



Ultramark™ Microplate Reader User Manual



Ultramark Catalog Number 170-9500

Ultramark User Manual Catalog Number 170-9502

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Warranty and Regulatory Notices

Warranty Statement

This warranty may vary outside of the continental United States. Contact your local Bio-Rad office for the exact terms of your warranty.

Bio-Rad Laboratories warrants that the Ultramark system will be free from defeats in material and workmanship, and will meet all performance specifications for the period of 1 year from the date of shipment. This warranty covers all parts and labor.

In the event that the instrument must be returned to the factory for repair under warranty, the instrument must be packed for return in the original packaging.

Bio-Rad shall not be liable for any incidental, special, or consequential loss, damage, or expense directly or indirectly arising from the use of the Ultramark system. Bio-Rad makes no warranty whatsoever in regards to products or parts furnished by third parties, such being subject to the warranty of their respective manufacturers. Service under this warranty shall be requested by the contacting your nearest Bio-Rad office.

This warranty does not extend to any instruments or parts thereof that have been subject to misuse, neglect, or accident, or that have been modified by anyone other than Bio-Rad or that have been used in violation of Bio-Rad instruction.

The foregoing obligations are in lieu of all other obligation and liabilities including negligence and all warranties, of merchantability, fitness for a particular purpose or otherwise, expressed or implied in fact or by law, and state Bio-Rad's entire and exclusive remedy for any claims or damages in connection with the furnishing of goods or parts, their design, suitability for use, installation, or operation. Bio-Rad will in no event be liable for any special, incidental, or consequential damages whatsoever, and Bio-Rad's liability under no circumstances will exceed the contract price for the goods for which liability is claimed.

Regulatory Notices

Important: This Bio-Rad instrument is designed and certified to meet EN55011, EN50082-1, and IEC 1010-1 requirements, which are internationally accepted electrical safety standards. Certified products are safe to use when operated in accordance with the instruction manual. This instrument should not be modified or altered in any way. Alteration will:

- Void the manufacture's warranty.
- Void the regulatory certification.
- Create a potential safety hazard.

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his/her own expense.

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1. General Information

1.1 Introduction

The Ultramark microplate reader provides all the flexibility you need for virtually any absorbance assay. You can use it to perform standard colorimetric ELISA and kinetic readings for general cell screening with 6, 12, 24, 96, 384, and 1536-well microplate formats. The Ultramark has a 10-magazine filter holder with a working wavelength range of 260–750 nm and an incubation temperature range up to 42 degrees Celsius. The optical design provides verifiable results up to 4.5 O.D. with an optical resolution 500 microns.

1.2 Ultramark Specifications

Light Source	Xenon Flash Lamp
Spectral Range	250–750 nm
Filter Capacity	10-position magazine
Shaking	Yes
Incubation	Up to 42°C , programmable in 0.2° C increments
Power	100–240 V, 60/50 Hz, 22 Amps
Dimensions	20 cm (H) x 43 cm (W) x 51 cm (D)
Compatible Plates	Any microplate or suitable medium with dimensions 138 mm (length) x 98 mm (width). Plate height cannot exceed 15 mm.
Resolution	500 microns
Linearity	Less than 0.5% CV from 0–4.0 O.D. at 405 nm
Precision	Less than 0.5% CV from 0–4.0 O.D. at 405 nm
Software Compatibility	A System 486 or higher, 32 Mb RAM, Windows 95 OS or higher
Read Times	96-well plate: 6 seconds single wavelength 24 seconds dual wavelength 384-well plate: 12 seconds single wavelength 32 seconds dual wavelength 1536-well plate: 34 seconds single wavelength 78 seconds dual wavelength
Compatible Plate types	Any format from 1 well to 1536 wells, up to a plate height of 15 mm.
Environmental Operating Range	5–40 degrees C; max. relative humidity 80% non-condensing

2. Equipment Set-up and Installation

2.1 Unpacking the Ultramark Microplate Reader

Before opening the box, check for any outer damage. Document any damages, if present.

Place the box upright with the TOP label facing up and open the box. Remove the instrument from the box in this position only.

Warning! Grasp the instrument firmly under the right and left sides before attempting to lift or carry it.

Check the instrument for damaged or broken parts. Document any damages in detail.

Each Ultramark instrument includes the following accessories. Verify that they are present:

- 1 power cord.
- 1 plastic container with filter holder and 10 filters: 260 nm, 280 nm, 340 nm, 405 nm, 415 nm, 490 nm, 550 nm, 630 nm, 655 nm, and 750 nm.
- 1 user manual.

Verify that the serial number on the back of the instrument is the same as that on the outside of the box.

Remove the side cover on the right side of the unit. Inside there are two docking brackets that need to be removed by unscrewing 3 screws as shown on the unpacking sheet attached to the unit. After removing the two docking brackets, install the Filter Magazine as described in the unpacking instructions.

2.2 SCSI II Cable Connection

The SCSI II port is located on the back of the instrument. There are two connectors, which allows the user to connect more than one SCSI instrument in a chain. If the Ultramark is the last instrument in the chain, make sure that the termination switch (next to the SCSI connectors) is in the "ON" position. If the Ultramark is an intermediate unit in the chain, make sure that the termination switch is in the "OFF" position. If the Ultramark is the only unit connected to the SCSI cable, make sure that the switch is in the "ON" position.

There is a small dial next to the SCSI connectors on the back of the unit. This dial selects the SCSI ID number for the unit at boot-up. Be sure to select an ID number that is not being used by any other SCSI device in the chain.

2.3 Power Connection

Before switching the power on for the first time, allow the Ultramark to warm to room temperature for **6 hours** after unpacking to prevent any condensation problems.

Plug the included power cord into the main power connector port. Make sure that the instrument is connected to a grounded conductor of the main power outlet.

2.4 Location of the Instrument

The Ultramark microplate reader is a precise optical measuring instrument. The following conditions must be met to ensure maximum sensitivity:

- Place the instrument on a flat surface that is free of vibration.
- Do not place the instrument in direct sunlight.
- Make sure that the instrument is being operated in a dust-free environment.

Warning! Do not operate the instrument with the filter cover off. Always have the filter cover attached to ensure proper data sampling and protect users from moving parts.

3. Using the Ultramark

The Ultramark is operated through the Protocol dialog boxes in Microplate Manager. See the **Microplate Manager User Guide** for instructions on specifying the filter wavelengths (section 2.7) and operating the Ultramark through the Protocol dialogs (Chapter 5).

3.1 Loading a Plate

To load a plate into the Ultramark, press the **Open/Close button** on the front of the instrument or click on the Reader Door: Open button in the Protocol dialog box in Microplate Manager. The front door of the reader will open and the plate loader will extend.

Place your microplate in the plate loader, pressing lightly to snap the plate into place. Press the Open/Close button again to close the reader door, or click on the Reader Door: Close button in the Protocol dialog in Microplate Manager.

- The Ultramark will accept any plate with the dimensions 138 mm (length) x 98 mm (width). Plate height cannot exceed 15 mm.

3.2 Reading a Plate

Plate readings are controlled entirely by Microplate Manager. See Chapter 5 of the Microplate Manager User Guide for instructions.

To stop a plate reading that is in progress, press the **Stop button** on the front panel of the Ultramark or click on the Stop button in the Microplate Manager Protocol dialog box.

3.3 Incubator Controls

The incubator in the Ultramark is controlled from within Microplate Manager. You can also start the incubator by pressing the **Incubator button** on the front panel of the Ultramark.

Pressing the Incubator button once will begin warming up the incubator (message: "Ready. Temp = ___"). Pressing it again will begin cooling the incubator down to ambient room temperature (message: "Cooling"). Pressing it again will turn the incubator off (message: "Ready. Incu. Off").

Incubator Set Point

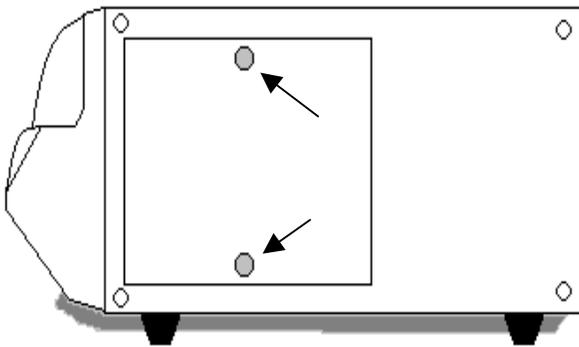
The incubator set point is set from within Microplate Manager. The last set point selected in Microplate Manager is stored in memory inside the Ultramark, so if you start the Ultramark and start the incubator without opening Microplate Manager, the incubator will begin warming up to the last specified set point.

4. Changing Filters in the Ultramark

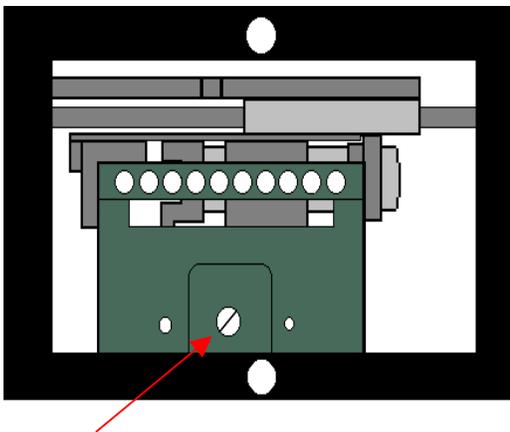
This section describes how to change a filter or filters in the Ultramark.

To enter filter removing mode, hold down the Open/Close button on the front panel while you turn on the Ultramark. The message window will read "Filter Removing"? Press the Incubator button to continue (the Stop button will exit filter removing mode). The message will read "Remove Magazine."

Remove the two thumbscrews on the right side of the Ultramark and remove the side cover.



Inside the side panel, remove the large thumbscrew (Screw 2) at the bottom of the Filter Magazine.



Screw 2

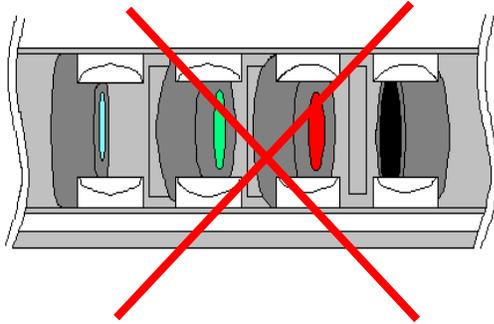
Pull the Filter Magazine forward off the pins and lift it out of the Filter Base.

Press any button on the front panel, and the filter arm will extend. Remove the filter from the arm, and press any button on the front panel. The filter arm will retract. Now turn off the Ultramark.

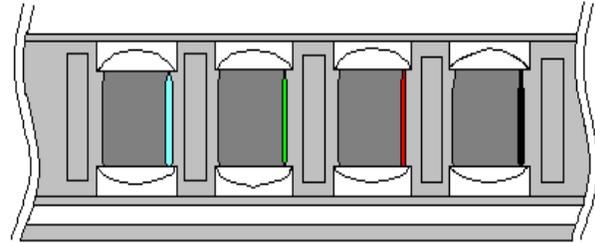
When installing new filters in the Magazine, make sure that each filter is oriented in the Magazine with the numbered side facing the rear of the Ultramark and the shiny side facing the front of the Ultramark.

- When installing filters, carefully note the wavelength of each filter you are inserting and the number of the clip you are inserting it into. You will have to enter this information into

Microplate Manager (see the Microplate Manager User Guide, section 2.7). Incorrect wavelength and clip information could result in damage to the Ultramark!



Incorrect



Correct

Make sure that all the filters sit securely and properly in the Magazine clips before reinstalling the Magazine.

Reinsert the Filter Magazine into the base so that the pins in the base fit in the holes in the magazine. Insert Screw 2 into the center hole in the Filter Magazine and tighten securely with a coin or screwdriver.

- The Filter Magazine must be securely fastened to the base to avoid serious problems.

Replace the side cover and fasten it with the thumbscrews. Restart the Ultramark.

Finally, be sure to enter the new filter information into Microplate Manager (see section 2.7 of the Microplate Manager User Guide).

5. Recovering from a Filter Error

There are three filter error messages that can appear in the front panel of the Ultramark:

- Filter Memory Error
- Filter Set Error
- Gain Mes-2 Error

To correct these errors:

1. Press any button on the front panel of the Ultramark to enter the Filter Set mode.
2. Remove the side panel and the Filter Magazine from the Ultramark (see instructions in previous section).
3. Note the number of the filter that is in the filter arm (i.e., the Magazine clip that does not have a filter).
4. To enter the number of the filter in the filter arm:
Press the Open/Close button on the front panel to increase the filter number.
Press the Stop button to decrease the filter number.
5. When you reach the correct filter number, press the Incubator button to reset the filter status.
6. Replace the Filter Magazine and the side panel.

6. Recovering a Dropped Filter

To recover a filter that has dropped inside the instrument, perform the following steps:



1. Turn power off.



2. Loosen thumbscrews on side panel and remove panel.



3. Remove thumbscrew holding filter magazine in place.



4. Remove filter magazine.



5. Reach inside instrument, locate dropped filter, and remove.
6. Reinsert filter into clip in magazine, replace the magazine and side panel, and turn the instrument back on.
7. Specify in Microplate Manager that the filter is in the magazine, not the filter arm.

7. Disinfection Procedure

All parts of this instrument that can come in contact with patient sera or positive samples must be handled as hazardous items. Bio-Rad Laboratories recommends using gloves when performing maintenance or working with the instrument.

- It is very important that the instrument undergo thorough disinfection before performing maintenance or before physical removal of the instrument from the laboratory. The instrument must be disinfected before you send it back to Bio-Rad Laboratories for service. For safety reasons, you must fill out a Disinfection Certificate and include it with the instrument. Without the Disinfection Certificate, Bio-Rad Laboratories will not accept any returned instruments.

Bio-Rad Laboratories recommends using a solution of 5% sodium hypochlorite solution (in water). Authorized persons wearing one way gloves and protective clothes must perform the disinfection procedure. The location must possess adequate ventilation.

- When disinfecting, be sure to wear disposable gloves.

To disinfect the Ultramark, use the following procedure:

7. Remove the instrument from the packaging.
8. Remove the SCSI II cable and any accessories that were returned.
9. Clean all the outside surface of the instrument carefully with a wad of cotton, which has been soaked in the 5% sodium hypochlorite solution.
10. Repeat the procedure for the disinfection on any accessories, which were also returned with the instrument.

8. Error Codes

The following error codes appear in the message window of the Ultramark.

Error Message	Probable Cause	Recommended Solution
Memory(SRAM)	An empty battery. ROM replaced. SRAM chip trouble.	Contact Bio-Rad. Not a problem. Contact Bio-Rad.
Memory(DRAM)	DRAM chip trouble.	Contact Bio-Rad.
Plate Carrier	Dirty guide shaft, or something blocking the guide shaft. Motor drive damaged. Photo sensor damaged.	Confirm that there is nothing blocking the guide shaft, then clean the shaft and put some grease on it. Contact Bio-Rad. Contact Bio-Rad.
X Axis	Dirty guide rail , or something blocking the rail. Motor drive damaged. Photo sensor damaged.	Confirm that there is nothing blocking the guide rail, then clean the rail and put grease on it. Contact Bio-Rad. Contact Bio-Rad.
Y Axis	Dirty guide rail , or something blocking the rail. Motor drive damaged. Photo sensor damaged.	Confirm that there is nothing blocking the guide rail, then clean the rail and put grease on it. Contact Bio-Rad. Contact Bio-Rad.
Filter Miss	Incomplete installation of filters in the magazine. Photo sensor damaged.	Install filters correctly into the magazine. Contact Bio-Rad.
Filter ph-s	Photo sensor damaged.	Contact Bio-Rad.
Incubator	Incubator electronics damaged.	Contact Bio-Rad.

Error Message	Probable Cause	Recommended Solution
Xe flash	The Xenon Lamp did not flash.	If this occurs only a few times a year, it is no problem.
	Hi-Voltage power supply damaged.	Contact Bio-Rad.
	Xenon Flash Lamp damaged.	Contact Bio-Rad.
Gain Mes-1	Measuring electronics damaged.	Contact Bio-Rad.
	Analog offset voltage is too high.	Contact Bio-Rad.
Gain Mes-2	Selected filter is not installed.	Install filter.
	Measuring electronics damaged.	Contact Bio-Rad.
Gain Mes-3	Xenon Flash Lamp damaged.	Contact Bio-Rad.
	Measuring electronics damaged.	Contact Bio-Rad.
	Optical Block is out of the starting point.	Contact Bio-Rad.
	Lenses and Mirrors may be dirty.	Contact Bio-Rad.
Gain Ref-1	Measuring electronics damaged.	Contact Bio-Rad.
	Analog offset voltage is too high.	Contact Bio-Rad.
Gain Ref-□	Measuring electronics damaged.	Contact Bio-Rad.
Gain Ref-3	Xenon Flash Lamp damaged.	Contact Bio-Rad.
	Measuring electronics damaged.	Contact Bio-Rad.
	Lenses and Mirrors may be dirty.	Contact Bio-Rad.
A/D Mes.	Malfunction of A/D converter.	Contact Bio-Rad.
A/D Incu	Malfunction of A/D converter.	Contact Bio-Rad.
EEPROM	EEPROM chip trouble.	Contact Bio-Rad.

Error Message	Probable Cause	Recommended Solution
SCSI ini.	SCSI chip trouble.	Contact Bio-Rad.
WCS R/W SCSI	SCSI chip trouble.	Contact Bio-Rad.
DPR R/W SCSI	SCSI chip damaged.	Contact Bio-Rad.
SCSI bus	Data communication problem between the Ultramark and your computer.	The Ultramark is not the source of the problem. Check your computer.
Bus Rst SCSI	The termination switch may be off. Another connected SCSI device is powered off.	Turn the SCSI termination switch on (located next to SCSI connector). Turn the connected machine on, or turn the termination switch on the Ultramark on.

9. Product Information

170-9500	Ultramark Microplate Imaging System, 110/230 V, Includes 10 Filters (260, 280, 340, 405, 415, 490, 570, 630, 655, and 750 nm)
170-9501	Feeder/Stacker
170-9518	1536 Well Microplate, 25
170-9519	96 Well UV Transparent Microplate, 25
170-9520	SCSI II Card and Cable for PC
170-9521	MPM 5.0 PC Software

Filter Table

170-9504	260 nm Filter
170-9505	280 nm Filter
170-9506	340 nm Filter
170-9507	405 nm Filter
170-9508	415 nm Filter
170-9509	450 nm Filter
170-9510	490 nm Filter
170-9511	540 nm Filter
170-9512	550 nm Filter
170-9513	570 nm Filter
170-9514	595 nm Filter
170-9515	630 nm Filter
170-9516	655 nm Filter
170-9517	750 nm Filter

Order Form—Emission Filter Ultramark Microplate Reader

Omega series filters (see website www.omegafilters.com for more information)

Mechanical Specifications

Laminated construction edges sealed.

Enclosure: ABS plastic ring.
 Diameter: 11.9 +0/-0.25mm without ring
 14.0 +0/-0.25mm with ring
 Thickness: 4.9 ± 0.1mm without ring
 4.9 ± 0.1mm with ring
 Clear aperture: 7.0+0.1/-0mm
 TWFD: ≤ Lambda / 10

Optical Specifications

Wavelength Type (Check one)
 (>450 nm) BP (Bandpass) WB (Wideband)
 DF (Discriminating) CF (Cut-on) EF (Edge)

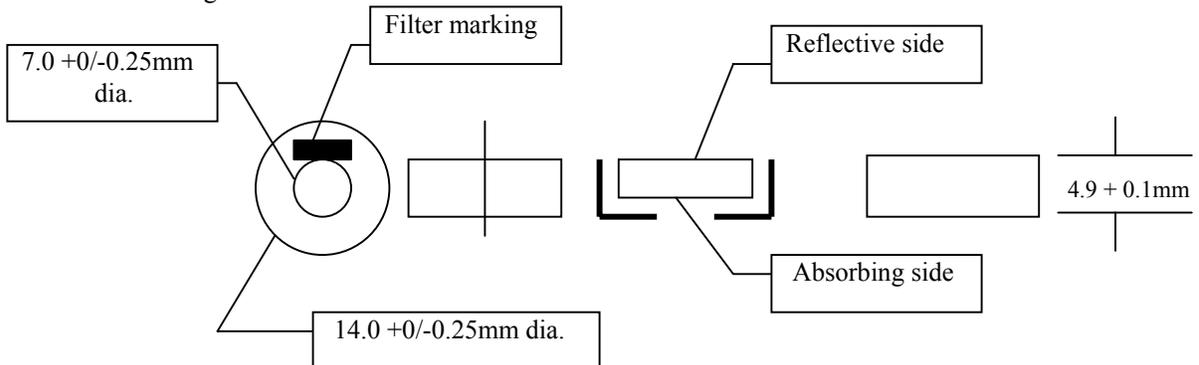
50% Transmission Point: ± 10nm

Transmission Band: Minimum to nm @ > 80% Avg.

Blocking: Minimum O.D. > 5.0 from cut-on to UV

Edge slope: Per Omega published data for EF series.

Each filter whose construction incorporates absorbing glass shall be oriented with the absorbing glass facing the rim of the aluminum ring. This orientation shall be clearly marked on the edge of the holder with an arrow. The head shall point toward the absorbing glass. The filter shall be used in an orientation with light going in the direction of the arrow. Thus, the light shall first strike the side furthest away from the absorbing (and possibly fluorescing) glass and autofluorescing shall be minimized.



FAX order form to:
 Omega Optical 3 Grove St. P.O. Box 573 Brattleboro, VT 05301
 Phone: 802/254-2690 FAX 802/254-3937
 Bio-Rad order form 410-0170 Rev. A

Disinfection Certificate

This instrument and its inventory have: (1) never been in contact with any dangerous biological material, or (2) been disinfected according to the instructions contained in the operating manual for this instrument.

Name (please print): _____

Firm name (please print): _____

Signature: _____ Date: _____

