Fisher Scientific

Isotemp

Isotemp -86C Freezers

Installation and Operation Manual

7018965 Rev. 0

Important installer and user information:

A redundant temperature sensing device has been included in this ULT freezer. This device is a type "T" thermocouple. For convenient access, the thermocouple (Figure 1-3) terminates in an interconnect jack (Figure 1-5) behind the base front cover. (May be located differently in chests. See Section 1.) It is strongly recommended that this thermocouple be attached to a redundant 24 hour 7 day monitoring system with alarm capabilities. Connecting the sensor to a monitoring and alarm system separate from the freezer provides the utmost in product safety, should the integral system fail. ▲

Catalog Number	Model	Capacity in Cubic Feet	Voltage
IU1386V	8965	13	230/50
IU1386D	8966	13	230/60
IU1386A	8967	13	120/60
IU1786A	8968	17	120/60
IU1786D	8969	17	230/60
IU1786V	8970	17	230/50
IU2386V	8971	23	230/50
IU2386D	8972	23	230/60
IU2386A	8973	23	120/60
IU2886D	8974	28	230/60
IU2886V	8975	28	230/50

MANUAL NUMBER 7018965

REV	ECR/ECN	DATE	DESCRIPTION	By
0	FR-2267	1/4/12	Compressor change - Release 7	ccs

Important Read this instruction manual. Failure to read, understand and follow the instructions in this manual may result in damage to the unit, injury to operating personnel, and poor equipment performance. ▲

Caution All internal adjustments and maintenance must be performed by qualified service personnel. ▲

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Important operating and/or maintenance instructions. Read the accompanying text carefully.

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Equipment being maintained or serviced must be turned off and locked off to prevent possible injury.

Hot surface(s) present which may cause burns to unprotected skin, or to materials which may be damaged by elevated temperatures.

Marking of electrical and electronic equipment, which applies to electrical and electronic equipment falling under the Directive 2002/96/EC (WEEE) and the equipment that has been put on the market after 13 August 2005.

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- ✔ Always dissipate extreme cold or heat and wear protective clothing.
- ✔ Always follow good hygiene practices.
- ✔ Each individual is responsible for his or her own safety.

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Section 1 Installation and Start-Up

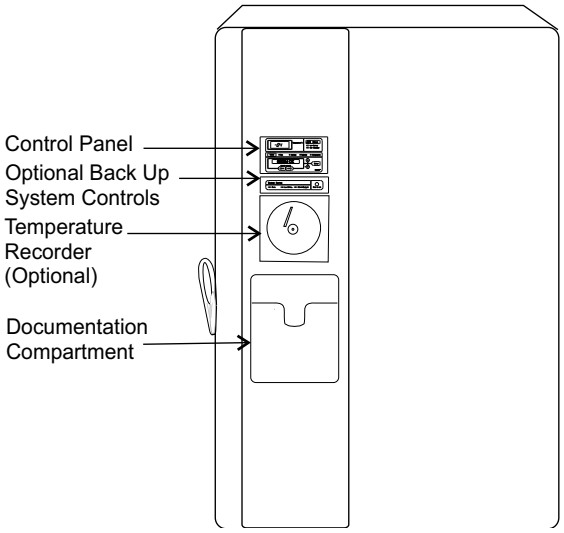


Figure 1-1. Front View

- Control Panel - keypad, displays and indicators.
- BUS (Optional Back Up System) panel.
- Optional temperature recorder - 7 day, one pen or datalogger.
- Documentation compartment - storage of user's manual and other documentation.

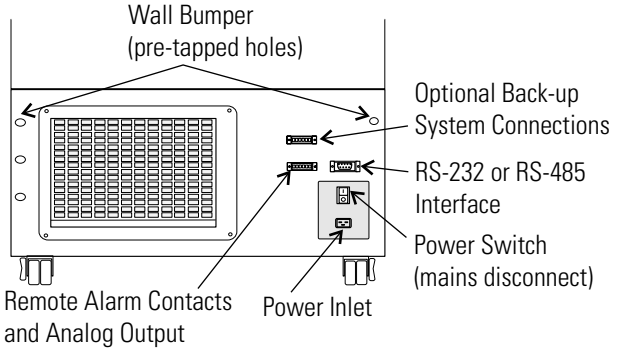


Figure 1-2. Rear View

- Remote alarm contacts and selectable analog output connection - 0-1V, 4-20mA (default), 0-5V.
- Power inlet for power cord connection.
- Optional BUS connections for probe and solenoid.
- RS-232 (default) or RS-485 interface.
- Power Switch (mains disconnect).

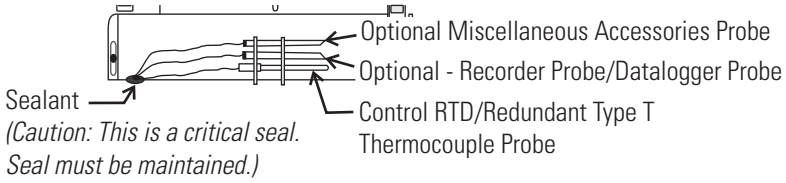


Figure 1-3. Chamber Probe

Figures 1-3 & 1-4

- Vacuum relief port - pressure equalization port
- Probe cover - houses control, optional recorder, datalogger or 1535 alarm probes

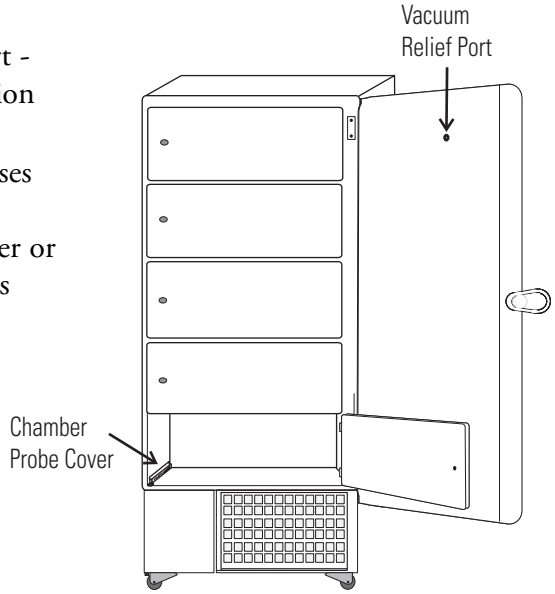


Figure 1-4. Vacuum Relief and Probe Cover Location

Figure 1-5

- Battery mounting bracket(s)
- Battery power switch (freezer and BUS)
- Freezer battery
- Optional BUS battery
- Freezer filter location

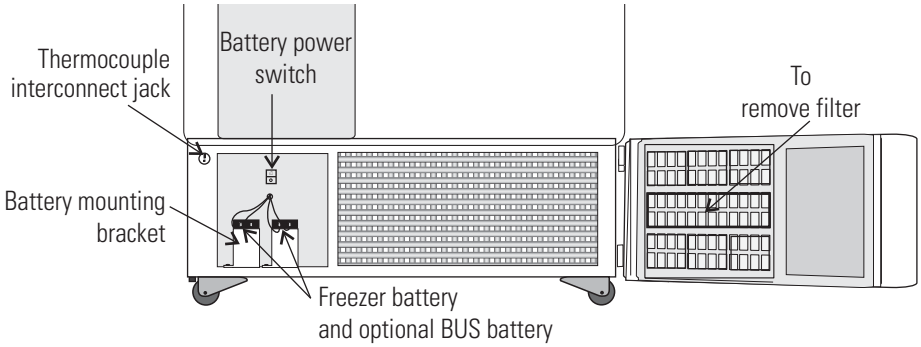


Figure 1-5. Battery(s) Location and Switch

Control Panel Keys, Displays & Indicators

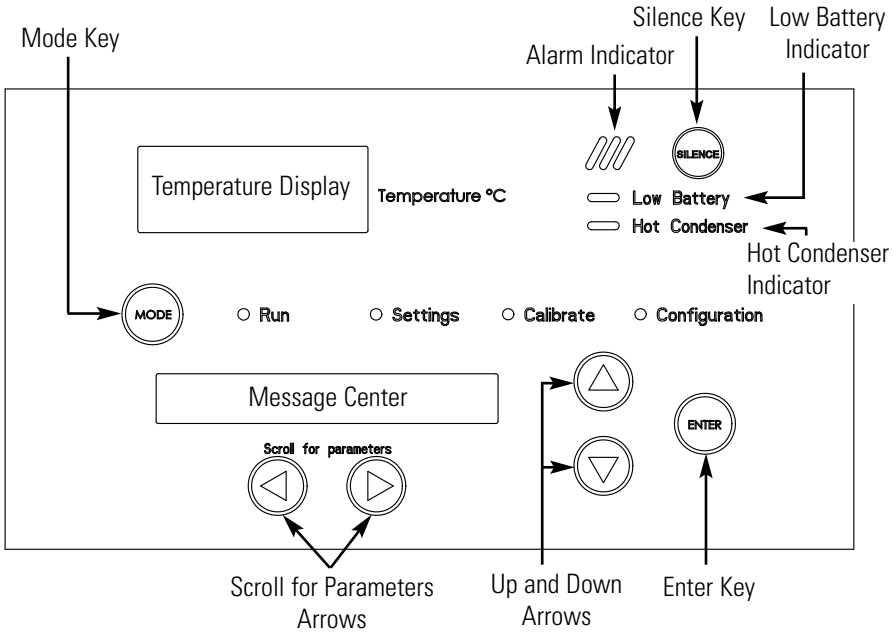


Figure 1-6. Control Panel

Mode Select Switch - Used to select Run, Settings, Calibrate and System Configuration Modes.

Mode Select Indicators -

Run: Run Menu

Settings: Set Points Menu

Calibrate: Calibrate Menu

Configuration: Configuration Menu

Temperature Display - Displays temperature in degrees Celsius.

Alarm Indicator - Light pulses on/off during a cabinet alarm condition.

Silence - Silences the audible alarm.

Low Battery - indicates a low battery condition of the freezer battery.

Hot Condenser - indicates a hot condenser condition.

Message Center - displays system status and alarms.

Scroll for Parameters Arrows - moves the operator through the choices of the selected mode.

Up and Down Arrows - Increases or decreases values, toggles between choices.

Enter - Stores the value into computer memory.

Keypad Operation

Isotemp -86C freezers have four basic modes which allow freezer setup: Run, Settings, Calibrate and Configuration.

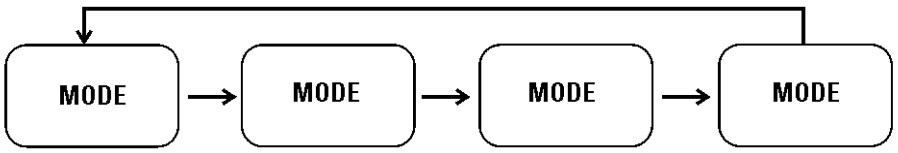
Run is the default mode for the freezer during normal operation.

Settings is used to enter system set points for freezer operation.

Calibrate is used to calibrate various system parameters.

Configuration allows for custom setup of various options.

The chart below shows the selections under each of the modes.



Run	Settings	Calibrate	Configuration
Default Mode System Ok	Control Set Point	Control Probe	High Alarm Test
Line Voltage	High Alarm Set Point	Optional Sample Probe	Low Alarm Test
Compensated Voltage	Low Alarm Set Point		System Battery Test
HSHX Temperature	Optional Back Up System Set Point		BUS Battery Test
			Display Temperature
			Clear High Stage Alarm
			Set Access Code
			RS485 Address
			BUS type CO2 or LN2
			Cold Excursion
			Warm Excursion
			Reset Excursion

Scroll for Parameters Arrows: Steps the operator through the parameters of SETTINGS, CALIBRATE and CONFIGURATION Modes. The right arrow goes to the next parameter, the left arrow returns to the previous parameter.

Up Arrow: Increases or toggles the parameter value that has been selected in the SETTINGS, CALIBRATE, and CONFIGURATION Modes.

Enter: Must press Enter key to save to memory all changed values.

Keypad Operation (continued)

Down Arrow: Decreases or toggles the parameter values that have been selected in the SETTINGS, CALIBRATE and CONFIGURATION Modes.

Silence Key: Press to silence the audible alarm. See Section 4 for alarm ringback times.

Displays

Message Center: Displays the system status (Mode) at all times. Displays SYSTEM OK during normal operation, or alarm messages if the system detects an alarm condition. See Section 4 - Alarms.

Install the Freezer

Caution If tipped more than 45°, allow the unit to set upright for 24 hours before start up. ▲

To remove the freezer from the pallet, use the 7/16" wrench to remove all the bolts securing the shipping bracket to the pallet.

Remove the shipping bracket. Remove the ramp boards from the pallet and place the slotted end over the ramp brackets on the pallet. The support blocks on the ramps will be facing down. Before moving the freezer, make sure the casters are unlocked and moving freely. Align the caster with the ramp boards. Use adequate personnel to roll the freezer off the pallet.

The freezer can be easily pushed to the desired approved location, described in the following section. If necessary, the doors and lower front panel may be opened to move the unit through tight openings. When the freezer is in position, set the front caster brakes.

Caution The freezer must not be moved with the product load inside. ▲

Choose the Location

Locate the freezer on a firm, level surface in an area with an ambient temperature between 18°C and 32°C. Provide ample room to reach the mains disconnect switch (power switch) located on the rear of the freezer.

Caution For proper ventilation and airflow, a minimum clearance of 5” at the rear and top and a clearance of 8” on the side of the freezer is required. Allow adequate space in the front of the freezer for door opening. ▲

Install the Wall Bumpers

The parts bag, located inside the cabinet, contains the following parts.

Qty	Stock #	Description	Purpose
2	510016	1/4-20 x 5-1/2" Bolt	Wall Bumper
2	380520	Neoprene Cap	Cap Protector

Install the bolts into the pre-tapped holes on the back of the compressor section. Install a neoprene cap on each bolt. Refer to Figure 1-2 for the locations of the pre-tapped holes.

Install the Shelves

Install the shelf clips into the shelf pilasters (front and back) at the desired shelf level. Install the shelves in the cabinet onto the clips.

Note Maximum shelf load is 100 lbs (45.4 kg) per shelf. ▲

RS-232 Communications

The Isotemp -86C freezers have a data communications interface. The factory default setting is RS-232.

The wiring identification for the interface is shown in Figure 1-7. One nine pin, sub "D" style connector is located on the back of the freezer. See Figure 1-2 for the location of the connector on the freezer.

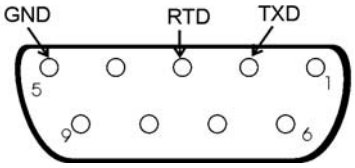


Figure 1-7. Wiring

The freezer transmits temperature information every 60 minutes. A standard DB9 serial extension cable can be used to connect the freezer to serial device. Some serial devices may require a null modem adapter.

Data format:

Baud 1200
Data bits . . . . . .8 (7 bit ASCII with leading zero)
Start bits 1
Stop bits 1
Parity . . . . . .none

RS-232 Communications (continued)

The data transfer sequence is transmitted in the following format. X refers to numerical temperature data.

(NUL) (-) XXX (SP) C (SP) (Error Message) (SP) (LF) (CR) (EOT) (SP)

In the event of a CNTRLFAIL, Er07, or the control probe is out of range error, the numerical temperature data (XXX) in the transmission would be replaced by T_ERR.

If no alarm condition exists, spaces will be sent. A total of 20 characters will be sent.

SP - Space
LF - Line feed
CR - Carriage return
EOT - End of text (4)
NUL - Null character (00)

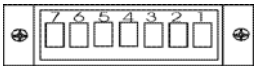
If an alarm condition does exist, "Error Message" in the protocol will be replaced by the following:

UNDERTEMP (temperature above the low alarm setpoint)
OVERTEMP (temperature below the high alarm setpoint)
PWRFAIL (AC power failure)
CNTRLFAIL (Control probe failure)
Er07 (Micro failure)
HSHX FAIL (Heat exchanger failure)
HOT COND (Hot condenser)

Note The RS-232 is not compatible with Model 1535 Monitor/Alarm System. ▲

Remote Alarm Contacts and Analog Output

Isotemp -86C freezers have remote alarm contacts and analog output. See Figure 1-2 for the location of the remote alarm contacts. The remote alarm connector is shipped in the parts bag provided with the manual. It must be installed if connecting the freezer to an alarm system. After installing the wiring from the alarm system to the connector, install the connector to the freezer microboard and secure with the two screws provided. The remote alarm provides a NO (normally open) output, a NC (normally closed) output and COM (common). The contacts will trip on a power outage, high temperature alarm or low temperature alarm. They will also trip on high stage, control probe or microboard failures. Figure 1-8 shows the remote contacts in alarm state.



REMOTE CONTACTS/ANALOG OUTPUT
PIN# 1 Analog Output +
PIN# 2 Analog Output -
PIN# 3 Not Connected
PIN# 4 Not Connected
PIN# 5 Normally Closed
PIN# 6 Common.
PIN# 7 Normally Open

Figure 1-8. Remote Contacts in Alarm

The analog output function allows the freezer to output signals representing the temperature of the freezer cabinet. The factory default setting is 4-20 mA. Refer to Figure 1-9 for output specifications.

	4-20 mA	0-1V	0-5V
Temperature	-100 to +50°C	-100 to +50°C	-100 to +50°C

Figure 1-9. Output Specifications

Attach the Power Cord

Insert the power cord into the power inlet module. Place the retaining bracket (P/N 195763) over the connector. Tighten retaining screws to secure.

Caution See the serial tag on the side of the unit for electrical specifications or refer to the electrical schematics in this manual. ▲

Connect the Unit to Electrical Power

The freezer should be operated on a dedicated grounded service. Check the voltage rating on the serial tag of the unit and compare it with the outlet voltage. Then, with the power switch turned off, plug the line cord into the wall outlet.

IMPORTANT USER INFORMATION

Caution! Stored product should be protected by a redundant 24 hour/day monitoring system with alarm capability. An interconnect jack and thermocouple are installed for centralized monitoring, should on-board system fail.

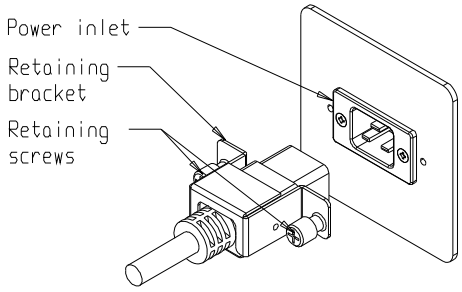


Figure 1-10. Secure Power Cord

Connect the Unit to Electrical Power (cont.)

First, turn on the freezer power switch. Then open the lower front door by grasping the bottom left corner. Locate the battery switch (Figure 1-5) and turn it to Standby mode (⏻). During initial freezer start-up, the system battery may require charging and the Low Battery indicator may illuminate.

Caution Ensure the battery switch is turned to Standby mode (⏻). The rechargeable batteries require 36 hours to charge at initial start-up. A "Low Battery" alarm may occur until the batteries are fully charged. Should a power failure occur during the initial start-up period, the electronics will have limited operation. ▲

Freezer Start-Up

With the freezer properly installed and connected to power, system set points can be entered. The following set points can be entered in Settings mode: Control temperature, high temperature alarm set point, low temperature alarm set point, and (optional) BUS set point. Default settings are shown in Table 1-1.

Table 1-1. Default Settings

Control Set Point	-80°C
High Temperature Alarm	-70°C
Low temperature alarm	-90°C
Optional BUS Set Point	-60°C

Caution If the set point is changed and the low temperature and high temperature alarms are set 10° from the set point, the alarm set points will adjust automatically to maintain a distance of at least 10° from set point. ▲

Set the Operating Temperature

All Isotemp -86C freezers have an operating temperature range of -50°C to -86°C, depending on ambient temperature. The freezer is shipped from the factory with a temperature set point of -80°C. To change the operating temperature set point:

1. Press the Mode key until the Settings indicator lights.
2. Press the right arrow until "SET PT = -XX" is displayed in the message center.
3. Press the up/down arrow key until the desired temperature set point is displayed.
4. Press Enter to save the set point.
5. Press the Mode key until the Run indicator lights for Run mode or press the right/left arrow keys to go to next/previous parameter.

If no control keys are pressed, the freezer will automatically return to RUN mode after 5 minutes.

Set the High Temperature Alarm

The high temperature alarm will activate an audible/visual warning when the freezer chamber temperature has reached or exceeded the high temperature alarm set point. To set the high temperature alarm set point:

1. Press the Mode key until the Set indicator lights.
2. Press the right arrow until "HI ALM = -XX" is displayed in the message center.
3. Press the up or down arrow key until the desired high temperature alarm set point is displayed.
4. Press Enter to save the setting.
5. Press the Mode key until the Run indicator lights or press the right or left arrow to go to the next or previous parameter.

If no control keys are pressed, the freezer will automatically return to RUN mode after 5 minutes.

Note The high alarm set point must be set at least 5°C from the control set point. ▲

Note At initial start-up, the high temperature alarm is disabled until the cabinet reaches set point or 12 hours elapse. ▲

Set the Low Temperature Alarm

The low temperature alarm will activate an audible/visual warning when the freezer chamber temperature has reached or decreased below the low temperature alarm set point. To set the low temperature alarm set point:

1. Press the Mode key until the Settings indicator lights.
2. Press the right arrow until “LO ALM = -XX” is displayed in the message center.
3. Press the up or down arrow key until the desired low temperature alarm set point is displayed.
4. Press Enter to save the setting.
5. Press the Mode key until the Run indicator lights or press the right or left arrow to go to the next or previous parameter.

If no control keys are pressed, the freezer will automatically return to RUN mode after 5 minutes.

Note The low alarm set point must be set at least 5°C from the control set point. ▲

Access Code

An access code of 000 is required to access the Settings, Calibrate or Configuration modes. If the access code is not at the default 000, a code must be entered to leave RUN mode. See Section 3 to modify the access code.

Run Mode

Run mode is the default mode for the freezer. Run mode will display the cabinet temperature on the temperature display and ‘SYSTEM OK’ on the message center under normal operating conditions. In addition, Run mode allows display of the following information:

LINE VOLTAGE
COMPENSATED VOLTAGE
HSHX TEMPERATURE (heat exchanger temperature)

This information is scrolled individually by pressing the right arrow key. In each case, the message center returns to SYSTEM OK in 10 seconds if no keys are pressed.

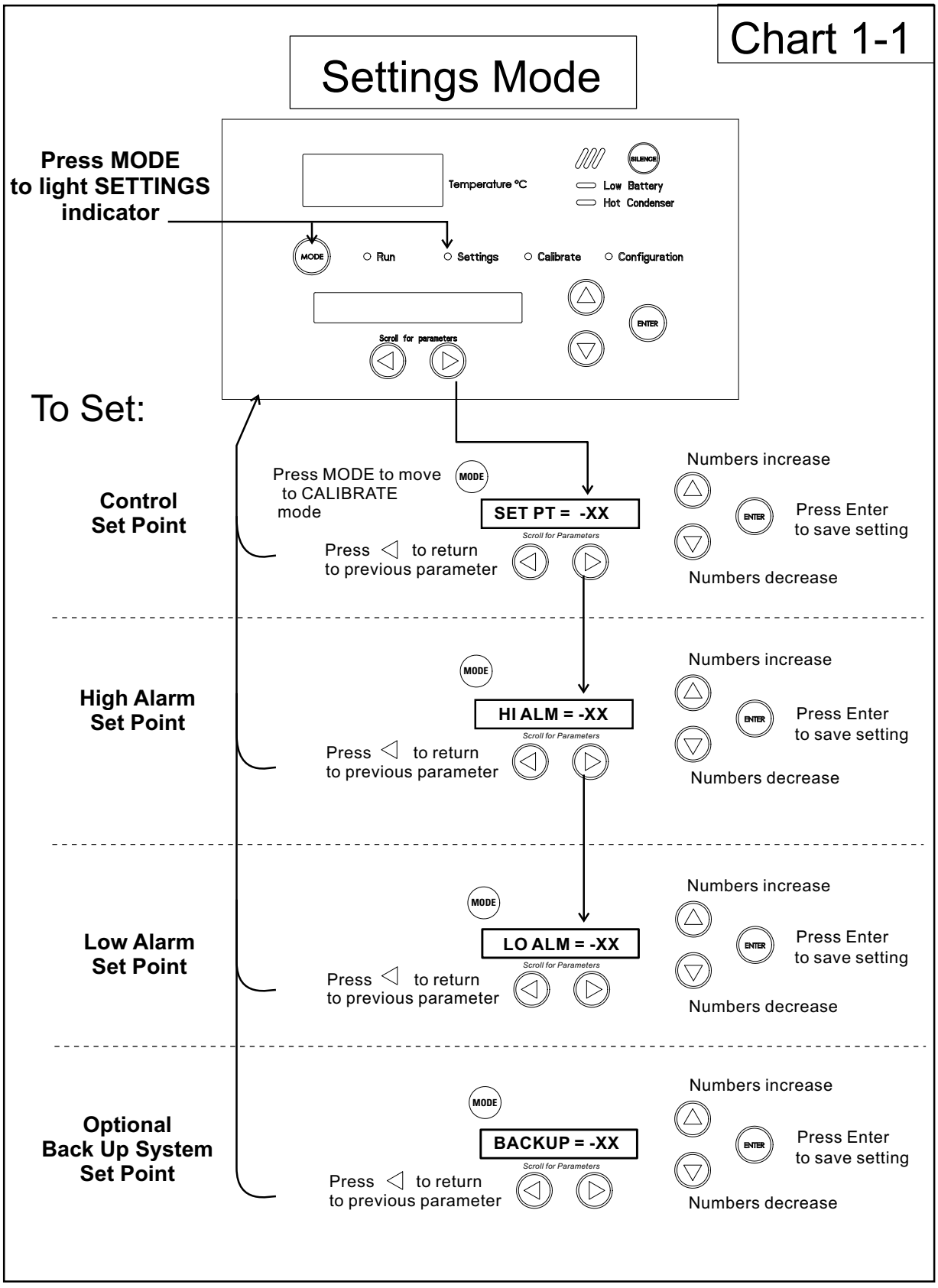


Chart 1-1
Settings Mode
Press MODE to light SETTINGS indicator
Temperature °C
SILENCE
Low Battery
Hot Condenser
MODE
Run
Settings
Calibrate
Configuration
ENTER
Scroll for parameters
To Set:
Control Set Point
Press MODE to move to CALIBRATE mode
MODE
SET PT = -XX
Scroll for Parameters
Press ◁ to return to previous parameter
Numbers increase
ENTER
Press Enter to save setting
Numbers decrease
High Alarm Set Point
MODE
HI ALM = -XX
Scroll for Parameters
Press ◁ to return to previous parameter
Numbers increase
ENTER
Press Enter to save setting
Numbers decrease
Low Alarm Set Point
MODE
LO ALM = -XX
Scroll for Parameters
Press ◁ to return to previous parameter
Numbers increase
ENTER
Press Enter to save setting
Numbers decrease
Optional Back Up System Set Point
MODE
BACKUP = -XX
Scroll for Parameters
Press ◁ to return to previous parameter
Numbers increase
ENTER
Press Enter to save setting
Numbers decrease

Section 2 Calibrate

After the freezer has stabilized, the control or sample probe may require calibration. Calibration frequency is dependent on use, ambient conditions and accuracy required. A good laboratory practice would require at least an annual calibration check. On new installations, all parameters should be checked after the stabilization period.

Caution Before making any calibration or adjustments to the unit, it is imperative that all reference instruments be properly calibrated. ▲

Calibrate the Control Probe

Plug a type T thermocouple reader into the receptacle located inside the lower door (see Figure 1-5). Compare the control temperature set point to the temperature of the measuring device. See Chart 2-1 at the end of this section for more detail.

1. Press the Mode key until the Calibrate indicator lights.
2. Press the right arrow until “CONT T = -XX.X” appears in the message center.
3. Press up/down arrow to match the display to calibrated instrument.
4. Press Enter to store calibration.
5. Press the Mode key to return to Run or the right/left arrow to go to next/previous parameter.

Calibrate the Optional Sample Probe

For freezers with the optional sample probe, place the calibrated instrument in the center of the sample bottle. The bottle should contain an appropriate medium and the measuring instrument should be centered in the bottle.

1. Press the Mode key until the Calibrate indicator lights.
2. Press the right arrow until "SAMP T = -XX.X" appears in the message center.
3. Press up/down arrow to match display to calibrated instrument.
4. Press Enter to store calibration.
5. Press the Mode key to return to Run or the right/left arrow to go to next/previous parameter.

See Chart 2-1 for calibration process functions.

Temperature Stabilization Periods

Startup - Allow 12 hours for the temperature in the cabinet to stabilize before proceeding.

Already Operating - Allow at least 2 hours after the display reaches set point for temperature to stabilize before proceeding.

Note During calibration, the temperature display is not available. ▲

If no keys are pressed for approximately five minutes while in Calibration mode, the system will reset to Run mode.

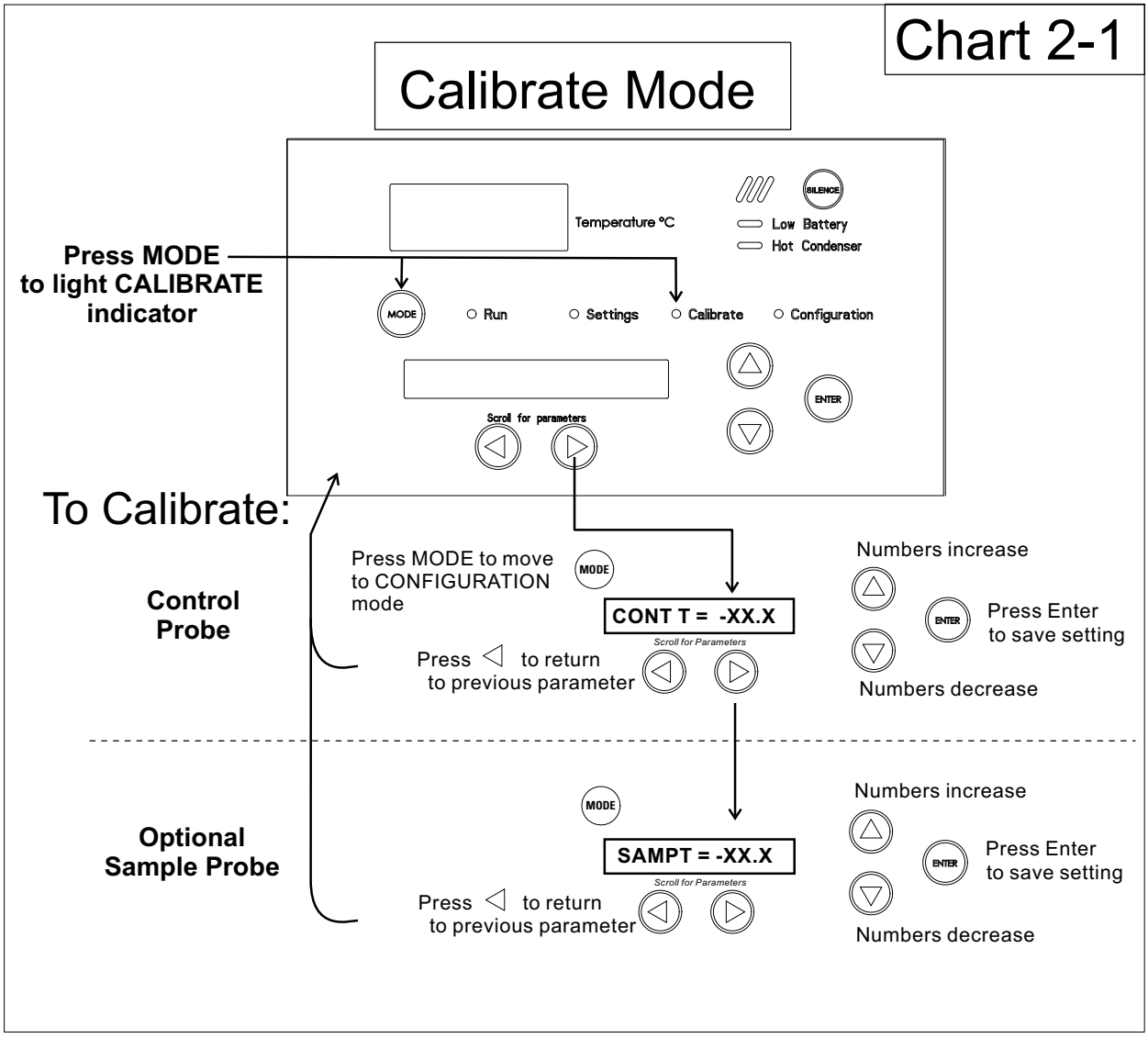


Chart 2-1
Calibrate Mode
Temperature °C
SILENCE
Low Battery
Hot Condenser
Press MODE
to light CALIBRATE
indicator
MODE
Run
Settings
Calibrate
Configuration
ENTER
Scroll for parameters
To Calibrate:
Control
Probe
Press MODE to move
to CONFIGURATION
mode
MODE
CONT T = -XX.X
Scroll for Parameters
Press ◁ to return
to previous parameter
Numbers increase
ENTER
Press Enter
to save setting
Numbers decrease
Optional
Sample Probe
MODE
SAMPT = -XX.X
Scroll for Parameters
Press ◁ to return
to previous parameter
Numbers increase
ENTER
Press Enter
to save setting
Numbers decrease

Section 3 Configuration

Configuration mode is used for testing and custom setup of the freezer. The configuration functions described below may not be necessary in all applications, but are available if needed. See Chart 3-1 for more detail.

High Alarm Test

The high alarm test is used to verify that the high alarm activates if the freezer temperature equals or exceeds the high alarm set point.

1. Press the Mode key until the Configuration indicator lights.
2. Press the right arrow until HI ALRM TEST is displayed in the message center.
3. Press Enter to initiate the test.

The temperature on the display begins to increase until the high alarm set point has been reached. The audible alarm sounds and the alarm indicator flashes. Press the Silence key to silence the alarm.

Low Alarm Test

The low alarm test is used to verify that the low alarm activates if the freezer temperature equals or decreased to less than the low alarm set point.

1. Press the Mode key until the Configuration indicator lights.
2. Press the right arrow until LO ALRM TEST is displayed in the message center.
3. Press Enter to initiate the test.

The temperature on the display begins to decrease until the low alarm set point has been reached. The audible alarm sounds and the alarm indicator flashes. Press the Silence key to silence the alarm.

System Battery Test

To test the freezer battery charge:

1. Press the Mode key until the Configuration indicator lights.
2. Press the right arrow until SYS BAT TEST is displayed in the message center.
3. Press Enter to initiate the test.

TESTING BATT displays during the testing period. Upon completion of the test, the message center displays BATT GOOD or BATT FAIL If a test fails, the audible alarm sounds, the alarm indicator and Low Battery indicator light. Press the Silence key and the alarm indicator will go off. The Low Battery light stays on until a future battery test is performed and passed.

BUS Battery Test

To test the charge of the back-up system (BUS) battery:

1. Press the Mode key until the Configuration indicator lights.
2. Press the right arrow until BUS BAT TEST is displayed in the message center.
3. Press Enter to initiate the test.

TESTING BATT displays during the testing period. Upon completion of the test, the message center displays BBAT GOOD or BBAT FAIL If a test is failed, the audible alarm sounds, the alarm indicator and the Low Battery indicator light. Press the Silence key. The audible alarm and alarm indicator will go off. The Low Battery light stays on. If this test fails, battery replacement is recommended.

Display Temperature

This function, only available on freezers with the optional sample probe, allows the user to select which temperature is displayed in the temperature display window. The options are CONTROL or SAMPLE.

1. Press the Mode key until the Configuration indicator lights.
2. Press the right arrow until DISP CONTROL or DISP SAMPLE is displayed in the message center.
3. Press up/down arrow to toggle between the two display selections.
4. Press Enter to save.

If control probe is selected, the temperature display will be on continuously. If sample probe is selected, the temperature display will be preceded with a letter ‘S’.

Clear High Stage Alarm

Should a high stage alarm occur, it may be necessary to clear the alarm condition after the condition has been corrected.

1. Press the Mode key until the Configuration indicator lights.
2. Press the right arrow until CLR HS ALARM is displayed in the message center.
3. Press Enter to clear the alarm.

Set an Access Code

To set the Access Code:

1. Press the Mode key until the Configuration indicator lights.
2. Press the right arrow until “SET ACC CODE” is displayed in the message center.
3. Press Enter.
4. The message center displays ACC CODE = 000. Press the up/down arrow until the desired access code is displayed (000 - 999). Press the left/right arrow to select digit 1, 2, 3.

Note The left and right arrow keys are used to move from the first through the third digits within the access code. ▲

5. Press Enter to save the setting
6. Press the Mode key until the Run indicator lights. A 3-digit Access Code can be entered to avoid unauthorized personnel from changing the set points, calibration, or configuration. A setting of 000 bypasses the access code. The factory setting is 000.

RS485 Address

If the freezer is configured for RS485 communications, it must have a unique identification address. This address is set through Configuration mode.

1. Press the Mode key until the Configuration indicator lights.
2. Press the right arrow until RS485ADDR is displayed in the message center.
3. Press Enter. The message center will display 485 ADDR XX.
4. Press up/down arrow to select the appropriate address for the freezer (1 - 24).
5. Press Enter to save.

Back-Up System Type

This function, only available on freezers with the optional BUS (back up system), allows the user to select which type of gas is injected into the freezer chamber. The options are CO_2 and LN_2.

1. Press the Mode key until the Configuration indicator lights.
2. Press the right arrow until BUS TYPE CO2 or BUS TYPE LN2 is displayed in the message center.
3. Press up/down arrow to toggle between the two display selections.
4. Press Enter to save.

Cold Excursion

This function displays the coldest temperature recorded by the control probe.

Warm Excursion

This function displays the warmest temperature recorded by the control probe.

Reset Excursion

This function resets the cold and warm excursions.

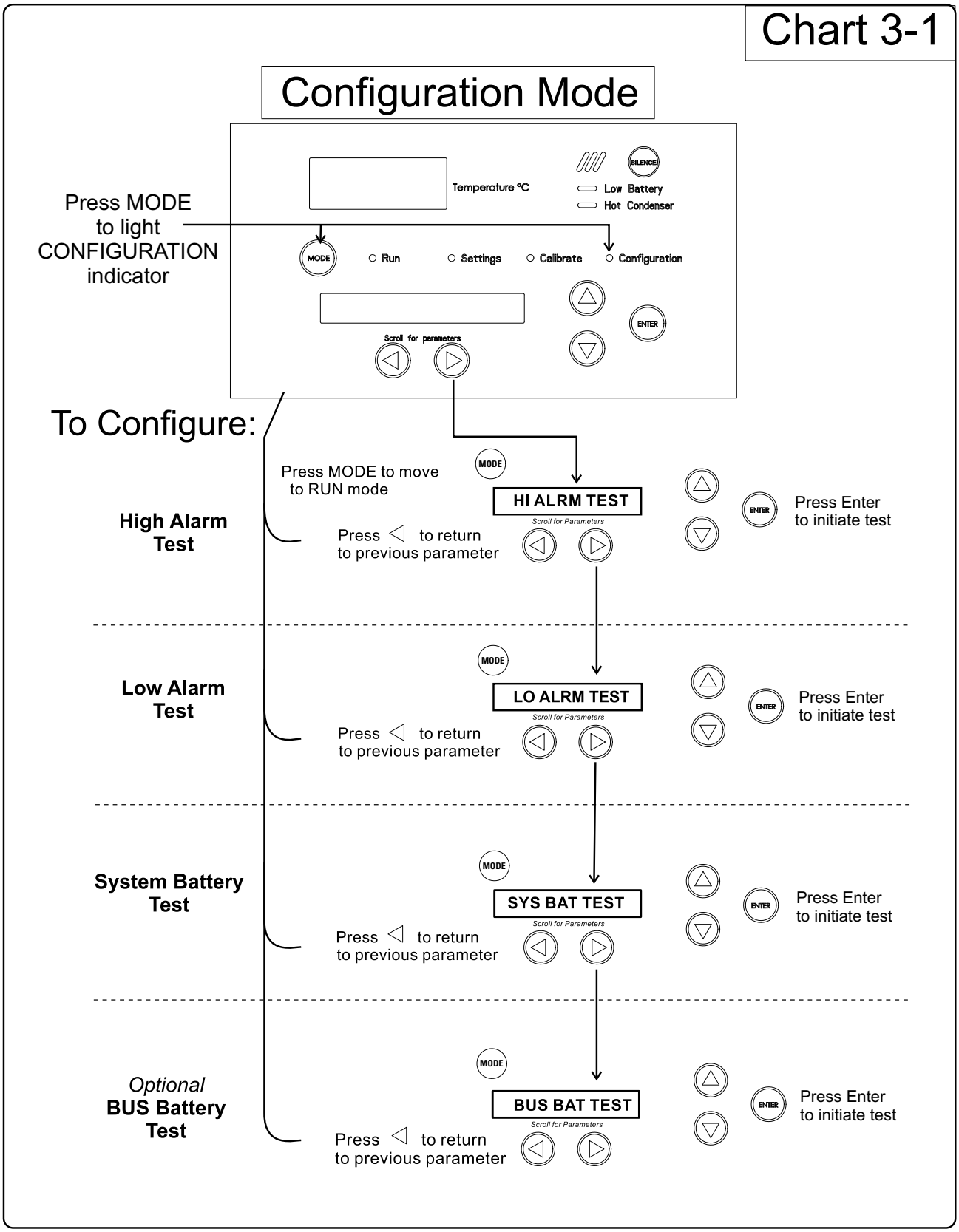
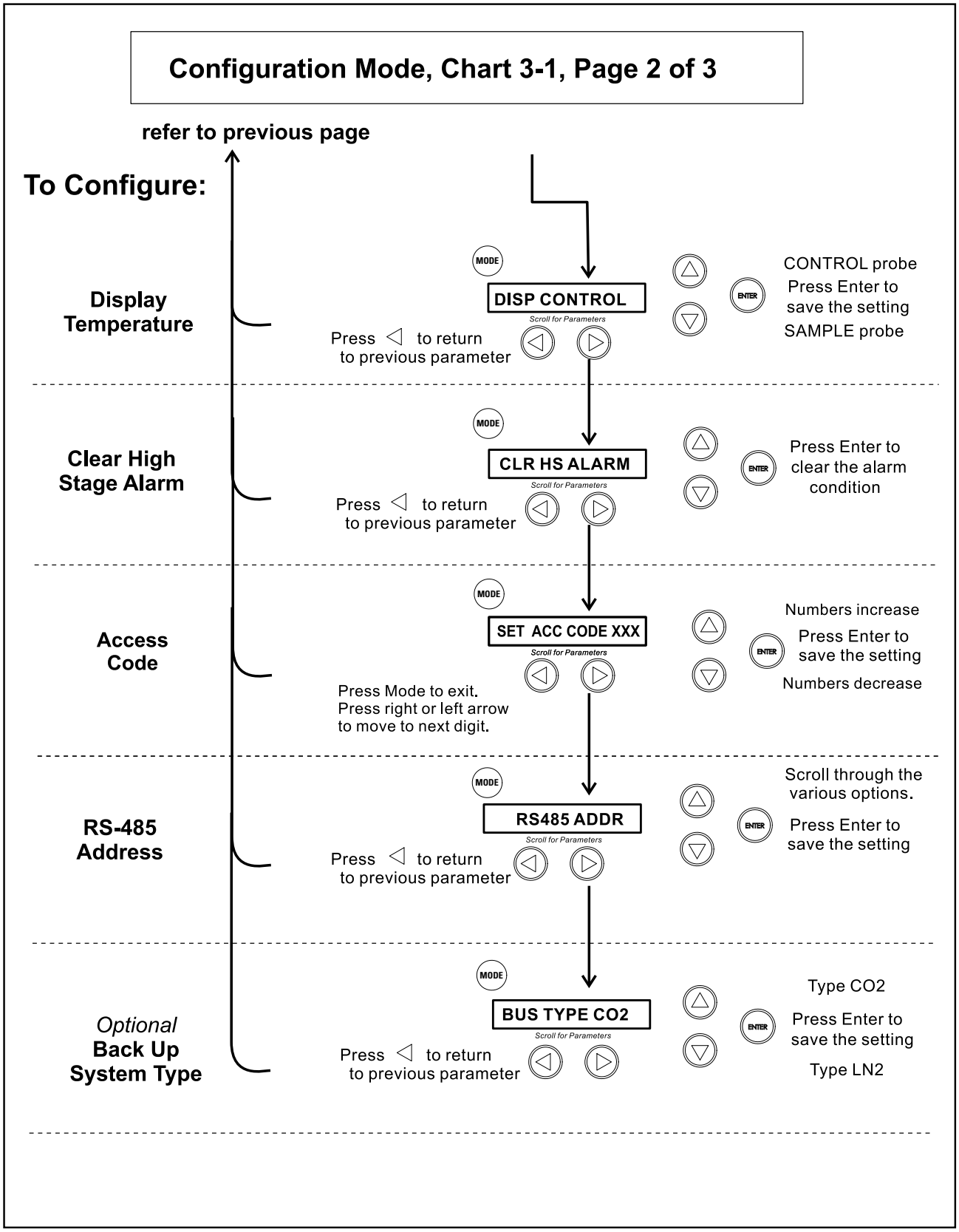
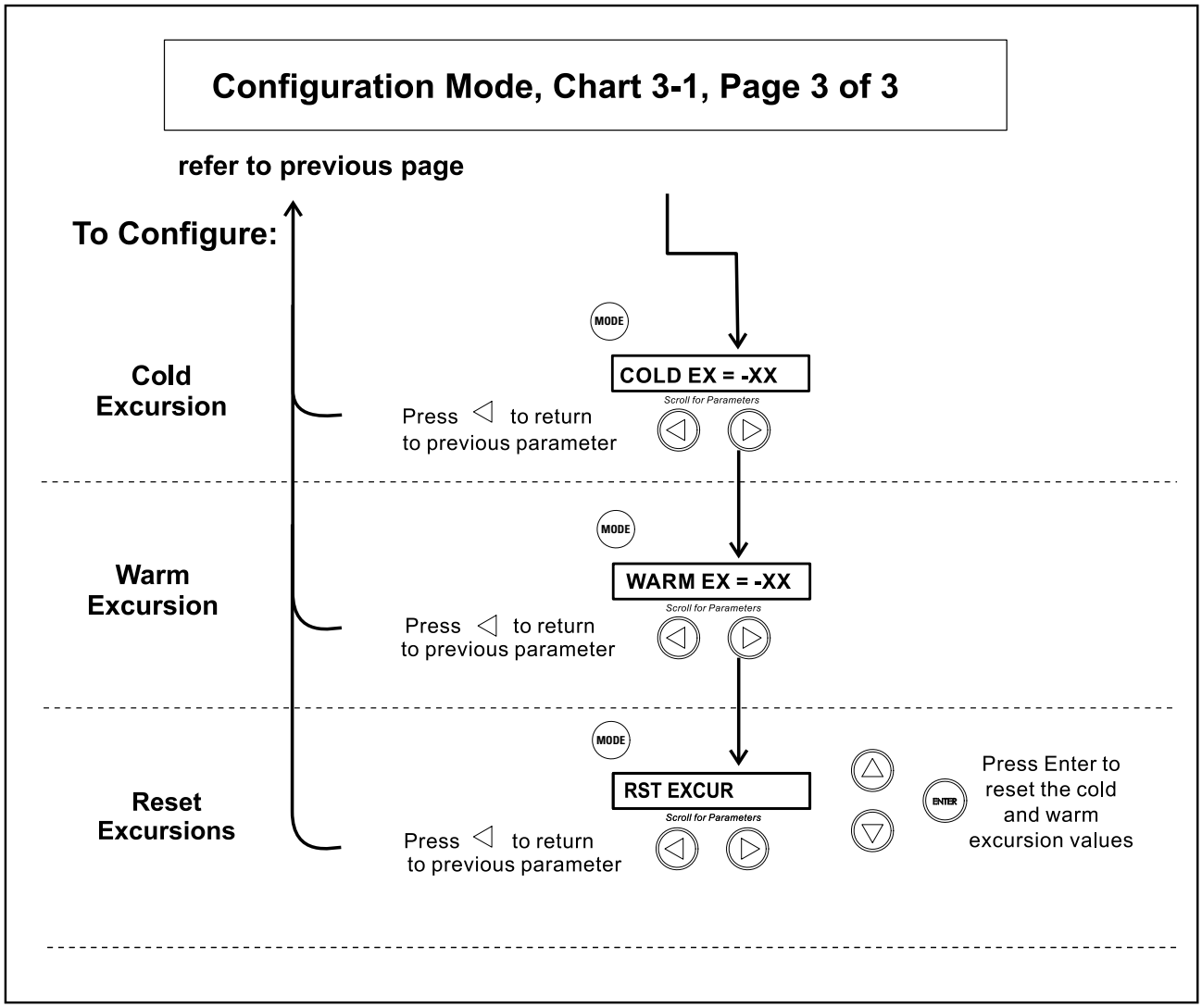


Chart 3-1
Configuration Mode
Temperature °C
SILENCE
Low Battery
Hot Condenser
Press MODE to light CONFIGURATION indicator
MODE
Run
Settings
Calibrate
Configuration
ENTER
Scroll for parameters
To Configure:
Press MODE to move to RUN mode
High Alarm Test
HI ALRM TEST
Scroll for Parameters
Press ◁ to return to previous parameter
Press Enter to initiate test
Low Alarm Test
LO ALRM TEST
System Battery Test
SYS BAT TEST
Optional BUS Battery Test
BUS BAT TEST


Configuration Mode, Chart 3-1, Page 2 of 3
refer to previous page
To Configure:
Display Temperature
MODE
DISP CONTROL
Scroll for Parameters
Press ◁ to return to previous parameter
ENTER
CONTROL probe
Press Enter to save the setting
SAMPLE probe
Clear High Stage Alarm
MODE
CLR HS ALARM
Scroll for Parameters
Press ◁ to return to previous parameter
ENTER
Press Enter to clear the alarm condition
Access Code
MODE
SET ACC CODE XXX
Scroll for Parameters
Press Mode to exit.
Press right or left arrow to move to next digit.
Numbers increase
ENTER
Press Enter to save the setting
Numbers decrease
RS-485 Address
MODE
RS485 ADDR
Scroll for Parameters
Press ◁ to return to previous parameter
Scroll through the various options.
ENTER
Press Enter to save the setting
Optional Back Up System Type
MODE
BUS TYPE CO2
Scroll for Parameters
Press ◁ to return to previous parameter
Type CO2
ENTER
Press Enter to save the setting
Type LN2


Configuration Mode, Chart 3-1, Page 3 of 3
refer to previous page
To Configure:
Cold Excursion
Warm Excursion
Reset Excursions
MODE
COLD EX = -XX
Scroll for Parameters
Press ◁ to return to previous parameter
MODE
WARM EX = -XX
Scroll for Parameters
Press ◁ to return to previous parameter
MODE
RST EXCUR
Scroll for Parameters
Press ◁ to return to previous parameter
ENTER
Press Enter to reset the cold and warm excursion values

Section 4 Alarms

Isotemp -86C freezer alarm system is shown in the table below. When an alarm is active, the message appears in the LED message center. Press the Silence key to disable the audible alarm for the ringback period. The visual alarm will continue until the freezer returns to a normal condition. The alarms are momentary alarms only. When an alarm condition occurs and then returns to normal, the freezer automatically clears the alarm condition and the message center.

Table 4-1. Alarms

Description	Message	Delay	Ringback	Relay
No alarm condition exists	SYSTEM OK	----	----	----
Power Failure	POWER FAIL	1 min.	15 min.	Yes
High Temperature Alarm	TEMP IS HIGH	1 min.	15 min.	Yes
Low Temperature Alarm	TEMP IS LOW	1 min.	15 min.	Yes
Door Ajar	DOOR IS OPEN	1 min.	15 min.	No
Low Battery*	LOW BATTERY	1 min.	8 hours	No
Low BUS Battery (optional)	LOW BUS BATT	1 min	15 min.	No
Control Probe Failure	CNT PRB FLT	1 min.	15 min.	Yes
Heat Exchanger Probe Failure	HSHX PRB FLT	1 min.	15 min.	No
Condenser Probe	COND PRB FLT	1 min.	15 min.	No
Sample Probe Failure (optional)	SMPL PRB FLT	1 min.	15 min.	No
High Stage System Failure	HS SYST FAIL	1 min.	15 min.	YES
Condenser Hot Condition	HOT CONDENSR	1 min.	none	No
Wrong Power	WRONG POWER	0 min.	none	YES
Micro Board Failure	MICRO FAIL	0 min.	15 min.	YES

All alarm delays and ringback times are +30 seconds.

**The automatic battery test runs immediately on power-up, then every 8 hours thereafter.*

High Stage System Failure Alarm

This condition is created when the high stage compressor and fans run for 30 minutes and are not capable of cooling the interstage heat exchanger to the proper temperature. Under this condition, the high stage compressor and fans will turn off (after 30 minutes), and an audible and visual alarm will occur along with the "HS SYST FAIL" message in the LED message center.

Multiple Alarms

When multiple alarm conditions occur, active messages are displayed in the message center one at a time, updating at 5 second intervals. Pressing Silence during multiple alarms causes all active alarms to be silenced and to ringback in 15 minutes.

Micro Board Failure Alarm

An internal communications failure has occurred with the micro board. During this alarm, the compressor(s) attempt to run continuously. However, with this type of failure, freezer operation becomes undependable.

Lost Communication

Communication between the micro board and the display board has been lost. Under this condition, the visual alarm LED flashes along with dashes (----) in the temperature display. In addition, 'LOST COMM' flashes in the message center. Contact Technical Services.

Error Messages

Error	High End Message	Notes
Er00	"INV. MODEL"	**Name:** Improper model selected. **Description:** Indicates that DIP SW3 has not selected a proper model or can't be accessed properly. **Response:** Display shows "Er00" and will not start-up until a proper model is selected. Contact Technical Services.
ErA1	" NO FREQUENCY"	This error condition will prevent peripherals (fans, compressors, etc.) from powering up with the incorrect voltage. **Name:** Voltage/Frequency failure **Description:** Indicates the measured RMS line voltage did not agree with the logic level sensed by the micros provided by the installed high voltage PCB; or the measured RMS voltage is not within a tolerable range (<180VAC < 270 for 230VAC unit / <85VAC < 160 for 115VAC unit); or the frequency measured over 10 cycles was not within a tolerable range (55 Hz < Freq < 70 Hz for 60 Hz units / 40 Hz < Freq < 55 Hz for 50 Hz units) **Response:** This condition is checked at power on reset and if it is active the unit will NOT power up. The unit will indefinitely display "Er_1" in the display and continue to monitor the frequency and voltage. Furthermore, the audible alarm will sound. Other startup error messages may be displayed prior to this message; however, the system will stop the startup sequence for this condition. ErA1 .. No pulses (zero crossings) detected to determine frequency (50 / 60 Hz) ErC1 .. Frequency detected is below 50 Hz Erd1 .. Frequency detected is above 60 Hz (Possible noise spikes on supply voltage) ErE1 .. Unit is 230V and the voltage detected is below the low limit (180VRMS) ErF1 .. Unit is 230V and the voltage detected is above the high limit (260VRMS) Erg1 .. Unit is 115V and the voltage detected is below the low limit (85VRMS) ErH1 .. Unit is 115V and the voltage detected is above the high limit (160VRMS)
ErC1	"FREQ <50Hz"	
Erd1	"FREQ >60Hz"	
ErE1	"VAC < 180V"	
ErF1	"VAC > 260V"	
Erg1	"VAC < 85V"	
ErH1	"VAC > 160V"	

Error (cont.)	High End Message	Notes
Er02	"CNT PRB FLT"	**Name:** Control (Cabinet) Sensor Failure **Description:** This condition indicates that the control sensor has failed to produce a valid reading for ≥12 consecutive reads (~60 seconds). **Response:** The unit will stage both compressors on (if necessary) and the unit will attempt to head to bottom out. If the sensor recovers, the system will begin to operate normally and respond to the temperature feedback. The remote alarm contacts will become active regardless of the key position for this mode of failure. 'Er02' will be added to the main display queue and the last valid cabinet temperature value will not be displayed
Er03	"HSHX PRB FLT"	**Name:** Heat Exchange Sensor Failure **Description:** This condition indicates that the heat exchange sensor has failed to produce a valid reading for ≥12 consecutive reads (~60 seconds). **Response:** The display will show "Er03" only when the button sequence to read the heat exchange sensor is depressed.
Er05	N/A	**Name:** Display Firmware Integrity Failure **Description:** The display firmware has failed to pass its CRC CCITT checksum integrity test. **Response:** The display performs this check at startup and the display board will fail to startup with out any error indication if it does not pass this at power on.
Er06	N/A	**Name:** Micro Firmware Integrity Failure **Description:** The micro firmware has failed to pass its CRC CCITT checksum integrity test. **Response:** This is checked at power on reset and the "Er06" will be displayed for ~10 seconds at startup if this condition exists.
Er07	"MICRO FAIL"	**Name:** Micro Fail - CS5521 SPI Failure / UISR Failure **Description:** This condition indicates a micro board failure due to either the SPI bus is unable to communicate with the ADC device or a UISR event caused the microcontroller to be in an unstable state. **Response:** The unit will try to recover from this fault three times by a hardware reset of the micro board. In the event that the system couldn't rectify the issue, the following sequence of events will occur: 1. Remote alarm contacts will become active. 2. Buzzer will annunciate audibly and will have a ringback of 15 minutes. 3. "Seven segment" display will show "Er07". 4. The system will have 10 minute staging between the high stage compressor and the low stage compressor activation. 5. The system will go to bottom out temperatures.

Error (cont.)	High End Message	Notes
Er09	N/A	**Name:** Stuck Button **Description:** This condition indicates that the display board has a stuck button. **Response:** The Er09 will show on the display periodically.
Er11	"COND PRB FLT"	**Name:** Condenser Probe Sensor Failure **Description:** This condition indicates that the condenser probe sensor has failed to produce a valid reading for ≥12 consectutive reads (~60 seconds). **Response:** The display shows "Er11".
N/A	"SMPL PRB FLT"	**Name:** Sample Probe Sensor Failure **Description:** This condition indicates that the sample probe sensor has failed to produce a valid reading for ≥12 consectutive reads (~60 seconds). **Response:** The message center shows "SMPL PRB FLT".
dErr	N/A	**This is a general display error in which the value being displayed can not be represented within the characters provided.**
(four dashes) ---- in display	N/A	**Name:** Lost Communication **Description:** Communication between the micro board and the display board has been lost. Under this condition, the visual alarm flashes along with dashes in the temperature display (----). Contact Technical Services.

Section 5 Maintenance

Caution If the unit has been in service, turn it off and disconnect the power cord connector before proceeding with any maintenance. ▲

Clean Cabinet Exterior

Avoid the excessive use of water around the control area due to the risk of electrical shock. Damage to the controls may also result.

Wipe down the freezer exterior using soap and water and a general use laboratory disinfectant. Rinse thoroughly with clean water and dry with a soft cloth.

Clean Air Filter (minimum 4 x/year*)

1. Open the front lower door by grasping the bottom left corner.
2. Locate the grille on the door. See Figure 1-5. Grasp the middle of the grille material and gently pull out to remove.
3. Wash the filter material using water and a mild detergent.
4. Dry by pressing between two towels.
5. Install the filter back into the grille and attach the grille.

* The clean filter alarm occurs every three months as a reminder to clean the air filter. Depending upon environmental conditions, the filter may need to be cleaned or replaced more frequently. If the filter becomes torn or excessively dirty, a replacement can be purchased. Order part number 760203.

Clean the Condenser (minimum yearly*)

1. Open the front lower door by grasping the bottom left corner. See Figure 1-5.
2. Using a vacuum cleaner, exercising care to not damage the condenser fins, clean the condenser.

* Depending upon environmental conditions, the condenser may need to be cleaned more frequently.

Clean the Water-cooled Condenser

The water-cooled condenser can be cleaned-in-place by using the CIP procedure. Cleaning solutions can be used, depending on type of deposits or build-up to be removed.

Caution Do not use liquids that are corrosive to stainless steel or the brazing material (copper or nickel). ▲

CIP (Clean-In-Place) Procedure

1. Disconnect the unit from the water supply.
2. Drain the unit.
3 . Rinse with fresh water and drain the unit again.
4. Fill with fresh water.
5. Add cleaning agent (solution and concentration dependent on deposits or build-up).
6. Circulate cleaning solution (if feasible).
7. Drain the cleaning solution.
8. Add and circulate a passivating liquid for corrosion inhibition of plate surfaces.
9. Drain this liquid.
10. Rinse with fresh water and drain.
11. Reconnect the water supply and fill the unit.
12 . Return to service.

Defrost the Chamber

1. Remove all product and place it in another freezer.
2. Turn the unit off and disconnect it from the power source.
3. Turn off the battery switch (O). See Figure 5-8.
4. Open all of the doors and place towels on the chamber floor.
5. Allow the frost to melt and become loose.
6. Remove the frost with a soft cloth.
7. After defrosting is complete, clean the interior with a non-chloride detergent. Rinse thoroughly with clean water and dry with a soft cloth.
8. Plug unit in and turn power switch on.
9. Turn the battery power switch to Standby mode (⏻).
10. Allow the freezer to operate empty overnight before reloading product.

Clean the Door Gasket (minimum monthly*)

Using a soft cloth, remove any frost build-up from the gasket and door(s). The Clean Gasket alarm occurs every three months as a reminder to remove frost build-up from the gasket and door(s). Press the Silence key to disable the audible alarm.

*The door gasket may need to be cleaned more frequently if dirt or excessive frost build-up prevents door from closing properly.

Vacuum Relief Port

The exterior door gasket provides an excellent seal that protects product, provides an energy efficient thermal barrier to keep cold air in and room temperature air out and reduces frost buildup on the inner doors.

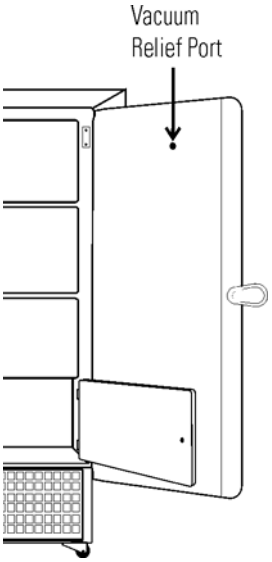


Figure 5-4. Location

Because the door gasket seals so well, a vacuum can be created after a door opening. Warm air enters the cabinet, cools and contracts, creating a vacuum that pulls the door in tightly against the seal.

To equalize the pressure inside the cabinet after a door opening requires 1.5-3.0 cu.ft. of ambient air to be drawn into the cabinet. The amount of air required to equalize the pressure varies depending on the cabinet size, cabinet temperature, duration of door opening, inventory volume and the temperature/humidity of the ambient air. The unit is designed with a "vacuum relief port" that allows the pressure to be equalized.

The time required to draw 1.5-3.0 cu.ft. of air into the cabinet depends on two factors:

a) the size and number of paths available for air to enter the cabinet, and
b) pressure difference between the internal cabinet and room ambient.

Cabinets with the vacuum relief port operating normally, (i.e. vacuum relief port not iced over) requires a minimum of 30 seconds up to a maximim of 120 seconds for the cabinet to equalize. This is also a good indication that the exterior door is well sealed.

The vacuum relief port requires routine maintenance. It will ice over unless preventive measures are taken. If the vacuum relief port becomes iced over, the freezer will take several hours to equalize pressure.

Caution Do not leave the freezer unattended with door unlatched. The vacuum could release, resulting in a door opening and product loss. ▲

Vacuum Relief Port (continued)

Observe the inner side of port periodically for frost and ice build-up. Remove any frost with a soft dry cloth. If the tube should become clogged with ice, it must be cleaned. Clear the vacuum relief tube completely free of ice to prevent rapid ice formation.

Factors that can affect the performance of the vacuum relief port include high ambient temperature, high humidity conditions and frequent door openings. Perform maintenance weekly, or as needed.

Note Failure to maintain the vacuum relief port may result in excessive ice build-up inside the tube, clogging the port, and inability to open the door. The vacuum relief port may need to be cleaned more often with frequent door openings and high humidity environments. ▲

Replace the Battery(s)

1. To gain access to the battery, open the lower door by grasping the bottom left corner. The battery is rectangular in shape, located on the front left corner of the compressor compartment and is secured in place by a mounting bracket with three bolts. See Figure 5-2.
2. Directly above the battery(s) is the battery power switch. Turn the battery power switch to the Off position.
3. Disconnect the battery connections.
4. Remove the tape securing the battery.
5. Remove the old battery and install the new battery.
6. Reconnect the battery (red to positive and black to negative).
7. Turn the battery power switch to Standby mode (⏻).
8. Close lower panel door.

Caution The % of charge can vary depending on the age, usage and condition of the battery. For a consistent and dependable charge, replace the battery every 2 years. Replacement batteries must be rechargeable and are available from Thermo. Refer to the parts list for stock number and description of the replacement batteries. Dispose of the used batteries in a safe manner and in accordance with good environmental practices. ▲

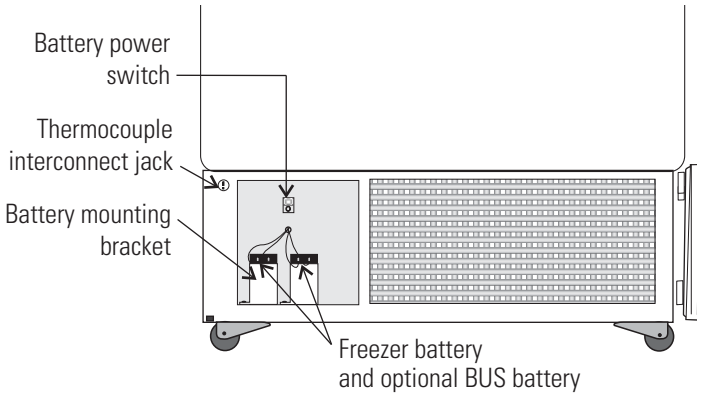


Figure 5-2. Battery Location

Prepare the Unit for Storage

Defrost the unit as described previously. This will prepare the unit for storage. Turn off the battery power switch. Turn off the freezer power switch. Disconnect power to the battery(s) and to the freezer.

PREVENTIVE MAINTENANCE
Freezers

Your equipment has been thoroughly tested and calibrated before shipment. Regular preventive maintenance is important to keep your unit functioning properly. The operator should perform routine cleaning and maintenance on a regular basis. For maximum performance and efficiency, it is recommended that the unit be checked and calibrated periodically by a qualified service technician.

The following is a condensed list of preventive maintenance requirements. See the specified section of the instruction manual for further details.

We have qualified service technicians, using NIST traceable instruments, available in many areas. For more information on Preventive Maintenance or Extended Warranties, please contact us at the number below.

Cleaning and calibration adjustment intervals are dependent upon use, environmental conditions and accuracy required.

Tips:
- Fill an upright by starting at the bottom near the probe and add racks to one shelf at a time. Allow freezer to recover to set point between shelves.
- Fill a chest by starting at the left side near the probe. Filling with room temperature racks will result in a long pull-down time.
- Fill unit with frozen product to help overall performance; frozen water jugs, for example.
- Always make certain the vacuum relief port is free of frost and ice, to allow for timely re-entry into the freezer after a door opening.

• 401 Millcreek Road, Box 649 • Marietta, Ohio 45750 USA • 740-373-4763
• USA and Canada 800-438-4851 • Telefax: 740-373-4189 • email: service.led.marietta@thermofisher.com

Preventive Maintenance for Freezers

Refer to Manual Section	Action	Monthly	Yearly	Every 2 Years
--	Verify ambient temperature, <90°F	☑		
--	* Adjust door handle for firm latching, as needed	☑		
Figure 1-4 for probe location 5	Check and clean probe cover, vacuum relief port, gaskets, hinges, and inner doors of ice and snow	☑ *More frequent cleaning may be required, depending on use and environmental conditions*		
5	Check air filter. Clean or replace as needed		☑ 4X	
1, 3	Check alarm back-up battery	☑		** Replace
--	Check condenser fan motor for unusual motor noise or vibration		☑	
2	* Verify and document calibration, at the minimum, annually		☑	
5	* Clean condenser compartment and wipe off condenser		☑	

* Qualified service technicians only
** Dispose of properly, according to all state and federal regulations

To minimize ice build-up inside of freezer:
- Locate the freezer away from drafts or heating/cooling vents
- Keep the number of door openings to a minimum
- Minimize the length of time door is open
- Make sure door latches securely after opening

Section 6 Factory Installed Options

Details for the factory installed options available, or already installed, are listed below.

Back-Up System (BUS) - P/N 1950526, 1950528

Caution Before installation of BUS components, make sure the power to the freezer is disconnected, the battery switch is turned off (O) and the freezer has warmed to ambient temperature. ▲

The built-in BUS (back up system) will keep the freezer chamber temperature below the critical level in the event of a power or equipment failure. If power to the freezer fails, or temperature increases to the back up alarm set point, the BUS injects liquefied gas into the chamber to keep the chamber temperature within the specified range.

The BUS operates on an internal 12-volt, rechargeable battery which is kept charged during normal operation by the integral battery charger.

Install Injection Assembly, Vent Stack and Solenoid

1. Install the injection assembly through the 1/2" pre-punched hole, directly behind the 2" vent stack hole in the center of the chamber ceiling. Note: Cover the open end of injection assembly with tape to keep insulation from entering the nipple.
2. Slide 3/8" flatwasher over open end of nipple.
3. Insert the covered end of the injection assembly through the exterior hole.
4. Remove the tape covering from the end of the nipple and install the 1/8" NPT brass tee on the open end of the nipple. Place permagum sealant between the brass tee and the interior top.
5. Remove the two Phillips head screws securing the metal bracket on the vent stack assembly.

Injection Assembly, Vent Stack and Solenoid (cont.)

6. Install the vent stack through the opening and secure it to the top of the freezer, using screws.

7. Go to the interior and seal around the end of the vent stack with Permagum.

8. Install the transfer hose connecting one end to the injection assembly, the other end to the solenoid valve. Install the solenoid valve to the supply source. The solenoid mounting bracket is not required and may be discarded.

Caution When selecting a CO_2 supply cylinder, it must be equipped with a siphon tube. ▲

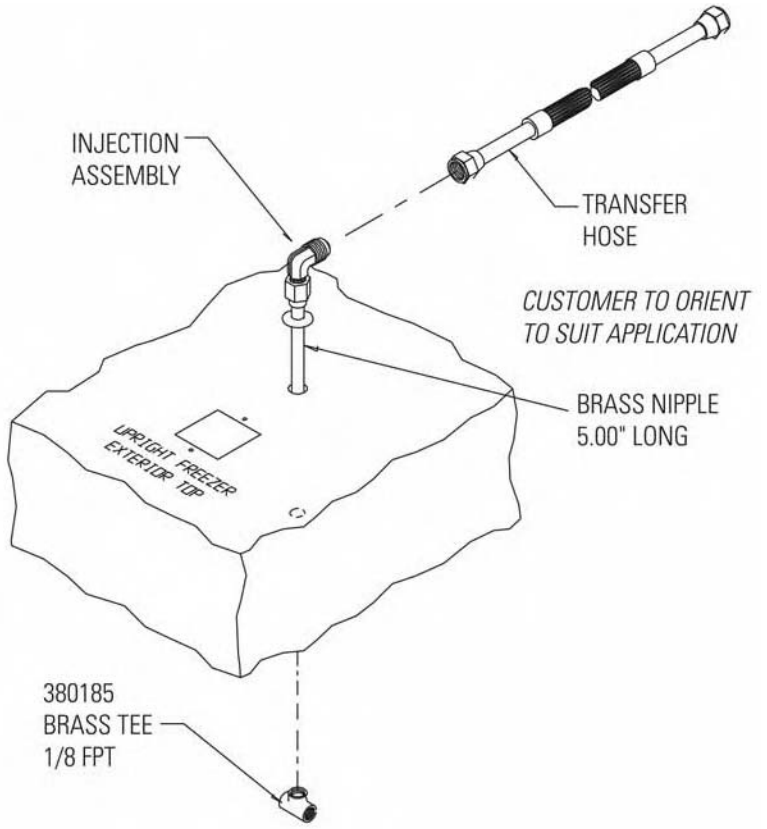


Figure 6-1. Injection Assembly

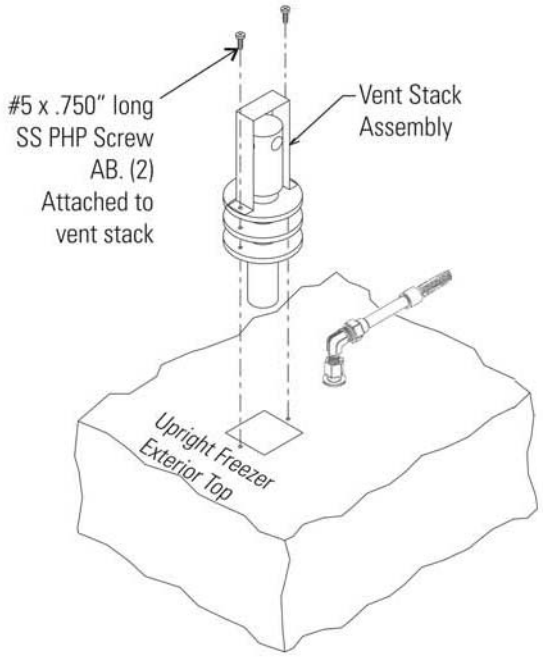


Figure 6-2. Vent Stack

Install the Temperature Probe

1. Locate the 0.500” pre-punched hole in the upper left hand back corner of the chamber ceiling. Remove the tie wrap securing the coiled probe/solenoid harness. Uncoil the probe lead and run the probe tip (approximately 12”) down through 0.500” porthole (Figure 6-4).

2. As shown in Figure 6-3, thread the small tie wrap through the openings in the front of the bracket. Secure the probe on the back of the bracket with the tie wrap.

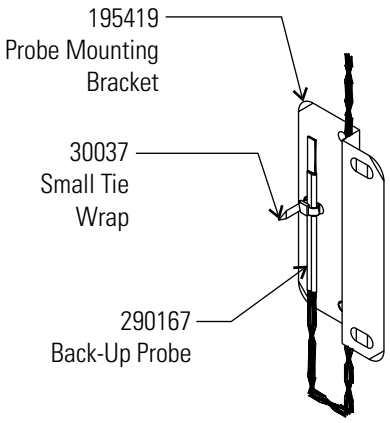


Figure 6-3. Secure Probe

3. Tap #8-32 the two pre-punched holes located on the interior left wall of the freezer. Mount the bracket. Figure 6-4 shows the back-up probe mounted on the interior left side wall of the freezer.

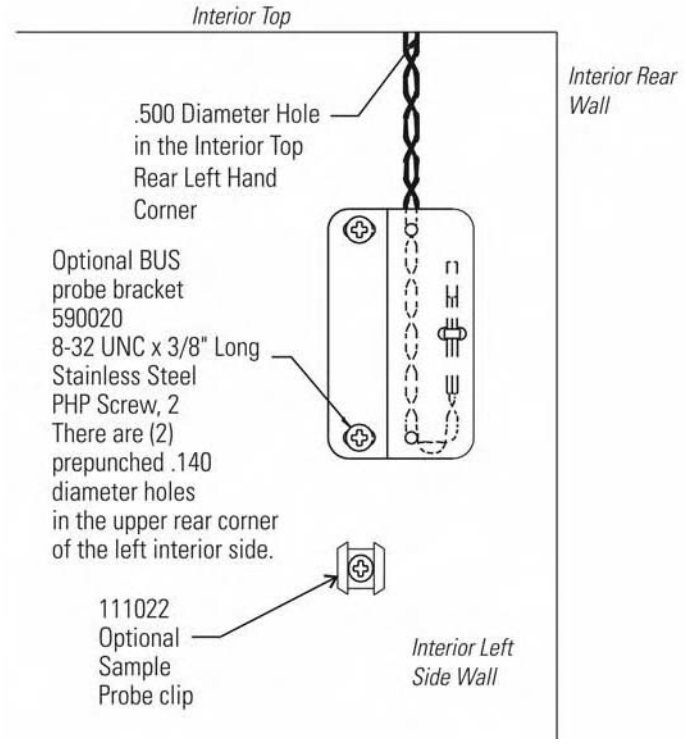


Figure 6-4. Mounted

Connect the Probe/Solenoid Harness

1. Remove the four screws on the freezer back panel and use them to mount the tie wrap anchors as shown in Figure 6-5. Secure the probe wire with tie wraps.
2. Plug the solenoid/probe connector into the BUS connection and secure with a screw on the right and left side. The connector is keyed.
3. Loosen the terminal screws on the solenoid. Slide the spade lug connectors under the screws and tighten to secure.

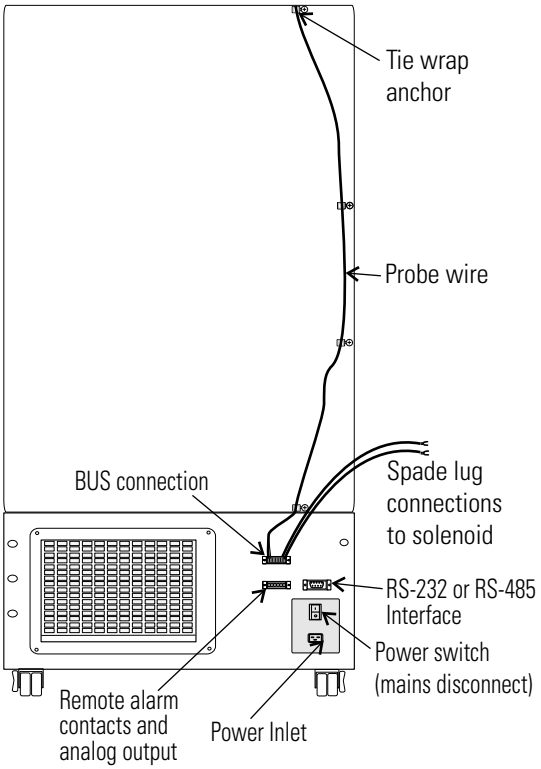


Figure 6-5. Routing

4. Connect power to the freezer. Turn the freezer On, with battery switch Off.
   a. The Solenoid Engaged light on the BUS control panel will illuminate (no injection occurs). This light stays on until the unit is below BUS setpoint.
   b. The Low Battery indicator may also illuminate.
5. Turn the battery switch to Standby mode (⏻) to charge both batteries.

BUS Control Panel

Figure 6-6. BUS Control Panel

Warning When activated, this unit injects liquid nitrogen or carbon dioxide. Liquid nitrogen can cause serious freezing (frostbite) if it comes in contact with unprotected skin or eyes. Nitrogen suppresses oxygen levels and may cause suffocation if area is not well ventilated. Refer to Appendix A for the proper handling of liquid LN_2. ▲

Caution Make sure the pressure relief valve on any LN_2 tank is adjusted to 30 PSI maximum blow-off. ▲

Warning Carbon dioxide gas suppresses oxygen levels and may cause suffocation if area is not well ventilated. Refer to Appendix B for the proper handling of liquid CO_2. ▲

Power - indicates the unit has AC power.

Low Battery - battery charge is low. The battery needs replaced or recharged.

Solenoid Engaged - BUS has opened the solenoid so it can inject gas (CO_2 or LN_2).

Press-To-Test - Activates the solenoid and injects LN2 or CO2 into the freezer chamber as long as the button is depressed. The solenoid engaged indicator should light. If the Low Battery indicator lights during the test, replace the BUS battery.

Note Solenoid will not engage if door is open. ▲

Set the Optional BUS Set Point

The optional back up system is designed to inject CO_2 or LN_2 into the freezer compartment if the temperature rises above back up system set point. To set the BUS set point:

1. Press the Mode key until the Settings indicator lights.
2. Press the right arrow until "BACKUP = -XX" is displayed in the message center.
3. Press the up or down arrow key until the desired BUS set point is displayed.
4. Press Enter to save the setting.
5. Press the Mode key until the Run indicator lights or press the right or left arrow to go to the next or previous parameter.

If no control keys are pressed, the freezer will automatically return to RUN mode after 5 minutes.

Caution Changing the operating temperature set point can affect the BUS set point. The BUS set point will self-adjust to maintain a temperature of at least 10°C above the operating temperature set point. ▲

Caution The BUS set point cannot be set colder than the high temperature alarm set point. (See Section 1.) If the back-up system is installed with CO_2, then -65°C is the coldest BUS set point that can be used (if cabinet set point is -75°C or colder). ▲

Test the BUS

After the freezer has stabilized and both batteries are fully charged, the BUS can be tested to verify proper operation.

1. Disconnect the AC power to the freezer by turning power switch off.
2. As the freezer warms up, verify the BUS injects at the desired temperature. Displayed temperature may vary by a few degrees from inject temperature due to the differences in probe locations.

Clean the Vent Stack

Routinely check the vent stack for frost or ice build-up. The type of frost that forms in the vent stack is generally very soft and may be easily removed with a bristle brush or soft cloth. If ice build-up has occurred, a complete defrost may occasionally be required. See Section 5 for freezer defrost instructions.

Disconnect the Fitting Assembly & Transfer Hose

To disconnect the freezer back-up from the gas supply:

1. Close the supply valve.
2. Depress the test button on the back-up system control box to remove the gas from the line.
3. Slowly disconnect the fitting assembly from the supply (in the event that any gas remains in the line).

Chart Recorder

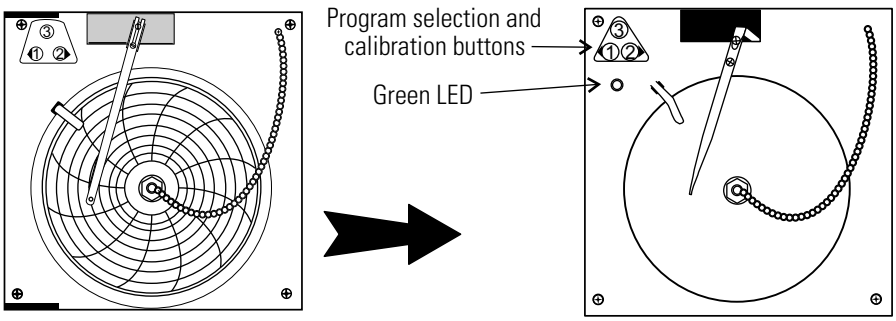


Figure 6-7. Recorder Buttons Location

Install the Chart Paper

1. Open the glass door of the recorder and press button #3 until the pen begins to move outward.
2. Unscrew the knob at the center of the chart and remove the paper.
3. Install the new chart paper, position the paper to the correct time line and replace the knob.
4. Remove the cap from the felt pen and press button #3.

Figure 6-8. Buttons

Change Recorder Temperature Range

The chart recorder contains eight temperature ranges and is factory-programmed for the freezer.

1. Press and hold button #3 for one second, then let the pen move off the chart paper.
2. Press and hold for five seconds either button #1 or button #2.
3. Release the button and the green LED will begin to flash. Count the number of flashes to determine the present program setting.
4. To change the program setting, press the left or right arrows to increase or decrease the count.
5. When the desired program number is flashing, press button #3 to bring the pen arm back onto the chart. Recording will begin in the new program.

Program	From	To
1	-40	30°C
2	0	60°C
3	-100	38°C
4	-5	50°C
5	0	100°C
6	-100	200°C
7	-115	50°C
8	-10	70°C

Calibrate the Chart Recorder

The recorder must be in service for 24 hours before performing the following calibration procedure.

1. Place an accurate thermometer in the chamber next to the recorder probe.
2. Temperature probes for the recorder are located in the left front corner of the freezer chamber (Figure 1-4).
3. After about three minutes, compare the thermometer reading with the chart recorder reading.
4. If an adjustment is necessary, press the #1 button to move the pen to the left or the #2 to move the pen to the right. The button must be held about five seconds before the pen begins to move. Release the button when the pen position matches the thermometer.

Note The felt-tip pen on the recorder requires periodic replacement. Usually the ink will appear to fade before replacement becomes necessary. Additional pen tips may be purchased. Refer to exploded parts drawings. ▲

Section 7 Specifications

Number (Model)	IU1386V (8965)	IU1386D (8966)	IU1386A (8967)	IU1786A (8968)
Temperature Range	-50°C (-58°F) to -86°C (-123°F) in an 18C to 32C* (64.4F to 89.6F) ambient			
Exterior Dimensions	33.3"W x 77.9"H x 32.9" 84.6 x 197.9 x 78.7 cm	33.3"W x 77.9"H x 32.9" 84.6 x 197.9 x 78.7 cm	33.3"W x 77.9"H x 32.9" 84.6 x 197.9 x 78.7 cm	33.3"W x 77.9"H x 38.9" 84.6 x 197.9 x 94.0 cm
Interior Dimensions	23.0"W x 51.5"H x 19.3" 58.4 x 130.8 x 49.0 cm	23.0"W x 51.5"H x 19.3" 58.4 x 130.8 x 49.0 cm	23.0"W x 51.5"H x 19.3" 58.4 x 130.8 x 49.0 cm	23.0"W x 51.5"H x 25.3" 58.4 x 130.8 x 64.3 cm
Capacity	13.0 cu. ft. (368.1 liters)	13.0 cu. ft. (368.1 liters)	13.0 cu. ft. (368.1 liters)	17.3 cu. ft. (489.9 liters)
Refrigeration	Two 1 HP (2545 BTUH each)			
Insulation	Non-CFC, foamed-in-place urethane: 5.0" (12.7 cm) cabinet; 4.5" (11.4 cm) door			
Electrical - Nominal voltage ±10%	230V, 50 Hz, 12.0 FLA Operating Range: 208-240V	230V, 60 Hz, 12.0 FLA Operating Range: 208-240V	120V, 60 Hz, 16.0 FLA Operating Range: 108-130V	120V, 60 Hz, 16.0 FLA Operating Range: 108-130V
Breaker Requirements	15 amp Dedicated Circuit, 15 Amp Time Delay Breaker	15 amp Dedicated Circuit, 15 Amp Time Delay Breaker	20 amp Dedicated Circuit, 20 amp Time Delay Breaker	20 amp Dedicated Circuit, 20 amp Time Delay Breaker
Shipping Weight Motor	711 lbs. (323 kg)	711 lbs. (323 kg)	711 lbs. (323 kg)	830 lbs. (376 kg)

***** *Compressors may not cycle off with cabinet running at -86C in a 32C ambient.*

Number (Model)	IU1786D (8969)	IU1786V (8970)	IU2386V (8971)	IU2386D (8972)
Temperature Range	-50°C (-58°F) to -86°C (-123°F) in an 18C to 32C* (64.4F to 89.6F) ambient			
Exterior Dimensions	33.3"W x 77.9"H x 38.9" 84.6 x 197.9 x 94.0 cm	33.3"W x 77.9"H x 38.9" 84.6 x 197.9 x 94.0 cm	40.8"W x 77.9"H x 38.9" 103.6 x 197.9 x 94.0 cm	40.8"W x 77.9"H x 38.9" 103.6 x 197.9 x 94.0 cm
Interior Dimensions	23.0"W x 51.5"H x 25.3" 58.4 x 130.8 x 64.3 cm	23.0"W x 51.5"H x 25.3" 58.4 x 130.8 x 64.3 cm	30.6"W x 51.5"H x 25.3" 77.7 x 130.8 x 64.3 cm	30.6"W x 51.5"H x 25.3" 77.7 x 130.8 x 64.3 cm
Capacity	17.3 cu. ft. (489.9 liters)	17.3 cu. ft. (489.9 liters)	23.0 cu. ft. (651.3 liters)	23.0 cu. ft. (651.3 liters)
Refrigeration	Two 1 HP (2545 BTUH each)			
Insulation	Non-CFC, foamed-in-place urethane: 5.0" (12.7 cm) cabinet; 4.5" (11.4 cm) door			
Electrical - Nominal voltage ±10%	230V, 60 Hz, 12.0FLA Operating Range: 208-240V	230V, 50 Hz, 12.0FLA Operating Range: 208-240V	230V, 50 Hz, 12.0FLA Operating Range: 208-240V	230V, 60 Hz, 12.0FLA Operating Range: 208-240V
Breaker Requirements	15 amp Dedicated Circuit, 15 amp Time Delay Breaker	15 amp Dedicated Circuit, 15 amp Time Delay Breaker	15 amp Dedicated Circuit, 15 amp Time Delay Breaker	15 amp Dedicated Circuit, 15 amp Time Delay Breaker
Shipping Weight Motor	830 lbs. (376 kg)	830 lbs. (376 kg)	900 lbs. (408 kg)	900 lbs. (408 kg)

Number (Model)	IU2386A (8973)	IU2886D (8974)	IU2886V (8975)
Temperature Range	-50°C (-58°F) to -86°C (-123°F) in an 18C to 32C* (64.4F to 89.6F) ambient		
Exterior Dimensions	40.8"W x 77.9"H x 38.9" 103.6 x197.9 x 94.0cm	46.8"W x 77.9"H x 38.9" 118.9 x 197.9 x 94.0cm	46.8"W x 77.9"H x 38.9" 118.9 x 197.9 x 94.0cm
Interior Dimensions	30.6"W x 51.5"H x 25.3" 77.7 x 130.8 x 64.3cm	36.6"W x 51.5"H x 27.0" 93.0 x 130.8 x 68.6cm	36.6"W x 51.5"H x 27.0" 93.0 x 130.8 x 68.6cm
Capacity	23.0 cu. ft. (651.3 liters)	28.0 cu. ft. (792.8 liters)	28.0 cu. ft. (792.8 liters)
Refrigeration	Two 1 HP (2545 BTUH each)		
Insulation	Non-CFC, foamed-in-place urethane: 5.0" (12.7 cm) cabinet; 4.5" (11.4 cm) door		
Electrical - Nominal voltage ±10%	120V, 60 Hz, 16.0 FLA Operating Range: 108-130V	230V, 60 Hz, 12.0FLA Operating Range: 208-240V	230V, 50 Hz, 12.0FLA Operating Range: 208-240V
Breaker Requirements	20 amp Dedicated Circuit, 20 amp Time Delay Breaker	15 amp Dedicated Circuit, 15 Amp Time Delay Breaker	15 amp Dedicated Circuit, 15 Amp Time Delay Breaker
Shipping Weight Motor	900 lbs. (408 kg)	1090 lbs. (494 kg)	1090 lbs. (494 kg)

***** *Compressors may not cycle off with cabinet running at -86C in a 32C ambient.*

Certifications

Declaration of Conformity is available from the factory

Safety Specifications

Indoor Use Only

Altitude - up to 2,000 meters

Temperature - 5°C to 43°C

Humidity - maximum RH 80% for temperatures up to 31°C, decreasing linearly to 50% RH at 40°C

Mains Supply Fluctuations - Mains supply voltage fluctuations not to exceed ±10% of the nominal voltage

Installation Category II [1]

Pollution Degree 2 [2]

Class of Equipment I

Intended Use

This product is intended for use as a General Purpose Laboratory Freezer for storing samples or inventory between -40 and -86C.

This unit is not intended for use in an explosive environment, nor to be used for the storage of flammable inventory. This unit is not intended for use in a Class II medical application as defined by Title 21 of the Federal Code of Regulations.

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1 Installation category (overvoltage category) defines the level of transient overvoltage which the instrument is designed to withstand safely. It depends on the nature of the electricity supply and its overvoltage protection means. For example, in CAT II which is the category used for instruments in installations supplied from a supply comparable to public mains such as hospital and research laboratories and most industrial laboratories, the expected transient overvoltage is 2500V for a 230V supply and 1500V for a 120V supply.

2 Pollution degree describes the amount of conductive pollution present in the operating environment. Pollution degree 2 assumes that normally only non-conductive pollution such as dust occurs with the exception of occasional conductivity caused by condensation.

THERMO FISHER SCIENTIFIC FREEZER WARRANTY

The Warranty Period starts two weeks from the date your equipment is shipped from our facility. This allows for shipping time so the warranty will go into effect at approximately the same time your equipment is delivered. The warranty protection extends to any subsequent owner during the warranty period.

During the first two years of the warranty period, component parts proven to be non-conforming in materials or workmanship will be repaired or replaced at Thermo's expense, labor included. The ULT Freezers include an additional two year warranty on the compressors, parts only, F.O.B. factory. Installation and calibration is not covered by this warranty agreement. The Technical Services Department must be contacted for warranty determination and direction prior to any work being performed. Expendable items, i.e., glass, filters, pilot lights, light bulbs and door gaskets are excluded from this warranty.

In addition to the standard warranty, the foamed-in-place cabinet design carries a unit production lifetime warranty (foamed-in-place cabinet, evaporator and foamed-in-place door; parts only). Please contact your sales representative or Thermo for additional information.

Replacement or repair of component parts or equipment under this warranty shall not extend the warranty to either the equipment or to the component part beyond the original two year warranty period. The Technical Services Department must give prior approval for the return of any components or equipment.

THIS WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, WHETHER WRITTEN, ORAL, OR IMPLIED. NO WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE SHALL APPLY. Thermo shall not be liable for any indirect or consequential damages including, without limitation, damages relating to lost profits or loss of products.

Your local Thermo Sales Office is ready to help with comprehensive site preparation information before your equipment arrives. Printed instruction manuals carefully detail equipment installation, operation, and preventive maintenance.

If equipment service is required, please call your Technical Services Department at 1-800-438-4851 (USA and Canada) or 1-740-373-4763. We're ready to answer your questions on equipment warranty, operation, maintenance, service, and special applications. Outside the USA, contact your local distributor for warranty information.

Rev. 0 6/11

Appendix A Handling Liquid Nitrogen

Warning Contact of liquid nitrogen or cold gas with the skin or eyes may cause serious freezing (frostbite) injury. ▲

Handle liquid nitrogen carefully.

The extremely low temperature can freeze human flesh very rapidly. When spilled on a surface the liquid tends to cover it completely and intimately, cooling a large area. The gas issuing from the liquid is also extremely cold. Delicate tissue, such as that of the eyes, can be damaged by an exposure to the cold gas which would be too brief to affect the skin of the hands or face.

Never allow any unprotected part of your body to touch objects cooled by liquid nitrogen.

Such objects may stick fast to the skin and tear the flesh when you attempt to free yourself. Use tongs to withdraw objects immersed in the liquid, and handle the object carefully.

Wear protective clothing.

Protect your eyes with a face shield or safety goggles (safety glasses without side shields do not give adequate protection). Always wear gloves when handling anything that is, or may have been, in immediate contact with liquid nitrogen. Insulated gloves are recommended, but heavy leather gloves may also be used. The gloves should fit loosely, so that they can be thrown off quickly if liquid should splash into them. When handling liquid in open containers, it is advisable to wear high-top shoes. Trousers (which should be cuffless if possible) should be worn outside the shoes.

Introduction

The safe handling and use of liquid nitrogen in cryogenic refrigerators and dewar flasks is largely a matter of knowing the potential hazards and using common-sense procedures based on that knowledge. There are two important properties of liquid nitrogen that present potential hazards:

1. It is extremely cold. At atmospheric pressure, liquid nitrogen boils at -320°F (-196°C).

2. Very small amounts of liquid vaporize into large amounts of gas. One liter of liquid nitrogen becomes 24.6 cu. ft. (700l) of gas.

The safety precautions in this booklet must be followed to avoid potential injury or damage which could result from these two characteristics. Do not attempt to handle liquid nitrogen until you read and fully understand the potential hazards, their consequences, and the related safety precautions. Keep this booklet handy for ready reference and review.

Note Because argon is an inert gas whose physical properties are very similar to those of nitrogen, the precautions and safe practices for the handling and use of liquid argon are the same as those for liquid nitrogen. ▲

Use only containers designed for low temperature liquids.

Cryogenic containers are specifically designed and made of materials that can withstand the rapid changes and extreme temperature differences encountered in working with liquid nitrogen. Even these special containers should be filled SLOWLY to minimize the internal stresses that occur when any material is cooled. Excessive internal stresses can damage the container.

Do not cover or plug the entrance opening of any liquid nitrogen refrigerator or dewar. Do not use any stopper or other device that would interfere with venting of gas.

These cryogenic liquid containers are generally designed to operate with little or no internal pressure. Inadequate venting can result in excessive gas pressure which could damage or burst the container. Use only the loose-fitting necktube core supplied or one of the approved accessories for closing the necktube. Check the unit periodically to be sure that venting is not restricted by accumulated ice or frost.

Use proper transfer equipment.

Use a phase separator or special filling funnel to prevent splashing and spilling when transferring liquid nitrogen into or from a dewar or refrigerator. The top of the funnel should be partly covered to reduce splashing. Use only small, easily-handled dewars for pouring liquid. For the larger, heavier containers, use a cryogenic liquid withdrawal device to transfer liquid from one container to another. Be sure to follow instructions supplied with the withdrawal device. When liquid cylinders or other large storage containers are used for filling, follow the instructions supplied with those units and their accessories.

Do not overfill containers.

Filling above the bottom of the necktube (or specified maximum level) can result in overflow and spillage of liquid when the necktube core or cover is placed in the opening.

Never use hollow rods or tubes as dipsticks.

When a warm tube is inserted into liquid nitrogen, liquid will spout from the top of the tube due to gasification and rapid expansion of liquid inside the tube.

Warning Nitrogen Gas Can Cause Suffocation Without Warning! ▲

Store and use liquid nitrogen only in a well-ventilated place.

As the liquid evaporates, the resulting gas tends to displace the normal air from the area. In closed areas, excessive amounts of nitrogen gas reduce the concentration of oxygen and can result in asphyxiation. Because nitrogen gas is colorless, odorless and tasteless, it cannot be detected by the human senses and will be breathed as if it were air. Breathing an atmosphere that contains less than 18% oxygen can cause dizziness and quickly result in unconsciousness and death.

Note The cloudy vapor that appears when liquid nitrogen is exposed to the air is condensed moisture; not the gas itself. The issuing gas is invisible. ▲

Never dispose of liquid nitrogen in confined areas or places where others may enter.

Disposal of liquid nitrogen should be done outdoors in a safe place. Pour the liquid slowly on gravel or bare earth where it can evaporate without causing damage. Do not pour the liquid on pavement.

Appendix B Handling Liquid CO_2

Warning High concentrations of CO_2 gas can cause asphyxiation! OSHA Standards specify that employee exposure to carbon dioxide in any eight-hour shift of a 40-hour work week shall not exceed the eight-hour time weighted average of 5000 PPM (0.5% CO_2). The short term exposure limit for 15 minutes or less is 30,000 PPM (3% CO_2). Carbon dioxide monitors are recommended for confined areas where concentrations of carbon dioxide gas can accumulate. ▲

Store and use liquid CO_2 only in a well-ventilated place.

As the liquid evaporates, the resulting gas tends to displace the normal air from the area. In closed areas, excessive amounts of CO_2 gas reduce the concentration of oxygen and can result in asphyxiation. Because CO_2 gas is colorless, odorless and tasteless, it cannot be detected by the human senses and will be breathed as if it were air. Breathing an atmosphere that contains less than 18% oxygen can cause dizziness and quickly result in unconsciousness and death.

Note The cloudy vapor that appears when liquid CO_2 is exposed to the air is condensed moisture; not the gas itself. The issuing gas is invisible. ▲

Never dispose of liquid CO_2 in confined areas or places where others may enter.

Disposal of liquid CO_2 should be done outdoors in a safe place. Pour the liquid slowly on gravel or bare earth where it can evaporate without causing damage. Do not pour the liquid on pavement.

Appendix C First Aid

If a person seems to become dizzy or loses consciousness while working with liquid nitrogen or carbon dioxide, move to a well-ventilated area immediately. If breathing has stopped, apply artificial respiration. If breathing is difficult, give oxygen. Call a physician. Keep warm and at rest.

If exposed to liquid or cold gas, restore tissue to normal body temperature (98.6° F) as rapidly as possible, followed by protection of the injured tissue from further damage and infection. Remove or loosen clothing that may constrict blood circulation to the frozen area. Call a physician. Rapid warming of the affected part is best achieved by using water at 108° F. Under no circumstance should the water be over 112° F, nor should the frozen part be rubbed either before or after rewarming. The patient should neither smoke nor drink alcohol.

CE Declaration of Conformity

Manufacturer: Thermo Fisher Scientific (Asheville) LLC
401 Millcreek Road
Marietta, Ohio 45750
U.S.A.

hereby declares under its sole responsibility that the following product(s)

Product Description: ISOTEMP® ULT -86°C General Purpose Freezer

Cat. No.	Model No.	Release Level(s)	Year of Initial Marking
IE1386V	8953	6 & 7	2011
IE1386D	8954	6 & 7	2011
IE1386A	8955	6 & 7	2011
IE1786A	8956	6 & 7	2011
IE1786D	8957	6 & 7	2011
IE1786V	8958	6 & 7	2011
IE2386V	8959	6 & 7	2011
IE2386D	8963	6 & 7	2011
IE2386A	8964	6 & 7	2011
IU1386V	8965	6 & 7	2011

Cat. No.	Model No.	Release Level(s)	Year of Initial Marking
IU1386D	8966	6 & 7	2011
IU1386A	8967	6 & 7	2011
IU1786A	8968	6 & 7	2011
IU1786D	8969	6 & 7	2011
IU1786V	8970	6 & 7	2011
IU2386V	8971	6 & 7	2011
IU2386D	8972	6 & 7	2011
IU2386A	8973	6 & 7	2011
IU2886D	8974	6 & 7	2011
IU2886V	8975	6 & 7	2011

(Release Level [REL#] shown on Serial Tag)

This product conforms to the following European Union Directive(s):

EMC: 2004/108/EC
LVD: 2006/95/EC

This product conforms to the following Harmonized, International and National Standards:

EMC:	**LVD:**
EN 61326-1:2006	EN 61010-1 2nd Edition
EN 61000-3-2	EN 60335-2-34 (applicable sections)
EN 61000-3-3	CSA C22.2 No. 61010-1 2nd Edition
	UL 61010-1 2nd Edition

Mark Bartlett 25 January 2012
Mark Bartlett
Supervisor, EPD

ThermoFisher SCIENTIFIC

Rev. 2

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