Installation and Operation Manual

Thermo Scientific HERAfreeze® TOP and BASIC Ultra-Low Temperature Freezers

Thermo
S C I E N T I F I C

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1 Safety Considerations

WARNING!   Do not modify or change system components. Replacement parts must be OEM exact replacement equipment. Modification or use of the equipment in a manner other than expressly intended may cause death or serious injury. This includes use of user-supplied components and materials not specifically designed for the unit. Reconfiguring the controller may cause death or serious injury.

The manufacturer shall not be liable for any damages, including incidental and/or consequential damages, regardless of the legal theory asserted, including negligence and/or strict liability.

Before using, user shall determine the suitability and integrity of the product for the intended use and that the unit has not been altered in any way. User assumes all risk and liability whatsoever therewith.

WARNING!   For personal safety and trouble-free operation, this unit must be properly grounded before it is used. Failure to ground the equipment may cause personal injury or damage to the equipment. Always conform to the National Electrical Code and local codes. Do not connect unit to already overloaded power lines.

WARNING!   Disconnect unit from main power before attempting any maintenance to equipment or controls.

WARNING!   This freezer operates at extremely low temperatures. Do not work inside the cabinet without proper covering for your hands and arms. Even brief exposure at ultra-low temperatures can damage your skin.

2 General Recommendations

This refrigeration system is designed to maintain ultra-low temperatures with safety in a +32°C ambient environment, **only** when the freezer is used for storage.

WARNING!   This unit is not a "rapid-freeze" device. Freezing large quantities of liquid, or high-water content items, will temporarily increase the chamber temperature and will cause the compressors to operate for a prolonged time period. Attempting to utilize this freezer improperly may jeopardize user product safety or cause undue stress or damage to the refrigeration compressors.

Avoid opening the door for extended time periods since chamber temperature air will escape rapidly. Room air, which is higher in humidity, replacing chamber air may cause frost to develop in the chamber more rapidly.

After reading and completing the Safety Considerations, Pre-Installation, Installation, and Operation sections of this manual, turn the Key Switch to the POWER ON position. **Please allow the freezer to operate at this temperature for a minimum of 12 hours before loading.**

2.1 Initial Loading

Before loading, follow the preceding instructions.

When loading the unit with "pre-frozen" materials, the operating temperature set point of the freezer should be set no lower than the temperature of the "pre-frozen" material. Allow the unit to operate at the set point for eight hours. The set point may then be lowered in increments no greater than ten degrees C. Allow a stabilizing period of eight hours for each ten degree adjustment, until the desired set point is achieved.

CAUTION!   Failure to follow these procedures or overloading the unit may cause undue stress on the compressors or jeopardize stored product safety.

3 Pre-Installation

3.1 Unpacking

At delivery, examine the exterior for physical damage while the delivery company's representative is present. If exterior damage is present, carefully unpack and inspect the unit and all accessories for damage.

If there is no exterior damage, unpack and inspect the equipment within five days of delivery. If you find any damage, keep the packing materials and immediately report the damage to the carrier. **Do not return goods without written authorization.** *When submitting a claim for shipping damage, request that the carrier inspect the shipping container and equipment.*

Note: **Do not discard the sublids from chest-style units.** *The sublids are necessary to maintain correct temperature, moisture control, and economy of operation. Upright models do not include sublids because they have built-in ABS plastic inner doors.*

4 Installation

Do not exceed the electrical and temperature ratings printed on the dataplate located on the lower left side of the unit.

⚠ **CAUTION!**   Improper operation of the equipment could result in dangerous conditions. To preclude hazard and minimize risk, follow all instructions and operate within the design limits noted on the dataplate.

4.1 Location

Install the unit in a level area free from vibration with a minimum of 15 cm of space on the sides, rear, and top. Refer to Section 4.4 for further instructions on leveling cabinets. Allow enough clearance so that door or lid can swing open at least 90 degrees.

Do not position the equipment in direct sunlight or near heating diffusers, radiators, or other sources of heat. The ambient temperature range at the location must be 15 to 32°C.

⚠ **CAUTION!**   To allow for proper air flow, a minimum of six inches of clearance space is required behind the freezer.

4.2 Wiring

⚠ **CAUTION!**   Connect the equipment to the correct power source. Incorrect voltage can result in severe damage to the equipment.

⚡ **DANGER!**   For personal safety and trouble-free operation, this unit must be properly grounded before it is used. Failure to ground the equipment may cause personal injury or damage to the equipment. Always conform to the National Electrical Code and local codes. Do not connect the unit to overloaded power lines.

Your freezer is equipped with one of the plugs shown in Figure 1. These plugs meet UL, CUL, and CE requirements.

Always connect the freezer to a dedicated (separate) circuit. Each freezer is equipped with a cable and plug designed to connect it to a power socket which delivers the correct voltage. Supply voltage must be within +10%, -5% of the freezer rated voltage.

⚠ **CAUTION!**   Never cut the grounding prong from the service cord plug. If the prong is removed, the warranty is invalidated.
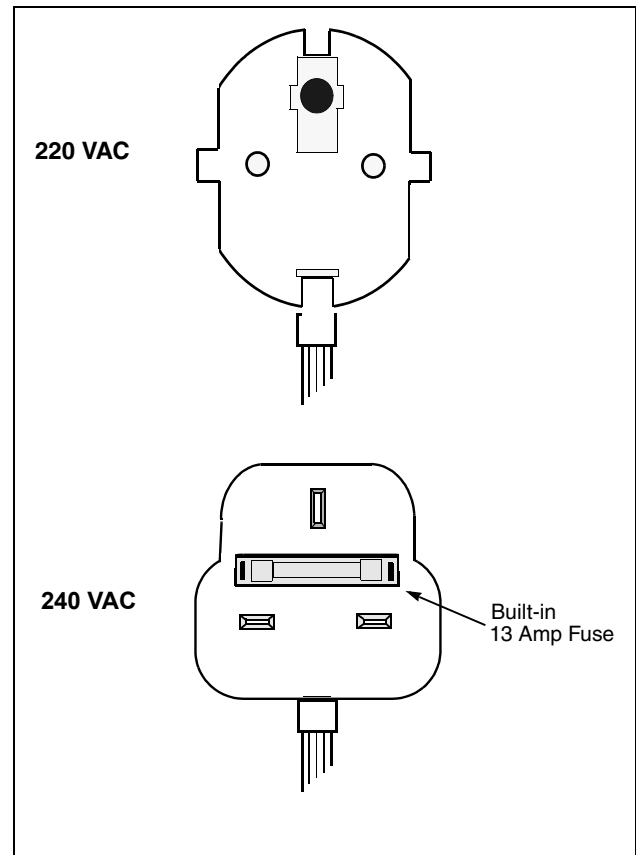
Figure 1. Plugs

4.3 Voltage Safeguard

Freezers are equipped with a standard built-in Voltage Safeguard circuit to detect and adjust low line voltage.

The Voltage Safeguard helps protect electrical equipment from damage by boosting low voltage automatically. On TOP models a panel light flashes to indicate when deficient line voltage is being corrected (see Figure 2 on page 4).

4.4 Leveling

The unit must be level both front to back and side to side.

To level chest models, leave the casters in place and shim the low wheel(s) with strips of sheet metal cut slightly wider than the caster.

Upright models have adjustable leveling feet which are located adjacent to the front casters.

4.5 Door Operation (Upright Models)

Upright freezer models are equipped with an advanced assembly specifically designed for ultra-low temperature freezers.

Features include:

- One-hand operation
- A front-accessible lock, keyed to match the freezer control lock
- Hasps for a standard padlock to provide additional security
- Durable construction for reliable operation and safe product storage.

⚠ CAUTION!   When moving the freezer, always grasp cabinet surfaces; never pull the freezer by the latch handle.

4.5.1 Opening the Door

1. Remove the padlock if you have one.
2. Move the key into the open position by rotating it clockwise.
3. Grasp the latch handle (preferably with your left hand) and pull it toward yourself until the latch disengages from the cabinet strike.
4. Keep pulling by the latch handle or the integrated door handle to open the main door.

4.5.2 Closing the Door

Note that the latch does not self-engage automatically when you close the door. You must rotate the latch into the open position first.

1. Grasp the latch handle (preferably with your left hand) and pull it toward yourself, rotating the latch into the open position.
2. Move the freezer door into the closed position and gently push the handle away from you, making sure that the latch engages fully with the cabinet strike.

⚠ CAUTION!   Closing the door without making sure the latch engages fully with the strike can result in substantial prying forces on the door.

3. Keep applying gentle pressure to the latch handle until the latch is securely in closed position.
4. Insert the key and rotate clockwise to lock.
5. Replace the padlock if you are using one.

4.6 Pressure Equalization Port

When an upright ultra-low temperature freezer door is opened, room temperature air rushes into the storage compartment. When the door is closed, the fixed volume of air is cooled rapidly. Pressure drops below atmospheric pressure, resulting in a substantial vacuum. Re-entry into the cabinet is impossible until internal pressures are returned to atmospheric pressure. Without a pressure equalization mechanism, it can take several minutes before the door can easily be reopened.

All upright models feature a port that provides vacuum relief after door openings.

The pressure equalization port is located in the bottom left side of the storage chamber. Although the port is designed to self-defrost, excessive frost accumulation in the bottom of the chamber could eventually restrict air flow. Therefore you should periodically inspect the port and brush away any loose frost using a stiff nylon brush.

⚡ WARNING!   To ensure proper operation, be sure not to obstruct the port. Push any storage racks near the port all the way to the rear of the cabinet.

♨ WARNING!   When the freezer is in operation, avoid touching the lower left side of the cabinet exterior near the "hot surface" warning label. The port can get hot immediately after it is activated.

5 Operation (HERAfreeze TOP Freezers)

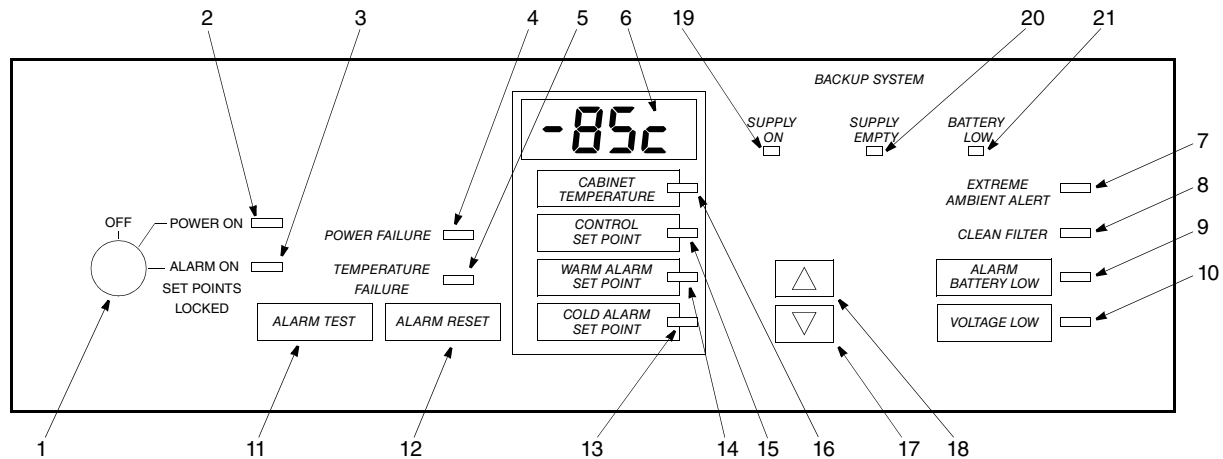## 5.1 Control Panel Features

Figure 2. HERAfreeze TOP Control Panel with Optional Backup System

Before the initial start up, take some time to become familiar with the controls on your freezer. Figure 2 illustrates the HERAfreeze TOP Chest and Upright Freezer control panel.

Note: *Figure 2 shows all possible functions. These functions vary depending on the model and options. You may not have all of the functions on your equipment. TOP models include the Set Points Locked feature and the Extreme Ambient Alert indicator light (8). The CO_2 or LN_2 Backup System lights (20, 21, 22) represent status indicators for a built-in CO_2 or LN_2 backup system, which is optional on all TOP models.*

1. Three position keyed Power On Switch.
2. Power On Indicator. This indicator lights when power is connected to the freezer.
3. Alarm On/Set Points Locked Indicator. This indicator lights when the alarm is activated. Also indicates that Set Points are locked.
4. Power Failure Indicator. This indicator lights when there is a power failure to the freezer (refer to Section 8 on page 10).
5. Temperature Failure Indicator. This indicator lights when the freezer temperature deviates either above or below the alarm temperature settings.
6. Digital Temperature Display Window. This window displays chamber temperature, alarm values, etc. depending on the operating status of the freezer and the procedure being performed.
7. Extreme Ambient Alert. This indicator lights when the ambient temperature has exceeded the upper limit of the recommended operating range. If the Extreme Ambient Alert is activated, the ambient environment needs to be improved for proper function of the freezer.
8. Clean Filter Indicator. This indicator lights when the air cooled condenser filter is dirty (refer to Section 8 on page 10).
9. Alarm Battery Low Indicator. This indicator lights when the charge on the alarm battery is low. Press this button to

display the percent of full battery charge in the digital display window.
10. Voltage Low Indicator. This indicator lights when incoming line voltage to the freezer is low. Press this pad to display the current line voltage in the digital display window.
11. Alarm Test Pad. Press this pad to start an alarm test (refer to Section 5.2.5 on page 6).
12. Alarm Reset Pad. Press this pad to reset *slowly* blinking indicators. Slowly blinking indicators denote that the condition *has* occurred but is now within the given operating parameters. This pad is also depressed to temporarily silence the audible alarm (refer to Section 5.2.4 on page 5).
13. Cold Alarm Set Point. Press this pad to set the cold alarm (refer to Section 5.2.3 on page 5).
14. Warm Alarm Set Point. Press this pad to set the warm alarm (refer to Section 5.2.3 on page 5).
15. Control Set Point. Press this pad to set the cabinet temperature (refer to Section 5.2.2 on page 5).
16. Cabinet Temperature Indicator. This indicator lights when the temperature display window is showing the cabinet temperature (refer to Section 5.2.1 on page 5).
17. Decrement Pad ($\bigtriangledown$). Use this pad to decrease temperature values.
18. Increment Pad ($\bigtriangleup$). Use this pad to increase temperature values.

The following indicators are available only when the freezer is equipped with the optional backup system (refer to Section 6.4 on page 7).

19. Backup System Supply On Indicator.
20. Backup System Empty Indicator
21. Backup System Battery Low Indicator.

5.2 Start Up

Refer to Section 5.1 and Figure 2 on page 4 as you complete the following procedures.

5.2.1 Turning the Power On

To start up your HERAfreeze TOP freezer, complete the following steps:

1. Plug the freezer into the power outlet (refer to Section 4.2 on page 2).
2. Turn the key switch to the POWER ON position. The Power On LED and the Cabinet Temperature LED illuminate.

Note: *The audible alarm function is not active at this time. Refer to Section 5.2.3 for information about setting the alarms. In addition, the Set Points will not be locked in this key position.*

5.2.2 Setting the Cabinet Temperature

To set the cabinet temperature, complete the following steps:

1. Press and hold the Control Set Point pad.
2. The Control set point LED lights and the Cabinet Temperature LED goes out.
3. Press and hold △ to increase the temperature or ▽ to decrease the temperature. The digital display scrolls through temperature settings.
4. Release both pads when the digital temperature display window shows the correct set point value.

Note: *If no keys are pressed within ten seconds, the temperature display reverts to the cabinet temperature.*

5.2.3 Setting the Alarms

To set the cold alarm, complete the following steps:

1. Confirm that the key switch is at the Power On position (Set Points not locked).
2. Press and hold the Cold Alarm Set Point pad. The LED next to this pad lights. The temperature display shows the Cold Alarm value.
3. Press and hold △ or ▽ to adjust the Cold Alarm Set Point.
4. Release both pads when the digital temperature display window shows the correct set point value.

To set the warm alarm, complete the following steps:

1. Confirm that the key switch is at the Power On position (Set Points not locked).
2. Press and hold the Warm Alarm Set Point pad. The LED next to this pad lights. The temperature display shows the Warm Alarm value.
3. Press and hold △ or ▽ to adjust the Warm Alarm Set Point.
4. Release both pads when the digital temperature display window shows the correct set point value.

When the cabinet temperature drops below the Warm Alarm setting, turn the key switch to ALARM ON. The freezer is ready to operate.

Note: *If a power failure occurs, the POWER ON light goes out. After 30 seconds the POWER FAILURE light and the digital temperature display flash simultaneously.*

⚡ **WARNING!** You must turn the three-position key switch to the ALARM ON/SET POINTS locked position to activate the audible alarm and place it in security operation.

5.2.4 Alarm Reset & Status Lights (TOP Freezers)

The alarm reset feature ensures user acknowledgment of the occurrence of certain alarm conditions. This provides greater monitoring power by alerting the user if an alarm condition has occurred during periods when the freezer must be left unattended. The alarm conditions that activate this feature are:

- Temperature Failure-Warm Alarm
- Temperature Failure-Cold Alarm
- Voltage Low
- Power Failure
- Extreme Ambient Alert

During any of these alarm conditions, the corresponding indicator will flash quickly, approximately 90 times per minute. If the alarm condition then disappears, the flash rate will decrease to approximately 15 times per minute. Unless the condition reoccurs, the indicator will then continue to flash at this rate until the Alarm Reset button is pressed. Once this has occurred, the indicator will no longer be lit.

In the case of TEMPERATURE FAILURE-WARM ALARM and TEMPERATURE FAILURE-COLD ALARM, if these conditions have occurred but are now within the given limits, the two indicators will alternately flash (180° out of phase). In addition, for these two temperature failures, the highest temperature and lowest temperature, respectively, during the error condition will be saved. Before you reset after temperature failure, you can view the temperature extreme by pressing the Cabinet Temperature pad simultaneously with either the Warm Alarm Set Point pad or the Cold Alarm Set Point pad.

Once the Alarm Reset button is depressed, the extreme temperature value is reset to the current cabinet temperature.

5.2.5 *Alarm Test*

To test the cold and warm alarms, complete the following steps:

1. Press and hold the Alarm Test pad. The digital temperature display indicates rising temperature. When the temperature reaches the warm alarm value, the alarm sounds.

Note: *The temperature of the refrigerated space does not change during this procedure. Only the sensor is heated.*

2. Release the Alarm Test pad, the sensor and display return to cabinet temperature in a few minutes.

You can press the Alarm Reset pad to silence the alarm but the alarm will ring back in five to seven minutes. You can silence the alarm in this manner as many times as necessary until the sensor cools below the warm alarm temperature. The alarm stops sounding automatically when the sensor cools below the warm alarm value.

Note: *There is a limit on the alarm test feature. The alarm test will not commence if the warm alarm set point is more than 15 degrees warmer than the operating temperature set point.*

6 Backup System (Optional)

When you purchase a built-in CO_2 or LN_2 optional backup system for the freezer, the backup system control panel is located behind a hinged panel adjacent to the grill (refer to Figure 3).

Note: *Always purchase the cylinders which are equipped with siphon tubes for withdrawing liquid from the bottom of the cylinder. CO_2 cylinders must be kept at room temperature to function properly. LN_2 bottles are functional at any reasonable temperature.*

Use the panel below to set the backup initiation temperature, usually 10 to 15°C warmer than the operating set point.
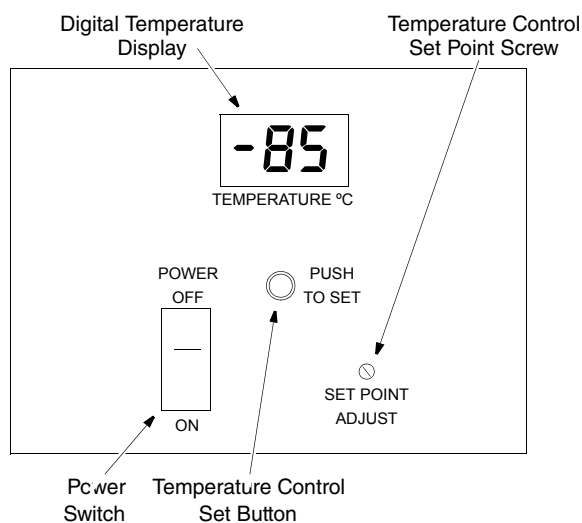

Figure 3. Control Panel for Optional Built-In Backup System

Note: *HERAfreeze BASIC chest models use free-standing, field installed Backup Systems.*

6.1 CO_2 and LN_2 Precautions

Observe the following precautions when using liquid CO_2 and LN_2 backup systems.

WARNING! If a CO_2 or LN_2 cylinder falls and a valve is knocked off, the cylinder becomes a deadly and completely unguided missile. Transport the cylinders in a handtruck or cart with secure chain ties for the cylinder. After cylinders are connected to the equipment, securely attach them with chains to a solid, stationary object such as a building column.

WARNING! CO_2 and LN_2 liquids are non-poisonous but are very cold and will burn unprotected skin. Always wear protective eyewear and clothing when changing cylinders or working on the piping systems attached to an active source of liquid refrigerant.

WARNING! The gases produced by evaporation of CO_2 or LN_2 are non-poisonous but displace the oxygen in a confined space and can cause asphyxiation. **Do not store the cylinders in subsurface or enclosed areas**.

CAUTION! When closing the cylinder valve, make sure that the injection solenoid is energized to allow all the liquid to bleed off instead of being trapped in the supply tubing. Failure to do this results in activation of the pressure relief device, which could damage the freezer and requires replacing if it is activated.

CAUTION! For chest and upright models ordered with factory installed built-in backup systems, the flow of liquid CO_2 or LN_2 will be discontinued if the door or lid is opened during operation of the backup system. For units operated with free-standing, field installed type backup system, the flow of liquid CO_2 or LN_2 will be discontinued upon door or lid opening **only** if the switch provided with the free-standing package is installed on the freezer.

6.2 Installation

WARNING! Backup systems should be installed only by qualified service technicians.

Field installed systems are supplied with complete installation and operating instructions. If your system is factory installed, the freezer is shipped with a coiled length of tubing to connect the freezer to the bottles:

- 3/8 in. OD copper tubing for connection to the CO_2 supply.
- 5/8 in. OD copper tubing covered with Armaflex® insulating tubing for connection to the LN_2 supply.

Straighten the coiled tubing and connect one end to the labeled connection on the freezer and the other end to the supply bottle or building supply fitting.

6.3 Operation

To activate the optional backup system, complete the following steps:

1. Push the Power Switch to the ON position. The digital temperature display window shows the current cabinet temperature.
2. Press and hold the Push to Set button to display the set point temperature in the digital temperature display window.
3. Use a small screwdriver to rotate the Set Point Adjust screw until the correct backup operating temperature shows in the display window. The recommended set point is 10 to 15°C above normal cabinet temperature.

Note: *The temperature shown in the display window is accurate to ±1°C.*

The backup system can run for about eight hours on battery power.

⚡ **WARNING!** You must push the Power Switch to the ON position in order to activate the backup system.

6.4 System Status Lights

In addition to the backup control system, the built-in backup system includes main control panel system status lights. These lights are only available when the backup system is installed.

- The Supply On Indicator lights when the backup system is operating on battery power.
- The Backup System Battery Low Indicator lights when the backup system battery charge is low. The built-in battery charger recharges the battery to full charge when power is restored to the system.

Note: *Since rechargeable batteries degrade over time, the battery should be replaced every three years.*

- The Backup System Empty Indicator lights when the standby CO_2 or LN_2 bottle is empty.

CO_2 Inlet Conn. Copper Tubing Factory Supplied 0.25" O.D.

2.375"

24.75"

MACHINE COMPARTMENT
REAR VIEW
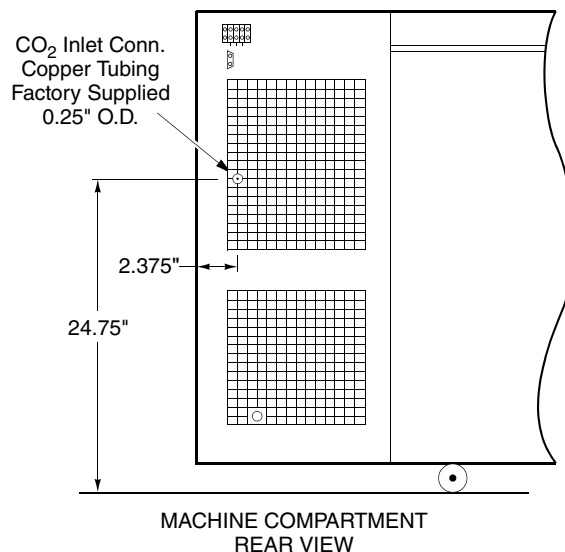
Figure 4. Location of CO_2 Connection Site, Chest Models Only

Table 1.   Backup System Flow Rates – Cryogenic Freezers

Center Air Temperature		Lbs/hr @ 24°C Ambient Temperature (Flow Rate)			
		-150°C	-140°C	-130°C	-120°C
Liquid LN$_2$					
Chest Freezers					
1.5 m^3	Empty	11.0	9.5	8.4	7.3
	1/2 Full	9.3	8.0	7.0	6.1
	Full	6.5	5.9	5.1	4.5
2.1 m^3	Empty	11.3	10.0	9.0	8.0
	1/2 Full	9.7	8.6	7.6	6.8
	Full	7.8	6.8	6.0	5.2
3 m^3	Empty	15.2	13.5	11.9	10.3
	1/2 Full	12.0	10.4	9.4	8.3
	Full	8.9	7.8	7.0	6.1

Table 2.   Backup System Flow Rates

Center Air Temperature		Lbs/hr @24×C Ambient Temperature (Flow Rate)		
		-50×C	-60×C	-70×C
Liquid CO_2				
Chest Freezers				
0.9 m³	Empty	2.83	2.96	3.1
	1/2 Full	2.4	2.7	3.1
	Full	1.8	2.1	2.4
2.1 m³	Empty	4.1	4.7	5.5
	1/2 Full	3.5	4.0	4.6
	Full	2.6	3.0	3.5
3 m³	Empty	4.9	5.6	6.6
	1/2 Full	4.2	4.8	5.5
	Full	3.1	3.6	4.1
4.2 m³	Empty	5.6	6.5	7.5
	1/2 Full	4.8	5.5	6.3
	Full	3.5	4.2	4.8
5.1 m³	Empty	6.5	7.5	8.7
	1/2 Full	5.5	6.3	7.3
	Full	4.1	4.8	5.5
6 m³	Empty	7.3	8.4	9.8
	1/2 Full	6.2	7.1	8.2
	Full	4.6	5.4	6.2
Upright Freezers				
4 m³	Empty	7.4	8.5	9.7
	1/2 Full	6.5	7.4	8.3
	Full	5.1	5.9	6.7
5.1 m³	Empty	8.3	9.5	10.9
	1/2 Full	7.3	8.3	9.3
	Full	5.8	6.6	7.5
6.4 m³	Empty	8.9	10.2	11.7
	1/2 Full	7.8	8.9	10.0
	Full	6.2	7.1	8.1
7.6 m³	Empty	9.5	10.9	12.5
	1/2 Full	8.3	9.5	10.7
	Full	6.6	7.6	8.7

Center Air Temperature		Lbs/hr @ 24°C Ambient Temperature (Flow Rate)		
		-60°C	-70°C	-80°C
Liquid LN_2				
Chest Freezers				
0.9 m³	Empty	2.7	3.1	3.5
	1/2 Full	2.2	2.6	2.9
	Full	1.7	1.9	2.2
2.1 m³	Empty	3.9	4.5	4.1
	1/2 Full	3.3	3.8	4.3
	Full	2.5	2.8	3.2
3 m³	Empty	4.7	5.4	6.1
	1/2 Full	4.0	4.5	5.1
	Full	3.0	3.4	3.8
4.2 m³	Empty	5.4	6.2	7.0
	1/2 Full	4.5	5.2	5.9
	Full	3.4	3.9	4.4
5.1 m³	Empty	6.2	7.1	8.1
	1/2 Full	5.3	6.0	6.8
	Full	3.9	4.4	5.1
6 m³	Empty	7.0	8.0	9.1
	1/2 Full	5.9	6.7	7.6
	Full	4.4	5.0	5.7
Upright Freezers				
4 m³	Empty	7.0	7.9	8.9
	1/2 Full	6.1	6.8	7.6
	Full	4.8	5.4	6.1
5.1 m³	Empty	7.7	8.7	9.8
	1/2 Full	6.7	7.5	8.4
	Full	5.3	5.9	6.7
6.4 m³	Empty	8.4	9.5	10.7
	1/2 Full	7.3	8.2	9.2
	Full	5.8	6.5	7.3
7.6 m³	Empty	9.1	10.3	11.6
	1/2 Full	7.9	8.9	10.0
	Full	6.3	7.1	7.9

7   Operation (HERAfreeze BASIC Freezers)

7.1   Control Panel Features

Before the initial start up, take some time to become familiar
with the controls on your freezer. Figure 5 illustrates the
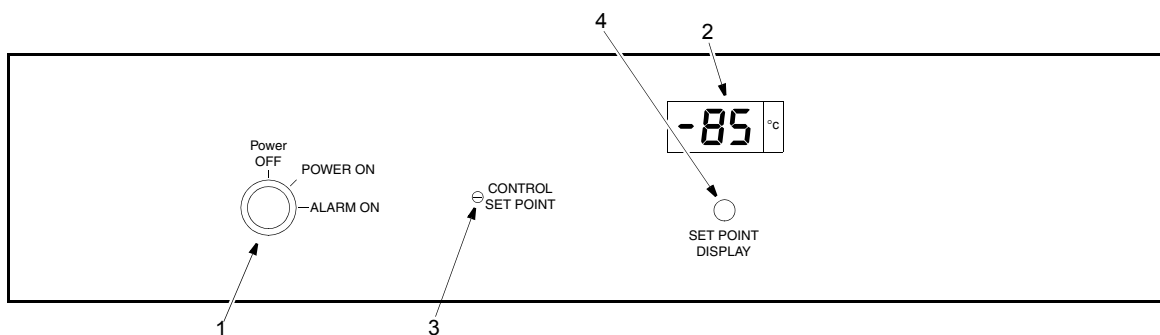HERAfreeze BASIC Chest and Upright Freezer control panel.

Figure 5. HERAfreeze BASIC Control Panel

1. Keyed Power On/Alarm On switch.
2. LED digital temperature display.
3. Recessed temperature control set point adjustment.
4. Temperature set point adjust button.

7.2   Start Up

Refer to Figure 5 as you complete the following procedures.

7.2.1   Turning the Power On

To start up the BASIC Series Freezers, complete the following
steps:

1. Plug the freezer into the power outlet (refer to Section 4.2 on
   page 2).
2. Turn the key switch to the POWER ON position. The digital
   temperature display shows the cabinet temperature.

Note: *The alarm function is not active at this time.*

7.2.2   Setting the Cabinet Temperature

To set the cabinet temperature, complete the following steps:

1. Insert a small screwdriver into the slotted screw labeled
   Control Set Point and simultaneously press and hold the Set
   Point Display button. The temperature display changes to
   read the existing set point value.
2. Turn the set point screw (clockwise for a colder setting and
   counterclockwise for a warmer setting) until the desired set
   point shows in the digital temperature display.
3. Release the Set Point Display button. The digital temperature
   display returns to the cabinet temperature.

7.2.3   Alarm

The BASIC's Alarm is operated by the freezer electronic control
system. The alarm is preset at the factory with a cold set point:

- For units designed to operate at -75°C and -85°C, the alarm
  set point is approximately 90% of the freezer temperature set
  point. For example, if the freezer set point is -80°C, the alarm
  set point is -72°C.
- For units designed to operate at -50°C and warmer, the alarm
  set point is 80% of the freezer temperature set point. For
  example, if the freezer set point is -40°C, the alarm set point
  is -32°C.

To activate the alarm, wait until the freezer reaches operating
temperature and turn the key switch to the ALARM ON position.

⚠   **WARNING!**   You must turn the three-position key
switch to the ALARM ON position to activate the alarm
and place it in operation.

8　Maintenance and Troubleshooting

⚡ **WARNING!**　Unauthorized repair of your freezer will invalidate your warranty. Contact Technical Service for additional information.

⚠ **CAUTION!**　Maintenance should only be performed by trained personnel.

8.1　Condenser Maintenance

8.1.1　Cleaning the Condenser

Clean the condenser at least every six months; more often if the laboratory area is extremely dust prone.

To clean the condenser, complete the following steps:

1. Pull the grill open.
2. Remove the filter. Check the fans. If a fan is not operating, contact an Authorized Service Company immediately.
3. Vacuum the condenser.
4. Replace the filter and close the grill.

8.1.2　Cleaning the Condenser Filter

Clean the condenser filter every two or three months.

1. Pull the grill open.
2. Remove the filter.
3. Shake the filter to remove loose dust, rinse the filter in clean water, shake the excess water from the filter, and replace the filter.
4. Close the grill.

Note:　*Countertop models do not have filters.*

8.2　Gasket Maintenance

Periodically check the gaskets around the door or lid for punctures or tears. Leaks are indicated by a streak of frost which forms at the point of gasket failure. Make sure that the cabinet is level (refer to Section 4.4 on page 2 for leveling information).

Keep the lid and door gaskets clean and frost free by wiping gently with a soft cloth.

8.3　Defrost Procedures

To defrost the equipment, complete the following steps:

1. Remove all products and place in another cabinet.
2. Turn off the unit and allow the interior to warm to room temperature.
3. Dispose of the ice and wipe out any water standing in the bottom of the cabinet.

If there is freezer odor, wash the interior with a solution of baking soda and warm water. Clean the exterior with any common household cleaning wax.

8.4　Alarm Battery Maintenance

Have a technician check the condition of the alarm battery at least once a year.

To replace the alarm battery, complete the following steps:

1. Remove the front grill. The alarm battery is located directly behind the grill. The terminals are the "push on" type.

Note:　*Countertop units require removal of the left side panel to access the battery.*

2. Grasp the terminal with pliers and work it gently back and forth while pulling it off. The fittings are tight.
3. Remove the battery and put the new battery in place.

Note:　*You may have to cut a strip of silicone rubber in order to remove the battery.*

4. Connect the battery terminals and replace the front grill.

8.5　Troubleshooting Procedures

⚡ **WARNING!**　Troubleshooting procedures involve working with high voltages which can cause injury or death. Troubleshooting should only be performed by trained personnel.

Table 3.　Troubleshooting Procedures

Problem	Solution
Clean Filter indicator is on.	Condenser filter is dirty. Refer to Section 8.1.2.
Alarm Battery Low indicator is on.	Alarm battery is low on charge. Have a technician check the alarm battery. Refer to Section 8.4.
Voltage Low indicator is on.	Line voltage is low and the freezer has activated the Voltage boost system to compensate. Call an electronics technician to check the power supply.

9   Chart Recorders

Panel-mounted seven-day recorders are available as options for all freezer models.

9.1   Set Up and Operation

To prepare the recorder to function properly, complete the following steps:

1. Open the recorder door to access the recorder.
2. Connect the nine volt DC battery located at the recorder's upper right corner. This battery provides backup power.
3. Install clean chart paper (refer to Section 9.3 below).
4. Remove the plastic cap from the pen stylus and close the recorder door.

Recorder operation begins when the system is powered on.The recorder may not respond until the system reaches temperatures within the recorder's range.
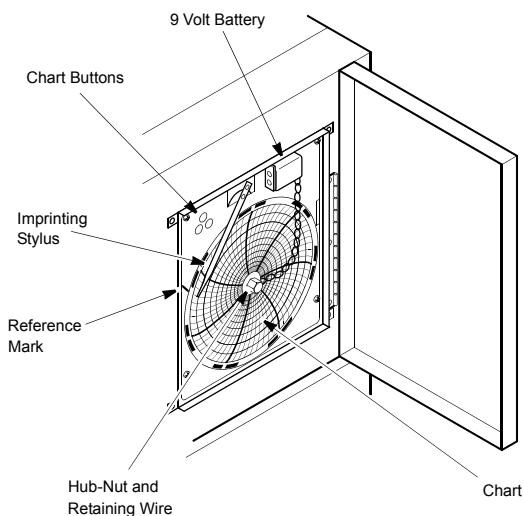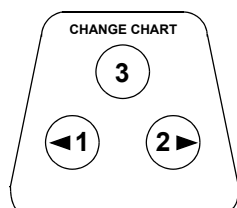

Figure 6. Chart Recorder

Figure 7. Chart Buttons

9.2   Power Supply

The recorder normally uses AC power when the system is operating. If AC power fails, the LED indicator flashes to alert you to a power failure. The recorder continues sensing cabinet temperature and the chart continues turning for approximately 24 hours with back-up power provided by the nine-volt battery.

The LED indicator glows continuously when main power is functioning and the battery is charged.

When the battery is low, the LED flashes to indicate that the battery needs to be changed.

9.3   Changing Chart Paper

To change the chart paper, complete the following steps:

1. Locate the pressure sensitive buttons at the front, upper left of the recorder panel.
2. Press and hold the Change Chart button (#3) for one second. The pen will move off the scale.
3. Unscrew the center nut, remove the old chart paper, and install new chart paper. Carefully align the day and time with the reference mark (a small groove on the left side of the recorder panel).
4. Replace the center nut and hand tighten. Press the Change Chart button again to resume temperature recording.

9.4   Calibration Adjustment

This recorder has been accurately calibrated at the factory and retains calibration even during power interruptions. If required, however, adjustments can be made as follows:

1. Run the unit continuously at the control setpoint temperature. Continue steady operation for at least two hours to provide adequate time for recorder response.
2. Measure cabinet center temperature with a calibrated temperature monitor.
3. Compare the recorder temperature to the measured cabinet temperature. If necessary, adjust recorder by pressing the left (#1) and right (#2) chart buttons.

Note: *The stylus does not begin to move until the button is held for five seconds.*

10 Optional Equipment

The following equipment is available for some freezer models either as factory-installed or as field-installed options.

For additional information, contact your sales representative or Customer Sales.

10.1 Backup Protection Devices

Liquid Nitrogen and Liquid CO_2 systems are available to protect your product in case of a prolonged power failure. These systems are powered by a rechargeable battery with a built-in automatic charger. Refer to Section 6.1 on page 6 for additional information.

Note: *These systems are not available for countertop models.*

10.1.1 Liquid Nitrogen (LN$_2$)

This system uses portable and locally refillable bottles. These containers keep the liquid at low temperature and pressure by continually venting a small amount of gaseous N_2. You must check the liquid level indicator daily to assure an adequate emergency supply.

10.1.2 Liquid CO$_2$

This system uses portable and locally refillable bottles that are not vented and have a virtually unlimited standby life unless they develop a leak. These containers hold liquid at room temperature and high pressure. Several bottles can be connected together, increasing the effective length of standby refrigeration.

The coldest center air temperature achievable with CO_2 backup is -70º C. For colder temperatures, use LN_2.

10.2 Circular Chart Recorder

Chart recorders can be factory or field installed. If your freezer does not have a recorder, you can order one for panel, wall, or freestanding mounting.

10.3 Remote Alarm

The remote alarm terminals on the back of the freezer are connected to freezer internal dry contacts. You can connect a remote alarm package with a separate 24 volt power supply.

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Great Britain

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France

Important

For your future reference and when contacting the factory, please have the following information readily available:

Model Number: _____

Serial Number: _____

Date Purchased: _____

The above information can be found on the dataplate attached to the equipment. If available, please provide the date purchased, the source of purchase (manufacturer or specific agent/rep organization), and purchase order number.

IF YOU NEED ASSISTANCE:

SALES DIVISION

    Phone: 1-866-984-3766

                           1-866-9-THERMO

LABORATORY PARTS and SERVICE

    Phone: 1-800-438-4851

TECHNICAL SUPPORT

    Phone: 1-800-438-4851

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