

RINEX AutoSTEER

User Manual

Part Number: 1-1290

Revision A

Issue Date: Feb 2008

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RINEX AutoSTEER User Manual

Written for RINEX AutoSTEER Controller
& GuideTRAX software version 3.2r17 or newer.

Publication Date, Feb 2008

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RINEX AutoSTEER

1	Introduction	1
1.1	This Manual.....	3
2	Installing the Controller	5
2.1	Mounting the controller.....	7
2.2	Connecting the controller cables	9
2.2.1	Power cable.....	9
2.2.2	Saturn Interface cable	9
2.2.3	Valve Control cable	10
2.2.4	Override sensor switch	10
3	Setting up GuideTRAX.....	11
3.1	Enabling AutoSTEER Option	13
3.2	Configuring the Vehicle	14
3.3	Turning AutoSTEER Option ON.....	15
4	Calibrating the AutoSTEER system.....	17
4.1	Required GPS Settings	19
4.2	GPS Antenna Location.....	19
4.3	Testing AutoSTEER functions	20
4.4	Calibrating the AutoSTEER.....	22
4.4.1	Tilt Compensation Calibration Procedure.....	23
4.4.2	AutoSTEER Calibration Procedure	26
4.5	Calibration Parameter Definitions.....	30
5	Using AutoSTEER	33
5.1	Engaging AutoSTEER.....	35
5.2	Disengaging AutoSTEER	36
5.3	The AutoSTEER Status Button	37
6	Appendix.....	39



1



Introduction



1.1 This Manual

Welcome to the RINEX AutoSTEER User Manual. This document describes how to setup and calibrate the RINEX AutoSTEER system.



Figure 1-1 RINEX AutoSTEER controller (Part # 2-0825)

The RINEX AutoSTEER system is designed to connect to a RINEX Saturn guidance system to allow the guidance system to AutoSTEER the vehicle along a line providing optimal accuracy.

This manual is designed for users of Saturn HT & Saturn HR systems running GuideTRAX version 3.2.



2

Installing the Controller

To obtain the best performance from the RINEX AutoSTEER system the AutoSTEER controller needs to be installed according to this manual. It is particularly important the best location in the tractor cabin is found and the controller is installed in the correct orientation.

Carefully read this entire section on how to install the controller before starting any work.

2.1 Mounting the controller

The AutoSTEER controller is supplied with a mounting tray which is attached to the controller with Velcro. This will allow the controller to be easily moved from vehicle to vehicle if required.

It is recommended that the mounting tray is fixed firmly to a bracket or to the floor of the tractor cabin and that the controller is attached to the mounting tray using the Velcro supplied.

It is important that the best location is found in the tractor cabin for the AutoSTEER controller. Read the following simple rules before mounting the controller.

1. The location to mount the controller must be away from feet or any place that it may pose as an obstruction to the operator of the vehicle.
2. Do not mount the controller where liquids, such as spilt drinks, may fall onto it.
3. The controller should be mounted to a bracket or to the floor where it will not move freely around.
4. The controller should be mounted as far forward in the tractor cabin as possible.
5. The controller must be mounted with the arrow on the controller pointing UP. See Figure 2-1.
6. Controllers with Tilt Compensation fitted must be mounted with the yellow sticker pointing in the direction of normal forwards travel. See Figure 2-2.



Figure 2-1 Mount controller UP

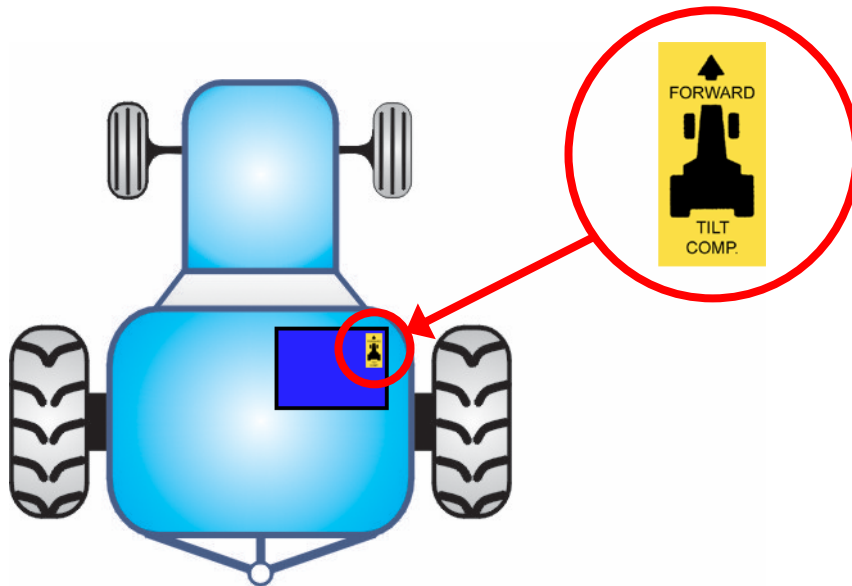


Figure 2-2 Mount with Tilt Comp. sticker pointing forward (if fitted)

2.2 Connecting the controller cables

2.2.1 Power cable

The power cable should be connected to a reliable 12 volt DC power source. It is recommended that the power is connected to a switched power source; however this is not necessary if the operator wishes to manually turn the controller ON and OFF each day. As with any power cable installation ensure that the cable is properly connected via a fuse to the power supply. A 5 amp fuse is suitable.

If required there are a number of different power cables available for the AutoSTEER controller which plug directly into the tractor OEM power source plugs located in the cabin. Contact your dealer if a specific power cable is required.

When the cable has been connected to a suitable power source the cable can be connected to the PWR IN port on the controller.

2.2.2 Saturn Interface cable

The Saturn Interface cable connects the AutoSTEER controller to the Saturn Guidance system. The 15 pin D connector should be connected to the Lightbar port on the Saturn system and the 9 pin D connector to the Serial port on the AutoSTEER controller. See Figure 2-3.

Ensure this cable is screwed in at each end and run neatly to avoid entanglement with the operators feet, or from being damaged.



Figure 2-3 Connecting the interface cable

2.2.3 Valve Control cable

The Valve Control cable connects to the Steering port on the AutoSTEER controller.

When connecting the Valve Control cable to the hydraulic valve block follow the instructions supplied with the hydraulic kit.

2.2.4 Override sensor switch

The override sensor cable connects to the Auxiliary port on the AutoSTEER controller. Follow the instructions supplied with the kit to install the sensor switch.



3

Setting up GuideTRAX

3.1 Enabling AutoSTEER Option

Once the AutoSTEER controller and hydraulic kit have been installed GuideTRAX will have to be setup and configured. The first step will be to enable the AutoSTEER option on the system using the password supplied with the AutoSTEER kit.

The password will be supplied with the following information;

- Serial number of the Saturn H interface controller unit
- Compact Flash Identification Number (CFID)

If the supplied information does not match the CFID, contact RINEX or your dealer as the password will not function.

- 1) The six character password must be entered in the **REGISTER** window.
- 2) From the main menu touch **SETUP** to display the Setup menu.
- 3) Touch **ABOUT GuideTRAX** and then **REGISTER** to display the registration screen. See Figure 3-1.

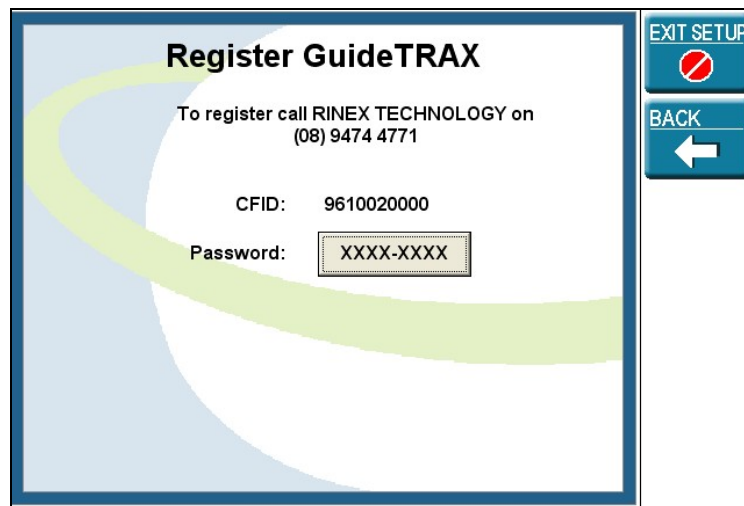


Figure 3-1: Register GuideTRAX Window

- 4) Touch the **PASSWORD** button to enter the password, and then touch **OK** when done.
- 5) Touch **BACK BACK** to return to the Setup menu, you should see the AutoSTEER button is no longer grey.

3.2 Configuring the Vehicle

Now that the AutoSTEER option has been enabled the vehicle needs to be configured to use the RINEX AutoSTEER controller.

- 1) From the Main menu touch **SETUP** to display the Setup menu.
- 2) Touch **VEHICLE SETUP** and then **RIG SETUP**
- 3) Select the vehicle that you are installing the AutoSTEER in from the list and touch **EDIT**
- 4) Touch **STEER CONTROL** to display the Steer Controller Settings Window (see Figure 3-2)

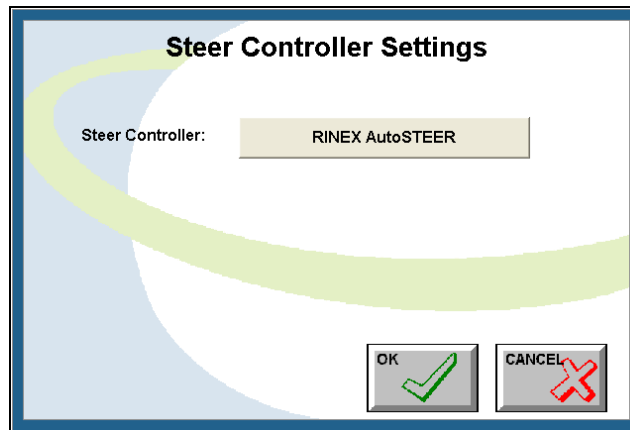


Figure 3-2: Steer Controller Settings Window

- 5) Touch the **STEER CONTROLLER** button to display the Steer Controller list window.
- 6) Select RINEX AutoSTEER from the list and touch **ACCEPT**
- 7) The Steer Controller Settings Window will be displayed with the RINEX AutoSTEER as the steer controller.
- 8) Now touch **OK OK SELECT BACK**

3.3 Turning AutoSTEER Option ON

When the RINEX AutoSTEER controller has been selected, in the Steer Controller Settings window for the vehicle, the AutoSTEER option must then be turned ON.

- 1) From the Main menu touch **SETUP** to display the Setup menu.
- 2) Touch the **AutoSTEER** button to display the AutoSTEER window. See Figure 3-3.

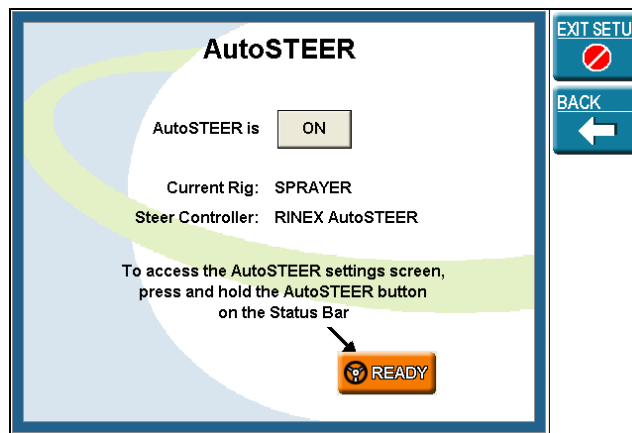


Figure 3-3: AutoSTEER Window

- 3) From the AutoSTEER window select AutoSTEER ON by touching the AutoSTEER **ON/OFF** button.
- 4) When AutoSTEER is turned ON the Disclaimer window will be displayed. A copy of the disclaimer can be found in APPENDIX 1.
- 5) Read the information carefully and if you agree touch **OK**. If you do not agree with this disclaimer, press **CANCEL** and the system will not activate steering. The Disclaimer will be displayed every time the system is started.



4

Calibrating the AutoSTEER system

Before calibrating the AutoSTEER ensure that you read and understand this entire section. If you are not familiar with the operation of the RINEX AutoSTEER system then it would be recommended that you also read section 5 Using AutoSTEER.

This section assumes that all previous sections in this manual have been completed and that the AutoSTEER kit has been installed and the software has been setup.

4.1 Required GPS Settings

Before calibrating the AutoSTEER system it is important that the GPS has the correct settings. If you have been using the guidance system previously then it could be assumed that most of the GPS settings have been configured correctly, however there are some settings that need to be checked.

The following settings should be configured in the GPS receiver.

- NMEA GPGGA @ 5 Hz
- NMEA GPVTG @ 5 Hz
- Baud rate to match settings in GuideTRAX (normally 19200)
- 8 Data bits, 1 Stop bit & Parity None

Read the instruction manual supplied with your receiver for instruction on how to configure the receiver.

4.2 GPS Antenna Location

Ensure that the antenna is mounted as far forward on the roof of the vehicle as possible. For hard to tune vehicles it may be worth mounting the antenna out on the front of the bonnet of the tractor providing that the cab will not excessively shadow the antenna from the sky.

4.3 Testing AutoSTEER functions

Before the AutoSTEER system can be calibrated the basic functions should be checked.

- 1) From the Main guidance screen touch and hold the **AutoSTEER Status** button on the status bar for 4 seconds. See Figure 4-1.

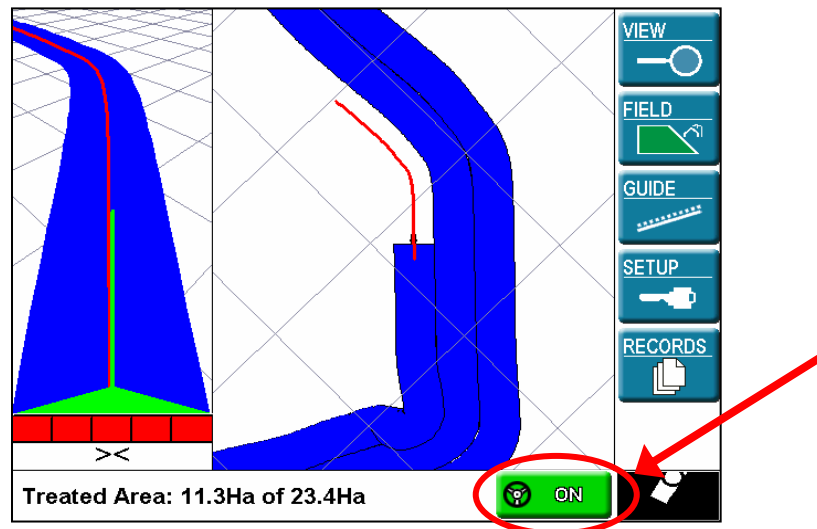


Figure 4-1 AutoSTEER Status button

- 2) The RINEX AutoSTEER screen will be displayed. Check that the firmware version is 2.32 or newer (3.02 or newer is required if Tilt Compensation is installed); there is a green light next to Connected and a green light next to GPS Heading. The Logging light is normally red unless logging steering data is temporarily turned ON. See Figure 4-2.

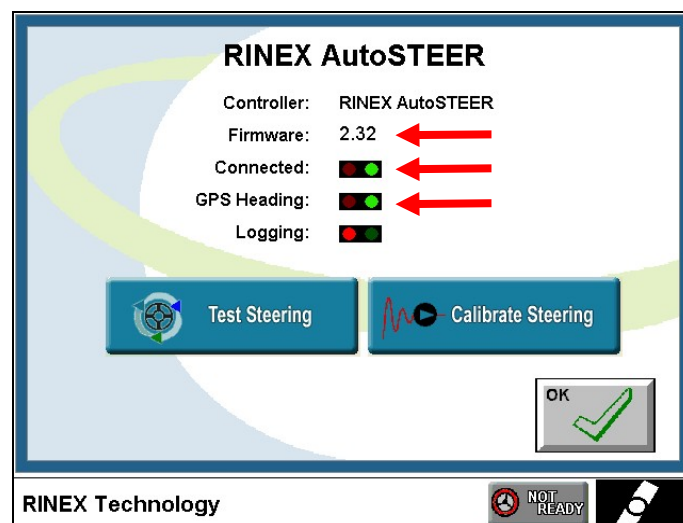


Figure 4-2 RINEX AutoSTEER screen

3) Touch on **TEST STEERING**

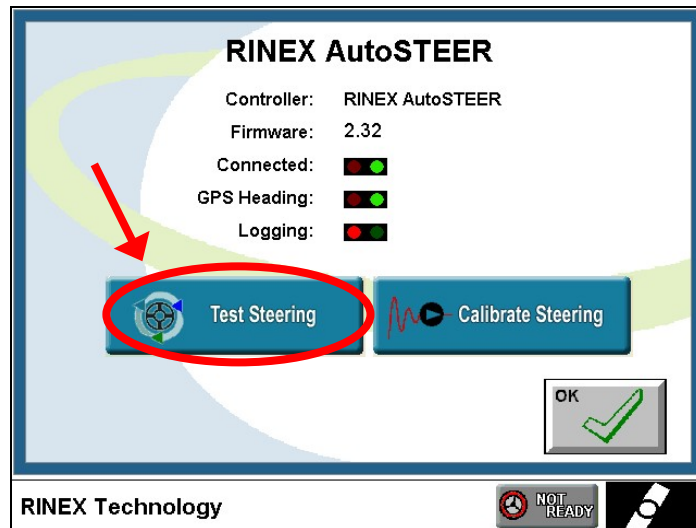


Figure 4-3 RINEX AutoSTEER screen

- 4) Ensure that no one is near the vehicle or anywhere where they may get injured when the vehicle turns. Touch **PULSE LEFT**, the steering should turn left. Touch **PULSE RIGHT**, the steering should turn right.
- 5) If the steering turns right when **PULSE LEFT** is pressed and left when **PULSE RIGHT** is pressed the left and right valve connections should be swapped over, and then repeat step 4 to check.

4.4 Calibrating the AutoSTEER

There are two different modes of operation for the AutoSTEER system, Proportional Pulsing and Full Proportional. The mode of operation selected will affect the method required to calibrate the AutoSTEER system.

Proportional Pulsing is the default method for the AutoSTEER system and applies to all hydraulic kits supplied by RINEX. To calibrate the AutoSTEER system using this mode of operation, see section 4.4.2 AutoSTEER Calibration Procedure.

Full Proportional is used on some OEM hydraulic valves where Proportional Pulsing is too fast for the system. This procedure should only be used if directed to do so by RINEX. To calibrate the AutoSTEER system using this mode of operation, see APPENDIX 2 – Full Proportional Calibration Procedure.

For AutoSTEER controllers fitted with Tilt Compensation this feature should be setup before performing the AutoSTEER Calibration Procedure; to setup and calibrate Tilt Compensation see section 4.4.1 Tilt Compensation Calibration Procedure.

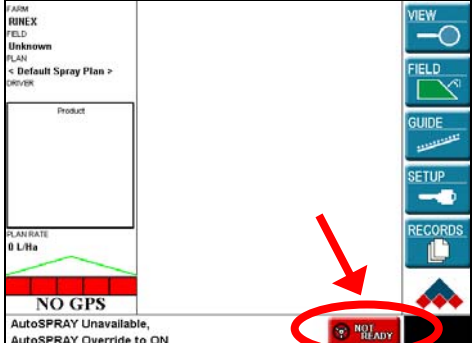
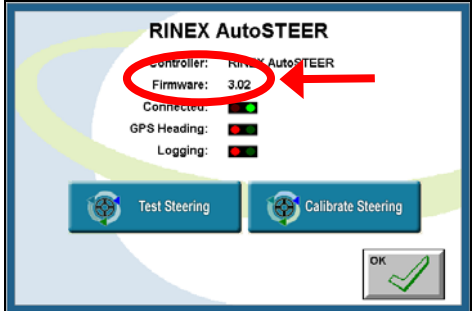

For a definition of the settings used when calibrating the AutoSTEER see section 4.5.

4.4.1 Tilt Compensation Calibration Procedure

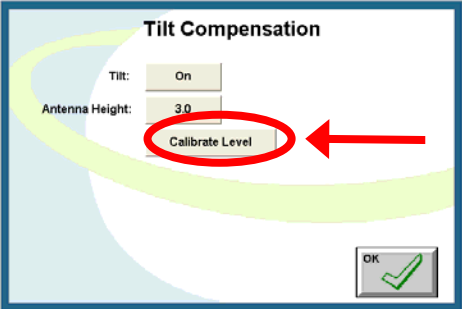
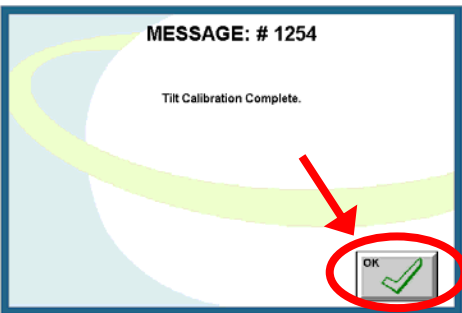
Some AutoSTEER controllers are fitted with a Tilt Compensation module which allows the system to compensate for any side slopes the vehicle may cross.

AutoSTEER controllers with this option fitted will have a yellow Tilt Comp sticker fitted to the top of the controller and the Firmware version will be displayed as 3.02 or newer.

For Tilt Compensation to function correctly the AutoSTEER controller must be fitted in the direction shown on the sticker and the module must be calibrated on flat level ground. The following instructions indicate how to setup and calibrate Tilt Compensation.

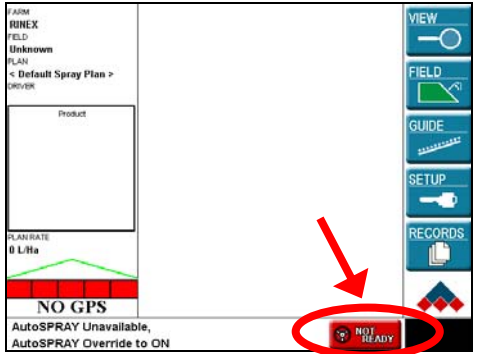
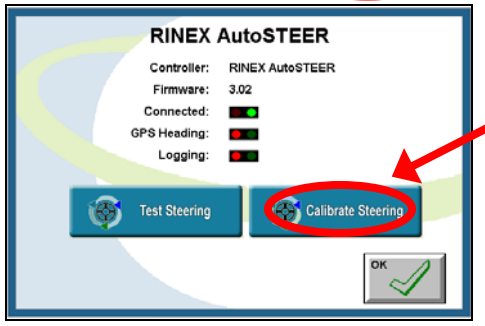
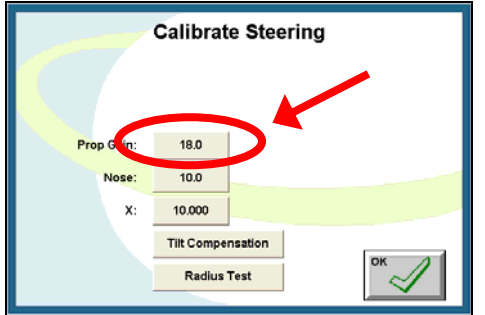
1	Check the Controller Firmware version is 3.02 or newer	
1.1	From the main screen touch and hold the AutoSTEER Status button for 4 seconds.	
1.2	The RINEX AutoSTEER main screen will be displayed and the firmware version will be shown.	
2	Turn Tilt Compensation ON	
2.1	Press the CALIBRATE STEERING button to display the Calibrate Steering screen	

2.2	Press the TILT COMPENSATION button to display the Tilt Compensation screen	
2.3	Press the Tilt OFF/ON button repeatedly until it displays ON Note: If the connected AutoSTEER controller is not equipped with Tilt Compensation Tilt will not turn ON	
3 Set the antenna height		
3.1	Measure the height of the antenna to within 5cm	
3.2	On the Tilt Compensation screen press the Antenna Height VALUE button, enter the antenna height and press OK	
4 Calibrate the Level position for the controller		
4.1	Ensure the vehicle is parked on a Flat Level surface	Tip: As GPS signal is not required to perform Level Calibration a shed floor may be used as the level surface if needed.

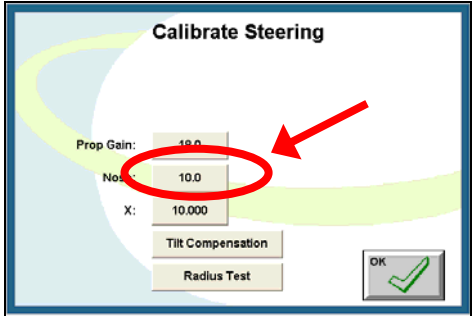
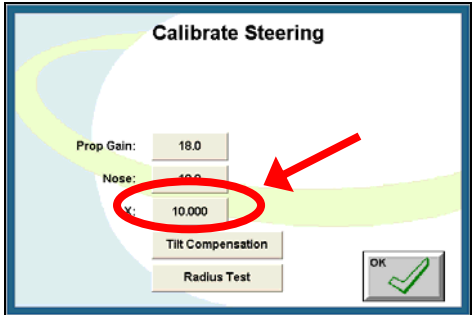
<p>4.2</p>	<p>On the Tilt Compensation screen press the CALIBRATE LEVEL button, then press the OK button</p>	
<p>4.3</p>	<p>When calibration is complete press the OK button</p>	

4.4.2 AutoSTEER Calibration Procedure

Before starting the calibration procedure ensure you are in a large open space and that you are aware of all obstacles around you. Ensure that there is no people close by when you are calibrating the AutoSTEER. Ensure you stay alert and aware of your surrounds at all times. Ensure that you are always in control of the vehicle. In an emergency situation stop the vehicle and turn the power switch OFF on the AutoSTEER controller to return absolute, full control back to the operator.

1	Ensure that any adjustment on the valve is set as described in the hydraulic kit installation manual.	
2	Set the Proportional Gain to 18	
2.1	From the main screen touch and hold the AutoSTEER Status button for 4 seconds	
2.2	Touch CALIBRATE STEERING Button to display the Calibrate Steering Screen	
2.3	Touch Prop Gain VALUE button, enter 18 and press OK	

3	Use Radius Test to AutoSTEER a 10,000m radius line	
3.1	From the Calibrate Steering Screen press the TEST RADIUS button	
3.2	Touch Radius VALUE button, enter 10000 and press OK	
3.3	While moving press the START RADIUS TEST button	
3.4	Observe the steering wheels of the vehicle, looking for any oscillations left and right. When done press STOP RADIUS TEST to disengage the steering	
4	If the steering wheels were oscillating left and right return to step 2 and reduce Proportional Gain by 2	
5	Manually steer the vehicle so that it follows a straight line, then use Radius Test to AutoSTEER a 25m radius line (clockwise circle).. Note: During this test the vehicle will turn right, ensure there is enough space to perform this test.	

6	<p>When the test is started the vehicle should turn right quickly and hold a circle.</p> <p>→ If the steering is un-responsive (takes a very long time to achieve desired radius) increase the Proportional Gain by 0.5 and return to step 3</p> <p>→ If the steering is oscillating left and right reduce the Proportional gain by 0.5 and return to step 3</p>
7	<p>Manually steer the vehicle so that it follows a straight line, then use Radius Test to AutoSTEER a -25m radius line (anticlockwise circle).</p> <p>Note: During this test the vehicle will turn left, ensure there is enough space to perform this test.</p>
8	<p>When the test is started the vehicle should turn left quickly and hold a circle.</p> <p>→ If the steering is un-responsive (takes a very long time to achieve desired radius) increase the Proportional Gain by 0.5 and return to step 3</p> <p>→ If the steering is oscillating left and right reduce the Proportional gain by 0.5 and return to step 3</p> <p>Note: Once the Proportional Gain has been set it should not be changed, use the X & Nose values to change the steering performance</p>
9	<p>Set the Nose Value</p>
9.1	<p>The starting value for the nose should be 200 divided by the average maximum speed of operation.</p> <p>Example: $200 / 30\text{km/hr} = 6.7$</p>
9.2	<p>From the Calibrate Steering Screen press the Nose VALUE button, enter desired value and press OK</p> 
10	<p>Set the X value to 10</p>
10.1	<p>From the Calibrate Steering Screen press the X VALUE button, enter 10 and press OK</p> 

11	Set AB Line and start Parallel Guidance
12	With the vehicle less than 1m from the AB line and within 10 degrees of the line set AutoSTEER ON while travelling at 70% of the Normal max speed
13	Observe the behaviour of the vehicle. Using Figure 4-4 as a guide, increase or decrease the Nose & the X values to change the response of the AutoSTEER
14	When complete record the tune settings in the space provided in Appendix 3.

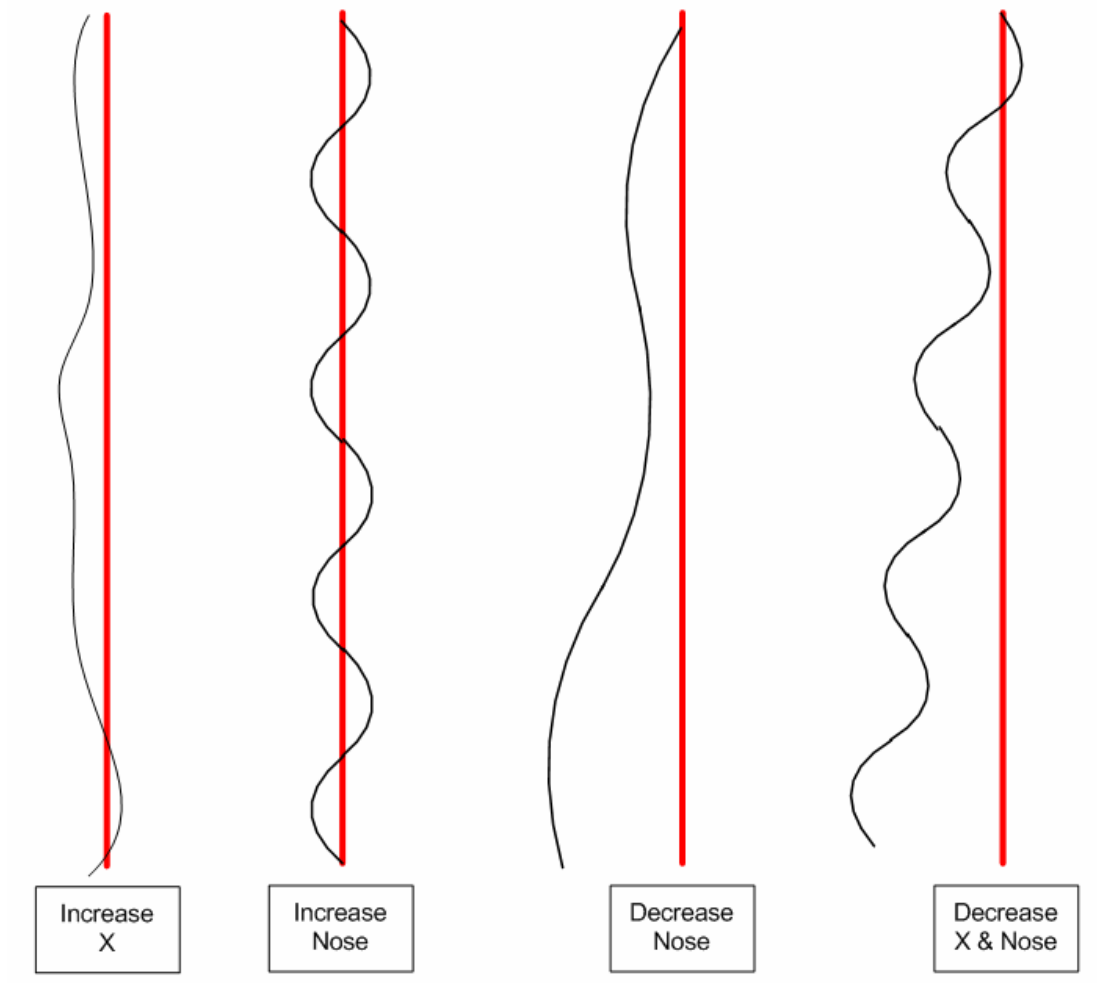


Figure 4-4 AutoSTEER Adjustments

4.5 Calibration Parameter Definitions

The settings shown are suitable for setting by the vehicle operator, all other AutoSTEER settings should not be changed and are for RINEX use only.

Setting	Description	Approx value range
Prop Gain (Proportional Gain)	<p>Proportional Gain is the aggressiveness of the hydraulic system. If this value is too high there will be sharp left / right turns; if this value is too low the steering will meander and be non-responsive.</p> <p>Decrease this value to get more stability, but less response (more drift). If the vehicle is drifting away from the line or not approaching the line fast enough, increase the value. Decrease the value if the vehicle is oscillating at too high a frequency.</p>	<p>Normal Range 10-20 Default 18</p>
Full Proportional Mode Only Min Left (Minimum Output Left)	<p>Minimum Left is the minimum voltage required before getting a response by the hydraulic valve when turning LEFT. Minimum Left is expressed as a percentage.</p>	<p>Normal Range = 5 to 50 Default 30</p> <p>Note: It is normal to sometimes have a difference of 10 to 15% between the Left & Right Minimum settings.</p>
Full Proportional Mode Only Min Right (Minimum Output Right)	<p>Minimum Right is the minimum voltage required before getting a response by the hydraulic valve when turning RIGHT. Minimum Right is expressed as a percentage.</p>	<p>Normal Range = 5 to 50 Default 30</p> <p>Note: It is normal to sometimes have a difference of 10 to 15% between the Left & Right Minimum settings.</p>

Setting	Description	Approx value range
Nose	<p>The nose is the projected point in front of the vehicle where the vehicle is trying to come online. A larger Nose value will provide more stability but will take longer to come online. If the nose value is too low the machine will tend to oscillate left and right.</p> <p>The Nose is measured in seconds therefore as the vehicle speeds up the nose point is lengthened or shortened as the vehicle slows.</p>	<p>Normal Range = 6 to 12</p> <p>Calculated as 200 divided by the normal maximum speed (km/hr)</p>
X	<p>X is how hard the steering will push left and right when it is offline.</p> <p>If X is too low the machine will tend to drift slowly away from the line. If this value is too high the machine will tend to overshoot the guideline.</p>	<p>SP Sprayers & Tractors Normal Range = 5 to 7</p> <p>4WD Articulated Tractors Normal Range = 12 to 18</p>



5

Using

AutoSTEER

5.1 Engaging AutoSTEER

Once AutoSTEER is enabled and setup it is ready to use.

AutoSTEER is simply engaged and disengaged by pressing the AutoSTEER button on the Status Bar (as shown in Figure 5-1). Alternatively AutoSTEER can be engaged by using optional remote button box or foot switch.



Figure 5-1: The AutoSTEER Status Button

Before AutoSTEER will be ready to be engaged, a number of conditions must be met. (For more information on the various AutoSTEER Status button states see section 5.3.)

- 1) Guideline must be set.
- 2) Vehicle must be travelling parallel to the guideline.
- 3) Vehicle must be within 2m of the guideline.
- 4) Vehicle must be travelling between 1 and 29 km/hr.

When all of the above conditions have been met, the AutoSTEER Status button which is displayed on the right hand side of the status bar will change to READY.

When the AutoSTEER Status button is pressed, while displaying READY, AutoSTEER will be engaged and the vehicle will start to steer automatically down the guideline. The AutoSTEER Status button will display ON when AutoSTEER is engaged.





5.2 Disengaging AutoSTEER

Once AutoSTEER is ON, there are various methods of disengaging it.

- 1 Move the steering wheel (only when the override sensor switch kit is fitted).
- 2 Press the AutoSTEER Status button when it is displaying ON.
- 3 If connected & configured press the assigned button on the optional remote button box.
- 4 If connected & configured press the optional foot switch.
- 5 Press **GUIDE OFF** in the Guide Menu.

5.3 The AutoSTEER Status Button

When AutoSTEER is enabled, a button will appear on the status bar at the bottom of the screen to the right. This button displays the current status of AutoSTEER. There are four states of operation when in AutoSTEER mode:

Status	Meaning
	<p>The AutoSTEER system has an Error. Usually this would occur when the guidance system can not communicate with the AutoSTEER controller, check the controller is turned ON and the interface cable is securely connected.</p>
	<p>The AutoSTEER system is operational but Not Ready to be engaged. There may be no guideline set or the vehicle is moving too slow or too fast.</p>
	<p>The AutoSTEER system is Ready to be engaged.</p>
	<p>The AutoSTEER system is engaged and currently steering the vehicle.</p>



6

Appendix

APPENDIX 1 – AutoSTEER Disclaimer Message

Disclaimer

This vehicle is equipped with a RINEX AutoSTEER system. Use of this system is strictly limited to providing steering assistance to the operator who must remain in control of the vehicle at all times.



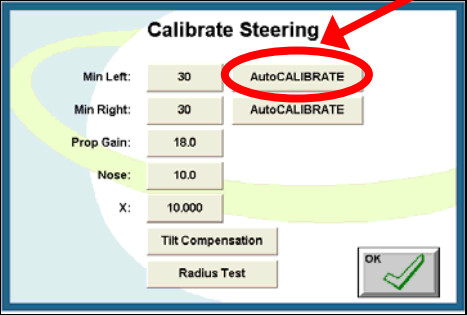
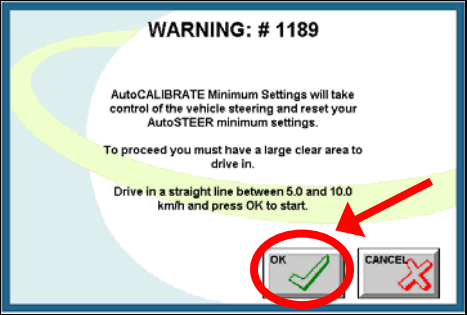
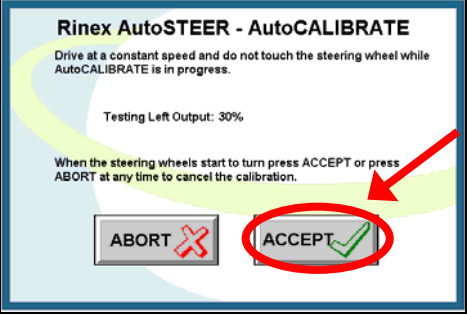
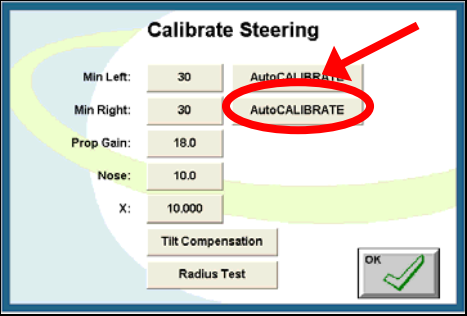
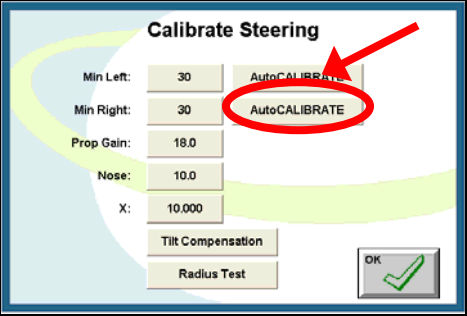
RINEX, including its officers, servants and agents, does not make any representation to any party and will not accept any responsibility or liability whatsoever for any loss or damage of whatever nature suffered by any such person or corporation choosing or seeking to use this system or any part thereof.

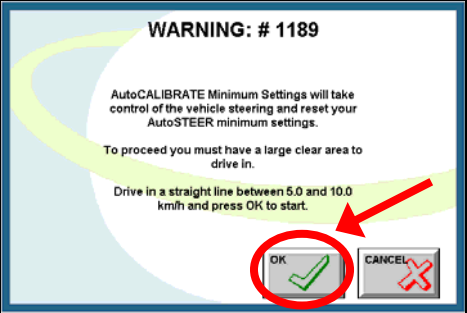
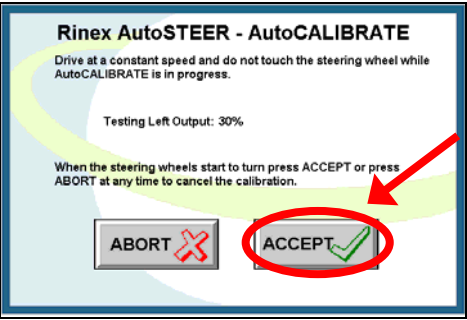
By use of this system you agree that RINEX is not liable or responsible for any damage whatsoever to the vehicle, any property, personal injuries, or death that may result from the use or abuse of this system.

APPENDIX 2 – Full Proportional Calibration Procedure

When directed by RINEX to use the AutoSTEER in Full Proportional Mode follow these steps before running the AutoSTEER Calibration Procedure in section 4.4.2

1	Set the AutoSTEER mode to Full Proportional	
1.1	From the main screen touch and hold the AutoSTEER Status button for 4 seconds	
1.2	Touch and hold the CALIBRATE STEERING Button for 4 seconds until the Advanced Calibrate Screen is displayed	
1.3	Touch the Z VALUE button repeatedly until it displays 0 Note: Do not change any other values in the Advanced Calibrate window unless directed to do so by RINEX.	
1.4	Press the OK button to return to the RINEX AutoSTEER main screen	

<p>2</p>	<p>Determine and set the Minimum Left value</p>	
<p>2.1</p>	<p>From the RINEX AutoSTEER main screen press the CALIBRATE STEERING button</p>	
<p>2.2</p>	<p>Press the AutoCALIBRATE button for the Min Left value Note: Ensure there is enough space to complete this step. The vehicle may need to travel for 400m before this value is determined at which time the vehicle may turn left suddenly</p>	
<p>2.3</p>	<p>Manually drive the vehicle in a straight line between 5 & 10 km/hr and press the OK button when ready to start the calibration</p> <p>When the vehicle begins to turn left press the ACCEPT button followed by the OK button</p>	 
<p>3</p>	<p>Determine and set the Minimum Right Value</p>	
<p>3.1</p>	<p>From the Calibrate Steering screen press the AutoCALIBRATE button for the Min Right value Note: Ensure there is enough space to complete this step. The vehicle may need to travel for 400m before this value is determined at which time the vehicle may turn right suddenly</p>	

<p>3.2</p>	<p>Manually drive the vehicle in a straight line between 5 & 10 km/hr and press the OK button when ready to start the calibration</p>	
<p>3.3</p>	<p>When the vehicle begins to turn left press the ACCEPT button followed by the OK button</p>	
<p>4</p>	<p>To complete calibration perform the AutoSTEER Calibration Procedure in section 4.4.2</p>	

APPENDIX 3 – AutoSTEER Tune Settings

Date: _____

Min Left Output: _____ (Full Proportional Mode Only)

Min Right Output: _____ (Full Proportional Mode Only)

Proportional Gain: _____

Nose: _____

X: _____

Tilt Compensation

Tilt: ON / OFF

Antenna Height: _____

ADVANCED SETTINGS

Max Output: _____

Int Gain: _____

Der Gain: _____

Dead Band: _____

TAU: _____

Cutout: _____

Z: _____

Comments:

