Synergy LX

Multi-Mode Microplate Reader

User Manual

ERRATA NOTICE: This document contains references to BioTek. Please note that BioTek is now Agilent. For more information, go to www.agilent.com/lifesciences/biotek.

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BioTek Instruments, Inc.

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Contents

Notices

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Santa Clara, CA 95051

Worldwide Sales and Support

www.agilent.com/en/contact-us/page

Technical Support and Service

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bio.tac@agilent.com

Instrument service and repair is available worldwide at one of our international service centers and in the field at your location.

UK Responsible Person (UKRP)

Agilent LD UK Ltd
5500 Lakeside
Cheadle Royal Business Park
Cheadle, Cheshire SK8 3GR

Intended Use Statement

The Synergy LX is a multi-mode microplate reader and intended to be used for the examination of specimens to analyze their characteristics and impact on a variety of analytes.

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.

Warranty and Product Registration

Review the warranty information that shipped with your product. Register your product to ensure you receive important information updates about the products you have purchased.

Safety Notices

Raadpleeg Bijlage D voor informatie in andere talen.

Reportez-vous à l'annexe D pour obtenir des informations dans d'autres langues.

Informationen in anderen Sprachen finden Sie in Anhang D.

Fare riferimento all'Appendice D per informazioni in altre lingue.

Consulte el Apéndice D para obtener información en otros idiomas.

Pay special attention to the following safety notices in all product documentation.

WARNING A WARNING notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do no proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

CAUTION A CAUTION notice denotes a hazard. It calls attention to an operating procedure, practice, pr the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a CAUTION notice until the indicated conditions are fully understood and met.

Warnings and Precautions

Electrical Hazards

WARNING **Internal Voltage.** Always turn off the power switch and unplug the power supply before cleaning the outer surface of the instrument.

WARNING **Power Rating.** The instrument's power supply or power cord 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.

CAUTION **Power Supply.** Use only the power supply shipped with the instrument, and operate it within the range of line voltages listed on it.

Chemical/Environmental

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. Always wear safety glasses and appropriate protective equipment, such as chemical-resistant rubber gloves and apron.

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, stop the program and turn off the instrument. Wipe up all spills immediately. Do not operate the instrument if internal components have been exposed to fluid.

CAUTION

Liquids. Do not immerse the instrument, spray it with liquid, or use a dripping-wet cloth on it. Do not allow water or other cleaning solution to run into the interior of the instrument. If this happens, contact Technical Support. Do not soak the touchscreen.

CAUTION

Environmental Conditions. Do not expose the instrument to temperature extremes. For proper operation, temperature near the instrument should remain within the range in the ***Specifications*** section of this document. Performance may be adversely affected if temperatures fluctuate above or below this range

CAUTION

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

CAUTION

Lubricants. Do not apply lubricants to moving parts. Lubricant on components in the carrier compartment will attract dust and other particles, which may cause the instrument to produce an error.

Components

WARNING

Hot Surface. The lamp assembly is hot when the instrument is turned on. Turn off the reader and allow the bulb to cool for at least 15 minutes before attempting to replace it.

WARNING

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

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

CAUTION **Filter Cube (F models).** The reader's internal filter cube table must exactly match the contents of the installed filter cube. Gen5 users: The Gen5 software filter cube table must exactly match the contents of the filter cube.

If you exchange the filter cube or modify its contents, you must update the filter cube table(s).

The filter cube is accessed through a hinged door in the front of the instrument. Do not open the door to access the filter cube during instrument operation! Doing so may result in invalid data.

CAUTION **Touchscreen.** Use your fingertip to operate the touchscreen. Do not use a sharp stylus or pencil on the touchscreen. Doing so will damage the touchscreen's surface. You can use a stylus designed for resistive touchscreens.

CAUTION **Touchscreen.** Avoid strong solvents, such as alcohol, acetone, ammonium chloride, methylene chloride, and hydrocarbons. These will permanently damage the touchscreen. Avoid fibrous materials, such as paper towels, which can scratch the touchscreen. Dirt particles and cleaning agents will get trapped in the scratches. Never spray solutions directly on the touchscreen.

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

Intended Product Use

WARNING **Software Quality Control.** The operator must follow the manufacturer's assay package insert when modifying software parameters and establishing reading methods. 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.

WARNING **Data Reduction.** No limits are applied to the raw measurement data. Data exported via computer control must be analyzed by the operator. The performance characteristics of the data reduction software have not been established with any laboratory diagnostic assay. Users must evaluate this instrument and 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.

WARNING **Unspecified Use.** Failure to operate equipment according to the guidelines and safeguards specified in the product user documentation could result in a hazardous condition.

CAUTION Use of labware other than described in this document can result in positioning errors during program execution.

Symbols

Veiligheidssymbolen

Symboles de sécurité

Sicherheitssymbole

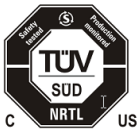
Simboli di sicurezza

Símbolos de seguridad

	Caution, consult the instructions for use for important cautionary information such as warnings and precautions Voorzichtig, raadpleeg de gebruiksaanwijzing voor belangrijke voorzorgsinformatie zoals waarschuwingen en voorzorgsmaatregelen Attention, pour des informations de mise en garde importantes telles que des avertissements et des précautions, consultez le mode d'emploi. Achtung, lesen Sie die Gebrauchsanweisung für wichtige Vorsichtshinweise wie Warnungen und Sicherheitsvorkehrungen Attenzione, consultare le istruzioni per l'uso per importanti informazioni cautelative come avvertenze e precauzioni Precaución, consulte las instrucciones de uso para obtener información importante, como advertencias y precauciones
	Warning; Biological hazard Waarschuwing; biologisch gevaar Avertissement : Risque biologique Warnung; biologische Gefahr Avvertenza, rischio biologico Advertencia: peligro biológico

	Warning; Pinch hazard Waarschuwing; beknellingsgevaar Avertissement : risque de pincement Warnung; Quetschgefahr Avvertenza, rischio di pizzicamento Advertencia: peligro de atrapamiento
	Warning; Hot surface Waarschuwing; heet oppervlak Avertissement : surface chaude Warnung; heiße Oberfläche Avvertenza, superficie molto calda Advertencia: superficie caliente

	Disposal Notice: Dispose of the instrument according to Directive 2012/19/EU, “on waste electrical and electronic equipment (WEEE)” or local ordinances Kennisgeving van verwijdering: Verwijder het instrument volgens Richtlijn 2012/19/EU betreffende afgedankte elektrische en elektronische apparatuur (AEEA) of lokale verordeningen Avis concernant la mise au rebut : mettez l'instrument au rebut conformément à la directive 2012/19/EU portant sur les déchets d'équipement électrique et électronique (DEEE) ou aux dispositions locales. Entsorgungshinweis: Entsorgen Sie das Gerät gemäß der Richtlinie 2012/19/EU „für Elektro- und Elektronik-Altgeräte (WEEE)“ bzw. den Landesvorschriften. Avviso per lo smaltimento: smaltire lo strumento in base alla Direttiva 2012/19/EU, sui "rifiuti di apparecchiature elettriche ed elettroniche (WEEE)" o le ordinanze locali Aviso de eliminación: elimine el instrumento de conformidad con la Directiva 2012/19/UE sobre residuos de aparatos eléctricos y electrónicos (RAEE) o las ordenanzas locales

CE	CE Marking CE Marking – Indicates compliance with the requirements of the Directive 2014/30/EU on Electromagnetic Compatibility and the Directive 2014/35/EU on Low Voltage CE-markering – Geeft aan dat wordt voldaan aan de vereisten van Richtlijn 2014/30/EU inzake elektromagnetische compatibiliteit en Richtlijn 2014/35/EU inzake laagspanning Marquage CE – Indique la conformité aux exigences de la directive 2014/30/UE sur la compatibilité électromagnétique et de la directive 2014/35/UE sur la basse tension CE-Kennzeichnung – Zeigt die Einhaltung der Anforderungen der Richtlinie 2014/30/EU über elektromagnetische Verträglichkeit und der Richtlinie 2014/35/EU über Niederspannung Marcatura CE – Indica la conformità ai requisiti della Direttiva 2014/30/UE sulla Compatibilità Elettromagnetica e della Direttiva 2014/35/UE sulla Bassa Tensione Marcado CE: indica el cumplimiento de los requisitos de la Directiva 2014/30 / UE sobre compatibilidad electromagnética y la Directiva 2014/35 / UE sobre baja tensión.
	Date of manufacture Productiedatum Date de fabrication Herstellungsdatum Data di produzione Fecha de fabricación
	TÜV SÜD Certification Mark – Type tested; production monitored TÜV SÜD certificeringsmerk - type getest; productie bewaakt TÜV SÜD Marque de certification – Type testé ; production contrôlée TÜV SÜD-Prüfzeichen – Typ geprüft; Produktion überwacht Marchio di certificazione TÜV SÜD: tipo testato, produzione monitorata Marca de certificación TÜV SÜD: tipo probado, producción controlada

	This product complies with environmental protection use period as defined in People's Republic of China Electronic Industry Standard SJ/T11364-2006. Toxic or hazardous substances will not leak or mutate under normal operating conditions for 40 years. Dit product voldoet aan de milieubeschermingsgebruiksperiode zoals gedefinieerd in de Electronic Industry Standard SJ/T11364-2006 van de Volksrepubliek China. Giftige of gevaarlijke stoffen zullen onder normale bedrijfsomstandigheden gedurende 40 jaar niet lekken of muteren. Ce produit est conforme à la période d'utilisation dans le cadre de la protection de l'environnement telle que définie par la norme de l'industrie électronique de la République populaire de Chine SJ/T11364-2006. Les substances toxiques ou dangereuses ne fuiront pas ou ne subiront pas de mutation dans des conditions de fonctionnement normales pendant 40 ans. Dieses Produkt entspricht der Umweltschutz-Nutzungsdauer gemäß der Definition im Electronic Industry Standard SJ/T11364-2006 der Volksrepublik China. Giftige oder gefährliche Stoffe werden unter normalen Betriebsbedingungen 40 Jahre lang nicht austreten oder mutieren. Questo prodotto è conforme al periodo di utilizzo della protezione ambientale come definito nello Standard del settore elettronico della Repubblica Popolare Cinese SJ/T11364-2006. Le sostanze tossiche o pericolose non fuoriescono o non subiscono mutazioni in condizioni operative normali per 40 anni. Este producto cumple con el periodo de uso de protección ambiental según el estándar SJ/T11364-2006 de la República Popular China para la industria electrónica. Las sustancias tóxicas o peligrosas no se filtrarán ni mutarán en condiciones de funcionamiento normales durante 40 años.

UKCA	UK Conformity Assessed marking is a certification mark that indicates conformity with the applicable requirements for products sold within Great Britain. De 'UK Conformity Assessed'-markering is een certificeringsmerk dat aangeeft dat producten die in Groot-Brittannië worden verkocht, voldoen aan de toepasselijke eisen. Le marquage UK Conformity Assessed est une marque de certification qui indique la conformité aux exigences applicables aux produits vendus en Grande-Bretagne. Die Kennzeichnung „UK Conformity Assessed“ ist ein Zertifizierungszeichen, das die Konformität mit den geltenden Anforderungen für in Großbritannien verkaufte Produkte anzeigt. Il marchio UKCA (conformità valutata del Regno Unito) è un marchio di certificazione che indica la conformità ai requisiti applicabili per i prodotti venduti in Gran Bretagna. El marcado UKCA (UK Conformity Assessed) es una marca de certificación que indica la conformidad con los requisitos aplicables para los productos vendidos en Gran Bretaña.

	EAC-MED is a certification mark to indicate products that conform to all the safety and quality requirements of the Eurasian Customs Union. It means that the EAC-MED marked products meet all requirements of the corresponding technical regulations and have passed all conformity assessment procedures. EAC-MED is een certificeringsmerk om producten aan te duiden die voldoen aan alle veiligheids- en kwaliteitseisen van de Euraziatische douane-unie. Dit betekent dat de producten met een EAC-MED-markering aan alle eisen van de desbetreffende technische voorschriften voldoen en alle conformiteitsbeoordelingsprocedures hebben doorlopen. EAC-MED est une marque de certification qui indique la conformité des produits à toutes les exigences de sécurité et de qualité de l'Union douanière eurasiatique. Cela signifie que les produits marqués EAC-MED satisfont à toutes les exigences des réglementations techniques correspondantes et ont passé toutes les procédures d'évaluation de la conformité. EAC-MED ist ein Zertifizierungszeichen zur Kennzeichnung von Produkten, die allen Sicherheits- und Qualitätsanforderungen der Eurasischen Zollunion entsprechen. Das bedeutet, dass die EAC-MED-gekennzeichneten Produkte alle Anforderungen der entsprechenden technischen Bestimmungen erfüllen und alle Konformitätsbewertungsverfahren bestanden haben. EAC-MED è un marchio di certificazione che indica prodotti conformi a tutti i requisiti di sicurezza e qualità dell'Unione doganale eurasiatica. Ciò significa che i prodotti con marchio EAC-MED soddisfano tutti i requisiti dei regolamenti tecnici corrispondenti e hanno superato tutte le procedure di valutazione della conformità. EAC-MED es una marca de certificación para indicar productos que cumplen con todos los requisitos de seguridad y calidad de la Unión Aduanera Euroasiática. Significa que los productos con la marca EAC MED cumplen todos los requisitos de los reglamentos técnicos correspondientes y han superado todos los procedimientos de evaluación de conformidad.

	Product complies with Australian Communications Requirements EESS - The Regulatory Compliance Mark (RCM) ACMA Labeling Requirements Product voldoet aan de Australische communicatie-eisen EESS - De markering voor naleving van de regelgeving (RCM) ACMA-etiketteringsvoorschriften Le produit est conforme aux exigences australiennes en matière de communication EESS - Marque réglementaire de conformité (RCM) Exigences en matière d'étiquetage ACMA Das Produkt entspricht den australischen Kommunikationsanforderungen. EESS – Kennzeichnung „Regulatory Compliance Mark“ (RCM) ACMA-Kennzeichnungsanforderungen Il prodotto è conforme ai requisiti Australian Communications Requirements EESS: marchio di conformità alle normative Requisiti di etichettatura ACMA El producto cumple con los requisitos de comunicaciones de Australia. EESS: marcado RCM (Regulatory Compliance Mark) de cumplimiento de la normativa. Requisitos de etiquetado de ACMA

	Korea Certification (KC) mark signifies Korea product compliance mark for safety and EMC/Radio/SAR of electrical and electronic equipment. The EMC requirements are applied to Agilent products. Korea Certification (KC)-merkteken staat voor Korea-productconformiteitsmerk voor veiligheid en EMC/Radio/SAR van elektrische en elektronische apparatuur. De EMC-eisen worden toegepast op Agilent-producten. La marque de certification coréenne (KC) signifie la marque de conformité des produits coréens pour la sécurité et l'EMC/Radio/SAR des équipements électriques et électroniques. Les exigences CEM s'appliquent aux produits Agilent. Das Korea-Zertifizierungszeichen (KC) bezeichnet das koreanische Produktkonformitätszeichen für Sicherheit und EMV/Funk/SAR von elektrischen und elektronischen Geräten. Die EMV-Anforderungen gelten für Agilent-Produkte. Il marchio Korea Certification (KC) indica il marchio di conformità del prodotto Corea per la sicurezza e EMC/Radio/SAR di apparecchiature elettriche ed elettroniche. I requisiti EMC vengono applicati ai prodotti Agilent. La marca de certificación de Corea (KC) significa la marca de cumplimiento de productos de Corea para la seguridad y EMC / Radio / SAR de equipos eléctricos y electrónicos. Los requisitos de EMC se aplican a los productos Agilent.
	Temperature limit Temperatuur limiet Limite de temperature Temperaturgrenze Limite di temperature Límite de temperatura

	Humidity limitation Vochtigheidsbeperking Limitation d'humidité Feuchtigkeitsbegrenzung Limitazione dell'umidità Limitación de humedad

Conformance to Standards

The Synergy LX meets the requirements of the following standards:

2014/35/EU – Low Voltage Directive

2014/30/EU – EMC Directive

2011/65/EU (with exemptions) and (EU) 2015/863 – RoHS Directives

2012/19/EU – WEEE Directive as amended by (EU) 2018/849

2006/42/EC of the European Parliament and of the Council of 17 May 2006 on machinery

Standard	Description
IEC QC 080000	IEC Quality Assessment System for Electronic Components (IECQ System) - Hazardous Substance Process Management (HSPM) System Requirements
UL 61010-1	UL Standard for Safety Electrical Equipment For Measurement, Control, and Laboratory Use; Part 1: General Requirements
EN 61010-1	Safety Requirements for Electrical Equipment For Measurement, Control, and Laboratory Use – Part 1: General Requirements
EN 61010-2-010	Safety Requirements for Electrical Equipment For Measurement, Control, and Laboratory Use – Part 2-010: Particular requirements for laboratory equipment for the heating of materials
CAN/CSA C22.2 No. 61010-1	Safety Requirements for Electrical Equipment For Measurement, Control, and Laboratory Use – Part 1: General Requirements
CAN/CSA C22.2 No. 61010-2-010	Safety Requirements for Electrical Equipment For Measurement, Control, and Laboratory Use – Part 2-010: Particular requirements for laboratory equipment for the heating of materials

EMC Information and Technical Description

The Synergy LX conforms to:

Emissions:

EN55011/CISPR 11, Class A

CFR Title 47 FCC Part 15 Subpart B, Class A

ICES-001, Issue 5, Class A (CAN ICES-001(A)/NMB-001(A))

ACMA AS/NZS CISPR 11, Class A

Immunity:

EN/IEC 61326-1 and 61326-2-6

ELECTRICAL EQUIPMENT FOR MEASUREMENT, CONTROL AND LABORATORY USE

PART 1: GENERAL REQUIREMENTS FOR (NON IVD) LISTED PRODUCTS

Ingress Protection Code

IP 20. Protected against solid foreign objects of 12.5 mm diameter and greater. No protection against water.

Disposal

Dispose of the instrument according to Directive 2012/19/EU, “on waste electrical and electronic equipment (WEEE)” or local ordinances.

Chapter 1

Introduction

This chapter introduces the Synergy LX and provides contact information for technical assistance.

Product Description

The Synergy LX is a multi-mode microplate reader. It is available in six models that support absorbance and/or fluorescence/luminescence measurements, with or without a built-in touchscreen.

With the touchscreen, endpoint reads and basic data analysis, reporting, and exporting are provided. 96- and 384-well microplates and the Take3 Micro-Volume Plate are supported.

With Gen5 software, read modes include endpoint, kinetic, area scanning, and absorbance spectral scanning, along with support for BioCell, Take3 Trio, and 60-, 72-, and 96-well Terasaki plates. Gen5 also offers extensive data analysis and reporting and exporting capabilities.

Part Number	Absorbance	Fluorescence	Luminescence	Touchscreen
SLXA-SN	•			
SLXF-SN		•	•	
SLXFA-SN	•	•	•	
SLXATS-SN	•			•
SLXFTS-SN		•	•	•
SLXFATS-SN	•	•	•	•

The models with fluorescence capability use a user-replaceable halogen bulb as their light source; models with absorbance capability use a xenon flash bulb. The SLXFA-SN and SLXFATS-SN contain both light sources. Only the halogen bulb is user-replaceable.

Use of labware other than described here can result in positioning errors during program execution.

See **Appendix A, Specifications**, for performance and technical specifications.

Package Contents

Item	Part #
Synergy LX User Manual on USB flash drive	1501000N
Power supply	01281
Power cord	Varies by country
USB cable	75108
Blank USB flash drive (Touchscreen models)	1560531
7/64" hex wrench (for opening bulb access panel)	48169
3/32" hex wrench (for removing shipping screw)	48570
LUM cube (F models)	1505003
Optional accessories per the sales order, unless shipped separately.	

Optional Accessories

Item	Part #
Absorbance Test Plate (400–800 nm)	7260522
Absorbance Test Plate (340 nm)	7260551
Fluorescence Test Plate	1400501
Luminescence Test Plate (Harta Luminometer Reference Microplate) (includes microplate carrier adapter PN 8032028 for Synergy LX)	8030015
Synergy LX Product Qualification (IQ-OQ-PQ) package	1500534N
Take3 Micro-Volume Plate	TAKE3
Take3 Trio Micro-Volume Plate	TAKE3TRIO
BioCell Adapter Plate	7270512
BioCell Quartz Vessel	7272051
Terasaki Adapter Plate	7330531
RP-D10 Seiko thermal printer/power cord (for use with touchscreen models)	02434/varies according to country of use
Halogen replacement lamp kit (fluorescence-capable models)	1500535
Filter cubes, filters, and mirrors	Contact BioTek for part numbers and availability
Gen5 software/upgrade	Contact your local dealer for details

Materials for Conducting Liquid Tests

Manufacturer part numbers are subject to change.

Item	Part #
Absorbance Liquid Tests	
BioTek Wetting Agent Solution	7773002
BioTek QC Check Solution #1 (25 mL)	7120779
BioTek QC Check Solution #1 (125 mL)	7120782
Phosphate-Buffered Saline (PBS) tablets, pH 7.2-7.6	Sigma #P4417
β-NADH Powder (β-Nicotinamide Adenine Dinucleotide, reduced form)	98233 or Sigma #N6785-10VL
Fluorescence Liquid Tests	
Test Kits	
Kit for FI tests using Sodium Fluorescein	7160013
Kit for FI tests using Methylumbelliferone	7160012
Individual Materials	
Sodium Fluorescein Powder, 1-mg vial	98155
Methylumbelliferone, 10-mg vial	98156
Carbonate-Bicarbonate Buffer (CBB) capsules	Sigma #3041
Phosphate-Buffered Saline (PBS) tablets, pH 7.2-7.6	Sigma #P4417
Sodium Borate, pH 9.18	Fisher Scientific #159532, or equivalent

Technical Support

See also **Contact Information** on page 6

Please be prepared to provide the following information:

- Your name and company information, along with a daytime phone or fax number, and/or an e-mail address.
- The product name, model, and serial number (the serial number is located on the right side of the reader).
- The instrument's basecode software part number and version:
    - Via the touchscreen by tapping **Instrument** on the Main Menu. Look for "Code:" in the upper-left corner of the Configuration screen.
    - Via Gen5 for the Synergy LX by selecting **System > Instrument Configuration**, select **Synergy LX**, then click **View/Modify > Setup**, select the **Basecode tab**, and click **Get Basecode Information**
- For troubleshooting assistance or instruments needing repair, the specific steps that produce your problem and any error codes displayed on the touchscreen or in Gen5 (see also **Appendix B, Error Conditions**).
- **Gen5 users:** A text file of the diagnostic history of the instrument (select **System > Diagnostics > History**, then select the appropriate file and click **Export**).

Running a system test when a problem occurs provides valuable information for Technical Support. See **Chapter 6, Instrument Qualification Procedures**, for instructions. When the test is complete, save it from the touchscreen to a USB flash drive or, in Gen5, click **Save As** to save a text file of the system test report, which can be emailed to Technical Support.

If you need to return an instrument to BioTek for service or repair, please contact Technical Support for instructions. Repackage the instrument according to the instructions at the end of **Chapter 2, Installation**.

Chapter 2

Installation

This chapter includes instructions for unpacking and setting up the Synergy LX. Instructions are also included for preparing the reader for shipment.

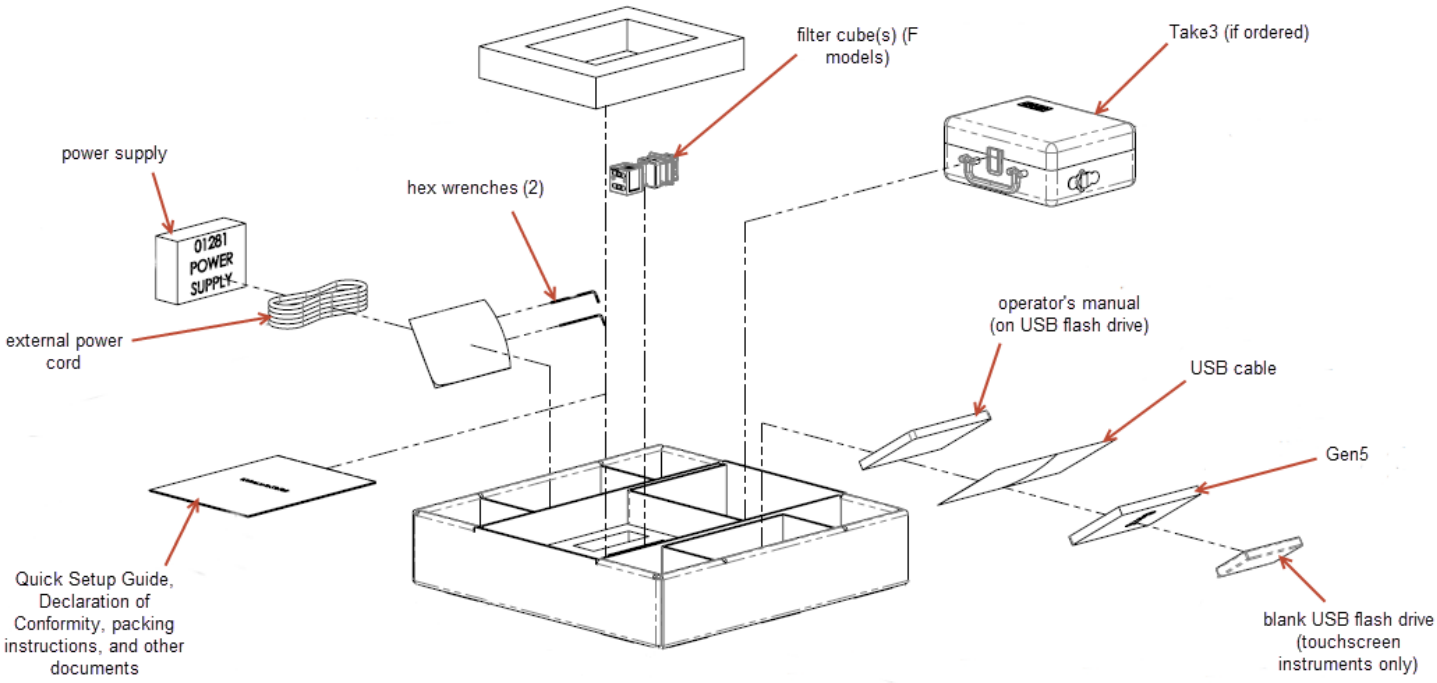
Important Information

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

- This chapter contains installation and setup tasks for the Synergy LX and accessories. Perform the tasks in the order presented.
- Save all packaging materials. Be sure to use packaging materials supplied by the manufacturer when shipping the reader. Using other forms of commercially available packaging, or failing to follow the repackaging instructions, may void your warranty.
- During the unpacking process, inspect the packaging, reader, and accessories for shipping damage. If the reader is damaged, notify the carrier and your BioTek representative. Keep the shipping boxes and the packaging materials for the carrier's inspection.

1. Unpack the Box and See What's Inside

1. Verify that the accessories tray (sample below) contains all of the standard items as well as the optional items that you ordered.

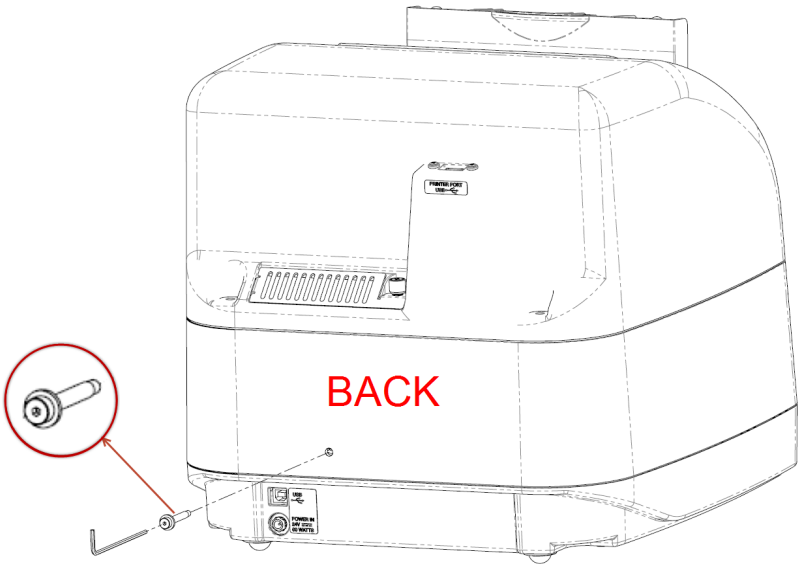


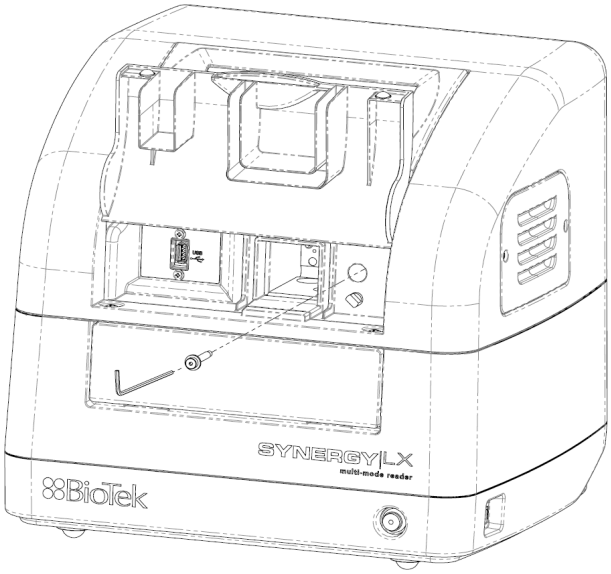
2. Remove the accessories tray and set it aside. Lift the reader out of the box and set it on a stable, level surface. Remove the plastic bag and remove the desiccant pack.
3. Save the box, bag, foam top tray and corner cubes, and accessories tray in case you need to send the reader to BioTek for service.

2. Remove the Shipping Screw and Insert the Light-Blocking Plug

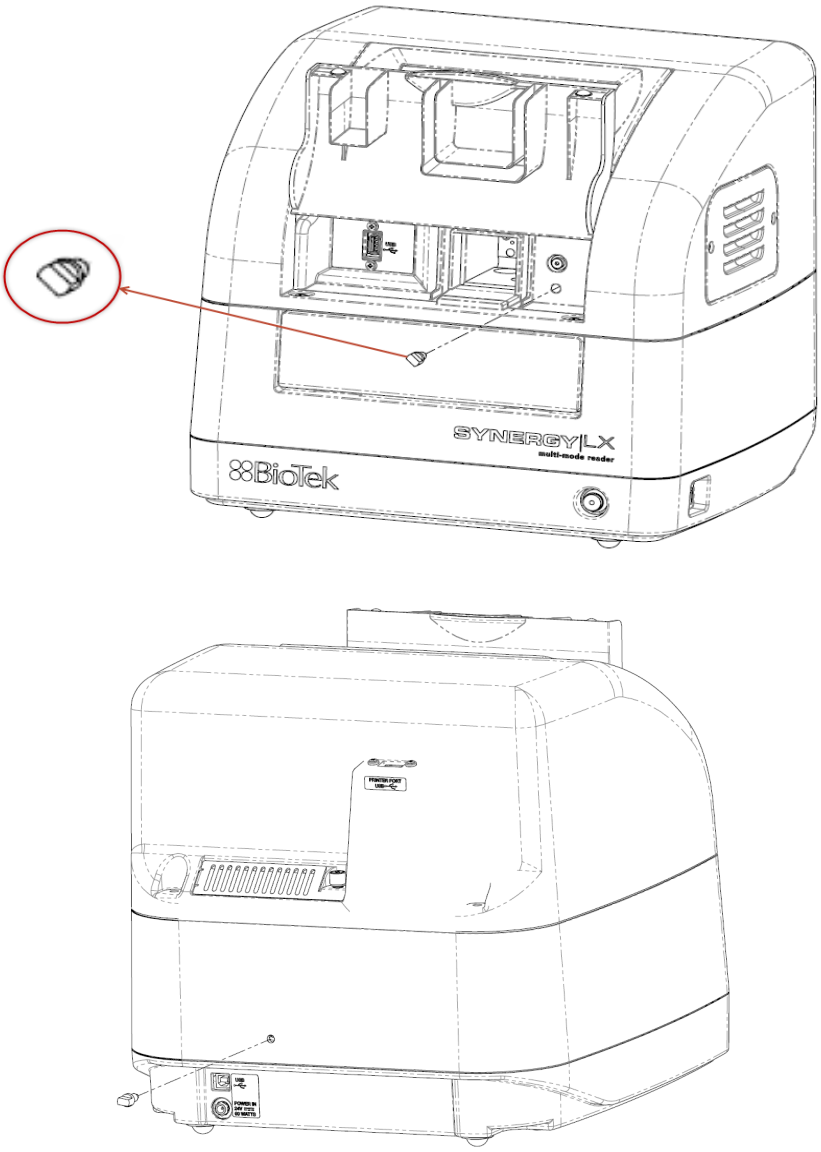
CAUTION **Shipping Hardware.** All shipping hardware must be removed before operating the instrument and reinstalled before repackaging the instrument for shipment.

1. From the back of the reader: Remove the shipping screw. At the front of the reader:
2. Open the upper access door. Insert the shipping screw into its storage location.





3. Below this storage location, remove the rubber light-blocking plug. At the back of the reader: Insert the plug into the hole left open during step 1. Twist to seat.



3. (Gen5 control only) Prepare 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 with Gen5 to install the software and USB driver.

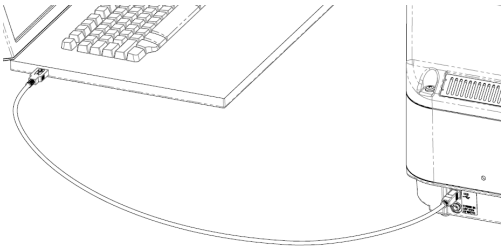
Gen5 software versions 3.11 and higher require Windows 10.

You must have administrator privileges to install Gen5. Log in to Windows as "Administrator" or consult your IT department for assistance.

4. (Gen5 control only) Connect the Host Computer and Reader

The USB cable is supplied in the accessories tray.

For touchscreen models: When the reader is connected to a host computer, the touchscreen is disabled.



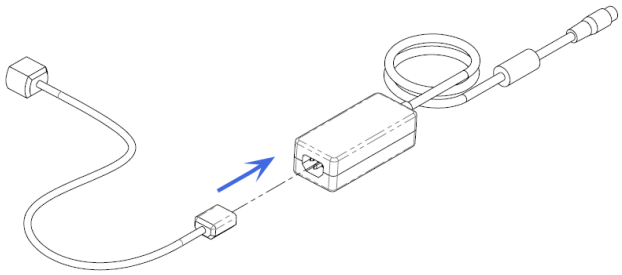
5. Install the Power Supply

WARNING **Power Rating.** The instrument 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

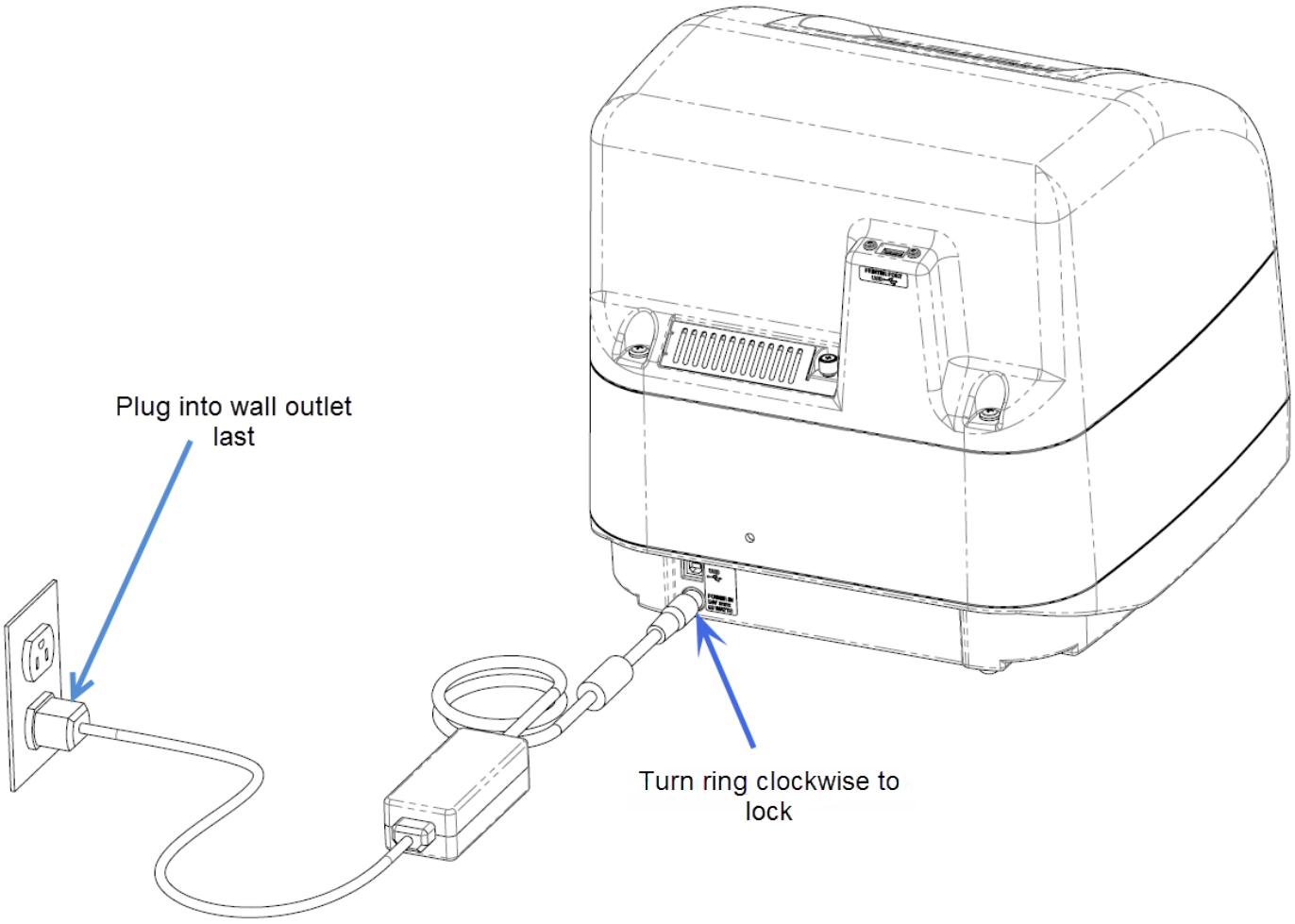
WARNING **Electrical Grounding.** Never use a plug adapter to connect primary power to the instrument. Use of an adapter disconnects the utility ground, creating a severe shock hazard. Always connect the system power cord directly to an appropriate receptacle with a functional ground.

CAUTION **Power Supply.** Use only the power supply shipped with the instrument, and operate it within the range of line voltages listed on it.

1. Locate the power inlet on the back of the reader at the base.
2. Plug the rounded end of the external power supply's cord into the power inlet, and tighten the collar by turning it clockwise.
3. Connect the power cord to the power supply, and plug it into an appropriate power receptacle.



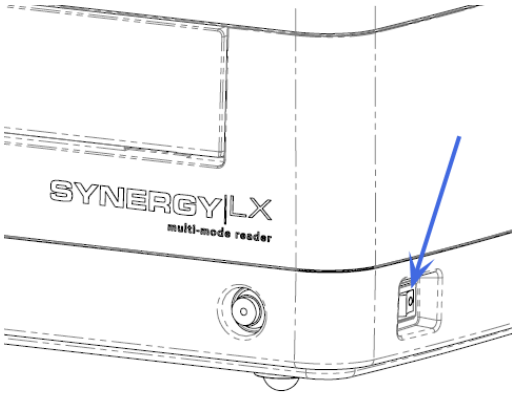
Power cord (left) and power supply (right) are supplied



6. Turn on the Reader and Run the Power-Up System Test

Allow the reader to settle at room temperature before turning it on.

1. On the right side of the reader, at the base, locate the power switch. The reader will perform a power-up system test.



2. If an error message is displayed on the touchscreen or if the instrument is beeping, this indicates a system error. For touchscreen models, refer to **Appendix B**. For models without a touchscreen, continue to the next step to obtain more information using Gen5. If the problem is something you can fix, do so now and run another system test. If the problem is something you cannot fix, or if the test continues to fail, contact Technical Support.
   (Optional) Press the lighted blue button on the front of the reader to store the microplate carrier in its chamber.

7. (Gen5 control only) Start Gen5 and Test Communication

1. Start Gen5.
2. If prompted to add a reader, click **Yes**. Otherwise, select **System > Instrument Configuration > Add Reader**.
3. Select the **Synergy LX** and click **OK**. The reader name and serial number appear. Click on the reader name and then click **Test Communications**. The message, “The reader is communicating!” should appear.
   If the communication attempt is not successful, try the following:

- Is the reader connected to the power supply and turned on?
- Is the communication cable firmly attached to both the reader and the computer?
- Did you select the correct Reader Type in Gen5?
- Try a different COM Port in Gen5 or use Plug & Play.
- Did you install the USB driver software?
- If applicable, is the touchscreen at the Main Menu?

If you remain unable to get Gen5 and the reader to communicate with each other, contact Technical Support.

Operational/Performance Qualification

Your Synergy LX was fully tested at BioTek prior to shipment and should operate properly following the successful completion of the installation and setup procedures described in this chapter.

If you suspect that problems occurred during shipment, if you received the reader back from BioTek following service or repair, or if regulatory requirements dictate that Operational/Performance Qualification is necessary, turn to **Chapter 6, Instrument Qualification**.

A Product Qualification & Maintenance (IQ/OQ/PQ) package for the Synergy LX is available for purchase (PN 1500534N). Contact your local BioTek dealer for more information.

Repackaging and Shipping Instructions

Important! Please read all of the information provided below before preparing the Synergy LX for shipment.

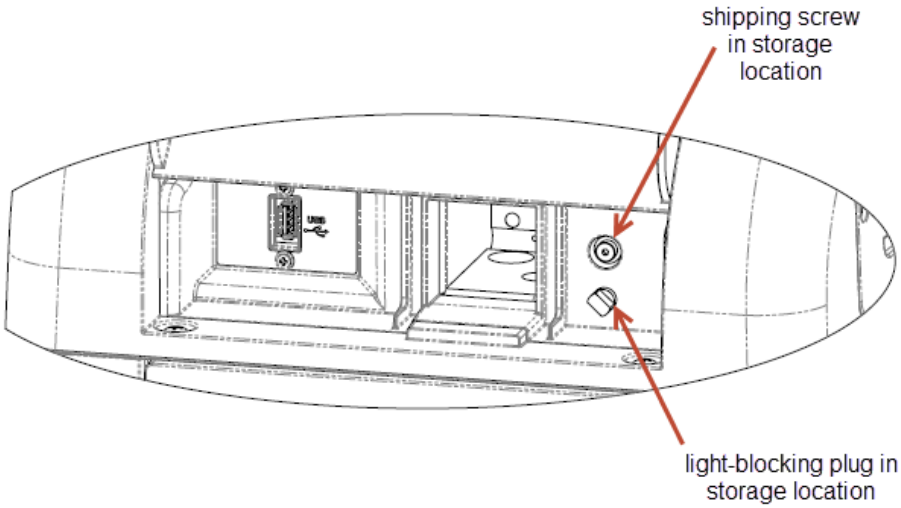
- Contact Technical Support before returning equipment for service.
- Decontamination prior to shipment is required by the U.S. Department of Transportation regulations.
- If the reader has been exposed to potentially hazardous material, decontaminate it to minimize the risk to all who come in contact with the instrument during shipping, handling, and servicing. The Maintenance chapter contains decontamination instructions.
- Ensure the microplate carrier is empty. Spilled fluids can contaminate the optics and damage the instrument.
- Install the shipping hardware (see next section).
- The instrument's packaging design is subject to change. If the instructions in this document do not apply to the packaging materials you are using, contact Technical Support for guidance.
- Be sure to use packaging materials supplied by the manufacturer. Other forms of commercially available packaging are not recommended and can void the warranty.
- If the packaging materials have been damaged or lost, or if the same set has been used more than four times, order replacements.
- If you require a replacement shipping screw, order part number 1500013.

Attach the Shipping Screw

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

For models with fluorescence/luminescence capability, do not ship the reader with the filter cube installed.

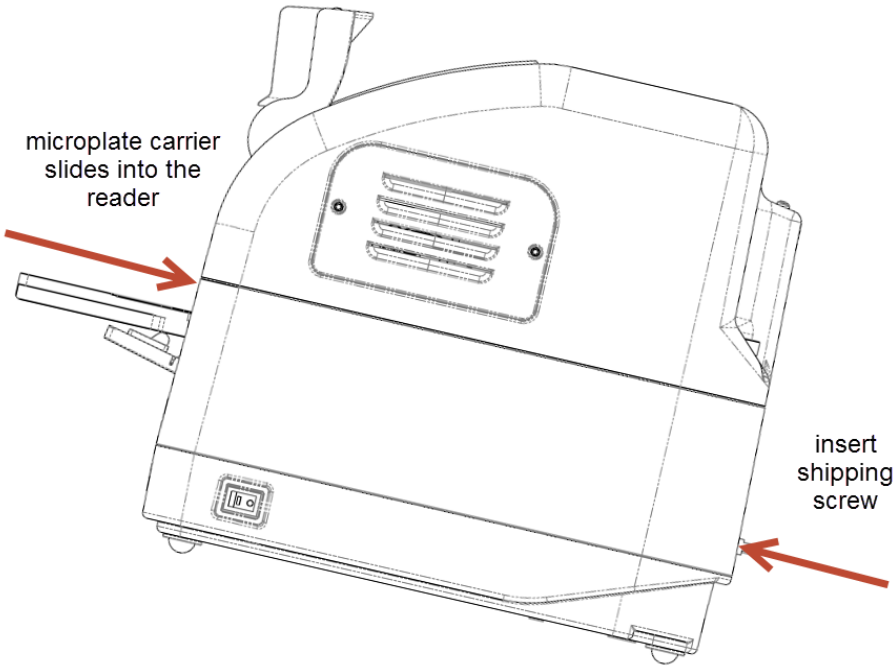
1. With the reader plugged in and powered up, carefully rotate it sideways on the benchtop so you can easily access both the front and back panels.
2. Remove the light-blocking plug from the reader's back panel.
3. Open the reader's front access door and
   - Insert the light-blocking plug into its storage location.
   - Using the supplied 3/32" hex wrench, remove the shipping screw from its storage location. Set it aside for a moment.



4. If the microplate carrier is inside the reader, press the carrier button to extend it.
5. Power off the reader.
6. Without moving the reader, disconnect the power and communication cables.

The next step ensures that a hole in the back of the carrier aligns perfectly with the hole on the back of the reader's case.

7. Tip up the front of the reader until the carrier gently slides to the back of the reader's interior chamber.
8. While holding the front end 2 or 3 inches above the benchtop, insert the shipping screw inside the hole on the reader's back panel. Without pushing against the carrier, twist the screw clockwise until it "catches" the hole in the carrier block.

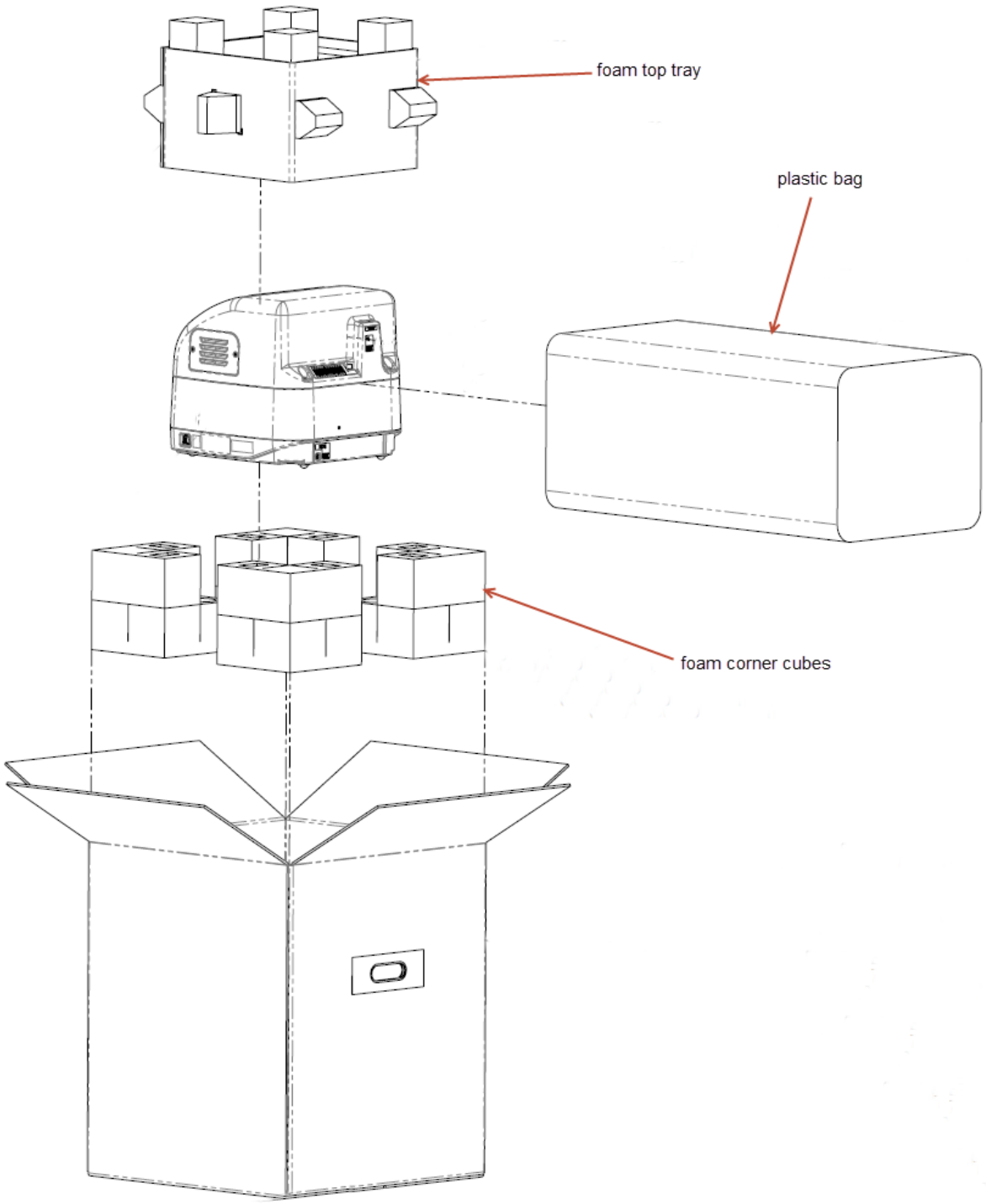


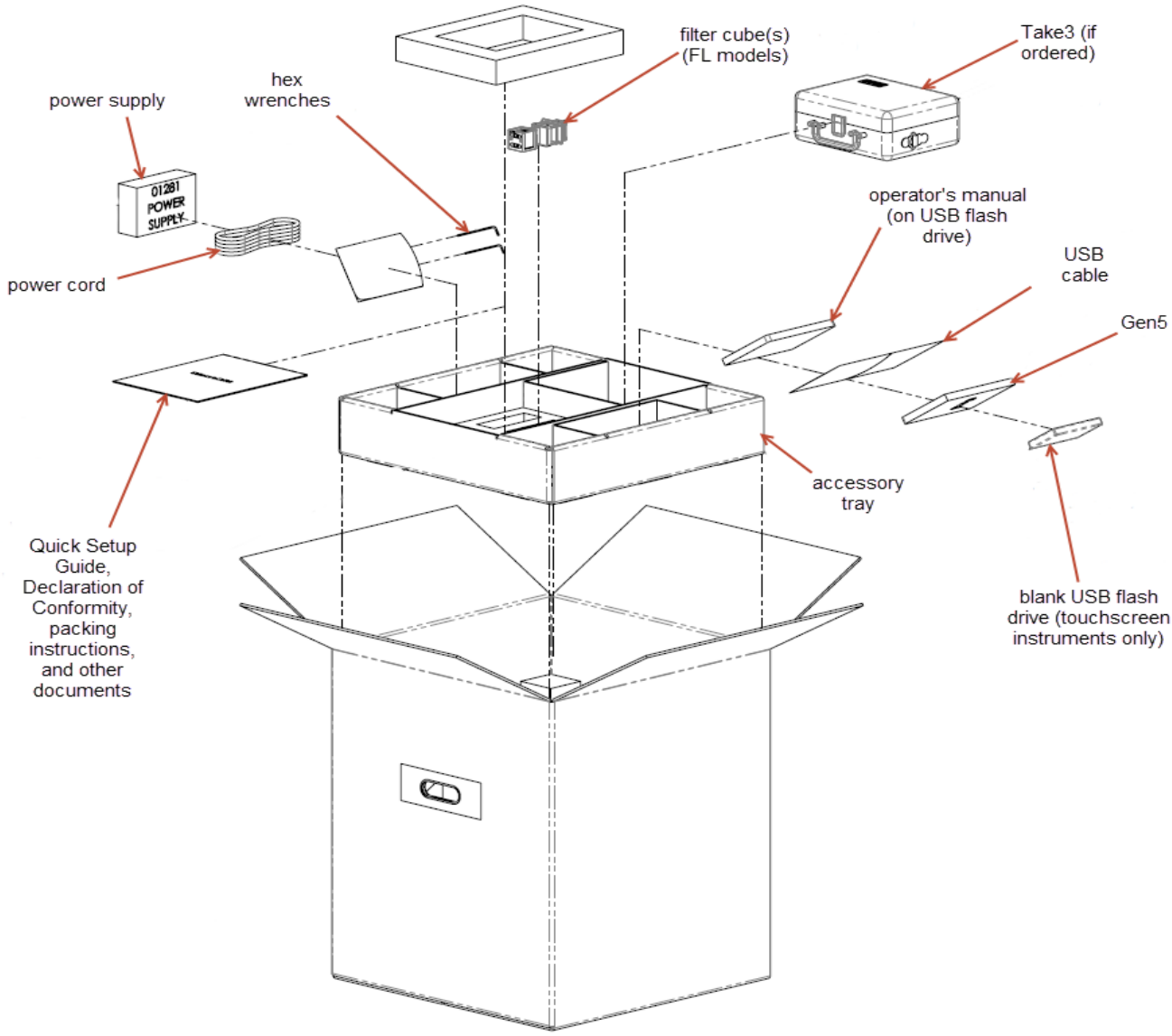
9. Use the supplied 3/32" hex wrench to firmly seat the shipping screw. Test this by tipping up the back of the reader. If the carrier does not move, the reader is ready for repackaging.

Repackage the Instrument

Ensure that the shipping screw has been attached as instructed in the previous section. Refer to the next figures when performing the following steps:

1. Place the four foam cubes into the corners at the bottom of the shipping container.
2. Tape the reader's front access door shut, then place the reader inside the original plastic bag, and carefully lower the reader onto the four foam cubes in the shipping container.
3. Place the foam top tray on top of the reader in the shipping container.
4. Place the accessory tray in the box, and then place the accessories into the tray as shown in the figure.
5. Close the top of the box, and secure it with shipping tape.


foam top tray
plastic bag
foam corner cubes


filter cube(s) (FL models)
Take3 (if ordered)
power supply
hex wrenches
01281 POWER SUPPLY
operator's manual (on USB flash drive)
USB cable
power cord
Gen5
accessory tray
Quick Setup Guide, Declaration of Conformity, packing instructions, and other documents
blank USB flash drive (touchscreen instruments only)

Chapter 3

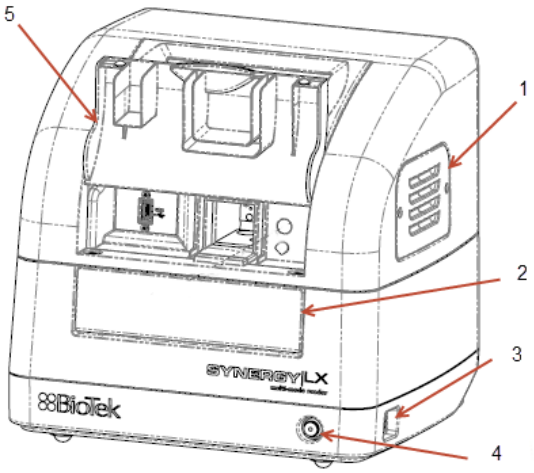
Getting Started

This chapter provides an introduction to the Synergy LX. It also contains recommendations for optimum performance.

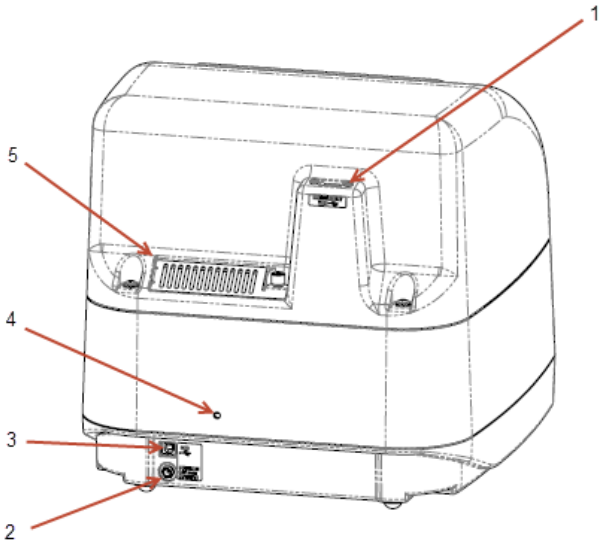
External Components

Touchscreen Models

1. halogen lamp access panel (for fluorescence-capable models)
2. microplate carrier access door
3. power on/off
4. carrier in/out, status LED
5. front compartment access door; shown open with touchscreen behind it

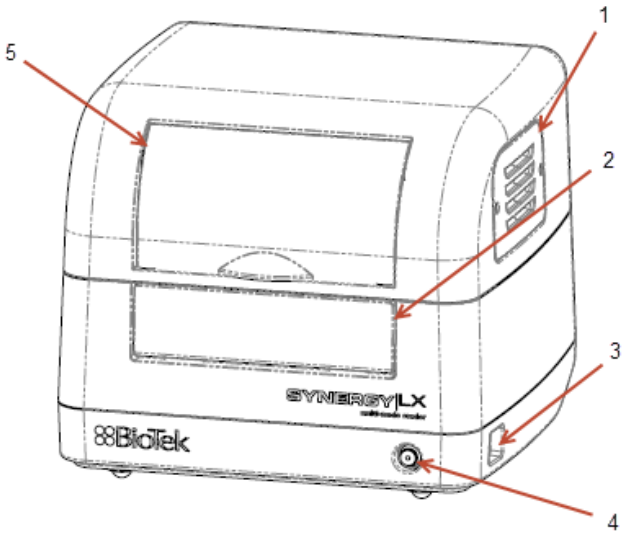


1. USB port for printer
2. power inlet
3. USB port for host computer
4. shipping screw
5. fan filter access

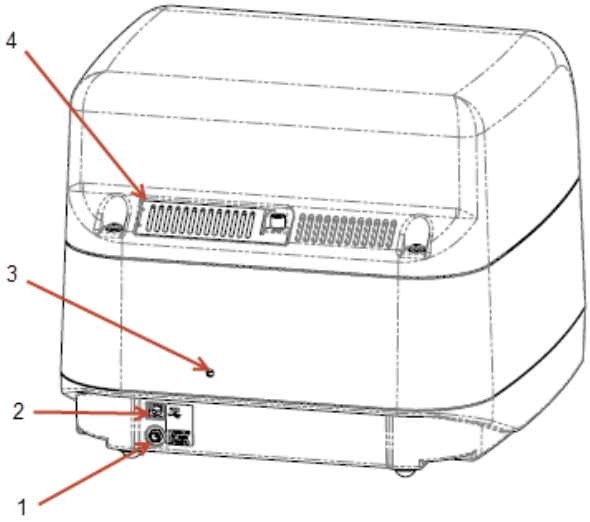


Non-Touchscreen Models

1. halogen lamp access panel (for fluorescence-capable models)
2. microplate carrier access door
3. power on/off
4. carrier in/out, status LED
5. front compartment access door



1. power inlet
2. USB port for host computer
3. shipping screw
4. fan filter access



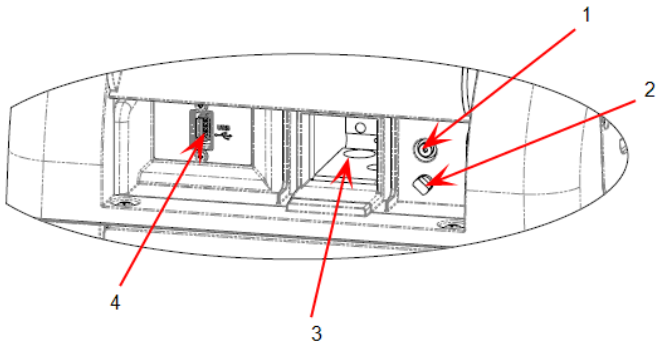
Inside the Front Compartment

1. shipping screw storage

2. light-blocking plug

3. filter cube port (for fluorescence-capable models)

4. USB port for data storage and basecode software installation (touchscreen models only)



Filter Cubes

Synergy LX models with fluorescence and luminescence capabilities are equipped with a filter cube that contains an excitation filter, an emission filter, and a mirror. The filter cube is accessed through the upper door on the front of the instrument. Each filter cube has an ID label that displays the filter cube's contents. You must have a filter cube installed to perform a fluorescence or luminescence read.

Configure a Filter Cube

For models with fluorescence/luminescence capability only

CAUTION **Filter Cube (F models)**. The reader's internal filter cube table must exactly match the contents of the installed filter cube. Gen5 users: The Gen5 software filter cube table must exactly match the contents of the filter cube.

If you exchange the filter cube or modify its contents, you must update the filter cube table(s).

The filter cube is accessed through a hinged door in the front of the instrument. Do not open the door to access the filter cube during instrument operation! Doing so may result in invalid data.

If necessary, disconnect the USB cable to regain access to touchscreen control.

All F models of the Synergy LX ship with a LUM filter cube. Other filter cubes can be ordered from BioTek.

Four preconfigured filter cubes, as well as an empty cube, are available from BioTek.

Filter Cube/PN	EX Wavelength/Bandpass	EM Wavelength/Bandpass	Mirror
Red, 1505004	530/25 nm	590/35 nm	570 nm
Green, 1505005	485/20 nm	528/20 nm	510 nm
Blue, 1505006	360/40 nm	460/40 nm	400 nm
LUM, 1505003	Plug	Hole	N/A
Empty, 1505000	N/A	N/A	N/A

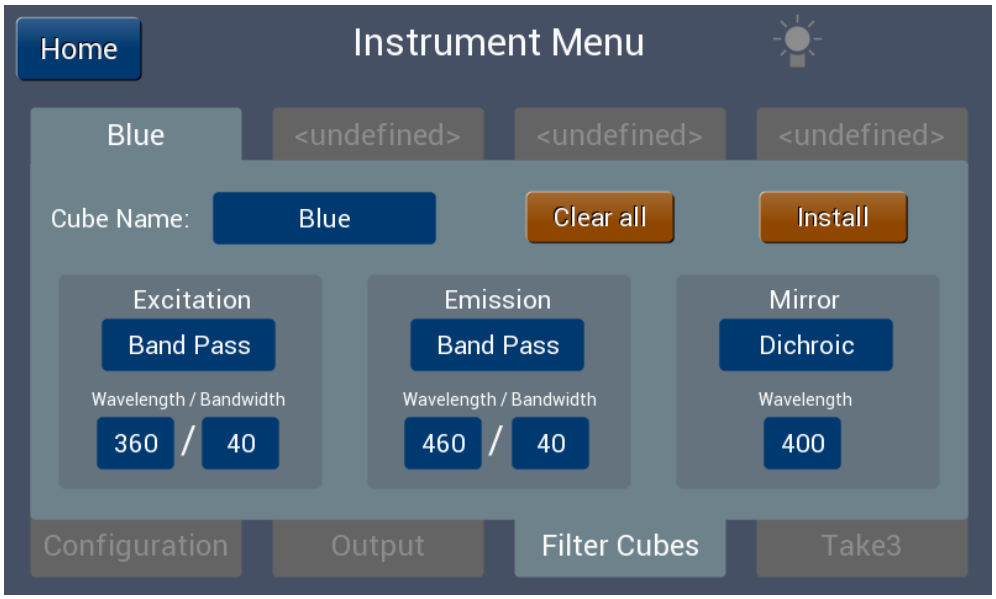
A filter cube must be configured in Gen5 or through the touchscreen (as applicable) prior to use.

Procedure

If using Gen5, select **System > Optics Library > Filter Cubes**. Click **Help** for guidance.

If using the touchscreen:

1. From the Main Menu, tap **Instrument** and tap the **Filter Cubes** tab.
2. Enter a cube name. It is recommended that you use the name on the filter cube's label.
3. Toggle through the Excitation, Emission, and Mirror settings to select the correct values for the filter cube.
4. Tap **Install** to configure the reader for this filter cube.



Install a Filter Cube

For models with fluorescence/luminescence capability only.

You can easily exchange one filter cube with another to meet varying assay requirements. Use the Gen5 Optics Library or, for models with a touchscreen, the Filter Cubes tab on the Instrument Menu to identify and manage the contents of multiple filter cubes.

1. Open the access door on the reader's front panel.
2. Slide the filter cube into the filter cube port, making sure the label on the filter cube handle is right-side up. See the photo below.

3. If equipped, on the touchscreen, go to the **Filter Cubes** tab, select the cube you just installed and tap **Install**. See **Configure a Filter Cube** on page 26.

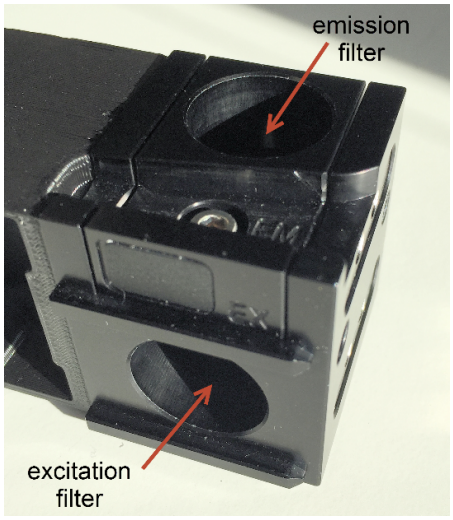
Install Filters in an Empty Filter Cube

CAUTION Do not use a sharp instrument when removing or replacing a filter or C-clip filter retainer.

Do not touch the filters or mirror with bare fingers. Handle the mirror by its edges.

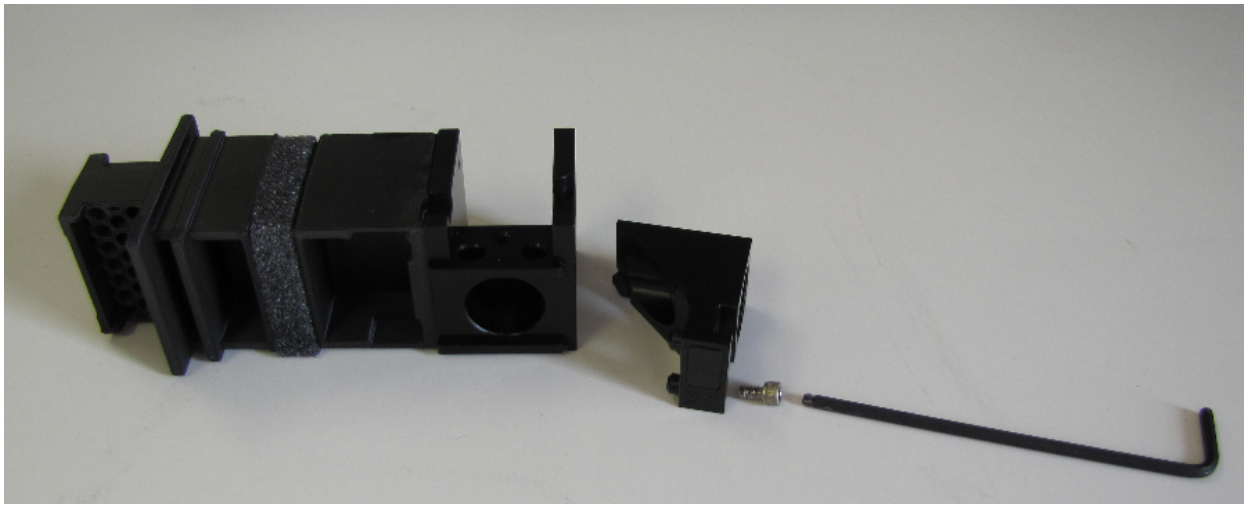
Tools

- 7/64 hex key (included with the Synergy LX)
- Lens paper
- Linen or cloth gloves (for handling the mirror)

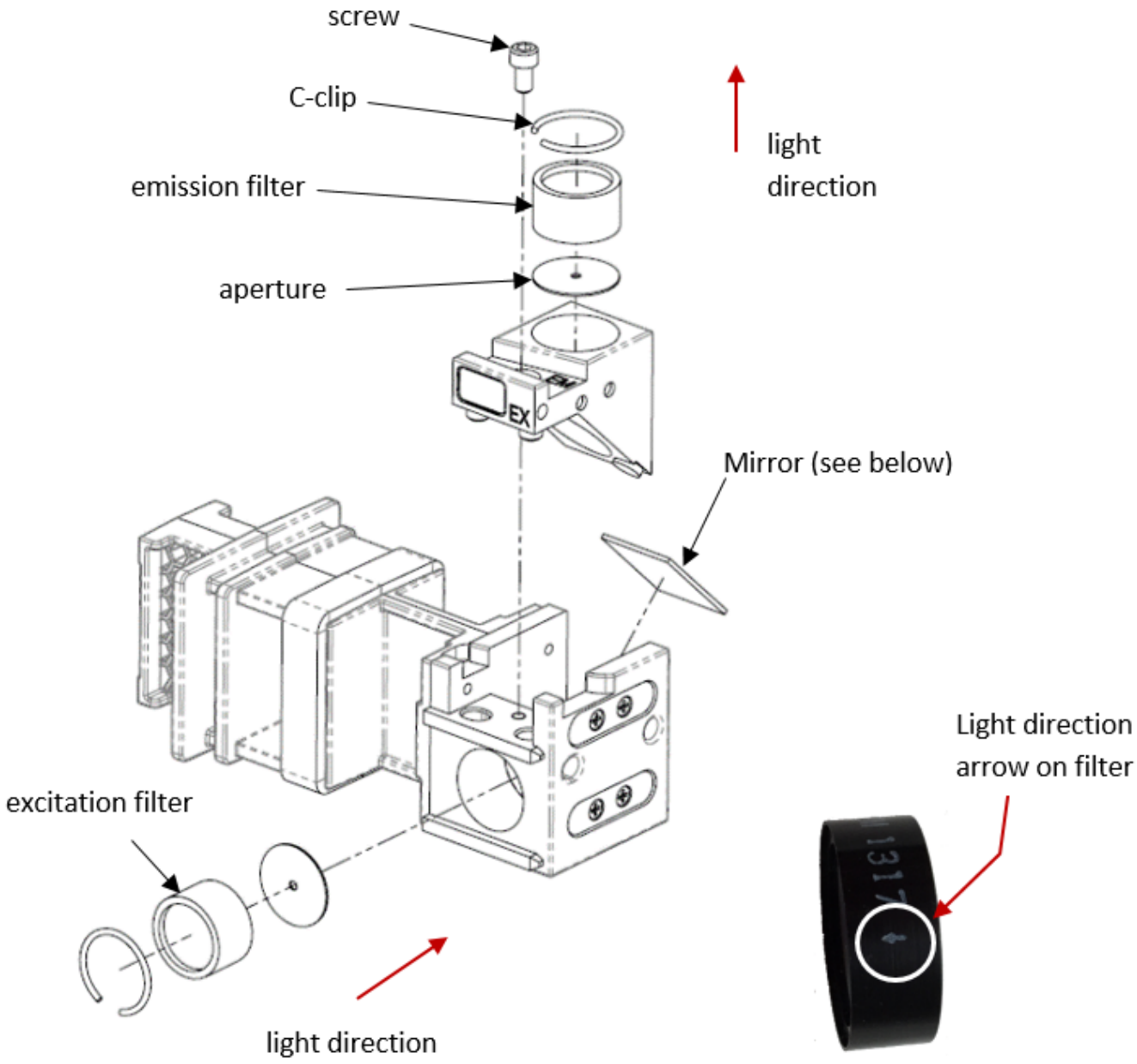


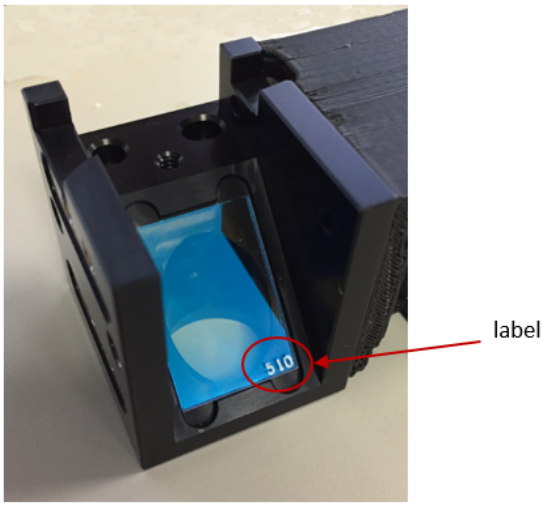
Procedure

1. Remove the screw and EM filter holder.



2. Using the following diagram, install the apertures, filters, C-clips, and mirror. Replace the EM filter holder when finished.


screw
C-clip
emission filter
aperture
EX
light
direction
Mirror (see below)
excitation filter
light direction
Light direction
arrow on filter



Optional Printer

For touchscreen models only.

The Synergy LX supports outputting the System Test report and measurement results, including raw data, dual OD (absorbance models only), and blanked data to a thermal paper printer. Use the supplied cable to connect the printer to the USB port on the reader's back panel.

Refer to the manual that ships in the printer's box for installation and setup instructions.

Load the Printer Paper

1. Ensure the printer is turned on.
2. Press the gray tab on the right side of the printer to open the door.
3. Place a roll of paper into the indented space on the back of the door with the leading edge of the paper coming from the top of the roll.

Ensure that the paper roll is installed so that the shiny side of the paper faces up. The printer will not print on the matte side of the paper.

4. Unroll the paper just enough so that it clears the end of the door, then firmly close the door until it clicks into place. The printer advances the paper and cuts it.

Use the Printer

- To test that the printer is properly installed and communicating with the reader, in the Main Menu, tap **Instrument**, then on the Option tab, tap **Start** to begin the Printer Test. A short test report prints. If the report did not print, check that the printer's power cable and USB cable are securely connected and run the test again.
- To print the results of a read, tap **Output** in the top-right corner of the results screen displayed when the read finishes.
- To print System Test results, tap **Print** in the screen that appears when the system test finishes.
- To cleanly tear the paper from the printer, pull upward from left to right.
- To advance the paper, press **Feed** on the front of the printer.
- To turn off the printer, press and hold the **ON/OFF** button for at least three seconds.

Operate the Reader Using the Touchscreen

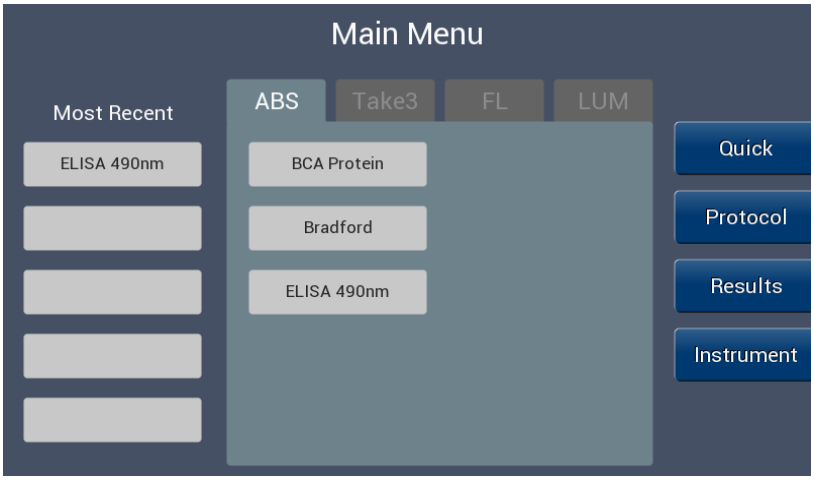
General Information

CAUTION **Touchscreen.** Use your fingertip to operate the touchscreen. Do not use a sharp stylus or pencil on the touchscreen. Doing so will damage the touchscreen's surface. You can use a stylus designed for resistive touchscreens.

When you turn on the Synergy LX, the touchscreen opens to the Main Menu after the start-up system test.

- To select a button or check box or to activate a tab, tap the item once.
- To return to the Main Menu from any other screen, tap **Home** in the top-left corner.
- For instructions on cleaning the touchscreen, see page 55.
- To preserve the life of the halogen lamp (fluorescence), turn it off when not needed by tapping  in the Instrument Menu.

Main Menu



The left side of the Main Menu lists the five protocols most recently created and saved or edited on the reader. In the middle are the protocols created for each available detection method and for use with the Take3 plate (if configured; see page 45).

The BCA Protein and Bradford protocols shown above come predefined on absorbance-capable models.

Up to 60 uniquely named protocols can be saved on the reader at one time, excluding the predefined Take3 protocols.

Protocols created through the touchscreen are limited to a single endpoint read step at one or two wavelengths and up to 12 blank wells. Use Gen5 if your assays require more complex reading methods or plate layouts.

The tabbed sections in the middle of the Main Menu contain the protocols created for each of the available detection methods and the Take3 plate (if used). To run an existing protocol, simply tap its name, define the columns to be read if not reading the full plate, and then tap **Start**.

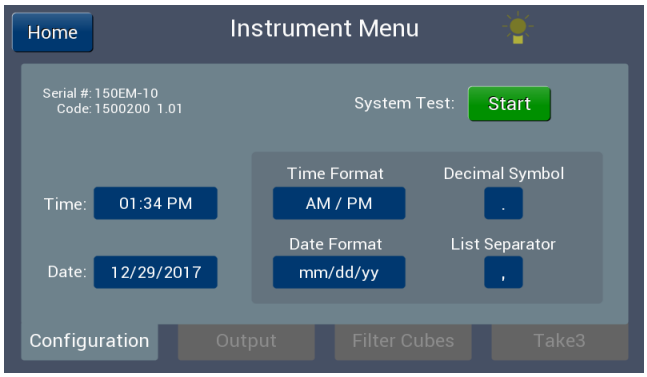
The right side of the Main Menu provides access to the following features:

- **Quick:** Define and run an Absorbance, Fluorescence, or Luminescence read, or perform a standalone shake. Quick reads do not support shake or delay actions, and they read the full plate. See page 37.
- **Protocol:** Edit, create (and save), delete, and copy protocols. Through this menu option, protocols support shake and delay actions and, at run time, allow you to select a subset of the full number of plate columns to read.
- **Results:** Provides access to results for the 12 most recently run protocols. Tap a protocol name to view its results, and then tap the screen to cycle through the available data sets (e.g., raw data, delta OD, blanked data).
- **Instrument:** Run a system test, define date/time settings, enable output to a printer and/or USB flash drive, define filter cubes (models with fluorescence/luminescence capability), and configure a Take3 plate (models with absorbance capability).

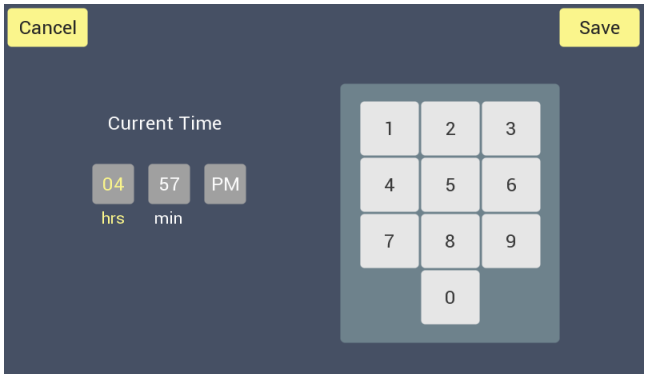
Configure Your Synergy LX

After you install the reader, and before you use it to create and run protocols, perform the tasks in this section to define important instrument settings.

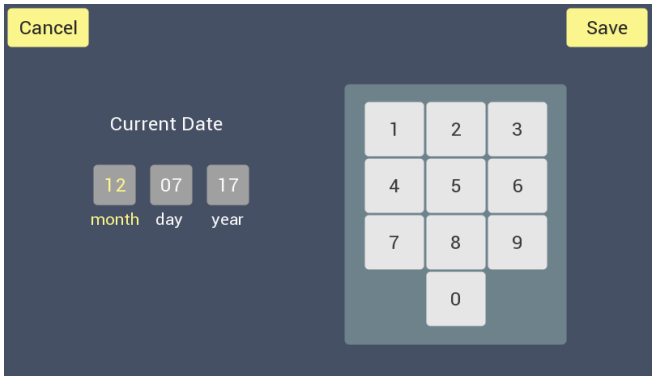
Confirm or Set the Time and Date



1. From the Main Menu, tap **Instrument** and then the **Configuration** tab. Review the current settings. If you do not need to make any changes, skip to the next topic, "Define Output Formats for Results Data" on page 37.



2. Tap in the Time field. Tap the hour value, and use the keypad to enter the correct time for both the hour and minutes, then click **OK**.

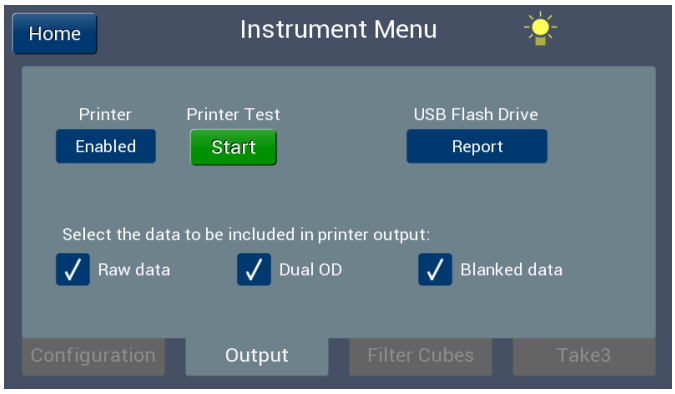


3. Tap the **Date** button.

4. Tap month, day, or year, and use the keypad to set the current date. Tap **Save** when done.

5. To set the Time Format, Date Format, Decimal Symbol, and List Separator (for use in the exported report .csv file), toggle through the values in each field on the Instrument Menu.

Define Output Formats for Results Data



If you want to send results to a printer connected to the reader:

1. From the Main Menu, tap **Instrument**, then tap the **Output** tab.

2. Toggle the Printer button to **Enabled**, and select the data to be included on the printout (you can select more than one):

- **Raw data**: The raw measurement value for each well.
- **Dual OD**: (Absorbance models only) Applicable only when a secondary wavelength is selected in an absorbance protocol. This is the calculated value for each well of the primary wavelength measurement minus the secondary wavelength measurement.
- **Blanked data**. The calculated value for each well, after subtracting the average of the blank well(s).

If you want to send results to a USB flash drive inserted in the reader, on the Output tab, toggle the **USB Flash Drive** button among the options.

- **Report**: Generates a .csv file containing the measurement values (with Raw data/Dual OD/Blanked data, as applicable). This file can be opened in Excel or other spreadsheet software.
- **Gen5 Input**: Generates a text file that can be opened in Gen5 using the Read from File option. This file contains only raw data, not dual ODs or blanked data.

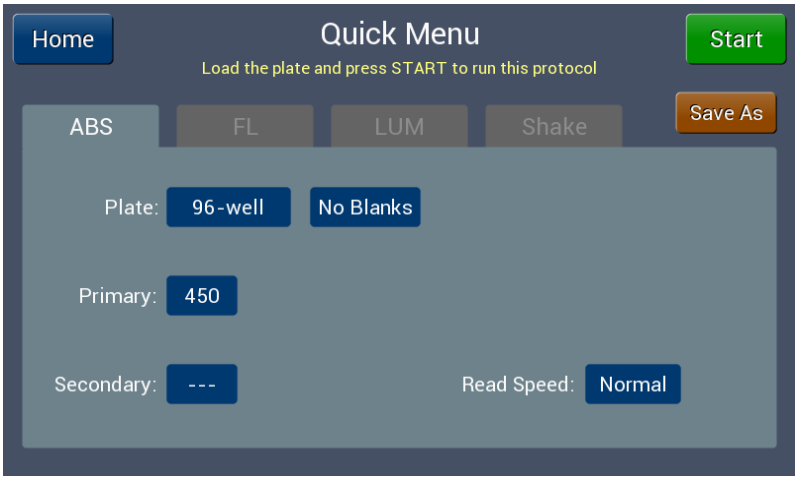
See page 117 for sample CSV and text files.

Define and Start a Quick Read

1. From the Main Menu, tap **Quick**.
2. Select the tab for the detection method you wish to use, then select the plate type and define the appropriate settings for your assay.

If you wish to create a protocol from the Quick parameters used, tap **Save As** and enter a name. To run a saved protocol, return to the Main Menu, select the protocol name, and tap **Start**.

3. Place the plate on the carrier and tap **Start** to run the protocol.



When the read is finished, the results are displayed. Tap **Output** to send results to the printer or USB flash drive.

Create and Save a Protocol

> The maximum number of uniquely named protocols that can be saved on the touchscreen at the same time is 60, excluding the predefined Take3 protocols.

1. From the Main Menu, tap **Protocol**, select the desired detection method tab, then tap **Create**.

2. Use the onscreen keyboard to enter a name for the protocol, then tap **Save**. Note that the protocol name is limited to 18 characters.

3. Define the protocol parameters, and then tap **Save**.

The next three sections describe the available parameters for each of the three possible detection methods.

Absorbance Protocols

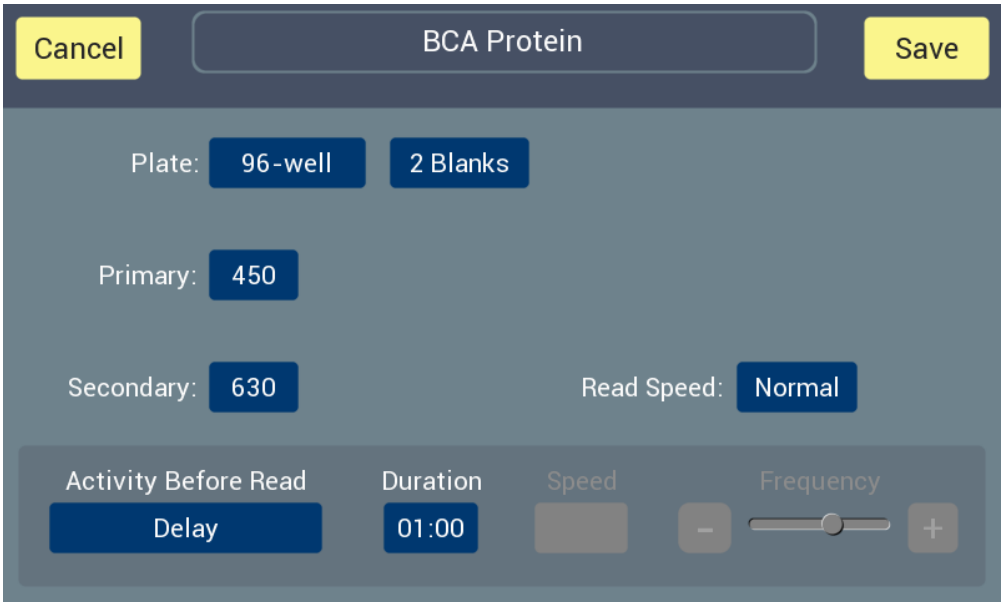


Plate: Tap the field to select the plate type. Options include standard 6-, 12-, 24-, 48-, 96-, and 384-well plates, and Take3 if the plate has been configured on the reader (see page 45).

Blanks: Tap the field to open a plate matrix. Tap up to 12 wells to be identified as Blank, and then tap **Save**. For a 384-well plate, the matrix is displayed in quadrants; tap the 1-2-3-4 box to change the view.

Primary and (optional) Secondary: Tap the field to define the primary or secondary wavelength. Enter a number within the valid range and tap **Save**.

Read Speed: This field is set to Normal by default. The other option is Sweep. Refer to Appendix A to compare performance and timing specifications between the two options.

Activity Before Read: Use the options here to include a delay (up to 15 minutes) or shake before the read. See page 48 for information on the available shake types.

When finished, tap **Save**. The protocol name is added to the Main Menu.

Fluorescence Protocols

Before you create a Fluorescence protocol, define at least one fluorescence filter cube on the reader; see page 26.

Plate: Tap the field to select a plate type. Options include standard 96- and 384-well plates and Take3 if the plate has been configured on the reader (see page 46).

Blanks: Tap the field to open a plate matrix that corresponds with the plate type. Tap up to 12 wells to be identified as Blank and then tap **Save**. For a 384-well plate, the matrix is displayed in quadrants; tap the 1-2-3-4 box to change the view.

Filter Set: If more than one fluorescence filter cube is defined on the reader, tap the field to cycle through the available filter cube names. The EX/EM wavelength values (e.g., 485/528) are displayed to aid in selection.

Gain: By default, when a plate read is initiated, the reader performs an AutoScale routine (see below) to determine the optimum PMT gain setting for the wells to be measured. Alternatively, tap to change AutoScale to Use Value and then enter a specific gain number in the range of 25–255.

If AutoScale is selected, the reader measures the full plate (or the columns selected at read time) as fast as possible, using the defined protocol parameters and a starting gain value of 40. If any wells overrange, the process is repeated using a lower gain value of 25. When all wells return valid measurements, the well with the highest RFU value is measured again to determine the optimum gain value that generates a target signal value for the dynamic range used (scaled to 50,000 for Standard range or 1,000,000 for Extended range). The optimum gain value is then used to measure all wells on the plate. It is also stored with the results and will be included in the output to printer and/or USB flash drive.

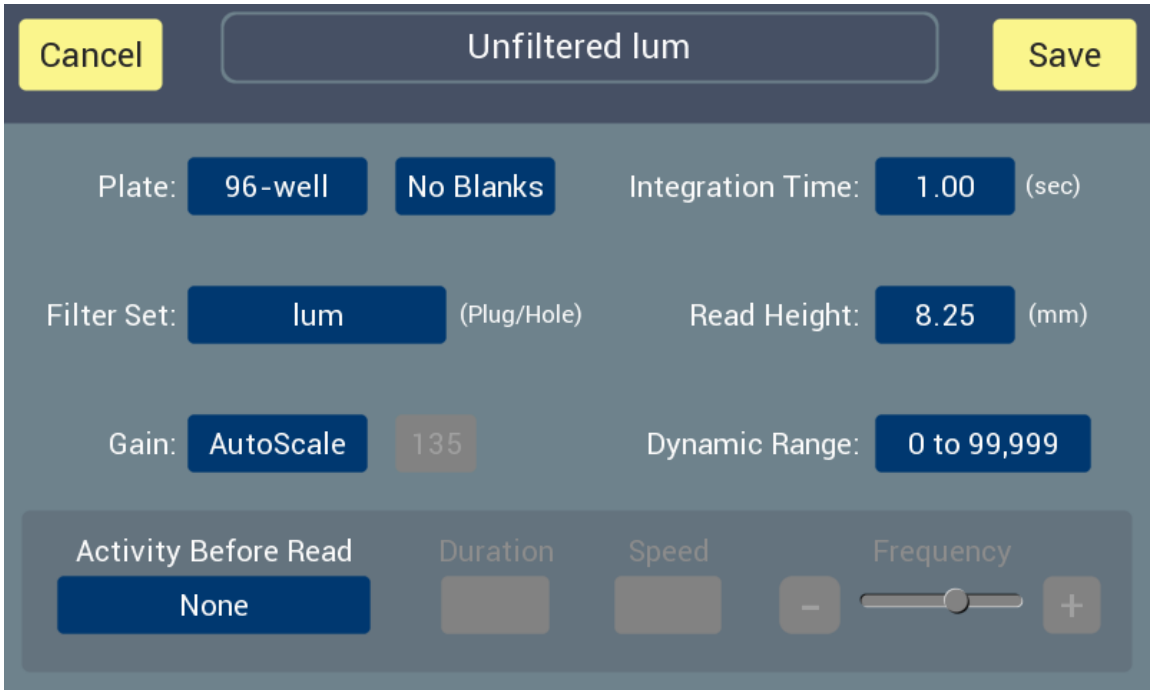
Read Height: This value represents the distance between the top of the plate and the optics. The default value depends on the selected plate type and is appropriate for standard height (14.22 mm) 96- and 384-well microplates with wells that are filled with solution. If you are using shorter plates or small volumes in standard height plates, you may wish to lower the read height value for better results. If you are using a plate that is taller* than 14.22 mm, consider increasing the read height. Note that the touchscreen's valid data entry range is based on a 14.22 mm high plate (17.50 mm for Take3); use Gen5 if you have more specific requirements.

** The maximum allowed plate height for Synergy LX is 0.81" (20.57 mm).*

Dynamic Range: The selection here, 0 to 99,999 (standard) or 0 to 5,800,000 (extended), indicates the range over which the measured relative fluorescence units (RFUs) will be reported. The greater the range, the greater the separation between samples or standards.

Activity Before Read: Use the options here to include a delay (up to 15 minutes) or shake before the read. See page 48 for information on the available shake types.

Luminescence Protocols



Before you create a Luminescence protocol, define at least one luminescence filter cube on the reader; see page 26.

Plate: Tap the field to select a plate type. Options include standard 96- and 384-well plates and Take3 if the plate has been configured on the reader (see page 46).

Blanks: Tap the field to open a plate matrix that corresponds with the plate type. Tap up to 12 wells to be identified as Blank and then tap **Save**. For a 384-well plate, the matrix is displayed in quadrants; tap the 1-2-3-4 box to change the view.

Filter Set: If more than one luminescence filter cube is defined on the reader, tap the field to cycle through the available filter cube names. The EX/EM settings (e.g., Plug/Hole) are displayed to aid in selection.

Gain: By default, when a plate read is initiated, the reader performs an AutoScale routine (see below) to determine the optimum PMT gain setting for the wells to be measured. Alternatively, tap to change AutoScale to Use Value and then enter a specific gain number in the range of 25–255.

If AutoScale is selected, the reader measures the full plate (or the columns selected at read time) as fast as possible, using the defined protocol parameters and a starting gain value of 150. If any wells overrange, the process is repeated using a lower gain value of 100. When all wells return valid measurements, the well with the highest RLU value is measured again to determine the optimum gain value that generates a target signal value for the dynamic range used (scaled to 50,000 for Standard range or 1,000,000 for Extended range). The optimum gain value is then used to measure all wells on the plate. It is also stored with the results and will be included in the output to printer and/or USB flash drive.

Integration Time: By default, the reader measures each well for 1 second, collecting 50 samples (which are then averaged). The valid range is 0.02 (1 sample) to 99.90 seconds per well. Increase the integration time for better precision; decrease it to improve read speed.

Read Height: This value represents the distance between the top of the plate and the optics. The default value depends on the selected plate type and is appropriate for standard height (14.22 mm) 96- and 384-well microplates with wells that are filled with solution. If you are using shorter plates or small volumes in standard height plates, you may wish to lower the read height value for better results. If you are using a plate that is taller* than 14.22 mm, consider increasing the read height. Note that the touchscreen's valid data entry range is based on a 14.22 mm high plate (17.50 mm for Take3); use Gen5 if you have more specific requirements.

** The maximum allowed plate height for Synergy LX is 0.81" (20.57 mm).*

Dynamic Range: The selection here, 0 to 99,999 (standard) or 0 to 5,800,000 (extended), indicates the range over which the measured relative luminescence units (RLUs) will be reported. The greater the range, the greater the separation between samples or standards.

Activity Before Read: Use the options here to include a delay (up to 15 minutes) or shake before the read. See page 48 for information on the available shake types.

Run a Protocol

CAUTION **Filter Cube (F models).** The reader's internal filter cube table must exactly match the contents of the installed filter cube. Gen5 users: The Gen5 software filter cube table must exactly match the contents of the filter cube.

The reader stores results for the 12 most recently run protocols. If 12 sets of results are already stored, the next set of results will overwrite the oldest of the saved results. Data is stored with the protocol name and a date stamp, format YYMMDD##, where ## is the next-in-sequence number for the detection method.

Note that only plate read results are saved. System Test results are not saved; they can only be exported to USB flash drive or printed.

The Synergy LX ships with several preprogrammed protocols. Depending on the reader's model, these protocols include Absorbance (BCA and Bradford), Fluorescence (Red, Blue, and Green), Luminescence (Lum (unfiltered)), and seven absorbance Take3 protocols.

1. From the Main Menu, tap a protocol in the Most Recent list or under one of the available tabs (ABS, Take3, FL, LUM). The Run Protocol screen opens, displaying the defined parameters.

2. To read a partial plate, tap **Full Plate** and then select the column(s) to read. Tap **Save**.
3. **Important:** If running a Fluorescence or Luminescence protocol, ensure that the correct

filter cube is installed.

4. Place the microplate on the carrier and tap **Start**.

   When the read is finished, the results are displayed (and automatically stored onboard). Tap the screen to toggle through the available data sets. Tap **Output** to send results to the printer and/or USB flash drive.

Edit, Delete, or Copy a Protocol

The Synergy LX ships with several preprogrammed protocols. Depending on the reader's model, these protocols include Absorbance (BCA and Bradford), Fluorescence (Red, Blue, and Green), Luminescence (Lum (unfiltered)), and the seven absorbance Take3 protocols. These protocols can be edited and deleted.

Edit a Protocol

1. From the Main Menu, tap **Protocol**.
2. Tap the protocol that you want to modify, then tap **Edit**.
3. Make any desired changes, then tap **Save**.

Delete a Protocol

1. From the Main Menu, tap **Protocol**.
2. Tap the protocol you want to delete, then tap **Delete**.

Copy a Protocol

Copying an existing protocol and then editing it is one way to create a new protocol.

1. In the Main Menu, tap the protocol you want to copy, then tap **Copy**.
2. Enter a name for the copied protocol, and then tap **Save**.
3. Make any desired changes, then tap **Save**.

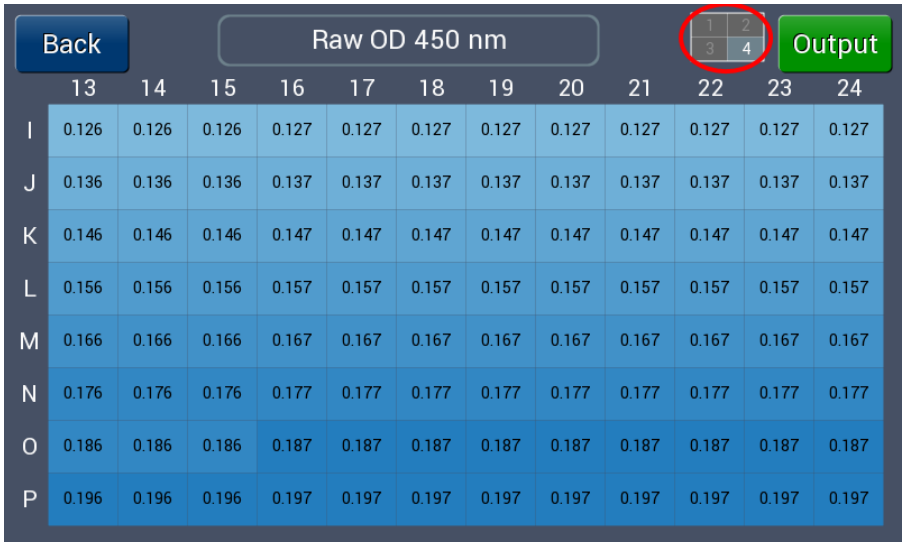
View or Output Results Stored on the Reader

1. In the Main Menu, tap **Results**, then select the protocol for which you want to view or output results. The results are displayed on the touchscreen. Tap the screen to toggle through the available data sets.

- Data is displayed in the unit of measure appropriate for the detection method.
- If a well displays “OVR,” this indicates that the measurements exceed (overflow) the maximum values.
- If a well displays “???,” this indicates a result could not be calculated.

2. Tap **Output**. The results are printed and/or saved to the USB flash drive, depending on the output format you selected (see page 37).

Note: When viewing results for a 384-well plate, tap the grid that appears to the left of the **Output** button to toggle through the results for each quadrant of the plate. In the example below, results for the lower-right quadrant of the plate are displayed.



	13	14	15	16	17	18	19	20	21	22	23	24
I	0.126	0.126	0.126	0.127	0.127	0.127	0.127	0.127	0.127	0.127	0.127	0.127
J	0.136	0.136	0.136	0.137	0.137	0.137	0.137	0.137	0.137	0.137	0.137	0.137
K	0.146	0.146	0.146	0.147	0.147	0.147	0.147	0.147	0.147	0.147	0.147	0.147
L	0.156	0.156	0.156	0.157	0.157	0.157	0.157	0.157	0.157	0.157	0.157	0.157
M	0.166	0.166	0.166	0.167	0.167	0.167	0.167	0.167	0.167	0.167	0.167	0.167
N	0.176	0.176	0.176	0.177	0.177	0.177	0.177	0.177	0.177	0.177	0.177	0.177
O	0.186	0.186	0.186	0.187	0.187	0.187	0.187	0.187	0.187	0.187	0.187	0.187
P	0.196	0.196	0.196	0.197	0.197	0.197	0.197	0.197	0.197	0.197	0.197	0.197

Run a Take3 Session Using the Touchscreen

For models with absorbance capability only.

If you will set up and measure the Take3 plate using Gen5, refer to the user guide that shipped with the plate.

The Synergy LX ships with seven default Take3 protocols. The protocols are available for use after a Take3 plate has been defined and calibrated. These protocols are not editable and are read at the wavelengths 260, 280, and 320 nm. For nucleic acid protocols, a secondary wavelength of 230 nm can be selected.

You can create an Absorbance, Fluorescence, or Luminescence protocol to read a Take3 plate, independent of the predefined Take3 protocols. Choose the plate type "Take3" when selecting the protocol parameters.

Define a Take3 Plate

For all new Take3 plates, you must enter the serial number, add pathlength values, align the plate, and select protocol options. After these steps have been completed, the Take3 tab appears on the Main Menu and contains all pre-programmed Take3 protocols.

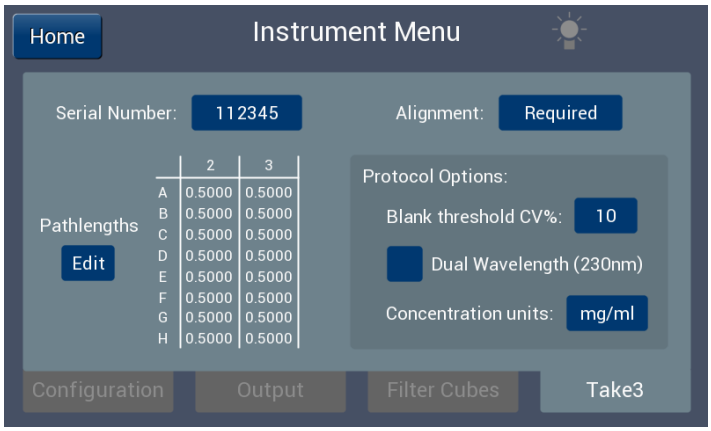
This procedure ensures that the Take3 slide's microspot positions are captured correctly in the reader's software.

Ensure that the glass slide in the plate is completely clean before running the alignment process. Refer to the *Take3/Take3 Trio User Guide* for cleaning instructions.

If you remove or replace the glass slide, perform the Pathlength Calibration procedure described in the *Take3/Take3 Trio User Guide* and then run the alignment procedure described below. Update the Pathlength Values on the touchscreen with the new values generated through the Pathlength Correction procedure described in the user guide.

The reader can be configured with only one Take3 plate at a time. The plate is identified by its serial number.

1. From the Main Menu, tap **Instrument**, then the **Take3** tab.



2. Enter the Take3 plate's serial number, and place the Take3 plate on the carrier. Tap **Required** and then **Start** to perform the alignment process. Note that this process can take several minutes.

3. Define protocol options as necessary for your assays:
   a. Enter a Blank threshold CV% if the default value of 10 does not meet your assay requirements. This setting compares all replicates of a blank to determine cleanliness of the microspots (dirty microspots could skew the %CV). Set the value smaller to have a tighter tolerance on deviation of cleanliness of the microspots, or set it higher to relax the tolerance.
   b. (Optional) For nucleic acid protocols, select to run a Dual Wavelength read using a secondary 230 nm wavelength.
   c. Toggle to select the Concentration unit desired.
4. Tap **Edit** and enter the pathlength values that came with the Take3 plate, then tap **Back** and **Home** to return to the Main Menu.

Run a Take3 Protocol

1. On the Main Menu, select the **Take3** tab, then select the Take3 protocol to run.
2. On the Blanks screen, tap up to 12 wells to use as blanking wells, then tap **Continue**.
3. Place the Take3 plate in the microplate carrier and tap **Start**.
   - If the Take3 Blank Masking screen appears and reports that the CV Status is DIVERGING, the %CV of the blank wells is higher than the Blank threshold CV% defined for the plate. Invalid blank wells are highlighted in red. Tap a well to mask (exclude) it from blank average and %CV calculations. When the remaining unmasked blank wells are valid, the Approve button illuminates. If the number of valid blank wells is sufficient for the assay, tap Approve, otherwise select Cancel and address the problem (e.g., clean the slides).
   - At least one blank well is required. If all blank wells are masked, the CV Status is INVALID.
   - Each masked blank well will be flagged with an asterisk in the printed and exported results.
4. When the read is finished, the results are displayed on the touchscreen. Tap the screen to toggle through the available data sets. Tap **Output** to send results to the printer or to a USB flash drive, if enabled (see page 44).

The results are also available for review and output by selecting **Results** from the Main Menu.

Plate Shaking Options

The Synergy LX supports linear, orbital, and double-orbital shaking plate shaking, with user-selected amplitude from 1 mm to 6 mm, in 1 mm steps. Frequency ranges from about 18 Hz to about 6 Hz, depending on the selected amplitude.

- Define a stand-alone shake from the Main Menu by tapping **Quick** and then **Shake**.
- Add a shake in a protocol by tapping the **Activity Before Read** field and selecting **Shake**.

Getting Started with Gen5 Software

BioTek Gen5 software supports all Synergy LX reader models. This section provides brief instructions creating protocols and experiments. For more information, refer to publications provided with Gen5 and the Gen5 help system (Help > Help Topics).

Protocols and Experiments

In Gen5, a protocol contains instructions for controlling the reader and (optionally) instructions for analyzing the data retrieved from the reader. At a minimum, a protocol must specify the procedure for the assay you wish to run. After creating a protocol, create an experiment that references the protocol. Run the experiment to read plates and analyze the data.

To create a protocol:

1. Optional, but recommended: Create the protocol with the reader connected to the computer and turned on.
2. In the Gen5 Task Manager, select **Protocol > Create New**.
3. Open the Procedure dialog. If prompted to select a reader, select Synergy LX and click OK.
4. Select a Plate Type to match your assay plate.

   > Gen5 stores measurements and other characteristics for individual plate types in a database. It is essential that you select the plate type to match the assay plate. Otherwise, results may be invalid.

5. Add a Read step to the Procedure.

- The Optics Type is already set for the Synergy LX (Monochromators).
- Choose a Detection Method: Absorbance, Fluorescence intensity, or Luminescence.
- Choose a Read Type: Endpoint/Kinetic, Spectral Scanning, or Area Scanning.
- Click **OK**.
- The Read Step dialog contains parameters specific to the Detection Method. Click the Help button for guidance.
- If the experiment will be run on a partial plate, click the **Full Plate** button and highlight the wells to read.
- Click **OK** to return to the Procedure dialog.

6. If this is a kinetic protocol, click **Start Kinetic** to add a kinetic loop. Drag the Read step and drop it between the Start and End Kinetic steps.
7. Click **Validate** to confirm that the reader supports the defined steps. Follow any instructions provided by Gen5 to adjust the protocol parameters.

   - If the reader is connected and turned on, Gen5 will communicate with the reader during this step to ensure that the protocol is valid.
   - If the reader is not connected, Gen5 will validate the syntax of the protocol (for example, the Read step is set between the Start and End Kinetic steps). Later, when you run the experiment, Gen5 conducts another check and will present a message if any Gen5 protocol settings require changing before the experiment can be run.

8. Optionally, perform any of these steps to analyze and report the results:

   - Open the Plate Layout dialog and assign blanks, samples, controls, and/or standards to the plate.
   - Open the Data Reduction dialog to add data reduction steps. Categories include Transformation, Well Analysis, Curve Analysis, and Qualitative Analysis.
   - Create a report or export template via the Report/Export Builders.

9. Select **File > Save** and give the file an identifying name.

To create an experiment and read a plate:

1. In the Gen5 Task Manager, select **Experiment > Create using an existing protocol**.
2. Select the desired protocol and click **OK**.
3. Select a plate in the menu tree and click the **Read Now** button.
4. When the read is complete, measurement values appear in Gen5. Select the desired data set from the Data list.
5. Select **File > Save** and give the file an identifying name.

Features Supported by Synergy LX That Require Gen5

- Reader qualification
- Performing fluorescence reads in more than one color
- Kinetic reads
- Area and spectrum scan
- Nonstandard plate types
- Partial plate reading beyond column-based
- Automatic export to Microsoft Excel
- Extensive data reduction options, including cutoff and transformations
- Ability to define standard wells and generates curves

Recommendations for Optimum Performance

General

- Microplates should be clean and free from dust or bottom scratches. Use new microplates from sealed packages. Do not allow dust to settle on the surface of the solution; use microplate covers or seals when not reading the plate. Filter solutions to remove particulates that could cause erroneous readings.
- Although the Synergy LX supports standard flat, U-bottom, and V-bottom microplates, when using absorbance, the reader achieves optimum performance with flat-bottomed wells. See **Appendix A, Specifications** for more information on the supported plates.

- When using absorbance, nonuniformity in the optical density of the well bottoms can cause loss of accuracy, especially with U- and V-bottom polyvinyl microplates. Check for this by reading an empty microplate. Dual wavelength readings can eliminate this problem or bring the variation in density readings to within acceptable limits for most measurements.
- Inaccuracy in pipetting has a large effect on measurements, especially if smaller volumes of liquid are used. For best results in most cases, use at least 100 µL per well in a 96-well plate.
- Pipetting solution into 384-well plates often traps air bubbles in the wells, which may result in inaccurate readings. A dual-wavelength reading method usually eliminates these inaccuracies. For best results, however, remove the air bubbles by degassing the plate in a vacuum chamber or spinning the plate in a centrifuge before reading.
- The inclination of the meniscus can cause loss of accuracy in some solutions, especially with small volumes. Shake the microplate before reading to help bring it within acceptable limits. Use Tween 20, if possible (or some other wetting agent) to normalize the meniscus for absorbance measurements. Some solutions develop menisci over a period of several minutes. This effect varies with the brand of microplate and the solution composition. As the center of the meniscus drops and shortens the light path, the density readings change. The meniscus shape will stabilize over time.
- It is the user's responsibility to understand the volumetric limits of the plate type in use as it applies to the assay being run.
- Use of liquids with concentrations of acids, corrosives, or solvents of 3% and greater can begin attacking the materials inside the instrument's chamber. Running multiple plates with concentrations < 3% in long kinetic experiments may also have a destructive effect. If the experiment is incubated, it will accelerate the deterioration of chamber components. When in doubt about the use of acids, corrosives, or solvents, please contact Technical Support.

Using 384-Well Microplates

When using a 384-well microplate, you can use the Gen5 Auto Map feature to ensure you are using an accurate plate map for your reads. See the Gen5 Help for more information.

Chapter 4

Periodic Maintenance

This chapter provides instructions for cleaning and decontaminating the Synergy LX.

Maintenance Overview

A general maintenance regimen for all Synergy LX models includes periodically cleaning all exposed surfaces and decontaminating the instrument before storage or shipment. This chapter also includes instructions for replacing the halogen bulb assembly.

Recommended Maintenance Schedule

The risk and performance factors associated with your assays may require performing some of all of the procedures more frequently than presented in this schedule.

Task	Page	Frequency
Clean External Surfaces	page 55	As needed
Inspect/Clean Touchscreen	page 55	As needed
Inspect/Clean the Filter Cubes	page 56	As needed
Clean the Air Filter	page 57	As needed
Replace the Halogen Bulb Assembly	page 59	As needed
Decontamination	page 60	Before shipment or storage

Required Materials

- Mild detergent
- Deionized or distilled water
- Clean, lint-free cotton cloths
- Sodium hypochlorite (NaClO, or bleach) (decontamination only)
- Safety glasses
- Surgical mask
- Protective gloves
- Lab coat
- Biohazard trash bags
- 125-mL beakers
- Cotton swabs or paper towels

- Flat-head or #2 Phillips screwdriver
- 70% isopropyl, ethyl, or methyl alcohol

Warnings and Precautions

Read the following before performing any maintenance procedures:

WARNING **Internal Voltage.** Always turn off the power switch and unplug the power supply before cleaning the outer surface of the instrument.

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, stop the program and turn off the instrument. Wipe up all spills immediately. Do not operate the instrument if internal components have been exposed to fluid.

CAUTION **Liquids.** Do not immerse the instrument, spray it with liquid, or use a dripping-wet cloth on it. Do not allow water or other cleaning solution to run into the interior of the instrument. If this happens, contact Technical Support. Do not soak the touchscreen.

CAUTION **Lubricants.** Do not apply lubricants to moving parts. Lubricant on components in the carrier compartment will attract dust and other particles, which may cause the instrument to produce an error.

WARNING **Potential Biohazards.** Wear protective gloves when handling contaminated instruments. Gloved hands should be considered contaminated at all times; keep gloved hands away from eyes, mouth, nose, and ears.

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 handling contaminated instruments.

Clean Exposed Surfaces

This procedure is for the housing of the Synergy LX instrument. See **Clean the Touchscreen** on page 55 for the cleaning procedure for the touchscreen.

A regular cleaning regimen is recommended to keep the instrument free from dust and particulates that can cause erroneous readings. Exposed surfaces may be cleaned (not decontaminated) with a cloth moistened (not soaked) with water or water and a mild detergent.

1. Turn off and unplug the instrument from the power supply.
2. Wet a clean cotton cloth with water or with water and mild detergent, then thoroughly wring out the cloth so that liquid does not drip from it.
3. Wipe the plate carrier, the inside of the plate carrier door and front access door, 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, lint-free cloth to dry all wet surfaces.

If liquid is spilled inside the reader, call Technical Support.

Clean the Touchscreen

For models with the touchscreen only.

Important! Never spray solutions directly on the touchscreen.

Materials

Use the following products to safely clean the touchscreen:

- Deionized or distilled water
- Dish soap or other mild cleaner
- Lint-free disposable towels

CAUTION

Touchscreen. Avoid strong solvents, such as alcohol, acetone, ammonium chloride, methylene chloride, and hydrocarbons. These will permanently damage the touchscreen. Avoid fibrous materials, such as paper towels, which can scratch the touchscreen. Dirt particles and cleaning agents will get trapped in the scratches. Never spray solutions directly on the touchscreen.

Procedure

Important! Never spray solutions directly on the touchscreen.

1. Turn off and unplug the instrument.
2. Moisten a clean, lint-free disposable cloth with water or with water and mild detergent, then thoroughly wring it out so that liquid does not drip from it. **Do not soak the cloth.**
3. Wipe the touchscreen gently with the moist cloth.
4. If detergent was used, wipe the touchscreen with a cloth moistened with water.
5. Dry the screen gently using another cloth.

Inspect/Clean Filter Cubes

For models with fluorescence/luminescence capability only.

Filters should be inspected and cleaned at least every three months. You'll need:

- Isopropyl, ethyl, or methyl alcohol
- Lens-cleaning tissue
- Cloth gloves
- Magnifying glass

Do not touch the filters with your bare fingers!

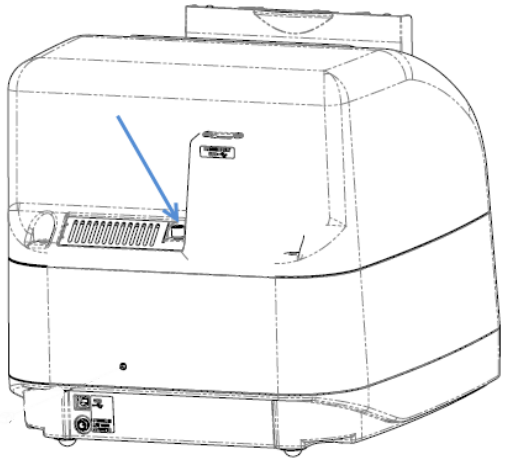
1. Open the top access door on the instrument's front panel, and slide the filter cube out of its port.
2. Inspect the glass filters for speckled surfaces or a "halo" effect. This may indicate deterioration due to moisture exposure over a long period of time.

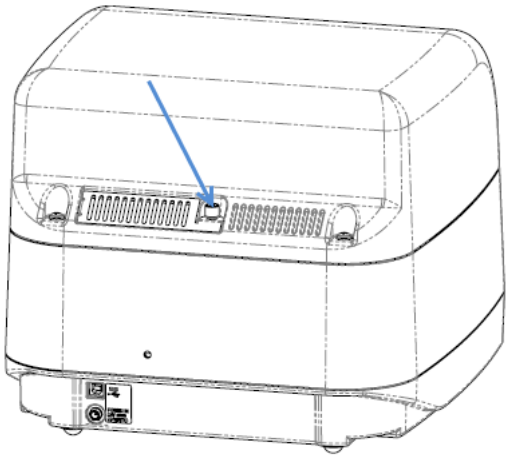
If you have any concerns about the quality of the filters, contact Technical Support.

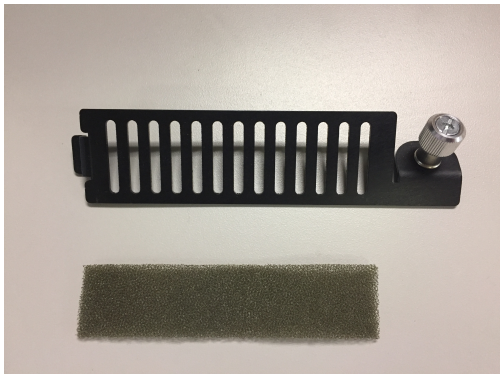
3. Using lens-cleaning tissue moistened with a small amount of high-quality alcohol, clean each filter by lightly stroking its surface in one direction.
4. Use a magnifying glass to inspect the surface for debris.
5. When the filters are clean, replace the filter cube and close the access door.

Clean the Air Filter

1. Using either a flat-blade or #2 Phillips screwdriver, remove the screw that secures the air filter cover on the rear of the reader. Remove the cover and filter.







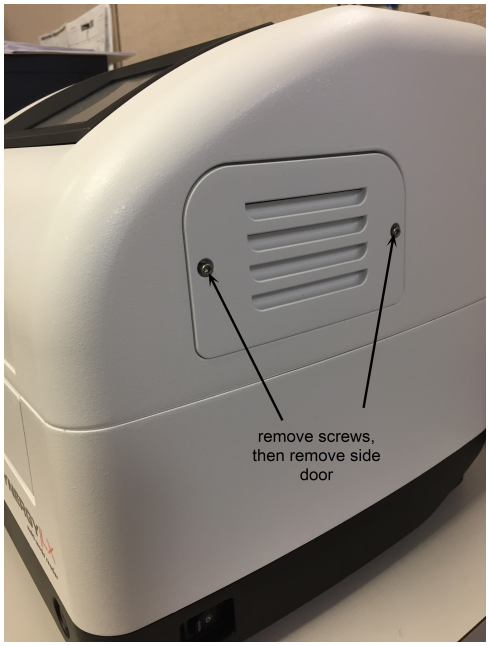
2. Rinse the air filter in water, then allow it to dry completely.
3. Replace the air filter and air filter cover on the reader, and secure them in place with the screw.

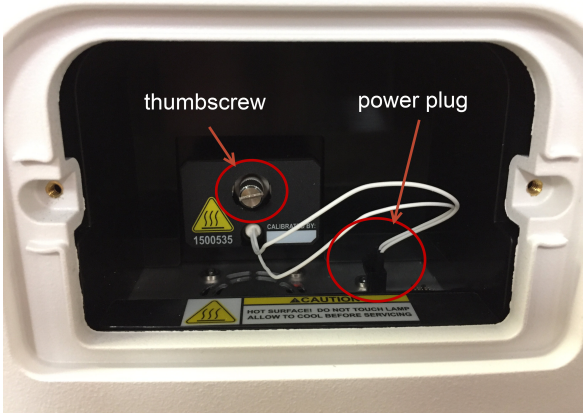
Replace the Halogen Bulb Assembly

For models with fluorescence/luminescence capability only.

WARNING **Hot Surface.** The lamp assembly is hot when the instrument is turned on. Turn off the reader and allow the bulb to cool for at least 15 minutes before attempting to replace it.

1. Turn off the instrument.
2. Using the supplied 7/64" hex key, unscrew the two screws that hold on the side door, then remove the door and set it aside.
3. Unplug the lamp's power plug and unscrew the thumbscrew that holds the lamp assembly in place. Remove the lamp from the instrument.
4. Slide the replacement lamp assembly into place, using the lamp assembly's tabs as guides.
5. Screw in the thumbscrew, then finger-tighten to secure the lamp. Plug in the lamp's power plug.
6. Replace the side door and secure it with the two screws.





Decontamination

- The Synergy LX requires decontamination prior to shipping, storage, and disposal.
- 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 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.

Decontaminating the Instrument

WARNING **Internal Voltage.** Always turn off the power switch and unplug the power supply before cleaning the outer surface of the instrument.

CAUTION **Liquids.** Do not immerse the instrument, spray it with liquid, or use a dripping-wet cloth on it. Do not allow water or other cleaning solution to run into the interior of the instrument. If this happens, contact Technical Support.

CAUTION **Touchscreen.** Avoid strong solvents, such as alcohol, acetone, ammonium chloride, methylene chloride, and hydrocarbons. These will permanently damage the touchscreen. Avoid fibrous materials, such as paper towels, which can scratch the touchscreen. Dirt particles and cleaning agents will get trapped in the scratches. Never spray solutions directly on the touchscreen

Required Materials

- 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 from the power supply.
2. Prepare an aqueous solution of 0.5% sodium hypochlorite (NaClO, or bleach). If the effects of bleach are a concern, 70% isopropyl alcohol may be used.

Check the percent NaClO of the bleach you are using. Commercial bleach is typically 10.0% NaClO; prepare a 1:20 dilution. Household bleach is typically 5.0% NaClO; prepare a 1:10 dilution.

3. Moisten a clean, lint-free cloth with the bleach solution, then thoroughly wring it out so that liquid does not drip from it. Do not soak the cloth.
4. If the instrument is equipped with a touchscreen, place the moistened cloth on the touchscreen, and it let rest there for 15 minutes, then remove it.
5. Wipe the plate carrier and all exposed surfaces of the instrument, including in the inside of the microplate carrier access door.
6. Allow the instrument to dry for 20 minutes for thorough decontamination by the bleach.
7. Moisten a cloth with deionized or distilled water and wipe all surfaces of the instrument that have been cleaned with the bleach solution.
8. Use a clean, dry lint-free cloth to dry all wet surfaces.
9. Discard the used gloves and cloths using a biohazard trash bag and an approved biohazard container.

Chapter 5

Instrument Qualification Process

This chapter describes the tests that BioTek Instruments, Inc., has developed for complete qualification of all models of the Synergy LX. This chapter introduces the various test methods, describes the materials and protocol parameters used to execute the tests, explains how to analyze test results, and provides troubleshooting tips in the event of a failure.

Instrument Qualification Procedures, starting on page 85, contains the actual step-by-step test procedures.

System Test

Each time the Synergy LX is turned on, it automatically performs a series of tests on the reader's motors, lamp(s), and optical systems. If all tests pass, the microplate carrier moves to its forward position, and, if equipped, the Main Menu appears on the touchscreen.

You can also initiate a system test through the touchscreen or Gen5.

If any test results do not meet the internally coded Failure Mode Effects Analysis (FMEA) criteria established by BioTek, the reader beeps repeatedly, and, if equipped, an error message appears on the touchscreen. If this occurs, either press the carrier eject button, or, if equipped, tap **OK** on the touchscreen to stop the beeping. If necessary, initiate another system test to try to retrieve more information from the reader.

Refer to **Error Conditions**, starting on page 119, for more information.

Refer to **Sample Reports**, starting on page 113, to see a sample System Test Report for Synergy LX.

Plate Shaker Test

This test verifies that the multi-speed plate shaker is operating properly. The test involves creating and running a protocol with shaking enabled for a duration of 30 seconds. The sound of the carrier shaking is all that needs to be confirmed to verify that the plate shaker is operating properly.

The rest of the section covers performance testing for each of the available detection methods. **Gen5 software is required** for conducting these qualification procedures. Microsoft Excel is also required if using the BioTek Fluorescence Test Plate.

Absorbance Testing

Applies only to models with absorbance capability

BioTek developed a series of tests for the absorbance system using a combination of solid state Absorbance Test Plates and liquid plates. An advantage of running liquid tests is the liquid in the wells has a meniscus, whereas the test plate's neutral density glass filters do not. The test plates and the materials used for creating the liquid plates are available for purchase from BioTek. See **Optional Accessories** on page 4.

To qualify the absorbance system for the Synergy LX, you should perform:

- Absorbance Liquid Test 1 *and* Absorbance Plate Test (using PN 7260522) *or*
- Absorbance Liquid Test 2

Optionally, to qualify operation in the UV range, you should also perform:

- Absorbance Liquid Test 3 *or* Absorbance Plate Test at 340 nm (using PN 7260551)

BioTek Absorbance Test Plates

Absorbance Test Plate PN 7260522 uses NIST-traceable neutral density filters to confirm absorbance specifications in the visible range (400–800 nm). This test plate also contains precision-machined holes to verify mechanical alignment. Absorbance Test Plate PN 7260551 uses NIST-traceable neutral density filters to confirm absorbance specifications in the UV range (340 nm).

Every test plate comes with a Test Plate Calibration Certificate, containing a table with Absorbance OD Standards for each filter at each wavelength supported by the plate.

Before the Absorbance Plate Test can be performed, the OD Standard values must be entered into Gen5. Enter and save these values once initially, and then update them annually when the test plate is recertified by BioTek.

Check the calibration due date on the test plate's label. If the test plate is overdue for recalibration, contact BioTek to schedule service.

Test Method

The Absorbance Plate Test is conducted using Gen5 software (**System > Diagnostics > Test Plates**) to confirm mechanical alignment and optical density accuracy, linearity, and repeatability. When complete, a results report displays Pass or Fail for each individual test.

- **Peak Absorbance:** The PN 7260522 test plate contains a glass filter in position C6 that is used to check the wavelength accuracy of the absorbance monochromator. The filter is scanned across a specified wavelength range in 1-nm increments. The

wavelength(s) of maximum absorbance are compared to the expected peak wavelength(s) supplied on the test plate's data sheet. The accuracy of the wavelength should be ±3 nm (±2 nm instrument, ±1 nm filter allowance).

- **Alignment:** The test plate has precisely machined holes to confirm mechanical alignment. The amount of light that shines through these holes is an indication of whether the microplate carrier is properly aligned with the absorbance optical path. A reading of more than 0.015 OD for any of the designated alignment holes indicates that the light is being "clipped" and the reader may be out of alignment.
- **Accuracy:** The test plate contains NIST-traceable neutral-density glass filters of known OD values at one or more wavelengths. Actual measurements are compared against the expected values provided in the test plate's data sheet. Since there are several filters with differing OD values, the accuracy across a range of ODs can be established. Once it is proven that the reader is accurate at these OD values, the reader is also considered to be linear. To further verify this, you can perform a linear regression analysis on the test plate OD values in a program such as Microsoft Excel; an R2 value of at least 0.9900 is expected.
- **Repeatability:** This test ensures the instrument meets its repeatability specification by conducting repeated reads of each neutral-density filter on the test plate and comparing the results.

Sample Test Report

Refer to **Sample Reports**, starting on page 113, to see a sample Absorbance Plate Test Report for Synergy LX.

Troubleshooting

If a test fails, try the troubleshooting tips below. If the test continues to fail, contact Technical Support.

Do not remove filters from the Absorbance Test Plate. Do not use alcohol or other cleaning agents, and do not touch the filters with your bare fingers.

If a higher-OD well reports "#N/A" for Min/Max Limit and Result, the measured OD is beyond the specified range for Accuracy or Repeatability used with this test, and therefore no pass/fail determination is made. It does not indicate a test failure.

Peak Absorbance Test

- Check the filter in the C6 position to ensure it is clean. If needed, clean the filter with lens paper. Do not remove the filter, and do not use alcohol or other cleaning agents.
- Verify that the Peak wavelength information entered for the plate in Gen5 matches the information provided on the test plate's data sheet.
- Check the calibration due date on the test plate's label. If the test plate is overdue for recalibration, contact BioTek to schedule service.
- Check the microplate carrier to ensure it is clear of debris.

Alignment Test

- Ensure that the test plate is properly seated in the microplate carrier.
- Check the four alignment holes (A1, A12, H1, H12) to ensure they are clear of debris.
- Check the microplate carrier to ensure it is clear of debris.

Accuracy Test

- Check the neutral-density filters to ensure they are clean (positions C1, D4, E2, F5, G3, H6). If needed, clean the filters with lens paper. Do not remove any filters, and do not use alcohol or other cleaning agents.
- Verify that the wavelength/expected OD values entered for the plate in Gen5 match the information provided on the test plate's data sheet.

Repeatability Test

- Check the neutral-density filters to ensure there is no debris that may have shifted between readings and caused changes.
- Check the microplate carrier to ensure it is clear of debris.

Absorbance Liquid Tests

BioTek Instruments, Inc. has developed a series of liquid test procedures for testing your reader's absorbance system.

Test Methods

Absorbance Liquid Test 1 confirms repeatability and alignment when a solution is used in the microplate. If these tests pass, then the lens placement and optical system cleanliness are proven. For the Repeatability portion of this test, two columns containing a color-absorbing solution are read five times at 405 nm. For each well, an "allowed deviation" is determined based on its Mean OD and the reader's repeatability specification. Each well's Standard Deviation must be less than its Allowed Deviation to pass. To confirm the reader's mechanical alignment, the plate is rotated 180 degrees in the carrier (e.g., A1 is now in the H12 position), and the same two columns are read. The initial and new OD readings are compared using the reader's accuracy specification. If the two readings in the same well do not meet specification, the reader may be out of alignment.

If an Absorbance Test Plate is not available, **Absorbance Liquid Test 2** may be conducted to test the instrument's alignment, repeatability, and accuracy by preparing a series of solutions of varying OD values as described on page 94.

Absorbance Liquid Test 3 is an optional test offered for those sites that must have proof of linearity at 340 nm. (Alternatively, the BioTek 340 nm Absorbance Test Plate may be used; see page 64.) This test is optional since the Synergy LX has good "front end" linearity throughout the specified wavelength range. While the absolute values of the OD cannot be determined by this test, the results will indicate if there is adequate repeatable absorbance and a linear slope. This method is dependent upon proper dye dilution and a skilled pipetting technique. It is expected that the first dilution (mid-level solution) will have an absorbance value near 75% of that of the stock (high-level) solution and that the second dilution (low-level solution) will have an absorbance value near 50% of that of the stock solution.

Gen5 Protocol Parameters

The information in this section represents the recommended reading parameters for the referenced Gen5 protocol(s). It is possible that your tests will require modifications to some of these parameters, such as the Plate Type.

> The Plate Type setting in each Gen5 protocol should match the actual 96-well plate in use.

Synergy LX Abs Test 1.prt

Parameter	Setting
Plate Type	96 WELL PLATE
Shake	Linear for 4:00
Two Read Steps	
Detection Method	Absorbance
Read Type	Kinetic
Kinetic loop (one per Read step)	Set a Run Time/Interval combination to read the plate five times with minimal delay
Read wells	First Read step: A1..H2 Second Read step: A11..H12
Wavelength	405 nm
Read Speed	Normal
Delay after plate movement	100 msec
Plate Out,In step between loops	Text "Please rotate the plate 180 degrees"

Synergy LX Abs Test 2.prt

Parameter	Setting
Plate Type	96 WELL PLATE
Two Read Steps	
Detection Method	Absorbance
Read Type	Kinetic
Kinetic loop (one per Read step)	Set a Run Time/Interval combination to read the plate five times with minimal delay
Step labels	First Read step: "Normal" Second Read step: "Turnaround"
Read wells	Full plate
Wavelength	2 (450 nm, 630 nm)
Read Speed	Normal
Delay after plate movement	100 msec
Plate Out,In step between loops	Text "Please rotate the plate 180 degrees"

Parameter	Setting
Data Reduction	Define two Delta OD transformations (450 – 630 nm), one per Read data set

Synergy LX Abs Test 3.prt

Parameter	Setting
Plate Type	96 WELL PLATE
Shake Step	Linear for 0:30
Detection Method	Absorbance
Read Type	Kinetic
Kinetic loop	Set a Run Time/Interval combination to read the plate five times with minimal delay
Read wells	A1..H6
Wavelength	340 nm
Read Speed	Normal
Delay after plate movement	100 msec

Results Analysis

The Absorbance Liquid Test procedures begin on page 92. All tests are conducted using the Normal read speed.

Absorbance Liquid Test 1

Accuracy Specification:

± 1.0% ± 0.010 OD from 0.000 to 2.000 OD
± 3.0% ± 0.010 OD from 2.000 to 2.500 OD

Repeatability Specification:

± 1.0% ± 0.005 OD from 0.000 to 2.000 OD
± 3.0% ± 0.005 OD from 2.000 to 2.500 OD

1. The plate is read five times in the “Normal” position at 405 nm. Calculate the Mean OD and Standard Deviation of those five reads for each well in columns 1 and 2.

2. For each well in columns 1 and 2, calculate the Allowed Deviation using the Repeatability specification for a 96-well plate (Mean OD x 0.01 + 0.010). For each well, its Standard Deviation should be less than its Allowed Deviation.

Example: Five readings in well A1 of 0.802, 0.802, 0.799, 0.798, and 0.801 result in a Mean of 0.8004 and a Standard Deviation of 0.0018. The Mean multiplied by 1.0% (0.8004 * 0.01) equals 0.008, and when added to 0.005 equals 0.013; this is the Allowed Deviation for well A1. Since the Standard Deviation for well A1 is less than this value, the well meets the test criteria.

3. The plate is read five times in the "Turnaround" position at 405 nm. Calculate the Mean OD of those five reads for each well in columns 11 and 12.
4. Perform a mathematical comparison of the Mean values for each well in its Normal and Turnaround positions (that is, compare A1 to H12, A2 to H11, B1 to G12,… H2 to A11). To pass the test, the differences in the compared Mean values must be within the Accuracy specification for a 96-well microplate.

   Example: If the Mean value for well A1 in the Normal position is 1.902 with a specified accuracy of ±1.0% ±0.010 OD, then the expected range for the Mean of the well in its Turnaround (H12) position is 1.873 to 1.931 OD. 1.902 x 0.010 + 0.010 = 0.029; 1.902 - 0.029 = 1.873; 1.902 + 0.029 = 1.931.

Absorbance Liquid Test 2

Accuracy Specification:

± 1.0% ± 0.010 OD from 0.000 to 2.000 OD
± 3.0% ± 0.010 OD from 2.000 to 2.500 OD

Repeatability Specification:

± 1.0% ± 0.005 OD from 0.000 to 2.000 OD
± 3.0% ± 0.005 OD from 2.000 to 2.500 OD

1. The plate is read five times at 450/630 nm ("Normal" position), resulting in five sets of Delta OD data. Calculate results for Linearity:
   - Calculate the mean absorbance for each well, and average the means for each concentration.
   - Perform a regression analysis on the data to determine if there is adequate linearity. Since it is somewhat difficult to achieve high pipetting accuracy when conducting linear dilutions, an R^2 value of at least 0.9900 is considered adequate.
2. Calculate the results for Repeatability:
   - Calculate the Mean and Standard Deviation for the five readings taken at each concentration. Only one row of data needs to be analyzed.

- For each Mean, calculate the Allowed Deviation using the Repeatability specification for a 96-well plate of ±1.0% ±0.005 OD.
- The Standard Deviation for each set of readings should be less than the Allowed Deviation.
  Example: Readings of 1.950, 1.948, 1.955, 1.952, and 1.950 will result in a Mean of 1.951, and a Standard Deviation of 0.0026. The Mean (1.951) multiplied by 1.0% 1.951 x 0.01) = 0.01951, which when added to the 0.005 (0.01951 + 0.005) = 0.02451 OD, which is the Allowed Deviation. Since the Standard Deviation is less than this value, the reader meets the test criteria.

3. After gathering data for the Linearity Test, the plate is read five more times with the A1 well in the H12 position ("Turnaround" position). This results in values for the four corner wells that can be used to assess alignment. Calculate results for the Alignment Test:
   - Calculate the means of the wells A1 and H1 in the Normal plate position (data from Linearity Test) and in the Turnaround position.
   - Compare the mean reading for well A1 to its mean reading when in the H12 position. Next, compare the mean values for the H1 well to the same well in the A12 position. The difference in the values for any two corresponding wells should be within the Accuracy specification for 96-well plates. If the four corner wells are within the accuracy range, the reader is in alignment.

     Example: If the mean of well A1 in the normal position is 1.902, where the specified accuracy is ±1.0% ±0.010 OD, then the expected range for the mean of the same well in the H12 position is 1.873 to 1.931 OD. (1.902 x 1.0% = 0.019 + 0.010 = 0.029, which is added to and subtracted from 1.902 for the range.)

Absorbance Liquid Test 3

Repeatability Specification:

± 1.0% ± 0.005 OD from 0.000 to 2.000 OD
± 3.0% ± 0.005 OD from 2.000 to 2.500 OD

1. The plate is read five times at 340 nm. For each well, calculate the Mean OD and Standard Deviation of the five readings.
2. For each Mean calculated in step 1, calculate the Allowed Deviation using the Repeatability specification for a 96-well plate (Mean OD x 0.015 + 0.005). For each well, its Standard Deviation should be less than its Allowed Deviation.

Example: Five readings in well A1 of 0.802, 0.802, 0.799, 0.798, and 0.801 result in a Mean of 0.8004 and a Standard Deviation of 0.0018. The Mean multiplied by 1.0% (0.8004 * 0.01) equals 0.008, and when added to 0.005 equals 0.013; this is the Allowed Deviation for well A1. Since the Standard Deviation for well A1 is less than this value, the well meets the test criteria.

3. Calculate results for Linearity:
   - For each of the three test solutions, calculate the average Mean OD for the wells containing that solution (mean of wells A1 to H2, A3 to H4, and A5 to H6).
   - Perform a regression analysis on the data to determine if there is adequate linearity. The three average Mean OD values are the “Y” values. The solution concentrations are the “X” values (1.00, 0.75, 0.50). Since it is somewhat difficult to achieve high pipetting accuracy when conducting linear dilutions, an R2 value of at least 0.9900 is considered adequate.

Troubleshooting

If an absorbance liquid test fails, try the following. If a test continues to fail, contact Technical Support.

- Check the microwells and plate carrier for debris that may have shifted and caused changes.
- Ensure the microplate is properly seated in the carrier.
- As applicable, confirm that the plate was properly oriented in the "Normal" and "Turnaround" positions.
- Liquid Test 1 can fail due to the meniscus effect, which can cause readings to decrease over time. If you suspect this may be the case, include a shake step between the read steps in the protocol.

Fluorescence Testing

For models with fluorescence capability, BioTek provides two options for testing the fluorescence system. One uses a solid state Fluorescence Test Plate (package PN 1400501*). The other uses liquid plates, the materials for which are available for purchase from BioTek (see **Materials for Conducting Liquid Tests** on page 5).

*Fluorescence Test Plate PN 7092092 cannot be used for these tests.

BioTek Fluorescence Test Plate

The Fluorescence Test Plate simplifies the process for conducting fluorescence intensity qualification tests on the Synergy LX. The test plate is solid and therefore immune to the pipetting errors, evaporation issues, and costs experienced with conventional Liquid Tests.

The test plate package includes Gen5 protocols designed specifically for use with the test plate. The protocols include embedded Microsoft Excel spreadsheets to automatically calculate results and determine pass/fail. The protocols and their spreadsheets were fully validated in accordance with BioTek Instruments' Product Validation policies and procedures.

The package also contains a user guide that describes the test methods, helps you get started with using the plate, and provides important information for cleaning and maintaining the test plate. The guide also provides troubleshooting tips and information on the annual recalibration program.

Results Analysis

Refer to the *Fluorescence Test Plate User Guide* for descriptions of the data reduction calculations for each test. The tests must meet the following criteria to pass:

Fluorescence Intensity (FI) Tests	
Corners	%CV < 3.0
Linearity	R^2 >= 0.9500
Sensitivity, filter-based system:	
Sodium Fluorescein analogue	Detection Limit <= 20 pM
Methylumbelliferone analogue	Detection Limit <= 0.16 ng/mL

Fluorescence Liquid Tests

Test Methods

- The **Corners Test** uses fluorescence compounds to verify that the plate carrier is properly aligned in relation to the fluorescence optics.
- The **Sensitivity Test** uses a fluorescence compound and buffer solution to test the fluorescence reading capability of the instrument. The ability to detect specific compounds at the required limit of detection ensures that the filters, optical path, and PMT are all in working order. This test verifies that the difference between the concentration well under investigation and the mean of the median buffer well is statistically distinguishable.
- The **Linearity Test** verifies that the system is linear; that is, the signal changes proportionally with changes in concentration (R^2 value). Proving that the system is linear allows the Sensitivity Test to be run on two points instead of using serial dilutions.

The tests presented in this section require specific microplates, solutions, wavelengths, mirrors, and filters. Your laboratory may require a deviation from some of these tests. For example, you may wish to use a different fluorescing solution or microplate.

If deviation from the tests as presented in this section is required, the following steps should be taken the first time each test is run (e.g., during the Initial OQ):

1. Perform the tests exactly as described on the following pages.

2. Rerun the tests using your particular solutions, filter cubes, microplates, and so on. If results are comparable, then the results from these tests will be your baseline for future tests.

3. Document your new test procedure(s), and save all test results.

Gen5 Protocol Reading Parameters

The information in the following tables represents the recommended reading parameters. It is possible that your tests will require modifications to some of these parameters, such as the Plate Type (see **Troubleshooting Tips** on page 79).

The Plate Type setting in each Gen5 protocol should match the plate you are actually using.

Synergy LX_FI_T_SF.prt

Parameter	Default Setting
Plate Type:	Costar 96-well black opaque (#3915)
Detection Method:	Fluorescence intensity
Four Read Steps	
Read Step 1: Kinetic	
Kinetic loop:	Run Time: 0:00:45 Interval: 0:00:03 Reads: 16
Step Label:	Sensitivity Read
Read Well:	D7
Filter Sets:	Filter set: Green Gain: Auto, Scale to High Wells, D7, 50000
Read Speed:	Normal Delay after plate movement: 350 msec Measurements per data point: 10 Dynamic Range: Standard
Read Height:	8.75 mm
Read Step 2: Kinetic	
Kinetic loop:	Run Time: 0:01:35 Interval: 0:00:06 Reads: 16
Step Label:	Sensitivity Read Buffer
Read Wells:	C9..E9
Filter Sets:	Filter set: Green Gain: Auto, Use first filter set gain from FIRST Read Step
Read Speed:	Normal Delay after plate movement: 350 msec Measurements per data point: 10 Dynamic Range: Standard
Read Height:	8.75 mm

Parameter	Default Setting
Read Step 3: Endpoint	
Step Label:	Corners Read
Read Wells:	A1–A3, A10–A12, H1–H3, H10–H12
Filter Sets:	Filter set: Green Gain: Auto, Scale to High Wells, A3, 50000
Read Speed:	Normal Delay after plate movement: 350 msec Measurements per data point: 10 Dynamic Range: Standard
Read Height:	8.75 mm
Read Step 4: Endpoint	
Step Label:	Linearity Read
Read Wells:	C1–F5
Filter Sets:	Filter set: Green Gain: Auto, Scale to High Wells, C1, 50000
Read Speed:	Normal Delay after plate movement: 350 msec Measurements per data point: 10 Dynamic Range: Standard
Read Height:	7.75 mm

Synergy LX_FI_T_MUB.prt

Parameter	Default Setting
Plate Type:	Costar 96-well black opaque (#3915)
Detection Method:	Fluorescence
Three Read Steps	
Read Step 1: Kinetic	
Kinetic loop:	Run Time: 0:00:45 Interval: 0:00:03 Reads: 16
Step Label:	Sensitivity Read
Read Well:	D7

Parameter	Default Setting
Filter Sets:	Filter set: Blue Gain: Auto, Scale to High Wells, D7, 80000
Read Speed:	Normal Delay after plate movement: 350 msec Measurements per data point: 10 Dynamic Range: Standard
Read Height:	8.25 mm
Read Step 2: Kinetic	
Kinetic loop:	Run Time: 0:01:35 Interval: 0:00:06 Reads: 16
Step Label:	Sensitivity Read Buffer
Read Well:	C9, D9, E9
Filter Sets:	Filter Set: Blue Gain: Auto, Use first filter set gain from FIRST Read Step
Read Speed:	Normal Delay after plate movement: 350 msec Measurements per data point: 10 Dynamic Range: Standard
Read Height:	8.25 mm
Read Step 3: Endpoint	
Step Label:	Linearity Read
Read Well:	C1–F5
Filter Sets:	Filter Set: Blue Gain: Auto, Scale to High Wells, C1, 80000
Read Speed:	Normal Delay after plate movement: 350 msec Measurements per data point: 10 Dynamic Range: Standard
Read Height:	7.25 mm

Results Analysis

The Fluorescence Liquid Test procedures begin on page 101.

Corners Test

1. Calculate the Mean of the 12 "corner" wells (A1–A3, A10–A12, H1–H3, and H10–H12).
2. Calculate the Standard Deviation for the same 12 wells.
3. Calculate the %CV: `(Standard Deviation / Mean) * 100`

The %CV must be **< 3.0** to pass.

Sensitivity Test

1. Calculate the Mean and Standard Deviation of the 16 reads for each of the buffer wells (C9, D9, E9).
2. Among the three buffer wells, find the Median Standard Deviation and corresponding Mean.
3. Calculate the Mean for the 16 reads of the SF (or MUB) Concentration well (D7).
4. Calculate the Signal-to-Noise Ratio (SNR) using the Mean SF (or MUB) Concentration, Buffer Media STD with its corresponding Buffer Mean:
   `(<SF or MUB> Mean – Buffer Mean)/3 * Buffer STD)`
5. Calculate the Detection Limit:

Sodium Fluorescein: Using the known concentration value of SF and the calculated SNR: 1000/SNR:

Filter Cube	To pass, the Detection Limit must be:
Green: 485/20, 528/20, 510 nm dichroic mirror	≤ 20 pM

Methylumbelliferone: Using the known concentration value of MUB and the calculated SNR: 17.6/SNR

Filter Cube	To pass, the Detection Limit must be:
Blue: 360/40, 460/40, 400 nm dichroic mirror	<= 0.16 ng/mL (0.91 nM)

Linearity Test

1. Calculate the Mean of the four wells for each concentration in columns 1–5.
2. Perform linear regression using these values as inputs:

Sodium Fluorescein	
x	**y**
1000	Mean of the 1000 pM wells
500	Mean of the 500 pM wells
250	Mean of the 250 pM wells
125	Mean of the 125 pM wells
62.5	Mean of the 62.5 pM wells

Methylumbelliferone	
x	**y**
100	Mean of the 100 nM wells
50	Mean of the 50 nM wells
25	Mean of the 25 nM wells
12.5	Mean of the 12.5 nM wells
6.25	Mean of the 6.25 nM wells

3. Calculate the R^2 value; it must be **>= 0.9500** to pass.

Troubleshooting

If any tests fail, please try the following suggestions. If the test(s) continue to fail, print the results and contact Technical Support.

- Are the solutions fresh? Discard the plate and any opened, unused test solutions after seven days.
- Are the excitation/emission filters clean?
- Are you using the proper filter cube?

- If the Corners Test continues to fail, the hardware may be misaligned. Contact Technical Support.
- Review the pipetting instructions to verify the plate was correctly prepared.
- Does the Plate Type setting in the Gen5 protocol match the plate you used?
- The Read steps in the protocols use the Gen5 Automatic Gain Adjustment feature to determine optimum sensitivity values for the plate. If an Auto Gain Result value is outside the range of 30–200, this may indicate a problem.

  If the value is less than 30:

  - The stock solution/dilution concentrations may be too high. Try creating fresh solutions/dilutions, and rerun the test using a new, clean plate.
  - If all of the tests are passing but the Gain value is low, a PMT in your reader may just be very sensitive. Contact Technical Support to confirm that this may be the case.

  If the value is greater than 200:

  - The stock solution/dilution concentrations may be too low. Try creating fresh solutions/dilutions, and rerun the test using a new, clean plate.
  - The PMTs or optical path(s) may be deteriorating, or the optics or other hardware may be misaligned. Contact Technical Support.

Luminescence Test

For models with luminescence capability, BioTek uses the Harta Luminometer Reference Microplate to test the luminescence system. The test plate is LED-based and NIST-traceable. Contact BioTek to purchase a plate (BTI #8030015; includes microplate carrier adapters) or visit www.HartaInstruments.com to learn more.

Test Method

The Harta Luminometer Reference Microplate is used to determine a detection limit by leveraging a known correlation of 35 photons per attomole of ATP. By using the NIST data provided with the Harta plate in photons/s, a conversion factor of 0.02884 attomole/photon is applied to determine an ATP concentration and subsequent limit of detection for the instrument under test.

Plate Layout

	1	2	3	4	5	6	7	8	9	10	11	12
A		REF					LED7	LED8				
B												
C												
D	Buffer	Buffer	Buffer	Buffer								
E	Buffer	Buffer	Buffer	Buffer								
F	Buffer	Buffer	Buffer	Buffer								
G	Buffer	Buffer	Buffer	Buffer								
H												

Results Analysis

The Luminescence Test procedure is described on page 106.

1. Determine if the plate's battery is functioning properly:
   - If A8 > (0.2 * A7), the battery is good. Otherwise, it requires replacement.

> A replacement battery is included with each Harta plate. A new spare battery will be supplied when the plate is recertified.

2. On the Harta plate's Calibration Certificate, locate the NIST measurement for the A2 position and convert it to attomoles: `(A2 NIST measurement*0.02884)`
3. Calculate the signal-to-noise ratio:
   `(A2–Mean of the buffer cells)/(3 * Standard deviation of buffer cells)`
4. Calculate the detection limit:
   `A2 NIST measurement in attomoles/signal-to-noise ratio`

Pass/Fail Criteria

- If the reader is equipped with the low-noise PMT, the detection limit must be **≤ 75 amol** to pass.
- If the reader is equipped with the red-shifted PMT, the detection limit must be **≤ 500 amol** to pass.

If you do not know which PMT is installed, (#49984 = low-noise PMT; #49721 = red-shifted PMT, please contact Technical Support.

Gen5 Protocol Reading Parameters

The information in this section represents the recommended reading parameters for the referenced Gen5 protocol(s).

Synergy LX_LumTest_Harta.prt

Parameter	Default Setting
Plate Type:	8030015 Harta with 8032028 adapter
Delay Step:	3 minutes
Read Step 1:	
Detection Method:	Luminescence
Read Type:	Endpoint
Step Label:	Reference well A2
Read Wells:	A2
Filter Set:	LUM
Gain:	150
Integration Time:	0:10.00 MM:SS.ss

Parameter	Default Setting
Delay After Plate Movement:	350 msec
Dynamic Range:	Standard
Read Height:	8.5 mm
Read Step 2:	
Detection Method:	Luminescence
Read Type:	Endpoint
Step Label:	Background
Read Wells:	D1..G4
Filter Set:	LUM
Gain:	150
Integration Time:	0:10.00 MM:SS.ss
Delay After Plate Movement:	350 msec
Dynamic Range:	Standard
Read Height:	8.5 mm
Read Step 3:	
Detection Method:	Luminescence
Read Type:	Endpoint
Read Wells:	A7–A8
Step Label:	Battery Check
Filter Set:	LUM
Gain:	50
Integration Time:	0:01.00 MM:SS.ss
Delay After Plate Movement:	350 msec
Dynamic Range:	Extended
Read Height:	8.5 mm

Troubleshooting

If the luminescence test fails, try the following suggestions. If it continues to fail, print the results and contact Technical Support.

- Ensure that the reading is performed through a hole in the filter cube, not through a glass filter.
- Verify that the filter cube settings in Gen5 match the filter cube installed in the reader.
- If the test continues to fail, the optics block may need to be cleaned. Contact Technical Support for instructions.

Chapter 6

Instrument Qualification Procedures

This chapter contains the step-by-step procedures for verifying that the Synergy LX and its various subsystems are performing to specification.

Chapter 5, **Instrument Qualification Process**, starting on page 62, introduces the various test methods, describes the materials and relevant protocol parameters used to execute the tests, explains how to analyze test results, and provides troubleshooting tips in the event of a failure.

Overview

Gen5 software is required for conducting the qualification procedures for the absorbance, fluorescence, and luminescence systems. Microsoft Excel is also required if using the BioTek Fluorescence Test Plate.

This chapter contains BioTek Instrument's recommended qualification procedures for all Synergy LX models.

Every Synergy LX reader is fully tested at BioTek prior to shipment and should operate properly upon initial setup. If you suspect that a problem occurred during shipment, if you have received the equipment after returning it to the factory for service, and/or if regulatory requirements dictate that you qualify the equipment on a routine basis, perform the procedures outlined in this chapter.

See the **Recommended Qualification Schedule** on page 88 to determine which qualification tests shall be conducted for your reader and to meet your site's regulatory requirements.

A Product Qualification Package (PN 1500534N) for the Synergy LX is available for purchase. The package contains complete procedures, Gen5 protocols, checklists, and logbooks for performing Installation Qualification, Operational Qualification, Performance Qualification, and Maintenance. Contact your local BioTek dealer for more information.

IQ/OQ/PQ Description

Installation Qualification confirms that the reader and its components have been supplied as ordered and ensures that they are assembled and configured properly for your lab environment.

- The recommended IQ procedure consists of setting up the instrument and its components as described in **Chapter 2, Installation**, and performing the System Test.
- The IQ procedure should be performed initially (before the reader is used for the first time).
- The successful completion of the IQ procedure verifies that the instrument is installed correctly. The Operational Qualification procedure should be performed immediately following the successful IQ.

Operational Qualification confirms that the equipment operates according to specification initially and over time.

- The recommended OQ procedure consists of performing the system test and a series of tests for the absorbance, fluorescence, and luminescence systems, as applicable for your instrument model.
- The OQ procedure should be performed initially (before first use) and then routinely; the recommended interval is annually. It should also be performed after any major repair or upgrade to the hardware or software.
- Although out-of-tolerance failures will be detected by the OQ tests, results should be compared with those from the routine Performance Qualification tests and previous OQ tests to monitor for trends.
- The successful completion of the OQ procedure, in combination with results that are comparable to previous PQ and OQ tests, confirms that the equipment is operating according to specification initially and over time.

Performance Qualification confirms that the reader consistently meets the requirements of the tests performed at your laboratory.

- The recommended PQ procedure consists of performing the system test and a series of tests for the absorbance, fluorescence, and luminescence systems, as applicable for your instrument model.
- Your facility's operating policies may also require that you routinely perform an actual assay to confirm that the reader will consistently give adequate results for the assays to be run on it.
- These tests should be performed routinely; the recommended interval is monthly or quarterly, depending on the test. This frequency may be adjusted depending on the trends observed over time.
- The successful completion of the PQ procedure confirms that the equipment is performing consistently under normal operating conditions.

Recommended Qualification Schedule

This table defines BioTek-recommended intervals for qualifying a Synergy LX used two to five days a week. The actual frequency, however, may be adjusted depending on your usage of the instrument and its various models. The schedule assumes that the instrument is properly maintained as outlined in the **Periodic Maintenance** chapter.

Tasks/Tests	IQ	OQ	PQ	
	Initially	Initially/ Annually	Monthly	Quarterly
All models:				
Installation, setup, and configuration of the reader, and, if used, host computer and Gen5 software	✓			
System Test	✓	✓	✓	
Models with absorbance capability:				
Absorbance Plate Test		✓	✓	
Absorbance Liquid Test 1 or Liquid Test 2*		✓		✓
(Optional) Absorbance Liquid Test 3 *or* 340 nm Absorbance Plate Test (using PN 7260551)		✓		✓
Models with fluorescence capability:				
Corners, Sensitivity, Linearity (FI) Tests		✓	✓	
Models with luminescence capability:				
Luminescence Test		✓	✓	

* If you have Absorbance Test Plate PN 7260522, perform Liquid Test 1. Otherwise, perform Liquid Test 2.

System Test

System Test, starting on page 63, describes this test and explains where to find information on error conditions, as well as sample test reports for Synergy LX.

Test Procedure Using the Touchscreen

1. From the Main Menu, tap **Instrument**, then select the **Configuration** tab.
2. Tap **Start** to begin the system test.
3. When the test finishes, tap **USB Report** to save the test results to a USB flash drive, **Print** to print the test results, or **Exit** to close the screen.

Test Procedure Using Gen5

1. From the Gen5 main screen, select **System > Diagnostics > Run System Test**.

If the test fails during execution, a message box appears in the Gen5. Close the box; the test report contains the error code that was generated by the failure.

2. When the test is complete, a dialog appears, requesting additional information. Enter any required information and then click **OK**.
3. The results report appears. it shows either “SYSTEM TEST PASS” or “SYSTEM TEST FAIL *** ERROR (error code) DETECTED.”

   If the test failed, look up the error code in **Appendix B, Error Conditions**, starting on page 119, to determine its cause. If the cause is something you can fix, turn off the reader, fix the problem, and then turn the reader back on and retry the test. If the test continues to fail, or if the cause is not something you can fix, contact Technical Support.

4. If required, print, sign, and date the report, and store it with your test documentation.

Absorbance Plate Test

BioTek Absorbance Test Plate, starting on page 64, describes the test methods and provides troubleshooting tips in the event of test failure.

Requirements

To perform this test, you will need:

- Absorbance Test Plate, PN 7260522
- (Optional) 340 nm Absorbance Test Plate, PN 7260551
- Current Absorbance Test Plate Calibration Certificate(s)
- Gen5 software

Setup

Before an Absorbance Test Plate can be used for qualification, you must enter information from its Calibration Certificate into Gen5. Perform these steps initially, and then repeat them annually after the test plate is recertified by BioTek.

1. Obtain the current Test Plate Calibration Certificate.
2. Start Gen5, and select **System > Diagnostics > Test Plates > Add/Modify Plates**.
3. Click **Add**. The Absorbance Test Plate dialog appears.
4. Select the appropriate Plate Type, and then enter the plate's serial number.
5. Enter the Last Certification and Next Certification dates from the calibration label on the Test Plate.
6. If the wavelength values in the top row of the grid in Gen5 are appropriate for your tests, enter the OD Standard values from the Calibration Certificate into the grid. Make sure you enter the correct value for each well/wavelength combination.

If you need to change the wavelength values, click **Wavelength List**. Add, change, or delete the values as needed and click OK.

7. Review all of the values that you entered. When finished, click **OK** to save the information.

Test Procedure

1. From the Gen5 main screen, click **System > Diagnostics > Test Plates > Run**. If prompted, select the desired Test Plate and click **OK**.
2. When the Absorbance Test Plate Options dialog appears, enter any required information.
3. Highlight the wavelength(s) to be included in this test.

You need to select only those wavelengths most appropriate for your use of the reader.

4. (Optional) Enter a comment.
5. Click **Start Test**.
6. Place the Absorbance Test Plate on the microplate carrier, with well A1 in the proper location.
7. Click **OK** to run the test.
8. When the test is complete, the results report appears. Scroll through the report; every result should show “PASS”.
   - Troubleshooting tips are provided on page 65.
   - Test descriptions are provided on page 64.

Absorbance Liquid Tests

Absorbance Liquid Tests, starting on page 67, describes the test methods, lists the Gen5 protocol parameters, explains how to analyze the test results, and provides troubleshooting tips in the event of test failure.

The tests in this section require specific microplates, solutions, and wavelengths. Your laboratory may require a deviation from some of these tests. For example, you may wish to use a different plate or test solution. If deviation from the tests as presented in this section is required, perform the following steps the first time each test is run:
• Perform the tests exactly as described here.
• Rerun the tests using your particular plates, solutions, and so on.
• If the results are comparable, then the results from these tests will be your baseline for future tests. Document your new test procedure, and save all test results.

Absorbance Liquid Test 1

Materials

Manufacturer part numbers are subject to change.

- New 96-well, clear, flat-bottom microplate (Corning Costar #3590 recommended)
- Stock Solution A or B, which may be formulated by diluting a dye solution available from BioTek (A) or from the materials listed below (B)
- The Gen5 protocol **Synergy LX Abs Test 1.prt** described on page 67

Solution A

- BioTek QC Check Solution No. 1 (PN 7120779, 25 mL; or 7120782, 125 mL)
- Deionized water
- 5-mL Class A volumetric pipette
- 100-mL volumetric flask

1. Pipette a 5-mL aliquot of BioTek QC Check Solution No. 1 into a 100-mL volumetric flask.
2. Add 95 mL of DI water; cap and shake well. The solution should measure approximately 2.000 OD when using 200 µL in a flat-bottom microwell.

Solution B

- Deionized water
- FD&C Yellow No. 5 dye powder (typically 90% pure)
- Tween 20 (polyoxyethylene (20) sorbitan monolaurate) or BioTek wetting agent, PN 7773002 (a 10% Tween solution)
- Precision balance with capacity of 100 g minimum and readability of 0.001 g
- 1-liter volumetric flask
- Weigh boat

1. Weigh out 0.092 gram of FD&C No. 5 yellow dye powder into a weigh boat.
2. Rinse the contents into a 1-liter volumetric flask.
3. Add 0.5 mL of Tween 20 or 5 mL of BioTek's wetting agent.
4. Make up to 1 liter with DI water; cap and shake well.

Test Procedure

Be sure to use a new microplate. Debris, fingerprints, or scratches may cause variations in readings.

1. Using freshly prepared stock solution (Solution A or B), prepare a 1:2 dilution using deionized water (one part stock, one part deionized water; the resulting solution is a 1:2 dilution). The concentrated stock solution should have an optical density of approximately 2.000 OD or lower.
2. Pipette 200 µL of the **stock** solution into column 1.
3. Pipette 200 µL of the **diluted** solution into column 2.

After pipetting the diluted test solution into the microplate and before reading the plate, we strongly recommend shaking the plate for four minutes. This will allow any air bubbles in the solution to settle and the meniscus to stabilize. Alternatively, wait 20 minutes after pipetting the test solution before reading the plate.

4. Create a Gen5 experiment based on the **Synergy LX Abs Test 1** protocol and read the plate. When prompted, rotate the plate 180 degrees and continue.

5. When the experiment is finished:
   - Save the experiment. Refer to the instructions on page 69 to perform calculations and determine pass/fail.
   - Troubleshooting tips are provided on page 72.
   - Test descriptions are provided on page 67.

Absorbance Liquid Test 2

The recommended method for testing the instrument's alignment, repeatability, and accuracy is to use Absorbance Test Plate PN 7260522 (see page 64). If the test plate is not available, however, Liquid Test 2 can be used for these tests.

Materials

Manufacturer part numbers are subject to change.

- A new 96-well, clear, flat-bottom microplate (Corning Costar #3590 is recommended)
- Ten test tubes, numbered consecutively, set up in a rack
- Calibrated hand pipette (Class A volumetric pipette recommended)
- Solution A or B (see the instructions for Liquid Test 1)
- A 0.05% solution of deionized water and Tween 20
- The Gen5 protocol **Synergy LX Abs Test 2.prt**, described on page 68

Test Procedure

1. Create a percentage dilution series, beginning with 100% of the original concentrated stock solution (A or B) in the first tube, 90% of the original solution in the second tube, 80% in the third tube, all the way to 10% in the tenth tube. Dilute using the 0.05% solution of deionized water and Tween 20. This solution can also be made by diluting the BioTek wetting agent 200:1.

Tube Number	1	2	3	4	5	6	7	8	9	10
Volume of Original Concentrated Solution (mL)	20	18	16	14	12	10	8	6	4	2
Volume of 0.05% Tween Solution (mL)	0	2	4	6	8	10	12	14	16	18
Absorbance expected if original solution is 2.0 at 200 µL	2.0	1.8	1.6	1.4	1.2	1.0	0.8	0.6	0.4	0.2

The choice of dilutions and the absorbance of the original solution can be varied. Use this table as a model for calculating the expected absorbances of a series of dilutions, given a different absorbance of the original solution.

2. Pipette 200 µL of the concentrated solution from Tube 1 into each well of the first column, A1 to H1, of a new flat-bottom microplate.
3. Pipette 200 µL from each of the remaining tubes into the wells of the corresponding column of the microplate (Tube 2 into wells A2 to H2, Tube 3 into wells A3 to H3, and so on).

After pipetting the diluted test solution into the microplate and before reading the plate, we strongly recommend shaking the plate for four minutes. This will allow any air bubbles in the solution to settle and the meniscus to stabilize. Alternatively, wait 20 minutes after pipetting the test solution before reading the plate.

4. Create a Gen5 experiment based on the **Synergy LX Abs Test 2** protocol and read the plate. When prompted, rotate the plate 180 degrees.
5. When finished:
   - Save the experiment. Refer to the instructions on page 69 to perform calculations and determine pass/fail.
   - Troubleshooting tips are provided on page 72.
   - Test descriptions are provided on page 67.

Absorbance Liquid Test 3 (optional)

Absorbance Liquid Test 3 is provided for sites requiring proof of linearity at 340 nm. This test is optional because the Synergy LX has good "front end" linearity throughout its wavelength range. As an alternative, the 340 nm Absorbance Test Plate (PN 7260551) may be used for this test.

Materials

Manufacturer part numbers are subject to change.

- New 96-well, clear, flat-bottom microplate (Corning Costar #3590 recommended)
- Calibrated hand pipette(s)
- Beakers and graduated cylinder
- Precision balance with readability to 0.01 g
- Buffer solution described below
- The Gen5 protocol **Synergy LX Abs Test 3.prt**, described on page 69

Buffer Solution

- Deionized water
- Phosphate-Buffered Saline (PBS), pH 7.2–7.6, Sigma tablets, #P4417 (or equivalent)
- β-NADH Powder (β-Nicotinamide Adenine Dinucleotide, Reduced Form) Sigma bulk catalog number N 8129, or preweighed 10-mg vials, Sigma number N6785-10VL (or BioTek PN 98233). Store the powder according to the guidelines on its packaging.

1. Prepare a PBS solution from the Sigma tablets.
2. In a beaker, mix 50 mL of the PBS solution with 10 mg of the β-NADH powder and mix thoroughly. This is the **100% Test Solution**.

Test Procedure

1. Prepare the **75% Test Solution** by mixing 15 mL of the 100% Test Solution with 5 mL of the PBS Solution.
2. Prepare the **50% Test Solution** by mixing 10 mL of the 100% Test Solution with 10 mL of the PBS Solution.
3. Carefully pipette the three solutions into a **new** 96-well microplate:
   - 150 µL of the 100% Test Solution into all wells of columns 1 and 2
   - 150 µL of the 75% Test Solution into all wells of columns 3 and 4
   - 150 µL of the 50% Test Solution into all wells of column 5 and 6

   After pipetting the diluted test solution into the microplate and before reading the plate, we strongly recommend shaking the plate for four minutes. This will allow any air bubbles in the solution to settle and the meniscus to stabilize. Alternatively, wait 20 minutes after pipetting the test solution before reading the plate.

4. Create a Gen5 experiment based on the **Synergy LX Abs Test 3** protocol and read the plate.
   - Save the experiment. Refer to the instructions on page 69 to perform calculations and determine pass/fail.
   - Troubleshooting tips are provided on page 72.
   - Test descriptions are provided on page 67.

Fluorescence Plate Tests

BioTek Fluorescence Test Plate on page 73 introduces the test plate and references its user guide for the test methods. Use of the test plate is offered as an alternative to conducting the fluorescence liquid tests described in the next section.

Requirements

Refer to the **Getting Started** section of the *Fluorescence Test Plate User Guide* for information on the required materials and prerequisite tasks.

Test Procedure

The **Qualification Tests** section of the *Fluorescence Test Plate User Guide* contains a procedure for cleaning the plate and then creating and running experiments based on supplied Gen5 protocols.

As described in the user guide, when each experiment is finished, Gen5 exports the measurement data to a prepared Microsoft Excel .xls file. The worksheet(s) within that file calculate results and determine pass or fail. Identify the reader-specific Gen5 protocols on the USB flash drive that came with the test plate. Use only those protocols that apply to your reader model and your organization's qualification requirements.

Fluorescence Liquid Tests

Fluorescence Liquid Tests, starting on page 74, describes the test methods, lists the Gen5 protocol parameters, explains how to analyze the test results, and provides troubleshooting tips in the event of test failure.

The tests presented in this section require specific microplates, solutions, and filter cubes. Your laboratory may require a deviation from some of these tests. For example, you may wish to use a different fluorescing solution or microplate.

If deviation from the tests as presented in this section is required, the following steps should be taken the first time each test is run:

- Perform the tests exactly as described on the following pages.
- Rerun the tests using your particular plates, solutions, and so on. If results are comparable, then the results from these tests will be your baseline for future tests.
- Document your new test procedure(s), and save all test results.

Required Materials

Kits containing the microplates and solutions required by the Liquid Tests are available for purchase; see Materials for Conducting Liquid Tests on page 5.

Manufacturer part numbers are subject to change.

All Tests:

- Deionized or distilled water
- Various beakers, graduated cylinders, and pipettes
- Aluminum foil
- (Optional, but recommended) 0.45-micron filter
- (Optional) Black polyethylene bag(s) to temporarily store plate(s)
- Gen5 protocols (described starting on page 74):
  - **Synergy LX FI_T_SF.prt**
  - **Synergy LX FI_T_MUB.prt**

Corners/Sensitivity/Linearity (FI) Tests

Manufacturer part numbers are subject to change.

The materials listed here are for use with Sodium Fluorescein. Methylumbelliferone can be used as an alternate or supplemental method for performing these tests. See page 102.

If using test kit PN 7160013 (see page 5), the buffer and SF are pre-diluted.

- Buffer:
  - NIST-traceable Sodium Borate Reference Standard (pH 9.18) (e.g., Fisher-Scientific 1 L Sodium Borate Mfr. #159532, or equivalent), **or**
  - Phosphate-Buffered Saline (PBS), pH 7.2–7.6 (e.g., Sigma tablets, Mfr. #P4417, or equivalent) and pH meter or pH indicator strips with pH range 4 to 10

- Sodium Fluorescein Powder (1 mg vial, BioTek PN 98155)
- A new, clean 96-well solid black microplate, such as Corning Costar #3915, or equivalent
- **Green** filter cube: EX: 485/20, EM: 528/20, Mirror: 510 nm; installed in the reader and configured in Gen5

Test Solutions

If using BioTek's sodium fluorescein powder (PN 98155), be sure to hold the vial upright and open it carefully; the material may be concentrated at the top. If a centrifuge is available, spin down the tube before opening.

When diluting the sodium fluorescein powder in buffer, it takes time for the powder to completely dissolve. Allow the solution to dissolve for five minutes, with intermittent vortexing, before preparing the titration dyes.

Wrap the vial containing the stock solution in foil to prevent exposure to light. Discard any open, unused solution after seven days.

1. The Sodium Borate solution does not require further preparation; proceed to step 2. If you are using PBS, prepare the solution:
   - (Optional, but recommended) Using a 0.45-micron filter, filter 200 mL of deionized or distilled water.
   - Follow the manufacturer's instructions on the PBS packaging to create 200 mL, dissolving the necessary amount of PBS into the filtered water.
   - Stir the solution (preferably using a stir table) until the PBS is completely dissolved.
   - Check the pH; it should be between 7.2 and 7.6 at 25°C.
2. Prepare the sodium fluorescein stock solution:
   - Add 2.0 mL of the buffer solution to the 1 mg Sodium Fluorescein (SF) vial. This yields a 1.3288 mM stock solution.
   - Ensure that the dye has completely dissolved and is well mixed.
3. Carefully prepare the dilutions. Label each with "SF" and the concentration:

Mix This SF Solution:	With Buffer:	To Make:	
0.53 mL of 1.3288 mM stock solution	13.47 mL	50.2 µM	
110 µL of 50.2 µM SF	13.89 mL	400 nM	
3.5 mL of 400 nM SF	10.5 mL	100 nM	
0.46 mL of 100 nM SF	13.54 mL	3.3 nM	*Corners Test*
4.24 mL of 3.3 nM SF	9.76 mL	1 nM	*Sensitivity/Linearity Tests*

Test Procedure

1. If you have not already done so, prepare the solutions for the tests you plan to perform. See **Test Solutions** on page 100.
2. Pipette the solutions for the Corners and Sensitivity/Linearity Tests into a clean, new 96-well solid black plate. Refer to the **Pipette Map** on page 101.
3. Create a Gen5 experiment based on the **Synergy LX FI_T_SF.prt** protocol described on page 74.
4. Read the plate, and then save the experiment.

Pipette Map

Seal the plates with foil or store them in black polyethylene bags until use. When using a clear-bottom plate, if the base of the plate is touched, clean the entire base with alcohol (95% ethanol) and then wipe with a lint-free cloth. Before placing the plate in the instrument, blow the bottom of the plate with an aerosol duster.

Corners, Sensitivity, and Linearity (FI) Tests

Using a single-channel pipette:

- Pipette 200 µL of the **3.3 nM SF** solution into the "corner" wells.
- Pipette 200 µL of buffer into the wells surrounding the SF. (Omit if using a solid black plate or Greiner SensoPlate).
- Pipette 200 µL of the **1 nM SF** solution into well D7.
- Pipette 200 µL of the buffer solution into wells C9, D9, and E9.

Using a multichannel pipette with just four tips installed:

- Pipette 150 µL of buffer solution into wells C2–F5. Discard the tips.
- Pipette 150 µL of the **1 nM SF** solution into column 1.
- Pipette 150 µL of the 1 nM SF solution into column 2. Mix the wells using the pipette. Do not discard the tips.
- Aspirate 150 µL from column 2, and dispense into column 3. Mix the wells using the pipette. Do not discard the tips.
- Aspirate 150 µL from column 3, and dispense into column 4. Mix the wells using the pipette. Do not discard the tips.
- Aspirate 150 µL from column 4, and dispense into column 5. Mix the wells using the pipette. Do not discard the tips.
- Aspirate 150 µL from column 5, and discard the tips.

	1	2	3	4	5	6	7	8	9	10	11	12
A	3300pM_200	3300pM_200	3300pM_200	CBUF					CBUF	3300pM_200	3300pM_200	3300pM_200
B	CBUF	CBUF	CBUF	CBUF					CBUF	CBUF	CBUF	CBUF
C	1000pM_150	500pM_150	250pM_150	125pM_150	62_5pM_150				BUF_200			
D	1000pM_150	500pM_150	250pM_150	125pM_150	62_5pM_150		1000pM_200		BUF_200			
E	1000pM_150	500pM_150	250pM_150	125pM_150	62_5pM_150				BUF_200			
F	1000pM_150	500pM_150	250pM_150	125pM_150	62_5pM_150							
G	CBUF	CBUF	CBUF	CBUF					CBUF	CBUF	CBUF	CBUF
H	3300pM_200	3300pM_200	3300pM_200	CBUF					CBUF	3300pM_200	3300pM_200	3300pM_200

Alternate/Supplemental Tests Using Methylumbelliferone (MUB)

As an alternative to using Sodium Fluorescein, Methylumbelliferone (“MUB”) can be used to test the fluorescence system.

Required Materials

Manufacturer part numbers are subject to change over time.

BioTek offers a liquid test kit (PN 7160012) containing the microplates and solutions used in the MUB fluorescence liquid tests.

- Methylumbelliferone ("MUB") (10-mg vial, BioTek PN 98156)
- Carbonate-Bicarbonate buffer ("CBB") capsules (BioTek PN 98158)
- 100% methanol (BioTek PN 98161)
- A new, clean 96-well solid black plate microplate, such as Corning Costar #3915 or equivalent.
- **Blue** filter cube: EX: 360/40, EM: 460/40, Mirror: 400 nm; installed in the reader and configured in Gen5
- Deionized or distilled water
- Various beakers, graduated cylinders, and pipettes
- Aluminum foil
- (Optional, but recommended) 0.45-micron filter
- (Optional) Black polyethylene bag(s) to temporarily store plate(s)
- Gen5 protocol described on page 74:
    - **Synergy LX FI_T_MUB.prt**

Test Solutions

Filter solutions to remove particulates that could cause erroneous readings. Do not allow dust to settle on the surface of the solution; use microplate covers or seals when not reading the plate.

Wrap the vial containing the MUB stock solution in foil to prevent exposure to light.

Discard any open, unused solutions after seven days.

1. Prepare the buffer (CBB) solution:
    - (Optional, but recommended) Using a 0.45-micron filter, filter 200 mL of deionized or distilled water.
    - Open and dissolve the contents of two CBB capsules (do not dissolve the outer gelatin capsule) into 200 mL of the water.

- Stir the solution (preferably using a stir table) until the CBB is completely dissolved.

2. Prepare the MUB stock solution:
   - Add 1 mL of 100% methanol to the 10 mg vial of MUB.
   - Make sure all of the dye has completely dissolved and is well mixed. This yields a 10 mg/mL stock solution.
   - Wrap the solution in aluminum foil to prevent exposure to light.
3. Prepare the dilutions. Label each with “MUB” and the concentration.

Mix This MUB Solution:	With:	To Make:
0.5 mL of 10 mg/mL stock solution	4.5 mL of 100% methanol	1 mg/mL
0.88 mL of 1 mg/mL solution	4.12 mL of CBB	176 µg/mL
0.1 mL of 176 µg /mL solution	9.9 mL of CBB	1.76 µg /mL
0.5 mL of 1.76 µg /mL solution	4.5 mL of CBB	176 ng/mL
1 mL of 176 ng/mL solution	9 mL of CBB	17.6 ng/mL (100 nM)

Test Procedure

1. If you have not already done so, prepare the test solutions. See page 103.
2. Perform the Sensitivity and Linearity tests.
   - Pipette the solutions into a clean, 96-well plate.
   - Create an experiment based on **Synergy LX FI_T_MUB.prt**.
   - Read the plate, and save the experiment.
3. Refer to the instructions starting on page 102 to calculate results and determine pass/fail.
   - Troubleshooting tips are provided on page 78 for results analysis.
   - Test descriptions are provided on page 74.

Pipette Map

Seal the plate with foil or store it in a black polyethylene bag until use. When using a clear-bottom plate, if the base of the plate is touched, clean the entire base with alcohol (95% ethanol) and then wipe with a lint-free cloth. Before placing a plate in the instrument, blow the bottom of the plate with an aerosol duster.

Using a single-channel pipette:

- Pipette 200 µL of 17.6 ng/mL (100 nM) MUB solution into well D7.
- Pipette 200 µL of buffer into wells C9, D9, and E9.

Using a multichannel pipette with just four tips installed:

- Pipette 150 µL of buffer into columns 2–5 (**not column 1**). Discard the tips.
- Pipette 150 µL of the 17.6 ng/mL (100 nM) solution into column 1. Discard the tips.
- Pipette 150 µL of the 17.6 ng/mL (100 nM) solution into column 2. Do not discard the tips.
- Aspirate 150 µL from column 2 and dispense it into column 3. Mix the wells using the pipette. Do not discard the tips.
- Aspirate 150 µL from column 3 and dispense it into column 4. Mix the wells using the pipette. Do not discard the tips.
- Aspirate 150 µL from column 4 and dispense it into column 5. Mix the wells using the pipette. Do not discard the tips.
- Aspirate 150 µL from column 5. Discard the tips.

	1	2	3	4	5	6	7	8	9	10	11	12
A												
B												
C	100nM_150	50nM_150	25nM_150	12_5nM_150	6_25nM_150				BUF_200			
D	100nM_150	50nM_150	25nM_150	12_5nM_150	6_25nM_150		100nM_200		BUF_200			
E	100nM_150	50nM_150	25nM_150	12_5nM_150	6_25nM_150				BUF_200			
F	100nM_150	50nM_150	25nM_150	12_5nM_150	6_25nM_150							
G												
H												

Luminescence Test

Luminescence Testing, starting on page 81, describes the test method, lists the Gen5 protocol parameters, explains how to analyze the test results, and provides troubleshooting tips in the event of test failure.

Required Materials

- Harta Luminometer Reference Microplate, PN 8030015 (which includes microplate carrier adapter PN 8032028)
- Gen5 protocol **Synergy LX_LumTest_Harta.prt**, described on page 82
- LUM filter cube (EX: Plug, EM: Hole, Mirror: Empty)

Test Procedure

1. Turn on the Harta reference plate using the I/O switch on the back of the plate.
2. Check the plate's battery by pressing the test button on the back of the plate and ensuring that the test light turns on. If the light does not turn on, replace the battery.

The test light may be difficult to see in bright light. Change your angle of view or move to a darker environment if you cannot see it.

3. Place the Harta plate adapter on the reader's carrier, then place the test plate on top of the adapter.
4. Create a Gen5 experiment based on the **Synergy LX_ LumTest_Harta** protocol, described on page 82, and read the plate.
5. When the experiment is complete, calculate and evaluate results as described under **Results Analysis** on page 81.
6. When finished, turn off the Harta reference plate to preserve battery life.

Appendix A

Specifications

This appendix contains BioTek's published specifications for the Synergy LX.

General Specifications

Microplates	
The Synergy LX accommodates standard 6-, 12-, 24-, 48-, 96-, and 384-well microplates with 128 x 86 mm geometry and the Take3 Micro-Volume Plate. If using Gen5, the Take3 Trio Micro-Volume plate, the BioCell, and 60-, 72-, and 96-well Terasaki plates are also supported. Maximum plate height: 0.81" (20.57 mm)	
Hardware and Environmental	
Light Source	Absorbance reads: xenon flash bulb, Fluorescence reads: halogen bulb, 500-hour lifespan
Dimensions	Touchscreen models: 15" H x 15" W x 15" D (38.1 x 38.1 x 38.1 cm) Non-touchscreen models: 12" H x 15" W x 15" D (30.5 x 38.1 x 38.1 cm)
Weight:	≤ 27 lbs (12.3 kg)
Environment:	Operational temperature range: 18°C to 37°C (64.4°F to 98.6°F) Storage temperature range: -25°C to 50°C
Humidity:	Operational: 10% to 85% relative humidity (non-condensing) Storage: 10% to 80% relative humidity (non-condensing)
Power:	The instrument is powered from an external 60W (minimum), 24VDC power supply compatible with 100-240 volts AC @50-60Hz.

Absorbance Specifications

Note: For the performance specifications described in this section, the gain on the optics test should be < 8.

Wavelength Range:	200–999 nm
Bandpass:	≤ 5 nm
Measurement Range:	0.000–4.000 OD
Resolution:	0.001 OD (touchscreen control only) 0.0001 OD (Gen5 control only)
Increment:	1 nm
Wavelength Accuracy:	± 2 nm
Wavelength Precision	± 0.2 nm (standard deviation)
Minimum Kinetic Interval (450 nm):	Sweep mode < 20 seconds, 96-well microplate
Throughput (time elapsed from plate moving in to plate moving out)	96-Well, 450 nm, sweep read mode: < 35 seconds

Accuracy

Tested with certified neutral density glass.

96-well plate, normal read speed:	0.000 to 2.000 OD: ±1.0% ±0.010 OD, delay after plate movement = 100 ms 2.000 to 2.500 OD: ±3.0% ±0.010 OD, delay after plate movement = 100 ms
384-well plate, normal read speed:	0.000 to 1.500 OD: ±2.0% ±0.010 OD, delay after plate movement = 100 ms 1.500 to 2.000 OD: ±5.0% ±0.010 OD, delay after plate movement = 100 ms
96- and 384-well plate, sweep read speed	0.000 to 1.000 OD: ±1.0% ±0.010 OD

Linearity

By liquid dilution.

96-well plate, normal read speed:	0.000 to 2.000 OD: ±1.0% ±0.010 OD, delay after plate movement = 100 ms 2.000 to 2.500 OD: ±3.0% ±0.010 OD, delay after plate movement = 100 ms
384-well plate, normal read speed:	0.000 to 1.500 OD: ±2.0% ±0.010 OD, delay after plate movement = 100 ms 1.500 to 2.000 OD: ±5.0% ±0.010 OD, delay after plate movement = 100 ms
96- and 384-well plate, sweep read speed:	0.000 to 1.000 OD: ±1.0% ±0.010 OD

Repeatability (Standard Deviation [STD])

Tested with certified neutral density glass measured by one standard deviation (8 measurements/data point)

96-well plate, normal read speed:	0.000 to 2.000 OD: ±1.0% ±0.005 OD, delay after plate movement = 100 ms 2.000 to 2.500 OD: ±3.0% ±0.005 OD, delay after plate movement = 100 ms
384-well plate, normal read speed:	0.000 to 1.500 OD: ±1.0% ±0.005 OD, delay after plate movement = 100 ms 1.500 to 2.000 OD: ±3.0% ±0.005 OD, delay after plate movement = 100 ms
96- and 384-well plate, sweep read speed:	0.000 to 1.000 OD: ±2.0% ±0.010 OD

Assay Validation Using a Take3 Plate

260 nm dsDNA detection limit: < 5 ng/µL

Fluorescence Specifications

Detection limit: Sodium Fluorescein in phosphate buffered saline (PBS)	DL ≤20 pM, Excitation 485/20 nm, Emission 528/20 nm, 510 nm mirror
Detection limit: Methylumbelliferone (MUB) in carbonate-bicarbonate buffer (CBB)	DL ≤0.16 ng/mL (0.91 nM), Excitation 360/40 nm, Emission 460/40 nm, 400 nm mirror
Minimum kinetic interval:	< 55 seconds for a 96-well microplate with the following read settings: Delay after plate movement: 100 ms Measurements per data point: 10
Wavelength range:	320–700 nm (low-noise PMT) 320–850 nm (red-shifted PMT)

Luminescence Specifications

Production testing is performed using a Harta plate.

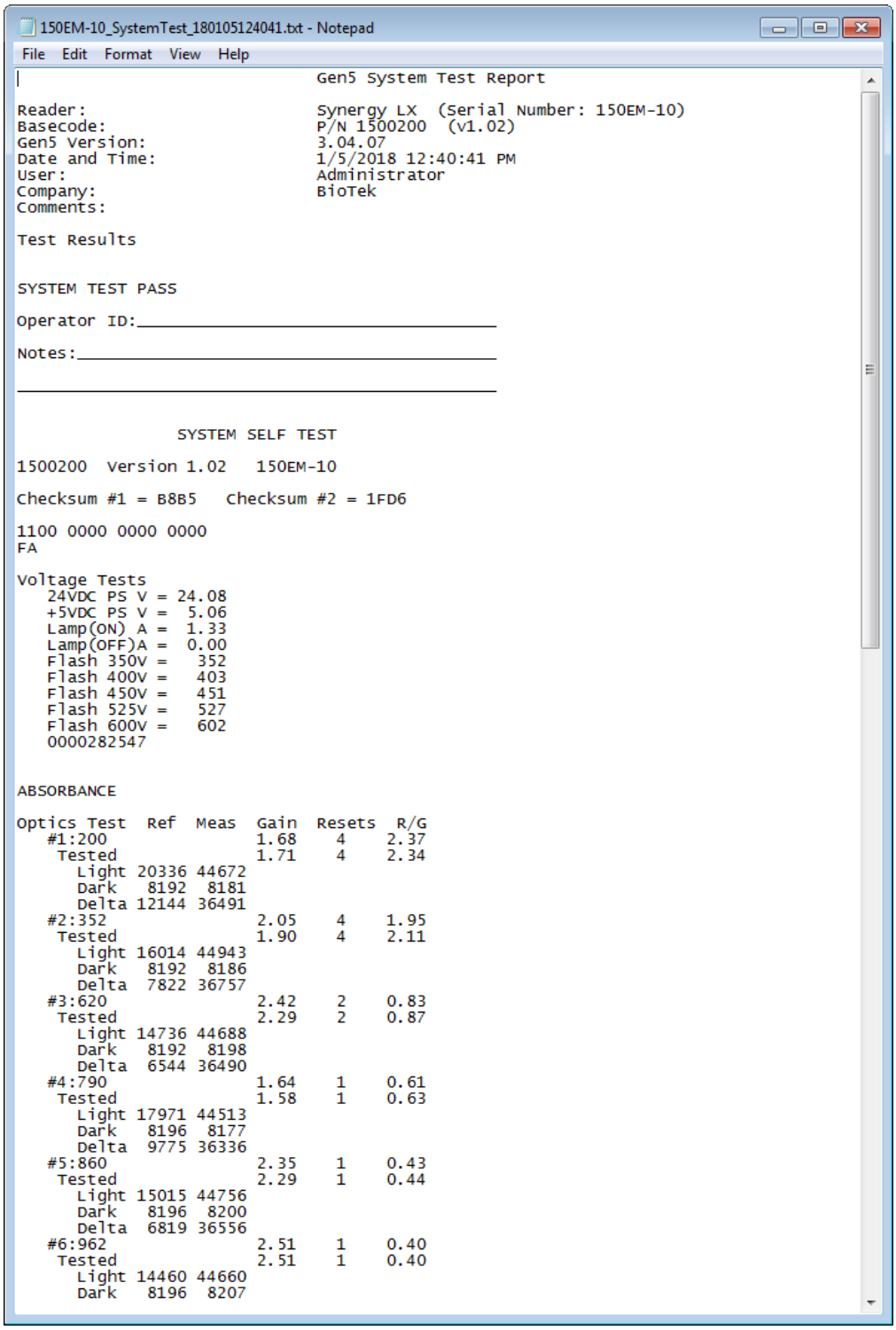
96-well plate with standard low-noise PMT	
Detection Limit for ATP:	≤ 75 amol/well
Integration Time:	10 seconds
PMT Gain:	150
Blank Wells:	16
Wavelength Range:	200–700 nm
96-well plate with red-shifted PM	
Detection Limit for ATP:	≤ 500 amol/well
Integration Time:	10 seconds
PMT Gain:	150
Blank Wells:	16
Wavelength Range:	200–850 nm

Appendix B

Sample Reports

This appendix contains sample System Test and Absorbance Plate Test reports for the Synergy LX.

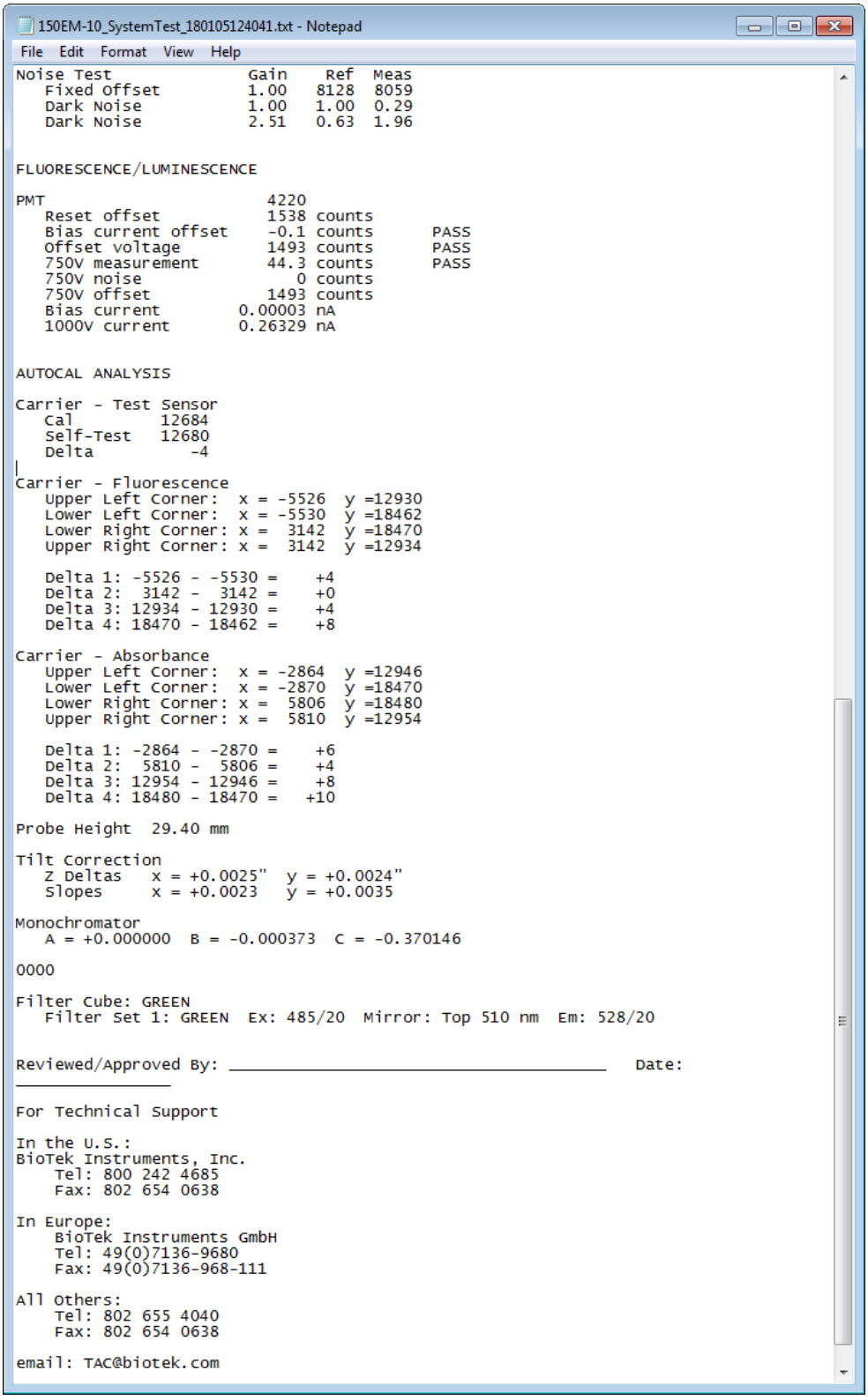
Sample System Report



150EM-10_SystemTest_180105124041.txt - Notepad

File Edit Format View Help

```
                                Gen5 System Test Report

Reader:                         Synergy LX  (Serial Number: 150EM-10)
Basecode:                       P/N 1500200  (v1.02)
Gen5 Version:                   3.04.07
Date and Time:                  1/5/2018 12:40:41 PM
User:                           Administrator
Company:                        BioTek
Comments:

Test Results


SYSTEM TEST PASS

Operator ID:_____________________________________

Notes:___________________________________________

_________________________________________________


                SYSTEM SELF TEST

1500200  Version 1.02   150EM-10

Checksum #1 = B8B5   Checksum #2 = 1FD6

1100 0000 0000 0000
FA

Voltage Tests
   24VDC PS V = 24.08
   +5VDC PS V =  5.06
   Lamp(ON) A =  1.33
   Lamp(OFF)A =  0.00
   Flash 350V =   352
   Flash 400V =   403
   Flash 450V =   451
   Flash 525V =   527
   Flash 600V =   602
   0000282547


ABSORBANCE

Optics Test  Ref  Meas  Gain  Resets  R/G
   #1:200                1.68    4    2.37
    Tested               1.71    4    2.34
      Light 20336 44672
      Dark   8192  8181
      Delta 12144 36491
   #2:352                2.05    4    1.95
    Tested               1.90    4    2.11
      Light 16014 44943
      Dark   8192  8186
      Delta  7822 36757
   #3:620                2.42    2    0.83
    Tested               2.29    2    0.87
      Light 14736 44688
      Dark   8192  8198
      Delta  6544 36490
   #4:790                1.64    1    0.61
    Tested               1.58    1    0.63
      Light 17971 44513
      Dark   8196  8177
      Delta  9775 36336
   #5:860                2.35    1    0.43
    Tested               2.29    1    0.44
      Light 15015 44756
      Dark   8196  8200
      Delta  6819 36556
   #6:962                2.51    1    0.40
    Tested               2.51    1    0.40
      Light 14460 44660
      Dark   8196  8207
```



150EM-10_SystemTest_180105124041.txt - Notepad

File Edit Format View Help

```
Noise Test              Gain    Ref  Meas
   Fixed Offset         1.00   8128  8059
   Dark Noise           1.00   1.00  0.29
   Dark Noise           2.51   0.63  1.96


FLUORESCENCE/LUMINESCENCE

PMT                       4220
   Reset offset           1538 counts
   Bias current offset    -0.1 counts      PASS
   Offset voltage         1493 counts      PASS
   750V measurement       44.3 counts      PASS
   750V noise                0 counts
   750V offset            1493 counts
   Bias current        0.00003 nA
   1000V current       0.26329 nA


AUTOCAL ANALYSIS

Carrier - Test Sensor
   Cal         12684
   Self-Test   12680
   Delta          -4

Carrier - Fluorescence
   Upper Left Corner:  x = -5526  y =12930
   Lower Left Corner:  x = -5530  y =18462
   Lower Right Corner: x =  3142  y =18470
   Upper Right Corner: x =  3142  y =12934

   Delta 1: -5526 - -5530 =    +4
   Delta 2:  3142 -  3142 =    +0
   Delta 3: 12934 - 12930 =    +4
   Delta 4: 18470 - 18462 =    +8

Carrier - Absorbance
   Upper Left Corner:  x = -2864  y =12946
   Lower Left Corner:  x = -2870  y =18470
   Lower Right Corner: x =  5806  y =18480
   Upper Right Corner: x =  5810  y =12954

   Delta 1: -2864 - -2870 =    +6
   Delta 2:  5810 -  5806 =    +4
   Delta 3: 12954 - 12946 =    +8
   Delta 4: 18480 - 18470 =   +10

Probe Height  29.40 mm

Tilt Correction
   Z Deltas    x = +0.0025"  y = +0.0024"
   Slopes      x = +0.0023   y = +0.0035

Monochromator
   A = +0.000000  B = -0.000373  C = -0.370146

0000

Filter Cube: GREEN
   Filter Set 1: GREEN  Ex: 485/20  Mirror: Top 510 nm  Em: 528/20


Reviewed/Approved By: _____   Date:
_____

For Technical Support

In the U.S.:
BioTek Instruments, Inc.
    Tel: 800 242 4685
    Fax: 802 654 0638

In Europe:
    BioTek Instruments GmbH
    Tel: 49(0)7136-9680
    Fax: 49(0)7136-968-111

All Others:
    Tel: 802 655 4040
    Fax: 802 654 0638

email: TAC@biotek.com
```

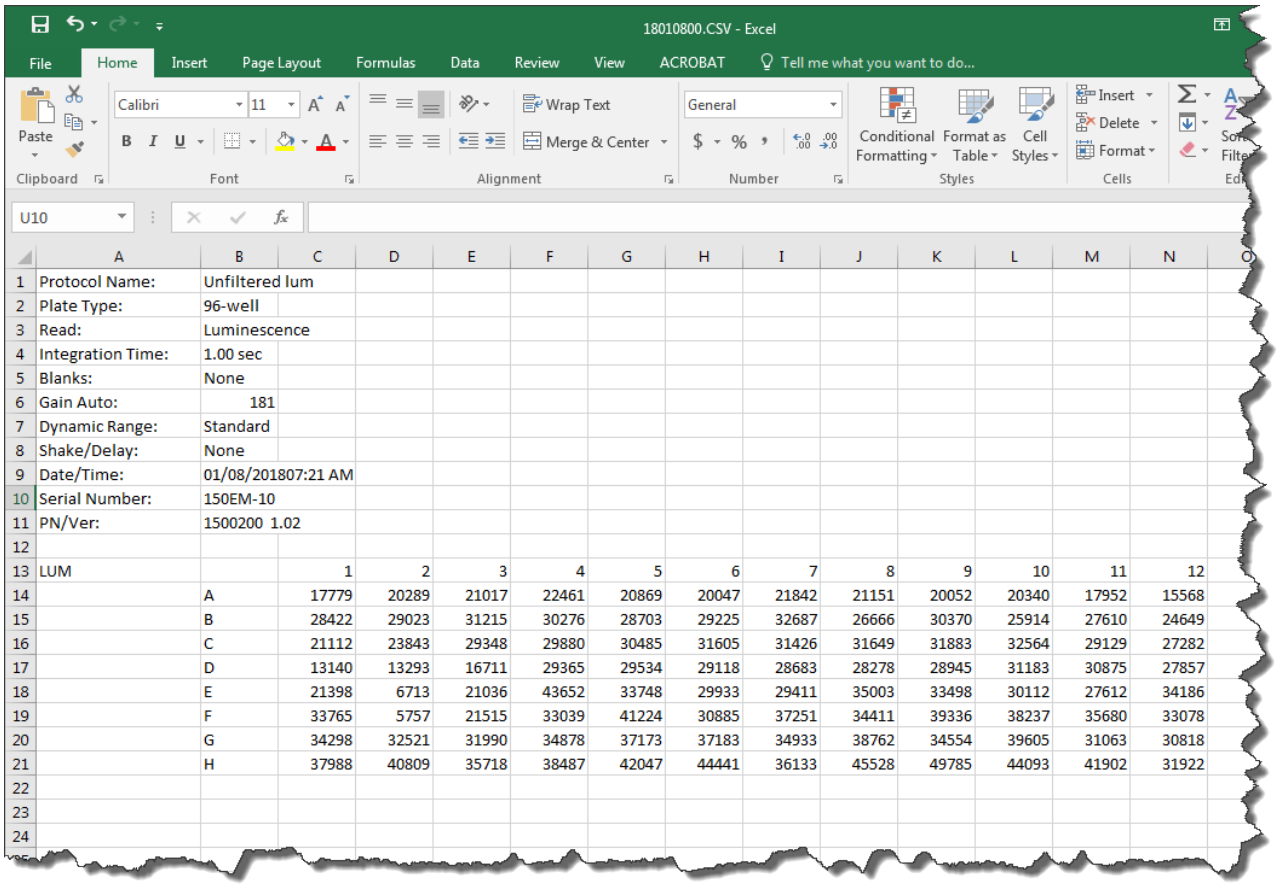
Sample Absorbance Test Plate Report

150EM-10_TestPlateResults_180105130731.txt - Notepad

File Edit Format View Help

```
                              Absorbance Test Plate Results

Reader:                       Synergy LX  (Serial Number: 150EM-10)
Basecode:                     P/N 1500200  (v1.02)
Date and Time:                1/5/2018 1:07:31 PM
Absorbance Plate:             7 Filter Test Plate (P/N 7260522) - S/N 210508
Last Plate Certification:     October 2017
Next Plate Certification Due: October 2018
User:                         Administrator
Comments:

Peak Absorbance Results

Well        C6
Reference   362
Tolerance   3
Read        362
Result      PASS

Alignment Results

Wells       A1          A12         H1          H12
Read        0.000       0.001       0.001       0.002
Tolerance   0.015       0.015       0.015       0.015
Result      PASS        PASS        PASS        PASS

Wavelength = 450 nm

Accuracy Results

Wells       C1          E2          G3          H6          F5          D4
Reference   0.143       0.580       1.082       1.645       1.919       2.496
Min Limit   0.120       0.548       1.040       1.592       1.861       2.376
Max Limit   0.166       0.612       1.124       1.698       1.977       2.616
Read 1      0.137       0.574       1.083       1.641       1.912       2.492
Result      PASS        PASS        PASS        PASS        PASS        PASS

Repeatability Results

Wells       C1          E2          G3          H6          F5          D4
Read 1      0.137       0.574       1.083       1.641       1.912       2.492
Min Limit   0.130       0.563       1.067       1.620       1.888       2.413
Max Limit   0.143       0.585       1.098       1.662       1.936       2.572
Read 2      0.137       0.574       1.083       1.641       1.912       2.494
Result      PASS        PASS        PASS        PASS        PASS        PASS

Reviewed/Approved By: _____________________________________   Date: _____________

For Technical Support

In the U.S.:
BioTek Instruments, Inc.
    Tel: 800 242 4685
    Fax: 802 654 0638

In Europe:
    BioTek Instruments GmbH
    Tel: 49(0)7136-9680
    Fax: 49(0)7136-968-111

All Others:
    Tel: 802 655 4040
    Fax: 802 654 0638

email: TAC@biotek.com
Product support center: http://www.biotek.com/service
```

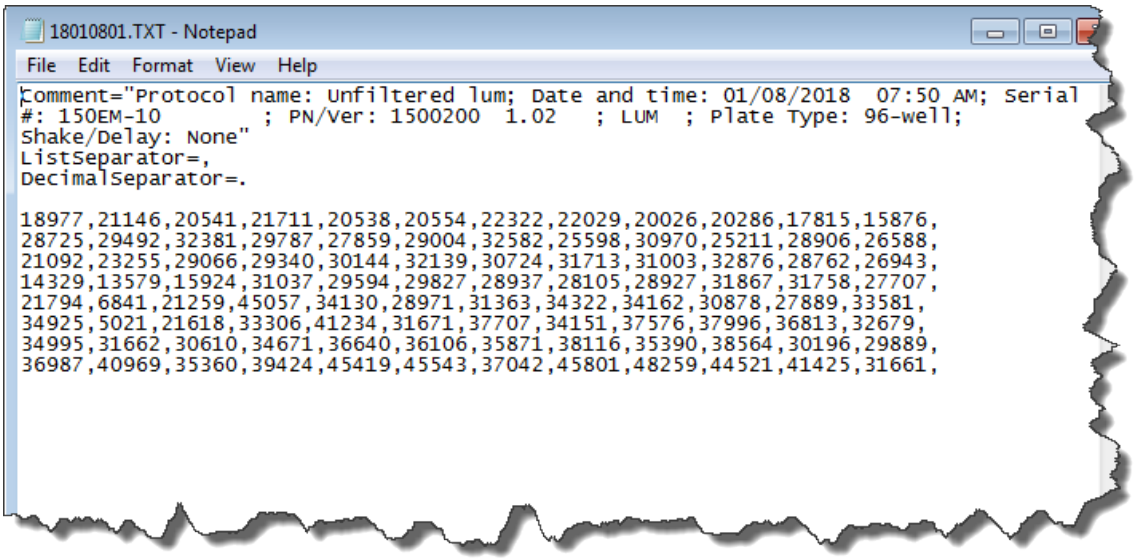
Sample Assay Results



18010800.CSV - Excel

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	Protocol Name:	Unfiltered lum												
2	Plate Type:	96-well												
3	Read:	Luminescence												
4	Integration Time:	1.00 sec												
5	Blanks:	None												
6	Gain Auto:	181												
7	Dynamic Range:	Standard												
8	Shake/Delay:	None												
9	Date/Time:	01/08/201807:21 AM												
10	Serial Number:	150EM-10												
11	PN/Ver:	1500200 1.02												
12														
13	LUM		1	2	3	4	5	6	7	8	9	10	11	12
14		A	17779	20289	21017	22461	20869	20047	21842	21151	20052	20340	17952	15568
15		B	28422	29023	31215	30276	28703	29225	32687	26666	30370	25914	27610	24649
16		C	21112	23843	29348	29880	30485	31605	31426	31649	31883	32564	29129	27282
17		D	13140	13293	16711	29365	29534	29118	28683	28278	28945	31183	30875	27857
18		E	21398	6713	21036	43652	33748	29933	29411	35003	33498	30112	27612	34186
19		F	33765	5757	21515	33039	41224	30885	37251	34411	39336	38237	35680	33078
20		G	34298	32521	31990	34878	37173	37183	34933	38762	34554	39605	31063	30818
21		H	37988	40809	35718	38487	42047	44441	36133	45528	49785	44093	41902	31922
22														
23														
24														

Sample (Report) CSV File



Sample (Gen5 input) TXT File

Appendix C

Error Conditions

This appendix describes error conditions and provides troubleshooting tips.

Overview

When a problem occurs during operation with the Synergy LX, an error code may appear on the touchscreen or in Gen5. Error codes typically contain four characters, such as "4168," and are accompanied by descriptive text to help you solve the problem. If the instrument repeatedly beeps after encountering an error, press the carrier eject button to stop this alarm.

Some problems can be solved easily, whereas others can be solved only by trained BioTek service personnel.

> Error codes beginning with "A" (e.g., A100) indicate conditions that require immediate attention. If this type of code appears, turn the instrument off and on. If the system test does not conclude successfully, record the error code and contact Technical Support.

If an error code appears, you should run a system test for diagnostic purposes. See **System Test** on page 89. Having the system test report before calling the Technical Support can speed the resolution of the error.

> If an error message appears during a plate read, it is the user's responsibility to determine the validity of any data that was received.

Use this appendix to diagnose problems and solve them if possible. If you need further assistance, contact Technical Support.

Error Codes

If an error code appears, look for it here. If you find the code, follow the suggestions provided for solving the problem. If you cannot find the code or if you are unable to solve the problem, please contact Technical Support. The Gen5 Help system also provides troubleshooting tips.

Fatal Errors

Generally, any of these errors mean that the main PCB must be replaced. Power-cycling the instrument may help, but the error may reoccur.

Error Code	Description	Troubleshooting
A100	Task not available. A requested subroutine or module has been requested but is not available.	If repeatable, contact Technical Support.
A200	Code version strings for digital PCB processors do not match.	
A300	The x-axis hardware module is not available.	
A301	The y-axis hardware module is not available.	
A302	The z-axis hardware module is not available.	
A303	The order-sorting filter wheel hardware module is not available.	
A304	The monochromator hardware module is not available.	
A500	EEProm memory read/write error	
AB00	Multiprocessor error	
AC00	External RAM error	
ADXX	Stack error	
AEXX	Invalid motor ramp profile	
7FXX	Dual processor error	

General Errors

Error Code	Description	Troubleshooting
0100	Abort error Assay process aborted Also known as the Halt command that aborts the running process without executing the Failure Mode & Effects Analysis (FMEA) task The carrier is moved outside, and other axes are moved to safe positions. The aborted process returns an error status (0100), indicating that it was aborted.	User aborted protocol or instrument operation. This is an informational error.
0300 0302 0303	Memory allocation error	Turn the instrument off and on. If the error reoccurs, contact Technical Support.
04XX errors A/D (analog/digital) data collection failure A/D converter for measurement circuits has failed or is generating inconsistent or noisy data For: • Fluorescence measurements • Absorbance measurements • Voltage reference measurements		
0401	Fluorescence measurement data converter never indicated “ready.”	Turning the instrument off and on may resolve the problem. If the error reoccurs, contact Technical Support.
0411	Fluorescence measurement channel producing inconsistent or noisy data.	
0402	Absorbance measurement data convert never indicated “ready.”	
0412	Absorbance measurement channel producing inconsistent or noisy data.	
040F	Voltage reference measurement data converter never indicated “ready.”	
041F	Voltage reference measurement channel producing inconsistent or noisy data.	

Error Code	Description	Troubleshooting
05XX errors Measurement channel A/D standby transition never occurred. For: Fluorescence filter PMT channel Absorbance channel		
0501 0511	Fluorescence channel A/D ready transition never occurred.	Basecode may need to be reloaded. Turning the instrument off and on may resolve the problem. If the error reoccurs, contact Technical Support.
0502 0512	Absorbance channel A/D ready transition never occurred.	
06XX errors Voltage reference failures Note: These are checked only during the system self-test.		
0600	24 VDC is outside of limits.	Turning the instrument off and on may resolve the problem. If the error reoccurs, contact Technical Support.
0610	24 VDC is noisy or inconsistent.	
0601	5 VDC is outside of limits.	
0611	5 VDC is noisy or inconsistent.	
0602	Lamp current test Lamp current is outside of limits.	
0612	Lamp current test Lamp current is noisy or inconsistent.	
0603	Lamp off test Lamp voltage is outside of limits.	
0613	Lamp off test Lamp current is noisy or inconsistent.	
0604	Mono flash absorbance minimum power test Flash voltage is outside limits.	
0614	Mono flash absorbance minimum power test Flash voltage is noisy or inconsistent.	

Error Code	Description	Troubleshooting
0605	Mono flash absorbance low power test Flash voltage is outside limits.	
0615	Mono flash absorbance low power test Flash voltage is noisy or inconsistent.	
0606	Mono flash absorbance medium power test Flash voltage is outside limits.	
0616	Mono flash absorbance medium power test Flash voltage is noisy or inconsistent.	
0607	Mono flash absorbance high power test Flash voltage is outside limits.	
0617	Mono flash absorbance high power test Flash voltage is noisy or inconsistent.	
0608	Mono flash absorbance maximum power test Flash voltage is outside limits.	
0618	Mono flash absorbance maximum power test Flash voltage is noisy or inconsistent.	
08XX errors Configuration checksum errors		
0800 0801 0802	Processor EEPROM configuration memory checksum mismatch	Basecode may need to be reloaded. Turning the instrument off and on may resolve the problem. If the error reoccurs, contact Technical Support.
20XX errors Command definition error		

Error Code	Description	Troubleshooting
2000	Command sent to reader was formatted incorrectly.	Verify that protocol was defined correctly and that verify step during protocol definition has been performed. Perform global reboot: • Exit Gen5 and turn the instrument's power off. • Turn the instrument's power on, wait for the self-test to complete, start Gen5, and try running protocol again. • If error reoccurs, contact Technical Support.
2001	Command sent to reader failed checksum test.	Verify that USB cable is firmly connected and is not close to high-voltage lines, which may corrupt data being sent. Perform a global reboot as described above. If the error reoccurs, contact Technical Support.
21XX errors Invalid parameter error This error will occur when the instrument is sent protocol parameters that are incompatible with it. Because Gen5 checks most of these parameters against the instrument model when the protocol is being defined, these errors generally serve as backup. If one of these errors occurs repeatedly, the user should contact Technical Support with the following information: • Instrument serial number • Gen5 version (available under Help > About Gen5) • An overview of the protocol definition • The plate type used and whether it is standard or custom defined		

Error Code	Description	Troubleshooting
2100	Set plate geometry Invalid number of wells	Ensure that the plate type is defined correctly, especially if it is a custom plate. If the plate type is based on an imported XML file, ensure that the XML file was defined correctly. Contact Technical Support.
2101	Set plate geometry Invalid number of columns Must be > 1 and < 50	
2102	Set plate geometry Invalid number of rows Must be > 1 and < 50	
2103	Filter mirror block: invalid mirror count	Verify at what step the error is generated. Send this information to Technical Support. The error can result from a corrupt or incorrectly formatted XML file.
2104	Filter mirror block: invalid excitation wavelength	
2106	Filter mirror block: invalid emission wavelength	
2101	Probe Z: not top fluorescence probe	
2101	Set lamp state: state out of range	
2101	Invalid dip switch selection	
2101	Flash and shake counter: invalid counter	
2101	Autosensitivity: invalid event number or event is not a read	
2102	Invalid dip switch state	
2102	Autosensitivity—invalid readset	
2103	Autosensitivity—invalid row	
2104	Autosensitivity—invalid column	
2105	Autosensitivity—invalid target value	
210A	Invalid event number	
210B	Event type should be a read	
210C	Shake carrier—invalid shake frequency	
210D	Unknown diagnostic command	
210E	Invalid autocalibration selection	
2110	Wavelength calibration—invalid wavelength	

Error Code	Description	Troubleshooting
2120 2121 2122 2123 2124 2125	Error setting Absorbance wavelength table	
2130	Invalid reader ID	
2131	Shake rate or time error	
2133	Orbital shake motor conflict	
2134	Orbital shake motor 1 must be x- or y-axis	
2135	Orbital shake motor 2 must be x- or y-axis	
2136	Linear shake motor conflict	
2137	Linear shake motor 1 must be x- or y-axis	
2138	Linear shake motor 2 must be x- or y-axis	
22XX errors Hardware mismatch error Autocalibration is being requested for an instrument configuration that does not exist.		
2201	Carrier to fluorescence probe	If error is repeatable, contact Technical Support.
2202	Carrier to absorbance probe	
2203	Carrier sensor positions	
2204	Probe Z	
2205	Carrier/Z tilt correction	
23XX errors Item not found error This indicates that a command is requesting an item that is not present in the instrument configuration memory (for example, a specific wavelength filter).		

Error Code	Description	Troubleshooting
2300	Plug requested but not found	Verify that the filter block is correctly installed. Verify that the filter block physically matches the optics library. See in Gen5 System> Optics Library for filter cube configuration. Compare this configuration with the physical configuration of the filter cube.
2301	Open hole requested but not found	
2304	Bandpass filter requested but not found	
2305	Filter or mirror requested but not found	
2350	Filter cube not installed or sensed	Ensure that the filter cube is installed.
24XX errors X/Y limit error Movement requested exceeds defined dimensions of selected plate. Specific error indicates which dimension is incorrect.		
2403	Invalid first row dimension	Verify that dimensions for specific plate are correctly defined in Gen5 plate definition table.
2404	Invalid last row dimension	
2405	Invalid first column dimension	
2406	Invalid last column dimension	
2407	Invalid plate width	
2408	Invalid plate length	
2409	Invalid plate height	
2500 error Lamp off error		
2500	Tungsten lamp is off when expected to be on.	The lamp has failed. P/N 1500535
2DXX errors Assay errors These errors are generated when a protocol entry is incorrect (setpoint, volume, etc.). These errors should not occur because Gen5 should trap them during protocol creation. If a 2DXX error does occur, contact Technical Support.		
2D01	Invalid readset count. Invalid number of readsets selected.	

Error Code	Description	Troubleshooting
2D02	Invalid chemistry. Chemistry defined for readset incompatible with processing mode.	
2D05	Invalid mode. Invalid processing mode selected.	
2D06	Assay definition not set. Validated assay not defined.	
2D0B	Invalid event count. Invalid number of total events selected.	
2D0C	Invalid event type. Invalid event type selected.	
2D0E	Assay missed scheduled start of plate mode event.	
2D14	Invalid plate mode data points. Invalid number of kinetic data points selected for plate/plate-synch mode.	
2D15	Invalid plate mode interval. Invalid kinetic interval selected for plate/plate-synch mode.	
2D16	An error is flagged if the assay timer is past the read setup time (same as the read event time). Otherwise, the process waits for the read setup time to arrive.	Verify computer set-up. Hibernate and/or sleep mode cannot be enabled.
2D32	Read event expected. Repeat shake must be followed by read.	
2D33	Invalid shake time. Invalid shake time selected.	
2D34	Invalid shake speed. Invalid shake speed selected.	
2D42	Invalid delay time. Invalid time selected for delay event.	
2D45	Spectral scan increment. Invalid increment (too large).	
2D46	Wavelength not found. Invalid wavelength specified.	• Wavelength must be between 230 and 999 • If error is repeatable, contact Technical Support.
2D47	Kinetic interval overrun. Minimum possible interval w/ selected options larger than allowed.	
2D4A	Invalid shake type. Specified shake type selected.	
2D99	Unit in debug mode self-test may not have been run.	• Run system self-test or turn instrument off and on. • If error is repeatable, contact Technical Support.

Error Code	Description	Troubleshooting
37XX errors Absorbance noise test error Fails if value is > 20		
3700	Absorbance reference channel failed noise test.	• Too much light in read chamber. • Ensure that instrument enclosure is completely installed and secured. • Ensure the carrier door is closing fully. • Ensure the filter cube access door is closed. • Humidity is outside environmental specification of instrument. Note specification in user manual and move to area of lower humidity.
3710	Absorbance measurement channel failed noise test.	
38XX errors Absorbance (fixed) offset test failed		
3800	Absorbance reference channel failed offset test.	• Too much light in read chamber. • Ensure that instrument enclosure is completely installed and secured. • Ensure the carrier door is closing fully. • Ensure the filter cube access door is closed.
3810	Absorbance measurement channel failed offset test.	
39XX errors Absorbance dark range outside of limits Fails if dark offset range is < 10 counts or > 16238 counts.		

Error Code	Description	Troubleshooting
3901 3902 3903 3904 3905 3906	Absorbance reference channel dark range outside limits. Y = wavelength number in list of wavelengths sent in an assay protocol.	Humidity is outside environmental specification of instrument. Note specification in user manual and move to area of lower humidity. Too much light in read chamber. Ensure that: • The instrument enclosure is completely installed and secured. • The carrier door is closing fully. • The filter cube access door is closed.
3911 3912 3913 3914 3915 3916	Absorbance measurement channel dark range out of limits. Y = wavelength number in list of wavelengths sent in an assay protocol.	
3AXX errors Absorbance gain errors		
3A10	Absorbance gain out of range while performing a full range gain calibration.	Possible intermittent flash failure. Contact Technical Support.
3A1X	Absorbance gain out of range, where x = optics test wavelength number.	
3EXX errors Absorbance read saturated. Fail if measurement is ≥ 65535. Either absorbance reference or measurement channel has saturated.		
3E10	Absorbance measurement channel saturation during carrier auto-calibration when on solid area of jig. The carrier is moved off the center region and absorbance integration is performed with the flash on, 8 cycles, and 8 resets. A saturation error is flagged if the measurement channel signal is higher than 50% of full scale.	Too much light in read chamber. Ensure that: • Instrument enclosure is completely installed and secured. • The carrier door is fully closed. • The filter cube access door is closed. Contact Technical Support.
3E0Y	Absorbance reference channel saturation y = test wavelength #.	
3E1Y	Absorbance measurement channel saturation y= test wavelength #.	
3EX2	Ratio between channels out of range.	
3FXX errors Absorbance signal out of range		

Error Code	Description	Troubleshooting
3F00	Absorbance target gain calibration is performed for the reference channel, shooting for a target at full-scale saturation. A signal error is flagged if the maximum gain of 254 does not result in saturation.	• Ensure that the door is completely closed. • Ensure that instrument enclosure is completely installed and secured. • Flash lamp missing flashes or too much flash to flash intensity variation. • Check for spill in chamber. Contamination on the lower or the upper optical assembly in the absorbance light path can cause this error. A system test will typically show elevated gains in the 230 nm wavelength if the absorbance optics is contaminated. • Contact Technical Support. Note: This error may not occur during a system test but can occur when the first read is attempted.
3F0Yw	Yw = wavelength readset # If the final signal for the reference channel (dark offset subtracted from light) is less than 500 counts, or if the measurement channel signal is less than 8000 counts, a signal error is flagged.	

Error Code	Description	Troubleshooting
3F0Yr	Yr = reference for readset # Absorbance reference channel <500 counts. The unfiltered normalized signal value for the reference channel is less than 500 counts (<100 counts in sweep mode). ***OR*** The reference value saved at blank read time is divided by the new reference signal to generate a reference correction (used to compensate for flash-to-flash variation when data filtering is not enabled). If this value is less than 0.5 or greater than 2.0 (0.3 and 3.0 if sweep mode), a signal error is flagged.	Check for spill in chamber. 3F11: Make sure any lids or seals used are not blocking the light path (hole at left rear of carrier). Ensure that the door is completely closed. Ensure that instrument enclosure is completely installed and secured. Flash Lamp missing flashes or too much flash to flash intensity variation. If repeatable, contact Technical Support.
3F11	Possible light blockage on rear of carrier over measurement verify hole.	
3F1y	Absorbance measurement channel <8000 counts. The unfiltered normalized signal value for the measurement channel is less than 8000 counts.	
3F2Y	Measurement/Reference ratio error If the unfiltered reference signal is greater than 18% of the measurement signal, a signal ratio error is flagged.	

<table>
<tr><th>Error Code</th><th>Description</th><th>Troubleshooting</th></tr>
<tr><td>4XXX</td><td>
Well location/error code for 1-well plate
<table>
<tr><td></td><td>1</td></tr>
<tr><td>A</td><td>4001</td></tr>
</table>
Well location/error code for 6-well plate
<table>
<tr><td></td><td>1</td><td>2</td><td>3</td></tr>
<tr><td>A</td><td>4001</td><td>4002</td><td>4003</td></tr>
<tr><td>B</td><td>4004</td><td>4005</td><td>4006</td></tr>
</table>
Well location/error code for 12-well plate
<table>
<tr><td></td><td>1</td><td>2</td><td>3</td><td>4</td></tr>
<tr><td>A</td><td>4001</td><td>4002</td><td>4003</td><td>4004</td></tr>
<tr><td>B</td><td>4005</td><td>4006</td><td>4007</td><td>4008</td></tr>
<tr><td>C</td><td>4009</td><td>400A</td><td>400B</td><td>400C</td></tr>
</table>
Well location/error code for 24-well plate
<table>
<tr><td></td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr>
<tr><td>A</td><td>4001</td><td>4002</td><td>4003</td><td>4004</td><td>4005</td><td>4006</td></tr>
<tr><td>B</td><td>4007</td><td>4008</td><td>4009</td><td>400A</td><td>400B</td><td>400C</td></tr>
<tr><td>C</td><td>400D</td><td>400E</td><td>400F</td><td>4010</td><td>4011</td><td>4012</td></tr>
<tr><td>D</td><td>4013</td><td>4014</td><td>4015</td><td>4016</td><td>4017</td><td>4018</td></tr>
</table>
Well location/error code for 48-well plate
<table>
<tr><td></td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td></tr>
<tr><td>A</td><td>4001</td><td>4002</td><td>4003</td><td>4004</td><td>4005</td><td>4006</td><td>4007</td><td>4008</td></tr>
<tr><td>B</td><td>4009</td><td>400A</td><td>400B</td><td>400C</td><td>400D</td><td>400E</td><td>400F</td><td>4010</td></tr>
<tr><td>B</td><td>4011</td><td>4012</td><td>4013</td><td>4014</td><td>4015</td><td>4016</td><td>4017</td><td>4018</td></tr>
<tr><td>C</td><td>4019</td><td>401A</td><td>401B</td><td>401C</td><td>401D</td><td>401E</td><td>401F</td><td>4020</td></tr>
<tr><td>D</td><td>4021</td><td>4022</td><td>4023</td><td>4024</td><td>4025</td><td>4026</td><td>4027</td><td>4028</td></tr>
<tr><td>E</td><td>4029</td><td>402A</td><td>402B</td><td>402C</td><td>402D</td><td>402E</td><td>402F</td><td>4030</td></tr>
</table>
Note: Follow the same patterns for 96-well and 384-well plates.
</td><td>Sensitivity too high.
Chemistry too concentrated (hot).
Verify that the physical filter configuration matches Gen5 filter table.</td></tr>
<tr><td colspan="3">47XX errors
PMT Fluorescence noise test error</td></tr>
</table>

Error Code	Description	Troubleshooting
4700	PMT Fluorescence noise test failure...reference channel	Ensure that instrument case is completely installed and secured. Ensure filter Cube access door is closed. If repeatable, contact Technical Support.
4710	PMT Fluorescence noise test failure...measurement channel	If repeatable, contact Technical Support.
48XX errors Fluorescence offset test error		
4800	PMT reference offset (failure if <1607.5 or > 1822.5 counts).	Too much light in chamber. Ensure that instrument case is completely installed and secured. If repeatable, contact Technical Support.
4810	PMT measurement offset (saturation), test.	
4AXX errors Fluorescence gain error		
4A00	PMT gain out of range	Too much light in chamber. Ensure that instrument case is completely installed and secured. If repeatable, contact Technical Support.
4A1Y	A flash fluorescence read error is flagged (4A1y, y=readset#) if the current PMT sensitivity does not match the sensitivity specified for the readset.	Perform a system self-test to reset Gain values. If repeatable, contact Technical Support.
4BXX errors PMT operations or test error		
4B0X	PMT Reference channel error	Ensure that door is fully closed and instrument cover is secured. Too much light in chamber.

Error Code	Description	Troubleshooting
4B1X	PMT Measurement channel error	Ensure that instrument case is completely installed and secured. If repeatable, contact Technical Support.
4EXX errors PMT saturation errors		
4E0X	PMT reference channel saturation	Too much light in chamber. Ensure that instrument case is completely installed and secured. Ensure that instrument door is fully closed when carrier enters chamber. Sensitivity set to high: try adjusting auto-sensitivity setting. Door not closing completely. If repeatable, contact Technical Support.
4E1X	PMT measurement channel saturation	
4FXX errors Fluorescence signal out of range		
4F00	Fluorescence reference signal out of range	Sensitivity too high. Ensure that door is fully closed. Ensure instrument cover is installed and secured. Open hole in emission and/or excitation filter cubes. Ensure that Gen5 Fluorescence/Luminescence wavelengths table matches the filters physically installed in the filter cubes.

Error Code	Description	Troubleshooting
4F10	Fluorescence measurement signal out of range	Contamination within read chamber. Clean read chamber. Verify that there is no filter wavelength overlap between emission & excitation positions. If repeatable, contact Technical Support.
50XX and 52XX errors Axis failed to home		
5000 5200	Carrier X failed to home	Shipping bracket installed. If the error occurs on a carrier in move, the middle sensor is responding as if it is already closed (a disconnected or defective opto sensor responds in this manner) An object may be obstructing the path. If repeatable, contact Technical Support.
5001 5201	Carrier Y failed to home	Shipping bracket installed. Y-axis rails are dirty or rusty where the dirt in roller bearing is causing bearings to jam. An object may be obstructing the path. Defective or broken optical sensor. If repeatable, contact Technical Support.

Error Code	Description	Troubleshooting
5002 5202	Probe height Z failed to home	Shipping bracket not removed. An object may be obstructing the path. If repeatable, contact Technical Support.
5003 5203	Absorbance Order sorting filter wheel failed to home	If repeatable, contact Technical Support
5004 5204	Monochromator grating failed to home	
51XX and 53XX errors Autocalibration		
5100 5300	Carrier X failed autocalibration	If repeatable, call Technical Support
5101 5301	Carrier Y failed autocalibration	
5104 5304	Absorbance monochromator failed autocalibration	
540X errors Verify movements		
5400	Carrier X failed positional verify	Verify there are no obstructions and that the carrier and the dispenser/probe Z-Axis are not hitting anything. If repeatable, contact Technical Support.
5401	Carrier Y failed positional verify	
5402	Probe Z-Axis failed positional verify	
5404	Monochromator failed positional verify	If repeatable, contact Technical Support.
55XX errors		
5500	Carrier X-Axis not homed successfully	Run self-test or power cycle instrument If repeatable or reoccurs, contact Technical Support.
5501	Carrier Y-Axis not homed successfully	
5502	Vertical Z-Axis not homed successfully	
5504	Monochromator not homed successfully	

Error Code	Description	Troubleshooting
56XX errors		
56XX 5601 5602 5604	Axis currently in use	If repeatable, contact Technical Support
57XX errors		
5700	Carrier X-Axis move attempted outside physical limits of travel	Verify that dispenser tip priming trough, lid, or other object has not become dislodged in instrument Tilt instrument front to back to verify that no hardware is loose in the chamber Gen5 generated a plate map outside the physical limits of the instrument and tried to execute run. Verify plate definition dimensions are correct, especially for custom defined plates. Verify plate height matches selected plate type If repeatable or reoccurs, contact Technical Support.
5701	Carrier Y-Axis move attempted outside physical limits of travel	
5702	Vertical Z-Axis move attempted outside physical limits of travel	
5704	Monochromator not homed successfully	
5800	Carrier X alternate sensor error	Verify the correct plate height is being used. Attempt retry with correct plate height. If retry is unsuccessful, run a system test and try once more using the correct plate height. If repeatable or reoccurs, contact Technical Support.
5801	Carrier Y alternate sensor error	

Error Code	Description	Troubleshooting
5A00	X-Axis plate jam or obstruction error	Plate has hit something. Plate cover not accounted for when creating plate dimension file or “Use lid” in the procedure was not selected. Wrong plate type (height) was selected for procedure. Correct plate type and rerun; no system test required. If repeatable or reoccurs, contact Technical Support.
5A01	Y-Axis plate jam or obstruction error	
5B00	Plate height violation Z-Axis probe told to move to position that would result in hitting plate.	This error can occur if the carrier is inside and the newly-defined plate height is different from the most-recently specified plate height. To resolve this error, eject the carrier prior to running the experiment. Plate is inside chamber when it should be outside. This may occur if read was aborted and ‘home all axis’ not performed.
5B01	Probe Z windup error	If repeatable or reoccurs, contact Technical Support.
5E00	No Peak found error	
6XXX	6XXX errors Calibration data missing or corrupted	If repeatable or reoccurs, contact Technical Support.

Touchscreen Errors

These errors occur only in models with a touchscreen.

Error Code	Description	Troubleshooting
1100	Manufacturing data checksum error	If repeatable or reoccurs, contact Technical Support
1110	User data checksum error	
1120	Results data checksum error	
1140	Filter data checksum error	
1150	Stored Data Checksum error	
2100	Invalid parameter error	
Note: Errors 21XX through 2DXX should be trapped by software during protocol definition and validation. If one of these errors repeatedly occurs, contact Technical Support.		
2111	Invalid EX filter wavelength	EX filter wavelength does not match available filters. Verify that EX filter configuration table is set correctly
2112	Invalid EX filter bandwidth	EX filter bandwidth does not match available filters. Verify that EX filter configuration table is set correctly
2113	Invalid EM filter wavelength	EM filter wavelength does not match available filters. Verify that EM filter configuration table is set correctly
2114	Invalid EM filter bandwidth	EM filter bandwidth does not match available filters. Verify that EM filter configuration table is set correctly
2115	Filter wavelengths are overlapping	Verify that selected protocol filters, including total bandwidth, do not overlap. Saturation of PMT may result.
2116	Dichroic wavelength must be between filter wavelengths	Ensure that configuration table matches physical configuration

Error Code	Description	Troubleshooting
2117	Filter name cannot be empty	Enter filter name
2D00	Assay definition error	If repeatable or reoccurs, contact Technical Support.
4000	Stored protocol checksum verify failed	
4010	Stored protocol storage area full	
4020	Protocol names must be unique	Verify that protocol name has not already been used. If repeatable or reoccurs, contact Technical Support.
4030	Protocol names cannot be empty	Enter protocol name
4040	Blanks defined that are beyond the limits of the plate	Ensure that the number of blanks does not exceed the total number of wells on the plate
4050	No compatible filters configured	Filters in protocol are not configured in reader. Verify that correct filters have been installed and update filter configuration table
Note: 50XX errors indicate problems with a device connected to a USB port, either flash drive or printer. If the device connected is a flash drive, try a different drive. If a printer, ensure that the printer is powered on and in the “ready” state.		

Error Code	Description	Troubleshooting
5010	USB port: Serial com response timeout	Verify that USB device (flash drive or printer), is attached. For printers, ensure that cable connector is firmly plugged in at both ends For flash drives, ensure that it is firmly seated. If repeatable or reoccurs, contact Technical Support.
5011	USB port: Serial com buffer over run error	
5012	USB port: Serial com command/resp error	
5013	USB port: Write file error	
5014	USB port: Read file error	
5015	USB port: Error creating directory	
5016	USB port: Open file error	
5017	USB port: Close file error	
5018	USB port: Error changing directory	
5019	USB port: Error writing to printer	
501A	USB port: Error deleting file	
501B	USB port: Error syncing	
501C	USB port: No output destination selected	
501D	USB port: No flash drive detected	
7FDD	Take3 plate no longer supported	In order to create and save a Take3 protocol, the S/N must be entered and the plate calibrated. If this protocol is then used with a different Take3 plate that has not been calibrated, this error will result. To use a new Take3 plate, the serial number must be entered and the plate calibrated before selecting it for a protocol.

Error Code	Description	Troubleshooting
7FDE	Error determining gain. Sample signal too low	Verify chemistry is correct for EX wavelength being used
7FDF	Time and date not set. Please set them now	Set time and date. If time and date are not held after unit powered down, battery may need replacement. See users guide for instructions.
7FE0	Error parsing assay response	If repeatable or reoccurs, contact Technical Support.
7FF2	Error calibrating Take3 plate	
7FF3	Error determining bulb status	
7FF4	Wells over-range while determining AutoScale	Wells are out of range (probably saturated). The reader will lower gain values for a 2nd try, but if wells are still out of range, this error will result
7FF5	AutoScale failed with over range well	

Error Code	Description	Troubleshooting
7FF6	Timeout waiting to set system event	If repeatable or reoccurs, contact Technical Support.
7FF7	Expected ETX missing	
7FF9	Checksum error parsing assay response	
7FFA	Error parsing reader response	
7FFB	Error parsing assay response	
7FFC	Error waiting to send command	
7FFD	Checksum error parsing command response	
81XX	Communication error	
A200	Basecode versions do not match	
AC00	External RAM error	

Appendix D

Safety Information

Veiligheidsmededelingen

Avis de sécurité

Sicherheitshinweise

Avvisi di sicurezza

Avisos de seguridad

This appendix contains safety information for the Synergy LX, translated into Dutch, French, German, Italian, and Spanish.

Safety Notices

Veiligheidsmededelingen

Avis de sécurité

Sicherheitshinweise

Avvisi di sicurezza

Avisos de seguridad

Pay special attention to the following safety notices in all product documentation.

Let vooral op de volgende veiligheidsmededelingen in alle productdocumentatie.

Portez une attention particulière aux avis de sécurité suivants dans l'ensemble de la documentation du produit.

Achten Sie besonders auf die folgenden Sicherheitshinweise in allen Produktdokumentationen.

Prestare particolare attenzione agli avvisi di sicurezza presenti in tutta la documentazione del prodotto.

Preste especial atención a los siguientes avisos de seguridad en toda la documentación del producto.

WARNING A WARNING notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

De aanduiding WAARSCHUWING duidt op een gevaar. Deze vestigt de aandacht op een bedieningsprocedure, praktijk of iets dergelijks die, indien niet correct uitgevoerd of nageleefd, persoonlijk letsel of de dood tot gevolg kan hebben. Ga niet verder bij een aanduiding WAARSCHUWING voordat de aangegeven voorwaarden volledig begrepen zijn en eraan voldaan is.

Un AVERTISSEMENT signale un danger. Il attire l'attention sur une procédure d'utilisation, une pratique ou autre qui, si elle n'est pas correctement exécutée ou respectée, peut entraîner des dommages corporels, voire un décès. Ne passez pas outre l'AVERTISSEMENT uniquement si les conditions indiquées sont entièrement comprises et remplies.

Ein WARNHINWEIS weist auf eine Gefahr hin. Er weist auf ein Betriebsverfahren, eine Vorgehensweise oder ähnliches hin, deren falsche Ausführung oder Nichtbeachtung zu Verletzungen oder zum Tod führen können. Fahren Sie bei einem WARNHINWEIS erst dann mit Ihrer Arbeit fort, wenn die angegebenen Bedingungen vollständig verstanden und erfüllt sind.

Un avviso di AVVERTENZA indica un pericolo. Richiama l'attenzione su procedure operative, pratiche o azioni simili che, se non rispettate o eseguite correttamente, potrebbero causare lesioni personali o decesso. Non procedere ignorando un avviso di AVVERTENZA fino a quando le condizioni indicate non sono state completamente comprese e soddisfatte.

Un aviso de ADVERTENCIA indica un peligro. Destaca la importancia de un procedimiento operativo, una práctica o un proceso similar que, si no se realiza o se sigue correctamente, podría provocar lesiones o la muerte. No siga adelante sin antes comprender y cumplir plenamente los requisitos indicados en el aviso de ADVERTENCIA.

CAUTION

A CAUTION notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a CAUTION notice until the indicated conditions are fully understood and met.

De aanduiding VOORZICHTIG duidt op een gevaar. Deze vestigt de aandacht op een bedieningsprocedure, praktijk of iets dergelijks die, indien niet correct uitgevoerd of nageleefd, schade aan het product of verlies van belangrijke gegevens tot gevolg kan hebben. Ga niet verder bij een aanduiding VOORZICHTIG voordat de aangegeven voorwaarden volledig begrepen zijn en eraan voldaan is.

Une MISE EN GARDE signale un danger. Elle attire l'attention sur une procédure d'utilisation, une pratique ou autre qui, si elle n'est pas correctement exécutée ou respectée, peut endommager le produit ou entraîner la perte de données importantes. Ne passez pas outre la MISE EN GARDE uniquement si les conditions indiquées sont entièrement comprises et remplies.

Ein VORSICHTSHINWEIS weist auf eine Gefahr hin. Er weist auf ein Betriebsverfahren, eine Vorgehensweise oder ähnliches hin, deren falsche Ausführung oder Nichtbeachtung zu einer Beschädigung des Produkts oder zum Verlust wichtiger Daten führen kann. Fahren Sie bei einem VORSICHTSHINWEIS erst dann mit Ihrer Arbeit fort, wenn die angegebenen Bedingungen vollständig verstanden und erfüllt sind.

Un avviso di ATTENZIONE indica un pericolo. Richiama l'attenzione su procedure operative, pratiche o azioni simili che, se non rispettate o eseguite correttamente, potrebbero causare danni al prodotto o perdita di dati importanti. Non procedere ignorando un avviso di ATTENZIONE fino a quando le condizioni indicate non sono state completamente comprese e soddisfatte.

Un aviso de PRECAUCIÓN indica un peligro. Destaca la importancia de un procedimiento operativo, una práctica o un proceso similar que, si no se realiza o no se sigue correctamente, podrían provocar daños en el producto o la pérdida de datos importantes. No siga adelante sin antes comprender y cumplir plenamente los requisitos indicados en el aviso de PRECAUCIÓN.

Warnings and Precautions

Electrical Hazards

Elektrische gevaren

Risques électriques

Elektrische Gefahren

Rischi elettrici

Peligros eléctricos

WARNING **Internal Voltage.** Always turn off the power switch and unplug the power supply before cleaning the outer surface of the instrument.

Interne spanning. Zet altijd de stroomschakelaar uit en haal de stekker uit het stopcontact voordat de buitenkant van het instrument wordt gereinigd.

Tension interne. Désactivez toujours l'interrupteur d'alimentation électrique et débranchez l'alimentation avant de nettoyer la surface extérieure de l'instrument.

Spannung im Geräteinneren. Vor dem Reinigen der Außenfläche des Geräts grundsätzlich den Stromschalter ausschalten und das Stromkabel aus der Steckdose ziehen.

Tensione interna. Spegnere sempre l'interruttore dell'alimentazione e scollegare l'alimentazione prima di pulire le superfici esterne dello strumento.

Tensión interna. Siempre apague el interruptor y desconecte la fuente de alimentación antes de limpiar la superficie exterior del instrumento.

WARNING

Power Rating. The instrument's power supply or power cord 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.

Vermogensklasse. De voeding of het netsnoer van het instrument moet worden aangesloten op een stopcontact dat spanning en stroom levert binnen de gespecificeerde nominale waarden voor het systeem. Gebruik van een niet-compatibel stopcontact kan leiden tot elektrische schokken en brandgevaar.

Puissance électrique nominale. L'alimentation ou le cordon d'alimentation de l'instrument doit être raccordé(e) à une prise de courant qui fournit la tension et le courant correspondants à la puissance spécifiée du système. L'emploi d'une prise de courant incompatible peut entraîner un choc électrique et un risque d'incendie.

Leistungsbemessung. Die Stromversorgung des Geräts bzw. das Anschlusskabel muss mit einer Steckdose verbunden werden, deren Spannungs- und Stromwerte innerhalb der für das System vorgeschriebenen Nennwerte liegen. Die Verwendung einer nicht kompatiblen Steckdose kann zu einem elektrischen Schlag und Brandgefahr führen.

Potenza nominale. L'alimentazione o il cavo di alimentazione dello strumento devono essere collegati a una presa di corrente che fornisca tensione e corrente comprese entro il valore nominale previsto per il sistema. L'uso di una presa di alimentazione non compatibile può causare scosse elettriche e rischi di incendio.

Potencia nominal. La fuente de alimentación o el cable de alimentación del instrumento tienen que conectarse a un receptáculo que suministre tensión y corriente dentro de la potencia especificada para el sistema. El uso de un receptáculo incompatible puede producir descargas eléctricas y riesgo de incendio.

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.

Elektrische aarding. Gebruik nooit een stekkeradapter om de primaire stroom aan te sluiten op de externe voeding. Het gebruik van een adapter verbreekt de verbinding met de aarding van het elektriciteitsnet, waardoor een ernstige schok kan ontstaan. Sluit het netsnoer altijd rechtstreeks aan op een geschikt stopcontact met werkende aarding.

Mise à la terre électrique. N'utilisez jamais d'adaptateur de prise pour raccorder l'alimentation principale à l'alimentation électrique extérieure. L'utilisation d'un adaptateur déconnecte la terre du secteur, créant un risque important de choc. Raccordez toujours le cordon d'alimentation directement à une prise appropriée dotée d'une mise à la terre fonctionnelle.

Elektrische Erdung. Verwenden Sie niemals einen Steckeradapter zum Anschließen der Primärstromversorgung an die externe Stromversorgung. Bei Verwendung eines Adapters wird die Verbindung zur Gebäudeerde unterbrochen, sodass ein erhebliches Stromschlagrisiko besteht. Das Stromkabel ist immer direkt an eine geeignete Steckdose mit Funktionserdung anzuschließen.

Messa a terra elettrica. Non usare mai un adattatore per collegare l'alimentazione principale all'alimentazione esterna. Se si usa un adattatore, si scollega la messa a terra della rete elettrica creando un grave pericolo di scosse elettriche. Collegare sempre il cavo di alimentazione direttamente a una presa idonea dotata di messa a terra funzionale.

Conexión a tierra. Nunca use un adaptador de enchufe para conectar la corriente principal a la fuente de alimentación externa. El uso de un adaptador desconecta la tierra del servicio y crea un riesgo de descarga grave. Conecte siempre el cable de alimentación directamente a un receptáculo adecuado con una toma de tierra funcional.

WARNING **Service.** Only qualified technical personnel should perform service procedures on internal components.

Service. Alleen gekwalificeerd technisch personeel mag serviceprocedures aan interne onderdelen uitvoeren.

Entretien. L'exécution des procédures d'entretien des composants internes doit être réservée au personnel technique qualifié.

Wartung. Wartungsarbeiten an Komponenten im Geräteinneren sollten nur von qualifizierten Servicetechnikern durchgeführt werden.

Manutenzione. Le procedure di manutenzione sui componenti interni devono essere eseguite esclusivamente da personale tecnico qualificato.

Revisión. Solo puede realizar procedimientos de revisión de los componentes internos el personal técnico cualificado.

CAUTION **Power Supply.** Use only the power supply shipped with the instrument, and operate it within the range of line voltages listed on it.

Voeding. Gebruik alleen de voeding die bij het instrument is geleverd en gebruik deze binnen het bereik van de netspanningen die op de voeding staan vermeld.

Alimentation électrique. Utilisez exclusivement l'alimentation électrique fournie avec l'instrument dans la plage de tension de ligne indiquée dessus.

Stromversorgung. Verwenden Sie nur die im Lieferumfang des Geräts enthaltene Stromversorgung und betreiben Sie diese innerhalb des darauf angegebenen Netzspannungsbereichs.

Alimentazione. Usare esclusivamente l'alimentatore fornito con lo strumento, utilizzando quest'ultimo entro l'intervallo delle tensioni di linea indicato sull'unità.

Fuente de alimentación. Use únicamente la fuente de alimentación incluida con el instrumento y úsela en el rango de tensiones de línea indicado en ella.

Chemical/Environmental

Chemisch/Milieu

Substances chimiques/Environnement

Chemie/Umwelt

Rischi chimici/ambientali

Riesgos químicos y medioambientales

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. Always wear safety glasses and appropriate protective equipment, such as chemical-resistant rubber gloves and apron.

Potentiële biologische gevaren. Sommige tests of specimens kunnen een biologisch gevaar inhouden. Er moeten adequate veiligheidsmaatregelen worden getroffen zoals aangegeven in de bijsluiter van de test. Draag altijd een veiligheidsbril en geschikte beschermingsmiddelen, zoals chemicaliënbestendige rubberen handschoenen en een schort.

Risques biologiques potentiels. Certains tests ou échantillons peuvent présenter un risque biologique. Des précautions de sécurité adéquates doivent être prises, comme indiqué dans la notice de l'emballage du test. Portez toujours des lunettes de sécurité et un équipement de protection approprié, comme des gants en caoutchouc résistant aux substances chimiques et un tablier.

Potenzielle Biogefahren. Manche Assays oder Proben stellen eine Biogefahr dar. Es sollten angemessene Sicherheitsvorkehrungen entsprechend der Packungsbeilage des Assays ergriffen werden. Tragen Sie immer eine Schutzbrille und eine geeignete Schutzausrüstung, wie chemikalienbeständige Gummihandschuhe und Schürze.

Potenziali rischi biologici. Alcuni test o campioni potrebbero comportare un rischio biologico. Implementare misure di sicurezza adeguate secondo quanto delineato nel foglietto della confezione del test. Indossare sempre occhiali di sicurezza e dispositivi di protezione appropriati, ad esempio guanti e grembiule in gomma resistenti alle sostanze chimiche.

Riesgos biológicos potenciales. Algunos ensayos y especímenes pueden constituir un riesgo biológico. Se han de tomar precauciones de seguridad suficientes tal como se indica en el folleto del paquete del ensayo. Use siempre gafas de seguridad y equipos protectores adecuados, como guantes de caucho resistentes a productos químicos y un delantal.

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, stop the program and turn off the instrument. Wipe up all spills immediately. Do not operate the instrument if internal components have been exposed to fluid.

Vloeistoffen. Voorkom dat vloeistoffen op het instrument worden gemorst; het doorsijpelen van vloeistoffen in interne onderdelen kan leiden tot schokgevaar of beschadiging van het instrument. Als een lekkage optreedt terwijl een programma loopt, stopt u het programma en schakelt u het instrument uit. Veeg alle gemorste vloeistof onmiddellijk op. Gebruik het instrument niet als interne onderdelen aan vloeistof zijn blootgesteld.

Liquides. Évitez de renverser des liquides sur l'instrument ; les infiltrations de liquide dans les composants internes créent un risque potentiel de choc ou de détérioration de l'instrument. En cas de déversement de liquide alors qu'un programme est en cours d'exécution, arrêtez le programme et mettez l'instrument hors tension. Essuyez immédiatement tout liquide renversé. N'utilisez pas l'instrument si les composants internes ont été exposés à du liquide.

Flüssigkeiten. Keine Flüssigkeiten auf dem Gerät verschütten! In die Bauteile im Geräteinneren bilden einsickernde Flüssigkeiten ein Potenzial für die Gefahr von Stromschlägen oder Schäden am Gerät. Bei Verschütten von Flüssigkeiten während ein Programm läuft, ist dieses zu stoppen und das Gerät auszuschalten. Verschüttete Flüssigkeiten sind unverzüglich abzuwischen. Das Gerät darf nicht betrieben werden, wenn Komponenten im Geräteinneren Flüssigkeiten ausgesetzt waren.

Liquidi. Evitare di versare liquidi sullo strumento; l'infiltrazione di fluidi nei componenti interni crea rischi di scosse elettriche o danni allo strumento. Se si verifica un versamento durante l'esecuzione di un programma, arrestare il programma e spegnere lo strumento. Ripulire immediatamente tutti i versamenti. Non utilizzare lo strumento se i componenti interni sono stati esposti a fluidi.

Líquidos. Procure no derramar líquidos sobre el instrumento, ya que si se filtran fluidos en los componentes internos se puede producir un riesgo de descarga o de deterioro del instrumento. Si se produce un derramamiento mientras se está ejecutando un programa, detenga el programa y apague el instrumento. Limpie el derrame inmediatamente. No utilice el instrumento si los componentes internos han estado expuestos a fluidos.

CAUTION

Liquids. Do not immerse the instrument, spray it with liquid, or use a dripping-wet cloth on it. Do not allow water or other cleaning solution to run into the interior of the instrument. If this happens, contact Technical Support. Do not soak the touchscreen.

Vloeistoffen. Dompel het instrument niet onder, bespuit het niet met vloeistof en gebruik er geen druipnatte doek op. Zorg ervoor dat er geen water of andere schoonmaakmiddelen in het inwendige van het instrument terechtkomen. Als dit gebeurt, neem dan contact op met de afdeling Technische Ondersteuning. Maak het aanraakscherm niet nat.

Liquides. N'immergez pas l'instrument, ne le vaporisez pas de liquide et n'utilisez pas de chiffon non essoré dessus. Ne laissez pas d'eau ou autre solution de nettoyage pénétrer à l'intérieur de l'instrument. Le cas échéant, contactez l'assistance technique. N'immergez pas l'écran tactile.

Flüssigkeiten. Das Gerät nicht in Flüssigkeit eintauchen oder damit einsprühen und keine tropfnassen Tücher verwenden. Kein Wasser oder andere Reinigungslösung in das Geräteinnere eindringen lassen. Sollte dies vorkommen, setzen Sie sich mit dem technischen Kundendienst in Verbindung. Den Touchscreen nicht einweichen.

Liquidi. Non immergere lo strumento, nebulizzarlo con liquidi né usare un panno che non sia stato strizzato bene. Evitare che acqua o soluzioni detergenti penetrino all'interno dello strumento. Se si verifica un'infiltrazione, contattare il supporto tecnico. Non mettere in ammollo il touchscreen.

Líquidos. No sumerja el instrumento, no lo pulverice con líquidos y no use un paño mojado que gotee sobre él. No permita que entre agua ni otra solución de limpieza en el interior del instrumento. Si esto sucediera, póngase en contacto con el servicio de soporte técnico. No remoje la pantalla táctil.

CAUTION

Environmental Conditions. Do not expose the instrument to temperature extremes. For proper operation, temperature near the instrument should remain within the range in the ***Specifications*** section of this document. Performance may be adversely affected if temperatures fluctuate above or below this range.

Omgevingsvoorwaarden. Stel het instrument niet bloot aan extreme temperaturen. Voor een goede werking moet de temperatuur in de buurt van het instrument binnen het bereik blijven zoals aangegeven in het gedeelte Specificaties van dit document. De prestaties kunnen nadelig worden beïnvloed als de temperatuur boven of onder dit bereik schommelt.

Conditions environnementales. N'exposez pas l'instrument à des températures extrêmes. Pour assurer un bon fonctionnement, la température à proximité de l'instrument doit demeurer dans la plage indiquée sous la rubrique Spécifications du présent document. La performance peut être affectée négativement si les températures fluctuent au-dessus ou au-dessous de cette plage.

Umgebungsbedingungen. Das Gerät darf keinen Extremtemperaturen ausgesetzt werden. Für den ordnungsgemäßen Betrieb müssen die Temperaturen in Gerätenähe in den im Abschnitt Spezifikationen dieses Dokuments angegebenen Grenzen bleiben. Temperaturschwankungen über diese Grenzwerte hinaus können die Geräteleistung beeinträchtigen.

Condizioni ambientali. Non esporre lo strumento a temperature estreme. Per il corretto funzionamento, la temperatura nei pressi dello strumento deve restare nell'intervallo indicato nella sezione Specifiche di questo documento. Fluttuazioni delle temperature al di sopra o al di sotto di questo intervallo possono compromettere le prestazioni dello strumento.

Condiciones ambientales. No exponga el instrumento a temperaturas extremas. Para su correcto funcionamiento, la temperatura que rodee al instrumento deberá estar dentro del rango indicado en la sección Especificaciones de este documento. Si las temperaturas fluctúan por encima o por debajo de este rango, el rendimiento puede verse afectado negativamente.

CAUTION

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

Natriumhypochloriet. Stel geen enkel deel van het instrument langer dan 20 minuten bloot aan de aanbevolen verdunde natriumhypochlorietoplossing. Langdurig contact kan de oppervlakken van het instrument beschadigen. Zorg ervoor dat alle oppervlakken goed worden afgespoeld en schoongeveegd.

Hypochlorite de sodium. N'exposez aucune pièce de l'instrument à la solution d'hypochlorite de sodium diluée comme recommandé pendant plus de 20 minutes. Un contact prolongé peut endommager les surfaces de l'instrument. Veillez à rincer et essuyer soigneusement toutes les surfaces.

Natriumhypochlorit. Kein Teil des Geräts darf der empfohlenen verdünnten Natriumhypochloritlösung länger als 20 Minuten lang ausgesetzt werden. Bei längerem Kontakt drohen Beschädigungen an den Geräteoberflächen. Alle Oberflächen unbedingt abspülen und gründlich abwischen.

Ipoclorito di sodio. Non esporre nessun componente dello strumento alla soluzione di ipoclorito di sodio diluita raccomandata per più di 20 minuti. Un contatto prolungato potrebbe danneggiare le superfici dello strumento. Accertarsi di sciacquare e ripulire accuratamente tutte le superfici.

Hipoclorito sódico. No exponga ninguna parte del instrumento a la solución de hipoclorito sódico diluido recomendada durante más de 20 minutos. Un contacto demasiado prolongado puede dañar las superficies del instrumento. Asegúrese de aclarar y secar concienzudamente todas las superficies.

CAUTION

Lubricants. Do not apply lubricants to moving parts. Lubricant on components in the carrier compartment will attract dust and other particles, which may cause the instrument to produce an error.

Smeermiddelen. Breng geen smeermiddelen aan op bewegende delen. Smeermiddel op onderdelen in het draagcompartiment zal stof en andere deeltjes aantrekken, waardoor het instrument een fout kan produceren.

Lubrifiants. N'appliquez pas de lubrifiants sur les pièces mobiles. La présence de lubrifiant sur les composants dans le compartiment du portoir attire la poussière et autres particules, ce qui peut provoquer une erreur de l'instrument.

Schmierstoffe. Keine Schmierstoffe auf bewegliche Teile auftragen. Schmierstoffe auf Komponenten im Trägerfach ziehen Staub und andere Teilchen an, die zu einem Gerätefehler führen können.

Lubrificanti. Non applicare lubrificanti alle parti in movimento. La presenza di lubrificante sui componenti del vano portapiastra attira polvere e altre particelle che potrebbero causare errori dello strumento.

Lubricantes. No aplique lubricantes en las piezas móviles. El lubricante en los componentes del compartimento del portador atraerá polvo y otras partículas que pueden hacer que el instrumento muestre un error.

Components

Onderdelen

Composants

Komponenten

Componenti

Componentes

WARNING

Hot Surface. The lamp assembly is hot when the instrument is turned on. Turn off the reader and allow the bulb to cool for at least 15 minutes before attempting to replace it.

Heet oppervlak. De lamp is heet wanneer het instrument wordt ingeschakeld. Zet het leesapparaat uit en laat de lamp ten minste 15 minuten afkoelen alvorens te proberen deze te vervangen.

Surface chaude. La lampe est chaude lorsque l'instrument est allumé. Éteignez le lecteur et laissez l'ampoule refroidir pendant 15 minutes au moins avant de la remplacer.

Heiße Oberflächen. Bei eingeschaltetem Gerät ist die Lampe heiß. Schalten Sie den Reader aus und lassen Sie die Glühbirne mindestens 15 Minuten lang abkühlen, bevor Sie versuchen, sie auszutauschen.

Superficie molto calda. Il gruppo lampada diventa molto caldo quando lo strumento è acceso. Prima di tentare di sostituirlo, spegnere il lettore e lasciare raffreddare la lampadina per almeno 15 minuti.

Superficie caliente. El conjunto de piezas de la lámpara está caliente cuando el instrumento está encendido. Apague el lector y deje que la bombilla se enfríe durante al menos 15 minutos antes de proceder a cambiarla.

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

Accessoires. Bij het instrument mogen alleen accessoires worden gebruikt die voldoen aan de specificaties van de fabrikant.

Accessoires. L'instrument doit être utilisé exclusivement avec des accessoires correspondant aux spécifications du fabricant.

Zubehör. In Verbindung mit dem Gerät dürfen nur Zubehörkomponenten verwendet werden, die den Spezifikationen des Herstellers entsprechen.

Accessori. Utilizzare esclusivamente accessori dello strumento che rispettano le specifiche del fabbricante.

Accesorios. Solamente aquellos accesorios que cumplan las especificaciones del fabricante deberán usarse con el instrumento.

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

Verzendingshardware. Alle verzendingshardware moet worden verwijderd voordat het instrument wordt gebruikt en opnieuw worden geïnstalleerd voordat het instrument opnieuw wordt verpakt voor verzending.

Matériel d'expédition. Tout le matériel d'expédition doit être retiré avant d'utiliser l'instrument et réinstallé avant de remballer l'équipement pour expédition.

Festes Versandmaterial. Alle festen Versandmaterialien müssen vor der Inbetriebnahme des Geräts entfernt und vor der Wiederverpackung des Geräts zum Versand neu angebracht werden.

Minuteria di spedizione. Prima di utilizzare lo strumento, rimuovere tutta la minuteria di spedizione, che dovrà essere reinstallata prima di reimballare lo strumento per la spedizione.

Equipo de envío. Antes de utilizar el instrumento es necesario retirar todo el equipo de envío y, del mismo modo, habrá que volver a colocárselo cuando el instrumento se vaya a enviar.

CAUTION

Filter Cube (F models). The reader's internal filter cube table must exactly match the contents of the installed filter cube. Gen5 users: The Gen5 software filter cube table must exactly match the contents of the filter cube.

If you exchange the filter cube or modify its contents, you must update the filter cube table(s).

The filter cube is accessed through a hinged door in the front of the instrument. Do not open the door to access the filter cube during instrument operation! Doing so may result in invalid data.

Filterkubus (F-modellen). De interne filterkubustabel van het leesapparaat moet exact overeenkomen met de inhoud van de geïnstalleerde filterkubus. Gen5-gebruikers: De filterkubustabel van de Gen5-software moet exact overeenkomen met de inhoud van de filterkubus.

Als u de filterkubus vervangt of de inhoud ervan wijzigt, moet u de filterkubustabel(len) bijwerken.

De filterkubus is toegankelijk via een scharnierende deur aan de voorzijde van het instrument. Open de deur niet om bij de filterkubus te komen als het instrument in bedrijf is! Als u dit wel doet, kan dit leiden tot ongeldige gegevens.

Cube de filtres (modèles F). Le tableau du cube de filtres internes du lecteur doit correspondre exactement au contenu du cube de filtres installé. Utilisateurs de Gen5 : Le tableau du cube de filtres du logiciel Gen5 doit correspondre exactement au contenu du cube de filtres.

Si vous changez le cube de filtres ou modifiez son contenu, vous devez mettre à jour le ou les tableaux du cube de filtres.

Le cube de filtres est accessible par une porte à charnière à l'avant de l'instrument. N'ouvrez pas la porte pour accéder au cube de filtres pendant le fonctionnement de l'instrument ! Cela peut entraîner la production de données non valides.

Filterwürfel (F-Modelle). Die interne Filterwürfeltabelle des Readers muss exakt mit dem Inhalt des installierten Filterwürfels übereinstimmen. Gen5-Benutzer: Die Filterwürfeltabelle der Gen5-Software muss genau mit dem Inhalt des Filterwürfels übereinstimmen.

Wenn Sie den Filterwürfel austauschen oder seinen Inhalt ändern, müssen Sie die Filterwürfeltabelle(n) aktualisieren.

Der Zugang zum Filterwürfel erfolgt über eine Klapptür an der Vorderseite des Geräts. Öffnen Sie während des Gerätebetriebs nicht die Tür, um auf den Filterwürfel zuzugreifen! Dies kann zu ungültigen Daten führen.

Filtro a cubo (modelli F). La tabella dei filtri a cubo interni del lettore deve coincidere esattamente con il contenuto del filtro a cubo installato. Utenti Gen5: la tabella dei filtri a cubo del software Gen5 deve coincidere esattamente con il contenuto del filtro a cubo.

Se si sostituisce il filtro a cubo o se ne modifica il contenuto, è necessario aggiornare le tabelle del filtro a cubo.

È possibile accedere al filtro a cubo attraverso uno sportello incernierato nella parte anteriore dello strumento. Per evitare di produrre dati non validi, non aprire lo sportello per accedere al filtro a cubo mentre lo strumento è in funzione.

Cubo de filtro (modelos F). La tabla de cubos de filtro interno del lector debe coincidir exactamente con el contenido del cubo de filtro instalado. Usuarios de Gen5: la tabla de cubos de filtro del software Gen5 debe coincidir exactamente con el contenido del cubo de filtro.

Si intercambia el cubo de filtro o modifica su contenido, debe actualizar la tabla o tablas de cubos de filtro.

El acceso al cubo de filtro se realiza a través de una puerta con bisagras en la parte frontal del instrumento. ¡No abra la puerta para acceder al cubo de filtro mientras el instrumento está en funcionamiento! Si lo hace, los datos podrían perder la validez.

CAUTION

Touchscreen. Use your fingertip to operate the touchscreen. Do not use a sharp stylus or pencil on the touchscreen. Doing so will damage the touchscreen's surface. You can use a stylus designed for resistive touchscreens.

Aanraakscherm. Gebruik uw vingertop om het aanraakscherm te bedienen. Gebruik geen scherpe stylus of potlood op het aanraakscherm. Als u dat wel doet, beschadigt u het oppervlak van het aanraakscherm. U kunt een stylus gebruiken die is ontworpen voor resistieve aanraakschermen.

Écran tactile. Utilisez votre doigt pour faire fonctionner l'écran tactile. N'utilisez pas de stylet ni de crayon pointu sur l'écran tactile. Cela endommagerait la surface de l'écran tactile. Vous pouvez utiliser un stylet conçu pour les écrans tactiles résistifs.

Touchscreen. Nutzen Sie Ihre Fingerspitze, um den Touchscreen zu bedienen. Verwenden Sie keinen spitzen Stylus oder Bleistift auf dem Touchscreen. Dadurch wird die Oberfläche des Touchscreens beschädigt. Sie können einen Stylus verwenden, der für widerstandsgesteuerte Touchscreens entwickelt wurde.

Touchscreen. Per utilizzare il touchscreen, usare la punta delle dita. Per evitare di danneggiare la superficie del touchscreen, non utilizzare uno stilo appuntito o una matita sul touchscreen. È possibile utilizzare uno stilo progettato per touchscreen resistivi.

Pantalla táctil. Utilice la yema del dedo para tocar la pantalla táctil. No utilice agujas afiladas ni lápices sobre la pantalla táctil. Si lo hace, dañará la superficie. Puede utilizar una aguja diseñada para pantallas táctiles resistivas.

CAUTION

Touchscreen. Avoid strong solvents, such as alcohol, acetone, ammonium chloride, methylene chloride, and hydrocarbons. These will permanently damage the touchscreen. Avoid fibrous materials, such as paper towels, which can scratch the touchscreen. Dirt particles and cleaning agents will get trapped in the scratches. Never spray solutions directly on the touchscreen.

Aanraakscherm. Vermijd sterke oplosmiddelen, zoals alcohol, aceton, ammoniumchloride, methyleenchloride en koolwaterstoffen. Deze zullen het aanraakscherm permanent beschadigen. Vermijd vezelige materialen, zoals papieren handdoeken, die krassen kunnen maken op het aanraakscherm. Vuildeeltjes en schoonmaakmiddelen zullen vast komen te zitten in de krassen. Spuit nooit oplossingen rechtstreeks op het aanraakscherm.

Écran tactile. Évitez les solvants puissants comme l'alcool, l'acétone, le chlorure d'ammonium, le chlorure de méthylène et les hydrocarbures. Ils endommageront irrémédiablement l'écran tactile. Évitez les matières fibreuses, comme les serviettes en papier, qui peuvent rayer l'écran tactile. Des particules de poussière et d'agent nettoyant s'incrusteront dans les rayures. Ne vaporisez jamais de solutions directement sur l'écran tactile.

Touchscreen. Verwenden Sie keine starken Lösungsmittel, wie Alkohol, Azeton, Ammoniumchlorid, Methylenchlorid und Kohlenwasserstoffe. Diese Mittel verursachen bleibende Schäden am Touchscreen. Faserstoffe, wie Papiertücher, können den Touchscreen zerkratzen. In den Kratzern sammeln sich Schmutzpartikel und Reinigungsmittel. Sprühen Sie niemals Lösungen direkt auf den Touchscreen.

Touchscreen. Per evitare di danneggiare in modo permanente il touchscreen, non usare solventi aggressivi come alcol, acetone, cloruro d'ammonio, cloruro di metilene e idrocarburi. Per evitare di graffiare il touchscreen, non utilizzare materiali fibrosi come asciugamani di carta. Particelle di sporcizia e agenti detergenti restano intrappolati nelle rigature. Non spruzzare mai soluzioni direttamente sul touchscreen.

Pantalla táctil. Evite los disolventes agresivos, como alcohol, acetona, cloruro de amonio, cloruro de metileno e hidrocarburos. Estos productos dañarán permanentemente la pantalla táctil. Evite los materiales fibrosos, por ejemplo, las servilletas de papel, que pueden arañar la pantalla táctil. Las partículas de suciedad y los agentes de limpieza se quedarán incrustados en los arañazos. Nunca pulverice soluciones directamente

sobre la pantalla táctil.

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.

Reserveonderdelen. Voor onderhoud mogen alleen goedgekeurde reserveonderdelen worden gebruikt. Het gebruik van niet-goedgekeurde onderdelen en accessoires kan tot gevolg hebben dat de garantie vervalt en mogelijk de prestaties van het instrument nadelig beïnvloeden of het instrument beschadigen.

Pièces de rechange. Utilisez exclusivement des pièces de rechange approuvées pour l'entretien. L'utilisation de pièces de rechange et accessoires non approuvés peut entraîner l'annulation de la garantie et potentiellement nuire à la performance de l'instrument ou l'endommager.

Ersatzteile. Für die Wartung sollten nur genehmigte Ersatzteile verwendet werden. Die Verwendung nicht genehmigter Ersatzteile und Zubehörkomponenten kann zum Verlust der Garantie führen und möglicherweise die Geräteleistung beeinträchtigen oder Schäden am Gerät verursachen.

Parti di ricambio. Per la manutenzione, usare esclusivamente parti di ricambio approvate. L'uso di parti di ricambio e accessori non approvati potrebbe dare luogo all'annullamento della garanzia e ripercuotersi negativamente sulle prestazioni o causare danni allo strumento.

Repuestos. Durante el mantenimiento, solo deben emplearse repuestos originales. El uso de repuestos y accesorios no autorizados puede producir la pérdida de la garantía y reducir el funcionamiento del instrumento o provocar daños en él.

CAUTION

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

Service. Alleen gekwalificeerd technisch personeel mag serviceprocedures aan interne onderdelen uitvoeren.

Entretien. L'exécution des procédures d'entretien des composants internes doit être réservée au personnel technique qualifié.

Wartung. Wartungsarbeiten an Komponenten im Geräteinneren sollten nur von qualifizierten Servicetechnikern durchgeführt werden.

Manutenzione. Le procedure di manutenzione sui componenti interni devono essere eseguite esclusivamente da personale tecnico qualificato.

Revisión. Solo puede realizar procedimientos de revisión de los componentes internos el personal técnico cualificado.

Intended Product Use

Beoogd productgebruik

Utilisation prévue du produit

Vorgesehene Produktverwendung

Uso previsto del prodotto

Uso previsto del producto

WARNING **Software Quality Control.** The operator must follow the manufacturer's assay package insert when modifying software parameters and establishing reading methods. 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.

Softwarekwaliteitscontrole. Bij het wijzigen van de softwareparameters en het vaststellen van afleesmethoden moet de operator de bijsluiter van de test van de fabrikant volgen. Het wordt beschouwd als een goede laboratoriumpraktijk om laboratoriummonsters te onderzoeken volgens de instructies en specifieke aanbevelingen die zijn opgenomen in de bijsluiter van de verpakking van de uit te voeren test. Het niet uitvoeren van kwaliteitscontroles kan leiden tot foutieve testgegevens.

Contrôle de qualité du logiciel. L'opérateur doit respecter la notice présente dans l'emballage du test lorsqu'il modifie les paramètres du logiciel et établit les méthodes de lecture. L'exécution d'échantillons de laboratoire conformément aux instructions et aux recommandations spécifiques présentées dans la notice de l'emballage du test à réaliser est considérée comme une bonne pratique de laboratoire. Ne pas exécuter les vérifications de contrôle de qualité peut produire des données de test erronées.

Qualitätskontrolle der Software. Beim Ändern von Softwareparametern und Festlegen der Leseverfahren muss der Bediener die Vorschriften des Herstellers auf der Packungsbeilage des Assays beachten. Es gilt als bewährte Laborpraxis, Messungen an Laborproben gemäß den Anweisungen und speziellen Empfehlungen der Packungsbeilage des Assay-Pakets für den beabsichtigten Test durchzuführen. Das Versäumnis, Qualitätskontrollprüfungen vorzunehmen, kann zu falschen Messergebnissen führen.

Controllo qualità del software. L'operatore deve attenersi alle istruzioni del fabbricante contenute nel foglietto della confezione del test quando modifica i parametri software e stabilisce i metodi di lettura. È considerata una buona pratica di laboratorio eseguire campioni di laboratorio in base alle istruzioni e alle raccomandazioni specifiche incluse nel foglietto della confezione del test relativo al test da condurre. La mancata esecuzione delle verifiche di controllo qualità potrebbe dare luogo a dati di test errati.

Control de calidad del software. El operador tiene que seguir las instrucciones del folleto del paquete del ensayo cuando modifique parámetros del software y establezca métodos de lectura. Se considera una buena práctica de laboratorio efectuar las muestras de laboratorio siguiendo las instrucciones y las recomendaciones específicas incluidas en el folleto del paquete del ensayo para cada prueba que se va a realizar. Si no se realizan las comprobaciones de control de calidad, la prueba puede arrojar datos erróneos.

WARNING **Data Reduction.** No limits are applied to the raw measurement data. Data exported via computer control must be analyzed by the operator. The performance characteristics of the data reduction software have not been established with any laboratory diagnostic assay. Users must evaluate this instrument and 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.

Gegevensreductie. Er worden geen grenzen toegepast op de onbewerkte meetgegevens. Gegevens die via computerbesturing worden geëxporteerd, moeten door de operator worden geanalyseerd. De prestatiekenmerken van de gegevensreductiesoftware zijn voor geen enkele diagnostische laboratoriumtest vastgesteld. Gebruikers moeten dit instrument en de pc-gebaseerde software evalueren in samenhang met hun specifieke test(s). Deze evaluatie moet de bevestiging omvatten dat aan de prestatiekenmerken voor de specifieke test(s) is voldaan.

Réduction des données. Aucune limite n'est appliquée aux données de mesure brutes. Les données exportées par commande informatique doivent être analysées par l'opérateur. Les caractéristiques de performance du logiciel de réduction des données n'ont pas été établies par un test de diagnostic en laboratoire. Les utilisateurs doivent évaluer l'instrument et le logiciel pour PC conjointement à leur(s) test(s) spécifique (s). Cette évaluation doit comprendre la confirmation que les caractéristiques de performance pour le ou les tests spécifiques sont remplies.

Datenauswertung. Auf die Rohdaten der Messung sind keine Grenzwerte anzuwenden. Computergesteuert exportierte Daten müssen vom Bediener analysiert werden. Die Leistungsmerkmale der Datenauswertungs-Software wurden bei keinem Labordiagnostik-Assay bestimmt. Die Evaluierung dieses Geräts und der PC-basierten Software durch den Anwender muss in Verbindung mit dessen speziellem/speziellen Assay(s) erfolgen. Diese Evaluierung muss die Bestätigung einschließen, dass die Leistungsmerkmale für den/die speziellen Assay(s) erfüllt sind.

Riduzione dei dati. Non sono previsti limiti ai dati di misurazione grezzi. I dati esportati tramite il computer devono essere analizzati dall'operatore. Le caratteristiche di prestazione del software di riduzione dei dati non sono state stabilite con alcun test di diagnostica di laboratorio. Gli utenti devono valutare questo strumento e il software basato su PC congiuntamente ai

loro test specifici. Tale valutazione deve comprendere la conferma che siano rispettate le caratteristiche di prestazione per i test specifici.

Reducción de datos. No se aplican límites a los datos de medición no procesados. El operador debe analizar los datos exportados a través del control informático. Las características de rendimiento del software de reducción de datos no se han establecido con ningún ensayo de diagnóstico de laboratorio. Los usuarios deberán evaluar este instrumento y el software basado en PC junto con sus ensayos específicos. Esta evaluación deberá incluir la confirmación de que se cumplen las características de rendimiento de los ensayos específicos.

WARNING **Unspecified Use.** Failure to operate equipment according to the guidelines and safeguards specified in the product user documentation could result in a hazardous condition.

Ongespecificeerd gebruik. Als de apparatuur niet wordt gebruikt volgens de richtlijnen en voorzorgsmaatregelen die in de gebruikersdocumentatie van het product staan vermeld, kan dat leiden tot een gevaarlijke situatie.

Utilisation non spécifiée. Ne pas utiliser l'équipement conformément aux recommandations spécifiées dans la documentation utilisateur relative au produit peut entraîner des situations dangereuses.

Von den Vorschriften abweichende Verwendung. Die Verwendung des Geräts und der zugehörigen Komponenten in Abweichung von den Vorschriften und Sicherheitshinweisen in diesem Dokument für Produktanwender kann gefährliche Situationen verursachen.

Uso non specificato. Il mancato utilizzo delle apparecchiature in base alle linee guida e le misure di protezione specificate nella documentazione per l'utente del prodotto potrebbe causare pericoli.

Uso no especificado. Si no se utiliza el equipo de conformidad con las directrices y salvaguardias especificadas en la documentación del producto para el usuario, se puede producir una situación de peligro.

CAUTION Use of labware other than described in this document can result in positioning errors during program execution.

Gebruik van labware anders dan beschreven in dit document kan leiden tot positioneringsfouten tijdens de uitvoering van het programma.

L'utilisation de matériel de laboratoire autre que celui décrit dans ce document peut entraîner des erreurs de positionnement lors de l'exécution du programme.

Die Verwendung anderer als in diesem Dokument beschriebener Laborgeräte kann zu Positionierungsfehlern bei der Programmausführung führen.

L'uso di vetreria diversa da quella descritta in questo documento può causare errori di posizionamento durante l'esecuzione del programma.

El uso de material de laboratorio diferente al descrito en este documento puede dar lugar a errores de posicionamiento durante la ejecución del programa.

In This Book

This document contains installation, operation, maintenance, and qualification information for all models of the Synergy LX.

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