



# **Seed Rate Controller Operators Manual**

Part Number A2678  
Rev. 1.41

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# Preface

This manual has been developed to provide you with information necessary to operate and maintain this Topcon Precision Agriculture (TPA) product. Proper service and use is important for the safe and reliable operation of the product. The sections provided in this manual include information necessary for the safe and correct operation, care, and troubleshooting of this product. The benefits this product provides can be greatly influenced by your knowledge of the products described in this manual.



## NOTICE

*Please read these Terms and Conditions carefully.*

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**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 the defective item at no charge, and ship it back to you. You must pay the shipping and

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Comments, suggestions, and questions about TPA products are welcomed. Contact your local TPA representative or a representative at our corporate facility.

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## **Service Information**

Service assistance can be provided by contacting your local TPA Authorised Dealer or by calling the Topcon Precision Agriculture Service Centre.

Phone: +61 8 8203 3300

Fax: +61 8 8203 3399

8.30am to 5pm (Adelaide Local Time), Monday through Friday.

## Manual Conventions

This Manual uses the following conventions:

**File>Exit** ~ Click/tap/press the **File** menu, then click/tap/press **Exit**.

**Enter** ~ Click/tap/press the button or key labelled **Enter**.



Supplementary information that can help you configure, maintain, or set up a system.



*Supplementary information that can have an effect on system operation, system performance, measurements & personal safety.*



***Notification that an action has the potential to adversely effect system operation, system performance, data integrity, or personal health.***



Notification that an action *will* result in systems damage, loss of data, loss of warranty, or personal injury.



**UNDER NO CIRCUMSTANCES SHOULD THIS ACTION BE PERFORMED.**

# Introduction

The X20 Console is a control system designed to complement an air seeder by controlling the rate of any product that is being sown or spread by the seeder.

The seed rate controller allows instant adjustment of the required rate of product (within the mechanical ability and physical limitations of the machine).

It does this using the ‘electric motors’, ‘linear actuators’ or ‘hydraulic valves’ to increase or decrease the output shaft speed, and in turn the metering shaft.

To achieve accurate rate control the controller requires the following information:

**Wheel:** Calibration factor to deliver accurate ground speed.

**Width:** actual working width of machine.

**Product CAL Factor:** Represents the actual amount of material that is metered by 1 revolution of the metering shaft.

**Encoder value (Actuator or Hydraulic):** This is the number of electrical pulses the controller receives for each metering shaft revolution.

OR

**Gear Ratio (Electric Motors):** The actual Gear ratio between the Electric motor and the metering shaft, taking into account the gear-box attached to the motor and any sprockets.

**NOTICE** NOTICE

*If any of the Factors are not correct proper monitoring and control cannot be achieved. Please take time to properly calculate this information. This will help you gain a clear understanding of how the system functions and ensure that your seeding operation is accurate and trouble free.*

As well as the control of the seeding application, the system also monitors the status of the seeder functions such as ground speed, hectares covered, fan speed, shaft speed, fan pressure and tank levels.

## **Seed Rate Controller Additional Features**

### **Liquid Drive (Optional)**

The X20 Seed Rate Controller is designed to also control a number of Liquid Channels. The tanks on the X20 air seeder can be selected to control liquid or control granular products.

The principles of liquid control are identical to a conventional spraying system with one main difference; only one section is used as opposed to multiple sections on some sprayers.

### **Variable Rate Control**

The X20 Console can be used for Region Based Prescription Variable Rate Control (VRC). The X20 Console comes preloaded and registered for Maplink VRC and Quickmap software packages. Maplink VRC can control up to 5 prescription maps simultaneously and log elevation automatically.

Quickmap creates and imports VRC prescription maps. Quickmap can import Shape files, GDX files (X20 Guidance files), VRC files created in 'Paddock Action Manager' (PAM) and Geo-referenced bitmaps.

# sing this Manual

Each Seed Rate Controller kit for will have its own installation manual. The installation manual will guide the operator through the complete installation of the hydraulics, Seed Rate Controller ECU, sensors and electrical harnesses.

To install the X20 console to the vehicle read the X20 Operators Manual (part number W106).

The following chapters in this manual will assist you in setting up and understanding the features of your Seed Rate Controller:

- Chapter 5 “Getting Started” explains starting the X20 console, checks the Seed Rate Controller software is registered and gives an overview of the Seed Rate Controller Working Screen
- Chapter 6 “Configuration” introduces the Options menu and the settings accessible from there to configure the Seed Rate Controller. The settings here need to be adjusted to suit your tractor system and the product you are sowing.
- Chapter 7 “Tank Setup and Calibration” explains how to calibrate and set up your tanks depending on the kind of drive system you are using and the product you are sowing.
- Chapter 8 “Main Screen Features” explains the functions of the buttons and indicators on the main interface of the X20 display
- Chapter 9 “Air Seeder Operations” explains how to operate the air seeder via the X20 console once the system has been configured and the tanks have been calibrated properly

- Chapter 10 “Lockout Feature” explains how to protect your configurations from accidental changes by locking out other users from accessing the Options menu.
- Chapter 11 “Functional Testing” explains how to perform functional tests and checks on the sensors, valves and switchbox of the seed rate controller
- Chapter 12 “Alarms” explains the meaning of the different kinds of alarm warnings and the reasons why they would occur during the operation of the seed rate controller

# **B**asic Concepts of the **Air Seeder**

The basic system consists of a X20 Console, Seed Rate Interface (InCab ECU), Tractor Loom, Implement Extension Loom, Chassis Extension Loom, Motor Drive Electronic Control Unit (MDECU), and the Tank Loom, sensors and mounting hardware is required, completing the system.

The X20 Console is mounted in the cabin of the tractor, with the 'Seedrate Interface' box (InCab ECU). The Seedrate Interface connects to the MDECU via the communication cable. The communication cable (consists of a Tractor, Implement and Chassis Extension Looms) are part of the power loom going to the MDECU.

There a drive looms going from the MDECU to each of the drives (electric motors, linear actuators or hydraulic valves) of each tank. The MDECU is mounted on the seeder, usually underneath or between the tanks, and contains the control circuitry to control the drives, fitted to each tank. The X20 Console can be configured to control granular or liquid products.

The system has been designed to operate 5 separate tanks, all of which can be calibrated independently, irrespective of the product in the tanks.

The X20 Console contains all of the data for the operation of the system, such as metering roller calibration, encoder values (or gear ratio), alarm points, tank volumes, application rates and other fixed data such as the seeder width and wheel circumference (wheel factor). The console also records area covered and operating time.

The MDECU communicates to the X20 Console via a communication link. The data received by these processors, applies the correct voltage to the drives (either electric motors, actuators or hydraulic drives) that are directly operated by the processors.

The data returned to the console includes the status of the system, alarms, and timing from the various sensors on the seeder.

The speed of the seeder is determined from the wheel sensor on one of the main wheels on the seeder, and is sent to the console for display and calculation of the feedback from the encoder wheel (actuators, hydraulics) or sensors in the electric motor; for the rate required. An alternative speed pickup connection is available on the 'TPA Seedrate Interface' on the plug marked 'Tractor Radar'.

A normal speed sensor mounted on the tractor can be connected at this point, or input from a Radar speed system may also be used.

The seeder width in the console should be the sowing width of the bar. If the circumference or width is inaccurate, the area calculations will also be inaccurate along with the application of the product.

Temporary changes in application rate of any tank product can be achieved by a single button press while seeding.

The rate increment of change is part of the initial product calibration. A manual operating speed needs to be entered into the console for correct operation, and while manual mode may not be anticipated, this value is required for calibration of each of the products.

# Getting Started

- Press and hold the green power button on the back of the X20 console for 3 seconds to turn on the X20 console
  - The operating system will boot



Figure 5-1. Warning Screen

- A warning screen will appear. This warning screen appears everytime the X20 Product Selection is run. **Read the content of the warning thoroughly** and Click (Tap) YES if you agree with the terms. (Selecting No will automatically shutdown your X20 console)



Figure 5-2. X20 Product Selection Screen

3. Click (Tap) the **STOP** button (Figure 5-2) when the *X20 Product Selection* screen is displayed
4. Click (Tap) the **Seed Rate Controller** window (Figure 5-2)
5. Click (Tap) the **START** button (Figure 5-2)
  - The Seed Rate Controller software will now be activated and the working screen will be displayed (Figure 5-3)



Figure 5-3. Seed Rate Controller Working Screen

## Registration and Seed Rate Controller Software Version

The Seed Rate Controller screen will be displayed, with the Seed Rate Controller Menu on the right side.

1. Click (Tap) the **Topcon** icon, an **About Seed Rate Controller** window will be displayed (Figure 5-4)



**Figure 5-4. About Seed Rate Controller Window**

The **About Topcon Seed Rate Controller** window (Figure 5-4) displays:

- The Seed Rate Controller software version number. A Topcon Service person may request this number
  - The Seed Rate Controller ECU version number (this is only displayed when the X20 console is connected to the Seed Rate Controller ECU)
  - Whether or not the Seed Rate Controller software is registered or unregistered
2. If the Seed Rate Controller software is unregistered, select the **Register** button (Figure 5-4) and contact your Topcon dealer.

The **Enable Lockout** button (Figure 5-4) is explained in Chapter 10

## Overview of Functions on Working Screen

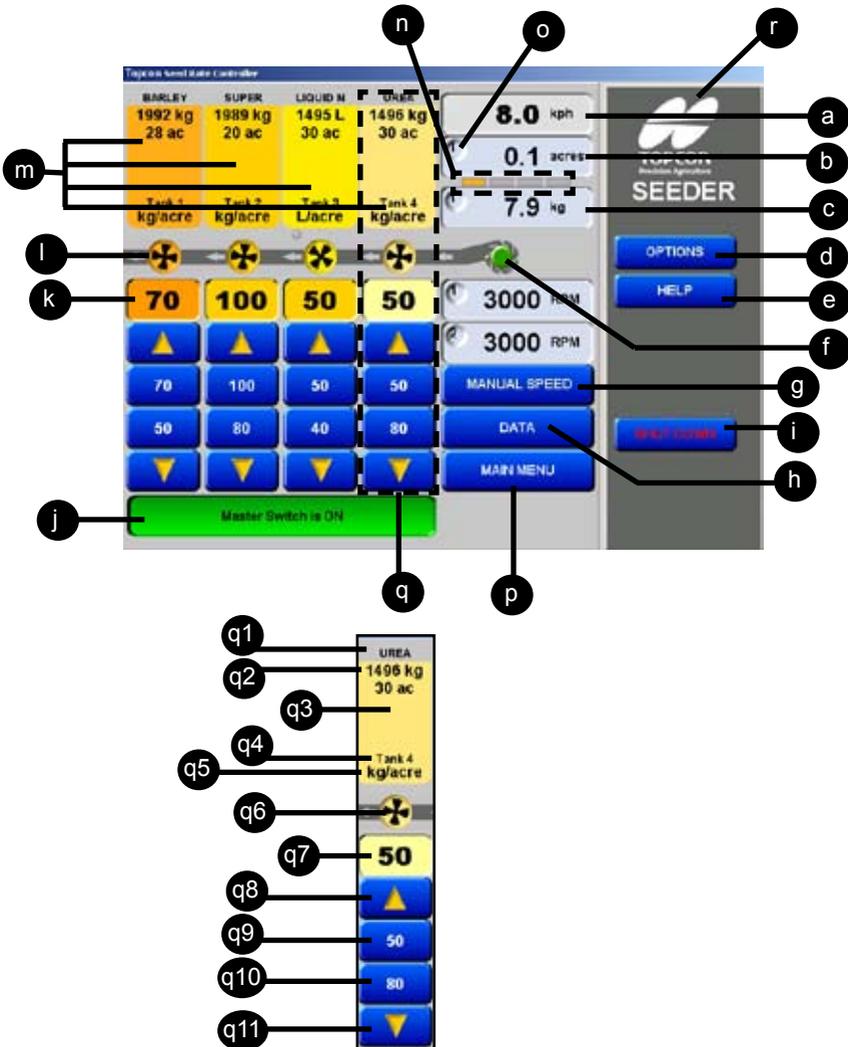


Figure 5-5. Seed Rate Controller Working Screen Overview

<b>Label</b>	<b>Description</b>
<b>a</b>	Ground Speed
<b>b</b>	Displays the Total of Area covered for the tank highlighted as displayed by the tank indicator
<b>c</b>	Displays the Total of Product metered for the tank highlighted as displayed by the tank indicator
<b>d</b>	Select 'OPTIONS' button to access the 'OPTIONS' window. The 'OPTIONS' window is where the Seeder settings can be entered.
<b>e</b>	Displays the 'On Screen' help
<b>f</b>	Shows if fan is ON/OFF
<b>g</b>	Enables Manual Speed
<b>h</b>	Activates the right hand data screen
<b>i</b>	Selecting the 'SHUTDOWN' button; returns the operator to the 'Windows Desktop'
<b>j</b>	Turns all seed/Fertilizer rollers ON or OFF
<b>k</b>	Actual rate being applied
<b>l</b>	Tank switches ON/OFF
<b>m</b>	Tank display icons
<b>n</b>	Tank indicators
<b>o</b>	Sub-area number
<b>p</b>	Displays the main menu on the right hand side
<b>q</b>	<b>1</b> Displays product being applied for the tank
	<b>2</b> Displays numerical weight/volume of product left in the tank
	<b>3</b> Displays graphical weight/volume of product left in the tank
	<b>4</b> Displays tank number
	<b>5</b> Displays 'Application Rate' units
	<b>6</b> Tank 3 Switch ON/OFF
	<b>7</b> Current application rate
	<b>8</b> Increase application rate
	<b>9</b> Preset Rate 1
	<b>10</b> Preset Rate 2
	<b>11</b> Decrease application rate
<b>r</b>	Topcon Precision Ag logo

- **Tank Display Area** - Displays the four tanks starting with Tank 1 on the far left to Tank 4 on the far right. The Tank Display Area shows how many tanks have been selected from the *Seeder tab* under the *Options menu*. The Tank Display Area shows:
  - The Product Name.
  - Weight/Volume of product remaining in tank.
  - Weight/Volume of product remaining in tank, shown graphically.
  - Tank Number
  - Displays the units the tank is using.
  - Displays whether the tank status is ON or OFF. If the tank is 'greyed' out the tank is switched OFF; if the tank is highlighted with a colour then the tank switch is ON.
- **Application Rate**- Displays the application rate of each tank, each tank displays the actual sowing rate selected for each tank and the actual sowing rate being applied. If the application rate for the tank is 'greyed out', then this is displaying the selected rate. If the application rate for the tank is 'highlighted', then this is displaying the actual sowing rate being applied.
- **Sub-Area Number**- Displays a number between 0 and 9, the number represents what Sub Area Number is being applied at the moment.
- **Sub-Area** - Displays the total of area covered for the selected Sub Area Number and for the tank highlighted . As displayed by the Tank Indicator.
- **Sub-area weight** - Displays the total of weight/volume applied for the selected Sub Area Number and for the tank highlighted . As displayed by the Tank Indicator.

- **Tank Indicators** - Displays which tank the ‘Sub Area’ and ‘Sub Area Weight’ readouts are being displayed. To change the tank indicator select either the ‘Sub Area’ and ‘Sub Area Weight’ readouts and the tank indicator will move and the readouts will display the area covered and weight of product dispensed for the highlighted tank.
- **Speed**- Displays the speed of the air seeder from a wheel sensor mounted on the air seeder or other external sources such as a tractor radar
- **Fan Pressure**- Displays the static air pressure as picked up from the Fan Pressure sensor mounted on the manifold near the fan
- **Fan Speed**- The Fan Speed window displays the actual fan speed in rpm
- **Alarm Window**- The Alarm window displays all the current warning messages. If there is more than one warning then the warnings will cycle through each warning, then the next alarm warning will be displayed.

## Main Menu



**Figure 5-5. Main Menu**

When the **Topcon** logo is Clicked (Tapped) the *About Topcon Seed Rate Controller* window appears displaying the:

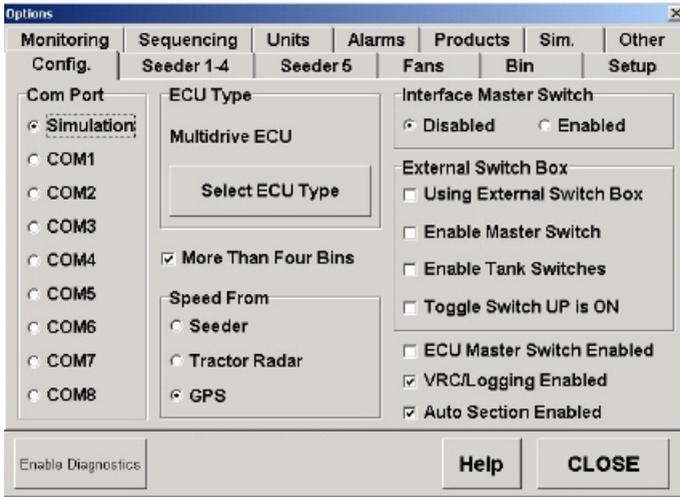
- **Software** Version
- **Register** Version
- **Lockout** button

The **OPTIONS** button accesses the *Options Menu* (refer to **Configuration** in Chapter 6). The *Options Menu* are used to setup and calibrate the Seed Rate Controller.

The **HELP** button accesses the help screen.

The **SHUTDOWN** button returns the operator to the Windows Desktop.

# Configuration



**Figure 6-1. Options window**

1. Click (Tap) the **OPTIONS** button from the Main Menu on the right of the Seed Rate Controller Working screen and the **Options Menu** as shown in Figure 6-1 will appear.

In the **Options Menu**, you will be able to configure the software according to your required specifications.

## Configuration

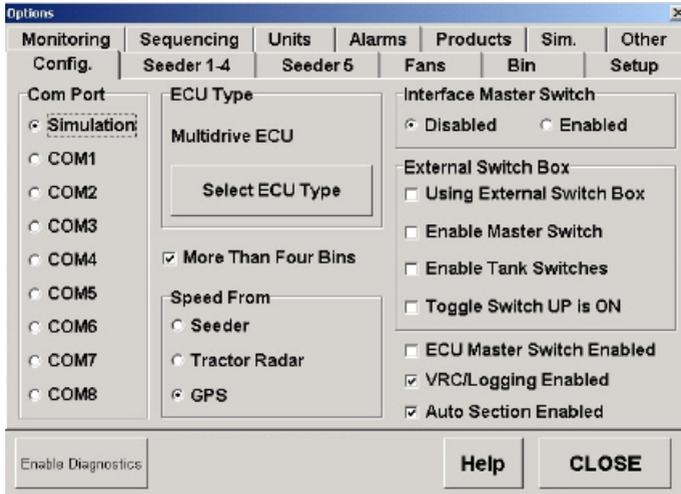


Figure 6-2. Configuration tab

### COM PORT

Select which Communications Port (Com Port) the 9 pin serial cable from the 'X20 Seedrate Interface' is connected to. Usually Com Port 2 or 3 are selected. COM Port 1 is usually reserved for the X20 Guidance GPS or DGPS receiver.



### NOTICE

*If any Master or Tank switches are enabled in this section then X20 touch screen Master or Tank functions become disabled*

### Interface Master Switch

Select the 'Enabled' option if connecting an A601 'Remote Master Switch' to the Tractor Loom to the '3 pin Weather-pak' connector marked 'Master'. Select 'Disabled' if not using a remote master switch.

## External Switch Box

If using an 'X20 Seeder Interface Switch Box' (A1267), which plugs into the "X20 Seedrate Interface" marked "Switch Box" select the three check boxes:

- Using External Switch Box
- Enable Master Switch
- Enable Tank Switches

When the 'Master Switch' and 'Tank Switches' are selected in this section, the equivalent X20 screen features will become disabled.

By default down is ON. If "Toggle Switch UP is ON" box is selected, then all switches (Master and Tank Switches) on the 'X20 Seeder Interface Switch Box' will change to "Up is ON".

## ECU Type

The 'ECU Type' window shows the current 'ECU Type' selected. By default this is 'Multidrive ECU'. To change the 'ECU Type' press the 'Select ECU Type' button. Another window will appear 'Select ECU Type'. Select one option from the following.

- Motor Drive 3 ch
- Motor Drive 2/4 ch
- Actuator 2/4 ch
- Multidrive ECU

Select 'Motor Drive 3 ch' if your 'ECU Type' has 'Satellite Commander' typed on the box and the '3 Drive channels' come out the right-hand side of the box, this type drives electric motors only.

Select 'Motor Drive 2/4 ch' if your 'ECU Type' has 'Satellite Commander' typed on the box and has the either 2 or 4 Drive plugs located on the top of the box. This type drives electric motors only and come in either '2 Channel (Drives) or 4 Channel (Drives).

Select 'Actuator 2/4 ch' if your 'ECU Type' has 'Satellite Commander' typed on the box and has the either 2 or 4 Drive plugs located on the top of the box. This type drives Linear Actuators only and come in either '2 Channel (Drives) or 4 Channel (Drives).

Select 'Multidrive ECU' if your 'ECU Type' has either 'Universal Electronic Control Unit' or 'Multidrive Electronic Control Unit' typed on the box. This Multidrive ECU can control 'Electric Motors', Linear Actuators, Liquid and Proportional Hydraulics.



### NOTICE

*If 'Motor Drive 3 ch' or 'Motor Drive 2/4 ch' is selected then only electric motors can be selected from the 'Tank' page; all other options are greyed out and inaccessible. On the 'Seeder' page 'Granular' is selected and all other options are greyed out and inaccessible.*

If 'Actuator 2/4 ch' is selected then only 'Actuators' can be selected from the 'Tank' page; all other options are greyed out and inaccessible. On the 'Seeder' page 'Granular' is selected and all other options are greyed out and inaccessible.

If 'Multidrive ECU' is selected then all options in the X20 Seeder software become available.

## More Than Four Tanks

Select this option if there is a 5th tank connected to the air seeder. To select this option the 'Multidrive ECU' must be fitted to the air seeder and selected as the ECU Type.

To control the 5th Tank one of the following Mini-ECU kits will be required:

- 1a. A2189 Mini-ECU
- 1b. A2245 Power/comms between ECU and MDECU. Dump, Reg and Flow outputs.

OR

- 2a. A2189 Mini-ECU
- 2b. A2251-Power/comms between ECU and MDECU.
- 2c. A2251- Liquid Harness Loom. The A1581 Hydraulic solenoid function not available on the A1581 loom.

The 5th tank can be used to control any one of the following at a time:

- A 'Granular' product using hydraulic regulator valve control.
- A 'Liquid' product using regulator valve control.
- A NH<sub>3</sub>' product using regulator valve control.

If selected an extra page will be displayed next to the 'Seeder 1-4' tab called 'Seeder 5'.

## **Speed From**

Select “Wheel Sensor” if a ground speed sensor is connected to the plug marked “Ground” on the Sensor Loom connected to an “ECU Type’ located on the air seeder cart.

Select “Tractor Radar” if connecting a Tractor radar. This plugs into the “X20 Seedrate Interface”, 3 pin weather pak plug marked “Tractor Radar”.

Select GPS if the speed is from a DGPS or GPS receiver. X20 Guidance or Maplink VRC has to be used in conjunction with the X20 Seeder control, for this option to be selected.

## **Auto Section Enabled**

Select ‘Auto Section Enabled’, (tick in the box) to enable ‘Auto Section Control’ with the X20 Guidance.

The ‘Auto Section Enabled’ should only be enabled when a DGPS is used in conjunction with X20 Guidance. This feature will automatically Start/Stop the air seeder, from overlapping or underlapping previously applied areas. ( Full swath width only )

The ASC option in the X20 Guidance must also be selected.

Note: If the ‘Auto Section Enabled’ option is selected then the ‘On Time’, ‘Off Time’ and ‘Coverage Map Offset’ values must be entered on the ‘Sequencing’ page.

## **VRC/Log Enabled**

Select this box if Maplink (Variable Rate Control) is being used with the X20 SeedRate controller with a DGPS or GPS. Maplink VRC is used for Variable Rate Applications and Logging of air seeder rates being applied.

## ECU Master Switch Enabled

If a 'Remote Master Switch' is connected to a plug marked 'Master' on the 'Chassis Extension Loom', then select 'ECU Master Switch'. If this feature is to be used a weather proof switch will be attached to the air seeder bar (not supplied by TPA), therefore when the air seeder bar is raised, it switches the 'Master' OFF; when the air seeder bar is lowered the 'Master' is switched ON.



### *NOTICE*

*Not all 'Chassis Extension Looms' have this feature.*

## Seeder 1-4

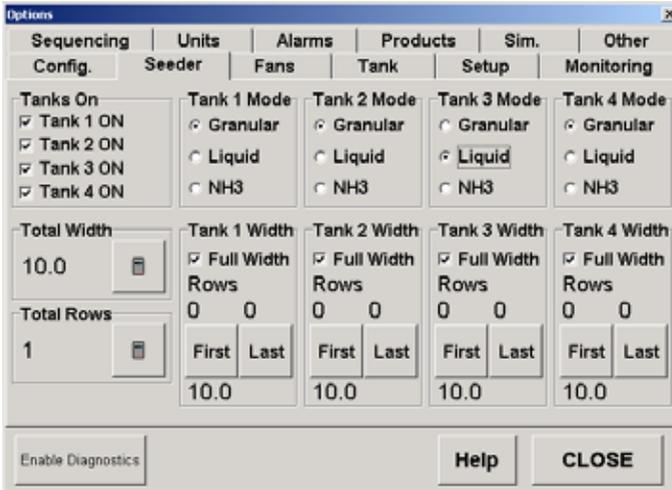


Figure 6-3. Seeder 1-4 tab

### Tanks On

Select how many Tanks you wish to control.

### Tank 1 Mode (Multidrive ECU)

Select the products that each Tank (1,2,3 or 4) will be distributing, either Granular, Liquid or NH3.



### NOTICE

If pressure is required for Liquid mode then channels 3 or 4 should be selected for Liquid. This selects the right units for the product being metered.

If 'ECU Type', 'Motor Drive 3 ch', Motor Drive 2/4 ch' or 'Actuator 2/4 ch' was selected then the 'Liquid' and 'NH3' will be greyed out and not accessible.

## Total Width

Effective Air Seeder working width.

## Tank (1,2,3 or 4) Width

Total Rows and Tank Widths are for planters and not for air seeders at this time. DO NOT alter these settings.

## Seeder 5 (If selected) (Multidrive Only)

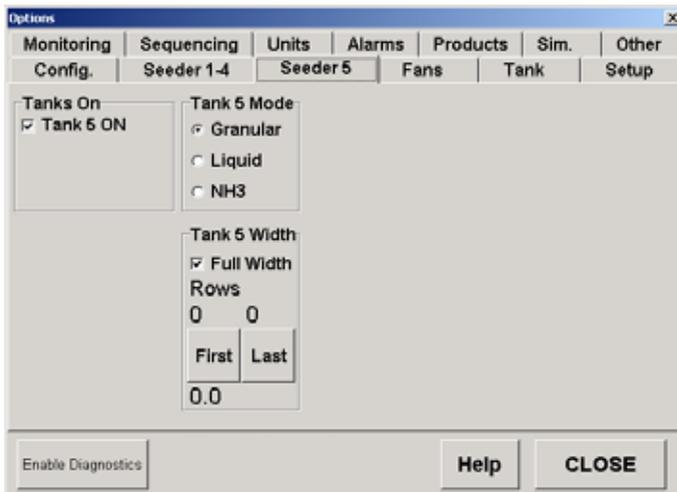


Figure 6-4. Seeder 6 tab

## Tanks On

Select 'Tanks On' if connecting a 5th tank to the air seeder. When selected will display extra windows are displayed as shown above.

## Tank 5 Mode

Select the product that the 5th Tank will be distributing, either Granular, Liquid or NH3. This selects the right units for the product being metered.

## Tank 5 Width

Tank Widths are for planters and not for air seeders at this time.  
DO NOT alter these settings, if setting up for an air seeder.

## Fans

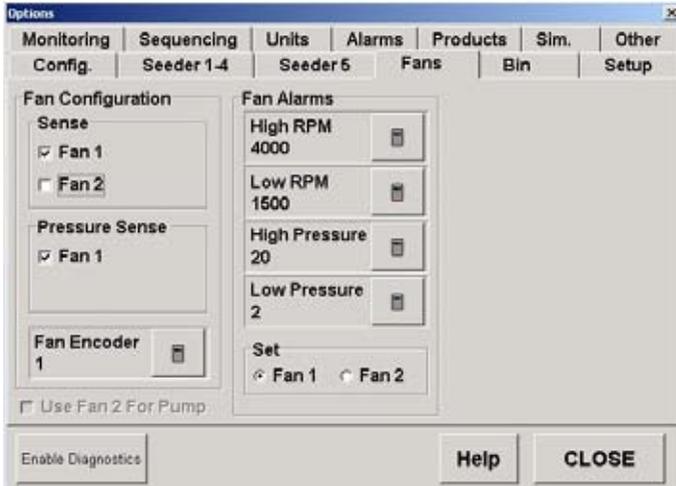


Figure 6-5. Fans tab

## Fan Configuration

### Sense

This selects the number of fans speed sensors that are being monitored. If no fans are fitted to the sensor loom then leave both 'Fan 1' and 'Fan 2' boxes unticked. If one fan is connected to the sensor loom then tick the 'Fan 1' box. If the sensor loom supports 2 Fan speed inputs and are both connected to the sensor loom, then tick both 'Fan 1' and 'Fan 2' boxes.

## **Pressure Sensor**

This selects the number of fan pressure sensors connected to the sensor loom. If no fans are fitted to the sensor loom then leave both 'Fan 1' and 'Fan 2' boxes unticked. If one fan pressure is connected to the sensor loom then tick the 'Fan 1' box. If the sensor loom supports 2 Fan pressure input.

## **Fan Alarms**

This window allows the operator to set the Fan speed alarms and Fan pressure alarms for each fan. To set the alarms for 'Fan 1' select 'Fan 1' in the 'Set' window.

Then select on the calculator icon next to the corresponding alarm and enter in the High RPM and Low RPM values for 'Fan 1' Then select on the calculator icon next to the corresponding alarm and enter in the High Pressure and Low Pressure alarm values for 'Fan 1'. To set the alarms for the 2nd Fan select 'Fan 2' from the 'Set' window.

Now enter in the Fan alarms for Fan speed and Fan Pressure for the second fan. To view the alarms for each fan then select either 'Fan 1' or 'Fan 2' from the 'Set' window and the corresponding alarms will be displayed for each fan.

## **Fan Encoder**

This option selects the name of pickup points for the fan speed sensor. Most air seeders have only one pickup point. If there is more than one then select the calculator icon and enter the number of pickup points for each fan sensor.

## **'Use Fan 2 For Pump'**

Use this option if using one of the drives as a Liquid channel.

## Tank

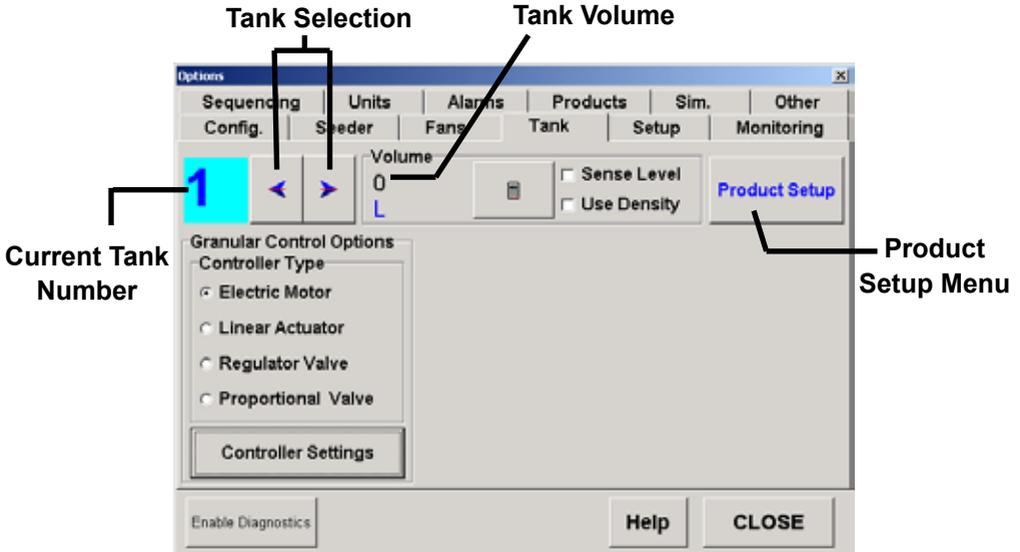


Figure 6-6. Tank tab

The 'Tank' page allows the operator to select what type of controller is controlling each Tank. I.e. 'Electric Motor'; 'Linear Actuator'; 'Regulator Valve'; and 'Proportional Valve'.

If Liquid or NH<sub>3</sub> was selected for one of the 'Tank Modes' (in Seeder 1-4 or Seeder5 pages) then the 'Granular Control Options' would not be displayed for the Tanks selected for Liquid or NH<sub>3</sub>.

Instead a 'Liquid/NH<sub>3</sub> Control Options' window would appear to the right, allowing the setup of a Liquid/NH<sub>3</sub> channel. See Section 5.5 for the setup options for a Liquid/NH<sub>3</sub> channel, for selected tanks.

Select a Tank Number by using the arrows, the current tank number selected will be displayed. Then select what type of controller is being used for the selected tank. If selecting:

- Electric Motor
- Linear Actuator
- Regulator Valve
- Proportional Valve

Then select the ‘Controller Settings’ button and go to the appropriate section to enter in the setup details for the selected tank.

### **Volume**

A volume for the selected tank can entered here especially if using density to fill the tanks.

### **Sense Level**

If a Tank Level sensor is fitted to the selected tank then select the ‘Sense Level’ option by placing a tick in the box.

### **Use Density**

Select this option if using density to fill the selected tank. This enables a density value to be entered in the ‘Product Setup’ window.



### **NOTICE**

*‘Use Density’ is not displayed when Liquid or NH3 is selected for the tank.*

## Product Setup

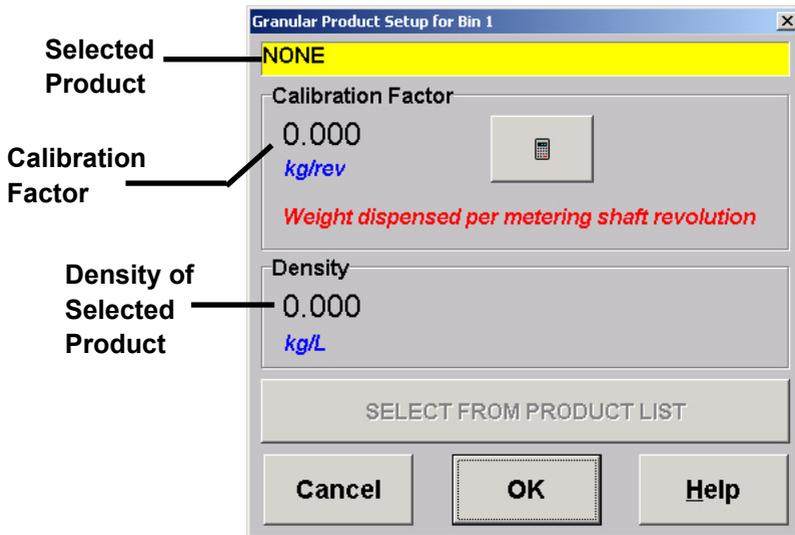


Figure 6-7. Product setup window

Select on the 'Product Setup' button to display the 'Product Setup' screen.

The above screen shows what the screen would look like when no products have been setup. See Section 11 (Products) to setup the products going to be used by the air seeder.

The 'SELECT FROM PRODUCT LIST' button is 'greyed' out because there are no products setup. See Section 11 (Products).

The 'Density' window is only displayed when 'Use Density' is selected on 'Tank' page.

Now select another Tank using the arrows.

1. Select the Controller type for the tank.
2. Select the Controller Settings button to setup the controller selected.
3. Enter a Volume for the selected tank.
4. Select whether a tank level sensor is fitted to the select tank.
5. Select whether the selected tank is going to use density to fill the tank.
6. Select the 'Product Setup' button when the products have entered in the 'Products' page see section 11.

Repeat the above procedure for the number of tanks that need to be setup.

## Electric Motor Setup

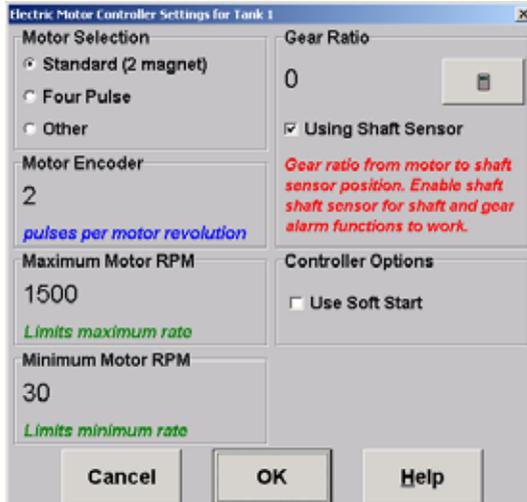


Figure 6-8. Electric motor setup window

## **Motor Selection**

By default most motors are 2 pulse motors. A 2 pulse motor means in the internal shaft of the electric motor there are 2 magnets. A 4 pulse motor has 4 magnets. Select Four pulse only if four pulse motors were supplied with the air seeder.

If 'Standard (2 magnet)' is selected then '2' will be displayed in the 'Motor Encoder' window. Also a Maximum of 1500 rpm and Minimum of 30 rpm is set for the motor.

If 'Four Pulse' is selected then '4' will be displayed in the 'Motor Encoder' window. Also a Maximum of 2000 rpm and Minimum of 30 rpm is set for the motor.

If 'Other' is selected then calculator icon's will be displayed in the 'Motor Encoder', Maximum Motor RPM and Minimum Motor RPM windows allowing different values to be entered. See motor specifications to make sure the correct values are being entered.

## **Gear Ratio**

Enter in the Gear Ratio for the selected tank. The gear ratio has to take into account the gear box fitted to the motor and any reduction gears used between the motor and the metering shaft.

Select 'Using Shaft Sensor' if a shaft sensor is fitted to the selected tank. Enable shaft sensor for shaft and gear alarm functions to work.

## **Controller Options**

Select if the electric motors require a soft startup.

## Linear Actuator Setup

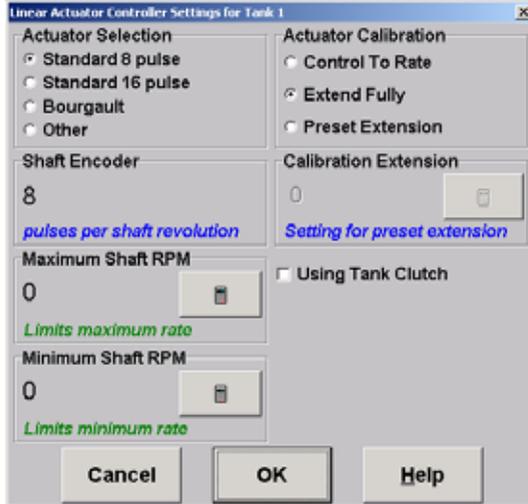


Figure 6-9. Linear actuator setup window

### Actuator Selection

On the metering shaft there will be an encoder wheel, count the number of magnets or teeth depending on the type of shaft sensor being used.

Select the correct option for the selected tank. The number of pulses for each metering shaft revolution is displayed in the Shaft Encoder window.

Select Bourgault if fitting to a Bourgault air seeder.

Select 'Other' if your selection isn't listed. This will enable a calculator in the Shaft Encoder window to enter in a value.

## **Maximum and Minimum Shaft RPM**

These values entered do not effect the controlling they are a guide to the maximum and minimum rates the selected tank is capable of achieving.

## **Actuator Calibration**

This setting sets where the linear actuator is positioned during the calibration of products. By default 'Extend Fully' is selected. This will make the actuator extend to its full reach during the calibration process.

If 'Control to Rate' is selected then the actuator position will depend on the rate selected during calibration.

If 'Preset Extension' is selected then a calculator icon will become accessible and a value can be entered in the 'Calibration Extension' window.

## **Using Tank Clutch**

If a tank clutch is fitted to the selected tank; then select the 'Using Tank Clutch' option.

## Regulator Valve Setup



Figure 6-10. Regulator valve setup window

### Controller Mode

Under normal conditions the Controller Mode can be set to the ‘Fastest’ setting. If the application rate seems to be overshooting and erratic then select ‘Medium’ and if still overshooting then select ‘Slowest’.

When either the Controller Mode is selected the ‘Max On Time’; PWM setting’; ‘Min On Time’ and ‘Gain Setting’ are set automatically and should not, need to be changed, unless instructed by a TPA representative.

### Reverse Valve Direction

this function allows the operator to reverse the polarity of the regulating valve. Select this option if the valve is going in the wrong direction.

### **Close Valve If Tank OFF**

Some regulating valves are also ON/OFF valves which means when the tank is switched OFF the valve will close. Select this option if this type of valve is fitted to the selected tank.

### **Relay On When Tank OFF**

If the system has a dump valve fitted then select “Relay on When Tank is Off”.

### **Sensitivity**

Under most conditions ‘Standard’ should be selected.

### **Shaft Encoder**

Enter in the number of magnets fitted to the metering shaft OR number of teeth on the sprocket which is fitted to the metering shaft. Enter the value by selecting the calculator icon.

### **Maximum and Minimum Shaft RPM**

These values entered do not effect the controlling they are a guide to the maximum and minimum rates the selected tank is capable of achieving. Select ‘OK’ once all settings have been entered.

## Proportional Valve Setup

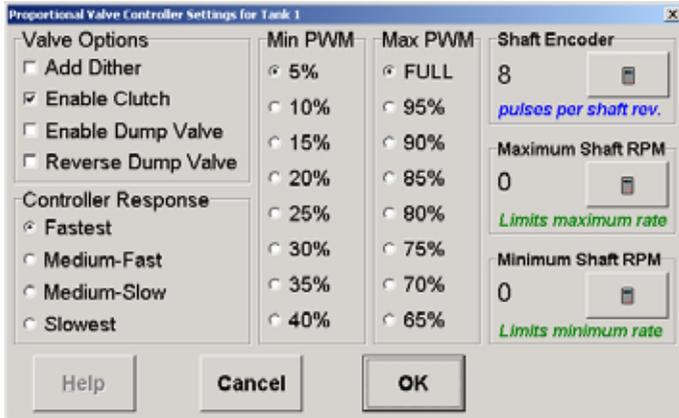


Figure 6-11. Proportional valve setup window

### Valve Options:

#### 1) Add Dither

Proportional valves can experience a “Friction” that occurs when the valve has been held in the same position for an extended period of time.

When the controller applies voltage to change the oil flow the valve may stick in the same spot, the controller then sees that the required correction has not been made to the rate so it applies more voltage.

The valve then frees from the stuck position and may overshoot resulting in a rate increase or decrease above or below the target rate. Ensure that this option is always selected with the Proportional Valve.

## **2) Enable Clutch**

The Danfoss Proportional valve is a “spool” valve that not only has electronic control but also has a lever that allows easy manual control if required.

The valve has its own internal electronics that require power from the controller. While the valve is “Powered” the manual lever is locked and cannot be used.

Enable Clutch applies power when the Master Switch is ON and removes it when switched OFF. This allows manual control any time the X20 Console is shut down or the Master Switch is OFF.

Select Enable Clutch if this type of valve is fitted to the tank.

## **3) Enable Dump**

If the Proportional valve on each control channel has its own Dump valve (not common) select “Enable Dump Valve”.

## **4) Reverse Dump**

If you find that the Dump valve is “Dumping” the oil back to tank, when the Master Switch is ON select the “Reverse Dump Valve”.

## **Controller Response**

Under normal conditions the Controller Response can be set to the 'Fastest' setting. If the application rate seems to be overshooting and erratic then select 'Medium-Fast' or 'Medium Slow'; and if the rate is still overshooting then select 'Slowest'.

## **Min PWM**

Select the Min PWM value for the tank selected.

## **Max PWM**

Select the Max PWM value for the tank selected.

## **Shaft Encoder**

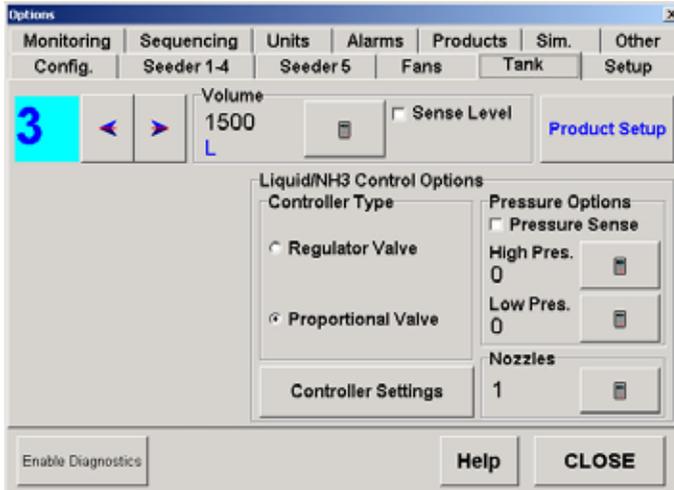
Enter in the number of magnets fitted to the metering shaft OR number of teeth on the sprocket which is fitted to the metering shaft. Enter the value by selecting the calculator icon.

## **Maximum and Minimum Shaft RPM**

These values entered don't effect the controlling they are a guide to the maximum and minimum rates the selected tank is capable of achieving.

Select 'OK' once all settings have been entered.

## Liquid/NH3 Control Setup



**Figure 6-12. Liquid/NH3 setup window**

1. Select the tank the Liquid or NH3 is fitted to by clicking on the arrows next to the tank number
2. Enter the volume of the Liquid or NH3 tank.
3. Check the 'Sense Level' option if a low tank sensor is fitted to the Liquid tank.

### Product Setup (When NH3 is selected as the 'Tank Mode')

Click (Tap) the 'Product Setup' button and a 'NH3 Mode Calibration Setup' window will be displayed. This is where the Calibration Factor for the Flow meter can be entered.

Click (Tap) the calculator icon to enter the value.

## Product Setup (When Liquid is selected as the ‘Tank Mode’)

Click (Tap) the ‘Product Setup’ button and a ‘Liquid Mode Calibration Setup’ window will be displayed. Here the operator can enter the name of the product by selecting the ‘ENTER LIQUID PRODUCT NAME’ button and entering a name of the product using the screen keyboard.

Click (Tap) the Calibration Factor’s calculator icon to enter in the Flow Meter Calibration Factor. The calibration Factor then is displayed in the window. A calibration to check the factor can be done later. Select whether the Controller type is a ‘Regulator Valve’ or ‘Proportional Valve’ which is fitted to the tank.

If ‘Regulator Valve’ is selected then select the ‘Controller Settings’ button to setup the valve. See Section 5.3 to setup the valve, but ignore the Shaft Encoder, Maximum Shaft RPM and Minimum Shaft RPM’ windows.

If ‘Proportional Valve’ is selected then select the ‘Controller Settings’ button to setup the valve. See Section 5.4 to setup the valve, but ignore the Shaft Encoder, Maximum Shaft RPM and Minimum Shaft RPM’ windows.

## Pressure Options

If a Pressure sensor is fitted to the selected tank then select the ‘Pressure Sense’ by placing a tick in the box. If an electronic pressure sensor is fitted to the tank then High and Low alarm points can be set. To set a High Pressure Alarm Point select the calculator icon and enter a value. To set a Low Pressure Alarm Point select the calculator icon and enter a value.

## Nozzles

Enter in the number of nozzles fitted to the air seeder. This is used to calculate the Flow per nozzle (Flow/Noz)

## Setup

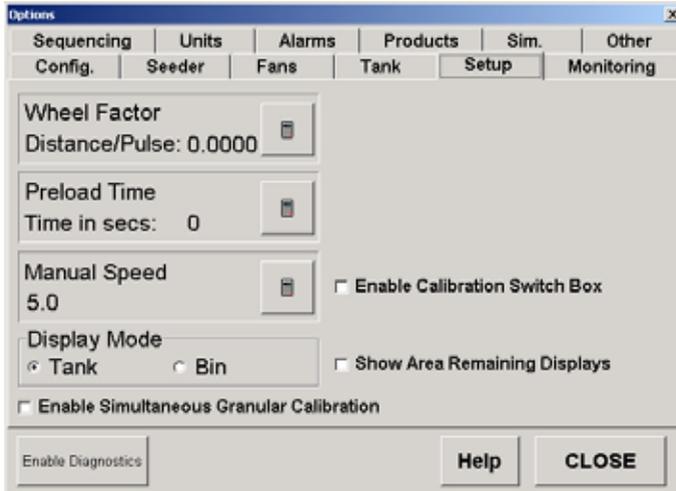


Figure 6-13. Setup tab

### Wheel factor

Displays the current “Wheel Factor” displayed as Distance/Pulse, this is used when the “Speed From” is selected as Tractor Radar or Wheel Sensor. Press the “screen calculator” next to the Wheel Factor, to advance to the “Wheel Factor Entry” screen to Calculate or Manually enter the Wheel factor.

### Manual Speed

Click (Tap) the calculator icon in this box to to enter in a Manual Speed. The Manual Speed may be used during:

- Calibration of products
- Checking air seeder settings while air seeder is stationary

## **Preload Time**

The Preload option applies only to tanks selected for electric motors or hydraulic motors. The Preload Time allows the air seeder's motors to operate prior to moving off and starting to sow, it takes several seconds to convey seed/fertiliser from the tanks to the seeding boots. This feature eliminates the start-up sowing gaps that might otherwise appear. A value around 7 seconds is normal.

## **Display Mode**

Select the terminology the operator wants to use "Tank" or "Bin". Tank and Bin terms are interchangeable.

## **Enable Calibration Switch**

If a calibration switch is fitted to the air seeder loom, then select this box. This feature allows the operator to remotely switch the motors (electric or hydraulic) ON and OFF remotely, when calibrating products.

## **Enable Simultaneous Granular Calibration**

By default unticked and calibrate one product at a time. This feature allows during the calibration of products, to calibrate all granular products at once. To calibrate all granular products at once select the option by placing a tick in the box.

## **Show Area Remaining Displays**

This feature when selected, displays the area remaining, on the Tank Icon on the Working Screen. It does this by knowing how much product is in the tank and the current application rate and therefore will predict how much area is remaining to seed. To display the area remaining select the option.

## Wheel Calibration Factor



Figure 6-14. Wheel calibration factor window

### Manual Entry

Press the “on screen calculator”, using screen keyboard enter the Wheel Factor manually.

### Calibrate

1. To calculate Wheel Factor, place a mark on the ground alongside of a vehicle wheel.
2. Press RESET.
3. Drive along steadily in a straight line and watch pulses accumulate from the wheel sensor.
4. After approx. 50 feet or so, stop and put another mark on the ground alongside of the same wheel.

5. Measure the distance.
6. Enter this distance, by pressing the “on screen calculator” next to “Enter Distance”
7. Wheel Factor is automatically calculated.
8. Press “ENTER” to save calibration and close the window.

### **Distance Check**

This can be performed to check the wheel calibration entered. Drive back between the two marks and the distance travelled should be the same as the distance measured.

## Monitoring (Block Head Sensors)

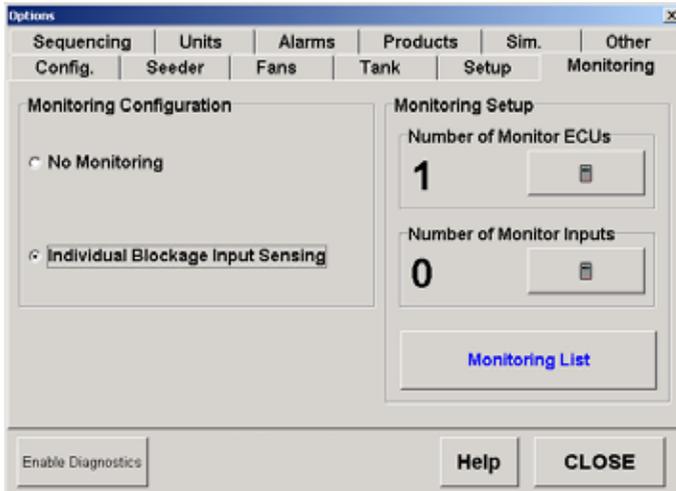


Figure 6-15. Monitoring tab

### Monitoring Configuration

The blocked head monitor kit is an optional extra and connects in line with the Sensor Loom plug, on the MDECU.

Select 'No Monitoring' if no blocked head kit is fitted.

Select 'Individual Blockage Input Sensing' if a blocked head kit is fitted inline with the Sensor loom near the MDECU. When this option is selected the 'Monitoring Setup' window will be displayed.

Also a 'BLOCKAGE' button will be displayed on the Main Menu Screen.

## Monitoring Setup

### Number of Monitor ECU's

Click (Tap) the calculator icon to select the number of Monitor ECUs fitted to the air seeder. The number of Monitor ECU's will be displayed.

### Number of Monitor Inputs

Click (Tap) the calculator icon to select the number of Blocked Head Sensors connected to the air seeder.

### Monitoring List

Click (Tap) the 'Monitoring List' button to display a list and number of blocked sensors connected to the air seeder.

Click (Tap) the 'ALL ON' button to switch ON monitoring of all sensors. Once this has been done, the list will display that all the blocked sensors are switch ON.

To switch an individual sensor OFF or ON individually select ON, which aligns with sensor which needs to be switched OFF to disable the sensor, 'Disabled' will be displayed.

Select the 'Row Height' to suit the operator, either Large, Medium, Small or Very Small.

## Sequencing

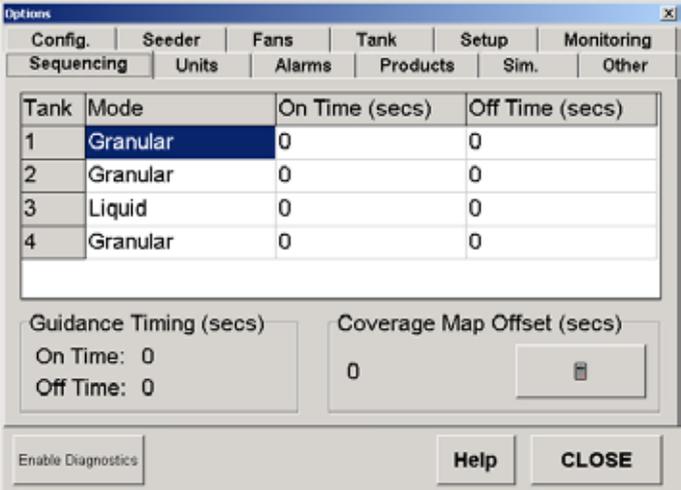


Figure 6-16. Sequencing tab

The Sequencing Page is used when the X20 Guidance is used in conjunction with the Seed Rate Control and ‘Auto Master’ has been enabled. The Auto Master will automatically switch the air seeder ON and OFF when the air seeder goes over areas it has already seeded.

This page allows for individual setting of lead times for different tanks for when they turn ON and allowing for the product to hit the ground. For example, when a tank is switched ON, it may take 7 seconds from the time the tank is switched ON for the product to hit the ground. For a Liquid system this may only take 2 seconds.

Therefore, an ‘On Time’ of 7 seconds would be used for the granular tanks and a 2 second ‘On Time’ for the Liquid tank.

Click (Tap) directly on the ON or OFF time that you want to change. A calculator screen appears and the value can be entered. Click (Tap) ‘ENTER’ to save the value and close the calculator; the value will be displayed.

## **Guidance Timing**

The Guidance Timing values for the 'On Time' and 'Off Time' are set automatically once the 'On Time' and 'Off Time' are set for the tanks. Guidance Timing takes the longest 'On Time' and the longest 'Off Time' from among the individual tanks and uses those values as its own On and Off Time

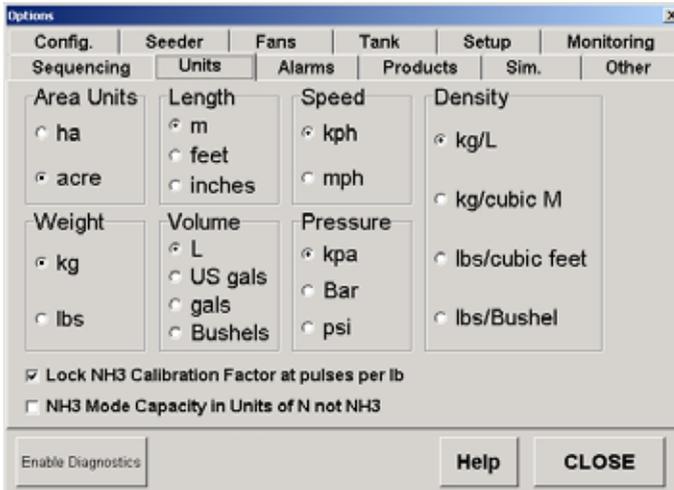
The air seeder will still use the individual tank times for switching the tanks ON and OFF. The Guidance Timing only uses the individual tank times as reference to decide when to switch the air seeder ON and OFF.

## **Coverage Map Offset**

Allows for little variances in the coverage map and starts drawing the Coverage Map in the Guidance software by the value set and also draws for that same time when switching off the coverage.

Therefore the coverage starts drawing the coverage map just before it is supposed to and stops drawing just after it is supposed to.

## Units



**Figure 6-17. Units tab**

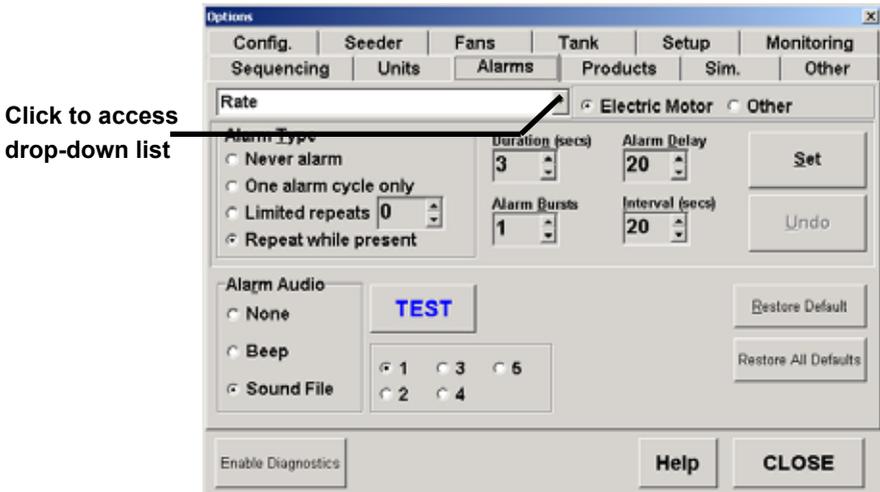
The UNITS page allows the operator to select the units preferred for operation.

### Lock NH3 Calibration Factor at pulses per lb

This option allows the operator when applying Anhydrous Gas and the Calibration Factor on the NH3 Regulator Valve is in lb's (Pulses per lb of N), but the operator wants to work in (kg of N) then select this box.

So the operator enters the Calibration Factor (pulses per lb of N), and selects the UNITS/Weight to 'kg', then the sprayer software will convert the (pulses per lb of N) and display 'kg of N' on the 'Working Screen' Select this option if one of the 'Tank Modes' is set to NH3 and the operator has manually entered a Calibration Factor in (pulses per lb of N) and selected 'kg' on the UNITS/Weight.

## Alarms



**Figure 6-18. Alarms tab**

The X20 Seeding software has a comprehensive alarm system, with various options for the method of indicating an alarm condition, as well as the frequency or occurrence of the alarm indicating a problem.

As part of the system, there is a set of voice alarms that will indicate the alarm condition without the need for the operator to look at the console to see what is happening.

Each of the alarm conditions can be set for individual conditions. For example if there is no pressure transducer fitted, the pressure alarms can be set to 'Never Alarm'.

The alarms are already set from the factory, so when you first use the X20 seedrate control there should be little reason to change the alarms.

## ‘Drop-down’ list

Click (Tap) the down arrow on the left of the ‘Electric Motor’ label to access the ‘Drop-down’ list. A list of all the alarms will be displayed. Select the ‘Alarm’ condition that requires changing by selecting the ‘Alarm’. The ‘Alarm’ will be displayed. Figure 6-18. shows the ‘RATE’ alarm selected.

## Alarm Type

Next select the preference for the type of alarm.

- **Never Alarm-** when selected switches the selected alarm OFF
- **One alarm cycle only-** when selected will alarm only once while the alarm is present
- **Limited repeats-** when selected and a number is entered next to it.e.g. ‘2’. Then while the alarm is present it will only alarm for ‘2’ cycles
- **Repeat while present-** when selected this will keep alarming while the cause of the alarm is present. All critical alarms should be set to this preference.

## Alarm Audio

Next select the preference for the type of audio.

- **None-** no audio alarm, only a ‘alarm window’ will be displayed on the console showing the type of alarm.
- **Beep-** a beep will be sounded through the X20 Console speaker, and the ‘alarm window’ will still be displayed showing the alarm type.
- **Sound File-** a voice alarm will be sounded through the X20 Console, and the ‘alarm window’ will still be displayed showing the alarm type.

## Select Tank

Select the Tank (1- 5) you wish to set the alarms for. Each tank can have different alarms conditions depending on the operator requirements.

## Setting Alarms

Now set the alarm conditions for the selected alarm. Change the 'Duration', 'Alarm Bursts', 'Interval' and 'Alarm Delay', using the 'Up and down' arrows next to each parameter. It is recommend you use the 'Mouse' supplied with X20 Console to set the values.

- **Duration-** The length of time the alarm will stay present.
- **Alarm Bursts-** The number of alarm bursts you will receive in the set duration.
- **Interval-** The time between each duration.
- **Alarm Delay-** The time from when the X20 Console detects a problem to when an alarm is sounded and displayed on the console.

After the alarm conditions have changed, the 'SET' button MUST be selected. Otherwise no changes will be saved. Once an alarm has been changed and the 'SET' button has been selected. The alarm changes can be undone by selecting the 'UNDO' button.

## Test Tank

Select the 'Alarm' that you wish to test and then select a Tank (1,2 or3) from the 'Tank Selection'. Then select the 'Test Tank' button. The alarm sound, duration, cycles etc can be observed. Reselect the 'Test Tank' button to turn test OFF.

## Defaults

- **Restore Defaults** - Resets the particular alarm you have selected to the factory setting.
- **Restore ALL Defaults** - Resets all alarms to the factory settings.

## Products

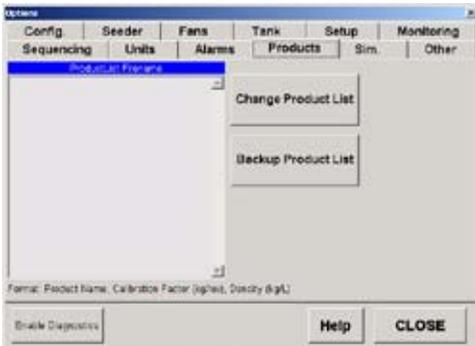


Figure 6-19. Products tab



Figure 6-20. Preset entry screen

### Presets

The ‘Presets’ page can display various products and calibrations. You are able to compile a complete list of the products that you will apply for the season.

### Change Preset List

Click (Tap) the ‘Change Preset List’ button. The ‘Preset Entry’ window will be displayed, (shown top right). Enter a name for the product by tapping the buttons as shown in Figure 6-20.

Click (Tap) the ‘CHANGE CAL FACTOR’ button. A Calculator screen will appear. Enter the ‘Calibration Factor’ value in (pulses per volume), for the product.

Click (Tap) the ‘Enter’ button, to save the ‘Calibration Factor’ and close the window. The new ‘Calibration Factor’ will be displayed.

Click (Tap) the 'Save List' button. A window will be displayed showing the new Product Name with the new Calibration Factor.

Click (Tap) 'YES' to save or 'NO' to cancel. Click (Tap) the 'CLOSE' button to close the window.

The new 'Product' and Calibration Factor' will be displayed in the 'Product List' window.

### **Backup Product List**

The 'Backup Product List' button allows the operator to backup the 'Product List' to another directory on the X20 Console or USB Thumbdrive. The 'Product List' can also be restored from the USB Thumbdrive at a later date.

Click (Tap) the 'Backup Product List' button. A 'Product List Backup' window will appear.

Click (Tap) the 'Select Folder' button. Select 'D: Drive' (USB Thumbdrive) from the 'Drop Down' menu.

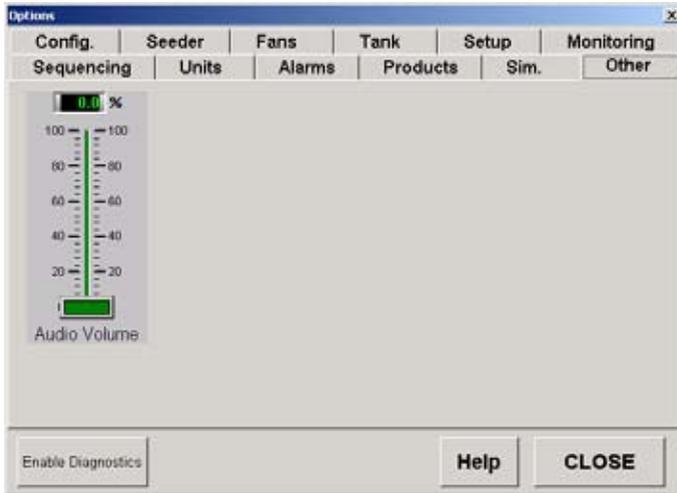
Select the 'OK' button to close the window.

Click (Tap) the 'Backup List' button to save the 'Preset List' to USB Thumbdrive.

Click (Tap) the 'Restore List' button to transfer the 'Preset List' from the USB Thumbdrive to the X20 Console.

Click (Tap) the 'Close' button to close the window.

## Other



**Figure 6-21. Other tab**

### Audio Volume

Allows the operator to set the desired audio level. There is an external speaker port on the rear X20 panel, that allows for another speaker to be fitted. The Volume can be adjusted, by touching the slide with your finger and moving the 'slide' up and down.

# Tank Setup and Calibration

## Type 1 - Granular (Electric or Hydraulic)

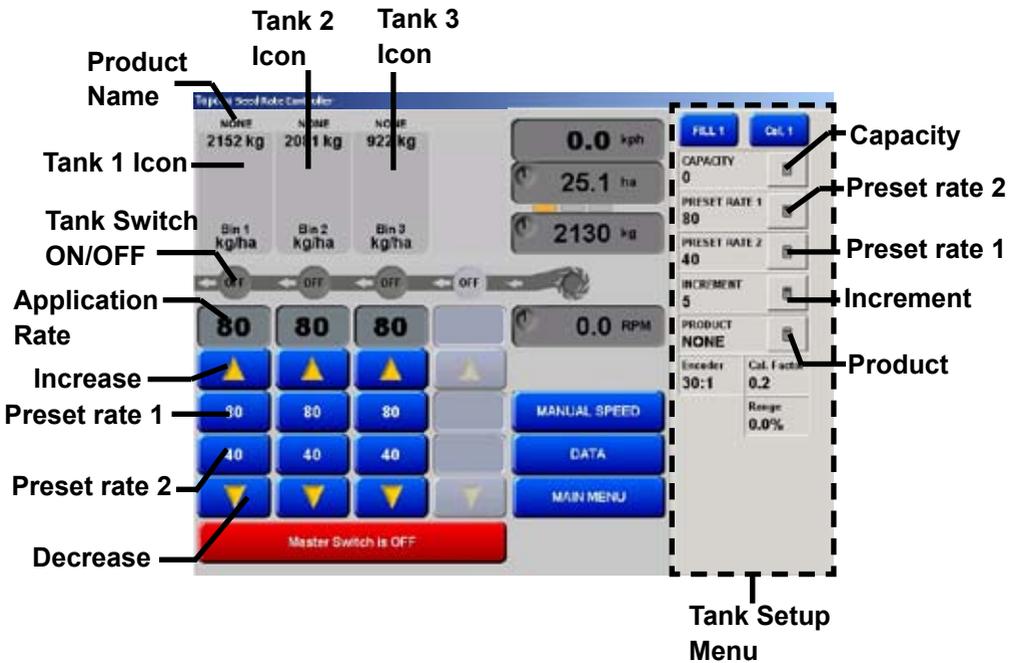


Figure 7-1. Granular Tank Setup

## Initial Setup

1. Select the 'Tank 1 Icon', and the 'Tank Setup' screen menu will be displayed.
2. Select the calculator icon next to the parameter that needs to be entered.
3. A screen calculator will be displayed allowing the operator to enter in a value. The Tank Setup allows the operator to enter in value for the Capacity, Preset 1, Preset 2,
4. Increment and select a product for the selected tank. Once these values have been entered then the Tank 1 is ready to calibrate the selected product.

**Capacity-** sets the tank size in weight.

**Preset Rate 1-** this sets the Primary seeding rate, the Primary Rate button displays the selected rate. This is the main rate.

**Preset Rate 2-** this sets the Secondary seeding rate , the Secondary Rate button displays the selected rate.

**Increment-** allows the operator to set the Increment Rate. Therefore when the operator presses the Increase Button the Application Rate will increase by the Increment Rate . When the operator presses the Decrease Button the Application Rate will decrease by the Increment Rate. In this case 5 Kg per hectare has been selected.

**Product-** Allows the operator to select a product from a drop-down list. The current product selected is displayed above the TANK 1 Icon.

**Tank Switch ON/OFF-** This switches the individual tanks ON or OFF, by selecting the 'OFF'. When the Tank Switch displays 'OFF'

and Tank Icon is 'grey out' then the Tank Switch is switched OFF. If the Tank Switch and Tank Icon is highlighted in 'orange', the Tank Switch is ON.

**Cal. Factor-** displays the Calibration Factor for the current Product selected, for the current the Tank. The 'Cal Factor' is amount of product metered out for one revolution of the metering roller for granular products. (Weight/rev)

**Range-** (Proportional Only) displays the PWM range (as a %) of the Proportional valve of the selected tank while seeding. (Actuators) when actuators is selected then the Range shows the Linear Actuator position (as a %) of the selected tank while seeding.

**Encoder-** (Hydraulic and Actuator only) displays the current encoder value for the selected Tank.

**Gear Ratio-**(Electric Motors only) displays the current Gear Ratio value for the selected Tank.

## **Calibration**

Before commencing a calibration of the granular tank make sure that following parameters have been entered correctly. If these parameters are accurate then the calibration will be accurate.

**Manual Speed-** A Manual Speed should be entered that reflects the average speed of the air seeder during seeding operations.

**Width-** An accurate effective working width of the air seeder should be entered.

**Preset Rate 1-** A realistic application rate should be entered for the product being calibrated.

**Cal Factor-** A ‘Cal Factor’ should of been entered for each product that is going to used in the air seeder.



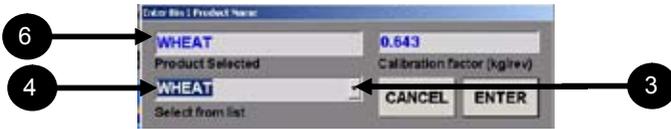
**NOTICE**

*If ‘Cal. Factor’ is not known, then enter ‘0.6’ as a ‘Cal. Factor’, for most products and ‘0.1’ for products like clover and canola. A ‘Cal. Factor’ has to be entered before calibrating the product can proceed.*

**Tank Calibration (Granular)**



1. Click (Tap) the Tank 1 icon, the ‘Tank Setup’ screen will be displayed.
2. Click (Tap) the calculator icon next to ‘PRODUCT’ and a ‘Enter Tank 1 Product Name’ will be displayed.



3. Click (Tap) the 'drop down arrow' and a 'drop down list' of the current products in the 'Product List' will appear.
4. Select the product, that is going to be calibrated for Tank 1. The current 'Cal Factor' will be displayed for the selected product.
5. Click (Tap) the 'ENTER' button.
6. The name 'NONE' will change, and be replaced by 'WHEAT' in the PRODUCT name. The last Calibration Factor for 'WHEAT' is also updated.



7. Click (Tap) the 'CAL.1' button and the 'CALIBRATE TANK 1' screen will be displayed.
8. The 'MANUAL SPEED' is automatically selected when in the 'CALIBRATE TANK' screen.

**Electric Motors** - when electric motor is selected for the tank the *Gear Ratio* will be displayed. The ‘*Motor*’ will display the number of revolutions the metering shaft has done during the calibration process.

**Regulator Hydraulics** - When regulator hydraulic is selected for the tank, then the *Encoder* value will be displayed. The ‘*H. Motor*’ will display the number of revolutions the metering shaft has done during the calibration process.

**Proportional Hydraulics** - When Proportional Hydraulic’s is selected for the tank, then the *Encoder* value will be displayed. The ‘*P.Valve*’ will display the number of revolutions the metering shaft has done during the calibration process.

The operator now places a container or bag under ‘Tank 1’ of the air seeder.

The operator presses the ‘On/Off’ button on the CALIBRATE TANK screen, to Prime the metering rollers, product will start to be dispensed from Tank 1. Allow 1-2 kgs of product to be dispensed this should be sufficient to ‘Prime’ the metering rollers.

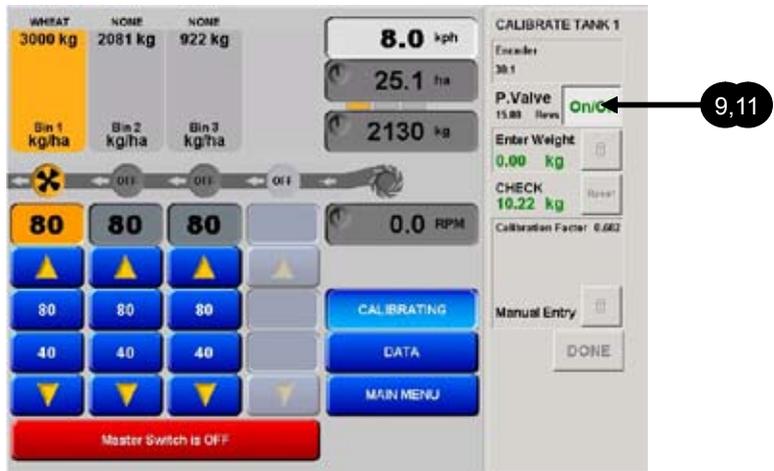
Press the On/Off button to stop the product being dispensed.

Press the ‘Reset’ button, on the ‘CALIBRATE TANK screen’. This resets the ‘Revs’ back to ‘0.00’ on the ‘CALIBRATE TANK’ screen.

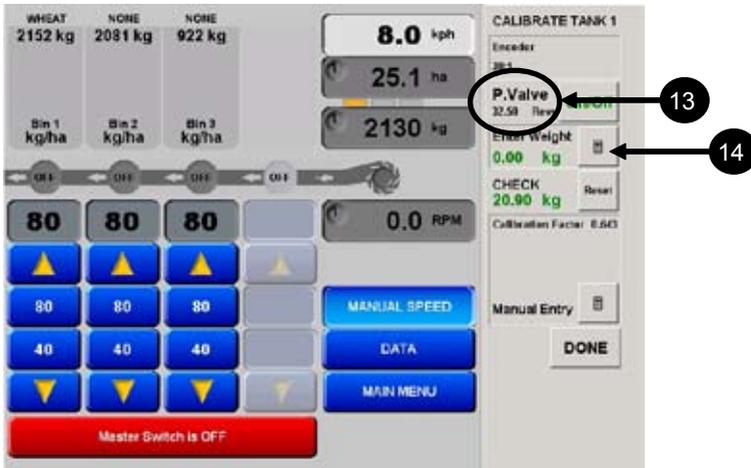


### NOTICE

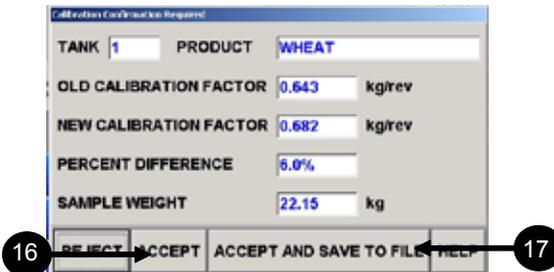
*Priming the rollers is important to achieve an accurate ‘Cal Factor’ for the product. Empty the container and tare the container using a set of accurate scales. Place the container back under ‘Tank1’*



9. Click (Tap) the 'On/Off' button.
10. Product will now be dispensed from Tank1.
11. Once sufficient material has been collected. ie: 15 Kg.  
Click (Tap) the 'On/Off' button.
12. Weigh the product collected and write down the weight, so  
the weight can be entered into the X20 Console.



13. The X20 Seedrate Controller software has automatically counted the amount of meter roller revolutions, this appears under ‘Motor’ (Electric) or ‘H.Motor’ (Reg Hyd.) or ‘P.Valve’ (Prop. Hyd.) as ‘Revs’.



14. Click (Tap) the ‘Enter Weight’ ‘calculator icon’.
15. The screen that appears, tells you what the new ‘Cal. Factor’ is, what the old ‘Cal. Factor’ was, and what the percentage difference is.
16. ACCEPT means that the ‘Cal Factor’ for the product will be used but not saved to the ‘Product List’.

17. ACCEPT AND SAVE TO FILE will mean the 'NEW CAL FACTOR' will be saved to the 'Product List'. Then the next time that WHEAT is selected, the 'New Cal. Factor' the same as just calibrated, will be used.



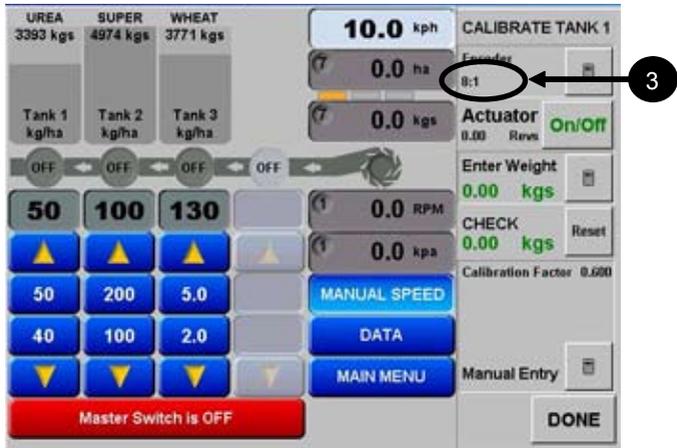
18. You will see that the new calibration factor is in place. You can recheck the accuracy, by placing the empty catchment container under Tank1 of the air seeder.
19. Press the 'RESET' button, then the 'On/Off' button. The metering unit will start again , and when you stop it, the CHECK Kg should be the same as what is weighed in the container.
20. Once you are satisfied with the calibration of 'Tank 1', select DONE.
21. Repeat the above procedure to calibrate the other tanks.

## Tank Calibration (Actuators)

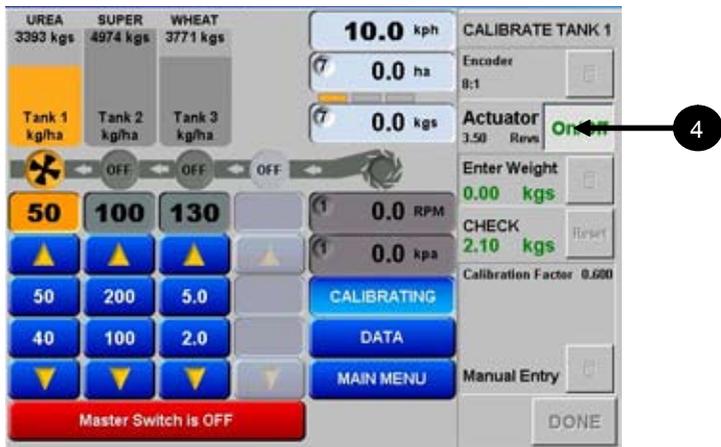
Use this section when the air seeder is fitted with actuators to one or more of the tanks to automatically adjust the seed rate.



1. Click (Tap) the “Tank 1” icon
2. Click (Tap) the “Cal.1” button



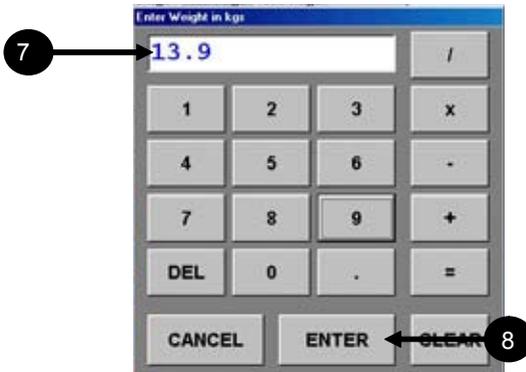
- Encoder should be set at the number of magnets (or teeth) on the wheel on the metering shaft. In this case we have counted 8 magnets on the encoder wheel, and entered in the value of '8'.



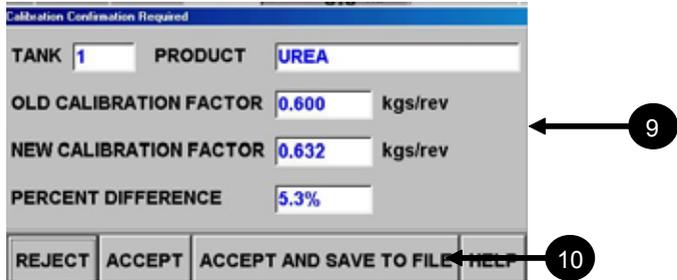
- Once you have loaded the metering rollers, Click (Tap) Actuator flow ON/OFF. This will wind the actuator out to full stroke. Now wind over the machine using the handle provided, and catch the product being metered out.



5. When you have caught enough product, Click (Tap) the Actuator flow ON/OFF button again.
6. Weigh the collected product, and select the Enter Weight Icon.



7. Enter in the amount of product that you have weighed. In this case 13.9kg was weighed.
8. Click (Tap) ENTER.



9. If you had a previous calibration figure entered, this screen will appear. This screen will tell you ( in percentage the difference in calibration factors, of the old and new calibrations.
10. Click (Tap) “ Accept And Save To File”. This will be the calibration for Urea the next time the product is selected.



11. You are able to check the calibration, by going through the above process again.
12. Once you have weighed the product, compare the weight against the “CHECK” reading. This is indicating that the computer has calculated how much product has been dispensed, using the previous calibration factor.
13. Repeat the above procedure to calibrate the other tanks to similar actuator settings.

## Type 2 - Liquid

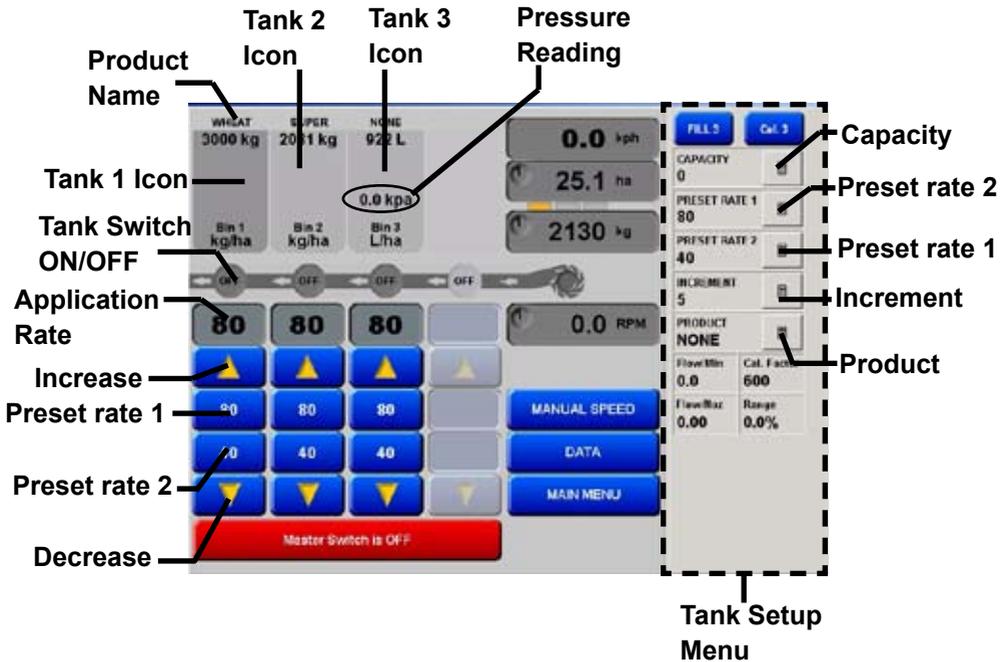


Figure 7-2. Liquid Tank Setup

### Initial Setup

1. Click (Tap) the ‘Tank 3 Icon’, and the ‘Tank Setup’ screen menu will be displayed.
2. Click (Tap) the calculator icon next to the parameter that needs to be entered.
3. A screen calculator will be displayed allowing the operator to enter in a value. The **Tank Setup** allows the operator to enter in value for the Capacity, Preset 1, Preset 2, Increment and select a product for the selected tank. Once these values have been entered then the Tank 3 is ready to calibrate the selected product.

**Capacity-** sets the tank size in volume.

**Preset Rate 1-** this sets the Primary seeding rate, the Primary Rate button displays the selected rate. This is the main rate.

**Preset Rate 2-** this sets the Secondary seeding rate , the Secondary Rate button displays the selected rate.

**Increment-** allows the operator to set the Increment Rate. Therefore when the operator presses the Increase Button the Application Rate will increase by the Increment Rate . When the operator presses the Decrease Button the Application Rate will decrease by the Increment Rate .In this case 5 litres per hectare has been selected.

**Product-** Allows the operator to enter in a name of the product being dispensed out of the selected liquid tank.

**Tank Switch ON/OFF-** This switches the individual tanks ON or OFF, by selecting the 'OFF'. When the Tank Switch displays 'OFF' and Tank Icon is 'grey out' then the Tank Switch is switched OFF. If the Tank Switch and Tank Icon is highlighted in 'orange', the Tank Switch is ON.

**Flow/Min-** displays the current flow rate of liquid being dispensed as read by the flow meter.

**Cal. Factor-** displays the Calibration Factor for the flow meter for the liquid tank.

**Range-** displays the PWM range (as a %) of the proportional valve of the selected tank while seeding. (The 'Range' is only displayed if 'Proportional' was selected for the liquid tank).

**Flow/Noz-** displays the current flow per nozzle.This value is the actual flow rate as read by the flow

## Calibration

Before commencing a calibration of the liquid tank make sure that following parameters have been entered correctly. If these parameters are accurate then the calibration will be accurate.

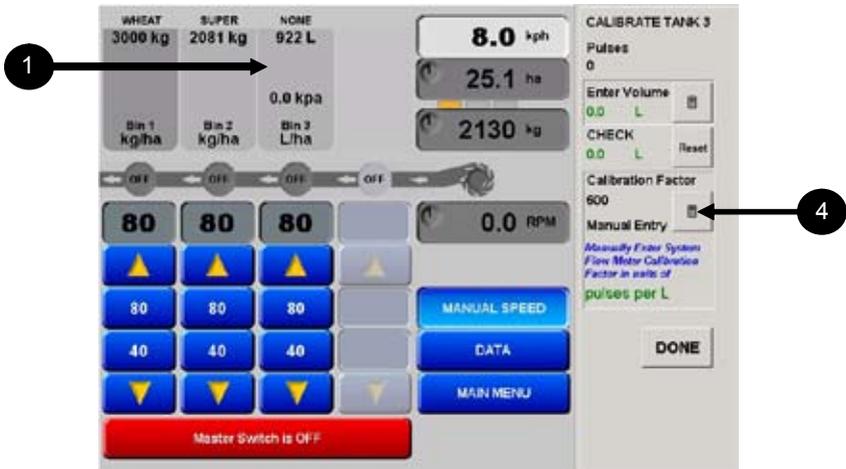
**Manual Speed-** A Manual Speed should be entered that reflects the average speed of the air seeder during seeding operations.

**Width-** An accurate effective working width of the air seeder should be entered.

**Preset Rate 1-** A realistic application rate should be entered.

**Cal Factor-** A realistic Cal Factor should be entered for the Flow meter. The Cal Factor is normally stamped on the Flow Meter body or a tag attached to the flow meter body. The Cal Factor is in 'Pulses/ Volume'.

## Tank Calibration (Liquid)



In this example, Tank 3 has been set to contain liquid product

1. Click (Tap) 'Tank 3 Icon' of the Liquid Tank. A 'Tank Setup' screen will appear.
2. Click (Tap) the 'Cal 3' button. A 'CALIBRATE TANK3' screen will appear and the 'Manual Speed' will be enabled automatically, on the Working Screen.

### Manual Entry of Calibration Factor

Note the 'Cal Factor' on the Flow meter and the units used (example: litres or gallons).

4. Select the Calculator Icon next to the 'Manual Entry' and enter the 'Cal Factor'. Then press the ENTER button to save the value. The current 'Cal Factor' will be displayed.

5. Engage the Tractor hydraulics for air seeder.
6. Fill the liquid tank with a quantity of water.
7. Undo a hose after the flow meter. Have a container with graduations to collect the liquid. (About 20 litres)
8. Using the 'Calibrate Switch' turn the 'RUN' switch ON. Then make sure liquid flows into the container.
9. Turn the 'RUN' switch OFF. Empty container. The system should be primed now.
10. Then Click (Tap) the 'RESET' button. This resets the 'PULSES' on the X20 Console to '0'.
11. Using the 'Calibrate Switch' turn the 'RUN' switch ON. Then make sure liquid flows into the container. Fill container to approx. 20 litres.
12. Turn the 'RUN' switch OFF. Write the actual volume of liquid dispensed into the container.
13. Return to the X20 Console.



14. The number of pulses accumulated by the flow meter is displayed.
15. Click (Tap) the 'Enter Volume' 'calculator icon' and enter the actual volume of liquid caught in the container; select 'Enter' to save the volume.
16. The 'Calibration Factor' value will now be updated and displayed.
17. Click (Tap) the 'DONE' button to close the 'Calibration Screen'. Calibration of the Liquid tank is complete.
18. If another Liquid tank needs setting up and calibration, select another liquid tank and follow the same procedures.

## Type 3 - NH3

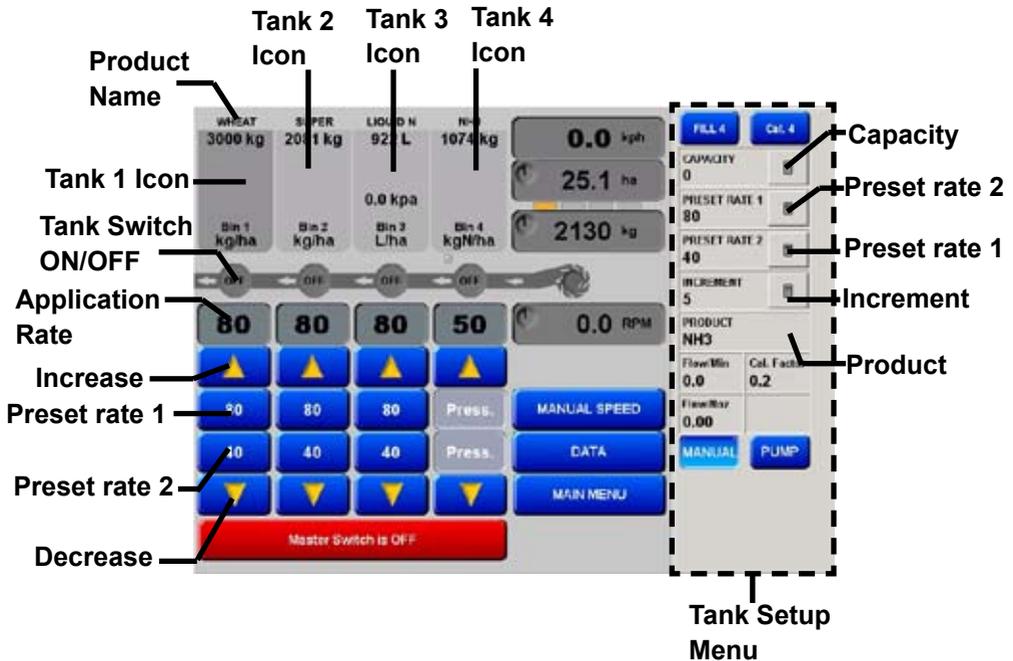


Figure 7-3. NH3 Tank Setup

### Initial Setup

**Capacity-** sets the NH3 tank size in volume.

**Preset Rate 1-** this sets the Primary seeding rate, the Primary Rate button displays the selected rate. This is the main rate, in volume/area

**Preset Rate 2-** this sets the Secondary seeding rate , the Secondary Rate button displays the selected rate, in volume/area.

**Increment-** allows the operator to set the Increment Rate. Therefore when the operator presses the Increase Button the Application Rate will increase by the Increment Rate . When the operator presses the Decrease Button the Application Rate will decrease by the Increment Rate .In this case 5 litres per hectare has been selected .

**Product-** Displays 'NH3' and this can't be changed when NH3 is selected as the tank.

**Tank Switch ON/OFF-** This switches the individual tanks ON or OFF, by selecting the 'OFF'. When the Tank Switch and Tank Icon is 'grey out' then the Tank Switch is switched OFF. If the Tank Switch and Tank Icon is highlighted in 'orange', the Tank Switch is ON.

**Flow/Min-** displays the current 'weight of Nitrogen (N)' dispensed per minute, as read by the flow meter.

**Cal. Factor-** displays the Calibration Factor for the flow meter for the liquid tank.

**Range-** displays the PWM range (as a %) of the proportional valve of the selected tank while seeding.

**Flow/Noz-** displays the current flow per nozzle. The number of nozzles is entered into Section 4.2. This value is the actual flow rate as read by the flow meter divided by the number of nozzles.

## Calibration



When CAL.4 is selected, this screen appears, but you will notice it is quite different from the other CAL. screens.

You are only able to enter the Calibration Factor that accompanies the NH<sub>3</sub> flow meter. This is usually in 'lb', as the flowmeters come from USA and are calibrated in lb's.

Make sure when entering the Calibration Factor the correct units are used. If the Calibration Factor being entered is metric (pulses per kg of N) make sure 'pulses per kg of N' is displayed.

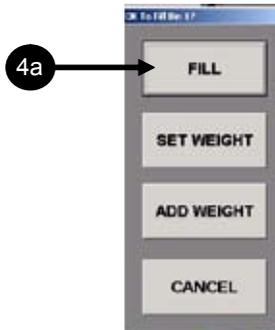
If the Calibration Factor being entered, is imperial (pulses per lb of N) make sure 'pulses per lb of N' is displayed. Release of NH<sub>3</sub> in calibration mode is not permitted, due to personal safety, and the volatile nature of NH<sub>3</sub>.

# Main Screen Features

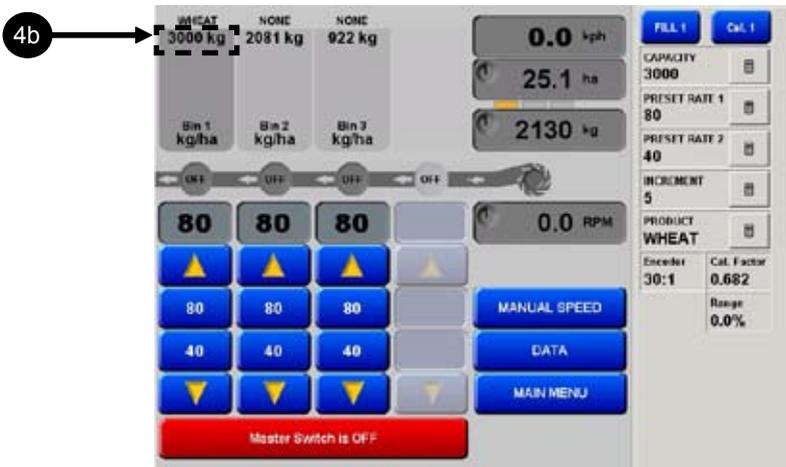
## Fill the Tanks



1. Click (Tap) 'Tank 1 Icon' OR 'Tank 2 Icon' OR 'Tank 3 Icon' OR 'Tank 4 Icon'
2. Then Click (Tap) the 'FILL 1' button OR 'FILL 2' button OR 'FILL 3' button OR 'FILL 4' button

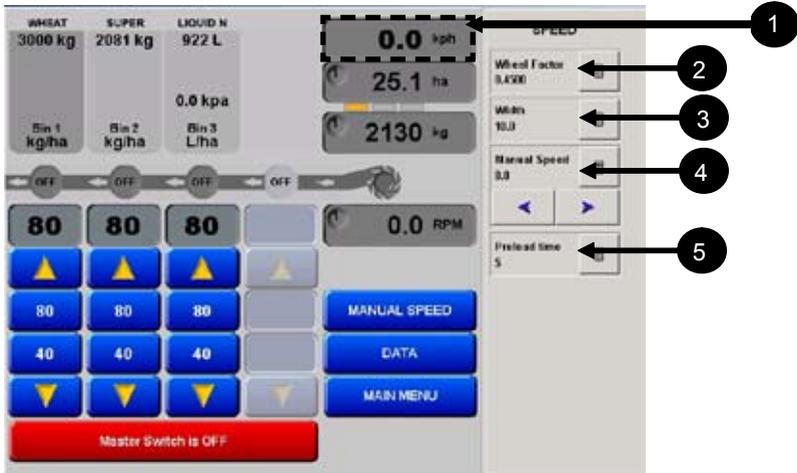


3. A window will be displayed showing 4 options:
  - **FILL** - Completely refill the tank to its total capacity as set in the 'Tank Setup' screen.
  - **SET VOLUME** - Allows the operator to set a known tank volume which is not the Tank capacity.
  - **ADD CAPACITY** - Allows the operator to add a known volume to already existing volume in the tank.
  - **CANCEL** - Returns to the main screen without making changes.



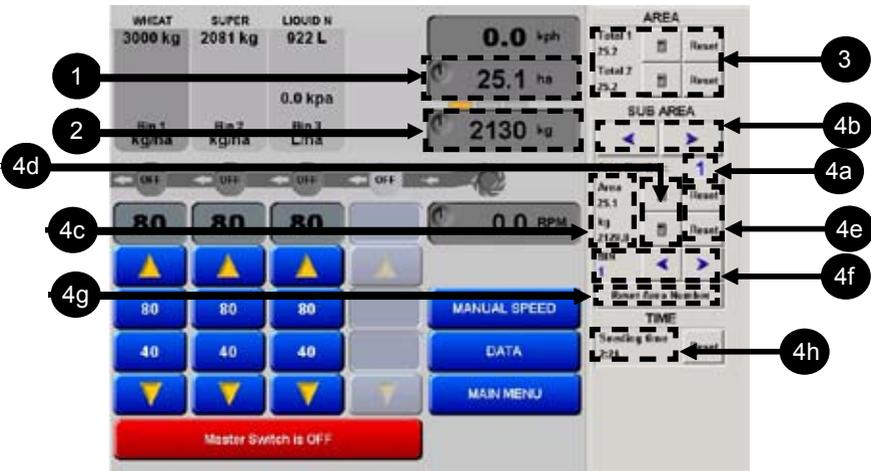
4. The FILL button was selected and the contents of 'Tank 1' now displays 3000kg. This is the same as previously set as the 'Tank 1' 'CAPACITY'.

## Speed Readout



1. **Speed Readout**- Displays the current ground speed either from: Wheel sensor, Tractor radar, GPS Speed or Test Speed. Select the ‘Speed Readout’ to display the SPEED window as shown above.
2. **Wheel Factor**- The current ‘Wheel Factor’ is displayed. When the ‘Calculator Icon’, next to the ‘Wheel Factor’ is selected, the ‘Wheel factor Entry’ window is displayed. This is the same window as selected in the OPTIONS/SETUP page, see Section 5.1 for setup details.
3. **Implement Width**- The current ‘Implement Width’ is displayed. When the ‘Calculator Icon’ next to the ‘Implement Width’ is selected the effective working width of the air seeder can be entered. The Width can be entered in Section 2.0.
4. **Manual Speed**- Select the ‘Increase Speed’ or ‘Decrease Speed’ to set a ‘Manual Speed’ OR select the ‘Calculator Icon’ next to the Manual Speed to enter a value. See Section 5.0 for details.
5. **Preload Time**- The current ‘Preload Time’ is displayed. When the ‘Calculator Icon’, next to the ‘Preload Time’ is selected, a value can be entered.

## Area Readout



1. **Sub-Area Readout** - Displays the Sub-Area for the ‘Sub Area Number’ shown. The Sub-Area Number is displayed in the top left hand side of the ‘Sub-Area Readout’ or in the ‘AREA window’, next to ‘Area Number’.
2. **Sub-Weight Readout** - Displays the Sub-Weight for the ‘Sub-Area Number’ shown. The ‘Sub- Area Number is displayed in the top left hand side of the ‘Sub-Weight Readout’ or in the AREA window, next to ‘Area Number’.
3. **TOTAL AREA** - Total 1 and Total 2, allows the operator to have two running totals for whatever reason you choose. I.e. Total 1 accumulates the area for the season; Total 2 accumulates the area for the month. To Reset a either Total 1 or Total 2, press The “Reset” button next to the Total (1 or 2) to be reset. A window will appear confirming whether to clear the total, select YES to clear or NO to cancel.

#### 4. Sub-Area/Weight

- a. **Sub-Area Number-** Displays the selected Sub Area Number, the Sub Area Number is displayed in the AREA window and in the ‘Sub-Area’ and ‘Sub-Weight’ Readouts.
- b. The Sub-Area Number is selected by using the Sub Area Number Selector arrows. By using the arrows you can select from 10 sub areas (0-9).
- c. As the Sub-Area Number changes the Sub-Area and Sub-Weight values will change to display the areas and weights accumulated for the selected sub area number, for the displayed Tank Indicator.
- d. Click (Tap) the ‘Calculator Icon’ aligned next to ‘Area’ or ‘Volume’, the area and weight( or volume) to enter a preset value.
- e. Selecting the ‘Reset’ button next to ‘Area’ and ‘Volume’, the area and weight (or volume) can be reset for each individual tank; for the Tank number displayed.
- f. Use the ‘arrows’ to the right of the ‘Tank’ number to select another tank number.



#### NOTICE

*The Sub-Weight units reflects which ‘Tank Mode’ OPTIONS/SEEDER was selected for each Tank (Granular, Liquid or NH3,) and also the units that are selected on the OPTIONS/UNITS page.*

The operator can select to display the Sub Area/Volume readouts for each Tank. The arrows aligned with the 'TANK' are used to select a tank number.

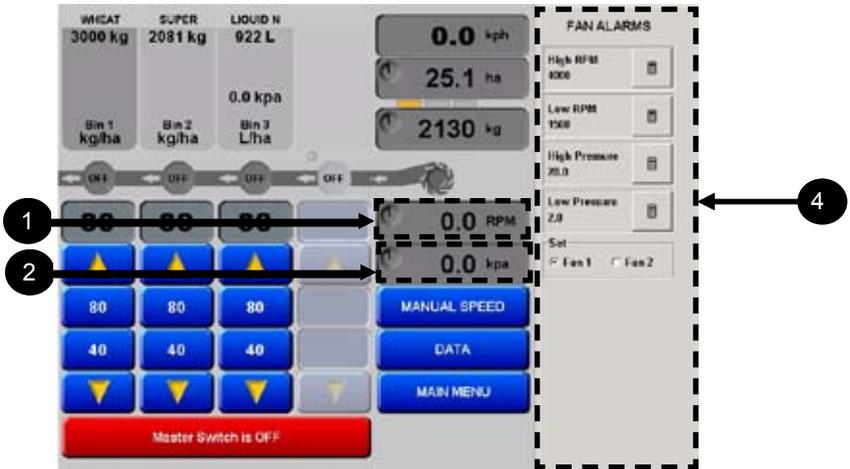
The TANK number will be displayed and the Sub Area/Weight readouts will display the area covered and weight used for each tank, on both the 'Working Screen' and AREA window readouts.

As the arrows are used to select the TANK number you will notice the 'Tank Indicator' on the 'Working Screen' will change to show which 'Tank' the Sub Area/Weight readouts are displaying.

The 'Tank Indicators' can also be changed from the 'Working Screen' by repeatedly selecting either the 'Sub-Area' or 'Sub-Volume' readouts, the orange 'Tank Indicator' will indicate which 'Tank' the Sub-Area/Weight readouts are displaying for. The orange 'Tank Indicators' are aligned in the same position as the Tank (1,2,3 or 4) Icons.

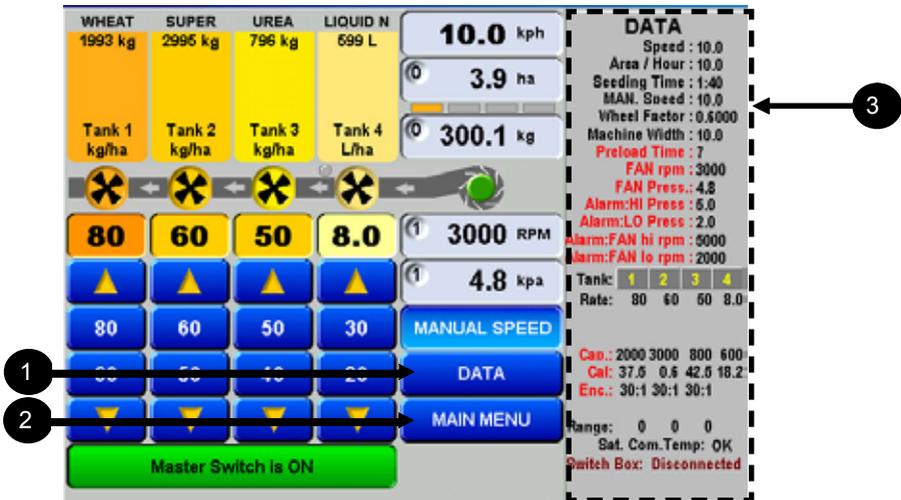
- g. **Reset Area Number** - the Area Number can be reset if "Reset Area Number" is selected and this will reset both the Area and Weight for all tanks, for selected Sub Area.
- h. **TIME** - There is also a resetable seeding time incorporated. This will only accumulate when the air seeder is actually seeding.

## Fan Readout



1. **Fan Speed Readout** - Displays the current Fan Speed, as read by the fan speed sensor mounted near the fan on the air seeder.
2. **Fan Pressure Readout**- Displays the current Fan Pressure, as read by the fan pressure sensor mounted near the fan on the air seeder.
3. Click (Tap) the ‘Fan Speed Readout’ or ‘Fan Pressure Readout’ to display the FAN ALARMS window as shown above.
4. The Fan Alarms window displays the High and Low Alarms for the Fan Speed sensor and the High and Low Alarms for the Fan Pressure Sensor. The Fan Alarms window is the same screen as displayed on the ‘Fan’ page. The Fan Alarms can be set here or on the ‘Fan’ page.

## Data Screen



1. Click (Tap) the DATA button from the Working Screen. The DATA screen will be displayed on the right hand side.
2. To hide DATA screen select the MAIN MENU button.
3. The DATA screen can be displayed at any time and does not effect seeding operations. The DATA screen gives an overview of what the air seeder is doing currently and an overview of the air seeder settings.

# Air Seeder Operations

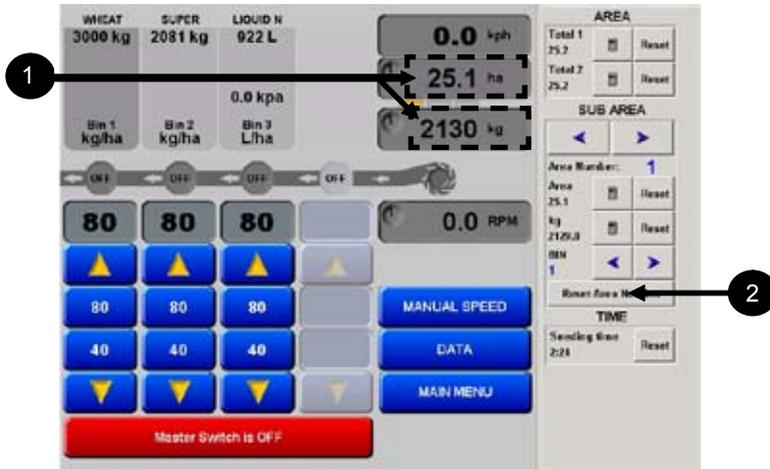
## Fill a tank



Each tank has to be electronically filled each time the air seeder tanks are physically filled.

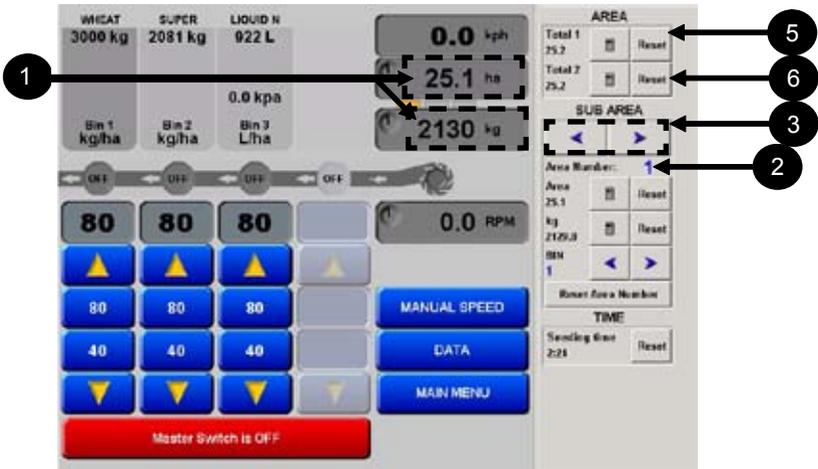
1. Ensure Master Switch is OFF.
2. Click (Tap) 'Tank 1 Icon', Then select the 'FILL 1' button  
OR 'Tank 2 Icon', Then select the 'FILL 2' button  
OR 'Tank 3 Icon', Then select the 'FILL 3' button  
OR 'Tank 4 Icon', Then select the 'FILL 4' button

## Reset Current 'Sub-area number'



1. Click (Tap) either the 'sub-area' or 'weight' readouts. The 'Area' window will be displayed.
2. Click (Tap) the 'Reset Area Number' button. A confirmation window will appear.
3. Select the 'YES' button, to reset everything for the selected 'Area Number'. This will reset to zero, the sub-area and sub-weight for all tanks for the selected 'Sub Area Number'.

## Change or select the 'Sub-area number'



1. Click (Tap) either the 'Sub-Area' or 'weight' readouts. The 'Area' window will be displayed.
2. The current 'Area Number' is displayed in the 'Sub-area' window.
3. Select the 'left' or 'right' arrows, above the 'Area Number' to change the 'Area Number'.
4. The new 'Area Number' will be displayed. Ten sub-area numbers can be selected, (0-9). The changed 'Area Number' is also displayed in the 'Area' and 'Weight' readouts.

## Reset the total area

5. Click (Tap) the 'Reset' button next to the 'Total 1' to reset the area for 'Total 1'.
6. Click (Tap) the 'Reset' button next to the 'Total 2' to reset the area for 'Total 2'.

## Select a Primary, Secondary Rate or Increase/Decrease Buttons



1. The Primary button for each tank displays the Primary rate. To select the Primary rate for each tank. Select the Primary button for each tank. The rate will then be displayed in the 'live' readout.
2. The Secondary button for each tank displays the Secondary rate. To select the Secondary rate for each tank. Select the Secondary button for each tank. The rate will then be displayed in the 'live' readout.
3. Click (Tap) the 'Increase' button to INCREASE the sowing rate, by the increment set in the 'Tank Setup' screen.
4. Click (Tap) the 'Decrease' button to DECREASE the sowing rate, by the decrement set in the 'Tank Setup' screen.

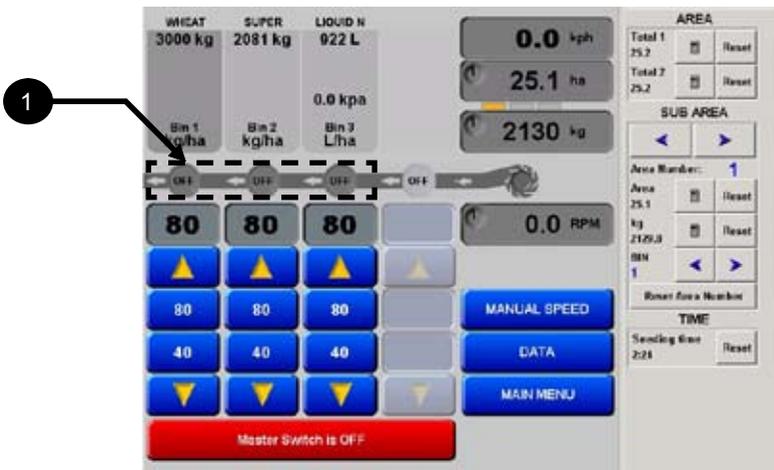
If the colour of the 'live' readout is grey, this means that the tank isn't applying product.

If the 'live' readout is highlighted 'orange', means the the Primary rate is selected for the tank and the tank is applying the required rate correctly.

If the 'live' readout alternates between 'white' and 'orange' then the rate highlighted 'orange' is the selected rate; and the the rate highlighted 'white' is the actual rate being applied.

If the 'live' readout alternates between 'white' and 'orange', and rate is the same in both colours then this is informing the operator that a rate other than the Primary rate for the tank is selected. Also after a period of time an alarm will appear 'Alternate Rate in Use'.

## Switch a Tank On or Off



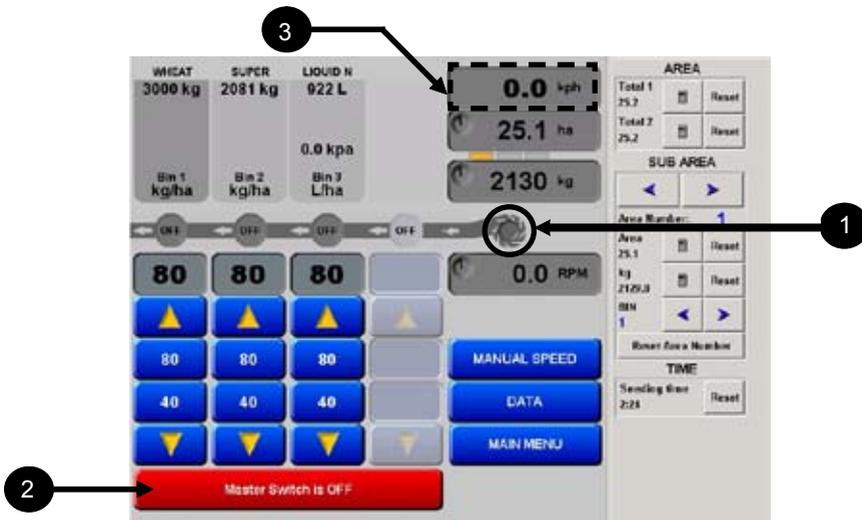
1. Click (Tap) the Tank Switch ON/OFF icon.

If the Tank Switch is ON, the 'Tank Switch and 'Tank Icon' for the selected tank will be highlighted.

If the Tank Switch is OFF, the 'Tank Switch and 'Tank Icon' for the selected tank will be 'greyed out'.

If the Master Switch is OFF, the 'Tank Switch' icon will be highlighted but not turning.

## Using the Preload Function



1. Click (Tap) the fan icon to Engage the Fan.
2. With the required tanks switched ON, switch the Master Switch ON.
3. The Speed Readout will be highlighted and display the Manual Speed, the Tank Switch Icons of each tank switched ON, will start turning.

The metering rollers of each selected tank will start sowing.

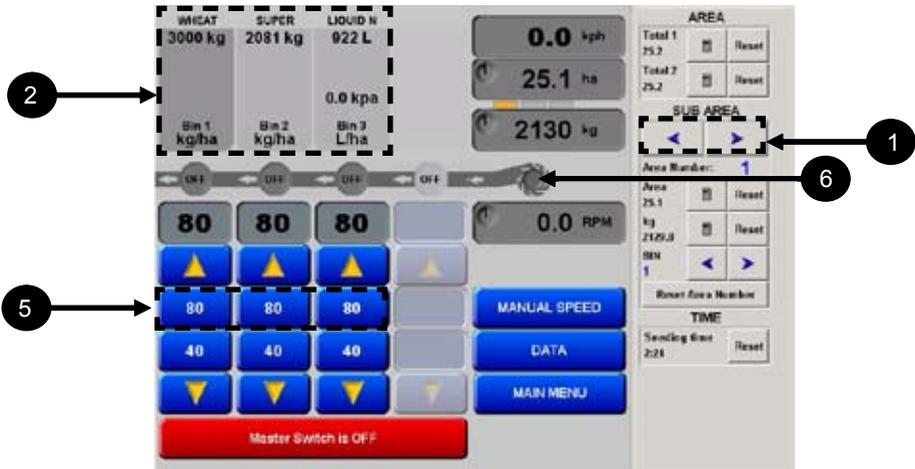
The operator must drive off within the specified time set in the Preload Time.



### NOTICE

*If the driver must move the vehicle within the Preload time, otherwise the Speed readout will grey out and the Tank switches will stop turning. The Master switch will have to be switched OFF, before attempting to start sowing again.*

## Begin Seeding



1. Click (Tap) the directional arrows to select a Sub-Area Number.
2. Select the 'Products' for each area.
3. Electronically REFILL the tanks being used.
4. Ensure any required TANKS are switched ON. The corresponding tanks will be highlighted in colour.
5. Click (Tap) the Primary Rate button for each tank.
6. Click (Tap) the fan icon to engage the Fan. The Fan icon will turn 'green' and the Fan pressure and Fan Speed readouts will be displayed.
7. Click (Tap) the Master Switch. The selected tanks, Tank Switch icons will start turning, indicating the metering rollers of the selected tanks are sowing.
8. Drive OFF, within the Preload Time (Electric and Hydraulic only)



# Lockout Feature

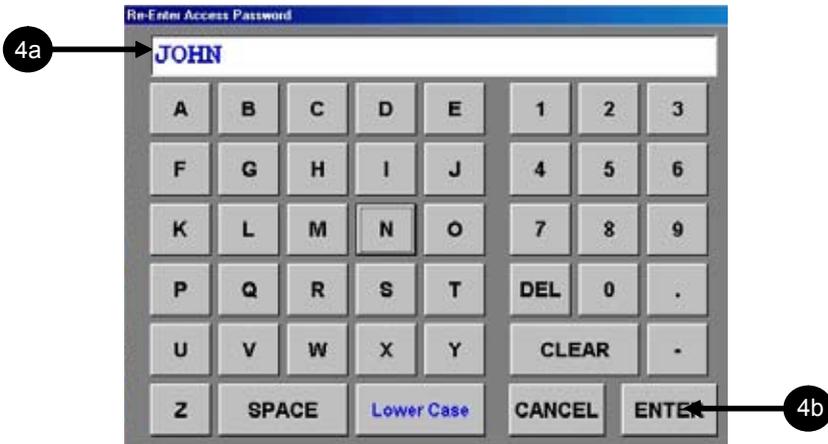
## Enable Lockout



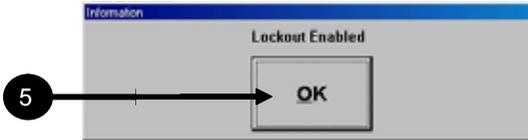
1. Click (Tap) the Topcon Logo in the upper right hand corner.



2. Click (Tap) the Register button, if your software is not registered you must purchase the software then unlock the code. Refer to your dealer.
3. **Enable Lockout** - Once this feature is activated, access can not be gained into options, and the wheel factor and machine width cannot be altered from the main screen.



4. You will be asked to enter in a password. Once you have typed it in once and pressed enter, you will be required to reenter the same password. The password is of your choice and can be of any configuration. DO NOT FORGET IT.



5. Once you have entered the lockout code in twice, Click (Tap) OK. Now when you try to access the options, the above window will appear. This means that the lockout function has been activated , and will have to be deactivated to allow you access.

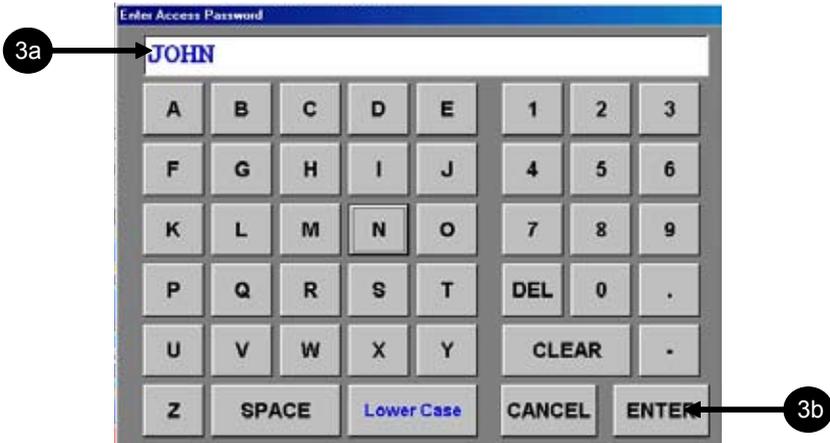
## Disable Lockout



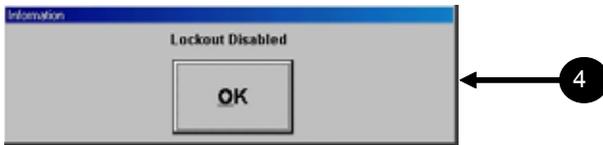
1. Click (Tap) the Topcon Logo in the upper right hand corner.



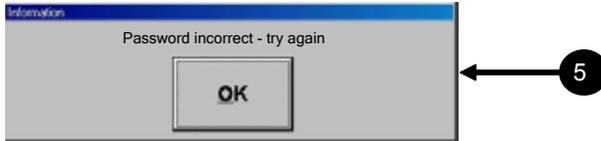
2. On the window that appears, Click (Tap) 'Disable Lockout'.



3. Enter in your password, and Click (Tap) 'Enter'



4. This screen will appear if the password you entered is correct.



5. This screen will appear if your password is incorrect.

# **F**unctional Testing

## **Checking Harness Voltages**

### **Hall Effect sensors**

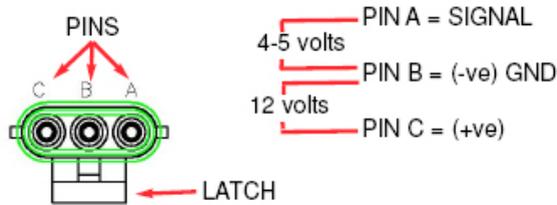
#### **Overview**

All Topcon Precision Ag shaft sensors (Hall Effect and Proximity) are pinned alike and so they are interchangeable. Each time the Hall Effect Sensor is exposed to the magnet it closes the circuit between Pin-A and Pin-B.

The controller sees this as 0V and 12V when the sensor is clear of the magnet. The Topcon Precision Ag Hall Effect sensor requires a distance of 2-3mm between the sensor and the magnet. The Wheel and Fan Speed sensors are Hall Effect type sensors.

- This test will check if the sensor is receiving the correct voltages, from the chassis harness.
- To carry out this test a multimeter is required which can measure DC voltage between 1V and 24V. A ruler to measure distance between sensor and magnet.
- This test procedure can be carried out on ground speed sensors, metering shaft sensors and the fan speed sensor all which have a 3 pin weather-pak connector, which connects the sensor to the chassis harness. Each connector has A, B and C marked on the connector. If the A,B and C are covered by shrink-wrap, then use diagram below to determine A,B and C pins position

1. Check the the distance between the magnet and sensor. The distance between them should be 2 to 3 mm. Readjust the distance if they are not within this range.
2. When checking the ground speed sensor, ensure that no magnets are missing and that they are evenly spaced apart.



**Figure 11-1. 'HARNESS' 3-pin Weather-Pak Plug**

3. Check for obvious signs of damage (breakage, corrosion etc) to the sensor, plug and wiring. Repair any damage.
4. From the sensor, trace back the wiring to the 3 pin weather-pak plug, unplug the sensor plug from the chassis harness plug.
5. Switch Console POWER switch ON.
6. The 'Latch' on the plug is what holds the 2 plugs together. With the 'Latch' facing down (as shown in diagram), the Pins starting from the left are: C, B and A.
7. Using multi-meter, the voltage between PIN C and PIN B should be 12V.
8. Using multi-meter, the voltage between PIN A and PIN B should be 4-5V.
9. If the voltages are correct as above then this would suggest a faulty sensor or that the magnets were incorrectly installed.

10. If one or both voltages are incorrect then write down the actual voltages and contact your local TPA Dealer.



## **WARNING**

**Sensor power is 1amp limited and should NEVER be used for any other purpose**

## **Proximity Sensors**

### **Overview**

Each time the Proximity Sensor is exposed to a piece of metal (tooth of a sprocket, as an example) within a certain distance, this closes the circuit between Pin-A and Pin-B.

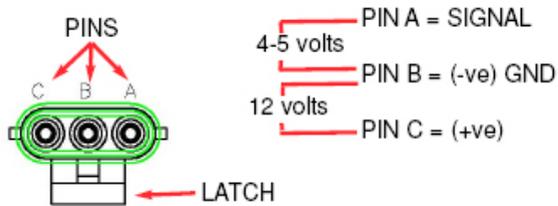
The controller sees this as 0V and 12V when the sensor is clear of the metal. At the back of the proximity sensor there is a red LED.

When the proximity sensor is exposed to metal at the correct distance the red LED lights up, therefore as the tooth goes past the sensor the red LED lights turns ON, the gaps between the teeth, the red LED turns OFF.

The TPA Proximity sensor requires a distance of 1mm between the sensor and the tooth. The proximity sensors are located near the metering shafts of each tank.

- This test will check the sensor is receiving the correct voltages, from the tank harness.
- To carry out this test a multimeter is required which can measure DC voltage between 1V and 24V. A ruler to measure distance between sensor and tooth of the sprocket.

- This test procedure can be carried out on the ‘Motor Feedback’ sensors that are connected to the tank harness. Each connector has A, B and C marked on the connector. If the A,B and C are covered by shrink-wrap, then use diagram below to determine A,B and C pins position
- Check the the distance between the magnet and the sprocket. The distance should be 1 mm. Reajust if the distance is incorrect.
- Check for obvious signs of damage (breakage, corrosion etc) to the sensor, plug and wiring. Rectify any damage.



**Figure 11-2. ‘HARNESS’ 3-pin Weather-Pak Plug**

- From the sensor trace back the wiring to the 3 pin weather-pak plug, unplug the sensor plug from the chassis harness plug.
- Switch Console POWER switch ON.
- The ‘Latch’ on the plug is what holds the 2 plugs together. With the ‘Latch’ facing down (as shown in diagram), the Pins starting from the left are: C, B and A
- Using multi-meter, the voltage between PIN C and PIN B should be 12V.
- Using multi-meter, the voltage between PIN A and PIN B should be 4-5V.
- If the voltages are correct as above then this would suggest a faulty sensor.

- If one or both voltages are incorrect then write down the actual voltages and contact your local TPA Dealer.

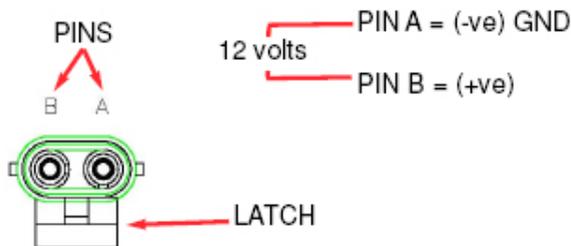


## WARNING

**Sensor power is 1amp limited and should NEVER be used for any other purpose**

### Tank/Bin Level Sensor

- This test should be carried out if the tank/bin level sensor appears to be faulty. This test will check the sensor is receiving the correct voltages.
- To carry out this test a multimeter is required which can measure DC voltage between 1V and 24V.
- Each tank/bin level sensor has a 2 pin weather-pak connector and has A and B marked on the connector.
- Check for obvious signs of damage(breakage, corrosion etc) to the sensor, plug and wiring. Rectify any damage.
- From the sensor trace back the wiring to the 2 pin weather-pak plug, unplug the sensor plug from the chassis harness plug.
- Switch Console POWER switch ON.



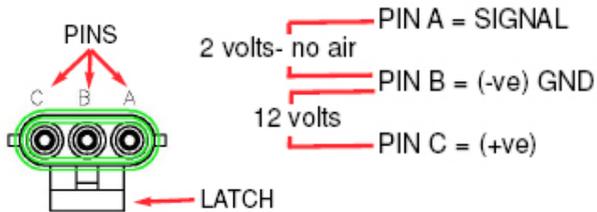
**Figure 11-3. 'HARNESS' 2-pin Weather-Pak Plug**

- The 'Latch' on the plug is what holds the 2 plugs together. With the 'Latch' facing down (as shown in diagram), the Pins starting from the left are: B and A.
- Using a multi-meter, the voltage between PIN A and PIN B on the chassis harness should be 12V.
- If the voltage is incorrect then write down the actual voltage and contact your TPA Dealer.

## Pressure Sensor Test

This is a simple test procedure that determines whether the pressure transducer sensor is functioning properly. A multi-meter is required which can measure DC voltage between 1V and 24V.

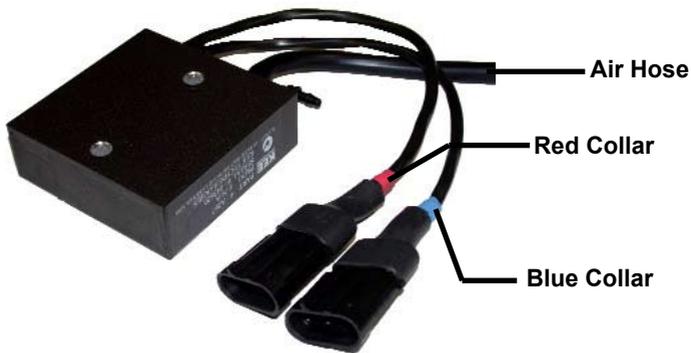
- The pressure transducer sensor is mounted on the air seeder chassis near the fan.
- The sensor has 2 weather-pak plugs(one with a red collar and one with a blue collar) and a spigot with a rubber hose which goes to the fan. See diagram of Pressure Transducer Sensor at bottom of page, showing red collar plug, blue collar plug and air hose
- For correct operations the weather-pak plug with the red collar should be connected to the chassis harness; if the red collar plug isn't connected then do so now and check console for a pressure reading; the blue collar plug is used for testing.
- To test the sensor unplug red collar plug from chassis harness.
- Connect the blue collar plug to the chassis harness.



**Figure 11-4. Red collar 3-pin Weather-Pak Plug**

- Switch Console POWER switch ON.
- The 'Latch Holder' on the plug is what holds the 2 plugs together. With the 'Latch Holder' facing down (as shown in diagram), the Pins starting from the left are: A, B and C.

- Using a multi-meter, the voltage between PIN C and PIN B should be 12V.
- Using multi-meter, the voltage between PIN A and PIN B should be 2V.
- Unplug the rubber hose from where it is attached to the fan.
- With the multi meter still across PIN A and PIN B, blow hard into the hose, the voltage should read approximately 3V.
- Once testing is finished ensure the weather-pak plug with the red collar is connected to the chassis harness and connected the rubber hose back to the spigot on the fan.
- If one or both voltages are incorrect then write down the actual voltages and contact your TPA Dealer.



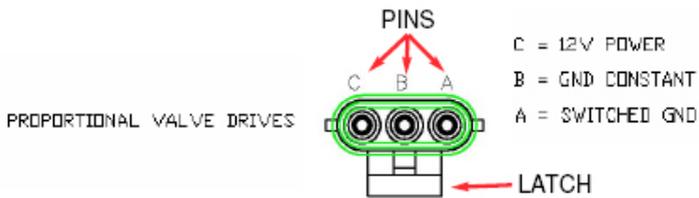
**Figure 11-5. Pressure Transducer Sensor**

## Proportional Valve Testing

### Proportional Valve Output Test

#### Overview

The proportional drive output allows control of PWM Hydraulic Solenoid valves. Pin- C provides a constant 12volt supply to the coil while Pin-A delivers a switched Gnd signal. Note Pin B is not used in standard proportional valve setups.



#### Proportional Valve Output Test Procedure

An automotive test light should be used for this test. With the Master and Tank switch on, and a manual speed set, the light should glow brightly.

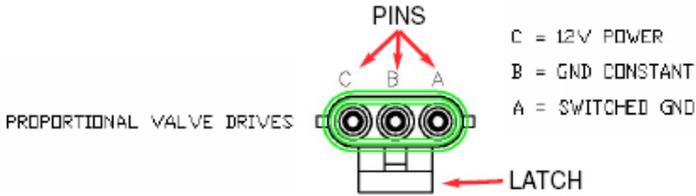
Reduce the Max PWM value pressing ‘OK’ after each 5% reduction. Confirm that the light’s brightness is reduced after each change.

### Danfoss Interface Test

#### Overview

With the addition of a “Danfoss” interface (TPA Supplied) connected to the Proportional drive outputs on the harness, Danfoss PVEH and PVEA hydraulic control valves can be controlled.

Use the same controller settings as the proportional valves for this valve type. The Danfoss interface converts the PWM signal into a voltage output to control the valve.



### Danfoss Interface Test Procedure

With the master switch OFF, Confirm the following:

1. 6V between Pin-A and Pin-B
2. 0V between Pin-B and Pin-C.

With the Master and Tank switch ON, 'Manual Speed' selected. Confirm the following:

1. 3V between Pin-A and Pin-B
2. 12V between Pin-B and Pin-C

## **External Master Switch**

### **Overview**

This input is provided to allow convenient location of an External Master switch (not supplied) for the operator.

Closing the circuit between Pin-A and Pin-B using an “off the shelf” ‘ON/OFF’ switch will control the screen master switch on the Controller.

The ‘External Master’ is a ‘3 pin weather-pak’ plug, but only Pins A and B are used.

### **Remote Master Test Procedure**

Confirm no less than 12V between Pin-A and Pin-B with the X20 Console switched ON.

Connect the pins together. The X20 Console screen Master Switch should ‘click’ and switch to the ON position.

Ensure that the correct Remote master switch options are properly selected.



# Alarms

All alarms to alert the operator will appear in the ‘Alarm Window’. The frequency and whether an alarm sounds when an alarm is displayed in the ‘Alarm Window’ is set in the Alarms tab under OPTIONS.

The alarm will keep appearing in the ‘Alarm Window’ until the cause of the alarm is rectified. If there is more than one alarm present then the alarms will scroll through in the ‘Alarm Window’ one alarm at a time, the first alarm will flash a number of times, then the next alarm will flash and so forth, until all alarms have been displayed.

The ‘Alarm Window’ will then start again with the first alarm. A list of all the alarms and an explanation for each alarm are listed on the following pages.



Figure 12-1. Working Screen Displaying Alarm

## Fan Alarms

**Fan Pressure Low-** if the fan pressure goes below the programmed Alarm Point, the message “FAN PRESS LOW” flashes in the ‘Alarm Window’ and the alarm sounds.

**Fan Pressure High-** if the fan pressure goes above the programmed Alarm Point, the message “FAN PRESS HIGH” flashes in the ‘Alarm Window’ and the alarm sounds.

**Fan Speed Low-** if the fan speed goes below the programmed Alarm Point, the message “FAN SPEED LOW” flashes in the ‘Alarm Window’ and the alarm sounds.

**Fan Speed High -** if the fan speed goes above the programmed Alarm Point, the message “FAN PRESS HIGH” flashes in the ‘Alarm Window’ and the alarm sounds.

**Fan Sensor Fail -** if the ‘Master Switch’ is ON, ‘Fan Pressure’ readout is above the ‘Fan Pressure Low’ alarm point and no pulses from the ‘Fan Speed’ this suggests the Fan Speed sensor has failed. Check Fan Speed sensor. Under these conditions , the message “FAN SENSOR FAIL” flashes in the ‘Alarm Window’ and the alarm sounds.

**Fan Pressure Low - Check Tank-** if the ‘Master Switch’ is ON, ‘Fan Speed’ readout is above the ‘Fan Speed Low’ alarm point and the ‘Fan Pressure’ readout is less than half the ‘Fan Pressure Low’ alarm point . Under these conditions , the message ‘Fan Pressure Low-Check Tank’ flashes in the ‘Alarm Window’ and the alarm sounds. Check the air seeder tank lids are closed.

## Rate Alarms

**Rate 1 Alarm-** if the selected application rate for TANK 1, can not be controlled to within 5% (above or below the rate), the message “RATE 1 ALARM” flashes in the ‘Alarm Window’, the alarm sounds. and the “actual” rate being metered will be displayed on LINE 1.

**Rate 2 Alarm-** if the selected application rate for TANK 2, can not be controlled to within 5% (above or below the rate), the message “RATE 2 ALARM” flashes in the ‘Alarm Window’, the alarm sounds. and the “actual” rate being metered will be displayed on LINE 2.

**Rate 3 Alarm-** if the selected application rate for TANK 3, can not be controlled to within 5% (above or below the rate), the message “RATE 3 ALARM” flashes in the ‘Alarm Window’, the alarm sounds. and the “actual” rate being metered will be displayed on LINE 3.

**Rate 4 Alarm-** if the selected application rate for TANK 4, can not be controlled to within 5% (above or below the rate), the message “RATE 4 ALARM” flashes in the ‘Alarm Window’, the alarm sounds. and the “actual” rate being metered will be displayed on LINE 4.

## **Tank (or Bin) Low (Sensor) Alarms**

**Tank 1 Low Alarm-** when the product level in TANK 1 falls below the sensor, the message “TANK 1 LOW” flashes in the ‘Alarm Window’ and the alarm sounds.

**Tank 2 Low Alarm-** when the product level in TANK 2 falls below the sensor, the message “TANK 2 LOW” flashes in the ‘Alarm Window’ and the alarm sounds.

**Tank 3 Low Alarm-** when the product level in TANK 3 falls below the sensor, the message “TANK 3 LOW” flashes in the ‘Alarm Window’ and the alarm sounds.

**Tank 4 Low Alarm-** when the product level in TANK 4 falls below the sensor, the message “TANK 4 LOW” flashes in the ‘Alarm Window’ and the alarm sounds.

## **Tank (or Bin) Empty (Contents) Alarms**

**Tank 1 Empty Alarm-** will alarm when the air seeder has calculated the last of the product has been metered, through TANK 1, “TANK 1 EMPTY” flashes in the ‘Alarm Window’ and the alarm sounds.

**Tank 2 Empty Alarm-** will alarm when the air seeder has calculated the last of the product has been metered, through TANK 2, “TANK 2 EMPTY” flashes in the ‘Alarm Window’ and the alarm sounds.

**Tank 3 Empty Alarm-** will alarm when the air seeder has calculated the last of the product has been metered, through TANK 3, “TANK 3 EMPTY” flashes in the ‘Alarm Window’ and the alarm sounds.

**Tank 4 Empty Alarm-** will alarm when the air seeder has calculated the last of the product has been metered, through TANK 4, “TANK 4 EMPTY” flashes in the ‘Alarm Window’ and the alarm sounds.

## **‘No Flow’ Alarms**

**No Flow - Tanks OFF-** will alarm when the ‘Master Switch’ is ON, a ground speed is detected, Fan Speed is above the ‘Fan Speed Low Alarm Point’ and all the tanks are OFF. ‘No Flow- Tanks Off’ flashes in the ‘Alarm Window’ and the alarm sounds. Alerting the operator there are no tanks switched ON.

**No Flow - No Ground Speed-** will alarm when the ‘Master Switch’ is ON, at least one tank switch is ON, Fan Speed is above the ‘Fan Speed Low Alarm Point’ and no ground speed is detected; ‘No Flow- Ground Speed’ flashes in the ‘Alarm Window’ and the alarm sounds. Check ground speed sensor

**No Flow - No Fan Speed-** will alarm when the ‘Master Switch’ is ON, at least one granular tank switch is ON, a ground speed is detected, and the Fan Speed readout displays less than a 100rpm ‘No Flow- No Fan Speed’ flashes in the ‘Alarm Window’ and the alarm sounds. Check Fan has been engaged and/or check fan speed sensor

## **Other Alarms**

**No Ground Speed-** when no signal is detected from the wheel sensor on the air seeder or tractor radar (if fitted), when a Tank is switched ON and MASTER is in the ON position. This will occur any time the air seeder stops and is intended as a warning only. If the “NO GROUND SPEED” message flashes in the ‘Alarm Window’ and the alarm sounds and the air seeder is moving, the wheel sensor (on air seeder) or Tractor radar (if fitted), should be checked immediately.

**NO COMMS-** if the Multi Drive Electronic Control Unit (MDECU) is disconnected, from the interface, the message flashes in the ‘Alarm Window’ and the alarm sounds. No seeding is possible if this alarm is present.

**No Interface Comms-** will alarm when the X20 Console does not detect the remote ECU is connected. The message ‘ No Interface Comms’ will flash in the ‘Alarm Window’ and the alarm sounds. This can be caused by:

- The Remote ECU is not connected to the battery.
- The wrong ‘communication ports’ (Comms Port) is selected in the X20 Console.
- The serial communications cable is not connected to the X20 Console or the Remote ECU.

**MASTER SWITCH OFF-** when a Tank is switched ON and the MASTER switch is in the OFF position, after a set period, the message “MASTER OFF” flashes in the ‘Alarm Window’ and the alarm sounds. This alarm is intended as a warning only.

**HIGH TEMP** - when the MDECU box, reaches or exceeds the maximum temperature, the message “HIGH TEMP” flashes in the ‘Alarm Window’ and the alarm sounds.

**TANKS OFF** - when the MASTER is switched to the ON position; but the Tank switches are switched OFF, the TANKS OFF will flash in the ‘Alarm Window’ This alarm is intended as a warning only.

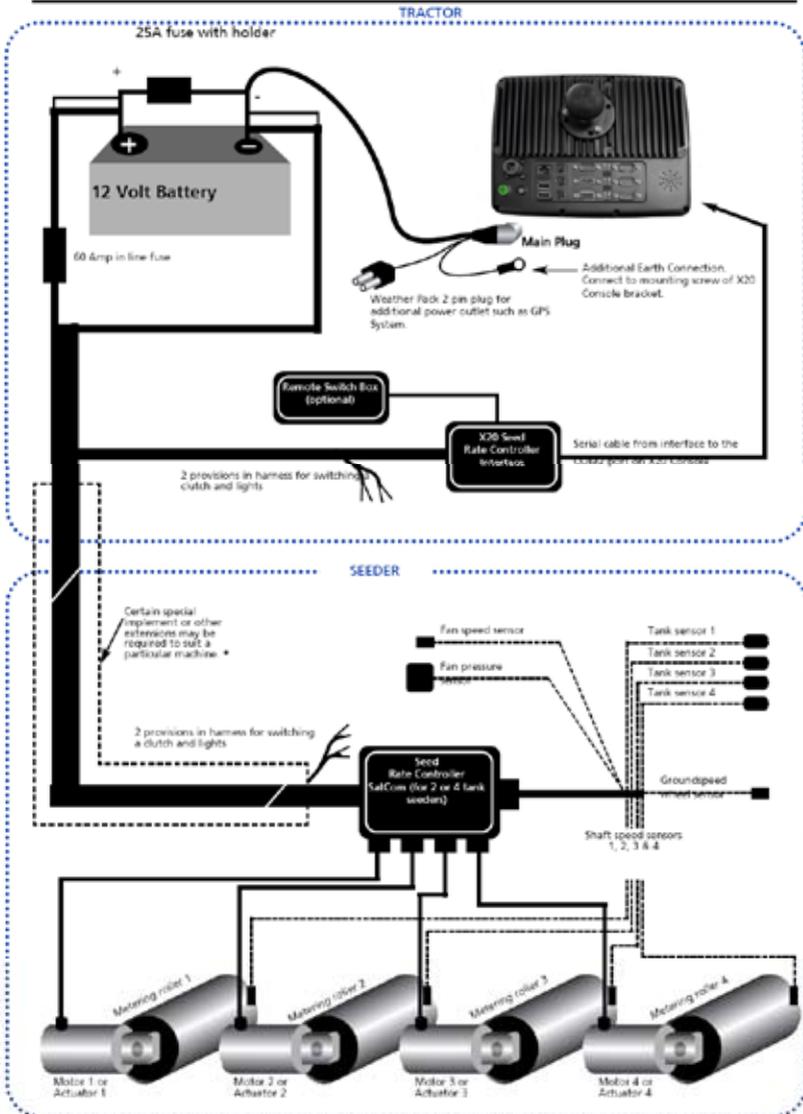
**TURN MASTER OFF**- when the MASTER switch is in the ON position and the operator tries to PRESS a button that requires the MASTER switch to be in the OFF position (ie go to the sub menu’s) then the TURN MASTER OFF alarm flashes in the ‘Alarm Window.’

**Alternate Rate In Use** - will alarm when the Primary Rate (Preset 1 Rate) is not being applied; the message ‘Alternate Rate In Use’ flashes in the ‘Alarm Window’ and the alarm sounds. This maybe because the Secondary Rate (Preset 2 Rate) or Increment/Decrement buttons where used. This alarm alerts the operator the Primary Seeding rate is not being applied in one of the tanks.

# Appendix A

## Schematic Layout

Wiring connections



\*For correct fitting of hardware consult with a Topcon Precision Ag representative



# Appendix B

## Product Specifications

### X20 Console

**Table B-1. X20 Console Specifications**

Supply Voltage	13-16V Negative earth system
----------------	------------------------------

The X20 Console's power leads must be connected directly to the tractors battery terminals. No attempt should be made to connect the system to positive earth vehicle. Damage will result and Warranty will become void.

### Ground Speed and Fan Speed (Hall Effect Sensors)

**Table B-2. Hall Effect Sensors Specifications**

Ground Speed, Fan and Shaft sensors	Hall effect type sensors, 3-Pin Weather-pak plug (Pin A,B and C)
Sensor to Magnet distance	2-3 mm
Supply Voltage	Supply 12 V from MDECU
Signal Voltage	4 -5- V sensor inactive < 1 V sensor activated by magnet

## Motor Feedback (Proximity Sensors)

**Table B-3. Proximity Sensors Specifications**

Motor Feedback, Sensors	Proximity Sensor 3-Pin Weather-pak plug (Pin A,B and C)
Sensor to Metal distance	1 mm
Supply Voltage	Supply 12V from MDECU
Signal Voltage	4 -5 V sensor inactive < 1 V sensor activated by metal

## Fan Pressure Sensors

**Table B-4. Fan Pressure Sensors Specifications**

Fan Pressure Sensors	Solid state aircraft altimeter type. Max. error 1%
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## Tank Level Sensors

**Table B-5. Tank Level Sensors Specifications**

Tank Level Sensor	Solid state capacitive type. 2 Pin weather-pak plug (Pin A and B) Triggered on flat end Sensitivity adjustable for light material eg. Urea
Supply Voltage	Supply 12V from MDECU

## Auxillary Lights Switchbox

**Table B-6. Auxillary Lights switchbox Specifications**

Aux. and Lights Switchbox	Maximum of 50 Watts continuous for each plug. Multi-meter across Pins 'A' and 'B'; 12 VDC when switches on the console are selected ON.
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