JELENKO COMMODORE™ II VPF

Operating & Maintenance Instructions

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Jelenko Commodore™ II 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 311400)

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 rubber ring from the furnace door.

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

9. Calibrate the furnace as outlined on page 23.

NOTE: It is important that your Commodore II 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.

MUFFLE CURING

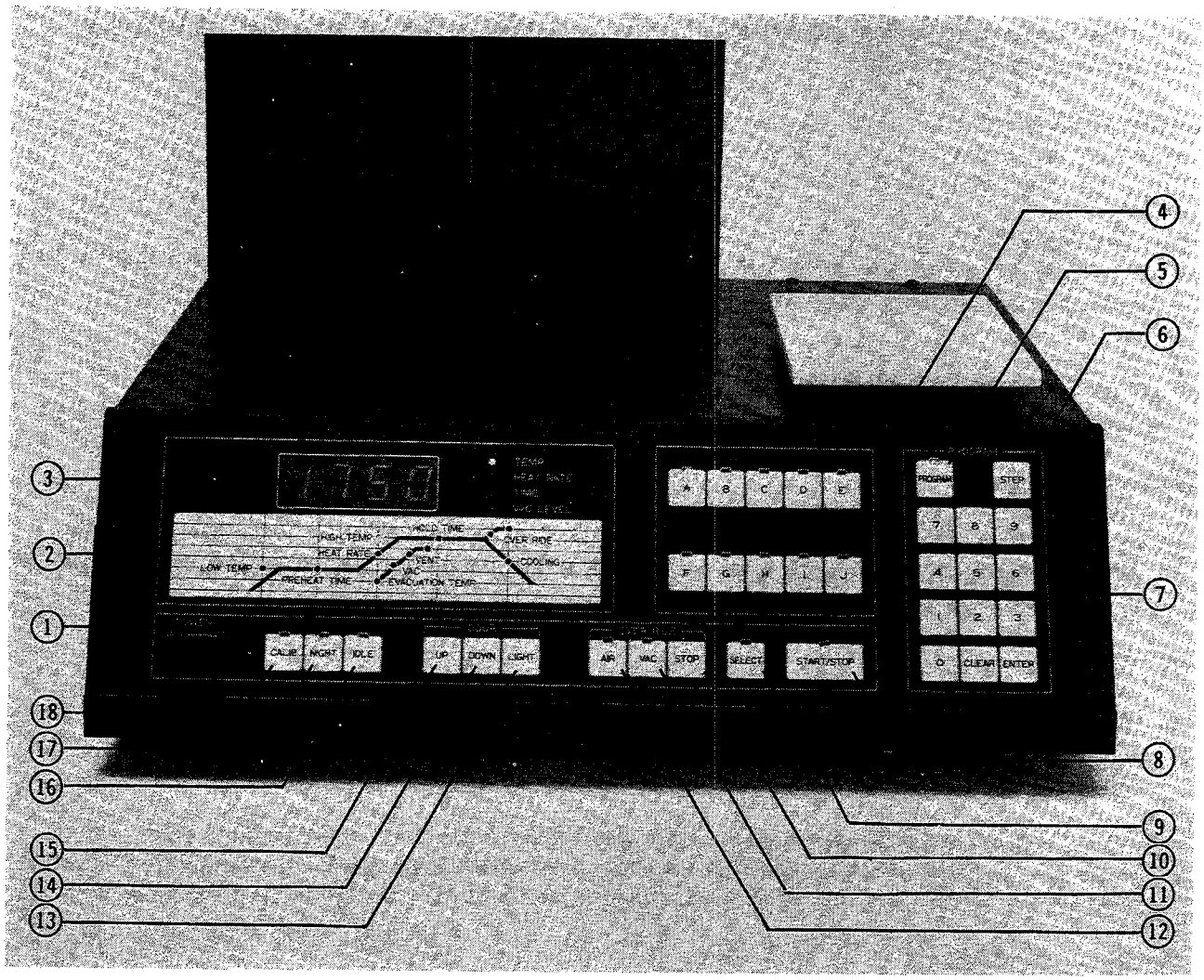
The muffle in the Commodore II Vacuum Porcelain Furnace has been designed and constructed of light-weight ceramic fiber materials, which are highly resistant to the absorption of atmospheric moisture. If vacuum loss is observed while operating the furnace after initial installation, or after replacing 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:

LOW TEMP	1000°F (538°C)
PREHEAT TIME	0 min 10 sec
HEAT RATE	100°F (56°C)
VACUUM LEVEL	28 inches (71 centimeters)
HIGH TEMP	1800°F (982°C)
HOLD TIME	20 min 0 sec
COOL TIME	0 min 10 sec
EVACUATION TEMP	1000°F (538°C)
VENT	20 min 0 sec

* 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.

COMMODORE II FRONT PANEL CONTROLS



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. Select Key
10. Stop Over Key
11. Vacuum Overide Key
12. Air Overide 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

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.

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. When the last parameter in a program (VENT) has been reached, the display will return to the first parameter (LOW TEMP) when the key is depressed the next time.

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.

SELECT KEY (9) :

Used to activate the second set of 10 programs, "A" through "J", for a total of 20. The indicator light above this key will be lit when this function 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.

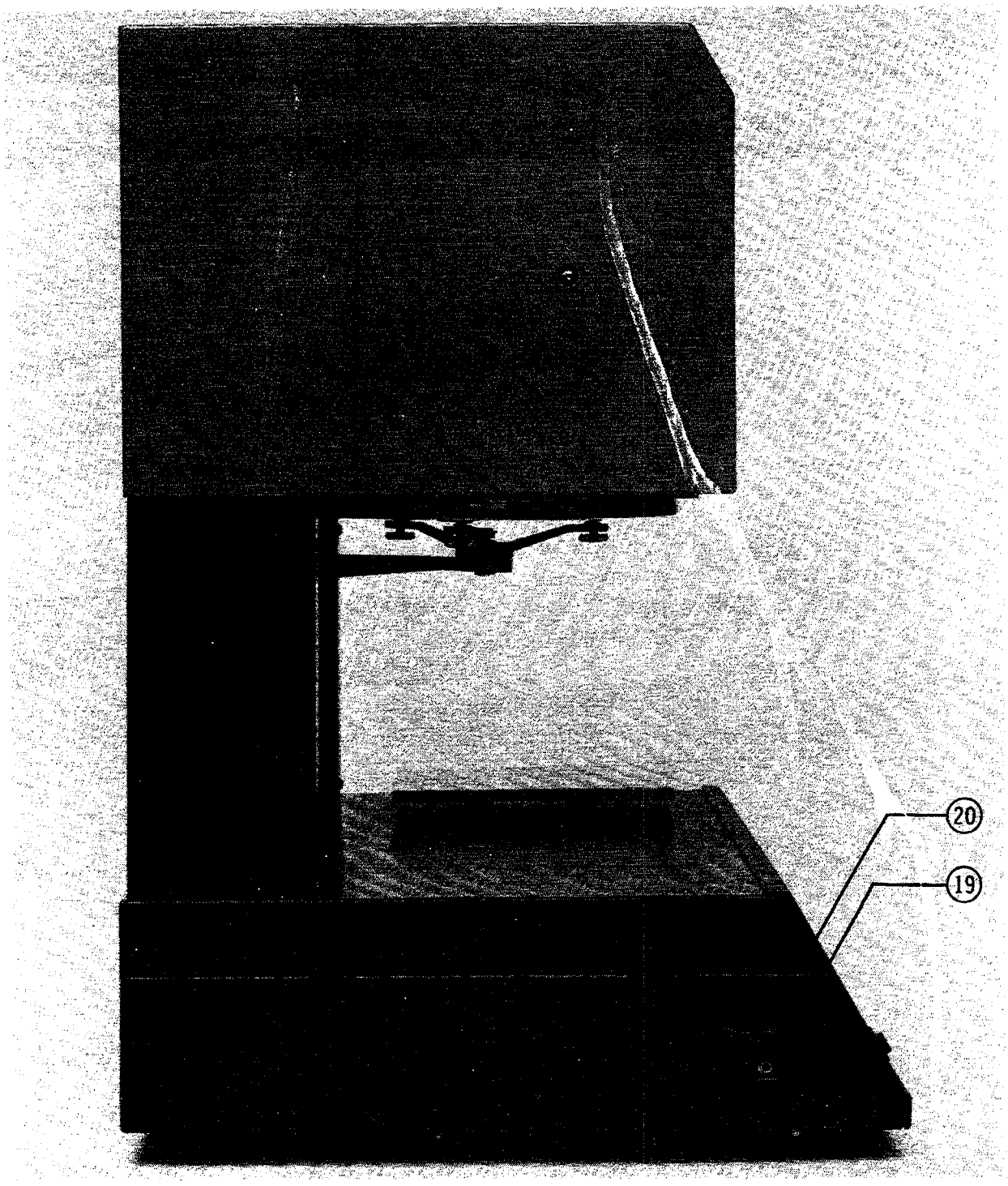
A brief tone response will be heard each time the NIGHT Key is depressed, and the indicator lamp above the key will light when the Night Program has been selected.

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.

COMMODORE II SIDE CONTROLS



SIDE CONTROLS

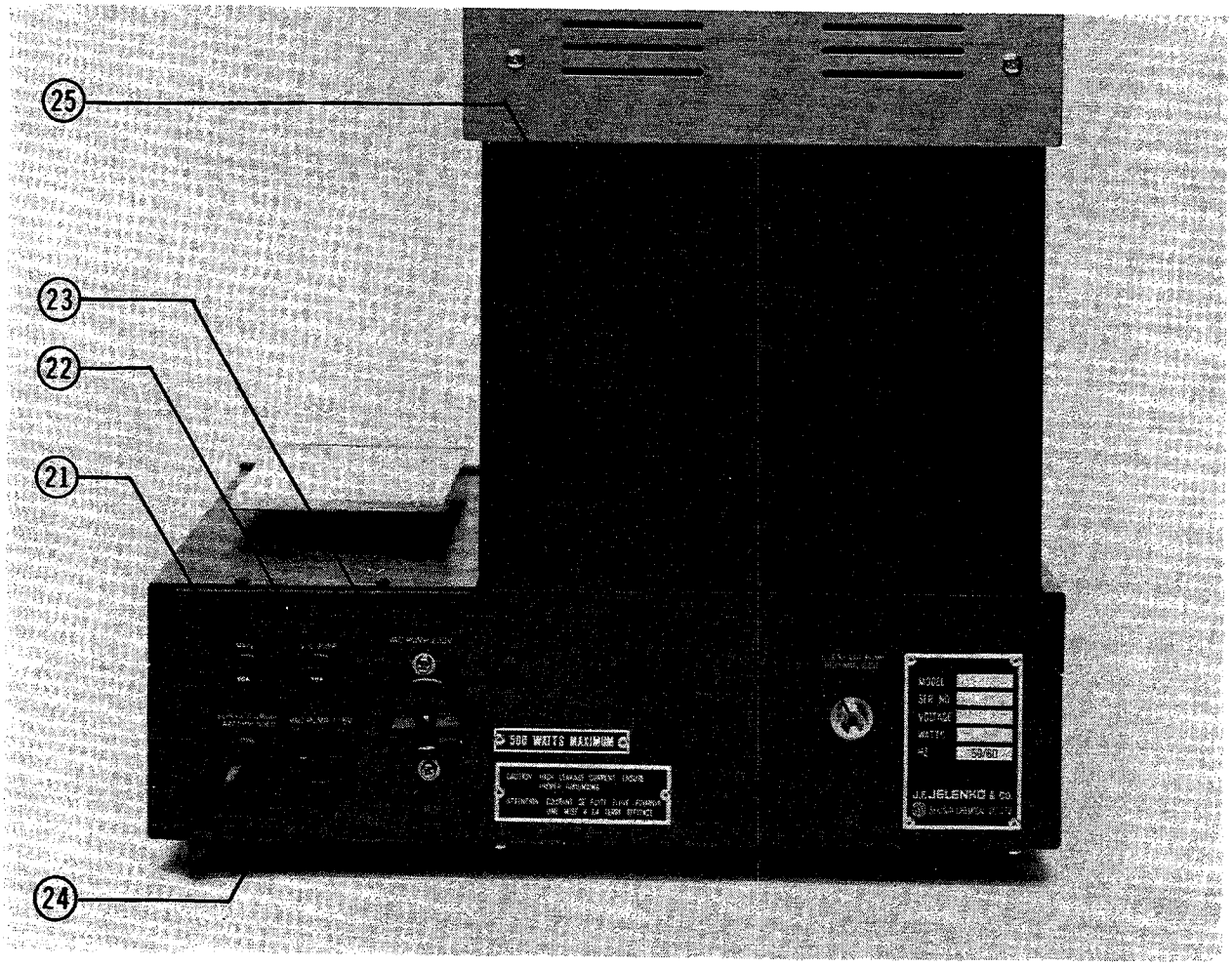
CALIBRATION JACK (19) :

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.

COMMODORE II REAR VIEW



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 $^1/_4$ inch NPT.

DESCRIPTION OF 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.

Any vacuum level between 8 inches (20 centimeters) and 30 inches (76 centimeters) may be programmed into the furnace. 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.

Any high temperature between 200°F (100°C) and 2200°F (1200°C) may be programmed into the furnace.

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.

Any Hold Time from 0 seconds through 99 minutes and 59 seconds may be programmed into the furnace.

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.

The Cool Time is programmable over a range of 10 seconds to 20 minutes, in 10 steps, by entering the number which corresponds to the desired Cool Time as outlined on page 14.

COOL TIME NUMBER	ACTUAL COOL TIME
0	10 Seconds
1	20 Seconds
2	30 Seconds
3	1 Minute 0 Seconds
4	1 Minute 30 Seconds
5	2 Minutes 30 Seconds
6	4 Minutes 0 Seconds
7	7 Minutes 0 Seconds
8	10 Minutes 0 Seconds
9	20 Minutes 0 Seconds

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-

This is the point during the firing cycle at which the vacuum within the furnace vacuum chamber will be automatically vented. 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 NINE FIRING CYCLE PARAMETERS

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

ERROR CODES

ERR 1

Cause	Action required by user
When changing a parameter while a firing cycle is in progress, the entry does not correspond with the allowable "IN-CYCLE" PARAMETER CHANGES.	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	Action required by user
a. Operator attempts to enter a parameter with a value which is not within the limits for that parameter.	a. Operator must select a value for the parameter which is within the limits for the parameter, as outlined on page 14 of this manual.
b. Each time the START/STOP Key is depressed to begin a program, the microcomputer checks all parameters to make certain that no parameters are out of the range of the furnace. If a parameter is out of the range of the furnace, this Error Code will appear.	b. The operator should review each program parameter to determine which parameter is causing this Error Code.

ERR 3

Cause	Action required by user
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 into the furnace.	The operator should review each program parameter to make certain the value for each parameter is correct according to the firing cycle being 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.	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	Action required by user
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.	Insert the plug from the Calibration Instrument into the Calibration Jack.
b. The silver wire has not been placed across electrodes of the Calibration Instrument.	Prepare the Calibration Instrument as outlined on-page 23-25 of this manual.

PROGRAMMING PROGRAMS "A" THROUGH "J"

The twenty programs, "A" through "J", and ["A" through "J"/ SELECT Key activated], on the Commodore II VPF are fully programmable by the operator, with each program consisting of nine different firing cycle parameters.

Once programmed, each of the twenty programs will be retained in the furnace memory for use as needed, even when the furnace POWER SWITCH has been turned OFF or line power to the furnace is disconnected.

Outlined below is the procedure to be used when programming programs "A" through "J". To illustrate this procedure, the following firing cycle parameters will be input to program "A".

PARAMETER NAME	PARAMETER VALUE
Low Temperature	1250°F (677°C)
Preheat Time	3 Minutes 45 Seconds
Heat Rate	100°F (56°C)/Minute
Vacuum Level	27 Inches (69 Centimeters)/Mercury
High Temperature	1800°F (982°C)
Hold Time	0 Minutes 30 Seconds
Cool Time	10 Seconds
Evacuation Temperature	1250°F (677°C)
Vent	1750°F (954°C)

If, when following this procedure, an ERROR CODE appears on the display after depressing the ENTER Key, refer to the description of ERROR CODES outlined on page 14 of this manual for an explanation of the cause.

1. Make certain the Commodore II furnace has been installed as outlined under "INSTALLATION" on page 5 of this manual and that the POWER SWITCH has been placed in the ON position.

The indicator lamp above the IDLE Key will light, and the DIGITAL DISPLAY will indicate the actual muffle temperature.

2. Depress PROGRAM SELECTOR Key "A". The indicator lamp above this key will light indicating program "A" has been selected.

* **NOTE:** The procedure outlined in this section uses degrees Fahrenheit for temperature and inches of mercury for vacuum. If the furnace is being used in the degrees Celsius mode, degrees Celsius for temperature and centimeters of mercury for vacuum (numbers in parentheses) should be used.

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

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

4. Depress the following numbers on the NUMERIC KEYBOARD.

1 2 5 0 - to correspond to the desired Low Temperature.

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

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.

Once the desired Low Temperature 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.

The Preheat Time presently programmed into the furnace will appear on the DIGITAL DISPLAY.

5. Depress the following numbers on the NUMERIC KEYBOARD:

03 - to correspond to the desired number of minutes for Preheating

AND

45 - to correspond to the desired number of seconds for Preheating.

Note that the TIME indicator lamp to the right of the display will flash on and off to indicate that a time parameter is being programmed. Also note that the minutes and seconds are separated by a decimal point on the display.

Once the desired Preheat Time 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.

The Heat Rate presently programmed into the furnace will appear on the DIGITAL DISPLAY.

6. Depress the following numbers on the NUMERIC KEYBOARD:

100 - to correspond to the desired Heat Rate

Note that the HEAT RATE indicator lamp to the right of the display will flash on and off to indicate that the Heat Rate parameter is being programmed.

Once the desired Heat Rate 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 VACUUM indicator lamp on the GRAPHIC DISPLAY will light.

The Vacuum Level presently programmed into the furnace will appear on the DIGITAL DISPLAY.

7. Depress the following numbers on the NUMERIC KEYBOARD:

27 - to correspond to the desired Vacuum Level

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.

Once the desired Vacuum Level 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.

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

8. Depress the following numbers on the NUMERIC KEYBOARD:

1800 - to correspond to the desired High Temperature

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.

Once the desired High Temperature 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.

The Hold Time presently programmed into the furnace will appear on the DIGITAL DISPLAY.

9. Depress the following numbers on the NUMERIC KEYBOARD:

00 - to correspond to the desired number of minutes to maintain the High Temperature

AND

30 - to correspond to the desired number of seconds to maintain the High Temperature

It should read "00.30" when you are finished.

Note that the TIME indicator lamp to the right of the display will flash on and off to indicate that a time parameter is being programmed, and that the minutes and seconds are separated by a decimal point on the display.

Once the desired Hold Time 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.

The code number for the Cool Time presently programmed into the furnace will appear on the DIGITAL DISPLAY.

10. In accordance with the Table of Cool Times outlined on page 14 of this manual, the Code Number which corresponds to the Cool Time used for this exercise is "0".

Depress "0" on the NUMERIC KEYBOARD.

Once the Code Number for the desired Cool Time 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 EVACUATION TEMP indicator lamp on the GRAPHIC DISPLAY will light.

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

11. Depress the following numbers on the NUMERIC KEYBOARD:

1250 - to correspond to the desired Evacuation Temperature

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.

Once the desired Evacuation Temperature 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 first VENT indicator lamp on the GRAPHIC DISPLAY will light.

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

12. The Vent parameter may be expressed as either a temperature or time. If it is desired to vent vacuum at or before the programmed High Temperature (as in this exercise), the desired Vent Temperature would be programmed at this time by depressing the following numbers on the NUMERIC KEYBOARD:

1750 - to correspond to the desired Vent Temperature

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.

If, for this parameter, it is desirable to maintain vacuum for a portion of or for the entire programmed Hold Time, the STEP Key should be depressed once, and the second VENT indicator lamp on the GRAPHIC DISPLAY will light.

The desired Vent Time would be entered by depressing the corresponding numbers on the NUMERIC KEYBOARD:

XX - to correspond to the number of minutes desired to maintain vacuum during the Hold Time

AND

YY - to correspond to the number of seconds desired to maintain vacuum during the Hold Time.

It should read "XX.YY" when you are finished.

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

Once the desired Vent Temperature or Time appears correctly on the display, depress the ENTER Key.

If the furnace has been programmed to vent vacuum by temperature, the STEP Key must be depressed after depressing the ENTER Key to advance to the next parameter.

If the furnace has been programmed to vent vacuum by time, the display will automatically advance to the first parameter entered (Low Temperature), indicating that programming for this program is complete.

At this time, all parameters should be checked for entry errors by advancing through the Program, one parameter at a time, using the STEP Key.

If an error is found, it may be corrected by depressing the keys on the NUMERIC KEYBOARD which correspond to the correct value, and then depressing the ENTER Key. The correct value will automatically replace the value previously entered.

13. Depress the PROGRAM Key. The indicator lamp above the key will turn off.

14. Program "A" has now been completely programmed and may be used to perform the programmed firing cycle by depressing the START/STOP Key.

Once the START/STOP Key has been depressed to begin a firing cycle, the indicator lamp above the key will light to indicate the firing cycle is in operation. The firing cycle may be stopped at any time by depressing the START/STOP Key a second time.

Once the muffle temperature is within approximately 10°F (6°C) of the programmed Low Temperature, the firing cycle will begin. Programs "B" through "J" are programmed using the same procedure outlined for Program "A" in this section.

"IN-CYCLE" PARAMETER CHANGES

The Commodore II 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:

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

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

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

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

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

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

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

PROGRAMMING AND OPERATING THE IDLE PROGRAM

The Commodore II 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

To illustrate the procedure for programming the Idle Program, a temperature of 1000°F (538°C) and vacuum level of 27 inches (69 centimeters) of mercury will be programmed.

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.

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.

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

3. Depress the following numbers on the NUMERIC KEYBOARD:

1000 - to correspond to the desired idle temperature

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.

Once the desired Idle Temperature appears correctly on the display, depress the ENTER Key. This parameter will be entered, the display will automatically advance to the next Idle Program parameter, and the VACUUM indicator lamp on the GRAPHIC DISPLAY will light.

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

4. Depress the following numbers on the NUMERIC KEYBOARD:

27 - to correspond to the Vacuum Level desired for the Idle Program

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.

Once the desired Vacuum Level appears correctly on the display, depress the ENTER Key. This parameter will be entered, and the display will automatically advance to again indicate the temperature programmed for the Idle Program, also indicating that programming for the Idle Program is complete.

5. Depress the PROGRAM Key. The indicator lamp above the key will turn off.

*NOTE: The procedure illustrated in this section uses degrees Fahrenheit for temperature and inches of mercury for vacuum. If the furnace is being in the degrees Celsius mode, degrees Celsius for temperature and centimeters of mercury for vacuum (numbers in parentheses) should be used.

OPERATING THE IDLE PROGRAM

Once the Idle Program has been programmed for temperature and vacuum as outlined on the previous page, 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 lighted.

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

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.

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. If a vacuum level greater than 27 inches (69 centimeters) of mercury is programmed, but this programmed vacuum level is not achieved, the vacuum pump will operate for one minute after achieving 27 inches (69 centimeters) of mercury. 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

The Commodore II also has the capability of an Automatic Idle. 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:

Idle ➨ Select ➨ Program ➨ Step ➨ Enter

The Step key will toggle the Auto Idle ON or OFF as indicated by the digital display.

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 lighted.

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

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.

4. Once the furnace door closes completely, the vacuum pump will turn on and operate for one minute and 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 turn on the Night Program before starting the selected user program so that the night cycle will automatically fire when the user program has completed its cycle. To turn the Auto Night feature on, use the following procedure:

Choose the desired firing cycle "A" - "J"

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

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.

CALIBRATION

Your Commodore II 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 25.

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 Celcius 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.

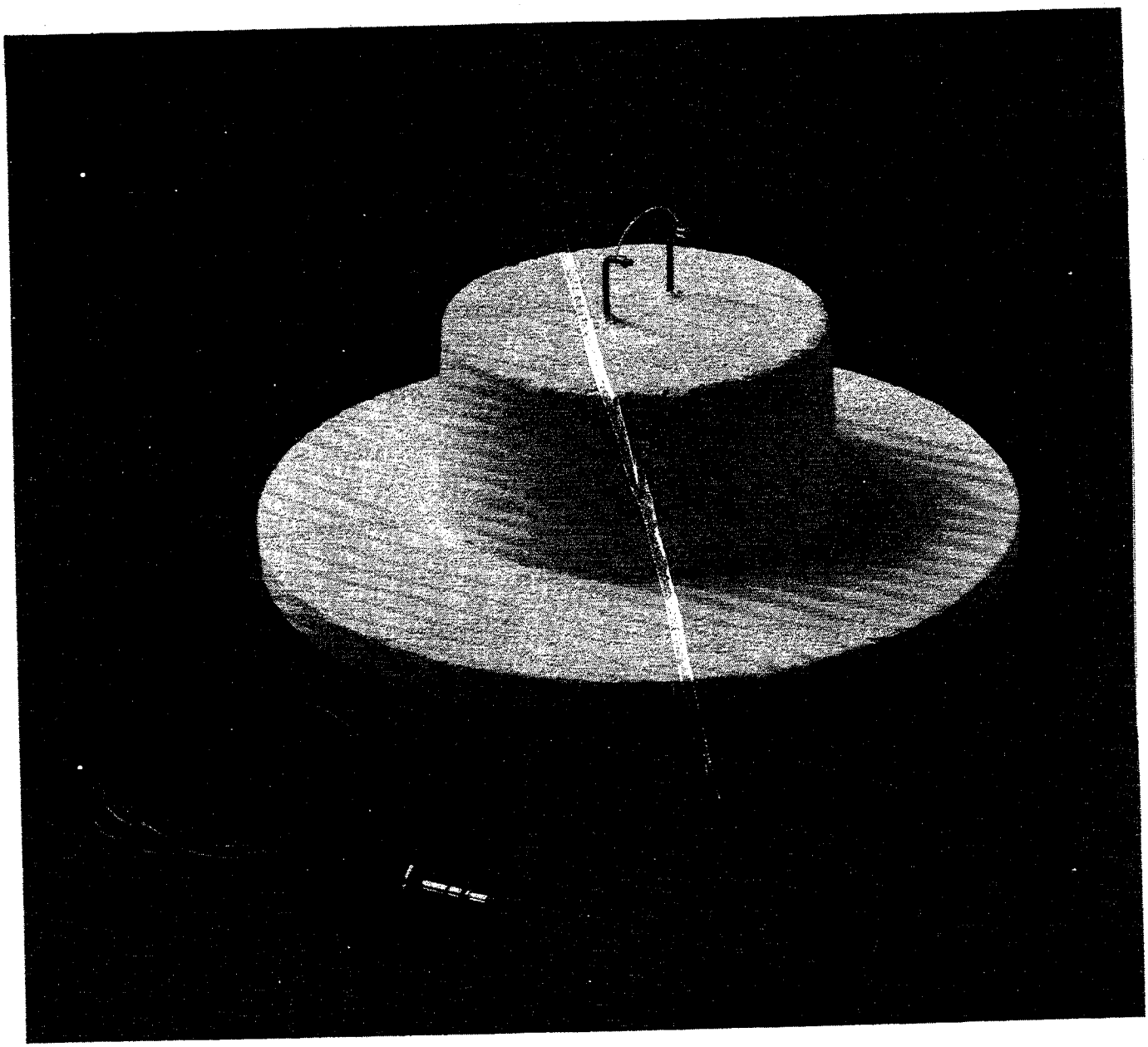
IMPORTANT NOTE: If during the furnace calibration procedure, "AL-5" appears on the display, the following should be checked:

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.

CALIBRATION INSTRUMENT PREPARATION



Bridge the electrodes of the Calibrating Instrument as shown, with pure silver wire. The wire should be wrapped around electrode three times, leaving a small loop of wire between the electrodes.

It is important NOT to stretch the wire between the two electrodes.

SELF-DIAGNOSTIC SYSTEM

The Commodore II 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 TRIAC
2. 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 ~~CLEAR~~ Calib + Light button and turn the POWER SWITCH on while keeping the ~~CLEAR~~ button depressed.**
5. Defective Control Circuit Board.

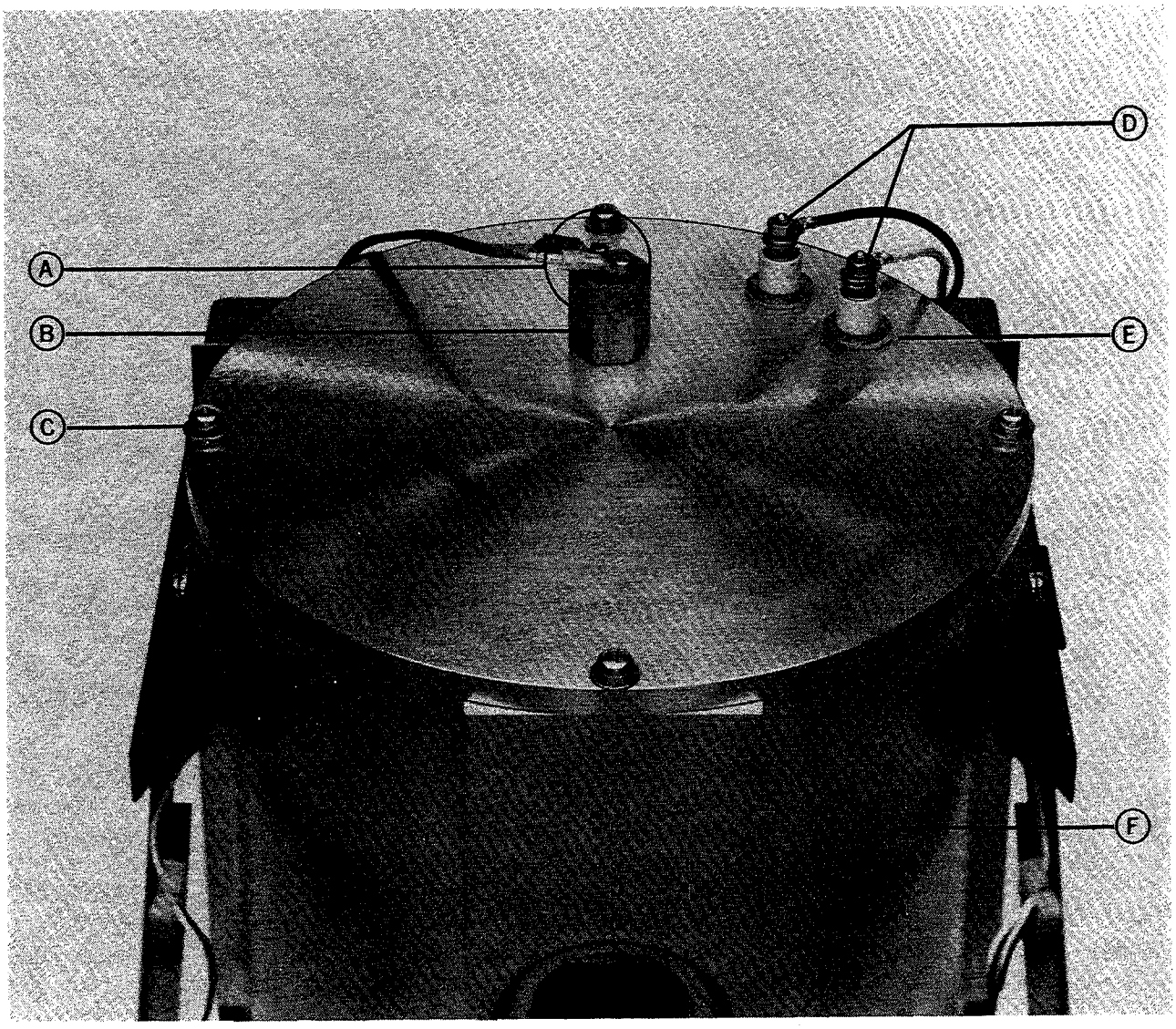
**When the warning tone sounds, the CLEAR Key must be depressed to silence the ALARM.*

***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.

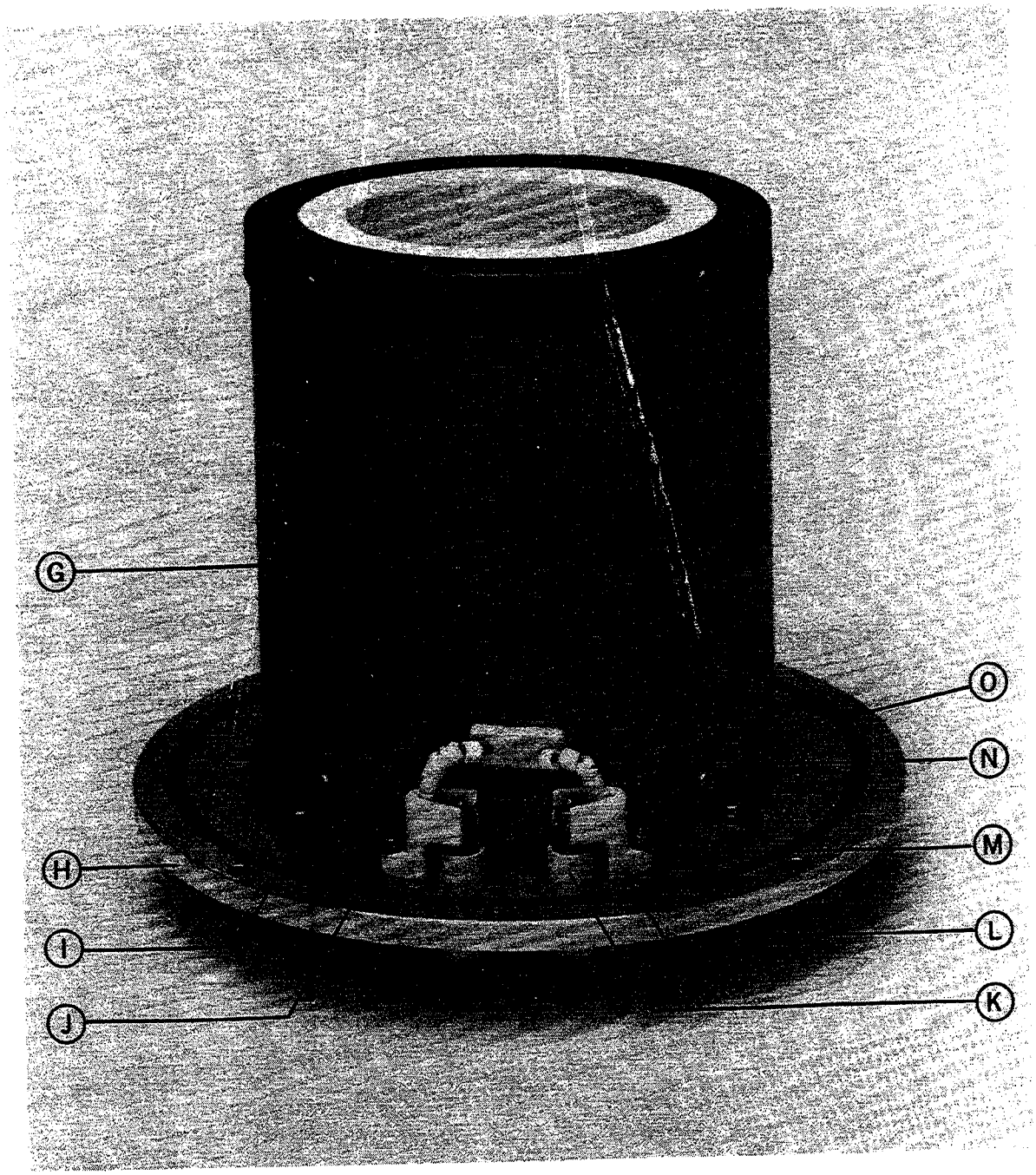
When this Alarm Code appears, the thermocouple is most likely defective and should be replaced. However, this Alarm Code may also appear as a result of a Control Circuit Board defect.

COMMODORE II TOP PLATE



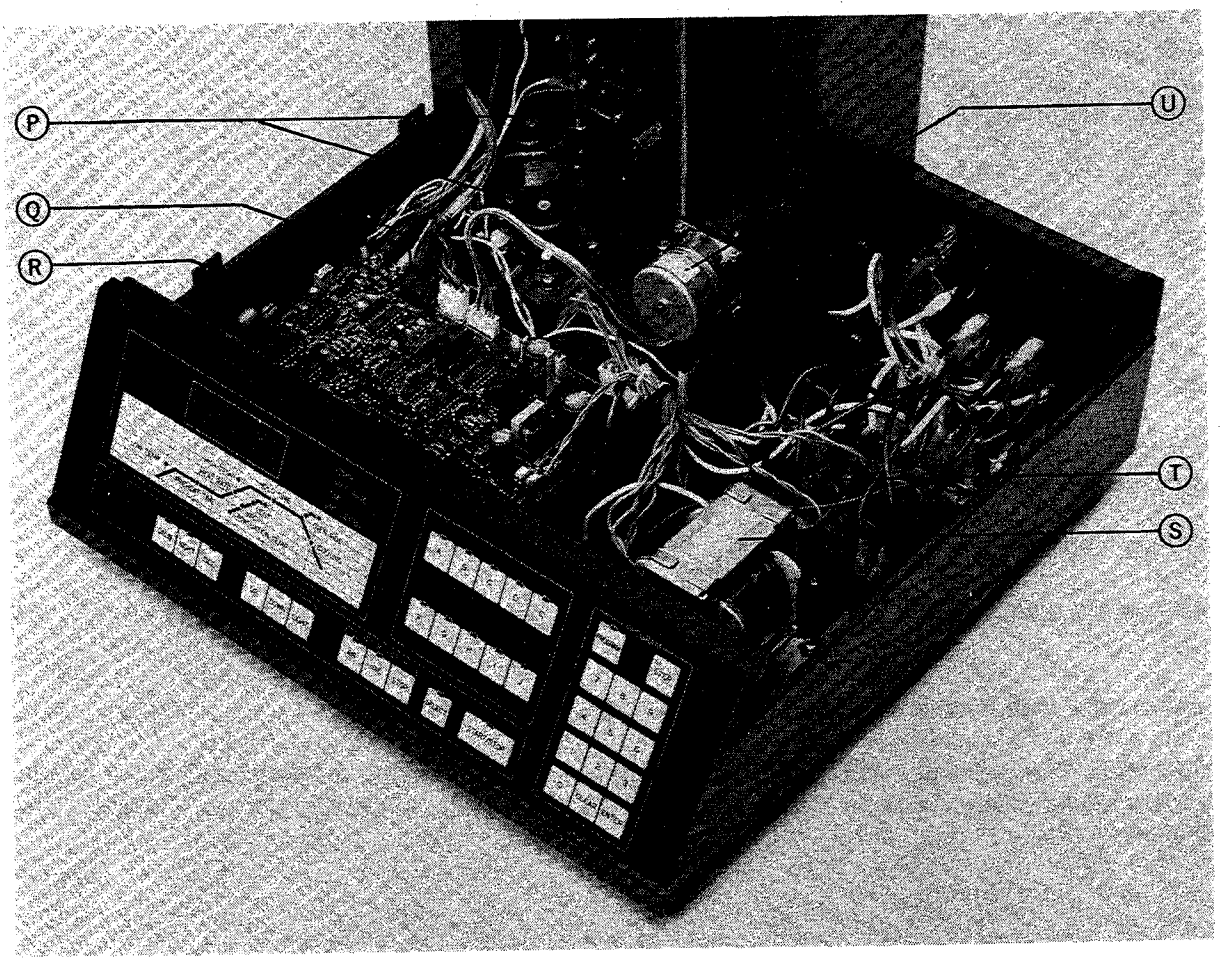
A. Thermocouple Leads
B. Thermocouple Assembly
C. Top Plate Screw (1 of 4)
D. Muffle Power Terminals
E. Muffle Power Terminal Gasket
F. Vacuum Chamber

COMMODORE II MUFFLE
(SHOWN MOUNTED ON TOP PLATE)



G. Muffle
H. Top Plate
I. Muffle Mounting Screw
J. Top Gasket
K. Muffle Power Terminal (1 of 2)
L. Muffle Power Terminal Insulator
M. Muffle Base Mounting Screw (1 of 4)
N. Muffle Power Leads
O. Muffle Base

COMMODORE II LOWER HOUSING ELECTRONICS



P. Vacuum Solenoids
Q. Thermocouple Leads
R. Control Circuit Board
S. Main Transformer
T. TRIAC
U. Door Drive Motor

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 eliminate lamp flickering. To prevent possible damage to this circuit, always use genuine Jelenko replacement lamps.

REPLACEMENT OF THE THERMOCOUPLE

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 page 23-25 of this manual.

NOTE: The thermocouple used in this furnace contains platinum and may be returned for credit against purchase of the replacement thermocouple.

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 page 23-25 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 CLEAR Button and hold depressed 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 page 23-25 of this manual.

COMMODORE™ II RENEWAL PARTS LIST

✓ = Flagship / Comm parts

PRODUCT NUMBER	PART DESCRIPTION
311105 ✓	Power Switch
311107 ✓	Vacuum Pump Receptacle - 230V
311108 ✓	Viewing Lamp (1)
311119 ✓	Door Up/Down Limit Switch
311123 ✓	Door Brick Platform
311124 ✓	Calibration Kit
311132 ✓	Muffle Power Terminal Insulator
311133 ✓	Muffle Power Terminal Replacement Kit
311138 ✓	Door Leg Spring
311139 ✓	Door Leg Pin
311154 ✓	Door Center Pin
311155 ✓	Door Center Spring
311406	Vacuum Pump Receptacle - 100/115V
311410	Power Transformer
311415	Control Circuit Board
311416	Front Circuit Board
311420	Muffle
~~311421~~ 311119	Door Drive Belt
311422	Vacuum Solenoid Assembly
311425	Door Drive Motor
311426	Door Seal Gasket/Top Gasket
311427	Viewing Window "O" Ring
311428	Muffle Viewing Window
311429	Viewing Window C-Ring
311430	Elevator Door
311143	Main Power Relay
311435	Thermocouple Assembly
311436	Thermocouple "O" Ring
311442	Door Mechanishm Assembly
~~311437~~ 311310	10 Amp Circuit Breaker (pump)
~~311438~~ 311309	15 Amp Circuit Breaker (main)
311439	Triac
311440	Pump Power Relay
311441	Pump Receptacle Relay
311616 ✓	Cooling Tray

use same # as Admiral

311460 Comm II ci

FAHRENHEIT/ CELSIUS CONVERSION CHART

Locate the termperature 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°

C	REF	F	C	REF	F	C	REF	F	C	REF	F	C	REF	F	C	REF	F	C	REF	F	C	REF	F
-17.8	0	32	24.4	76	168.8	321	610	1130	743	1370	2498	1166	2130	3866	1588	2890	5234	2010	3650	6602	2432	4410	7970
-17.2	1	33.8	25.0	77	170.6	327	620	1148	749	1380	2516	1171	2140	3884	1593	2900	5252	2016	3660	6620	2438	4420	7988
-16.7	2	35.6	25.6	78	172.4	332	630	1166	754	1390	2534	1177	2150	3902	1599	2910	5270	2021	3670	6638	2443	4430	8006
-16.1	3	37.4	26.1	79	174.2	338	640	1184	760	1400	2552	1182	2160	3920	1604	2920	5288	2027	3680	6656	2449	4440	8024
-15.6	4	39.2	26.7	80	176.0	343	650	1202	766	1410	2570	1188	2170	3938	1610	2930	5306	2032	3690	6674	2454	4450	8042
-15.0	5	41.0	27.2	81	177.8	349	660	1220	771	1420	2588	1193	2180	3956	1616	2940	5324	2038	3700	6692	2460	4460	8060
-14.4	6	42.8	27.8	82	179.6	354	670	1238	777	1430	2606	1199	2190	3974	1621	2950	5342	2043	3710	6710	2466	4470	8078
-13.9	7	44.6	28.3	83	181.4	360	680	1256	782	1440	2624	1204	2200	3992	1627	2960	5360	2049	3720	6728	2471	4480	8096
-13.3	8	46.4	28.9	84	183.2	366	690	1274	788	1450	2642	1310	2210	4010	1632	2970	5378	2054	3730	6746	2477	4490	8114
-12.8	9	48.2	29.4	85	185.0	371	700	1292	793	1460	2660	1316	2220	4028	1638	2980	5396	2060	3740	6764	2482	4500	8132
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7.22	45	113.0	149	300	572	571	1060	1940	993	1820	3308	1416	2580	4676	1838	3340	6044	2260	4100	7412	2682	4860	8780
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8.89	48	118.4	166	330	626	588	1090	1994	1010	1850	3362	1432	2610	4730	1854	3370	6098	2277	4130	7466	2699	4890	8834
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16.1	61	141.8	238	460	860	660	1220	2228	1082	1980	3596	1504	2740	4964	1927	3500	6332	2349	4260	7700			
16.7	62	143.6	243	470	878	666	1230	2246	1088	1990	3614	1510	2750	4982	1932	3510	6350	2354	4270	7718			
17.2	63	145.4	249	480	896	671	1240	2264	1093	2000	3632	1516	2760	5000	1938	3520	6368	2360	4280	7736			
17.8	64	147.2	254	490	914	677	1250	2282	1099	2010	3650	1521	2770	5018	1943	3530	6386	2366	4290	7754			
18.3	65	149.0	260	500	932	682	1260	2300	1104	2020	3668	1527	2780	5036	1949	3540	6404	2371	4300	7772			
18.9	66	150.8	266	510	950	688	1270	2318	1110	2030	3686	1532	2790	5054	1954	3550	6422	2377	4310	7790			
19.4	67	152.6	271	520	968	693	1280	2336	1116	2040	3704	1538	2800	5072	1960	3560	6440	2382	4320	7808			
20.0	68	154.4	277	530	986	699	1290	2354	1121	2050	3722	1543	2810	5090	1966	3570	6458	2388	4330	7826			
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21.1	70	156.0	288	550	1022	710	1310	2390	1132	2070	3758	1554	2830	5126	1977	3590	6494	2399	4350	7862			
21.7	71	159.8	293	560	1040	716	1320	2408	1138	2080	3776	1560	2840	5144	1982	3600	6512	2404	4360	7880			
22.2	72	161.6	299	570	1058	721	1330	2426	1143	2090	3794	1566	2850	5162	1988	3610	6530	2410	4370	7898			
22.8	73	163.4	304	580	1076	727	1340	2444	1149	2100	3812	1571	2860	5180	1993	3620	6548	2416	4380	7916			
22.3	74	165.2	310	590	1094	732	1350	2462	1154	2110	3830	1577	2870	5198	1999	3630	6566	2421	4390	7934			
23.9	75	167.0	316	600	1112	738	1360	2480	1160	2120	3848	1582	2880	5216	2004	3640	6584	2427	4400	7952			