ELx800™

Absorbance Microplate Reader
Instructions for Use

March 2013

Part Number 7331047
Revision D
BioTek® Instruments, Inc.

Notices

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Instructions for Use Requirements

This document fulfills the basic needs of persons operating this device, according to the requirements of the In Vitro Diagnostic Directive for "Instructions for Use." Many of the device's higher-level functions, such as programming and advanced troubleshooting, are described in the ***ELx800 Operator's Manual***.

Intended Use Statement

The ELx800 is an absorbance microplate reader. The performance characteristics of the data reduction software have not been established with any laboratory diagnostic assay. The user must evaluate this instrument and (if used) PC-based software in conjunction with their specific assay(s). This evaluation must include the confirmation that performance characteristics for the specific assay(s) are met.

If the instrument has an "IVD" label, it may be used for clinical and non-clinical purposes, including research and development. If there is no such label, the instrument may be used only for research and development or other non-clinical purposes.

Quality Control

It is considered good laboratory practice to run laboratory samples according to instructions and specific recommendations included in the assay package insert for the test to be conducted. Failure to conduct Quality Control checks could result in erroneous test data.

Warnings

Operate the instrument on a level, stable surface and away from excessive humidity.

Bright sunlight or strong incandescent light can reduce the linear performance range of the instrument.

Measurement values may be affected by extraneous particles (such as dust) in the microplate wells. A clean work area is necessary to ensure accurate readings.

When operated in a safe environment according to the instructions in this document, there are no known hazards associated with the instrument. However, the operator should be aware of certain situations that could result in serious injury; these vary depending on the instrument type. See ***Hazards*** and ***Precautions***.

Hazards

The following hazard warnings are provided to help avoid injury:

Warning! Power Rating. The instrument's power supply must be connected to a power receptacle that provides voltage and current within the specified rating for the system. Use of an incompatible power receptacle may produce electrical shock and fire hazards.

Warning! Electrical Grounding. Never use a plug adapter to connect primary power to the external power supply. Use of an adapter disconnects the utility ground, creating a severe shock hazard. Always connect the power cord directly to an appropriate receptacle with a functional ground.

Warning! Service. Only qualified technical personnel should perform service procedures on internal components.

Warning! Accessories. Only accessories that meet the manufacturer's specifications shall be used with the instrument.

Warning! Lubricants. Do not apply lubricants to the microplate carrier or carrier track. Lubricant on the carrier mechanism or components in the carrier compartment will attract dust and other particles, which may obstruct the carrier path and cause the instrument to produce an error.

Warning! Liquids. Avoid spilling liquids on the instrument; fluid seepage into internal components creates a potential for shock hazard or instrument damage. If a spill occurs while a program is running, abort the program and turn the instrument off. Wipe up all spills immediately. Do not operate the instrument if internal components have been exposed to fluid.

Warning! Unspecified Use. Failure to operate this equipment according to the guidelines and safeguards specified in this manual could result in a hazardous condition.

Warning! Software Quality Control. The operator must follow the manufacturer's assay package insert when modifying software parameters and establishing reading methods. Failure to conduct quality control checks could result in erroneous test data.

Warning! Reader Data Reduction Protocol. The onboard assay software will flag properly defined controls when they are out of range. The software will present the data with the appropriate error flags for the operator to determine control and assay validity. If the reader is operated via computer control, no limits are applied to the raw absorbance data. All information exported via computer control must be thoroughly analyzed by the operator.

Warning! Internal Voltage. Always turn off the power switch and unplug the power supply before cleaning the outer surface of the instrument or removing its top case.

Warning! Hot Surface. The lamp assembly is hot when the instrument is turned on. Turn off the reader and allow the lamp to cool down before attempting to replace it.

Warning! Potential Biohazards. Some assays or specimens may pose a biohazard. Adequate safety precautions should be taken as outlined in the assay's package insert. This hazard is noted by the symbol shown here. Always wear safety glasses and appropriate protective equipment, such as chemically resistant rubber gloves and apron.

Precautions

The following precautions are provided to help avoid damage to the instrument:

Caution: Service. The instrument should be serviced by BioTek authorized service personnel. Only qualified technical personnel should perform troubleshooting and service procedures on internal components.

Caution: Spare Parts. Only approved spare parts should be used for maintenance. The use of unapproved spare parts and accessories may result in a loss of warranty and potentially impair instrument performance or cause damage to the instrument.

Caution: Environmental Conditions. Do not expose the instrument to temperature extremes. For proper operation, ambient temperatures should remain within the range listed in the ***Specifications*** section. Performance may be adversely affected if temperatures fluctuate above or below this range. Storage temperature limits are broader.

Caution: Sodium Hypochlorite. Do not expose any part of the instrument to the recommended diluted sodium hypochlorite solution (bleach) for more than 20 minutes. Prolonged contact may damage the instrument surfaces. Be certain to rinse and thoroughly wipe all surfaces.

Caution: Power Supply. Only use the power supply shipped with the instrument. Operate this power supply within the range of line voltages listed on it.

Caution: Disposal. This instrument contains printed circuit boards and wiring with lead solder. Dispose of the instrument according to Directive 2002/96/EC, "on waste electrical and electronic equipment (WEEE)" or local ordinances.

Caution: Warranty. Failure to follow preventive maintenance protocols may **void the warranty**.

Caution: Shipping Hardware. All shipping hardware must be removed before operating the instrument and reinstalled before repackaging the instrument for shipment.

Caution: Electromagnetic Environment. Per IEC 61326-2-6 it is the user's responsibility to ensure that a compatible electromagnetic environment for this instrument is provided and maintained in order that the device will perform as intended.

Caution: Electromagnetic Compatibility. Do not use this device in close proximity to sources of strong electromagnetic radiation (e.g., unshielded intentional RF sources), as these may interfere with the proper orientation.

CE Mark

CE	***Based on the testing described below and information contained herein, this instrument bears the CE mark***

❖ See the Declaration of Conformity for more specific information.

Directive 2004/108/EC: Electromagnetic Compatibility

Emissions—Class A

The system has been type-tested by an independent, accredited testing laboratory and found to meet the requirements of EN 61326-1: Class A for Radiated Emissions and Line Conducted Emissions.

Verification of compliance was conducted to the limits and methods of EN 55011—CISPR 11, Class A. In a domestic environment it may cause radio interference, in which case you may need to mitigate the interference.

Immunity

The system has been type-tested by an independent, accredited testing laboratory and found to meet the requirements of EN 61326-1 and EN 61326-2-6 for Immunity. Verification of compliance was conducted to the limits and methods of the following:

EN 61000-4-2, Electrostatic Discharge
EN 61000-4-3, Radiated EM Fields
EN 61000-4-4, Electrical Fast Transient/Burst
EN 61000-4-5, Surge Immunity
EN 61000-4-6, Conducted Disturbances from RFI
EN 61000-4-11, Voltage Dips, Short Interruptions and Variations

Directive 2006/95/EC Low Voltage (Safety)

The system has been type-tested by an independent testing laboratory and was found to meet the requirements of this Directive. Verification of compliance was conducted to the limits and methods of the following:

EN 61010-1, "Safety requirement for electrical equipment for measurement, control and laboratory use. Part 1, General requirements."

EN 61010-2-081, "Particular requirements for automatic and semi-automatic laboratory equipment for analysis and other purposes."

Directive 2002/96/EC: Waste Electrical and Electronic Equipment

Disposal Notice: This instrument contains printed circuit boards and wiring with lead solder. Dispose of the instrument according to Directive 2002/96/EC, "on waste electrical and electronic equipment (WEEE)" or local ordinances.

Directive 98/79/EC: In Vitro Diagnostics (if labeled for this use)

- Product registration with competent authorities.
- Traceability to the U.S. National Institute of Standards and Technology (NIST).
- EN 61010-2-101, "Particular requirements for in vitro diagnostic (IVD) medical equipment."

Electromagnetic Interference and Susceptibility

USA FCC CLASS A

RADIO AND TELEVISION INTERFERENCE

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 their own expense.

In order to maintain compliance with FCC regulations, shielded cables must be used with this equipment. Operation with non-approved equipment or unshielded cables is likely to result in interference to radio and television reception.

Canadian Department of Communications Class A

This digital apparatus does not exceed Class A limits for radio emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

Le present appareil numerique n'émet pas de bruits radioelectriques depassant les limites applicables aux appareils numerique de la Class A prescrites dans le Reglement sur le brouillage radioelectrique edicte par le ministere des Communications du Canada.

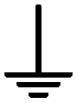
User Safety

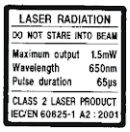
This device has been type-tested by an independent laboratory and found to meet the requirements of the following:

- Underwriters Laboratories UL 61010-1, "Safety requirements for electrical equipment for measurement, control and laboratory use; Part 1: General requirements."
- Canadian Standards Association CAN/CSA C22.2 No. 61010-1, "Safety requirements for electrical equipment for measurement, control and laboratory use; Part 1: General requirements."
- EN 61010 Standards, see the ***CE Mark*** section.

Safety Symbols

Some of these symbols appear on the instrument or accessories:

	Alternating current Courant alternatif Wechselstrom Corriente alterna Corrente alternata		Both direct and alternating current Courant continu et courant alternatif Gleich - und Wechselstrom Corriente continua y corriente alterna Corrente continua e corrente alternata
	Direct current Courant continu Gleichstrom Corriente continua Corrente continua		Earth ground terminal Borne de terre Erde (Betriebserde) Borne de tierra Terra (di funzionamento)
	On (Supply) Marche (alimentation) Ein (Verbindung mit dem Netz) Conectado Chiuso		Protective conductor terminal Borne de terre de protection Schutzleiteranschluss Borne de tierra de protección Terra di protezione
	Off (Supply) Arrêt (alimentation) Aus (Trennung vom Netz) Desconectado Aperto (sconnessione dalla rete di alimentazione)		Caution (refer to accompanying documents) Attention (voir documents d'accompagnement) Achtung siehe Begleitpapiere Atención (vease los documentos incluidos) Attenzione, consultare la doc annessa
	Warning, risk of electric shock Attention, risque de choc électrique Gefährliche elektrische schlag Precaución, riesgo de sacudida eléctrica Attenzione, rischio di scossa elettrica	 	Warning, risk of crushing or pinching Attention, risque d'écrasement et pincement Warnen, Gefahr des Zerquetschens und Klemmen Precaución, riesgo del machacamiento y sejeción Attenzione, rischio di schiacciare ed intrappolarsi
	Warning, hot surface Attention, surface chaude Warnen, heiße Oberfläche Precaución, superficie caliente Attenzione, superficie calda		Warning, potential biohazards Attention, risques biologiques potentiels Warnung! Moegliche biologische Giftstoffe Atención, riesgos biológicos Attenzione, rischio biologico

IVD In vitro diagnostic medical device Dispositif médical de diagnostic in vitro Medizinisches In-Vitro-Diagnostikum Dispositivo médico de diagnóstico in vitro Dispositivo medico diagnostico in vitro	Separate collection for electrical and electronic equipment Les équipements électriques et électroniques font l'objet d'une collecte sélective Getrennte Sammlung von Elektro- und Elektronikgeräten Recogida selectiva de aparatos eléctricos y electrónicos Raccolta separata delle apparecchiature elettriche ed elettroniche
Consult instructions for use Consulter la notice d'emploi Gebrauchsanweisung beachten Consultar las instrucciones de uso Consultare le istruzioni per uso	  Laser radiation: Do not stare into beam Rayonnement laser: Ne pas regarder dans le faisceau Laserstrahlung: Nicht in den strahl blicken Radiación de láser: No mire fijamente al rayo Radiazione di laser: Non stare nel fascio

Installation

Package Contents

❖ Part numbers are subject to change. Contact BioTek Customer Care with questions.

Item	Part #
ELx800 Operator's Manual	7331000
Power Cord	varies
Power Supply	01281
Printer Cable	71072
Serial Cable	75034
USB Cable with USB Driver Software	75108 7090204
Dust Cover	7332040
Filter wheel with four standard filters: 405 nm, 450 nm, 490 nm, 630 nm, plus one blank filter. The UV model includes one 340 nm filter.	-

Unpack and Inspect the ELx800

Important! Save all packing materials. If you need to send the reader to BioTek for repair or replacement, use the original packing materials. Using other forms of commercially available packing materials, or failure to follow the packaging instructions at the end of this section, may **void your warranty**.

Unpack the reader and retain the packing materials for future use.

Inspect the shipping box, reader, and accessories for signs of damage.

If the reader is damaged, notify the carrier and your manufacturer's representative. Keep the shipping cartons and packing material for the carrier's inspection. The manufacturer will arrange for repair or replacement of your reader.

Remove the Shipping Hardware

1. Carefully turn the reader upside down on a level surface.
2. Remove four mounting screws to detach the top cover from the base. Set the screws aside.
3. Unhook the shipping straps from the post in the middle of the base.

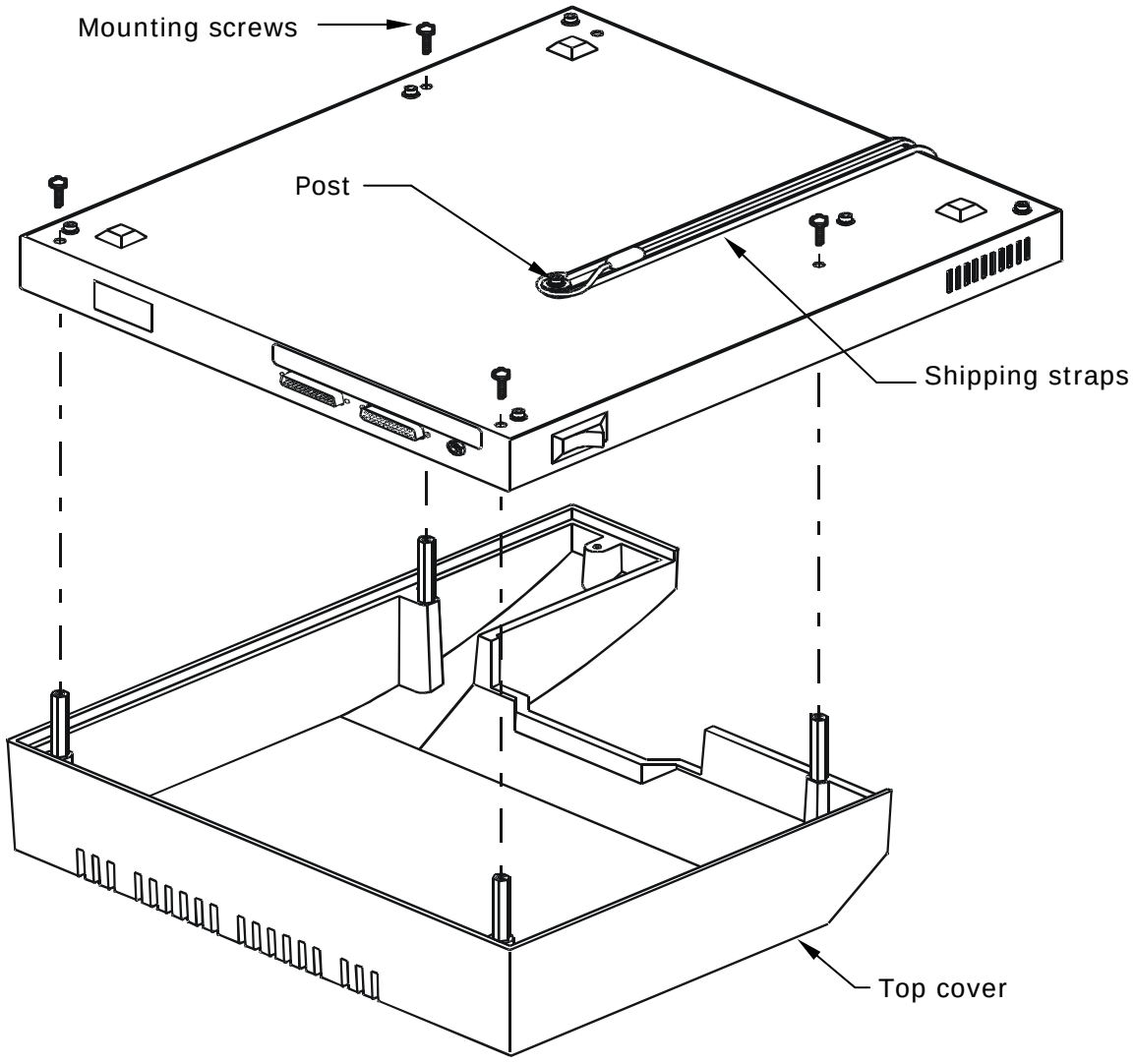


Figure 1: Remove the mounting screws (4)

4. While holding the carrier, turn the reader's base right side up.

5. Remove two mounting screws to detach the shipping block from the base. Store the screws and block with the packaging materials.

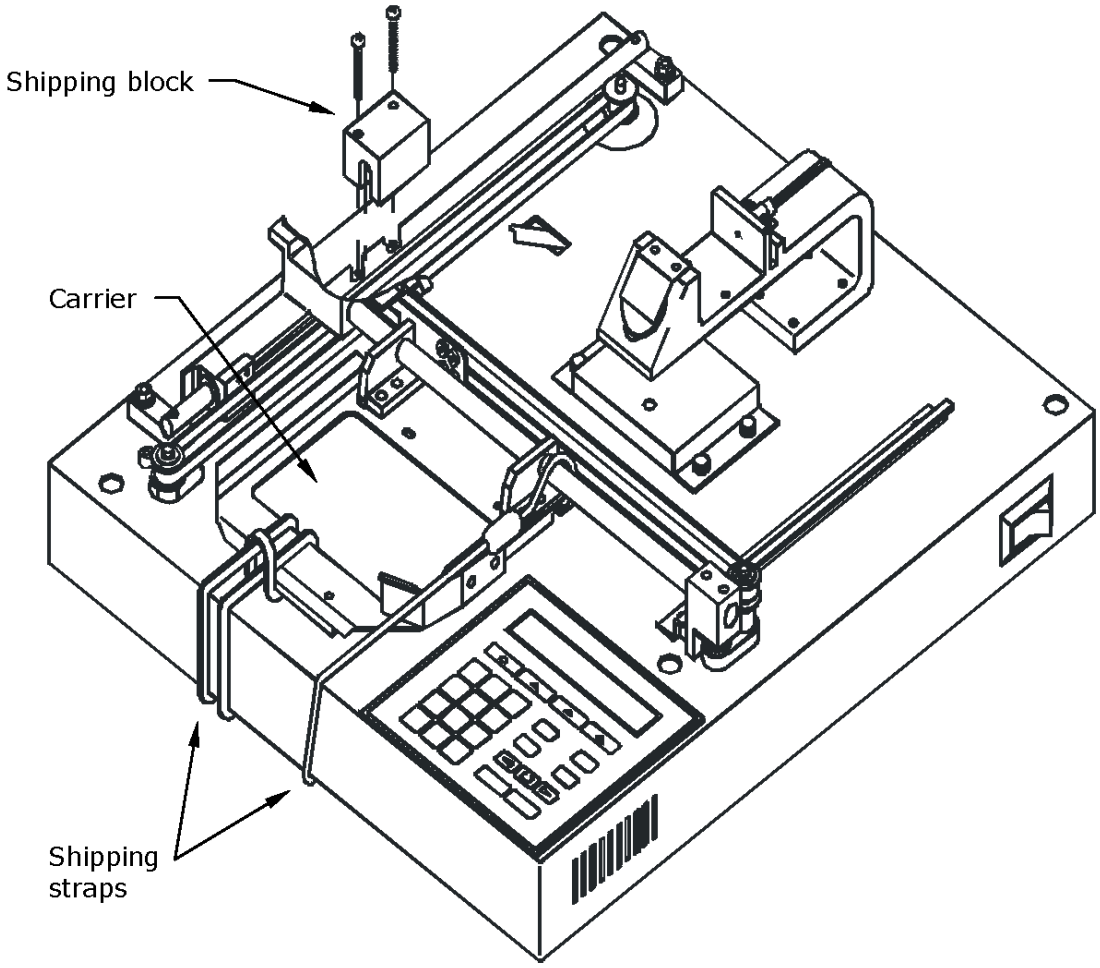


Figure 2: Remove the shipping block

6. Remove the shipping straps from the top of the carrier and store them with the packaging materials.
7. If you need to install additional filters, do so now (see page 20).
8. Place the top cover on the base. While holding the carrier, turn the reader upside down and replace the four mounting screws. When finished, carefully turn the reader right side up.

Set Up the ELx800

Select an Appropriate Location

Install the reader on a level surface in an area where ambient temperatures remain between 18°C (64°F) and 40°C (104°F). The reader is sensitive to extreme environmental conditions; avoid these conditions:

- **Excessive humidity:** Condensation directly on the sensitive electronic circuitry can cause the reader to fail internal self-checks.
- **Excessive ambient light:** Bright sunlight or strong incandescent light can reduce the linear performance range of the reader.
- **Dust:** Optical density readings may be affected by extraneous particles (such as dust) in the microplate wells. A clean work area is necessary to ensure accurate readings.

Install the Power Supply

Caution! Power Supply. Use only the specified power supply to ensure proper operation of the unit. The ELx800 has a universal 24-VDC, 2.1 A power supply that functions from 100 to 240 V~ (± 10.0%) @ 50 to 60 Hz without external switching.

Caution! Electrical Grounding. Never use a plug adapter to connect primary power to the ELx800 power supply. Use of an adapter disconnects the utility ground, creating a severe shock hazard. Always connect the power supply cord directly to an appropriate receptacle with a functional ground.

1. Connect the power cord to the external power supply.
2. Plug the cord into the **Power In** port on the back of the reader, and tighten the nut to secure it.
3. Plug the end of the power cord into an appropriate power receptacle.

Warning! Power Rating. The power supply must be connected to a power receptacle that provides voltage and current within the specified rating for the system. Use of an incompatible power receptacle may produce electrical shock and fire hazards.

Power-Up and Run System Test

After you have installed the ELx800 and connected the power supply, turn on the reader to run a System Test. The on/off switch is located on the lower right side.

If the test passes, a brief **SYSTEM TEST PASS** message will display, and then the main menu will appear (see below). If the test fails, the reader will "beep" and display an error code. If this happens, see the ***ELx800 Operator's Manual*** for a list of error codes.

Following successful power-up, the **Main Menu** appears:

```
READY    01:22PM    07/23/09
READ    DEFINE  REPORT  UTIL
```

Change Global Default Settings (if needed)

BioTek defines certain settings onboard the reader before shipping it. Brief instructions for modifying the default settings are provided below.

To change the Date/format:

1. Select **UTIL > SETUP > DATE**.
2. Select the desired format: **MM/DD/YY** or **DD/MM/YY**.
3. Use the arrow and number keys to change the date, if necessary.

To change the Time/format:

1. Select **UTIL > SETUP > TIME**.
2. Select the desired format: 12 Hour or 24 Hour.
3. Use the arrow and number keys to change the time, if necessary. When using the 12 hour format, use AM/PM option to change the setting.

To change the Output option:

1. Select **UTIL > OUTPUT**.
2. Select Print, Computer or Both to specify where to send the results (only applicable when using the reader in standalone mode).

To change the read-time prompt and read mode options:

1. Select **UTIL > READ**.
2. Select Yes or No and press Enter to proceed through each of the options.

Connect a Printer to the ELx800 (for keypad control)

Connect a printer to the ELx800 **only** if you are running the reader in standalone mode (using the keypad). If you are using BioTek's Gen5 software, skip this step.

To avoid system instability, turn off the reader before connecting the printer.

The ELx800 has a printer port to connect to parallel (Centronics) printers, such as HP Deskjet or Inkjet printers. The port is shown below. Use the parallel cable (PN 71072) provided with the reader.

1. If the reader is on, turn it off.
2. Place the printer near the ELx800.
3. Attach one end of the supplied cable to the printer's parallel port.
4. Attach the other end of the cable to the parallel port on the rear of the ELx800.
5. Tighten the securing screws on both ends of the cable.
6. Plug the power cord into an appropriate power receptical and turn the printer on.

❖ BioTek offers an adapter to connect the reader to a USB-only printer. For a list of compatible printers, use the Search tool at www.biotek.com, or call BioTek's Technical Assistance Center.

Figure 3: Connectors for power supply, printer (parallel), and computer (serial RS232 or USB), located on the reader's rear panel

Install Additional Filters (if needed)

The filters that come with the reader are already installed in the internal, five-position filter wheel. Standard models have 405, 450, 490, and 630 nm filters. The UV model has an additional 340 nm filter.

Keep track of all filter locations. The physical locations of the filters must match the filter locations mapped in the reader's software filter table. The filter wheel must have no empty locations; all locations must be filled with either a filter or a blank plug. **Install all filters with the light direction arrow pointing downward.**

Store unused filters in a cool, dry place away from direct sunlight. The filters can be wrapped in a piece of lens paper to protect them from scratches and dust .

To install additional filters or change the filter locations:

1. Turn off the reader and disconnect the power cord.
2. If you have not already done so, remove the reader's top cover as described on page 15.
3. The filter wheel is inside a small black box (filter wheel cover) directly under the end of the optics arm (see below). Remove the four thumbscrews from the filter wheel cover.
4. The filter wheel sits on a pin and can be lifted off. Remove the filters by turning the wheel upside down over a lint-free cloth. The filters, which are labeled with the **wavelength** and **light direction arrow**, should easily slide out. Handle the filters from the edges. Do not touch the glass portion of the filter. Clean any filters that appear dirty with lens paper and isopropyl alcohol.
5. Once the filters are installed in the wheel, place the wheel back on the pin, making sure it sits flat and meshes with the filter wheel drive gear.
6. Install the filter wheel cover with the four thumbscrews.
7. Reinstall the top cover as described on page 15.
8. Reconnect the power supply and cable.

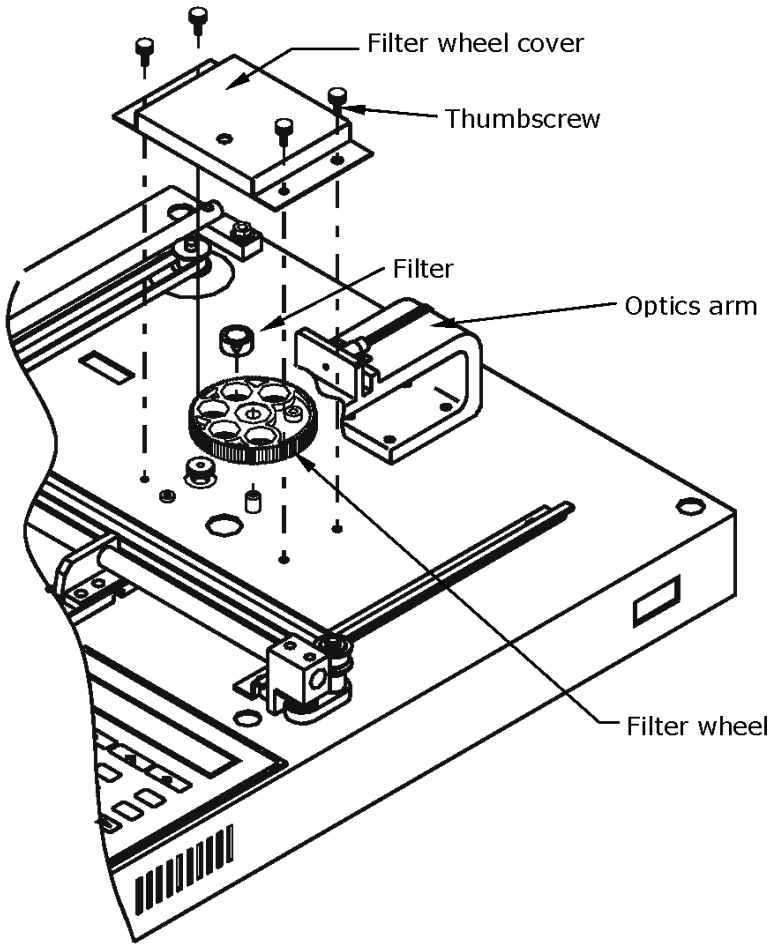


Figure 4: Accessing the filter wheel

Check the Reader's Filter Table

If you installed or moved filters, ensure that the ELx800's filter table (the reader's software reference for filter locations) matches the physical location of the filters. To check or change the software filter table:

1. Turn on the reader and select **UTIL > SETUP > FILTER**.
2. The wavelength for Filter #1 will be displayed. To change a filter wavelength value, use the keypad to enter a number at the cursor location. The cursor will automatically advance to the next editable location. Press the **Enter** key to save the value and move to the next filter.

```
E N T E R
F I L T E R # 1   W A V E L E N G T H : 4 0 5
```

3. After entering the last filter, press the **Main Menu** key to return to the main menu.

Install Software/Connect to Computer (Optional)

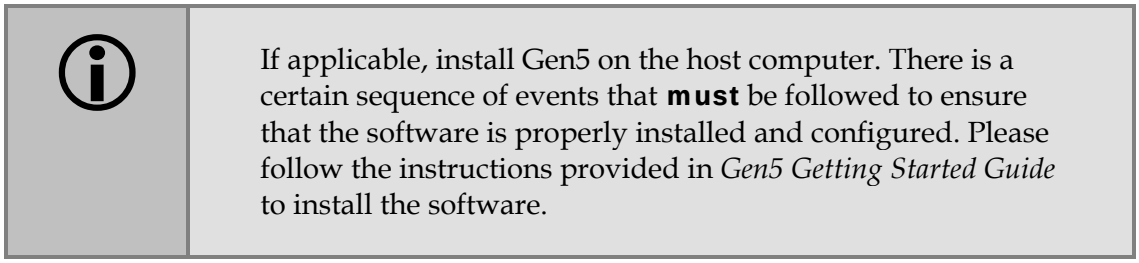
The ELx800 is equipped with two communication ports: Serial (RS-232) and USB. Both ports are located on the back of the reader. The ports allow the reader to communicate with a computer using the BioTek Gen5 software. It also allows for upgrades to the ELx800 basecode (on-board) software.

> ❖ The reader's default communication parameters are: 9600 Baud Rate, 8 Data Bits, 2 Stop Bits, no parity. The baud rate can be changed, however, Gen5 requires 9600. The other settings cannot be changed.

Attach the Cable

- Two communication cables are included in the accessories box. Determine which cable is supported by the host computer.
- Connect one end to the appropriate port on the reader and the other end to the appropriate port on the host computer.

Install Gen5 Software on the Host Computer



If applicable, install Gen5 on the host computer. There is a certain sequence of events that **must** be followed to ensure that the software is properly installed and configured. Please follow the instructions provided in *Gen5 Getting Started Guide* to install the software.

Establish Communication

> ❖ If using the USB cable, refer to the instructions that shipped with the USB Driver Software CD to install the necessary drivers.

1. Start Gen5 and log in if prompted. The default System Administrator password is **admin**.
2. Go to the Gen5 main screen:
   - Gen5 version 2.x users: From the Task Manager, select **Setup > Go to System Menu.**
   - Gen5 version 1.x users: From the Welcome screen, select **System Menu**.
3. Select **System > Instrument Configuration** and click **Add**.
4. Set the Reader Type to **ELx800**.

5. Set the Com Port to the computer's COM port to which the reader is connected.
   - If using the USB cable, the information can be found via the Windows Control Panel, under Ports in the Hardware/Device Manager area of System Properties (e.g., Serial Port (COM5)).
6. Click **Test Comm**. Gen5 attempts to communicate with the reader. If the communication attempt is successful, return to the Gen5 main screen.

   If the communication attempt is **not** successful, see the ***ELx800 Operator's Manual*** for troubleshooting tips.

Repackaging and Shipping Instructions

Refer to the* ELx800 Operator's Manual *for complete instructions for repackaging and shipping the reader.

	**Important!** Failure to properly package the reader increases the likelihood of damage to the reader during shipping. The shipping system stabilizes the reader's mechanical components, which would otherwise be free to move around during shipping. If you need to send the reader to BioTek for service or repair, use the original packing materials. Other forms of commercially available packing materials are not recommended and can **void the warranty**. If the original materials have been damaged or lost, contact BioTek for replacements (PN 7332062).
	**Warning!** If the reader has been exposed to potentially hazardous material, decontaminate it to minimize the risk to all who come in contact with the reader during shipping, handling, and servicing. Decontamination prior to shipping is required by U.S. Department of Transportation regulations.

Getting Started

This section describes how to operate the reader using its keypad. If Gen5 is used to control the reader, refer to the Gen5 Help system for operational and data analysis instructions. Note: To read a 384-well plate, Gen5 software is required. The plate type is selected within the Procedure dialog.

Some readers have custom programmed assays installed. Not all features of the software discussed in this chapter are available on custom instruments. Please contact BioTek's Technical Assistance Center (TAC) if you have any questions about the assays on your reader.

All users should read "Recommendations for Optimum Performance" in the ***ELx800 Operator's Manual***.

The Keypad

Startup Screen

The ELx800 performs a self-test when powered on, displaying the Startup screen until initialization is complete. During this period, no keys are active. Should the instrument fail to pass the self-test, a beep will sound, and an error code will display. Refer to the ***Troubleshooting and Error Codes*** section in the ELx800 Operator's Manual to interpret this code. For further information, please contact BioTek's Technical Assistance Center.

```
Bio-Tek  ELx800
System  Self-Test
```

Main Menu Screen

```
READY      9:45AM    01/31/12
READ   DEFINE  REPORT  UTIL
```

Press the "soft key" that corresponds to a displayed menu option to activate that option:

- **READ** option (or, press the key labeled READ on the keypad) for plate-reading prompts. You will be asked to select from a list of pre-programmed assays.
- **DEFINE** option: Allows the creation of a reading and data reduction protocol. You will be prompted to select an assay from an assay definition list. The device programmer should conduct this step.
- **REPORT** option: Allows printing of results and protocol descriptions. You will be prompted for the name of a previously run assay with valid data.
- **UTIL** option: Includes diagnostic tests, printing, and wavelength settings.

The **DEFINE OPTION** screen allows you to edit the *Method*, *Map, Formula,* or *Curve Fit*.

```
DEFINE:
METHOD  MAP  FORMULA  CURVE
```

Press the soft key beneath the displayed option to access the following functions:

- **SOFT KEY 1: METHOD** allows you to define the method by selecting Endpoint, Delay First Read, Filter Wavelengths Applied, and Microplate Type.
- **SOFT KEY 2: MAP** prompts you to generate a Plate Map after identifying the location of samples, blanks, standards, and controls.

- **SOFT KEY 3: FORMULA** allows you to select Cutoff, Transformation, Assay Validation, and General formulas.
- **SOFT KEY 4: CURVE FIT** allows you to edit and enter Curve Fit Type, Outliers, Axis Identification, and Extrapolation of Unknowns.
- In addition, the **MAIN MENU**, **PREVIOUS SCREEN** and **ENTER** keys are active, allowing you to move back and advance through the menu structure.

Curve Fit Types

The instrument has the following curve fits available to the technical programmer:

- **Linear curve fit:** A simple best-fit straight line is plotted using the values of the standards.
- **Quadratic or "Quad" curve fit:** A curve fit that uses the quadratic equation "$ax^2 + bx + c = y$" to plot the standard's values. Using this curve, any data point for a standard that deviates from the ideal value will not affect the entire curve.
- **Cubic curve fit:** A curve fit that uses the equation "$ax^3 + bx^2 + cx + d = y$" to plot the standard's values. This type of curve fit is affected even less than the quadratic fit when any particular standard has a poor value.
- **2-P (LOGIT/LOG):** A curve fitted to the standard values, which is characterized by a skewed sigmoidal (S-shaped) plot that eventually becomes asymptotic to the upper and lower standard values. The logistic equation is algebraically transformed to a simpler form in which experimentally determined values are used for the responses at concentrations of zero and infinity.
- **Cubic Spline (C-Spline) curve fit:** A piecewise polynomial approximation consisting of joining a set of data points by a series of straight lines (**Point to Point**), which is then smoothed by using a cubic fit.
- **4-Parameter Logistic or "4-P":** A curve fitted to the standard values, which is characterized by a skewed sigmoidal (S-shaped) plot that eventually becomes asymptotic to the upper and lower standard values. The 4 parameters are: Left asymptote, Right asymptote, Slope and Value at the Inflection point. This fit is most recommended for immunoassay data, and is more exact than Logit/Log.
- **Point to Point or "PT to PT":** A plot that connects each standard point with a line, with no averaging of the values to "smooth" the curve at each standard.

Reading a Microplate

Use the **READ** option, found at the Main Menu, to read a microplate.

- From the **MAIN MENU** screen, press the soft key beneath the **READ** menu option to access the **SELECT ASSAY NUMBER** screen, or press the **READ** key on the lower right of the keypad.

Select Assay

At the Select Assay Number screens:

- Use the **NUMERIC** keys to enter the number of any predefined Assay Definition Files stored in the reader's memory, or the **OPTION** key to advance one assay at a time.

```
SELECT ASSAY NUMBER:65
NAME:HBS-AG1
```

- Press **ENTER** to advance to the **RUN-TIME PROMPTS** screen.
- Use **Labeled** keys to move around the reader's menu structure, specify the assay number, or clear the display.
- Press **CLEAR** to clear the reader's LCD.
- Use **ENTER, MAIN MENU,** and **PREVIOUS SCREEN** keys to advance or move back through the menu structure.

Run-Time Prompts

After the assay is selected, you may be prompted for information. Prompts might include:

- The number of samples
- Standard Concentrations
- Assay ID
- Fill Pattern
- Blank Method
- First Well Location
- Replicate Count for each well type
- Wavelength Mode
- Report preferences, etc.

Utility prompts might include:

- Enter number of samples
- Plate ID
- Enter Sample ID

If a **Manual Map** is used, prompts for information might include:

- Well locations for each sample

Enter Number of Samples

You can enter from 00 to the maximum number of samples permitted by the previously created well map.

```
ENTER
NUMBER OF SAMPLES: 20
```

Enter Plate ID

You can enter a 10-character (maximum) identifier to assign to the plate. Since this Plate ID will be stored in the reader's memory, each plate ID should be unique.

```
PLATE ID:
 -       /       :       SPACE
```

- Use the **KEYPAD** to enter numbers, and the **Shift-Letter** sequence, or **OPTION** key to scroll letters.
- Use the **CLEAR** key to clear the display.
- Use the **LEFT** and **RIGHT ARROW** keys to move the cursor to the previous or next editable field.
- Use **SOFT KEYS 1, 2, 3,** and **4** when using alphanumeric characters on the display in the field above the soft key.

Enter Sample ID

You can enter starting sample identification from 0001 to 9999. The software will automatically increment each subsequent sample identification by 1. The sample IDs will be assigned by following the mapping order previously defined.

```
ENTER
SAMPLE ID:
```

- Use the **KEYPAD** to enter numbers, and the **LEFT / RIGHT** arrow keys to move the cursor. **CLEAR** clears the display.

Prompts for Well Location

Well locations can be changed at run time if a Manual Map has been specified, and you have requested a sample count at run time via the Utilities menu.

```
SAMPLE#  1          LOCATION
                    REP#  1:G01
```

- Use the **KEYPAD** to enter the well location. Press the **SHIFT-LETTER** sequence to key in letters, and press **ENTER** to specify the desired location.

Beginning the Plate Read

When the following screen appears on the display, the reader is ready to read a plate:

```
PLACE  PLATE  IN  CARRIER
AND  PRESS  <READ>  KEY
```

- Place the plate in the carrier and press the **READ** key to initiate the plate read. After the plate is read, all requested reports will be generated.
- To halt the read in progress, press the **STOP** key.

Printing Reports and Assay Lists

Reports are automatically generated after a plate has been read. To manually regenerate results reports, use the **REPORT** option from the Main Menu. You can also print Map, Assay, and Assay List reports.

```
PRINT  REPORT:
RESULT  MAP  ASSAY  LIST
```

- Select the **RESULT** option to print an exact copy of results from the plate reading.
- Select **MAP** to print a matrix showing the locations of the Blanks, Standards, Controls, and Samples for a selected assay.
- Select **ASSAY** to print a plate map and a listing of all of the assay's settings, such as wavelengths, numbers of well types, formulas, and curve-fit parameters.
- Select **LIST** to print a list of all assays (name and number) currently programmed in the instrument.

❖ **Note:** The reader stores the last 8 plates in memory.

Result

```
REPORT:HBS-AG
ID:  001        01/31/03
```

- Use the **OPTION** key to select the appropriate Plate ID and Report. Note that the Assay ID will change if the selected Plate ID was read with a different assay. Once you have found the correct Plate ID, press the **ENTER** key.

Printing Results

After the assay is selected and standard outliers are edited (if necessary), the results report can be printed.

```
PRINT RESULTS?
 YES    NO
```

- Press **YES** to print reports, or **NO** to return to the Main Menu.

Map

- Select **REPORT** at the Main Menu, and then select **MAP.**

```
SELECT ASSAY NUMBER:01
NAME:  HBS-AG
```

- Use the keypad to type the assay number, or the **OPTION** key to cycle through the list of available assays. Press **ENTER** to enter the assay and begin printing the map.

Assay

Select **REPORT** at the Main Menu, and then select **ASSAY**.

```
SELECT ASSAY NUMBER:01
NAME:  HBS-AG
```

- Use the keypad to type the assay number, or the **OPTION** key to cycle through a list of available assays. Press **ENTER** to enter the assay and begin printing the map and other assay parameters.

Maintenance

Overview

A daily preventive maintenance routine is the best way to ensure accurate performance and a long life for your instrument. Frequent cleaning of the microplate carrier and all exposed surfaces of the instrument will help to reduce the amount of particulates or dust that can cause erroneous readings.

	**Warning! Internal Voltage**. Always turn off and disconnect the reader from the power supply for all cleaning operations.
	Do not immerse the instrument, spray it with liquid, or use a "wet" cloth. Do not allow the cleaning solution to run into the interior of the reader. If this happens, contact the BioTek Service Department. Do not soak the keypad—this will cause damage. Moisten a clean cloth with deionized or distilled water and wipe the keypad. Dry immediately with a clean, dry cloth. Do not apply lubricants to the microplate carrier or carrier track. Lubrication on the carrier mechanism or components in the carrier compartment will attract dust and other particles, which may obstruct the carrier path and cause the reader to produce an error.

Routine Cleaning Procedure

You will need a mild detergent, deionized or distilled water, and clean, lint-free cotton cloths.

1. Turn off and disconnect the instrument from the power supply.
2. Moisten a clean cotton cloth with water, or with water and the mild detergent. Do not soak the cloth.
3. Wipe the plate carrier and all exposed surfaces of the instrument.
4. If detergent was used, wipe all surfaces with a cloth moistened with water.
5. Use a clean, dry cloth to dry all wet surfaces.

Decontamination Procedure

Any laboratory instrument that has been used for research or clinical analysis is considered a biohazard and requires decontamination prior to handling. Decontamination minimizes the risk to all who come into contact with the instrument during shipping, handling, and servicing. Decontamination is required by the U.S. Department of Transportation regulations. Persons performing the decontamination process must be familiar with the basic setup and operation of the instrument.

	BioTek Instruments, Inc. recommends the use of the following decontamination solutions and methods based on our knowledge of the instrument and recommendations of the Centers for Disease Control and Prevention (CDC). Neither BioTek nor the CDC assumes any liability for the adequacy of these solutions and methods. Each laboratory must ensure that decontamination procedures are adequate for the Biohazard(s) they handle.
	Wear prophylactic gloves when handling contaminated instruments. Gloved hands should be considered contaminated at all times; keep gloved hands away from eyes, mouth, nose, and ears. Eating and drinking while decontaminating instruments is not advised. Mucous membranes are considered prime entry routes for infectious agents. Wear eye protection and a surgical mask when there is a possibility of aerosol contamination. Intact skin is generally considered an effective barrier against infectious organisms; however, small abrasions and cuts may not always be visible. Wear protective gloves when performing the decontamination procedure. The bleach solution is caustic; wear gloves and eye protection when handling the solution.

Tools and Supplies

- Sodium hypochlorite (NaClO, or bleach)
- 70% isopropyl alcohol (as an alternative to bleach)
- Deionized or distilled water
- Safety glasses

- Surgical mask
- Protective gloves
- Lab coat
- Biohazard trash bags
- 125 mL beakers
- Clean, lint-free cotton cloths

Procedure

1. Turn off and unplug the instrument.
2. Prepare an aqueous solution of 0.5% sodium hypochlorite (NaClO, or bleach). As an alternative, 70% isopropyl alcohol may be used if the effects of bleach are a concern.
    - Check the percent NaClO of the bleach you are using; this information is printed on the side of the bottle. Commercial bleach is typically 10.0% NaClO; if this is the case, prepare a 1:20 dilution. Household bleach is typically 5.0% NaClO; if this is the case, prepare a 1:10 dilution.
3. Moisten a cloth with the bleach solution or alcohol. Do not soak the cloth.
4. Wipe the keypad (do not soak). Wipe again with a clean cloth moistened with deionized or distilled water. Dry immediately with a clean, dry cloth.
5. Wipe the plate carrier and all exposed surfaces of the instrument.
6. Wait 20 minutes. Moisten a cloth with deionized or distilled water and wipe all surfaces of the instrument that have been cleaned with the bleach solution or alcohol.
7. Use a clean, dry cloth to dry all wet surfaces.
8. Discard the used gloves and cloths using a biohazard trash bag and an approved biohazard container.

Filter Storage and Handling

To properly store interference filters during extended periods of non-use, package the filters in a light-tight envelope or container, away from high humidity. This will ensure the longest life for the filters. When handling the filters, keep the surfaces clean from fingerprints and debris by simply wiping with a lens tissue or other lint-free cloth.

Replacing and Aligning the Bulb

The lamp is rated for an average life of 600 hours. The intensity of the lamp will slowly drop over time until the run-time self-check detects a low signal level and the instrument displays an error code. The bulb should be replaced and aligned at this time.

- For standard model readers, order replacement bulb kit PN 7330513.
- For UV and NB model readers, order replacement bulb kit PN 7330516.

The kits contain complete instructions for replacing and aligning the bulb. See the ***ELx800 Operator's Manual*** for replacement and alignment instructions.

Warning! The lamp will be hot immediately after the reader has been shut down. Allow the lamp to cool down for at least 10 minutes before attempting to replace the bulb.

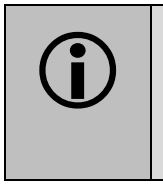
Warning! The alignment procedure requires you to observe the light path while the bulb is turned on. To prevent possible vision impairment, avoid looking directly at the bulb while it is on.

Instrument Testing

Test Procedures

Tests outlined in this section may be used to confirm performance of the ELx800.

- System Self-Test: Verifies proper gain, bulb operation, and low electronic noise.
- Absorbance Plate Test: Confirms the optical accuracy/linearity, repeatability, and alignment of the instrument.
- See the ***ELx800 Operator's Manual*** for additional procedures for testing the reader with liquids.



IMPORTANT! All verification procedures should be run with the ELx800 set to High-Precision or "Regular" (50-second, not "Rapid") read mode.

Accessing Tests and Calibration Using the Utility Option

From the Main Menu screen, press the soft key to select **UTIL**.

```
READY      9:45AM    01/31/12
READ    DEFINE  REPORT  UTIL
```

Test Options

```
SELECT UTILITY OPTION?
TESTS  SETUP  OUTPUT  READ
```

- Press SOFT KEY 1 to select TESTS.

```
SELECT TEST
SYSTEM CHKSUM      CALPLATE
```

"CHKSUM" (Checksum Test)

This test also runs automatically when the reader is powered on. The test compares the software to the internally recorded checksum values to ensure that the software has not been corrupted. If there are any errors during the power-on checksum test, they will be displayed. To verify the checksum, revisions, and version of software currently loaded onto your reader, press SOFT KEY 2 from the Tests submenu.

When the CHKSUM Test is selected, the software versions and the software's checksum appear on the display, as shown in the example below:

Software P/N	**Software Version**
7330202	Version #.##
Code Checksum:	(F#B#)

The second screen shows:

Configuration P/N	**Configuration Version**
7330203	Version #.##

"SYSTEM" (System Self-Test)

The System Self-Test confirms that the light levels and electronic noise at all installed filter wavelengths meet factory acceptance criteria. To accomplish this, the air and dark readings are measured and evaluated to ensure that they fall within specified ranges.

The reader automatically runs an internal System Test each time it is powered on. An error will be displayed if the power-on System Test fails. No printout will occur at the power-on System Test. To obtain a printout of the System Test values for either periodic testing and documentation or troubleshooting, press **SOFT KEY 1** from the Tests submenu. Results print in a pass/fail format using the printer attached to the reader.

Photodiodes

The Optics portion of the System Self-Test confirms that the reading channels have adequate signal range without saturating the electronics.

Light Bulb

The Optics test also indicates if the light bulb is within operational limits.

Operator ID:_____

Notes: 185812

_____

08:28AM 01/24/03 SYSTEM SELF TEST

Filter: 405 Gain: 9.85
Air: 54895
Dark: 1064
Delta: 53831

Filter: 450 Gain: 2.51
Air: 54759
Dark: 1068
Delta: 53691

Filter: 490 Gain: 2.56
Air: 54863
Dark: 1067
Delta: 53796

Filter: 630 Gain: 1.98
Air: 54606
Dark: 1068
Delta: 53538

Noise Max: 1052
Noise Min: 1048
Delta: 4

AUTOCAL ANALYSIS

Upper Left Corner: x= 9090 y=10760
Lower Left Corner: x= 9082 y=16280
Lower Right Corner: x= 412 y=16282
Upper Right Corner: x= 416 y=10762
Delta 1: 9090 - 9082= +8
Delta 2: 416 - 412= +4
Delta 3: 10762 -10760= +2
Delta 4: 16282 -16280= +2

SYSTEM TEST PASS

Sample System Self-Test Report

Absorbance Plate Test

The Absorbance Plate Test, also referred to as the Universal or Calibration Plate Test, compares the reader's optical density measurements and mechanical alignment to NIST-traceable values. Accuracy/linearity, repeatability, and alignment are tested. Specific standard calibration values must be entered from the data sheet for each wavelength to be tested.

Entering Absorbance Plate Specifications

Using the Data Sheet provided with the Absorbance Test Plate (Part Number 7260522), enter the calibration values into the reader:

From the Main Menu:

```
READY      9:45AM    01/31/12
READ   DEFINE  REPORT  UTIL
```

- Select **UTIL.**

```
SELECT  UTILITY  OPTION:
TESTS  SETUP  OUTPUT  READ
```

- Select **SETUP.**

```
EDIT  SETUP  INFORMATION:
 DATE   TIME  FILTER  *MORE
```

- Select **MORE.**

```
EDIT  SETUP  INFORMATION:
RS232     CALPLATE     *MORE
```

- Select **CALPLATE**.

```
CALIBRATION  FILTER:  405
 405     450     490     630
```

- Press the soft key beneath the desired filter wavelength to select it and then press the **ENTER** key.

```
WAVELENGTH:405  WELL:C01
CALIBRATION  VALUE:0.139
```

- Refer to the Data Sheet. Enter the absorbance value associated with the selected wavelength for the displayed well location.
- After each entry, press **ENTER** to advance to the next consecutive well location.
- Repeat for the remaining filter wavelengths.
- When all calibration values have been entered, press the Main Menu key.

Running the Absorbance Plate Test

From the reader's **Main Menu** display:

- Press **UTIL.**
- Press **TESTS.**
- Select **CALPLATE.**

```
SELECT  TEST?
SYSTEM  CHKSUM       CALPLTE
```

```
CALIBRATION  FILTER:  405
  405      450      490      630
```

- The test is run using one filter wavelength. Select the desired wavelength from the **CALIBRATION FILTER** screen.
- When prompted, insert the calibration plate into the Automated Microplate Reader's plate carrier, and press the **READ** key to begin the calibration program.
- The Analysis Report will be sent to a printer when the test is run.

CALIBRATION PLATE ANALYSIS

08:29AM 01/24/03 Read Mode:Normal Filter: 405

Operator ID:_____

Notes: 185812

Alignment Results

B02=0.000 PASS	B12=0.002 PASS	G01=0.000 PASS	G11=0.001 PASS

Accuracy Results

	C01	D04	E02	F05	G03	H06
STANDARD	0.150	2.897	0.637	2.227	1.148	1.708
DATA	0.151	2.884	0.633	2.228	1.144	1.691
RESULT	PASS		PASS		PASS	PASS

Repeatability Results

	C01	D04	E02	F05	G03	H06
READ 1	0.151	2.884	0.633	2.228	1.144	1.691
READ 2	0.151	2.873	0.633	2.224	1.144	1.691
RESULT	PASS		PASS		PASS	PASS

Sample Absorbance Test Report

IMPORTANT! The ELx800 Absorbance Plate is used to test the accuracy and repeatability specifications from 0.000 to 2.000 OD only. The Calibration Plate Analysis report displays the OD value read in well position D04 (in this example), but does not indicate PASS or FAIL, because the value is higher than 2.000 OD and therefore is not within the software test range.

The Absorbance Report has the following parameters:

- **Alignment**: This portion of the test measures the alignment of the microplate carrier with the optical path. A reading of > 0.015 represents an out-of-alignment condition. Wells B02, B12, G01, and G11 are the only valid alignment holes for the reader on the part no. 7260522 absorbance test plate.
- **Accuracy/Linearity**: Accuracy is a measure of the absorbance (optical density) of Plate wells C01, D04, E02, F05, G03 and H06 compared to known standard values contained in the Data Sheet that accompanies each Absorbance plate. If the accuracy specifications are met, then the reader also proves to be linear.

- **Repeatability**: This parameter is a measure of the instrument's ability to read the same well with minimum variation between two reads with the well in the same location.

Test Failures

If any of the test parameters report as "FAIL", confirm that the standard values on the test plate data sheet match the values on the printout. If you find an error, correct and retest. If the test still fails, please contact BioTek's Technical Assistance Center. Refer to the *Preface* for contact information. Please have a copy of the test and the reader's serial number available when you call.

Specifications

Specifications

All Models

Light Source:	Tungsten gas-filled bulb
Dimensions:	42 cm x 38 cm x 18 cm (16.5" deep x 15" wide x 7" tall)
Weight:	8 kg (18.5 lb. maximum)
Environment:	Operating temperature 18° to 40°C (64° to 104°F)
Humidity:	10% to 85% noncondensing
Power Supply:	Input 100 to 240 V~ ± 10.0% @ 50 to 60 Hz Output +24 VDC, 2.1 A

Standard Model

Wavelength Range:	400 to 750 nm
Filters:	10 nm half-bandwidth interference filters. User-accessible filter wheel. Up to 5 filters may be installed on the instrument at one time. Filters supplied: 405, 450, 490, and 630 nm.

The following specifications apply to 96-well, flat- or round-bottom plates, single-wavelength measurements with a 50-second read (normal read mode):

Absorbance Measurement Range: 0.000 to 3.000 OD

Accuracy:	± 1.0% ± 0.010 OD from 0.000 to 2.000 OD @ 405 nm
Linearity:	± 1.0% from 0.000 to 2.000 OD at 405 nm ± 3.0% from 2.000 OD to 3.000 OD @ 450 nm
Repeatability (STD):	± 0.5% ± 0.005 OD from 0.000 to 2.000 OD @ 405 nm

The following specifications apply to 96-well, flat- or round-bottom plates, single-wavelength measurements with a 30-second read (rapid read mode):

Absorbance Measurement Range: 0.000 to 3.000 OD

Accuracy:	± 2.0% ± 0.020 OD from 0.000 to 2.000 OD @ 405 nm
Linearity:	± 2.0% from 0.000 to 2.000 OD @ 405 nm
Repeatability (STD):	± 1.0% ± 0.010 OD from 0.000 to 2.000 OD @ 405 nm

Ultraviolet/UV Model

Wavelength Range: 340 to 750 nm

Filters: 10 nm half-bandwidth interference filters.

User-accessible filter wheel. Up to 5 filters may be installed on the instrument at one time.

Filters supplied: 340, 405, 450, 490, and 630 nm.

The following specifications apply to 96-well, flat- or round-bottom plates:

Optical specifications for 400-750 nm range (50-second read in normal read mode):

Absorbance Measurement Range: 0.000 to 3.000 OD

Accuracy: ± 1.0% ± 0.010 OD from 0.000 to 2.000 OD @ 405 nm

Linearity: ± 1.0% from 0.000 to 2.000 OD @ 405 nm
± 3.0% from 2.000 to 3.000 OD @ 450 nm

Repeatability (STD): ± 0.5% ± 0.005 OD from 0.000 to 2.000 OD @ 405 nm

Optical specifications for 340-400 nm range (50-second read in normal read mode):

Absorbance Measurement Range: 0.000 to 2.000 OD

Accuracy: ± 2.0% ± 0.010 OD from 0.000 to 2.000 OD @ 340 nm

Linearity: ± 2.5% from 0.000 to 2.000 OD @ 340 nm

Repeatability (STD): ± 1.5% ± 0.005 OD from 0.000 to 2.000 OD @ 340 nm

Optical specifications for 400-750 nm range (30-second read in rapid read mode):

Absorbance Measurement Range: 0.000 to 3.000 OD

Accuracy: ± 2.0% ± 0.020 OD from 0.000 to 2.000 OD @ 405 nm

Linearity: ± 2.0% from 0.000 to 2.000 OD @ 405 nm

Repeatability (STD): ± 1.0% ± 0.010 OD from 0.000 to 2.000 OD @ 405 nm

Optical specifications for 340-400 nm range (30-second read):

Absorbance Measurement Range: 0.000 to 2.000 OD

Accuracy: ± 2.5% ± 0.020 OD from 0.000 to 2.000 OD @ 340 nm

Linearity: ± 2.5% from 0.000 to 2.000 OD @ 340 nm

Repeatability (STD): ± 2.0% ± 0.010 OD from 0.000 to 2.000 OD @ 340 nm

Narrow Beam / NB Model

Filters: 10 nm half-bandwidth interference filters.

User-accessible filter wheel. Up to 5 filters may be installed on the instrument at one time.

Filters supplied: 405, 450, 490, and 630 nm.

The following specifications apply to 96-well, flat- or round-bottom plates with a 50-second read (normal read mode).

Absorbance Measurement Range: 0.000 to 3.000 OD

Accuracy:	± 1.0% ± 0.010 OD from 0.000 to 2.000 OD @ 405 nm
Linearity:	± 1.0% from 0.000 to 2.000 OD @ 405 nm ± 3.0% from 2.000 to 3.000 OD @ 450 nm
Repeatability (STD):	± 0.5% ± 0.005 OD from 0.000 to 2.000 OD @ 405 nm

---

The following specifications apply to 96-well, flat- or round-bottom plates with a 30-second read (rapid read mode).

Absorbance Measurement Range: 0.000 to 3.000 OD

Accuracy:	± 2.0% ± 0.020 OD from 0.000 to 2.000 OD @ 405 nm
Linearity:	± 2.0% from 0.000 to 2.000 OD @ 405 nm
Repeatability (STD):	± 1.0% ± 0.010 OD from 0.000 to 2.000 OD @ 405 nm

---

The following specifications apply to a 384-well plate. The minimum volume of fluid in a well to obtain the specified performance is 80 microliters. The specifications apply to the dual wavelength mode of read only.

Absorbance Measurement Range: 0.000 to 3.000 OD

Normal Read Mode:	Dual wavelength (4 minutes, 45 seconds)
Accuracy:	± 2.0% ± 0.020 OD from 0.000 to 2.000 OD @ 405 nm
Linearity:	± 2.5% from 0.000 to 2.000 OD @ 405 nm
Repeatability (STD):	± 1.5% ± 0.010 OD from 0.000 to 2.000 OD @ 405 nm
Rapid Read Mode:	Dual wavelength (3 minutes, 25 seconds)
Accuracy:	± 2.5% ± 0.020 OD from 0.000 to 2.000 OD @ 405 nm
Linearity:	± 2.5% from 0.000 to 2.000 OD @ 405 nm
Repeatability (STD):	± 2.0% ± 0.010 OD from 0.000 to 2.000 OD @ 405 nm