Thermo Scientific -20C
Laboratory and Enzyme Freezers A and D

Installation and Operation

325099H01 Rev. C December 2018

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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.

Material in this manual is for informational purposes only. The contents and the product it describes are subject to change without notice. Thermo Fisher Scientific makes no representations or warranties with respect to this manual. In no event shall Thermo be held liable for any damages, direct or incidental, arising from or related to the use of this manual.

Table of Contents

1 Introduction

This manual provides installation and operation instructions for laboratory and enzyme freezers with a preset temperature setpoint of -20°C.

These units are not intended for use as a medical device and are not intended for in vitro diagnostic use.

The control system, standard on all models, includes:

- Key-operated power and alarm switch
- Preset temperature setpoint
- Adjustable temperature range
- Digital temperature display with 0.1°C resolution
- Graphic temperature display
- Audible and visual power failure indicators
- High and low temperature, door ajar, low battery alarms
- Alarm silence, ringback, and automatic reset functions
- SureTemp™ alarm system test
- Logging of highest and lowest recorded temperature

Other standard features include:

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

2 Safety Precautions

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

WARNING: A potential danger of electric shock 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. If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.
- Do not modify system components, especially the controller. Use Thermo Scientific 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.

WARNING: Do not store flammable materials in this unit.

3 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 Temperature Monitoring

IMPORTANT NOTE: We recommend the use of a redundant and independent temperature monitoring system so that the freezer can be monitored continuously for performance commensurate with the value of product stored.

5 Installation

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

5.1 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).

5.2 Leveling

The unit must be level. If the unit is out of level, you may need to shim the corners or casters with thin sheets of metal.

5.3 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.

5.4 Shelves

All the freezers come standard with wire shelves. -20°C enzyme freezers come standard with enzyme bins installed and wire shelves which have a rail at the front. Laboratory freezer shelves have no front rail. Additional shelves are offered as available options.

Note *When a purchased 12ft^3 model is converted from a wire shelve based model to drawer based model, after purchase, the anti-tilt bracket must be installed to add stability to the unit and prevent possible overturning of the unit.*

CAUTION: Failure to install the anti-tip bracket may/can cause injury to the user in the event of an overbalance condition.

CAUTION: Failure to install the anti-tip bracket is viewed as misuse of the product as safety testing has indicated that the anti-tip bracket is needed.

Unit Type	Shelf Type	Shelf Count	Bins included
Enzyme Freezer	Shelf with Front Rail	9	Yes, 45 bins are standard
Laboratory Freezer	Full shelf	4	No bins standard

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 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).

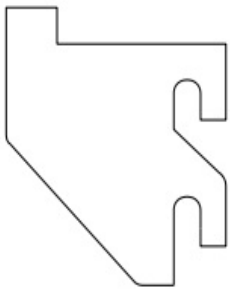

Figure 1. Shelf Support Hanger

5.5 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 in the cabinet, 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, you need to either replace the gasket.

5.6 Solid Doors

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

5.7 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.

6 Control Panel

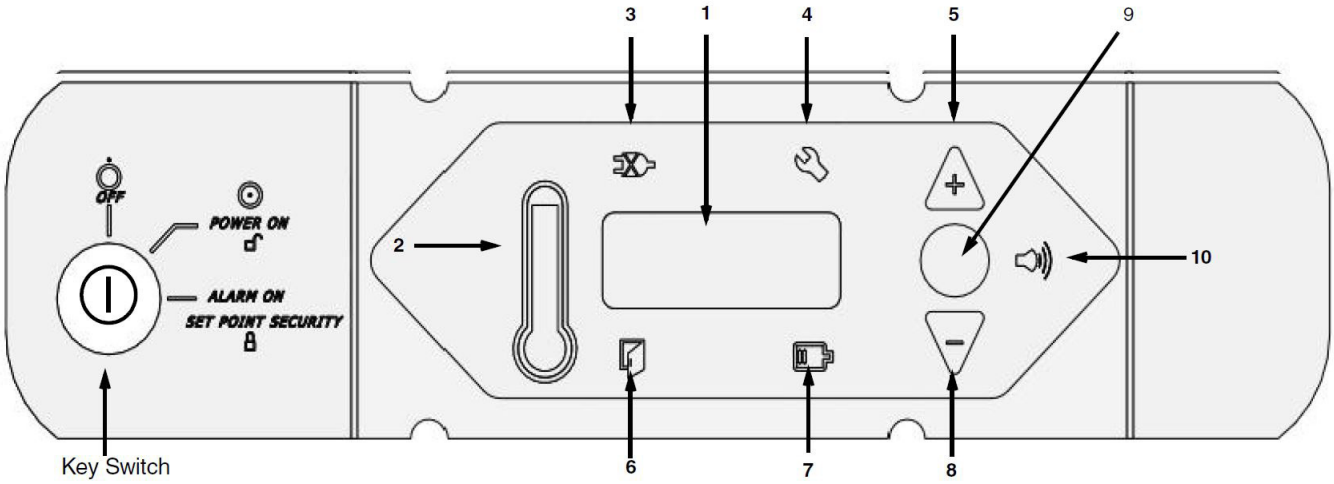

Figure 2. Refrigerator Control Panel

6.1 Control Panel Features

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 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.

1. Main temperature display — during normal operation, shows cabinet temperature in degrees Celsius, as measured by the upper sensor inside the cabinet. You can use the buttons to display other values such as setpoints, and 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. 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 -20°C and that the warm and cold alarm setpoints are -16°C and -24°C. Then the number of bars illuminated indicates cabinet temperature as follows in Table 1.

Table 1. Thermometer display on control panel (setpoint -20ºC)

Bars Displayed	Temperature	Bars Displayed	Temperature
bulb only	-24ºC (cold alarm)	6 bars	-18°C
1 bar	-23°C	7 bars	-17°C
2 bars	-22°C	8 bars	-16°C (warm alarm)
3 bars	-21°C	9 bars	-15°C
4 bars	-20°C (setpoint)	10 bars	-14°C
5 bars	-19°C		

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 3) 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, and the key switch is turned to the alarm position).

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, programming, and service functions, refer to the following Tables.

6.2 Display Functions

Table 2. Control Panel Display Functions

Function	Meaning	Sequence	Display
Normal operation	Default display while refrigerator is running.	None (default display)	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 6 minutes.	Press (the Scan ○ button between ▽ and ▽).	Display and thermometer show cabinet temperature, alarm icon continues to flash.
Alarm and temperature log reset	Return to default display after alarm condition, clears temperature log.	Press △ and ▽ Scan simultaneously, hold for five seconds.	Excursion values are reset; temperature display shows cabinet temperature.
TempTest Alarm test	Tests alarm system by warming probe surface; key switch must be in alarm mode.	Press △ and ○ simultaneously.	Display and thermometer icon show simulated cabinet temperature, alarms flash and sound as appropriate. Alarms clear when test is completed.

6.3 Programming Functions

You can enter programming mode by pressing the Scan button (●) and holding for 5 seconds. Pressing repeatedly scrolls through the available setpoint functions: temperature control setpoint, cold alarm and warm alarm.

Table 3. Setpoint Programming Functions

Function	Programming Sequence
Adjust temperature control setpoint	Enter programming mode by ● pressing and holding for 5 seconds. On release, the current temperature setpoint value flashes in the temperature display; ▽ use and △ to adjust it. Press ● to confirm the new value. The display automatically returns to normal operating mode 30 seconds after the last key entry or after scrolling through all available functions.
Adjust cold alarm setpoint	Enter programming mode and press ● repeatedly until the top of the thermometer is illuminated. The current warm alarm setpoint value then flashes in the temperature display; ▽ use △ and to adjust it. Press ● to confirm the new value. The display automatically returns to normal operating mode 30 seconds after the last key entry or after scrolling through all available functions.
Adjust warm alarm setpoint	Enter programming mode and press ● repeatedly until the top of the thermometer is illuminated. The current warm alarm setpoint value then flashes in the temperature display; use △ and ▽ to adjust it. Press ● to confirm the new value. The display automatically returns to normal operating mode 30 seconds after the last key entry or after scrolling through all available functions.

6.4 Service Parameters

You can access service parameters by entering programming mode with the controller key in the Power On position, then pressing ● for an additional 5 seconds. On release of the button, the display will go blank, then display "SEr" with the service wrench icon illuminated. Then the *firmware checksum* (read-only) will be displayed for about 4 seconds.Pressing ● repeatedly scrolls through the available service functions. While you are in service mode, the wrench icon is illuminated. For any flashing parameter you can use △ and ▽ to adjust the value.

CAUTION: Adjusting service parameters may adversely affect operation. Be sure to consult with Technical Support before changing service parameters.

Table 4. Service Parameters

Parameter	Meaning	Notes
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. Line voltage	Err.	Not available for this model.
3. Network address	nEt (2 sec.); Adr (2 sec.); then value.	Can only be modified by RS-485 communications software.

7 Operation

7.1 Temperature Settings

The factory default temperature setting is -20°C for all manual defrost freezers, including enzyme freezers.

CAUTION: The freezers described in this manual are designed for optimum performance at -20°C. It is advisable to call Technical Service before changing setpoints.

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

7.2 Start Up

To start up the freezer, complete the following steps:

1. Plug in the power cord.
2. All freezers have a double pole circuit breaker switch located next to the power inlet. Make sure that is in the ON (“1”) position.
3. Insert the silver colored key in the switch on the control panel and turn the power on, turning the key switch to position 1. The compressor should start immediately.
4. Rotate the power switch to the ALARM ON position when the temperature drops below the warm alarm setpoint.
5. 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 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 system.

8 Defrost

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. 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.

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

9 Alarm Systems

9.1 Operating the Alarm

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.

The alarm system is activated only when the key switch is turned to the Alarm On position. Note that the audible alarm will not sound when the key switch is in the second (ON) position. The audible warning signal sounds when there is a power failure or temperature alarm condition, or when the door is ajar for more than 3 minutes.

The Mute function (pressing the ○ button) allows you to turn off the audio warning without turning off the visual indicators.

To turn off and reset flashing visual alarms, press △ and ▽ simultaneously.

There is also a ringback function after approximately 6 minutes if any alarm condition remains active.

9.2 Remote Alarm (Optional)

Freezer units can have an optional user-installed remote alarm. Operating and testing procedures are the same for both types of alarm.

The maximum distance between a blood bank and a remote alarm depends on the wire gauge used. Refer to Table 5 below.

Table 5. 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	1,330	665
14	2,120	1,060
12	3,370	1,685

9.3 Installing a Remote Alarm (Optional)

Remote alarm terminals are located at the rear of the machine compartment. The terminals are: Common (purple), Open on Fail (black, Normally Closed), and Close on Fail (red, Normally Open).

1. Make the following connections:
    a. Connect the common terminal on the cabinet switch to the Common wire on the alarm.
    b. Connect the normally closed terminal on the cabinet to the Open on Fail wire the alarm. This connection gives an alarm when the switch contacts open.
2. Plug the alarm system service cord into an electrical outlet.

9.4 Alarm Test

Your freezer is equipped with a TempTest™ testing system which automatically tests the alarm probe and electronics. This may eliminate the need for other methods of warming or cooling the probe, such as ice baths.

Theory of Operation

During the alarm test, the temperature sensor 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 control panel displays these changes.

While this alarm testing procedure is very accurate and reliable, the temperature of the refrigerated space does not change during the alarm test.

Alarm Test Procedure

Note *This test automatically advances through all steps and stops.*

1. Verify that the key position is in the Alarm On mode, and that the current warm setpoint is within normal range (the warm simulations may not work if the setpoints are set to extreme values).

2. To start the alarm test, press △ and ○ simultaneously. During the test the main display and thermometer bulb will indicate simulated (not actual) cabinet temperature.

3. When simulated temperature exceeds the warm alarm setpoint, the alarm sounds and the alarm icon on the control panel illuminates (#10 in on Figure 2).

4. The test is now complete but the alarm continues to sound until the temperature on the display is back in the operating range as the sensor cools.

If the simulated alarm conditions do not occur during the first five 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 (Power On) 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 10-minute delay before the test can be run again.

10 Chart Recorders (Optional)

Panel-mounted six inch recorders are standard and factory installed option.

Recorder operation begins when the system is powered on.

10.1 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 back-up power.
3. Install clean chart paper (refer to Section 10.2 below).
4. Close the recorder door.

Note *The recorder may not respond until the system reaches temperatures within the recorder's range.*

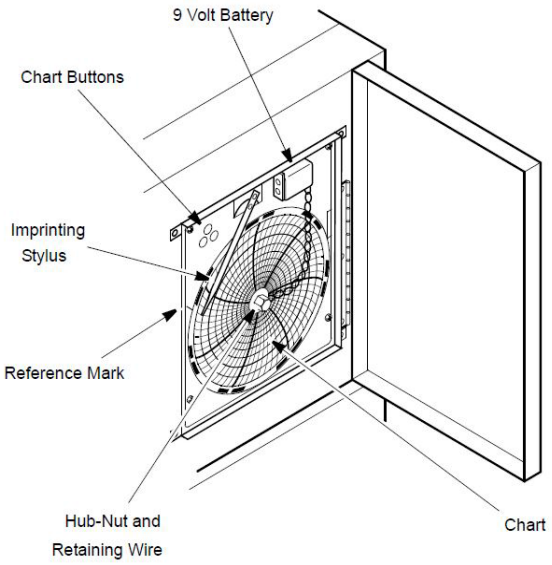

Figure 3. Six Inch Chart Recorder

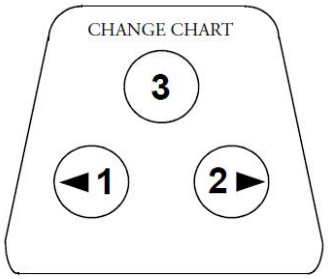

Figure 4. Pressure Sensitive Chart Buttons

10.2 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 on the upper left of the panel) 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 on the recorder panel (a small groove on the left side of the panel, shown in Figure 3).

4. Replace the center nut and hand tighten. Press the change chart button again(#3) to resume temperature recording.

10.3 Power Supply

The recorder normally uses AC power when the system is operating. If AC power fails, the LED indicator on the recorder 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.

11 Cleaning

11.1 Cleaning the Shelves

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

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

The table below shows troubleshooting procedures,

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

Table 6. Troubleshooting Procedures

Problem	Cause	Solution
Unit does not operate or Power Failure Indicator is on.	Power supply	Check that the cord is securely plugged in. All models have a double pole circuit breaker located next to the power inlet. Make sure that it is in the ON (“1”) position. Try cycling the switch to OFF (“0”) then ON (“1”). Plug another appliance into the outlet to see if it is live. 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.
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	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 If the unit warms up with the compressor running, contact Technical Service at 800-438-4851.

13 Warranty Statement

Domestic Warranty • 24 Months Full Warranty Parts and Labor
International Warranty • 24 Months Full Warranty for Parts Only.

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. 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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THERMO FISHER SHALL NOT BE LIABLE FOR ANY INDIRECT OR CONSEQUENTIAL DAMAGES INCLUDING, WITHOUT LIMITATION, DAMAGES TO LOST PROFITS OR LOSS OF PRODUCTS.

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:

Thermo Scientific products are backed by a global technical support team ready to support your applications. We also offer cold storage accessories, including remote alarms, temperature recorders and validation services. Visit www.thermoscientific.com or call:

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