

---

**BARNSTEAD|THERMOLYNE CORPORATION**

# **DATAPLATE<sup>®</sup>**

## **Digital Hot Plate/Stirrer**

**OPERATING MANUAL**  
*Series 720*

---

# Table of Contents

Introduction .....	3
Important Information .....	3
Safety Information .....	4
Alert Signals .....	4
Warnings .....	4
Cautions .....	5
General Description .....	7
Heater .....	7
Stirrer .....	7
Timer .....	8
Other Instruments in the 700 Series .....	8
Operation .....	10
Front and Rear Panels .....	10
Set-Up .....	12
Setting Temperature, Ramp Rate, Stirrer Speed and Timer .....	13
Display Functions .....	14
Setting Temperature, Ramp Rate, Stir Speed & Timer .....	16
Auto-Off Function .....	19
Other Operations .....	19
Maintenance .....	20
Temperature Calibration .....	20
Helpful Hints .....	21
Troubleshooting .....	22

---

# Introduction

Congratulations on your purchase of a Digital Hot Plate/Stirrer. This unit is designed to do a number of jobs within your laboratory. Please read the instructions carefully to insure that you receive the maximum benefit from it. Also, be sure to fill out and return the enclosed warranty registration card. We would like to receive the information requested, and it will help us assure you of proper warranty coverage.

## Important Information

This manual contains important operating and safety information. You must carefully read and understand the contents of this manual prior to using this equipment.

---

# Safety Information

## Alert Signals



### Warning

Warnings alert you to a possibility of personal injury.



### Caution

Cautions alert you to a possibility of damage to the equipment.



### Note

Notes alert you to pertinent facts and conditions.

Your Dataplate Digital Hot Plate/Stirrer has been designed with function, reliability, and safety in mind. It is the user's responsibility to install it in conformance with local electrical codes. For safe operation, please pay attention to the alert boxes throughout the manual.

Please note the following WARNINGS:

## Warnings

This warning is presented for compliance with California Proposition 65 and other regulatory agencies and only applies to the insulation in this product. This product contains refractory ceramic, refractory ceramic fiber or fiberglass insulation, which can produce respirable dust or fibers during disassembly. Dust or fibers can cause irritation and can aggravate preexisting respiratory diseases. Refractory ceramic and refractory ceramic fibers (after reaching 1000°C) contain crystalline silica, which can cause lung damage (silicosis). The International Agency for Research on Cancer (IARC) has classified refractory ceramic fiber and fiberglass as possibly carcinogenic (Group 2B), and crystalline silica as carcinogenic to humans (Group 1).

The insulating materials can be located in the door, the hearth collar, in the chamber of the product or under the hot plate top. Tests performed by the manufacturer indicate that there is no risk of exposure to dust or respirable fibers resulting from operation of this product under normal conditions. However, there may be a risk of exposure to respirable dust or fibers when repairing or maintaining the insulating materials, or when otherwise disturbing them in a manner which causes release of dust or fibers. By using proper handling procedures and protective

equipment you can work safely with these insulating materials and minimize any exposure. Refer to the appropriate Material Safety Data Sheets (MSDS) for information regarding proper handling and recommended protective equipment. For additional MSDS copies, or additional information concerning the handling of refractory ceramic products, please contact the Customer Service Department at Barnstead|Thermolyne Corporation at 1-800-553-0039.

---

## Cautions

---

### Heater Plate Surface

DATAPLATE Hot Plate/Stirrer Series 720 is capable of temperatures in excess of 370°C,  $\pm$  tolerance, at the plate surface. Touching the heated surface will cause severe burns. USE EXTREME CAUTION AT ALL TIMES. Never leave your DATAPLATE Hot Plate/Stirrer accessible to others while it is hot. Although the unit is equipped with a "Hot Warning" indicator on the front panel, do not rely on this alone. Never touch the heating surface unless you are absolutely sure that it is cool.

---

### Temperature Probe

When attempting to control PROBE TEMPERATURE, it is necessary to plug in a temperature probe and to place it in the sample AT ALL TIMES. If the probe is not placed into the sample, the unit will not be able to sense the rising temperature of the

**Caution**

Touching the heated surface will cause severe burns. USE EXTREME CAUTION AT ALL TIMES.

sample as heat is applied. This will result in driving the heater to its maximum and could result in ruining the sample.

An optional temperature probe is made of 316 stainless steel is available. The stainless steel probe can be attacked by some chemicals. Coating the probe with Teflon spray or Teflon tubing may help. However, this coating may slow the probe response time and result in temperature errors until it equilibrates. Also available is our borosilicate glass temperature probe #710-0203 for use with very aggressive chemicals. Temperature probes are not included with unit.

---

**Electrical**

The DATAPLATE Hot Plate/Stirrer 720 Series is made in models that operate at 100, 120 and 240 volts AC. Be certain that your voltage matches the unit that you receive. Check the plate on the bottom for the voltage setting on your unit. Take the normal care and precaution one would use with any electrical appliance. Be very careful to keep the AC line cord away from the hot plate.

The DATAPLATE Hot Plate/Stirrer Series 720 is a programmable, general purpose, digital laboratory hot plate with stirrer. The series includes the Model 721, single position stirrer, the Model 725, 5-position stirrer and the Model 729, 9-position stirrer. All functions on the Series 720 are settable from a digital front panel keyboard and display. Both the plate temperature and the stirrer speed are controllable to an accuracy never before offered in similar devices.

---

# General Description

## Heater

Either the plate surface temperature or the actual sample temperature may be set by the user. A sensor in the plate is used to monitor surface temperature, or, alternatively, a temperature probe may be connected to the rear of the unit and inserted into the sample. An optional 100 $\Omega$  3-wire, Platinum RTD temperature probe is available with a 6" stainless steel or glass jacket. When a temperature is set by the user, power is applied to the heater to precisely control the temperature at the plate surface or at the sample, as directed.

An optional "ramp value" may be entered into the unit which causes the temperature to approach the target value at a controlled rate of temperature change. Temperature may be displayed in either  $^{\circ}\text{C}$  or  $^{\circ}\text{F}$  as set by a rear panel switch.

## Stirrer

The stirrer is a motor-driven magnet which, in the model 721, revolves directly under the center of the heater plate. The Model 725 has five motors with one placed in the center and one at each corner of the plate. The Model 729 has nine stirrer motors placed in three rows of three each. It is common practice, when heating solutions, to spin a "stir bar" (Teflon-coated bar magnet) which is placed in the solution. This assures a more uniform temperature throughout the solution.

The stirrer speed is set from the front panel keyboard.

---

## Timer

All Series 720 units have built-in timers. The timer counts down in hours, minutes and seconds, sounding an alarm when it reaches zero. The timer may be used independently of the heater and stirrer or may be used in conjunction with the "Auto Off" function to shut off both the heater and stirrer after a preset length of time.

---

## Other Instruments

---

### Model 730 Programmable Hot Plate/Stirrer

The Series 730, available in 1, 5, and 9 position stirrer models, includes extra features not available in the 720 series. In addition to all of the functions found on the 720, the Model 730 contains a program memory of 75 steps. The user may enter a sequence of temperatures, stir speeds and time delays which may be run by pressing a single button. The program memory is battery-powered so the program remains in the unit indefinitely when it is turned off.

The 730 series also has an infrared remote control sensor circuit. The optional Model 745 remote control keyboard can be used to operate the various models from distances of up to 15 feet. This typically is used in situations where the unit is kept under a fume hood or is otherwise inaccessible.

---

### Model 740 Multi-Controller

Both Series 720 and 730 DATAPLATE Hot Plate/Stirrers may be operated as remote stations to the Model 740 DATAPLATE Multi-Controller.



The Multi-Controller connects to the units through a small cable, and is capable of controlling up to 8 units at a time. The Multi-Controller provides a number of enhancements, including 0.1 degree temperature resolution, larger program memory, real-time clock and printer interface.

When connected to the Multi-Controller, front panel controls on both Series 720 and 730 Hot Plate/Stirrers remain operational. Also available for use with the Model 740 Multi-Controller is the Series 710 Hot Plate/ Stirrer which is the same unit as the Series 720 but has no front panel controls. It is designed to be operated remotely from the Model 740 Multi-controller.

# Operation

## Front And Rear Panels

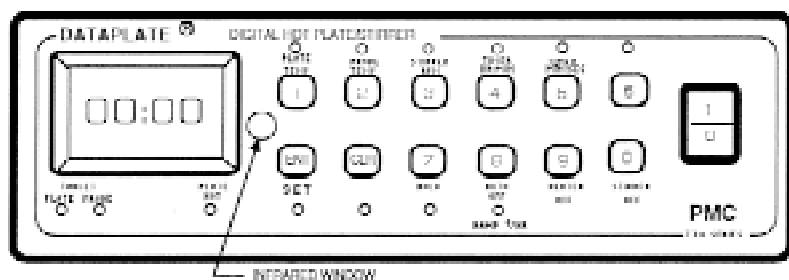
### Front Panel

The front panel of the DATAPLATE 720 Series has a digital keyboard display for monitoring and controlling hot plate functions. The ON/Off switch is located on the right side of the front panel. When the unit is on, the display located on the left side of the unit will be lighted.

The display is a four-digit vacuum fluorescent type with a colon between the middle two digits. It is used to display the temperature, stirrer speed and timer value. The keyboard has 12 pushbutton keys and is used both for selecting the display function and for entering numerical values for the temperature, stirrer speed and timer.

A number of LED indicator lamps also are located on the front panel. These will be explained in a later section.

A thin plastic membrane which fits over the front panel is supplied with the unit to protect it from dust, dirt and possible chemical spills. The keyboard may be operated with the membrane in place. Replacement membranes are available.



Front Panel

**Caution**

If the fuse blows repeatedly, contact the distributor.

**Rear Panel**

The AC power connector jack and fuse holder combination is located on the left side of the rear panel. The °C/°F display switch is to its right, followed by the I/O port, the remote temperature sensor jack and the four temperature calibration pots on the right side of the panel.

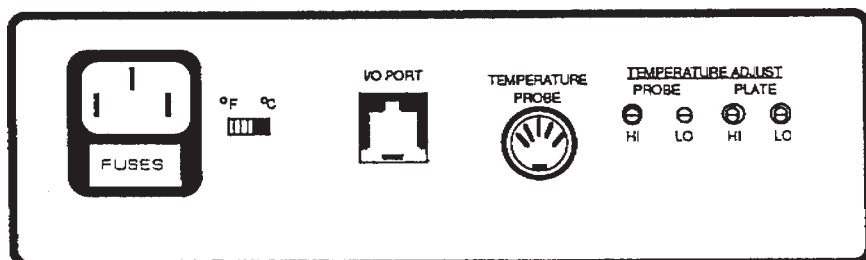
The AC power jack is a three-prong, male plug combined with a dual, snap-in fuse holder. The type of fuse used in the unit is embossed on the front of the holder. Both neutral and high lines are fused.

The °C/°F display is controlled by the position of the slide switch to the right of the power jack. The front panel display will reflect the temperature units by displaying a °C or °F after the temperature readout.

The I/O port will, when used with the proper cable, allow for remote control of the unit by the Model 740 multicontroller.

The remote temperature sensor input is a 5-pin DIN jack which is used with a three-wire, Platinum RTD temperature probe.

The two calibration potentiometers on the left are for calibrating the remote temperature sensor, the two on the right are for calibrating the hot plate temperature readout.



Rear Panel

## Set-Up

1. Place the unit on a level, dry bench or surface.
2. Plug the unit into a properly grounded, three wire outlet of proper voltage.
3. Plug the temperature probe (if used) into the jack on the rear of the unit.
4. Place the sample on the heater plate and put the temperature probe and stir bar into the sample. Be sure the vessel is centered and that the stir bar is centered in the vessel. Also be sure that the temperature probe will not obstruct the rotation of the stir bar.

Try to match the stir bar to the sample and container size to optimize mixing. Generally, larger stir bars are needed to mix more viscous samples. However, two-inch long bars match the magnet in the stirrer best.

5. Turn the unit ON by the rocker switch on the front panel. Note that the unit will beep once and will be in the PLATE TEMPERATURE mode. At this point you can change the display modes by touching PLATE TEMP, PROBE TEMP, STIRRER RPM, TIMER HR:MIN, or TIMER MIN:SEC. Note that the display indications will change as you touch the different keys.
6. Set the target temperature, stirrer speed, timer and ramp rate according to the instructions that follow.

---

## Display Functions

The display can be instructed to show any of six different functions. The function currently being displayed is indicated by a small LED lamp located above the corresponding display function key (top row of keys).

PLATE  
TEMP



---

### Heater

Press this key to display the temperature of the heater plate surface. The display will be in °C or °F as selected by the rear panel C/F switch, and indicated by a "C" or "F" on the right portion of the display. If a target plate temperature has been set into the unit, the display will toggle at brief intervals to display the target temperature. The PLATE TARGET lamp will turn on during the time the target temperature is shown. The red PLATE HOT lamp located to the right and below the display, will blink if the plate temperature is above 50 °C (122 °F) as a safety reminder.

PROBE  
TEMP



Press this key to display the temperature measured by the probe. The display will be in °C or °F as selected by the rear panel C/F switch and indicated as above. IF the probe is not plugged in, the probe temperature will read 0°C or 32°F. If a target probe temperature has been set, the display will toggle at brief intervals to display the target temperature. The PROBE TARGET lamp will turn on during the time that the target temperature is shown. If the probe is unplugged the display will show all dashes. Dashes will also appear if the temperature is out of range (0 - 400°C).

STIRRER  
RPM



---

### Stirrer Speed

Press this key to display the speed of the stirrer. The speed is shown to the nearest ten RPM. On multi-position stirrer models the speed is taken from the center stirrer position.

TIMER  
HR:MIN



---

### Timer

Press this key to display the hours and minutes left on the timer.

TIMER  
MIN:SEC



Press this key to display the minutes and seconds left on the timer.

RAMP  
°/HR



---

### Ramp

Press this key to display the current ramp value. The value is displayed in °C/HR or °F/HR as selected by the rear panel C/F switch. If ramping is disabled, the display will show "OFF".

---

## Setting Temperature, Ramp Rate, Stirrer Speed and Timer

The heater, stirrer and timer may all be set through the use of the SET/ENTER key. The settable functions are listed below, followed by an explanation of how values are entered for those functions.

---

### Heater

The heater may be set to control either the plate surface or the sample itself. This is done by entering a "target" temperature from the front

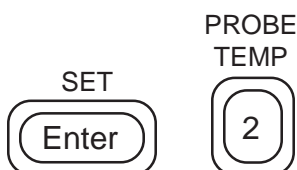
panel keyboard. The control electronics in the hot plate will automatically apply power to the heater plate to reach the desired target temperature.

The user may enter either a target plate temperature or a target probe temperature. Only one target temperature is allowed at a time. Setting a target plate temperature erases any target probe temperature that may have been set previously and vice versa.

Target temperatures may be set anywhere in the range of 0 to 370°C (32 to 698°F).



To set a target plate temperature, press the SET key followed by the PLATE TEMP key; enter the temperature value desired and press the ENTER key. The target temperature is entered in °C or °F depending on the current mode as set by the C/F switch on the rear panel. Setting a target temperature enables the heater plate. This means that the heater plate will turn on as necessary to heat the plate surface to the target temperature. If the target is below the actual plate temperature, the heater plate will not turn on until the plate cools to near the target temperature.



To set a target probe temperature, press the SET key followed by the PROBE TEMP key; enter the temperature value desired and press the ENTER key. The target temperature is entered in °C or °F depending on the current mode as above. Setting the target temperature enables the heater plate. The heater plate will turn on as necessary to heat the sample until the sample probe reaches the target temperature. If the probe is unplugged, heating power will be disabled until the probe is plugged into the rear connector.



### Caution

Be sure the temperature probe is in the sample solution and plugged into the rear panel when heating. Failure to do so could damage your sample because the hot plate will drive to maximum seeking a temperature it cannot find.

## OPERATION

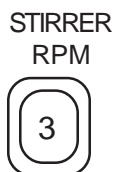


### Note

Aluminum top, 10" x 10"  
Digital Hot Plate/Stirrers  
operate from 100 to 800  
RPM.



To disable the heater plate and erase the plate or probe target temperature, press the HEATER OFF key.



### Stirrer

The stirrer speed is set in a similar manner to the target temperature above except that the STIRRER RPM key is pressed after the SET key. The target stirrer speed is rounded internally to a multiple of ten RPM. The stirrer may be set to any speed within the range 0 to 1500 RPM. However, the majority of the units are specified to operate from 100 to 1200 RPM.

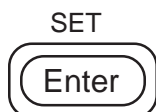


To turn off the stirrer, press the STIRRER OFF key. This is the same as setting the stirrer speed to zero.

### Timer

The timer counts in hours, minutes and seconds. However, the user may only display or set the hours and minutes or the minutes and seconds at a given time. Setting the hours and minutes also sets the seconds to zero. Setting the minutes and seconds sets the hours to zero.

The timer may be set to any count up to 99:99, however, when the minutes or seconds roll over they will be set to 59 as on a clock. For example, 80 seconds may be set into the timer either as 1:20 or as :80 minutes/seconds. When the timer reaches zero it will alarm with three audible chirps.



To set the timer in hours and minutes, press SET followed by TIMER HR:MIN. The seconds will be set to zero. Timing starts exactly when the ENTER key is pressed.





To set the timer in minutes and seconds, press SET followed by TIMER MIN:SEC. The hours will be set to zero. Timing starts exactly when the ENTER key is pressed.

### Ramp

The ramp setting controls the rate at which the temperature approaches the target temperature. The ramp values may be set within the range of 0 to 555°C/HR or 0 to 999°F/HR. The unit can ramp up or down depending on the target temperature. A target temperature above the sample temperature will make the unit ramp up at the specified rate. Likewise, a target temperature below the sample temperature will make the unit ramp down at the specified rate. The thermal characteristics of the sample and hot plate determine the maximum rate at which the temperature can ramp toward the target setting. If the ramp setting is higher than this rate it can not be attained.



To set the temperature ramp, press the SET key followed by the RAMP °/HR key.



### Caution

Be sure to enter a target temperature before entering a ramp rate. The hot plate will drive to maximum and may damage the unit if no target value has been entered.

### Entering Values

To set a value into the heater, stirrer, timer or ramp, first the SET function is selected, a numerical value is entered, and then the ENTER key is depressed.



As described previously, the SET function is selected by pressing the SET key followed by the key of the function desired. When the SET key is pressed, the display shows all dashes with vertical doglegs (L L L L). At this time only the six settable function keys and the CLEAR key are active. Pressing the CLEAR key will erase SET

and return the unit to the function that was being displayed before SET was pressed. Pressing one of the function keys will cause the display to show all zeros. At this point, the keys become numeric and the value may be entered.



Key in the value you wish to set, one digit at a time, up to four digits. The digits enter the display from the right, calculator-style.



If you make a mistake, press the CLEAR key and the display will return to all zeros. If you wish to exit from the SET function without actually entering a value, press the CLEAR key again while the display shows all zeros.



After keying in the desired value, press the ENTER key. The new value will be entered at this time and the function which was just set will be displayed. If the value entered is out of range, however, it will not be accepted, and will be held on the display until the CLEAR key is pressed. Once the value is accepted, the keys return to their normal functions and no longer represent numeric data.



AUTO  
OFF

## **Auto-Off and Hold Functions**

When the auto-off function is enabled, a time-out of the timer automatically turns off the heater and the stirrer. This provides a convenient way to preset the length of time a sample is to be heated without the need for anyone to be present at the end of the period.

To enable the auto-off function, press the AUTO-OFF key and the lamp under the key will turn on. To disable auto-off, press the key again and the lamp will go out.

---

## Other Operations

The DATAPLATE Digital Hot Plate/Stirrer is designed to be used as a temperature meter and laboratory timer, too. To use either way, follow the instructions below:

---

### Temperature Meter

To use the DATAPLATE as a temperature meter, bring the sample to the unit and plate the temperature probe in the solution. Then touch PROBE TEMP and the temperature will be displayed.

---

### Timer

To use your DATAPLATE Digital Hot Plate/Stirrer as a laboratory timer, simply touch SET, TIMER HR:MIN (or TIMER MIN:SEC), the time desired, then ENTER. As soon as the ENTER key is touched the unit will start to count down. It will beep three times at zero.

---

# Maintenance

## Temperature Calibration

The temperature readouts for both the plate surface and the probe may be calibrated by the user. Two rear panel adjustments are provided for each temperature channel.

Probe calibration is performed using an accessory calibration kit (part # 710-5001) which precisely simulates fixed temperature points. The kit has a high temperature "dummy" probe which when plugged into the probe connector presents the same value of resistance to the internal temperature analyzing circuitry as the RTD probe at the temperature which is written on the calibrator case. There is also a low temperature plug-in which simulates the response at the temperature called out on the calibrator case.

To calibrate the probe readout, first insert the high temperature "dummy" probe into the temperature probe DIN connector located on the rear panel. Then adjust the calibration pot marked PROBE HI until the front panel readout agrees with the temperature stamped on the "dummy" probe. When the high temperature has been adjusted, repeat the procedure with the low temperature probe module by adjusting the potentiometer marked PROBE LO to agree with the temperature marked on the "dummy" probe. The probe readout calibration is now complete. The calibration must be carried out in the order specified above (Hi temp; Low temp).

## Helpful Hints

1. Use on a level surface when stirring, especially when stirring violently. If the unit is not level, the sample container will "walk", and could walk right off the plate.
2. Stirring thicker solutions may require using a larger stir bar. Generally, the more viscous a solution, the larger the stir bar needed. For best operation overall, it is recommended that the stir bar match the magnet poles in the stirrer. These are 2 inches apart.
3. Targeting the temperature for the heater plat can result in an overshoot of the target temperature as measured at the sample. This is especially true when high ramp hating rates are used in conjunction with small liquid samples, and when target temperature is close to ambient temperature.

For best results with the least overshoot, two methods can be chosen. First, less overshoot occurs in metal sample containers, but that doesn't help those who use glass. Second, if using glass, expect a slight temperature overshoot. If it important not to overshoot, then target your temperature 5°C to 10°C below the desired temperature. When that temperature is reached, the unit will slowly ramp the final temperature. This will result in a very minimal temperature overshoot. Large samples and target temperatures over 100°C very seldom overshoot.

---

# Troubleshooting

PROBLEM	WHAT TO DO/EXPLANATION
The sample temperature does not rise as rapidly as the programmed ramp value.	1. Try heating a smaller sample. The heating capacity of the DATAPLATE Heater/Stirrer is probably not adequate to raise the sample temperature at the programmed rate.
The probe temperature does not display 100°C or 212°C when immersed in boiling water.	1. If you are in a location which is 1000 ft. or more above sea level, your boiling point will decrease. 2. Perform the probe calibration procedure given on p. 20.
The probe temperature readout does not display 0°C or 32°F when immersed in an ice bath.	1. Check the purity of the water. Dissolved substances will usually lower the freezing point of water. 2. Perform the probe calibration procedure given on p. 20.
The sample temperature reading remains higher than the target temperature.	1. Check the ambient temperature. The target temperature may be below room temperature.
The probe temperature reads 0°C or 32°F regardless of the target setting.	1. Check to see that the probe plug is seated tightly and making contact. If it is not making contact the read-out will default to 0°C or 32°F.
The stir bars are turning at too low a speed or are revolving erratically.	1. Check to see that the sample containers are centered over the stir bar motors. 2. The stir bars may not be able to keep up with the motors due to the viscosity of the liquid sample.

---

---

## **Barnstead|Thermolyne**

2555 Kerper Blvd. A Sybron laboratory products company

P.O. Box 797

Dubuque, IA 52004-2241

Phone: 319-556-2241 800-553-0039

Fax: 319-589-0516

E-Mail Address: [mkt@barnstead.com](mailto:mkt@barnstead.com)

