LINDBERG/BLUE M

3-Zone Tube Furnace

Models: STF55346C
STF55666C

Installation and Operation Manual

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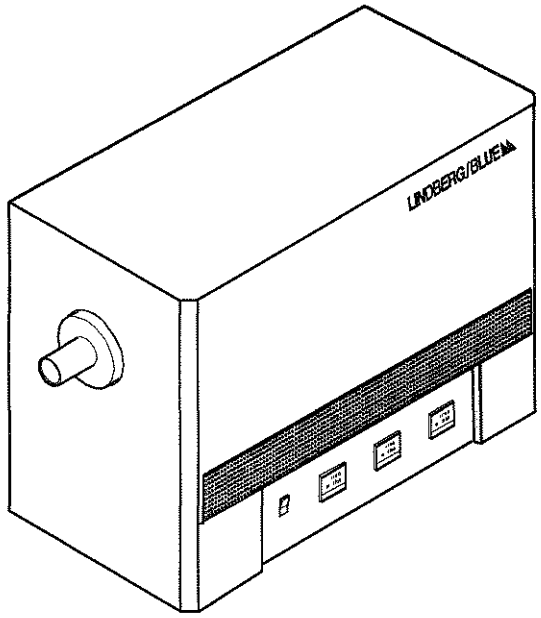


1 Introduction

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.

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! 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.

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)	

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 V_2O_5 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.

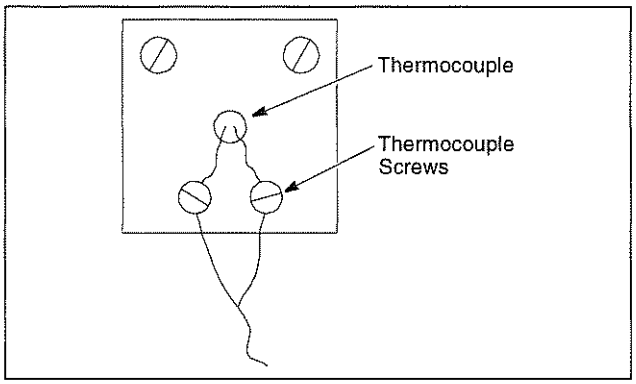


Figure 1. Thermocouple

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 eyeware.
- 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 Section 6 as you perform the following procedures:

1. Adjust the setpoint to 550°C, following the instructions in Section 6.
2. Run the furnace for two hours at 550°C.
3. Adjust the setpoint to 1000°C.
4. Run the furnace for two hours at 1000°C.
5. Adjust setpoint to room temperature.

6 Operation – UP150 Controller

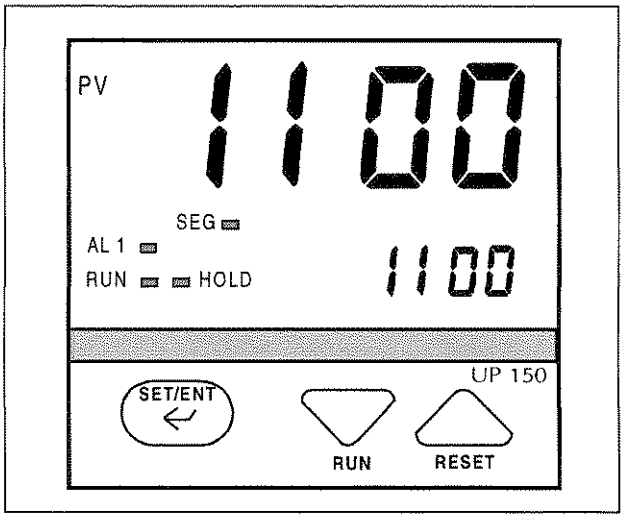


Figure 2. UP150 Control Panel

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

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

For more detailed instructions, refer to the Yokogawa UP150 manual (2nd edition).

6.1 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 pushbutton keypad. Refer to Table 1 and Table 2 for lists of displayed parameters and keypad functions.

The UP150 controller will accept a single program of up to 16 segments. This controller includes an automatic tuning feature and "Super" control to improve the performance. Refer to the UP150 manual for detailed information on the "Super" feature and on autotuning.

Table 3. UP150 Parameter Functions

Parameter Code	Factory Set Value	Description
Operating parameters (access by holding the SET/ENT key)		
HoLd	OFF	Program Hold
AdV	OFF	Segment Advance
CtL	Pid	Control mode
At	oFF	Auto tuning
P	34	Proportional band (°C; °F=93)
I	44	Integral time
d	11	Derivative time
Ct	1	Heat cycle time
FL	OFF	Sensor filter
bS	0.0	PV bias (offset)
LoC	1	Key lock
Setup parameters (access by setting LoC=-1)		
In	1	Input type (J thermocouple)
SC	ON	Super function

Table 4. Pushbutton Keypad

Button	Function
SET/ENT	Pressing and holding the SET/ENT for three seconds advances the display to the Operation Parameters Menu. While in the Operation Parameters Menu, use SET/ENT to move from one parameter to the next, and to register changes you have made in setpoint and parameter values. Holding SET/ENT for three seconds exits either the Operation or Setup Parameters menu.
△	Use the Up Arrow button to increase 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. While in operating mode, pressing this key stops (resets) program operation.
▽	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. While in operating mode, pressing this key starts (runs) a program

6.2 Basic Operation

To operate the UP150 controller, you must first enter a program. Once the program is entered into the controller, press the "arrow down" key to run it. Once the program is running, it can be placed in "hold mode" to maintain the current setpoint. Also, a "program advance" can be executed to step the program rapidly through program segments.

6.3 Entering Program Parameters

To access programming mode:

1. Press the SET/ENT key for 3 seconds. Make sure the RUN light is not lit at this time.
2. "PrG" will be displayed in the upper display with "0" in the lower display. Press the "arrow down" key once until "-1" is displayed with a flashing decimal.
3. Press the SET/ENT key once. Now the programming mode is accessed.

Prior to entering the actual program steps, you will be prompted for event type settings (EV1). This refers to how a relay will function, either as a "time event" or a "process variable (alarm) event".

To enter a program in program mode:

1. With "EV1" in the upper display and "0" in the lower display, press the SET/ENT key.
2. Next, "AL1" appears in the upper display. A value of "9" in the lower display configures the alarm as a high temperature alarm which is the factory setting. (For more information see "PV Event (alarm) Function List" in the UP150 Instruction Manual).
3. Press the SET/ENT key to advance to the Alarm 1 value (A1). This is the temperature at which the alarm will trip. This is typically set for 10° higher than the highest setpoint in the program.
4. Use the arrow up/down keys to enter the Alarm 1 value. Notice that the decimal point will flash indicating a change has been made. You must press the SET/ENT key to register a change.
5. Press the SET/ENT key to advance past the EV2 and AL2 settings to the SSP (starting setpoint) value and enter the appropriate setting.
6. From this point, you will be prompted for SP1 (setpoint 1), tM1 (time 1), SP2 – tM2, SP3 – tM3... etc. until all the program parameters have been entered. Note that Time is entered in hours and minutes, for example, 1.45 equals 1 hour and 45 minutes.
7. The controller will accept up to 16 setpoints and times. If fewer than 16 are required, enter "oFF" as a time value. This tells the controller you are finished. ***Do not enter a setpoint into your program beyond the maximum operating temperature of your unit.***
8. Next, you will be prompted for a Junction Code (JC). This determines how the controller will function at the end of the program. Three Junction Code values are available: "0" will cause the controller to shut-off its outputs at the end of the program. This is called the "reset" mode. "1" will place the controller in "Hold" mode. "2" will cause the program to repeat continuously.
9. Next you will be prompted for a Wait Zone (WTZ). This is similar to "guaranteed soak". The factory setting is "oFF" which means "not used". A wait zone causes the controller to stop the program clock if, at the transition from a ramp segment to a soak segment, the actual chamber temperature (PV) is not close enough to the setpoint. Assume the controller is programmed to ramp from 25°C to 100°C in 1 minute. Since the unit does not have the capability to heat up this quickly, the controller will change the setpoint from 25° to 100° in 1 minute and wait at beginning of the 100° segment for the unit to catch up with the setpoint before continuing the program. The program will continue when the unit temperature (PV) falls within the specified Wait Zone. The minimum value of the Wait Zone is 1% of the controller's span for a given input type. In this example, the span is from -200° to 1000° (1200° x 1% = 12°). This means, in the above example, the controller will continue the program when the unit temperature reaches 88° (100° - 12° = 88°).
10. The program is now complete and ready to run. Exit the program parameter setting mode by pressing and holding the SET/ENT key for 3 seconds.

6.4 Running the Program

To run the program, press the Run or "arrow down" key until the RUN light illuminates.

6.5 Using the Hold Function

To hold a running program:

1. Press and hold the SET/ENT key for 3 seconds."HoLd" will appear in the upper display.
2. Press the "arrow up" key so that "on" with flashing decimal appears in the lower display.
3. Press the SET/ENT key to accept.
4. Press and hold the SET/ENT key again to return to the normal display.

To exit the hold mode:

Press and hold the SET/ENT key for 3 seconds. "HoLd" will appear in the upper display. Press the "arrow down" key so that "oFF" with flashing decimal appears in the lower display. Press the SET/ENT key to accept. Press and hold the SET/ENT key again to return to the normal display.

6.6 Using the Advance Function

While the program is running, press and hold the SET/ENT key for 3 seconds. "HoLd" will appear in the upper display. Press the SET/ENT key again and "AdV" will appear in the upper display. "oFF" will appear in the lower display. Press the "arrow up" key so that "on" with flashing decimal appears in the lower display. Press the SET/ENT key to accept. The controller will automatically return to the normal display and the increment the program segment by one.

7 Communication Option

The Communication Option enables digital communication between the UP150 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.

7.1 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 Lindberg/Blue M 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.

7.2 UP150 Communications Setup Parameters

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

1. Hold the **SET/ENT** button for three seconds to display the Operating Parameters. Press and release the **SET/ENT** button to display the 'LoC' parameter. 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 5. UP150 Communications Parameters

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

7.3 Software Installation

1. Load the SpecView software onto the PC hard drive, using the disks provided.
2. Run the software. (If you have purchased the SpecView Plus Communication Software with the copy protection key, skip step 3.)
3. If you do not have a copy protection key, a 'SpecView' window opens with the message, "Problem with Dongle: 'Dongle' (Copy Protection Key) not detected on parallel port." Click the OK button to acknowledge the message. Without the copy protection key, this diagnostic/sampler software has a 20-minute time limit on each run. If the message 'demo version of SpecView has stopped communicating - values are frozen' appears before the communication diagnostics are finished, close the software and reopen it for another 20-minute segment.
4. When the 'Configurations Found..' window opens, click on the "Test Comms for New Config." Button.
5. The 'Input Required..' window then opens. Enter a new Config. Name (up to 8 characters with no spaces) or accept the 'DEFAULT' name. Click OK.
6. The 'Ports and Protocol' window opens next. On the 'COM1:' line (if the COM1 port is the serial port used to connect to the controller) select the pulldown menu from Protocol column. Highlight "*Yokogawa 100" or "100 Series" for controller model UP150.
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. See Section 7.8 on page 7 for detailed instructions on configuring multiple controllers.
9. After the instrument scan is completed, a SpecView window appears with the message, "All channels scanned. Press OK to continue, or cancel to rescan". Press OK if all of the connected controllers are properly displayed. If no controls are displayed, check the "troubleshooting" section at the end of this setup.
10. To begin communication between the PC and the controller, click on the 'Enter Runtime' button (an icon of a running figurine). This action will ask for a file name to save this display: use the given default or select another.
11. The "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 7.7 on page 7.

7.4 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.

7.5 Ordering SpecView

If this software program is what you need as a tool to organize and operate the digital communication on Lindberg/Blue M equipment, contact Lindberg/Blue M sales, SpecView directly at sales@specview.com, or on their Internet site at www.specview.com, and request "SpecView Plus".

7.6 Troubleshooting

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

A. Verify complete and tight cable connections between the Lindberg/Blue M 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 5 on page 6.

D. Verify the values in the 'Ports & Protocols' window (see step 6 in Section 7.3).

7.7 Decimal Point Adjustment

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

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

7.8 Addresses for Multiple Controllers

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

1. Determine a unique address for each temperature controller equipped with the communications option.
2. On the UP150 controller, access the Operating Parameters menu by pressing and holding **SET/ENT** for 3 seconds.
3. Press and release **SET/ENT** repeatedly until the upper display reads LoC.
4. Press ∇ until the displayed value of LoC is -1; then press **SET/ENT** to access the Setup Parameters menu .
5. Press and release the **SET/ENT** button to access the six parameters specific to the communications option. Compare the displayed values to those in Table 5 on page 6. Make adjustments as needed.
6. Press and hold **SET/ENT** for 3 seconds to exit the Setup Parameters Menu.

8 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.

9 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 11.
For wiring schematics, refer to Section 11 on page 11.

9.1 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 3 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 3).
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.

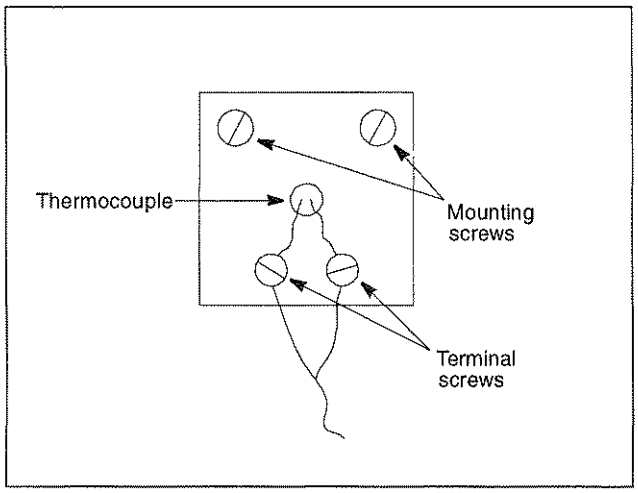


Figure 3. Thermocouple Replacement

9.2 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 4).
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.

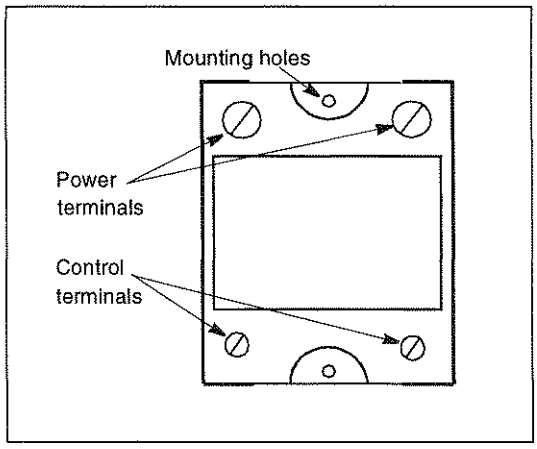


Figure 4. Solid State Relay

9.3 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.

10 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.

Table 6. UT150 Controller Troubleshooting

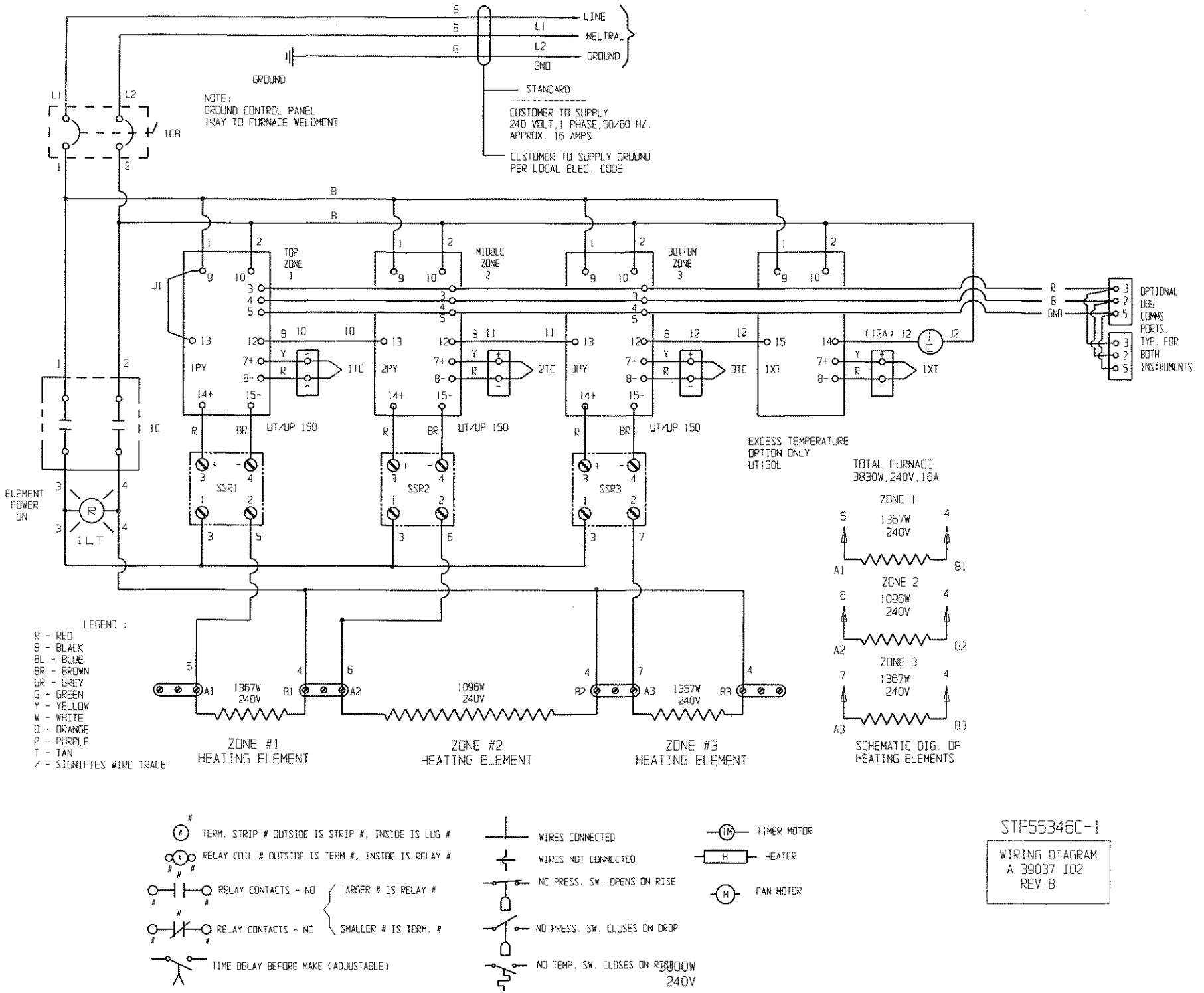
Problem	Probable Causes	Solution
Controller reads P.Er.	Abnormal parameter value	Check controller parameter settings and reset to proper values.
Controller reads b. o	Input burnout	Check the sensor wiring, replace sensor if necessary.
Controller reads ooo.	PV exceeds effective range	Check the input type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

11 Replacement Parts and Wiring Diagrams

Table 7. Replacement Parts

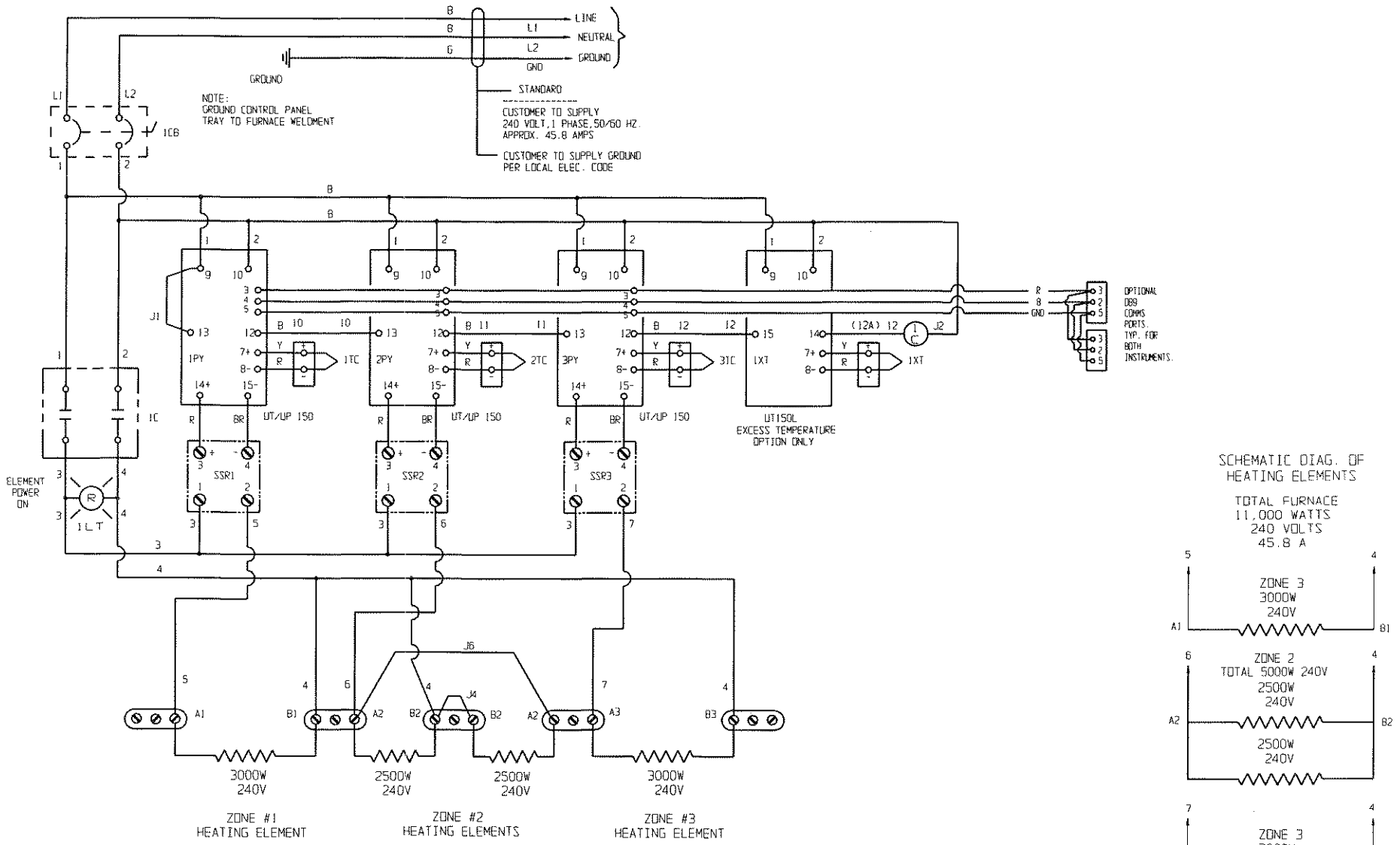
Numbers in parentheses indicate quantities; otherwise the quantity is one.

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	303115H07	303115H07
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



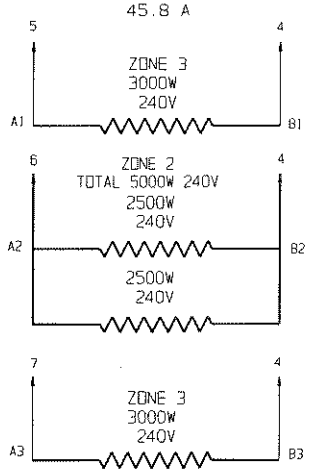
STF55346C-1

WIRING DIAGRAM
A 39037 102
REV.B



SCHEMATIC DIAG. OF
HEATING ELEMENTS

TOTAL FURNACE
11,000 WATTS
240 VOLTS
45.8 A



LEGEND :

R - RED
B - BLACK
BL - BLUE
BR - BROWN
GR - GREY
G - GREEN
Y - YELLOW
W - WHITE
O - ORANGE
P - PURPLE
T - TAN
/ - SIGNIFIES WIRE TRACE

TERM. STRIP # OUTSIDE IS STRIP #, INSIDE IS LUG #

RELAY COIL # 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 CONNECTED

NC PRESS. SW. OPENS ON RISE

NO PRESS. SW. CLOSES ON DROP

NO TEMP. SW. CLOSES ON RISE

TIMER MOTOR

HEATER

FAN MOTOR

STF55666C-1

WIRING DIAGRAM
A 39038 102
REV.B

12 Warranty

12.1 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.

12.2 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.

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

LINDBERG/BLUE

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Asheville, NC 28804
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