OPERATING MANUAL

Echotherm™
HPLC COLUMN CHILLER/HEATER
MODEL CO30

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TABLE OF CONTENTS

I. INTRODUCTION

Congratulations on your purchase of a Torrey Pines Scientific EchoTherm™ Model CO30 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.

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.**

V. CAUTIONS

HEATED SURFACES

The Model CO30 HPLC Column Chiller/Heater has a temperature range from 4.0°C (39.2°F) to 70.0°C (158.0°F). At 70.0°C the metal surfaces inside the chamber are hot enough to cause burns if touched. Please use care when changing columns, fittings or valves when the chamber is hot.

ELECTRICAL

The CO30 Chilling/Heating HPLC Column Ovens are made to 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. This makes the instrument intrinsically safe since it uses only low voltage DC to operate. 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 CO30 is intended for indoor use. Ambient temperatures for the lab should not exceed the range of 15ºC to 22ºC for proper performance of the instrument. Temperatures from 5ºC to 40ºC will not affect the structure of the unit. Maximum relative humidity of 80% for temperatures up to 31ºC decreasing to 50% for relative humidity at 40ºC should not be exceeded.

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 front of the chamber and out the chamber drain. Use a collection vessel to catch the condensate.

GENERAL

The CO30 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 CO30 HPLC Column Chiller/Heater is an extremely simple use, set and forget, 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. Be sure to save the packing material in case the unit needs to be returned to the factory for service. The unit weighs 23 pounds (10.4 kg), is bulky, and has no handles. It is best to have two people remove the unit from the box and place it on the lab bench. Always cradle the unit from the underside.

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

3. 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 module. Also, there must be about 12" (30.48 cm) clearance on either side of the unit to allow proper venting.

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

5. Valve installation. Any Rheodyne valve number 7175, 7725, 8125, or 9125 will fit the mounting hole in the door. To install the valve, remove the chamber hole-plug and the insulation plug from the inside of the door. Next, remove the hole-plugs (3) on the outside of the front door of the unit. Mount the valve from the inside of the door using the holes to secure the valve to the door from the outside.

6. The tubing to connect the valve and/or columns should be routed from the pump and detector to inside the chamber through the slits cut into the door gasket near the bottom of the chamber. This will cause the least stress to the tubing when opening and closing the chamber door and will keep the tubing as short as possible.

7. Drains. There are two drains in the unit. One is on the bottom left of the door and is for the valve. The other is in the floor of the unit and is for chamber spills. The valve drain exits the chamber on the left side of the door. The chamber spill drain exits the chamber on the bottom center of the unit. Both require 1/8" ID tubing.

8. Column mounting. The chamber on the CO30 can accommodate up to 4-30cm by 1" columns. Any size column up to that size can be mounted easily. There are four rods in the chamber for mounting the columns. The columns are secured anywhere on two of the rods using the “O” rings supplied. Select the “O” rings of proper size to loop over the column and two of the rods. Loop the “O” ring over one rod, lay the column on the “O” ring and then loop the “O” ring over the rod again. **See the drawing on the following page as an example.**

VII. GENERAL DESCRIPTION

The Torrey Pines Scientific CO30 HPLC Column Chiller/Heater is a digitally controlled, Peltier driven chilling/heating chamber. 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 ***at or near ambient room temperature.*** The unit can hold temperatures accurately, and reproduce temperatures exactly. The chamber is epoxy painted aluminum and the rods are clear anodized aluminum.

Since the unit is 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. The external fan is used to remove the heat or cold, as appropriate, from the chilling/heating module. This rear fan must be kept clear, so be sure that the unit is at least 6" (2.4 cm) away from the wall or other obstruction.

Temperature is sensed by a microchip 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, and auto-off.

The timer is in hours, minutes when displaying hours. When the timer counts down to minutes only the display will show minutes and seconds. The timer can be set to 99:99 hours/minutes maximum. When the timer counts down 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 CO30 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 I/O port. More information is available on this in a later chapter.

VIII. FRONT AND REAR PANEL

FRONT PANEL

The front panel of the CO30 HPLC Chilling/Heating Column Oven has a digital display and keyboard for monitoring and controlling all heater and timer functions. When the power is turned on, the display will show the chamber temperature.

The display is a four-digit LCD with decimal for the heater/chiller temperature and a colon for the timer. In addition, there are three green LED's on the front panel keyboard. They tell when the display is in the TIMER mode, TEMP mode, or that AUTO-OFF is activated. When a target temperature has been set, the display will toggle between the target and actual chamber temperatures. The TEMP LED will light when the actual temperature is displayed.

REAR PANEL

The rear panel of the CO30 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, allow the user to write software to control the unit remotely by the computer. This can be simple or complex temperature/time profiles.

IX. DISPLAY

The display is a liquid crystal type with four 5/8" high digits. When in the temperature 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 in the timer mode the display will show a colon between the middle two digits. **The display will show only temperature or timer.**
In the timer mode the display will show 99:99 hours/minutes maximum settable. When the timer counts down past the last hour, the display will switch and show minutes/seconds.

When the display is in the temperature mode, the green LED under the TEMP button will be on.

When the display is in the timer mode, the green LED under the TIMER button will be on.

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 release the TEMP key (if the unit has just been turned on it will already be in this mode.

2. 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 70.0°C). Release the arrow key. The unit will now proceed to the target temperature instructed.

NOTE: The display will now toggle between the target and actual temperatures. This will show the user both parameters. The LED under TARGET will toggle and illuminate only when the actual temperature is displayed. Also, note that to achieve the minimum temperature of 4.0°C the ambient temperature of your laboratory should not be over 22.0°C. The unit has a below ambient temperature range from ambient room temperature. This range is about 16.0°C to 18.0°C and is load dependent. It may take longer to reach very low temperatures when the chamber is filled with large samples.

3. To target a new or different temperature simply depress and hold the UP or DOWN ARROW until the display shows the new temperature desired. Please note that the unit must be displaying temperature to do this. If the unit is in the timer mode then the TEMP key must be depressed first.

4. 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. Only turning the unit off and on again while holding the TEMP key depressed will remove a target temperature. The TEMP key must be held depressed while the unit is turned off and on again because if this is not done the unit will think it has seen a power failure. The unit has power interrupt protection so that when a power failure occurs, the unit will return to what it was doing before power failed. The unit will then flash the AUTO-OFF key when power is restored.

SETTING TIMER

1. Depress and release the TIMER key. This will shift the display to the timer mode.

2. Depress and hold the UP ARROW until the time wanted is in the display. Depressing and holding the DOWN ARROW will move the timer setting to a lower value. When the UP or DOWN ARROW is released the timer will start to count down to zero. When the timer counts down to zero, the audible alarm will sound ten times.

NOTE: Switching between TIMER and TEMP on the display can be done any time during a run without affecting the target temperature or timer. To do this, simply depress and release either the TEMP or TIMER keys.

SETTING AUTO-OFF

AUTO-OFF is an on/off toggle key that activates the AUTO-OFF function. When the key is depressed, the AUTO-OFF light will come on. This tells the heater/chiller to turn off when the timer counts down to zero. If no timer value is set, the AUTO-OFF function will not have any affect on the operation of the unit. Also, AUTO-OFF can be activated at any time during a timer count down without affecting the timer.

1. Depress and release the AUTO-OFF key. This activates this function and illuminates the Auto-Off LED and tells the unit to turn off the heater/chiller when the timer counts down to zero.

2. To turn off this function, simply depress and release the AUTO-OFF key again. The AUTO-OFF LED will go off.

XI. CALIBRATION & POWER FAILURE PROTECTION

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 for most applications. The user may wish to calibrate the unit to his own standard. This can be done in the field following the instructions below. Calibration may be done at a single point or at two separate temperatures for straight line interpolation.

CALIBRATION

Single point calibration is used for maximum accuracy. However, the unit is sent to the user with two point calibration for accuracy at every temperature. If single point calibration is used be sure to clear the memory first. Follow the instructions below for both single point and two point calibration.

Single Point Calibration

1. Clear the calibration in memory by turning the unit off. Then depress and hold the TIMER key while turning the unit on again. The memory is cleared.

2. Set the unit to the target temperature to be calibrated. Measure the chamber temperature using your laboratory standard. Be sure to allow the chamber and your thermometer time to equilibrate at the target temperature you desire.

3. Push and hold the TIMER key for five seconds until the display shows the chamber temperature of the instrument.

4. Touch the UP or Down arrow until the temperature in the display of the CO30 agrees with the temperature as measured in the chamber by your standard.

5. Touch the TIMER key again. After a second or two the unit will display all zeros. Touch the TEMP key and the display will show the target and actual temperatures. The unit is now calibrated at that temperature.

Two Point Calibration

For two-point calibration, one calibration temperature must be above 37.0 C and the other must be below 37.0 C. For best results, use temperatures around 10.0 C and 60.0 C. Follow the calibration procedure as for a single point. Then repeat the procedure at the second point. When you calibrate the second point, the calibration of the first point is not affected. However, 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 fairly accurate digital thermometers.

POWER FAILURE PROTECTION

The CO30 stores the targeted temperature in memory. If power fails and returns, the unit will return to the temperature it was running before the power failure. Also, the AUTO-OFF light will be flashing to tell the user that a power interruption has occurred. To turn off the AUTO-OFF light simply touch the TEMP key. The user can then determine if the interruption has caused a problem with the samples being run. It should be noted that the unit does not distinguish between a power interruption and when the unit is intentionally turned off. Therefore, when the unit is turned back on, it will go back to the target temperature that was running before the unit was turned off.

XII. OTHER OPERATIONS

The CO30 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 required. 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.

XIII. 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
440-0008	O-ring, Large
440-0009	O-ring, Small

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