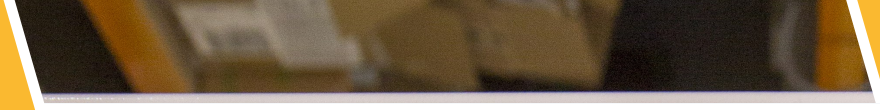


GRAINSAFE 6000

AERATION COOLING CONTROLLER

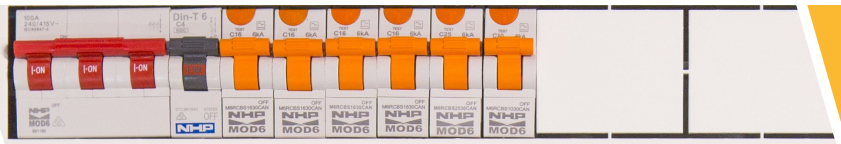
Grain Aeration Controllers

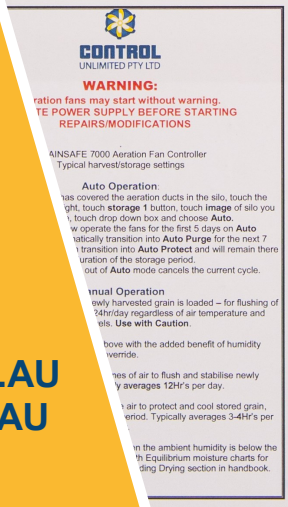
Site Automation

Electrical Switchboards

Loading & Unloading Stations

Grain Storage Accessories & Parts




CONTROL
UNLIMITED PTY LTD

WARNING:

ration fans may start without warning.
TE POWER SUPPLY BEFORE STARTING
REPAIRS/MODIFICATIONS

AINSAFE 7000 Aeration Fan Controller
Typical harvest/storage settings

Auto Operation:
as covered the aeration ducts in the silo, touch the
ght, touch **storage 1** button, touch **image** of silo you
, touch drop down box and choose **Auto.**
w operate the fans for the first 5 days on **Auto**
atically transition into **Auto Purge** for the next 7
transition into **Auto Protect** and will remain there
uration of the storage period.
out of **Auto** mode cancels the current cycle.

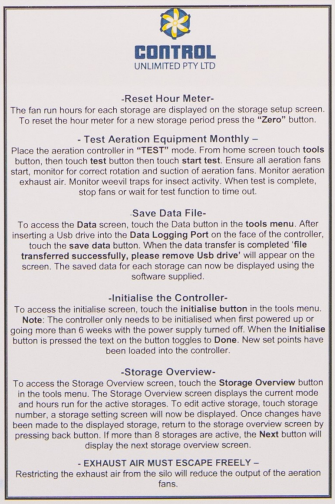
nual Operation
ewly harvested grain is loaded – for flushing of
24hr/day regardless of air temperature and
els. **Use with Caution.**

bove with the added benefit of humidity
verride.

es of air to flush and stabilise newly
averages 12Hr's per day.

air to protect and cool stored grain,
eriod. Typically averages 3-4Hr's per

n the ambient humidity is below the
h Equilibrium moisture charts for
ding Drying section in handbook.


CONTROL
UNLIMITED PTY LTD

-Reset Hour Meter-
The fan run hours for each storage are displayed on the storage setup screen. To reset the hour meter for a new storage period press the **"Zero"** button.

- Test Aeration Equipment Monthly –
Place the aeration controller in **"TEST"** mode. From home screen touch **tools** button, then touch **test** button then touch **start test**. Ensure all aeration fans start, monitor for correct rotation and suction of aeration fans. Monitor aeration exhaust air. Monitor weevil traps for insect activity. When test is complete, stop fans or wait for test function to time out.

Save Data File-
To access the **Data** screen, touch the Data button in the **tools menu**. After inserting a Usb drive into the **Data Logging Port** on the face of the controller, touch the **save data** button. When the data transfer is completed '**file transferred successfully, please remove Usb drive**' will appear on the screen. The saved data for each storage can now be displayed using the software supplied.

-Initialise the Controller-
To access the initialise screen, touch the **initialise button** in the tools menu. **Note**: The controller only needs to be initialised when first powered up or going more than 6 weeks with the power supply turned off. When the **Initialise** button is pressed the text on the button toggles to **Done**. New set points have been loaded into the controller.

-Storage Overview-
To access the Storage Overview screen, touch the **Storage Overview** button in the tools menu. The Storage Overview screen displays the current mode and hours run for the active storages. To edit active storage, touch storage number, a storage setting screen will now be displayed. Once changes have been made to the displayed storage, return to the storage overview screen by pressing back button. If more than 8 storages are active, the **Next** button will display the next storage overview screen.

- EXHAUST AIR MUST ESCAPE FREELY –
Restricting the exhaust air from the silo will reduce the output of the aeration fans.

CONTROL
UNLIMITED PTY LTD
PH: (07) 46 344 706
INFO@GRAINAERATION.COM.AU
WWW.GRAINAERATION.COM.AU

Contents

CONTROL
UNLIMITED PTY LTD

Included Items

1 x GRAINSAFE 6000/2 Aeration Controller
1 x Weather Station Sensor
1 x 20mm Compression Gland
1 x Stainless Steel Sensor Protector
2 x Self Drilling Screws (8 Gauge x 12 mm)
1 x Operators Manual

GRAINSAFE 6000/2 Aeration Controller

Self -Drilling Screws

Weather Station Sensor

Stainless Steel Sensor Protector

20mm Compression Gland

CONTROL
UNLIMITED PTY LTD

Introduction

Overview:

The Grainsafe 6000/2 is a replacement for the older Rimik AC10-12-20 aeration controllers. This controller is a wet bulb controller with humidity override, large smart phone interface, functional test operation and gen start functionality.

Features:

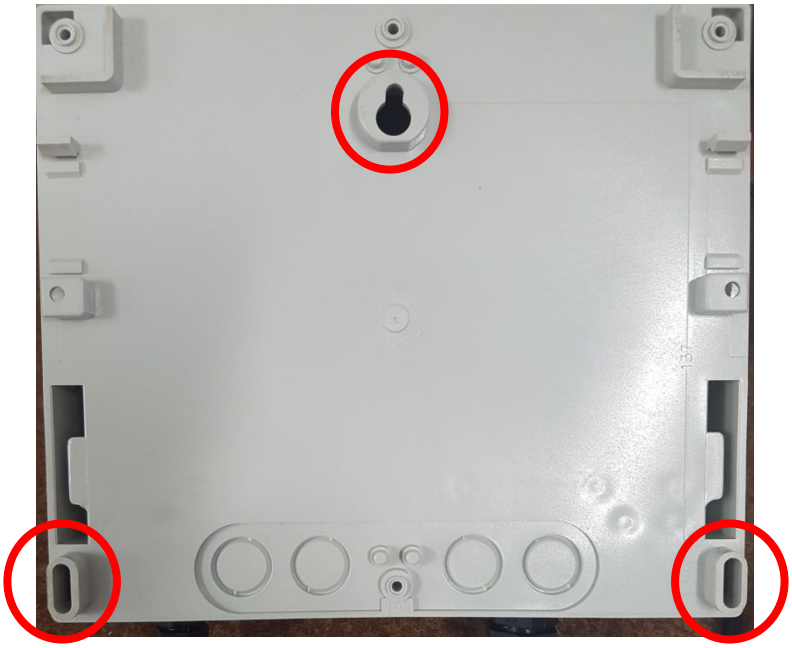
- 6.2” smart phone interface
- User friendly operation
- Data logging
- Humidity override
- Resettable hour meters
- Test mode
- Remote generator start feature
- Generator warm up/cool down timer
- Real time clock

Setting Up

Mounting Options:

Note: the GRAINSAFE 6000/2 isn’t waterproof and cannot be mounted in a location where exposure to moisture is possible

- The controller should be located in a suitable electrical cabinet at the site to ensure that it remains out of the weather. The image below displays the mounting holes in the back of the control box. (Note: The GrainSafe 6000 should always be mounted facing south or in a shaded position. This is to ensure the display is easy to read at any time during the day.)



CONTROL UNLIMITED PTY LTD

The controller is mounted to the inside of a cabinet by placing a screw into the inside face of the cabinet and 'hooking' the controller to it using the elongated top hole. Once the controller is in the desired position, it can be secured by drilling two more screws into the bottom holes from the front side.

- **Mounting Weather Station Sensor –** Once Controller installation is complete, a 20mm diameter hole needs to be drilled in the gland plate at the bottom of the electrical cabinet (ensure the senor doesn't foul on inner door or electrical equipment). See the image below. Then using the Stainless-Steel sensor protector as a template, place it over the compression gland hole until the hole is roughly centred, then mark the two drill holes that are required to mount the Stainless-Steel Sensor Protector. Drill these two holes with a 3mm drill bit then use the two 8-gauge x 12mm self-drilling supplied to mount the Stainless-Steel Sensor Protector to the Gland Plate. Mount the sensor through the compression gland fitted into the gland plate until the probe is all the way through the gland but not protruding below the Stainless-Steel Sensor Protector, tighten the compression gland to keep the sensor in place. Connect the 4-pin connector cable to the 4-pin plug on the side of the sensor and tighten the threaded locking ring.

Power:

The GRAINSAFE 6000/2 operates best when continuously connected to a power supply. This allows the controller to keep track of current conditions and be ready to aerate connected storages using ambient conditions that are optimum for protecting the grain stored.

The Generator start option, which comes in 12V DC supply, would be suitable for sites where a 240v power supply isn't available. The controller is powered from the Generator batteries, generally a solar panel is used to keep batteries fully charged.

GrainSafe 6000/2 Operation

Check the Aeration Installation:

Ensure that the Aeration Controller has been connected and initialised correctly before use. It is important for the user to check that the aeration system is operating correctly on a monthly basis as it is always possible that a fan may have failed, circuit breaker/overloads tripped, or the system may have been damaged by a storm or power surge etc.

Check the following regularly:

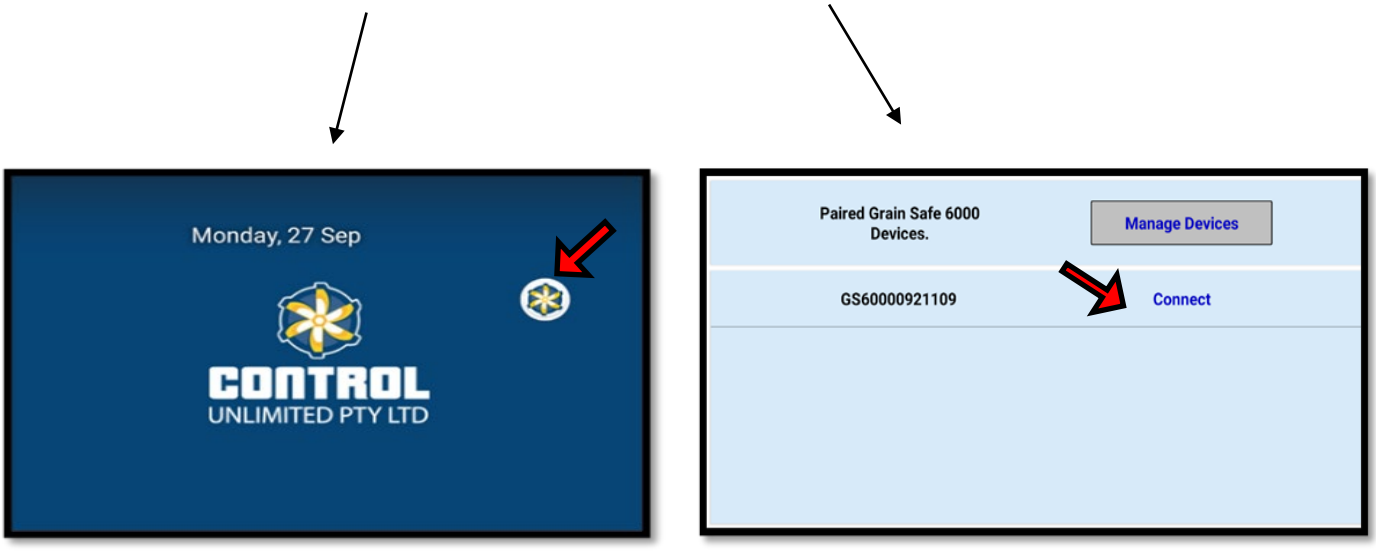
- Check that the fans are sucking air when they are switched on - to do this, use the test function (pg. 9) to run the fans and then verify that the fan is actually running and drawing air into the inlet. When done, stop the test mode or wait for the test mode to time out (10 Minutes).
- Inspect the condition of the grain in each silo.

Initial Start Up of device

Turn the power supply to the controller on and a short 'beep' will confirm its start-up. When the 'Power' light is illuminated and the 'Run' light is flashing rhythmically this indicates that the controller is operating properly. The mobile phone interface will need to be turned on by holding down the small button on the right-hand side of the phone for approximately 3-4 seconds until the start-up screen appears. The phone can then be mounted horizontally on the face of the controller and connected to the charging lead.

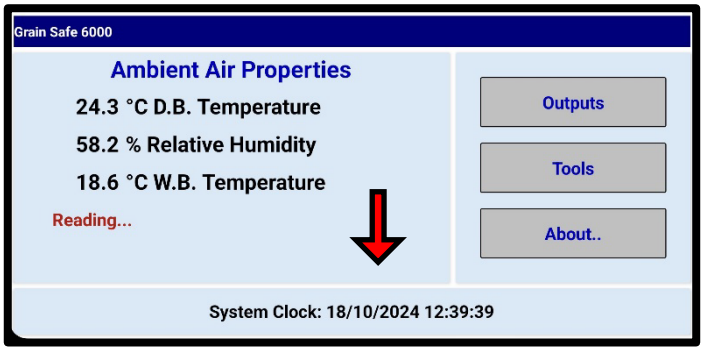
Opening the App

Once the device has been initiated, the home screen will appear with a singular app (see below). Select the app and after a brief moment the paired devices screen will appear. Click on the connect button beside the device you wish to pair (the controller serial number can be found on the bottom left of the enclosure by looking from underneath).



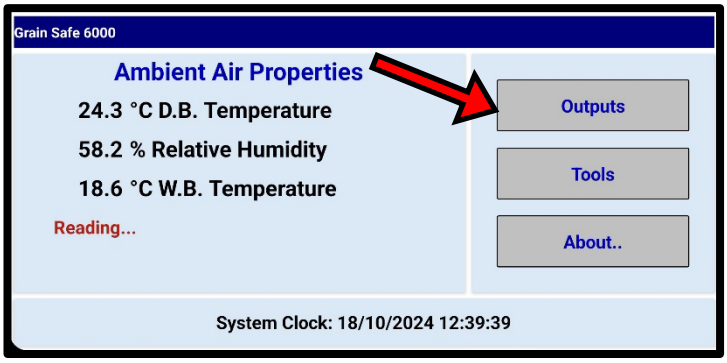
CONTROL
UNLIMITED PTY LTD

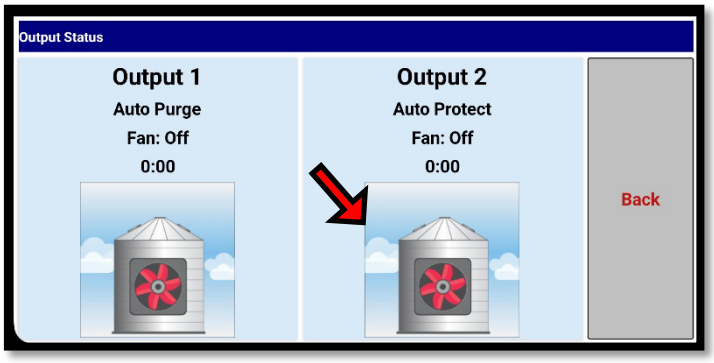
Home Screen:



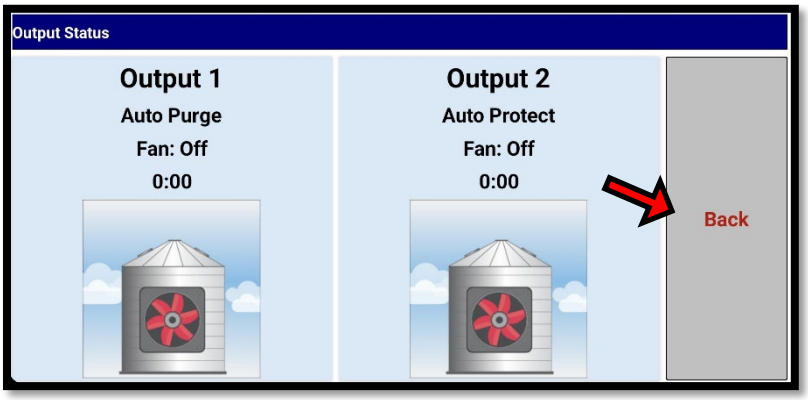
Displayed on the **Home Screen** is the current Ambient Air Properties of Temperature, Relative Humidity and Wet Bulb Temperature. Also displayed on the home screen is **Storages**, **Tools** and **About** buttons. The date and time can be synchronised with the phone by double tapping on the system clock located at the bottom of the home screen. Once the display has been clicked, a small bubble will appear above the date and time acknowledging the time is now synchronised with the device.

View Outputs:



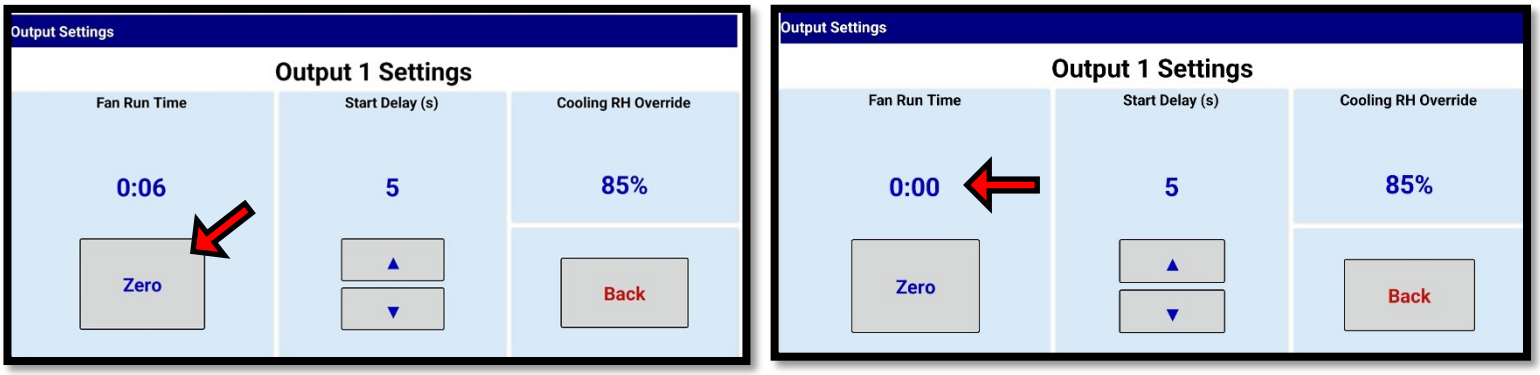


To access the Storage Status screen, touch the **Storages** button, the **Storage Status** screen will appear. Displayed on the screen will be the Output number and an animated image of the output. To select an output, touch on the image you wish to open. To return to the home screen press **Back.**



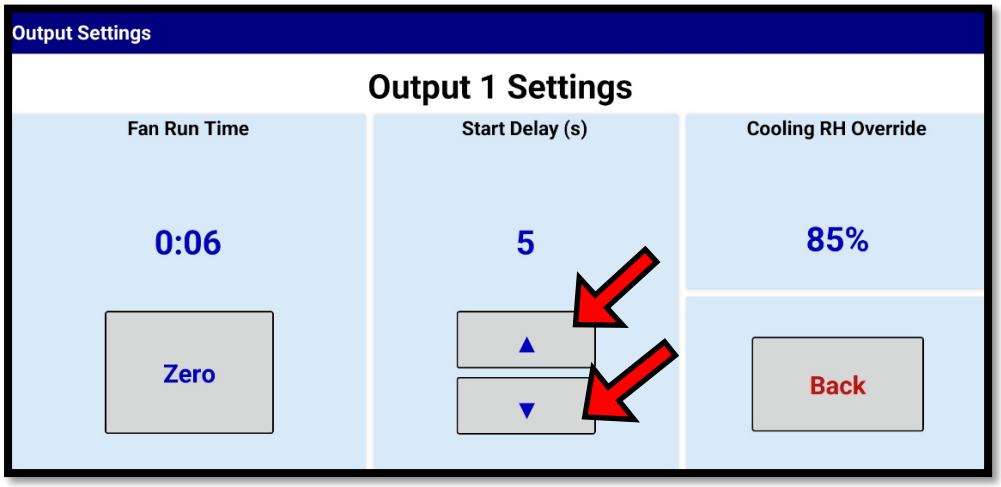
CONTROL UNLIMITED PTY LTD

Zero Fan Run Time:



To reset the fan run time touch the **Zero** button, the fan run time will reset to zero.

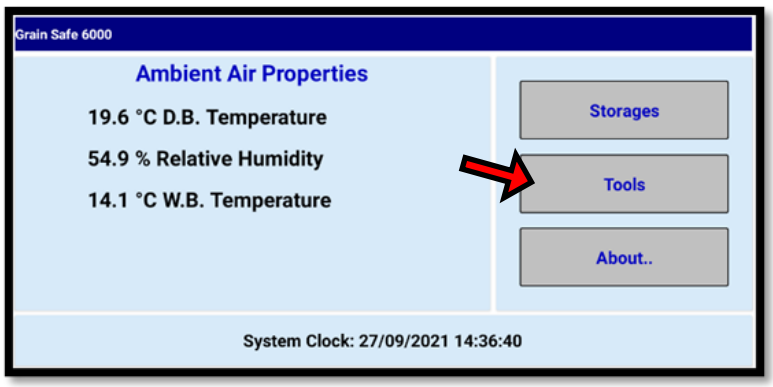
Changing the Start Delay Time:

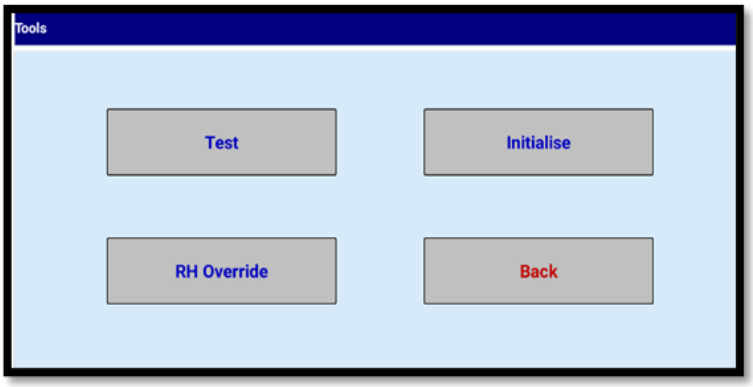


To change the **START DELAY** time, touch the **Up** or **Down** buttons to increase or decrease the start delay between aeration fans starting. (Minimum 5 seconds and maximum 60 seconds).

CONTROL UNLIMITED PTY LTD

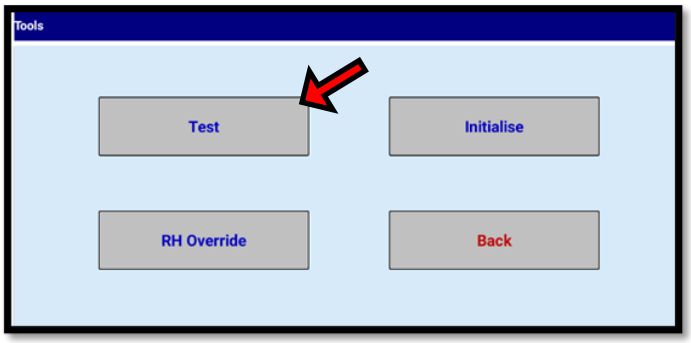
Accessing the Tools Menu:

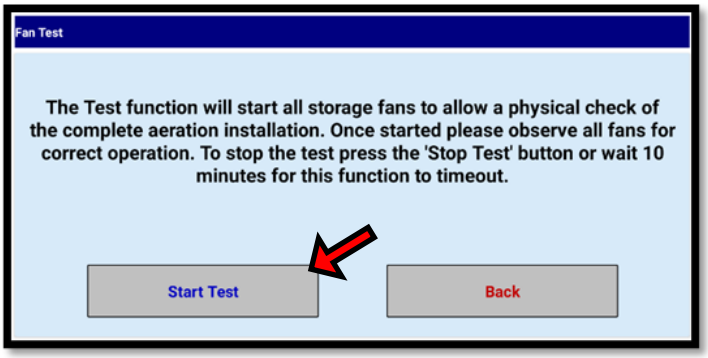




To access the Tools Menu, touch the **Tools** button and this screen option will appear.

Running a Test:

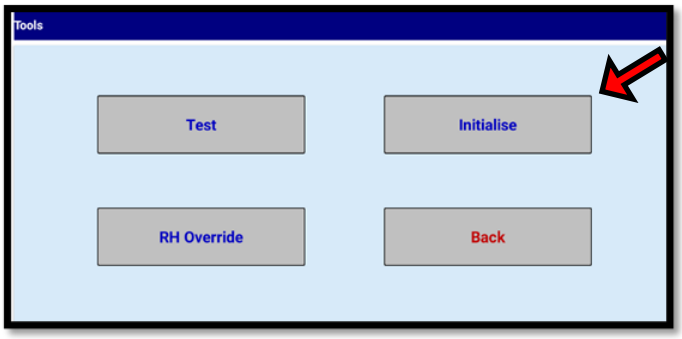


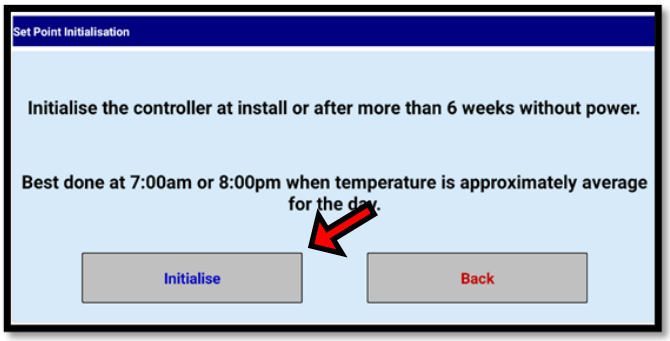


To access the Test screen, touch the **Test** button on the Tools Menu. Selecting 'Start Test' activates all storage fans in a timed sequence that allows the operator to walk alongside storages and confirm aeration fans are working properly. Touch the 'Stop Test' icon once complete. Tests should be performed once a month and in preparation for harvest.

CONTROL UNLIMITED PTY LTD

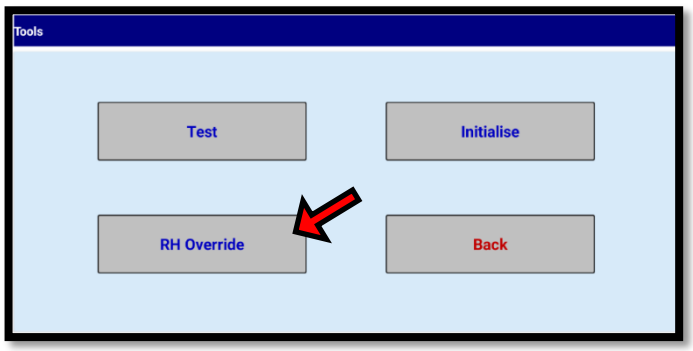
Initialise the Controller:

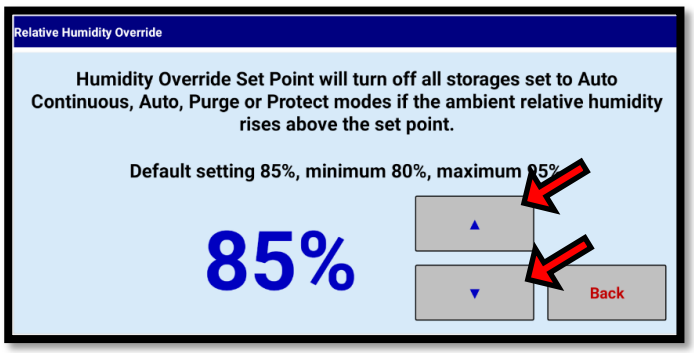




To access the Initialise screen, touch the **Initialise** button in the Tools menu.
Note: The controller only needs to be initialised when first installed or after more than 6 weeks with the power supply turned off. It is used to update the controller setpoints in accordance with local conditions, however, the controller will find the appropriate setpoints after approximately 2 weeks of operation as well.

RH Override:

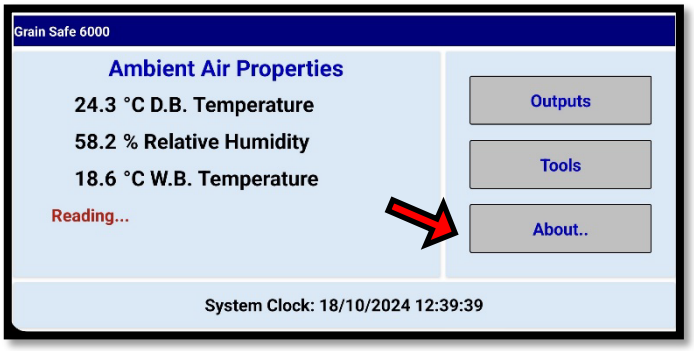


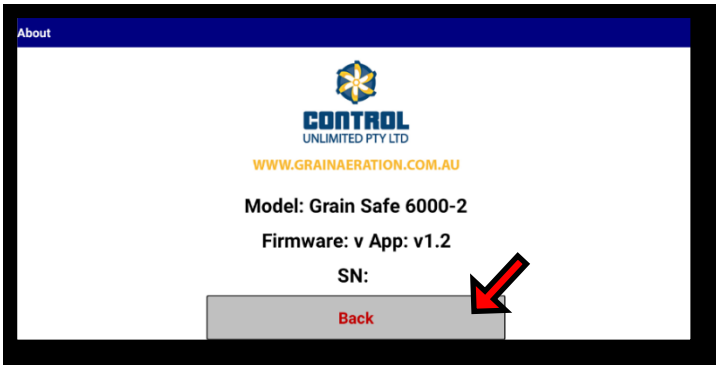


To access the Humidity Override screen, touch the **Humidity Override** button in the Tools menu.
The Humidity Override can be adjusted between 80% and 95% Relative Humidity by touching the **Up** or **Down** buttons. **Factory setting is 85% and should be left at this setting unless advised otherwise by your controller supplier.**
Note: The Humidity Override feature stops the controller from running the fans in any of the **Auto** modes when the relative humidity is higher that the override set point.

CONTROL
UNLIMITED PTY LTD

About Screen:





The **About** screen displays the controller's serial number, Firmware version and App version. This information is sometimes required by the manufacturer for servicing/update purposes.

Download/Upload Data:

The GrainSafe 6000 records all historical weather data, storage modes and fan run time data. This can be downloaded via the USB port on the face of the controller. Simply insert a USB drive and wait for the animated beep to sound, indicating that the data download is complete, then remove USB.

Accessing the data is done through the 'GrainSafe Manager' software which can be downloaded from the Control Unlimited website or emailing: info@grainaeration.com.au.

CONTROL
UNLIMITED PTY LTD

Operation Mode Description

Selection of Output Number: From the home screen, choose 'Outputs' button. The screen will now display 2 outputs (Purge and Protect), by touching inside the outline of the image for the storage you wish to edit, that storage set up screen will be displayed.

Operation Modes:

Hours Reset: While storage setup screen is displayed, pressing the "Zero" button will reset the fan run time back to zero.

Start Delay: use the up or down buttons to increase or decrease the time delay for the displayed storage from the previous storage. Minimum time setting is 5 seconds, maximum time is 60 seconds.

Test Mode: Pressing the "Start Test" button will turn on (stagger start) all activated storages and will time out after 10 minutes, this allows the operator to visually inspect all aeration fans for correct operation. When satisfied all fans are operating correctly, press the "Stop Test" button.

Wet Bulb Trigger Point / Initialization: The controller needs to be initialised when it is first installed or has been turned off for a period of more than 6 weeks. Do not initialise the controller if it has been running for more than 4 weeks, it will have optimised it set points at this stage. Initialise the controller at 7Am or 8Pm for best results as this is approximately the average temperature for the day. Never initialise the controller in the middle of the day, this will cause the controller to run excessive fan run hours in the early stages until it is able to adjust the set points back to a more realistic setting.

To initialise the controller press the "Initialise" button, the text will toggle to "Done" to show the process has been completed.

Settings related information:

Save Data: Insert Usb stick into Usb port and press "Save Data" button, after several seconds "Files transferred, please remove Usb stick" will appear at top left of the screen. All files have been transferred to the memory stick, this information can now be downloaded and viewed on a computer.

Update Settings: If at any stage the controller needs to be expanded or more options accessed, a file will be e-mailed to the client. "Update Settings" button will allow new setting to be loaded into the controller. These settings are serial # specific, settings for a given serial # will not load onto a controller with a different serial #!

Update Firmware: If at any stage a firmware update becomes available for the controller, the firmware update will be loaded by using the "Update Firmware" button in conjunction the instructions supplied with the firmware.

Humidity Override: The Humidity Override setting displayed is the relative humidity level that at which the controller will turn the fans off if exceeded. Can be adjusted down to a minimum of 80% and a maximum of 95%. Factory setting is 85%. The humidity override should be left at 85% unless advised otherwise by your controller supplier.

Warranty

1: Control Unlimited Pty Ltd warrants to the original purchaser that the product will be free from defects in workmanship and materials under normal use for a period of 1 year from the date of purchase.

Warranty Conditions

2.1 This warranty covers parts found to be defective in workmanship and/or materials during the period of warranty and will be repaired or replaced at the discretion of the manufacturer.

2.2 Control Unlimited Pty Ltd will not be responsible for any cost in connection with freight or post of replacement products or parts.

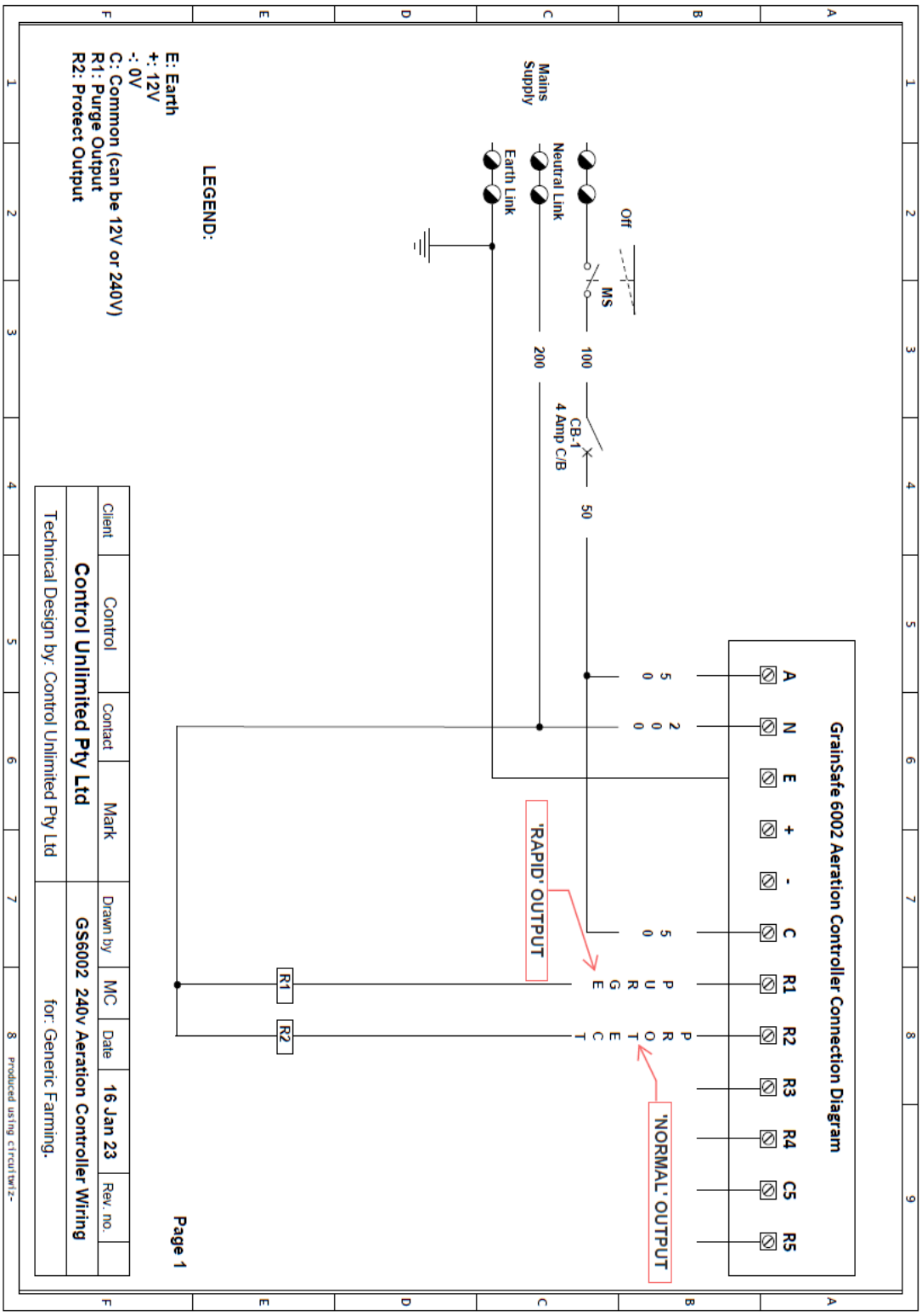
2.3 This warranty will be void and accordingly no claim of any nature will be enforced against the manufacturer if the product is not installed and operated according to the printed instructions supplied with the product. Or if the product is subjected to abuse, neglect, misuse or an accident.

2.4 The Manufacturer and/or distributor will not be liable for any incidental or consequential loss or damage arising from any cause whatsoever including but not limited to loss or damage arising from the instillation or operation of the product and/or the failure of any part for any reason whatsoever.

2.5 There are no warranties expressed or implied except those above.

Generic Wiring Diagram:

The following wiring diagrams are not site specific and are to be used as an indication of how to connect the GrainSafe 6000/2 aeration controller into an existing system. Please see configuration below:



CONTROL UNLIMITED PTY LTD

Frequently Asked Questions

1. **My GRAINSAFE-6000 Aeration Controller turns fans on at different times to another controller that I installed a few years ago ...**

... Other controllers may use different principles to select when to operate fans. They may be effective but will operate at different times. The GRAINSAFE-6000 uses 'wet bulb temperature' control instead of 'dry-bulb' control as used in some other (particularly older) controllers.

2. Why does my GRAINSAFE-6000 Controller sometimes operate fans when air temperature is higher than I would expect ?

... Fans may run at times when air temperature 'seems' too high. Here's a little background to the way the GRAINSAFE-6000 controller 'thinks'.

Wet-Bulb Control: >> The GRAINSAFE-6000 uses 'wet bulb temperature' control, not 'dry-bulb' control. This means that it sometimes takes advantage of air with a ***low WET-BULB*** *temperature (e.g. warm air of* ***LOW*** *humidity) to catch up on fan run hours. The frequency depends on what the weather has been doing e.g. the controller may 'catch-up' on fan hours after an unusually long period of high temperature and/or high humidity.*

As an example, air that is 'hotter' than 30degC but 'drier' than 20% humidity may have the ability to cool grain at 14%mc to less than 20degC. This feature means that the GRAINSAFE-6000 adapts better to extended periods of 'hot and/or high humidity' weather than some other controllers.

3. Why do we suggest that I run the aeration fans continuously for the first 5 day of storage once the storage is full....won't the warm daytime air reverse the cooling effect achieved at night time*...?*

In the first part of the storage period we are trying to rapidly cool the grain in storage and remove any free moisture from the storage. The grain (if harvested in Oct-Dec) could be put into the storage at 30-35 Deg C. As per the example above, hot dry air has the ability to cause an evaporative cooling effect in the storage, allowing the grain temperature to be driven down to a lower temperature than if the fans were turned off in this early stage of the storage period.

4. Won't running the fans at night time when the relative humidity tends to be higher, run the risk of re-wetting the grain in storage?

No..... as shown below, cold air for a give relative humidity (%Rh) hold less water than warmer air with the same relative humidity (%Rh).

Troubleshooting

Fault/Symptom	Possible Cause	Remedy
The display on the controller is blank!	The phone is flat or off Main switch is turned off. Control circuit breaker is off.	Charge the phone and then turn it back on. Turn control circuit breaker on.
Dry bulb, relative humidity and wet bulb temperature displaying zero, reading error displayed, alarm sounding.	Rht sensor disconnected or damaged.	Check 4 pin connector on Rht sensor is connected/tight. Inspect Rht sensor for damage, replace if necessary.
Fans not running.	The fan mode is set to off. The fan has been disconnected. Fault with the fan motor or wiring.	Set the fan mode to appropriate mode for storage. Check and reconnect the fan. If possible, swap the fan for a known working one.
Fans have not run for several days.	Unseasonal warm conditions. Continuous period of high humidity when auto modes would normally be in operation.	Wait for normal conditions to return- the GrainSafe 6000 will make up hours when conditions are more favourable.
Fans are running more than expected.	Unseasonable cool conditions. GrainSafe 6000 making up hours after passing of warm or high humidity conditions.	GrainSafe 6000 taking advantage of cool conditions. Normal operation of controller responding to varying weather conditions.
Gen start controller- Nothing happens when I start a storage or use test mode.	Generator is not in Auto (remote start) Mode.	Put Generator in Auto (remote start) mode.
Gen start controller- Generator starts, but fans don't run when I start a storage or use test mode.	Voltage monitoring relay not sensing output from gen set. Warm up timer has not timed out.	No output from gen set, check output circuit breaker. Check control circuit breaker in electrical cabinet. Wait one minute for warm up timer to time out.
Gen start controller- Fans turn off but generator doesn't stop.	Generator is not in Auto (remote start) Mode. Cool down timer has not timed out. Gen set has its own cool down timer.	Put gen set in Auto (remote start) mode. Wait one minute for cool down timer to time out. Wait for gen set cool down timer to time out, can be up to five minutes.

Equilibrium Moisture Content

Equilibrium moisture Content (EMC) of Grain

Relative Humidity (RH) is a measure of how much water (moisture) is present in air compared to the MAXIMUM amount that could be held. For example …if a sample of air (at a particular temperature) contains 25 units of water and the maximum amount that could be held is 50 units then the air is at 50% RH.

- When the Relative Humidity (RH) of air and the Moisture Content (MC) of grain are in '*equilibrium*' then no movement of moisture occurs between air and grain. The air and grain are at their ERH (Equilibrium Relative Humidity) and EMC (Equilibrium Moisture Content) points respectively.
- If the RH of air surrounding grain is LESS than the *ERH* value then moisture moves **from the grain** to the air.
- If the RH of air surrounding grain is HIGHER than the *ERH* value then moisture moves from the air **to the grain**.

- **FOR GENERAL GUIDANCE ONLY –**

Actual values may vary from those shown. Factors that affect ERH & EMC values include
temperature, variety, location AND whether grain is losing or absorbing moisture.
(Information is typical for temperatures between 25°C to 30°C)

Relative Humidity	***Equilibrium Moisture Content (%wb)***					
	Sorghum	*Barley*	*Maize*	*Wheat*	*Soybean*	*Sunflower*
90%	*19*	*23*	*21*	*20*	*20*	*18*
80%	*16*	*17*	*17*	*16*	*15*	*11*
70%	*14*	*15*	*15*	*14*	*12*	*9*
60%	*12*	*13*	*13*	*13*	*9*	*7*
50%	*11*	*11*	*12*	*12*	*8*	*6*
40%	*10*	*10*	*11*	*11*	*7*	*5*

Example *(@25°C to 30°C):* The table shows that air at 70%RH is in equilibrium with Sorghum grain at 14%mc. This means that air with less than 70%RH has the potential
to remove moisture from 14%mc Sorghum.

But note that the rate of moisture removal will generally be SLOW until RH is well below the equilibrium value.