



1100°C Three Zone Tube Furnace

**Models: STF55346C
 STF55666C**

Installation and Operation Manual



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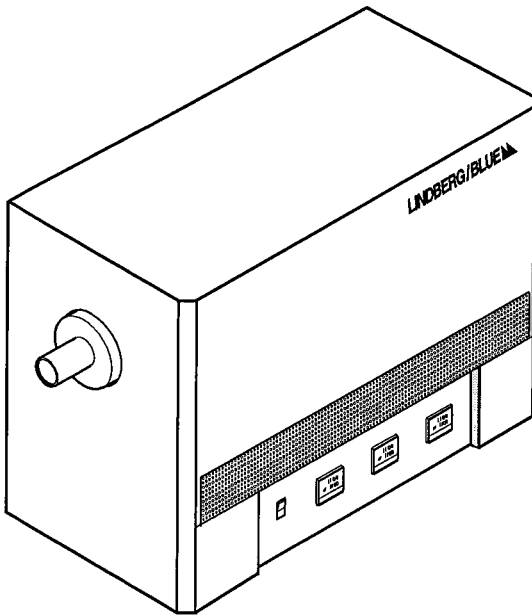
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1 Introduction

The Lindberg/Blue M STF55346 and STF55666 models are ultra lightweight, economical, laboratory tube furnaces. The low thermal mass Moldatherm[®] insulation/heating element provides fast duty cycles, energy conservation, and efficient programming. Refer to Table 1 for specifications.

1.1 Features and Benefits

- Controlled heat-up rate eliminates thermal shock to materials.
- Quick heat-up and cool-down rates.
- Energy efficient Moldatherm insulation suitable for high interior-exterior temperature differential. These units are rated for a maximum operating temperature of 1100°C.
- Digital instrumentation for precise temperature setpoint and display. Microprocessor automatically optimizes control parameters during furnace operation. You can choose single setpoint or 16-segment control.
- Main power ON/OFF switch on front panel.
- Various sizes of tube adapters to accommodate various process tubes.

1.2 Specifications

Table 1. Lindberg/Blue M STF55346 and STF55666 Series Moldatherm Tube Furnaces

Model	Dimensions in. (cm)		Heated Length in. (cm)	Maximum Operating Temperature	Watts	Thermocouple	Voltage	Shipping Weight lbs (kg)	Number of Heat Zones
	Exterior W x F-B x H	Process Tube Diameter ^a							
STF55346C	35 x 17 x 21 (88.9 x 43.2 x 53.3)	1 to 3 (2.54 to 7.62)	24 (60.96)	1100°C	3830	Type K	240 VAC 50/60 Hz, single phase	75 (34)	3
STF55666C	54 x 22 x 26 (137.2 x 55.9 x 66)	3 to 6 (7.62 to 15.24)	36 (91.4)		11000			165 (75)	

^a A process tube must be used with the furnace. Process tubes are customer supplied and will vary with the application.

2 Safety Considerations



WARNING! Do not modify or change system components. Replacement parts must be O.E.M. exact replacement equipment. Modification or use of the equipment in a manner other than expressly intended may cause death or serious injury. This includes use of user-supplied components and materials not specifically designed for the oven. Reconfiguring the controller may cause death or serious injury.

Lindberg/Blue M shall not be liable for any damages, including incidental and/or consequential damages, regardless of the legal theory asserted, including negligence and/or strict liability.

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. User assumes all risk and liability whatsoever therewith.



CAUTION! This product contains ceramic fiber or other refractories which can result in the following:

- May be irritating to skin, eyes, and respiratory tract.
- May be harmful if inhaled.
- May contain or form cristobalite (crystalline silica) with use at high temperature (above 871°C) which can cause severe respiratory disease.
- Possible cancer hazard based on tests with laboratory animals. Animal studies to date are inconclusive. No human exposure studies with this product have been reported.



WARNING! Before maintaining this equipment, read the applicable MSDS (Material Safety Data Sheets) at the back of this manual.



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

- Keep personnel not involved in the installation out of the area.
- Use a good vacuum to clean area and equipment. Do **not** use compressed air.
- Use NIOSH high efficiency 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 cleaning.
- Promptly place used ceramic fiber parts and dust in plastic bags and dispose of properly.

3 Pre-Installation

3.1 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 Lindberg/Blue M without written authorization. When submitting a claim for shipping damage, request that the carrier inspect the shipping container and equipment.

3.2 Operating Conditions

High concentrations of sulfates, chlorides, fluorides, alkalis, and V₂O₅ can have corrosive effects on the ceramic fiber. Contact Lindberg/Blue M for additional information about the effects of specific atmospheres on furnace performance.

With prolonged use, hairline cracks can develop in the insulation materials. These minor cracks will not affect the furnace's performance. We recommend turning off the furnace completely when not in use. The heating unit is not damaged by rapid heating and cooling cycles.

3.3 Atmosphere Systems

The Lindberg/Blue M STF55300/STF55600 Series furnaces are not designed for use with combustible or inert atmospheres requiring an airtight chamber. If an exhaust port is used, the furnace should not be located in an enclosed area without proper ventilation.

Note: *Lindberg/Blue M tube furnaces must be used with process tubes. Do not operate the furnace without an appropriately installed process tube or other customer supplied vessel.*



WARNING! Do not use combustible gases in this furnace.



CAUTION! Avoid combustible products which generate toxic or hazardous vapor or fumes. Work should only be done in a properly vented environment.

4 Installation

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



CAUTION! 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.

4.1 Location

Install the furnace in a level area free from vibration with a minimum of three inches of space, for air flow, around the unit.

4.2 Wiring

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

4.2.1 240 VAC Operation

The STF55346C and STF55666C models are 240 VAC furnaces. Power and ground wires are not provided with these furnaces.

1. Determine the length of wire needed to connect the furnace to the power source. Furnace installation requires two power wires and one ground wire. Refer to Table 2 for minimum recommended wire gauge sizes.

Table 2. Minimum Wire Gauge Sizes

Furnace Model	Amps	Power Wire Size
STF55346C	16.0	14 GA
STF55666C	45.8	10 GA

2. Label the power wires *Line1* and *Line2* and label the ground wire *Ground*.
3. Remove the screws from the corners of the top front and top back panels. This provides access to the terminal block (Model STF55666C) and the grounding screw.
4. Thread the Line1, Line2, and Ground wires through the 7/8 in. knock-out port in the bottom rear panel. Use wire nuts to connect the wires to the appropriate screws:

Wire	Screw
Line1	L1
Line2	L2
Ground	GND

5. Check that the thermocouple is securely mounted and undamaged. Check the thermocouple wiring connections. Refer to Figure 1. Red is always negative.



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

6. Check that all electrical connections are secure.
7. Place the back panel on the furnace and secure with the corner screws.

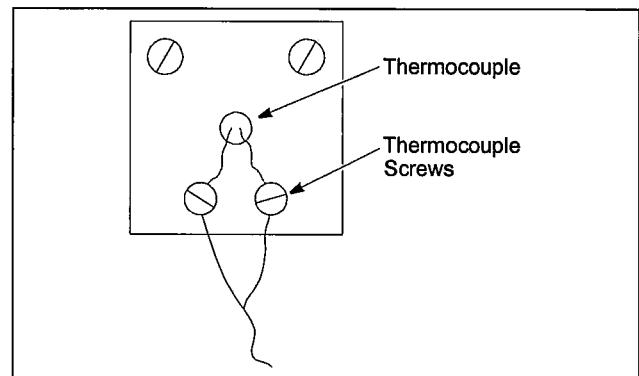


Figure 1. Thermocouple

4.2.2 208 VAC Operation

Lindberg/Blue M Moldatherm tube furnace heating elements are specifically designed for operation on 208 or 240 VAC. A furnace wired for 240 VAC operation can also operate on 208 VAC. However, heatup and recovery times will be longer.

4.3 Tube Adapters

Install tube adapters to each end of the furnace.



CAUTION! Do not operate the furnace without properly sized and installed tube adapters.

5 Start Up



CAUTION! Observe the following precautions when operating the furnace:

- 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 process tube.



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

- Keep personnel not involved in the installation out of the area.
- Use a good vacuum to clean area and equipment. Do **not** use compressed air.
- Use NIOSH high efficiency 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 operating this equipment, read the applicable MSDS (Material Safety Data Sheets) provided with your unit.

5.1 Furnace Start Up

To start up, the furnace, turn it ON using the power switch on the front panel. Refer to Figure 2 on page 5 as you perform the following procedures:

1. Use the arrow keys to adjust the setpoint to 550°C.
2. Run the furnace for two hours at 550°C.
3. Use the arrow keys to adjust the setpoint to 1000°C.
4. Run the furnace for two hours at 1000°C.
5. Adjust setpoint to room temperature.

5.2 Controller Start Up

All LEDs illuminate at power up. After 3 or 4 seconds, two numbers display. The lower number is the setpoint and the upper number is the actual furnace temperature (refer to Figure 2).

6 2416 Control Operation

All 3-zone 1100°C Tube Furnace models use the 2416 Setpoint Programming Controller. Each zone has its own controller. The controllers are configured and tuned at the factory to function well for most applications. Occasionally, it may be advisable to configure a temperature controller differently to suit a particular working environment or process.



CAUTION! Before reconfiguring a controller, read this chapter and the *Model 2416 Installation and Operation Handbook*. Reconfiguring the controller can change the unit characteristics and design parameters, which can hamper performance and make the equipment dangerous to use.

6.1 Introduction

The 2416 controller includes an LED display and a pushbutton keypad (see Figure 2). You can use the Page, Scroll, Increase and Decrease buttons to check program status and to view and change pid settings and other parameters. When you are not using the pushbutton keypad, the upper display always shows process temperature and the lower display shows the current temperature setpoint value. This is the default, or Home, display.

You can operate the 2416 controller in either single setpoint or programming mode.

To run in single setpoint mode, verify that neither the RUN nor HOLD display is illuminated, then press ▲ or ▼ until the lower display shows the desired setpoint (see Section 6.2). The controller will then direct power output to the heating elements so that the setpoint is reached in the shortest possible time.

In 2416 programming mode, you can create, store and run a program that contains up to 16 segments. The main types of segments are *ramps* (periods of time during which setpoint temperature changes at a specified rate) and *dwells* (periods during which setpoint temperature remains constant). For programming techniques and examples, refer to Section 6.8.

The following sections provide brief instructions on how to:

- change the temperature setpoint
- change between Celsius and Fahrenheit
- start the Autotune function
- view current pid settings
- restore factory settings after Autotune
- create and run programs.

For complete instructions on configuring the temperature controller, refer to the *Model 2416 Installation and Operation Handbook*.

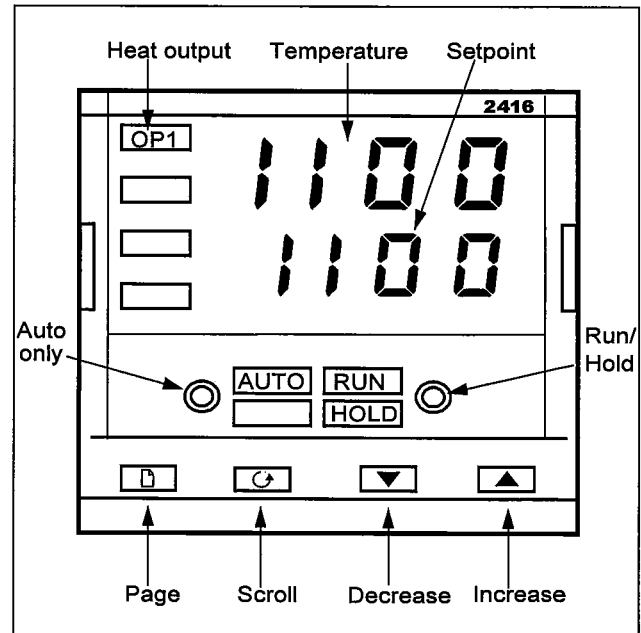


Figure 2. 2416 Control Panel

Table 2. 2416 Pushbutton Keypad Functions

Pushbutton	Description
	The page key advances the display to show units (°C, °F), programmer functions, alarm settings, tuning parameters (Atun), the Pid list, and access to the protected list (ACCS).
	The scroll key advances the display to show the next item within each page. While in the protected list the scroll key advances the display to the next parameter code and setting.
	The up arrow key is used to increase or change a setpoint or parameter setting.
	The down arrow key is used to decrease or change a setpoint or parameter setting.
Run/ Hold	The button to the right of the RUN and HOLD displays is used to start and stop the stored program or to put the program on hold, allowing temporary changes.

6.2 Changing the Temperature Setpoint

During normal operation, the current temperature setpoint is displayed below the current process temperature.

To change the setpoint in single setpoint mode, verify that a program is not running (i.e., that the RUN and HOLD displays are not illuminated). Then press and hold ▲ or ▼ until the desired setpoint shows on the lower LED display. When the display shows the desired setpoint, release the button. After two seconds (during which the controller stores the new value) the display will blink, indicating that the new setpoint has been accepted.

If a program is running, then you can change it temporarily, revise the program, or stop it to operate in single setpoint mode (see Section 6.8.4).



CAUTION! Do not adjust the setpoint above 1100°C (2012°F).

6.3 Changing between Celsius (°C) and Fahrenheit (°F)

Changing the displayed units of measure requires paging to the protected list (ACCS), entering the appropriate access codes, and changing the setting of the unit parameter.



CAUTION! When changing units of measure, be sure that you follow the steps exactly and that you do not modify any other parameter settings. Changing parameter settings on the protected list (ACCS) can hamper performance and make the equipment dangerous to use.

To change from °C to °F or from °F to °C:

1. Press the page button ▢ and release until ACCS is displayed.
2. Press the scroll button ⇄ once to display codE.
3. Press ▲ to display the number 1. The control program will acknowledge this access code by displaying PASS.
4. Press ⇄ to display Goto, then press ▲ to display the value conF.
5. Press ⇄ to display Conf (note the capital “C”).
6. Press ▲ to display the number 2. The control program will acknowledge this access code by displaying PASS.
7. Press ▢ to display PU Conf, then Press ⇄ to display unit.
8. Press and release ▲ to display the choices C and F. Once the choice you want is displayed, press the page button ▢ to display Exit.
9. Indicate you want to exit by pressing ▲ to display YES. The actual temperature display will return after two seconds.

To verify the units you chose, press and release ▢.

6.4 Auto Tune Operation

The factory set parameters are designed to optimize furnace performance under normal operating conditions. If you have unusual conditions or requirements — for example, high ambient temperatures or heavy shelf loading — you can use the Auto Tune function to change the furnace’s performance characteristics.



CAUTION! Be sure that you analyze current performance carefully before deciding to do an Auto Tune operation.

If you are not satisfied with the results of an Auto Tune operation, you can restore the factory set parameter values by following the instructions in Section 6.6.

Before starting Auto Tune operation, be sure to have the furnace operating with typical load and ambient temperature conditions.

To start Auto Tune:

1. Press and release the page button ▢ repeatedly until you reach the Atun LiSt display.
2. Scroll (⇄) to display tunE.
3. Press ▲ to display on.
4. Press the ▢ and ⇄ buttons *together* and release. At this point the actual temperature value and tunE will display alternately to indicate that tuning is in progress.

You can interrupt and terminate the Auto Tune operation at any time by scrolling to tunE (steps 1 and 2 above) and pressing ▲ to display OFF.

After a sufficient number of cycles of temperature oscillation (usually two), the tuning process is completed, the tuner switches itself off, and the controller resumes normal operation with the new proportional values.

After Auto Tune operation, you can view the changed settings for proportional values by following the steps described below in Section 6.5.

6.5 Viewing PID Settings

To view the current proportional values:

1. Press and release the page button repeatedly until you reach the display Pid LiSt.
2. Press and release the scroll button to display each list item. The name of each item will appear in the upper display, its current value in the lower display.
3. The quickest way to return to the Home display is to press the page and scroll buttons simultaneously.

6.6 Restoring Factory Set PID Values

The factory set proportional values are shown below in Table 3.

Table 3. Default Factory Parameter Settings

Parameter Code	Default Value	Description
Pb	20	Proportional band
ti	120	Integral time
td	30	Derivative time
Hcb	Auto	High cutback
Lcb	Auto	Low cutback

If you have changed these settings by means of Auto Tune and have not experienced improved performance, you can restore the factory settings as follows:

1. The values shown in Table 3 are based on Celsius (°C) display mode. If your current display mode is Fahrenheit (°F) you should temporarily change it to °C following the instructions in Section 6.3.
2. Press the page button \square and release to display ACCS.
3. Press the scroll button \curvearrowright once to display codE.
4. Press \blacktriangle to display the number 1. The control program will acknowledge this access code by displaying PASS.
5. Press \curvearrowright to display Goto, then press \blacktriangle to display the value FuLL.
6. Press the page button \square and release to display Pid LiSt.
7. Press the scroll button \curvearrowright to display the name of the parameter you want to restore (the first one will be Pb).
8. Press \blacktriangle or \blacktriangledown until the factory set value is displayed (refer to Table 3).
9. Repeat steps 7 and 8 for each of the remaining parameters t1, td, Hcb, and Lcb.
10. When you have restored all parameter values, press the page button \square to display ACCS.
11. Press the scroll button \curvearrowright once to display codE.
12. Press \blacktriangle to display PASS.
13. Press \curvearrowright to display Goto.
14. Press \blacktriangle to display the value oPEr.
15. Press the page button \square and release to return to the actual temperature display.

You can verify proportional values at any time by following the steps described in Section 6.5.

6.7 Setting the Overtemperature Alarm

The factory default setting for the overtemperature alarm is 1125°C. To change the alarm setpoint:

1. Press the page button \square until AL LiSt appears on the display.
2. Press the scroll button \curvearrowright until 1FSH appears on the display.
3. Press \blacktriangle or \blacktriangledown until the desired setpoint is indicated on the bottom line of the display.



CAUTION! Do not adjust the alarm above 1150°C (2124°F).

6.8 Programming the 2416 Controller

You can use the 2416 program parameters to program the controller for specific applications. For sample programs refer to Section 6.8.2 and Section 6.8.3 below.

6.8.1 Entering a Program

The controller stores one program at a time. A program can have up to 16 segments. To enter a program:

1. Page to run LiSt, scroll to StAt, and if necessary use the \blacktriangle key to set the value StAt OFF.
2. Page to ProG LiSt. Scrolling through this list enables you to enter, verify or change all the program parameters. For each parameter, the name appears in the upper display, the current value in the lower display. You can use the \blacktriangle and \blacktriangledown keys to change a value or the scroll key \curvearrowright to display the next parameter.
3. The first four parameters displayed in the ProG LiSt apply to the entire program. Hb U denotes width of the holdback band, or maximum deviation from temperature profile (the default value is 20°C). rmP.U and dwL.U denote units of time used for ramps and dwells. CyC.n denotes the number of cycles (times you want the program to run). The value of CyC.n can be 1 to 999, or cont for continuous cycling.
4. The next parameter displayed will be SEG.n (the segment number) with the value 1. As you scroll through program parameters, segment numbers will appear in sequence automatically.
5. The next parameter will be tYPE, which specifies the type of segment, for example ramp or dwell. For a given segment, the parameters you need to specify depend on the segment type, as shown below in Table 4.
6. Once you have entered the complete program (through the End segment) you can run the program at any time following the instructions in Section 6.8.4.

Table 4. Program Segment Types

Segment Type	Function	Required Parameters
rmP.r	Ramp temperature rate (rAtE) sets temperature rise per unit of ramp time (rmP.U)	Hb, tGt, rAtE
rmP.t	Ramp rate time (dur) sets amount of time to rise to target setpoint (tGt)	Hb, tGt, dur
dwEIl	Keeps the temperature constant for a set period of time (dur)	Hb, dur
STEP	Instantaneously changes the target setpoint (tGt) to a new value	tGt
End	Indicates end sequence. The End.t (end type) parameter can specify dwell, reset, or S OP to set output power.	End.t, Pwr if End.t=S OP

The following sections show some typical programming examples. For complete information on programming functions, refer to the *Model 2416 Installation and Operation Handbook*.

6.8.2 Example 1: Ramp and Hold

In the following simple program, segment 1 ramps to the temperature 1100°C at a rate of 20° per minute. Segment 2, the end segment, holds temperature at 1100°C indefinitely. The program is:

SEG.n	1	SEG.n	2
tYPe	rmPr	tYPe	End
Hb	bAnd	End.t	dwEll
tGt	1100		
rAtE	20		

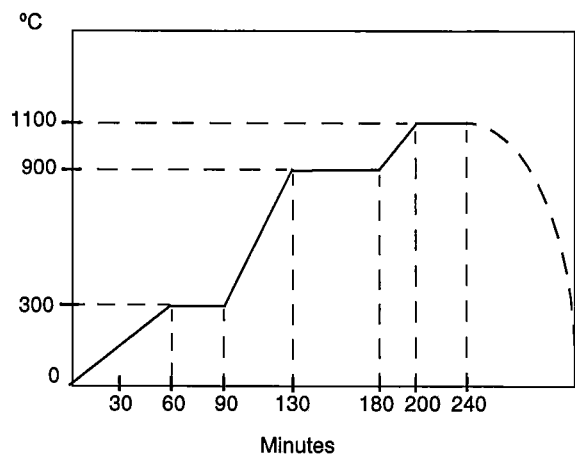


Figure 3. Three Ramps and Dwells

6.8.3 Example 2: Three Ramps and Dwells

In the following program, there are three ramps and dwells. Segment 1 ramps slowly to 300°C at a rate of 5° per minute; segment 2 dwells at 300°C for 30 minutes. Segment 3 ramps to 900°C at a rate of 15° per minute; segment 4 dwells for 50 minutes. Segment 5 ramps to the maximum furnace temperature 1100°C at a rate of 10° per minute; segment 6 dwells for 40 minutes. Segment 7 is a step segment specifying a setpoint of 30°C (close to ambient). The end segment, segment 8, halts the program and resets.

Note that the ramps and dwells (segments 1–6) have the Hb parameter (holdback) set to the value bAnd (deviation band holdback). Other possible values for Hb are OFF (disabled, as in segment 7), Lo (deviation low), and Hi (deviation high).

Each time this program runs it will produce the temperature profile shown in Figure 3.

The program is:

SEG.n	1	SEG.n	5
tYPe	rmPr	tYPe	rmPr
Hb	bAnd	Hb	bAnd
tGt	300	tGt	1100
rAtE	5	rAtE	10
SEG.n	2	SEG.n	6
tYPe	dwEll	tYPe	dwEll
Hb	bAnd	Hb	bAnd
dur	30	dur	40
SEG.n	3	SEG.n	7
tYPe	rmPr	tYPe	StEP
Hb	bAnd	Hb	OFF
tGt	900	tGt	30
rAtE	15	SEG.n	8
SEG.n	4	tYPe	End
tYPe	dwEll	END.t	rSEt
Hb	bAnd		
dur	50		

6.8.4 Run and Hold Functions

You can run a stored program by paging to run LiSt, scrolling to the StAt parameter, and using the ▲ button to set the value run.

The Run/Hold button (see Figure 2 on page 5) provides an easier way to control program operation. Pressing Run/Hold once illuminates the RUN display and starts the stored program. Pressing it a second time halts the program temporarily and illuminates the HOLD display. When the program is in hold you can make temporary changes. Pressing the button again cancels the hold and resumes operation of the program.

Pressing and holding the Run/Hold button for two seconds causes the program to stop, reset and erase any temporary changes made while in hold mode. This reset mode enables single setpoint operation.

6.8.5 Checking Program Status

To check on the status of the current program, page to run LiSt and scroll through the following parameters to review their values:

Table 5. Run List Parameters

Parameter Code	Meaning
StAt	Program status. run = program is running; OFF = program is not running; hoLd = program halted, can be modified temporarily; End = program is processing last segment. Caution! When you view StAt be careful not to change program status by pressing the up and down keys.
PSP	Current segment setpoint target temperature.
CYC	The number of cycles remaining in the program.
StYP	The active segment type.
SEG.t	Time remaining in the current segment
PrG.t	Time remaining in the current program.

7 Three Zone Operation

Models STF55346C and STF55666C are capable of three-zone operation. These tube furnaces are designed with ample reserve power in the end zones to compensate for inherent heat losses from the ends of the furnace.

Generally, the greatest furnace temperature uniformity exists in the center zone, over a length that reaches almost to the ends of the center zone heating unit. This length of uniformity will change depending on how you balance the end zones of your furnace.

To achieve the desired uniformity within the furnace, it is necessary to use a separate monitoring thermocouple in conjunction with an appropriate measuring instrument, such as a digital thermometer.

By recording the temperature at various points inside the furnace process tube, a graph of temperature versus length can be drawn. Using the graph as a guide, make end zone adjustments in small increments.

A minimum of 60 minutes should be allowed for the power change to stabilize within the furnace. Make temperature measurements again each time before making another adjustment.

8 Maintenance



CAUTION! Maintenance should only be performed by trained personnel.



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



WARNING! Before maintaining this equipment, read the applicable MSDS (Material Safety Data Sheets) at the back of this manual.



WARNING! 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 efficiency 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 cleaning.
- Promptly place used ceramic fiber parts and dust in plastic bags and dispose of properly.

For replacement parts specifications, refer to Table 7 on page 12.
For wiring schematics, refer to Section 10 on page 12.

8.1 Thermocouple Replacement



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

Note: For optimal performance, the thermocouple should be replaced once a year. In some situations a more frequent replacement schedule is warranted. **Snb or Err H** on the controller display indicates a broken thermocouple.

Refer to Figure 4 as you perform the following procedure:

1. Remove the screws from rear panel corners. Remove the rear panel.
2. Loosen the terminal screws and remove thermocouple lead wires.
3. Remove thermocouple mounting screws.
4. Slide out head and old thermocouple (refer to Figure 4).
5. Replace the thermocouple and connect new wires. Be careful not to bend the thermocouple wire. Red is always negative. (If the extension leads are black and white, white is negative).
6. Replace the furnace rear panel.

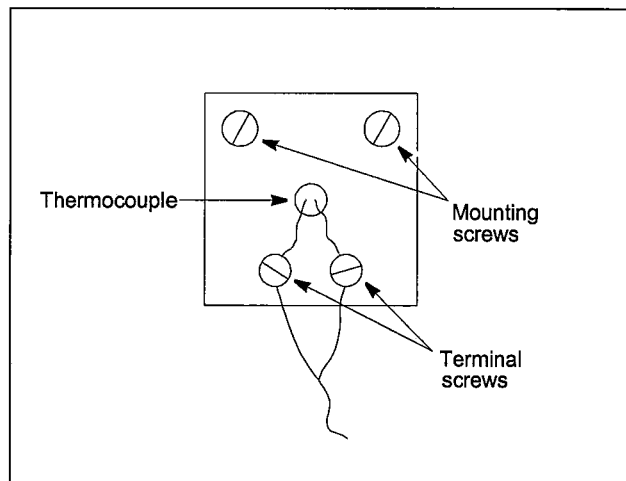


Figure 4. Thermocouple Replacement

8.2 Solid-State Relay Replacement



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

If a solid-state relay is inoperable, complete the following steps to replace the relay:

1. Remove the screws located on the left and right sides of the control panel.
2. Slide the panel assembly away from the unit to expose components.
3. Locate the solid-state relay on the component tray (the relay is shown in Figure 5).
4. Note the terminal connections of the relay wires and label them for reattachment. Remove the wires from the terminals of the relay.
5. Remove the mounting screws from the relay.
6. Replace the relay and reconnect the wires.
7. Reassemble the unit.

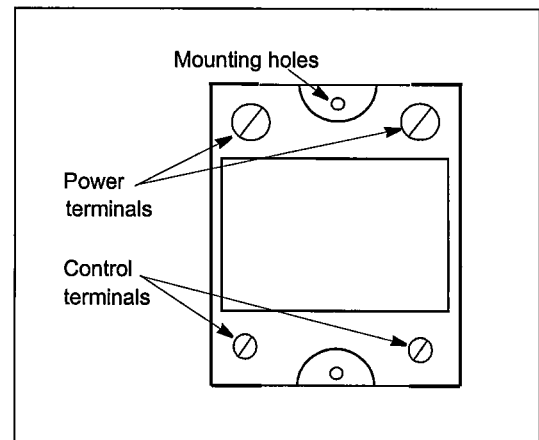


Figure 5. Solid State Relay

8.3 Temperature Controller Replacement



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

To replace the temperature controller, complete the following steps:

1. Disconnect main power and switch the circuit breaker to the OFF position.
2. Remove the two sheet metal screws located on each side of the furnace near the lower front. Pull the control panel forward to access the controller.
3. Note the terminal connections of the wires and label them for reattachment. Remove power input and output wires from the back of the controller. Observe polarity for the thermocouple lead wire. Red is always negative. Refer to wiring diagrams for additional wiring information.
4. Unscrew and remove the mounting bracket from the back of the temperature controller.
5. Pull the controller out through the front of the control panel.
6. Install the replacement controller by reversing the above procedure.

9 Troubleshooting



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

This section is a guide to troubleshooting furnace problems indicated by the controller. Furnaces are identified by the type of controller. Refer to Table 6 for troubleshooting procedures.

Table 6. Controller Troubleshooting

Problem	Solution
Controller reads SnSr.	Thermocouple: <ol style="list-style-type: none"> 1. Check the thermocouple visually for breaks. If a break is evident, replace thermocouple. 2. Check the thermocouple for continuity with an ohmmeter. If there is no continuity, replace thermocouple. 3. Check all thermocouple connections. Connections should be clean and free of corrosion.
Controller reads tunE FAIL.	Self-tuning operation failed because controller cannot maintain setpoint: <ol style="list-style-type: none"> 1. Touch any key to acknowledge the message. 2. Remove the cause of failure, such as blown heater fuse, etc.
Controller reads LinE FAIL.	Loss of controller power during self-tuning operation renders sampled data questionable: <ol style="list-style-type: none"> 1. Touch any key to acknowledge the message. 2. Verify power supply. 3. Reinitiate self-tuning procedure.

10 Replacement Parts and Wiring Diagrams

Table 7. Replacement Parts

Numbers in parentheses indicate quantities; otherwise the quantity is one.

Furnace Model	STF55346C	STF55666C
Heating Unit	7012-1001-00A	7012-1002-00A
Thermocouple Head	(3) 7214-2051-00A	(3) 7214-2051-00A
Single Thermocouple	(3) 7299-1122-0AN	(3) 7299-1122-0AH
Thermocouple Wire	(14 ft) 33940-002	(17 ft) 33940-002
Terminal Block, Heating Unit	(4) 7218-2047-001	(5) 7218-2047-001
Temperature Controller	(3) 302545H01	(3) 302545H01
Solid-State Relay	102460	(3) 102460
Power Relay (OTP)	16934	101235
Fiber	34907H02	34907H02
Tube Adapter, 6 in. Bore	—	(2) 7100-2444-065
Tube Adapter, 5 in. Bore	—	(2) 7100-2444-080
Tube Adapter, 4 in. Bore	—	(2) 7100-2444-081
Tube Adapter, 3 in. Bore	(2) 7100-2444-064	(2) 7100-2444-082
Tube Adapter, 2 in. Bore	(2) 7100-2444-077	—
Tube Adapter, 1 in. Bore	(2) 7100-2444-078	—
Tube Adapter, Blank (Solid)	(2) 7100-2444-079	(2) 7100-2444-083
Terminal Block, Power	—	33402-002

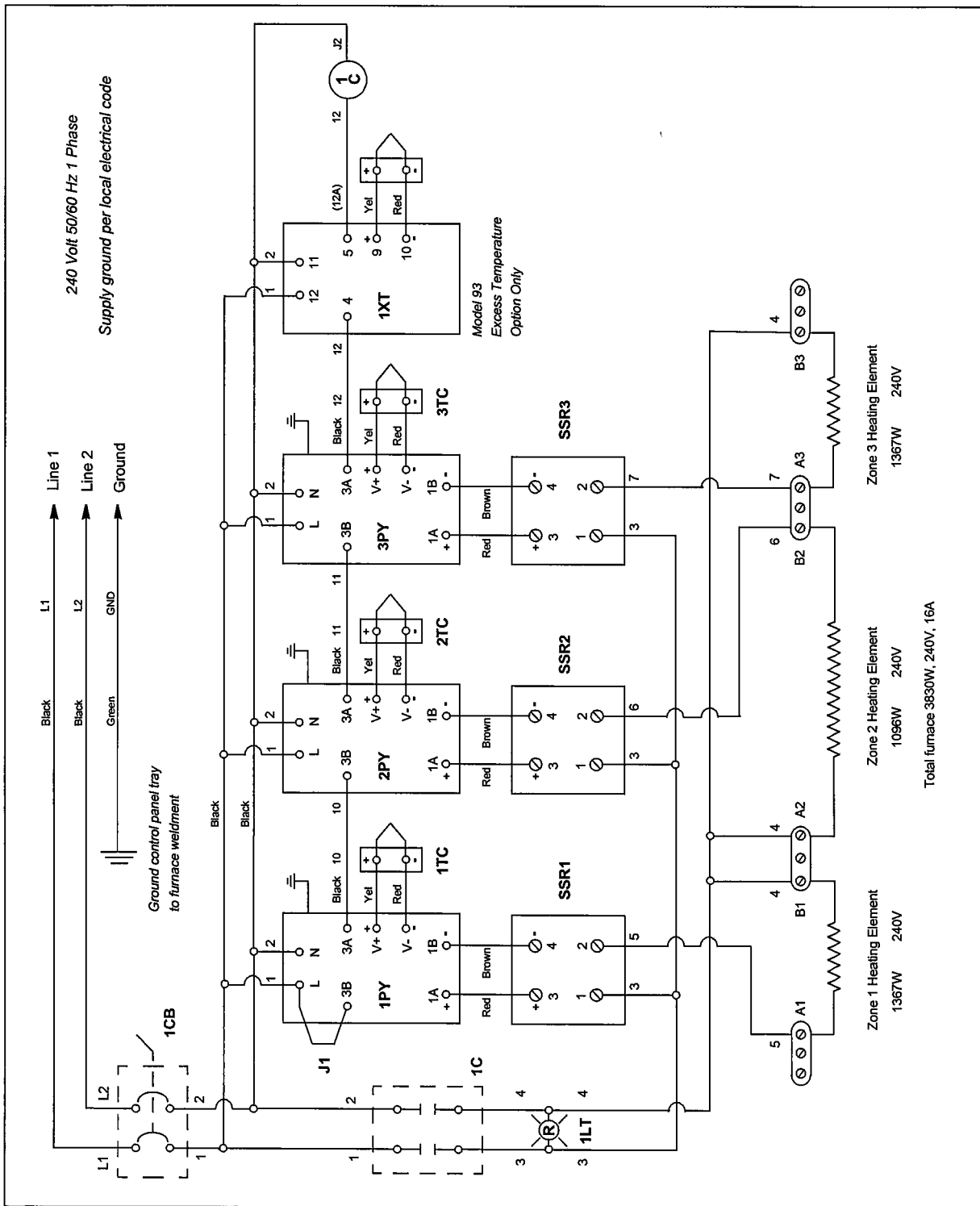


Figure 6. Wiring diagram for Model STF55346C

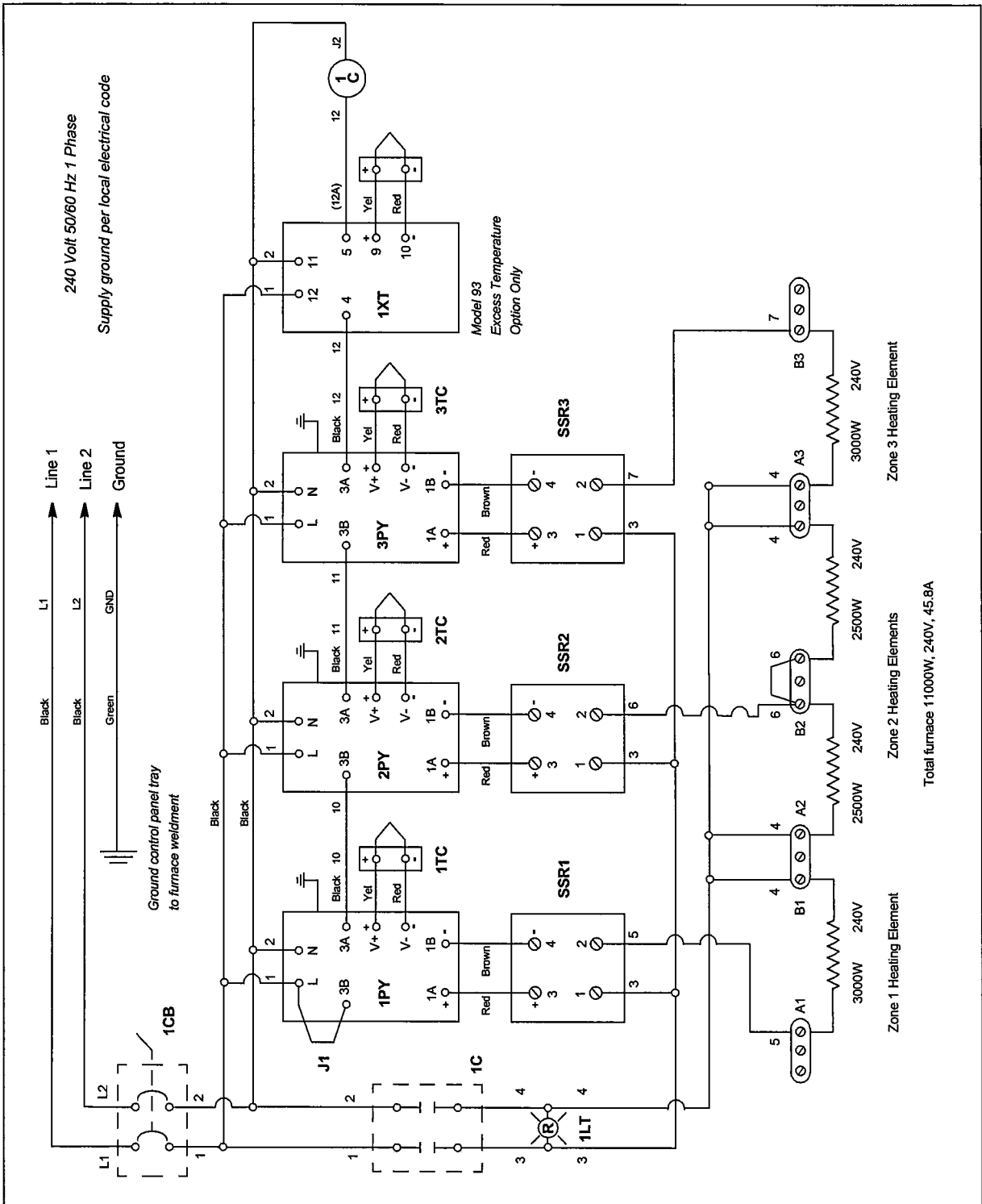


Figure 7. Wiring diagram for Model STF55366C

11 Warranty

11.1 Domestic Warranty (United States and Canada)

Lindberg/Blue M warrants this product to the owner for a period of twelve (12) months from date of shipment by Lindberg/Blue M. Under this warranty Lindberg/Blue M through its authorized Dealer or service organizations, will repair or at its option replace any part found to contain a manufacturing defect in material or workmanship, without charge to the owner, for a period of ninety (90) days, the labor, and a period of one (1) year, the parts, necessary to remedy any such defect. All components used in the manufacture of this product are covered by this warranty excluding heating elements and thermocouples.

This warranty is limited to products purchased and installed in the United States and Canada. It does not apply to damage caused from failure to properly install, operate, or maintain the product in accordance with the printed instructions provided. This warranty shall not apply to equipment or parts which have been subjected to negligence, accident, or damage by circumstances beyond Lindberg/Blue M's control or improper operation, application, maintenance, or storage.

To obtain prompt warranty service, contact the nearest Lindberg/Blue M authorized service center or Dealer. A listing of these companies will be provided upon request. Lindberg/Blue M's own shipping records showing date of shipment shall be conclusive in establishing the warranty period.

This warranty is in lieu of any other warranties, expressed or implied, including merchantability or fitness for a particular purpose. The owner agrees that Lindberg/Blue M's sole liability with respect to defective parts shall be as set forth in this warranty, and any claims for incidental or consequential damages are expressly excluded.

11.2 International Warranty (excluding Canada) 12 Months Parts Warranty

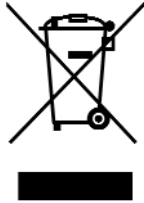
Lindberg/Blue M warrants this product to the original owner for a period of twelve (12) months from the date of shipment from the Lindberg/Blue M factory. Thermocouples and heating elements are excluded from this warranty. If any part is found to contain a manufacturing defect in material or workmanship Lindberg/Blue M will, at its option, repair or replace the part. Lindberg/Blue M assumes no responsibility for any labor expenses for service, removal, or reinstallation required to repair or replace the part, or for incidental repairs, and such costs are the responsibility of the Owner and his Dealer.

The warranty does not apply to damage caused by accidents, misuse, fire, flood, Acts of God or any other events beyond Lindberg/Blue M's control or to damage caused from failure to properly install, operate, or maintain the product in accordance with the printed instructions provided by Lindberg/Blue M. To obtain prompt warranty service, simply contact the Dealer from whom you purchased the product or the nearest Dealer handling Lindberg/Blue M products. Lindberg/Blue M's own shipping records showing date of shipment shall be conclusive in establishing the warranty period.

This warranty is in lieu of any other warranties, expressed or implied, including merchantability or fitness for a particular purpose. The owner agrees that its sole remedy and Lindberg/Blue M's sole liability with respect to defective parts or any other claim shall be as set forth in this warranty, and any claims for incidental, consequential or other damages are expressly excluded.

WEEE Compliance

Great Britain



WEEE Compliance. This products 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/disposal companies in each EU Member State, and this products should be disposed of or recycling 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



WEEE Konformität. 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 wiederverwertet oder 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



Conformità WEEE. Questo prodotto deve rispondere alla direttiva dell'Unione Europea 2002/96EC in merito ai Rifiuti degli Apparecchi Elettrici ed Elettronici (WEEE). È marcato col seguente simbolo. Thermo 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 ditte di riciclaggio nel Vostro paese e informazioni sui prodotti Thermo Scientific che possono essere utili alla rilevazione di sostanze soggette alla Direttiva RoHS sono disponibili sul sito www.thermo.com/WEEERoHS

France



Conformité WEEE. Ce produit doit être conforme à la directive européenne (2002/96EC) des Déchets d'Equipements Electriques et Electroniques (DEEE). Il est marqué par le symbole suivant. Thermo 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 le détection des substances sujettes à la directive RoHS sont disponibles sur www.thermo.com/WEEERoHS

Important

For your future reference and when contacting the factory, please have the following information readily available:

Model Number: _____

Serial Number: _____

The above information can be found on the dataplate attached to the equipment. If available, please provide the date purchased, the source of purchase (Lindberg/Blue M or specific agent/rep organization), and purchase order number.

IF YOU NEED ASSISTANCE:

LINDBERG/BLUE M SALES DIVISION

Phone: 828/658-2711
800/252-7100

FAX: 828/645-3368

LABORATORY PARTS and SERVICE

Phone: 828/658-2891
800/438-4851

FAX: 828/658-2576

TECHNICAL SUPPORT

Phone: 800/438-4851

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