Thomas Scientific

Muffle Furnace

OPERATION MANUAL
AND PARTS LIST
Series 1170

Model	Voltage	Control	Display
5300A15/FD1535M-TS	120V	Single Setpoint Model	°C

LT1170X9 • 5/12/09

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IMPORTANT INFORMATION

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

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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.

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.

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

Your Thomas Scientific 5300A15/FD1535M-TS Muffle Furnace has been designed with function, reliability, and safety in mind. It is the user's responsibility to install it in conformance with local codes. For safe operation, please pay attention to the alert signals throughout the manual.

Warnings

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. Have the door switch operating properly.

To avoid burns, this furnace must:

Not to be touched on the exterior or interior surfaces during use or for a period of time after use.

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. Refer servicing to qualified personnel.

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 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 Thomas Scientific at 1-800-345-2100.

Introduction

Intended Use

The 5300A15/FD1535M-TS furnace is a general laboratory and heat treating furnace. For optimum element life, it is suggested that this furnace be used for applications requiring temperatures from 212°F (100°C) to 2192°F (1200°C). For maximum element life, it is recommended to operate the furnace at temperatures from 212°F (100°C) to 1950°F (1066°C) for continuous use, or temperatures from 1950°F (1066°C) to 2192°F (1200°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) heating chamber, 2) a digital controller and 3) a door interlock relay for user safety.

General Usage

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

Principles of Operation

The furnace chamber is heated by four electric resistance heaters which are embedded in a refractory material. The chamber is insulated with a ceramic fiber insulation. For safety, a door switch is incorporated to remove power from heating elements when door is opened. The furnace chamber is supported by the control section which also houses the electrical connections.

General Specifications

5300A15/FD1535M-TS Model

Dimensions in Inches (cm):

Chamber:	4 (10) W x 3.75 (9.5) H x 9 (22.9) D
Overall:	11 (28) W x 16.5 (42) H x 18 (46) D

Weight: 42 lb. (19 kg)

Electrical Ratings:

Volts:	120
Amps:	18.6
Watts:	2230
Frequency:	50/60
Phase:	1

Temperature:

Operating Range: 100°- 1066°C (212° - 1951°F) continuous
1066°-1200°C (1951 - 2192°F) intermittent

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; 20% to 80% relative humidity.

Unpacking

1. Visually check for any physical damage to the shipping container.
2. Inspect the equipment surfaces that are adjacent to any damaged area.
3. Open the furnace door and remove the packing material from inside the furnace chamber.
4. Attach door handle.
5. Vacuum the chamber prior to use to remove the insulation dust due to shipment.
6. Retain the original packaging material if reshipment is foreseen or required.

The 120V models are not supplied with a power cord because current requirements are too great to be handled by ordinary power cords and standard wall supply.

Installation

Caution
Be sure ambient temperature does not exceed 104°F (40°C). The recommended ambient temperature is 17°C-27°C. Ambients above this level may result in damage to the controller.

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

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

Site Selection

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

Electrical Connections

The electrical specifications are located on the specification plate on the back of the furnace. Consult Thomas Scientific if your electrical service is different than those listed on the specification plate. Prior to connecting your 5300A15/FD1535M-TS furnace to your electrical supply, be sure the two position power switch is in the OFF position.

Your 5300A15/FD1535M-TS furnace may be wired either directly through a conduit system or by using a power cord and plug which conforms to the National Electrical Codes and electrical code requirements of your area. The terminal block to be used in wiring is located on the lower rear of the furnace. For 120V supply connections, use 14 AW or larger wires suitable for at least 105°C (221°F).

Operation

Warning
To avoid personal injury 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: Avoid Contact. To avoid burns, this furnace must not be touched on the exterior or interior surfaces during use or for a period of time after use.

Warning
Always wear safety glasses or a safety shield and high temperature gloves when loading or unloading the furnace. Long sleeved, fire retardant clothing and a fire retardant apron is also recommended.

Warning
To avoid electric shock, the door safety switch must be operating properly.

Power Switch

Both the ON/OFF power switch and the digital display will illuminate when power is switched ON. The furnace will begin to heat to the controller's current setpoint. (See the instructions for your type of controller for information on checking and setting the setpoint.)

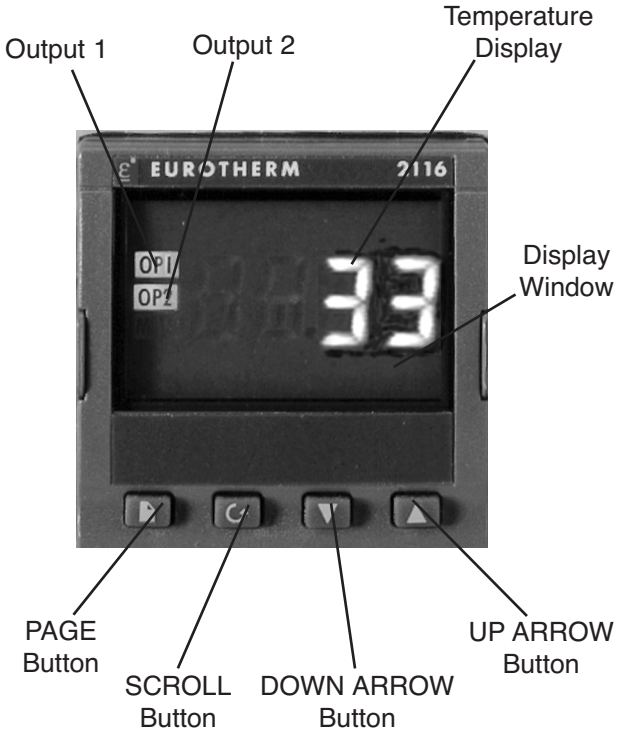
Cycle Light

The amber cycle light will illuminate whenever the power is being applied to the heating elements. The cycle light will flicker on/off as furnace reaches setpoint.

Door Safety Switches

The door safety switches remove power from the heating elements when the door is opened. Open and close the door a few times; note that the amber CYCLE light will be out when door is open. This check must be done when furnace is heating or when cycle light is illuminated. If this condition is not true, consult the Troubleshooting section before proceeding.

Single Setpoint w/OTP



The single setpoint model w/OTP furnace controller provides a single digital display to indicate the current chamber temperature or setpoint temperature. This temperature controller features sensor break protection, self-tuning capability and over temperature protection (OTP) with an additional OTP relay device

Basic Operation

When the controller is turned ON it will perform a short self-test and then display the measured value (process value) in the HOME DISPLAY.

Buttons and Indicators

OP1 (Output 1): Illuminates when the logic output is ON.

OP2 (Output 2): Illuminates when the relay output is ON (will go out during an alarm situation).

PAGE button: Allows you to select a new list of parameters.

SCROLL button: Allows you to select a parameter within a list of parameters.

DOWN button: Allows you to decrease a value.

UP button: Allows you to increase a value.

Note
If at any time you want to return to the HOME DISPLAY, simultaneously press PAGE and SCROLL buttons.

To View or Change the Setpoint

To view the setpoint, press and release the UP or DOWN buttons. If you want to change the setpoint, continue pressing until the desired setpoint value is displayed and then release the button. A few seconds after the button is released, the controller will accept the new value and revert to the HOME DISPLAY.

To View the Display Units

From the HOME DISPLAY press the SCROLL button. The display will show the temperature units in °C/F/K and then return to the HOME DISPLAY. (Call Customer Service if you require a different temperature unit.)

To View the % Output Power

From the HOME DISPLAY press the SCROLL button twice. Press and release the UP or DOWN button to view the % output power. This value is a read-only value and cannot be changed.

Controller Parameters

Home display

°C: Temperature units in Celsius. Temperature units can not be changed without entering the configuration. Contact Customer Service if a different temperature unit is required.

OP: % output power demand.

IdHi: Deviation high alarm. Factory preset to 50°C.

AI List

IdHi: Deviation high alarm. Factory preset to 50°C.

3FSL: Full scale low alarm. Factory preset to -99°C. Cannot be adjusted by end users.

Atun List

tunE: One-shot autotune enable. Factory preset to XX

Pid List

Pb: Proportional band (in display units). Factory preset to 5.0.

ti: Integral time in seconds. Factory preset to 0.48.

td: Derivative time in seconds. Factory preset to 0.08.

ACCS List Code: Access code (Code needed to enter or change the other configuration parameters which are not normally accessible.) Not accessible.

Alarms

The controller will flash an alarm message in the home display if an alarm condition is detected.

2FSH: Measured value full scale high alarm. The full scale high alarm is for furnace protection. The parameter is not accessible from the user list.

Note
3FSL is not a true alarm. The value can be seen in the user list but cannot be changed.

IdHi: Measured value deviation high alarm. The deviation alarm is for load protection. Factory preset at 50°C. If the chamber temperature rises to 50°C above the setpoint temperature, this error condition will alert end users. The furnace will continue to heat as the **IdHi** is only a soft alarm. End users must power off the furnace and contact Customer Service for troubleshooting assistance. Do not reset this alarm below 20.

S.br: Sensor break: check that sensor is connected correctly. Open thermocouple.

L.br: Loop break: check that the heating circuits are working properly.

Ld.F: Heater Circuit fault: indication of either an open or short solid state relay, a blown fuse, missing supply or open circuit heater.

Sensor Break Protection

This controller provides sensor break protection in the event the thermocouple opens. If an open thermocouple condition occurs, the digital display will blink “S.br” and the power to the heating element will be shut OFF (Cycle light will extinguish).

Over-Temperature Protection (OTP)

The OTP will be in effect during any alarm condition when the temperature of the furnace has deviated beyond the limit. The "Deviation High" alarm is the only alarm value which can be changed. To change it, press the SCROLL button until "IdHi" appears on the display. Press the UP or DOWN button to select the OTP value you desire. We recommend a value of 20° above your working temperature to provide protection for your workload.

In addition to over-temperature protection, units containing a single setpoint controller w/OTP feature a mechanical OTP relay device which disconnects power from the elements in an alarm condition.

Note
Furnace must be at ambient temperature before starting a tune.

Tuning

This controller incorporates a self-tuning feature which determines the optimum control parameters for the best temperature accuracy with your load and setpoint. Use this feature the first time you use your furnace and each time you change either your setpoint or the type of load you are heating. Thomas Scientific recommends you use this feature to provide the best temperature accuracy the controller can attain. To use the tuning feature:

Note
Tune has completed when "tunE" stops flashing on display.

1. Start tuning with the process at ambient temperature. This allows the tuner to calculate the low cutback and high cutback values more accurately.

2. Adjust the setpoint to your desired value.

3. Press the PAGE button until display reads, "Atun."

4. Press the SCROLL button. Display will read, "tunE."

5. Press the UP or DOWN button to select, "on."

6. Simultaneously press the PAGE and SCROLL buttons to return to the HOME DISPLAY. The display will alternately flash between "tunE" and the HOME DISPLAY while tuning is in progress.

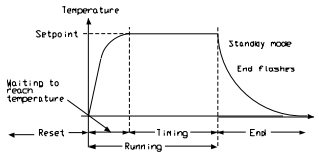
7. The controller will then turn the heating on and off to

induce an oscillation. When the measured value reaches the required setpoint the first cycle will end.

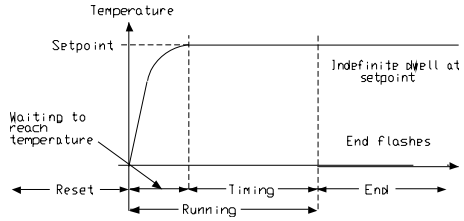
8. Tuning will be complete after two oscillation cycles and then the tuner will turn itself off.

9. Normal control function will resume after the controller calculates tuning parameters.

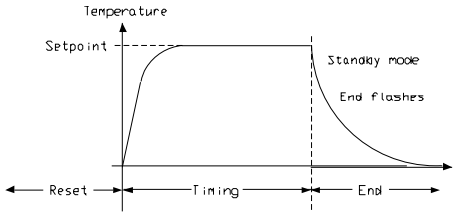
Single Ramp & Dwell



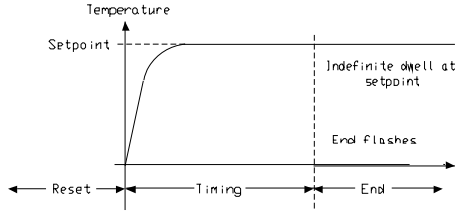
Mode 1 (Opt. 1)



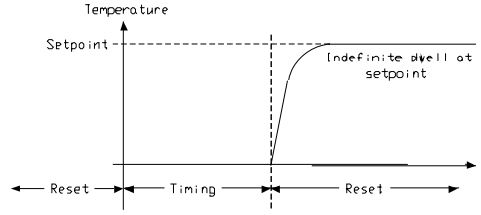
Mode 2 (Opt. 2)



Mode 3 (Opt. 3)



Mode 4 (Opt. 4)



Mode 5 (Opt. 5)

Functions

This type of controller has single ramp and dwell programming capabilities. The Ramp and Dwell can be configured to five different modes.

1. Mode 1 (Opt. 1) is a Ramp (if needed) to the Setpoint temperature, a Dwell, and then a cool down.

2. Mode 2 (Opt. 2) is the same as mode 1, except the controller continues to heat at the Setpoint after the Dwell has completed. (This mode does not cool down.)

3. Mode 3 (Opt. 3) is the same as mode 1, except the Dwell time includes the Ramp (if needed).

4. Mode 4 (Opt. 4) is the same as mode 2, except the Dwell time includes the Ramp (if needed).

5. Mode 5 (Opt. 5) is a Dwell (delay time) before the controller Ramps (if needed) to the Setpoint temperature.

Program Overview

- A program mode can be set by changing the “tm.OP” variable to “Opt. 1, Opt. 2, Opt. 3, Opt. 4, or Opt. 5.

- A Ramp rate may be set by changing the “SPrr” variable to a value. The Ramp rate units are in degrees per minute.

- The Dwell time can be set by changing the “dwEll” variable to the desired value. Dwell time units are in minutes.

- The program Status can be set by changing the “StAt” variable to “run” or “oFF.” This variable will start or stop the program.

Note
The program must be stopped and the controller must be displaying the actual temperature before beginning the Setup.

Program Setup

1. Press the PAGE button until the “SP” is displayed.

2. Press the SCROLL button once, “SPrr” (Ramp Rate) will be displayed, set the desired Ramp rate with the UP or DOWN buttons, if the ramp to setpoint feature is needed. If the Ramp rate is not needed, then set to “OFF” with the UP or DOWN buttons.

3. Press the SCROLL button once, “tm.OP” (Ramp & Dwell mode) will be displayed, select the desired mode with the UP or DOWN buttons. (Opt. 1, Opt. 2, Opt. 3, Opt. 4, Opt. 5)

4. Press the SCROLL button once, “dwEll” will be displayed, set the desired Dwell time with the UP or DOWN buttons. (Dwell in minutes.)

5. Press the PAGE button until the Actual temperature is displayed.

Running the Program

1. Press the SCROLL button until “StAt” is displayed, set to “run” with the UP or DOWN buttons.

2. Press the PAGE button to display Actual temperature.

Stopping the Program

Press the SCROLL button until “StAt” is displayed, set to “oFF” with the UP or DOWN buttons.

Clearing the Flashing End

Press the PAGE and SCROLL buttons at the same time.

Verifying a Running Program

Press the SCROLL button until “StAt” is displayed. The display will show “run” if the program is running, or “oFF” if it is not running. Press the PAGE button to display Actual temperature.

Furnace Loading

Caution
Do not overload your furnace chamber. If the load is to be heated uniformly it should not occupy more than the center two-thirds of the furnace 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. Maintain a 3/4" clearance between the load and the sides of the chamber.
- If you are heating a number of small parts, spread them throughout the center two-thirds of the furnace chamber.
- Keep objects away from thermocouple.
- Raise your load up off the furnace floor with small pieces of ceramic or a hearth plate to promote even heating.
- Use insulated tongs and mittens when loading and unloading furnace.
- Always wear safety glasses.

Preventive Maintenance

Warning
Before using any cleaning or decontamination method except those recommended by Thomas Scientific users should check with Thomas Scientific that the proposed method will not damage the equipment.

Warning
Disconnect the furnace from power supply before cleaning.

Warning
Opening the door for an extended period of time will cause the painted surfaces above the door to be discolored or burnt.

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).

The resistance wire is high-grade nickel-chromium. Some chemicals, notably sulphur, halogens, and cyanides, attack this wire at high temperatures, so avoid spilling these chemicals in the furnace or heating them any hotter than necessary. The refractory cement helps to protect the wire, but will not completely immunize it from damage.

All heating elements must be considered expendable, and replacement is expected; however, reasonable care in their use will greatly extend the service they will give. As the manufacturer has no control over the use or care of the elements, no specific service guarantee can be made.

Housekeeping is vital to your electric furnace—KEEP IT CLEAN! Run your furnace up to 871°C (1600°F) empty occasionally to burn off the contamination that may exist on the insulation and elements. Run for approximately two hours with the door slightly open. See warning.

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 (500°F).

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 controller readings.

General Cleaning Instructions

Wipe exterior surfaces with a dampened cloth and mild soap solution.

Troubleshooting

PROBLEM	POSSIBLE CAUSES	CORRECTIVE ACTION
Cycle light does not illuminate.	The furnace is not connected to power supply.	Reconnect furnace to power supply.
	Incorrect power source.	Connect to correct power source.
	ON and OFF power switch defective.	Replace power switch.
	Defective cycle light.	Replace cycle light.
	Door switch malfunction.	Realign or replace furnace door safety switch.
Furnace does not heat.	No power.	Check power source and fuses or breakers.
	Defective electrical hookup.	Repair electrical hookup.
	Thermocouple has oxidized and opened the circuit.	Replace thermocouple.
	Controller malfunction.	Replace controller.
	Heating elements burned out.	Replace defective elements.
	Solid state relay defective.	Replace solid state relay.
	Door switch malfunction.	Re-align or replace door switch.
	Defective OTP relay.	Replace relay.
	Defective solid state relay.	Replace relay.
Door switch does not cut power to heating elements.	Door switch not functioning	Realign or replace door safety switch.
Controller over-temp. does not cut power to furnace chamber.	Alarm output device malfunction.	Replace controller.
	OTP relay malfunction.	Replace relay.
	Element shorted to ground.	Replace faulty element.

PROBLEM (cont.)	POSSIBLE CAUSES (cont.)	CORRECTIVE ACTION (cont.)
Slow heatup.	Low line voltage. proper voltage. (Isolate furnace from other electrical loads.)	Install line of sufficient size and
	Wrong heating element.	Install proper element.
	Heating element burned out.	Replace element.
	Heavy load in chamber.	Lighten load in chamber to allow heat to circulate.
Repeated element burnout.	Overheating furnace.	Keep furnace under maximum temperature. Closer supervision of control setting.
	Heating harmful materials.	Enclose material in container. Clean up spills in and on chamber. Ventilate chamber by leaving top vent slightly open when heating known harmful reagents.
	Contamination present from previous burnout.	Replace insulation material.
Inaccurate temperature readout.	Oxidized or contaminated thermocouple.	Replace thermocouple.
	Poor thermocouple connection.	Tighten connections.
	Improper loading procedures.	Use proper loading procedures.
	Poor ventilation of control.	Clear area around furnace control.
	Thermocouple connections reversed.	Reconnect thermocouple correctly.

Maintenance and Servicing

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

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

Refer servicing to qualified personnel.

To Replace a Heating Element

1) Disconnect furnace from power supply.

2) Remove back terminal cover.

3) Loosen the nuts on the terminals of the element to be replaced.

4) Straighten the leads of the old element.

5) Open the door and pull the defective element out. (It may be easiest to turn the furnace so that the element to be removed is on top.)

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

7) Reverse the disassembly procedure, making sure you thread all element lead wires through the insulating porcelain bushings on the back of the furnace and cut off any excess element lead wire after securing the leads to the terminal points.

8) Replace the back terminal cover.

9) Reconnect furnace to power supply.

10) Test the operation of the furnace.

To Replace the Platinel II Thermocouple:

1) Disconnect the furnace from power supply.

2) Remove the back terminal cover. (Note placement and connection of wires.)

3) Remove the screw and washer from clip holding the thermocouple in place and remove the nuts and washers on the thermocouple terminals.

4) Remove the thermocouple.

Note
Pull the thermocouple straight out of the hole in the chamber to avoid damage to the insulation.

5) Insert the new thermocouple straight through hole in the chamber until the tip extends approximately 1" into the chamber. Make sure the thermocouple lead wire with the colored bead is connected to the terminal marked positive.

6) Secure the thermocouple extension wires to the terminals (yellow to +).

7) Secure the thermocouple with clip, screw and washer.

8) Replace the back cover.

9) Reconnect furnace to power supply.

10) Test the operation of the furnace.

To Replace Door Switch (Micro-Switch)

1) Disconnect the furnace from power supply.

2) Remove the screws from the front dial and the three bottom screws and lock washers on the back cover of the control section.

3) Remove the back terminal cover.

Note
Do not pull excessively on the internal wires.

4) Disconnect the two wires on terminals T1 and T2 going to the control section.

5) Slide the control section forward.

6) Remove two screws and nuts from the door switch and slide the switch from the wire rod.

7) Disconnect the wires from the door switch. Identify or mark the wires disconnected to insure proper placement and connection when reinstalling.

8) Reconnect the wires identified or marked in step 7 to the new door switch.

9) Install the new door switch while sliding it over the wire rod and secure with the screws and nuts removed in step 6.

10) Slide the control section back and replace the screws and lock washers described in step 2.

11) Connect wire marked T1 to terminal T1 and wire marked T2 to terminal T2 with nuts removed in step 4.

12) Replace the back terminal cover with screws and lock washers removed in step 3.

13) Test operation of door switch. (See next section “To Realign Door Switches” step 5.)

14) Reconnect to power supply.

Note
Center the rod from front to back of hole in control case before tightening screws.

To Realign Door Switches

1) Disconnect the furnace from power supply.

2) Loosen the setscrew on the cam. Open the door approximately 1” and rotate the cam counterclockwise until you hear a click then rotate the cam clockwise until you hear a click, tighten the set screw on adjusting cam.

3) Open and close the door; the switch should click when the door is opened approximately 2” and 1” to 2” before the door is closed.

4) Reconnect to power supply.

5) To test the operation of the door switch: turn the power switch on, set the control to a setting high enough to keep the control from cycling, open and close the door; the cycle light should turn OFF when the door is opened approximately 2” and turn back ON 1” to 2” before the door is closed.

To Replace the Controller

The controller plugs into a panel mounting sleeve, which should be left permanently installed in the furnace housing. To remove the controller, release the side clips and slide the controller out. Do not attempt to dismantle this unit further; replace it with a Thomas Scientific loaner or a new unit.

Replacement Parts

Part Number	Description
0165A38	Heating Element, Top or Bottom
0165A39	Heating Element, Sides
0165A86	Platinel II Thermocouple
0165A71	Solid State Relay
0165A73	Mechanical Relay (120V)
0165A81	Door Switch
0165A30	Temperature Control, Single Setpoint
0165A78	Power Switch (100-120 volt)
0165A68	Cycle Light (100-120 volt)
0165A34	Door Only (Insulated)
0165A94	Hearth Plate
0165A35	Door Assembly (includes handle and hinge)
0165A70	Terminal Plate with Insulators
0165A91	Terminal Block

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.

Wiring Diagrams

Single Setpoint w/OTP Control

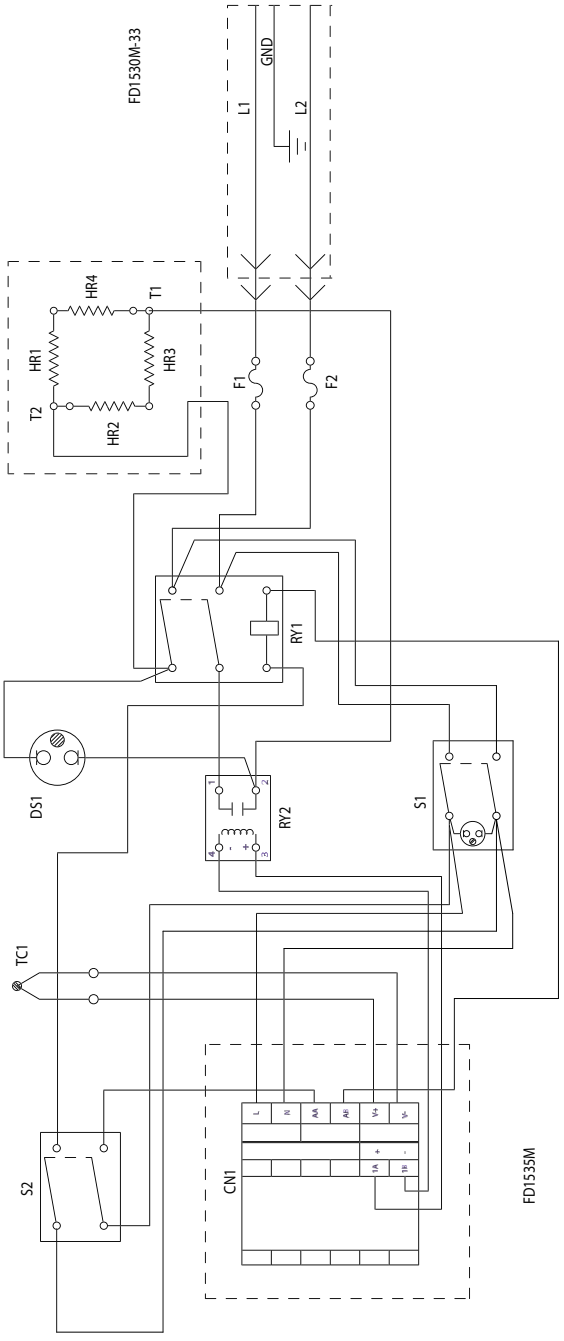


DIAGRAM COMPONENT LIST

REF. NO.	DESCRIPTION	MODEL NO. AND OUR PART NO.(S)
		FD1535M-TS
CN1	CONTROLLER	CN71X99
DS1	CYCLE LIGHT	PLX76
F1	FUSE	FZX63
F2	FUSE	FZX63
HR1	HEATING ELEMENT	EL11X11
HR2	HEATING ELEMENT	EL11X12
HR3	HEATING ELEMENT	EL11X11
HR4	HEATING ELEMENT	EL11X12
RY1	RELAY, DPST, N.O.	RYX56
RY2	RELAY, SOLID STATE	RYX34
S1	SWITCH, POWER	SWX143
S2	SWITCH, DOOR	SWX78
TB1	TERMINAL BLOCK	TRX39
TC1	THERMOCOUPLE	TC408X1A

Warranty Repair and Service

In addition to manufacturer warranties, Thomas Scientific (the Company) warrants all instruments and equipment (other than supplies, small items, reagents and chemicals) delivered to and retained by their original purchasers to be free from defect in material and workmanship for one year from the date of the Company's invoice to the purchaser (Thomas Scientific makes no warranty with respect to consumable parts or supplies). For a period of one year from the date of such invoice, the Company will correct, either by repair or replacement at the Company's sole election, any defect in material or workmanship (not including defects due to misuse, abuse, abnormal conditions or operation, accident, alteration, improper installation, acts of God, or service or modification of the product without prior authorization of the Company) without charge for labor, parts or shipment of the product to and from the service facility designated by the Company. Manufacturer warranties that extend beyond this 1-year period are the sole responsibility of the manufacturer.

The determination of whether any product has been subject to misuse or abuse will be made solely by the Company. The Company shall not be liable for any delay in performance under this warranty caused by any contingency beyond the Company's control, including war, government restrictions, strikes, acts of God, or reduced supply of materials. The Company shall not be liable for any special, incidental, or consequential damages, or any damage to plant, personnel, equipment or products, directly or indirectly resulting from the use or misuse of any product. Representations and warranties made by any person, including dealers and representatives of the Company which are inconsistent, in conflict with or in excess of the terms of this warranty shall not be binding upon the Company unless placed in writing and approved by an officer of the Company.

This warranty and all claims hereunder shall be governed by the laws of the State of New Jersey, United States of America.

The foregoing warranty is in lieu of all other warranties, guarantees, or representations, whether oral, written or implied, including any warranty of merchantability or fitness for use or purpose.

The Company's liability under this warranty or otherwise with respect to products of their use (including liability for negligence or otherwise in tort) is limited exclusively to the remedies provided herein and no other right or remedy shall be available to any person.

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