



# **-20°C Flammable Materials Storage Laboratory Freezers**

**TSX Series**

## **Installation and Operation**

332192H01

Rev. A

May 2021

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[www.thermofisher.com/labwarranty](http://www.thermofisher.com/labwarranty)

**thermoscientific**

**IMPORTANT** Read this instruction manual. Failure to follow the instructions in this manual can result in damage to the unit, injury to operating personnel, and poor equipment performance.

**CAUTION** All internal adjustments and maintenance must be performed by qualified service personnel.

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For your future reference and when contacting the factory, please have the following information readily available. It can be found on the dataplate attached to your unit.

Model Number: \_\_\_\_\_

Serial Number: \_\_\_\_\_

The following information, if available, is helpful for contacting the factory.

Date Purchased: \_\_\_\_\_

Purchase order number: \_\_\_\_\_

Source of Purchase: \_\_\_\_\_

(manufacturer or specific agent/rep organization)

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# 1 Introduction

This manual provides installation and operation instructions for Flammable Material Storage (FMS) laboratory freezers with a preset temperature setpoint of -20°C.

## 1.1 Models

The table below shows the units covered in this operation and installation manual by model number. Refer to *Section 6.1* for details on the voltage specifications for the various models.

**Table 1. Applicable Models**

Unit	Model (*)	Energy Star Model (*) 
TSX2320H*		A

## 2 Safety Precautions

Conventional freezers are not suitable for storing flammable materials. Such units have components in their electrical and refrigeration systems that can trigger explosions of flammable air and vapor mixtures inside the unit.

Flammable Material Storage (FMS) freezers have no internal components that could trigger an explosion or fire inside the unit. FMS freezers are designed for use in locations which are not classified as hazardous by the Authority Having Jurisdiction (AHJ). Under normal operating conditions, the buildup or presence of flammable vapors will not occur in the environment outside the unit.

In this manual, the following symbols and conventions are used:



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



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



**WARNING:** This symbol indicates situations where dangerous voltages exist and potential for electrical shock is present.



**WARNING:** This symbol indicates potentially hazardous situations, which if not avoided could result in fire.



**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.

**CAUTION:** This indicates a situation which may result in property damage.



This symbol indicates surfaces which may become hot during use and may cause a burn if touched with unprotected body parts.



Before installing, using or maintaining this product, please be sure to read the manual and product warning labels carefully. Failure to follow these instructions may cause the product to malfunction, which could result in injury or damage.



This symbol indicates possible pinch points which may cause personal injury.



The snowflake symbol indicates low temperatures and risk of frost bite. Do not touch bare metal or samples with unprotected body parts.



This symbol indicates a need to use gloves during indicated procedures. If performing decontamination procedures, use chemically resistant gloves.

Below are important safety precautions that apply to this product:



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 the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.



FMS units are NOT designed for use in Class I, Division 1 classified environments, which require explosion-proof models.



**WARNING:** Risk of Fire. Keep away from open flames and ignition sources. FMS units are designed for use in laboratory environments with adequate ventilation.



**WARNING:** Risk of Injury. The port hole in back of the unit allows the use of redundant temperature monitoring devices. All probes introduced into the cooling chamber **MUST** be suitable for use in Class I, Division 1 environments.



**WARNING:** Use appropriate Personal Protective Equipment (PPE) while handling the materials to avoid possible injury. Operators should be trained in the handling of all potentially hazardous materials.



Always store flammable materials in closed containers. Follow the Standard on Fire Protection for Laboratories Using Chemicals, NFPA 45-2011, Clause 10.5.2.



**WARNING:** Risk of Shock. Your unit must be properly grounded in conformity with national and local electrical codes. Do not connect the unit to overloaded power sources.



**WARNING:** Risk of Shock. Disconnect the unit from all power sources before cleaning, troubleshooting, or performing other maintenance on the product or its controls.



**WARNING:** Risk of Fire. This unit is charged with hydrocarbon refrigerants. Only qualified service personnel should service this unit.



**WARNING:** Risk of Fire. No equipment that uses an open flame should be placed inside the freezer. This will harm the unit, hamper functionality and compromise your safety.



**CAUTION:** Risk of Fire. Do not use any battery powered or externally-powered equipment in the freezer.



**CAUTION:** Risk of Abrasion. Hidden sharp edges may be present on drawers. Use appropriate Personal Protective Equipment (such as gloves) while handling the drawers to avoid possible sharp points related injury.



Do not modify system components, especially the controller. Use OEM exact replacement equipment or parts. Before use, confirm that the product has not been altered in any way.



**CAUTION:** Unauthorized repair of your freezer will invalidate your warranty. Contact Technical Service at 1-800-438-4851 for additional information.

## EMC

EMC Registration is done on this equipment for business use only. It may cause interference when the product would be used in home.

This equipment has been tested and found to comply with the limits for a Class A digital device. Class A covers devices for usage in all establishments other than domestic and that are not directly connected to a low voltage power supply network, which supplies domestic environment.

This ISM device complies with Canadian ICES-001.

## FCC

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

### 3 Unpacking

At the time of delivery, be sure to inspect the unit packaging for damage before signing for the shipment. If packaging damage is present, request immediate product inspection and file a claim with the carrier.

**Note** Packaging damage does not denote that unit damage exists.

If concealed damage is found (damage that is not apparent until the item has been unpacked), stop further unpacking and save all packing for carrier's inspection. Make a written request for inspection to delivering carrier. This must be done within 15 days after delivery. Then file a claim with the carrier.

***Do not return goods to the manufacturer without written authorization.***

## 4 Packing List

Inside the freezer cabinet is a bag containing:

- Essential safety instructions
- Certificate of Conformance
- Warranty Card
- Quick start guide
- Two control panel keys
- Two cabinet door keys
- Safety Data Sheet for Glycerin

If the unit was ordered with shelves, the bag will also include:

- Small bag with shelving clips

If specified on the order, the bag may also include:

- QC temperature graph and test log
- Calibration information

Other items with your unit include:

- Power Cord
- Baskets, Shelves or Drawers
- Thermal Bottle (some models)

**Manual Label provides link to Installation and Operation Manual for the unit.**

**Note:** To download the complete Installation and Operation Manual for the unit, please visit: <https://www.thermofisher.com/usermanuals>

## 5 General Recommendations

This section includes some general recommendations for your unit.

### 5.1 Temperature Monitoring



**IMPORTANT NOTE** We recommend the use of a redundant and independent temperature monitoring system so that the device can be monitored continuously for performance commensurate with the value of the product stored. Please use the probe in glycol bottle (if present) as the temperature reading reference point for all calibration / validation procedures.



**WARNING:** Risk of Injury. All probes introduced into the cooling chamber **MUST** be suitable for use in Class I, Division 1 environments.

### 5.2 Intended Use

The -20°C flammable storage freezers described in this manual are high performance units for professional use. These products are intended for use as cold storage of potentially flammable materials in research use and as a general purpose laboratory freezer, storing samples or inventory at operating temperatures between -25°C and -15°C.

These units are not intended for use as a medical device and are not intended for in vitro diagnostic use. Components and design have been evaluated by Underwriters Laboratories (UL) to meet the requirements of the National Fire Protection Association Standards, Nos. 45, 70.

Expected users of this equipment include but are not limited to personnel from the following areas: Professional and clinical laboratories, Pharma and Biotech facilities, Academic, Industrial, and Government facilities or those trained in laboratory protocols put in place at your facility. The units are not for use by the general public.

It is not considered a medical device and has therefore not been registered with a medical device regulatory body (e.g. FDA); that is, it has not been evaluated for the storage of samples for diagnostic use or for samples to be re-introduced to the body.

FMS units are **NOT** designed for use in Class I, Division 1 classified environments, which require explosion-proof models.



Storage of unsealed corrosive substances may cause the interior of the unit to corrode.

## 6 Operating Standards

The freezers described in this manual are classified for use as stationary equipment in a Pollution Degree 2 and Overvoltage Category II environment.

These units are designed to operate under the following environmental conditions:

- Indoor use
- Altitude up to 2000 m (6512 feet)
- Maximum relative humidity 60% for temperatures from 15 to 32°C (59 to 90°F).
- Main supply voltage fluctuations not to exceed 10% of the nominal voltage.
- The freezer must not be connected to a GFCI (Ground Fault Circuit Interrupter) protected outlet as it may be subject to nuisance tripping.

Operation outside of these conditions will affect the performance of the unit and the samples stored inside.

### 6.1 Unit Specifications

The last character in the model number listed on the freezer identifies the electrical specifications for your unit.

The dataplate is located on the upper left side of the unit.

**Table 2. Unit Specifications**

Model	Rated Voltage	Rated Current	Frequency / Phase	Power Module Plug	Approximate Lab Freezer Weight Kg (lbs)	Approximate Freezer Weight Kg (lbs)	Exterior Dimensions (D x W x H)	Hydrocarbon Refrigerant
23A	115 V	5.56 A	60 Hz	IEC C19	178 (394)	203 (449)	93.6 x 71.1 x 199.4 cm (36.9 x 28.0 x 78.5 in)	R290, 145 g

## 7 Installation



**WARNING:** Risk of Shock. Do not exceed the electrical rating printed on the data plate located on the upper left side of the unit.



Do not move the unit using the drain pan on the back. This could cause damage to the equipment.

### 7.1 Location

Install the unit on a level area free from vibration with a minimum of 6 inches of space on the sides and rear and 12 inches at the top. Do not position the equipment in direct sunlight or near heating diffusers, radiators, or other sources of heat.



**WARNING:** Risk of Injury. Do not move the unit while loaded. Unit shall always be moved when empty and by pushing slowly at handle level or lower on the unit. Be especially careful on any uneven surfaces.

#### 7.1.1 Installation Instructions

The unit must be level both front to back and side to side when installed. If the unit is out of level, you may need to shim the corners or casters with thin of metal. Be sure to set the brakes for units equipped with casters.



An unlevel unit may result in instability and performance issues for the doors and drawers.

**7.2 Wiring** The wiring diagrams are attached on the back of the cabinet.



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



**CAUTION:** Risk of Shock. For personal safety and trouble-free operation, this unit must be properly grounded while in use. 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.



Do not position the unit in a way that impedes access to the disconnecting device or circuit breaker in the back of the unit.



Always connect the unit to a dedicated (separate) circuit. Each unit is equipped with a service cord and plug designed to connect it to a power outlet which delivers the correct voltage. Supply voltage must be within  $\pm 10\%$  of the unit rated voltage. If cord becomes damaged, replace with a properly rated power supply cord.

**Table 3. Power Cord Specifications**

Model	Power Cord Specifications
A	3-G 12 AWG, NEMA 5-15P, 15 A/125 V



**CAUTION:** Risk of Shock. Never cut the grounding prong from the service cord plug. If the prong is removed, the warranty is invalidated.



In an emergency, the power cord is a disconnect device.

The  $-20^{\circ}\text{C}$  Flammable Materials Storage Laboratory Freezers are equipped with a connectivity port on the back of the unit. For use, refer to the instructions provided with the applicable Thermo Fisher Scientific connectivity device.

**7.3 Shelves** All the freezers come standard with wire shelves. Laboratory freezers come standard with 4 shelves.

Maximum shelf capacity is 45 kg (100 lbs). For safety in shipping, the shelves are packaged and secured inside the cabinet. Insert the shelf support hangers (included inside the unit) into the built-in shelf supports (located on the inside walls of the cabinet interior) at the desired locations. Position the shelves on the flat supports (refer to *Figure 1*). Do not position shelving to disrupt the thermal bottle(s).



**Figure 1.** Shelf Support Hanger

**7.4 Drawers** Drawers can be ordered as an accessory for this unit.

Drawers are shipped in a factory installed position that promotes uniform spacing between the drawers. The drawer slides are adjustable to higher and lower positions in the cabinet. You can position these slides in the vertical slots which are spaced at one-inch intervals. The drawers must be removed in order to adjust the position of the drawer slides.

The maximum drawer capacity is 27 kg (60 lbs).



**CAUTION:** Risk of Abrasion. Hidden sharp edges may be present on drawers. Use appropriate Personal Protective Equipment (such as gloves) while handling the drawers to avoid possible sharp points related injury.

### 7.4.1 Removing the Drawers

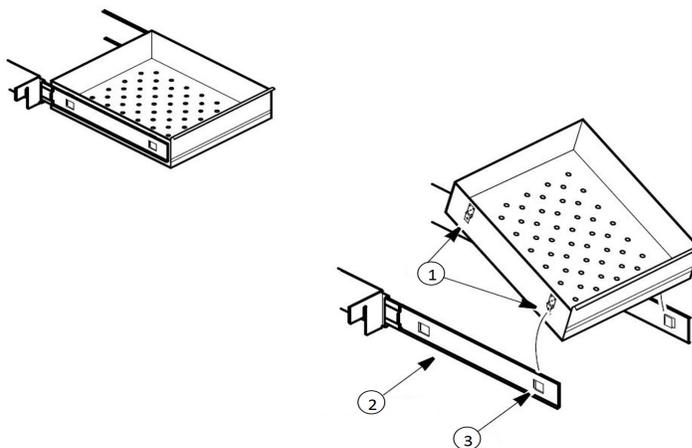
To remove the drawers, complete the following steps (refer to *Figure 2*):

1. Pull the drawer towards you until the slides are fully extended.
2. Lift the back of the drawer to disengage the mounting tabs from the slots on the slides.



**Note** The drawers fit snugly between the slides. Push the back of the drawer from underneath to remove the drawer.

3. Raise the back of the drawer almost to a vertical position and disengage the front mounting clips from the sides.



**Figure 2.** Drawer Removal and Installation

Label	Description
1	Tabs
2	Drawer slide
3	Slot

### 7.4.2 Reinstalling the Drawers

To reinstall the drawers, complete the following steps (refer to *Figure 2*):

1. Pull both the slides of the drawer towards you until the slides are fully extended.
2. Position the drawer between the slides and with the back facing end raised at 45 degree angle, insert the mounting clips at the front into the slots on front of the slides.
3. Push the back of the drawer down between the slides and insert the basket tabs into the slots at the back.



**Note** The drawers fit snugly between the slides. Push on the back of the drawer from the inside to insert the drawer tabs completely into the slots. Make sure both the drawer tabs are aligned with the slots on the slides before pushing the drawer down between the slides.

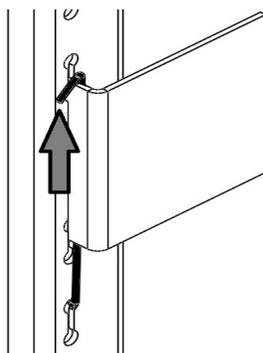


**CAUTION:** Be careful when reinstalling the drawers to avoid possible pinching.

### 7.4.3 Changing Drawer Position

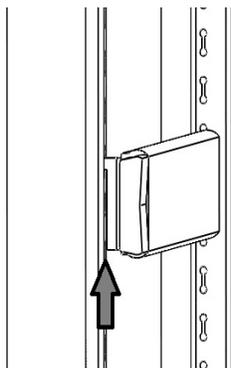
Drawer slides have a small wire safety clip at the front pilaster which prevent the slides from falling when the drawer is removed. To change the position of the drawer slides, complete the following steps:

1. Locate the safety clip.
2. Slip a small screwdriver under the bottom of the wire clip and pry the clip towards the inside of the freezer.



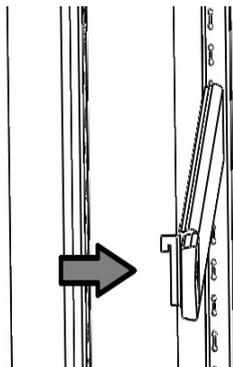
**Figure 3.** Clip Removal

3. Lift up the slide at the front. The slide is free to move from the front pilaster.



**Figure 4.** Front of slide Removal

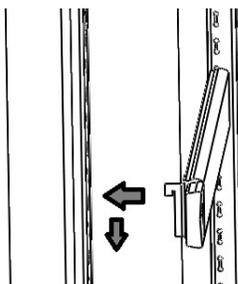
4. The drawer slide must be removed from the rear pilaster at approximately a 45 degree angle towards the center of the cabinet.



**Figure 5.** Slide Rotation

5. Pull the slide towards the front of the cabinet.
6. Determine desired location for the slide and insert the slide into the rear pilaster at a 45 degree angle towards the center of the cabinet.

7. Once the slide is seated in the rear pilaster, rotate the slide until it is parallel with the unit wall and insert slide into front pilaster.

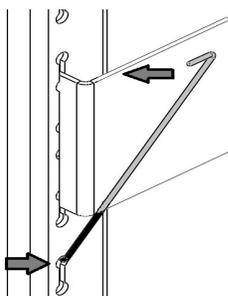


**Figure 6.** Slide Installation



**CAUTION:** Ensure the slide is level. If the slide is not seated in a level orientation, the drawers/baskets will not function as intended. This could cause injury or product damage.

8. Replace the safety clip by hooking the clip under the front pilaster slide bracket. Then rotate the wire safety clip over the top of the same bracket.



**Figure 7.** Clip Replacement



**CAUTION:** Drawer slides do *not* require lubrication. Additional lubricant could impede movement of the drawers when lubricant is cold.

## 7.5 Baskets

Baskets can be ordered as an accessory for this unit.

The basket slides are adjustable to higher and lower positions in the cabinet. You can position these slides in the vertical slots which are spaced at one-inch intervals.

The baskets must be removed in order to adjust the position of the slides. The procedure for removing, reinstalling, and changing position of the baskets can be found in *Section 7.4.1*, *Section 7.4.2*, and *Section 7.4.3*.

The maximum basket capacity is 27 kg (60 lbs).

## 7.6 Temperature Sensor Bottles (if present)

On some models, the temperature displayed on the control panel is measured by a probe inserted in sensor bottle inside the cabinet. If present, the sensor probe must be inserted in the glycol bottle prior to operation.

The sensor bottle is positioned on the back wall of the unit.

To install the sensor(s) into the bottles, complete the following steps:

1. Remove the bottle from the bracket and verify that each bottle is full of liquid.
2. Remove the solid cap from the bottle and save for the next time the unit needs to be moved.
3. Remove the taped lid and temperature sensor(s) from the wall.
4. Insert the temperature probe(s) into the bottle.
5. Secure the Lid to the bottle and return the bottle to the bracket.

## 7.7 Door Operation

The doors on all units are designed to stay open if opened 90 degrees or more. The door spring tension cannot be adjusted.

If the self-closing door does not work properly, make sure the unit is level.



Door seal integrity is critical for unit's performance. Never route anything through the door seal. A loose fitting gasket allows moist air to be drawn into the cabinet, resulting in quicker frost buildup on the evaporator coil, longer running time, poor temperature maintenance, and increased operation cost.



**CAUTION:** Keep hands and body parts clear of closing doors. The moving parts create a potential pinch point.



**WARNING:** Risk of Fire. There are port holes in the walls of the cabinet to help facilitate routing of tubing, independent temperature sensors, and other non-electrical items. The ports are not intended to supply power to devices inside the device. Be sure to seal the holes after routing items to prevent undesired air exchange.

## 7.8 Remote Alarm (Optional)

All units have factory-installed local alarm contacts that can be used for remote alarm systems.

The maximum distance between a freezer and a remote alarm depends on the wire gauge used. Refer to *Table 4* below:

**Table 4. Wire Gauges and Distance to Remote Alarm**

Wire Gauge	Total Wire Length (feet)	Distance to Alarm 1/2 Wire Length (feet)
20	530	265
18	840	420
16	1330	665
14	2120	1060
12	3370	1685

Remote alarm terminals are located at the rear of the machine compartment. The three terminals are: COMMON, OPEN ON FAIL (Normally Closed), and CLOSE ON FAIL (Normally Open).

**REMOTE ALARM CONNECTIONS**  
**CONNEXIONS DE L'ALARME À DISTANCE**

CONTACT RATING 1 AMP MAX  
 CLASS 2 CIRCUIT ONLY  
 VALEUR NOMINALE DE CONTACT DE 1 AMP MAX.  
 SUR UN CIRCUIT DE CLASSE 2 UNIQUEMENT

WIRE COLOR (FIL DE COULEUR)	FUNCTION (FONCTION)
○ — PURPLE (VIOLET)	COMMON (COMMUNE)
○ — BLACK (NOIR)	OPEN ON FAIL (EN POSITION OUVERTE)
○ — RED/WHITE (ROUGE/BLANC)	CLOSE ON FAIL (EN POSITION FERMÉE)

**Figure 8.** Remote Alarm Diagram

To install the remote alarm, make the following connections:

1. Connect the COMMON terminal on the cabinet switch to the COMMON wire on the alarm.
- 2a. To get an alarm when the switch contacts open, connect the OPEN ON FAIL terminal on the cabinet to the OPEN ON FAIL wire on the alarm.
- 2b. To get an alarm when the switch contacts close, connect the CLOSE ON FAIL terminal on the cabinet to the CLOSE ON FAIL wire on the alarm. The COMMON and CLOSE ON FAIL wires must be tied together in this application.
3. Plug the alarm system service cord into an electrical outlet.

The contacts will trip in the event of a power outage, high temperature alarm or low temperature alarm.

## 7.9 Final Checks

Before start up, be sure to complete the following steps:

1. Make sure that the unit is free of all wood or cardboard shipping materials, both inside and outside.
2. Check the positions of the shelves, drawers or baskets. If you want to adjust the positions, see instructions in *Section 7.3*, *Section 7.4* and *Section 7.5*.
3. Verify that the unit is connected to a dedicated circuit.

## 8 Startup

### 8.1 Initial Startup

To start up the freezer, complete the following steps:

1. Ensure the double pole circuit breaker switch located next to the power inlet is in “ON” position (i.e. “I” position).
2. Insert the silver colored key in the switch and turn to the **Power On** position. The display will show the actual cabinet temperature and the compressor should start within approximately 10 minutes.
3. Allow the unit to reach operating temperature before loading it with any product. To stabilize the temperature profile, a 24-hour waiting period is recommended.
4. If you desire to enable the alarms, turn the three position key switch one turn further clockwise to the **Alarm On** position. To avoid nuisance alarms, wait until the unit has cooled down to the desired operating temperature (-20°C default).
5. If you have a remote alarm, hook it up at this point (refer to *Section 7.8*).
6. If desired, lock the cabinet door using the gold colored key. Place duplicate key copies in a safe place.

All controls should now be fully operational, the alarm active (if enabled), and all visual indicators active.



**CAUTION:** Use gloves when handling samples to avoid potential frost bite.

## 8.2 Product Loading and Unloading Guidelines

When loading your freezer, take care to observe the following guidelines:

- Distribute the load as evenly as possible. Temperature uniformity depends on air circulation, which could be impeded if the internal storage components are overfilled, particularly at the top of the cabinet.



**CAUTION:** Always store flammable materials in closed containers. Follow the standard on Fire Protection for Laboratories Using Chemicals, NFPA 45-2011, Clause 10.5.2.

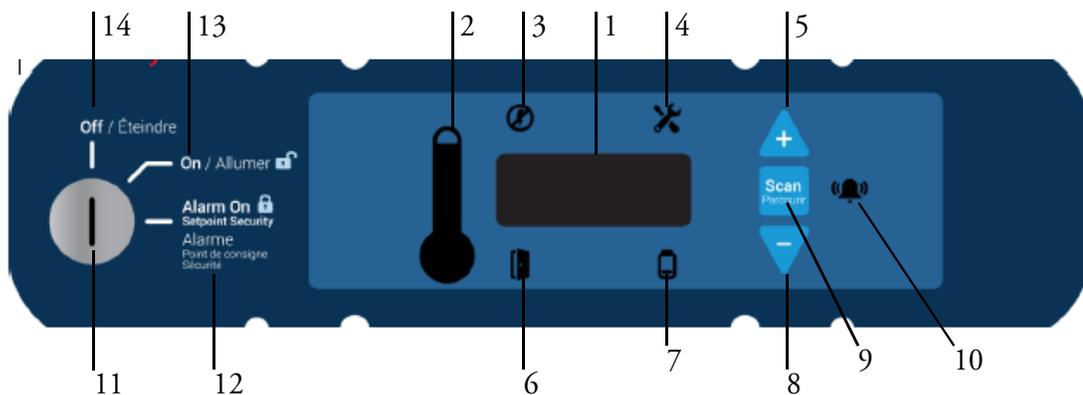
- For critical applications, be sure that the alarm systems are working and active before you load any product.
- Ensure clearance between the top of the cargo and the bottom of the shelf/drawer/basket. Lack of clearance may affect unit performance or impede operation of drawer/basket. Keep cargo within the bounds of the shelf/drawer/basket.
- For initial product loading and after removing the drawers or baskets for cleaning, be sure to load the unit from the bottom drawer or basket up to ensure the components are seated properly. (Applicable for drawers and baskets only).
- Only open one drawer or basket at a time.
- Avoid disrupting the thermal bottle(s) when repositioning interior components.
- The floor of the cabinet should not be loaded.
- Never load the unit above the upper load limit line or below the lower limit line (if present). This is important to ensure that air can circulate properly and evenly distribute the temperature throughout the interior.



**Figure 9.** Load Limit Line

## 9 Operation

### 9.1 Control Panel



**Figure 10.** Freezer Control Panel

The control panel is located on the top right side of your freezer. You can use the three pushbuttons (#5, #8, and #9 in *Figure 10*) to change the temperature display (#1) or to adjust temperature and alarm setpoints as given in *Section 9.3*. The thermometer display (#2) provides a quick visual indicator of current cabinet temperature and alarm conditions.

1. **Main temperature display** - during normal operation, shows cabinet temperature in degrees Celsius, as measured by the primary sensor inside the cabinet. You can use the buttons to display other values such as setpoints and highest, highest and lowest recorded temperatures. The number in the main display flashes when the value can be modified.
2. **Thermometer** - shows cabinet temperature and alarm conditions. There are 10 horizontal bars: 9 are displayed during normal operation, the tenth (top) bar indicates a warm alarm condition. The number of bars illuminated indicates approximate cabinet temperature. With the default settings, 4 to 6 bars illuminated indicate that the cabinet is at desired setpoint. For example, suppose that the cabinet temperature setpoint is  $-20^{\circ}\text{C}$  and that the cold and warm alarm setpoints are  $-25^{\circ}\text{C}$  and  $-10^{\circ}\text{C}$ . Then the number of bars illuminated indicates cabinet temperature as follows:

**Table 5. Thermometer Display on Control Panel (Setpoint -20°C)**

<b>Bars Displayed</b>	<b>Temperature (°C)</b>	<b>Bars Displayed</b>	<b>Temperature (°C)</b>
Bulb Only	-25 (cold alarm)	6 Bars	-16
1 Bar	-23.5	7 Bars	-14.5
2 Bars	-22	8 Bars	-13
3 Bars	-20.5	9 Bars	-11.5
4 Bars	-19	10 Bars	-10 (warm alarm)
5 Bars	-17.5		

When cabinet temperature exceeds the warm alarm setpoint, the top bar of the thermometer flashes. When temperature is lower than the cold alarm setpoint, the bulb flashes. When you are in programming mode (described in *Table 7*) the thermometer shows the setpoint value you are changing.

3. **Power failure** - illuminates when the main power supply is interrupted. In this case the audible alarm also sounds.
4. **Service mode** - illuminates when the controller is in service programming mode.
5. **Increase** - pushbutton used to increase setpoint values in programming mode and for various display functions.
6. **Door ajar** - illuminates when the freezer door is open longer than the duration specified in the service parameters table; default is approximately 3 minutes (when the alarm is activated and the key switch is turned to the alarm position).
7. **Battery low** - illuminates when the backup battery is low (refer to *Section 11.6*).
8. **Decrease** - pushbutton used to decrease setpoint values in programming mode and for various display functions.
9. **Scan** - pushbutton used to change the main display and for various other functions.
10. **Audible alarm** - illuminates during warm and cold alarm conditions.

11. **Key Switch** - switch used to turn the power and alarms on and off for the unit.
12. **Alarm On** - Setpoint Security - when the key switch is in the alarm on position, the alarms are on and the setpoints cannot be modified.
13. **Power On** - when the key switch is in the on position, the unit power is on with no alarms active.
14. **Off** - when the key switch is in the off position, the unit is off.

For full descriptions of display, programming and service functions, refer *Table 6*, *Table 7* and *Table 8*.

## 9.2 Display Functions

**Table 6. Control Panel Display Functions**

Function	Meaning	Sequence	Display
Normal operation	Default display while freezer is running.		Temperature display and control panel thermometer icon show cabinet temperature.
Coldest logged temperature	Show coldest cabinet temperature since last startup or reset.	Press 	Display shows coldest logged temperature while button is pressed.
Warmest logged temperature	Show warmest cabinet temperature since last startup or reset.	Press 	Display shows warmest logged temperature while button is pressed.
Mute	Silence audible alarm for approximately 6 minutes.	Press 	Display and thermometer show cabinet temperature, alarm icon continues to flash.
Reset	Return to default display after alarm condition, clears temperature log.	Press and hold  and  simultaneously.	Excursion values are reset; temperature display shows cabinet temperature.
Alarm Test	Test by simulating warm alarm. Key switch must be in alarm mode.	Press  and  simultaneously, hold for approximately 5 seconds.	First, the display will show "AtSt" to show entry of the test. Display and thermometer show simulated cabinet temperatures (warm), alarms flash and sound as appropriate. Alarms clear when test is completed.

### 9.3 Programming Functions

You can enter the programming mode by pressing the Scan button  and holding for approximately 5 seconds. The display will then flash “Prg” to indicate that you have entered the programming mode. Use (▲) and (▼) buttons to modify the values and press the scan  button to save the value and go to the next screen.

**Note** If the alarms are enabled, all parameters are read only and cannot be edited.

**Table 7. Setpoint Programming Functions**

Screen/Button		Function	Summary
1	Initial Screen	Unit Setpoint	The temperature that the unit is set to run.
2	Press Scan 	Cold Alarm Temperature	The temperature that will actuate the cold alarm (if active).
3	Press Scan 	Warm Alarm Temperature	The temperature that will actuate the warm alarm (if active).
4	Press Scan 	Exit Program Mode	Returns to normal operating screen.

If the unit is left idle for a period of approximately 30 seconds during program mode, the program mode shall be exited.

If at any point the scan button is pressed and held for a period of approximately 10 seconds, the unit shall enter the service mode.

### 9.4 Service Parameters

You can enter the service mode by pressing the Scan button  and holding for approximately 10 seconds while in Programming mode (refer to *Section 9.3*). The display will then flash “SEr” to indicate that you have entered the service mode followed by the software checksum values flashing on the screen. The service icon (✘) will also illuminate. Use up (▲) and down (▼) buttons to modify the values and press the scan  button to save the value and go to the next screen.

**Note** If the alarms are enabled, the unit will not enter Service Mode.



Resetting any of the following parameter values could adversely affect the performance of your unit. Be sure to understand your product requirements prior to making any adjustments to the service parameter values. These settings very rarely need to be changed from normal operation. Call technical support if you have any questions prior to making any adjustments to service parameter values.

**Table 8: Service Parameters**

Screen/Button		Display	Function	Summary
1	Initial Screen	SEr -20	Temp of unit	Allows the user to see what temperature the unit is designed to run.
		Varies	CPU Checksum	Shows the current checksum of the CPU board for validation.
		Varies	Relay Board Checksum	Shows the current checksum of the Relay board for validation.
		tyP	Model Type	Unit type 20 for -20 Freezer. This parameter should never be changed.
2	Press Scan (  )	CFg	Type of unit	This parameter should only be changed by trained service personnel.
3	Press Scan (  )	CuFt	Size of the unit	Setting for Size of the unit.
4	Press Scan (  )	Pd oFSt	Control Probe Pulldown Offset	The difference in temperature between the control probe value and the average compartment temperature that determines when the control system changes from pull down mode to steady state operation. This can be useful to adjust if the average compartment temperature has an undershoot or overshoot relative to setpoint during pull down mode. This offset is also used on some freezer models as a response to door openings.
5	Press Scan (  )	Cnt oFSt	Control Probe Offset	The difference in temperature between the control probe value and the average compartment temperature that is used to control the cooling system to the unit setpoint during steady state operation. This can be useful to adjust if there is a discrepancy between the unit setpoint and the average cabinet temperature.
6	Press Scan (  )	dIS oFSt	Display Probe Offset	The difference in temperature between the display probe value seen on the User Interface display and the average compartment temperature at the unit setpoint during steady state operation. This can be useful to adjust the display during unit calibration procedures.
7	Press Scan (  )	Ctr CAI	Display Control Probe with Offset	(If present) Normally OFF (00). If ON (01), the Upper Bottle Temperature output on main display is replaced by the control probe temperature value with offset when exiting the service menu.
8	Press Scan (  )	Cnt ucl	Control Upper Hysteresis	The degree increase in temperature from the setpoint that will trigger the unit to begin cooling to prevent the unit from getting too warm.

**Table 8: Service Parameters**

Screen/Button		Display	Function	Summary
9	Press Scan 	Cnt lcl	Control Lower Hysteresis	The degree decrease in temperature from the setpoint that will trigger the unit to stop cooling to prevent the unit from getting too cold.
10	Press Scan 	door AJAr	Door Alarm Time	The approximate time the door can remain open before the door ajar alarm activates in minutes.
11	Press Scan 	qUA	Quality Mode	Normally OFF(00). Used for production line testing.
12	Press Scan 	bot	BOT Mode	Normally OFF(00). If ON(01), the unit is forced to run at coldest possible temperature for approximately 24 hours. Defrosts will still occur as scheduled.
13	Press Scan 	PEr	Perimeter Heater Duty Cycle	Controls the perimeter heater ON time.
14	Press Scan 	Cnt Prb	Control Probe Temperature	Displays control probe temperature (Read only).
15	Press Scan 	Anb Prb	Ambient Probe Temperature	Displays ambient probe temperature in deck (Read only).
16	Press Scan 	---	Exit Service Mode	Returns to normal operating screen.

If the unit is left idle for a period of approximately 30 seconds during service mode, the unit will exit service mode and return to normal operation.

**Note** If an alarm occurs while in the service mode, it will not show until exiting this mode.

To reset values back to factory settings, perform the following procedure:

1. Turn keyswitch to “OFF” position.
2. Hold the up () and down () arrows while turning the keyswitch to the “ON” position.
3. Continue to hold buttons for approximately 10 seconds.
4. Release buttons and turn keyswitch to “OFF” position.
5. Turn keyswitch to “ON” position.



Performing this reset will overwrite any changes made after receipt of this unit and may overwrite any changes that were made at the factory to optimize performance.

## 9.5 Temperature Settings

The factory default temperature setting is  $-20^{\circ}\text{C}$  for all manual defrost freezers. To change the factory temperature settings, refer to the instructions in *Section 9.3*.



The freezer described in this manual is designed for optimum performance at  $-20^{\circ}\text{C}$ . It is advisable to call Technical Service before changing setpoints.

## 9.6 Alarms

The alarm system is designed to provide visual and audible warning signals for both power failure and rise in temperature. The alarm is equipped with a battery backup.

Default cold and warm alarm values are  $-25^{\circ}\text{C}$  and  $-10^{\circ}\text{C}$ . These values may be adjusted, following instructions in *Section 9.3*.

The alarm system is activated only when the key switch is turned to the Alarm On position. The audible warning signal sounds when there is a power failure, temperature alarm condition, or when the door is ajar for approximately 3 minutes with default door alarm setting.

The Mute function (pressing the  button) allows you to turn off the audio warning without turning off the visual indicators. The alarm will ring back approximately after 6 minutes if the alarm is still active.

During a warm alarm, a flashing of the uppermost bar of the thermometer, the temperature display, and the speaker icon will occur at the same time.

If there has been a warm alarm since the last alarm reset, but the temperature is not currently in an alarm state, the uppermost bar of the thermometer and the speaker icon will slowly alternate in flashing.

During a cold alarm, a flashing of the bulb of the thermometer, the temperature display, and the speaker icon will occur at the same time. If there has been a cold alarm since the last alarm reset, but the temperature is not currently in an alarm state, the bulb of the thermometer and the speaker icon will slowly alternate in flashing.

During a power failure, the power failure icon will illuminate, the thermometer will display without the bulb, and the temperature will flash approximately every 3 seconds. If there has been a power failure since the last alarm reset, the power failure icon and the speaker icon will slowly alternate in flashing.

During a low battery condition, the low battery icon will illuminate.

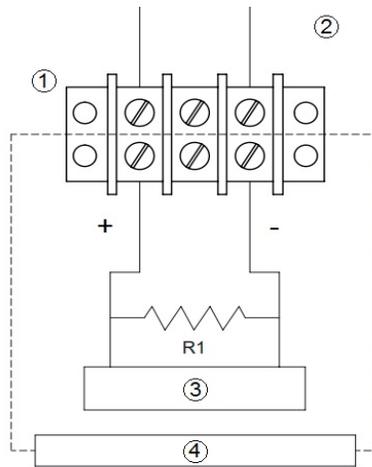
The alarms can be reset by pressing and holding the  and  simultaneously.

## 10 Temperature Transmitter (Optional)

### 10.1 Powered Temperature Transmitter

A powered temperature transmitter is an option for this unit. This temperature transmitter allows for remote temperature monitoring of your system.

To connect your remote temperature monitoring system to the powered temperature transmitter, refer to *Figure 11* below.



**Figure 11.** Powered Temperature Transmitter

Label	Description
1	Terminal Strip
2	Rear of Unit
3	Controller and/or Indicator
4	Customer Provided System

**Note** The building management system load wiring must have a resistance less than 340 ohms.

### 10.2 Unpowered Temperature Transmitter

An unpowered temperature transmitter is an option for this unit. This temperature transmitter allows for remote temperature monitoring of your system.

To connect your remote temperature monitoring system to the unpowered temperature transmitter, refer to the diagram attached on the back of the unit.

## 11 Maintenance



**WARNING:** Risk of Shock. Disconnect equipment from main power before attempting any maintenance to equipment or its controls unless stated otherwise.

### 11.1 Cleaning the Cabinet Interior

To clean the cabinet interior, remove the shelves, drawers, or baskets following the instructions in *Section 7.3*, *Section 7.4* and *Section 7.5*. Use a solution of water and a mild detergent for cleaning. Rinse the interior storage components and wipe them dry with a soft cloth.

### 11.2 Cleaning the Condenser Filter

Clean the condenser filter every three months. There is one condenser filter located in the back cage of the unit that can be accessed without removing the back cage or disconnecting the power.

To clean the filter, complete the following steps:

1. Remove the filter by pulling upwards through the slot in the back cage.
2. Shake the filter to remove loose dust.
3. Rinse the filter in clean water.
4. Shake the excess water from the filter and let it dry.
5. Reinstall filter by pushing downwards through the slot in the back cage.



**CAUTION:** Risk of Abrasion. Do not pull the filter downwards from the bottom. The condenser has sharp surfaces.

### 11.3 Cleaning the Condenser



**CAUTION:** Condensers should be cleaned at least every six months; more often if the laboratory area is dusty. In heavy traffic areas, condensers load with dirt more quickly. Failure to keep the condenser clean can result in equipment warm-up or erratic temperatures.



**CAUTION:** Risk of Abrasion. Never clean around the condensers with your fingers. Some surfaces are sharp.

The condenser is located in the top rear of the machine compartment. To clean the condenser, complete the following steps:

1. Disconnect the power.
2. Remove the filter.
3. Vacuum the condenser and clean up any loose dust.
4. Replace the filter.
5. Reconnect power.

## 11.4 Defrost

You should defrost the freezer whenever there is significant frost buildup inside the cabinet.



Ice buildup in the freezer and around the control sensor could cause drift in unit operating temperature.

To defrost:

1. Remove all products and place in another cold storage medium.
2. Turn off the unit and allow the interior to warm to room temperature. Leave the door ajar to shorten defrost time.
3. Dispose of the ice and wipe out any water standing in the bottom of the cabinet.



**WARNING:** DO NOT use heating devices such as heat guns and hair dryers to speed up the defrosting process. Fire or explosion of residual vapors may result!



**CAUTION:** When defrosting your freezer, never use sharp or heavy tools such as chisels or scrapers. Damage to the equipment can result. Let the ice melt enough so that it can be easily removed.

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 solution.

## 11.5 Gasket Maintenance

Periodically check the gaskets around the door for punctures or tears. Leaks are indicated by condensation or frost which form at the point of gasket failure. Make sure that the cabinet is level (refer to *Section 7.1.1* for leveling information).

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

To check the door seal, complete the following steps:

1. Open the door.
2. Insert a strip of paper (a couple of inches wide) between the door gasket and the cabinet flange and close the door.
3. Slowly pull the paper strip from the outside. You should feel some resistance.
4. Repeat this test at 4-inch intervals around the door. If the door does not seal properly, replace the gasket.

## 11.6 Alarm Battery Maintenance

Have a certified technician replace the alarm battery every twelve months at most or when the alarm is active. The part number for a replacement battery is 322533H01.

## 11.7 Preparation for storage

If the unit is going to be stored in an off condition, allow the unit to warm up and dry out with the door open before moving into storage.

## 12 Troubleshooting



**WARNING:** Risk of Shock. Troubleshooting procedures involve working with high voltages which can cause injury or death. Troubleshooting should only be performed by trained personnel.

This section is a guide for troubleshooting equipment problems.

**Table 9. Troubleshooting Procedures**

Problem	Cause	Solution
Unit does not operate or Power Failure Indicator is on	Power supply	<p>Check that the cord is securely plugged in.</p> <p>Plug another appliance into the outlet to see if it is live.</p> <p>Check that the double pole circuit breaker located next to the power inlet is in “ON” position (i.e. “I” position). Try cycling to OFF position (i.e. “O” position) &amp; then bring to ON (“I”) position.</p> <p>Test the voltage and verify that it is correct for your unit (refer to <i>Table 2</i>).</p> <p>If the outlet is dead, check the circuit breaker or fuses.</p> <p>The unit should not be connected to a GFCI (Ground Fault Circuit Interrupter) protected outlet as it may be subject to nuisance tripping.</p>
Temperature fluctuates	Temperature Control	Make sure that the control is set correctly. Refer to <i>Section 9.3</i> .
	Condenser clogged	Make sure the condenser and filter are clean. Refer to <i>Section 11.2</i> and <i>Section 11.3</i> .
	Other causes	If the temperature control is set correctly, the condenser is clean, but temperature continues to fluctuate, call an authorized service representative.
Low battery icon is lit	12V backup battery needs to be replaced.	Replace the battery. It is located on the top right hand side of the cabinet. Call an authorized service representative.
Condensation around door frame	Incorrect Perimeter Heater Duty Cycle (Swinging doors only)	Increase the Perimeter Heater Duty Cycle, Refer to <i>Section 9.4</i> .
	Gaps exist in unit port holes	Ensure all port holes in the cabinet top, sides, and back are sealed properly to prevent warm airflow into the cabinet. Seal any gaps.
	Door seal is broken	Verify nothing is placed through the door seal such as a sensor. Check the door seal following instructions in <i>Section 11.5</i> .

**Table 9. Troubleshooting Procedures**

<b>Problem</b>	<b>Cause</b>	<b>Solution</b>
Unit is warm around door frame	Perimeter Heater is ON	This is a normal function of the unit and is a result of the perimeter heater to reduce condensation.
Unit warms up	Door is open	Make sure the door is completely closed.
	Door seal	Check the door seal, following instructions in <i>Section 11.5</i> .
	Warm product recently loaded in unit	Allow ample time to recover from loading warm product.
	Power supply	Check for proper voltage to the unit. If there is no voltage to the unit, call an electrician.
	Setpoints need to be adjusted	To adjust the setpoint, refer to <i>Section 9.3</i> .
“E01” on display	Invalid Algorithm	Check to ensure the model type is set correctly in service mode. Refer to <i>Section 9.4</i> .
“E02” on display	Control Probe Failure	Check for loose probe connector. Replace control probe.
“E05” on display	Ambient Probe Failure	Check for loose probe connector. Replace ambient probe.
“E07” on display	Compressor Run Time High	The compressor is working harder to overcome the ice on the unit walls and may start to thermally fail. Defrost the unit.
“Err” on display	Upper Bottle Probe Failure	Check for loose probe connector. Replace upper bottle probe.
“---” on display	Lost Communication	Call customer service.

## 13 End of Life Care

Be sure to follow local regulations when disposing of an old unit. Some suggestions are listed in the following.

1. Remove items and defrost unit. Be sure to clean up any biological safety hazards.
2. Remove the cabinet door to help prevent entrapment inside of a unit.
3. Have a certified technician remove the refrigerant and compressor, then drain the compressor and oil from the system. Dispose of components following local regulations.

## 14 Warranty

Domestic Warranty • 2 Years Parts and Labor Plus an Additional 8 Years on V-Drive

International Warranty • 2 Years Parts Plus an Additional 8 Years on V-Drive

During the first twenty four (24) months from shipment, Thermo Fisher Scientific Inc, through its authorized Dealer or service organizations, will at its option and expense repair or replace any part found to be non-conforming in material or workmanship with the exception of V-drive which is covered for an additional 8 years (96 months) from the time of the shipment. Thermo Fisher Scientific Inc reserves the right to use replacement parts, which are used or reconditioned. Replacement or repaired parts will be warranted for only the unexpired portion of the original warranty.

This warranty does not apply to damage caused by (i) accident, misuse, fire, flood or acts of God; (ii) failure to properly install, operate or maintain the products in accordance with the printed instructions provided, (iii) causes external to the products such as, but not limited to, power failure or electrical power surges, (iv) improper storage and handling of the products, (v) use of the products in combination with equipment or software not supplied by Thermo Fisher; or (vi) installation, maintenance, repair, service, relocation or alteration of the products by any person other than Thermo Fisher or its authorized representative. To obtain proper warranty service, you must contact the nearest authorized service center or Dealer. Thermo Fisher Scientific, Inc's own shipping records showing date of shipment shall be conclusive in establishing the warranty period. At Thermo Fisher's option, all non-conforming parts must be returned to Thermo Fisher postage paid and replacement parts are shipped FOB Thermo Fisher's location.

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