

# Control Link Case Display Installation Instructions

## Overview

The Control Link Case Display (CL-CD) (P/N 818-2060) is a electronic refrigerated case display that uses up to five inputs to monitor case temperature, defrost termination temperature, product or return air temperature, and other sensor values and switches related to refrigerated case operation. The CL-CD displays these temperatures and values on an LED display. The CL-CD may be networked with an E2 RX controller (software version 2.30 or higher) to share sensor data with a Standard Circuit application that controls the case refrigeration.

Because CL-CDs require only a single network cable to communicate with an E2, cases equipped with CL-CDs require significantly less wiring and installation labor than traditional installations (which typically require one cable per sensor run to a centrally located group of input boards).

**NOTE:** For more 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 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

The Control Link main module is designed for mounting on a refrigerated case or in an enclosure near the case. Figure 1 shows module dimensions.

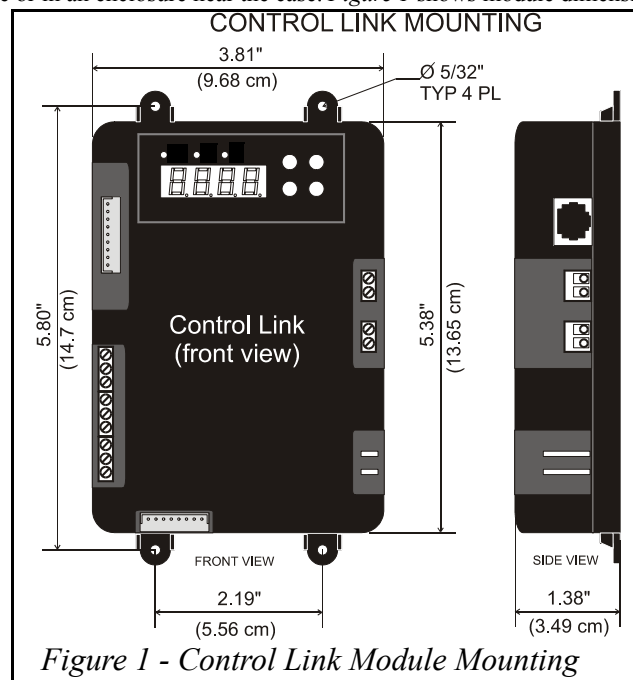


Figure 1 - Control Link Module Mounting

## Remote Display Mounting

The remote display is designed to be mounted on an accessible part of a refrigerated case or enclosure, no more than 20 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 2 shows the dimensions.

**Power down the main module before connecting the remote display.** Use CAT5 wiring with RJ45 connectors to connect the Main Module with the Remote Display. Do not exceed a maximum length of 20 feet.

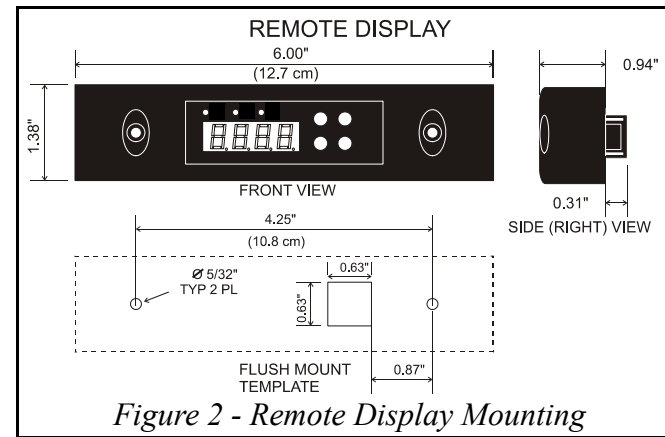


Figure 2 - Remote Display Mounting

## 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 3). Observe polarities as indicated.

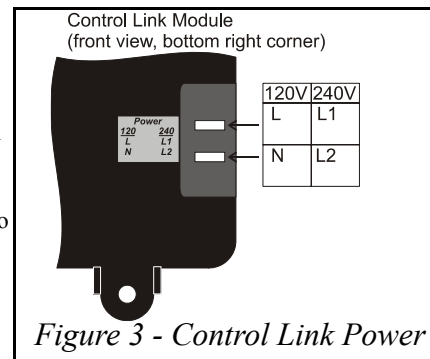


Figure 3 - Control Link Power

### Sensors

Case temperature and product temperature or return air sensors must be wired to the top three-terminal connector on the left side of the Control Link module. The defrost termination and coil outlet temperature sensors (if present) must be wired to the middle three-terminal connector. Use only CPC NTC 10k thermistors. The defrost termination sensor can be either a 10k thermistor or a temperature switch. Wire as shown in Figure 4.

Mount the case temp sensor in the discharge air stream for the case. Mount the defrost termination sensor near the evaporator coil. Mount the product temperature sensor anywhere in the refrigerated space. If using a return air sensor, mount the sensor in the return air stream. The coil outlet sensor must be tie-wrapped to the evaporator coil at the outlet.

The bottom three-terminal connector may be used for one generic digital sensor. This sensor's ON/OFF state is sent back to the E2 as a generic input value, and may be programmed in a Standard Circuit application as a clean switch, door switch, or any other type of digital input. **NOTE:** This input

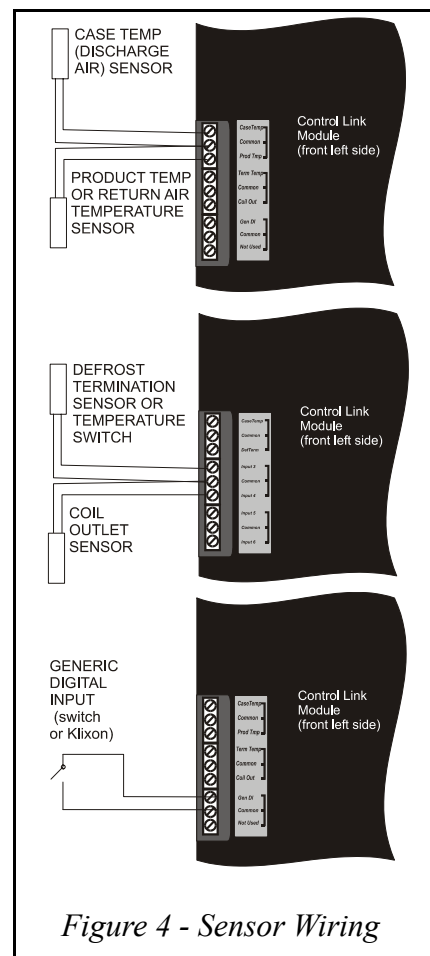


Figure 4 - Sensor Wiring

does not support pushbuttons and momentary switches and may only be used for edge-triggered or level-triggered switches.

## CL-CD Onboard Outputs

The CL-CD has two on-board relays that may be used as satellite outputs by other E2 applications. Wire the outputs to the two-wire terminals on the right side of the control unit, as shown in Figure 5. Each of these output points are rated to a maximum of 3A @ 250V.

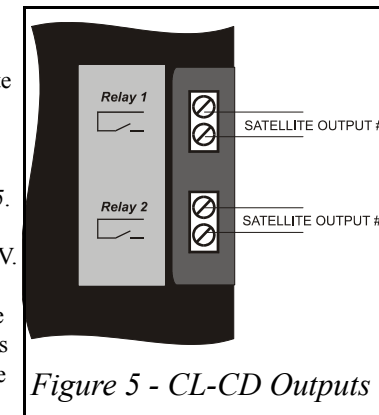


Figure 5 - CL-CD Outputs

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

## Networking

CL-CDs communicate with a parent E2 controller using a MODBUS network. Each CL-CD must be equipped with a network card (P/N 618-2080), which plugs into the Control Link main module in the "Network Comm. Bus" socket. The network card has a three-terminal connector for wiring the MODBUS network cable, and a DIP switch bank with eight switches for assigning the CL-CD a unique network address.

CL-CDs must be networked together in a daisy-chain configuration (all CD's networked in series from the E2, and terminated at the two end devices). No splits or "star configurations" are allowed. The network cable must be Belden #8761 or equivalent. Observe network polarity, wiring RS485+ to RS485+, 0V to 0V, and RS485- to RS485- (see Figure 6).

### Termination

The devices at both ends of the daisy chain must be terminated using the network termination jumpers. On the CL-CD network card, these are located below the network connector. To terminate a device, set all three termination jumpers to the LEFT position (i.e. toward the rear of the module). To unterminate a device, set all three jumpers to the RIGHT position (i.e. toward the front of the module). Refer to Figure 6.

### CL-CD Network Addressing, Baud Rate, and Parity

Each CL-CD must have a unique network address. The network address is set by switches 1-6 of the DIP switch bank on the network card. Switches 1-6 correspond to binary digits of the network address (1, 2, 4, 8, 16, and 32 respectively). Each switch in the UP (ON) position adds the corresponding value to the network address. CL-CDs should be numbered in order starting with unit #1 (see Figure 6).

Switches 7 and 8 set baud rate and parity. Set switch 7 to DOWN (OFF) to set the baud rate at 19.2k. Set switch 8 DOWN (OFF) to specify no parity.

### Network Connection to E2

Connecting a CL-CD to an E2 unit requires the E2 to be version 2.30 or above. An E2 has up to three COM ports that can be assigned for MODBUS communication (COM2, an RS485 port on the E2 power interface board, and COM4 and COM6, which are optional ports requiring expansion cards). Refer to the latest E2 manual (026-1610, Rev 4 or above) for information about port locations and expansion cards.

Connect the CL-CD network cable to the three-terminal connector on the COM port you wish to assign as MODBUS. Like the CL-CD connections, wire RS485+ to RS485+, RS485- to RS485-, and the shield cable to the middle terminal. If the E2 will be the first device in the daisy-chain, set the port's termination jumpers to the TERMINATED position. Refer to the E2 user manual for more information.

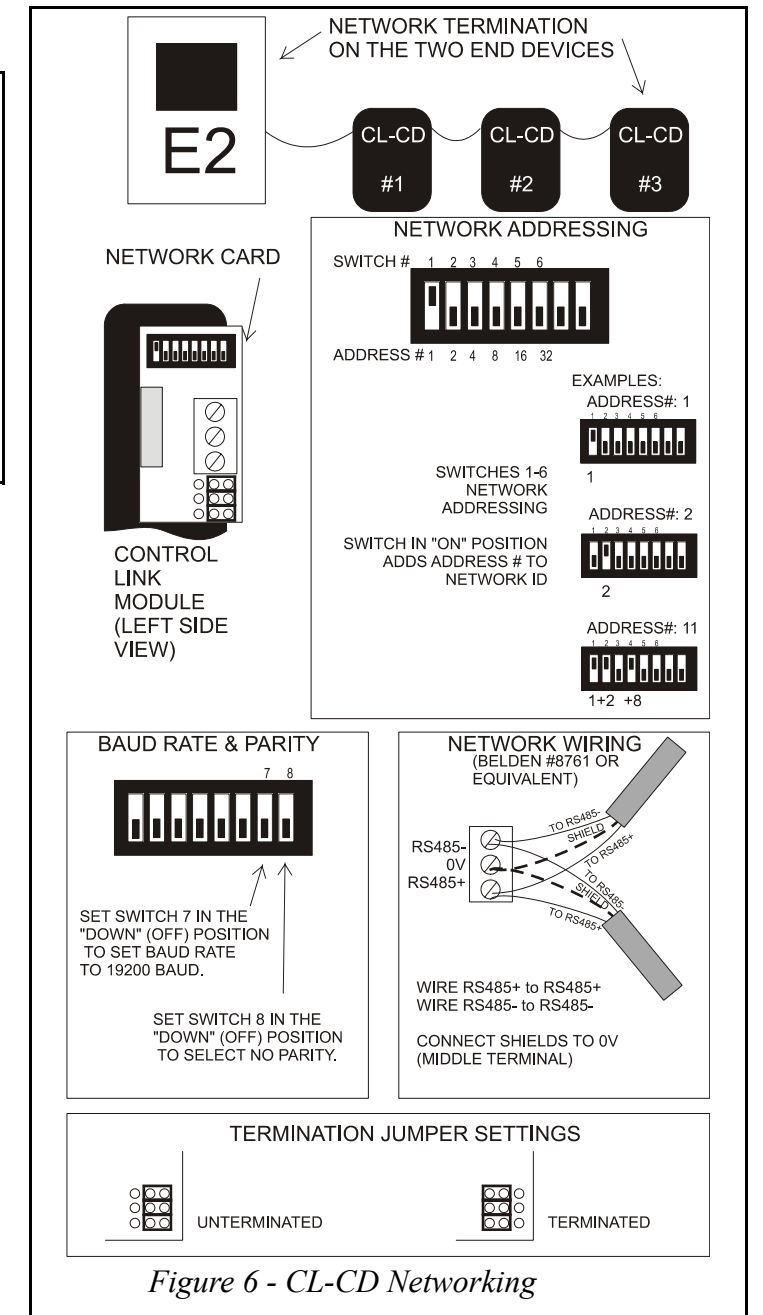


Figure 6 - CL-CD Networking

## E2 Setup of CL-CD Devices

To enable communications between E2 and the CL-CD units, the devices must be added and addressed in E2.

1. Log in to the E2 with Level 4 access.
2. Press **Menu** **2** **7** **2** - "Connected I/O Boards and Controllers."
3. In the Connected I/O screen, in a box labeled "ECT Devices," there will be a parameter called **CtrlLink CaseDisp**. In this field, enter the number of CL-CDs on the network.
4. Press **Back** to return to the Network Setup menu, then select **3** - "Controller Setup."
5. Locate the CtrlLink CaseDisp units you added to the network list (press **Up** and **Down** to scroll through the list). The default name for a CL-CD is a code string beginning with ".CD". If desired, enter a new name for each device in the Name field.
6. By default, each CtrlLink CaseDisp in the network list has a board number of 0. To set the address and begin communication, press **F4** and select **1** - "Select Address." In the list of MODBUS devices, choose the address number corresponding to the CL-CD's dip switch setting, and press **Enter** to select it.

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Repeat steps 5 and 6 until each CL-CD device has a name and address. When finished, press **ESC** to return to the Network Setup menu, then press **F1** - "Controller Status." Locate the CL-CDs you set up, and verify their status reads "Online." If not, verify the CL-CD is powered up, wired correctly, and has the proper network address, baud rate, and parity.

## CL-CD Software Setup

Once a CL-CD unit has been added and is online on the E2 MODBUS network, the CL-CD itself must be programmed. This may be done either by directly programming the CL-CD and uploading the configuration to E2, or by programming the CL-CD through E2 and downloading it to the CL-CD. Because there are features of the CL-CD that can only be enabled and configured through the E2, it is recommended all CL-CD setup be done through E2. However, if a CL-CD must be installed with no available access to E2 (either because it is stand-alone or because E2s have not been installed yet), you may wish to configure the CL-CD from the Control Link main module or remote display interface.

## Configuring CL-CD Through E2

- While logged in to the E2 with Level 4 access, press **F5** - CONFIGURED APPLICATIONS.
- Select "42. Control Link CD"
- Highlight the application name whose number corresponds to the network address of the CL-CD you wish to set up (i.e. "CL CD001" for CL-CD #1).
- From the CL-CD's status screen, press **F5** - SETUP.
- The parameters in these setup screens can be used to specify which inputs are present, the case name or defrost override message, sensor offsets, and other important functions. The E2 Online Help will explain the function of each parameter - to access Online Help, highlight the parameter you need assistance with, and press **?**.
- When all parameters are set properly, press **ESC** to return to the CL-CD's status screen. From the status screen, press **Enter** and select "9. Application Commands." Application commands allow you to clear alarms in the CL-CD, send configuration from E2 down to the CL-CD, or receive configuration from the CL-CD. Select "3. Snd E2 Cnfg to Device."

Repeat steps 1-6 until all CL-CDs are set up.

## Configuring CL-CD From The Control Link Interface

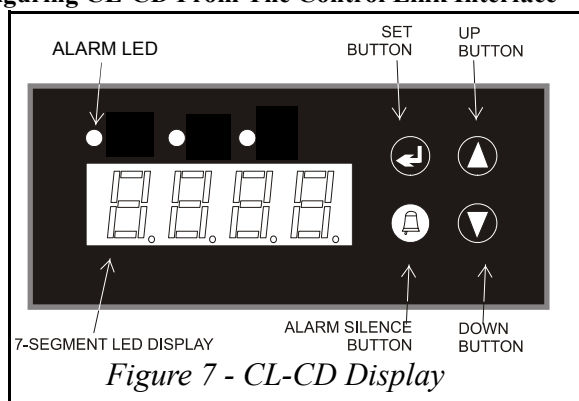


Figure 7 - CL-CD Display

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 password (default is 0000), and press (SET) to enter it.

The display will show the first programmable parameter: LF (line frequency). The arrow keys may be used to scroll through the list of general parameters. To change the value of any parameter:

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

- The current value of this parameter will be displayed. Use the arrow keys to change the value.
- Press (SET) to accept value.
- Repeat steps 1 - 4 until all set points have been properly configured.
- When finished, press (SET) again for five seconds to save changes and exit. The display will blank for one second and then revert to normal display if the save was successful.
- 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.**

- If this CL-CD is connected to an E2, you must save the CL-CD's settings in the E2. Press **Menu** **F5** and select "42. Control LinkCD". Highlight the application whose number corresponds to the network address number of the CL-CD you programmed in steps 1-13. From the Status Screen that appears, press **Enter** and select "9. Application Commands." Select "2. Snd E2 Cnfg to Device."

Advanced Parameters				
Code	Description	Min	Max	Default
LF	Input power line frequency (Hz)	50	60	60
FC	Temperature units (this affects units for both display and setpoints)	F	C	F
5IPr	If the discharge air sensor is connected to input #1, set this parameter to YES.	no	YES	YES
52Pr	If a product temp or return air temperature sensor is connected to input #2, set this parameter to YES.	no	YES	no
53Pr	If the defrost termination sensor is connected to input #3, set this parameter to YES.	no	YES	no
54Pr	If the coil outlet temperature sensor is connected to input #4, set this parameter to YES.	no	YES	no
55Pr	If the generic digital input (#5) is being used and has a switch or digital sensor connected, set this parameter to YES.	no	YES	no
SHA	Smoothing factor for superheat calculation (higher values cause the calculated superheat to respond slower to changes in superheat)	1	10	5
d5dP	Default sensor value to display during normal operation (select input #; default is discharge air (#1))	1	4	1
CLt	For the generic digital input, defines whether the input is edge-triggered or level-triggered.	Ed9E	LwL	Ed9E
Drnt	Text to display during defrost. This may not be set through the CL-CD keypad input, but you may view its value by pressing (SET). This must be programmed through E2.			blank
Drdt	Time after defrost ends that the defrost message (Drnt) will continue to be displayed (minutes).	0	60	1
CASn	Case name displayed when the UP ARROW key is pressed. This may not be set through the CL-CD keypad input, but you may view its value by pressing (SET). This must be programmed through E2.			blank
Prtd	If a sensor is connected to input #2, this determines how product temperature is calculated. If #2 is a product temp sensor (5n5r), the raw value of the sensor will be used as the product temp. If #2 is a return air temp sensor (CAL), product temp will be calculated by weighted average of the discharge and return air temperatures (PrCt).	5n5r	CAL	5n5r
PrCt	Weight (in percentage) of the discharge air sensor value (#1) in calculating the product temperature, if CAL is used as the product temp method. For example, if PrCt is 60, 60% of input #1 will be added to 40% of input #2 to yield the product temperature.	0	100	50
rLY1	Fail-safe state of relay #1 if communication is lost with the E2.	OFF	On	OFF
rLY2	Fail-safe state of relay #2 if communication is lost with the E2.	OFF	On	OFF

Advanced Parameters				
Code	Description	Min	Max	Default
dFtE	Input type of defrost termination sensor (#3). Choose nE if a temp sensor, or dI 9 if a temperature switch.	nE	dI 9	nE
CAL1, CAL2, CAL3, CAL4	Calibration offsets of the temperature inputs #1, #2, #3, and #4. If a sensor is giving a high or low reading, enter an offset to correct it.	-10	10	0
APAS	The password required to edit settings from the CL-CD keypad.	0000	9999	0000
5Ft	Software revision number. This field is read-only.			

## E2 Circuit Association

The final step in setting up an E2 MODBUS network with Control Link CDs is associating the Standard Circuit applications in the E2 with the CL-CDs they are attached to. Refer to the E2 user manual for information on how to add and configure standard circuits.

- Log in to the E2 with level 4 access.
- Press **F3** - CIRCUITS to view the circuit summary screen.
- Highlight the circuit you wish to configure, then press **F5** - SETUP.
- In Setup screen C1: GENERAL, set the following two parameters:
  - Num Case Sensrs:** Enter the number of CL-CDs on this circuit.
  - Num Prod Sensrs:** If the CL-CDs on this circuit have sensors on input #2, enter the number of these sensors.
  - Using CaseDisp:** Set to YES, indicating the case temperature and other temps related to this circuit are being supplied by CL-CDs.
- Press **F2** to move to Setup screen C2: Case Disp. This screen will show a number of Case Display fields equal to the number entered in Num Case Sensrs (step 4). For each field, press **F4** - LOOK UP and select the application name whose number corresponds to the network address number of the CL-CD you want to associate. For example, if you want to associate CL-CD #7 with this circuit, select "CL CD007" from the Look-Up Table.

Once associated, the Standard Circuit will automatically receive discharge air, termination temperature, and product temperature (either by sensor or calculation) from the CL-CDs.

## Operation

The Control Link module display is primarily used to view temperatures and other information about the case circuit, and secondarily to program the CL-CD or clear alarms. The display on the front of the Control Link module and the remote display unit commonly used with CL-CD are identical and are used the same way.

## 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.

## Alarm LEDs

The ALARM LED is located on the left side of the display directly above the seven-segment LEDs. This LED is ON to indicate one or more alarms are active for that case. This may be an alarm generated by Control Link, or if the Control Link is associated with an E2 Standard Circuit, it may also indicate an alarm generated by E2 for the circuit.

## Buttons

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

## Modes of Operation

### Case Temperature Display (Normal Mode)

When the case circuit is not in defrost and no alarms are active, the CL-CD display shows a temperature. The user may select any of the four temperature inputs on the CL-CD as the default display temperature (by default, the CL-CD shows the discharge air temperature).

In this mode, you may view the values of all the other inputs and outputs by pressing the DOWN BUTTON. Each time the DOWN BUTTON is pressed, a message will be displayed for one second to indicate what input or output value will be shown, followed by the current value

Msg Displayed	Sensor Value Displayed
dA	Discharge air sensor value (Input #1)
Pr	Product temperature (Input #2)
dF	Defrost termination temperature or switch state (Input #3)
CO	Coil outlet temperature (Input #4)
dI	Generic digital input (Input #5)
SH	The calculated coil superheat, if #3 and #4 have thermistors.
rLY1	State of generic relay #1
rLY2	State of generic relay #2

In this mode, you may also use the UP BUTTON to view the name of the case (programmed for the CL-CD via E2) and the MODBUS address of the CL-CD. Pressing the UP BUTTON cycles between the case name (if defined; otherwise, blank) and the MODBUS address number.

### Defrost Mode

When the case circuit is in defrost, the CL-CD may be programmed to display any four-character message instead of the default temperature. This feature ensures the higher case temperatures that occur during a defrost cycle do not alarm customers. The defrost message is displayed throughout the defrost cycle and for a programmed amount of time afterwards.

### Alarms

When a CL-CD is associated with a Standard Circuit application in E2, any alarm that occurs on the E2 pertaining to the circuit will cause the status LED to glow red, indicating an active alarm.

If a temperature sensor connected to the CL-CD fails, an alarm message "E5" will be displayed indicating which input number has failed and whether the sensor is open or short. "E5 10", for example, indicates temp sensor #1 is open. The CL-CD will also send this alarm to the E2.

Press the ALARM SILENCE button to clear the alarm message and display the default temperature (or defrost message, if in defrost mode). If the condition that caused the alarm is still present, the alarm will re-occur after one minute.

The ALARM SILENCE button will also return to normal all alarms in E2 related to the CL-CD. If the alarm re-occurs, a new alarm record will be written to the E2 Alarm Log.

### Multiple Alarms

If more than one CL-CD related alarm is active, the CL-CD display will only display the first alarm that occurred. All other alarms will only be visible from the E2 Alarm Log. Pressing the ALARM SILENCE button returns all alarms to normal both on the CL-CD display and the E2 Alarm Log.

**NOTE: It is recommended you manage alarms through the E2 Alarm Log instead of the CL-CD interface. Viewing and resetting the alarms through E2 will ensure you are aware of all alarms affecting the case, and you can reset or clear individual alarms when necessary.**