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BARNSTEAD|THERMOLYNE CORPORATION

# *Type F21100*
# Tube Furnace

## OPERATION MANUAL
## AND PARTS LIST
## *SERIES 1029*

| Model # | Voltage | Control |
|---|---|---|
| F21124 | 100 | Manual |
| F21125 | 120 | Manual |
| F21120 | 240 | Manual |
| F21130 | 240 | Single Set Point |
| F21130-33 | 230 | Single Set Point |
| F21135 | 120 | Single Set Point |

*LT1029X1T • 3/7/97*

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# General Information

## Alert Boxes



**WARNING**

Warnings alert you to a possibility of personal injury.



**HOT SURFACE**

Hot surfaces alert you to a possibility of personal injury if you come in contact with a surface during use or for a period of time after use.



**CAUTION**

Cautions alert you to a possibility of damage to the equipment.



**NOTE**

Notes alert you to pertinent facts and conditions.

## Safety Information

Your Thermolyne Tube Furnace has been designed with function, reliability, and safety in mind. It is your responsibility to install it in conformance with local electrical codes. For safe operation, please pay attention to the alert boxes throughout the manual.

### WARNING

To avoid electrical shock, this furnace must:

1. Use a properly grounded electrical outlet of correct voltage and current handling capacity.
2. Disconnect from the power supply prior to maintenance and servicing.
3. Always use a properly sized combustion tube.

To avoid personal injury:

1. Do not use in the presence of flammable or combustible materials ; fire or explosion may result. This device contains components which may ignite such material.
2. Refer servicing to qualified personnel.



**HOT SURFACE**

“Caution: Hot Surface. Avoid Contact.” To avoid burns, do not touch this furnace on the exterior or interior surfaces during use or for a period of time after use.

# Warning



**Please note the following warnings:**

## WARNING

This warning is presented for compliance with California Proposition 65 and other regulatory agencies and only applies to the insulation in this product. This product contains refractory ceramic, refractory ceramic fiber or fiberglass insulation, which can produce respirable dust or fibers during disassembly. Dust or fibers can cause irritation and can aggravate pre-existing respiratory diseases. Refractory ceramic and refractory ceramic fibers (after reaching 1000°C) contain crystalline silica, which can cause lung damage (silicosis). The International Agency for Research on Cancer (IARC) has classified refractory ceramic fiber and fiberglass as possibly carcinogenic (Group 2B), and crystalline silica as carcinogenic to humans (Group 1).

The insulating materials can be located in the door, the hearth collar, in the chamber of the product or under the hot plate top. Tests performed by the manufacturer indicate that there is no risk of exposure to dust or respirable fibers resulting from operation of this product under normal conditions. However, there may be a risk of exposure to respirable dust or fibers when repairing or maintaining the insulating materials, or when otherwise disturbing them in a manner which causes release of dust or fibers. By using proper handling procedures and protective equipment you can work safely with these insulating materials and minimize any exposure. Refer to the appropriate Material Safety Data Sheets (MSDS) for information regarding proper handling and recommended protective equipment. For additional MSDS copies, or additional information concerning the handling of refractory ceramic products, please contact the Customer Service Department at Barnstead|Thermolyne Corporation at 1-800-553-0039.

1-800-446-6060
1-800-553-0039

# Introduction

## Introduction

### Intended Use

The type 21100 furnaces are small, inexpensive furnaces ideally suited for school, chemical and industrial laboratories. They are intended for applications requiring temperatures up to 1100°C for manual control bases or temperatures up to 1200°C for the electronic single set point control bases. See specification sheet for continuous and intermittent operating temperatures.

### General Usage

Do not use this product for anything other than its intended usage.

### Principles of Operation

The furnace chamber is heated by heating elements embedded in a refractory material. The tubular chamber is insulated with a ceramic fiber insulation. The furnace chamber is supported by the control base which also houses the electrical connections. Two types of controls are used:

**1. Manual Control -** A percentage input control which compensates for line voltage fluctuation and ambient temperature changes. The temperature is measured by a thermocouple and is displayed on a pyrometer.

**2. Single Set Point Control** - An electronic control which enables the user to bring the furnace up to a preset temperature and hold the temperature. (See Figure 1)

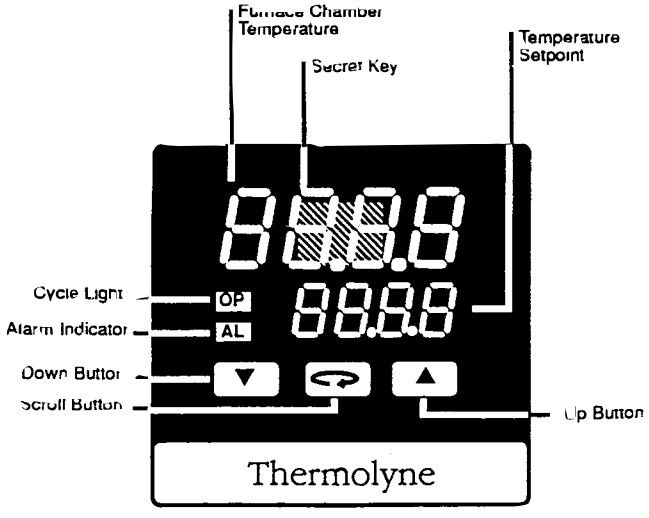
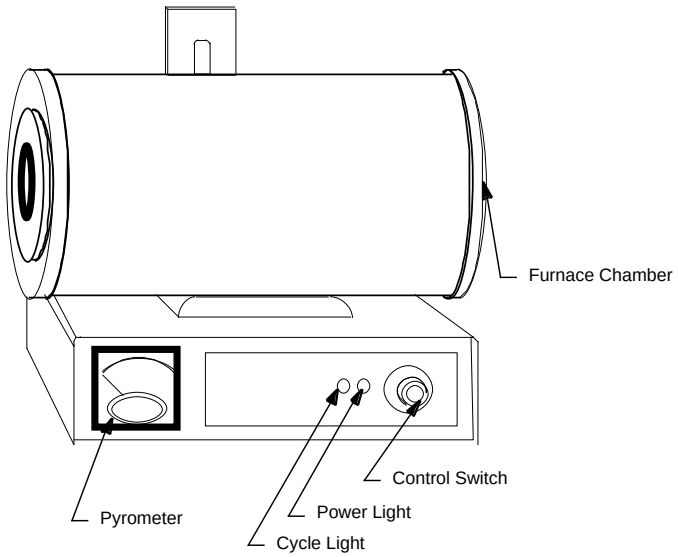
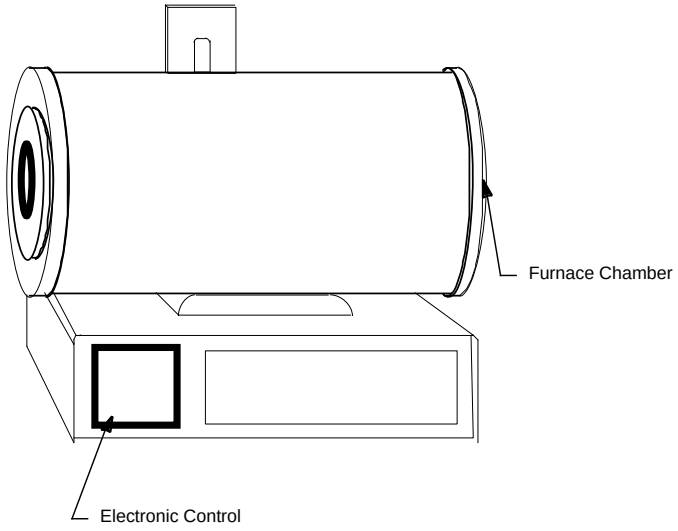



***Figure 1 Single Set Point Control***




**Type F21100 Furnace**
**(**Manual Control Model)




**Type F21100 Furnace**
**(**Single Set Point Control Model)

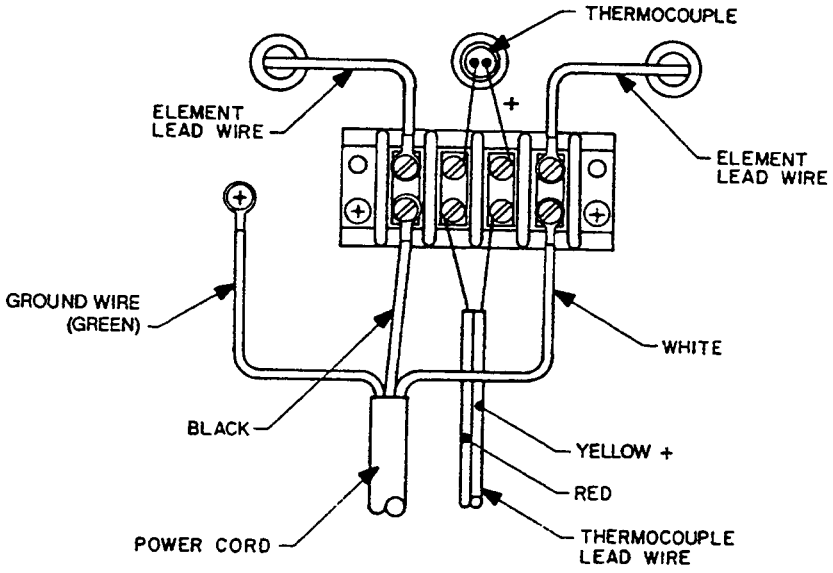



***Figure 2a (All Models except F21130-33)***

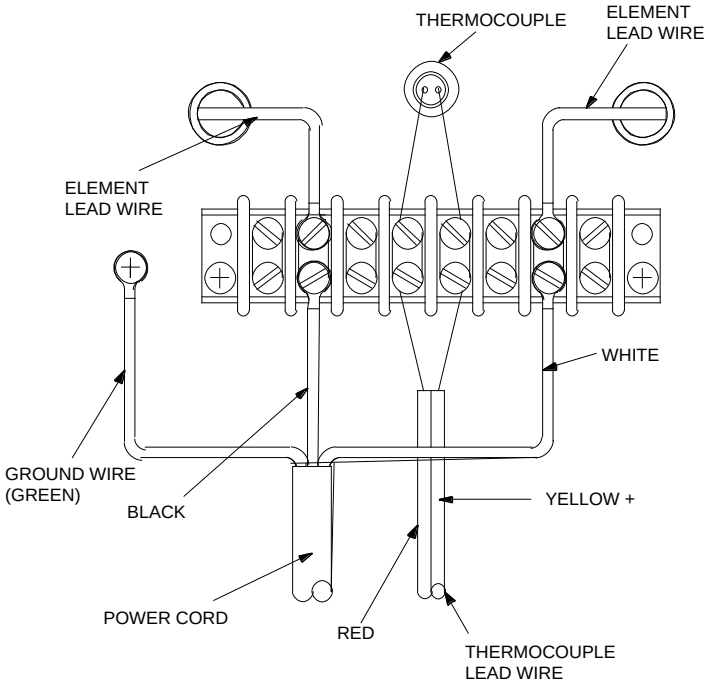



***Figure 2b (Model F21130-33)***

# General Specifications

| Model Number | F21135, *F21125 | F21130, *F21120 | *F21124 | F21130-33 |
|---|---|---|---|---|
| Dimensions - In. (cm) | | | | |
| Overall Width<br>Height | 16 (40.6)<br>14.63, *14.75<br>(37.2, *37.5) | 16 (40.6)<br>14.63, *14.75<br>(37.2, *37.5) | 16 (40.6)<br>14.63, *14.75<br>(37.2, *37.5) | 16 (40.6)<br>14.63, *14.75<br>(37.2, *37.5) |
| Chamber Width<br>Height | 12 (30.5)<br>1.0 & 2.0 Dia.<br>(2.5 & 5) | 12 (30.5)<br>1.0 & 2.0 Dia.<br>(2.5 & 5) | 12 (30.5)<br>1.0 & 2.0 Dia.<br>(2.5 & 5) | 12 (30.5)<br>1.0 & 2.0 Dia.<br>(2.5 & 5) |
| Weight - lbs (Kg) | 19 lbs 5 oz (8.8)<br>*19 lbs 12 oz (9.0) | 19 lbs 5 oz (8.8)<br>*19 lbs 12 oz (9.0) | 19 lbs 5 oz (8.8)<br>*19 lbs 12 oz (9.0) | 19 lbs 5 oz (8.8)<br>*19 lbs 12 oz (9.0) |
| Electrical Ratings<br>Volts<br>Amps<br>Watts<br>Freq.<br>Phase | <br>120<br>11.25<br>1350<br>50/60<br>1 | <br>240<br>5.6<br>1350<br>50/60<br>1 | <br>100<br>13.5<br>1350<br>50/60<br>1 | <br>230<br>5.4<br>1240<br>50/60<br>1 |
| Temperature Ratings °C | 100 - 1200°C<br>*371 - 1100°C | 100 - 1200°C<br>*371 - 1100°C | 100 - 1200°C<br>*371 - 1100°C | 100 - 1200°C<br>*371 - 1100°C |

* For models with manual control.
Temperatures specified, obtained with both 1.0” Dia. and 2.0” Dia. ceramic process tubes, 17” long.

### Environmental Conditions

Operating: 17°C - 27°C; 20% to 80% relative humidity, non-condensing. Installation Category II (over-voltage) in accordance with IEC 664. Pollution Degree 2 in accordance with IEC 664.
Altitude limit: 2,000 meters.
Storage: -25°C to 65°C; 10% to 85% relative humidity.

# Declaration of Conformity

## Declaration of Conformity (-33 models only)

Barnstead|Thermolyne hereby declares under its sole responsibility that this product conforms with the technical requirements of the following standards:

EMC: EN 50081-1 Generic Emission Standard; EN 50082-1 Generic Immunity Standard;

Safety: IEC 1010-1-92 Safety requirements for electrical equipment for measurement,
control, and laboratory use; Part I: General Requirements
IEC 1010-2-010 Part II: Particular requirements for laboratory equipment for the heating of
materials
per the provisions of the Electromagnetic Compatability Directive 89/336/EEC, as amended by 92/31/EEC and 93/68/EEC, and per the provisions of the Low Voltage Directive 73/23/EEC, as amended by 93/68/EEC.

The authorized representative located within the European Community is:

European Manager
Barnstead|Thermolyne
Saarbrückener Str. 248
D-38116 Braunschweig
Germany

Copies of the Declaration of Conformity are available upon request.

# Unpacking

## Unpacking

Unpack furnace from box and remove packing material from inside furnace chamber. The furnace is supplied with a three wire cord and plug & 2-JC211x1 (1") diameter tube mounting vestibules. Furnace does not contain a refractory process tube.



**NOTE**

Contact the dealer from which your furnace was purchased to obtain proper process tube and information regarding its use.

## Installation

**SITE SELECTION:** Install furnace on a sturdy surface and allow space for ventilation.

The electrical specifications are located on the specification plate on the back of the furnace. Consult Barnstead/Thermolyne if your electrical service is different than those listed on the specification plate. Prior to connecting your Type 21100 furnace to your electrical supply, be sure the power or control switch is in the OFF position.



### CAUTION

Be sure ambient temperature does not exceed 104°F (40°C); ambients above this level may result in damage to the control.

Allow at least six inches of space between the furnace and any combustible surface. This permits the heat from the furnace case to escape so as not to create a possible fire hazard.



### NOTE

Furnace comes with both 1" and 2" dia. end caps. Install the end cap which fits the tube you plan to use.



### WARNING

To avoid electrical shock, this furnace must be installed by a competent, qualified electrician who insures compatibility among furnace specification, power source and ground code requirements.

# Operation



**WARNING**

Do not use in the presence of flammable or combustible chemicals. Fire or explosion may result; this device contains components which may ignite such materials.



**HOT SURFACE**

“Caution: Hot Surface. Avoid Contact.” To avoid burns, do not touch this furnace on the exterior or interior surfaces during use or for a period of time after use.



**CAUTION**

Monitor furnace if percent time input is set greater than 40% on and particularly when the control is set on “HI” or in the red zone. The furnace may overheat and burn out the elements or thermocouple if not properly monitored under these conditions.

## Operation of Manual and Automatic Models

**Observe These Warnings Before Operating Your Furnace:**

## Manual Control Models (F21124, F21125, F21120)

The control switch is a combination ON/OFF switch and temperature control. The furnace is ON at any setting of the control switch except in the OFF position. The green power light will be illuminated as long as power is applied. Turn the control switch counterclockwise to set rate of heating.

**Cycle Light:** The amber cycle light will illuminate whenever the power is being applied to the elements.

**Power Light:** The green power light will illuminate whenever the control switch is turned to a setting other than the OFF position.

The marks on the control indicate the percent of time power is applied to the heating elements. An increase in percent time “On” results in a higher chamber temperature. Adjust control switch to maintain desired temperature setting. To turn the furnace off, turn control either fully clockwise or fully counterclockwise to the OFF position.

### Pyrometer

The pyrometer with a thermocouple indicates the chamber temperature. It does not control the furnace in any manner. It is provided to enable the operator to observe the temperature within the chamber.

## NOTE

The temperature control in this automatic models is a single set-point device. By using the “up” or “down” push buttons, a specific temperature can be chosen. The control will cause the furnace chamber to heat to the chosen temperature and hold it at this temperature until you turn off the power switch or select another temperature.

## NOTE

When performing the following steps remember that if more than eight to ten seconds elapse before the buttons are used again, the display screen will automatically switch back to displaying chamber temperature. If this happens, light up the front panel again and step through each parameter until you reach the point at which the interruption occurred. The parameter values you checked earlier, however, will not be lost or altered. Holding down on the scroll button allows longer viewing time.

# Single Set Point Temperature Control (Automatic) (F21130, F21130-33, F21135)

This furnace control consists of a microprocessor based three-mode (Proportional, Integral, Derivative), single set point temperature control. The control features programmable overtemperature protection and thermocouple break protection.

**Power Switch:** Switch power switch to the “ON” position. The switch will illuminate when power is on.

**Cycle Indicator:** The amber “OP” cycle light will illuminate whenever the power is being applied to the heating elements. (See Figure 1).

**Digital Readout**
The digital readout continuously displays chamber (upper display) and set point (lower display) temperatures unless the PAR (parameter) button is depressed.

**Initial Startup:**
When the power switch is turned on, the control will perform a self-test to make sure control is operating properly. (If all four 1’s do not light up or fail to go to “8888,” contact Thermolyne.)

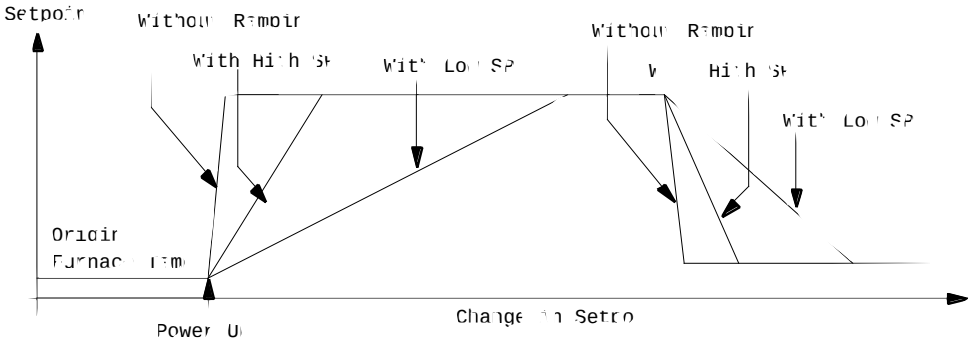
## Adjustment of Parameters (See Figure 1)

To Illuminate “up,” “down,” and “scroll” buttons, touch anywhere on front panel. See Figure 1 “Secret Key.”

**Set Point Temperature**
Push “up” or “down” button to modify temperature set point (lower digital display).

**Temperature Indication**
Push scroll button once. “°C” will appear. This indicates temperature measurement. (Contact Thermolyne if control needs to be changed to °F.)

**Ramp to Set point Operation — SP.rr**
The set point ramp rate is designed to allow a user to reduce the heat-up rate or cooling rate that the furnace normally exhibits. When not using this feature, the furnace will operate at its maximum heat-up rate and cool down capability.




To access SP.rr set point ramp rate:

1. Push scroll button until AL.SP appears.
2. Push Secret Key to enter protected list.
3. Push scroll button until SP.rr (Set point Ramp Rate) appears. SP.rr is expressed in °C/min.

## CAUTION

Do not change any parameters in the “protected list” other than SP.rr. Changing other parameters could result in furnace malfunction.

## NOTE

Remember when setting SP.rr you must stay within the heating and cooling capabilities of the furnace. See specification sheet.

## NOTE

SP.rr must be set to Off if Self Tuning is selected.

If you desire to ramp to the set temperatures at a specified rate, depress “UP” or “DOWN” button to give current setting of ramp rate, then depress “UP” or “DOWN” button again until you achieve desired setting.

The set point ramping feature is started by setting SP.rr to any value except OFF. Ramping is initiated only by one of two conditions:

•Power-up (Upon power-up, ramping always starts from the current furnace temperature.)

•Change in set point.

If you choose not to use the ramp to set point feature, set SP.rr to OFF.

**Tuning**
This control incorporates a self tuning feature which determines the optimum control parameters for the best temperature accuracy. We recommend that you tune the furnace to your specific application to obtain the best results. Perform the following procedures when you first set up your furnace and each time you change your load type or operating temperature.

Push scroll button until “tunE” appears. To start tuning function, push “UP” button. To stop tuning function, push “DOWN” button.

When the tuning process is started, the lower display will flash “tunE” along with the furnace temperature set point. During tuning the temperature set point cannot be changed. To change temperature set point, “tunE” must be turned off.

**Overtemperature Protection**
The control is fitted with a solid-state relay which is de-energized in the alarm mode. If the primary control circuit fails, the OTP will control the furnace temperature at the preset value you have entered. It does not shut off the furnace but will maintain the chamber temperature at that value.

To set the OTP value, depress the scroll button until “AL.SP” (Alarm Set Point) appears. The lower display should indicate 1210°C. Depress either the “UP” or “DOWN” push button to select the OTP value you desire. Thermolyne recommends that you set the value either at the maximum operating temperature of the furnace or a value of 20 degrees above your working temperature if you desire to provide protection for your workload.



**NOTE**

If the power to furnace is turned off or interrupted while in “tuning,” upon returning power to furnace, the controlled display will indicate “LINE FAIL” because sample data could be questionable. To restart tuning, refer to “Tuning” procedure.

If the control cannot maintain temperature set point, “tunE FAIL” will appear on display. First correct problem for not maintaining temperature set point, then restart tuning.

# Furnace Loading

## Furnace Loading

For best results of furnace loading and temperature uniformity, use only the center six inches  of the furnace chamber.



**CAUTION**

Do not overload your furnace chamber. Failure to observe this caution could result in damage to furnace components.

Keep objects away from thermocouple.

Use insulated tongs and mittens when loading and unloading furnace.

Always wear safety glasses.

Use the proper process tube.

# Preventative Maintenance



**WARNING**

To avoid electrical shock, this furnace must always be disconnect from the power supply prior to maintenance and servicing.

Refer servicing to qualified personnel.

## Preventive Maintenance

Contamination is a major cause of element failure, therefore, when possible, remove the fume forming material before heating. (e.g., cleaning cutting oil from tool steel).

Housekeeping is vital to your electric furnace—KEEP IT CLEAN! Run your furnace up to 871°C empty occasionally to burn off the contamination that may exist on the insulation and elements. Run for approximately two hours with the process tube removed.

Element life is reduced somewhat by repeated heating and cooling. If the furnace is to be used again within a few hours, it is best to keep it at the operating temperature or at a reduced level such as 260°C.

During normal use the thermocouple in your furnace can become oxidized and cause inaccurate readings; therefore, we suggest that if you regularly use your furnace **you should change your thermocouple once every six months to assure the accuracy of your meter readings**.

## General Cleaning Instructions

Wipe exterior surfaces with lightly dampened cloth containing mild soap solution.

# Troubleshooting

## Troubleshooting

### WARNING

THIS FURNACE CONTAINS REFRACTORY CERAMIC INSULATION WHICH CAN PRODUCE RESPIRABLE FIBERS AND DUST WHEN HANDLED. THESE FIBERS CAN CAUSE IRRITATION AND CAN AGGRAVATE PRE-EXISTING RESPIRATORY DISEASE. THE INTERNATIONAL AGENCY FOR RESEARCH ON CANCER (IARC) HAS CLASSIFIED REFRACTORY CERAMIC FIBER AS POSSIBLY CARCINOGENIC.

AFTER SERVICE REFRACTORY CERAMIC FIBER DUST MAY CONTAIN CRYSTALLINE SILICA, WHICH MAY CAUSE LUNG DAMAGE (SILICOSIS) AND WHICH HAS BEEN CLASSED BY IARC AS A PROBABLE CARCINOGEN.

The refractory ceramic materials are located in the hearth collar and in the chamber of the furnace. Tests performed by the manufacturer indicate that there is no significant risk of exposure to dust or respirable refractory ceramic fiber resulting from operation of the equipment under normal conditions. However, there may be a risk of exposure to respirable refractory ceramic dust or fiber when repairing or maintaining the insulating materials, or when otherwise disturbing the materials in a manner which causes release of dust or fibers therefrom. Through the use of proper handling procedures you can work safely with these insulating materials and minimize any exposure. Accordingly, before you repair or replace any insulating materials, or perform any other servicing on this product which could disturb or cause exposure to dust from insulating materials, you should consult the appropriate Material Safety Data Sheets (MSDS's) for such products with respect to proper handling and appropriate protective equipment. For additional MSDS's, or additional information concerning the handling of refractory ceramic products, please contact the Customer Service Department of Barnstead/Thermolyne Corporation.

REFER SERVICING TO QUALIFIED PERSONNEL.

### WARNING

Disconnect from the power supply prior to maintenance and servicing.

Refer servicing to qualified personnel.

The Troubleshooting section is intended to aid in defining and correcting possible service problems. When using the chart, select the problem category that resembles the malfunction. Then proceed to the possible causes category and take necessary corrective action.

| Problem | Possible Causes | Corrective Action |
|---|---|---|
| The power light does not illuminate. | The furnace is not connected to power supply. | Check furnace connection to power supply. |
| No display on Single Set Point Control | ON and OFF power switch defective. | Replace power switch. |
| The furnace does not heat. | No power. | Check power source and fuses or breakers. |
| | Thermocouple is open or thermocouple leads reversed. “SnSr FAIL” will be displayed. | Replace thermocouple or check thermocouple connections. |
| | Single Set Point Control malfunction.“EE FAIL” will be displayed. | Verify and correct all parameters and configuration values. If “EE FAIL” persists, replace control. |
| | Element burned out. “LP.Br” will be displayed. | Replace muffle (element). |
| | Solid state relay defective. | Replace solid state relay. |
| | Chamber section not connected to base. | Reconnect chamber section to base. |
| Slow heatup. | Low line voltage. | Install line of sufficient size and proper voltage. (Isolate furnace from other electrical loads.) |
| | Heavy load in chamber. | Lighten load in chamber to allow heat to circulate. |
| | Wrong heating element. | Install proper element. |
| | Low SP.rr setting. | Increase setting. |

## TROUBLESHOOTING

| Problem | Possible Causes | Corrective Action |
|---|---|---|
| Repeated element burnout. | Overheating furnace. | Keep furnace under maximum temperature. Closer supervision of control setting. |
| | Control malfunction. | Replace control. |
| | Incorrect element. | Install proper element. |
| | Oxidized thermocouple leading to inaccurate reading. | Replace thermocouple. |
| | Wired improperly. | Check wiring diagram for correct wiring of your furnace. |
| Inaccurate temperature readout. | Oxidized or contaminated thermocouple. | Replace thermocouple. |
| | Poor thermocouple connection. | Tighten connections. |
| | Improper loading procedures. | Use proper loading procedures. |
| | Poor ventilation of base. | Clear area around furnace base. |
| | Thermocouple connections reversed. | Reconnect thermocouple correctly. |
| | *Static charge on pyrometer case. | Dispel static charge by breathing on cover, treat for static charge. |
| | Control out of calibration. | Contact Barnstead/Thermolyne |
| | P.I.D. values invalid. | Re-tune control. |
| | Control malfunction. “EE FAIL” will be displayed. | Verify and correct all parameter and configuration values. If “EE FAIL” persists, replace control. |

**Applies to the manual temperature control models.*

# Maintenancing and Servicing

## Maintenance and Servicing

### To Replace Vestibule End Caps

a. Disconnect furnace from power supply.
b Remove the metal end cap.
c. Remove old vestibule. Insert the new vestibule, aligning the two holes in the vestibule with the holes on the bracket.
d. Before pushing the metal end caps back onto the chamber, insert the two screws through the holes in the metal end cap and vestibule. Then, start the two screws into the holes in the bracket two or three turns, push the metal end cap onto the chamber and finish tightening the two screws.
e. Reconnect furnace to power supply.

### To Replace The Heating Element Tube (Without Case Assembly):

a. Disconnect furnace from power supply.
b. Disconnect the cord from furnace chamber to control base. Identify the color and placement of the thermocouple extension wires and disconnect from control base.
c. Remove furnace chamber from the bracket.
d. Remove both end caps and vestibules of furnace chamber.
e. Remove terminal plate with six screws to expose wiring. (Note placement and connection of thermocouple and element wires.)
f. Remove two element lead wires from terminal block. Also, remove thermocouple by removing two screws on block then pulling it straight back.
g. Remove the four screws that secure heating element tube inside the case, then slide out the old heating element tube.
h. Insert new heating element tube and thread each element lead wire through the plastic bushings.
i. Secure heating element tube to case.
j. Reinstall thermocouple and connect thermocouple and new element lead wires to terminal block.
k. Replace terminal plate.
l. Insert the screw on the terminal plate through the mounting bracket and secure with knob.
m. Replace both end caps and vestibules.
n. Reconnect power cord from furnace chamber to control base.

o. Reconnect thermocouple extension wires to control base terminal block. Looking from the rear of the furnace, reconnect the red wire to the terminal on the right side of the block. The yellow wire connects to the terminal on the left side of the terminal block.
p. Reconnect furnace to power supply.

### To Replace Control Base:

a. Disconnect furnace from power supply.
b. Disconnect power cord from control base to furnace chamber. Identify the color and placement of the thermocouple extension wires and disconnect wires from control base.
c. Remove bracket and furnace chamber from control base.
d. Slide the bracket onto the new control base and secure.
e. Plug power cord from furnace chamber into new control base.
f. Reconnect thermocouple extension wires as identified in Step b.
g. Reconnect furnace to power supply.

### To Replace Pyrometer (Manual Control Models)

a. Disconnect furnace from power supply.
b. Disconnect power cord from furnace chamber to control base and disconnect thermocouple extension wires from control base.
c. Turn control base upside down and remove bottom cover.
d. Remove yellow and red wires from pyrometer.
e. Remove pyrometer from dial plate of control base.
f. Insert new pyrometer and secure to dial plate.
g. Slide the yellow wire over the positive terminal as designated by the positive sign (+) on the back of the pyrometer and secure. Slide the red wire over the negative terminal on the pyrometer and secure. (Make sure connections are tight or erroneous readout will result.)
h. Replace bottom cover.
i. Turn control base upright and secure furnace chamber to it.
j. Reconnect power cord from furnace chamber to control base.

k. Looking from the rear of the furnace, reconnect red coded thermocouple extension wire to the terminal on the right side of the terminal block. Reconnect yellow thermocouple extension wire to the terminal on the left side of the terminal block.
l. Reconnect furnace to power supply.



**NOTE**

Perform only maintenance described in this manual. Contact an authorized dealer or our factory for parts and assistance.

### To Replace Manual Temperature Control Switch:

a Disconnect furnace from power supply.
b. Disconnect power cord from furnace chamber to control base and disconnect thermocouple extension wires from control base.
c. Turn control base upside down and remove bottom cover.
d. Remove control knob with two Allen set screws.
e. Remove two screws holding control to dial plate.
f. Disconnect wires from control. Identify or mark wires disconnected from control to insure proper placement and connection when reinstalling. Remove defective control.
g. Looking from the rear of the furnace, insert new control with the $H_1$ (vertical lead) and $H_2$ (horizontal lead) leads on top and secure to dial plate.
h. Turn shaft of control until the flat section is facing up (opposite of the percent time on indicating mark). Slide knob over shaft and align the OFF mark with the percent time on indicating mark. Secure knob with two Allen set screws.
i. Reconnect the wires identified or marked in Step (f) to new control.
j. Replace bottom cover.
k. Turn control base upright and secure furnace chamber to it.
l. Reconnect power cord from furnace chamber to control base.
m. Looking from the rear of the furnace, reconnect the red coded thermocouple extension wire to the terminal on the right side of the terminal block. Reconnect yellow thermocouple extension wire to the terminal on the left side of terminal block.
n. Reconnect furnace to power supply.

### To Replace Furnace Chamber:

a. Disconnect furnace from power supply.
b. Disconnect power cord from furnace chamber to control base. Identify the color and placement of thermocouple extension wires and disconnect from control base.
c. Remove black knob holding furnace chamber to bracket and remove furnace chamber.
d. Remove terminal plate on back of furnace chamber. (Note placement and connection of wires.)
e. Disconnect thermocouple extension wires and power cord from terminal block.
f Remove back terminal plate on new furnace chamber.
g. Insert power cord and thermocouple extension wires through their proper holes in the bracket on the new furnace chamber. (See Figure 2a or 2b for placement and connection of wires.)
h. Replace back terminal plate.
i. Insert screw on back terminal plate through bracket slot and secure with knob.
j Reconnect power cord from furnace chamber to control base.
k. Reconnect thermocouple extension wires as identified in Step b.
l. Reconnect furnace to power supply.

### To Replace Type K (Chromel/Alumel) Thermocouple (Manual Control Models):

a. Disconnect furnace from power supply.
b. Disconnect the cord from furnace chamber to control base and also disconnect thermocouple extension wire from control base.
c. Remove knob that holds furnace chamber to the bracket and remove the furnace chamber.
d. Remove terminal plate on back of furnace chamber.
e. Remove two screws that secure the old thermocouple and remove thermocouple by pulling straight back.
f. Insert the new thermocouple until tip extends approximately 1/4" into the heating chamber. Connect the lead marked (+) on insulator of thermocouple to the terminal across from yellow thermocouple extension wire, and fasten the other thermocouple lead (-) to the remaining terminal. (See Figure 2a or 2b.)

(A polarity test of the lead wire is easily made with the use of a magnet. On chromel/alumel thermocouples and extension wires, the non-magnetic wire is positive (+ ) and the magnetic wire is negative (- ).

g. Replace terminal plate.
h. Insert the screw on the terminal plate through the mounting bracket and secure with knob.
i. Reconnect power cord from furnace chamber to control base.
j. Looking from the rear of the furnace, reconnect the red coded thermocouple extension wire to the terminal on the right side of the block. The yellow thermocouple extension wire connects to the terminal on the left side of the terminal block.
k. Reconnect furnace to power supply.

### To Replace Type Platinel II Thermocouple (Single Set Point Control Models)

a. Disconnect furnace from power supply.
b. Disconnect the cord from furnace chamber to control base and also disconnect thermocouple extension wires from control base.
c. Remove knob that holds furnace chamber to the bracket and remove the furnace chamber.
d. Remove terminal plate on back of furnace chamber.
e. Remove two screws that secure the old thermocouple and remove thermocouple by pulling straight back.
f. Insert the new thermocouple until tip extends approximately 1/4" into heating chamber.
g. Connect the blue and yellow beaded thermocouple lead to the terminal across from yellow thermocouple extension wire and the other thermocouple lead to the remaining terminal.
h. Insert the screw on the terminal plate through the mounting bracket and secure with knob.
i. Reconnect power cord from furnace chamber to control base.
j. Looking from the rear of the furnace, reconnect the red coded thermocouple extension wire to the terminal on the right side of the block. The yellow thermocouple extension wire connects to the terminal on the left side of the terminal block.
k. Reconnect furnace to power supply.

# Replacement Parts List

## Replacement Parts List
## Series 1029

**WARNING**

Replace fuses with same type and rating.

| Part Number | Description | Model Number |
|---|---|---|
| EL211X1B | 120V Element | F21125, F21135 |
| EL662X1A | 100V Element | F21124 |
| EL211X2B | 230V Element | F21120, F21130, F21130-33 |
| TC211X1A | Thermocouple, Chromel/Alumel | All Manual Control Models |
| TC662X1A | Thermocouple, Platinel II | All Electronic SSP Models |
| CN71X47 | Electronic SSP Control | All Electronic SSP Models |
| CNX60 | Manual Control | F21124, F21125 |
| CNX61 | Manual Control | F21120 |
| ME71X4 | Pyrometer | All Manual Control Models* |
| RYX34 | Solid State Relay | All Electronic SSP Models** |
| FZX31 | Fuse, Type ABC, 250V, 8 Amp | F21120 |
| FZX28 | Fuse, Type ABC, 250V, 15 Amp | F21124, F21125 & All Electronic SSP Models |
| FZX61 | Fuse, Type T, 250V, 6.3 Amp | F21130-33 |
| SWX136 | Main Power Switch | All Electronic SSP Models |
| CAX94 | Filter, EMI | F21130-33 |
| CS211X5A | Furnace Chamber Complete, 240V | F21120 |
| CS211X6A | Furnace Chamber Complete, 120V | F21125 |

*All Manual Models — F21120, F21124, F21125

**All SSP (Single Set Point) Models — F21130, F21130-33, F21135

# Ordering Procedures

## Ordering Procedures

Please refer to the Specification Plate for the complete model number, serial number, and series number when requesting service, replacement parts or in any correspondence concerning this unit.

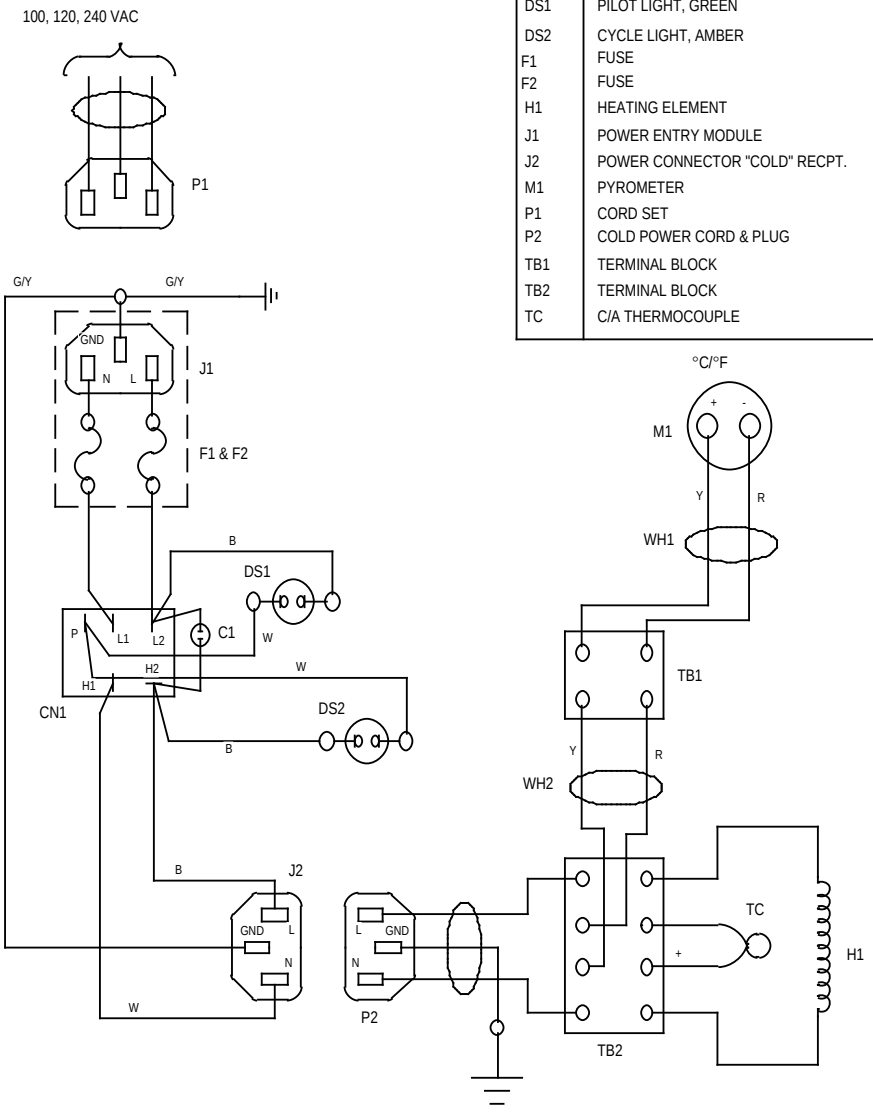
All parts listed herein may be ordered from the **Barnstead|Thermolyne** dealer from whom you purchased this unit or can be obtained promptly from the factory. When service or replacement parts are needed we ask that you check first with your dealer. If the dealer cannot handle your request, then contact our Customer Service Department at 319-556-2241 or 800-553-0039.

Prior to returning any materials to **Barnstead|Thermolyne** Corp., please contact our Customer Service Department for a "Return Goods Authorization" number (RGA). Material returned without a RGA number will be refused.

# Wiring Diagrams

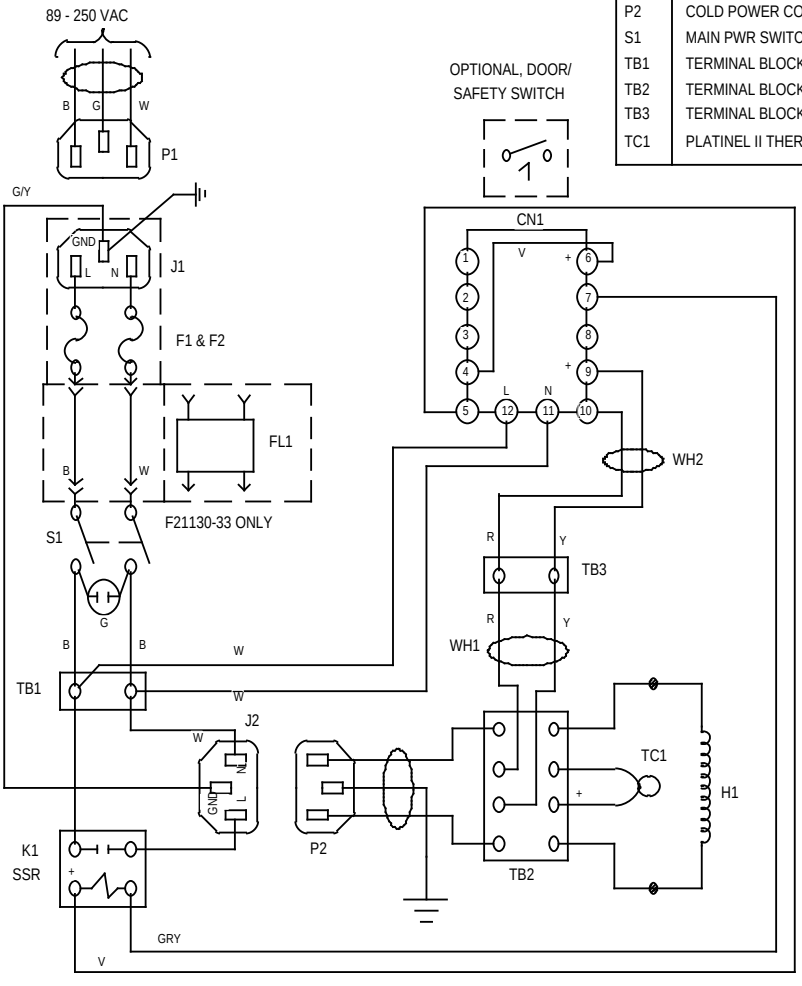
DIAGRAM COMPONENT LIST

| REF. NO. | DESCRIPTION |
|---|---|
| C1 | CAPACITOR |
| CN1 | INPUT CONTROL |
| DS1 | PILOT LIGHT, GREEN |
| DS2 | CYCLE LIGHT, AMBER |
| F1 | FUSE |
| F2 | FUSE |
| H1 | HEATING ELEMENT |
| J1 | POWER ENTRY MODULE |
| J2 | POWER CONNECTOR "COLD" RECPT. |
| M1 | PYROMETER |
| P1 | CORD SET |
| P2 | COLD POWER CORD & PLUG |
| TB1 | TERMINAL BLOCK |
| TB2 | TERMINAL BLOCK |
| TC | C/A THERMOCOUPLE |




***Wiring Diagram for Models F21120, F21124, F21125***

| REF. NO. | DESCRIPTION |
|---|---|
| CN1 | TEMPERATURE CONTROL |
| F1 | FUSE |
| F2 | FUSE |
| FL1 | LINE FILTER |
| H1 | HEATER/CHAMBER |
| J1 | POWER ENTRY MODULE |
| J2 | POWER CONNECTOR, FEMALE |
| K1 | SOLID STATE RELAY |
| P1 | CORD SET |
| P2 | COLD POWER CORD & PLUG |
| S1 | MAIN PWR SWITCH, W/PILOT LIGHT |
| TB1 | TERMINAL BLOCK |
| TB2 | TERMINAL BLOCK |
| TB3 | TERMINAL BLOCK |
| TC1 | PLATINEL II THERMOCOUPLE |




***Wiring Diagram for Models F21130, F21130-33, F21135***

# One Year Limited Warranty

**Barnstead|Thermolyne Corporation** warrants that if a product manufactured by **Barnstead|Thermolyne** and sold by it within the continental United States or Canada proves to be defective in material or construction, it will provide you, without charge, for a period of ninety (90) days, the labor, and a period of one (1) year, the parts, necessary to remedy any such defect. Outside the continental United States and Canada, the warranty provides, for one (1) year, the parts necessary to remedy any such defect. The warranty period shall commence either six (6) months following the date the product is sold by **Barnstead|Thermolyne** or on the date it is purchased by the original retail consumer, whichever date occurs first.

All warranty inspections and repairs must be performed by and parts obtained from an authorized **Barnstead|Thermolyne** dealer or **Barnstead|Thermolyne (at its own discretion)**. Heating elements, however, because of their susceptibility to overheating and contamination, must be returned to our factory, and if, upon inspection, it is concluded that failure is not due to excessive high temperature or contamination, warranty replacement will be provided by **Barnstead|Thermolyne**. The name of the authorized **Barnstead|Thermolyne** dealer nearest you may be obtained by calling 1-800-446-6060 or writing to:

**Barnstead|Thermolyne**
P.O. Box 797
2555 Kerper Boulevard
Dubuque, IA 52004-0797
USA
FAX: (319) 589-0516
E-Mail: mkt@barnsteadthermolyne.com

**Barnstead|Thermolyne's** sole obligation with respect to its product shall be to repair or replace the product. Under no circumstances shall it be liable for incidental or consequential damage.

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