



Installation and Operations Manual

H-IM-SSC

August 2013

Part No. 25007901

Split System Controller for Low Profile Unit Coolers

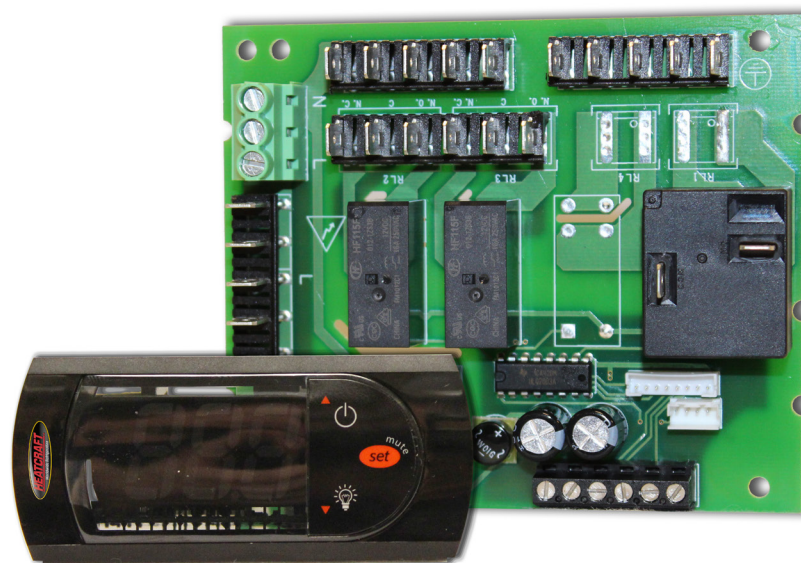


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General Safety Information

1. Installation and maintenance to be performed only by qualified personnel who are familiar with this type of equipment
2. Some units are pressurized with dry air or inert gas. All units must be evacuated before charging the system with refrigerant.
3. Make sure that all field wiring conforms to the requirements of the equipment and all applicable national and local codes.
4. Avoid contact with sharp edges and coil surfaces. They are a potential injury hazard.
5. Make sure all power sources are disconnected before any service work is done on units.

WARNING: Refrigerant can be harmful if it is inhaled. Refrigerant must be used and recovered responsibly.
Failure to follow this warning may result in personal injury or death.

Inspection

Responsibility should be assigned to a dependable individual at the job site to receive material. Each shipment should be carefully checked against the bill of lading. The shipping receipt should not be signed until all items listed on the bill of lading have been accounted. Check carefully for concealed damage. Any shortage or damages should be reported to the delivering carrier. Damaged material becomes the delivering carrier's responsibility, and should not be returned to the manufacturer unless prior approval is given to do so. When uncrating, care should be taken to prevent damage. Heavy equipment should be left on its shipping base until it has been moved to the final location. Check the serial tag information with invoice. Report any discrepancies to your Heatcraft Refrigeration Products Sales Representative.

Warranty Statement

Seller warrants to its direct purchasers that products, including Service Parts, manufactured by SELLER shall be of a merchantable quality, free of defects in material or workmanship, under normal use and service for a period of one **(1) year from date of original installation, or eighteen (18) months from date of shipment** by SELLER, whichever first occurs. Any product covered by this order found to Seller's satisfaction to be defective upon examination at Seller's factory will at SELLER's option, be repaired or replaced and returned to Buyer via lowest common carrier, or SELLER may at its option grant Buyer a credit for the purchase price of the defective article. Upon return of a defective product to SELLER's plant, freight prepaid, by Buyer, correction of such defect by repair or replacement, and return freight via lowest common carrier, shall constitute full performance by SELLER of its obligations hereunder.

SELLER shall have no liability for expenses incurred for repairs made by Buyer except by prior, written authorization. Every claim on account of breach of warranty shall be made to SELLER in writing within the warranty period specified above – otherwise such claim shall be deemed waived. Seller shall have no warranty obligation whatsoever if its products have been subjected to alteration, misuse, negligence, free chemicals in system, corrosive atmosphere, accident, or if operation is contrary to SELLER's or manufacturer's recommendations, or if the serial number has been altered, defaced, or removed.

Seller makes no express warranties except as noted above. All implied warranties are limited to the duration of the Express Warranty. Liability for incidental and consequential damages is excluded. The forgoing is in lieu of all other warranties, express or implied, notwithstanding the provisions of the uniform commercial code, the Magnuson-Moss Warranty - Federal Trade Commission Improvement Act, or any other statutory or common law, federal or state.

SELLER makes no warranty, express or implied, of fitness for any particular purpose, or of any nature whatsoever, with respect to products manufactured or sold by seller hereunder, except as specifically set forth above and on the face hereof. It is expressly understood and agreed that SELLER shall not be liable to buyer, or any customer of buyer, for direct or indirect, special, incidental, consequential or penal damages, or for any expenses incurred by reason of the use or misuse by buyer or third parties of said products. To the extent said products may be considered "consumer products," As defined in Sec. 101 of the Magnuson-Moss Warranty - Federal Trade Commission Improvement Act, SELLER makes no warranty of any kind, express or implied, to "consumers," except as specifically set forth above and on the face hereof.

The following conditions should be adhered to when installing this unit to maintain the manufacturers warranty:

- (a) System piping must be in accordance with good refrigeration practices.
- (b) **Inert gas must be charged into the piping during brazing.**
- (c) The power supply to the unit must meet the following conditions:
 - A. Three phase voltages must be +/- 10% of nameplate ratings. Single phase must be within +10% or -5% of nameplate ratings.
 - B. Phase imbalance cannot exceed 2%.
- (d) All control and safety switch circuits must be properly connected according to the wiring diagram.
- (e) The factory installed wiring and piping must not be changed without written factory approval.
- (f) All equipment is installed in accordance with Heatcraft Refrigeration Products specified minimum clearances.

Low Profile Unit Cooler Placement

Some general rules for evaporator placement which must be followed are:

1. The air pattern must cover the entire room.
2. **NEVER** locate evaporators over doors.
3. Location of aisles, racks, etc. must be known.
4. Location relative to compressors for minimum pipe runs.
5. Location of condensate drains for minimum run.

The size and shape of the storage will generally determine the type and number of evaporators to be used and their location.

NOTE: Leave space equal to unit height between bottom of unit and product. Do not stack product in front of fans.

Low Profile Unit Cooler Mounting

Most evaporators can be mounted with rod hangers, lag screws, or bolts. Use 5/16" bolt and washers or rod for up to 250 pounds, 3/8" for up to 600 pounds and 5/8" for over 600 pounds. Care should be taken to mount the units level so that condensate drains properly.

When using rod hangers, allow adequate space between the top of the unit and the ceiling for cleaning. To comply with NSF Standard 7, the area above the unit cooler must be sealed or exposed in such a way to facilitate hand cleaning without the use of tools. When lagging or bolting the unit flush to the ceiling, seal the joint between the top and the ceiling with an NSF listed sealant and ends of open hanger channels must be sealed to prevent accumulation of foreign matter.

When locating unit coolers in a cooler or freezer, refer to Figures 1

NOTE: Always avoid placement of Unit Coolers direct above doors and door openings.

Check Out and Start Up

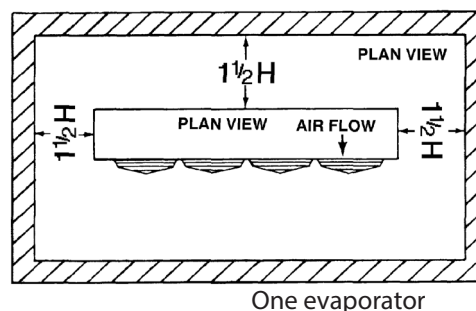
NOTE: All adjustable controls and valves must be field adjusted to meet desired operation. There are no factory preset controls or valve adjustments. This includes low pressure, high pressure, adjustable head pressure systems and expansion valves.

After the installation has been completed, the following points should be covered before the system is placed in operation:

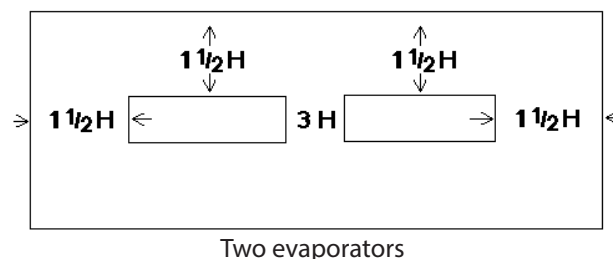
- A. Check all electrical and refrigerant connections. Be sure they are all tight.
- B. Check the room thermostat for normal operation and adjust.
- C. All fan motors on evaporators should be checked for proper rotation. Fan motor mounts should be carefully checked for tightness and proper alignment.
- D. Electric and hot gas evaporator fan motors should be temporarily wired for continuous operation until the room temperature has stabilized.
- E. Do not leave unit unattended until the system has reached normal operating conditions and the oil charge has been properly adjusted to maintain the oil level between 1/4 and bottom of the sight glass.
- F. Make sure all Schrader valve caps are in place and tight.

Minimum Unit Clearances

Figure 1. Low Profile Unit Coolers



NOTE:
H = Total height of evaporator coil surface.



Operational Check Out

After the system has been charged and has operated for at least two hours at normal operating conditions without any indication of malfunction, it should be allowed to operate overnight on automatic controls. Then a thorough recheck of the evaporator operation should be made as follows:

- A. Check liquid line sight glass and expansion valve operation. If there are indications that more refrigerant is required, leak test all connections and system components and repair any leaks before adding refrigerant.
- B. Thermostatic expansion valves must be checked for proper superheat settings. Feeler bulbs must be in positive contact with the suction line and should be insulated. Valves set at high superheat will lower refrigeration capacity. Low superheat promotes liquid slugging and compressor bearing washout.
- C. Check defrost controls for initiation and termination settings, and length of defrost period. Set fail safe at length of defrost + 25%.
Example: 20 minute defrost + 5 minutes = 25 minute fail safe
- D. Check drain pan for proper drainage.
- E. Install instruction card and control system diagram for use of building manager or owner.

Condensate Drain Lines

Either copper or steel drain lines should be used and properly protected from freezing. In running drain lines, provide a minimum 1/4 inch per foot pitch for proper drainage. Drain lines should be at least as large as the evaporator drain connection. All plumbing connections should be made in accordance with local plumbing codes. All condensate drain lines must be trapped, and run to an open drain. They must never be connected directly to the sewer system. Traps in the drain line must be located in a warm ambient. We recommend a trap on each evaporator drain line prior to any tee connections. Traps located outside, or extensive outside runs of drain line must be wrapped with a drain line heater. The heater should be connected so that it operates continuously. It is recommended that the drain line be insulated to prevent heat loss. A heat input of 20 watts per linear foot of drain line for 0°F (-18°C) room applications and 30 watts per linear foot for -20°F (-29°C) rooms is satisfactory. In freezers, the evaporator drain pan fitting should be included when heating and insulating the drain line.

Inspect drain pan periodically to ensure free drainage of condensate. If drain pan contains standing water, check for proper installation. The drain pan should be cleaned regularly with warm soapy water.

WARNING: All power must be disconnected before cleaning. Drain pan also serves as cover of hazardous moving parts. Operation of unit without drain pan constitutes a hazard.

Traps on low temperature units must be outside of refrigerated enclosures. Traps subject to freezing temperatures must be wrapped with heat tape and insulated.

NOTE: Always trap single evaporator system drain lines individually to prevent humidity migration.

Figure 5. Condensate Drain Lines

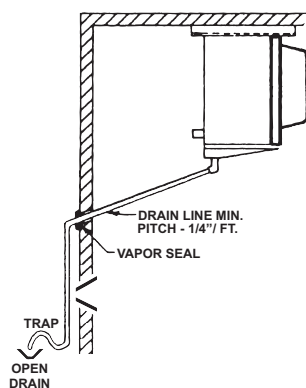
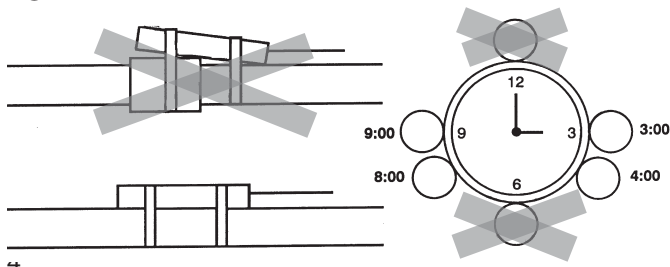


Figure 6. Bulb and Contact Location



Evaporator Superheat

Check your superheat. After the box temperature has reached or is close to reaching the desired temperature, the evaporator superheat should be checked and adjustments made if necessary. Generally, systems with a design TD of 10°F should have a superheat value of 6° to 10°F for maximum efficiency. For systems operating at higher TD's, the superheat can be adjusted to 12° to 15°F as required.

NOTE: Minimum compressor suction superheat of 20°F may override these recommendations on some systems with short line runs.

To properly determine the superheat of the evaporator, the following procedure is the method Heatcraft recommends:

WARNING: If the condensing unit has no flooded condenser head pressure control, the condensing unit must have the discharge pressure above the equivalent 105°F condensing pressure.

1. Measure the temperature of the suction line at the point the bulb is clamped.
2. Obtain the suction pressure that exists in the suction line at the bulb location by either of the following methods:
 - a. A gauge in the external equalized line will indicate the pressure directly and accurately.
 - b. A gauge directly in the suction line near the evaporator or directly in the suction header of the evaporator will yield the same reading as 2a above.
3. Convert the pressure obtained in 2a or 2b above to saturated evaporator temperature by using a temperature-pressure chart.
4. Subtract the saturated temperature from the actual suction line temperature. The difference is superheat.

Alternate Superheat Method

The most accurate method of measuring superheat is found by following the previous procedure, Temperature/Pressure method. However, that method may not always be practical. An alternate method which will yield fairly accurate results is the temperature / temperature method:

1. Measure the temperature of the suction line at the point the bulb is clamped (outlet).
2. Measure the temperature of one of the distributor tubes close to the evaporator coil (inlet).
3. Subtract the inlet temperature from the outlet temperature. The difference is superheat.

This method will yield fairly accurate results as long as the pressure drop through the evaporator coil is low.

Split System Controller - Adjusting Defaults

Unit comes automatically set to factory defaults (See Table 1)

TO CHANGE FACTORY DEFAULTS AS A GROUP FOLLOW THESE STEPS:

1. PRESS SET BUTTON AND HOLD IN FOR 3-5 SECONDS UNTIL THE DISPLAY FLASHES "PS".
2. PRESS THE SET BUTTON AND THE DISPLAY WILL CHANGE TO "0" AND WILL BEGIN TO FLASH.
3. PRESS THE UP BUTTON UNTIL "22" IS DISPLAYED.
4. PRESS THE SET BUTTON.
5. PRESS THE DOWN BUTTON 2 TIMES. "EZY" WILL BE DISPLAYED.
6. PRESS THE SET BUTTON.
7. SELECT THE PROPER NUMBER FOR THE MODEL NEEDED BY PRESSING THE UP OR DOWN KEY.
 - 1 - FREEZER
 - 2 - COOLER
8. PRESS "SET" AND WAIT FOR UNIT TO RETURN OUT OF PROGRAMMING MODE.
9. TURN POWER OFF
10. PRESS "SET" KEY WHILE TURNING UNIT ON
11. "CE" SHOULD DISPLAY TO VERIFY PROGRAMMING DISPLAY

TABLE 1 Control Factory Default Settings

Parameters	Temperature Set Points	Defrost Start Times	Defrost Duration (Maximum)	Drip Time	Fan Delay	Defrost Termination Set Point	EZY Default
Freezer	-10°F	6 / day	30 min.	2 min.	Drip Time + 1 min.	60°F	1
Cooler	35°F	4 / day	40 min.	–	–	38°F	2

Refrigeration/Defrost Sequence of Operation

The sequence of operation varies depending on the model that has been installed. The two basic models are Cooler and Freezer models.

Control of the refrigeration and defrost system is provided by the Carel controller along with a space (box) temperature sensor and a coil (defrost) temperature sensor. The controller will control on and off switching for the solenoid valve, evaporator fan motor(s) and electric defrost heaters for electric defrost units.

The Split System controller is pre-programmed for both cooler and freezer applications. This is done with the use of the parameter list.

TABLE 2 Model Freezer | Low Temperature Models | EZY SETTING =1

SET POINT IS -10° F

These models are intended for freezer applications and require electric defrost. The controller is pre-programmed for 4 defrost per pay. These periods are reprogrammable.

Parameters	Status		Solenoid	Evaporator Fans	Defrost Heaters	Notes
N/A	Off	Display alternates "OFF" and Room Temperature	Off	Off	Off	If unit shows "OFF", press the "^" button and hold for three seconds.
d4	On	Automatic Defrost on start up	Off	Off	On	If coil temperature is below 65° F. If it is above, defrost is not initiated. Drip Time and Freeze Time are ignored.
dt	On	Defrost Sensor reaches 65° F and defrost is terminated	Off	Off	Off	
dd	On	Cooling cycle initiated - Drip Time	Off	Off	Off	System Timer Begins/ 1 min drip time
Fd, d1	On	Drip Time of 2 minutes ends - coil freeze begins	On	Off	Off	Compressor starts and evaporator fans delay for 2 minutes to freeze the coil.

TABLE 2 CONTINUED Model Freezer | Low Temperature Models | EZY SETTING = 1

SET POINT IS -10° F

These models are intended for freezer applications and require electric defrost.

Parameters	Status		Solenoid	Evaporator Fans	Defrost Heaters	Notes
Fd, F1	On	Evaporator fans start after 1 min delay	On	On	Off	28° F Cut-in
st	On	Box Temperature (-10.1° F) is satisfied	Off	On	Off	
rd, C2	On	Box Temperature rises to -8.0° F	On	On	Off	2° F Differential, Minimum Compressor Off time is 4 minutes
dl	On	Defrost Initiated (Manually or 4 hour counter)	Off	Off	On	Electric Defrost
Fd, F0	On	Drip Time of 2 minutes ends - coil freeze begins	On	Off	Off	Compressor starts and evaporator fans delay for 2 minutes to freeze the coil.

TABLE 3 Model Cooler | EZY SETTING = 2

SET POINT IS 35° F

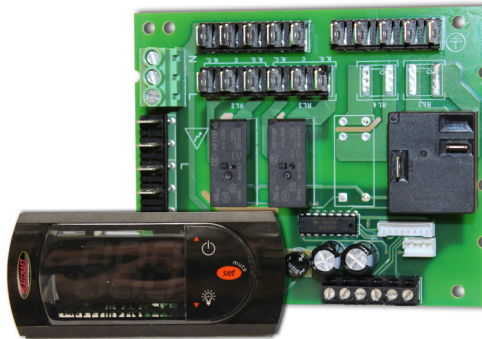
These models are intended for cooler applications and have air (Off-cycle) defrost. The controller is pre-programmed for 4 defrost per day. These periods are reprogrammable.

Parameters	Status		Solenoid	Evaporator Fans	Defrost Cycle	Notes
N/A	Off	Display alternates "OFF" and Room Temperature	Off	Off	Off	If unit shows "OFF", press the "^" button and hold for three seconds.
N/A	On	Cooling Cycle initiated	On	On	Off	System Timer Begins
St	On	Box Temperature (34.9° F) is satisfied	Off	On	Off	
rd	On	Box temperature rises to 37.0° F	On	On	Off	2° F Differential, Minimum Compressor Off Time is 4 minutes
dl	On	Defrost Initiated (Manually or 6 hour counter)	Off	On	On	Air Defrost
d0, dt	On	Defrost Terminated by time	On	On	Off	

Programming the Heatcraft Split System Controller

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The Heatcraft Split System Controller is a fully configurable electronic refrigeration controller. The Low Profile unit cooler uses the Heatcraft controller for both cooler and freezer applications. The models differ by a pre-programmed parameter list that is specific for each application. There are two levels of programming with the Heatcraft controller. The first level can be accessed through the keypad. Set Point (st), Interval between defrost (dl), Maximum Defrost Duration (dP), and Dripping Time (dd) are examples of first level parameters. Second level parameters can be accessed by entering a password. See “Modifying Parameters” (page 16).



Electrical Connections

WARNINGS:

The electrical connections must only be completed by a qualified electrician.

A power supply other than the type specified may seriously damage the system.

Separate as much as possible the sensors and digital input signal cables from the cables carrying inductive loads and power cables to avoid possible electromagnetic disturbance. Never lay power cables (including the electrical cables) and sensor signal cables in the same conduits. Do not install the sensor cables in the immediate vicinity of power devices (contactors, circuit breakers or similar).

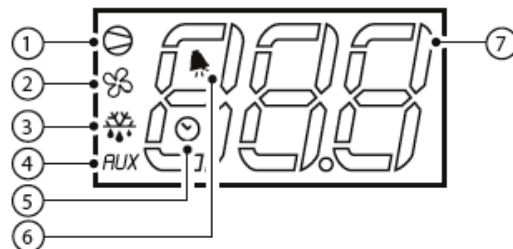
Reduce the path of the sensor and sensor cables as much as possible, and avoid spiral paths that enclose power devices.

Avoid direct contact with internal electronic components.

Connection errors (and connections other than those indicated in this manual) may involve danger to the safety of the users and cause faults on the instruments and the components connected.

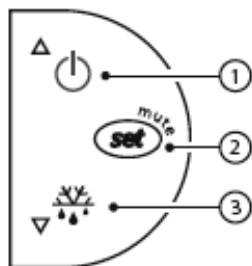
Fit the unit with all the electromechanical safety devices required to guarantee correct operation and the complete safety of the user.

Display



ICON #	FUNCTION	NORMAL OPERATION			START UP
		ON	OFF	flash	
1	solenoid	on	off	call	on
2	fan	on	off	call	on
3	defrost	on	off	call	on
4	AUX	-	-	-	-
5	clock (RTC)	RTC available, enabled (tEN=1) and at least one time band has been set)	RTC not available or not enabled (tEN=0) or no time band set		on (if the clock is fitted)
6	alarm	alarm in progress	no alarm in progress	-	on
7	digits	three digits with decimal point and range -199 to 999. See parameters /4, /5, /6 for the type of sensor displayed, values in °C/°F and decimal point			

Keypads



BUT. NO.	NORMAL OPERATION		START UP	
	pressing the button alone	pressing with other buttons		
1	more than 3 sec: switch ON/OFF	pressed together with 3 activates/deactivates the defrost	-	
2	- 1 sec: displays/sets the set point - more than 3 sec: accesses the parameter setting menu (enter password 22) - mutes the audible alarm (buzzer)	-	for 1 sec RESET current EZY set	pressed together (2 and 3) activate parameter reset procedure
3	more than 3 sec: activates/deactivates the defrost	pressed together with 1 activates/deactivates the defrost	for 1 sec displays firmware version	

Preliminary Configurations

Once the electrical connections have been completed, simply power-up the controller to make it operative.

Control Parameters	
st	set point
rd	set point differential

Defrost Parameters	
d0	type of defrost
dl	interval between two defrosts
dt	end defrost temperature
dP	maximum defrost duration

Alarm Parameters	
Ad	temperature alarm delay
AL	low temperature alarm threshold/deviation
AH	high temperature alarm threshold/deviation

Functions Available from Keypad

ON AND OFF

Switching the instrument ON: press UP for more than 3 sec (when pressing the button, the display shows ON).

Switching the instrument OFF: press UP for more than 3 sec. The display shows the message "OFF", alternating with the temperature measured by the set sensor.

In off status, the following functions are disabled (if featured by the model):

- compressor control / duty setting / continuous cycle;
- defrost;
- fan control;
- alarms : 'LO', 'HI', 'IA', 'cht', 'CHT';
- door switch (A4= 7/8);
- buzzer (when available)

While the following are enabled:

- temperature display, alternating with the message "OFF";
- parameter display and setting;
- alarms: "E0", "E1", "E2";
- the internal timer relating to parameter 'dl' is updated. If 'dl' expires in OFF status, a defrost is performed when restarting;
- auxiliary relay management, only in the following configurations:
 - H1= = 1/2 ("E0" alarm only)
 - H1= 3, A4= 6;

Note: when exiting OFF status, the following settings are set to zero (that is, are not saved prior to OFF): evaporator fan alarm hysteresis and management (A0), temperature control hysteresis (rd), cht pre-alarm hysteresis (AE). In addition, the delays are set to zero for the display of the temperature alarms (Ad, d8, c6), dripping (dd) and post-dripping (Fd).

SET POINT SETTING (DESIRED TEMPERATURE VALUE)

The Split System Controller device controls the desired temperature (set point) inside the cooler/freezer directly and dynamically.

To view and modify the set point:

- press SET for 1 sec, the set value will start flashing;
- increase or decrease the value using UP or DOWN;
- press SET to confirm the new value.

MANUAL DEFROST

Press DOWN for more than 3 sec (activated only if the temperature conditions are right, and if the light output is not set, $H1 \neq 4$) Alternatively, if the light output is set ($H1 = 4$), the defrost can be activated by pressing UP and DOWN together, when $H6 = 1$.

CONTINUOUS CYCLE

Press UP+DOWN for more than 3 sec (activated only if the temperature conditions are right and only when $H6=0$)

The continuous cycle is used to maintain refrigeration activity in the cooler/freezer, regardless of the temperature inside the units. This may be useful for rapidly bringing the temperature below the set point value.

LIGHT

As already mentioned, when a light output is configured ($H1=4$), the DOWN button switches the light on/off, otherwise it starts/stops the defrost.

Temperature Display

The temperature displayed, the unit of measure and the decimal resolution can be set according to the following parameters: /4, /5 and /6.

/4 : Select Sensor Displayed

Used to choose whether to display the temperature read by the control sensor (Sensor 1), Sensor 2 or the status of the multifunction input (analogue or digital).

Parameter /4 selects the sensor shown on the display, all the other display and control modes remain unchanged.

/5: Select °C/°F

Defines the unit of measure used for temperature control.

/5=0 to work in °C

/5=1 to work in °F.

WARNING:

When changing from one unit of measure to the other, all the values of the temperature parameters are modified to the new unit of measure.

The max and min limits of the absolute temperature parameters are the same for both °C and °F. The range of temperatures allowed is therefore different between °C and °F

/6: Disable Decimal Point

Used to enable or disable the temperature display with the resolution to the tenths of a degree between -20 and + 20

/6= 0 temperature displayed to the tenth of a degree;

/6=1 temperature displayed without the tenths of a degree.

NOTE: the decimal point is only disabled in relation to the reading shown on the display (the calculations performed by the controller remain unchanged).

Temperature Control

The following parameters are used to control the temperature: St, r1, r2, r3, r4 and rd.

St: set point, r1 minimum value and r2 maximum value of the set point

Parameter St determines the desired temperature to be maintained inside the cooler/freezer(set point). Parameters r1 (minimum value) and r2 (maximum) set the range of temperatures for setting the set point.

NOTE: the set point can be set by pressing the SET button (see paragraph ("Setting the set point (desired temperature value)").

r3: Select Direct/Reverse Operation

Defines the operating mode of the device:

- r3=0: direct with defrost. Used to request the activation of the compressor when the temperature measured by sensor 1 rises above the set point. This mode also includes defrost
- r3=1: direct without defrost
- r3=2: reverse without defrost. Used to request the activation of the compressor when the temperature measured by sensor 1 falls below the set point. This mode does NOT include defrost.

r4: Night-time Set Point Delta

Value that automatically increases the set point temperature during the night-time operation time bands.

r4=0: night-time set point= St

r4>0: night-time set point= St + r4

rd Control Differential

Value that is added to (or subtracted from, in 'reverse' mode) the temperature set point.

rd= low values:

- More precise temperature control
- High compressor On/Off switching frequency in the event of minimum temperature deviations (with the risk of causing damage)

rd= high values:

- Less precise temperature control
- Low compressor On/Off switching frequency in the event of minimum temperature deviations

Duty Setting

Safety function that ensures the operation of the compressor even in the event of a control sensor fault. If alarm E0 occurs, duty setting ensures the operation of the compressor until the fault is resolved. The compressor, not being able to be activated according to temperature, works cyclically with an ON time equal to the value assigned to parameter c4 (in minutes) and a fixed OFF time of 15 minutes.

Duty Setting and Defrost

If the control sensor error occurs when the controller is in defrost mode, the function is not stopped but rather is completed as required; in addition, the defrost can still be performed when called. During the defrost, the duty setting timer is not stopped but rather keeps counting the ON and OFF times.

Duty Setting and Continuous Cycle

If the continuous cycle is operating, the controller instantly exits this status and activates duty setting (also for safety reasons, given that during the continuous cycle the low temperature alarm is disabled). To re-activate continuous cycle operation, the ambient sensor fault must be resolved. If the sensor error is no longer present, the unit returns to normal operation. The compressor again takes on the logic of the control, respecting the times c1, c2, c3.

Continuous Cycle

The continuous cycle is used to maintain refrigeration continuously active, regardless of the temperature inside the unit. The function is used to rapidly lower the product temperature, even below the set point, for example after filling the cabinets. In this phase, the temperature may fall below the set point. To activate or deactivate the continuous cycle from the keypad, see paragraph 3.5, the display shows "cc" and the icon flashes (2 flashes, pause).

cc: Continuous Cycle Duration

This represents the time in hours that the compressor operates continuously for so as to lower the temperature, even below the set point. If cc=0 the continuous cycle is not activated. The controller exits the continuous cycle procedure after the time set for parameter "cc" has expired, or when reaching the minimum temperature (see the minimum temperature alarm, parameter AL).

c6: Temperature Alarm Bypass After Continuous Cycle

This is the time in hours during which all the temperature alarms are deactivated after a continuous cycle. If the temperature of the refrigerated unit, after the continuous cycle, lowers due to inertia below the minimum temperature threshold (set point-AL), the activation of the low temperature alarm is delayed for the time c6. In any case, the continuous cycle is deactivated at the temperature (set point-AL).

Compressor Protection

The Split System controller is fitted with an automatic compressor protection system to avoid continual starts or stops of the unit. The protection is based on the times in minutes set for parameters c0; c1; c2; c3:

c0 Compressor and Fan Start Delay on Power-Up

When the controller is powered-up, this delays the start of the compressor and the evaporator fan.

c1 Minimum Time between Consecutive Compressor starts

Delay between two consecutive starts of the compressor.

Note:

- If the maximum number of starts/hour allowed is 10, simply set c1=6 to ensure this limit is observed.
- As well as c1, also remember that parameter "dd" (dripping time) stops the compressor and the evaporator fan after a defrost.

c2/c3 Minimum CompressorOff /On Time

These determine the minimum off time (c2) and on time (c3) for the compressor. The compressor will not be controlled until times c2 and c3 have elapsed.

c11: Second Compressor Delay

This parameter determines the delay in the activation of the second compressor compared to the main compressor. The parameter has no effect on the deactivation of the compressor.

Defrost

Type of Defrost (parameter d0):

- By temperature: using the defrost sensor located on the evaporator. In any case, the defrost will end after a maximum settable safety duration. The end defrost for maximum duration alarm "Ed" (parameter A8) can be disabled.
- By time: when there is no defrost sensor.
- By time with temperature control (heater only); for a programmable time: the defrost output is only activated when the temperature is below the end defrost threshold, guaranteeing energy saving and defrosting of the evaporator even in more extreme situations.

How to Start the Defrost:

- From the keypad pressing the DOWN button for 3 sec (manual defrost) (H1 must be ≠4. If H1=4 the UP and DOWN buttons can be pressed together, when H6=1)
- From the supervisor
- Setting the time bands (if RTC available /enabled)
- At the end of the interval between two defrosts (parameter dl>0)
- When switching the instrument on (parameter d4=1)

The Defrost May Be Called, but Not Activated, In the Following Cases:

- Continuous cycle
- Dripping (dd>0)
- Post-dripping (Fd>0)
- Compressor protectors
- Off status
- Disabling from digital input(A4=2)
- Setting the time delay (d5>0) for the defrost function when the instrument is switched on (d4=1)
- Direct control mode only without defrost (r3=1) or reverse (r3=2) (in this case the defrost is not called)
- Defrost by temperature (d0=0, 1) and temperature measured by the defrost sensor above the end defrost set point (dt)

The Defrost Ends Correctly:

- At the end of the pre-set time (see parameter "dP")
- Once having reached the set temperature (dt)

When the defrost ends correctly, the dripping (equal to the time set for parameter dd) and post-dripping (parameter Fd) phases start.

The Defrost Ends Early:

- From the keypad, pressing the DOWN button for 3 sec (manual end defrost, for easy split H1 must be ≠4 or pressing UP+DOWN together 3 sec when H6=1)
- Due to an immediate external alarm "IA"
- Due to a dirty condenser alarm "CHT"
- By setting direct mode only without defrost (r3=1) or reverse (r3=2)
- Switching off
- When requested from the supervisor
- From digital input (see parameter A4=2) (the defrost call remains pending)

In these cases, the early end of the defrost is not followed by dripping and post-dripping.

Important:

- The defrost is only available in direct mode, that is, when parameters r3=0 or A4=9 (the latter has priority over r3)
- Using parameter d0, and according to the model available, type of defrost to be activated can be selected
- The defrost has priority over normal temperature control; it may also have priority over the compressor protectors (see parameter d9)
- During the defrost, the temperature display can be frozen (see parameter d6)
- The continuous cycle has priority over the defrost

Parameters for Configuring the Defrost

dl: Interval Between Defrosts

The defrost is performed periodically at a frequency of every "dl" (in hours or minutes, see parameter dC).

The interval starts counting from the start of the current defrost. If the time is equal to 0 (dl=0), the defrost is not performed, except when activated from the keypad, by digital input, from the supervisor or by time band.

During defrosts the temperature alarms are inhibited.

dt: End Defrost Temperature Set Point/Defrost Temperature Threshold with Temp. Control

This parameter allows an evaporator temperature to be set at which the defrost is stopped (the evaporator temperature is measured by the defrost sensor). The end defrost temperature differential is fixed at 1° C (defrost with temperature control, d0= 4).

If at the start of a defrost cycle with the controlled output by temperature (d0=0, 1) the temperature measured by the sensor is greater than the value set for "dt", the defrost is not performed.

In the event of defrost sensor failure, the controller performs a timed defrost with a duration equal to the value set for "dP". The same is true if the end defrost set point can not be reached, the defrost is stopped after a maximum time equal to the value of dP, and the error Ed is displayed (if enabled by A8) and stays on until a correct defrost cycle is performed.

dP: Maximum Defrost Duration

Determines the maximum duration of the defrost (in minutes or seconds, see parameter dC). When defrost by time is set (d0= 2/3/4) dP represents the effective duration of the defrost.

d4: Defrost When Switching the Control On

Starts a defrost when switching the control on (d4= 1). This has priority over the activation of the compressor and the continuous cycle.

Running a defrost when switching the control on may be useful in special situations (e.g. frequent power failures).

d6: Freeze Control Temperature Display During Defrost

This function locks the display of the ambient temperature during the defrost cycle at the last value read before the current defrost (d6= 1).

d6= 0 display the message "dF" alternating with the temperature measured by the control sensor;

d6= 1 freeze the display on the last temperature measured before the defrost.

The display normally returns when the measurement first reaches the set point or, in any case, after the set alarm bypass time after defrost (parameter d8).

The freeze mode is also valid for the display of the second and third sensor, if enabled (parameter /4).

dd: Dripping Time

This parameter forces the compressor and the evaporator fans off after a defrost, in order to allow the evaporator to drip.

The value of this parameter indicates the number of minutes the compressor and fan are off. If dd = 0 no dripping is set, therefore at end defrost the compressor starts immediately.

d8: Alarm Bypass Time After Defrost

The parameter has two effects:

1. it delays the temperature alarm signal after a defrost;
2. it delays the temperature alarm signal after opening the door. In this case, it is only active when A7=0.

d/: Defrost Sensor Reading

Used to display the value measured by the defrost sensor on the instruments where this is fitted.

d9: Defrost Priority Over Compressor Protectors

Cancels the compressor protection times (c0, c1, c2, c3) at the start of the defrost. The possible values are:

d9= 0 protection times observed;

d9= 1 protection times ignored; the defrost has higher priority and the compressor times are not observed.

d/: Defrost Sensor Reading

Used to display the value measured by the defrost sensor on the instruments where this is fitted.

dC: Time Base

Used to modify the unit of measure used to count the times for parameters dI (defrost interval) and dP (defrost duration).

Table of Alarms and Signals

When an alarm is activated, the display shows the corresponding message that flashes alternating with the temperature; if fitted and enabled, the buzzer and the alarm relay are also activated.

All the alarms have automatic reset (that is, they stop when the causes are no longer present), except for alarm 'CHt' which has manual reset (instrument on/off using the UP button or by disconnecting the power supply).

NOTE:

- In split system controller, when starting control (powering up the controller and/or switching from OFF status), the high temperature alarm signal is disabled until the first time the compressor stops, to avoid false signals. The first time the compressor stops indicates that the set temperature has been reached, and, consequently, the high temperature alarm signal is enabled. This function is always active.*

Pressing the SET button mutes the buzzer, while the code displayed and the alarm relay only go off when the causes of the alarm have been resolved.

The alarm codes are shown in the table below:

Alarm Code	Buzzer and Alarm Relay	LED	Alarm Description	Reset	Enable Alarm parameters involved
E0	active	ON	sensor 1 error= control	automatic	-
E1	not active	ON	sensor 2 error= defrost	automatic	d0= 0 / 1 / 4, F0= 1
E2	not active	ON	sensor 3 error= condenser/product	automatic	[A4=13/14]
IA	active	ON	external alarm	automatic	[A4 = 1] [+A7]
dOr	active	ON	open door alarm	automatic	[A4=7/8/10/11][+A7]
LO	active	ON	low temperature alarm	automatic	[AL] [Ad]
HI	active	ON	high temperature alarm	automatic	[AH] [Ad]
EE	not active	ON	unit parameter error	not possible	-
EF	not active	ON	operating parameter error	manual	-
Ed	not active	ON	defrost ended by timeout	on first defrost ended correctly	[dP] [dt] [d4] [A8]
dF	not active	OFF	defrost running	automatic	[d6=0]
cht	not active	ON	dirty condenser pre-alarm	automatic	[A4=13]
CHt	active	ON	dirty condenser alarm	manual	[A4=13]
EtC	not active	ON	clock alarm	by setting the time	if bands are active
SrC	not active	ON	maintenance request signal	manual, set HMr=1	[HMP] [HMD] [HMr]

Description of the Main Signals and Alarms

LED Flashing

The activation of the corresponding function is delayed by a timer, awaiting an external signal or disabled by another procedure that is already in progress. e.g. if is a continuous cycle in progress and a defrost is called, the latter will remain pending until the end of the continuous cycle, and the corresponding LED (defrost) will flash.

E0 Steady or Flashing

Control sensor error:

- Sensor not working: the sensor signal is interrupted or short-circuited
- Sensor not compatible with the control

The alarm signal E0 is steady if it is the only active alarm (the temperature value is not displayed), while it flashes if other alarms are active or the second sensor is displayed.

E1 Flashing

Evaporator sensor or food conservation sensor error:

- Sensor not working, the sensor signal is interrupted or short circuited
- Sensor not compatible with the control

E2 Flashing

Condenser sensor or food conservation sensor error:

- Sensor not working, the sensor signal is interrupted or short-circuited
- Sensor not compatible with the instrument

IA Flashing

Immediate or delayed alarm from multifunction digital input:

- Check the multifunction input and parameters A4 and A7.

dOr Flashing

Open door alarm:

- Check the multifunction input and parameters A4 and A7.

LO Flashing

Low temperature alarm. The sensor has measured a temperature lower than the set point by a value that exceeds parameter AL:

- Check parameters AL, Ad and A0.

The alarm is automatically reset when the temperature returns within the set limits (see parameter AL).

HI Flashing

High temperature alarm. The sensor has measured a temperature higher than the set point by a value that exceeds parameter AH.

- Check parameters AH, Ad and A0

The alarm is automatically reset when the temperature returns within the set limits (see parameter AH).

EE Displayed During Operation or on Power-Up

Unit parameter reading error. See Data errors.

EF Displayed During Operation or on Power-Up

Operating parameter reading error. See Data errors.

Ed flashing

The last defrost ended after exceeding the maximum duration rather than when reaching the end defrost set point.

- Check parameters dt, dP and d4
- Check the efficiency of the defrost

The message disappears when the next defrost ends correctly.

dF Flashing

Defrost running:

- This is not an alarm signal, but rather a message that the instrument is running a defrost. Only shown if d6= 0.

cht Flashing

Dirty condenser pre-alarm:

- Check parameters A4, Ac, AE and Accd

CHt Flashing

Dirty condenser alarm:

- Check parameters A4, Ac, AE and Accd

EtC Flashing

Internal clock error.

SrC Flashing

Maintenance request signal. Displayed only if parameter HMP≠0.

Data Error

In certain operating conditions, the instrument may detect errors in the data saved. These errors may compromise the correct operation of the instrument. If the microprocessor detects a data saving error, the display shows the message "EE".

If the fault persists, the controller needs to be replaced. If, on the other hand, the message disappears, it can continue to be used. When "EE" error occurs frequently and/or remains for some time, the controller should be checked, as the original precision may not be guaranteed.

Modifying the Parameters

PARAMETER NAVIGATION

The operating parameters, modifiable using the keypad, are divided into two types: frequent (type F) and configuration (type C). Access to the latter is protected by password (default= 22) to prevent accidental or unauthorized modifications.

Accessing the type F parameters:

- Press the SET button for more than 3 sec (if there are active alarms, mute the buzzer), the display shows the parameter code 'PS' (password)
- Use the UP and DOWN buttons to scroll the parameters. The LED corresponding to the category of parameters will be on
- Press SET to display the value associated with the parameter increase or decrease the value using the UP or DOWN button respectively;
- Press SET to temporarily save the new value and display the parameter again
- Repeat the procedure for any other parameters that need to be modified
- Press the SET button for more than 3 sec to permanently save the parameters and exit the parameter setting procedure.

Accessing the type C parameters:

- Press the SET button for more than 3 sec (if there are active alarms, mute the buzzer), the display shows the parameter code "PS" (password)
- Press the SET button to access the password setting
- Use the UP and DOWN buttons to scroll the numbers until displaying "22" (password to access the parameters)
- Press the SET button to confirm the password
- Use the UP and DOWN buttons to scroll the parameters. The LED corresponding to the category of parameters will be on (see Table below)
- Press SET to display the value associated with the parameter increase or decrease the value using the UP or DOWN button respectively
- Press SET to temporarily save the new value and display the parameter again
- Repeat the procedure for any other parameters that need to be modified
- Press the SET button for more than 3 sec to permanently save the parameters and exit the parameter setting procedure.

Warnings:

If no button is pressed for 60 sec, all the changes made to the parameters, temporarily saved in the RAM, will be cancelled and the previous settings restored.

The day, hr, min parameters are not restored, as these are saved instantly when entered.

If power is disconnected from the control before saving the settings (pressing the SET button for 3 sec), all the changes made to the parameters and temporarily saved will be lost.

Category	Initial	Icon
Probe parameters	/	-
Control parameters	r	-
Compressor parameters	c	
Defrost parameters	d	
Alarm parameters	A	
Fan parameters	F	
AUX output configuration parameters	H1	AUX
RTC parameters	-	

Setting the Default Parameters

Warnings:

Running this procedure overwrites any custom parameter settings.

To reset the default parameters:

- Disconnect power from the instrument
- Reconnect power while holding the SET and DOWN buttons
- The display will show the message "CF"
- After a few seconds the instrument starts operating with the default configuration. Any different parameter settings will need to be updated.

Troubleshooting

The following table shows a number of situations that may occur on the various models.

The most frequent causes and corresponding checks are described:

Problem	Cause	Checks
The compressor does not start (signalled by the compressor LED flashing)	- Compressor delay set defrost post - Dripping in progress	parameters c0, c1 and c2 and dd
The temperature is over the set limits but there is no alarm message and the buzzer, if fitted, does not sound.	Alarm delay is set.	parameters Ad, c6, d8
Alarm IA is signalled (multifunction input) without actually being active.	The multifunction input generates an alarm when the contact opens.	connection of the input and whether this is closed in normal operation
The alarm connected to the multifunction input is not detected.	Alarm delay set or parameter programming error.	1. if A4=1 2. the status of digital input A7
The defrost is not activated.	Defrost duration too short (dP) Interval between defrosts dl=0: in this case the defrost is not activated	parameters dP and dl
	The end defrost temperature is too low or the evaporator temperature is too high.	parameters dt and d/ (defrost sensor)
The manual defrost is not activated and the defrost LED flashes.	Compressor protection times are set.	parameter d9 (select d9=1)
The high temperature alarm is shown after a defrost.	The alarm delay after defrost is too short or the alarm threshold is too low.	parameters d8 and AH
The display remains frozen even after the defrost.	The ambient temperature has not yet reached the set point or alternatively the time d8 has not elapsed.	wait or reduce d8
After modifying a parameter the controller continues working with the old values.	The control has not updated the old value or alternatively the parameter setting procedure has not been ended correctly by pressing the SET button for 3 sec.	turn the instrument off and on again or alternatively reprogram the parameters correctly
The evaporator fan does not start.	1. A compressor and fan start delay has been set. 2. If F0=1 (fan managed by fan controller) - The evaporator is "hot": the evaporator temperature can be read by selecting parameter /d - Dripping in progress - F1 (evaporator fan control set point) too low - Post-dripping delay set 3. If F0=0 - F2=1 and the compressor is off - Dripping in progress - Post-dripping in progress	1. parameter c0 2. parameters F0, F1, Fd, dd and d/ 3. parameters F0, F2, dd and Fd

Factory Defaults

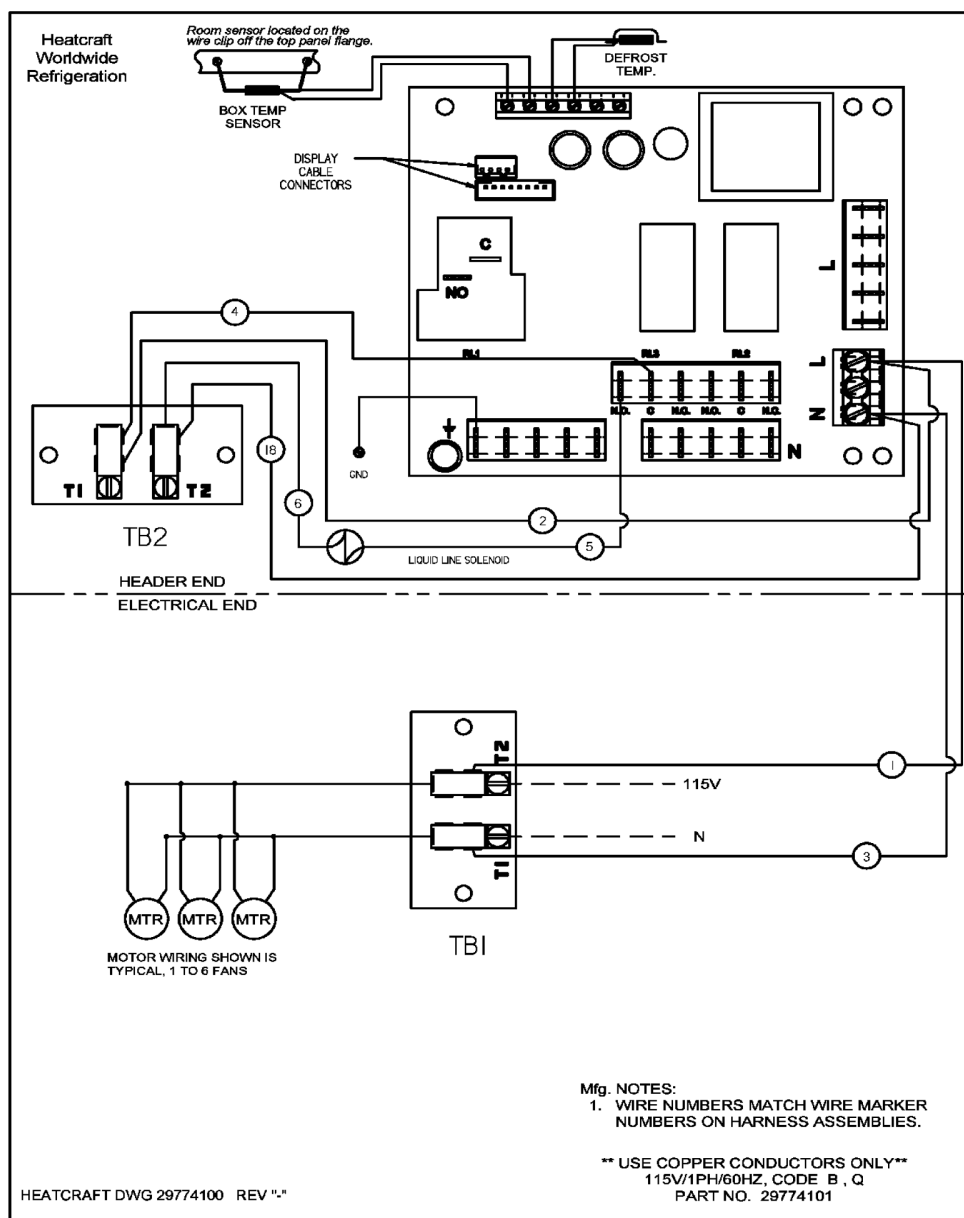
Set 1 -Freezer Models

Device Setup								
Set 1								
		Read	Write	Search				
Set 0	Set 1	Set 2	Set 3	Set 4				
Parameter	Description	Min	Max	Read	Written	Changed		
St	Set point	-20	40	-10	-10			
rd	Control differential	0	19	2	2			
r1	Minimum set point allowed	-50	40	-20	-20			
r2	Maximum set point allowed	-20	300	40	40			
d0	Defrosttype	0	4	0	0			
d1	Interval between defrosts	0	199	4	4			
dt	End defrost temperature	-50	300	60	60			
dP	Maximum defrost duration	1	199	30	30			
d4	Enable defrost at start up	0	1	1	1			
dd	Dripping time after defrost	0	15	2	2			
F0	Fan management	0	1	1	1			
F1	Fan control set point	-50	300	48	48			
F2	Fan off with compressor off	0	2	0	0			
F3	Fan in defrost	0	1	1	1			
Fd	Post dripping time	0	15	1	1			

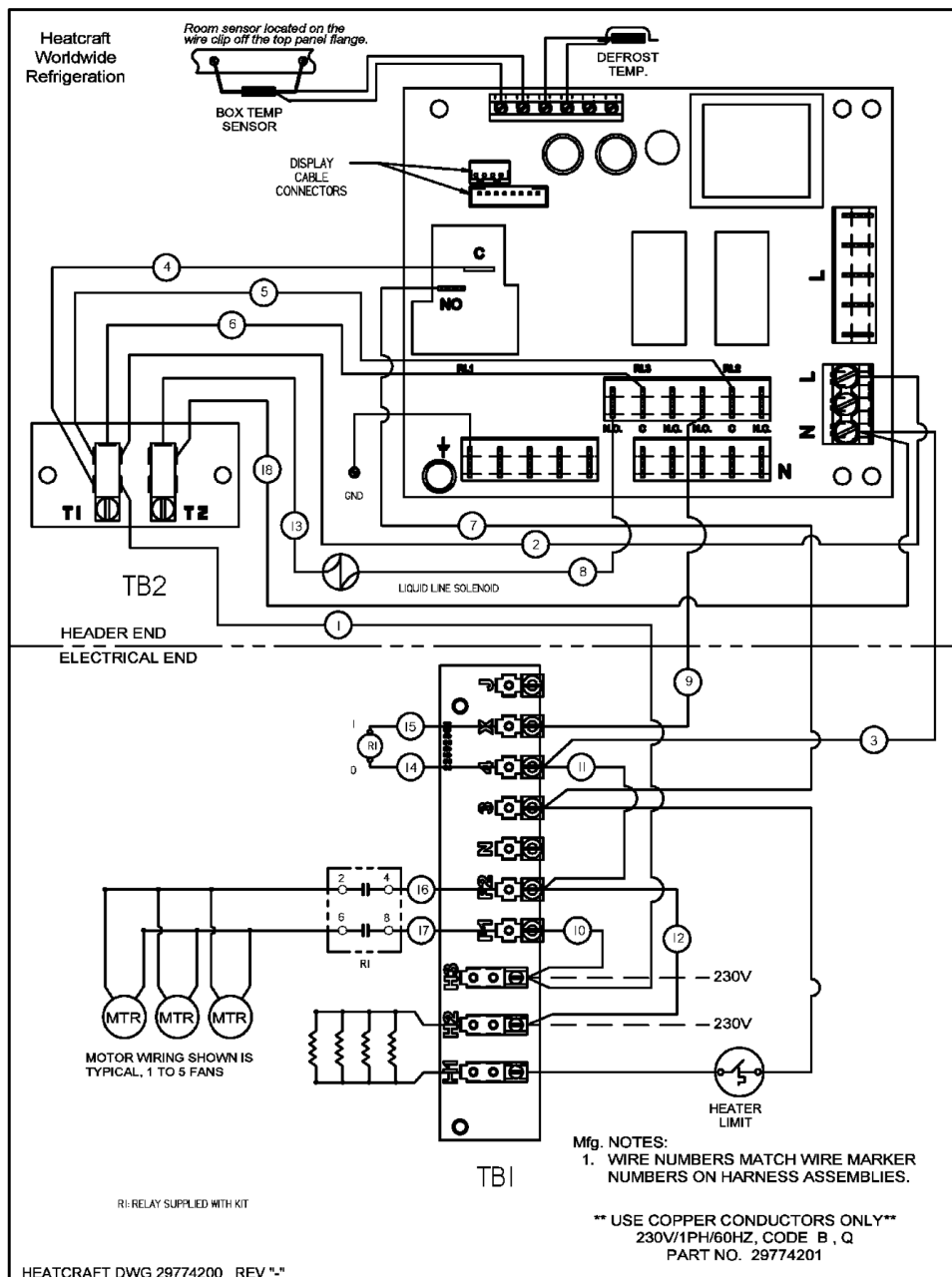
Set 2 - Cooler Models

Device Setup								
Set 2								
		Read	Write	Search				
Set 0	Set 1	Set 2	Set 3	Set 4				
Parameter	Description	Min	Max	Read	Written	Changed		
St	Set point	0	50	35	35			
rd	Control differential	0	19	2	2			
r1	Minimum set point allowed	-50	50	0	0			
r2	Maximum set point allowed	0	300	50	50			
d0	Defrosttype	0	4	2	2			
d1	Interval between defrosts	0	199	6	6			
dt	End defrost temperature	-50	300	38	38			
dP	Maximum defrost duration	1	199	40	40			
d4	Enable defrost at start up	0	1	0	0			
dd	Dripping time after defrost	0	15	0	0			
F0	Fan management	0	1	0	0			
F1	Fan control set point	-50	300	35	35			
F2	Fan off with compressor off	0	2	0	0			
F3	Fan in defrost	0	1	0	0			
Fd	Post dripping time	0	15	0	0			

Wiring Diagram - Air Defrost



Wiring Diagram - Electric Defrost



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Since product improvement is a continuing effort, we reserve the right to make changes in specifications without notice.