REFRIGERATION PLANT

SCROLL HERMETIC COMPRESSORS

Farm Electronics

Operator Instructions

Crop Storage Equipment

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Farm Electronics

MAINTAINANCE & FAULT FINDING GUIDE

Scroll Hermetic Compressors

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 AND DON'TS

IMPORTANT WARNINGS

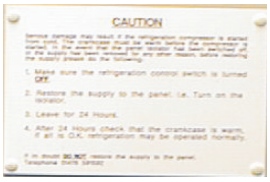
Before Starting the Plant. (Units without Crankcase Heaters)

If the plant has been switched **OFF** at the **Main Panel Isolator** or the **Mains Power,** it should be restarted in the following way.

Ensure the **Main Selector Switch** on the refrigeration control panel, is in the **Off** position before turning the mains power back on. Next turn the **Main Selector Switch** to **Pump Down**. The compressor will most likely run for 2 or 3 minutes and then stop. It is now safe to turn the unit to **Automatic** operation.

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**



Mains Isolator Handle

Crop Storage Equipment

REFRIGERATION PLANT - OPERATOR INFORMATION

IMPORTANT NOTICE

Ensure the **Main Selector Switch** ***(see figure 1)*** on the refrigeration control panel is in the **OFF** position before turning the mains power back on. 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)
Main Selector Switch

Keep it Clean

A clean tidy plant tends to be a reliable one. Keep the area around the compressor and receiver tank 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 regularly, (large or small) for signs of seeping of 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.

REFRIGERATION PLANT - OPERATOR INFORMATION (Continued)

PUMPING THE SYSTEM DOWN

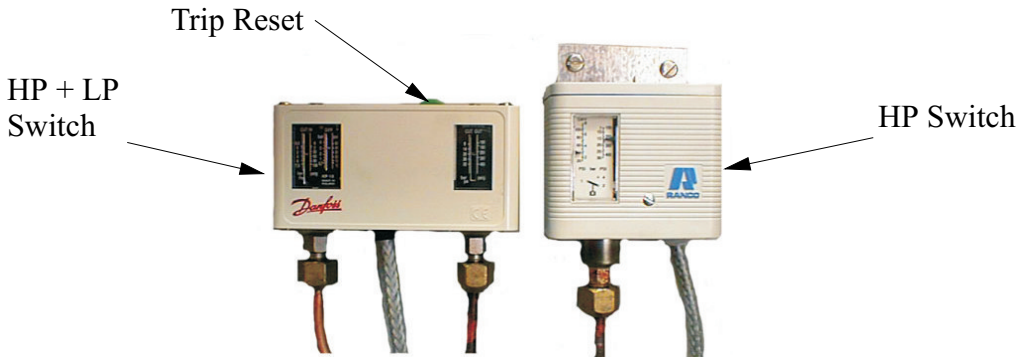
Pumping down means returning all the refrigerant gas to the Discharge side of the compressor. This is how the system needs to be when re-starting the plant. Therefore if a manual decision to stop the plant is taken it should always be **Pumped Down** first before putting the **Main Switch** to **Off**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

If the plant is 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 a running state.

PRESSURE SWITCHES

The plant utilises several pressure switches to provide safety cut outs and operation of equipment at certain pressure levels ***(see figure 2)***, these switches have been carefully adjusted to the optimum requirements of your plant. **DO NOT ATTEMPT TO RE-ADJUST THESE SWITCHES**, without correct knowledge of the pressures within the system, it will be **DANGEROUS or DAMAGING** to alter the settings on these switches.

(figure 2)

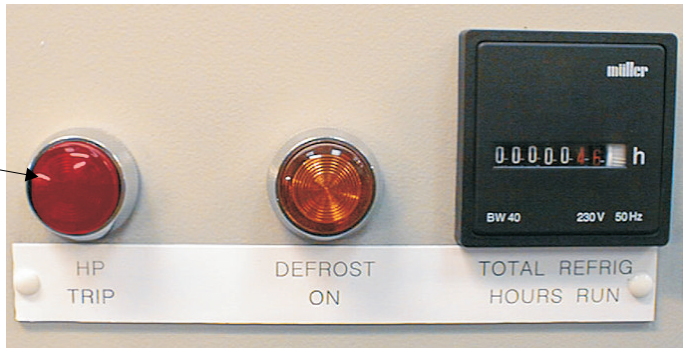


REFRIGERATION PLANT - OPERATOR INFORMATION (Continued)

SAFETY WARNING LIGHTS

All the devices capable of tripping the Refrigeration Plant **OFF** are fitted with a RED tell tale warning lamp ***(see figure 3)***. These are all mounted on the main control panel door and are labelled to show their function. If the plant stops for an unknown reason always check these lights first to see which device cut the plant out, make a note of which device it was before attempting to reset the fault. If any fault will not reset or continues to repeat, contact our service department immediately for advice.

(figure 3)



Compressor Hours Run Totaliser - All FE control panels are fitted with an hours run meter. ***(see figure 3)*** 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

Most 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 ***(see figure 4)***. 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 large Amber warning lamp next to the thermostat labelled - Temp Below Low Limit.

(figure 4)

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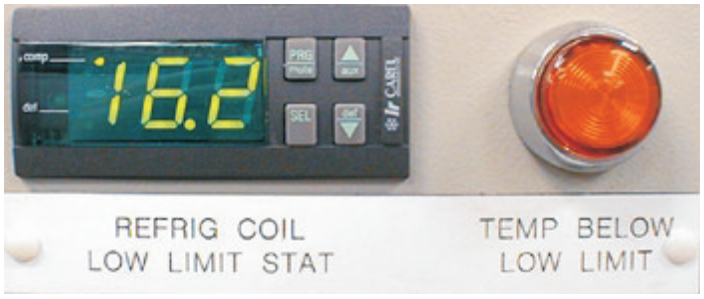


REFRIGERATION PLANT - OPERATOR INFORMATION (Continued)

DEFROST OF THE EVAPORATOR COIL

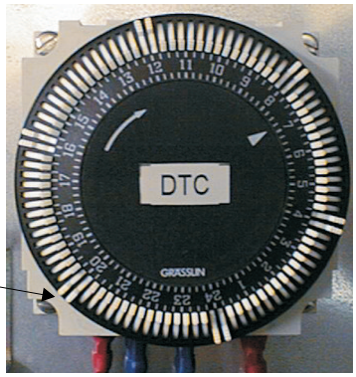
During the normal operation of the refrigeration plant, an ice build up will gradually occur on the fins of the **Evaporator Coil**. This build up must be limited to prevent **Bridging** between the coil fins. If bridging is allowed to happen, large areas of the coil can quickly become totally iced up thereby drastically reducing the efficiency of the plant. 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 2.5 degrees C the Defrost is carried out using the **Off Cycle** system. This technique simply pumps down the compressor for a preset 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 set on the Defrost Time Clock. ***(see figure 5)*** The Defrost sequence can be adjusted if necessary by altering the pegs on the Defrost Time Clock.

(figure 5)
A Defrost Time Clock showing typical set up for off cycle defrost

Push Pegs Out to set Defrost ON PERIOD



(figure 6)
Defrost Termination Stat

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 little ice is on the coil the Defrost period will terminate early, this is because the **Defrost Termination Thermostat** ***(see figure 6)*** fitted to the face if the evaporator coil will heat up again and signal to the panel that defrost can now be ended.

REFRIGERATION PLANT - OPERATOR INFORMATION (Continued)

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. Remember ice is **Clear** in colour.

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 play 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.

Defrost Override Thermostat - On some systems it may be considered that Defrost is not necessary until the return air temperature has fallen below a certain temperature. In this case a dedicated thermostat is installed to prevent Defrost occurring until the temperature has fallen below this level.

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 electrically interlock the switch for these fans with the Refrigeration initiation circuit. Unless the Evaporator Fans switches are set to **Auto** 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 to carry out loading 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 in 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 to **Auto.**

REFRIGERATION PLANT - OPERATOR INFORMATION (Continued)

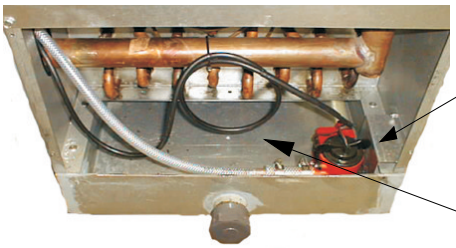
CONDENSATE DRAINAGE

Pumped Condensate System

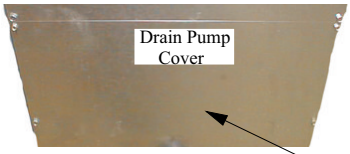
Most fully packaged Refrig Plants are fitted with an automatic pumped condensate drain system. The pump used has a float switch ***(See figure 7)*** and will run whenever the water level in the coil cartridge tray gets too high. A small RED LED indicates when the pump is running ***(see figure 9).***

If the pump fails to operate, remove the pump cover ***(see figure 8)***. Ensure there is no solid debris in the drainage tray. The pump bracket can be unscrewed ***(see figure 7).***

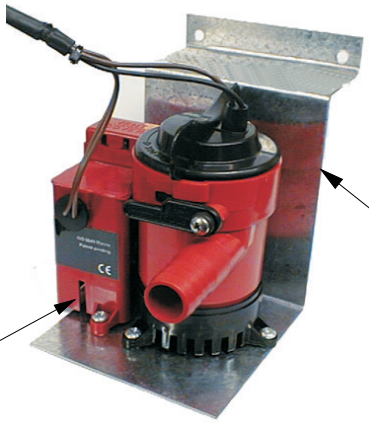
(figure 8)
Pump in end of Evap Coil



Drain Pump Cover



(figure 7)
Condensate Pump
12v DC



REFRIGERATION PLANT - OPERATOR INFORMATION (Continued)

CONDENSATE DRAINAGE

Pumped Condensate System (Continued)

Check the pump, impeller and float switch, to ensure they are clean and free from foreign objects. After replacing the pump check the fuse ***(see figure 9)*** and replace if blown. (This can happen if the pump has been jammed).

(figure 9) RED LED = Pump Running

Fuse 2 amps (20 x 5mm)

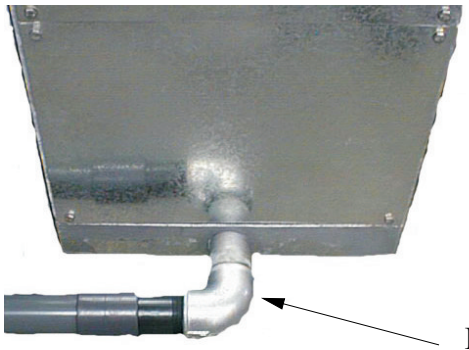
Pump Power Supply Box
12v DC

Socket for Pump
Cable

Gravity Drain Systems

Larger plants and some packaged units are simply piped to the outside of the building. ***(see figure 10)*** Here only the pipe needs to be checked periodically to ensure it has not become blocked.

(figure 10)



Drain Pipe

REFRIGERATION PLANT - OPERATOR INFORMATION (Continued)

MOTOR OVERLOAD TRIPS & FUSEGEAR

Status Lamps

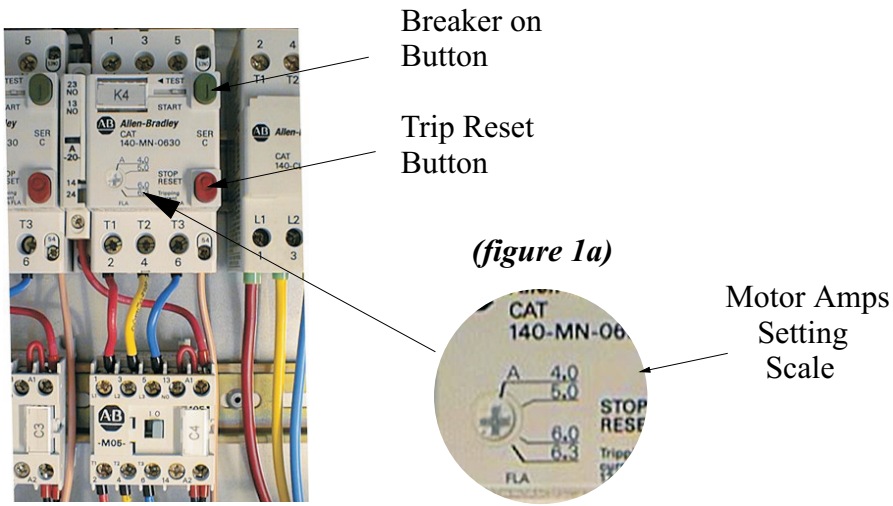
On FE control panels the majority of the equipment have an individual status lamp. These take the form of a GREEN lamp for motor running and a RED lamp to show an overload trip ***(see figure 10)***. In the event of a RED trip light refer to the following information on how to reset.

(figure 10)

Motor Breaker

This type of Starter uses a re-settable Current Breaker instead of fuses. In the event of a trip the red button will flick out. In order to reset the device the red button must be pressed in, followed by the green button ***(see figure 1).*** The motor trip amperage setting is made using the screwdriver adjustable scale. ***(See figure 1a).***

Motor Breaker
(figure 1)



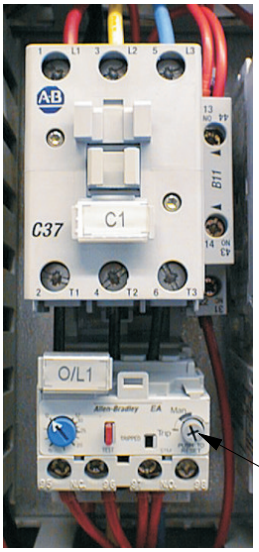
REFRIGERATION PLANT - OPERATOR INFORMATION (Continued)

MOTOR OVERLOAD TRIPS & FUSEGEAR

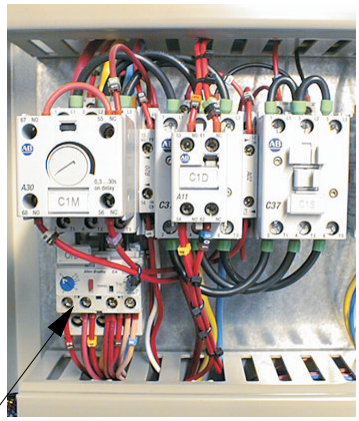
DOL & Star Delta Starters

Both these types of motor starters are used in conjunction with the Cartridge Fuses as a further cut out back up. However they are more likely to trip on the motor overload ***(see figure 2a)***. To reset the overload simply press the small reset button once. The motor amperage setting can be made on the scale which is adjustable using a small screwdriver. In the case of the DOL starter, the amperage is as set. On the Star Delta starter the motor amperage must be multiplied by 0.58 to obtain the setting required.

DOL Starter
(figure 2)



Star Delta
(figure 3)



Motor Amps Setting Scale

Reset Button

(figure 2a)

REFRIGERATION PLANT - OPERATOR INFORMATION (Continued)

MOTOR OVERLOAD TRIPS & FUSEGEAR

Single and Triple Pole Fuse Carriers

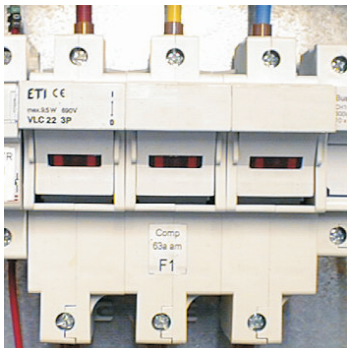
These fuse carriers are used to protect individual circuits of the electrical equipment. The fuses can be removed by simply pulling the top of the carriers forward. The fuses can then be slid out ***(see figures 4-7).***

Fuse Carrier 10.3 x 38 SP
(figure 4)

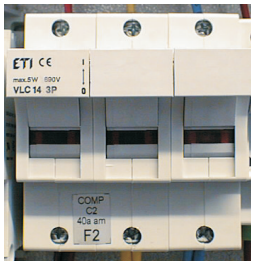
Fuse Carrier 10.3 x 38 TP
(igure 5)

Pull Down
To Open

,Fuse Carrier 22 X 58
(figure 7)



Fuse Carrier 14 x 52 TP
(figure 6)



MCB 6amps SP
(figure 8)

Cartridge Fuses
(figure 9)

22 x 58 14 x 52 10.3 x 38

Cartridge Fuses

Two types of fuselinks are fitted to control panels. These are type aM. this type are especially designed for surge currents which occur in electric motor starting. Type gL. this type are used for thermal (non-surge) loads, such as electric heaters. To test these fuses use a battery continuity meter. Fuses rarely blow unless there is a solid electrical fault. We strongly recommend you contact your maintenance electrician or Farm Electronics before replacing blown fuses.