WARRANTY

WARRANTY: Except with respect to those components parts and uses which are hereinafter described, Ney Dental Inc. (NDI) warrants this furnace to be free from defects in material and workmanship for a period of two years from the date of sale. NDI's liability under this warranty is limited solely to repairing or, at NDI's option, replacing those products included within the warranty which are returned to NDI within the applicable warranty period (with shipping charges prepaid), and which are determined by NDI 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 NDI 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 NDI 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 NDI 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:
Ney Dental Inc.
65 West Dudley Town Road
Bloomfield, CT 06002-1316 USA
860.242.6188
FAX 860.769.5050

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

Q200 9902 93-63-093

Ney Dental Inc.

CENTURION Q200

Vacuum Porcelain Furnace

Operating Manual & Log

Model No:	***Voltage:***
94-94-000	**100V 50/60Hz**
94-94-003	**120V 50/60Hz**
94-94-004	**230V 50/60Hz**

SAFETY:

- If equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.
- 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 23)
- 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 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 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.

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 NDI at the phone numbers below and obtain a service manual for a nominal fee.

BEFORE RETURNING THE FURNACE, DO THE FOLLOWING:

- Remove all firing trays, work platforms, and other loose items from inside the muffle.
- The original packing material should be used for the return shipment. Contact NDI for replacements if they are not available.
- Call NDI 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.
- Equipment damaged in shipment as the result of improper packing may not be paid by the carrier. The Ney Dental Inc. will not be responsible for damages resulting from improper packing.

Ship Prepaid To:

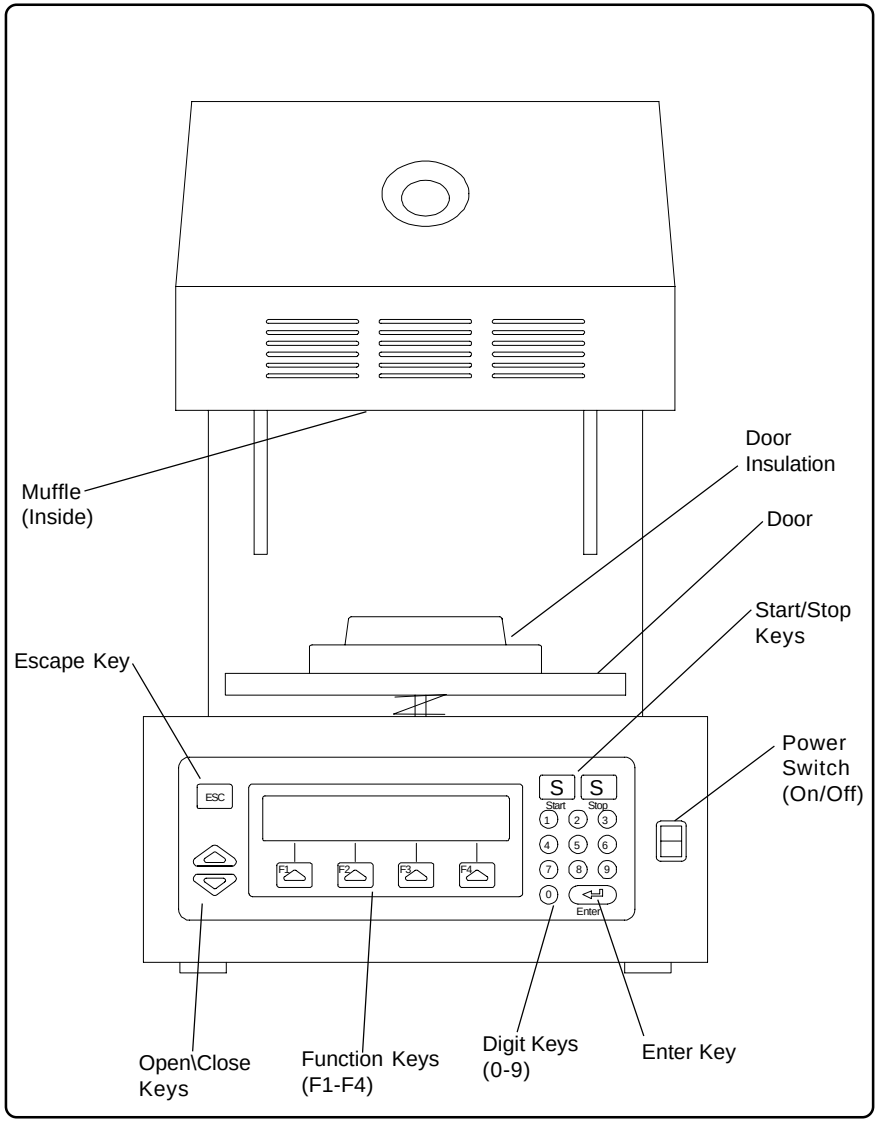
909.795.2461
FAX 909.795.5268

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

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; 230V; 50/60Hz	9492410
Side Mounted Work Shelf	9492932
Ceramic Side Platform Tray	9390017
De-Con-Tam Kit; 5 carbon rods	9490799
Silver Calibration Coupons	9982561
Firing Tray, Round Honeycomb	9998813
Service Manual, Q50, Q100, Q200	9363078

FURNACE DESCRIPTION:



Centurion Q200 **Figure 1**

(See also "Features", page 14)

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

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:

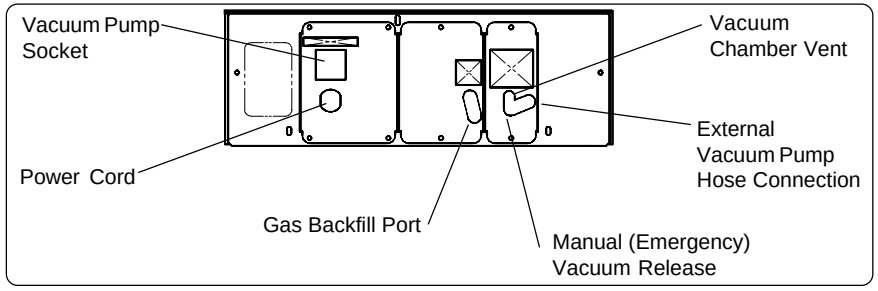
- One furnace complete with power cord
- Owner & Operator's Manual (this document)
- Side work shelf, Program log book and cards
- Vacuum tubing, connections, and fuses
- Fiber Door Insulation (MUST BE INSTALLED in furnace before operation, see page 3)
- Ceramic firing trays and ceramic pegs for temperature checks

LIFTING AND CARRYING:

- Get a firm footing. Keep your feet shoulder width apart for a stable base.
- Bend your knees. Don't bend at the waist.
- Grip the base of the furnace and lift with your legs.
- Keep the load close to your body and carry the unit to the destination. Keep your back upright during lifting.

INSTALLATION:

- 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.
- The furnace should not be located directly under shelves or other airflow restrictions.
- Vacuum pump connections (see Figure 2, below).



Rear Panel View, Q200 **Figure 2**

- Connect the power cord to a power circuit or receptacle with an overcurrent protection (circuit breaker or fuse) rating of at least 15 Amps. This circuit should only supply the furnace and pump. Never use an extension cord.

PARAMETER DESCRIPTION (CONT.)

Experimental Mode

This mode of operation allows the operator to customize firing cycles. Each cycle has up to 9 segments. However, the first and last segments are special to include drying and cooling features.

Segment 1 parameters

Temp: This is the temperature before and during the segment 1 firing cycle

Pos: At the start of a firing cycle the muffle is lowered according to the position value specified. From this position the muffle is lowered in steps. A value of zero has no movement. A value of 9 will close the muffle.

Time: This is the time the muffle stepped to its closed position while the temperature is controlled at Lo T.

Segment 2 thru 8 Parameters

Rate: This value determines the rate of temperature change of the muffle

Vac%: This value instructs the control how much vacuum to pull.
A value of 100% indicates that vacuum be pulled until the pump cannot deliver any more and then to turn off the pump.
A value of 101% will instruct the pump to stay on until the release command is given.
A value of less than 100% will turn off the pump at the appropriate value.

Hold: This is the time the muffle is controlled at the end of the Rate.

Temp: This is the temperature at the end of the Rate

Gas: This parameter is programmed either ON or OFF
When programmed ON it allows a gas (when connected to the back of the furnace) to enter the muffle. The flow can be adjusted by means of a needle valve during this segment.

Segment 9 Parameter

Cool: This is the time the muffle is stepped to its open position.

PARAMETER DESCRIPTION:

InCer Mode

All the ceramic firing programs have two segments each consisting of a Rate, a Temperature and a Time parameter.

R1: This parameter determines the rate of temperature change inside the muffle to reach its first destination temperature

T1: This value determines the temperature inside the muffle at its first segment

H1: This value determines the time the muffle is controlled at T1

R2: This parameter determines the rate of temperature change inside the muffle to reach its second destination temperature

T2: This value determines the temperature inside the muffle at its second segment

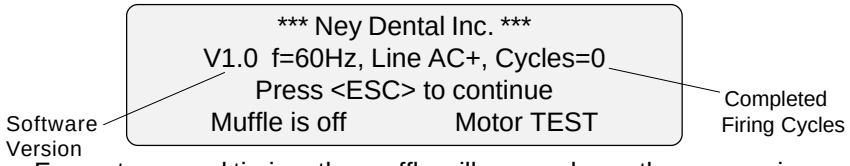
H2: This value determines the time the muffle is controlled at T2

OPERATING INSTRUCTIONS:

GETTING STARTED:

The following example is for conventional porcelain firing in the Dental mode, for other operating modes, see page 18.

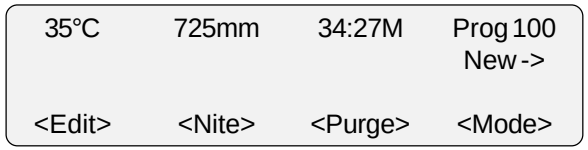
- Turn on the furnace power switch (see Figure 1, page 3).
- The furnace display will show the test screen:



- For motor speed timing, the muffle will go up, down, then up again.

⚠ Remove the foam padding from inside the muffle and place the door insulation in center of door. (See Figure 1, page 3).

Pressing the (ESC) key will start normal operation



- Program 100 is preprogrammed to remove any accumulated moisture.

It is recommended to run this cycle now and observe the different stages during the firing cycle. Press the green (S) start key.

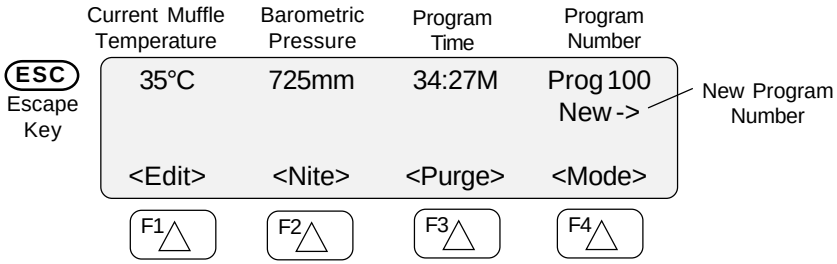
The furnace control now enters the firing mode and heats the muffle temperature to its LoT=550°C. At that point the muffle travels to its "Dry" Position (programmable from 0-9, in this case, 2) and continues to close in small steps for 5 minutes.

Once the muffle is closed a 1 minute "Heat" soak is performed, followed by a heat increase ("Rate") of 55°C/min to 960°C under vacuum to remove any moisture. The vacuum pump will turn off once it reads a steady level but will repump if excess moisture is in the muffle. (If the furnace does not pull vacuum, a "No Vac" error will occur. See page 22, "Error Codes"). After a 20 minute soak at 960°C the furnace enters the cool cycle as the muffle opens.

OPERATING INSTRUCTIONS:

- 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. (See "Setup", page 17).

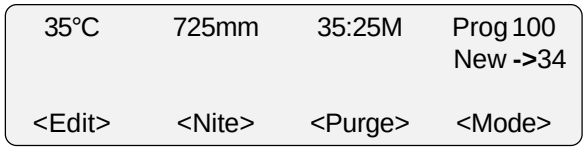


- The function keys F1-F4 activate different tasks shown on the display in brackets (< >).

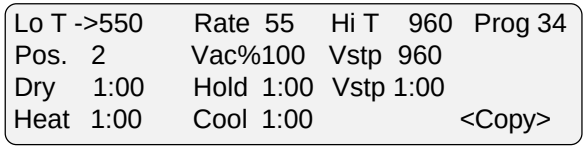
CHANGING PROGRAMS:

- The blinking arrow below the program number indicates a new program may be entered.

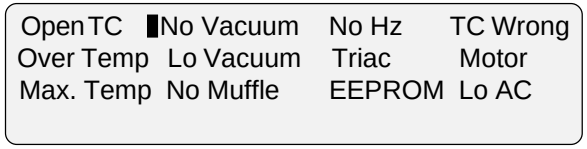
  Example: Change current program 100 to program 34.
  Key sequence: **3, 4**, (Enter).



The program parameters of program 34 are displayed.



ERROR CODES:



Typical Error Display

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

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

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

No Vacuum; Detected no or little pull; Possible causes: Vacuum pump not connected (hose and power cord), interference material on O-ring surface (See figure 2, page 4)

Lo Vacuum; Possible causes: moisture in muffle (run program 100), poor vacuum pump performance, Press ESC to clear the Err and continue the firing cycle

Open Muffle: No muffle current detected; Possible causes: Muffle opened, bad wiring connections to muffle, bad triac

Low AC Voltage; Possible causes: wall socket shared with other loads, furnace connected with small extension cord, low voltage from power company

EEPROM error; Microcomputer program memory error; Possible causes: computer PCB

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

Motor; Too slow, time to reach up position was greater than 12 sec. Possible causes: weight on top of enclosure, bent lift mechanism, control PCB failure, Motor connector not connected

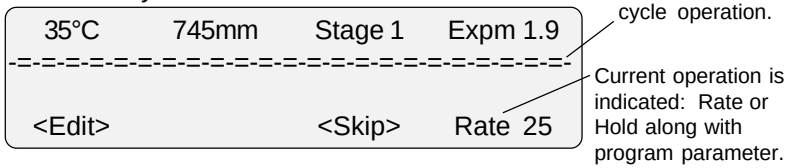
Triac; Fires continuously; Possible causes: Triac driver or triac shorted

No Hz; No line frequency detected; Possible causes: computer PCB

OTHER OPERATIONS:

- It is recommended that before programming in the Experimental mode the user should complete a temperature profile curve.

Press the Start key:



Line flickers to indicate firing cycle operation.

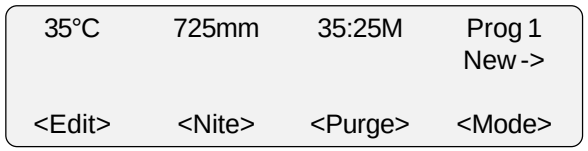
Current operation is indicated: Rate or Hold along with program parameter.

- <Edit> Parameter may be changed during a firing cycle. The original values will be restored upon completion of the cycle.
- <Skip> Press F3 to advance to the next rate or hold time parameter.

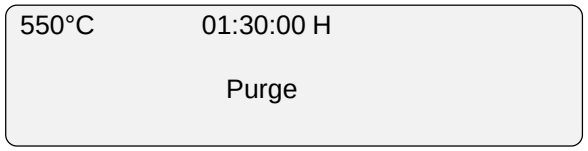
The Stage number will be updated as the firing cycle progresses.

PURGE PROGRAM: (Dental Mode Only)

In the idle display of the Dental mode:



Press F3 to start the Purge Program

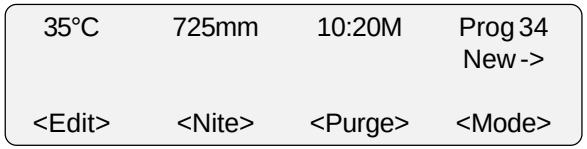


NOTE: Only the Stop key is accepted by the controller.

⚠ Do not abort a Purge cycle at high temperatures when using a graphite or carbon rod. Oxygen will react violently with hot carbon.

OPERATING INSTRUCTIONS:

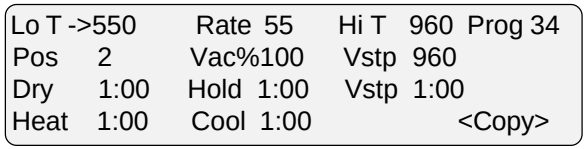
Press **ESC** key.



Program 34 is now ready to be ran by pressing the **Start** key.

EDITING PROGRAM PARAMETERS:

- After selecting a new program number the contents of the program can be edited to the operator's desired values. Press the F1 key below the word "Edit".
- It is recommended to fill out the respective screen in the log section (see page 10) before entering new data.



Dental Mode

Lo T: This is the firing cycle start temperature. The muffle is also controlled at this temperature after a firing cycle.

Pos: At the start of a firing cycle the muffle is lowered according to this **pos**ition value. A value of zero has no movement and starts from the full open position. A value of 9 will close the muffle. From this starting position the muffle is lowered in steps controlled by the **Dry** time.

Dry: This is the time required for the muffle to step from the starting position to its closed position while the temperature is controlled at Lo T.

Heat: This is the time the muffle is controlled at Lo T in the closed position.

Rate: This value determines the rate of temperature change of the muffle in degrees per minute.

Vac%: This value instructs the control on how much vacuum to pull at the beginning of the rate.

OPERATING INSTRUCTIONS:

A value of 100% indicates that the vacuum pump will operate until the vacuum level stops increasing (lowest reading). Approximately 1 minute.
A value of 101% will instruct the pump to stay on until the release command is given.
A value of less than 100% will turn off the pump at the appropriate vacuum level below full vacuum.
A value of 0% will be an "Air" cycle and not turn on the vacuum pump.

Hold: This is the time the muffle is controlled at the high temperature (Hi-T) at the end of the Rate.

Cool: This is the time the muffle is stepped to its open position from the closed position.

Hi T: This is the high temperature at the end of the Rate held for the Hold time.

Vstp: This value sets the vacuum release temperature during the Rate. If programmed below the Hi T the vacuum is release at that temperature. If programmed above the Hi T the vacuum is held for all of the Hold Time.

Vstp: When **Vstp temp above** is set equal to the **Hi T** then a vacuum stop time can be set. This is the amount of time during the Hold time with vacuum.

- The blinking arrow after LoT indicates that this parameter can be changed by means of the digit keys followed by the Enter key. After the LoT value has been entered the arrow advances automatically to the next parameter.

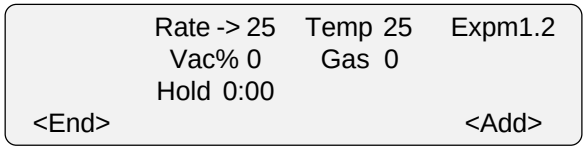
  - Press F1 to advance to the parameter that needs to be changed in the F1 column.
  - Press F2 for parameters that need to be changed in the F2 column.
  - Press F3 for parameters that need to be changed in the F3 column.

  If a parameter is programmed out of range the display will show the allowed ranges:

Lo T:	25-800°C	Prog:	1-100 (1-5, 1-9)
Rate:	1-222°C/min	Tcal:	860 - 1060°C
Temp:	25-1205°C	Vac:	0,50...100,101%
Tmax:	800-1210°C	Nite:	25-800°C

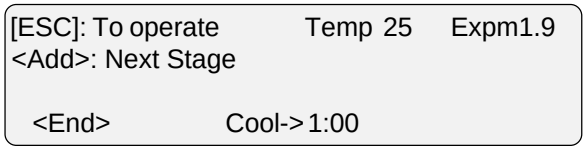
OTHER OPERATIONS:

The first stage in the Expm mode is the muffle closing operation. Press the F1 key to edit the parameters. Pressing the F4 key adds a second stage to the program.

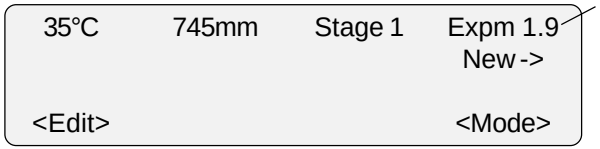


Use the F2 and F3 keys to edit the parameters. The Rate, Vac%, Hold and Temp parameters are the same as those used in the Dental Mode. The Gas parameter, when set to 100%, activates the gas backfill valve. A low pressure inert gas blanket can be applied to the chamber. The bottom aluminum door acts as the pressure relief valve. The flow into the chamber is limited by the needle adjustment valve on the rear of the furnace.

Pressing the F4 "Add' key adds another stage to the program. Up to 6 more stages can be added. When the program reaches stage 9, the last stage is the muffle opening (Cooling) operation.



The <End> key can be pressed at any number of stages to limit the program length.



9 indicates that there are 9 stages in Program 1.

Pressing the (ESC) key puts the furnace into the Expm Idle mode. The display shows the current muffle temperature, chamber pressure, current stage, and program name.

Pressing one of the 1 - 9 digit keys followed by the (↵) Enter key changes to one of the 8 other Experimental programs.

OTHER OPERATIONS:

Pressing the (ESC) key puts the furnace into the InCer Idle Mode.

```
35°C          9:18:00H        InCer 1
                              New ->

<Edit>                        <Mode>
```

Pressing one of the 1 - 5 digit keys followed by the (↵) Enter key changes to one of the 4 other InCer programs. Pressing the Start key starts the firing cycle for the selected program. The display changes as indicated below:

```
35°C          9:18:00H        InCer 1
-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-
                        R1
<Edit>
```

Count down time in Hours:minutes: second

Indication of current operation being performed

Pressing the F4 <Mode> key causes the control to display the mode selection screen.

```
*** Operating Mode Selection ***

              InCer Mode
<Dental>    <InCer>    <Expm>
```

Expm. Mode (Experimental):

Pressing the F3 key activates the Experimental (Expm) mode. This mode of operation allows for the free form construction of multiple stage firing cycles. These cycles can be any combination of temperatures, ramp rates, vac or air, and gas backfill parameters. Each program stage is individually programmable with full atmospheric control.

Nine programs (Expm 1 - 9) are available in the Experimental mode each with nine stages. The Expm mode programs are numbered as "Expm x.y". Where "x" is the program number and "y" indicates the stage number in that program.

OPERATING INSTRUCTIONS:

COPYING PROGRAMS:

- This function is used to speed up programming when several programs have similar parameters.

  Press F4 to activate the copy program while in the <Edit> display:

```
LoT ->550°C   Rate 50     Hi T  960  Prog 34
Pos    2      Vac%100    Vstp  960  Copy _
Dry    1:00   Hold 1:00   Vstp 1:00
Heat   1:00   Cool 1:00              <Copy>
```

Select new program number to be copied to.

  Simply enter the program number to be copied to.

  Example: Copy Program 34 to Program 1
  Key Sequence: 1, (↵)(Enter)

```
550°C      725mm      10:20M     Prog 1
                                 New ->

<Edit>     <Nite>     <Purge>    <Mode>
```

  Press the F1 key (edit) to change some of the parameters of prog 1

START A FIRING CYCLE:

- The firing cycle of the selected program starts. The cycle timer counts down.

  Press the green start (S) key. (See figure 1, page 3).

```
550°C      725mm      35:25M     Prog 1
-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-

<Edit>     <Nite>     <Skip>     LoT 550
```

Line flickers to indicate firing cycle running.

Indicates the starting temp.

- <Edit>: Parameters may be changed during a firing cycle. The original values will be restored upon completion of the cycle.
- <Nite>: Pressing F2 tells the control to enter the "Nite Mode" after completion of the cycle. To cancel this mode, press ESC.
- <Skip>: Press F3 to advance the control processor to the next parameter in the cycle.

  Examples:

  - If waiting for LoT - the dry cycle will start.
  - If ramping - the present temperature is the new HiT and the Hold time is activated.
  - If cooling - the muffle closes again and the rate segment is activated again.

OPERATING INSTRUCTIONS:

STOP A FIRING CYCLE:

- Program stops, muffle opens.
  Press the red stop (S) key. (See figure 1, page 3).

550°C	725mm	10:20M	Prog 1 New ->
<Edit>	<Nite>	<Purge>	<Mode>

NITE MODE:

100°C	NITE	
	[ESC]	
<Setup>	to operate	<Mode>

- In this mode the muffle temperature is controlled by the parameter programmed in <Setup> (Default is set at 100°C, See Setup & Maintenance on page 15). Once this temperature is reached, the muffle closes.
- It is recommended to place the furnace into this mode at the end of the working day to prevent moisture from entering the muffle.
- To return to the operating mode press ESC.

DRY POSITION TEMPERATURE:

Listed are temperatures at the load for various position (Pos) and LoT settings.

Position:						
1 --	50	70	80	95	120	135
2 --	55	75	85	105	130	155
3 --	60	85	100	120	155	180
4 --	75	100	120	155	195	230
5 --	90	130	160	195	255	290
6 --	120	180	240	320	380	470
7 --	190	330	420	515	600	675
8 --	265	380	480	580	680	780
9 --	295	395	495	595	695	790
	300	400	500	600	700	800

Lo T in °C

Example: LoT=457°, Pos=2
Temperature at load: approx: 80°C

NOTE: Ambient room temperature variations (heater, fan, etc.) will have a great effect on the load temperature.

OTHER OPERATIONS:

OPERATING MODE SELECTION:

The Q200 has three different modes of operation. The first mode is for conventional porcelain firing and is called <Dental>. The second mode is for sintering all ceramic restorations and is called <InCer>. The last mode is for experimental or longer firing cycles and is called <Expm> for Experimental. The following pages explain the <InCer> and <Expm> modes of operation.

In the Idle display, the mode selection icon <Mode> is visible.

35°C	725mm	35:25M	Prog 1 New ->
<Edit>	<Nite>	<Purge>	<Mode>

- Press F4 to select the desired mode:

*** Operating Mode Selection ***		
	Dental Mode	
<Dental>	<InCer>	<Expm>

Pressing the F1 key activates the Dental Mode which is described beginning on page 5.

InCer Mode:

Pressing the F2 key activates the InCer Mode. This mode fires all ceramic restoration using a non-vacuum two stage process. The process generally requires hours rather than minutes of firing time. Five programs (InCer 1 - 5) are available.

T1 -> 120	T2	1120		InCer 1
R1 .3	R2	8.3		
H1 0:00	H2	2:00		

Each InCer program contains two stages of three parameters each for a total of six parameters. These programs do not have drying, preheating or cooling operations. The sinter cycles are all air firing cycles, no vac.

These parameters can be edited using the F1 and F2 keys (see page 7). T1 is the first stage temperature in Degrees C; R1 is the first stage ramp rate in degrees C per minute. The ramp rate is programmable from 0.1°C/min to 222°C/minute (.3 is 3/10 of a degree per minute); H1 is the first stage hold time in hours and minutes (hh:mm). T2, R2 and H2, are the same respective parameters for the second stage.

SETUP & MAINTENANCE:

SETUP:

- This function allows the operator to customize operating parameters.

Press F2 to enter the Nite Mode.

```
 35°C        725mm        35:25M        Prog 1
                                        New ->__

 <Edit>      <Nite>       <Purge>       <Mode>
```

Press F1 to view or change the "Setup" parameters.

```
100°C                NITE

                     [ESC]
<Setup>              to operate            <Mode>
```

Setup parameters can now be reviewed or changed.

```
            *** Setup Parameters***

Tnite -> 100    Tcal    960    Deg. C   Audio On
Tmax     1210   Down    10:00  <  >     <  >
```

- Tnite - temperature at which the muffle is controlled during the Nite Mode.
- Tmax - alarm temperature. For extra protection during firing cycle.
- Tcal - calibration temperature at 960°. Increasing this value will increase the actual muffle temperature at 960°C by this change.
- F3 - toggles °C to °F.
- F4 - toggles "key beep" On to Off.

MAINTENANCE:

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. Some solutions will attack the panel or electronics and may cause the furnace to malfunction.

REPLACEABLE FUSES:

- F1: F 250V / 1.0A

PROGRAM LOG

Name:

Name:_____

Lo T _____	Rate ____	Hi T _____	Prog 1
Pos ____	Vac% ___	Vstp _____	
Heat __:__	Hold __:__	Vstp __:__	
Dry __:__	Cool __:__		

Name:_____

Lo T _____	Rate ____	Hi T _____	Prog 2
Pos ____	Vac% ___	Vstp _____	
Heat __:__	Hold __:__	Vstp __:__	
Dry __:__	Cool __:__		

Name:_____

Lo T _____	Rate ____	Hi T _____	Prog 3
Pos ____	Vac% ___	Vstp _____	
Heat __:__	Hold __:__	Vstp __:__	
Dry __:__	Cool __:__		

Name:_____

Lo T _____	Rate ____	Hi T _____	Prog 4
Pos ____	Vac% ___	Vstp _____	
Heat __:__	Hold __:__	Vstp __:__	
Dry __:__	Cool __:__		

Name:_____

Lo T _____	Rate ____	Hi T _____	Prog 5
Pos ____	Vac% ___	Vstp _____	
Heat __:__	Hold __:__	Vstp __:__	
Dry __:__	Cool __:__		

Name:_____

Lo T _____	Rate ____	Hi T _____	Prog 6
Pos ____	Vac% ___	Vstp _____	
Heat __:__	Hold __:__	Vstp __:__	
Dry __:__	Cool __:__		

Name:_____

Lo T _____	Rate ____	Hi T _____	Prog 7
Pos ____	Vac% ___	Vstp _____	
Heat __:__	Hold __:__	Vstp __:__	
Dry __:__	Cool __:__		

Name:_____

Lo T _____	Rate ____	Hi T _____	Prog 8
Pos ____	Vac% ___	Vstp _____	
Heat __:__	Hold __:__	Vstp __:__	
Dry __:__	Cool __:__		

PROGRAM LOG

Name: _____

Name:_____

Lo T _____	Rate ____	Hi T _____	Prog 9
Pos ____	Vac% ___	Vstp _____	
Heat__:__	Hold __:__	Vstp __:__	
Dry __:__	Cool__:__		

Name:_____

Lo T _____	Rate ____	Hi T _____	Prog 10
Pos ____	Vac% ___	Vstp _____	
Heat__:__	Hold __:__	Vstp __:__	
Dry __:__	Cool__:__		

Name:_____

Lo T _____	Rate ____	Hi T _____	Prog 11
Pos ____	Vac% ___	Vstp _____	
Heat__:__	Hold __:__	Vstp __:__	
Dry __:__	Cool__:__		

Name:_____

Lo T _____	Rate ____	Hi T _____	Prog 12
Pos ____	Vac% ___	Vstp _____	
Heat__:__	Hold __:__	Vstp __:__	
Dry __:__	Cool__:__		

Name:_____

Lo T _____	Rate ____	Hi T _____	Prog 13
Pos ____	Vac% ___	Vstp _____	
Heat__:__	Hold __:__	Vstp __:__	
Dry __:__	Cool__:__		

Name:_____

Lo T _____	Rate ____	Hi T _____	Prog 14
Pos ____	Vac% ___	Vstp _____	
Heat__:__	Hold __:__	Vstp __:__	
Dry __:__	Cool__:__		

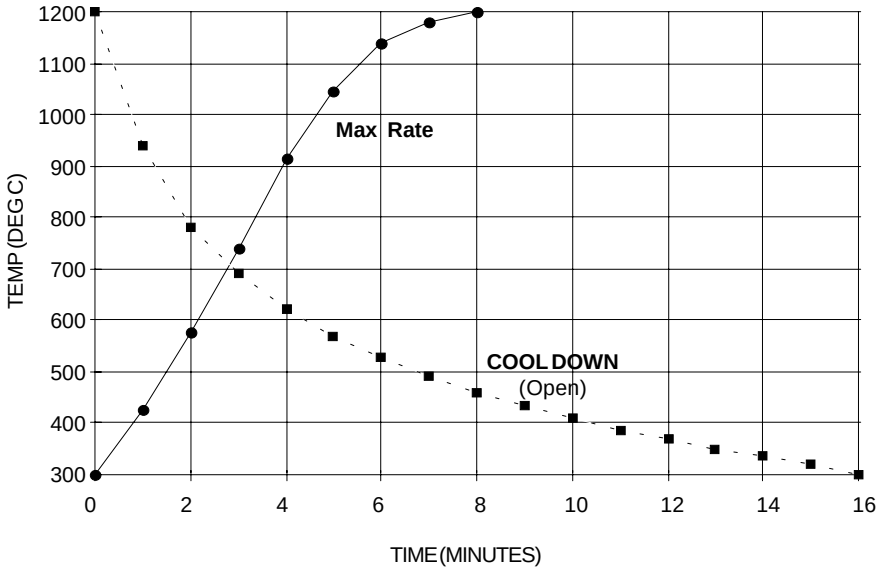
Name:_____

Lo T _____	Rate ____	Hi T _____	Prog 15
Pos ____	Vac% ___	Vstp _____	
Heat__:__	Hold __:__	Vstp __:__	
Dry __:__	Cool__:__		

Name:_____

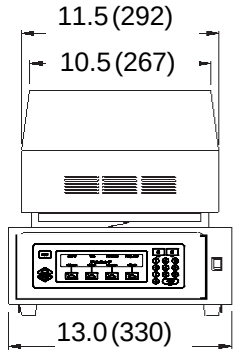
Lo T _____	Rate ____	Hi T _____	Prog 16
Pos ____	Vac% ___	Vstp _____	
Heat__:__	Hold __:__	Vstp __:__	
Dry __:__	Cool__:__		

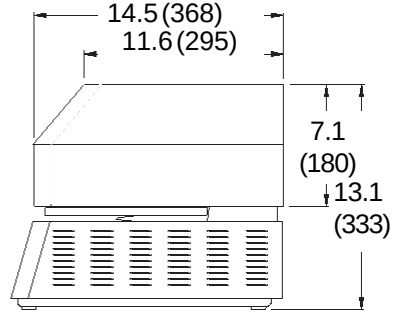
PERFORMANCE CURVES:



OUTLINE DRAWINGS:

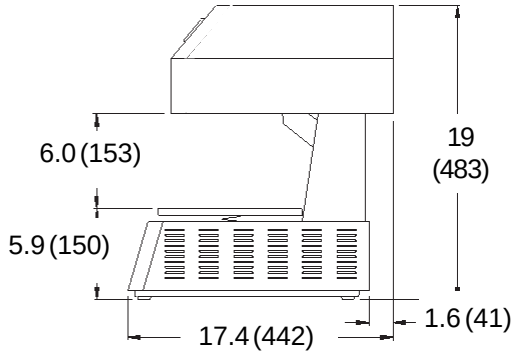
in (mm)





SYMBOL TABLE

- ⚠ - Important
- ~ - Alternating current
- **I** - On (Supply)
- **O** - Off (Supply)
- ♨ - Hot Surface
- ⏚ - Protective Conductor Terminal



FEATURES:

- Three User Modes of Operation:
  - Conventional Porcelain Firing: 100 Programs
  - Ceramic Sinter: 5 Programs
  - Experimental: 9 Programs of 9 Stages each
- High Performance Quartz Spiral Muffle Produces Superior Porcelain with Long Life Characteristics
- Internal Barometer for Automatic Vacuum Control and Calibration.
- Programmable Muffle Dry Position with Continuous Step Movement During Dry and Cool Times
- 1204°C (2200°F) Maximum; 25°C (177°F) Minimum Temperature
- Smooth Muffle Movement with Stationary Work Support

- Large Low Heat Loss Viewport; Optimum Viewport Angle Viewing
- "Heat" Parameter Allows Work to be Preheated with Muffle Closed
- Large 10cm (4") Diameter Muffle

- Fast Cool Down for Short Times Between Loads Gives Maximum Productivity
- Vacuum Release Programmable in Temperature or Time

- 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 Alarm
- Nite Mode Temperature
- Friendly User Interface; Manual Not Required In Most Applications
- 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
- PURGE Cycle for Muffle Decontamination After the Use of Silver Alloys

- Automatic Temperature and Vacuum Calibration
- Inert Gas Backfill Capability with Adjustable Needle Valve in Expm Mode

PROGRAM LOG

Name: ____________________

Name: ____________

Lo T _____	Rate ____	Hi T ______	Prog __
Pos ____	Vac% ___	Vstp _____	
Heat __:__	Hold __:__	Vstp __:__	
Dry __:__	Cool __:__		

Name: ____________

Lo T _____	Rate ____	Hi T ______	Prog __
Pos ____	Vac% ___	Vstp _____	
Heat __:__	Hold __:__	Vstp __:__	
Dry __:__	Cool __:__		

Name: ____________

Lo T _____	Rate ____	Hi T ______	Prog __
Pos ____	Vac% ___	Vstp _____	
Heat __:__	Hold __:__	Vstp __:__	
Dry __:__	Cool __:__		

Name: ____________

Lo T _____	Rate ____	Hi T ______	Prog __
Pos ____	Vac% ___	Vstp _____	
Heat __:__	Hold __:__	Vstp __:__	
Dry __:__	Cool __:__		

Name: ____________

Lo T _____	Rate ____	Hi T ______	Prog __
Pos ____	Vac% ___	Vstp _____	
Heat __:__	Hold __:__	Vstp __:__	
Dry __:__	Cool __:__		

Name: ____________

Lo T _____	Rate ____	Hi T ______	Prog __
Pos ____	Vac% ___	Vstp _____	
Heat __:__	Hold __:__	Vstp __:__	
Dry __:__	Cool __:__		

Name: ____________

Lo T _____	Rate ____	Hi T ______	Prog __
Pos ____	Vac% ___	Vstp _____	
Heat __:__	Hold __:__	Vstp __:__	
Dry __:__	Cool __:__		

Name: ____________

Lo T _____	Rate ____	Hi T ______	Prog __
Pos ____	Vac% ___	Vstp _____	
Heat __:__	Hold __:__	Vstp __:__	
Dry __:__	Cool __:__		

PROGRAM LOG

Name: ______________________________

Name: ____________

Lo T _____ Rate ____ Hi T ______ Prog __
Pos ____ Vac% ____ Vstp _____
Heat __:__ Hold __:__ Vstp __:__
Dry __:__ Cool __:__

Name: ____________

Lo T _____ Rate ____ Hi T ______ Prog __
Pos ____ Vac% ____ Vstp _____
Heat __:__ Hold __:__ Vstp __:__
Dry __:__ Cool __:__

Name: ____________

Lo T _____ Rate ____ Hi T ______ Prog __
Pos ____ Vac% ____ Vstp _____
Heat __:__ Hold __:__ Vstp __:__
Dry __:__ Cool __:__

Name: ____________

Lo T _____ Rate ____ Hi T ______ Prog __
Pos ____ Vac% ____ Vstp _____
Heat __:__ Hold __:__ Vstp __:__
Dry __:__ Cool __:__

Name: ____________

Lo T _____ Rate ____ Hi T ______ Prog __
Pos ____ Vac% ____ Vstp _____
Heat __:__ Hold __:__ Vstp __:__
Dry __:__ Cool __:__

Name: ____________

Lo T _____ Rate ____ Hi T ______ Prog __
Pos ____ Vac% ____ Vstp _____
Heat __:__ Hold __:__ Vstp __:__
Dry __:__ Cool __:__

Name: ____________

Lo T _____ Rate ____ Hi T ______ Prog __
Pos ____ Vac% ____ Vstp _____
Heat __:__ Hold __:__ Vstp __:__
Dry __:__ Cool __:__

Name: ____________

Lo T _____ Rate ____ Hi T ______ Prog __
Pos ____ Vac% ____ Vstp _____
Heat __:__ Hold __:__ Vstp __:__
Dry __:__ Cool __:__

SPECIFICATIONS:

PARAMETER	MINIMUM	MAXIMUM	INCREMENT
Low Temperature	25°C (177°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	25°C (122°F)	1204°C (22 °F)	1°C (1°F)
Hold Time	0 Seconds	99:59 Min.	1 Sec
Vacuum Level*	5%	101%	1%
Vac Pull Temperature	25°C (122°F)	1204°C (2200°F)	1°C (1°F)
Vac Stop Temperature	25°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, then pump turns off; 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

ELECTRICAL

Voltage Ranges:	100V 50/60Hz	120V 50/60Hz	230V 50/60Hz
Currents:	15 Amps	12 Amps	6 Amps
Wattage: (less pump)	1500W	1400W	1400W

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