CROPSCAN 16.2

OPERATOR INSTRUCTIONS

GENERAL DESCRIPTION OF UNIT FUNCTION

The controller is a scanning thermostat capable of scanning up to 16 crop sensors.
Desired crop temperature can be pre-set and the unit can control cooling via the ambient cooling fan with or without air mix and also refrigeration if available. A basic crop warming program is also available using the "Heating" selection.

Digital LED display of crop temperatures, ambient temperatures, duct temperature, crop, frost, air mix set points can be selected.

Crop sensor on duty is digitally displayed.

Recirculation control is available on a timed interval/period basis if required. This function can also be selected to operate in several special modes detailed in these instructions.

Total ambient fan hours run is also totalized on the Cropscan 16.2 fascia mounted hours run meter.
SEVEN CONTROL PROGRAMS ARE AVAILABLE VIA THE "**PROGRAM SELECTOR**" SWITCH. The operation of these program selections is detailed below.

1: SELECTION - **"Read Out Only"**

Select "**Read Out Only**" on Program Selector switch.

Crop temperatures etc can now be read without any automatic control relay output functions. This selection can be used during manual control in order to monitor the sensors only.

2: SELECTION - **"Heating" How to Set the Parameters.**

Select **"Heating"** on Program Selector switch.

Turn the Display Selector switch to :- **"Set Crop"**
- set the desired heat up target temperature using the **"Crop Set"** knob on the main digital display in degrees C.

After setting this dial turn the Display Selector switch back to the **"Crop Temp"** position.

2: SELECTION - **"Heating" How the program operates**

When any crop sensor is found below the **"Crop Set"** level the temperature is compared with ambient sensor temperature. If it is 2^{o}C (standard Offset Value) or more less than the ambient

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OPERATOR INSTRUCTIONS (cont.)

temperature heating is initiated. Heating will continue until this differential is reduced or the crop sensors are heated up to the **"Crop Set"** level.

IMPORTANT NOTE REGARDING THE "Heating" function.

Unlike Cooling when utilising the "Heating" function it is important that all the Crop Temperature sensors are plugged in.
ie: there must not be any open sockets reading -29 degrees. If there are these values will cause the **Heating demand to continue indefinitely.**
It is not particularly necessary to have all the crop sensors actually in the Crop. This is because the ones in the crop would always be likely to be colder than the ones not put in.

3: SELECTION - **"Cooling" How to Set the Parameters.**

Select **"Cooling"** on Program Selector switch.

Turn the Display Selector switch to :- **"Set Crop"**

- set the desired storage temperature using the **"Crop Set"** knob on the main digital display in degrees C.

Turn the Display Selector switch to **"Air Mix Set"**

-set the lowest acceptable cooling air temperature (the temperature of the air duct used to cool the crop) using the **"Air Mix Set"** knob.
The recommended setting for this is 2^{o}C below the **"Crop Set"** temperature. This setting acts only as a safety cut out if the duct temperature falls below the set level.

Turn the Display Selector switch to :- **"Set Low Limit"**

- set the lowest acceptable cooling (blown) air temperature using the **"Low Limit Set"** knob on the main digital display in degrees C.

After setting these two dials turn the Display Selector switch back to the **"Crop Temp"** position.

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To set the Recirculation operation set the unit as follows:

Set the interval between recirculation (1-8 hrs) using the Recirculation **"Interval"** knob.

Set the run time on the fans during recirculation (5-30 mins) using the Recirculation **"Period"** knob.

3: SELECTION - **"Cooling" How the program operates**

When any crop sensor is found above **"Crop Set"** level the temperature is compared with

ambient sensor temperature. If it is 2^{o}C (standard Offset Value) or more above the ambient temperature cooling is initiated. Cooling will continue until this differential is reduced or the crop sensors are cooled below the **"Crop Set"** level.

Hot sensors can be seen when scanned by the **"Cooling Required**" Red LED which will flash as this sensor is read by the Cropscan 16. If a suitable ambient air temperature differential exists the **"Cooling Poss."** LED will illuminate. A twelve minute run on timer is initiated each time the **"Cooling Poss."** LED flashes. This will prevent the system "Hunting " the cooling fans on/off as the Cooling demand is lost. The state of the Cooling output relay can be seen using the **"Cool On"** LED which will illuminate.

If the ambient temperature falls below the **"Low Limit"** set level cooling will immediately cease. Low Limit cut off is indicated by the **"Low Amb."** Red LED.

During periods of no demand for cooling or a Frost condition the recirculation **"Interval"** begins timing. If this times out the cooling fans will be run for the recirculation **"Period"**. When fan is running on Recirculation the **"Recirc On"** Red LED will illuminate.

4: SELECTION - **"Refrig." How to set the parameters.**

Select **"Refrig."** on Program Selector switch.

When any crop sensor is found more than 0.3 C above **"Crop Set"** a demand for Refrigeration is generated. Refrig. demand will continue until all the crop sensors are reduced to the target **"Crop Set"** level.

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Hot sensors can be seen when scanned by the **"Refrig. Required**" Red LED which will flash as this sensor is read by the Cropscan 16. A twelve minute run on timer is initiated each time the **"Refrig. Required"** LED flashes. This will prevent the system "Hunting " the cooling fans on/off as the Cooling demand is lost. The state of the Refrig. output relay can be seen using the **"Refrig. On"** LED which will illuminate.

4: SELECTION - **"Refrig." How the program operates.**

The remote Refrig. plant will be initiated whenever an individual crop sensor rises 0.3 C above the Crop Set target temperature. This also has a twelve minute minimum run timer reset by the **"Refrig. Required"** Red LED.

5: SELECTION - **"Cooling + Refrig." How to set the parameters.**

Select **"Cooling + Refrig."** on Program Selector switch.

Set up the parameters as described for **"Cooling"** in Program 3.

5: SELECTION - **"Cooling + Refrig." How the program operates.**

Operation is as for Cooling except if Cooling is still required but no suitable ambient air temperature differential exists or a Low Limit condition exists the refrigeration plant will be initiated. This also has a twelve minute minimum run timer reset by the **"Refrig. Required"** Red LED. The state of the current output relay that is utilised can be seen using the **"Cool On " or "Refrig. On"** LED's either of which may be illuminated.

6: SELECTION - **"Cooling + Air Mix" How to set the parameters.**

Select **"Cooling + Refrig."** on the Program Selector switch.

Set up the parameters as described above for cooling.

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OPERATOR INSTRUCTIONS (cont.)

Turn the Display Selector switch to **"Air Mix Set"**

-set the desired cooling air temperature (the temperature of the air duct used to cool the crop) using the **"Air Mix Set"** knob.
The recommended setting for this is 1.5 to 2°C below the **"Crop Set"** temperature.

NB. The Air Mix function ignores the **"Low Limit Set"** level as the system has an automatic in-built low limit cut off 1.5°C below whatever **"Air Mix Set"** temperature level is set.

Set the restart delay time (0.25-4 hrs) on the **"Restart Delay Time"** knob.

6: SELECTION - **"Cooling + Air Mix"** **How the program operates.**

Operation is as for cooling except the motorised louvres will be modulated during cooling to maintain the tunnel (blown air) cooling temperature +/- 0.5°C around the **"Air Mix Set"** temperature level.

This is achieved on a timed pulse control of the Motorised Louvres.

ie. if the Tunnel temperature is more than 0.5°C above the **"Air Mix Set"** level - the louvres will pulse open for 3 seconds.

- if the Tunnel temperature is more that 0.5°C below the **"Air Mix Set"** level - the louvres will pulse close for 3 seconds.

After each louvre movement (pulse) the Cropscan 16.2 waits 3 minutes before attempting further louvre movement. If the temperature is still out of limit a further movement (pulse) will take place.

This louvre modulation is indicated by 3 LED's on the Cropscan 16.2 fascia panel.
These are labelled - **"Step Close"** Red LED. Will illuminate while a close louvre demand is present. When the louvre pulse occurs the Led will go out for 3 seconds.

"In Limit" Red LED. Will illuminate when the tunnel temperature is OK.

"Step Open" Red LED. Will illuminate while an open louvre demand is present.

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OPERATOR INSTRUCTIONS (cont.)

When the louvre pulse occurs the Led will go out for 3 seconds.

If the Motorised Louvres get fully closed during Air Mixing (due to a very cold ambient air temperature) a micro switch fitted to the Main Air Intake louvre is pressed. This signals the Cropscan 16.2 to cease ambient cooling. The **"Restart Delay Interval"** timer is activated which has to time out before ambient air cooling can re-commence. The status of the Restart Delay Timer this is indicated from cooling by the **"Restart Delay"** Red LED. This will remain on until the time set on the **" Restart Delay Interval"** knob has elapsed.

During this period the Recirculation function can take place if demanded.

This restart delay off will also be brought in if a tunnel frost temperature is registered (preset 2.5^{o}C below **"Air Mix Set"**). The timer will also be activated at the end of every Ambient Cooling or Refrigeration operation and therefore will act as a restart delay to prevent too many cooling starts occurring when the crop temperature is very close to the **"Crop Set"** level.

7: SELECTION - **"Cooling + Air Mix + Refrig." How to set the parameters.**

Select **"Cooling + Air Mix + Refrig."** on the Program Selector switch.

Set up the parameters as described above for Cooling + Air Mix in Program 6.

7: SELECTION - **"Cooling + Air Mix + Refrig." How the program operates**

Operation is as for Cooling + Air Mix except Refrigeration will be initiated whenever a demand for cooling exists but ambient air is unavailable to cool.
The demand for Refrigeration is shown by the **"Refrig. Required"** Red LED, which flashed when a crop sensor which requires cooling is scanned.

RECIRCULATION SELECTOR Switch **How the "RECIRC SELECTOR" operates**

The Cropscan 16.2 allows Store Air Recirculation to be controlled in up to FIVE separate selections. The operation of each selection is described below:

Select **"Standard Recirc."**

This provides normal timed Recirculation fan running as described in the program descriptions for previous selections.

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OPERATOR INSTRUCTIONS (cont.)

Select **"Recirc. Off"**

This disables the Recirc. function and no recirc. fan operations will occur.

Select **"On During Timeclock Off"**

This will allow timed recirculation to occur as preset during a period when the normal Auto Control outputs have been disabled by the timeclock **"Time Off"** function.

Select **"On During Refrig. On"**

On some store ventilation systems the refrigeration system utilises its own dedicated evaporator fans. It can be desirable to use the Ambient Air Fans to recirculate the store air on a timed basis in addition. This selection allows this to be set.

Select **"On During T/Clck + Refrig."**

This setting combines the two previous selections and allows recirc to occur under either condition.

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OPERATOR INSTRUCTIONS (cont.)

GENERAL POINTS FOR THE SUCCESSFUL OPERATION OR THE UNIT

Ensure all **Crop Temperature Sensors** that are in use are always in the crop.

Un-plug any Crop Sensor that cannot be placed in the stored crop. These un-plugged sensors will be ignored for control purposes.

At the end of storage season always coil up crop sensors and store in safe dry place.

Do not skewer potatoes etc with sensor.

Either drop the Crop Sensors down pre-positioned tubes in the stack (bulk) or bury sensor under the crop (box).

It is a good idea to record fan hours run daily or weekly on record sheets (available on request) or in a note book to see what operations are taking place. **Remember** the Cropscan 16.2 is a very useful management aid which will make best use of cooling air when available. It should never however be left in sole control of a store without regular inspections to see the store condition and monitor operations.

Always leave control unit switched on even when not in use. This will maintain electronics in a sound, dry condition. Switch to **"Readout Only"** to eliminate control outputs.

During normal auto operation after the parameters have been set for control program you have selected the Display Selector switch would normally be left in the **"Croptemp"** position. This will show a continuous readout of all the Crop Temperature sensors as they are scanned in turn. The Cropscan locks onto each sensor for approximately 5 seconds in turn.

DATA RECORDING

The Cropscan 16.2 is designed to easily interface with the optional Cropscan Datalog recording unit.
This "Add-On" device can be preset to record all the Cropscan 16.2 temperature sensor values at 4,8,12 or 24 hour intervals. This stored data can then be collected and transferred to a PC computer. Software is available for the Datalog to provide graphical analysis and print outs as required.

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INSTRUCTIONS FOR INSTALLATION. **Single Live Output Version**

GENERAL

Screw unit to a firm flat surface using external black brackets on casing.

Try and ensure unit is at operator eye-line height to give ease of viewing readouts.

The unit required a 240 volt AC 50 Hz power supply fused at 5 amp (max).
Output connections depend on the complexity of the installation. (see terminal list).

In principal however cooling, recirc, louvres open, louvres close give a single live output when the controller wishes to activate these functions.
The common of these relays can be linked to any voltage required (normally 240 volt AC 50 Hz).

Refrigeration control is via a normally open voltage free contact.

On air mix systems a micro switch is required to show when the air intake louvre is fully closed. This is linked to the controller wired normally open when the louvres are open (unpressed). The switch contact should make when the louvres are closed (pressed).

Two separate external "Cut Out" contacts are provided (low voltage). These can be utilised to provide shut down of the Automatic outputs in conjunction with a Timeclock or remote Froststat etc. The terminals marked "AMB DISABLE" disable the Ambient Cooling Auto outputs. The terminals marked "TIMECLOCK" disable the Refrigeration Auto outputs. To disable the outputs the terminals must be shorted together. If both sets of terminals are shorted together in parallel a complete auto output cut off occurs. When an external cut out is active the **"Time Off"** Red Led will illuminate.

Under no circumstances must an external voltage be applied to any of these terminals. Serious Damage will be caused to the Cropscan 16.2 if this is done.

Up to 16 crop sensors can be connected to the controller.

This as via a two-way splitter box which plugs into the 25 way Dee socket on the unit. One or two 8-way sensor junction boxes can then be plugged into this.
On units with only 8 crop sensors a single 8 way junction box will plug directly into the Cropscan 16 via the 25 way Dee socket.

The Ambient sensor plugs into its own blue socket on the unit side and is positioned near air intake on the stand off bracket provided.

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INSTRUCTIONS FOR INSTALLATION. **Single Live Output Version** (continued)

The Air Mix (duct) sensor is positioned after the fans (usually part way down the air tunnel) to detect cooling air temperature.

This plugs into blue socket on side of the unit.

Mount at least 3m from fans if possible.

Important Note: Avoid running all sensor cables and multicore with mains cable as electrical interference can be induced in the cables in extreme cases.

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INSTRUCTIONS FOR INSTALLATION. **Volt Free Contacts Version.**

GENERAL

Screw unit to a firm flat surface using external black brackets on casing.

Try and ensure unit is at operator eye-line height to give ease of viewing readouts.

The unit required a 240 volt AC 50 Hz power supply fused a 5 amp (max).
Output connections depend on the complexity of the installation. (see terminal list).

In principal however cooling, recirc, louvres open, louvres close and refrigeration relays provide a Volt Free contact which makes when the controller wished to activate these functions. It should be noted that interference suppressors are fitted to across the louvre open and close relay contacts. These can cause small control relays to hold in after the relay has released under some circumstances.

On Air Mix systems a micro switch is required to show when the air intake louvre is fully closed. This is linked to the controller wired normally open when the louvres are open (unpressed). The switch contact should make when the louvres are closed (pressed).

Two separate external "Cut Out" contacts are provided (low voltage). These can be utilised to provide shut down of the Automatic outputs in conjunction with a Timeclock or remote Froststat etc. The terminals marked "AMB DISABLE" disable the Ambient Cooling Auto outputs. The terminals marked "TIMECLOCK" disable the Refrigeration Auto outputs. To disable the outputs the terminals must be shorted together. If both sets of terminals are shorted together in parallel a complete auto output cut off occurs. When an external cut out is active the **"Time Off"** Red Led will illuminate.

Under no circumstances must an external voltage be applied to any of these terminals. Serious Damage will be caused to the Cropscan 16.2 if this is done.

Up to 16 crop sensors can be connected to the controller.

This as via a two-way splitter box which plugs into the 25 way Dee socket on the unit. One or two 8-way sensor junction boxes can then be plugged into this.
On units with only 8 crop sensors a single 8 way junction box will plug directly into the Cropscan 16 via the 25 way Dee socket.

The Ambient sensor plugs into its own blue socket on the unit side and is positioned near air intake on the stand off bracket provided.

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INSTRUCTIONS FOR INSTALLATION. **Volt Free Contacts Version** (continued)

The Air Mix (duct) sensor is positioned after the fans (usually part way down the air tunnel) to detect cooling air temperature.

This plugs into blue socket on side of the unit.

Mount at least 3m from fans if possible.

Important Note: Avoid running all sensor cables and multicore with mains cable as electrical interference can be induced in the cables in extreme cases.