SPECTRAmax[®] 340PC³⁸⁴ Microplate Spectrophotometer Operator's Manual



Molecular Devices Corporation 1311 Orleans Drive Sunnyvale, California 94089

Part # 0112-0079 Rev. A



Molecular Devices

Molecular Devices Corporation

SPECTRAmax[®] 340PC³⁸⁴ Operator's Manual

Copyright

© Copyright 2001, Molecular Devices Corporation. All rights reserved. No part of this publication may be reproduced, transmitted, transcribed, stored in a retrieval system, or translated into any language or computer language, in any form or by any means, electronic, mechanical, magnetic, optical, chemical, manual, or otherwise, without the prior written permission of Molecular Devices Corporation, 1311 Orleans Drive, Sunnyvale, California, 94089, United States of America.

Patents

The SPECTRAmax 340PC³⁸⁴ and methods are protected by the following patents:

U.S. Patents 4,968,148, 5,112,134, 6,151,111, and 6,188,476; Canadian Patent 1,305,334.

Other U.S. and International patents pending.

Trademarks

SPECTRAplate, SPECTRAstrip, PathCheck and Automix are trademarks and SPECTRAmax and SOFTmax are registered trademarks of Molecular Devices Corporation.

Apple and Macintosh are registered trademarks of Apple Computer, Incorporated.

All other company and product names are trademarks or registered trademarks of their respective owners.

Disclaimer

Molecular Devices Corporation reserves the right to change its products and services at any time to incorporate technological developments. This manual is subject to change without notice.

Although this manual has been prepared with every precaution to ensure accuracy, Molecular Devices Corporation assumes no liability for any errors or omissions, nor for any damages resulting from the application or use of this information.

Molecular Devices Corporation Instrument Warranty

Molecular Devices Corporation warrants this product against defects in material or workmanship as follows:

- 1) All parts of the SPECTRAmax 340PC³⁸⁴ Microplate Spectrophotometer are warranted for a period of one (1) year from the original date of delivery.
- 2) All labor charges to repair the product for a period of one (1) year from the original date of delivery will be paid by Molecular Devices Corporation.
- 3) This warranty covers the SPECTRAmax 340PC³⁸⁴ instrument only, and does not extend to any computer, printer, software, reagents, or disposables used with the instrument.



Labor and Parts

To obtain warranty service during the applicable warranty period, you must take the product or deliver the product properly packaged in the original shipping materials and carton to an authorized Molecular Devices Corporation service facility. You must call or write to the nearest Molecular Devicees Corporation service facility to schedule warranty service. You may call Molecular Devices Corporation at the telephone number or address below to locate the nearest service facility. You must schedule warranty service **prior** to bringing or shipping the product for servicing. At the time of requesting warranty service, you must present proof of purchase documentation which includes the date of purchase and Molecular Devices Corporation must have the enclosed Warranty Registration form completed, signed and returned by you within ten (10) working days of the date of delivery.

This warranty only covers defects arising under normal usage and does not cover malfunctions of failures resulting from misuse, abuse, neglect, alteration, modification, or repairs by other than an authorized Molecular Devices Corporation service facility.

Repair or replacement as provided under this warranty is the exclusive remedy of the purchaser (the "Buyer"). Molecular Devices Corporation (the "Seller") shall not be liable for any incidental or consequential damages for breach of any express or implied warranty on this product, except to the extent required by applicable law. The Seller specifically excludes all express and implied warranties including without limitation any implied warranty that the products sold under this agreement are merchantable or are fit for any particular purpose, except such warranties expressly identified as warranties and set forth in the Seller's current operating manual, catalog or written guarantee covering such product. The Seller also makes no warranty that the products sold under this agreement are delivered free of the rightful claim of any third party by way of patent infringement or the like. If the Buyer furnishes specifications to the Seller, the Buyer agrees to hold the Seller harmless against any claim which arises out of compliance with the specifications.

Any description of the products contained in this agreement is for the sole purpose of identifying them. Any such description is not part of the basis of the bargain, and does not constitute a warranty that the products shall conform to that description. Any sample or model used in connection with this agreement is for illustrative purposes only, is not part of the basis of the bargain, and is not to be construed as a warranty that the products will conform to the sample or model. No affirmation of fact or promise made by the Seller, whether or not in this agreement, shall constitute a warranty that the products will conform to the promise.

For the name of the nearest authorized Molecular Devices Corporation service facility, please contact Molecular Devices at one of the following telephone numbers:

(408) 747-1700

(800) 635-5577 (U.S. and California)







Contents

| F C C | igures and Table |
|--------------------|--|
| Chapter | 1 Instrument Description 1-1 |
| Iı C | httroduction. 1-3 General Overview. 1-3 PathCheck™ 1-4 Component Description 1-5 |
| | Control Panel 1-5 Control Panel Display. 1-7 The Microplate Drawer 1-7 The Back Panel 1-8 |
| F | unctional Description. 1-9 Stand-Alone Operation 1-9 Wavelength Selection 1-9 Temperature Regulation 1-9 Computer Control 1-10 |
| S | pecifications 1-13 |
| Chapter | 2 Installation 2-1 |
| In In U S | nstallation Warnings |
| Chapter | 3 Stand-Alone Operation 3-1 |
| P | repare for a Reading3-3Turn the Instrument and Printer On3-3Set the Temperature3-3Select the Wavelength3-3Operation Overview3-3 |

72

| Chapter 4 Maintenance and Troubleshooting 4 | - 1 |
|---|---------------------------------|
| Technical Support.4Warnings and Cautions.4General.4Cleaning.4Cleaning the Fan Filter.4Changing the Fuses4 | l-3 l-3 l-4 l-4 l-4 |
| Error Codes and Probable Causes | l-7 l-7 11 |
| Appendix A Printers and CablesA | -1 |
| Compatible Printers | -3 -3 |
| Appendix B AccessoriesB | 3-1 |
| Items Available for Use with the SPECTRAmax 340PC ³⁸⁴ B | 8-3 |
| ndexI | [-1 |



| Figures | Figure 1.1: Figure 1.2: Figure 1.3: Figure 1.4: Figure 1.5: | SPECTRAmax 340PC3841-3Major Areas of the SPECTRAmax 340PC3841-5Control Panel1-5Microplate Drawer1-7Components on the Back Panel of theSPECTRAmax 340PC3841-8 |
|---------|---|--|
| | Figure 2.1: | View of Rear Panel2-4 |
| | Figure 4.1: Figure 4.2: Figure 4.3: | Power Switch, Fuse Box, and Power Receptacle4-5 Removing the Fuse Box4-6 The Fuse Box and Holder (with Fuses) Removed4-6 |

| Table Table 4. | : Error Codes | |
|----------------|---------------|--|
|----------------|---------------|--|

Conventions
 Used in this
 The names of keys that appear on the SPECTRAmax PLUS³⁸⁴ control panel are shown in boxed Helvetica type. Example: Drawer.
 Italic and boldface type are used for emphasis. Examples: "Press carefully to engage," "Do not press down."
 NOTE: A note provides information that will help you properly execute an action or procedure.
 A CONTROL Indicates an action or condition that could potentially dam.

- **CAUTION:** Indicates an action or condition that could potentially damage the instrument or one of its components or could result in loss of data.
- **WARNING:** Indicates a situation that could result in potential injury to a person working with the system.
- **BIOHAZARD:** Indicates a condition involving potentially infectious biological agents requiring that proper handling precautions be taken.

Glossary of Terms

Absorbance, A

The amount of light absorbed by a solution. To measure absorbance accurately, it is necessary to eliminate light scatter. In the absence of turbidity, absorbance = optical density.

 $A = \log (I_0/I)$

 $I_0 = incident \ light$

I = transmitted light

In this manual, we use the terms absorbance and optical density interchangeably.

Optical Density, OD

The amount of light passing through a sample to a detector relative to the total amount of light available. Optical Density includes absorbance of the sample plus light scatter from turbidity.

Transmittance, T

The ratio of transmitted light to the incident light.

$$T = I/I_0$$

%T = 100 T



Chapter 1 Instrument Description

| Introduction1-3 |
|-----------------------------|
| General Overview1-3 |
| PathCheck TM 1-4 |
| Component Description1-5 |
| Control Panel |
| Control Panel Display1-7 |
| The Microplate Drawer1-7 |
| The Back Panel1-8 |
| Functional Description1-9 |
| Stand-Alone Operation |
| Wavelength Selection |
| Temperature Regulation |
| Computer Control1-10 |
| Specifications1-12 |
| |





Introduction General Overview

The SPECTRAmax[™] 340PC³⁸⁴ microplate spectrophotometer provides rapid and sensitive measurements of a variety of analytes across a wide range of concentrations. It measures the optical density (OD) of samples in both 96and 384-well microplates at a selected wavelength for a single point in time (endpoint), over a specified period of time (kinetic), or over a selected wavelength range (spectral scan).



Figure 1.1: The SPECTRAmax 340PC³⁸⁴ System

The on-board microprocessor calculates and reports the absorbance (or % Transmittance) for each well of a microplate. Data from multiple wavelengths can be acquired during a single reading, if desired, and different calculations can be made based on this data using SOFTmax PRO software, including the subtraction of blanks, use of standard curves, etc.

Typical applications include endpoint assays (quantitation of cytoproliferation by MTT reduction, colorimetric protein assays, and endpoint ELISAs) and kinetic measurements (enzyme studies, such as determination of the activity of enzymes released from cells, and kinetic ELISAs).

All standard 96- and 384-well microplates, strip wells, and filter-bottom microplates can be used in the SPECTRAmax 340PC³⁸⁴.

With SOFTmax PRO, the contents of the wells in a microplate can be mixed automatically by shaking before each read cycle, making it possible to perform kinetic analysis of solid-phase, enzyme-mediated reactions (mixing is not critical for liquid-phase reactions). The temperature of the microplate chamber can also be regulated, if desired, from 4°C above ambient to 45°C.



PathCheckTM

As predicted by the Beer Lambert law of light absorption, absorbance is proportional to the distance that light travels through the sample—the longer the pathlength, the higher the absorbance.

Microplate readers use a vertical light path so the distance of the light through the sample depends on the volume. This variable pathlength makes it difficult to perform extinction-based assays and confusing to compare results between microplate readers and spectrophotometers.



This pathlength correction is accomplished only with the use of SOFTmax PRO software. SOFTmax[®] PRO software from Molecular Devices provides full instrument control and statistical data analysis.



Component Description

The main components of the SPECTRAmax 340PC³⁸⁴ are:

- The control panel
- The microplate drawer
- The back panel (connections and power switch)



Figure 1.2: Major areas of the SPECTRAmax 340PC³⁸⁴

Control Panel



Figure 1.3: Control Panel

The control panel consists of an LCD and eight pressure-sensitive, colorcoded membrane keys which can be used to perform the stand-alone functionality of the SPECTRAmax 340PC³⁸⁴, including setting the temperature inside the microplate drawer, setting the wavelength at which to read the microplate, and opening or closing the microplate drawer. Pressing a control panel key activates the function.

<u>LCD</u>

A 2- \times -20-character liquid crystal display which shows the current instrument settings.



<u>Keys</u>



(Incubator) Enables/disables the incubator function.



(Incubator) Allows you to enter a set point to regulate the microplate chamber temperature. Pressing the up or down arrow key scrolls up or down, starting at the previous temperature setting (or the default of 37.0°C, if no setting had been made). Pressing the up (\blacktriangle) or down (\triangledown) arrow *once* increments or decrements the temperature shown in the display by 0.1°C; pressing and holding either arrow increments or decrements the temperature shown in the display by 1°C until it is released. If you increment the setting to the highest limit (45°C) and continue to press the up (\bigstar) arrow, the display will not change. If you decrement the setting to the lowest limit, 15°C, and continue to press the down (\triangledown) arrow, the display will not change.

CAUTION: If the incubator is disabled, pressing the Temp On/Off key will *enable* the incubator.



Selects the wavelength that will be used for reading the microplate manually. Pressing the up or down arrow key scrolls up or down through the available wavelengths, starting at the previous setting. Pressing the up (\blacktriangle) or down (\bigtriangledown) arrow *once* increments or decrements the wavelength shown in the display by 1 nm; pressing and *holding* either arrow increments or decrements the wavelength shown in the display by 10 nm until it is released. If you increment the setting to the highest limit (850 nm) and continue pressing the up (\bigstar) arrow, the display returns to the lowest possible setting (340 nm) and begins incrementing from there. The inverse is true for decrementing by pressing the down (\bigtriangledown) arrow.

NOTE: Setting the wavelength in SOFTmax PRO and reading using the software will override the manual setting. The control panel will not show the wavelength selected through SOFTmax PRO.



Selects either 96- or 384-well plate for a stand-alone read.



Drawer

Initiates the reading of the microplate in stand-alone mode. Data is sent to the printer port of the 340PC³⁸⁴.

Opens or closes (toggles) the microplate drawer. Whether or not the drawer will remain open depends on the incubator





setting. If the incubator is off, the drawer will remain open; if the incubator is on, the drawer will close after approximately 10 seconds to assist in maintaining temperature control within the microplate chamber.

Control Panel Display



The left side of the display shows the temperature, both actual and set point, and whether or not the temperature is at the set point (enunciator blinks if not at set point). (The temperature of the plate drawer is shown in the SOFTmax PRO software.)The middle of the display shows the wavelength. The right side of the display toggles between displaying 96 and 384 when the $\boxed{96/384}$ key is pressed.

The Microplate Drawer



Figure 1.4: Microplate Drawer

The microplate drawer is located on the right side of the SPECTRAmax 340PC³⁸⁴ and slides in and out of the reading chamber. Springs on two sides of the drawer automatically position and hold a microplate in the proper position. The drawer remains in the reading chamber during read cycles.

Microplate drawer operation varies, depending upon the incubator status. To open the drawer, press the Drawer key. If the incubator is turned on, the drawer will remain open for approximately ten seconds, after which a beep-



ing sound will alert you approximately two seconds before the drawer closes automatically.

NOTE: Do not obstruct the movement of the drawer. If you must retrieve a plate after an error condition or power outage and the drawer will not open, it is possible to open it manually (see Chapter 4, "Maintenance and Troubleshooting").

Microplates

The SPECTRAmax 340PC³⁸⁴ can accommodate standard 96- and 384-well microplates, strip wells, and filter-bottom microplates.

Not all manufacturers' microplates are the same with regard to design, materials, or configuration. Temperature uniformity within the microplate may vary depending on the type of microplate used.





Figure 1.5: Components on the Back Panel of the SPECTRAmax 340PC³⁸⁴

The following components are located on the back panel of the SPECTRAmax 340PC³⁸⁴ system:

- Power switch—a rocker switch, labeled I/O (for on and off, respectively).
- **Power cord receptacle**—plug the power cord in here.
- **Fuse box cover**—cannot be opened while the power cord is plugged in. When opened, it provides access to the fuse box containing two fuses that are required for operation.
- **Printer port** (double-shielded, 25-pin parallel, for use in stand-alone operation)—plug the 25-pin end of the cable into this port; the other (Centronics) end attaches to the port on the printer.
- **Computer port** (double-shielded 8-pin RS-232 serial, for use with an external computer)—plug the 8-pin DIN serial cable connecter into this port; the other end attaches to the serial (modem) port of the computer.
- **Labels**—provide information about the SPECTRAmax 340PC³⁸⁴, such as line voltage rating, cautionary information, serial number, etc. Record the serial number shown on this label for use when contacting Molecular Devices Technical Services.



Functional Description

Stand-Alone Operation

The paragraphs that follow describe functions that can be activated during stand-alone operation.

When operating the SPECTRAmax $340PC^{384}$ as a stand-alone system, you can choose a temperature setting, choose a wavelength, and make an Endpoint read. Data is sent to the printer port of the SPECTRAmax $340PC^{384}$. The wavelength is chosen by pressing the up or down arrows beneath the display labeled λ . Temperature regulation of the microplate chamber can be enabled and set using the keys on the left side of the control panel and actual temperature can be monitored in the display. To obtain a reading of the microplate, press the READ key. You can also open or close the drawer using the Drawer key on the right of the control panel.

NOTE: Due to the continuous changes in printer technology leading to printer obsolescence and the ability of SOFTmax PRO software to print on PC- and Macintosh-compatible printers, Molecular Devices does not recommend reliance on printing in the stand-alone mode.

Wavelength Selection

The display on the control panel shows the currently selected measurement wavelength (λ). You can change the wavelength by pressing the up or down arrows until the display shows the desired wavelength. The wavelength will wrap around to the top or bottom when the last selectable wavelength is reached.

Temperature Regulation

The SPECTRAmax $340PC^{384}$ has been designed to regulate the temperature of the microplate chamber from 4°C above ambient to 45°C. Upon power up, when the incubator is off, the temperature in the SPECTRAmax $340PC^{384}$ microplate chamber is ambient and isothermal. Pressing the incubator [TEMP On/Off] key will cause the instrument to begin warming the microplate chamber. The temperature set point defaults to 37.0°C at start-up.

NOTE: Accuracy of the temperature set point is only guaranteed if the set point is at least 4°C above ambient. If the temperature set point is lower than the ambient temperature, the chamber temperature will remain at ambient. Temperature regulation is controlled by heaters only and, therefore, cannot cool the temperature to a setting lower than ambient. Additionally, the highest setting (45°C) can be achieved only if the ambient temperature is >20°C.

You can change the temperature set point by pressing the up (\blacktriangle) or the down (\bigtriangledown) arrow keys above and below the word TEMP until the desired set point is shown in the display. Typically, the microplate chamber will reach 37.0°C in 15 to 30 minutes.

The microplate chamber temperature is maintained at the set point until you press the incubator TEMP On/Off key again, turning temperature regulation off. The microplate drawer will open and the temperature within the chamber will begin returning to ambient.



NOTE: Should you turn the incubator back on after a momentary shutdown, allow about ten minutes after reaching temperature for the control algorithm to fully stabilize the microplate chamber temperature.

Temperature regulation within the microplate chamber is achieved through electric heaters, a fan, efficient insulation, and temperature sensors. The heaters are located in the chamber which is insulated to maintain the temperature set point. The sensors, also mounted inside the chamber, measure the air temperature. The temperature feedback closed-loop control algorithms compare the measured air temperature inside the chamber against the temperature set point, and use the difference to calculate the heating cycles. This technique results in accurate, precise control of the chamber of less than 1.0°C. (The temperature uniformity within the microplate will depend upon the design, materials, and / or configuration of that component.)

Computer Control

The SPECTRAmax 340PC³⁸⁴ is equipped with an 8-pin DIN RS-232 serial port through which a computer can communicate with and control the instrument.

<u>SOFTmax PRO</u>®

Molecular Devices' SOFTmax PRO software is a highly integrated program that can be used to control and collect data from the SPECTRAmax 340PC³⁸⁴. SOFTmax PRO is easy to use, yet is powerful and flexible, and makes it possible to access the full capabilities of the SPECTRAmax 340PC³⁸⁴.

SOFTmax PRO allows you to:

- Read microplates for endpoint, kinetic, or spectral scans
 - Use up to six wavelengths for endpoint and kinetic readings
 - Perform Absorbance or %Transmittance readings in the 340- to 850-nm range
 - Extend kinetic run times up to 99 hours
 - Select your own read intervals for kinetic runs
 - Specify the duration for Automix before and between readings
 - Read the whole plate or a subset of microplate strips
- Use PathCheck to normalize the absorbance readings in each microplate well to a 1-cm pathlength
- Design microplate templates to simplify data reduction
 - Identify groups of wells with labels of your choice
 - Identify individual wells with unique names
 - Blank the entire plate, groups, and/or individual wells



- Save instrument settings, template formats, and data analysis parameters for microplates as assay protocol files and recall them for later use
 - Rapid instrument and analysis set up for repeated microplate assays
 - Uniform analysis for equivalent microplates
- Turn the incubator on or off to control the temperature in the microplate drawer
- Acquire data from the SPECTRAmax 340PC³⁸⁴
- Save data files for in-depth analysis at a later time
- Save multiple microplates with individual template and data analysis parameters in one or more experiments in a single data file
- Pre-read microplates
- Analyze kinetic and spectrum data as it is collected
- Use the Automix function to shake the microplate at preset intervals, thereby mixing the contents of each well (highly recommended for ELISAs and other solid-phase, enzyme-mediated reactions)
- Display data on screen
 - Raw values, reduced number, or raw values with reduced number
 - Raw microplate data in a microplate format
 - Ranged data as integers between 0 and 9 in a microplate format
 - Threshold data as being above, below, or between set limits in a microplate format
 - Gray scale data in seven shades of gray corresponding to high and low limits in a microplate format
 - Kinetic or spectrum plots of all 96 or 384 microplate wells
 - Enlarge the display of individual well plots and overlay multiple well plots
- Perform data analysis using SOFTmax PRO features
 - Calculate maximum kinetic rates on non-linear data
 - Assign plate, group, or sample blanks
 - Perform pathlength correction based on 1-cm cuvette readings
 - Customize data analysis for each group in the template
 - Create graphs with multiple plots
 - Pick from nine curve-fitting routines
- Analyze unknown samples against a standard curve
- Analyze and compare data within a plate, between plates, and between experiments



- Multiple print formats
 - Print all or individual sections of the data file
 - Define and print a report containing only selected sections
 - Customize the order of data file sections
- Export data in tab-delimited ASCII format for use with Excel or other database programs

For a complete description of the features of SOFTmax PRO, refer to the *SOFTmax PRO User's Manual*.

| Specifications | Thermal specifications for microplates used in the SPECTRAmax 340PC ³⁸⁴ |
|----------------|--|
| | apply to flat-bottom microplates with isolated wells. All other microplate |
| | specifications apply to standard 96-well polystyrene flat-bottom microplates. |
| | |

NOTE: Technical specifications are subject to change without notice.

| | Photometric Performance |
|---|--|
| Wavelength range | 340–850 nm |
| Wavelength selection | Monochromator tunable in 1-nm increments |
| Wavelength bandwidth | \leq 2.0 nm FWHM (full width half maximum) |
| Wavelength accuracy | \pm 1.0 nm across wavelength range |
| Wavelength repeatability | \pm 0.2 nm across all optical channels |
| Photometric range | -0.3 to 4.000 OD |
| Photometric resolution | 0.001 OD |
| Photometric accuracy/linearity (microplate), 0–2.0 OD: | 340–850 nm <± 1.0% and ± 0.006 OD |
| Photometric precision | |
| (repeatability), 0–2.0 OD: | 340–850 nm <± 1.0% and ± 0.003 OD |
| Stray light | $\le 0.05\%$ at 340 nm |
| Photometric stabilization | Instantaneous |
| Photometric drift | None—continuous referencing of monochromatic output |
| Calibration | Automatic before first kinetic read and before every end- point reading |
| Optical alignment | None required |
| Light source | Xenon flash lamp (5 watts) |
| Average lamp lifetime | 1 billion flashes |
| Illumination | Top down |
| Photodetectors | Silicon photodiode |
| | Photometric Analysis Modes |

Stand-Alone

• Single wavelength Absorbance reading of the microplate

Using SOFTmax PRO

- Express data as Absorbance or %Transmittance
- Single wavelength reading of microplate
- Multiple wavelength (up to six) reading of microplate
- Kinetic and kinetic graphics of microplate
- Spectral scan (340–850 nm) of microplate



| | Measurement Time (calibration off) |
|---|---|
| Read time (endpoint) Standard read* Kinetic read intervals | 96 wells in 9 seconds (single wavelength) 96 wells in 19 seconds (dual wavelength—425 & 650 nm) 384 wells in 29 seconds (single wavelength) 384 wells in 59 seconds (dual wavelength—425 & 650 nm) 96 wells, 9-second minimum interval between readings (single wavelength) 1 column, 2-second minimum interval between readings (single wavelength) 384 wells, 29-second minimum interval between readings (single wavelength) |
| | ings (single wavelength) |
| | Scan Speed |
| Normal scan | 33*K nm/min (8-well strip); 21*K nm/min (16-well strip) |
| Speed scan | 135*K nm/min (8-well strip); 77*K nm/min (16-well strip) |
| | |
| | Temperature Regulation |
| Reading chamber | Isothermal when temperature regulation is not enabled |
| Range | 4° C above ambient to 45° C when temperature regulation enabled. The ambient temperature must be >20°C to |
| | achieve temperature regulation at 45°C. |
| Resolution | achieve temperature regulation at 45° C. ± 0.1°C |
| Resolution Accuracy | achieve temperature regulation at 45°C. $\pm 0.1^{\circ}$ C $\pm 1.0^{\circ}$ C |
| Resolution Accuracy Temperature uniformity at equilibrium | achieve temperature regulation at 45° C. $\pm 0.1^{\circ}$ C $\pm 0.5^{\circ}$ C at 37° C |
| Resolution Accuracy Temperature uniformity at equilibrium Chamber warm-up time | achieve temperature regulation at 45°C. $\pm 0.1^{\circ}$ C $\pm 1.0^{\circ}$ C $\pm 0.5^{\circ}$ C at 37°C 15-30 minutes (measured on air) after initiation of temper- ature regulation |
| Resolution Accuracy Temperature uniformity at equilibrium Chamber warm-up time Temperature regulation | achieve temperature regulation at 45° C. $\pm 0.1^{\circ}$ C $\pm 1.0^{\circ}$ C $\pm 0.5^{\circ}$ C at 37° C 15-30 minutes (measured on air) after initiation of temper- ature regulation 4 sensors |
| Resolution Accuracy Temperature uniformity at equilibrium Chamber warm-up time Temperature regulation Drift | achieve temperature regulation at 45°C. $\pm 0.1^{\circ}$ C $\pm 1.0^{\circ}$ C $\pm 0.5^{\circ}$ C at 37°C 15-30 minutes (measured on air) after initiation of temper- ature regulation 4 sensors $\pm 0.2^{\circ}$ C (regulated) |
| Resolution Accuracy Temperature uniformity at equilibrium Chamber warm-up time Temperature regulation Drift Temperature regulation diagnostics | achieve temperature regulation at 45°C. $\pm 0.1^{\circ}$ C $\pm 1.0^{\circ}$ C $\pm 0.5^{\circ}$ C at 37°C 15-30 minutes (measured on air) after initiation of temper- ature regulation 4 sensors $\pm 0.2^{\circ}$ C (regulated) Temperature regulation system is continuously monitored and updated |
| Resolution Accuracy Temperature uniformity at equilibrium Chamber warm-up time Temperature regulation Drift Temperature regulation diagnostics Evaporation | achieve temperature regulation at 45°C. $\pm 0.1^{\circ}$ C $\pm 1.0^{\circ}$ C $\pm 0.5^{\circ}$ C at 37°C 15-30 minutes (measured on air) after initiation of temper- ature regulation 4 sensors $\pm 0.2^{\circ}$ C (regulated) Temperature regulation system is continuously monitored and updated Plate lid required to minimize evaporative cooling |
| Resolution Accuracy Temperature uniformity at equilibrium Chamber warm-up time Temperature regulation Drift Temperature regulation diagnostics Evaporation Recommended microplate | achieve temperature regulation at 45°C. $\pm 0.1^{\circ}$ C $\pm 1.0^{\circ}$ C $\pm 0.5^{\circ}$ C at 37°C 15-30 minutes (measured on air) after initiation of temper- ature regulation 4 sensors $\pm 0.2^{\circ}$ C (regulated) Temperature regulation system is continuously monitored and updated Plate lid required to minimize evaporative cooling Flat-bottom microplates with isolated wells and lid (use of plate films is not recommended) |
| Resolution Accuracy Temperature uniformity at equilibrium Chamber warm-up time Temperature regulation Drift Temperature regulation diagnostics Evaporation Recommended microplate | achieve temperature regulation at 45° C. $\pm 0.1^{\circ}$ C $\pm 1.0^{\circ}$ C $\pm 0.5^{\circ}$ C at 37° C 15-30 minutes (measured on air) after initiation of temper- ature regulation 4 sensors $\pm 0.2^{\circ}$ C (regulated) Temperature regulation system is continuously monitored and updated Plate lid required to minimize evaporative cooling Flat-bottom microplates with isolated wells and lid (use of plate films is not recommended) Automix with SOFTmax PRO |
| Resolution Accuracy Temperature uniformity at equilibrium Chamber warm-up time Temperature regulation Drift Temperature regulation diagnostics Evaporation Recommended microplate | achieve temperature regulation at 45° C. $\pm 0.1^{\circ}$ C $\pm 1.0^{\circ}$ C $\pm 0.5^{\circ}$ C at 37° C 15-30 minutes (measured on air) after initiation of temper- ature regulation 4 sensors $\pm 0.2^{\circ}$ C (regulated) Temperature regulation system is continuously monitored and updated Plate lid required to minimize evaporative cooling Flat-bottom microplates with isolated wells and lid (use of plate films is not recommended) Automix with SOFTmax PRO Selectable: off, once prior to any reading, and once prior to and between kinetic readings |



Compatibility

Microplate Standard and half-area 96-well flat-bottomed microplates (0.3 mL). 384-well flat-bottomed microplates.

General Instrument

| Display | 2-x-20-character backlit LCD |
|---------------------------|--|
| Operating panel | 8 key membrane keypad |
| Self-diagnosis | Continuous on-board diagnostics |
| Spill control | Drawer mechanism/reading chamber assembly is protect- ed from accidental spillage by drainage ports |
| Computer interface | 8-pin DIN RS-232 serial (double shielding required) |
| Printer interface | Parallel 25-pin to Centronics (double shielding required) |
| Microplates supported | All 96-well and strip-well microplates, including lids |

Environmental

| | For indoor use only |
|------------------------------|---------------------|
| Operating temperature | 5 to 40°C |
| Operating altitude | < 2000 m |
| Installation category | II |
| Pollution degree | 2 |
| Operating humidity | < 80% |
| Storage temperature | -20 to 65°C |

Physical

| Size ($h \times w \times d$) | 8.6 in. (22 cm) × 22.8 in. (58 cm) × 15 in. (38 cm) |
|--------------------------------|---|
| Weight | 30 lb (13.6 kg) |
| Power consumption | < 250 watts |
| Line voltage | 100-240 VAC, 4 A |
| Line frequency | 50/60 Hz |



Chapter 2 Installation

| Installation Warnings | 2-3 |
|--------------------------------|-----|
| Installation Cautions | 2-3 |
| Unpacking | 2-3 |
| Setting Up for Stand-Alone Use | 2-4 |





Installation Warnings

| | 1) | Always make sure the power switch on the instrument is in the OFF position and remove the power cord from the back of the instrument prior to any instal- lation or relocation of the instrument. | | |
|--------------------------|----|---|--|--|
| | 2) | Do not operate the instrument in an environment where potentially damag- ing liquids or gases are present. | | |
| Installation Cautions | | Do not touch or loosen any screws or parts other than those specifically desig- nated in the instructions. Doing so might cause misalignment and will void the instrument warranty. | | |
| Unpacking | | The SPECTRAmax 340PC ³⁸⁴ is packed in a specially designed carton. Please retain the carton and the packing materials. If the unit should need to be returned for repair, you must use the original packing materials and carton for shipping. If the carton has been damaged in transit, it is particularly important that you <i>retain it for inspection by the carrier in case there has also been damage to the instrument.</i> | | |
| | | ★ WARNING: The SPECTRAmax 340PC ³⁸⁴ weighs approximately 30 lb (13.6 kg) and should be lifted with care. It is recommended that two persons lift the instrument together, taking the proper precautions to avoid injury. | | |
| | | After examining the carton, place it on a flat surface in the upright position. Open the top of the box and lift the SPECTRAmax 340PC ³⁸⁴ , along with the packing materials around the ends, up and out of the shipping box. Remove the packing material from both ends of the instrument and set the instrument down carefully. | | |



Setting Up for Stand-Alone Use

- 1) Place the SPECTRAmax 340PC³⁸⁴ on a *level surface, away from direct sunlight, dust, drafts, vibration, and moisture.*
- 2) Turn the instrument around so that the back of the instrument is facing you as shown in Figure 2.1.



Figure 2.1: View of Rear Panel

- 3) Insert the appropriate (Macintosh or PC) serial interface cable into the RS-232 serial port on the SPECTRAmax 340PC³⁸⁴. Connect the other end to the serial port of the computer.
- 4) Insert the female end of the power cord into the power receptacle at the rear of the SPECTRAmax 340PC³⁸⁴. Connect the male end to a grounded power outlet of the appropriate voltage. Molecular Devices recommends that you use a surge protector between the power cord and the grounded power outlet.
- 5) If you are using a printer for reading microplates in stand-alone mode, locate the printer port (25-pin parallel) on the rear panel of the SPECTRAmax 340PC³⁸⁴. Connect one end of the cable to this port and the connect the other (Centronics) end to the printer. Load paper into the printer according to the manufacturer's instructions and connect the printer's power cord to the power outlet.
- 6) Turn the SPECTRAmax 340PC³⁸⁴ around so that the control panel now faces you. Be sure no cables run beneath the instrument. Leave at least three inches between the back of the instrument and the nearest objects or surfaces to ensure proper ventilation and cooling.
- 7) Turn on the power to the SPECTRAmax 340PC³⁸⁴, wait for the microplate drawer to open, and remove the tape and protective covering from the drawer subplate.

Chapter 3 Stand-Alone Operation

| Prepare for a Reading | 3-3 |
|------------------------------------|-----|
| Turn the Instrument and Printer On | |
| Set the Temperature | 3-3 |
| Select the Wavelength | |
| Operation Overview | |



Prepare for a

Reading

This chapter contains operating information for the SPECTRAmax 340PC³⁸⁴ Microplate Spectrophotometer. If you are an experienced user of this instrument, you can turn to the Operation Overview on page 3-3 for a quick review of the operating steps.

NOTE: Only temperature selection and single-wavelength readings are available in stand-alone mode through front panel control. To achieve full use of this instrument, connect it to a computer and use SOFTmax PRO software.

Turn the Instrument and Printer On

The power switch for the SPECTRAmax 340PC³⁸⁴ is located on the back panel. Press the rocker switch to the ON position. The instrument will automatically perform diagnostic checks to ensure that it is functioning correctly. Turn the printer on at the same time.

Set the Temperature

If elevated temperature within the microplate chamber is required, you should turn on the incubator first, allowing enough time for the temperature to reach the set point before performing a reading. When you first turn the instrument on, up to 30 minutes may be required for the temperature within the chamber to reach the set point.

To enable the incubator, press the incubator TEMP On/Off key. The LCD display will update to show the temperature set point and the current chamber temperature.

To change the temperature set point, press the up or down arrows above and below TEMP until the desired temperature set point is shown in the display.

The microplate chamber temperature will be maintained at the set point until you disable temperature control by touching the incubator <u>TEMP On/Off</u> key again. When the incubator is off, the drawer will open and the temperature within the chamber will begin returning to ambient.

NOTE: Should you turn the incubator back on after a momentary shutdown, allow about ten minutes for the control algorithm to fully stabilize the chamber temperature.

Select the Wavelength

Press the up or down arrow keys above and below the λ to increment or decrement the wavelength setting (1 nm increments).

OperationThe following steps provide a quick reminder of the basic operating proce-
dures required to read a microplate using the SPECTRAmax $340PC^{384}$.

- 1) Turn on the power switch of the SPECTRAmax 340PC³⁸⁴ (located on the back panel).
- 2) If you wish to regulate the temperature inside the microplate reading chamber, touch the <u>TEMP On/Off</u> key to bring the chamber to the default temperature of 37.0°C. The microplate drawer will close and the indicator on the right of the LCD will flash until the set temperature is reached.



- 3) If the incubator is on, the LCD will show the current temperature along with the temperature set point. To change the set point (to any setting from ambient +4° to 45°C), press either the up or down arrow above or below TEMP.
- 4) Select the desired measurement wavelength by pressing the up or down arrow near λ . Scroll up or down through the list of wavelengths shown in the LCD using the up or down arrows until the desired measurement wavelength is highlighted.
- 5) Load the prepared microplate into the chamber. Select 96- or 384-well with the 96/384 key. Press the READ key.
 - **NOTE:** Due to the continuous changes in printer technology leading to printer obsolescence and the ability of SOFTmax PRO software to print on PC- and Macintosh-compatible printers, Molecular Devices does not recommend reliance on printing in the stand-alone mode.

Chapter 4 Maintenance and Troubleshooting

| Technical Support4- | 3 |
|-----------------------------------|---|
| Warnings and Cautions4- | 3 |
| General | 4 |
| Cleaning | 4 |
| Changing the Fan Filter4- | 4 |
| Changing the Fuses4- | 5 |
| Error Codes and Probable Causes4- | 7 |
| Error Messages4- | 7 |
| Opening the Drawer Manually4-1 | 1 |
| | |





This chapter lists maintenance procedures and troubleshooting information, including error codes that may be seen, followed by their most likely causes and remedies.

TechnicalMolecular Devices Corporation is a leading worldwide manufacturer and dis-
tributor of analytical instrumentation. We are committed to the quality of our
products and to fully supporting our customers with the highest level of tech-
nical service. In order to fully benefit from our technical services, please com-
plete the registration card and return it to the address printed on the card.

If you have any problems using the SPECTRAmax 340PC³⁸⁴ Microplate Spectrophotometer that are not covered in this chapter, in the U.S., contact our Technical Services group at 1-800-635-5577; elsewhere contact your local representative.

Warnings and Cautions

- BIOHAZARD: It is your responsibility to decontaminate the instrument, as well as any accessories, before requesting service by Molecular Devices representatives and before returning the instrument or any components to Molecular Devices Corporation.
- **WARNING:** All maintenance procedures described in this manual can be safely performed by qualified personnel. Maintenance not covered in this manual should be performed by a Molecular Devices representative.
- **WARNING:** Removal of protective covers that are marked with the High Voltage warning symbol shown below can result in a safety hazard.



- **WARNING:** Always turn the instrument off and remove the power cord and any computer/printer cables from the back prior to any maintenance or installation operation
- **WARNING:** Never perform any operation on the instrument in an environment where liquids or potentially damaging gases are present.
- WARNING: Risk of electrical shock. Refer servicing to qualified personnel.
- **CAUTION:** Use of organic solvents (such as dichloromethane) may cause harm to the optics in the SPECTRAmax 340PC³⁸⁴. Extreme caution is advised when using organic solvents. Always use a plate lid and avoid placing a plate containing these materials in the reading chamber for prolonged periods of time. Damage caused by the use of incompatible or aggressive solvents is NOT covered by the instrument warranty.
- ▲ CAUTION: Never touch any of the optic mirrors, filters, or cables or their housing, or manifold. The optics are extremely delicate, and critical toe of the instrument.
- **CAUTION:** Do not touch or loosen any screws or parts other than those specifically designated in the instructions. Doing so could cause misalignment and possibly void warranty.



| General | | Keep the drawer closed when the instrument is not in use. The drawer can be opened by pressing the DRAWER button. Always close the drawer immedi- ately prior to switching the instrument off. | | |
|----------------------------|----|--|--|--|
| Cleaning | | BIOHAZARD: Wear gloves during any cleaning procedure that could involve contact with either hazardous or biohazardous materials or fluids. | | |
| | | Periodically, you should clean the <i>outside</i> surfaces of the SPECTRAmax 340PC ³⁸⁴ using a cloth or sponge that has been dampened with water. Do not use abrasive cleaners. If required, clean the surfaces using a mild soap solution diluted with water or a glass cleaner and then wipe with a damp cloth or sponge to remove any residue. Do not spray cleaner onto the instrument. | | |
| | | If needed, clean the microplate drawer using a cloth or sponge that has been dampened with water. | | |
| | | Should fluids spill in the drawer area when the drawer is out, they will be directed to a tray at the bottom of the instrument from which they will exit to the bench or counter beneath the instrument. Wipe up any spills immediately. Clean only the exterior of the unit (and the microplate drawer, if necessary). Never clean the inside of the instrument. Do not allow excess water or other fluids to drip inside the instrument. | | |
| Cleaning the Fan Filter | | The fan filter on the bottom of the instrument requires periodic cleaning. The frequency of the cleaning depends on how dusty your particular lab is and could range from once a month to once every six months. | | |
| | 1) | Turn power to the instrument OFF and then remove the power cord and cables from the back of the instrument. | | |
| | 2) | Make sure no plate is in the instrument. Turn the instrument over so that it rests flat on the bench. | | |
| | 3) | Pop the black fan cover off the remove the filter. | | |
| | 4) | Clean the filter by blowing clean, canned air through it or by rinsing it—first with water and then with alcohol—and allowing it to dry completely. | | |
| | 5) | Place the clean, dry filter over the fan and replace the black cover. | | |
| | 6) | Turn the instrument back over. Reconnect the power cord and cables to the instrument. | | |
| | | | | |

| (III) | Maintenance and Troubleshooting |
|-----------------------|---|
| Changing the Fuses | Fuses burn out occasionally and must be replaced. If the instrument does not seem to be getting power after switching it on (the LCD shows no display), first check to see whether the power cord is securely plugged in to a function- ing power outlet and to the receptacle at the rear of the SPECTRAmax 340PC ³⁸⁴ . If power failed while the SPECTRAmax 340PC ³⁸⁴ was already on, check that the power cord is not loose or disconnected and that power to the power outlet is functioning properly. If these checks fail to remedy the loss of power, follow the steps listed below to replace the fuses. Spare fuses (two U.S. and two metric) are shipped with the instrument. The U.S. and metric fuses are identical except for physical size. They may be taped to the back of the SPECTRAmax 340PC ³⁸⁴ . |
| | If you no longer have spare fuses, you may obtain new ones from Molecular Devices (part numbers: 4601-0013 for U.S., 4601-0014 for metric) or from a local hardware store. Make sure fuses are rated SLOWBLOW (U.S.: 4-amp time-delay; metric: 4-amp, 5×20 mm, time-delay). |
| | To change fuses, follow the steps below. |
| | 1) Switch power to the instrument off and then remove the power cord from the outlet and from the SPECTRAmax 340PC ³⁸⁴ power cord receptacle. |
| 2 |) Remove the printer cable and computer cable (if connected) from the back of the SPECTRAmax 340PC ³⁸⁴ . |
| 3 |) Turn the instrument around for easy access to the rear panel. |
| 4 |) On the left-hand side of the rear panel (viewed from the back) is the power switch, fuse box, and power cord receptacle. As shown in the figures below, press to the right of the black plastic cover of the fuse box to release it. Pull the fuse box cover away from the instrument. The fuse box will begin to slide forward. |
| | |



Fuse Box Cover



Figure 4.1: Power Switch, Fuse Box, and Power Receptacle



5) Continue gently pulling the fuse box forward until it is free of the instrument.



Figure 4.2: Removing the Fuse Box

- 6) When removed, the fuse assembly will appear as shown in Figure 4.3. The holder inside contains two fuses.
- 7) It is possible that only one of the fuses may have blown. Molecular Devices recommends that you replace both fuses, however, to ensure continued proper operation. Pull both fuses out of the holder and discard them.



Figure 4.3: The Fuse Box and Holder (with Fuses) Removed

- 8) Insert new SLOWBLOW-rated fuses into the fuse holder. Either end of the fuse may be forward.
- 9) Insert the fuse box into the opening in the instrument, making sure that the fuses are on the right side (toward the power receptacle). Press the fuse box into place, making sure the cover snaps closed.
- 10) Reconnect the power cord to the instrument and to the wall outlet and reconnect other cables previously disconnected.



Error Codes and Probable Causes

If a problem occurs during operation that causes an unrecoverable error, the instrument will stop and an error code number will be shown in the display on the front panel. To correct the problem, call your local Molecular Devices representative for assistance.

Error Messages

The LCD will display *Fatal Error* codes when a situation arises that requires attention. Any reading in progress will stop. *Warning* messages do not stop a reading but are logged in the error buffer. Warning messages indicate a situation that requires attention but is not sufficient to stop or prevent a reading. Examples of situations that might cause warning messages are low memory, entries being out of range, or operations that could result in loss of data. These messages are generally self explanatory. For assistance regarding warning messages, contact your local Molecular Devices representative.

Error Code Classifications

Not all error messages are listed in this manual. The errors are grouped in relationship to possible causes as follows:

| Error Code Numbers | Possible Causes |
|--------------------|---|
| 100 -199 | Errors possibly caused by unrecognized commands being sent from the computer to the instrument. |
| 200-299 | Errors probably due to a main board failure or an error in the firmware code. Most of these errors require the assistance of Technical Support. |
| 300-399 | Instrument errors due to either a main board failure or other system failure. Most of these errors require the assistance of Technical Support. |
| 400-499 | Errors caused by a motor motion failure. Most of these errors require the assis- tance of Technical Support. |
| 500-599 | Errors due to failure or improper initialization of the instruments non-volatile memory (NVRAM). All of these errors require the assistance of Technical Support. |

Some errors (shown in **boldface** in this manual) are considered fatal if they are detected during power up (the instrument will abort the power up sequence and display "FATAL ERROR ###" on the LCD panel). Check the following table to see if you can do something to prevent the fatal error. After correcting the problem, leave the instrument on for about five minutes, turn it off and then back on. If you continue to get the fatal error message on power up, record the error message number and contact Molecular Devices Technical Support or your local representative for assistance.

NOTE: If the instrument is functioning normally when using SOFTmax PRO, no errors should be in the buffer (except error number 100).



| ERROR CODE | ERROR MESSAGE | NOTES |
|---------------|---|--|
| 100-199: Un | recognized Command Erro | ors Sent from the Computer |
| 100 | command not found | Command string not recognized. |
| 101 | invalid argument | Command Argument not recognized. |
| 102 | too many arguments | Too many arguments after command. |
| 103 | not enough arguments | Missing arguments. |
| 104 | input line too long | Too many characters in the input line. |
| 105 | command invalid, sys- tem busy | Instrument could not perform the give command because it was busy doing another task. Example: Request a wavelength while the monochromator is in motion. |
| 106 | command invalid, mea- surement in progress | Instrument could not perform command because a measurement was in progress |
| 107 | no data to transfer | Inputting transfer when there's no data in the buffer |
| 108 | data buffer full | To many data sets in the buffer. Can be caused by setting up a long kinetic and disconnecting computer or SOFTmax PRO is preempted by another application. |
| 109 | error buffer overflow | More than 65 errors in the buffer, clear the buffer. |
| 110 | stray light | |
| 111 | invalid read settings | |
| 200-299: Fir | mware Errors | |
| 200 | assert failed | Firmware error. |
| 201 | bad error number | Firmware error. |
| 202 | receive queue overflow | Caused by external device sending too much data over serial port and ignoring flow control. |
| 203 | serial port parity error | Parity bit error detected with incoming serial data. |
| 204 | serial port overrun error | Caused by host computer sending too much data and ignoring the flow control signal. |
| 205 | serial port framing error | |
| 206 | cmd generated too much output | Firmware error. |

Table 4.1. Error Codes, Messages, and Notes about the Errors



| ERROR CODE | ERROR MESSAGE | NOTES |
|---------------|------------------------------------|---|
| 207 | fatal trap | Instrument error. Instrument locks up. |
| 208 | RTOS error | Firmware error. |
| 209 | stack overflow | Firmware error. |
| 210 | unknown interrupt | Firmware error. |
| 300-399: Ha | rdware Errors | |
| 300 | thermistor faulty | Unable to read a reasonable thermistor value. Thermistor faulty or disconnected, Main board problem, or ambient temperature out of range. |
| 301 | safe temperature limit exceeded | A temperature of over 50°C detected on one or more of the 4 thermistors. Temperature will be shut off and remain off until a successful completion of power-up reset. |
| 302 | low light | Not enough light detected to make an accurate measurement. |
| 303 | unable to cal dark cur- rent | Too much stray light detected on power-up, faulty or discon- nected pre-amp boards. |
| 304 | signal level saturation | |
| 305 | reference level saturation | |
| 306 | plate air cal fail, low light | Minimum signal/reference ratio not met during air calibration. |
| 307 | cuv air ref fail | |
| 308 | stray light | Light leak in reading chamber. Could also be a faulty pre-amp board. |
| 309 | front panel not respond- ing | LCD front panel bad or disconnected. |
| 310 | | |
| 311 | | |
| 312 | gain calibration failed | Power-up calibration and check of signal path gain is out of tol- erance. Could be due to bad or disconnected pre-amp or exces- sive stray light. |
| 313 | reference gain check fail | Power-up check of the Reference amplifier's gain out of toler- ance. Could be due to bad or disconnected pre-amp board or excessive stray light. |
| 314 | low lamp level warning | |

| Table 4.1 Error | Codes Messages | and Notes about the | Errors |
|------------------|-------------------|---------------------|--------|
| 1001C 1.1. LIIUI | Couco, micosugeo, | unu nones about ine | |



| ERROR CODE | ERROR MESSAGE | NOTES |
|---------------|-----------------------------------|---|
| 315 | can't find zero order | On power-up grating motor could not find zero-order home position. |
| 316 | grating motor driver faulty | Grating motor didn't move to where it was commanded to in a reasonable time. |
| 317 | monitor ADC faulty | |
| 400-499: Mo | otion Errors | |
| 400 | carriage motion error | Carriage did not move to either of its photo interrupts in a rea- sonable time, or can't find its photo interrupt. |
| 401 | filter wheel error | Filter wheel did not move to its photo interrupt in a reasonable time, or can't find its photo interrupt. |
| 402 | grating error | Grating did not move to its photo interrupt in a reasonable time, or can't find its photo interrupt. |
| 403 | stage error | Stage did not move to its photo interrupt in a reasonable time, or can't find its photo interrupt. |
| 500-599: NV | RAM Errors | |
| 500 | NVRAM CRC corrupt | The CRC for the NVRAM data is corrupt. |
| 501 | NVRAM Grating cal data bad | Grating calibration data is unreasonable. |
| 503 | NVRAM Plate air cal data error | Plate air calibration data is unreasonable. |
| 504 | NVRAM Carriage offset error | Carriage offset data is unreasonable. |
| 505 | NVRAM Stage offset error | Stage offset data is unreasonable. |
| 506 | NVRAM Battery | Time to replace the NVRAM battery (U3). |

| Table 4.1. Error | Codes. | Messages. | and Notes | about the | Errors |
|------------------|----------|-----------|-----------|-----------|--------|
| 11010 1.1. 11101 | Conco, 1 | messages, | unu nonco | about the | LIIUIS |



| Opening the Drawer Manuallu | If an error occurs while the drawer is closed and you need to open the drawer, press the Drawer key. If the drawer does not open, turn power to the instrument off and then on again. |
|-----------------------------------|---|
| y | If the drawer still remains closed, turn the power off and using your thumb nail, locate the groove in the upper left side wall of the door. Open the door, and with your index finger, pull the microplate drawer out of the instrument (<i>do not force the drawer</i>) and remove the microplate. This action will not harm the instrument, but should only be taken if the first two options have failed to open the drawer. |
| | If you are still unable to open the drawer, contact Molecular Devices Technical Support or your local representative for assistance. |



Appendix A Printers and Cables

| Compatible Printers. | • | | • | • | • | | | • | | • | • | • | A- | .3 |
|----------------------|---|------|-------|-------|---|--|--|---|--|---|---|-------|--------|----|
| Cables | • | | • | • | • | | | • | | • | • | | A- | .3 |



| Compatible Printers | The SPECTRAmax 340PC ³⁸⁴ can be used with an Epson-compatible strip printer. Compatibility may require changing the dip switch or pin settings on the printer or insertion of an emulation cartridge. Please check your printer's manual to assess compatibility based on this criterion—some printers will not meet this requirement. | | | | | | | | |
|------------------------|---|--|--|--|--|--|--|--|--|
| | NOTE: Due to the continuous changes in printer technology leading to printer obsolescence and the ability of SOFTmax PRO software to print on PC- and Macintosh-compatible printers, Molecular Devices does not recommend reliance on printing in the stand-alone mode. | | | | | | | | |
| Cables | Molecular Devices recommends that you use high-quality, double-shielded cables to connect the SPECTRAmax 340PC ³⁸⁴ to other peripheral instruments, such as a printer or computer. Choose cables that meet the following requirements: | | | | | | | | |
| | Printer Cable (for Stand-alone operation only): | | | | | | | | |
| | Centronics parallel, male 25D to Centronics. | | | | | | | | |
| | Serial Interface Cable (contact Molecular Devices for specific pin-out requirements) | | | | | | | | |
| | Macintosh: Male DB8 to male DB8 | | | | | | | | |
| | IBM Compatible: Male DB8 to Female DB9 (custom cable made by Molecular Devices) | | | | | | | | |



Appendix B Accessories

| Items Available for Use with the | |
|----------------------------------|---------|
| SPECTRAmax 340PC ³⁸⁴ | B-3 |





Items Available for Use with the SPECTRAmax 340PC³⁸⁴

Part Number

| Cable, RS-232, Macintosh to SPECTRAmax 340PC ³⁸⁴ 8-pin DIN to 8-pin DIN | 91 |
|---|----|
| Cable, RS-232, PC to SPECTRAmax 340PC ³⁸⁴ | |
| 9-pin to 8-pin DIN | 49 |
| Fuse, 4-amp (5 × 20 mm) Time Delay | 14 |
| Power Cord (US, Canada, Japan, Mexico, India) 4400-000 | 02 |
| Power Cord, EC1 (Germany, France, Scandinavia, Italy, Korea) 4400-003 | 36 |
| Power Cord, EC2 (UK, Indonesia, Singapore, Malaysia) | 37 |
| Power Cord, AP1 (Australia, Hong Kong, China) | 38 |
| SPECTRAmax Mouse Pad 9000-013 | 33 |
| SPECTRAtest 340PC ³⁸⁴ Validation Package | 05 |





B

Back panel 1-8 Bandwidth 1-13

C

Cables 2-4, A-3 connecting 2-4 serial 1-8 Calibration 1-13 Cleaning 4-4 Computer control 1-10 Connections 1-5, 1-8 cables 2-4, A-3 printer 1-8, 2-4 Control panel 1-5 Control panel display 1-7

D

Drawer key 1-6, 1-7, 1-9 open manually 4-11

E

Error Messages 4-7

F

Fan filter 4-4 Fuses 4-5 accessing 1-8

I

Incubator 1-7, 1-9, 3-3 Installation 2-3

K

Keys (control panel) 1-5

L

Labels 1-8

LCD (Liquid Crystal Display) 1-5, 3-4, 4-7

Μ

Microplate 1-3 96-well 1-8 filter-bottom 1-8 strip wells 1-8 temperature uniformity 1-8 Microplate drawer 1-5, 1-6, 1-7 closing 1-7 incubator status 1-7

P

Pathlength correction 1-4 Ports 2-4 printer 1-8 serial 1-8 Power cord 1-8, 2-4, B-3 Power switch 1-5, 1-8, 3-3 Printer 2-4, 3-3 Printer port 1-8, 2-4

R

Read mode 1-10 Read the microplate 1-10 Remote control 1-10

S

Serial port 1-8 Set point 1-6 Set point, temperature 1-7 SOFTmax PRO 1-3, 1-4, 1-10 Specifications 1-13 Spills 4-4 Stand-alone operation 1-9, 2-4

T

Technical service 4-3 Temperature 1-9, 1-10, 3-3 equilibration 1-10, 3-3 incubator 1-10, 3-3



regulation 1-9 set point 1-6, 1-10, 3-3 setting 3-3 stabilization 1-10

W

Warranty i-ii Wavelength 3-4 range 1-13 Selection 1-9 Wavelength setting 1-6