

**Blood Bank Refrigerator**  
**Installation and Operation Manual**



**HXC-158/258/358/608**

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- Thoroughly read this manual before using the refrigerator
- Please keep this manual for convenient reference
- The actual color and appearance of the refrigerator may vary slightly from catalog

## After-Sale Support and Warning Instruction

Dear Customer,

As any products might be subject to a possibility of failure, we encourage you to routinely observe the operation of the refrigerator and any change of the stored products. Should there be any changes, please attempt to follow the instruction in the manual for resolution. If the problem persists, please notify your local Haier service center for quick service. This is to reduce the chance of product loss.

### After Sale Service

1. From the date this unit is sold, the entire unit is warranted for one year. The key components such as the evaporator, condenser, filter dryer, compressor, capillary tube, fans, and blowers are guaranteed for three years.
2. Warranty certificate: When you need to have service done or to inquire about the unit, please provide this warranty certificate and proof of purchase to your local Haier service center and please keep this document in a safe place.

## Safety Precautions

The Haier Blood Bank unit is designed for storage of whole blood and related products at constant temperature in clinical, pharmaceutical, research, and other laboratory applications. Please carefully read this manual, and follow the instructions to properly operate the unit.



This action may cause fatal injury or severe damage.

This manual covers all aspects of installing and operating the unit. It also provides information that can prevent a user from being injured. "Caution" and "Warning" suggest two levels of safety implications. Please follow them carefully.

### Example of labels:



This symbol suggests precaution be followed.



This symbol means that an action is strictly prohibited.



This symbol designates procedures to be followed.

Please keep this manual for convenient reference



This action may cause fatal injury or severe damage.

### Environmental Conditions

This unit is designed for applications in the following environmental conditions. It is safe to operate the unit at these or more favorable conditions:

1. Indoor usage
2. Elevation of less than 2,000 meters

## Safety Precautions

3. Ambient temperature between 5 °C to 35 °C
4. Maximum relative humidity of 80 percent at an ambient of less than 31 °C. Maximum allowable relative humidity will decrease as the ambient temperature rises.
5. Voltage variation within ±10 percent of nominal voltage supply
6. Factory-approved abnormal voltage range
7. Instantaneous over-voltage complies with second grade for installation of equipment. For the main voltage supply, the minimum and normal supply is second level.
8. Environment complying with IEC664 standard, Grade 2 Contamination.



### WARNING



Do not use this refrigerator in outdoor conditions. If the unit is rained on, there is a possibility of electric shock or electrocution.



Do not place volatile or flammable materials into the refrigerator. Storage of such materials in the refrigerator may cause an explosion or fire.



The installation of this refrigerator unit should only be performed by a certified technician. Improper installation may lead to refrigerant gas leak or liquid leak, electric shock or fire.



Before any repair work or maintenance or inspection is done, the power cord must be unplugged from the power supply. This is to prevent any risk of potential injury or electrical shock.



The unit should be situated on a solid surface or ground. If the installation is not on a solid foundation, the unit can tilt or tip over to fall causing injury or property damage.



During loading and unloading products from the unit, do not pull out two drawers at the same time. If there are heavy loads in the drawers, the unit may tilt over and fall causing injury.

High Temperature Alarm	Flashing Alarm Indicator, alarm buzzer, remote alarm contact			
Low Temperature Alarm	Flashing Alarm Indicator, buzzer alarm without time delay, remote alarm contact			
Door Ajar Alarm	Alarm for door opening after 10 minutes delay			
Memory Device	Non-Volatile memory storage			
Florescent Light	10 W X 1 for HXC-158, 15 W X 1 For Others			
Temperature Recorder	Custom for HXC-158, Standard For Others Including one box of recorder chart paper, and 4 pieces of 9 V battery			
Accessory items	One set of key, one certificate of warranty, one copy of operation manual, one plastic bag			
Weight	107 kg	146 kg	158 kg	204 kg
Rechargeable battery	DM8-6 (8V6AH)			

## Operating Parameters


Model	HXC-158	HXC-258	HXC-358	HXC-608
Sensor Bottle Temperature	+4 C +/- 1 C			
Design Ambient Temperature	+5 C To 35 C			
Rated Power	400 W	400 W	500 W	500 W
Sustainable Alarm Time	72 Hours With Fully chargeable battery			


Note: the design parameters of this refrigerator may change without notice.


## Specification


Description	Blood Bank Refrigerator For Medical Application			
Model Number	HXC-158	HXC-258	HXC-358	HXC-608
External Dimension	W 560 X D 570 X H 1520 mm	W 720 X D 690 X H 1520 mm	W720 X D 690 X H 1730 mm	W 780 X D 840 X H 1960 mm
Internal Dimension	W 460 X D 350 X H 950 mm	W 620 X D 470 X H 950 mm	W 620 X D470 X H 1160 mm	W 680 X D 620 X H 1400 mm
Effective Storage Volume	158 L	258 L	358 L	608 L
External Wall Surface	Powder Coated Cold Rolled Steel			
Internal Wall Surface	Stainless Steel			
Door	Electric heater heated glass door			
Insulation	Hard Polyurethane foam (No Fluoride)			
Drawer/Shelves	4 Plastic shelves	4 Plastic shelves	5 Plastic shelves	6 Plastic shelves
Refrigeration system	Forced air cooling			
Compressor	Hermetically sealed			
Condenser	Finned coil condenser			
Evaporator	Finned coil evaporator			
Refrigerant	R-134a			
Defrost system	Automatically Forced defrost system			
Temperature controller	Electronic Controller			


## Safety Precautions


 Do not place the unit in a place where it is damp or is subject to water spray. Damage to the insulation of the unit may cause electrical shock or electrocution.


 Do not directly apply water into the refrigerator as the moisture may cause electrical shortage and electrical shock.


 The unit must be connected to a dedicated power supply line. Using an extension cord or a power strip may cause fire.

 Do not allow unqualified personnel to dismantle, repair or modify the refrigerator. Such action may cause fire or injury of personnel.

 The power plug must be plugged securely into a clean power outlet. A dusty power outlet may cause fire.

 Should there be malfunctions of the unit, unplug the power cord from the power supply. Continuous operation of the unit abnormally may cause fire or electrical shock.

 The power receptacle must be equipped with a ground prong. If an intended power receptacle does not include a ground, a certified electrician must install a ground wire before the refrigerator can be plugged to the power outlet.

 When used for storage of poisonous products, or products that are radiant and products that can be harmful to public health, the unit needs to be placed in a safe location. Improperly using the unit with these types of products may cause harm to the user's health or to the environment.

## Safety Precautions



Never use gas line, water pipe, telephone line, or lightning rod for grounding wire for the unit. Such installation may cause electrocution.



Do not probe into the air ventilation holes. A probing object may accidentally touch moving parts and cause injury.

Warning: Class A equipment is intended for use in an industrial environment. In the documentation for the user, a statement shall be included drawing attention to the fact that there may be potential difficulties in ensuring electromagnetic compatibility in other environments, due to conducted as well as radiated disturbances.



Decommission of old refrigerators must be performed by professional workers. Do not discard unused refrigerators in places where children could play with them and accidentally get locked inside.



If there is a need to extend the power cord for the unit, the cross area of the extended cord conductor must be no less than 1.5 square millimeter. When moving the equipment, be careful not to run over the power cord. If the power cord is damaged, it should be repaired with specialty



Should there be any abnormality about the temperature, or the temperature alarm sounds, transfer the stored products inside the refrigerator to a safe place immediately. This will reduce the chance of loss of properties.

## Maintenance

2. Remove the left panel and the cover for the electrical control box.
3. Remove the defective starter.
4. Install a new starter. Make sure it is securely in position.
5. Install the cover for the electrical box and the left panel.
6. Plug the power plug back into the system.

### Purchasing chart paper for temperature chart recorder

The chart recorder papers are imported chart papers designed for the recorder. The papers that are supplied with the unit usually last about half of a year. When you are running short of the chart paper, please contact Haier to purchase more. The lead time to deliver the charts is 15 days after receiving the payment. Please call Haier for details.

### Purchasing backup battery for temperature recorder

You can purchase a high quality battery from a store for the same size and voltage (9V). You may also call Haier to purchase a high quality replacement battery. The lead time to deliver the battery is 15 days after receiving the payment. Please call Haier for details.

### Changing fuse breaker

If there is a burnt out fuse on a PC board, please contact Haier's after sales support department.

## Maintenance



### WARNING

Before any inspection or maintenance work is performed, the refrigerator's power plug should be disconnected from the power supply socket. This is to prevent any potential electrical shock or injury. During the maintenance work, do not breathe the dust and aerosols near the unit; they might be harmful to your health.

### Cleaning the refrigerator

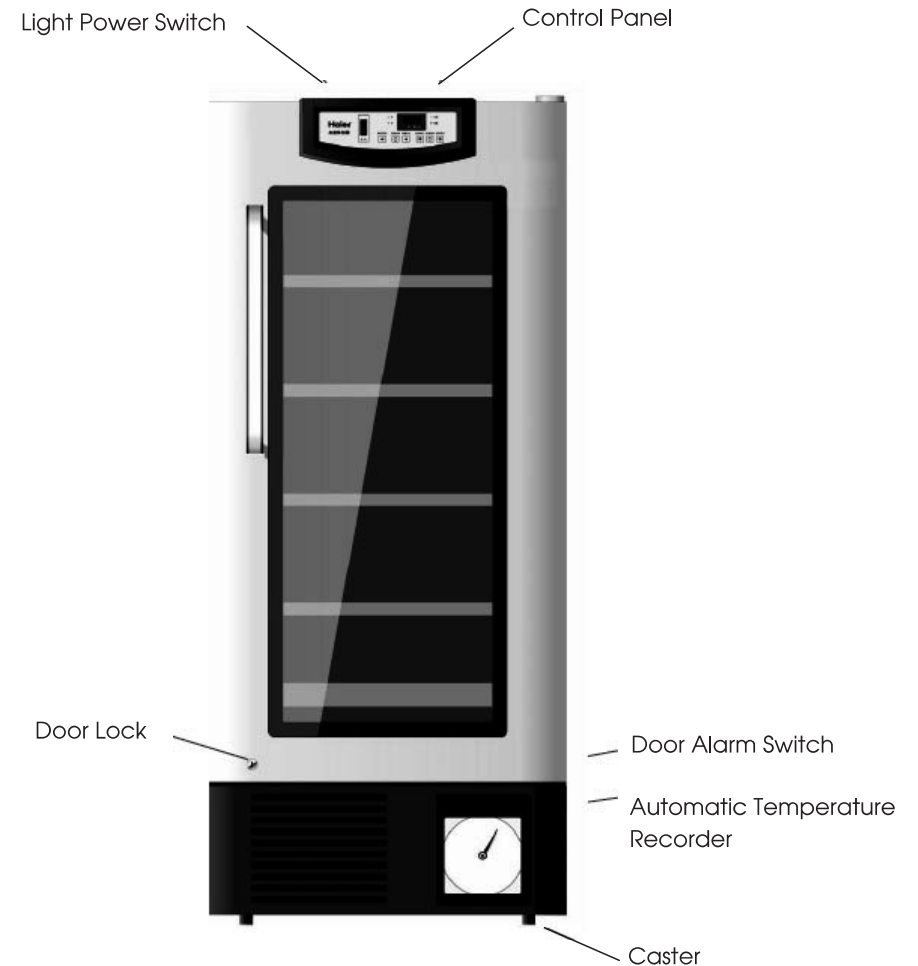
1. The refrigerator should be cleaned once a month. Regular cleaning can keep the unit looking new.
2. Use a dry, soft cloth to clean the dust off the interior and exterior. If necessary, use a soft cloth with a solution of water and mild detergent to wipe the unit.
3. After the cleaning, use a dry cloth to wipe off any solution residue off the surfaces.
4. Do not pour water directly into the refrigerator. By doing so, the water can damage the insulation materials and cause problems.
5. Parts in the refrigeration system for this refrigerator are completely sealed. They do not require any lubricants.
6. The air filter for the condenser should be cleaned at least once within a 90 day period. The procedure is as follows.
  - (a) Remove the front louver panel for the refrigerator.
  - (b) Remove the air filter located in front of the condenser; wash it in water.
  - (c) After cleaning the filter, install it in front of the condenser and the louver panel.

### Changing the light bulb starter

The florescent light bulb is located in the upper front area of the refrigerator. When changing the light bulb, please perform the following steps.

1. Unplug the refrigerator from the power supply.

## Descriptions of Refrigerator Parts and Their Functions



Due to continuous improvements on the products, your actual Haier refrigerator may not resemble the depicted image thus published in the catalog. We apologize for that.

## Descriptions of Refrigerator Parts and Their Functions

- 1. Control Panel**

The control panel on the Haier blood bank shows the actual storage temperature inside the refrigerator. You can use the push buttons on the panel to adjust the temperature set point and test the alarm functions.
- 2. Light Power Switch**

You can use the switch to turn on and off the interior lights of the refrigerator.
- 3. Condensation Heater Control**

You can use this switch (located inside the back of the refrigerator behind a cover) to turn on the heater that reduces the condensation build up. "1" means power on and "0" means power off.
- 4. Battery Power Switch**

The switch controls the rechargeable battery that powers the alarm system in case of the loss of main power. "1" is on and "0" is off.
- 5. Door Lock**

You can use this feature to lock the refrigerator.
- 6. Door Handle**

For ease of opening and closing the door.
- 7. Casters**

The casters underneath the unit provide the convenience of moving the unit around.
- 8. Automatic Temperature Recorder**

The refrigerator is equipped with an automatic temperature recorder. Its paper chart runs for a full turn in 7 days, so the storage temperature can be permanently recorded. The chart paper must be changed once every 7 days.
- 9. Leveling Leg(The unit must be level to operate)**

You can adjust the screws on the leveling leg underneath the refrigerator to adjust the height.
- 10. Glass Inner Door**

The glass inner door is designed to reduce the temperature fluctuation while the outer door is open.

## Proper usage of the Refrigerator

During the initial startup and continuous usage of the refrigerator, the following procedures should be followed.

1. Power the refrigerator in a dedicated power socket. The voltage requirement is 220 VAC and 50 Hz. When started, do not place any products in the refrigerator.
2. When the unit initially starts up, the buzzer alarm may sound. This is normal. You can push the buzzer alarm button to cancel the sound. The buzzer alarm continues to work until the upper bottle temperature reaches the range of 2 C to 6 C.
3. Make sure that both sensor bottles have glycerin solution of 10% concentration. Please refer to item 4 in the Operation section for details.
4. This refrigerator has been factory preset to operate at a range of 4 C +/-1. It is not necessary to adjust the temperature set point.
5. It usually takes several hours for the unit to reach the preset temperature. Once the unit's temperature is stable, check the sensor bottle temperature to see if it matches the set point.
6. Turn on the light for the interior. Inspect the light to make sure it functions properly.
7. Once a thorough inspection of the unit is completed, products can be loaded into the refrigerator. Beware to not load too many warm products into the unit at one time.

### Remote alarm contact

The terminals for the remote alarm contact are located on the back of the unit cover panel. The contacts are designed for 30 VDC and 2A load. The remote alarm contacts work in synchronization with the buzzer alarm on the refrigerator. Therefore, the remote alarm can be terminated by pushing the buzzer alarm button. However, in case of a power outage, the remote alarm contacts cannot be controlled by the buzzer alarm.

Remote alarm condition: Open for Normal, Close for Abnormal



## Operation

- d. Place the center nut over the chart paper and tighten it. Press the #3 button to move the stylus back to the chart to continue the temperature recording.
- e. Inspect the contact between the pen and the paper chart. Adjust the arm if necessary to make contact. *(Note, do not damage the pen and arm. It might be easier to remove the arm and pen to make a small bending adjustment and then install the pen back on the recorder. Repeat the process until the recorder arm and pen work properly.)*
- f. The accuracy of the temperature must be checked after changing the chart paper. The procedure is described as follows. Press and hold the #3 button until the pen moves to the outside of the chart paper. Then press the #3 button again; the pen should return to the chart paper area. When the pen reaches the outer most circle of the chart paper, it pauses for a moment. If the pen does not match the outer circle of the chart marks, you can use the #2 or the #1 button to move the pen to match the line. This must be done within 5 seconds after the pen pauses. If the calibration is incomplete, repeat the same process until the pen matches the outer circle line.

#### 4. Calibration of Temperature Recorder

This recorder has been calibrated at the factory. It retains the temperature accuracy and calibration even when there is a power supply interruption. Should there be a need to recalibrate the recorder, please follow the procedures below.

- a) Let the blood bank run continuously until it reaches a stable condition. The recorder has registered temperature for at least two hours.
- b) Place a standard thermocouple in a 100 ml container filled with 10% glycerin solution. Place the container and the temperature recorder sensor in the refrigerator. Do not place the recorder sensor in contact with any liquid.
- c) After four hours of soak time at the stable refrigerator temperature, the container temperature should match the refrigerator temperature. Then compare the thermocouple reading with the temperature recorder reading. If there is a discrepancy, use the #1 or the #2 button on the recorder to move the pen on the chart to reflect the correct temperature.

*Please note the pen moves five seconds after the button is released.*

**Note that the recorder has been calibrated in the factory. Unless it is absolutely necessary, please do not change the setting.**

## Descriptions of Refrigerator Parts and Their Functions

#### 11. Blood Storage Drawer and/or Shelves

The drawers and shelves are designed to conveniently store and unload the blood samples.

#### 12. Interior Lights

The light bulb is 15 watts rated for HXC-150.

#### 13. Door Ajar Alarm

When the door is open for 10 minutes, the door ajar alarm will sound. You should reduce the open door time to stabilize the refrigerator temperature.

## Location of Refrigerator

Your refrigerator should be placed at a location that satisfies the following conditions. By doing so, the optimum operating results can be achieved.

### 1. Firm, level floor surface

Installing the unit on a firm and flat floor surface reduces the chance of excessive noise and vibration.

### 2. A place that is far away from any heat source

Avoid placing the unit near any heat dissipating devices such as a gas stove, radiator, oven and other source of heat. The refrigerator would lose its efficiency once the insulation is exposed to heat.

### 3. Do not install a refrigerator in direct sunlight

If a unit is in direct sunlight, it may not function properly and its life expectancy can be shortened.

### 4. Dry area

Avoid placing the unit near damp areas such as a water faucet and sink.

### 5. Clean area

Avoid installing a unit in or near chemical materials and materials that might have out-gassing property. Also avoid dusty locations.

### 6. Good ventilation

There must be sufficient space around the unit for air ventilation. Lack of such space will reduce the unit's cooling capability.

### 7. Ground protection

Grounding the refrigerator will prevent electrical shock to operators if its electrical insulation becomes weak.

#### **WARNING**



An electrical power plug with a ground prong must be used to power the unit. This is to prevent electrical shock.



Do not use water lines to replace a properly installed ground wire for ground protection. This is because many water lines are actually built with non-conductors such as plastic.



Never use gas lines as the ground protection for the refrigerator. This action can be very dangerous.



Never use a telephone line or lightning rod as a grounding protection for the refrigerator. This is because during lightning, there is a strong current present which is extremely dangerous.

## Operation

Please be aware that a weak battery should be replaced to avoid corrosion in the connector buttons. The battery power can be saved by disconnecting the connector button when the unit is not in service. During normal usage, make sure that the battery is plugged in to power the recorder in case of an AC power outage. The LED indicator glows continuously until the main power supply is on and the standby battery is replaced. When the battery is low, the LED indicator flashes to indicate that the battery needs to be replaced.

### Replacement of Recorder Battery

When the green LED on the recorder flashes, there are two ways to inspect the unit.

#### 1. Supplementary power supply (9 volt DC)

If the LED light is off and the recorder stops working, it would suggest that there might be issues associated with the main power supply. Please inspect whether there is a loss of power, a short circuit, or a loose connection. If there is no issue with the main power supply and the recorder starts working normally, please install the backup battery to the recorder. At this time, if the LED stops flashing, the supplementary power supply is normal. If the LED continues to flashes, it means that the power supply is under capacity requirement. It is necessary to replace the battery. The LED green light is off when there is sufficient power to the recorder.

#### 2. Remove the supplementary power supply.

Power LED light continues to flash. The recorder works normally. It suggests that the main power supply is sufficient while the backup battery lacks capacity. It is then necessary to replace the battery until the green LED lights up and stops flashing.

#### 3. Changing of Recorder Chart Paper

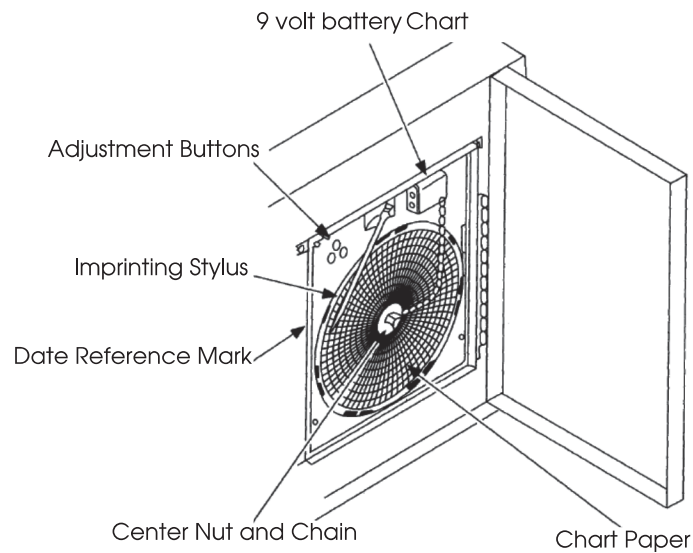
When changing the chart paper for the recorder, please use the following steps.

- Locate the #3 button at the front of the recorder.
- Press and hold the #3 button for about one second. The imprinting stylus of the recorder moves to the left side of the chart.
- When the stylus is completely off the chart, unscrew the center nut for the paper and remove the old chart paper off the recorder. Place a new chart paper on the recorder. Carefully match the day and time line on the chart with the reference mark on the recorder panel (there is a small groove on the front of the recorder as shown in the figure).

## Operation

For proper operation of the temperature recorder, please follow the procedures below.

1. Open the recorder door to access the recorder.
2. Plug in the 9 volt battery located on the upper right corner of the recorder. This battery is a standby power.
3. Install a new chart by following the diagram below.



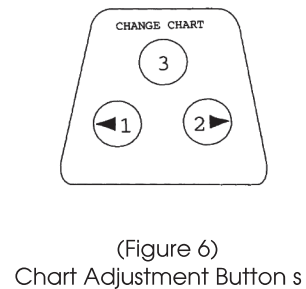
(Figure 5)  
The Temperature Recorder

## 2. Power Supply

The recorder normally uses AC power supply as the refrigerator operates. If the AC power supply malfunctions, the LED indicator flashes to alert a power supply failure. The recorder continues to operate on its standby battery to track the refrigerator temperature. The typical battery can sustain the chart operation for about 30 hours.

## Location of Refrigerator

8. Do not place any objects on top of the refrigerator.



(Figure 6)  
Chart Adjustment Buttons

## Installation

1. Remove packaging materials, packaging bag and straps. Open the refrigerator door to let it air out. If there are dirt marks on the outside of the unit, use a soft sponge with a light detergent solution to wipe the unit clean. Then, rinse the unit with a clean, slightly damp towel.

2. Adjust the height of the unit. Turn the leveling leg screw counterclockwise to level the front end of the unit. The front casters should be off the ground.

3. Preparation of sensor bottle  
Before using the refrigerator, inspect the sensor bottle located at the back of the drawers and shelves to see if the liquid level is up to the 200 mark inside the bottle. If the bottle has no fluid or the fluid level is lower than the 200 mark, use the following steps to fill the bottles at the upper corner and the lower corner with solution of 10% glycerin concentration (or other equivalent liquid such as glycol solution).

- (1) Remove the top drawer, bottom drawer, shelves and baskets.
- (2) Unscrew the fastener that positions the bottle, remove the bottle.
- (3) Unscrew the bottle's cap that is used for the sensor mounting.
- (4) Pour a solution of 10% glycerin concentration into the bottle(s) to the 200 mark line.
- (5) Mount the bottle back to the refrigerator liner wall.
- (6) Install the bottle back to its original position. Place the temperature sensor back inside the temperature bottle.

<p>Unit's refrigeration is not effective. Temperature tends to operate out of range.</p>	<ol style="list-style-type: none"> <li>1. Inspect to see if the unit is overloaded or products with warm temperature have been loaded into the unit.</li> <li>2. Make sure there is an air gap between products.</li> <li>3. Check to make sure the unit is not in direct sunlight or subject to any heat radiation.</li> <li>4. Investigate to see if there have been frequent door openings.</li> <li>5. Investigate to see if the environment temperature is too high.</li> <li>6. Inspect air channels to see if they are blocked.</li> <li>7. Check the condenser air filter to see if it is clogged with dirt.</li> </ol>
<p>The unit is too noisy.</p>	<ol style="list-style-type: none"> <li>1. Make sure the unit is placed on a level floor.</li> <li>2. Make sure any part of the unit does not touch a wall or any object.</li> </ol>
<p>Alarm light flashes, alarm buzzer sounds.</p>	<ol style="list-style-type: none"> <li>1. If warm blood products are just loaded to the unit, allow ample time for the temperature to recover. The alarm signal cancels when the temperature recovers to normal level.</li> <li>2. Inspect the door to make sure it is shut properly. Door ajar alarm can sound if the door is slightly opened.</li> <li>3. There might be insufficient power supply. Let it run for some time to recover.</li> <li>4. Check the temperature of the unit to see if it is in over-temperature condition.</li> </ol>

### Temperature Recorder

The blood bank refrigerator is equipped with a 6-inch temperature recorder for the chamber temperature. When the unit is powered up, the recorder starts working.

#### 1. Installation and Operation

## Operation

button. If the unit is in the alarm mode due to loss of power, the remote alarm contact remains in the alarm mode. This condition persists until the power is resumed. All alarms will automatically stop once the problem is corrected. If the alarm condition is not corrected within 30 minutes, the buzzer alarm and remote alarm contact are activated again. In the case of losing power, a fully charged battery can support the alarm system for 72 hours. For a newly started refrigerator or a refrigerator that has been unplugged for a long time, you should make sure the battery is fully charged. This charging process can take up to two days. When the battery discharges, the remote alarm contact continues to function. When the battery is defective or there is error in wiring, the battery alarm light on the control panel stays on. You should make sure that the power switch for the battery is turned on and the wiring is correct. When all else fails, you should change the battery.

### Procedure to Test the Alarm System

Push the "Alarm Test" button once. The alarm buzzer sounds three consecutive times in 1 Hz frequency. At the same time, the alarm light also flashes three consecutive times and the remote alarm contact opens and closes for three times. The alarm system functions properly.



**This blood bank refrigerator should be cared for by dedicated personnel. The operational status of the unit should be inspected and recorded daily. If the temperature runs toward over-temperature condition, you should transfer the stored products to another refrigerator. The products are only allowed back in the original unit only when operating errors are corrected.**

## Trouble Shooting Guide

Problem	Solution
Unit stops operating.	<ol style="list-style-type: none"> <li>1. Inspect fuse blocks.</li> <li>2. Check that the cord is securely plugged into the power outlet.</li> <li>3. Inspect for problems associated with control wires.</li> <li>4. Make sure the voltage is not too low.</li> </ol>

## Operation

### Control Panel

#### 1. Temperature Indicator

This refrigerator is factory preset to run at  $4\text{ }^{\circ}\text{C} \pm 1\text{ }^{\circ}\text{C}$ . The high temperature alarm is set at  $6\text{ }^{\circ}\text{C}$ , the low temperature alarm is set at  $2\text{ }^{\circ}\text{C}$ .

Table 1, Temperature Indication

●Light on

○Light off

	Operation	Push Button	Display	Definition of display
1	Plug in the unit, power is on		Average Temperature in Sensor Bottle ●up ●low	Average Temperature
2	Push temperature display button		Upper sensor bottle temperature ●up ○low	Upper sensor bottle temperature
3	Push temperature display button		Lower sensor bottle temperature ○up ●low	Lower Sensor bottle temperature
4	Push temperature display button		Average Temperature in Sensor Bottle ●up ●low	Average Temperature
5	Repeat Step 2			

Note: The digital display indicates either the upper bottle temperature or the lower bottle temperature respectively. The displayed temperature does not always stay at  $4\text{ }^{\circ}\text{C}$ . The temperature sensor represents the average temperature inside the refrigerator.

### Defrost Cycle

This blood bank refrigerator has two automatic defrost cycles.

#### 1. Cycle defrost

To maintain a constant temperature inside the blood bank, the refrigeration system cycles on and off according to the temperature demand. When the refrigeration compressor cycles off, a small electric heater is energized to thaw the frost off the evaporator surface. The function does not have an obvious impact to the chamber temperature.

## Operation

### 2. Forced defrost cycle

When the environmental humidity is too high or the products loaded into the refrigerator emit much moisture, cycle defrost will not be sufficient to remove all frost and ice accumulated on the evaporator surface. The equipment will start the forced defrost cycle. Once the frost is thawed, the refrigerator will resume normal operation. During the defrost process, the temperature of a 200-ml blood bag would probably rise by 1~ 2 C.

### Alarm, Safety, and Auto-diagnostic Features

This unit is equipped with all features listed in Table 2. Additionally, it also has auto-diagnostic features.

Table 2, Alarm and Safety Features

Alarm or Safety	Refrigerator Behaviors	Alarm Methods and Indication	Buzzer Alarm	Safe Operation
High Temperature	Either upper sensor or lower sensor reaches 6 °C and warmer	Alarm light flashes	Buzzer alarm sounds	Remote alarm contact triggers
Low Temperature	Either upper sensor or lower sensor is below 2 °C	Alarm light flashes	Buzzer alarm sounds	Remote alarm contact triggers
Over Temperature	Over temperature sensor detects that the chamber temperature is either equal to or greater than 8 °C, or the chamber temperature is less than 2 °C	The unit is already in alarm mode. No further alarm triggers.	Buzzer is already activated.	Remote alarm contact triggers.

Loss of power	The unit lost power or the power switch is off.	Temperature display shows for 5 seconds, and stops showing for 30 seconds. The process repeats until power is on again.	After the time of losing power exceeds 72 hours, buzzer alarm sounds.	Remote alarm contact triggers.
Door ajar	Outer door is slightly open or wide open.	After a 10-minute delay, alarm light flashes.	After a 10-minute delay, buzzer alarm sounds.	Remote alarm contact triggers.
Sensor calibration lost	Button on control panel cannot function within 90 seconds.	Display shows sensor bottle temperature.	No impact	Complete calibration
Abnormal sensor performance	Upper temperature sensor circuit shorts or opens.	Alarm light flashes. Temperature display shows "E1".	Buzzer alarm sounds.	Remote alarm contact triggers.
	Lower temperature sensor circuit shorts or opens.	Alarm light flashes. Temperature display shows "E2".	Buzzer alarm sounds.	Remote alarm contact triggers.
	Defrost sensor circuit shorts or opens.	Alarm light flashes. Temperature display shows "E3".	Buzzer alarm sounds.	Remote alarm contact triggers.
	Over temperature sensor circuit shorts or opens.	Alarm light flashes. Temperature display shows "E4".	Buzzer alarm sounds.	Remote alarm contact triggers.
	Rechargeable battery has low voltage, or there is no circuit.	Alarm light stays on. Display shows temperature normally.		No impact

Note: Remote alarm contact and buzzer alarm work together. When the refrigerator is in alarm mode, the remote alarm contact can be disconnected by pushing the buzzer

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