OPERATOR INSTRUCTIONS

Packaged Refrigerated Coolers using a Scroll Hermetic Compressor

R410 a

Farm Electronics Ltd
Woodland Drive
Alma Park Industrial Estate
Grantham
NG31 9SR
Telephone: 01476 591592
Email: info@farmelec.co.uk

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REFRIGERATION PLANT – OPERATOR INFORMATION

The long-term reliability of your refrigeration equipment, can be greatly enhanced by carrying out some basic maintenance checks periodically and by being aware of the general operation of the system which will enable potential problems to be identified quickly.

BASIC DO'S & DON'TS

IMPORTANT WARNINGS

Before starting the plant. (Units with Crankcase Heaters)

If the plant has been switched **OFF** at the **Main Isolator** or the **Mains Power** for more than 12 hrs it should not be restarted until the power has been switched back on again for at least **4 hrs**.

REFRIGERATION PLANT – OPERATOR INFORMATION

IMPORTANT NOTICE – POWER UP PROCEDURE

Press the Emergency stop button on the panel "in". Switch the panel door isolator back on.

Ensure the main selector switch (see figure 1) on the refrigeration touch screen controller is in the OFF position then release the emergency stop button. The compressor motor must not be allowed to run at all. This is to allow the crankcase oil heater to warm up the oil to the correct temperature. During normal operation this heater is automatically switched on whenever the plant is idle.

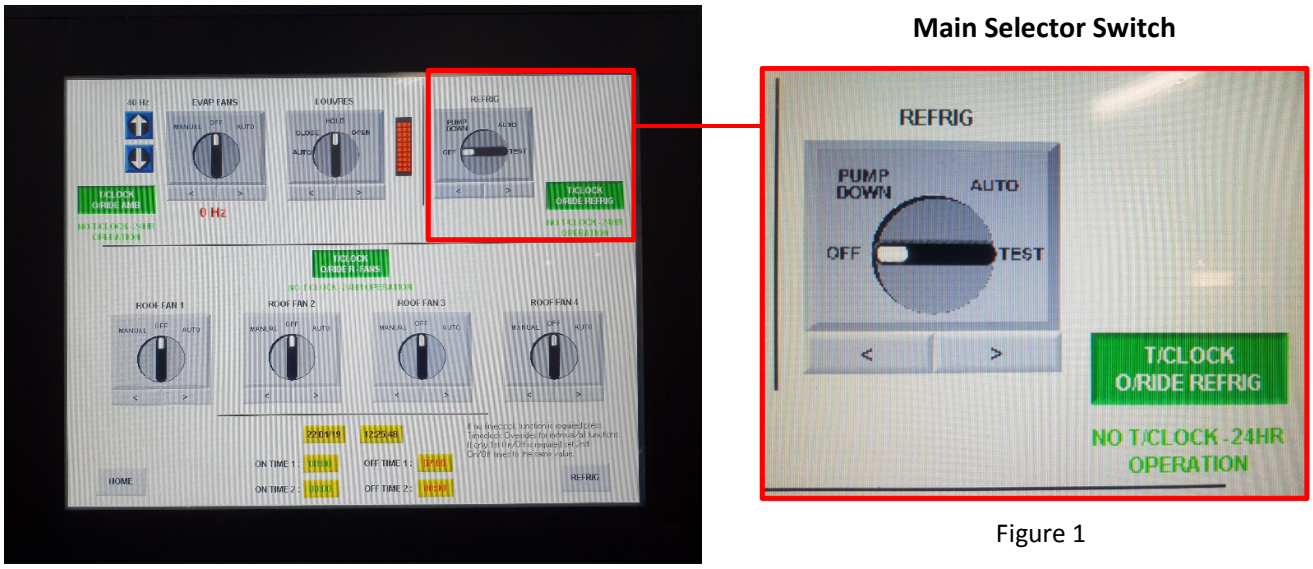
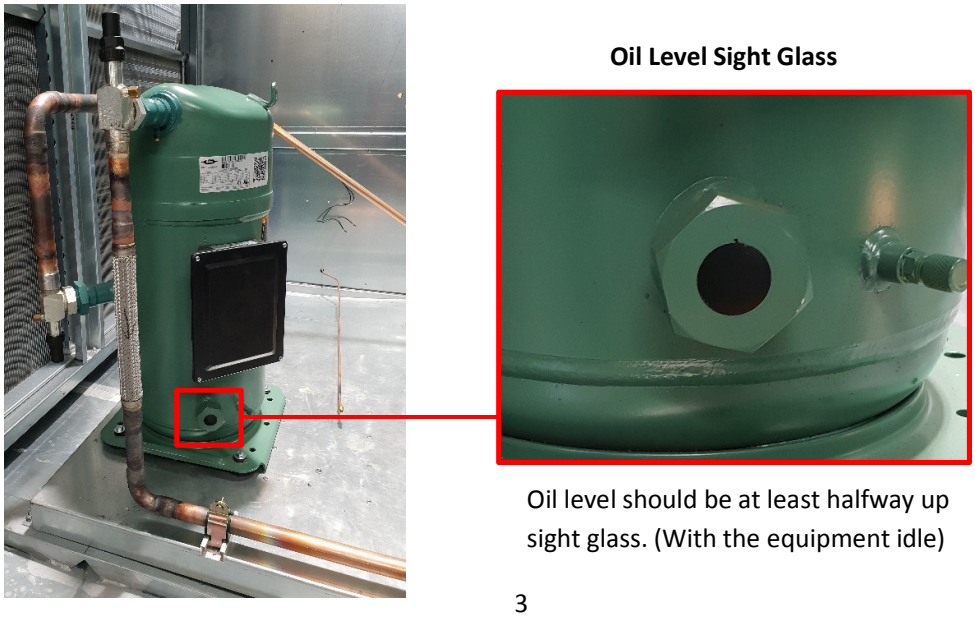


Figure 1

Keep it clean

Oil in a refrigeration plant is contained within the pressurised system. Oil can only be added or removed by a qualified engineer using specialist equipment.



Oil level should be at least halfway up sight glass. (With the equipment idle)

Keep it clean

A clean tidy plant tends to be a reliable one. Keep the area around the cooler housing and condenser clear. This will enable you to spot any oil leaks which are indicative of a problem with the plant. Any suspected leaks should be immediately investigated to avoid unnecessary loss of expensive refrigerant gas.

We recommend that you examine the pipe work regular (large or small) for signs of seeping oil. Care should be taken not to confuse water condensation with oil – make sure the deposit is in fact oily.

Refrigerant gas loss is becoming environmentally more sensitive, as well as expensive to replace. For this reason, the plant should be periodically tested for gas leaks. This can be carried out reasonably quickly using a modern electronic leak detector unit.

All new refrigeration plants are supplied with a maintenance "log book". This should be kept with the refrigeration plant at all times (inside the control panel) so as to be accessible to a maintenance engineer. When work or leak testing is carried out the date and name of the qualified engineer will be recorded.

This procedure is now a legal requirement for any system containing "F-Gas" on a periodic basis. The frequency of these inspections is dependent on the size of the refrigerant charge in a system.

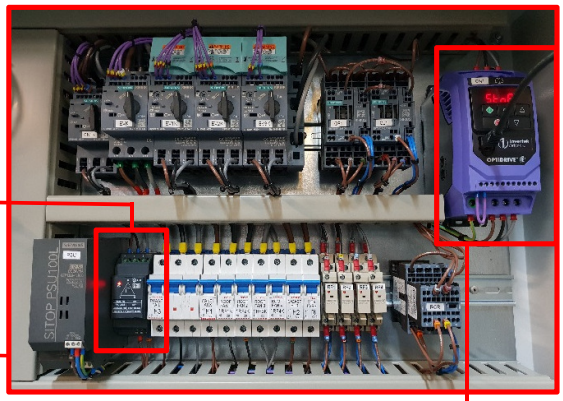
Refrigeration Plant Sizes (Kw)	Gas Charge (Kg)	Frequencies (Months)
30	30	6
36	30	6
46	50	6
58	60	6
61	60	6
74	68	6
82	76	6
92	80	6

IDENTIFICATION OF MAIN CONTROL PANEL COMPONENTS

Motor Circuit Breakers

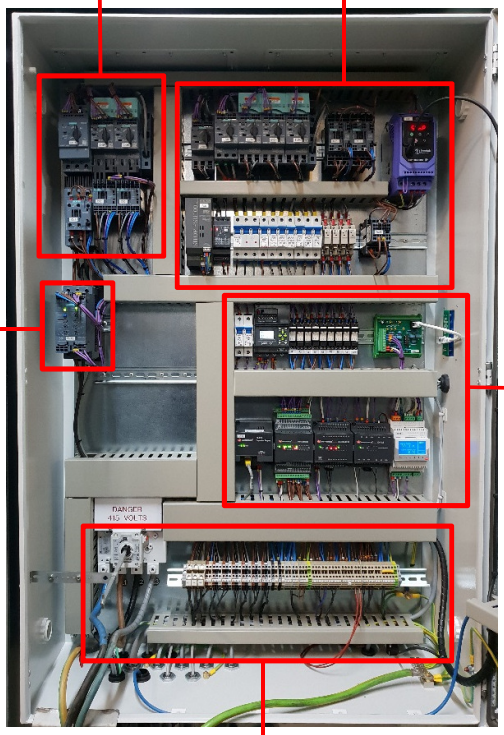
Phase Protection Sequence Relay

MCB Circuit Breakers and Condenser Frequency Inverter

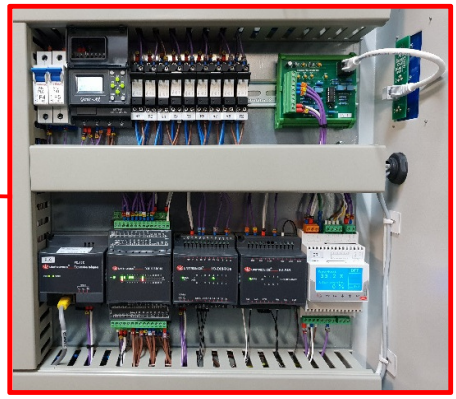


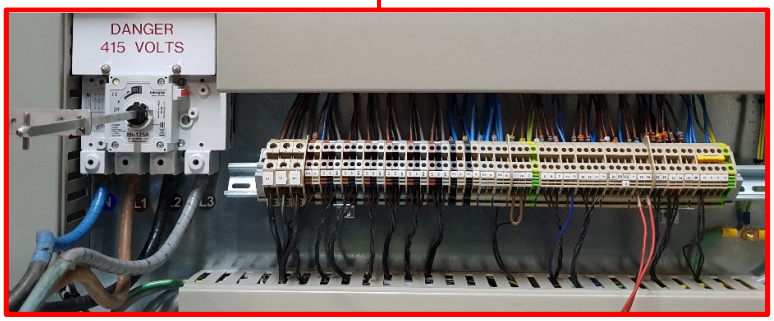
Frequency Inverter

Soft Starter



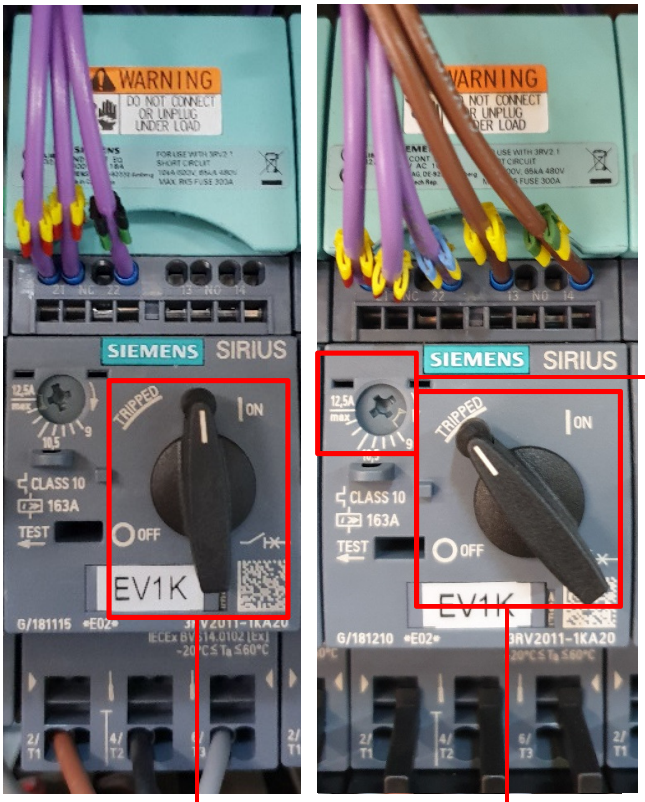
PLC I0 & Control Relays





Mains Isolator & Outgoing Electrical Terminals

Motor Protection Circuit - Breakers



Amperage setting dial

(Adjustable to suit motor loading & site conditions)

Rotary trip switch in <u>Run</u> position

Rotary trip switch in <u>Tripped</u> position

To reset the tripped circuit breaker, turn handle anticlockwise to the "off" position and then clockwise to the vertical "on" position. To increase the motor average setting turn the amperage setting dial clockwise with the pointed segment indicating the amperage setting.

<u>REFRIGERATION PLANT – OPERATOR INFORMATION</u> (Continued)

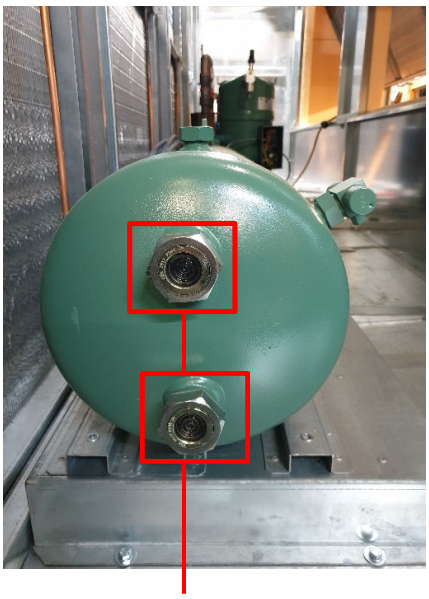
PUMPING THE SYSTEM DOWN

Pumping down means returning all the refrigerant gas to the discharge side of the compressor. This is how the system needs to be when re-starting the plant. Therefore, if a manual decision to stop the plant is taken it should always be **Pumped Down** first before putting the **Main Selector Switch** to **Off** or the main panel **Door Isolator Switch** to **Off**.

If the plant has already stopped by its own devices it will already be pumped down as this is part of the normal operating sequence. The above procedure need only be done when the plant is deliberately or accidentally halted from running state.

We would recommend that if the system is to be shut down for an extended period of time, the panel is left switched on and the main selector switch left in the "pump down" position. The compressor may start up very infrequently for a very short time to equalise the gas pressure. All refrigeration systems will leak gas from either side of the control solenoid over a period of time and the pressure difference need to be corrected.

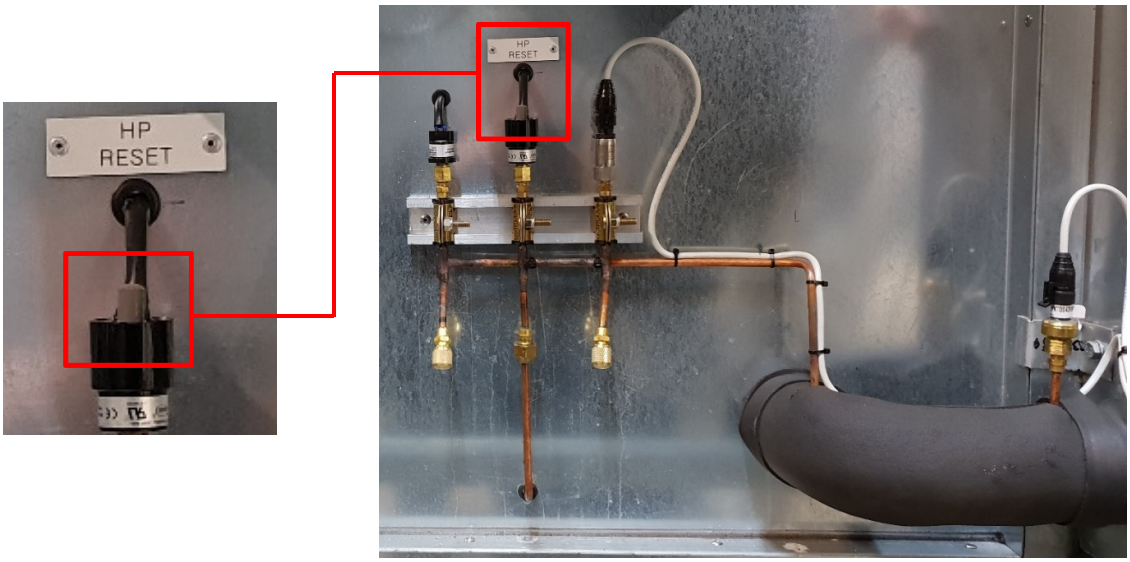
Liquid Receiver



Refrigerant Liquid Sight Glasses

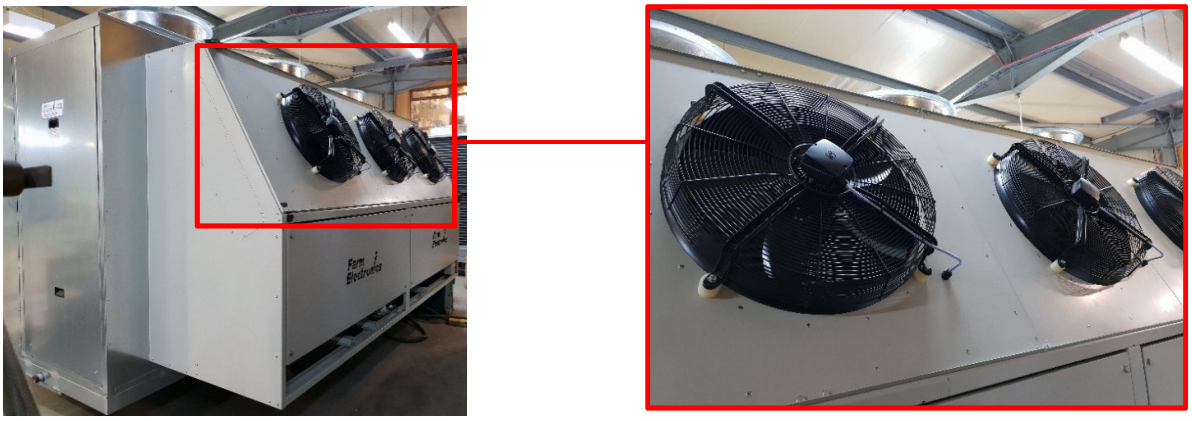
PRESSURE SWITCHES

The plant utilises several pressure switches to provide safety cut out and operation of equipment at certain pressure levels, these switches have been carefully adjusted to the optimum requirements of your plant and require no further adjustment. The high-pressure switch has a “reset button” on top of the switch body.



This may trip out in excessively hot ambient conditions or possibly the failure of one of the condenser fans. If tripping is being experienced try and ensure that all the condenser fans are running before a HP trip out occurs.

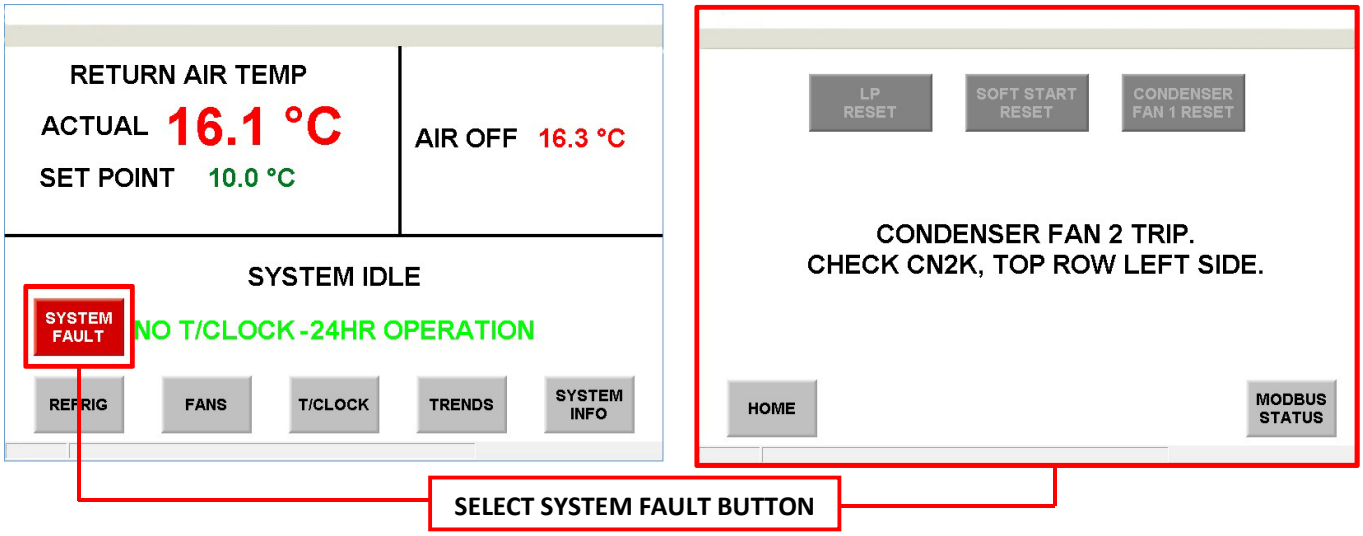
Condenser Fans



REFRIGERATION PLANT – OPERATOR INFORMATION (Continued)

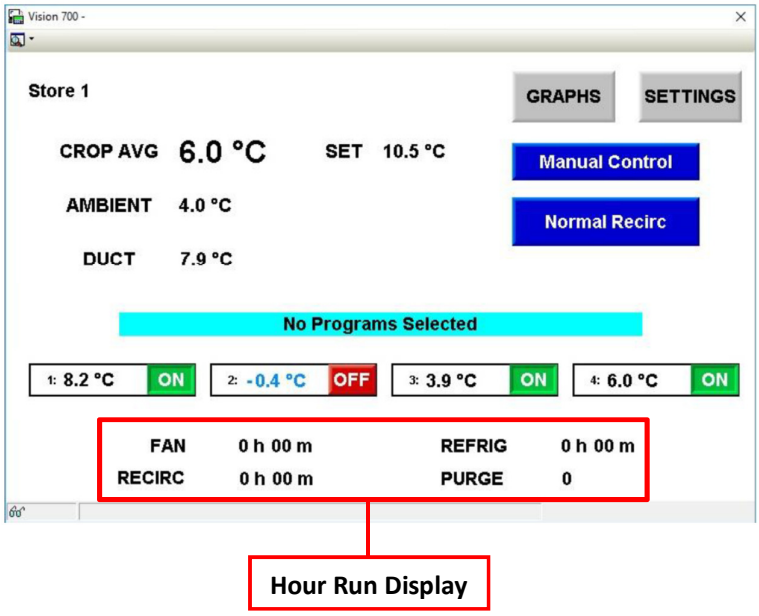
SAFETY MESSAGES

All the devices capable of tripping the refrigeration plant OFF will flag a flashing SYSTEM FAULT warning display. This will appear on the main home screen of the touchscreen controller, press the flashing SYSTEM FAULT button on the touchscreen. A message will now appear on the screen indicating which device cut the plant out, make a note of which device it was before attempting to reset the fault. Instructions on how to reset each type of fault will be contained within the screen message. If any faults do not reset or continues to repeat, contact our service department immediately for advice.



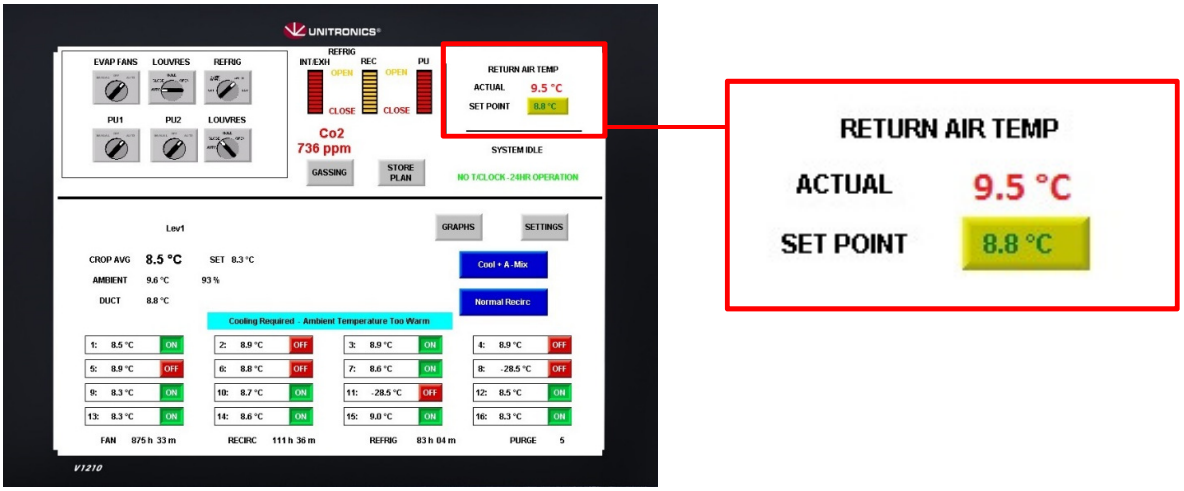
Hours Run Displays

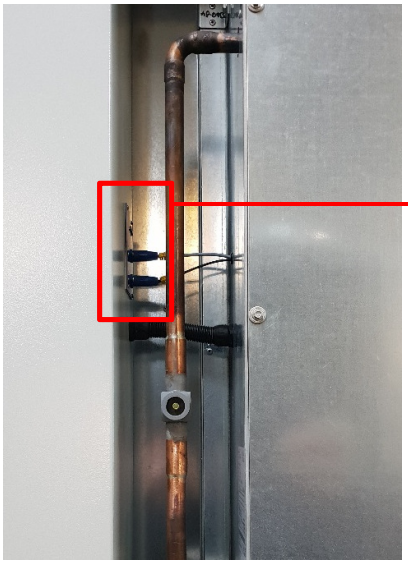
The HMI screen provides an hours run display. It is recommended that at least a weekly record of the total hours run is maintained. This will give a good indicator to the satisfactory operation of the equipment.



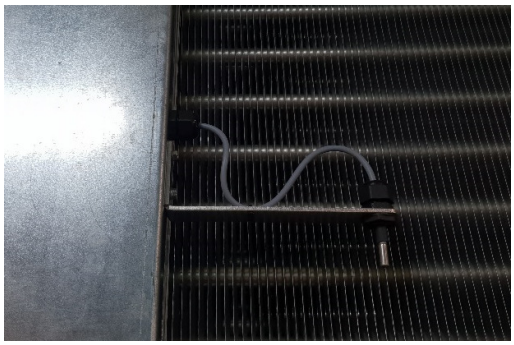
LOW LIMIT SAFETY THERMOSTAT

All FE systems are fitted with a Refrig Coil Low Limit safety stat. This digital thermostat gives a readout in degrees Celsius and has a remote sensor fitted in the return air stream to the evaporator cooling coil. A set point temperature can be manually entered, which will stop the refrigeration system if the return air falls below it. This situation is indicated by the temperature figure "flashing" on the HMI display.





Low limit sensor socket location



Low limit sensor position on <u>TOP LEFT</u> of the cooling coil "Air On" Face

Normally the low limit stat is set around 1degrees Celsius lower than the desired storage temperature. On "OFF CYCLE" defrost systems the lowest permissible setting is +2 degrees Celsius. On "Electric Heater" defrost systems the lowest permissible setting is -1 degrees Celsius.

REFRIGERATION PLANT – OPERATOR INFORMATION (Continued)

DEFROST OF THE EVAPORATOR COIL

During the normal operation of the refrigeration plant, an ice build-up will gradually occur on the fins of the **Evaporator Coil**. This build up must be limited to prevent Bridging between the coil fins. If **Bridging** is allowed to happen, large areas of the coil can quickly become engulfed with ice, resulting in the efficiency of the plant being dramatically reduced. In order to prevent this ice build-up, the system is designed to periodically run in a **Defrost** mode.

In plants designed to hold temperatures at a minimum 2.5degrees C the Defrost is carried out using the **OFF-Cycle** system. This technique simply pumps down the compressor for a pre-set period based upon the total running time of the compressor but leaves the evaporator fans running in order that the air friction over the evaporator coil will melt off the ice build-up.

The time interval of this defrost is pre-set within the control software.

The "Defrost Enable" temperature sensor which is permanently fixed to the cooling coil distributor pipework will only initiate "off cycle" defrost when the refrigerant liquid temperature is too low. This will avoid unnecessary defrosts occurring when the store is operating at higher temperature.

In plants designed for temperatures below 2.5 degrees C **Electric Defrost** is normally used. This system will pump down the compressor and stop the evaporator fans again for a period based on the compressor total running time. Electric heater elements which run inside tubes within the evaporator coil will then be switched on in order to melt the ice. If there is no ice on the coil the defrost period will terminate early, this is because the **Defrost Termination Thermostat sensor** fitted to the air off face of the evaporator coil will heat up and signal to the panel that defrost can now be ended.

If the system is fitted with motorised recirculation louvres, these will be powered closed for the duration of the defrost in order to minimize heat migration into the stored crop.

Systems without louvres will be fitted with gravity air dampers above the cooling fans to prevent heat rising up the upper ducting and into the store.

The frequency of these defrost periods has to be determined and set to suit each installations particular requirements.

Periodically check the evaporator coil for ice build-up. This is most likely to start at the base of the coil on the **AIR OFF** side. This can be quite difficult to see and a torch is recommended to improve viewing.

If excessive ice is found it is important to completely remove it before trying to run the refrigeration plant. If the ice is only partially removed bridging will quickly re-occur and the problem will be the same. A good way to dislodge the ice from the coil is to use a water hose to spray between the coil fins. This warmer water will help melt the ice much more quickly. If desired the evaporator fans can be run manually to speed up the process.

EVAPORATOR FANS

These are the main fans used to draw the store air over the Evaporator Coil and discharge the cooled air into the store. It is important that these fans are running whenever the refrigeration plant is cooling. For this reason, it is normal to electronically interlock the starters for these fans with the refrigeration initiation circuit. Unless the Evaporator fans are all running, the refrigeration plant will not run in cooling.

LOADING OR UNLOADING THE STORE

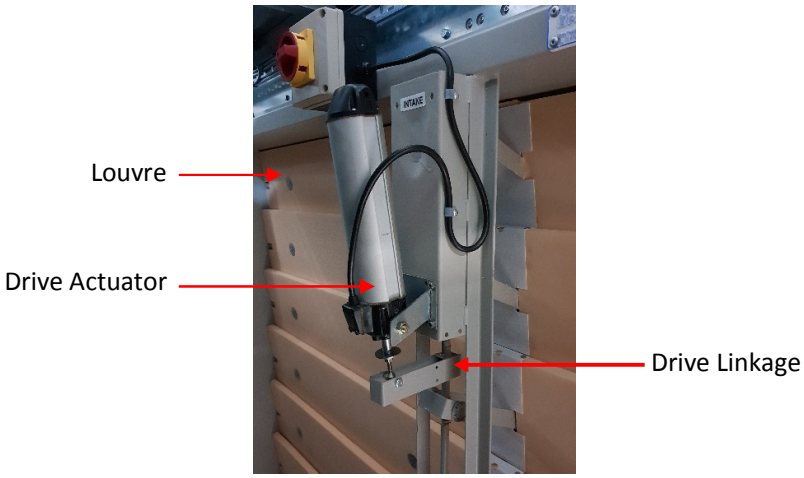
Inevitably you will need to have the main doors of the building open at sometime to carry out loading or unloading operations, during this time it will be impossible for the refrigeration plant to cope with the incoming outside air. No effective cooling can be achieved in this situation and you are only wasting electricity. The only result if the plant remains running will be to ice up the evaporator coil. This can, if left for too long result mechanical damage to and failure of the compressor. To prevent this, always turn the refrigeration to **Pump Down** if the doors are to be open for more than 5 minutes. Once the doors are closed again, turn the plant back onto **Auto**.

All our control panels are provided with a “door cut out link” which could be wired to a micro switch on the building doors to automatically stop the system if the doors are not closed.

Maintenance Guide to Farm Electronics Motorised Louvres

The Farm Electronics Motorised Louvre is a robust product which is primarily designed for installation in crop stores. By the nature of the ventilation systems in these buildings the louvres are subject to extremes of temperature and humidity, frequently installed in inaccessible locations, making routine maintenance almost impossible. Our experience has shown that the louvres with stand this lack of maintenance very well, with the majority giving reliable service over many years.

However, if the louvre is located in a position where access is possible a small amount of annual maintenance would obviously be beneficial in increasing the overall life of the louvre. This maintenance can be broken down in to three areas, visual inspection of the louvre, drive linkage and drive actuator.



Visual Inspection

The louvre is manufactured from 16g Zintec electroplated steel which is further protected after priming with vinyl micaceous iron oxide high build paint, which provides an extremely tough weather resistance finish.

The louvre should be inspected for any damaged areas of paint which will over a prolonged period of time allow rust to form, any damaged paint work should be touched up.

On the front of the louvre there is a brush seal at each end of each blade, the condition of the brush seal should be checked.

Many louvres are insulated on the back of the blade with 20mm of rigid polyurethane foam, this should be checked to ensure that it is firmly fixed to the blade.

Drive Linkage

In the centre on the back of each blade is a bracket which holds a nylon bush, the drive rod runs through the centre of each bush and is joined at the top of the drive actuator via a lever arm, where the drive rod passes through the nylon bush, it runs through a small spring under the bush, this allows the blade to have a small amount of spring loading.

The linkage should be inspected to ensure that it is straight and not damaged, the nylon bushes require no maintenance. The spring under each nylon bush should be smeared with light grease to prevent the spring rusting or binding on the drive rod.

The pivot at each end of the blade is a stainless-steel pin in a light bronze bush, it is injected with Waxoil during manufacture and sealed with a plastic cap, there is no further maintenance required.

Avoid application of products such as WD40 which are penetrating oils and will quickly dry out and actually accelerate seizing. We only recommend long term spray oils such as ROCOL Z30.

Drive Actuator

The 220v-240v drive actuator is located top centre at the back of the louvre, the actuator is fixed into the cradle bracket with a single piece of threaded rod fixed with a nut on either side which locate into nylon pockets in the actuator body. These nuts should be checked for tightness. The design of the mounting allows for the actuator to pivot on the rod and rock in a small arc during operation, this pivoting movement is correct and must not be inhibited.

Finally

Whilst you are near to the louvre ask a second person to operate the controls, watch the louvre open and close. Ensure that it operates freely without binding and pulls up the springs on the linkage.

Summary

Annually inspecting the louvre for damage and correct operation, grease springs on drive linkage, check that the set screws holding the actuator are tight.