the machine to settle on the line.

ON-LINE (OL) MODE AND SENSITIVITY

FIGURE 32. OL Mode Indicator



NOTE: The screen in the figure above illustrates an example of a situation in which SmarTrax is operating in OL mode. This mode will remain active as long as the machine steers within 24 inches [60 cm] of the displayed guidance line.

The OL Sensitivity value affects the response of the machine while steering within 24 inches [60 cm] of the displayed guidance line. If the machine tends to slowly weave across the guidance line and does not remain within 24 inches [60 cm] of the desired path, increase the OL Sensitivity value one increment at a time, allowing SmarTrax at least 30 seconds between adjustment to adjust to the change in the value.

Setting the OL Sensitivity value too high may cause the machine to over-correct or become jittery while on the line. Lowering the value in these situations will allow the vehicle to remain on the desired path.

ADVANCED SETUP TOOLS AND SYSTEM DIAGNOSTICS

Advanced setup tools allow fine-tuning of the system to adjust for operating conditions and improve steering accuracy.

NOTE: Some features or settings are not able to be adjusted unless SmarTrax is in an active job.

NOTE: Some features or settings are configured during the SmarTrax calibration wizard and cannot be modified or changed without resetting the SmarTrax system. Refer to Reset Calibration section on page 37 for additional assistance with resetting the SmarTrax system to default settings.

SYSTEM INFORMATION TAB

NOTE: To change the Sensor Type, Machine Type, Control Device, or Wheel Base settings, the SmarTrax system must be reset and recalibrated.



- **Machine Type** - Displays the machine type or model selected during the SmarTrax calibration wizard. This information cannot be changed without resetting the SmarTrax system. Generic machine types which may be displayed in this area include:
 - SP Sprayer RBoom - Self-propelled sprayer with a rear boom
 - SP Sprayer FBoom - Self-propelled sprayer with a front boom
 - FS Tractor - Front-steered tractor
 - Articulated
 - Rear Steered - Rear-steered machine
 - **Control Device** - Displays the steering control device selected during the calibration wizard. This setting cannot be changed without resetting the SmarTrax system. Available control devices may include:
 - Raven Hydraulic - SmarTrax hydraulic valve is controlling the vehicle steering.
 - Steer Ready - An optional steering control system was installed at the factory - available on select machines only.
 - **Sensor Type** - Displays the primary sensor type that is providing machine feedback (yaw sensor or wheel angle sensor/SPS). The sensor type is automatically detected by the system and cannot be changed.
 - **Wheel Base** - The measured distance between the front and rear axles on the equipment.
 - **Antenna Height** - The measured distance from the ground to the antenna base mounting plate.
 - **Antenna Position** - Enter the measured fore/aft distance from the machine pivot point to the GPS antenna. The fore/aft offset distance must be measured parallel with the direction of travel.
- NOTE:** The antenna position measurement will normally be entered as a positive value. If the antenna is mounted behind the rear axle, enter a negative value for the antenna fore/aft position.
- **Recal Hydraulics** - Restarts the machine's steering calibration process. Refer to Calibrate the Machine's Steering System section on page 27 for information on completing the machine's steering calibration.
 - **Reset SmarTrax** - Resets the SmarTrax system to the default values.

NOTE: If Reset SmarTrax is selected, the SmarTrax system must be recalibrated before the system can be enabled. Refer to the Calibrate the SmarTrax System section on page 16 for information on completing the SmarTrax system calibration.

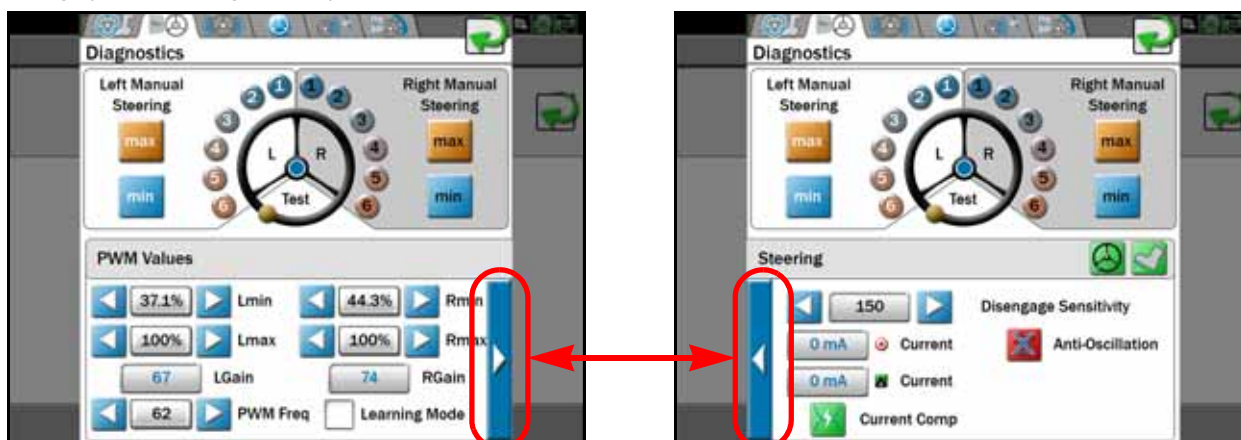
DIAGNOSTICS TAB



- **Left and Right Manual Steer** - Used to manually test the SmarTrax system. Select one of the numeric settings (1 being very low, 6 being very high) positioned around the steering wheel graphic or the Min or Max button to steer the machine. If it does not respond as expected, the PWM values may need to be adjusted.
- **PWM Values** - Displays SmarTrax valve PWM minimum, maximum, and gain values. Adjustment of these values is not typically necessary. Raven Industries recommends leaving these values as configured by the SmarTrax system unless a technician instructs you to modify the settings. Raven Industries also recommends leaving the system in manual mode. Auto mode could cause instability, causing poor system performance. Pressing PWM Setup displays the PWM Status screen to allow manual adjustments of the PWM values.
- **Learning Mode** - Enable the learning mode feature to allow the system to automatically adjust system response during operation. This feature allows the SmarTrax system to adjust the PWM valve and minimum values during field operation to continuously tune the steering response for monitored field conditions. Disable learning mode to keep the system from automatically tuning the PWM minimum values and disable automatic system response adjustment. Raven Industries does not typically recommend enabling learning mode to avoid unexpected changes to PWM values.

NOTE: If the PWM values are adjusted, the SmarTrax system will no longer automatically adjust the PWM minimum values unless the Learning Mode function is enabled again.

Use the scroll button at the bottom of the Diagnostics prompt to toggle between the following PWM values and steering system settings and options:

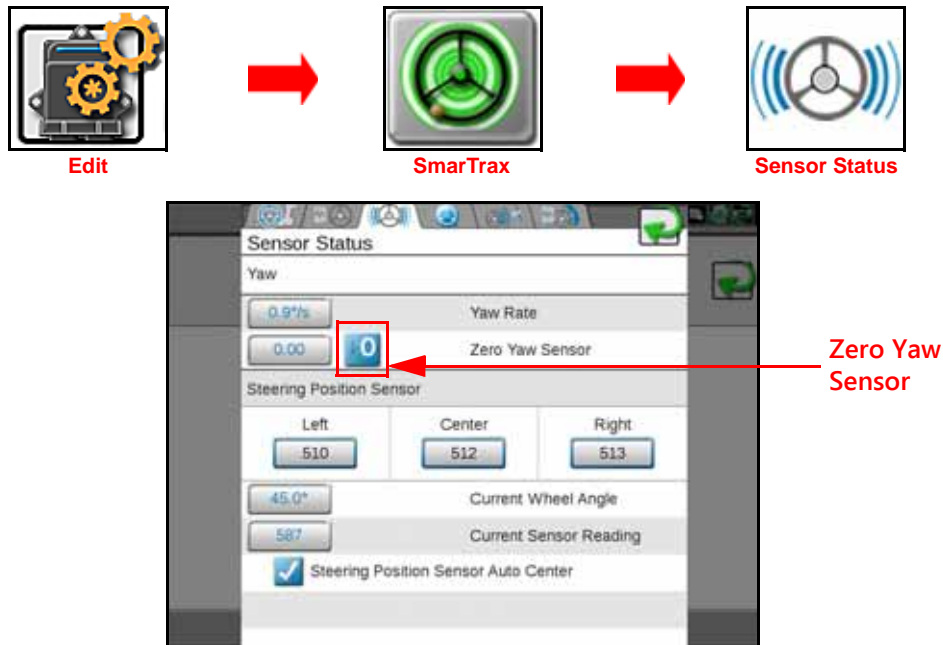


- **Disengage Sensitivity** - Proper tuning of the disengage sensitivity value allows the equipment operator to disengage SmarTrax by turning the steering wheel with minimal or moderate effort. Disengage sensitivity requires minimal adjustment. The default disengage sensitivity value when a pressure or flow switch are present is 150. When one pressure transducer is present in the system, this value represents the PSI value that must be reached before the system is able to disengage. If two pressure transducers are present, the value represents the difference between the readings of the transducers.

NOTE: If the sensitivity value is too low, the steering system may disengage in rougher fields without any input from the operator. Raising the sensitivity value too high may make disengaging the SmarTrax system at the steering wheel difficult or impossible.

- **Target Current and Actual Current** - Current readings performed on SmarTrax systems containing hydraulic valves with kit part numbers 117-0295-xxx and 117-4001-xxx. Target Current is what the system expects to read. Actual Current displays the amount of current the system is using to steer the machine. These values are used to adjust system performance.
- **Current Compensation** - Used only with certain non-steering ready machines. This feature is automatically enabled or disabled during the calibration process and cannot be modified.
- **Anti-Oscillation-Articulated Machines** - This feature is only used with articulated machines and should not be enabled with any other type of machine. Anti-Oscillation automatically turns on when an articulated machine is selected during the machine configuration stage of the SmarTrax setup. Enabling this feature with any machine that is not articulated may degrade the system performance.
- **Anti-Oscillation-RoGator B, TerraGator B, and New Holland Front Booms Only** - Enables and disables terrace mode for improved terrace performance. Enabling this feature while not working on terraces may degrade system performance.

SENSOR STATUS



- The Yaw Sensor Status area of the screen displays the yaw sensor diagnostic information:
 - **Current Wheel Angle** - An approximation of the steering inputs detected by the yaw sensor.
 - **Current Sensor Reading** - The total yaw detected by the sensor.
 - **Zero Yaw Button** - Recalibrates the yaw sensor to zero. The machine must be at a full stop before recalibrating the yaw sensor. The example above shows the Zero Yaw Sensor as already been recalibrated to 0. During normal operation, the value will likely show a value other than 0.
- If the SmarTrax system detects a SPS/WAS during calibration, the SPS Sensor Status area of the screen displays the SPS/WAS sensor status information. If no SPS/WAS was detected, this field will remain blank.

NOTE: SmarTrax nodes 016-0173-031 and 016-0173-042 only - The SmarTrax node must be hardware version C or higher to utilize the SPS/WAS.

- **Left, Center, and Right** - Displays sensor readings. If the sensor is repositioned or replaced, these values should be recalibrated before operating the SmarTrax system.
- **Current Wheel Angle** - The current wheel angle detected by the SPS/WAS.
- **Current Sensor Reading** - Current value registered by the sensor.
- **Steering Position Sensor Auto Center** - When set to Active, the SmarTrax system automatically recalibrates the SPS/WAS center position during operation to adjust for slight shifts in the sensor's center position. Bypassing this feature leaves the SPS/WAS center position at its current value.

NOTE: Refer to the Wheel Angle Sensor (SPS) Calibration - If Applicable section on page 20 for sensor calibration information.

SMARTRAX 3D COMPENSATION TAB



- **Forward and Downward** - Indicate the orientation of the node programmed during calibration of the SmarTrax system.
- **Yaw Rate, Roll, Pitch, and Yaw** - Real-time measurement data used by the 3D terrain compensation feature.
- **Current Direction** - Indicates the direction in which the machine is traveling. If the direction is incorrect, drive forward and press the Send Forward Command button. Verify the direction of travel is displayed correctly when the machine is being driven in both forward and reverse.
- **3D Compensation** - Touch the 3D Compensation status button to toggle the 3D compensation features on or off. When disabled, the SmarTrax system will not adjust the displayed guidance path for any machine tilt during field operations.
- **Calibrate** - Used to calibrate the 3D terrain compensation feature. Refer to the Enhanced Tilt Calibration section on page 24 for the calibration procedure.

GPS SETUP TAB



- **SmarTrax HDOP Limit** - Horizontal Dilution of Precision (HDOP) is an indicator of the quality of the GPS signal. A high HDOP indicates that not enough satellites are distributed evenly throughout the sky, diminishing the accuracy of the guidance system. The number displayed is the maximum number SmarTrax will allow to run. Raising this number may degrade system performance.

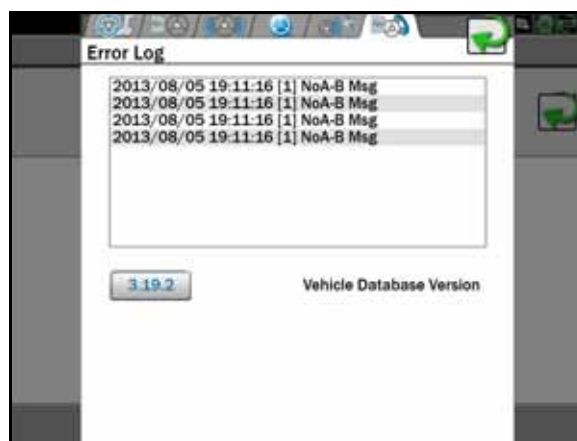
NOTE: The default SmarTrax HDOP limit is 2.5. Increasing the HDOP limit may degrade SmarTrax performance. Decreasing the HDOP limit may cause SmarTrax to disengage more often.

- **SmarTrax GPS Baud** - The rate the system uses to communicate with the GPS receiver. This value is typically set to 19200, but it can be changed to match the baud rate of receivers that cannot be easily changed to 19200.

NOTE: With the 600S GPS Receiver and SmarTrax software version 7.4 and newer, the GPS baud will automatically change to 115200 to allow communication with the 600S for configuration or changing settings.

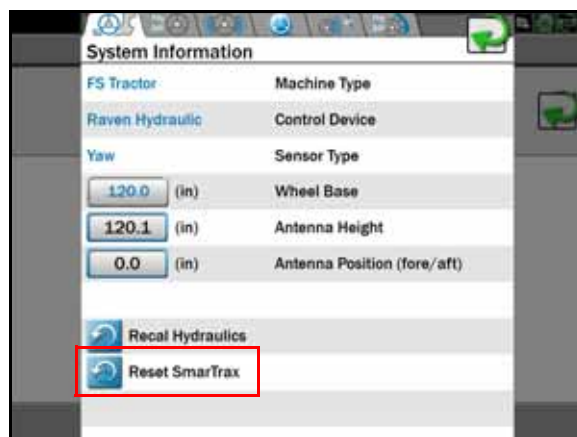
- **SmarTrax GPS Frequency** - The GGA message update frequency in hertz (Hz).
- **Minimum GPS Correction** - This setting is used to select the correction source providing the minimum accuracy allowable for SmarTrax operation. This selection may be used to prevent the SmarTrax system from sudden course changes if the desired correction source is lost. For example, selecting RTK for this feature will disengage SmarTrax if RTK corrections are lost.

ERROR LOG TAB



- **Error Log** - Displays the last 10 errors that have appeared in the SmarTrax status area of the Viper 4 and the time they occurred.
- **Vehicle Database Version** - The vehicle database version currently installed on the SmarTrax control node. It contains the list of machine tune sets, measurements, and driving devices available.

RESET CALIBRATION

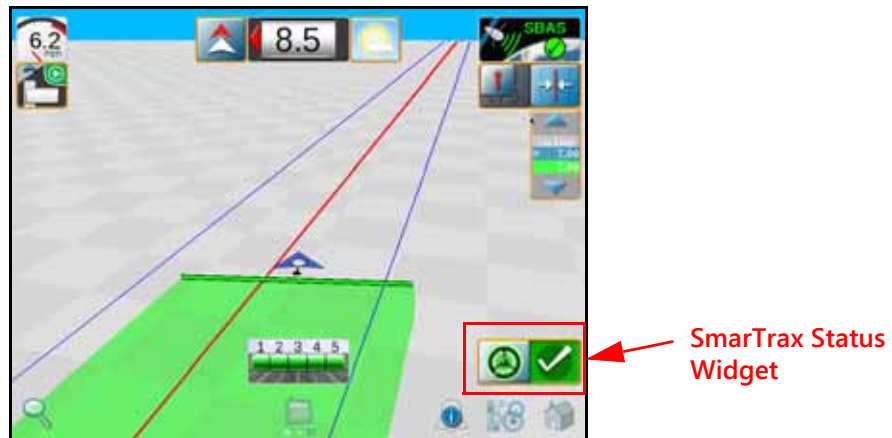


Resetting the SmarTrax system calibration will delete all system settings and adjustments that have been performed. Before resetting the SmarTrax calibration, write down the current system settings for reference later. Recalibrate the SmarTrax system after the system is reset.

ROUTINE OPERATION

ENGAGE SMARTRAX

FIGURE 33. SmarTrax Status Widget



NOTE: If the SmarTrax steering widget does not appear on the screen, refer to the Viper/Viper 4+ Installation and Operation manual (P/N 016-0171-539) for further information on adding widgets.

Touch the SmarTrax status widget during field operations to engage and disengage the SmarTrax features as desired during field operations.

NOTE: The operator liability waiver must be accepted before the SmarTrax system can be enabled for operation.

The SmarTrax steering may also be engaged using the following methods:

- Tap the foot switch or rocker switch to engage SmarTrax features without touching the Viper 4 display.
- Press the SmarTrax on-screen status widget to engage the SmarTrax during field operation.

UPDATING THE NODE

Refer to the Viper 4 Installation & Operation Manual (P/N 016-0171-539) for instructions on updating the node software.

SYSTEM SETTINGS

System Setting	Average Setting	Suggested Range	Function
Line Acquisition (LA) Aggressiveness	10	4 to 16	The LA Aggressiveness value affects how quickly the machine steers toward a displayed guidance line when it is traveling further than 24 inches [60 cm] from the desired path.
OnLine (OL) Sensitivity	10	4 to 20	The OL Sensitivity value affects the response of the machine while steering within 24 inches [60 cm] of the displayed guidance line.

System Setting	Average Setting	Acceptable Range	Function
Zero Yaw	0	-2 to 2	Indicates amount error in the internal yaw sensor while no yaw motion is present.
Message Frequency - GGA and VTG	10 Hz	10 Hz	Displays the frequency of GGA messages from the GPS receiver.
Message Frequency - ZDA	.3 Hz	.3 to 10 Hz	Displays the frequency of GGA messages from the GPS receiver.
HDOP	2.5	N/A	Indicates the quality of the GPS signal.

NODE

The SmarTrax CAN control node features several green light-emitting diodes (LEDs) which may be used to diagnose issues within the SmarTrax system.

NOTE: If the LEDs are not displayed as outlined in the figure below or are all on continuously, check the CAN connections and the control cable connections on the node. If the issue persists, contact your local Raven dealer for additional technical support.

FIGURE 1. SmarTrax CAN Control Node LEDs



ERROR MESSAGES

Message	Possible Cause	Corrective Action
Cal SPS	The SPS/WAS has been detected but not calibrated.	Calibrate the SPS/WAS.
GAIN DIFFERENTIAL HIGH	The Gain values are too far apart. NOTE: Continued system operation is possible, but system performance may be degraded.	<ul style="list-style-type: none"> • Verify that the SmarTrax hydraulic hose, fitting, and valve connections are secure and no leaks are present. • Verify that the machine's hydraulic hose, fitting, and valve connections are secure and no leaks are present.
Guide Com	Guidance points are no longer received by SmarTrax.	<p>Verify connections between SmarTrax and the field computer.</p> <p>Viper Pro Only - Verify that the "Send Guidance Message" option is on the Lightbar Setup screen.</p>
HDW FailH/HDW FailL	Improper valve voltage output from the node	<p>Check for a short in the valve harness</p> <p>Cycle power to the node to clear the failure.</p> <p>Replace the node.</p>
High HDOP	Insufficient GPS signal is being received.	Wait a few minutes to see if signal improves.
HYDRAULICS BACKWARDS	The hydraulic components are not hooked up properly.	Verify that the hydraulic components are installed correctly and hoses are connected properly.
	Feedback from the SPS/WAS or node is inconsistent.	Verify that the node and SPS/WAS connections are correct and connected securely.
Hyd Stuck or HYDRAULICS_STUCK	Insufficient or no wheel movement is detected by the field computer.	Check all valve hydraulic connections.
		Check all valve electrical connections.
		Check the SPS/WAS sensor and connections.
		Replace the node.
Low Stats	The GPS receiver is not receiving signal from enough satellites.	Wait a few minutes to see if more satellites are found.
No A-B Msg	The A-B line has not been set on the field computer.	Set the A-B line in the field computer.
	No communication from the field computer.	<p>Verify cabling is correct and secure.</p> <p>Ensure the "Send Guidance" message is selected.</p>
No Cal	SmarTrax has not been calibrated.	Calibrate the SmarTrax system using the calibration wizard.
No Diff	The GPS differential signal has not been found.	Wait a few minutes to see if the GPS differential signal is found.
		Check the receiver differential settings.
No GGA	No GGA messages are being received.	Check the receiver settings. The recommended setting is 10Hz.

Message	Possible Cause	Corrective Action
No GMS	SmarTrax has lost communication with the machine's steering system.	<ul style="list-style-type: none"> • Ensure the machine's roading switch is turned on. • Turn the steering wheel to restart the machine's steering system. • Verify that the field computer is set up to communicate with the SmarTrax system. • Ensure that the correct GPS source is selected in the field computer, if applicable.
No GPS	No GPS information is being received.	Verify the GPS receiver is properly installed and configured.
No HC Pwr	High current power is not being detected.	Check the high current cable connections. Check the fuse.
No VTG	No GGA messages are being received.	Check the receiver settings. The recommended setting is 10Hz.
Road Mode	The roading switch is in the off position.	Switch the roading switch to the on position.
Swath Jmp	The guidance points being sent from the field computer has jumped swaths, causing the system to disengage.	Verify the guidance line on the field computer is not switching between lines.
TC Error	3D terrain compensation has been disabled because a gyro has failed but SmarTrax may still be used.	The SmarTrax node must be repaired or replaced. Contact your local Raven dealer.
3D Cold	The system is significantly cooler than when terrain compensation was calibrated.	Recalibrate terrain compensation.
Too Fast	The vehicle speed is above 27 mph [45 km/h] and SmarTrax will be disengaged in five seconds.	Decrease the vehicle speed.
Too FAST	The vehicle speed is above 29 mph [45 km/h] or has been above 27 mph for more than 5 seconds and SmarTrax has been disengaged.	Decrease the vehicle speed and re-engage the SmarTrax system.
3D Hot	The system is significantly warmer than when terrain compensation was calibrated.	Recalibrate terrain compensation.
Too Slow	The vehicle speed is too slow and SmarTrax has been disengaged.	Increase the vehicle speed and re-engage the SmarTrax system.
VALID POINTS LOW	Not enough valid measurements are being received by the steering control device during calibration.	<ul style="list-style-type: none"> • Verify that the SmarTrax hydraulic hose, fitting, and valve connections are secure and no leaks are present. • Verify that harness cable connections are correct and securely installed. • Check the steering linkages to ensure they are connected securely and meet the machine manufacturer's factory specifications.



Message	Possible Cause	Corrective Action
Vlve Flt	Communication could not be established with the Steering Ready ISO valve.	Verify the proper software version is installed on the machine's ISO CANbus.
		Verify that the system is connected to a Raven-supported, ISO-compatible valve.
Wrong HDW	The software and hardware versions of the node are not compatible.	Update the node software to the proper version.
XDucer Er	A problem with the pressure transducer or cabling has been detected.	Verify the PSI values on the System Diagnostics screen.
		Verify pressure transducer connection and cabling.
		Replace the transducer(s).
Yaw Error	Yaw rate sensor values are out of range.	Replace the SmarTrax node.

SMARTRAX OPERATION

Problem	Possible Cause	Corrective Action
SmarTrax will not power up.	The power connections are loose or not properly connected.	Check the power connections to ensure they are secure and properly connected.
	The fuse is blown.	Replace the fuse.
	The battery connections are loose, corroded, or not properly connected.	Check the battery connections to ensure they are secure and properly connected.
	The machine does not have proper voltage to run the system.	Test for +12VDC using a voltmeter.
	The field computer or cabling is defective.	<ul style="list-style-type: none"> • Test the cable voltage from the field computer to the node. • Replace the field computer.

Problem	Possible Cause	Corrective Action
SmarTrax will not engage by pressing the foot/enable switch.	The node is not communicating properly.	Check the LEDs on the node to ensure proper communication.
	There is an error in the SmarTrax system.	Identify and correct system errors.
	The steer switch override is active.	Test the voltage (12V) and ground at the disengage switch and pressure transducers.
		Adjust the disengage settings and/or pressure switch knob. <ul style="list-style-type: none"> • Replace the pressure switch. • Replace the flow disengage switch. • Replace the transducer.
The foot/enable switch cable is not connected or is faulty.	Test the voltage (12V) and ground on the foot/enable switch cable connection, using a jumper wire to simulate foot/enable switch function.	
SmarTrax will not disengage when the steering wheel is turned.	The Disengage Setting is incorrect.	Adjust the Disengage Setting in the field computer.
	The knob on the pressure switch is turned in too far. (SmarTrax hydraulic valve part numbers 334-0003-056 through 334-0003-079 only)	Turn the knob on the pressure switch out.
	The pressure disengage switch has failed.	Replace the faulty pressure disengage switch.
SmarTrax will disengage only when the steering wheel is turned one way.	The flow disengage switch has failed on one side.	Replace the faulty flow disengage switch.
The wheels turn the wrong way when the steering wheel is turned.	The hydraulic hose connections are reversed.	Reverse the left and right steering hoses on the machine's steering orbital.
Valve makes noise in stand-by mode.	The pressure relief adjustment on the SmarTrax valve is set incorrectly.	Adjust the relief valve on the SmarTrax valve until the noise stops.
Valve makes noise all of the time.	The load sense orifice in the valve is plugged.	Inspect the load sense orifice for blockage.
	The incorrect SmarTrax valve is installed.	Install the SmarTrax hydraulic valve recommended for the machine being used.

Problem	Possible Cause	Corrective Action
Cannot manually steer left or right from the System Diagnostics screen.	Hydraulic connections are plugged or not properly connected.	Check the hose connections.
	No high current power	<ul style="list-style-type: none"> • Check the node status lights for high current (HC) power. • Check the power/ground fuses and connections.
	Cable is improperly or not connected.	Check the solenoids on the SmarTrax valve for proper connection and voltage.
	There is a short or break in the cable.	Inspect the cable for shorts or breaks.
	The PWM Max settings are incorrect.	Verify PWM Max settings are set correctly in the field computer.
	Flow control valve is closed. (SmarTrax hydraulic valve part numbers 334-0003-056 through 334-0003-079 only)	Verify FC adjustment is turned all the way out. Typically eight or nine threads are visible beyond the jam nuts.
System manually steers the wrong way from the System Diagnostics screen.	The left and right proportional solenoid connections are reversed.	Verify all solenoid connections are connected to the correct coils. Reverse if necessary.
	The left and right hydraulic connections to the SmarTrax valve are reversed.	Verify all hydraulic connections are connected to the correct ports. Reverse if necessary, if applicable.
The steering wheel turns by itself when the power is on and SmarTrax is not engaged.	There is an internal leak in the machine's steering orbital.	Check for and fix leaks in the steering orbital.
	A SmarTrax valve cartridge is leaking.	<ul style="list-style-type: none"> • Swap the left and right proportional cartridge (if applicable). • Replace the SmarTrax valve.
	The machine may have a reactive steering unit.	<ul style="list-style-type: none"> • Verify the steering unit type functions properly. • Verify the blocking valve is installed correctly.
	There is a failure in the dual counter-check valve (if applicable to the SmarTrax kit installed).	Replace the dual counter-balance valve or dual check valve.
SmarTrax will not find the guidance line.	SmarTrax is not engaged.	Engage the SmarTrax system.
	The GPS signal is hindered by the GL1DE speed filter.	Disable the GL1DE speed filter. (Phoenix 300 receivers only)
	The LA Aggressiveness setting is too low.	Increase the LA Aggressiveness setting.
	The OL Sensitivity setting is too low.	Increase the OL Sensitivity setting in increments of 1, allowing at least 40 seconds between adjustments.

Problem	Possible Cause	Corrective Action
Wheels are jittery while on-line.	The OL Sensitivity setting is too high.	Decrease the OL Sensitivity setting in increments of 1, allowing at least 40 seconds between adjustments.
	PWM Min values are too high.	Lower PWM Min values until the front wheels steer very slowly manually and with minimum buttons.
System slowly oscillates while on-line.	The OL Sensitivity setting is too low.	Increase the OL Sensitivity setting in increments of 1, allowing at least 40 seconds between adjustments.
	PWM Min values are too high.	Lower PWM Min values until the front wheels steer very slowly manually and with minimum buttons.
Machine consistently drives to the left or right of the guidance line.	The yaw or SPS/WAS sensor is out of calibration.	<ul style="list-style-type: none"> Recalibrate the yaw sensor to zero while the machine is stationary. Reset the SPS/WAS center calibration.
	The left or right PWM Min value is too high.	Lower the appropriate PWM Min value until the front wheels steer very slowly manually and with minimum buttons.
	The LA Aggressiveness setting is too low.	Increase the LA Aggressiveness setting.
	The OL Sensitivity setting is too low.	Increase the OL Sensitivity setting.
Machine consistently skips or overlaps in the field.	Antenna is position entered in the field computer does not correlate with the position on the roof.	Physically re-measure the antenna height and offset. Adjust the values in the field computer.
The system disengages when the auxiliary hydraulic functions (including boom and pump functions, raising and lowering an implement) are operated.	The knob on the pressure release switch is turned out too far.	Turn the knob on the pressure switch in, if applicable.
	The Disengage setting is too low.	Increase the Disengage setting.
Wheels do not turn fast enough in LA mode.	The LA Aggressiveness setting is too low.	Increase the LA Aggressiveness setting.
Steering wheel is difficult to turn when attempting to disengage SmarTrax.	The pressure switch knob or disengage setting is set incorrectly.	Turn the knob out on the pressure switch and/or decrease the disengage setting.
Steering wheel is difficult to turn when attempting to turn the vehicle while SmarTrax is not engaged.	Load sense hose connections are installed incorrectly.	Verify the load sense hoses are installed correctly on the SmarTrax valve.

Problem	Possible Cause	Corrective Action
The hydraulic disengage switch or transducer is not detected during calibration.	The priority valve in the open center valve is stuck.	<ul style="list-style-type: none"> • Replace the cartridge. • Replace the open center valve.
	Cable connection(s) to the disengage switch is improperly connected or loose.	Verify disengage switch connections are correct and secure.
	The cable connection to the transducer is improperly connected or loose.	Verify the connection to the transducer is correct and secure.

The diagrams contained in this chapter may be helpful when installing or troubleshooting the SmarTrax system. Some of the diagrams may show optional features or components not required for SmarTrax operation and may not necessarily apply to the SmarTrax system installed on the machine.

NOTE: Contact your local Raven dealer for ordering information on any optional features or components.

Additional system diagrams are available on the Raven Industries web site:

<http://www.ravenhelp.com>

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RAVEN

Limited Warranty

What Does this Warranty Cover?

This warranty covers all defects in workmanship or materials in your Raven Applied Technology Division product under normal use, maintenance, and service when used for intended purpose.

How Long is the Coverage Period?

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

How Can I Get Service?

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

What Will Raven Industries Do?

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

What is not Covered by this Warranty?

Raven Industries will not assume any expense or liability for repairs made outside our facilities without written consent. Raven Industries is not responsible for damage to any associated equipment or products and will not be liable for loss of profit, labor, or other damages. The obligation of this warranty is in lieu of all other warranties, expressed or implied, and no person or organization is authorized to assume any liability for Raven Industries.

Damages caused by normal wear and tear, misuse, abuse, neglect, accident, or improper installation and maintenance are not covered by this warranty.



Extended Warranty

What Does this Warranty Cover?

This warranty covers all defects in workmanship or materials in your Raven Applied Technology Division product under normal use, maintenance, and service when used for intended purpose.

Do I Need to Register My Product to Qualify for the Extended Warranty?

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

Where Can I Register My Product for the Extended Warranty?

To register, go online to www.ravenhelp.com and select Product Registration.

How Long is the Extended Warranty Coverage Period?

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

How Can I Get Service?

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

What Will Raven Industries Do?

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

What is Not Covered by the Extended Warranty?

Raven Industries will not assume any expense or liability for repairs made outside our facilities without written consent. Raven Industries is not responsible for damage to any associated equipment or products and will not be liable for loss of profit, labor, or other damages. Cables, hoses, software enhancements, and remanufactured items are not covered by this Extended Warranty. The obligation of this warranty is in lieu of all other warranties, expressed or implied, and no person or organization is authorized to assume any liability for Raven Industries.

Damages caused by normal wear and tear, misuse, abuse, neglect, accident, or improper installation and maintenance are not covered by this warranty.