



CONSTANT
TEMPERATURE OVEN
MICROPROCESSOR
CONTROLLED

FLOOR MODELS:
FX14-2 & FX28-2

INSTALLATION AND OPERATIONAL MANUAL

Sheldon Manufacturing Inc. P.O. Box 627 Cornelius, Oregon 97113
EMAIL: tech@Shellab.com INTERNET: <http://www.Shellab.com/~Shellab>
1-800-322-4897 (503) 640-3000 FAX (503) 640-1366



LAB Online Exhibition

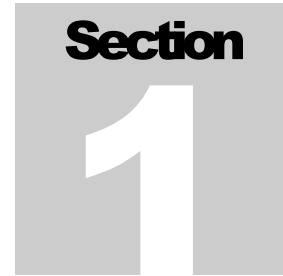


TABLE OF CONTENTS

SECTION 1.0	RECEIVING AND INSPECTION
SECTION 2.0	GRAPHIC SYMBOLS
SECTION 3.0	INSTALLATION
SECTION 4.0	PRECAUTIONS
SECTION 5.0	CONTROL PANEL OVERVIEW
SECTION 6.0	OPERATION
SECTION 7.0	MAINTENANCE
SECTION 8.0	TROUBLESHOOTING
SECTION 9.0	PARTS LIST
	UNIT SPECIFICATIONS
	SCHEMATICS

REV. 01/04
4861581

These units are general purpose air ovens for professional, industrial or educational use where the preparation or testing of materials is done at approximately atmospheric pressure and no flammable, volatile or combustible materials are being heated. These units are not intended for hazardous or household locations or use.











RECEIVING AND INSPECTION

Your satisfaction and safety require a complete understanding of this unit. Read the instructions thoroughly and be sure all operators are given adequate training before attempting to put the unit in service. **NOTE: This equipment must be used only for its intended application; any alterations or modifications will void your warranty.**

- 1.1 Inspection:** The carrier, when accepting shipment, also accepts responsibility for safe delivery and is liable for loss or damage. On delivery, inspect for visible exterior damage, note and describe on the freight bill any damage found, and enter your claim on the form supplied by the carrier.
- 1.2** Inspect for concealed loss or damage on the unit itself, both interior and exterior. If necessary, the carrier will arrange for official inspection to substantiate your claim.
- 1.3 Return Shipment:** Save the shipping crate until you are sure all is well. If for any reason you must return the unit, first contact your customer service representative for authorization. Supply nameplate data, including model number and serial number.
- 1.4 Accessories:** Verify that all of the equipment indicated on the packing slip is included with the unit. Carefully check all packaging before discarding. The HX14-2 are equipped with 3 shelves, 12 shelf clips and 4 leveling feet. The FX28-2 is equipped with 6 shelves, 24 shelf clips and 4 leveling feet.

GRAPHIC SYMBOLS

Your oven is provided with a display of graphic symbols which should help in identifying the use and function of the available user adjustable components.

- 2.1  This symbol indicates that you should consult your manual for further description or discussion of a control or user item.
- 2.2  Indicates “**AC Power**”
- 2.3  Indicates “**Manual Control**”
- 2.4  Indicates “**Timer**”
- 2.5 $^{\circ}\text{C}$ Indicates “**Degrees Celsius**”
- 2.6  Indicates “**Temperature**”
- 2.7  Indicates “**Over Temperature Safety**”
- 2.8  Indicates “**Earth Ground**”
- 2.9  Indicates “**Potential Shock Hazard**” behind partition

INSTALLATION

Local city, county or other ordinances may govern the use of this equipment. If you have any questions about local requirements, please contact the appropriate local agency. Installation may be performed by the end user. Under normal circumstances this unit is intended for use indoors, at room temperatures between 5° and 40°C, at no greater than 80% Relative Humidity (at 25°C) and with a supply voltage that does not vary by more than 10%. Customer service should be contacted for operating conditions outside of these limits.

Installation of the FX28-2 requires hard wiring and should be performed by a qualified electrical technician. The next higher circuit breaker value above the data plate amperage may be used provided the requirements in article 422 of the National Electric Code are met (USA). The FX14-2 can be installed by the end user without a technician.

- 3.1 Power Source:** The electrical supply circuit to the oven must conform to all national and local electrical codes. Consult the incubator's serial data plate for the voltage, cycle wattage and ampere requirements before making connection. **VOLTAGE SHOULD NOT VARY MORE THAN 10% FROM THE SERIAL PLATE RATING.** This unit is intended for 50/60 Hz application. A separate circuit is recommended to prevent possible loss of product due to overloading or failure of other equipment on the same circuit.
- 3.2 Location:** When selecting a site for the oven, consider all conditions which may affect performance, such as extreme heat from steam radiators, stoves, ovens autoclaves, etc. Avoid direct sun, fast-moving air currents, heating/cooling ducts, and high traffic areas. To ensure air circulation around the unit allow a minimum of 5cm between the unit and any walls or partitions which might obstruct free airflow.
- 3.3 Lifting / Handling:** These units are heavy and care should be taken to use appropriate lifting devices that are sufficiently rated for these loads. Units should only be lifted from their bottom surfaces. Doors, handles and knobs are not adequate for lifting or stabilization. The unit should be completely restrained from tipping during lifting or transport. All moving parts, such as shelves and trays should be removed and doors need to be positively locked in the closed position during transfer to prevent shifting and damage.
- 3.4 Leveling:** The unit must sit level and solidly. Leveling feet are supplied and must be installed in the four holes in the bottom corners of the unit. With the unit

standing upright, turn the leveling feet counterclockwise to raise level. If the unit must be moved, turn the leveling feet in all the way to prevent damage.

- 3.5 3.5 Cleaning:** The oven interior was cleaned at the factory, but not sterilized. Remove all interior parts if assembled and clean with a disinfectant that is appropriate to your application. DO NOT USE chlorine-based bleaches or abrasives as this will damage the stainless steel interior. DO NOT USE spray cleaners that might leak through openings and cracks and get on electrical parts or that may contain solvents that will harm the coatings. A similar periodic cleaning is recommended.

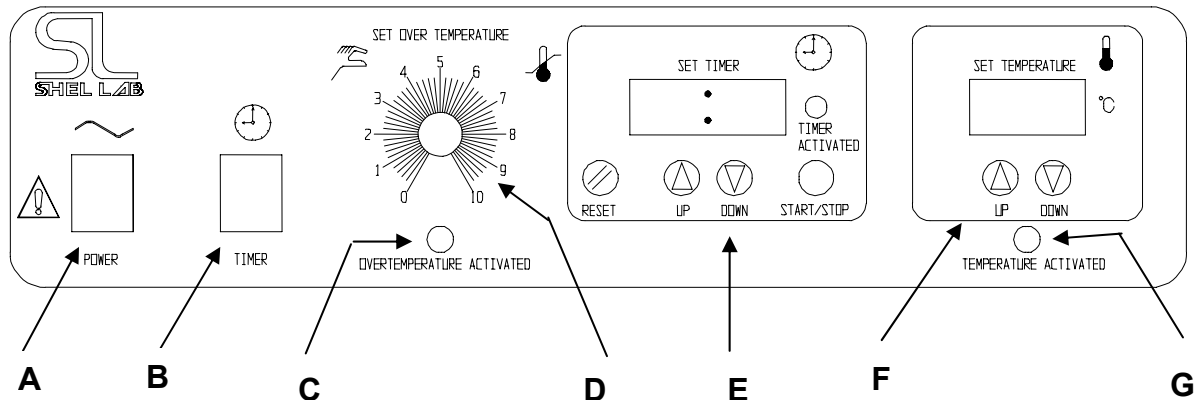
WARNING: Never clean the unit with alcohol or flammable cleaners with the unit connected to the electrical supply. Always disconnect the unit from the electrical service when cleaning and assure all volatile or flammable cleaners are evaporated and dry before reattaching the unit to the power supply.

- 3.5 Burn In:** It is recommended that the unit go through a “burning in” process prior to operation. This is to eliminate the smoking of protective coatings on the element. Read sections 4, 5 and 6 carefully to understand operating requirements. To burn in turn the Overtemperature Safety to maximum and set the digital display to 200°. Run a minimum of one (1) hour until smoke dissipates.

PRECAUTIONS

- 4.1 These units have been designed with dampered vents from the chamber. In order to work effectively and safely, some precautions will need to be taken by the operator.
- A. In most applications, the EXHAUST damper will need to be opened during drying or degassing for best results.
 - B. **THIS OVEN IS NOT DESIGNED TO HANDLE COMBUSTIBLE GASSES AND IS NOT AN EXPLOSION PROOF UNIT. Do not place explosive, combustible, or flammable materials into the chamber.**
 - C. Some of the outgassed by-products may be hazardous or unpleasant to operating personnel. If this is the case, the exhausts should be positively ventilated to the outside and dealt with according to local regulations.
- 4.2 Do not operate near noxious fumes.
- 4.3 Do not place sealed or filled containers in the oven chamber.
- 4.4 Do not cut or remove the ground prong from the power cord.
- 4.5 Be sure that the power supply is of the same voltage as specified.
- 4.6 Disconnect the unit from the electrical source before proceeding to make any electrical repairs or replacements.
- 4.7 If a mercury thermometer is used and breakage should occur, all spilled mercury **MUST** be completely removed from the chamber before continuing operation.
- 4.8 This oven is **NOT** designed for use in Class I, II, or III locations as defined by the National Electrical Code.
- 4.9 This oven is not intended, nor can it be used, as a patient connected device.

CONTROL PANEL OVERVIEW



- A. Power Switch
- B. Timer Switch
- C. Overtemperature Safety Light
- D. Overtemperature Safety thermostat
- E. Timer Control
- F. Main Temperature Controller
- G. Temperature Activated Light

- 5.1 Power Switch:** The main power switch on the control panel (green lighted I/O) controls all power to the unit and must be in the I/ON position before any systems are operational. The switch will be lighted when in the I/ON position.
- 5.2 Timer Switch:** The black I/O switch marked TIMER is located to the right of the power switch. It controls the power to the time circuit. In the off position the oven heat is controlled with no timed duration. In the on position the heat is controlled for a timed interval and then the heat shuts off.
- 5.3 Main Temperature Control:** This control is marked SET/TEMPERATURE and consists of the digital display and UP/DOWN arrow pads for inputting set point temperatures and calibration.

- 5.4 Overtemperature Safety Thermostat:** This control is marked HIGH LIMIT and is equipped with a graduated dial from 0-10. It is independent of the Main Controller and guards against any failure which would allow the temperature to rise past the Main Controllers set point. This allows continued operation of the oven until the problem can be corrected or service can be arranged. It is not recommended that the unit be operated for extended periods of time using only the Overtemperature Safety as the controller as temperature uniformity will suffer.
- 5.5 OTP Light:** This pilot lamp is marked OTP and is directly above the Overtemperature Safety Thermostat. The light will come on when the Safety Thermostat has been activated and taken control of the oven. Under normal operating conditions this pilot lamp should never be on.
- 5.6 Timer Control:** This control is marked SET/TIMER and consists of a digital display, UP/DOWN arrow pads, a RESET "PUSH" pad, a START/STOP "PUSH" pad and a TIMER ACTIVATED Light. This control provides the ability to set a timed heat interval, activate the start-up of the timed heat cycle and shut down the timed heat cycle automatically.
- 5.7 Temperature Activated Light:** This pilot lamp will be lit when the elements are receiving power.

OPERATION

- 6.1 Connection to Power Supply:** Assure that the electrical power supply is properly configured and rated for the oven. The FX28-2 must be hard wired as stated in Section 3.0, Installation.
- 6.2** Push the POWER switch to the ON position. The digital temperature display will indicate a temperature value. Turn the Overtemperature Safety Thermostat to its maximum position, clockwise, by using a flat-head screwdriver.
- 6.3 Set Main Temperature Controller:** Enter desired set point temperature. To enter set point mode on the controller, press either the Up or Down arrow pad one time. The digital display will start to blink, going from bright to dim. While blinking, the digital display is showing the set point. To change the set point, use the Up and Down arrow pads. If the arrow pads are not pressed for five (5) seconds, the display will stop blinking and will read the temperature of the unit. Note that the High Limit Thermostat should be turned to its maximum position until the unit has stabilized at desired set point temperature. Allow the oven at least 24 hours to stabilize.
- 6.4 Calibration:** Temperature calibration is done once the unit is installed in its working environment and has been stable at set point for several hours. Place a certified reference thermometer in the chamber by either placing it directly inside, or through the access tube at the top left of the unit. Be certain the thermometer is not touching any shelving. Allow the temperature to stabilize again until the thermometer reads a constant value for one hour. Compare the digital display with the reference thermometer. If there is an unacceptable difference, put the display into calibration mode by pressing both the Up and Down arrow pads at the same time until the two outside decimal points begin to flash. While the decimal points are flashing the display can be calibrated by pressing the Up or Down arrow pads until the display reads the correct value. Allow the oven temperature to stabilize again, and recalibrate if necessary.

NOTE: Temperature accuracy should be checked at least monthly or after the unit has been turned off for an extended period of time.

- 6.5 Set Overtemperature Safety Thermostat:** As mentioned in step 6.3, the Safety Thermostat should be initially set to its maximum position to allow the unit to stabilize. Once the oven is stable at the desired set point, turn the Safety

Thermostat counterclockwise with a flat-head screwdriver until the OTP light turns ON. Next, turn the Thermostat clockwise just until the OTP light turns OFF. Then turn the thermostat clockwise two (2) of the smallest divisions on its scale past the point where the light went out. This sets the Safety Thermostat at a temperature approximately 10°C above the Main Temperature set point. Note that the Safety is in series with the output from the control relay, and the OTP light will be blinking when the Main Temperature Controller is calling for heat.

6.6 Set Timer Display: Turn the Timer switch to the ON position. The SET/TIMER display digits will light with no lighted decimals showing (**See Figure 2**). Note that if during any of the following steps, several seconds elapse with no arrow pad or RESET pad activity, the timer will default to the present displayed setting and it will be necessary to restart all functions over again. The values must be programmed in a consecutive manner with no delays between settings or the default will occur.

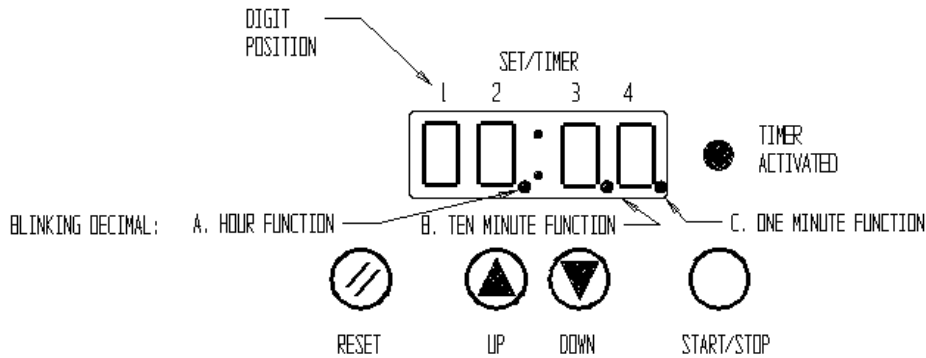
- A. Hour Function:** Press and hold the RESET pad until the digits start blinking and a blinking decimal point is between digits 2 and 3. In this mode, pressing the UP or DOWN arrow pads increases or decreases the whole hour value from 0 to 99 (digits 1 and 2).
- B. Ten Minute Function:** After the correct value for hours is set, push the RESET pad again. The blinking decimal will now move one digit to the right between digits 3 and 4. Pushing the UP or DOWN arrow pads will increase or decrease the ten minute function allowing values between 0 to 5 to be set (digit 3).
- C. One Minute Function:** After the correct ten minute value is set, push the RESET pad again. The blinking decimal point will now move one digit to the right beyond digit 4 and be located at the extreme bottom right of the display. With the display in this mode, pushing the UP or DOWN arrow pad will increase the one minute function allowing the value of digit 4 to be adjusted between 0 and 9.
- D. Activation:** Pause until timer stops blinking. After all settings are made, push the START/STOP button. The timer activated light will come on and after a brief pause, the present oven temperature settings will be valid and heating will begin. The oven will now heat up, control at the set point and stop after the timed period on the SET/TIMER display has elapsed.

Note that when the system is in the timer mode, the heating circuit is de-energized until the START/STOP button is pushed or the TIMER switch is turned Off. If a time change or correction is necessary and the timer has

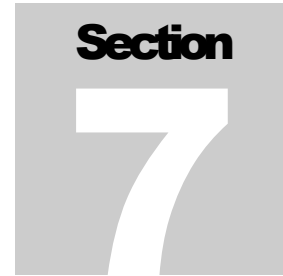
already been activated, push the START/STOP button to “STOP” the timer, then repeat steps A through D above.

- 6.7** To set the timer so that timed operation will not start until the oven is stable at set point, pre-heat the oven in the normal mode until the desired temperature has stabilized. Turn on the TIMER switch. Push and hold the RESET button until the timer display blinks, this is to be sure that the pre-set timed value is correct. Press the START/STOP button to activate the timer.

Figure Two



995763
1305-EG0
TIMER SETUP FOR MANUAL



MAINTENANCE

- 7.1 Cleaning:** Clean the oven interior and remove and clean shelves on a regular basis. Use a disinfectant that is suitable for your application. **DO NOT USE** chlorine-based bleaches or abrasives, as this will damage the stainless steel interior. **DO NOT USE** spray cleaners that might leak through openings and cracks and get on electrical parts or that may contain solvents that will harm the coatings. A similar periodic cleaning is recommended. Use care when cleaning the door gasket to prevent damage which could impair the positive door seal.

WARNING: Never clean the unit with alcohol or flammable cleaners with the unit connected to the electrical supply. Always disconnect the unit from the electrical service when cleaning and assure all volatile or flammable cleaners are evaporated and dry before reattaching the unit to the power supply.

- 7.2 Storage:** To prepare the unit for storage, remove all shelves and shelf clips, dry the chamber completely and disconnect the power supply. Be certain that the door is positively locked in the closed position. See Section 3.3, Lifting/Handling, for proper transport procedures.
- 7.3** No maintenance is required on the electrical components. If the unit fails to operate as specified, please see the Troubleshooting guide, Section 8.0, before calling for service.

TROUBLESHOOTING

TEMPERATURE

Temperature too high.

- 1/ Controller set too high-see section 6.3
- 2/ Controller failed on – call Customer Service.
- 3/ Wiring error – call Customer Service.

Display reads "HI" or "400"+.

Probe is unplugged, is broken or wire to sensor is broken – trace wire from display to probe; move wire and watch display to see intermittent problems

Chamber temp spikes over set point and then settles to set point.

Recalibrate – see section 6.4.

Temperature too low

- 1/ High limit set too low – see section 6.5.
- 2/ Controller set too low – see section 6.3.
- 3/ Unit not recovered from door opening – wait for display to stop changing.
- 4/ Unit not recovered from power failure or being turned off – ovens will need several hours to warm up and stabilize.
- 5/ Element failure – compare current draw to data plate.
- 6/ Controller failure – call Customer Service.
- 7/ High limit failure – confirm with front panel lights that Safety Thermostat is operating correctly.
- 8/ Wiring problem – check all functions and compare wiring to schematic in section 9.0 - especially around any areas recently worked on.
- 9/ Loose connection – check control panel for loose connections.

Display reads "LO"

- 1/ Bad probe or disconnected – call Customer Service.
- 2/ If ambient temperature is lower than range of unit – compare set points and ambient temperature to rated specifications in section 9.0.

Unit will not heat over a temperature that is below set point

- 1/ Confirm that fan is moving and that amperage and voltage match data plate – check for air movement in chamber.
- 2/ Confirm that set point is set high enough –turn Safety

Thermostat all the way clockwise and see if OTP light comes on.
3/ Check connections to sensor.
4/ Check calibration – using independent thermometer, follow instructions in section 6.4.

Unit will not heat up at all

1/ Check amperage – amperage should be virtually at maximum rated (data plate) amperage.
2/ Do all controller functions work?
3/ Is the Safety Thermostat set high enough? – for diagnostics, should be fully clockwise with the OTP light never on.
4/ Has the fuse/circuit breaker blown?
5/ Has timer turned unit off?

Indicated chamber temperature unstable

1/ ± 0.1 may be normal.
2/ Is fan working? – verify movement of air in chamber.
3/ Is ambient room temperature radically changing – either door opening or room airflow from heaters or air conditioning? – stabilize ambient conditions.
4/ This may happen if exhaust stack is 100% open or if power exhaust is cycling – adjust stack to at least $\frac{1}{4}$ closed.
5/ Sensor miss-located, damaged or wires may be damaged - check mounts for control and OTP sensors, then trace wires or tubing between sensors and controls.
6/ Calibration sensitivity – call Customer Service.
7/ High limit set too low – be sure that Safety Thermostat is set more than 5 degrees over Main Controller set point; check if OTP pilot is on continuously; turn controller knob completely clockwise to see if problem solved then follow instructions in section 6.5 for correct setting.
8/ Electrical noise – remove nearby sources of RFI including motors, arcing relays or radio transmitters
9/ Bad connection on temperature sensor or faulty sensor – check connectors for continuity and mechanical soundness while watching display for erratic behavior; check sensor and wiring for mechanical damage.
10/ Bad connections or faulty solid state relay – check connectors for mechanical soundness and look for corrosion around terminals or signs of arcing or other visible deterioration.
11/ If set point is below 60 degrees, temperature can be unstable. See unit specifications for individual ranges.

Will not maintain set point

1/ Assure that set point is at least 5 degrees over ambient.
2/ See if ambient is fluctuating; check for adjacent open doors or HVAC duct openings – stabilize ambient conditions.

Display and reference

thermometer don't match

- 1/ Calibration error – see section 6.4.
- 2/ Temperature sensor failure – call Customer Service.
- 3/ Controller failure – call Customer Service.
- 4/ Allow at least two hours to stabilize.
- 5/ Verify that reference thermometer is certified.

Can't adjust set points or calibration

- 1/ Turn entire unit off and on to reset.
- 2/ If repeatedly happens, call Customer Service.

Calibrated at one temperature, but not at another

This can be a normal condition when operating temperature varies widely. For maximum accuracy, calibration should be done at or as close to the set point temperature.

MECHANICAL

Motor doesn't move

- 1/ If shaft spins freely: check connections to motor and check voltage to motor.
- 2/ If shaft rubs or is frozen, relieve binding and retest.

Motor makes noise

- 1/ If noise is from the motor, tap the top of motor shaft with ball peen hammer.
- 2/ If the sound gets worse, tap the other end of the shaft – avoiding touching the blower wheel.
- 3/ If there is no change, call Customer Service.

Door not sealing

- 1/ Adjust hinge blocks or twist the door.
- 2/ Confirm that unit has not been damaged and body is not out of square.
- 3/ Check physical condition of gasket for tears or punctures.

OTHER

Controller on at all times - "locked-up"

- 1/ Adjust set point to room temperature. If the unit is still heating, replace the solid state relay.
- 2/ Turn unit off and on to reset.
- 3/ If cannot change any condition on the front panel, call Customer Service.

Controller timer resets on its own

- 1/ Confirm that power from wall is consistent and within specifications.
- 2/ Call Customer Service with serial number.

Front panel displays are all off

- 1/ Check connections to the temperature display control board and assure that all are tight and in the correct orientation.

	2/ Check for wire damage.
Unit or wall fuse/circuit breaker is blown	
	1/ Check wall power source. 2/ Compare current draw and compare to specs on data plate. 3/ See what other loads are on the wall circuit.
Unit will not turn on	
	1/ Check wall power source. 2/ Check fuse/circuit breaker on unit or in wall. 3/ See if unit is on, e.g., fan or heater, and just controller is off. 4/ Check all wiring connections, especially around the on/off switch.
Unit is smoking – Out of box	
	This is not an uncommon occurrence when first operating new units. Put unit under vent and run at high temperature for one hour until smoke dissipates.
Contamination in chamber	
	1/ See cleaning procedure in section 7.0. 2/ Develop and follow standard operating procedure for specific application; include definition of cleaning technique and maintenance schedule.
Contamination in sample	
	1/ See “Contamination in chamber”. 2/ Reduce air flow in chamber by dampening down exhaust port; be sure to verify adequate temperature uniformity at the reduced air flow. 3/ Protect open samples from areas of maximum air current, e.g., inlet air ducts.

PARTS LIST

Description	220V
Adjustable Feet	2700506
Black I/O Switch, Timer	X1000124
Blower Motor	4880512
Cordset, FX14-2	1800500
Element FX14-2	9570737
Element FX28-2	9570730P
EMI Filter FX14-2	2800502
EMI Filter FX28-2	2800504
Fuse, 10amp 5 x 20mm	3300516
Green I/O Switch, Power	103351
Knob, OTP	4450506
Pilot Light, Heating	200021
Pilot Light, OTP	200020
Safety Thermostat	1750615
Shelf Clip	200137
Shelf FX14-2 & FX28-2	5130581
Temp/Time Control	1750613

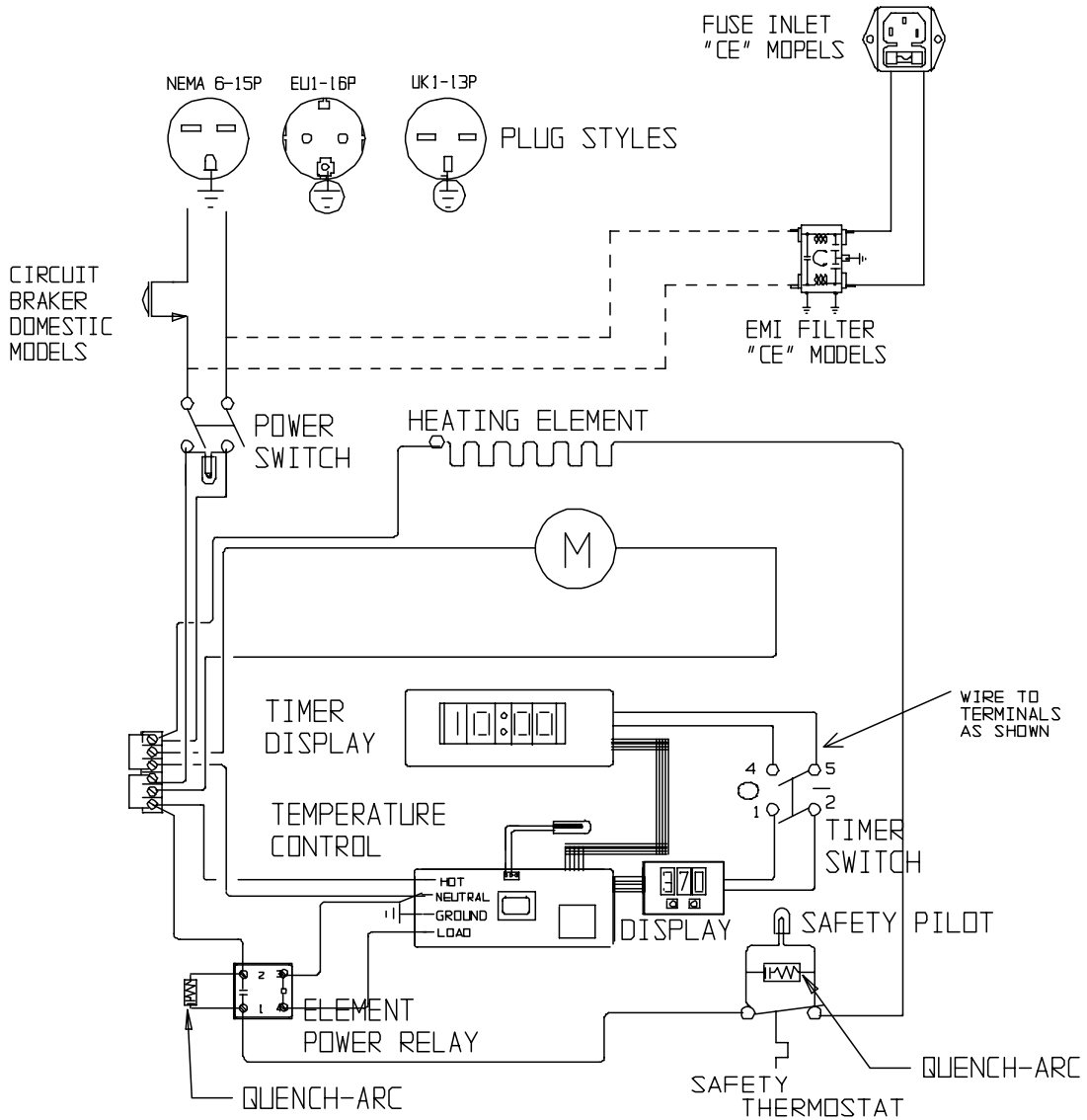
UNIT SPECIFICATIONS

These units are 240 volt. Please refer to the unit data plate for its individual specifications.

Unit	Dimensions WxDxH		Weight		Capacity
	<i>Exterior</i>	<i>Interior</i>	<i>Shipping</i>	<i>Net</i>	<i>Cubic Ft</i>
FX14-2	37X34X47	30.75x24.75x47	490 lbs.	280 lbs.	14
FX28-2	37.5x24.75x78.25	30.75x24.75x62.5	550 lbs.	390 lbs.	28

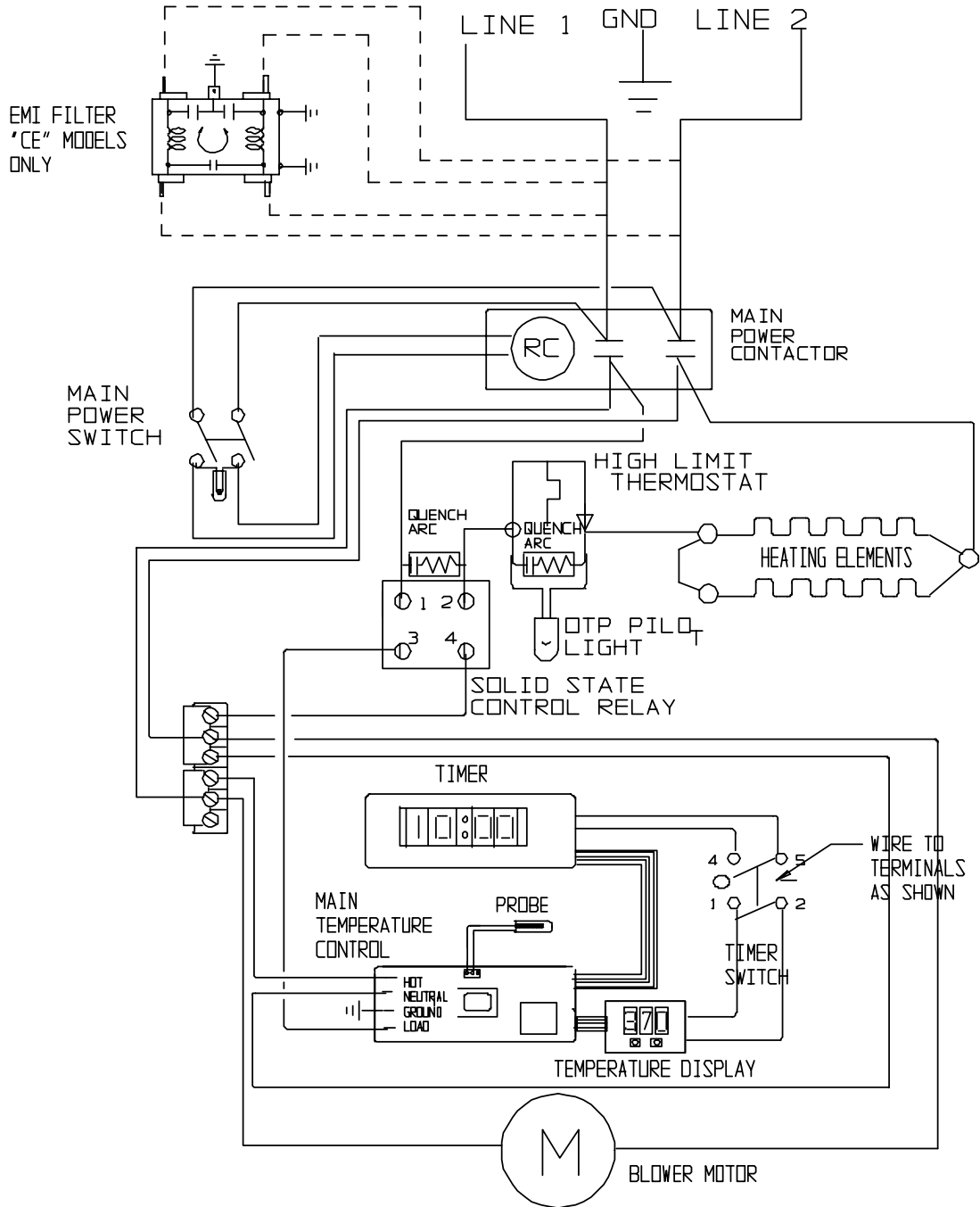
Temp. °C	Range	Uniformity	Heat-up Time to 150°	Recovery to 150°	Sensitivity
FX14-2	Amb. +5 to 220°C	± 1.5° @ 100°	14 min.	4 min (door open 30 sec.)	± .05°
FX28-2	Amb. +5 to 220°C	± 1.5° @ 100°	14 min.	4 min (door open 30 sec.)	± .05°

WIRE DIAGRAM FX14-2



9850511 1375FM, 1380FM, SL-03, SL-D14

WIRE DIAGRAM FX28-2



9850512