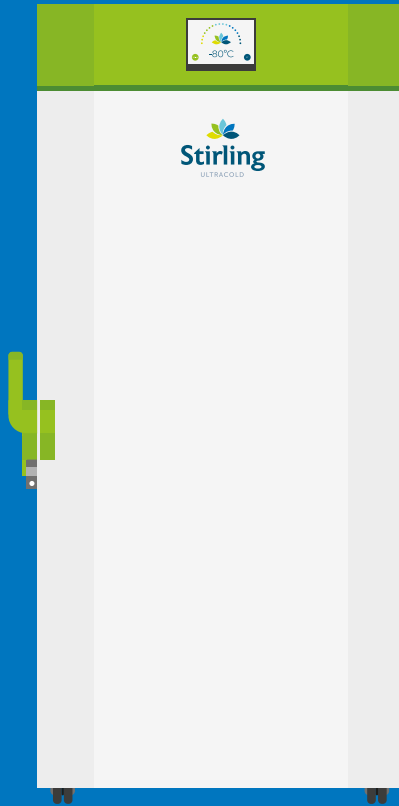




SU780XLE OPERATING MANUAL



Upright Ultra-Low
Temperature Freezer

STIRLING POWER



SU780XLE QUICK GUIDE

INITIAL SETUP

- 1 Unpack freezer unit and included components, ensure all packaging material has been removed from around the fan inlet and outlet holes.
- 2 Adjust the leveling feet (wrench included) to secure the freezer in place.
- 3 Plug AC power cord into the main power socket at the back of the unit and then into an electrical outlet.
- 4 Switch AC power to the "On" position.
- 5 **Notice:** Ensure the access port stopper or sealant is in place. Remove factory tape at the port stopper prior to initial use.
- 6 Review the date, time and temperature set point within the Graphical User Interface and adjust as needed. Default set point is -80°C.

GUIDE TO BASIC GRAPHICAL USER INTERFACE (GUI) FUNCTIONS

| | |
|-----------------|--|
| ON / OFF | Switch the main power on, located at the back of the unit adjacent to the AC cord. |
| Change Setpoint | Tap Home > Set-up > Enter PIN > Enter > Select Setpoint Type > +/- > Save |
| Silence Alarm | Tap on-screen alarm warning. |
| Event Log | Tap Home > Event Log > use ^/v to view |
| Chart History | Tap Home > Chart History > Select Chart History Type > use </> to view |

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GUIDE TO ADVANCED GUI FUNCTIONS

| | |
|----------------|---|
| Alarm Set-up | Tap Home > Set-up > Enter PIN > Enter > Alarms > Select Alarm Type > use +/- to adjust > Save |
| Date and Time | Tap Home > Set-up > Enter PIN > Enter > Date / Time > Select Date/Time component > use +/- to adjust > Save |
| Change PIN | Tap Home > Set-up > Enter PIN > Enter > PIN > Enter New PIN > Enter > Re-enter New PIN > Enter |
| Calibrate RTDs | Requires Authorized Service & PIN Tap Home > Set-up > About > Service > Enter Service PIN > RTD Calib. > Select RTD > use +/- to adjust > Save |

HANDLE OPERATION

The Stirling Ultracold handle is designed for one-handed operation. To open the freezer, rotate handle towards the user approximately 90°. To engage the Power-Release, apply firm downward pressure on the handle while in its open position. The Power-Release assists when the freezer door is adhered to the gasket after long periods of non-use as well as when air pressure is not yet equalized. To close, with handle in the horizontal position, push door to cabinet and return the handle to its original vertical position.

CAUTION: Tipping Hazard

The unloaded freezer is **TOP HEAVY**. Use caution in moving and installation. Do not pitch the freezer more than 12 degrees from horizontal. Doing so may cause it to tip over.

SU780XLE

ULTRA-LOW TEMPERATURE FREEZER -86°C

The SU780XLE model incorporates next generation free-piston Stirling engine technology. Free-piston Stirling engine technology differs from conventional compressor-based refrigeration by providing high efficiency, deep-temperature cooling in a compact package.

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1 INTRODUCTION

1.1 DESCRIPTION

The Stirling Ultracold SU780XLE Ultra-Low Temperature Freezer uses a unique free-piston Stirling engine to provide high efficiency, deep-temperature cooling.

1.2 INTENDED USES

The SU780XLE freezer provides ultra-low temperature storage for general (non-flammable) research laboratory materials requiring a stable, computer-controlled, deeply-frozen environment. The storage of blood or blood products intended for medical purposes is prohibited.

The SU780XLE freezer is classified for use as stationary equipment in a Pollution Degree 2 and Overvoltage Category II environment. The unit is designed to operate under the following environmental conditions:

- Indoor use
- Altitude up to 2000 m
- Maximum relative humidity 80% for temperatures up to 31°C decreasing linearly to 50% relative humidity at 40°C.

1.3 DOCUMENTATION

This operating manual describes all aspects of receiving, installing, set-up, use, moving and storage of the Stirling Ultracold SU780XLE Freezer.

The freezer is controlled with a Graphical User Interface (GUI). This operating manual describes use of the GUI in Section 5.

1.4 ORGANIZATION OF THIS MANUAL

This manual is organized as follows:

- Features
- Safety Precautions
- Unpacking and Installation
- Operation
- Transporting, Moving and Storage
- Preventative Maintenance
- Troubleshooting
- Specifications
- Warranty.

Please note that precautions and safety instructions are part of each section and must be observed to avoid damage to the freezer or harm users.

1 INTRODUCTION (Continued)

USER ADVISORY:

Deep temperatures are dangerous, use proper precautions when operating ultra-low temperature freezers. This ultra-low temperature freezer is intended for storage of frozen sample product or vials at deep temperatures. Stirling Ultracold, a Division of Global Cooling, Inc. cannot be held responsible for damages or loss of stored product attributed to unintended use. In no case will Stirling Ultracold, a Division of Global Cooling, Inc. be held liable for loss of stored product resulting from electrical, mechanical or structural failure. As with any ultra-low temperature freezer, appropriate back-up and redundancy considerations are the responsibility of the user.

To assure the correct use of the product, basic safety measures should always be followed including the warnings and cautions listed on the product and in this operating manual.

Hazard Symbols



This symbol used alone indicates important operating instructions which reduce the risk of injury or poor performance of the unit.



CAUTION: This symbol, in the context of a CAUTION, indicates a potentially hazardous situation which if not avoided could result in minor to moderate injury or damage to the equipment.



WARNING: This symbol, in the context of a WARNING, indicates potentially hazardous situations which, if not avoided, could result in serious injury or death.



Flammable warning messages alert the user to possible risks of personal injury and equipment damage.

Degrees of Danger

DANGER Will lead to severe injuries or death

WARNING May lead to severe injuries or death

CAUTION May lead to light to moderate injuries

NOTICE May lead to material damage

FLAMMABLE REFRIGERANT USE:

SU780XLE uses 90 grams of R-170 (Ethane) in a hermetically sealed thermosiphon tubing. It requires caution in use and repair.

- A Danger** – Risk of Fire or Explosion. Flammable Refrigerant Used.
Do Not Drill or Puncture Inner Liner.
- B Danger** – Risk of Fire or Explosion. Flammable Refrigerant Used.
To be Repaired Only by Trained Service Personnel. Component Parts Shall Be Replaced With Like Components. Do Not Puncture Refrigerant Tubing.
- C Caution** – Risk of Fire or Explosion. Flammable Refrigerant Used.
Consult Repair Manual/Owner's Guide Before Attempting to Service this Product. All Safety Precautions Must be Followed.
- D Caution** – Risk of Fire or Explosion. **Dispose of Properly in Accordance with Federal or Local Regulations.** Flammable Refrigerant Used.
- E Caution** – Risk of Fire or Explosion Due to Puncture of Refrigerant Tubing;
Follow Handling Instructions Carefully. Flammable Refrigerant Used.

2.1 FREE-PISTON STIRLING ENGINE

The SU780XLE Ultra-Low Temperature Freezer uses the Stirling Ultracold Model M600 free-piston Stirling engine to provide high efficiency, deep-temperature cooling. No HCFC or CFC refrigerants are used in the M600 and SU780XLE. The M600 Stirling engine uses approximately 10 grams of helium gas as a working fluid. Approximately 90 grams of R-170 (Ethane) is used in the thermosiphon which removes heat from the freezer.

2.2 CABINET DESIGN FEATURES

The cabinet utilizes vacuum-insulated panels with non-HFC polyurethane foam support providing an internal volume of approximately 780 liters. The environmentally friendly blowing agent is Ecomate®. Door sealing consists of three gaskets that are fully replaceable. The handle uses cam-actuated, 90° rotation to apply a mechanical advantage in opening the freezer door. An integrated door gasket heater minimizes water or ice deposits on the gasket interface.

2.3 HANDLE FEATURES

The Stirling Ultracold handle is designed for one-handed operation. A Power-Release cam assists when the freezer door is adhered to the gasket after long periods of non-use as well as when air pressure is not yet equalized.

2.4 TEMPERATURE MONITORING FEATURES

One Resistance Temperature Detector (RTD) measures the internal cabinet temperature of the SU780XLE. The RTD provides input to the controller and the GUI (Graphical User Interface) display for reporting and logging. The RTD may be calibrated by the user through the GUI. The GUI provides a door open time-out alarm and monitors the temperature for instances beyond high and low limits. These limits can be set automatically or adjusted manually. Alarms are reported through an audible alarm in the freezer enclosure and through a contact closure that may be connected to an external alarm. The GUI provides options to temporarily suppress alarms and set a delay time before the alarm is reported via the contact closure.

2.5 GRAPHICAL USER INTERFACE (GUI)

The Graphical User Interface (GUI) is implemented on a touch screen control panel on the front of the cabinet. The GUI allows the user to:

- Set freezer control, alarm and communications parameters
- Provide password protected access to parameter changes
- Display freezer status
- Display temperature graph and event log
- Display diagnostic and service information
- Display freezer identification information.

The following SU780XLE parameters are accessed and modified through the GUI touch screen (for complete instructions see Section 5).

| Accessible Values | Modifiable Values |
|--|---|
| > Current freezer temperature | > Temperature setpoint |
| > Temperature history chart | > Under temperature limit |
| > Alarm status | > Over temperature limit |
| > Event log | > Over temperature alarm delay after door opening |
| > Battery information | > Audible alarm silence duration |
| > "About" screen (general information) | > External contact alarm delay |
| > Service contact information | > Door open alarm delay |
| | > Door defrost percentage |
| | > Password Identification Number (PIN) |
| | > Current date |
| | > Current time |
| | > RTD calibration adjustments |

2.6 PICTORIAL TOUR

- 1 Mechanical compartment containing M600 Stirling engine
- 2 Temperature recorder location (optional)
> Factory or field installed
- 3 LCD Display and Graphical User Interface (GUI)
- 4 Magnetic latching inner doors
- 5 Vacuum relief port (interior, not shown)
- 6 Recessed electrical panel
 - A AC Power Switch
 - B AC Power Connector – Universal power input 120 to 240VAC at 50/60 Hz, single phase
 - C Seismic Strap Anchor Location (accepts - 5/16" -18 x 5/8" screw)
- 7 Recessed accessory panel
 - C Seismic Strap Anchor Location (accepts - 5/16" -18 x 5/8" screw)
 - D External Alarm Terminal (dry contacts), 4-20mA (optional)
[(+) : (-) : G : NC : NO : C]
(+) – Positive
(-) – Negative
G – Ground
NC – normally closed, opened at alarm
NO – normally opened, closed at alarm
C – common
 - E CO₂/LN₂ Backup connector (optional - factory or field installed)
 - F Ethernet Port
- 8 Air vent
- 9 Outer door hinges
- 10 Access port for independent thermocouple
> 0.5" (12.7 mm) with plug
- 11 Cabinet breaker
- 12 Dual-wheel casters and leveling feet at front casters
- 13 Stainless steel shelves (shown with 2 shelves)
> Adjustable on 0.5" (12.7 mm) centers
- 14 Temperature sensor (RTD)
- 15 Lockable door handle
- 16 Flexible door gasket
- 17 Electrical grounding stud
> Inside mechanical compartment, not shown

2.7 INCLUDED ITEMS

- Packing List
- Operating Manual (this document)
- Quick Guide
- Port Sealant
- Dry Contacts Plug
- 2 Keys
- Ice Scraper
- 1 Wrench



CAUTION: Tipping Hazard

The unloaded freezer is **TOP HEAVY**. Use caution in moving and installation. Do not pitch the freezer more than 12 degrees from horizontal. Doing so may cause it to tip over.

Potential hazards associated with use of the SU780XLE freezer may impact the safety of persons in the workplace in which the freezer is installed. This includes persons who operate the freezer, and other personnel in its vicinity. The freezer itself may also be damaged and/or its warranty voided by improper operation or usage. All personnel that install, operate, transport or place the freezer into storage should read this entire manual to understand those hazards. Consider storing this manual for ready reference within close proximity of the freezer.

Specific precautions are included in each section of this operating manual. However, several important general precautions must be observed and are described below.

- **Do not** disassemble, modify or repair.* There are no user serviceable parts inside the freezer unit. Contact Stirling Ultracold for authorized repair procedures as required.
- **Do not** immerse in water, pour water on the unit, or operate where water may drip or fall on the unit. Operation under extreme environmental conditions, e.g., in very high humidity environments (RH 85% or more) also may lead to condensation or water intrusion.*
- **Do not** modify the cabinet, controls or free-piston Stirling engine.*
- **Do not** cut, change or modify the power cable.*
- **Do not** store flammable items such as gasoline, thinner or solvents in the freezer
 - > The freezer is NOT designed for Flammable Material Storage or rated as an explosion-proof freezer.
- **Do not** use hard and/or sharp objects, such as knives, screwdrivers, etc. to remove any frost or ice that has accumulated on the inside of the freezer. The inside panels are heat exchangers and can be damaged. Defrosting the cabinet is described later in this operating manual.
- **Do not** use solvents to clean the panel or the outside or inside of the freezer.
- **Do not** remove the power cable by pulling on the cable, instead grasp the plug firmly and pull away from the outlet.
- **Do not** block the air vents from the mechanical compartment.
 - > 4" clearance on right side of unit is recommended.

*Doing so will void the warranty.

3 SAFETY PRECAUTIONS (Continued)

- Frostbite can occur instantly at -86°C. Safe operating procedures are essential.
 - > **Do not** handle samples or freezer accessories with bare hands. Be especially careful not to spill ultra-low temperature materials onto skin or clothing.
 - > **Do not** use gloves that become brittle at ultra-low temperatures.
 - > Nitrile and latex gloves are inadequate.
 - > Permeable gloves are dangerous because frozen materials can contact skin and cause damage.
 - > Be especially careful that materials at low temperatures are not spilled onto skin or clothing.
- Ultra-low temperatures may adversely impact freezer contents:
 - > **Do not** put ice or liquid water directly in the freezer box; always use suitable containers.
 - > Use only sample containers that have been approved or tested for ultra-low temperature use.
 - > **Do not** use glass containers when the contents might freeze and expand.
 - > Some plastics shatter at ultra-low temperatures. Avoid splinter hazards.
 - > Biological and chemical hazards are still hazardous at ultra-low temperatures. Always wear proper protective equipment and follow appropriate isolation protocols.
 - > Many types of labels will fall off and/or break at ultra-low temperatures. Some types of ink which stick to glass and/or plastic at room temperature lose adhesion at ultra-low temperature.
- In addition to the ultra-low temperature hazards above, there are also physical hazards to consider:
 - > Be cautious when closing the door to avoid a pinching hazard.
 - > Be careful when loading the cabinet with heavy items.

4 SITE QUALIFICATION & SETUP

NOTE: Prior to installing the SU780XLE, inspect the unpacked unit and any included items for shipping damage. Compare all contents to the packing list for completeness.

4.1 FREEZER SITE QUALIFICATION

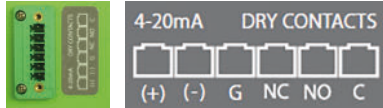
- 1 Note the shipping dimensions of 2134 x 1092 x 1168 mm (84" H x 43" D x 46" W) and shipping weight of 347 kg (765 lbs).
- 2 Be mindful when moving the shipment from the point of receipt to the place where it will be unpacked. The installation site must accommodate the freezer exterior dimensions of 1994 x 870 x 915 mm (78.5" H x 34.3" D x 36" W) and weight of 297 kg (655 lbs).
- 3 There are no specific required clearances for the top and back of the freezer; however allowances must be made for electrical connections to the panel on the back of the freezer. The left side requires appropriate space for handle access. The right side requires appropriate space for door opening and air vent.
- 4 The access port must be plugged at all times for normal operation. Ingress to the access port (see Section 2.6) is required during normal operation.
- 5 The freezer should be installed on a level surface. The leveling feet can accommodate small variations.
- 6 There must be sufficient room to fully open the freezer door in order to access contents.
- 7 The facility/room lighting must not obscure the readability of the touch screen display and must provide good visibility for working with the contents of the freezer.
- 8 Do not block the air vents from the mechanical compartment. 4" clearance on right side of unit is recommended.
- 9 Care must be taken while unpacking and installing the freezer. Be mindful of its size and weight. Dropping the freezer is likely to damage it.
- 10 **TIPPING HAZARD:** Do not pitch the freezer more than 12 degrees from horizontal. Doing so may cause it to tip over. **CAUTION: TOP HEAVY.**

4.2 SETUP

- 1 Unpack freezer unit and included components, ensure all packaging material has been removed from around the fan inlet and outlet holes.
- 2 Adjust the leveling feet (wrench included) to secure the freezer in place.

3 Before switching on electrical power to the freezer, make all desired external connections:

- A AC power connection
- B External alarm



- 4 Switch the AC power to the "On" position.
- 5 **Notice:** Ensure the access port stopper or sealant is in place. Remove factory tape at the port stopper prior to initial use.
- 6 Review the date, time and temperature setpoint within the Graphical User Interface and adjust as needed. Default setpoint is -80°C.
- 7 A one-time temperature alarm suppression provided by the software allows for the initial cooling of the freezer after start-up.
- 8 After the freezer reaches its operating temperature and its door is opened and closed, the partial vacuum created when warm air is admitted, then cooled, will prevent reopening of the door until the pressure is equalized. A vacuum relief port is provided to accelerate this process.
- 9 Be mindful of any electrical shock hazards associated with making electrical connections to the freezer, especially the external alarm connection.

5.1 RESPONSIBLE OPERATION

Responsibility for freezer operation should be part of the policy and procedure documentation or guidelines for the clinical, laboratory, or other activity for which the freezer is used. Safety requirements are integral to these responsibilities. Use this product only in the way described in the product literature and in this manual. Before using it, verify that this product is suitable for its intended use. If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

5.2 HANDLE OPERATION

The Stirling Ultracold handle is designed for one-handed operation. To open the freezer, rotate handle towards the user through an angle of about 90°. To engage the Power-Release, gently apply firm, downward pressure on the handle while in its open position. The Power-Release assists when the freezer door is adhered to the gasket after long periods of non-use as well as when air pressure is not yet equalized. To close, with handle in the horizontal position, push door to closed position and return the handle to its original vertical position.

5.3 GRAPHICAL USER INTERFACE (GUI)

Values for the following SU780XLE parameters are viewed and modified through the GUI touch screen.

5.3.1 Modifiable Values

The GUI is pre-programmed with default values for most parameters. Unless temperature limits are set manually, the software calculates default values appropriate for the temperature setpoint.

| Accessible Values | Modifiable Values |
|--|---|
| > Current freezer temperature | > Temperature setpoint |
| > Temperature history chart | > Under temperature limit |
| > Alarm status | > Over temperature limit |
| > Event log | > Over temperature alarm delay after door opening |
| > "About" screen (general information) | > Audible alarm silence duration |
| > Service contact information | > External contact alarm delay |
| | > Door open alarm delay |
| | > Door defrost percentage |
| | > Password Identification Number (PIN) |
| | > Current date |
| | > Current time |
| | > RTD calibration adjustments |

5.3.2 PIN

A Password Identification Number (PIN) may be set, but is not displayed. Use the PIN to restrict access to GUI controls. The default PIN is 1234 and may be changed by the user to any four-digit numeric code or disabled.

5.3.3 GUI Menu

A hierarchical menu system is used to display and adjust system values. Each screen has a button to return to the default "Home" screen and a "Back" button to return to the prior level of the menu. Screen names (where applicable) are within brackets.

Home – display of current freezer temperature.

Data – display of current freezer temperature, system date and time, temperature setpoint and door defrost status (if at 0%).

- **Set-up** – display current temperature setpoint. *PIN required if enabled.*
 - > **Alarms** – display and change alarm delay settings
 - **Temp. Delay (min)** – duration of time in which the audible alarm is delayed when temperature is out-of-specification.
 - **Silence Dur. (min)** – duration of time in which the audible alarm is delayed after the "Silence" button is tapped.
 - **Ext. Delay (min)** – duration of time in which the alarm dry contact activation is delayed after the alarm condition is detected.
 - **Door Delay (min)** – duration of time that the door may remain open before an audible alarm sounds.
 - > **Battery Info** – display battery voltage and current information.
 - > **Date/Time** – display and change system date and time.
 - > **Door Defrost** – adjust defrost heater between 0 to 100%. A warning will be displayed on 'Home' screen if set to 0%.
 - > **Setpoint** – display and adjust over temperature setpoint, temperature setpoint, and under temperature setpoint
 - > **PIN** – disable/enable the system PIN and change PIN.

- **Event Log** – track the last 200 alarm conditions such as: door openings, temperature setpoint changes, over temperature condition, and power outages.
- **Chart History** – display the cabinet interior air temperature over the last 12 hours, 24 hours or 7 days. Increase chart resolution by tapping the screen.
- **About** – display freezer model number, serial number, firmware version, engine number, run hours, temperature setpoint, and date.
 - > **Alarm Test** – test the system alarm.
 - > **Service Contact** – display manufacturer contact information.
 - > **Service** – display temperature setpoint, cabinet and cold-head RTD temperatures, warm-head thermistor temperature, as well as engine voltage, current and power. *Service screen information is used for service by authorized personnel only. Service PIN required.*
 - **RTD Calib.** – display RTD readings and calibration offsets. Calibration is used to compensate for discrepancies between Display RTD and user-supplied temperature measurement.

5.3.4 Basic GUI Controls

- To change a value on the screen:
 - > Tap the appropriate button to highlight the parameter
 - > Use the +/- or </> buttons to enter the desired value
 - > Then use the "Save" button to complete the change.
- Each screen has a button to return to the default "Home" screen and/or a "Back" button to return to the prior level of the menu.
- PINs are entered through a numeric keypad screen with an "Enter" button to complete the entry and a "Cancel" button to terminate the entry.
- PINs may be disabled on the **PIN** screen by leaving the new PIN value blank. *When the PIN is disabled, any person can perform all actions available via the GUI, including changing the temperature setpoint and alarm settings.*

Guide to Basic GUI Functions

| | |
|------------------------|--|
| ON / OFF | Switch the main power on, located at the back of the unit adjacent to the AC cord. |
| Change Setpoint | Tap Home > Set-up > Enter PIN > Enter > Select Setpoint Type > +/- > Save |
| Silence Alarm | Tap on-screen alarm warning. |
| Event Log | Tap Home > Event Log > use ^/v to view |
| Chart History | Tap Home > Chart History > Select Chart History Type > use </> to view |

Guide to Advanced GUI Functions

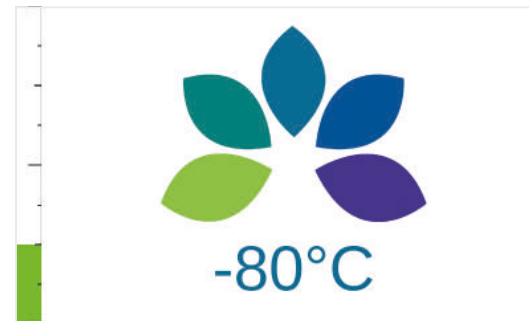
| | |
|-----------------------|--|
| Alarm Set-up | Tap Home > Set-up > Enter PIN > Enter > Alarms > Select Alarm Type > use +/- to adjust > Save |
| Date and Time | Tap Home > Set-up > Enter PIN > Enter > Date / Time > Select Date/Time component > use +/- to adjust > Save |
| Change PIN | Tap Home > Set-up > Enter PIN > Enter > PIN > Enter New PIN > Enter > Re-enter New PIN > Enter |
| Calibrate RTDs | Requires Authorized Service & PIN Tap Home > Set-up > About > Service > Enter Service PIN > RTD Calib. > Select RTD > use +/- to adjust > Save |

5.3.5 GRAPHICAL USER INTERFACE (GUI) INSTRUCTIONS



1 Power Up:

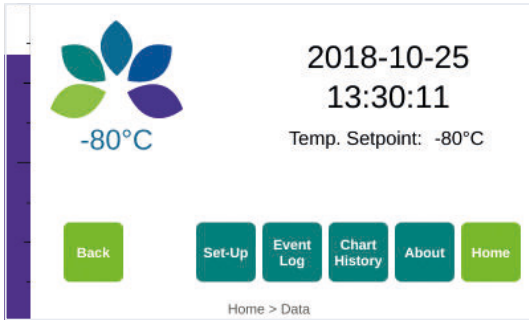
The Power Up screen will appear for 20 seconds when the freezer is initially turned on.



2 Home:

The Home Screen displays the current temperature of the freezer.

- Tap the display to access the Data screen



3 Data:

Home > Data

- Tap the **Set-up** button to change temperature setpoints and access menus for battery alarm, alarms, date & time, door defrost and PIN*
- Tap the **Event Log** button to view the last approximately 200 events
- Tap the **Chart History** button to view the cabinet air temperature over the last 12 hours, 24 hours or 7 days
- Tap the **About** button for freezer information including serial number, service contact and alarm test

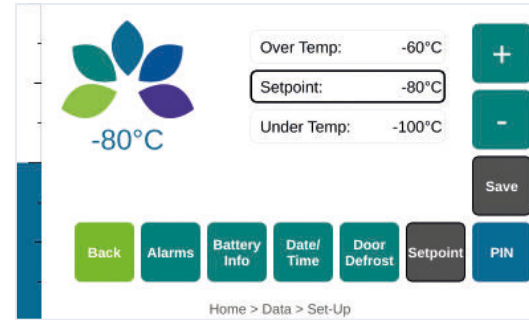
*Accessing GUI menus within Set-up requires a PIN (if PIN is enabled)



4 PIN Entry Screen:

Home > Data > Set-up (if PIN is enabled)

- Tap **1 2 3 4** (default PIN)
- Tap **Enter**

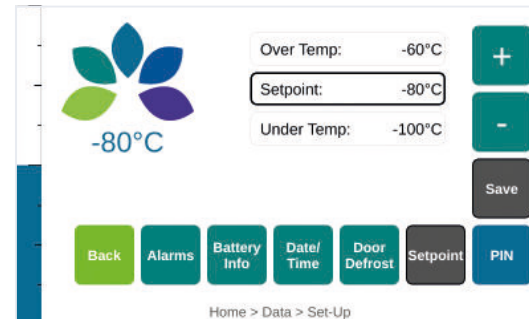


5 Set-up:

Home > Data > Set-up > Enter PIN > Enter

The Set-up screen displays the over temperature, current temperature, and under temperature setpoints.

- Tap the **Alarms** button to view/change the alarm delays
- Tap the **Battery Info** button to view battery details
- Tap the **Date /Time** button to view/change system date and time
- Tap the **Door Defrost** button to view/change defrost percentage
- The **Setpoint** button is pre-selected. User can view/change the setpoints on this screen
- Tap the **PIN** button to change or disable the PIN

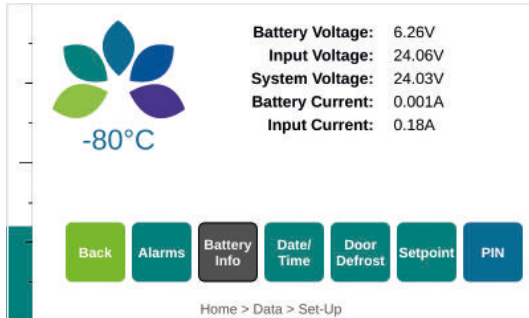


6 Setpoint:

Access this screen to change the temperature setpoint or over/under temperature thresholds.

Home > Data > Set-up > Enter PIN > Enter

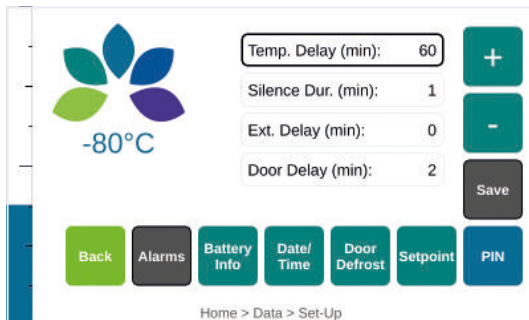
- Select the appropriate setpoint type, use the **+** and **-** buttons to adjust, then tap **Save**. (Note: If **Save** is not tapped, new values will not be used.)
- Over and Under Temperature thresholds can be no less than 4°C and no more than 20°C from the setpoint
- Over and Under Temperature thresholds will automatically be kept within this range



7 Battery Information:

Home > Data > Set-up > Enter PIN > Enter > Battery Info

View battery, input, and system voltage as well as battery and input current information.

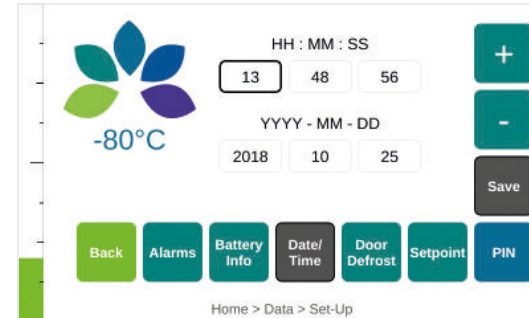


8 Alarms:

Access this screen to view or alter freezer alarms.

Home > Data > Set-up > Enter PIN > Enter > Alarms

- Select the appropriate alarm type, use the + and – buttons to adjust to preferred delay/duration (in minutes), then tap **Save**. (Note: If Save is not tapped, new values will not be used).
 - **Temp. Delay** [Temperature Delay] delays the over temperature alarm (from 1 to 120 mins) after a door opening
 - **Silence Dur.** [Silence Duration] delays alarm for a specified period of time (from 1 to 120 mins) when silence is tapped
 - **Ext. Delay** [External Delay] delay (from 0 to 120 mins) between audible alarm and remote alarm
 - **Door Delay** [Door Delay] period of time (from 1 to 10 mins) that the door can be open before alarm sounds



9 Date/Time:

Access this screen to enter date and time values.

Home > Set-up > Enter PIN > Enter > Date / Time

- Select the appropriate time/date component, use the + and - buttons to adjust, then tap **Save**



10 Door Defrost:

Adjust defrost heater levels percent based on 30 minute periods.

Tap **Home > Set-up > Enter PIN > Enter > Door Defrost**

- Use the + and – buttons to adjust the percent then tap **Save**
 - 100% turns the heater on for maximum duty cycle
 - 60% is recommended for most laboratory environments
 - 0% provides no-defrost heating (Note: Warning will display on Data screen.)

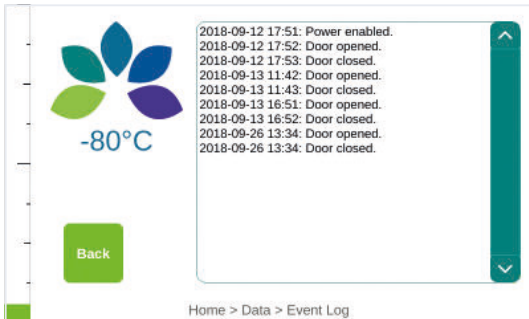


11 PIN:

By default the PIN is enabled with the value of 1-2-3-4. Use the PIN screen to change or disable the PIN.

Home > Data > Set-up > Enter PIN > Enter > PIN

- To change the PIN:
 - Using the keypad, enter a new 4 digit PIN then tap **Enter**.
 - You will then be prompted to re-enter the new PIN, then tap **Enter**
- To disable the PIN:
 - Leave the Enter New PIN field blank and tap **Enter**. Leave the Re-Enter New PIN field blank and tap **Enter**. PIN is disabled and user is returned to the Set-up Screen



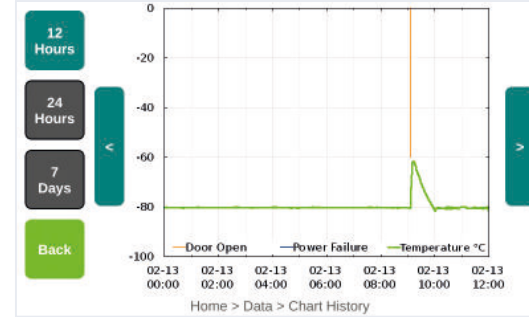
12 Event Log:

The Event Log will display the last approximately 200* events in about 30 pages, listing 7 events per page. The last 7 events are shown by default. Events beyond 30 pages will not be saved.

Home > Data > Event Log

- Tap the **^** or **v** to scroll

*Approximate because the length of the stored parameter changes depending on the event. Once the registers are full, the oldest data is deleted to make place for the newest data.

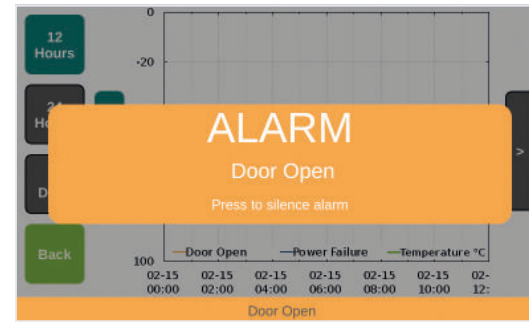


13 Chart History:

The Chart History screen will display the internal air temperature of the freezer for the previous 11 months in 12 hour, 24 hour, or 7 day increments.

Home > Data > Chart History

- Tap **12 Hours**, **24 Hours** or **7 Days** as desired
- Tap **<** or **>** to adjust time/date in view



14 Alarm:

In the event of an Alarm event, a warning will be seen on each screen informing the user of the reason for the alarm. Tap the warning to silence the alarm.

**15 About:**

Access this screen to observe specific freezer information including Model Number, Serial Number, Firmware Version, Inverter Version, Engine Number, Run Hours, Power Up Hours, and IP Address.

Home > Data > About

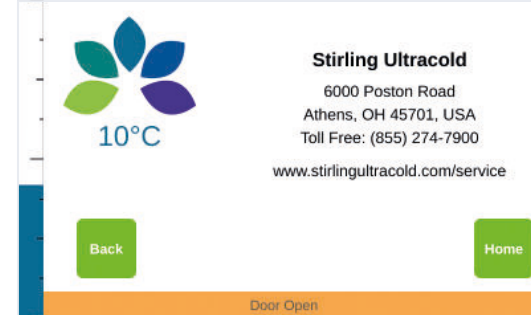
- Tap **Alarm Test** button to test alarms
- Tap **Service Contact** to see service contact information
- Tap the **Service** button to view freezer parameters such as RTD temperatures and engine voltage, current, and power

**16 Alarm Test:**

Use this button to test the alarms.

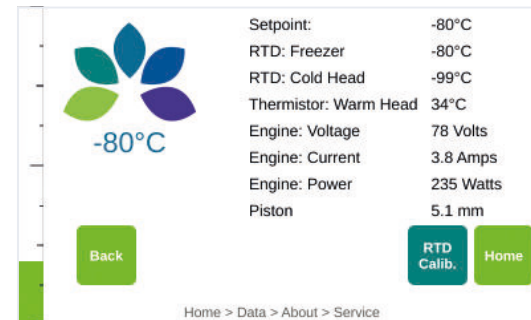
Tap **Home > Data > About > Alarm Test**

- Tap the **Alarm Test** button to test temperature alarm
 - Alarm sounds and the alarm test button becomes orange (see above)
- Tap the **Alarm Test** button again to silence the alarm
 - Alarm is silenced and button returns to its original color

**17 Service Contact:**

The Service Contact Screen provides manufacturer contact information.

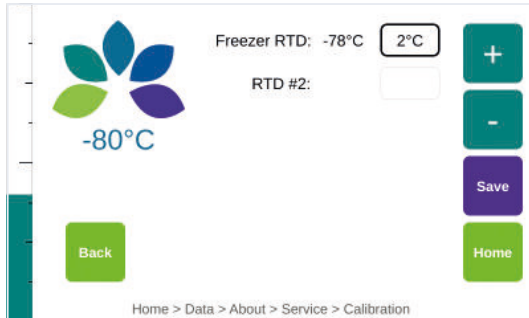
Home > Data > About > Service Contact

**18 Service:**

The service screen provides technical information needed for service as well as RTD calibration. This screen is accessible only through the use of the service-PIN number.

Home > Data > About > Service > Enter Service PIN > Enter

- Tap the **RTD Calib.** button to calibrate the RTD(s)



19 Calibration:

RTD Calibration Screen is used to compensate for discrepancies between the Display RTD and a user provided standard. This screen requires Authorized Service & PIN.

Home > Data > About > Service > Enter Service PIN > Enter > RTD Calib.

- Tap to select the desired RTD, then use the + and – buttons to adjust the offset, then tap **Save**

5.4 MANAGING FREEZER CONTENTS

The SU780XLE freezer is designed for long-term storage of sample materials with ultra-low, well-regulated temperature storage requirements.

- The temperature setpoint for the freezer should be changed as appropriate for the materials being stored using the Graphical User Interface (GUI) – adjusting the high and low temperature limits as necessary.
- The current freezer temperature is displayed on the Home screen, and a temperature history chart is available within the set-up screen.
- Materials may be placed in the freezer in any convenient arrangement that does not block the access port, interfere with the door gasket, or prevent the door from closing completely.
- For best results operate freezer at full capacity with real or simulated product to increase the thermal mass, displace air, and maintain optimal stability.
- Please review the safety precautions in Section 3.

5.5 CLEANING

Cleaning the Freezer Surfaces

- Clean the exterior surfaces of the SU780XLE cabinet as needed by using a soft cloth and mild detergent. Do not use solvent (such as bleach) or harsh abrasive cleansers or pads.
- In the event of excess ice accumulation, remove any ice that accumulates inside the freezer by defrosting it.
 - > Transfer the contents of the freezer to alternate storage, switch off the power to the freezer and wait for the ice to melt.
 - > Wipe up moisture with a clean cloth. If the freezer door can be left ajar safely, defrosting will be more rapid.
 - > After defrosting the freezer, switch the power back on. When the temperature reaches the setpoint, return the contents to the freezer.
- Refer to Safety Precautions (Section 3) of this Operating Manual while defrosting the freezer.

5.6 CALIBRATION OF THE RESISTANCE TEMPERATURE DETECTOR (RTD)

The SU780XLE RTD may be calibrated by inserting a temperature sensor through the access port of the cabinet wall and securing it next to the RTD located in the right rear corner of the interior, just above the shelf.

- To provide access to the RTD, it may be necessary to transfer the contents of the freezer to alternate storage. Note the Safety Precautions in Section 3 of this Operating Manual while making such transfers.
- Navigate to the RTD Calibration screen using the Graphical User Interface (GUI). This requires a Service PIN.
- To change offsets:
 - > Use the “+” and “-” buttons to adjust the offset to the desired value.
 - > Tap “Save”.

5.7 SAFETY PRECAUTIONS

To assure the correct use of the product, basic safety measures should always be followed, including the warnings and cautions listed on the product and in this operating manual.

Hazard Symbols

This symbol used alone indicates important operating instructions which reduce the risk of injury or poor performance of the unit.



CAUTION: This symbol, in the context of a CAUTION, indicates a potentially hazardous situation which if not avoided could result in minor to moderate injury or damage to the equipment.



WARNING: This symbol, in the context of a WARNING, indicates potentially hazardous situations which, if not avoided, could result in serious injury or death.



Flammable warning messages alert the user to possible risks of personal injury and equipment damage.

Degrees of Danger

DANGER Will lead to severe injuries or death

WARNING May lead to severe injuries or death

CAUTION May lead to light to moderate injuries

NOTICE May lead to material damage

6 TRANSPORTING, MOVING AND STORAGE

To move the freezer to another location or temporarily place it into storage, perform the following steps:

- Transfer the contents of the freezer to alternate storage. Refer to Safety Precautions (Section 3) of this Operating Manual while making such transfers.
- Shut down the freezer by turning off the power and allowing it to come to room temperature.
- Dry the inside of the freezer compartment and clean any spills.
- Disconnect wires and cable connected to the freezer. See Section 4.2 “Setup” for precautions associated with this task.
- Disinfect with suitable sterilizing agent if the freezer has been used for biohazards. Do not use bleach.
- Close and secure the door to the freezer.
- Move the freezer. See Section 4 for precautions associated with this task.

7 PREVENTATIVE MAINTENANCE & SERVICE

The SU780XLE freezer is designed for years of trouble-free operation. To prevent costly and inconvenient repairs and maintain your freezer to an optimum level of performance, follow the recommended preventative maintenance schedule and contact an authorized service provider as needed.

7.1 MONTHLY MAINTENANCE

7.1.1 De-ice Gaskets and Breaker

Remove any frost buildup from around door, door gaskets, and breaker using the provided scraper or a soft cloth.

7.1.2 Inspect Vacuum Relief Port

Ensure vacuum relief port is free of frost or ice at the vacuum breaker. Clear any ice using provided scraper.

7.2 YEARLY MAINTENANCE

To be performed only by an authorized service provider.

7.2.1 Check and Clean Heat Reject Fins

CAUTION: Stored voltage hazard – performed by authorized service provider only.

CAUTION: Cover is in two parts and together weighs approximately 24 lbs.

7.2.2 Check Door Alignment

Check that door alignment is correct and allows the door latch to be easily engaged.

7.3 BIENNIAL MAINTENANCE

To be performed only by an authorized service provider.

7.3.1 Replace Battery

CAUTION: Stored voltage hazard – performed by authorized service provider only.

CAUTION: Cover is in two parts and together weighs approximately 24 lbs.

CAUTION: Only use a sealed lead acid rechargeable battery (6V, 7Ah) as specified. Power-Sonic (PS-670) replacement batteries can be purchased from Stirling Ultracold (Part# SU105U-A000).

WARNING: Using a non-rechargeable battery may cause the battery to leak or explode and in extreme cases the battery may burst into flames. Non-rechargeable batteries contain dangerous chemicals which may escape if used, causing serious health hazards.

7.4 POWER CORD REPLACEMENT

CAUTION: Contact an authorized service provider before replacing mains/power cord. Cord must be rated at a minimum of 250V and 12A. Cord must be approved by the following agencies: UL and CSA. If the freezer's voltage rating does not match your mains/electrical supply, or if the plug on the mains/power cord does not fit the outlet, do not plug in the freezer.

| Problem | Possible Cause | Solution |
|---|---|--|
| Freezer does not power on | Power is not getting to the freezer from the Power Supply | Check the connections of the AC cord Assure that the wall plug is firmly seated |
| | Inadequate air circulation | Remove airflow obstructions from external fan inlet and outlet vents |
| Freezer does not achieve or maintain desired setpoint | Inadequate power | Assure that the wall plug is firmly seated |
| | Improper environment | Remove freezer from direct sunlight, hot room, etc. Check that freezer is level. Tilts of more than 5 degrees in some directions will degrade performance |
| | Door is not completely closed | Check for ice buildup, remove if necessary, and properly close door |
| Freezer recovers/ returns to set point slowly | Door is open and closed too often | Minimize opening and closing of door |
| | Inadequate air circulation | Unblock air vents |

Note

This freezer is designed for storage of frozen product. For best results:

- Operate your freezer at full capacity with real or simulated product to increase the thermal mass, displace air and maintain optimal stability
- Minimize the frequency and duration of door openings.

9 SPECIFICATIONS

9.1 FREEZER SPECIFICATIONS

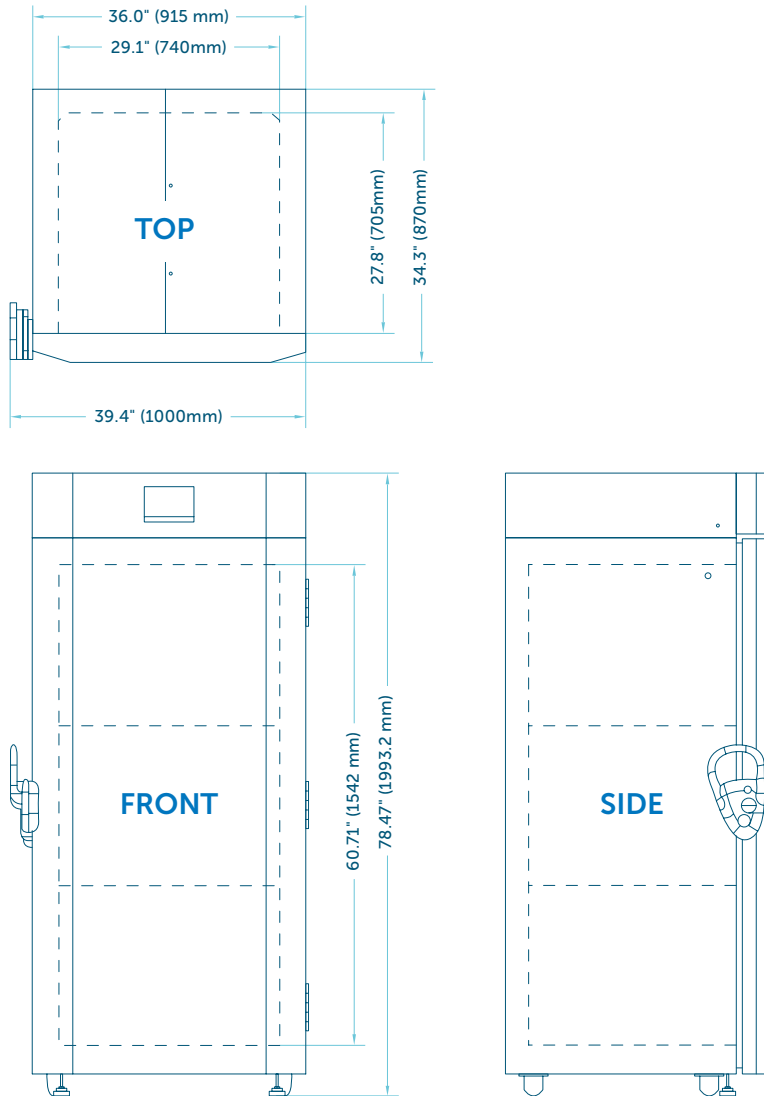
| | |
|---|--|
| Electric Power | 100 - 240VAC at 50/60Hz (Japan) 120 - 240VAC at 50/60Hz (All other regions) |
| Maximum Power (Current) | 1200 watts (10 amps @120V, 5 amps @240V), nominal |
| Electric Supply Rating | 15 amp or greater grounded circuit |
| Cooling Engine | Helium charged free-piston Stirling engine |
| Heat Transport System | Gravity driven thermosiphon |
| Refrigerant, Thermosiphon | R-170 (Ethane) CFC/HCFC-Free, 90 grams <i>To be repaired only by trained service personnel.</i> |
| Risk of fire or explosion. Flammable refrigerant used. Do not drill or puncture inner liner. | <i>Component parts shall be replaced with like components.</i> <i>Consult Service Manual before attempting to service this product. All safety precautions must be followed.</i> <i>Dispose of properly in accordance with federal or local regulations.</i> <i>Follow handling instructions carefully.</i> |
| Temperature Range | -86°C to -20°C adjustable to 1°C increments |
| Ambient Operating Temperature | +5°C to +35°C (41°F to 95°F) |
| Warehouse Storage Temperature | -5°C to +60°C (23°F to 140°F) at RH 65% |
| Operational Environment | This ultra-low temperature freezer is designed for use in a normal laboratory environment. Avoid unusual dust or particulate circulation. |

9 SPECIFICATIONS (Continued)

9.1 FREEZER SPECIFICATIONS (Continued)

| | |
|---------------------------------------|--|
| Useful Life | 12 years, nominal |
| Volume | 780 liters (27.5 cu.ft.) |
| Interior Dimensions | 1542 x 705 x 740 mm (60.7" H x 27.8" D x 29.1" W) |
| Exterior Dimensions | 1994 x 870 x 915 mm (78.5" H x 34.3" D x 36" W) |
| Net Weight, 5 Shelves, No Load | 297 kg (655 lbs.) |
| Shelf Capacity | Maximum 3.175mm (0.125") deflection with 68 kg (150 lbs.) evenly distributed |
| Insulation | High performance vacuum insulated panels and polyurethane foam using the Ecomate® environmentally friendly, SNAP-compliant blowing agent |
| Noise | < 48 dB(A) at 1 meter from front of freezer in steady state operation |
| Control Sensor | One RTD (PT100 Class A) |
| Dry Contacts | Positive, Negative, Ground, Normally Closed, Closed, Normally Open, and Common; activated by power outage or any alarm condition |
| Battery Back-up | 12 hour control battery back-up for touchscreen |

9.2 FREEZER DIMENSIONS



9.3 PERFORMANCE DATA

EMPTY CABINET

| | |
|--|---|
| Setpoint | -80°C |
| Steady State Energy Use (ENERGY STAR® Final Test Method) | 6.67 kWh/day at -75°C (Weighted Average) |
| Pull-Down from Ambient (25°C) | 6.5 hours |
| Recovery from Door Opening (ENERGY STAR® Final Test Method) | 35 minutes |
| Warm-Up Profile | 2.5 hours to -60°C 6.5 hours to -40°C 12 hours to -20°C |
| Heat Dissipation | 981 BTU/h (load to HVAC) |

9.4 MATERIALS SPECIFICATIONS

| Part | Material | Color | Treatment |
|---|------------------------------|-------------|---------------|
| Body: Main Body, Door, Front Cover and Top Cover | Mild steel | White/Green | Powder coated |
| Interior | Steel | White | Powder coated |
| Shelves | Stainless Steel (adjustable) | - | - |
| Handle | Zinc Alloy | Green | Powder coated |
| Hinges | Steel | White | Powder coated |
| LCD Bezel | Polycarbonate | Gray | Natural |

The following Warranty applies to the SU780XLE manufactured by Global Cooling, Inc. In order to maintain maximum uptime and to optimize customer service, Global Cooling, Inc. reserves the right to exchange the SU780XLE with a serviceable new or previously used replacement at its discretion.



LIMITED WARRANTY, USA

- The warranty period starts **TWO WEEKS** after the original date of shipment from Global Cooling, Inc.
- The Stirling Ultracold freezer is warranted for a period of **TWO YEARS** for materials and labor.
- The Stirling Ultracold free-piston Stirling engine and thermosiphon is warranted for a full **SEVEN YEARS**, parts only, from original date of shipment from Global Cooling, Inc.
- If a service issue arises, contact Global Cooling, Inc. Service Department to register Warranty Service and initiate a resolution.
- Advanced authorization for a service company to diagnose the problem must be approved by Global Cooling, Inc.
- Global Cooling, Inc. will not be responsible for charges incurred for service calls made by a third party prior to authorization by Global Cooling, Inc.
- Global Cooling, Inc. retains the right to replace any product in lieu of servicing it in the field.
- Liability in all events is limited to the purchase value only.
- Under no circumstances will Global Cooling, Inc. be responsible or held liable for consequential or incidental damages associated with loss of stored product in the event of an equipment failure.

LIMITED WARRANTY, CANADA

- The warranty period starts **ONE MONTH** after the original date of shipment from Global Cooling, Inc.
- The Stirling Ultracold freezer is warranted for a period of **TWO YEARS** for materials and labor.
- The Stirling Ultracold free-piston Stirling engine and thermosiphon is warranted for a full **SEVEN YEARS**, parts only.
- If a service issue arises, contact Global Cooling, Inc. Service Department to register Warranty Service and initiate a resolution.
- Advanced authorization for a service company to diagnose the problem must be approved by Global Cooling, Inc.
- Global Cooling, Inc. will not be responsible for charges incurred for service calls made by a third party prior to authorization by Global Cooling, Inc.
- Global Cooling, Inc. retains the right to replace any product in lieu of servicing it in the field.
- Under no circumstances will Global Cooling, Inc. be responsible or held liable for consequential or incidental damages associated with loss of stored product in the event of an equipment failure.

INTERNATIONAL DISTRIBUTOR LIMITED WARRANTY

- Warranty will start **ONE MONTH** after the ship date from Global Cooling.
- Global Cooling warrants that Distributor shall acquire products purchased hereunder free and clear of all liens and encumbrances.
- Global Cooling further warrants all products to be free from defects in materials under normal use and service for a period of **TWO YEARS**.
- The Stirling Ultracold free-piston Stirling engine and thermosiphon is warranted for a full **SEVEN YEARS**, parts only.
- Global Cooling shall provide to Distributor, without charge, replacement parts to substitute for parts that must be replaced by reason of valid warranty claims.
- This warranty obligation is limited solely to the replacement of replaceable defective parts.
- All service charges with respect to the repair or replacement of defective parts of products shall be the responsibility of the Distributor and/or Distributor's customer.
- Distributor, on behalf of Global Cooling, shall perform such ordinary and customary servicing, repair and/or parts replacement within the Territory at Distributor's expense; which may be passed on to Distributor's customer, at Distributor's discretion.



Stirling Ultracold

6000 Poston Road, Athens, Ohio 45701, USA

T 740.274.7900 / 1.855.274.7900 | F 740.274.7901

www.stirlingultracold.com

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Specifications subject to change without notice.
Refer to stirlingultracold.com for the latest specifications.

