OPERATING MANUAL

Echotherm™
PROGRAMMABLE
HPLC COLUMN CHILLER/HEATER
MODEL CO50

DOCUMENT NUMBER CO50-01
November 2008

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I. INTRODUCTION

Congratulations on your purchase of a Torrey Pines Scientific EchoTherm™ Model CO50 HPLC Column Chiller/Heater. You will find it easy to use and to maintain. 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. ***Be sure to fill in and return the enclosed warranty registration card.***

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: Torrey Pines Scientific reserves the right to make improvements in design, construction and appearance without notice.

IV. LABELS

There are various labels on the body of the unit. Listed below are the labels and their meanings.

This symbol means: **Attention. The instruction manual is to be consulted for further information.**

This symbol means: **Warning. Hot surface.**

This symbol is the **WEE** symbol meaning this unit must be disposed of in a manner prescribed by your local government for any electrical or electronic device.

V. CAUTIONS

HEATED SURFACES

The Model CO50 HPLC Column Chiller/Heater has a temperature range from 4.0°C (39.2°F) to 100.0°C (212.0°F). At 100.0°C the metal surfaces inside the chamber are hot enough to cause burns if touched. **Please use care when changing columns or fittings when the chamber is hot.**

ELECTRICAL

The CO50 HPLC Column Chiller/Heater is made in models that operate from a bench top power supply that takes 100VAC to 260VAC, 50/60Hz inputs from the AC line and converts that voltage to 12VDC for the unit. Take the normal care and precautions one would use with any electrical appliance. **Be certain to use a line cord of the same type and rating as the one supplied with this unit.**

CONDENSATION

Condensation can occur in the chamber when working at low temperatures for long periods in a humid environment. If condensation occurs, it will run toward the right end of the chamber to the chamber drain. Have a collection vessel to catch the condensate.

GENERAL

The CO50 is designed for laboratory use and for use only as instructed in this manual. If the instrument is used in a manner not specified by the manufacturer, the protection provided in the design of the equipment may be impaired.

VI. SET UP INSTRUCTIONS

The CO50 HPLC Column Chiller/Heater is an extremely simple use unit. The digital, microprocessor design and PID temperature control will assure that the correct temperature as set is attained and held...**exactly.**

SET UP PARAMETERS

1. Ambient operating temperature range is from 5°C to 40°C.

2. Maximum altitude of operation should not exceed 2000 meters.

3. Maximum ambient operating relative humidity should not exceed 80% at 31°C decreasing linearly to 50% relative humidity at 40°C.

ENVIRONMANTAL INFORMATION

1. This unit is for installation category II.

2. This unit is rated pollution degree 2.

SET UP INSTRUCTIONS

1. Unpack the unit carefully. Save the packing material in case the unit needs to be returned to the factory for service. The unit weighs 14.5 pounds (6.6kg) and has no handles. Use care when removing it from the box to avoid damage if dropped.

2. Plug the line cord into the receptacle on the bench top power supply provided. Plug the thin wire end into the jack on the rear of the unit. Plug the line cord into a properly grounded three-wire outlet of proper voltage.

3. Position the CO50 on a bench where it has at least 6" (15.24 cm) clearance on either side of the unit to the wall or other equipment. The fans on the bottom of the unit need to draw air clearly to the Peltier module, so be sure the bottom of the unit is clear as well.

4. Turn the unit on by the main ON/OFF switch on the rear panel. The display on the front panel will illuminate and be in the temperature mode/timer mode. The fans on the bottom panel will start to run. The instrument is now ready to set up for columns and fittings.

5. The tubing to connect the columns should be routed from the pump and detector to inside the chamber through the slits cut into the ends of the chamber.

6. Drain. There is a chamber spill drain on the unit on the right side. It is a stainless steel tube that is ¼" OD and ⅛" ID. Tubing or a small vessel can be used to collect spills.

7. Column mounting. The chamber on the CO50 can accommodate 1-30cm by 1/4" or 3/8" diameter column or any columns of those diameters of lesser length. The columns are mounted by snapping them into the clips mounted on the ridge on the chamber floor. Larger diameter columns may be used by removing the clips and laying the column in the chamber.

VII. GENERAL DESCRIPTION

The Torrey Pines Scientific CO50 HPLC Column Chiller/Heater is a digitally controlled, fully programmable Peltier driven chilling/heating column oven. Because it is Peltier driven, it has no CFC's or other refrigeration gases. Also, being Peltier driven, the unit has the ability to heat and cool and control temperature exactly ***at or near ambient room temperature regardless of changes in room temperature.*** The unit can hold temperatures accurately, and reproduce temperatures exactly. The chamber is clear anodized aluminum.

Since the unit is Peltier driven it has fans on the bottom of the unit. The external fans are used to remove the heat or cold, as appropriate, from the chilling/heating modules. These fans must be kept clear on the bottom of the unit so that the unit can draw air in and vent it properly out the sides. The fans run continuously when chilling. When heating to targets over 80.0ºC the fans will turn off.

Temperature is sensed by a platinum RTD sensor on the bottom of the chamber. The settable temperature range is from 4.0°C to 100.0°C. The unit has a membrane keypad with tactile touch and audible feedback for setting temperature, timer, auto-off, and for programming the unit.

The timer is in days, hours, minutes and seconds. When the timer counts down to zero it will sound the audible alarm for one minute and start to count up so that the user will know how long it has been since the alarm sounded. The unit can be set to turn off the heater/chiller at the end of a timed event by using the AUTO-OFF function. This also may be done within a program.

The CO50 is 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.

VIII. FRONT AND REAR PANEL

FRONT PANEL

The front panel of the CO50 HPLC Chilling/Heating Column Oven has a digital display and keyboard for monitoring and controlling all functions. When the power is turned on, the display will illuminate and show the actual chamber temperature and the target temperature.

The display is a two line alphanumeric type with 16 characters per line. In addition, there are two red's on the front panel keyboard. One is the power ON indicator and the other is the stable temperature indicator. The stable temperature lamp is lit when the actual chamber temperature is stable and is within 0.2ºC of the set target temperature.

REAR PANEL

The rear panel of the CO50 has an ON/OFF switch, a DC power input jack for connecting the bench top power supply, a counter jack for connecting the injection counter, and an I/O port for the RS232. The I/O port will be discussed later in the chapter on the RS232. There is a reorder label on the rear panel that 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, allow the user to write software to control the unit remotely by the computer. This can be simple or complex temperature/time profiles. The port also may be used to collect temperature data.

IX. DISPLAY

The display is a two-line alphanumeric type with 16-charracters per line. When in the normal mode there is a decimal between the unit and tenth degree with a “C” for degrees centigrade in the last place on the right. When displaying the timer the display will show a colon between the digits on the timer on the second line of the display. The top line will show the target and actual chamber temperatures.

When running a program the display will show additional information about the program. This will be explained in the section on programming.

X. 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 hold the UP or DOWN ARROW until the display scrolls to the target temperature desired (this range is from 4.0°C to 100.0°C). Release the arrow key. The unit will now proceed to the target temperature instructed.

   NOTE: The display will now display the target and actual temperatures. This will show the user both parameters. Also, note that to achieve the minimum temperature of 4.0°C the ambient temperature of your laboratory should not be over 24.0°C.

2. To target a new or different temperature simply depress and hold the UP or DOWN ARROW until the display shows the new temperature desired.

3. To turn off the target temperature the unit must be turned off at the AC input switch. Scrolling the target temperature back to room temperature will cause the unit to target this as a new temperature and does not turn off the target temperature.

SETTING THE TIMER

The TIMER can be set to count down, time out and sound an audible alarm, and it can be set to work with the auto-off function to turn the chiller/heater off at the end of a count down timed period. When the timer counts down to zero, it will start to count up so that the user will know how long it has been since the timed event. To stop the alarm and reset the timer display to zero, touch the DOWN arrow.

SETTING AUTO-OFF

AUTO-OFF is an on/off toggle that activates the AUTO-OFF function. TIMER OPTIONS must be reached in the secondary functions of the unit. Pressing both UP and DOWN arrows together will access the function. AUTO-OFF can be set to either YES or NO by using the DOWN arrow. Once the function is set, hit both the UP and DOWN arrows together to exit the function. Now the timer can be set following the instructions above. When activated, at the end of a count-down timer setting, the heater/chiller will turn off when the alarm sounds.

SETTING COUNTER

The CO50 comes with an injection counter for use with your auto-sampler. There is a small port on the rear of the unit that accepts the counter cable supplied with the unit. Attached the counter cable to your chromatograph or auto sampler and plug the male connector into the rear of the unit.

Using the secondary functions of the unit, scroll the pointer down to CLEAR COUNTER. Press both UP and DOWN arrows to clear the counter. Then scroll up to SET COUNTER, and press both the UP and DOWN arrows. The counter is now active and will show up on the main screen of the display. Injections will count up as they are made.

XI. CALIBRATION

NOTE: The unit stores calibration and target temperature information in memory even through power failures. The temperature calibration is set at the factory and should be accurate enough for all applications. However, the user may wish to calibrate the unit to their own standard. This can be done in the field following the instructions below.

CALIBRATION

Calibration is two-point. One calibration temperature must be above 37.0ºC and the other must be below 37.0ºC. For best results, use temperatures around 10.0ºC and 80.0ºC.

To calibrate the temperature, set the unit to go to 10.0C. Wait for 30 minutes to be sure the chamber is stable and equilibrated. Measure the chamber floor near the chamber center with a good surface temperature probe. Then use the secondary functions and scroll to CLEAR CALIBRATION. Clear the calibration points by pressing both the UP and DOWN arrows at the same time. Now use the secondary functions, and scroll to CALIBRATE. Press both the UP and DOWN arrows together to move the pointer arrow to the calibration point wanted, HI or LOW. Then press both the UP and DOWN arrows together and the display will show ACTUAL and MEASURED.

Set the LOW temperature to the chamber temperature measured on your external meter. Repeat the process at 80.0ºC or the high temperature calibration point chosen. 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 of the chamber bottom is not easy to do. A good surface temperature probe is needed. Ask your dealer or Torrey Pines Scientific, Inc. about this if you have a problem. Generally speaking, glass thermometers found around a lab are not accurate enough or readable enough to do a good job. A good digital thermometer is best.

XII. PROGRAMMING

Note-The timer on the unit can be used two ways in a program. Follow the instructions below for best results.

Setting the TIMER in a program

The timer can be set to run when a program step starts or to wait until a target temperature is reached before starting to count down. This latter setting is preferred for more accurate work.

After the unit is turned on the display will show SET POINT and the TEMPERATURE of the chamber with their associated values. Depress both the UP and DOWN arrows together to reach the secondary functions. Use the DOWN arrow to scoll the pointer arrow down to Pgm Options. Depress the UP and DOWN arrows together and the screen will show TIMER WAITS UNTIL PT=SP: yes or no. Use the Up arrow to move to the setting wanted. Depress both the Up and DOWN arrows together and the display will exit the timer start settings. Then scroll the pointer arrow up to EXIT and press both the UP and DOWN arrows again. The normal display screen will appear.

WRITING A PROGRAM

Before entering a program, write out the steps or profile of the program first. To enter the program, do the following:

Depress the UP and DOWN arrows together. The display will go into the secondary functions with the pointer arrow at EXIT. Use the DOWN arrow to scroll down to PROGRAM. Depress both the UP and DOWN arrows together and the following screen will appear:

→ Pgm 1	Run	Edit
New	Clr	Exit

The pointer arrow can be moved around the screen by touching the DOWN arrow.

Pgm 1 tells the number of the program. Touching the UP arrow will advance the number through programs 1 to 5. Start with program 1 for your first program

Run When the pointer is on Run, the program entered into Pgm can be started to run by pressing both the UP and DOWN arrows together.

Edit When placing the pointer here and pressing the Up and DOWN arrows together enters the screen for writing programs.

New Placing the pointer here and touching the UP and DOWN arrows together erases a program in the numbered slot so that a new program can be written in that slot.

Clr placing the pointer here and pressing the UP and DOWN arrows will clear the program written in that slot. This acts like New.

Exit Placing the pointer here and pressing the Up and DOWN arrows will exit the program mode and return the display to PROGRAM. Then scroll up to EXIT and press the Up and DOWN arrows to return to the home screen.

To write a program do the following:

1) When the display is at Pgm 1, place the pointer arrow next to Prg and use the UP arrow to identify the program. Pgm 1 through 5 can be used.
2) Scroll the pointer arrow to Edit using the DOWN arrow. Press both the UP and DOWN arrows. The following screen will appear:

SP: xx.x (the actuat temp) ←X →

1 0d 0h 0m 0s

Sp: is the actual temperature or the target you will set.
→ is to step up in a program
← is to step down in a program
1 is the program step
0d is days on the timer
0h is hours on the timer
0m is minutes on the timer
0s is seconds on the timer
X is to exit the program

3) Starting at program step 1 use the DOWN arrow to move the pointer arrow to SP: and use the UP arrow to set the first target temperature. Note that if you overshoot the temperature you will have to continue to go up until you go around to the number again.

4) Move the pointer to 0s or 0m or 0h or 0d and use the UP arrow to set the timer value for the temperature set. By now the timer should have been set to start to run with initiation of the first temperature step or after the first target temperature has been reached.
5) Repeat the above steps until the program is complete. Then scroll the pointer to X and touch the UP and DOWN arrows together. The next screen that will appear will ask how many cycles the program is to run. 1 to 99 cycles are available. The screen will appear like this:

Pgm: 1 Cycles=1

Run Exit

Pgm 1 shows the program number
Cycles is the number of cycles from 1 to whatever number chosen
Run Starts the program running when the pointer is placed on it and the UP and DOWN arrows are pressed
Exit is to exit the programming mode. The program is now complete and can be run.

RUNNING A PROGRAM

Once a program is written and stored in memory it can be recalled and run at any time by doing the following:

1) When on the home screen, depress the UP and DOWN arrows.
2) Use the DOWN arrow to move the pointer to Program. Depress both the UP and DOWN arrows to move to the next screen
3) Use the Down arrow to move to the pointer to RUN. Depress both the UP and DOWN arrows and the next screen will come up identifying the program number and giving the user one more chance to change the cycle setting.
4) Use the DOWN arrow to move the pointer to Run and depress the UP and DOWN arrows. The program will start to run and the following screen will appear. This screen shows all running functions of the program for monitoring.

Sp: (and a value) T: (and a value)

1 1 1 0d 0h 0m 0s

1 The first digit shows the program being run. It will change when another program is run.
1 The second digit shows the program step being run. It will change as the steps advance in the program.
1 The third digit shows the program cycle being run. If only one cycle is being used, it will not change. If more than one cycle is being used, it will display the cycle currently being run.

Sp Shows the temperature target or set point for the program step.
T Shows the actual chamber temperature.

Remember that as the timer counts down and the unit goes through all its steps it will reach zero on its last step. At that time the alarm will sound and can be stopped by pressing either the UP or DOWN arrow.

XIII. OTHER OPERATIONS

The CO50 has 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 SPECIFICATIONS

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 1 (upper right pin when looking at the jack) is ground. Pin 3 (third pin from the right on the upper row) is RX. Pin 4 (fourth in from the right on the upper row) is TX. .

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 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. If the command is incorrect "Command Failed"+CR will be the response.

Note: to comply with CE and to avoid possible EMI radiation from the RS232 cable, use a shielded cable.

XIV. CLEANING, MAINTENANCE, AND CONSUMABLE PARTS

CLEANING

This unit is subject to spills during normal use. Be sure to clean all spills quickly. Wipe spills with a soft cloth or paper towel. If a cleaning solution is necessary, use a mild soap or detergent solution and a soft cloth.

MAINTENANCE

There is no ongoing maintenance program needed with this unit other than the normal care and cleaning as instructed above, and a simple inspection done whenever the unit is to be used. This simple inspection should include:
1- Checking the AC line cord for fraying or burns.
2- Checking that the unit is not dirty to a point where proper performance is impaired. This is especially important relative to the membrane switch and LCD window.
3- Being certain to store the unit properly when not in use in an area that will not have items placed on top of the unit, and covered in a way that will keep dirt and other foreign bodies out of the unit.

SPARE AND COMSUMABLE PARTS

Part Number	Description
730-0001	Power Cord, US
730-0006	Power Cord, German (European)
730-0008	Power Cord, UK
730-0004	Power Cord, Italian
730-0005	Power Cord, Australian

XIV. ADDITIONAL SYMBOLS

The following are additional symbols found on the labels of the instrument.

Symbol	Description	Symbol	Description
V	Voltage	W	Power
~	Alternating Current	F	Fast Acting Fuse
A	Current	I	Mains On
Hz	Frequency	O	Mains Off