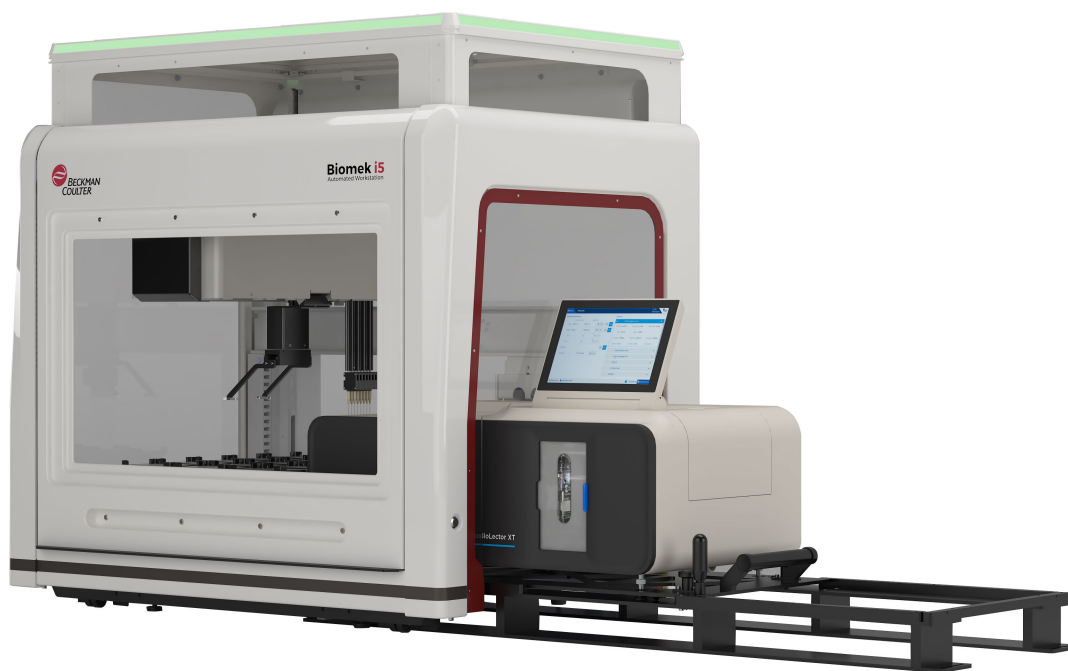


BioLector XT Microbioreactor / Biomek i-Series Automated Workstation

Automated Bioprocessing Platform



PN D06915AA
January 2024



Beckman Coulter GmbH
Europark Fichtenhain B 13
47807 Krefeld, Germany



**BioLector XT Microbioreactor / Biomek i-Series
Automated Workstation
Integration Manual**
PN D06915AA (January 2024)

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Contact Us

If you have any questions, contact our Customer Support Center.

- Worldwide, find us via our website at www.beckman.com/support/technical
- In the USA and Canada, call us at 1-800-369-0333.
- In Austria, call us at 0810 300484
- In Germany, call us at 02151 333999
- In Sweden, call us at +46 (0)8 564 859 14
- In the Netherlands, call us at +31 348 799 815
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Glossary of Symbols is available at
beckman.com/techdocs (PN C24689).

*May be covered by one or more pat. - see
www.beckman.com/patents*

Original Instructions

Revision History

This document applies to the latest software listed and higher versions. When a subsequent software version changes the information in this document, a new issue will be released to the Beckman Coulter website. For labeling updates, go to www.beckman.com/techdocs and download the most recent manual or system help for your instrument.

Initial Issue D06915AA, 1/2024

BioLectorAgent Version: 1.10

RoboLectorAgent Version: 1.8.3

Safety Notice

Read all product manuals and consult with Beckman Coulter-trained personnel before attempting to operate the instrument. Do not attempt to perform any procedure before carefully reading all instructions. Always follow product labeling and manufacturer's recommendations. If in doubt as to how to proceed in any situation, [contact us](#).

Beckman Coulter, Inc. urges its customers and employees to comply with all national health and safety standards such as the use of barrier protection. This may include, but it is not limited to, protective eyewear, gloves, and suitable laboratory attire when operating or maintaining this or any other automated laboratory system.

WARNING

If the equipment is used in a manner not specified by Beckman Coulter, Inc., the protection provided by the equipment may be impaired.

Alerts for Danger, Warning, Caution, Important, and Note

All Dangers, Warnings, and Cautions in this document include an exclamation point, framed within a triangle.

The exclamation point symbol is an international symbol which serves as a reminder that all safety instructions should be read and understood before installation, use, maintenance, and servicing are attempted.

DANGER

DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

CAUTION indicates a potentially hazardous situation, which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

IMPORTANT **IMPORTANT** is used for comments that add value to the step or procedure being performed. Following the advice in the Important adds benefit to the performance of a piece of equipment or to a process.

NOTE **NOTE** is used to call attention to notable information that should be followed during installation, use, or servicing of this equipment.

Instrument Safety Precautions

Please read and observe all cautions and instructions. Remember, the most important key to safety is to operate the instruments with care.

WARNING

Risk of operator injury if:

- All doors, covers and panels are not closed and secured in place prior to and during instrument operation.
- The integrity of safety interlocks and sensors is compromised.
- Instrument alarms and error messages are not acknowledged and acted upon.
- You contact moving parts.
- You mishandle broken parts.
- Doors, covers and panels are not opened, closed, removed and/or replaced with care.
- Improper tools are used for troubleshooting.

To avoid injury:

- Keep doors, covers and panels closed and secured in place while the instrument is in use.
- Take full advantage of the safety features of the instrument. Do not defeat safety interlocks and sensors.
- Acknowledge and act upon instrument alarms and error messages.
- Keep away from moving parts.
- Report any broken parts to your Beckman Coulter Service Representative.
- Open/remove and close/replace doors, covers and panels with care.
- Use the proper tools when troubleshooting.

WARNING

Risk of personal injury. Safety protection can be impaired if used in a manner not specified by the manufacturer. To avoid personal injury, use the instrument according to the manufacturer's instructions only.

CAUTION

Risk of instrument damage. This device is intended for indoor use only. To avoid device damage, do not install the instrument outdoors.

 CAUTION

System integrity could be compromised and operational failures could occur if:

- This equipment is used in a manner other than specified. Operate the instrument as instructed in the product manuals.
- You introduce software that is not authorized by Beckman Coulter into your automation controller. Operate your system's automation controller only with software authorized by Beckman Coulter.
- You install software that is not an original copyrighted version. Only use software that is an original copyrighted version to prevent virus contamination.

 CAUTION

If you purchased this product from anyone other than Beckman Coulter or an authorized Beckman Coulter distributor, and, if it is not presently under a Beckman Coulter Service Maintenance Agreement, Beckman Coulter cannot guarantee that the product is fitted with the most current mandatory engineering revisions or that you will receive the most current information bulletins concerning the product. If you purchased this product from a third party and would like further information concerning this topic, [contact us](#).

 WARNING

Risk of personal injury. To avoid injury due to moving parts, observe the following:

- Never attempt to exchange labware, reagents, or tools while the instrument is operating.
- Never attempt to physically restrict any of the moving components of the instrument.
- Do not override instrument interlocks.
- Keep the instrument work area clear to prevent obstruction of the movement.
- Keep covers and panels closed and/or secured in place while the instrument is in use.
- Do not block the light curtain.

Electromagnetic Compatibility



This device complies with the emissions and immunity requirements as specified in the EN/IEC 61326 series of Product Family Standards for a “basic electromagnetic environment.” Such equipment is supplied directly at low voltage from public mains network. This equipment is not intended for residential use.

This device generates, uses, and can radiate unintentional radio-frequency (RF) energy. If this device is not installed and operated correctly, this RF energy can cause interference with other equipment. It is the responsibility of the end user to be sure that a compatible electromagnetic environment for the device can be maintained so that the device operates as intended.

In addition, other equipment can radiate RF energy to which this device is sensitive. If one suspects interference between this device and other equipment, Beckman Coulter recommends the following actions to correct the interference:

- Evaluate the electromagnetic environment before installation and operation of this device.
- Do not operate this device close to sources of strong electromagnetic radiation (for example: unshielded intentional RF sources), as these can interfere with proper operation. Examples of unshielded intentional radiators are handheld radio transmitters, cordless phones, and cellular phones.
- Do not place this device near medical electrical equipment that can be susceptible to malfunctions caused by close-proximity to electromagnetic fields.
- This device has been designed and tested to CISPR 11, Class A emission limits. In a domestic environment, this device can cause radio interference, in which case, you need to take measures to mitigate the interference.

Instrument-Specific Safety Messages

Safety messages for the BioLector XT microbioreactor and the Biomek i-Series automated workstations are provided in the Instructions for Use and Safety Manuals for each instrument. Refer to [Related User Manuals](#) for more details about the accompanying documentation you should consult.

Multi-Compliance Label



This symbol indicates compliance with:

-  — This is a caution symbol which indicates that the operator should consult the Instructions for Use for additional information.
-  The RCM (Regulatory Compliance Mark) mark is intended for use on products that comply with Australian Communications Media Authority (ACMA) EMC Requirements.
- CSA 169502 — This mark represents recognition by the Canadian Standards Association (CSA), which is a Nationally Recognized testing Laboratory (NRTL), and indicates that the product has met the relevant product safety standards.

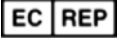
NOTE 169502 is Applicable to North American models only.

-  — A “CE” mark indicates that a product has been assessed before being placed on the market, and has been found to meet European Union safety, health, and/or environmental protection requirements.
-  — A “UKCA” mark indicates that a product has been assessed before being placed in the UK market, and has been found to meet UK safety, health, and/or environmental protection requirements.
-  — The symbol of a crossed-out wheeled bin on the product is required in accordance with the Waste Electrical and Electronic Equipment (WEEE) Directive of the European Union. The presence of this marking on the product indicates:
 - That the device was put on the European Market after August 13, 2005 and
 - That the device is not to be disposed via the municipal waste collection system of any member state of the European Union.

For products under the requirement of the WEEE directive, please contact your dealer or local Beckman Coulter office for the proper decontamination information and take back program which will facilitate the proper collection, treatment, recovery, recycling, and safe disposal of the device.

Instrument Labels

Symbol	Title of Symbol/ Regulatory Mark	Standard Reference	Meaning of Symbol
	Caution	ISO 7000 ^a ; 0434A	To indicate that caution is necessary when operating the device or control close to where the symbol is placed, or to indicate that the current situation needs operator awareness or operator action in order to avoid undesirable consequences.
	Moving Parts	N/A	The moving parts symbol indicates that there are moving parts in the area. Only operate the system when all covers are in position and use caution to reduce the risk of personal injury. While the system is operating, do not touch the moving parts of the system. Do not insert fingers or hands into any system opening.
	Caution, Hot Surface	IEC 60417 ^c ; 5041	To indicate that the marked item can be hot and should not be touched without taking care.
	Biohazard Symbol	ISO 7000 ^a ; 0659	The biohazard symbols indicate areas of the instrument and associated fluid handling equipment that can contain potentially infectious material from body fluids. Follow proper laboratory procedures for handling and disposing of materials from these areas.
	Warning, Sharp elements	ISO 7010 ^b ; W022	To warn of a sharp element.
	On/Off (push-push)	IEC 60417 ^c ; 5009	Indicates a control that can be used to turn on or off the device without turning off the power supply or disconnecting from the mains.
	Protective Earth; Protective Ground	IEC 60417 ^c ; 5019	To identify the product's protective earthing terminal (ground). This terminal is intended for connection to an external conductor for protection against electric shock in case of a ground fault.
 T10AL250V	Fuse	IEC 60417 ^c ; 5016	To identify fuse(s), their type/ratings and location.

Symbol	Title of Symbol/ Regulatory Mark	Standard Reference	Meaning of Symbol
	Multi-Compliance Label	N/A	See Multi-Compliance Label
	UKCA Mark	N/A	A "UKCA" mark indicates that a product has been assessed before being placed in UK market, and has been found to meet UK safety, health, and/or environmental protection requirements.
	cNRTLus Certification Mark Canadian Standards Association Symbol	N/A	This mark indicates North American product certification by the Canadian Standards Association (CSA) which is a Nationally Recognized Testing Laboratory (NRTL). The product has been evaluated to ensure that it has met the relevant product safety requirements.
	RoHS Caution Label	People's Republic of China Electronic Industry Standard SJ/T11364-2006	This label indicates that the electronic information product contains certain toxic or hazardous substances. The center number is the Environmentally Friendly Use Period (EFUP) date, and indicates the number of calendar years the product can be in operation. Upon the expiration of the EFUP, the product must be immediately recycled. The circling arrows indicate the product is recyclable. The date code on the label or product indicates the date of manufacture.
	EC Representative	EN ISO 15223-1 ^d ; 5.1.2	Indicates the Authorized representative in the European Community.
	Consult the Instructions for Use Symbol	EN ISO 15223-1 ^d ; 5.4.3	Indicates the need for the user to consult the instructions for use.
	Serial Number	EN ISO 15223-1 ^d ; 5.1.7	Indicates the manufacturer's serial number so that specific medical device can be identified.
	Manufacturer	EN ISO 15223-1 ^d ; 5.1.3	Indicates the device legal manufacturer.

a. ISO 7000:2019, Graphical symbols for use on equipment – Registered symbols

b. ISO 7010:2019, Graphical symbols – Registered safety sign

c. IEC 60417:2002 DB, Graphical symbols for use on equipment

d. EN ISO 15223-1:2021, Medical devices – Symbols to be used with information to be supplied by the manufacturer – Part 1: General requirements

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Introduction

Overview

This chapter contains introductory information on using this manual. Topics include the following:

- [About This Manual](#)
- [Related User Manuals](#)
- [Conventions](#)

About This Manual

This manual is intended to provide you with the information needed to operate and maintain your BioLector XT microbioreactor integrated with the Biomek i-Series automated workstation. The following topics are covered in this manual; read them in sequence, or refer to the specific topic of interest.

- [CHAPTER 1, Integration Overview](#) provides an introduction to the BioLector XT microbioreactor / Biomek i-Series automated workstation integration, including description, configuration, and consumables.
- [CHAPTER 2, Software Overview](#) is an overview of the different software components to the integration and how to set triggers to carryout an automated experiment.
- [CHAPTER 3, Running an Integration Experiment](#) describes how to complete an integration experiment, including setting up, initializing, and running the experiment.
- [APPENDIX A, Instrument Installation](#) provides the instrument installation procedures for your BioLector XT microbioreactor / Biomek i-Series automated workstation integration.

Related User Manuals

ASG documentation will describe the hardware and SILAS module installation. These manuals are NOT available online.

GUIDE - Biolector XT on i-series will be provided on the USB stick with the SILAS module installer.

This manual should be used in conjunction with the other Beckman Coulter Instructions for Use (IFU) manuals, which are listed below. These documents can be found at Beckman.com/techdocs.

Enter **BioLector XT Microbioreactor** or **Biomek i-Series Automated Workstation** in the search box and press **(Enter)** to locate the available documents.

- *BioLector XT Microbioreactor / Biomek i-Series Automated Workstation Integration Manual* (this manual)

BioLector XT Microbioreactor User Manuals

- *BioLector XT Microbioreactor System Instructions for Use*
- *BioLector XT Microbioreactor System Safety Manual*

Biomek i-Series Automated Workstation User Manuals

- *Biomek i-Series Automated Workstations Instructions for Use*
- *Biomek i-Series Safety Messages and System Help Download Instructions*
- *Biomek i-Series Workstation Pre-Installation Manual*
- *Biomek i-Series Software Reference Manual*
- *Biomek i-Series Tutorials*
- *Biomek i-Series Automated Workstation Hardware Reference Manual*
- *Biomek i-Series Automated Labware Positioners, Accessories, and Devices Instructions for Use*

Conventions

This guide uses the following conventions:

- Throughout this manual, your BioLector XT microbioreactor and Biomek i-Series instrument are also referred to as the “system” or “instrument.”
- **Bold font** indicates a software option, such as **Experiments**.
- The software path to a specific function or screen appears with the greater than (>) symbol between the succeeding screen options, like this: **Experiments > New**
- **Courier font** indicates text you have to type using the keyboard.
- **()** indicates a key (such as **(Enter)**).
- **() + ()** indicates that the two keys listed (such as **(Alt) + (F2)**) are linked for a specific function and must be pressed in this sequence:
 1. Press down on the first key listed and while continuing to press it, press down on the second key listed.
 2. Release both keys at the same time.
- The term “select” is used to indicate either one or both of the following actions:
 - To tap or touch with your finger.
 - To click with a mouse.

NOTE The verb “press” is reserved for mechanical buttons, such as keys on the keyboard.

- The terms “screen” and “window” are used interchangeably.

- Conventions for safety alerts are described in [Safety Notice, Alerts for Danger, Warning, Caution, Important, and Note](#).

CHAPTER 1

Integration Overview

Chapter Overview

Topics in this chapter include:

- [Integration Description](#)
- [System Configuration](#)
- [Consumables and Supplies](#)
- [System Specifications](#)

Integration Description

Not for use in diagnostic procedures.

The BioLector XT microbioreactor / Biomek i-Series automated workstation integration is a unique automated bioprocessing platform integrating the high-throughput fermentation and online-monitoring capabilities of the BioLector XT microbioreactor with the precise and accurate liquid handling of a robotic system, the Biomek i-Series automated workstation. Automated fermentations with the integration of the BioLector XT microbioreactor and the Biomek i-Series instrument allow far more elaborate and complex experiments than the respective standalone instruments. During the online-monitored high-throughput cultivations, the system can add inducer molecules and feed solutions as well as adjust the pH value. The system monitors and triggers processes for each cultivation well of the BioLector XT microtiter plate individually, either according to a predefined schedule or by online process signals. Automated sampling into various targets, including e.g., a temperature-controlled or shaken plate position, facilitates optimal process monitoring and control.

Features

- Parallel high-throughput cultivations with online measurement of biomass, pH value, dissolved oxygen in the liquid phase (DO) and fluorescence measurement at up to three different wavelengths
- pH-controlled batch and fed-batch cultivations
- Automated sampling and dosing actions activated by experiment time and/or online-monitored BioLector XT microbioreactor signals (pH, DO, biomass and fluorescence)
- Induction profiling, pH profiling, synchronized process manipulation

System Configuration

The system integrates a BioLector XT microbioreactor into a Biomek i-Series instrument. Refer to [Figure 1.1](#).

Figure 1.1 BioLector XT microbioreactor / Biomek i-Series Instrument Diagram



- | | |
|--|---|
| 1. Biomek i-Series automated workstation | 7. BioLector XT Microbioreactor support framework slide |
| 2. Pod arm | 8. Slide support table (not required, not part of the standard system) |
| 3. Liquid handling pipettor | 9. Biomek i-Series Mobile Workstation instrument worktable (not required) |
| 4. Gripper | |
| 5. Deck layout | |
| 6. BioLector XT Microbioreactor | |

System Connections

For details on the system connections, refer to the IFU of the instrument in question. See [Related User Manuals](#).

Equipment

A Beckman Coulter field service engineer installs and configures the BioLector XT microbioreactor / Biomek i-Series instrument integration. While your integration is custom depending on what you ordered, generally the integration features the items below:

Table 1.1 Delivery Content

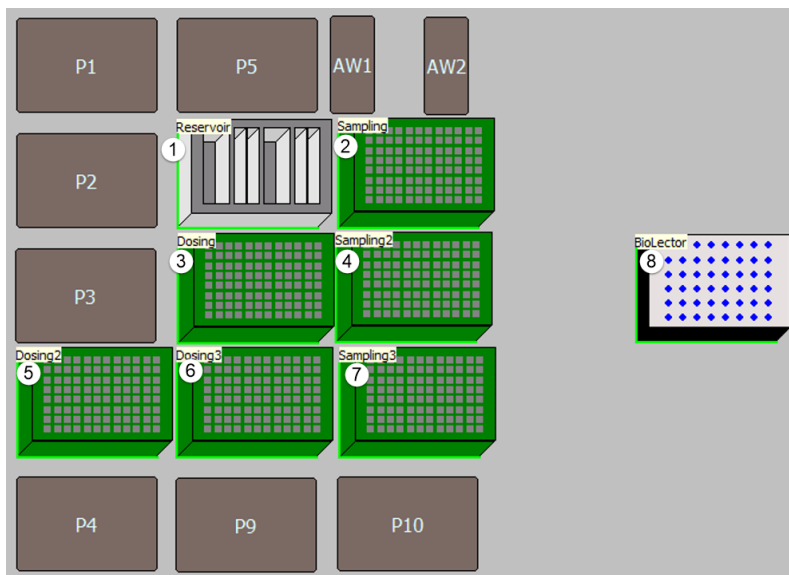
Description	Quantity
BioLector XT Microbioreactor	1
Software package, BioLector / Biomek integration	1
Gassing lid, 48 well, Robotics, BioLector XT	1
Robotic lid	1
Biomek i-Series automated workstation, Span-8 with enclosure	1
Piercing probe, 112 mm, Teflon coated	8
Biomek i-Series Large Volume Tubing Kit	1
ALP, 1x1 static	13
Wash station, Span-8 pipette tips, active	2
Device controller input / output box	1
Qinstrument ColdPlate Heater Cooler	1
Kit, Integration, ColdPlate, Deck on i-Series	1
Kit, Installation, i-Series Workstation (including Biomek configuration tool software)	1
Kit, Integration, BioLector XT Microbioreactor / Biomek i-Series instrument	1

For physical requirements of the integration (e.g., physical space, load capacity, workstation tables, and installation environments), refer to [APPENDIX A, Installation Environment](#). Also refer to the IFU of the instruments in question. See [Related User Manuals](#).

Each BioLector XT microbioreactor / Biomek i-Series instrument integration is delivered with predefined deck layouts. [Figure 1.2](#) illustrates an example deck layout. Microtiter plates (MTPs) must be named accordingly in the software.

IMPORTANT After installation and configuration, do not change the positions of the components nor the given vessel configuration, as configuration in the software is crucial to operation. [Contact us](#) if you would like to change the deck layout.

Figure 1.2 Example Deck Layout



- | | |
|--------------------|--------------------|
| 1. Reservoir Plate | 5. Dosing2 Plate |
| 2. Sampling Plate | 6. Dosing3 Plate |
| 3. Dosing Plate | 7. Sampling3 Plate |
| 4. Sampling2 Plate | 8. BioLector MTP |

Consumables and Supplies

The BioLector XT microbioreactor / Biomek i-Series instrument integration utilizes consumable supplies to perform analysis operations. For detailed information about the consumables and supplies required by each instrument, refer to the IFU of the specific instrument. See [Table 1.2](#) and [Related User Manuals](#).

Table 1.2 Consumables Reference Documents

Item	Description
BioLector XT microbioreactor microtiter plates (MTPs)	Beckman Coulter offers sterile MTPs (FlowerPlate MTP and Round Well Plate) in 48 well and 32 well format with integrated optical sensors (optodes) to measure the pH value and the dissolved oxygen (DO) of the cultivation media. For detailed information refer to the <i>BioLector XT Microbioreactor System Instructions for Use</i> .
BioLector XT microbioreactor MTP accessories	See Lids and Foils . For detailed information refer to the <i>BioLector XT Microbioreactor System Instructions for Use</i> .
Biomek i-Series instrument accessories and consumables	For detailed information refer to the <i>Biomek i-Series Automated Workstations Instructions for Use</i> , <i>Biomek i-Series Automated Workstation Hardware Reference Manual</i> , and <i>Biomek i-Series Automated Labware Positioners, Accessories, and Devices Instructions for Use</i> .

Lids and Foils

Completing robotic experiments requires the use of specific [Gassing Lids](#) and [Foil](#)s.

Gassing Lids

- M2P-E-BDR48: for non-microfluidic, robotic experiments. See [Figure 1.3](#).
- M2P-E-BDR32: for microfluidic, robotic experiments. See [Figure 1.4](#).
- M2P-E-BDRL: for all robotic experiments

NOTE For robotic experiments, the respective gassing lid [PN, M2P-E-BDR48 or PN, M2P-E-BDR32] is required in addition to the robotic lid [PN, M2P-E-BDRL].

Figure 1.3 Gassing Lid 48 Well, Robotic Variant (PN, M2P-E-BDR48 + M2P-E-BDRL)



Figure 1.4 Gassing Lid Microfluidic 32 Well, Robotic Variant (PN, M2P-E-BDR32 + M2P-E-BDRL)



Foils

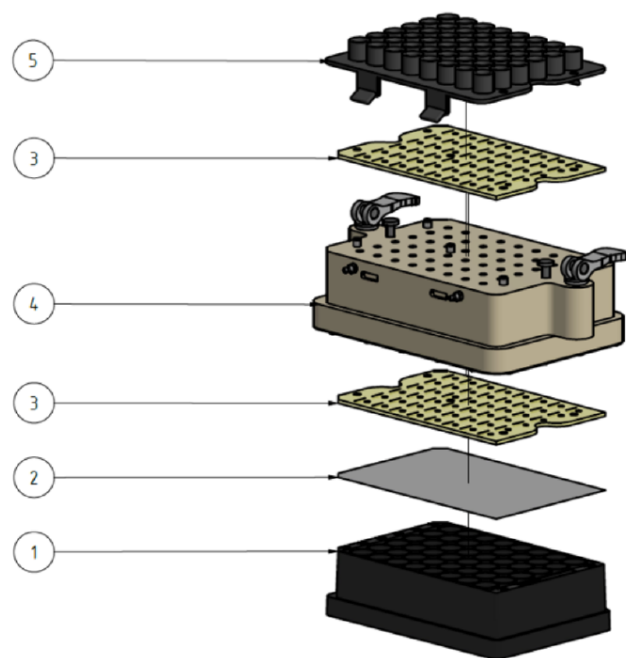
Gas-permeable sealing films are required for BioLector XT experiments as shown in [Table 1.3](#).

Table 1.3 MTP Cover Foils

Description	PN	Quantity Per Experiment
Adhesive gas-permeable sealing film (non-woven, serves as a sterile barrier)	M2P-F-GP-10	1
Self-adhesive, gas-permeable silicone foil for the BioLector XT microbioreactor for sealing microtiter plates and robotic gassing lids. Reduce evaporation and allow sampling through self-sealing slits. For all BioLector XT microbioreactor-compatible microtiter plates. Can only be used in combination with the BioLector XT Foil Applicator.	M2P-F-RSXT-10	2

When you prepare an experiment, you apply the sealing foils to the MTP and gassing lid. See [Figure 1.5](#). For detailed information refer to Chapter 5 of the *BioLector XT Microbioreactor System Instructions for Use*.

Figure 1.5 Gassing Lid, Foils, and Robotic Lid Assembly



1. MTP
2. Adhesive gas-permeable sealing film
3. Self-adhesive, gas-permeable silicone foil
4. Gassing lid
5. Robotic lid

System Specifications

For instrument specifications and performance characteristics, refer to [APPENDIX A, Installation Environment](#) and the instrument-specific documentation. See [Related User Manuals](#).

[Table 1.4](#) lists the technical data for the BioLector XT microbioreactor / Biomek i-Series instrument integration.

Table 1.4 Integration Specifications

Item	Description
Pipetting Channels	8
Pipetting Volume	10–400 µL
System Fluid Requirements	- De-ionized (DI) water. - System Fluid should be de-gassed for 24 hours prior to use.
Tip Types	Fixed tips
Dimensions and Weight	Refer to APPENDIX A, Installation Environment and the instrument-specific documentation. See Related User Manuals .
Environment	Indoor use only
Electrical Requirements	Refer to the instrument-specific documentation. See Related User Manuals .
Installation Category	Category II
Pollution Degree	2
Sound Pressure Level	- Maximum sound pressure: 70 dB(a) - Maximum sound pressure at 1 meter: 70 dB(a)

CHAPTER 2

Software Overview

Chapter Overview

This chapter contains the following topics:

- [Software Overview](#)
- [BioLector Agent Software](#)
- [RoboLector Agent Software](#)
- [Biomek Software and RoboLector Agent Interaction](#)

Software Overview

The BioLector XT microbioreactor is integrated into the Biomek i-Series instrument and complimentary software packages provide communication between the instruments. After the integration is installed, you will work with the software packages to control experiments. In general, you may need to refer to the instrument IFUs for more detailed information about the specific software packages. Refer to [Table 2.1](#) and [Related User Manuals](#) for more information.

Table 2.1 Instrument Software

Instrument	Software	Refer to
BioLector XT microbioreactor	BioLector microbioreactor HMI software	Chapter 3 of <i>BioLector XT Microbioreactor System Instructions for Use</i>
	BioLection Software	Chapter 3 of <i>BioLector XT Microbioreactor System Instructions for Use</i>
	BioLector Agent	
	RoboLector Agent	
Biomek i-Series	Biomek Software	<i>Biomek i-Series Software Reference Manual</i>
	Bioreactor SILAS module	<i>GUIDE - Biolector XT on i-series</i>

The starting order of the software programs is crucial to starting a BioLector XT microbioreactor / Biomek i-Series instrument integration experiment. Refer to [CHAPTER 3, Initializing the Experiment](#) for additional details. Below is an overview of the general steps in an automated experiment:

1. Create a BioLector XT microbioreactor protocol in BioLection software, refer to Chapter 5 of the *BioLector XT Microbioreactor System Instructions for Use*.

2. Upload the protocol to the BioLector XT microbioreactor, refer to Chapter 5 of the *BioLector XT Microbioreactor System Instructions for Use*.
3. Create pipetting triggers for the experiment in RoboLector Agent software, refer to [Setting Triggers](#).
4. Start BioLector Agent software.
5. Start RoboLector Agent software.
6. Start Biomek software.
7. Start the Biomek method, refer to [CHAPTER 3, Initializing the Experiment](#). Make sure the software is in “Wait for Handshake file” mode.
8. Start the BioLector protocol in RoboLector Agent.
RoboLector Agent starts the BioLector XT microbioreactor protocol and then waits until it receives new data from the BioLector XT microbioreactor.
9. The BioLector XT microbioreactor performs a complete measurement cycle (Biomass, pH, DO, etc.).
10. When the BioLector XT microbioreactor measurement cycle completes, BioLector Agent transfers the online signals to RoboLector Agent.
11. RoboLector Agent checks if any setpoints of the programmed pipetting triggers are met. If none are met, RoboLector Agent commands the BioLector XT to continue to the next measurement cycle, returning to Step 9.
12. If a setpoint is met:
 - a. RoboLector Agent sends **Pause** command to the BioLector XT microbioreactor.
 - b. RoboLector Agent creates handshake files, refer to [Biomek Software and RoboLector Agent Interaction](#).
 - c. Biomek software reads the handshake files, refer to [Biomek Software and RoboLector Agent Interaction](#).
 - d. The Biomek software archives the handshake files and goes back to “Wait for Handshake file” mode.
 - e. RoboLector Agent sends **Continue** command to the BioLector XT microbioreactor.
13. BioLector XT microbioreactor continues to the next measurement cycle, returning to Step 9.

Below is a list of possible issues that might arise if you do not perform the correct order of operations:

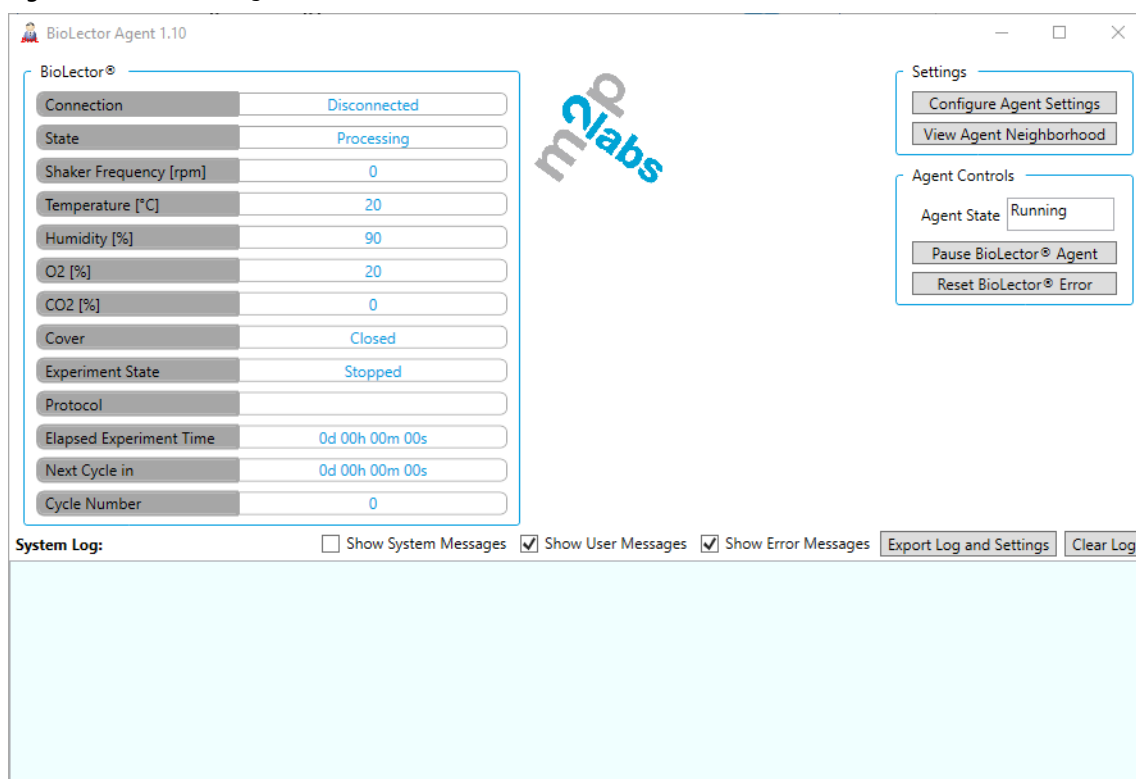
- The protocol list in RoboLector Agent does not show your newly generated protocol file as being present on the BioLector XT microbioreactor.
- RoboLector Agent shows the BioLector XT microbioreactor status as disconnected and you cannot start an experiment.

BioLector Agent Software

The BioLector Agent software is a program which runs in the background during experiments, see [Figure 2.1](#). It enables remote control of the BioLector XT microbioreactor by the [RoboLector Agent Software](#).

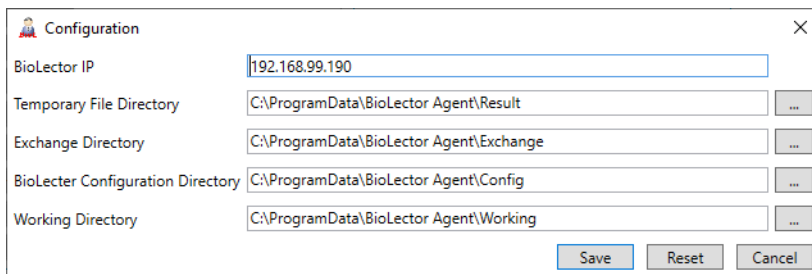
IMPORTANT Only start BioLector Agent immediately prior to starting your experiment. Starting the program immediately before the experiment ensures that the experiment uses the correct protocols and calibration files. In case of doubt, close the program and reopen it prior to opening any other software (e.g., RoboLector Agent and Biomek software).

Figure 2.1 BioLector Agent Software Main Screen



When the field service engineer installs and configures the BioLector XT microbioreactor / Biomek i-Series instrument integration, they will configure the settings. However, if the communication settings must change, select **Configure Agent Settings**. From the configuration screen ([Figure 2.2](#)), you can enter the BioLector XT microbioreactor IP address or change the directory locations.

Figure 2.2 BioLector Agent Configuration Screen



The configuration window titled 'Configuration' contains the following fields and buttons:

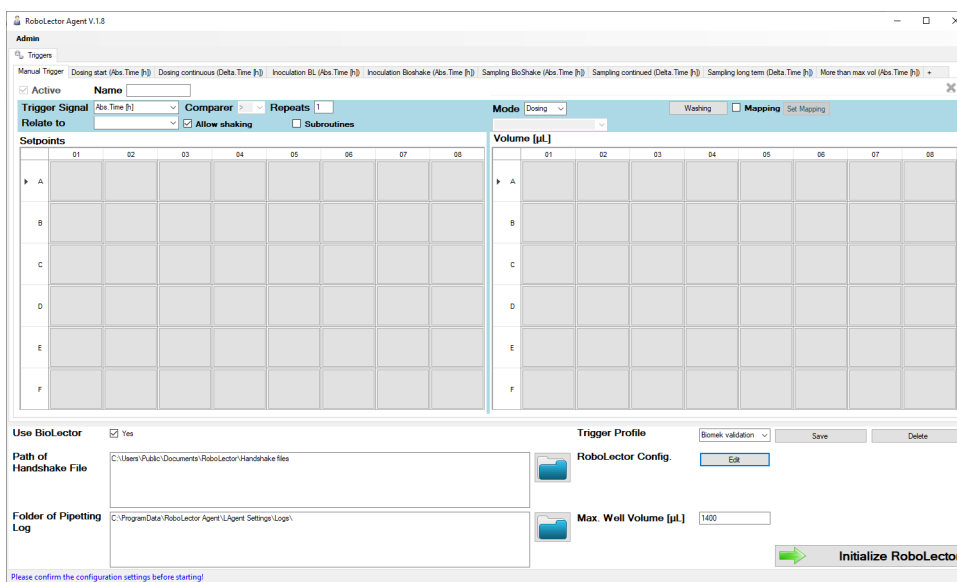
- BioLector IP:** 192.168.99.190
- Temporary File Directory:** C:\ProgramData\BioLector Agent\Result
- Exchange Directory:** C:\ProgramData\BioLector Agent\Exchange
- BioLector Configuration Directory:** C:\ProgramData\BioLector Agent\Config
- Working Directory:** C:\ProgramData\BioLector Agent\Working
- Buttons:** Save, Reset, Cancel

Each time BioLector Agent starts, it downloads the protocol list, installed filter modules, and calibration settings from the connected BioLector XT microbioreactor. Changes to protocols, filter settings, or calibration settings that occur after the BioLector Agent starts will not be available or displayed for selection in the RoboLector Agent software until BioLector Agent restarts. Therefore, you should only start programs in the specified order so that the BioLector XT microbioreactor / Biomek i-Series instrument integration experiment uses the correct settings. For more information refer to [CHAPTER 3, Initializing the Experiment](#).

RoboLector Agent Software

The RoboLector Agent software is a program which controls a BioLector XT microbioreactor / Biomek i-Series instrument integration experiment, see [Figure 2.3](#). The Biomek i-Series instrument provides automated sampling and dosing based upon defined setpoints which you define in RoboLector Agent. RoboLector Agent monitors the experiment and directs the Biomek i-Series instrument to perform sampling and dosing actions based upon the activated triggers, which can be specified experiment time or dependent upon online-monitored signals.

Figure 2.3 RoboLector Agent Main Screen



The main screen of RoboLector Agent V.1.8 includes the following sections:

- Admin:**
 - Triggers:** Manual Trigger, Dosing start (Abs. Time [h]), Dosing continuous (Delta Time [h]), Inoculation (BL (Abs. Time [h]), Inoculation BioShake (Abs. Time [h]), Sampling BioShake (Abs. Time [h]), Sampling continuous (Delta Time [h]), Sampling long term (Delta Time [h]), More than max vol (Abs. Time [h]).
 - Trigger Signal:** Relate to (Abs. Time [h]), Comparator, Repeats (1), Mode (Dosing), Washing, Mapping, Set Mapping.
 - Setpoints:** A grid for defining setpoints (A-F) across 01-08 hours.
 - Volume [μL]:** A grid for defining volumes (A-F) across 01-08 hours.
- Use BioLector:** ☒ Yes
- Path of Handshake File:** C:\Users\Public\Documents\RoboLector\Handshake files
- Folder of Pipetting Log:** C:\ProgramData\RoboLector Agent\Agent Settings\Log\
- Trigger Profile:** Biomek validation, Save, Delete
- RoboLector Config:** Edit
- Max. Well Volume [μL]:** 1400
- Initialize RoboLector:** Green arrow button

Please confirm the configuration settings before starting!

The header of the RoboLector Agent main screen contains the **Admin** menu, see [Figure 2.4](#). The **Device** button is typically used by Beckman Coulter field service engineers only, but may be used if

your integration uses specific configurations. Selecting **Device Management** opens the **Device Manager** window, see [Figure 2.5](#). The **Device Manager** window provides general information about the liquid handler, including the list of microtiter plates available for trigger functionality. Selecting **Neighborhood** opens the **Neighborhood** window, see [Figure 2.6](#). The **Neighborhood** contains a list of all available devices on the network.

IMPORTANT We do not recommend changing settings found in the **Admin** menus. [Contact us](#) if you would like to change settings. If your configuration requires you to change settings, specific training will be provided when your integration is installed.

Figure 2.4 Admin Menu

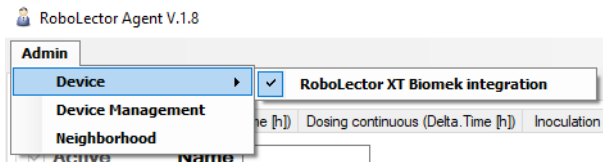


Figure 2.5 Device Manager Window

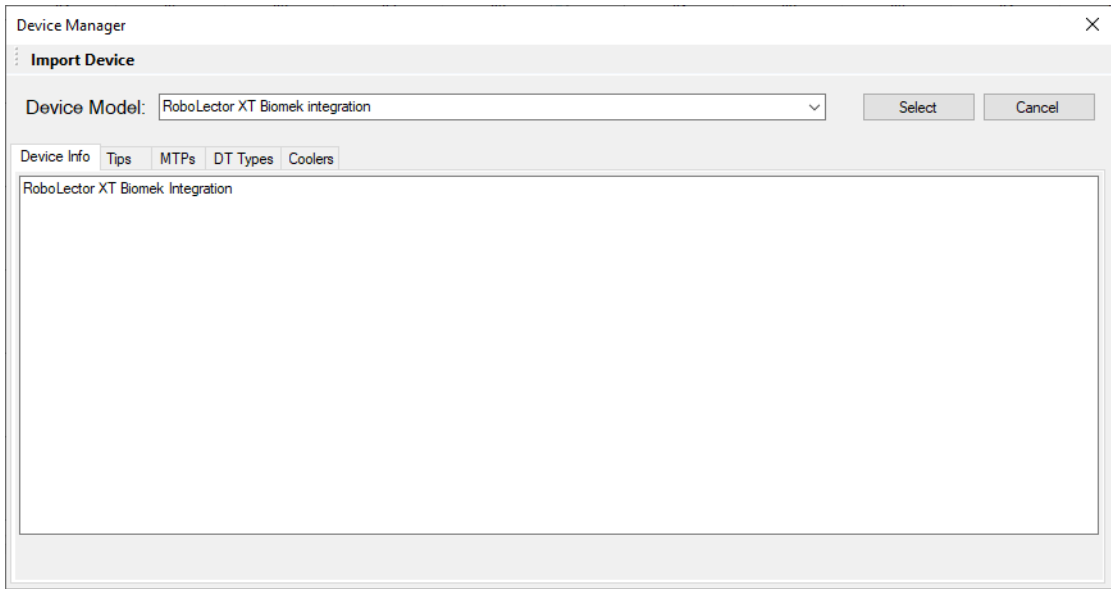
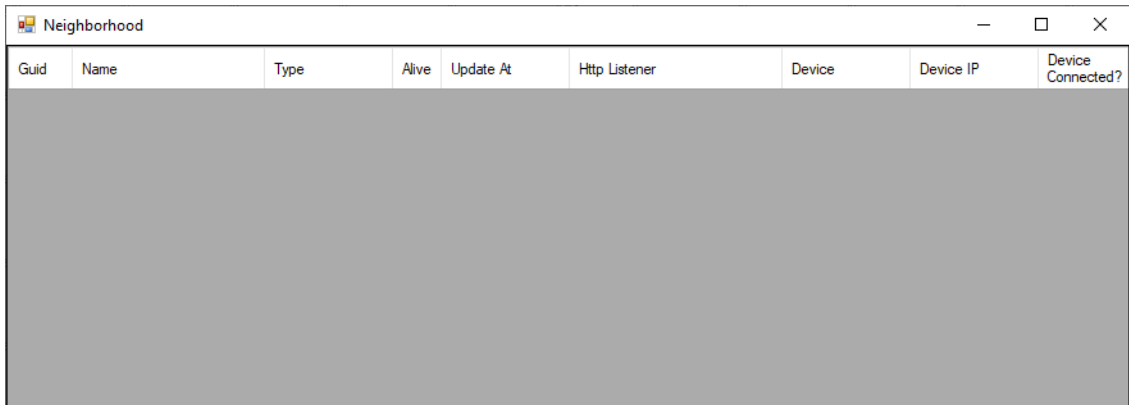


Figure 2.6 Neighborhood Window



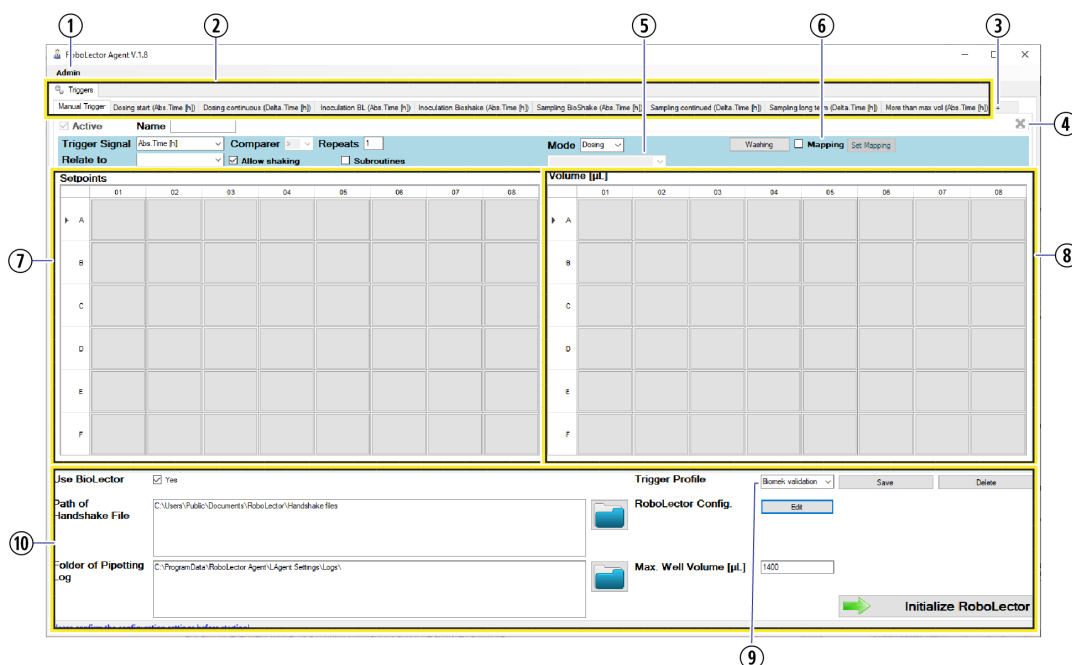
Triggers

Triggers are the main function of the RoboLector Agent software, and, therefore, provide the key feature of a BioLector XT microbioreactor / Biomek i-Series instrument integration. Through triggers, RoboLector Agent directs the Biomek i-Series instrument to transfer liquids into and out of a running BioLector XT microbioreactor based upon experiment time, pipetted volumes, measured signals (e.g., pH value, biomass, or DO), or a combination of these.

You define trigger conditions (setpoints) in the RoboLector Agent software. When a BioLector XT microbioreactor / Biomek i-Series instrument integration experiment runs, RoboLector Agent checks the online-monitored signals of the BioLector XT microbioreactor at the end of every measuring cycle. If the software detects that a triggering condition is met, the Biomek i-Series instrument executes the predefined pipetting steps. While the Biomek i-Series instrument executes liquid handling actions, the BioLector XT microbioreactor pauses measurement, temperature control, and microfluidic feeding (if your instrument is equipped with the microfluidic module). Gassing continues and shaking continues by default, but shaking can be set to stop during specific triggers. However, this is not recommended. Refer to [Figure 2.7](#) for an overview of the RoboLector Agent triggers functionality.

IMPORTANT If you would like to stop the shaking of the BioLector XT microtiter plate while liquid handling actions are executed, you may disable the shaking in the RoboLector Agent. However, this is not recommended. Please reach out to us if you would like to implement this.

Figure 2.7 RoboLector Agent Triggers



1. **Admin** menu, see [Figure 2.4](#).
2. **Trigger tabs**: Each trigger exists as a tab. The tab title shows the trigger's name and selected trigger signal. There can only be one **Manual Trigger**, though the quantity of standard triggers is not limited.
3. **Add trigger button**: Select + to add a new trigger and a new trigger tab opens. You cannot add another **Manual Trigger** tab.
4. **Delete trigger button**: Select X to delete the opened trigger tab. You cannot delete the **Manual Trigger** tab.
5. **Mode button**: Defines whether liquid is added to the cultivation well(s) of the BioLector XT MTP or whether liquid is drawn from the cultivation well(s) of the BioLector XT MTP. Each trigger must be set individually as a "Dosing" or "Sampling" liquid transfer action, respectively.
6. **Mapping**: Provides the ability to define pipetting procedures for more flexible sampling and dosing steps (than A01 to A01, for example). See [Mapping](#) for more information.

IMPORTANT It is recommended to always set a mapping for each and every trigger. This will ensure correct pipetting locations.

7. **Setpoints well map**: Well map represents the MTP in the BioLector XT microbioreactor incubation chamber, used to specify trigger setpoints. See [Trigger Setpoint Settings](#) for more information.
8. **Volume [µL] well map**: Well map represents the target microplate liquid is added to or drawn from, depending on the trigger Mode (Dosing or Sampling). This can be the MTP in the BioLector XT microbioreactor incubation chamber or a microplate sitting on the deck of the Biomek i-Series liquid handler. The well map is used to specify volumes the Biomek i-Series liquid handler dispenses/draws when it fulfills the triggered condition. See [Trigger Volume Settings](#) for more information.

9. **Trigger Profile:** Enter a name and select **Save** to save a trigger profile or select **Delete** to delete the open trigger profile. Select the drop-down to open a saved trigger profile.
10. Integration settings, see [BioLector XT Microbioreactor / Biomek i-Series Instrument Integration Settings](#).

There is always one **Manual Trigger**, which provides the ability to manually command processes during the experiment. The **Manual Trigger** can be reprogrammed, activated, deactivated, or reactivated at any time during the experiment so that you can directly influence running processes. You cannot delete or add another **Manual Trigger**. Furthermore, the **Manual Trigger** is the only trigger that can be modified during a running experiment.

When defining a new trigger, you choose between independent and dependent triggers. Once started, dependent and independent triggers can not be adjusted. **Independent** triggers are based upon online-monitored signals, such as experiment time, well volumes, pipetted volumes, or measured signals (e.g., pH value, biomass, or DO concentration). **Dependent** triggers are connected to an independent trigger, the independent trigger acting as the dependent trigger's activation trigger. A dependent trigger can also be linked to another dependent trigger, thereby allowing cascades of triggers. You always need at least one independent trigger to initiate the dependent trigger cascade.

Setting Triggers

To create a new trigger select the + button ([Figure 2.7](#) callout 3). You can also select an existing trigger to modify it. In order to set trigger conditions, the trigger must be marked as active by checking the ☒ **Active** checkbox.

A trigger requires two parameters to operate: a **Setpoint** trigger condition ([Figure 2.7](#) callout 7) and a **Volume [μL]** ([Figure 2.7](#) callout 8) that the liquid handler transfers when the setpoint condition is detected. It is highly recommended to always set a mapping, refer to [Mapping](#).

Trigger Setpoint Settings

A **Setpoint** condition defines the time or event which activates a trigger. If after a measurement cycle occurs the **Setpoint** condition is not detected, the liquid handler will not perform the defined action and the BioLector XT microbioreactor will continue to the next measurement phase without interruption. Refer to [Figure 2.8](#) for an overview of the functional components of **Setpoint** settings. Online-monitored signals (raw data and calibrated values), experiment time, well volume, and pipetted volume are available **Setpoint** settings.

Figure 2.8 Setpoint Settings

Triggers

1 Manual Trigger Activation Feeding (DO) Feeding trigger (DO) 4 Inoculation BL (Abs. Time [h]) 6 Inoculation Bioshake (Abs. Time [h]) 5

☒ Active Name Feeding trigger 4

Trigger Sig 2 DO Comparer > 6 Repeats -1 5

Relate to 3 Activation Feeding (DO) ☒ Allow shaking ☐ Subroutines 9

Setpoints 7

	01	02	03	04	05	06	07
A	0.25	0.25	0.25	0.25	0.25	0.25	0.25
B	0.25	0.25	0.25	0.25	0.25	0.25	0.25
C	0.25	0.25	0.25	0.25	0.25	0.25	0.25
D	0.25	0.25	0.25	0.25	0.25	0.25	0.25

Setpoint 8

Value

0.25

Set to NaN

Use this value Cancel

- Active checkbox:** Check this box to activate the trigger. If checked, you can edit the trigger settings. RoboLector will only use active triggers. If you do not want an experiment to use a trigger but do not want to delete it, you can uncheck the box.
- Trigger Signal:** The signal that activates the trigger. Select the drop-down to choose a signal for the trigger:
 - Abs. Time [h]:** absolute experiment time
 - Delta. Time [h]:** (only shown if you select a **Relate to** activation trigger) the time period between either:
 - The first triggering of the trigger's **Relate to** activation trigger and the first activation of the dependent trigger, or
 - Single repetitions of the dependent trigger
 - pH:** calibrated pH measurement
 - DO:** calibrated dissolved oxygen measurement
 - Biomass:** calibrated biomass measurement
 - Measurement Channel 1–Measurement Channel 6:** raw data from measurement channels 1–6
 - Act. Volume:** measured volume in the well
 - Pip. Volume:** measured volume in the well minus start volume
- Relate to:** Use to select another trigger as the activation trigger. Select the drop-down to choose from other available triggers (which are not in recursive relation of the current trigger). The trigger becomes dependent on the **Relate to** trigger and **Abs. Time [h]** changes to **Delta. Time [h]** (see callout 2). Note that there are no end trigger settings.
- Name:** Type a name for your trigger. Make sure to use unique names for each trigger in case you want to use as a **Relate to** trigger.

5. **Repeats:** Type a value to define how often a trigger activates. For each repetition, RoboLector Agent checks for the trigger setpoints in each BioLector XT microbioreactor measurement cycle after the trigger initially detected (but only one time each measurement cycle). When set to -1 the trigger activates continuously each measurement cycle for the duration of the experiment. For example:
 - When set to 1, the trigger executes for one measurement cycle
 - When set to 10, the trigger executes for 10 measurement cycles
 - When set to -1, the trigger executes continuously
 6. **Comparer:** Select the dropdown to choose whether the trigger activates when the measured value surpasses (>, greater than) or falls below (<, less than) the defined **Setpoint**.
 7. **Allow shaking:** Check this box for shaking in the incubation chamber to continue during liquid handling operations, shaking is enabled by default to avoid cultivation process interruption. Uncheck this box if you want shaking to stop when the trigger activates, for example when sampling the entire contents of the MTP wells or to reduce dead volume during pipetting. Note that when a trigger activates in which **Allow shaking** is unchecked, all remaining triggers executed in the same measurement cycle will execute without shaking. Minimum viable shaking speed should be used while accessing the biolector with the i-Series.
- IMPORTANT** If you would like to stop the shaking of the BioLector XT microtiter plate while liquid handling actions are executed, you may disable the shaking in the RoboLector Agent. However, this is not recommended. Please reach out to us if you would like to implement this.
8. **Setpoint window:** When you select a well on the well map, click and hold to select multiple wells, select a row, or select a column, the **Setpoint** window appears. This window is where you enter the setpoint value for the trigger to activate when detected. Type a value and select **Use this value** to set the selected well(s) **Setpoint**. Select **Set to NaN** to reset the value or select **Cancel** to discard changes.
 9. **Subroutines:** Check this box to enable subroutines used in the [Biomek Software and RoboLector Agent Interaction](#) settings.

Every trigger you create can act as the activation trigger for all other available triggers. When an activation trigger activates for the first time, RoboLector Agent checks the **Setpoint** conditions of the **Relate to** dependent trigger. If the **Setpoint** conditions are met, the dependent trigger executes. After the initial activation of the dependent trigger, RoboLector treats it as an independent trigger for all remaining measurement cycles. In this manner, triggers can be nested as complex as you desire provided no recursive (circular) logic is present.

Trigger Volume Settings

The **Volume [μL]** settings defines the liquid handling process the Biomek i-Series instrument performs when the **Setpoint** conditions are met. Refer to [Figure 2.9](#) for an overview of the functional components of **Volume [μL]** settings. See [Mapping](#) for more information.

Figure 2.9 Volume Settings

The screenshot shows the 'Volume Settings' window. At the top, there is a 'Mode' dropdown menu (1) set to 'Sampling'. To its right is a 'Washing' checkbox (2) and a 'Mapping' checkbox (3) which is checked. Next to 'Mapping' is a 'Set Mapping' button (4). Below these are input fields for 'Block [h]' (6) and 'Pause [h]' (5), both set to 0. A 'Subroutine' dropdown (7) is set to 'Subroutine01, Subroutine02'. The main area is a table titled 'Volume [μL]' with columns 01 through 07 and rows A through E. A 'Volume' dialog box (8) is open over the table, showing a 'Value [μL]' input field with the number 8 and buttons for 'Set to NaN', 'Use this value', and 'Cancel'.

	01	02	03	04	05	06	07
A	2	4	6	8	2	4	6
B	2	4			2	4	6
C	2	4			2	4	6
D	2	4	6	8	2	4	6
E	2	4	6	8	2	4	6

- Mode:** Select the dropdown to choose the process mode. Selecting **Dosing** commands the Biomek i-Series instrument to transfer liquid from a dosing MTP (any defined microplate on the deck) into the cultivation MTP (MTP inside the BioLector XT microbioreactor incubation chamber) and selecting **Sampling** commands the instrument to transfer liquid from the cultivation MTP into a sampling MTP. By default liquids transfers occur from the source well into the target well of the same name (i.e., from A01 of the dosing MTP into A01 of the cultivation MTP, or from A02 of the cultivation MTP into A02 of the sampling MTP). However, it is always highly recommended to set a mapping. For this, refer to [Mapping](#).
- Washing:** Select **Washing** to open the washing window to configure trigger-specific washing steps. Refer to [Washing](#).
- Mapping:** It is recommended to set a mapping for every trigger. When checked, the **Set Mapping** button is available and the liquid handling performs as defined. When unchecked the **Set Mapping** button is greyed out and unavailable and liquid transfers occur from the source well into the target well of the same name (i.e., from A01 of the dosing MTP into A01 of the cultivation MTP, or from A02 of the cultivation MTP into A02 of the sampling MTP). Refer to [Mapping](#) for more information.
- Set Mapping:** Select the button to open the **Mapping Settings** window for defining more complex liquid handling. Refer to [Mapping](#) for more information.
- Pause [h]:** Type a number to specify a pause time period, meaning a time period after the trigger activates in which RoboLector Agent starts to check the trigger setpoints again. Set to 0 if you do not want to specify a pause time.
- Block [h]:** Type a number to specify a block time period, meaning a time period during which the setpoint conditions will activate a trigger. This feature ensures the trigger does not activate too early. A sufficient block time should last for at least two measurement cycles or the trigger could activate by signal outlier peaks. Set to 0 if you do not want to specify a block time.

7. **Subroutines:** Select the dropdown to choose a Biomek method subroutine to activate. You can configure up to 10 subroutines in the Biomek method. A subroutine activates (if set to =True in the subroutine file) after all liquid handling steps of the corresponding trigger have executed and when the corresponding trigger is active in an MTP well of the BioLector XT microbioreactor measurement cycle. If the trigger activates in more than one well, the subroutine activates only one time each measurement cycle. Note that you should not create subroutines that are too complex to avoid the cultivation being paused for long durations while the Biomek i-Series instrument carries out the subroutine, for example avoiding dosing while the BioLector XT microbioreactor temperature control and microfluidic feeding are paused to avoid interruptions of the cultivation that are too long.
8. **Volume window:** When you select a well on the well map, click and hold to select multiple wells, select a row, or select a column, the **Volume** window appears. This window is where you enter the volume value for the liquid handler to sample or dose. Type a value and select **Use this value** to set the selected well(s) volume. Select **Set to NaN** to reset the value or select **Cancel** to discard changes. When a volume input is missing the volume and setpoint wells turn red.

Washing

When you select **Washing** in the trigger **Volume [μL]** settings, the **Washing Settings** window opens. Refer to 2.10. You can only choose between enabling or disabling **Use Global Washing Settings**. When you uncheck **Use Global Washing Settings**, you can choose between **Simple Cleaning** or **Extended Cleaning**. All of the settings for these three options are defined in the Biomek method. Refer to [Figure 2.17](#) for more details

Figure 2.10 Washing Settings Window

Washing Settings

☐ Use Global Washing Settings

Washing Procedure

Timeline diagram showing Transfers 1 through 6, Triggers 1 and 2, and BioLector Exp. Cycle N. A red dot indicates the Wash event.

☒ 1. after each transfer (dosing/sampling)

☐ 2. after the trigger event

Washing Options

☒ **Simple Cleaning**

Volume [μ L] 1000

☐ **Extended Cleaning**

Volume [μ L] 300

Incubation Time [s] 20

Wash Liquid Liquid 1

Mixing Settings

☐ Use Mixing

Volume [μ L] 200

No. of Pipetting Steps 1

OK **Cancel**

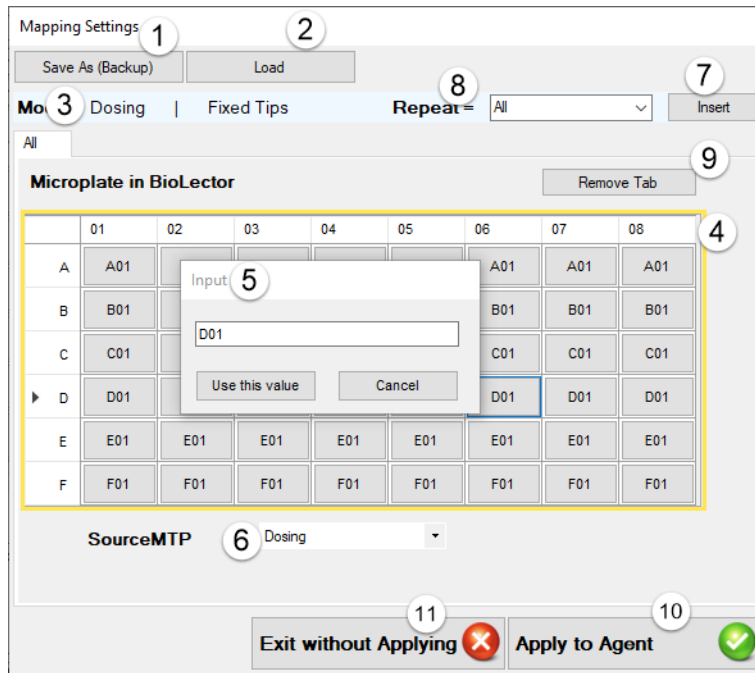
1. Use Global Washing Settings
2. **Simple Cleaning**: by default a flush with system liquid into one of the two active wash stations.
3. **Extended Cleaning**: a thorough cleaning of the tips (both inside and outside) with ethanol in the second active wash station.
4. Select **OK** to save changes and close the window.
5. Select **Cancel** to discard changes and close the window.

Mapping

IMPORTANT It is always recommended to set a mapping for every trigger. This will ensure the correct pipetting locations.

Checking the **Mapping** check box on the selected trigger enables mapping for the trigger and makes the **Set Mapping** button available. Select the **Set Mapping** button to open the **Mapping Settings** window for defining the liquid handling. Refer to [Figure 2.11](#).

Figure 2.11 Mapping Settings Window



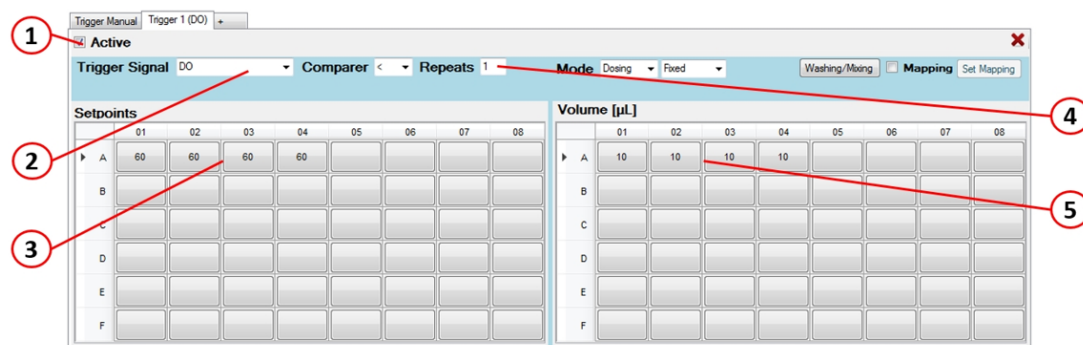
1. **Save As (Backup):** Select this button to save the selected mapping tab as a file. When you select this button, navigate to where you would like to save it and select **Save**.
2. **Load:** Select **Washing** Select this button to load a previously saved mapping file. When you select this button, navigate to the file and select **Open**. Note that loading a file will discard the settings of the selected mapping tab.
3. **Mode:** This area displays the selected pipetting mode as text information. When the trigger tab defines dosing, **Dosing** is shown and when it defines sampling, **Sampling** is displayed.
4. **Mapping Well Map:** The displayed well map represents the MTP in the microbioreactor. Select a well on the well map, click and hold to select multiple wells, select a row, or select a column to specify the wells you want to dose into or sample from and the **Input** window appears.
5. **Input** window: This window is where you enter the input value to specify the source MTP well(s) you want to dose from or sample into, according to the **Mode** selection. Type a value and select **Use this value** to set the selected well(s). Select **Cancel** to discard changes. When entering MTP wells use well numbering (A01, A02, etc.) by row. When entering rack cavities follow 1, 2, 3, etc. by row.
6. **SourceMTP / Destination MTP:** Select the dropdown to choose the source MTP from the liquid handler deck when dosing or the destination MTP on the liquid handler deck when sampling according to the **Mode** selection. When dosing, **Source MTP** is shown, when sampling, **Destination MTP** is shown. The availability of MTPs and other vessels like reaction tube racks depends on the setup of your layout and can differ based upon configuration.
7. **Insert:** Select the **Insert** button to add an empty pipetting scheme tab. The new tab's name is based upon the **Repeat** value.

8. **Repeat:** Select the dropdown to choose **Default** or **All** or type an integer to specify the repeat value for the inserted pipetting scheme tab. Adding a **Repeat** pipetting scheme allows you to specify more than one pipetting scheme per trigger event which corresponds to the repeat settings of the trigger (see [Figure 2.8](#) callout 5), meaning when a trigger's setpoint conditions are met the configured pipetting volume might be transferred once per configured tab in the mapping settings.
 - **All:** If selected, this tab executes each time the corresponding trigger's setpoint conditions are met and will be executed in repeat until all repeats are done.
 - **Integer:** If selected, this tab executes when the number of the **Repeat** matches the **Integer** selected, e.g., you configure the integer tab with **2** it will execute during the second repeat of the trigger.
 - **Default:** If selected, this tab will execute only if the trigger is activated in a **Repeat** during which no other tab will execute, meaning it only works in combination with **Integer** tabs. If an **All** tab is available the **Default** tab will never execute.
9. **Remove Tab:** Select the **Remove Tab** button to delete the selected repeat tab.
10. **Apply to Agent:** Select this button to save and apply the defined mapping pipetting scheme to the trigger. Note that it is only possible to save the mappings if you designated the correct **SourceMTP / Destination MTP** nomenclature for the selected MTP slot.
11. **Exit without Applying:** Select this button to close the window and discard changes.

Dosing Mapping Example

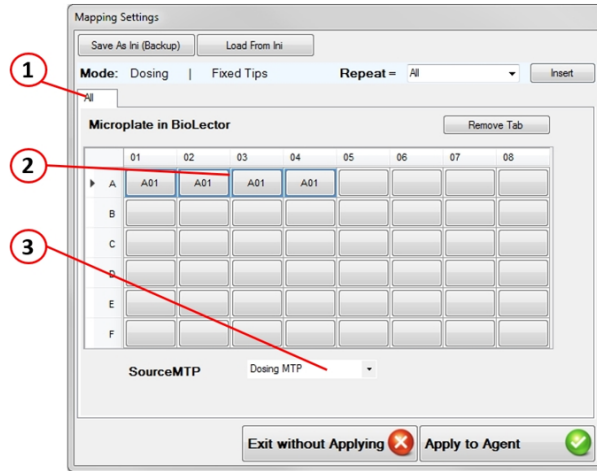
Refer to [Figure 2.12](#) for an example of a dosing trigger that will trigger when the DO concentration in the culture falls below 60%. After adding the new trigger, it must be activated (1) since inactive triggers cannot be modified and will not be executed. **DO** is selected as trigger signal (2) and the comparer is set to **<**. The **Setpoints** of the BioLector microbioreactor MTP wells A01, A02, A03, and A04 are set to **60%** (3) and the **Volume [μL]** that will be transferred in response to triggering the trigger to **10 μL** (5). The **Repeats** (4) are set to **1** so that the trigger will execute only once. **Mode Dosing** is selected.

Figure 2.12 Dosing Example - Setpoints and Volumes



Refer to [Figure 2.13](#) for the mapping settings of the dosing trigger. Pipetting mode is displayed as text information. The pipetting scheme applies to **All** repeats (1) (in this case only once as **Repeats** are set to 1 and trigger will execute only once). **SourceMTP** is set to **Dosing MTP** (3), and the source well of the SourceMTP is set to **A01** to dose into microbioreactor wells A01, A02, A03, and A04. Therefore, the liquid handler pipettes 10 μL of fluid from well A01 of the **Dosing MTP** into each of the four mapped wells of the microbioreactor MTP wells when the trigger executes.

Figure 2.13 Dosing Example - Mapping

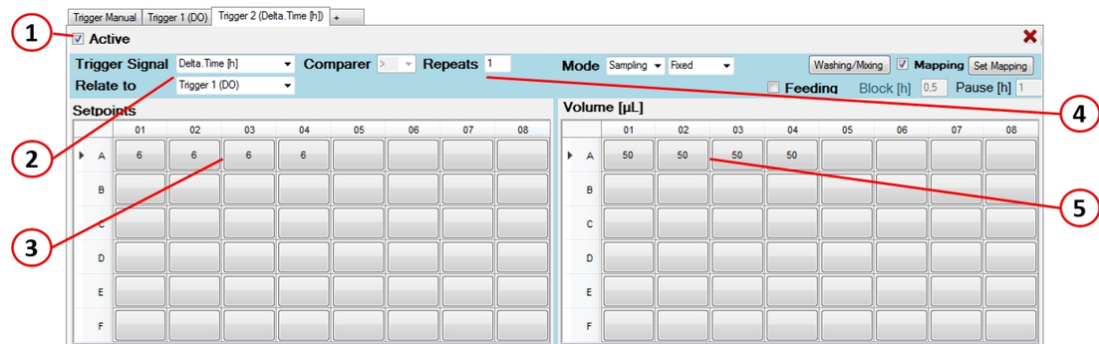


Sampling Mapping Example

Refer to [Figure 2.14](#) for an example of a dependent sampling trigger which will sample twice every six hours after the first DO dependent trigger executes. Note that it will execute every six hours even though only one repeat is selected in the general trigger settings.

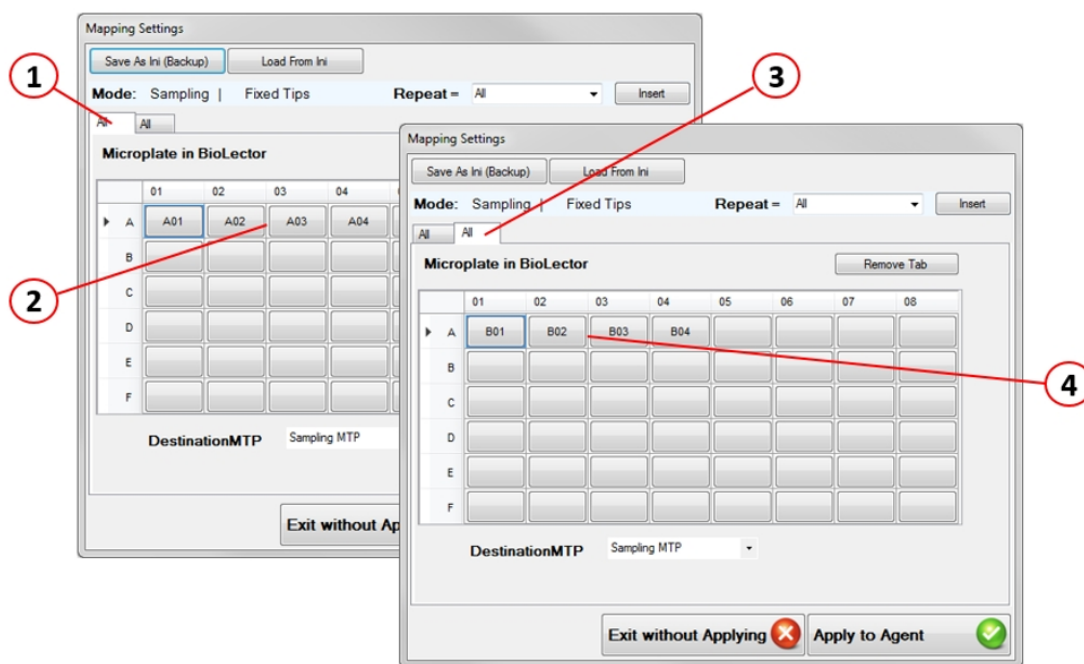
After adding the new trigger, it must be activated (1) since inactive triggers cannot be modified and will not be executed. **Delta Time [h]** is selected as **Trigger Signal** and, because it is a dependent trigger, **Relates to** is set to **Trigger 1 (DO)** (2). The **Setpoints** of the BioLector microbioreactor MTP wells A01, A02, A03, and A04 are set to 6 (3) to designate 6 hours after the first execution of the related trigger. The **Volume [μL]** that will be transferred in response to triggering the trigger is set to 50 μL (5). The **Repeats** (4) are set to 1 so that the trigger will execute only once, but the mapping defines additional repeats functionality. The **Mode** is set to **Sampling**

Figure 2.14 Sampling Example - Setpoints and Volumes



Refer to [Figure 2.15](#) for the mapping settings of the sampling trigger. Pipetting mode is displayed as text information. In this example, the goal is to pipette two samples out of the BioLector XT microbioreactor MTP wells, sampling 50 μ L into two different destination wells. Therefore, there are two **All** repeat tabs (1) and (3). **Destination MTP** is set to **Sampling MTP**. The first tab specifies the destination wells of the **Sampling MTP** as A01, A02, A03, and A04 (2). The second tab specifies the destination wells of the **Sampling MTP** as B01, B02, B03, and B04 (4). Because both sampling steps are described in the same mapping settings, the liquid handler pipettes 50 μ L of fluid from well A01-A04 of the microbioreactor MTP into rows A01-A4 followed by rows B01-B04 of the **Sampling MTP** within the same cycle every six hours before another trigger executes or the microbioreactor resumes cultivation. Note that different **Destination MTP** could have been selected for each repeat.

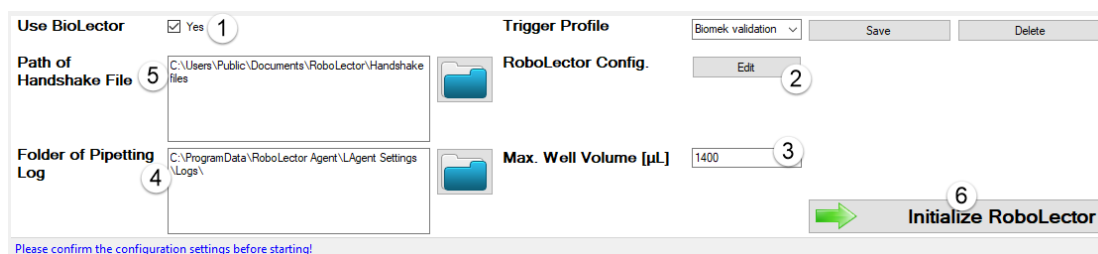
Figure 2.15 Sampling Example - Mapping



BioLector XT Microbioreactor / Biomek i-Series Instrument Integration Settings

The integration area of RoboLector Agent provide general settings for and initialization of a BioLector XT microbioreactor / Biomek i-Series instrument integration experiment. Refer to [Figure 2.16](#).

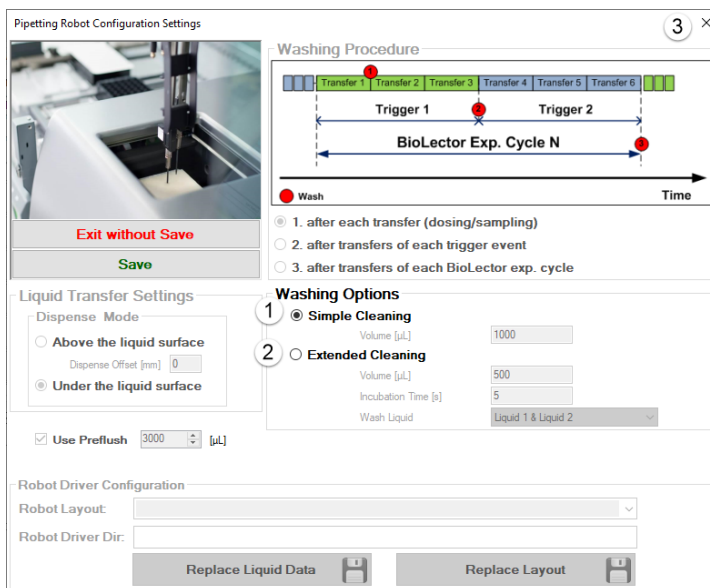
Figure 2.16 Integration Settings



1. **Use BioLector:** Be sure to select this checkbox, it enables connection to a BioLector XT microbioreactor. If it is unchecked RoboLector Agent will not connect to the microbioreactor.
2. **RoboLector Config.:** Select this button to open the global washing settings window. Refer to [Figure 2.17](#).
3. **Max. Well Volume [μL]:** Enter the maximum filling volume of a well. The maximum volume depends on the experiment parameters, refer to the **BioLector XT Microbioreactor System Instructions for Use** for more information. The liquid handler will stop dosing if the cultivation reaches the maximum filling volume to prevent culture from overflowing and damaging the MTP cover foil or incubation chamber.
4. **Folder of Pipetting Log:** This field specifies the location where pipetting logs are stored. For each run of an integration experiment, a pipetting log file populates in the specified folder. The default location is C:\ProgramData\RoboLector Agent\Agent Settings\Logs\.
5. **Path of Handshake File:** This field specifies the location where the handshake files are stored. Refer to [Biomek Software and RoboLector Agent Interaction](#) for more information about handshake files. The path here must match the directory configured in the Biomek method and should always be set to C:\Users\Public\Documents\RoboLector\Handshake files\.
6. **Initialize RoboLector:** Select this button to initialize BioLector XT microbioreactor / Biomek i-Series instrument integration experiment. Refer to [CHAPTER 3, Initializing the Experiment](#) for more details about running experiments.

The **Use Global Washing Settings** window is similar to the **Washing Settings** window. Refer to [Washing](#) and [Figure 2.17](#).

Figure 2.17 Global Washing Settings

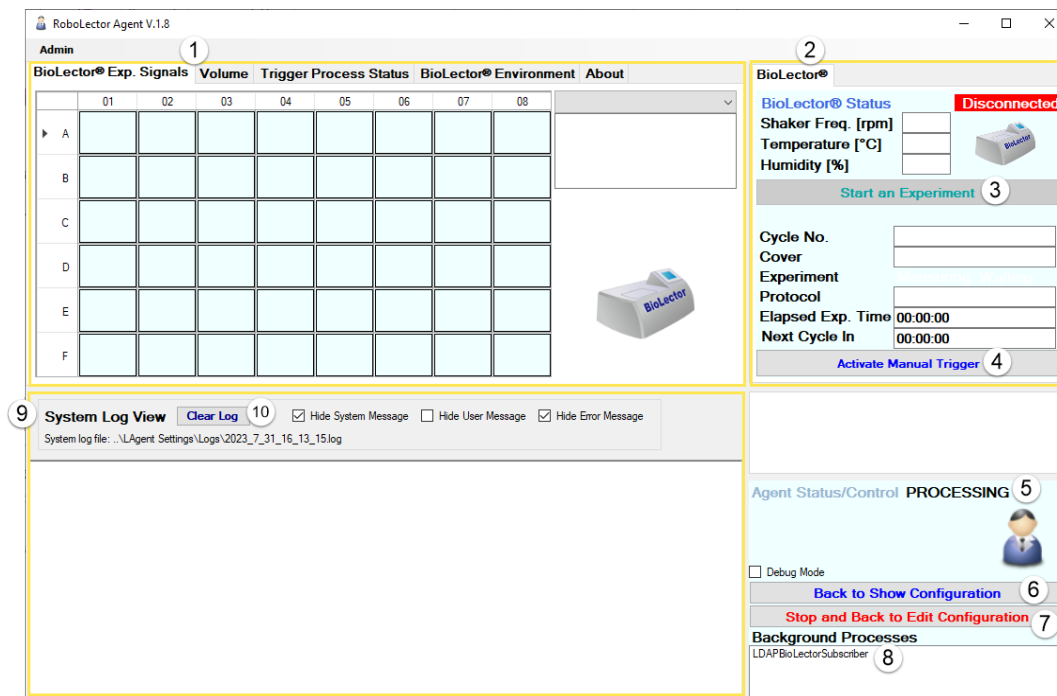


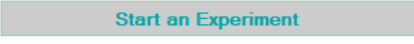
1. **Simple Cleaning:** by default a flush with system liquid into one of the two active wash stations.
2. **Extended Cleaning:** a thorough cleaning of the tips (both inside and outside) with ethanol in the second active wash station.
3. Select **X** to close the window.

RoboLector Agent Integration Control Window

When you are ready to proceed with an experiment and select  **Initialize RoboLector**, the RoboLector Agent software displays the integration control window. Refer to [Figure 2.18](#).

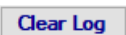
Figure 2.18 Integration Control Window



- Monitoring Area:** This area displays BioLector XT microbioreactor signal values and online-measurement details about the ongoing experiment. It contains several tabs: **BioLector Exp. Signals**, **Volumes**, **Trigger Process Status**, **BioLector Environment**, and **About**. Depending on which tab you select, it shows in the main area a well map or other details. Refer to [CHAPTER 3, Running the Experiment](#) for more details about monitoring experiment conditions with the monitoring area.
- BioLector XT Microbioreactor Status:** This area displays the current status of the connection with the microbioreactor. When an experiment is running, the area displays real-time shaking frequency [rpm], temperature [°C], and humidity [%]. The area also displays details about the experiment, including cycle number, experiment name, protocol name, elapsed time, and the time until the next cycle.
- Select  to start an experiment. Refer to [CHAPTER 3, Initializing the Experiment](#).
- Select  to activate the manual trigger. When activated and the trigger conditions are met, the manual trigger executes after the running measurement phase completes. The next measurement cycle does not begin until all triggers execute, so choose a cycle time longer than the measurement cycle. The required measurement time depends on the number of wells measured and shaking frequency. Measuring one parameter in 48 wells takes around two to three minutes. When you want to stop the manual trigger, select .
- Agent Status/Control:** Displays the status of the RoboLector Agent software.

6. Select  to return to the trigger configuration window (Figure 2.7) without interrupting a running experiment.
7. Select  to stop the running processes, disconnect the liquid handler, and edit a trigger or media preparation setting. Selecting this button is also how you end an experiment.

NOTE If you stop the process the experiment will stop and cannot be restarted from the current process, it will start at the beginning again.

8. **Background Processes:** Displays ongoing background processes.
9. **System Log View:** Displays the system log messages. By default it displays only user messages, but you can enable or disable display of the messages by selecting or deselecting the check boxes.
10. Select  to clear the **System Log View**.

Biomek Software and RoboLector Agent Interaction

Biomek Software is used to control the Biomek line of Laboratory Automation Workstations. Biomek Software consists of a method editor and other tools and editors for configuring the system to perform desired operations.

Information about the liquid-handling system is stored in two separate files. The instrument file includes information specific to an instrument, including additional components installed, deck layout, and framing information. A project file stores information about labware, tip, and liquid types, and pipetting techniques and templates.

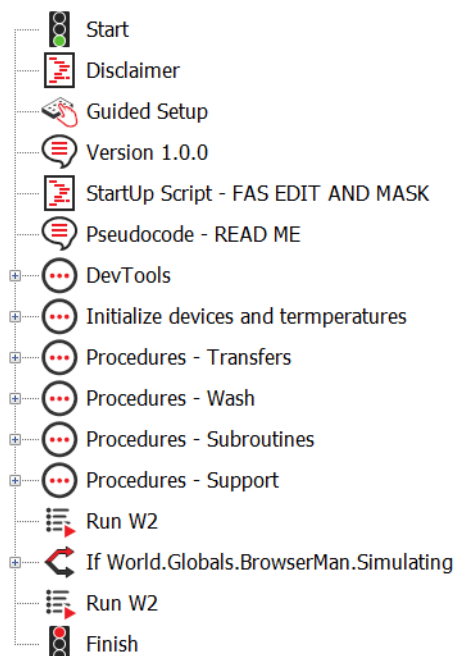
Effectively using Biomek Software includes using the method editor for method building and the various tools and editors to appropriately configure the instrument and project files for the desired task or application. Refer to the *Biomek i-Series Software Reference Manual* for detailed information about Biomek software and configuring methods.

When the field service engineer installs and configures the BioLector XT microbioreactor / Biomek i-Series instrument integration, they complete the following four actions:

- Physically configure the deck
- Install and configure the SILAS module
- Configure the deck in Biomek software
- Frame the deck in Biomek software

Refer to [Figure 2.19](#) for a view of the Biomek method.

Figure 2.19 Example Biomek Method



When you start an integration experiment, you must start the programs and processes in a specific order. Refer to [CHAPTER 3, Initializing the Experiment](#) for detailed instructions.

In order to operate the integration, you first start the experiment, then when prompted to start the robot script you start the provided Biomek method, see [Figure 2.19](#).

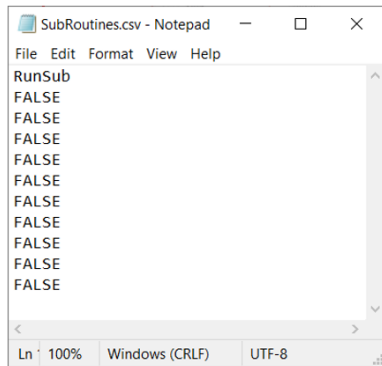
IMPORTANT The Biomek method illustrated in [Figure 2.19](#) is configured by the Beckman Coulter Field Applications Scientist (FAS) during installation and is not user-configurable. [Contact us](#) if you would like changes.

The Biomek method waits for commands in the form of handshake files to perform the requested operation. When it detects the handshake file, it carries out the actions requested in FixedTips.csv ([Figure 2.20](#)). If activated, it also carries out any subroutines present in SubRoutines.csv ([Figure 2.21](#)). The handshake directory path must match the directory configured in the Biomek method and should always be set to C:\Users\Public\Documents\RoboLector\Handshake files\.

Figure 2.20 Handshake File - FixedTips.csv

```

FixedTips.csv - Notepad
File Edit Format View Help
SrcPos,SrcWell,DstPos,DstWell,Vol,WashOp
BioLector,"=Array(1,1,1,1,1,1,1,9)",BioLector,"=Array(2,3,4,5,6,7,8,10)", "=Array(25,25,25,25,25,25,25,25)",W0
BioLector,"=Array(9,9,9,9,9,9,17,17)",BioLector,"=Array(11,12,13,14,15,16,18,19)", "=Array(25,25,25,25,25,25,25,25)",W0
BioLector,"=Array(17,17,17,17,17,25,25,25)",BioLector,"=Array(20,21,22,23,24,26,27,28)", "=Array(25,25,25,25,25,25,25,25)",W0
BioLector,"=Array(25,25,25,25,33,33,33,33)",BioLector,"=Array(29,30,31,32,34,35,36,37)", "=Array(25,25,25,25,25,25,25,25)",W0
BioLector,"=Array(33,33,33,41,41,41,41,41)",BioLector,"=Array(38,39,40,42,43,44,45,46)", "=Array(25,25,25,25,25,25,25,25)",W0
BioLector,"=Array(41,41)",BioLector,"=Array(47,48)", "=Array(25,25)",W0
  
```

Figure 2.21 Handshake File - SubRoutines.csv

When the action is completed, the file is timestamped and archived in another directory in the handshake file location and deleted from the main directory. Deletion of the handshake files commands the RoboLector Agent to continue with the experiment wherein the BioLector XT microbioreactor continues with the next measurement cycle. The Biomek software awaits the next batch of handshake files.

Running an Integration Experiment

Chapter Overview

This chapter contains the following topics:

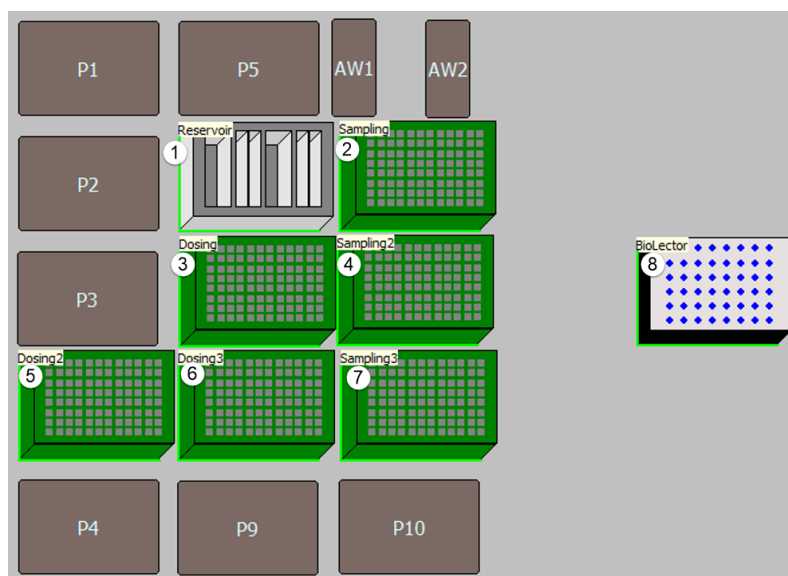
- [Setting Up the Experiment](#)
- [Initializing the Experiment](#)
- [Running the Experiment](#)

Setting Up the Experiment

Each BioLector XT microbioreactor / Biomek i-Series instrument integration is delivered with predefined deck layouts. [Figure 3.1](#) illustrates an example deck layout. MTPs must be named accordingly in the software.

IMPORTANT After installation and configuration, do not change the positions of the components nor the given vessel configuration, as configuration in the software is crucial to operation. [Contact us](#) if you would like to change the deck layout.

Figure 3.1 Example Deck Layout



- | | |
|--------------------|--------------------|
| 1. Reservoir Plate | 5. Dosing2 Plate |
| 2. Sampling Plate | 6. Dosing3 Plate |
| 3. Dosing Plate | 7. Sampling3 Plate |
| 4. Sampling2 Plate | 8. BioLector MTP |

The standard deck layout is typically equipped with the dosing and sampling items shown in [Table 3.1](#).

Table 3.1 Dosing and Sampling MTPs

Quantity	Item	Named in Biomek Software
1	BioLector XT Microbioreactor Microtiter Plate	BioLector
3	Dosing Microtiter Plate	Dosing Dosing2 Dosing3
3	Sampling Microtiter Plate	Sampling Sampling2 Sampling3

MTP names should not be changed in the Biomek method, though they can be placed anywhere on the deck provided the deck layout in Biomek software aligns with what is present physically. The use of more than one dosing or sampling MTP requires mapping functionality in the RoboLector Agent, refer to [CHAPTER 2, Mapping](#) for more information.



Risk of method failure or software crash. If RoboLector Agent tries to pipette to a microtiter plate that is not available on the Biomek software deck it can cause the Biomek method to fail. Make sure to select only the MTPs in RoboLector Agent which are present in the Biomek software and physically on the deck.

Setting up an Experiment

- 1 Create a BioLector XT microbioreactor protocol in BioLector software, refer to Chapter 5 of the *BioLector XT Microbioreactor System Instructions for Use*.
- 2 Define the liquid handling triggers in RoboLector Agent. Refer to [CHAPTER 2, Setting Triggers](#) for details on configuring the RoboLector Agent.
- 3 Set up the BioLector XT microbioreactor and MTP for a robotic experiment, refer to Chapter 5 of the *BioLector XT Microbioreactor System Instructions for Use*.

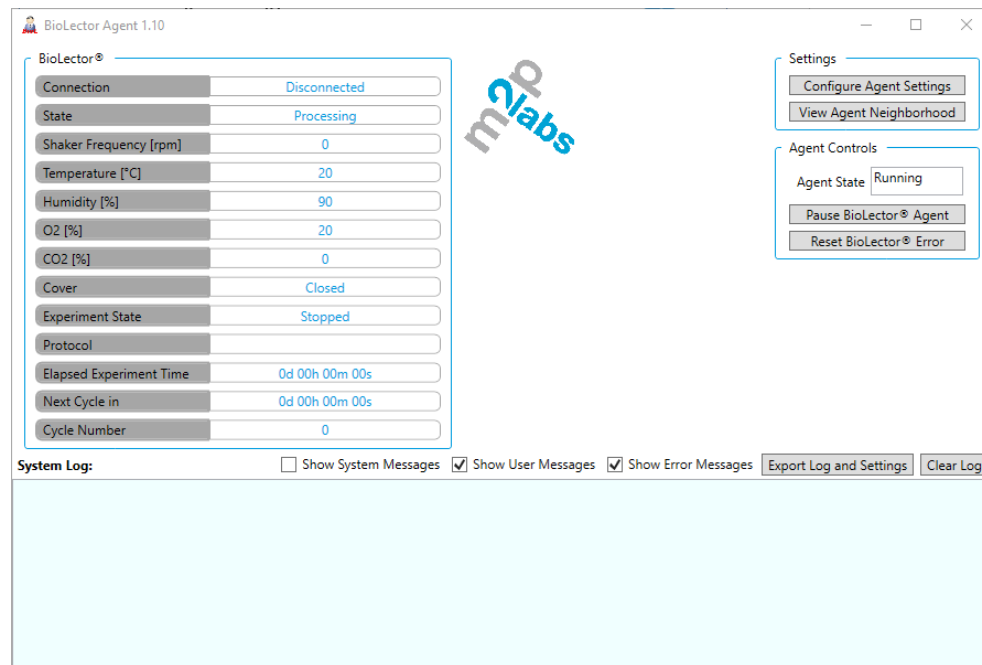
Initializing the Experiment



CAUTION

Risk of incorrect results, process disruption, or software crash. Starting the software packages in an incorrect order can cause incorrect experiment configuration and software settings, which can cause experiment actions and readings to perform incorrectly. Only start the software and initialize the experiment as described in the procedure.

- 1 Start the BioLector Agent software and allow to run in the background.

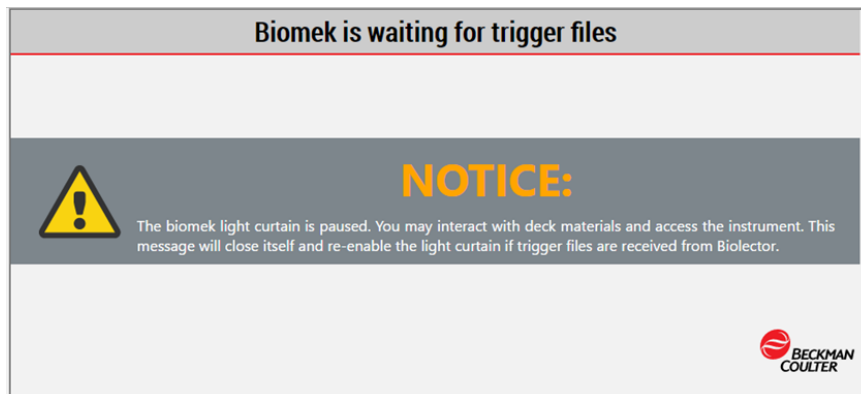


- 2 Start the RoboLector Agent software.
- 3 Start the Biomek software. Open and start the **Biomek_XT_Imports** method.

NOTE If selected, confirm labware setup.

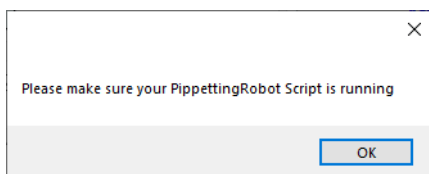
- 4 Allow the Biomek i-Series instrument to perform its startup routine and wash cycle.

- 5 Make sure it is in mode **Wait for Trigger file**. When it is ready to accept handshake files, the waiting screen appears:

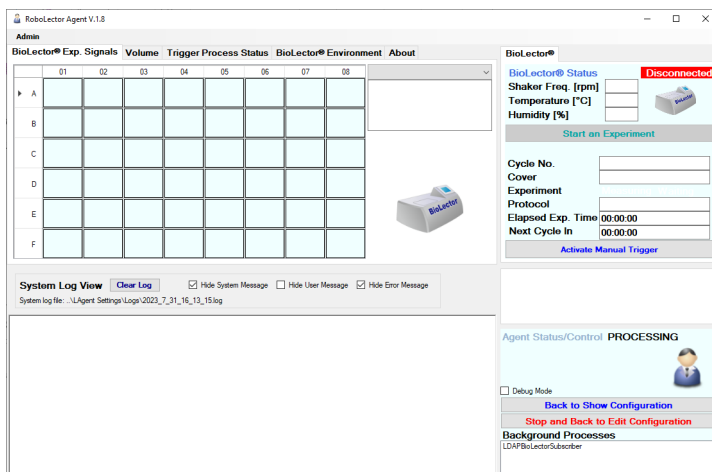


- 6 When you have confirmed the trigger settings, experiment configurations, and that the other programs are operating, select  **Initialize RoboLector**.

- 7 Confirm in the dialogue that the PipettingRobot Script (Biomek method) is running by selecting **OK**.



The RoboLector Agent integration control window appears. Refer to [CHAPTER 2, RoboLector Agent Integration Control Window](#) for more details.



- 8 Select **Start an Experiment**. The **Select a BioLector protocol** window appears:

	1	2	3	4	5	6	7	8
A	800	800	800	800	800	800	800	800
B	800	800	800	800	800	800	800	800
C	800	800	800	800	800	800	800	800
D	800	800	800	800	800	800	800	800
E	800	800	800	800	800	800	800	800
F	800	800	800	800	800	800	800	800

- 9 Select the dropdown and select the protocol loaded on the BioLector XT microbioreactor you would like to run.
- 10 Enter the starting volumes of the MTP wells. For more details about creating protocols and preparing MTPs, refer to Chapter 5 of the *BioLector XT Microbioreactor System Instructions for Use*.
- 11 Select **OK**. The BioLector XT microbioreactor protocol begins to run and the BioLector XT microbioreactor / Biomek i-Series instrument integration experiment begins. Proceed to [Running the Experiment](#).

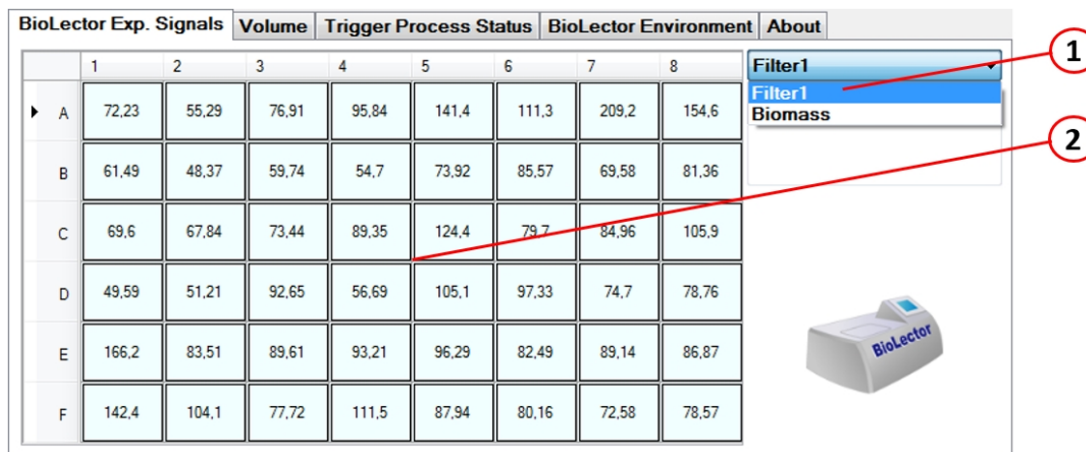
Running the Experiment

Running a BioLector XT microbioreactor / Biomek i-Series instrument integration experiment involves monitoring the actions and cultivation parameters. The RoboLector Agent software Integration Control Window ([Figure 2.18](#)) offers tabs which displays details during the experiment. Refer to the descriptions below:

- **BioLector Exp. Signals** tab: displays current filter values for each well by available filters by selected filter. See [Figure 3.2](#)
- **Volume** tab: displays current volume measurements for each well by selected volume measurements. See [Figure 3.3](#).

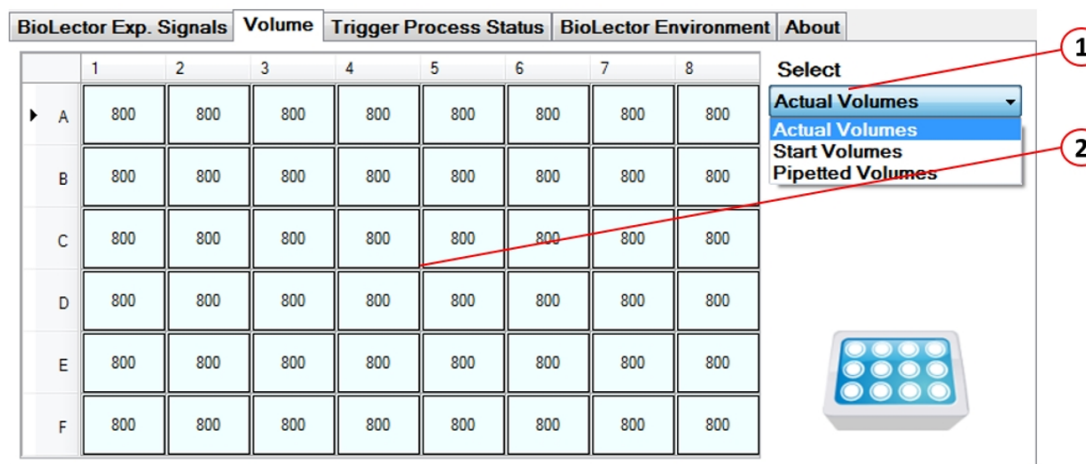
- **Trigger Process Status** tab: displays an overview of the trigger states for each well by a selected trigger. See [Figure 3.4](#).
- **BioLector Environment** tab: only refer to the BioLector software for details about the BioLector XT microbioreactor environmental conditions during the cultivation.

Figure 3.2 BioLector Experiment Signals



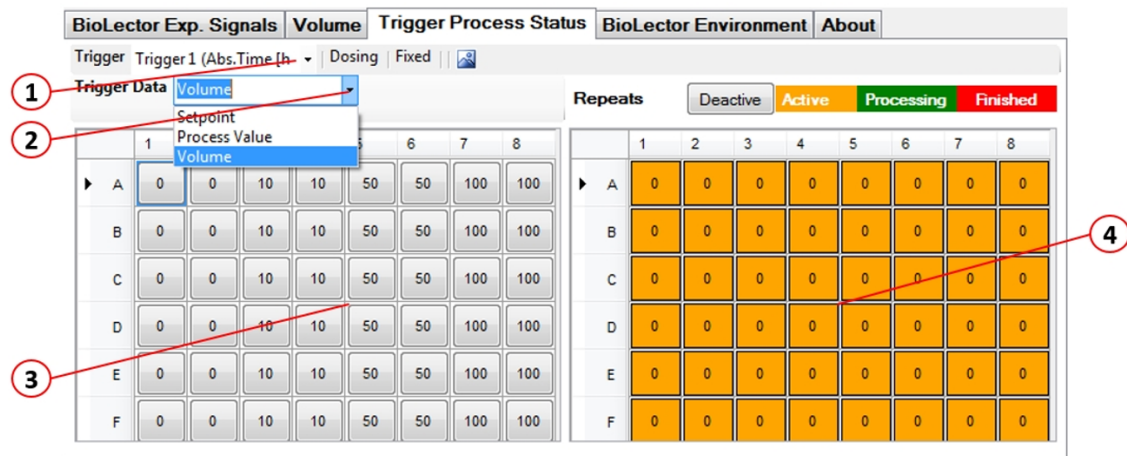
1. Dropdown to select which filter readings you would like the well map to display.
2. Well map displaying the most recently acquired measurement. The value represents the measurement of the well in question by the selected filter (1).

Figure 3.3 Current Volume



1. Dropdown to select which volume reading you would like the well map to display:
 - **Actual Volumes:** current measured well volume
 - **Start Volumes:** specified starting volume
 - **Pipetted Volumes:** actual volume minus start volume
2. Well map displaying the most recently acquired measurement. The value represents the measurement of the well in question by the selected volume (1). Positive values indicate addition of liquid while negative values indicate removal of liquid.

Figure 3.4 Trigger Process Status



1. **Trigger:** Dropdown to select which trigger you would like the well map to display from the available trigger tabs you created for the experiment. The mode (dosing/sampling) and tip type (fixed/disposable) are shown as text information.
2. **Trigger Data:** Dropdown to select which data are displayed in the trigger well map (3). Available options display specified data in the wellmap:
 - **Setpoint:** trigger setpoint for the well in question
 - **Process Value:** actual process value for the well in question
 - **Volume:** current volume of the well in question
3. Well map displaying the most recently acquired measurement. The value represents the measurement of the well in question by the selected **Trigger Data** (2).
4. Well map displaying the trigger status of the well in question by the selected **Trigger** (1). The color of the well corresponds to the status of the trigger, described in the key above the wellmap:
 - **Deactive** - select to terminate the trigger so that no further repeats are triggered. A trigger cannot be reactivated once it is terminated.
 - **Active** - trigger currently active
 - **Processing** - trigger currently processing
 - **Finished** - trigger has finished

Update a Manual Trigger

- 1 Select [Back to Show Configuration](#). The RoboLector Agent Triggers screen (Figure 2.7) appears.
- 2 On the **Trigger Manual** tab, make updates to the trigger as desired. Refer to [CHAPTER 2, Setting Triggers](#) for more details.

NOTE When the settings on the **Setpoints** wellmap do not match the **Volume [μL]** wellmap the wells turn red on both sides.

- 3 When you are satisfied with the settings on the **Trigger Manual** tab, select

Go to RoboLector View  .

Activate/Deactivate a Manual Trigger

- 1 Select **Activate Manual Trigger** to activate the manual trigger. When activated and the trigger conditions are met, the manual trigger executes after the running measurement phase completes.

The next measurement cycle does not begin until all triggers execute, so choose a cycle time longer than the measurement cycle. The required measurement time depends on the number of wells measured and shaking frequency. Measuring one parameter in 48 wells takes around two to three minutes.

- 2 When you want to stop the manual trigger, select **Deactivate Manual Trigger** .

Stopping an Experiment

- 1 Select **Stop and Back to Edit Configuration** .
- 2 Stop the BioLector XT microbioreactor protocol complete the experiment, refer to Chapter 5 of the *BioLector XT Microbioreactor System Instructions for Use*.
- 3 Stop the Biomek method from Biomek software.

APPENDIX A

Instrument Installation

Overview

The BioLector XT microbioreactor / Biomek i-Series automated workstation integration is installed by your Beckman Coulter Service Representative. Do not open the box or crate. Wait for a qualified Beckman Coulter Service Representative.

This chapter contains information on:

- [System Specifications](#)
- [Installation Environment](#)

System Specifications

For more information on System Specifications, refer to the manuals for the instrument in question. See [Related User Manuals](#).

Installation Environment

Table A.1 System Dimensions

Description	Value
Width	206 cm (81.1 in.)
Depth	81 cm (31.9 in.)
Height	147 cm (57.9 in.) (max height with door open)

The system should be installed on a table with the correct dimensions. See the two options below:

- **Option 1:** Biomek i-Series instrument deck (PN C02612) with 1x1m table for Biomek i-Series instrument (PN C02617)
- **Option 2:** Custom deck with minimum requirements:
 - Dimensions: Width 220 cm (86.6 in.) x Depth 85 cm (33.5 in.)
 - Load capacity: 300 kg (661.4 lbs)

NOTE The system dimensions apply for an integration of a BioLector XT microbioreactor without a microfluidics module (VCU). In addition, table material must be able to be tapped for M6 threads (**phenolic surfaces recommended**).

For more information on Installation Environment, refer to the manuals for the instrument in question. See [Related User Manuals](#)

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Related Documents

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Instructions for Use**

PN C75078

**BioLector XT Microbioreactor System Safety
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