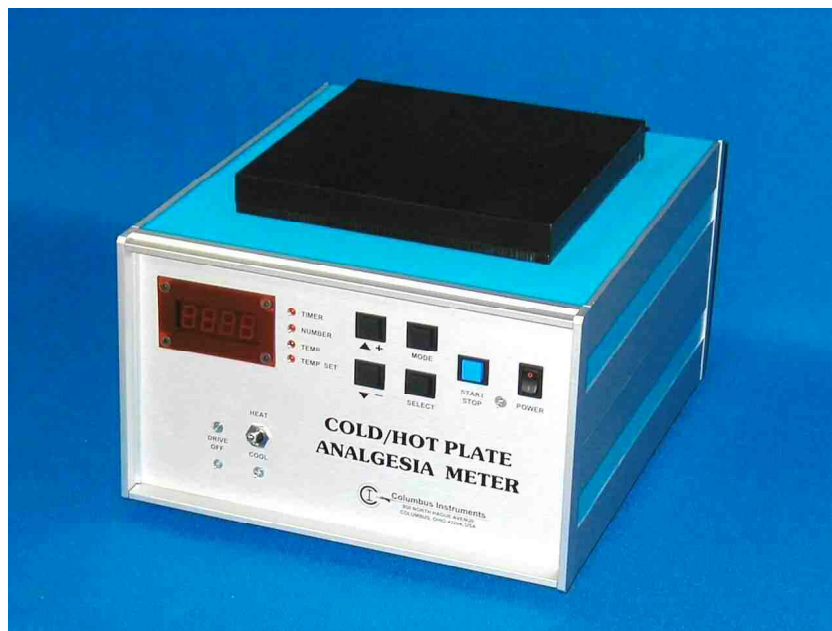


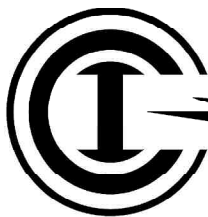
Serial Number: \_\_\_\_\_  
(Please refer to this number for service)

# Cold/Hot Plate Analgesia Meter Instruction Manual



0214-001M

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# COLUMBUS INSTRUMENTS COLD/HOT PLATE ANALGESIA METER OPERATING MANUAL

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- SECTION 1 -

SPECIFICATIONS

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## COLD/HOT PLATE ANALGESIA METER SPECIFICATIONS

### 1.0 BASIC SPECIFICATIONS

Actual Cold/Hot Plate size:	8" x 8" x 3/4"
Finish:	Clear anodized
Temperature range:	5 degrees C. to 79.9 degrees C. (in 20 degree C. ambient environment)
Temperature accuracy:	+/- 0.5 degrees C.
Digital thermometer accuracy:	+/- 0.1 degrees C.
Built-in digital timer:	0 to 999.9 seconds.
Subject ID number range:	0000 to 9999
RS-232 Port, Modem connection:	9600 baud.
Printer Port:	Centronics compatible, dot-matrix output
Remote footswitch:	included
Clear acrylic subject cage with lid:	included

### 1.1 PHYSICAL SPECIFICATIONS

Power requirements:	250 watts (maximum), 120VAC, 60Hz., or 240VAC, 50Hz (Factory selected)
Size:	14.5" x 11.5" x 8.5" (37 x 29.2 x 21.5 cm)
Weight:	22 lbs. (10 kg)

## 1.2 INPUT SPECIFICATIONS

### 1.21 Footswitch Input

The footswitch input is a monophonic 1/4" phone jack on the rear panel of the Cold/Hot Plate. It is designed to be used with a normally open, momentary contact pushbutton or footswitch. The footswitch input is connected in parallel with the front panel "START/STOP" switch.

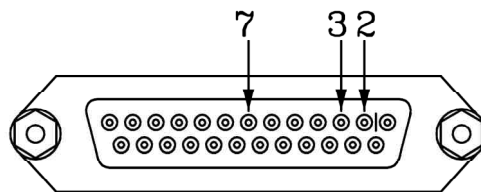
## 1.3 OUTPUT SPECIFICATIONS

### 1.31 Printer Output

The printer output jack is on the rear panel of the Cold/Hot Plate. This 25 pin female D-sub connector is a standard Centronics type parallel printer interface. It can be connected with an IBM style printer cable to any Epson compatible dot matrix printer. Ink-jet and laser printers are NOT supported.

### 1.32 Serial Output

The serial output jack is a 25 pin female D-sub connector on the rear panel next to the printer output. The serial output is a simple three-wire RS-232 interface, none of the handshake lines are used. It is a standard "modem" connection with the output data on pin 3 and the input on pin 2. Pin 7 is the ground connection. The data rate is fixed at 9600 baud: the format is 8 bits, one stop bit, no parity.

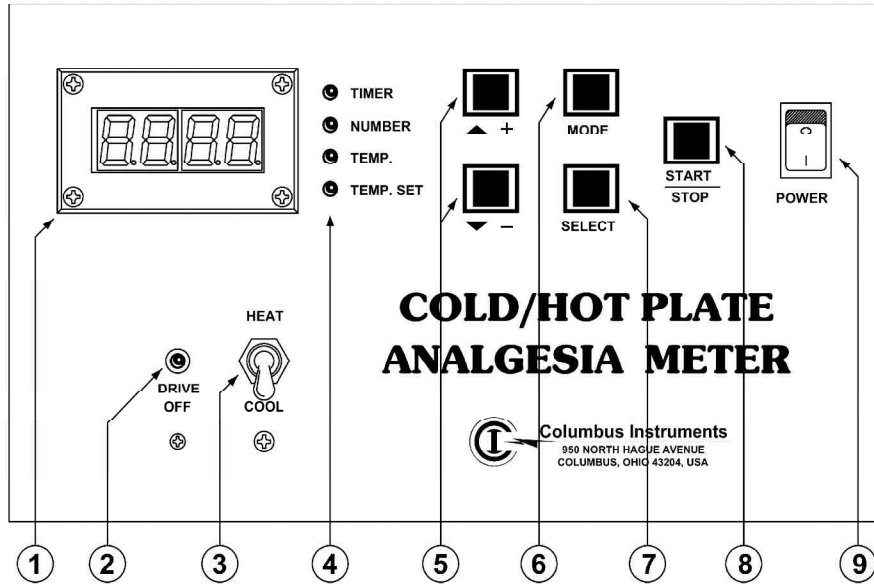


RS-232 CONNECTOR PIN NUMBERS

0100-1025



## 1.4 FRONT PANEL CONTROLS



1. Front panel four digit LED display. This display can show the current plate temperature, the setpoint temperature, the subject number, or the timer count.

2. This LED will begin pulsing on as the plate approaches the set temperature.

3. Set this switch to HEAT for temperatures above 30 degrees, to COOL for below 20 degrees.

4. Mode indicator LEDs. These LEDs indicate what mode the Cold/Hot Plate is in and what information is currently displayed on the four digit readout:

TIMER -- The display is in seconds and tenths. It will begin counting when the START/STOP button is pushed.

NUMBER -- This displays the subject ID number. It will automatically increment by one for each timing cycle.

TEMP. -- Displays the current plate temperature in degrees C.

TEMP.SET -- Displays the temperature setpoint and the printer output status ("P" for printer on, "n" for printer off).

5. The up [+] and down [-] pushbuttons are used to enter values on the four digit display. The [+] button increments a digit, the [-] button decrements a digit. These buttons only operate in the NUMBER and TEMP.SET modes.

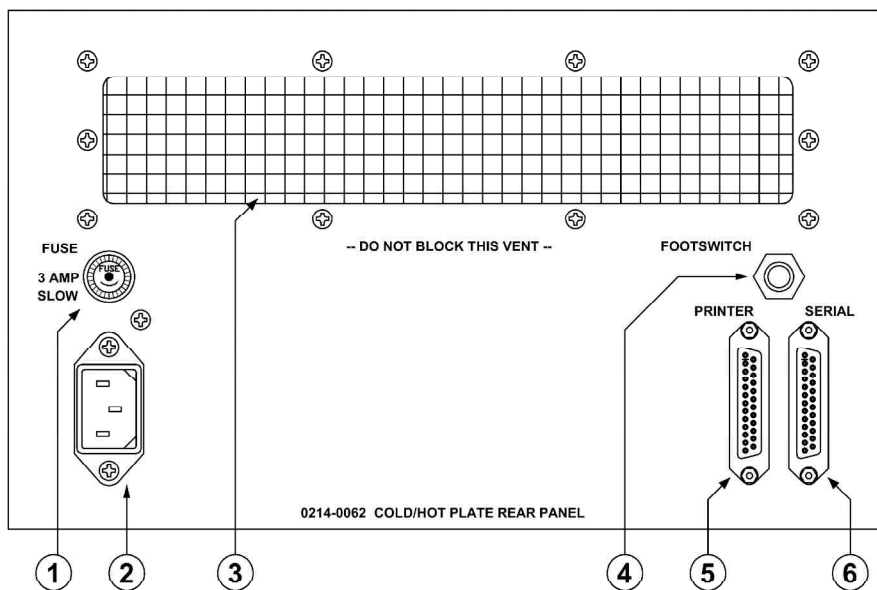
6. The MODE button selects the modes described above.

7. The SELECT button selects the display digit that will be affected by the [+] and [-] buttons.

8. The **START/STOP** button is the main operator control. Press it once to start the timer, press again to stop the timer. The footswitch control is a remote **START/STOP** button.

9. The **POWER** rocker switch should be rocked downward to turn the unit on. The upper side of the rocker will show a red surface when the power switch is on.

### 1.5 REAR PANEL CONNECTIONS



1. Fuseholder -- A 3 (three) ampere delay fuse should be used in this fuseholder.
2. AC power cord input jack -- plug the power cord in here.
3. Rear Vent. This vent must have a clear space for airflow.
4. Footswitch Input -- The footswitch input is a monophonic 1/4" phone jack on the rear panel of the Cold/Hot Plate. It is designed to be used with a normally open, momentary contact pushbutton or footswitch. The footswitch input is connected in parallel with the front panel "START/STOP" switch.
5. Printer Connection -- A standard 25pin to Centronics parallel printer cable should be connected between this output and your Epson compatible dot matrix printer.
6. RS-232 Serial Port -- A serial interface cable connects from this output to the serial port input of your computer. The data rate is fixed at 9600 baud; the format is 8 bits, one stop bit, no parity.

- SECTION 2 -

OPERATION

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## 2.0 INTRODUCTION

The Cold/Hot Plate Analgesia Meter is designed for rapid and efficient screening of analgesia levels in small laboratory animals. The Cold/Hot Plate provides a constant temperature surface that can be set to test temperatures both above and below room temperature. The plate is set to a cold or hot temperature that is uncomfortable for a normal subject but not harmful over a short exposure time. The subject is placed on the Cold/Hot Plate and the START/STOP button is pushed: the Cold/Hot Plate Analgesia Meter will begin timing in tenths of a second. A small plastic cage around the Cold/Hot Plate prevents the subject from scampering off the plate surface. The moment that the experimenter observes temperature discomfort in the subject (i.e., licking of paws and feet), the START/STOP button or footswitch is pressed, and the subject is immediately removed from the plate. The timer reading can then be manually recorded, automatically printed on a dot-matrix printer, or sent directly through the serial port to a computer for immediate disk storage. The Cold/Hot Plate is a special version of the standard Hotplate and uses thermoelectric modules to control the plate temperature instead of a simple heating element. The system is in a larger enclosure, and requires forced-air cooling provided by an internal fan system. It is very important that the area directly under and behind the enclosure is clear of any debris or obstructions to free airflow.

## 2.1 SYSTEM INSTALLATION

Set the Cold/Hot Plate on a low desk at a comfortable working level. Plug the AC power cord into the rear panel AC jack, then plug the other end into a standard AC power outlet. Be sure there are at least six inches of open space behind the unit, and that there are no obstructions to airflow or loose materials in the space around and beneath the unit.

If you are going to use the footswitch, plug the footswitch into the rear panel "Footswitch" jack. Route the cord around the desk so the footswitch can be reached comfortably by the operator's foot.

If you are going to use the printer output, plug one end of the printer cable into the 25 pin "Printer" connector on the Cold/Hot Plate rear panel. Plug the Centronics ribbon connector on the other end into the jack on the rear of the printer. The printer should have paper loaded into it, and be "On Line", ready to print. The printer must be a dot-matrix type.

### 2.11 INTERFACING TO A COMPUTER

The RS-232 output of the Cold/Hot Plate can connect to any computer with a serial port, but the computer needs to have some sort of program running to receive the incoming serial data and store it to disk. Columbus Instruments provides a simple Hot Plate interface program for Windows 98, 2000, and XP compatible computers with a serial port.

Connect the serial cable from the 25 pin Cold/Hot Plate "RS-232" connector on the rear panel to the serial input port of your computer. Refer to section 3.1 of this manual "OPERATING THE COLD/HOT PLATE INTERFACE PROGRAM" for further instructions on using the computer program itself.

## 2.2 FIRST TIME OPERATION

Turn the Cold/Hot Plate on with the front panel rocker switch. After about one second, the front panel display will light up, and the TEMP. mode LED will begin flashing. The display will show the actual temperature of the Cold/Hot Plate in degrees C. As you watch, the temperature will begin changing as the Cold/Hot Plate begins warming up. The mode LED flashes continuously whenever the Cold/Hot Plate temperature is more than 0.5 degrees from the setpoint temperature.

At this point, press the MODE button once. This will change to the TEMP.SET mode. The TEMP.SET mode LED should now be flashing, and "P55.0" or "n55.0" will show on the display, with the "P" or "n" flashing.

## 2.3 SETTING THE PRINTER OUTPUT

The leading "P" represents the printer output status. If "P" shows, the printer output is active. If "n" shows, the printer output is turned off. Use either the [+] button or the [-] button to toggle the printer output on and off. If you press the MODE button, the new printer setting will be stored as the default.

NOTE: if you have the printer output turned on, and run a test without an operating printer connected to the Cold/Hot Plate, the message "PErr" will appear on the Cold/Hot Plate display. This indicates a Printer Error. Press any button, and the unit will go back to timer mode. The experiment time will be displayed, and the PRINTER OUTPUT WILL BE AUTOMATICALLY DISABLED. If the printer problem is corrected while the "PErr" message is still being displayed, the printer output will stay on. You may go to the TEMP.SET mode at any time to turn the printer output back on if it was automatically disabled. Also, if the printer output is disabled automatically, the new setting ("n") will NOT be saved when the power to the Cold/Hot Plate is turned off. To save the TEMP.SET settings, they must be manually entered before leaving the TEMP.SET mode.

## 2.4 SELECTING COOL OR HEAT MODE

There is a large toggle switch on the front panel that selects the heating or cooling mode for the Cold/Hot Plate. For temperatures above 30 degrees C it should be switched to "Heat". For temperatures below 20 degrees C it must be switched to "Cool". If the switch is in the wrong position for the currently selected setpoint temperature the display will show "Err" instead of the normal count or temperature reading. Switch the Heat/Cool switch to the other position, and

press the [Mode] button to resume normal operation. When changing Heat/Cool modes, change the plate temperature BEFORE changing the Heat/Cool switch. You cannot change the plate temperature when the system is in the “Err” error state.

## 2.5 SELECTING COLD/HOT PLATE TEMPERATURE

The Cold/Hot Plate should be in the TEMP.SET mode. If it is not, press the MODE button repeatedly until the TEMP.SET LED is lit. The digits to the right of the "P" or "n" printer status flag show the current Cold/Hot Plate temperature setting in degrees C. The standard value for heat analgesia studies is 55.0 degrees. The Cold/Hot Plate may be set for any temperature between 0.0 and 79.9 degrees C. The cooling mode works only when the setpoint is less than 20 degrees C. The heating mode works when the setpoint is 20 degrees or higher, but is specified to operate properly only above 30 degrees C.

To change the Cold/Hot Plate temperature setting, press the SELECT button to choose a digit to change. The selected digit will flash rapidly. Then press the [+] button to increment, or the [-] button to decrement the selected digit. When you have selected and changed all three digits to the new temperature, press the MODE button to leave the TEMP.SET mode and save the new settings. If your new temperature setting requires a change to the Heat/Cool mode, the “Err” message will appear on the display. Switch the Heat/Cool switch to the other position, and press the [Mode] button to resume normal operation. If the system does not respond, turn off the main power switch for ten seconds, then turn it back on to reboot the system.

The mode indicator LED will flash rapidly whenever the Cold/Hot Plate temperature is more than 0.5 degrees above or below the setpoint temperature. All functions of the Cold/Hot Plate will still operate when this temperature error exists. If an experiment timer run is made, however, there will be an asterisk (\*) printed at the end of the data line on the printer output. This asterisk printed next to the actual Cold/Hot Plate temperature reading at the time of the experiment is a reminder that the temperature was not within specification. The serial data stream is similarly flagged.

### IMPORTANT NOTE:

Due to the physics of thermoelectric cooling, the active heating and cooling rates of the Cold/Hot plate are considerably different. It should take only about 15-20 minutes for the plate to come up to 55 degrees C, but it may take over an hour to drop from 20 degrees down to 5 degrees C. The clear plastic restraining cage around the plate should be kept in place: it provides additional temperature stability and prevents excessive heat losses.

In cooling mode, the ambient temperature and humidity should be kept as low as practicable. If the ambient temperature exceeds 22 degrees C it will be difficult to reach 5 degrees C. If the relative humidity is greater than 30%, condensation on the plate may be a major problem. This condensation creates a wet film on the plate, which may affect the subject response, and requires more cooling power as the latent heat of condensation is absorbed by the plate.

## 2.6 USING THE TIMER

The **TIMER** mode is the main operating mode of the Cold/Hot Plate. Press the **MODE** button until the Cold/Hot Plate is in the **TIMER** mode. The display should show "000.0" if no tests have been run yet. When a subject is placed on the plate surface of the Cold/Hot Plate, the **START/STOP** button or Footswitch should be pressed. The display will begin timing in tenths of a second, up to 999.9 seconds. As soon as the subject shows the symptoms of discomfort, the **START/STOP** button or Footswitch is pressed again to stop the timer. The time will be held on the display. During the timing of the experiment, none of the other buttons are active. Only the **START/STOP** button or Footswitch can terminate the experiment and stop the timer.

When the **START/STOP** button is pressed again, the timer is automatically reset, and begins timing again from 000.0 seconds. When the timer is stopped, the Cold/Hot Plate sends the timer reading and subject number to the printer and sends the same data to the serial port.

No matter what mode the Cold/Hot Plate is in, pressing the **START/STOP** button or Footswitch will immediately switch the unit to **TIMER** mode, reset the timer, and begin timing.

## 2.7 SETTING THE SUBJECT ID NUMBER

The Cold/Hot Plate data sent to the printer and serial port contains an experiment number. This can be a subject ID number. The number can be any four digits from 0000 to 9999. To enter a subject number, press the **MODE** button repeatedly until the **NUMBER LED** is lit. The number entry system works the same as for entering a temperature. Use the **SELECT** button to select a digit to change, then use the **[+]** and **[-]** buttons to change the digit. The number you enter will be recorded on the next timer run. After the timer has been stopped, use the **MODE** button to move to the **NUMBER** mode and enter the next ID number.

**NOTE:** The Cold/Hot Plate will automatically increment the ID number by one, unless a new ID number is manually entered. When the Cold/Hot Plate is first turned on, the ID number is set to 0001. If the experimenter does not manually enter any ID numbers, sequential numbers from 0001 to 9999 will be automatically assigned to each timer run.



- SECTION 3 -

TECHNICAL NOTES, ACCESSORIES

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### 3.1 OPERATING THE COLD/HOT PLATE INTERFACE PROGRAM

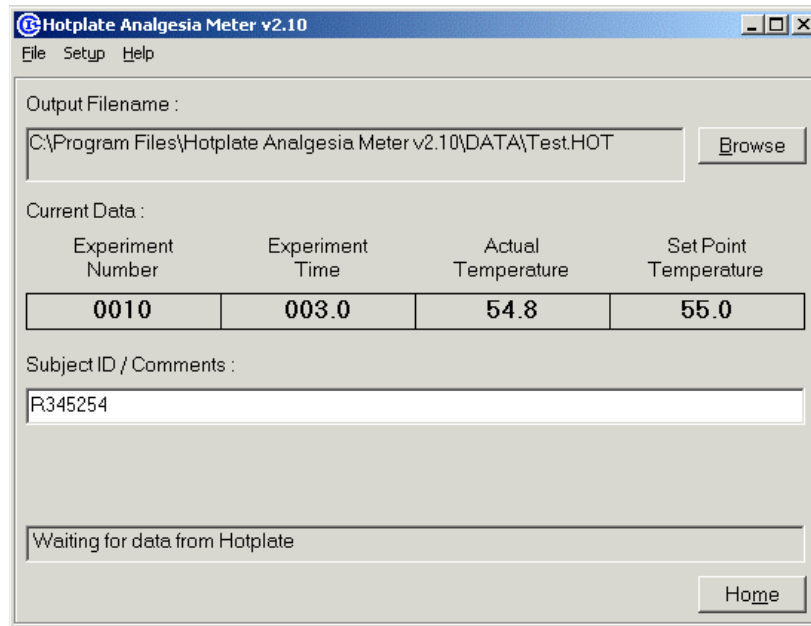
The serial port on the rear panel of the Cold/Hot Plate must be connected to the computer's serial port before running the program. A 25 to 9 pin "AT" serial cable is provided for the serial port connection to the host computer. The Cold/Hot Plate does not receive any signals from the computer; it only transmits data when the Start/Stop switch is used to terminate a subject trial.

#### 3.11 INTERFACE PROGRAM INSTALLATION

The Cold/Hot Plate uses the standard Hotplate program which normally comes on a single CD. Insert the CD in your computer's CD drive. The CD should automatically begin the installation program. If not, use the Windows interface to open the CD drive by double-clicking on the CD icon. If the installation program still does not start, double-click on the "Setup.exe" icon on the CD drive. When the installation program begins, follow the prompts to complete the Cold/Hot Plate program installation.

#### 3.12 PROGRAM OPERATION

When the program is started, it will open directly to the Experiment Setup screen:

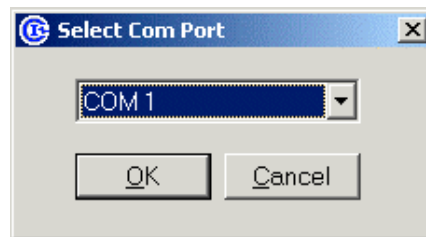


The Cold/Hot Plate is a passive transmitter of data. The Cold/Hot Plate program can receive this data, but does not initiate transmission by the Cold/Hot Plate. The only thing that causes the Cold/Hot Plate to send data is the end of a timing interval, as triggered by the START/STOP button or Footswitch. In the middle of the setup screen is a data field labeled, "Current Data." If you press the START/STOP switch to start a timing run, and then press it again a few seconds

later, Cold/Hot Plate data should appear in this screen space. The first number is the subject or timing run number. The second is the timer reading in seconds and tenths. The third is the actual Cold/Hot Plate temperature, and the last is the temperature setpoint. These last two readings should be within 0.5 degrees of each other for valid experimental data. After you have verified proper operation of the Cold/Hot Plate system, select the Cold/Hot Plate NUMBER mode and reset the subject number to 0001 before starting data collection.

### 3.13 SELECTING ANOTHER SERIAL (COM) PORT

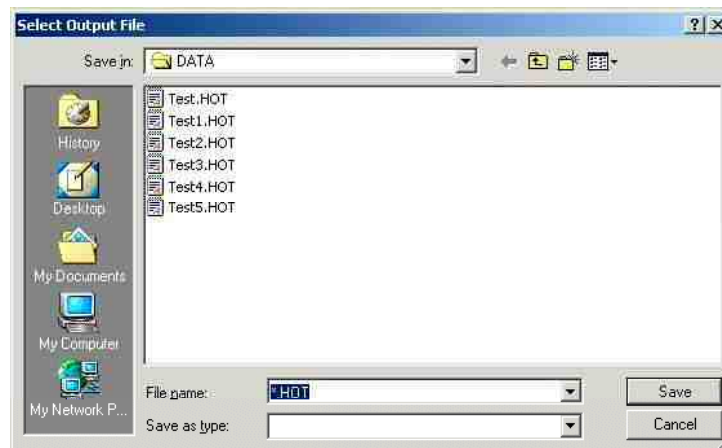
If the serial data stream timing results do not appear on your screen during the previous test there may be a problem with the serial port connection to the Cold/Hot Plate. The default serial port used by the program is COM1. You may switch the program to another port using the Setup/Com Port selection on the top menu. The following selector box will appear:



Click on the drop-down box arrow to display the available serial COM ports on your computer, and click on one of the COM port names to select it. This selection will be saved in a configuration file, and used automatically when the program is started later. Make sure you are plugged into the serial port of your computer, and that the proper cable is being used. A standard 25 to 9 pin "AT" serial cable is provided for the computer serial port connection. A 25 to 25 pin serial cable can be provided by special request.

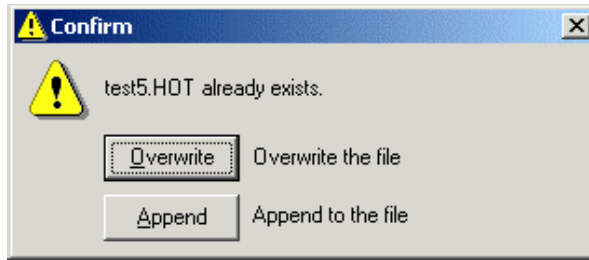
### 3.14 CHOOSING A DATA FILE NAME

Click on the [Browse] button in the Setup Experiment screen. The file requester will appear:



Type the new file name directly into the File Name text box. The extension “.HOT” will be automatically appended onto the name unless another extension is entered. It is highly recommended to always use the standard default “.HOT” extension so that Cold/Hot Plate data files can be recognized later by the program.

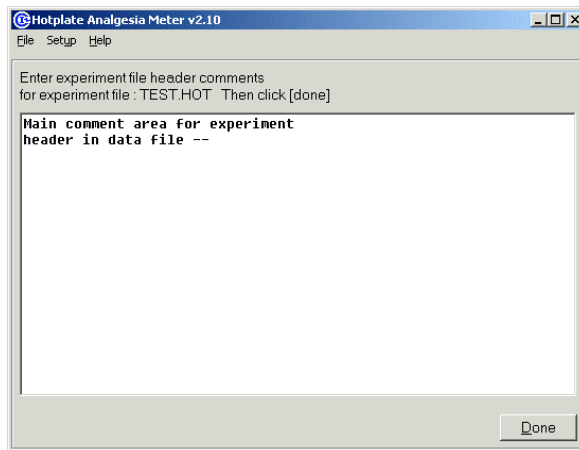
If you select a data file name that already exists, a warning box will appear:



To keep the old file and select another file name click the [X] in the upper right hand corner to close the box, and open the file selector window again to choose another name. Click the [Overwrite] button, or press the [Enter] key to overwrite the existing file. **WARNING:** This will ERASE the previous data. If you wish to append new data to the old file, click on the [Append] button.

### 3.15 EXPERIMENT HEADER COMMENT ENTRY

Any comment to be placed in the data file header must be entered before beginning the experiment. On the main menu at the top of the window, select Setup/Comments, and the Comments screen will appear:



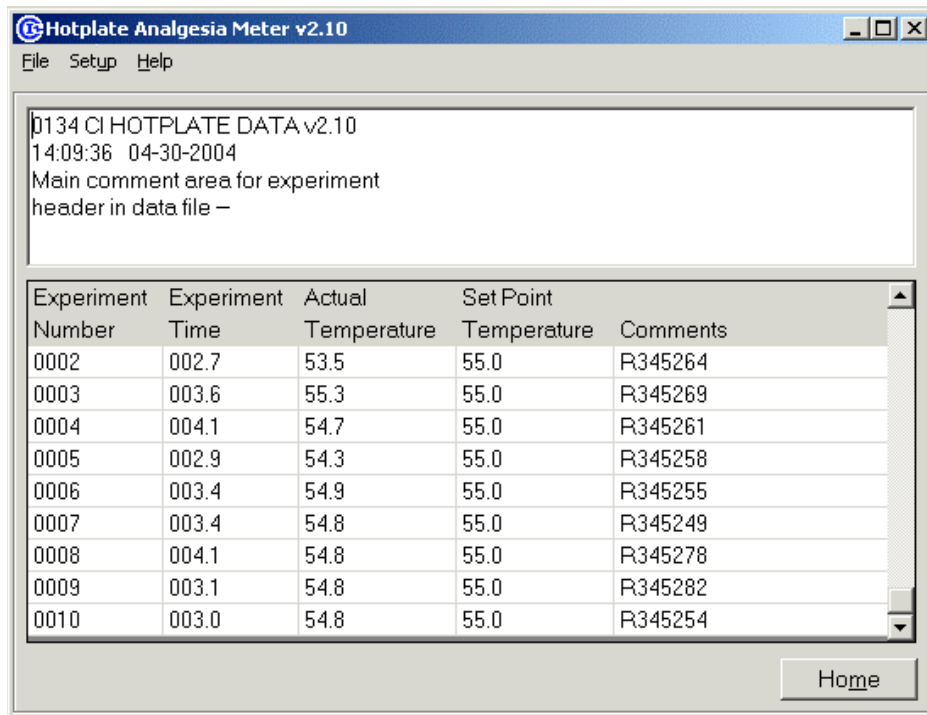
Several lines of text may be entered directly in this screen. Click the [Done] button to return to the experiment setup screen. Note: when the first data is sent back by the Cold/Hot Plate, the experiment has begun, and no additional comments will be recorded from this screen.

### 3.16 EXPERIMENT TRIAL COMMENT ENTRY

While the Cold/Hot Plate experiment is running the Cold/Hot Plate sends a data string when the START/STOP button or Footswitch is pressed to stop the timer. The data will be displayed in the "Current Data" field, and the one line comment field will be cleared. This line can then be used to enter the subject's name or other brief comment, or left blank. The Current Data and comment will be saved when the next data string is sent by the Cold/Hot Plate. Comment entries are surrounded by quotes to allow easy identification and stripping out by spreadsheet programs.

### 3.17 VIEWING AND PRINTING DATA FILES

To view or print existing Cold/Hot Plate data files, go to the main menu bar and click File/Open. A file requester will appear. Normally, only Cold/Hot Plate data files with the filename extension “.HOT” will be displayed. Select a filename and click the [Open] button. The data display screen will appear:



On the main menu bar, click on File/Print to print out the displayed file data.

### 3.18 DATA FILE FORMAT

The Cold/Hot Plate data file format is plain ASCII text in a basic “comma-separated variable” (CSV) format that can be directly imported into most spreadsheet programs. The comments are

enclosed in quotation marks so they can be easily identified and stripped out, if necessary, for automatic data analysis.

Cold/Hot Plate sample data file:

```
"0134 CI HOTPLATE DATA v2.10"  
"14:09:36 04-30-2004"  
"Main comment area for experiment"  
"header in data file --"  
"  
"  
0001,007.3,50.8,55.0,"R345627"  
0002,002.7,53.5,55.0,"R345264"  
0003,003.6,55.3,55.0,"R345269"  
0004,004.1,54.7,55.0,"R345261"  
0005,002.9,54.3,55.0,"R345258"  
0006,003.4,54.9,55.0,"R345255"  
0007,003.4,54.8,55.0,"R345249"  
0008,004.1,54.8,55.0,"R345278"  
0009,003.1,54.8,55.0,"R345282"  
0010,003.0,54.8,55.0,"R345254"
```

### 3.2 CALIBRATION OF THE COLD/HOT PLATE

Calibration of the Cold/Hot Plate should only be attempted by laboratories with accurate thermometers and trained calibration technicians. Columbus Instruments cannot guarantee the absolute accuracy of Cold/Hot Plate temperatures if the unit has been recalibrated.

The Cold/Hot Plate is factory calibrated over its full range, but the user can recalibrate the temperature offset for maximum accuracy at a given temperature. Place an accurate thermometer temperature probe on the Cold/Hot Plate about halfway between the center and an edge. The probe should be held down, and should be covered with an insulating shield. The Cold/Hot Plate temperature should be set for its normal operating temperature as previously described in section 2.4 of this manual. Allow the Cold/Hot Plate at least two hours to reach a completely stable operating temperature.

Use the MODE button to switch the Cold/Hot Plate to the TEMP mode. The current temperature of the Cold/Hot Plate will be displayed. If this does not match the reading on the calibration thermometer, +/- 1 digit plus the calibration thermometer error, proceed with recalibration.

Press the [+] and [-] buttons on the Cold/Hot Plate simultaneously. The display will show a "c" in the first digit position, followed by the three digit setpoint temperature, i.e.: "c55.0".

Press the START/STOP button once. The "c" will flash for about a second, then the display will drop the leading "c" and show just the temperature value, with the leading digit flashing. Use the SELECT button to select any digit, and then use the [+] and [-] buttons to change the value of that digit. You should change the value on the Cold/Hot Plate display to match the temperature value that is indicated by the calibration thermometer.

Press the START/STOP button one more time. The value on the display will be saved in the Cold/Hot Plate's calibration memory. If you wish to abort the recalibration procedure, turn the Cold/Hot Plate off for five seconds with the main power switch. You may abort the recalibration any time before the final press of the START/STOP button.

### 3.3 COLD/HOT PLATE CAGE OPTIONS

The standard cage sent with the Cold/Hot Plate is 10" (25cm) high. This allows a rat to fully rear without constraint from the lid. The height also permits rapid screening by using the system without the lid, since most subjects cannot easily climb over the cage walls. If the height of the cage makes subject transfer difficult, a much shorter cage, 6" (15cm) high is available.

### 3.4 PRINTER OUTPUT FORMAT

The printer output from the Cold/Hot Plate is clearly labeled. The "ID#" is the subject or experiment number. The "TIME" is the timer reading, and the "TEMP" is the temperature of the Cold/Hot Plate when the timer reading was taken. If the temperature of the Cold/Hot Plate is more than 0.5 degrees C away from the setpoint, an asterisk will be printed immediately after the TEMP data. A typical printout follows: note that the Cold/Hot Plate was still warming up when the first two tests were run.

CI	COLD/	HOT	PLATE	ID#	0001	TI ME	003. 4	TEMP	54. 0	*
CI	COLD/	HOT	PLATE	ID#	0002	TI ME	004. 8	TEMP	54. 4	*
CI	COLD/	HOT	PLATE	ID#	0001	TI ME	003. 7	TEMP	54. 9	
CI	COLD/	HOT	PLATE	ID#	0001	TI ME	004. 4	TEMP	54. 9	
CI	COLD/	HOT	PLATE	ID#	0001	TI ME	002. 8	TEMP	55. 0	

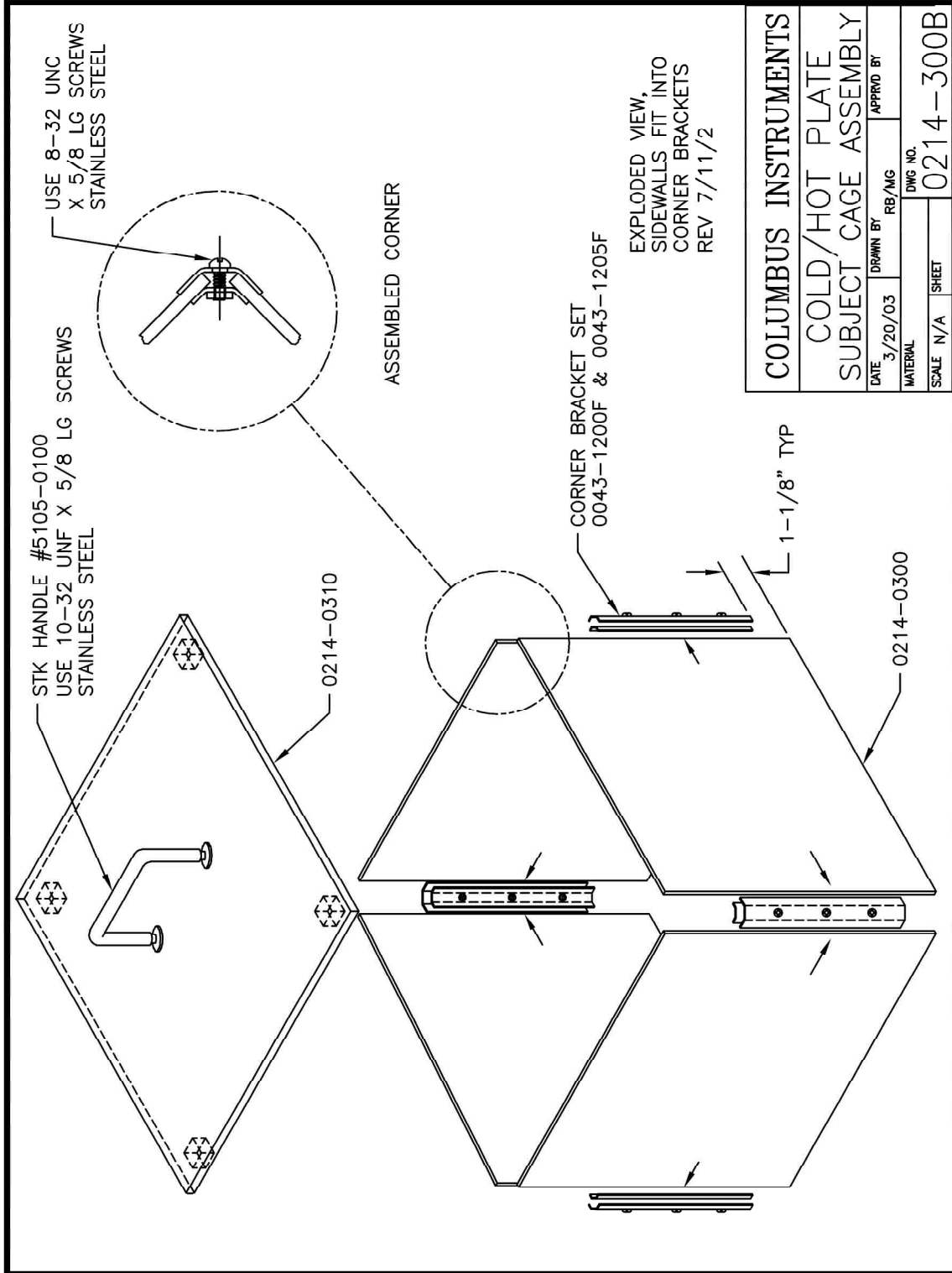


- SECTION 4 -

DIAGRAMS

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Cold/Hot Plate Cage Assembly Diagram



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