



LHS-720 SERIES



Digital Hot Plate / Stirrer



Operator's Manual
M1584/0593

SECTION 3 OPERATING THE DIGITAL HOT PLATE / STIRRER

The OMEGA Digital Hot Plate/Stirrer is simple to use. Once you've learned, you won't want to twist a dial or knob on another hot plate/stirrer again.

3.1 OPERATING INSTRUCTIONS

NOTE

It is common practice, when heating solutions, to spin a "stir bar" (Teflon-coated bar magnet) in the solution. This assures a more uniform temperature throughout the solution.

1. Place the sample on the heater plate. Put the temperature probe and stir bar into the sample. Position the vessel properly on the plate and center the stir bar in the vessel. Also, be sure that the temperature probe will not obstruct the rotation of the stir bar.

TIP

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

2. Turn the unit ON using the rocker switch on the front panel. The unit will beep once and enter 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. The display indications will change as you touch the different keys.
3. Set the target temperature, stirrer speed, timer and ramp rate according to the instructions given in Section 3.5.

CAUTION - HEATED SURFACE

The OMEGA LHS-720 Series Hot Plate/Stirrer can reach temperatures in excess of 400 °C at the plate surface. Touching the heated surface will cause severe burns. USE EXTREME CAUTION AT ALL TIMES. Never leave your OMEGA 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.

CAUTION - TEMPERATURE CONTROL

When attempting to control PROBE TEMPERATURE, you must plug in a temperature probe and place it in the sample AT ALL TIMES. If the probe is not placed into the sample and plugged into the rear of the hot plate, the unit will not be able to sense the rising temperature of the sample as heat is applied. This will drive the heater to its maximum and could ruin the sample.

SECTION 4 TEMPERATURE CALIBRATION

You can calibrate the temperature readouts for both the plate surface and the probe. Two rear panel adjustments are provided for each temperature channel.

Perform probe calibration using an accessory calibration kit that precisely simulates fixed temperature points. The kit has a high temperature “dummy” probe. This probe, 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 that is written on the calibrator case. There is also a low temperature plug-in that simulates the response at the temperature called out on the calibrator case.

To calibrate the probe readout, follow the steps below:

1. Insert the high temperature “dummy” probe into the temperature probe DIN connector located on the rear panel.
2. Adjust the calibration pot marked PROBE HI until the front panel readout agrees with the temperature stamped on the “dummy” probe.
3. After adjusting the high temperature, 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. Carry out the calibration procedure in the order specified above (HI temperature/LO temperature).

To calibrate the plate temperature readout, obtain a calibrated surface temperature probe to use as a calibration reference. This is available from OMEGA Engineering as an option. The OMEGA surface probe plugs into the external probe connector on the rear panel and is read by pressing the PROBE TEMP key on the front panel. If you are using the OMEGA surface temperature probe, be certain that you have calibrated the probe readout before carrying out the following procedure.

NOTE

The plate does not have to be calibrated if you are using the probe circuit only. They are completely independent.

1. Set the plate target temperature to a value between 300°C and 400°C using the procedure given in Section 3.3.
2. Wait until the plate temperature reaches the target value, then wait 5 minutes more.
3. When the temperature readout has reached a stable value, take a reading from the surface temperature probe. Then adjust the PLATE HI potentiometer until the plate temperature reading agrees with the surface temperature probe.



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 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 that 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 you press the CLEAR key. Once the value is accepted, the keys return to their normal functions and no longer represent numeric data.

3.6 AUTO-OFF FUNCTION

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.

3.7 OTHER OPERATIONS

You can also use the OMEGA Digital Hot Plate/Stirrer as a temperature meter and laboratory timer. To use it either way, follow the instructions below:

3.6.1 Temperature Meter

To use the OMEGA Digital Hot Plate/Stirrer as a temperature meter, bring the sample to the unit and place the temperature probe in the solution. Then press PROBE TEMP, and the temperature will be displayed.

3.6.2 Timer

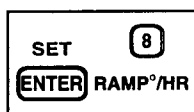
To use your OMEGA Digital Hot Plate/Stirrer as a laboratory timer, simply press SET, TIMER HR:MIN (or TIMER MIN:SEC), the time desired, then ENTER. As soon as you press the ENTER key, the unit will start to count down. It will beep three times at zero.

3.5.4 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 cannot be attained.



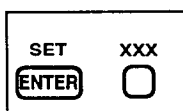
To set the temperature ramp, press the SET key followed by the RAMP °/HR key. Then enter the ramp value and press the ENTER key.

CAUTION

**Be sure to enter a target temperature before entering a ramp rate.
The hot plate will not turn on if there is no target temperature.**

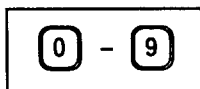
3.5.5 Entering Values

To set a value into the heater, stirrer, timer or ramp, select the SET function, enter a numerical value, and press the ENTER key.



As described previously, select the SET function by pressing the SET key followed by the key of the function desired. When you press the SET key, the display shows all dog-legged dashes (L L L L). At this time, only the six settable function keys and the CLEAR key are active. Pressing the CLEAR key erases SET and returns

the unit to the function displayed before you pressed SET. Press one of the function keys. The display will show all zeros. At this point, you may use the keys to enter the numeric value.



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.

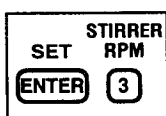
CAUTION

Be sure that 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 the maximum, seeking a temperature it cannot find.

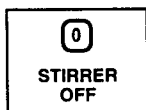


To disable the heater plate and erase the plate or probe target temperature, press the HEATER OFF key.

3.5.2 Stirrer



Set the stirrer speed in a similar manner to the target temperature above, with one exception: press the STIRRER RPM key after the SET key. The target stirrer speed is rounded internally to a multiple of ten RPM. You can set the stirrer to any speed within the range 0 to 1500 RPM. However, the unit is specified to operate from 100 to 1500 RPM.

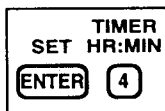


To turn off the stirrer, press the STIRRER OFF key. This is the same as setting the stirrer speed to zero.

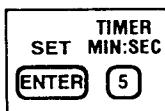
3.5.3 Timer

The timer counts in hours, minutes, and seconds. However, you may only display or set hours and minutes or 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.

You may set the timer 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, unique, audible chirps.



To set the timer in hours and minutes, press SET followed by TIMER HR:MIN (the seconds will be set to zero). Enter the numerical value and press the ENTER key. Timing starts exactly when you press the ENTER key.



To set the timer in minutes and seconds, press SET followed by TIMER MIN:SEC (the hours will be set to zero). Enter the numerical value and press the ENTER key. Timing starts exactly when you press the ENTER key.

3.5 SETTING TEMPERATURE, RAMP RATE, STIR SPEED AND TIMER

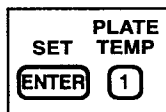
The heater, stirrer and timer all may be set using the SET/ENTER key. Functions that can be set are listed below, followed by an explanation of how to enter values for those functions.

3.5.1 Heater

The heater is set to control either the plate surface or the sample itself. To do this, enter a “target” temperature from the front panel keyboard. Target temperatures may be set anywhere in the range of 0 to 400°C (32 to 752°F). The control electronics in the hot plate will automatically apply power to the heater plate to reach the desired target temperature.

You 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.

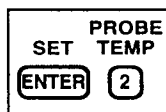
To set a target plate temperature, follow the steps below:



1. Press the SET key, followed by the PLATE TEMP key.
2. Enter the temperature value desired and press the ENTER key. The target temperature is entered in °C or °F, depending on the current mode set by the C/F switch on the rear panel.

Setting the target plate 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, follow the steps below:



1. Press the SET key, followed by the PROBE TEMP key.
2. 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 probe 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 you unplug the probe, heating power will be disabled until the probe is plugged into the rear connector.

3.4.2 Stirrer Speed

STIRRER
RPM
3

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.

3.4.3 Timer

TIMER
HR:MIN
4

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

TIMER
MIN:SEC
5

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

3.4.4 Ramp

RAMP
°/HR
6

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".

- 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.

CAUTION

If the fuse blows repeatedly, contact the OMEGA Engineering Customer Service Department.

- The position of the slide switch (to the right of the power jack) controls the °C/°F display. The front panel display will reflect the temperature units by displaying a °C or °F after the temperature readout.
- The I/O port is not normally used. However, it is an RS-232 port for remote control or data collecting. For more information, contact the OMEGA Engineering Customer Service Department.
- 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.

3.4 DISPLAY FUNCTIONS

The display can show any one 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).

3.4.1 Heater

PLATE
TEMP
①

Press this key to display the temperature of the heater plate surface. The temperature will appear in °C or °F, as selected by the rear panel C/F switch. This selection is 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
②

Press this key to display the temperature measured by the probe. The temperature will appear in °C or °F TEMP as selected by the rear panel C/F switch and indicated as above. 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 (0-409°C).

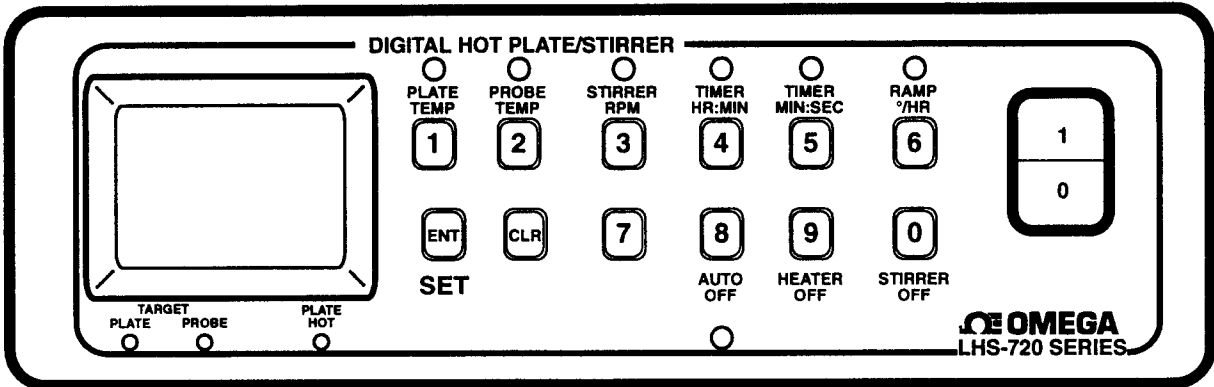


Figure 3-1. LHS-720 Front Panel

The display is a four-digit vacuum fluorescent type with a colon between the middle two digits. It displays the temperature, stirrer speed and timer value. The keyboard has 12 push button keys 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 are described in SECTION 3.4.
- 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. You may use the keyboard with the membrane in place. Replacement membranes are available.

3.3.2 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. See Figure 3-2.

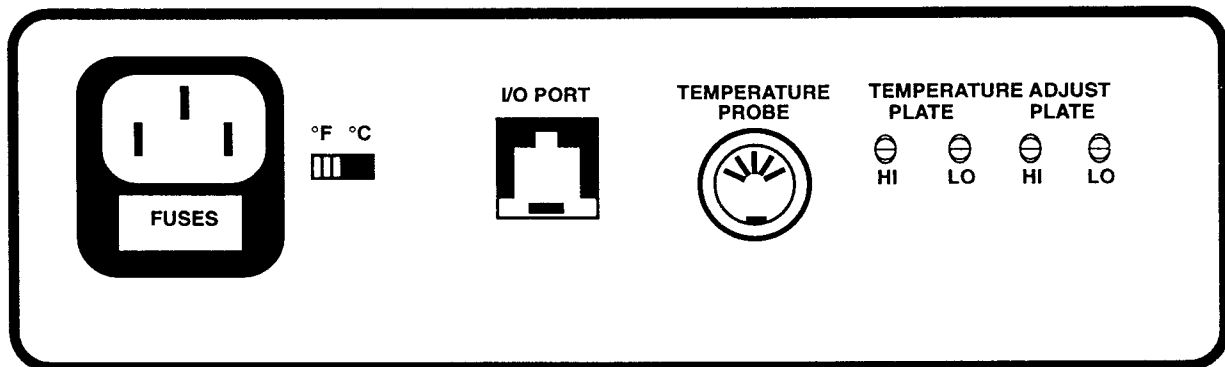


Figure 3-2. LHS-720 Rear Panel

CAUTION - ELECTRICAL HAZARD

The OMEGA LHS-720 Series Hot Plate/Stirrer is available in models that operate at 100, 115 and 230 Vac. 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 precautions you would use with any electrical appliance. Be very careful to keep the AC line cord away from the hot plate.

3.2 HELPFUL HINTS

1. Use on a level surface when stirring, especially when stirring vigorously. 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, the stir bar should match the magnet poles in the stirrer. These are 2 inches apart.
3. Targeting the temperature for the heater plate can result in an overshoot of the target temperature as measured at the sample. This is especially true when using high ramp heating rates in conjunction with small liquid samples, and when the target temperature is close to the ambient temperature. For the best results with the least overshoot, choose one of the following methods:
 - a. Less overshoot occurs in metal sample containers.
 - b. If using glass, expect a slight temperature overshoot. If it is important not to overshoot, then target your temperature 5°C to 10°C below the desired temperature. When that temperature is reached, re-instruct the unit to go to the final temperature. This will result in a very minimal temperature overshoot.
 - c. Large samples and target temperatures over 100°C very seldom overshoot.

3.3 FRONT AND REAR PANEL CONTROLS

3.3.1 Front Panel

The front panel of the OMEGA LHS-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. See Figure 3-1.

1.1.4 Probe (Optional)

The 316 stainless steel temperature probe which is most commonly used can be affected by some chemicals. Also available is our borosilicate glass temperature probe (#710-0203) and our solid Teflon® probe (#710-0205) for use with very aggressive chemicals. Temperature probes are not included with this unit.

1.2 OTHER INSTRUMENTS IN THE LHS-700 SERIES

OMEGA Engineering manufactures a full line of Hot Plate/Stirrers and accessories, including the following:

LHS-730 MODEL PROGRAMMABLE HOT PLATE/STIRRER:

The LHS-730 Series, available in 1, 5, and 9 position stirrer models, includes extra features not available on the LHS-720 Series. In addition to all functions found on the LHS-720, the LHS-730 model contains a program memory of 75 steps. You can enter a sequence of temperatures, stir speeds and time delays and run them by pressing a single button. The program memory is battery-powered, so the program remains in the unit for up to 5 years when it is turned off.

SECTION 2 INSTALLING THE DIGITAL HOT PLATE / STIRRER

2.1 UNPACKING

Remove the Packing List and verify that all equipment has been received. If there are any questions about the shipment, please call the OMEGA Customer Service Department at 1-800-622-2378 or (203) 359-1660.

Upon receipt of shipment, inspect the container and equipment for any signs of damage. Take particular note of any evidence of rough handling in transit. Immediately report any damage to the shipping agent.

NOTE

The carrier will not honor any claims unless all shipping material is saved for their examination. After examining and removing contents, save packing material and carton in the event reshipment is necessary.

2.2 SETTING UP THE UNIT

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.

SECTION 1 INTRODUCTION

Congratulations on your purchase of an OMEGA LHS-720 Series Digital Hot Plate/Stirrer. The unit is designed to do a number of jobs within your laboratory. Please read this manual carefully to ensure that you receive the maximum benefit from your unit.

1.1 GENERAL DESCRIPTION

The OMEGA Hot Plate/Stirrer LHS-720 Series is a general purpose, digital laboratory hot plate with stirrer. All functions on the LHS-720 Series can be set 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. The series includes the Model LHS-721 single position stirrer, the Model LHS-725 5-position stirrer and the Model LHS-729 9-position stirrer.

1.1.1 Heater

You may set either the plate surface temperature or the actual sample temperature. When you set a temperature, power is applied to the heater for precise temperature control either at the plate surface or at the sample (as directed).

- A sensor in the plate monitors surface temperature.
- Alternatively, you can connect a temperature probe to the rear of the unit and insert it into the sample. An optional 100 Ω , 3-wire, Platinum RTD temperature probe is available with a 6" stainless steel or glass jacket.
- You may enter an optional "ramp value" into the unit. This causes the temperature to approach the target value at a controlled rate of change.
- Set a rear panel switch to display the temperature in either $^{\circ}\text{C}$ or $^{\circ}\text{F}$.

1.1.2 Stirrer

The stirrer is a motor-driven magnet that, in the LHS-721 model, revolves directly under the center of the heater plate. The LHS-725 model has 5 motors, with one placed in the center and one at each corner of the plate. The LHS-729 model has nine stirrer motors placed in three rows of three each. The stirrer speed is set from the front panel keyboard.

1.1.3 Timer

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

OMEGA ENGINEERING INC.
One Omega Drive
Box 4047
Stamford, CT 06907-0047

May 7, 1993

PMC Industries, Inc.
8880 Rehco Road
San Diego, CA 92121-3208
Attn: Tony Cassiano

Dear Tony:

Enclosed is a print-ready original of the following manual:

PRODUCT	MANUAL NUMBER
720 SERIES	M1584/0593
HOT PLATE / STIRRER	

This manual is designed to be printed on both sides of the page, and to be saddle-stitched. We normally have our manuals printed on 60# white opaque, with 80# white opaque covers. I have enclosed a mock-up for your printer's reference.

Sometime soon, I will need to know the printing status of these manuals. Ultimately, I will need to order some from you for our in-house use. We can discuss this when we are reviewing the next manual.

Thank you.

Sincerely,



Catherine Donroe
Senior Technical Writer

**DIGITAL HOT PLATE/STIRRER
SERIES LHS-720**

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WARRANTY

OMEGA warrants this unit to be free of defects in materials and workmanship and to give satisfactory service for a period of **13 months** from date of purchase. OMEGA Warranty adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that our customers receive maximum coverage on each product. If the unit should malfunction, it must be returned to the factory for evaluation. Our Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective it will be repaired or replaced at no charge. However, this WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of being damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components which wear or which are damaged by misuse are not warranted. These include contact points, fuses, and triacs.

We are glad to offer suggestions on the use of our various products. Nevertheless OMEGA only warrants that the parts manufactured by it will be as specified and free of defects.

OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESSED OR IMPLIED, EXCEPT THAT OF TITLE AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED.

LIMITATION OF LIABILITY: The remedies of buyer set forth herein are exclusive and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.

Every precaution for accuracy has been taken in the preparation of this manual, however, OMEGA ENGINEERING, INC. neither assumes responsibility for any omissions or errors that may appear nor assumes liability for any damages that result from the use of the products in accordance with the information contained in the manual.

RETURN REQUESTS / INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA ENGINEERING Customer Service Department. Call toll free in the U.S.A. and Canada: 1-800-622-2378, FAX: 203-359-7811; International: 203-359-1660, FAX: 203-359-7807.

BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, YOU MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OUR CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

FOR WARRANTY RETURNS, please have the following information available BEFORE contacting OMEGA:

1. P.O. number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems you are having with the product.

FOR NON-WARRANTY REPAIRS OR CALIBRATION, consult OMEGA for current repair/calibration charges. Have the following information available BEFORE contacting OMEGA:

1. Your P.O. number to cover the COST of the repair/calibration,
2. Model and serial number of product,
3. Repair instructions and/or specific problems you are having with the product.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. That way our customers get the latest in technology and engineering.

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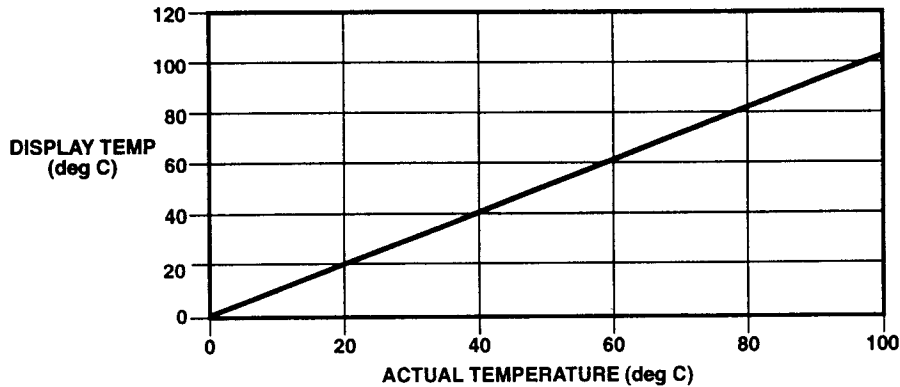


Figure 4-1. Display Versus Actual Temperatures

Intermediate temperatures may be corrected for inaccuracies by reading them off the graph. As an example, consider the plot below:

SAMPLE: The thermometer reads 2° high in the ice bath and 3° high in boiling water. In this example, it is assumed that calibration was carried out at sea level. If this were not the case, the high point on the graph would be adjusted on the horizontal axis according to Figure 4-1, above. Assume that the thermometer reads 27.5°C. Find this value on the vertical axis and then read over and down to the horizontal axis to find the actual temperature. In this case, it is 25.2°C.

To complete the calibration of the probe, immerse the probe and the calibrated thermometer in a cold water bath (or any other suitable liquid) which is at a temperature between 5 - 15°C. Adjust the thermometer readout using the calibration graph and then adjust the low temperature potentiometer (second from the left) on the rear panel until the OMEGA Hot Plate/Stirrer readout is equal to the corrected value. When this adjustment is done after the high temperature calibration as described above, the calibration of the external probe is complete.

SECTION 5 TROUBLESHOOTING

PROBLEM	WHAT TO DO/EXPLANATION
1. The sample temperature does not rise as rapidly as the programmed ramp value.	Try heating a smaller sample. The heating capacity of the OMEGA Heater/Stirrer is probably not adequate to raise the sample temperature at the programmed rate.
2. The probe temperature does not display 100°C or 212°F when immersed in boiling water.	Check the boiling point correction table on page 13 if you are in a location which is 1000 ft. or more above sea level. or Perform the probe calibration procedure given in Section 4.
3. The probe temperature readout does not display 0°C or 32°F when immersed in an ice bath.	Check the purity of the water. Dissolved substances will usually lower the freezing point of water. or Perform the probe calibration procedure given in Section 4.
4. The sample temperature reading remains higher than the target temperature.	Check the ambient temperature. The target temperature may be below room temperature.
5. The probe temperature reads 0°C or 32°F regardless of the target setting.	Check to see that the probe plug is seated tightly and making contact. If it is not making contact the readout will default to 0°C or 32°F.
6. The stir bars are turning at too low a speed or are revolving erratically.	Check to see that the sample containers are centered over the stir bar motors. or The stir bars may not be able to keep up with the motors due to the viscosity of the liquid sample. Also, stir bars lose magnetic strength when dropped or stored improperly. Try a new stir bar.

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