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Jelenko Commodore 100 Vacuum Porcelain Furnace

SPECIFICATIONS

Maximum Temperature:
2200 °F (1200 °C)

Overall Dimensions:
15 1/2" wide x 15 1/4" deep x 21 1/4" high
(39.4 cm wide x 38.7 cm deep x 54.0 cm high)

Muffle:
Accepts any restoration 3" diameter x 2 1/4" high
(7.6 cm diameter x 5.7 cm high)

Electrical:
115V/230V 50/60 Hz 1400 watts (PN 311480)

Net Weight:
48.1 lbs (21.6 Kg)

Supplied Accessories:
Set of three-- Single Point Sagger Trays
Set of two-- Crown Sagger Trays
Full Arch Sagger Tray
Calibration Kit (Includes instrument and silver wire)

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 produced and 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 exposure 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.
INSTALLATION

1. Remove all packaging material from around the furnace.

2. Place the furnace in an area which provides a minimum of two inches (5.1 cm) of air space on all sides.

3. Connect the vacuum pump hose from your vacuum pump to the vacuum hose connector at the rear of the furnace. Use of a Jelenko oil-less pump (115V - PN 306230; 230V - PN 306235) is recommended.

4. Plug the vacuum pump line cord into the vacuum pump receptacle rated for the same voltage that the furnace is operating at. If the pump is plugged into the wrong receptacle it will not operate.

5. Plug the furnace into a wall receptacle rated at a minimum of 15 amperes. An independent electrical circuit must always be used.

6. Press the POWER SWITCH to the ON position. The DIGITAL DISPLAY will light and indicate the actual muffle temperature.

7. Lower the furnace door and remove the foam ring from the furnace door.

8. Unpack the door brick platform and place it on the door within the raised ridge.


NOTE: It is important that your Commodore 100 furnace be operated only from an independent electrical outlet with no other equipment on the same circuit.

This furnace, as with all microprocessor-controlled devices, will perform reliably when it is operated from a stable power source, free from frequent voltage fluctuations.

MUZZLE CURING

The muffle in the Commodore 100 Vacuum Porcelain Furnace has been designed and constructed of lightweight ceramic fiber materials, which are highly resistant to the absorption of atmospheric moisture. If vacuum loss is observed while operating the furnace after initial installation, or after replacing the muffle, it is most likely the result of muffle outgassing,* and the muffle curing procedure outlined below should be performed twice.

Using any available program, program the following parameters:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOW TEMP</td>
<td>1000°F (538°C)</td>
</tr>
<tr>
<td>PREHEAT TIME</td>
<td>0 min 10 sec</td>
</tr>
<tr>
<td>HEAT RATE</td>
<td>100°F (56°C)</td>
</tr>
<tr>
<td>VACUUM 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 0 sec</td>
</tr>
<tr>
<td>COOL TIME</td>
<td>0 min 10 sec</td>
</tr>
<tr>
<td>EVACUATION TEMP</td>
<td>1000°F (538°C)</td>
</tr>
<tr>
<td>VENT</td>
<td>20 min 0 sec</td>
</tr>
</tbody>
</table>

* Muffle outgassing occurs when moisture contained within the muffle insulation, or door platform, is boiled and changed into a gaseous state, usually at muffle temperatures of 1000°F and above. This gas results in a reduction in the vacuum level within the furnace vacuum chamber, thus creating apparent vacuum leakage.
1. Power Switch
2. Graphic Display
3. Digital Display
4. Program Selector Keyboard
5. Program Key
6. Step Key
7. Numeric Keyboard
8. Start/Stop Key
9. Page Key
10. Stop Over Key
11. Vacuum Override Key
12. Air Override Key
13. Viewing Light Key
14. Door Down Key
15. Door Up Key
16. Idle Key
17. Night Key
18. Calibrate Key
FRONT PANEL CONTROLS

POWER SWITCH (1) :
Turns the power to the furnace ON or OFF. The front panel display will light when this switch is placed in the ON position.

GRAPHIC DISPLAY (2) :
A two section display which indicates the status of the furnace in a programmed firing cycle and, during programming, identifies the selected firing cycle parameter.

DIGITAL DISPLAY (3) :
A multiple function display which indicates the actual muffle temperature, actual vacuum level, remaining preheat or hold time, as well as the values of any of the nine different firing cycle parameters.

PROGRAM SELECTOR KEYBOARD (4) :
A group of ten keys with indicator lamps, labeled “A” through “J”, used to select the desired program.

PROGRAM KEY (5) :
When this key is depressed the furnace is placed into the “program” mode and will accept firing cycle parameter changes entered through the NUMERIC KEYBOARD. This key must always be depressed when entering or changing parameters in any of the programs or when reviewing data in any of the programs.

STEP KEY (6) :
Used in conjunction with the program key during programming, or when reviewing a program, to advance the GRAPHIC DISPLAY to the next parameter in the program.

Depressing the key once will cause the display to advance one parameter; holding the key depressed will cause the display to advance the parameters automatically, one parameter at a time, until the key is released. A brief tone response will be heard with each parameter advancement.

NUMERIC KEYBOARD (7) :
A group of keys labeled zero through nine, including CLEAR and ENTER keys, used when programming the furnace. To program a parameter, the numbered keys are depressed to enter the parameter value. As each numbered key is depressed, the number will appear on the DIGITAL DISPLAY with the numbers advancing from right to left.

If, during the entry, an error is made, the CLEAR key should be depressed to remove the incorrect entry from the display.

START/STOP KEY (8) :
Used either to begin or terminate a selected firing cycle, the Calibration, Night or Idle programs.

PAGE KEY (9) :
Used to select any of the 10 menu Pages, "P 1" through "P 10". The Digital Display will indicate the menu Page number when this Key is activated.

STOP OVERRIDE KEY (10) :
Used during override period which occurs at the end of the programmed Cool Time to terminate either Air Override or Vacuum Override function. This key, rather than the program STOP key, must be used to stop an override function as it will not terminate the complete firing cycle.
VACUUM OVERRIDE (11):

Used at the end of the firing cycle to automatically close the furnace door and raise the muffle temperature an additional 100°F (56°C) higher than the programmed high temperature under the vacuum level programmed for the firing cycle in use. The furnace will maintain the programmed high temperature for approximately 45 seconds after the door automatically opens at the end of the firing cycle, at which time this override may be used.

To operate, determine if a higher temperature or additional time at the original High Temperature is necessary when the furnace door opens at the end of the firing cycle. If so, momentarily depress the VACUUM OVERRIDE Key. The furnace door will close. The vacuum pump will operate until the vacuum level programmed for the firing cycle is achieved and then turn off. The muffle temperature, as indicated on the DIGITAL DISPLAY, will increase at the Heat Rate programmed for the firing cycle in use.

Once the desired temperature has been reached, it may be maintained by momentarily depressing the VACUUM OVERRIDE Key. The temperature may be further increased by again momentarily depressing the VACUUM OVERRIDE Key. Any desired temperature may be maintained by momentarily depressing the VACUUM OVERRIDE Key. This overriding and holding process may be repeated as many times as desired.

If at any time during the Vacuum Override procedure it is necessary to open the furnace door, the STOP OVERRIDE Key should be depressed. By using the STOP OVERRIDE Key, it is possible again to use either the Vacuum Override Key or Air Override feature.

Each time the VACUUM OVERRIDE Key is depressed, a brief tone response will be heard, and the indicator lamp above the key will light when the Vacuum Override function is in use.

Note that the indicator lamps above the VACUUM OVERRIDE and AIR OVERRIDE Keys will alternately flash on and off during the override period, indicating that either key is operative during that period.

AIR OVERRIDE (12):

Used at the end of the firing cycle to automatically close the furnace door and raise the muffle temperature up to an additional 100°F (56°C) higher than the programmed High Temperature, without vacuum. The furnace will maintain the programmed High Temperature for approximately 45 seconds after the door automatically opens at the end of the firing cycle, at which time this override feature may be used.

To operate, determine if a higher temperature or additional time at the original High Temperature is necessary when the furnace door opens at the end of the firing cycle. If so, momentarily depress the AIR OVERRIDE Key. The furnace door will close and the muffle temperature, as indicated on the DIGITAL DISPLAY, will increase at the heat rate programmed for the firing cycle in use.

Once the desired temperature has been reached, it may be maintained by momentarily depressing the AIR OVERRIDE Key. The temperature may be further increased by again momentarily depressing the AIR OVERRIDE Key. Any desired temperature may be maintained by momentarily depressing the AIR OVERRIDE Key. This overriding and holding process may be repeated as many times as desired.

If at any time during the air override procedure, it is necessary to open the furnace door, the STOP OVERRIDE Key should be depressed. By using the STOP OVERRIDE Key, it is possible again to use either the Air Override or Vacuum Override feature.

Each time the AIR OVERRIDE Key is depressed a brief tone response will be heard, and the indicator lamp above the key will light when the Air Override function is in use.
Note that the indicator lamps above the VACUUM OVERRIDE and AIR OVERRIDE Keys will alternately flash on and off during the override period, indicating that either key is operative during that period.

VIEWING LIGHT KEY (13):
Turns the Viewing Lights, which light the work area, on or off. During the opening or closing of the furnace door, the Viewing Lights will be operated automatically by the furnace controls. The VIEWING LIGHT Key will also serve to override the automatic operation of the Viewing Lights to turn them either on or off.

DOOR DOWN KEY (14):
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, allowing the door to be stopped at any point along its travel. The DOOR DOWN Key may be used as many times as desired until the door reaches the fully opened position.

Each time the DOOR DOWN Key is depressed a brief tone response will be heard.

Note that the DOOR DOWN Key is inoperative while the furnace is executing a firing cycle, or while operating the Calibration, Night or an Idle Program with vacuum.

DOOR UP KEY (15):
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, allowing the door to be stopped at any point along its travel. The DOOR UP Key may be used as many times as desired until the door reaches the fully closed position.

Each time the DOOR UP Key is depressed a brief tone response will be heard.

IDLE KEY (16):
Used to select the Idle Program which is intended to be used during the workday to maintain the furnace at a temperature close to the programmed Low Temperature. This serves to reduce the amount of time required for the furnace to reach the programmed Low Temperature after the furnace door has been opened.

When the IDLE Key is depressed and the indicator lamp above the key is lit, the Idle Program will be started once the START/STOP Key is depressed and the indicator lamp above the key lights. Both temperature and vacuum level for the Idle Program are fully programmable by the user.

A brief tone response will be heard each time the IDLE Key is depressed, and the lamp above the key will light when the Idle Program has been selected.

NIGHT KEY (17):
Used to select the Night Program when the furnace is to remain on overnight or for extended periods of time. Use of the Night Program is recommended during these periods to prevent the accumulation of atmospheric moisture within the muffle and also to help extend muffle life.

When the NIGHT Key is depressed and the indicator lamp above the key is lighted, the Night Program will be started once the START/STOP Key is depressed and the indicator lamp above the key lights. The Night Program is a “fixed” program which will maintain the furnace at a temperature of 590°F (310°C) with the vacuum pump being operated for one minute after the start of the cycle and turning off automatically.

A brief tone response will be heard each time the NIGHT Key is depressed, and the indicator lamp above the key will light when the Night Program has been selected.
CALIBRATE KEY (18):
Used during the furnace calibration procedure to select the "fixed" automatic calibration program.

Each time the CALIBRATE Key is depressed a brief tone response will be heard, and the indicator lamp above the key will light to indicate that the calibration program has been selected.
SIDE CONTROLS

CALIBRATION JACK (19):
Accepts the plug from the calibration instrument used during the furnace calibration procedure.

TONE VOLUME (20):
Using a small screwdriver, the volume of the tones produced by the furnace may be increased or decreased with this control. Rotate the screwdriver clockwise to increase the tone volume or counter-clockwise to decrease the volume, until the desired volume is obtained.

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

MAIN CIRCUIT BREAKER (21):
A safety device designed to protect the furnace electronics in the event of a short circuit.

VACUUM PUMP CIRCUIT BREAKER (22):
An added safety device designed to protect the vacuum pump in the event of a short circuit or overload.

VACUUM PUMP RECEPTACLE 230V (23):
VACUUM PUMP RECEPTACLE 115V (24):
Controlled by the furnace electronic controls, these outlets provide electrical power for the vacuum pump. Note: The 115V receptacle will be active only if the furnace is operating at 115 Volts. The 230V receptacle will be active only if the furnace is operating at 230 Volts.

VACUUM HOSE CONNECTOR (25):
The vacuum hose from the pump is connected to this fitting. The fitting is a standard \( \frac{1}{4} \) inch NPT.

MANUAL VENT CONTROL (26):
A manual venting port which may be unscrewed to bleed off vacuum prior to manually opening the door during power interruptions.
DESCRIPTION OF CONVENTIONAL PORCELAIN
FIRING CYCLE PARAMETERS

LOW TEMPERATURE-
The temperature at which the door will begin to close for preheating the restoration. Once the furnace door has closed completely, the firing cycle will begin at this temperature.

PREHEAT TIME-
The length of time, programmable in both minutes and seconds, required for the furnace door to travel from the initial preheating position to the fully closed position. The furnace door will not begin to close until the furnace temperature is within approximately 10°F (6°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 furnace vacuum chamber throughout the programmed firing cycle.

For firing cycles where no vacuum is required, zero is programmed as the desired vacuum level.

HIGH TEMPERATURE-
The maximum temperature which will be obtained during a programmed firing cycle. Once the high temperature has been attained, the furnace will maintain this temperature for the duration of the programmed hold time.

HOLD TIME-
The length of time, programmable in both 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 programmed Cool Time.

COOL TIME-
The length of time, 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 open at its maximum speed until it reaches a factory determined position and then continue to open slowly over the programmed Cool Time.

<table>
<thead>
<tr>
<th>COOL TIME NUMBER</th>
<th>ACTUAL COOL TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>10 Seconds</td>
</tr>
<tr>
<td>1</td>
<td>20 Seconds</td>
</tr>
<tr>
<td>2</td>
<td>30 Seconds</td>
</tr>
<tr>
<td>3</td>
<td>1 Minute 0 Seconds</td>
</tr>
<tr>
<td>4</td>
<td>1 Minute 30 Seconds</td>
</tr>
<tr>
<td>5</td>
<td>2 Minutes 30 Seconds</td>
</tr>
<tr>
<td>6</td>
<td>4 Minutes 0 Seconds</td>
</tr>
<tr>
<td>7</td>
<td>7 Minutes 0 Seconds</td>
</tr>
<tr>
<td>8</td>
<td>10 Minutes 0 Seconds</td>
</tr>
<tr>
<td>9</td>
<td>20 Minutes 0 Seconds</td>
</tr>
</tbody>
</table>
EVACUATION TEMPERATURE-
The temperature at which the vacuum pump will automatically turn on to produce the programmed level of vacuum within the furnace vacuum chamber.

If no delay in the operation of the vacuum pump is desired, the Evacuation Temperature should be programmed with the same value used for the low temperature.

VENT-
When a temperature has been programmed, this will be the temperature during the firing cycle at which the vacuum will be vented.

When a time has been programmed, this will be the length of time in minutes and seconds over which the vacuum will be maintained during the programmed Hold Time.

UPPER AND LOWER LIMITS FOR NINETY-SEVEN CONVENTIONAL PORCELAIN FIRING CYCLE PARAMETERS

<table>
<thead>
<tr>
<th>PARAMETER NUMBER</th>
<th>PARAMETER</th>
<th>LOWER LIMIT</th>
<th>UPPER LIMIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Low Temperature</td>
<td>200°F (100°C)</td>
<td>2200°F (1200°C)</td>
</tr>
<tr>
<td>2</td>
<td>Preheat Time</td>
<td>10 seconds</td>
<td>99 minutes 59 seconds</td>
</tr>
<tr>
<td>3</td>
<td>Heat Rate</td>
<td>40°F (20°C)/min</td>
<td>400°F (220°C)/min</td>
</tr>
<tr>
<td>4</td>
<td>Vacuum Level</td>
<td>0 or 8 in (20 cm)</td>
<td>30 inches (76 centimeters)</td>
</tr>
<tr>
<td>5</td>
<td>High Temperature</td>
<td>200°F (100°C)</td>
<td>2200°F (1200°C)</td>
</tr>
<tr>
<td>6</td>
<td>Hold Time</td>
<td>0 seconds</td>
<td>99 minutes 59 seconds</td>
</tr>
<tr>
<td>7</td>
<td>Cool Time</td>
<td>0 through 9</td>
<td>0 through 9</td>
</tr>
<tr>
<td>8</td>
<td>Evacuation Temp.</td>
<td>200°F (100°C)</td>
<td>2200°F (1200°C)</td>
</tr>
<tr>
<td>9</td>
<td>Vent</td>
<td>0 seconds</td>
<td>99 minutes 59 seconds</td>
</tr>
<tr>
<td></td>
<td></td>
<td>200°F (100°C)</td>
<td>or 2200°F (1200°C)</td>
</tr>
</tbody>
</table>

DESCRIPTION OF CERAMIC RESTORATIVE FIRING CYCLE PARAMETERS

Please note that the parameter name differs from the actual function of the parameter when using the three special ceramic restorative firing cycles.

The descriptions listed below must be followed for three special programs, menu PAGE "P 10" - programs "H", "I", and "J".

LOW TEMPERATURE:
The first stage temperature (TEMPERATURE 1) for the desired ceramic core restorative material.

PREHEAT TIME:
The rate of temperature rise within the muffle, starting from ambient temperature (approximately 75 degrees F [24 degrees C]) to the first stage temperature, in degrees per minute.
HEAT RATE:
   The rate of temperature rise within the muffle, starting from the first stage temperature to the second stage temperature, in degrees per minute.

VACUUM LEVEL:
   This parameter is not utilized with ceramic core restorative material and will be skipped during programming.

HIGH TEMPERATURE:
   The second stage temperature (TEMPERATURE 2) for the desired ceramic core restorative material.

HOLD TIME:
   The length of time, in both hours and minutes, over which the second stage temperature will be maintained prior to the furnace cooling.

COOL TIME:
   The amount of time, programmable in both hours and minutes, over which the ceramic core restorative material will cool at a controlled rate from the high temperature to a temperature of 752 degrees F (400 degrees C). Once a temperature of 752 degrees F (400 degrees C) is obtained, the elevator door will open and the vacuum pump (pump optional) will operate until a temperature of 392 degrees F (200 degrees C) is achieved. This will speed the cooling process of the furnace.

EVACUATION TEMPERATURE:
   This parameter is not utilized with ceramic core restorative material and will be skipped during programming.

VENT:
   This parameter is not utilized with ceramic core restorative material and will be skipped during programming.

UPPER AND LOWER LIMITS OF CERAMIC RESTORATIVE FIRING CYCLE PARAMETERS

<table>
<thead>
<tr>
<th>PARAMETER NUMBER</th>
<th>PARAMETER</th>
<th>LOWER LIMIT</th>
<th>UPPER LIMIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Low Temperature</td>
<td>70°F (20°C)</td>
<td>2200°F (1200°C)</td>
</tr>
<tr>
<td>2</td>
<td>Preheat Time</td>
<td>0.00 &amp; 0.45°F (0.25°C)/min</td>
<td>75.00°F (40.00°C)/min</td>
</tr>
<tr>
<td>3</td>
<td>Heat Rate</td>
<td>2°F (1°C)/min</td>
<td>400°F (220°C)/min</td>
</tr>
<tr>
<td>4</td>
<td>High Temperature</td>
<td>200°F (100°C)</td>
<td>2200°F (1200°C)</td>
</tr>
<tr>
<td>5</td>
<td>Hold Time</td>
<td>00:00 (Hrs:Min)</td>
<td>10:00 (Hrs:Min)</td>
</tr>
<tr>
<td>6</td>
<td>Cooling</td>
<td>0:40 (Hrs:Min)</td>
<td>10:00 (Hrs:Min)</td>
</tr>
</tbody>
</table>

FAHRENHEIT/CELSIUS MODE SELECTION:

To have the furnace operate in degrees Fahrenheit, press the zero button on the numeric keypad, and the "F" button on the program selector keyboard simultaneously.

To have the furnace operate in degrees Celsius, press the zero button on the numeric keypad, and the "C" button on the program selector keyboard.
PROGRAMMING THE NINETY-SEVEN CONVENTIONAL PORCELAIN FIRING CYCLES

There are one hundred programs on the Commodore 100 VPF which are fully programmable by the operator. Ninety-seven of the programs are for use with conventional porcelains and metals. The remaining three programs are preset with the required information for use with In-Ceram® all ceramic restorative materials.

There are nine parameters (or steps) to each of the firing cycles. Once programmed, each parameter of the one hundred programs will be stored in the furnace memory for use as needed. In the event that the POWER SWITCH is turned OFF or electrical power is interrupted to the furnace, the information in memory will be retained.

Outlined below are the procedures to be used when programming the ninety-seven available programs in the furnace for use with conventional porcelains (stored in menu PAGES "P 1" through "P 9", programs "A" through "J" and PAGE "P 10", programs "A" through "G"): 

1. After installing the unit (as recommended on page 3 of this manual) turn the POWER SWITCH to the ON position. The furnace will perform a self-diagnostic check, which will take a few seconds, prior to allowing operator input.

Upon completing the self-diagnostic check, the letters "P 1" will momentarily appear on the DIGITAL DISPLAY followed by an ambient temperature reading. This signifies that the unit is now ready for operation.

2. Push the PAGE key to select the menu PAGE ("P 1" through "P 10").

The desired menu PAGE number may be directly input by depressing the corresponding number of the desired PAGE.

ex: OPERATOR INPUT DIGITAL DISPLAY OPERATOR INPUT DIGITAL DISPLAY

PAGE
P 1 + 3 = P 3

Depressing the STEP key will allow you to advance forward, one page at a time, to the desired menu PAGE number for storing your program information.

ex: DIGITAL DISPLAY OPERATOR INPUT DIGITAL DISPLAY

P 3 + STEP = P 4

Should you accidentally pass the menu PAGE number you are searching for, the CLEAR key may be depressed to perform a backward search for the desired menu PAGE number.

ex: DIGITAL DISPLAY OPERATOR INPUT DIGITAL DISPLAY

P 5 + CLEAR = P 4

*In-Ceram® is a Registered Trademark of Vident, Inc.
3. Once the desired menu PAGE number appears on the DISPLAY, push the key of the corresponding letter (marked “A” through “J”) to select a program. Once selected, the red indicator lamp above the corresponding key will illuminate.

ex: DIGITAL OPERATOR FURNACE DISPLAY INPUT FUNCTION

P 5 + B = PAGE 5, PROGRAM B

has been selected by the operator

4. Push the PROGRAM key so that the red indicator lamp above the key illuminates. This indicates that the unit is in the programming mode which will allow you to input your firing cycle information into the furnace.

ex: DIGITAL OPERATOR FURNACE DISPLAY INPUT FUNCTION

P 5 + PROGRAM = PAGE 5, PROGRAM B

may now be programmed by the operator

The LOW TEMP indicator lamp on the GRAPHIC DISPLAY will then illuminate to prompt you to begin entering the firing cycle information as listed below:

<table>
<thead>
<tr>
<th>GRAPHIC DISPLAY LAMP</th>
<th>DESIRED DATA</th>
<th>OPERATOR INPUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOW TEMP</td>
<td>1200 F</td>
<td>1 2 0 0 ENTER</td>
</tr>
<tr>
<td>PREHEAT TIME</td>
<td>3 Min 00 Sec</td>
<td>3 0 0 ENTER</td>
</tr>
<tr>
<td>HEAT RATE</td>
<td>100 F/Min</td>
<td>1 0 0 ENTER</td>
</tr>
<tr>
<td>VAC</td>
<td>-28 In Hg</td>
<td>2 8 ENTER</td>
</tr>
<tr>
<td>HIGH TEMP</td>
<td>1750 F</td>
<td>1 7 5 0 ENTER</td>
</tr>
<tr>
<td>HOLD TIME</td>
<td>0 Min 20 Sec</td>
<td>2 0 ENTER</td>
</tr>
<tr>
<td>COOLING</td>
<td>10 Sec</td>
<td>0 ENTER</td>
</tr>
<tr>
<td>EVACUATION TEMP</td>
<td>1200 F</td>
<td>1 2 0 0 ENTER</td>
</tr>
<tr>
<td>VENT TEMP*</td>
<td>1700 F</td>
<td>1 7 0 0 ENTER</td>
</tr>
<tr>
<td>OR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VENT TIME*</td>
<td>0 Min 10 Sec</td>
<td>1 0 ENTER</td>
</tr>
</tbody>
</table>

*NOTE: The VENT parameter may be used as either a TEMPERATURE or TIME. The red indicator to the right of the display will flash on and off to indicate if a "TEMP" or "TIME" is being programmed.
5. When the programming information is complete, depress the PROGRAM key to exit the programming mode. The red indicator lamp above this key will dim, verifying that the programming mode is no longer active.

ex: OPERATOR 
    INPUT 
    PROGRAM = EXIT PROGRAMMING 
    FUNCTION MODE

6. To begin the firing cycle, simply depress the START/STOP. The green indicator lamp above this key will illuminate to verify that the firing cycle has begun.

ex: OPERATOR 
    INPUT 
    START/STOP = BEGIN FIRING CYCLE 
    FUNCTION

PROGRAMMING THE THREE CERAMIC RESTORATIVE FIRING CYCLES

The parameters which are preset into the memory for menu PAGE "P 10" programs "H", "I", and "J" of your Commodore 100 have been established for use with In-Ceram® ceramic core restorative material. The programs parameters are programmable, by the user, and may be changed as desired.

Example of In-Ceram® Firing Cycles:

Menu page "P 10" program "H" = Sinter firing
Menu page "P 10" program "I" = Glass infiltration firing for single crowns
Menu page "P 10" program "J" = Glass infiltration firing for bridge frameworks

The remaining 97 programs are for use in firing conventional porcelains and the programming format for conventional porcelain materials should be followed.

NOTE: Only menu PAGE "P 10" programs "H", "I" and "J" will accept programming information for the ceramic core restorative material.

Door operation in the three special programs will be automatically controlled to maintain an open position of 1/4" (6mm). This will allow for air circulation needed for accurate firings of the core material.

1) Select menu PAGE "P 10", followed by the PROGRAM SELECTOR Key "H". The lamp above this key will illuminate indicating that program "H" has been chosen.

2) Depress the "PROGRAM" Key. The lamp above this key will illuminate indicating that the furnace is in the Program mode, and the LOW TEMP indicator lamp on the GRAPHIC DISPLAY will light.

3) Depress the numbers, corresponding with the first stage temperature (TEMPERATURE 1), for the desired ceramic core restorative material firing cycle.
Example:

LOW TEMP of 120 - corresponds to a first stage temperature (TEMPERATURE 1)
of 120 degrees, to which the furnace will climb to from ambient temperature.

If, while making these entries, an incorrect key is depressed, the display may be cleared by depressing the CLEAR button.

Once TEMPERATURE 1 appears correctly on the display, depress the ENTER Key. This parameter will be entered, the display will automatically advance to the next parameter and the PREHEAT TIME indicator lamp on the GRAPHIC DISPLAY will light.

4) Depress the numbers, corresponding with the required rate of temperature climb from the ambient temperature to the first stage temperature for the desired ceramic core restorative material firing cycle.

If not known, HEAT RATE 1 may be calculated as follows:

\[
\text{TEMPERATURE 1 - STARTING TEMPERATURE} = \text{TEMPERATURE DIFFERENTIAL} \\
120 \text{ Degrees} - 25 \text{ Degrees} = 95 \text{ Degrees}
\]

\[
\text{TIME SEGMENT 1} \times 60 = \text{TOTAL TIME} \\
6 \text{ Hours} \times 60 = 360 \text{ Minutes}
\]

\[
\text{TEMPERATURE DIFFERENTIAL / TOTAL TIME} = \text{HEAT RATE 1} \\
95 \text{ Degrees} / 360 \text{ Minutes} = 0.26 \text{ Degrees per Minute}
\]

Example:

PREHEAT TIME of 00.26 - corresponds to a 0.26 degree per minute increment in temperature from the ambient temperature to the first stage temperature. This is equal to a 6 hour and 00 minute TIME SEGMENT 1.

Once HEAT RATE 1 appears correctly on the display, depress the ENTER Key. This parameter will be entered, the display will automatically advance to the next parameter and the HEAT RATE indicator lamp on the GRAPHIC DISPLAY will light.

5) Depress the numbers, corresponding with the required rate of temperature climb from the first stage temperature to the second stage temperature, for the desired ceramic core restorative material firing cycle.

If not known, HEAT RATE 2 may be calculated as follows:

\[
\text{TEMPERATURE 2 - TEMPERATURE 1} = \text{TEMPERATURE DIFFERENTIAL 2} \\
1120 \text{ Degrees} - 120 \text{ Degrees} = 1000 \text{ Degrees}
\]

\[
\text{TIME SEGMENT 2} \times 60 = \text{TOTAL TIME 2} \\
2 \text{ Hours} \times 60 = 120 \text{ Minutes}
\]

\[
\text{TEMPERATURE DIFFERENTIAL 2 / TOTAL TIME 2} = \text{HEAT RATE 2} \\
1000 \text{ Degrees} / 120 \text{ Minutes} = 8 \text{ Degrees per Minute}
\]
Example:

HEAT RATE of 8 - corresponds to an 8 degree per minute increment in temperature from the first stage temperature to the second stage temperature. This is equal to a 2 hour and 00 minute TIME SEGMENT 2.

Once HEAT RATE 2 appears correctly on the display, depress the ENTER Key. This parameter will be entered, the display will automatically advance to the next parameter and the HIGH TEMP indicator lamp on the GRAPHIC DISPLAY will light.

6) Depress the numbers, corresponding with the second stage temperature (TEMPERATURE 2), for the desired ceramic core restorative material firing cycle.

If, while making these entries, an incorrect key is depressed, the display may be cleared by depressing the CLEAR button.

Example:

HIGH TEMP of 1120 - corresponds to a second stage temperature (TEMPERATURE 2) of 1120 degrees, to which the furnace will climb to from the first stage temperature (TEMPERATURE 2).

Once TEMPERATURE 2 appears correctly on the display, depress the ENTER Key. This parameter will be entered, the display will automatically advance to the next parameter and the HOLD TIME indicator lamp on the GRAPHIC DISPLAY will light.

7) Depress the numbers, corresponding with TIME SEGMENT 2, for the desired ceramic core restorative material firing cycle.

Example:

2.00 - to correspond to a time period of 2 hours and 00 minutes over which the second stage temperature (TEMPERATURE 2) will be maintained.

Once TIME SEGMENT 2 appears correctly on the display, depress the ENTER Key. This parameter will be entered, the display will automatically advance to the next parameter and the COOLING indicator lamp on the GRAPHIC DISPLAY will light.

8) Depress the numbers, corresponding with the amount of time needed, to allow the unit to cool from the second stage temperature (TEMPERATURE 2) to a temperature of 400 Degrees C (752 Degrees F).

Example:

COOLING of 2.00 - to correspond to a time of 2 hours and 00 minutes over which the heating chamber will gradually cool at a controlled rate.
Some ceramic core restorative materials, such as Dicor®, require a firing cycle with only one stage. They may be run in your Jelenko Commodore100 by following the below steps:

The HEAT RATE value must be programmed to be the same as the value for the PREHEAT TIME.

The HIGH TEMP value must be programmed to be the same as the value for the LOW TEMP.

**"IN-CYCLE" PARAMETER CHANGES**

The Commodore 100 VPF has been designed for superior flexibility by permitting the operator to change the firing cycle parameters while a firing cycle is in progress.

Any firing parameter may be changed during a firing cycle, with the following exceptions:

- The Low Temperature cannot be changed once the furnace has reached the programmed Low Temperature.

- Once a vacuum has been obtained in the furnace Vacuum Chamber, the Evacuation Temperature cannot be changed.

- Once a vacuum has been obtained in the furnace Vacuum Chamber, the Vacuum Level cannot be changed.

- The Vent Temperature cannot be changed once the vacuum within the furnace Vacuum Chamber has been vented.

- The Vent Time cannot be changed once the furnace has reached the programmed High Temperature.

- During the temperature increase portion of the firing cycle, a High Temperature LOWER than the ACTUAL furnace temperature cannot be entered.

- Once the furnace has reached the cooling portion of a firing cycle, the Cool Time cannot be changed.

Any changes made while a firing cycle is in progress, will not be permanent and will only work for the duration of the cycle that is in progress.

**PROGRAMMING AND OPERATING THE IDLE PROGRAM**

The Commodore 100 VPF Idle Program is fully programmable by the operator for both temperature and vacuum. The Idle Program is programmed and operated as outlined below:

**PROGRAMMING THE IDLE PROGRAM**

**Example:**

<table>
<thead>
<tr>
<th>Idle Temperature</th>
<th>100°F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vacuum level</td>
<td>27 inches of mercury</td>
</tr>
</tbody>
</table>

1. With the furnace POWER SWITCH in the ON position, depress the IDLE Key. The indicator lamp above this key light to indicate that the Idle Program has been selected.

ex: OPERATOR INPUT IDLE

*Dicor is a Registered Trademark of Dentsply International*
2. Depress the PROGRAM Key. The indicator lamp above this key will light to indicate the furnace is in the Program mode, and the LOW TEMP indicator lamp on the GRAPHIC DISPLAY will light.

ex: 
OPERATOR 
INPUT 
PROGRAM 

The Idle Temperature presently programmed into the furnace will appear on the DIGITAL DISPLAY.

3. Depress the following numbers on the NUMERIC KEYBOARD:

ex: 
OPERATOR 
INPUT 
1 0 0 0 ENTER 

Note that the TEMP indicator lamp to the right of the display will flash on and off to indicate that a temperature parameter is being programmed.

The Vacuum Level presently programmed for the Idle Program will then appear on the DIGITAL DISPLAY.

4. Depress the numbers corresponding to desired vacuum level on the NUMERIC KEYBOARD:

ex: 
OPERATOR 
INPUT 
2 7 ENTER 

Note that the VAC LEVEL indicator lamp to the right of the display will flash on and off to indicate that the vacuum level is being programmed.

5. Depress the PROGRAM Key to exit the programming mode.

ex: 
OPERATOR 
INPUT 
PROGRAM 

OPERATING THE IDLE PROGRAM

Once the Idle Program has been programmed for temperature and vacuum as outlined above, it may be operated in the following manner:

1. With the furnace POWER SWITCH in the ON position, make certain that the PROGRAM Key has NOT been selected and that the indicator lamp above this key is NOT illuminated.

2. Depress the IDLE Key. The indicator lamp above this key will light to indicate that the Idle Program has been selected.

ex: 
OPERATOR 
INPUT 
IDLE
3. Depress the START/STOP Key. The indicator lamp above this key will light to indicate that the Idle Program is in operation, the furnace door will begin to close, and the DIGITAL DISPLAY will indicate the actual muffle temperature.

ex: OPERATOR
    INPUT
    START/STOP

4. If vacuum has been programmed for the Idle Program, the vacuum pump will turn on as soon as the furnace door closes completely. The vacuum pump will operate until the programmed vacuum level is achieved and then automatically turn off. Once the vacuum pump has turned off, the pump will not turn on again should the vacuum level within the Vacuum Chamber drop below the programmed value.

5. To stop the Idle Program, depress the START/STOP Key. The indicator lamp above this key will turn off, vacuum within the furnace Vacuum Chamber will be vented (if vacuum is programmed), and the furnace door will automatically open.

AUTO IDLE

It is possible to have the Idle Program automatically engage after completing any of the 92 conventional firing cycles. When the Auto Idle feature is turned on, the furnace will idle at the last programmed Low Temperature and hold at that temperature for 90 minutes. After 90 minutes the muffle will cool to ambient temperature. Once this feature is turned on, it will remain on until turned off by the user. To turn the Auto Idle feature on, depress the following keys in this order:

ex: OPERATOR
    INPUT
    PAGE → IDLE → PROGRAM → STEP → ENTER
    ↑
The Step key will toggle the Auto Idle either on or off as indicated by the digital display.

Depress PAGE button to exit the Auto Idle Selection mode.

ex: OPERATOR
    INPUT
    PAGE

The desired firing cycle may now be started.

OPERATING THE NIGHT PROGRAM

The Night Program is a fixed program which will maintain the furnace at a temperature of 590°F (310°C) with vacuum.

The Night Program may be operated in the following manner:

1. With the furnace POWER SWITCH in the ON position, make certain that the PROGRAM Key has not been selected and that the indicator lamp above this key is not illuminated.
2. Depress the IDLE KEY followed by the NIGHT Key. The indicator lamp above the NIGHT key will light to indicate that the Night Program has been selected.

ex: OPERATOR
    INPUT
    IDLE  NIGHT

3. Depress the START/STOP Key. The indicator lamp above this key will light to indicate that the Night Program is in operation, the furnace door will begin to close, and the DIGITAL DISPLAY will indicate the muffle temperature.

ex: OPERATOR
    INPUT
    START/STOP

4. Once the furnace door closes completely, the vacuum pump will turn on and operate for one minute, after maximum vacuum is achieved, then automatically turn off. Once the vacuum pump has turned off, the pump will not turn on again, even if the vacuum level within the Vacuum Chamber drops.

5. To stop the Night Program, depress the START/STOP Key. The indicator lamp above this key will turn off, vacuum within the furnace Vacuum Chamber will be vented, and the furnace door will automatically open.

AUTO NIGHT

It is possible to have the Night Program automatically engage after completing any of the 97 conventional firing cycles. To turn the Auto Night feature on, use the following procedure:

Choose the desired menu PAGE, "P 1" - "P 10" and firing cycle "A" - "J"

ex: OPERATOR
    INPUT
    PAGE  →  1  →  PAGE  →  B

Depress the NIGHT key. The light above this key will blink on and off indicating that the Auto Night feature has been selected.

ex: OPERATOR
    INPUT
    NIGHT

Depress the START/STOP Key to begin the selected firing cycle. At the completion of the selected firing cycle, the furnace will automatically go into the Night cycle.

ex: OPERATOR
    INPUT
    START/STOP
CALIBRATION

Your Commodore 100 VPF has been factory-calibrated. However, it is recommended that the calibration be checked prior to initial operation and once each month as part of normal furnace maintenance.

To calibrate the furnace, the calibration procedure outlined below 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 24.

2. Open the furnace door completely and remove the Door Brick Platform from the door.

3. Place the Calibration Instrument on the furnace door.

4. Make certain that the PROGRAM Key has not been selected and that the indicator lamp above this key is not lighted.

5. Depress the CALIBRATE Key. The indicator lamp above this key will light to indicate that the Calibration Program has been selected.

6. Insert the plug from the Calibration Instrument into the Calibration Jack located on the left side of the furnace.

7. Depress the START/STOP Key. The indicator lamp above the key will light to indicate that the Calibration Program is in operation, and the DIGITAL DISPLAY will indicate the actual Muffle temperature.

8. When the muffle temperature, as indicated on the DIGITAL DISPLAY, reaches 1300°F (704°C), the furnace door will automatically close and the muffle temperature will begin to increase.

9. When the pure silver wire across the electrodes of the Calibrating Instrument melts, the actual muffle temperature is 1760°F (960°C). The furnace will automatically adjust to the DIGITAL DISPLAY to indicate 1760°F (or 960°C if the furnace is in degrees Celsius mode). A tone will be heard, and the furnace door will open automatically.

10. The calibration procedure is now complete, and the Calibration Instrument may be unplugged and removed from the furnace door.

IMPORTANT NOTE: If during the furnace calibration procedure, “AL-5” appears on the display, the following should be checked:

1. Make certain the silver wire has been wrapped tightly around the electrodes of the Calibration Instrument.

2. Make certain the electrodes of the Calibration Instrument are scraped clean prior to use.

If, after performing the above steps, this Alarm Code appears after three consecutive calibration attempts, refer to the description of the “AL-5” Alarm Code as outlined under “SELF-DIAGNOSTIC SYSTEM” on pages 26-28 of this manual.
Bridge the electrodes of the Calibrating Instrument as shown, with pure silver wire. The wire should be wrapped around electrode four times, leaving a small upward loop of wire between the electrodes.

NOTE: DO NOT stretch the wire tight between the two electrodes.
**ERROR CODES**

**ERR 1**

**Cause**

When changing a parameter while a firing cycle is in progress, the entry does not correspond with the allowable "IN-CYCLE" PARAMETER CHANGES.

**Action required by user**

Virtually any parameter change while a firing cycle is in progress is permitted. However, certain changes are not permitted as outlined in "IN-CYCLE" PARAMETER CHANGES on page 20 of this manual.

**ERR 2**

**Cause**

a. Operator attempts to enter a parameter with a value which is not within the limits for that parameter.

b. Each time the START/STOP Key is depressed to begin a program, the

**Action required by user**

a. Operator must select a value for the parameter which is within the limits for the parameter, as outlined on pages 11 and 13 of this manual.

b. The operator should review each program parameter to determine which parameter

**ERR 3**

**Cause**

a. This Error Code appears when entering parameters for a program if the value for the parameter being entered is in contradiction to a parameter value previously programmed.

An example of this would be if the operator enters a Low Temperature value which is higher than the High Temperature previously programmed.

b. Each time the START/STOP Key is depressed, the microcomputer checks all parameters to make certain that no parameters are in contradiction with each other, as described in the example above. If parameters are in contradiction to each other when the firing cycle is started, this Error Code will appear.

**Action required by user**

The operator should review each program parameter to make certain the value for each parameter is correct according to the firing cycle being programmed.

**ERR 4**

**Cause**

a. When the Calibration program has been selected the START/STOP Key is depressed to begin the program before the plug from the Calibration Instrument is inserted into the Calibration Jack.

b. The silver wire has not been placed across electrodes of the Calibration Instrument.

**Action required by user**

Insert the plug from the Calibration Instrument into the Calibration Jack.

Prepare the Calibration Instrument as outlined on pages 23-24 of this manual.
SELF-DIAGNOSTIC SYSTEM

The Commodore 100 VPF has been designed with a seven-point self-diagnostic system which continuously monitors the vital functions of the furnace.

In the event a major component of the furnace operating system malfunctions, a warning tone will sound, and an Alarm Code will appear on the DIGITAL DISPLAY to indicate the exact nature of the malfunction.

Described below are the seven “Alarm Codes” which may be displayed on the furnace, and the corrective action required in the event one should appear.

"CPU X"
The display will appear with a warning tone* and a code number in place of the “X” indicated above, to indicate six types of malfunctions which may occur with the furnace microprocessor (or CPU) located on the Control Circuit Board.

When this display appears, the furnace POWER SWITCH should be turned OFF for approximately five minutes and then turned back ON again.

Should this display reappear after doing this, the Control Circuit Board should be replaced.

"AL-1"
In the event the furnace temperature exceeds 2250°F (1230°C) this Alarm Code will appear, a warning tone* will sound, vacuum with in the furnace Vacuum Chamber will be vented, and the furnace door will automatically open to lower the temperature within the muffle.

The cause for this type of malfunction is stated below.

1. Defective Control Circuit Board.

"AL-2"
As the furnace door opens and closes, the furnace control system monitors the travel of the door. If at any time the furnace Door does not reach either the fully opened or fully closed position within the proper period of time, this Alarm Code will appear and a warning tone* will sound.

Causes for this type of malfunction are listed below, in order of probability.

1. An obstruction which prevents the door from reaching either the fully opened or fully closed position. This obstruction must be removed.

2. A defective door “up” or “down” limit switch.

"AL-3"
Once the START/STOP Key is depressed to begin the program, the furnace control system monitors the actual muffle temperature and compares this temperature to the programmed temperature.

If, after a predetermined period of time, the programmed temperature is not achieved or the actual furnace temperature varies excessively from the programmed temperature, this Alarm Code will appear and a warning tone* will sound.

*When the warning tone sounds, the CLEAR Key must be depressed to silence the ALARM.
Causes for this type of malfunction are listed below, in order of probability. When replacing components to correct this problem, it is recommended that they be replaced in the order indicated.

1. Defective Muffle
2. Defective Triac
3. Defective Control Circuit Board

“AL-4”
This Alarm Code will appear for several reasons related to the vacuum function of the furnace. When this Alarm Code appears, a warning tone* will sound, and if there is no vacuum present within the furnace Vacuum Chamber, the furnace door will automatically open.

The causes for this Alarm Code and the corrective action required are outlined below.

1. When a program using vacuum has started and no vacuum is achieved, this display will appear approximately ten seconds after the furnace door closes. Possible causes are:
   a. Vacuum pump not plugged into the Vacuum Pump Receptacle at the rear of the furnace.
   b. Vacuum pump hose not connected to the Vacuum Hose Connector at the rear of the furnace.
   c. Defective Vacuum Pump.
   d. Defective Control Circuit Board.

2. When a program using vacuum has been started and vacuum is achieved, but the programmed Vacuum Level or 27 inches (69 centimeters) of mercury is not attained within approximately one minute after the furnace door closes, the possible causes are:
   a. Vacuum pump being used is not capable of producing sufficient vacuum.
   b. Furnace has a rapid vacuum leak.
   c. Defective Control Circuit Board.

3. During a program using vacuum, the vacuum venting point is reached, but vacuum is not vented within approximately 25 seconds. Possible causes for this malfunction are:
   a. Defective Vacuum Vent Solenoid
   b. Defective Control Circuit Board.

“AL-5”
This Alarm Code will appear and a warning tone* will sound if, during the furnace calibration procedure, the melting of the pure silver wire on the Calibration Instrument occurs before 1580°F (860°C) or after 1940°F (1060°C). This could occur for one of the following reasons:

1. The silver wire has not been wrapped tightly around the electrodes of the Calibration Instrument.
2. The electrodes of the Calibration Instrument are covered with oxide and need to be scraped clean prior to use.
3. The Calibration Instrument is defective.
4. The furnace calibration must be reset. To reset the calibration, depress the CALIBRATION and LIGHT Keys simultaneously and turn the POWER SWITCH on while keeping the Keys depressed.**
5. Defective Control Circuit Board.

*When the warning tone sounds, the CLEAR Key must be depressed to silence the ALARM.
**If the Furnace Calibration is reset, the furnace must be recalibrated prior to use.
"AL-6"
In the event the furnace thermocouple fails, this Alarm Code will appear, and the warning tone* will sound; vacuum within the furnace Vacuum Chamber will be vented, and the door will automatically open.

When this Alarm Code appears, the thermocouple is most likely defective and should be replaced. However, this Alarm Code may also appear as a result of a Control Circuit Board defect.

*When the warning tone sounds, the CLEAR Key must be depressed to silence the ALARM.
A. Thermocouple Leads
B. Thermocouple Assembly
C. Top Plate Screw (1 of 4)
D. Muffle Power Terminals
E. Muffle Power Terminal Gasket
F. Vacuum Chamber
G. Muffler
H. Top Plate
I. Muffler Mounting Screw
J. Top Gasket
K. Muffler Power Terminal (1 of 2)
L. Muffler Power Terminal Insulator
M. Muffler Base Mounting Screw (1 of 4)
N. Muffler Power Leads
O. Muffler Base
P. Muffler Insulation Plate
Q. Vacuum Solenoids
R. Thermocouple Leads
S. Control Circuit Board
T. Pump Receptacle Relay

U. Main Transformer
V. Triac
W. Door Drive Motor
X. Pump Power Relay
REPLACEMENT OF THE MUFFLE VIEWING WINDOW

1. Press the furnace POWER SWITCH to the OFF position.

2. Unplug the power cord from your electrical outlet.

3. With the rear of the furnace facing you, loosen and remove the two screws located at the rear of the Upper Housing Cover. Also loosen and remove each screw on either side of the Upper Housing Cover.

4. With the front of the furnace facing you, lift the Upper Housing Cover off the furnace.

5. Using a pair of 'C' ring pliers or needle nose pliers, squeeze the "C" ring and remove it. Remove the Viewing Glass.

6. Reverse this procedure to install the replacement window.

REPLACEMENT OF THE VIEWING LAMPS

1. Press the furnace POWER SWITCH to the OFF position.

2. Unplug the power cord from your electrical outlet.

3. With the rear of the furnace facing you, loosen and remove the two screws located at the rear of the Upper Housing Cover. Also loosen and remove each screw on either side of the Upper Housing Cover.

4. With the front of the furnace facing you, lift the Upper Housing Cover off of the furnace.

5. Remove the defective Viewing Lamp(s) by pressing the Lamp inward and turning slightly counter-clockwise.

6. Reverse this procedure to install the replacement Viewing Lamp(s).

IMPORTANT: The Viewing Lamps in this furnace are powered by a special power supply circuit designed to minimize lamp flickering. To prevent possible damage to this circuit, only use genuine Jelenko replacement lamps.

REPLACEMENT OF THE THERMOCOUPLER

1. Press the POWER SWITCH to the OFF position.

2. Unplug the power cord from your electrical outlet.

3. With the rear of the furnace facing you, loosen and remove the two screws located at the rear of the Upper Housing Cover. Also loosen each screw on either side of the Upper Housing Cover.

4. With the front of the furnace facing you, lift the Upper Housing Cover off of the furnace.

5. Locate and disconnect the two Thermocouple Leads which are attached to the top of the thermocouple assembly. Note the position and color-coding of the two Thermocouple Leads so they may be reattached in the same manner.

6. Loosen the Thermocouple Assembly and remove it from the TOP PLATE.
7. Reverse this procedure to install the replacement Thermocouple.

8. Recalibrate the furnace after replacing the Thermocouple as outlined under "CALIBRATION" on pages 23-24 of this manual.

NOTE: The thermocouple used in this furnace contains platinum and may have some value for scrap purposes.

REPLACEMENT OF THE MUFFLE

1. Press the furnace POWER SWITCH to the OFF position.

2. Unplug the power cord from your electrical outlet.

3. With the rear of the furnace facing you, loosen and remove the two screws located at the rear of the Upper Housing Cover. Also loosen and remove each screw on either side of the Upper Housing.

4. With the front of the furnace facing you, lift the Upper Housing Cover off the furnace.

5. Locate and disconnect the two Power Leads which are attached to the two Power Terminals on the Top Plate. Note that the lug on each Power Lead is secured to the Power Terminal with a hex nut on either side. DO NOT attempt to loosen the top hex nut without first holding the bottom hex nut with a wrench or pliers.

6. Locate and disconnect the two Thermocouple Leads which are attached to the Thermocouple Assembly. Note the position and color-coding of the two Thermocouple Leads so they may be reattached in the same manner.

7. Loosen and remove the four Top Plate screws which secure the Top Plate to the Vacuum Chamber.

8. Lift the Top Plate off the Vacuum Chamber and place the Top Plate on a working surface with the open end of the Muffle facing you.

9. Locate the two Muffle Power Terminal Insulators. Loosen and remove the screw which secures each insulator to the Top Plate and remove both insulators.

10. Locate and disconnect the two Muffle Power Leads which are attached to the two Power Terminals on the exposed side of the Top Plate. Note that the lug on each Power Lead is secured to the Power Terminal with a hex nut. Do not attempt to loosen the top hex nut without first holding the bottom hex nut with a wrench or pliers.

11. Loosen and remove the four screws which secure the muffle to the Muffle Base.

12. Carefully lift the muffle straight off the Muffle Base, which remains attached to the Top Plate. It is important not to "rock" the muffle from side to side when removing it as this may damage the thermocouple.

13. Reverse this procedure to install the replacement muffle. When repositioning the Top Plate on the Vacuum Chamber, make certain the Top Gasket is properly seated between the Top Plate and the Vacuum Chamber.
REPLACEMENT OF THE FRONT CIRCUIT BOARD

1. With the furnace POWER SWITCH in the ON position, depress the DOOR UP Key and allow the furnace door to close completely.

2. Press the furnace POWER SWITCH to the OFF position.

3. Unplug the power cord from your electrical outlet.

4. With the front of the furnace facing you, loosen and remove the six screws which secure the two covers located on either side of the Door Lift Arm. Remove these two covers.

5. Loosen and remove the two screws located on top of the Lower Housing Cover, at the rear of the furnace.

6. While facing each side of the furnace, loosen and remove the three screws located along the edge of the Lower Housing Cover. Note that one screw is located near the furnace control panel; while the remaining two screws are located within the recessed portion on the side of the furnace.

7. Raise the rear portion of the Lower Housing Cover slightly and then lift the entire Lower Housing Cover upward and off the furnace.

8. Loosen and remove the two screws which secure the front control panel to the furnace. These screws are located on the bottom of the furnace, along the front edge.

9. Unplug the connector for the flat cable which interconnects the Control Circuit Board. This connector is released by pressing the tabs located at both ends of the connector away from the connector.

10. Once the flat cable has been disconnected, lift the front panel upward and off the furnace. Position the front panel faced downward in front of the furnace.

11. Loosen and remove the 11 nuts which secure the Front Circuit Board to the front control panel. Once the nuts have been removed, lift the circuit board away from the front control panel.

12. Reverse this procedure to install the replacement Front Circuit Board.

13. Recalibrate the furnace after replacing the Front Circuit Board, as outlined under "CALIBRATION" on pages 22-24 of this manual.

REPLACEMENT OF THE CONTROL CIRCUIT BOARD

1. With the furnace POWER SWITCH in the ON position, depress the DOOR UP Key and allow the furnace Door to close completely.

2. Press the furnace POWER SWITCH to the OFF position.

3. Unplug the power cord from your electrical outlet.

4. With the front of the furnace facing you, loosen and remove the six screws which secure the two covers located on either side of the Door Lift Arm. Remove these two covers.

5. Loosen and remove the two screws located on top of the Lower Housing Cover, at the rear of the furnace.
6. While facing each side of the furnace, loosen and remove the three screws located along the edge of the Lower Housing Cover. Note that one screw is located near the furnace control panel; while the remaining two screws are located within the recessed portion on the side of the furnace.

7. Raise the rear portion of the Lower Housing Cover slightly and then lift the entire Lower Housing Cover upward and off the furnace.

8. Loosen and remove the two screws which secure the front control panel to the furnace. These screws are located on the bottom of the furnace, along the front edge.

9. Unplug, from the Control Circuit Board, the connector for the flat cable which interconnects the Control Circuit Board and the Front Circuit Board. This connector is released by pressing the tabs located at both ends of the connector away from the connector.

10. Once the flat cable has been disconnected, lift the front panel upward and off the furnace. Position the front control panel faced downward in front of the furnace.

11. Locate and disconnect the two Thermocouple Wires which are connected to the terminals at the rear of the Control Circuit Board. Before removing these wires, note the color-coding on each so that they may be reconnected in the same manner.

12. Locate and disconnect the vacuum tubing connected to the Vacuum Transducer at the rear of the Control Circuit Board. Note that the tubing is secured to the vacuum transducer with a small spring clamp, which must first be slid back along the tubing before the tubing can be disconnected.

13. Unplug, from the Control Circuit Board, the cable connectors located at the rear of the circuit board. These connectors are released by squeezing the tab of the connector and pulling directly upward on the connector.

14. The Control Circuit Board is held in place by six plastic standoffs with tabs. To release the circuit board from the standoffs, use pliers to squeeze the two tabs together while pulling directly upward on the circuit board. The circuit board must be removed from each standoff, one at a time, until six are disengaged.

15. Reverse this procedure to install the replacement Control Circuit Board.

16. With the furnace POWER SWITCH in the OFF position, depress the CALIB and LIGHT Keys simultaneously while placing the furnace POWER SWITCH in the ON position.

17. Recalibrate the furnace after replacing the Control Circuit Board, as outlined under “CALIBRATION” on pages 23-24 of this manual.
## COMMODORE 100 RENEWAL PARTS LIST

<table>
<thead>
<tr>
<th>PRODUCT NUMBER</th>
<th>PART DESCRIPTION</th>
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<tbody>
<tr>
<td>311105</td>
<td>Power Switch</td>
</tr>
<tr>
<td>311107</td>
<td>Vacuum Pump Receptacle - 230V</td>
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<tr>
<td>311108</td>
<td>Viewing Lamp (1)</td>
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<tr>
<td>311119</td>
<td>Door Up/Down Limit Switch</td>
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<tr>
<td>311123</td>
<td>Door Brick Platform</td>
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<tr>
<td>311124</td>
<td>Calibration Kit</td>
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<tr>
<td>311132</td>
<td>Muffle Power Terminal Insulator</td>
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<tr>
<td>311133</td>
<td>Muffle Power Terminal Replacement Kit</td>
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<tr>
<td>311138</td>
<td>Door Leg Spring</td>
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<td>Door Leg Pin</td>
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<td>Door Center Pin</td>
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<td>311155</td>
<td>Door Center Spring</td>
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<td>311406</td>
<td>Vacuum Pump Receptacle - 100/115V</td>
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<td>311410</td>
<td>Power Transformer</td>
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<td>311487</td>
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<td>311416</td>
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<td>Viewing Window C-Ring</td>
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**FAHRENHEIT/ CELSIUS CONVERSION CHART**

Locate the temperature you wish to convert in the Reference Column ("REF")

- To find the Fahrenheit equivalent - **read to the RIGHT.**
- To find the Celsius Equivalent - **read to the LEFT.**

Example: You are working at 990°C. Find 990 in the reference column. Read to the right. Fahrenheit equivalent is 1814°F