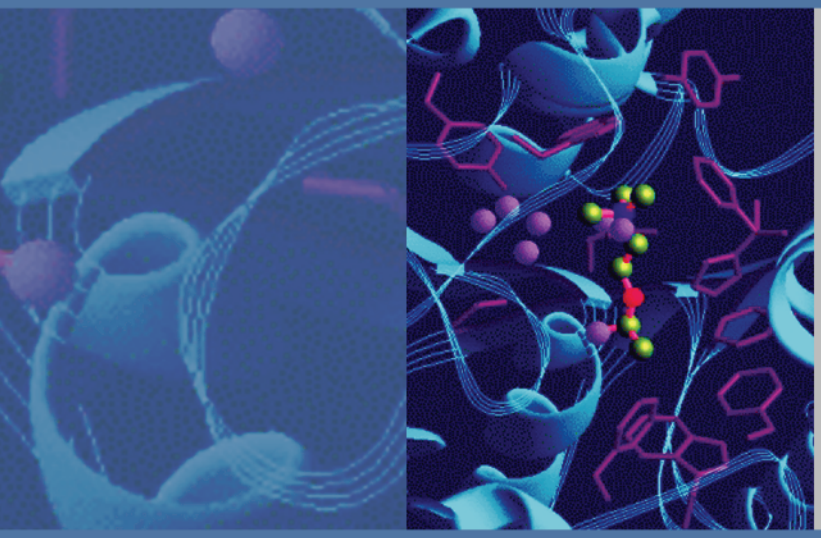

SpectraSYSTEM

UV/Vis Detectors

User Guide

A0099-97005 Revision A August 2008

Thermo SCIENTIFIC

Release history: Revision A released August 2008

For Research Use Only. Not regulated for medical or veterinary diagnostic use by U.S. Federal Drug Administration or other competent authorities.

Regulatory Compliance

Thermo Fisher Scientific performs complete testing and evaluation of its products to ensure full compliance with applicable domestic and international regulations. When the system is delivered to you, it meets all pertinent electromagnetic compatibility (EMC) and safety standards as described below.

EMC Directive 2004/108/EC

EMC compliance has been evaluated by TUV Rheinland of North America.

CISPR 11: 1998	EN 61000-4-4: 2004
EN 55011: 1998, A1:1999, A2, 2002	EN 61000-4-5: 2001
EN 61000-3-2: 2000	EN 61000-4-6: 2003
EN 61000-3-3: 1995, A1: 2001	EN 61000-4-11: 2001
EN 61000-4-2: 2001	EN 61326-1: 1997, A1: 1998, A2: 2001, A3: 2003
EN 61000-4-3: 2002	CFR 47: 2007

Low Voltage Safety Compliance

Low voltage safety compliance has been evaluated by TUV Rheinland of North America.

This device complies with Low Voltage Directive 2006/95/EC, harmonized standard EN 61010-1: 2001, IEC 61010-1: 2002, UL 61010A-1: 2004, and CAN/CSA 22.2 61010-1: 2004.

Changes that you make to your system may void compliance with one or more of these EMC and safety standards. Changes to your system include replacing a part or adding components, options, or peripherals not specifically authorized and qualified by Thermo Fisher Scientific. To ensure continued compliance with EMC and safety standards, replacement parts and additional components, options, and peripherals must be ordered from Thermo Fisher Scientific or one of its authorized representatives.

FCC Compliance Statement

THIS DEVICE COMPLIES WITH PART 15 OF THE FCC RULES. OPERATION IS SUBJECT TO THE FOLLOWING TWO CONDITIONS: (1) THIS DEVICE MAY NOT CAUSE HARMFUL INTERFERENCE, AND (2) THIS DEVICE MUST ACCEPT ANY INTERFERENCE RECEIVED, INCLUDING INTERFERENCE THAT MAY CAUSE UNDESIRED OPERATION.

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CAUTION Read and understand the various precautionary notes, signs, and symbols contained inside this manual pertaining to the safe use and operation of this product before using the device.

Notice on Lifting and Handling of Thermo Scientific Instruments

For your safety, and in compliance with international regulations, the physical handling of this Thermo Fisher Scientific instrument ***requires a team effort*** to lift and/or move the instrument. This instrument weighs 18 kg (40 lbs) and is too heavy for one person alone to handle safely.

Notice on the Proper Use of Thermo Scientific Instruments

In compliance with international regulations: Use of this instrument in a manner not specified by Thermo Fisher Scientific could impair any protection provided by the instrument.

Notice on the Susceptibility to Electromagnetic Transmissions

Your instrument is designed to work in a controlled electromagnetic environment. Do not use radio frequency transmitters, such as mobile phones, in close proximity to the instrument.

For manufacturing location, see the label on the instrument.

WEEE Compliance

This product is required to comply with the European Union's Waste Electrical & Electronic Equipment (WEEE) Directive 2002/96/EC. It is marked with the following symbol:

Thermo Fisher Scientific has contracted with one or more recycling or disposal companies in each European Union (EU) Member State, and these companies should dispose of or recycle this product. See www.thermo.com/WEEERoHS for further information on Thermo Fisher Scientific's compliance with these Directives and the recyclers in your country.

WEEE Konformität

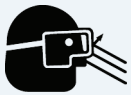
Dieses Produkt muss die EU Waste Electrical & Electronic Equipment (WEEE) Richtlinie 2002/96/EC erfüllen. Das Produkt ist durch folgendes Symbol gekennzeichnet:

Thermo Fisher Scientific hat Vereinbarungen mit Verwertungs-/Entsorgungsfirmen in allen EU-Mitgliedsstaaten getroffen, damit dieses Produkt durch diese Firmen wiederverwertet oder entsorgt werden kann. Mehr Information über die Einhaltung dieser Anweisungen durch Thermo Fisher Scientific, über die Verwerter, und weitere Hinweise, die nützlich sind, um die Produkte zu identifizieren, die unter diese RoHS Anweisung fallen, finden sie unter www.thermo.com/WEEERoHS.

Conformité DEEE

Ce produit doit être conforme à la directive européenne (2002/96/EC) des Déchets d'Equipements Electriques et Electroniques (DEEE). Il est marqué par le symbole suivant:

Thermo Fisher Scientific s'est associé avec une ou plusieurs compagnies de recyclage dans chaque état membre de l'union européenne et ce produit devrait être collecté ou recyclé par celles-ci. Davantage d'informations sur la conformité de Thermo Fisher Scientific à ces directives, les recycleurs dans votre pays et les informations sur les produits Thermo Fisher Scientific qui peuvent aider la détection des substances sujettes à la directive RoHS sont disponibles sur www.thermo.com/WEEERoHS.

CAUTION Symbol	CAUTION	VORSICHT	ATTENTION	PRECAUCION	AVVERTENZA
	**Electric Shock:** This instrument uses high voltages that can cause personal injury. Before servicing, shut down the instrument and disconnect the instrument from line power. Keep the top cover on while operating the instrument. Do not remove protective covers from PCBs.	**Elektroschock:** In diesem Gerät werden Hochspannungen verwendet, die Verletzungen verursachen können. Vor Wartungsarbeiten muß das Gerät abgeschaltet und vom Netz getrennt werden. Betreiben Sie Wartungsarbeiten nicht mit abgenommenem Deckel. Nehmen Sie die Schutzabdeckung von Leiterplatten nicht ab.	**Choc électrique:** L'instrument utilise des tensions capables d'infliger des blessures corprelles. L'instrument doit être arrêté et débranché de la source de courant avant tout intervention. Ne pas utiliser l'instrument sans son couvercle. Ne pas elensver les étuis protecteurs des cartes de circuits imprimés.	**Descarga eléctrica:** Este instrumento utiliza altas tensiones, capaces de producir lesiones personales. Antes de dar servicio de mantenimiento al instrumento, éste debera apagarse y desconectarse de la línea de alimentacion eléctrica. No opere el instrumento sin sus cubiertas exteriores quitadas. No remueva las cubiertas protectoras de las tarjetas de circuito impreso.	**Shock da folgorazione.** L'apparecchio è alimentato da corrente ad alta tensione che puo provocare lesioni fisiche. Prima di effettuare qualsiasi intervento di manutenzione occorre spegnere ed isolare l'apparecchio dalla linea elettrica. Non attivare lo strumento senza lo schermo superiore. Non togliere i coperchi a protezione dalle schede di circuito stampato (PCB).
	**Chemical:** This instrument might contain hazardous chemicals. Wear gloves when handling toxic, carcinogenic, mutagenic, or corrosive or irritant chemicals. Use approved containers and proper procedures to dispose waste oil.	**Chemikalien:** Dieses Gerät kann gefährliche Chemikalien enthalten. Tragen Sie Schutzhandschuhe beim Umgang mit toxischen, karzinogenen, mutagenen oder ätzenden/reizenden Chemikalien. Entsorgen Sie verbrauchtes Öl entsprechend den Vorschriften in den vorgeschriebenen Behältern.	**Chimique:** Des produits chemiques dangereux peuven se trouver dans l'instrument. Proted dos gants pour manipuler tous produits chemiques toxiques, cancérigènes, mutagènes, ou corrosifs/irritants. Utiliser des récipients et des procédures homologuées pour se débarrasser des déchets d'huile.	**Química:** El instrumento puede contener productos quimicos peligrosos. Utilice guantes al manejar productos quimicos tóxicos, carcinogenos, mutagenos o corrosivos/irritantes. Utilice recipientes y procedimientos aprobados para deshacerse del aceite usado.	**Prodotti chimici.** Possibile presenza di sostanze chimiche pericolose nell'apparecchio. Indossare dei guanti per maneggiare prodotti chimici tossici, cancerogeni, mutageni, o corrosivi/irritanti. Utilizzare contenitori aprovo e seguire la procedura indicata per lo smaltimento dei residui di olio.
	**Heat:** Before servicing the instrument, allow any heated components to cool.	**Hitze:** Warten Sie erhitzte Komponenten erst nachdem diese sich abgekühlt haben.	**Haute Temperature:** Permettre aux composants chauffés de refroidir avant tout intervention.	**Altas temperaturas:** Permita que lop componentes se enfríen, ante de efectuar servicio de mantenimiento.	**Calore.** Attendere che i componenti riscaldati si raffreddino prima di effetturare l'intervento di manutenzione.
	**Fire:** Use care when operating the system in the presence of flammable gases.	**Feuer:** Beachten Sie die einschlägigen VorsichtsmaBnahmen, wenn Sie das System in Gegenwart von entzündbaren Gasen betreiben.	**Incendie:** Agir avec précaution lors de l'utilisation du système en présence de gaz inflammables.	**Fuego:** Tenga cuidado al operar el sistema en presencia de gases inflamables.	**Incendio.** Adottare le dovute precauzioni quando si usa il sistema in presenza di gas infiammabili.
	**Eye Hazard:** Eye damage could occur from splattered chemicals or flying particles. Wear safety glasses when handling chemicals or servicing the instrument.	**Verletzungsgefahr der Augen:** Verspritzte Chemikalien oder kleine Partikel können Augenverletzungen verursachen. Tragen Sie beim Umgang mit Chemikalien oder bei der Wartung des Gerätes eine Schutzbrille.	**Danger pour les yeux:** Dex projections chimiques, liquides, ou solides peuvent être dangereuses pour les yeux. Porter des lunettes de protection lors de toute manipulationde produit chimique ou pour toute intervention sur l'instrument.	**Peligro par los ojos:** Las salicaduras de productos químicos o particulas que salten bruscamente pueden causar lesiones en los ojos. Utilice anteojos protectores al mnipular productos químicos o al darle servicio de mantenimiento al instrumento.	**Pericolo per la vista.** Gli schizzi di prodotti chimici o delle particelle presenti nell'aria potrebbero causare danni alla vista. Indossare occhiali protettivi quando si maneggiano prodotti chimici o si effettuano interventi di manutenzione sull'apparecchio.
	**General Hazard:** A hazard is present that is not included in the above categories. Also, this symbol appears on the instrument to refer the user to instructions in this manual.	**Allgemeine Gefahr:** Es besteht eine weitere Gefahr, die nicht in den vorstehenden Kategorien beschrieben ist. Dieses Symbol wird im Handbuch auBerdem dazu verwendet, um den Benutzer auf Anweisungen hinzuweisen.	**Danger général:** Indique la présence d;un risque n'appartenant pas aux catégories citées plus haut. Ce symbole figure également sur l'instrument pour renvoyer l'utilisateur aux instructions du présent manuel.	**Peligro general:** Significa que existe un peligro no incluido en las categorias anteriores. Este simbolo también se utiliza en el instrumento par referir al usuario a las instrucciones contenidas en este manual.	**Pericolo generico.** Pericolo non compreso tra le precedenti categorie. Questo simbolo è utilizzato inoltre sull'apparecchio per segnalare all'utente di consultare le istruzioni descritte nel presente manuale.
	When the safety of a procedure is questionable, contact your local Technical Support organization for Thermo Fisher Scientific San Jose Products.	Wenn Sie sich über die Sicherheit eines Verfahrens im unklaren sind, setzen Sie sich, bevor Sie fortfahren, mit Ihrer lokalen technischen Unterstützungsorganisation für Thermo Fisher Scientific San Jose Produkte in Verbindung.	Si la sûreté d'un procédure est incertaine, avant de continuer, contacter le plus proche Service Clientèle pour les produits de Thermo Fisher Scientific San Jose.	Cuando la certidumbre acerca de un procedimiento sea dudosa, antes de proseguir, pongase en contacto con la Oficina de Asistencia Tecnica local para los productos de Thermo Fisher Scientific San Jose.	Quando e in dubbio la misura di sicurezza per una procedura, prima di continuare, si prega di mettersi in contatto con il Servizio di Assistenza Tecnica locale per i prodotti di Thermo Fisher Scientific San Jose.

CAUTION Symbol	CAUTION	危険警告	危險警告
	**Electric Shock:** This instrument uses high voltages that can cause personal injury. Before servicing, shut down the instrument and disconnect the instrument from line power. Keep the top cover on while operating the instrument. Do not remove protective covers from PCBs.	**電撃：**この計測器は高電圧を使用し、人体に危害を与える可能性があります。保守・修理は、必ず操業を停止し、電源を切ってから実施して下さい。上部カバーを外したままで 計測器を使用しないで下さい。プリント配線板の保護カバーは外さないで下さい。	電擊：儀器設備使用會造成人身傷害的高伏電壓。在維修之前，必須先關儀器設備並切除電源。務必要在頂蓋蓋上的情況下操作儀器。請勿拆除PCB保護蓋。
	**Chemical:** This instrument might contain hazardous chemicals. Wear gloves when handling toxic, carcinogenic, mutagenic, or corrosive or irritant chemicals. Use approved containers and proper procedures to dispose waste oil.	**化学物質：**危険な化学物質が計測器中に存在している可能性があります。毒性、発がん性、突然変異性、腐食・刺激性などのある薬品を取り扱う際は、手袋を着用して下さい。廃油の処分には、規定の容器と手順を使用して下さい。	化學品：儀器設備中可能存在有危險性的化學物品。接觸毒性致癌、誘變或腐蝕／刺激性化學品時，請配帶手套。處置廢油時，請使用經過許可的容器和程序。
	**Heat:** Before servicing the instrument, allow any heated components to cool.	**熱：**熱くなった部品は冷えるのを待ってから保守・修理を行って下さい。	高溫：請先等高溫零件冷卻之後再進行維修。
	**Fire:** Use care when operating the system in the presence of flammable gases.	**火災：**可燃性のガスが存在する場所でシステムを操作する場合は、充分な注意を払って下さい。	火災：在有易燃氣體的場地操作該系統時，請務必小心謹慎。
	**Eye Hazard:** Eye damage could occur from splattered chemicals or flying particles. Wear safety glasses when handling chemicals or servicing the instrument.	**眼に対する危険：**化学物質や微粒子が飛散して眼を傷つける危険性があります。化学物質の取り扱い、あるいは計測器の保守・修理に際しては防護眼鏡を着用して下さい。	眼睛傷害危險：飛濺的化學品或顆粒可能造成眼睛傷害。處理化學品或維儀器設備時請佩戴安全眼鏡。
	**General Hazard:** A hazard is present that is not included in the above categories. Also, this symbol appears on the instrument to refer the user to instructions in this manual.	**一般的な危険：**この標識は上記以外のタイプの危険が存在することを示します。また、計測器にこの標識がついている場合は、本マニュアル中の指示を参照して下さい。	一般性危險：說明未包括在上述類別中的其他危險。此外，儀器設備上使用這個標誌，以指示用戶本使用手冊中的說明。
	When the safety of a procedure is questionable, contact your local Technical Support organization for Thermo Fisher Scientific San Jose Products.	**安全を確保する手順がよくわからない時は、作業を一時中止し、お近くのサーモエレクトロンサンローゼプロダクトのテクニカールサポートセンターごご連絡ください。**	如对安全程序有疑问，请在操作之前与当地的菲尼根技术服务中心联系。

Contents

Preface

About This Guide

This guide describes how to control the UV1000 and UV2000 detectors from the keypad and how to maintain the detectors for optimal performance.

Safety and Special Notices

Make sure you follow the precautionary statements presented in this guide. The safety and other special notices appear in boxes.

CAUTION A caution alerts you to situations that could result in personal injury. It also tells you how to avoid them.

CAUTION This icon alerts you to the presence of high voltage and to the potential injury that could occur from electrical shock were you to come in contact with a specific instrument area or component. It also tells you how to avoid contact with the high-voltage areas in your instrument.

CAUTION This icon alerts you to potential injury that could occur from coming in contact with a heated surface or area on or in an instrument. It also tells you how to avoid contact with the heated surfaces in your instrument.

IMPORTANT Alerts you to the correct operating or maintenance procedures needed to prevent equipment or data damage. They also alert you to important exceptions, side effects, or unexpected occurrences that might result from certain action(s).

Tip Tips call out general rules or shortcuts. They specify ways to obtain the best performance and results from your instrument.

Contacting Us

CAUTION Highlights hazards to humans, property, or the environment. Each CAUTION notice is accompanied by an appropriate CAUTION symbol.

There are several ways to contact Thermo Fisher Scientific.

❖ To contact Technical Support

Phone	800-685-9535
Fax	561-688-8736
E-mail	TechSupport.C+MS@thermofisher.com
Knowledge base	www.thermokb.com

Find software updates and utilities to download at www.mssupport.thermo.com.

❖ To contact Customer Service for ordering information

Phone	800-532-4752
Fax	561-688-8731
Web site	www.thermo.com/finnigan

❖ To suggest changes to documentation or to Help

- Fill out a reader survey online at www.thermo.com/lcms-techpubs.
- Send an e-mail message to the Technical Publications Editor at techpubs.finnigan-lcms@thermofisher.com.

Introduction

This chapter provides you with the three basic rules you will need for using your Thermo Scientific SpectraSYSTEM UV/Vis detector. It also introduces you to the instrument's command center and describes the conventions we will use in this manual.

Before you start this chapter, be sure to read the Safety Information section beginning on page v of this manual and Chapter 6, "Installation and Specifications."

Throughout our explanations, we encourage you to explore the general architecture of the instrument's menus and screens. Use the Menu Trees in Chapter 7, "Menu Reference," as your guide if you want.

Contents

Learning Your Way Around

It's easy to learn your way around a SpectraSYSTEM detector. Just remember these three rules:

1. The arrow keys ∧, ∨, <, > move the cursor in the direction printed on the key.

   Tip Press [MENU] to jump quickly to the top of the menu structure.

2. The shape of the cursor determines how you make a selection:

   - If a triangular Cursor appears, press the [ENTER] key.
   - If a blinking square cursor ▒ appears, press the + or - keys to change values. Depending on the field, you will scroll up or down through preset choices, or change alphanumeric entries one letter or digit at a time.

3. There are four ways to accept (and automatically save) an entry. Just move the cursor out of the field by any of the following methods:
   - Pressing the [ENTER] key
   - Using the arrow keys
   - Pressing the [MENU] key
   - Pressing the [STATUS] key

Tip You won't be able to leave a menu if errors are present or if you haven't filled in all the necessary entries.

Visual Clues

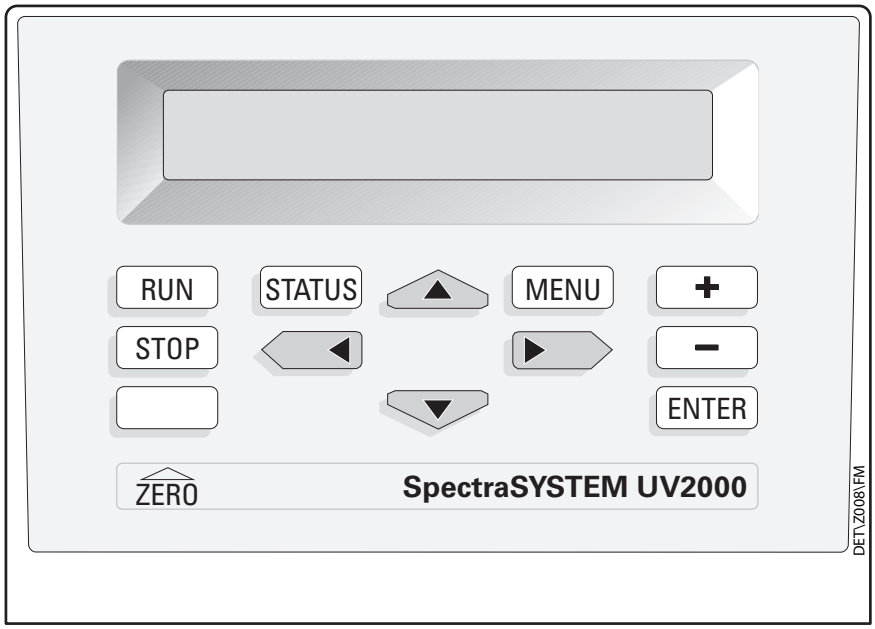
The following conventions are used on the detector's display:

1. Top-level menu choices are displayed in all-capital letters.
2. A field's square cursor changes to an underscore cursor when you're scrolling through preset choices or entering numerical values and characters.
3. A solid down-arrow ▼ on the right side of some displays indicates that the current menu continues on additional screens. To access additional menu lines, press ∨.
4. The last line of a longer menu is frequently a blank display line (without a solid down-arrow).

Instrument Control

Take a look at the keypad and two-line display located on the front panel (Figure 1). This is the command center from which you'll access menus and control the instrument's operations. A brief explanation of the keys and the main menus and screens follows.

Figure 1. The detector's command center



Keypad

The keypad of each SpectraSYSTEM instrument consists of twelve keys. Four keys directly control the instrument's operation: RUN, STOP, STATUS, and on the detector, a blank key called ZERO. The remaining keys either access commands (MENU and ENTER), or are used to set parameters and move around the display (∧ , ∨ , < , > , + , -). The function of each is explained below.

Keys	Functions
RUN	Pressing the [RUN] key starts a run.The detector must be in the READY state (or QREADY if a queue is loaded), indicating that the detector is stabilized and waiting to begin a run.
STOP	Pressing the [STOP] key halts a run, stops the internal clock, and returns the detector to a READY state. If a wavelength program is operating, pressing the [STOP] key halts the program and returns the detector to its initial conditions.
STATUS	Pressing the [STATUS] key displays the Status Screen (Figure 1). From the Status Screen you can monitor the run in progress. You can also access the Status Menu. See page 5 for more information.

Keys	Functions
ZERO	The unlabeled key is the only variable key in the whole SpectraSYSTEM family. On the detector, the blank key is the [ZERO] key. The key's name appears on the nameplate below the key. Pressing the [ZERO] key resets the detector output to zero volts, plus or minus any offset.
MENU	Pressing the [MENU] key displays the Main Menu (Figure 1 and Figure 2). See page 4 for more information.
ENTER	Pressing the [ENTER] key accepts a selected choice or menu entry. The [ENTER] key also advances the cursor to a new field, either on the same line of the display or in the line below.
∧, ∨, <, >	Pressing any arrow key (up, down, left, or right) moves the cursor in the direction indicated on the key. The up- and down-arrow keys also move the cursor between menus and displays.
+ and -	Pressing the + and - keys scrolls you through a field's available choices or changes the value of alphanumeric entries. Holding down either key will continuously scroll the list of choices forward or backward until you release the key. In fields that require numerical entries, the value of each digit is increased or decreased by one unit each time you press the + or - key. In fields that accept either numeric or character entries, such as the File Name field, the + and - keys scroll through the alphabet from A to Z, then through the numbers 0 to 9, and finally to a slash, hyphen, and blank space. In other fields, the + key advances you through a preset list of choices while the - key takes you back through the list.

Menus, Screens, and Messages

Your detector's display can show you three kinds of information: menus, screens, and messages. Menus require you to make selections or enter specific values. Screens display information that cannot be edited. Messages confirm actions and point out errors. The Menu Tree in Appendix B outlines the structure and content of the menus and screens.

Menus

- Main Menu

  The Main Menu is the top level of the menu structure. In the UV1000, (Figure 2) the Main Menu gives you access to four other menus: FILE, COMMANDS, OPTIONS, and TESTS. In the UV2000, there is and additional menu choice, QUEUE (Figure 3). To see the Main Menu, press [MENU] at any time.

Figure 2. The UV1000's Main Menu

Figure 3. The UV2000's Main Menu

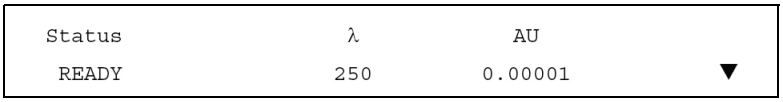
From the UV1000's and the UV2000's File(s) Menu you can edit, load, or delete files. The UV2000 also lets you copy files. The Commands Menu lets you insert an event mark onto your chromatogram, short outputs, or shut down the detector. The Tests Menu lets you run built-in instrument tests and diagnostics. In the Options Menu, you can set up or change your instrument's configuration. From the Queue Menu you can edit or change the order of files in the sample queue. Refer to Chapters 3, 4, 5, and Appendix B for more information on any of the instrument's menus.

Screens

- Status Screen

  The Status Screen (Figure 4) displays the detector status, wavelength setting(s), and the absorbance reading. It automatically appears whenever the instrument is powered on or the [STATUS] key is pressed. No entries are made on the Status Screen.

  Figure 4. The Status Screen

- Status Menu

  Just below the Status Screen is the Status Menu. To access the Status Menu, press the down-arrow key from the Status Screen. The Status Menu lets you review and edit run parameters during a run. Chapter 3 discusses the Status Menu in more detail.

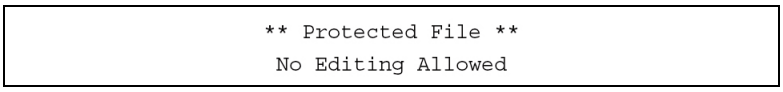
Messages

There are three different kinds of messages that can appear on your detector's display: user messages, confirmation messages, and error messages.

- User Messages

  User messages, indicated on the display by double asterisks, tell you about an existing instrument condition or ask for further actions. Some of these will only appear on the display for three seconds. An example of a message requiring further action is shown in Figure 5.

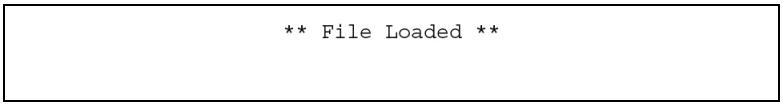
Figure 5. An example of a user message



- Confirmation Messages

  Confirmation messages (Figure 6), also indicated on the display by asterisks, appear for one second after an operation has been carried out successfully.

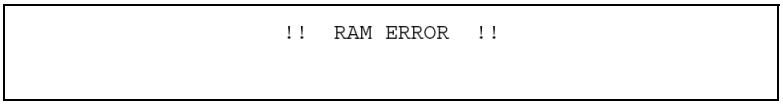
  Figure 6. An example of a confirmation message



- Error Messages

  Error messages (Figure 7), indicated on the display with capital letters and exclamation points, are shown whenever an undesirable condition exists that prevents the instrument from carrying out an operation. Error messages remain on the display until you press a key.

  Figure 7. An example of an error message



Manual Conventions

This manual uses several conventions. Among them are menu displays, text conventions (brackets, slashes, and so on), and standard words.

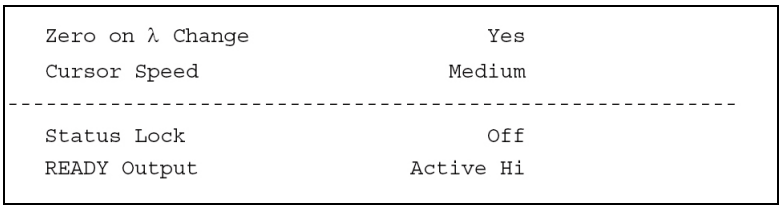
Displays

Figure 8 shows how we depict the two-line display. Note that, in menu illustrations, the triangular cursor location is indicated by a caret (>).

Figure 8. A two-line menu display

Frequently the two lines shown on the display are only part of a longer menu. In this manual, menus having more than two lines are represented as in Figure 9.

Figure 9. A menu longer than two lines



Text

Three typographic conventions are used to differentiate between keys, menus, and fields.

- Brackets

  Brackets, [ ], indicate instrument keys.
  For example: Press [MENU].

- Slashes

  Slashes, / /, are used around menu choices.
  For example: From the Main Menu, select /FILES/.

- Capitalization

  Capitalization is used to make field and menu names appear just as they do on the display. Generally, the first letters of field names are capitalized.
  For example: Select /FILES/, /Copy/, Copy File #.

Standard Words

We have also standardized the meanings of two words: "select" and "enter."

- select

  The word "select" is used when you need to choose from among available options. For example, to "select" a particular menu choice, you would move the cursor to the appropriate choice and press [ENTER]. To "select" a field entry, move the cursor to the appropriate field and use the + and - keys to scroll to the desired preset value.

- enter

  The word "enter" is used when you need to specify individual alphanumeric digits. To "enter" a particular value, move the cursor to the desired field and use the + and - keys to increment or decrement each digit in the field until the desired value or letter appears.

What's Next?

Now you're ready to try the practice example in Chapter 2, “Quick Example.”

Quick Example

In Chapter 1, you read about the three easy rules for using your detector's command center and some of its menus and screens. In this chapter, you will find an example procedure that shows you how the rules and keys actually work as you move through the various menus.

Once the detector is installed in your chromatographic system according to the procedures described in Chapter 6, "Installation and Specifications," and you have completed the Installation Checklist, you are ready to begin your quick example.

This quick example uses only a fraction of the features available on your detector and is included only as a first step in becoming familiar with your new instrument.

After experimenting with this example, you'll want to turn to Chapter 3, "Basic Operations," and Chapter 4, "Advanced Operations," which cover the detector's basic and more advanced operations. It is in those chapters that you'll learn about the full capabilities of your detector.

First though, to give you a general understanding of the capabilities and design of the detectors, we will briefly describe the features and benefits of the UV1000 and UV2000 here.

The UV1000 detector is a time-programmable, variable-wavelength UV/Vis (ultraviolet/visible) absorbance detector. It operates in single-wavelength mode in either the UV range (using a deuterium lamp), or in the visible range (with an optional tungsten lamp). The UV1000's optical system has a novel, high light-throughput design that provides high sensitivity detection along with maximal application versatility. The UV1000 detector can be upgraded to a UV2000.

The UV2000 detector is a full-featured, time-programmable, dual-wavelength UV/Vis absorbance detector. It operates in both single- and dual-wavelength modes in the UV and visible ranges. The UV2000 offers the same optical system design as the UV1000. In addition to the features of the UV1000, the UV2000 also offers spectral scanning, a Develop File (for method development), multiple file storage, a Queue feature (that allows you to link files), and more.

Contents

UV1000 Example

In this example, we will show you how to prepare an edit file and how to load the edit file into the detector's run file. After a practice run, we will add a stop-time.

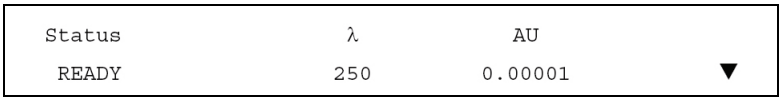
Tip You may wish to keep the Menu Tree in Chapter 7, "Menu Reference," on hand as you work through this example. If you lose your place at any time, you can:

1. Press the Λ key to move back to a previous screen.
2. Or, press [STATUS] to return to the Status Screen and retrace your steps.

Startup

Set the power switch located on the detector's rear panel to On. After a series of power-up tests, the Status Screen (Figure 10) appears on the display. (We will discuss the Status Screen after you have set up your operating parameters.)

Figure 10. The UV1000's Status Screen



Setting Parameters

To set your parameters, you need to prepare an edit file.

❖ To access the Edit Menu and prepare the file

1. Press the [MENU] key. The detector's Main Menu appears on the screen (Figure 11).

   Figure 11. The UV1000's Main Menu

2. Now select /FILES/ to display the Files Menu (Figure 12).

   Figure 12. The UV1000's Files Menu

3. Select /Edit/ to display the Edit Menu (Figure 13).

   Figure 13. The UV1000's Edit Menu

Wavelength

You use the Wavelength program to set the monitoring wavelength. Wavelength is an example of a field that requires a numeric entry.

❖ To set the wavelength

1. From the Edit Menu (Figure 13), select /Wavelength Program/ to display the Wavelength Program (Figure 14).

   Figure 14. The UV1000's wavelength program

   ```
   Time                              Wavelength
   0.00                                 254
   ```

2. Using the + and - keys, edit the wavelength field to the desired setting for your analysis. Remember that each digit must be edited individually.
3. Press [ENTER] to accept the new wavelength setting.

Range

Range is an example of a field that has a preset list of choices.

❖ To set the range

1. Select /Options/ from the Edit Menu (Figure 13) to display the Options Menu (Figure 15).

   Figure 15. The UV1000's Options Menu

   ```
   Rise Time                          1.0
   Autozero Time                     0.00
   ------------------------------------------------------------
   Range                              1.0
   ```

2. Scroll down in the Options Menu and move the cursor to Range 1 using the ∨ key.
3. Using the + or - key, select the desired setting from the list of choices.
4. Press [ENTER] to accept the new range setting.

We will use the rise time and autozero time default settings for this example. You will learn more about setting these parameters in Chapter 3, "Basic Operations."

Loading the File

You are now ready to load the settings from the edit file into the detector's operating parameters (its run file).

❖ **To load the file**

1. Return to the File Menu (Figure 12) using the ∧ key.
2. Select /Load/. The screen in Figure 16 appears.

   Figure 16. The Load File command

   ```
   >Load File
   ```

3. Press ENTER to execute. The confirmation message shown in Figure 17 appears for one second.

   Figure 17. The file-loaded message

   ```
   ** File Loaded **
   ```

You are automatically returned to the Status Screen and are ready to run your detector.

A Practice Run

Now you're ready for a practice run. Note that the Status Screen (Figure 10) now displays your wavelength setting, the detector's status, and the absorbance reading. If the Status reads READY, the required lamp is lit; if it reads NRDY (Not Ready), there is an error or the lamp isn't lit; and if it reads UVW, the ultraviolet (D2) lamp is still warming up.

When the baseline is stabilized:

1. Press the [ZERO] key to zero the detector's analog output signal.
2. Inject your sample.

During setup, you may have noticed that there was no stop-time entered in the detector's parameters. In this case, the detector stays in the READY state and continually monitors the column eluant. You do not need to manually start or stop a run with this set-up.

Adding a Stop-Time

To add a stop-time, you need to modify the detector's operating parameters as follows. We will then show you how to start and stop a run using the new setting.

❖ **To add a stop-time**

1. From the Status Screen, press the ∨ key to move down to the Status Menu (Figure 18), which is the programming area below the Status Screen. The cursor appears on the "tens" digit of the wavelength value.

Figure 18. The UV1000's Status Menu

```
  Time                          Wavelength
  0.00                              250▼
------------------------------------------------------------
  Rise Time                          1.0
  Autozero Time                      0.00
  Range                              1.0
```

2. Using the ∨ key, move the cursor to the blank line below the 0.00 time line and press +. This adds a second line, with a time of 1.00 and the same wavelength setting as the first. Change 1.00 to the desired stop-time for the run, and leave the wavelength unchanged.
3. To save your edits, scroll down to the words "Save File" which now appear below Range, and press ENTER. The confirmation message shown in Figure 19 appears and you are automatically returned to the Status Screen.

Figure 19. The file-saved message

```
                    ** File Saved **
```

Running with a Stop-Time

Now that you have entered a stop-time, you will need to start the run with each injection.

❖ To start the run

1. Zero the detector's analog output signal by pressing the [ZERO] key.
2. When the detector is stabilized, inject your sample and press [RUN].

   Notice that Status now shows the run time. If you wish to stop your run before the set stop-time, press [STOP].

UV2000 Example

In this example, specifically designed for the UV2000, we will show you how to prepare a file and how to load it into the detector's operating parameters. After a practice run, we will add a stop-time. To keep the instructions simple, we will use the single-wavelength mode.

Tip You may wish to keep the Menu Tree in Chapter 7, "Menu Reference," on hand as you work through this example. If you lose your place at any time, you can:

1. Press the Λ key to move back to a previous screen.
2. Or, press [STATUS] to return to the Status Screen and retrace your steps.

Startup

Set the power switch located on the detector's rear panel to On. After a series of power-up tests, the Status Screen (Figure 20) appears on the display. (We will discuss the Status Screen after you have set up your operating parameters.)

Figure 20. The UV2000's Status Screen

Setting Parameters

To set your parameters, you need to prepare an edit file.

❖ To access the Edit Menu and prepare the file

1. Press the [MENU] key. The detector's Main Menu appears on the screen (Figure 21).

   Figure 21. The UV2000's Main Menu

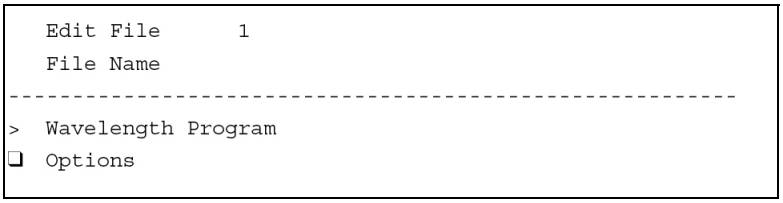
2. Now select /FILES/ to display the Files Menu (Figure 22).

   Figure 22. The UV2000's Files Menu

3. Select /Edit/ to display the Edit Menu (Figure 23).

Figure 23. The UV2000's Edit Menu



For this example, we will use a file designation of 1 and leave the File Name field blank.

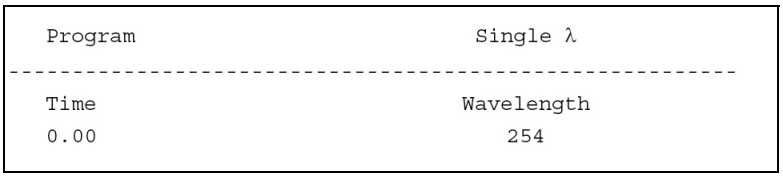
Wavelength

Wavelength is an example of a field that requires a numeric entry.

❖ To set the wavelength

1. From the Edit Menu (Figure 23), select /Wavelength Program/ to display the Wavelength Program (Figure 24).

Figure 24. The UV2000's wavelength program



2. Scroll down to the wavelength field.
3. Using the + and - keys, edit the wavelength field to the desired setting for your analysis. Remember that each digit must be edited individually.
4. Press [ENTER] to accept the new wavelength setting.

Range

Range is an example of a field that gives you a preset list of choices. Note that Range 1 and 2 correspond to Analog Outputs 1 and 2 on the rear panel of your detector.

❖ To set the range

1. Select /Options/ from the Edit Menu (Figure 23) to display the Options Menu (Figure 25).

   Figure 25. The UV2000's Options Menu

   ```
     Rise Time                          1.0
     Autozero Time                     0.00
   ------------------------------------------------------
     Range 1                            1.0
     Range 2                            1.0
   ```

2. Scroll down in the Options Menu and move the cursor to Range 1 using the ∨ key.
3. Using the + or - key, select the desired setting from the list of choices.
4. Press [ENTER] to accept the new Range 1 setting.

We will use the rise time, autozero time, and range 2 default settings for this example. You will learn more about setting these parameters in Chapter 3, "Basic Operations."

Loading the File

You are now ready to load the settings from File 1 into the detector's operating parameters.

❖ To load the file

1. Return to the Files Menu (Figure 22) by pressing either the [ENTER] or ∨ key.
2. Select /Load/. The screen in Figure 26 appears.

   Figure 26. The Load File command

   ```
   >  Load File    1:(filename)
   ```

2. You will be able to select from among several files in the Load File field. Depending on whether or not your detector has ever been used before, these files will either contain previously stored settings or default settings. Use the + and - keys to scroll through available choices. When the file you want to load appears (we're using the default settings for this example), press [ENTER] to execute the load command.

3. The confirmation message shown in Figure 27 appears for one second, after which you are automatically returned to the Status Screen.

Figure 27. The file-loaded message

```
** File Loaded **
```

A Practice Run

Now you're ready for a practice run. Note that the Status Screen (Figure 20) now displays your wavelength setting, the detector's status, and the absorbance reading. If the Status reads READY, the required lamp is lit; if it reads NRDY (Not Ready), there is an error (for example, you may have chosen a wavelength outside the selected lamp's range) or the lamp isn't lit; and if it reads UVW, the ultraviolet (D2) lamp is still warming up.

When the detector is stabilized:

1. Press the [ZERO] key to zero the detector's analog output signal.
2. Inject your sample.

During setup, you may have noticed that there was no stop-time entered in the detector's parameters. In this case, the detector stays in the READY state and continually monitors the column eluant. You do not need to manually start or stop a run with this set-up.

Adding a Stop-Time

To add a stop-time, you need to modify the detector's operating parameters. We will then show you how to start and stop a run using the new setting.

❖ To add a stop-time

1. From the Status Screen, press the ∨ key to move down to the Status Menu (Figure 28), which is the programming area below the Status Screen.

Figure 28. The UV2000's Status Menu

```
  File 1:
------------------------------------------------------------
  Time                      Wavelength
  0.00                          250
                                 ▼
  Rise Time                     1.0
  Autozero Time                0.00
  Range 1                       1.0
  Range 2                       1.0
```

2. Using the ∨ key, move the cursor to the blank line below the 0.00 time line and press +. This adds a second line, with a time of 1.00 and the same wavelength setting as the first. Change 1.00 to the desired stop-time for the run, and leave the wavelength unchanged.

3. To save your edits, scroll down to the words "Save File" which now appear below Range 2, and press [ENTER]. The confirmation message shown in Figure 29 appears and you are automatically returned to the Status Screen.

Figure 29. The file-saved message

```
** File Saved **
```

Running with a Stop-Time

Now that you have entered a stop-time, you will need to start the run with each injection.

❖ **To start the run**

1. Zero the detector's analog output signal by pressing the [ZERO] key.
2. When the detector is stabilized, inject your sample and press [RUN].

Notice that Status now shows the run time. If you want to stop your run before the set stop-time, press [STOP].

What's Next?

Once you have completed this example and are comfortable with the keypad and display, proceed to Chapter 3, "Basic Operations," to learn more about your detector.

Basic Operations

This chapter provides step-by-step instructions for the most frequently used detector operations, including setup and run procedures for single- and dual-wavelength modes, detector file management and protection, and analog output operations.

You should be aware that your display's values might differ from those presented in this manual, especially if the detector has been previously programmed.

Before you begin this chapter, your detector should be installed in a chromatographic system (see Chapter 6, “Installation and Specifications,”) and you should have completed the Installation Checklist. We also recommend that you review Chapter 1, “Introduction,” which includes general instructions for using the detector keypad.

Contents

UV1000, Single-Wavelength Operation

The UV1000 uses a standard deuterium lamp to operate in a single-wavelength mode in the ultraviolet (UV) range. Adding an optional tungsten lamp increases the detector's capabilities to the visible (Vis) range.

To perform a single-wavelength operation, you first enter the desired detector parameters into an edit file. You then load the edit file into the run file, which contains the detector's current operating parameters. These instructions will show you how to start and stop a run, and how to modify the detector's operating parameters.

This section contains the following topics:

Setting Parameters

You set up the UV1000's parameters by using the File Menu to prepare an edit file. You then load the edit file into the run file.

To access the File Menu, first press [MENU]. The Main Menu appears on the screen. From the Main Menu, select /FILE/. The menu shown in Figure 30 will appear.

Figure 30. The UV1000's Files Menu

From the File Menu, select /Edit/ to display the Edit Menu. The Edit Menu (Figure 31) selections are **Wavelength Program**, which contains time and wavelength fields, and **Options**, which contains the Rise Time, Autozero Time, and Range fields.

Figure 31. The UV1000's Edit Menu

Wavelength Program

Select /Wavelength Program/ from the Edit Menu. The Wavelength Program is a Table containing the Time and Wavelength fields (Figure 32).

Figure 32. The UV1000's Wavelength Program

Time	Wavelength
0.00	254

In the single-wavelength mode, you can operate with either a one-line or a two-line wavelength program. Using a one-line program, the detector is always in the READY state and you can continually monitor the baseline. Using a two-line program, you can use a stop-line and you can start and stop the detector during a chromatographic run. (Stop-lines are useful, for example, in an automated series of runs where you want to autozero the detector's baseline after each injection.)

For a one-line program, enter the wavelength(s) for your analysis in the Wavelength field that corresponds to the time of 0.00.

For a two-line program, add an additional line (the stop-line) by scrolling down to the blank line below the time 0.00 line and pressing +. The second line will automatically have a time setting of 1.00 and the same wavelength setting(s) as the first. Change 1.00 to the desired stop-time for the run, and leave the wavelength value unchanged.

An example of a two-line wavelength program for a nine-minute run at 283 nm is shown in Figure 33.

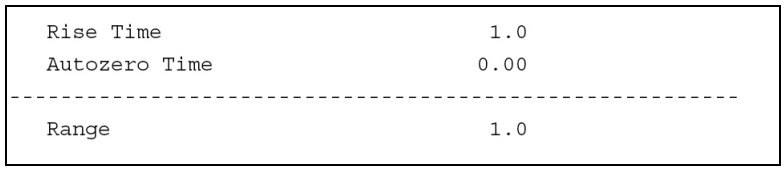
Figure 33. An example of a two-line wavelength program with a programmed stop-time

Time	Wavelength
0.00	283
9.00	283

Options Menu

Select /Options/ from the Edit Menu to display the Options Menu (Figure 34). Use this menu to set the detector's rise time, autozero time, and range.

Figure 34. The UV1000's Options Menu



- Rise Time

  This field controls the detector's response time. Rise time is inversely proportional to the amount of baseline noise. For example, the longer the rise time, the less noise detected. The one-second default value is appropriate for most applications.

  Tip To minimize baseline noise while retaining maximum resolution, select a rise time that is at least one-tenth of the peak width at the base of the narrowest peak of interest.

- Autozero Time

  This parameter tells the detector when to perform an automatic zero of the baseline. If you do not wish to set an autozero and you are using a stop-line in your wavelength program, simply set the autozero time to a value greater than your stop-time.

  Tip It is good practice to zero the detector automatically at the start of each run. This will keep the detector output in range throughout an automated series of runs.

- Range

  We recommend a range of 1.0 when you are using an integrator or data system.

  Tip It is good practice to zero the detector automatically at the start of each run. This will keep the detector output in range throughout an automated series of runs.

Loading the Edit File

When you are ready to load the settings from the edit file into the detector's run file, select /Load/ from the File Menu. The screen will display the words "Load File." Press ENTER to accept the settings. The confirmation message shown in Figure 35 will appear for one second. You are then returned to the Status Screen.

Figure 35. The file-loaded message

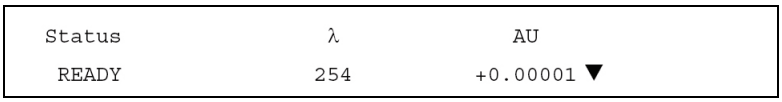
Running Your Detector

Once you've set your detector parameters in the edit file and have loaded the parameters into the run file, you're ready to run your analysis. First, check the detector's status by viewing the Status Screen. If you're using a stop-line in your wavelength program, you will start and stop the run with each injection.

Status Screen

You can check the detector's status, wavelength setting, and absorbance reading from the Status Screen (Figure 36). To access the Status Screen, press [STATUS].

Figure 36. The UV1000's Status Screen



If the Status reads READY, the detector is stabilized and ready to run. If NRDY appears, the detector's lamps might need additional time to warm up, or a wavelength outside the selected lamp's range might have been chosen.

Inject your Sample

When the detector is stabilized and you are ready to inject your sample, first manually zero the detector by pressing the [ZERO] key. If you are not using a stop-line in the wavelength program, the detector remains in the READY state throughout your chromatographic runs. If you are using a stop-line, you must start and stop the run with each injection, following the procedures below.

Starting a Run

If you are using a stop-line in your wavelength program, you need to start the run with each injection. There are two ways to start a run using the UV1000.

- Manually, by pressing [RUN] each time you make an injection.
- Automatically, by interfacing the detector with a remote run-signal from the injector (see Chapter 6, "Installation and Specifications," for details). In this scenario, a signal that is equivalent to pressing RUN is automatically sent from the injector to the detector with each injection.

During the run, you can monitor the run time from the Status Screen.

Stopping a Run

There are two ways to stop a run:

- Manually, by pressing [STOP] before the programmed stop-time.
- Automatically, by allowing the run to finish at the programmed stop-time.

In either case, the detector returns to its READY state.

Changing Run Parameters

There are two ways to change the detector's run parameters:

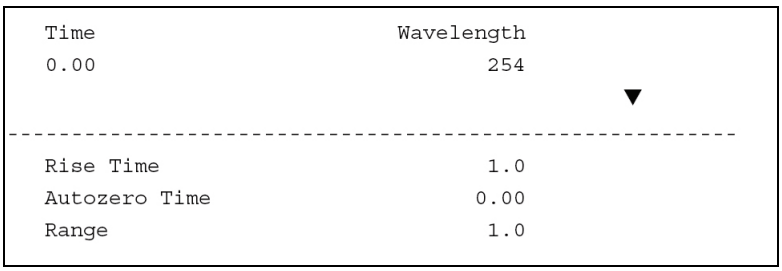
- You can use the Files Menu and follow the procedures outlined under "Setting Parameters" on page 20.
- Or you can use the Status Menu, which is the programming area below the Status Screen.

Each method has a distinct advantage. Programming in the Status Menu allows you to change the detector's current operating parameters, even while the detector is running. Programming in the Files Menu allows you to prepare an edit file containing the changes without altering the current detector settings. The file can then be loaded later.

Status Menu

From the Status Screen, scroll down to the Status Menu (Figure 37). The Status Menu contains the Wavelength Program, Rise Time, Autozero Time, and Range.

Figure 37. The UV1000's Status Menu



The parameters are set using the same instructions given under Wavelength Program and Options Menu on page 22.

When you use the Status Menu to change the UV1000 settings, each change is effective immediately upon leaving the field.

Notice the words "Save File" below the Range field. Press [ENTER] when the cursor is in the Save File field to save the new settings to the run file. The confirmation message shown in Figure 38 will appear briefly.

Figure 38. The File Saved message

IMPORTANT When you change the detector settings from the Status Menu, the contents of the edit file do not change. Only the run file values are modified.

To return to your previous setting without saving the new ones, do not press [ENTER]. Instead, you can reenter the unaltered file, as follows:

1. Press [MENU].
2. Select /FILE/.
3. Select /Load/.
4. The words "Load File" will appear on the screen. Press [ENTER].

A confirmation message (Figure 35) will appear for one second. You are then returned to the Status Screen, and all settings will contain their original values.

Deleting the File

To delete the edit file, select /Delete/ in the File Menu. The words "Delete File" will appear on the screen. When you press [ENTER], the confirmation message shown in Figure 39 appears briefly, and the display returns to the File Menu. The edit file parameters return to their default settings.

Figure 39. The File- Deleted message

UV2000, Single- and Dual-Wavelength Operation

You can operate the UV2000 in either a single- or a dual-wavelength mode. In the dual-wavelength mode, the detector simultaneously monitors two wavelengths in either the UV range or the visible range in a single run.

To perform a single- or dual-wavelength operation, you need to be able to identify and enter a file, load that file into the detector's current operating parameters, and start and stop a run. This section will also show you how to modify the detector's current operating parameters.

This section contains the following topics:

Setting Parameters

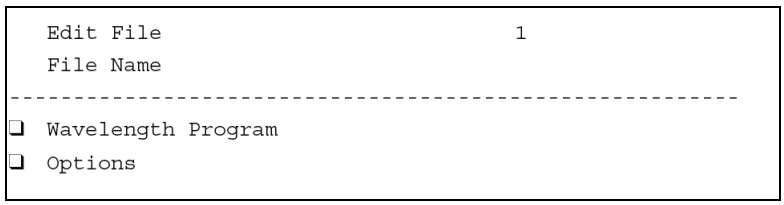
Before you set any detector parameters, you need to access the Files Menu to identify the file you want to edit.

To access the Files Menu, first press [MENU]. The Main Menu appears on the screen. From the Main Menu, select /FILES/. The menu shown in Figure 40 will appear.

Figure 40. The UV2000's Files Menu

Select /Edit/ from the Files Menu to display the Edit Menu (Figure 41).

Figure 41. The UV2000's Edit Menu



File Identification

Enter the number of the file you want to edit in the Edit File field. The UV2000 can store up to four files in memory, so file numbers from 1 to 4 are allowed. You can also enter a name of up to eight characters in the File Name field.

While in the Edit File, you will see file choices of "S" and "D" that represent the Scan and Develop files, respectively. These files are some of the UV2000's advanced features that you will learn about in Chapter 4, "Advanced Operations."

Wavelength Program

From the Edit Menu, select /Wavelength Program/. The Wavelength Program designates dual- or single-wavelength operation, and also contains a Table of time and wavelength. A wavelength program for dual-wavelength operation appears in Figure 42.

Figure 42. The UV2000's Wavelength Program in dual-wavelength mode

```
  Program                  Dual λ(190-450)
-----------------------------------------------------------
  Time                          λ1      λ2
  0.00                         254     280
```

Select Single, Dual (190-450), or Dual (366-700) in the Program field. The Table for time and wavelength(s) will appear. (For single-wavelength operation, there is only one wavelength field.)

You can operate with either a one-line or a two-line wavelength program. Using a one-line program, the detector is always in the READY state and you can continually monitor the chromatographic eluant. Using a two-line program, you can use a stop-line and you can start and stop the detector during a chromatographic run. (Stop-lines are useful, for example, in an automated series of runs where you want to autozero the detector's baseline after each injection.)

For a one-line program, enter the wavelength(s) for your analysis in the 1 and 2 (or Wavelength) fields that correspond to the time of 0.00.

For a two-line program, add an additional line (the stop-line) by scrolling down to the blank line below the time 0.00 line and pressing +. The second line will automatically have a time setting of 1.00 and the same wavelength setting(s) as the first. Change 1.00 to the desired stop-time for the run, and leave the wavelength value(s) unchanged.

An example of a dual-wavelength, nine-minute run at 254 and 283 nm is shown in Figure 43.

Figure 43. A wavelength program with a programmed stop-time

Time	λ1	λ2
0.00	254	283
9.00	254	283

Options

Select /Options/ from the Edit Menu to display the Options Menu (Figure 44). Use this menu to set the detector's rise time, autozero time, and ranges.

Figure 44. The UV2000's Options Menu

Rise Time	1.0
Autozero Time	0.00
Range 1	1.0
Range 2	1.0

- Rise Time

  This field controls the detector's response time. Rise time is inversely proportional to the amount of baseline noise. For example, the longer the rise time, the less noise detected. The one-second default value is appropriate for most applications.

  Tip To minimize baseline noise while retaining maximum resolution, select a rise time that is at least one-tenth of the peak width at the base of the narrowest peak of interest.

- Autozero Time

  This parameter tells the detector when to perform an automatic zero of the baseline. If you do not want to set an autozero and you are using a stop-line in your wavelength program, set the autozero time to a value greater than your stop-time.

  Tip It is good practice to zero the detector automatically at the start of each run. This will keep the detector output in range throughout an automated series of runs.

- Range 1 and 2

  These parameters range the signal from Analog Output 1 and Analog Output 2 (shown as ANLG 1 Output and ANLG 2 Output on the detector's rear panel). Set each range to an appropriate full-scale absorbance for your sample. For more information on the use of ranges and analog outputs, see page 36 and page 90.

  Tip We recommend a range of 1.0 when you are using an integrator or data system.

Loading a File

When you are ready to load a file into the detector settings, select /Load / from the Files Menu. The screen will display the words "Load File 1:(filename)." Use the + and - keys to view the number and name of available files. When the desired file number appears, press [ENTER].

The confirmation message shown in Figure 45 will appear for one second. You are then returned to the Status Screen.

Figure 45. The message that's displayed when a file is loaded

```
** File Loaded **
```

Tip When a dual-wavelength program is loaded, you'll hear the motor start to operate in dual-wavelength mode even though you didn't press [RUN].

Running Your Detector

Once you've set your detector parameters in the designated file and have loaded the file into the detector's operating parameters, you are ready to run your analysis. First, check the detector's status by viewing the Status Screen. If you are using a stop-line in your wavelength program, you will start and stop the run with each injection.

Status Screen

You can check the detector's status, wavelength setting(s), and absorbance reading(s) from the Status Screen. To access the Status Screen, press [STATUS]. The Status Screen for the UV2000 in dual-wavelength mode appears below (Figure 46). Note that, in the single-wavelength mode, the third line does not appear.

Figure 46. The UV2000's Status Screen for dual-wavelength operation

```
  Status              λ            AU
   READY            254         +0.00001 ▼
-------------------------------------------------------
                    280         -0.00001
```

If the Status reads READY, the detector is stabilized and ready to run. If NRDY appears, the detector's lamps might need additional time to warm up, or a wavelength outside the selected lamp's range might have been chosen.

Inject your Sample

When the detector is stabilized and you are ready to inject your sample, first manually zero the detector by pressing the [ZERO] key. If you are not using a stop-line in the wavelength program, the detector remains in the READY state throughout your chromatographic runs. If you are using a stop-line, you must start and stop the run with each injection, following the procedures below.

Starting a Run

If you are using a stop-line in your wavelength program, you need to start the run with each injection. There are two ways to start a run using the UV2000:

- Manually, by pressing [RUN] each time you make an injection.
- Automatically, by interfacing the detector with a remote run-signal from the injector (see Chapter 6, "Installation and Specifications," for details). In this scenario, a signal that is equivalent to pressing [RUN] is automatically sent from the injector to the detector with each injection.

During the run, you can monitor the run time from the Status Screen.

Stopping a Run

There are two ways to stop a run:

- Manually, by pressing [STOP] before the programmed stop-time.
- Automatically, by allowing the run to finish at the programmed stop-time.

If you're conducting a dual-wavelength run, you can also stop the run by loading a single-wavelength file.

Regardless of how you stop a run, the detector returns to READY.

Changing Run Parameters

If you want to change the detector's parameters:

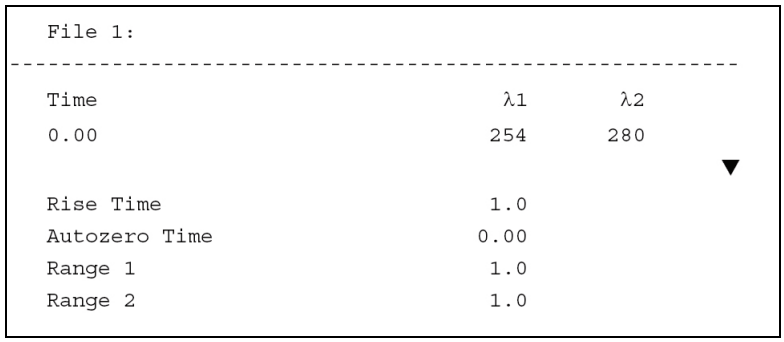
- You can use the Files Menu and follow the procedures outlined under "Setting Parameters" on page 26.
- Or you can use the Status Menu, which is the programming area below the Status Screen.

Each method has a distinct advantage. Programming in the Status Menu allows you to change the detector's current operating parameters, even while the detector is running. Programming in the Files Menu allows you to prepare an edit file containing the changes without altering the current detector settings. The file can then be loaded later.

Status Menu

From the Status Screen, scroll down to the Status Menu (Figure 47). The Status Menu contains the loaded file identification (its number and name), Wavelength Program, Rise Time, Autozero Time, and Ranges.

Figure 47. The UV2000's Status Menu for dual-wavelength operation



The Status Menu shown in Figure 47 is typical for dual-wavelength operation. In the single-wavelength mode, only one wavelength field appears in the wavelength program.

The detector's parameters are set following the same instructions given under "Wavelength Program" on page 27 and "Options" on page 28 . However, you cannot modify either the file identification or the wavelength mode (dual or single) from the Status Menu.

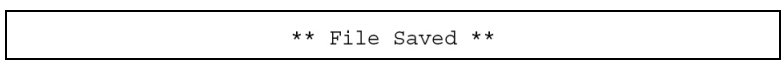
IMPORTANT When you modify a file's parameters from the Status Menu, you do not change the contents of the same file number stored in the detector's memory. Only the copy of the active file is modified.

Saving the File

When you change the UV2000's settings from the Status Menu, each change is effective as soon as you leave the field. You'll also see that the File identification on the first line of the Status Menu (Figure 47) now reads "File N:xxxx-changed" (where N:xxxx is the file number and name) and that the words "Save File" now appear below Range 2.

To save the changed file, press [ENTER]. The confirmation message shown in Figure 48 will appear briefly.

Figure 48. The File Saved message



To keep the original file without saving the changes, don't press [ENTER]. Instead, reload the unaltered file using the Files Menu as follows:

1. Press [MENU].
2. Select /FILES/.

3. Select /Load/.
4. The words "Load File" will appear on the screen. Enter the desired file number and press [ENTER].

A confirmation message (Figure 45) will appear for one second. You are then returned to the Status Screen, and all settings will contain their original values.

More About UV2000 Files

In Setting Parameters, you learned how to edit and load files from the Files Menu. The UV2000 also allows you to copy and delete files (and to protect files from being edited, copied to, or deleted) in a few steps.

Copying Files

❖ To copy a file

1. Press [MENU].
2. Select /FILES/ to display the Files Menu (Figure 49).

Figure 49. The UV2000's Files Menu

3. Select /Copy/. The Copy Menu will appear on the screen (Figure 50).

Figure 50. The UV2000's Copy Menu

4. Enter the identification number for the file you want to copy in the Copy File field.
5. Enter the number of the file to which you want to copy in the To File field.
6. Press [ENTER]. The confirmation message shown in Figure 51 appears briefly, and you are returned to the Files Menu.

Figure 51. The message that's displayed when a file is copied

If you attempt to copy to a protected file (see Protecting Files), you will get the message shown in Figure 52. If a file is not protected, make sure it's empty or unwanted before you copy to it, as it will be overwritten.

Figure 52. The message that is displayed when you attempt to copy to a protected file

```
** Protected File **
Cannot Be Copied To
```

You cannot use Copy for the Scan or Develop files. You will learn more about these files in Chapter 4, "Advanced Operations."

Deleting Files

❖ To delete a file

1. Press [MENU].
2. Select /FILES/ to display the Files Menu (Figure 40).
3. Select /Delete/. The Delete File field will appear on the screen.
4. Enter the identification number of the file you want to delete. When you press [ENTER], the confirmation message shown in Figure 53 appears briefly and the display returns to the Files Menu. (The parameters in the file you have just deleted return to their default values.)

Figure 53. The message that's displayed when a file is deleted

```
** File Deleted **
```

If you attempt to delete a protected file (see the next section, Protecting Files), you will get the message shown in Figure 54.

Figure 54. The message that's displayed when you try to delete a protected file

```
** Protected File **
Cannot Be Deleted
```

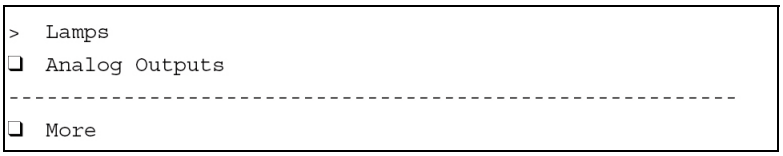
Protecting Files

The UV2000 allows you to protect files from being edited, copied to, or deleted.

❖ To access the file protection operation

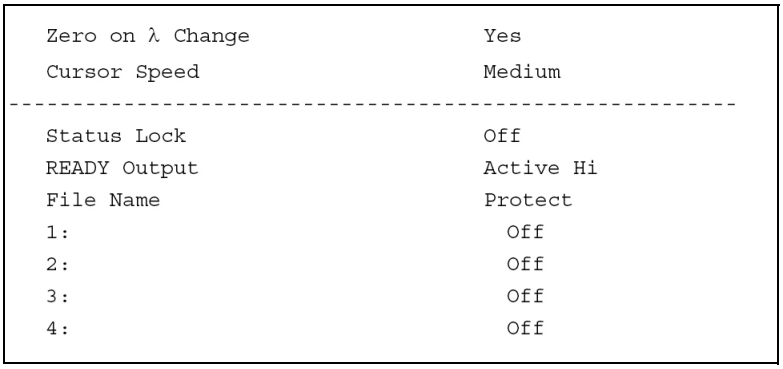
1. Press [MENU].
2. Select /OPTIONS/. The Options Menu appears in Figure 55.

Figure 55. The UV2000's Options Menu



3. Select /More/. The More Menu appears in Figure 56.

Figure 56. The UV2000's More Menu



4. Scroll down to the Table containing the fields File Name and Protect. To protect a file, select On in the Protect field corresponding to the appropriate file number. To remove the file protection, select Off.

UV1000 Analog Signals

The UV1000 detector has two analog outputs.

Analog Outputs

There are two analog outputs for the UV1000: Analog Output 1and Analog Output 2. On the detector's rear panel, they appear as "Unranged output" and "Ranged Output." Analog Output 1 is set at 1 V/AU and is intended for an integrator interface. Analog Output 2 is range-selectable and is used for recorders and other devices. Rear-panel connections for both outputs are discussed on page 85.

Analog Offsets

Analog offsets can be used when there is a high background absorbance reading, or when there is considerable baseline drift from your chromatographic system and you are unable to keep your integrator's (recorder's) signal on-scale.

Because integrators have very limited capacity for handling negative signals, you might want to set a small positive offset (1%) when using an integrator.

Use negative offsets with recorders, where you might want to set the pen at either side of the strip chart.

Offset options are selectable from the Analog Outputs Menu.

❖ To access these options

1. Press MENU.
2. Select /OPTIONS/.
3. Select /Analog Outputs/.

The Analog Outputs Menu is shown in Figure 57.

Figure 57. The UV1000's Analog Outputs Menu

```
Analog 1 Offset (mV)            0
Analog 1 Offset (%)             0
```

Tip Although the default for the Analog 1 offset is set at zero, we recommend a 1 mV setting for use with your data system or integrator.

UV2000 Analog Signals

The UV2000 produces two analog signals.

Analog Outputs

There are two analog outputs on the UV2000, Analog Output 1 and Analog Output 2. On the detector's rear panel, they appear as ANLG 1 Output and ANLG 2 Output. Rear-panel connections for both outputs are discussed on page 90.

Analog Output 1

By default, Analog Output 1 is either the absorbance reading for single-wavelength operation, or the absorbance reading of wavelength one (1) for dual-wavelength operation.

Analog Output 2

Analog Output 2 is selectable (AU, AU1-K*AU2, and AU1/AU2), and so can be used to monitor several different outputs.

❖ **To access these options**

1. Press [MENU].
2. Select /OPTIONS/.
3. Select /Analog Outputs/. The Analog Outputs Menu shown in Figure 58 appears.

Figure 58. The UV2000's Analog Outputs Menu

```
  Analog 1 Offset (%)                0
  Analog 2 Offset (%)                0
-------------------------------------------------------
  Analog 2                          AU
  K Factor                        1.000
```

4. Scroll down to Analog 2. The selections are:

   - **AU**, which is either the same absorbance reading you got from Analog Output 1 in single-wavelength operation, or the absorbance reading of wavelength two (2) for dual-wavelength operation.
   - **AU1-K*AU2**, which is the readout of the suppressed signal using the K-Factor technique. See "K-Factor (UV2000)" on page 63 for more details.
   - **AU1/AU2**, which is the ratio of the dual-wavelength absorbance values. This ratio is sometimes used to check peak purity. See "Absorbance Ratios (UV2000)" on page 68 for more details.

Analog Offsets

Both analog outputs 1 and 2 can be offset on the UV2000. Analog offsets can be used in cases where there is a high background absorbance reading, or when there is considerable baseline drift from your chromatographic system and you are unable to keep your integrator's (recorder's) signal on-scale.

Because integrators have very limited capacity for handling negative signals, you might want to set a small positive offset (1%) when using an integrator.

Negative offsets are available for use with recorders, where you might want to set the pen at either side of the strip chart.

The offset options are selectable from the Analog Outputs Menu shown in Figure 58.

Tip Although the offset for each output is set at 0% of full-scale readout by default, we recommend a 1% setting for use with your data system or integrator.

Advanced Operations

In this chapter, you will learn to use the more advanced capabilities of your detector. You should be familiar with the instructions presented in Chapter 3, "Basic Operations," before you begin.

Contents

Wavelength Programming

Your detector can change wavelength as a function of time, a feature we call Wavelength Programming. This feature gives you maximum detection sensitivity for each component of a mixture without making multiple injections of the sample.

Tip A wavelength program can be built in either the Status Menu or the File(s) Menu.

Building the Program

In wavelength programming, you enter time lines into a "Wavelength Program." Each time line specifies the time at which you want a wavelength change to occur.

The following instructions are for single-wavelength operation, but you can build a dual-wavelength program using the same procedure.

Initial Conditions

Access the Wavelength Program (Figure 59) through either the Status Menu or the Files Menu.

Figure 59. The wavelength program for single-wavelength operation

The initial time entry is 0.00. Move the cursor to the corresponding Wavelength field, and enter the initial wavelength for your analysis.

Adding Lines

To add a second time line, scroll down to the first blank line and press +. The second line will automatically have a time setting of 1.00 and the same wavelength setting as the first. Change the Time and corresponding Wavelength fields to the desired values. Subsequent lines are added in the same fashion.

A wavelength program can contain as many as ten lines for a single run. On the UV1000, all of the lines' wavelengths must be in the same range (either UV or visible). On the UV2000, however, you can cross between the UV and visible ranges (in single-wavelength mode only).

If you enter time lines out of sequence, the detector will automatically sort the lines and place them all in chronological order.

The Stop-line

The last line of the program (the stop-line) lists the time at which the detector will automatically end the run and return to initial conditions. Since wavelength is not important in the stop-line, it can be set to any value.

IMPORTANT Remember, the last line of the program is always the detector's signal to end a run; it is not a programmed wavelength change.

Deleting a Line

To delete an entire time line, place the cursor in the Time field and press - repeatedly until the value goes blank. When you leave the line, it will be deleted.

An Example

Figure 60 shows a completed wavelength program for single-wavelength operation.

Figure 60. An example of a completed wavelength program

Time	Wavelength
0.00	254
5.00	280
7.00	265
10.00	265

In our example, the initial detection wavelength is 254 nm. At 5.00 minutes into the run, the wavelength changes to 280 nm. At 7.00 minutes, it changes to 265 nm. The run ends at 10.00 minutes, and the detector returns to its initial wavelength of 254 nm and to its READY state.

Running the Program

After you set the rest of your parameters, the detector is ready to run. It is good practice to zero the detector at the beginning of every run and at each wavelength change. See the next section, Programmed Autozero, for details.

Once you start the run, you can edit any timed event (wavelength change, autozero, or stop-time) that has not yet taken place. These edits can only be made from the Status Menu however. Each edit is entered immediately into the detector's operating wavelength program.

For example, for the program displayed in Figure 60, the stop-time is 10.0 minutes. If, at 7.00 minutes into the run, you determine that the run should be 9.00 minutes long, you can edit the last line of the program such that the current run will stop at 9.00 minutes.

Programmed Autozero

The detector can be programmed to perform an automatic zero with each wavelength change during a run using the Zero on λ Change field.

❖ To access this feature

1. Press [MENU] and select /OPTIONS/ to access the Options Menu (Figure 61).

   Figure 61. The Options Menu

   ```
   >  Lamps
   ❑  Analog Outputs
   ----------------------------------------------------------
   ❑  More
   ```

2. Select /More/ to display the More Menu.
3. Place the cursor on the Zero on λ Change field. This field appears on the first line of the More Menu.
4. Select **Yes**, to automatically zero the detector response with each wavelength change during a run, or **No**, to turn this feature off.

You can also use this automatic zero feature to add autozeros into your wavelength program without changing the detector's wavelength settings. To do this, add additional time lines. Adding autozeros in this way is convenient in cases such as solvent programming, where the detector's baseline might drift due to changes in solvent background.

An example program is shown in Figure 62.

Figure 62. An example of a wavelength program with automatic autozeros

```
  Time                              Wavelength
  0.00                                 254
-----------------------------------------------------------
  2.00                                 254
  5.00                                 280
  7.00                                 280
  10.00                                280
```

With Zero on λ Change set to Yes, the detector will autozero at 2.00, 5.00, and 7.00 minutes into the run, even though the wavelength will only change once (at 5.00 minutes into the run).

Automatic Lamp Operations

The Lamps Menu

The Lamps Menu (Figure 63) allows you to select lamps, track lamp life, and turn the lamps on and off automatically. Field descriptions for this menu follow.

❖ To access the Lamps Menu

1. Press [MENU] and select /OPTIONS/.
2. Select /Lamps/.

Figure 63. The UV2000's Lamps Menu

```
  Lamp                      D2 (190-365)
  D2 Lamp Hours                        0
-------------------------------------------------------
  W Lamp Hours                         0
  Current Time                      0:00
  Startup                         Manual
  Startup Time                      0:00
  Shutdown                        Manual
  Shutdown Time                     0:00
  Time from READY                   1:00
```

- Lamp

  The Lamp field allows you to select from the following:

  – D2 (190-365), for deuterium
    W (366-800), for tungsten
    [the UV1000 reads D2 (190-380)]

  – D2+W (190-800), for dual-lamp operation

  – or *Off*, to shut the lamp(s) off

  Actually though, the wavelength setting in the loaded file automatically selects the appropriate lamp for you. In fact, the wavelength setting you choose in your file has priority over any selection you make here in the Lamp field!

  For example, if the loaded file designates a wavelength in the UV range, but you manually selected W (366-800) in the Lamp field, the detector's display will read NRDY (not ready) for the deuterium lamp.

- Lamp Hours (W and D2 fields)

  These fields automatically track the number of hours each lamp has been in operation. For the value to be accurate, set the appropriate Lamp Hours field to zero each time you install a new lamp.

Tip If you switch lamps before they are burned out (with the intention of using them again at a later date), keep a record of how many hours they have been in operation.

- Startup and Shutdown

  When you set the Startup and Shutdown fields to "Manual," the lamp designated in the Lamp field turns on and off when the detector power is switched on and off, respectively.

- Startup and Shutdown Times

  When you set the Startup and Shutdown fields to "Time" (see above), the designated lamp will automatically turn on and off at the local time set in the Startup Time and Shutdown Time fields, respectively.

  IMPORTANT For the detector to perform automatic lamp startup and shutdown correctly, the detector's 24-hour clock must be set to your local time. Set the clock in the Current Time field. Since the clock resets to zero each time the detector is turned off, it will have to be reset prior to performing automatic lamp startup and shutdown unless the detector has been left on continuously.

- Time from READY

  If you prefer, you can program the detector to shut the lamp off after a series of automated runs by using the Time from READY feature. Time from READY is a preset time interval that automatically begins each time the detector returns to its READY state. If the Time from READY interval elapses without a run signal being received from either the keypad or the detector's Run (Input) terminal, the detector's lamp turns itself off.

❖ To use the Time from READY feature

1. Select Time from READY in the Shutdown field.
2. In the Time from READY field, enter the length of time during which a run signal must be received by the detector before the lamp turns off.

For example, let's say your chromatographic system is set up for an automated run and the autosampler signals the detector to run after each injection. With the detector settings shown in Figure 64, the lamp will turn off ten hours after the last run is completed.

Figure 64. An example of the Time from Ready feature

```
  Shutdown              Time from READY
  Shutdown Time                 00:00
-------------------------------------------------------
  Time from READY               10:00
```

You can also program the UV2000's lamps to turn off at the end of a queue by selecting End of Queue in the Shutdown field. For more information on the Queue feature, see page 58.

Other Features

Additional features offered by the UV1000 and UV2000 detectors include the abilities to lock the Status Screen, to short the detector outputs, to place an event mark on the chromatogram, and to send a ready signal to external devices. You can also control the display's contrast and cursor speed, and do a quick shutdown of the detector's lamps and motors.

Status Lock

You can lock the detector's display using the Status Lock field. This feature lets you prevent accidental changes to a file that is currently being run. With the lock on in the UV1000, only the Status Screen appears. In the UV2000, you can scroll down from the Status Screen as far as the Status Menu's File Name field. You will still be able to access the Main Menu and the rest of the menu structure using the MENU key however.

❖ To access Status Lock

1. Press [MENU].
2. Select /OPTIONS/.
3. Select /More/.
4. Scroll down to Status Lock. Select **On** or **Off** to turn the lock on or off, respectively.
5. Press [STATUS].

Short Outputs

When zeroing a readout device such as an integrator or recorder, it's convenient to be able to short the detector outputs. You can do this using the Short Outputs feature.

❖ To access Short Outputs

1. Press [MENU].
2. Select /COMMANDS/. The Commands Menu (Figure 65 appears.

Figure 65. The Commands Menu

```
>  Event Mark
❑  Short Outputs
-----------------------------------------------------
❑  Shutdown Detector
```

When you select /Short Outputs/, the detector's analog outputs are shorted together (zero volts) and the field name changes to "Unshort Outputs." To remove the short and return the outputs to their normal operating state, select /Unshort Outputs/, and the field changes back, now reading "Short Outputs." (When you leave this screen, the field returns automatically to Short Outputs.)

Event Mark

Using the event mark feature, you can place an event mark on your chromatogram to note various occurrences, such as the turning of a sampling valve. The event mark is a spike (15% of full-scale for one second) in both detector output signals.

❖ To access Event Mark

1. Press [MENU].
2. Select /COMMANDS/. The Commands Menu (Figure 65) appears.
3. Place the cursor on Event Mark. Press [ENTER] each time you want to place an event mark on your chromatogram.

IMPORTANT You might not want to use event marks if your data will be analyzed by an integrator. Integrators can misinterpret event marks as peaks.

Ready Output

Using the READY (Output) terminal on the detector's back panel, the detector can send a signal to other devices each time it goes to its READY state. This feature is frequently used with autosamplers to signal that the detector is ready for the next injection.

❖ To access the READY Output field

1. Press [MENU].
2. Select /OPTIONS/.
3. Select /More/.
4. Scroll down to the READY Output field. Select **Active Hi** or **Active Lo**, depending on which signal you want to send.

Tip All SpectraSYSTEM instruments are set to receive high signals, so select **Active Hi** if you are hooking up to this type of chromatograph. For any other type of instrument, refer to the appropriate reference manual.

Display Contrast

You can vary the display's contrast to make it easier to read.

To change the display's contrast, first press [STATUS]to access the Status Screen. Then simultaneously press the > key and the + key to increase the contrast, or the > key and the - key to reduce the contrast.

Cursor Speed

You can control the display's cursor speed to make it easier to use.

❖ To access Cursor Speed

1. Press [MENU].
2. Select /OPTIONS/.
3. Select /More/.
4. Scroll down to Cursor Speed and select **Fast**, **Medium**, or **Slow**.

Shutdown Detector

This feature offers a quick shutdown, and subsequent startup, of the detector's lamps and motors. The electronics stay on to maintain the detector's memory.

❖ To shut down the detector

1. Press [MENU].
2. Select /COMMANDS/.
3. Scroll down to the Shutdown Detector field.
4. Press [ENTER]. The confirmation message shown in Figure 66 appears on the display.

Figure 66. Shutdown confirmation message

```
** Detector Shutdown **
```

To start the detector up again, press any key on the keypad. The detector will come up under the same conditions present when the Shutdown Detector command was activated.

Scanning (UV2000)

The UV2000 can perform a spectral scan on eluting peaks without stopping the eluant flow. This unique feature greatly simplifies the determination of wavelength maxima for individual compounds in your sample during method development work.

How It Works

When a scan is initiated, the monochromator moves from the run-wavelength to the scan's start-wavelength. The detector scans by stepping through a defined spectral range at specified wavelength increments. Individual absorbance values are read at each increment until the monochromator has reached the last wavelength.

The UV2000 can collect and store as many as ten spectra from a single chromatographic run in its memory. The actual number of spectra is determined by the number of data points in each scan. Since the number of data points varies with the wavelength interval and the scanning range, first calculate the number of data points using Equation 1, then use either Equation 2 or Equation 3 to determine the number of spectra you will be able to collect.

Equation 1. Use this equation to calculate the number of data points for any scan between λ1 (the lower wavelength), and λ2 (the higher wavelength):

$$\#\ \text{of data points} = \frac{\lambda 2 - \lambda 1}{\lambda \text{intervals}}$$

Equation 2. Use this equation to calculate the number of spectra you can collect when using wavelength intervals of 2 nm or greater. Round the resulting number down to the nearest integer.

$$\#\ \text{of spectra} = \frac{5000 - (\#\ \textit{of data points} * 12)}{(\#\ \textit{of data points} * 4) + 14}$$

Equation 3. Use this equation to calculate the number of spectra you can collect when using wavelength intervals of 1 nm. Round the resulting number down to the nearest integer.

$$\#\ \text{of spectra} = \frac{5000 - (\#\ \textit{of data points} * 4)}{(\#\ \textit{of data points} * 4) + 14}$$

For example, if you want to scan from 190 to 564 nm in 2-nm steps, there would be 188 data points and the UV2000 would be able to store up to 3 spectra:

$$\#\ \text{of spectra} = \frac{5000 - (188 * 12)}{(188 * 4) + 14} = \frac{2744}{766} = 3.58 = 3$$

Each scan is corrected for baseline absorbance before being played back either as individual data points, or as a smoothed, continuous spectrum.

Selecting the Scan File

❖ To select spectral scanning

1. Press [MENU]. Select /FILES/.
2. Select /Edit/.
3. Use the + key to increment the Edit File field until an "S" is displayed (Figure 67). The File Name field is automatically named SCAN. (You cannot edit the Scan File's name.)

Figure 67. The Scan File's Edit Menu

```
  Edit File                          S
  File Name                       SCAN
-----------------------------------------------------
❑ Setup
❑ Replay
```

4. Select /Setup/ to set up your spectral scanning parameters.

Setting Up the Scan File

The Scan File's Setup Menu is shown in Figure 68.

Figure 68. The Scan File's Setup Menu

```
  Start λ                          220
  End λ                            365
-----------------------------------------------------
  λ Interval                         5
  Run λ                            250
  Rise Time                        1.0
  Scan Zero Time                  0.00
  Range 1                          1.0
  Range 2                          1.0
```

❖ To set the parameters for scanning

1. In the Start λ field, enter the wavelength at which each scan should start.
2. In the End λ field, enter the wavelength at which each scan should end.
3. In λ Interval, enter the wavelength interval to be used. To perform a scan, the UV2000 takes individual absorbance readings at wavelengths incremented by the interval you specify.

> **Tip** Five nanometers is an excellent wavelength interval for most applications. At this interval, you get very rapid scans and you can still display the Max to 1 nm accuracy.

4. In Run λ, enter the wavelength at which the chromatographic run will be monitored.

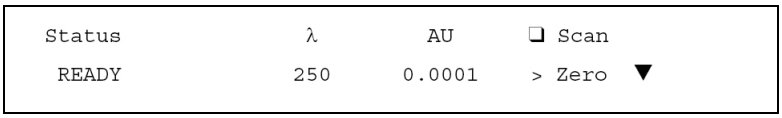
5. In Scan Zero Time, enter the runtime at which you want the detector to perform an automatic baseline scan. If you use an automatic baseline scan, make sure no peaks are eluting during the designated scan time.
6. Fill in entries for Rise Time, Range 1, and Range 2 as you would for any chromatographic run.

When you are finished setting up the Scan File, you are ready to load it and run.

Running the Scan File

When the Scan File is loaded, you will notice the fields Zero and Scan in the Status Screen (Figure 69).

Figure 69. The Status Screen with the Scan File loaded



- Zero

  Zero is used to perform baseline scans of the solvent's background absorbance. With the detector's baseline stabilized and the cursor on the Zero field, press [ENTER]. The UV2000 performs and stores a baseline scan using the parameters you set in the Scan File. While the detector is performing a baseline scan, the Status field displays SCAN 0.

  Baseline scans can be taken at any time during the run, as long as no peak is eluting at that time. Subsequent sample scans are corrected using the last baseline scan taken. This is especially advantageous for gradient elution, where the background absorbance of the eluant might be constantly changing.

  For example, let's say you perform a baseline scan before you initiate a run, and then again at 5.00 minutes into the run. You also perform sample scans of your eluting peaks at 2.4 and 5.6 minutes into the run. The sample scan taken at 2.4 minutes will be corrected using the baseline scan taken before the run began. The sample scan taken at 5.6 minutes will be corrected using the baseline scan taken at 5.0 minutes.

- Scan

  Once you begin the run, the cursor will move from Zero to Scan in the Status Screen. Each time you want to perform a sample scan, press [ENTER].

  IMPORTANT There is a one-second delay from the time the detector takes its absorbance readings to the time you see the same reading on the analog readout. Keep this in mind when choosing your scan times.

Each time you perform a sample scan, the detector's monochromator moves from the run wavelength to the start wavelength. The detector performs each scan (from the start wavelength to the end wavelength) by taking individual absorbance readings at wavelengths incremented by the interval you set in the Scan File. When the scan is finished, the monochromator returns to the run wavelength.

For example, using the default Scan File Setup Menu shown in Figure 68, the detector would monitor the run at 250 nm. Each scan would include absorbance readings for wavelength settings of 220, 225, 230, 235, and so on, up to 350 nm.

IMPORTANT If you chose starting and ending wavelengths that were not an exact multiple of your wavelength interval, the ending spike (event mark) on your chromatogram would be placed at the last multiple of the wavelength interval that falls within the scanning range. For example, with a starting wavelength of 200 nm, an ending wavelength of 365 nm, and a wavelength interval of ten, the end spike on your chromatogram would be at 360 nm, the last full wavelength multiple within the range.

While the detector is scanning, the Status field displays SCAN.

IMPORTANT During scanning, the output signal will hold at the last absorbance value taken before the scan was initiated until the scan is finished. For this reason, quantitative analysis should never be performed when scanning.

Scan Summary Data Screen

When the Scan File is loaded, the normal Status Menu no longer appears below the Status Screen. Instead, several new lines that we call the "Scan Summary Data Screen" appear. The Scan Summary Data Screen is useful in setting up the parameters to replay your stored spectra.

An example of the Scan Summary Data screen as it appears after two sample scans is shown in Figure 70.

Figure 70. An example of the Scan Summary Data Screen

```
  File S: SCAN
-------------------------------------------------------
  Time                λMax     λMaxAU     λMin
   10.50               280     1.6668      230
   11.66               255     0.7768      220
```

The Scan Summary Data Screen has four fields:

- Time, which is the run time at which the scan was initiated
- λMax, which is the scan wavelength where the maximum absorbance occurred
- λMaxAU, which is the maximum absorbance

- λMin, which is the scan wavelength where the minimum absorbance occurred

If no maximum was found, the λMax and λMaxAU fields read 0 (zero). The summary information is updated as each sample scan is completed.

Tip The UV2000 uses a second derivative to find the "local" λMax.

In our example (Figure 70), scans were taken at 10.50 and 11.66 minutes into the run. The scan taken at 10.50 minutes has a maximum absorbance of 1.6668 AU at 280 nm. The minimum absorbance occurred at 230 nm. To replay your 10.50-minute scan, you would use a range of 2.0 AUFS to keep the absorbance values on-scale.

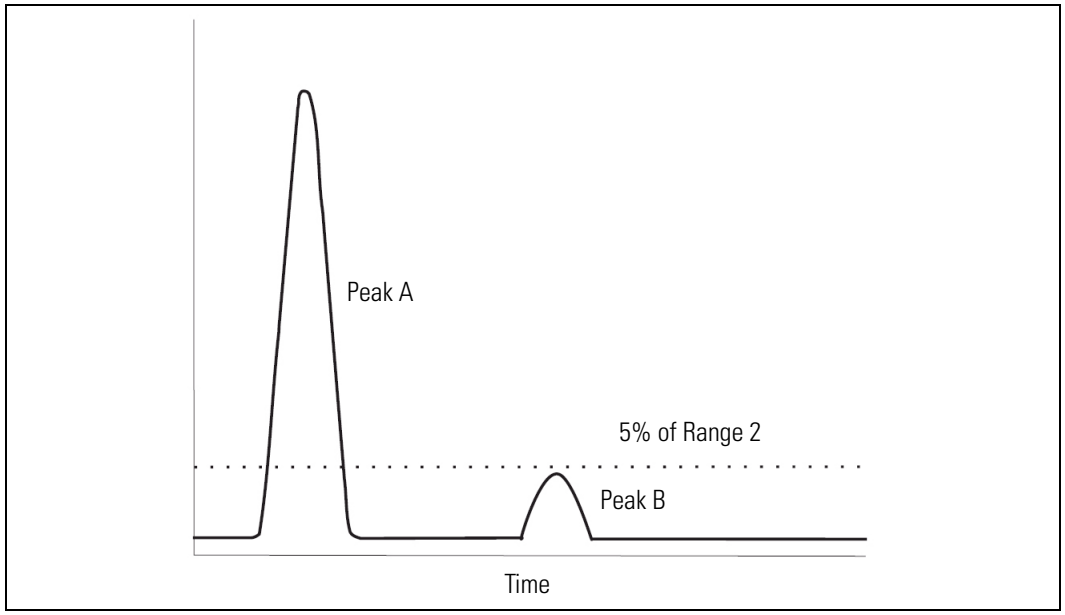
Stopping the Scan File

There is no programmed stop in the Scan mode. The run will continue until it reaches 99.99 minutes, or until you press [STOP].

Automatic Scanning (UV2000)

If you've set the Auto Scan field in the Setup Menu to On, your detector will perform an automatic scan whenever there are at least three consecutive data points with positive slopes followed by three consecutive data points with negative slopes. The absorbance values for all these data points must exceed 5 percent of the value set in the **Range 2** field. In our example chromatogram (Figure 71), a scan would occur automatically for Peak A, since it has at least three data points with positive slopes followed by at least three data points with negative slopes, all of which exceed 5% of the value set in **Range 2**. Conversely, no scan would occur for peak B, since none of its absorbance values exceeds the 5% threshold, even though it might satisfy the consecutive-slope criteria.

Figure 71. An example of how automatic scanning works



An automatic baseline scan will occur at the time specified in the Spectra Menu's Scan Zero Time field.

IMPORTANT Make sure that no peaks are eluting at the specified scan-zero time or your baseline scan will be zeroed erroneously for the eluting peak's value at the moment when the scan zero occurs. This will produce a baseline scan that is heightened artificially.

Replaying Your Spectra

When you have completed your run, you can retrieve your stored sample spectra using the Replay Menu (Figure 72).

❖ To access the Replay Menu

1. Press [MENU]. Select /FILES/.
2. Select /Edit/ to display the Scan File's Edit Menu (Figure 67).
3. Select /Replay/.

Figure 72. The Replay Menu

```
  Range 1                          1.0
  Range 2                          1.0
-------------------------------------------------------
  Replay Rate (nm/sec)               5
  Spectra Time                   10.50
❑ Replay Spectra
❑ Display AU,λ
```

Setting Replay Parameters

❖ To set the parameters for replay

1. Set Range 1 and Range 2 for Analog Output 1 and Analog Output 2. If you are using only one output, disregard the appropriate range.
2. Enter the Replay Rate (nm/sec). This is the rate at which the detector will read out the spectral data to your chart. You will use this value and an appropriate chart speed to calculate wavelength increments on your printed sample spectrum.

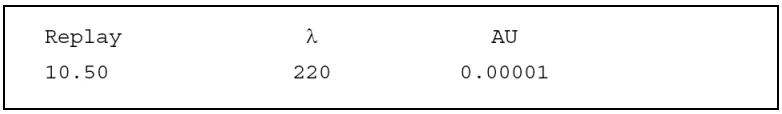
   For example, if your sample scan were taken between 190 and 340 nm (a span of 150 nm), a replay rate of 5 nm/sec would print the spectrum in 30 seconds. A chart speed of 30 cm/min would give you a scan of 15 centimeters in increments of 10 nm/cm.
3. Select the spectrum you want to replay by selecting its start time in the Spectra Time field. Each spectrum taken during the run is individually identified by the run time at which it was initiated.

When you finish setting your replay parameters, you are ready to send the spectral data to your chart using the Replay Spectra command.

Running Replay

To initiate the Replay Spectra command in the Replay Menu, press [ENTER]. While the replay is occurring, the screen shown in Figure 73 appears on the display.

Figure 73. The display as it appears while spectra are being replayed

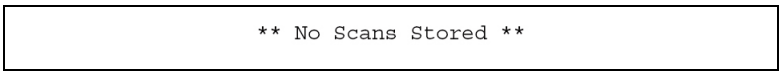


The screen's Replay field displays the start time of the spectrum being replayed. The λ and AU fields display the individual data points being plotted.

The UV2000 uses advanced curve-fitting algorithms to present a smooth, continuous plotted spectrum. The spectrum is replayed in 1 nm steps regardless of the wavelength interval selected. To change the appearance of replayed spectra from 1 nm stepped curves to smooth curves (or vice versa), vary the recording device's replay rate and response time.

If no spectra are stored in memory when you activate the Replay Spectra command, the message shown in Figure 74 will appear on the display. When the replay is finished, the display returns to the Replay Menu.

Figure 74. The message that appears when no spectra are stored in memory



Stopping Replay

You can stop a replay at any time by pressing [STOP].

Spectral Data Storage

Spectral data are stored in the UV2000's memory until a new file or queue is loaded or the detector is turned off.

Viewing Data

You can display the individual data points of your stored spectra by selecting the Display AU, λ field in the Replay Menu (Figure 72). A screen similar to that shown in Figure 75 will appear on the display.

Figure 75. The Display AU, λ screen

```
  Display              λ              AU
   1.50              220          0.00001
-------------------------------------------------------
   1.50              250          1.66681
   1.50              280          0.28831
```

Note Only actual data points (separated by the proper wavelength interval) can be displayed.

The Display AU, λ screen shows the time at which the scan was initiated, along with each wavelength and absorbance reading collected. You can scroll through the data using the + and - keys. To return to the Replay Menu, press ∧.

The Develop File (UV2000)

The Develop File is unique to the UV2000. It allows you to make sequential sample injections at different wavelengths automatically. This automation makes method development much easier because you can use an automated run to determine the optimum wavelength of detection for each component in your sample. You can also use the Develop File to troubleshoot chromatographic problems, or to confirm method transfer from laboratory to laboratory.

Selecting the Develop File

❖ To select the Develop File

1. Press [MENU]. Select /FILES/.
2. Select /Edit/.
3. Use the + key to increment the Edit File field until a "D" is displayed. The File Name field will read DEVELOP. (You cannot edit the Develop File's name.)

Editing the Develop File

❖ To edit Develop File parameters

1. Once you've selected the Develop File as described above, press either the [ENTER] or the ∨ key to access the Develop File's Edit Menu (Figure 76).

   Figure 76. The Develop File's Edit Menu

```
  Edit File                          D
  File Name                    DEVELOP
-----------------------------------------------------
  Start λ                          220
  End λ                            350
  λ Interval                         5
  Run Time                       10.00
  Runs per λ                         2
  Rise Time                        1.0
  Autozero Time                   0.00
  Range 1                          1.0
  Range 2                          1.0
```

2. In the Start λ field, enter the wavelength at which the first chromatogram is to be monitored.
3. In the End λ field, enter the wavelength at which the last chromatogram is to be monitored.

4. In λ Interval, enter the wavelength increment that the detector's monochromator should use for each wavelength change.
5. In Run Time, enter how long each run should last.
6. In Runs per λ, enter the number of injections to be made at each wavelength setting.
7. Enter Rise Time, Autozero Time, Range 1, and Range 2, as you would for a typical run. Note that Range 1 and Range 2 are the corresponding ranges for Analog Outputs 1 and 2, respectively.

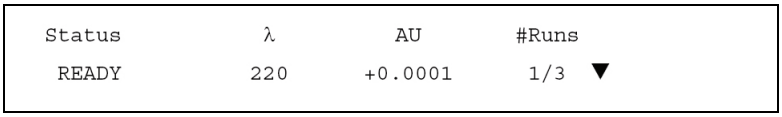
As an example, we will use the Develop File shown in Figure 76. The UV2000 would make its first two ten-minute runs at 220 nm. The monochromator would then change to 225 nm, and the detector would make two runs at this wavelength. This pattern would continue in five-nanometer increments until the detector has made two runs at the last wavelength, 350 nm.

After setting up your Develop File, you are ready to load it and run.

Running the Develop File

When the Develop File is loaded, you will notice an additional field in the Status Screen, #Runs (Figure 77).

Figure 77. The Status Screen with the Develop File loaded



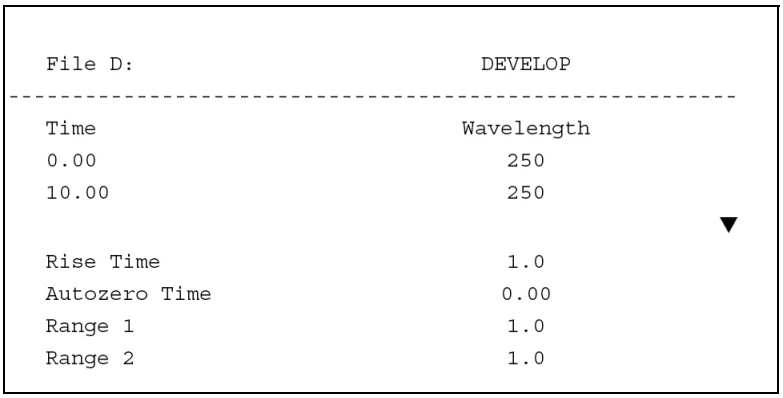
- #Runs

  The #Runs field in the Status Screen shows the current run number, followed by a forward slash and the total number of injections for the wavelength specified in the λ field. For example, if the file is set up to make three injections per wavelength, and the detector is in the second run for the 250 nm setting, the #Runs field would appear as 2/3. The field is updated with each injection.

- Status Menu

  The Status Menu looks the same for a Develop File as it does for a typical chromatographic file (Figure 78).

Figure 78. The Status Menu with the Develop File



IMPORTANT You can change any of the parameters in the Status Menu while the detector is running, but the changes will be effective only until the next wavelength is loaded.

Repeating the Develop File

After the last wavelength is run, the detector is reset automatically to the starting wavelength in the Develop File. The file can be run as many additional times as you want, as long as the detector continues to receive run signals.

Sample Queue (UV2000)

Sometimes it's convenient to group samples together under different detector conditions in an automated run. For these occasions, the UV2000 offers a queuing feature. Using a queue, you can program the detector to load and run a specified file for your first group of samples, and then automatically load a second file to run your next group of samples. The queue feature allows you to run as many as ten groups in a single queue.

Queue Menu

❖ **To access the Queue Menu**

1. Press [MENU].
2. Select /QUEUE/.

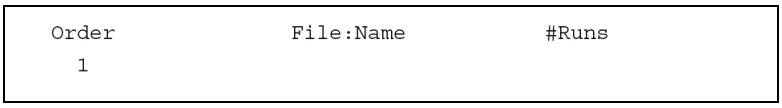
   When no queue is loaded, the Queue Menu appears as shown in Figure 79. On page 60, we'll see how the menu appears when a queue is loaded.

Figure 79. The Queue Menu with no queue loaded

Setting Up a Queue

To set up a queue, select /Edit / from the Queue Menu. For an empty queue, the display appears as shown in Figure 80.

Figure 80. An empty queue



Entering a Line

A "1" is automatically placed in the Order field of the first file to be run. You can't change that, so the cursor appears under the first editable field, File:Name. Scroll through the available files and press [ENTER] when your choice appears.

IMPORTANT You can only select numbered files. The Scan and Develop files are not available in the Queue mode.

Enter the number of injections to be made in the #RUNS field and press [ENTER]. You can have as many as 999 injections per file.

Adding More Lines

After completing the first line, a second line appears automatically. The Order field reads 2, and the rest of the line is blank. Select the proper file and the number of injections to be made for that file. You can have as many as ten groups in the queue.

Deleting a Line

To delete a line, use the - key in the File:Name field until it goes blank. When you leave the line, it is deleted and the queue is resorted automatically.

An Example

An example of a queue appears in Figure 81.

Figure 81. An example of a queue

```
Order            File:Name          #Runs
  1              2:THEOPHYL             5
  2              3:ABCD                25
  3              1:BARBITUA            10
```

In our example, we have programmed the detector to run File 2 for the first five injections, File 3 for the next 25 injections, and File 1 for the last ten injections.

Loading a Queue

To load a queue, select /Load/ in the Queue Menu. When the words "Load Queue" appear, press [ENTER]. The confirmation message in Figure 82 appears for one second.

Figure 82. The confirmation message when a queue is loaded

```
                ** Queue Loaded **
```

When a queue is loaded, the letter "Q" appears at the extreme left of the Status Screen (Figure 83).

Figure 83. The Status Screen when a queue is loaded

```
Status              λ              AU
 Q READY          250          +0.00001▼
```

If you attempt to load a queue when no queue exists, the message shown in Figure 84 will appear on the display.

Figure 84. The message that is displayed when no queue is available

```
              ** No Queue Available **
```

Running a Queue

When the detector receives its first start signal, it loads and runs the file designated in Order 1. It will continue to run this file each time it receives a start signal until the file has run the number of times specified in the #Runs field. The detector will then load and run the file designated in Order 2 and run it the number of times specified in that line, and so on, until the entire queue has run.

Viewing its Progress

❖ **To view a queue's progress while it is running**

1. Press [MENU].
2. Select /QUEUE/. Note that when a queue is loaded, the Queue Menu (Figure 85) looks different. The Load field has been replaced by "Pause," which we will discuss on page 62.

   Figure 85. The Queue Menu with a queue loaded

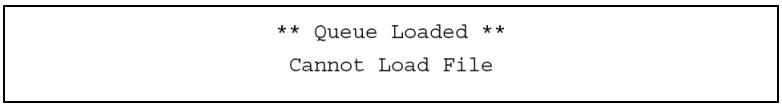
3. Select /Edit/ to display the queue. (Refer to Figure 81 for an example queue.)

While the queue is running, the #Runs field automatically decreases by one with each injection. When a particular file's last injection is made, the queue is automatically resorted. In other words, the information for Order 2 is now moved up to Order 1, the information for Order 3 is moved up to Order 2, and so forth. This process continues until the queue becomes empty, is paused, or is deleted.

Loading other Files

When a queue is loaded or running, you can not load any other file from the Files Menu without first pausing or deleting the queue. If you forget to pause or delete the queue and attempt to load a different file, you will get the message shown in Figure 86. You are then returned to the Files Menu.

Figure 86. The message that appears when you attempt to load a file when a queue is already loaded or running



Editing a Queue

To edit an existing queue, follow the procedures outlined in "Setting Up a Queue" on page 59. You are allowed to edit the Queue while it is running, but if you want to edit anything in Order 1, you'll have to pause the queue first.

Pausing a Queue

❖ To pause a queue

1. Select /Pause/ from the Queue Menu.
2. When the words "Pause Queue" appear, press [ENTER]. If a file is running, the run continues until it is completed, at which point the detector returns to its READY state. The letter Q no longer appears in the Status Menu.

When you want to continue, you must reload the queue. When the detector receives a start signal, the queue will resume operation at the point where it left off.

Deleting / Stopping a Queue

❖ To delete an existing queue or to stop a running queue

1. Display the Queue Menu.
2. Select /Delete/.
3. When the words "Delete Queue" appear, press [ENTER]. If a file is running, the run continues until it is completed. The confirmation message shown in Figure 87 appears for one second and you are returned to the Queue Menu.

Figure 87. The queue-deleted message

```
** Queue Deleted **
```

You can delete or stop a queue at any time, but remember that the queue will be subsequently erased from the detector's memory. It is good practice to delete an existing queue prior to designing a new one.

K-Factor (UV2000)

The K-factor calculates a factored response that can be used to eliminate, add, or subtract absorbances. This technique is useful for suppressing peaks when there are two co-eluting, or poorly resolved, peaks in your chromatogram. It is also useful in applications where you want to add or subtract absorbances at two different wavelengths in real-time.

For example, if you want to quantitate a peak without interference from another peak, you would use the K-factor to calculate a response of zero.

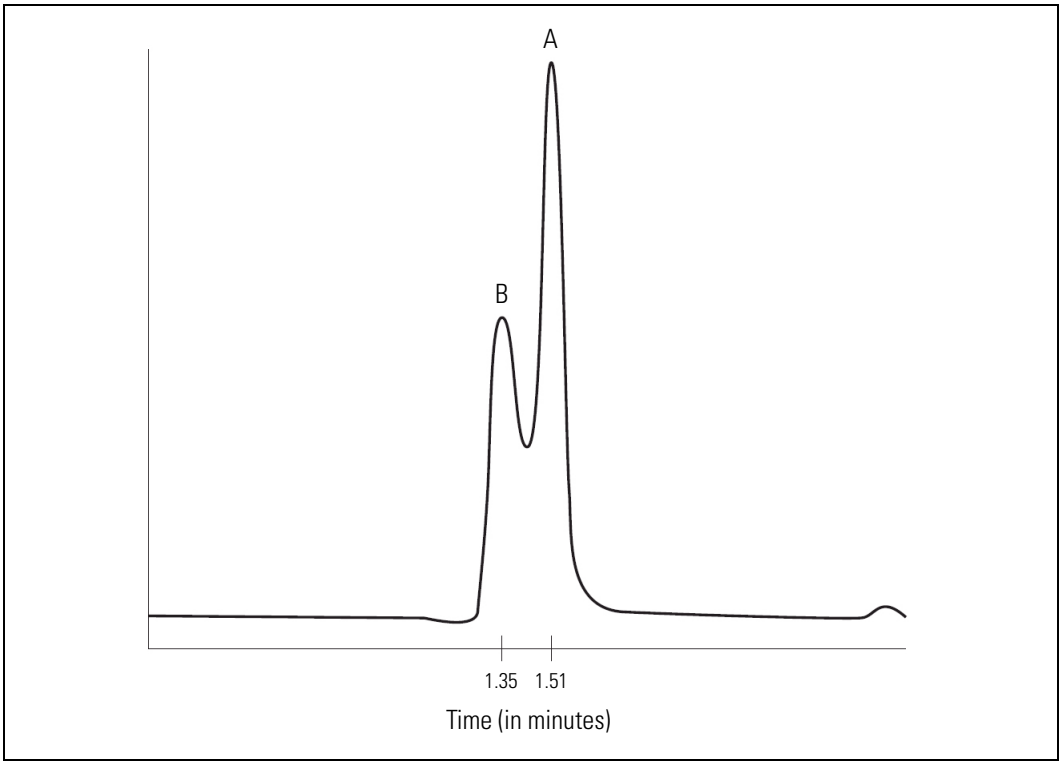
More specifically, let's say you want to analyze for Compound A in the presence of Compound B. If both absorb at the monitoring wavelength, 1, but only Compound B absorbs at a second wavelength, 2, you can calculate a K-factor for Compound B using its absorbances at 1 and 2. You can then use the K-factor to calculate the absorbance due only to Compound A at the monitoring wavelength (1), by subtracting Compound B's contribution from the total absorbance. The UV2000 uses the algorithm:

$$Absorbance\ due\ to\ A\ at\ \lambda 1\ =\ TAbs(\lambda 1) - K\,x\,TAbs(\lambda 2)$$

where TAbs(λ1) is the sum of the absorbances of A and B at the monitoring wavelength, K is the K-factor, and TAbs(λ2) is the total absorbance obtained at λ2.

Figure 88 shows a chromatogram of a mixture of toluene and butyl paraben where the two compound peaks overlap. Toluene (Peak A) is the compound of interest. Butyl paraben (Peak B) is the peak we want to suppress. We will use this example throughout the following steps for determining and using the K-factor.

Figure 88. A chromatogram of two unresolved peaks toluene (A) and butyl paraben (B)



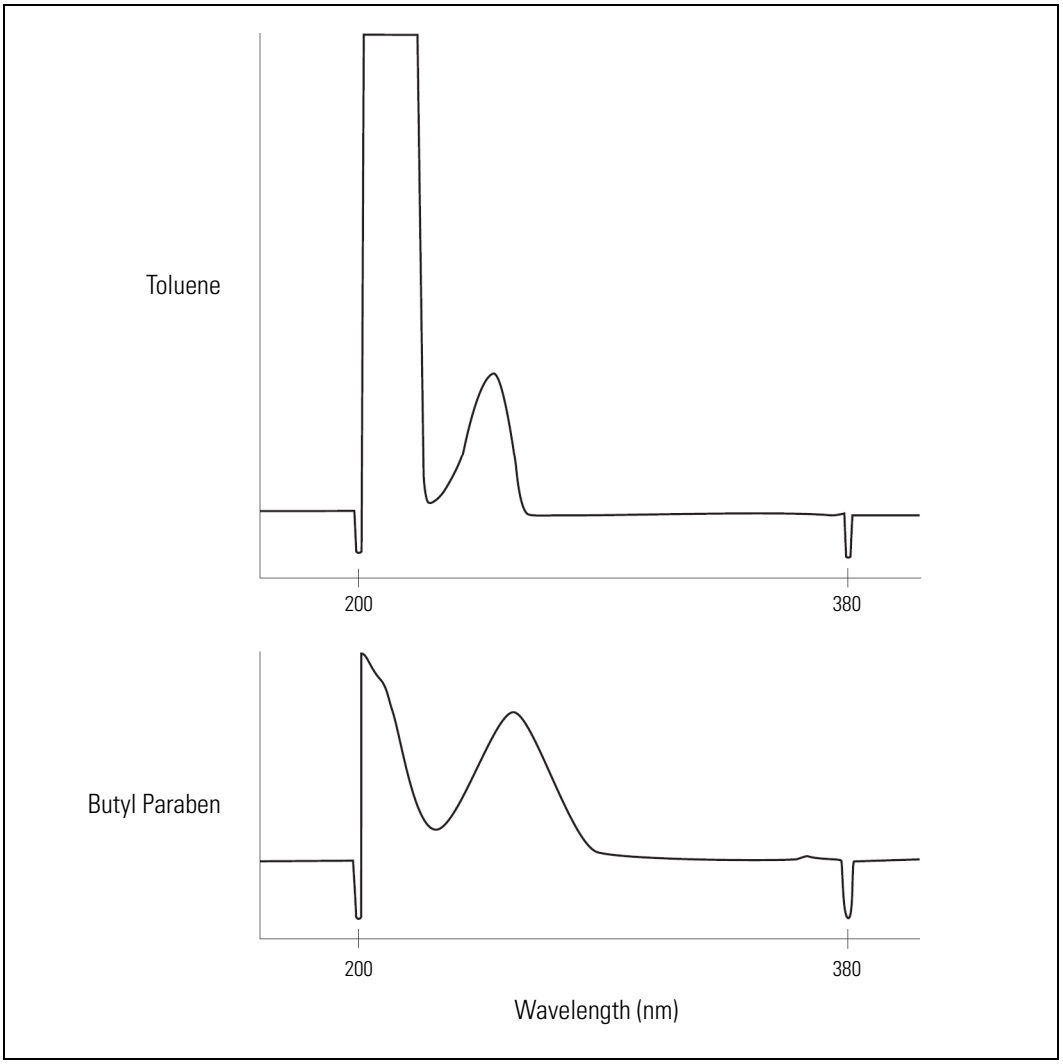
Choosing a Pair of Wavelengths

The first step in determining the K-factor is to choose a pair of wavelengths for your analysis.

1. Take an absorbance spectrum of each compound. You can do this by injecting samples of compound A and compound B alone, separately, under the same chromatographic conditions as your analysis, and using the UV2000's scanning feature. See "Scanning (UV2000)" on page 48.

   For the compounds in our example, we get the spectra shown in Figure 89.

Figure 89. Spectra of individual compounds



2. Label the wavelength maximum for your peak of interest as 1.
3. From the spectra, pick a wavelength for which compound B absorbs and compound A does not. This wavelength is labeled 2. For our example, we have chosen 254 nm as 1 and 280 nm as 2.

Calculating the K-factor

Use the UV2000's Display AU, λ screen (Figure 75) to obtain the individual absorbance value data from your scan of compound B.

Calculate the K-factor using the following equation:

$$K = AU1/AU2$$

where *AU1* and *AU2* are the absorbance values for compound B at λ1 and λ2, respectively.

For our example, the absorbance values are 0.0144 and 0.0032 (for 254 and 280 nm respectively), so our K-factor is 4.5, calculated as follows:

$$K = 0.0144 / 0.0032 = 4.5$$

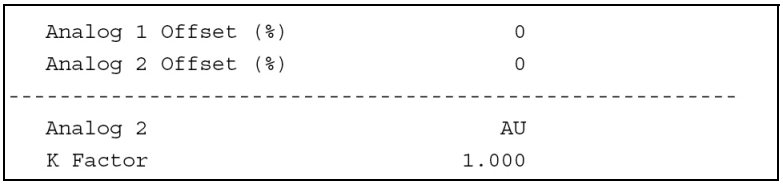
Using the K-Factor

❖ To use the K-factor

1. Press [MENU].
2. Select /OPTIONS/.
3. Select /Analog Outputs/.

   The menu shown in Figure 90 will appear.

   Figure 90. UV2000's Analog Outputs Menu

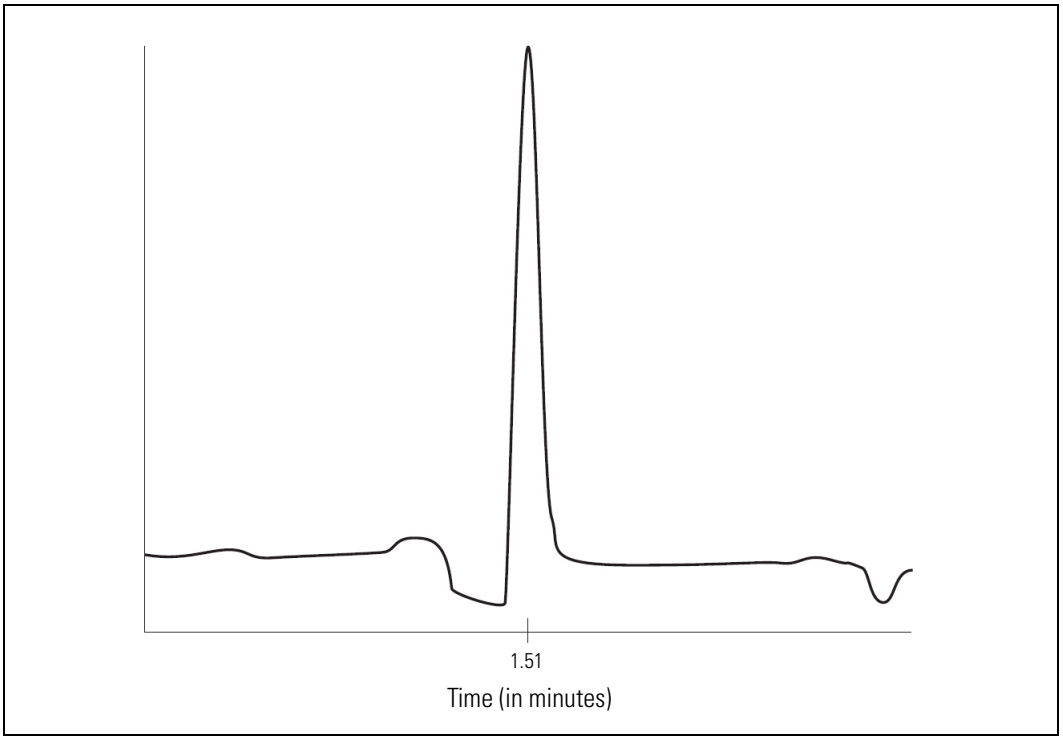


4. Scroll down to Analog 2 and select AU1-K*AU2.
5. Scroll down to K-factor and enter your calculated value (4.5, for our example).
6. Inject your sample.

   Tip Make sure your file was set to dual-wavelength mode as described in Chapter 3, "Basic Operations." Also remember that in this example, AU1 (1) is 254 nm and AU2 (2) is 280 nm.

7. Use Analog Output 2 on the detector's rear panel to monitor the chromatograms for your peak of interest.

Figure 91. Chromatogram of toluene with butyl paraben suppressed

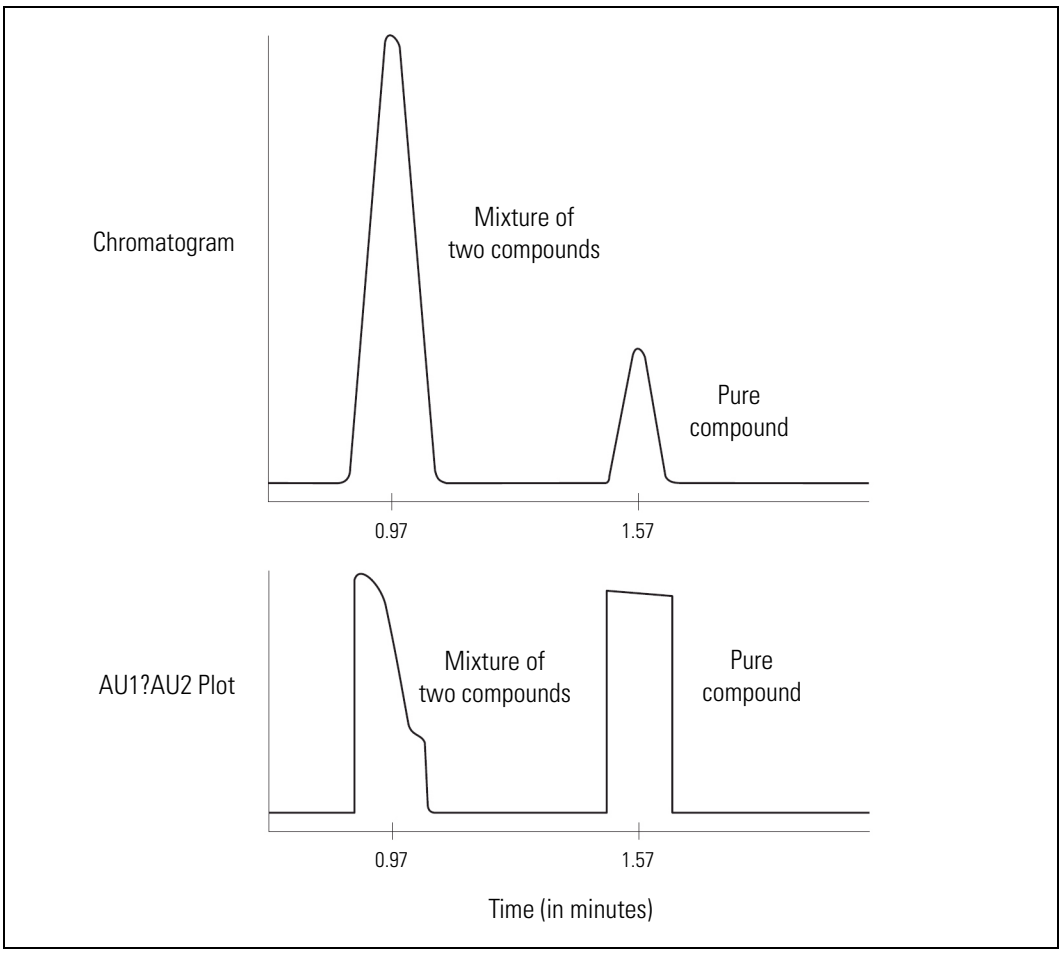


Our example chromatogram would now appear as shown in Figure 91, with a slightly lowered response for toluene and no absorbance contribution from butyl paraben. Using the K-factor in this way, we can quantitate toluene in the presence of butyl paraben without altering the chromatography.

Absorbance Ratios (UV2000)

Ratioing the detector's outputs from two different wavelengths can be a useful way of confirming peak purity. When a peak is pure, the ratio of the absorbances should remain constant. Thus, the ratio for a pure compound produces a relatively square wave, while the ratio for an impure compound produces a distorted wave (see the plots at 1.57 and 0.97 minutes, respectively, in Figure 92).

Figure 92. Using absorbance ratios to determine the purity of two peaks in a chromatogram



To use absorbance ratioing, you need to select AU1/AU2 for the Analog 2 Output field in the Analog Outputs Menu. You also need to select the two wavelengths you want to ratio.

To select the most appropriate wavelengths, use the UV2000's Scan File to collect a spectrum across a range of wavelengths. Then select /Display AU/, from the Replay Menu and examine the collected data.

The data shown in Figure 93 are typical.

Figure 93. The Display AU, λ screen

Display	λ	AU
1.50	220	0.00001
1.50	250	1.66681
1.50	280	0.28831

Ratioing only occurs when the absorbance value for each wavelength exceeds 12.5% of the corresponding range value. So, in our example, if Ranges 1 and 2 were set to 1.0 in the FILES > Edit > Options Menu, the 250 and 280 nm wavelengths could be ratioed. [Twelve and a half percent of 1.0 (the range) is 0.125. Absorbance values less than 0.125 are too low for ratioing.] No ratio output is produced when the absorbance values fall below 7.5% of the range values.

Generally, good wavelengths to choose are:

- the lambda max of the main peak (AU1)
- a wavelength with an absorbance value less than the lambda max but greater than 12.5% of the corresponding range (AU2)

Tip A good rule of thumb is to select a second wavelength that is either half the height of the lambda max or more than ten nanometers removed from the lambda max.

Whichever wavelengths you choose, don't select a wavelength that has a low absorbance value. Low absorbance values decrease the signal-to noise ratio, thus making the absorbance ratios less meaningful. Similarly, a small fluctuation in AU2 results in a big difference in the absorbance ratio if AU2 is very small. Fortunately, by relying on the preset range values, the UV 2000 has a built-in safeguard that prevents the ratioing of low absorbance values.

Required Maintenance

The SpectraSYSTEM UV1000 and UV2000 detectors are finely-tuned scientific instruments that we at Thermo Fisher Scientific are proud to stand behind. Even so, routine maintenance is necessary to ensure peak performance, so we can only guarantee the performance of the detector if you follow proper care and maintenance procedures.

This chapter shows you how to replace and clean your detector's flowcell and lamps.

Also included in this chapter is a procedure for testing the detector's absorbance linearity. This characteristic is particularly useful if your laboratory's standard operating procedures require periodic detector validation. You will need the optional cuvette holder to perform the test.

If you have any questions on proper maintenance or would like to arrange for a preventive maintenance program, please contact your local Thermo Fisher Scientific representative.

Contents

Flowcells

This section describes the changing and general cleaning of your detector's flowcell. For other flowcell problems, such as a cracked window or leaks that occur in locations other than at the inlet/outlet fittings, contact your Thermo Fisher Scientific representative.

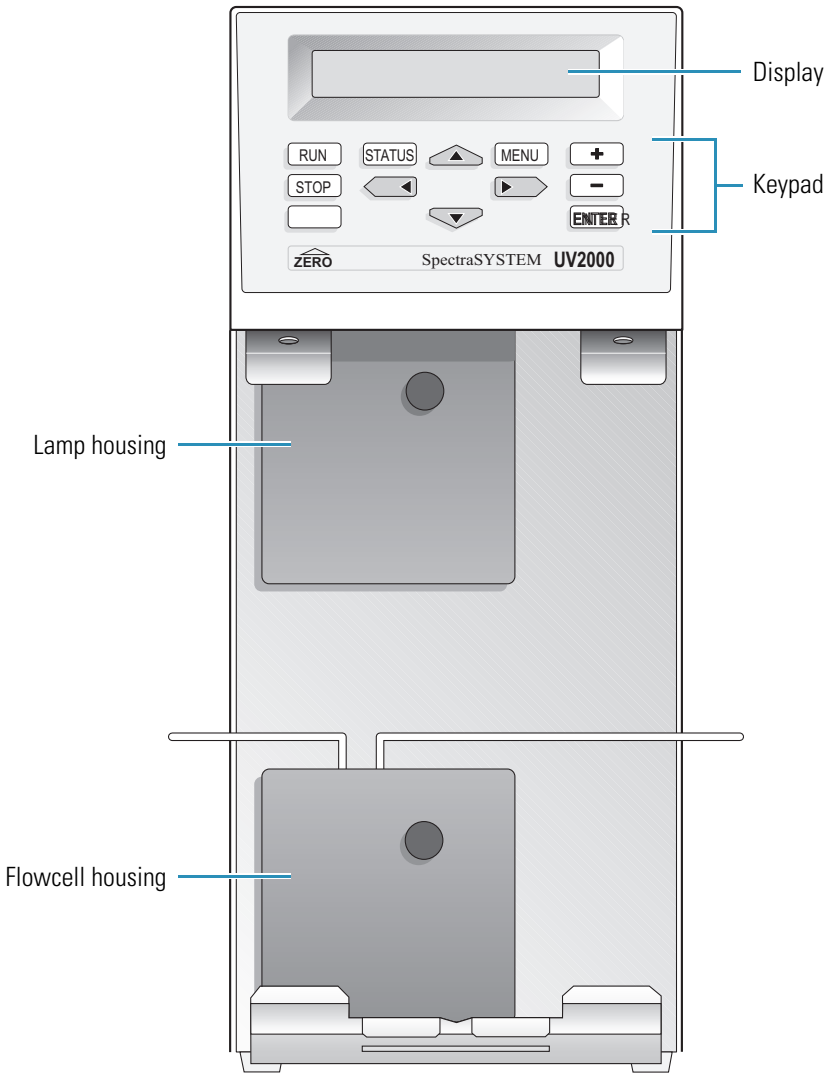
CAUTION Flowcells are factory-assembled units that should not be disassembled under any circumstance.

Changing the Flowcell

The flowcell needs to be removed whenever you replace a broken cell, change specialized applications, or clean the cell with nitric acid. For a list of available flowcells, see "Optional Flowcells" on page 94. All flowcells are shipped premounted in a holder for easier installation and alignment.

To access the flowcell, remove the front panel of the detector. The flowcell assembly is located behind the lower housing (Figure 94). Once the housing is removed, the flowcell is easily identified by the tubing that extends from the fittings on either side of the cell body (Figure 95).

Figure 94. Detector flowcell and lamp housings



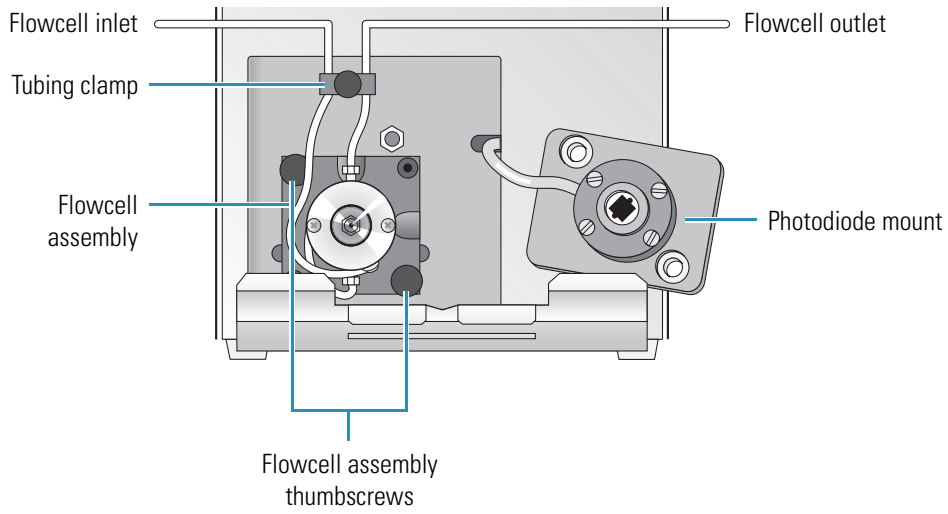
Flowcell Removal

❖ To remove the flowcell

1. Disconnect the power cord from the rear panel of the detector and make sure that the instrument is turned off.
2. If you have not already done so, remove the detector's front panel by grasping the bottom of the panel firmly with one hand and pulling back.
3. Loosen the knurled thumbscrew that holds the flowcell housing in place, and remove and set aside both the thumbscrew and the housing.
4. Disconnect the flowcell inlet tube from the chromatograph and free the flowcell outlet tubing from the waste reservoir.
5. Loosen the two thumbscrews on the photodiode mount and carefully pull the mount straight back (Figure 95). The cable that connects the photodiode mount to the detector is sufficiently long to allow the mount to rest on the bench top.

Note Avoid putting fingerprints or scratches on the flowcell windows, photodiode surface, or monochromator lens, all of which are exposed during these procedures. If dirty, the surfaces should be cleaned with spectroscopic-grade methanol (or isopropanol) and lint-free lens paper only.

Figure 95. Removing the cell cover to expose the flowcell and the photodiode mount



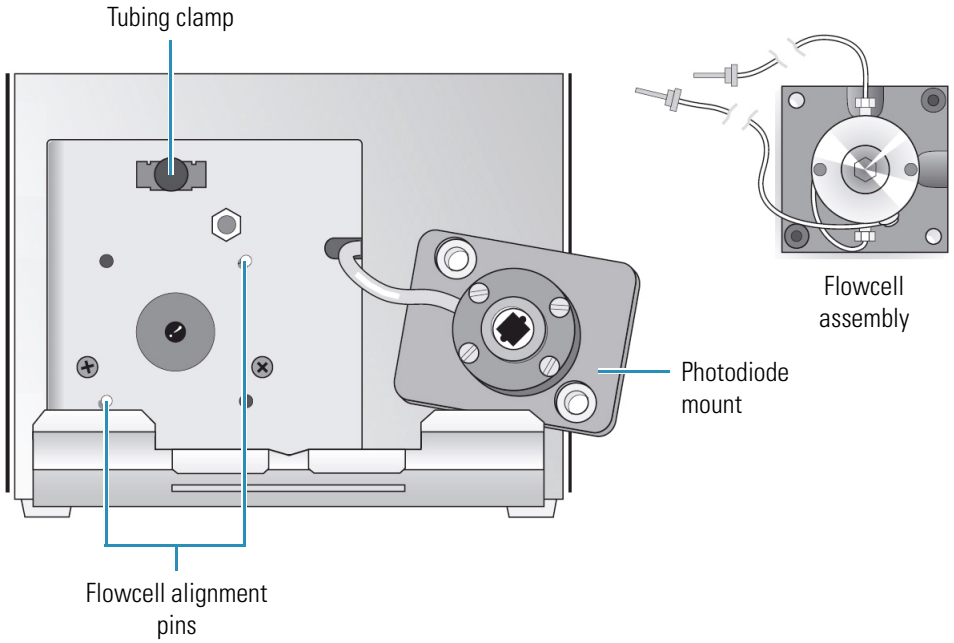
6. Loosen the thumbscrew that holds the tubing clamp in place. Gently pull the clamp toward you just far enough to disengage the tubing.
7. Loosen the two thumbscrews that hold the flowcell assembly. Carefully pull the assembly toward you to remove it from the detector.

Flowcell Installation

❖ To install a flowcell

1. With the inlet tube on the bottom, slide the flowcell assembly onto the alignment pins (Figure 96) and securely fasten it in place with the two thumbscrews.

   Figure 96. Installing the flowcell assembly



2. Slip the flowcell's inlet and outlet tubes into the slots of the tubing clamp and tighten the thumbscrew that holds the clamp in place.
3. Replace the photodiode mount and fasten it securely with the two thumbscrews.
4. Connect the inlet tubing to the chromatographic column and the outlet tubing to the waste reservoir.
5. Taking care not to pinch the cable or tubing, replace the flowcell housing and secure it with the knurled thumbscrew. Replace the detector's front cover.
6. Connect the power cord to the rear detector panel.

Cleaning the Flowcell

The exterior and/or interior surfaces of the flowcell can become contaminated. When flowcell contamination occurs, it is usually caused by precipitation or solubility problems, such as when the quality of your mobile phase solvent components and the cleanliness of your samples are variable. Signs of a contaminated flowcell are increased baseline noise, signal spiking, erratic or drifting baselines, and increased backpressure.

Cleaning with Organic Solvents

If you suspect that your flowcell needs to be cleaned, start with the following procedure using organic solvents.

CAUTION Flowcells are factory-assembled units that should not be disassembled under any circumstance. If you encounter contamination problems that are not remedied by this cleaning procedure, contact your local Thermo Fisher Scientific representative to arrange for repair or replacement.

❖ To clean with organic solvents

1. Make certain that the cleaning solvent(s) you plan to use is/are miscible with the solvent already present in the flowcell and pump. Isopropanol is a good choice for most applications.

   IMPORTANT If the last solvent in the pump was an aqueous buffer solution, be sure to pump 25 - 40 mL of HPLC-grade water (or equivalent) through the system to remove any salts before flushing with the cleaning solvent(s).

2. Flush the flowcell with 40 to 50 milliliters of solvent (HPLC-grade water, methanol, or isopropanol). You can either pump the solvent through the flowcell with the chromatographic pump, or you can draw the solvent through the flowcell using a large-volume syringe.

   If you use an LC pump to flush the flowcell, first remove the column from your chromatographic system to avoid column degradation. Replace the column with an appropriate length of tubing, ensuring that all connections are snug and leak-free. If you use a syringe, always draw the solution through the flowcell.

CAUTION Never use a syringe to force solvent through a flowcell. Pressurizing the syringe could cause a leak or rupture that would result in an extremely dangerous, uncontrolled spraying of solvent.

Cleaning with Nitric Acid

Methanol or isopropanol is generally sufficient for cleaning a flowcell. However, if the flowcell is still contaminated after flushing with organic solvents, follow this nitric acid procedure.

CAUTION Nitric acid is extremely corrosive and can react explosively with alcohols (especially methanol). Be sure to adhere to your company's safety procedures for handling and disposal of corrosive acids. Flush the flowcell with water to remove all traces of alcohol prior to flushing with nitric acid.

❖ To clean with nitric acid

1. Remove the flowcell assembly from the detector housing (see "Flowcell Removal" on page 73) before cleaning with a nitric acid solution. This will prevent possible leaks from harming the mechanical or electronic components of the detector.
2. Flush the flowcell with water before proceeding. This step is very important.
3. Prepare a 20% (v/v) solution of nitric acid in HPLC-grade water.
4. Pump the nitric acid solution through the flowcell with the chromatographic pump or draw it through with a large-volume syringe.

   If you use an LC pump, replace your column with tubing and make sure water was the last solvent in the pump and solvent reservoir. If you use a syringe, always draw the solution through the flowcell.

CAUTION Never use a syringe to force nitric acid through a flowcell. Pressurizing the syringe could cause a leak or rupture that would result in an extremely dangerous, uncontrolled spraying of nitric acid.

5. After you have finished the cleaning procedure and before returning to the buffer solution, pump another 25 to 40 mL of water through the flowcell to remove all traces of nitric acid before returning to your chromatographic solvents. Reinstall the flowcell assembly.

IMPORTANT Flush the pump with water immediately after the nitric acid flush. Leaving nitric acid solution in the pump for prolonged periods can damage pump seals.

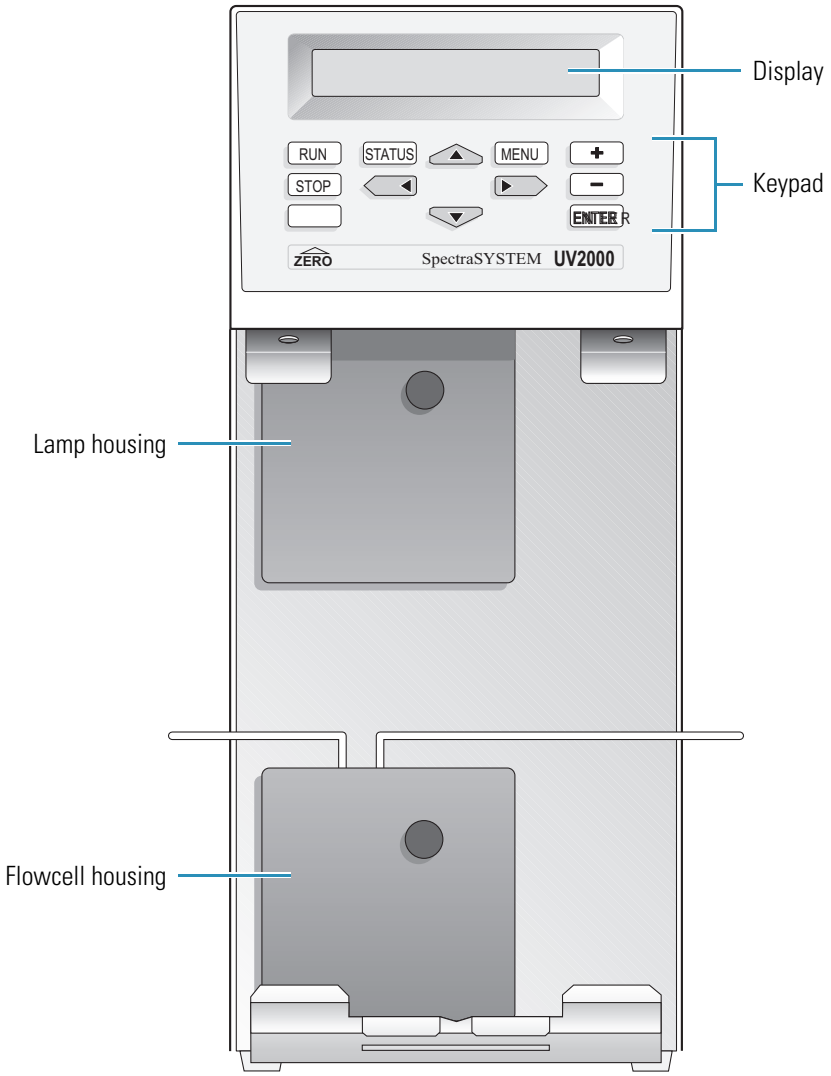
Lamps

As lamps age, there is a reduction in light output that results in increased baseline noise. If the noise level on your detector's output signal is increasing and cleaning the flowcell doesn't help, you should change the appropriate lamp, using the procedures in this section.

Remove the front panel of the detector. The deuterium and tungsten lamps are located in the upper housing (Figure 97). Both lamps are supplied prealigned in their individual assemblies to make them easy to install and align.

IMPORTANT Never loosen the screws that hold the lamp to its assembly or attempt to rotate or move the lamp up or down in the assembly. Either of these actions can cause a loss of alignment and degrade the system's performance.

Figure 97. Location of lamp housing



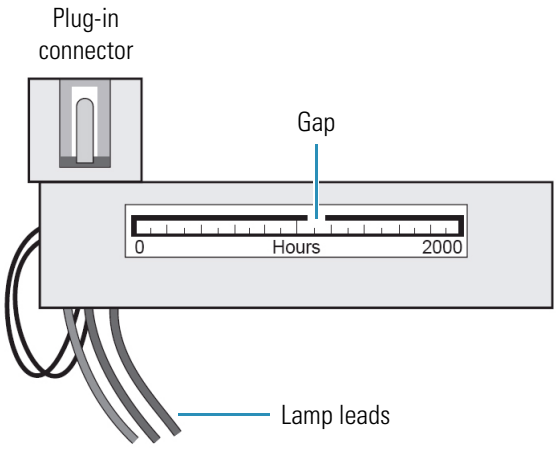
The Deuterium Lamp

The deuterium (D2) lamp typically requires a warm-up time of twenty to thirty minutes. However, for applications that demand great sensitivity, you might want to allow a warm-up period of up to an hour.

The deuterium lamp's lifetime is usually at least 1000 hours. Each D2 lamp assembly is equipped with a chronometer (Figure 98) that tracks the total hours of lamp operation. To read the chronometer, note the position of the "gap" in the mercury tube against the graduated background. You can also track lamp life automatically. (See "Automatic Lamp Operations" on page 43 for details.)

IMPORTANT The lamp surface must be kept free of fingerprints and smudges. If the surface needs cleaning, use a lint-free lens paper moistened with methanol or isopropanol.

Figure 98. Deuterium lamp chronometer



D2 Lamp Removal

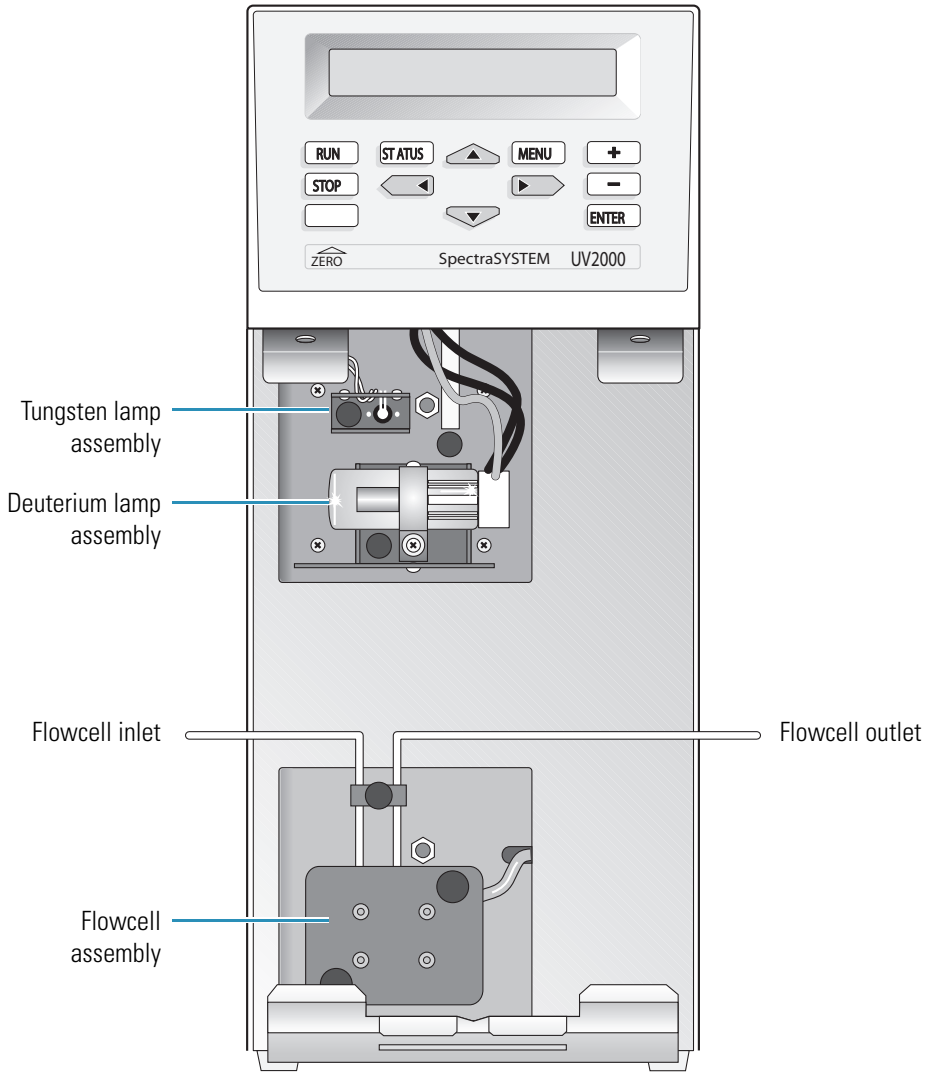
❖ **To remove the deuterium lamp**

1. Disconnect the power cord from the detector's rear panel and make sure that the instrument is turned off.

CAUTION Intense UV light can damage your eyes. Always disconnect the power cord before exposing the lamp and always allow sufficient time for the lamp to cool before removing it, as it gets quite hot when lit.

2. If you have not already done so, remove the detector's front panel by grasping the bottom of the panel firmly with one hand and pulling back.

Figure 99. Deuterium and tungsten lamp assemblies



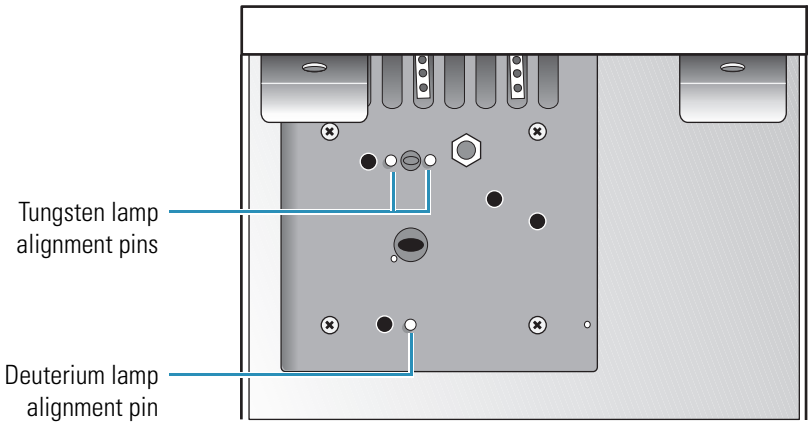
3. Remove the lamp housing by loosening the thumbscrew and pulling the cover straight back to expose the lamp assemblies (Figure 99).
4. Unplug the deuterium lamp lead from the detector, taking care not to twist the connector as you gently pull it out.
5. Loosen the two thumbscrews that hold the lamp assembly in place and pull the assembly straight out.

D2 Lamp Installation

❖ **To install a new D2 lamp**

1. Hold the deuterium lamp assembly so that the leads are at the top. Slide the assembly onto the alignment pin shown in Figure 100. (The alignment pin is located directly below the detector's monochromator aperture.)
2. Securely fasten the assembly in place with the two thumbscrews and aluminum standoffs.
3. Connect the lamp lead to the right-hand terminal in the lamp compartment.
4. Replace the lamp housing and secure it with the knurled thumbscrew. Replace the detector's front cover.
5. Connect the power cord to the rear detector panel.

Figure 100. Deuterium and tungsten lamp alignment pins



The Tungsten Lamp

The tungsten (W) lamp typically requires only fifteen minutes of warm-up time. Its lifetime is approximately 2500 hours. You can track lamp life automatically. (See "Automatic Lamp Operations" on page 43 for details.)

W Lamp Removal

❖ **To remove the tungsten lamp**

1. Disconnect the power cord from the detector's rear panel and make sure that the instrument is turned off.

CAUTION Hot Surface. Avoid burns. Always allow sufficient time for the lamp to cool before removing it.

2. If you have not already done so, remove the detector's front panel by grasping the bottom of the panel firmly with one hand and pulling back.
3. Remove the lamp housing by loosening the thumbscrew and pulling the cover straight back to expose the lamp assembly (Figure 100).
4. Unplug the tungsten lamp lead from the detector, taking care not to twist the connector as you gently pull it out.
5. Loosen the thumbscrew and the aluminum standoff that hold the lamp assembly in place and pull the assembly straight out.

W Lamp Installation

❖ To replace the tungsten lamp

1. Hold the lamp assembly so that the leads are at the top. Slide the assembly onto the two alignment pins shown in Figure 100. (The alignment pins are located on either side of the detector's monochromator aperture.)
2. Securely fasten the assembly in place with the thumbscrew and aluminum standoff.
3. Connect the lamp lead to the left-hand terminal in the lamp compartment.
4. Replace the lamp housing and fasten securely with the thumbscrew.
5. Connect the power cord to the rear detector panel.

Installation and Specifications

This chapter covers the initial installation of your UV/Vis detector, including hookup to other chromatographic instrumentation. As you go through unpacking and installation, you might want to use the Start-up Checklist located at the beginning of this manual. The checklist is an abbreviated version of this chapter and is supplied as a quick reference of how to conduct a successful installation. After installation, verify that the detector is working properly by running the two tests described on "External Diagnostic Tests" on page 122.

Also included in this Chapter is a list of your detector's specifications.

Contents

Installation Checklist

Use this checklist to ensure that you have completed all the steps necessary for the proper installation of your SpectraSYSTEM UV/Vis detector.

The following installation checklist is a brief summary of the steps that you need to complete in sequence for the proper installation of the PDA detector.

Unpacking

- ❒ Unpack and inspect your instrument. Check for damage.
- ❒ Check your accessory kit and manual:
  - ❒ present?
  - ❒ complete?
- ❒ Read the Safety Information Card.

Positioning Detector

- ❒ Place on benchtop as close as possible to the column and at least 5 in. (13 cm) from the wall.

Power Checkout

- ❒ Set voltage for local requirements.
- ❒ Check that the correct fuses are installed.

Rear Panel Connections

- ❒ Insert the 8- and 12-pin green connectors into their corresponding sockets.
- ❒ Connect the Analog Output and the corresponding ground terminals to your data system/recorder.
- ❒ Connect the desired remote communications terminals to external devices:
  - ❒ STOP (Input)
  - ❒ RUN (Input)
  - ❒ ZERO (Input)
  - ❒ READY (Output)
- ❒ Connect the power cord.

Flowcell Connections

- ❒ Remove the detector's front panel.
- ❒ Remove the flowcell assembly from the detector.
- ❒ Connect the flowcell inlet directly to your LC column outlet.
- ❒ Connect the flowcell outlet to waste tubing and a waste container.
- ❒ Replace the detector's front panel.

Instrument Power-up

- ❒ Install the power cord and turn on the instrument.
- ❒ Check that self-tests are running and that no error messages appear.

❒ Check that the Status Screen appears on display.

Registration Card

❒ Complete and return the registration card.

This detector was installed by:

(Name) (Date)

Unpacking

Carefully remove the detector from the shipping container and inspect both the detector and packing for any signs of damage. If you find any damage, immediately contact the shipping company.

The shipping container should contain the detector, an accessory kit, any options you ordered for your detector, and this manual. The accessory kit should contain the following items:

- 8-pin connector
- 12-pin connector
- Nut and ferrule tubing set
- Teflon tubing
- Nut fitting for 1/16-in. OD high-pressure tubing (1/4-28 thread)
- Ferrule fitting for 1/16-in. OD high-pressure tubing
- Union
- External run/autozero cable
- Analog cable
- Extra cap screws (2)
- LC test mix vial
- 3-foot, 4-conductor cable

Carefully check to make sure you received all the items listed on the packing list. If any items are missing, contact your Thermo Fisher Scientific representative immediately.

You will need the following tools for installation:

- a narrow-tip screwdriver (2 mm wide)
- a #2 Phillips screwdriver

Place the detector on the benchtop as close as possible to the chromatographic column outlet (thus minimizing the length of tubing necessary for connection to the flowcell inlet). Allow at least five inches (13 cm) of clear space between the detector's rear panel and any wall or obstruction. This provides both access to the rear-panel connectors and a free flow of cooling air.

Checking the Power

The detector is shipped with the voltage and fuses preset for your location. To verify the correct setting, look through the cut-out window on the voltage selector cover (Figure 101). (The cover is located on the detector's rear panel but, if your instrument is new, it might be hidden behind a precautionary sticker.) If the voltage setting satisfies you local site requirements, skip to "Fuses" on page 88. If not, proceed to the next section, Voltage Selection.

CAUTION Do not plug in the instrument without first verifying that the voltage is properly set for your location. And never run the detector at more than 10% below the nominal line voltage.

Voltage Selection

If the preset voltage does not satisfy your local requirements, select the correct voltage.

❖ To select the correct voltage

1. Insert a small flat-blade screwdriver into the slot at the top of the voltage selector cover (Figure 101).

Figure 101. Opening the voltage selector cover

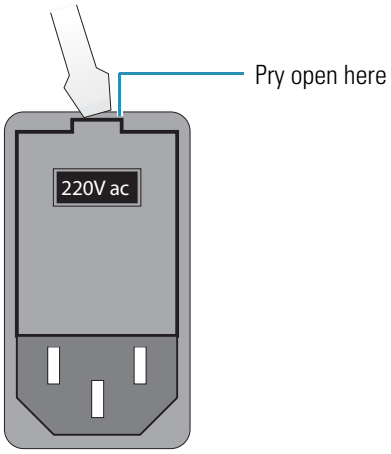
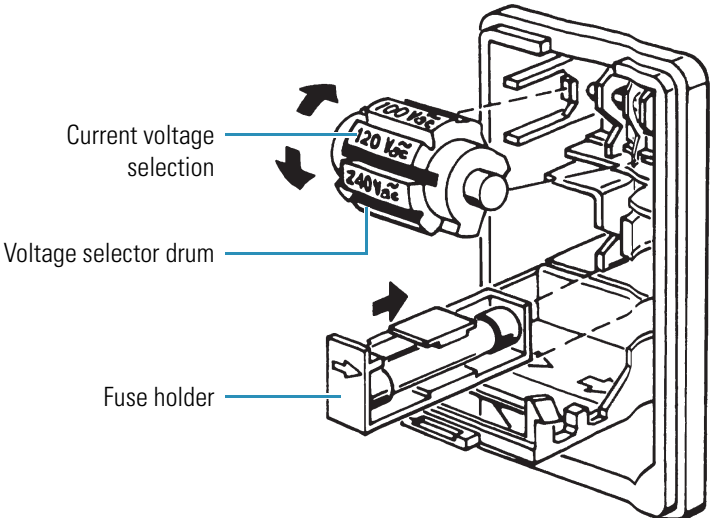


Figure 102. Voltage selector barrel and fuse holders



2. Gently pry open the cover. Once unlatched, the cover will swing downward to reveal the voltage selector barrel and the fuses.
3. Remove the voltage selector barrel from the detector. The selector resembles a wheel with four settings: 100, 120, 220, and 240 V (Figure 102).
4. Rotate the barrel such that the desired voltage setting will be visible through the cut-out in the cover when it is replaced.
5. Replace the barrel in the detector. Before closing the cover, check the fuses according to the procedure on page 88.

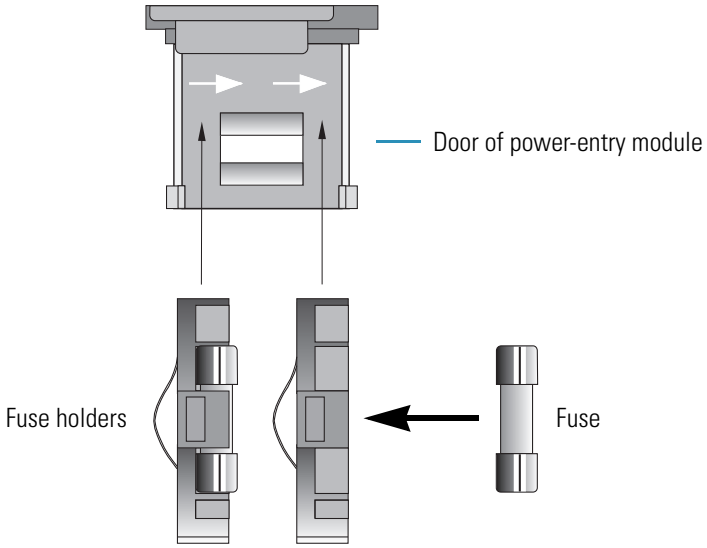
Fuses

❖ **To verify that your detector is fitted with the correct fuses**

IMPORTANT If you haven't verified that your detector is fitted with the correct fuses, first open the voltage selector cover according to step 1 in the Voltage Selection procedure.

1. Pull each fuse holder straight towards you. The fuse holders are the black squares with arrows located directly beneath the voltage selector (Figure 102).
2. Remove each fuse from its holder. Check the fuse amperage, voltage, and type according to the following description. You should have either:
   - two T2A/250V fuses, for 100 - 120 VAC operation, or
   - two T1A/250V fuses, for 220 - 240 VAC operation

Figure 103. Fuses



3. Assuming that you have the proper fuses on hand, reinsert the fuses and fuse holders, making sure that the arrows on the holders are oriented in the same direction as the arrow inside the cover panel (Figure 103).
4. Close the cover panel by swinging it upward and pressing it in until it snaps closed. The correct voltage should appear in the cut-out panel.

CAUTION To avoid damaging the instrument, verify that the new voltage setting (displayed in the cut-out window) is correct before you turn it on.

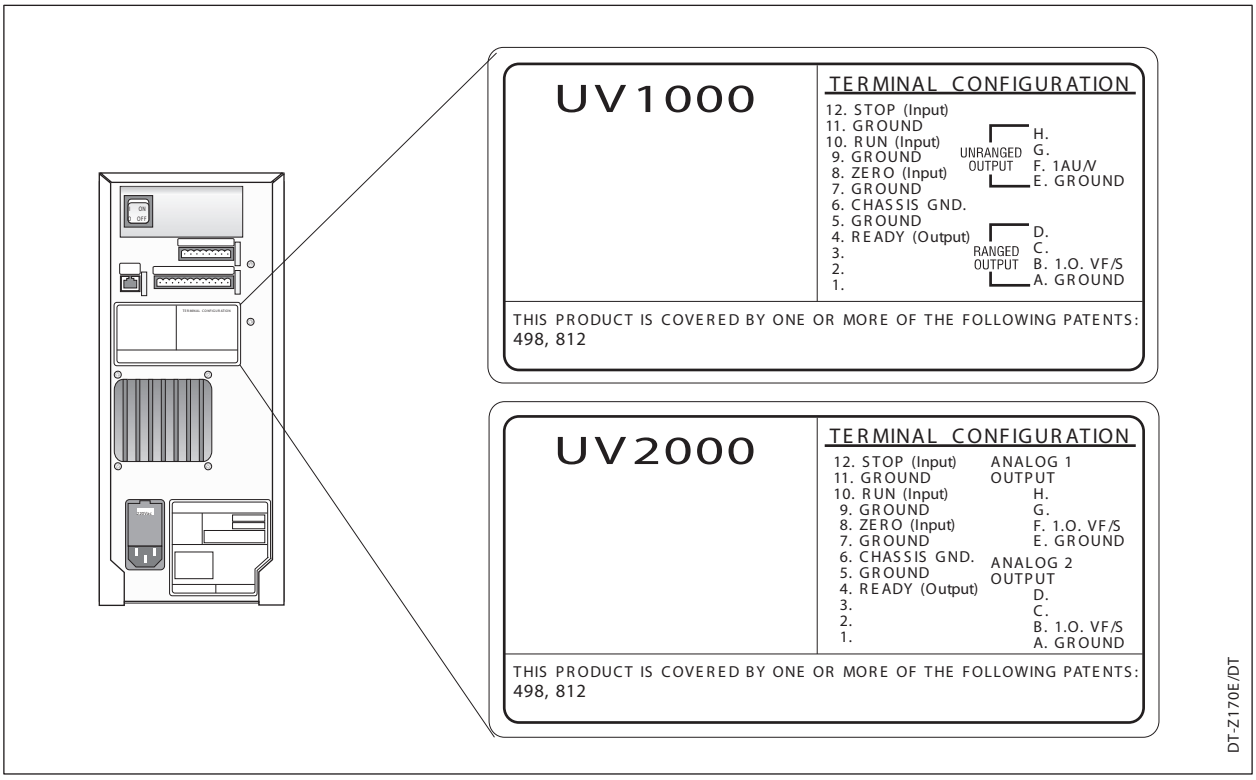
Power Cord

Attach the power cord at the lower left of the detector's rear panel.

Making Rear Panel Connections

Locate the two connectors (8-pin and 12-pin) in your accessory kit and insert them in the appropriate sockets on the detector's rear panel (Figure 104). Note that the connectors are both labeled and keyed to the sockets, making it impossible to insert them incorrectly.

Figure 104. Analog output and remote communications connectors



The upper connector holds the detector's analog output terminals. The lower connector allows the detector to communicate with other devices in your liquid chromatographic system. There is also a communications port, labeled COMM.

Use the cables supplied with your detector to make the connections described in this section. For each connection, insert the cable's bare wire into the appropriate detector terminal. Hold the wire in place while you tighten the small setscrew located next to each opening.

UV2000 Analog Output Connections

The terminals on the UV2000's analog output connector are labeled ANLG 1 Output and ANLG 2 Output (Figure 104). Each output has four terminals, labeled H through E for Output 1, and D through A for Output 2. These terminals correspond to:

- 0.01 V full-scale (terminals H and D)
- 0.10 V full-scale (terminals G and C)
- 1.0 V full-scale (terminals F and B)
- Ground (terminals E and A)

IMPORTANT Analog outputs are driven to twice their range. In other words, their maximum output is twice the selected range. To avoid clipping the voltage, be sure to connect integrators and data systems to the 1.0 V terminal and to use caution when connecting recorders to the 0.01 or 0.10 V terminals.

Integrators/Workstations	For the UV2000, connect your integrator/workstation to the 1.0VF/S (F or B) and corresponding ground (E or A) terminals.
Recorders	Connect the positive input from your recorder to the full-scale voltage (0.01, 0.10, or 1.0 V) appropriate for your recorder. Connect the recorder's floating ground input to the corresponding GROUND terminal. **Note** Do not connect the detector's GROUND to any earth ground on your recorder. This would lead to an increased noise level and a subsequent decrease in sensitivity.

UV1000 Analog Output Connections

The terminals on the UV1000's analog output connector are labeled UNRANGED Output and RANGED Output (Figure 104). The UNRANGED Output is a 1 AU/VOLT unrangeable output primarily used for integrators and workstations. The UNRANGED Output can be connected to terminal F with a ground at terminal E or A. The RANGED Output has four terminals:

- 0.01 V full-scale (terminals H and D)
- 0.10 V full-scale (terminals G and C)
- 1.0 V full-scale (terminals F and B)
- Ground (terminals E and A)

Integrators/Workstations	For the UV1000, connector your integrator/workstation to the 1AU/V output terminal (F) and the ground (E) terminal.
Recorders	Connect the positive input from your recorder to the full-scale voltage (0.01, 0.10, or 1.0 V) appropriate for your recorder. Connect the recorder's floating ground input to the corresponding GROUND terminal. **Note** Do not connect the detector's GROUND to any earth ground on your recorder. This would lead to an increased noise level and a subsequent decrease in sensitivity.

Remote Communications Connections

Your detector can accept inputs from, and send inputs to, remote devices through the remote communications connector (Figure 104). For example, if your chromatographic system has programmable timed events (contact closures or TTL), you can use one to automatically zero the detector signal during a run.

The terminals available on the detector's remote communications connector are labeled STOP (Input), RUN (Input), ZERO (Input), and READY (Output), each with an associated ground terminal. The terminals are labeled 12 through 1.

STOP (Input)	You can use a timed event from your chromatographic system to take the detector out of run by connecting the system's event to the detector's STOP (Input) and GROUND terminals (terminals 12 and 11).
RUN (Input)	You can use the remote-start event on your injector or autosampler to automatically put the detector into run whenever an injection occurs by connecting the event to the detector's RUN (Input) and GROUND terminals (terminals 10 and 9).
ZERO (Input)	You can zero the detector signal automatically by connecting a timed event on your chromatograph to the detector's ZERO (Input) and GROUND terminals (terminals 8 and 7).

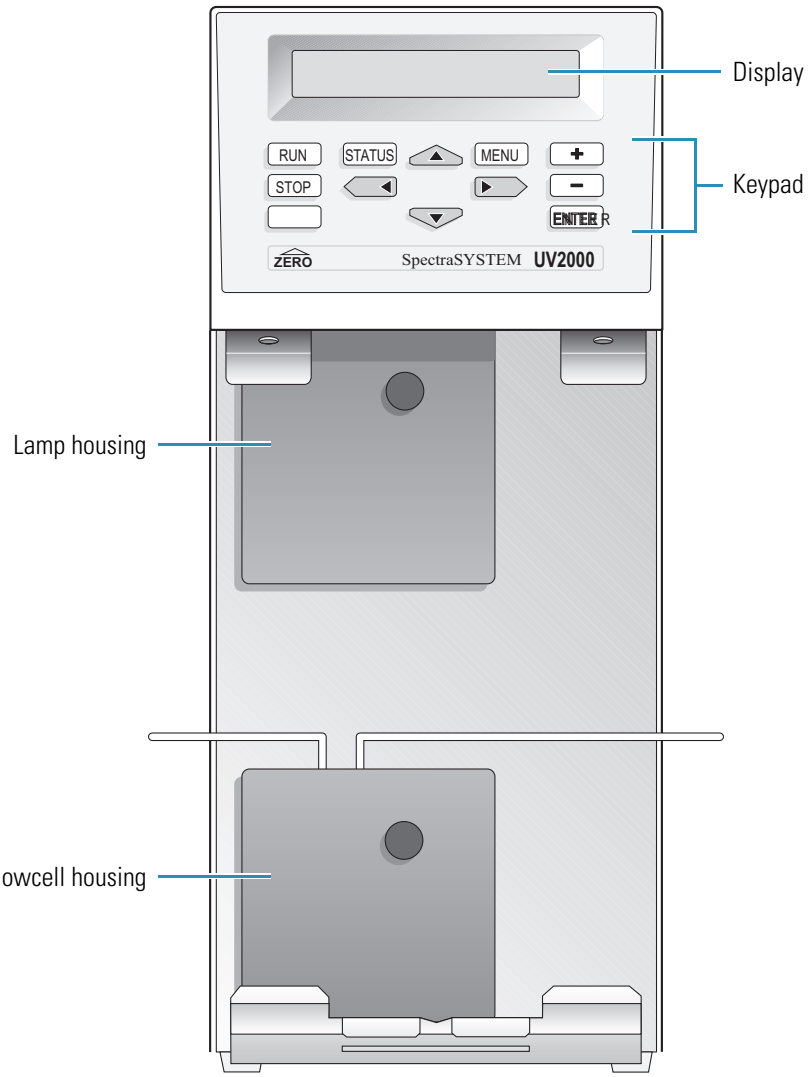
READY (Output)	The detector is capable of driving one TTL load each time it goes to its READY state through the READY (Output) terminal. This ability to signal other instruments is particularly useful with autosamplers, where the detector can signal that it is ready for the next injection in an automated series of runs. To hook up the READY (Output) terminal, connect the input from the other instrument to the detector's READY (Output) and GROUND terminals (terminals 4 and 5). For more information on accessing this feature through the detector's keypad, see "Ready Output" on page 46.

Connecting to the Flowcell

❖ **To connect the flowcell**

1. Remove the front panel of the detector. Although the flowcell assembly is located behind the lower housing (Figure 105), the housing does not need to be removed to connect your inlet and outlet lines.

   Figure 105. The flowcell assembly is located behind the flowcell housing



2. Use the finger-tight fitting and ferrule sets included with the installation kit to connect the column outlet directly to the detector's flowcell (fluid) inlet. Figure 106 shows how the inlet line enters the detector from the left side, and winds around the flowcell before entering the flowcell from the bottom.

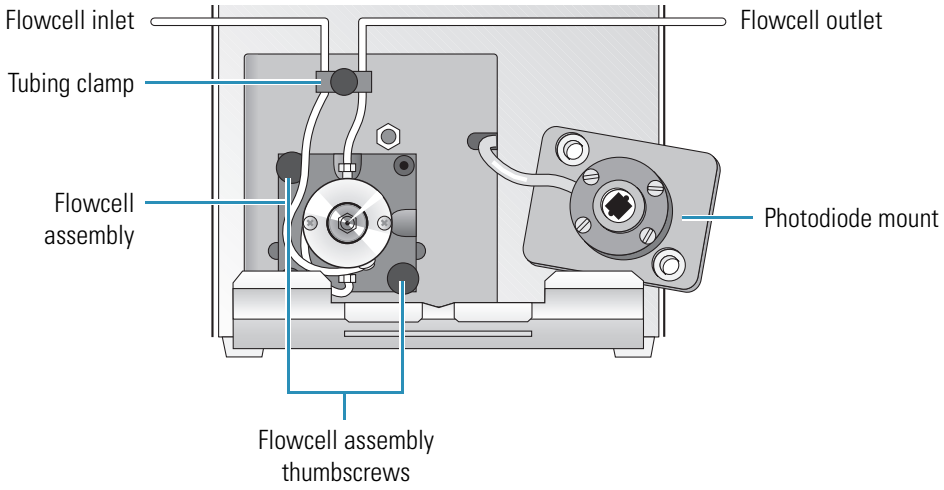
   IMPORTANT If additional tubing is required to reach the inlet, use a zero dead-volume union.

3. Connect the detector's fluid outlet to the low-pressure union and waste tubing supplied in the installation kit.

> **Tip** If you have several detectors (fluorescence, refractive index, electrochemical, and so on) hooked up in series, place your UV2000 detector closest to the column outlet, as its flowcell can withstand the greatest backpressure.

4. Replace the front panel of the detector; making sure that the tubing passes through the slots without being pinched.

Figure 106. The flowcell assembly showing thumbscrews, photodiode mount, and flowcell inlet



Optional Flowcells

Thermo Fisher Scientific offers several different flowcells for use in different applications. Each flowcell possesses distinct design characteristics and performance specifications. These characteristics are compiled in Table 1. Contact your Thermo Fisher Scientific representative for details.

Table 1. Design and performance specifications for SpectraSYSTEM flowcells*

Path Flowcell	Path Length (mm)	Volume (µL)	Tubing Diameter. (in.)	Material**	Max. Flow (mL/min)	Max. Press. (psi)
Analytical LC	6	9	.01	SS1	50	1000
Analytical LC	10	15	.01	SS1	50	1000
Microbore	3	1.2	.005	SS1	10	1000
Microbore	6	7.0	.007	SS1	20	1000
Semi-Prep. Open Column	3	4.5	.02	SS1	100	1000

* All cells use sapphire for windows. All but the preparative flowcells have a heat exchanger.

**SS1 = Stainless Steel with TFE Gaskets.

Flowcell Orientation

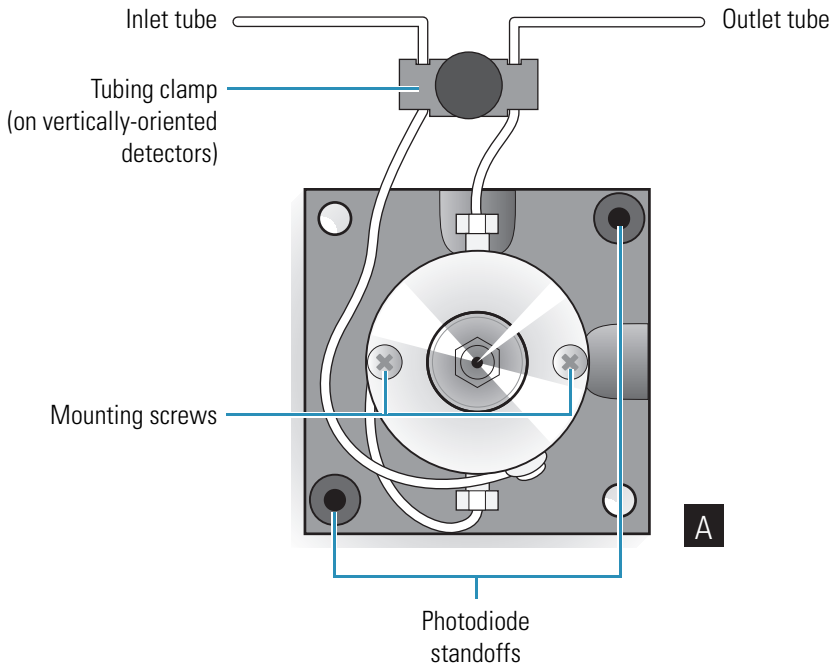
The flowcells listed above are configured for use with any SpectraSYSTEM detector. These detectors are vertically-oriented detectors that have the tubing clamp located above the flowcell as shown in Figure 107.

If you plan to use any of these flowcells on non- SpectraSYSTEM detectors (primarily horizontally-oriented detectors that have their tubing clamps located to the left side of the flowcell as shown in Figure 108), you must realign the cell holder as described in the following instructions.

Figure 107 shows the flowcell as it is shipped. Figure 107 and Figure 108 show the tubing clamp as an aid to the proper positioning of the inlet and outlet tubes. The tubing clamp, however, is actually mounted onto the detector and is not part of the flowcell itself.

IMPORTANT To ensure proper alignment, always hold the cell holder and flowcell in the orientation shown in the illustrations.

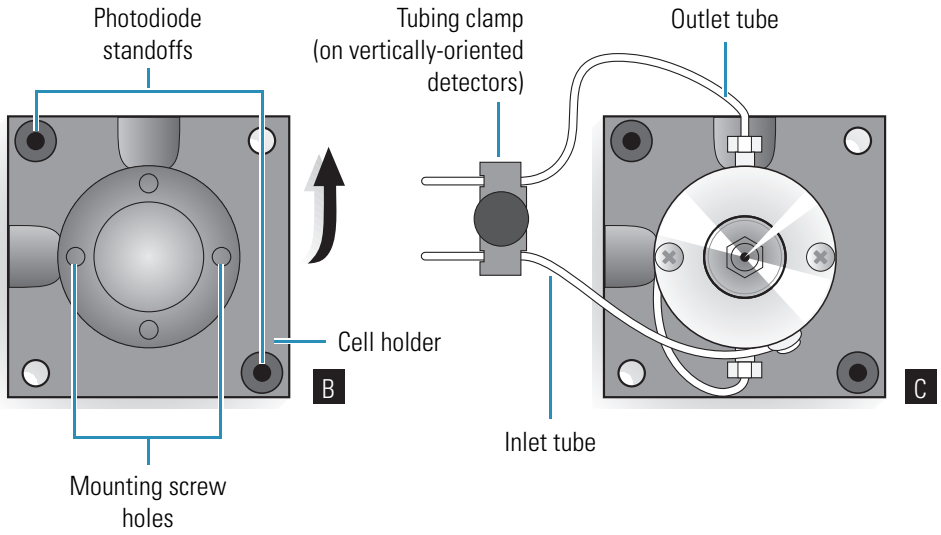
Figure 107. The alignment of UV2000 flowcells as they are shipped



❖ To realign the cell holder

1. Remove the mounting screws and set them aside.
2. Rotate the cell holder 90 degrees counterclockwise. Do not rotate the cell body. Part B of Figure 108 shows the cell holder in its new position. Note the new position of the photodiode standoffs.

   Figure 108. Changing the alignment of a flowcell so that it can be used on other detectors (Turn the cell holder as shown in Part B. Align the inlet and outlet tubes with the tubing clamp as shown in Part C.)



3. Reattach the cell body by replacing and securing the mounting screws.
4. Gently bend the inlet and outlet tubes as shown in Part C of Figure 108. The inlet tube (wound around the cell body) should always enter at the bottom of the flowcell; the outlet tube should always exit at the top of the flowcell.

Specifications

Wavelength:	D2 lamp • 190 to 380 nm (UV1000) • 190 to 365 nm (UV2000) W lamp • 366 to 800 nm
Lamp(s):	UV1000: D2 standard, W optional UV2000: D2 and W standard
Bandwidth:	6 nm
Wavelength Accuracy:	±1.0 nm
Wavelength Precision:	±0.1 nm
Range Selections:	3.0, 2.0, 1.0, 0.5, 0.2, 0.1, 0.05, 0.02, 0.01, 0.005, 0.002, 0.001, 0.0005 AUFS
Absorbance Range:	0.0005 to 3.0 AUFS
Absorbance Linearity @ 254 nm:	Better than 1% to 2.0 AU
Analog Outputs:	(UV2000) Outputs 1 and 2: Range-selectable over entire absorbance range
Communications:	Remote Inputs: Run, Stop, and Zero Remote Outputs: Ready
Noise:	Single-wavelength Mode: • @ 254 nm, 1.0-sec rise time: < $\pm 1.0 \times 10^{-5}$ AU Dual-wavelength Mode: • @ 254 280 nm, 1.0-sec rise time (UV2000 only): < $\pm 2.5 \times 10^{-5}$ AU
Drift:	After warm-up @ 254 nm: < 2×10^{-4} AU/hour
Display:	2 × 24 character, high-contrast LCD
Dimensions:	14.5 in. (37 cm) × 6 in. (15 cm) × 18.5 in. (47 cm)
Weight:	40 lb. (18 kg)
Power Requirements:	100/120/220/240 VAC 50/60 Hz 1.5/1.6/8.0/0.8A, 225VA
Environmental:	10-40 °C 5-95% RH noncondensing

Menu Reference

This chapter provides you with two Menu Trees, one each for the UV1000 (Figure 109) and the UV2000 (Figure 110 and Figure 111). It also provides you with an alphabetical description of all the instrument's display fields. Fortunately, it is not necessary to read this Chapter in order to learn how to use your detector. It is included in the manual simply as a quick reference and aid to using your instrument.

The Menu Trees are a representation of the detector's overall menu structure. They show the location and interrelation of all the menus for your detector and, as such, they are a good reference to keep on hand while you work through the operating instructions in Chapter 3 and Chapter 4. The menu trees will also help if you become "lost" while moving through the detector's menus. Separate, removable copies can be found in the pocket at the front of this manual.

The Menu Reference is an alphabetical listing of each menu field and command. Included in each listing is the field's definition and, where appropriate, all allowable and default values.

Menu Trees

The UV1000 and UV2000 Menu Trees are useful tools for learning your way around your detector. You might want to keep one handy while you learn where each display is located in the overall menu structure.

Menu Reference

For quick reference, we have included this alphabetical list of each field, including a short definition, and allowable and default values. For a more detailed explanation of the functions of your detector, you should refer to Chapter 3, “Basic Operations,” and Chapter 4, “Advanced Operations.”

Some fields are common to both the UV1000 and the UV2000, so we have indicated the detector name for fields that appear in only one detector.

Figure 109. UV1000 Menu Tree

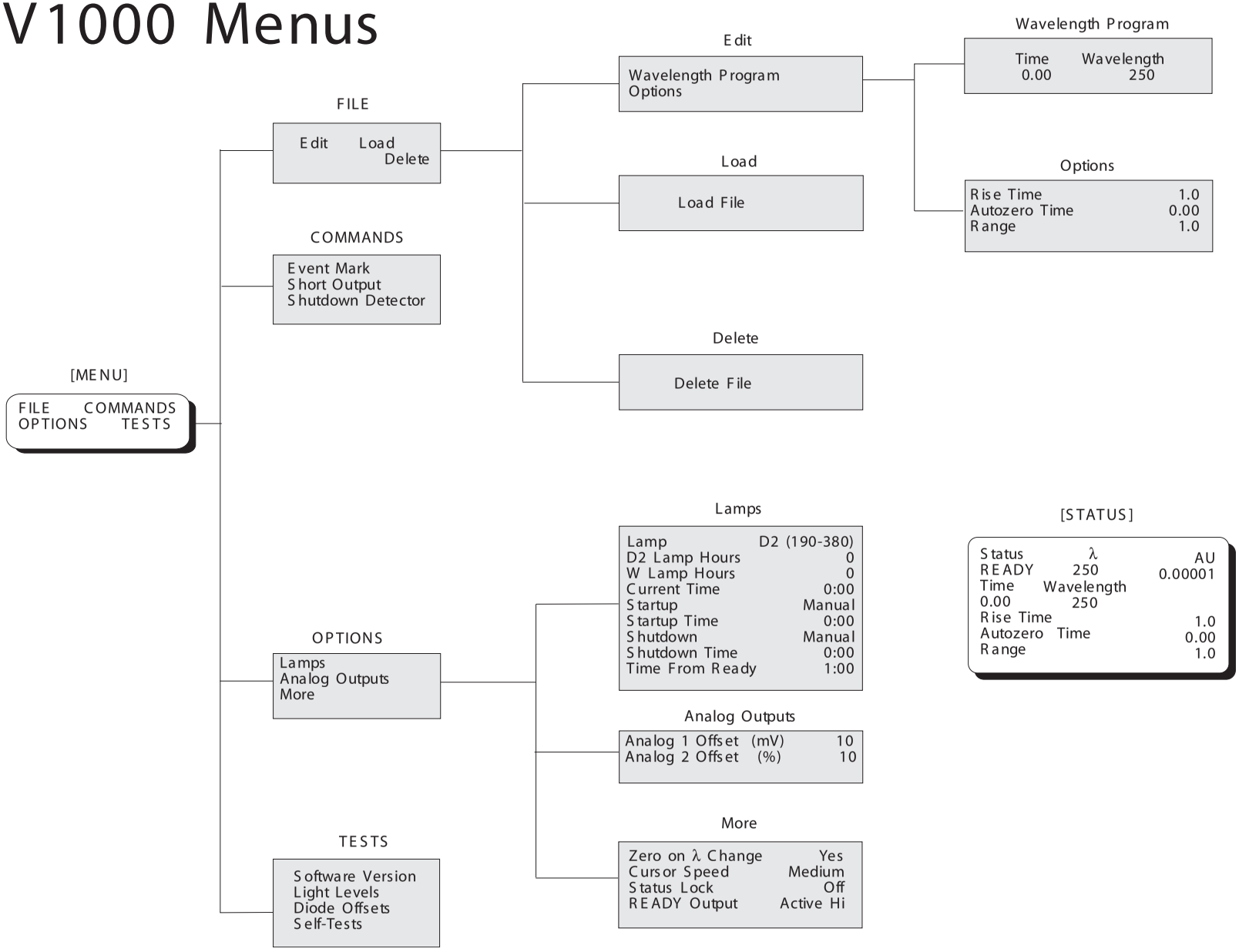


Figure 110. UV2000 Menus Tree (1 of 2)

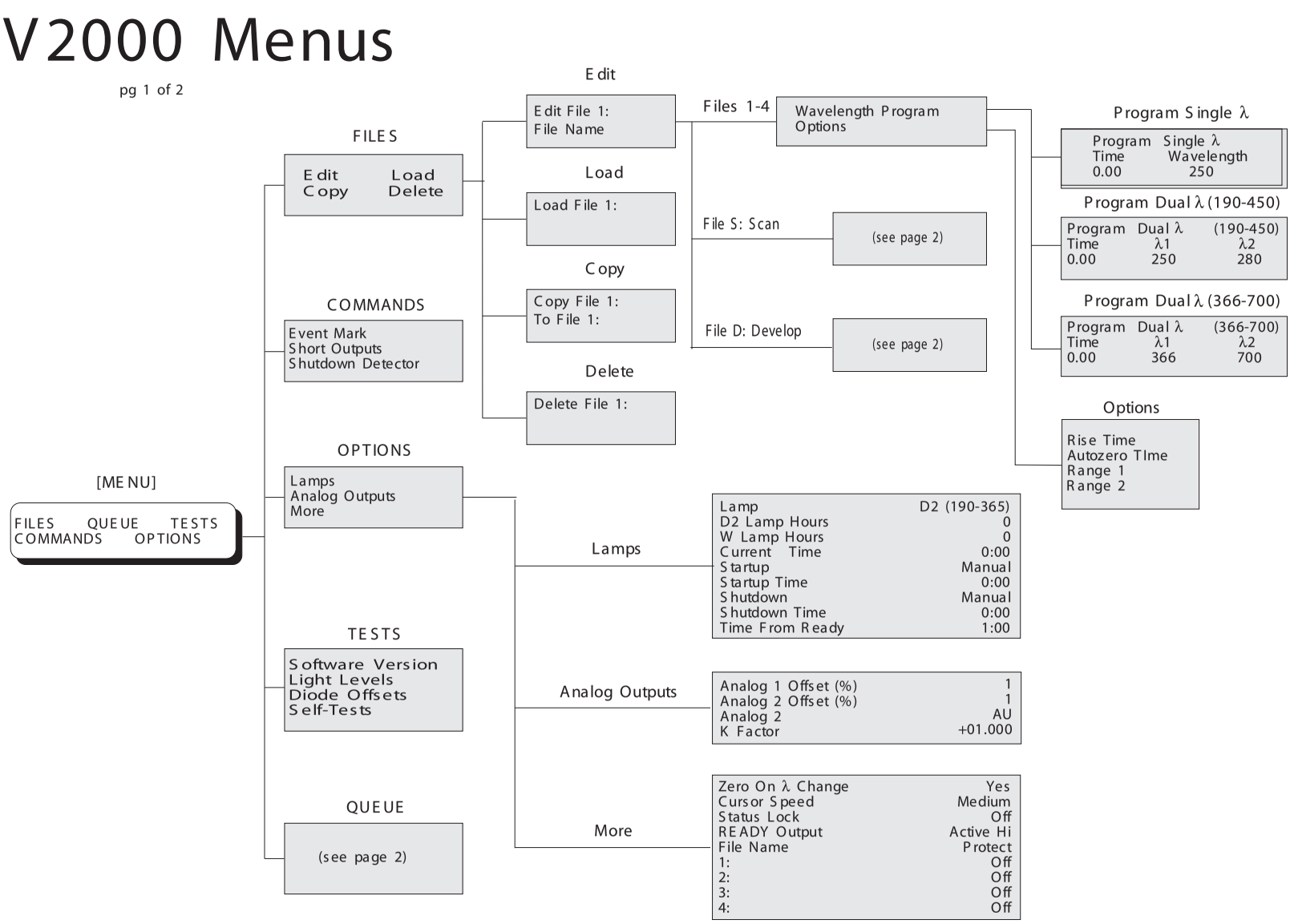


Figure 111. UV2000 Menu Tree (2 of 2)

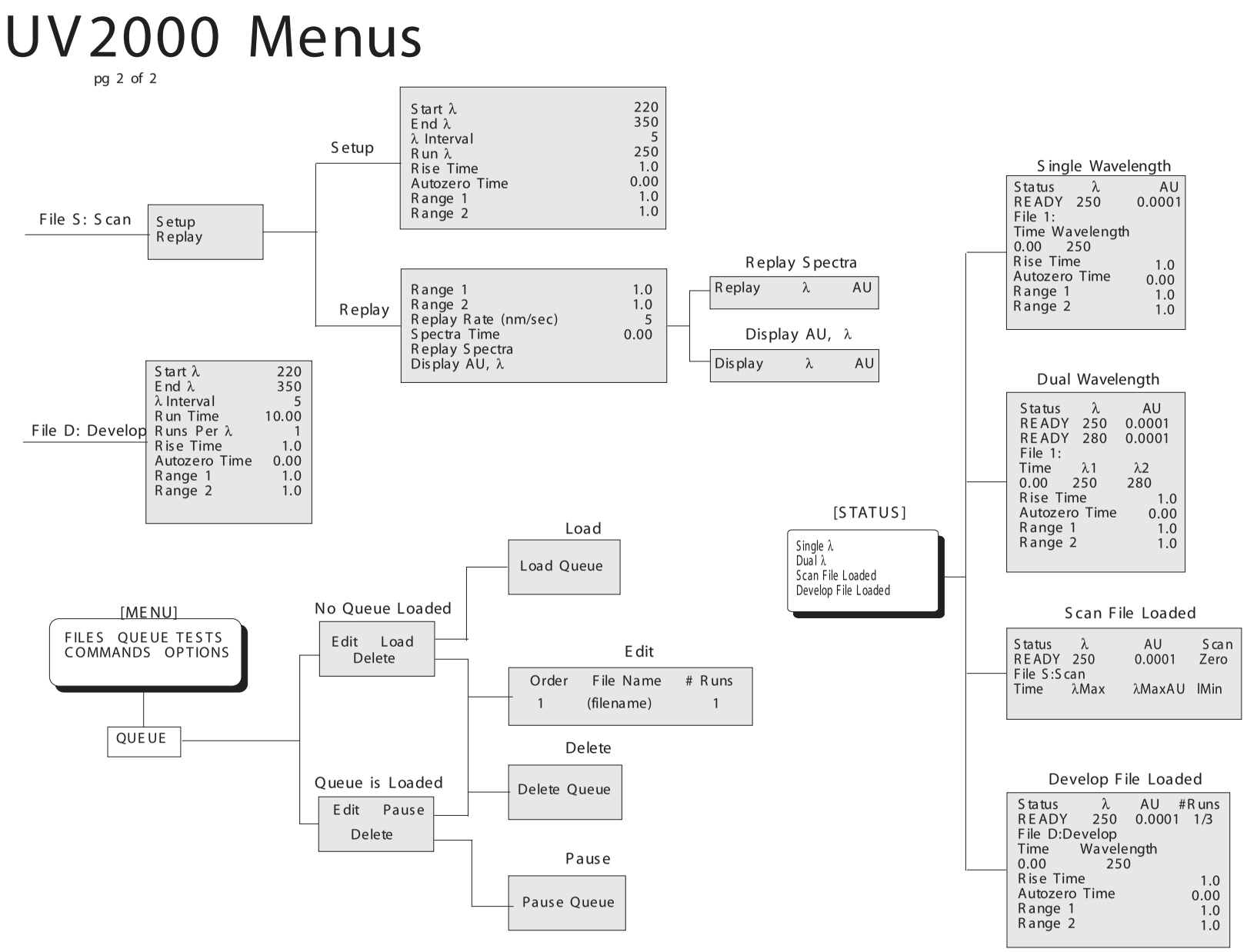


Table 2. Menu Reference (Sheet 1 of 7)

Fields	Description
Analog 1 Offset (mV)	(UV1000 only) This field offsets the Analog 1 output signal by 0, 1, 2, 5, 10, 20, or 50 mV. The default setting of 10 mV is appropriate in most cases.
Analog 1 Offset (%)	(UV2000 only) This field offsets the Analog 1 output signal by a positive or negative 50, 20, 10, 5, 2, 1, or 0 percent of the full-scale range. Default is 0%.
Analog 2	(UV2000 only) This field allows you to select the output signal from the Analog Output 2 terminal. The selections are AU (the absorbance signal for wavelength one in single-wavelength operation or from wavelength two in dual-wavelength operation), AU1-KxAU2 (a calculated peak response using the K Factor technique), and AU1/AU2 (the absorbance ratio of wavelength 1 to wavelength 2). Default is AU.
Analog 2 Offset (%)	This field offsets the Analog 2 output signal by a positive or negative 50, 20, 10, 5, 2, 1, or 0 percent of the full-scale range. Default is 0%.
Analog Outputs	This menu allows you to offset the signals from the analog output terminals located on the back panel of the instrument. For the UV2000, you can also select the output signal for Analog Output 2 and input a K factor.
AU	This field, located in the Status Screen, shows the detector's current absorbance reading. It is a six-digit number, ranging from -3.00000 to +3.00000 AUFS.
Autozero Time	This field tells the detector when to perform an automatic zero. Allowable values are 0.00 to 999.99 minutes. Default is 0.00 minutes.
COMMANDS	The Commands Menu lets you put an event mark into your chromatogram, short detector outputs, and shut down the detector.
Copy	(UV2000 only) This field accesses the Copy File field.
Copy File	(UV2000 only) This field, along with the To File field, allows you to copy from the specified file to another file designation.
Current Time	This field displays local time ranging from 0:00 to 23:59.
Cursor Speed	This field can be set to Slow, Medium, or Fast according to your need. Default is Medium.
Delete	Under the top-level menu FILE(S), this field accesses the Delete File command. (UV2000 only) Under the top-level menu QUEUE, this field accesses the Delete Queue command.
Delete File	This field deletes the designated file, setting all fields to their default values. After pressing ENTER, the confirmation message **File Deleted** appears for one second.
Delete Queue	(UV2000 only) This field deletes the queue. After pressing ENTER, the confirmation message **Queue Deleted** appears for one second.
D2 Lamp Hours	This field tracks the total number of hours the detector's deuterium lamp has been in operation (up to 9999). When a new lamp is installed, you must set this parameter to zero.

Table 2. Menu Reference (Sheet 2 of 7)

Fields	Description
Diode Offsets	This field displays the analog-to-digital (A/D) conversion frequencies of the sample and reference diodes when both lamps are turned off. These values can be used to measure the detector's digital noise level.
Display AU, λ	This command calls up the Display AU, λ screen, a screen that shows the incremental wavelength versus absorbance data for the selected spectral scan.
Edit	Under the top-level FILE(S) menu, the Edit Menu allows you to set up or edit files. The edits do not change the current settings of the detector until the file is loaded. (UV2000 only) Under the top-level QUEUE menu, the Edit Menu allows you to set up or edit a Queue. Edits can not be made to Order 1 while a queue is loaded or running unless you pause the queue first.
Edit File	(UV2000 only) This field allows you to identify the file for set up or edit. Allowable designations are 1 to 4, S for the Scan file, and D for the Develop file. Default is 1.
End λ	(UV2000 only) In the Scan File Setup, this field defines the wavelength at which the detector should finish the scan. Allowable values are 191 to 800 nm. Default is 350 nm. (UV2000 only) In the Develop File Setup, this field defines the wavelength at which the detector should run its last set of injections. Allowable values are 191 to 800 nm. Default is 350 nm.
Event Mark	The Event Mark field applies a 15% of full-scale spike on the detector's output signals.
FILE(S)	The UV1000's FILES Menu and the UV2000's FILES Menu allow you to edit, load, and delete files. On the UV2000, the FILES Menu also lets you copy files.
File Name	(UV2000 only) This field allows you to enter a file name for a designated file (numbered 1 to 4). The name can contain up to eight characters from the following list: A to Z, 0 to 9, /, -, and blank. Default is blank. (UV2000 only) For Files S and D, the file names are automatically designated as SCAN and DEVELOP, respectively. No editing of these file names is allowed.
K Factor	(UV2000 only) This field is used in the technique. Allowable values are -99.999 to 99.999. Default is 1.000.
λ (λ1, λ2)	The wavelength field (λ in the UV1000, λ1, λ2 in the UV2000) located in the Status Screen shows the current detector wavelength setting(s). (UV2000 only) These fields also appear in the Wavelength Program for dual-wavelength operation.
λ Calibration	The wavelength calibration screen located in the Tests Menu shows the current detector wavelength setting(s).

Table 2. Menu Reference (Sheet 3 of 7)

Fields	Description
λ Interval	(UV2000 only) In the Scan File Setup, this field defines the wavelength interval at which the detector should perform the scan. Allowable values are 1, 2, 3, 4, 5, and 10 nm. Default is 5 nm. (UV2000 only) In the Develop File Setup, this field defines the wavelength increment the detector monochromator should use for wavelength changes between each set of injections. Allowable values are 1, 2, 3, 4, 5, 10, and 20 nm. Default is 5 nm.
λMax	(UV2000 only) This field is the wavelength maximum in a spectral scan.
λMaxAU	(UV2000 only) This field is the absorbance value for the corresponding wavelength maximum in a spectral scan.
λMin	(UV2000 only) This field is the wavelength minimum in a spectral scan.
λ Offset	The lambda offset screen lets you choose a number of steps, each representing 0.25 nm, by which you want to offset the wavelength. This field is used to check the detector's wavelength accuracy. Allowable entries are: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, -1, -2, -3, -4, -5, -6, -7, -8, -9, and -10. The default is 0.
Lamp	The Lamp field allows you to choose from among several selections: D2 (190-380) for the UV1000's deuterium lamp; D2 (190-365) for the UV2000's deuterium lamp; W (366-800) for the tungsten lamp; D2+W (190-800) for dual-lamp operation (UV2000 only); or Off to shut the lamp(s) off. Default is D2 (190-380) or D2 (190-365), for the UV1000 and UV2000, respectively.
Lamps	The Lamps Menu allows you to control the detector's lamp operations.
Light Levels	This field displays the analog-to-digital (A/D) conversion frequencies of the light detected by the sample and reference diodes when the D2 lamp is on.
Load	Under the top-level menu FILE(S), the Load selection accesses the Load File command. (UV2000 only) Under the top-level menu QUEUE, the Load selection accesses the Load Queue field.
Load File	The Load File field loads the designated file settings into the active runfile. After pressing ENTER, the confirmation message **File Loaded** appears for one second.
Load Queue	(UV2000 only) The Load Queue field loads the queue. After pressing ENTER, the confirmation message **Queue Loaded** appears for one second.
More	This menu allows you to access the Zero on λ Change, Cursor Speed, Status Lock, and READY Output fields. In the UV2000, you can also protect files from this menu.
OPTIONS	Found in the Main Menu, the Options Menu allows you to perform lamp and analog output operations.
Options	The Options selection in the Edit Menu of FILE(S) allows you to edit Rise Time, Autozero Time, and Range.

Table 2. Menu Reference (Sheet 4 of 7)

Fields	Description
Order	(UV2000 only) This field designates the order in which the selected files in a queue will be run.
Pause	(UV2000 only) This field accesses the Pause Queue command.
Pause Queue	(UV2000 only) This field pauses an active queue. If a file is running, it continues until completed, and the detector returns to a READY state.
Program	This field allows you to select single- or dual-wavelength operation. The selection toggles between Single λ, Dual λ (190-450) and Dual λ (366-700). Default is Single λ.
Protect	(UV2000 only) This field, along with the File Name field, protects a specified file from being edited, copied to, or deleted. The field toggles between On, allowing no changes to the file, and Off, where changes can be made. Default is Off.
QUEUE	(UV2000 only) The Queue Menu allows you to edit, load, delete, or pause a queue. A queue is a series of files that are run in a specific order, and is typically used for automated runs.
Range	(UV1000 only) The Range field controls the full-scale output range for the UV1000's Analog Output 2 terminal. Allowable full-scale ranges are 3.0, 2.0, 1.0, 0.5, 0.2, 0.1, 0.05, 0.02, 0.01, 0.005, 0.002, 0.001, and 0.0005 AUFS. Default is 1.0 AUFS.
Range 1, Range 2	(UV2000 only) The Range 1 and Range 2 fields control the full-scale output ranges for the UV2000's Analog Output 1 and Analog Output 2 terminals. Allowable full-scale ranges are 3.0, 2.0, 1.0, 0.5, 0.2, 0.1, 0.05, 0.02, 0.01, 0.005, 0.002, 0.001, and 0.0005 AUFS. Default is 1.0 AUFS.
READY Output	This field is used to communicate with other devices through the detector's READY (Output) terminal. This TTL terminal switches the transistor between high and low states whenever the detector starts a run. Select "Active Hi" or "Active Lo," for the high or low state, respectively. Default is Active Hi.
Replay	(UV2000 only) The Replay command sends you to the Replay Menu, from which you can set up the parameters for replaying stored spectra.
Replay Spectra	(UV2000 only) This command is used to initiate replay of the designated spectrum.
Replay Rate	(UV2000 only) This field designates the rate at which the detector replays a stored spectrum. Allowable values are 1, 2, 5, 10, and 20 nm/sec. Default is 5 nm/sec.
Rise Time	This field controls the detector's response time. Rise time is inversely proportional to the amount of baseline noise. Allowable values are 0.0, 0.1, 0.2, 0.5, 1.0, 2.0, 3.0, 4.0, and 5.0 seconds. Default is 1.0 second.
#Runs	(UV2000 only) When this field appears in the Status Screen, the current run and the total number of injections to be made at the displayed wavelength appear directly below it. The field is updated at the beginning of each injection. (UV2000 only) When this field appears in a Queue setup, it displays the number of times each file runs in a queue.

Table 2. Menu Reference (Sheet 5 of 7)

Fields	Description
Run λ	(UV2000 only) This field designates the monitoring wavelength to be used when running the Scan file. Allowable values are 190 to 800 nm. Default is 254 nm.
Run Time	(UV2000 only) Located in the Develop file, this field is the amount of time designated for each chromatographic run. Allowable values are 0.01 to 999.99 minutes. Default is 10.00 minutes.
Runs per λ	(UV2000 only) Located in the Develop file, this field designates the number of injections to be performed at each wavelength increment. Allowable values are 1 to 9. Default is 1.
Scan	(UV2000 only) This field appears in the Status Screen when the Scan file is loaded. To initiate a scan, move the cursor to this field and press ENTER.
Scan Zero Time	(UV2000 only) This field allows you to set a runtime at which the detector will perform a baseline scan automatically. Allowable values are 0.00 to 99.99 minutes. Default is 0.00.
Self-Tests	This command tells the detector to run through its internal diagnostic tests.
Setup	(UV2000 only) The Setup Menu allows you to set up the parameters in the Scan file.
Short Outputs	This command allows you to short the detector's outputs together. When you select Short Outputs, the detector's analog outputs are shorted together (zero volts) and the field changes to Unshort Outputs. To remove the short and return the outputs to their normal operating state, select Unshort Outputs, and the field changes back to Short Outputs. When you leave this screen, the field returns automatically to Short Outputs.
Shutdown	This field toggles between Manual (you turn off the lamp manually), Time (the lamp turns off automatically at a preset time), Time from READY (as explained under the Time from READY field), and End of Queue (the lamp turns off when the queue is finished, UV2000 only). Default is Manual.
Shutdown Detector	This command shuts down the detector's lamps and motors, leaving the electronics on to preserve memory. Press any key to return the detector to the same settings as when this field was activated.
Shutdown Time	This field displays the local time, ranging from 0:00 to 23:59, at which you have programmed the lamp to turn off automatically. Default is 0:00.
Software Version	This field displays the EPROM version of your detector's software.
Spectra Time	(UV2000 only) This field displays a list of the scans that are currently stored in memory. Each scan is identified by the runtime at which it was initiated.
Start λ	(UV2000 only) In the Scan File Setup, this field defines the wavelength at which the detector should begin the scan. Allowable values are 190 to 799 nm. Default is 220 nm. (UV2000 only) In the Develop File Setup, this field defines the wavelength at which the detector should run its first set of injections. Allowable values are 190 to 799 nm. Default is 220 nm.

Table 2. Menu Reference (Sheet 6 of 7)

Fields	Description
Startup	The Startup field toggles between Manual, where you manually turn on the lamp, and Time, where the lamp automatically powers up at a preset time. Default is Manual.
Startup Time	This field displays the local time, ranging from 0:00 to 23:59, at which you have programmed the lamp to start up automatically. Default is 0:00.
Status	This field in the Status Screen shows the current condition of the detector. The possible conditions are: READY (the selected lamp is lit and ready for initiation of a run), NRDY (the detector is set to the wrong lamp for the run-wavelength requested, is performing internal tests, or has a possible internal problem), or UVW (the deuterium lamp is warming up). The run time is displayed when the running file has a programmed stop-time. In the UV2000, the letter Q appears at the beginning of this field when a queue is loaded.
Status Lock	The Status Lock field limits accessibility to the Status Menu (the programming section below the Status Screen). When set to On, only the Status Screen appears on the display and the down-arrow icon is not seen. Default is Off.
TESTS	The TESTS menu allows you to perform the detector's internal diagnostic, light level, and diode offset tests.
Time, Wavelength	The Wavelength Program contains the Time and Wavelength fields. It allows you to program changes in the detector's wavelength as a function of time. Time refers to the run time, in minutes, when a timed event (wavelength change, autozero, or run stop) is to occur. Allowable values range from 0.00 to 999.99 minutes. Default is 0.00 minutes. Wavelength refers to the wavelength that will be set at a specified time. Allowable values for the UV1000 are: 190 to 380 nm with the deuterium lamp, and 366 to 800 nm with the tungsten lamp. Allowable values for the UV2000 are: 190 to 365 nm with the deuterium lamp, and either 366 to 700 nm or 366 to 800 nm with the tungsten lamp (depending on whether the detector is operating in the dual-wavelength or the single-wavelength mode, respectively). Default is 250 nm.
Time from READY	A preset time interval from the Ready state of the detector, after which the detector lamp will turn off if a start signal has not been received from the keypad or external Run (Input) terminal. Allowable values range from 0:30 to 9:59 hours. Default is 1:00.
To File	(UV2000 only) This field, along with the Copy File field, allows you to copy a file to the specified file identification.
W Lamp Hours	This field tracks the total number of hours the detector's tungsten lamp has been in operation (up to 9999). When a new lamp is installed, you must set this parameter to zero.

Table 2. Menu Reference (Sheet 7 of 7)

Fields	Description
Wavelength Program	This command allows you to access the Wavelength Program. See the Time, Wavelength for details.
Zero	(UV2000 only) This field appears in the Status Screen when the Scan file is loaded. To initiate a background scan, move the cursor to this selection and press ENTER.
Zero on λ Change	This field toggles between Yes, where the detector baseline automatically zeroes at each timed event during a programmed run, and No. Default is Yes.

Troubleshooting

This chapter provides you with helpful information for troubleshooting possible detector and chromatographic system problems.

Contents

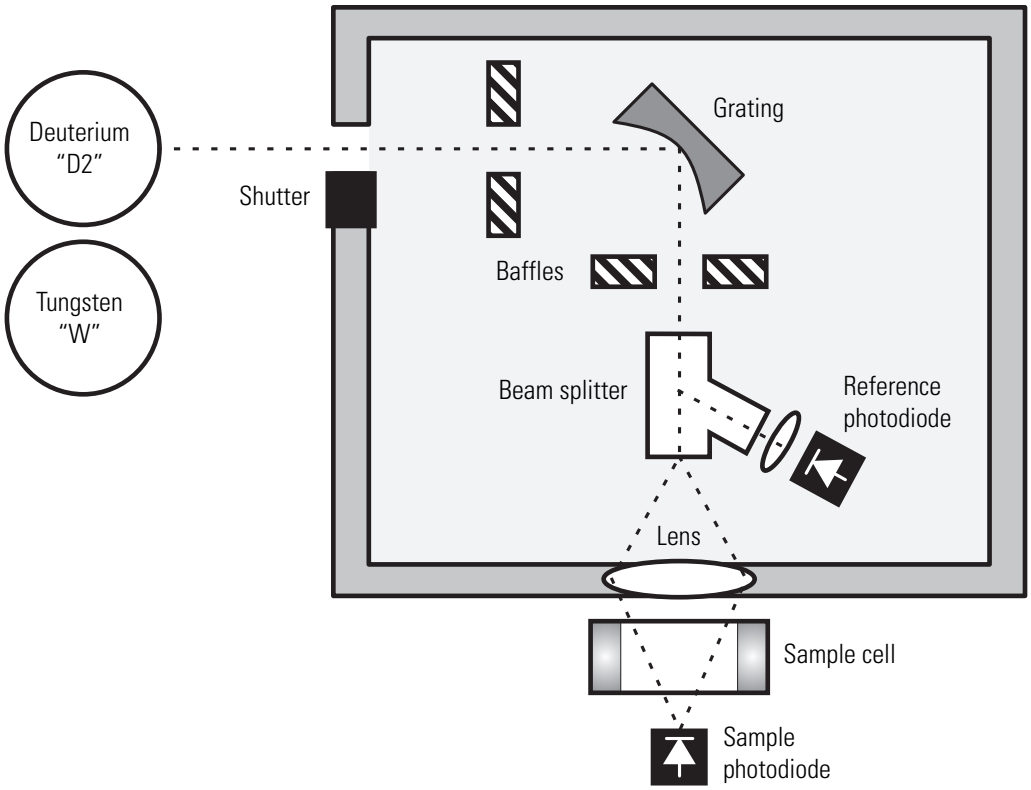
Theory of Operation

This brief theory of operation is included to aid you in troubleshooting problems and performing maintenance for your detector. For more detailed information, contact your Thermo Fisher Scientific representative.

Figure 112 shows the optical system. The detector operates in a double-beam mode using a fiber-optic beam-splitter that creates sample and reference beams. The reference beam is directed to a reference photodiode. The sample beam is lens-focused prior to passing through the flowcell to a sample photodiode.

An analog PCB processes the signals from the photodiodes and provides analog output signals through an 8-pin external connector. The digital PCB contains the EPROM (the built-in software), provides digital processing circuitry, and interfaces with the keyboard/display and the remote communications devices. (Additional software is held on an EPROM PCB.) The Motherboard provides all the necessary interconnections and power supplies.

Figure 112. The optical system for the UV2000 detector



The deuterium and tungsten lamps are continuum light sources that provide high light intensity over the UV and visible wavelength ranges. Two sets of baffles minimize stray light. A concave holographic grating actuated by a microprocessor-controlled stepper motor provides wavelength selection.

Common Problems

This next section contains a table of symptoms, possible causes, and remedies for some common problems you might observe in detector response. Many of the problems attributed to the detector might actually be due to other components in the chromatographic system, so we have included references to these types of problems and solutions as well.

Table 3. Troubleshooting Table (Sheet 1 of 4)

Symptom	Cause	Remedy
1. Spikes on baseline.	a. Gas bubbles in the flowcell.	a. Degas mobile phase. Supply backpressure device to flowcell (check back-pressure rating). Check for leaks at high-pressure fittings.
	b. Immiscible solvent bubbles following mobile phase changeover.	b. Flush flowcell with 2-propanol, then with mobile phase.
	c. Electrical interference.	c. Check electrical lines for good connections and/or interference from broadcast radiation. Check for ground loops.
	d. Extremely large fluctuations in voltage on AC line.	d. Remove systems (for example, ovens) that cause voltage fluctuations, isolate the detector to "quiet" circuit, or use UPS (UPS, uninterruptible power supply).

Table 3. Troubleshooting Table (Sheet 2 of 4)

Symptom	Cause	Remedy
2. Random noisy baseline.	a. Contaminated flowcell.	a. Flush flowcell with cleaning solvents as described in "Cleaning the Flowcell" on page 75.
	b. Leak in sample inlet line.	b. Check all fittings from column outlet to flowcell inlet for leaks.
	c. Bubble trapped in flowcell.	c. Increase flow rate until bubble is removed. Supply backpressure device to flowcell (check back-pressure rating to avoid rupturing flowcell).
	d. Leaking flowcell.	d. Replace flowcell.
	e. Insufficient lamp warm-up.	e. Allow a 30 minute warm-up for normal operation; one hour for maximum sensitivity.
	f. Lamp aging or defective.	f. Replace lamp.
	g. Ground loop problem between integrator and detector.	g. Check for proper cable connections for detector output; do not ground at both ends of cable.
	h. Flowcell, lamp, lenses, or photodiode dirty.	h. Clean dirty component as described in "Cleaning the Flowcell" on page 75.
	i. Integrator input voltage does not match detector output voltage.	i. Connect integrator to appropriate output connectors on detector (see Chapter 6, "Installation and Specifications."). Check attenuation setting on integrator.

Table 3. Troubleshooting Table (Sheet 3 of 4)

Symptom	Cause	Remedy
3. Excessive baseline drift. See Baseline problems.	a. Flowcell contaminated.	a. Flush flowcell with cleaning solvents as described in "Cleaning the Flowcell" on page 75. Check for leaks.
	b. Mobile phase contamination.	b. Replace with fresh mobile phase made with high-purity solvents.
	c. Material bleeding from column.	c. Clean or replace column.
	d. Leaks in system, or flowcell.	d. Check all fittings for leaks. Replace flowcell.
	e. Tiny bubble trapped in flowcell.	e. Increase flow rate until bubble is removed. Connect backpressure device to flowcell outlet (check backpressure rating to avoid rupturing flowcell).
	f. Large temperature fluctuations.	f. Remove system from drafts. Thermostatically control column temperature.
4. No peaks, or peaks much smaller than expected.	a. Incorrect wavelength setting.	a. Check wavelength setting. Make sure the correct file is selected.
	b. Lamp not on or defective.	b. Make sure lamp is lit. Run detector's diagnostic tests to check lamp. Replace lamp if necessary.
	c. Integrator input voltage does not match detector output voltage.	c. Connect integrator to appropriate output connectors on detector (see Chapter 6, "Installation and Specifications."). Check attenuation setting on integrator.
	d. Insufficient sample reaching the detector.	d. Check entire chromatographic system for leaks. Verify sample injection volume.
5. Broad, tailing peaks.	a. Rise time is too large (too slow).	a. Lower the rise time selection.
	b. Flowcell volume too large.	b. Change to a flowcell with smaller volume.
6. Clicking sound when UV2000 is in dual-wavelength mode.	a. Noise comes from grating motor, and is normal.	a. No action necessary.

Table 3. Troubleshooting Table (Sheet 4 of 4)

Symptom	Cause	Remedy
7. Detector won't power up.	a. Tripped circuit breaker at AC wall outlet.	a. Resolve problem, reset circuit breaker.
	b. Blown detector fuse.	b. Resolve problem, replace fuse.
	c. Incorrect voltage selected.	c. Reset detector for correct incoming line-voltage (see Chapter 6, "Installation and Specifications.").
	d. Power cord not connected.	d. Connect power cord.

Error Messages

There are three types of error messages that you might see on your detector's display:

- System errors
- Real-time errors
- User-Input Errors

Each type of error is explained below in further detail.

System errors

System errors are indicated on the display by a double set of exclamation points (!! !!). They occur whenever an undesirable condition exists that prevents the detector from operating. If one of these messages appears, try turning the detector's power switch off and on. If the message recurs, contact your Thermo Fisher Scientific representative.

- SYSTEM RESET
- RAM ERROR
- ADDRESS ERROR
- BUS ERROR
- DIVIDE BY ZERO
- LOW L0 ERROR
- LOW L1 ERROR
- DISTANT QUEUE ERROR

Real-time errors

Real-time error messages indicate that you need to correct a certain hardware condition. Possible messages are:

Error messages	Description
Lamp Cover Open	Check that the detector's lamp housing is in place and properly installed.
Low Light Detected From Deuterium Lamp	This message indicates that the deuterium lamp might not be on, might be improperly installed, or needs to be replaced due to low light energy. It can also appear if the lamp cover is replaced while the lamp is on. Using the Lamps Menu (see "Automatic Lamp Operations" on page 43), turn the lamp state to off, wait five seconds, and then switch the lamp on. If the error message recurs, check for proper lamp installation according to the procedure outlined in Chapter 6, "Installation and Specifications." If the lamp is installed correctly, its surface is clean, and the message still appears, replace the lamp.
Low Light Detected From Tungsten Lamp	This message indicates that the tungsten lamp might not be on, might be improperly installed, or needs to be replaced due to low light energy. Using the Lamps Menu (see"Automatic Lamp Operations" on page 43), turn the lamp state to off, wait five seconds, and then switch the lamp on. If the error message recurs, check for proper lamp installation according to the procedure outlined in Chapter 6, "Installation and Specifications." If the lamp is installed correctly, its surface is clean, and the message still appears, replace the lamp.

User-Input Errors

The following error messages indicate improper use of the detector's menu system.

Error messages	Description
A File Is Already Running	You cannot start a different file while a file is already running.
Invalid Parameters, Spectrum Not Allowed	Invalid scanning setup parameters have been entered, so the detector cannot perform a spectral scan.
No More Available Memory	All available system memory is full.
No Queue Available (UV2000)	You cannot load a queue if none has been set up first.
No Spectra Available (UV2000)	You cannot run Replay Spectra when no spectra are available in memory.
Protected File, Cannot Be Copied To (UV2000)	You cannot copy to a protected file.
Protected File, Cannot Be Deleted (UV2000)	You cannot delete a protected file.
Protected File, Cannot Be Edited (UV2000)	You cannot modify a protected file.
Queue Loaded, Cannot Load File (UV2000)	When a queue is loaded, you cannot load any other file.
Run In Progress, Testing Not Allowed	You cannot run the detector's built-in diagnostics while a run is in progress.
Run Not In Progress, No Scanning Allowed (UV2000)	A spectral scan can only be performed when a run is in progress.
Detector Shutdown	This message occurs when you use the Shutdown Detector field to turn off the detector. (See "Shutdown Detector" on page 47) Press any key on the keypad to turn on the detector.
Scan Memory Full (UV2000)	This message occurs when the Scan File is loaded and the scan data memory storage is full.
Run In Progress, No Replay Allowed (UV2000)	The UV2000 does not allow you to replay stored spectral scans when the Scan file is loaded and a run is active.

Diagnostic Tests

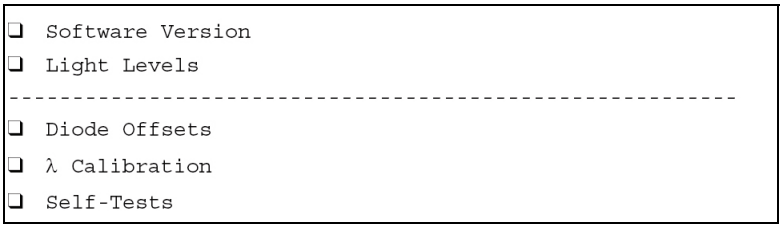
This section describes the internal diagnostic tests supplied with your detector. It also references two external tests that you can run. Use these tests if you suspect that your detector is not working properly.

Internal Diagnostic Tests

❖ **To access the detector's internal diagnostic tests**

1. Press [MENU].
2. Select /TESTS/.
3. The Tests menu appears in Figure 113.

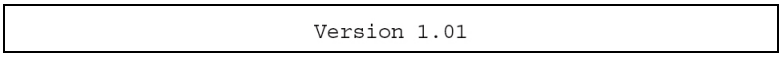
Figure 113. Detector's Tests Menu



Software Version

Select this field to display the EPROM version of your detector's software Figure 114.

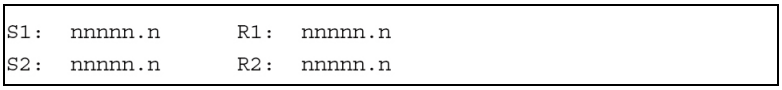
Figure 114. The software version



Light Levels

The Light Levels test displays numbers related to the level of light intensity seen by the sample and reference photodiodes. When you select /Light Levels/, the screen in Figure 115 appears.

Figure 115. The Light Levels screen

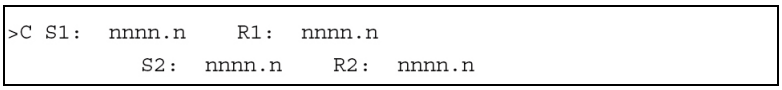


The sample (S1, S2) and reference (R1, R2) numbers can differ considerably between instruments. A five- or six-digit number is typical. If you get an unusual reading, check the photodiodes and the analog PCB. These components are the ones that are the most likely to affect light intensity. If any of the numbers is zero, call Thermo Fisher Scientific.

Diode Offsets

The Diode Offsets test presents numbers related to the level of background signal received from the sample and reference photodiodes when the lamps are off (dark current). When you select **Diode Offsets**, the screen in Figure 116 appears.

Figure 116. The diode offsets screen



The sample (S1, S2) and reference (R1, R2) numbers can vary considerably between instruments. A three- or four-digit number is typical. As with the Light Levels test, check the photodiodes and the analog PCB, the components most likely to affect light intensity, if you get an unusual reading. If any of the numbers are zero, call Thermo Fisher Scientific.

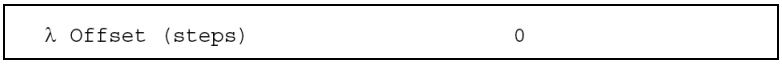
To recalculate the diode offsets, select C. The offsets might need to be recalculated if the light levels are less than the diode offsets. This situation normally occurs after slight diode offset drift or while working with extremely low light.

λ Calibration

Selecting /λ Calibration/ brings up the screen shown in Figure 117. You can use this screen (in combination with the optional Cuvette Holder Accessory) to offset the factory-calibrated wavelength to more closely match an FDA, industry, or in-house calibration standard.

Note If you want to conduct your calibration using the Cuvette Holder, the following procedure has also been detailed in Appendix E for your convenience.

Figure 117. The lambda offset screen



Note The UV2000 detector is calibrated using a mercury lamp fixture. This provides a very narrow emission line at 254 nm. Broad-band calibration standards, such as holmium oxide and didymium filters, make calibration more difficult and less accurate.

To offset the factory-calibrated wavelength, select the number of "steps" by which you want the wavelength to be offset. Each step represents approximately 0.25 nm, so if you choose "2" for the number of steps, you will have offset the wavelength by +0.5 nm. You can offset the wavelength by as much as 2.5 nm.

Note The offset value is not cleared upon resetting the RAM memory. It can only be changed from the lambda offset screen.

Self-Tests

The detector automatically runs eight internal diagnostic tests when it is powered up. To run the tests at any other time, select /Self-Tests/.

If any test (other than the two lamp tests) fails, you'll see a message to that effect on the display. Clear the message and run the remainder of the self-tests by pressing ENTER. Repeat this process as many times as necessary until all self-tests are completed and the Status Screen appears. If any test has failed, the Status Screen will read "NRDY" (Not Ready).

Although you can frequently get back to the Ready state on your own (for example, you can manually turn on the lamps from the Options Menu, or load a file), the detector might not function properly and your results might be affected. For this reason, and to help you troubleshoot the detector on your own, we have listed the MLF (most likely failure) for each test. Problems that are not readily resolved should be referred to your Thermo Fisher Scientific representative.

The eight self-tests are:

1. **RAM**. This test checks both non-volatile and volatile RAM with a read/write test. The "Testing RAM" message only appears during self-initiated testing. On power-up, the test occurs without any special message. A failure during either type of testing is indicated by the messages "Bad DRAM" or "Bad NOVRAM." MLF: Digital PCB.
2. **Voltages**. This test checks the circuitry-supply voltages. MLF: Motherboard.
3. **Analog Outputs**. This test checks the scale and linearity of the output signal (recorder/integrator). Failure is indicated by a "Fail" or a "Bad Analog Linearity" message. MLF: Analog PCB.
4. **Diode Offsets**. This test checks the diodes (photodiodes) with the lamp(s) off (dark current). Either a "Bad Sample Diode" or an "Intense Light Detected" message indicates failure. You should verify that the sample photodiode is fastened securely to the flowcell and that light is actually passing through the flowcell. If "Fail" or a "Bad Ref. Diode Detected" appear, call your Thermo Fisher Scientific representative. MLF: Photodiode or Analog PCB.
5. **Motor**. The Motor Test checks the monochromator motor and its voltages. MLF: Motor.
6. **Deuterium Lamp**. This test checks the D2 lamp and its voltages when the lamp is on and when it is off. If the message "D2 Not Detected" appears, the lamp voltages are good, but the lamp is either not present or not functioning properly. Try replacing the deuterium lamp and retrying the test. If the word "Fail" appears, call your Thermo Fisher Scientific representative. MLF: Lamp or Motherboard.
7. **Tungsten Lamp**. This test checks the W lamp and its voltages when the lamp is on and when it is off. If the message "W Not Detected" appears, the lamp voltages are good, but the lamp is not present or is not functioning properly. Try replacing the tungsten lamp and retrying the test. If the word "Fail" appears, call your Thermo Fisher Scientific representative. MLF: Lamp or Motherboard.

8. **Lamp and Shutter**. This UV2000 test actually has several parts, each of which checks a different part of the lamps' and shutter's operation. If either of the lamps fails, an appropriate message will be displayed. Try replacing the lamp and retrying the test. If a "Bad Shutter" message appears, call your Thermo Fisher Scientific representative. MLF: part listed on display.

External Diagnostic Tests

This section describes two external diagnostic tests that can be used to verify that your detector is working properly.

Checking the Chromatogram Produced by Injecting LC Test Mix

An ampule of prepared LC Test Mix is included as part of your detector's accessory kit. An instruction sheet describing the parameters for running the test mix and showing the resulting chromatogram is also enclosed. This is a good test to run when you first set up your LC system.

Tip Keep the chromatogram that you generate with the LC Test Mix. It can be a useful baseline for troubleshooting problems later on.

Absorbance Linearity

Use the optional cuvette holder (see Chapter 9, “Cuvette Holder Accessory,”) and certified standards to test the absorbance linearity of your detector in the UV range (approximately 235 nm to 350 nm). For your convenience, the following procedure is also detailed in Chapter 9, “Cuvette Holder Accessory.”

Tip This procedure is particularly useful for laboratories that require periodic detector validation.

To perform the test, you will need procedure E 925 from the American Society for Testing and Materials (ASTM) and standard potassium dichromate (SRM 930) from the National Institute of Standards and Technology (NIST; formerly the National Bureau of Standards, NBS). The test involves the preparation of acidic solutions of potassium dichromate at four concentrations and the absorbance measurement of each solution at four wavelengths between 235 and 350 nm. After correcting for an absorbance blank, the linearity deviation of a plot of absorbance versus concentration should be less than 1%.

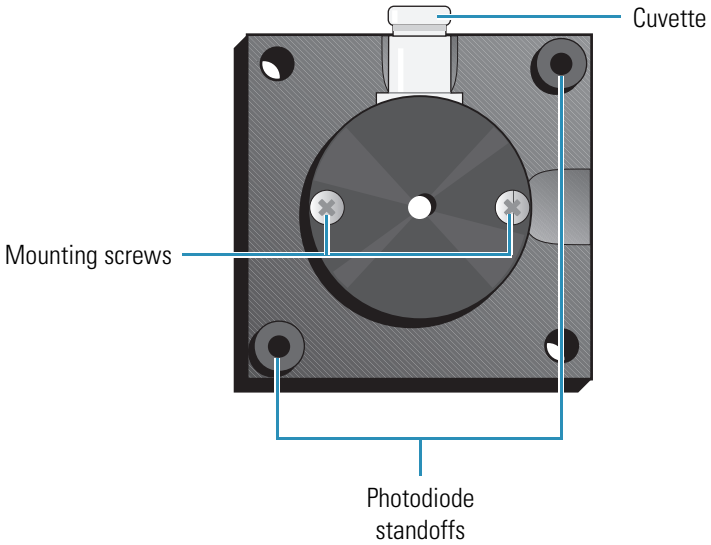
If you want more information on this test, or find that your instrument does not conform to these specifications and requires service, contact your local Thermo Fisher Scientific representative.

Cuvette Holder Accessory

This Chapter provides information on the installation, use, and maintenance of the Cuvette Holder Accessory (Figure 118). This accessory is available to simplify calibration/standardization of your UV2000 UV/Vis detector using FDA, industry, or in-house calibration standards. The cuvette holder is a modular accessory that installs in place of the detector flowcell. It allows analysis of calibration standards (for example, potassium dichromate) to ensure your detector's compliance with FDA, industry, and/or in-house regulations.

To use the cuvette holder, prepare your calibration standard according to the instructions provided with the sample. Then place the sample in a standard 10.0 mm I.D. (12.5 mm O.D.) quartz cuvette. Analyze the sample and compare its measured maxima to its certified maxima. If there's a discrepancy in the measured wavelength, the detector can be recalibrated using the procedure described on "λ Calibration" on page 120.

Figure 118. Cuvette Holder accessory



Installation

The cuvette holder attaches to your detector using the standard flowcell mounting hardware.

❖ To remove the flowcell and install the cuvette holder

1. Remove the front panel of the detector (Figure 119) to gain access to the flowcell mounting area. Note that the front panel is a friction-grip mount and will snap free if you pull outward on its lower edge.
2. Remove the thumbscrew that secures the flowcell cover to the front of the detector (Figure 120). Remove the flowcell cover and set it aside.
3. Remove the two thumbscrews that secure the photodiode assembly to the front of the flowcell (Figure 121) and then reposition the photodiode assembly out of the way to provide access to the flowcell.
4. Remove the two thumbscrews (top left, lower right) that secure the flowcell mount (Figure 122) to the front of the detector and then remove/reposition the flowcell.

   Tip You needn't disconnect the flowcell's tubing connections to your LC system if the cuvette holder is only going to be used long enough to conduct a calibration. Simply reposition the flowcell and omit Step 7 of this procedure.

5. Position the cuvette holder and secure the two thumbscrews (at top left and lower right) that secure the holder to the threaded holes on the detector's front panel.
6. Replace the photodiode assembly and secure it to the cuvette holder's standoffs with its two thumbscrews (at top right and lower left).
7. Snap the detector's front panel back in place.

Figure 119. Detector front panel

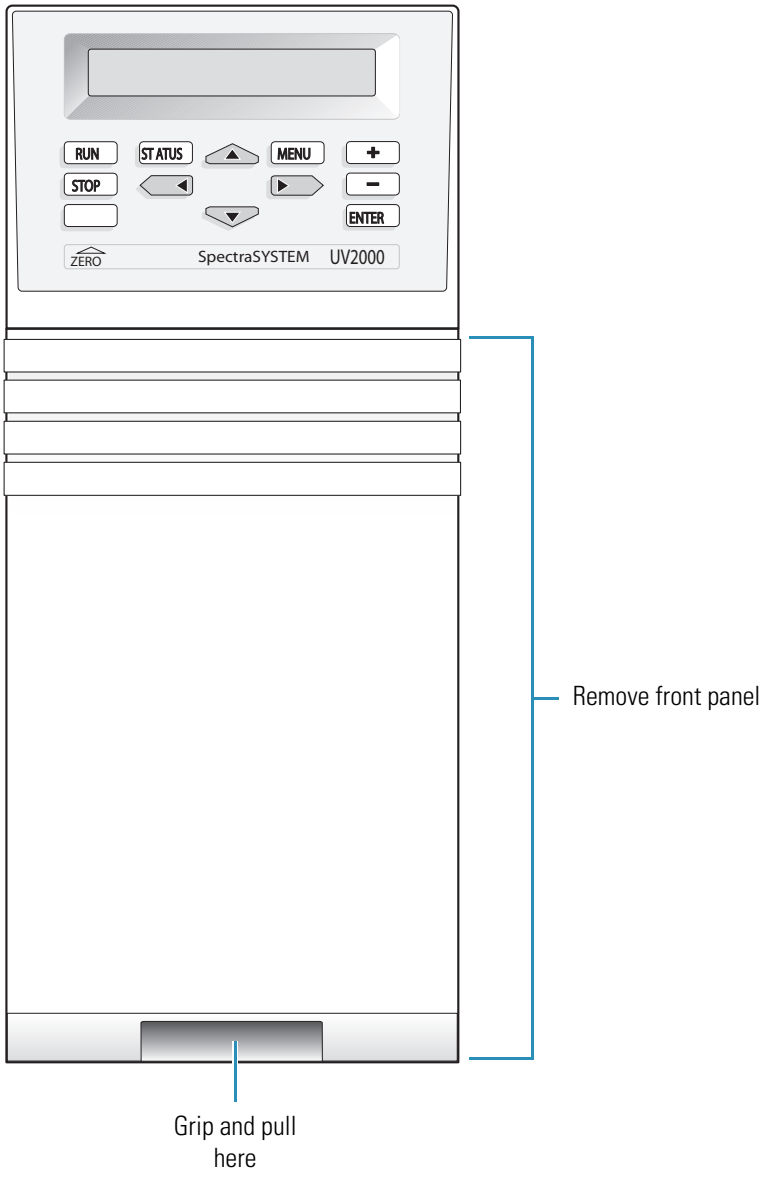


Figure 120. Detector with front panel removed to expose flowcell housing

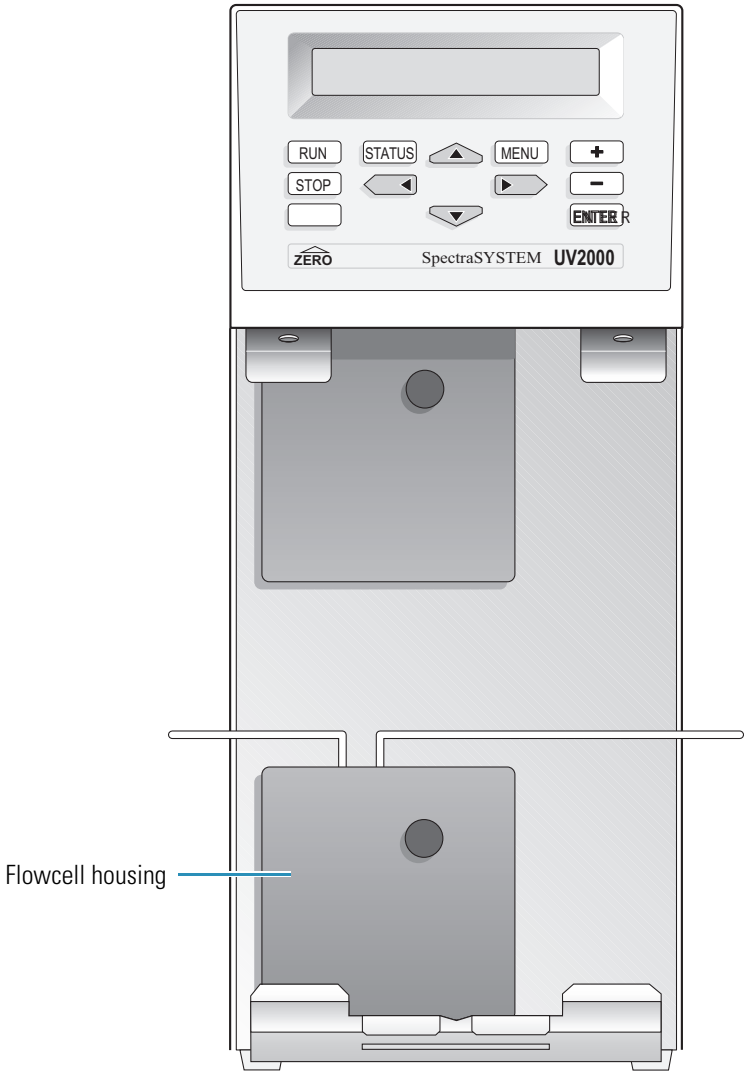


Figure 121. Detector with flowcell assembly exposed to show photodiode assembly-mounting thumbscrews

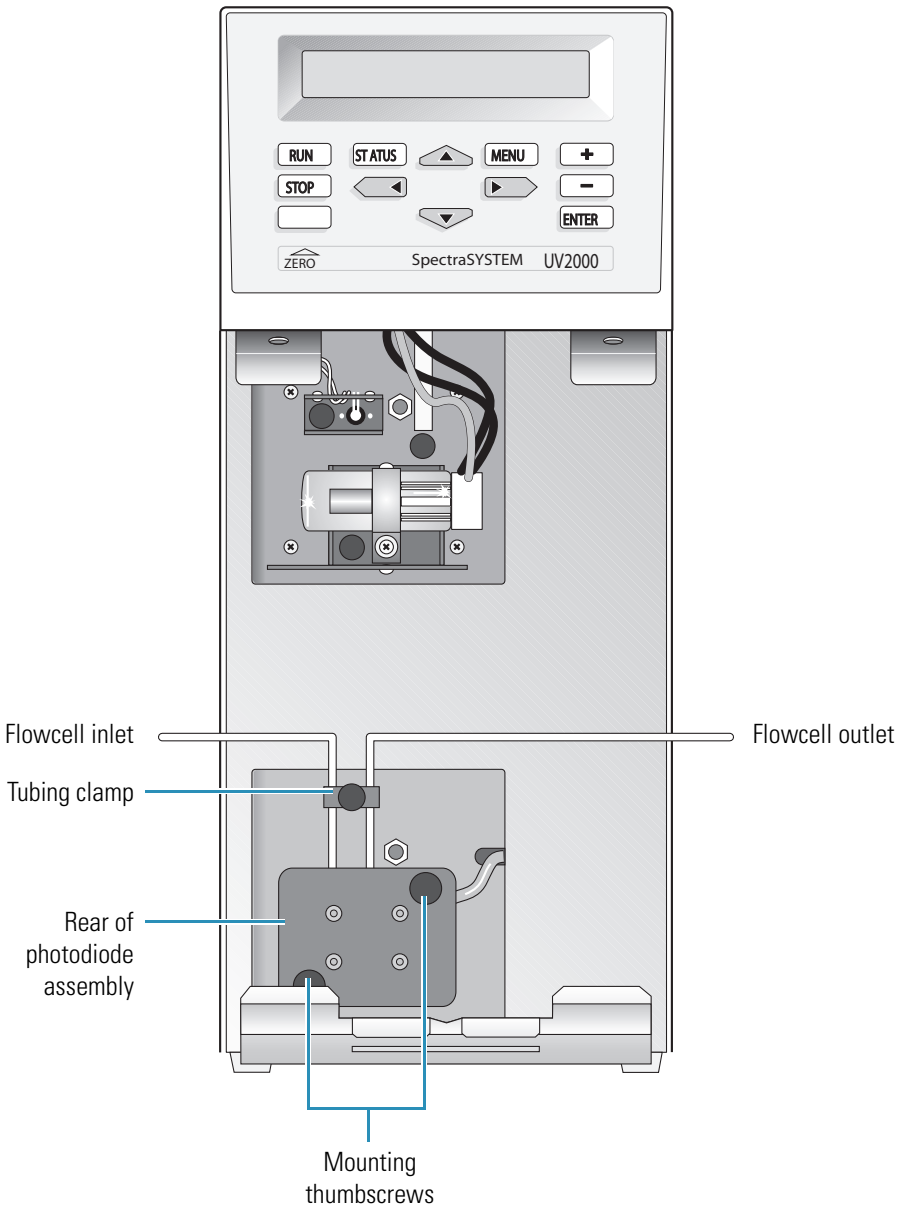
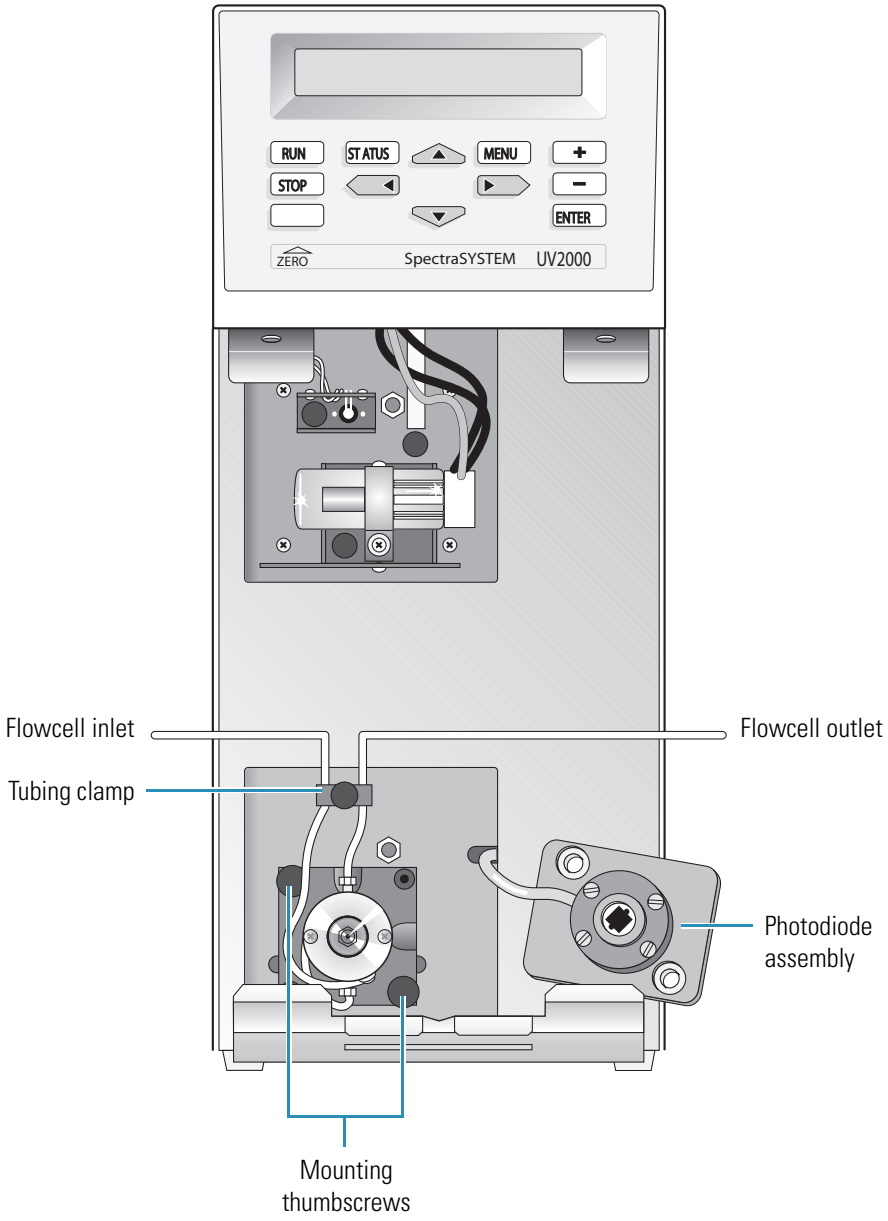


Figure 122. Detector with photodiode assembly repositioned to expose flowcell



Using the Cuvette Holder

The two procedures that follow allow you to use the Cuvette Holder to test the linearity of your detector's absorbance and to recalibrate the detector, if necessary.

IMPORTANT Be sure to insert the cuvette inside the holder so that its transparent sides (rather than the frosted ones) are in line with the beam of light from the detector's lamp. Failure to insert the cuvette properly might result in insufficient light levels for accurate analyses.

Absorbance Linearity

You can use the optional Cuvette Holder and certified standards to test the absorbance linearity of your detector in the UV range (approximately 235 to 350 nm).

Tip This procedure is particularly useful for laboratories that require periodic detector validation.

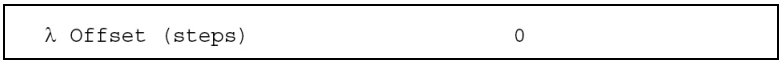
To perform the test, you'll need procedure E 925 from the American Society for Testing and Materials (ASTM) as well as standard potassium dichromate (SRM 930) from the National Institute of Standards and Technology (NIST; formerly the National Bureau of Standards, NBS). The test involves the preparation of acidic solutions of potassium dichromate at four concentrations and the absorbance measurement of each solution at four wavelengths between 235 and 350 nm. After correcting for an absorbance blank, the linearity deviation of a plot of absorbance versus concentration should be less than 1%.

If you want more information on this test, or find that your instrument does not conform to these specifications and requires service, contact your local Thermo Fisher Scientific representative.

λ Calibration

Selecting /λ Calibration/ brings up the screen shown in Figure 123. You can use this screen to offset the factory-calibrated wavelength to more closely match FDA, industry, or in-house standards.

Figure 123. The lambda (wavelength) offset screen



Tip The UV2000 detector is calibrated using a mercury-lamp fixture. This provides a very narrow emission line at 254 nm. Broad-band calibration standards, such as holmium oxide and didymium filters, make calibration more difficult and less accurate.

To offset the factory-calibrated wavelength, select the number of "steps" by which you want the wavelength to be offset. Each step represents approximately 0.25 nm, so if you choose "2" for the number of steps, you will have offset the wavelength by + 0.5 nm. You can offset the wavelength by as much as ±2.5 nm.

IMPORTANT The offset value isn't cleared upon resetting the RAM memory. It can only be changed from the lambda offset screen.

Maintenance

The cuvette holder contains no user serviceable components; however, cleanliness of the cuvettes is critical to obtaining accurate analyses. Therefore, these instructions are provided for inspecting and cleaning the cuvettes.

Inspecting a Cuvette

Cuvettes, whether previously used or new, should always be visually inspected before use.

❖ To inspect a cuvette

1. Grasp the cuvette by its two frosted sides and hold it up in front of a bright light source such as a fluorescent fixture, incandescent bulb, or sunny window.
2. Carefully observe the cuvette's two transparent glass sides. Look for physical damage such as chips, cracks, scratches, etc. Also look for dirt, smudges, fingerprints, and so forth.
3. Based on the results of your inspection, you can do one of the following three things:
   a. If no optical-surface damage or contamination is noted, fill the cuvette with sample and use it for your analysis.
   b. If you see physical damage or severe contamination on the optical surfaces, replace the cuvette with a new one.
   c. If no physical damage is noted and only light to moderate contamination, clean the cuvette using the procedure in Cleaning a Cuvette.

Cleaning a Cuvette

If the visual inspection reveals contamination of or damage to the cuvette's optical surfaces (the inner and/or outer surfaces of the cuvette's two transparent faces), then the cuvette should be cleaned before use.

❖ To clean a cuvette

1. Immerse the cuvette in a small beaker filled with an appropriate cleaning solution. Use detergent and water to clean cuvettes that are contaminated with residue from water-based solutions. Use an appropriate organic solvent (for example, methanol, ethanol, isopropanol, and so on) for cuvettes contaminated with residue from organic-solvent-based samples.
2. Place the beaker containing the cuvette(s) and cleaning solution in an ultrasonic bath and set the timer. Use a time setting that's appropriate for the amount of contamination that has to be removed.
3. Remove the cuvette from the beaker, handling it by its frosted sides only. Rinse it thoroughly with clean deionized water until all traces of detergent and dirt have been flushed away.
4. Dry the cuvette thoroughly with a lint-free wiper, exercising care to handle the cuvette only by its two frosted (non-optical) sides.
5. Carefully inspect the cuvette for residual contamination using the steps detailed in the preceding section of this appendix. If any is noted, repeat Steps 1 through 4 until the cuvette is completely clean and dry.

Tip In cases of serious contamination that resists removal, it might be easier to replace a dirty cuvette than to spend a lot of time cleaning it.

List of Spare Parts, Consumables, and Kits

Shown below is a list of spare parts and consumables available from Thermo Fisher Scientific for use with your SpectraSYSTEM UV/Vis detector. Contact your local Thermo Fisher Scientific representative for current prices.

Flowcells

9550-0100 . . . . . Analytical LC (6 mm)
9550-0234 . . . . . Analytical LC (10 mm)
9550-0053 . . . . . Microbore (3 mm)
9550-0265 . . . . . Microbore (6 mm)
9550-0101 . . . . . Semi-preparative, Open Column (3 mm)
9550-0263 . . . . . Cuvette Cell Holder

Options And Accessories

2103-9119 . . . . . External Events Connector
A4095-010 . . . . . Remote Interface Cable
9551-0022 . . . . . Tungsten Lamp, prealigned
9551-0023 . . . . . Deuterium Lamp, prealigned
9051-0143 . . . . . Regulated Backpressure Accessory

Manuals

A0099-64001 . . . . . SpectraSYSTEM documentation CD

Maintenance Parts

A4051-010 . . . . . Standard Fittings Kit
(Kit includes stainless steel fittings and tubing used in a SpectraSYSTEM LC system.)

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