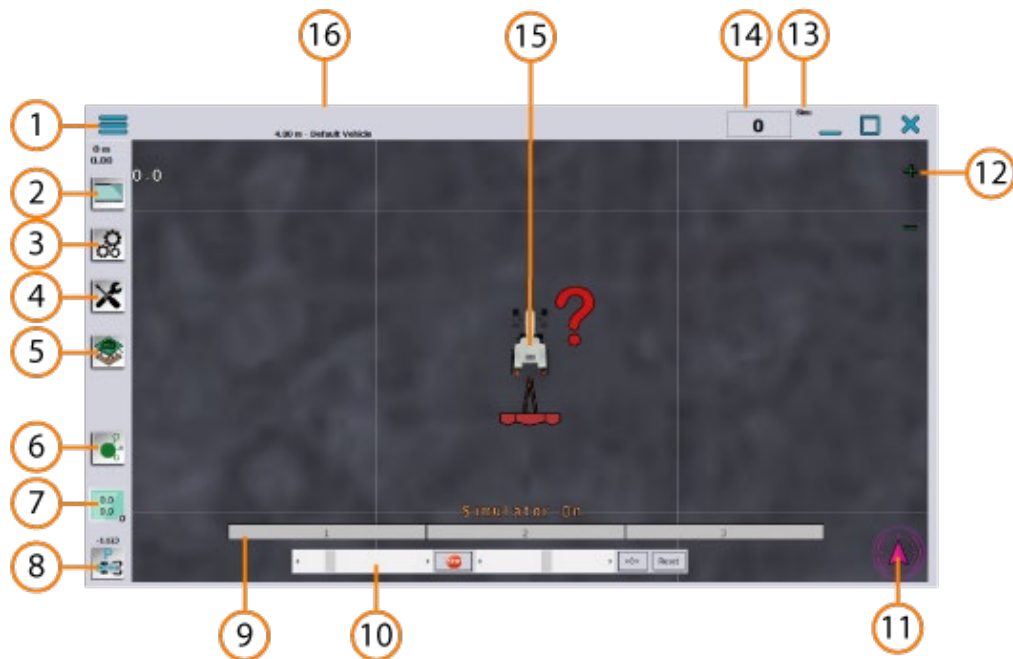




VERSION 5  
SMOOTH LINE

AgOpenGPS  
MANUAL

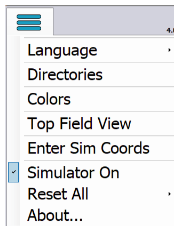
## AgOpenGPS Main Screen



- 1.- Main menu
- 2.- Screen options
- 3.- General Configuration
- 4.- Utilities
- 5.- Field Menu
- 6.- AgIO Shortcut
- 7.- Steer Configuration
- 8.- Steer Mode
- 9.- Section Display
- 10.- Simulator Control
- 11.- Steer Indicator
- 12.- Zoom Buttons
- 13.- GPS Mode
- 14.- Speedometer
- 15.- Virtual button reset direction (restarts forward direction at push)
- 16.- Field and Vehicle Information

## 1.- Main Menu

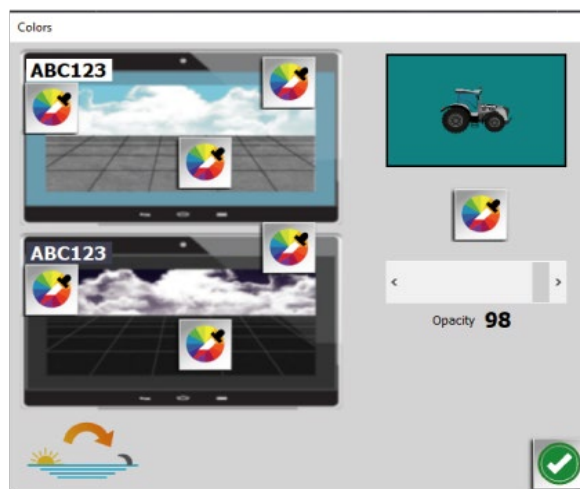
AgOpenGps general configuration.



Language: Available Translations for AgOpenGPS

Directories: Folders used in AgOpenGPS

Colors: Color configuration for all



You can configure the colors for the day and night version, the color of the field, the letter and the windows.

Select the vision of the tractor or triangle, and color and intensity.

Top Field View:



Small window with the aerial view of the field.

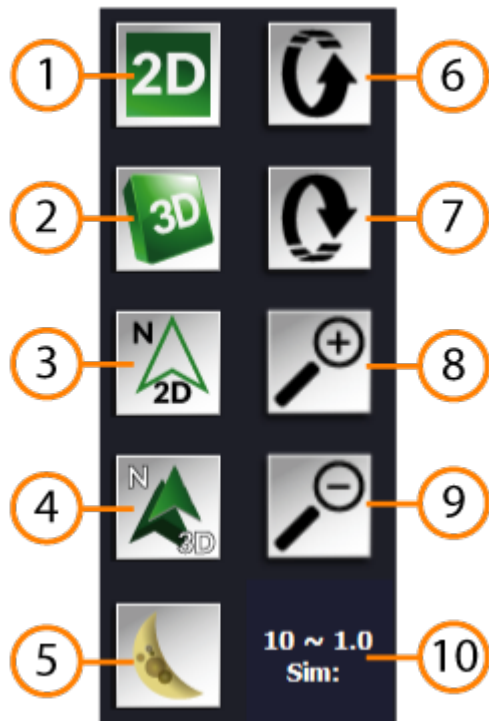
Enter Sim Coordinates: Possibility of modifying the simulation coordinates.

Simulator On: Turn on/off simulator.

Reset All: Reset all configuration to default.

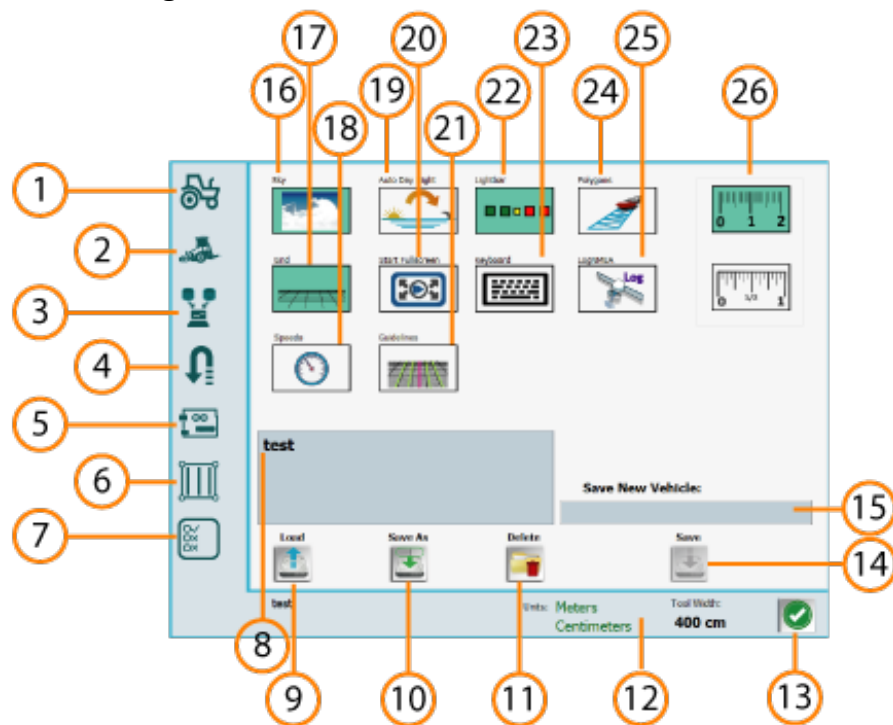
About: Information about AgOpenGPS, Developer Team and License

## 2.- Screen Options



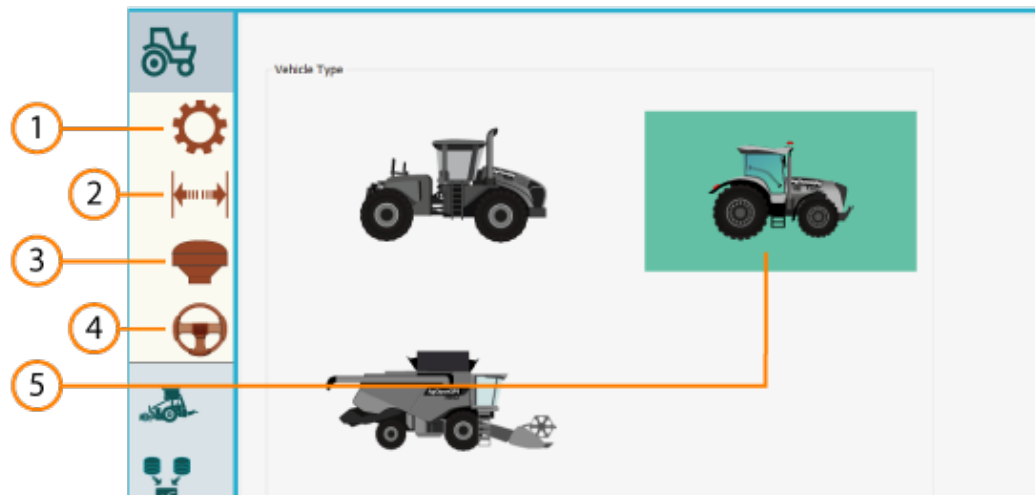
1	2D view	6	Pitch view up
2	3D view	7	Pitch view down
3	2D view North	8	Zoom in
4	3D view North	9	Zoom out
5	Day/Night	10	Performance Monitor

### 3.-General Configuration



SUBMENU		LOAD/SAVE		EXTRAMENU	
1	Vehicle configuration	8	Saved vehicles	16	Sky view in 3D
2	Implement configuration	9	Load selected vehicle	17	View grid in field
3	Sources configuration	10	Save actual vehicle as	18	View speedometer
4	Uturn configuration	11	Delete selected vehicle	19	Day/Night auto cycle
5	Arduino configuration	12	Vehicle information	20	Start full screen
6	Trams configuration	13	Done and exit	21	View extra guides
7	Icons configuration	14	Save vehicle	22	View lightbar
		15	Name new vehicle	23	Open keyboard
				24	Polygons in mapping
				25	Log NMEA
				26	Units selection (cm/in)

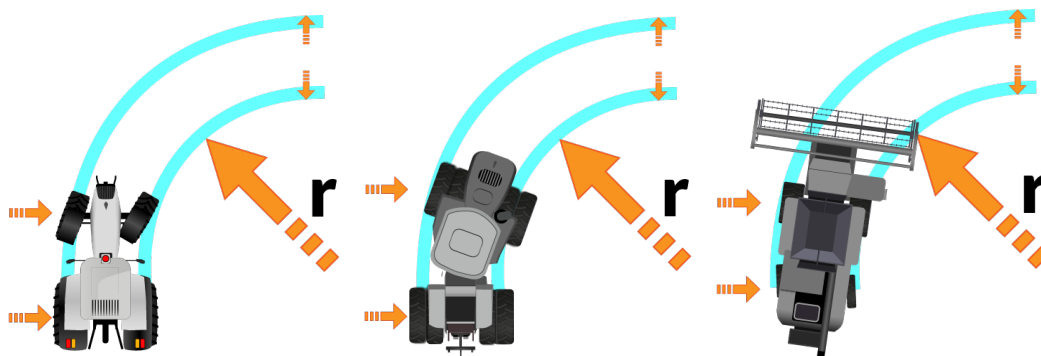
### 3.1.- Vehicle configuration



3.1.1	Vehicle type
3.1.2	Vehicle dimensions
3.1.3	Antenna Configuration
3.1.4	Steer options
3.1.5	Vehicle selected
3.1.1	Vehicle type

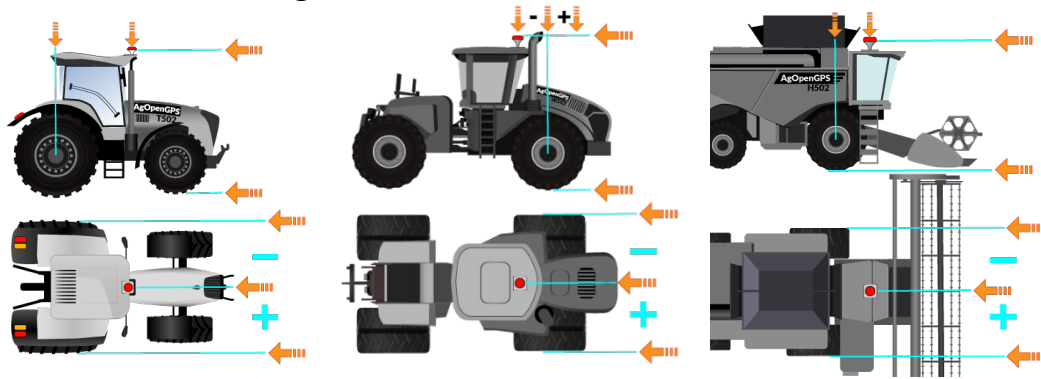
3.1.1.- Vehicle type
Articulated 4WD tractor
Standard tractor
Harvester

### 3.1.2.- Vehicle dimensions



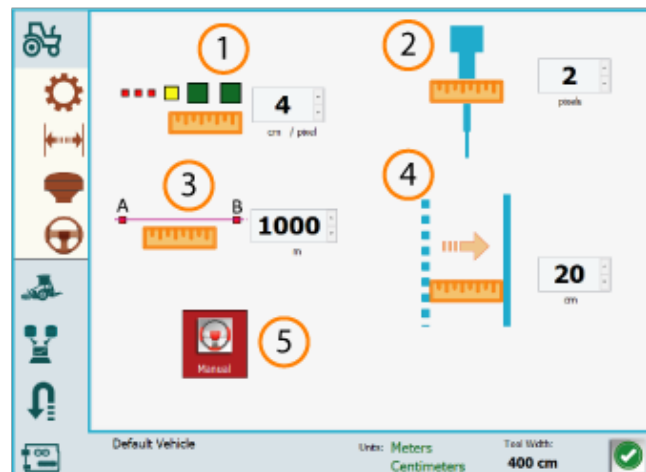
Wheel Base	Horizontal distance between centres of the front and rear wheels in cm/in
Track	Distance measured across an axle from the centre line of one tyre tread to the centre line of the opposite tyre tread in cm/in
Radius	Minimum turn radius in cm/in

### 3.1.3.- Antenna configuration



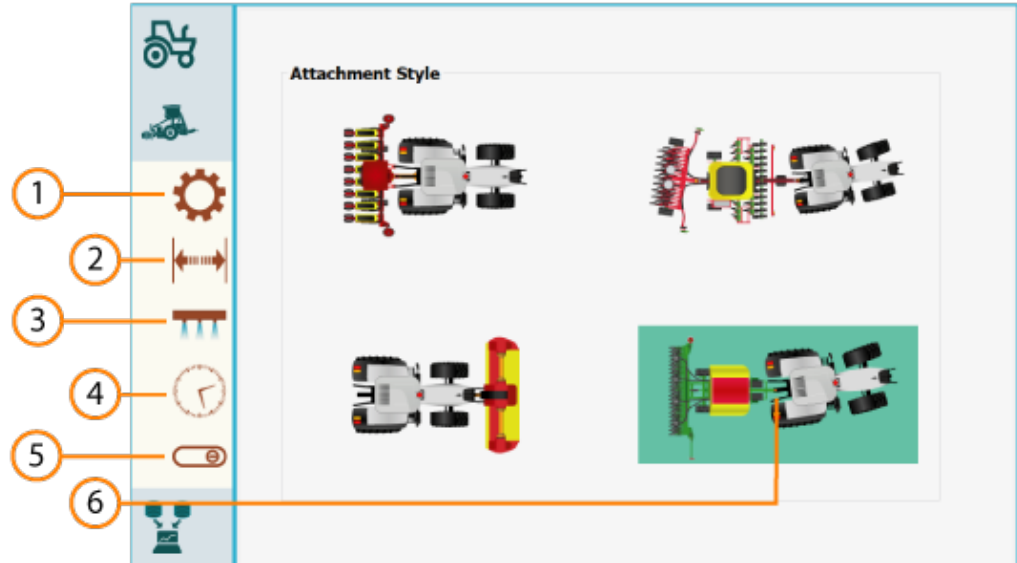
Antenna distance	Antenna distance to pivot point in cm/in
Antenna height	Distance between antenna and ground in cm/in
Offset antenna	Distance between the antenna and the central axis of the vehicle, positive to the right, negative to the left in cm/in

### 3.1.4.- Steer options



1	Lightbar	Distance in cm/in for each frame
2	Lines width	In pixels
3	AB Line Distance	In meters distance A to B
4	Snap Distance	Default distance to snap
4	Button to let the software button follow the steer switch/button status	Default snap distance in cm/in

3.2.- Implement configuration



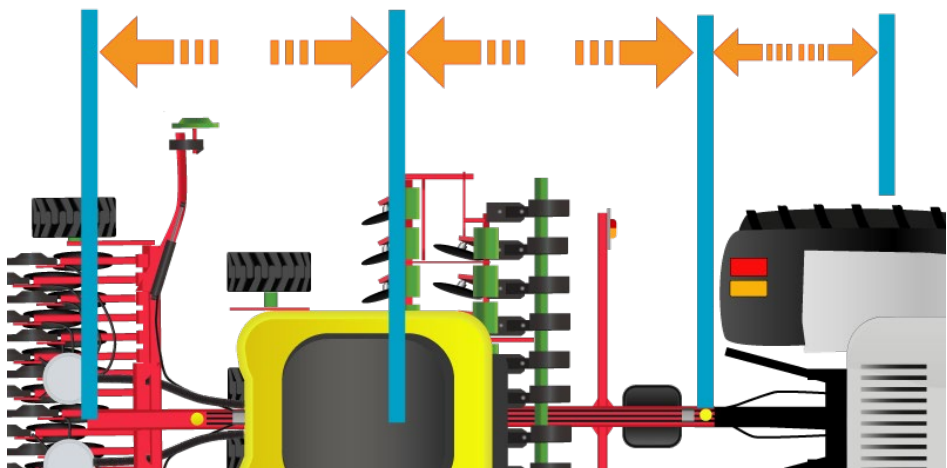
3.2.1	Attachment style
3.2.2	Attachment dimensions
3.2.3	Attachment sections
3.2.4	Attachment options
3.2.5	Work switch
3.2.6	Attachment selected

3.2.1.- Attachment style

Rear fix
Doubled trailed
Front
Trailed

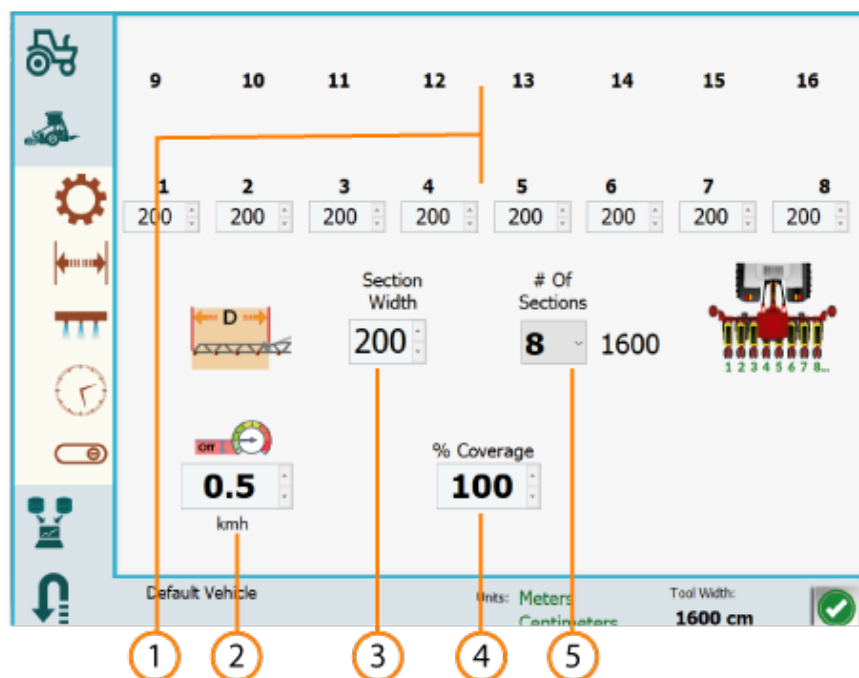
3.2.2.- Attachment dimensions

Distance from tractor pivot point to attachment, different distances for each type of attachment

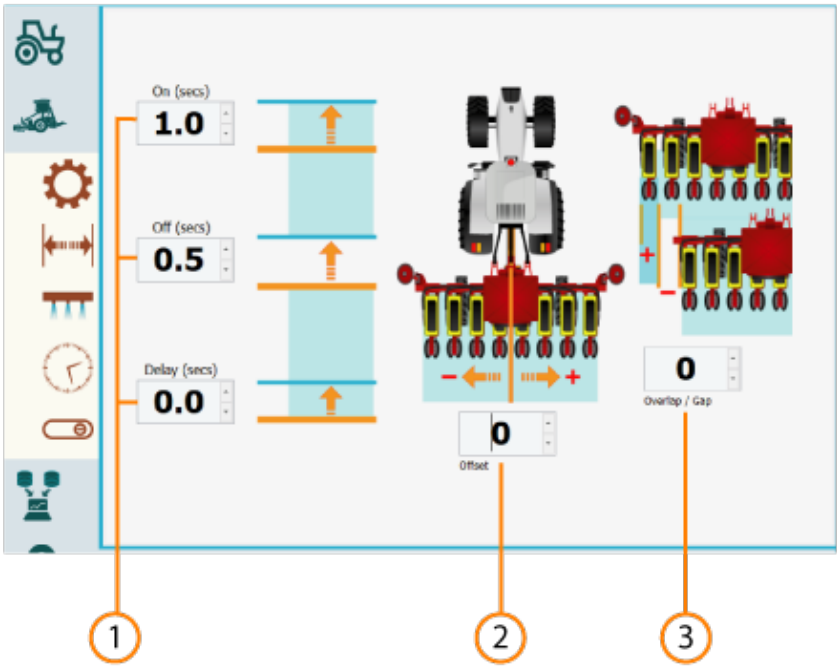




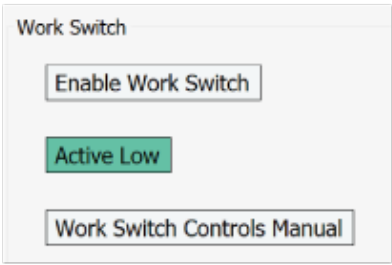
3.2.3.-Attachment sections	
1	Length for each section in cm/in
2	Speed below which sections are deactivated
3	Length of default section, if you change number of sections, all new sections have this length, in cm/in for each section
4	% Coverage all sections
5	Number of sections, and total length for attachment, in cm/in



3.2.4.-Attachment <u>options</u>	
1	Time in seconds for activate disactivate, and delay
2	Offset attachment Distance between the central axis of attachment and the central axis of the vehicle, positive to the right, negative to the left in cm/in
3	Overlap/Gap Overlap distance in positive (cm/in) Gap distance in negative (cm/in)

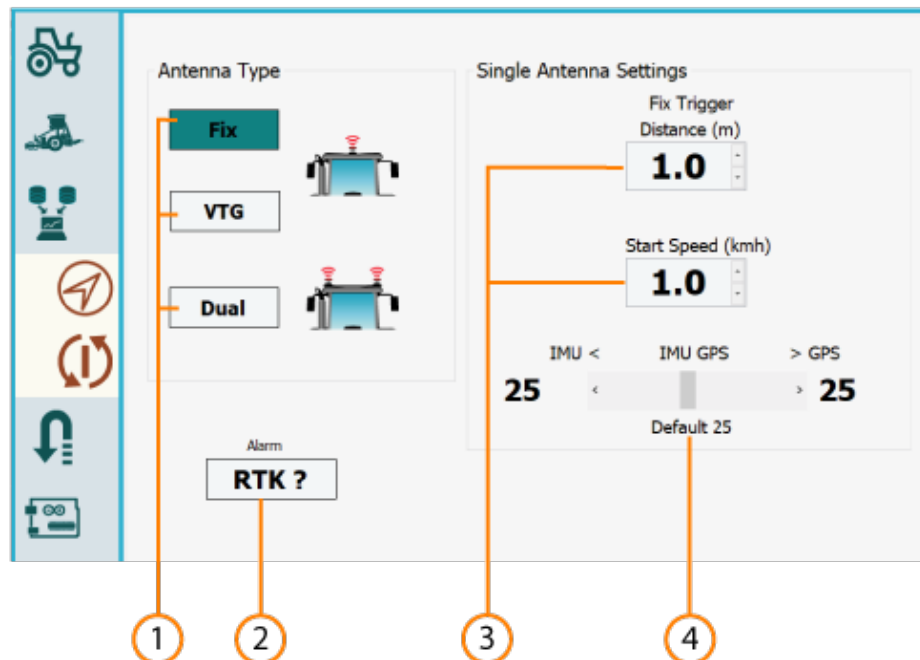


3.2.5.- Work Switch
Enable work switch
Active Low
Manual control for work switch



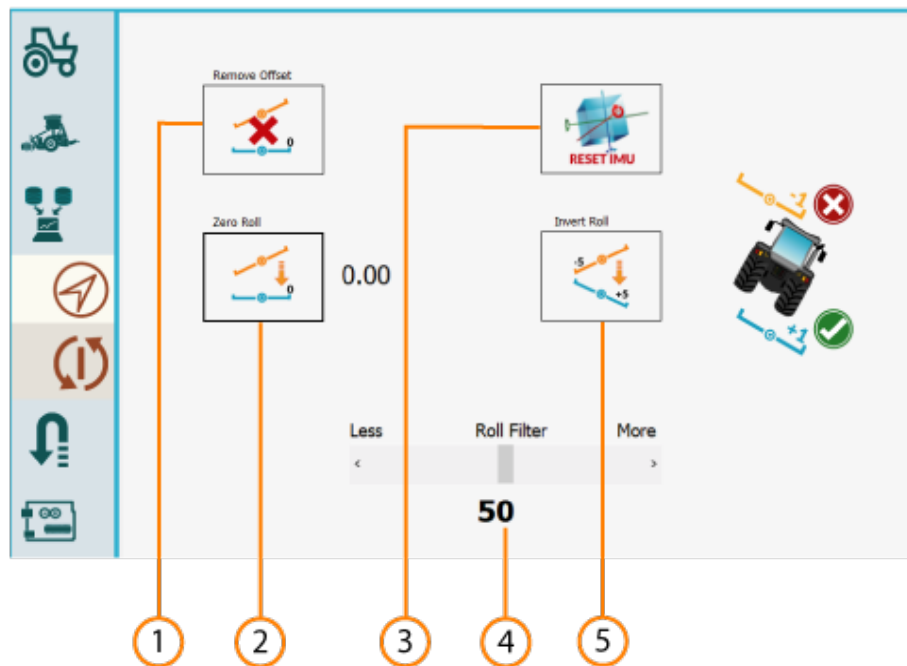
### 3.3.- Sources configuration

3.3.1.- Heading		
1	Antenna Type	Single: Fix or VTG Dual
2	RTK alarm	Screen message when RTK lost
3	Single antenna settings	<b>Fix trigger distance:</b> Distance in meters to start recognizing movement <b>Start speed:</b> Minimum speed to start recognizing movement
4	Heading filter	Fusion heading filter, more GPS or more IMU



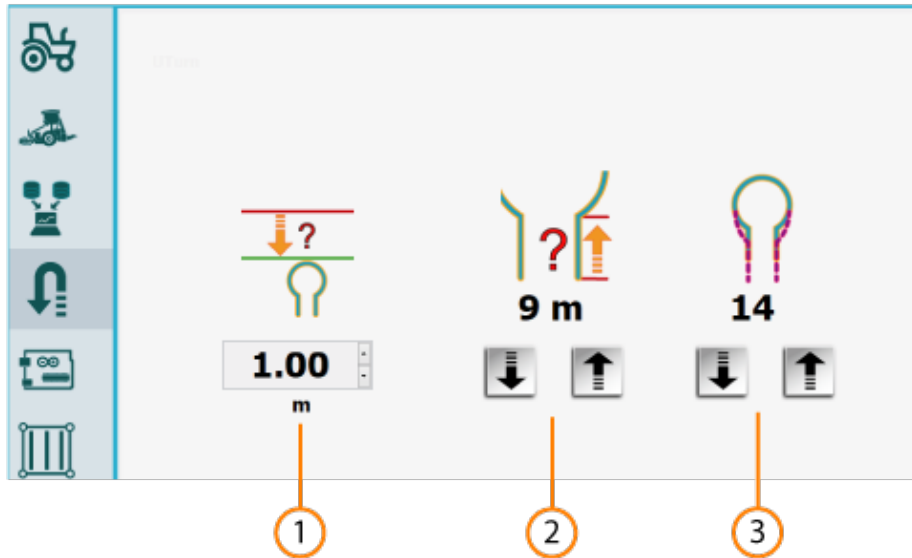
### 3.3.2.- Roll

1	Remove offset	
2	Roll zero	
3	Reset IMU	Reset IMU to default settings
4	Roll Filter	
5	Invert Roll	Positive for tilt to the right, negative for tilt to the left



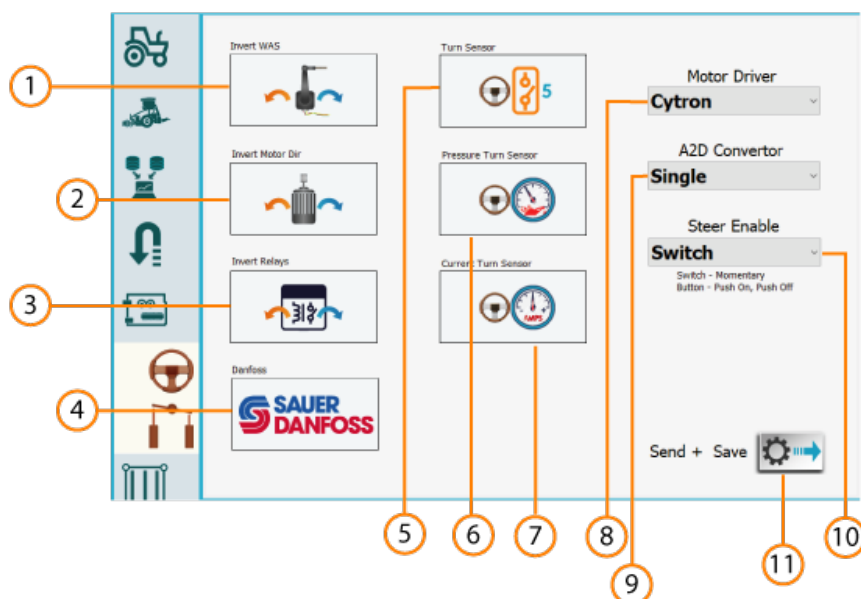
### 3.4.-Uturn configuration

1	Distance to boundary
2	Distance Uturn legs
3	Smooth entry and exit



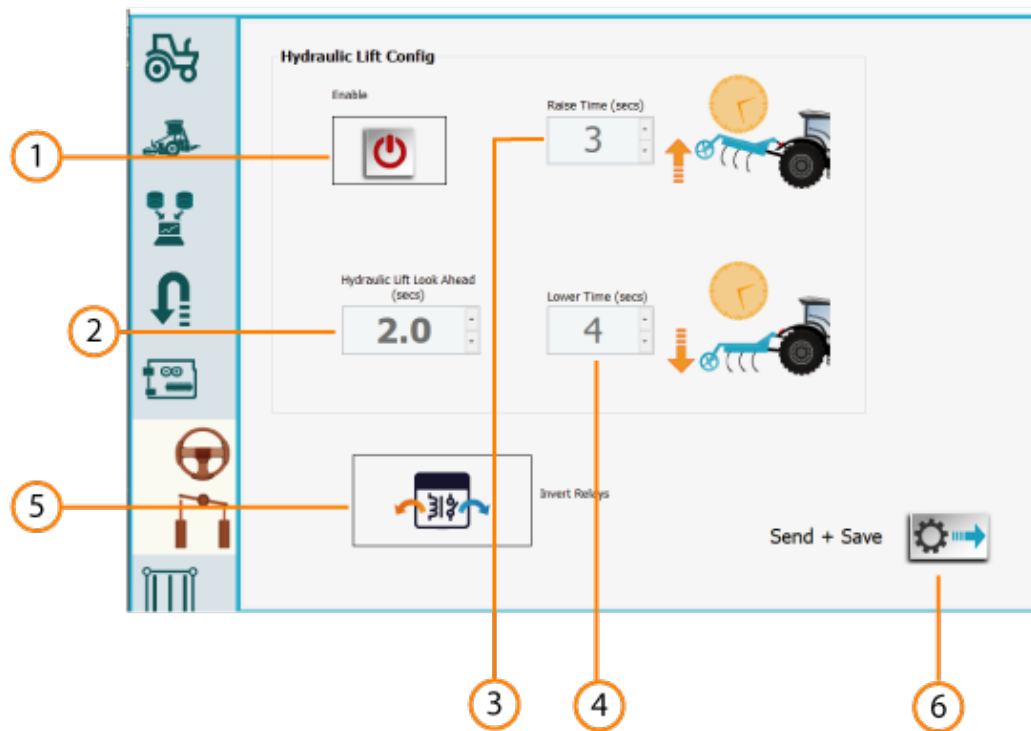
### 3.5.1- Arduino steer configuration

1	Invert WAS	Turn right positive value/ Turn left negative value
2	Invert Motor Direction	
3	Invert Relays	
4	Danfoss	Activate special configuration for Danfoss
5	Turn Sensor	When activated, box appears for counts selection
6	Pressure Turn Sensor	When activated, box appears for psi selection
7	Amperemeter Turn Sensor	When activated, box appears for amps selection
8	Selection Motor driver	Cytron or IBT2
9	A2D Convertor	Single or differential modes
10	Steer enable	None, switch or button
11	Send and save	<b><u>Mandatory for any change in this menu</u></b>



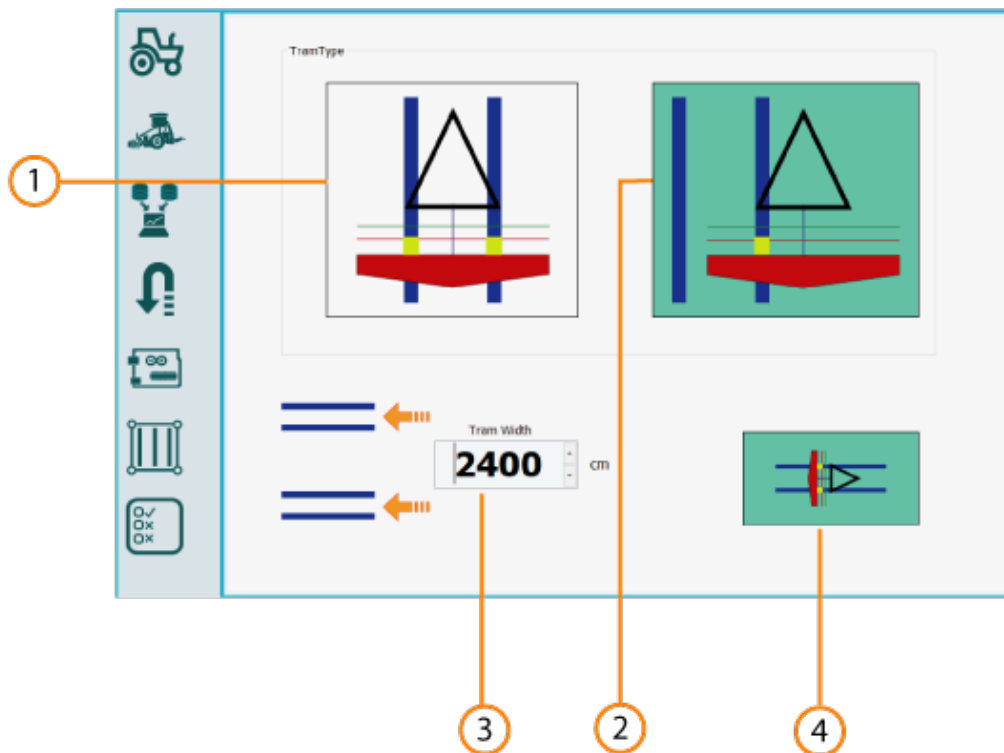
### 3.5.2- Arduino lift configuration

1	Enable lift control	
2	Hydraulic lift look ahead	Time in seconds that the program looks forward to operate hydraulic lift
3	Raise time	Time in seconds that the raise of the hydraulic lift advances
4	Lower time	Time in seconds that the lowering of the hydraulic lift advances
5	Invert relays	
6	Send and save	<u>Mandatory for any change in this menu</u>



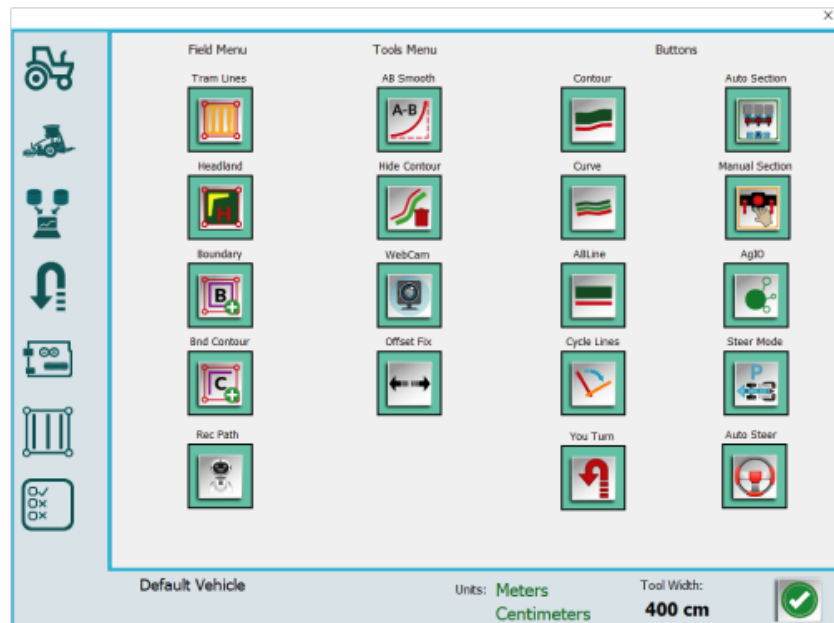
### 3.6.- Tram Lines configuration

1	Tram line made in a single pass	(Mostly with a sprayer with odd width)
2	Tram lines made in two passes	(Mostly with a sprayer with even width)
3	Tram width	Distance between two tram lines in cm/in
4	Automatic Tram shutoff valves	Will also turn off the section above the tram (if the section is small enough)



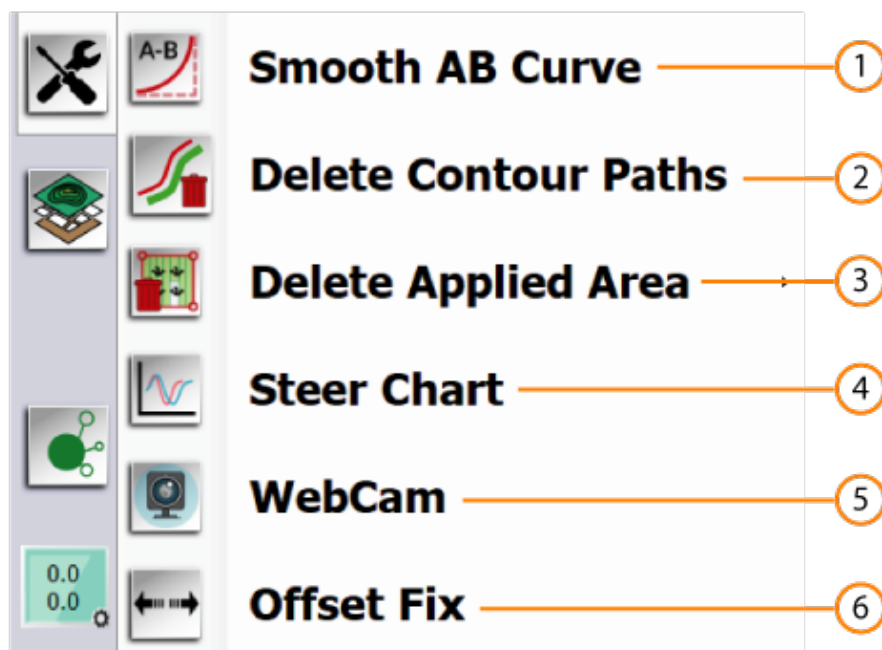


### 3.7.- Icons configuration



Show or hide icons

### 4.-Utilities





#### 4.1.- Smooth AB Curve

1	Activate AB Curve
2	Use arrows to modify AB Curve
3	Save only for now (this use), Or save to file, or cancel operation



#### 4.2.- Delete contour paths

1	Delete all contour paths created
---	----------------------------------



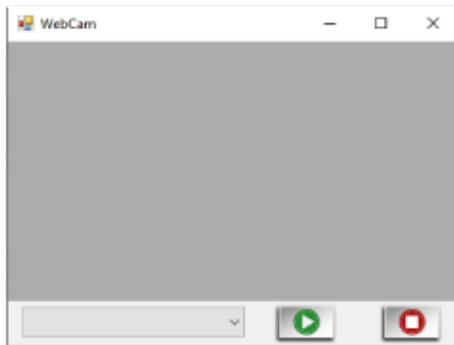
#### 4.3.- Delete applied area

1	Delete all sections and contours (cleans all painted areas)
---	---

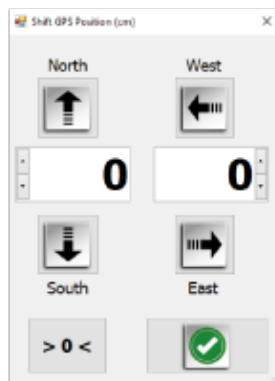


#### 4.4.- Steer chart

1	Real-time graph of current angle and calculated angle
---	---

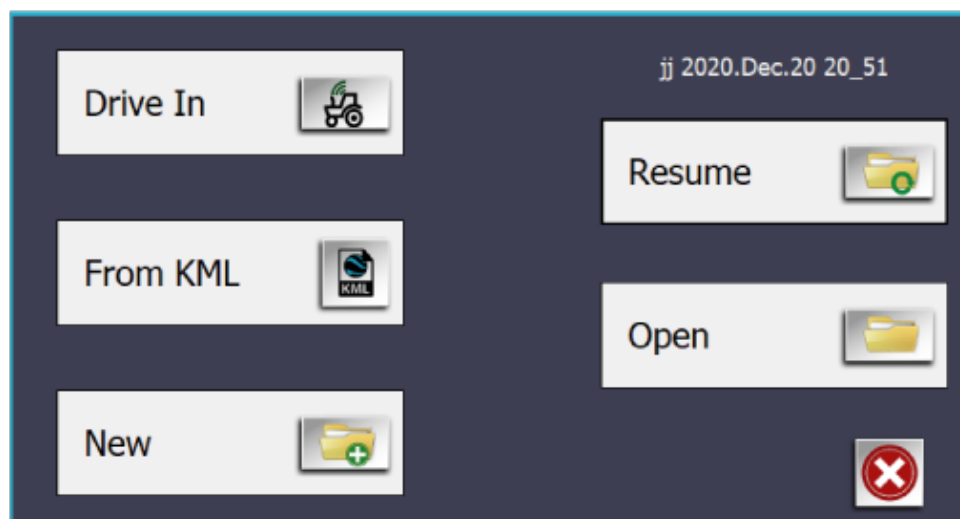


4.5.- Webcam	
1	Small window for webcam output signal

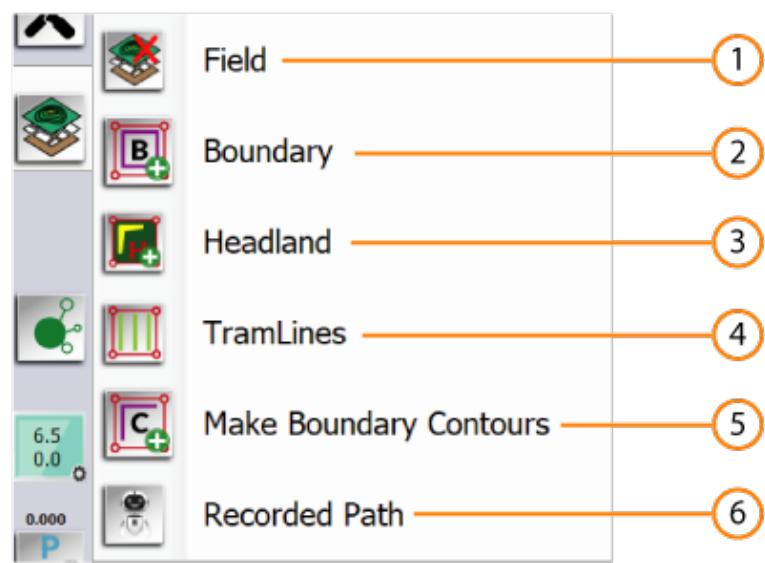


4.6.- Offset fix	
1	Shift GPS Position in cm/in
2	North/South
3	West/East
4	Reset

5.1.a- Field menu (none field opened) This window appears if you don't have any field opened		
1	Drive in	Drive to create new field
2	From KML	Import KML file created with Google Earth
3	New	Create a new field file, add name, date...
4	Resume	Resume work in last field opened (last field displayed in top right corner)
5	Open	Open field previously saved
6	Cancel	



5.1.b.- Field Menu

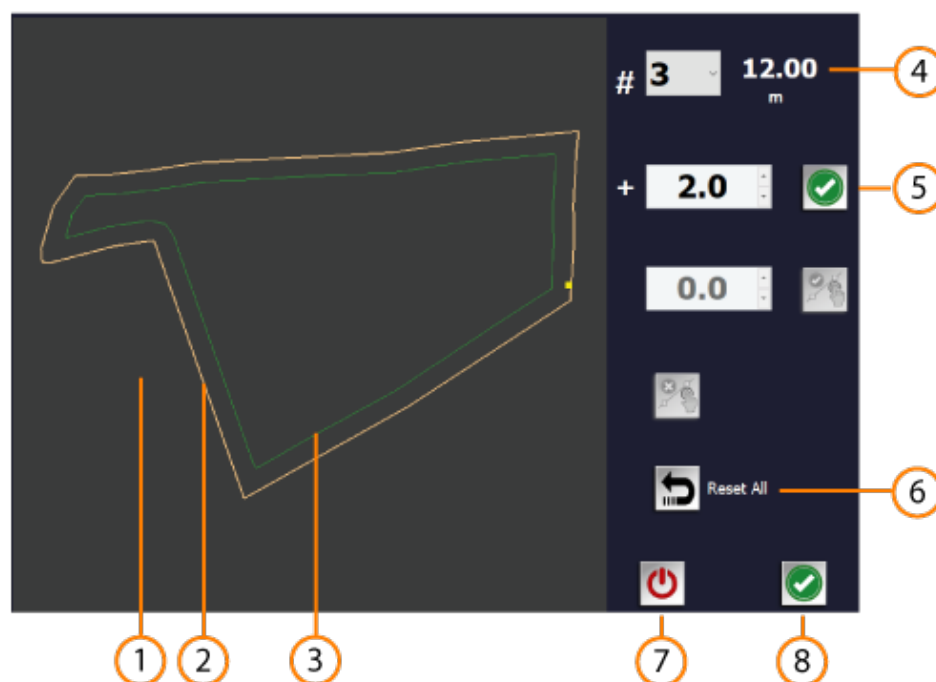


5.1.1.- Field Close

5.1.2- Boundary		
1	Delete selected boundary	
2	Delete all boundary list	
3	Import Google Earth file	Import KML file created with Google Earth
4	Add new boundary	You can add new boundary driving in or with KML file
5	Done	
6	Boundary List	

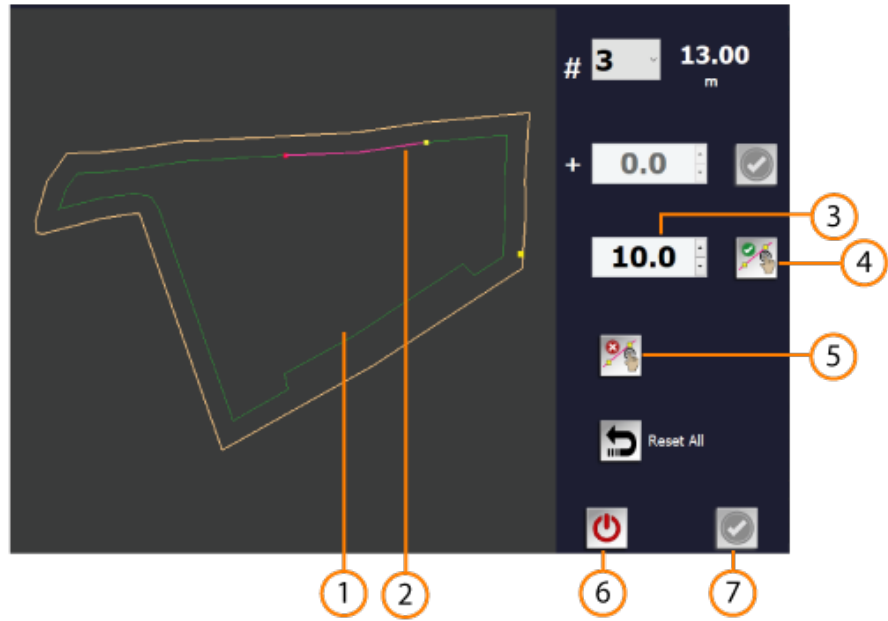


5.1.3.a- Headland (make)		
1	Field Map	
2	Boundary	
3	Headland	
4	Number of passes	Headland distance calculated by the number of passes multiplied by the width of the implement
5	Extra Width	You can add extra width in metres
6	Reset all	
7	Cancel	
8	Done	



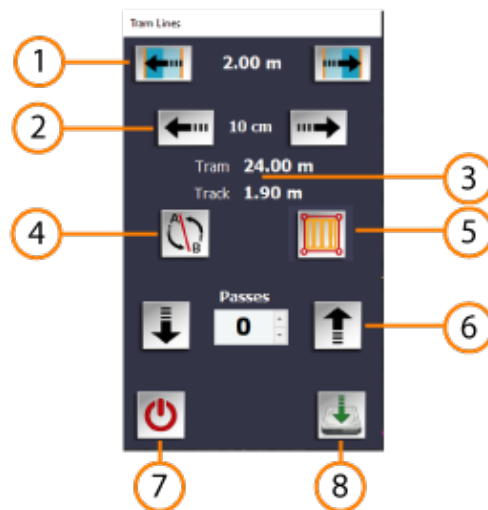
When the headland is active new buttons appear at the bottom edge of the window, see point 32

5.1.3.b- Headland (modification)		
1	Modified Headland	
2	Headland selected ready to modification	Selection by touching two points in map
3	Distance	Distance in meters for modification, positive for inward direction, negative for outward direction
4	Validate modification	
5	Cancel Modification	
6	Cancel	
7	Done	



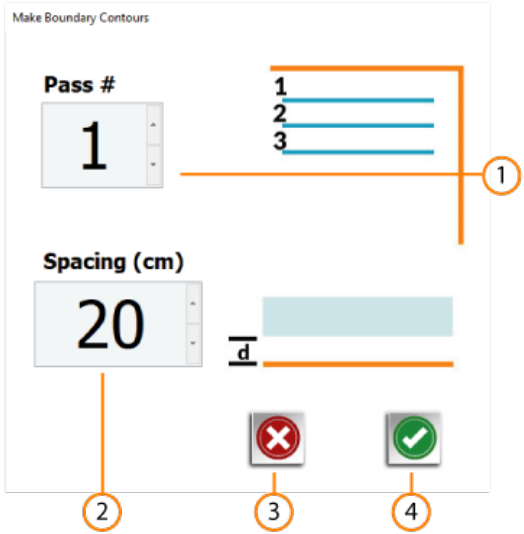
### 5.1.4-Tramlines

1	Arrows for modifying the starting line of the tram lines	Distance in meters, half of attachment
2	Arrows for modifying the starting line of the tram lines	Distance in cm
3	Tram lines information	Tram spacing configured in General configuration of Tram lines (3.6) Track configured in General configuration of vehicle (3.1.2)
4	Change direction the starting line	
5	Type of tram lines	Only tram lines All tram lines with headland Only headland tram lines Cancel tram lines
6	Number of passes	
7	Shut Off	Turn Off Tramlines
8	Done	





5.1.5.-Boundary Contours		
1	Number of passes	
2	Spacing	Distance in cm between boundary and first passe
3	Cancel	
4	Done	

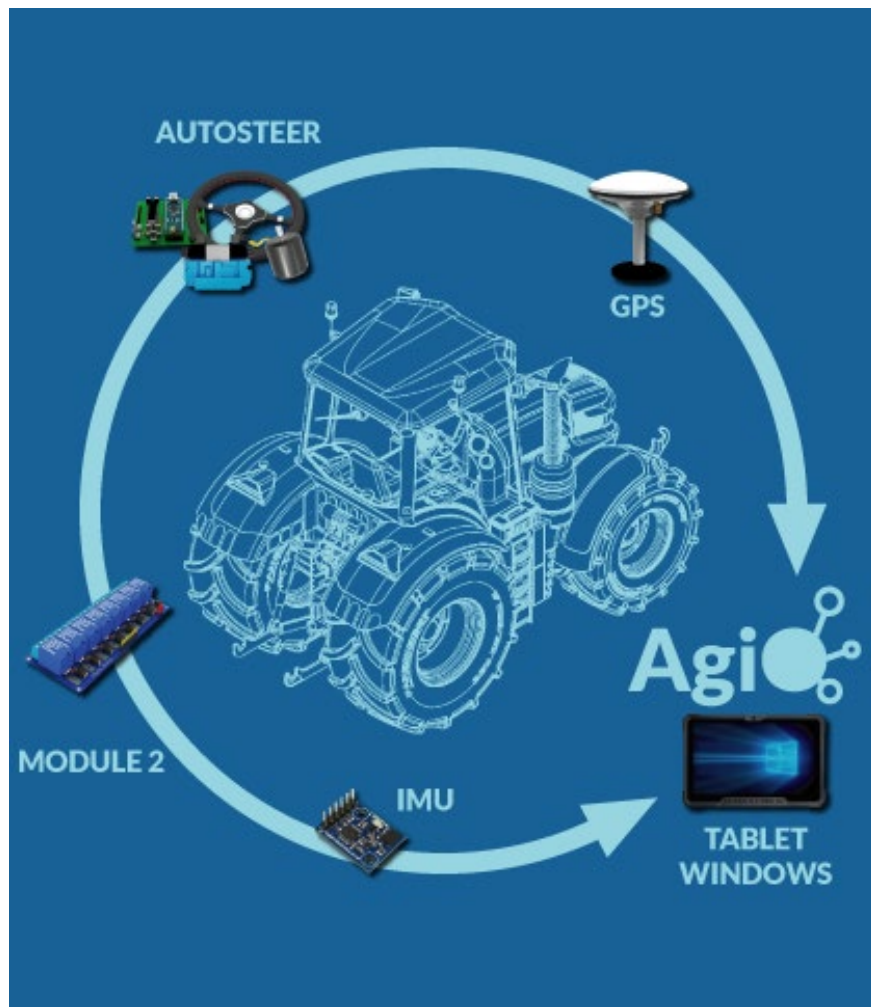


5.1.6.-Recorded Path		
1	Play	
2	REC	Once pressed, it changes to stop, to be able to stop recording
3	Cancel	



This function allows you to register any route to execute it

## 6.- AgIO



Program that controls communications between AgOpenGPS and all components:

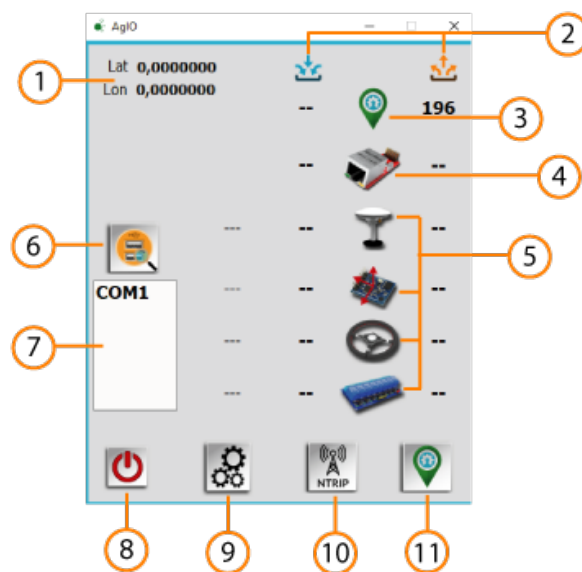
Tablet with AgOpenGPS

GPS

AutoSteer (PCB, DC Motor, Hydraulic valves)

Machine modules

6.-AgIO		
1	Coordinates information	
2	In/Out information for each component	It is also a virtual button that opens a window with information on GPS, speed, height, satellites, ...
3	AgOpenGPS icon	
4	UDP icon	It is also a virtual button that opens a window that opens a window for UDP configuration
5	Components icons	It is also a virtual button that opens a window for the configuration and connection of the components
6	Scan Ports	
7	Ports information	
8	Turn Off	
9	Extra configuration	
10	NTRIP configuration	
11	Show AgOpenGPS	



## 6.4.-UDP configuration



Ethernet Configuration

**\*\* You must RESTART for any changes to take effect!**

Drive Server	Module Address and Ports
<u>This Computer</u>	<u>Module Port</u>
Host: DESKTOP-K7O3NKG	IP: 192.168.1.255
IP: 192.168.1.139	Port: 8888
Port: 9999	8888
All modules send to 9999	All modules use 8888.

Networking

**UDP On**

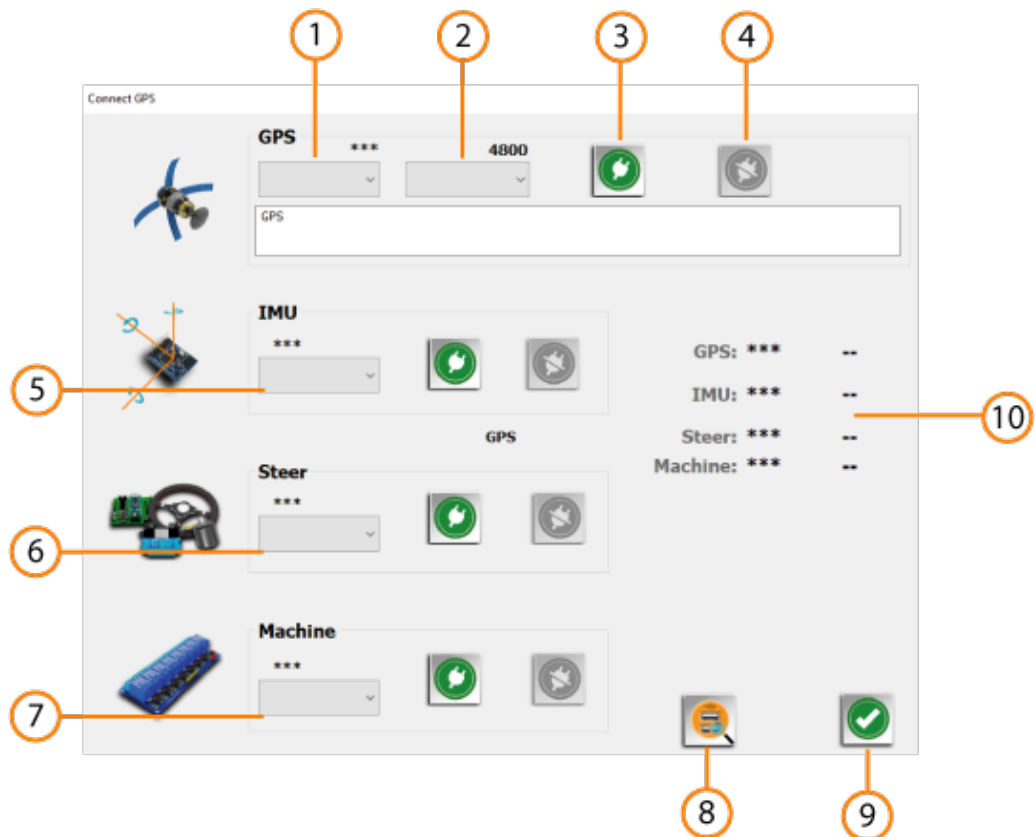
 

Press the UDP On button and restart (AgIO) to enable UDP

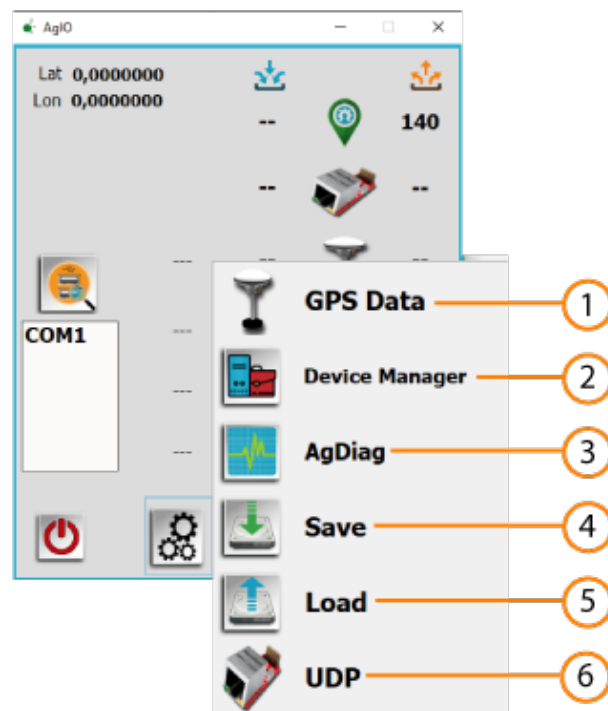
Standard sketches use 192.168.1.255 and 9999/8888 ports

## 6.-AgIO Components

1	GPS Port	
2	Bit Rate connection	Box down shows information about GPS messages (NMEA string)
3	Connect	
4	Disconnect	
5	IMU Module Port	If you connect IMU directly to PCB don't have port for IMU
6	Machine Module Port	
7	Scan Ports	
8	Done	
9	Ports information	



6.5.-AgIO Extra configuration		
1	GPS Information	Shows GPS information, same as related in point 6.2
2	Device Manager	Opens Windows Device Manager
3	AgDiag	Runs AgDiag
4	Save	Save AgIO configuration
5	Load	Save AgIO configuration
6	UDP	Opens a window that opens a window for UDP configuration, same as related in point 6.4



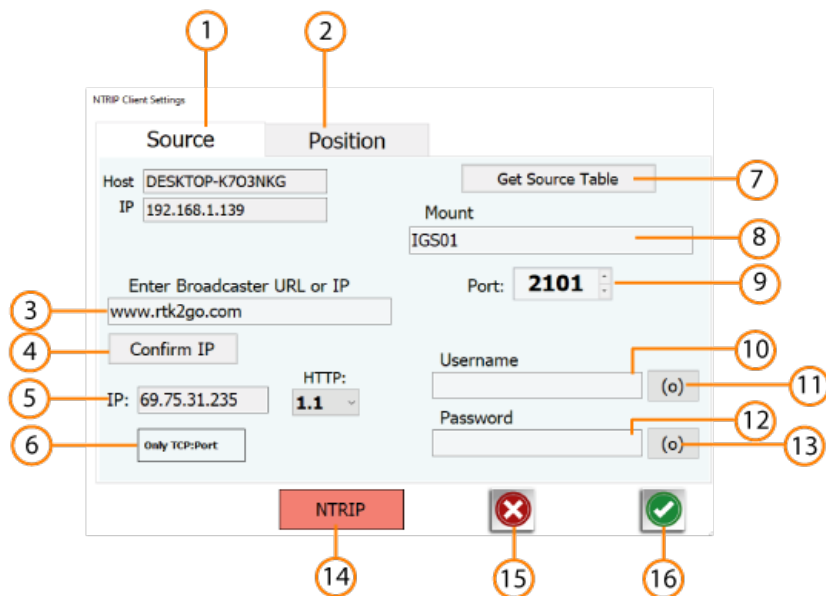
6.9.3.-AgDiag



Tool that's shows information about what it's happens in AgOpenGPS and all modules

### 6.10.1-NTRIP Configuration (Source tab)

1	Source tab	
2	Position Tab	
3	Broadcaster	Enter URL or IP
4	Confirm IP	
5	IP address and HTTP protocol	If you connect IMU directly to PCB don't have port for IMU
6	Only TCP Port	
7	Get source table	Shows source table and you can select a mount
8	Mount	Shows your selected mount
9	NTRIP Broadcaster Port	
10	Username	
11	(o)	Shows username
12	Password	
13	(o)	Shows password
14	Turns on/off NTRIP	
15	Cancel	
16	Done	





### 6.10.2.-NTRIP configuration (Position tab)

1	Latitude for manual fix	
2	Longitude for manual fix	
3	Select fix type	Use GPS Fix Use Manual Fix
4	Latitude current GPS fix	
5	Longitude current GPS fix	
6	Send GPS fix to Manual fix	
7	UDP Port	Set to 0 for serial port (USB/RS232) or port number for UDP
8	GGA interval	Some providers like VRS Systems (Maschinenring, Sapos...) need your position, without your position they are not able to send you data. Here you can set the time how often you send back your position in seconds, 0 for turn off
9	Turns on/off NTRIP	
10	Cancel	
11	Done	

NTRIP Client Settings

Source Position

Manual Fix:

1 Lat:

2 Lon:

3

To UDP Port  7

\*Set to 0 for Serial

Current GPS Fix:

4 Lat:

5 Lon:

6

GGA Interval (secs)  0 = Off 8

9

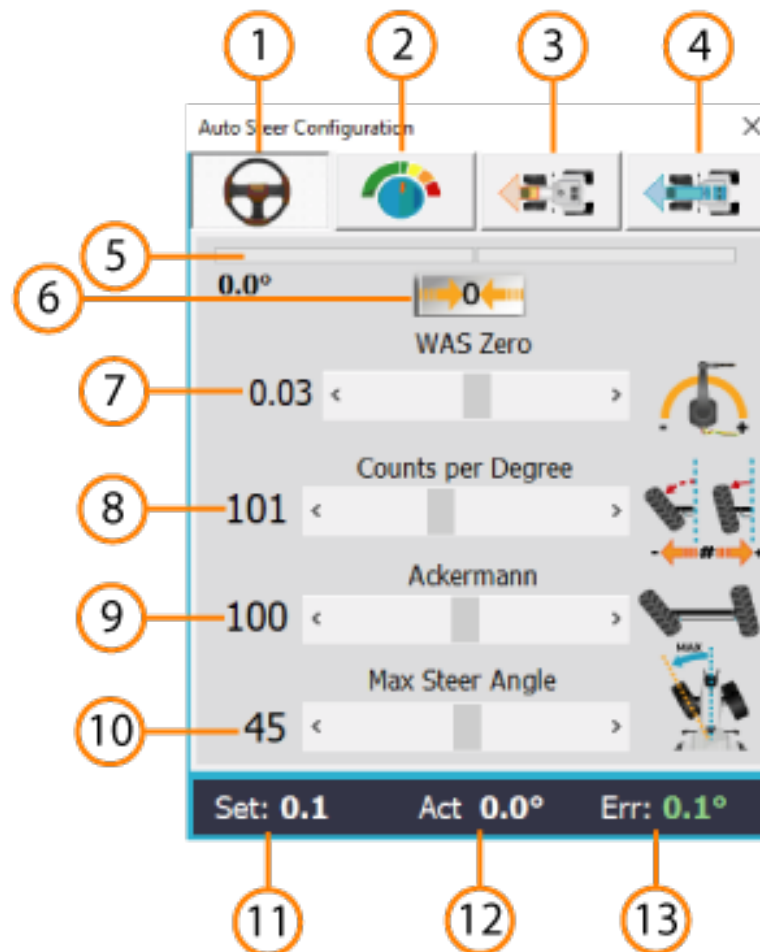
10

11

## 7.-Steer Configuration



Icon that shows the current angle and the setpoint angle, and is the button to open the steer configuration



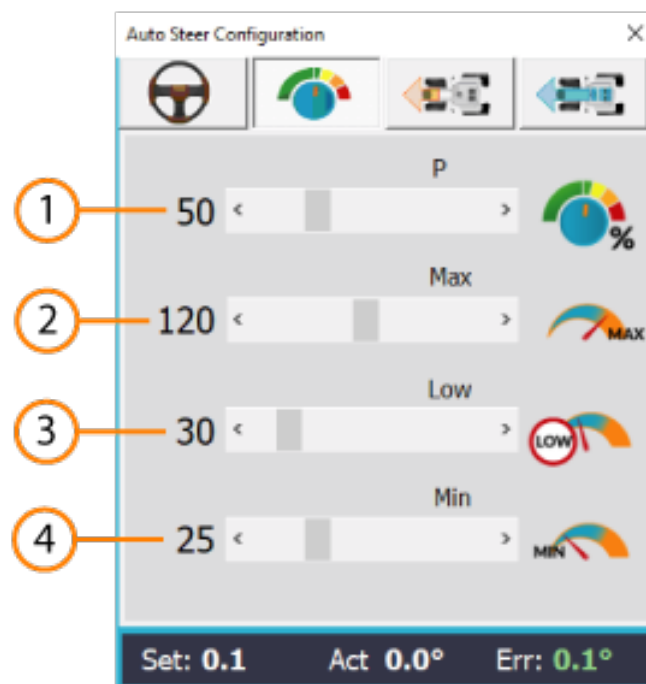
### 7.1.-Steer configuration (Steer Tab)

1	Steer Tab	
2	Power Tab	
3	Stanley Tab	
4	Pure Pursuit Tab	Also known as PP
5	WAS Angle indicator	WAS: Wheel Angle Sensor

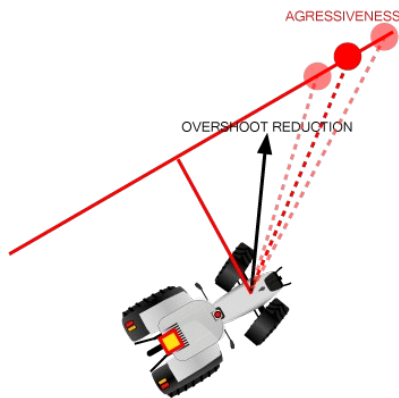
6	WAS Zero	Allows the steering angle to be zero degrees when driving forward. This setting must be done and be zero degrees when driving straight ahead in order to be properly set. Wheel Angle Sensor (WAS) zero allows you to remove that non-zero steering angle so it is zero degrees. This is a very important setting and must be accurately set.
7	WAS Zero slider	For manual calibration, or tweak calibration
8	Counts per Degree	Also known as CPD The A/D converter puts out -4000 to +4000 (8000 in total) levels as the Wheel Angle Sensor puts out 0 to 5v. To convert that into steer angle degrees - because we don't visualize counts very well, we now divide those levels by counts per degree. So when the CPD is increased, the wheels turn farther for each degree needed. When lowered, the wheels don't turn as far.
9	Ackermann	Ackermann steering geometry is a geometric arrangement of linkages in the steering of a vehicle designed to solve the problem of wheels on the inside and outside of a turn needing to trace out circles of different radius.
10	Maximum steer angle	
11	Steer angle setpoint	Steer angle requested by AgOpenGPS
12	Actual steer angle	Read by WAS
13	Error Angle	Error between setpoint angle and actual angle

## 7.2.-Power configuration

1	Proportional gain	The proportional gain are multiplied by the error then added to the minimum PWM value to generate the final output value. The higher this value the faster the motor will correct the steering. However if it is too high, the steering will overshoot the line and then oversteer the other way again. Too low of a value and it will either take too long or never get to the guidance line
2	Maximun PWN power	The maximum PWM value to generate the final output value
3	Low PWN power	As the vehicle gets closer to the line, the gain is reduced linearly from the max value to the low value. This helps it overshoot the line when close, but provide rapid movement when further away
4	Minimun PWN power	Minimum PWM value is used to apply a minimum amount of power to overcome friction of the valve/motor



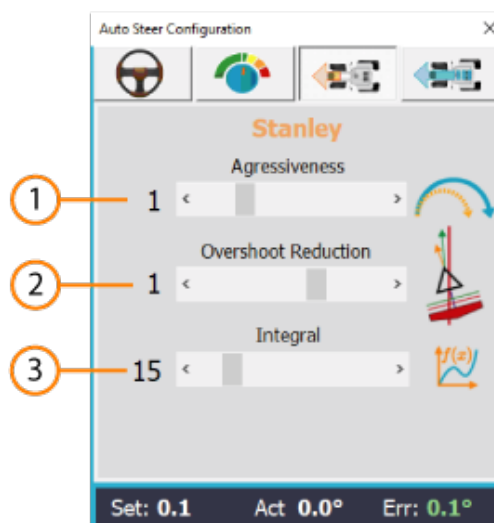
### 7.3.- Steer Configuration (Stanley Tab)



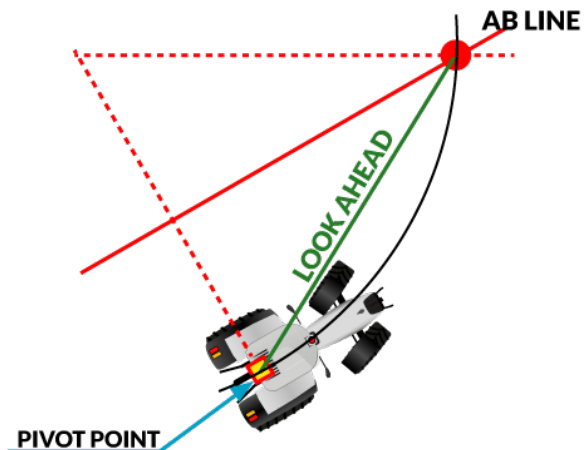
Stanley method use the front axle as its reference point. Meanwhile, it looks at both the heading error and cross-track error. In this method, the cross-track error is defined as the distance between the closest point on the path with the front axle of the vehicle.

### 7.3.-Stanley configuration

1	Aggressiveness	The aggressiveness works with distance. The more aggressive the faster it tries to steer towards the line with the risk of crossing over the line
2	Overshoot reduction	The overshoot affects how much opposition to aggressiveness there is by keeping the vehicle turning away from the line.  It's the winner of the two, heading and distance away that determines the length of time to get to the line. Ideal is to balance them so you get quickly to the line without going too far over the line or oscillating back and forth (too aggressive).
3	Integral	Uses 2nd order derivatives (non-linear steering methods) to bring the vehicle back to the line. As in, as they approach the line it needs to start steering away from the line to prevent crossing back and forth over the line and never getting on course, like an icy road. the opposite is taking way too long to get back on the line.



## 7.4.-Steer configuration (Pure Pursuit Tab)

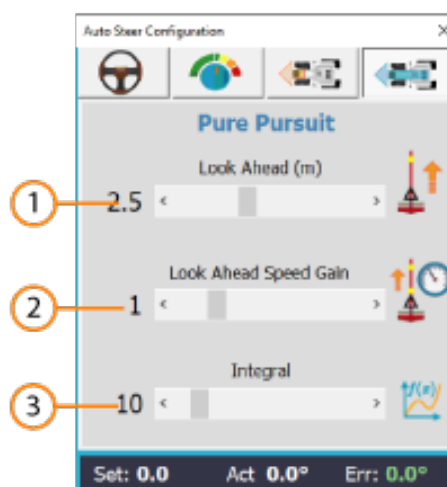


Pure Pursuit mode uses a look-ahead point which is a fixed distance on the reference path ahead of the vehicle as follows. The vehicle needs to proceed to that point using a steering angle which we need to compute.

In this method, the centre of the rear axle is used as the reference point on the vehicle.

### 7.4.-PP configuration

1	Look Ahead	Distance in meters how far is reference point
2	Look Ahead Speed Gain	How far the look ahead goes ahead based on speed
3	Integral	Uses 2nd order derivatives (non-linear steering methods) to bring the vehicle back to the line. As in, as they approach the line it needs to start steering away from the line to prevent crossing back and forth over the line and never getting on course, like an icy road. the opposite is taking way too long to get back on the line.



## 7.5.-Drive and test

If you touch the lower edge and drag it, the drive and test function appears

1	Drive	Connect the autosteer even if we don't have a line, drive straight. We can change the angle with the arrows.
2	Snap Left/Right	Increases by one degree in the selected direction
3	Zero	Set angle to zero, or if the is zero to +5
4	PWN	Shows PWM used to run motor/valves
5	REC	Function to calculate the real steering angle, drive steady and show the angle when finished.

With all these functions they help us to correctly configure the parameters of the Steer tab (7.1), WAS Zero, CPD, Akerman and Maximum Steer angle



## 8.- Steer Mode



By pressing the button you can change the steering mode, the active mode is the one shown, P for Pure Pursuit and S for Stanley.  
The small numbers above the icon are the integral correction calculations

## 11.-Steer Indicator

The direction indicator gives you information about the direction module. It also rotates like the wheels of the vehicle do.  
There are four colors to know the status of the autosteer.



Purple

No steer module connected



Red

Steer module connected, not enabled



Orange

Steer Module connected and enabled, steer switch off

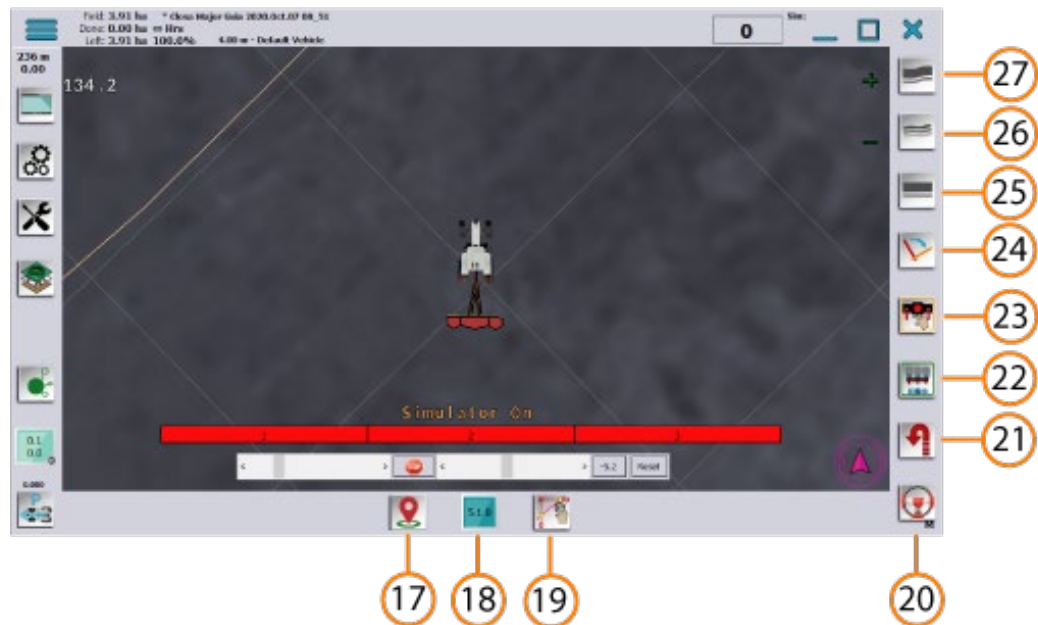


Green

All connected and enabled



## AgOpenGPS Main Screen (Field Opened)



17.- Flags

18.-Version/Paint color Mapping

19.-AB line

20.-Autosteer

21.-Uturn

22.-Automatic sections

23.-Manual sections

24.-Cycle AB line

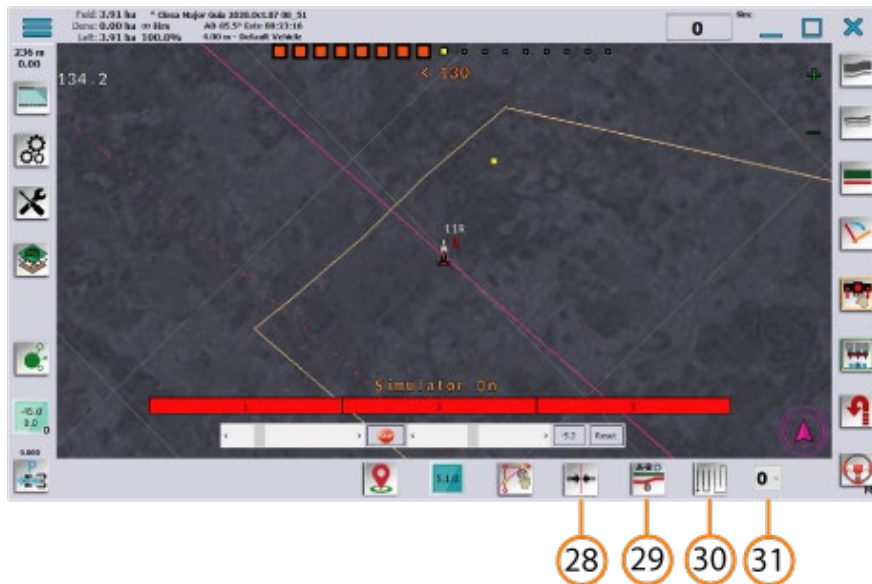
25.-AB line

26.- AB curve

27.-Contour

## AgOpenGPS Main Screen (Field Opened AB Line selected)

Once an AB Line has been selected, new icons appear on the lower edge with new functions, all of them can be hidden from the General configuration, Icons submenu (3.7)



28.- Snap to pivot

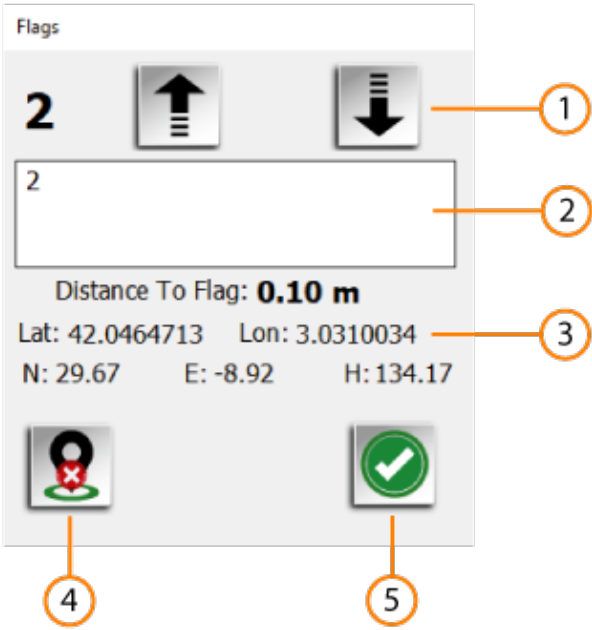
29.- AB Line Edit

30.- Your Skip

31.- Uturn skip

17.-Flags

7.5.-Drive and test		
AgOpenGPS allows you to flag anything you want to mark		
1	Navigation arrows	Browse through the available flags.
2	Flags list	
3	Flag information	
4	Delete Flag	
5	Done	



## 18.-Version/Paint color Mapping



Icon that shows the current version, and is the button to open the color picker for mapping.

In AgOpenGPS you can choose anything color for mapping



1.-Day mode

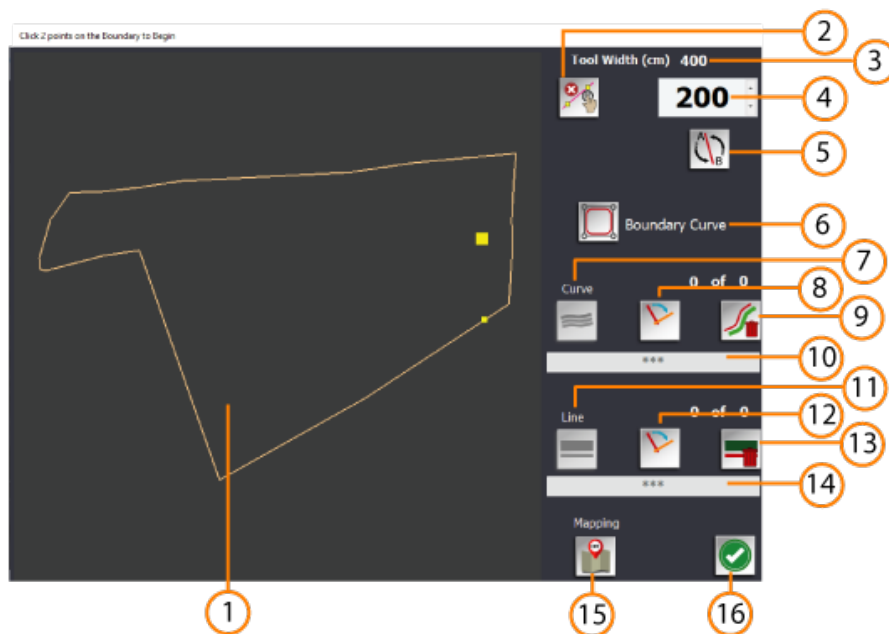
2.-Night mode

3.- Lock/Unlock colors

4.-Done

5.-Preset colors

19.-AB Line		
1	Field Map	In the field map you can create all AB lines, existing ones are also shown.  To create a new line, you only have to select two points on the boundary (the points can be deleted with the icon 2 "Point delete"). The line between the two points is created using the icon 7 "Curve" or the icon 11 "Line".
2	Delete Point	
3	Attachment width information	
4	Distance to boundary	By default is half the width of the attachment
5	AB Line Swap direction	
6	Boundary curve	Create a curve line following the boundary limit
7	Curve	For manual calibration, or tweak calibration
8	Cycle Curve Lines	
9	Delete selected curve	
10	Curve information	Heading direction and time.
11	Line	
12	Cycle Lines	
13	Delete selected line	
14	Line Information	Heading direction and time.
15	Mapping	Shows in map paint sections.
16	Done	



20.-Autosteer

This icon is a button to activate the autosteer module (in green), if it is disconnected or deactivated, it is shown in red.

The letter refers to the option in general configuration 3.1.4, M for Manual and R for remote  
3.1.4.1.- Button to let the software button follow the steer switch / button status



Green

ON



Red

OFF

21.-Uturn



Green

ON



Red

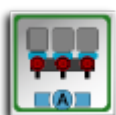
OFF

Uturn configuration in 3.4

22.-Automatic sections



ON



OFF

This button allows control sections with machine module.  
You can see sections on or off in section display (9)

23.-Manual sections



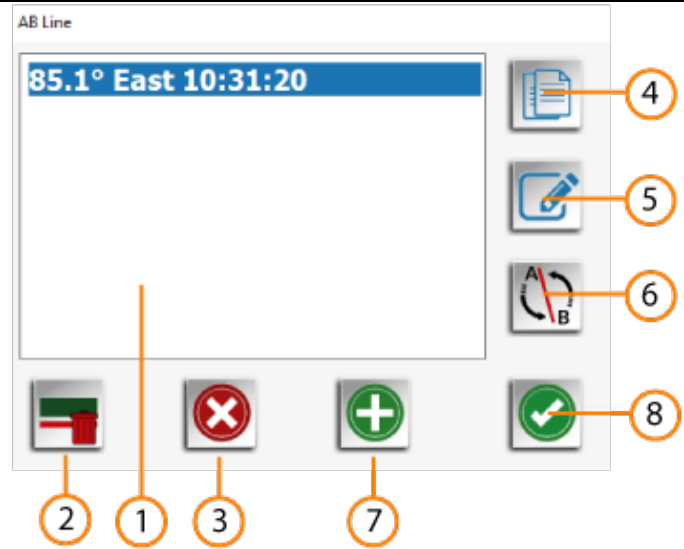
ON



OFF

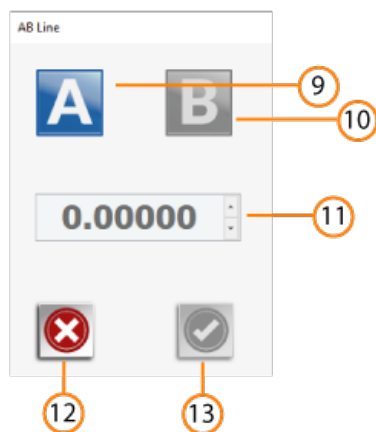
This button allows you to control sections manually  
You can see and operate individual sections (on or off) in section display (9)

25/26.-AB Line/Curve		
1	Line list	
2	Delete selected line	
3	Cancel	
4	Duplicate line	
5	Edit Line	
6	Change direction line	
7	Add AB line	New window appears, point 9 and following
8	Done	



This new window allows you to make a new AB Line driving between two points (A to B)

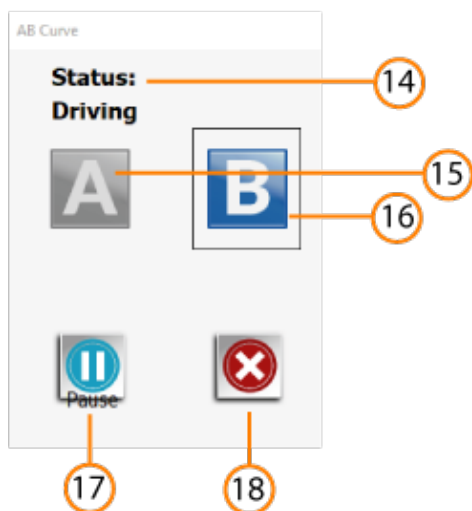
In Line



- |    |                   |
|----|-------------------|
| 9  | A Point           |
| 10 | B Point           |
| 11 | Heading direction |
| 12 | Cancel            |
| 13 | Done              |

This new window allows you to make a new path driving between two points (A to B)

In Curve



- |    |           |
|----|-----------|
| 14 | Status    |
| 15 | A Point   |
| 16 | B Point   |
| 17 | REC/Pause |
| 18 | Cancel    |



## 27.-Contour

This button change line to contour line

When activated a new button appears.



### 1 Lock/Unlock

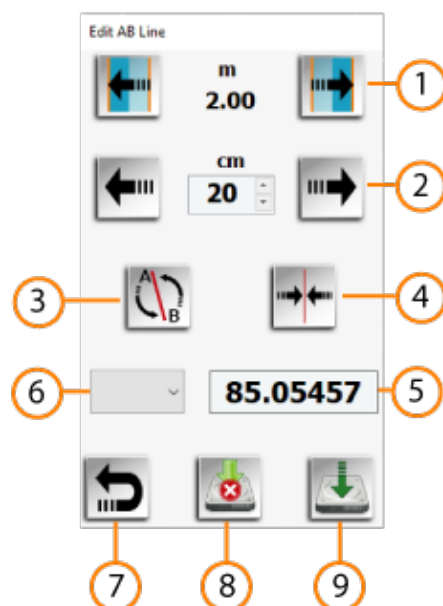
Locks or unlocks the line tracking, forcing to follow the line once it is locked, if it is in the locked position an intermittent message appears on the screen

## 28.-Snap to pivot



This button sets the line at the pivot point

29.-AB Line Edit		
1	Half Snap	
2	Snap	
3	Change direction line	
4	Snap to pivot	
5	Heading direction	You can manual edit heading direction
6	Presets heading direction	0/90/180/270 Degrees
7	Cancel and return	
8	Done but don't save	
9	Save and done	



### 30.-Your Skip

Automatic skips in uturn like picture in icon



Enabled

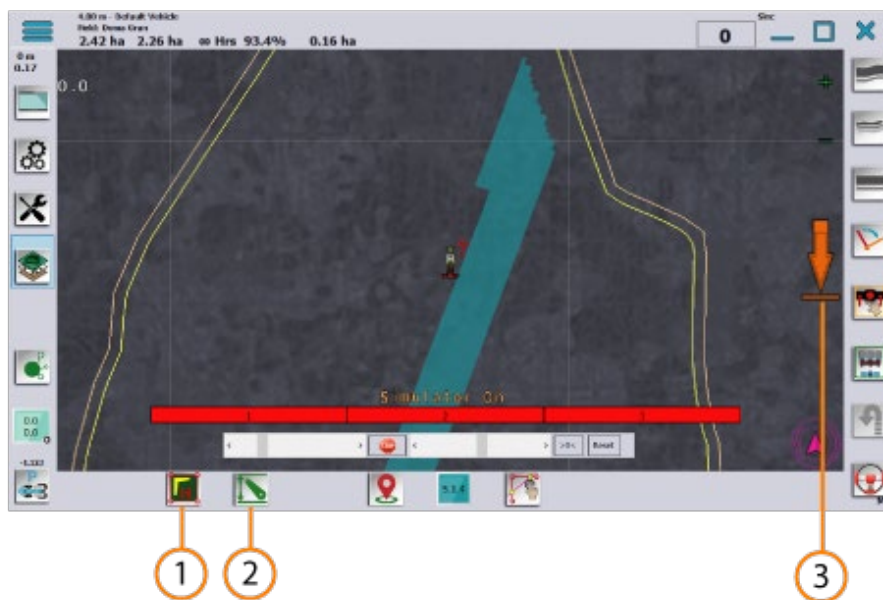


Disabled

### 31.- Uturn Skips

Drop-down list with skip options in U Turn (0 to 10)

### 32.- Headland (active)



- 1 Headland ON/OFF
- 2 Lift Control ON/OFF
- 3 Arrow lift control UP/DOWN info