

**INSTRUCTIONAL MANUAL**  
**CAT. 72356-10, 72356-20**

**SuperNuova™ Digital Multi-Position**  
**Multi-Position Stirrer and**  
**Stirring Hot Plates**



## Safety Information

### Warning signals



**Warning.** Indicates possibility of personal injury as well as reference to servicing by authorized personnel.



**Caution.** Indicates possibility of damage to equipment.



**Note.** Indicates pertinent facts and conditions.



**Hot Surface.** Indicates possibility of personal injury should you come in contact with surfaces during use or for a period of time.

This product should only be used under the operating conditions explicitly stated in this instruction manual. We advise adhering to all safety procedures such as unplugging when not in use, for example. Authorized personnel using this product should be prepared and anticipate any problems. If over-temperature failure occurs, the top surface temperature could rise to the maximum temperature (300-540°C, depending on the specifications of your model) and remain at that temperature indefinitely. Considering these conditions, the material being heated on the surface of the hotplate could reach excessive temperature levels.

## Warnings



**Note.** The SuperNuova™ Multi-Place hot plates are not explosion proof, therefore, if explosion proof materials are needed, contact Customer Service at 1-800-523-5874.



**Warning.** Only qualified service personnel should attempt any servicing of equipment.

### To avoid electrical shock

1. Electrical outlets should always be properly grounded, be of the correct voltage and current handling capacity.
2. Prior to maintenance and servicing, the power supply should always be disconnected.



### **Warning. To avoid personal injury ...**

1. Avoid using the product near flammable materials and/or sources – doing so will result in fire or explosion. Please note that this product contains components that can ignite such material. These units are not rated for use in hazardous atmospheres.
2. Use the utmost caution when hearing volatile materials – top surface and element can reach the “Flash Point Temperature” of many chemicals. These hot plates are not explosion proof – fire and/or explosion can result.
3. Please keep the top surface clean. To clean, use a non-abrasive cleaner. Any spills involving alkali, hydrofluoric acids, or phosphoric acids may damage the top and lead to thermal failure. Should this occur, unplug the product and address the spills promptly. DO NOT, under any circumstances, immerse the product for cleaning.
4. If damage by etching, scratching, or chipping is present, replace the top immediately. Any damage to the top can break when in use.
5. DO NOT use metal foil on the hot plate – this can block air flow, resulting in overheating.
6. Be sure to check and tighten the removable cord, making sure that it is secure. If the cord becomes loose, it could become hot and/or spark, resulting in a potential fire hazard. Any cords that appear damaged in any way should be replaced immediately by qualified personnel.



**Warning continued. To avoid personal injury ...**

7. DO NOT remove or modify the grounded power plug – use ONLY properly grounded outlets to avoid a shock hazard.
8. ALWAYS use appropriate hand and eye protection when handling hazardous chemicals.
9. The gross weight of the items placed on top of the hot places SHOULD NOT exceed 35 pounds (15.9 kg).
10. “CAUTION-HOT TOP.AVOID CONTACT”. The top plate of the unit can remain hot for some time after use, however, a “CAUTION-HOT TOP” light will remain on until the temperature cools to below 50°C.
11. DO NOT leave an active probe out of the fluid – this may cause uncontrollable heating of the fluid on the hot plate, unintentional boiling, or an explosion.
12. Localized heater element temperature can be significantly higher than the temperature indicated on the display. If flammable materials reach the internal element, fire could result.
13. NOTE that the exterior housing of the element will be hot during and after the time of use.
14. All servicing and maintenance should be referred to authorized personnel.

## Specifications

### General Specifications

General Specifications			
Stirring Hot Plates Model #		72356-10	72356-20
Overall Dimensions	Width	11.3" (28.7 cm)	
	Height	4.0" (10.1 cm)	
	Depth	16.2" (41.1 cm)	
	Weight in lb (kg)	20.5 lbs (9.3 kg)	
Top Plate	Width	10.5" (26.7 cm)	
	Height	1.0" (2.5 cm)	
	Depth	10.5" (26.7 cm)	
Electrical Ratings	Volts	120	220-240
	Amps	11.8	6.1
	Watts	1400	1450
	Frequency	60	50/60
	Phase	1	
	Max. Set-point Temp. °F (°C)	698°F (370°C)	

### Stirring Speed Specifications

- **Speed range:** 50 to 1200 rpm
- **Accuracy of stirring speeds above 200 rpm:**  $\pm 2.0\%$
- **Stability of the stirring speed set-point (600 ml of water in a 1000 ml glass flask above 200 rpm):**  $\pm 2.0\%$   
(At speeds lower than 200 rpm, the powerful magnetic fields begin to interact with each other.)
- **Top Plate Size:** 10" x 10"
- **Recommended Maximum Flask Size:** Four 1 liter flasks
- **Maximum Weight on Top Plate:** 35 lb

## Specifications, *continued*

Heating Specifications	
Top plate surface	Solid ceramic
Temperature range	1°C - 370°C (34°F - 698°F)* NOTE: This plate does not cool. The minimum temperature is 1°C if used in a cold room below 1°C.
Heat-up time to within 5°C of maximum temperature (unloaded top plate)	8 minutes
Temperature stability using remote probe (500 ml of water in a 1000 ml flask at 70°C)	± 1.0°C
Accuracy of the temperature display vs. actual avg. temperature of a 2" diameter at the center of the top plate (set-point 100°C unloaded)	± 10.0°C
Temperature stability at the center of the top plate surface	± 2.0°C
accuracy of remote probe at user selected calibration temperature after calibration procedure	±0.5°C typical
*Accuracy of the temperature display vs. the actual average temperature of a 2" diameter at the center of the top plate unloaded and at set-points other than 100°C will be approximate and relative to environmental, heat thermodynamics, and/or other variable conditions. Use the remote probe when load accuracy is required.	

### Environmental Conditions

**Operating:** 0°C to 27°C  
 20% to 80% relative humidity, non-condensing  
 Installation category II (over voltage) in accordance with IEC 664  
 Pollution degree 2 in accordance with IEC 664  
 Altitude Limit: 2,000 meters

**Storage:** -25°C to 65°C  
 10% to 85% relative humidity

### Declaration of Conformity

Electron Microscopy Sciences declares under our responsibility that this product conforms to the technical requirements of the following standards (copies of the Declaration of Conformity are available upon request):

<b>EMC</b>	EN 61000-3-2	Limits for harmonic current emissions
	EN 61000-3-3	Limits for voltage fluctuations and flicker
	EN 61326-1	Electrical equipment for measurement, control, and laboratory use; Part 1: General Requirements
<b>SAFETY</b>	EN 61010-1	Safety requirements for electrical equipment for measurement, control, and laboratory use; Part 1: General Requirements
	EN 61010-2-010	Part II: Particular requirements for laboratory equipment for the heating of materials
	EN 61010-2-051	Part II: Particular requirements for laboratory equipment for mixing and stirring

Per the provisions of the Electromagnetic Compatibility Directive 89/336/EEC, as amended by 92/31/EEC and 93/68/EEC, and per the provisions of the Low Voltage Directive 73/23/EEC, as amended by 93/68/EEC.

## Introduction

Thank you for buying the SuperNuova™ Multi-Place Plate! Your hot plate, stirrer, or stirring hot plate is a heating and/or stirring plate that aids in various laboratory procedures that require precise control of temperature and/or stirring speeds.

### Product Description & Operation

- Four in One Performance – all of the features of the SuperNuova™ with 4-position stirring ability
- Precision Control – 1 rpm stir control and 1°C temperature control
- Smart Performance – Walk away timer, RS232 output and user calibration function
- Simple operation – A single knob controls both heating and stirring
- Built-in Safety Features – Hot top warning system and user defined over-temperature protection
- 24 Month Warranty
- SuperNuova™ Multi Position stirring hot plates combine the features of the SuperNuova with four individually controlled stirring positions; making it the only one of its kind on the market
- Stir Trac™ breaking feature brings stir bar to an immediate stop for quick flask removal and prevents 'runaway' or decoupled stir bars
- Operation is simple, with a single knob controlling both heating and stirring
- Store up to three programs and recall at the touch of a button using the preset buttons
- Simultaneous, dual digital display for both temperature and stir speed
- Adjust temperature in increments of 1° up to 370°C (698°F); 0.1°C for temperatures below 100°C with remote temperature probe.
- Stirring adjustable from 50 rpm up to 1200 rpm
- "Hot Top" warning system alerts users when the hot plate is over 50°C even the power is off
- Walk away timer shuts off heating, stirring, or both after 1, 2, 4, 8, or 12 hours

### Applications

- General-purpose heating
- Sample preparation
- Media preparation
- Heating reagents
- Sterilization
- Digestions
- Melting paraffin
- Titrations
- Warming resinous chemicals
- Sand baths
- Content analysis
- Micro-scale chemistry
- Solvent evaporation

### Accessory

**6" (15.2cm) Remote Probe:** Catalog #72352-01, Model #TC732X1, 316 Stainless Steel, Maximum Temperature 1100°C

#### **NOTICE**

Do not use this product for anything other than its intended usage.

### **General cleaning instructions**

1. Keep the top surface of the unit clean.
2. To clean the unit, use a non-abrasive cleaner.
3. If spills occur, unplug the unit and clean the spill immediately.
4. DO NOT immerse the unit for cleaning under any circumstances.
5. The exterior housing can be wiped clean with a damp cloth and mild soap.

## Unpacking and Installation



- Use a properly grounded electrical outlet with the correct voltage and current capabilities.
- DO NOT remove or modify grounded outlets – this avoids electrical shock
- DO NOT use near flammable sources – fire or explosion could occur as this device contains materials that can ignite such sources
- Unit NOT RATED for hazardous atmospheres
- If an explosion proof model is needed, contact Customer Service for at 1-800-523-5874
- DO NOT use in highly corrosive atmospheres – this could damage the top of the unit as well as its internal components



Some of the parts of this unit may have been misaligned during shipment – prior to use, run the stirrer at maximum speed for 10 minutes to realign the bearings

### Unpacking

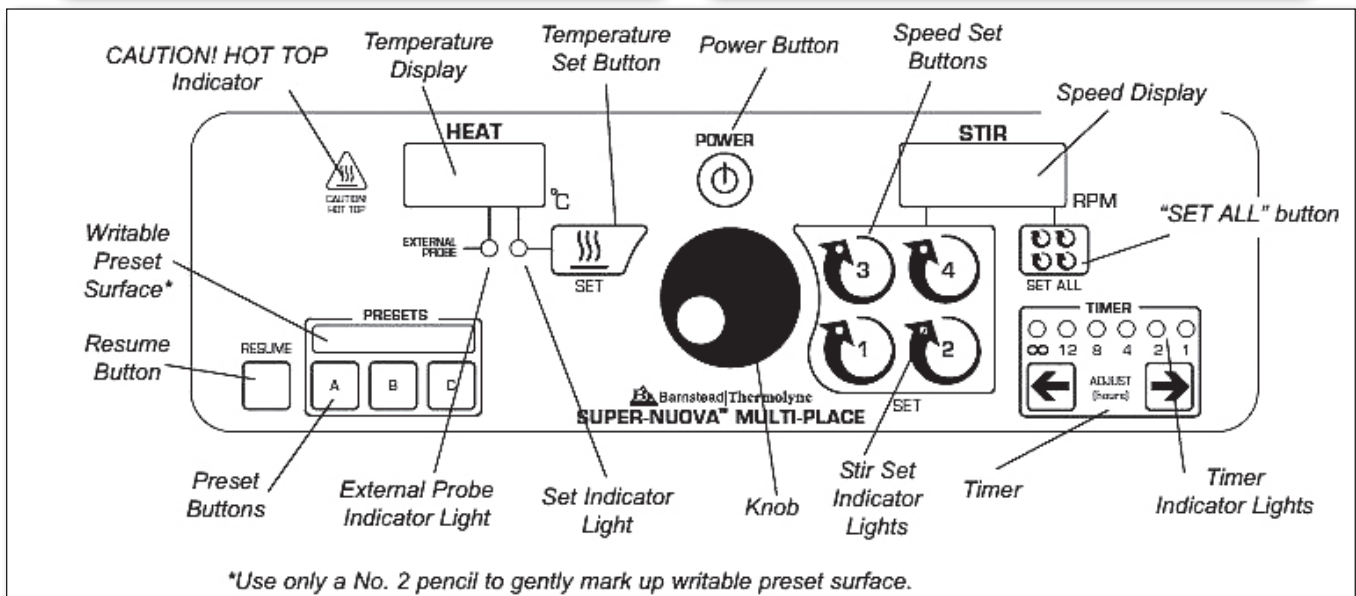
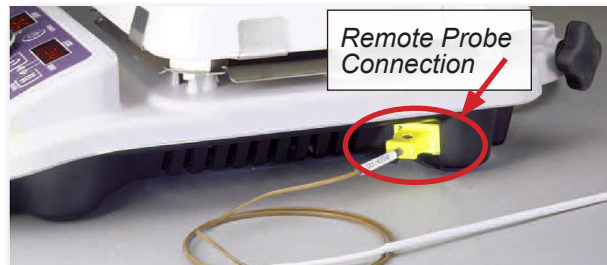
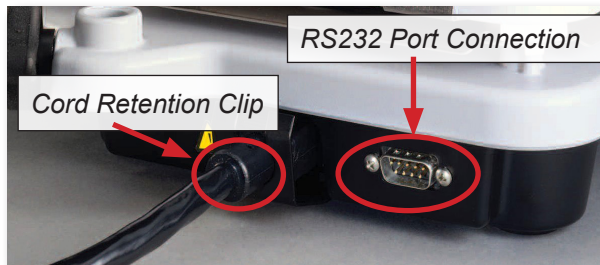
Remove the unit from its packaging and inspect to ensure there is no damage that has occurred during shipment. If there is any visible damage to your unit, call Customer Service immediately at 1-800-523-5874.

The following items are included with the SUPERNUOVA™ unit. If any of the following are missing, contact Customer Service immediately.

- |   |  |
|---|--|
| <input checked="" type="checkbox"/> Super Nuova Multi-Place Plate | <input checked="" type="checkbox"/> Ring Stand Knob    |
| <input checked="" type="checkbox"/> Remote probe PT100            | <input checked="" type="checkbox"/> Instruction manual |
| <input checked="" type="checkbox"/> Stir bar                      |  |

### Installation

1. Set the unit on a flat surface, at least 12" away from any combustible source of any kind.
2. Plug the cord set into a properly grounded electrical outlet with the correct voltage and current capabilities.





## Operating Principles



This plate does not cool. The minimum temperature is 1°C if used in a cold room at 1°C.

### POWER BUTTON

- The power button located on the front control panel.
- Power is turned on by pressing the POWER button or **any** button on the control panel.
- Once the unit is turned on, there will be three beeps, the unit will initialize and then OFF will be displayed on the HEAT and STIR display screens until a temperature and/or stirring speed are entered.
- Press POWER button to turn off power to the unit.

### STIRRING FUNCTION

- The electronic feed-back speed control maintains a precise speed set-point from 50 rpm through 1200 rpm.
- Stirring speed stability is 2.0% at speeds greater than 200 rpm.  
**NOTE:** Maximum speed is dependent on viscosity of the solution.
- The plates have a high torque motor and a strong magnet that can draw a vortex in fluids up to 700 cp.



When the unit is first plugged into a power source, or when it is unplugged and re-plugged in, dashes and zeros will flash on the display for a few seconds. This is simply the normal, initial check.

#### Set EACH Position to Different Stirring Speeds

1. Press desired stirring position key (1-4) located under the STIR display.
2. Select speed using the center knob.
3. To increase the speed – turn the knob clockwise.
4. To decrease speed – turn knob counterclockwise.
5. When desired speed has been reached, press same key (1-4) under the STIR display or wait a moment and the unit will beep indicating that it has been set.  
*Repeat for each individual stirring position.*
6. When all desired stirring speeds have been set, the indicator lights will alternate to each position, displaying each stirring set-point.



Pushing the center knob alone has no function. The knob functions activate after one of the “SET” buttons is pushed first.

#### Set All Positions to Same Stirring Speed

1. Press the SET ALL key under the STIR display.
2. Select speed with main control knob.
3. To increase the speed – turn the knob clockwise.
4. To decrease speed – turn knob counterclockwise.
5. When desired speed has been reached, press the SET ALL key again or wait a moment and the unit will beep when it has been set.
6. Once the unit begins stirring, the display will register *actual speed* until the set-point has been reached. **NOTE:** To check the set-point, press the corresponding stirring position key (1-4 or SET ALL” and set-point will be displayed again for a few seconds. The display will automatically return to indicating actual speed.

#### Stop Stirring Action Without Changing Setpoint

1. Press the position 1-4 or “SET ALL” button, and hold a beep sounds. “PAUSE” will scroll across the display.
2. To resume stirring at the set speed, quickly press the corresponding button again.
3. Pause all positions at once by using the “SET ALL” button, or pause individual positions.

#### Turn Stirring Off

1. Press desired stirring position key (1-4 or “SET ALL”) under the STIR display
2. Turn the knob counterclockwise until the display reads “OFF.” **NOTE:** It is possible to turn off all positions, even if the stirring speeds were individually set and not by using the “SET ALL” key. To turn stirring off to all positions, press “SET ALL” and turn the knob counterclockwise until “OFF” is displayed.

#### Best Performance At Low Stirring Speeds

- Leave all four motors running. If stirring is not desired in one or more locations, take stir bar(s) out of flasks at those locations and allow all four motors to run, rather than stopping or pausing unused motor(s).



Pausing the motors: Each motor can be paused individually or all motors at the same time. See recommendations for “Best Performance When Using Low Stirring Speeds”.

## Operating Principles, *continued*



### Warnings

- Volatile materials must be heated carefully as top surface and element can reach the “Flash Point Temperature” of many chemicals.
- These plates are not explosion proof. Fire or explosion may result. Unit contains components which may ignite such materials.
- Use applicable hand and eye protection when handling hazardous chemicals.
- “Caution: Hot Top. Avoid Contact.” The top plate of the unit can remain hot for some time after use.
- The “Caution: Hot Top” light will remain on until top plate temperature cools to below 50°C.

## HEATING FUNCTION

- The electronic closed-loop feedback control maintains temperature set-points from 1°C above ambient through 370°C.
- An unloaded hot plate will heat to maximum temperature in 8 minutes.
- A “CAUTION HOT TOP” light on the front panel will illuminate whenever the top surface temperature exceeds 50°C.
- The temperature may be controlled either at the top plate by the internal Type K thermocouple sensor, or in the solution using an accessory ungrounded Type K thermocouple probe. *If a probe is used*, the “external probe” light will be illuminated on the front panel.
- A 6” chemically resistant stainless steel remote probe is included with the unit. **NOTE:** The Super-Nuova Multi-place will accept any ungrounded Type K thermocouple probe, however the accuracy of probes other than those tested and specified may not reach the probe accuracy rating designated

### Set Temperature



- Temperature display will read out actual temperature of the top plate (1°-370°C). **This plate does not cool.** Minimum temperature is 1°C if used in a cold room at 1°C.
- Solution volume and the surface area of the flask touching the plate affect boiling times, therefore the same volume of a solution will heat about 20% faster when in a 2L flask as when in a 1L flask.
- The top plate temperature will be higher than the solution temperature, so using an external probe to read actual solution temperature is recommended.

1. Press SET key (located under the HEAT display). The **RED** set temperature indicator light will blink, indicating it is ready to be set.
2. Use the center knob to select a temperature.
3. To increase temperature – turn the knob clockwise.
4. To decrease temperature – turn knob counterclockwise.
5. When desired temperature has been reached, press the SET key or wait a moment and the unit will beep when it has been set. **NOTE:** All plate positions will heat to the same setting. Different positions cannot be set to different heating set-points.
6. Once the unit begins heating, the display will register *actual temperature* until the set-point has been reached.
7. To check set-point, press SET under the HEAT display and set-point will be displayed again for a few seconds. **NOTE:** The display will automatically return to indicating actual temperature. **NOTE:** Temperature accuracy is affected by temperature fluctuations caused by various conditions such as drafts.



## Operating Principles, *continued*

### CONTROLLING SOLUTION TEMPERATURE USING EXTERNAL PROBE



There is only one external probe plug, so only one of the four plate positions can be monitored by an external probe.

1. Insert the included probe (or an ungrounded Type K thermocouple probe) into the probe receptacle which is located on the right side of the unit. Be sure to insert the probe connector using the proper polarity.
2. Place probe into the solution. The actual solution temperature, as measured by the probe, will be displayed, with the probe indicator LED illuminated. **NOTE:** drafts and/or other situational factors may cause temperature fluctuations that will affect temperature accuracy.

**NOTE:** The external probe can offer a more accurate temperature control than regulating the top plate by the internal sensor. To control solution temperature with a precise set-point, an external probe is recommended. Also, a support rod clamp should be used to hold the probe in the solution.

#### Accurate Probe Reading

1. Immerse as much of the probe sheath as possible in the solution.
2. Make sure the probe is immersed in the solution and not in the air or in the center of the stirring vortex.



**HOT SURFACE:** If the probe is plugged into the stirring hot plate, but is not in solution while the heat control is operating, the temperature display will continue to indicate an ambient temperature, and a “Probe out of solution” error message will occur. Since the set-point cannot be reached, the element will continue to supply heat to the top plate, and the top plate temperature of 370°C may be reached. If the remote probe does not sense a temperature change in 9 minutes, the unit will display a heating error and shut down. If more or less than 9 minutes is required, see “Service and Calibration/Probe Response.”

### USING PRESET PROGRAMS

The Super-Nuova Multi-place features the option of pre-setting 3 set-points into its memory (A, B or C.)

#### Program a Preset

1. Adjust the heat and/or stir features to desired set-points.
2. Press and hold one of the presets until the unit beeps, indicating that those set-points have been stored in memory. **NOTE:** The presets will be held in memory, even if the unit is unplugged, until it is overridden by another preset.

#### To activate one of the presets

3. Quickly press the corresponding letter and the stir and/or heat features will automatically adjust themselves. **NOTE:** Use a No. 2 pencil to gently mark on the writable preset surface.

### HEATING METAL VESSELS AND SAND BATHS



With the advanced electronic controls, the Super-Nuova Multi-place is capable of regulating the top plate solid ceramic temperature. Even safely heating metal vessels and sand baths without the danger of the ceramic top breaking, unlike other solid ceramic top plates which are not able to heat metal vessels and sand baths because the metal and the sand tend to reflect heat back into the top, eventually exceeding the maximum temperature rating for a ceramic top, which can cause it to break.

## Operating Principles, *continued*

### **SETTING THE TIMER**

- The timer function can be set to shut off stirring or heating, or both, in all four positions at once.
- It can be set for a desired number of hours (1, 2, 4, 8 or 12) or for a non-specific period of time (Infinity symbol).

#### **Set the Timer**

- Use the right and left arrows until the light above the number corresponds to the desired time. **NOTE:** The default setting is turning off heating only. To change this setting, see “Calibration – Timer Shutdown.”

#### **Reset the Timer**

- Press the right or left arrow keys until the indicator light corresponds to your desired time. The unit will beep when it has been reset. **NOTE:** One minute before shutdown, the unit will beep three times and flash the 1 hour light. The unit will beep three more times to indicate it has timed out.

### **POWER INTERRUPTION PROTECTION**

If an interruption in power supplied to the unit occurs, which is no longer than 10 seconds, the unit will resume normal operation after power is restored. If the interruption is longer than 10 seconds, the unit's power will be off once power is restored.

### **RESUME BUTTON**

- The RESUME button will recall the operation being performed when power is shut off to the unit. It applies to both a voluntary power-off by using the power button or if power is lost due to an outage.
- If the power loss lasts longer than 10 seconds, press “POWER” then “RESUME” to recall the previous operation once power is restored.
- If the power loss is less than 10 seconds, the unit will automatically resume its operation.

### **USING PROBE TEMPERATURE DISPLAY FOR STIRRING-ONLY APPLICATIONS**

On stirring hot plate models, the probe can also be used to monitor the actual temperature of the solution when stirring the solution without heating.

- Change unit to “Thermometer” mode. See “Calibration/ – Thermometer Mode.”
- Turn the knob counterclockwise until the display indicates “OFF” in order to use the probe without heating the solution, **NOTE:** The element will not supply heat to the top plate.



The display on the stirring hot plate will indicate temperatures from 0 to 370°C when displaying temperature from a probe. If the actual temperature is below 0°, the display will still read 0. If the temperature is higher than 370°, the display will still read 370.

## Operating Principles, *continued*

### RS232 OUTPUT

- An RS232 port outputs elapsed time, speed, and temperature data.
- When unit is on, data is printed once every second.
- Data is easily be imported into a spreadsheet as CSV (Comma Separated Values).
- The actual data stream sent every second consists of:
  - Elapsed Time
  - Stirring Set-point (for each of the stirring positions)
  - Actual Stirring Speed (for each of the stirring positions)
  - Heating Set-point
  - Actual Temperature. (Actual temperature refers to top plate temperature, or remote probe temperature if a probe is being used.)
- Elapsed time is a 1 second counter that rolls over to zero again every 12 hours (43,200 seconds).
- Speeds are given in rpm.
- Temperatures are given in degrees Celsius.
- When the unit is first powered on (displays turn on), a header will print indicating the columns.

In order to communicate with the Super-Nuova Multi-place, the computer connected to it needs to be set with the following parameters:

- BITS per SECOND: 57,600
- DATA BITS: 8
- PARITY: NONE
- STOP BITS: 1
- FLOW CONTROL: NONE

Sample of the diagnostic data that is sent is via RS232 (and can be viewed with a terminal program) when unit is plugged in for the first time.

Calibration Set-point (CSP) (Temperature the unit was calibrated at when calibration was performed)	Calibration Offset (COS) (Offset is determined at the calibration temperature.)
70	0

### STORE DATA ON A PC USING HYPERTERMINAL WITH RS232

The RS232 output data with HyperTerminal allows you to store data on a PC. NOTE: Other terminal programs that capture RS232 data can be used as well.

#### Setup HyperTerminal

What is needed:

1. Microsoft Windows 95, or greater, with HyperTerminal installed (it is available from the Windows installation CD, if not installed already).
2. A PC that has an available 9 pin DB-9 RS232 connector.
3. Connect PC to hot plate communications cable – Connect it from the back of the hot plate to the communications port desired.
4. From the START menu of Windows, select ▶ ACCESSORIES ▶ COMMUNICATIONS ▶ HYPER- TERMINAL
5. Type in a name (example: SuperNuova) that you would like to refer to the connection by in the NAME box. You may also select an icon if you would like. Select ▶ OK.
6. Select the RS232 port that you plan to use to connect to the hot plate (typically Com 1 or Com 2). Then select ▶ OK.
7. Under port settings, select the following:
  - a. BITS per SECOND: 57,600
  - b. DATA BITS: 8
  - c. PARITY: NONE
  - d. STOP BITS: 1
  - e. LOW CONTROL: NONE
8. Then Select ▶ OK.
9. Select ▶ FILE ▶ SAVE AS (save this setup wherever you would like it to be located) ▶ "Name" ▶ SAVE.
10. If you put the file on the Desktop, next time you need to run HyperTerminal, you'll be able to just double-click the icon
11. HyperTerminal setup is now complete. You can view the past data, but the program will only allow you to see the past 500 lines in its buffer. To capture data permanently follow the "Capture with HyperTerminal" instructions next.

## Operating Principles, *continued*

### **CAPTURE DATA WITH HYPERTERMINAL**

Start HyperTerminal by double-clicking on the Icon created in the Setup procedure above.

1. Select ▶ TRANSFER ▶ CAPTURE TEXT.
2. Select ▶ Folder and File name you would like to use to refer back to this data (example: C:\SuperNuova\ Test1.txt).  
NOTE: It is important to use the .txt extension so that when you double-click on the file at a later date, it will automatically open in a text viewing program, or it use the .csv extension and it will open in a spread-sheet program such as Excel.
3. Operate the hot plate and the data will be stored (it is still viewable on-screen) to the file that was setup in the previous step.
4. The data file must be closed at the end of the day (or the end of the capturing session) by selecting TRANSFER ▶ CAPTURE TEXT ▶ STOP.
5. CLOSE data file before shutting down the computer.
6. The program may be exited by selecting ▶ FILE ▶ EXIT. Select ▶ YES to the question "ARE YOU SURE YOU WANT TO DISCONNECT NOW?".

## Service

### SERVICE MENU

The Service Menu has many features that will allow a user to customize the unit. A table of the features available in the Service Menu is given below. The features are given in order of their appearance in the Service Menu when rotating the center knob clockwise.

Feature	Display	Availability	Brief Description
Over-temperature Set Point	OSP	Stirring Hot Plate	Allow the user to see the setting of the Over Temperature Protection control.
Temperature Probe Calibration	CAL	Stirring Hot Plate	Allows calibration of the temperature probe and associated circuitry.
Thermometer Mode	Prb	Stirring Hot Plate	Allows probe circuit to be used as a thermometer while still allowing independent use of the stirring control (if so equipped). Default is OFF.
Timer Shutdown	End	Stirrer Stirring Hot Plate	When the timer elapses, a choice of what should turn off is selectable between heating, stirring, or both. Default is heating only (H) on Stirring Hot Plate and Stirring only.
Probe Temperature Limit	PL	Stirring Hot Plate	Allows the user to limit the maximum temperature of the heating set point, when the probe is attached, to 250° C or allow it to be unlimited. Default is 250° C.
Probe Response	Pr	Stirring Hot Plate	Sets the minimum time required for the probe temperature to rise before signaling an error (E03). Adjustable from 3 - 20 minutes, in 1 minute increments. Default is 9 minutes.
Set Point Limit	SL	Stirring Hot Plate	The maximum settable temperature can be limited to below the OSP, or can be unlimited. Unlimited can allow the OTP circuit to automatically disconnect relay power if the OSP setting is exceeded. Default is to be limited by the OSP.
Error Disable	Err	Stirrer Stirring Hot Plate	All errors except E12 (locked rotor) can be disabled if they present problems with the operation of a unit. Default is "all errors enabled". Care must be exercised when changing the default.
Factory Defaults	dEF	Stirrer Stirring Hot Plate	All settings listed in this table will be reset to the default factory setting. Useful in troubleshooting.
Model Selection	SEL	Stirrer Stirring Hot Plate	Allows the unit to be configured as a stirrer, or stirring hot plate.
Flash Upgrade	FLS	Stirrer Stirring Hot Plate	If a new version of firmware is obtained, it can be loaded into the device using this menu. All options will be set to factory defaults when complete.

## Calibration



The POWER key can be used to return to a previous menu, for *most* routines. Also, many of the options can be checked to see how the unit is configured by selecting the feature and observing which menu item is displayed. The unit will always display the current configuration first.

### OVER-TEMPERATURE SET-POINT (OSP)

**NOTE:** This option is only available for units that have heating functionality. The over-temperature set-point is the set-point of the independent temperature control. The control limits the top temperature of the element independently of the standard heating control. This is very helpful if there the main control fails, causing the top to heat excessively. Adjustment is at the front edge of the unit, adjusting with a small, straight blade screwdriver. Mostly, the set-point will be adjustable from 60 to 400°C, in 10°C increments.

#### View Over-Temperature Set-Point

1. Plug the unit into the appropriate power, **but do not turn it on** (displays should be blank, unless Hot Top Warning System indicates a hot surface).
2. Enter the Service Menu by pressing and holding the POWER key for about 3 seconds.
3. After about 3 seconds, a single beep sound. Release the POWER key. The display will change to OSP.
4. Press the SET key under the HEAT display to begin viewing the current setting. The set-point may be changed with a screwdriver and the display will update accordingly.
5. When setting and/or viewing is complete, press the POWER key to return to the previous menu.

### TEMPERATURE PROBE CALIBRATION (CAL)



This section applies only to the calibration of the temperature probe system, **not** the hot plate surface **nor** the motor speed. This method is only applicable to units that have heating functionality.

There are two types of calibration available. The choice of which calibration to choose will depend on the equipment that is available. Calibration for either method is done at a single-user selectable temperature, therefore the calibration will be most accurate at that temperature. **NOTE:** The unit has not been calibrated at any temperature from the factory.

Preferred method of calibration is oil, also known as **Oil Bath Method**. It is relatively ease quick to do and requires a precision bath with temperature readout. The bath can be just about any fluid or material (such as salt, water, oil) as long as the temperature is stable and the readout is accurate. A thermocouple simulator may also be used, but this will not correct for error in the probe.

The second type of calibration is **SyS**, also known as **System Calibration**. SyS used when an independent temperature source such as a bath is not available. The hot plate itself is used to supply the bath, although an independent and accurate method of determining temperature is still required. This measuring system could be as simple as an accurate thermometer. The bath chosen should be as similar to the user's typical load as possible. For example, if the load is 600 ml of aqueous solution in a 1 liter Erlenmeyer flask, then the load during calibration should be the same.



## Calibration, *continued*

### **CALIBRATION USING THE OIL BATH METHOD**

1. Connect probe to the unit to be calibrated.
2. Insert the connected probe into a bath that has stabilized at the desired calibration temperature. **NOTE:** Allow sufficient time for the probe to stabilize.
3. Plug the unit into the appropriate power, but do not turn it on (displays should be blank, unless Hot Top Warning System is indicating a hot surface).
4. Enter the Service Menu by pressing and holding the POWER key.
5. In about 3 seconds, a single beep will sound. Release the POWER key. *The display will change to OSP.*
6. Rotate the center knob dial one position clockwise and the display will read CAL. **NOTE:** This is the calibration menu.
7. Press the SET key under the HEAT display. *The display will now change to OIL.*
8. Press the SET key under the HEAT display, again, to accept. *Display will change to NO.*
9. Rotate the center knob one position to change the display to YES and press the SET key under the HEAT display again.
10. The HEAT display will show the temperature that is currently measured at the probe. **NOTE:** If the display shows “---” then the probe is not connected to the unit and must be connected before continuing. The SET indicator under the HEAT display will be flashing to let user know that the display is ready to be adjusted using the center knob.
11. Adjust the HEAT display with the center knob until it matches the independent probe. When this is complete, press the SET key under the HEAT display.
12. The unit will turn OFF automatically.
13. Calibration of the probe system is now complete.

## Calibration, *continued*

### **CALIBRATION USING THE SYSTEM METHOD**

1. Select an independent temperature probe to be placed in the load, along with the unit temperature probe.
2. Select and place the load to be calibrated on top of the hot plate.
3. Make sure probe is connected to unit.
4. Place a stir bar in the mixture, if stirring is desired and available on the unit being calibrated.
5. Set the OTP adjustment on the front edge of the unit high enough to allow the load to achieve the calibration temperature.
6. With the unit plugged into the appropriate power, but not turned on yet (displays should be blank, unless the Hot Top Warning System is indicating a hot surface), enter the Service Menu by pressing and holding the POWER key.
7. In about 3 seconds, a single beep will sound. Release the POWER key. *The display will change to OSP.*
8. Rotate center knob dial one position clockwise, display will read CAL. **NOTE:** This is the calibration menu.
9. Press the SET key under the HEAT display. *The display will now read OIL.*
10. Rotate center knob one position. *Display will read SyS.*
11. Press the SET key under the HEAT display, again, to accept. *Display will change to NO.*
12. Rotate the center knob one position to change the display to YES.
13. Press the SET key under the HEAT display again.
14. SET indicator under the HEAT display will be lit. **NOTE:** Displays will show the temperature at which the unit was last calibrated.
15. Adjust calibration temperature with the center knob. Temperature can only be selected in whole degrees Celsius. The adjustable range is 1 – 370°C.
16. When the adjustment is completed, press the SET key under the HEAT display to approve the selection.
17. (If the unit undergoing calibration does not have stirring capability then skip to the next step.) The SET indicator under the STIR display will be lit, and the displays will show the stirring control set point. The adjust speed with the center knob. The adjustable range is 50 – 999, and also OFF (zero).
18. When the adjustment is completed, press the SET key under the STIR display to approve the selection. **NOTE:** The HEAT display will now show the temperature that is currently measured at the probe. If the display shows “---” then the probe is not connected to the unit and must be connected before continuing. The unit will begin heating to the set-point. The HEAT and STIR displays will flash until the temperature is within  $\pm 2^{\circ}\text{C}$  of the chosen set-point.
19. Once the temperature is within  $\pm 2^{\circ}\text{C}$  of the set point, a beep will sound and the SET indicator under the HEAT display will begin flashing. When this happens, the display is ready to be adjusted using the center knob. Patience is a virtue, so it may be more desirable to wait longer so the temperature of the unit and fluid stabilize further.
20. Adjust the HEAT display with the center knob to make it match the independent probe. When this is complete, press the SET key under the HEAT display.
21. The unit will turn OFF automatically. Calibration of the probe system is now complete.

## Calibration, *continued*

### **THERMOMETER MODE (PRB)**

**NOTE:** Only units with heating functionality have this option.

The Thermometer Mode can be used to display temperature using the probe *without* the heating control on. Stirring can also be independently used if desired. **NOTE:** Heating will suspend while in thermometer mode.

#### **Thermometer Mode**

1. Plug the unit into the appropriate power, but do not turn it on (displays should be blank, unless Hot Top Warning System is indicating a hot surface).
2. Enter the Service Menu by pressing and holding the POWER key.
3. In about 3 seconds, a single beep will sound. Release the POWER key. *The display will change to OSP.*
4. Rotate center knob dial until display reads Prb.
5. Press the SET key under the HEAT display to accept, and the display will change to OFF.
6. Rotate the center knob one position to change the display to ON and press the SET key under the HEAT display again.
7. The unit will re-start and when done initializing, and will now be in Thermometer Mode. **NOTE:** The SET key under the HEAT display will have no affect while in Thermometer Mode.
8. Return to normal operation by pressing the POWER key, and the unit will turn OFF. When the unit is turned back ON, it will be back to normal operation.

### **TIMER SHUTDOWN - END**

This feature is available for all units, but not all sub-menu options will be applicable. This feature controls what is turned off when the timer elapses. **NOTE:** The *default* is HEATING OFF for hot plates and stir plates, and STIRRING OFF for stirrers.

#### **Modify/view the Timer Shutdown**

1. Plug the unit into the appropriate power, but do not turn it on (displays should be blank, unless Hot Top Warning System is indicating a hot surface).
2. Enter the Service Menu by pressing and holding the POWER key.
3. In about 3 seconds, a single beep will sound. Release the POWER key. *The display will change to OSP.*
4. Rotate center knob dial until display reads END.
5. Press the SET key under either display to accept, and the display will change to H (Heating off), H S (Heating and Stirring off), or S (Stirring off).
6. Rotate the center knob to change the display to the method of choice.
7. Press the SET key under either display again. *The unit will return to the previous menu.*
8. Select another feature to change, or press the POWER key again to return to the off mode.

## Calibration, *continued*

### **PROBE TEMPERATURE LIMIT (PL)**

This feature is available for units with heating functionality and is only applicable when using a probe. It limits the heating set-point to 250°C or it can allow it to be unlimited only when the probe is plugged in. Limiting the set-point is useful when Teflon coated probes are used, since it helps prevent damage to the probe from over-heating. If that is not a concern or a different material of probe is chosen, then unlimited is a safe choice.

#### **Modify/view the Probe Temperature Limit**

1. Plug the unit into the appropriate power, but do not turn it on (displays should be blank, unless Hot Top Warning System is indicating a hot surface).
2. Enter the Service Menu by pressing and holding the POWER key.
3. In about 3 seconds, a single beep will sound. Release the POWER key. *The display will change to OSP.*
4. Rotate center knob dial until display reads PL.
5. Press the SET key under the HEAT display to accept.
6. Display will change to 250 (250°C limit), or UL (unlimited).
7. Rotate the center knob to change the display to the method of choice and press the SET key under the HEAT display again.
8. The unit will return to the previous menu.
9. Select another feature to change, or press the POWER key again to return to the OFF mode.

### **PROBE RESPONSE (PR)**

This feature is available for units with heating functionality and is only applicable when using a probe. This selects the minimum time required for a temperature change to be detected before signaling a probe out of Solution error (e03) by choosing anywhere from 9 to 20 minutes, in 1 minute increments. **NOTE:** The default is 9 minutes, but if a large load is placed on the top, the time may need to be extended to avoid nuisance e03 errors.

#### **Modify/View the Probe Response**

1. Plug the unit into the appropriate power, but do not turn it on (displays should be blank, unless Hot Top Warning System is indicating a hot surface)
2. Enter the Service Menu by pressing and holding the POWER key.
3. In about 3 seconds, a single beep will sound. Release the POWER key. *The display will change to OSP.*
4. Rotate center knob dial until display reads PR.
5. Press the SET key under the HEAT display to accept. *Display will change to the current time chosen.*
6. Rotate the center knob to change the display and press the SET key under the HEAT display again.
7. The unit will return to the previous menu.
8. Select another feature to change, or press the POWER key again to return to the OFF mode.

## Calibration, *continued*

### **SET POINT LIMIT (SL)**

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This feature is available for units with heating functionality. Choose how the maximum set-point will be limited, based on either the over-temperature Set point (OSP) or unlimited (UL). When limited by OSP, the maximum set-point that can be chosen will be based on the setting of the OTP control on the front edge of the unit. If a heating set point of 250°C is desired, the OTP must be set at least 50°C higher, therefore the OSP setting would need to be at least 300°C. The probe circuit is also affected by the selection of OSP. Selection of UL would allow the set-point to be unlimited and would not be affected by OSP setting.

#### **Modify/view the Set-Point Limit**

1. Plug the unit into the appropriate power, but do not turn it on (displays should be blank, unless Hot Top Warning System is indicating a hot surface).
2. Enter the Service Menu by pressing and holding the POWER key.
3. In about 3 seconds, a single beep will sound. Release the POWER key. *The display will change to OSP.*
4. Rotate center knob dial until display reads Sl.
5. Press the SET key under the HEAT display to accept. Display will change to either OSP or UL.
6. Rotate the center knob to change the display
7. Press the SET key under the HEAT display again.
8. The unit will return to the previous menu.
9. Select another feature to change, or press the POWER key again to return to the OFF mode.

### **ERROR DISABLE (ERR)**

---

This feature allows the operator to either enable or disable a particular error from being detected and displayed.

- All errors except E12 (locked rotor – stirring control) are able to be disabled.
- A general option is also available to re-enable all errors at once. **NOTE:** Errors must be disabled (if desired) one at a time.

## Troubleshooting – Error Codes

Type of Error	Error Message	Intended to Detect	Cause	Solution
Heating Errors	E01	Internal thermocouple out of range.	Internal thermocouple not connected. Thermocouple open. Thermocouple connected backwards (reversed polarity).	Ensure proper connection and polarity of thermocouple. Replace thermocouple (attached to element). Ensure proper connection and polarity of thermocouple.
	E02	Excessive top heat-up time	Internal thermocouple short circuit. Failure in Internal thermocouple. Failure in Element. Failure in optocoupler/triac circuit.	Remove short. Replace thermocouple (attached to element). Replace Element. Replace Control Board.
	E03	External Probe left out of solution	External Probe left out of solution. OTP potentiometer set too low. User selected timeout (Probe Response) too short for current load. External probe connected backwards.	Place external probe into solution. Increase OTP setting. Increase external probe timeout (Probe Response). Correct orientation of external probe.
	E04	OTP thermocouple out of range	OTP Circuit failure.	Replace Control Board.
	E05	OTP potentiometer out of range	OTP Circuit failure.	Replace Control Board.
	E06	OTP detected over temperature condition, relay has opened, power to the element removed	OTP thermocouple temperature is above the OTP potentiometer setting. OTP thermocouple temperature is above the OTP potentiometer setting. OTP thermocouple not connected.	Increase OTP potentiometer setting. Reduce hotplate set-point. Ensure proper connection and polarity of OTP thermocouple.

**NOTICE**
**Error Messages E01 through E07**

- Error messages E01 through E07 are heating errors.
- Error Handler will lock out heating functions if heating error is detected.
- Stirring functionality is unaffected.
- If the condition that caused the error is no longer present, pressing the POWER button or unplugging the unit will clear errors E01-E07.



## Troubleshooting – Error Codes, *continued*

Type of Error	Error Message	Intended to Detect	Cause	Solution
Heating Errors	E07	Large difference between Internal thermocouple and OTP thermocouple	Internal or OTP thermocouple not connected.	Ensure proper connection and polarity of affected thermocouple.
			Internal or OTP thermocouple short circuit.	Remove short of affected thermocouple.
			Internal or OTP thermocouple connected backwards (reversed polarity).	Ensure proper connection and polarity of affected thermocouple.
Stirring Error	E11	AC power not properly detected	Failure in AC power detection (zero cross) circuit.	Replace Control Board.
	E12	Locked rotor in stirring control	Locked rotor condition.	Free locked rotor
			Failure in motor.	Replace motor.
			Failure in motor optocoupler/triac circuit.	Replace Control Board.
			Failure in motor optical encoder/ encoder wheel.	Replace motor optical encoder.
	E13	Program checksum	Memory failure.	Replace Control Board. Reprogram Control Board.
Data Flash Memory Error	E21	Corrupted data flash memory	Checksum failure during data flash recovery.	Data flash memory will be automatically re-initialized. Action needed for this error is the following: 1. Re-enter custom settings for preset A, preset B and preset C as the unit has been reset to factory defaults.

### NOTICE

#### **Error Messages E01 through E07**

- Error messages E01 through E07 are heating errors.
- Error Handler will lock out heating functions if heating error is detected.
- Stirring functionality is unaffected.
- If the condition that caused the error is no longer present, press the POWER button or unplug the unit to clear errors E01-E07.

#### **Error Messages E11 through E12**

- Errors E11 and E12 are stirring errors.
- Error Handler will lock out stirring functions if stirring error is detected.
- Heating functionality is unaffected.
- Press the POWER button or unplug the unit to clear error E12.
- Unplug the unit to clear error E11.

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