# OPERATING MANUAL

## EchoTherm™

## DIGITAL CHILLING INCUBATOR

## MODEL IN30/IN40/IN50-12VDC

DOCUMENT NUMBER IN30-10

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TORREY PINES SCIENTIFIC, INC.

2713 Loker Ave. West

Carlsbad, CA 92010

Telephone: (760)-930-9400

TOLL FREE: (866)-573-9104

Fax: (760)-930-9480

E-Mail: info@torreypinesscientific.com

Web Site: www.torreypinesscientific.com

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## I. INTRODUCTION

Congratulations on your purchase of a Torrey Pines Scientific EchoTherm™ Digital Chilling Incubator. Please read these instructions carefully to insure that you receive the maximum benefit from it.

## II. WARRANTY

Torrey Pines Scientific warrants this unit to be free from defects in material and workmanship for a period of one year from the date of purchase. If repair or adjustment is necessary within the one year period, and has not been the result of abuse or misuse, please return the unit, freight prepaid, and correction will be made without charge. Out of warranty products will be repaired on a charge basis.

## III. RETURN OF ITEMS

*Authorization must be obtained before returning items for any reason.* When applying for authorization, please include data regarding the reason the items are to be returned. For your protection, items must be carefully packed to prevent damage in shipment and insured against possible damage or loss. Torrey Pines Scientific will not be liable for damage resulting from careless or insufficient packing. A 15% restocking charge will be made on all unauthorized returns.

**NOTE:** We reserve the right to make improvements in design, construction and appearance without notice.

## IV. CAUTIONS

HEATED SURFACES

The Models IN30/IN40/IN50 Chilling Incubators have a temperature range from 4°C (39.2°F) to 70°C (158.0°F). At 70°C the wire racks and other metal surfaces inside the chamber are hot enough to cause burns if touched. Please use care when placing samples into or removing samples from a heated chamber.

ELECTRICAL

The IN30/IN40/IN50 Chilling Incubators operate from a universal, bench top power supply that takes AC inputs from 100VAC to 260VAC, 50/60Hz and converts that to 12 volts DC for the unit. The instrument is intrinsically safe. Even so, take the normal care and precautions one would use with any electrical appliance. This product is suitable for installation category II, pollution degree II.

ENVIRONMENTAL OPERATING CONDITIONS

The Chilling Incubator is intended for indoor use. Ambient temperatures for the lab should not exceed the range of 15°C to 22°C for proper performance of the instrument. Temperatures from 5°C to 40°C will not affect the structure of the unit. Maximum relative humidity of 80% for temperatures up to 31°C decreasing to 50% for relative humidity at 40°C should not be exceeded.

CONDENSATION

Condensation can occur in the sample chamber when working at very low temperatures for long periods in a humid environment. Precautions should be taken to assure that your samples are not affected. Something as simple as placing a paper towel on the bottom of the chamber can help. If condensation needs to be completely eliminated, a good amount of desiccant may be needed. If condensation occurs, it will run toward the front of the chamber where it can easily be cleared.

GENERAL

The IN30/IN40/IN50 incubators are designed for laboratory use as instructed in this manual. If the instrument is used in a manner not specified by the manufacturer damage may occur that may not be covered in the warranty.

## V. SET UP INSTRUCTIONS

The IN30/IN40/IN50 Digital Chilling Incubator are extremely simple to use, set and forget, units. The digital, microprocessor design and PID temperature control will assure that the correct temperature as set is attained and held . . . **exactly even through changes in room temperature.**

SET UP

1. Unpack the unit carefully. Be sure to save the packing material in case the unit needs to be returned to the factory for service.
2. The units weigh between 45 to 65 pounds (20.4 kg to 29.4kg), are bulky, and have no handles. It is best to have two people remove the unit from its box and place it on the lab bench. Always cradle the unit from the underside. Two people should always be used to move the unit.
3. Plug the power supply cable into the jack on the rear of the unit. Plug the line cord into the power supply. Plug the other end of the line cord into a properly grounded three-wire outlet of proper voltage.

5. Position the unit on a bench where it has at least 6" (15.24 cm) clearance from the back of the unit to the wall, bench or other obstruction. The cooling fan on the rear of the unit needs to draw air clearly to cool the Peltier unit. Also, there must be about 3" (7.62 cm) clearance on either side of the unit and 6" (15.24cm) on top of the unit to allow proper venting.
6. Place the wire racks provided into the slots selected.
7. Turn the unit on by the main On/Off switch on the rear panel. The display on the front panel will illuminate and display the chamber temperature. The fans on the rear panel and inside the instrument chamber will start to run. The instrument is now ready to use.

## VI. GENERAL DESCRIPTION

The Torrey Pines Scientific IN30/IN40/IN50 Chilling Incubators are digitally controlled, Peltier driven chilling incubators. Because they are Peltier driven, they have no CFC's or other refrigerating gas. Also, being Peltier driven, these units have the ability to heat and cool ***and control exactly at or near ambient room temperature.*** They can hold temperatures accurately, and reproduce temperatures exactly. The chamber is molded ABS plastic and the racks are electro-polished steel.

Since these units are Peltier driven there is a fan in the chamber and one on the rear of the unit. The internal fan is used to keep the chamber at a uniform temperature throughout. There is an inner chamber door of clear polycarbonate to help hold the chamber temperature while viewing the sample.

Temperature is sensed inside the chamber. The settable temperature range is from 4.0°C to 70.0°C. The unit has a membrane keypad with tactile touch and audible feedback for setting temperature, timer, temperature ramping, and auto-off.

The timer displays days, hours, minutes, and seconds to a maximum of 99 days. When the timer counts to zero, it will sound the audible alarm. The unit can be set to turn off the heater/chiller at the end of a timed event by using the AUTO-OFF function.

The incubators also have a temperature ramping feature for setting exactly timed rates of heating or cooling.

The IN30/IN40/IN50 units are supplied with an RS232 I/O port for taking data or for instructing the unit from a computer. Programming the unit to do complex profiles is possible through the RS232 port. More information is available on this in a later chapter.

## VII. FRONT PANEL

The front panel of the IN30/IN40/IN50 Chilling Incubators have a display and keyboard for monitoring and controlling all heater/chiller, ramping and timer functions. When the power is first turned on the display will show the actual chamber temperature and the timer with all zeros.

The display is a backlit two-line alphanumeric type with 16-characters per line. When a target temperature is set the display will show the target and actual temperatures on the top line of the display. When a timer value is entered it will be displayed on the bottom line of the display in days, hours, minutes and seconds.

**NOTE: The front door of the units can be removed if wanted. Just open the door fully and lift it straight up.**

## VII. REAR PANEL

The rear panel of the IN30/IN40/IN50 has a connector jack for the power supply input, and the main On/Off switch. In addition, the rear panel has the I/O port for the RS232 and the reorder label. The I/O port will be discussed later in the chapter on the RS232. The reorder label tells the model number, serial number, operating voltage of the unit, power consumption and the address information for Torrey Pines Scientific.

The I/O port will, when used with the proper connector and cable allow the user to write software to control the unit remotely by a computer. This can be simple settings or complex temperature/time profiles.

## VIII. DISPLAY

The display is a two-line 16-digit alphanumeric back lighted LCD. When a target temperature has been set the display will show the target temperature to the left of the actual chamber temperature. When a temperature ramp has been set, the value will appear to the right of the actual temperature.

## IX. SETTING TEMPERATURE, TIMER, AND AUTO-OFF

All of these functions are easily set from the keyboard. Please note that the keyboard has both tactile and audible feedback.

SETTING TEMPERATURE

1. Depress and release the TEMP key.
2. Use the LEFT ARROW to move the settable digit to the left. Use the UP or DOWN ARROW to scroll to the value wanted for that digit. USE the RIGHT ARROW to move to the next digit to the right. Use the UP or DOWN ARROW to set that digit. Move to the last digit and set that value using the UP or DOWN arrows.
3. Depress ENTER. The target temperature is now set. The actual chamber temperature will now start to change and move toward the target temperature set.
4. To remove a target temperature hit TEMP, ERASE. The target temperature is now gone and the unit will stop heating or chilling and will start to drift back to room temperature.

**NOTE: If you want to cancel and instruction made before entering the value hit CANCEL. To achieve the minimum temperature of 4°C the ambient temperature of your laboratory should not be over 22°C for the IN30 and IN50 and 18ºC to 20ºC for the IN40. The units have a below ambient temperature range from ambient room temperature. This range is about 16°C to 20°C and is load dependent. It may take longer to reach very low temperatures when the chamber is fully loaded.**

**The units have a power failure backup circuit. When power fails and then returns the units will continue to run at the temperature targeted prior to the power failure. When power returns the temperature display will flash to let the user know that a power interruption has occurred. To stop the temperature from flashing touch CAN.**

SETTING A TEMPERATURE RAMP

Temperature ramping is increasing or decreasing temperature at a given rate, that is, a change in temperature over a specific time. The setting is always in degrees C/Hour. When a ramp is set the setting will be displayed to the right of the chamber temperature. If a ramp is not needed it need not be set.

**Note: Always set the temperature ramp before setting the target temperature. The ramp rate can only be set to go as fast as the unit can drive the chamber if no ramp were used. Normally the chamber will go from temperature A to temperature B faster without a ramp rate set. Ramping is normally used to slow the temperature increase or decrease for target A to target B. The maximum ramp rate settable is 99.9°C/Hour.**

1. Depress RAMP. Note that the digits to the right of the actual chamber temperature will illuminate with the far right digit flashing.

2. Use the UP or Down ARROW to set the flashing digit. To move to the other digits to be set use the LEFT or RIGHT ARROW.

3. When the value is set press ENTER. The ramp rate is now set.

SETTING TIMER

The timer is a count down timer that can be set to a maximum of 99 days, 23 hours, 59 minutes, and 59 seconds. It can be set to be used with an auto-off function that will turn the heater or chiller off at the end of the count down period. The auto-off function is separate from the timer. The timer can be used without the auto-off function.

1. Depress and release the TIME key. The timer display, which is across the whole lower line of the display, will start to flash the digit to the far right, the 1 second digit.

2. To move to the left and set days, hours or minutes, press the LEFT ARROW to the desired digit. Press the UP or DOWN ARROW until the value sought is reached. Scroll left or right using the RIGHT or the LEFT ARROW to get to the other digits, and then set them using the UP or DOWN arrows until the timer value sought is reached.

3. Press ENTER and the display will show AUTO-OFF, ENTER/CANCEL? Hitting ENTER will start the timer with the auto-off function set to turn the heater/chiller off at the end of the count down. Hitting CANCEL will cancel the auto-off function making the timer count down without an instruction to turn off the heater/chiller.

**NOTE: The timer will count down to zero. At zero, the audible alarm will sound once a second for one minute. Also, as the timer starts to sound the alarm, the display for the timer will start to count up letting the user know how much time has passed since the timed event ended. The audible alarm can be turned off at any time during the first minute by pressing CAN.**

## X. CALIBRATION

**NOTE:** The unit stores calibration information in memory even through power failures. The temperature calibration is set at the factory and should be accurate enough for most applications. However, the user may wish to calibrate the unit to their own standard. This is done in the field following the instructions below. The calibration is done at two separate temperatures for straight line interpolation.

CALIBRATION

The unit is sent to the user with two point calibration for accuracy at every temperature. For two point calibration, one calibration temperature must be above 37.0 C and the other must be below 37.0 C. Use temperatures around 10.0 C and 60.0 C. Follow the calibration procedure below for one point and then repeat the procedure at the second point. When you calibrate the second point, the calibration of the first point is not affected. All other temperatures will adjust to a straight line through the two calibration points.
**NOTE:** Measuring the chamber temperature is easy to do, but not necessarily accurately. Glass thermometers found around a lab are not accurate enough or readable enough to do a good job. Good, certified glass thermometers are available from lab supply dealers as are accurate digital thermometers.

Setting a Calibration Point

Before setting calibration always clear the existing calibration. To clear calibration:

1. Hold the TEMP key for 5 seconds until the display says CALIBRATE? On the top line of the display and ENTER/CANCEL on the bottom line of the display.

2. Depress ENT
3. Then press ERASE. The display will now say ERASE Cal? on the top line and ENTER/CANCEL on the bottom line of the display.
4. Depress ENT.

The existing calibration is now erased.

CALIBRATION

Use temperature settings of 10.0°C for the low calibration point and 60.0°C for the high calibration point.

1. Set the unit to the target temperature for the low calibration point. Give the chamber time to reach and equilibrate at this temperature, about 30 minutes after initially reaching the target. Measure the chamber temperature using your laboratory standard.
2. Push and hold the TEMP key for 5 seconds until the display says CALIBRATE? on the top line of the display.
3. Depress ENT.
4. Enter the value into the display as read from your temperature standard and depress ENT.
5. Repeat the procedure above at the high calibration temperature point. When you calibrate the second temperature point the first point will not be affected.

Calibration is now complete.

## XI. OTHER OPERATIONS

The IN30/IN40/IN50 Chilling Incubators have been designed with an RS232 interface. The port is on the rear of the unit and is a standard D subminiature connector. This interface is input and output. This means that the unit can be controlled remotely from a computer to perform any number of procedures or routines as complicated as you wish. The interface also can be used to collect data from the unit for record keeping or for regulatory agencies as needed. The instructions for connection and use follow.

RS232 INTERFACE SPECIFICATION

Parameters: 2400 baud, 8 data bits, 1 stop bit, no parity. No handshake hardware or software is necessary. It will work well on a Windows terminal program per these settings.

All communications settings and queries are done using ASCII characters with the carriage return as the terminating character (CR1).

Pins in use on the RS232 jack are:

Pin 2 - RXD (data from incubator to PC)

Pin 3 - TXD (data from PC to incubator)

Pin 5 - Ground

| Query | Command |
|---|---|
| Request current temperature | a |
| Request current timer | b |
| Request auto mode status | c |
| Request target temperature | d |

For example: to request current temperature program you need to send two characters:
aCR where “CR” is carriage return.and the unit responds xx.xCR, where xx.x is the present temperature.

Note: If there is no Target Temperature, the unit will send the message “ no target set”CR
Auto status is reported as “ Auto On”CR or “Auto Off”CR

| Set | Command |
|---|---|
| Target Temperature | A |
| Timer | B |
| Auto | C |
| Change display to temperature indicator | D |
| Change display to Timer indicator | E |

For example:

To set a temperature target of 50.0°C , the command string is as follows:
A(space)50.0CR

To set a Timer for one hour:

B(space)010000CR

To set Auto-off on

C(space)ONCR

To set Auto-off off

C(space)OFFCR

To change the display mode to temperature indicator

D(space)CR

To change the display mode to timer indicator

E(space)CR

If the command string is valid the unit will respond with the message “Command OK”CR and if the command is incorrect “ Command Failed”CR