Perplant Sensor manual – Service Operator

Version 01.0.01

Date 05.03.2024

PerPlant

Table of content

1 Technical understanding of the underlying concepts supporting the sensor

See presentation on the drive folder:
https://www.canva.com/design/DAF-rts0mAo/ej2Sf1MYx2ULA1eyjDNAXQ/view?utm_content=DAF-rts0mAo&utm_campaign=designshare&utm_medium=link&utm_source=editor

2 How to install the sensor

2.1 Preconditions that needs to be in place.

- TC is still the one defining the overall task. Sensor is only contributing with overruling prescription rates and turn on/off sections. Following therefore needs to be in place:
    - Connected to the sprayer through ISOBUS (only for sensor VRA mode but not for scanning mode)
    - Have a task defined for the field that needs to be operated in (with boundaries).
    - Have variable license opened
    - Have section control license opened

    - Have ISOBUS license opened (if not by default)
    - Have internet connection
    - Make sure all options match the situation and tool selection.

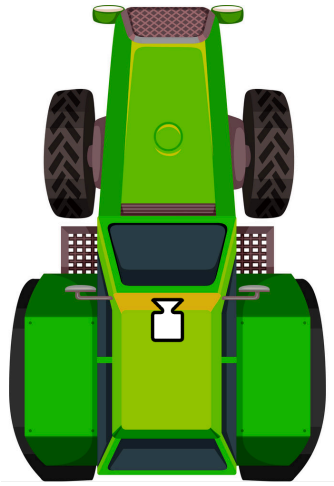
- User login for farmer to access sensor app needs to be created by **Perplant support team**

- Optional to have an ipad for accessing the app and monitor “camera view”. This can also be done through a smartdevice.

2.2 Placing the sensor on tractor

The “PerPlant sensor” should be placed on the tractor's roof over the driver's windshield.

- Some tractors do not have a plane surface, there you should find a board/platform to place on your roof.
- the sensor needs some free space to work probably, make sure there's nothing in front of the sensor that can block the view.
- The sensor needs 10 cm clean space around the sensor not to interfere with the system.



Standard placement of the sensor

1. Test if the sensor works before mounting it to the roof. Connect the ISOBUS cable from the vehicle to the sensor. start the vehicle to see if the sensor powers on and you can see it on the TC screen.
2. clean the placement area, remove dust and dirt with a wet towel and dry it off.
3. remove the overlay sticker from the tape on the bottom of the sensor holder.
4. slow and steady to make sure to place the sensor holder correctly on the plane placement area.
5. push it down on the surface and make sure it stays in place.
6. place the sensor arms in the rubber mount. make sure it's in place.
7. tilt the sensor to horizontal level by using the winged tighten bolt on the sides of the sensor base holder.

8. Connect the ISOBUS to the sensor to make sure it is connected to the tractor (power source) ISOBUS input.

   A stationary installation should only be done by Perplant Certified Service Operator

2.3 Calibration of camera detection width

- Will be installed remotely by Perplant suppport team and in alignment with primary implement width (e.g. 36m wide trailer sprayer). For calibration to other widths, Perplant support service team needs to be contacted.
- Perplant sensor needs to be in level when positioned on tractor roof. Use levelmeter and check camera view from the tablet by accessing sensor vra app and check “camera view” -
    - Does camera look like it is in level?
    - Is something blocking the view?
    - Use measuring tape and put it on the ground where camera view is located (check tablet), and measure the width distance with measuring tape

2.2 Pumps latency of spraying time

From camera detection to actual spraying there is a latency time influenced by the “spraying pumps spraying time”. To be able to calibrate sensor to this latency, farmer needs to perform a test drive (e.g. use a spray with water in the tank) with the sensor in “sensor VRA mode” and spray a complete field (e.g. 5 ha). Based on the scanned field and “actual spraying map” Perplant support team can calculate the latency time and adjust for that in the prescription rates. **Perplant support team needs to be informed for this calibration**.

2.3 Operation process (after first installation have been done)

The farmer operators the sensor in the following step-by-step process:

- (Optional) When tractor is in the barn. Optional to fiil up the tank of the sprayer based on calculations from “tank estimation app” (only relevant for redistribution strategies)
- Check if TC preconditions further above are confirmed. All has to be confirmed.
- (Optional) Put up sensor box on the roof mount and put in the isobus cable in the sensor (if the sensor has been stored away since last operation)
- Check if the Perplant UT pops up on on terminal.
    - **If not shown** - it might be because the screen view has to be reorganized among other ISOBUS devices. Farmers needs to go to the feature where he can reorganize what screens should be displayed on the screen.
- Check on Perplant UT: Is there a green dot with the name of the implement? Then it is connected to the implement. If not - check troubleshooting section.
- Drive to field and drive inside the field to make sure the sensor GPS is within boundaries of the field
- Launch sensor app modes - either sensor VRA mode or scanning mode
- Define operation and approve. Check on the UT that all three systems are “active” (colour is turned from grey to black)
- If sensor is active, sprayer then needs to be activated by farmer and section control and VRA needs to be activated before he can start the task on the TC
- Farmer start task on TC and performs the task
- Farmers can monitor the app along the way to check for indicators status, variation in the field from camera view, and the actual rates being prescribed.
- When all field has been sprayed he needs to click “finish operation” and the maps will then be uploaded to field app.
- He can then drive to the next field and define a new operation to be executed on for the next field.

3 Troubleshooting both sensor hardware & software issues

In case of issues while operating a task: Stop current operation by hitting “stop button” or “finish operation” on Perplant app and troubleshoot before starting a new operation. When hitting “stop” all current mapping will be stored - but when hitting “stop” no field data will be stored.

TC & ISOBUS issues

- TC (e.g. GPS terminal) cannot connect to sprayer or connection is fluctuating:
    - Turn off tractor - Try starting TC screen first - then turn on power on tractor
    - Check if all the TC preconditions above are confirmed
    - Contact Perplant support team.

Indicators are red

- Contact Perplant support team directly checks the backend for issues related to indicators turning red

Hardware Issues

- The sensor can have trouble operating if the sensor camera is blocked or covered (son flare, foggy weather, low light, dune on plant, blocked camera, dirt and dust.)
    - Clean the sensor with a microfiber cloth. check the sensor camera view on the Perplant webapp.
- Make sure there's no damage on the ISOBUS cable.
    - The ISOBUS cable should be replaced
- GPS interference. If metal and other electronics are too close it can cost GPS interference.
    - Make sure the sensor is installed correctly. (Check sensor placement guide 2.2)
- Sensors do not turn on.
    - make sure the ISOBUS cable (power source) is connected right from the sensor to the vehicle. call the Perplant support team.
- There can't be any damage on the sensor's outer shield. This can cause internal wire issues or water damage.
    - Damaged hardware shall be replaced. call the Perplant Support team
- No connection to wifi.
    - reboot the system 1-2 times and try to connect again. drive 10 m from your current position and connect again. if still causing trouble contact the PerPlant support team.
- Hotspot doesn't show up. in terms that the PerPlant hotspot is missing.
    - reboot the system 1-2. still missing contact Perplant support team.
- locking suggested prescription rate. This can be caused by losing internet connection. In this case the sensor will fall back on the newest map possible (max 1 week old) and still be functional until it reconnects to the internet.
- Error starting up. this can be cost by driver/update issues
    - Reboot the system 1-2 times. Call the Perplant Support team.

Wrong field operations have been defined (e.g. wrong crop, wrong input chemical, wrong strategy, etc.)

- Stop current operation by hitting stop button and create a new operation or choose “finish operation” to save the map. The old operation will not be saved if you hit “stop” - only when picking “finish”.

Satellite indicator
If it is turned red, probably satellite navigation pane will also fluctuate on screen. In this case “sensor VRA” prescription rates will be based on average rate defined in the operation

Camera indicator is red:

- Can be due to several reasons. Follow standard procedure below before reaching out to the support.

Isobus indicator turns red:

- “Scanning mode” does not require connection to sprayer as opposed to “sensor VRA mode”. So in “scanning mode” sensor will still map the field, but in “sensor VRA mode” sensor will stop mapping the field and it will not be saved. A new operation has to be started all over.

Camera view

- Sensor view in “sensor VRA mode” cannot be seen on the whole tablet/mobile/pc screen. Contact perplant support team that can adjust this remotely

4 Understanding escalation processes for issues

1 Restart the tractor and all systems
2 Restart again
3 Call support and report error code. Support related to ISOBUS error codes will be handled by Ag Precision. Other error codes will be handled by Perplant.

5 Ressources and documenting tickets

All requests from customer has to be documented in this spreadsheet: https://docs.google.com/spreadsheets/d/1-ZlRY2xIsmRUp3xzCyABHh_EoibOpUNslnWXo4wd4KY/edit#gid=0 **(Important!)**

Access “support presentation” for Perplant: https://www.canva.com/design/DAF-rts0mAo/ej2Sf1MYx2ULA1eyjDNAXQ/view?utm_content=DAF-rts0mAo&utm_campaign=designshare&utm_medium=link&utm_source=editor

Access to ressource hub where images, how to guides and documentation will be uploaded during the season: https://drive.google.com/drive/folders/1ETmcWlEqbAzG__i3UIdWJ0qHBAKh95RR?usp=sharing

7 Error codes
Error codes on screen where farmer will be advised to call Ag Precision:

Code ID	Module	Description	Severity	Occurance	Potential Cause	Recommended Actions	id
05x024	**prescription_actuator**	No geometry received.	4	3	ISOBUS issue.	Reboot the device.	02
05x034	**prescription_actuator**	Actual prescription rate is different that the section prescription rate.	4	3	ISOBUS issue.	Reboot the device.	03
05x044	**prescription_actuator**	TC Error	4	3	ISOBUS issue.	Reboot the device.	04
05x054	**prescription_actuator**	UT Error	4	3	ISOBUS issue.	Reboot the device.	05
05x064	**prescription_actuator**	Variable rate active.	4	3	ISOBUS issue.	Reboot the device.	06

05x074	**prescription_actuator**	No valid implement.	4	3	ISOBUS issue.	Use a valid implement. Reboot the device. Call support.	07

8 FAQ

How far away does the sensor see?
Depends on the height of the tractor and is calibrated remotely from Perplant Support team.

How is prescription rates calculated in terms of inputs?
This depends on chosen crop and type of operation defined as different agronomy models are supporting different calculations of rates. Typically it is a mix of sensory, satellite and external data inputs (soil and yield maps if available for upload to the field app)

Contact info - Perplant support team:

Rasmus Emil Hansen: 25142988, rasmus@perplant.ai

Jeppe Heidenreich Skov: 26164693, jeppe@perplant.ai

Ag Precision consultants