

# Thermo Fisher Scientific Laboratory Box Furnaces

BF51841C  
BF51841BC

Installation and Operation Manual

304259H01 Rev A

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# Table of Contents

<b>Chapter 1</b>	<b>Safety Notes</b>	
	Basic Operating Precautions .....	1-1
	Explanation of Safety Information and Symbols .....	1-2
	Additional Symbols for Safety Information .....	1-3
	Safety Consideration. ....	1-3
	Warranty .....	1-4
	Material Safety Data Sheet .....	1-5
	Product Safety Information .....	1-10
	Standards and Directives.....	1-11
<b>Chapter 2</b>	<b>Introduction</b>	
	Feature and Benefits .....	2-1
	Specifications.....	2-2
<b>Chapter 3</b>	<b>Unpacking</b>	
	Unpacking.....	3-1
<b>Chapter 4</b>	<b>Installation</b>	
	Location. ....	4-1
	Wiring.....	4-1
	Gas Inlet Tube. ....	4-2
	Important Guidelines for Ashing Applications. ....	4-3
	Hearth Plate Information.....	4-4
	Shelf Installations in the Box Furnaces.....	4-5
<b>Chapter 5</b>	<b>Operation</b>	
	Initial Start-up.....	5-1
	Idling Period.....	5-1
	Vent .....	5-1
	Atmosphere Port.....	5-2
	Option B (Excess Temperature Controller).....	5-2
<b>Chapter 6</b>	<b>Operation - UT150 Controller</b>	
	Normal Controller Operation.....	6-2
	Setting the Temperature. ....	6-4
	Setting the Over Temperature Protection (OTP) Temperature.....	6-4
	Changing between Celsius and Fahrenheit.....	6-4
	Setting the Ramp to Setpoint Rate. ....	6-5
	Auto Tuning the Controller.....	6-6
	Corrosion of Temperature Overshoot.....	6-7

<b>Chapter 7 Excess Temperature Option</b>	
Control Display .....	7-1
Excess Temperature Option Features.....	7-1
Exceeded Temperature Duration Timer.....	7-1
Peak Exceeded Temperature.....	7-1
Operating Parameters. ....	7-1
Excess Temperature Setpoint.....	7-2
Hysteresis.....	7-2
Excess Temperature Controller Operation. ....	7-2
<b>Chapter 8 Communication Option</b>	
Cable Installation. ....	8-1
UT150 Communications Setup Parameters. ....	8-1
Software Installation. ....	8-2
Communications Test.....	8-3
Troubleshooting. ....	8-3
Decimal Point Adjustment.....	8-4
Addresses for Multiple Controllers.....	8-4
<b>Chapter 9 Maintenance</b>	
General Maintenance. ....	9-1
Heating Elements. ....	9-2
Heating Unit Replacement.....	9-2
Thermocouple (T/C) Replacement. ....	9-3
Solid State Relay (SSR) Replacement. ....	9-5
Door Insulation Replacemen. ....	9-5
Right Hand Door Conversion.....	9-7
Overtemperature Alarm Protection .....	9-7
<b>Chapter 10 Troubleshooting .....</b>	<b>10-1</b>
<b>Chapter 11 Replacement Parts. ....</b>	<b>11-1</b>
<b>Chapter 12 Error Codes .....</b>	<b>12-1</b>
<b>Chapter 13 WEEE Compliance.....</b>	<b>13-1</b>
<b>Chapter 14 Spare Parts and Accessories .....</b>	<b>14-1</b>
<b>Chapter 15 Device Log.....</b>	<b>15-1</b>
<b>Chapter 16 Contact .....</b>	<b>16-1</b>



# List of Figures

Figure 1	BF51841 Laboratory Box Furnace .....	2-1
Figure 2	Thermocouple .....	4-2
Figure 3	Gas Inlet Tube Assembly .....	4-3
Figure 4	Hearth Plate Ripped .....	4-4
Figure 5	BF51731 and BF51732 Chamber Showing Shelf Groove.....	4-4
Figure 6	BF51841 and BF51842 Chamber Showing Shelf Groove.....	4-5
Figure 7	UT150 Control Panel.....	6-1
Figure 8	Heating Unit Replacement .....	9-4
Figure 9	Thermocouple .....	9-5
Figure 10	Door Insulation .....	9-6
Figure 11	Door Insulation Replacement.....	9-7
Figure 12	Door Hinge (Sheet 1/2) .....	9-8
Figure 12	Door Hinge (Sheet 2/2) .....	9-9
Figure 13	Wiring Diagram.....	11-3

## List of Figures

# Safety Notes

## Basic Operating Precautions

These operating instructions describe 1200 °C Laboratory Box Furnaces.

1200 °C Laboratory Box Furnaces have been manufactured to the latest state of the art and have been tested thoroughly for flawless functioning prior to shipping. However, the Laboratory Box may present potential hazards, particularly if it is operated by inadequately trained personnel or if it is not used in accordance with the intended purpose. Therefore, the following must be observed for the sake of accident prevention:

- 1200 °C Laboratory Box Furnaces must be operated by adequately trained and authorized professional personnel.
- 1200 °C Laboratory Box Furnaces must not be operated unless these operating instructions have been fully read and understood.
- The present operating instructions, applicable safety data sheets, plant hygiene guidelines and the corresponding technical rules issued by the operator shall be used to create written procedures targeted at personnel working with the subject matter device, detailing:
  - The decontamination measures to be employed for the Laboratory Box and the accessories used with it,
  - The safety precautions to be taken when processing specific agents,
  - The measures to be taken in case of accidents.
- Repair work on the Laboratory Box must be carried out only by trained and authorized expert personnel.
- The contents of these operating instructions are subject to change at any time without further notice.
- Concerning translations into foreign languages, the English version of these operating instructions is binding.
- Keep these operating instructions close to the Box Furnace so that safety instructions and important information are always accessible.
- Should you encounter problems that are not detailed adequately in these operating instructions, please contact Thermo Fisher Scientific immediately for your own safety.

## Explanation of Safety Information and Symbols

### Safety Notes and Symbols Used Throughout These Operating Instructions

	 <b>DANGER</b>
	Indicates a hazardous situation which, if not avoided, will result in death or serious injuries.
	 <b>WARNING</b>
	Indicates a hazardous situation which, if not avoided, could result in death or serious injuries.
	 <b>CAUTION</b>
	Indicates a situation which, if not avoided, could result in damage to equipment or property.
	 <b>NOTE</b>
	Is used for useful hints and information regarding the application.

### Additional Symbols for Safety Information

	Wear safety gloves!
	Wear safety goggles!
	Harmful liquids!
	Electrical shock!
	Hot surfaces!

	Fire hazard!
	Explosion hazard!
	Suffocation hazard!
	Biological hazard!
	Contamination hazard!

## Safety Considerations

	<div style="text-align: center;">  </div> <p>Do not modify or use equipment in a manner other than expressly Intended. Modification of equipment other than that for which it is explicitly designed could cause severe injury or death. Any customer after-market retrofit violates the warranty of the equipment.</p> <p>Do not modify or disconnect any safety features provided. Disconnection of the unit safety features could allow the unit to become overheated and start on fire, causing personal injury or death, product and property damage.</p> <p>Do not use components or materials not specifically designed for this equipment. Failure to comply with this precaution could result in damage to equipment used or the furnace and may create an overheat situation. Also, do not use anything other than OEM exact replacement equipment and parts. Not using OEM replacement parts could cause faulty. Instrumentation readings, inoperable equipment, or temperature overshoot. Both situations may cause personal Injury or death, product, and property damage.</p> <p>Before using, user shall determine the suitability and integrity of the product for the intended use and that the unit has not been altered in any way. Misapplication may compromise the safety of the end user or the life of the product.</p>
--	---

	<p> <b>CAUTION</b></p> <p>This product contains refractory ceramic fiber which can result in the following:</p> <ul style="list-style-type: none"><li>• May be irritating to skin, eyes, and respiratory tract.</li><li>• May be harmful if inhaled.</li><li>• May contain or form cristobalite (crystalline silica) with use at high temperature (above 871°C) which can cause severe respiratory disease.</li></ul>
--	--

	<p> <b>WARNING</b></p> <p>Before maintaining this equipment, read the applicable MSDS (Material Safety Data Sheets) in the safety notes of this manual.</p>
--	---

## Warranty

Thermo Fisher Scientific warrants the operational safety and functions of the Laboratory Box Furnaces only under the condition that:

- The Laboratory Box is operated and serviced exclusively in accordance with its intended purpose and as described in these operating instructions,
- The Laboratory Box is not modified,
- Only original spare parts and accessories that have been approved by Thermo Scientific are used (third-party spares without Thermo Scientific approval void the limited warranty),
- Inspections and maintenance are performed at the specified intervals,
- An operation verification test is performed after each repair activity.

The warranty is valid from the date of delivery of the Laboratory Box to the customer.

# Material Safety Data Sheet

## I. PRODUCT IDENTIFICATION

Trade Name:	MOLDATHERM		
Generic Name:	Refractory Ceramic Fiber Insulation	Manufacturer:	Rex Rota Corporation
		Address:	P.O. Box 980 Fowlerville, MI 48836
Chemical Name:	N/A (Mixture)		
CAS#:	None Assigned	Telephone:	517/223-3787

## II. PRODUCT HAZARD SUMMARY

Health



May be harmful if inhaled.

May be irritating to the skin, eyes and respiratory tract.

possible cancer hazard based on test with laboratory animals.

Flammability: Non - Combustible

Reactivity: Stable

## III. HEALTH HAZARDS A. SIGNS/SYMPTOMS OF OVEREXPOSURE

Ingestion: May cause gastrointestinal disturbances such as irritation, nausea, vomiting and diarrhea.

Eyes: Slightly to moderately irritating. Abrasive action may cause damage to the outer surface of the eye.

Skin: Slight to moderate irritation or rash. Irritation is due to mechanical reaction to sharp, broken ends of fibers.

Inhalation: May cause irritation or soreness of throat and nose. Extreme exposure may produce coughing, congestion, and even difficulty breathing. Pre-existing medical conditions may be aggravated by exposure: e.g. bronchitis, emphysema, and asthma.

#### IV. HEALTH HAZARDS B. FIRST AID

- Ingestion: Do not induce vomiting. Get medical attention if irritation persists.
- Skin: Wash affected areas gently with soap and water. Do not rub or scratch exposed skin. Using a skin cream or lotion may be helpful. Get medical attention if irritation persists.
- Eyes: Flush immediately with large amounts of water. Do not rub eyes. Get medical attention if irritation persists.
- Inhalation: Remove affected person from source of exposure. Drink water to clear throat, and blow nose to expel mist/dust. Avoid tobacco smoke. Get medical attention if irritation persists.

#### V. HEALTH HAZARDS C. SUMMARY/RISKS

At this time there are no known published reports that demonstrate an associated association between RCF exposure and respiratory disease. The following is a review of the result date:

1. There is no evidence of any fibrotic lung disease (interstitial fibrosis) whatsoever on x-ray.
2. There is no evidence of elevated lung disease among those employees exposed to RCF that had never smoked.
3. A statistical "trend" was observed in the exposed population between the duration of exposure to RCF and a decrease in some measures of pulmonary function. These observations are clinically insignificant. In other words, if these observations were made on an individual employee, the results would be interpreted as being within the normal range.
4. Pleural plaques (thickening along the chest wall) have been observed in a small number of employees who had a long duration of employment. There are several occupational and non-occupational causes for pleural plaque. It should be noted that plaques are not associated with any measurable effect on lung function.

A number of studies on health effects of inhalation exposure of rats and hamsters, have been completed. Rats exposed to doses corresponding to 200 f/cc developed progressive lung damage (interstitial fibrosis) and cancers of the lung and of the pleura (lining of the chest wall and lung). Hamsters similarly exposed developed interstitial fibrosis and pleural cancer, but no lung cancer.

In a multiple dose study in rats, statistically significant increases in lung tumors were observed following exposure to the highest doses; there were no excess lung cancers at lower doses.

As a result, the International Agency for Research on Cancer (IARC) has classified RCF, along with fibrous glasswool and mineral wool, as possible human carcinogens (Group 2B) based on sufficient evidence of carcinogenicity in animals but insufficient data in humans. IARC has also classified respirable crystalline silica, which may be found in after-service RCF exposed to temperatures above 1800°F, as a known carcinogen to humans (Group 1). See Section IX for additional information concerning after service RCF.

## VI. PERSONAL PROTECTION

**Eye Protection:** Safety glasses with side shields or goggles are recommended, particularly when working overhead. Do not wear contact lenses.

**Skin Protection:** Wear gloves, hats, or loose fitting full body clothing as required to prevent skin irritation. Wash exposed areas with soap and warm water after handling. Wash work clothes separately from other clothing. Rinse washing machine thoroughly after use.

**Respiratory Protection:** Use mechanical ventilation with proper dust collection equipment to keep the dust level below the exposure limits listed in the Ingredients/Health Hazard Information section. Use NIOSH or MSHA approved equipment when airborne exposure limits are exceeded. Acceptable respirators recommended for various respirable fiber concentrations are:

<u>Concentration</u>	<u>Respirator Type</u>
.5-5 f/cc	Half-face, tight fitting respirator with HEPA filter cartridges (Example: 3M 6340)
5-25 f/cc	Tight fitting, full face air purifying respirator with HEPA filter cartridges or powered air-purifying respirator (PAPR) equipped with HEPA filter cartridges (Example: 3M 7800 with 7255 filters)
25-50 f/cc	Full face, supplied air respirator operated in positive pressure mode (Example: 3M 7800 with W9435 hose and W3195 regulator)

### NOTE

f/cc = Fibers per cubic centimeter

HEPA = High-efficiency particulate air filter.

## VII. PHYSICAL CHARACTERISTICS

Appearance/Odor:	White board or shape/No odor	Specific Gravity: -(H <sub>2</sub> O-l.):	.2 -.6
Boiling Point:	N/A		
Evaporation Rate (Butyl - Acetate=l.):	N/A	Melting Point:	N/A
Solubility in Water:	Negligible	Vapor Pressure:	N/A
Vapor Density (Air=1):	N/A	Percent Volatile:	N/A

## VIII. FIRE AND EXPLOSION DATA

Flash Point:	Non-flammable		
Auto-ignition Temp:	None		
Flammability Limits in Air (% By Vol.)	N/A	Upper:	N/A
		Lower:	N/A
Usual Fire or Explosion Hazards:	None		
Special Fire Fighting Procedures	Use extinguishing method suitable for type of surrounding fire.		

## IX. REACTIVITY DATA

Stability/Incompatibility:	Stable under normal condition of use. Incompatible with strong acids and alkalis.
Hazardous Decomposition and By-products:	None

## X. ENVIRONMENTAL INFORMATION

Spill or Release to the Environment:	Vacuum clean dust where possible. Use a dust suppressant if sweeping is necessary. Personal safety and exposure recommendations described elsewhere in this data sheet apply to exposure during clean-up of spilled material.
Waste Disposal:	Wastes generated during use or demolition are not hazardous wastes as defined by 40 CFR 261. Transportation, storage, and disposal of this product must comply with Federal, State and Local regulations.

Toxic Substances Control Act (TSCA):	All substances in this product are listed, as required, on the TSCA inventory. These products contain RCF which may be subject to Section 12 (b) Export Notification Requirements.
Toxic Substances Control Act (TSCA):	All substances in this product are listed, as required, on the TSCA inventory. These products contain RCF which may be subject to Section 12 (b) Export Notification Requirements.
SARA Title III:	This product does not contain any substances reportable under Sections 302, 304, 313. Sections 311/312 apply.

## **XI. SPECIAL PRECAUTIONS / SUPPLEMENTAL INFORMATION**

Product which has been in service at elevated temperatures (greater than 1800°F) may undergo partial conversion to cristobalite, a form of crystalline silica. Chronic exposure to respirable crystalline silica may lead to delayed lung injury (silicosis). The amount of cristobalite present will depend on the temperature and length in service.

IARC has concluded that crystalline silica from occupational sources inhaled in the form of quartz or cristobalite is carcinogenic to humans (Group 1) [IARC Monograph Vol. 68, June 1997]. The OSHA permissible exposure limit (PEL) and the 1988-89 ACGIH threshold limit value (TLV) for cristobalite is 0.05 mg/lf (respirable dust). Particular care should be taken when working with “used” material to minimize generation of dust. When removing and handling product used in high temperature applications, special caution should be taken to avoid unnecessary cutting and tearing of the used material to minimize generation of airborne dust. Workers should. Use respiratory protection. Use NIOSH or MSHA approved equipment when airborne exposure limits may be exceeded, especially in confined areas with inadequate ventilation.

Insulation surfaces should be lightly sprayed with H<sub>2</sub>O before removal to suppress airborne dust. As water evaporates during removal, additional water should be sprayed on surfaces as needed. Only enough water should be sprayed to suppress dust so that water does not run on to the fiber in the work area.

After RCF removal is completed, dust-suppressing cleaning methods, such as wet sweeping or wet vacuuming, should be used to clean the work area. If dry vacuuming is used, the vacuum must be equipped with a HEPA filter. Air blowing or dry sweeping should never be used. Dust-suppressing components can be used to clean up light dust.

## **XII. INGREDIENTS / HEALTH HAZARD INFORMATION**

<u>COMPONENT LIMITS</u>	<u>CAS NO.</u>	<u>%</u>	<u>EXPOSURE LIMITS</u>
Refractory Ceramic Fiber	142844-00-6	40-95	.5 Fiber/cc Guideline-RRC* 5 mg/M <sup>3</sup> -Nuisance Respir – OSHA 10 mg/M <sup>3</sup> - Nuisance Total – ACGIH*
Amorphous Silica	7631-86-9	0-60	6 mg/M <sup>3</sup> (total) PEL

Inert Fillers and Organic Binders**			N/A
Remaining components not determined hazardous and/or hazardous components present at less than 1.0% (0.1% for carcinogens)	N/A	Trace	N/A

\*Pending the results of long-term health effects studies, airborne exposures should be controlled at or below the recommended industry exposure guidelines listed above.

\*\*Identity, CAS Numbers and/or percent composition are trade secrets.

As of the date of preparation of this document, the foregoing information is believed to be accurate and is provided in good faith to comply with applicable Federal and State laws. However, no warranty or representation, expressed or implied, is made as to the accuracy or completeness of the foregoing data.

## Product Safety Information

### Refractory Ceramic Fibre Product

 <b>WARNING</b>
This product contains refractory ceramic fibers which have been identified by the International Agency for Research on Cancer (IARC) as possibly carcinogenic to humans.

This product contains refractory ceramic fibers which have been identified by the International Agency for Research on Cancer (IARC) as possibly carcinogenic to humans.

Avoid breathing fiber particulates and dust.

#### RISKS:

- Possible cancer hazard by inhalation
- May cause temporary irritation to eyes, skin, and respiratory tract

#### PRECAUTIONARY MEASURES:

- Minimize airborne fibers with engineering controls.
- Use NIOSH/MSHA approved respiratory as required (see MSDS).
- Wear long sleeved, loose-fitting clothing, eye protection, and gloves

FIRST AID MEASURES:

Eyes: Flush with water.

Skin: Wash with soap and warm water.

Ingestion: Do not induce vomiting. Get medical attention if gastrointestinal symptoms develop.

Inhalation: Remove to fresh clean air.

If any of the above irritations persists, seek medical attention.

CONSULT MSDS FOR ADDITIONAL PRODUCT INFORMATION AND  
HANDLING INSTRUCTIONS.

REX ROTD CORPORATION

P.O. BOX 980

FOWLERVILIE, MI 48836

517/223-3787

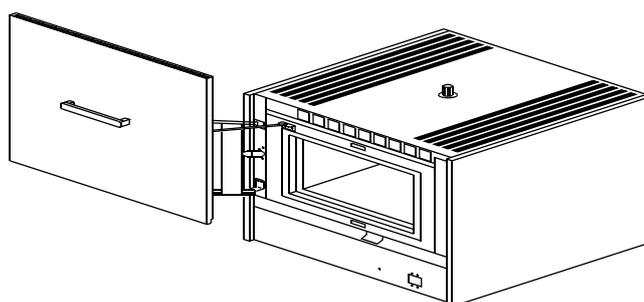
## Standards and Directives

The Laboratory Box Furnaces complies with the following standards and guidelines:

- Current/Approved Agency standards (Underwriters Laboratory/CSA/CE).

**Safety Notes  
Standards and Directives**

## Introduction



**Figure 1. BF51841 Laboratory Box Furnace**

The Thermo Fisher Scientific BF51841 is a reliable, energy efficient 1200 °C laboratory box furnace. The heating elements and low thermal mass Moldatherm® insulation provide fast duty cycles, energy conservation, and efficient programming. Refer to “[Table 1](#)” for specifications.

## Features and Benefits

- Controlled heat-up rate eliminates thermal shock to materials.
- Quick heat-up and cool-down rates.
- Left swing door (reversible)
- Safety interlock switch automatically interrupts power to heating elements when door is opened. This feature protects heating elements and eliminates operator's exposure to electrical shock.
- Energy efficient Moldatherm insulation suitable for high interior-exterior temperature differential. The unit is rated for a maximum operating temperature of 1200 °C.
- Patented LGO (light gauge overbend) heating elements transfer radiant heat energy to the work chamber and load efficiently and economically.
- Replaceable hearth plates and shelves.
- Digital control with adjustable parameters.
- Main power ON/OFF switch and power indicator on control panel.

- Double wall construction.
- Front control panel is recessed at the top. This feature provides easy viewing of the control LED and protection for the control instrumentation.

## Specification

**Table 1. BF51841 Laboratory Box Furnaces**

Model	Dimension WXF-BXH in.(cm)			Maximum Operating Temp	Watts	Thermoco uple	Voltage	Integral Control	Shipping Weight lbs (kg)
	Cham ber	Exterior	Shipping (Approxim ate)						
BF51841C BF51841BC	15x15 x15 (38.1x 38.1x3 8.1)	29x28x33 (73.6x71.1 x83.8)	30x34x31 (6835x78. 6x71)	1200 °C	5800	Type PL II	208/240 VAC 50/60 Hz single phase	Single setpoint	280 (127)

The BF51841BC model has adjustable over-temperature control.

# Unpacking

## Unpacking

Carefully unpack and inspect your furnace for damage. If the product is damaged, report it to the appropriate carrier and retain packing materials. Retaining all packing materials and documentation is essential in any damage claims filed.

**Unpacking  
Unpacking**

# Installation

## Location

Locate your furnace in a level area which is free from vibration. Allow a minimum of three (3) inches of space at sides and (12) inches above for air flow around the unit. Access to the furnace for routine maintenance should also be considered, especially when the furnace is wired.

## Wiring

Thermo Fisher Scientific model BF51841 furnaces are designed for operation on 240 VAC. The furnaces will operate on 208 volts, but will have reduced heat up rates.

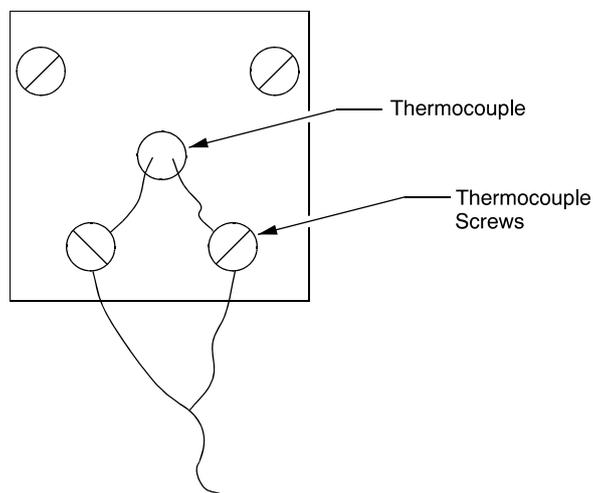
Power and ground wires are not provided with the furnaces.

1. Suitable lengths of properly sized wires must be acquired prior to the installation of your furnace. The BF51841 will draw approximately 20 amps on 240 VAC. Minimum recommended wire gauge size is 14 gauge. A high temperature (150 °C) wire casing is also recommended. A ground wire should be provided per local code.
2. Remove the right panel (side with High Voltage label) of the furnace by removing the appropriate screws. Removing the side panel allows for access to the terminal block and grounding screw, located at the base of the unit.
3. The 7/8 inch diameter hole located on the lower rear panel may be used to mount a standard 1/2 inch electrical conduit connector.
4. Thread two properly sized power wires and one properly sized ground wire through the conduit hole. The wires should be marked L1, L2, and ground. Insert power leads L1 and L2 into the terminal block and tighten down securely. Ground on the provided ground screw.
5. Check that the thermocouple (top left of rear of furnace chamber) is securely mounted and that it is not damaged. Remove small cover on Rear panel of furnace to check thermocouple wiring connections. Red is always negative. Refer [Figure 2. "Thermocouple"](#).
6. As a final inspection step, check that all electrical connections are secure and verify that the door stop bracket properly contacts the power interrupt switch

**Installation**  
**Gas Inlet Tube (Refer Figure 3. Gas Inlet Tube Assembly)**

near the front of the furnace. If mechanical adjustment is necessary, slight bending of the switch arm can be done.

7. Replace and secure the small cover on the Rear panel and right side panel of the furnace using the necessary screws.



**Figure 2. Thermocouple**

## **Gas Inlet Tube (Refer Figure 3. Gas Inlet Tube Assembly)**

The gas inlet tube assembly has been packaged separately to avoid breakage during shipping and handling.

Even if you do not intend to use the gas inlet, you must install the assembly before operating the furnace. The only tool you need is a Phillips head screwdriver.

To install the gas inlet assembly:

1. Carefully remove the assembly from the package and inspect for any damage.
2. Remove the two mounting screws from the rear housing panel of the furnace.
3. Insert the ceramic tube end through the access hole in the rear of the furnace and guide the tube into the back of the chamber.
4. Align the mounting holes in the rear housing panel with the holes in the gas inlet tube assembly and secure the assembly with the mounting screws.

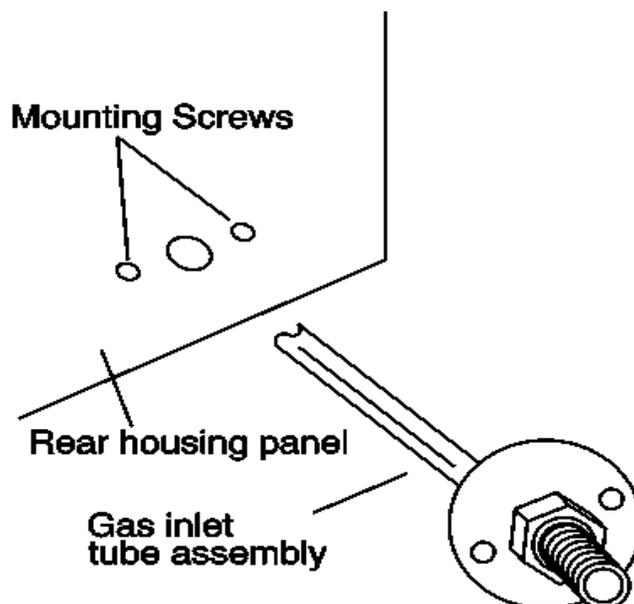


Figure 3. Gas Inlet Tube Assembly.

## Guidelines for Ashing Applications

Ashing products at relatively low furnace temperatures (400 ° to 800 °C) may cause carbon residue to build up on the walls, floor, ceiling and heating elements inside the furnace chamber. The carbon will look like a black powder, similar to smoke on glass from a candle.

Carbon is an electrical conductor. If the furnace chamber and heating elements are coated with carbon, an electrical short-circuit may occur and cause the elements to overheat and burn out.

There is also some danger that the carbon residue will be absorbed through the surface of the Moldatherm insulation and affect the fully embedded heating elements.

The best way remove carbon residue from the chamber and elements surfaces is to operate the empty furnace at a chamber temperature above 900 °C for one hour. Do this regularly, whenever the chamber interior shows signs of carbon residue.

Do not scrub or scrape the chamber surfaces, this may damage the heating elements and the insulation.

## Hearth Plate Information

### Why Use

- To provide a load bearing surface and distribute the weight of product being heated.
- To protect the furnace chamber from spillage.
- To lengthen the life of furnace, by allowing heat from the chamber floor to circulate into the chamber center.

### When to use

- Hearth Plates are recommended during each furnace operation.

### How to Install

- Hearth plates are designed with a grooved surface.
- The grooved surface must be positioned against the chamber floor.

	 <p>Most hearth plate materials made of ceramic fibre and can be broken if dropped.</p>
--	--

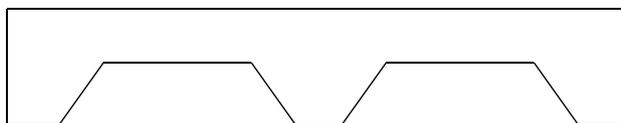


Figure 4. Hearth Plate Ripped

## Shelf Installation in Box Furnaces

1. Model series BF51731 and BF51732 are supplied with a pair of half-depth shelves.
2. One or both of these shelves can be installed into the chamber using the single groove at the mid-point on each side wall

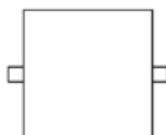
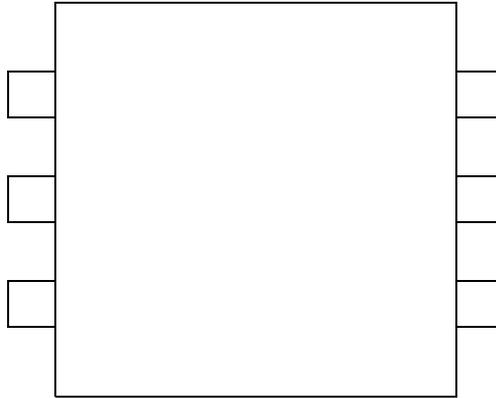


Figure 5. BF51731 and BF51732 Chamber Showing Shelf Groove

3. Model series BF51841 and BF51842 are supplied with a pair of half-depth shelves.
4. One or both of these shelves can be installed into the chamber using any of the three groove sets near the mid-point on each side wall.



**Figure 6. BF51841 and BF51842 Chamber Showing Shelf Groove.**

**Installation**  
**Shelf Installation in Box Furnaces**

# Operation

## Initial Start-up

1. Check to ensure that furnace is properly wired. Refer to the [Section “Wiring Diagram”](#).
2. Apply power to the furnace by closing the power circuit breaker on the base of the furnace.
3. Lower the door and make sure that it is fully closed. A safety disconnect switch is provided to turn power off when the door is not closed. Use both handles when opening and closing the furnace.  
Thermo Fisher Scientific recommends initially running the furnace at 1100°C for 7-10 hours in order to burn off contaminants and to form a protective oxide layer on the heating elements.
4. Adjust controller setpoint to 1100 °C. If the furnace has over-temperature protection (option B), set that instrument above 1100 °C. Allow furnace to run for 7-10 hours.

The furnace is now ready for normal operation. Refer to [Section “Operation - UT150 Controller”](#) and the UT150 manuals for more information on the controller.

Thermo Fisher Scientific recommends initially running the furnace at 1100 °C for 7-10 hours in order to burn off contaminants and to form a protective oxide layer on the heating elements.

## Idling Periods

Due to the fast heat-up and low thermal mass of the furnace, the furnace can be turned off when the furnace will not be in use for periods of times greater than a few hours.

## Vents

The vent provided at the top of the furnace is designed to help remove contaminants from the furnace chamber. Whenever high amounts of contaminants, (smoke, chemical vapors, etc.) are present, the vent should be opened to aid in prolonging heating element life.

## Atmosphere Port

The BF51841 furnace has a factory-installed air/atmosphere port.

Most inert atmospheres (i.e. nitrogen, argon, and helium) can be safely run in the BF51841 box furnace. However, maximum temperatures may be derated depending on atmosphere. An initial burn in period in air is recommended. Please contact Thermo Fisher Scientific prior to using the furnace with an inert atmosphere.

The furnace should be run for 7-10 hours at 1100 °C before using an inert atmosphere and after every 60 hours of use with an inert atmosphere. This burn in process will help remove contaminants and provides a protective oxide layer on the heating elements.

The BF51841 furnace is not designed to be a gas-tight atmosphere furnace.

## Option B (Excess Temperature Controller)

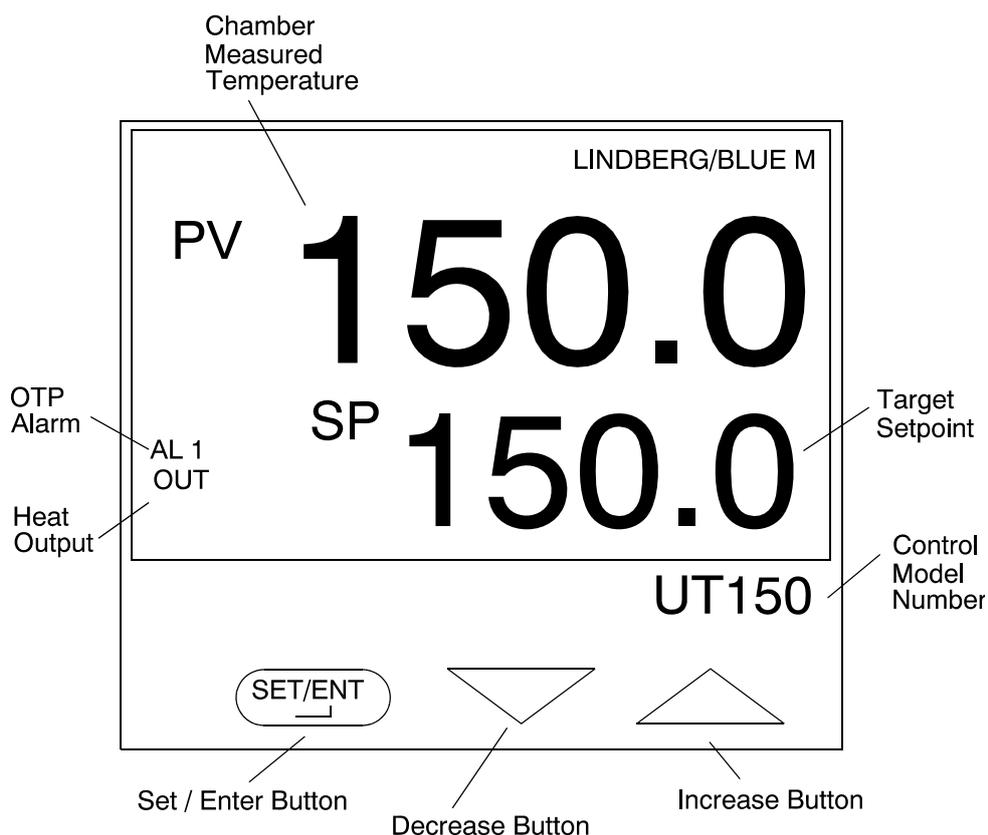
The over-temperature protection system (option B) is a redundant over-temperature protection system which utilizes a separate controller, magnetic contactor and thermocouple.

For protection of the furnace the over-temperature alarm setpoint should be set slightly higher than the furnace maximum operating temperature. To protect the furnace load set the alarm setpoint higher than the working temperature but below the critical material temperature.

If an over-temperature condition occurs, an alarm will be displayed and the heating element power will be disconnected until the controller is reset manually. The front panel is similar to the UT150 temperature control panel (Refer to [Figure "Heating Unit Replacement"](#)).

For detailed instructions, refer to [Section "Excess Temperature Option"](#).

## Operation - UT150 Controller



**Figure 7. UT150 Control Panel**

The furnace temperature controller is configured and tuned at the factory to function well for most applications. Occasionally, it may be advisable to configure the temperature controller differently to suit a particular working environment or process.



Before reconfiguring the controller, read this chapter and the UT150 operation manual. Reconfiguring the controller can change the unit characteristics and design parameters, which can hamper performance and make the equipment dangerous to use.

## Normal Controller Operation

This chapter provides brief instructions on how to perform the following configuration changes:

- Setting the temperature
- Setting the Over-temperature Protection Temperature
- Changing between celsius and fahrenheit
- Setting the ramp to setpoint time
- Autotuning the controller

Detailed instructions on configuring the temperature controller are found in the UT150 operation manual.

For instructions on the Controller -PC Communication Option, refer to [Section “Communication Option”](#).

## Normal Controller Operation

The Temperature Controller senses the chamber air temperature of the furnace (the PV, or process value) and supplies the heat necessary to achieve the desired setpoint. The controller includes an LED display and a push button keypad. Refer to [“Table 2”](#) and [“Table 3”](#) for lists of displayed parameters and keypad functions.

**Table 2. UT150 Parameter Functions**

Operating Parameters (access by holding the SET/ENT button)		
Parameter code	Factory set value	Description
A1	1225.0	Alarm Setpoint (°C, 2237 °F)
CtL	Pid	Control mode
At	oFF	Auto tuning
P	20.0	Proportional band (°C, °F=16.2)
I	120	Integral time
d	30	Derivatives time
Ct	1	Heat cycle time
FL	oFF	Sensor filter
bS	0.0	PV bias (offset)
Loc	0	Key loc
Setup parameter (access by setting LoC = “-1”)		

In	14	Input type (J thermocouple in °C; °F=44)
SPH	1200	High setpoint limit °C; °F =2192
SPL	0.0	Low setpoint limit °C; °F =32
Upr	oFF	Up ramp rate (degrees C or F / minute)
Dnr	oFF	Down ramp rate (degrees C or F / minute)
tmU	1	Ramp Times Units, °Per minute ( 0=°Per Hour)
AL1	9	Alarm 1 type
AL2	oFF	Alarm 2 type
HY1	1	Alarm 1 hysteresis (°F=1)
HY2	0	Alarm 2 hysteresis
SC	on	Super Control
dr	0	Direct/Reverse action

Table 3. Push button Keypad

Button	Function
	<p>Pressing and holding the SET/ENT for three second advances the display to the Operation Parameters Menu.</p> <p>While in the Operation Parameters Menu, use SET/ENT to move from one parameter to next, and to register changes you have made in setpoint and parameter value.</p> <p>Holding SET/ENT for three seconds exits either the Operation or Setup Parameters menu.</p>
	<p>Use the Up Arrow button to increase the temperature setpoint display and change parameter values in the Operation and Setup Parameter menus. Whenever you change the value of setpoint or parameter, the decimal point flashes to remind you to register the changed value with SET/ENT.</p>
	<p>Use the Down Arrow button to decrease the temperature setpoint display and to change parameter values in the Operation and Setup Parameter menus. Whenever you change the value of a setpoint or parameter, the decimal point flashes to remind you to register the changed value with SET/ENT.</p>

## Setting the Temperature

To set the temperature to the desired setpoint, complete the following steps:

1. Press  or  until the desired setpoint is indicated on the bottom line of the display.
2. Press SET/ENT to register the new setpoint.

## Setting the Over-temperature Protection (OTP) Temperature

The high limit alarm system built into the temperature controller disables the heater output. To set the alarm on the temperature controller (typically 5 °C above the desired main temperature setpoint), complete the following steps:

1. Press and hold SET/ENT for 3 seconds, until A1 is displayed on the upper line.
2. Press  or  until desired over-temperature limit setpoint shows on the bottom line of the display.
3. Press SET/ENT to register the new over-temperature alarm setpoint.
4. Press and hold SET/ENT for 3 seconds to return to the normal display.

## Changing Between Celsius and Fahrenheit

The controller is factory-set to operate with degrees Celsius. To change the display modes and parameter settings to the Fahrenheit scale, you will need to change the Input Type parameter In and also the values of various scale-dependent parameters. If during this procedure the buttons are inactive for more than two minutes, the controller will return to the standard display.

To change from Celsius to Fahrenheit:

1. With the controller operating, access the Operating Parameters menu by pressing and holding SET/ENT for 3 second.
2. Press and release SET/ENT repeatedly until the upper display reads LoC. The value before LoC must be "0". If not use "0", use arrow to select "0" followed by sides press of SET/ENT button.
3. Press  until the displayed value of LoC is - 1; then press SET/ENT to access the Setup Parameters menu (Refer to [Table 2. "UT150 Parameter Function"](#)).
4. The first setup parameter displayed is Input Type (In). Press to change its value from 14 to 44. After making this adjustment (and all following parameter

- adjustments) be sure to press and release SET/ENT again to register the change.
5. Press and release SET/ENT to advance to The SPH parameter and change its value 2192.
  6. Press and release SET/ENT to advance to the SPL parameter and change its value to 32.
  7. Press and release SET/ENT to advance to the HY1 parameter and change its value to 1. Press & Release SET/OUT.
  8. Press and hold SET/ENT for 3 seconds to exit the Setup Parameters Menu.
  9. Press and hold SET/ENT for 3 second to enter the operating Parameters Menu and display the A1 parameter.
  10. Use the  button to set the A1 parameter to the desired over-temperature limit in °F.
  11. Press and release SET/ENT to advance the P parameter and change its value to 16.
  12. Press and hold SET/ENT for 3 seconds to exit the Operating Parameters Menu.
  13. The new temperature units are now effective. Follow the instructions in Section “Normal Controller Operation” to reset the temperature setpoint in °F.
  14. Apply the °F label over °C label on the control panel.

## Setting the Ramp to Setpoint Rate

The Ramp Rate feature allows the chamber to be heated or cooled at any rate slower than the maximum capability of the unit. To fine tune ramp rates, you may need to test using loads with similar and thermal properties to loads you intend to use in furnace applications.

To set the ramp to setpoint rate, complete the following steps. If during this procedure the buttons are inactive for more than two minutes, the controller will return to the standard display.

1. With the controller operating, press and hold SET/ENT for 3 seconds to enter the Operating parameters menu.
2. Press and release SET/ENT until the LoC parameter is on the upper display. The value before LoC must be “0”. If not use “0”, use arrow to select “0” followed by sides press of SET/ENT button.
3. Press the down arrow button to show “1”, and press SET/ENT once to enter the Setup Parameters menu.
4. Press and release SET/ENT until the Upr parameter is on the upper display.

## Auto Tuning the Controller

5. Press the arrow buttons to select the new Up Ramp Rate value, in °C per minute or °F per minute, or “OFF”. Press and release SET/ENT to register the value change.
6. Press and release SET/ENT until the dnr parameter is on the upper display.
7. Press the arrow buttons to select the new Down Ramp Rate value, in °C per minute or °F per minute, or “OFF”. Press and release SET/ENT to register the value change.
8. Press and hold SET/ENT for three seconds to exit the Setup Parameters menu.
9. The new Ramp Rates are now effective.
10. Follow the instructions in Section “Normal Controller Operation” to reset the temperature setpoint.

### NOTE

The ramp rate begins when the SET/ENT button is pressed after target setpoint is selected. The setpoint display on the controller will show the changing setpoint at the selected ramp rate.

To view the target setpoint during the ramp rate, press and release an arrow button. The lower display will show the setpoint next to the selected target setpoint. Return to the ramping setpoint display by pressing and releasing the other arrow button.

## Auto Tuning the Controller

Factory settings are provided for general purposes, but your process can be enhanced through the auto tune feature. For a given process temperature and product load, auto tuning maximizes the performance of the chamber by operating with the quickest response and minimal temperature overshoot.

To auto tune the controller.

1. Load the chamber with materials that have the same mass and thermal characteristics as a typical product load.
2. Operate the chamber to the process temperature.
3. Press and hold SET/ENT for 3 seconds to display the A1 parameter of the Operating Parameter menu.
4. Press and release SET/ENT to show the At parameter.
5. Press and release the arrow buttons show “ON” in the lower display.
6. Press SET/ENT once to enter the auto tune mode and exit the Operating Parameters menu.

The controller will cycle three times heating and cooling pattern, measuring the characteristics of the load and chamber temperature controls. During the auto tuning, At will alternately flash with the measured temperature (PV) to indicate that the auto tuning is in progress. The length of time for the auto tune varies with the load, chamber size and temperature selected.

The auto tune is completed when the regular display of the measured temperature is shown. The chamber should now operate to the process temperature with the given product load, with the quickest response and minimal temperature overshoot.

If the process temperature or load changes significantly, another auto tune session may be necessary to optimize the chamber performance.

## Correction of Temperature Overshoot

An alternative method of running the auto tune is to select the target setpoint followed immediately by the activation of the autotune furnace.

This method allows the autotune to correct for overshoot of the temperature overshoot.

As the furnace heats to the setpoint, the autotune will begin when the measured temperature (PV) equals the setpoint and follows the three cycles described above.

## Correction of Temperature Overshoot

## Excess Temperature Option (“B” Model)

The Excess Temperature Option, when installed, provides an additional, independent temperature control system to help protect products from excess temperatures.

Read this section carefully before using this option.

### Control Display

When the Excess Temperature Controller is first turned on, it displays only the excess temperature setpoint in the bottom display. Press and release the SET/ENT button to show the duration time of the last excess temperature incident. (See [“Exceeded Temperature Duration Timer Section”](#).)

Press and release the SET/ENT button once again to show the peak temperature measured for the last excess temperature incident.

Pressing and releasing the SET/ENT button once again shows the current temperature measured by the controller in the top display; this may differ slightly from the main temperature controller. The value shown in the bottom display is the current excess temperature setpoint.

Pressing and releasing the SET/ENT button again cycles back to the first display.

### Excess Temperature Option Features

#### 1. Exceeded Temperature Duration Timer

The Exceeded Temperature Duration Timer measures the time that the setpoint is exceeded (and power to the heater interrupted) until the hysteresis value is reached as the chamber temperature cools. This time indicates when the chamber temperature exceeded the Excess Temperature setpoint.

#### 2. Peak Exceeded Temperature

The Peak Exceeded Temperature is the highest temperature measured by the Excess Temperature Controller.

## Operating Parameters

### 1. Excess Temperature Setpoint

The Excess Temperature setpoint is typically set about 10 °C (18 °F) above the operating temperature of the chamber, or to the maximum temperature the product or process could tolerate.

The Excess Temperature setpoint is selected by holding the SET/ENT button for three seconds to show "SP" in the top display and the current setpoint in the bottom display. Adjust the setpoint with the arrow button and press the SET/ENT to register the new setpoint.

### 2. Hysteresis

Set the hysteresis ("HYS") of the Excess Temperature Controller to effectively use the Duration Timer feature. This value is usually 80% of the temperature difference between the Excess Temperature setpoint and the chamber operating temperature.

For example, with an Excess Temperature setpoint of 1220 °C and chamber operating temperature of 1180 °C, set the hysteresis to 32 °C.

The hysteresis also controls the indicator is extinguished and the Excess Temperature Controller can be reset.

Exit the Operating Parameters by holding the SET/ENT button for three seconds.

## Excess Temperature Controller Operation

After the Excess temperature Setpoint and Hysteresis values are selected, the controller is ready for operation. The setpoint and hysteresis should be reviewed and adjusted if necessary, when the main controller setpoint is changed.

During an excess temperature incident, the "EXCEEDED" and "OUT" indicators are lit on the controller display area when the setpoint is tripped. The "EXCEEDED" indicator will stay on while the temperature cools to the hysteresis amount, then turn off.

When the "EXCEEDED" indicator is extinguished, the Excess Temperature Controller can be reset holding the "up arrow/reset" button for one second when the normal operating display is showing the current measured temperature and the setpoint or just the setpoint.

The Exceeded Temperature Duration Timer and the peak Exceeded Temperature can be viewed either before or after the controller is reset. These are viewed on the controller display when the SET/ENT button is pressed and released, with the "tIn" or "HI" in the top display. These values will be erased from the display and memory when the "up arrow/reset" button is pressed during their respective display (add the "EXCEEDED" indicator is off).

Loss of power to the Excess Temperature Controller will not change the setpoint or hysteresis value. However, the last recorded Exceeded Temperature Duration Time and peak Exceeded Temperature will be lost.

In some instances, the "OUT" indicator is illuminated without a high temperature event. In this "TRIPPED OUT MODE", the power to the heating element is introduced.

A source failure (indicated with "0.0" in the upper display) will cause "OUT" illuminated.

A power failure, in some instances causes "OUT" to be illuminated.

As long as the "EXCEEDED" indicator is extinguished, the UT150L can be reset with press and hold of "UP ARROW/RESET" button.

**Excess Temperature Option("B" Model)  
Excess Temperature Controller Operation**

## Communication Option

The Communication Option enables digital communication between the UT150 controller and a PC. It is a factory-installed temperature controller and cable assembly using an RS-485 connection through a DB9 cable.

This option is supplied with the necessary cable and diagnostic software to set up and check the connections between the unit and the PC. Follow the steps below to make the cable connections and to check the data transfer. If you have purchased the “SpecView Plus Communication Software” with the copy protection key, refer to the SpecView instructions in parallel with this setup outline.

### Cable Installation

1. To install the 25-foot external cable, disconnect the electrical power from both the unit and PC.
2. Connect the cable end with a black housing to the 9-pin port on the rear of the Thermo Fisher Scientific unit.
3. Connect the other cable end with the RS-232/485 converter to the COM 1 Port (or other COM port of your choice) on the rear of the PC.
4. If you have purchased the Spec View Plus Communication Software with the copy protection key, install this key on your parallel port. It may be necessary to locate the key between a cable and the parallel port.
5. Apply electrical power to the unit and the PC.

### UT150 Communications Setup Parameters

**Table 4. “UT150 Communication Parameters”** shows the default values for UT150 Communications Setup Parameters. To access these parameter:

1. Hold the SET/ENT button for three second to display the Operating Parameters. Press and release the SET/ENT button to display the “LoC” parameter. Assure lower value at “ø”. Press the down arrow to show “-1” in the lower display and press SET/ENT to acknowledge and enter the Setup Parameter menu.
2. Press and release the SET/ENT button to access the six parameters specific to communication option.

**Table 4. UT150 Communication Parameters**

Parameter Code.	Factory Set Value	Description
Communications Setup Parameters		
PSL	0	Protocol selection
Adr	1	Controller address
bPs	9600	Baud rate
Pr1	EVN	Parity (even)
StP	1	Stop bit
dLn	8	Data length

## Software Installation

1. Load the SpecView software onto the PC hard drive, using the disks provided.
2. Run the software. (If you have purchased the SpecView Plus Communication Software with the copy protection key, Skip step 3.)
3. If you do not have a copy protection key, a "SpecView" window opens with the message, "Problem with Dongle: "Dongle" (Copy Protection Key) not detected on parallel port". Click the OK button to acknowledge the message. Without the copy protection key, this diagnostic/sampler software has a 20-minute time limit on each run. If the message "demo version of SpecView has stopped communicating - value are frozen" appears before the communication diagnostics/sampler are finished, close the software and reopen it for another 20-minute segment.
4. When the "Configuration Founds.." windows opens, click on the "Test Comms for New Config". Button.
5. The "Input Required.." window then opens. Enter a new Config. Name (up to 8 characters with no spaces) or accept the "DEFAULT" name. Click OK.
6. The "Port and Protocol" window opens next. On the "COM1:" line (if the COM1 port is the serial port used to connect to the port controller) select the pull down menu from protocol column. Highlight "\*\*Need to identify the proper/accurate selection from the current Communications Software "for controller mode UT150.
7. Select the pull down menu from the Baud Rate column. Highlight "9600". Click on the "Start Scan" button.
8. The SpecView program scans all 99 possible controller addresses and places a representative "Instrument View" of the temperature controller on the PC Screen for each controller found connected to PC. The factory-set addresses

are 1, 2, 3, etc. depending on the number of controller's address to be changed. See Section "Addresses for Multiple Controller" on page 8-4 for detailed instructions on configuring multiple controllers.

9. After the instrument scan is completed, a SpecView window appears with the message, "All channels scanned. Press OK to continue, or cancel to rescan". Press OK if all of the connected controllers are properly displayed. If no controls are displayed, check the "Troubleshooting" section at the end of this setup.
10. To begin communication between the PC and the controller, click on the "Enter Runtime" button (an icon of a running figurine). This action will ask for a file name to save this display: use the given default or select another.
11. The "Spec View" window will be displayed, showing the current PV (process variable) and SP (set point). If the SpecView display of the controller shows X's, the communication connection or power to the control may have been interrupted.
12. On some controllers, the decimal point position has been changed from the YOKOGAWA factory default. This will make the SpecView display differ from the controller. If this is the case, follow the instructions in [Section "Decimal Point Adjustment" Chapter "Communication Option"](#).

## Communications Test

When you have established a working communications link between the controller and PC, you should check the link by varying the target set point function:

1. Click on the arrows of the controller(s) shown in the SpecView window. This will open a keypad window where the set point can be changed.
2. Select a temperature set point a few degrees from the current temperature and press the "send" button. Verify that the controller display shows the setpoint change.
3. Select the original temperature set point through the keypad on the controller and observe the change on the PC display.
4. The controller parameters may be viewed through SpecView by clicking on the "PAR" button. A window opens that lists the controller parameters. Each parameter can be changed by selecting it and clicking on the "Alter" button. Select the "Close" button. Make no changes at this time.

This concludes the initial software diagnostics.

## Troubleshooting

If your connection is not working properly, check the following conditions:

- A. Verify complete and tight cable connections between the Thermo Fisher Scientific unit and the PC.
- B. Verify that power has been supplied to the unit and temperature controller before starting the software program.
- C. Verify the configuration values in the controller, listed in the [Table 4. “Communication Parameters”](#).
- D. Verify the values in the “ports & protocols” window ([see step 6 in section “Software Installation”](#)).

## Decimal Point Adjustment

If the decimal point on the PC display of the controller does not match the controller display, you can make an adjustment to correct this:

1. From the Configuration Mode (available through the “file” drop down while in the Runtime Mode), select the “Variables List” icon, represented by a page with lines on it.
2. Select the controller model number and select “Properties” button. The “Add/Rename Instrument” box appears.
3. In the Address window, highlight the middle digit (usually a 1), and change to “0” (zero).
4. Click the “Rename Only” button. Close the “Variables” box (click on “X” in corner of smaller box).
5. Select the “Enter Runtime” icon to see the results of the change.

## Addresses for Multiple Controllers

When more than one controller has the same communication address, alternative addresses need to be set up in the individual controllers. Addresses 1 through 99 can be selected on The same communication link to each PC COM port.

1. Determine a unique address for each temperature controller equipped with the communication option.
2. On the UT150 controller, access the Operating Parameters menu by pressing and holding SET/ENT for 3 seconds.
3. Press and release SET/ENT repeatedly until the upper display reads LoC.
4. Press  until the displayed value of LoC is - 1, then press SET/ENT to access the Setup Parameters menu.

5. Press and release the SET/ENT button to access the six parameters specific to the communications option. Compare the displayed values to those in [Table 4. "UT150 Communication Parameters"](#). Make adjustments to the Adr parameter as needed.
6. Press and hold SET/ENT for 3 seconds to exit the Setup Parameters Menu.

Loss of power to the Excess Temperature Controller will not change the setpoint or hysteresis value. However, the last recorded Exceeded Temperature Duration Time and peak Exceeded Temperature will be lost.

**Communication Option  
Addresses for Multiple Controllers**

# Maintenance

## General Maintenance

The Thermo Fisher Scientific BF51841 furnace is designed for long service life and trouble free operation. Keeping the furnace free of possible contaminants is recommended. Service life of the heating units and thermocouple will vary greatly, depending on the particular furnace application.



Maintenance should only be performed by trained personnel.



Disconnect furnace from main power before attempting any maintenance to furnace or its controls.



Before maintaining this equipment, read the applicable MSDS (Material Safety Data Sheets) in the safety notes.



When installing, maintaining, or removing the fibre glass Insulation, the following precautions will minimize airborne dust and fiber:

- Keep personnel not involved in the installation out of the area.
- Use a good vacuum to clean area and equipment. Use a dust suppressant if sweeping is necessary. Do not use compressed air.
- Use a disposable mask suitable for nuisance dust.
- Wear long sleeve clothing, gloves, hat, and eye protection to minimize skin and eye contact. Do not wear contact lenses.
- Thoroughly wash self after work is complete.
- Launder work clothing separate from other clothes and thoroughly clean laundering equipment after use. If clothing contains a large amount of dust and/or fiber, dispose of rather than clean.
- Promptly place used fiberglass parts and dust in plastic bags and dispose of properly.

## Heating Elements

The heating units are rated for a maximum of 1200 °C. They will resist attack from most corrosive agents. High concentrations of atmospheres or chemicals which may have corrosive effects on the ceramic fiber are sulfates, chlorides, fluorides, alkalis, and vanadium. Please contact Thermo Fisher regarding questions on the effect of specific atmospheres on your furnace performance.

High concentrations of volatile materials being burnt off in the furnace may reduce heating element life. Proper venting of the volatiles is essential.

After prolonged use, hairline cracks may develop in the insulating materials. Minor cracks will not affect furnace performance.

Care should be taken when working with or handling the heating units, as the ceramic fibers and dust particles are a possible eye/skin/lung irritant. Refer [Section “Safety Notes”](#).

## Heating Unit Replacement

Replacement of the heating units requires partial disassembly of the furnace. Two persons may be required for parts of the procedure. Allow adequate work space for the disassembly.

1. Be sure to disconnect all power to the furnace.
2. Remove the outer panels of the furnace by removing the appropriate hex-head screws.
3. Remove the thermocouple and the power wires/connecting straps from the heating elements at the rear of the furnace.
4. Open furnace door slightly. Disassemble the chamber frame starting from the top rear and working toward the base. The front supports do not have to be removed. The heating elements can then be pulled back and out of the remaining front support brackets.
5. A gasket made of ceramic fiber blanket is located between the two heating units. This material should be retained and used with the replacement heating units.
6. Install the replacement heating units in the frame and reverse the above procedure to reassemble the furnace.

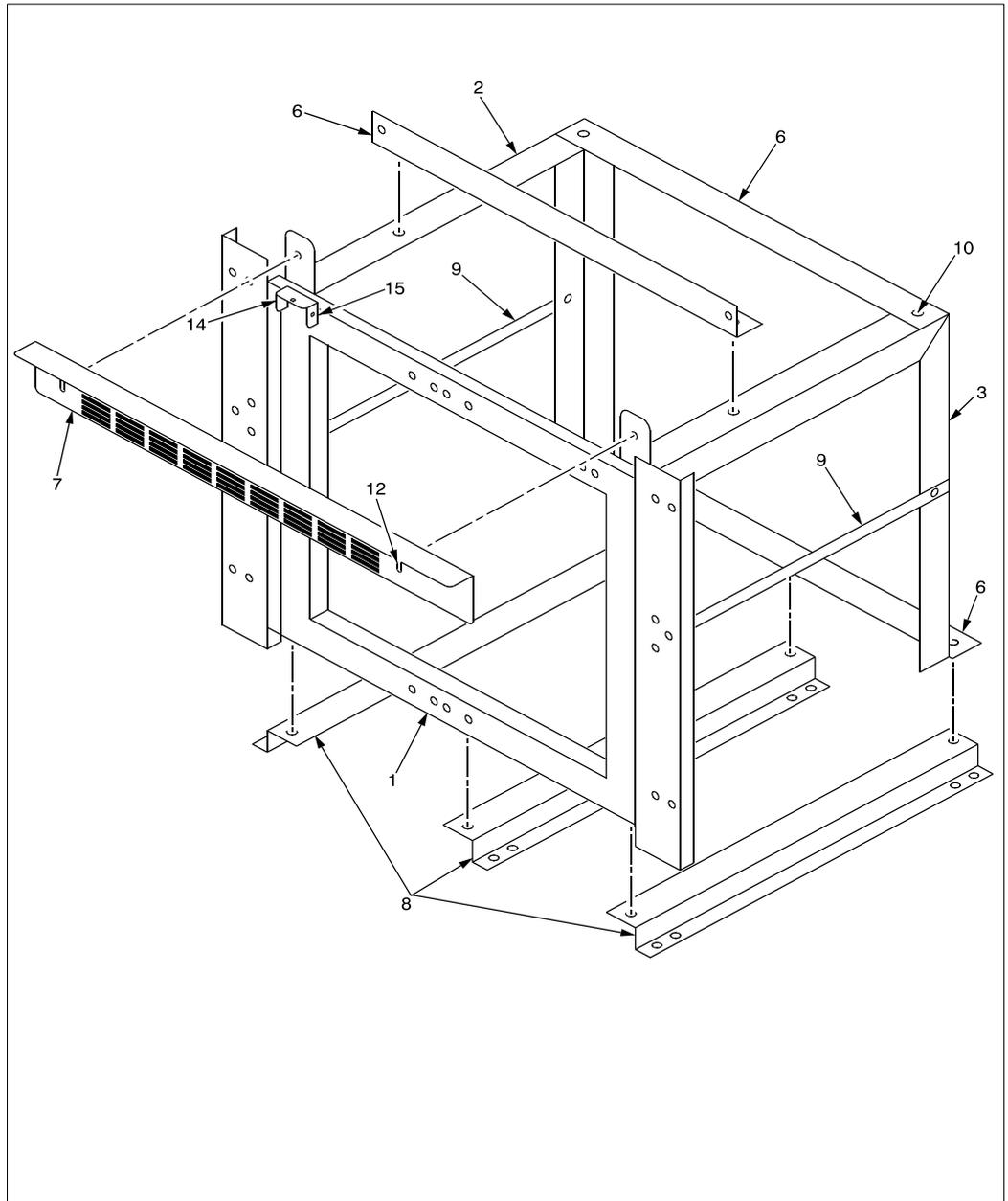


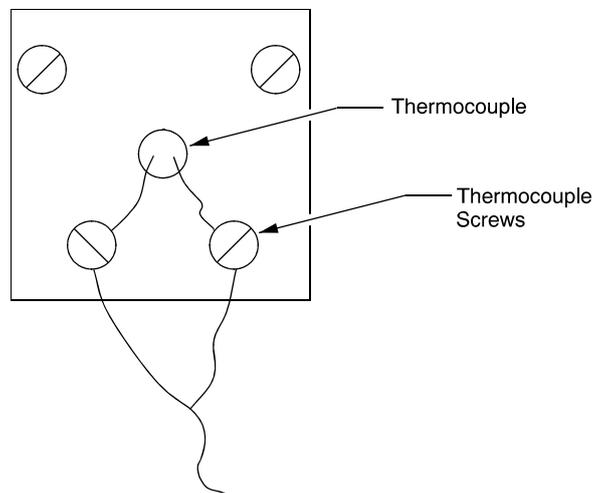
Figure 8. Heating Unit Replacement

## Thermocouple (T/C) Replacement

To replace the thermocouple:

1. Disconnect power to the furnace.

2. Remove the back panel of the furnace by removing the appropriate eight hex-head screws.
3. The thermocouple is located in the upper left hand corner of the rear of the furnace. Note location and color of the thermocouple and lead wires. Remove the mounting and connection screws. Carefully pull the thermocouple assembly out of the furnace chamber.
4. Replace the cylindrical thermocouple section with the new section. Put the thermocouple assembly back into the furnace chamber. Fasten with the mounting screws and reconnect wires. Refer to [Figure "Wiring Diagram"](#) for proper wire connections.
5. Replace the back panel.



**Figure 9. Thermocouple**

## Solid State Relay (SSR) Replacement

To replace the solid state relay:

1. Disconnect power to the furnace.
2. Remove the left side panel (facing front) to provide access to the SSR assembly.
3. Note positions of the wires on the SSR. Disconnect the wires and remove outer screws. Remove the heatsink and SSR from the furnace.
4. Remove the SSR from the heat sink. Replace with the new SSR and reverse the above procedure for reassembly.

# Door Insulation Replacement

To replace the door insulation:

1. Disconnect power.
2. Open furnace door.
3. Loosen the screws holding the upper and lower door insulation brackets in place. The screws do not need to be removed.
4. Pull the door insulation out of the support brackets. Insert new insulation and reassemble the support brackets.

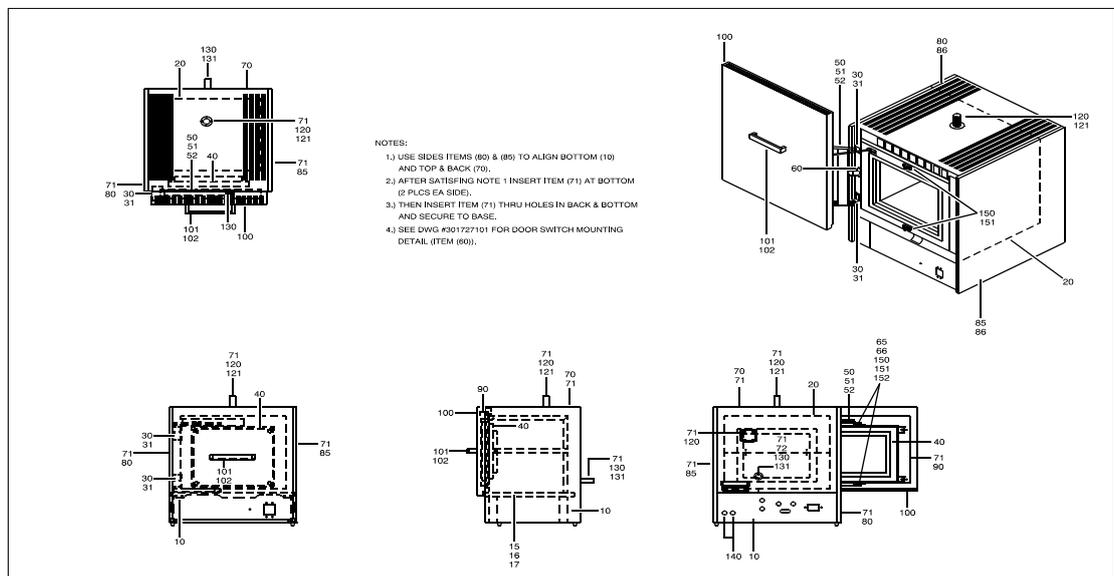


Figure 10. Door Insulation

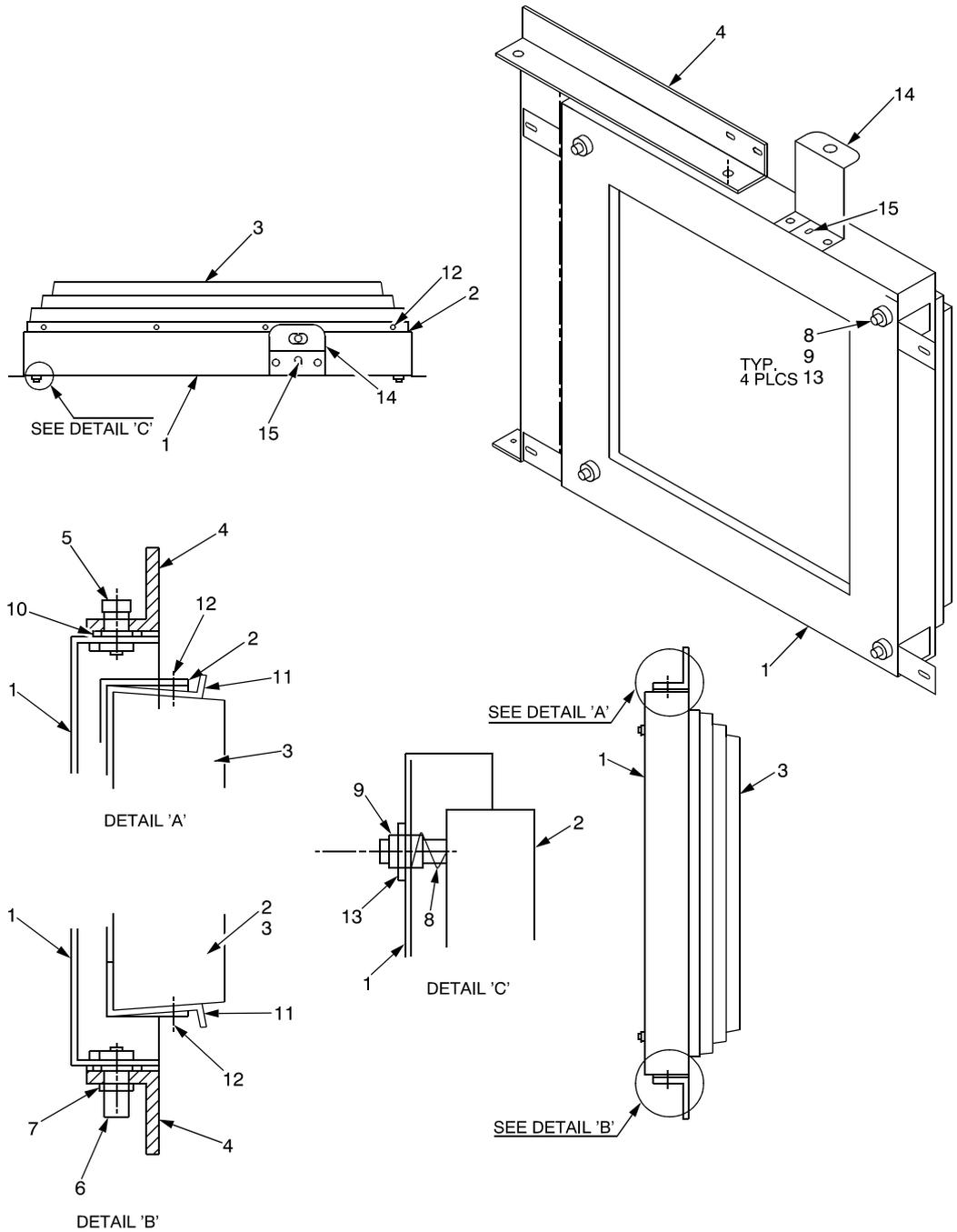


Figure 11. Door Insulation Replacement

## Right Hand Door Conversion

The furnace door can easily be converted to a right hand swing door as follows:

1. Open and support the furnace door. Remove the four bolts holding the door assembly to the furnace frame.
2. Remove the contact switch mounted below the door.
3. Install door on right hand side of the chamber frame, using the bolts in the holes provided. Install the contact switch in the mounting location provided at the right of old location.
4. Check alignment of the door insulation with the chamber.

Sideways adjustment can be made by loosening the door insulation supports and moving the insulation plug. Vertical adjustment can be made by placing or removing spacers on the door hinge.

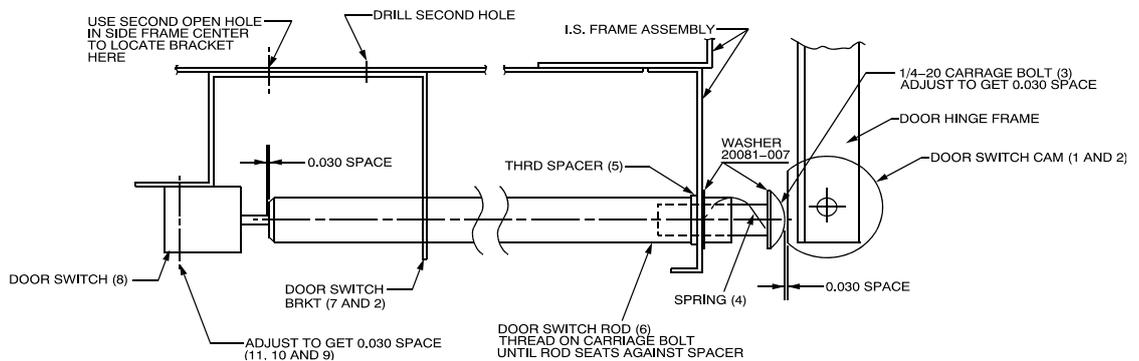


Figure 12. Door Hinge (Sheet 1/2)

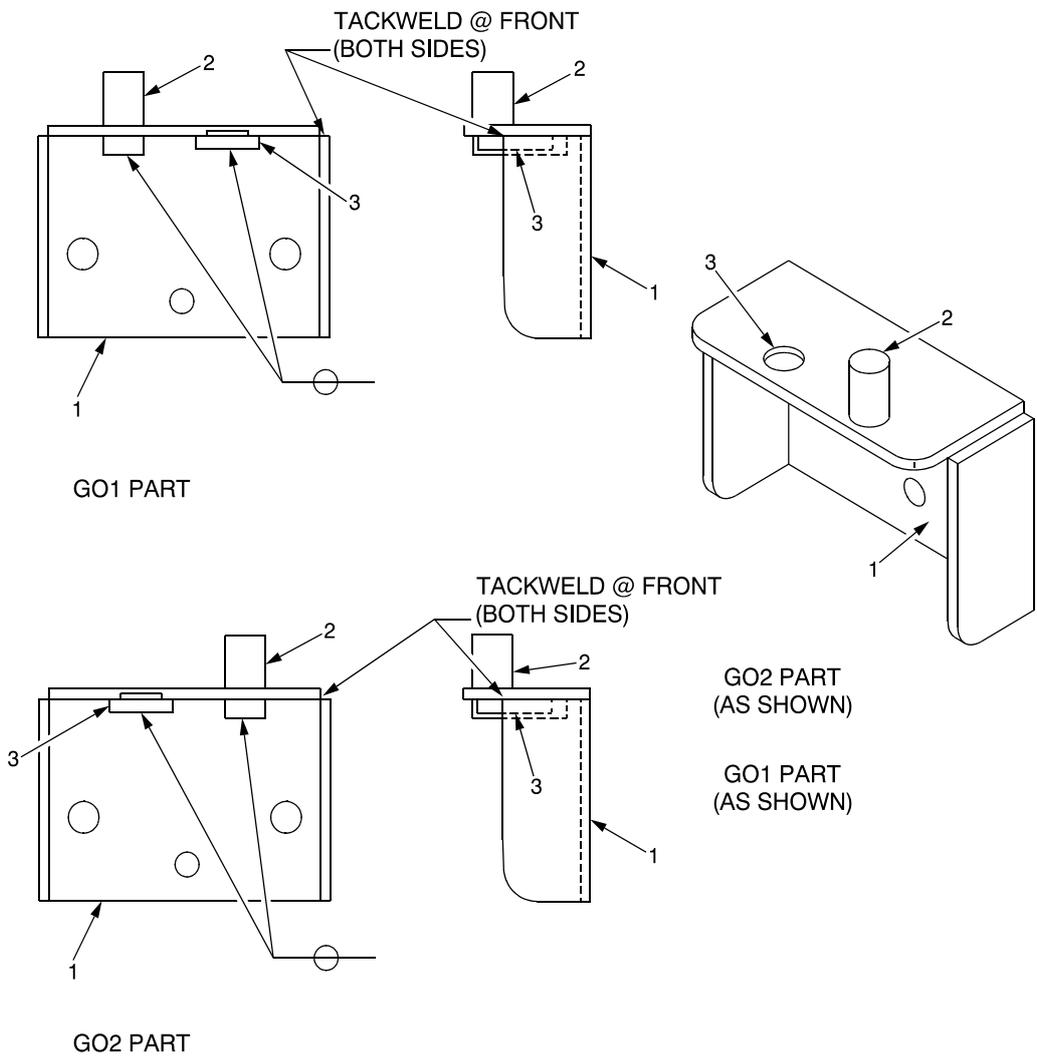


Figure 12. Door Hinge (Sheet 2/2)

## Over-Temperature Alarm Protection (OTP)

The Load Over-temperature Alarm. System indicates if the temperature inside the chamber exceeds the load alarm setpoint.

To insure proper operation, this alarm system must be checked at least once a month.

To test the load over-temperature alarm, complete the following steps:

1. Operate the furnace without a product load at your normal operating temperature.
2. Readjust main temperature control to a temperature above the load alarm setting (refer to [Section "Setting the Temperature"](#)).
3. Observe the unit closely until the load alarm trips, indicated on the controller beside the A1 label.
4. Reset the main temperature control to normal operating temperature. Once the unit cools below the alarm setpoint, the A1 indicator will go off.

## Troubleshooting

**Table 5. Controller Troubleshooting**

<b>Problem</b>	<b>Probable Causes</b>	<b>Solution</b>
Controller reads P.Er.	Abnormal parameter value	Check controller parameter of settings and reset to proper values
Controller reads b.o	Input burnout	Check the sensor wiring, replace sensor if necessary
Controller reads ooo.	PV exceed effective range	Check the input type and range settings and correct them
Controller reads UUU.	PV is below effective range	Check the input type and range settings and correct them.
Controller reads Err	Probable hardware failure	Call Service for controller repair
The controller displays do not illuminate.	The furnace is not connected to the power	Check furnace connection to power source
	Main switch is defective	Replace power switch or controller
	Fuse(s) Blown	Replace fuse(s) and verify power connections

Troubleshooting

Temperature varies or fluctuates.	Improper loading	Test the unit empty. If results are satisfactory, oven was improperly loaded. Redistribute the load
	Poor sensor connections	Check connections. Clean and tighten
	Contaminated sensor	Clear the area around the base
	Poor ventilation base	Clear the area around the base
	Inlet and / or exhaust vents are open	Close vents
	Inadequate tuning values.	Auto-tune the controller
	Insufficient stabilization time	Allow load ample time to reach equilibrium
	Intermittent failure of switch, controller, limit switch, or wiring	Verify wiring connection
Temperature Offset.	Controller degradation and/or sensor degradation	Offset or bias the controller and / or replace the sensor

## Replacement Parts

### Model BF51841C, Box Furnace , 1200 °C

Description	Item	BF51841C-1	BF51841BC-1
Heater-Chamber, top or bottom	300880H01	2	2
Hearth Plate	300807H01	1	1
Shelf, half-depth	7221-2067-001	2	2
Exhaust Port Cover	7221-2063-00A	1	1
Gas Inlet Assembly	300253G02 S	1	1
Thermocouple, Single	7299-1104-00B S	1	0
Thermocouple , Double	7299-1200-00M S	0	1
T/C Leadwire	33940-006	6 feet	12 feet
Wire Harness	38850G31	1	1
Main Circuit Breaker	302795H05	1	1
Control circuit breaker	21642H01	2	2
Heater fuse	32657-004	2	2
Contactors	300088H01	1	1
Solid State Relay	102460	1	1
Red Pilot Light	33002001	1	1
Main Controller	303115H03	1	1
Over-temp Controller	303775H05	0	1
Door Insulation Assembly	7221-2070-00A	1	1
Door Switch	46113H02	1	1
Door Catch/Latch	38280H01	2	2

## Replacement Parts

Door Bracket for Trailing Arm	300531G01	1	1
Door Bracket for Trailing Arm	301665G01	1	1
Cab.Bracket, Trailing Arm rhd	301665G01	1	1
Cab.Bracket, Trailing Arm rhd	301665G02	For optional right hand door swing	
Operation Manul	304259H01	1	1
Wiring Diagram	304258I01	1	1

On the next page is a wiring diagram for all BF51841 models.

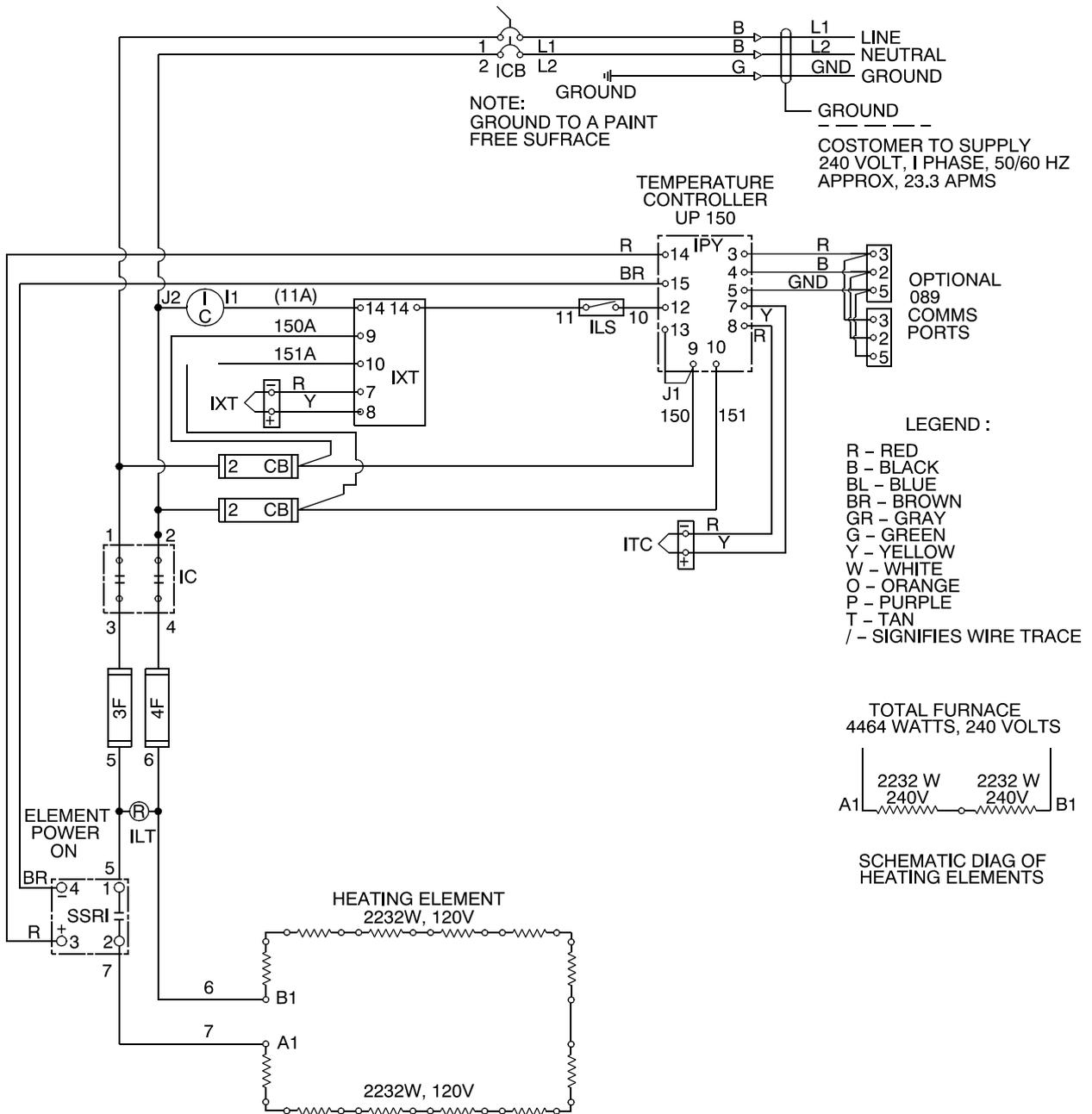


Figure 13. Wiring Diagram

## Replacement Parts

## Error Codes

This chapter is not applicable.



## WEEE Compliance

### Great Britain



This product is required to comply with the European Union's Waste Electrical & Electronic Equipment (WEEE) Directive 2002/96EC. It is marked with the following symbol. Thermo Scientific has contracted with one or more recycling disposed companies in each EU Member State, and this product should be disposed of or recycled through them. Further information on Thermo Scientific's compliance with these Directives, the recyclers in your country, and information on Thermo Scientific products which may assist the detection of substances subject to the RoHS Directive are available at [www.thermo.com/WEEERoHS](http://www.thermo.com/WEEERoHS)

### Deutschland



Dieses Produkt muss die EU Waste Electrical & Electronic Equipment (WEEE) Richtlinie 2002/96EC erfüllen. Das Produkt ist durch folgendes Symbol gekennzeichnet. Thermo Scientific hat Vereinbarungen getroffen mit Verwertungs-Entsorgungsanlagen in allen EU-Mitgliederstaaten und dieses Produkt muss durch diese Firmen verwertet/entsorgt werden. Mehr Informationen über die Einhaltung dieser Anweisungen durch Thermo Scientific, die Verwerter und Hinweise die Ihnen nützlich sein können, die Thermo Scientific Produkte zu identifizieren, die unter diese RoHS Anweisung fallen, finden Sie unter [www.thermo.com/WEEERoHS](http://www.thermo.com/WEEERoHS)

### Italia



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 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 Scientific con queste Direttive, l'elenco delle aziende 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 [www.thermo.com/WEEERoHS](http://www.thermo.com/WEEERoHS)

### France



Ce produit doit être conforme à la directive européenne (2002/96EC) des Déchets d'Équipements Électriques et Électroniques (DEEE). Il est marqué par le symbole suivant. Thermo Scientific s'est associé avec une ou plusieurs compagnies de recyclage dans chaque État membre de l'union européenne et ce produit devrait être collecté ou recyclé par celles-ci. Davantage d'informations sur la conformité de Thermo Scientific à ces directives, les recycleurs dans votre pays et les informations sur les produits Thermo Scientific qui peuvent aider à la détection des substances sujettes à la directive RoHS sont disponibles [www.thermo.com/WEEERoHS](http://www.thermo.com/WEEERoHS)



## Spare Parts and Accessories

This chapter is not applicable.







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