

CropSpec Operator's Manual



CropSpec™

Operator's Manual

Part Number: AGA5408

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For use with Software Version 4.02

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Preface

This manual provides information about operating and maintaining this Topcon Precision Agriculture product. Correct use and servicing is important for safe and reliable operation of the product.

It is very important that you take the time to read this manual before using the product.

Information in this manual is current at the time of publication. A system may vary slightly. The manufacturer reserves the right to redesign and change the system as necessary without notification.

Terms and Conditions

Note: Please read these Terms and Conditions carefully.

General

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- (ii) normal wear and tear
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- (iv) unauthorized modifications of the product; and/or
- (v) use of the product in combination with other products not supplied or specified by TPA.

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- the laws of South Australia if the product is sold and supplied to you in Australia (in which case the courts of South Australia or the Federal Court of Australia (Adelaide Registry) have exclusive jurisdiction in respect of any claim or dispute) or
- the laws of the State of California if the product is sold and supplied to you outside of Australia
- the provisions of the United Nations Convention on Contracts for the International Sale of Goods shall not apply to these Terms and Conditions.

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Service Information

Service assistance can be provided by contacting your local TPA Authorized Dealer.

Communications Regulation Information

FCC Compliance Statement (USA)

This equipment has been tested and found to comply with the limits for a Class ‘A’ digital device, pursuant to Part 15 of the FCC Rules. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at the user's expense.



FCC Compliance Statement (Canada)

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulation.



CE EMC Statement (European Community)

Warning: This is a class ‘A’ product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.



‘C’ Tick EMC Statement (Australia & New Zealand)

This product meets the applicable requirements of the Australia and New Zealand EMC Framework.

Type Approval and Safety Regulations

Type approval may be required in some countries to license the use of transmitters on certain band frequencies. Check with local authorities and your dealer. Unauthorized modification of the equipment may void that approval, the warranty and the license to use the equipment.

The receiver contains an internal radio-modem. This can potentially send signals. Regulations vary between countries, so check with the dealer and local regulators for information on licensed and unlicensed frequencies. Some may involve subscriptions.

Radio and Television Interference

This computer equipment generates, uses, and can radiate radio-frequency energy. If it is not installed and used correctly in strict accordance with TOPCON Precision Agriculture instructions, it may cause interference with radio communication.

You can check if interference is being caused by this equipment by turning the Topcon equipment off to see if the interference stops. If the equipment is causing interference to a radio or other electronic device, try:

- Turning the radio antenna until the interference stops
- Moving the equipment to either side of the radio or other electronic device
- Moving the equipment farther away from the radio or other electronic device
- Connecting the equipment to another circuit that is not linked to the radio.

To reduce potential interference operate the equipment at the lowest gain level that will allow successful communication.

If necessary contact your nearest Topcon Precision Agriculture dealer for assistance.

Note: Changes or modifications to this product not authorized by TOPCON Precision Agriculture could void the EMC compliance and negate authority to operate the product.

This product was tested for EMC compliance using Topcon Precision Agriculture peripheral devices, shielded cables and connectors. It is important to use Topcon Precision Agriculture devices between system components to reduce the possibility of interference with other devices

General Safety



DANGER: It is essential that the following information and the product specific safety information is read and understood.

Most incidents arising during operation, maintenance and repair are caused by a failure to observe basic safety rules or precautions. Always be alert to potential hazards and hazardous situations.

Always follow the instructions that accompany a Warning or Caution. The information these provide aims to minimize risk of injury and/or damage to property.

In particular follow instructions presented as Safety Messages.

Safety Messages and Warnings

The safety symbol is used with the relevant word: DANGER, WARNING or CAUTION.

Messages marked in this way recommend safety precautions and practices. LEARN and apply them.



DANGER: Indicates an imminently hazardous situation that, if not avoided, could result in **DEATH OR VERY SERIOUS INJURY**.



WARNING: Indicates a potentially hazardous situation that, if not avoided, could result in **DEATH OR SERIOUS INJURY**.



CAUTION: Indicates a potentially hazardous situation that, if not avoided, may result in **MINOR INJURY**.

Safety Signs



WARNING: DO NOT remove or obscure safety signs. Replace any safety signs that are not readable or are missing. Replacement signs are available from your dealer in the event of loss or damage.

If a used vehicle has been purchased, make sure all safety signs are in the correct location and can be read. Replace any safety signs that cannot be read or are missing. Replacement safety signs are available from your dealer.

Operator Safety



WARNING: It is YOUR responsibility to read and understand the safety sections in this book before operating this vehicle. Remember that YOU are the key to safety.

Good safety practices not only protect you, but also the people around you. Study this manual as part of your safety program. This safety information only relates to Topcon equipment and does not replace other usual safe work practices.



WARNING: Ensure power is removed from the Topcon equipment prior to maintenance or repair of the vehicle or implements.



WARNING: Ensure appropriate precautions are taken prior to handling any hazardous substances. Always read the Material Safety Data Sheet prior to commencing work.



WARNING: In some of the illustrations or photos used in this manual, panels or guards may have been removed for demonstration purposes. Never operate the vehicle with any panels or guards removed. If the removal of panels or guards is necessary to make a repair, these **MUST** be replaced before operation.



WARNING: Always check that any suspended vehicle attachments are lowered to the ground before beginning repair or maintenance work on a vehicle.



WARNING: Vehicle and implement parts can become hot during operation and may be under pressure. Refer to vehicle manuals.



WARNING: Wear appropriate protective clothing for the task being undertaken and conditions.



WARNING: Do not operate equipment around explosive equipment or supplies.



WARNING: Topcon is committed to good environmental performance and minimizes the use of any potentially harmful substances in its products. However, it is always advisable not to handle damaged electronic equipment. This Topcon product may contain a sealed lithium battery. Always dispose of any electronic equipment thoughtfully and responsibly.

Exposure to Radio Frequency

Exposure to energy from radio frequencies is an important safety issue. Keep a distance of at least 20 cm (7.8 inches) between people and any radiating antenna. Keep a distance of at least 20 cm between transmitting antennas.



WARNING: Products using cellular modem or an RTK base station can transmit radio frequency energy. Check with your dealer.

This device is designed to operate with TPA approved antennas. Discuss with your dealer.

Preparation for Operation

- Read and understand this manual and learn all of the controls before you use the equipment.
- Keep the manual with the equipment.
- If the equipment is moved to another vehicle, move the manual as well.
- Read the manual for the vehicle with which the equipment will be used and check that the vehicle has the correct equipment required by local regulations.

- Make sure you understand the speed, brakes, steering, stability, and load characteristics of the vehicle before you start.
- Check all controls in an area clear of people and obstacles before starting work.
- Identify possible hazards.



WARNING: Topcon equipment must not be used by an operator affected by alcohol or drugs. Seek medical advice if using prescription or over-the-counter medication.

Disclaimer

Topcon accepts no responsibility or liability for damages to property, personal injuries, or death resulting from the misuse or abuse of any of its products.

Further, Topcon accepts no responsibility for the use of Topcon equipment or the GNSS signal for any purpose other than the intended purpose.

Topcon cannot guarantee the accuracy, integrity, continuity, or availability of the GNSS signal.

The operator must ensure that the equipment is correctly turned off when not in use.

Before operating any vehicle equipped with Topcon products, read and understand the following product specific safety precautions.

Important Safety Information

Operator Alertness and Responsibility

The console helps the operator to steer the vehicle, but the operator remains in charge and must be alert and in complete control of the vehicle at all times. The operator is ultimately responsible for safe operation of this equipment.

It is essential that safety requirements are met when operating the console and any of its components. All operators and other relevant personnel must be advised of safety requirements.

Electrical Safety



WARNING: Incorrectly connected power can cause severe injury and damage to people or the equipment.

When working with electrical components, you must do the following:

- Make sure the negative terminal of the battery is disconnected before doing any welding on the vehicle.
- Check that all power cables to system components are connected to the correct polarity as marked. Please refer to the vehicle manual for safety information.
- Check that equipment is grounded in accordance with installation instructions.

Operation and Risk of Obstacles

The following list is not exhaustive or limited. To use the console for assisted steering along a defined wayline, the operator must ensure that it is used:

- Away from people and obstacles
- Away from high voltage power lines or other overhead obstructions (identify any clearance problems before activating the console)
- On private property without public access
- Within cleared fields
- Off public roads or access ways.

Note that:

- The operator needs to know the vehicle's position and the field conditions at all times.
- The operator will need to respond if the GNSS satellite or differential correction signal is lost momentarily.
- The console cannot detect obstacles (people, livestock or other).
- Only use the console in areas that are clear of obstacles and keep a proper distance.
- Steering needs to be disengaged for manual control if an obstacle appears in the path or the vehicle moves away from the wayline.

On/Off and Manual Control



WARNING: Ensure the steering switch is Off to prevent unintentional engagement of the assisted steering. When repairing or maintaining the vehicle/implement, ensure the vehicle CANNOT be moved. Disengage steering, apply brakes and remove keys.

The operator must ensure that the steering switch is Off (*all* LED indicators are off) when assisted steering is not being used.

The operator must disengage assisted steering and use manual control if an obstacle is in the line of travel or moves into the line of travel, or if the vehicle steers away from the desired wayline.

To disengage assisted steering:

- Turn the steering wheel a few degrees OR
- Select the Disengage Auto Steering button on the console AND/OR
- If using an external steering switch, disengage using the switch if the above actions do not disengage assisted steering.

Vehicle Shut Down Safety

Before leaving the vehicle, disengage assisted steering, disengage external steering switch if this is being used, and remove the key from the key switch.

Using a Reference (Base) Station



WARNING: Do not move a reference station while in operation. Moving an operating reference station can interfere with the controlled steering of a system using the reference station. This could result in personal injury or damage to property.

Operators and other affected personnel must be advised of the following safety precautions.

- Do not erect the reference station under or within the vicinity of high voltage power lines.
- When using the portable reference station, make sure that the tripod is securely mounted.

To Get the Best Out of the Product

Back up data regularly. The console has large, but limited storage capacity. Use the Diagnostics Mini-view to view capacity available. A warning screen displays if storage is reaching its limit.

Be aware of file format compatibility. Discuss compatible formats with the dealer. Topcon Agricultural Products are hardy and designed to work in tough conditions. However, if equipment is unused for a length of time, store away from water and direct heat sources.

Alert Symbols

In this manual two alert symbols are used:

Note: This offers additional information.



WARNING: A warning signal appears on safety signs and in this manual to show that this information is very important to your safety. LEARN these and APPLY them.

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Chapter 1 – Introduction

Nutrient supply within a field can be highly variable, as a crop canopy absorbs nutrients at different rates at different locations. As a result, uniform blanket application of nitrogen fertilizer can result in over and under fertilization. With Topcon's CropSpec sensor system, you can measure the current local nitrogen supply and adapt the fertilizer application rate to meet crop requirements accurately.

CropSpec sensors allow operators to determine the nitrogen nutrition status of their crops, making it easier to estimate biomass and nitrogen uptake. The sensors measure plant reflectance to determine chlorophyll content, which is closely related to the nitrogen concentration in the leaf. This non-destructive, non-contact method provides accurate, stable readings and repeatable values which can then be related to crop health.



The CropSpec feature is integrated as a real-time crop monitoring application for use with the X Family consoles. CropSpec operates with the Variable Rate Control (VRC) program or any of the application controllers and allows the user to monitor in-field variability, treat on-the-go and keep data for future analysis or prescription application.

The CropSpec solution uses a two-sensor or single-sensor configuration that mounts on the cabin roof.

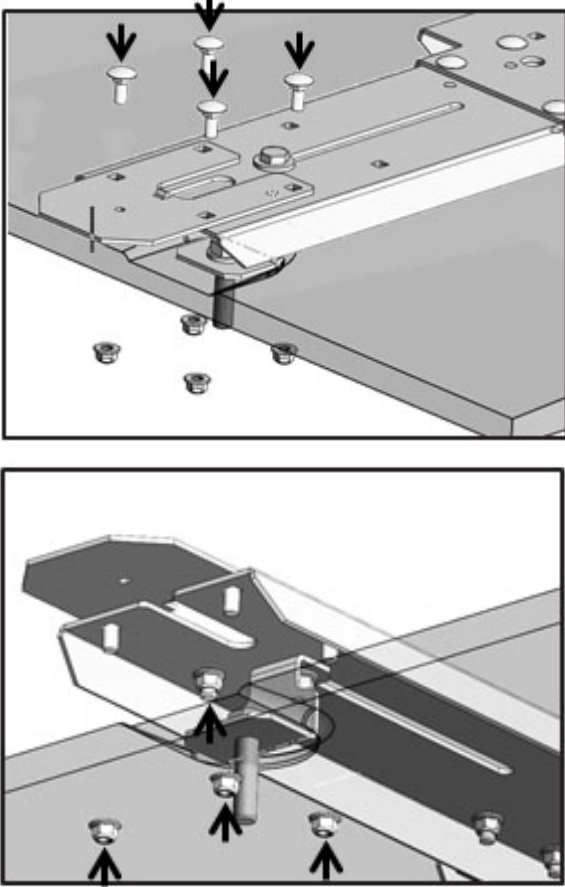


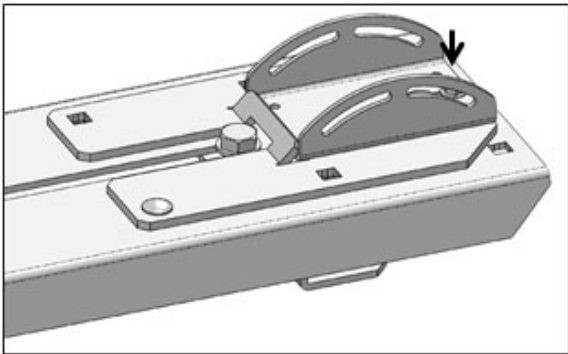
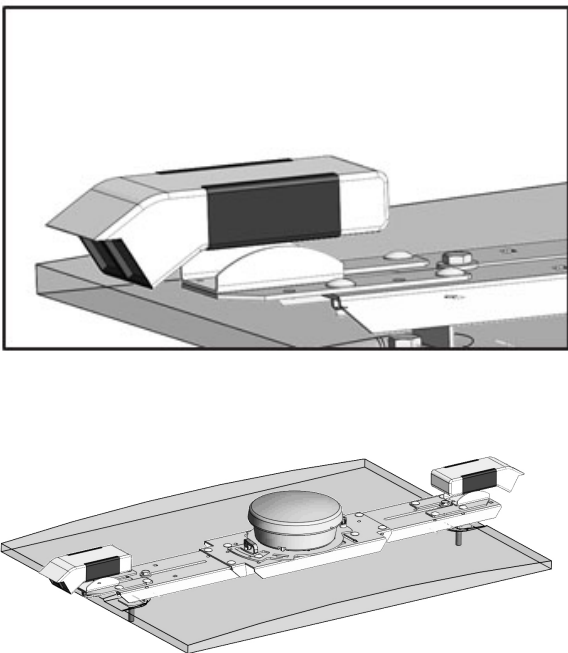
Do not look directly into the sensors. Lasers may cause permanent eye damage.

Chapter 2 – Installing CropSpec Hardware

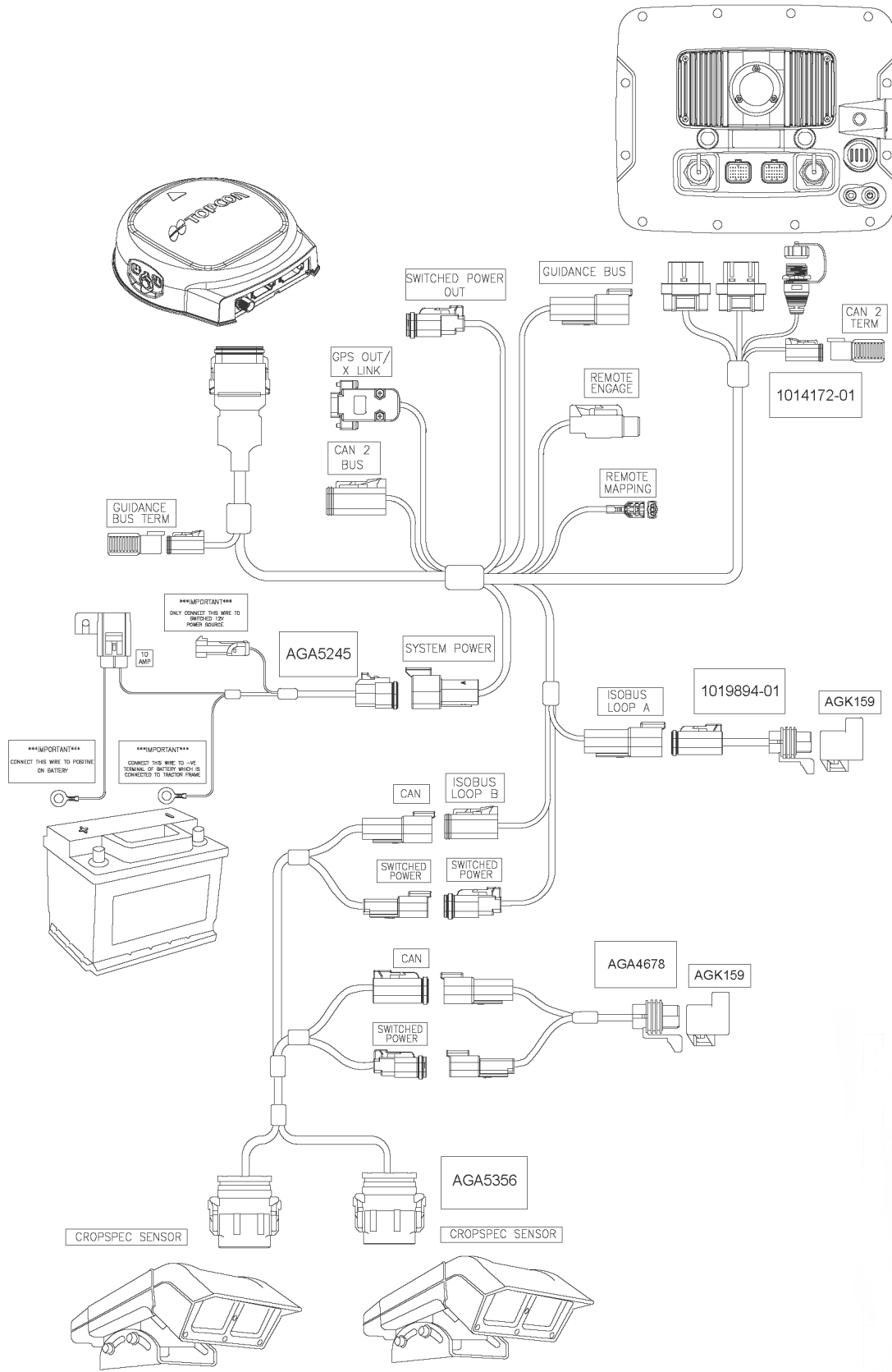
This section describes the steps required to install the 1004326-01 or 1004327-01 KIT on a tractor cabin.

Note: Before installing the CropSpec kit, the AGA3644 KIT must be installed according to the instructions in the A3710 INSTALL GUIDE. The AGB1315 BRACKET is not required for mounting the CropSpec kit.

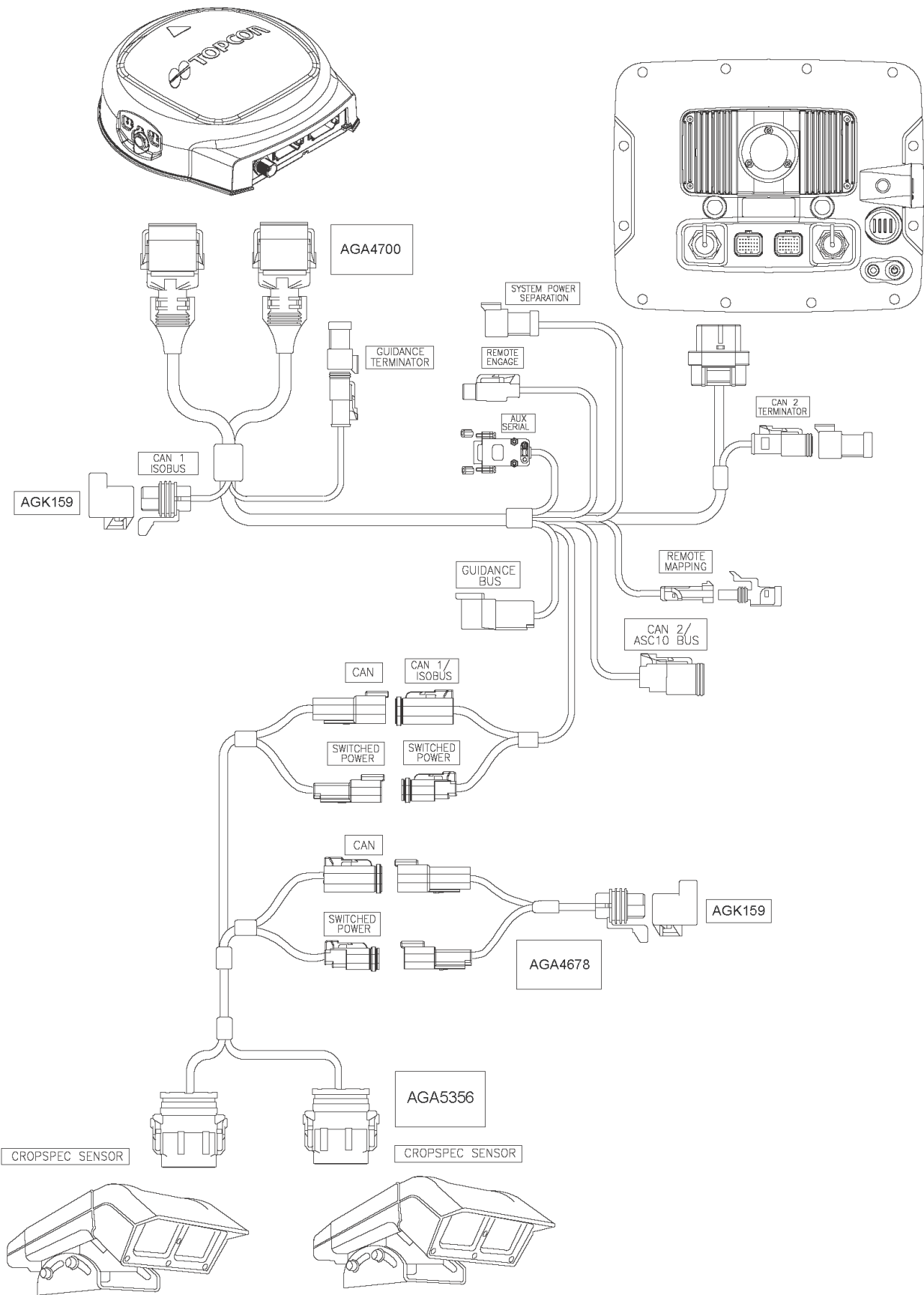
Step View	Procedure
1. 	Use the M10 NUTS (AGF426) to attach the BASE PLATES (9090-1613) to the B142 BRACKETS (one on each side) through any four of the available six holes. Place the M10 WASHERS (AGF440) and secure with the M10 BOLTS (AGF430). Or, use an alternate mounting position as shown.

Step View	Procedure
2. 	Fasten the BASE PLATE (9090-1613) and secure with the supplied M6 SCREWS (2506-0119).
3. 	Secure the CropSpec SENSORS (319000101AGA3838) to the BASE PLATES (9090-1613), one on each side. Note: The sensor with the lower ID value should be installed on the left side of the vehicle. The identity sticker can be found under the sensor. For a two-sensor CropSpec kit (1004326-01), the final set up has a sensor on each side of the tractor roof.

2.1. 1014172-01 Gen 3 Lite harness connections



2.2. AGA4700 harness connections



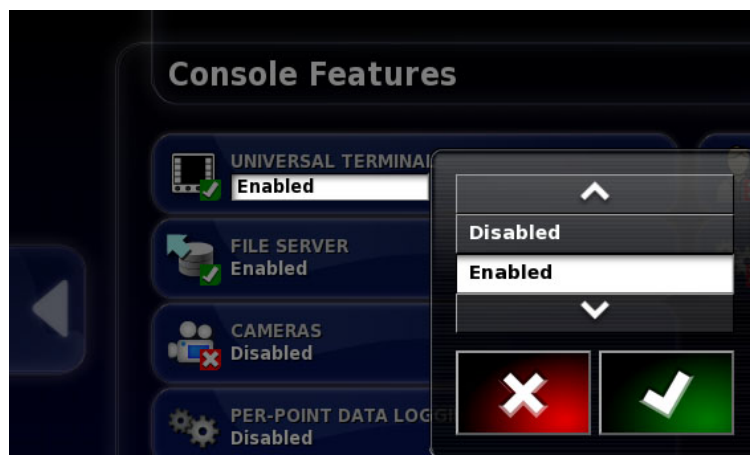
Chapter 3 – CropSpec Setup

This chapter explains how to enable and set up the CropSpec feature on the console.

3.1. Enabling Universal Terminal

To use the CropSpec feature, enable the ISOBUS Universal Terminal (UT) on the console. Universal Terminal allows interaction with ISOBUS compliant ECUs.

1. Select **Setup** screen .
2. Select **System**  / **Features**  / **Console** .



3. Select **UNIVERSAL TERMINAL**.
4. Select **Enabled** and confirm .

3.2. Enabling CropSpec feature

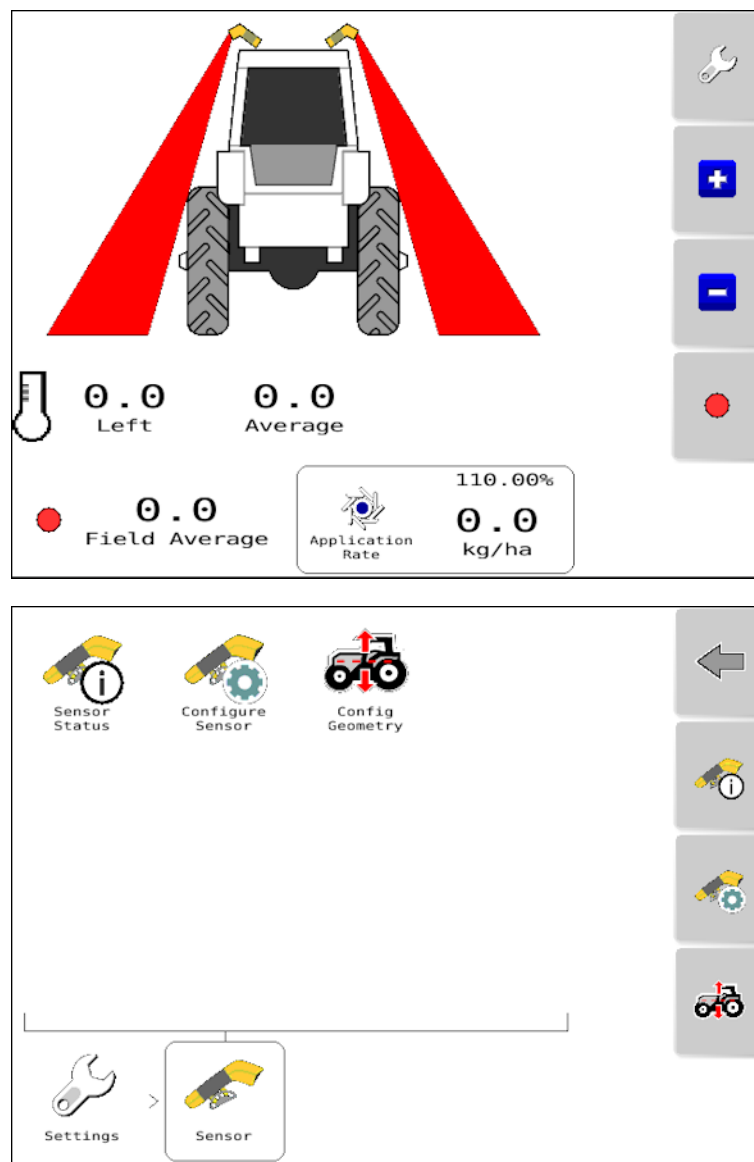
Follow these steps to enable CropSpec:

1. Select **System**  / **Features**  / **Implement**  .
2. Select **NITROGEN SENSING**.
3. Select **Enabled (Topcon CropSpec)**.
4. Select  to confirm and exit. The console will restart.

3.3. Setting up the sensors

To set up the sensors:

1. Select  to switch to the **Operation** screen.
2. From the left navigation bar, select  to open the UT mini-view. Swipe right across the mini-view to maximize the Universal Terminal.
3. Select  and select **Sensor** .



3.3. Setting up the sensors

Sensor status

1. Select **Sensor Status**.

Sensor Status	
Direction	Left
Firmware Version	0
CropSpec Reading	0.0
R1	0
R2	0
Ambient Temp.	0.00
Sensor Temp. 1	0.00
Sensor Temp. 2	0.00

- **Direction:** Select  to switch the sensor between left hand side and right hand side. The displayed **Direction** will change when you switch the sensor.
- **Firmware Version:** Displays the current firmware version.
- **CropSpec Reading:** Figure that represents the crop health reading taken by the sensor/s.
- **R1 / R2:** These are red and near infra-red readings that measure the amount of photosynthesis. The valid range for R1 and R2 readings is 0 - 32767.
- **Ambient Temperature:** Temperature inside the sensor.
- **Sensor Temp 1 / Temp 2:** Each sensor contains two photo sensors (one sensor for each of the two wavelengths that CropSpec uses). It takes approximately 5-10 minutes for the CropSpec sensors to warm up to their operating temperature of 30° Celsius.

Configure sensors

1. Select **Configure Sensor**.

Configure Sensor	
Direction Left	 
Enabled Enabled	
Identity 0	
Automatic Gain Enabled	
Gain Number 1	

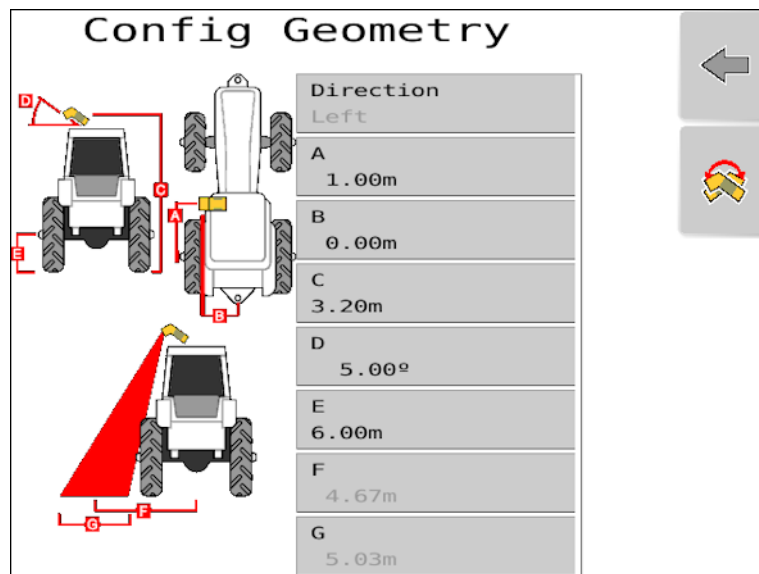
- **Direction:** Select  to switch the sensor between left hand side and right hand side. The displayed **Direction** will change when you switch the sensor.
- **Enabled:** Select to enable or disable the selected sensor.
- **Identity:** Select to display the identities of the installed sensors. The identity sticker can be found under the sensor. Select the identity that matches the sensor installed on the selected **Direction** (left or right).
- **Automatic Gain:** Select to enable **Automatic Gain**. The **Gain Number** is automatically adjusted by the software.

Note: **Automatic Gain** ensures that the CropSpec sensors operate at an appropriate sensitivity level for the conditions of the field. **Automatic Gain** should always be enabled. Disabling **Automatic Gain** and manual entry of **Gain Number** (between 1-6) is only required for fields that have inconsistent CropSpec readings caused by high variations of crop health. In case of inconsistent readings, contact your Topcon dealer for more information.

3.3. Setting up the sensors

Configure geometry

1. Select **Config Geometry**.



Note: Ensure geometry is defined for both sensors if two sensors are installed. Select  to switch the sensor between left hand side and right hand side.

- **A:** Distance from the center of the rear axle to the CropSpec sensor.
- **B:** Distance from the center of the tractor to the CropSpec sensor.
- **C:** Height of the CropSpec sensor from the ground.
- **D:** Angle of the CropSpec sensor.

Note: The angle for **D** is recommended to be 5 degrees. This angle determines a suitable footprint area for the CropSpec sensors.

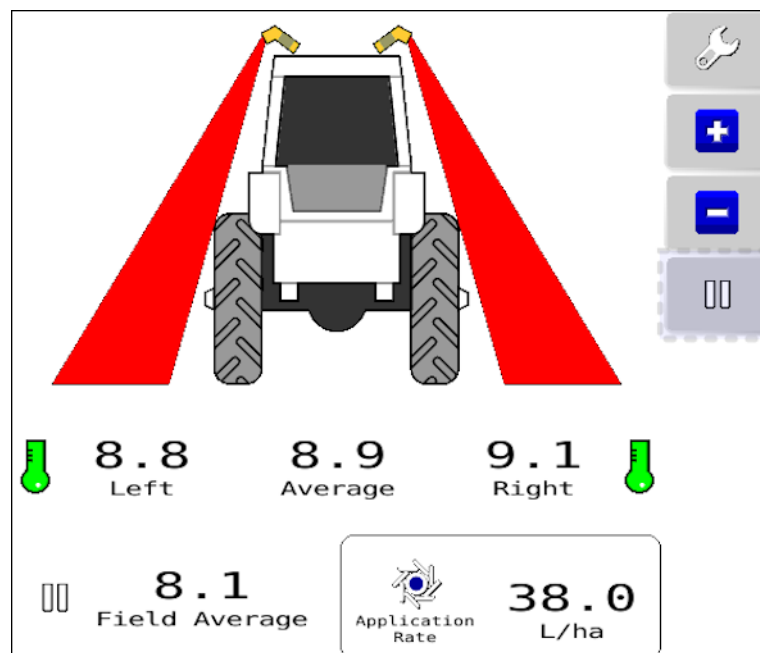
- **E:** Height of the center of the wheel from the ground.
- **F:** Distance from the center of the tractor to the approximate center of the sensor footprint.
- **G:** Approximate width of the sensor footprint.

Note: Approximate width of footprint (**G**) depends on the height of the sensor from the ground (**C**).

C Height of sensor G Width of footprint	
2 m	2.08 m
3 m	3.11 m
4 m	4.15 m

2. Select  repeatedly to display the main screen of the Universal Terminal.

Once the sensors warm up, the biomass values from the crop canopy populate the **Left reading** and **Right reading** and the temperature indicators next to the readings change from red to green.



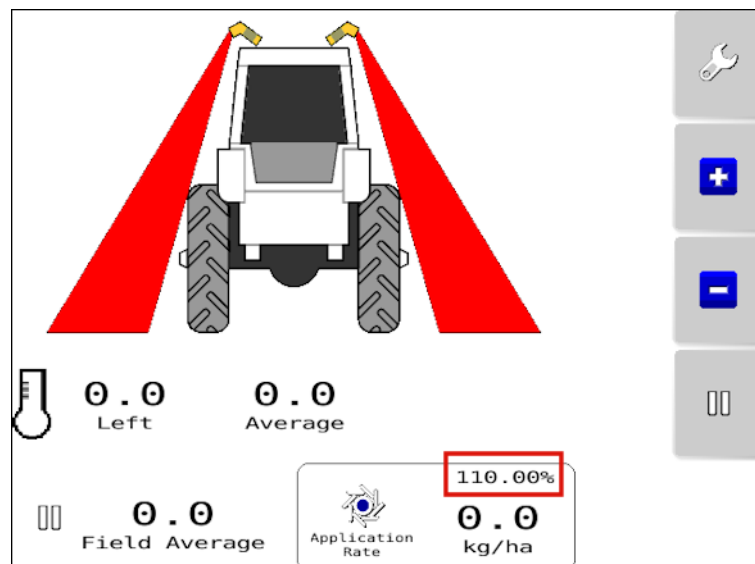
3.4. Setting output configuration

Output configuration determines changes to the application rate.

1. Select  and select **Output Configuration** .

Output Configuration	
Output Scale	100.00%
Output Scale Increment	10.00%
Application Rate	Mass/Area
Metric Area Unit	ha

- **Output Scale:** An Output Scale of 100% means that the prescription defined in the source will be used directly. However, depending on weather conditions, the operator may choose to increase or decrease the rate of application. Changing this percentage provides a uniform rate change for all defined rates. The adjusted rate percentage is displayed on the main screen. Scale is limited to between 50 - 150%.



- **Output Scale Increment:** This allows the rate to be adjusted via the plus  and minus  buttons on the main screen, as required. The value entered here defines how much the rate will

change each time the buttons are pressed. The adjusted rate percentage is displayed on the main screen as shown in the image above.

- **Application Rate:** The Application Rate setting is required if CropSpec is being used to apply product using prescriptions. The selection must match that used by the equipment being used to apply product. For example, most spraying equipment would use **Volume/Area** for liquid products. **Mass/Area** is used for granular products and **Count/Area** is not applicable for use with CropSpec. **Nitrogen Content based Mass/Area** enables the user to configure their prescription based on the mass of Nitrogen element (usually about 22%). The system then automatically multiplies it out to the mass of actual product needed based on the **Concentration %N** setting defined in the prescription (see Configuring prescription types, page 25).

Nitrogen Content based Mass/Area selected

Concentration 21.0%N	
A	Minimum Rate 0.0kgN/ha
B	Maximum Rate 100.0kgN/ha

Mass/Area selected

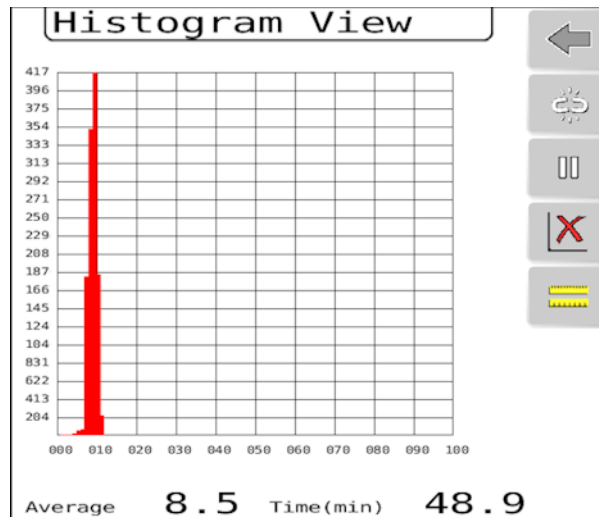
Concentration 21.0%	
A	Minimum Rate 0.0 kg/ha
B	Maximum Rate 100.0 kg/ha

- **Metric Area Unit:** Displays the units in the prescription editor and the main screen as hectares (100 'ares') or 10-are (10 'ares'). **Note:** The console must be restarted if 10-are is selected.

3.5. Histogram view

The histogram shows the average and distribution of the CropSpec sensor data for a given sample area.

1. Select  and select **Histogram View** .



The X axis is the CropSpec value (biomass %) and the Y axis is the frequency/number of times each CropSpec value occurs in the sample.

The histogram functionality can be used to monitor the average CropSpec value in the field or to assist in setting up an 'on the go' treatment plan using a prescription.

For example; when using Two Point prescription mode (see page 25), the histogram can be used to determine the two calibration points. The user could sample a good crop area in the field and then an area with poor crop and use the two CropSpec average values obtained as the calibration points for the prescription.

When using One Point plus Slope prescription mode (see page 29), an average of a larger area of the field can be used to determine the average CropSpec value and a corresponding application rate can be assigned.

Note: When using Target Rate mode (see page 31), the histogram must be used, as the value is required to be used as the average CropSpec value.

3.5.1. Starting and stopping data collection

The  button indicates that data collection is controlled by starting , stopping  and resetting  the data collection manually.

The  and  buttons are also available on the home screen.

Alternatively, sampling may be linked to the console master switch:

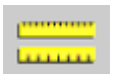


To link data collection to the console master switch:

1. Press the  button. The  button indicates that the console master switch is linked to CropSpec data collection.

Field averaging

The field average can be based on time or distance travelled. Press the

button   to toggle between the two.

Note: To base the field average on distance, the GPS NMEA2000 POSITION functionality must be enabled via the setup screen

Implement / Speed & Position.

3.5. Histogram view

Chapter 4 – CropSpec Operation

Once the CropSpec sensors are configured and sensor readings appear in the Universal Terminal, CropSpec data can be collected by driving through the field.



Do not look directly into the sensors. Lasers may cause permanent eye damage.

CropSpec can be used to:

- Record readings
- Apply product using prescriptions

Note: To use prescriptions to vary the product application rate, Variable Rate Control (VRC) must be enabled on the console.

X25 consoles must be upgraded to ‘Advanced’ to enable VRC.

4.1. Recording CropSpec readings

CropSpec readings represent crop health data. You can export the CropSpec data for analysis or use it in setting up prescription types.

Crop health data can be used to determine minimum or maximum application rates for a particular crop at a specific time of its growth.

Note: It takes approximately 5-10 minutes for the CropSpec sensors to warm up to their operating temperature of 30 degrees Celsius.

Once the sensors warm up, biomass values from the crop canopy will populate the **Left reading** and **Right reading**.

Follow these steps to record CropSpec readings for your field:

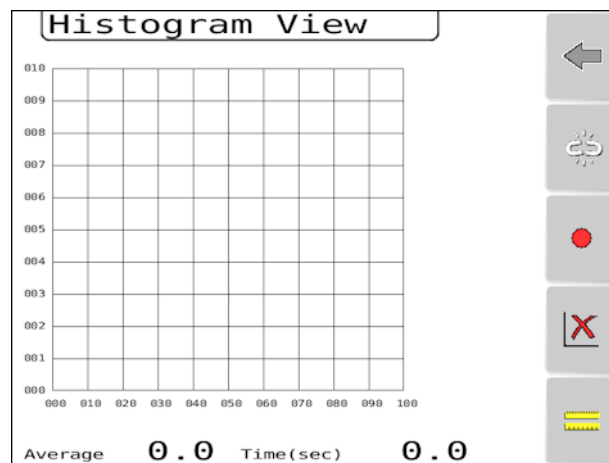
1. Select **Field Menu**  / **Create New Field** .
2. Enter descriptions for **Client**  / **Farm**  / **Field** .
3. Create a new job; select the **Job Menu**  / **Create New Job** .

4.1. Recording CropSpec readings

4. Launch the CropSpec Universal Terminal  from the left navigation bar.

5. Select  and select **Histogram View** .

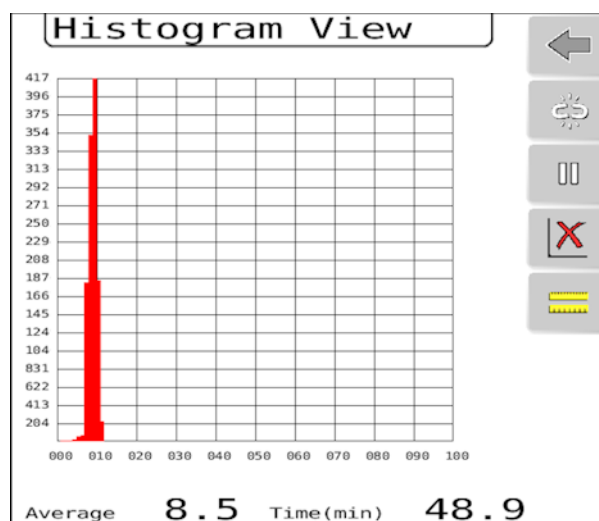
6. Clear the current histogram by selecting .



7. Select  to start recording biomass values. (If recording is linked to the master switch, operate the master switch instead.)

8. Drive the tractor at normal operating speed through the field.

9. Select  to end the recording. (If recording is linked to the master switch, operate the master switch instead.)



4.1.1. Exporting CropSpec job reports

CropSpec can be used to collect crop biomass data by exporting jobs with crop health reports and maps. CropSpec job records can be exported in PDF and CSV format to a USB drive.

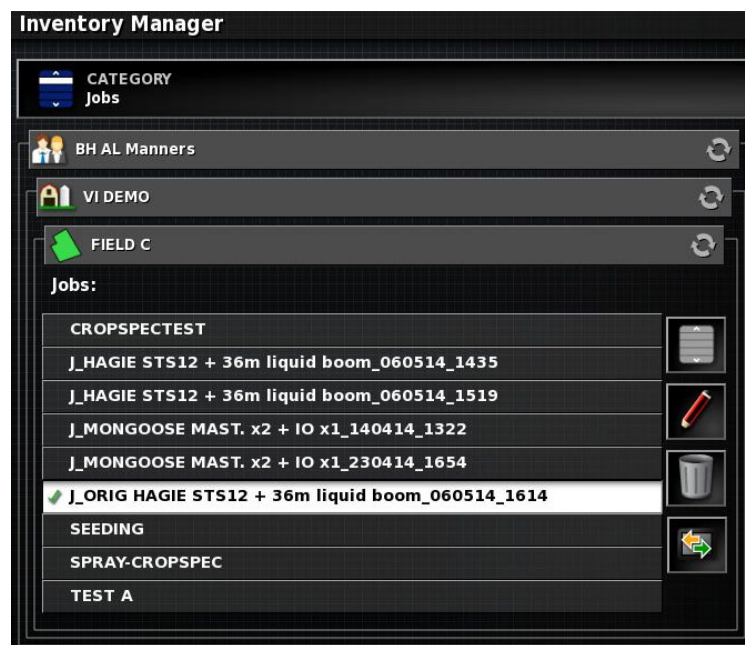
1. Insert the USB into the console.

2. Select **Inventory Manager** .

3. From the **CATEGORY** dropdown, select **Jobs** and confirm



4. Select the client / farm / field and then job related to CropSpec from the list.



5. Select  to export selected items to the USB.

6. Select **Export Job Report**.

4.1. Recording CropSpec readings



The Job Report Options screen displays.

7. Select the required option/s:

- **Auto adjust ranges:** If data exists that uses a color legend, the colors used in the report map shading are altered so that the maximum variation in colors is used to illustrate the yield rates.
- **Create shape files:** Shape file data is exported to D:/Client/Farm/Field/ CoverageShapefiles and D:/Client/Farm/Field/ BoundaryShapefiles
- **Task data:** Exporting a job report also exports XML based task data into a folder named TASKDATA.

On successful export, the following message will appear on screen.



8. Select  to confirm.

The PDF report of the exported job is located in:

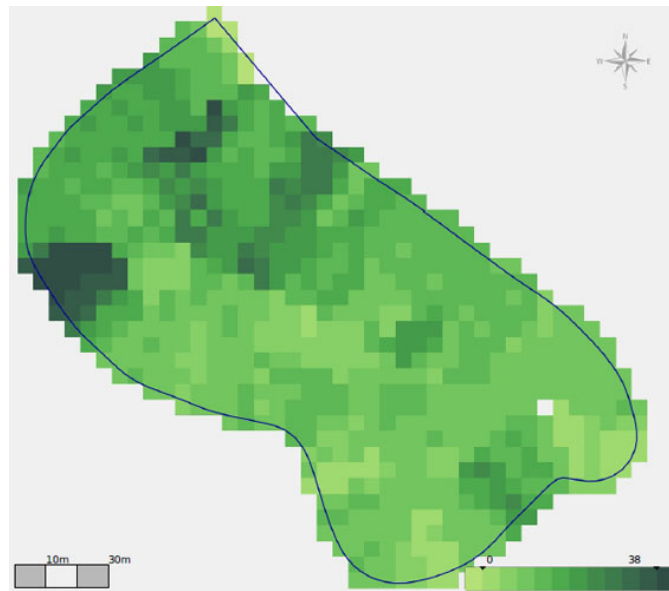
USB Root directory:/Client/Farm/Field/Reports

The .csv file is located in:

USB Root directory:/Client/Farm/Field/Jobs

Note: Before removing the USB, always disconnect first by selecting the USB eject  icon on the base of the console. (The icon is on the swipe up menu on the X35 and X25.) A message will display that it is safe to remove the USB. If this is not done, the report may be missing or corrupt.

Note: The CropSpec map in the PDF file appears on the last page.



4.2. CropSpec prescription types

CropSpec prescriptions can control the fertilizer application rate according to the readings gathered by the sensors. There are four types of CropSpec prescriptions available:

Note: There are also three prescription types that are specific to Japan. Refer to Configuring Japanese wheat prescription types, page 34.

4.2.1. On/Off

On/Off prescription type provides elementary rate control that can start or stop the fertilizer application. However, this prescription type can also be used to assign maximum and minimum values for the application rate.

4.2.2. Two Point

Two Point prescription type uses two average CropSpec readings (from parts of the field where crop health is good and from parts of the field where crop health is poor) to define the application rate between the two levels of biomass.

4.2.3. One Point plus Slope

One Point plus Slope prescription type uses an application rate that corresponds with the average CropSpec value for the field to vary the applied rate as the CropSpec value increases and decreases. Enter a +/- slope value so that as the CropSpec reading moves above or below the average CropSpec reading, the application rate will adjust according to the slope value.

4.2.4. Target Rate

This prescription type is the same as One Point plus Slope, except that the application rate is linked to the live average CropSpec reading rather than a pre-entered, fixed average. As the current CropSpec reading changes, the application rate is adjusted.

4.3. Configuring prescription types

Note: Before setting CropSpec prescriptions, ensure that the GPS receiver and CropSpec sensors are set up correctly.

4.3.1. Creating a new prescription

1. Select  and select **Prescription** .
2. Select  to create a new prescription, or  to copy a prescription, which can then be edited.
3. Enter the desired name and confirm .
4. Select the prescription type.
5. Enter data values according to the selected prescription type. Refer to the following sections for details on configuring the prescription types.

Prescription	
	NAME TOMEAST
	TYPE Tomeba East
	CONCENTRATION 21.0%
	MINIMUM RATE 0.0 kg/ha
	MAXIMUM RATE 100.0 kg/ha
	FALLBACK RATE 20.0 kg/ha
	RATE STEP 1.0kg/ha
	HARVEST VOL 600.0kg/ha

6. Select escape  repeatedly until you reach the CropSpec home screen.
 -  Create a new prescription.
 -  Copy a prescription (which may then be edited).

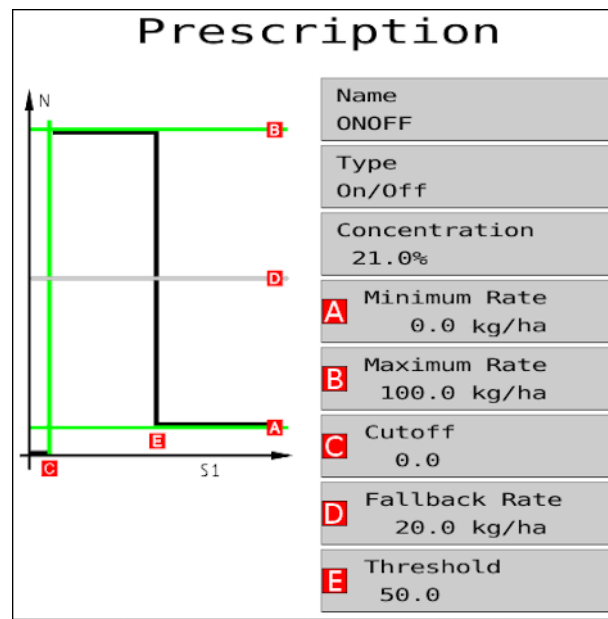
4.3. Configuring prescription types

-  Switch between the list of prescriptions and the prescription slope graph.
-  Delete prescriptions. See [Deleting prescriptions](#), page 40.
-  Download a prescription from USB. See [Download a prescription from USB](#), page 40.
-  Upload a prescription to USB. See [Upload a prescription to USB](#), page 39.

The following sections describe how to configure the selected prescription type.

4.3.2. Configuring On/Off prescription

Enter the following data values to configure the On/Off prescription:



- **Concentration %:** The ratio of the active ingredient in the product being applied (nitrogen if **Nitrogen Content based Mass/Area** selected in output configuration, see page 14).
 - **Minimum Rate:** The minimum rate of the active ingredient that should be applied relative to the amount of biomass detected.
 - **Maximum Rate:** The maximum rate of the active ingredient that should be applied relative to the amount of biomass detected.
- Note:** To set the rate based on the desired amount of total product (as opposed to active ingredient), set the concentration to 100%.
- **Cutoff:** The CropSpec value at which the applicator will stop applying product. When the CropSpec value is equal to or less than this value, the application rate drops to zero.
 - **Fallback Rate:** The application rate that the software should default to if unable to obtain a valid reading from either sensor. This can happen if no biomass is detected.
 - **Threshold:** The CropSpec value where the application rate changes from maximum to minimum (on/off). When the CropSpec value is less than the threshold, the application rate will be at the maximum.

4.3. Configuring prescription types

When the CropSpec value is greater than or equal to the threshold value the application rate will be at the minimum.

4.3.3. Configuring Two Point prescription

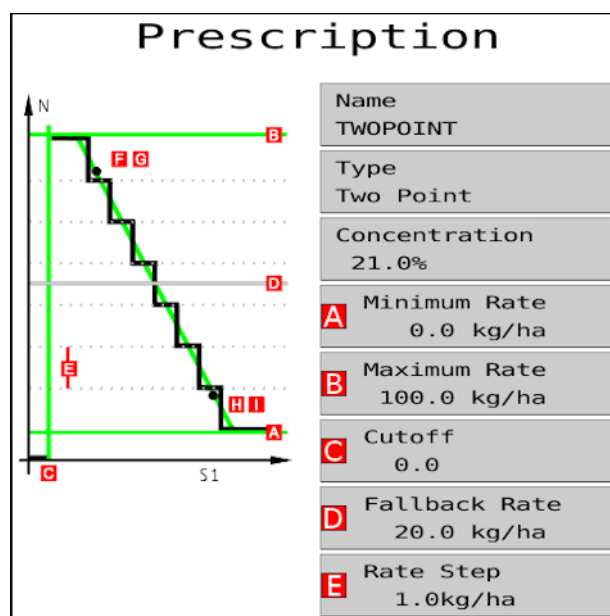
For this prescription type, the average CropSpec reading for both poor crop health and good crop health is required.

1. Drive through the parts of the field where crop health is poor to acquire the average reading for poor crop health (**Crop Sense A**).
2. Drive through the parts of the field where crop health is good to acquire the average reading for good crop health (**Crop Sense B**).

Refer to Recording CropSpec readings, page 19 for details on recording average CropSpec readings.

The two average readings are used to automatically generate a slope that defines the change in application rate with respect to the change in CropSpec value between the two readings.

Enter the following data values to complete the configuration:



- **Concentration %:** The ratio of the active ingredient in the product being applied (nitrogen if **Nitrogen Content based Mass/Area** selected in output configuration, see page 14).
- **Minimum Rate:** The minimum rate of the active ingredient that should be applied relative to the amount of biomass detected.

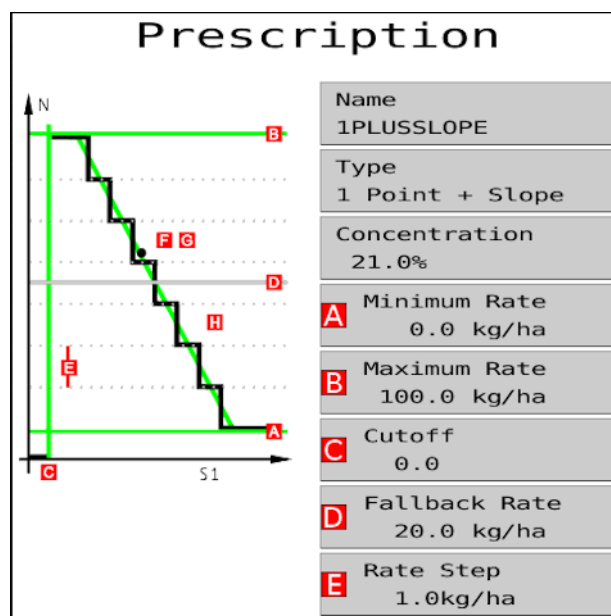
- **Maximum Rate:** The maximum rate of the active ingredient that should be applied relative to the amount of biomass detected.
Note: To set the rate based on the desired amount of total product (as opposed to active ingredient), set the concentration to 100%.
- **Cutoff:** The CropSpec value at which the applicator will stop applying product. When the CropSpec value is equal to or less than this value, the application rate drops to zero.
- **Fallback Rate:** The application rate that the software should default to if unable to obtain a valid reading from either sensor. This can happen if no biomass is detected.
- **Rate Step:** The rate step defines the amount of application rate change that should be applied as the CropSpec value increases or decreases. The values entered for minimum and maximum rate are rounded up or down to the nearest multiple of the value entered for Rate Step, effectively changing the minimum and maximum rate. To prevent this, the value entered here should be a multiple of the minimum and maximum rate values.
- **Crop Sense A:** The average CropSpec reading of the poor biomass from a field. It is collected by driving through the part of the field where crop health is poor.
- **Rate A:** The application rate when the CropSpec reading matches the value of **Crop Sense A**.
- **Crop Sense B:** The average CropSpec reading of the good biomass from a field. It is collected by driving through the part of the field where crop health is good.
- **Rate B:** The application rate when the CropSpec reading matches the value of **Crop Sense B**.

4.3.4. Configuring One Point plus Slope prescription

To configure One Point plus Slope prescription type, you need to determine the average CropSpec reading for the field (this figure is entered into **Crop Sense A**). To collect the reading, drive through the part of the field that represents the best average sample for the entire

4.3. Configuring prescription types

field. Refer to Recording CropSpec readings, page 19 for details on recording average CropSpec readings. Enter the following data values to complete the configuration:



- **Concentration %:** The ratio of the active ingredient in the product being applied (nitrogen if **Nitrogen Content based Mass/Area** selected in output configuration, see page 14).
- **Minimum Rate:** The minimum rate of the active ingredient that should be applied relative to the amount of biomass detected.
- **Maximum Rate:** The maximum rate of the active ingredient that should be applied relative to the amount of biomass detected.

Note: To set the rate based on the desired amount of total product (as opposed to active ingredient), set the concentration to 100%.

- **Cutoff:** The CropSpec value at which the applicator will stop applying product. When the CropSpec value is equal to or less than this value, the application rate drops to zero.
- **Fallback Rate:** The application rate that the software should default to if unable to obtain a valid reading from either sensor. This can happen if no biomass is detected.
- **Rate Step:** This defines the amount of change of application rate as the CropSpec value increases or decreases. The values entered

for minimum and maximum rate are rounded up or down to the nearest multiple of the value entered for Rate Step, effectively changing the minimum and maximum rate. To prevent this, the value entered here should be a multiple of the minimum and maximum rate values.

- **Crop Sense A:** The average CropSpec reading for the field. For this example, average Crop Sense A is 40.
- **Rate A:** The application rate when the CropSpec reading matches the value of **Crop Sense A**.
- **Slope:** The change in application rate with respect to the change in CropSpec value. Positive slope will increase application rate as biomass reading increases and negative slope will decrease application rate as biomass increases.

Note: A negative slope value is usually required.

Note: If you are unsure what this number should be, please consult with a qualified agronomist.

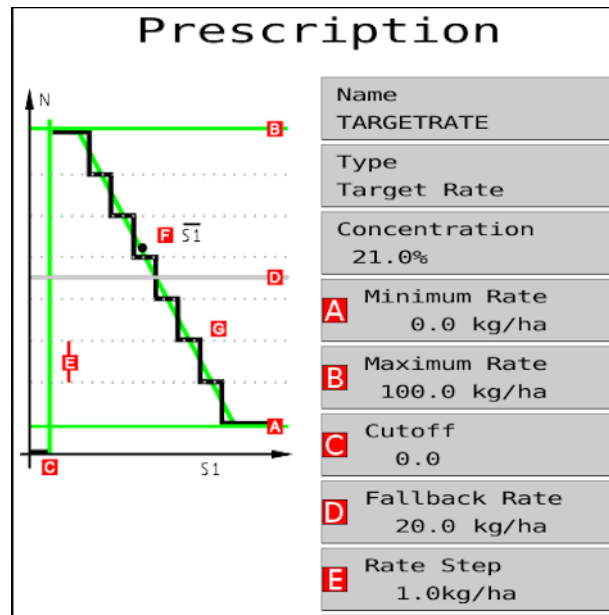
4.3.5. Configuring Target Rate prescription

Note: Histogram recording must be active for this mode to operate. Refer to page 16.

Target Rate mode is very similar to One Point plus Slope. Instead of a fixed CropSpec value reference point, it uses the live field average determined automatically as the CropSpec system is processing the field. Gradually the system finds the average CropSpec parameter and varies the application rate based on this parameter.

The entered Target Rate is linked to the CropSpec field average. If the live CropSpec value is equal to the field average, the application rate will be the entered Target Rate. If the live CropSpec value is greater or less than the field average then the application rate will adjust accordingly. Note the field average is continuously updated hence the line on the graph shifts left/right as the field average changes.

4.3. Configuring prescription types



- **Concentration %:** The ratio of the active ingredient in the product being applied (nitrogen if **Nitrogen Content based Mass/Area** selected in output configuration, see page 14).
- **Minimum Rate:** The minimum rate of the active ingredient that should be applied relative to the amount of biomass detected.
- **Maximum Rate:** The maximum rate of the active ingredient that should be applied relative to the amount of biomass detected.

Note: To set the rate based on the desired amount of total product (as opposed to active ingredient), set the concentration to 100%.

- **Cutoff:** The CropSpec value at which the applicator will stop applying product. When the CropSpec value is equal to or less than this value, the application rate drops to zero.
- **Fallback Rate:** The application rate that the software should default to if unable to obtain a valid reading from either sensor. This can happen if no biomass is detected.
- **Rate Step:** This defines the amount of change of application rate as the CropSpec value increases or decreases. The values entered for minimum and maximum rate are rounded up or down to the nearest multiple of the value entered for Rate Step, effectively changing the minimum and maximum rate. To prevent this, the

value entered here should be a multiple of the minimum and maximum rate values.

- **Target Rate:** The application rate when the CropSpec reading matches the average field value.
- **Slope:** The change in application rate with respect to the change in CropSpec value. Positive slope will increase application rate as biomass reading increases and negative slope will decrease application rate as biomass increases.

Note: A negative slope value is usually required.

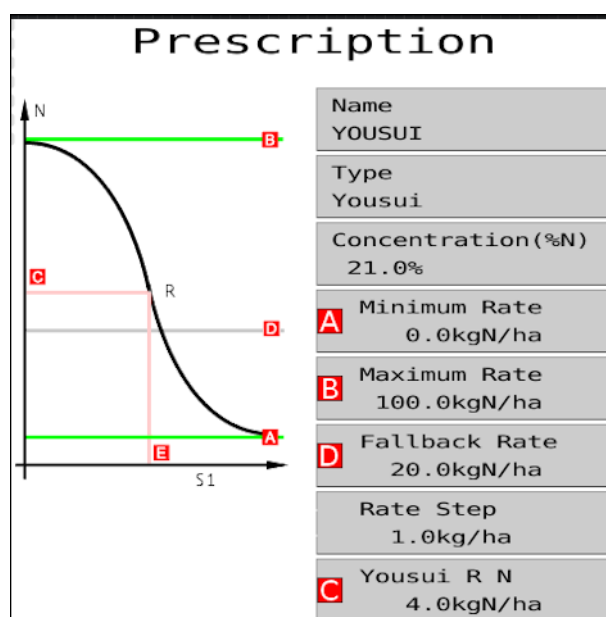
Note: If you are unsure what this number should be, please consult with a qualified agronomist.

4.4. Configuring Japanese wheat prescription types

4.4.1. Configuring Yousui prescription

Yousui prescription type uses a nitrogen application rate that corresponds with the average CropSpec value for the field to vary the applied nitrogen rate as the CropSpec value increases and decreases.

To configure Yousui prescription type, you need to determine the average CropSpec reading for the field (this figure is entered into **Crop Sense R**). To collect the reading, drive through the part of the field that represents the best average sample for the entire field. Refer to Recording CropSpec readings, page 19 for details on recording average CropSpec readings. Enter the following data values to complete the configuration:



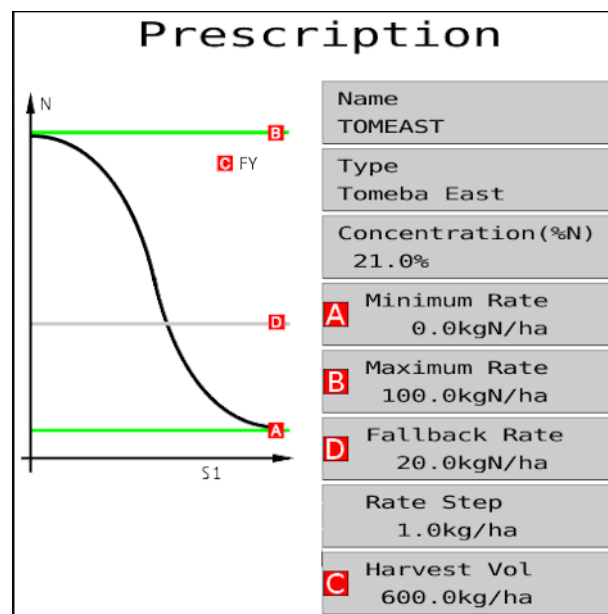
- **Concentration %:** The ratio of the active ingredient in the product being applied (nitrogen if **Nitrogen Content based Mass/Area** selected in output configuration, see page 14).
- **Minimum Rate:** The minimum rate of the active ingredient that should be applied relative to the amount of biomass detected.
- **Maximum Rate:** The maximum rate of the active ingredient that should be applied relative to the amount of biomass detected.

Note: To set the rate based on the desired amount of total product (as opposed to active ingredient), set the concentration to 100%.

- **Fallback Rate:** The application rate that the software should default to if unable to obtain a valid reading from either sensor. This can happen if no biomass is detected.
- **Rate Step:** This defines the amount of change of application rate as the CropSpec value increases or decreases. The values entered for minimum and maximum rate are rounded up or down to the nearest multiple of the value entered for Rate Step, effectively changing the minimum and maximum rate. To prevent this, the value entered here should be a multiple of the minimum and maximum rate values.
- **Yousui R N:** The application rate when the CropSpec reading matches the average field value (**Crop Sense R**). At higher CropSpec readings less nitrogen will be applied and at lower readings more will be applied.
- **Crop Sense R:** The average CropSpec reading for the field.

4.4.2. Configuring Tomeba East prescription

The estimated per hectare yield (Harvest Volume) is used to determine the required nitrogen application rate. The rate applied varies as the CropSpec value increases and decreases.



4.4. Configuring Japanese wheat prescription types

- **Concentration %:** The ratio of the active ingredient in the product being applied (nitrogen if **Nitrogen Content based Mass/Area** selected in output configuration, see page 14).
- **Minimum Rate:** The minimum rate of the active ingredient that should be applied relative to the amount of biomass detected.
- **Maximum Rate:** The maximum rate of the active ingredient that should be applied relative to the amount of biomass detected.

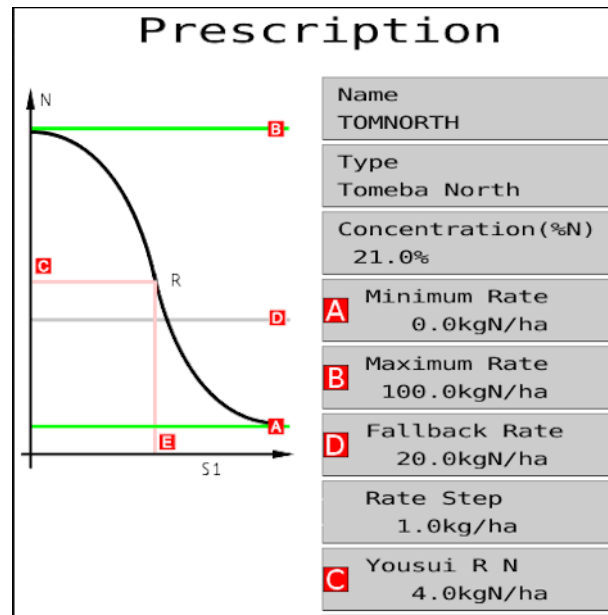
Note: To set the rate based on the desired amount of total product (as opposed to active ingredient), set the concentration to 100%.

- **Fallback Rate:** The application rate that the software should default to if unable to obtain a valid reading from either sensor. This can happen if no biomass is detected.
- **Harvest volume:** The estimated per hectare yield of the field.

4.4.3. Configuring Tomeba North prescription

Tomeba North prescription type uses a nitrogen application rate that corresponds with the average CropSpec value for the field to vary the applied nitrogen rate as the CropSpec value increases and decreases.

To configure Tomeba North prescription type, you need to determine the average CropSpec reading for the field (this figure is entered into **Crop Sense R**). To collect the reading, drive through the part of the field that represents the best average sample for the entire field. Refer to Recording CropSpec readings, page 19 for details on recording average CropSpec readings. Enter the following data values to complete the configuration:



- **Concentration %:** The ratio of the active ingredient in the product being applied (nitrogen if **Nitrogen Content based Mass/Area** selected in output configuration, see page 14).
 - **Minimum Rate:** The minimum nitrogen rate that should be applied relative to the amount of biomass detected.
 - **Maximum Rate:** The maximum nitrogen rate that should be applied relative to the amount of biomass detected.
- Note:** To set the rate based on the desired amount of total product (as opposed to active ingredient), set the concentration to 100%.
- **Fallback Rate:** The application rate that the software should default to if unable to obtain a valid reading from either sensor. This can happen if no biomass is detected.
 - **Rate Step:** This defines the amount of change of application rate as the CropSpec value increases or decreases. The values entered for minimum and maximum rate are rounded up or down to the nearest multiple of the value entered for Rate Step, effectively changing the minimum and maximum rate. To prevent this, the value entered here should be a multiple of the minimum and maximum rate values.

4.4. Configuring Japanese wheat prescription types

- **R Rate:** The application rate when the CropSpec reading matches the average field value (**Crop Sense R**). At higher CropSpec readings less nitrogen will be applied and at lower readings more will be applied.
- **Crop Sense R:** The average CropSpec reading for the field.

4.5. Managing prescriptions

4.5.1. Selecting a prescription

Once prescriptions have been created and saved, they can be selected from a list.

1. Select  and select **Prescription** .
2. Highlight the required prescription from the list.

Prescription	
	1PLUSSLOPE
	CROPSPEC
	ONOFF
	TARGETRATE
	TOMEAST
	TOMNORTH
	TWOPOINT
	YOUSUI
    	
Name	TOMEAST
Type	Tomeba East
Concentration	21.0%
Minimum Rate	 0.0 kg/ha
Maximum Rate	 100.0 kg/ha
Fallback Rate	 20.0 kg/ha
Rate Step	1.0kg/ha
Harvest Vol	 600.0kg/ha

3. Select escape  repeatedly until you reach the CropSpec home screen.

4.5.2. Transferring prescriptions to and from USB

Upload a prescription to USB

1. Ensure a USB is plugged into the console.
 2. Select  and select **Prescription** .
 3. Highlight the required prescription.
 4. Select .
 5. Select **fs_usb**, navigate to location on the USB that the prescription will be copied and confirm .
- The selected prescription is copied to the USB.

Download a prescription from USB

1. Ensure the USB containing the prescription to be transferred is plugged into the console.

2. Select  and select **Prescription** .

3. Select .

4. Select **fs_usb**, navigate to location on the USB that the prescription is located and select the required prescription.

The prescription is copied to the console.

4.5.3. Deleting prescriptions

1. Select  and select **Prescription** .
2. Highlight the required prescription from the list and press the delete button .

Note: The currently selected prescription cannot be deleted.

3. Press  to confirm deletion of the selected prescription.

4.6. Variable Rate Control with CropSpec

CropSpec can be used with Variable Rate Control (VRC) to vary the application rate depending on the prescription. The application rate of the product being applied to the crop will be adjusted automatically. As the CropSpec sensors measure the nitrogen level when the tractor drives over the field, the applied rate will vary according to the prescription set.

Before use, VRC must be set up with a controller and must be enabled on the console Setup screen (**System / Features / Implement**). X25 consoles must be upgraded to ‘Advanced’ to enable variable rate control.

Note: For VRC to work, GPS must be enabled and the implement must be set up with the correct ECU.

Note: Before configuring VRC, ensure that a CropSpec prescription is configured and both sensors are at an optimum temperature of 30° Celsius.

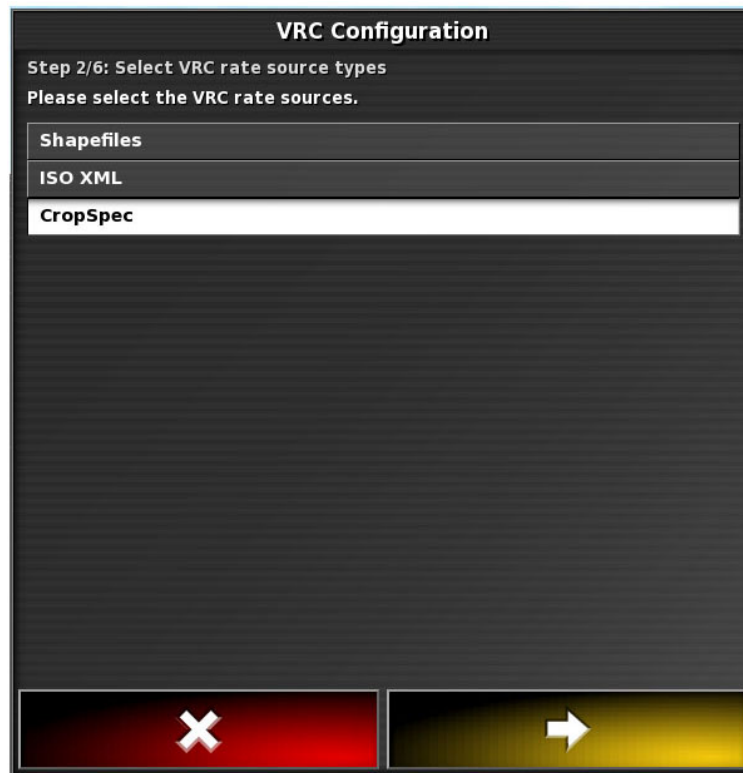
4.6.1. Configuring VRC

1. Select **Field Menu**  / **Create New Field** .
2. Enter descriptions for **Client**  / **Farm**  / **Field** .
3. Create a new job; select the **Job Menu**  / **Create New Job** .
4. Select **Job Menu**  / **Configure Variable Rate Control** .
The VRC Configuration wizard is displayed.
5. At Step 1, confirm the job created in the previous steps and select next .

4.6. Variable Rate Control with CropSpec



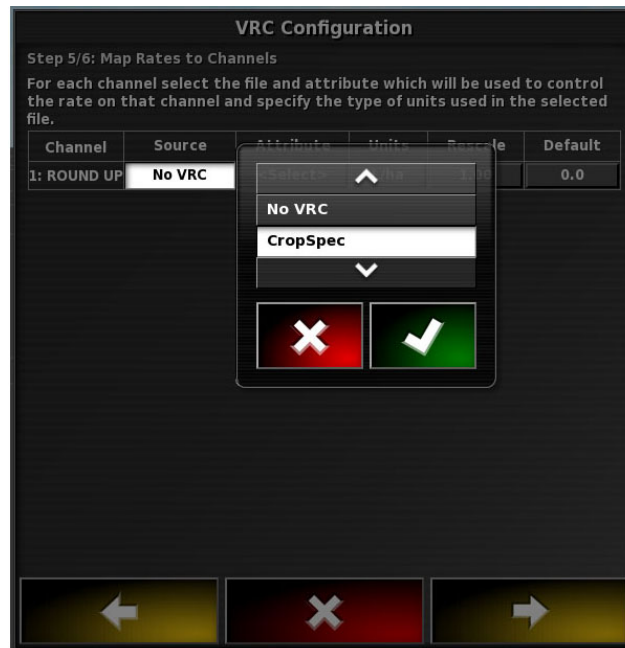
6. Select **CropSpec** as the VRC rate source at step 2. Select next



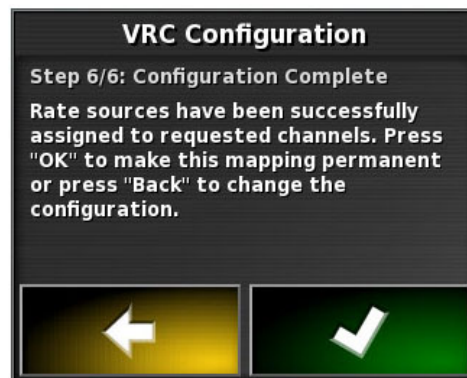
Step 3 and 4 of the VRC Configuration wizard contain the parameters defined while creating the job and will not appear.

7. Assign attributes to channel and source in Step 5:
- **Channel:** The tank or bin that is being controlled.
 - **Source:** The source of the prescription map for that channel.

8. Select **CropSpec** as the live source.



9. Select next to complete the VRC configuration.

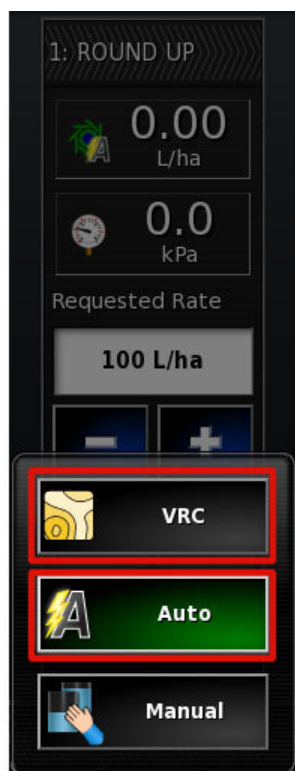


10. Select the application controller from the left hand navigation bar.

To open a mini-view, select  for sprayer controller, or  for spreader controller.

11. Maximize the mini-view of the application controller by swiping right. Select **Auto** to display other options. Select **VRC** as the application rate controller.

4.6. Variable Rate Control with CropSpec



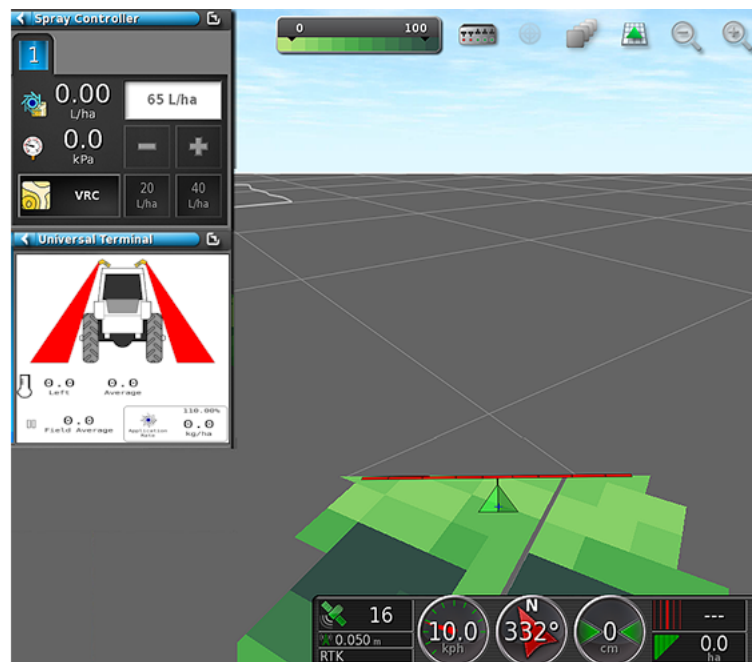
12. Select  to enable the VRC Map display on the guidance screen.



13. On the Map Layers screen, select **N-Rate** as the **Coverage Map** and an ECU for the **VRC Map**.



The VRC-controlled fertilizer application will display along with the CropSpec readings.



4.6. Variable Rate Control with CropSpec

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