ENGLISH

SOLSTEER

Installation and User Manual
CNH Tractor Agri-Steer

Automatic steering system

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Information and technical data detailed in this manual represent the latest version at the time of publication. Revisions to this document may be made without prior notice. This document is revision 5.0.

Contents

1. Important User Information 2
1.1 The Agri-Steer 2
1.2 The Installation and User Manual 2
1.3 Intended Use 2
1.4 Technical Support 3
1.5 Copyright 3
2. Safety 5
2.1 Symbols 5
2.2 Important Safety Warnings 6
2.3 User Responsibility 6
2.4 Operating Personnel 7
2.5 Specialist Staff 7
2.6 Personal Protective Equipment (PPE) 8
2.7 General Safety Instructions and Accident Prevention Regulations 8
3. Installation Guide 11
4. Set-up Guide 23
5. Steering Tuning 26
6. Troubleshooting 28

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1. Important User Information

1.1 The Agri-Steer

The Agri-Steer has been designed to convert steering commands coming from the John Deere GreenStar system into commands that the vehicle can understand without the need for an electrically driven steering system. It is a ‘Plug and Play’ solution.

1.2 The Installation and User Manual

This installation and user manual must be read and fully understood prior to using the Agri-Steer. This installation and user manual provides information regarding the correct use of the Agri-Steer. It is required that **all** safety instructions be read carefully, prior to using the Agri-Steer. It is advised that this manual always remains with the operator of the machine and is easily accessible.

This installation and user manual **does not** replace the user manuals of other manufacturers of tractors, agricultural equipment, and devices. These manuals must be carefully read and understood including all safety instructions prior to reading this manual.

Information regarding regulations for the prevention of accidents and protection of the environment must also be followed when conducting any work with the use of the Agri-Steer.

1.3 Intended Use

The Agri-Steer should only be used for steering applications in agricultural machines. The use of the Agri-Steer for other applications, making unauthorised changes, adding, or removing parts or any configurations to the software or hardware will be considered contrary to the intended use of the Agri-Steer.
The manufacturer is not liable for any damages or negative externalities resulting from these activities and therefore the risk lies solely with the user. The manufacturer disclaims any liability for damage or injury resulting from the failure to follow **all** instructions, cautions and warnings detailed in this manual.

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It is required that the Agri-Steer be only used by authorised individuals who have been introduced to the functions of the product.

The product may only be used in conjunction with the information provided in this manual. The use of the Agri-Steer beyond what is stated in this manual may lead to personal injury, as well as machine damage.

Any safety and warning iconography used in this manual must be closely observed to ensure safe use of the Agri-Steer. It is important that the operator must contact SolSteer Ltd prior to use of the Agri-Steer, if any information provided in this manual is not fully understood by the operator.

1.4 Technical Support

SolSteer will assist with any technical support or information that is required. Support is available via telephone, email and the internet during business hours, Monday to Friday. Please contact SolSteer using the following contact information:

Address: SolSteer Limited, Link Farm, Pulborough, West Sussex, RH20 2EL, UK
Website: www.solsteer.com
Email: info@solsteer.com

1.5 Copyright

This document must be treated as confidential and its intended use is for the operator alone. Breaching this may result in legal action.

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EC Declaration of Conformity

The Manufacturer

SolSteer Limited
Link Farm, Pulborough, West Sussex, RH20 2EL, UK

hereby declares under his sole responsibility that the product:

Agri-Steer ECU/001

is in conformity with the following standard:

- BS EN 61326-1:2013 - Electrical equipment for measurement & control. EMC requirements.

in compliance with the provisions of the following EU guidelines:

- Directive 2014/30/EU of the European Parliament and of the Council of 20th April 2016.
- Directive 2011/65/EU of the European Parliament of 8th June 2011 (2002/95/EC and successive amendments recast)
- EMC Directive 2004/108/EC (Electronic Compatibility)
- Commission Delegated Directive (EU) 2015/863 of 31st March 2015 amending to Annex II to Directive 2011/65/EU of the European Parliament and of the Council as regards the list of restricted substances

I hereby declare that the equipment above has been designed to comply with the relevant sections of the above referenced specifications. The product complies with all the essential requirements of the mentioned EU Directives.

Name: Chaunce Barrett-Crosdil
Position: Director
Place: Pulborough, UK
Date: 11/08/2020

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2. Safety

This manual contains basic safety information that must be followed during installation and operation. If safety instructions are not followed, you risk injury to yourself and others as well as risk of damage to the product, property, and the surrounding environment.

2.1 Symbols

The following symbols are used throughout this document to notify of safety instructions that must be carefully followed to avoid accidents, personal injuries, and damage to property.

WARNING!
A danger which may result in death or serious injury if instructions are not followed.

CAUTION!
A danger which may result in injury if instructions are not followed.

ELECTRICAL HAZARD!
An electrical hazard which may result in injury if instructions are not followed.

FIRE HAZARD!
A fire hazard which may result in injury if instructions are not followed.

INFO
Useful information and recommendations to ensure optimal product performance.

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2.2 Important Safety Warnings

- The Agri-Steer **does not** avoid obstacles autonomously. The user of the Agri-Steer **must always** be in the operator seat of the vehicle to manually override the Agri-Steer system to avoid obstacles such as people, trees etc.
- The Agri-Steer **does not** control the speed of the vehicle. The user of the Agri-Steer **must always** manually control the speed of the vehicle while using the Agri-Steer system
- The Agri-Steer system **must not** be used when the vehicle is on public roads. The Agri-Steer system **must** be disconnected prior to the vehicle being driven on public roads

2.3 User Responsibility

The Agri-Steer is to be used solely for commercial applications and therefore the user is subject to statutory requirements for safety at work. The user must follow all safety instructions, the instructions for the prevention of accidents and the regulations for environmental protection.

The user must familiarize himself with all health and safety requirements and if necessary, carry out a risk assessment for the environment in which the product is used.

The user must ensure that any other persons using the Agri-Steer has read and understands this installation and user manual prior to use. Any other persons who use the Agri-Steer must also be familiarized with the functions of the product and of the potential risks associated with the product if the safety instructions are not followed.

The operator of the vehicle is solely responsible for safe operation of the vehicle which has the Agri-Steer installed.

The steering system **is not** designed to replace the role of the operator.

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2.4 Operating Personnel

To prevent personal injury, damage to the product or damage to the environment persons using the Agri-Steer must satisfy the following requirements:

- Are physically capable of controlling the SolSteer user interface
- Can carry out work safely using the Agri-Steer following all instruction stated in this manual
- Understands the basic function of the product and can recognise and understand the dangers associated with the work
- Understands the contents of this manual and can safely apply this information when using the product
- Are competent with any other products, devices and machines associated with the Agri-Steer such as tractors, rear and front mounted implements, and navigation systems
- Have read and fully understood user and operator manuals of these associated products, devices, and machines prior to using the Agri-Steer. All safety instructions of these products, devices and machines must be fully understood and implemented prior to using the Agri-Steer
- Are instructed and trained to operate the machine and is aware of all preventative measures to eliminate potential risks and dangers.

2.5 Specialist Staff

Specialist staff are those who are permitted to carry out assigned tasks and can identify potential risks associated with the Agri-Steer by themselves. They are specialized individuals with the capable knowledge and experience of applicable regulations associated with the product. They have permission to install, diagnose and update software as well as make internal changes to the product. They are the **only** personnel permitted to carry out repairs. These individuals include but are not limited to the following:

- SolSteer staff and technicians
- SolSteer dealers
- Individually SolSteer trained personnel

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2.6 Personal Protective Equipment (PPE)

When using the Agri-Steer and other associated products, devices and machines it is vital that the following equipment are worn during use and installation of the Agri-Steer. Not wearing this equipment increases the risk of injury or serious health problems. The following are recommended while installing the Agri-Steer:

- Wear non-conductive, protective gloves
- Wear insulated protective footwear
- Wear protective clothing
- Never wear rings, chains, or jewellery
- Long hair must be tied up, or covered

2.7 General Safety Instructions and Accident Prevention Regulations

The Agri-Steer manufacturers and installers disclaim all responsibility for damage or physical harm caused by the failure to adhere to the following safety requirements.

To eliminate the risk of death or serious injury the following instructions **must** be strictly followed:

- **Never** leave the vehicle operator's seat with the Agri-Steer engaged
- **Never** allow people or obstacles near the vehicle during installation, start-up, calibration or tuning of the Agri-Steer system unless authorised
- **Never** drive on public roads with the Agri-Steer system engaged, ensure that it is shut down and fully disconnected prior to driving
- Ensure a stable position when installing the Agri-Steer system to the vehicle. If this is not possible use a step ladder to provide a safe working platform instead
- **Always** switch off the vehicle when installing or checking hardware near the Wheel Angle Sensor (WAS). Movements in the steering mechanism can result in death or serious injury

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2. Safety

To eliminate the risk of electrical shock the following safety instructions **must** be strictly followed:

- **Always** disconnect the power supply when performing electrical works on the vehicle during installation and repairs. If there is no battery power switch, then disconnect the battery
- Carefully inspect wiring of equipment before each use. No exposed wiring should be visible
- Any damaged or frayed wiring, lack of insulation on wiring and any damaged plugs or connectors should be taken out of service immediately and reported and returned to SolSteer Ltd
- Know the location of isolator switches and how to operate them prior to use of the Agri-Steer
- Ensure any water or chemicals are not within the proximity of the Agri-Steer at all times
- Ensure any electrical conductors are not within the proximity of the Agri-Steer at all times
- Isolate the product by disconnecting the power source prior to servicing or repairing the Agri-Steer
- When handling electrical equipment that is plugged in, dry non-conductive protective gloves and insulated protective footwear are recommended
- If working with only one hand, ensure that the other hand does not make contact with any conductive material
- If the product directly interacts with water or other chemical liquids, the equipment must be shut off at the main power and disconnected immediately
- If an individual comes into direct contact with a live electric source **do not** make contact with the individual, equipment, wiring or other connected devices. Disconnect the power source immediately by switching off the main power or disconnecting the main plug.

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To eliminate the risk of a fire the following safety instructions **must** be strictly followed:

- Immediately disconnect the power source when a component exhibits abnormal heat generation
- Immediately disconnect the power source when a component starts sparking or smoking

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3. Installation Guide

Prior to the installation of the Agri-Steer please verify with the vehicle manufacturer that the vehicle has the following:

- A factory installed steering system such as the Case IH AccuGuide Ready, the New Holland IntelliSteer Ready, the AGCO AutoGuide Ready, the Fendt VarioGuide Ready, the Deutz Agrosky Ready or other manufacturer specific steering systems.
- Calibrated factory installed components such as a steering valve, steering wheel encoder and wheel angle sensor.
- A steering system in good working order with no play and proportionally steers left and right.
- An electrical system and battery operating correctly and in good working condition.
- A clean internal environment within the vehicle cab to ensure safe installation of hardware and for safe cable routing.
-

If the vehicle does not satisfy any of the above requirements, then these must be rectified prior to installation of the SolSteer Agri-Steer. The SolSteer CNH Agri-Steer can be used on the following model series:

- New Holland T6 series, Tier 4B
- New Holland T7 series, Tier 4B
- Case Puma Tier 4B
- Case Maxxum
- Case Optum

The CNH Tractor Agri-Steer contains the following components:

Part Number	Quantity	Description
CNH/011	1	CNH Tractor Agri-Steer interface harness
CNH/002	1	CNH SCAN adaptor
S/GS3	1	GS3 harness
ECU/001	1	Agri-Steer module

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Additional parts not provided include:

- John Deere GreenStar display and mounting components
- John Deere StarFire receiver and mounting components

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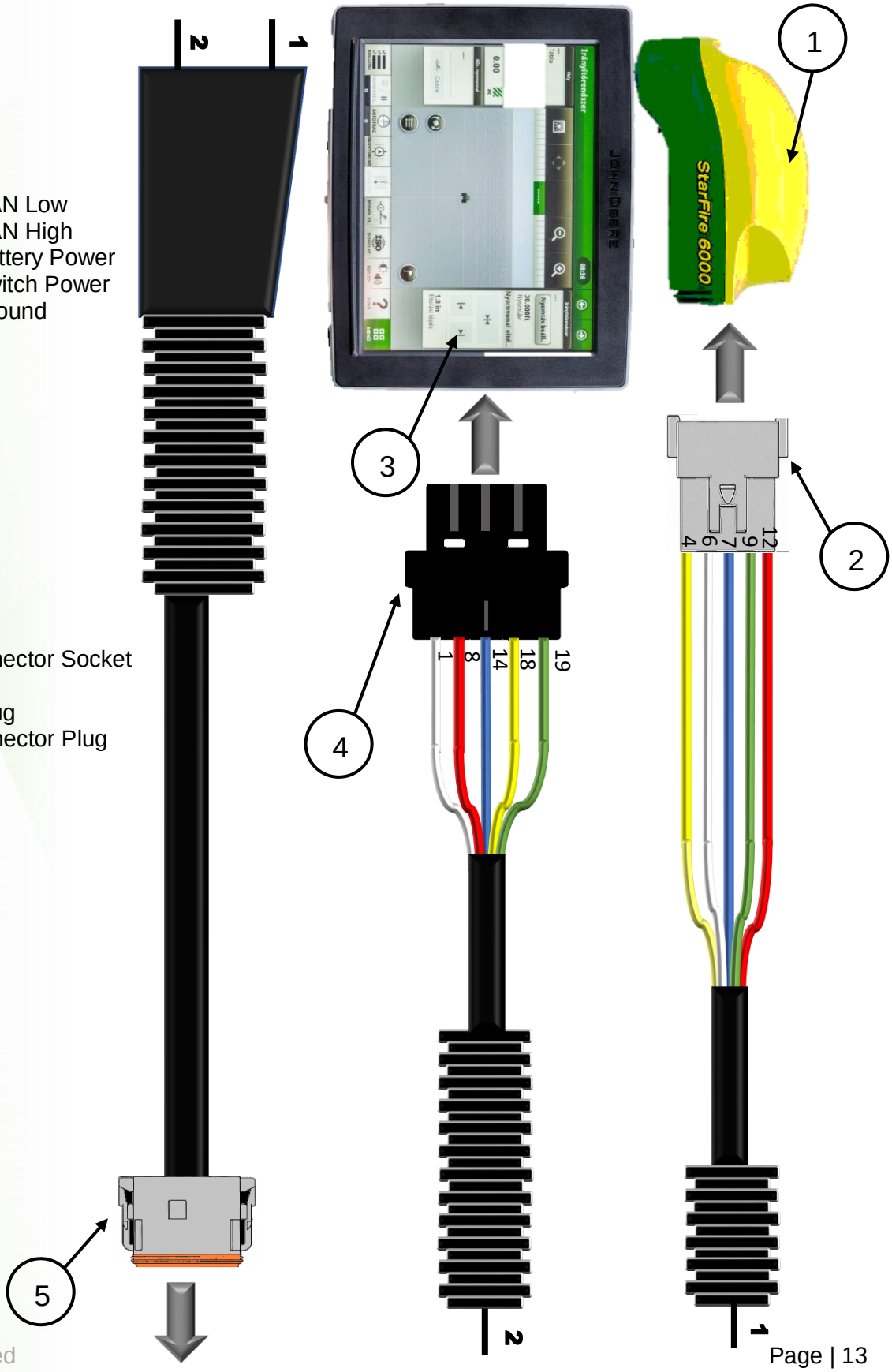
The GS3 Harness (S/GS3)

Not to Scale

Key

CAN Low
CAN High
Battery Power
Switch Power
Ground



1. John Deere StarFire
2. Deutsch 12-way Connector Socket
3. John Deere Display
4. 26-way Connector Plug
5. Deutsch 12-way Connector Plug

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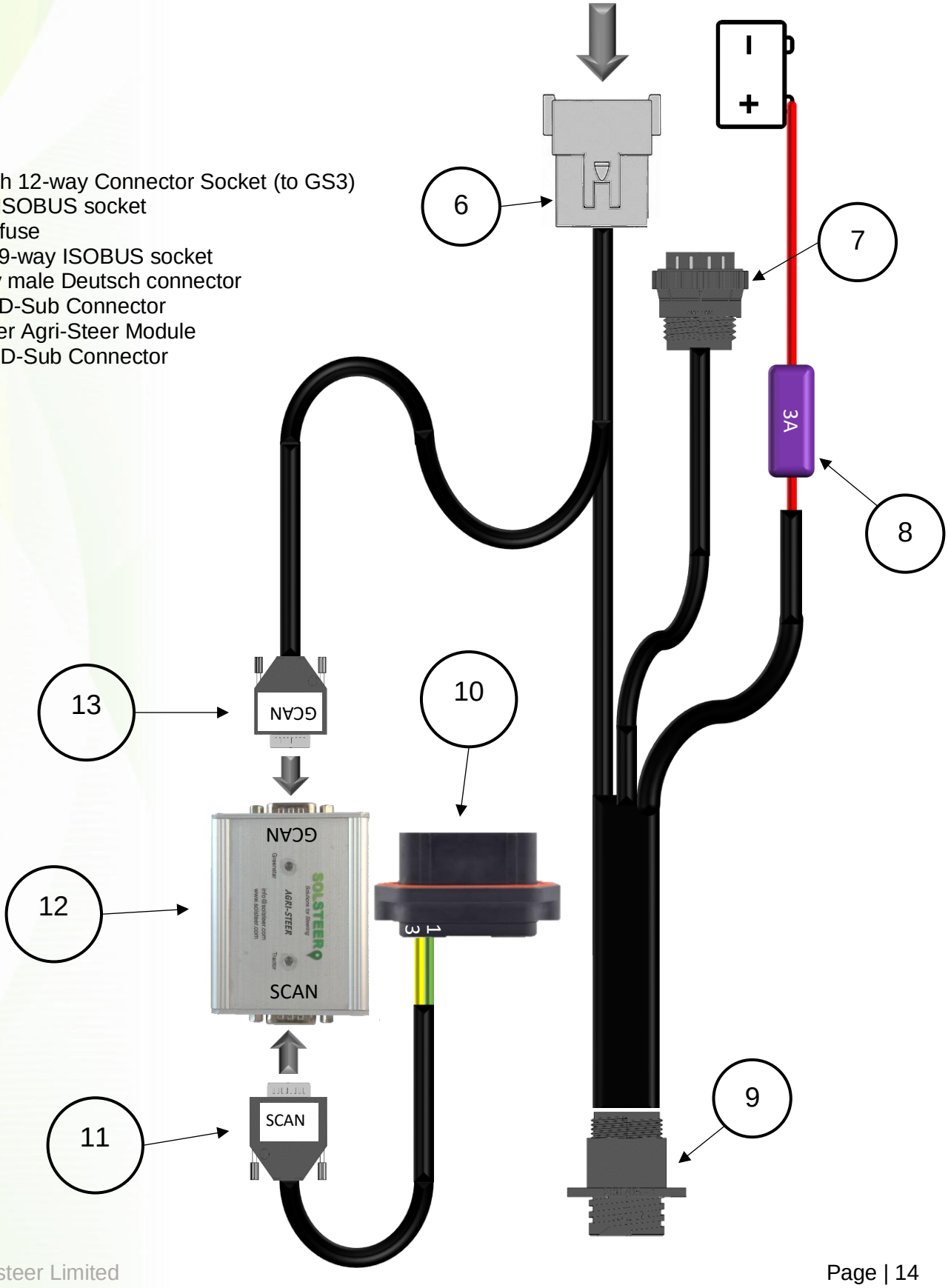
CNH Tractor Agri-Steer Interface Harness (CNH/011)

Not to Scale

6. Deutsch 12-way Connector Socket (to GS3)
7. 9-way ISOBUS socket
8. 3-amp fuse
9. In-cab 9-way ISOBUS socket
10. 40-way male Deutsch connector
11. SCAN D-Sub Connector
12. SolSteer Agri-Steer Module
13. GCAN D-Sub Connector



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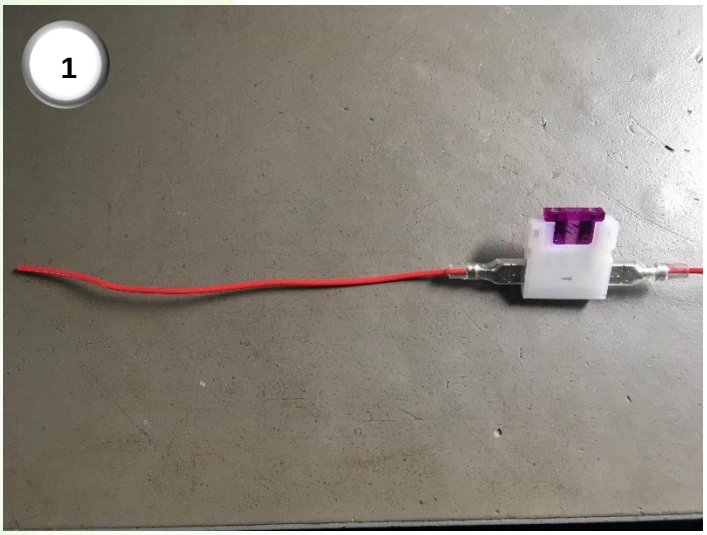
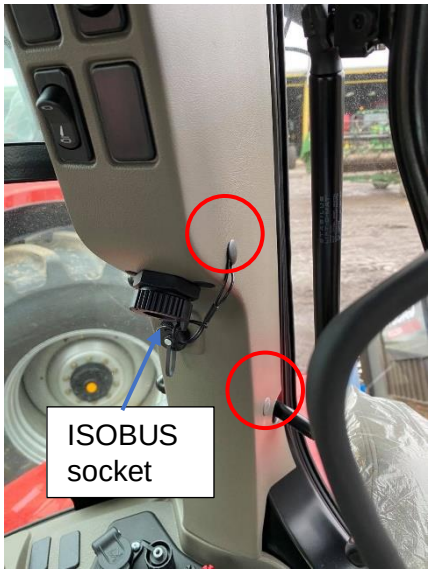
3. Installation Guide

To ensure safe and correct installation of the CNH Agri-Steer please adhere closely to the following instructions:



1) Connect the CNH Agri-steer interface harness to a permanent power source with the red wire.

2) Remove the NAV controller panel to the left of the driver's seat and locate the 40-way Deutsch connector. Plug the Agri-steer loom labelled 'SCAN' here and connect the other end to the port labelled 'GCAN' on the CNH Agri-steer harness (14).



3) Locate the 9-way ISOBUS socket at the back-left column of the cab. Remove the panel where the ISOBUS socket is located, by removing the plastic caps shown and unscrewing the screws beneath them. Replace the 9 way in-cab ISOBUS socket with the same socket of the CNH Agri-Steer harness (10). Connect the remaining 9 way ISOBUS socket of the CNH Agri-steer harness (8) to the 9 way ISOBUS socket that had just been removed.

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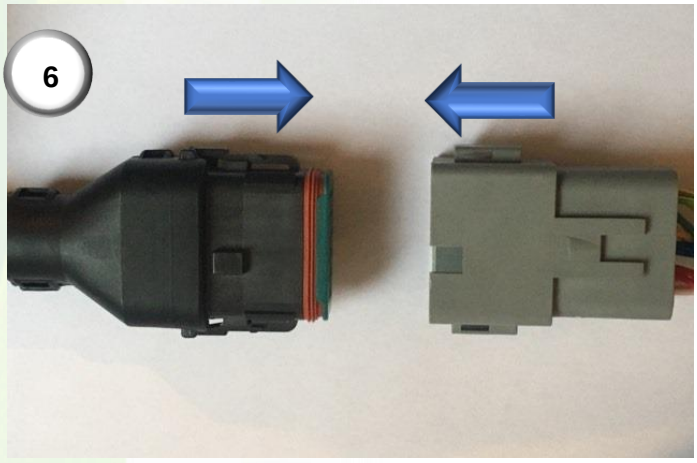
4) Connect 12-way connector of the GS3 harness to the StarFire receiver (2). Ensure that the receiver is mounted as far forwards and as central as possible.

5) Mount the Greenstar VT and connect it to the GS3 harness by plugging in the 26-way connector (5).



6) Connect the 12-way connector of the CNH Agri-steer harness (7) to the 12 way connector of the GS3 harness (6).

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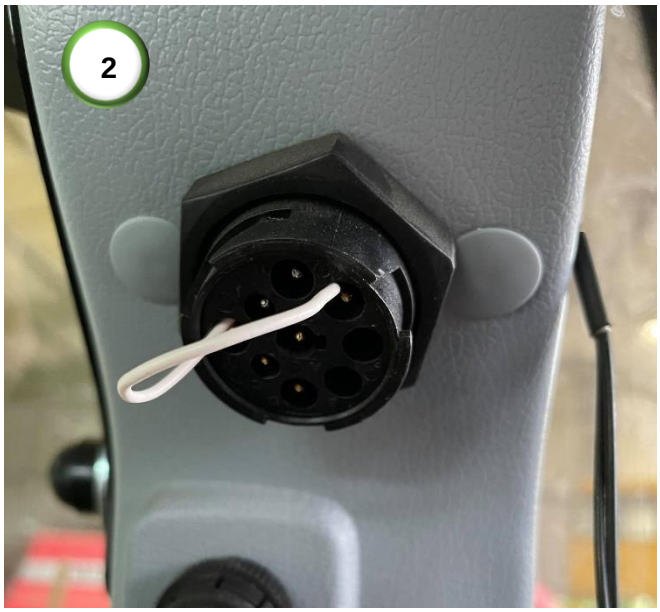
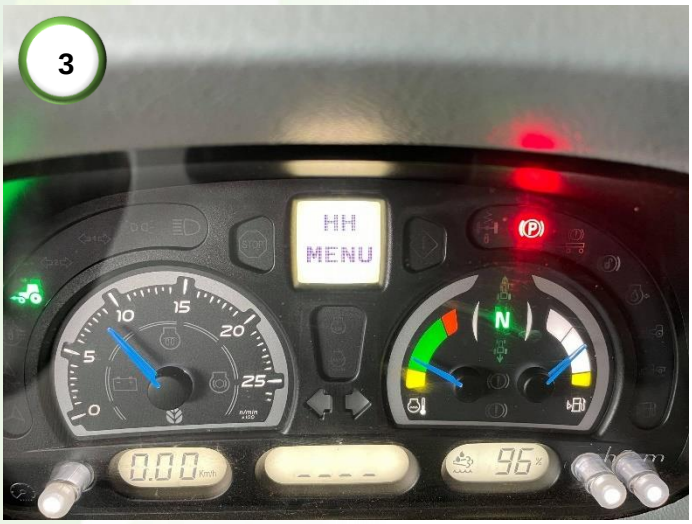
4. CNH Valve Set-up Guide

1) Locate the 9 way in-cab socket located on the back-right upright pillar of the cab.



2) Use a wire connect pins ‘B’ and ‘G’. Turn the tractor on.



3) On the display on the dashboard ‘HH MENU’ should now be displayed.

4) Use the button shown to scroll through the menu on the until ‘U1’ is displayed.

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5) Use the left button shown to enter ‘U1’.

6) Use the button shown until ‘H3’ is shown.

7) Enter the ‘H3’ menu.

8) Scroll through using the button shown.

9) Once a steering icon is displayed, press the button shown to enter it.

10) Now ‘ch _’ will be displayed on the lower middle display.

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11) Press button shown until ‘ch 1’ is shown.

12) When ‘no’ is displayed press button shown.

13) Now press **and** hold the button shown.

14) This will save the ‘yes’ setting.

15) Repeat steps 7 to 10. For step 11, this time select ‘channel 2’.

16) Repeat steps 12 to 14.

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5. Valve and WAS Calibration

1) Perform steps 1 and 5 on page 17.

2) Enter the ‘H1’ menu.

3) Scroll until the ‘steering’ icon is shown.

4) Enter the ‘steering’ menu. ‘WAS’ is shown.

5) Steer full lock right, checking the value shown.

6) Use the button shown to confirm.

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5. Valve and WAS Calibration

7) The word ‘PASS’ should now be shown.

8) Steer full lock left, checking the value shown.

9) Repeat steps 6 and 7. Steer to neutral position.

10) Repeat steps 6 and 7. ‘Spoo’ should show.

11) Move the wheel. ‘MOVE’ will now show. Continue moving the wheel left and right.

12) When ‘Al In’ shows the system is ready to start the auto-calibration routine. Press ‘auto’.

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13) The routine takes about 5 minutes. Ensure there are at least 1500 revs on the dashboard. The value shown should be changing.

14) Once 'End' is shown the auto-calibration routine has finished.

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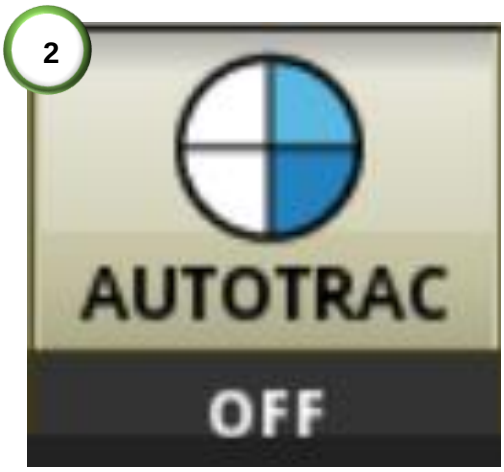
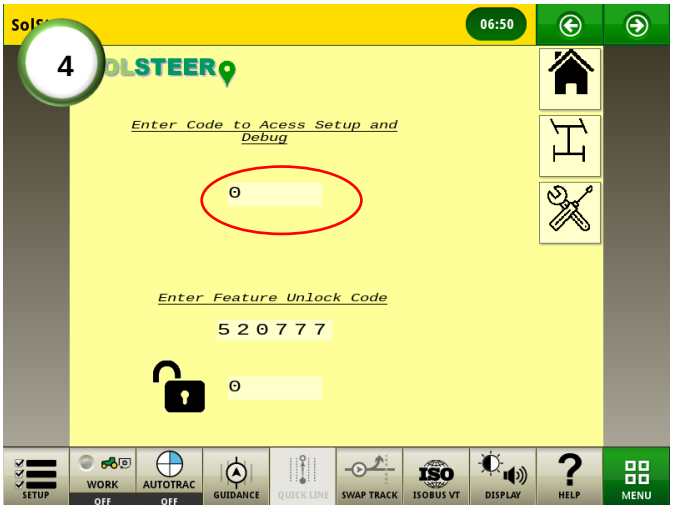
6. Solsteer Set-up Guide



1) Turn the ignition on and wait for the GreenStar to turn on. Note that the LED's on the Agri-Steer module will be red until communication is made with the GreenStar display. The LED's will then flash orange until there is communication with the GreenStar display.

2) Once an A-B line is set, arm the GreenStar for steering. This is done by pressing the 'AUTOTRAC' button at the bottom of the screen. Once three-quarters of the circle are filled the system is ready to engage. **IMPORTANT!** Disarm the GreenStar steering with two-quarters of the circle full when travelling on public roads.



3) Locate the Solsteer page by clicking on the ISOBUS VT icon. When there is a valid track selected, a valid GPS signal and the vehicle is ready to engage, all pre-acquisitions should be ticked.

4) Access the setup and dealer lever diagnostics page. Enter the code 835 into the debug field.

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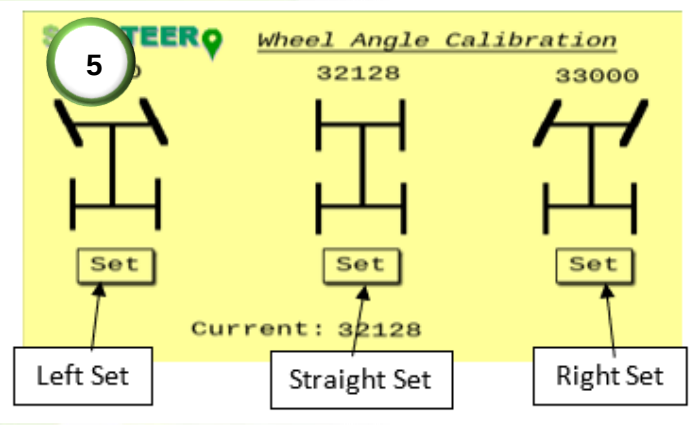

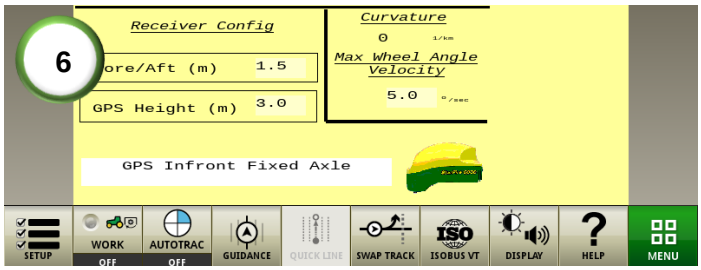

5) Calibrate the wheel angle sensor (WAS) limits. Ensure the current reading angle is not reading 0. Turn the steering wheel full lock left and press the left set button. Turn the wheel full lock right and press the right set button. Turn the wheel to dead straight and press the straight set button. Check the values above each set point to see if they've changed. Repeat the straight calibration using the WAS calibration procedure in step 8.

6) Ensure the receiver config settings are correct. Fore/Aft is the distance between the center of the fixed axle to the receiver. A TCM calibration will be required after changing these values. The maximum speed that the wheels can be turn can be set under 'Max Wheel Angle Velocity'. Default is 5°/sec.

7) Before the tractor will engage, the system needs to be armed. Press the right-hand 'auto' button.

8) A steering wheel with 'auto' will then be displayed on the tractors display. The system is now ready to engage.

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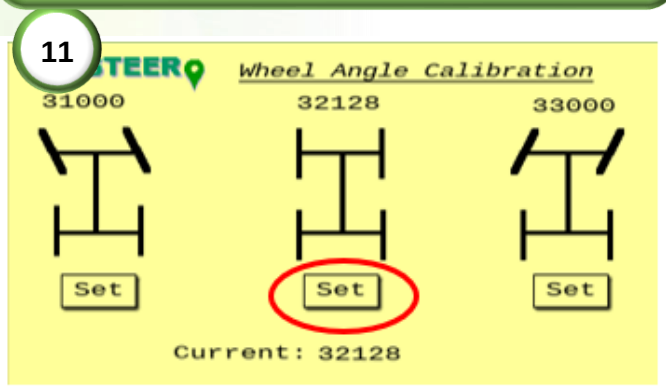
9) Engage the steering by pressing the 'auto' button on the joystick.

10) Engage the steering and drive at about 4kph. Wait for the cross-track error to be holding a stable value around 0cm.



11) While tracking on-line, press the straight set button in the setup page. This will then save the dead center point of the wheel angle sensor (WAS).

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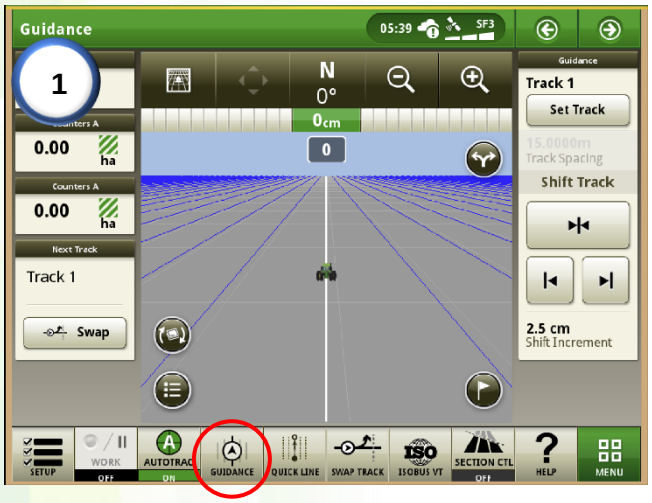
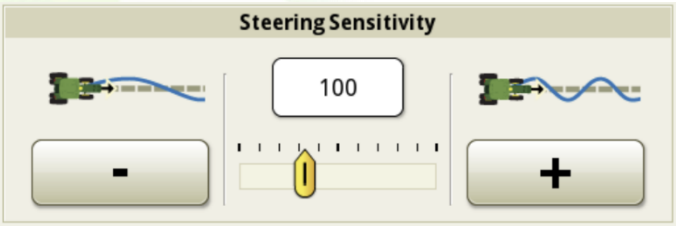
7. Steering Tuning

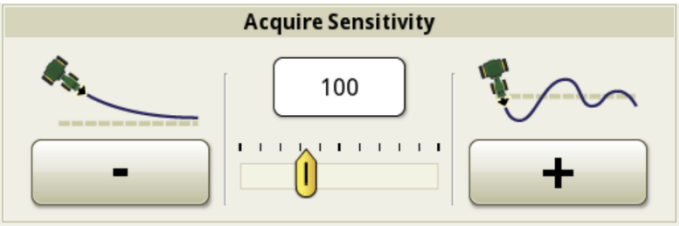
The SolSteer Agri-Steer module uploads to the John Deere Greenstar display the optimal steering adjustment settings for your specific vehicle. However, if for any reason you wish to adjust these values, these can be changed following the steps below.



1) Select the guidance icon shown.

2) Select the steering icon shown. On the menu select 'steering adjustments'. The following options can be adjusted.





3) Adjust this parameter to make the system more aggressive. The higher this number, the more the wheels will turn for the same amount of error. **NOTE:** If this value is too high, the wheels can over- oscillate.

4) Adjust this parameter until the acquisition is satisfactory. The higher this number, the more aggressive the vehicle will turn onto the line.

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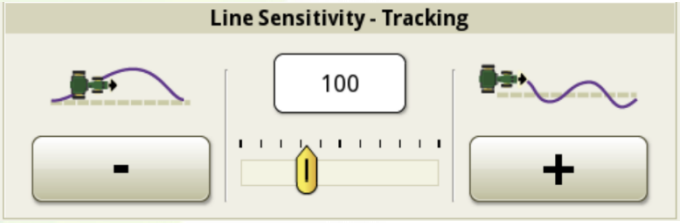
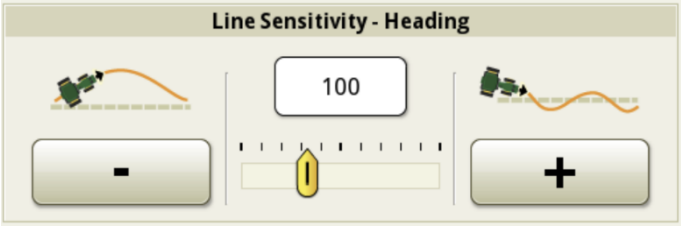
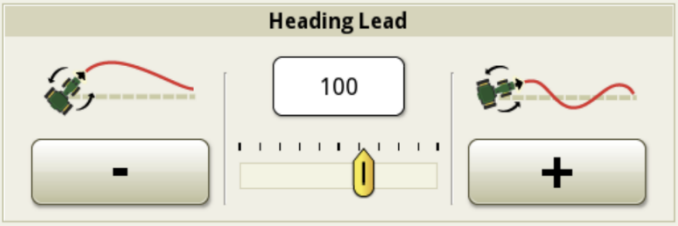
7. Steering tuning



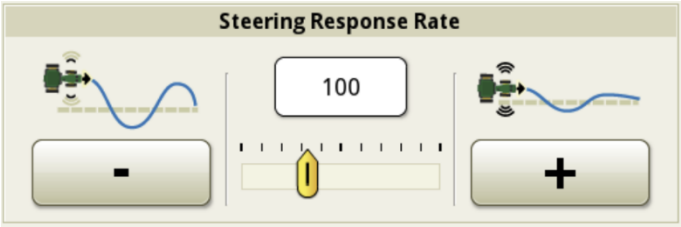
5) If the machine moves too far from the A-B line increase the tracking line sensitivity. If the machine is unstable on AB line decrease this value.



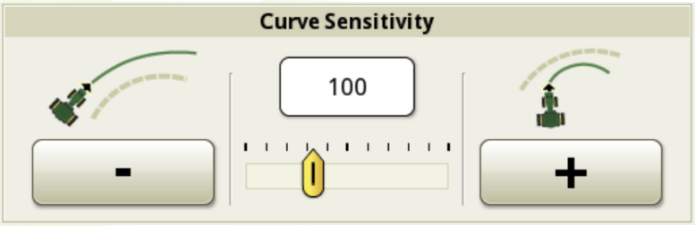
6) Adjust this parameter if the heading error is oscillating, the higher the number, the more sensitive to heading error the system will become.



7) This parameter changes the look-ahead function. The lower the number the further the system will look-ahead on the line. This can improve the online tracking performance and stability of the system.



8) If the tracking performance is poor due to the system being too slow, increase the steering response rate. Increasing this too much, can result in jittery behavior.



9) This parameter adjusts how sensitive the system is to curves on the track. The higher the number the more the vehicle will undercut the line. Adjust this to improve the tracking performance when driving around a curve.

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8. Troubleshooting

The following contains a series of common problems, their causes, and the solutions to be carried out to resolve them. The problems and causes are listed in order of likelihood in occurring.

The SolSteer ISO user interface will not display	
Causes	**Solutions**
ISOBUS is disabled in the John Deere Display	Check ISOBUS is enabled in the John Deere Display
The priority number is incorrect	Check the priority number and set it as the highest priority number possible
The CANBUS connection is faulty on the GCAN side of the steering controller	Check CANBUS connections are working with 2.5 volts on CAN high and CAN low respectively

Steering will not engage with ¾ pie chart	
Causes	**Solutions**
Trial has expired	Request unlock code from SolSteer
The engage switch is faulty	Check wiring to the switch, or contact SolSteer to install an engage switch
Tractor is not ready to engage	Check the diagnostic code in the Solsteer page under tractor ready

0 pie chart with steering controller not detected	
Causes	**Solutions**
GCAN and SCAN are the wrong way round	Correct GCAN and SCAN connections
No connection with steering valve (‘Tractor’ LED is red) since the CANBUS is offline	Contact SolSteer Ltd for wiring diagram
No connection with Greenstar display (‘Greenstar’ LED is red) since the CANBUS is offline	Contact SolSteer Ltd for wiring diagram. Check GS3 pinouts from section 3 page 12

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8. Troubleshooting

Constant cross track error	
Causes	**Solutions**
Incorrect wheel angle sensor (WAS) calibration	Calibrate the wheel angle sensor (see step 6, page 18)

Full pie chart on the Auto Trac circle but wheels are not steering	
Causes	**Solutions**
Third party navigation is interfering	Disconnect third party navigation control

One light on the Agri-Steer on the module is flashing green, the other is stable orange	
Causes	**Solutions**
Check the CAN wires (yellow and green) are in the correct pinouts on the GCAN side (check the diagram on page 12 of the pin-outs for the GS3 harness)	If the pinouts are not in the correct position, then correct them

Tractor ready diagnostic table	
0	Steering wheel moving
16	Tractor is ready to steer
20	Tractor is steering
32	Waiting for steering wheel to move
80	Reset required
61	System lockout (road mode or valve not enabled)

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