Apollo Sprayer Control
Operator's Manual

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TOPCON

Apollo Sprayer Controller

Operator Manual

Part Number: 1011275-01-EN

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For use with Software Version 5.02

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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.

Technical documentation and utility software

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- Firmware and software updates
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- Product quick guides
- Training videos
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Chapter 1 – Introduction

Note: The following features are only available to specific customers. Contact your dealer for details:

- Horticultural sprayer (including fan monitoring)
- Chemical injection support

The Sprayer and Auto Section Controller allows better control of the amount of product being applied to a field. Once set up, it will adjust the flow according to vehicle speed, the area being covered and the preset application rate. This provides greater accuracy to manage product over specified areas.

Refer also to the X Family Displays Horizon operator manual.

Auto Section Control minimizes wastage, turning parts of the sprayer on and off and varying rates as the equipment passes through the defined areas. The system will turn on when it detects an area that has not been covered and it will turn off when it detects areas that have already been covered.

The sprayer pressure is adjusted with factors such as speed of the vehicle, unlike a manual pressure controlled sprayer where the pressure remains constant during speed changes.

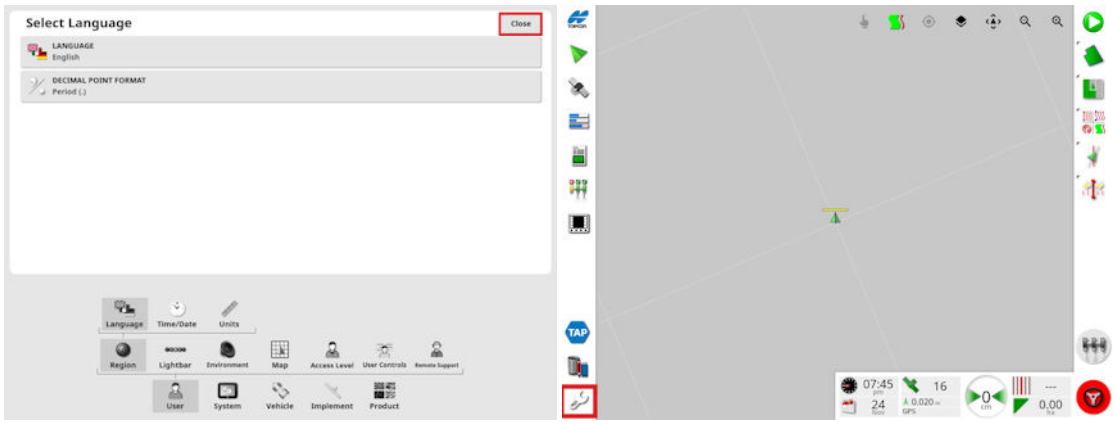
Variable Rate Control presets the different spray rates for particular fields, using a VRC prescription map. It will automatically adjust the spray rate for different zones as the implement moves through the mapped areas.

Once set up, Sprayer Control, Auto Section Control and Variable Rate Control can be enabled and disabled through the display.

Note: Regional information such as time and product measurement units can be set by selecting **User**  / **Region**  from the Setup screen. Refer to the X Family Display Horizon operator manual.

1.1. Switching between setup and operation screen

The displays have two main screens; the Setup screen and the Operation screen.



Use the highlighted buttons to switch between the screens.

Chapter 2 – Implement Setup

This chapter explains how to setup and configure the display for use with the Sprayer Controller and Auto Section Control features.

2.1. Setting up a new implement

Creates a new implement profile for the attached implement.

Note: Existing implement files can be imported from a USB. Refer to the X Family Displays Horizon operator manual.

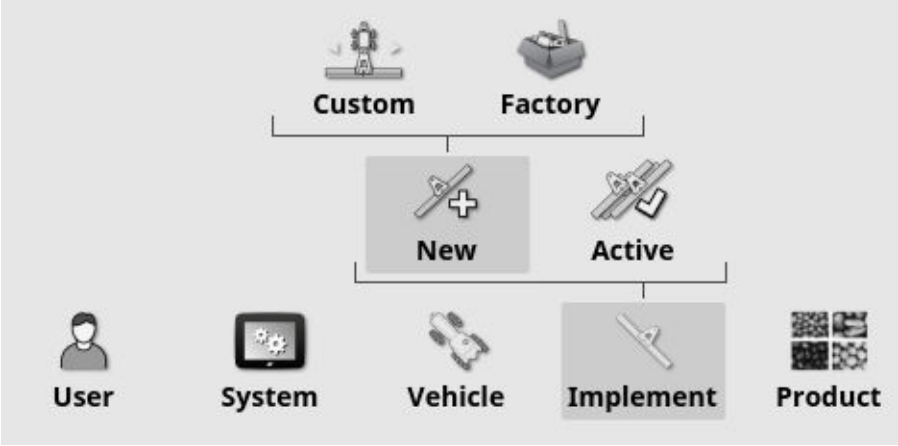
Note: If a Hypro CanNode ECU is connected, a license must be purchased to enable this functionality.

Note: Once the implement profile is set up, selecting the **Apollo Sprayer** profile on the **Implement** menu displays the **Default task name** option. This enables a default name to be entered for all tasks performed using the currently selected 'primary' implement. A number is added to the end of each task name if multiple tasks are performed in the same field. If a default name is not entered, the task name is derived from the implement type and current date.

If the selected implement is pivoted, selecting the profile on the **Implement** menu displays the **Implement model** option, which is used to specify whether the implement is actively steered. This setting ensures the ASC operates accurately and headland turn shapes are correctly generated.

To create a new implement:

1. On the Setup screen, select **Implement** / **New** .

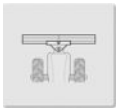


- **Custom**: Create a new implement profile.
- **Factory**: Select an implement template from a pre-defined list.

2. If the required implement is not available in the **Factory** templates, select **Custom**.
3. Use the arrows to select the implement **Type** and confirm.


rigid


pivoted (tow behind)


front mount


double pivoted (tow between)

A default name for the implement is displayed.

Note: It is highly recommended that items are named in a thoughtful and structured way to allow easy use in future seasons.

4. To change the default name, select **IMPLEMENT NAME** and enter the new name, then confirm.

The New Implement Setup wizard displays.

ECU type

5. Select **Apollo**.

Implement control

6. Select **Section Control Only** or **Section Control and Rate Control**.

Implement function

- **Sprayer**: Standard broad acre sprayer.
- **Horticultural sprayer**: Sprayer used for horticulture / viticulture.
- **Slurry tanker**: Liquid manure dispenser.
- **NH3 applier**: Fertilizer dispenser.

  Note: The options shown during implement creation depend on the selected implement function.

Configuration type

- **Standard**: Allows automatic control of two spray lines by setting the maximum flow for each line. Does not allow nozzle profiles to be used.
- **Advanced**: Allows automatic control of up to four spray lines to achieve the target droplet size. Requires nozzle profiles to be created with accurate pressure to droplet relationships.

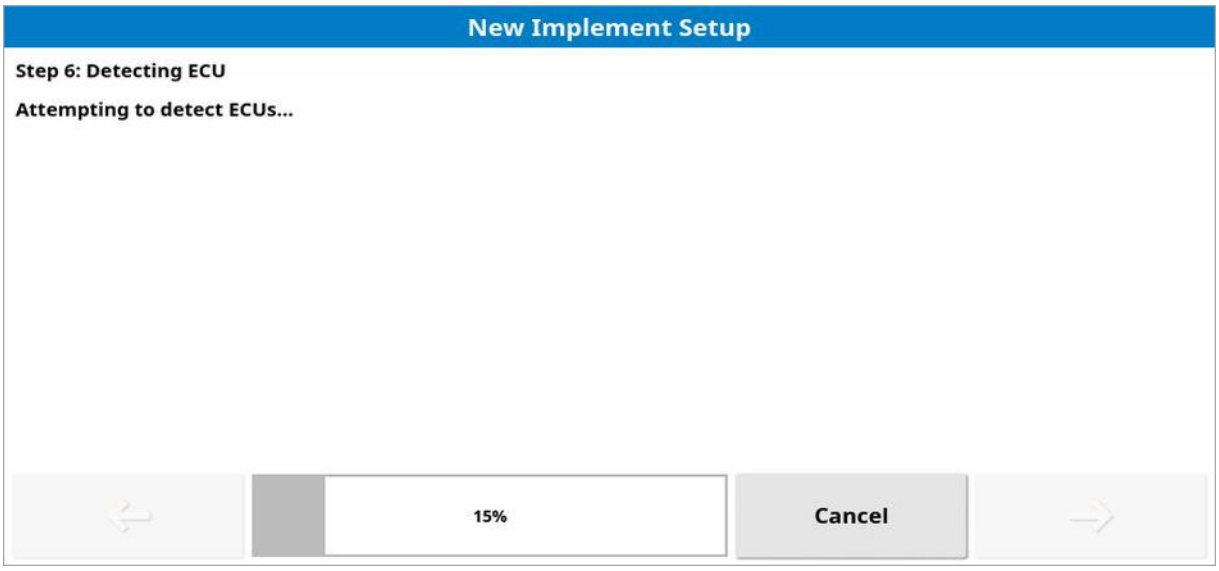
ECUs should be connected to the CAN1 connector on the display's termination harness. Only one termination is necessary, placed at the ECU farthest from the display.

Note: If the implement has multiple ECUs, these can all be connected during detection, however if you have multiples of one type of ECU (i.e. two CM-40s or two EM-24s) then it may be difficult to determine the ECU numbering, so it may be more convenient to detect them one at a time.

Note: Implements can be created without having the ECUs physically connected, but the **Add ECU** button  must be pressed during implement creation to define the number and type of ECUs that will be

connected. Refer to Add/replace ECU, page 9 to add ECUs once the implement is created.

7. Select next. The system will try to detect the connected ECUs. If not successful, check that the ECU is connected, or finish implement creation and add the ECU later.



8. Once the ECU is detected, select next.

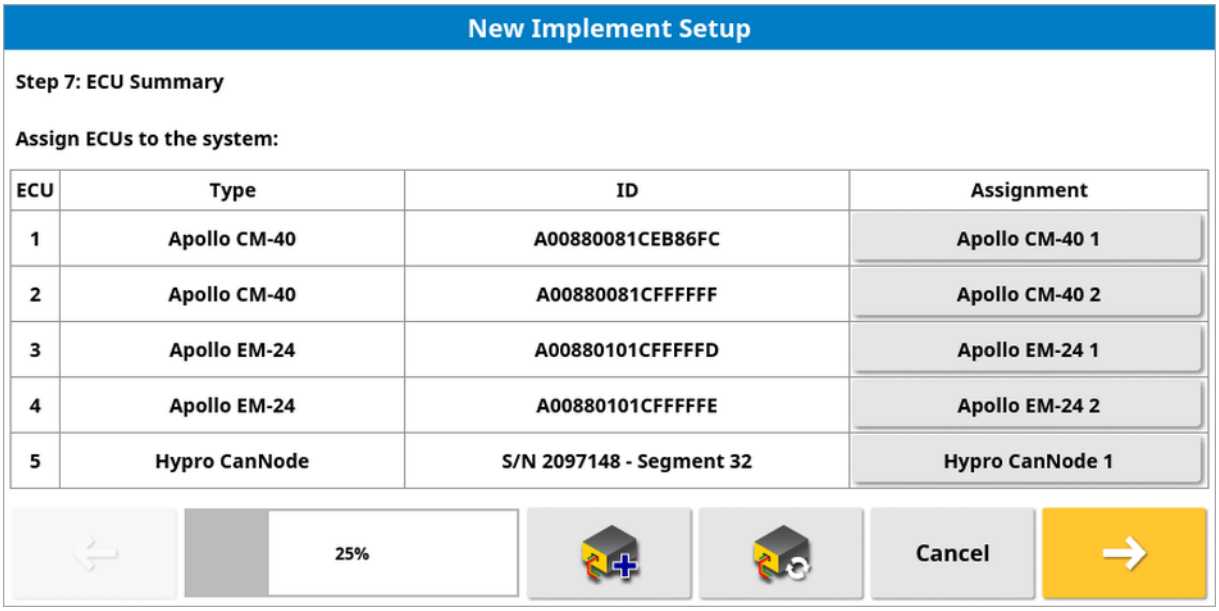
   A summary of detected ECUs appears.

ECU summary

If more than one ECU of the same type is connected, this page is used to define which CM-40 ECU is the principle (CM-40 1). The ID is embedded in the ECU and can be seen if the ECU has previously been connected on an existing implement by selecting **Implement** / **Apollo Sprayer** / **ECU** / **Manage** .

No action needs to be taken if only one ECU of each type is connected to the implement.

If a Hypro CanNode ECU is connected, refer to Configure Hypro CanNodes, page 11.



Spray tanks

9. Enter the number of tanks (total number of spray and chemical injection tanks). One ECU is required per two tanks.[1]

   Up to four spray tanks and four chemical injection tanks may be connected. A boom is created for each spray tank that is specified.

Rinse tanks

10. Enter the number of rinse tanks.

Tank summary

- **Name**: Enter a name for the tank. This is shown on the tank panel on the operator screen unless **Use Product as Name** is enabled on the Tank Setup screen.
- **Type**: Select Liquid or Chemical Injection.
- **Drive**: Select the ECU drive channel connected to the tank (labeled Ch 1 and Ch 2 on the ECU connectors).

Boom summary

The number of booms displayed is determined by the number of spray tanks.

[1] Chemical injection is only available for specific customers. Contact your dealer for information.

- **Name**: Enter a name for the boom. The boom name is shown on status panel on the operation screen.
- **Assignment**: Select the ECU/s controlling the section outputs for the boom. **Note**: Do not assign Hypro CanNode ECUs to booms that already have CM-40 or EM-24 ECUs assigned.
- **Assigned ECUs**: Displays the ECUs assigned to that boom.

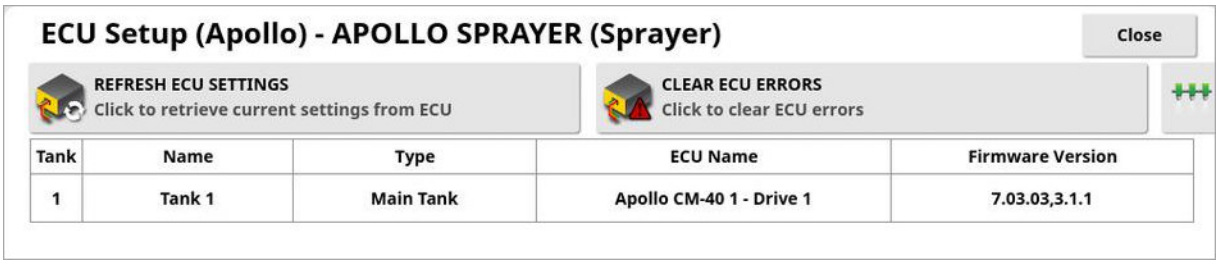
Additional RPM control channels

Allows up to two external devices that have hydraulic control (e.g. fixed speed pumps) to be run at a fixed RPM. Once the implement creation is complete, setup is done via **Implement**  / **Apollo Sprayer**  / **Sprayer**  / **RPM Control**.

2.2. Setting up the ECU

2.2.1. ECU setup

1. Select **Implement** / **Apollo Sprayer** / **ECU** / **Setup** .



- **Refresh ECU Settings**: Used to reload task controller / resynchronize ECU. This option should only be used if instructed to do so by a service technician.
- **Clear ECU Errors**: Used to clear the error if an ECU error displays.
- : Used to switch between the tanks and booms display.

2.2.2. Add/replace ECU

1. Select **Implement** / **Apollo Sprayer** / **ECU** / **Manage** .

- **Add New ECUs**: Used to add a new secondary or EM-24 ECU after the implement has been created. Selecting this option starts the Add New ECUs wizard.

To detect ECUs:

1. Select the button in the **Status** column for the CM-40 ECU and select **Replace**.

   The display will restart after going through the detection wizard.

2. Select the button in the **Status** column for all other ECUs and select **Replace**. The display will not restart for EM-24 ECUs.

2.2.3. Disable / Replace / Unassign / Remove ECUs

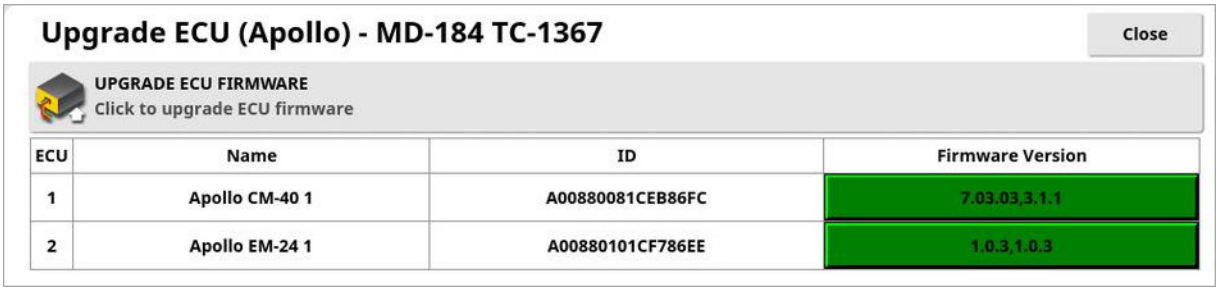
1. Select **Implement**  / **Apollo Sprayer**  / **ECU**  / **Manage**  .

2. Select the button in the **Status** column.

- **Aux CPU Enabled**: Re-enables communication to the ECU (should only be used if instructed by service personnel).
- **Aux CPU Disabled**: Disables communication to the ECU (should only be used if instructed by service personnel).
- **Disabled**: Useful if the ECU is not currently required, or if it has failed (to prevent alarms being triggered).
- **Replace**: Assign an ECU to a newly created implement profile.
- **Unassign**: Unassign an ECU from an implement profile. The display will restart if the Apollo principle (CM-40 1) is unassigned. The ECU can now be 'replaced'.
- **Remove**: Completely remove the ECU from the implement profile. The Apollo principle (CM-40 1) cannot be removed.

2.2.4. Upgrade ECUs

1. Select **Implement**  / **Apollo Sprayer**  / **ECU**  / **Upgrade**  .



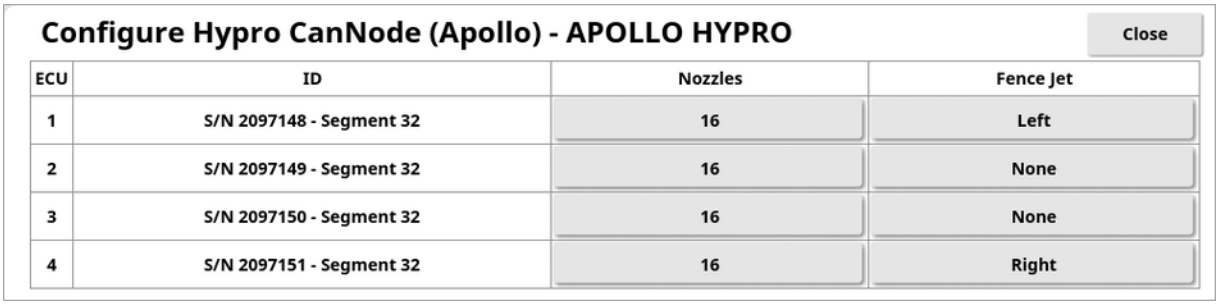
This screen is used to update firmware on the ECUs. It should only be used if instructed to do so by a service technician. Refer to Updating Apollo ECU firmware, page 106 for details.

2.2.5. Configure Hypro CanNodes

The Apollo Sprayer system can be used to interface to the Hypro Pentair Prostop E CAN controlled nozzle bodies, to allow individual nozzle control. The Hypro Prostop E system comprises of CanNodes and nozzle bodies. The Apollo CM-40 ECU communicates with the CanNodes and the CanNodes communicate to the nozzle bodies. Each CanNode can communicate with up to 32 nozzle bodies.

Note: This screen is only applicable to single boom setups. Multi-boom setups must be configured by a dealer.

1. Select **Implement** / **Apollo Sprayer** / **ECU** / **Hypro CanNode** .



Note: The Fence Jet column is only displayed if fence jets are enabled. See Setting up fence jets, page 35.

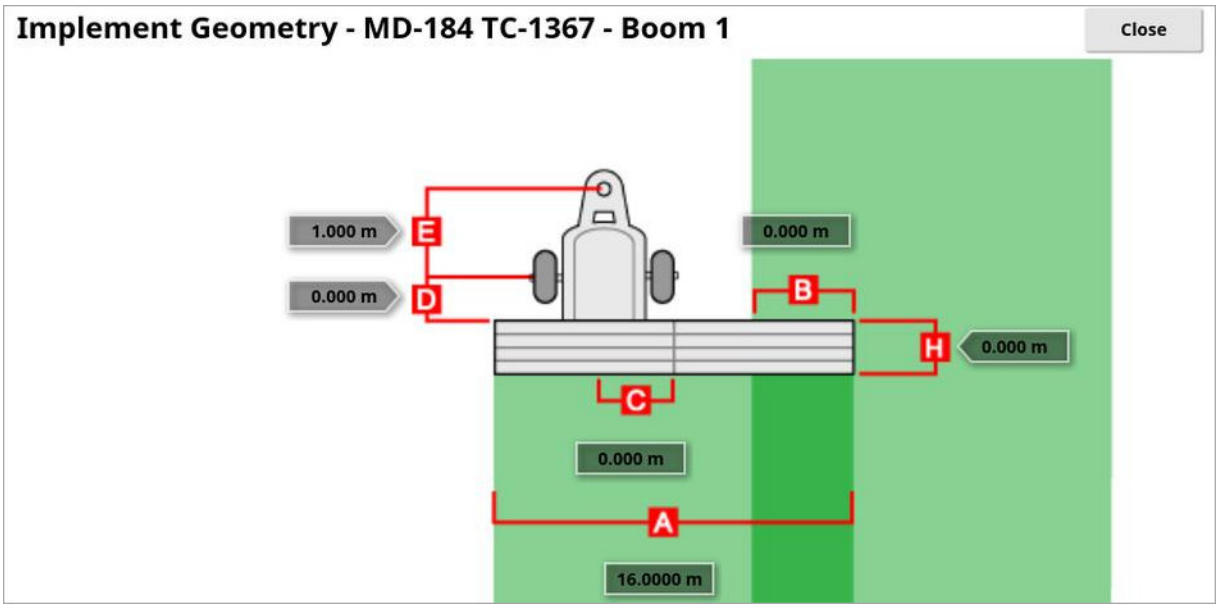
2. Enter the number of nozzles for each boom segment (section). Note that each Hypro ECU contains two ECUs (segments).

3. If one of the nozzles in the segment is used as a fence jet, select the type of fence jet in the Fence Jet column.

2.3. Setting the implement geometry

To set the implement geometry:

1. Select **Implement** / **Apollo Sprayer** / **Geometry** .



2. Select an implement dimension. The name of the dimension appears in the title bar.

   Note: Measure the implement dimensions as accurately as possible as these measurements will affect the modelling, mapping and GPS based product placement. The recommended tolerance is +/- 5 cm.

3. Add or adjust dimensions where required and confirm.

The following dimensions are used in the system. The dimensions displayed vary, depending on the type of implement:

- **Swath width**: Measures the working width of the implement (that is, the width of the area that is treated during one pass of the implement).
- **Overlap**: Measures the width of the overlap between two adjacent rows.
- **Inline offset**: Measures the off-center offset of the implement relative to the hitch point. Enter a positive number if the implement is shifted to the right and a negative number if it is shifted to the left.

- **Implement wheels offset**: Measures the distance between the wheels and the working area of the implement. If the sprayer has dual axles the wheels point should be set to midway between the axles.
- **Implement offset**: Measures the distance between the hitch point and the wheels of the implement.
- **Trailer wheels offset**: Measures the distance between the implement hitch point and the trailer wheels. Note: This dimension is only shown for double pivot implements.
- **Trailer offset**: Measures the distance between the trailer hitch point on the vehicle and the trailer wheels. Note: This dimension is only shown for double pivot implements.
- **Working length**: Length from the start to the finish of the working area of the boom. Together with swath width, it defines the 'Working Area', which is the region that product is applied over for that boom. Note: This must be a positive number.

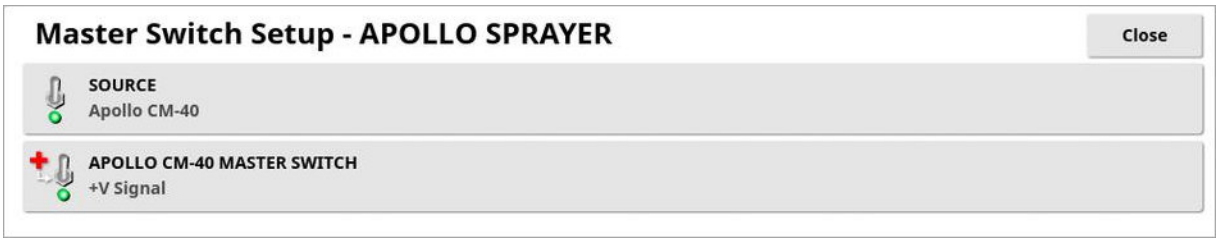
2.4. Setting up the operator inputs

2.4.1. Master switch setup

Note: When using multiple implements, the master switch only controls the Apollo sprayer and does not turn on/off the ISOBUS implements that are also connected to the system. These must be turned on independently via the UT or an AUX-N input.

To set up the master switch:

1. Select **Implement** / **Apollo Sprayer** / **Operator Inputs** / **Master Switch** .



The following options are available:

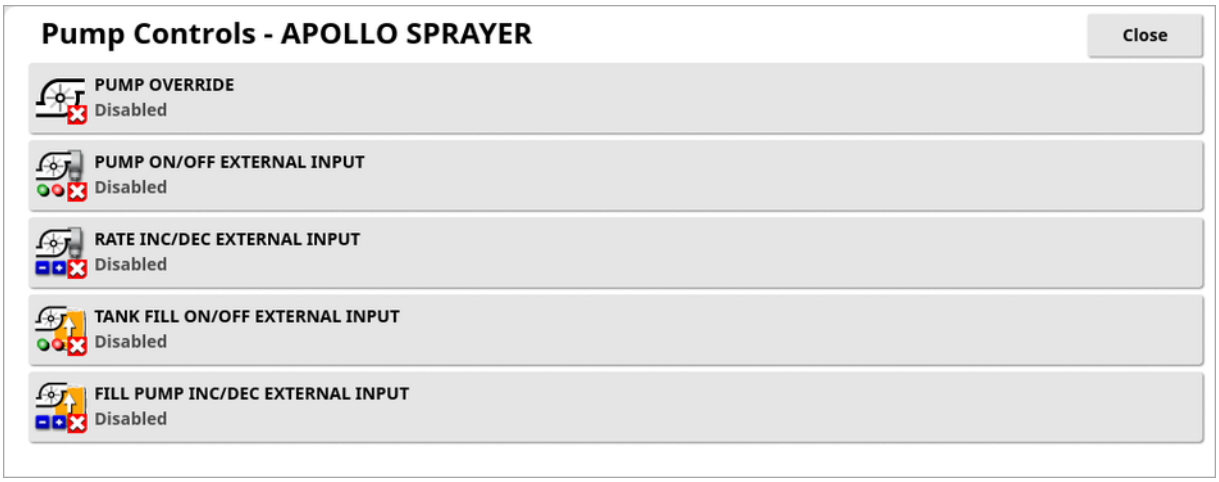
- **Source**:
  - **Virtual**: Master switch to be controlled from the display screen.
  - **Apollo CM-40**: Use if Apollo CM-40 ECU switch is in use and connected to the Apollo harness.
  - **External console input**: Enables the master switch to be operated via an external switch (a physical switch box / master switch connected to the display).
  - **Steering engage and virtual**: Steering engage triggers the master switch. Disengaging steering turns off the master switch. If a remote steering engage switch is being used it will have the same behavior. The virtual master switch button may still be used to toggle the master switch state without changing the steering engage state.

- Apollo CM-40 master switch: Indicates whether the master switch input is activated by positive or zero volts. Refer to manufacturer's documentation.

2.4.2. External pump controls setup

Sets up external switches to control the spray and fill pump. These switches are only used when the tank fill window is open. Refer to Filling tanks, page 76.

1. Select **Implement** / **Apollo Sprayer** / **Operator Inputs** / **Pump** .



- **Pump override**: Enabling this option adds a pump button on the operator screen, above the master switch. This button allows the sprayer pump to be turned off if agitation is not required (for example, if the tank is empty). If agitation is enabled (see Sprayer menu settings, page 38), the pump is running when the master switch is turned off. The pump button enables the agitation to be controlled independently of the master switch.

  Note: Enabling **Pump on/off external input** removes the pump button from the operator screen.

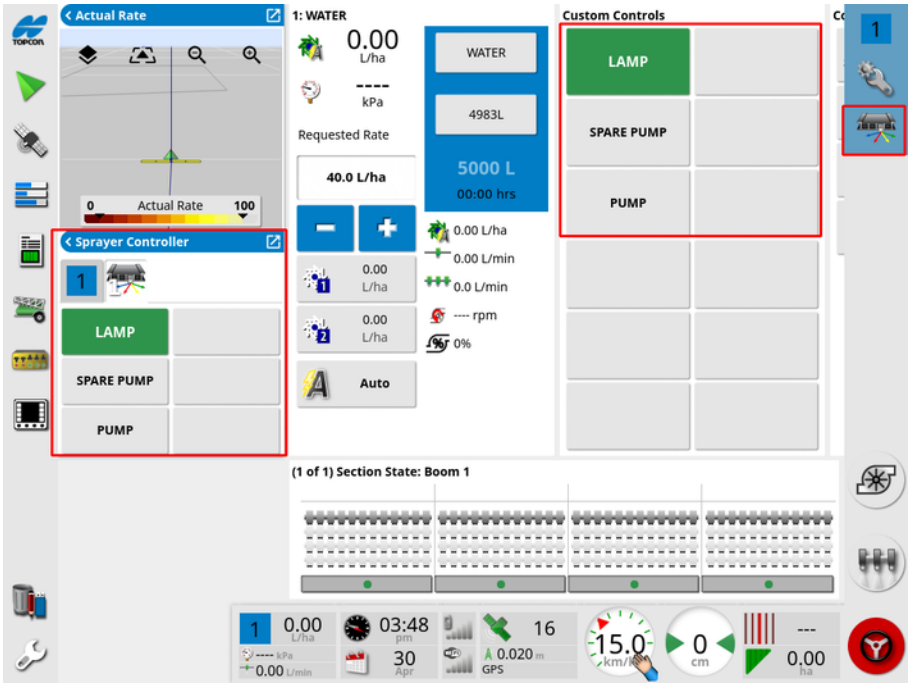
- **Pump on/off external input**: The sprayer pump may be turned on and off via an external switch.
- **Rate inc/dec external input**: The sprayer pump may have its speed increased / decreased via external switches.
- **Tank fill on/off external input**: The tank fill pump may be turned on and off via an external switch.

- **Fill pump inc/dec external input**: The tank fill pump may have its speed increased / decreased via external switches.

2.4.3. Custom controls setup

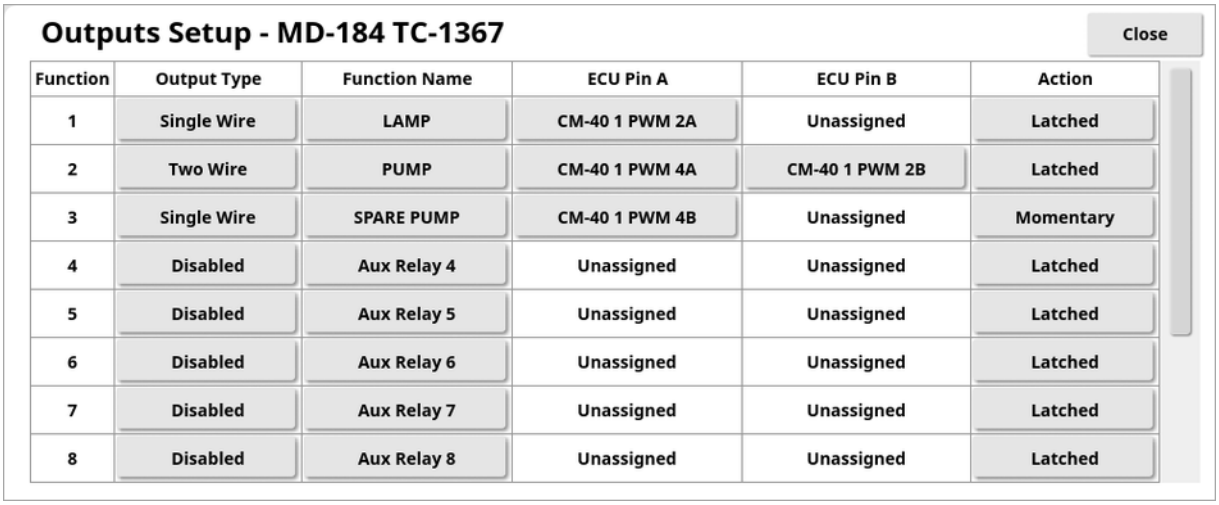
Custom controls can be assigned to up to 12 spare ECU outputs. This allows control of auxiliary functions such as work lights (beacons), hydraulic functions etc.

Outputs (see below) and RPM Controls (created via **Implement** / **Apollo Sprayer** / **Sprayer** / **RPM Control**) are displayed in a sprayer mini-view and in a separate Custom Controls panel on the operation screen. **Note**: RPM Controls allow an external device that has hydraulic control (e.g. a fixed speed pump) to be run at a fixed RPM.



Outputs

1. Select **Implement** / **Apollo Sprayer** / **Operator Inputs** / **Custom Controls** / **Outputs** .



Function	Output Type	Function Name	ECU Pin A	ECU Pin B	Action
1	Single Wire	LAMP	CM-40 1 PWM 2A	Unassigned	Latched
2	Two Wire	PUMP	CM-40 1 PWM 4A	CM-40 1 PWM 2B	Latched
3	Single Wire	SPARE PUMP	CM-40 1 PWM 4B	Unassigned	Momentary
4	Disabled	Aux Relay 4	Unassigned	Unassigned	Latched
5	Disabled	Aux Relay 5	Unassigned	Unassigned	Latched
6	Disabled	Aux Relay 6	Unassigned	Unassigned	Latched
7	Disabled	Aux Relay 7	Unassigned	Unassigned	Latched
8	Disabled	Aux Relay 8	Unassigned	Unassigned	Latched

- **Output type**: If output requires bi directional control, select **Two Wire**.
- **Function name**: User assignable name that will show on the sprayer mini-view and Custom Controls panel.
- **ECU Pin A**: Connected ECU pin for single wire output type.
- **ECU Pin B**: Connected ECU pin for two wire output type.
- **Action**: Sets whether the custom control button is momentary (press and hold) or latched on when it is pressed. **Note**: If the button is momentary, it is advisable to indicate this via the **Function name**. The button will only show as green while it is held down.

Assignments

The Assignments screen assigns Outputs and RPM Controls to a specified button on the Custom Controls panel.

The name entered as **Function Name** on the Outputs screen is shown as the button name.

1. Select **Implement** / **Apollo Sprayer** / **Operator Inputs** / **Custom Controls** / **Assignments** .
2. Select the Output or RPM Control to be assigned to each button.

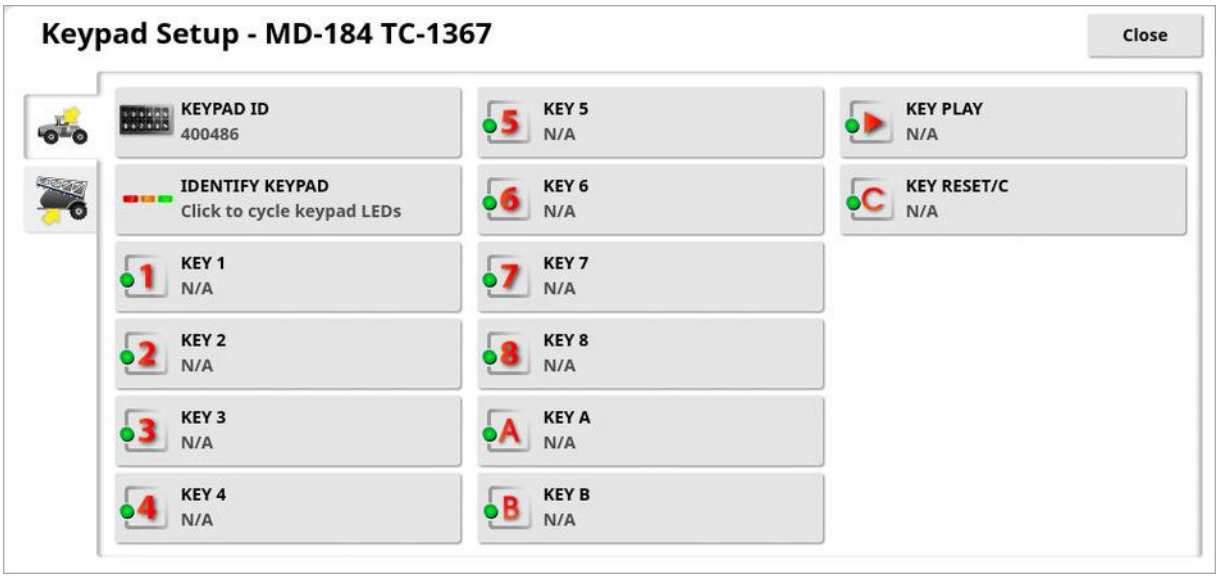
2.4.4. Keypad setup

The keypad is an external device that may be used in the cabin and/or on the sprayer frame to control selected functions. Refer to External keypad operation, page 97 for more information.

To setup the keypad:

1. Select **Implement** / **Apollo Sprayer** / **Operator Inputs** / **Keypad**.

   The tabs on the left switch between the 'in cabin' and 'on frame' keypads setup screens.



- **Keypad ID**: If more than one keypad is installed, this selects which keypad is installed in the cabin and which is on the frame (the screen title displays which keypad is being currently setup).

- **Identify keypad**: This setting is used to identify which keypad is installed in the cabin and which is installed on the sprayer frame. When selected, the LEDs on that keypad flash.

All other buttons provide a range of functions that may be selected. The in cabin and on frame keypads provide the same options.

The sprayer specific options are as follows:

- **Auto/Manual/VRC**: Rate control mode selector. Allows you to cycle between Auto control, manual mode or VRC. Note that Auto Section Control will not work in manual mode.
- **Increase Rate** / **Decrease Rate**: Increase / decrease the application rate in Auto mode or the flow rate in Manual mode. These keys perform the same action as the blue – and + buttons on the tank panel. See Using the tank panel, page 73.
- **Tank 1**, **Tank 2** etc: Turn on / off the tank.
- **Section Switch 1**, **Section Switch 2**, etc: Turn on / off the appropriate section switch. If a virtual section switch hasn't been configured, then the key will turn on / off the appropriate section.
- **Line 1 Auto/Manual**: Switch spray line 1 between auto switching and manual switching (multi line setting).
- **Master Switch**: Turns the master switch on / off.
- **Pump On/Off**: Turns the sprayer pump on / off. See **Pump override**, page 17.
- **Left / Right Fence Jet**: Turns fence jets on / off. See Setting up fence jets, page 35.
- **Tank Rinse**: Activates a relay to use the fresh water tank to rinse the chemical tank, once spraying is complete. Ensure **Implement**  / **Apollo Sprayer**  / **Sprayer**  / **Water Routing**  / **Tank Connections**  / **RINSE CONTROL** is enabled on the setup screen.

- **Rinse Tank Fill**: Turns on the rinse tank fill valve to start filling the tank to the required volume. Once the target volume has been reached, the button LED changes to amber. Once tank capacity is reached, the valve shuts off automatically.
- **Boom Section Switches**: If using a VDC, this option places the VDC into section switching mode so that sections can be turned on and off using the knob.
- **Tank 1 Fill**, **Tank 2 Fill** etc: If the tank fill screen is open on the display, this option is available to fill the tank to capacity (see Filling tanks, page 76).
- **Tank Fill Pump Rate Increase** / **Decrease**: Increase / decrease the speed of the fill pump. Only available if the tank fill screen is open and a proportional fill pump is in use.
- **Drill Lift/Lower**: Lift and lower the drill on an NH3 applier or slurry tanker.
- **Drill Lift/Lower Track Master**: Drill follows the state of the master switch on an NH3 applier or slurry tanker.

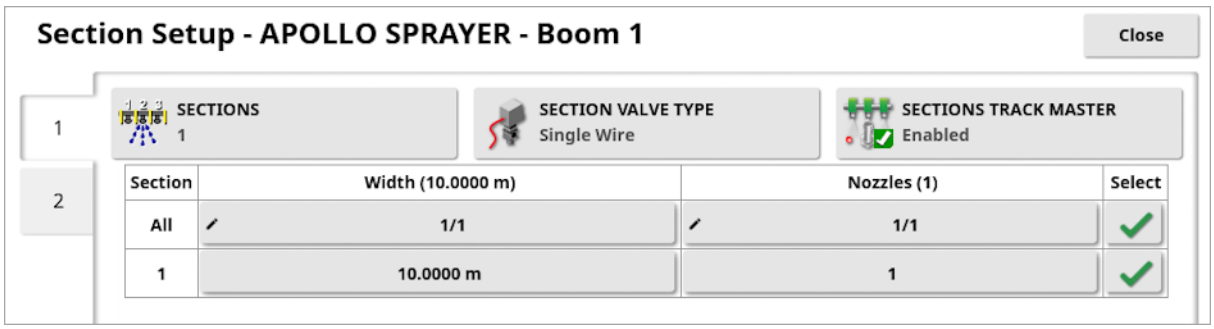
Chapter 3 – Boom Setup

3.1. Setting up the sections

The display can support up to 40 sections if using a CM-40 (16 sections) and an EM-24 ECU (24 sections). The maximum total width of the boom is 100 m.

To set up section control:

1. Select **Implement** / **Apollo Sprayer** / **Boom** / **Sections** .



- **Sections**: Enter the number of sections.
- **Section valve type**: Select single or two wire.
- **Sections track master**: If disabled, the sections remain powered when the master switch is turned off.

2. To set section width for all sections, select **Width** next to **All**. Enter the section width for all sections and confirm.
3. Alternatively, to set individual widths for sections, select the width next to a section, enter the width and confirm.
4. Repeat for each section.
5. To set the number of nozzles for each section, select the section under **Nozzles**, enter the number and confirm.

Note: It is important to set the number of nozzles attached to each section correctly. During operation this affects the display of flow per nozzle information and affects pressure based control.

3.2. Setting up timing

These settings set the response times for the sections when switched on or off. It is important to accurately calculate the response times to minimize overlaps or gaps in product application.

To calculate the response times:

1. Ensure the implement is ready to begin product application and that the flow meter calibration for the product has been performed (refer to Flow meter calibration, page 90).
2. Use a stop watch to time the delay between switching a section on and the application of product. This is the **ON TIME**.
3. When the section is switched off, time the delay between switching it off and the product ceasing to flow. This is the **OFF TIME**.

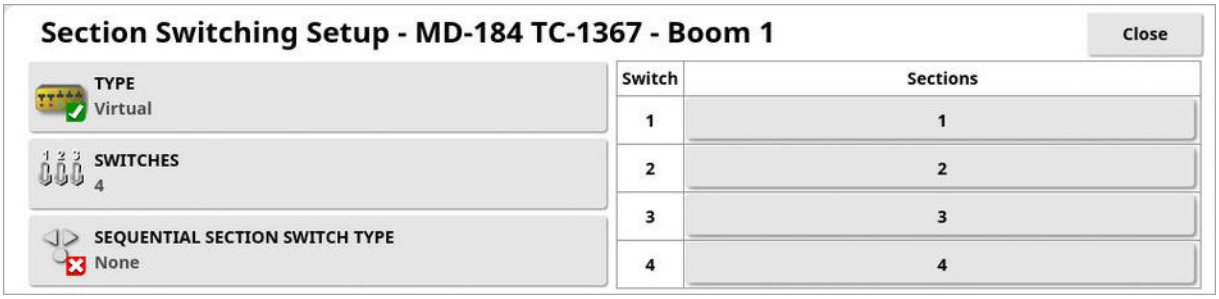
To set the response times:

1. Select **Implement**  / **Apollo Sprayer**  / **Boom**  / **Timing**  .
2. Select **ON TIME** to set how many seconds delay there is between switching a section on and the application of product, then confirm.
3. Repeat for **OFF TIME** and confirm. This will set how many seconds delay there is between switching a section off and stopping product flow.

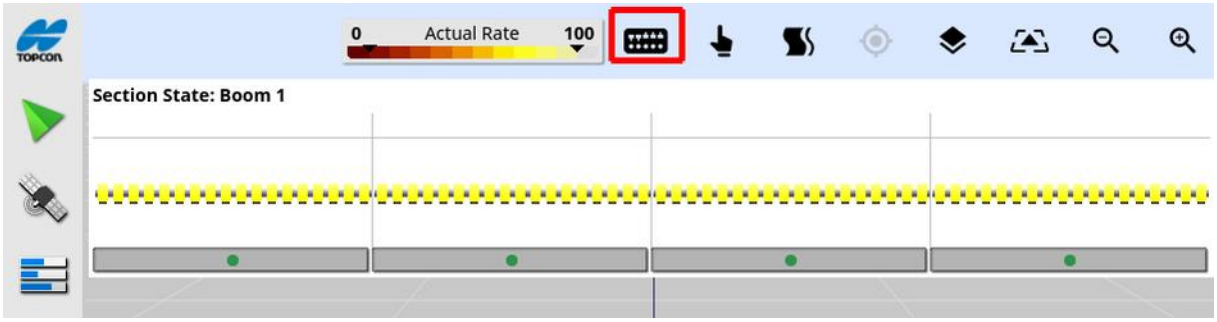
3.3. Setting up section switching

The section switch can be either virtual (on the display screen) or external (a physical switch connected to the Apollo ECU).

1. Select **Implement** / **Apollo Sprayer** / **Boom** / **Section Switch** .



- **Type**:
  - **None**: Select if section switching is not required.
  - **Virtual**: An additional virtual switchbox appears on the operation screen and a mini-view icon is available in the navigation bar on the left . Selecting the icon displays the section state display. Selecting sections on the display will turn them on and off.



  - **External ECU sense**: Uses an external switchbox that is connected to the Apollo ECU wiring.

- **Switches**: Used to set how many section switches are available. This may be a different number to the total sections entered in **Implement**  / **Apollo Sprayer**  / **Boom**  / **Sections**  , but cannot be greater than the number of sections.
- **Sequential section switch type**: A self propelled sprayer joystick provides manual section switching.

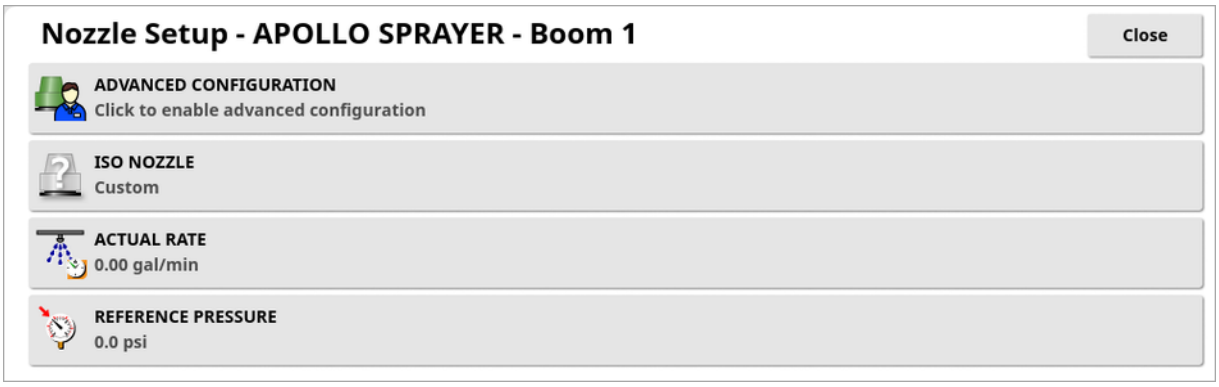
The table on the right is used to determine which switch controls which section. Assign the required switch to each section.

3.4. Setting up nozzles

3.4.1. Standard configuration

1. Select **Implement** / **Apollo Sprayer** / **Boom** / **Nozzles** .

This screen is displayed if **Standard** was selected as **Configuration type** when the implement profile was created. See Implement Setup, page 3.



- **Advanced configuration**: Select this option to switch to advanced configuration for nozzles and spray lines. See below.

Note: The following settings are only required if **Pressure Control** is enabled **Implement** / **Apollo Sprayer** / **Sprayer** / **Liquid** / **Pressure Control** .

- **ISO nozzle**: Select from the list of ISO standard nozzles.
- **Actual rate**: The actual rate of flow at the Reference Pressure. This value can be altered, if needed, to adjust for wear and tear. If unsure, test the actual rate by collecting the flow over a minute and measuring the amount collected.
- **Reference pressure**: The pressure at which the stated actual rate for the nozzle should be achieved. Check nozzle manufacturer's information.

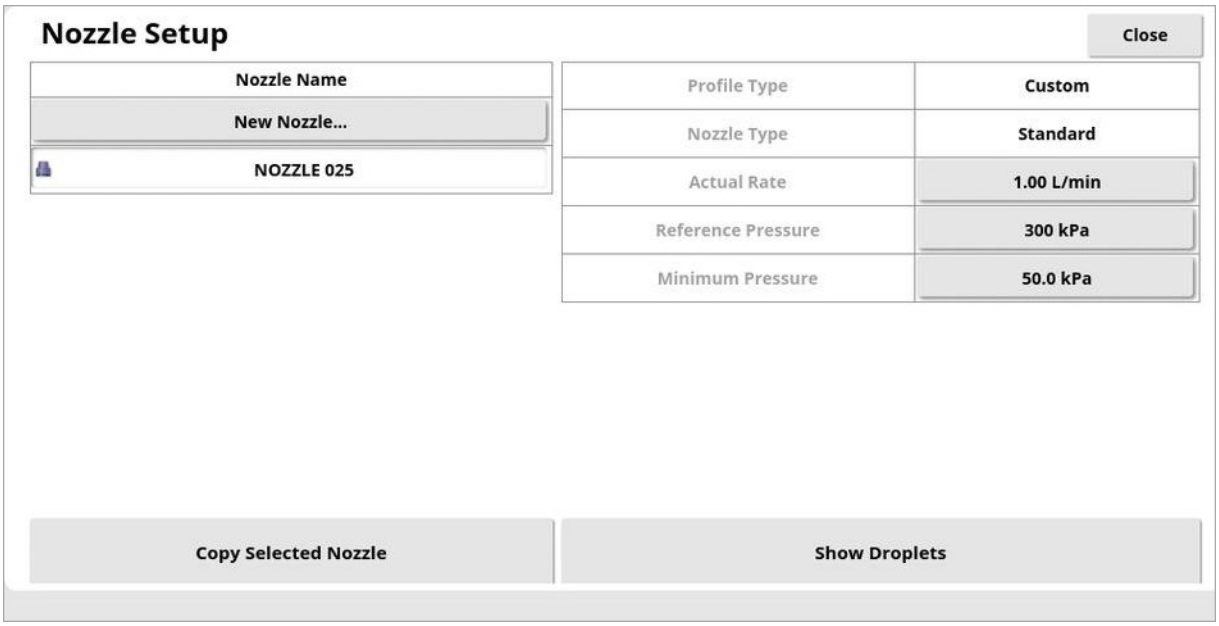
3.4.2. Advanced configuration

Note: At least one nozzle must be correctly configured for the system to be operational.

Note: Ensure droplet sizes are entered before using the system. Select **Show Droplets** and follow the instructions below.

1. Select **Implement** / **Apollo Sprayer** / **Boom** / **Nozzles** .

This screen is displayed if **Advanced** was selected as **Configuration type** when the implement profile was created. See Implement Setup, page 3.



Note: The pressure unit displayed can be psi, kPA or bar. Select **User** / **Region** / **Units** / **PRESSURE UNITS** to change the displayed unit.

2. Select **New Nozzle** in the **Nozzle Name** list.

   A list of ISO standard default nozzles is supplied. Alternatively, custom nozzles can be setup.

3. Select from the list of ISO standard nozzles, or select **Custom Nozzle**.

4. Enter a new **Nozzle Name**.
5. Complete the following:
   - **Nozzle type**: Standard or Fence jet (refer to Setting up fence jets, page 35).
   - **Actual rate**: The actual rate of flow at the Reference Pressure. This value can be altered, if needed, to adjust for wear and tear. If unsure, test the actual rate by collecting the flow over a minute and measuring the amount collected.
   - **Reference pressure**: The pressure at which the stated actual rate for the nozzle should be achieved. Check nozzle manufacturer's information.
   - **Minimum pressure**: Lowest pressure at which this nozzle can function effectively. The system will not allow pressure to go below this value and an alarm will be triggered. This figure is used as the minimum value in the pressure range for the droplet settings (see below).

Note: To edit the name, or to delete a nozzle, use the Inventory Manager (refer to the X Family Displays Horizon operator manual).

3.4.3. Droplet size versus pressure

Lower spraying pressures provide larger droplet sizes, while higher spraying pressures yield smaller droplet sizes.

Most agrochemical applications recommend a fine, medium, or coarse spray:

- Fine sprays provide enhanced retention for directed spraying on the target, including foliar acting weed control and contact-acting fungicides and insecticides.
- Medium sprays are the most widely used spray type. Used by default by most applicators when spray quality is not defined by the label. Systemic acting fungicides, insecticides and herbicides.
- Coarse sprays are used with systemic, residual and soil applied herbicides.

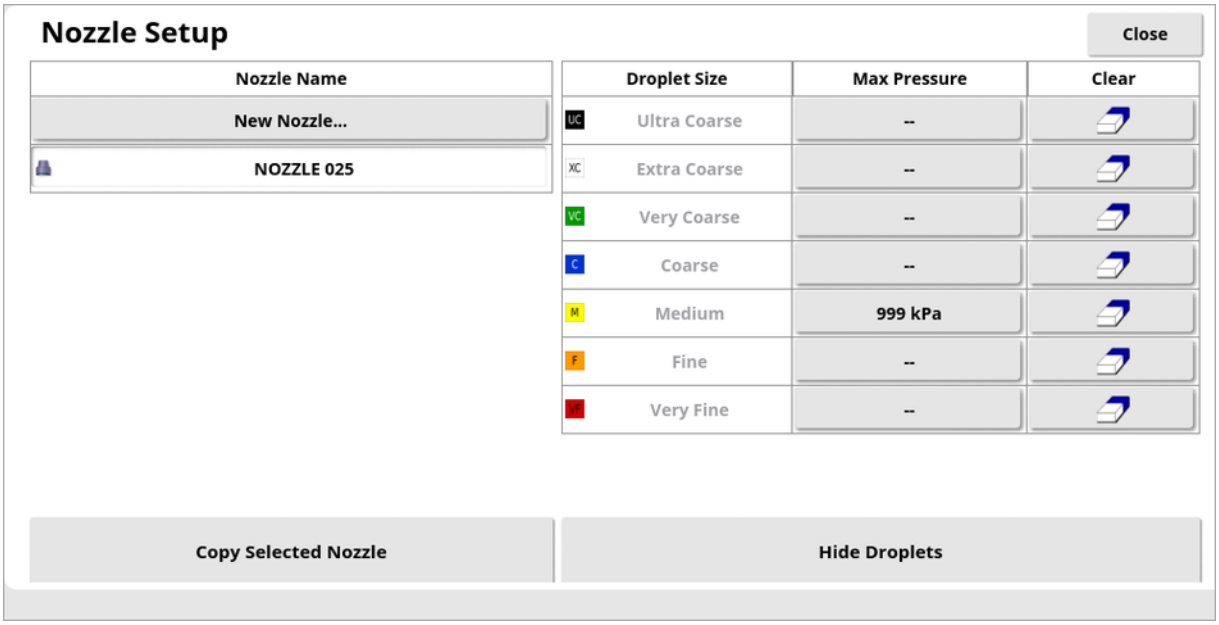
Nozzles should be supplied with information showing the droplet size that will be achieved at a specified pressure.

For example, the XR80015 nozzle (the green one) shown in the following image can produce a medium spray at a maximum pressure of 25 PSI. Higher pressure will reduce the droplet size to fine.

	PSI						
	15	20	25	30	40	50	60
XR8001	M	F	F	F	F	F	F
XR80015	M	M	M	F	F	F	F
XR8002	M	M	M	M	F	F	F
XR8003	M	M	M	M	M	M	F
XR8004	C	C	M	M	M	M	M
XR8005	C	C	C	C	M	M	M
XR8006	C	C	C	C	C	C	C
XR8008	VC	VC	VC	C	C	C	C

Droplet size

Note: The pressure unit displayed can be psi, kPA or bar. Select **User** / **Region** / **Units** / **PRESSURE UNITS** to change the displayed unit.



1. Select **Show Droplets** to display the droplet settings table.
2. For each required **Droplet Size** for the selected nozzle, enter the maximum pressure at which the stated droplet size will be achieved

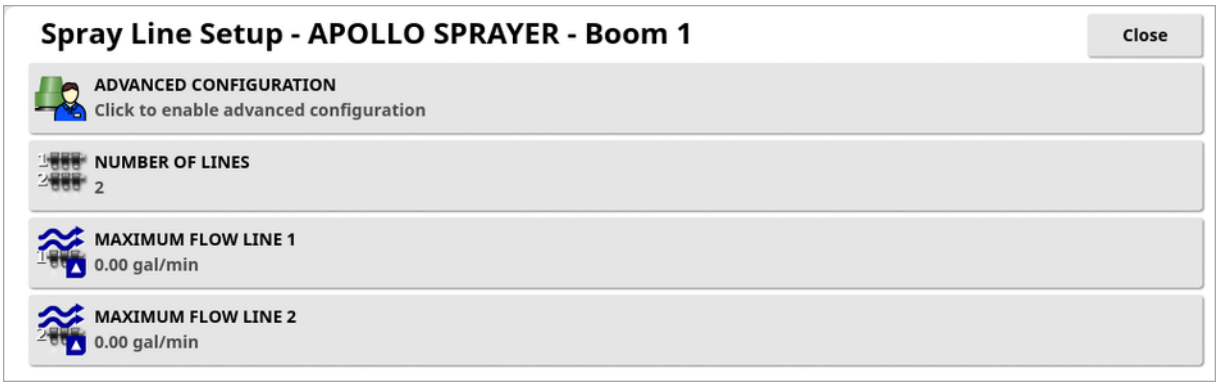
by this nozzle. Refer to nozzle manufacturer's information. The minimum pressure that can be used is set by the Minimum Pressure entered for the nozzle profile, shown by selecting **Hide Droplets**.

3.5. Setting up spray lines

3.5.1. Standard configuration

1. Select **Implement** / **Apollo Sprayer** / **Boom** / **Spray Line** .

This screen is displayed if **Standard** was selected as **Configuration type** when the implement profile was created. See Implement Setup, page 3.



- **Advanced configuration**: Select this option to switch to advanced configuration for nozzles and spray lines. See below.
- **Number of lines**: Enter the number of spray lines.
- **Maximum flow line 1**: (Only available if there are two spray lines.) Sets the flow at which line 1 is turned off and line 2 is turned on.
- **Maximum flow line 2**: Sets the flow that triggers both lines to be turned on.

  Note: For this feature to work as intended, the nozzles used in line 2 should have a higher flow rate than the nozzles in line 1. If both lines have the same nozzles (and flow rates), the maximum flow settings for both lines should be the same.

3.5.2. Advanced configuration

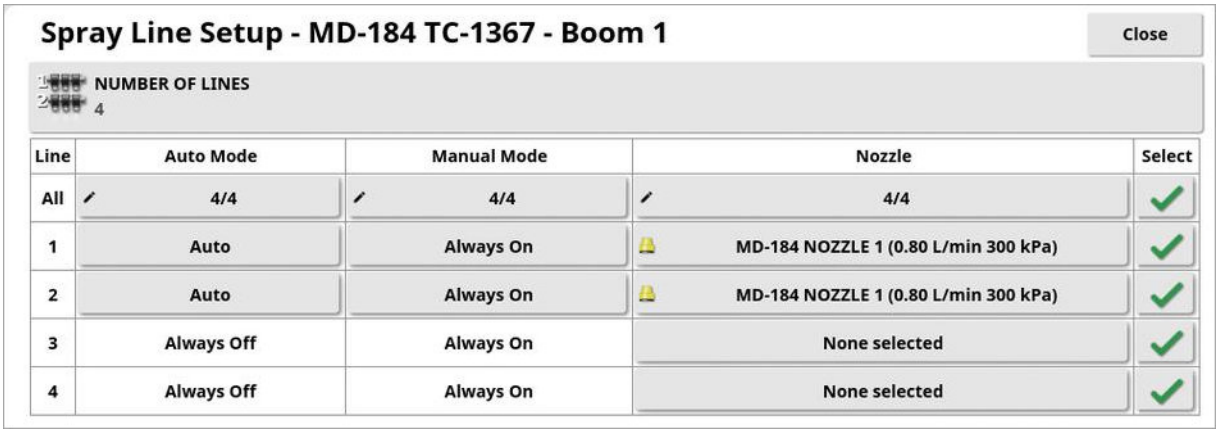
Spray line setup enables up to four lines of nozzles to manually or automatically switch between nozzle lines based on pressure selection.

More than one line may be activated at one time to increase the application rate.

Note: Only one spray line is supported if a Hypro CanNode ECU is controlling the boom.

1. Select **Implement** / **Apollo Sprayer** / **Boom** / **Spray Line** .

This screen is displayed if **Advanced** was selected as **Configuration type** when the implement profile was created. See Implement Setup, page 3.



Line	Auto Mode	Manual Mode	Nozzle	Select
All	4/4	4/4	4/4	✓
1	Auto	Always On	MD-184 NOZZLE 1 (0.80 L/min 300 kPa)	✓
2	Auto	Always On	MD-184 NOZZLE 1 (0.80 L/min 300 kPa)	✓
3	Always Off	Always On	None selected	✓
4	Always Off	Always On	None selected	✓

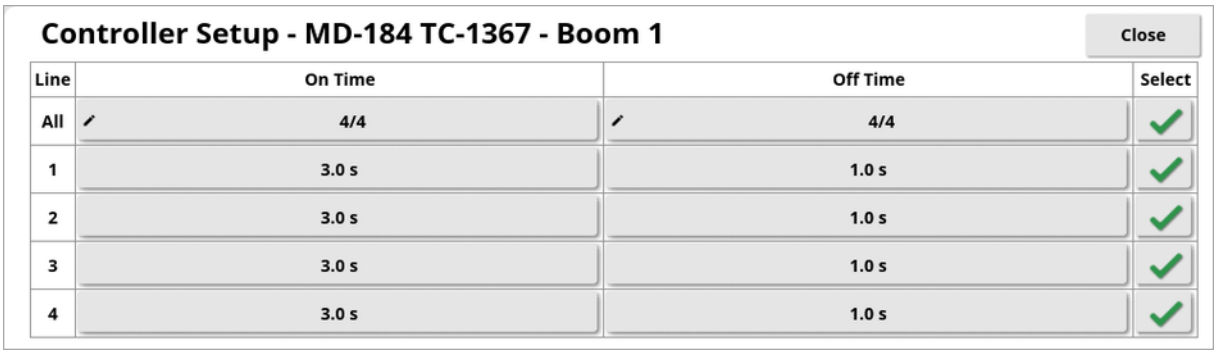
- **Auto mode**: When operating in auto mode, the lines can be set as **Always off**, **Always on**, or set to **Auto** to allow nozzle selection to be dynamically changed by the software, based on the sprayer's speed.
- **Manual mode**: When operating in manual mode, the lines can be set to **Always off** or **Always on**.
- **Nozzle**: The nozzles connected to each line must be selected from the **Nozzle** column drop down lists.

3.6. Setting up line timing

1. Select **Implement** / **Apollo Sprayer** / **Boom** / **Line Timing** .

Line timing enables the system to predict when to turn individual lines on and off to ensure that there will always be product flowing as the lines transition.

Note: This option is only visible if more than one spray line has been configured.



To set the on/off times, observe the spray lines as they transition. If there is a gap in spray as the first line turns off and the second line turns on, increase the on time for the second line to turn it on sooner.

If there is an overlap where both lines are on, which seems longer than acceptable, increase the off time for the first line to turn it off sooner.

3.7. Setting up fence jets

Fence jets are designed to spray outwards from the ends of the boom. They have a 1-2 metre coverage, compared to approximately 1/2 metre for normal nozzles.

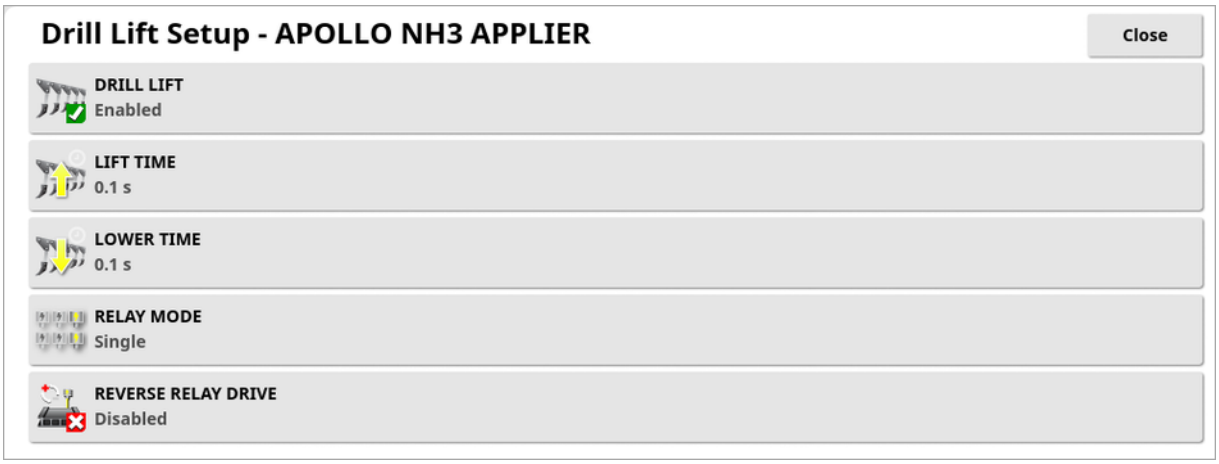
1. Select **Implement**  / **Apollo Sprayer**  / **Boom**  / **Fence Jets**  .

- **Fence jets**: The position of the fence jets on the boom (left, right or both ends).
- **Fence jet mode**: **Driven** means the jets are auto controlled by a relay, **Sense only** means they are turned on and off manually by a switch in the cab but the state is monitored by the display so that rate control remains accurate.
- **External inputs**: Select **Enabled** if **Sense only** is selected. This indicates that the fence jets are turned on and off by external switches.
- **Nozzles per end**: Each end of the boom can have a maximum of two fence jets.
- **Nozzle**: Select the fence jet nozzle type. Nozzles (with **Nozzle Type** of **Fence Jet**) must be created by selecting **Implement** / **Apollo Sprayer** / **Boom** / **Nozzles**. Note: This setting is not required for Standard implement configuration.

3.8. Setting up drill lift

Note: This option is only applicable for an NH3 Applier implement with drill control enabled.

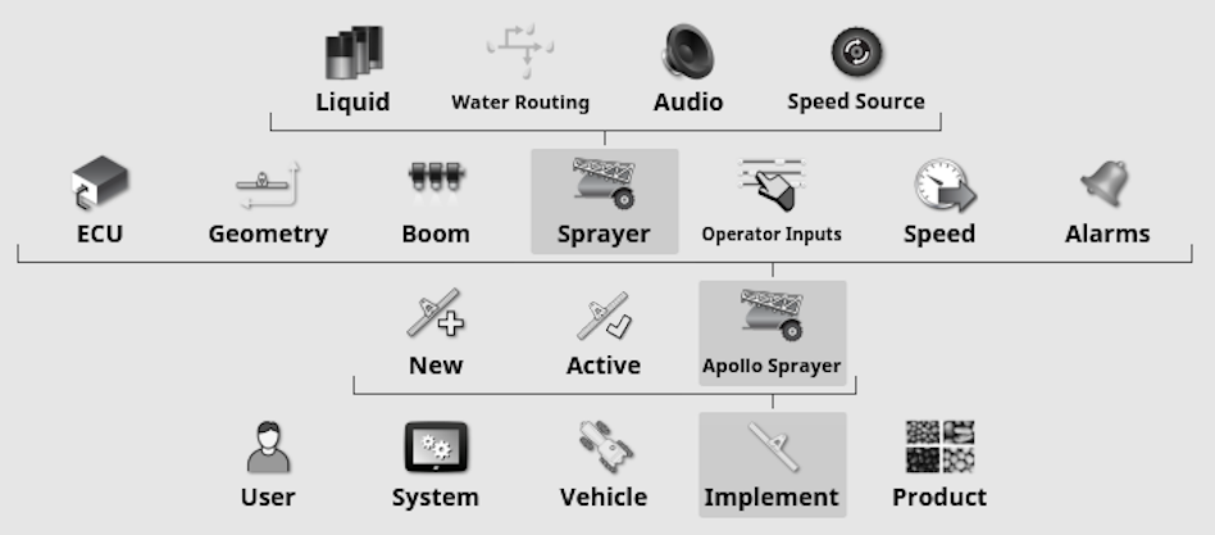
1. Select **Implement** / **Apollo Sprayer** / **Boom** / **Drill Lift** .



- **Drill lift**: Enable if implement is fitted with an ECU to control the lift/lower.
- **Lift time**: Set lift time in seconds.
- **Lower time**: Set lower time in seconds.
- **Relay mode**: Lift/lower solenoids may require more current than a single output can supply. Selecting **Ganged Pair** doubles the available current. The manual supplied with the sprayer implement should indicate if this is required.
- **Reverse relay drive**: Enable to reverse the lift/lower control.

Chapter 4 – Sprayer Controller Setup

This chapter explains how to set up the Sprayer Controller.



Note: The Sprayer menu options displayed are dependent on the type of sprayer defined in the implement setup process.

The following table lists all possible settings for the Sprayer menu in alphabetical order. Not all settings are required or displayed for each sprayer type.

All options displayed when **Implement** / **Apollo Sprayer** / **Sprayer** is selected must have the required settings entered, using the descriptions provided in the following table.

Note: Always refer to the sprayer manufacturer's manual to set efficient and safe settings for the particular implement.

4.1. Sprayer menu settings

Note: The path (or paths) to the settings are shown at the top of each setting description. All paths are preceded with **Implement** / **Apollo Sprayer** / **Sprayer** (or Horticultural Sprayer or NH3 Applier).[1]

The sprayer controller has functions and settings that are hidden when they are disabled, or only displayed when a related setting is enabled. Text in brackets details conditions to display each setting if they are hidden by default.

Setting	Description
Add dither	Liquid / Control Valve, NH3 / Control Valve, RPM Control / Control Valve (Only available if Proportional selected as Control Valve.) Dither makes the valve vibrate slightly to help prevent sticking. Valve quality and brand will dictate whether this setting is required. Varies the PWM +/- of the set point.

[1] Chemical injection tanks are only available for specific customers. Contact your dealer for information.

Setting	Description
Agitation mode	Liquid / Pump Control (Only available if Proportional selected as Control Valve.) Keeps the proportional valve driving when the Master Switch is turned off. Allows slight agitation to keep the mixture moving. **Preset PWM**: Pump speed is set at a fixed value. **Preset pressure**: Pump pressure is set at a fixed value. Pressure is read via the main pressure sensor. **Proportional PWM**: Pump speed is reduced as tank level decreases to prevent foaming. **Proportional Pressure**: Pump pressure is reduced as the tank level decreases to prevent foaming.
Agitation pressure	Liquid / Pump Control (Only available if Agitation Mode is set to Preset Pressure.) Sets the pump pressure to this fixed value.
Agitation PWM	Liquid / Pump Control (Only available if Agitation Mode is set to Preset PWM.) Sets the pump speed to this fixed value.
Auto close valve time	NH3 / Flow If flow is detected after a user settable time (in seconds) when the tank should be off, the regulator valve will be driven shut. This is a safety precaution for NH3 systems using a dump valve to turn the tank off. If the dump valve fails, this provides a back up to ensure that no gas is discharged.

Setting	Description
Automatic wash program	Automatic Wash Program A multiple step automatic washing cycle can be configured, which operates the water routing valves in different configurations for a preset time. See Setting up wash program, page 60 for instructions.
Aux rinse output	Water Routing / Tank Connections An auxiliary output that can be used in conjunction with the clean water rinse feature. It may be used for sending clean water to another part of the sprayer, such as a chemical induction hopper, during the wash program. This output must be controlled via the Wash Program.
Balanced valves	Liquid / Flow, NH3 / Flow The sprayer software is capable of controlling systems that use balanced valves. These valves, when closed, bypass the flow from the boom section back to the tank. This bypass flow is adjustable. This enables the system to maintain sprayer pressure when turning the sections off or on. In a normal system, when a section is turned off, the sprayer is working with a lesser width, and the regulator reduces the pressure to maintain the flow rate for the remaining sprayer width. This can affect the nozzle performance and thus the effectiveness of the sprayer. With a balanced valve system, the pressure is maintained and thus the spray pattern will always be optimal.

Setting	Description
Boom rinse valve	Water Routing / Tank Connections Used if a valve is fitted to the sprayer that allows water to be diverted between the tank system and boom system when rinsing. Select one (half bridge) or two (full bridge) wire for the output.
Calibration factor	Liquid / Flow, NH3 / Flow, Injection / Flow The number of pulses from the flow meter per liter of liquid or weight. Check the calibration factor on the tag on the flow meter of the sprayer. Note that manually specifying the calibration factor on this screen should only be performed if the flow factor is already known or has previously been calculated via Flow meter calibration, page 90. If the Calibration Factor is not known, this field should be left blank and the Auto Flow Calibration wizard followed, refer to Flow meter calibration, page 90.
Capacity	Liquid / Tank, NH3 / Tank, Injection / Tank, Water Routing / Rinse Fill Enter the tank capacity.
Chemical injection carrier tank	Injection / Tank Select the tank containing the carrier liquid for the chemical injection tank.
Close valve when off	Liquid / Control Valve, NH3 / Control Valve, RPM Control / Control Valve (Only available if Regulator selected as Control Valve.) Ensures that the valve is closed when the tank is not in use. This closes the valve when the Master Switch is off and/or when all sections are turned off.

Setting	Description
Connected rinse tank	Water Routing / Tank Connections Select the rinse tank connected to the displayed spray tank.
Control switch point	Liquid / Pressure Control, Injection / Pressure Control The low flow rate that will activate pressure control.
Control valve	Liquid / Control Valve, NH3 / Control Valve, RPM Control/ Control Valve Regulator valve systems are placed in line with the pump and adjust the flow of product to the boom by diverting excess flow back to the tank. Proportional valve systems typically control a hydraulic valve that adjusts the speed of the pump to control the flow that is being delivered directly to the boom.
Controller mode	NH3 / Control Valve (Only available if Regulator Valve is selected as Control Valve.) Choose from Standard, Micro-Trak, DICKEY-john or Raven. When a controller mode is selected, the minimum on time, maximum on time, gain setting and PWM setting are automatically set. These settings can be adjusted if required.

Setting	Description
Controller response	Liquid / Control Valve, NH3 / Control Valve, RPM Control / Control Valve (Only available if Proportional selected as Control Valve.) This sets how quickly the controller will try to achieve the required rate. If set too high, the sprayer may pass the target rate and take time to adjust, searching for the right level. If set too low, the valve will take a long time to move to the desired rate and control will be slow to respond. Find the best setting for the equipment being used.
Density	Liquid / Pressure Control The density of the liquid (water = 1).
Desired fan speed	Fans (Horticultural sprayer only) If **Controlling** is selected for **Fans**, this sets the required fan RPM.
Desired RPM	RPM Control / Control Settings Required RPM for connected external device.
Fallback type	Speed Source Select speed source to be used if GPS is selected and the signal is lost.

Setting	Description
Fans	Fans (Horticultural sprayer only) **Monitoring**: Select to monitor fan speed. **Controlling**: Select if the sprayer is fitted with a hydraulic control system that allows variable speed control of the fans. The Apollo system can control the fan speed. Note: If **Controlling** is selected, control of the fans is automatically linked to the Control Settings. **RPM Control** is enabled but not editable. The **Track to Function** option is editable (see Track to function, page 56).
Feedback fan	Fans (Horticultural sprayer only) If **Controlling** is selected for **Fans**, this selects the fan to use as the reference speed.
Fill aux output	Liquid / Tank Fill An auxiliary output that can be powered when the tank fill operation is in progress (Active Filling), or completed (Active Full).
Fill flow meter	Water Routing / Rinse Fill Selects the tank fill flow meter to be used to monitor the tank level when filling the rinse tank.
Fill valve control	Water Routing / Rinse Fill Valve type being used to start and stop tank fill operation. **1** and **2 wire active full**: Valve should be open when tank is full. **1** and **2 wire active filling**: Valve should be open when tank is filling.

Setting	Description
Filling calibration factor	Liquid / Tank Fill The calibration factor of the flow meter.
Flow confirmation sensor	Injection / Flow If the system has a sensor installed to confirm that there is flow output from the chem injection tank when required, the Apollo system can monitor this. Two options are offered for sensing here: **Pulsed**: Used if a flow meter is used to detect flow. **Switched**: Used if there is a pressure switch used to detect flow.
Flow meter sampling	Liquid / Control Valve, NH3 / Control Valve, RPM Control / Control Valve Sets how frequently sampling is done. Standard sampling is recommended. Reduced is recommended only if flow may be highly irregular (for example, on worn equipment).
Follow carrier tank	Injection / Tank **Warning only**: Provides a warning that the carrier tank has been turned on. **Follow carrier tank**: Turning on the carrier tank turns on the chemical injection tank.
Full tank PWM	Liquid / Pump Control (Only available if Agitation Mode is set to Proportional PWM.) Sets the pump speed when the tank is full (more effort is required to agitate a full tank).

Setting	Description
Gain setting	Liquid / Control Valve, NH3 / Control Valve, RPM Control / Control Valve (Only available if Regulator selected as Control Valve.) This sets how quickly the controller will try to achieve the required rate. If set too high, the sprayer may pass the target rate and take time to adjust, searching for the right level. If set too low, the valve will take a long time to move to the desired rate and control will be slow to respond. Find the best gain percentage for the equipment being used.
Low speed pressure hold	Liquid / Pressure, NH3 / Pressure, Injection / Pressure This allows the system to go into 'low pressure hold' based on speed. If the controller is in auto and the speed drops below the set value, the system will stop controlling to the set application rate and go into manual mode. When the speed goes back above this value it will go back into auto mode. The speed threshold must be entered.
Low tank PWM	Liquid / Pump Control (Only available if Agitation Mode is set to Proportional PWM.) Sets the agitation power when the tank is empty.

Setting	Description
Manual pulse duration	Liquid / Control Valve This setting is used to set how long the valve should be moved each time you press the +/- button when operating in manual. This has defaults based on the selected valve speed as follows: • Fastest: 600 ms • Medium: 75 ms • Slow: 50 ms These defaults can be overridden if required.
Master switch audio	Audio Enables a unique sound when the master switch is turned on and off.
Maximum on time	Liquid / Control Valve, NH3 / Control Valve, RPM Control / Control Valve (Only available if Regulator selected as Control Valve.) The maximum time that power can be applied to move the valve.
Maximum pressure	Liquid / Pressure, NH3 / Pressure, Injection / Pressure The maximum pressure rating that the sensor can read.

Setting	Description
Maximum PWM	Liquid / Control Valve, NH3 / Control Valve, RPM Control / Control Valve (Only available if Proportional selected as Control Valve.) Sets the maximum amount of PWM power that can be provided to the valve before maximum possible speed is achieved. The time that the Pulse Width Modulation (PWM) is active. Higher values set the pulse of power for longer during a pulse cycle. Anything over this figure the implement (motor, valve actuator) will not respond.
Maximum voltage	Liquid / Pressure, NH3 / Pressure, Injection / Pressure Set the maximum output voltage at maximum pressure. This value is read from the pressure transducer.
Minimum flow	Liquid / Flow, NH3 / Flow, Injection / Flow Sets the minimum flow that the flow meter can effectively measure. When in auto mode, the system will not control below this value. This could cause over application of product, but will ensure that stable control can always be achieved. Refer to the flow meter manufacturer's information.
Minimum nozzle flow	Liquid / Flow, NH3 / Flow, Injection / Flow Sets the minimum flow that will create an adequate spray pattern. When in auto mode, the system will not allow control below the flow rate that is calculated by the minimum nozzle flow multiplied by the number of nozzles activated. Refer to nozzle manufacturer's information.

Setting	Description
Minimum on time	Liquid / Control Valve, NH3 / Control Valve, RPM Control / Control Valve (Only available if Regulator selected as Control Valve.) The minimum time that power needs to be applied to move the valve.
Minimum PWM	Liquid / Control Valve , NH3 / Control Valve, RPM Control / Control Valve (Only available if Proportional selected as Control Valve.) Sets the minimum amount of PWM or power required to allow the metering unit to rotate or discharge product. The time that the Pulse Width Modulation (PWM) is active. Higher values set the pulse of power for longer during a pulse cycle. Minimum PWM is used to locate at what point a valve or motor will respond to the power provided. Anything under this figure the implement (motor, valve actuator) will not respond.
Minimum voltage	Liquid / Pressure, NH3 / Pressure, Injection / Pressure Set the minimum output voltage at zero pressure. This value is read from the pressure transducer.
Name	Liquid / Tank, NH3 / Tank, Injection / Tank Change the default tank name. This name will be used if USE PRODUCT AS NAME is disabled.

Setting	Description
Number of fans	Fans (Horticultural sprayer only) Number of fans mounted on the sprayer to be monitored or controlled. If more than one fan is selected, the fan speed is displayed in the sprayer mini-views (see Mini view windows, page 70) and fan monitor panels. If only one fan is entered, the fan speed is displayed in the sprayer dashboard (see Using the sprayer dashboard, page 65).
Pressure boost	Liquid / Pump Control This increases the pressure when the sprayer has been turned off. This drives the valve to increase pressure for a short time after the Master Switch and/or all the sections are turned off (section control). This allows spraying to resume at normal pressure when it is restarted. Note: This option is not available if agitation is enabled.
Pressure control	Liquid / Pressure Control, Injection / Pressure Control The display supports **Pressure Only** or **Pressure Fallback** control. Pressure fallback control uses flow control unless the flow falls below a set flow rate. It will then use pressure control until the flow increases. Note that this setting is disabled if **Sensor Type** is set to **None** under **Implement** / **Apollo Sprayer** / **Sprayer** / **Liquid** / **Pressure**.
Pressure threshold	Liquid / Pressure Refer to **Low Pressure Hold Source**.
Pulses / revolution	Fans (Horticultural sprayer only) Sets the number of pulses detected per revolution of the fan.

Setting	Description
Pulses / revolution	Liquid / Pump Control (Only available if Pump Speed enabled.) If set at 1, the sensor picks up from a target bolt, one pulse per revolution. Sets the number of pulses detected per revolution of the pump.
Pulses / revolution	RPM Control / Control Settings Sets the number of pulses detected per revolution of the auxiliary RPM control.
Pump speed	Liquid / Pump Control Some sprayers have a hydraulically driven pump and have a speed sensor fitted to monitor the driven speed of the pump. Setting up pump speed allows the pump speed to be monitored during operations.
Pump type	Liquid / Tank Fill Pump type used to fill the sprayer tank. **Spray pump**: Sprayer pump is being used to fill the tank. **Secondary pump (on/off)**: Separate on/off pump is being used to fill the tank. **Secondary pump (proportional)**: Separate proportional speed pump is being used to fill the tank.

Setting	Description
PWM setting	Liquid / Control Valve, NH3 / Control Valve, RPM Control / Control Valve (Only available if Regulator selected as Control Valve.) This is the time that the Pulse Width Modulation (PWM) is active. This setting is used to reduce the overall applied voltage to the actuator. Use with caution as this will reduce the torque that the actuator is able to apply. Control of a motor or valve is achieved by varying the amount of time power is switched on/off. This happens at a very fast rate.
Recirculating flow	Liquid / Flow Circulates excess product back through the tank to allow chemicals to continually move through the system.
Return flow factor	Liquid / Flow (Only available if Recirculating Flow is enabled.) The calibration factor for the flow meter that measures the recirculating flow returning to the tank.
Reverse dump valve	Liquid / Flow, NH3 / Flow The dump valve releases liquid back to the tank. In some cases the valve may have been wired to work in the opposite direction. To allow the dump valve to work in reverse, select Reverse Dump Valve.
Reverse valve	Liquid / Control Valve, NH3 / Control Valve, RPM Control / Control Valve (Only available if Regulator is selected as Control Valve.) In some sprayers the valve may have been wired to work in the opposite direction. This setting allows the valve to work in reverse.

Setting	Description
Rinse control	Water Routing / Tank Connections Activates a relay to allow the fresh water tank to be used to rinse the chemical tank once spraying is complete. See Tank Rinse on/off, page 78.
Rinse valve	Water Routing / Tank Connections Select one (half bridge) or two (full bridge) wire for the output.
RPM control	RPM Control / Control Settings Allows an external device that has hydraulic control (e.g. a fixed speed pump) to be run at a fixed RPM. The device control can be linked to a virtual button (see Custom controls setup, page 18). Select **None** if this is required. Note: If **None** is selected, but no assignment is selected under **Operator Inputs** / **Custom Controls** / **Assignments**, the device will run all the time. Control can also be linked to an existing item such as the virtual pump button (see External pump controls setup, page 17). Select **Pump**. Alternatively it can track the master switch. Select **Master**.
Sections on off audio	Audio Enables a unique sound when sections are turned on and off (manually or automatically).
Sensor type	Liquid / Pressure, NH3 / Pressure, Injection / Pressure The pressure sensor may be **Voltage** sensor type.

Setting	Description
Smart rate	Liquid / Tank Smart rate enables spraying at a virtual speed when the vehicle is stationary, or moving below a specified speed. This feature is typically used when starting spraying in the corner of a field. It allows a suitable spray pattern to be achieved by simulating speed. It then automatically returns to the previous rate control mode (Auto or VRC) at a configured time/speed. Smart rate is activated by linking to the master switch or by pressing **Smart** on the rate control mode selector (see Using the tank panel, page 73).
Smart rate active time	Liquid / Tank Time in seconds that smart rate is active (unless the vehicle goes above the cancel speed before the time expires).
Smart rate cancel speed	Liquid / Tank Smart rate is deactivated when the vehicle reaches this speed.
Smart rate link to master	Liquid / Tank Linking smart rate to the master switch will put the vehicle into smart rate mode when the master switch is turned on (if the smart rate conditions are met).
Smart rate virtual speed	Liquid / Tank When in smart rate mode, the spray rate is equivalent to the rate if the vehicle was travelling at this speed.

Setting	Description
Soft start	Liquid / Control Valve, NH3 / Control Valve (Only available if Proportional Valve selected as Control Valve.) Allows a gradual increase in the valve signal when the valve is activated. This is used to prevent mechanical damage from sudden starts.
Soft stop	Liquid / Control Valve, NH3 / Control Valve (Only available if Proportional Valve selected as Control Valve.) Allows a gradual decrease in the valve signal when the valve is deactivated. This is used to prevent mechanical damage from sudden stops.
Speed source	Speed Source Sets the source of speed information supplied to the implement which is used to determine the application rate required.
Speed threshold	Liquid / Pressure Refer to **Low Speed Pressure Hold**.
Switched sensor output	Injection / Flow (Only available if Flow Confirmation Sensor is set to Switched.) Set if the switch connects to 12V (high) when it is active, or to 0V (low) when it is active.
Tank aux output	Liquid / Tank Fill An auxiliary control can be assigned to spare ECU outputs.

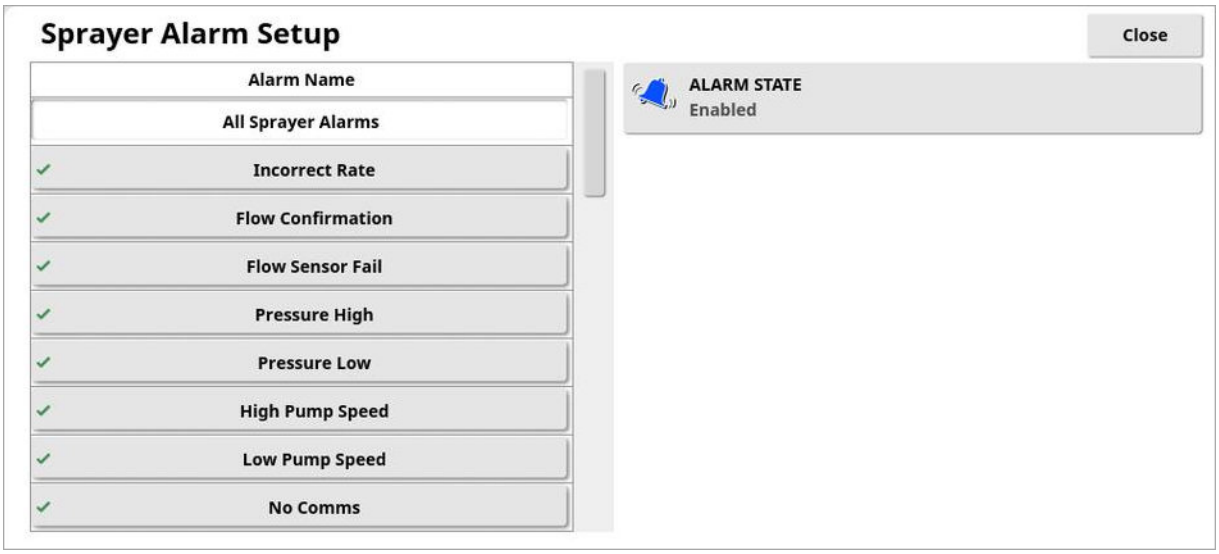
Setting	Description
Tank fill mode	Liquid / Tank Fill Enables start / stop of tank fill. See Auto fill control, page 77. Monitors quantities going into the tank.
Tank switch audio	Audio Enables a unique sound when tanks are turned on and off.
Track to function	RPM Control / Control Settings Control can be linked to an existing item such as the virtual pump button (see External pump controls setup, page 17). Select **Pump**. Alternatively it can track the master switch. Select **Master**.
Use product as name	Liquid / Tank, NH3 / Tank, Injection / Tank On the Operation screen tank panel the product is displayed as the tank name if this is enabled. If no product is assigned to the tank, the tank name is 'Empty'. If disabled, the tank name entered for the individual tank is used.
Valve control	Liquid / Tank Fill Valve type being used to start and stop tank fill operation. 1 and **2 wire active full**: Valve should be open when tank is full. 1 and **2 wire active filling**: Valve should be open when tank is filling.

Setting	Description
Valve speed	Liquid / Control Valve, RPM Control / Control Valve (Only available if Regulator selected as Control Valve) Sets the speed at which the valve is driven to control the rate.
Wash program	Water Routing / Wash Program A multiple step wash program can be created to automatically direct water along a specified route, for a preset time. See Setting up wash program, page 60.
Wash program setup	Water Routing / Wash Program Select to setup the wash program.
Wheel factor	Speed Source The wheel factor defines how far the implement travels per pulse from the wheel sensor. A wheel fitted with four magnets, with a circumference of one meter, will travel 0.25 meters per pulse. If Wheel Sensor is selected as the Speed Source, the wheel speed calibration factor must be calculated (or entered here if known). The wheel factor cannot be set to zero. To carry out a calibration enter a value of one, then proceed with the calibration. Refer to Wheel sensor calibration, page 86.

4.2. Setting up alarms

Alarms can be enabled for all alarms or individual alarms. Use the **All Sprayer Alarms** option to universally enable or disable all sprayer alarms.

1. Select **Implement** / **Apollo Sprayer** / **Alarms** .



2. To enable all alarms, select **All Sprayer Alarms** / **Alarm State** and **Enabled**.

   This enables all sprayer alarms listed. Alarms that require more information are shown below.

- **Incorrect Rate**: This alarm will sound and display if the detected actual rate is different from the preset rate by the threshold percentage amount. Enter the percentage in **INCORRECT RATE THRESHOLD** (lower is more sensitive).
- **Pressure High**: This alarm will sound and display when pressure exceeds the preset maximum pressure (at which the sprayer nozzles become inefficient) for each tank.
- **Pressure Low**: This alarm will sound and display when pressure drops below the preset minimum pressure (at which the sprayer nozzles become inefficient) for each tank.
- **High Pump Speed**: This alarm will sound and display when RPMs exceed the preset maximum RPMs for each tank.

- **Low Pump Speed**: This alarm will sound and display when RPMs drop below the preset minimum RPMs for each tank.
- **Tank Low**: This alarm will sound and display if the tank contents drop below the preset percentage for each tank.

4.3. Setting up wash program

A multiple step wash program can be created to automatically direct water along a specified route, for a preset time.

1. Select **Implement**  / **Apollo Sprayer**  / **Sprayer**  / **Water Routing**  / **Wash Program**  and ensure that **Wash Program** is enabled.
2. Select **Wash Program Setup**.
3. Enter the number of outputs required then select next. Each output is a water routing option, for example a relay or valve. Include all outputs that will have their state changed by the wash program.

   Up to 20 outputs may be specified, depending on the system configuration. The maximum number allowed is limited by the available functions.
4. Assign a function to each output. Each output must have a function assigned before selecting next. The following functions are available:
   - All sections
   - All spray lines
   - Aux output control
   - Tank aux rinse output
   - Tank control channels
   - Tank rinse valve
   - Tank fill pump
   - Tank fill valve
   - Pump on/off
   - Tank clean water valve
   - Tank boom rinse valve

- Tank dump valve: releases liquid back to the tank
- Custom controls: See Custom controls setup, page 18.

5. Enter the number of steps required for the wash program. Each step assigns routing / valve states etc. Up to 20 steps may be specified.
6. Specify the output state for the assigned functions and the duration for the first step. This directs the water along the required route. Relays and sections may be off or on. Valves may be open or closed. The open percentage must be specified for control channels.
7. Select next and specify the output states and duration for the next step. Repeat until all steps are defined.
8. Select **OK** to save the wash program.

See Wash program, page 89 for wash program operation.

Chapter 5 – Product Setup

5.1. Setting up chemicals

1. Select **Product**  / **Tank Mixtures**  / **Chemicals**  .

Chemicals that are defined here must be added to mixtures (see Setting up mixtures, page 63). They may be either liquid or granular.

This is different to products defined via **Product** / **Liquid**. Products have increment / decrement values assigned and an associated calibration factor. Products may be directly assigned to fill a tank and apply to a field. To add a new product, refer to Selecting / adding a product, page 79.

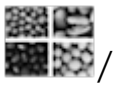
To setup a new chemical, select **New Chemical** from the Chemicals list and follow the wizard.

Once a chemical has been created and added to a mixture, highlighting the chemical in the Chemicals list displays the mixtures it is used in.

Note: Once a chemical has been added to a mixture, it is not possible to change the **Display As** option between **Rate** and **Percentage**.

5.2. Setting up mixtures

The Create Mixture wizard can be used to select multiple chemicals and define their respective application rates to make up a mixture to be applied.

Chemicals must be defined by selecting **Product**  / **Tank Mixtures**  / **Chemicals**  before they can be added to a mixture.

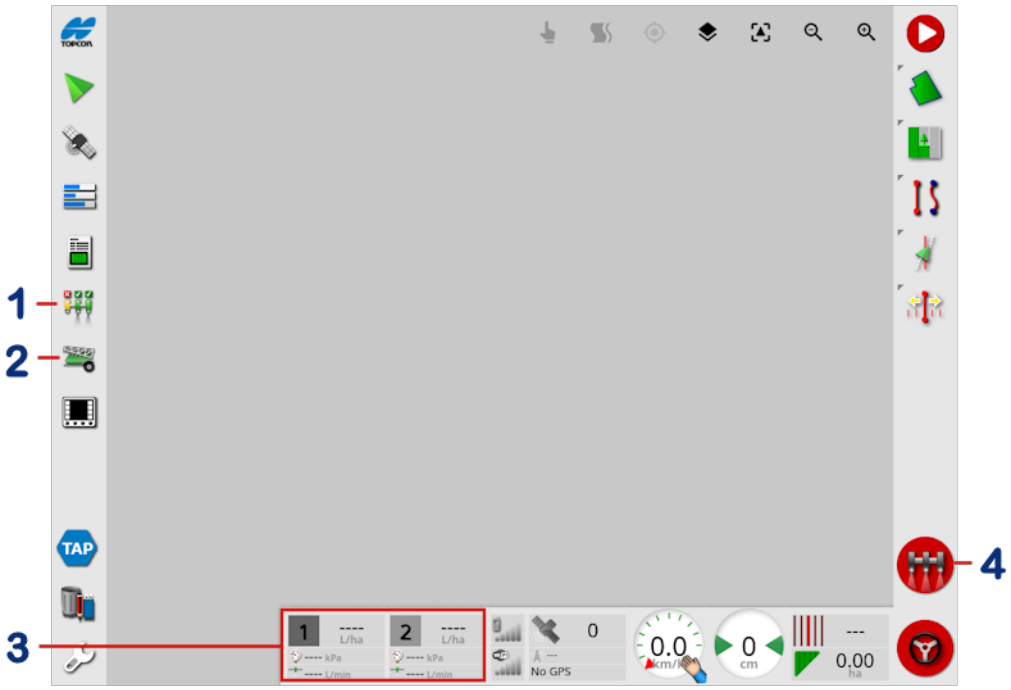
1. Select **Product**  / **Tank Mixtures**  / **Mixtures**  .
2. Select **New Mixture** from the Mixtures list to create a new mixture.
3. Enter a **Mixture Name**.
4. Use the Add a chemical button  to add chemicals to the mixture and enter the required application rate. More than one chemical may be added.

Once a mixture has been defined, it can be used to calculate the amount of each chemical that must be added to a tank for a task (see Selecting a mixture, page 81) or used in the recipe calculator (see Calculating a recipe, page 83). The mixture breakdown and application rates are recorded in the task details and task report.

Chapter 6 – Operation

Once setup is complete and auto section control and sprayer controller are enabled, the auto section control and sprayer controller icons appear on the Navigation bar (left of screen).

Sprayer controller information is added to the dashboard and the sprayer master switch appears bottom right.



1 Auto section control icon. See Opening auto section control, page 66.

2 Sprayer controller icon. See Opening sprayer controller, page 68.

3 Sprayer dashboard. See Using the sprayer dashboard, page 65.

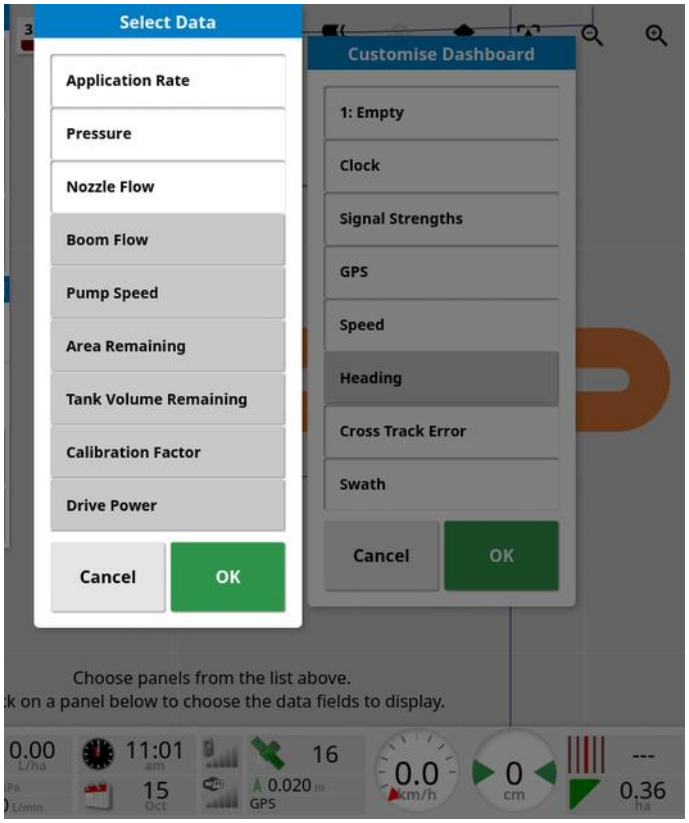
4 Sprayer master switch. See Using the master switch, page 96.

6.1. Using the sprayer dashboard

Sprayer information is added to the dashboard when the Sprayer Controller is enabled.

Note: The options shown on the sprayer dashboard vary depending on the type of sprayer implement selected.

1. Select anywhere on the dashboard to customize what is shown on the dashboard.
2. Press again on the particular panel to be customized and further options display.
3. Deselect and select options as required.

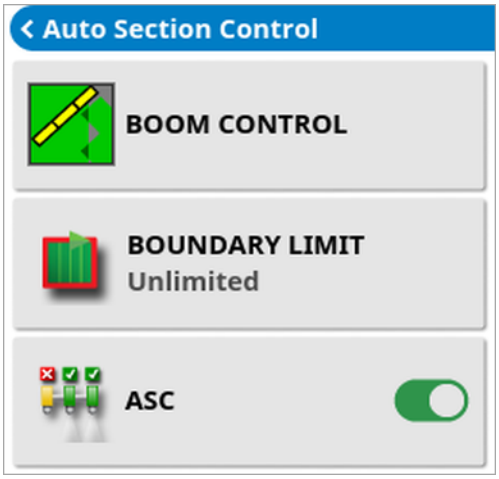


4. Confirm the new dashboard display. The selected options appear on the dashboard.

6.2. Opening auto section control

Auto section control is available when an implement and ECU have been set up and Auto Section Control has been enabled in the Setup screen (**System** / **Features** / **Implement**).

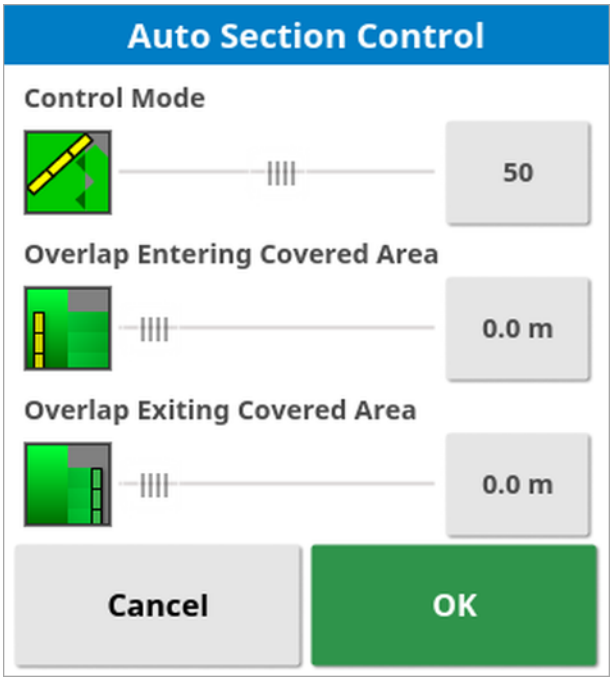
1. Select **Auto Section Control** . The Auto Section Control mini-view opens.



- **Boundary limit**: Sets which type of boundary limit will turn off coverage when using auto section control:
  - **Field Boundary** and **Headland** are defined using the Field menu on the Operation screen. Refer to the X Family Displays Horizon operator manual for more information on these.
- **ASC on/off**: Turn auto section control on/off on all booms.

6.2.1. Boom control

Single boom



- **Control mode**: Use the slider or number keypad to set to avoid overlap (0) or avoid gaps (100). If avoid overlap is chosen, there may be some spaces where product is not applied. If avoid gaps is chosen, some overlap of application is likely near boundaries. The default (50) is a compromise.
- **Overlap entering / exiting covered area**: Determines how much overlap is achieved when entering or exiting an area that already has coverage.

Multiple booms

If the implement has multiple booms, the control mode and overlap covered area settings may be adjusted separately for each boom.

 Boom override turns off section control for this boom. Select the required boom and press **Boom Override**. At least one boom must be turned on. Use **ASC on/off** on the mini-view to turn off all booms.

6.3. Opening sprayer controller

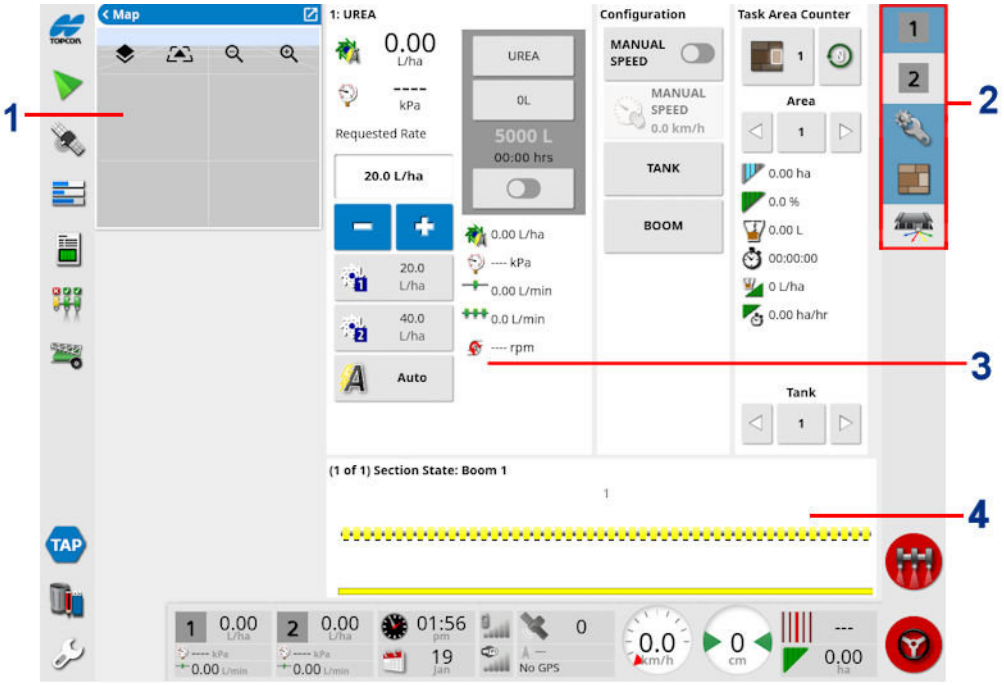
The sprayer controller interface can appear either in a mini-view or in full screen. When the sprayer controller is in full screen, the guidance view can appear as a mini-view, so that the operator can still monitor the map.

1. Select the sprayer icon to open a mini-view, or swipe left to right across the icon to open the sprayer controller to full screen  . The Guidance screen can remain as a mini-view.

   Use the mini-view to monitor status or adjust rate.

2. To move the mini-view to another position on the screen, slide up or down.

   The sprayer controller full screen interface shows a number of panels.



1 Guidance mini-view

2 Sprayer toolbar

3 Sprayer panels

4 Status panel

3. Select the panels to view using the Sprayer toolbar:

Tank panel, see Using the tank panel, page 73.

Configuration panel, see Configuring and calibrating, page 86.

Area counters, see Setting area counters, page 92.

Custom controls, see Custom controls setup, page 18.

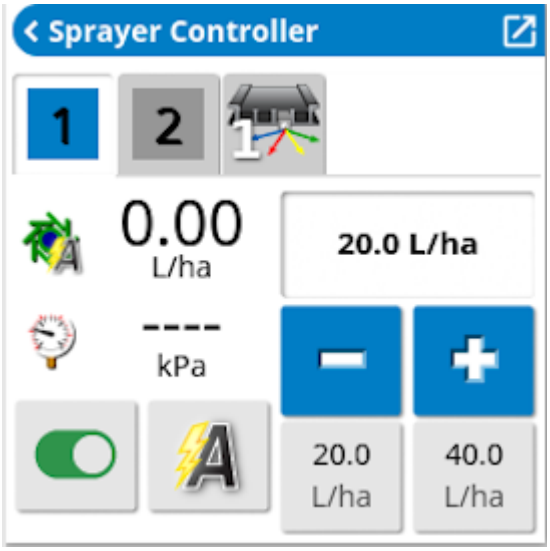
Section state.

Note: If a horticultural sprayer implement is selected, fan monitor panels are also available.

6.4. Mini view windows

To display the sprayer controller mini-view, select the sprayer icon from the left hand menu. The sprayer controller mini-view window has a number of tabs at the top that display information for different features. Only enabled features and tanks are displayed.

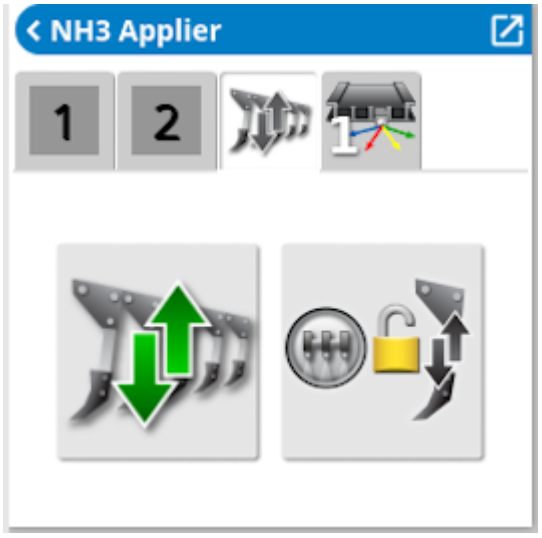
Tank



The icon at the top of the mini-view is the same for all tank types but the displayed units change (nitrogen amount per area for NH3 and a fraction of the liquid tank unit for the chemical injection tank). Displayed units may be changed via **User** / **Region** / **Units**.

See Using the tank panel, page 73 for an explanation of the buttons.

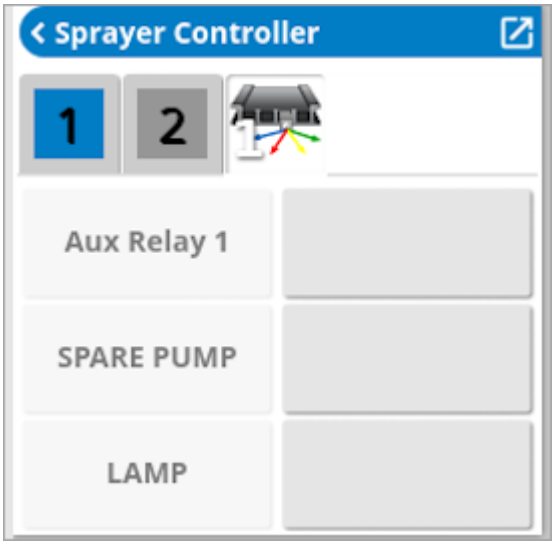
Drill lift / lower



 Lift/lower drill

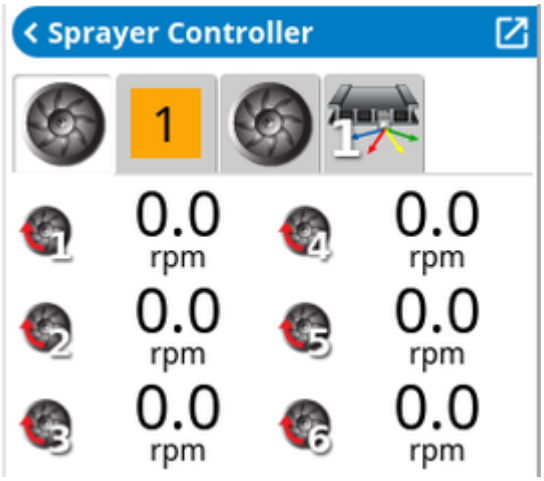
 Drill lift/lower track master (control down force using the master switch)

Custom controls



See Custom controls setup, page 18.

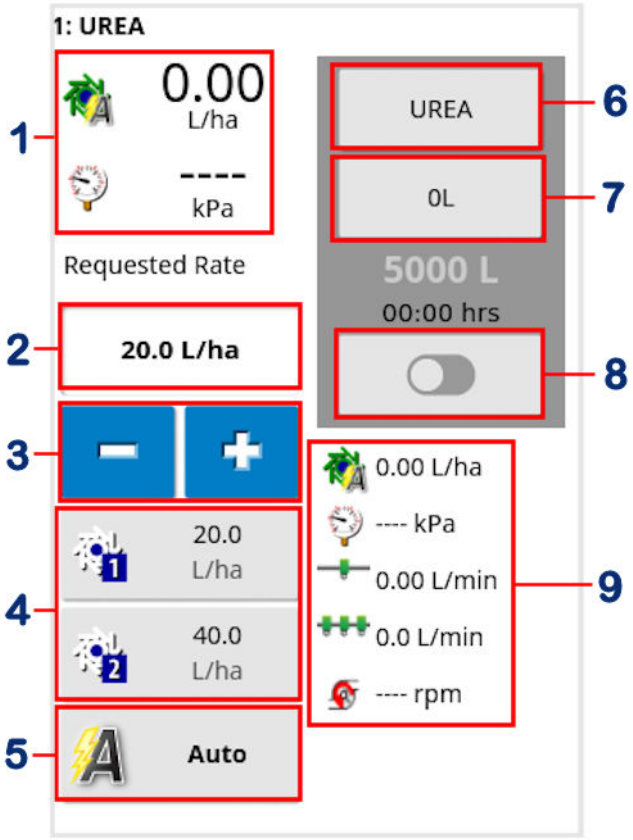
Fan speeds



Displays the left and right fan speeds for horticultural sprayers with more than one fan. The fan speeds are also shown on the fan speed panels available on the sprayer toolbar on the right of the screen.

6.5. Using the tank panel

1. Select the Tank icon on the toolbar to the right of the screen to open the panel for the tank being used 1.
2. Touch the Tank Panel title bar to expand and collapse the panel to show product information.



1 Displays two parameters related to the specific tank. Selecting opens a customize data window with a list of available parameters to be displayed.

2 Requested application rate. Used to enter and display the application rate. The control system uses the calibration factor to adjust the product flow for the given product. This is disabled if VRC or manual mode is being used.

3 Increase/decrease requested application rate by preset rate increment (increment is set by selecting button shown at 6).

4 Requested application rate presets. These are the user-defined default application rates (set by selecting button shown at 6). Selecting one of these icons adjusts the application rate to that value.

5 Rate control mode selector. Allows you to select VRC, Auto control or Smart rate (see Smart rate, page 54).

Manual may also be selected. Note that Auto Section Control will not work in manual mode. When in manual mode, the requested rate is greyed out and the actual rate may be adjusted using the + and – buttons.

6 Product selection. Opens the select product window for the tank. Refer to Selecting a product, page 79.

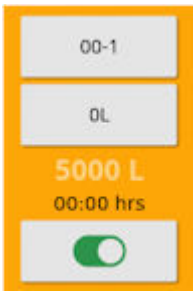
7 Tank fill. Opens the tank fill window to add volume of the product being used. Refer to Filling tanks, page 76.

8 Tank application on/off toggle. Green when tank is on, grey when tank is off. This is not shown for single tank implements.

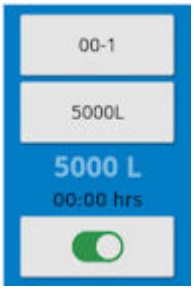
9 Displays up to five parameters related to the specific tank. Opens a customize data window with a list of available parameters to be displayed.

6.5.1. Tank colors

Grey tank. On/Off button grey.
System is on standby. Tank is turned off.
Check Master Switch and tank On/Off.



Yellow tank. On/Off button green.
Tank is turned on, but empty.



Blue tank. On/Off button green.
Tank is full and turned on.

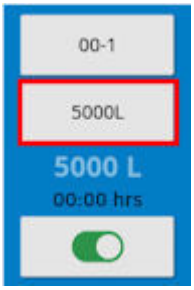
Blue color dropping shows approximate level of product remaining.

Note: If the tank is being rinsed, the tank color will flash orange.

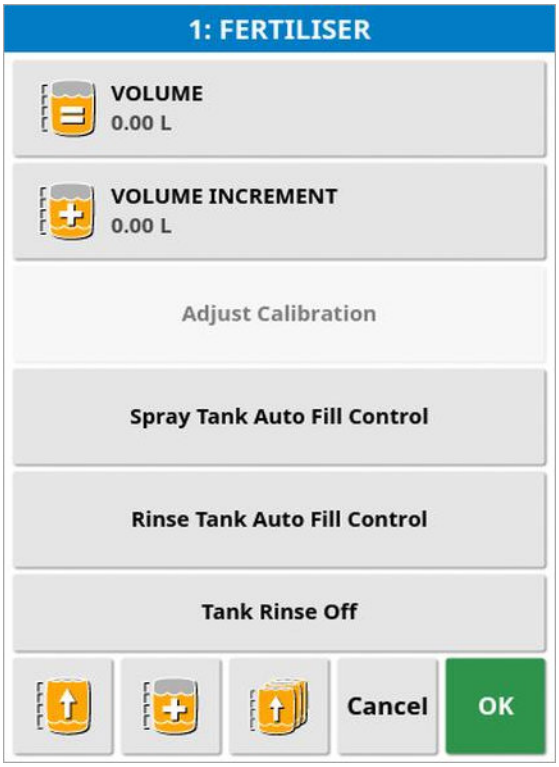
6.5.2. Filling tanks

To fill the sprayer tanks:

1. Select the Tank Fill button.



The Tank Fill screen displays.



 **Set volume**: Set the volume of product in the tank.

 **Volume increment**: Set the volume value to be used when increasing volume in the tank by increments.

 **Fill tank to capacity**: Fill the tank to the capacity entered on the Setup screen (**Implement** / **Apollo Sprayer** / **Sprayer** / **Liquid** / **Tank**).

 **Increase volume by increment**: Adds product by the volume set for **Volume increment**.

 **Fill all tanks to capacity**: Fill multiple tanks to the capacity entered on the Setup screen (**Implement** / **Apollo Sprayer** / **Sprayer** / **Liquid** / **Tank**).

Adjust calibration

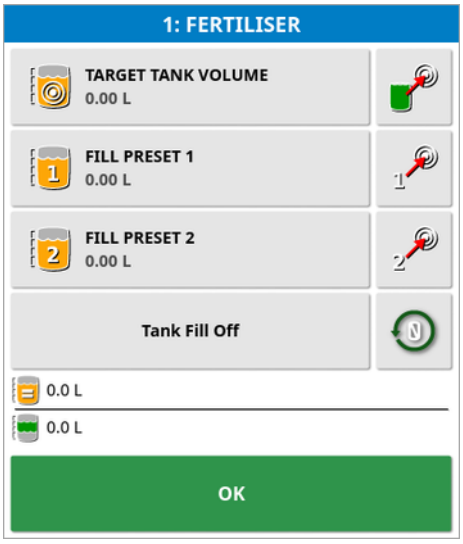
This option is used to adjust the calibration factor when there is a known starting volume and a known error in the finishing volume. It allows the calibration factor to be automatically recalculated based on the percentage difference between the calculated and actual volume remaining. This may be useful when there is an inconsistency between the displayed and known product remaining.

1. Select **Adjust Calibration**.
2. Select **Actual Volume Remaining**.
3. Enter the volume of product remaining in the tank and confirm.

The Calibration Adjustment percentage is automatically calculated.

Auto fill control

This option allows the tank to be filled with a specified amount of liquid if a flow meter is connected to the tank fill. Ensure **Implement** / **Apollo Sprayer** / **Sprayer** / **Liquid** / **Tank Fill** has **Flow Meter** selected for **TANK FILL MODE** on the setup screen.



- **Target tank volume**: Set the volume of product required in the tank.
-  : Fill the tank to capacity.
- **Fill preset 1 / 2**: Set two preset tank volumes.
-  : Fill to the preset values.
-  : Set the tank volume to zero.
-  **Current tank volume**: Volume of product currently in the tank.
-  **Volume remaining to target**: Amount of product still to be added to reach the target volume.

1. Select **Tank Fill Off** to start filling the tank to the required volume.
2. Alternatively select  to fill the tank to capacity.

Tank Rinse on/off

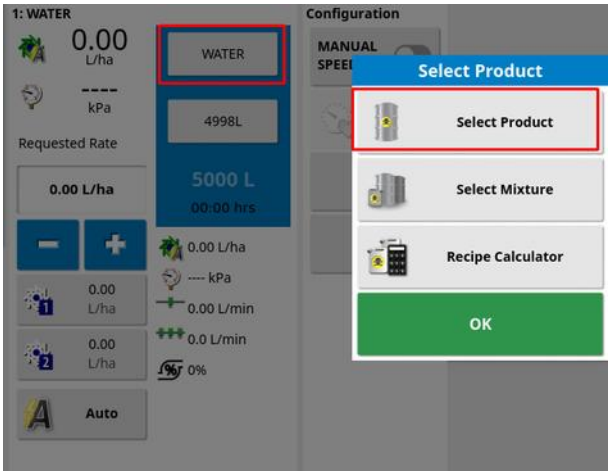
Activates a relay to use the fresh water tank to rinse the chemical tank, once spraying is complete. Ensure **Implement** / **Apollo Sprayer** / **Sprayer** / **Water Routing** / **Tank Connections** / **RINSE CONTROL** is enabled on the setup screen.

6.6. Selecting a product

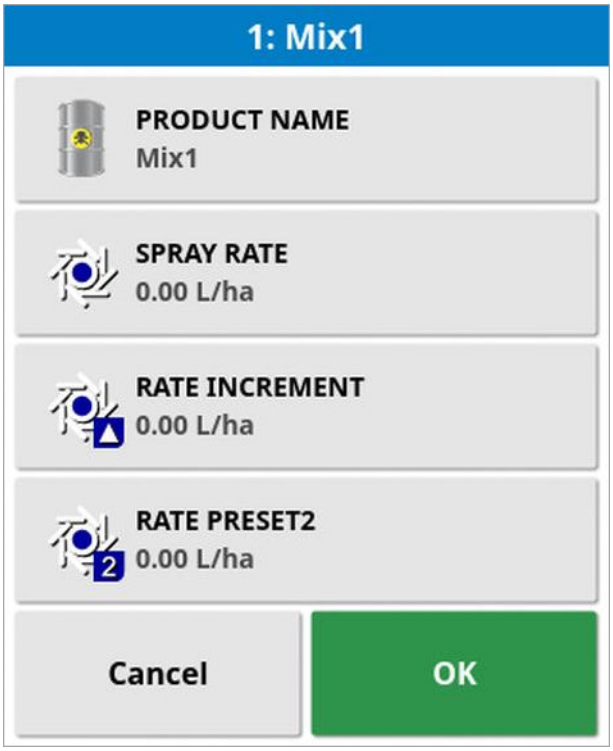
6.6.1. Selecting / adding a product

To select or add a new product:

1. Select the Product Configuration button, then select **Select Product**.



The Product Configuration screen displays.



2. Select **PRODUCT NAME** to select a product from the list, or to add a new product. Products defined on the setup screen under **Product** / **Liquid** are displayed here.

Selecting **New Product** opens the New Product Setup wizard.

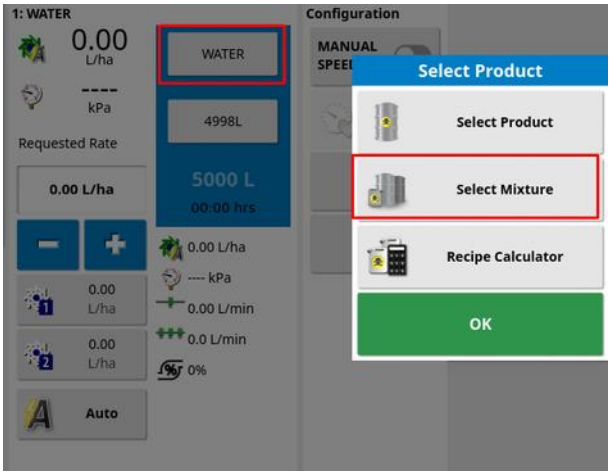
Follow the wizard to add a new product. **Custom Product** may be selected to create a new product from scratch, or a product template may be selected from the list. Note that some of the available product templates apply only to granular products.

- **Spray rate**: Defines the preset application rate.
- **Rate increment**: Defines how much the application rate will change when the operator presses the application rate up/down button. The rate can be changed by a fixed rate or by a percentage of the rate set for **Spray rate**. To change the rate increment type:
  1. On the Setup screen, select **User** / **Region** / **Units**. The **APPLICATION RATE INCREMENT TYPE** may be set to **Fixed rate** or **Percentage of Preset 1**. Note: **Preset 1** is the value entered for **Spray rate**.
- **Rate preset 2**: Defines an alternative preset application rate.

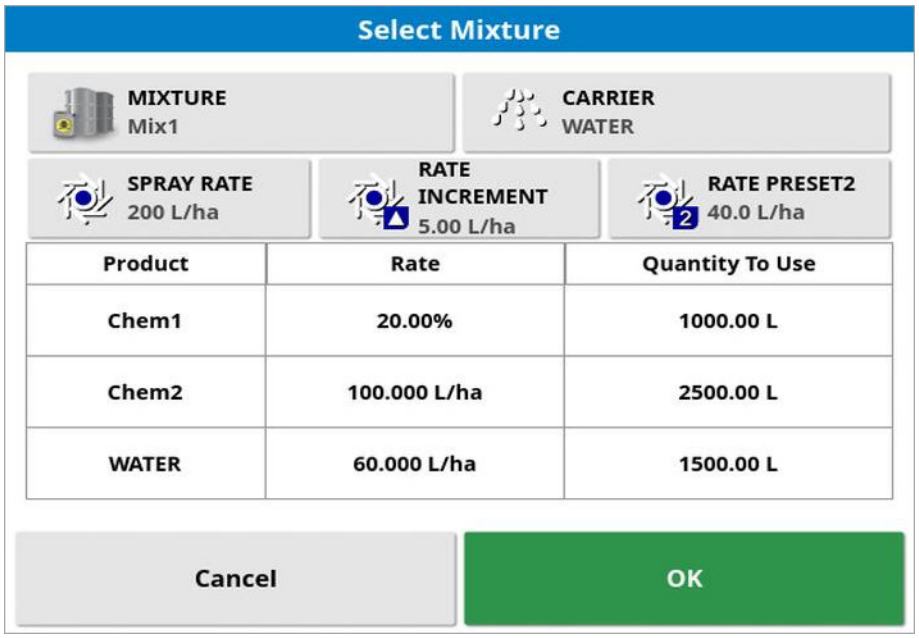
6.6.2. Selecting a mixture

The Select Mixture option can be used to calculate the quantity of chemicals and a carrier, at a defined spray rate, required to fill the tank.

1. Select the Product Configuration button, then select **Select Mixture**.



The Select Mixture screen displays.



2. Select the required mixture from the **Mixture** drop down list.

   Mixtures are defined on the setup screen under **Product** / **Tank Mixtures** / **Mixtures**. Refer to Setting up mixtures, page 63.

3. Select a **Carrier** (such as water). Products defined on the setup screen under **Product** / **Liquid** are displayed here.

4. Enter the **Spray rate**, **Rate increment** and **Rate preset2** required for the current operation.

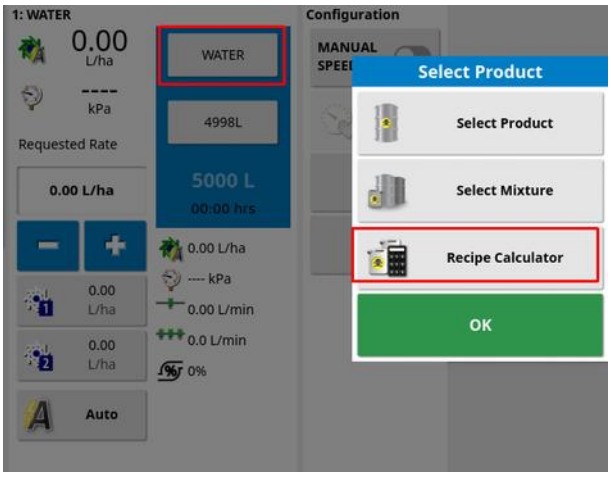
   Rate increment defines how much the application rate will change when the operator presses the application rate up/down button. **Rate preset 2** defines an alternative preset application rate.

   The quantities required to fill the tank are displayed. Selecting the tick assigns the mixture to the tank.

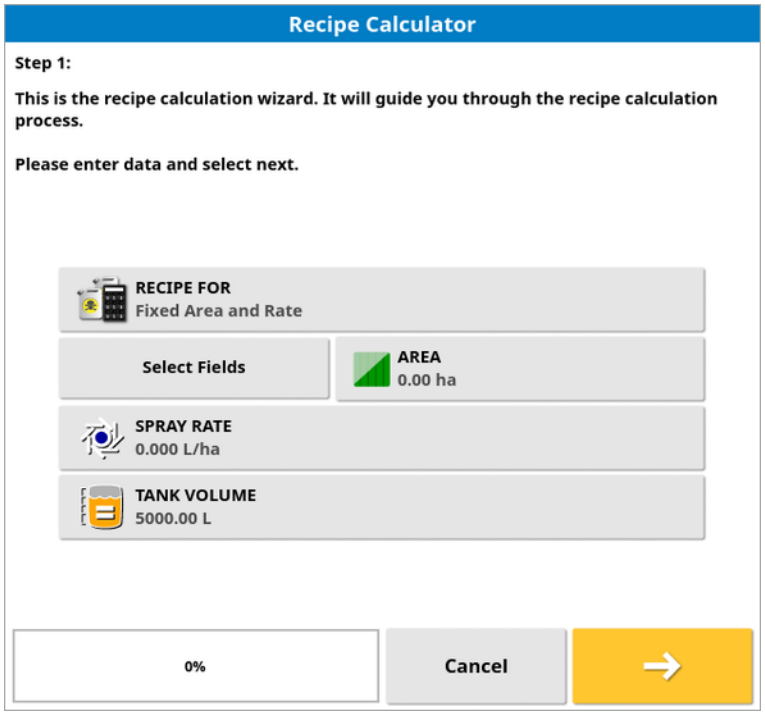
6.6.3. Calculating a recipe

The recipe calculator enables a range of parameters to be used to calculate exact chemical quantities and the number of tank fills required, or the area that may be sprayed with existing quantities.

1. Select the Product Configuration button, then select **Recipe Calculator**.



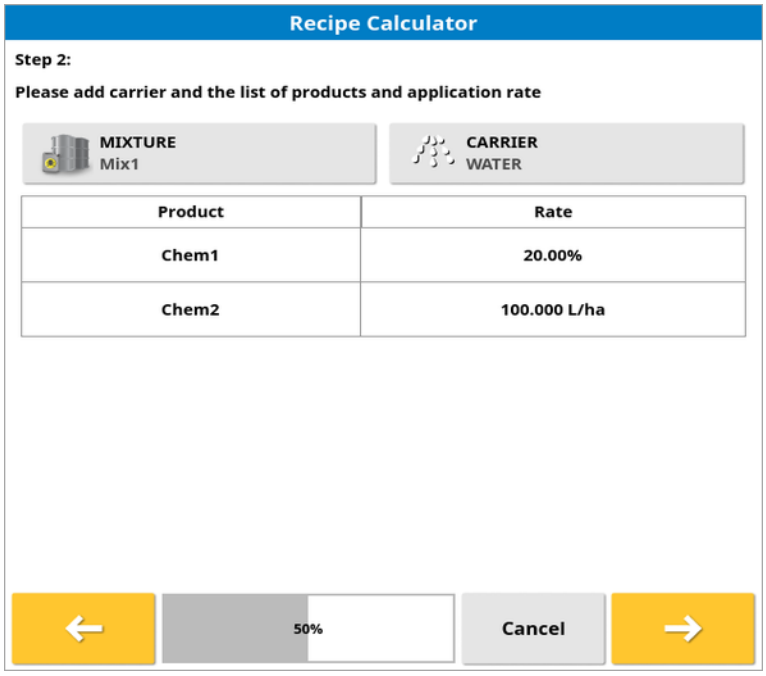
The recipe calculator displays.



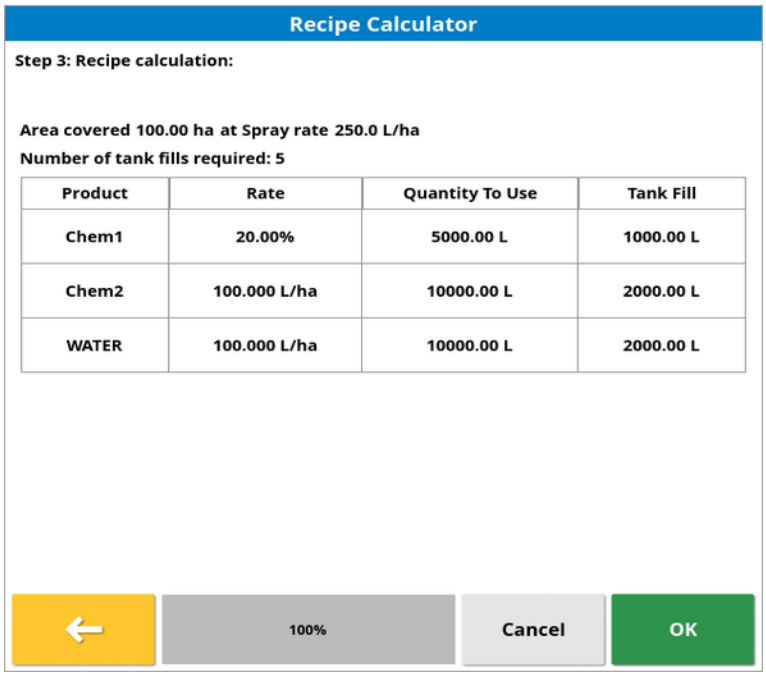
2. Once the following information is complete, select next.

- **Recipe for**:
  - **Fixed area and rate**: Calculates the mixture quantity required for a fixed area at a fixed spray rate.
  - **Fixed rate**: Calculates the area possible for a fixed spray rate with a limited quantity of a mixture.
  - **Fixed area**: Calculates the spray rate possible for a fixed area with a limited quantity of a mixture.
  - **Empty tank at fixed rate**: Calculates the area possible for a fixed spray rate with the mixture remaining in the tank. (**Select fields** and **Area** is greyed out.)
- **Select fields**: Multiple fields from the currently selected client / farm may be selected to automatically calculate the area. Select the Add Field button  , highlight the required field/s and confirm. The total area is displayed.
- **Area**: Enter the required area. Alternatively, the **Select fields** option can be used to calculate the area of selected fields.
- **Spray rate**: Enter the required spray rate.
- **Tank volume**: Enter the volume of the tank that is to be used.

3. Select the required mixture (see Setting up mixtures, page 63) and the required carrier (this list shows liquid products, see Selecting / adding a product, page 79), then select next.



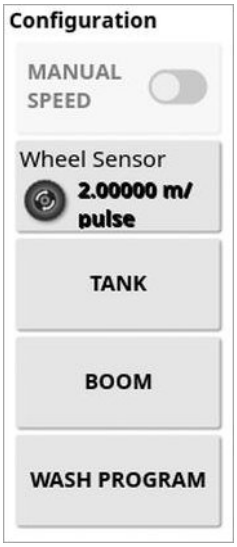
The calculation results are displayed.



Selecting yes will assign the recipe to the selected tank. If the recipe calculator is closed without assigning the recipe, the results will be redisplayed when the calculator is reopened.

6.7. Configuring and calibrating

1. Select Configuration on the toolbar to the right of the screen  .
   The Configuration screen displays.



6.7.1. Manual speed

Allows the user to select manual speed and override the selection made in the Setup screen **Implement** / **Apollo Sprayer** / **Sprayer** / **Speed Source**. This is only possible if the vehicle is stationary, or if GPS is selected and the signal drops out. The speed is used to calculate application rates.

Note that manual overrides a number of automatic features and is not recommended for operations. It should be used for stationary testing of nozzles only. It must be changed to the correct speed source before operating the sprayer under normal conditions.

- **Manual speed display**: Enables the manual speed to be entered. This indicator changes to **Wheel Sensor** if that is selected as the speed source in the Setup screen **Implement** / **Apollo Sprayer** / **Sprayer** / **Speed Source**, refer to Sprayer menu settings, page 38.

6.7.2. Wheel sensor calibration

If **Wheel Sensor** is selected in the Setup screen **Implement** / **Apollo Sprayer** / **Sprayer** / **Speed Source**, the wheel factor must be calibrated.

Wheel factor defines how many meters per pulse are received from the wheel speed sensor.

1. Select **Wheel Sensor** from the configuration screen.

   The Auto Speed Cal wizard displays.

2. Follow the wizard prompts to calibrate the wheel sensor.

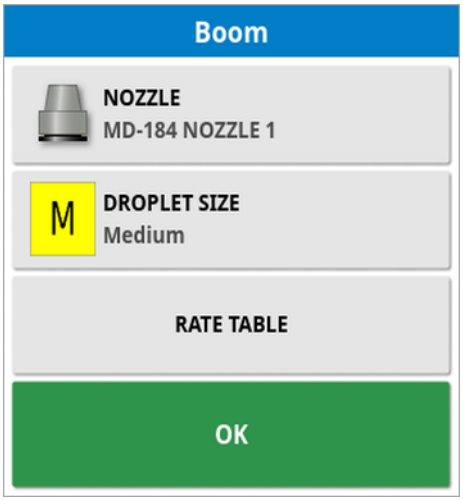
6.7.3. Tank

Displays the recipe calculator (refer to Calculating a recipe, page 83) and the flow meter:

- **Flow meter**: Displays the flow meter calibration wizard to be used if the calibration factor for the flow meter is not known and entered in the Setup screen **Implement** / **Apollo Sprayer** / **Sprayer** / **Liquid** / **Flow**. Refer to Flow meter calibration, page 90.

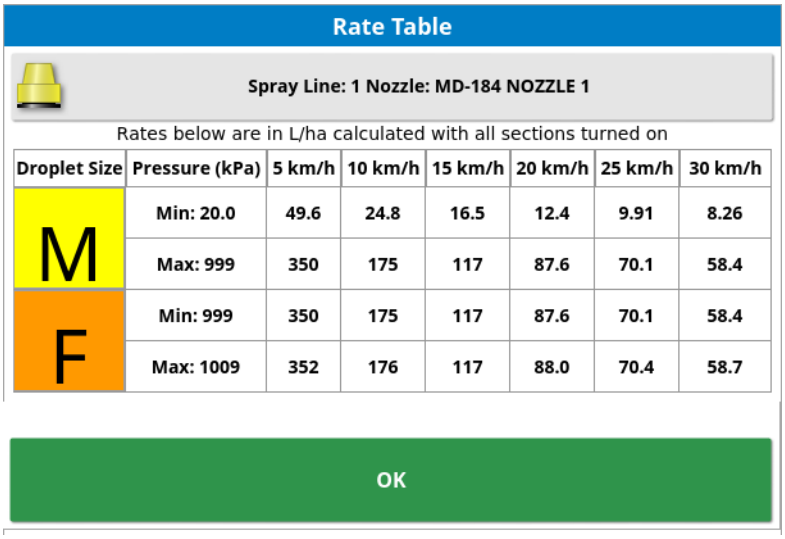
6.7.4. Boom

Note: This screen is not available for Standard implement configuration.



Note: If there is more than one boom, ensure these settings are defined for each boom.

- **Nozzle**: Displays nozzle selection. (Only displayed for single spray line implements. Selection may also be made on the setup screen via **Implement** / **Apollo Sprayer** / **Boom** / **Spray Line**.)
- **Droplet size**: Select from the droplet sizes defined for the selected nozzle. See Setting up nozzles, page 27.
- **Rate table**: Displays the possible spray rates at different speeds for each droplet size based on pressures configured in the nozzle setup screens (see Setting up nozzles, page 27).



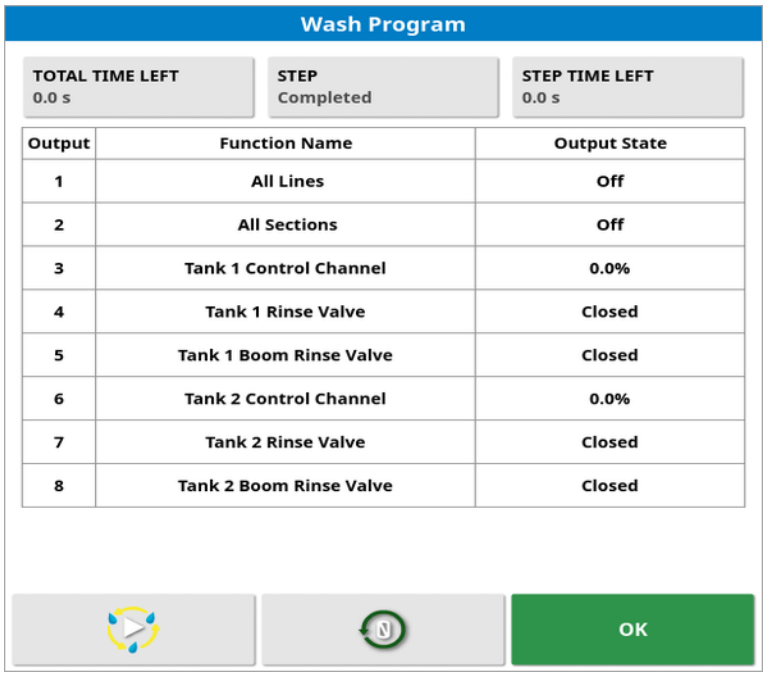
Droplet Size	Pressure (kPa)	5 km/h	10 km/h	15 km/h	20 km/h	25 km/h	30 km/h
M	Min: 20.0	49.6	24.8	16.5	12.4	9.91	8.26
	Max: 999	350	175	117	87.6	70.1	58.4
F	Min: 999	350	175	117	87.6	70.1	58.4
	Max: 1009	352	176	117	88.0	70.4	58.7

6.7.5. Wash program

A multiple step wash program can be created to automatically direct water along a specified route, for a preset time. Refer to Setting up wash program, page 60 for wash program setup instructions.

To run the wash program:

1. Select **Wash Program** from the configuration screen.



2. Select  to start the wash program. The total time left, current step number, time left for the current step and output states are displayed.

   Note: The OK button exits the wash program.

The pause button  pauses the timer but leaves the outputs in their current state.

The reset button  takes the program back to the beginning, putting outputs back into their original state.

6.7.6. Flow meter calibration

Flow meter calibration determines the number of pulses from the flow meter per liter of liquid.

To calibrate the flow meter:

1. Select **Tank** from the sprayer configuration screen.

2. Ensure the required tank is selected using the tank left and right buttons (if there is more than one tank).
3. Select **Flow Meter** from the tank screen.

   The Auto Flow Calibration wizard displays.
4. Divert the flow from a section output into the calibration bucket.
5. Activate the master switch. Select next.

   Note: If using balanced valves, do not turn sections on or off during calibration unless instructed, as it will result in an incorrect calibration factor. Switching sections will turn the wizard text red. Turn the master switch off and select the back arrow before resuming the calibration.
6. Run the liquid drive until sufficient liquid product has been obtained. (The larger the volume measured, the more accurate the flow meter calibration will be. The + and – buttons may be used to increase or decrease the flow and pressure.). Deactivate the master switch to turn off the liquid drive and select next.
7. Measure the volume of product in the calibration bucket.

8. Select **Volume Captured** on the calibration wizard, and enter the amount of liquid measured in calibration bucket, then select next.
9. Confirm the displayed calculated flow factor.

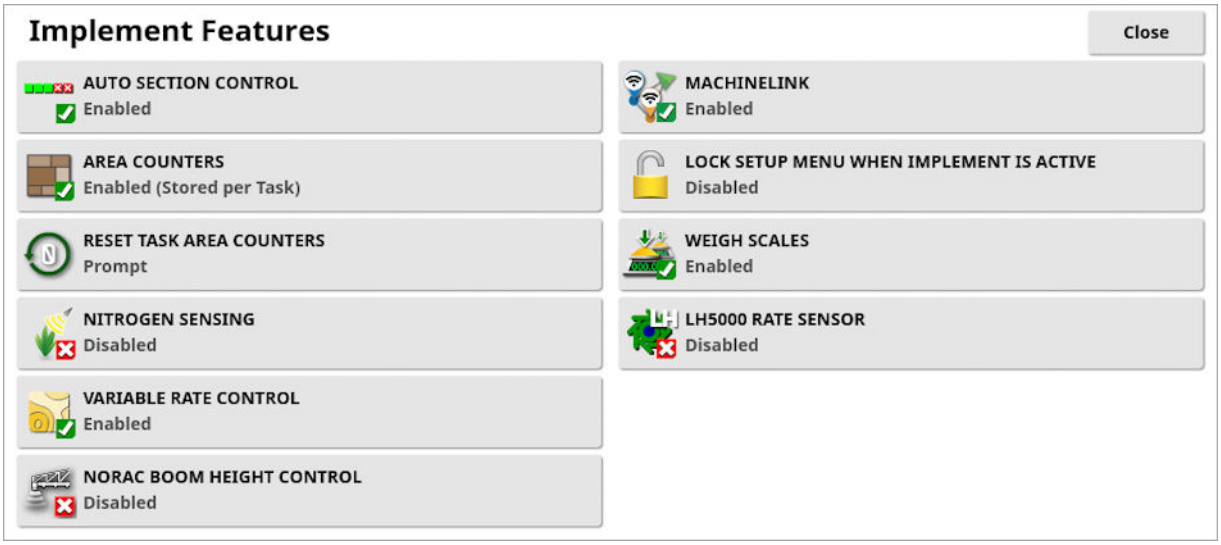
6.8. Setting area counters

Area counters are used with spreaders, sprayers and seeders to record data such as treated area, product used, operating time, average rate and productivity rate. Area counters are not available when using ISO implements.

Note: Values recorded for area counters are printed in the pdf task report.

To enable area counters:

1. On the Setup screen, select **System** / **Features** / **Implement** .



2. Select **AREA COUNTERS** and select one of the following:
   - **Enabled (Stored per task)**: Area counters are stored separately for each task, (if a task is started and coverage laid, then another task is selected and coverage laid, going back to the first task displays the area counters from the first task).
   - **Enabled (Stored per implement)**: Area counters continue across tasks, but loading a new implement displays new area counters. Reloading the first implement displays the area counters as they were when that implement was last used.

- **Enabled (Stored per task and implement)**: Separate area counters are available for tasks and implements.

Reset area counters

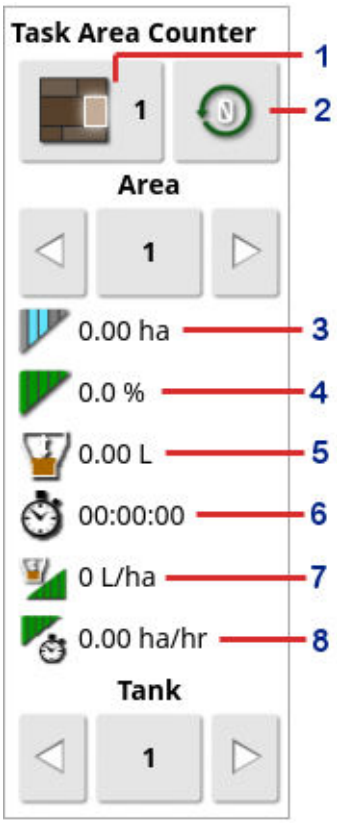
This option is only applicable if area counters per task is enabled.

- **Never**: The area counters must be reset manually, or they will continue to accumulate data.
- **Prompt**: When a task is erased you will be asked if area counters should be reset.
- **Auto**: Creating a new task or erasing a task will automatically reset the area counters.

To use area counters:

1. Select Area Counters on the toolbar to the right of the screen.

   Note: A separate icon for task and implement area counters is shown if both are enabled.



1 Set active area counter number

2 Reset area counter window

3 Treated area

4 ASC savings

5 Product used

6 Operating time

7 Average rate (area)

8 Productivity time

2. To select the area counter against which the data will be stored, select **Set Active Area Counter Number** and select the required counter.

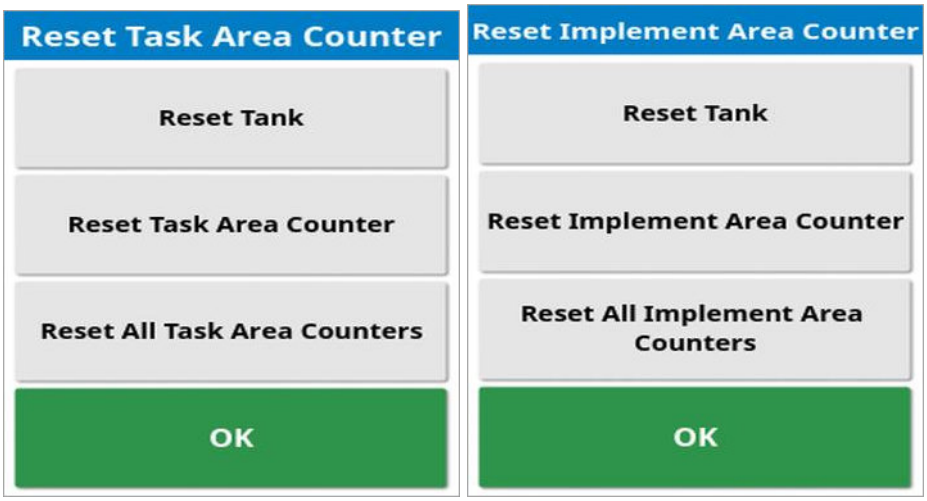
   The same area counter must be selected each time data on the same topic is to be stored.

Data stored against the area counter is displayed in the lower half of the window.

3. Use the arrows or select the middle **Area** button to view data stored against each area counter.
4. Use the arrows or select the middle **Tank** button to view data stored against each tank.

Reset area counter window

Select this option to reset data for a tank, the currently selected task or implement area counter, or all task or implement area counters.



6.9. Using the master switch

When **Virtual** has been selected in the Setup screen (**Implement** / **Apollo Sprayer** / **Operator Inputs** / **Master Switch**), the Sprayer Master Switch on the Operation screen turns the sprayer system on. Refer to Master switch setup, page 15.

Note: When using multiple implements, the master switch only controls the Apollo sprayer and does not turn on/off the ISOBUS implements that are also connected to the system. These must be turned on independently via the UT or an AUX-N input.

The switch also indicates the readiness of the system.

Green

Sprayer Controller is on and working. Select the Master Switch to turn the sprayer off.

White

Sprayer Controller is in standby. Select the Master Switch to turn the sprayer on.

Red

Sprayer Controller is off and cannot be used. Select the Master Switch to see possible causes of the problem.

Green indicates that the system is ready.

Red indicates that the system is not ready.

Select OK to return to the main screen and complete the necessary action.

The alarm bell button shows the number of active alarms.

Implement Calibrated indicates that a flow calibration factor has not been set (see Flow meter calibration, page 90).

If the Implement Configured LED is red, check that nozzles and spray lines have been configured properly.

6.10. External keypad operation

The keypad is an external device that may be used in the cabin and/or on the sprayer frame to control selected functions. Refer to Keypad setup, page 20 for setup information.

LED behavior

- If an assigned function is not available, the LED will be red.
- If a function is available but inactive, the LED will be amber.
- If a function is available and active, the LED will be green.
- If the assigned function is an increase / decrease type of button, the green LED will flash and the amber LED will remain on while the value is being changed.

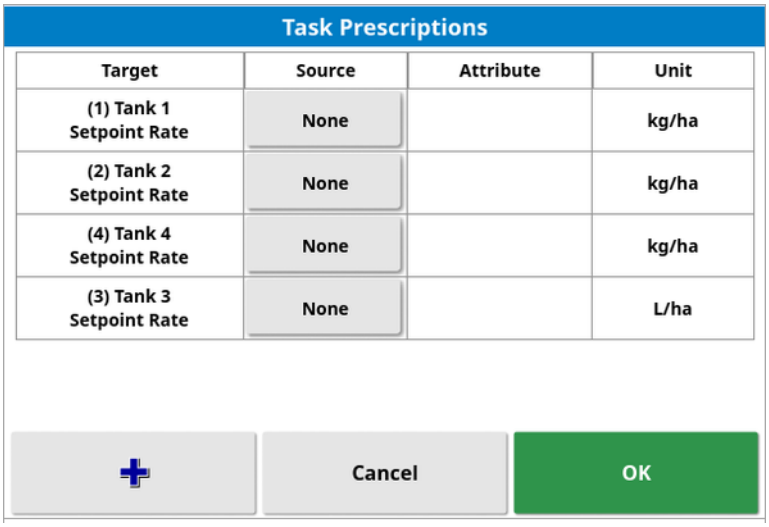
Chapter 7 – Variable Rate Control

Before use, Variable Rate Control (VRC) must be set up with a controller and must be enabled on the Setup screen (**System** / **Features** / **Implement**).

Select  to enable or disable the VRC Map display on the guidance screen.

Product application rates that can be controlled by the display are automatically added to the list of available targets. If the ECU has support for control targets that have not been automatically added to the list, e.g. pump or fan speed, these can also be added to the list of control targets. To do this, press the  button and the select the desired target from the list of available targets that is shown. The rate control of this target can then be configured in the same way as any of the other targets in the list.

1. Select or create a task.
2. Select **Task Menu**  / **Configure Task Prescriptions**  .



- **Target**: The tank or bin that is being controlled. Select  to add another target.
- **Source**: The rate source for the target:

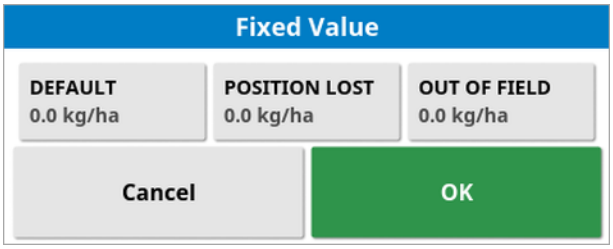
- **None**: No rate control for this target.
- **Fixed**: Fixed values for Default, Out of Field, and Position Lost.
- **Task prescription**: Use a grid based or polygon based prescription map associated with the selected task, created on external software.
- **Shapefile**: Import a shapefile (.shp) from USB or TAP, or select from shapefiles stored on the display.
- **Peer control**: Control the target based on a value from a different ECU, for example a nitrogen sensor (Cropspec).

- **Attribute**: The rate source (task prescription, shapefile or fixed source) may have multiple attributes to define the rates for more than one target. This enables the operator to map the prescription to the appropriate target.
- **Unit**: The units the shapefile is using.

7.1. Source options

7.1.1. Fixed source

If **Fixed** is selected as the **Source**, the following screen displays.



- **Default**: The default rate to be applied.
- **Position lost**: Rate to be applied if the GPS position is lost.
- **Out of field**: Rate to be applied if the implement moves beyond the field boundary.

7.1.2. Task prescription source

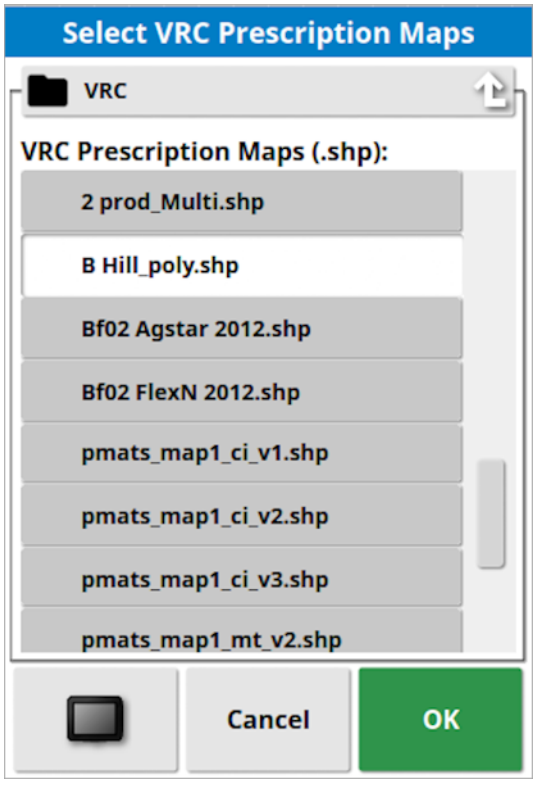
Tasks may be created on an external system with associated prescriptions configured in a grid or polygon format. These tasks can be imported via the inventory manager.

If the selected task has a prescription associated, this option may be used to apply it to a target.

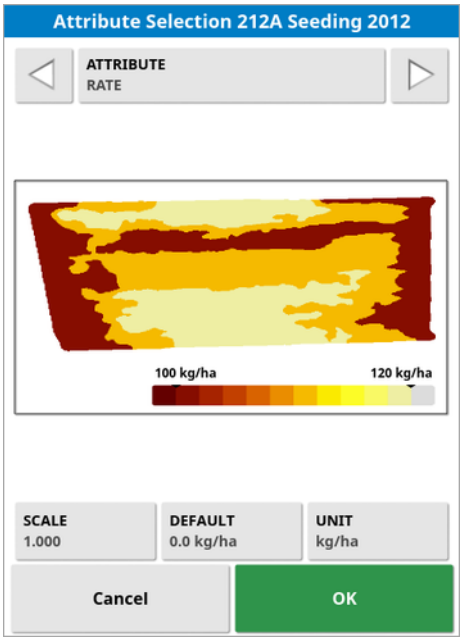
7.1.3. Shapefile source

If **Shapefile** is selected as the **Source**:

1. If required, insert a USB with prescription maps or ensure the display is connected to TAP.
2. Select USB , TAP or the console as the shapefile source.



Once the shapefile is selected and imported the following screen displays.



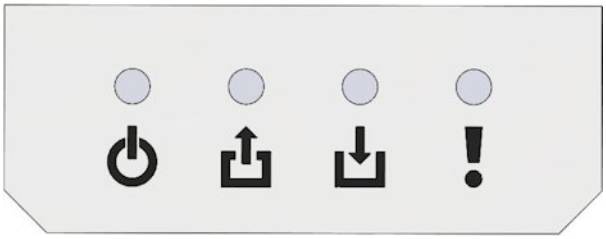
- **Attribute**: Select which attribute from the shapefile you want to use.
- **Scale**: This defaults to 1, which means that the prescription defined in the source will be used directly. However, depending on weather conditions, the operator may choose to increase or decrease the rate of application. This allows a uniform increase for all defined rates. For example, a scale of 1.1 will apply 110% of the rate defined in the source.
- **Default**: Defines the rate to use if the source doesn't specify a rate for that region of the field.
- **Unit**: Select the unit the shapefile is in from a drop-down list. If the display is using a different unit, a scaling factor is applied to change the shapefile values to that being used by the display. This enables a user whose display is in metric, for example, to use a shapefile that is in gallons/acre instead of litres/hectare.

Chapter 8 – Apollo ECU Information

There are two types of Apollo ECUs available:

- The CM-40 is the main control module.
- The EM-24 is the Input/Output expansion module.

8.1. Interpreting Apollo ECU LEDs



Power LED

Transmit LED

Receive LED

ECU Status LED

8.1.1. Power LEDs

The power LEDs display different behavior on the CM-40 and EM-24 ECUs.

The following types of 12V power are applied to the Apollo ECUs:

- **ECU power**: Powers the internal logic and sensor power supplies.
- **solenoid power**: Powers the relays and H-bridges.
- **VCB solenoid power**: (Vertical Connector Board) power supplied on the ECU connectors.

CM-40 Power LED

LED state	Power state
Green	ECU power on solenoid power on VCB solenoid power on

LED state	Power state
Amber	ECU power on Either solenoid or VCB solenoid power on
Flashing amber	ECU power on solenoid power off VCB solenoid power off
Red	ECU, solenoid, VCB solenoid or sensor power fault solenoid and VCB solenoid power off affected sensor supplies off an alarm is triggered
Off	ECU, solenoid, VCB solenoid and sensor power off

Sensor power is on when the ECU is on, unless the sensor power supplies experience a fault.

EM-24 Power LED 

LED state	Power state
Green	ECU power on solenoid power on VCB solenoid power on sensor power (5V, 8V and 12V) on
Amber	ECU power on solenoid power on VCB solenoid power on some or all sensor power off
Flashing amber	ECU power on solenoid power off VCB solenoid power off sensor power off

LED state	Power state
Red	ECU, solenoid, VCB solenoid or sensor power fault solenoid and VCB solenoid power off affected sensor supplies off an alarm is triggered

8.1.2. Transmit LED

LED state	Communication state
Flashing green	This indicates that the control processor is executing the application firmware.
Flashing red	If the LED is OFF, this indicates that the boot loader is running.

8.1.3. Receive LED

LED state	Communication state
Flashing green	Communicating with master. No CAN faults.
Amber	No communication with master. No CAN faults.
Flashing amber	Communicating with master. CAN is operating in error active mode.
Red	No communication with master. CAN bus fault (bus off).
Flashing red	Communicating with master. CAN is operating in error passive mode.

8.1.4. ECU status LED

LED state	ECU state
Green	Control output (PWM and relay) allowed. No Power, communication or ECU configuration faults.
Amber	Control output is inhibited. No faults are active. For example: 'drive enable'.

LED state	ECU state
Flashing amber	Control output is allowed for unaffected sub-systems. A warning level fault is active. An alarm will be shown. For example: 'relay over current'.
Red	Control output is inhibited. Fault/error state. An alarm will be raised.
Off	The boot loader is running.

8.2. Updating Apollo ECU firmware

For a single CM-40 ECU

1. On a Windows machine, unzip the firmware ZIP file onto a USB flash drive.
2. On the setup screen, select **System** / **Features** / **Console** and ensure that **FILE SERVER** is enabled.
3. Select **Implement** / **Apollo Sprayer** / **ECU** / **Upgrade**.
4. Open the README.html file that is supplied in the zipped files to check the supplied firmware versions.
5. Check the versions displayed in the **Firmware version** column against the supplied firmware. Any that do not match must be updated.

   The first part of the displayed firmware versions (**6.03.00** in the example above) refers to the Main CPU version. The second part (**2.10.1**) refers to the Auxiliary (Aux) CPU version.

6. Click in the **Firmware version** column on the ECUs to be updated and select from the following:
   - **Upgrade Main CPU**: Select if the first part of the displayed firmware version does not match the supplied firmware.
   - **Upgrade Aux CPU**: Select if the second part of the displayed firmware version does not match the supplied firmware.
   - **Upgrade both**: Select if both parts of the displayed firmware version do not match the supplied firmware.
7. Once all required selections have been made, select **UPGRADE ECU FIRMWARE** at the top of the screen.
8. Confirm the warning message and select the next arrow.

9. Insert the USB flash drive containing the firmware into the display and select next once the USB is recognised.
10. The USB contents are displayed. Navigate to the firmware files and select the next arrow.
11. Confirm the message to start the update. Note: If **Upgrade both** is selected, during the upgrade process the messages 'Configuring ECU' and 'Synchronising ECU' are displayed. DO NOT press the green confirmation tick until these have completed.
12. **Upgrade Complete** is displayed once the process has finished. Confirm to restart the display.
13. Once the display has restarted, if the Aux CPU or both CPUs have been upgraded, power down the system, ensuring the ECUs have turned off before powering them back up again.

    Note: : If the displayed firmware versions are not correct after the restart, power down and restart the tractor.

For multiple CM-40 ECUs

If the system has more than one CM-40 ECU installed, a dummy implement profile must be created to update the Main CPU firmware for the additional CM-40 ECU.

1. Create a new implement profile for a single CM-40 ECU using the additional CM-40 ECU as the CM-40 1 (see Setting up a new implement, page 3).
2. Follow the update steps detailed above for a single CM-40 ECU.

For EM-24 ECUs

1. On a Windows machine, unzip the firmware ZIP file onto a USB flash drive.
2. On the setup screen, select **System** / **Features** / **Console** and ensure that **FILE SERVER** is enabled.
3. Select **Implement** / **Apollo Sprayer** / **ECU** / **Upgrade**.
4. Open the README.html file that is supplied in the zipped files to check the supplied firmware versions.

5. Check the versions displayed in the **Firmware version** column against the supplied firmware. Any that do not match must be updated.
6. Click in the **Firmware version** column on the ECUs to be updated and select **Upgrade both**.
7. Select **UPGRADE ECU FIRMWARE** at the top of the screen.
8. Confirm the warning message and select the next arrow.
9. Insert the USB flash drive containing the firmware into the display and select next once the USB is recognised.
10. The USB contents are displayed. Navigate to the firmware files and select the next arrow.
11. Confirm the message to start the update.
12. **Upgrade Complete** is displayed once the process has finished. Confirm to restart the display.

    Note: If the displayed firmware versions are not correct after the restart, power down and restart the tractor.

Chapter 9 – Index

Chapter 10 – Regulatory and Safety Warnings

Terms and Conditions

Note: Please read these Terms and Conditions carefully.

General

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ELECTRONIC AND MECHANICAL COMPONENTS -TPA warrants that the electronic components manufactured by TPA shall be free of defects in materials and workmanship for a period of one year from the original date of shipment to the dealer. TPA warrants that all valves, hoses, cables and mechanical parts manufactured by TPA shall be free of defects in materials and workmanship for a period of 90 days from the date of purchase.

RETURN AND REPAIR - During the respective warranty periods, any of the above items found defective may be shipped to TPA for repair. TPA will promptly repair or replace the defective item at no charge, and ship it back to you. You must pay the shipping and handling charges in respect of the same. Calibration of components, labor and travel expenses incurred for in-field removal and replacement of components are not covered in this warranty policy. The foregoing warranty shall NOT apply to damage or defects resulting from:

(i) disaster, accident or abuse

(ii) normal wear and tear

(iii) improper use and/or maintenance

(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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Other

These Terms and Conditions may be amended, modified, superseded or cancelled, at any time by TPA. These Terms and Conditions will be governed by, and construed in accordance with:

- 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.

All information, illustrations, and applications contained herein are based on the latest available information at the time of publication. TPA reserves the right to make product changes at any time without notice.

If any part of these Terms and Conditions would be unenforceable, the provision must be read down to the extent necessary to avoid that result, and if the provision cannot be read down to that extent, it must be severed without affecting the validity and enforceability of the remainder of these Terms and Conditions.

Service Information

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

Communications Regulation Information

FCC Compliance Statement (USA)

FCC Title 47 §15.19(a)(3)

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

FCC Title 47 §15.21

Changes or modifications made to this equipment not expressly approved by Topcon may void the FCC authorization to operate this equipment.

FCC Title 47 §15.105(a)

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. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. 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 his own expense.

ISED Compliance Statement (Canada)

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

CAN ICES-003(A)/NMB-003(A)

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.

XD2 complies with the essential requirements of EMC directive 2014/30/EU.

EMC Statement (Australia & New Zealand)

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

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.

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 display 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 display 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 display 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 display)
- 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 display cannot detect obstacles (people, livestock or other).
- Only use the display 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 display 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.

Transporting the Vehicle

WARNING: When transporting the vehicle on a public roadway, the auto-guidance system must be switched OFF. Ensure the steering switch is Off to prevent unintentional engagement of the assisted steering.

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 display 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.

10.1. Topcon Positioning Systems, Inc. End User License Agreement

IMPORTANT: PLEASE READ CAREFULLY. The software product provided to you by Topcon Positioning Systems, Inc. (**"Topcon"**) or its licensee along with its associated manuals and documentation (collectively, the **“Software”**) is owned by Topcon and your use is subject to the terms and conditions of this End-User License Agreement (**“Agreement”**). The Software is intended for use on and/or as embedded in a Topcon display/console upon/in which the Software is intended (pursuant to its applicable documentation) to be installed and used (each a **“Device”**). If you are entering into this Agreement on behalf of a company or other legal entity, you represent that you have the authority to bind such entity to these terms and conditions, in which case the terms **"you"** or **"your"** shall refer to such entity. If you do not have such authority, or if you do not agree with these terms and conditions, you may not use the Software. Topcon also reserves the right to immediately terminate this Agreement for failure to comply with the terms provided herein. In the event of any conflict between a non-English language version of this Agreement and the English version, the English version shall prevail.

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WARNING: The Device and software (the “System”) may be used to assist with (a) steering (“Steering Control”) and/or (b) planting, spraying, spreading or fertilizing (“Applications”).

IMPORTANT: By accepting this Agreement and operating the System, you attest that you are properly trained in its use and that you have read and will follow the procedures and instructions within the applicable System Operator’s Manuals. Improper operation may result in: (a) inaccurate Steering Control and/or Application performance; and (b) damage to property and equipment, serious injury to persons, poor yields and/or crop damage or failure. You are fully responsible for the control and use of the System and results thereof.

STEERING CONTROL:

- DO NOT use on public or private roads. While on a road Steering Control MUST be disabled.
- Steering Control will assist in steering to a pre-determined guideline; however, you must be alert and manually take control from time to time.
- While Steering Control is active you MUST:
  - manually turn the vehicle if the guideline will intersect with boundaries/obstacles.
  - take control if the vehicle or implement may contact boundaries or obstacles.
  - manually turn the vehicle on sharp corners.

- ensure the vehicle speed is suitable to safely follow the guideline.
- NEVER leave the vehicle steering station.

APPLICATIONS: You are responsible for: (a) accurately entering the information required for the System to apply Applications to your requirements and (b) calibrating the System and ensuring Applications are applied in accordance with specifications.

1. Professional Use. Topcon products, including the Software (**"Topcon Products"**), are designed to be used by professionals. Prior to use and operation, you should have received professional training in the operation and use of the Topcon Products and have good knowledge of agricultural practices and precision agriculture equipment. You must review and follow all user and safety instructions, including those set forth in the applicable System Operator's Manuals, before operating, inspecting or adjusting any Topcon Products and/or related equipment.

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