WARRANTY

WARRANTY: Except with respect to those components parts and uses which are hereinafter described, Degussa-Ney Dental, Inc. (Degussa-Ney) warrants this furnace to be free from defects in material and workmanship for a period of two years from the date of sale. Degussa-Ney's liability under this warranty is limited solely to repairing or, at Degussa-Ney's option, replacing those products included within the warranty which are returned to Degussa-Ney within the applicable warranty period (with shipping charges prepaid), and which are determined by Degussa-Ney to be defective. This warranty shall not apply to any product which has been subject to misuse; negligence; or accident; or misapplied; or modified; or repaired by unauthorized persons; or improperly installed.

INSPECTION: Buyer shall inspect the product upon receipt. The buyer shall notify Degussa-Ney in writing of any claims of defects in material and workmanship within thirty days after the buyer discovers or should have discovered the facts upon which such a claim is based. Failure of the buyer to give written notice of such a claim within this time period shall be deemed to be a waiver of such claim.

DISCLAIMER: The provisions here-in stated Degussa-Ney sole obligation and exclude all other remedies or warranties, expressed or implied, including those related to *MERCHANTABILITY* and *FITNESS FOR A PARTICULAR PURPOSE.*

LIMITATION OF LIABILITY: Under no circumstances shall Degussa-Ney be liable to the buyer for any incidental, consequential or special damages, losses or expenses.

LIMITATION OF ACTIONS: The buyer must initiate any action with respect to claims under the warranty described in the first paragraph within one year after the cause of action has accrued.

Corporate and Sales Office:
Degussa-Ney Dental, Inc.
65 West Dudley Town Road
Bloomfield, CT 06002-1316 USA
860.242.6188
FAX 860.769.5050

Product Service Office:
Degussa-Ney Dental, Inc.
Equipment Division
13553 Calimesa Blvd.
Yucaipa, CA 92399-2303 USA
909.795.2461
FAX 909.795.5268

Q100 9933 93-63-071

Q100

Ney CENTURION

Vacuum Porcelain Furnace

Owner & Operator's Manual

Model No: ***Voltage:***
94-93-928 **100-120V 50/60Hz**
94-93-929 **230V 50/60Hz**

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Control Panel Description	10
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SAFETY:

- 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 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.
- Use only air, Nitrogen, CO_2 and Argon for backfilling operations. Do not use any other type of gas for backfilling.

OSHA AND CALIFORNIA PROPOSITION 65:
MUFFLE DUST EXPOSURE

In keeping with the policy of Degussa-Ney Dental, Inc. 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 Degussa-Ney Dental, Inc. 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.

Canadian Standards Association (CSA) and TÜV-GS certified.

ACCESSORIES:

DESCRIPTION	PART NUMBER
Tongs; 25cm (10") Stainless Steel	9390014
Tongs; 30cm (12") Stainless Steel	9390015
Vacuum Pump; 100-125V; 50/60Hz	9492999
Vacuum Pump; 220-250V; 50/60Hz	9492410
Side Mounted Work Shelf	9492932
Ceramic Side Platform Tray	9390017
Program Log Book	9364027
De-Con_Tam Kit; 5 carbon rods	9490799
Silver Calibration Coupons	9982561
Firing Tray Kit, 75mm (3") Round w/ pegs	9492969
Firing Tray Peg Kit (White)	9990042
Firing Tray Peg Kit (Black)	9990043
Firing Tray, flat 25mm sq (1"x1", 5 points)	9353047
Magnetic Language Information Cards	Call Degussa-Ney
Magnetic Log Cards (pkg 5)	9492975
Service Manual, Q100	9363078

PRODUCT SERVICE:

Three methods of product service are available for the CENTURION. The first is telephone assistance available at the numbers listed below. The second is to return the furnace for servicing using the instructions below. The final method is to call Degussa-Ney at the phone numbers below and obtain a service manual for a nominal fee.

BEFORE RETURNING THE FURNACE, DO THE FOLLOWING:

1. Remove all firing trays, work platforms, and other loose items from inside the muffle.
2. The original packing material should be used for the return shipment. Contact Degussa-Ney for replacements if they are not available.
3. Call Degussa-Ney for a RMA number (Return Material Authorization). This is used to track and identify your furnace. Material received without this number may not be identifiable.
4. Equipment damaged in shipment as the result of improper packing may not be paid by the carrier. The Degussa-Ney Dental, Inc. will not be responsible for damages resulting from improper packing.

Ship Prepaid To:

909.795.2461
FAX 909.795.5268

Degussa-Ney Dental, Inc.
Equipment Division
RMA Number _____
13553 Calimesa Blvd.
Yucaipa, CA 92399-2303 USA

TROUBLESHOOTING:

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 80VAC or 160VAC) Possible causes: wall socket shared with other loads, furnace connected with small extension cord, low voltage from power company

Err 8: EEPROM error; Microcomputer program memory error; Possible causes: 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 15: Motor too slow, time read up position is greater than 12 sec. Possible causes: weight on top of enclosure, bent lift mechanism, control PCB failure

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

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

FEATURES:

- 100 User Programs
- High Performance Quartz Spiral Muffle Produces Superior Porcelain with Long Life Characteristics.
- Two Stage Programs for Controlled Tempering or Annealing (Programs #80 - #100)
- Programmable Muffle Dry and Cooling Positions with Continuous Step Movement During Dry and Cool Times
- 1204°C (2200°F) Maximum; 50°C (122°F) Minimum Temperature
- Ultra Smooth Muffle Movement with Stationary Work Support
- Large Low Heat Loss Viewport
- "Heat" Parameter Allows Work to be Preheated with Muffle Closed
- Optimum Viewport Angle for Viewing Work Area
- Large 10cm (4") Diameter Muffle
- Fast Cool Down for Short Times Between Loads Gives Maximum Productivity
- Vacuum Release Programmable in Temperature or Time
- Fast Heat Rates of up to 222°C/minute (400°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 Key; User Can Copy and Edit Programs Rather Than Enter ALL Parameters for EACH Program
- Energy Saver "Idle Down Time"; Programmable Timer Closes Muffle but Maintains Lo Temp
- NITE MODE: Closes Muffle when Temperature Reaches 100°C to Prevent Moisture Absorption
- Automatic PURGE Cycle for Muffle Decontamination After the Use of Silver Alloys
- Automatic Temperature and Vacuum Calibration; Operator Override Available with Automatic Programs
- Agency Approvals: CSA, TÜV-GS, CE
- Insert Gas Backfill Capability with Adjustable Needle Valve

INSTALLATION INSTRUCTIONS:

UNPACKING:

Carefully unpack and remove the furnace from its shipping carton.

- **Do not lift furnace by the top cabinet assembly.**
- **Save the carton and other packing material for future use in transporting the furnace.**
- **Shipping damage should be reported to the carrier as soon as detected.**

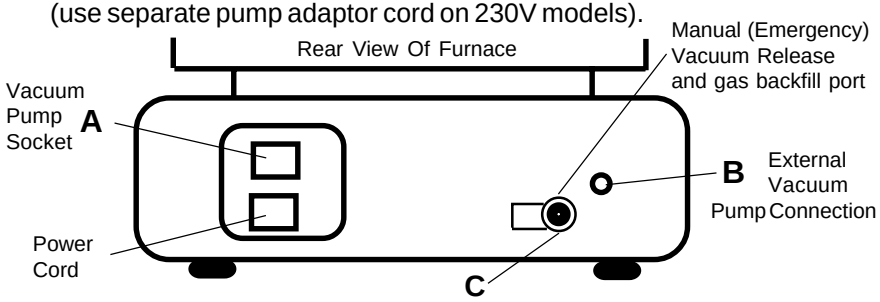
The furnace shipping carton contains the following:

- One furnace complete with power cord
- Owner & Operator's Manual (this document)
- Side work shelf, Program log book and cards
- Vacuum tubing, connections, and fuses
- Ceramic work platform (MUST BE INSTALLED in furnace before operation)
- Ceramic firing trays, ceramic pegs, and silver coupons for temperature 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. 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** (use separate pump adaptor cord on 230V models).



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

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

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.

- Press the (ENTER) key five times after turning on the power switch to the furnace when the display initially shows "Setup?".
- 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 airborne 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 / 1.0A; F2: F 250V / 1.0A

7. To check press the ↵ ENTER key when the display shows "Setup?" after power is turned on.

PROGRAMMABLE HIGH LIMIT TEMPERATURE:

The user can program a high limit temperature that is lower than the fixed limit of 1204°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.

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 1000m from the maximum of 740mm at sea level. (1" for every 1000' from 29")

1. Turn on power switch. When "Setup?" is displayed, press the ↵ key three times. Display shows "beep on".
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.

OR

- The "Vac Cal" maximum value can be established by running program 102. This cycle takes about 1 hour and stores the max vacuum valve into the setup routine at the end of the hold time automatically. Check by following step 1 above.

OR

- The maximum vacuum possible can be checked by programming a long hold time with the VAC set to 101%. This will cause the vacuum pump to run continuously. The maximum vacuum appears on the LCD display. Enter this new value for 100% vacuum in step 3 above.

Beep ON/OFF

- Turn on power switch. When "Setup?" is displayed, press the ↵ key four times. Display shows "beep on". Press 1 followed by the ↵ enter key to turn off beep function. Press ESC to leave setup routine.

6. The furnace display will show "Nite Mode", "Test f=60Hz" and "AC+ xxx" after approximately 8 to 10 seconds of self test.
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" change to new circuit. The furnace is on the same circuit breaker/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 (green) S start 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 1/2 hour.

   If the furnace does not pull vacuum "Err4" press the (red) 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.
   - Verify needle valve **C** on rear is closed.

   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 furnace is being operated at a high altitude the Vac Cal may require an adjustment. Run program #102 to adjust the vacuum calibration. (See page 16)
10. Daily Use: Before starting the normal firing process each day allow the furnace to preheat for 15 to 30 minutes at its low temperature. Alternately, running a firing cycle without a load can also be used as a preheat operation. Preheating the furnace will provide more accurate and consistent results.

    When the furnace is not being used keep the muffle closed. This prevents the absorption of moisture into the thermal insulation which reduces vacuum levels when normal firing is attempted.

OPERATING INSTRUCTIONS:

CHANGING PROGRAMS:

The current program number is displayed in the upper right-hand corner of the display window. The program number can be changed when not running a program (No red LED's are turned on).
Example: Change to program 34.
Key sequence: (3) (4) (↵)

STARTING PROGRAMS:

Press green Start (S) key to start current program. Pressing the red Stop (S) key during a cycle or program stops or aborts the program.

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, "Heat" for preheat 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.

Pressing the keys additional times simply cycles the display through the parameters again. The selected parameter remains active for approximately 60 seconds and then the display changes back to an idle mode. Press the (ESC) key to change the display sooner.

SETUP & MAINTENANCE:

The CENTURION 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 on/off, and Idle Down Time.

TEMPERATURE ADJUSTMENT:

Every CENTURION 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 recommended 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:

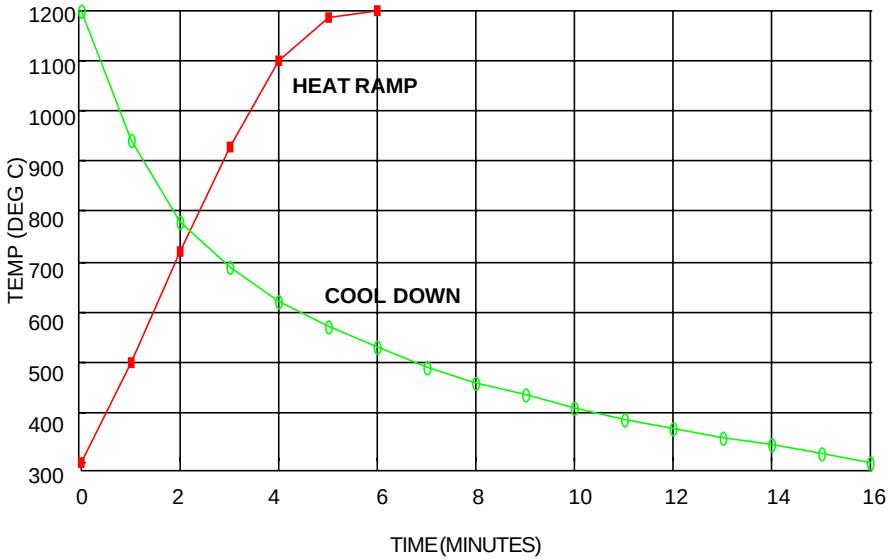
1. Press the (↵) (ENTER) key when the display shows "Setup?" after power is turned on.
2. Enter the desired Tcal value followed by the (↵) key.
3. Press the (ESC) key to exit Setup.

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:

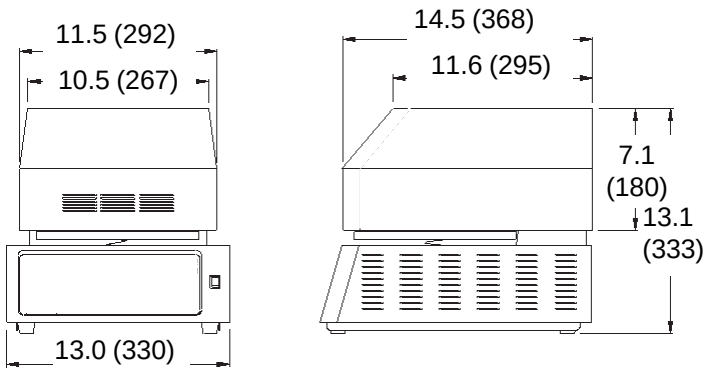
1. Set the cal. to 960°C (see above).
2. Preheat the furnace by running several firing cycles that heat to 960°C.
3. Place the silver on a firing tray that was preheated. Silver should have minimum contact with the tray and be at the normal working height.
4. Change to program 101. This is a preprogrammed cycle for doing silver calibrations. Press the (green) (S) to start the cycle.
5. Observe the silver coupon, when it starts to change appearance, the temperature reached 960°C.
6. Press the (red) (S) key to stop the cycle. This will automatically store the new Tcal valve into the setup routine.

PERFORMANCE CURVE (maximum ramp rate)



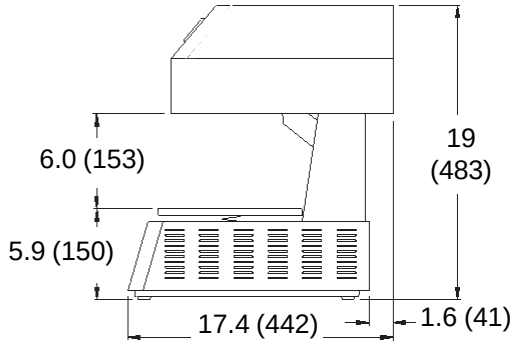
OUTLINE DRAWING:

in (mm)



SYMBOL TABLE

- ~ - Alternating current
- I - On (Supply)
- O - Off (Supply)
- Hot Surface
- Protective Conductor Terminal



TEMPERATURE PARAMETERS:

Example: Change rate to 140°C/Min.

Key sequence: ESC [i] [i] 1 4 0 [↵]

The ESC key is optional. If not used the number of times the parameter key must be pressed will vary depending on the previous keys pressed.

Parameter values programmed or changed during a firing cycle are used only during the current cycle and are not stored permanently in memory. Parameters in a firing cycle that have already been started will not be changed or affected.

The Specifications Parameter Table (page 13) lists the allowable ranges for the various parameters. Attempts to enter values outside the allowable limits will cause the furnace to beep, display the limits and revert back to the original value.

"Lo T" LOW TEMPERATURE is the initial or starting temperature parameter.

"Rate" TEMPERATURE RAMP RATE is the temperature increase parameter in degrees per minute.

"R2" (programs 80-100 only) This is displayed during the transition from the "Hi T" to "T2". This rate is not programmable for cooling and uses the first "Rate" for heating parameters.

"Hi T" HIGH TEMPERATURE is the final or last temperature parameter where the furnace ends the firing cycle.

"T2" SECOND HIGH TEMPERATURE (programs 80-100 only) is the second final or last temperature parameter where the furnace ends the firing cycle. The same "Rate" is used. "T2" can be higher or lower than the "Hi T". See "TWO STAGE OPERATIONS" later in this section.

TIME PARAMETERS:

Example: Change cool time to 3 minutes and 40 seconds (program 1-79).

Key sequence: ESC [⏱] [⏱] [⏱] [⏱] 3 4 0 [↵]

"Dry" TIME is the parameter for the time period between the start of the cycle and the muffle closure. The muffle closes to the programmed position then moves to the fully closed position using multiple small steps in the programmed dry time.

"Heat" is the parameter for the time period that the muffle will hold the LoT with the chamber closed.

"Hold" is the parameter for the time period that the muffle is held at the high temperature.

OPERATING INSTRUCTIONS (cont)

"Cool" is the parameter for the time period from the end of the "Hold" time until the muffle is completely open. At the end of the "Hold" time the muffle opens in multiple steps from fully closed to the programmed "Cool" position.

"H2" (programs 80-100 only) is the parameter for the second time period that the muffle is held at the second high temperature "T2". See "TWO STAGE OPERATIONS" later in this section.

VACUUM PARAMETERS:

Example: Change VAC level to 100%.

Key sequence: ESC  1 0 0 ↵

"Vac" VACUUM LEVEL is programmed in percent of the total available vacuum. The vacuum is turned off by programming the level to 0%. The maximum vacuum is achieved by programming the level to 100% and the minimum by programming to 10%. In special cases where it is desired that the pump run continuously when vacuum is programmed on, the level must 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:

COPY - Press the COPY key. 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: COPY 7 3 ↵

Program 73 will now contain an exact copy of the original program parameter.

SPECIFICATIONS:

PARAMETER	MINIMUM	MAXIMUM	INCREMENT
Low Temperature	50°C (122°F)	800°C (1472°F)	1°C (1°F)
Dry Time	0 Seconds	99:59 Min.	1 Sec
Heat Time	0 Seconds	99:59 Min.	1 Sec
Heat Rate	1°C/Min. (2°F/ Min.)	222°C/Min. (400°F/ Min.)	1°C/min. (1°F/min.)
High Temperature	50°C (122°F)	1204°C (22 °F)	1°C (1°F)
Hold Time	0 Seconds	99:59 Min.	1 Sec
Vacuum Level*	10%	100%	1%
Vac Pull Temperature	50°C (122°F)	1204°C (2200°F)	1°C (1°F)
Vac Stop Temperature	50°C (122°F)	1204°C (2200°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:	100-120V 50/60Hz	230V 50/60Hz
Currents:	13 Amps @ 100V 10.8 Amps @ 120V	5.7 Amps @ 230V

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

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 (red) 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 2 4 6 keys followed by the ↵ (ENTER) key. The furnace will display "DRY POSITION --_" while calibrating itself.
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 Dry time the muffle will close in multiple small steps from the programmed height to the fully closed.

"COOL" Position:

1. Press 1 3 5 keys followed by the (ENTER) ↵ key. The furnace will display "COOL POSITION _--" while calibrating itself.
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.
4. During the Cool time the muffle will open in multiple small steps from fully closed to the programmed height.

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 during DRY and/or COOL. The furnace will remain in the position and not until the dry or cool time has elapsed.

NEXT STEP - Pressing the key ⏭ during a firing cycle will cause the control to end the current cycle segment and move on to the next. (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.

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.

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 LoT RATE R2 HiT 8 5 0 ↵

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

Key sequence: DRY HEAT HOLD H2 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

CONTROL PANEL DESCRIPTION:

COPY Press key followed by digit keys and **ENTER** to copy current program parameters to new program.

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

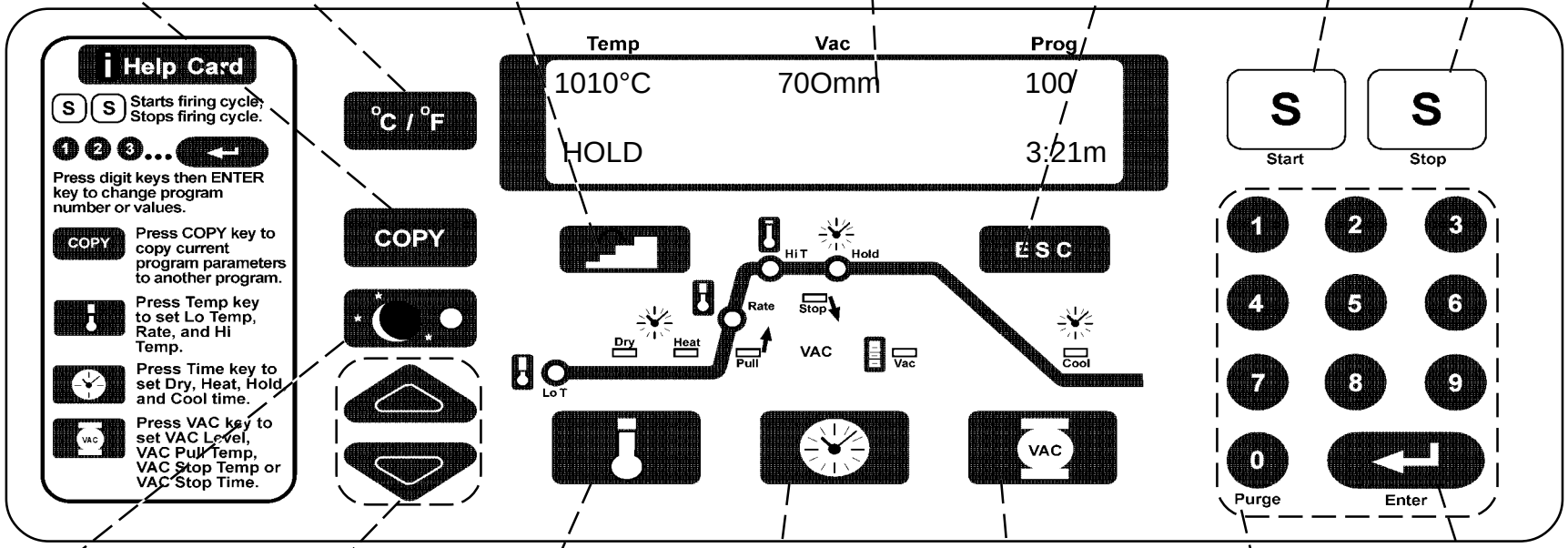
NEXT STEP causes the control to go to the next step (segment) of the current firing cycle.
e.g. Hold >> Cool

LCD Display shows muffle temperature; "Air" or "Vac" (mm or In of Hg during cycle); current program number.
Second Line displays current status and cycle time which counts down during cycle.

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

START starts current cycle or program.

STOP Stops or aborts program if already operating.



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 KEY access to program or review 3 temperature parameters: Low Temp; Ramp Rate; and High Temp(s).

TIME KEY access to program or review 4 timing parameters: Dry Time; Heat, Hold Time(s); and Cool Time.

VACUUM KEY access to program or review 3 (4) vacuum parameters: Vacuum Level; Vac Pull (start) Temp; and Vac Stop Temp (stop time).

Digit KEYS used to enter program numbers, parameters and purge cycle.

ENTER KEY used to store new program number or parameter in memory.