

SmarTrax™ & QuickTrax™
Operation Manual

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CHAPTER

1

INTRODUCTION

SmarTrax & QuickTrax Systems

Congratulations on your purchase of the Raven SmarTrax or QuickTrax system! This system is designed to provide cutting-edge, hands-free steering of your machine via GPS coordinates. This manual can be used for both the SmarTrax and QuickTrax systems.

The steering system consists of these major components:

- SmarTrax Controller
- Raven Lightbar and/or Envizio and DGPS Receiver
- Hydraulic Steering Kit or QuickTrax MDU (mechanical drive unit)
- GPS Enhancer (only if using a SmarTraxDM system)



How the Systems Work

In the SmarTrax system, the lightbar and receiver provide the navigational data that determines the location of the machine in the field. The system calculates where the equipment should be located by referring to the swath path set by the operator and the actual location of the equipment as reported by the DGPS receiver. The SmarTrax controller processes this information and, if the machine is off the intended swath line, tells the hydraulic steering unit which direction to turn the wheels in order to correct the machine to the intended swath line. The QuickTrax system works the same way, with the exception of the hydraulic steering unit. In the QuickTrax system, the MDU (mechanical drive unit) turns the steering wheel to correct the machine to the intended swath line. The mode will appear in the upper right corner of the home screen. Two of the modes (Line Acquire and On-line) can be configured to achieve the best steering for your machine.

Notes:

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2

COMPONENTS

Controller

Whether you have purchased the SmarTrax or QuickTrax system, you will have the same controller, as shown below.

SmarTrax Controller

**Controller Modes**

The SmarTrax controller has three possible modes that it can be in:

Modes	Description
Off	No steering
LNA	Line Acquire
ONL	On-line

The mode will appear in the upper right corner of the home screen. Two of the modes (Line Acquire and On-line) can be configured to achieve the best steering for your machine.

Lightbar

You can use a wide variety of lightbars and monitors with the SmarTrax system, including:

- RGL500 or RGL600
- RGL500-T or RGL 600-T
- Cruizer
- Envizio Plus/Pro
- Viper Pro

When the SmarTrax system is engaged, the middle GPS warning light on each side of the lightbar is illuminated. If using the Envizio, the outside red light will illuminate on each side. If Viper is used, the steering wheel icon will turn green when the SmarTrax is engaged. If the steering wheel of the vehicle is turned, or the foot switch is pressed, SmarTrax steering disengages and the lights on the lightbar are no longer illuminated.

If the vehicle is moving too fast (between 27.0 and 28.9 mph), the lightbar sends a warning to the driver by activating the scrolling lights on both sides of the lightbar. You have 5 seconds to reduce the speed to below 27.0 mph or the SmarTrax steering will disengage. If the speed reaches 29 mph, the SmarTrax system will disengage and all lights will flash until the steering wheel is turned. If the vehicle goes below 1 mph, the scrolling lights will occur. When 0.9 mph is detected, all lights will flash and the steering wheel must be turned to disengage the system.

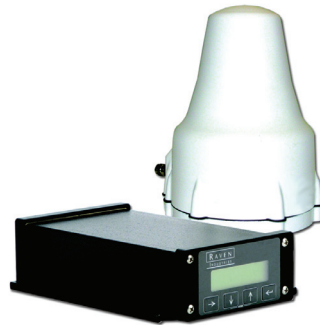
Receiver

Phoenix 200, RPR 210/310 and RPR 110/115

These receivers will work well with the SmarTrax and QuickTrax systems for sub-meter pass-to-pass accuracy.

Phoenix 300

The Phoenix 300 receiver is designed to function seamlessly with the SmarTrax system and other components. The Phoenix 300 receives all necessary GPS information for pinpointing machine coordinates and is capable of receiving the following differential source signals: WAAS, CDGPS, OmniSTAR VBS, OmniSTAR XP, and OmniSTAR HP. In order to support decimetric performance, the Phoenix 300 must be using OmniSTAR HP as the differential correction mode. A subscription for the signal may be purchased from OmniSTAR.



Other Receivers

Any DGPS receiver that outputs NMEA messages, GGA and VTG at a minimum of 5 Hz will work with the SmarTrax and QuickTrax systems.



Note: Using 5 Hz receivers will limit speeds to 10 mph.

Steering Kit

See the Hydraulic Steering Kit Manual for complete information and instructions.

QuickTrax MDU

See the QuickTrax Installation Manual for complete installation instructions for the QuickTrax MDU.



Enhancer

The GPS Enhancer is the component that allows the SmarTrax system to accurately hold the line in decimetric mode by removing variations due to antenna movement from the GPS data stream. By removing antenna motion, overall system accuracy is greatly improved. GPS course and position messages from the receiver are automatically compensated for machine movement, resulting in improved overall system performance.

The GPSE (GPS Enhancer) corrects GGA and VTG messages that are affected by machine movement and GPS errors. The GPSE has an 'Auto-baud' feature allowing it to lock on to any baud rate coming in. The output will be set the same as the input.



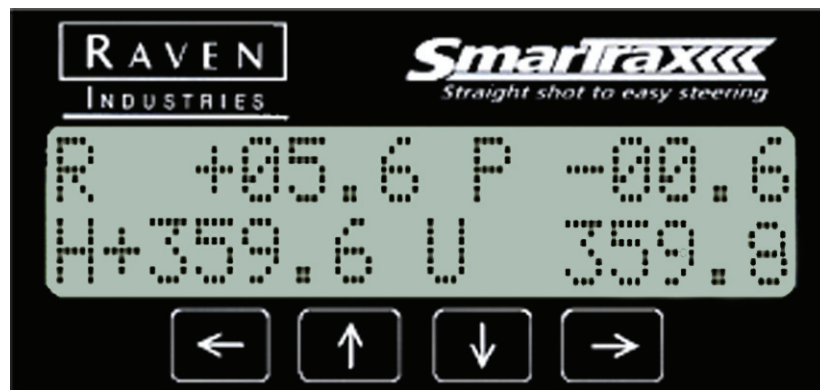
Mounting the Enhancer

Because the enhancer is correcting the GPS for roll, it is very important that the enhancer be mounted level to the machine. It should be mounted solidly in the cab, with the cables pointed toward the back of the machine.



Important: The enhancer contains motion-sensitive components. Avoid placing the unit anywhere it may be struck, such as near pedals or under components that move during normal tractor operation.

1. Drive the machine onto the most level surface possible.
2. Mark the front and rear, as well as the center line of the machine, either on the ground or with other visual marks.
3. On the SmarTrax controller, go to the GPS Enhancer Configuration screen, and then arrow down to the 'Roll' screen.



Note: Roll is displayed as 'R' in the upper left-hand corner of the home screen.

4. The current roll will display and update every second. This could be a positive or negative number, with positive being to the right and negative being to the left. Record a few of these numbers and calculate the average. Be sure to write this number down, as you will need it for later use.
5. Turn the machine 180 degrees and line it up on the front, rear, and center line marks.
6. The current roll will display and update again every second. Record a few of these numbers and calculate the average. If the enhancer is perfectly level, the value will be the same in both directions, with one of the numbers being negative, so that the sum of the numbers equals zero.

Example:

$$\begin{array}{r} 2.16 \text{ degrees North} \\ + -2.16 \text{ degrees South} \\ \hline 0 \end{array}$$

If the two values are not the same for both directions (with the exception of the negative sign), you will need to physically adjust the mounting of the enhancer. This can be done by adding a washer or washers to the nut and bolt on one side. To calculate to what degree you need to shift your mounting, take the first number minus the second number, then divide by two. See the examples below:

Example 1: 4.23 degrees North
 + -2.60 degrees South
 1.63 degrees / 2 = **.82 degrees**

Action: Tilt the enhancer .82 degrees to the left.

Example 2: -5.50 degrees East
 + -1.40 degrees West
 -6.9degrees / 2 = **-3.45 degrees**

Action: Tilt the enhancer 3.45 degrees to the right.

Example 3: -3.00 degrees East
 + -2.00 degrees West
 -5.00 degrees / 2 = **-2.5 degrees**

Action: Tilt the enhancer .5 degrees to the right.



Note:

- If the difference of the two numbers is less than .5 degrees, no action is needed.
- A negative number means the roll is to the left.

TM-1 Tilt Sensor

1. Tilt sensor must be mounted flat on the floor.
2. Arrow must point forward.
3. Antenna height must be entered from vehicle setup menu.
4. Calibrate TM-1 Sensor to level ground by zeroing sensor under TM-1 Tilt Sensor Menu.
5. Different tilt speeds may be used to provide better performance.



Notes:

CHAPTER

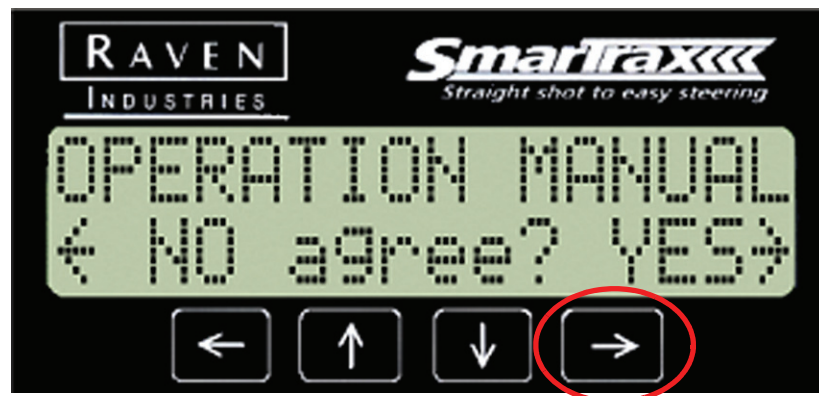
3

SETTING UP AND STARTING THE SMARTRAX & QUICKTRAX SYSTEMS

Initial Start-up

Upon initial start-up of the SmarTrax controller, you will be prompted to complete the initial calibration procedure. Once completed, the initial calibration will not have to be done again and SmarTrax or QuickTrax will be ready for use when the system is powered up. The initial calibration follows:

1. Upon initial start-up, the SmarTrax controller will prompt you to answer 'Yes' or 'No' to having read and understand the Operation Manual. Answer either 'Yes' or 'No.' To continue with start-up, you must answer 'Yes' by pressing the Right arrow button.



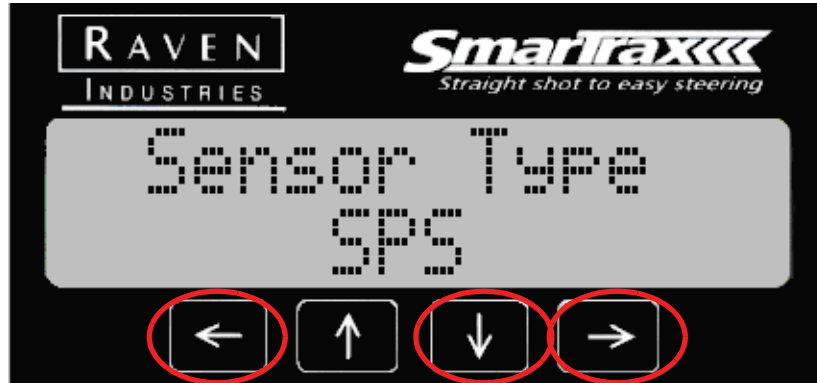
Sensor Type

SmarTrax has the capability to use either a Steering Position Sensor (SPS) or a Yaw Sensor to control steering of your vehicle. SmarTrax must be configured for the Sensor Type that will be used with your SmarTrax system. SmarTrax will not function if the wrong sensor type is selected and properly configured. Follow the appropriate instructions to configure your SmarTrax system.

SPS Sensor Setup

The following instructions will help you setup your SmarTrax system for use with a Linear or Rotary Steering Position Sensor.

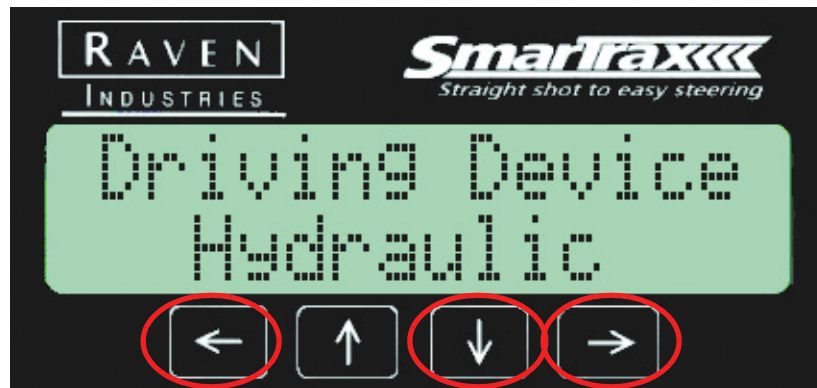
1. On the Sensor Type screen, press the Left or Right arrow to display SPS as the sensor type. Press the Down arrow to make your selection.



2. Next, select the machine type. Use the Left or Right arrows to view the available options. If a pre-programmed tune set is available for your specific machine, you may select your vehicle tune set. If no tune set exists for your vehicle, select one of the generic machine type (Articulated, Front Steered or Track). Press the Down arrow to select the displayed option and continue to the next screen.



3. Select the Driving Device (Hydraulic or QuickTrax) by pressing the Left or Right arrow. When finished, press the Down arrow.



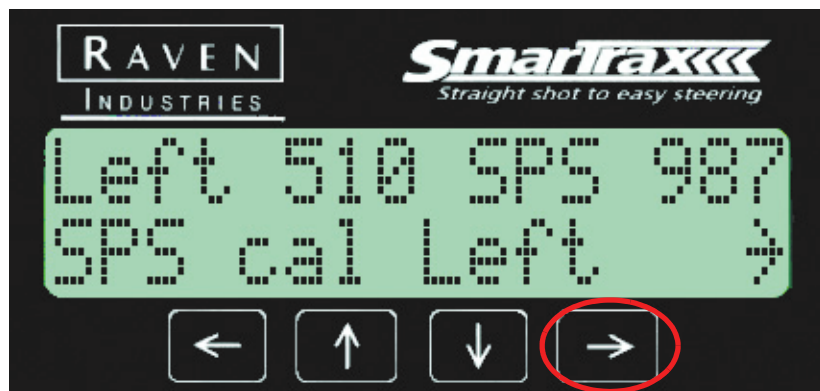
- Turn the steering wheel. The controller will need to detect a change in the pressure switch to continue start-up.



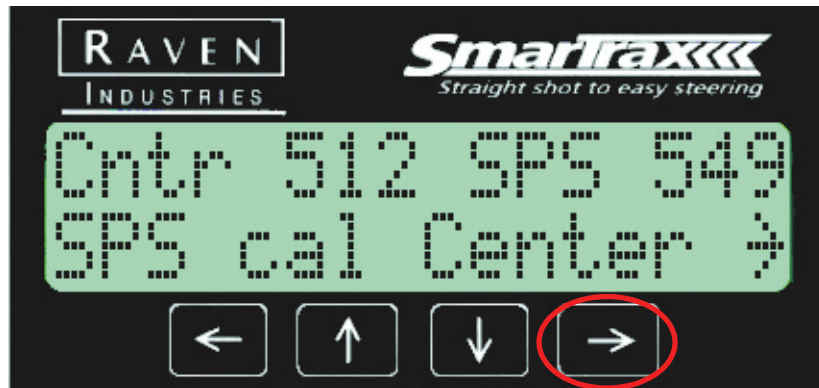
- Press the foot switch. The controller will need to detect a change in the foot switch position to continue with start-up.



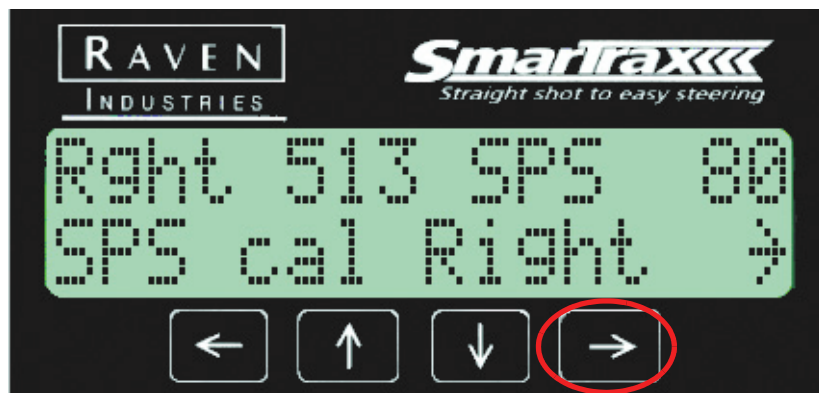
- The Left SPS Cal screen displays. To set the Left SPS value, turn the machine wheels to full left and hold the position. Press the Right arrow key to set the value.



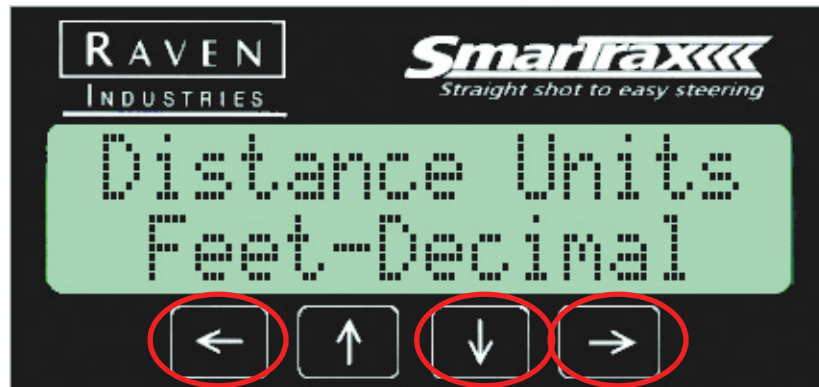
7. The Center SPS Cal screen displays. To set the Center SPS value, turn the machine wheels to the center and hold the position. You may need to drive the machine forward to verify that the wheels are centered. Press the Right arrow key to set the value.



8. The Right SPS Cal screen displays. To set the Right SPS value, turn the machine wheels to full right and hold the position. Press the Right arrow key to set the value.



9. Next, select the preferred units of measurement for your SmarTrax controller. Press the Left or Right arrow to select either Feet-Decimal, Feet-Inches, or Metric. Press the Down arrow to set the value



Important: The following measurements are critical for proper and accurate operation of your SmarTrax or QuickTrax system. Measure carefully.



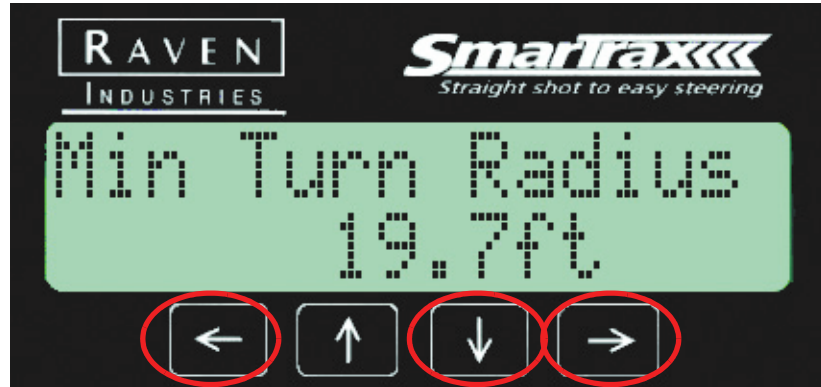
Note: If a generic machine type was selected in Step 3, proceed with the following instructions to program the Wheel Base and Minimum Turning Radius for your vehicle.

If a tune set was available for your specific machine and selected in Step 3, proceed to Step 12.

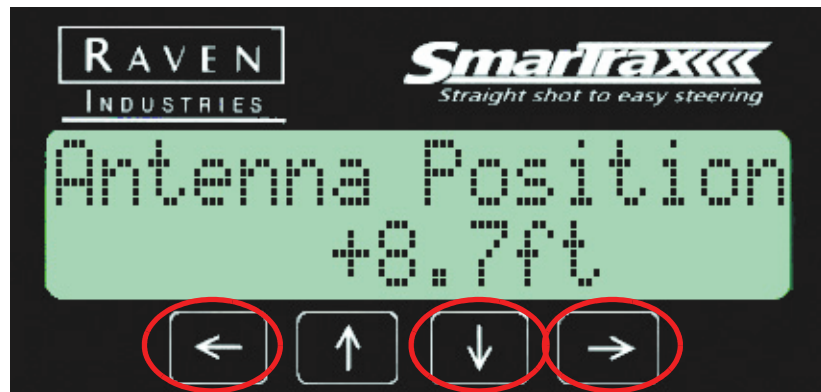
10. Press the Left or Right arrows to set the Wheel Base of your machine (Refer to Chapter 5 for measurement instructions). When you are finished, press the Down arrow to save the displayed setting.



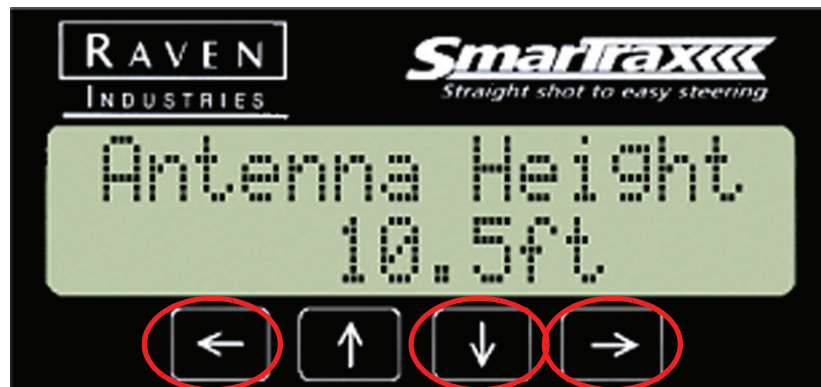
11. Press the Left or Right arrows to set the Minimum Turn Radius for your machine (Refer to Chapter 5 for measurement instructions). When you are finished setting the value, press the Down arrow.



12. Use the Left or Right arrows to program the fore or aft position of the GPS antenna with respect to the rear axle. If the GPS antenna is in front of the rear axle, enter a positive value for this setting. When you are finished, press the Down arrow to save the displayed setting.



13. Use the Left or Right arrows to program the height of the GPS antenna above ground. When you are finished, press the Down arrow to save the displayed setting.



A hydraulic calibration will now be required, turn to page 19 for details on the calibration procedure.

Yaw Sensor Set up

The following instructions will help you setup your SmarTrax system for use with the Raven Yaw Sensor.

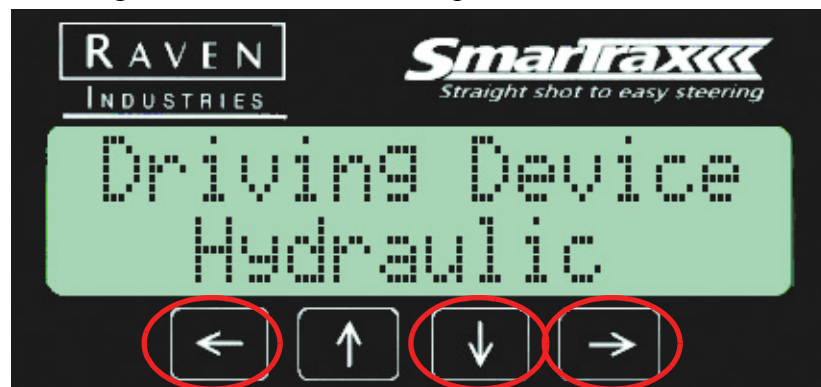
1. On the Sensor Type screen, press the Left or Right arrow to display Yaw as the sensor type. Press the Down arrow to make your selection.



2. Next, select the machine type for your machine. Use the Left or Right arrows to view the available options. Press the Down arrow to select the displayed option and continue to the next screen.



3. Select the Driving Device (Hydraulic or QuickTrax) by pressing the Left or Right arrow. When finished, press the Down arrow.



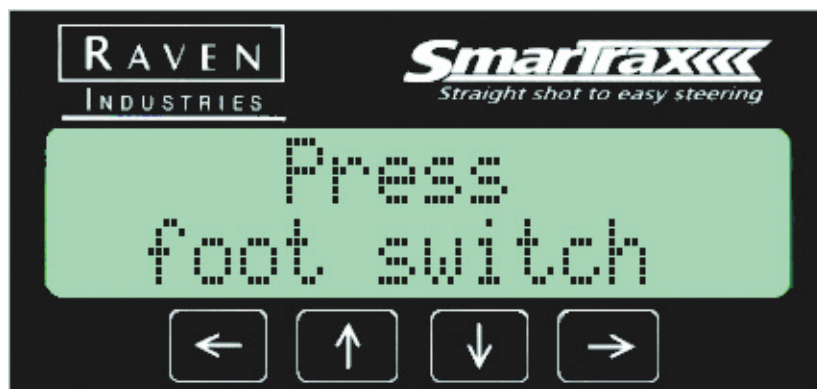
- If no tune set was selected, the wheelbase will have to be entered.



- Turn the steering wheel. The controller will need to detect a change in the pressure switch to continue start-up.



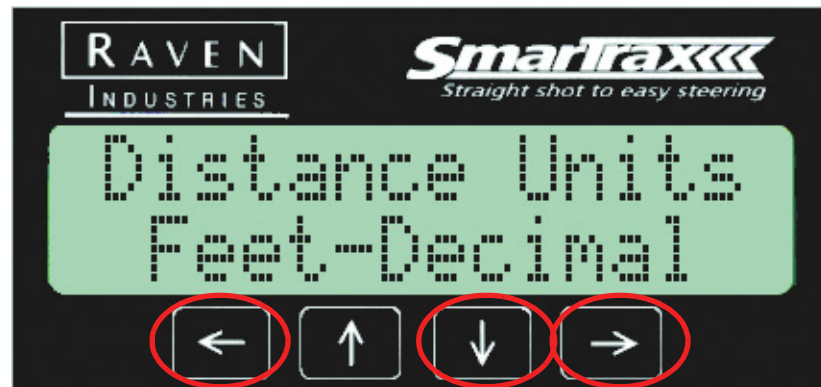
- Press the foot switch. The controller will need to detect a change in the foot switch position to continue with start-up.



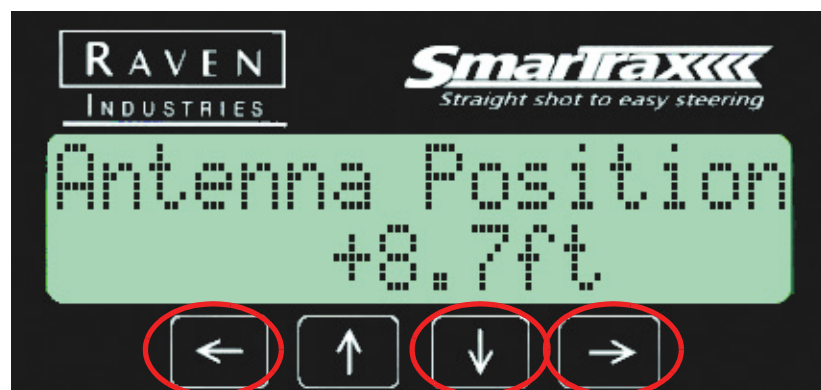
7. The Zero Yaw Rate screen displays. Make sure that the vehicle is at a complete stop before pressing the Right arrow key to zero the Yaw Sensor.



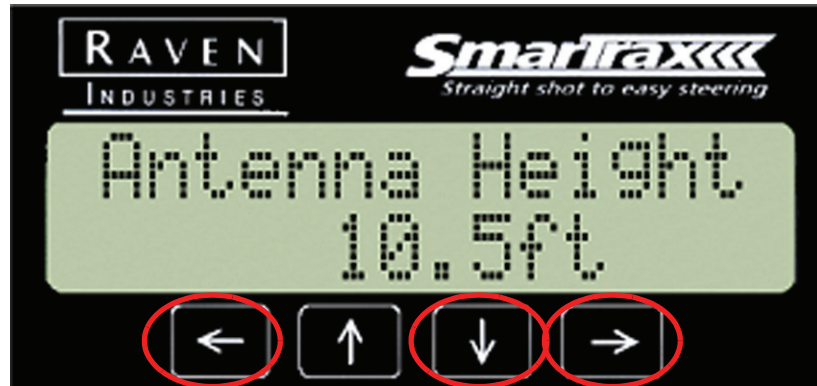
8. Next, select the preferred units of measurement for your SmartTrax controller. Press the Left or Right arrow to select either Feet-Decimal, Feet-Inches, or Metric. Press the Down arrow to set the value



9. Use the Left or Right arrows to program the fore or aft position of the GPS antenna with respect to the rear axle. If the GPS antenna is in front of the rear axle, enter a positive value for this setting. When you are finished, press the Down arrow to save the displayed setting.



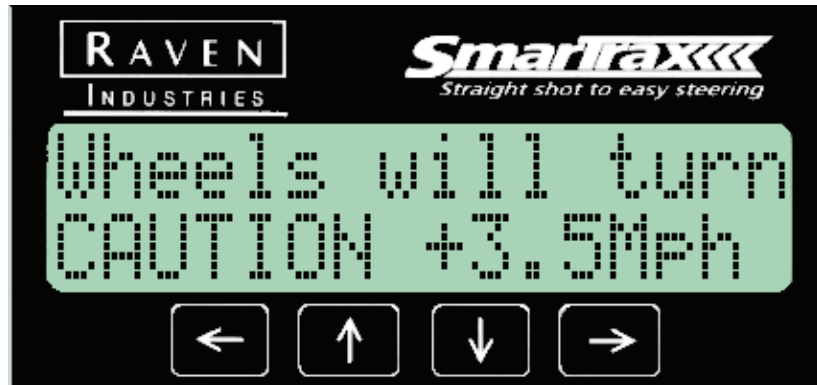
10. Use the Left or Right arrows to program the height of the GPS antenna above ground. When you are finished, press the Down arrow to save the displayed setting.



11. A hydraulic calibration will now be required. See the next section for details on the calibration procedure.

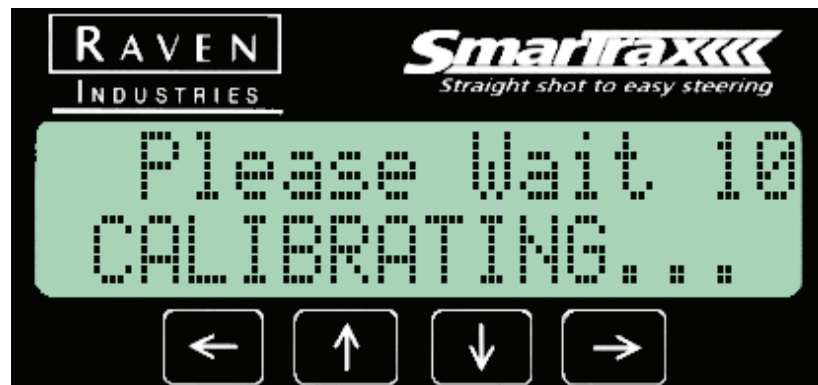
Hydraulic Calibration

Move the machine to an open area. Be sure the machine is running at working RPM. Drive ahead from 3-6 mph [5-9 km/h] and press the foot switch. The wheels will turn as the hydraulics automatically calibrate.

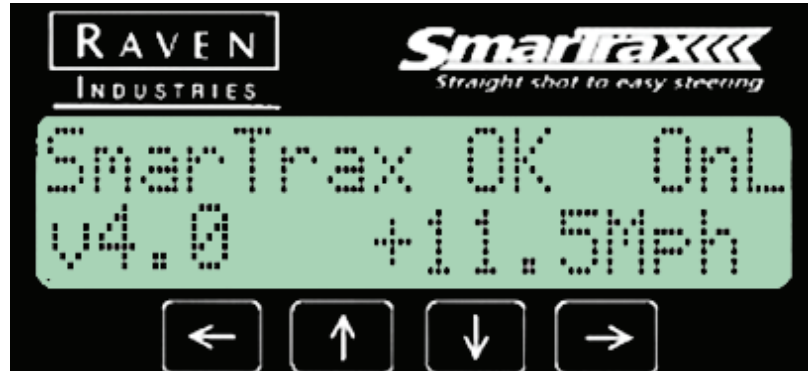


To stop calibration turn the steering wheel to activate the steer switch. To continue calibration, press the right arrow to bring up the caution screen and then press the foot switch again.

When the hydraulics calibrate, the wheels will turn to the left and then back to the right several times. A countdown from 10 to 2 will indicate the progress of the calibration. The first countdown shows the calibration of the right hydraulics and the second countdown shows the calibration of the left hydraulics. If the calibration is successful the SmartTrax will return to the home screen. If it was not successful, some settings may need to be changed and another calibration will need to be performed. Refer to the next section for troubleshooting.



When Calibration is complete, the console will beep and the home screen will display. SmarTrax is now ready to operate.



Troubleshooting

If there is a problem calibrating the hydraulics, review the following errors and conditions and make the appropriate changes to allow it to calibrate.

- **Gain Difference High-** This error occurs if the calibration values for the left and right hydraulics differ by too much. Try to operate the system if the performance is unsatisfactory then recalibrate. If this error continually occurs, there is likely a problem with the hydraulic system.
- **Hydraulics backwards-** This error will occur if the machine turns in the opposite direction of what the SmarTrax expects. To fix this, reverse the connectors on the solenoids and then recalibrate.
- **Hydraulic Error-** This error will occur if the hydraulics are connected improperly or if one or both of the solenoids are disconnected.
- **SPS Backwards-** The SPS was calibrated backwards (i.e. left is right, right is left). If this occurs, the SmarTrax will prompt you to reset the SPS left center and right values and then a new calibration will be necessary.
- **Steer Switch Activated-** If the steer switch is continually being engaged, the steer pulse time can be altered. To do this, press down from the steer switch screen. Then press the right arrow to increase the time. Press down again to return to the calibration screen and then press the foot switch. Also, to ignore any steer switch signals, the left arrow can be held during calibration. If the pulse time is changed, it will be reset to the default value of 150 ms after calibration is complete.
- **Too Slow-** This error appears when the speed drops below 3 mph or when the SmarTrax loses DGPS. To continue calibration, confirm a valid GPS signal, drive the machine above 3 mph and then press the foot switch.
- **Too Fast-** This error appears when the speed rises above 6 mph. To continue, drive between 3 and 6 mph and press the foot switch.
- **Valid Points Low-** If the SmarTrax does not receive enough valid data from the calibration a new calibration will be needed.
- **Yaw Backwards-** If the yaw sensor is mounted improperly this error will occur. Be sure that the yaw is connected properly and is mounted with the flat surface parallel to the ground with the Raven logo facing up.

Notes:

CONFIGURING SYSTEM COMPONENTS

Lightbar Configuration

The lightbar or Envizio will automatically be configured when connected to a SmarTrax controller.

Receiver Setup and Configuration

RPR 110/115/ Phoenix 200

The RPR 110/115 does not have a front panel that can be used to configure the receiver. To verify proper setup, view the 'Delta Time' under the Status Menu. The 'Delta Time' and 'Actual' should be the same.

RPR 210/310

The RPR 210/310 can be checked in the same way as the RPR 110/115, or by entering the 'output config' menu. Check the baud rate and that the GGA and VTG messages are turned on at .1 seconds (10 Hz). Refer to the RPR 210/310 manual for more information.

Phoenix 300

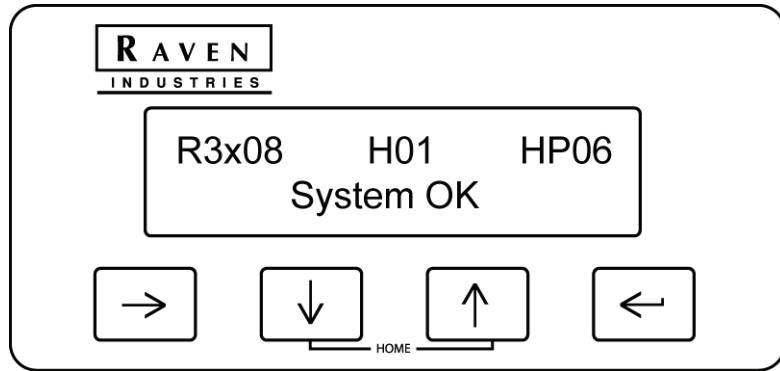
Starting the Receiver

After start-up of the Phoenix 300, an 'R' must be present in the upper left hand corner of the receiver screen before Decimeter swathing. On initial start-up, it may take up to 45 minutes for the receiver to 'lock' onto the GPS signal. When a signal is found and locked in, the 'R' will be present.



Note:

- Swathing may begin with a 'D' or 'C', showing instead of an 'R', but pass-to-pass accuracy will be reduced.
- By connecting the Phoenix 300 directly to a battery with it's own switch and fuse, you can avoid shutting off the receiver when you power off the machine. This will eliminate searching for GPS and locking onto a signal each time you cycle the power of the machine.



Receiver Output

The output for the Phoenix 300 Receiver should be set at:

- Baud Rate @ 19200
- GGA @ 10 Hz (.1 seconds)
- VTG @ 10 Hz (.1 seconds)
- ZDA @.2 Hz (5 seconds)

Enhancer Configuration

Enhancer configuration can be done by accessing the 'GPS Enhancer Configuration' menu screen on the SmarTrax controller. You can only access this menu if the SmarTrax controller detects the GPS Enhancer upon initial startup. See Chapter 5 to change the settings for the 'GPS Enhancer Configuration' screen.

CHAPTER

5

SYSTEM SCREENS

Main Screens

Once you have completed the initial start-up calibration and configured the necessary components, you are now ready to engage the SmarTrax system. On the SmarTrax controller, the Home screen will display the current controller status.

**Screen Sections**

The Home screen is split up into four sections as shown above: the upper left section (“SmarTrax OK”), the upper right section (“OnL”), the lower left section (“v4.0”), and the lower right section (“+11.5Mph”).

Upper Left Section

The upper left section of the screen displays the word ‘SmarTrax OK’ if the controller unit is working properly. If the controller is not working properly, it will display a brief error message about the problem.



Note: Refer to the Troubleshooting chapter for more information about error messages.

Upper Right Section

The upper right section of the screen displays information that indicates if the steering system is either On or Off. The following modes are available:

Modes	Definition
Off	The steering control is not enabled.
LNA	The steering control is on and is in the Line Acquisition mode to make turns onto the line.
OnL	The steering control is on and is in the Online mode.

Lower Left Section

The lower left section of the screen displays the SmarTrax software version number currently running on the controller.

Lower Right Section

The lower right section of the screen displays actual GPS ground speed of the vehicle as determined by the DGPS. This speed is displayed in either MPH or Km/H.

Home Screen

From the Home screen, navigate to the following screens by pressing the Down arrow:

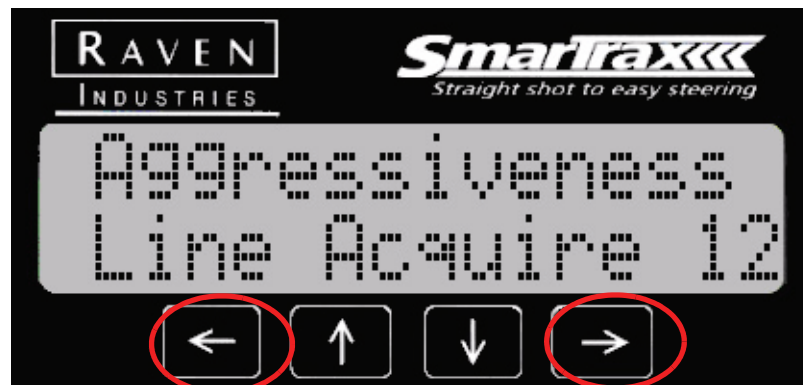
- Aggressiveness Line Acquire
- Sensitivity OnLine



Note: You can always get back to the Home screen from any screen within the controller system by pressing the Up and Down buttons at the same time.

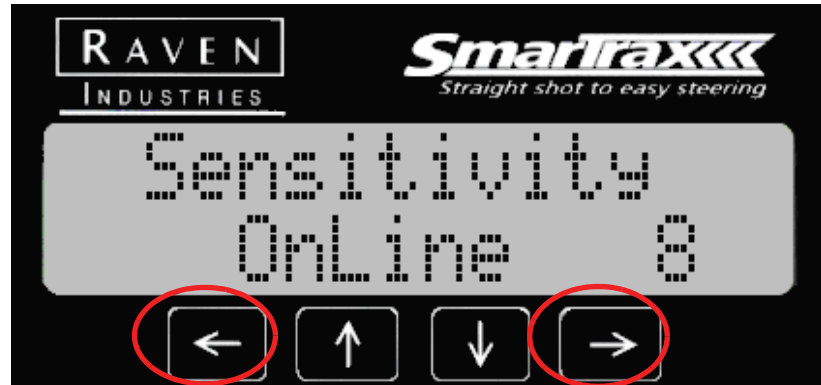
Aggressiveness Line Acquire

This screen adjusts the performance when acquiring the line. This value can be adjusted between 1 and 20. The higher the value, the more aggressive the machine is when acquiring the line. Use the Left and Right arrows to adjust the value.



Sensitivity OnLine

This screen adjusts the sensitivity of the on-line performance. This value can be adjusted between 1 and 20. The higher the value, the more aggressive the machine is on-line. Use the Left and Right arrows to adjust the value.

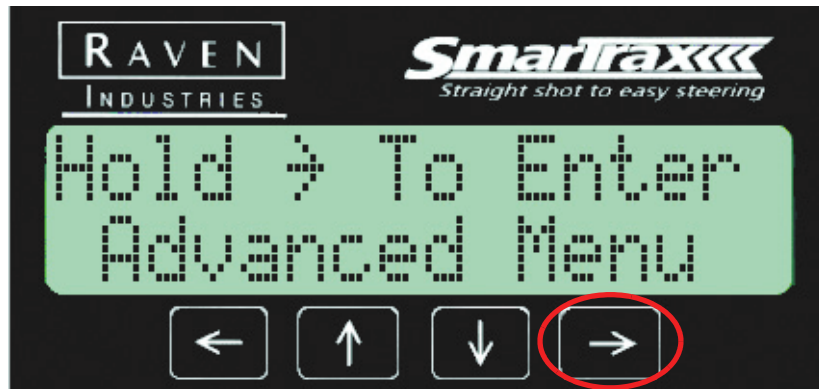


Entering the Advanced Menu

There are five sub-menus for the SmarTrax controller:

- Vehicle Setup
- GPS Enhancer Configuration (only accessible if the GPS Enhancer is detected)
- Tilt Sensor Configuration (only accessible if the tilt sensor is detected)
- Console Configuration
- Status Menu

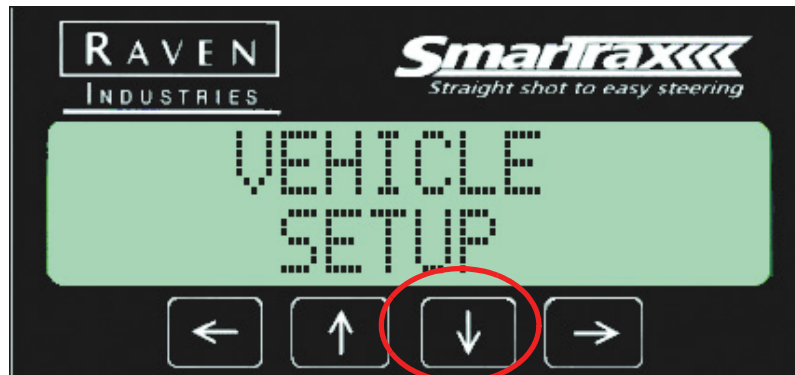
From the Home screen, press the Up arrow once to get the Enter Advanced Menu screen. Press and hold the Right arrow to enter the Advanced Menu.



Vehicle Setup

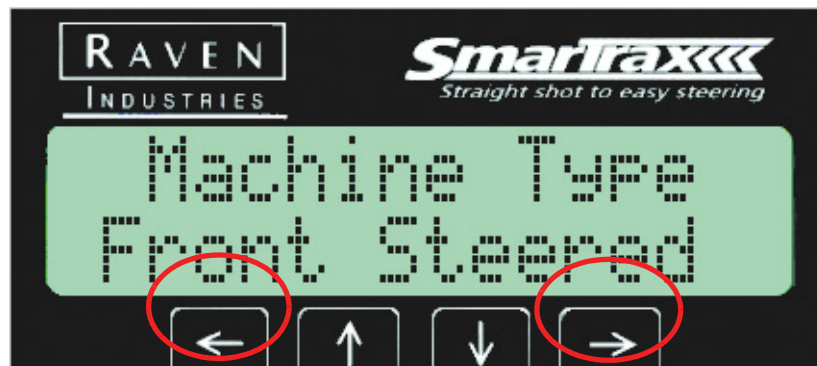
The Vehicle Setup screen allows you to view or set the following vehicle configurations by pressing the Down arrow:

- Machine Type
- Driving Device (This option cannot be changed)
- View Sensor Type
- Left, Center, and Right SPS or Yaw Calibration
- Zero Yaw Rate (if Yaw Sensor is installed)
- Wheel Base
- Minimum Turning Radius (if SPS is selected)
- Antenna Position
- Antenna Height
- Steer Pulse Time



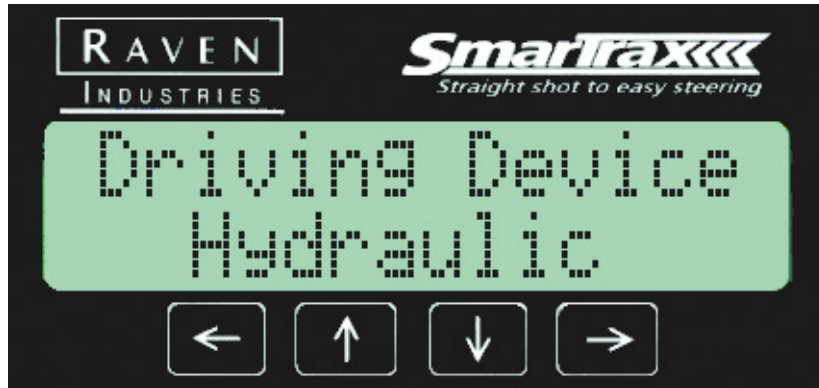
Machine Type

The Machine Type screen displays the type of machine you are using (Specific Vehicle Tune Set, Front steered, Articulated, or Track). This is a display only.



Driving Device

The Driving Device screen displays the driving device of the machine you are using (Hydraulic or QuickTrax). This is a display only.



Sensor Type

The Sensor Type screen displays the type of sensor for which SmarTrax is currently calibrated. This is a display only.

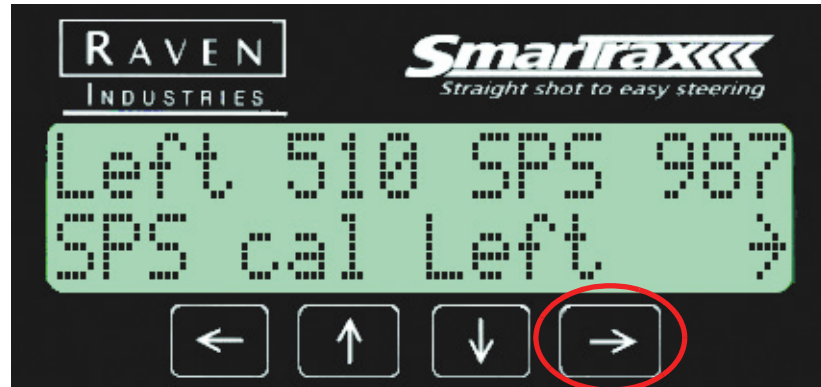


Note: If 'Yaw' is selected on this screen, the Left, Center, and Right SPS Calibration screens will not appear in the Advanced Menu as these screens are not used for Yaw Sensor operation.

Left SPS Calibration

The Left SPS Calibration screen displays the calibrated full left wheel position as well as the current SPS count.

To set the Left SPS Calibration, turn the wheels to the full left position. Once you have reached the full-left position, press and hold the Right arrow to program the value into the controller.



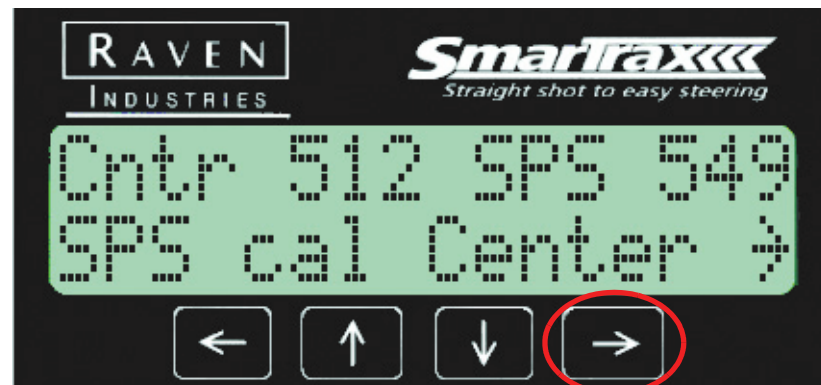
Note:

- The Left SPS value should be between 10 and 1000. If the value displayed on the screen is above or below these values, re-position the steering position sensor until an acceptable value displays.
- The counts between left to center and center to right must be greater than 100.

Center SPS Calibration

The Center SPS Calibration screen displays the calibrated center wheel position of the vehicle as well as the current SPS count.

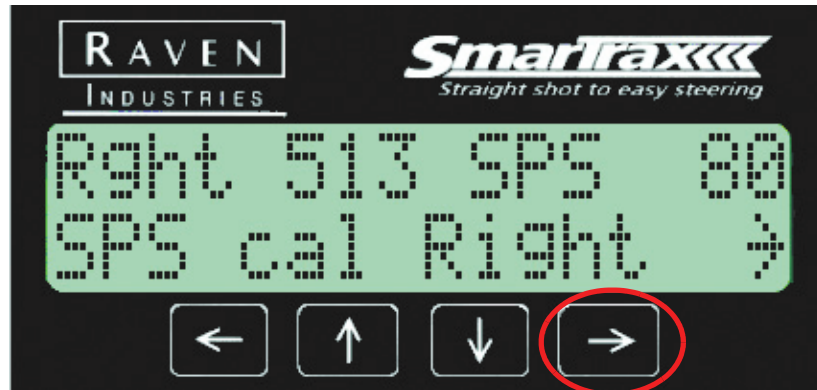
To set the Center SPS Calibration, slowly drive the vehicle forward as straight as possible. Press and hold the Right arrow to program the value into the controller.



Right SPS Calibration

The Right SPS Calibration screen displays the calibrated full right wheel position as well as the current SPS count.

To set the Right SPS Calibration, turn the wheels to the full right position. As the wheels are turning, verify that the current SPS values are changing. Once you have reached the full-right position, press and hold the Right arrow to program the value into the controller.



Note: The Right SPS value should be between 10 and 1000.

Zero Yaw Rate

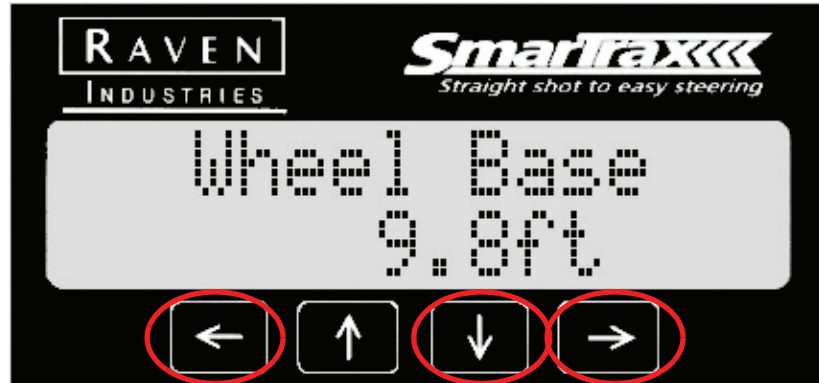
If you have selected 'Yaw' as the Sensor Type, the SPS Calibration screens (shown above) will be replaced with the Zero Yaw Rate screen.



Make sure the machine is at a complete stop before pressing the Right arrow button to re-zero the Yaw Sensor.

Wheel Base

The Wheel Base screen displays the distance from the center of the front axle to the center of the rear axle. You must set this measurement during the initial set up of the system in order for the system to steer properly.



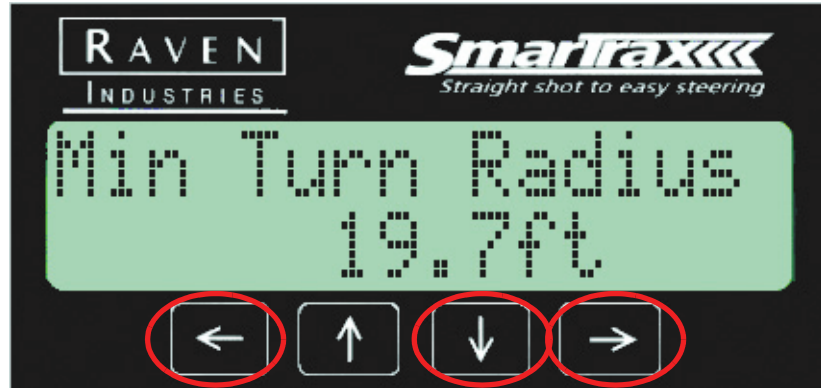
Note: The Wheel Base and Minimum Turning Radius screens will only display the pre-programmed settings if a specific vehicle tune set has been selected as the Machine Type.

Measuring the Wheel Base

1. Measure the wheel base of the vehicle. This is the distance from the center of the front axle to the center of the rear axle.
2. Press the Left or Right arrow button until the correct wheel base value appears.

Minimum Turning Radius

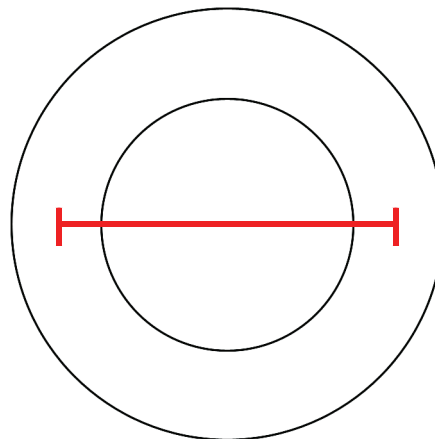
The Minimum Turning Radius screen allows you to program the tightest circle in which the vehicle can turn. You will only be able to program a Minimum Turning Radius if no Yaw Sensor is detected.



Center to Center Method

Use the Center to Center Method to determine the minimum turning radius for your machine.

1. Drive the vehicle in the tightest possible circle.
2. Measure the diameter between the center of the front wheel tracks. See the diagram below.



Center to Center



Note: DO NOT measure from the rear wheel tracks.

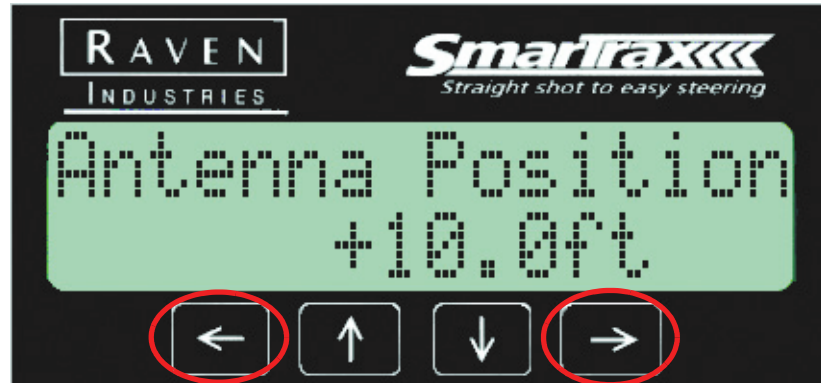
3. Divide the measurement by 2 to calculate the minimum turning radius.

Setting the Turning Radius

1. Press the Left or Right arrow button until the turning radius that you previously measured for your machine is displayed.

Antenna Position

The antenna position refers to where the antenna is in respect to the wheels.

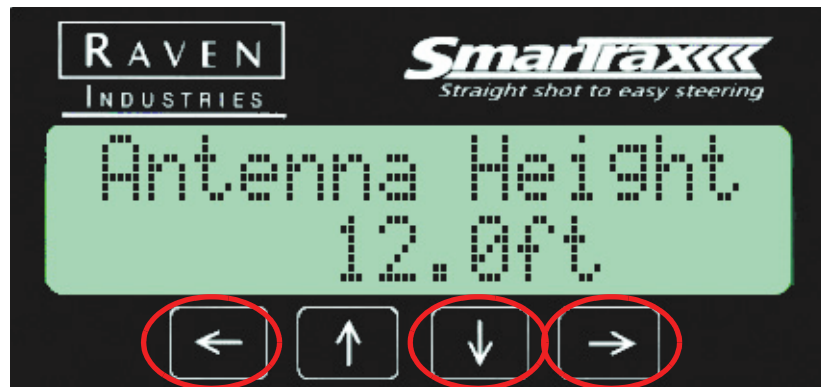


Setting the Antenna Correction

1. Measure the horizontal distance from the rear axle to the antenna.
Press the Left or Right arrow until the measured value is displayed.

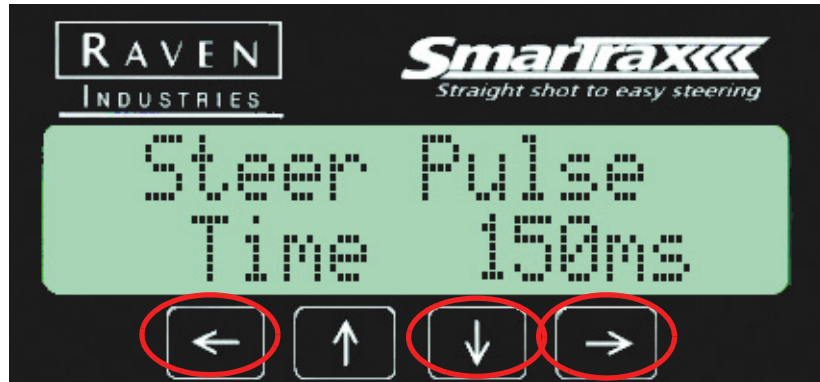
Antenna Height

Antenna height is a critical value that will need to be measured and entered into the controller. This value is the height from the ground to the antenna and is necessary in order for an enhancer or tilt sensor to work properly. Press the Left or Right arrow to set the antenna height, then press the Down arrow button when you are finished setting the value.



Steer Pulse Time

The Steer Pulse Time screen allows you to set the time that it takes to deactivate the controller when the pressure switch or flow switch is activated. This feature filters out any small spikes in pressure that can occur when the SmarTrax controller is engaged. This setting displays in milliseconds (ms) and represents the amount of time that the controller must read a high-pressure spike before disengaging the system. If the system disengages while traveling through the field, increase the delay setting to filter out small spikes in the hydraulic system.



Note:

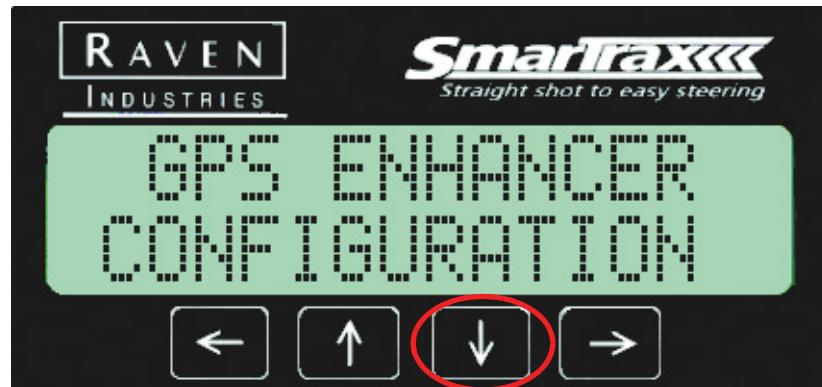
- The factory stop switch delay setting is 150ms.
- An adjustment may also need to be made on the pressure switch.

Setting the Steer Pulse Time

Press the Left or Right arrow to set the Steer Pulse Time to the desired value.

GPS Enhancer Configuration

The GPS Enhancer Configuration Menu screen allows you to change or set configurations for the GPS enhancer (see list below for configurations you can set).



Note: This menu screen is only available if you are using a GPS enhancer.

- Roll and Pitch
- VTG Config
- Enhancer Firmware Version
- Reset Enhancer
- Toggle Enhancer



Important:

- You must have GPS messages before the SmarTrax unit will recognize that an enhancer is present.

If the enhancer is powered up and working properly, an additional menu will appear on the SmarTrax controller menu between the Vehicle Setup and Console Configuration.



Note:

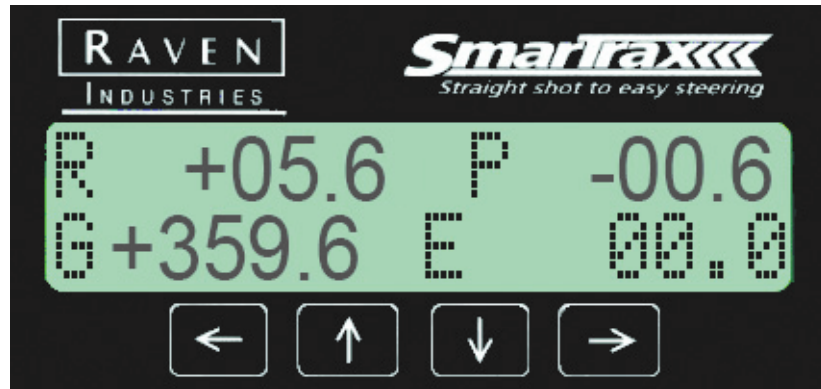
- Enhancer settings are stored in the enhancer, not the SmarTrax controller.
- The enhancer unit has been calibrated at the factory for pitch, roll, and yaw so no additional enhancer calibration is needed



Important: The tilt function needs to be disabled in the lightbar when an enhancer is present.

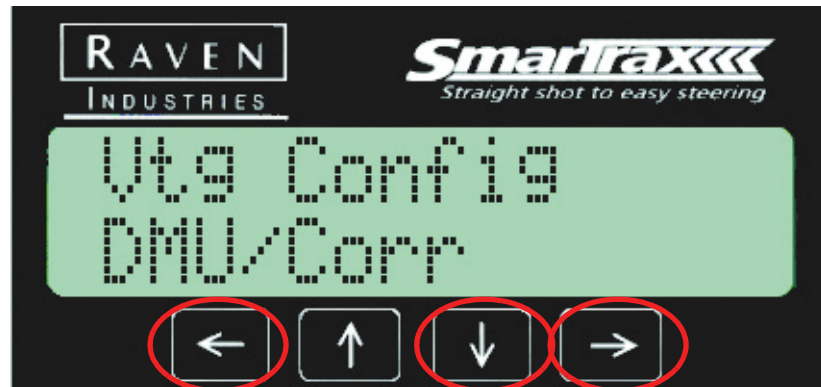
Pitch and Roll

This sub-menu is for diagnostics and will display the roll and pitch of the enhancer as well as the GPS and enhancer heading. This screen is updated automatically every second and is used to verify that the GPS Enhancer is mounted level. Refer to the 'Mounting the Enhancer' section in Chapter 2 for more information. Roll, pitch, and heading are displayed in degrees.



VTG Config

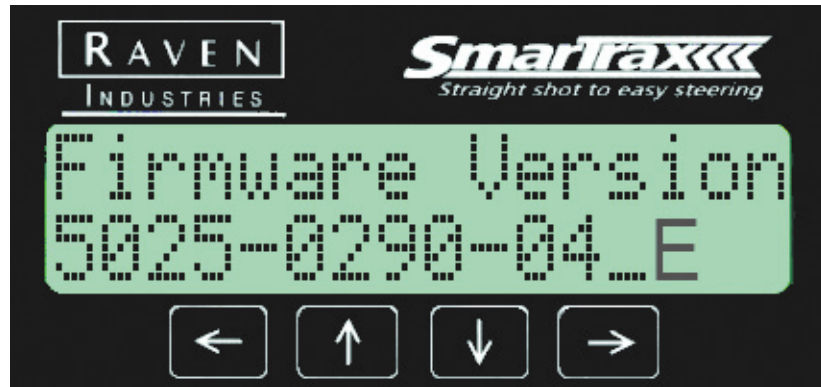
The VTG Config screen displays where the current corrected heading is being received from. The DMU/Corr setting is default.



Press the Left or Right arrow until the desired message correction type displays.

Firmware Version Screen

Also included in the enhancer menu options is the Firmware Version screen. This screen displays the current firmware version running on your enhancer.



Reset Enhancer

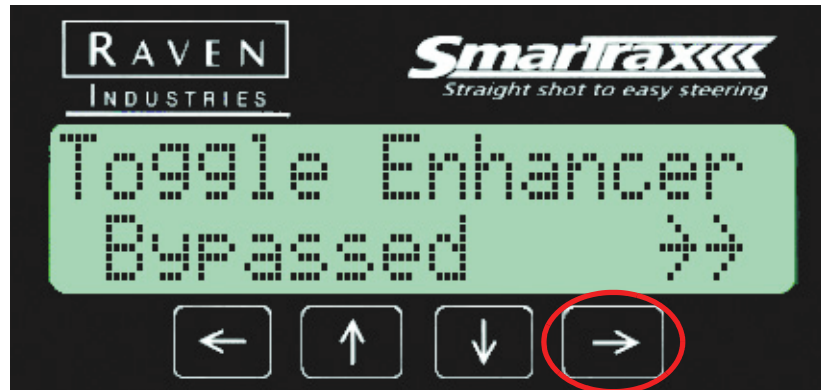
Press the Right arrow button to reset the GPS Enhancer.



1. Press the Right arrow button to reset the Enhancer.
2. Drive your machine forward.

Toggle GPSE Bypass

Press the Right arrow button to change the status of the GPSE to either 'Active' or 'Bypassed.'



Press the Right arrow to select the desired enhancer status. When you are finished setting the status, press the Down arrow to continue.



Note: Bypass mode disables the enhancer corrections

TM-1 Tilt Sensor Configuration

The TM-1 Tilt Sensor Configuration Menu screen allows you to change or set configurations for the TM-1 Tilt Sensor (see list below for configurations you can set).

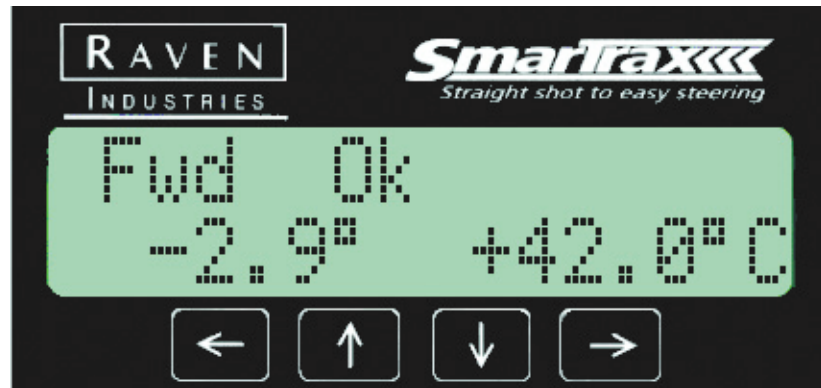


Note: This menu screen is only available if you are using the TM-1 Tilt Sensor.

- Status
- Zero Tilt Angle
- Tilt Filter Speed

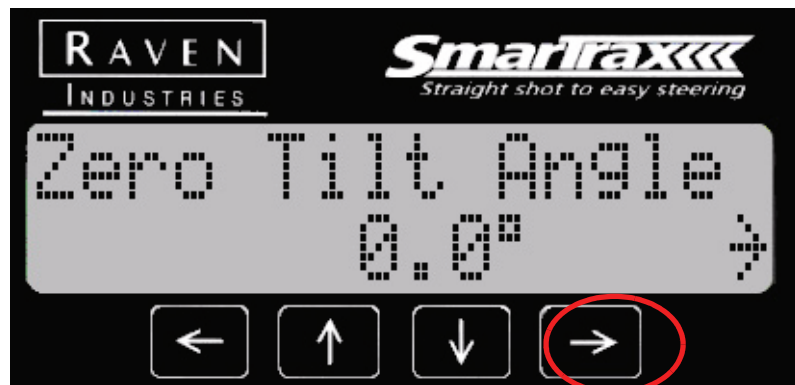
Status Screen

The Status Screen displays the current status of the tilt sensor including direction, degrees, and temperature of the sensor.



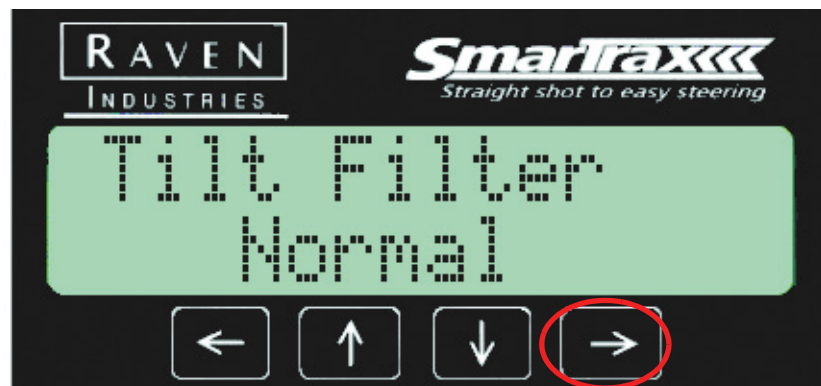
Zero Tilt Angle

The Zero Tilt Angle screen allows the tilt sensor to be calibrated for zero angle or level ground. To set the tilt sensor zero, drive the machine on to level ground and press the Right arrow.



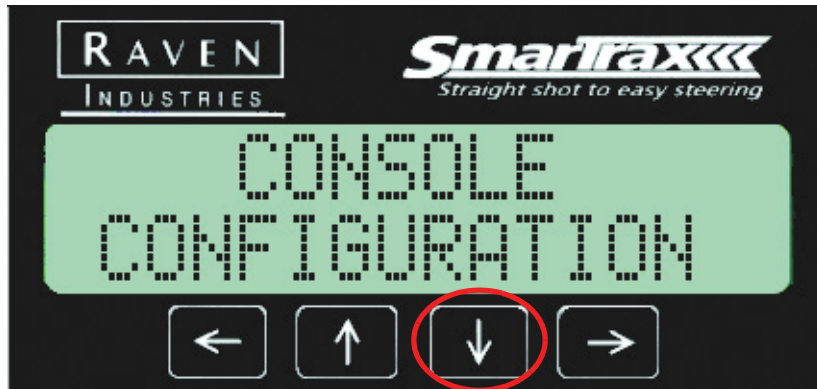
Tilt Filter

The Tilt Filter screen refers to the tilt compensation speed. Press the Right arrow to select from Slow, Normal, Fast, or Off.



Console Configuration

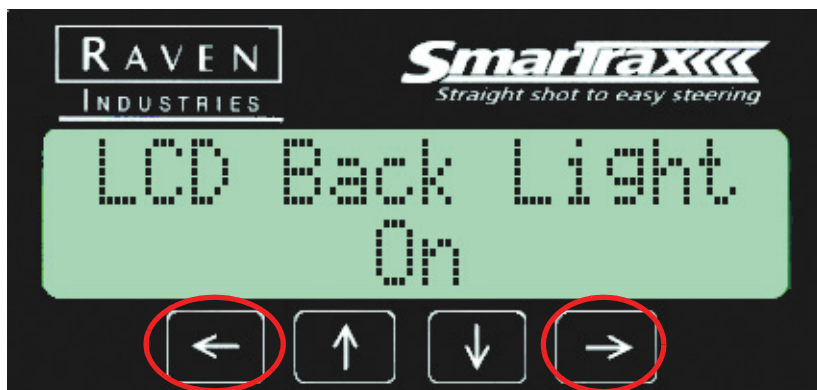
The Console Configuration Menu screen allows you to change or set configurations for the SmarTrax console (see list below for configurations you can set).



- LCD Back Light
- LCD Contrast
- Distance Units
- Speed Units
- Output
- Key Beep
- Serial Number
- Lockout Settings

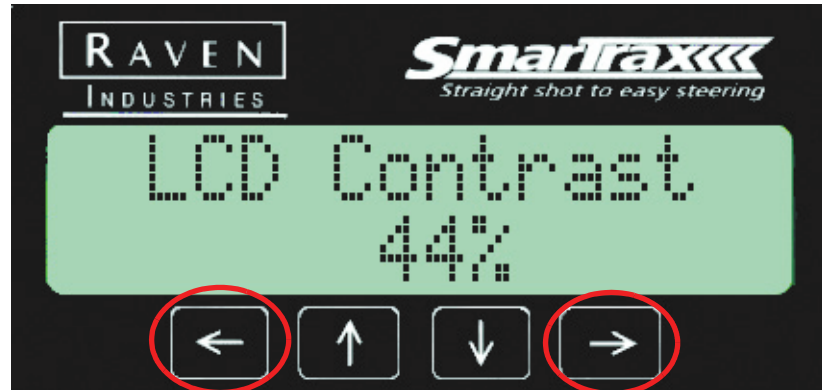
LCD Backlight Setting

The LCD Backlight screen allows you to turn the backlight on or off. Press the Left or Right arrow until the desired setting displays. There are only two possible settings, On or Off.



LCD Contrast

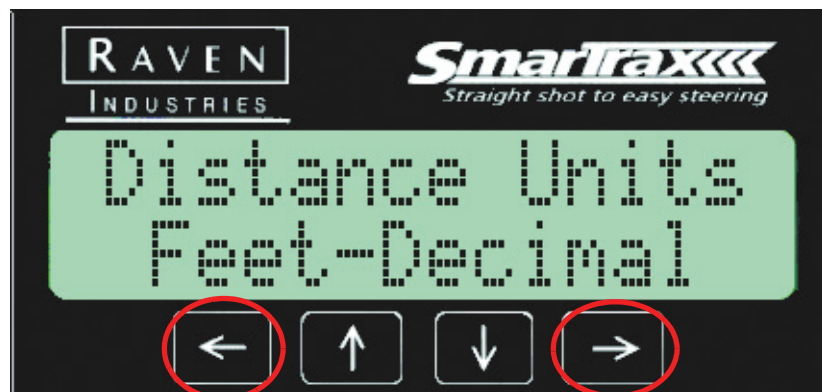
The LCD Contrast screen allows you to set the screen contrast for better viewing of the screen. Press the Right arrow to adjust the contrast for the console screen. 44% is the recommended setting.



Distance Unit Setting

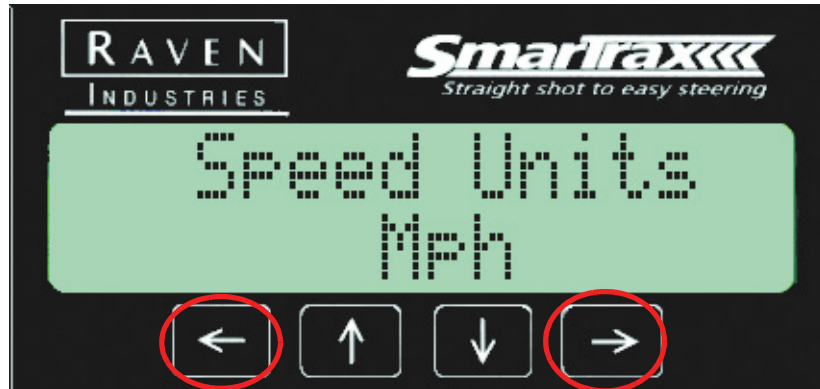
The Distance Unit Setting screen allows you to set the distance measurement to display in either feet or metric measurement. Press the Left or Right arrow until the desired unit of measurement is displayed. You can set the distance to the following units:

- Feet - inches
- Feet - decimal
- Metric



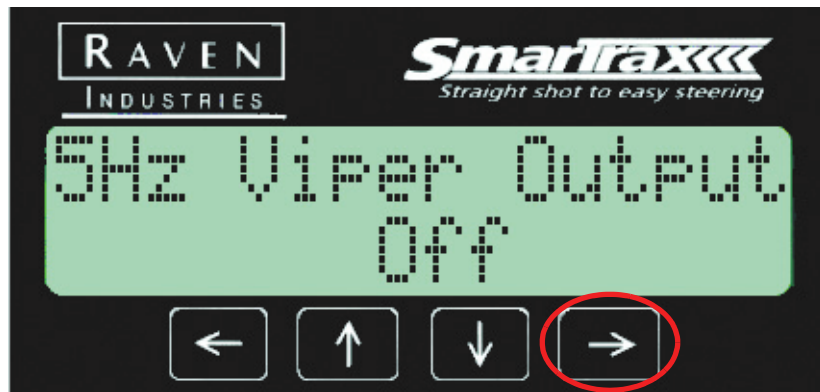
Speed Unit Setting

The Speed Unit Setting screen allows you to set the unit of measurement for speed, either in MPH or Km/H. Press the Left or Right arrow button until the desired speed unit is displayed.



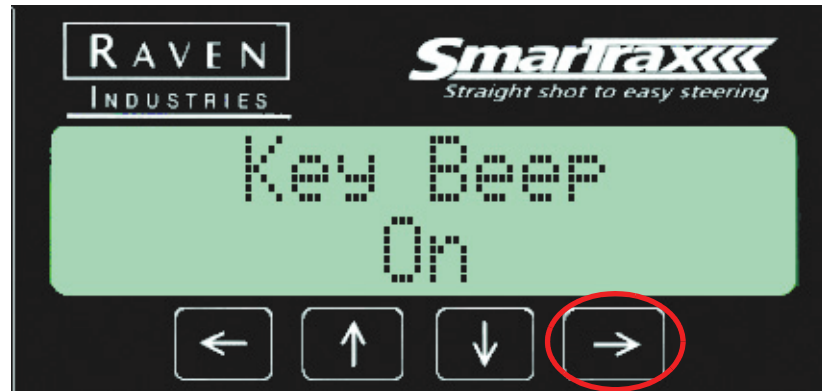
Output Setting

The Output Setting screen refers to the GPS output on the programming port. Press the Right arrow to select from On or Off.



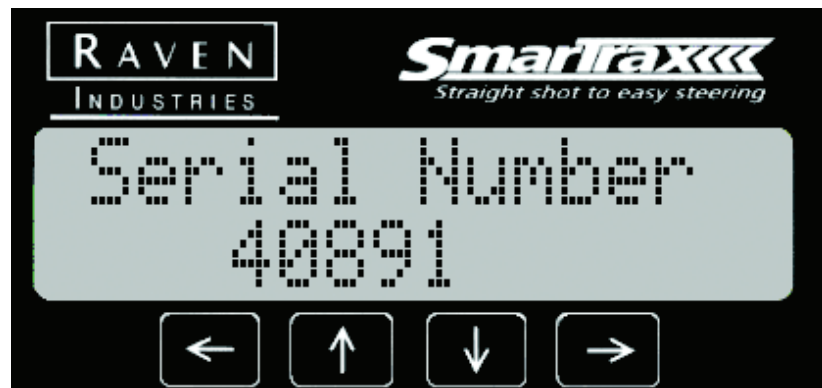
Key Beep

The Key Beep screen allows you to set the key beep for the screen. If Key Beep is set to On, there will be a beep after each button push. If the Key Beep is set to Off, there will be no beeps after a button is pressed. Press the Right arrow to select from On or Off.



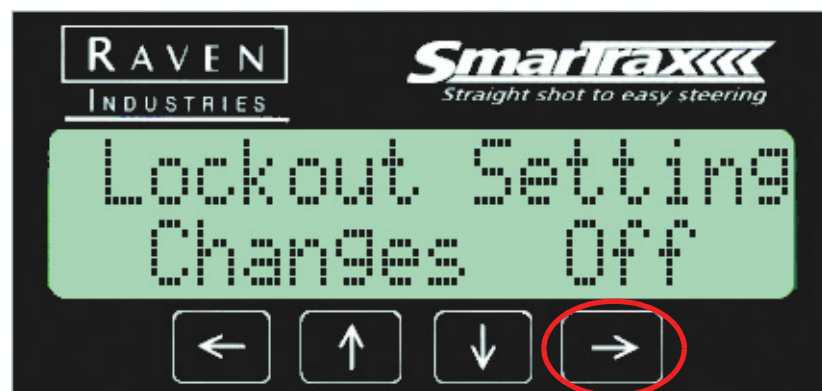
Serial Number

The Serial Number screen displays the serial number of the console.



Lockout Setting

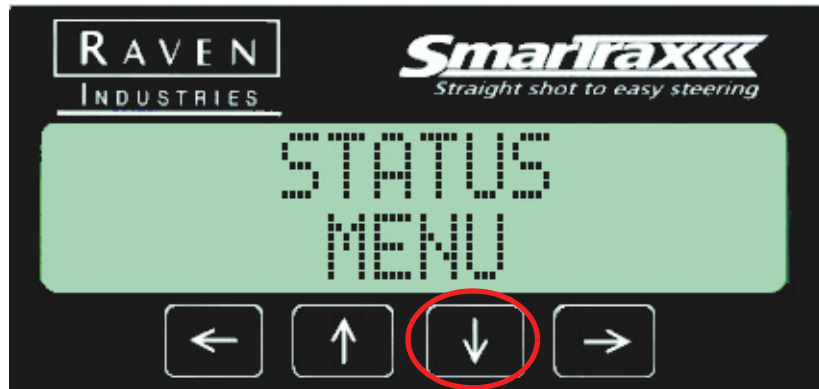
The Lockout Setting screen allows you to lock the calibration values that were entered for the machine. On locks the screen and Off unlocks it. Press the Right arrow to select from On or Off.



Status Menu

The Status Menu screen allows you to view or set the following system configurations:

- Troubleshooting Screen
- Delta Time
- Error Log
- GPS Date and Time
- Yaw Rate (if a Yaw Sensor is detected)
- Time vs. Inches Stats
- Average Speeds



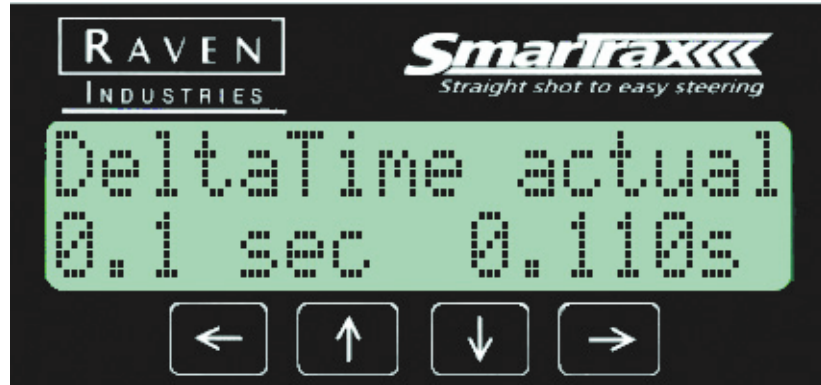
Troubleshooting Screen

The Troubleshooting screen displays the current reading from the steering sensor and pressure switch. The foot switch is active if the letters appear in all capitals (ex. FOOT SWTCH). The pressure switch is active if the letters appear in all capitals (ex. STEER SWTCH). If everything is lower-case, the foot switch and steer switch are both inactive. The correct operation of the hydraulics can be verified by pressing the left and right buttons to manually turn the wheels left and right respectively. The number in the lower right section of the screen shows the current SPS or Yaw reading. If an SPS is used, this number should change as the wheels turn. If a yaw is used, the number should change as the wheels turn if the machine is moving.



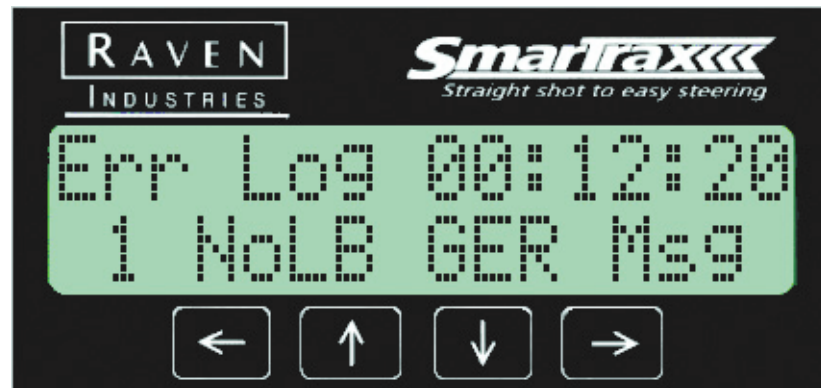
Delta Time

The Delta Time screen displays the actual receiver speed in the lower right-hand portion of the screen. 1 = 10 Hz and 2 = 5 Hz. It also displays the calculated receiver speed in the lower left-hand portion of the screen.



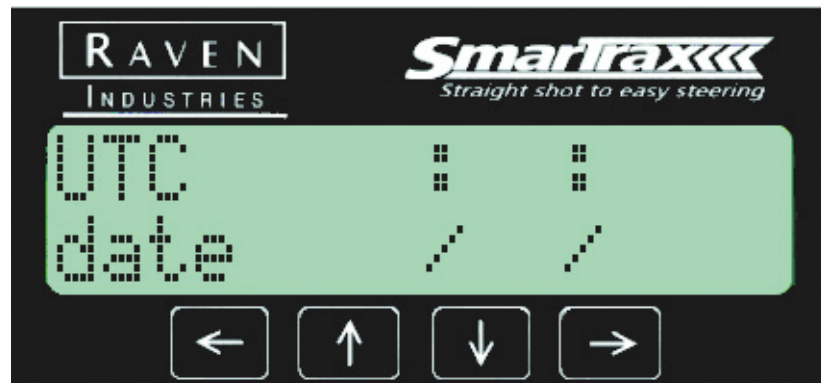
Error Log

The Error Log screen displays the error logs (if any) for the system. Press the Right arrow to view error logs 1 through 10.



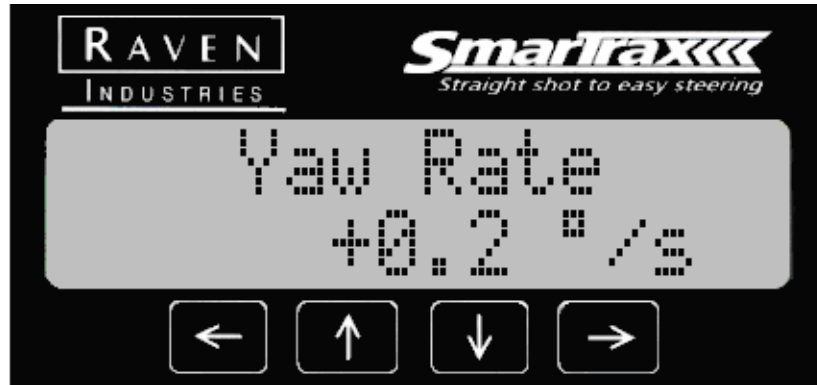
GPS Date and Time

The GPS Date and Time screen displays the date and time for the GPS system.



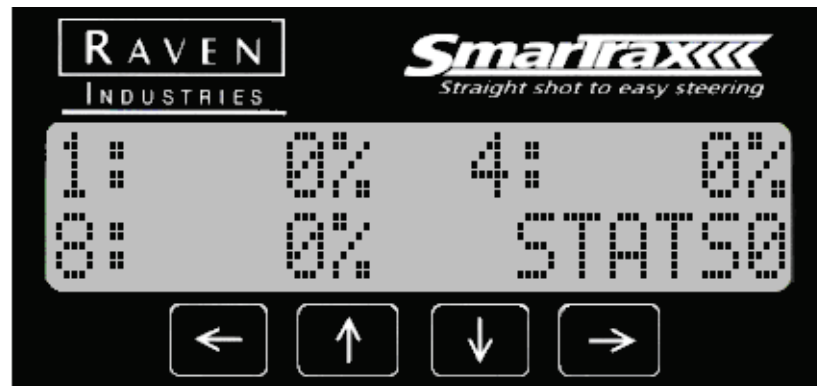
Yaw Rate

The Yaw Rate screen displays real time yaw rate if a Yaw Sensor is detected by the SmarTrax controller.



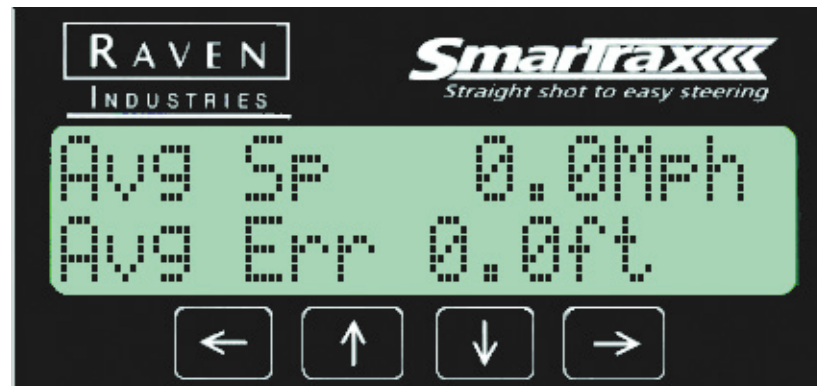
Time VS Inch Status

The Time VS Inch Status screen shows performance statistics for the Smartrax system. It shows the percentage of time the system is within 1, 4, and 8 inches of the target position for the last hour that the system has been engaged.



Average Speeds

The Average Speeds screen displays the average speed and errors over the last 5 minutes the system was engaged.



CHAPTER

6

TROUBLESHOOTING

If you encounter an error while running the SmarTrax controller, it could be for a number of reasons. This chapter lists some potential problems you could encounter and how to correct them. In this chapter you will see:

- A list of error messages displayed by the controller, what those error messages mean, and how to resolve the error.
- A list of mechanical problems and the action to take to correct the problem.
- A list of operational problems and the action to take to correct the problem.

Error Messages

When the controller is not working properly, the Home screen will display an error message associated with the problem. The table below lists the possible error messages that could display on the home screen, as well as how to correct them.

Error Message	Problem	Solution
Calibrate SPS		Re-calibrate the SPS.
SPS Calibration	The SPS does not have enough distance between the left and center positions and the right and center positions.	Re-calibrate the positions and verify at least 100 counts between positions. Remount the sensor to add distance between positions.
SPS Error	The count from the SPS is outside calibrated range. The SPS is broken. The SPS is disconnected or wire is broke.	Re-calibrate SPS Sensor Check to see that the SPS is operating properly. Check the SPS connections.

Error Message	Problem	Solution
SPS Stuck	SPS value does not change when the wheels move.	Possible hydraulic issue. Verify that the SPS moves when the wheels turn. Verify that the wheels move when using the manual steering. Contact technical support.
Low GPS Sats	The GPS receiver sees a low number of satellites.	May need to reposition the GPS antenna.
Bad GPS/HDOP	The accuracy of the GPS receiver is low due to either satellite blockage or position.	Move the vehicle to receive better satellite coverage or reposition the receiver.
No DGPS Diff	The receiver is not picking up the differential correction.	May need to wait for a better signal. Check the configuration of the receiver.
Too Slow	The vehicle is moving too slow and the controller has turned itself off.	Increase the speed of the vehicle and re-engage.
Too Fast	The vehicle is moving too fast and will shut down in 9 seconds.	Decrease the speed of the vehicle.
Too FAST	The vehicle is moving too fast and the controller has shut down.	Decrease the speed of the vehicle and re-engage the SmarTrax controller.
No DGPS Pos	The SmarTrax is not getting a position solution.	Check the receiver connections and configuration.
NoLB GER Msg	The GER message function from the lightbar is not turned on or no A-B line is set.	Turn lightbar GER message to 'On'. Set A-B line.
NoLB A-B Set	The A-B line has not been set on the lightbar or Envizio.	Set the A-B line so that the controller has a line on which to drive.

Error Message	Problem	Solution
No GPS/VTG	The VTG message on the receiver is Off.	Turn the VTG message for the receiver On.
No GPS/GGA	No GPS information or GGA is turned off.	Verify proper GPS setup.
Max Yaw	Maximum Yaw rate exceeded while steering engaged.	Slow down the steering rate.
Yaw Error	Yaw rate sensor values are out of range.	Check that the sensor is connected properly.
GPSE Comm	No communication with the enhancer.	Check for proper connections on the enhancer.
GPSE DMU	Pitch or roll is greater than 30 degrees.	Reset the enhancer.
No Cal	Calibration wizard not completed.	Press and hold Right arrow on the Home Screen to initiate the calibration wizard.
CommErr	Serial communication failure.	Check cables, baud rates, and message output.
Yaw Exceeded	The combination of speed and angle of approach to the guidance line creates a dangerous situation.	Decrease speed or angle of approach.
HYD Backwards	Hydraulics or solenoids are connected backwards.	Check the connection from the status menu; if backwards, reverse the solenoid connection.
HYD Error	One or both of the hydraulics or solenoids are disconnected or the Yaw is mounted incorrect.	Check connections and check for proper yaw mounting.
Yaw Backwards	The yaw is mounted upsidedown or improperly.	Mount the yaw with the flat side down.

Error Message	Problem	Solution
SPS Backwards	The SPS has been calibrated backwards.	Recalibrate the SPS by resetting the left center and right positions.
Gain Diff High	The calibration of the left hydraulics was inconsistent with the right hydraulics.	Perform another hydraulic calibration.
Valid Pts Low	The calibration did not find valid data.	Perform another hydraulic calibration.

Mechanical Problems

Mechanical problems with the vehicle can cause the SmarTrax controller to not work properly. Before you start troubleshooting the system, trace all hoses and wires to make sure that they are connected to the proper ports and connectors. You can avoid many potential problems by making sure that all wires and hoses are properly connected.



Note: Make any adjustments to the hydraulic components in small increments so that you can identify problems and solutions correctly. Perform only one change at a time to better troubleshoot the issue.

The following table lists some common mechanical problems and the corrective action needed to fix the problem.

Mechanical Problem	Solution
SmarTrax will not power up.	<ol style="list-style-type: none"> 1. Turn the key to the On position. 2. Check the fuses. 3. Check the battery connections. 4. Test for +12VDC using a voltmeter. 5. Replace the controller.
SmarTrax arrow keys do not function.	<ol style="list-style-type: none"> 1. Unplug the power cable from the back of the controller and then reattach it and power up. 2. Replace the controller.
SPS or Yaw count does not change.	<ol style="list-style-type: none"> 1. Inspect the SPS cable and controller cable for proper pinning and connection. 2. Inspect and replace the SPS, if necessary. 3. Replace the controller.
Cannot enter or change the initial settings on the controller.	<ol style="list-style-type: none"> 1. Turn off the power to the controller and then turn it back on. 2. Verify that the Lockout Setting is Off. 3. Replace the controller.

Mechanical Problem	Solution
Cannot pulse left or right.	<ol style="list-style-type: none"> 1. Check the hose and cable connections. 2. Check the solenoids for proper connection and voltage (12 VDC). 3. Adjust sequence valve (for closed center). 4. Adjust pressure relief cartridge. 5. Replace the valve. 6. Replace the controller.
When power is on, the wheel turns by itself.	<ol style="list-style-type: none"> 1. Make sure that the hoses are connected to the correct ports. 2. Check all electrical cables.
Steer Switch does not change to capital letters (STEER SWTCH) when wheel is turned.	<ol style="list-style-type: none"> 1. Turn the screw on the pressure switch in or out until the screen changes. 2. Turn the screw on the needle valve in or out and counterbalance the cartridges until the screen changes (for open center). 3. Check the wiring and hose connections to make sure they are correct and tight.
System pulses the wrong way.	<ol style="list-style-type: none"> 1. Check the solenoid connections and change them if they are hooked up backwards. 2. Check the hydraulic hose connections and switch them if they are hooked up backwards.
Wheels do not move when using the Manual Steering screen	<ol style="list-style-type: none"> 1. Turn the screw on the flow control out. 2. Check the hydraulic hoses and plumbing.
System does not engage by pressing the foot switch.	<ol style="list-style-type: none"> 1. Turn the screw on the pressure switch in. 2. Turn the screw on the needle valve out. 3. Verify that you are engaging the system from the Home screen.
The system does not disengage when you turn the steering wheel.	<ol style="list-style-type: none"> 1. Turn the screw on the pressure switch out. 2. Turn the screw on the pressure switch in. 3. Turn the screw on the needle valve in. 4. Verify that you are engaging the system from the Home screen.
Wheels turn the wrong way with the steering wheel.	<ol style="list-style-type: none"> 1. Switch the left and right hoses at the orbital or tees.
Valve makes noise or 'squeaks' in stand-by mode.	<ol style="list-style-type: none"> 1. Turn the screw on the pressure relief switch in.

Operational Problems

Operational problems can cause problems with the vehicle while in the field. The following table describes some common operational problems and the solution to fix the problem.

Operational Problem	Solution
The system will not find the line.	<ol style="list-style-type: none"> 1. Make sure that SmarTrax is engaged and displays 'OK' on the home screen. 2. Make sure that you have an unobstructed GPS signal. 3. Check the wiring for breaks or loose connections. 4. Check the SPS and re-calibrate if necessary. 5. Increase the line acquire aggressiveness.
Wheels 'chatter' while on line.	<ol style="list-style-type: none"> 1. Decrease the OnLine Sensitivity
Wheels do not turn fast enough when acquiring a new line.	<ol style="list-style-type: none"> 1. Increase the Line Acquire Aggressiveness.
Steering wheel is difficult or 'fights' when you attempt to turn the vehicle.	<ol style="list-style-type: none"> 1. Adjust the handle on the pressure switch out. 2. Turn the screw on the needle valve in.
System oscillates while on line.	<ol style="list-style-type: none"> 1. Increase the OnLine Sensitivity. 2. Reduce the valve timing. 3. Re-calibrate the SPS. 4. Check and confirm the minimum turning radius and wheelbase of the vehicle. 5. Verify SPS is rigidly mounted.
Flow switch does not function after adjustment.	<ol style="list-style-type: none"> 1. Check the plumbing of the switch to make sure that it is installed correctly. 2. Raise the Steer Pulse Time. 3. Replace the switch.
Vehicle consistently drives to the left or right of the swath line.	<ol style="list-style-type: none"> 1. Check the tilt sensor on the lightbar. 2. Check and adjust the antenna height, if necessary.

Operational Problem	Solution
System disengages when the auxiliary hydraulic functions are operated.	<ol style="list-style-type: none"><li>1. Turn the Relief Valve in.<li>2. Turn the screw on the needle valve out.<li>3. Turn the screw on the pressure switch in.
Vehicle veers in one direction while the system engages.	<ol style="list-style-type: none"><li>1. Decrease the Line Acquire Aggressiveness.<li>2. Inspect the SPS and re calibrate if necessary.<li>3. Decrease the valve timing.<li>4. Check and confirm the minimum turning radius and wheelbase of the vehicle.<li>5. Confirm that the lightbar swath and width and offset settings are correct.

APPENDIX



SYSTEM DIAGRAMS

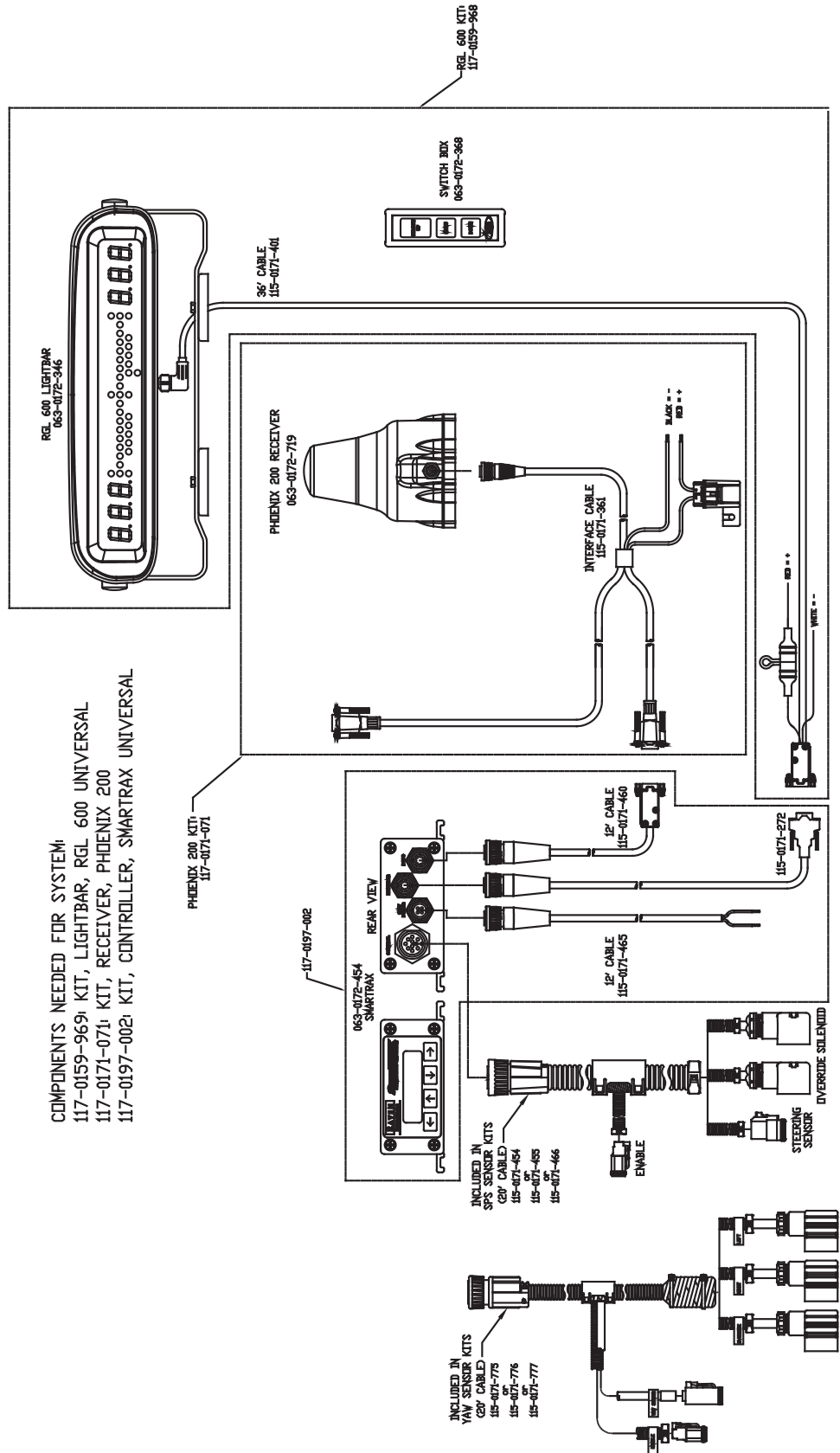
In this section you will find system diagrams for the following:

- Invicta 115/RGL 600 Universal/SmarTrax
- Viper/Invicta 115/RGL 600 Universal/SmarTrax
- Invicta 210 or 310/RGL 600 SmarTrax Guidance
- Viper/Invicta 210 or 310/RGL 500 SmarTrax Guidance
- RGL 600/SmarTrax/Non-Raven Receiver
- SmarTrax Decimeter Guidance

Each diagram also displays the components needed to correctly install the system.

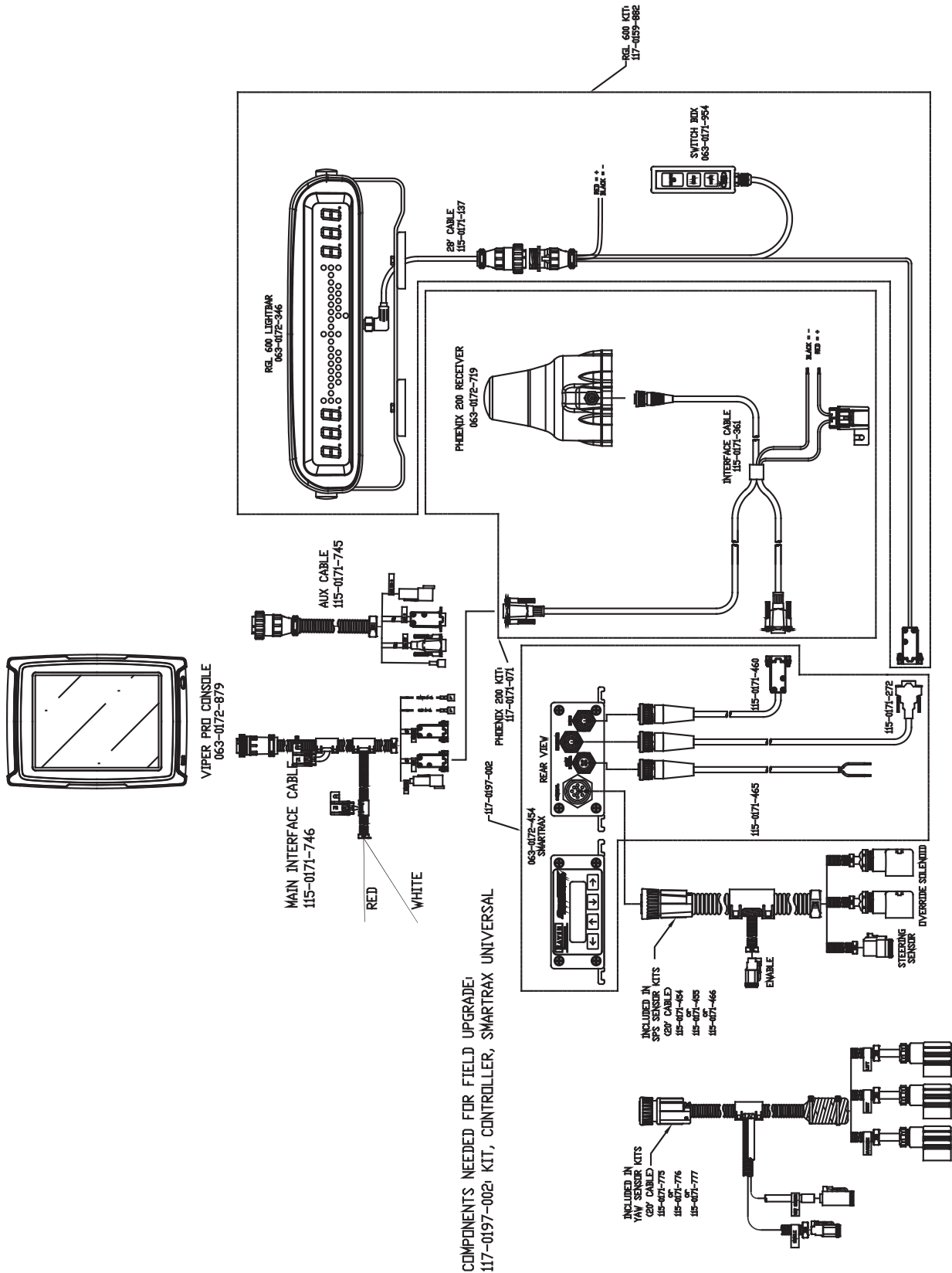
P200/RGL 600 UNIVERSAL/SMARTRAX PACKAGE

COMPONENTS NEEDED FOR SYSTEM:
 117-0159-969: KIT, LIGHTBAR, RGL 600 UNIVERSAL
 117-0171-071: KIT, RECEIVER, PHOENIX 200
 117-0197-002: KIT, CONTROLLER, SMARTRAX UNIVERSAL



Viper Pro/Phoenix 200/RGL600 Universal/SmarTrax Package

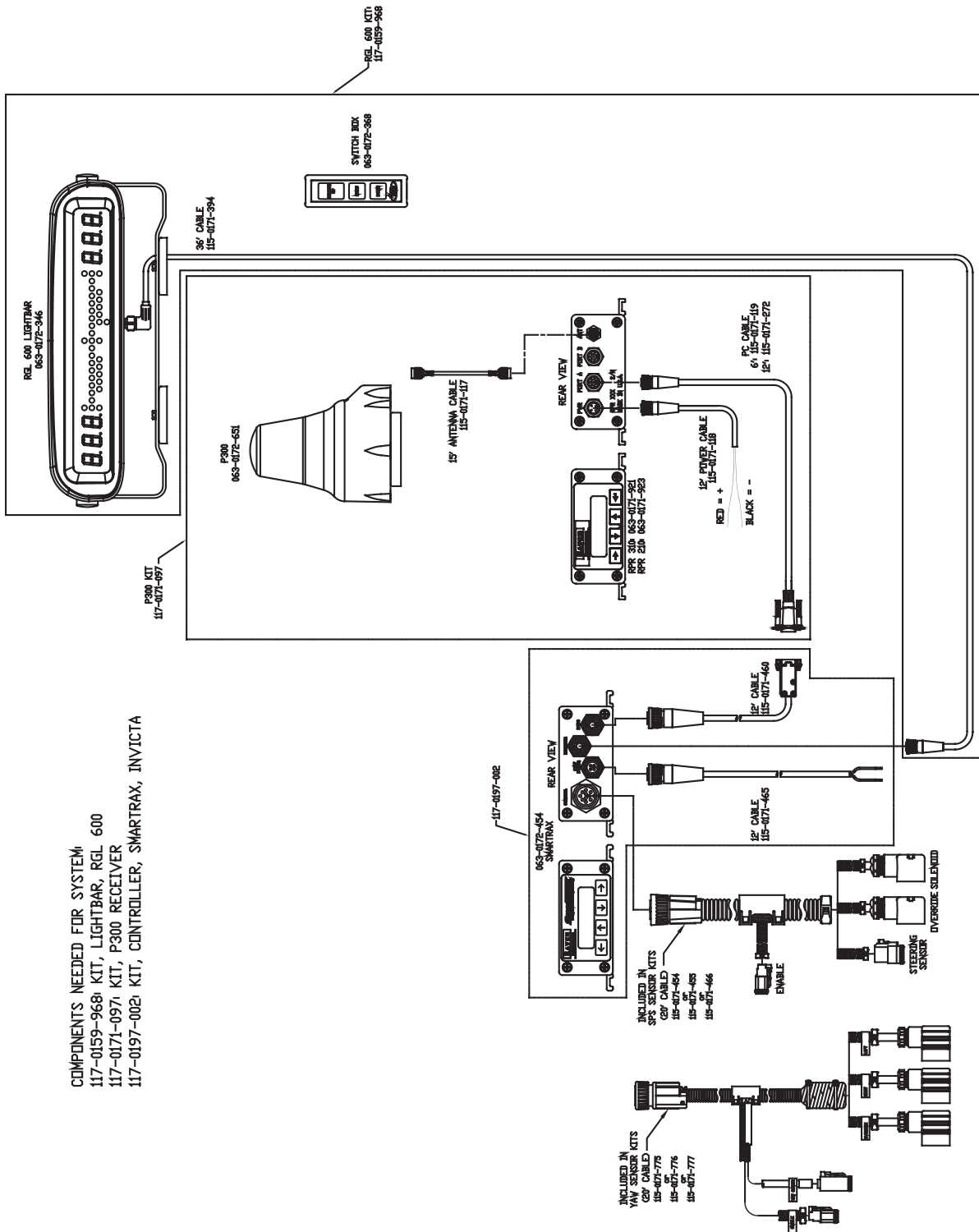
VIPER PRO/P200/RGL 600 UNIVERSAL/SMARTRAX PACKAGE



COMPONENTS NEEDED FOR FIELD UPGRADE:
117-0197-002 KIT, CONTROLLER, SMARTRAX UNIVERSAL

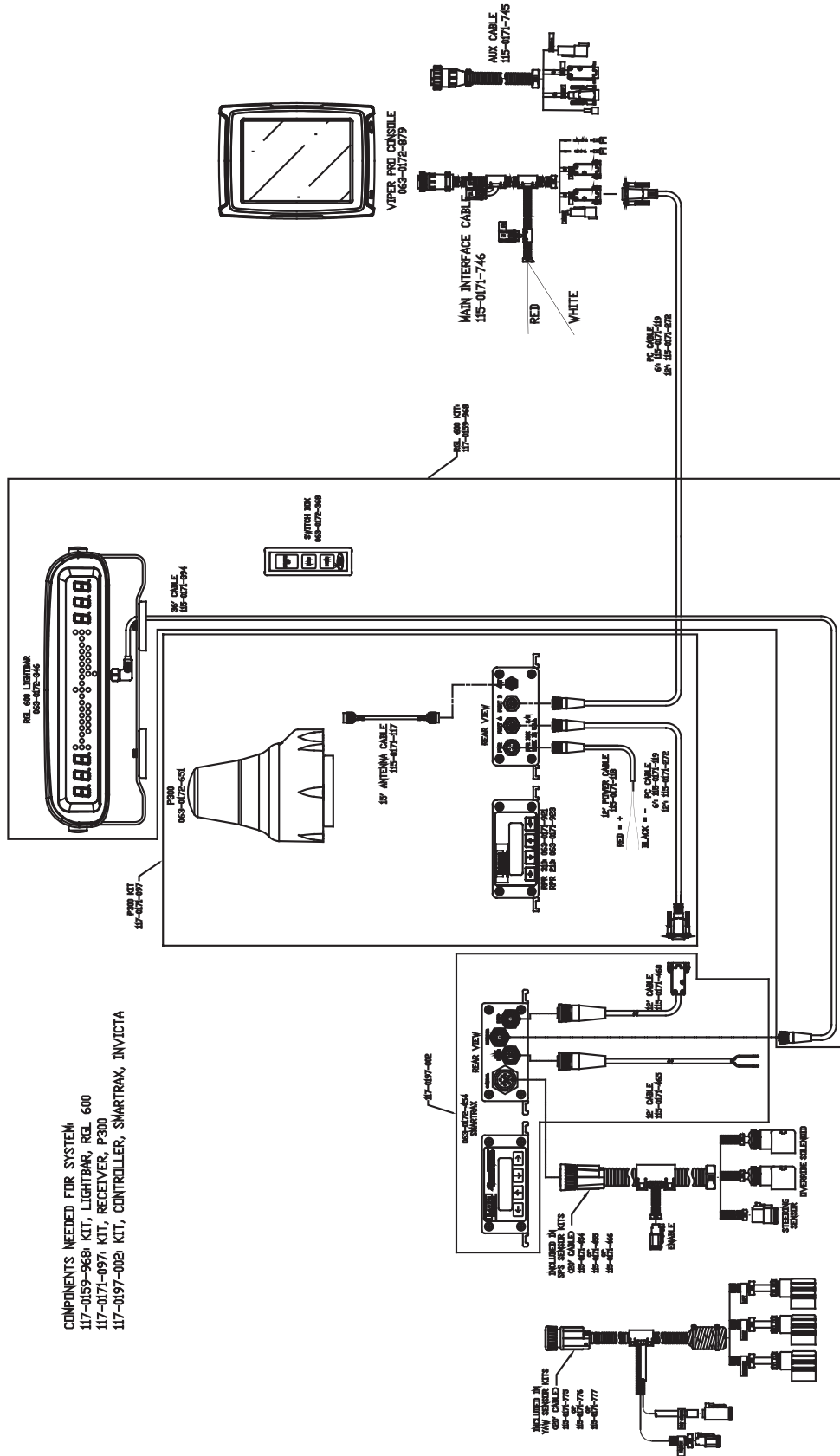
P300/RGL 600/SMARTRAX GUIDANCE PACKAGE

COMPONENTS NEEDED FOR SYSTEM:
 117-0159-968: KIT, LIGHTBAR, RGL 600
 117-0171-097: KIT, P300 RECEIVER
 117-0197-002: KIT, CONTROLLER, SMARTRAX, INVICTA

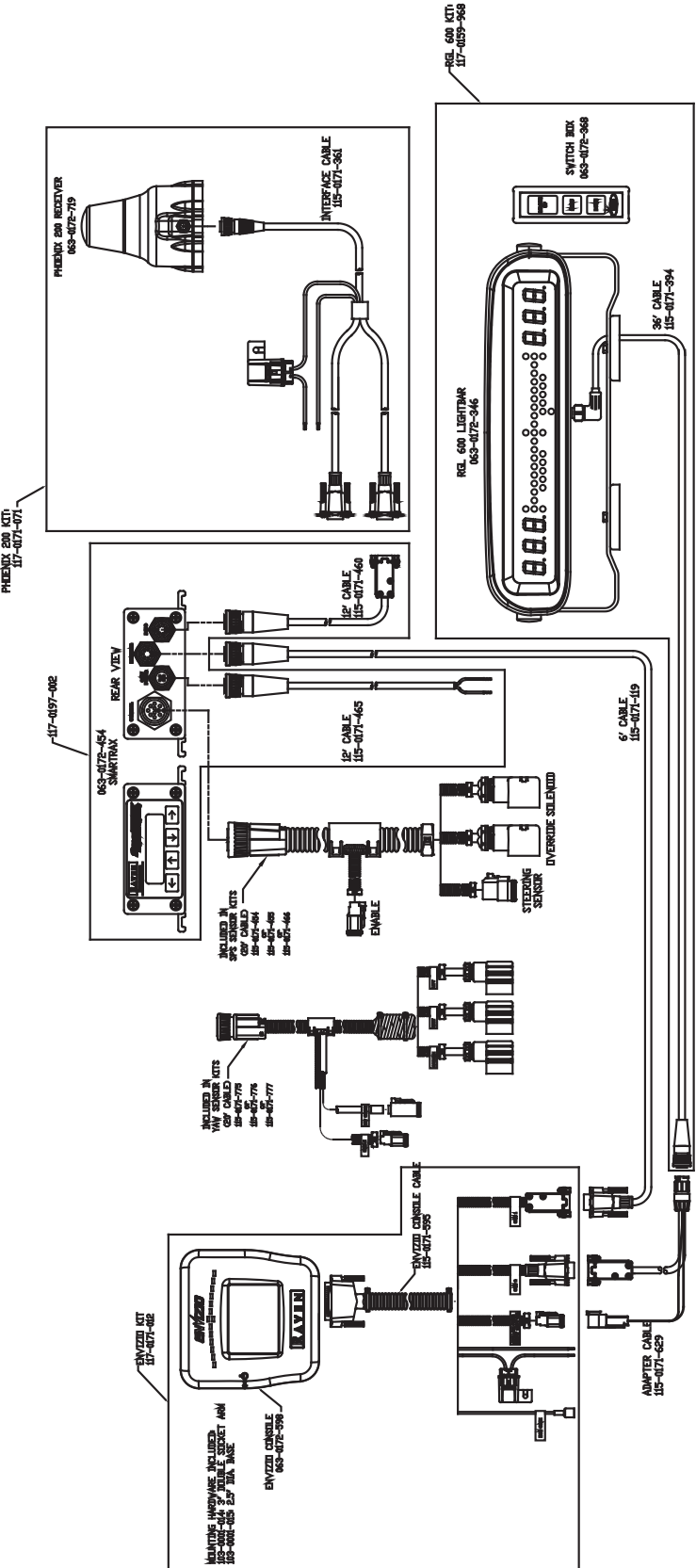


VIPER/P300/RGL 600/SMARTRAX GUIDANCE PACKAGE

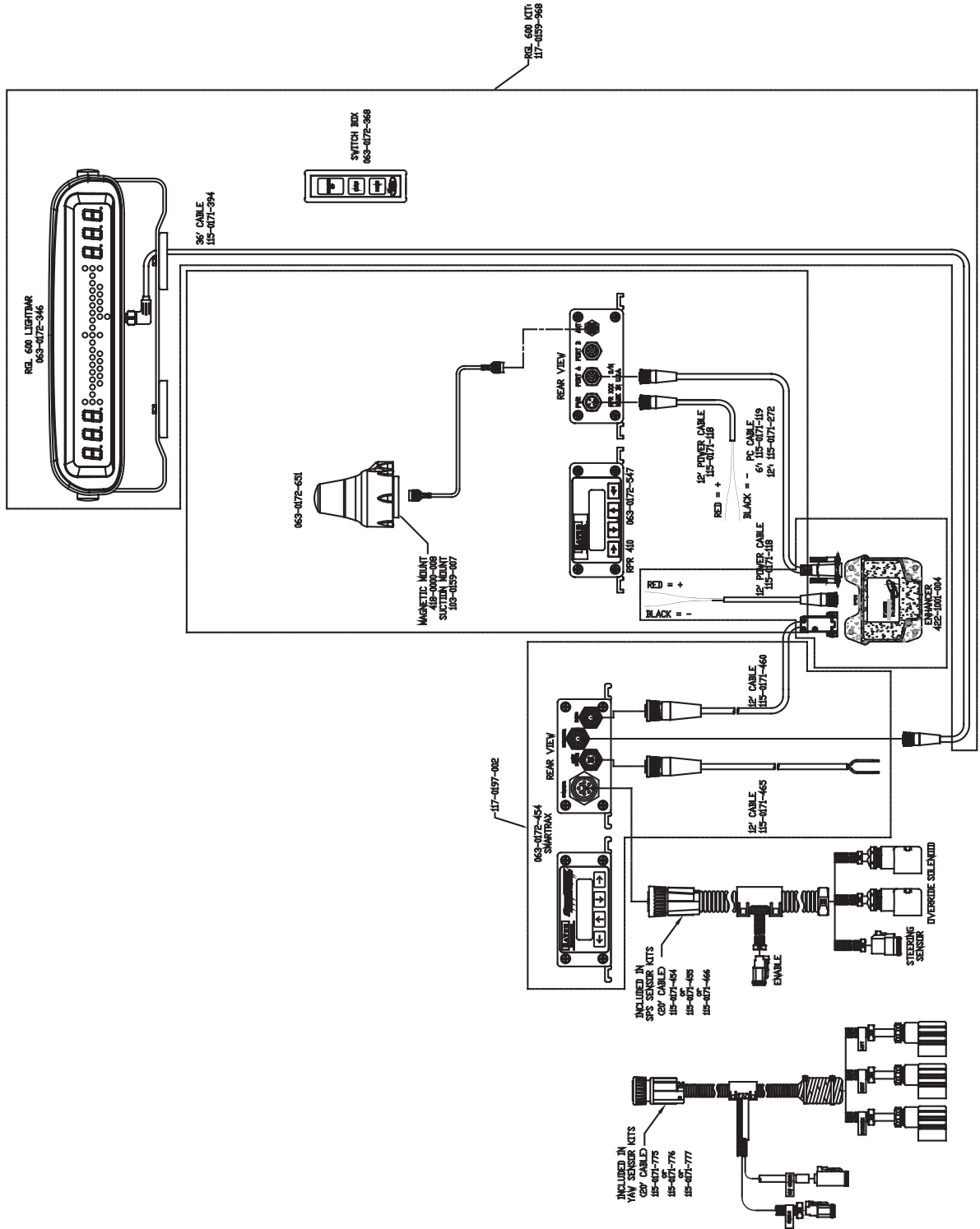
COMPONENTS NEEDED FOR SYSTEM:
 117-0159-968 KIT, LIGHTBAR, RGL 600
 117-0171-097 KIT, RECEIVER, P300
 117-0197-002 KIT, CONTROLLER, SMARTRAX, INVICTA



ENVIZIO WITH SMARTRAX, P200 RECEIVER AND EXISTING RGL 600



SMARTRAX DECIMETER GUIDANCE PACKAGE



Notes:

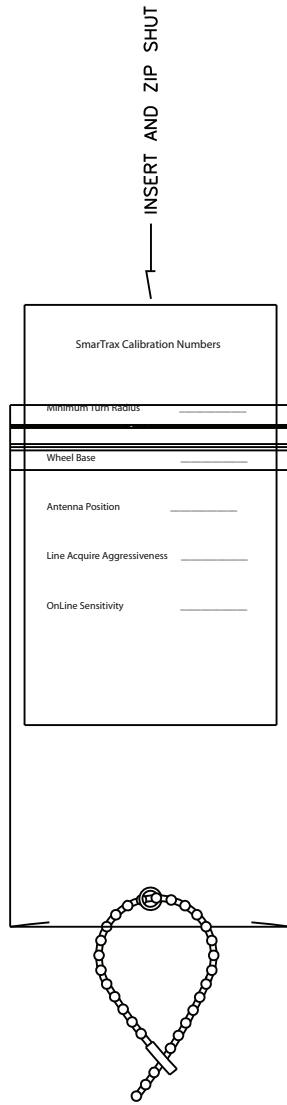
APPENDIX

B

CALIBRATION CARD

The calibration card on the next page is included for your convenience. As you are calibrating the SmarTrax system, be sure to write your calibration numbers on the calibration card and insert it into the plastic envelope that was provided with the system. This will ensure that you always have your most current calibration numbers should you need to know them.

THIS CARD IS PROVIDED FOR YOUR CONVENIENCE. PENCIL IN YOUR CALIBRATION NUMBERS FOR FUTURE REFERENCE. CUT ON DOTTED LINE, FOLD, AND INSERT INTO PLASTIC ENVELOPE.



SmarTrax Calibration Numbers

Minimum Turn Radius _____

Wheel Base _____

Antenna Correction _____

Line Acquire Aggressiveness _____

OnLine Sensitivity _____

CUT ON DOTTED LINE

RAVEN

RAVEN INDUSTRIES

Limited Warranty

What Does this Warranty Cover?

This warranty covers all defects in workmanship or materials in your Raven Applied Technology Product under normal use, maintenance, and service.

How Long is the Coverage Period?

Raven Applied Technology Products are covered by this warranty for 12 months after the date of purchase. This warranty coverage applies only to the original owner and is nontransferable.

How Can I Get Service?

Bring the defective part and proof of purchase to your Raven Dealer. If your Dealer agrees with the warranty claim, the Dealer will send the part and proof of purchase to their distributor or to Raven Industries for final approval.

What Will Raven Industries Do?

Upon confirmation of the warranty claim, Raven Industries will, at our discretion, repair or replace the defective part and pay for return freight.

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 or other special 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.