Thermo
SCIENTIFIC

Type 1700 Furnace

OPERATION MANUAL
AND PARTS LIST
Series 85 Gray

Model Numbers

FA1730 & FA1730-1	240 volt	FA1740 & FA1740-1
FA1736 & FA1736-1	480 volt	FA1746 & FA1746-1
FA1738 & FA1738-1	208 volt	FA1748 & FA1748-1

LT85X8 • 5/27/08

Table of Contents

IMPORTANT INFORMATION

This manual contains important operating and safety information. You must carefully read and understand the contents of this manual prior to the use of this equipment.

Safety Information

Alert Signals

Warning
Warnings alert you to a possibility of personal injury.

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

Note
Notes alert you to pertinent facts and conditions.

Your Thermo Scientific Thermolyne Type 1700 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 signals throughout the manual.

Warnings

To avoid electrical shock, this furnace must:

1. Be installed by a competent, qualified electrician who ensures compatibility among furnace specifications, power source and grounding code requirements.

2. Be disconnected from the power supply prior to maintenance and servicing.

3. Have the door switch operating properly.

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 materials.

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

3. Refer servicing to qualified personnel.

Please note the following WARNINGS:

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 preexisting 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 1-800-553-0039.

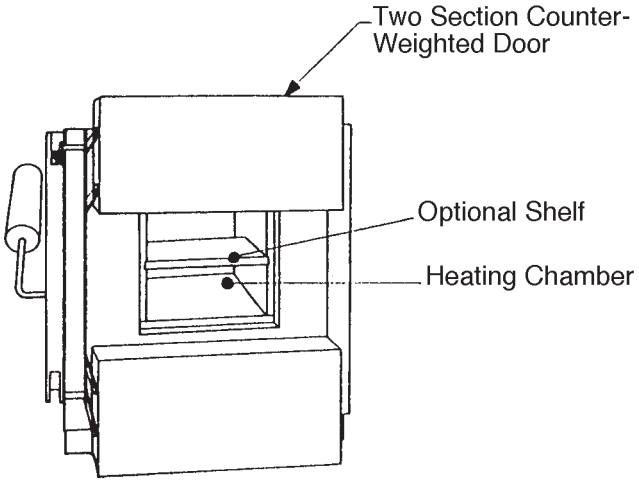

Figure 1: 1700 Furnace

Introduction

Intended Use

The Type 1700 furnace is a large capacity furnace used for both general laboratory procedures and as a heat treating furnace. Standard models are intended for applications requiring temperatures from 300°F (150°C) to 1800°F (982°C) for continuous use, or temperatures from 1800°F (982°C) to 2000°F (1093°C) for intermittent use. High temperature (-1) models are intended for applications requiring temperatures from 300°F (150°C) to 1950°F (1066°C) for continuous use, or temperatures from 1950°F (1066°C) to 2150°F (1177°C) for intermittent use. Continuous use is operating the furnace for more than 3 hours and intermittent use is operating the furnace for less than 3 hours.

The unit consists of 1) a heating chamber, and 2) a two-section counter-weighted door. See Figure 1 for the overall shape and general features of the furnace.

Principles of Operation

The furnace chamber is heated by four electric resistance heaters which are embedded in a special refractory cement. The chamber is insulated with firebrick and ceramic fiber insulation. The furnace incorporates a two-section counter-weighted door to aid inspection and reduce heat loss of furnace chamber. For safety, a door switch is added to remove power from heating elements when the door is opened.

Unpacking

Unpack furnace from box. The door counterweight is included in the box as well as three (3) PHX2 hearth plates. After unpacking the furnace, attach the door handle, tighten set screw and remove packing material from inside furnace chamber. THE TYPE 1700 FURNACES DO NOT COME WITH A POWER CORD BECAUSE CURRENT REQUIREMENTS ARE TOO GREAT TO BE HANDLED BY ORDINARY POWER CORDS AND STANDARD WALL SUPPLY.

Installation

Caution
Space unit six inches from combustible walls under any condition. This permits the heat from furnace case to escape so as not to create a possible fire hazard.

Warning
To avoid electrical shock, this furnace must be installed by a competent, qualified electrician who ensures compatibility among furnace specifications, power source and grounding code requirements.

Caution
For supply connections, use 10 AWG or larger wires suitable for at least 200°C.

Site Selection

Install furnace on a sturdy surface and allow space for ventilation.

The electrical specifications are located on the specification plate on the side of the furnace. Consult Customer Service if your electrical service is different than those listed on the specification plate.

Your 1700 Furnace may be wired either directly through a conduit system or by a flexible cable system which conforms to the National Electrical Codes and electrical code requirements of your area. The terminals to be wired are located on the middle rear of the furnace under the terminal cover. See Wiring Diagrams for wiring locations.

Operation

Note
For correct operation consult the operating instructions for the automatic temperature controller which is intended to be used on this furnace.

Caution
Disconnect from power supply if temperature exceeds 2000°F for standard models or 2150°F for hi-temperature models (-1).

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

Warning
To avoid electrical shock, this furnace must have the door switch operating properly.

Door Safety Switch

The door safety switch removes power from the heating elements when the door is opened. Test door switch to ensure proper operation. If the door switch is not working properly, consult the Troubleshooting section before proceeding. Power is restored to heating elements when the door is closed.

The element wire on high temperature models (-1) is protected at high temperatures by the formation of an aluminum oxide on the surface of the heating element. This oxide layer gives the heating element its strength at high temperatures and prevents contamination from outside sources. Formation of the aluminum oxide takes approximately 8-10 hours of operating at a temperature of at least 1800°F (982°C). Formation of the oxide is relatively critical to the overall life of the heating unit. Any substance coming in contact with the heating element and preventing formation of the oxide will cause premature failure.

Furnace Loading

Caution
Do not overload your furnace chamber. If the load is to be heated uniformly, it should not occupy more than two-thirds of any dimension of the chamber. Failure to observe this caution could result in damage to furnace components.

For best results of furnace loading, use less than two-thirds of any dimension of the chamber. Place load on hearth plate (PHX2) if not using shelf (PH42X1). Maintain 3/4” - 1” clearance between load and side heating elements.

- If you are heating a number of small parts, spread them throughout the middle two-thirds of the chamber.
- Keep objects away from thermocouple.
- Block up load with small pieces of ceramic, use hearth plate or shelf. Refer to Replacement Parts list.
- Use insulated tongs and mittens when loading and unloading furnace.
- Always wear safety glasses.

Maintenance and Servicing

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

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

Warning

Please note the following WARNINGS:

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 preexisting 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).

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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 electrical furnace—KEEP IT CLEAN! Run your furnace up to 1600°F empty occasionally for 3-4 hours to burn off the contamination that may exist on the insulation and elements.

- 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 500°F (260°C).

Note
To avoid damaging good elements: High temperature element wire becomes very brittle after being heated (-1 models). Heating the wires with a soldering iron or small torch will soften the wire. The straighten the element leads with a rounded nose pliers. Never nick or gouge the element wire!

To Replace Heating Element

a. Disconnect furnace from power supply.

b. Remove back terminal cover.

c. Loosen the nut on the terminals of the element to be replaced. (Note placement and connection of wires.) Corroded hardware should be replaced to ensure proper electrical connections.

d. Straighten the leads of the old element.

e. Open the door and pull the defective element out.

f. Slide the new element into place, threading the leads through the insulating bushing in the back of the furnace.

9. Bend the elements across the “U” shaped terminal clamp washer. Replace the adjacent element lead across the washer. Put the terminal clamp washer over the element leads and tighten the nut securely. Cut off any excess lead wire. (See Figure 2.) Use rounded nose pliers to bend the new wires in place. Never nick or gouge the element wire!

h. Replace the back terminal cover.

i. Reconnect furnace to power supply.

Caution
Thermocouple must be matched with the controller! Temperature run-away may occur if the incorrect thermocouple is used. Contact Customer Service with model number and serial number of the furnace and controller to ensure the proper thermocouple is obtained.

To Replace Thermocouple (Type F) Platinell II - Supplied with Thermolyne Controllers

a. Disconnect furnace from power supply.

b. Remove the back terminal cover of the furnace with four screws. (Note placement and connection of wires.)

c. Loosen the screws holding thermocouple to terminal block and pull out the old thermocouple from the porcelain insert.

d. Insert the new thermocouple into the porcelain insert.

e. Insert the thermocouple lead tagged (colored bead on the lead) positive (+) into the terminal on the block marked positive(+).

f. Insert the remaining thermocouple lead into the terminal on the block marked negative (-). Tighten set screws securely.

g. Replace back terminal cover.

h. Reconnect furnace to power supply.

Note
If insulation needs to be replaced, contact Customer Service.

To Replace Door Switch

a. Disconnect furnace from power supply.

b. Remove the door counterweight by removing set screw and pulling.

c. Remove the four screws from door switch cover and slide cover off.

d. Remove the two screws from door switch and desolder its two wires.

e. Insert new door switch and secure.

f. Resolder wires to new door switch.

g. Replace cover.

h. Replace door counterweight.

i. Reconnect furnace to power supply.

Troubleshooting

The Trouble Shooting Tips 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 connections to power source.
	Controller malfunction.	See troubleshooting section in controller instructions.
	Furnace door is not fully closed.	Close furnace door.
	Door switch malfunction.	Realign or replace door switch.
The furnace does not heat.	No power.	Check power source and fuse.
		Defective electrical hook-up. Repair electrical hook-up.
	Controller malfunction.	See troubleshooting section in controller instructions.
	Door switch malfunction.	Realign or replace door switch.
	One or more heating elements in 480V furnace are burned out.	Replace burned out elements.
	Two or more heating elements in 208V or 240V furnace are burned out.	Replace burned out elements.
Slow heat-up.	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 and allow heat to circulate.
	Wrong heating element.	Install proper element.
	One or two heating elements in 208V or 240V furnace are burned out.	Replace burned out elements.

Temperature erratic or no control over temperature.	Controller malfunction.	See troubleshooting section in controller instructions.
	Incorrect thermocouple.	Check controller instructions for correct thermocouple type.
Door switch does not cut power to furnace chamber.	Door switch malfunction.	Realign or replace door switch.
Repeated element burn-out.	Overheating furnace.	Keep furnace under maximum temperature. Closer supervision of control setting.
	Heating harmful materials.	Enclose material in container. Clean up spills in chamber. Ventilate chamber by leaving door cracked slightly open when heating known harmful reagents.
	Controller malfunction.	See troubleshooting section in controller instructions.
	Wrong element.	Install proper element.
	Oxidized thermocouple.	Replace thermocouple.
	Contamination present from previous burn out.	Call Customer Service.
Inaccurate temperatures.	Incorrect thermocouple.	Check controller instructions for correct thermocouple type.
	Oxidized or contaminated thermocouple.	Replace thermocouple.
	Controller malfunction.	See troubleshooting section in controller instructions.
	Poor thermocouple connection.	Tighten connections.
	Improper loading.	Use proper loading procedures.
	Poor ventilation of controller.	Clear area around furnace controller.
	Thermocouple or thermocouple extension wires have reversed polarity.	See thermocouple installation.

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 **Thermo Scientific** 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 563-556-2241 or 800-553-0039.

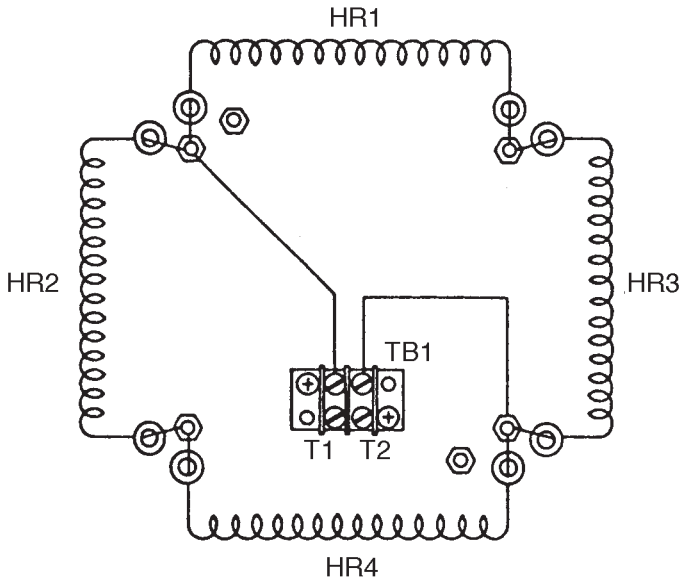
Prior to returning any materials, please contact our Customer Service Department for a “Return Materials Authorization” number (RMA). Material returned without an RMA number will be refused.

Replacement Parts List

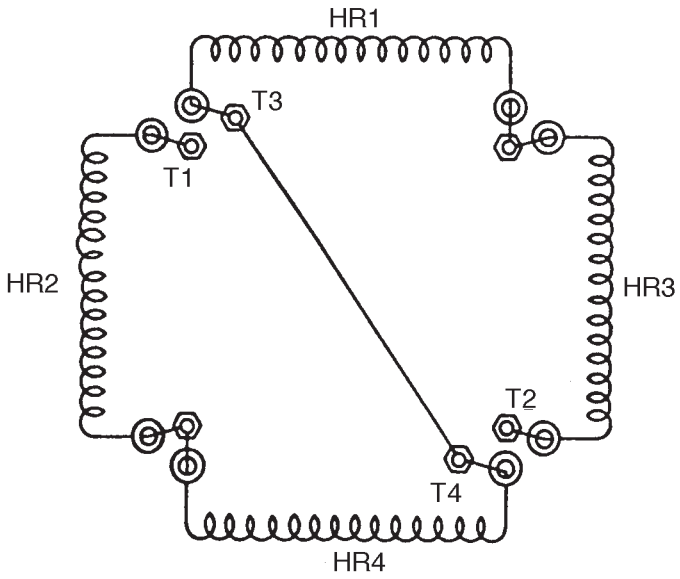
Series 85 Gray Heating Elements

Top/Bottom	EL9X1 (2 required)	(FA1730, FA1736)
	EL9X3 (2 required)	(FA1740, FA1746)
	EL9X5 (2 required)	(FA1738)
	EL9X7 (2 required)	FA1748)
	EL9X9 (2 required)	FA1730-1, FA1736-1)
	EL9X11 (2 required)	FA1740-1, FA1746-1)
	EL9X13 (2 required)	FA1738-1)
	EL9X15 (2 required)	(FA1748-1)
Side	EL9X2 (2 required)	(FA1730, FA1736)
	EL9X4 (2 required)	(FA1740, FA1746)
	EL9X6 (2 required)	(FA1738)
	EL9X8 (2 required)	(FA1748)
	EL9X10 (2 required)	(FA1730-1, FA1736-1)
	EL9X12 (2 required)	(FA1740-1, FA1746-1)
	EL9X14 (2 required)	(FA1738-1)
	EL9X16 (2 required)	(FA1748-1)
Doors	DR85X3A	Bottom, insulated & painted (All models) Gray
	DR85X3B	Top, insulated & painted (All models) Gray
Door Safety Switch Ass'y	PT219X3C	Switch mounted on plate (All models)
Switch	SWX19	Switch only
Optional Shelf	PH42X1	See Fig. 1
Hearth Tray	PHX2	3 7/8" X 8" Covers bottom heating element. Use to elevate load/protect element. (3 supplied with furnace.)
Patching Cement	JC71X7	Premix Cement to patch insulation. Sold by the pound.

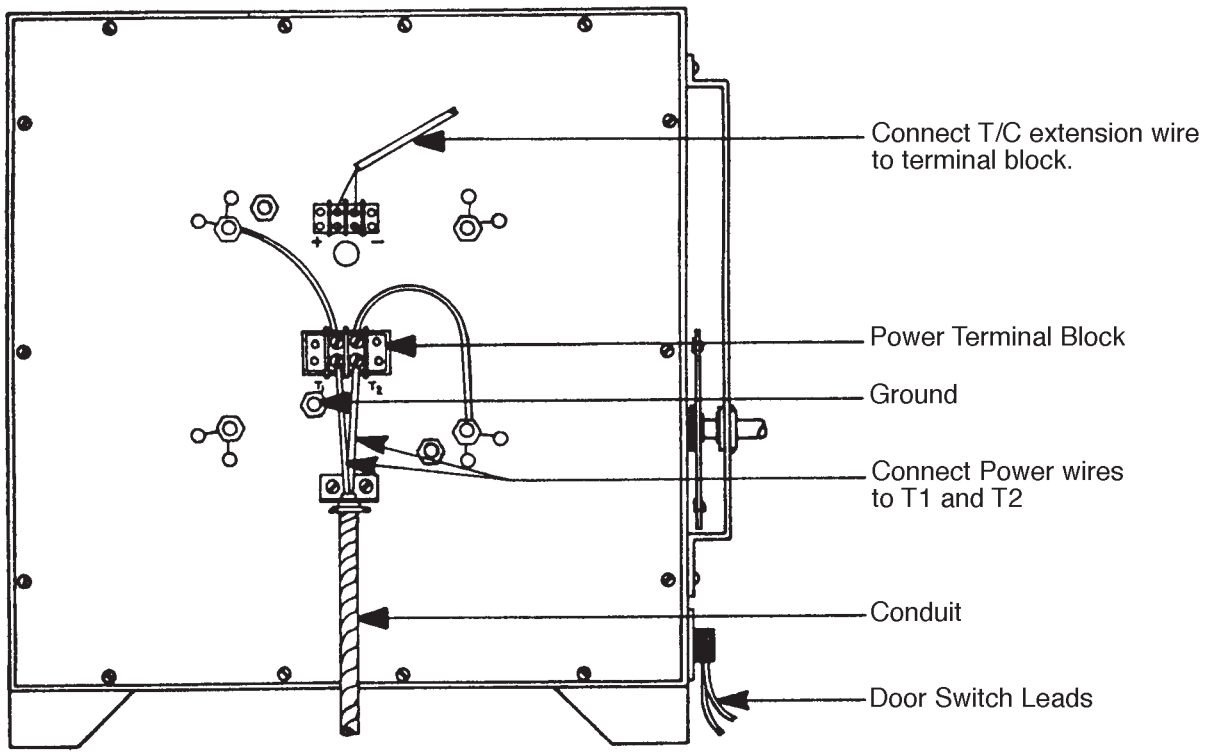
Wiring Diagrams



Back Wiring of 208 & 240 Volt 1700 Low & High Temp. Furnaces

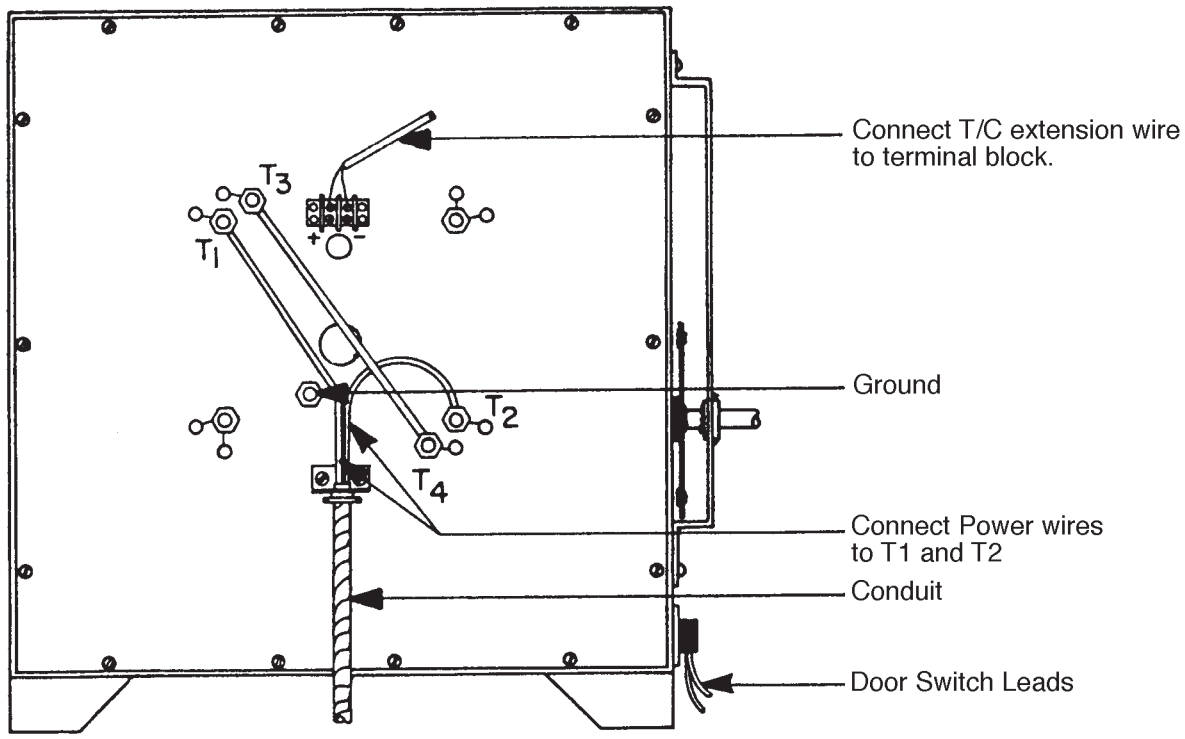


Back Wiring of 408 Volt 1700 Low & High Temp. Furnaces
Figure 2



Back Wiring of 208 & 240 Volt 1700 Low & High Temp. Furnaces

Figure 3



Back Wiring of 1736/46 Low & High Temp. Furnaces

Figure 4

One Year Limited Warranty

This Thermo Scientific product is warranted to be free of defects in materials and workmanship for one (1) year from the first to occur of (i) the date the product is sold by the manufacturer or (ii) the date the product is purchased by the original retail customer (the "Commencement Date"). Except as expressly stated above, the MANUFACTURER MAKES NO OTHER WARRANTY, EXPRESSED OR IMPLIED, WITH RESPECT TO THE PRODUCTS AND EXPRESSLY DISCLAIMS ANY AND ALL WARRANTIES, INCLUDING BUT NOT LIMITED TO, WARRANTIES OF DESIGN, MERCHANT ABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

An authorized representative of the manufacturer must perform all warranty inspections. In the event of a defect covered by the warranty, we shall, as our sole obligation and exclusive remedy, provide free replacement parts to remedy the defective product. In addition, for products sold within the continental United States or Canada, the manufacturer shall provide free labor to repair the products with the replacement parts, but only for a period of ninety (90) days from the Commencement Date.

The warranty provided hereunder shall be null and void and without further force or effect if there is any (i) repair made to the product by a party other than the manufacturer or its duly authorized service representative, (ii) misuse (including use inconsistent with written operating instructions for the product), mishandling, contamination, overheating, modification or alteration of the product by any customer or third party or (iii) use of replacement parts that are obtained from a party who is not an authorized dealer of Thermo Scientific products.

Heating elements, because of their susceptibility to overheating and contamination, must be returned to the factory and if, upon inspection, it is concluded that failure is due to factors other than excessive high temperature or contamination, the manufacturer will provide warranty replacement. As a condition to the return of any product, or any constituent part thereof, to the factory, it shall be sent prepaid and a prior written authorization from the manufacturer assigning a Return Materials Number to the product or part shall be obtained.

IN NO EVENT SHALL THE MANUFACTURER BE LIABLE TO ANY PARTY FOR ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, OR FOR ANY DAMAGES RESULTING FROM LOSS OF USE OR PROFITS, ANTICIPATED OR OTHERWISE, ARISING OUT OF OR IN CONNECTION WITH THE SALE, USE OR PERFORMANCE OF ANY PRODUCTS, WHETHER SUCH CLAIM IS BASED ON CONTRACT, TORT (INCLUDING NEGLIGENCE), ANY THEORY OF STRICT LIABILITY OR REGULATORY ACTION.

For the name of the authorized Thermo Scientific product dealer nearest you or any additional information, contact us:

2555 Kerper Blvd., Dubuque, Iowa, 52004-0797
Phone: 563-556-2241 or 1-800-553-0039
Fax: 563-589-0516
Web: www.thermo.com