

Thermo Fisher Scientific 1700 °C Box Furnaces

BF51634BC-1 / BF51634C-1
BF51634PBC-1 / BF51634PBCCOMC-1
BF51634PC-1 / BF51634PCOMC-1
BF51664BC-1 / BF51664C-1
BF51664PBC-1 / BF51664PBCCOMC-1
BF51664PC-1 / BF51664PCOMC-1

Installation and Operation Manual

305378H01 Rev H

06-09-2012



© 2012 Thermo Fisher Scientific Inc. All rights reserved.

These operating instructions are protected by copyright. Rights resulting thereof, particularly reprint, photomechanical or digital postprocessing or reproduction, even in part, are only allowed with the written consent of Thermo Fisher Scientific.

This regulation does not apply to reproductions for in-plant use.

The contents of this operating instructions manual may change at any time and without any prior notice. Concerning translations into foreign languages, the English version of these operating instructions is binding.

Trademarks

Linderberg/Blue M is a brand owned by Thermo Fisher Scientific Inc.

All other trademarks mentioned in the operating instructions are the exclusive property of the respective manufacturers.

Thermo Electron LED GmbH
Robert-Bosch-Straße 1
D - 63505 Langenselbold
Germany

Thermo Electron LED GmbH is an affiliate to:
Thermo Fisher Scientific Inc.
81 Wyman Street
Waltham, MA 02454
USA

Thermo Fisher Scientific Inc. provides this document to its customers with a product purchase to use in the product operation. This document is copyright protected. and any reproduction of the whole or any part of this document is strictly prohibited, except with the written authorization of Thermo Fisher Scientific Inc.

The contents of this document are subject to change without notice.

All technical information in this document is for reference purposes only. System configurations and specifications in this document supersede all previous information received by the purchaser.

Thermo Fisher Scientific Inc. makes no representations that this document is complete, accurate or error-free and assumes no responsibility and will not be liable for any errors, omissions, damage or loss that might result from any use of this document, even if the information in the document is followed properly.

This document is not part of any sales contract between Thermo Fisher Scientific Inc. and a purchaser. This document shall in no way govern or modify any Terms and Conditions of Sale, which Terms and Conditions of Sale shall govern all conflicting information between the two documents.

Table of Contents

Chapter 1	Safety Notes	
	Basic Operating Precautions.....	1-1
	Safety Consideration.....	1-2
	Warranty.....	1-3
	Material Safety Data Sheet.....	1-4
	Explanation of Safety Information and Symbols.....	1-12
	Additional Symbols for Safety Information.....	1-13
	Standards and Directives.....	1-13
Chapter 2	Introduction	
	Feature and Benefits.....	2-1
	Specifications.....	2-2
	Temperature Control System.....	2-3
	Heating Elements.....	2-3
	Furnace Construction.....	2-4
	Furnace Insulation.....	2-4
	Thyristor Power Controller.....	2-4
Chapter 3	Pre-Installation	
	Unpacking.....	3-1
	Furnace Assembly.....	3-1
Chapter 4	Installation	
	Location.....	4-1
	Power Wiring.....	4-1
	Final Inspection.....	4-4
Chapter 5	Start Up	
	Initial Start Up Procedure.....	5-1
	Furnace Operation.....	5-3
	Furnace Shutdown.....	5-4
Chapter 6	UP150 Control Overview	
	UP550 Controller.....	6-1
	Program Mode Operation.....	6-2
	Local Mode Operation.....	6-4
Chapter 7	Communication	
	Cable Installation.....	7-1
	Communication Setup Parameter.....	7-1
	Software Installation.....	7-2
	Communication test.....	7-3
	Troubleshooting.....	7-4
	Decimal Point Adjustment.....	7-4

Table of Contents

UT350 Control	7-4
Normal Controller Operation	7-5
Setting the Temperature	7-6
Setting the Over- Temperature Protection Temperature	7-6
Changing Between Celsius and Fahrenheit	7-6
Setting the Ramp to Setpoint Rate	7-7
Auto Tuning the Controller	7-8
Chapter 8 Excess Temperature Option (“B” Model)	
Control Display	8-1
Excess Temperature Option Feature	8-1
Operating Parameters	8-2
Excess Temperature Controller Operation	8-2
Chapter 9 Maintenance	
Circuit Breakers	9-2
Heating Element Replacement	9-2
Removing the Heating Element	9-3
Installing the Heating Elements	9-4
Door Insulation Replacement	9-5
Thermocouple Replacement	9-6
Chapter 10 Troubleshooting	10-1
Chapter 11 Replacement Parts	11-1
Chapter 12 Error Codes	12-1
Chapter 13 WEEE Compliance	13-1
Chapter 14 Spare Parts and Accessories	14-1
Chapter 15 Device Log	15-1
Chapter 16 Contact	16-1

List of Figures

Figure 1	Laboratory Box Furnace	2-1
Figure 2	Furnace Rear Access	4-2
Figure 3	Power Connections	4-3
Figure 4	UP150 Control Panel	6-1
Figure 5	Heating Element Replacement	9-3
Figure 6	Door Insulation Replacement	9-7
Figure 7	Thermocouple Replacement	9-8
Figure 8	Wiring Diagram (Sheet 1 of 2)	11-3
Figure 8	Wiring Diagram (Sheet 2 of 2)	11-4

List of Figures

Safety Notes

Basic Operating Precautions

These operating instructions describe 1700 °C Box Furnaces.

1700 °C 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 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:

- 1700 °C Box Furnaces must be operated by adequately trained and authorized professional personnel.
- 1700 °C 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 Box Furnace 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 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 incubator 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.

Safety Considerations

Definition of Safety Precautions

	 <p>This precaution warns of immediate hazards which will result in severe personal injury or death.</p>
--	---

	 <p>This precautions refer to a hazards or unsafe practice which can result in severe personal injury or death.</p>
--	--

	 <p>This precaution refers to a hazard or unsafe practice which can result in personal injury, product, or property damage.</p>
--	--

Safety Precautions

For proper and safe use of this equipment. the user must follow the safety precautions in this manual including those set forth below. Failure to do so could result in death or serious injury to the user or bystanders and damage to the equipment and any load inside or property nearby.

 **DANGER**

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.

Do not reconfigure the controller. Any reconfiguration of the control Instrument could cause inaccurate readings, faulty instrument values, and may cause the unit to become overheated and start on fire, causing personal Injury or death, product and property damage.

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.

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.

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.

 **WARNING**

Do not process hazardous work loads such as those containing combustible volatile fluids Dr materials which emit explosive vapors. Processing those workloads could result In a fire or explosion which could cause personal injury or death, product, and property damage. If there is any question about the safety of the workload, consult your safety engineering staff or Thermo Fisher customer service department.

 **WARNING**

Make sure that the unit is level when Installed. If the unit is tilted, the door may swing shut at any time and Injure personnel.

 **CAUTION**

This product contains ceramic fiber and airborne dust and fibers. When installing, maintaining, or removing the refractory Insulation, you must follow safety precautions as described In the applicable MSDS (Material Safety Data Sheet) in the safety notes of this manual.

 **WARNING**

When installing, maintaining or removing the refractory 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 ceramic fiber parts and dust in plastic bags and dispose of properly.

Notice

In compliance with the National Electrical Code (NEC) and good electrical practice, this Lindberg/Blue M unit has not been provided with a line cord and plug.

If a line cord is used to connect this unit to your power system, it most probably will be in violation of the Code and OSHA requirements.

A permanent connection to the power system with an approved disconnect means is the preferred method of installation as greater safety is assured. Installation should be accomplished only by those knowledgeable with NEC requirements.

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

PRODUCT IDENTIFICATION

Trade Name: MOLDATHERM

Safety Notes
Material Safety Data Sheet

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 data:

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 repairable 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 ₂ O-l.):	.2 -.6
Boiling Point:	N/A		

Evaporation Rate (Butyl - Acetate=1.):	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.		

XI. REACTIVITY DATA

Stability/Incompatibility:	Stable under normal condition of use. Incompatible with strong acids and alkalies.
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 H₂O 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 ³ -Nuisance Respir – OSHA 10 mg/M ³ - Nuisance Total – ACGIH*
Amorphous Silica	7631-86-9	0-60	6 mg/M' (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

	 WARNING
	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:

Safety Notes
Explanation of Safety Information and Symbols

- 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
FOWLERVILLE, MI 48836
517/223-3787

Explanation of Safety Information and Symbols

Safety Notes and Symbols Used Throughout These Operating Instructions

	 DANGER Indicates a hazardous situation which, if not avoided, will result in death or serious injuries.
	 WARNING Indicates a hazardous situation which, if not avoided, could result in death or serious injuries.
	 CAUTION Indicates a situation which, if not avoided, could result in damage to equipment or property.
	 NOTE 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!

Standards and Directives

The Box Furnaces complies with the following standards and guidelines:

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

**Safety Notes
Standards and Directives**

Introduction

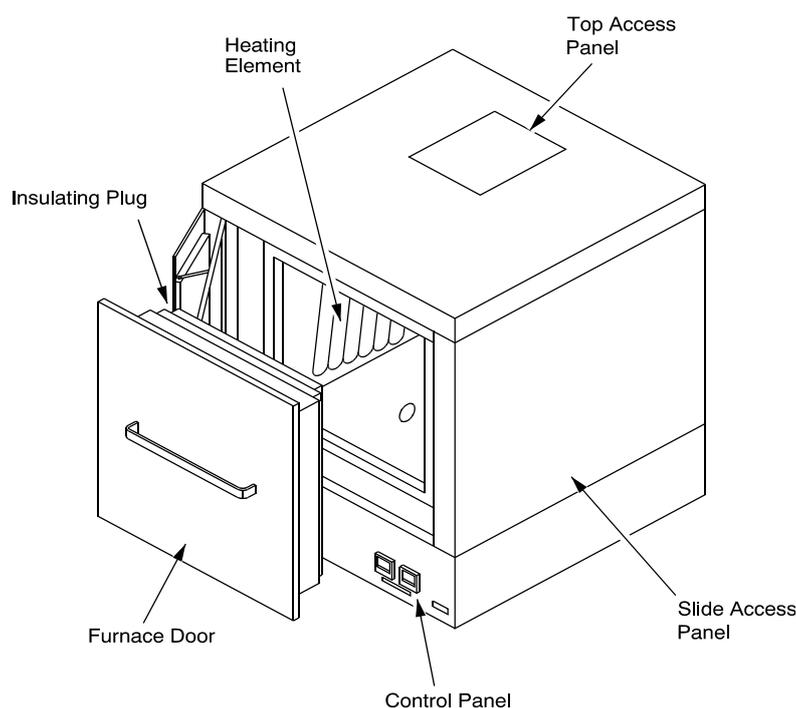


Figure 1. Laboratory Box Furnace

The Lindberg/Blue 1700 °C Box Furnaces are designed to heat laboratory process applications and small production work loads to maximum temperature of 1700 °C (3092 °F). The complete furnace assembly consists of the box furnace and a control panel featuring a digital display controller, a power module, and a single circuit breaker for the furnace heating system. Refer to Table 1 for specific furnace specifications.

Features and Benefits

- Temperature range of 500 - 1700 °C.
- Available in two chamber sizes, approximately 0.6 and 0.9 cubic foot capacities.
- Double shell construction provides low external shell temperatures and energy-efficient operation.

**Introduction
Specifications**

- Moldatherm insulation a high temperature ceramic fiber insulation, provides fast heat-up and thermal shock resistance.
- Side-swing door:
 - i. Protects the operator from excessive heat surges.
 - ii. Provides full and easy access to the chamber.
- Removable panels provide easy access to heating elements and thermocouple.
- Inert atmosphere port, located on the back of the unit, allows fresh air or provides an inlet for inert gas (i.e. Nitrogen, Argon. etc.).
- Ceramic hearth plate.
- Integral controls include microprocessor-based instrumentation, solid state power module with ammeter, circuit breaker, transformer, and front panel indicators for open element, fuse failure, and power on.
- Type B thermocouples ensure accurate high temperature measurement and long thermocouple life.

Specifications

Table 1. BF51634/BF51664 Series Box Furnaces

Model	Dimensions Wx Hx D in. (cm)			Watts	Voltage (50/60 Hz)	Integral control	Heat up Rate Ambient to 1700 °C.	Cool Down Rate 1700 °C.to 500	Ship-ping weight Lbs (Kg)	Prod-uct weight Lbs(Kg)
	Chamber	Exterior	Shipping (Approximate)							
BF51634(B)C	11 x 9 x 10.5 (28x23X27)	28x31x24 (71x79x61)	37x45x37 (94x114x94)	5900	208/240	UT350	95 min.	125 min.	325 (147)	275 (125)
BF51634P(B)C						UP550				
BF51634P(B)COMC										
BF51664(B)C	11 x 9 x 15.5 (28x23X39)	28x31x29 (71x79x74)	42x45x48 (107x114x122)	7100		UT350	105 min.	240 min.	370 (168)	320 (145)
BF51664P(B)C						UP550				
BF51664P(B)COMC										

Temperature Control System

The 1700 °C Box Furnace temperature control system is located beneath the furnace. The following is a brief description of the controls;

- Digital indicating controller, with a dual four-digit display screen. BF51634BC, BF51664BC and C units use the programmable UP350 controller: refer to [Section “UT350 Controller Operation”](#). All other models use the programmable appendix for detailed information.
- Thyristor with:
 - a. SCR Fuse
 - b. Current limit Potentiometer
- Amber lamp, located in the right front corner of the furnace, illuminates when power is supplied to the unit and to the fans. The furnace is not necessarily heating when this light is illuminated.
- Red lamp, located in the right front corner of the furnace, illuminates when power is supplied to the heating element circuit. The furnace is not necessarily heating when this light is illuminated.
- High limit over-temperature protection disconnects power to the elements. The red lamp does not illuminate in this condition.
- Redundant over-temperature controller (option B) provides positive protection for both furnace and the load in the event of a control circuit failure. This option includes an additional over-temperature controller and thermocouple. The red lamp does not illuminate in the alarm condition.
- The Communication Option control system comes equipped with RS232 digital communications which allows modification and interrogation of all instrument control and configuration parameters from a remote computer. Refer to [Figure “Furnace Rear Access”](#) for RS232 port location.

Heating Elements

The molybdenum disilicide heating elements are designed in a V-shaped configuration to ensure long life, minimum distortion at extreme temperatures, and easy replacement. These elements are resistant to thermal shock and can be subjected to extremely rapid heat-cool cycling for prolonged periods of time with no adverse effects.

The resistance of these elements does not change with use, which allows replacement of individual elements at any time without matching the resistance values of the new elements to the old elements. Refer to [Section “ Heating Element Replacement”](#) for additional information.

Furnace Construction

The 1700 °C Box Furnace has a double shell construction which results in very low outside surface temperatures while the inside chamber is operating at maximum temperature.

The furnace contains removable access panels which provide easy access to the heating element terminals and the Thermocouple. Heating elements and ceramic fiber insulation assemblies are easily removed and replaced from the inside of the heating chamber. The hearth plate is removable.

The furnace door construction protects the operator from an immediate heat surge when the furnace door is opened.

Furnace Insulation

The Thyristor Power Controller has been adjusted at the factory for the maximum designed power rating of your furnace model. The factory settings are not user-adjustable.

The controller provides:

- Control precision within 2% of maximum voltage
- Linearity better than within 2% of full scale
- Automatic compensation for variations in supply voltage over a range from -10% to +10% of the nominal voltage.

Thyristor Power Controller

The Thyristor Power Controller has been adjusted at the factory for the maximum designed power rating of your furnace model. The factory settings are not user-adjustable.

The controller provides:

- Control precision within 2% of maximum voltage
- Linearity better than within 2% of full scale
- Automatic compensation for variations in supply voltage over a range from -10% to +10% of the nominal voltage.

Pre-Installation

Unpacking

Carefully unpack and inspect the unit and all accessories for damage, if you find any damage, keep the packing materials and immediately report the damage to the carrier. We will assist you with your claim, if requested. Do not return goods to Thermo Fisher Scientific without written authorization. When submitting a claim for shipping damage, request that the carrier inspect the shipping container and equipment.

Furnace Assembly

The furnace is shipped completely assembled with all heating elements and the thermocouple installed. Power connection wires to the furnace are not provided.

Inspect the furnace as follows:

1. Check to make sure all packaging materials have been removed from the furnace.
2. Unscrew and remove the furnace top access panel and visually inspect the thermocouple and thermocouple lead wire.

connections (refer to [Figure “Laboratory Box Furnaces”](#) and [Figure “Thermocouple Replacement”](#)). Tighten if necessary.

NOTE

The red thermocouple extension lead is always negative.

CAUTION

Failure to check thermocouple wiring connections before initial start up could result in damage to the furnace.

3. Open the furnace door. Use both hands to pull the door handle away from the furnace. The door moves away from the furnace and then swings to the left (Refer to [Figure "Laboratory Box Furnaces"](#)).

	 NOTE
	The door insulation plug should be made properly with the furnace vestibule opening.

4. Check that the thermocouple protrudes into the work area about 2.5 inches. Make sure the thermocouple is not broken.

	 CAUTION
	Molybdenum disilicide heating elements are extremely fragile and must be handled only with the greatest of care.

5. Check to make sure that the U (hot section) of each element is located approximately 1/2 inch from the inside surface of each side chamber wall.

To adjust a heating element:

- a. Hold the terminal end of the element.
 - b. Apply even pressure on each terminal to push the element through the holes in the insulation.
6. Inspect the three cooling fans (refer to [Figure "Furnace Rear Access"](#)). Make sure the fans are undamaged and turn freely.

Installation

Do not exceed the electrical and temperature ratings printed on the dataplate of the furnace.

	 <p>Improper operation of the furnace could result in dangerous conditions. To preclude hazard and minimize risk, follow all instructions and operate within design limits noted on the dataplate.</p>
--	---

Location

Install the furnace in a level area free from vibration with a minimum of two feet of space above the unit and six inches of space, for air flow, around the unit. Allow 13 inches in front and 15 inches to the side of the furnace for the door to swing.

Power Wiring

For detailed wiring information, refer to the wiring diagrams at the end of this manual.

The 1700 °C Box Furnaces are designed for operation on a power source of either 240 or 208 volts, single phase, at 50 or 60 Hertz. If operating on 208 volts, change the wiring on the transformer from 240 volts to 208 volts for best performance.

Power wires, ground wires, and main disconnect or circuit breakers are not provided with the 1700 °C Box Furnaces. Two holes located at the bottom rear of the furnace (refer to [Figure “Power Connections”](#)), provide access for the power connection wires.

Install a main line disconnect switch or circuit breaker on the main power line. Always conform to local electrical codes when installing disconnects, grounding the furnace, and sizing power lines.

	 WARNING
Make sure that the power is off when making These and any other connections.	

Connecting Power to the Furnace

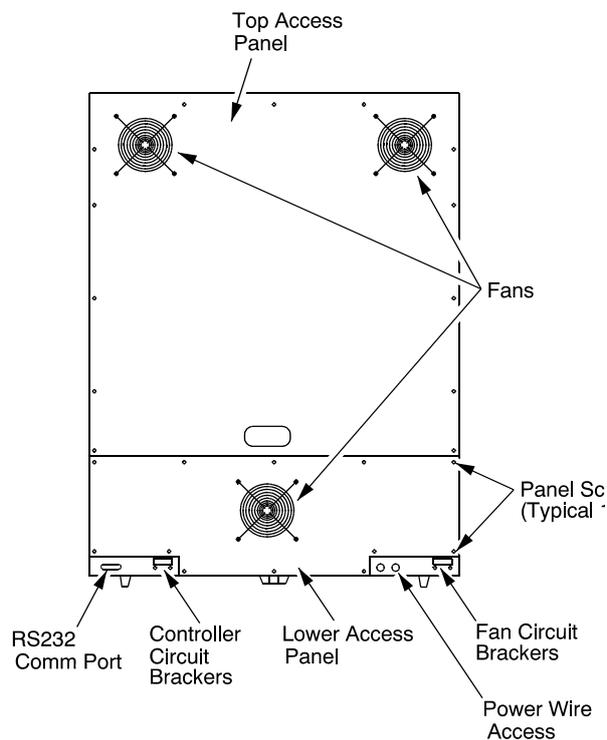


Figure 2. Furnace Rear Access

1. Remove the screws fastening the lower rear access panel to the furnace back. Save the screws for later use.
2. Label two lines L1 and L2 and label the ground wire Ground.
3. Thread the Ground, L1 and L2 wires through the power wire access ports in the panel before making any connections. -
4. Use a screwdriver to connect the two lead wires from the power source to Terminal Block 1TB:

Wire	1TB
L1	L1
L2	L2

NOTE

1TB is located include the back of the furnace and on the right side. (Refer to [Figure "Power Connection"](#)).

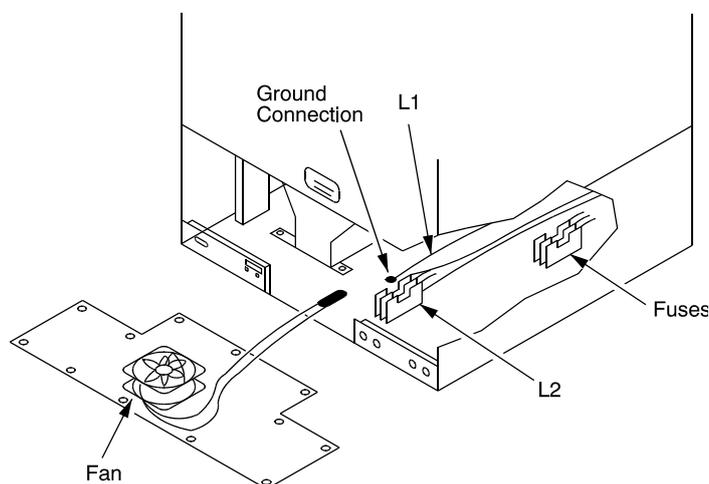


Figure 3. Power Connections

5. Connect the Ground wire from the main lug on the ground bar at the left of Terminal Block 1TB to a ground in the facility. Make sure the ground wire connects to a bare metal surface. Always conform to wiring codes.

NOTE

Make sure that the furnace is 100% grounded. Do not ground the furnace to a painted surface. The ground Connection must be to a clean, bare metal surface to assure proper furnace operation.

6. Install the rear access panel with the screws removed in Step 1.

Final Inspection

Before initial start up, perform the following checks:

1. Check that all packaging materials have been removed from the furnace and the control, including inside the furnace.
2. Check that the door insulation plug (refer to [Figure “Laboratory Box Furnaces”](#)) aligns with the furnace vestibule opening. This plug is designed to reduce heat loss.
3. Inspect all three rear cooling fans for damage. Make sure they rotate and run freely (refer to [Figure “Furnace Rear Access”](#)).
4. Visually inspect all electrical connections and make sure all access panels are replaced.

Start-up

Initial Start Up Procedure

	<p> CAUTION</p> <p>Observe the following precautions when operating the furnace:</p> <ul style="list-style-type: none">• Never stand in front of an open furnace.• Wear protective eyewear.• Wear protective gloves.• Use tongs to insert and remove furnace load.• Do not allow the load to touch the furnace walls.• Always use a hearth plate on the furnace bottom.
--	--

	<p> CAUTION</p> <p>This furnace should not be left unattended during the Initial break-in period as the temperature could ramp out of control. Failure to check thermocouple wiring connectors before start up could result in damage to the furnace. Observe the following precautions when operating the furnace.</p>
--	---

	 <p>Always wear tinted safety glasses when opening the furnace door, especially as the furnace temperature approaches the white-hot range (1300 °C to 1700 °C). Damage to the naked eye can occur while looking at light in the white-hot range.</p>
--	---

Before operating the furnace for the first time, review control operation as described in [Section “Control Operation - UP550”](#). Verify that the furnace is correctly wired and is in operating condition.

To start the furnace, complete the following steps:

1. Make sure that the control circuit breaker on the front of the control panel is off. Turn on the power at the main line disconnect switch or circuit breaker.

The amber light on the console control panel illuminates and the cooling fans turn on as soon as the main power is turned ON.

2. Verify that all three cooling fans are on.

	 <p>Failure to check fans may result in damage to the furnace.</p>
--	---

3. Turn the control circuit breaker on.

(Depending on the specific constructions and there settings).The red light on the control panel may illuminate and power may be applied to the elements.

	 <p>Even If the power to the furnace is shut off at the control circuit breaker, the power remains on at the control and the fans continue to operate. Do not shut off power until the fans cool the furnace back to ambient (room) temperature. Damage to the fans or furnace could result If power is shut off while the furnace is very hot.</p>
--	--

Although the furnace heating chamber is insulated with Moldatherm, the furnace should initially be started from cold at a slower dry out rate to drive the moisture out and to minimize the effect of thermal shock.

4. Set the alarm at 825 °C (refer to [Section “Control Operation”](#) and the UT350 and UP550 manual).
5. Adjust the controller temperature set point to 800 °C.
6. Run the furnace for one hour.
7. Reset the alarm set point to 1720 °C.
8. Reset the temperature set point to 1700 °C.
9. Run furnace for one hour.

When the furnace reaches the setpoint temperature and if all Controls and indications are working, the furnace is ready for use.

	<p style="text-align: center;">NOTE</p> <p>If the controls and indications are not working properly:</p> <ul style="list-style-type: none"> • Shut off the circuit breaker; • Shut off all power to the system before attempting any maintenance or repair. • Refer to Section “Maintenance”.
--	---

Furnace Operation

It is not necessary to repeat the procedure in [Section “Initial Startup Procedure”](#), start from the room temperature, the 800 °C heat-up is a system electrical and mechanical checkout procedure.

	<p style="text-align: center;">NOTE</p> <p>The 1700 °C Box Furnace is tested for 1700 °C continuous-duty operation. However, we recommend that continuous-duty operation is less than 1700 °C to prolong the life of the furnace components, heating elements, thermocouple, and insulation.</p>
--	---

1. Adjust the alarm and furnace temperature setpoints.

NOTE

To avoid nuisance alarms, always change the alarm set point before changing the furnace temperature setpoint.

2. . Heat the process load.

Furnace Shutdown

1. Adjust the furnace temperature setpoint to ambient.
2. Turn the control circuit breaker off.
3. When the furnace is cool, shut of power at the main power disconnect switch.

NOTE

The furnace can be shut off at the circuit breaker but do not disconnect power until the furnace shell is cool.

Operation - UP550 Controller

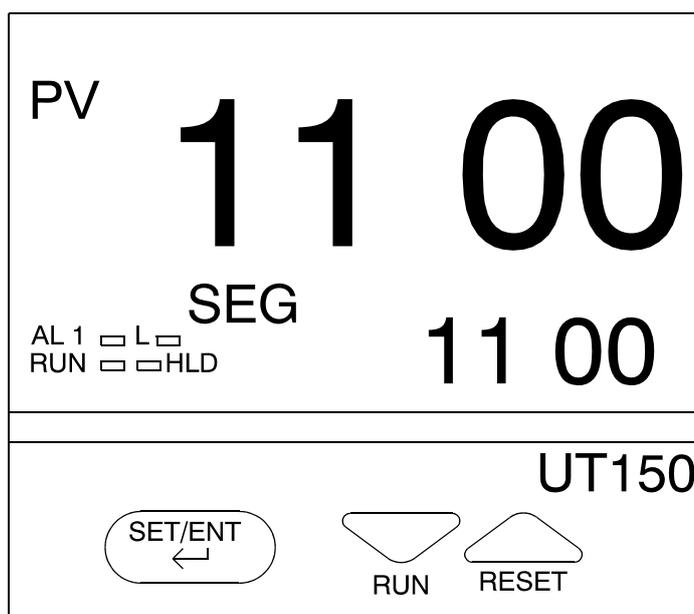


Figure 4. UT150 Control Panel.

The following instructions are very basic and meant to provide the minimum amount of information to get you started. Please read the appendix and the UP550 Short Form Instruction Manual to more fully understand the capabilities of this control.

UP550 Controller

The UP550 temperature controller is a microprocessor-based PID-type controller that can store up to 30 programs (programs are also referred to as patterns) with up to 99 segments each or a single program of up to 300 segments. In addition to operating as a programmable controller with "ramps and dwells", it can also operate as a single setpoint unit in the LOCAL mode.

First, you will need to be informed about the various modes of operation that are available. The green LED next to the lower display shows the mode the control is in at any given time.

- PRG - Program mode. A pattern is being executed by the control. Refer to [Section "Program Mode Operation"](#)
- RST - Reset Mode. In this mode, all outputs are off except for alarm outputs. This mode is accessed by holding down the Reset key for 2 seconds. When a pattern has completed running, the controller goes to the Reset mode.
- HLD - Hold Mode. This mode is accessed only when a pattern is running. The Hold mode freezes the program clock. It is accessed through the Mode key.
- LOC - Local Mode. This mode allows the controller to operate in a "steady-state" mode where a single setpoint is maintained continuously. Refer to [Section "Local Mode Operation"](#)
- MAN - Manual Mode.

	 WARNING
	Manual mode allows the user to set a control output manually and prevents the unit from controlling temperature. This mode should only be accessed for troubleshooting purposes.

When the MAN indicator light is off the control is in the Automatic mode. Return to Automatic mode by pressing the

MODE key until "MODE: AUTO!" appears with the flashing word "changing!". Press the SET/ENT key. When entering and exiting the manual mode, the following message will be displayed: DANGER - MANUAL MODE OPERATION IS UNSAFE. RETURN CONTROLLER TO AUTOMATIC MODE!

Program Mode Operation

A program pattern setup table should be filled out prior to entering a pattern. Make several copies for your use.

	 NOTE
	Software is available to make entering a pattern into the UP550 much easier. Also an infrared interface device that snaps onto the front panel of the control, known as a "light loader", is available which uploads and downloads information to the UP550. The light loader will function whether or not the controller has the digital communications option.

To enter a pattern into the UP550, proceed as follows. Whenever you challenge a value, be sure to press SET/ENT to register the change.

1. Hold the SET/ENT key down for 3 seconds. PROG will appear in the lower display.
2. Press the SET/ENT key again LOC will appear.
3. Press the up arrow key and PRG will appear. Press the SET/ENT key and the control is now in the programming or "pattern entry" mode.
4. PTN = 1 will be displayed. This means "Pattern 1" is being is being configured. Note that pattern 1 has already been entered at the factory for test purposes. this pattern may be reconfigured or you may select any pattern number between 1 and 30 using the up/down arrow keys. If another pattern number is selected the word "changing" will appear flashing. The SET/ENT key must be pressed to register the change.
5. Press SET/ENT and "SEG =0" will appear. This allows you to select any segment of the program for editing.
6. Press SET/ENT and "SSP1 = 25.0.ØC" will appear. This is the "starting setpoint" for the pattern and it is typically set at ambient temperature.
7. Press SET/ENT and "STC =0" will appear which stands for "start code". Leave this setting at "0".
8. Press SET/ENT and "TSP1=(value)" appears which means "target setpoint 1". Enter the first setpoint here.
9. The next value that appears is "TIME=0h00" which means "no (hours and no minutes)". Enter a time in hours and minutes for the first segment time. This value represents the time it will take the controller to change the setpoint from the "starting setpoint" to "target setpoint 1".
10. Press SET/ENT and "EVI = 0" appears which means, "event 1 is not used". Leave this value at "0".
11. Press SET/ENT and "JC = 0" appears which means, "Junction Code". Leave this value at "0".
12. Continuing to press the SET/ENT key will enter values for subsequent segments. Notice the setpoint already entered is the next segment which is equal to the setpoint of the previous segment. Leaving the setpoint the same will create a "soak" segment. Changing the setpoint will create a "ramp" segment.
13. Continue entering segment information until the pattern is complete. When the segment time is left as a dash (-), it informs the control that the pattern is complete. Use the DISP (Display) key to back out to the main menu.

Local Mode Operation

To operate the UP550 controller in the LOCAL mode, proceed as follows:

1. From the RESET mode (RST light is lit on front panel), press the MODE key once.
2. In the lower display, you will see "LOC: ON" with the word "changing" flashing. Press the SET/ENT key. The LOC light is now lit indicating you are in the LOCAL mode.
3. Use the up and down arrow keys to enter a setpoint. Press the SET/ENT key to register the setpoint.
4. While in the local mode, it is recommended to enter an alarm value. The alarm value should be approximately 10 °C above the setpoint. To enter an alarm value, hold the SET/ENT key down for 3 seconds.
5. PROG will appear in the lower display. Press the "up arrow" key once. "AL" will appear. Press the SET/ENT key once then enter the alarm value using the up/down arrow keys. Press the SET/ENT key to register the alarm value.

To shut off the control's output, place the unit in RESET mode by holding down the RESET key for 2 seconds.

Communication Option

The Communication Option enables digital communication between the UP150 or UP550 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 SpecView 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.

UT550 Communications Setup Parameters

Table 4 shows the default values for UP150 or UP550 Communications Setup Parameters. To access these parameters:

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 "0". Press the down arrow to show "-1" in the lower display and press SET/ENT to acknowledge and enter the Setup Parameters menu.
2. Press and release the SET/ENT button to access the six parameters specific to the communications option.

Table 2. UT150 Communications Parameters

Para-meter 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. Rub 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 - values are frozen" appears before the communication diagnostics are finished, clone the software and reopen it for another 20-minute segment.
4. When the "Configuration Found.." windows opens, click on the "Test Comms for New Config." Button.
5. The "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 "Ports and Protocol" window opens next. On the "COM1:" line (if the COM 1 port in the serial port used to connect to the controller) select the pulldown menu from Highlight "*Yokogawa 100" or 100 Series" Need to identify the proper/accurate selection from the current Communications Software for controller model UP550.
7. Select the pulldown 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 the PC. The factory-set addresses are 1, 2, 3, etc., depending on the number of controllers with communications in a single furnace. Additional units with communications will require the controller's address to be changed.

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 "SpecView" 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 communications 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"](#).

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 2. "UP150 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 Run time 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 at), 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.

UT350 Control (BF51634C, BC models only)

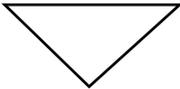
BF51634C and BF51634BC models use the single setpoint UT350 controller. For complete controller instructions, refer to the separate UT350 manual provided with your furnace.

The 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.

	 <p>Before reconfiguring the controller read this chapter and the UT350 operation manual. Reconfiguring the controller can change the unit characteristics and design parameters, which can hamper performance and make the equipment dangerous to use.</p>
--	--

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 the table below for a list of keypad functions.

Button	Function
	<p>Pressing and holding the SET/ENT for three seconds 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

1. The high limit alarm system with the temperature controller disables the heater output. To set the alarm on the temperature controller (typically 5DC above the desired main temperature setpoint), complete the following steps:
2. Press and hold SET/ENT for 3 seconds, until A1 is displayed on the upper line.
3. Press  or  until the desired over-temperature limit setpoint shows on the bottom line of the display
4. Press SET/ENT to register the new over-temperature alarm setpoint.
5. 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 Parameter menu by pressing and holding SET/ENT for 3 seconds.
2. Press and release SET/ENT repeatedly until the upper display reads LoC.
3. Press  until the displayed value of LoC is -1; then press SET/ENT to access the Setup Parameters menu.
4. The first setup parameter displayed is Input Type (In). Press to change its value from 5 to 35. 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.

6. Press and release SET/ENT to advance 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.
8. Press and hold SET/ENT for 3 seconds to exit the Setup Parameters Menu.
9. Press and hold SET/ENT for 3 seconds 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 °F.
11. Press and release SET/ENT to advance to the P parameter and change its value to 16.9.
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 "Setting the Temperature"](#) to reset the temperature setpoint in °F.

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 mass and thermal properties to loads you intend to use in furnace applications.

To set the ramp to setpoint time, 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.
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.
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, °C in 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 “ Setting the Temperature”](#) to reset the temperature setpoint.

	NOTE
	The ramp rate begins when the SET/ENT button is pressed after the 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.

11. Load the chamber with materials that have the same mass and thermal characteristics as a typical product load.
12. Operate the chamber to the process temperature.
13. Press and hold SET/ENT for 3 seconds to display the A1 parameter of the Operating Parameter menu.
14. Press and release SET/ENT to show the At parameter.
15. Press and release the arrow buttons to show on in the lower display.
16. Press SET/ENT once to enter the auto tune mode and exit the Operating Parameters menu.

The controller will cycle three times through a heating and cooling pattern, measuring the characteristics of the load and chamber temperature controls. During the auto tuning, the display 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.

Excess Temperature Option (“B” Models)

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 (Mode UT150) 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, of the SET/ENT in lower 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 was 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 planned 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 illuminated on the controller display area when the setpoint is tripped. The “EXCEEDED” indicator will stay illuminated 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 few 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” Models)
Excess Temperature Controller Operation**

Maintenance



Maintenance should only be performed by trained personnel.



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



When installing, Maintaining, or removing the refractory insulation, the following precautions will minimize airborne dust and ceramic fiber:

- Keep personnel not involved in maintenance out of the area.
- Use a good vacuum to clean area and equipment. Do not use compressed air.
- Use NIOSH high efficiently respirator (3M #8710 or equivalent).
- 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 ceramic fiber, dispose of rather than clean.
- Promptly place used ceramic fiber parts and dust in plastic bags and dispose of properly.

	 WARNING Before maintaining this equipment, read the applicable MSDS in Safety Notes.
--	--

For replacement parts specifications, refer to [Table. “Replacement Parts” Chapter “Replacement Parts”](#). For wiring schematics, refer to [Section “Wiring Diagram”](#).

Circuit Breakers

	 NOTE When circuit breakers trip, there is usually an electrical short that needs to be fixed. Identify and repair any electrical problem before resetting the circuit breakers.
--	---

- Two fan circuit breakers are located at the rear of the furnace (lower right side, refer to [Figure “Furnace Rear Access”](#)). Press the switch to reset a circuit breaker. Replace any circuit breaker that does not reset.
- Two controller circuit breakers are located at the rear of the furnace (lower left side). Press the switch to reset a circuit breaker. Replace any circuit breaker that does not reset.
- One control circuit breaker is located in front of the furnace (bottom left side). Press the switch off, then on to reset the circuit breaker.

Heating Element Replacement

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

NOTE

The heating elements are extremely fragile. Handle these elements carefully

Removing the Heating Elements

To remove one or more heating elements, complete the following steps:

1. Disconnect the main power at the disconnect switch.
2. Identify the heating element:
 - a. Visually inspect the heating element to be cracked or broken.
 - b. Perform a resistance check across the element. No resistance indicates an open circuit or a broken heating element.
3. Remove the side access panel screws on the side of the furnace containing the broken heating element.
4. Loosen the three side access panel screws located on the back of the furnace. The screws do not need to be removed.
5. Remove the side access panel.

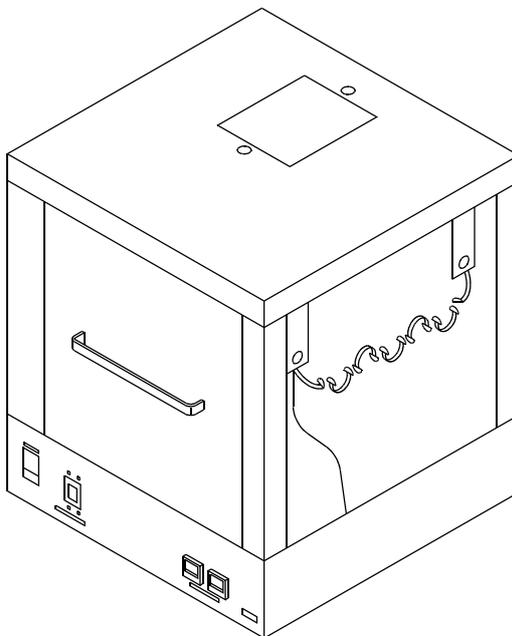


Figure 5. Heating Element Replacement

6. Carefully remove the stainless winged M clamps holding the braided aluminum interconnecting straps to the aluminized terminal extensions (lead sections) of

each heating element to be replaced. Squeeze the M clamp wings together to open the clamp jaws and remove the clamp.

7. Carefully remove the braided straps and label them so they can be reconnected at the same location. Perform a resistance check across the element. No resistance indicates an open circuit or a broken heating element.
8. Very carefully pull each broken heating element completely through the holes in the insulation.

NOTE

The heating elements are extremely fragile. The best method of removal is to have one person carefully push the element rods from the outside of the furnace while another person guides and pulls the element from inside the furnace.

Installing the Heating Elements

To install one or more heating element, complete the following steps:

1. Make sure that the main power is disconnected at the disconnect switch
2. Very carefully unpack the replacement heating element(s).

NOTE

The heating elements are extremely fragile. Handle these elements carefully.

3. Carefully remove the wood support block from the element terminal ends.

CAUTION

Do not touch the section of the heating element which is smallest in diameter. Touching this section could contaminate the element and result in impaired furnace performance.



Molybdenum disilicide heating elements are extremely fragile and must be handled only with the greatest of care.

4. Carefully guide the two open ends of the heating element through the original holes of the insulated furnace wall inside the chamber. Make sure to apply equal pressure on each leg.
5. Check to make sure that the U (hot section) of each element is located approximately 1/2 inch from the inside surface of each side chamber wall.

To adjust a heating element:

- a. Hold the terminal end of the element
 - b. Apply even pressure on each terminal leg to push the element through the holes in the insulation.
6. Use the interconnecting braided straps and the M clamps to connect the heating elements in series (refer to [Figure "Heating Unit Replacement"](#)).
 - a. Fit a braided strap over the outside circumference of the heating element terminal lead section. The strap may require some hand forming for good contact between the terminal and the strap.
 - b. Squeeze the clamp jaws, opening the M clamp wings, slip the jaws over the strap and terminal, and release the clamp wings.



Do not rotate the clamp and strap around the terminal. This induced rotational stress may break the heating element.

7. If there are additional heating elements to replace, repeat the above steps until all heating elements are installed and connected to element terminals.
8. Replace the side access panel.
9. Tighten the three side access panel screws located on the back of the furnace.
10. Replace the side access panel screws located on the side access panel.

Door Insulation Replacement

**WARNING**

When installing, maintaining, or removing the refractory 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 of fiber, dispose of rather than clean.

To replace the door insulation, complete the following steps (refer to [Figure “Door Insulation Replacement”](#)):

1. Open the door completely.
2. Loosen the top and bottom screws and the bracket holding the top of the insulation.
3. Carefully remove the old door plug.
4. Install the new door insulation plug.
5. Replace the top bracket and screws.

NOTE

The door insulation plug should mate properly with the furnace vestibule opening.

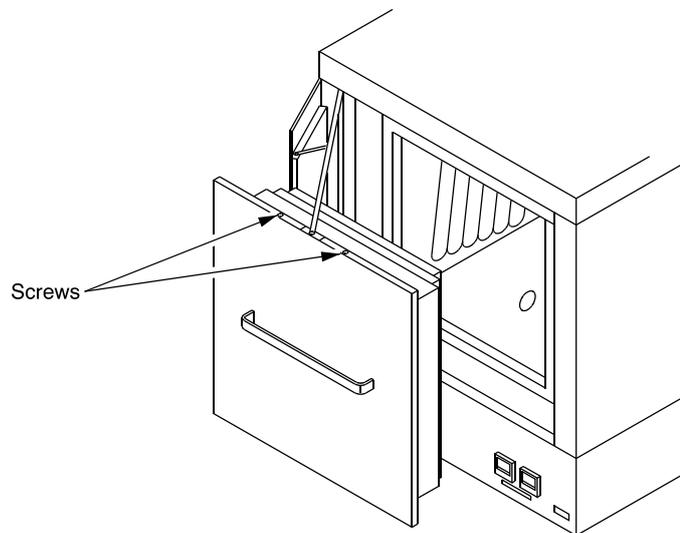


Figure 6. Door Insulation Replacement

Thermocouple Replacement

All thermocouples are subject to aging and deterioration. This condition is indicated by a gradual drop in millivolt output for any temperature and by furnace operation at a higher temperature than the controller indicates. For critical processes, periodically check the furnace chamber temperature with a separate thermocouple and instrument to determine the amount of error.

The appropriate frequency of thermocouple replacement depends upon frequency of operation and operating temperatures. For additional information, refer to Table. "UT 150 Controller Operation"

	<p style="text-align: center;">NOTE</p> <p>The main disconnect power does not need to be turned off to replace the thermocouple</p>
--	--

To replace the thermocouple, complete the following steps (refer to [Figure "Thermocouple Replacement"](#)):

1. Remove the two top access panel screws and remove the top access panel.

Maintenance
Thermocouple Replacement

2. Note polarity and wire location. Disconnect the positive and negative thermocouple lead wire extension leads from the terminal screws on the thermocouple head.
3. Lift the thermocouple vertically out of its hole in the top insulation.
4. Replace the thermocouple and connect the new wires. Red is always negative. (If the extension leads are black and white, white is negative),
5. Replace the furnace top access panel and replace the screws.

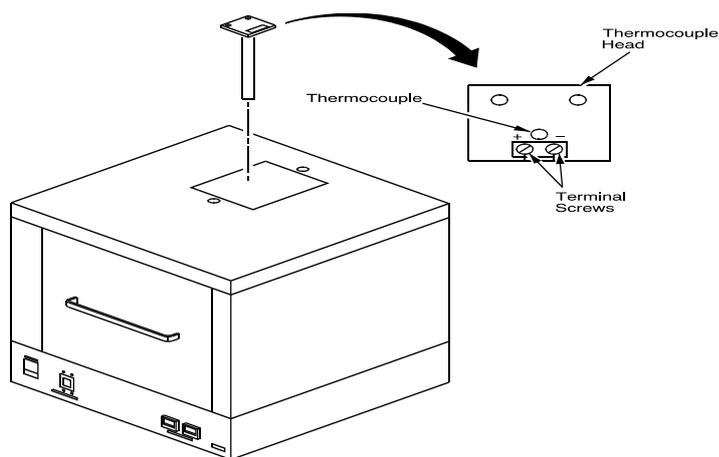


Figure 7. Thermocouple Replacement

Troubleshooting

	 <p>Troubleshooting procedures involve working with high voltages which can cause injury or death. Troubleshooting should only be performed by trained personnel. This section is a guide to troubleshooting controller and furnace problem.</p>
--	---

Table 3. Furnace Troubleshooting.

Problem	Solution
Absence of current and presence of voltage on element input terminal.	Heating element is cracked or open. Replace broken element.
Heating element curls towards wall	<ol style="list-style-type: none"> 1. Shut off immediately. 2. After the furnace cools, relocate the element farther from wall.
Controller actual furnace temperature display decreases when furnace is heating	Check thermocouple polarity. Red is always negative (Refer to Section Troubleshooting).

Troubleshooting

<p>Controller actual furnace temperature display does not increase or decrease when the furnace is heating</p>	<ol style="list-style-type: none"> 3. Check all thermocouple wires for a short. <ol style="list-style-type: none"> a. Visually inspect the thermocouple wires for a cut in the wire. b. Check that the wires at the connections do not touch each other. 4. Check the controller. Use a secondary temperature display device, design for Type B thermocouple, to check thermocouple temperature. If thermocouple temperature is correct, the controller may be faulty.
<p>Coating on heating element crack.</p>	<p>Heat element above 995 °C to restore coating.</p>
<p>Foreign substance on heating element</p>	
<p>Furnace temperature is too high</p>	<p>Thermocouple:</p>
<p>Heating element fail to shut off.</p>	<ol style="list-style-type: none"> a. Check the thermocouple visually for breaks. If a break is evident replace the thermocouple. b. Check the ceramic thermocouple support tube for cracks which result in the thermocouple wires touching in breaking area. If the wires are touching break the thermocouple. c. Check all thermocouple connections. Connections should be clean and free of corrosion. d. Check the reductions of diameter in the wire immediately behind the welded junction. If there is reduction, replace thermocouple. e. Check for reduction of diameter in the wires immediately behind the welded junction. if there is reduction, replace thermocouple.

Problem	Solution
Indicator Lights	
<p>Red light is on. Amber light is on. Furnace does not heat.</p>	<ol style="list-style-type: none"> 1. Check the controller output Power (OP) display. 2. Check the controller configuration. 3. Check the heating elements for continuity. Replace any broken heating elements. 4. Check the fuses for continuity. Replace any defective or blown fuses. 5. Check the transformer for voltage on the primary and secondary side. If there is no voltage at the secondary side and there is voltage on the primary side. replace the defective transformer. <p>CAUTION: Failure to isolate the condition which resulted in the failed fuse or circuit breaker could result in damage to any electric components.</p>
<p>Red light is all. Amber light is on.</p>	<ol style="list-style-type: none"> 1. Check that the control circuit breaker is on. 2. Check that the red light is working. Replace the light if necessary. 3. Check that the door interlock switch has a closed circuit when the door is closed. Adjust or replace the switch if necessary. 4. Check that the Alarm Setpoint on the controller is set above the operating temperature.
<p>Amber light is all. The fans are not working.</p>	<ol style="list-style-type: none"> 1. Check the fan circuit breakers. Replace if necessary. 2. Check that the main disconnect switch is on. 3. Visually check all wire connections. 4. Check that the light is working. Replace the light if necessary. 5. Check that the fans are working. Replace if necessary.
<p>Amber light is on. The fans are not working.</p>	<ol style="list-style-type: none"> 1. Check the fan(s) wire connections visually. 2. Check that the fan(s) is receiving power. 3. If wire connections are secure and the fan(s) is receiving power. replace the fan(s).
<p>Amber light is off. The fans are working.</p>	<ol style="list-style-type: none"> 1. Check that the light is working. Replace if necessary. 2. Check the light wire connections.

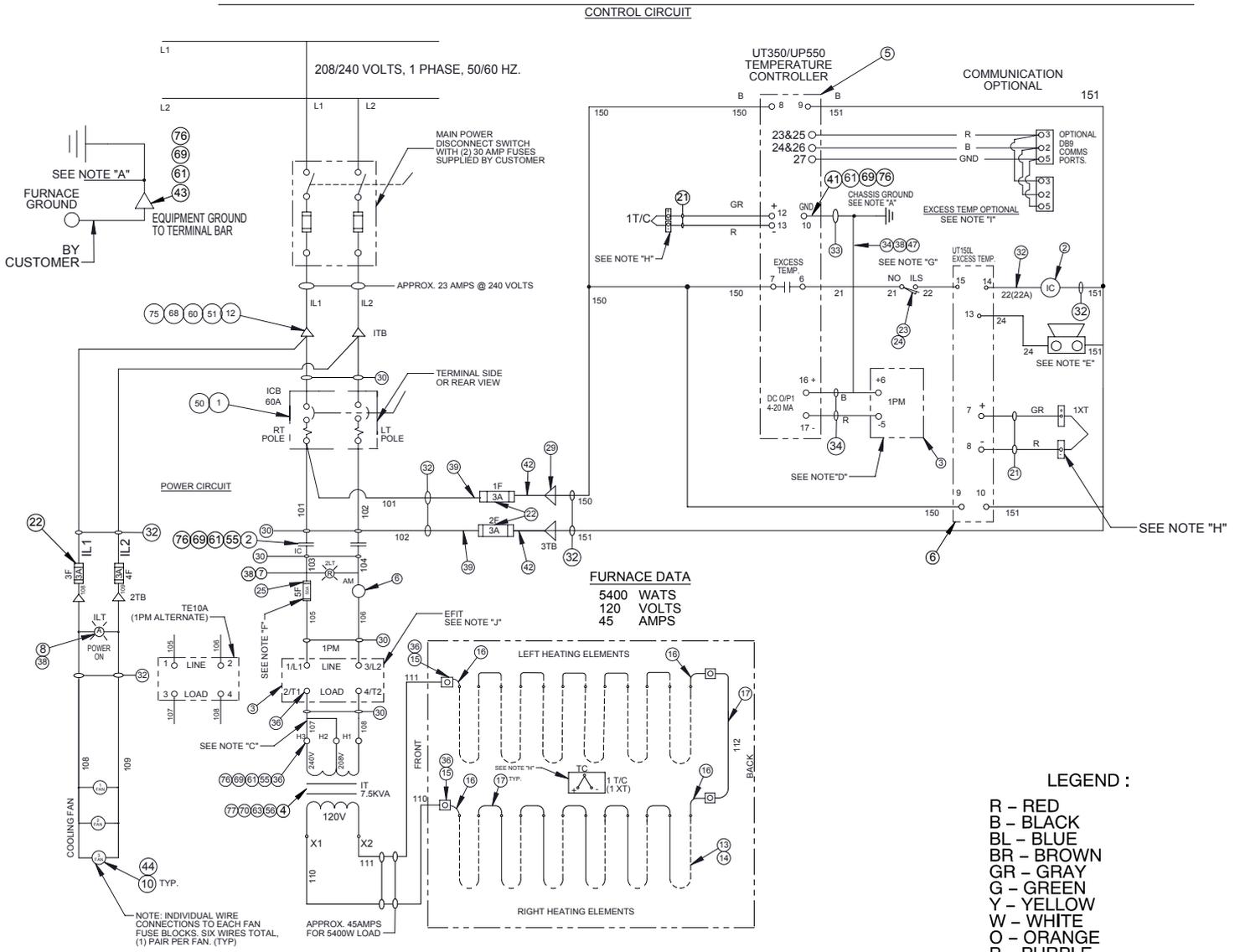
Replacement Parts

Replacement Parts - Model BF51634 Series, Box Furnace, 1700°C			
Description	Part Number	Qty	Model Notes
Heater	7219-1152-001	10	
Controller, UT350	303115H09 S	1	Non-P Option Only
Controller, UP550	303115H13 S	1	P Option Only
Controller, UP550 w/COM	303115H14 S	1	P and COM Option Only
Hearth Plate ***	38246-012	1	
Door Insulation	303323G02	1	
Kit, Chamber Insulation	38246G01	1	
Thermocouple, Single	7299-1166-00K S	1	Non-B Option Only
Thermocouple, Double	7299-1238-00F S	1	B Option Only
Terminal Strap	33810-003	8	
Terminal Contact	33810-001	4	
Terminal Clip	33810-002	20	
Terminal Block	7218-2054-00A S	4	
T/C Leadwire	33940-021	6 feet	Non-B Option Only
T/C Leadwire	33940-021	12 feet	B Option Only
Circuit Breaker, control/fan, 3A	21642H01	4	
Circuit Breaker, Main, 60A	302795H10	1	
Heater Fuse, power module, 50A	302623H01	1	
Contactor, 240V ,75 A	119750	1	
Power Module	302621H01	1	
Transformer	38340H01	1	
Ammeter, 30A	302627H01	1	
Red Pilot	33002-001	1	
Amber Pilot	33002-005	1	
Cooling Fan	48042H04	3	
Door Switch, Sensor	38258H01	1	
Door Switch, Actuator	38259H01	1	
Door Catch	38280H01	1	
Excess Temp Control, UT150L	303115H05 S	1	B Option Only
Gas Inlet Port	300253G02 S	1	
Fuseholder	302322H01	1	
COM Accessory Kit	7115-8	1	COM Option Only
*** Included with Chamber Insulation Kit			

Replacement Parts

Replacement Parts - Model BF51664 Series, Box Furnace, 1700°C			
Description	Part Number	Qty	Model Notes
Heater	7219-1152-001	12	
Controller, UT350	303115H09 S	1	Non-P Option Only
Controller, UP550	303115H13 S	1	P Option Only
Controller, UP550 w/COM	303115H14 S	1	P and COM Option Only
Hearth Plate ***	300845-012	2	
Door Insulation	303323G02	1	
Kit, Chamber Insulation	300845G01	1	
Thermocouple, Single	7299-1166-00K S	1	Non-B Option Only
Thermocouple, Double	7299-1238-00F S	1	B Option Only
Terminal Strap	33810-003	10	
Terminal Contact	33810-001	4	
Terminal Clip	33810-002	24	
Terminal Block	7218-2054-00A S	4	
T/C Leadwire	33940-021	6 feet	Non-B Option Only
T/C Leadwire	33940-021	12 feet	B Option Only
Circuit Breaker, control/fan, 3A	21642H01	4	
Circuit Breaker, Main, 60A	302795H10	1	
Heater Fuse, Power Module, 50A	302623H01	1	
Heater Fuse, Switch, 50A	32655-041	1	
Contact, 240V, 75 A	119750	1	
Power Module	302621H01	1	
Transformer	38340H02	1	
Red Pilot	33002-001	1	
Amber Pilot	33002-005	1	
Cooling Fan	48042H04	3	
Door Switch, Sensor	38258H01	1	
Door Switch, Actuator	38259H01	1	
Door Catch	38280H01	2	
Excess Temp Control, UT150L	303115H05 S	1	B Option Only
Gas Inlet Port	300253G02 S	1	
Fuseholder	302322H01	1	
COM Accessory Kit	7115-8	1	COM Option Only
*** Included with Chamber Insulation Kit			

WIRING DIAGRAMS



POWER & CONTROL WIRING DIAGRAM
FOR MODEL 51634
W/UT350/UP550 CONTROLLER
WIRE DIAGRAM PART#38339102

- ITEM. STRIP OUTSIDE IS STRIP, INSIDE IS LUG
- RELAY CUIL OUTSIDE IS TERM, INSIDE IS RELAY
- RELAY CONTACTS - NO LARGER IS RELAY
- RELAY CONTACTS - NC SMALLER IS TERM
- TIME DELAY BEFORE MAKE (ADJUSTABLE)
- WIRES CONNECTED
- WIRES NOT CONNECTE
- NC PRESS. OPENS ON F
- NO RESS. CLOSSES ON F
- NO TEMP. CLOSSES ON F
- TIMER MOTOR
- HEATER

Figure 8. Wiring Diagram (Sheet 1 of 2)

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

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

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

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

Spare Parts and Accessories

This chapter is not applicable.

Contact

Overview of Thermo Fisher International Sales Organization

Postal address in Germany

Thermo Electron LED GmbH
Robert-Bosch-Straße 1
D - 63505 Langenselbold

Enquiries from Germany:

Phone

Sales 0800 1 536376

Service 0800 1 112110

Fax

Sales/Service 0800 1 112114

Email info.labequipment.de@thermofisher.com

Enquiries from Europe, Middle East and Africa:

Phone. + 49 (0) 6184 / 90-6940

Fax + 49 (0) 6184 / 90-6772

E-Mail info.labequipment.de@thermofisher.com

Postal address USA:

Thermo Scientific
275 Aiken Road
Asheville, NC 28804
USA

Enquiries from North America:

Phone +1 866-984-3766

Fax +1 888-618-2676

E-Mail info.labequipment@thermofisher.com

Enquiries from Latin America:

Phone +1 828-658 2711

Fax +1 828-645 9466

E-Mail info.labequipment@thermofisher.com

Contact

Enquiries from Asia Pacific:

Phone +852-2711 3910

Fax +852-2711 3858

E-Mail info.labequipment@thermofisher.com