Warning Symbols

Caution Symbol

The Furnace should not be installed on a flammable surface. Flammable or hazardous materials should not be stored, used in, on or in close proximity to the Furnace. Should any hazardous materials be spilled on or in the Furnace, it is the operator's responsibility to clean and/or decontaminate the Furnace.

The Furnace contains moving parts which may present a pinch hazard. Caution should be exercised by the operator to avoid placing materials, hands or fingers near the path of the moving Door Platform.

When lifting the Furnace remember to firmly grasp the unit by the vertical portion of the chassis, just below the Top Cover area. Remember to bend your legs when lifting heavy objects, such as the Furnace.

Electrical Shock Hazard Symbol

The Furnace Chassis should not be opened unless the electrical supply cord has been removed from both the AC electrical receptacle and the power block connector on the rear of the Furnace Chassis. Failure to observe these measures can result in injury or death due to electrical shock.

Hot Surface / Material Symbol

The Muffle area, Door Platform, Door Brick Insulation Platform, Firing Trays and any materials fired within the Furnace will become hot during operation of the Furnace. Do not use your bare hands to remove work or materials from the Furnace. Use tongs or forceps when removing hot work or materials. Items may be handled after allowing them to cool down for a period of at least 10 minutes after removal from the Furnace.

Warning

Only Argon gas should be connected to the Argon Gas input on the rear panel of this Furnace. Use of any other gases could result in explosion or personal injury.

Warning

The ceramic fiber refractory material used in this product is known to produce cristobalite (crystalline silica) after being in service at temperatures greater than 1600°F (871°C). In certain cases, such as when servicing equipment, insulation dust may be irritating to the skin, eyes and respiratory tract, and may be harmful if inhaled. Prolonged or repeated exposure to ceramic fiber dusts which have been exposed to the temperatures indicated above may cause lung disease (silicosis).

Where insulation dust may be produced, the following work practices are recommended:

- Use local exhaust equipment to keep airborne fiber exposures at the lowest attainable level.
Use a NIOSH or MSHA approved high-efficiency air-purifying respirator (3M 8710 or equivalent) during installation and removal of insulation that has been exposed to high temperatures and whenever airborne concentrations exceed 2 fibers/cc or 2 mg/m of dust. For airborne concentrations greater than 5 fibers/cc, consult the MSDS on ceramic fibers.

- While handling the above insulation, wear long-sleeve clothing, gloves, hat and eye protection to prevent skin and eye contact. Wash thoroughly after handling.

Avoid taking unwashed clothes home. Wash work clothes separately from other clothing. Rinse washing machine thoroughly after use.

**Note**
The gases produced from the heat treating of Refractory Models in this Furnace will result in damage to the Quartz portion of the Muffle and could also result in difficulties with the Vacuum System. It is recommended that Refractory Models be preheated in a Burnout Furnace prior to placing them in a Vacuum Porcelain Furnace to prevent damage to the Muffle and Vacuum System.

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**JELENKO 3/2 WARRANTY STATEMENT**

The J. F. Jelenko & Co. ("Jelenko") "3/2" Warranty Plan covers the electronic components of the covered Jelenko vacuum porcelain Furnace for a period of three years and the muffle for a period of two years from date of invoice. All mechanical and non-electronic components are excluded from this warranty and limited to one year under the normal equipment warranty. This warranty applies to the original purchase only. This warranty shall not apply to any Article which (1) has been altered outside Jelenko's factory in any way so as, in Jelenko's judgment, to affect such Article's reliability; (2) has been subject to misuse, negligence or accident; (3) has been used other than in accordance with any printed instructions prepared by Jelenko and provided by Jelenko with the Article; or (4) has been repaired in an unauthorized manner. THE WARRANTY DESCRIBED IN THIS PARAGRAPH, IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, AND MAY NOT BE MODIFIED OR EXTENDED BY ANY AGENT, REPRESENTATIVE OR DISTRIBUTOR OF THE JELENKO COMPANY. In no event shall Jelenko be liable (a) for direct damages in excess of the original purchase price of the goods claimed to be defective, or (b) for any special, consequential, incidental or indirect damages with respect to this contract or anything done in connection herewith, whether based upon contract, tort (including negligence), or otherwise.

**JELENKO**

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JELENKO JELFIRE Vacuum Porcelain Furnace

SPECIFICATIONS

Maximum Temperature:
2192 °F (1200 °C)

Overall Dimensions:
11" wide x 15 3/4 " deep x 20 1/2" high
(27.9 cm wide x 40.0 cm deep x 52.1 cm high)

Muffle:
Accepts any restoration 3 1/4" diameter x 2" high
(8.3 cm diameter x 5.1 cm high)

Number of Programs:
55 Programs - total capacity

Each program is operator definable into one of three program categories:

NORM (NORMAL) - For use with High Fusing restorative materials.

LOW (LOW FUSING) - For use with Low Fusing restorative materials.

APS (ARGON POST SOLDERING) - For use with POST SOLDERING materials. This category provides an oxide reducing Argon gas environment, which will minimize oxide formation during the soldering process.

Electrical:
PN 311700 - 115 VAC +/- 10% 50/60 Hz 1050 Watts (with Pump 1400 Watts)
PN 311705 - 230 VAC +/- 10% 50/60 Hz 1050 Watts (with Pump 1400 Watts)

Operating Environment:
Ambient Temperature 55°F (13°C) to 90°F (32°C)
Humidity 20% to 70% non-condensing
Ventilation 3" (7.6 cm) free air space on all surfaces

Net Weight:
48.3 lbs (21.9 Kg)

Supplied Accessories:
1 - Jelenko Metal Support Tray with Assorted Pegs (PN 230705)
1 - Electrical Supply Line Cord for Furnace (115V - PN 311711) or (230V - PN 311712)
1 - Electrical Supply Line Cord for Vacuum Pump (115V - PN 311713) or (230V - PN 311714)
1 - Door Brick Platform (PN 311717)
1 - Cooling Tray (PN 311733)
1 - Calibration Instrument with Silver Wire (PN 311718)
2 - Spare Fuses (115V - PN 311729) or (230V - PN 311730)
INSTALLATION

1) Remove all packaging material from around the Furnace.

2) Place the Furnace in an area which provides a minimum of three inches (7.6 cm) of clearance on all sides.

3) Remove the two wing nuts which secure the aluminum shipping bar from under the Door of the unit. Push upward on the bolts to pass them through the holes and free them from the aluminum shipping bar. Slide the aluminum shipping bar out from either side of the underside of the Door.

4) Connect the Electrical Supply Line Cord for the Furnace to the right outlet of the Power Connector Block on the rear chassis of the Furnace. Plug the Furnace into a wall receptacle rated at a minimum of 15 amperes for the 115 Volt unit (a minimum of 7 amperes for the 230 Volt unit).

   Note: It is recommended that the Furnace be connected to an independent electrical circuit. This Furnace, as with all microprocessor-controlled devices, will perform reliably when it is operated on a stable power source which is free from voltage fluctuations.

5) Connect the Electrical Supply Line Cord for the Vacuum Pump to the left outlet of the Power Connector Block on the rear chassis of the Furnace. Take the plug from the Vacuum Pump and insert it into the corresponding receptacle on the end of the Vacuum Pump Electrical Supply Line Cord.

6) Press the POWER SWITCH located on the rear chassis of the Furnace to the “ON” or “|” position. The FRONT PANEL DISPLAY will illuminate and the Furnace will beep indicating that it has begun the Power-up sequence.

During each Power-up sequence the Furnace will conduct a self-test where various functions (such as relay, solenoid valve and door motor operation) are tested. Upon completion of the self-test, the Furnace will sound a series of musical tones and the Front Panel Display will show the following information:

Indicates the operating software version number.

\[
\text{VER - X.XX.XX JL}
\]

prompts the operator to depress the ENTER key to continue to the Main Menu.

The operator should then depress the ENTER key (as indicated above) which will cause the Main Menu to appear on the FRONT PANEL DISPLAY.
7) Open the included accessory kit box and unpack the supplied Door Brick Platform. Depress the DOOR↓ key, to lower the Door and place the Door Brick Platform onto the Door.

**Note:** The bottom surface of the Door Brick Platform has a hole located in the center. This hole must align with the male pin which is located on the center of the Door.

**Note:** The memory of this Furnace is supported by a Lithium Coin cell type battery which is mounted on the Control Circuit Board. The battery is should provide a long service life of approximately seven years, however to minimize the chances of memory loss it is recommended that the battery be replaced after five years of service. To help keep track of the age of the battery we recommend that you write down the date the Furnace was installed in the front of this manual for later reference.

The Power Switch should be left in the ON position when replacing the battery. This will allow the Furnace to retain memory as the old battery is removed and the replacement battery is installed.

**MUDDLE CURING**

The Muffle in your Jel-Fire Vacuum Porcelain Furnace is constructed of light-weight ceramic fiber materials. If vacuum loss is observed while operating the Furnace after the initial installation, or after replacing the Muffle, it is most likely the result of Muffle outgassing*, and the Muffle curing program outlined below should be performed twice.

Program the following parameters into a NORM (NORMAL) program category of any of the available 55 programs.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOW TEMP</td>
<td>1000°F (538°C)</td>
</tr>
<tr>
<td>PREHEAT TIME</td>
<td>00 Min 00 Sec</td>
</tr>
<tr>
<td>HEAT RATE</td>
<td>100°F/Min (56°C/Min)</td>
</tr>
<tr>
<td>VAC LEVEL</td>
<td>28 Inches (71 centimeters)</td>
</tr>
<tr>
<td>HIGH TEMP</td>
<td>1800°F (982°C)</td>
</tr>
<tr>
<td>HOLD TIME</td>
<td>20 Min 00 Sec</td>
</tr>
<tr>
<td>COOL TIME</td>
<td>00 Min 00 Sec</td>
</tr>
<tr>
<td>VAC START</td>
<td>1000°F (538°C)</td>
</tr>
<tr>
<td>VAC TIME</td>
<td>20 Min 00 Sec</td>
</tr>
</tbody>
</table>

*Muffle outgassing occurs when moisture contained within the Muffle insulation, or Door Brick Platform, is boiled and changes into a gaseous state, usually at muffle temperatures of 1000°F (538°C) and above. This gas will result in a reduction of vacuum level within the Furnace, creating the appearance that vacuum is leaking.
FRONT PANEL CONTROLS

FRONT PANEL DISPLAY (1):
The Front Panel Display is capable of showing information containing text, numbers and symbols. The Display will indicate Temperature, Vacuum and Time values pertaining to firing cycle information of the during Furnace programming or operation.

DOOR ↑ (2):
When depressed, this key will activate the motor to close (raise) the Furnace door. Once this key has been depressed, the door will automatically continue to close until the key is depressed a second time, which allows the door to be stopped at any point along its travel. The key will control upward door movement until the door reaches the fully closed position.

DOOR ↓ (3):
When depressed, this key will activate the motor to open (lower) the Furnace door. Once this key has been depressed, the door will automatically continue to open until the key is depressed a second time, which allows the door to be stopped at any point along its travel. The key will control downward door movement until the door reaches the fully opened position.

START (4):
This key only becomes active after the operator has selected a program for activation. Once this key has been depressed, the Furnace will begin the selected program.

STOP (5):
This key only becomes active after the operator has selected and started a program. Once this key has been depressed, the Furnace will cease operation of the selected program.

STEP → (6):
When a selected program is operating, this key may be used to scroll or step through additional information on the FRONT DISPLAY PANEL. The displayed information will advance one step or parameter each time the key is depressed.

This key is also used when programming the Furnace. When this key is depressed after either the RUN, PROG or SETUP key, the operator will be able to select other options from each of these categories.

STEP ← (7):
As with the above STEP key listed in (5), this key also is used to scroll or step through additional information on the FRONT PANEL DISPLAY when a selected program is operating. It should be noted however, that this key will scroll or step in the opposite direction from the STEP → key listed in (5).
As with the above STEP → key listed in (5), this key is also used when programming the Furnace. When this key is depressed after either the RUN, PROG or SETUP key, the operator will be able to select other options from each of these categories. It should be noted however, that this key will scroll or step in the opposite direction from the STEP → key listed in (5).

RUN (8):
When depressed this key will allow the operator to select a program for operation. Once this key has been depressed, the operator may then use either of the STEP keys to scroll to the desired program number, or the operator may use the NUMERIC Keypad to directly input the desired program number.

After the desired program number appears on the FRONT DISPLAY PANEL the operator must depress the START key to begin the desired program.

PROG (9):
When depressed this key will allow the operator to select a programming function. Once the PROG (PROGRAM) key has been depressed, the operator may then use either of the STEP keys to scroll to the desired programming function. The operator will have access to the following programming functions, as shown on the Front Panel Display:

<table>
<thead>
<tr>
<th>SELECT ITEM: LOOK AT PROGRAM</th>
<th>Used to review existing information in any of the 55 programs in the Furnace memory.</th>
</tr>
</thead>
<tbody>
<tr>
<td>SELECT ITEM: ADD A PROGRAM</td>
<td>Used to add a program into the memory of the Furnace. The operator can assign firing cycle information into any of the 55 programs.</td>
</tr>
<tr>
<td>SELECT ITEM: CHANGE A PROGRAM</td>
<td>Used to change the firing cycle information in any of the 55 programs in the furnace memory.</td>
</tr>
<tr>
<td>SELECT ITEM: COPY/CHANGE PROG</td>
<td>Used to copy the firing cycle information from one location in the Furnace memory, to another location in the Furnace memory. Once copied, the operator will then be prompted to any of the parameters of the newly created program.</td>
</tr>
<tr>
<td>SELECT ITEM: MOVE PROGRAM</td>
<td>Used to move the firing cycle information from one location in the Furnace memory, to</td>
</tr>
</tbody>
</table>
another location in the Furnace memory.

SELECT ITEM: ERASE A PROGRAM
Used to delete the firing cycle information from any of the 55 programs from the Furnace memory.

SELECT ITEM: PRINT PROGRAMS
When an IBM compatible printer is connected to the port on the right side of the Furnace and the operator depresses the ENTER key, the Furnace will then print out all firing cycle information stored in memory.

After the desired programming function appears on the FRONT DISPLAY PANEL the operator must then depress the ENTER key to gain access to, or activate the desired programming function.

SETUP (10):
When depressed this key will allow the operator to select functions associated with the operational configuration of the Furnace. Once this key has been depressed, the operator may then use either of the STEP keys to scroll to select the desired setup function.

The operator will have access to the following SETUP functions, as shown on the Front Panel Display:

SELECT ITEM: NIGHT MODE
Used to activate the Night program. The START key would be depressed to activate the NIGHT program.

SELECT ITEM: CHANGE IDLE TEMP
Used to change the Idle Temperature in the Furnace memory.

SELECT ITEM: TEMP IN C OR F?
Used to allow the Furnace to have the temperature appear in either Fahrenheit or Celsius on the Front Panel Display.

SELECT ITEM: PROG START DELAY
When the Program Start Delay is selected the operator will be prompted to input a time value, in minutes and seconds, during which the Furnace will keep the Door in the fully open position and the muffle will maintain the Low Temperature. Once this time elapses, the Furnace will automatically proceed to the Preheat portion of the cycle and the Furnace Door will then begin to close slowly.
over the amount of time specified in the Preheat parameter of the firing cycle.

NOTE: If this feature is activated, it will apply the Program Start Delay to all firing cycles in the Furnace memory.

SELECT ITEM: CONSTANT VAC PUMP

When the Constant Vacuum Pump is selected the operator will be prompted to choose (YES or NO).

This feature will allow the Vacuum Pump to operate constantly, during the entire duration of the vacuum portion of the firing cycle.

NOTE: If this feature is activated, it will apply the Constant Vacuum Pump feature to all firing cycles in the Furnace memory.

SELECT ITEM: SP COOL POSITION

When the Special Cool Position is selected the operator will be prompted to choose a time value. This time value is factory set to 50. It is recommended that this value be left at the original factory setting, unless it is found that the Low Fusing restorative materials require a Door distance which is either a greater (or lesser) distance from the original distance of approximately 1 5/8 inches (4.1 centimeters).

This feature will allow the operator to vary the distance which the Door will open to and maintain, during the Special Cooling potion of a LOW (LOW FUSING) firing cycle. Higher numbers will increase the distance from the Door to the muffle, while lower numbers will decrease the distance from the Door to the muffle.

NOTE: If this feature is altered, the new Special Cooling Position will apply to all LOW (LOW Fusing) firing cycles in the Furnace memory.

SELECT ITEM: CAL LOW FUSING

This feature will allow the operator to adjust the lower temperature reference scale (from 1470°F or 800°C) or lower, of the Furnace.
Slight temperature differences may be seen in the firings from one Furnace to another, even with Furnaces of the same manufacturer. Through this feature slight over or under-firing of Low Fusing restorative materials can be adjusted.

**SELECT ITEM:**
**CAL HIGH FUSING**
This feature will allow the operator to adjust the upper temperature reference scale (1470°F or 800°C) or higher, of the Furnace.

Slight temperature differences may be seen in the firings from one Furnace to another, even with Furnaces of the same manufacturer. Through this feature slight over or under-firing of standard, High Fusing restorative materials can be adjusted.

**SELECT ITEM:**
**PROGRAMS --> BOX**
This feature will allow the operator to download the firing cycle information stored in the memory of the Furnace into a Data Transfer Box (optional accessory from Jelenko). The Data Transfer Box may then be connected to another JelFire Furnace and the firing cycle information may then be transferred (or uploaded) into the memory of the other Furnace.

**SELECT ITEM:**
**PROGRAMS <-- BOX**
This feature will allow the operator to upload the firing cycle information stored in the Data Transfer Box (optional accessory from Jelenko) into the memory of a JelFire Furnace.

**SELECT ITEM:**
**TEST FURNACE**
This feature when activated, will allow the operator to test various functions of the Furnace.

The operator may test the Vacuum system, Argon system, Muffle/Heating system and Door Motor Up or Down operation.

The operator can also gain access to an electronic hour meter which records how many hours the Furnace has been in use at normal operating temperatures.

**SELECT ITEM:**
**CALIBRATE OVEN**
This feature when activated, will allow the operator to calibrate various functions of the Furnace.
The operator may calibrate the Door Lift operation, the High Temperature, the Vacuum Sensor (either the Low Vacuum or High Vacuum setting).

A password is required to gain access to calibrate any of the above listed items. The password is 135.

After the desired setup function appears on the FRONT DISPLAY PANEL the operator must then depress the ENTER key to activate or access the desired setup function.

NUMERIC KEYPAD (11):
A group of keys labeled zero (0) through nine (9), including the CLEAR and ENTER keys, used when selecting a program for operation or programming cycle information into the Furnace.

To select a program, or program a parameter, the numbered keys are depressed to match the desired parameter value. As each numbered key is depressed, the number will appear on the FRONT DISPLAY PANEL with numbers advancing from right to left.

If an error is made during selection of the desired numeric value, the CLEAR key may be depressed to remove the incorrect information from the display.

After the desired numeric value appears on the FRONT DISPLAY PANEL, the operator must then depress the ENTER key to activate the desired setup function.
SIDE PANEL CONTROLS

VOLUME CONTROL (12):
Using a small screwdriver, the volume of the tones produced by the Furnace may be increased or decreased by varying this control. Rotate the screwdriver clockwise to increase the volume or counter-clockwise to decrease the volume, until the desired volume level is achieved.

CAUTION: Do not use excessive force when adjusting the volume control or the control may be damaged.

DISPLAY CONTROL (13):
Using a small screwdriver, the contrast (or darkness) of the characters that appear on the FRONT PANEL DISPLAY may be increased or decreased by varying this control. Rotate the screwdriver clockwise to increase the contrast or counter-clockwise to decrease the contrast, until the desired contrast level is achieved.

CAUTION: Do not use excessive force when adjusting the display control or the control may be damaged.

PRINTER/CALIBRATION/DATA TRANSFER PORT (14):
This female 25 Pin D - Subminature connector port serves several purposes:

1) Printer port - When an IBM compatible printer is connected to this port and the operator depresses the PROG key and steps to select the PRINT PROGRAMS option, the Furnace will then print out all cycle information stored in memory.

2) Calibration port - When the included Calibration Instrument is prepared with silver wire and the corresponding plug is connected to this port, the operator may calibrate the Furnace by depressing the SETUP key and stepping to select the CALIBRATE OVEN option.

Note: The Calibration feature is password protected to prevent unauthorized Calibration of the Furnace.

The password for access to Calibration is 135. Once the password is correctly entered, the operator may then step to the CAL HIGH TEMP option to begin Calibration of the Furnace. Your Furnace has been factory calibrated and it is therefore not necessary to perform the Calibration unless drastic temperature variances are seen in the results of your firings.
3) Data Transfer port - When an optional Data Transfer Box (available as an accessory from Jelenko) is connected to this port, the operator may then copy the program information which is in memory into a Data Transfer Box.

The Data Transfer Box containing the program information from the first Furnace may then be connected to other JelFire Furnaces and the program information may then be copied from the Data Transfer Box into the memory of the other JelFire Furnaces.
REAR PANEL CONTROLS

POWER SWITCH (15):
Turns the power to the Furnace ON and OFF. The FRONT PANEL DISPLAY will illuminate when this switch is placed in the "ON" or "I" position.

POWER CONNECTOR BLOCK (16):
This Power Block is made up of two connectors where the included Electrical Supply Line Cords for both the Furnace and the Vacuum Pump must be connected.

The left receptacle of the Power Connector Block should be connected to the Electrical Supply Line Cord for the Vacuum Pump, where as the right receptacle of the Power Block should be connected to the Electrical Supply Line Cord for the Furnace.

MAIN FUSEHOLDER (17):
A safety device designed to protect the Furnace electronics in the event of a short circuit or overload. The fuse should be replaced only with one of the same type, rating and rupture speed as indicated on the labels on the rear chassis near the fuseholder.

VACUUM PUMP FUSEHOLDER (18):
A safety device designed to protect the Furnace electronics in the event of a short circuit or overload. The fuse should be replaced only with one of the same type, rating and rupture speed as indicated on the labels on the rear chassis near the fuseholder.

MANUAL DOOR LIFT CRANK (19):
Provided as a means for manually opening the Furnace Door in the event of a power failure or Furnace breakdown.

Either a 1/2" (13 mm) socket wrench or flat blade screwdriver can be used to rotate the crank counter-clockwise until the Furnace Door has opened the desired distance.

ARGON HOSE CONNECTOR (20):
The argon gas hose from the argon gas regulator is connected to this fitting. The fitting is a standard male 1/4" - 18 NPSM Swivel Ball/Nut Fitting.

WARNING: Connect only a regulated argon gas supply to this fitting. Use of any other gases could result in an explosion or personal injury.

VACUUM HOSE CONNECTOR (21):
The vacuum hose from the vacuum pump is connected to this fitting. The fitting is a standard male 1/4" - 18 NPSM Swivel Ball/Nut Fitting.
FAHRENHEIT/CELSIUS MODE SELECTION
The Fahrenheit/Celsius selector mode can be activated as follows:

1) Depress the SETUP key.

2) Depress either the STEP → key or STEP ← key until

3) Depress the ENTER key.

4) Depress either the STEP → key or STEP ← key to toggle between NO or YES on the Front Display Panel.

To display the temperature in Fahrenheit and vacuum in Inches of Mercury select NO, to display temperature in Celsius and vacuum in Centimeters of Mercury select YES.

5) When the appropriate selection (YES or NO) appears on the display, depress the ENTER key to log your choice into the memory of the Furnace.

Once the ENTER key has been depressed, the Furnace will exit the SETUP and return to displaying SELECT RUN, PROG OR SETUP BUTTON on the Front Panel.

PROGRAMMING & OPERATING
THE AUTOMATIC IDLE PROGRAM
The Furnace is equipped with an Automatic Idle program, which when programmed by the operator, will allow the Furnace to automatically maintain the desired temperature, programmed by the operator, of up to 1200°F (650°C) in-between firing cycles. The Door may be left in the open position to allow air drying during porcelain build-up or the Door may be closed, in either case the Door position can be varied by depressing either the DOOR ↑ key or DOOR ↓ key.

Using the Automatic Idle program will save time by keeping the Muffle at temperatures which are very close to the Low Temperature. As a result, the operator will not have to wait for the Furnace to heat from room temperature. Over the period of a day this can save a good deal of time.
Using the Automatic Idle program will also prolong the service life of the Muffle. As a Muffle heats up from, and cools down to room temperature the Heating Element Wire is repeatedly subjected to the normal stress associated with the expansion and contraction of the Wire. It is therefore recommended that the Automatic Idle program be activated to minimize this effect.

The Idle program may be programmed in the following manner:

1) Depress the SETUP key.

   SELECT ITEM:
   NIGHT MODE

   will appear on the Front Display Panel.

2) Depress either the STEP → key or STEP ← until

   SELECT ITEM:
   CHANGE IDLE TEMP

   appears on the Front Display Panel.

3) Depress the ENTER key.

   CHANGE IDLE TEMP
   NEW IDLE - XXX F

   will appear on the Front Display Panel.

4) Use the Numeric Keypad and input the numbers corresponding to the desired Idle Temperature. When the desired Idle Temperature appears on the display, depress the ENTER key to log your choice into the memory of the Furnace.

   Note: The Automatic Idle program can be disabled by inputting an Idle Temperature which is equal to, or slightly below, room temperature.

Once the ENTER key has been depressed, the Furnace will exit the SETUP and return to displaying SELECT RUN, PROG OR SETUP BUTTON on the Front Panel.

ENERGY SAVING MODE

After Idling for a period of 90 minutes with no activity, the Furnace will automatically enter an Energy Saving Mode which will further reduce the Muffle temperature to 752°F (400 °C) to save electricity.

Should the Furnace continue operation without activity once the Energy Saving Mode has begun, the Furnace will then automatically begin the Night program after a period of 30 minutes has elapsed.

OPERATING THE NIGHT PROGRAM

The Furnace is equipped with a Night program which when activated by the operator will allow the Furnace to automatically maintain a temperature of 250°F (121°C). Once the Furnace either heats up to or cools down to the above indicated temperature, the
Furnace Door will automatically close and the Furnace will maintain the indicated temperatures until the STOP key is depressed.

Using the Night program is beneficial as it will prevent vacuum problems by keeping the Muffle at a temperature which prevents moisture from accumulating within the Muffle.

Using the Night program will also prolong the service life of the Muffle by minimizing the normal stress which the Heating Element Wire of a Muffle endures as it heats up from, and cools down to room temperature.

It is recommended that the Night program be activated at the end of each work day and during any time when the Furnace will not be used for extended periods of time, such as weekends and holidays.

The Night program may be activated in the following manner:

1) Depress the SETUP key.

   SELECT ITEM:
   NIGHT MODE

   will appear on the Front Display Panel.

2) Depress the START or ENTER key. Once the START or ENTER key has been depressed, the Furnace will exit the SETUP and begin the Night program.

   ** NIGHT MODE **

   will appear on the Front Display Panel.

Once the Furnace either heats up to or cools down to Night program temperature of 250°F (121°C), the Furnace Door will then automatically close.

**OPERATING THE AUTOMATIC NIGHT PROGRAM**
The Night program may also be selected to automatically begin immediately after the completion of a firing cycle. This feature may only be activated during the operation of a firing cycle, as follows:

1) While a firing cycle is in operation depress either the STEP → key or STEP ← key until appears on the Front Display Panel.

   PRESS ENTER FOR
   AUTO NIGHT - NO

2) Depress the ENTER key to select either NO or YES.

3) Depress either the STEP → key or STEP ← key until the desired information of the current firing cycle appears on the Front Display Panel.
Once the Furnace completes the selected firing cycle and the Furnace Door opens to cool the fired work, the Furnace will then cool down to Night program temperature of 250°F (121°C), and the Furnace Door will then automatically return to the closed position.

DESCRIPTION OF FIRING CYCLE PROGRAM CATEGORIES
The Furnace is equipped with 55 programs which can be programmed by the operator as desired. Each of the 55 programs can be designated into any of three different categories, listed below, to match the selected restorative materials which are to be fired:

NORM - for use with NORMAL restorative materials. This category should be selected for use with standard, high firing or high fusing porcelains.

LOW - for use with LOW FUSING restorative materials. This category should be selected for use with low firing or low fusing porcelains.

APS - for use with ARGON POST SOLDERING. This category should be selected when post-soldering in an oxide reducing Argon gas environment is desired.

The firing cycle parameters for each of the three categories (NORM, LOW and APS) are very different from each other. Please see the Description of Firing Cycle Parameters for the appropriate category for additional information.

PARAMETER LIMITS & DESCRIPTIONS OF THE NORMAL PROGRAM CATEGORY
A NORM (NORMAL) program consists of:

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>LOWER LIMIT</th>
<th>UPPER LIMIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOW TEMP</td>
<td>32°F (0°C)</td>
<td>1508°F (820°C)</td>
</tr>
<tr>
<td>PREHEAT</td>
<td>00 Min 00 Sec</td>
<td>99 Min 00 Sec</td>
</tr>
<tr>
<td>HEAT RATE</td>
<td>2°F (1°C)</td>
<td>234°F (130°C)</td>
</tr>
<tr>
<td>VAC LEVEL</td>
<td>0 inHg (0 cmHg)</td>
<td>30 inHg (76 cmHg)</td>
</tr>
<tr>
<td>HIGH TEMP</td>
<td>LOW TEMP VALUE</td>
<td>2192°F (1200°C)</td>
</tr>
<tr>
<td>HOLD TIME</td>
<td>00 Min 00 Sec</td>
<td>99 Min 00 Sec</td>
</tr>
<tr>
<td>COOLING</td>
<td>00 Min 00 Sec</td>
<td>99 Min 00 Sec</td>
</tr>
<tr>
<td>START VAC</td>
<td>LOW TEMP VALUE</td>
<td>HIGH TEMP VALUE</td>
</tr>
<tr>
<td>VACUUM VENT-TEMP</td>
<td>LOW TEMP VALUE</td>
<td>HIGH TEMP VALUE</td>
</tr>
<tr>
<td>or TIME</td>
<td>00 Min 00 Sec</td>
<td>HOLD TIME VALUE</td>
</tr>
</tbody>
</table>
LOW TEMP -
The temperature at which the Door will begin to close for preheating the restoration. Once the Furnace Door has completely closed, the firing cycle will begin at this temperature.

When programming this value it must either be equal to, or lower than the Vacuum Start Temperature.

PREHEAT -
The length of time, programmable in minutes and seconds, required for the Furnace Door to travel from the initial preheat position to the fully closed position. The Furnace Door will move in five stages from the fully open to the fully closed position. The Furnace Door will not begin to close until the Muffle temperature is within approximately 5°F (3°C) of the programmed Low Temperature.

HEAT RATE -
The rate of temperature rise within the Muffle, starting from the programmed Low Temperature up to the programmed High Temperature, in degrees per minute.

VACUUM LEVEL -
The level of vacuum which will be maintained within the Muffle vacuum chamber, throughout the programmed firing cycle.

HIGH TEMP -
The maximum temperature which will be obtained during the programmed firing cycle. Once the high temperature has been reached the Furnace will maintain this temperature for the amount of time programmed in the Hold Time.

When programming this value it must either be equal to, or higher than the Low Temperature.

HOLD TIME -
The length of time, in minutes and seconds, over which the programmed High Temperature will be maintained prior to the Furnace door opening.

At the end of the programmed Hold Time the Furnace door will automatically open over the period of programmed Cooling time.

When programming this value it must either be equal to, or greater than the Vent Time.

COOLING -
The length of time, programmable in minutes and seconds, required for the Furnace door to reach the fully opened position.
At the end of the programmed Hold Time, the Furnace door will gradually open, in five stages, from the fully closed position to the fully opened position over the programmed amount of time.

**START VAC -**
The temperature at which the vacuum pump will automatically turn on to develop the programmed level of vacuum within the Muffle vacuum chamber.

If no delay in the development of vacuum is desired, the Start Vac Temperature should be programmed with the same value as the Low Temperature.

When programming this value it must either be equal to, or higher than the Low Temperature.

**VENT -**
The Furnace has the capability to Vent off vacuum at either a specified temperature or after a specified amount of time has elapsed.

**TEMP**
When a Vent Temperature has been programmed, the vacuum in the muffle vacuum chamber will be automatically released when the specified Temperature has been reached.

When programming this value it must either be equal to, or less than the High Temperature.

**TIME**
When a Vent Time has been programmed, the vacuum in the muffle vacuum chamber will be automatically released when the specified amount of Time has elapsed.

When programming this value it must either be equal to, or lower than the Hold Time.

**PROGRAMMING A NORM (NORMAL) FIRING CYCLE**
A NORM (NORMAL) firing cycle may be programmed in the following manner:

1) Depress the PROG key.

**SELECT ITEM:**
**LOOK AT PROGRAM**

will appear on the Front Display Panel.
2) Depress either the \texttt{STEP $\rightarrow$} key or \texttt{STEP $\leftarrow$} key until \texttt{SELECT ITEM: ADD A PROGRAM} appears on the Front Display Panel.

3) Depress the \texttt{ENTER} key, the Furnace will then prompt the operator the program number (represented below by \texttt{XX}). \texttt{ADD: XX} will appear on the Front Display Panel.

4) Using the Numeric Keypad, input the numbers corresponding to the desired program number where you wish to store the firing cycle in memory (00 through 55), followed by the \texttt{ENTER} key. \texttt{ADD: 01} will appear on the Front Display Panel. 01 represents the program number of where the firing cycle will be stored in memory.

5) Depress either the \texttt{STEP $\rightarrow$} key or \texttt{STEP $\leftarrow$} key until the desired program category (NORM, LOW or APS) appears on the Front Display Panel.

When the desired porcelain category appears, depress the \texttt{ENTER} key. \texttt{PORCELAIN TYPE: 01 NORM}

6) Depress either the \texttt{STEP $\rightarrow$} key or \texttt{STEP $\leftarrow$} key to scroll the display until the desired letter, number or symbol appears on the Front Display Panel. \texttt{ENTER PROG NAME: 01 NORM - _} will appear on the Front Display Panel to prompt the operator to input a name (up to 8 characters total length) for the firing cycle.

When the desired character appears on the display, depress the \texttt{ENTER} key to log your choice into the memory of the Furnace.

Repeat this procedure (up to 7 more times) to spell out the desired name for the firing cycle. \texttt{ENTER PROG NAME: 01 NORM - TEST1}

Once the last character of the desired name for the firing cycle has been input into memory the Furnace will then advance to the first parameter of the firing cycle.
7) Using the Numeric Keypad, input the numbers corresponding to the desired Low Temperature followed by the ENTER key.

```
01 NORM - TEST1
LOW TEMP XXXXF
```

will appear on the Front Panel Display prompting the operator to input the desired Low Temperature.

Once the Low Temperature has been input into memory the Furnace will then advance to the next parameter of the firing cycle.

8) Using the Numeric Keypad, input the numbers corresponding to the desired Low Temperature followed by the ENTER key.

```
01 NORM - TEST1
PREHEAT XX:XX
```

will appear on the Front Panel Display prompting the operator to input the desired Preheat Time value represented in minutes and seconds.

Once the Preheat Time has been input into memory the Furnace will then advance to the next parameter of the firing cycle.

9) Using the Numeric Keypad, input the numbers corresponding to the desired Heat Rate followed by the ENTER key.

```
01 NORM - TEST1
HEAT RATE XXXF/M
```

will appear on the Front Panel Display prompting the operator to input the desired Heat Rate value represented in degrees Fahrenheit or degrees Celsius per minute.

Once the Heat Rate has been input into memory the Furnace will then advance to the next parameter of the firing cycle.

10) Using the Numeric Keypad, input the numbers corresponding to the desired Vacuum Level followed by the ENTER key.

```
01 NORM - TEST1
VAC LEVEL XX:XX
```

will appear on the Front Panel Display prompting the operator to input the desired level of vacuum represented in either Inches of Mercury or Centimeters of Mercury.

Note: If a level of 0 inHg (0 cmHg) is selected, the Furnace will automatically eliminate any other vacuum related information (i.e. Vacuum Start and Vent parameters) from appearing during the programming procedure.

Once the Vacuum Level has been input into memory the Furnace will then advance to the next parameter of the firing cycle.
11) Using the Numeric Keypad, input the numbers corresponding to the desired High Temperature followed by the ENTER key.

```
01 NORM - TEST1
HIGH TEMP XXXXF
```
will appear on the Front Panel Display prompting the operator to input the desired value for the High Temperature.

Once the High Temperature has been input into memory the Furnace will then advance to the next parameter of the firing cycle.

12) Using the Numeric Keypad, input the numbers corresponding to the desired Hold Time followed by the ENTER key.

```
01 NORM - TEST1
HOLD TIME XX:XX
```
will appear on the Front Panel Display prompting the operator to input the desired Hold Time value represented in minutes and seconds.

Once the Hold Time has been input into memory the Furnace will then advance to the next parameter of the firing cycle.

13) Using the Numeric Keypad, input the numbers corresponding to the desired Cooling Time followed by the ENTER key.

```
01 NORM - TEST1
COOLING XX:XX
```
will appear on the Front Panel Display prompting the operator to input the desired Cooling Time value represented in minutes and seconds.

Once the Cooling Time has been input into memory the Furnace will then advance to the next parameter of the firing cycle.

14) Using the Numeric Keypad, input the numbers corresponding to the desired Vacuum Start Temperature followed by the ENTER key.

```
01 NORM - TEST
START VAC XXXXF
```
will appear on the Front Panel Display prompting the operator to input the desired temperature represented when the vacuum pump should begin.

Once the Start Vacuum Temperature has been input into memory the Furnace will then advance to the next parameter of the firing cycle.

15) Using either the STEP → key or STEP ← key to scroll the display until the desired function, corresponding to the desired Vacuum Vent option followed by the ENTER key.
VACUUM VENT - TIME

will appear on the Front Panel Display prompting the operator to select either a Time or a Temperature for the vacuum to be released.

16) Once the appropriate selection (TEMP or TIME) appears on the Front Display Panel, depress the ENTER key.

01 NORM - TEST
VACUUM VENT
XXXXF

OR

01 NORM - TEST
VACUUM VENT
XXXXF

will appear on the Front Panel Display prompting the operator to input the desired Temperature represented when the vacuum should be released.

will appear on the Front Panel Display prompting the operator to input the desired Time, which once elapsed, will allow the vacuum to be released.

Once the Vacuum Vent (Temp or Time) has been input into memory the Furnace will then return to the Main Menu display (SELECT RUN, PROG OR SETUP) as shown below, indicating that programming for that firing cycle has been completed.

SELECT RUN, PROG
OR SETUP BUTTON

PARAMETER LIMITS & DESCRIPTIONS OF THE LOW (LOW FUSING) PROGRAM CATEGORY

A LOW (LOW FUSING) program consists of:

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>LOWER LIMIT</th>
<th>UPPER LIMIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENTRY TEMP</td>
<td>32°F (0°C)</td>
<td>1508°F (820°C)</td>
</tr>
<tr>
<td>PREHEAT</td>
<td>00 Min 00 Sec</td>
<td>99 Min 00 Sec</td>
</tr>
<tr>
<td>LOW TEMP</td>
<td>ENTRY TEMP VALUE</td>
<td>2192°F (1200°C)</td>
</tr>
<tr>
<td>LOW HOLD</td>
<td>00 Min 00 Sec</td>
<td>60 Min 00 Sec</td>
</tr>
<tr>
<td>HEAT RATE</td>
<td>2°F (1°C)</td>
<td>234°F (130°C)</td>
</tr>
<tr>
<td>VAC LEVEL</td>
<td>0 inHg (0 cmHg)</td>
<td>30 inHg (76 cmHg)</td>
</tr>
<tr>
<td>HIGH TEMP</td>
<td>LOW TEMP VALUE</td>
<td>2192°F (1200°C)</td>
</tr>
<tr>
<td>HOLD TIME</td>
<td>00 Min 00 Sec</td>
<td>99 Min 00 Sec</td>
</tr>
<tr>
<td>COOLING - STANDARD or SPECIAL-</td>
<td>00 Min 00 Sec</td>
<td>99 Min 00 Sec</td>
</tr>
</tbody>
</table>
TIME and TEMP
VAC START WITH - TEMP or LOW HOLD VACUUM VENT-
TEMP or TIME

00 Min 00 Sec
ENTRY TEMP VALUE LOW TEMP VALUE 00 Min 00 Sec ENTRY TEMP VALUE
20 Min 00 Sec HIGH TEMP VALUE HIGH TEMP VALUE
LOW HOLD VALUE
HIGH TEMP VALUE
HOLD TIME VALUE

ENTRY TEMP -
The temperature at which the Door will remain in the full open position to allow the restoration to be preheated. This is typically required to allow special liquids which are used in Low Fusing Porcelains to evaporate prior to the Preheat portion the firing cycle.

PREHEAT -
The length of time, programmable in minutes and seconds, required for the Furnace Door to travel from the initial preheat position to the fully closed position. The Furnace Door will move in five stages from the fully open to the fully closed position. The Furnace Door will not begin to close until the Muffle temperature is within approximately 5°F (3°C) of the programmed Low Temperature.

LOW TEMP -
The temperature at which the Door will begin to close for preheating the restoration. Once the Furnace Door has completely closed, the firing cycle will begin at this temperature.

When programming this value it must either be equal to, or higher than the Entry Temperature.

LOW HOLD -
The length of time, in minutes and seconds, over which the programmed Low Temperature will be maintained.

At the end of the programmed Hold Time the Furnace will automatically advance to the next parameter.

If no Hold Time is desired, zeros should be programmed into memory.

HEAT RATE -
The rate of temperature rise within the Muffle, in degrees per minute.
This value will be used for the rate of temperature rise from the programmed Entry Temperature up to the programmed Low Temperature, and also for the rate of temperature rise from the programmed Low Temperature up to the High Temperature.

**VAC LEVEL**

The level of vacuum which will be maintained within the Muffle vacuum chamber, throughout the programmed firing cycle.

**HIGH TEMP**

The maximum temperature which will be obtained during the programmed firing cycle. Once the high temperature has been reached the Furnace will maintain this temperature for the amount of time programmed in the Hold Time.

When programming this value it must either be equal to, or higher than the Low Temperature.

**HOLD TIME**

The length of time, in minutes and seconds, over which the programmed High Temperature will be maintained prior to the Furnace door opening.

At the end of the programmed Hold Time the Furnace door will automatically open over the period of programmed Cooling time.

When programming this value it must either be equal to, or higher than the Vent Time.

**COOLING**

The Furnace has the capability to cool restorations in two manners:

**STANDARD**

The length of time, programmable in minutes and seconds, required for the Furnace door to reach the fully opened position.

When selected, this option will cool the restoration at the end of the programmed Hold Time from the High Temperature, down to Room Temperature. The Furnace door will gradually open, in five stages, from the closed position to the fully opened position over the programmed amount of time.

**SPECIAL**

When selected, this option will then ask the operator for a Temperature and a Time.
TEMP
This is a operator programmable Temperature which the restoration will cool down to from the High Temperature, after the Hold Time has elapsed.

TIME
This is the amount of Time, programmable in minutes and seconds, that the restoration will be held at the above Special Cooling Temperature.

VAC START WITH -
The point at which the vacuum pump will automatically turn on to develop the programmed level of vacuum within the Muffle vacuum chamber.

The Furnace has the capability to Start the Vacuum at either a Temperature or during the Low Hold.

TEMP
When selected, the Furnace will prompt the operator to program a Temperature at which the Vacuum Pump will engage and develop the programmed Vacuum Level.

When programming this value it must either be equal to, or higher than the Entry Temperature.

LOW Hold
When selected, the Furnace will begin operation of the Vacuum Pump during the Low Hold and develop the programmed Vacuum Level. The operation of the pump will be delayed by the amount of Time specified by the operator.

VENT -
The Furnace has the capability to Vent off vacuum at either a specified Temperature or after a specified amount of Time has elapsed.

TEMP
When a Vent Temperature has been programmed, the vacuum in the muffle vacuum chamber will be automatically released when the specified Temperature has been reached.

When programming this value it must either be equal to, or lower than the High Temperature.

TIME
When a Vent Time has been programmed, the vacuum in the muffle vacuum chamber will be automatically released when the specified
amount of Time has elapsed.

When programming this value it must either be equal to, or lower than the Hold Time.

**PROGRAMMING A LOW (LOW FUSING) FIRING CYCLE**

A LOW (LOW FUSING) firing cycle may be programmed in the following manner:

1) Depress the **PROG** key.

   | **SELECT ITEM:** | will appear on the Front Display Panel. |
   | LOOK AT PROGRAM   |

2) Depress either the **STEP →** key or **STEP ←** key until

   | **SELECT ITEM:** | appears on the Front Display Panel. |
   | ADD A PROGRAM     |

3) Depress the **ENTER** key, the Furnace will then prompt the operator the program number (represented below by **XX**).

   | **ADD:**         | will appear on the Front Display Panel. |
   | **XX**           |

4) Using the Numeric Keypad, input the numbers corresponding to the desired program number where you wish to store the firing cycle in memory (00 through 55), followed by the **ENTER** key.

   | **ADD:**         | will appear on the Front Display Panel. **02** represents the program number of where the firing cycle will be stored in memory. |
   | **02**           |

5) Depress either the **STEP →** key or **STEP ←** key until the desired program category (NORM, LOW or APS) appears on the Front Display Panel.

   | **PORCELAIN TYPE:** | When the desired porcelain category appears, depress the **ENTER** key. |
   | **02 LOW**         |

6) Depress either the **STEP →** key or **STEP ←** key to scroll the display until the desired letter, number or symbol appears on the Front Display Panel.
ENTER PROG NAME:
02 LOW - _

will appear on the Front Display Panel to prompt the operator to input a name (up to 8 characters in total length) for the firing cycle.

When the desired character appears on the display, depress the ENTER key to log your choice into the memory of the Furnace.

Repeat this procedure (up to 7 more times) to spell out the desired name for the firing cycle.

ENTER PROG NAME:
02 LOW - TEST2

Once the last character of the desired name for the firing cycle has been input into memory the Furnace will then advance to the first parameter of the firing cycle.

7) Using the Numeric Keypad, input the numbers corresponding to the desired Entry Temperature followed by the ENTER key.

02 LOW - TEST2
ENTRY TEMP XXXXF

will appear on the Front Panel Display prompting the operator to input the desired Entry Temperature.

Once the Entry Temperature has been input into memory the Furnace will then advance to the next parameter of the firing cycle.

8) Using the Numeric Keypad, input the numbers corresponding to the desired Low Temperature followed by the ENTER key.

02 LOW - TEST2
PREHEAT XX:XX

will appear on the Front Panel Display prompting the operator to input the desired Preheat Time value represented in minutes and seconds.

Once the Preheat Time has been input into memory, the Furnace will then advance to the next parameter of the firing cycle.

9) Using the Numeric Keypad, input the numbers corresponding to the desired Low Temperature followed by the ENTER key.

02 LOW - TEST2
LOW TEMP XXXXF

will appear on the Front Panel Display prompting the operator to input the desired Low Temperature.

Once the Low Temperature has been input into memory the Furnace will then advance to the next parameter of the firing cycle.
10) Using the Numeric Keypad, input the numbers corresponding to the desired Low Temperature followed by the ENTER key.

```
02 LOW - TEST2
LOW HOLD XX:XX
```

will appear on the Front Panel Display prompting the operator to input the desired Hold Time value, at the Low Temperature, represented in minutes and seconds.

Once the Low Hold has been input into memory, the Furnace will then advance to the next parameter of the firing cycle.

11) Using the Numeric Keypad, input the numbers corresponding to the desired Heat Rate followed by the ENTER key.

```
02 LOW - TEST2
HEAT RATE XXXF/M
```

will appear on the Front Panel Display prompting the operator to input the desired Heat Rate value represented in degrees Fahrenheit or degrees Celsius per minute.

Once the Heat Rate has been input into memory the Furnace will then advance to the next parameter of the firing cycle.

12) Using the Numeric Keypad, input the numbers corresponding to the desired Vacuum Level followed by the ENTER key.

```
02 LOW - TEST2
VAC LEVEL XX IN
```

will appear on the Front Panel Display prompting the operator to input the desired level of vacuum represented in either Inches of Mercury or Centimeters of Mercury.

**Note:** If a level of 0 lnHg (0 cmHg) is selected, the Furnace will automatically eliminate any other vacuum related information (i.e. Vacuum Start and Vent parameters) from appearing during the programming procedure.

Once the Vacuum Level has been input into memory the Furnace will then advance to the next parameter of the firing cycle.

13) Using the Numeric Keypad, input the numbers corresponding to the desired High Temperature followed by the ENTER key.

```
02 LOW - TEST2
HIGH TEMP XXXXF
```

will appear on the Front Panel Display prompting the operator to input the desired value for the High Temperature in degrees Fahrenheit or Celsius.
Once the High Temperature has been input into memory the Furnace will then advance to the next parameter of the firing cycle.

14) Using the Numeric Keypad, input the numbers corresponding to the desired Hold Time followed by the ENTER key.

```
02 LOW - TEST2
HOLD TIME  XX:XX
```

will appear on the Front Panel Display prompting the operator to input the desired Hold Time value represented, in minutes and seconds.

Once the Hold Time has been input into memory the Furnace will then advance to the next parameter of the firing cycle.

15) Using the STEP → key or STEP ← key, scroll the display to the desired Type of Cooling (STANDARD or SPECIAL), followed by the ENTER key.

```
COOLING TYPE ?
STANDARD
```

will appear on the Front Panel Display prompting the operator to select the desired method of Cooling (STANDARD or SPECIAL).

If a Standard Cooling Type has been input into memory, the Furnace will then advance to ask the operator to input the according Cooling Time.

```
02 LOW - TEST2
COOLING  XX:XX
```

will appear on the Front Panel Display prompting the operator to input the desired Cooling Time value, in minutes and seconds.

OR

If Special Cooling Type has been specified for the Cooling Type, the operator must then input the according Special Cooling Time, followed by a Special Cooling Temperature.

```
02 LOW - TEST2
SP CL TIME  XX:XX
```

will appear on the Front Panel Display prompting the operator to input the desired Special Cooling Time value, in minutes and seconds.

AND

```
02 LOW - TEST2
SP CL TEMP  XXXXF
```

will appear on the Front Panel Display prompting the operator to input the desired Special Cooling Temperature value, in degrees Fahrenheit or Celsius.
Once the Special Cooling Time and Special Cooling Temperature have been input into memory, the Furnace will then advance to ask the operator to input the according Cooling Time.

```
02 LOW - TEST2
COOLING  XX:XX
```

will appear on the Front Panel Display prompting the operator to input the desired Cooling Time value, in minutes and seconds.

The Furnace will then advance to the next parameter of the firing cycle.

16) Using the STEP → key or STEP ← key, scroll the display to the Vacuum Start Method (Temp or Low Hold) followed by the ENTER key.

```
VAC START WITH ?
TEMP
```

will appear on the Front Panel Display prompting the operator to input the desired method (Temp or Low Hold) with which the vacuum pump should begin operation.

Once the Vacuum Start method has been input into memory the Furnace will then advance and ask the operator for the appropriate Vacuum Start Temperature or Time value within the Low Hold.

```
02 LOW - TEST2
START VAC XXXXF
```

will appear on the Front Panel Display prompting the operator to input the desired Vacuum Start Temperature value, in degrees Fahrenheit or Celsius.

Or

```
START VAC XX:XX
```

will appear on the Front Panel Display prompting the operator to input the desired Vacuum Start Time value, in minutes and seconds, after which the vacuum pump will begin operation during the Low Hold function.

17) Using either the STEP → key or STEP ← key to scroll the display until the desired Vacuum Vent function (TEMP or TIME), input the numbers corresponding to the desired Vacuum Vent option followed by the ENTER key.

```
VACUUM VENT - TIME
```

will appear on the Front Panel Display prompting the operator to select either a Temperature, or a Time for the vacuum to be released.
Once the appropriate selection (TEMP or TIME) appears on the Front Display Panel, depress the ENTER key. The display will appear on the Front Panel Display prompting the operator to input the desired temperature, in degrees Fahrenheit or Celsius, represented when the vacuum should be released.

OR

The display will appear on the Front Panel Display prompting the operator to input the desired time, in minutes and seconds, which once elapsed will allow the vacuum to be released.

Once the Vacuum Vent (Temp or Time) has been input into memory the Furnace will then return to the Main Menu display (SELECT RUN, PROG OR SETUP) as shown below, indicating that programming for that firing cycle has been completed.

SELECT RUN, PROG OR SETUP BUTTON

ARGON GAS REQUIREMENTS

Argon gas may be obtained from your local bottled gas dealer or welding supply house.

There are many grades of Argon gas, however it should be noted that usually the lowest cost, industrial grade of Argon will be adequate for use with the Furnace.

**Warning:** Only Argon gas should be connected to the Argon Gas input on the rear panel of this Furnace. Use of any other gases could result in fire or explosion causing personal injury or death.

The Argon Gas tank will require a Regulator to reduce the pressure to an acceptable level which the Furnace can handle. It is recommended that an Argon Gas Regulator with a built in flow meter be utilized (such as Jelenko P/N 340015). The flowmeter of the Argon Gas Regulator should be adjusted for a setting of 4 cu ft/hour (1.9 liters/minute) when argon is flowing into the Furnace.
### PARAMETER LIMITS & DESCRIPTIONS OF THE APS (ARGON POST SOLDERING) PROGRAM CATEGORY

An APS (ARGON POST SOLDERING) program consists of:

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>LOWER LIMIT</th>
<th>UPPER LIMIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOW TEMP</td>
<td>32°F (0°C)</td>
<td>1508°F (820°C)</td>
</tr>
<tr>
<td>PREHEAT</td>
<td>00 Min 00 Sec</td>
<td>99 Min 00 Sec</td>
</tr>
<tr>
<td>LOW HOLD</td>
<td>00 Min 00 Sec</td>
<td>60 Min 00 Sec</td>
</tr>
<tr>
<td>1ST RATE</td>
<td>2°F (1°C)</td>
<td>234°F (130°C)</td>
</tr>
<tr>
<td>1ST TEMP</td>
<td>LOW TEMP VALUE</td>
<td>2192°F (1200°C)</td>
</tr>
<tr>
<td>2ND RATE</td>
<td>2°F (1°C)</td>
<td>2192°F (1200°C)</td>
</tr>
<tr>
<td>HIGH TEMP</td>
<td>LOW TEMP VALUE</td>
<td>2192°F (1200°C)</td>
</tr>
<tr>
<td>HOLD TIME</td>
<td>00 Min 00 Sec</td>
<td>99 Min 00 Sec</td>
</tr>
<tr>
<td>COOLING</td>
<td>00 Min 00 Sec</td>
<td>99 Min 00 Sec</td>
</tr>
</tbody>
</table>

**VACUUM**

- (either Vacuum environment or Argon environment)
  - YES or NO

**LOW TEMP**

- The temperature at which the Door will begin to close for preheating the restoration. Once the Furnace Door has completely closed, the firing cycle will begin at this temperature.

**PREHEAT**

- The length of time, programmable in minutes and seconds, required for the Furnace Door to travel from the initial preheat position to the fully closed position. The Furnace Door will move in five stages from the fully open to the fully closed position. The Furnace Door will not begin to close until the Muffle temperature is within approximately 5°F (3°C) of the programmed Low Temperature.

**LOW HOLD**

- The length of time, in minutes and seconds, over which the programmed Low Temperature will be maintained.

At the end of the programmed Hold Time the Furnace will automatically advance to the next parameter.

If no Hold Time is desired, zeros should be programmed into memory.

**1ST RATE**

- The 1ST (first) rate of temperature rise within the Muffle, starting from the programmed Low Temperature up to the programmed 1ST (first) Temperature, in degrees per minute.
1ST TEMP -
The 1ST (first) temperature which will be obtained after the Low Temperature, during the programmed firing cycle. Once the 1ST Temperature has been reached the Furnace will then advance to the specified High Temperature, increasing at the 2ND Rate of climb.

When programming this value it must either be equal to, or higher than the Low Temperature.

2ND RATE -
The 2ND (second) rate of temperature rise within the Muffle, starting from the programmed 1ST Temperature up to the programmed High Temperature, in degrees per minute.

HIGH TEMP -
The maximum Temperature which will be obtained after the 1ST Temperature, during the programmed firing cycle. Once the High Temperature has been reached the Furnace then advance to the Hold Time.

When programming this value it must either be equal to, or higher than the Low Temperature.

HOLD TIME -
The length of time, in minutes and seconds, over which the programmed High Temperature will be maintained prior to the Furnace door opening.

At the end of the programmed Hold Time the Furnace door will automatically open over the period of programmed Cooling time.

When programming this value it must either be equal to, or higher than the Vent Time.

COOLING -
The length of time, programmable in minutes and seconds, required for the Furnace door to reach the fully opened position.

At the end of the programmed Hold Time, the Furnace door will gradually open, in five stages, from the fully closed position to the fully opened position over the programmed amount of time.

VACUUM -
The Furnace has the capability to either develop a Vacuum environment (without Argon Gas) or an Argon environment during the APS program.

During programming, should the operator select YES, the Furnace will initiate Vacuum (without Argon) during the Low Temperature. The
Vacuum level is fixed and will be maintained throughout the firing cycle. The Vacuum will be released after the Hold Time has elapsed.

Should the operator select NO during programming, the Furnace will initiate a Vacuum during the Low Hold which will be followed immediately by a flushing procedure. Each time the fixed Vacuum level is achieved the Furnace will then activate the Argon Gas flow to flush the Muffle/Vacuum Chamber of other residual gases. This procedure will be repeated twice. The Argon environment will remain intact until after the Hold Time has elapsed.

PROGRAMMING AN APS (ARGON POST SOLDERING) FIRING CYCLE
An APS (ARGON POST SOLDERING) firing cycle may be programmed in the following manner:
1) Depress the PROG key.

SELECT ITEM: LOOK AT PROGRAM

will appear on the Front Display Panel.

2) Depress either the STEP → key or STEP ← key until

SELECT ITEM: ADD A PROGRAM

appears on the Front Display Panel.

3) Depress the ENTER key, the Furnace will then prompt the operator the program number (represented below by XX).

ADD:
XX

will appear on the Front Display Panel.

4) Using the Numeric Keypad, input the numbers corresponding to the desired program number where you wish to store the firing cycle in memory (00 through 55), followed by the ENTER key.

ADD:
03

will appear on the Front Display Panel. 03 represents the program number of where the firing cycle will be stored in memory.

5) Depress either the STEP → key or STEP ← key until the desired program category (NORM, LOW or APS) appears on the Front Display Panel.

When the desired porcelain category appears, depress the ENTER key.

PORCELAIN TYPE:
03 APS
6) Depress either the `STEP →` key or `STEP ←` key to scroll the display until the desired letter, number or symbol appears on the Front Display Panel.

```
ENTER PROG NAME:
03 APS - _
```

will appear on the Front Display Panel to prompt the operator to input a name (up to 8 characters total length) for the firing cycle.

When the desired character appears on the display, depress the ENTER key to log your choice into the memory of the Furnace.

Repeat this procedure (up to 7 more times) to spell out the desired name for the firing cycle.

```
ENTER PROG NAME:
03 APS - TEST3
```

Once the last character of the desired name for the firing cycle has been input into memory the Furnace will then advance to the first parameter of the firing cycle.

7) Using the Numeric Keypad, input the numbers corresponding to the desired Low Temperature followed by the ENTER key.

```
03 APS - TEST3
LOW TEMP XXXXF
```

will appear on the Front Panel Display prompting the operator to input the desired Low Temperature.

Once the Low Temperature has been input into memory the Furnace will then advance to the next parameter of the firing cycle.

8) Using the Numeric Keypad, input the numbers corresponding to the desired Low Temperature followed by the ENTER key.

```
03 APS - TEST3
PREHEAT XX:XX
```

will appear on the Front Panel Display prompting the operator to input the desired Preheat Time value represented in minutes and seconds.

Once the Preheat Time has been input into memory the Furnace will then advance to the next parameter of the firing cycle.

9) Using the Numeric Keypad, input the numbers corresponding to the desired Heat Rate followed by the ENTER key.

```
03 APS - TEST3
LOW HOLD XX:XX
```

will appear on the Front Panel Display prompting the operator to input the desired Time, in minutes and seconds, during which the Low
Temperature will be maintained.

Once the Low Hold has been input into memory the Furnace will then advance to the next parameter of the firing cycle.

10) Using the Numeric Keypad, input the numbers corresponding to the desired 1ST Heat Rate followed by the ENTER key.

```
03 APS - TEST3
1ST RATE XXXF/M
```

will appear on the Front Panel Display prompting the operator to input the 1ST Heat Rate represented in either degrees Fahrenheit per minute or degrees Celsius per minute.

Once the 1ST Heat Rate has been input into memory the Furnace will then advance to the next parameter of the firing cycle.

11) Using the Numeric Keypad, input the numbers corresponding to the desired 1ST Temperature followed by the ENTER key.

```
03 APS - TEST3
1ST TEMP XXXXF
```

will appear on the Front Panel Display prompting the operator to input the desired value for the 1ST Temperature.

Once the 1ST Temperature has been input into memory the Furnace will then advance to the next parameter of the firing cycle.

12) Using the Numeric Keypad, input the numbers corresponding to the desired 2ND Heat Rate followed by the ENTER key.

```
03 APS - TEST3
2ND RATE XXXF/M
```

will appear on the Front Panel Display prompting the operator to input the 2ND Heat Rate, represented in either degrees Fahrenheit per minute or degrees Celsius per minute.

Once the 2ND Heat Rate has been input into memory the Furnace will then advance to the next parameter of the firing cycle.

13) Using the Numeric Keypad, input the numbers corresponding to the desired High Temperature followed by the ENTER key.

```
03 APS - TEST3
HIGH TEMP XXXXF
```

will appear on the Front Panel Display prompting the operator to input the desired value for the High Temperature, in either degrees Fahrenheit or Celsius.

Once the High Temperature has been input into memory the Furnace will then advance to the next parameter of the firing cycle.
14) Using the Numeric Keypad, input the numbers corresponding to the desired Hold Time followed by the ENTER key.

```
03 APS - TEST3
HOLD  TIME
XX:XX
```
will appear on the Front Panel Display prompting the operator to input the desired Hold Time value, represented in minutes and seconds.

Once the Hold Time has been input into memory the Furnace will then advance to the next parameter of the firing cycle.

15) Using the Numeric Keypad, input the numbers corresponding to the desired Cooling Time followed by the ENTER key.

```
03 APS - TEST3
COOLING  XX:XX
```
will appear on the Front Panel Display prompting the operator to input the desired Cooling Time value represented in minutes and seconds.

Once the Cooling Time has been input into memory the Furnace will then advance to the next parameter of the firing cycle.

16) Using either the \textit{STEP} \rightarrow key or \textit{STEP} \leftarrow key to scroll the display until the desired information of YES or NO, input the numbers corresponding to the desired Vacuum Vent option followed by the ENTER key.

```
03 APS - TEST3
USE VACUUM - NO
```
will appear on the Front Panel Display prompting the operator to select either NO or YES.

If YES is selected, the Furnace will initiate Vacuum (without Argon) during the Low Temperature. The Vacuum level is fixed and will be maintained until after the Hold Time has elapsed.

If NO is selected, the Furnace will initiate a Vacuum during the Low Hold. Each time the fixed Vacuum level is achieved the Furnace will then activate the Argon Gas flow to flush the Muffle/Vacuum Chamber of other residual gases. This procedure will be repeated twice. The Argon environment will remain intact until after the Hold Time has elapsed.
Once the selection for Vacuum use has been input into memory the Furnace will then return to the Main Menu display (SELECT RUN, PROG OR SETUP) as shown below, indicating that programming for that firing cycle has been completed.
CALIBRATION

Your JelFire VPF has been factory-calibrated and should not require adjustment. Should calibration be necessary, the Furnace is equipped with an automatic temperature calibration system.

NOTE: The electrodes of the Calibration Instrument should be cleaned to remove any residual silver wire from previous calibrations prior to preparing the Instrument with fresh silver wire.

To calibrate the Furnace, the following procedure should be followed:
1) Prepare the Calibration Instrument by bridging the two electrodes of the instrument with pure silver wire as shown in the photograph on page 47.

   The pure silver wire should be wrapped around each electrode tightly, four times with a slight upward arc between the electrodes of approximately 1/4 inch (6 mm).

   The operator should then lightly squeeze each electrode where the wire wraps around it with a small pair of pliers or hemostats to enhance the connection of the silver wire to the electrode.

2) Warm up the Furnace for at least one hour and run at least four complete programs.

3) Open the Furnace Door completely and remove the Door Brick Platform.

4) Place the Calibration Instrument on the Furnace Door.

5) Insert the plug from the Calibration Instrument into the Calibration Port (located behind the access panel on the right side of the Furnace).

6) Depress the DOOR ↑ key to raise the Door and allow the Calibration Instrument to warm up for approximately five minutes.

7) Depress the SETUP key. The Furnace will display:

   SELECT ITEM:
   NIGHT MODE
depress either the STEP → key or STEP ← key to scroll the display until CALIBRATE OVEN appears on the Front Display Panel.

8) The Furnace will prompt the operator for a password. The password to access the Calibration function of the Furnace is 135.

   PASSWORD - 0

   Depress the numbers 135 on the Numeric Keypad, followed by the ENTER key.
9) The Furnace will display

SELECT ITEM
CALIBRATE LIFT

Depress either the STEP g key or STEP f key to scroll the display until CAL HIGH TEMP appears on the Front Display, followed by the ENTER key.

10) The Furnace will display

SELECT ITEM:
CALIBRATE ?NO

Depress either the STEP → key or STEP ← key to scroll the display until the appropriate response (YES or NO) appears on the Front Display, followed by the ENTER key.

11) The Furnace will display

SELECT METHOD:
USE CALIBRATOR

Depress either the STEP → key or STEP ← key to scroll the display until MELT SILVER WIRE appears on the Front Display, followed by the ENTER key.

12) Once the ENTER key has been depressed, the Furnace will automatically begin the Calibration program. It will take approximately 30 minutes for the Calibration program to be completed.

After the silver wire melts, the Furnace will maintain the Calibration temperature for a period of time. This is normal - DO NOT INTERRUPT THE CALIBRATION PROGRAM.

When completed, the Furnace will sound a series of musical tones and the Calibration program will automatically end indicating that the cycle has completed on the Front Display Panel.

DISPLAYING ADDITIONAL INFORMATION DURING THE OPERATION OF A FIRING CYCLE

During the operation of any of the firing cycles the operator may gain access to additional information pertaining to that firing cycle.

When a firing cycle is operating, the general status will appear on the display, as shown below:

01 NORM - BAKE1
HOLD 1755F V
The top line indicates which program number is in operation, the category and name of the program.

The bottom line indicates the status of the program in operation. It will indicate which parameter is presently in operation, followed by the temperature information and an indicator of whether Vacuum (V) or Argon (A) is present.

By depressing either the STEP → key or STEP ↵ key, the operator may scroll the display through seven (7) levels to show the following additional information on the Front Display Panel. The information will appear as follows:

"TARGET TEMP XXXXF"
"ACTUAL TMP XXXXF"

The top line of this display indicates the target temperature for this parameter and the bottom line indicates the actual temperature of the muffle.

Depressing the STEP → key will advance the display to the next information level.

"TIME LEFT: XX:XX"
"STEP TIME: XX:XX"

The top line of this display indicates the amount of time remaining for the entire firing cycle to be completed and the bottom line indicates the amount of time left for that parameter.

Depressing the STEP → key will advance the display to the next information level.

"VACUUM - XX IN"

This line of this display indicates the amount of vacuum, in either Inches of Mercury or Centimeters of Mercury, currently in the Furnace.

Depressing the STEP → key will advance the display to the next information level.

"ENTER = SKIP STEP"
"RATE RISE: XXXF"

The top line of this display indicates that if the operator depresses the ENTER key, that the Furnace will skip this parameter and advance to the next parameter of the firing cycle.

The bottom line indicates the status of the program in operation. This information will also appear as part of the general display.

Depressing the STEP → key will advance the display to the next information level.
This display indicates that if the operator depresses the ENTER key, that the Furnace will allow the operator to change firing cycle information for the program in operation.

This change is temporary and will remain in effect only for the duration of the firing cycle which is in operation.

Depressing the STEP → key will advance the display to the next information level.

This display indicates that if the operator depresses the ENTER key, that the Automatic Night program will be activated.

When activated the Furnace will begin the Night program immediately after the firing cycle which is in operation has been completed.

The Auto Night program will only affect the firing cycle which is presently in operation.

Depressing the STEP → key will advance the display back to showing general information on the display.
ERROR MESSAGES

The Jelenko JelFire is equipped with a number of self-diagnostic features which, if trouble arises, will cause the Furnace to sound an alarm and display any one of several error messages as listed below to appear on the Front Panel Display:

NO VACUUM
This error message will appear if the Furnace has not achieved a minimum level of 27 InHg (68 cmHg) within thirty (30) seconds of operation. When this message appears the Furnace will have automatically aborted the firing cycle.

DUPLICATE NAME
This error message will appear during programming if operator has attempted to assign a name to a firing cycle which is identical to that used for another firing cycle.

Should this occur the operator should input a different name for the firing cycle which is being programmed.

PRINTER ERROR
This error message indicates that there is a problem with the IBM compatible printer which is connected to the Furnace. The printer should be checked to insure it is connected properly, that the “on-line” status light on the printer is illuminated and that the printer is not out of paper.

CHECK PROGRAMS
The error message will occur when the Furnace has detected corrupted information where the programs are stored. All programs should be inspected and if necessary, corrected.

TEMP CAL ERROR
This error message will occur when the Furnace has detected a problem with the Calibration Temperature information. The Furnace should be recalibrated when this error is displayed.

VAC CAL ERROR
This error message will occur when the Furnace has detected a problem with the Vacuum Calibration information. The Vacuum system should be recalibrated when this error is displayed.

MAX TEMP ERROR
This error message will occur when the Furnace has detected a temperature which is higher than the maximum temperature which the Furnace will allow. Should this occur, the Furnace will automatically shut power off to the Muffle. The operator will need to turn the Power Switch to the OFF position for a period of ten (10) seconds. Turning the Power Switch back to the ON position will
reset the Furnace. Should the error occur again contact either Jelenko, or your Authorized Jelenko Dealer for service assistance.

**THERMOCOUPLE ERROR**

This error message will occur when the Furnace has detected an open circuit in the Thermocouple for a period of 25 seconds (or longer). The Furnace will automatically shut power off to the Muffle. The operator will need to turn the Power Switch to the OFF position for a period of ten (10) seconds. Turning the Power Switch back to the ON position will reset the Furnace. Should the error occur again the Thermocouple should then be replaced.
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<thead>
<tr>
<th>PRODUCT NUMBER</th>
<th>PART DESCRIPTION</th>
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<tr>
<td>311710</td>
<td>Power Switch</td>
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<td>311711</td>
<td>Line Cord for Furnace - 115V</td>
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<tr>
<td>311712</td>
<td>Line Cord for Furnace - 230V</td>
</tr>
<tr>
<td>311713</td>
<td>Line Cord for Vacuum Pump - 115V</td>
</tr>
<tr>
<td>311714</td>
<td>Line Cord for Vacuum Pump - 230V</td>
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<tr>
<td>311715</td>
<td>Door Seal Gasket / Top Gasket</td>
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<tr>
<td>311716</td>
<td>Vacuum Pump Hose Connector / Argon Hose Connector</td>
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<tr>
<td>311717</td>
<td>Door Brick Platform</td>
</tr>
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<td>311718</td>
<td>Calibration Kit (includes Calibration Instrument &amp; Silver Wire)</td>
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<tr>
<td>311719</td>
<td>Door Drive Belt</td>
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<tr>
<td>311720</td>
<td>Door Up/Down Limit Switch</td>
</tr>
<tr>
<td>311721</td>
<td>Door Drive Mechanism Assembly</td>
</tr>
<tr>
<td>311722</td>
<td>Vacuum / Argon / Vent Solenoid</td>
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<tr>
<td>311723</td>
<td>Thermocouple Assembly</td>
</tr>
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<td>Muffle -115V</td>
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<tr>
<td>311725</td>
<td>Muffle - 230V</td>
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<td>311726</td>
<td>Front Circuit Board</td>
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<td>311727</td>
<td>Power Supply Circuit Board - 115 / 230V</td>
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<td>311728</td>
<td>Control Circuit Board</td>
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<tr>
<td>311729</td>
<td>Main / Vacuum Pump Fuse - 115V</td>
</tr>
<tr>
<td></td>
<td>12 Amp, 1/4&quot; x 1 1/4&quot; - Type T Slow Blow Fuse (pkg 5)</td>
</tr>
<tr>
<td>311730</td>
<td>Main / Vacuum Pump Fuse - 230V</td>
</tr>
<tr>
<td></td>
<td>6 Amp, 5mm x 20mm - Type T Slow Blow Fuse (pkg 5)</td>
</tr>
<tr>
<td>311731</td>
<td>Power Supply Circuit Board Fuse</td>
</tr>
<tr>
<td></td>
<td>1 Amp, 1/4&quot; x 1 1/4&quot; - Type T Slow Blow Fuse (pkg 5)</td>
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<tr>
<td>311732</td>
<td>Front Mylar Panel</td>
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<td>311736</td>
<td>Secondary Power Supply Circuit Board Fuse</td>
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<td></td>
<td>5 Amp, 5mm x 20mm - Type F Fuse (pkg 5)</td>
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<tr>
<td>311737</td>
<td>Power Supply Circuit Board - 100V</td>
</tr>
<tr>
<td>340015</td>
<td>Argon Gas Regulator</td>
</tr>
<tr>
<td>400844</td>
<td>Air Hose with Fitting (for use with Vacuum Pump or Argon Regulator)</td>
</tr>
<tr>
<td>130160</td>
<td>Silver Calibration Wire</td>
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