NEY 🌐
DENTAL INTERNATIONAL

Vacuum Porcelain Furnace

CENTURION VPC

Owner & Operator's Manual

Standard:			interVac (Internal Vacuum Pump):		
94-93-126	100-125V	50/60Hz	94-93-128	100-125V	50/60Hz
94-93-127	200-250V	50/60Hz	94-93-129	200-250V	50/60Hz

> Never operate furnace in close proximity to combustible materials or place materials on top of the furnace.
> The furnace must be electrically grounded to a three wire electrical outlet or receptacle. The electrical service provided must be a dedicated line of the proper size according to local electrical codes.
> Disconnect the line cord before attempting to service the furnace.
> Do not attempt to service the furnace until you read and understand the service manual. (See Manual under Accessories on on page 19)
> Do not touch the reflective viewport window with fingers; the reflective surface can be damaged by hand oils. Clean the window with a clean soft dry cloth when furnace is in NITE MODE.
> Do not operate the furnace controls with tongs or other tools; the tongs will damage the control switches.
> Do not use solvents or liquid cleaners on the control panel; they will enter the panel and damage it.
> Do not place firing trays or other hot objects directly in front of the furnace; they will melt the graphic overlay.

OSHA AND CALIFORNIA PROPOSITION 65:
MUFFLE DUST EXPOSURE

In keeping with the policy of Ney Dental International to build safe products, comply with all National and State statutes and keep you, the valued customer informed; the services of a Certified Industrial Hygienist firm were employed to test and evaluate the lab operator's exposure to respirable refractory ceramic fiber (RCF) and crystobalite (a form of crystalline silica) present in the furnace muffle.

The findings of this test revealed that levels of exposure during the normal operation of this equipment, as outlined in the operator's manual, were far less than the Permissible Exposure Limit set by the Federal Government.

When it becomes necessary to replace the muffle, the person doing this work is recommended to wear a HEPA filter respirator and protective gloves as a precautionary matter.

Seal used muffle in a plastic bag and dispose of in accordance with local, state and Federal regulations.

Because this product and many similar products on the market today contain crystalline silica and ceramic fibers, it is necessary under the statutes of California Proposition 65 that Ney Dental International include the following statement:

"This product contains substance(s) known to the State of California to cause cancer."

Material Safety Data Sheets for RCF materials supplied upon request.

Designed to meet Canadian Standards Association, TÜV and Underwriters Laboratories safety requirements.

FEATURES:

- 100 User Programs
- Optional Internal Venturi Vacuum Pump, Full Vacuum Without Maintenance.
- Two Stage Programs for Controlled Tempering or Higher Heating (Programs #80 - #100)
- High Performance Long Life Muffle

- 1200°C (2192°F) Maximum; 50°C (122°F) Minimum Temperature
- Ultra Smooth Muffle Movement with Stationary Work Support
- Programmable Muffle Dry and Cooling Positions

- Large Low Heat Loss Viewport
- Optimum Viewport Angle for Viewing Work Area
- Large 10cm (4") Diameter Muffle

- Fast Cool Down for Short Times Between Loads (40% faster for more productivity)
- Vacuum Release Programmable in Temperature or Time
- Fast Heat Rates of up to 200°C/minute (360°F/minute)

- Full Program Flexibility; Parameters Changeable During Firing Cycle
- Power Outage Return; Short Power Outages (<30seconds) Do Not Interrupt Cycle Or Cause Loss of Vacuum Due To Outage
- Programmable High Limit Temperature

- Ultra Friendly User Interface; Manual Not Required In Most Applications
- "i" Cards; Multiple Language Information and Help Cards
- Copy Program Function; User Can Copy and Edit Programs Rather Than Enter ALL Parameters for EACH Program

- Energy Saver "Idle Down Time"; Muffle closes but maintains Lo Temp
- NITE MODE: Closes muffle when temperature reaches 100°C to prevent moisture absorbtion
- Automatic PURGE cycle for muffle decontamination after the use of silver alloys

- Easy temperature and vacuum calibration; operator reads out and adjusts calibrations from control panel
- Safety Agency Approvals (CSA, TÜV)
- Two Line LCD Display With Improved Backlighting For Better Visibility

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INSTALLATION INSTRUCTIONS:

UNPACKING:

Carefully unpack and remove the furnace from its shipping carton. **Save the carton and other packing material for future use in transporting the furnace.**

DO NOT LIFT FURNACE BY THE TOP MUFFLE ASSEMBLY!

Shipping damage should be reported to the carrier as soon as detected.
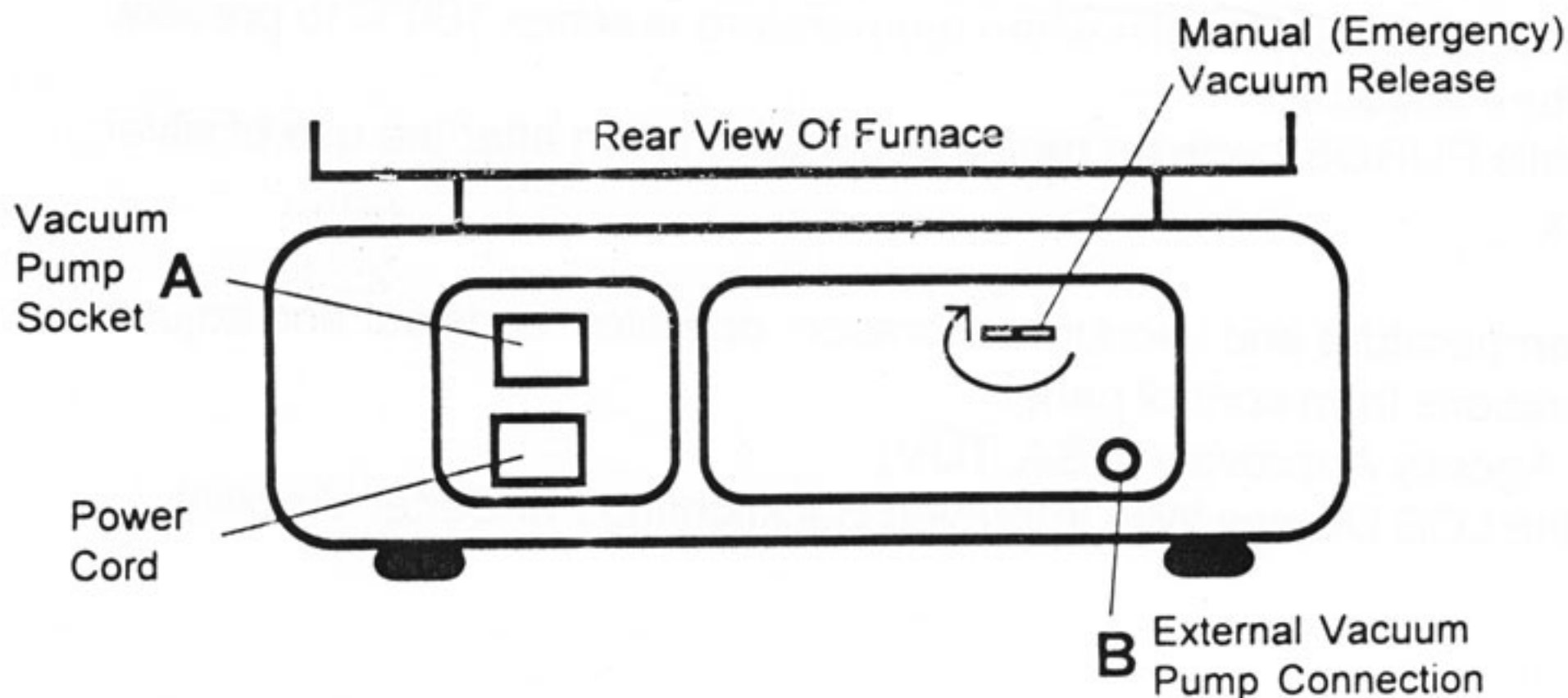
The furnace shipping carton contains the following:
- One furnace complete with power cord
- Owner & Operator's Manual (this document)
- Side work shelf, Program log card and book
- Vacuum tubing, connections, and fuses
- Ceramic work platform (MUST BE INSTALLED in furnace before operation)
- Ceramic firing trays, ceramic pegs, and silver coupons for calibration checks

INSTALLATION:

1 - Remove all packing material from in and around the furnace. The furnace should be located at least 15cm (6") away from walls, shelves and heat sensitive materials.
2 - The furnace should not be located directly under shelves or other airflow restrictions.
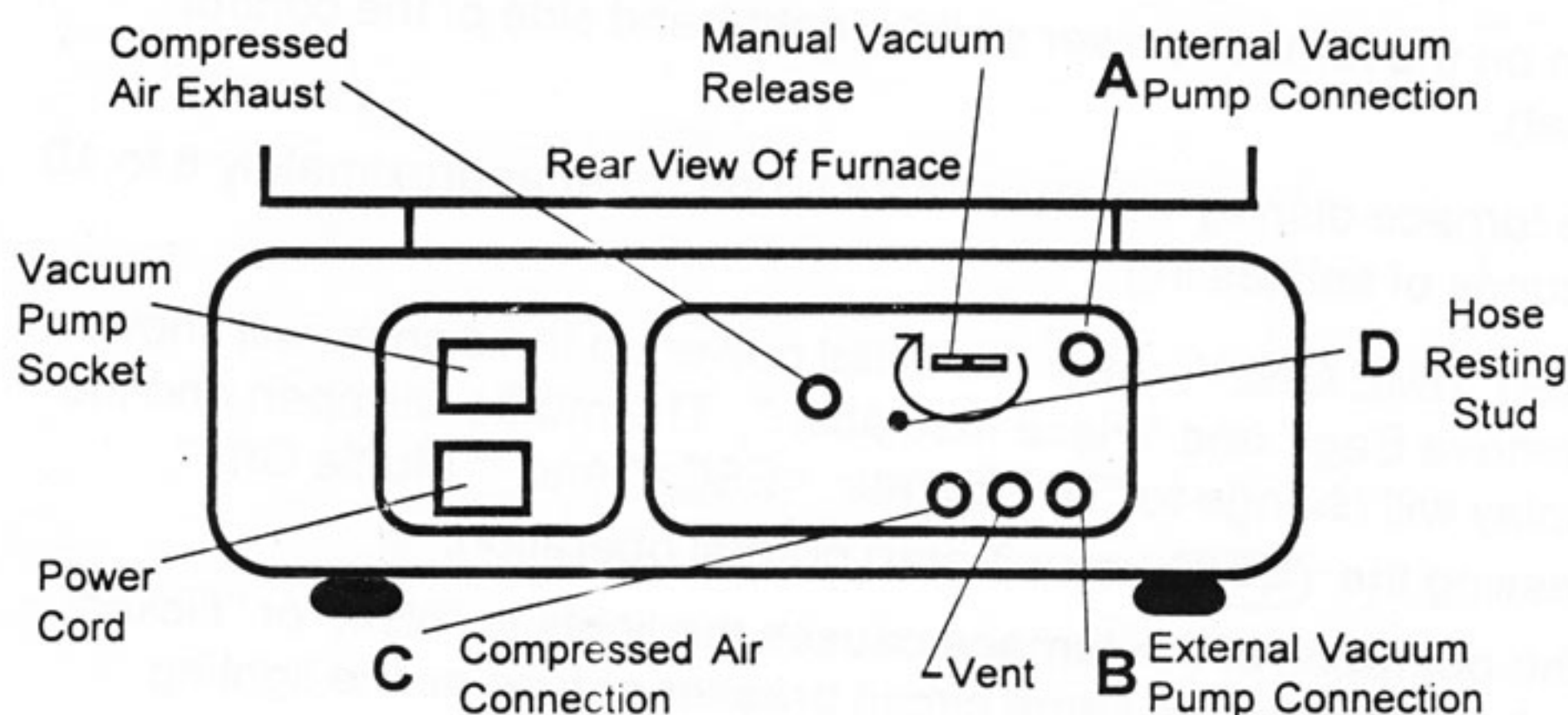3 - Vacuum pump connections:

ELECTRIC VACUUM PUMP CONNECTIONS:
From the rear of the furnace connect the vacuum pump's tubing to Point **B** and plug the pump's power cord into the socket at point **A**.

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OPTIONAL INTERNAL VACUUM PUMP CONNECTIONS:

Compressed Air Exhaust

Manual Vacuum Release

A Internal Vacuum Pump Connection

Rear View Of Furnace

Vacuum Pump Socket

Hose **D** Resting Stud

Power Cord

C Compressed Air Connection

Vent

B External Vacuum Pump Connection

If the furnace is equipped with "InterVac" (optional internal venturi vacuum pump) the furnace can be operated with compressed air supply. The furnace is shipped with the internal vacuum pump ready to operate (**A** is connected to point **B**). Connect your compressed air line to point **C** and the furnace is ready for operation.

WARNING: The air supply needs to be clean filtered air, free of dirt and rust. Purge the compressed air lines before connecting them to the furnace. Rust and dirt can block the vacuum pump or valve.

The compressed air supply must provide a minimum of:

Air Consumption: 112 l/min (4 CFM)
Pressure Req'd: 5.6 - 8.4 Kg_f/cm^2 (80 - 120 psi) (550 - 825 kPa)
(1.5 horsepower compressors normally produce 140l/min @ 8.4Kg_f/cm^2 (5CFM at 90psi)

The internal pump will produce:

Pull time: 30 seconds to 95% max vacuum, 45 sec to full vacuum
Vacuum level: 740 mm (29 in) at sea level (20 mm absolute)

If an external electric vacuum pump is going to be used, connect the hose from point **A** to **D** and connect the external pump hose to **B**. No connection is made to **C**.

The compressed air exhaust hose should be routed down and away from the furnace and your work area. This will minimize the air noise and prevent it from blowing any dust. Do not pinch this hose or block its exhaust because this will reduce the performance of the InterVac pump.

4 - Connect the furnace to a power circuit or receptacle with an overcurrent protection (circuit breaker or fuse) rating of 20 Amps. This circuit should only supply the furnace and pump.

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5 - Turn on the furnace power switch (right-hand side of the control panel).

6 - The furnace display will show "Nite Mode" after approximately 8 to 10 seconds of self testing.

7 - FIRST TIME ONLY: After the initial power up the display will show: "Remove Bag!" and "Place Insulation". The muffle will open and the display will change to "To Operate: <ESC>" and "* Muffle Off *" Pressing the (ESC) key will start normal operation.

   If the operation of the furnace causes the lights to "blink" or "flicker" the furnace is on the same circuit breaker or fuse as the lighting.

8 - **IMPORTANT!** Open up furnace with muffle movement keys located on lower left side if the furnace does not open automatically. Install ceramic work platform ("Place Insulation").
   Operating the furnace without this platform will damage the furnace!

9 - Press (ESC) key followed by the [S | S] (green/red) start/ stop key in the upper right corner of the control panel. Program 50 will now run to remove any accumulated moisture. This program will take approximately 30 minutes.

   If the furnace does not pull vacuum "Err4" press the [S | S] key and stop the cycle. Check the following:
     - Verify that the ceramic work platform is centered on the door.
     - Check the vacuum pump to verify that it is energized.
     - Check the vacuum hose connections to verify that they are connected to the correct locations.
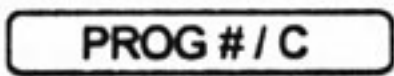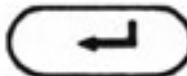
   If the furnace pulls a low vacuum "Err5" there may be moisture in the muffle. Press the (ESC) key and allow the furnace to continue running to remove the moisture.

   If the InterVac pump is being used verify that the air pressure is a minimum of 5.6Kg$_f$/cm^2 (80psi). Also check the compressed air exhaust hose for kinks or blockage.
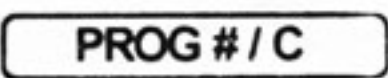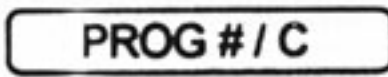
OPERATING INSTRUCTIONS:

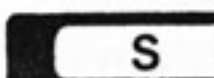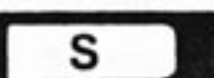**CHANGING PROGRAMS:**

Press [PROG # / C] followed by number keys and (↵) (ENTER) to change programs. The current program number is displayed in the upper right-hand corner of the display window.

Example: Change to program 34.

Key sequence: [PROG # / C] (3) (4) (↵)

CAUTION: Pressing the [PROG # / C] twice activates the COPY feature. This feature will copy the current programs parameters to the new program number that is entered. The new program parameters are lost! See next page for additional information.
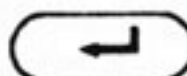
STARTING PROGRAMS:

Press [S | S] to start current program. Pressing this key during a cycle or program stops or aborts the program. The red and green portions of the key have the same effect.

When a firing cycle is started all of the parameter LED's light (VAC LED's also light if vacuum is on). The second line of the LCD display shows the current cycle segment and the approximate time remaining in the firing cycle. If the cycle is a vacuum cycle the "Vac" in the top line of the display is replaced by "0mm" or "0in" for the readout of vacuum level.

The LED's turn off as the associated cycle segment is completed. The LCD displays the current cycle segment name and the approximate time remaining.

CHANGING PROGRAM PARAMETERS:

Press one of the [🌡] [🕐] [🔲] parameter keys followed by the digit keys and (↵) (ENTER) key to change a parameter of the current program. Each time the key is pressed the next parameter in the sequence is activated.

[🌡] "Lo T" for low temperature, "Rate" for ramp rate, and "Hi T" for high temperature. The LED for the selected parameter is turned on when selected. For "T2" see special operations sections.

[🕐] "Dry" for dry time, "Hold" for hold time, and "Cool" for cool time. For "H2" see special operations sections.

[🔲] "Vac" for vacuum level, "Pull" for vacuum start temperature, and "Stop" for vacuum stop temperature and stop time.
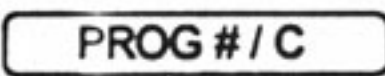
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10%. In special cases where it is desired that the pump run continuously when vacuum is programmed on, the level can be set to 101%.

"Pull" is the vacuum start temperature parameter. This controls the temperature at which vacuum is applied. This should be programmed equal to or lower than the "Lo T" in most applications.
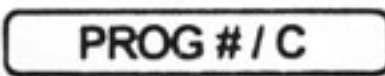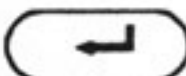
"Stop" is the vacuum stop temperature and time parameters that stops or turns off the vacuum. Normally this parameter is programmed higher than the "Hi T" so that the vacuum is held during the full cycle. Programming this lower than the "Hi T" will stop the vacuum during the temperature ramp at the programmed temperature.

For the vacuum to be held for only a portion of the "Hold" time the vacuum "Stop" temperature must be set equal to the "Hi T" temperature. The furnace will then ask for a vacuum stop time which can be programmed from 0 to a value equal to the current "Hold" time. The factory setting is 1:00 minute. The vacuum "Stop" time does not affect the length of time the muffle is held at the "Hi T".
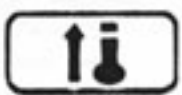
SPECIAL OPERATIONS:

PROGRAM COPY - Press the [PROG # / C] key twice slowly (four fast beeps). The second line of the display will prompt for a new program number to copy the current program contents to.

Example: Copy current program parameters to program 73.

Key sequence: [PROG # / C] [PROG # / C] (7) (3) (⏎)

NEXT STEP - Pressing the [🔼📶] key during a firing cycle will cause the control to end the current cycle segment. (e.g. Rate > Hold > Cool) Pressing this key during the Cool segment will cause the furnace to repeat the last cycle starting with the Rate.
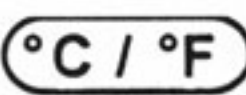
ESC - Pressing the (ESC) key during programming will return the furnace to the IDLE MODE or FIRING CYCLE MODE if the furnace was running a cycle.

HI TEMP INCREASE - Pressing the [1🌡] key during the Hold Time will cause the muffle temperature to increase. When used, this key should be pressed momentarily and released. This key is only active during the Hold Time.

NITE - Pressing the [🌓] key will cause the furnace to go into NITE MODE if the furnace is in IDLE MODE. The furnace will cool down to 100°C and the muffle will close. If the furnace is in a firing cycle when the key is pressed, the furnace will go into NITE MODE after the cycle.

Press the (ESC) key or one of the parameter keys to cancel or abort the NITE MODE.

MUFFLE MOVEMENT ◢△◣ ◢▽◣ - Pressing the up or down key will move the muffle in the indicated direction until it reaches its full travel. Pressing the key while the muffle is moving will stop the muffle at its current position. See page 12 for muffle movement during the DRY and COOL portions of the firing cycle.

(°C / °F) Key changes the display from Celsius to Fahrenheit and back. The conversion can not be done during parameter programming. The measurement units for vacuum also changes from "mm Hg" to "in Hg" when the temperature units are changed.

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°C/°F changes the temperature and vacuum units from °C/(mm) to °F (in) and back. This key is <u>not</u> active during parameter programming.

HI TEMP INCREASE increases the High Temp during the HOLD time. It is used for soldering and calibration.

NEXT STEP causes the control to go to the next step (segment) of the current firing cycle.
e.g. Hold >> Cool

LC
"Air
cyc
Sec
and
dur

"Dry" LED

"Rate" LED

"Hi T" LED

TEMP

1010°C
Hold

i Help Card

S S *Starts firing cycle; Stops firing cycle.*

PROG#/C *Press once to change program number. Press twice to copy current program parameters to new program number.*

1 2 3 ... ↵
Press digit keys followed by ENTER key to change values.

"Nite" "Mode" LED

⊥ Press Temp key to set Lo Temp, Rate, and Hi Temp.

⏱ Press Time key to set Dry, Hold, and Cool time.

VAC Press VAC key to set VAC Level, VAC Pull Temp, VAC Stop Temp or Time.

"Lo T" LED

"Pull" LED

NITE MODE puts the furnace into **NITE MODE** (muffle is held at 100°C and muffle closes). If pressed during a cycle, the furnace goes into **NITE MODE** at the end of the cycle.

MUFFLE MOVEMENT keys open and close the muffle. Pressing it a second time during movement causes the muffle to stop.

TEMPERATURE access to program or review 3 temperature parameters: Low Temp; Ramp Rate; and High Temp.

TIME
progra
timing
Dry Ti
Time; ;
Time.

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D Display's muffle temperature; " or "Vac" (mm or In of Hg during e); current program number. ond Line displays current status cycle time which counts down ng cycle.

ESC exits Nite Mode. If pressed during programming exits to **IDLE MODE.**

START/STOP starts current cycle or program. Stops or aborts program if already operating.

"Stop" LED

"Hold" LED

VAC

PROG

700mm

100

3:21m

S   S

PROG # / C

1 2 3

4 5 6

7 8 9

0 ↵

VAC

"Vac" LED

"Cool" LED

ccess to or review 3 rameters: Hold d Cool

VACUUM access to program or review 3 vacuum parameters: Vacuum Level; Vac Pull (start) Temp; and Vac Stop Temp.

Digit Keys used to enter new program numbers or parameters.
ENTER key used to store new program number or parameter in memory.

PROGRAM/ COPY Press key once followed by digit keys and **ENTER** to select new program. Press key twice to copy current program parameters to new program.

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OPERATING INSTRUCTIONS (cont)

TWO STAGE OPERATIONS - Programs 80 through 100 have a second "Hi T" or high temperature **("T2")** and "Hold" time **("H2")** that allow for special operations such as tempering.
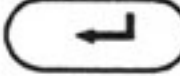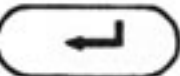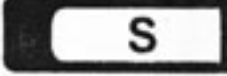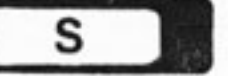
Example: Program "T2" to 850°C.

Key sequence: (ESC) [🌡] [🌡] [🌡] [🌡] (8) (5) (0) (↵)

Example: Program "H2" to 2 minutes and 0 seconds.

Key sequence: (ESC) [⏱] [⏱] [⏱] [⏱] (2) (0) (0) (↵)

"T2" can be programmed lower or higher than the corresponding   "Hi T".

PURGE CYCLE: Program "0" is the automatic purge cycle. Load the carbon rod into the muffle in the horizontal position. Change the program number to 0 and then press the

(↵) key. The Purge Cycle starts automatically when the (↵) key is pressed.

Pressing the [S   S] key **stops** the cycle. A complete purge cycle lasts approximately 2 hours.

CAUTION: Do not stop this cycle at elevated temperatures, the release of vacuum can damage the muffle and cause an unsafe condition.
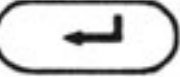
MUFFLE POSITION:
The "DRY" and "COOL" positions can be adjusted for each furnace. To change the factory preset "DRY" or "COOL" positions, use the following procedure:

"DRY" Position:

1 - Press [PROG # / C] (2) (4) (6) keys followed by the (↵) (ENTER) key.

The furnace will display "DRY POSITION --_".

2 - Press the [△] [▽] keys so that the muffle moves to the desired position
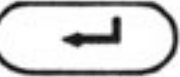
followed by the (ENTER) (↵) key.

3 - The muffle will then move up and then down to confirm the new programmed position. This will be the "DRY" position for all programs.

4 - During the last 20 to 60 seconds of the Dry time the muffle will close in multiple small steps depending on the programmed height.

"COOL" Position:

1 - Press [PROG # / C] (1) (3) (5) keys followed by the (↵) (ENTER) key.

The furnace will display "COOL POSITION _--".

2 - Press the [△] [▽] keys so that the muffle moves to the desired position

followed by the (ENTER) (↵) key.

3- The muffle will then move down and then up to confirm the new programmed position. This will be the "COOL" position for all programs.

Manual Muffle Positioning:
The muffle can be manually position during the DRY and COOL portions of the firing cycle by using the muffle movement keys if the DRY and/or COOL time is longer than 1:00 minute. During the last minute of the DRY and COOL time these movement keys are disabled.

SPECIFICATIONS:

PARAMETER	MINIMUM	MAXIMUM	INCREMENT
Low Temperature	50°C (123°F)	800°C (1472°F)	1°C (1°F)
Dry Time	0 Seconds	99:59 Min.	1 Sec
Heat Rate	1°C/Min.	200°C/Min.	1°C/min.
	(2°F/ Min.)	(361°F/ Min.)	(1°F/min.)
High Temperature	50°C (123°F)	1200°C (2192°F)	1°C (1°F)
Hold Time	0 Seconds	99:59 Min.	1 Sec
Vacuum Level*	10%	100%	1%
Vac Pull Temperature	50°C (123°F)	1200°C (2192°F)	1°C (1°F)
Vac Stop Temperature	50°C (123°F)	1200°C (2192°F)	1°C (1°F)
Vac Stop Time	0 Seconds	Full Hold Time	1 Sec
Cool Time	0 Seconds	99:59 Min.	1 Sec

* Special Vacuum Cases: 0% is no vacuum or air firing cycle; 100% is the maximum vacuum possible at current location; 101% is pump on continuously during the programmed vacuum on time.

OPERATIONAL
- Temperature Accuracy: +/- 3°C (+/- 5.5°F) at steady state
- Muffle Temperature Uniformity: +/- 5°C (+/- 9°F) at steady state
- Vacuum Recycling Dead Band: 30mm Hg
- Muffle Temperature In NITE MODE: 100°C +/- 10°C

ELECTRICAL
Voltage Ranges: 100-125V   200-250V
                    50/60Hz   50/60Hz
    Currents: 13 Amps @ 100V   5.9 Amps @ 220V
                    10.8 Amps @ 120V   5.4 Amps @ 240V
    Wattage: 1300 Watts (less pump) Steady State
              [1800 W during ramp-up cycle]
    Watts to Maintain 1000°C: less than 400 Watts, muffle closed,
                                no vacuum pump

MECHANICAL

Exterior Dimensions:	Height	Width	Depth
Muffle open	48cm (19")	33cm (13")	45cm (17.5")
Muffle closed	33cm (13")	33cm (13")	41cm (16")

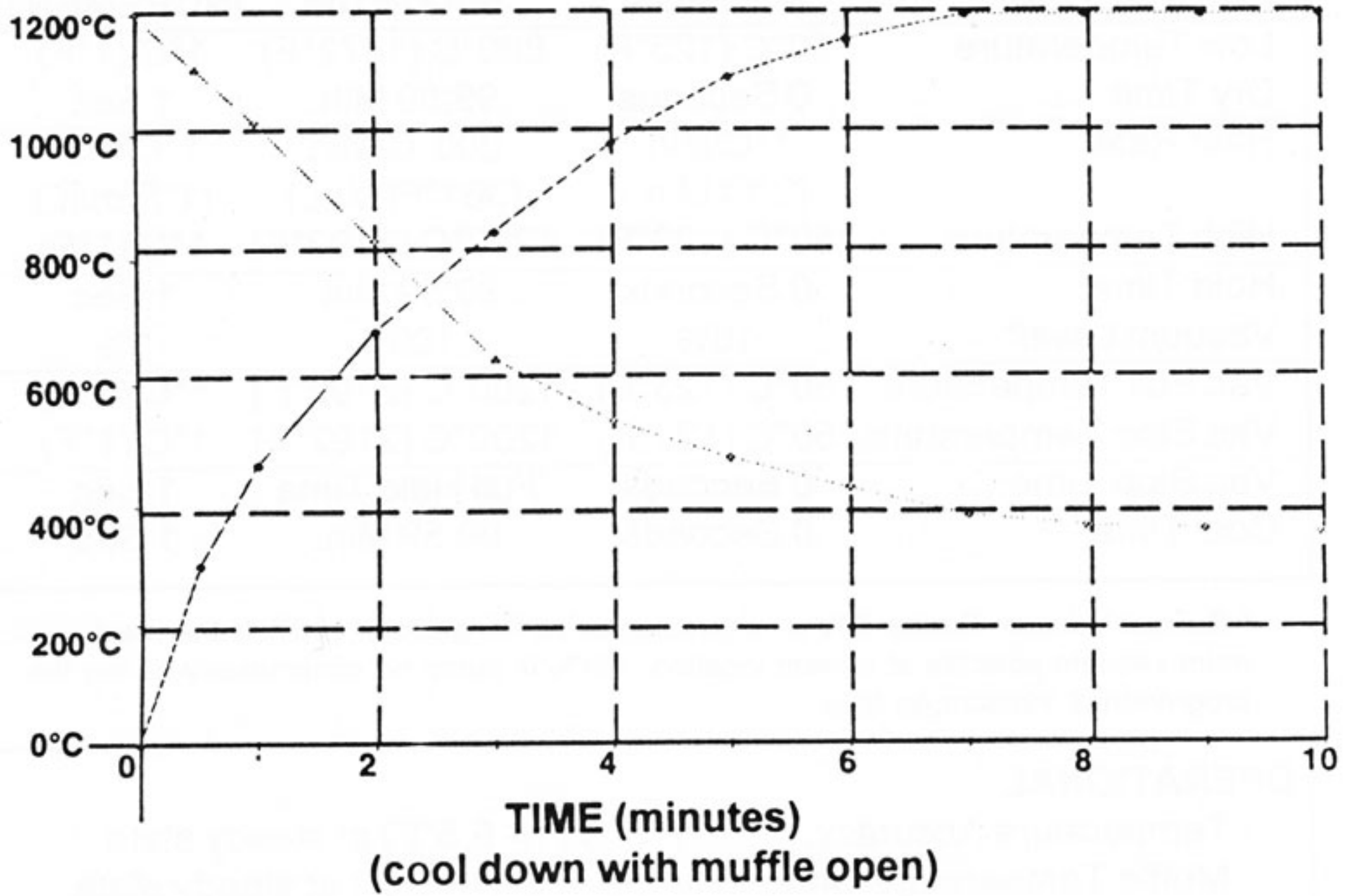Interior Muffle Dimensions:
        Height: 6.3cm (2.5")   Diameter: 10cm (4")
Furnace Weight: 21Kg (45lbs)   Shipping Weight: 25Kg (55lbs)

ENVIRONMENTAL
Ambient Operating Temperature: 5 - 40°C
Relative Humidity: Maximum 80%, non-condensing

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PERFORMANCE CURVE: (maximum ramp rate)

TIME (minutes)
(cool down with muffle open)

OUTLINE DRAWING:
in (mm)
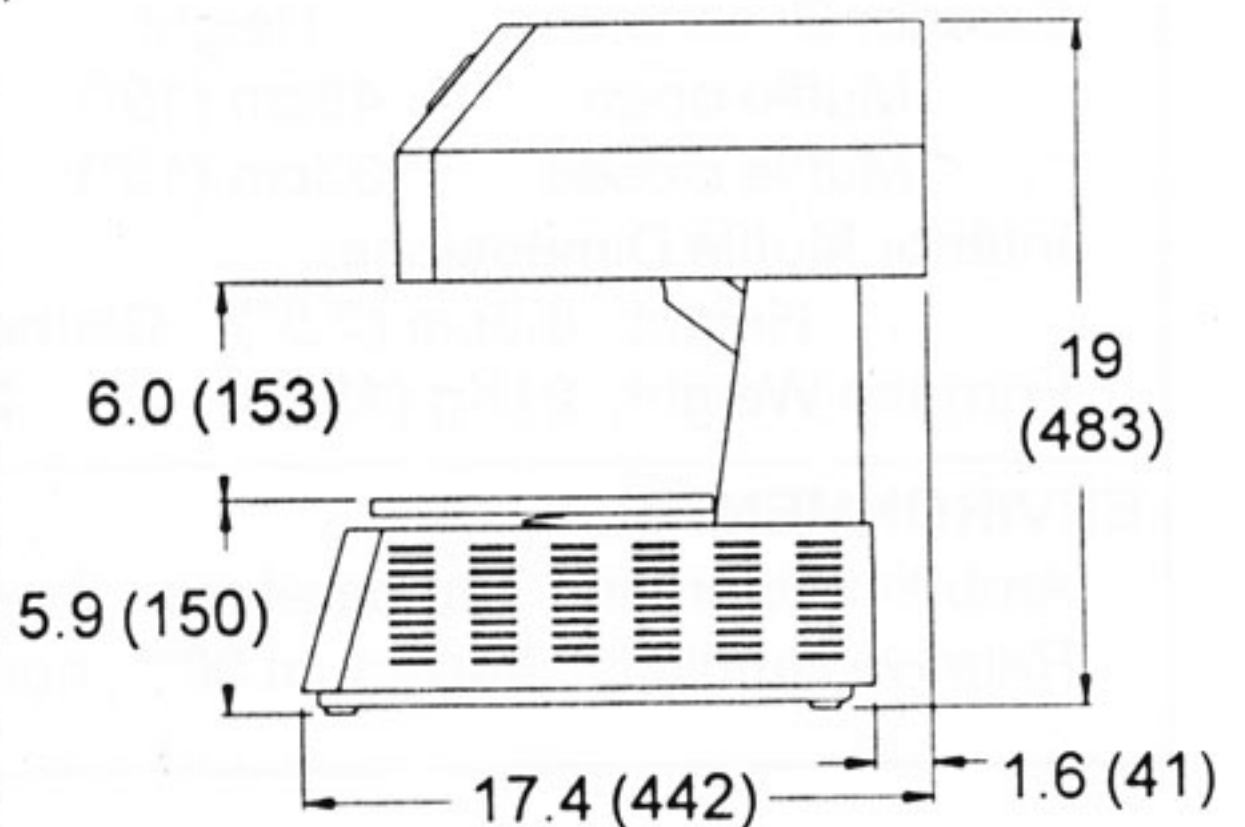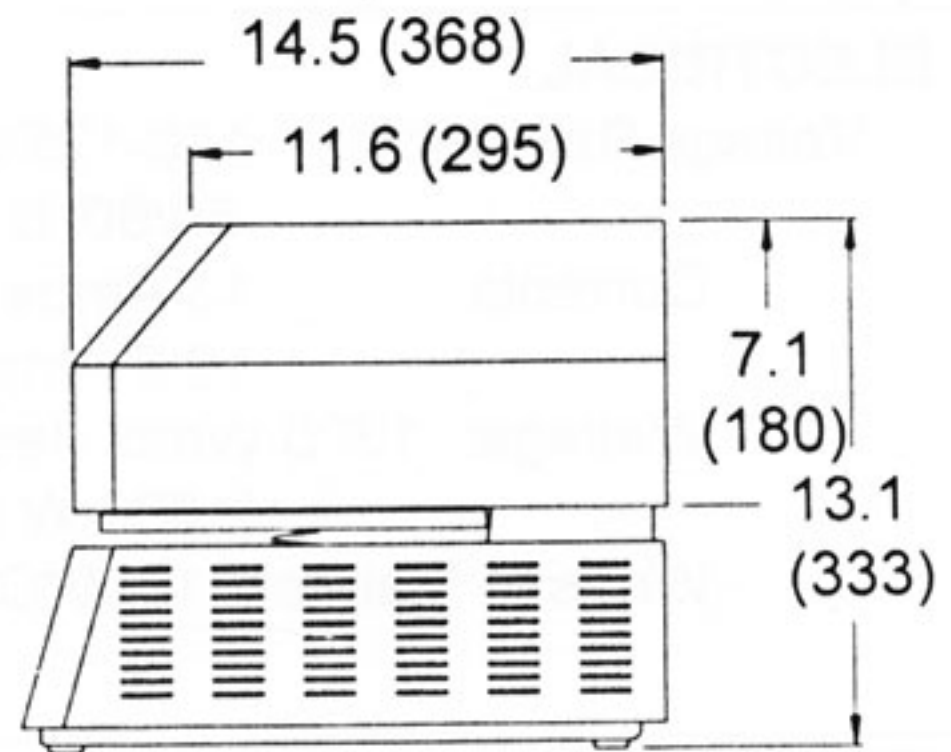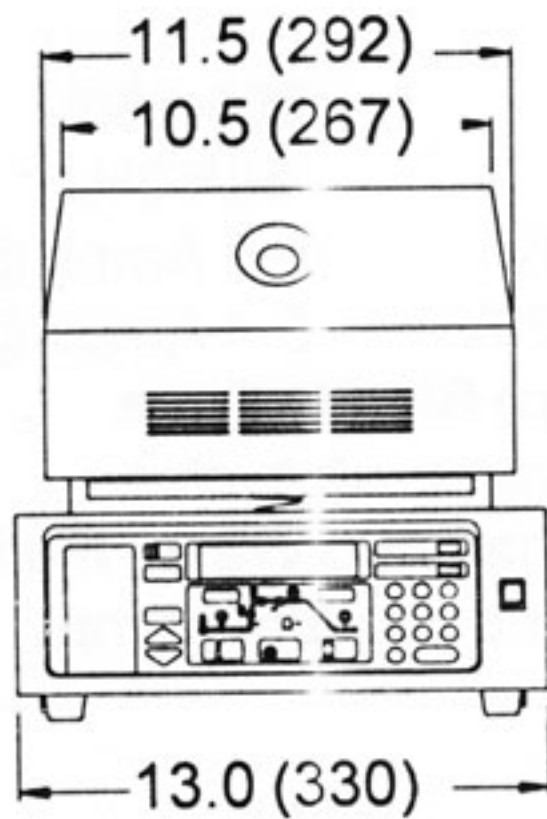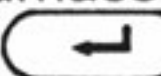
SYMBOL TABLE	
$\sim$	- Alternating current
I	- On (Supply)
O	- Off (Supply)
△	- Hot Surface
⏚	- Protective Conductor Terminal

SETUP & MAINTENANCE:

The CENTURION *vpc* has a software adjustment program for changes in operation. It is called "Setup". The following procedure identifies how to use the "Setup" routine to make these types of changes.

The furnace displays "Setup? " after it's internal testing when power is turned on. If the (↵)(ENTER) key is pressed when the word "Setup?" is displayed the furnace will go into an operator "Setup" routine. In this routine various control characteristics can be reviewed and changed. These include: Temperature Adjustment, Programmable High Limit Temperature, Vacuum Adjustment, "beep" response to automatic functions, and Idle Down Time.

If changes are made to the characteristics listed above, the power switch must be turned off and back on for these new setting to take affect. Erratic performance may result if the furnace is not restarted.
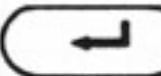
Initial Conditions: Furnace is not running a firing cycle and the temperature has been changed to °C readout.

A. TEMPERATURE ADJUSTMENT:

Every CENTURION *vpc* is calibrated at the factory to 960°C +/- 3°C. This calibration will not drift with time or firing cycles beyond this range. This accuracy applies to furnaces that are temperature stabilized (i.e., furnace has operated at the Lo T for a minimum of 20 minutes).

> Silver calibration is not recommend due to its poor accuracy. Silver calibration under ideal conditions is only accurate to +/- 10°C. If not done correctly, a +/- 25°C error is possible.

The Tcal setup feature allows the operator to adjust for temperature differences between materials and techniques. If consistent overfiring is occurring, the Tcal value should be reduced by the estimated number of degrees that it is overfiring. The estimated number of degrees that the furnace is underfiring should be added to the Tcal value. If the furnace is estimated to be over firing by 15°C then subtract 15 from 960 which results in 945. 945 is entered into the Tcal value replacing the 960. Procedure:

1 - Press the (↵) (ENTER) key when the display shows "Setup?" after power is turned on.
2 - Enter the desired Tcal value followed by the (↵) key.
3 - Press the (ESC) key to exit Setup.

The furnace can be reset to the factory calibration by setting the Tcal value to 960°C. Changes in the Tcal value affects all temperature and programs.

If a silver calibration must be done, use the following procedure:
1 - Preheat the furnace by running several firing cycles that heat to 960°C.
2 - Place the silver on a firing tray that was preheated. Silver should have minimum contact with the tray and be at the normal working height.

3 - Change to program 101. This is a preprogrammed cycle for doing silver calibrations. Press the [S S] to start the cycle.

4 - Observe the silver coupon, when it starts to change appearance, the temperature displayed on the LCD display should be recorded.

5 - Press the [S S] key to stop the cycle. Turn the power switch off and then on.

6 - Press the (↵) ENTER key when the display shows "Setup?" after power is turned on.

7 - Enter the desired Tcal value recorded above followed by the (↵) key. The furnace has now been recalibrated electronically.

8 - Press the (ESC) key to exit Setup.

B. PROGRAMMABLE HIGH LIMIT TEMPERATURE:

The user can program a high limit temperature that is lower than the fix limit of 1215°C built into the control. This limit will cause the furnace to go into Err3 if the muffle temperature exceeds this value.

1 - Press the (↵) (ENTER) key twice after turning on the power switch to the furnace when the display initially shows "Setup?".

2 - Enter the digits keys of high desired high temperature followed by the (↵) key and the (ESC) key.

C. VACUUM ADJUSTMENT:

The 100% vacuum level can be adjusted if the furnace is being operated at a high elevation or with a weak vacuum pump. The Vcal should be reduced for higher elevations by subtracting 80mm per 1Km of altitude from 740mm. (1" for every 1000' from 29")

1 - Press the (↵) (ENTER) key three times after turning on the power switch to the furnace when the display initially shows "Setup?".

2 - The display will show the current vacuum setting "Vac Cal" "100%=710mm".

3 - Enter the new Vcal value followed by the (↵) key. The furnace is now recalibrated to the new value. Press the (ESC) key to leave the Setup routine.

4 - The maximum vaccum possible can be checked by programming a long hold time program to 101%. This will cause the vacuum pump to run continuously. The maximum vacuum appears on the LCD display.

D. AUDIO BEEP:
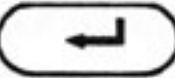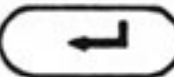
The audio or beep response to automatic functions which occur during the firing cycle can be turned off.

1 - Press the (↵) (ENTER) key four times after turning on the power switch to the furnace when the display initially shows "Setup?".

2 - The display will show "Hi=1 Lo=0". Press 0 followed by the (↵) key to turn off the automatic beep. 1 will then turn it on. Press the (ESC)

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key to leave the Setup routine.

E. IDLE DOWN TIME:

The length of time the furnace waits before closing the muffle when not used can be programmed from 1 to 99 minutes. The time is set to 15 minutes when shipped from the factory. Programming the time to 0 turns off this feature.

    1 - Press the (↵) (ENTER) key five times after turning on the power switch to the furnace when the display initially shows "Setup?".

    2 - The display will show the current programmed time. Use the digit keys to enter a new time in minutes followed by the (↵) key.

CLEANING:

- Vacuum dust and dirt from the furnace rather than blow. This will minimize the amount of air born dust particles.
- Use a soft damp cloth to clean the control panel. Avoid excess water or solution when cleaning the furnace. These solutions can attack the panel or electronics and cause the furnace to malfunction.

FUSES:

F1: F 250V / 0.5A;   F2: F 250V / 1.0A;   F3: F 250V / 15A

ERROR CODES:

Err codes can be cleared from the display by turning off and then on the power switch if the error code was caused by a temporary condition.

Err 1: Over Temperature (Muffle temperature > 1220°C); Possible causes: Shorted Thermocouple, shorted triac, shorted optotriac on computer PCB, bad wiring connections, bad computer PCB

Err 2: Open Thermocouple (TC); Possible causes: Open TC tip, bad connection to TC, bad TC to computer PCB connection, bad computer PCB

Err 3: Over Temperature; Temperature above programmable limit Tmax; Possible causes: Prog High Limit programmed lower than current parameters, overshoot from high heat rate, same as Err1

Err 4: No Vacuum; Detected vacuum less than 40mm Hg; Possible causes: Vacuum pump not connected (hose and power cord), interference material on O-ring surface

Err 5: Lo Vacuum; Possible causes: moisture in muffle (run long cycle with vacuum on), vacuum programmed higher than possible at current location, poor vacuum pump performance, Press ESC to clear the Err and continue the firing cycle.

Err 6: Open Muffle: Little or no muffle current detected; Possible causes: Open muffle, low line voltage, bad wiring connections, bad triac

Err 7: Low AC Voltage; (Line voltage less than 90VAC or 190VAC) Possible causes: wall socket shared with other loads, furnace connected with small extension cord.

Err 8: EEPROM error; Microcomputer program memory error; Possible causes: bad computer PCB

Err 9: Shorted or Reversed Thermocouple (TC); Possible causes: TC connections reversed at computer board terminals, TC extension wire shorted against metal structure or cabinet

Err 12: Over Current; Excess line voltage; Possible causes: muffle shorted, triac shorted, wiring short, bad computer PCB

Err 13: Solenoid 2 Disconnected; Valve on left (front view); Possible causes: valve wiring not connected

Err 14: Solenoid 1 Disconnected; Valve on right (front view); Possible causes: valve wiring not connected

Err 15: Motor Jammed: Possible causes; Lift mechanism stopped during movement, excess load stacked on top enclosure

Err 16: Muffle Relay Open; Possible causes: bad computer PCB

Err 17: Pump Relay Open; Possible causes: bad computer PCB

Err 18: Triac Driver Failure; Possible causes: Muffle or triac shorted.

Err 19: No line frequency detected; Possible causes: bad computer PCB

WIRING DIAGRAM

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