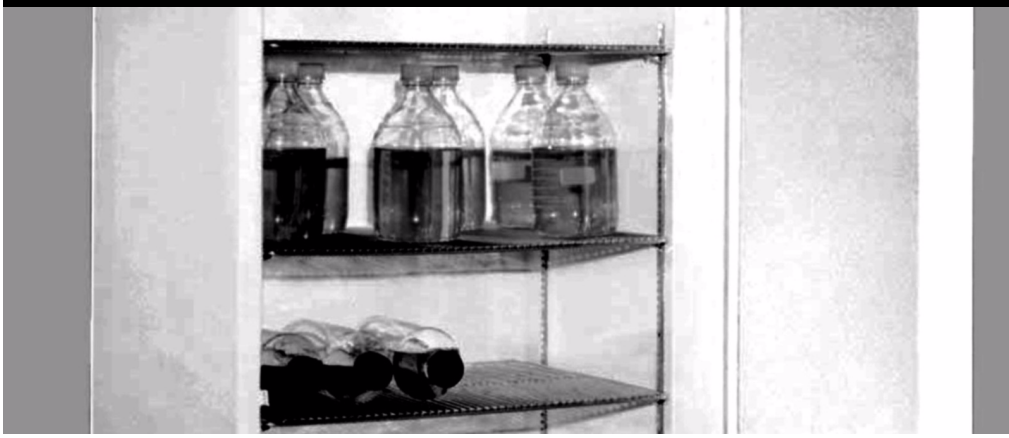
Installation and Operation Manual

Thermo Scientific Revco®
Laboratory Freezers



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1 Introduction

This manual provides installation and operation instructions for laboratory freezers with preset temperature setpoints of -20ºC and -30ºC.

The control system, standard on all models, includes:

- Key-operated power and alarm switch
- Preset temperature setpoint
- Digital temperature display with 0.1ºC resolution
- Graphic temperature display
- Audible and visual power failure indicators
- Alarm silence, ringback, and automatic reset functions
- Pushbutton alarm test

Other standard features include:

- Remote alarm contacts
- CFC-free refrigerant
- CFC-free foamed in-place urethane insulation
- Quiet, hermetically sealed refrigeration compressors
- Keyed door locks

2 Safety Precautions

In this manual and on labels attached to this product, the words WARNING and CAUTION mean the following:

- WARNING: a potentially hazardous situation which, if not avoided, could result in serious injury or death.
- CAUTION: a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or damage to the equipment.

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

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.
- 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.
- Your unit must be properly grounded in conformity with national and local electrical codes. Never connect the unit to overloaded power sources.
- Disconnect the unit from all power sources before cleaning, troubleshooting, or performing other maintenance on the product or its controls.

3 Pre-Installation

3.1 Unpacking

At delivery, examine the exterior for physical damage while the carrier'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.

4 Installation

CAUTION! Improper operation of the equipment could result in dangerous conditions. Follow all instructions and operate within design limits noted on the dataplate.

4.1 Location

Install the unit in 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. The ambient temperature range at the location must be 59 to 90°F (15 to 32°C).

4.2 Wiring

Before connecting your freezer to a power source, be sure to check the dataplate for correct voltage. Standard NEMA plugs are provided with all units. Wiring diagrams are attached to the back of the cabinet.

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

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.

Always connect the equipment to a dedicated (separate) circuit. Electrical codes require fuse or circuit breaker protection for branch circuit conductors. Use time delay fuses for #12 AWG circuits.

4.3 Leveling

The unit must be level. Use thin sheets of metal to level units equipped with casters.

4.4 Shelves and Drawers

Plasma freezers come standard with drawers. All other freezers come standard with wire shelves. -20°C enzyme freezers come standard with wire shelves which have a rail at the front. Additional drawers and/or shelves are offered as available options.

For safety in shipping, the shelves are packaged and secured inside the cabinet. Insert the shelf support hangers (included with the shelves) 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).

Note: *The number of shelves supplied per cabinet varies according to type of unit and size of cabinet.*

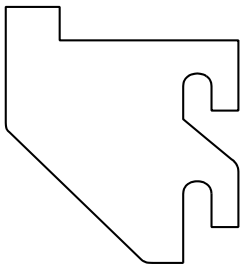


Figure 1. Shelf Support Hanger

4.5 Door Seal

Door seal integrity is critical for freezers. 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.

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.

4.6 Solid Doors

Solid doors stay open if opened 90 degrees. Solid door spring tension cannot be adjusted.

4.7 Final Checks

Before start up, complete the following steps:

1. Make sure that the unit is free of all wood or cardboard shipping materials, both inside and outside.
2. Verify that the unit is connected to a dedicated circuit.

5 Control Panel

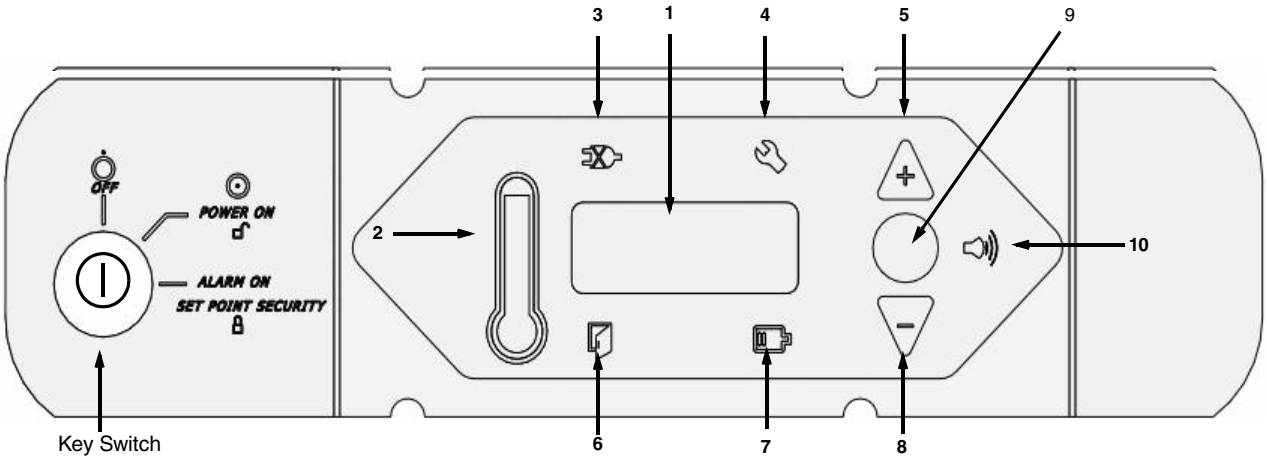


Figure 2. Laboratory Freezer Control Panel

5.1 Control Panel Features

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

Before starting up your freezer, take some time to review the control panel functions:

1. Main temperature display — during normal operation, shows cabinet temperature in degrees Celsius, as measured by the sensor inside the cabinet. You can use the buttons to display other values such as setpoints and extreme values.

   The number in the main display flashes when you are changing a value.

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. Depending on alarm settings, 4 or 5 bars illuminated indicate that the cabinet is at setpoint.

   For example, suppose that the cabinet temperature setpoint is -30ºC and that the warm and cold alarm setpoints are -26ºC and -34ºC. Then the number of bars illuminated indicates cabinet temperature as follows:

bulb only	-34 (cold alarm)	6 bars	-29.2
1 bar	-33.2	7 bars	-28.4
2 bars	-32.4	8 bars	-27.6
3 bars	-31.6	9 bars	-26.8
4 bars	-30.8	10 bars	-26
5 bars	-30 (setpoint)		(warm alarm)

   When cabinet temperature exceeds the warm alarm setpoint, the top 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 2) the thermometer shows the setpoint value you are changing.

3. Power failure — illuminated when the main power supply is interrupted. In this case the audible alarm also sounds.

4. Service required — illuminated when the controller is in service programming mode or when simulated warm or cold alarm conditions are failing to occur during an alarm test.

5. Increase — pushbutton used to increase setpoint values in programming mode and for various display functions.

6. Door ajar — illuminated when the freezer door is open and the alarm is activated (key switch turned to the alarm position). (This feature is not available for 45 ft^3 sliding glass door models.)

7. Battery low — illuminated when the backup battery is low.

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.

For full descriptions of display and programming functions, refer to Tables 1 and 2 on page 4.

5.2 Display Functions

Table 2. Control Panel Display Functions)

Function	Meaning	Sequence	Display
Normal operation	Default display whilefreezer is running	—	Temperature display, thermometer show cabinet temperature.
Cold excursion	Show coldest cabinet temperature since last startup or reset	Press ▽	Thermometer, display show cold excursion while button is pressed.
Warm excursion	Show warmest cabinet temperature since last startup or reset	Press △	Thermometer, display show warm excursion while button is pressed.
Mute	Silence audible alarm	Press Scan	Thermometer, display show cabinet temperature, alarm icon continues to flash.
Reset	Return to default display after excursion or alarm condition	Press △ and ▽ simultaneously, hold for five seconds	Excursion values are reset; thermometer, display show cabinet temperature. Display blinks twice to confirm reset.
Alarm test	Test by simulating warm alarm conditions	Press △ and Scan simultaneously, hold for five seconds	Display shows simulated cabinet temperature, alarms flash and sound as appropriate. Display blinks twice when test is started. Alarms are cleared when test is completed.

5.3 Setpoint Programming

To enter programming mode, make sure that the key switch is in position 1 (see Figure 3), press □, hold for 5 seconds, and release. The first value displayed is the cabinet temperature setpoint.

Table 3. Setpoint Programming Functions

Function	Programming Sequence
Adjust cabinet temperature setpoint	Enter programming mode by pressing Scan and holding for about 5 seconds. The display will go blank, then display “Prg”. On release of the button, the current cabinet temperature setpoint value flashes in the temperature display and is shown on the thermometer. Use ▽ and △ to adjust the setpoint. The display automatically returns to normal operating mode 30 seconds after the last key entry or after scrolling through all available functions and parameters.
Adjust cold alarm setpoint	Enter programming mode and press Scan repeatedly. When the current cold alarm setpoint value flashes in the temperature display, and the bottom LED of the thermometer is illuminated, use ▽ and △ to adjust it. The display automatically returns to normal operating mode 30 seconds after the last key entry or after scrolling through all available functions and parameters.
Adjust warm alarm setpoint	Enter programming mode and press Scan repeatedly. When the current warm alarm setpoint value flashes in the temperature display, and the top LED of teh thermometer is illuminated,use ▽ and △ to adjust it. The display automatically returns to normal operating mode 30 seconds after the last key entry or after scrolling through all available functions and parameters.

Note: *In order to maintain setpoint security, the alarm setpoints cannot be adjusted when the key switch is in the alarm position.*

5.4 Service Mode Parameters

The service parameters are displayed after the alarm setpoints described in Section 5.3 above. To enter Service Mode, press □ and hold for about 5 seconds (this can be done from any program mode when the alarms are not enabled). The display will go blank, then display “SEr” with the service wrench icon illuminated. On release of the button, the *firmware checksum* (read-only) will be displayed for about 4 seconds. Pressing Scan repeatedly scrolls through the available functions. For any modifiable parameter you can use ▽ and △ to adjust the value. The display automatically returns to normal operating mode 30 seconds after the last key entry or after scrolling through all available functions and parameters.

Table 4. Service Mode Parameters

Parameter	Display	Notes
1. Offset	Value in main display, single bar illuminated in thermometer	Center air temperature calibration. Default value is 0 (maximum + or - 10.0).
2. Network address	nEt (2 sec.); Adr (2 sec.); then value	Can only be modified by RS-485 communications software.
3. Defrost probe temperature	dEF (2 sec.); Prb (2 sec.); then value	Display only.

6 Operation

6.1 Temperature Settings

The factory default temperature settings are:

- -30°C for automatic defrost freezers, including plasma freezers.
- -20°C for manual defrost freezers, including enzyme freezers.

To change the factory temperature settings, refer to the instructions in Section 5.3.

6.2 Start Up

To start up the freezer, complete the following steps:

1. Plug in the power cord.
2. Insert the key in the switch and turn the power on, turning the key switch to position 1. The compressor and the evaporator fans should start immediately.
3. Rotate the power switch to the ALARM ON position when the temperature drops below the warm alarm setpoint.

All controls should now be fully operational, the alarm activated, and all visual indicators active.

CAUTION! Do not operate strong radio emission sources such as walkie-talkies within 3 feet of the freezer. EMI and RFI can affect the performance of the control systems.

7 Defrost

7.1 Automatic Defrost (-30º C Models Only)

The defrosting process on all -30°C freezers initiates automatically in response to a built-in timer.

All models are set for one defrost cycle every six hours. The defrost cycle is 20 minutes. The cycle terminates automatically if during defrost the evaporator coil temperature exceeds 15ºC.

7.2 Manual Defrost (-20º Models Only)

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

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.
3. Dispose of the ice and wipe out any water standing in the bottom of the cabinet.

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.

8 Alarm Systems

8.1 Operating the Alarm

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

The alarm is activated when the freezer is operating and the key switch is turned to the third position (see Figure 2 on page 3).

When the alarm system is activated, there is a Ringback feature: the audible alarm sounds approximately every six minutes until the alarm condition is corrected or the user resets.

Refer to pages 3 and 4 for descriptions of alarm functions and displays.

8.2 Remote Alarm Terminals

When you order an optional freestanding alarm package with the cabinet, remote alarm terminals are provided. These terminals are located at the rear of the machine compartment. The terminals are: Common, Normally Closed, and Normally Open.

8.3 Installing the Remote Alarm

1. The remote alarm system has two keyhole slots on the back to hang the alarm system on the wall. Insert two screws, no longer than a #12 truss-head type and spaced two inches apart, into a wall and mount the alarm.
2. Refer to Table 5 to make the following connections:
   a. Connect the common terminal on the cabinet switch to the orange wire on the alarm.
   b. Connect the normally closed terminal on the cabinet to the red wire on the alarm. This connection gives an alarm when the switch contacts open.

Note: *If you require the alarm signal when the switch contacts close, connect the normally open terminal on the cabinet to the black wire on the alarm. The orange and red wires must be tied together in this application.*

Table 5. Wire Gauges

Wire Gauge	Total Wire Length (feet)	Distance to Alarm 1/2 Wire Length (feet)
20	530	265
18	840	420
16	1,330	665
14	2,120	1,060
12	3,370	1,685

3. Plug the alarm system service cord into an electrical outlet. This alarm is designed for 115V/60 Hz, 115V/50 Hz, or 100V/50 Hz operation.

Note: *The wiring diagram is attached to the inside of the alarm back cover.*

8.4 Alarm Test

It is important to test the alarm before loading your laboratory freezer with any critical product.

8.4.1 Theory of Operation

The alarm test procedure applies to all models, whether they have factory-installed built-in alarms or field-installed remote alarms.

While this procedure is very accurate and reliable, *the temperature of the refrigerated space does not change during the alarm test*. The alarm test checks the temperature sensor which is artificially heated by a tiny, built-in thermoelectric heating unit which simulates warm conditions. The electronic control module notes the sensor temperature changes and the LED displays these changes.

8.4.2 Alarm Test Procedure

When the unit is in operating temperature range, activate the alarm test by pressing △ and □ simultaneously and holding for about five seconds. The test then automatically advances through all steps and stops:

1. The main display (Figure 2 on page 3, #1) and the thermometer (#2) show the warm alarm temperature.
2. The alarm sounds and the alarm icon (#10) flashes.
3. The test is now complete but the alarm continues to sound until the temperature on the display is back in the operating range.

If the simulated alarm conditions do not occur during the first 10 minutes of the alarm test, the service (wrench) icon illuminates and the test is terminated. You can also terminate the test immediately by turning the key switch to the second (non-alarm) position. When during the alarm test, the temperature display does not change or the service icon illuminates, check the sensor connections.

After an alarm test has terminated, there is a 5-minute delay before the test can be run again.

9 Chart Recorders

Panel-mounted six inch recorders are standard and factory-installed on all plasma freezers except for undercounter models, for which free-standing recorders are available as optional accessories. Recorders are available as optional accessories for all laboratory and enzyme freezers.

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.

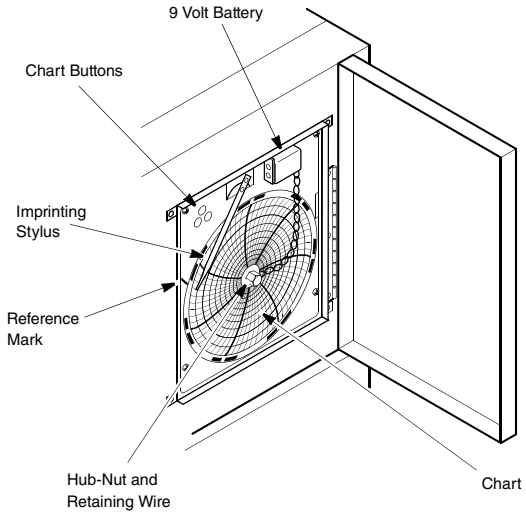


Figure 2. Chart Recorder

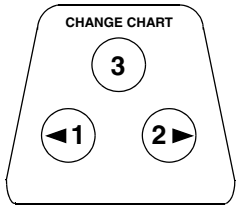


Figure 3. Chart Buttons

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 solution temperature with a calibrated temperature monitor. (Solution temperature is measured inside the sensor bottles — see .)
3. Compare the recorder temperature to the solution 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 Drawers (Optional)

The drawers in all models can be removed for cleaning or adjustment.

10.1 Removing the Drawers

To remove the drawers, complete the following steps (refer to Figure 4):

1. Pull the drawer toward 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 slides.

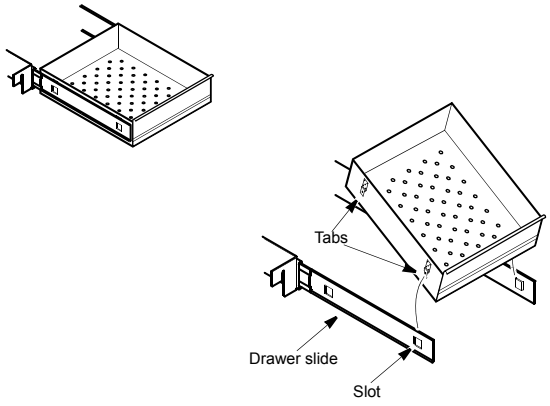


Figure 4. Drawer Removal

10.2 Reinstalling the Drawers

To reinstall the drawers, complete the following steps (refer to Figure 4):

1. Pull both drawer slides toward you until the slides are fully extended.
2. Position the drawer between the slides and insert the front mounting clips into the slots on front of the slides.
3. Push the back of the drawer down between the slides and insert the drawer tabs into the back slots.

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 drawer tabs are aligned with the slots on the slides before pushing the drawer down between the slides.*

10.3 Changing Drawer Slide Position

The drawer slides are adjustable. You can position these slides in the vertical slots which are spaced at one-inch intervals.

Drawer slides have a small wire safety clip at the front shelf support which prevents the slides from falling when the drawers are removed. To change the position of the drawer slides, complete the following steps:

1. Locate the safety clip.
2. Slip your fingernail or a small screwdriver under the bottom of the wire clip and pry the clip out toward the inside of the freezer.
3. Lift up the slide at the front. The slide is free to move from the front shelf support.
4. The drawer slide must be removed from the rear shelf support at approximately a 45 degree angle toward the center of the cabinet.
5. Pull the slide toward the front of the cabinet.

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

11 Cleaning

11.1 Cleaning the Drawers or Shelves

To clean the drawers or shelves, use a solution of water and a mild detergent. Rinse the drawers or shelves and wipe them dry with a soft cloth.

For instructions on removing and reinstalling drawers, refer to Section 10.

11.2 Cleaning the Condenser

CAUTION! Condensers should be cleaned at least every six months. 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.

WARNING! Be sure to disconnect the unit from main power before cleaning the condenser.

CAUTION! Never clean near condensers with your fingers. Some surfaces are sharp.

In all models, the condenser is located in the top machine compartment. To clean the condenser:

1. Disconnect the power.
2. Remove the top front grill.
3. Use a vacuum cleaner with hose and brush attachments to clean the front face of the finned surface.
4. Clean up any loose dust and replace the front grill.
5. Reconnect the power.

12 Troubleshooting

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

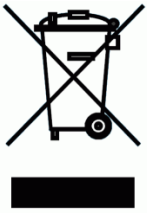
This section is a guide to troubleshooting equipment problems.

Table 6. Troubleshooting Procedures

Problem	Cause	Solution
Unit does not operate or Power Failure Indicator is on.	Power supply	1. Check that the cord is securely plugged in. 2. Plug another appliance into the outlet to see if it is live. 3. If the outlet is dead, check the circuit breaker or fuses.
Temperature fluctuates.	Cold control	Make sure that the cold control is set correctly. Refer to Section 5.
	Condenser	Make sure the condenser is clean. Refer to Section 11.2 on page 8.
Unit warms up.	Door is open.	Make sure the door is completely closed.
	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.
	Compressor	1. If the compressor is not running, check if the unit has a power failure alarm. If the power failure alarm light is on, have an electrician check for proper voltage to the unit. 2. If the compressor is running, open the door and look through the slotted air intake in the bottom of the evaporator cover to see if icing is present on the evaporator. If icing is present and there is no air flow behind evaporator, call technical service for assistance. The evaporator fans may be inoperative. 3. If the compressor is running and there is air flow behind the evaporator, contact an authorized service provider or c 4. Call the technical support hot line for assistance.

WEEE Compliance

Great Britain



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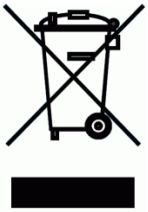

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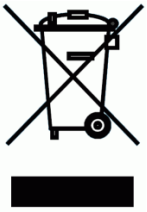
Conformità WEEE. Questo prodotto deve rispondere alla direttiva dell' Unione Europea 2002/96EC in merito ai Rifiuti degli Apparecchi Elettrici ed Elettronici (WEEE). È marcato col seguente simbolo.Thermo Fisher Scientific ha stipulato contratti con una o diverse società di riciclaggio/smaltimento in ognuno degli Stati Membri Europei. Questo prodotto verrà smaltito o riciclato tramite queste medesime. Ulteriori informazioni sulla conformità di Thermo Fisher Scientific con queste Direttive, l'elenco delle ditte di riciclaggio nel Vostro paese e informazioni sui prodotti Thermo Scientific che possono essere utili alla rilevazione di sostanze soggette alla Direttiva RoHS sono disponibili sul sito **www.thermo.com**/

France



Conformité WEEE. Ce produit doit être conforme à la directive européenne (2002/96EC) des Déchets d'Equipements Electriques et Electroniques (DEEE). Il est marqué par le symbole suivant. Thermo Fisher Scientific s'est associé avec une ou plusieurs compagnies de recyclage dans chaque état membre de l'union européenne et ce produit devraitêtre collecté ou recyclé par celles-ci. Davantage d'informations sur laconformité de Thermo Fisher Scientific à ces directives, les recycleurs dans votre pays et les informations sur les produits Thermo Scientific qui peuvent aider le détection des substances sujettes à la directive RoHS sont disponibles sur **www.thermo.com/**

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 (866-9-THERMO)

LABORATORY PARTS and SERVICE

Phone: 1-800-438-4851

TECHNICAL SUPPORT

Phone: 1-800-438-4851

Thermo Fisher Scientific Inc.

275 Aiken Road
Asheville, NC 28804
United States

www.thermofisher.com

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