Apollo ISOBUS UT Seeder
Operator's Manual

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Apollo ISOBUS UT Seeder

Operator Manual

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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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Chapter 1 – Introduction

The Apollo ISOBUS Universal Terminal (UT) Seeder can be configured to either control or monitor the operations of an air seeder system.

When controlling, it adjusts the discharge rate according to vehicle speed and the area being covered to maintain the preset application rate. This provides more accurate use of a product over the specified areas.

Auto Section Control minimizes wastage, turning sections of the seeder on and off and varying rates as the equipment passes through the defined areas. The system turns sections on when it detects areas that have not been covered and it turns sections off when it detects areas that have already been covered.

When monitoring, it enables the operator to ensure the system is operating correctly.

Note: ISOBUS refers to the ISO 11783 communication protocol used in the agriculture industry. A vehicle must be fitted with an ISO 11783 compatible display for the Apollo ISOBUS UT Seeder to operate.

The Apollo ISOBUS UT Seeder comes with these features:

- **Seeder Monitoring**: Operator feedback is supplied on seeder functions such as application rate, fan RPM, fan pressure, tank levels and product remaining. Alarms can be enabled to alert the operator in case of conditions such as low tank level, low case drain pressure, and blocked heads.
- **Metering Control**: Provides two preset rate options per product, as well as incremental rate adjustment, allowing the operator to increase or decrease application rates during seeding.
- **Multiple Product Settings**: Store data for up to 16 products on the system, including calibration factors. This eliminates the need to enter product and calibration data each time the products are changed.

- **Manual and Automatic Calibration**: The calibration feature provides an easy four-step process to calibrate. Common keypad controls enable quick and accurate product calibration from the tractor cab.
- **Operation Diagnostics**: The Apollo ISOBUS UT Seeder is capable of displaying runtime information on various operations; including ground speed, fan status, shaft status, tank levels and blocked heads.

1.1. Display / ECU interface

When viewing information from an ECU on a display via the Universal Terminal, the display has no knowledge of what is on the UT. The ECU has no knowledge of what the display is doing or the capabilities of the display.

A Task Controller (TC) is required for the display to be able to command the ECU to perform functions (for example; auto section control or variable rate control), or for the ECU to tell the display what it is doing (for example; the on/off state of each section or the current application rate). However, not all displays that have a UT also have a TC. Additionally, some TCs may not be compatible with the Apollo Seeder ECU. To enable the TC, refer to Configuring advanced settings, page 78.

Another ISOBUS component is the File Server (FS). This enables data such as configuration profiles or firmware upgrade files to be transferred between the display and the ECU. Many UT compatible displays do not have FS support.

ECUs can only connect to a single UT, a single TC and a single FS. If there are multiple UTs etc on the ISOBUS, the ECU may initially not connect to the desired component. This can be fixed by using the 'Switch display' or 'Switch TC' functions (refer to Configuring advanced settings, page 78).

Chapter 2 – Seeder Settings

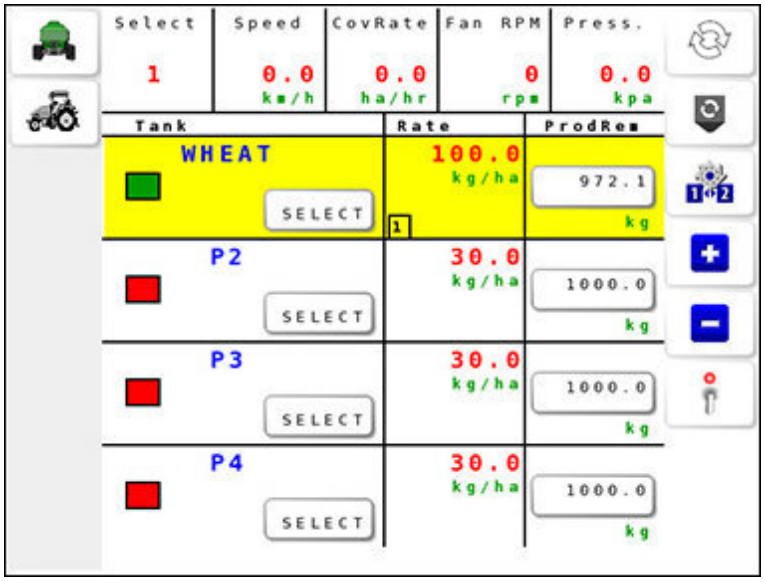
The seeder requires settings for tanks, seeder width, speed, product calibration factors and alarms to operate.

2.1. Setting up the seeder

Follow these steps to launch the seeder and open the settings screen:

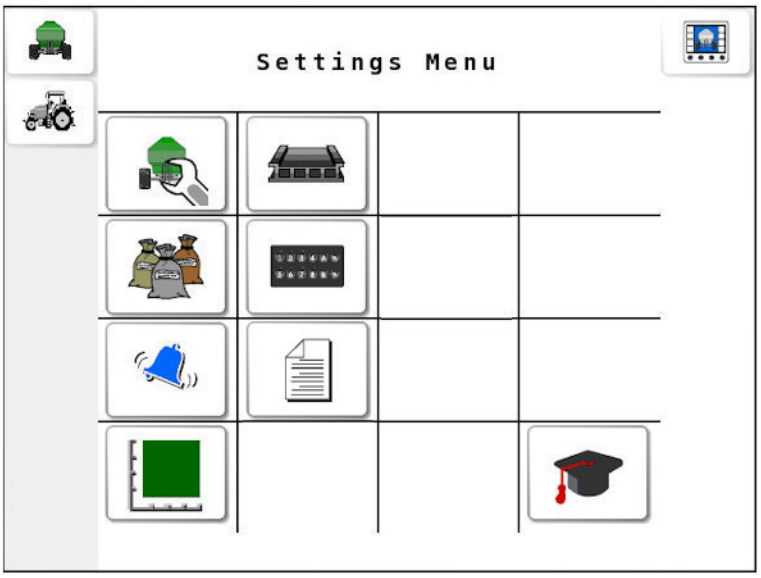
1. Select  from the main **Universal Terminal** screen to open the seeder.

   The operation screen 1 displays.

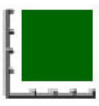


2. Select  to cycle between operation screen 1, operation screen 2 and the section control operation screen (if section control is licensed and a section control boom has been assigned to a tank). See Selecting the seeder operation screen, page 83.

3. Select  from operation screen 2 to open the **Settings Menu**.

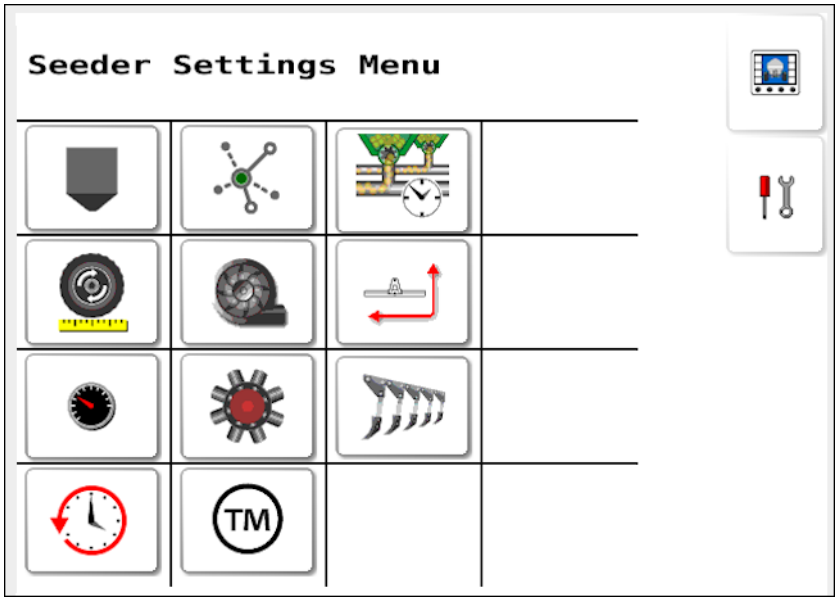


Settings menu

Icon	Description	Page
	Seeder settings menu	5
	ECU setup	43
	Product settings menu	45
	Keypad setup	61
	Alarm settings menu	67
	Managing implement profiles	40
	Area test	60

Icon	Description	Page
	Advanced settings	78

4. Select  to open the **Seeder Settings Menu**.



Seeder settings menu

Icon	Description	Page
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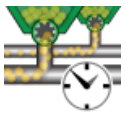
	External options	18
	Tank preload settings	20
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Icon	Description	Page
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	Geometry settings	26
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	Blocked head settings	30
	Boom menu	32
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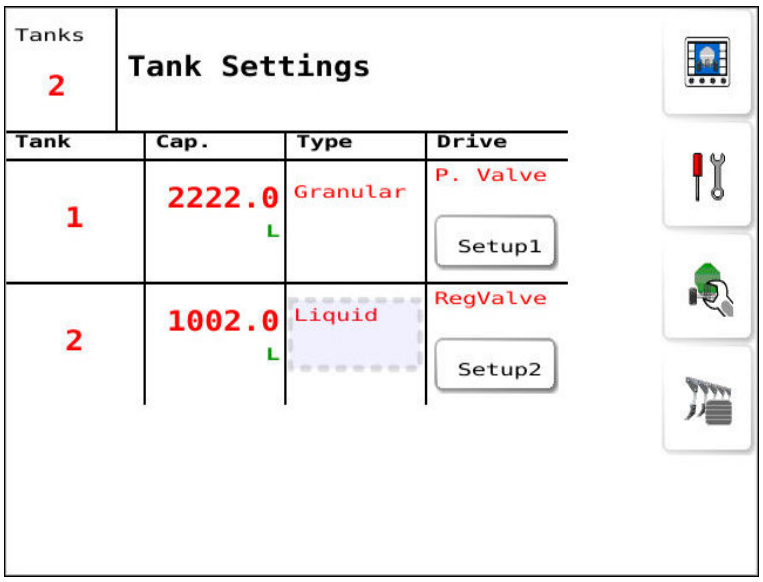
2.2. Setting up tanks

1. Select **Seeder Settings Menu** / **Tank Settings** .



- **Tanks**: Set the number of tanks that will be controlled or monitored.
- **Cap.**: Tank capacity.

  Note: Use the table on page 93 to record the tank capacities for future use.
- **Type**: Type of tank (granular, liquid, NH3).
- **Drive**: Type of drive:
  - **Granular**: Electric, actuator, proportional valve, monitor.
  - **Liquid/NH3**: Regulator valve, proportional valve, monitor.

Note: Each tank type and drive combination requires extra settings that may be accessed via the **Setup#** button in the **Drive** column. The following tables list the required settings for each combination.

Boom assignment: See Boom assignment, page 16.

2.2.1. Granular tank settings

Drive	Drive Settings	Control Settings
Electric	Motor selection Pulses/rev Min motor RPM Max motor RPM Gear ratio Soft start Shaft sensor Shaft pulses/rev	
Actuator	Encoder teeth Clutch Style	
Proportional valve	Gear ratio Encoder pulses/rev Min shaft RPM Max shaft RPM Tank clutch Shaft sensor Shaft pulses/rev	Add dither Soft start Soft stop Dump valve Min PWM Max PWM Controller response
Monitor	Gear ratio Encoder pulses/rev Tank clutch Shaft sensor Shaft pulses/rev	

Electric drive

An electric motor electrically drives the metering or discharge unit. Rate is controlled by controlling the RPM of the unit via varying the PWM or

current supplied to the motor.

Drive settings

- **Motor selection**: Sets the number of pulses per motor revolution for the motor.
- **Pulses/rev**: Set the number of pulses / revolutions for each revolution of the metering shaft.
- **Min motor RPM/ max motor RPM**: Sets minimum / maximum motor shaft RPM.
- **Gear ratio**: Gear ratio between the drive motor and the metering unit.
- **Soft start**: Allows a gradual increase in the control signal when the motor is activated. This is used to prevent mechanical damage from sudden starts.
- **Shaft sensor**: Enable the sensor that is used to detect when the metering shaft has stopped so that an alarm can be raised.
- **Shaft pulses/rev**: Sets how many pulses the metering shaft sensor provides per revolution.

Actuator drive

A linear actuator controls the lever to adjust the gearbox speed from a ground drive shaft. The output shaft from the gearbox drives the metering unit. Rate is controlled by controlling the ratio of the gearbox via the position of the actuator.

Drive settings

- **Encoder teeth**: The number of pulses per revolution of the drive shaft. The number of teeth can be counted or procured from the drive manufacturer.
- **Clutch**: Enable to allow control of the tank clutch.
- **Style**: Select from **Zeromax**, **Bourgault**, **generic**.

Proportional valve drive

A proportional valve (P valve) controls the hydraulic oil flow to the motor to vary the speed of the motor so that the metering unit is only delivering

what is required. It uses a solenoid to open a hydraulic valve to drive a hydraulic motor. The opening of the valve varies with the current applied to the solenoid.

Drive settings

- **Gear ratio**: The ratio between the drive motor and the metering unit.

  Note: Use the table provided on page 93 to record the gear ratio for the P Valve drive.
- **Encoder pulses/rev**: Sets the number of pulses/revolutions for each revolution of the metering shaft.
- **Min shaft RPM/ max shaft RPM**: Sets minimum and maximum shaft RPM.
- **Tank clutch**: Enable to allow control of the tank clutch.
- **Shaft sensor**: When enabled sets alarm for incorrect gear ratio or shaft jam.
- **Shaft pulses/rev**: Sets how many pulses the stop shaft sensor provides per revolution.

  Note: Use the table provided on page 93 to record the shaft pulses/rev value.

Control settings

- **Add dither**: Enabling dither adds a small amount of current to the solenoid of the P Valve, resulting in slight vibrations. This prevents magnetism or sticking of the valve.
- **Soft start**: 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**: Allows a gradual decrease in the valve signal when the valve is deactivated. This is used to prevent mechanical damage from sudden stops.
- **Dump valve**: Use this option if the proportional valve has its own dump valve on each channel.

- **Min PWM/max PWM**: Select a percentage. Min PWM sets the minimum amount of PWM or power required to allow the metering unit to rotate or discharge product. Max PWM sets the maximum amount of power that can be provided to the valve running the metering unit before maximum possible speed is achieved. Higher percentage sets the pulse of power for longer during a pulse cycle.
- **Controller response**: This sets how quickly the controller tries to achieve the required rate. If set too high, the seeder 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.

Monitor drive

Monitor drive is used to monitor operations for the seeder without application rate control. The application rate must be set by physically changing the drive settings on the metering unit for each tank.

Drive settings

- **Gear ratio**: The ratio between the drive motor and the metering unit. Input a number.
- **Encoder pulses/rev**: The number of pulses/revolutions for each revolution of the metering shaft. Input a number.
- **Tank clutch**: Enable to allow control of the tank clutch.
- **Shaft sensor**: When enabled, it triggers an alarm for incorrect gear ratio or shaft jam.
- **Shaft pulses/rev**: Sets how many pulses the stop shaft sensor provides per revolution.

2.2.2. Liquid/NH3 tank settings

Drive	Control Settings	Pressure Settings	Pump Sense
Regulator valve	Sensitivity Close valve when off Reverse valve Dump valve Controller mode Min on time Max on time Gain setting PWM setting Auto close valve time	Pressure sensor Max pressure Min voltage Max voltage	Speed monitoring Pulses / revolution
Proportional valve	Add dither Soft start Soft stop Dump valve Min PWM Max PWM Controller response	Pressure sensor Max pressure Min voltage Max voltage	Speed monitoring Pulses / revolution
Monitor	Dump valve Pressure sensor Min voltage Max voltage Max pressure		

Regulator valve drive

A regulator valve (Reg valve) uses a motor to open or close the valve depending on the flow requirements. Positive or negative power is applied to run the motor. The tank output to the regulator valve stays constant. The regulator valve either restricts or diverts excess product.

Control settings

- **Sensitivity**: Sets how frequently sampling is done. Standard sensitivity is recommended. Reduced sensitivity is recommended only if flow is highly irregular (for example, on worn equipment).
- **Close valve when off**: Ensures that the valve is closed when the tank is not in use. This closes the valve when the Master Switch is off.
- **Reverse valve**: Allows for the polarity of the regulating motor to be reversed if it was wired incorrectly.
- **Dump valve**: Allows for the polarity of the dump valve to be set as standard or reversed.
- **Controller mode**: Select from **Standard**, **Micro-Trak**, **DICKEY-john** or **Raven**. Most liquid systems use the standard option. When a controller mode is selected, the minimum on time, maximum on time, gain setting and PWM settings are automatically set. These settings can be adjusted if required.
- **Min on time**: The minimum time that power needs to be applied to move the valve.
- **Max on time**: Sets the maximum time that the controller will send a pulse to the control valve before checking the rate. It is used to make a large correction for the rate.
- **Gain setting**: This sets how quickly the controller tries to achieve the required rate. If set too high, the seeder 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.

- **PWM setting**: Sets the pulse width modulation. Lowering this number reduces the voltage supplied to the valve, slowing it down.
- **Auto close valve time** (NH3 only): 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.

Pressure settings

- **Pressure sensor**: Use this option if a liquid pressure sensor is fitted to this tank.
- **Max pressure**: Sets the maximum pressure for the voltage pressure sensor.
- **Min voltage**: Sets the minimum output voltage at zero pressure. This value is read from the pressure transducer.
- **Max voltage**: Sets the maximum output voltage at maximum pressure. This value is read from the pressure transducer.

Pump sense

- **Speed monitoring**: Enables pump speed monitoring.
- **Pulses/revolution**: Sets the number of pulses per revolution for the pump speed monitor.

Proportional valve drive

A proportional valve (P valve) controls the hydraulic oil flow to the motor to vary the speed of the motor so that the metering unit is only delivering what is required. It uses a solenoid to open a hydraulic valve to drive a hydraulic motor. The opening of the valve varies with the current applied to the solenoid.

Control settings

- **Add dither**: Enabling dither adds a small amount of current to the solenoid of the P Valve, resulting in slight vibrations. This prevents magnetism or sticking of the valve.

- **Soft start**: 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**: Allows a gradual decrease in the valve signal when the valve is deactivated. This is used to prevent mechanical damage from sudden stops.
- **Dump valve**: Use this option if the proportional valve has its own dump valve on each channel.
- **Min PWM/max PWM**: Select a percentage. Min PWM sets the minimum amount of PWM or power required to allow the metering unit to rotate or discharge product. Max PWM sets the maximum amount of power that can be provided to the valve running the metering unit before maximum possible speed is achieved. Higher percentage sets the pulse of power for longer during a pulse cycle.
- **Controller response**: This sets how quickly the controller tries to achieve the required rate. If set too high, the seeder 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.

Pressure settings

- **Pressure sensor**: Use this option if a liquid pressure sensor is fitted to this tank.
- **Max pressure**: Sets the maximum pressure for the voltage pressure sensor.
- **Min voltage**: Sets the minimum output voltage at zero pressure. This value is read from the pressure transducer.
- **Max voltage**: Sets the maximum output voltage at maximum pressure. This value is read from the pressure transducer.

Pump sense

- **Speed monitoring**: If the system is fitted with a pump speed sensor for this tank, enable it here. Refer to ECU Setup, page 43 to then assign the sensor to a pin on the ECU.
- **Pulses/revolution**: Set how many pulses there are per revolution of the pump shaft.

Monitor drive

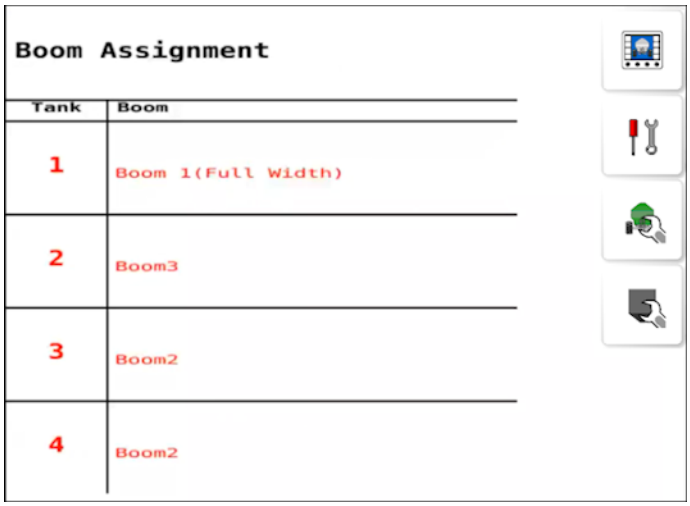
Monitor drive is used to monitor operations for the seeder without application rate control. The application rate must be set by physically changing the drive settings on the metering unit for each tank.

Drive settings

- **Dump valve**: Use this option if the proportional valve has its own dump valve on each channel.
- **Pressure sensor**: Use this option if a tank pressure sensor is fitted to the seeder.
- **Min voltage**: Sets the minimum output voltage at zero pressure. This value is read from the pressure transducer.
- **Max voltage**: Sets the maximum output voltage at maximum pressure. This value is read from the pressure transducer.
- **Max pressure**: Sets the maximum pressure for the voltage pressure sensor.

2.2.3. Boom assignment

Note: This option is only available if a boom has been enabled.

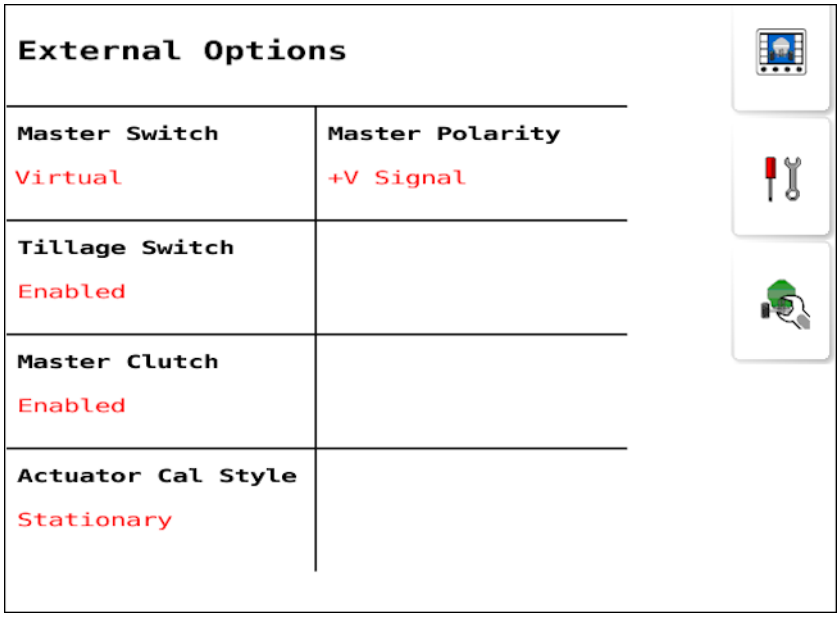


Assign tanks to the appropriate boom.

2.3. Setting up external options

External Options enables additional settings on the seeder.

1. Select **Seeder Settings Menu** / **External Options** .
2. Select **Master Switch** and select one of the following options:
   - **Virtual**: Master switch to be controlled from the UT.
   - **Tillage**: Select if a tillage/whisker switch is fitted.
   - **Apollo**: Select if an external switch is connected to the Apollo ECU.
   - **Keypad**: Master switch may be controlled via the vehicle's cabin keypad.
   - **Keypad/Virtual**: Master switch may be controlled via the vehicle's cabin keypad and the UT screen.



   The **Virtual** and **Keypad/Virtual** options enable the virtual master switch on the operation screen.

3. Set the following options:
   - **Tillage Switch**: Used to indicate if the drill is on the ground or in the air. When enabled, if the tillage switch indicates the seeder drill is in the air, it will automatically turn off liquid/NH3 sections and the **Master on tillage off** alarm displays.

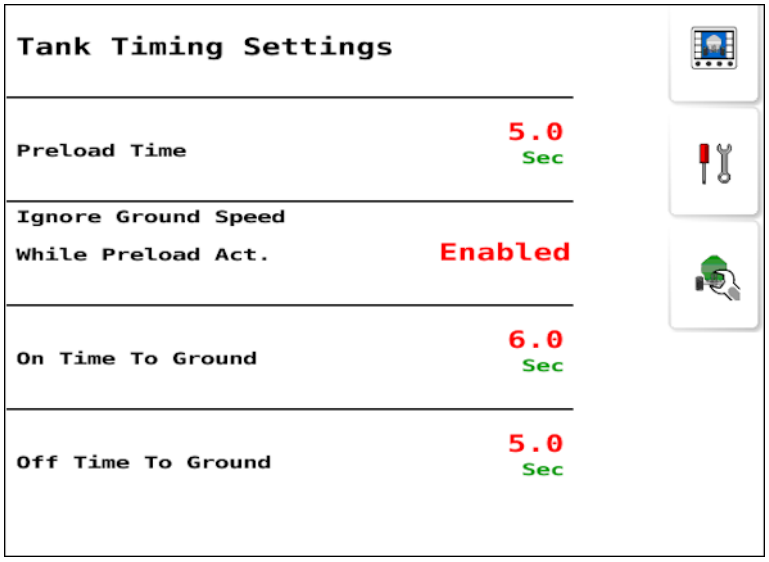
- **Master Clutch**: Enable the master clutch for tanks with an actuator drive.
- **Actuator Cal Style**: Select **Stationary** or **Rolling** option used to calibrate granular tanks with an actuator drive. For stationary option, the product must be dispensed for calibration using a hand crank. For rolling option, the product is dispensed for calibration automatically while the vehicle is moving. Refer to Automatic calculation of calibration factor, page 51.
- **Master Polarity**: Indicates whether the master switch input is activated by positive or zero volts. Refer to manufacturer's documentation.

2.4. Setting up tank timing

When starting a seeding pass when stationary, preload time allows for granular product to be at the openers before moving to avoid gaps in product application. It is the time in seconds that the seeder needs to run before moving off and starting to seed after the master switch is engaged. (Not applicable to tanks with linear actuator drive types.)

This is triggered when the master switch is turned on while stationary. During preload time, the meters run at the rate based on the manual speed that has been set. Once preload time has expired, the system reverts to the selected speed source.

1. Select **Seeder Settings Menu** / **Tank Preload Settings** .



2. Select **Preload Time**, enter a value in seconds and confirm .

- **Ignore ground speed while preload active**: If this setting is enabled and the master switch is turned on, the meters run at the manual speed for the full preload time, regardless of ground speed or whether the vehicle was stationary when the master switch was turned on.

Note: The following two settings are only visible if **Enable TC** and **TC SC** are enabled on the Advanced settings screen, see page 78, and if section control is disabled.

- On time to ground: Time for product to get to the ground once the tank is switched on. A reasonable initial setting for most configurations is 6 seconds.
- Off time to ground: Set time in seconds for remaining product to run out of lines to the ground once a tank is switched off.

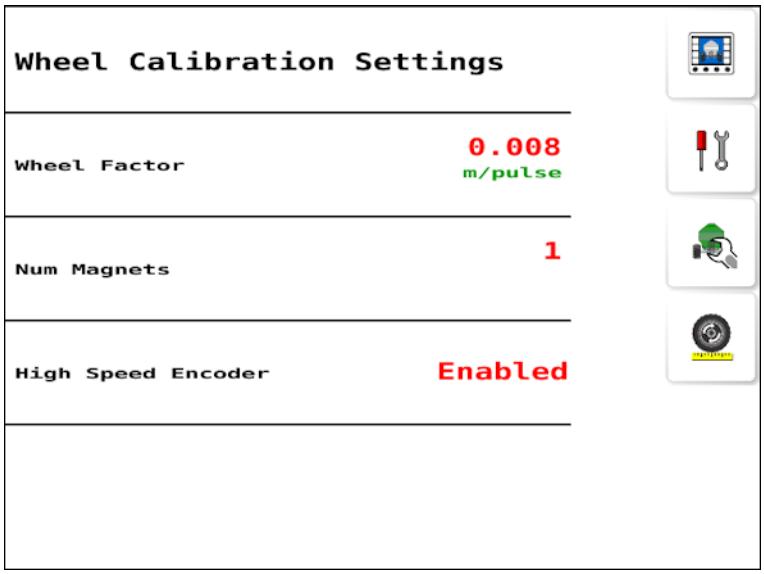
  To fine tune these settings, it is best to seed a strip one way and then another strip at 90 degrees to that with auto section control active on the console. Then get out and dig in the dirt to find where the seed starts and stops and adjust times to compensate for overlap and under-lap.

2.5. Setting up wheel factor

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.

2.5.1. Manual entry of wheel factor

1. Select **Seeder Settings Menu** / **Wheel Calibration Settings** .



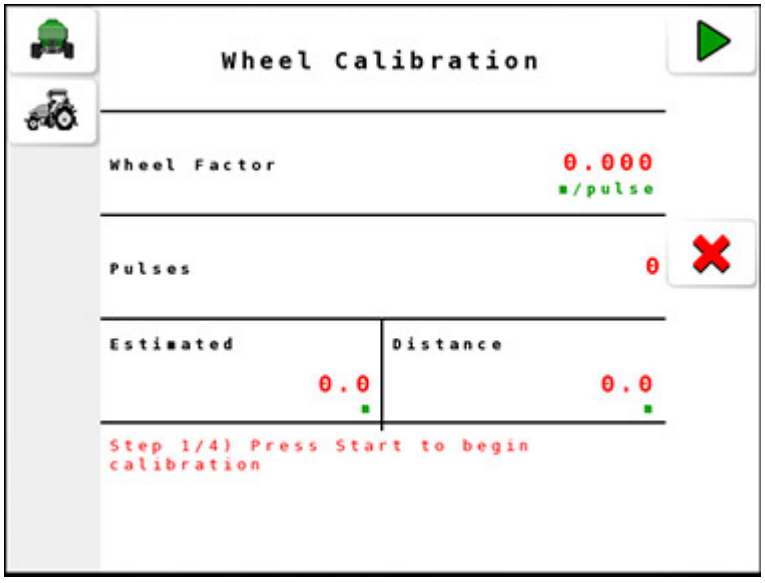
- **Wheel factor**: Enter a value in meters/pulse and confirm

  Note: Record this value for future use. Use the table on page 93 to record the wheel factor.
- **Num magnets**: The number of magnets fitted to the implement wheel.
- **High speed encoder**: Use for encoders that generate a high number of pulses per revolution.

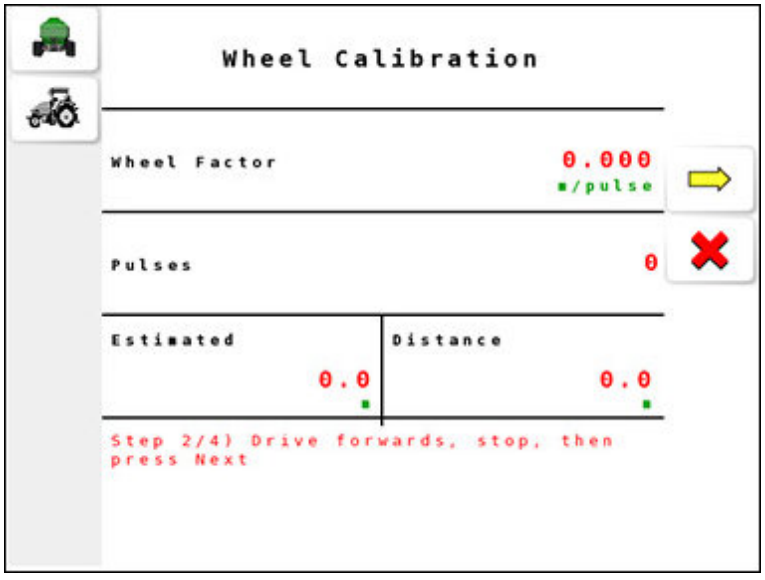
2.5.2. Automatic calibration of wheel factor

1. Select **Seeder Settings Menu** / **Wheel Calibration Settings** .
2. Select from the top right corner.

3. Select ▶ to start the calibration.

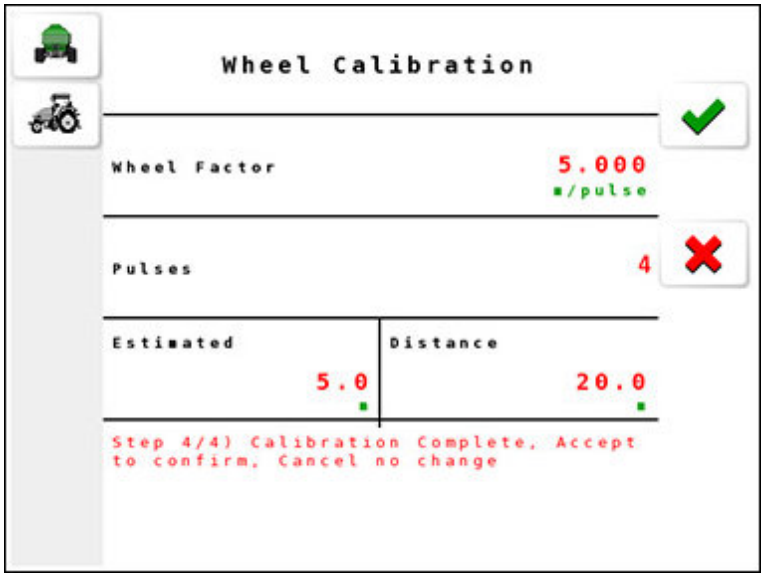


4. Drive the tractor for some distance, stop and select ➡.



5. Enter the **Distance** travelled and select ➡.

   According to the number of pulses emitted over the distance, the estimated wheel factor appears on screen.



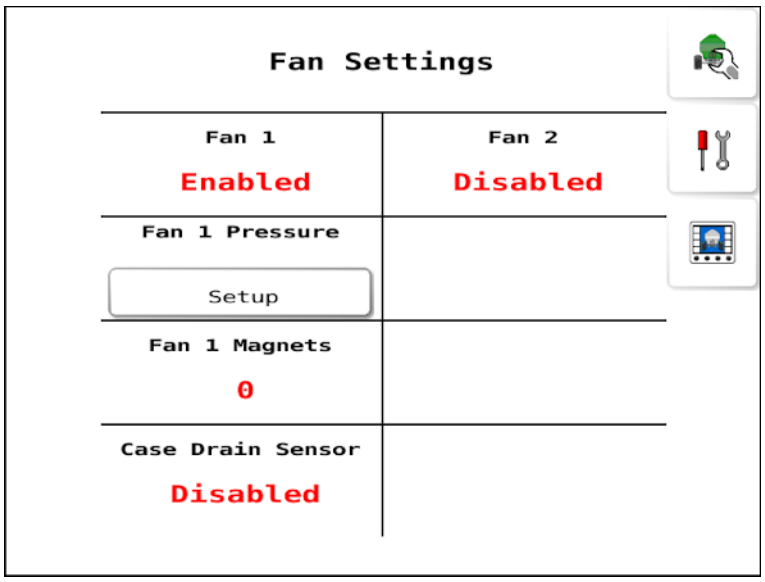
6. Select ✔ to confirm and return to the **Wheel Calibration Settings** screen.

Note: Record this value for future use. Use the table on page 93 to record the wheel factor.

2.6. Setting up fans

Use the fan settings to enable and configure fans for the seeder operation.

1. Select **Seeder Settings Menu** / **Fan Settings** .

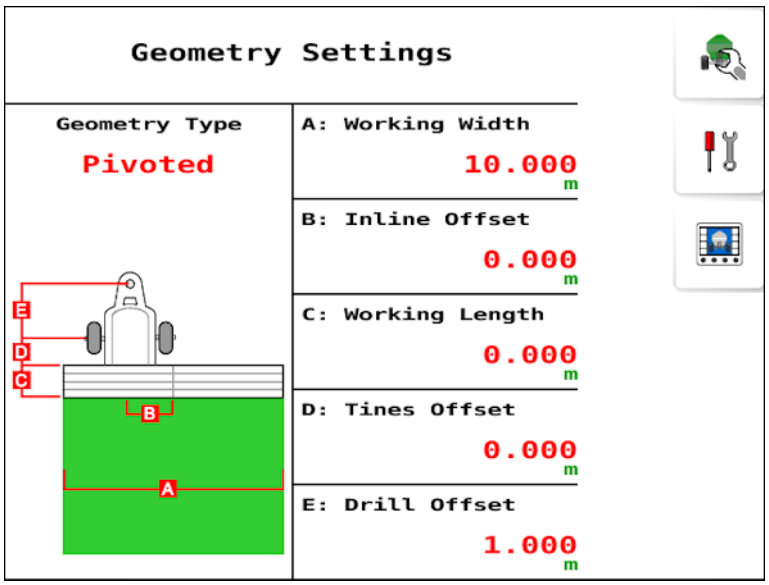


- **Fan #**: Enables a fan.
- **Fan # Pressure**:
  - **Pressure sensor**: If a fan pressure sensor is fitted to the seeder, select standard or voltage pressure sensor type.
  - **Min voltage**: Set the minimum output voltage at zero pressure. This value is read from the pressure transducer.
  - **Max voltage**: Set the maximum output voltage at maximum pressure. This value is read from the pressure transducer.
  - **Max pressure**: Set pressure in kPa.
  - **Pressure input**: Fan pressure inputs can be enabled and assigned to inputs on Aux or Drive connectors.
- **Fan # Magnets**: Set the number of magnets for the selected fan.
- **Case Drain Sensor**: Set to Enabled if the seeder has a case drain sensor fitted to the fan motor.

2.7. Setting up geometry

To set the implement geometry:

1. Select **Seeder Settings Menu** / **Geometry Settings** .



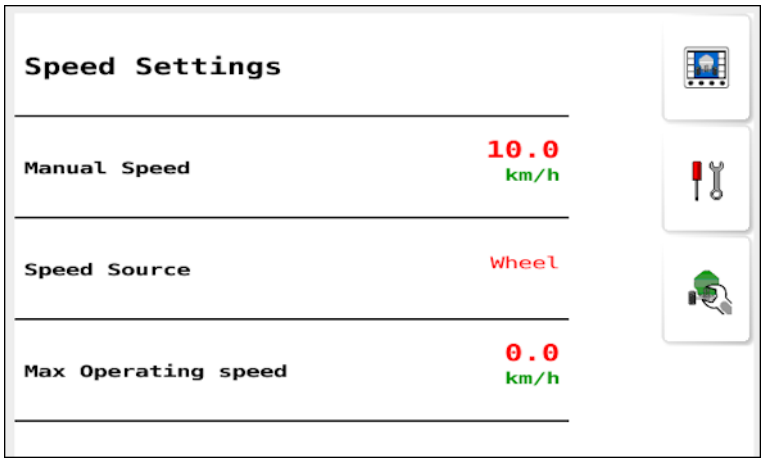
- **Geometry type**: Select the implement type (rigid, pivoted, double pivoted or front mount).
- **Working width**: Measures the working width of the implement (that is, the width of the area that is treated during one pass of the implement).
- **Inline offset**: Measures the off-center offset of the 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.
- **Working length**: Distance from the back of the bar/drill to the front of the bar/drill. Note: This must be a positive number.
- **Tines offset**: Measures the distance from the back of the bar/drill to the front of the bar/drill. Note: For correct product placement, please ensure this is entered as a negative number.
- **Drill offset**: Measures the distance from the hitch point to the back of the bar/drill.

- **Cart rear**: Measures the distance between the implement hitch point and the trailer wheels. (For dual axle air carts, F and G should be measured to the center point between the two axles.) **Note**: This dimension is only shown for double pivot implements.
- **Cart front**: 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.

2.8. Setting up speed

Seeder operation requires a source of speed for the seeder.

1. Select **Seeder Settings Menu** / **Speed Settings** .



- **Manual Speed**: Manual speed allows the user to specify a speed value. This is only possible if the vehicle is stationary. This value is normally set to 7-10 km/h, which is the speed used for normal seeding operations. This setting is used for calibration and preloading.
- **Speed Source**: This is used to determine the required application rate from the seeder. Select the **Speed Source** from the following options:
  - **Wheel**: Select if there is a ground speed sensor on the vehicle.
  - **Manual**: Select if no other working speed source is available due to sensor/GPS failure, or if stationary testing needs to be carried out. Also use to perform tank calibration and calculate application rates.
  - **ISO Wheel** / **ISO Radar** / **NMEA2000**: Can be used to source speed from the tractor's ECU (if available). Refer to documentation supplied with the tractor for more information.

Note: If a speed source other than manual is selected, the speed icon displays on operation screen 2  . See Operation screen 2, page 85.

- **Max Operating Speed**: The seeder does not operate when the vehicle speed exceeds the maximum operating speed.

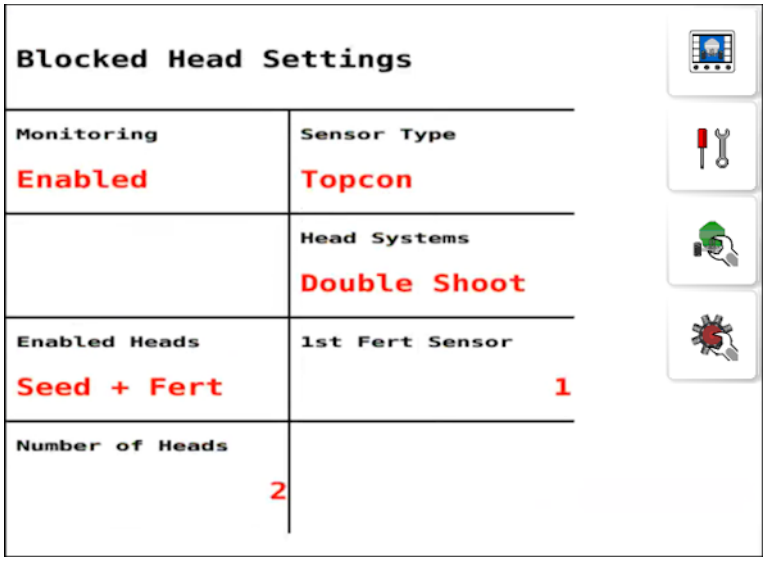
  Note: There is also a minimum operating speed, which is not user settable, that is set at 0.5 km/hr.

2.9. Settings for blocked heads

The seeder may get blocked during the course of seeding operations, which leads to gaps in product application. Blocked head sensors alert the operator to the status of the seeder heads and triggers an alarm if blockage occurs.

Note: See Viewing diagnostics, page 90 to view detailed data of blocked heads.

1. Select **Seeder Settings Menu** / **Blocked Head Settings** .



- **Monitoring**: Enable if a blockage system is installed.
- **Sensor Type**: Select sensor type as **Topcon** unless using **Dickey-john** sensors.
- **Number of Sensors**: Enter the number of sensors for distribution heads. Number of sensors depends on the **Head Systems** described next.
- **Head Systems**: Can be **Single Shoot** or **Double Shoot**.

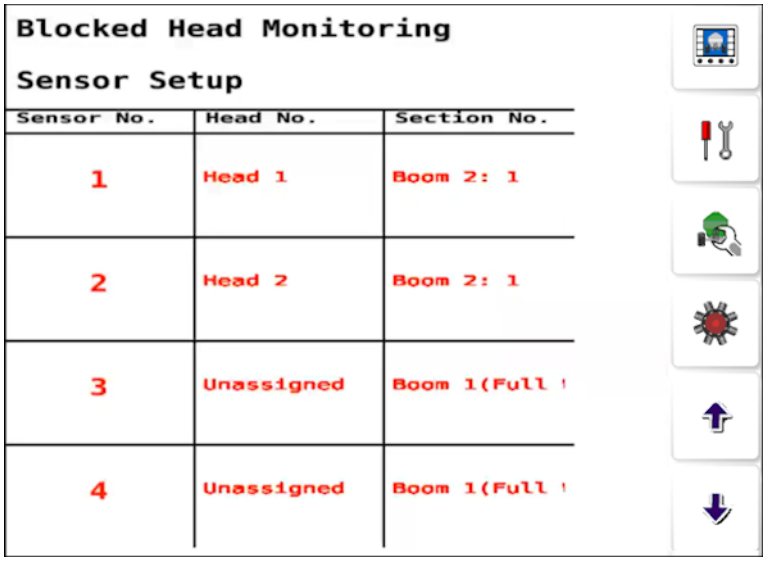
  Note: Single shoot head systems have one transfer line (entire product metered into a single line), and one seeder kit is mounted on the tillage implement. Double shoot systems are configured with two transfer lines and two separate seeder kits are mounted on the tillage unit.

- **Enabled Heads**: This setting can be used to disable sensors that are not in use to avoid false alarms. Seed and fertilizer, seed only or fertilizer only.
- **1st Fert Sensor**: The number of the first sensor that is fitted to a fertilizer head. For example, if there are 36 sensors in total with the first 24 assigned to seed heads and the rest (12) assigned to fertilizer heads, this should be set to 25.
- **Number of Heads**: Enter the number of distribution heads. Up to 10 for single shoot and 20 for double shoot.

Blocked head monitoring sensor setup

Note: This option is only available if a granular boom has been enabled.

1. Select **Seeder Settings Menu** / **Blocked Head Settings** / **Blocked head sensor setup** .



This screen is used to setup which blocked head sensor is assigned to each head and boom / section number. Select **Next** and **Previous** to view the complete list of sensors.

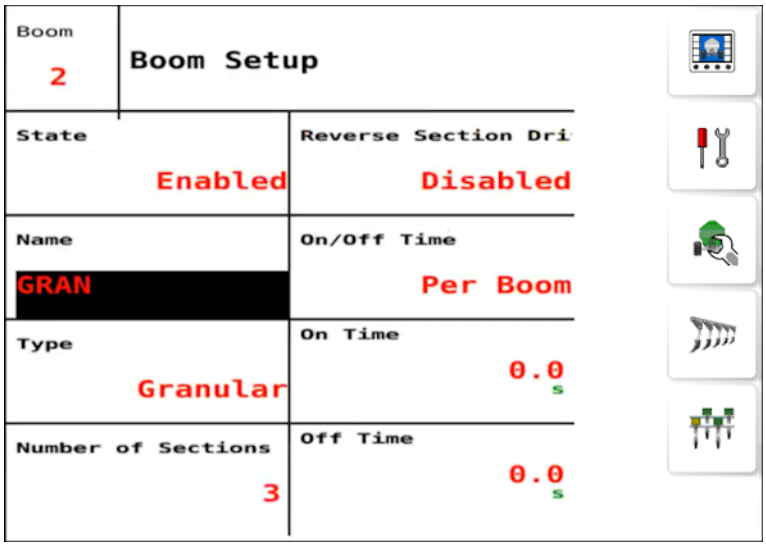
2.10. Setting up booms

Note: This option is only available if section control is licensed.

Note: After changing any boom settings, a restart confirmation is displayed when accessing the operation screen.

2.10.1. Boom setup

1. Select **Seeder Settings Menu** / **Boom** / **Boom Setup** .

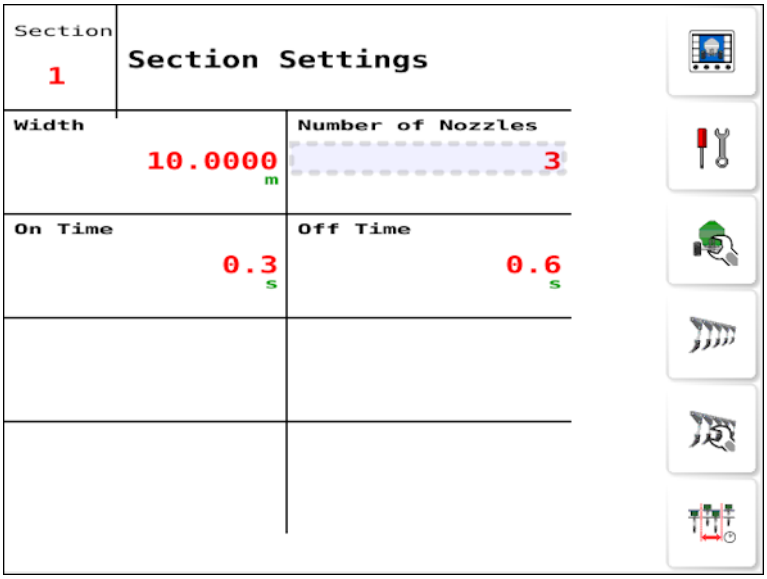


- **Booms**: Select the boom to be configured.
- **State**: Enable or disable the boom.
- **Name**: Boom identifier.
- **Type**: Granular or liquid boom.
- **Number of Sections**: Number of sections on selected boom.
- **Reverse Section Drive**: When this option is enabled, power is applied to the section when the section is off (instead of on).
- **On/Off Time**: Per boom or per section. If per section is selected, select **Section Settings** to set on and off time.
- **On Time**: Select to set how many seconds delay there is between switching a section on and the application of product. See Timing, page 34 for calculation instructions.

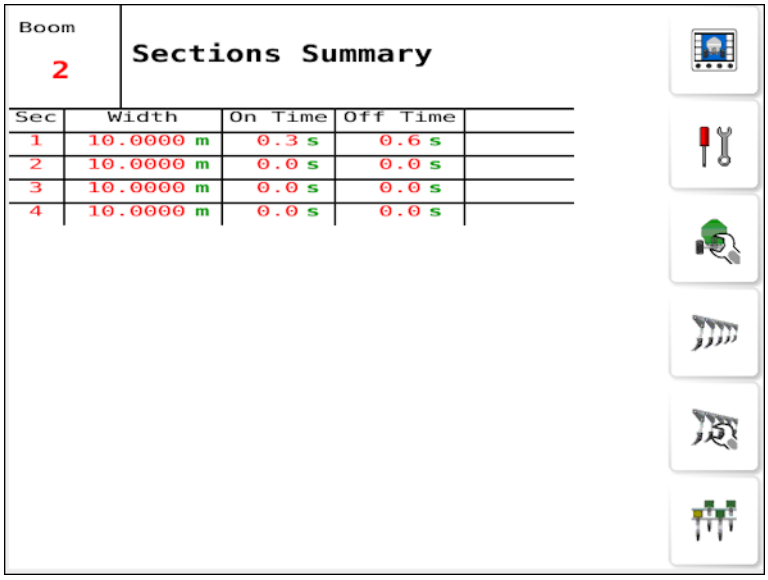
- **Off Time**: Select to set how many seconds delay there is between switching a section off and product flow stopping. See Timing, page 34 for calculation instructions.

2.10.2. Section settings

1. Select **Seeder Settings Menu** / **Boom** / **Boom Setup** / **Section Settings** .



- **Section**: Select the section to be configured. **All** can be selected if required.
- **Width**: Width of the selected section.
- **Number of nozzles**: Number of nozzles (liquid boom only).
- **On time** / **Off time**: See above.
- **Section Summary** can be selected to display a summary of section settings.



Timing

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

To calculate the response times:

1. Ensure the implement is ready to begin product application and that the calibration factor for the product has been calculated (refer to Calibrating the Tanks, page 48).
2. Use a stop watch to time the delay between switching the boom on and the application of product. This is the **On Time**.
3. When the boom 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 **Seeder Settings Menu** / **Boom** / **Boom Setup** if **Per Boom** is selected,

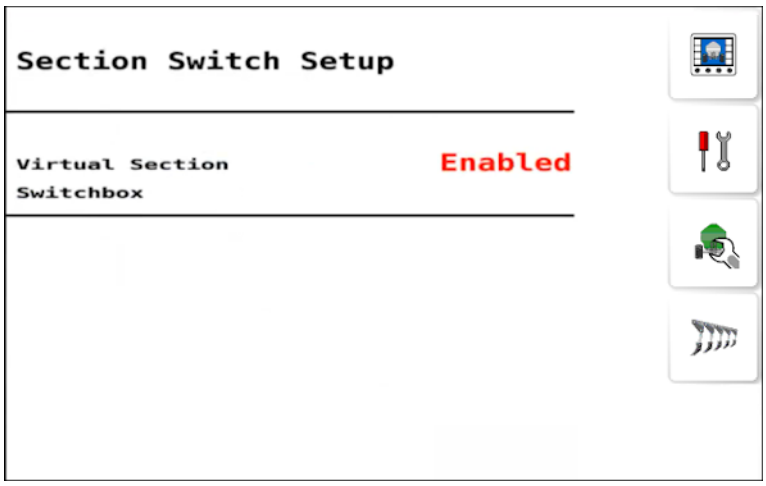
   Or **Seeder Settings Menu** / **Boom** / **Boom Setup** / **Section Settings** if **Per Section** is selected.

2. Select **On Time** and enter how many seconds delay there is between switching the boom on and the application of product.
3. Select **Off Time** and enter how many seconds delay there is between switching the boom off and stopping product flow.

2.10.3. Setting up the section switch

The virtual section switchbox is displayed on the operation screen and enables manual control of sections.

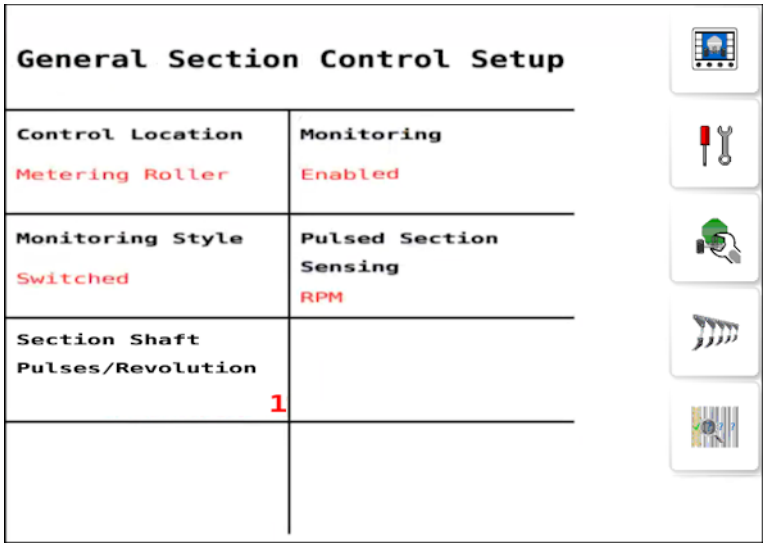
1. Select **Seeder Settings Menu** / **Boom** / **Section Switch** .



2. Select **Virtual Section Switchbox** and enable to allow the configuration of a virtual switchbox.

2.10.4. General section control setup

1. Select **Seeder Settings Menu** / **Boom** / **General Section Control Setup** .

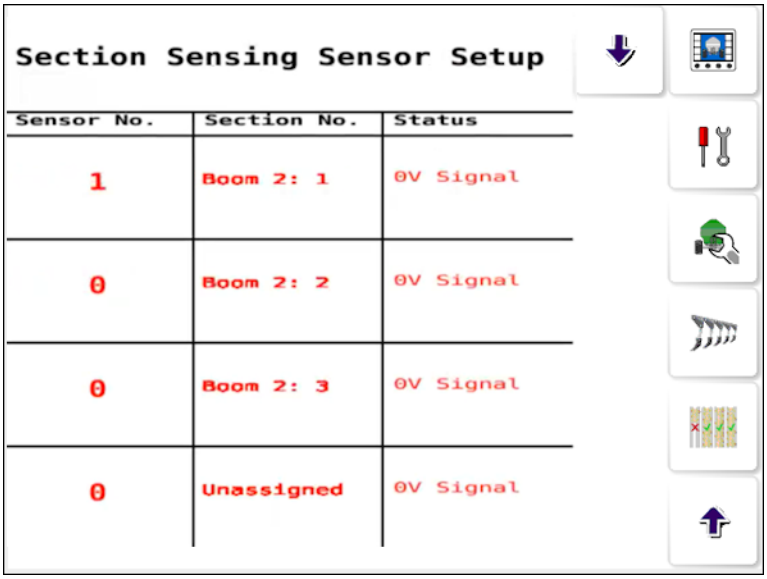


- Control Location:
  - Metering Roller: Use when granular section control is controlled by individual metering rollers being turned off and on.
  - Distribution Head: Use when granular section control is controlled by a system that uses individual distribution heads being opened and closed.
- Monitoring Style: Selects the type of sensor used for monitoring section state.
  - Switched: An on / off limit switch.
  - Pulsed: Monitors rotating gears for each section.
- Section Shaft Pulses / Revolution: The number of pulses detected by the sensor for each revolution of the section shaft.
- Monitoring: This provides a sensor to check that when a section is supposed to be on, that it is physically mechanically engaged. The sensors may be switched or pulse type sensors. An alarm is triggered if a section is not active when it should be. When enabled, the Section Sensing page is available (see below).
- Pulsed Section Sensing:
  - RPM: Section shaft must rotate at the correct RPM for the section to be considered on.
  - Movement: Any movement of the section shaft indicates the section is on.

Section sensing sensor setup

This screen is used to setup which sensor is assigned to each section and whether a 12 V signal (active high) or 0 V signal (active low) turns each section on (**Status**).

1. Select **Seeder Settings Menu** / **Boom** / **General Section Control Setup** / **Section Sensing Sensor Setup** .



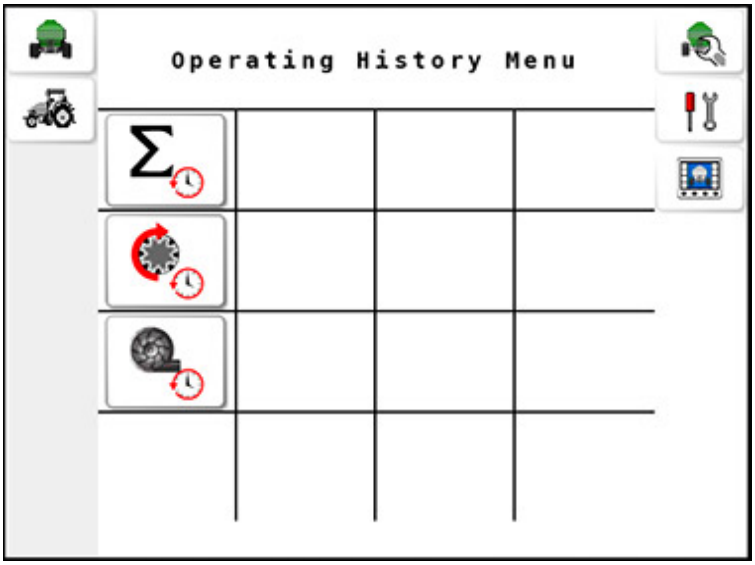
Note: The **Status** column is only visible if **Switched** is selected as the **Monitoring Style**.

2.11. Viewing operating history

The operating history menu contains the values recorded for the seeder operation over its life.

Note: Operating history values are not editable by the user.

1. Select **Seeder Settings Menu** / **Operating History Menu** .

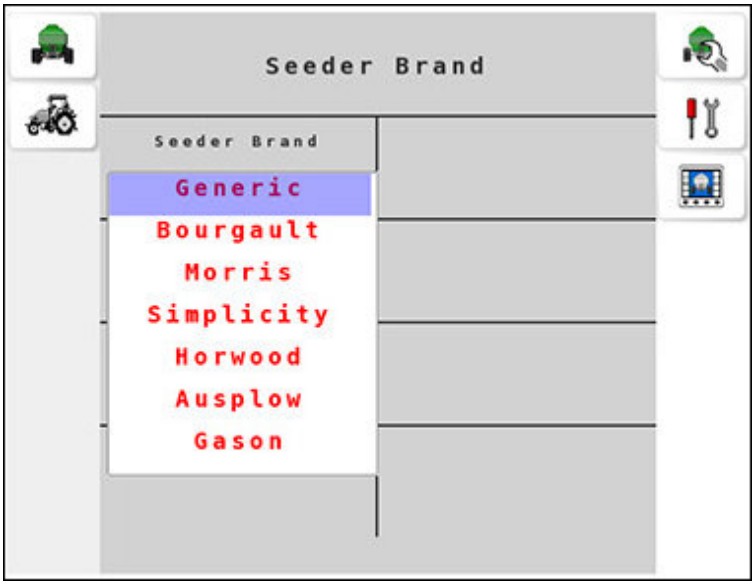


- **Totals History** : Displays the total area, total distance, total time, maximum speed and total product dispensed from each tank.
- **Shafts History** : Displays the maximum shaft speed attained by different shafts.
- **Fan History** : Displays the maximum speed, maximum pressure, average speed and average pressure of the selected fan. Select EditFan 1 to change the fan.

2.12. Selecting seeder brand

Use the **Seeder Brand** option to select the seeder manufacturer.

1. Select **Seeder Settings Menu** / **Seeder Brand** .

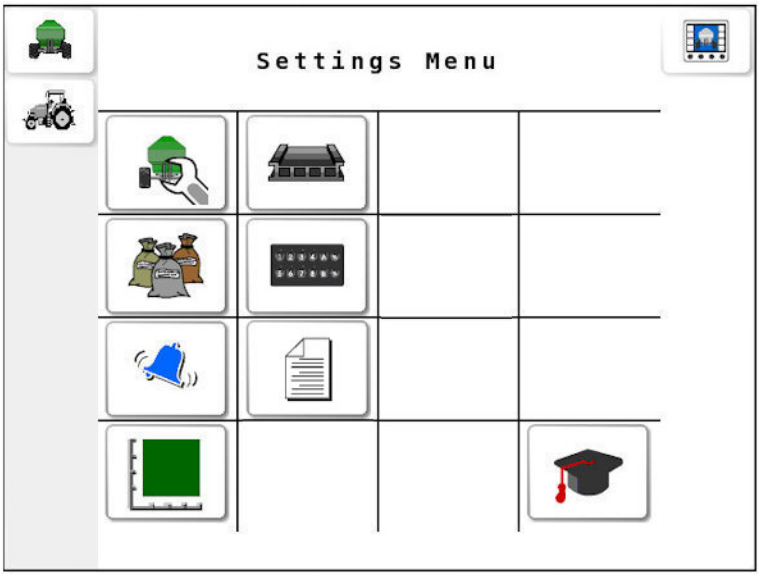


2. Select **Generic** if the seeder brand is not known.

2.13. Managing implement profiles

2.13.1. Creating an implement profile

1. Select **Profiles Setup** from the Settings menu.



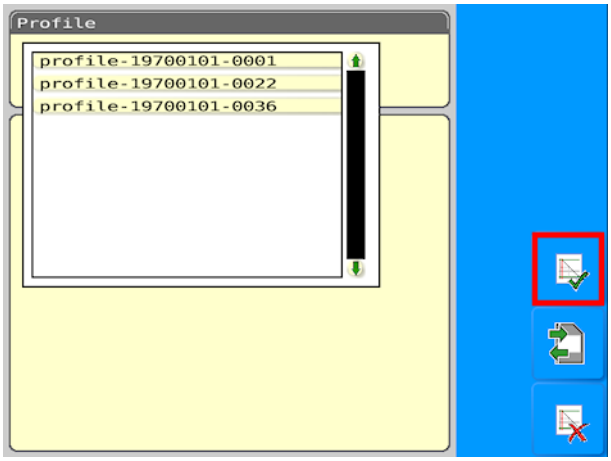
2. Select the create new profile button, then confirm with the tick button.

2.13.2. Selecting a profile

Once profiles have been created on the ECU, they can be selected from a list.

1. Select **Profiles Setup** from the Settings menu.

2. Select the folder button, then press the currently selected profile name to display a list of saved profiles.

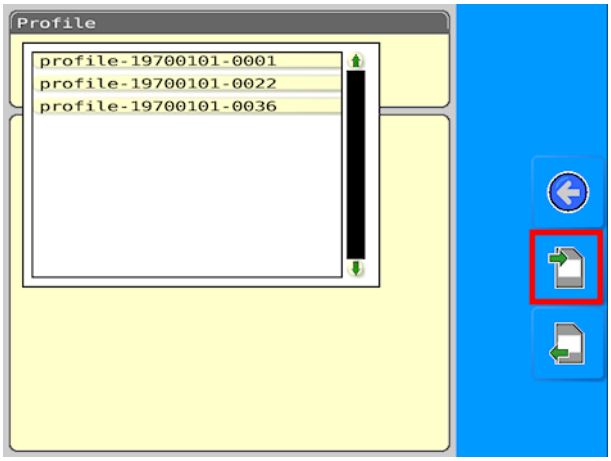


3. Select the required profile from the list and press the tick button to confirm.

2.13.3. Copying a profile to / from USB

Save a profile to USB

1. Ensure a USB is plugged into the display.
2. Select **Profiles Setup** from the Settings menu.
3. If this is the first time you have saved a profile to USB, select the create new profile button to name the profile.
4. Select the folder button, then select the transfer button.
5. Select the currently selected profile name to display a list of profiles.



6. Select the profile to be saved to USB from the list.
7. Select the right arrow and select **fs_usb**. The selected profile is saved to the USB.

Copy a profile from USB

1. Ensure the USB containing the profile to be copied is plugged into the display.
2. Select **Profiles Setup**  from the Settings menu.
3. Select the folder button  , then select the transfer button  .
4. Select the left arrow  , then select **fs_usb**. A list of files stored on the USB is displayed.
5. Select the profile to be copied, then select the displayed .ini file.

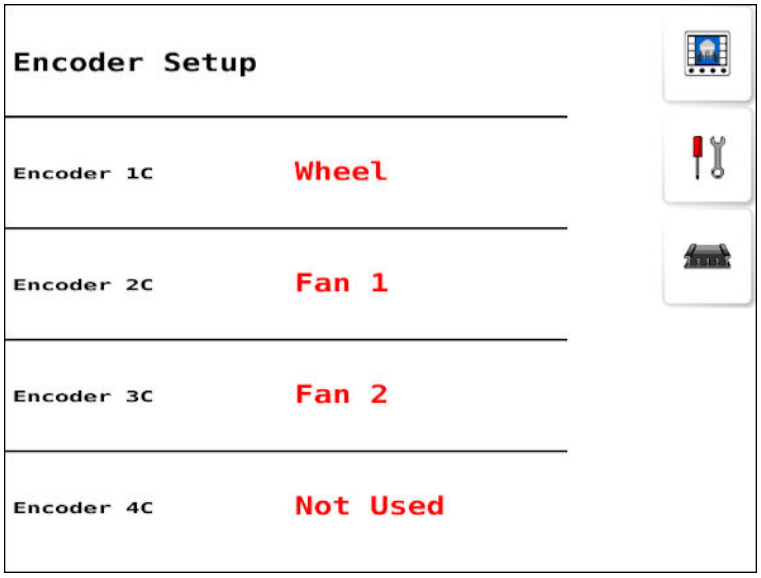
   The profile is copied to the display.

Chapter 3 – ECU Setup

3.1. Encoder setup

The Apollo ECU has four encoders that are assignable for monitoring seeder inputs. Use the **ECU Setup** menu to assign these encoders to seeder components according to the harness connections.

1. Select **Settings Menu** / **ECU Setup** / **Encoder Setup** .



2. For each encoder, depending on the harness connection, select from the following options: **Not Used**, **Fan 1**, **Fan 2**, **Wheel** and **Tank # Pump**.

   Note: **Tank # Pump** is only available on liquid/NH3 tanks, and only if Speed Monitoring is enabled on the Pump Sense screen. Refer to Liquid/NH3 tank settings, page 12.

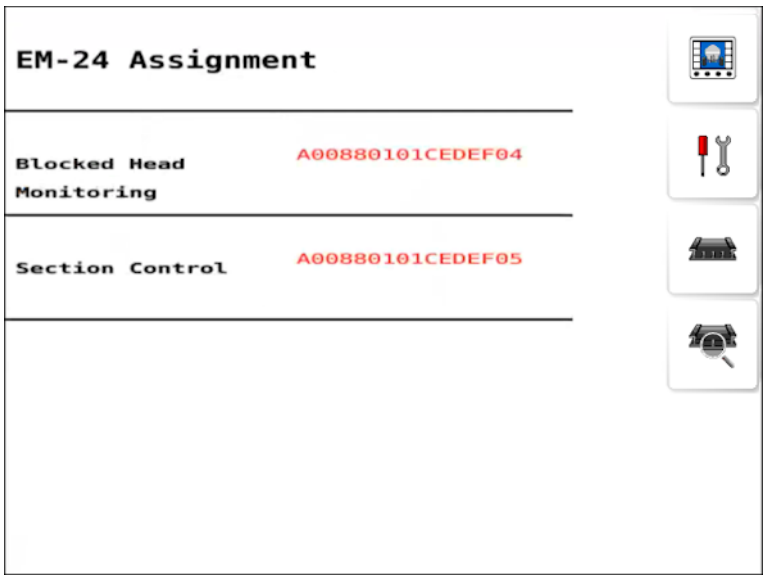
3.2. EM-24 assignment

The ISOBUS UT Seeder supports up to two EM-24 ECUs for blocked head monitoring and section control.

Note: This option is only available if section control is licensed.

Note: Connect one EM-24 ECU and assign it at a time.

1. Select **Settings Menu** / **ECU Setup** / **EM-24 assignment** .



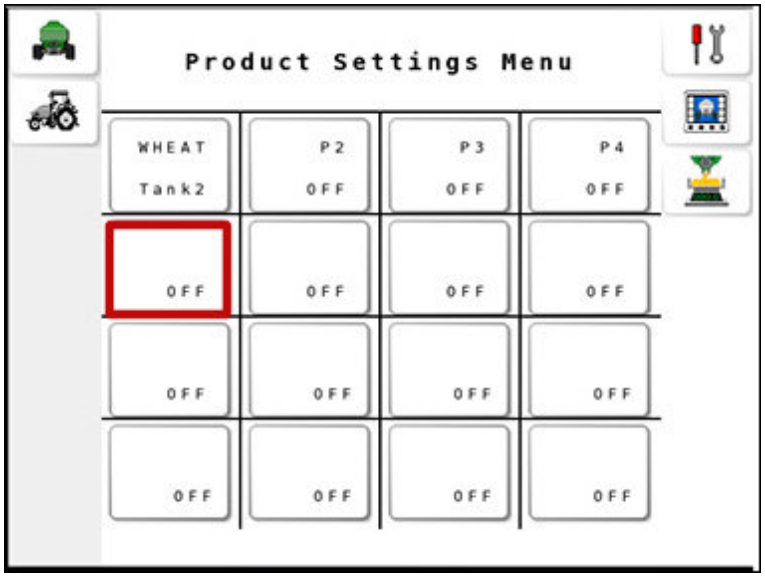
2. Select the drop down to assign the required ECU to blocked head monitoring or section control. Identify the ECU by the ISONAME.
3. If the required ECU is not shown in the list, select **Detect ECU** .

Chapter 4 – Product Settings

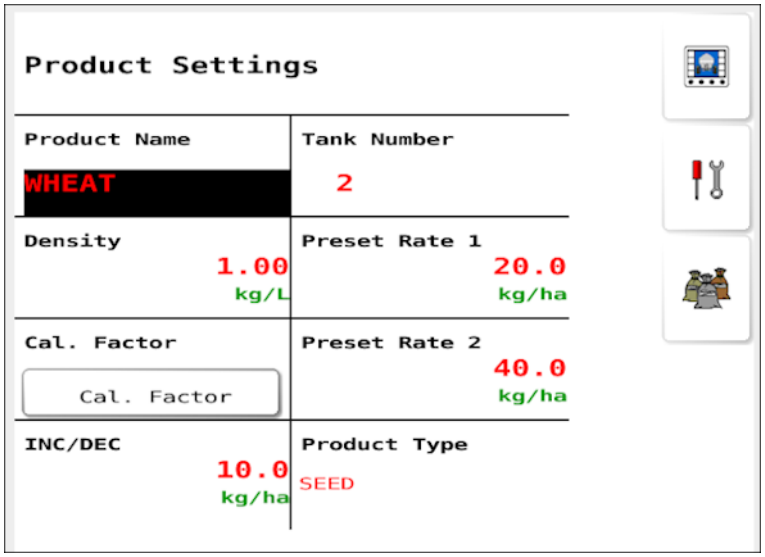
Use the **Product Settings Menu** to configure up to 16 products that can be used for seeding.

4.1. Setting up products

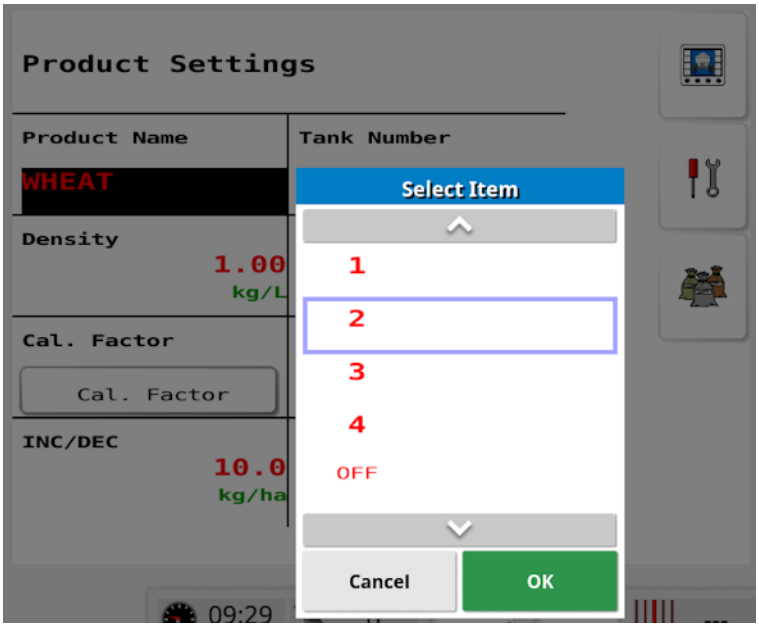
1. Select **Settings Menu** / **Product Settings Menu** . The default value for each product is **OFF**.



2. Select **OFF** to open the **Product Settings** screen.



- **Product Name**: Type in a name for the product.
- **Tank Number**: Assign a tank number to use this product in the selected tank. Set to OFF if this product is not currently being used in a tank.



- **Density**: Enter the product density. The density of the product determines the actual weight of each tank.
- **Preset Rate 1**: Sets the primary seeding rate. This is the default application rate.
- **Preset Rate 2**: Sets the secondary seeding rate. Preset rates can be toggled from the operation screen.
- **Cal. Factor** (Calibration Factor): Enter a calibration factor manually or perform the calibration according to the steps described in the next section. Refer to Calibrating the Tanks, page 48, for instructions to determine calibration factor. A Tank Number must be assigned before calibration can be performed.
- **INC/DEC**: Sets the amount the rate will change by when pressing the + / − buttons on operating screen 1 for this product.
- **Product Type**: Select Seed or Fertilizer. When Task Controller is enabled, it is important to correctly set the product type to ensure the display knows the type of product that is in each tank for

documentation purposes. Some systems will not allow tanks that don't have the correct product type associated to be associated with certain layers on a variable rate map. Note: This option is not shown for liquid/NH3 tanks, the product is defaulted to fertilizer for these tank types and can't be changed.

Chapter 5 – Calibrating the Tanks

Tanks must be calibrated when setting up a seeder for the first time, changing the batch of seeds, or adding a new product.

Correctly calibrating tanks/bins ensures that seeding is carried out at the proper rate to obtain maximum yield and crop. The size of seed and supplement product varies between batches. This requires that the seeder metering system be calibrated so that the correct amount of seed is dispensed.

All the different products being used in each different tank can be calibrated and stored in the UT before the operator starts seeding.

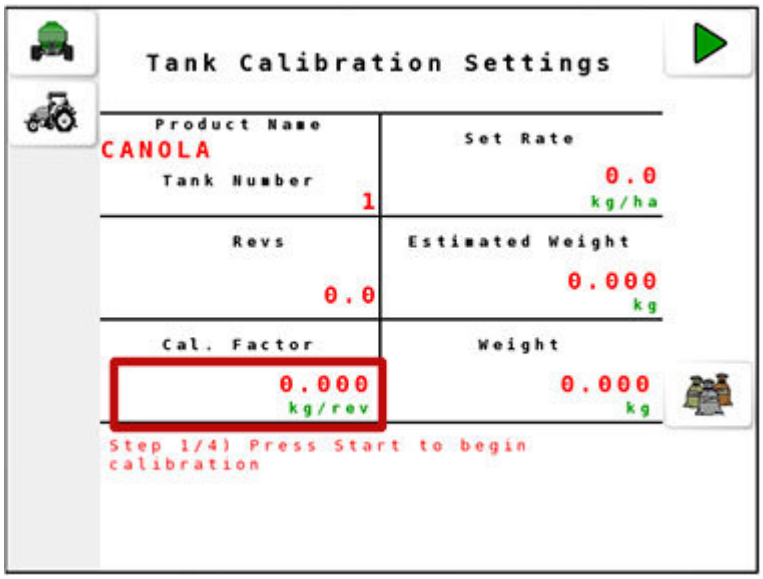
Note: NH3 tanks have a preset calibration value and the calibration factor must be entered manually. Check the calibration factor on the tag on the flow meter of the NH3 system.

5.1. Manual entry of calibration factor

Manual entry of calibration factor can only be used if the calibration factor for the selected product is known. Follow these steps to enter a calibration factor manually.

1. Select **Settings Menu** / **Product Settings Menu**.
2. Select a product from the **Product Settings Menu**.
3. Select Cal Factor from the **Product Settings** screen.

4. Select **Cal. Factor** from the **Tank Calibration Settings** screen.



5. Enter a value for the calibration factor and confirm  .

5.2. Automatic calculation of calibration factor

The seeder can be calibrated automatically by collecting and measuring the seed that is discharged.

Calibration may be performed using an external keypad, if fitted. Refer to External Keypad, page 61.

Note: Ensure that the speed source is set to manual for calibrating the tanks. Refer to Setting up speed, page 28. Enter a speed to match the seeding operation.

Note: A calibration factor must be entered manually before automatic calibration of tank. An approximate value can be used initially, or enter 1 if an approximate value is not known.

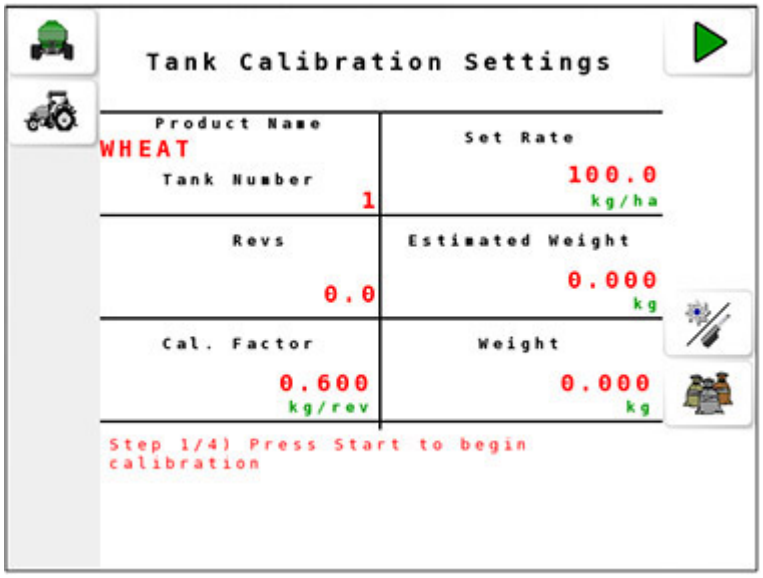
5.2.1. Calibrating a single granular tank

1. Select **Settings Menu**  / **Product Settings Menu**  .
2. Select a product from the **Product Settings Menu**.
3. Ensure a Tank Number has been assigned to the product.
4. Select 

from the **Product Settings** screen.
5. Place a calibration bucket under the metering roller of the tank being calibrated.

   Note: For granular tanks with actuator drive type, the option to collect the dispensed products depends on **Actuator Cal Style** set as Stationary or Rolling. Refer to Setting up external options, page 18.

   - **Stationary**: Product must be dispensed for calibration using a hand crank.
   - **Rolling**: Product is dispensed for calibration automatically while the vehicle is moving.
6. Select  to start the calibration.

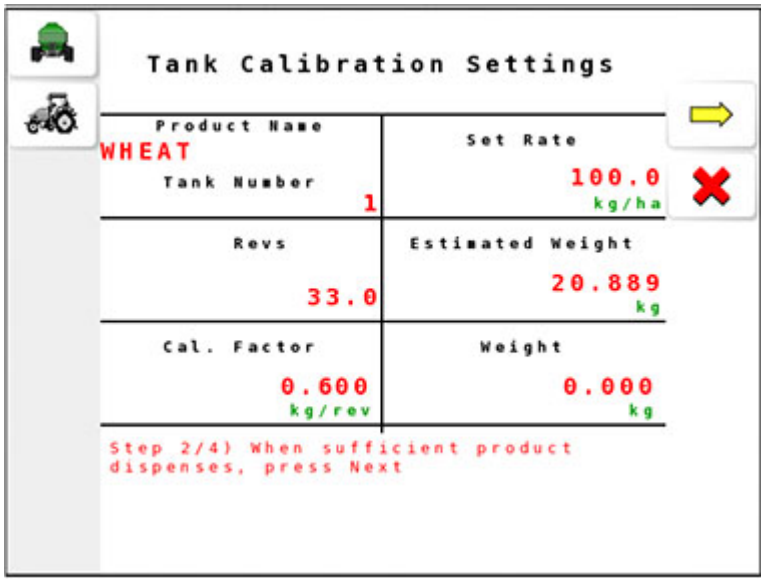


Note: For granular tanks with actuator drive, select  to toggle the calibration mode as **Set Rate** of application or **Actuator Extension** target percentage.

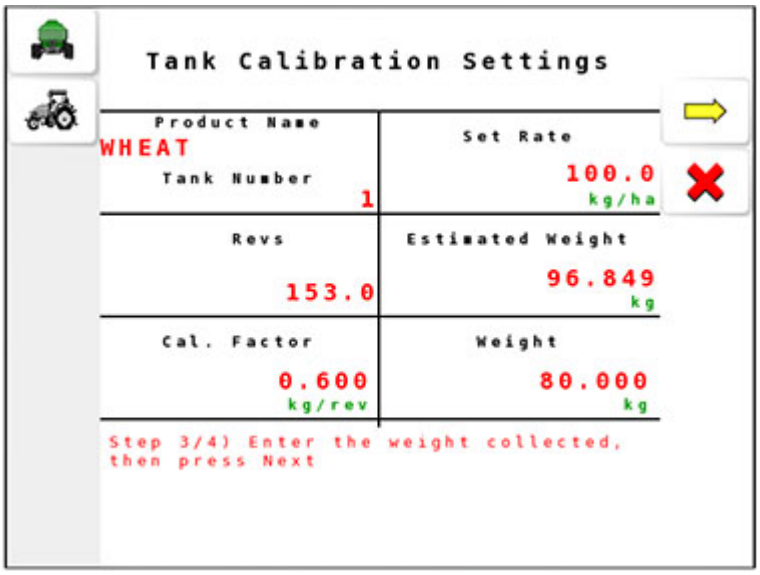
- **Set Rate**: Actuator opens to accommodate the rate set on the screen.
- **Actuator Extension**: Actuator opens to the percentage of extension requested. Use this to enter the percentage the actuator should open to dispense product.

Note: Select  to stop the calibration at any point.

7. The **Estimated Weight** value starts to increase. When sufficient product is collected in the bucket, select  .

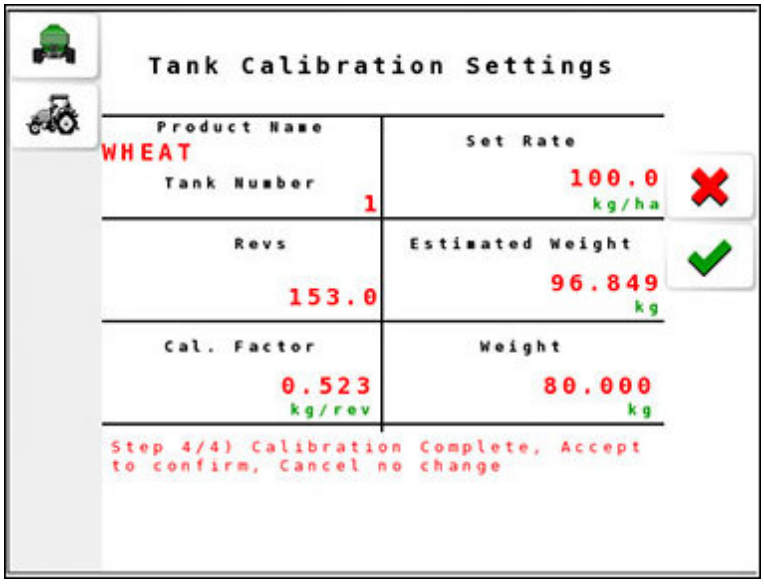


8. Measure the weight in the bucket and enter the value by selecting **Weight**, then confirm .



9. Select → to complete the calibration.

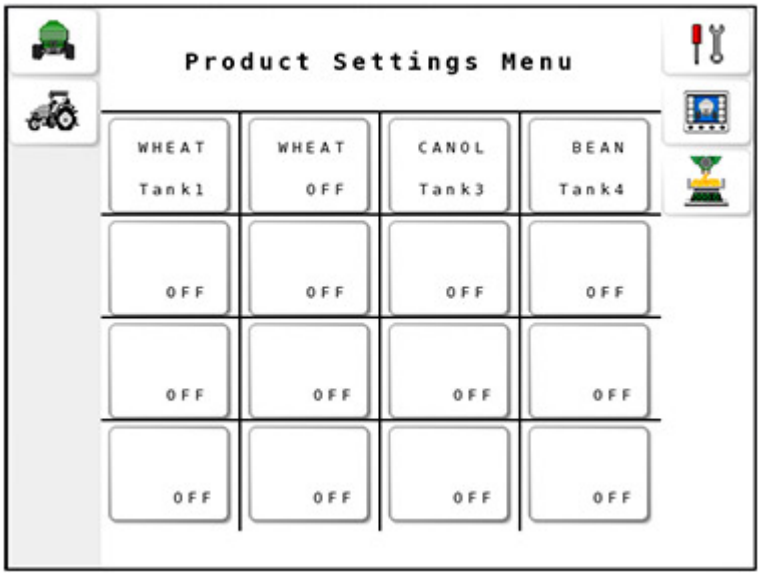
10. The new calibration factor appears on screen. Select ✔ to save the calibration factor or ✖ to reject it.



Note: Use the table provided on page 93 to record the calculated calibration factor.

5.2.1. Calibrating multiple granular tanks

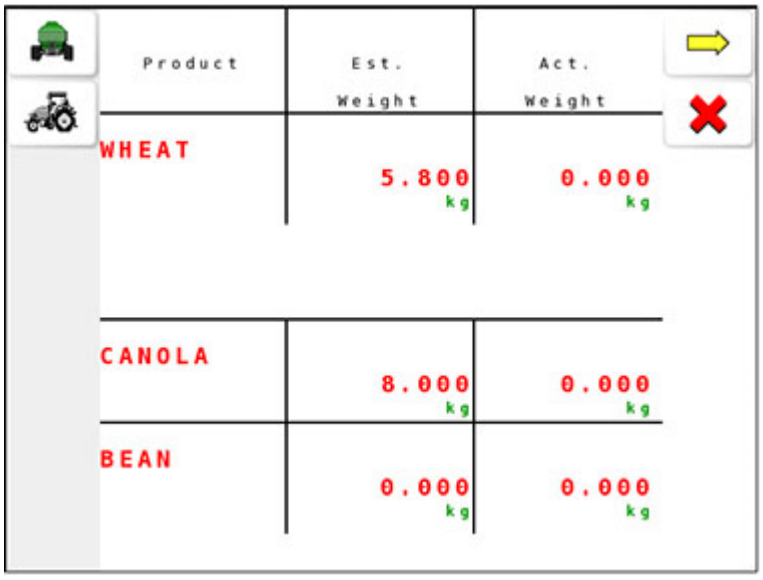
1. Select **Settings Menu** / **Product Settings Menu** .



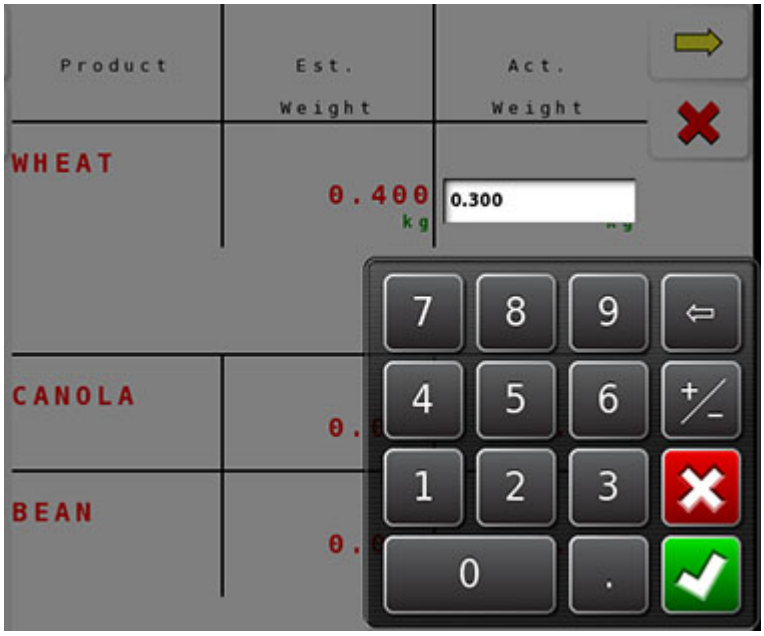
2. To perform calibration of multiple tanks, select .
3. Select OFF to switch on the tanks to be calibrated. Tanks that are switched on, appear with ON.

Note: Four products can be calibrated at a time, as the Apollo ISOBUS UT seeder supports four tanks for operation.

4. Place the calibration buckets under the metering rollers of the tanks to be calibrated.
5. Select → to start the calibration. The estimated weight (**Est. Weight**) starts to increase.



6. When sufficient product is collected in the buckets, select →.
7. Measure the weight collected in each bucket and enter the values by selecting actual weight (**Act. Weight**), then confirm ✓.



8. Select ➡ to view the calculated calibration factors. The screen displays old calibration factors (**Old Cal**), new calibration factors (**New Cal**), percentage difference between the two (**Diff**) and the status to save or ignore the new calibration factors.

9. Set the Status for products to have the calibration factor saved to SAVE. Pressing that button again switches the status to IGNORE if the calibration factor is not to be saved.

10. Alternately, select to save all of the new calibration factors, or select to ignore all of the new calculations.

    Select to return to the previous screen.

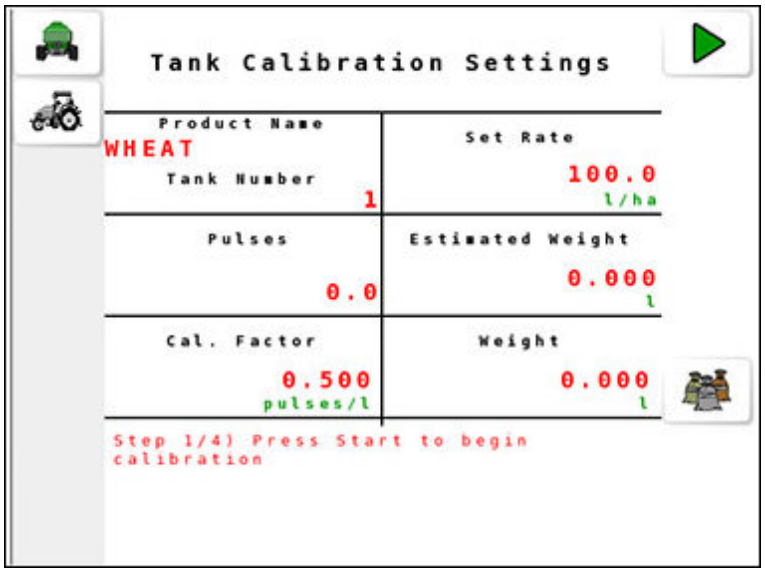
11. Select to confirm and exit.

Note: Use the table provided on page 93 to note the calculated calibration factor.

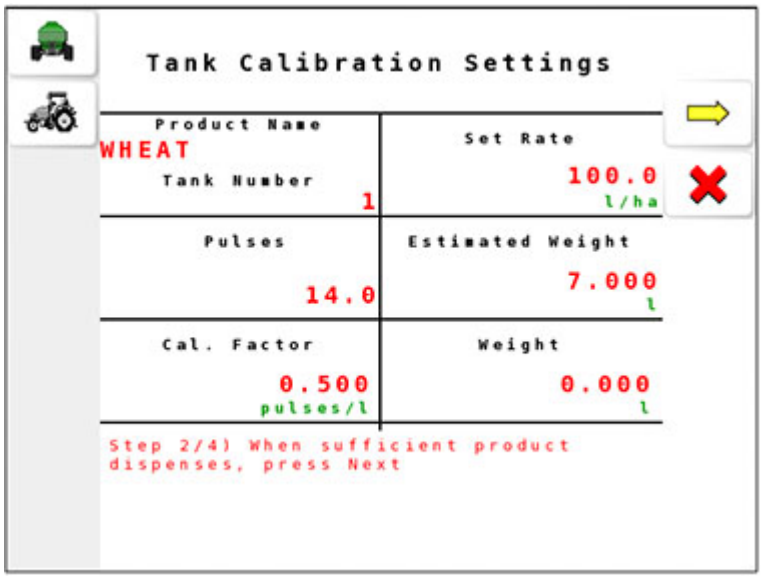
5.2.1. Calibrating a liquid tank

Note: Liquid tanks must be calibrated one at a time.

1. Select **Settings Menu** / **Product Settings Menu**.
2. Select a product from the **Product Settings Menu**.
3. Ensure a Tank Number has been assigned to the product.
4. Select Cal Factor from the **Product Settings** screen to open **Tank Calibration Settings**.
5. Place a calibration bucket under the nozzle of the tank being calibrated.
6. Select to start the calibration.



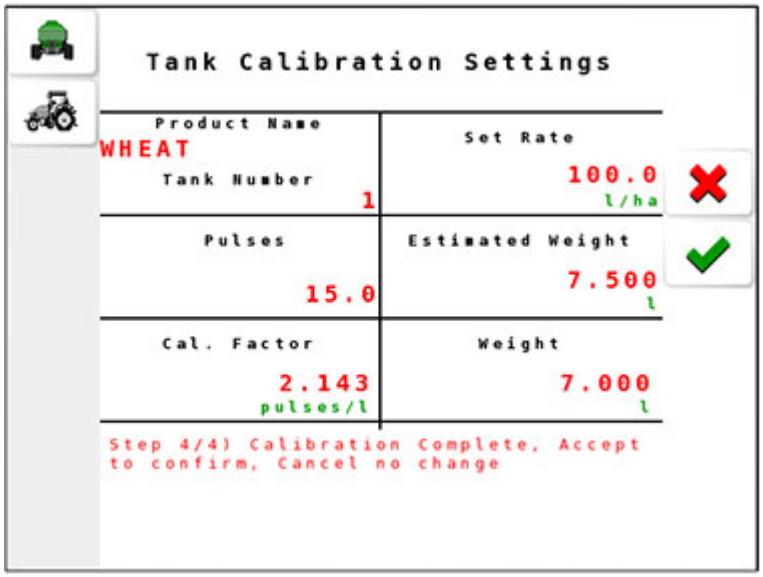
7. When sufficient product is collected in the bucket, select ➡.



8. Measure the volume collected in the bucket and enter the value by selecting **Volume** and select confirm ✔.

9. Select ➡ to complete the calibration.

10. The new calibration factor appears on screen. Select ✔ to save the calibration factor or ✖ to reject it.



Note: Use the table provided on page 93 to note the calculated calibration factor.

Chapter 6 – Area Test

Area test is used to verify whether the tank and wheel calibrations are accurate. It simulates the seeder function according to the tank calibration factor and wheel calibration settings over a user definable distance. This ensures that the amount of product metered out is correct and as expected.

For example; applying product at 80 kg/Ha and selecting to cover 0.25 Ha, operating at the entered manual speed is simulated over that distance. Once complete, you can verify that the machine has metered out 20 kg.

6.1. Performing the area test

1. Select **Settings Menu** / **Area Test** .
2. Enter the required area and press .

3. Area test progresses until the required area is covered. To pause, press . To reset the area test, press .
4. Select to return to the **Settings Menu**.

Chapter 7 – External Keypad

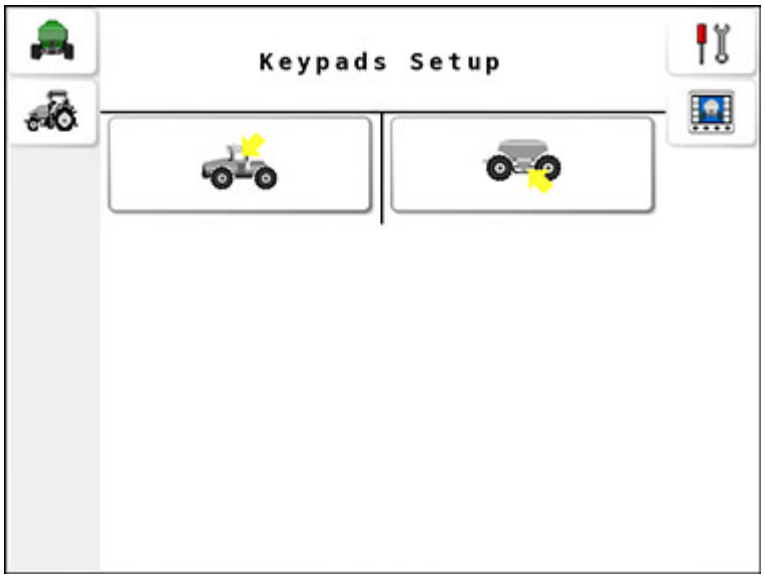
The keypad is an external device that may be used in the cabin and/or on the seeder frame to control selected functions.

The ‘in cabin’ keypad may be used to turn tanks on and off, increase and decrease tank rates and perform a ‘blockage check’ on the openers.

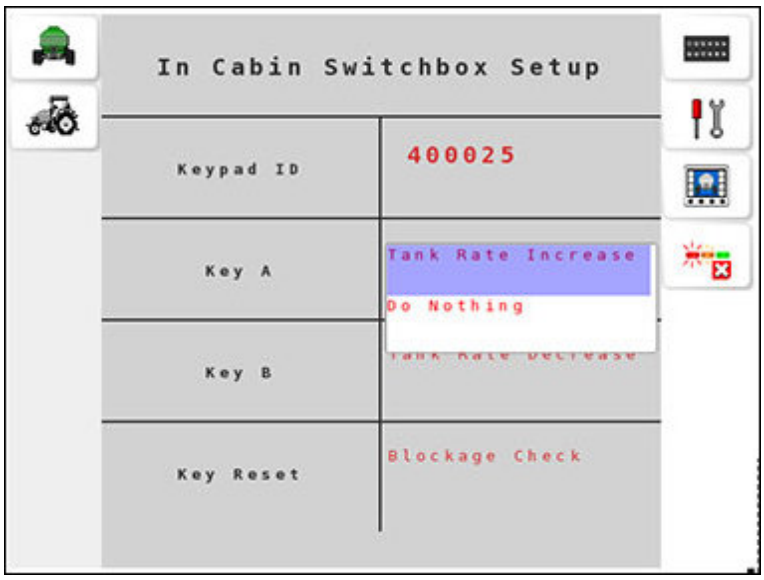
The ‘on frame’ keypad can be used to turn tanks on and off, turn calibration mode on and off and perform a ‘blockage check’ on the openers.

7.1. Keypad setup

1. Select **Settings Menu** / **Keypads Setup** .



2. Select  to configure the **In Cabin** keypad, or select  to configure the **On Frame** keypad.



- **Keypad ID**: If more than one keypad is installed, this selects which keypad is installed in the cabin and which is on the frame. Each keypad has a unique identity number. Select  to identify which keypad is installed in the cabin and which is installed on the seeder frame. When selected, the LEDs on that keypad flash.

In cabin keypad:

- Keys marked 1 – 8 turn tanks on and off. Note that Apollo ISOBUS UT seeder supports four tanks.
- Key A or B: Fill all tanks. Fill tanks to their maximum capacity.
- Key A: Tank rate increase. The amount the rate changes by is entered in the INC/DEC setting on the Product Settings screen. Refer to Setting up products, page 45.
- Key B: Tank rate decrease.
- Key Reset (): Blockage check. Runs granular product to the openers for the time period entered in Preload Time (see Setting up tank timing, page 20). (This is only available for proportional drive

tank types. It is not available for linear actuator, regulator valve and monitoring only tank types.) Pressing and holding this button primes the implement until the button is released. This overrides the time entered in Preload Time.

- Master switch (): Performs the same function as the master switch on the operation screen.

On frame keypad:

- Keys marked 1 – 8 turn tanks on and off. Note that Apollo ISOBUS UT seeder supports four tanks.
- Key A: Calibration mode on/off.
- Key Reset (): Blockage check. Runs granular product to the openers for the time period entered in Preload Time (see Setting up tank timing, page 20). (This is only available for proportional drive tank types. It is not available for linear actuator, regulator valve and monitoring only tank types.) Pressing and holding this button primes the implement until the button is released. This overrides the time entered in Preload Time.
- Master switch (): Performs the same function as the master switch on the operation screen.

7.2. LED behavior

Tank keys:

- Tank disabled (buttons 3 and above on a 2 tank implement): All LEDs are dark.
- Tank is on: Green LED (Tank and master switch is on. Product is flowing.)
- Tank is off but active: Amber LED (it is selected and ready to run but master is off and not doing prime/preload).
- Otherwise: Red LED

  Special case one: During calibration, the tanks that have green or amber LEDs on also have the red LED flash in sequence. On a single tank system the red LED of tank 1 would flash, on 2 a tank system the red LEDs on tanks 1 and 2 would flash alternately and on a 3+ tank system the red LEDs would flash on keys 1, 2, 3, … 1, 2, etc. While this is happening the amber or green LED indicate the state of the tank.

  Special case two: The Cabin keypad will not have the flashing LEDs described above if the master switch is not controlled by the keypad.

Master switch ():

- Master switch is on: Green LED
- Cabin keypad and master switch is not controlled by the keypad: All LEDs are dark.
- In normal mode (no calibration), master switch is off, can be turned on: Amber LED
- In normal mode (no calibration), master switch is off, can’t be turned on: Red LED
- In calibration mode, master switch is off, any tank is active (selected): Amber LED
- In calibration mode, master switch is off, no tank is active (selected): Red LED

Blockage check ():

- Preload is enabled and preload is in progress: Green LED
- Preload is enabled but preload is not running: Amber LED
- Preload is not enabled: Red LED

Preload is enabled when all of these are true:

- Manual speed is configured
- System is operational (UT has been uploaded)
- Calibration is not in progress
- In UT mode and not using manual speed
- Master switch is off
- Fan speed is good
- There is at least one tank which satisfies all of these conditions:
  - Is active (has been selected)
  - Has a product assigned
  - Is a granular tank
  - Has a non-zero application rate
  - Is enabled
  - Is proportional drive

Reset ():

The reset function resets the Estimated Weight figures on the calibration wizard, ready for calibration to start over.

The Prime/Preload/C key acts as a reset during calibration mode.

Pressing it during calibration will reset the pulse counts, but only if the master is off or all tanks are off.

It displays a red LED, but when the reset happens the green LED flashes to confirm the action.

Calibration mode:

- If the calibration is in progress: Green LED
- If the calibration is not in progress, but is allowed: Amber LED
- If calibration is not allowed: Red LED

Calibration is allowed if:

- In UT mode and the system is on the main operation screen or products grid screens
- Master switch is off
- Not preloading
- All granular and enabled tanks with a product assigned have some remaining volume of their products.

If not in calibration mode, pressing the button will immediately switch the system to calibration mode.

If in calibration mode, the button must be pressed and held for a while to cancel calibration mode. While the button is down, the LEDs change from Red to Red + Amber to Red + Amber + Green (like a progress bar moving right) and only after that the system goes out of calibration mode.

Chapter 8 – Alarm Settings

Alarms provide warnings if any function of the seeder system is not functioning properly.

8.1. Managing seeder alarms

1. Select **Settings Menu** / **Alarm Settings Menu** .

2. Select to enable all alarms or to disable all.

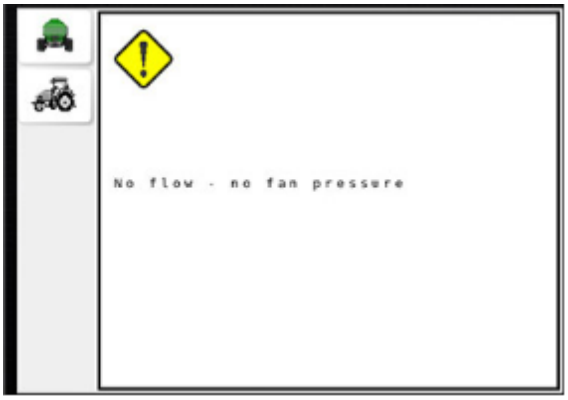
Seeder alarms

Icon	Description	Page
	Fan alarms	69
	Tank motor alarms	70
	Shaft alarms	71
	Tank gear alarms	72

Icon	Description	Page
	Tank alarms	73
	Tank pressure alarms	74
	Other alarms	75
	No flow alarms	77

Alarm screen

When an alarm is triggered, the following type of screen appears.

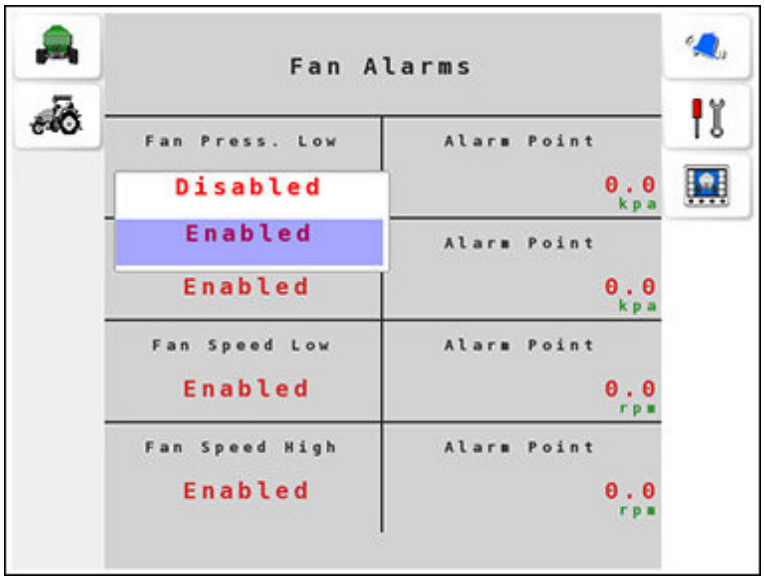


Refer to the next sections for information to configure alarms.

8.2. Setting up fan alarms

Fan alarms operate by using pressure transducer sensors mounted on the seeder chassis near the fan. The sensors determine the pressure of the system. If the alarm point is set too close to the operating pressure, the alarm can trigger whenever fan pressure or fan speed changes significantly.

1. Select **Settings Menu** / **Alarm Settings Menu** / **Fan Alarms** .



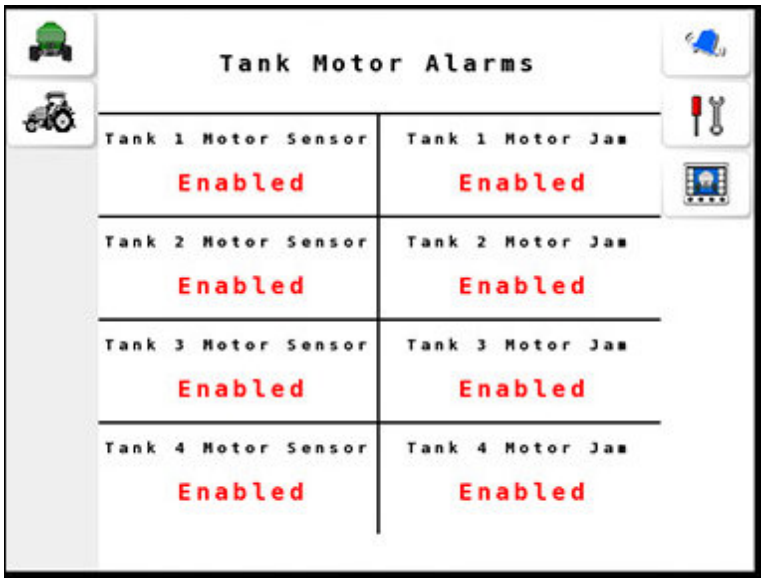
- **Fan Press. Low**: (Fan Pressure Low): Triggered if system pressure drops below the alarm point.
- **Fan Press. High** (Fan Pressure High): Triggered if system pressure exceeds the set alarm point.
- **Fan Speed Low**: Triggered if the fan rpm drops below the set alarm point. The alarm point is usually set to 20% below the normal operating speed of the fan.
- **Fan Speed High**: Triggered if the fan rpm exceeds the set alarm point. The alarm point is usually set to 20% above the normal operating speed of the fan.

2. Set the **Alarm Point** for the enabled alarms and confirm .

8.3. Setting up tank motor alarms

The tank motor alarms activate if the tank motor fails to function due to a fault in the power supply or if it becomes jammed.

1. Select **Settings Menu** / **Alarm Settings Menu** / **Tank Motor Alarms** .



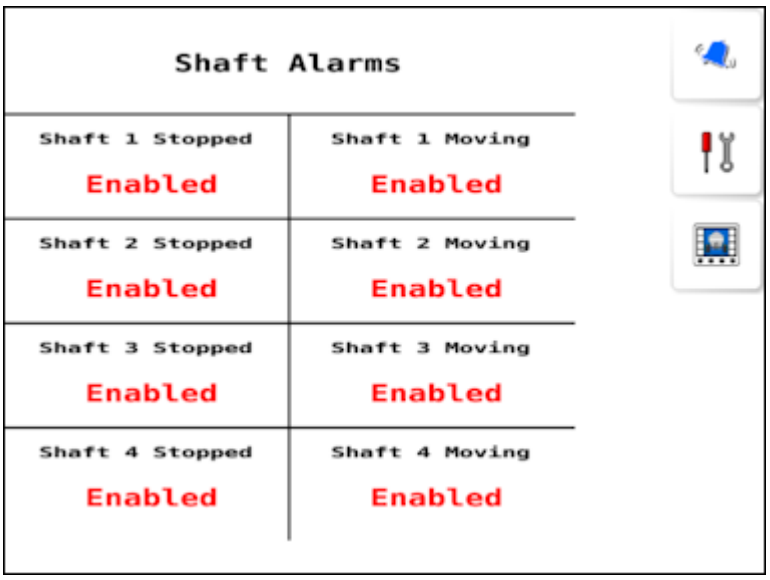
Configure the following alarms:

- **Tank # Motor Sensor**: Enables the tank motor sensor alarm.
- **Tank # Motor Jam**: Enables the tank motor jam alarm.

8.4. Setting up shaft alarms

A shaft alarm triggers if there is no signal as expected from the metering shaft sensor. Another common cause for a shaft alarm is if the sensor has moved. The sensors should be mounted so that the magnet passes the sensor with a clearance of approximately 2 to 3 mm.

1. Select **Settings Menu** / **Alarm Settings Menu** / **Shaft Alarms** .



2. Select **Shaft # Stopped** to enable the alarm. # denotes the tank number. The default setting is **Enabled** for shaft alarms.

   Note: If a drive chain or gear breaks, then a **Shaft # Stopped** alarm is triggered. The alarm persists until the problem is rectified.

   When enabled, the **Shaft # Moving** alarm triggers if there is an unexpected signal from the metering shaft sensor.

8.5. Setting up tank gear alarms

Gear alarms will trigger if the gear ratio value entered in the drive setup menu is different to the value calculated based on the shaft sensor and motor encoder.

1. Select **Settings Menu** / **Alarm Settings Menu** / **Tank Gear Alarms**.

2. Select **Tank Gear #** to enable the alarm. **#** denotes the tank number.

8.6. Setting up tank alarms

In each tank there is a sensor that triggers an alarm once the product level falls below the sensor. When product in the tank covers the tank sensor, the light on the back of the sensor is off.

1. Select **Settings Menu** / **Alarm Settings Menu** / **Tank Alarms** .

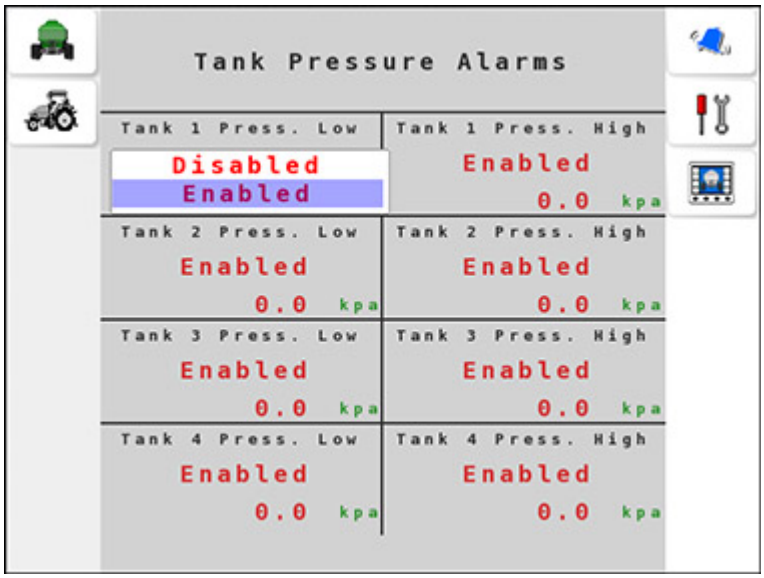
Configure the following alarms:

- **Tank # Low**: This alarm is triggered when the product level falls below the sensor. The alarm reappears in the alarm window until the tank is refilled with the product. **#** denotes the tank number.
- **Tank # Empty**: This alarm is triggered when the last grain is calculated to pass over the metering rollers. During seeding, the signal from the metering shaft sensor is used to decrease the bin weight based on the calibration factor.

8.7. Setting up tank pressure alarms

Pressure transducer sensors may be fitted for liquid or NH3 tanks to measure tank pressure. The tank pressure alarm can alert the operator if the tank pressure is too high or too low relative to the set alarm point.

1. Select **Settings Menu** / **Alarm Settings Menu** / **Tank Pressure Alarms** .



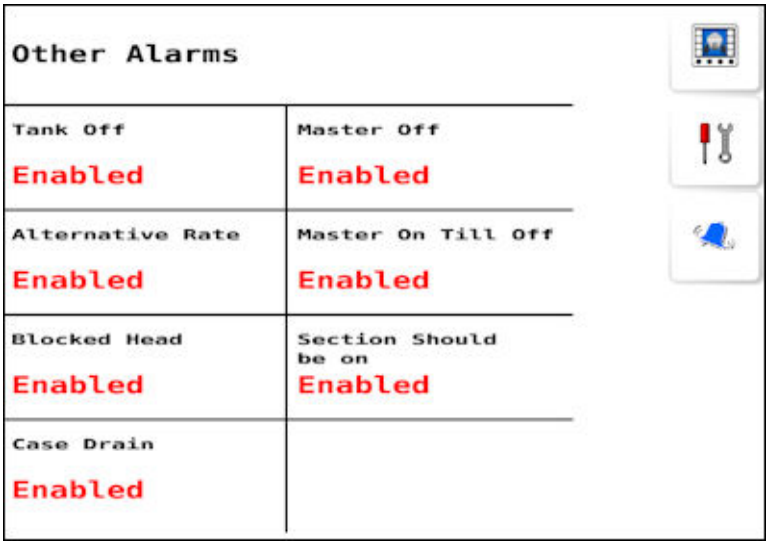
Configure the following alarms:

- **Tank # Press. Low**: The tank low pressure alarm is triggered when the tank pressure falls below the set alarm point. # denotes the tank number.
- **Tank # Press. High**: The tank high pressure alarm is triggered when the tank pressure exceeds the set alarm point.

8.8. Setting up other alarms

There are additional alarms that can be configured for the seeder operation.

1. Select **Settings Menu** / **Alarm Settings Menu** / **Other Alarms** .



Configure the following alarms:

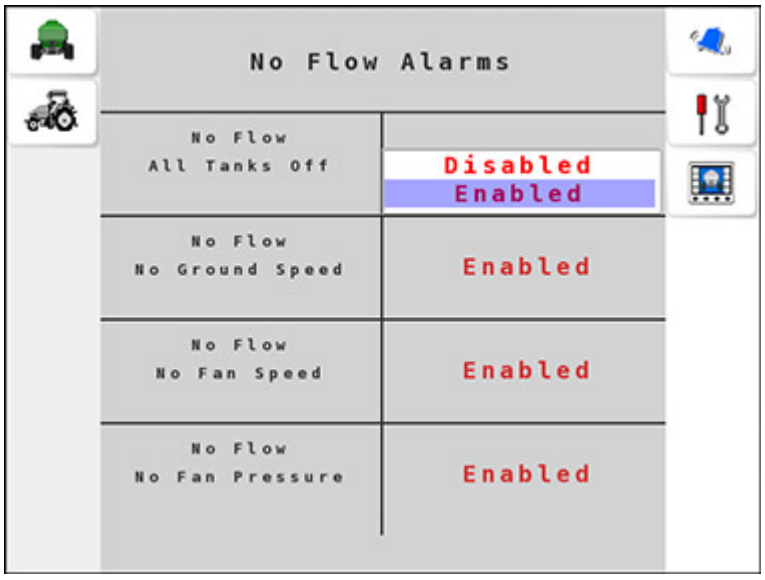
- **Tank Off**: Triggered when the master switch is on but the tanks are switched off. This alarm is intended as a warning only.
- **Master Off**: Triggered when a tank is switched on and the master switch is in the off position. This alarm is intended as a warning only.
- **Alternative Rate**: Triggered when the primary rate (preset rate 1) is not being applied. Either the secondary rate (preset rate 2) is active, or increment/decrement buttons are used to change the application rate.
- **Master On Till Off**: Triggered when the master switch is on but the seeder drill is in the air. (**Tillage Switch** must be enabled, see Setting up external options, page 18.)

- **Blocked Head**: Triggered if the mounted sensors detect one or more blocked heads.
- **Section Should Be On**: Triggered if a section was supposed to be on but it isn't. This can be seen only if the section sensing is enabled and the sensors configured.
- **Case Drain**: This alarm can be used if the seeder has a case drain alarm fitted to the fan motor. The alarm is triggered if the fan motor case drain pressure is too high (> 450 kPa).

8.9. Setting up no flow alarms

No flow alarms alert the operator if any critical function of the seeder is hindered.

1. Select **Settings Menu** / **Alarm Settings Menu** / **No Flow Alarms**.



Configure the following alarms:

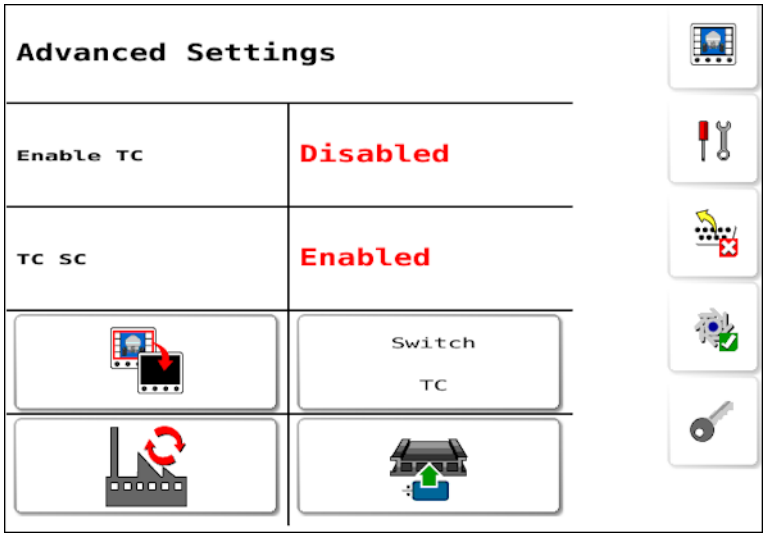
- **No Flow**: **All Tanks Off**: Triggered if there are no tanks switched on.
- **No Flow**: **No Ground Speed**: Triggered when no ground speed is detected.
- **No Flow**: **No Fan Speed**: Triggered when the fan speed drops below 100 rpm. Check if the fan has been engaged and/or check the fan speed sensor.
- **No Flow**: **No Fan Pressure**: This alarm indicates that there is no fan pressure detected.

Chapter 9 – Advanced Settings

Advanced settings provide the ability to enable the Task Controller (TC), reset the Apollo ECU to factory settings, switch ISOBUS UT displays and upgrade the firmware for the ECU.

9.1. Configuring advanced settings

1. Select **Settings Menu** / **Advanced Settings** .



- **Enable TC**: This enables or disables the task controller for the ECU.

  Note: Enabling the task controller provides additional functionality between the Apollo ECU and the display. The TC can be used to perform functions such as controlling the rates on each tank on the ECU using a VR map loaded on the display, logging the applied rates from the ECU on the display and mapping coverage when the seeder has been applying product. For this to work, the display must have a compatible TC enabled. Please refer to your display documentation for information on how to set your display up to support these features.
- **TC SC**: If **Enable TC** is **Enabled**, the tanks are turned on and off via section control (the TC sees the seeder ECU as a single section). Disabling **TC SC** prevents tanks being turned on and off via section control.

- **Switch display**  : Select to switch the ISOBUS UT display. Use this option if the vehicle has multiple ISOBUS UT terminals.
- **Factory reset**  : Select to perform a factory reset of the Apollo ECU. A warning message appears on screen to confirm the reset.

  Note: Factory reset deletes all the settings and data stored on the Apollo ECU. Use the factory reset option only when recommended by Topcon support or a service technician.
- **Switch TC**: Select to switch the ISOBUS task controller that will be used to control this ECU. Use this option if the vehicle has multiple ISOBUS task controllers.
- **Firmware upgrade**  : Select to upgrade the Apollo ECU firmware. Refer to Upgrading ECU firmware, page 80.
- **Serial port access**  : Select to enable serial port access to the Apollo ECU. This option is useful for service technicians and should be disabled for normal seeder operation.
- **Monitoring mode**  : Selecting places all drives into monitoring mode (disables rate control). Note: To re-enable rate control, drive type settings must be manually reconfigured. Refer to Setting up tanks, page 7.
- **License**  : Select to enable section control license.

Note: The Apollo ECU must be powered off to carry out any repair or maintenance.

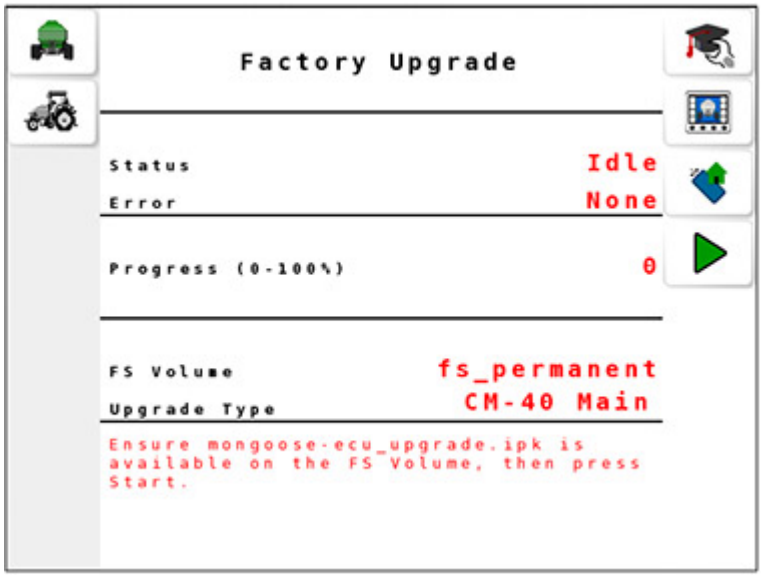
9.2. Upgrading ECU firmware

The Apollo ECU firmware can be upgraded from the **Advanced Settings** screen.

Note: Contact your Topcon dealer for the Apollo ECU firmware upgrade file/s. These should be placed in the root (top-level) directory of a USB flash drive.

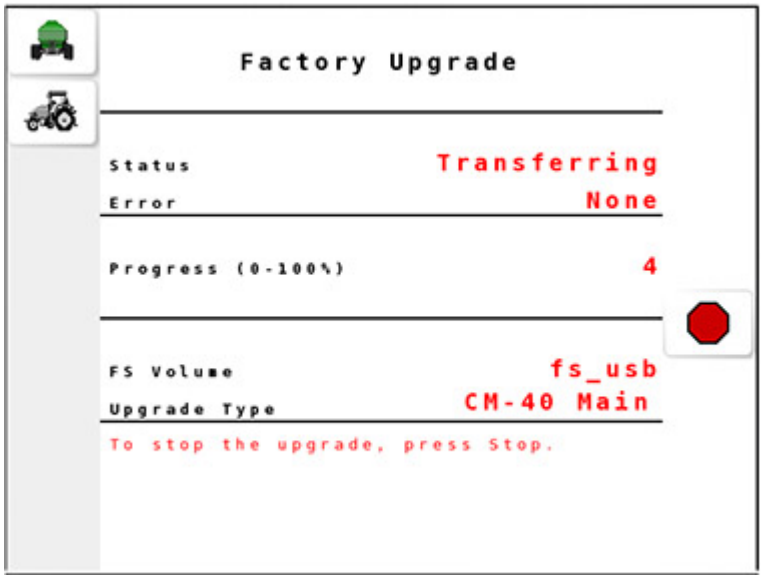
9.2.1. CM-40 Main ECU

1. Select **Settings Menu** / **Advanced Settings** / **Factory Upgrade** .
2. Ensure **CM-40 Main** is selected as the **Upgrade Type**.



3. Insert the USB flash drive into the terminal's USB port and select to read the drive.
4. If the USB flash drive contains a valid *.ipk file, select to start the upgrade.

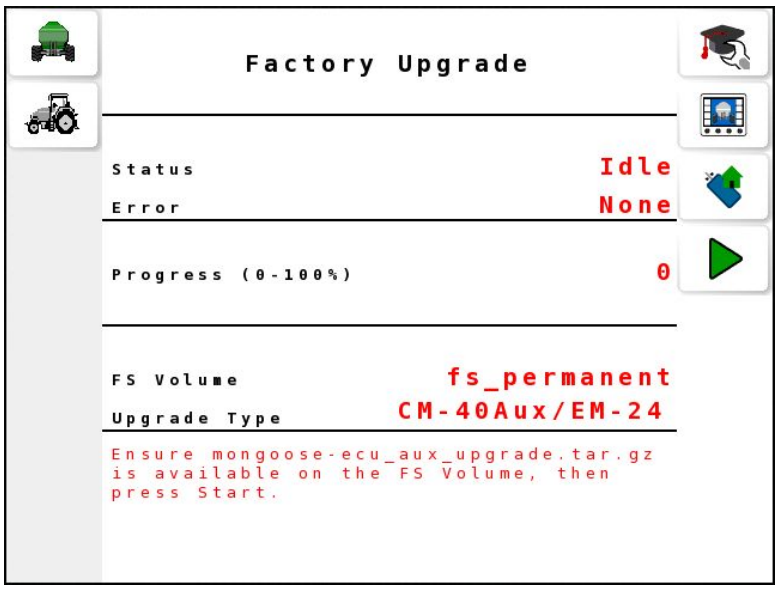
   The Progress indicator starts counting to 100 and the Status appears as **Transferring**.



Once the transfer is done, the status appears as **Complete** and progress reaches 100. The ECU will restart.

9.2.2. CM-40 Aux ECU / EM-24 ECU

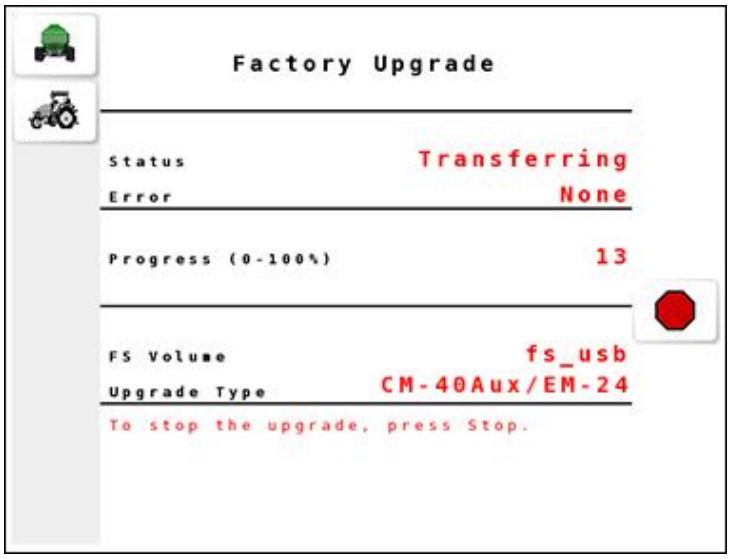
1. Select **Settings Menu** / **Advanced Settings** / **Factory Upgrade** .
2. Select **Upgrade Type** and select **CM-40 Aux / EM-24**.



3. Insert the USB flash drive into the terminal's USB port and select to read the drive.

4. If the USB flash drive contains a valid *.tar.gz file, select  to start the upgrade.

   The Progress indicator starts counting to 100 and the Status appears as **Transferring**.

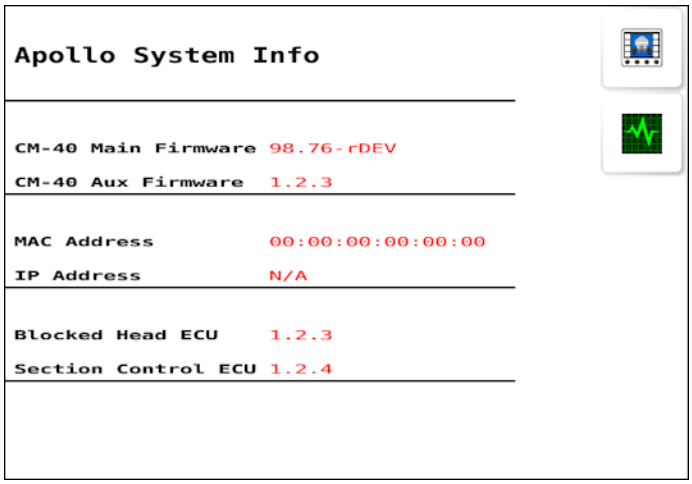


   Once the transfer is done, the status appears as **Complete** and progress reaches 100. The ECU will restart.

9.2.3. Verifying upgrade

1. To verify the upgraded ECU version, select  from the operation screen to open the **Diagnostics** screen.

2. Select  from the **Diagnostics** screen.



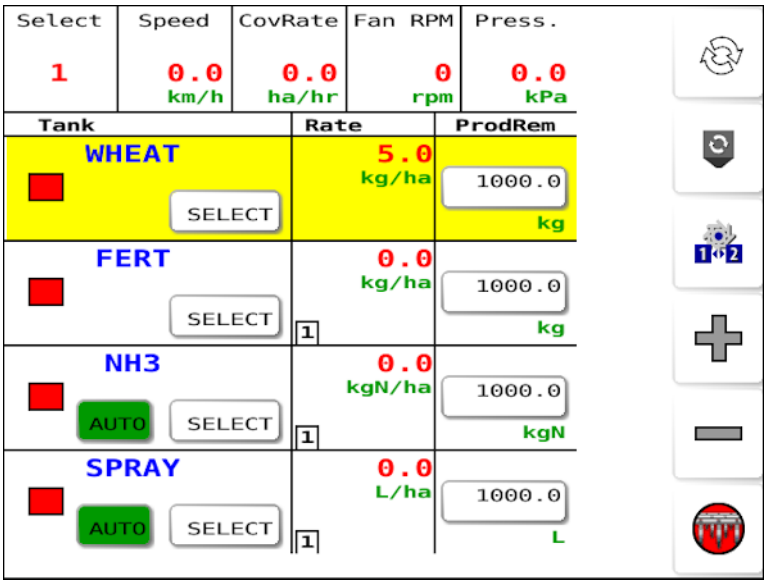
Chapter 10 – Seeder Operation

This chapter describes how to operate the Apollo ISOBUS UT seeder.

10.1. Selecting the seeder operation screen

1. Select  from the main **Universal Terminal** screen to open the Seeder screen.

Operation screen 1

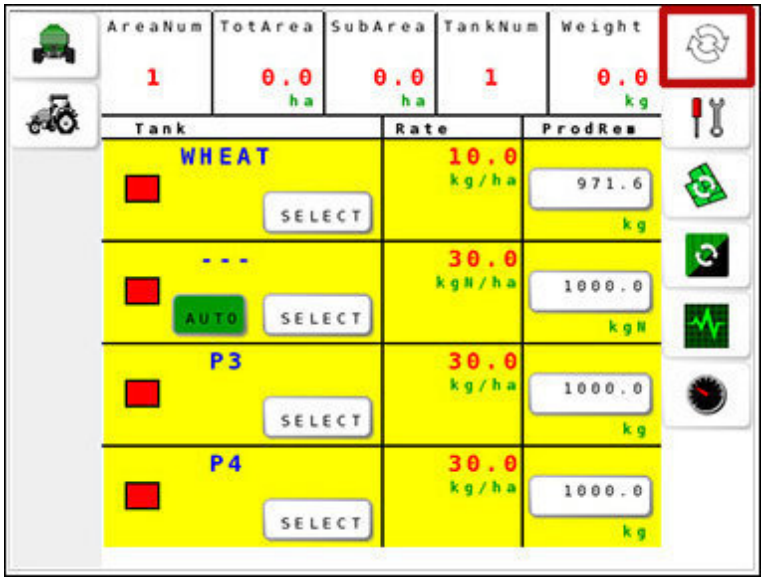


Icon	Description
	Used to select the required tank/s (the **Select** button in each tank may also be used). All tanks may be selected simultaneously. Tanks that do not have a product assigned may be selected using this method.
	The current speed of the vehicle/implement as calculated from the configured speed source.

Icon	Description
CovRate 0.0	The instantaneous coverage rate. Calculated by speed and width with at least one tank turned on. For example: an implement of 10 m width, moving at 10 km/hr gives a coverage rate of 10 hectares/hr.
Fan RPM 0	Fan 1 and/or 2 RPM (if enabled in Fan Settings screen)
Press. 0.0	Fan 1 and/or 2 Pressure (if enabled in Fan Settings screen)
	Cycles between operation screen 1, operation screen 2 and the section control operation screen (if section control is licensed and a section control boom has been assigned to a tank).
	Enable/disable the selected tank.
	Activate preset application rates. See Setting up products, page 45.
	Increase/decrease the application rate by set amount. See Setting up products, page 45.
	The master switch may be controlled via the operation screen if set to Virtual or Keypad/Virtual. See Setting up external options, page 18.

Icon	Description
AUTO MAN	The Auto / Man button is only available for liquid or NH3 tanks. Pressing the button toggles the tank between auto and manual modes. **Auto** is displayed when the tank is in auto mode. In this mode, the ECU actively controls the valve to achieve the required application rate. **Man** is displayed when the tank is in manual mode. In this mode, the ECU is not actively controlling the valve and the valve will be left in a fixed position, unless the operator uses the + or − soft keys to manually adjust it. This mode can be useful to allow the required pressure to be reached while the implement is stationary.

Operation screen 2



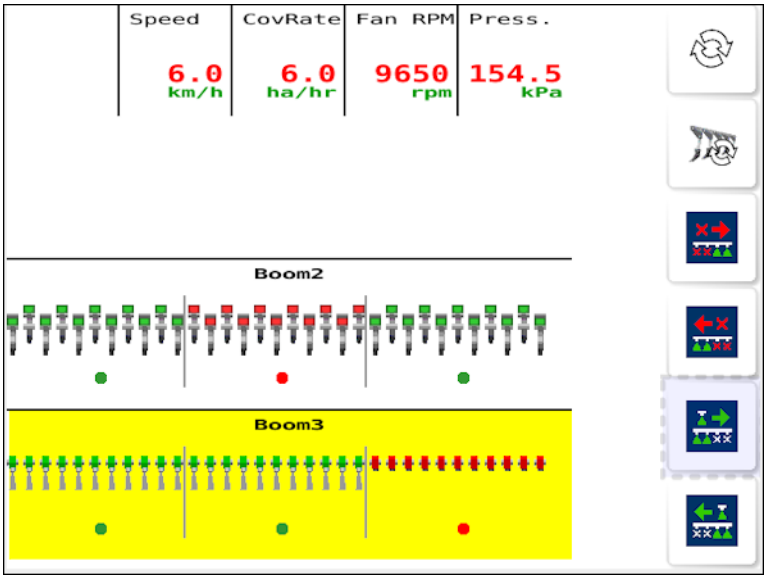
Icon	Description
AreaNum 1	Currently selected Area number for accumulating data.
TotArea 0.0	Total (cumulative) area covered. At least one tank must be turned on.

Icon	Description
SubArea 0.0	Cumulative area covered for the selected tank (see TankNum below) and area (see AreaNum above).
TankNum 1	Currently selected tank for displaying SubArea and Weight totals.
Weight 0.0	Total product output for the selected tank (TankNum) and area (AreaNum).
	Select the settings menu. See Settings menu, page 4.
	Reset the sub area counter. See Selecting and resetting area counters, page 89.
	Resets the total area. See Selecting and resetting area counters, page 89.
	Display the diagnostics screen. See Viewing diagnostics, page 90.
	Temporary manual speed. Used to perform tank calibration or to calculate application rates. Displays if the vehicle is stationary and a setting other than Manual is selected as the speed source. See Setting up speed, page 28. Selecting the icon toggles temporary manual speed  . Temporary manual speed is automatically cancelled when the vehicle starts moving.

Section control operation screen

Sections may be manually turned on and off. Sections that are on are shown as green and off are red.

Only booms containing more than one section are displayed.



 **Toggle boom**: Select the required boom (if more than one boom present).

 : Turns off the left most section of the selected boom.

 : Turns off the right most section of the selected boom.

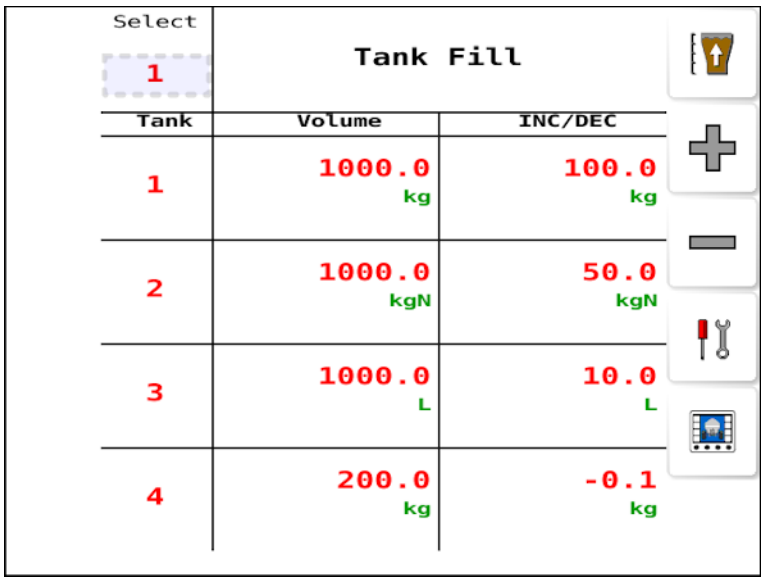
 : Turns on the left most section of the selected boom.

 : Turns on the right most section of the selected boom.

10.2. Selecting and filling tanks

1. Select 

to open **Tank Fill** options.

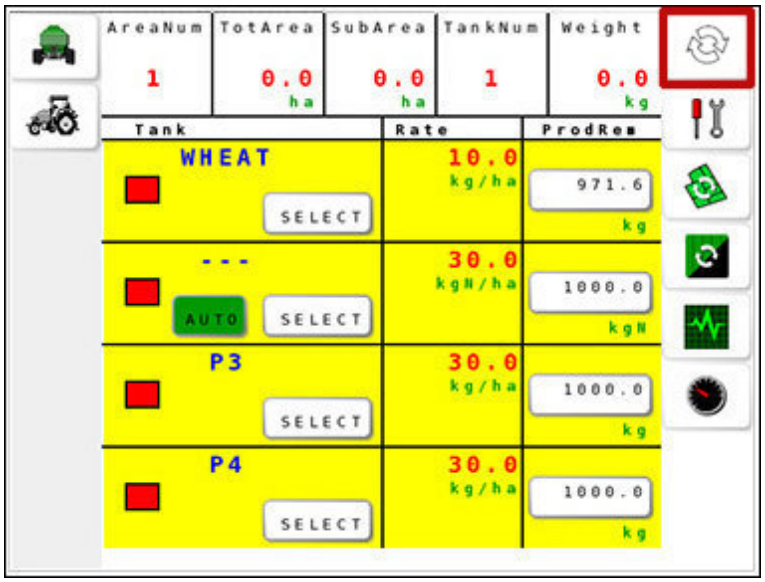


2. Press **Select** to select an individual or All tanks.
3. Select  to fill the selected tanks to their maximum capacity.
4. Select the number displayed in the Volume column to manually enter the volume that is in a tank/bin if that is known.
5. Enter a value in the INC/DEC column to assign an amount to the  and buttons. This feature may be helpful when adding bagged product (for example, certified canola.) Set the inc/dec value to the bag size, then press  each time you add a bag.
6. Select  to return to the operation screen.

10.3. Selecting and resetting area counters

Area counters are used with the seeder to record data such as treated area, total area, sub area, and product tank in use.

1. Select  to toggle between operation screen 1 and operation screen 2.



2. To assign the area number against which the data will be stored, select AreaNum 1 and select the required number.

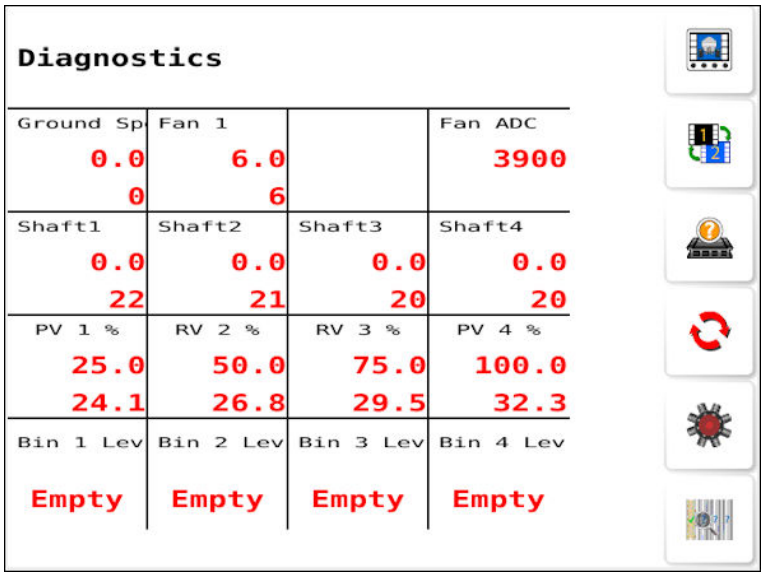
3. Select  to reset sub area. The area counter must be reset manually, or it continues to accumulate data.

4. Select  to reset total area. This option resets data for a tank, the selected area counter, or all area counters.

10.4. Viewing diagnostics

Apollo ISOBUS UT seeder provides a run time view of seeder operation through the diagnostics option.

1. Select operation screen 2 / **Diagnostics** .

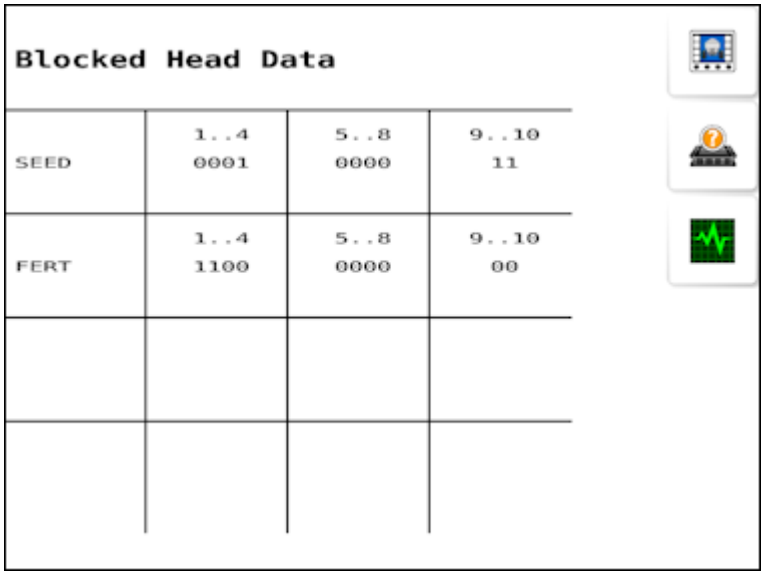


The diagnostics displays the time in milliseconds between pulses of the sensor as the top value and pulse count for this sensor at the bottom. For example, diagnostics for a fan display 

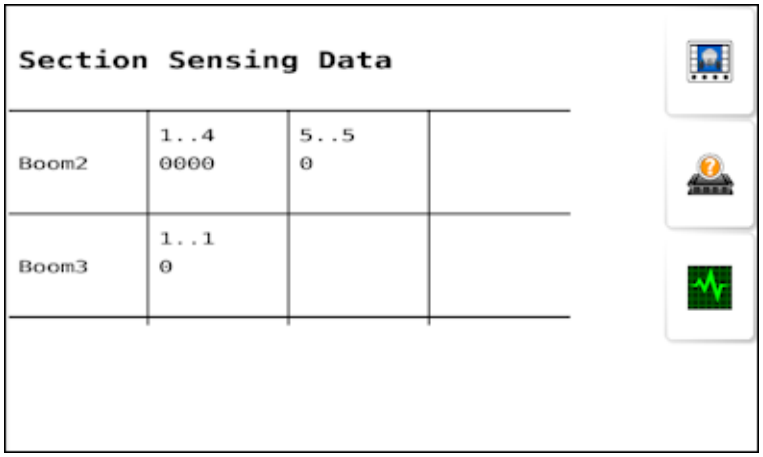
, where 33554.4 is the period in milliseconds and 1768 is the number of pulses since turning on the ECU or resetting the pulses displayed ( ).

- **Ground Spd**: Provides pulse count from the vehicle speed sensor.
- **Fan #**: Provides pulse count from the enabled fans.
- **Shaft #**: Provides pulse count from the tank shaft.
- **PV #%**: For proportional drives: the percentage of full power that the valve is currently being driven. For actuator drives: the current extension of the actuator.
- **RV #%**: N/A.
- **Bin # Lev**: Level sensor signal from the tanks.

- **Fan ADC**: Analog to Digital Converter for the fans.
-  : Displays ECU information.
-  : Displays if the ECU setup has any errors.
-  : Displays blocked head data. A value of 0 indicates no blockage and 1 indicates a blocked head.



-  **Section Sensing**: Displays the section sensor data. 0 indicates flow is detected and 1 indicates no flow.



The pulse count is reset to zero by selecting  .

2. Select  to return to the **Diagnostics** screen, and select  to return to the operation screen.

Chapter 11 – Record User Data

Use this table to record values set for the seeder. This data is useful in case of factory reset, upgrading the ECU, or for service and support purposes.

11.1. Recording user data

Setting	Value
Wheel factor	
Seeder width	
Calibration factor	Product 1 Name: Cal Factor:..... Product 2 Name: Cal Factor: Product 3 Name: Cal Factor: Product 4 Name: Cal Factor: Product 5 Name: Cal Factor: Product 6 Name: Cal Factor: Product 7 Name: Cal Factor: Product 8 Name: Cal Factor: Product 9 Name: Cal Factor: Product 10 Name: Cal Factor: Product 11 Name: Cal Factor: Product 12 Name: Cal Factor: Product 13 Name: Cal Factor: Product 14 Name: Cal Factor: Product 15 Name: Cal Factor: Product 16 Name: Cal Factor:
Pulses / revolution	

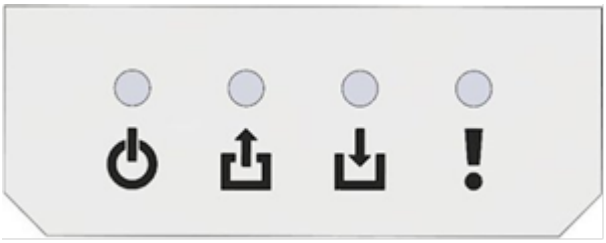
Setting	Value
Tank capacity	Tank 1: Tank 2: Tank 3: Tank 4:
Gear ratio	

Chapter 12 – 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.

12.1. Interpreting Apollo ECU LEDs



Power LED

Transmit LED

Receive LED

ECU Status LED

Note: If a fault occurs in the ECU, an error code may be displayed. Refer to Apollo ECU error codes, page 99.

12.1.1. 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
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

LED state	Power state
Flashing amber	ECU power on solenoid power off VCB solenoid power off sensor 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

12.1.2. 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.

12.1.3. 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 passive mode.
Red	No communication with master. CAN bus fault (bus off).

12.1.4. 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.

12.2. Apollo ECU error codes

12.2.1. Error levels

There are three different severity levels for errors and faults.

Severity level	Description
Error/fault	All control output will be stopped. Relays will turn off and actuators will power down.
Warning	Control output will continue for subsystems not affected by the fault. For example, if a sensor power supply experiences over current, the relays will not power down.
Information	Control output is not affected.

12.2.2. Error code signature

The error codes displayed in Sunrise or on the Universal Terminal will have the following signature:

IOGGPPDDEE

The meaning of each pair of digits is covered in the following sections.

Note: This is a hexadecimal number, base 16 arithmetic should be used.

12.2.3. CM-40 ECU error codes

EE - ECU error state

These two digits give an indication of which ECU subsystems have high severity errors/faults.

The specific error(s) in each subsystem, specified by EE, can be found by decoding the preceding digits (IOGGPPDD).

Not all high severity errors are included in the preceding digits, in this case faulty subsystems are only identified. IOGGPPDD can be zero (not displayed) in this case and only EE will have a value.

If any of the preceding digits are not zero, but the error state digits (EE) are zero, the fault identified by the preceding digits is only a warning or informational.

EE Value	Subsystem
01	Communication (CAN)
02	Drive (H-Bridges or relays)
04	Power
08	General
10	ECU input/output

DD - Drive errors

These digits identify individual faults in the drive subsystem.

DD Value	Subsystem
01	H-Bridge A (channel 1 and 2) over temperature warning
02	H-Bridge B (channel 3 and 4) over temperature warning
04	Hardware over current shutdown
08	Software over current shutdown
20	Drive shutdown
40	Relay over current fault

PP - Power error flags

These digits identify faults in the power subsystems.

PP Value	Subsystem
01	Solenoid power under voltage
02	Solenoid power over voltage or over current
04	Connector board solenoid power over voltage or over current
08	ECU power over voltage or over current

PP Value	Subsystem
10	12V sensor power over current
20	5V sensor power over current
40	Solenoid power MOSFET off
80	ECU power MOSFET off

GG - General flags

These digits give information or identify faults that affect the ECU but do not fit in any other subsystem or category.

GG Value	Subsystem
01	Transport/disabled mode active
02	ECU sleep active
04	Outputs disabled and software configuration cleared
08	ECU software configuration error

IO - ECU input/output flags

These digits identify faults in the ECU inputs and outputs.

IO Value	Subsystem
01	Input capture over frequency

12.2.4. EM-24 ECU error codes

EE - ECU error state

These digits have the same meaning as for the CM-40 ECU. If not zero, EE identifies subsystems with high severity faults. If zero the fault given by the preceding digits is only a warning or informational.

EE Value	Subsystem
01	Communication (CAN or SPI)
02	Drive output (relays)
04	Power

EE Value	Subsystem
08	General
10	ECU input/output

DD - Drive errors

These digits identify individual components with faults in the drive subsystem.

DD Value	Subsystem
40	Relay over current

PP - Power error flags

These digits identify faults in the power subsystems.

PP Value	Subsystem
01	Solenoid power under voltage
02	Solenoid power over voltage or over current
04	Connector board solenoid power over voltage or over current
08	ECU power over voltage or over current
10	5V sensor power over current
20	8V sensor power over current
40	12V sensor power over current
80	Solenoid power MOSFET off

GG - General flags

These digits give information or identify faults that affect the ECU but do not fit in any other subsystem or category.

GG Value	Subsystem
01	Transport/disabled mode active
04	Outputs disabled and software configuration cleared

GG Value	Subsystem
08	ECU software configuration error
10	No communication with auxiliary CPU (auxiliary CPU in boot loader mode)
20	Main and auxiliary CPU firmware mismatch

IO - ECU input/output flags

These digits identify faults in the ECU inputs and outputs.

IO Value	Subsystem
01	Input capture over frequency

12.2.5. Decoding error codes

These examples show how to decode the error codes using the signature.

Example 1

This example applies to both the CM-40 and EM-24.

IOGGPPDDEE = Error signature

0000010004 = Error displayed (**10004** is displayed in Sunrise)

The displayed error is split across three values in Universal Terminal mode, these should be joined.

Align the last digit of the displayed error with the last digit of the signature.

Note that leading zeros (green) are not displayed when using Sunrise and should be added.

Signature digits	Decoded error
EE = 04	The power subsystem has a high severity fault
DD = 00	The drive subsystem does not have any errors
PP = 01	Specific fault in this case is: Solenoid power under voltage

Signature digits	Decoded error
GG = 00	There are no general errors
IO = 00	There are no input or output errors

Example 2

This example applies to the CM-40 ECU only.

DDEE = Error signature (shortened for brevity).

0502 = Error displayed

Signature digits	Decoded error
EE = 02	The drive subsystem has a high severity error(s)
DD = 05 (= 01 + 04)	In this case there are multiple errors active, this is because the value 05 is not listed in the drive error table. The errors can be found by determining which numbers add up to the value displayed In this case 01 and 04 add up to 05 The errors are: 01 = H-Bridge A (channel 1 and 2) over temperature warning 04 = Hardware over current shutdown

Chapter 13 – Regulatory and Safety Warnings

Terms and Conditions

Note: Please read these Terms and Conditions carefully.

General

APPLICATION - You accept these Terms and Conditions by purchasing the product from Topcon Precision Agriculture (TPA) or from one of TPA's product dealers.

COPYRIGHT - All information contained in this manual is the intellectual property of, and copyrighted material of TPA. All rights are reserved. You may not use, access, copy, store, display, create derivative works of, sell, modify, publish, distribute, or allow any third parties access to, any graphics, content, information or data in this manual without TPA's express written consent and may only use such information for the care and operation of your product. The information and data in this manual are a valuable asset of TPA and are developed by the expenditure of considerable work, time and money, and are the result of original selection, coordination and arrangement by TPA.

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WEBSITE AND OTHER STATEMENTS - No statement contained at the website of TPA or any other Topcon Group company or in any other advertisements or TPA literature or made by an employee or independent contractor of TPA modifies these Terms and Conditions.

IMPORTANT: SAFETY - Improper use of the product can lead to death or injury to persons, damage to property and/or malfunction of the product. The product should only be repaired by authorized TPA service centers. You should closely review the safety warnings and directions as to the proper use of the product in this manual and at all times comply with the same.

Limited Warranty

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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In any event, TPA's liability to you or any other person for any claim, loss or damage (in contract, tort or on any other basis) will be limited (in TPA's option) to either (a) the replacement or repair of the product, or (b) payment of the cost of replacing or repairing the product.

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)

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

FCC Compliance Statement (Canada)

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

CE EMC Statement (European Community)

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

'C' Tick EMC Statement (Australia & New Zealand)

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

Type Approval and Safety Regulations

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

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

Radio and Television Interference

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

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

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

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

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

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

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

General Safety

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

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

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

In particular follow instructions presented as Safety Messages.

Safety Messages and Warnings

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

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

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

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

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

Safety Signs

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

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

Operator Safety

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

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

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

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

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

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

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

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

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

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

Exposure to Radio Frequency

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

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

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

Preparation for Operation

- Read and understand this manual and learn all of the controls before you use the equipment.
- Keep the manual with the equipment.
- If the equipment is moved to another vehicle, move the manual as well.
- Read the manual for the vehicle with which the equipment will be used and check that the vehicle has the correct equipment required by local regulations.
- Make sure you understand the speed, brakes, steering, stability, and load characteristics of the vehicle before you start.
- Check all controls in an area clear of people and obstacles before starting work.
- Identify possible hazards.

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

Disclaimer

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

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

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

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

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

Important Safety Information

Operator Alertness and Responsibility

The 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.

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.

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