ECT Control Link Refrigeration System Controller Installation Instructions

the case temperature setpoint is satisfied. The fan relay is activated and de-activated the same way as the compressor relay, unless the CL-RSC has been programmed to keep the fans always ON.

Alarms During Refrigeration

If the case temperature sensor value falls below the low temperature set-point or rises above the high temperature setpoint, the alarm relay (if defined) will energize, and the display will show the alarm code. The ener-gized alarm relay and display code will continue until the temperature returns to normal (1°F below high temp alarm setpoint or 1°F above low temp setpoint) or until the Alarm Silence button is pressed (alarm is sus-pended for 5 minutes, then will reoccur if problem is still active).

Defrost Operation

Defrost cycles are initiated at the times programmed in the CL-RSC. Dur-ing defrost, the compressor relay is de-energized, and the defrost relay is energized. The defrost relay will be de-energized when the defrost termina-tion temperature is reached or until the programmed defrost duration has elapsed (whichever occurs first). While the defrost relay is energized, the display will show **dEF** instead of the case temperature.

If a defrost drip duration has been programmed, immediately after defrost termination the compressor relay will remain OFF for an amount of time to allow moisture to drain off the coil. During this time, the display will read **drI P**. When the drip time is over, refrigeration will resume.

Fans may be either off or on during defrost, based on user programming.

Manual Defrost

A manual defrost may be initiated at any time by holding the SET button for 10 seconds until the **dEF** message is shown on the display. Defrost will begin immediately and terminate normally. If one of the auxiliary inputs is configured as a manual defrost switch, a contact closure on the switch will also initiate a manual defrost.

Compressor Fail-Safe Mode

If the case temperature sensor fails, the CL-RSC will operate in a fail-safe mode that cycles the compressor ON and OFF at a user-defined regular interval. The ON/OFF rate is determined by setting parameters **CSFP** and **CSFO** in the CL-RSC. **CSFP** sets the interval period, and **CSFO** sets the amount of time during that period the compressor will be ON.

For example, if during fail-safe you want the compressor to alternate being ON for three minutes and OFF for seven minutes, set **CSFO** to 3 and **CSFP** to 10. This will cause the compressor to be ON for three minutes of the 10 minute interval, and OFF for the remaining seven minutes.

Programming the CL-RSC

General Parameters

General parameters are used by technicians and operators to set control set-points, defrost schedules, time and date.

Before changing parameters, clear any active alarms by pressing the Alarm Silence button. Press (SET) and hold for five seconds. If general mode pro-gramming has been password protected, you will see PASS on the display. Press (SET) and use the arrow keys to increment the password number until the correct password is shown, and then press (SET). (If general parameters are not password protected, PASS will not appear on the dis-play).

The display will show the first programmable parameter: CSP (case tem-perature set point). The arrow keys may be used to scroll through the list of general parameters. To change the value of any parameter:

1. Select the parameter using the arrow keys (until the code is shown).
2. Press (SET).

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3. The current value of this parameter will be displayed. Use the arrow keys to change the value.
4. Press (SET) to accept value.
5. Repeat steps 1 - 4 until all set points have been properly configured.
6. When finished, press (SET) again for five seconds to save changes and exit. The display will blank for one second and then revert to nor-mal display if the save was successful.
7. To cancel all changes, press and hold (SILENCE) for five seconds, or leave controller idle for 60 seconds. You will lose all setpoint changes made since you entered general programming mode.

> **WARNING!**
> You MUST press and hold (SET) after changing setpoints if you want your changes to be permanent. Leaving the controller idle for 60 seconds will log you out and cancel all your setpoint changes.

NOTE: Parameters in General Parameters *shaded gray are only shown if the real-time clock module is being used.*

Table 1: General Parameters

Code	Description	Min	Max	Default
CSP	Temp control set point (deg F, can be displayed in deg C)	-40	100	25
CLSt	Clock time set (military). UP button adjusts minutes. DOWN adjusts hours..			
YEAr	Year set (last two digits of year)	05	99	05
n0	Month set	1	12	1
dAY	Day set	1	31	1
dEFt	Defrost termination temperature (deg F, can be displayed in deg C)	-40	100	35
dEFd	Defrost cycle duration (minutes)	1	120	10
dUPU	Defrost upon power-up? (if yes, ini-tiates defrost cycle after power restore)	no	YES	no
ddAP	Defrost delay after powerup (minutes)	0	120	5
dr iP	Compressor OFF delay after defrost (minutes)	0	60	10
dCPd	Defrost cycles per day (if set to 0, no dFx schedule times will be shown)	0	12	10
dF 1 - dF 12	The number of dFx parameters in the list will be equal to parameter dCPd. Starting with dF1, enter the time of day each scheduled defrost cycle will begin.	00:00	23:59	(every 2 hours)
tRH	High temperature alarm setpoint. (deg F, can be displayed in deg C)	-40	100	100
tRL	Low temperature alarm setpoint (deg F, can be displayed in deg C)	-40	100	-40
Adtd	Alarm delay after defrost (temp alarms are suspended for this many minutes after end of defrost)	0	60	10
AdEL	Alarm delay for high/low temp alarm. Temp must remain out of alarm setpoint range for this number of minutes before an alarm can occur.	0	60	10

Table 1: General Parameters

Advanced Parameters

Advanced parameters are used to change higher-level parameters not directly related to system operation. Selecting and changing advanced parameters works the same way as general parameters, except they are accessed in a different way and require entering a different password.

Before changing parameters, clear any active alarms by pressing the Alarm Silence button. Press and hold the UP and DOWN buttons simultaneously for five seconds to enter advanced programming mode. The display will show **APAS**. Press (SET) and use the arrow keys to select the correct pass-word (default is 0000), and press (SET) to enter it.

Advanced Parameters

Code	Description	Min	Max	Default
r9bd	Selects whether outputs will be controlled from the RSC's onboard relays (no) or the expansion board (YES).	no	YES	YES
LF	Line frequency (Hz)	50	60	60
r2Fn	Function of the aux relay (relay #2) on the RSC. dEF=Defrost, FAn=case fans, LCon=lighting control, ALAr=alarm. Visible only when r9bd = no.	dEF	ALAr	dEF
F C	Temperature units (this affects units for both display and setpoints)	F	C	F
dI FF	Control temp setpoint differential (dead-band around setpoint) in degrees	1	10	1
HSP	High temp control setpoint limit (CSP can-not be set higher than this value) in degrees	-40	100	100
LSP	Low temp control setpoint limit (CSP can-not be set lower than this value) in degrees	-40	100	-40
SI 2	Determines type of sensor on input #2 (defr. term). If ntc is selected, input will be used as defrost term; if d9t selected, input will be used as an auxiliary input (whose function is determined by SI 2d).	ntc	d9t	ntc
SI 2d	If input #2 (defr. term) is d9t, determines function of digital input. SS = setpoint shift ("ON" causes the value of CSS to be added to set points), I dEF = start manual defrost.	I dEF	SS	I dEF
SI 3	Determines type of sensor on input #3. ntc = 10K CPC thermistor, d9t = digital sen-sor.	ntc	d9t	ntc
SI 3d	If input #3 is d9t, determines function of digital input. SS = setpoint shift (closure causes the value of CSS to be added to set points), I dEF = initiate manual defrost.	I dEF	SS	I dEF
CAL 1 CAL 2 CAL 3	Value of CAL 1, CAL2, and CAL 3 parame-ters are added to their respective temp inputs for calibration purposes.	- 10	10	0
FRn0	Fan during normal mode. no = on only when compressor is on, YES = always on during normal mode. Visible only if fan output is present (i.e. expansion board is being used, or r2Fn=FAn).	no	YES	no
FRnd	Fan during defrost. no = fan off, YES = fan on during defrost. Visible only if the RSC is controlling both fan and defrost with an expansion board.	no	YES	no
FDtP	Fan ON temp setpoint. After defrost, temp must fall below this setpoint before fans will be allowed to activate. Visible only if the RSC is controlling both fan and defrost with an expansion board.	-40	100	32
FdAd	Fan activation delay after defrost, in sec-onds. (if zero, FDtP is used after defrost; if non-zero, FdAd is used). Visible only if the RSC is controlling both fan and defrost with an expansion board.	0	120	10
CSUd	Compressor ON delay after power-up (minutes)	0	15	10
COt	Minimum compressor OFF time (minutes)	0	15	5
COnt	Minimum compressor ON time (minutes)	0	15	1
CSFP	Compressor fail-safe period. When case temp sensor fails, compressor will cycle ON/OFF over this period (see CSFO).	0	60	10
CSFO	Amount of time in the CSFP fail-safe period that the compressor will be ON (minutes).	0	60	5

Advanced Parameters

Code	Description	Min	Max	Default
CSS	Control setpoint shift - value is added to all control and alarm setpoints when a setpoint shift input is closed.	-20	20	0
drt	Minimum time between defrosts, in min-utes. Visible if a defrost output is present (using expansion board, or r2Fn=dEF).	0	120	60
Add	Alarms display disabled. YES = no alarm codes displayed on the RSC. no = alarms enabled.	no	YES	no
ArA	For the expansion board, sets the function of the auxiliary relay. ALAr =close on alarm, LCOn = lighting control. Visible only if r9bd=YES.	ALAr	LCOn	ALAr
LtOn	Light control ON time (UP button changes hours, DOWN changes minutes)	0:00	23:59	0:00
LtOF	Light control OFF time (UP button changes hours, DOWN changes minutes)	0:00	23:59	0:00
LOC	General parameter password enable. If YES, user must enter password to change general parameters.	no	YES	no
PASS	Password for general programming. If 0000, no password is required.	0000	9999	0000
APAS	Password for advanced programming.	0000	9999	0000

Alarms

There are ten different alarms that may occur in a CL-RSC. When an alarm is detected, CL-RSC takes the following actions:

- Displays a four-character error code on the LED display (unless parameter "Add" is set to "YES")
- Closes the Aux relay (if parameter "ArA" is set to "ALAr")
- Uses fail-safe modes and settings to compensate for the alarm condi-tion and attempt to keep the system running until repair can be done.

Alarm Codes

Code	Description
tS 10	Sensor #1 (case temp) is open. CL-RSC uses CSFP and CSFO to pulse the compressor ON and OFF as a fail-safe.
tS 15	Sensor #1 (case temp) is short. CL-RSC uses CSFP and CSFO to pulse the compressor ON and OFF as a fail-safe.
tS20	Temp sensor #2 (defr. term) is open. Defrosts will last the full time duration (dEFd) and will not terminate by temperature.
tS25	Temp sensor #2 (defr. term) is short. Defrosts will last the full time duration (dEFd) and will not terminate by temperature.
tS30	Temp sensor #3 is open. No fail-safe actions.
tS35	Temp sensor #3 is short. No fail-safe actions.
HtP	High temperature alarm setpoint was reached after the Adtd (def. delay) or AdEL (normal delay) elapsed. No fail-safe actions.
LtP	Low temperature alarm setpoint was reached after the Adtd (defrost delay) or AdEL (normal delay) elapsed. No fail-safe actions.
dtt	During defrost, the case temperature did not reach the defrost termination temperature setpoint (dEFt) before the defrost cycle time finished. No fail-safe actions.
rLY	Compressor fault detected.

Clearing Alarms

To clear an alarm and cause the CL-RSC to resume normal operation, press the Alarm Silence button. The alarm message will disappear, the Aux relay will open (if parameter "ArA" is set to "ALAr"), and the CL-RSC will attempt to resume normal operation. If the condition or conditions that caused the alarm are still present, the alarm will reoccur after the appropri-ate alarm delays have elapsed.

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ECT Control Link Refrigeration System Controller Installation Instructions

Overview

The Control Link Refrigeration System Controller (CL-RSC) is an electronic device that can control all functions of a single-compressor refrigeration system, including refrigeration, defrost, and alarming. Scheduled defrost and case light control is also possible with the addition of an expansion real-time clock module (P/N 618-2082, available separately).

The CL-RSC reads discharge air and defrost termination temperature from sensors mounted in the case. The CL-RSC may control two external relays (compressor plus one configurable relay) directly from its two onboard dry-contact relay outputs, or it may use a pluggable expansion output board (P/N 618-2085) for activating the compressor, fans, defrost, and auxiliary.

NOTE: For information about networking Control Link CD with E2, refer to Technical Bulletin 026-4602 available on the Internet at http://www.cpcus.com/ (click "Library," then "Technical Bulletins").

Mounting

Control Link / Expansion Board Operating Environment

Operating Temperature: -10 — 60°C (14—140°F)
Operating Humidity: 90% RH non-condensing
Storage Temp: -30—65°C (-22—149°F)
Max Power Consumption: 15W (Control Link w/expansion board)

Main Module / Relay Expansion Board

The Control Link main module and relay expansion board are designed for mounting in a refrigerated case or in an enclosure near the case. The output board connects to the main module with a ribbon cable and therefore should be mounted directly below the main module using the attached stand-off bracket. *Figure 1* shows module dimensions, and *Figure 2* shows relay expansion board dimensions.
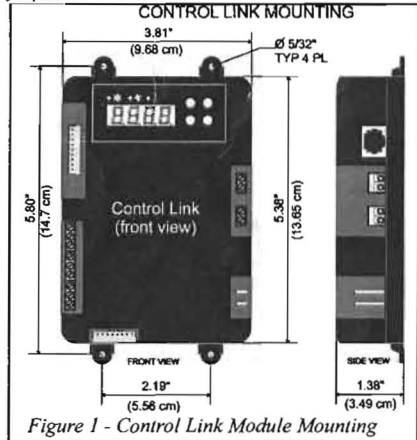

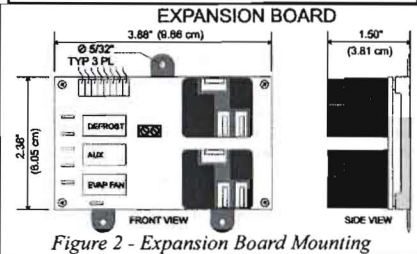*Figure 1 - Control Link Module Mounting*

Figure 2 - Expansion Board Mounting

Remote Display Mounting

The remote display is designed to be mounted on an accessible part of a refrigerated case or enclosure, no more than 10 feet from the main module. If flush mounting on a flat surface such as the front of a case or enclosure, punch a 5/8" square hole in the surface to allow the protruding RJ45 jack to recess, and then drill 5/32" holes for the mounting screws using the remote display itself as a template. *Figure 3* shows the dimensions.
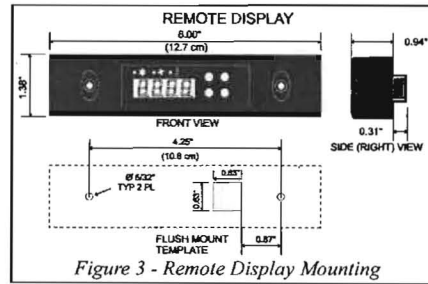

Figure 3 - Remote Display Mounting

Wiring

Power (Control Link Module)

The spade lug connectors on the lower right side of the Control Link module are the power connectors. Connect to 120-240 VAC 50-60 Hz line voltage (*Figure 4*)
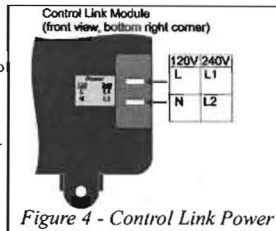
The expansion board is powered from the CL-RSC and requires no external power connection.

Figure 4 - Control Link Power

Sensors

Case temperature and defrost termination temperature sensors must be wired to the top three-terminal connector on the left side of the Control Link module. Use only CPC NTC 10k thermistors. The defrost termination sensor must be a 10k thermistor, not a temperature switch. Wire as shown in *Figure 5*. Mount the case temp sensor in the discharge air stream for the case. Mount the defrost termination sensor near the evaporator coil.

Inputs for switches to activate setpoint shift and initiate defrost may be wired to Input 3, and also to the Def Term input (Input #2) if no defrost termination sensor is being used. The functions of these switches are determined by parameters 5I 2d and 5I 3d in Advanced Parameters.
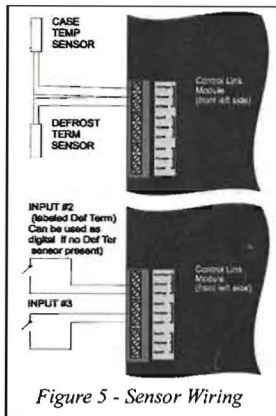

Figure 5 - Sensor Wiring

CL-RSC Onboard Outputs

If using CL-RSC without an expansion board, wire the outputs to the two-wire terminals on the right side of the control unit, as shown in *Figure 6*. Each of these output points are rated to a maximum of 3A @ 250V.

For loads greater than 3A, use the outputs to energize external relays for compressors, defrost, and case lights.

Expansion Board

The relay output board connects to the Control Link main module using an 8-pin ribbon cable. Plug the cable onto the Expansion Board connector at the bottom of the main module.

Defrost, Fans, and Aux Relay

Using spade lugs, connect the defrost heater(s), case fans, and auxiliary output (either case lights or an alarm device) to the three relays on the left side of the relay output board as shown in *Figure 6*.

Compressor Relays

The Control Link uses two relays on the output board to control the compressor. Line voltage must be connected to the Line 1 and Line 2 connectors on relays 1 and 2 respectively. The Load 1 and Load 2 connectors are wired to the compressor. *Figure 7* shows the wiring diagram.
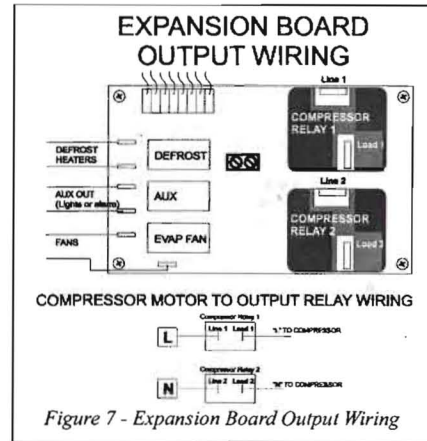

Figure 6 - CL-RSC Outputs

Figure 7 - Expansion Board Output Wiring

Expansion Board Relay Ratings

Defrost and Aux: 10A at 120VAC
Compressors: 208-230VAC 10FLA 60LRA
115VAC 13FLA 86LRA
Fan: 208-230VAC 2 FLA 4 LRA

Pressure Switch Wiring

If desired, a pressure switch may be used to deactivate the compressor if a high/low suction pressure condition occurs. Remove the jumper wire and connect this switch to the dual screw-terminal Pressure Switch connector located in the middle of the relay output board. See *Figure 8*. If not used, these terminals must be jumpered in order for the board to work.

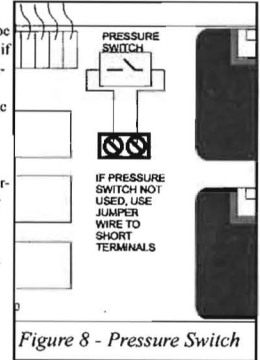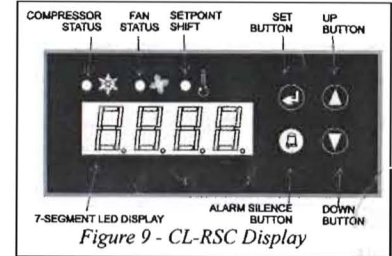The pressure switch must be N.C. (normally closed) type.

Figure 8 - Pressure Switch

CL-RSC Operation

The Display

Figure 9 - CL-RSC Display

The primary means of interaction with the CL-RSC system during programming and operation will be the display on the front of the Control Link module (or the remote display, if one is being used).

Seven-Segment Display

The four-digit seven-segment display is the primary means a technician or operator will use for viewing temperatures and alarm codes, and programming setpoints.

Status LEDs

The three LEDs above the seven-segment display show the status of the compressor relay, the fan relay, and whether or not a setpoint shift is active (lit if setpoint shift is active).

Buttons

The four buttons to the right of the seven-segment display are used to program the CL-RSC, select temperatures and alarms for viewing, and perform other functions such as alarm silencing and manual defrost.

Modes of Operation

Start-Up

Compressor operation will be suspended after power-up based on the value of the C5Ud parameter (default 10 minutes). After this delay, the CL-RSC resumes normal refrigeration control. To prevent nuisance alarms when the case is first started up, no high temperature case alarms will be generated until 120 minutes after the start of the first cooling cycle.

Normal Operation (Refrigeration)

When in refrigeration mode, the CL-RSC energizes the compressor relay when the case temperature is above the setpoint, and de-energizes it when