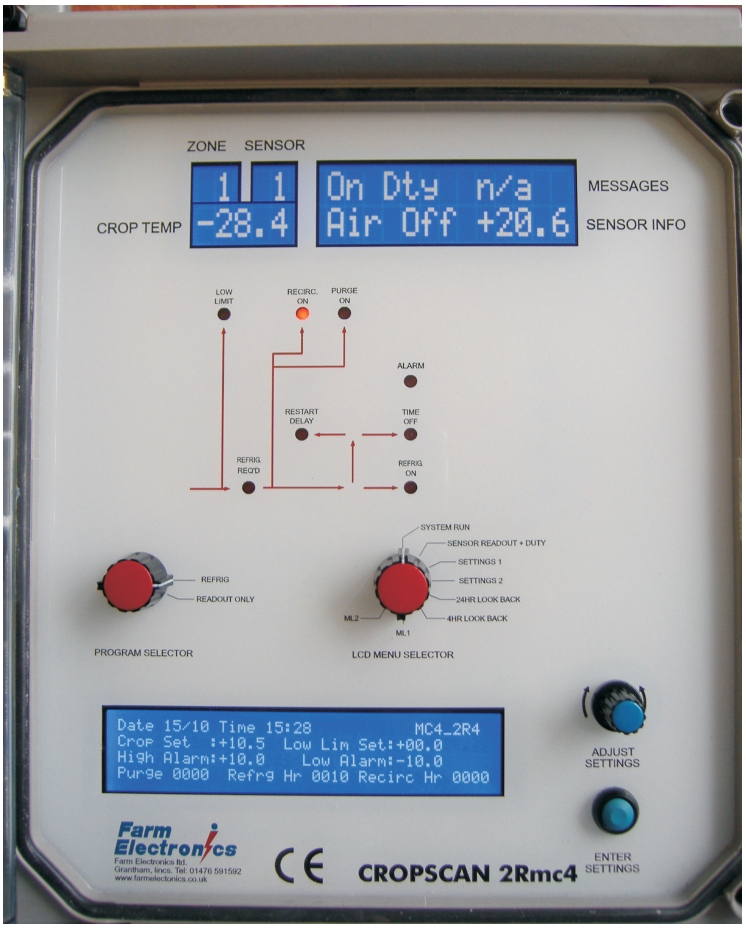
CROPSCAN 2R mc4

Farm Electronics

Operator Instructions



Crop Storage Equipment

Farm Electronics Ltd
Woodland Drive
Alma Park
Grantham
Lincs. NG31 9SR
Tel: 01476 591592 Fax: 01476 591188
email: info@farmelec.co.uk

Instruction Code:
Temp/CS2Rmc4/10/09

CROPSCAN 2R mc4

INSTRUCTION BOOK INDEX

CROPSCAN 2R mc4

OVERVIEW OF CONTROLS

The Cropscan 2Rmc4 fascia has been designed to make the entering and retrieval of information as easy as possible.

All temperature settings are digital : i.e. what you see on the display is what you are setting.

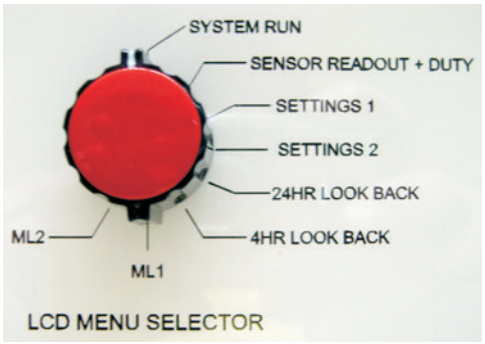
The CS2Rmc4 has two LCD displays. The upper larger digit display ***(figure 1)*** shows actual temperatures and status messages, the lower 4 line display ***(figure 5)*** shows status information, control parameters and allows readout of logged data.

Associated with the lower display is a set of 3 controls. A short cut LCD MENU SELECTOR switch (*figure 3*) which provides quick access to the parameters you require. An ADJUST SETTINGS knob (*figure 2*) which will alter the selected value and an ENTER SETTINGS push button to both select, and confirm, all inputs made

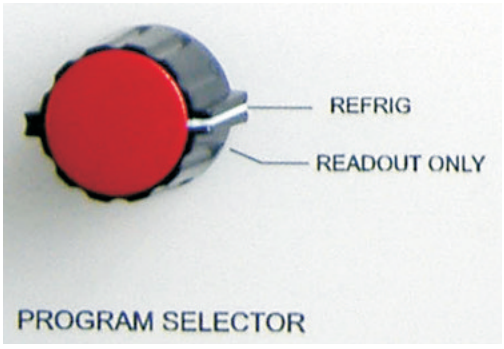
(figure 1)

(***figure 2***)

(***figure 3***)



(figure 4)



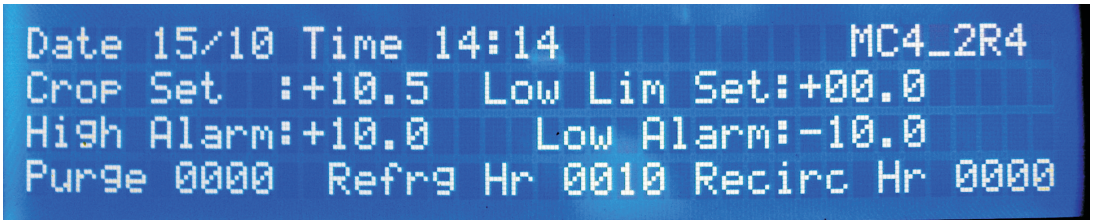
The Program Selector knob ***(figure 4)***, centre left in the fascia, gives access to the control programmes available on the Cs2Rmc4

CROPSCAN 2R mc4

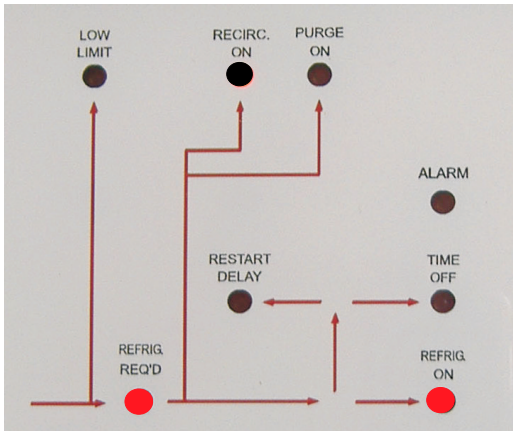
OVERVIEW OF CONTROLS

(figure 5)

Active Lower Display (SYSTEM RUN)

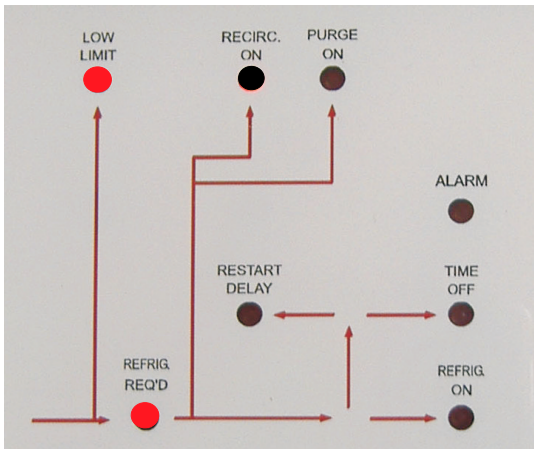


The LED "Flow Diagram" shows the logic sequence of the Cropscan 2Rmc4. The LED's are positioned in the same order as the decision making logic of the controller as indicated by the printed arrows



Example 1

In this example there is a REFRIG **REQUIRED** demand.
REFRIG REQUIRED shows. Refrig is **ON**



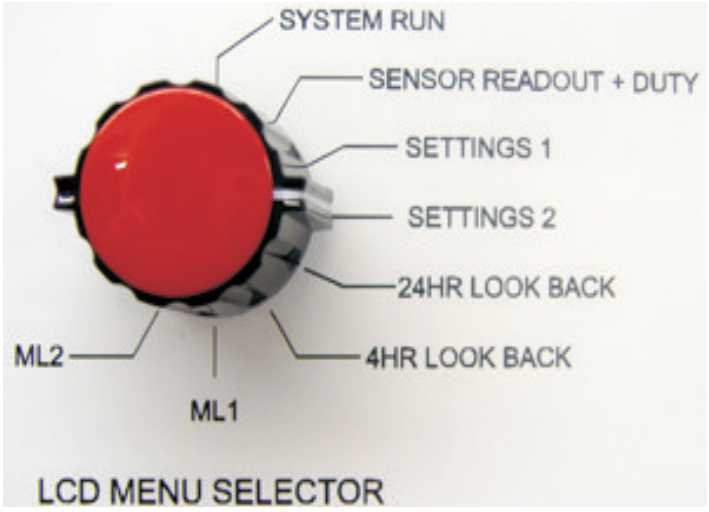
Example 2

In this example there is a REFRIG **REQUIRED** demand. Refrig is not **ON,** the **AIR ON** temperature is below the **LOW LIMIT** set.

Operator Instructions
LCD MENU SELECTOR

SYSTEM RUN - Shows Date and Time, Purge Count, all primary control setting values and Hours Run Total for Refrig and Recirc Fans.

SENSOR READOUT + DUTY - Shows current temperature of all sixteen Crop Temperature Sensors. Allows sensors to be selected ON or OFF DUTY (Y = ON, N = OFF)



LCD MENU SELECTOR

SETTINGS 1 - Use this screen to enter all temperature based control values.

SETTINGS 2 - Use this screen to enter time based control values + activate or de-activate more complex features.

24HR LOOKBACK - Allows a daily "Lookback" of average temp, high and low Crop Temperature values and hours run, for up to 14 days.

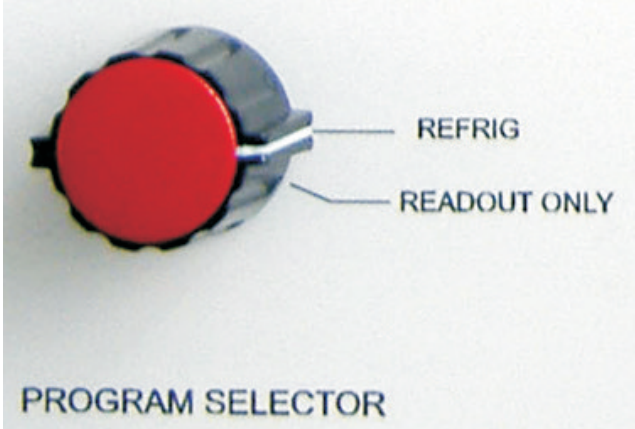
LCD MENU SELECTOR

4HR LOOK BACK - Allows a more detailed "Lookback" giving readings on a 4hr interval (6 per day) for up to 14 days.

ML1 & ML2 - These positions access the set up and maintenance level screens and are not required during normal Cropscan day to day use.

Operator Instructions

Program Selector



REFRIG - How the program operates

When any crop sensor is found more than 0.1C above **Crop Set** refrigeration is initiated. Demand for refrigeration will continue until all crop sensors are reduced to the objective.(If set to Hi sensor operation) If selected to run on the average, (Avg) refrig will be initiated if the average of all active crop sensors is above the Crop Set.

READOUT ONLY- How the program operates.

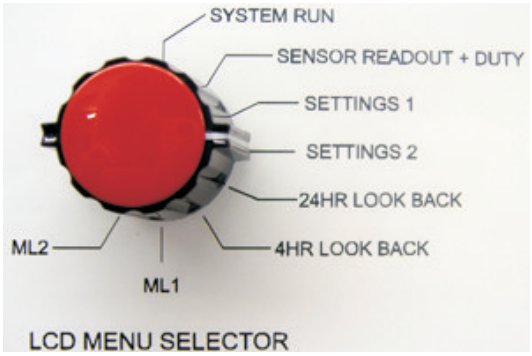
Crop temperatures and control parameters can now be displayed without any automatic control relay functions being activated. this can be used during manual control in order to monitor the sensors only. We recommend leaving the controller in this selection when the store is not in use.

How to enter new settings

All settings are entered on the lower LCD display via the ADJUST SETTINGS encoder and the ENTER SETTINGS push button (***figure 2***)

(***figure 2***)

(***figure 3***)

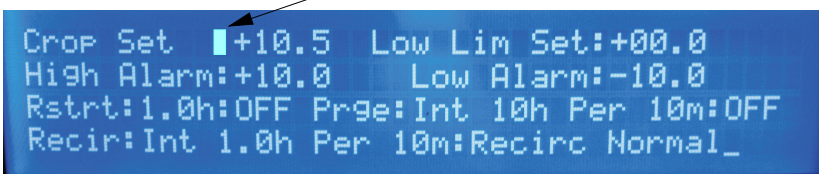


Example

Select the SETTINGS 1 or SETTINGS 2 LCD screen using the LCD MENU SELECTOR (***figure 3***)

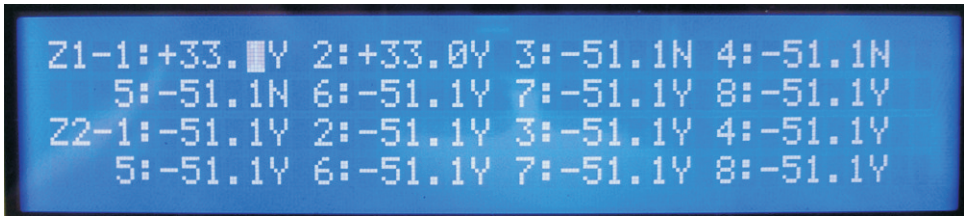
Use the ADJUST SETTINGS encoder to move the "On Screen CURSOR BAR" to the menu item you wish to alter. Press the ENTER SETTINGS button once. The CURSOR BAR will now flash, indicating that the value setting can now be altered. Use the ADJUST SETTINGS encoder to alter the value to the setting / level you desire.
Press the ENTER SETTINGS button once again and the new value / setting is entered.

SETTINGS 1 **CURSOR BAR**



OVERVIEW OF CONTROLS

SENSOR DUTY + READOUT



Settings Available on this screen

This screen gives a readout of all CROP temperature sensors in degrees Celsius.

It also allows individual sensors to be turned ON or OFF DUTY. Ie. OFF DUTY means the sensor will continue to provide a temperature readout but will not be used to initiate auto cooling and will not be used in the CROP AVERAGE temperature calculation.

ON DUTY sensors show a Y after the temperature value

OFF DUTY sensors show a N after the temperature value

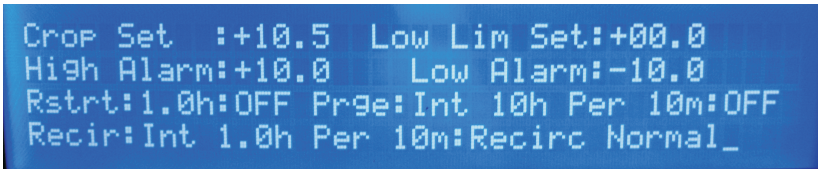
Use the CURSOR to scroll to any sensor you wish to change the state of and program in the normal way (see page 5)

Operator Instructions

Cropscan 2R mc4
Controls

OVERVIEW OF CONTROLS

SETTINGS 1



Settings Available on this screen

Crop Set : Enter desired Storage Temperature in degrees C

Low Lim Set : Minimum Return air temperature (AIR ON) acceptable for cooling.

High : Enter high alarm limit for CROP temperature sensors.
ie: +03.0C with a Crop set of +10.0C = Hi Limit of +13.0C (+10.0C plus + 03.0C)
Any Crop sensor found above this value will indicate "**On Duty High**" on the message LCD display. This sensor(s) will not initiate cooling.

Low : Enter low alarm limit for CROP temperature sensors
ie: -03.0C with a CROP set of +10.0C L Limit of +07.0C (+10.0C minus - 03.0C)
Any Crop sensor found below this value will indicate "**On Duty Low**" on the massage LCD display. Any cooling operation in progress will be halted.

Rstrt : This time value sets a delay before another Cooling Start in initiated. Range 0.5 to 5.0 hours
Can be set : **ON** or **OFF**

Prge : This function allows a PURGE (Air Change) time to be entered. **Int** (Interval between purge) Range 1 to 23 hours. **Per** (Period of fan run time of PURGE) Range 10 mins, 20 mins, 30 mins. Can be set : **ON** or **OFF**.

Recir : This function allows a Recirculation time to be entered. **Int** (Interval between Recirculation periods) Range 1 to 23 hours. **Per** (Period of fan run time for Recirculation)
Range 10 mins, 20 mins, 30 mins. Can be set **ON** or **OFF**.

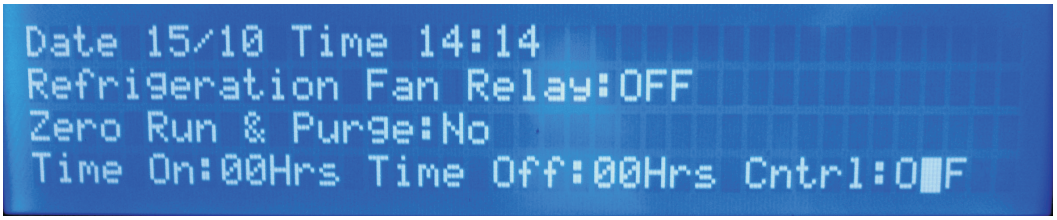
Recirc Duty : Recirculation can be set up in 5 possible regimes

- **Recirc Off** - No recirculation required
- **Recirc Normal** - Standard Recirculation to run on Time Interval and Periods set.
- **On with T/Off** - Standard Recirc as above and Recirculation will also occur in the Timeclock OFF period.
- **On with Refrig** - Recirculation function will occur in the REFRIG only program
- **On with T/Off + Ref** - Recirculation will occur in the REFRIG only program and also in the Timeclock OFF period

NOTE : The PURGE function is only applicable to stores that have a separate fan for bringing in and exhausting ambient air.
The RECIRCULATION function will only be active if connected to the EVAPORATOR FAN starter, separate to the refrigeration system.

OVERVIEW OF CONTROLS

SETTINGS 2



Settings Available on this Screen

Date : Allows the current DAY/MONTH to be entered.

Time : Allows the current HOUR/MINUTE to be entered

Cntrl : Selects the CROP SENSOR control type to be based on an individual high sensor (Hi) or based on the average of all the on DUTY CROP sensors (Avg) (see page 9)

Zero Run & Purge : Enables the Hours Run and Purge total to be set to ZERO (Typically this might be required at the start of a new Storage screen). Default value = **No** - Change to **YES** to ZERO values.

Time On : Set the time to start AUTO CONTROL functions (24hr CLOCK- DAILY)

Off : Set the time to stop AUTO CONTROL functions (24hr CLOCK DAILY)

Time Cntrl : Set Timeclock Control Function **ON** or **OFF**

Program Issue Number

The 4 Digit code displayed in the top right hand corner of the LCD display shows the "PROGRAM ISSUE NUMBER". This indicates if the software is up to date as continual development causes new software versions to be released from time to time.

The Cropscan 2Rmc4 can easily be updated via a plug in EPROM memory chip if this is required.

SYSTEM RUN

Program Issue Number

ALTERNATIVE AVERAGING CROP SET CONTROL

The normal and recommended basis for Cooling initiation is based on an individual sensor reading being above the CROP SET temperature.

However there may be some situations where it is desired to operate the Cooling initiation based on the AVERAGE of all the active Crop Sensors. To allow this the control Criteria can be altered on LCD MENU SELECTOR - SETTINGS 2 screen. Change menu line Cntrl : Avg.

No other logic functions are changed other than the decision to initiate Refrig. The calculated average of all the ACTIVE CROP SENSORS has to be above the CROP SET temperature in order for REFRIG REQUIRED to be displayed and Refrig started.

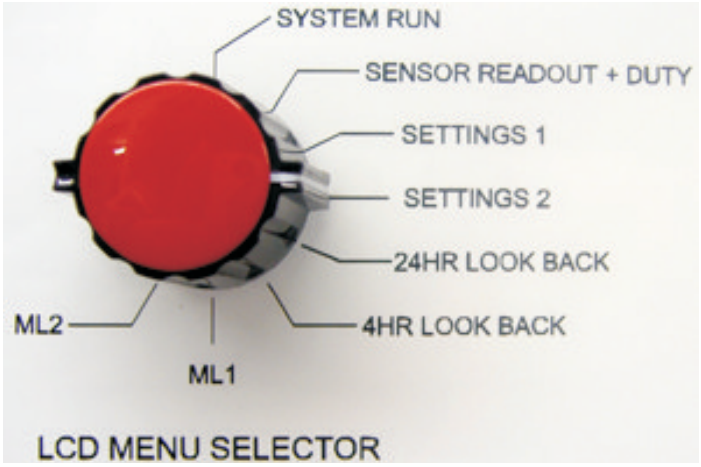
The current CROP AVERAGE calculated temperature is shown on the Top Display as shown in (***figure 15***) The value scans in sequence with the AIR ON (Coil) and AIR OFF (Duct) temperatures.

(***figure 15***)

Displaying average Crop Temperature

CROP AVERAGE control is set on LCD **MENU SELECTOR SETTINGS 2 screen** as shown in ***(figure 16)*** The LCD lower display 3rd line reads Cntl :
Change the Cntrl : Setting to Avg (Note. Default setting = Hi)

(figure 16)



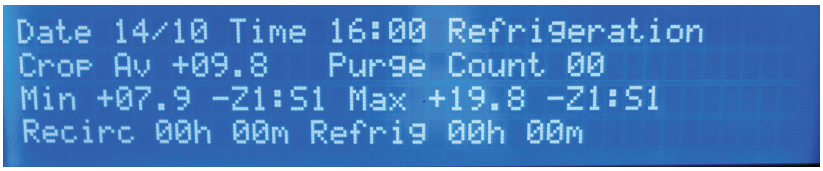
LCD MENU SELECTOR

Operator Instructions

Cropscan 2R mc4 Controls

OVERVIEW OF CONTROLS

24Hr Lookback RECORDED DATA



(*Figure 17*)

On this screen the previous 14 days of recorded data can be viewed - one day at a time. The date of the day displayed is shown on the top left of the display. Other data shown is as follows :
Control Program selected, Average Crop Temperature, Purge Count for the day, Minimum and Maximum recorded temperatures, including sensor numbers and locations, Recirculation and Refrig run hours for the day. To scroll back and forth to find the data you simply turn the ADJUST SETTINGS encoder until the data appears.

4Hr Lookback RECORDED DATA

(*Figure 18)*

On this screen the previous 14 days of recorded data can be viewed for each day but now in six 4 hour recordings per day. The data available is as per the 24hr selection, except the PURGE COUNT is now replaced by the AIR ON TEMPERATURE (NB. Only shows value if the unit was cooling at the recording time) It should also be noted that the CROP AVERAGE value is for the 4 hour period only. Again use the ADJUST SETTINGS encoder to scroll the date and time.

After 30 seconds the date will revert to the last recording automatically. This ensures that when you first enter these screens you always see the latest data first.

Operator Instructions

SUMMARY OF TERMINOLOGY USED

Cropscan 2R mc4 Controls

TERM (SETTINGS)	WHAT IT MEANS
CROP TEMP	The temperature of individual crop sensors.
AIR ON TEMP	The return air temperature to the cooling coil.
AIR OFF TEMP	The actual discharge cooling air temperature.
CROPSET	The desired storage temperature for the stored crop.
LOW LIMIT SET	The lowest acceptable return air temperature for cooling
MIN/MAX CROP LIMITS	The set temperature levels that prevent over cooling of the crop. The MIN set is the temperature that the lowest crop sensor can fall below the Crop Set before cooling is prevented. (set in - degrees C below the CROP SET target temperature). This shows up as a L on the main temperature readout. The MAX set will ignore any crop sensor that is above this temperature for control purposes. (set in + degrees C above the CROP SET target temperature). This shows up as a H on the main temperature readout
RECIRC MODE	The type of recirculation program required.
RECIRC PERIOD	The length of the fan run time during recirculation.
RECIRC INTERVAL	The time elapse between RECIRC PERIOD fan runs.
SENSOR DUTY	Individual crop temperature sensors can be turned "OFF DUTY" for control purposes.
RESTART DELAY	The time to elapse after any fan or refrig operation, before the system can cool again.
CO2 PURGE	Optional air change system that will remove a CO2 gas build up by bringing in ambient fresh air on a timed basis.
READ OUT ONLY	Select if the controller is not in automatic use. It will continue to give readout information but no cooling will be initiated.

Operator Instructions

Cropscan 2R mc4 Controls

SUMMARY OF TERMINOLOGY USED

TERM (LED DISPLAY)	WHAT IT MEANS
LOW LIMIT	Return air is below your LOW LIMIT SET.
RECIRC ON	Fan is running in a RECIRC PERIOD.
PURGE ON	Fan is running in a PURGE PERIOD
RESTART DELAY	The unit is held "OFF" because the RESTART DELAY time has not elapsed yet.
TIME OFF	The unit is held "OFF" because the external timeclock is giving an "OFF" signal.
REFRIG REQ'D	The mc4 needs to cool a high crop sensor using Refrigerated air. NB. Illuminates as that sensor is scanned.
REFRIG ON	Refrigeration is taking place.
ALARM	System has identified a problem which needs to be corrected to ensure safe operation of Cropscan 16mc4. The nature of this alarm can usually be identified on the LCD message displays.

Operator Instructions

Cropscan 2R mc4 Controls

GENERAL POINTS FOR THE SUCCESSFUL OPERATION OF THE UNIT

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

Unplug any Crop Sensors that cannot be placed in the stored crop. These un-plugged sensors will be ignored for control purposes. Alternatively turn unused sensors "OFF DUTY" by using the SENSOR DUTY program on the mc4 lower LCD “SENSOR READOUT + DUTY” selection.

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

Do not skewer potatoes etc. with sensors.

Either drop the Crop Sensor down pre-positioned tubes in the stack (bulk storage) or bury sensor under the crop 150mm to 200mm (box storage).

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. NB. This may not be deemed necessary if the Datalog files are downloaded to a PC. **Remember** the Cropscan 2R mc4 is a very useful management aid which will make best use of cooling air. 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.

The Cropscan 2R mc4 has an automatic inbuilt datalogging function. This records all temperature and most primary setting values every 4 hours. The memory will hold a maximum of 2 weeks of recorded data after which time the oldest data will be discarded. Each mc4 has its own unique 3 digit identity number which enables its data to be identified. *(see figure 6)*

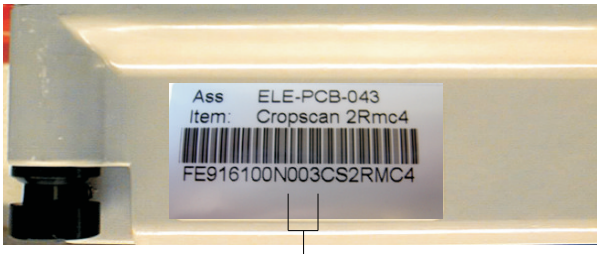
This data can be utilised by using the Farm Electronics mc4 Comms and mc4 Graphing software packages. These programs will run on any PC using Windows 95, 98, ME, XP or Vista operating systems.

Connection to the Cropscan 2R mc4 is made via the inbuilt RS232 port in the side panel of each unit. *(see figure 4)* If using a Laptop computer a simple short wire lead can be used. For remote sites various methods can be employed, such as fixed hard wiring, landline or GSM modems. *(see figure 5)* Multiple Cropscans can be accessed from one modem using an optional RS485 network interface system.

When a connection system is in place the computer can be used to collect the long term data at any time but in addition can download current temperatures, equipment run times, system fault status and settings. It can also be used to reprogram the key setting parameters of the mc4 if required. The graphing software builds a complete season graph for the store which can be analysed at any time on the PC. From this data a greater understanding can be gained on the operation of the ventilation system throughout the long term storage period. Print outs can be made from several of the download options.

For operation of any of the above systems refer to the information supplied with the download option supplied.

(figure 6)



Identity Number 003

(figure 4)

Communication Port

(figure 5)

GSM Modem Unit

FAULT TROUBLESHOOTING

The Cropscan range of store controllers have proved to be very reliable in operation.

Most problems when they do occur are usually associated with the external temperature sensors or junction boxes. This is either due to physical damage by mishandling or rodents or possibly an individual sensor failure. (*see figures 11, 12, 13)*

An open circuit (or broken wire) sensor failure is easy to spot as the readout will register approx. E27.7C.

A short circuit (wires touching) sensor can be more difficult to find as its effect can sometimes be seen on undamaged sensor values. The best approach to locate this type of fault is to unplug all the Crop Sensors at the 8 way junction box. Then proceed by plugging in each sensor in turn. Look at the Cropscan 16 mc4 readout after each sensor is replaced. When you plug in the sensor causing the error the effect on the other sensors can usually be seen.

ALWAYS REMOVE ANY SENSORS FOUND DAMAGED OR SUSPECT IN THIS WAY from the store and return to Farm Electronics for testing or repair

While the Cropscan can work satisfactorily on a reduced number of Crop Sensors the LOW LIMIT (AIR ON) and AIR OFF duct sensors must always be working. If either of these sensors fails a Crop Sensor can be substituted temporarily until a repair can be made.

When reporting any suspected malfunction to the service department always try and have a note of which Function LED's were illuminated at the time. (I.e. Cooling Required, Low Limit Etc.)
This will enable us to interpret possible control situations much more easily.

On a microprocessor based controller, electrical interference is a potential problem. The mc4 is well protected against power failures but in some instances partial corruption of the unit may occur. To correct this simply turn the mains supply to the Cropscan off for 5 seconds and then on again. This will give a clean master reset. If this fails to sort it out contact Farm Electronics Service Department.

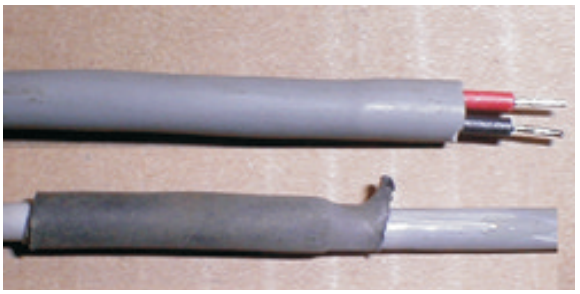
TYPICAL SENSOR DAMAGE

(figure 11)

Crushed Wire

(figure 12)

Broken Wire



(figure 13)

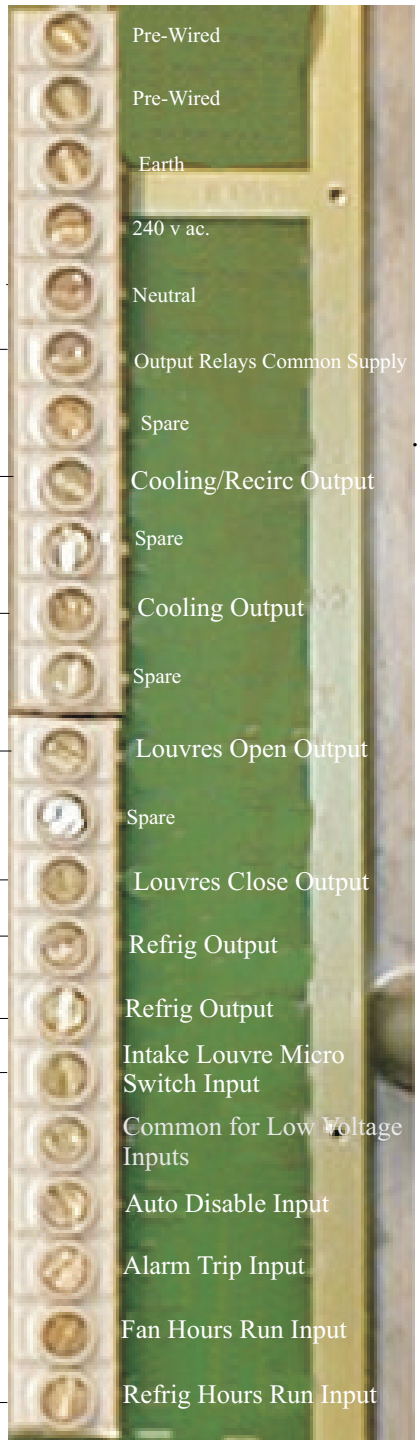
Rodent Damaged

Installation Instructions

Cropscan 2R mc4 Controls

Cropscan 2R
Mc4 P/Supply
(single outputs)

NB. Do not apply MAINS VOLTAGES to terminals 17 - 22



Fan

L-Open

L-Close

Refrig

Low Voltage Inputs

Do Not Apply Mains Voltages to these Terminals under any circumstances

1. Pre-Wired
2. Pre-Wired
3. Earth
4. 240 v ac.
5. Neutral

Mains Supply

6. Output Relays Common Supply
7. Spare
8. ● Fan Start Output
9. Spare
10. ●
11. Spare
12. ● **Louvres Open Output**
13. Spare
14. ● **Louvres Close Output**
15. Refrig Output
16. Refrig Output

Volt Free

17. Spare
18. Common for Low Voltage Inputs
19. Auto Disable Input
20. Alarm Trip Input
21. Fan Hours Run Input
22. Refrig Hours Run Input

Installation Instructions

Single Live Output Version

Screw unit to a firm 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 requires 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.

An external **"Cut Out"** contact is provided (low voltage). This can be utilised to provide shut down of the Automatic outputs in conjunction with a Timeclock or remote Froststat etc. The terminal is marked "DISABLE". When an external cut out is active the **"Time Off"** Red LED will illuminate.

Low voltage input terminals are provided for signals from auxiliary contacts on the FAN and COMPRESSOR starters. This will provide Hours Run information which the Cropscan 2R mc4 records.

Under no circumstances must an external voltage be applied to any of these terminals. Serious Damage will be caused to the Cropscan 2R mc4 if this is done.

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

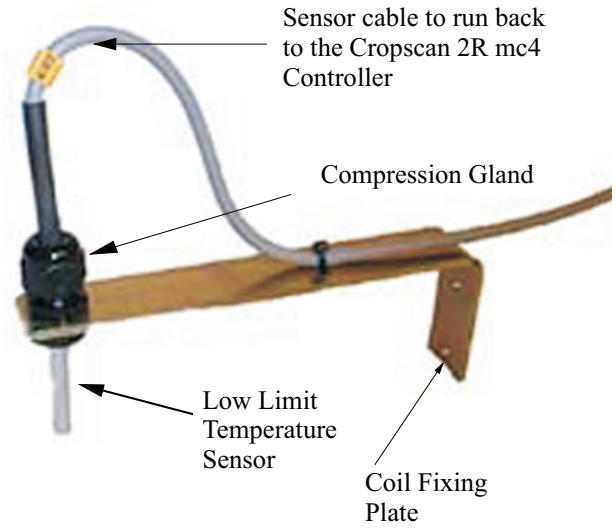
This is via a two-way splitter box which plugs into the 25 way dee socket on the unit. One or two, 8-way sensor junction boxes can be plugged into this.

On units with only 8 crop sensors a single 8-way junction box will plug directly into the Cropscan 2R mc4 via the 25 way Dee socket marked **Crop.**

Installation Instructions
Single Live Output Version (Continued)

The Low Limit sensor plugs into its own blue socket marked “LOW LIMIT" on the side of the cropscan. The sensor is positioned near the air intake to the Cooling Coil on the stand off bracket provided. This bracket spaces the sensor off the cooling coil helping to obtain a more accurate AIR ON temperature reading.

Mounting of LOW LIMIT (Air On) Temperature Sensor Bracket



The AIR OFF (duct) sensor is positioned after the cooling fans (usually part way down the air discharge duct) to detect cooling air temperature. This plugs into the blue socket on the side of the Cropscan marked “AIR OFF”.

Mount at least 3m from the cooling fans if possible.

Important Note: Avoid running all sensor cables and multicore cables close to a mains cable as electrical interference can be induced in the cables in extreme cases. If positioned on a cable tray, space away from mains cables by 50mm.

The datalog Download Comms RS232/RS485 socket is a 25 way MALE DEE socket marked COMMS.