# BioCel System

## User Guide

Original Instructions

Agilent Technologies

# Notices



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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.

# Contents

**Preface** . . . . . v
About this guide . . . . . vi
Accessing Automation Solutions user guides . . . . . viii

**1. BioCel System overview** . . . . . 1
BioCel System description . . . . . 2
Hardware overview . . . . . 5
Device integration options . . . . . 20
Software overview . . . . . 21

**2. Setting up the BioCel System** . . . . . 23
Setup Workflow . . . . . 24
Adjusting the keyboard shelf and computer monitor . . . . . 26
Starting up and shutting down the BioCel System . . . . . 28
Adding and deleting devices in the software . . . . . 32

**3. Preparing for a protocol run** . . . . . 37
Workflow for preparing a protocol run . . . . . 38
Performing dry runs . . . . . 39
Reviewing protocols and planning for the run . . . . . 40
Adding or removing devices mounted on docking tables . . . . . 41
Checking for system readiness . . . . . 50
Replacing the waste bin . . . . . 52
Loading labware in the system . . . . . 54

**4. Maintenance and troubleshooting** . . . . . 55
Routine maintenance . . . . . 56
Recovering from a power outage . . . . . 60
Recovering from servo errors . . . . . 61
Troubleshooting plate-sensor errors . . . . . 63
Troubleshooting hardware problems . . . . . 64
Reporting problems . . . . . 69

**A. Additional BioCel System Devices** . . . . . 71
BioCel System additional devices overview . . . . . 72
Auxiliary barcode reader . . . . . 74
Lid Hotel Station . . . . . 81
Linear Translator . . . . . 88

Orbital Shaking Station . . . . . 101
Phantom Robot . . . . . 107
Plate Hotel . . . . . 111
Plate Hub Carousel. . . . . 118
Platepad . . . . . 131
Vacuum Delid Station . . . . . 134
Waste bin . . . . . 138
Weigh Pad . . . . . 141

**B. Block diagrams** . . . . . 147
Power system . . . . . 148
Air system . . . . . 152
Vacuum system . . . . . 154

**Index** . . . . . 157

# Preface

This preface contains the following topics:


- "About this guide" on page vi
- "Accessing Automation Solutions user guides" on page viii

# About this guide

## Who should read this guide

This user guide is for people with the following job roles:

| Job role | Responsibilities |
|---|---|
| Installer | Unpacks, installs, and tests the BioCel System before it is used. |
| Integrator | Configures hardware and writes software. |
| Lab manager, administrator, or technician | • Manages the automation system that contains the BioCel System<br>• Develops the applications that are run on the system<br>• Develops training materials and standard operating procedures for operators |
| Operator | Performs the daily production work on the BioCel System and solves routine problems. |

## What this guide covers

This guide describes the BioCel System, the operation of the hardware components, and the use of the diagnostics software.

This guide does not provide instructions for the following:

- VWorks software or third-party software
- Agilent Technologies devices, such as the Bravo Automated Liquid Handling Platform, PlateLoc Thermal Microplate Sealer, Microplate Seal Piercer, Microplate Labeler, Vertical Pipetting Station, Microplate Centrifuge, and Labware Stacker.
- Third-party devices

For more information about these topics, see the relevant user guides for these products.

## What's new in this guide

| Feature and description | See |
|---|---|
| Device file – You can now disable up to 10 devices within a single device file | "Disabling a device in a device file" on page 35 |

## Related guides

The *BioCel System User Guide* should be used in conjunction with the following user documents:

- *BioCel System Safety Guide*. Describes the potential safety hazards on the BioCel System and how to avoid them. Explains the emergency-stop procedure and the recovery methods.
- *Automation Control Unit User Guide*. Explains how to install, set up, and operate the Automation Control Unit.
- *BioCel Environmental-Control System User Guide*. Describes the Environmental-Control System in the BioCel System, the operation of the relevant hardware components, and the use of the iSeries Diagnostic software.
- *BenchBot Robot User Guide*. Explains how to set up and operate the BenchBot Robot.
- *Direct Drive Robot User Guide*. Explains how to set up and operate the Direct Drive Robot.
- *Lab automation software user documentation*. Explains how to define labware, add devices, and create protocols.
- *Automation Solutions device user guides*. Explain how to set up and use the Automation Solutions device.
- *Third-party device user documents*. Explain how to set up and use third-party devices.

For site preparation and installation requirements, see the site-specific documentation provided by Automation Solutions. The site-specific documents address different system configurations and requirements. If you have questions, contact Automation Solutions Technical Support.

The 3-Axis Robot, Peak KiNEDx Robot, BioCel I/O Interface, Microplate Conveyor, Microplate Shuttle, and Rotator are no longer supplied with the BioCel System. However, if you have these devices in your existing system, you can find information about the devices in the *BioCel System User Guide*, Revision 01, August 2010.

## Related information

| For information about... | See... |
|---|---|
| Accessing related user guides | "Accessing Automation Solutions user guides" on page viii |
| Reporting problems | "Reporting problems" on page 69 |

# Accessing Automation Solutions user guides

## About this topic

This topic describes the different formats of Automation Solutions user information and explains how to access the user information.

## Where to find user information

The Automation Solutions user information is available in the following locations:

- *Knowledge base*. The help system that contains information about all of the Automation Solutions products is available from the Help menu within the VWorks software.
- *PDF files*. The PDF files of the user guides are installed with the VWorks software and are on the software CD that is supplied with the product. A PDF viewer is required to open a user guide in PDF format. You can download a free PDF viewer from the internet. For information about using PDF documents, see the user documentation for the PDF viewer.
- *Agilent Technologies website*. You can search the online knowledge base or download the latest version of any PDF file from the Agilent Technologies website at www.agilent.com/lifesciences/automation.

## Accessing safety information

Safety information for the BioCel System is provided in the *BioCel System Safety Guide*.

Safety information for the Agilent Technologies devices appears in the corresponding device safety guide or user guide.

You can also search the knowledge base or the PDF files for safety information.

## Using the knowledge base

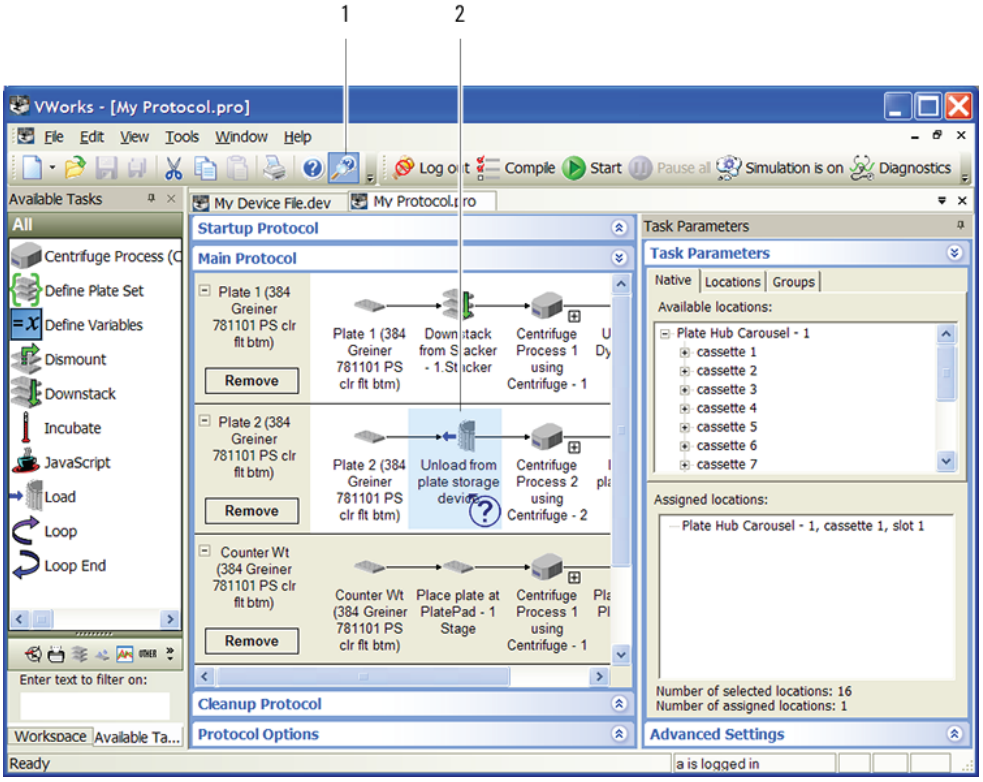
Knowledge base topics are displayed using web browser software such as Microsoft Internet Explorer and Mozilla Firefox.

*Note:* If you want to use Internet Explorer to display the topics, you might have to allow local files to run active content (scripts and ActiveX controls). To do this, in Internet Explorer, open the **Internet Options** dialog box. Click the **Advanced** tab, locate the **Security** section, and select **Allow active content to run in files on my computer.**

***To open the knowledge base, do one of the following:***

- From within VWorks software, select **Help** > **Knowledge Base** or press F1.
- From the Windows desktop, select **Start** > **All Programs > Agilent Technologies > VWorks** > **User Guides** > **Knowledge Base.**

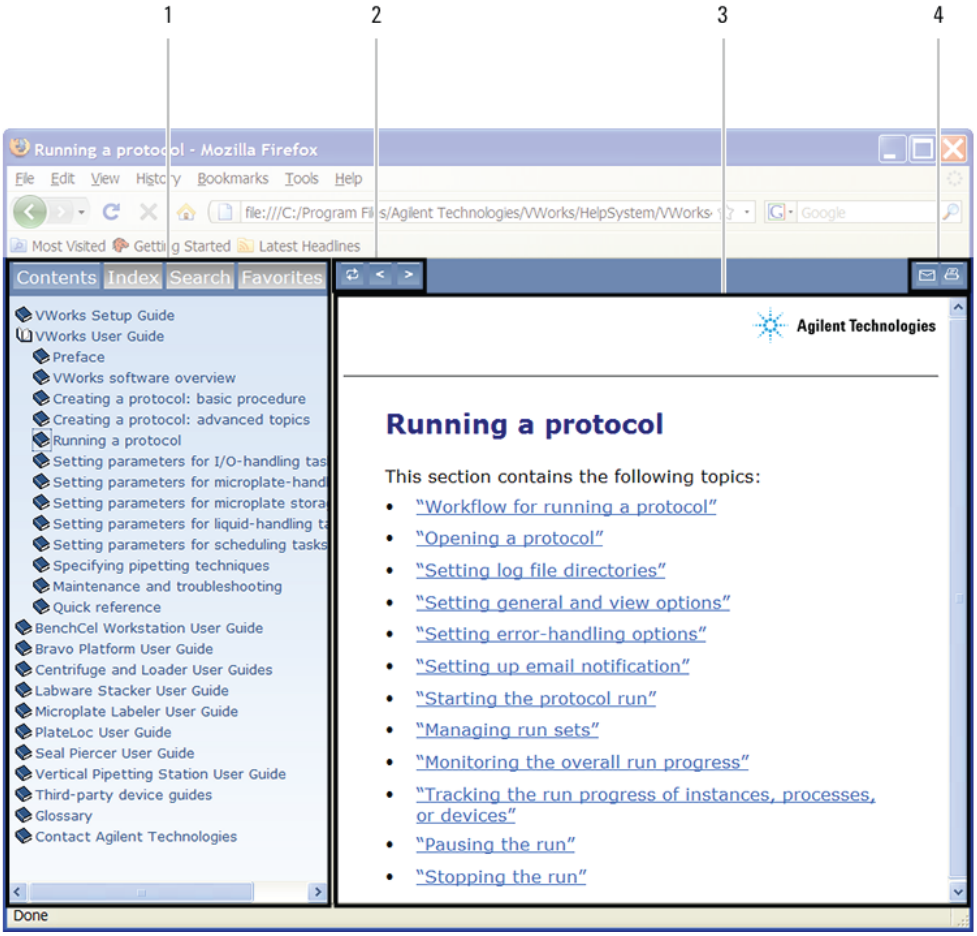
### Opening the help topic for an area in the VWorks window




***To access the context-sensitive help feature:***

1. In the main window of the VWorks software, click the help button . The pointer changes to . Notice that the different icons or areas are highlighted as you move the pointer over them.
2. Click an icon or area of interest. The relevant topic or document opens.

### Features in the Knowledge Base window




| Item | Feature |
|---|---|
| 1 | *Navigation area.* Consists of four tabs:<br>• *Contents.* Lists all the books and the table of contents of the books.<br>• *Index.* Displays the index entries of all of the books.<br>• *Search.* Allows you to search the Knowledge Base (all products) using keywords. You can narrow the search by product.<br>• *Favorites.* Contains bookmarks you have created. |
| 2 | *Navigation buttons.* Enable you to navigate through the next or previous topics listed in the Contents tab. |
| 3 | *Content area.* Displays the selected online help topic. |
| 4 | *Toolbar buttons.* Enable you to print the topic or send documentation feedback by email. |

## Related information

| For information about... | See... |
|---|---|
| Who should read this guide | “About this guide” on page vi |
| What this guide covers | “About this guide” on page vi |

# 1 BioCel System overview

This chapter contains the following topics:


- "BioCel System description" on page 2
- "Hardware overview" on page 5
- "Device integration options" on page 20
- "Software overview" on page 21

# BioCel System description

## Description

The BioCel System is a laboratory automation platform that:

- Stores labware (microplates, tip boxes, tube racks, and others) that will be processed during a protocol run.
- Moves labware to and from devices for processing. The devices are integrated in the BioCel System and controlled by the VWorks software. For a list of the devices that you can integrate in the system, see "Device integration options" on page 20.

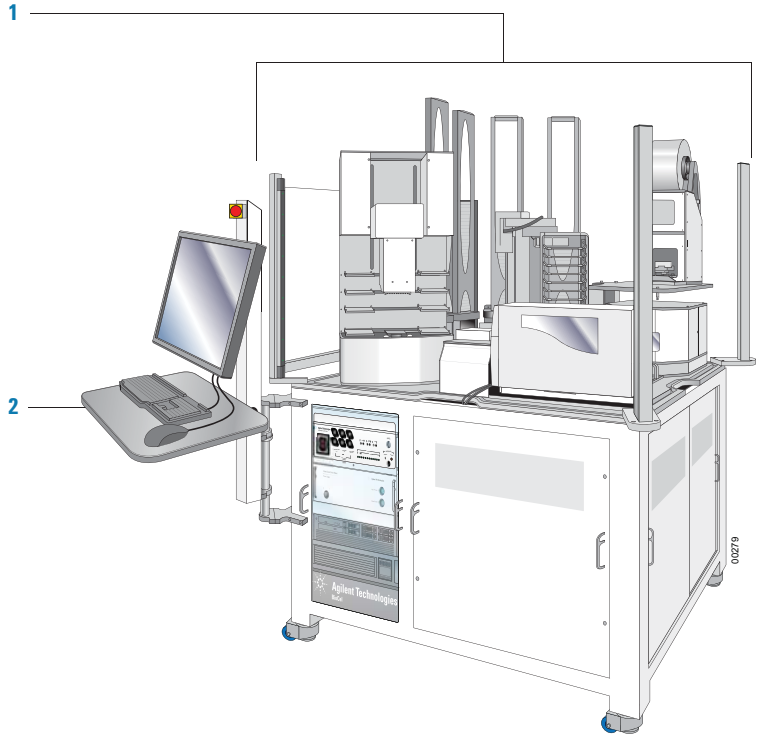
You can use the BioCel System for applications such as compound management, PCR sample preparation, cell-based assays, ADME-Tox assays, high-throughput screening, and so on.

Three models of the BioCel System are available: BioCel 900 System, BioCel 1200 System, and BioCel 1800 System. An environmental-control option can be added in the two larger systems (the BioCel 1200 and 1800 Systems) to create fully contained, contaminant-free environments.

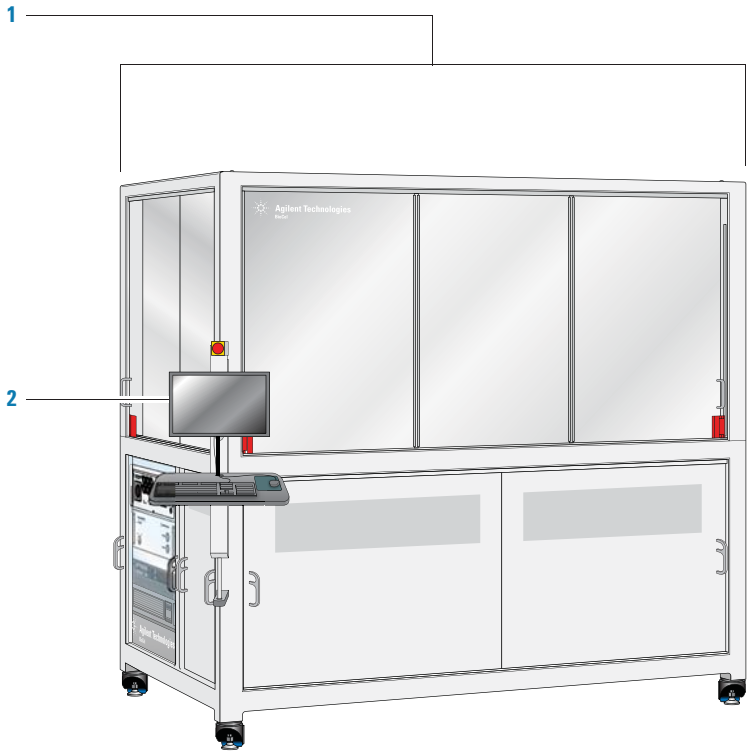
## Components

All three BioCel System models consist of the following components: Main body (1), computer (2), and VWorks software (not shown). In a system where multiple BioCel units are connected, only one computer is typically provided.

### BioCel 900 System



## BioCel 1200 System




## BioCel 1800 System

## Before you operate the system

**WARNING** **For safe operation, it is imperative that you become familiar with the information in the *Automation Control Unit User Guide* and follow the precautions in the *BioCel System Safety Guide*.**

## Related information

| For information about... | See... |
|---|---|
| BioCel System features | "Hardware overview" on page 5 |
| Device integration options | "Device integration options" on page 20 |
| Additional devices | "Additional BioCel System Devices" on page 71 |
| Software that controls the BioCel System | "Software overview" on page 21 |
| Safety information | *BioCel System Safety Guide* |
| Automation Control Unit | *Automation Control Unit User Guide* |

# Hardware overview

## About this topic

This topic describes the following BioCel System hardware features:

- Safety equipment
- Electronics cabinet
- Environmental Controls panel (in some BioCel 1200 and 1800 Systems)
- Liquid management components
- Air distribution panel
- Direct plumbing and external utilities connections (optional)
- Robot
- System status indicators
- Hood and deck light switch
- Barcode reader power supply (optional)
- Trash door and chute (optional)
- Docking tables (optional)

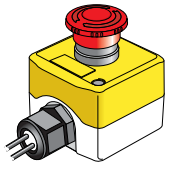
## Safety equipment

The following safety equipment is supplied with the BioCel System:

- Emergency-stop pendants (all system models)
- System doors (BioCel 1200 or 1800 System only)
- Light Curtain (BioCel 900 System only)
- Removable windows on docking tables

### Emergency-stop pendants

Emergency-stop pendants are supplied with every system and installed outside of the danger zone. To stop the system in an emergency, press the red button on the emergency-stop pendant. The robots and devices stop immediately, regardless of whether the INTERLOCK key switch is set at NORMAL or BYPASS.



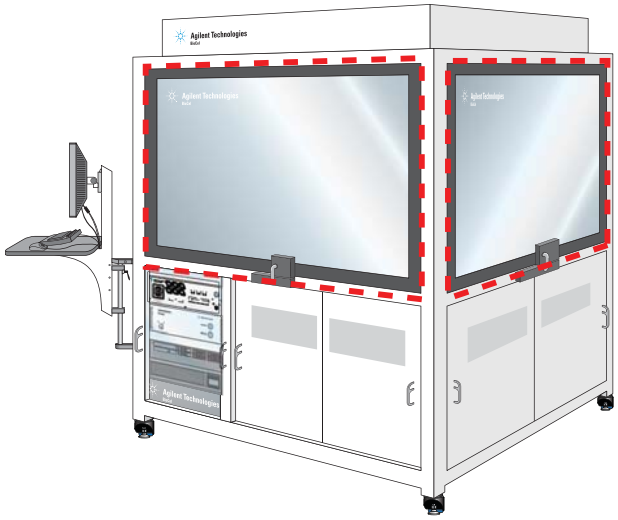
For more information about stopping the system in an emergency, see the *BioCel System Safety Guide*.

### System doors

Depending on the configuration, either sliding doors or flip-up doors are installed in the BioCel 1200 System or BioCel 1800 System. Typically, flip-up doors are installed in systems that require environmental control.

The sliding doors and flip-up doors are part of the safety interlock circuit that must be closed for the system to operate. Designed to protect you from moving-part hazards while the system is in operation, opening a door will open the safety circuit, stop the motion of the robots, and pause the run.

**IMPORTANT** You cannot open doors of inert environment systems until the gas is purged.

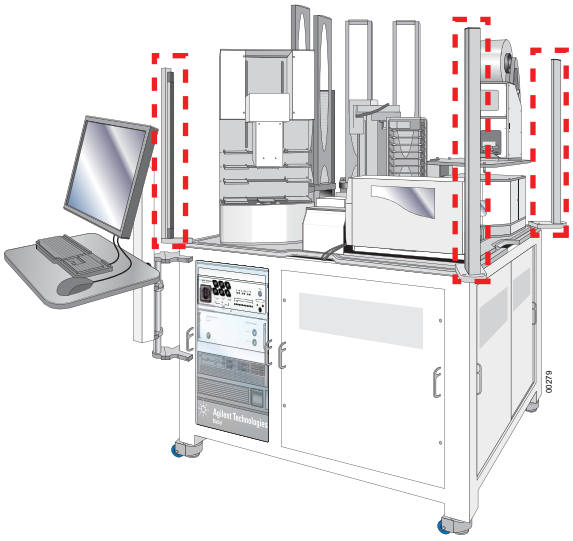


For detailed safety information, see the *BioCel System Safety Guide*.

### Light Curtain

The Light Curtain is part of the safety interlock circuit that must be closed for the BioCel 900 System to operate. Designed to protect you from moving-part hazards while the system is in operation, interrupting the Light Curtain will open the safety circuit, stop the motion of the robots, and pause the protocol run.

A Light Curtain post is located at each corner of the BioCel 900 System.



For detailed safety information, see the *BioCel System Safety Guide*.

### Removable windows on docking tables

Some docking tables have protective windows that are connected to the safety interlock circuit and function like system doors. Designed to protect you from moving-part hazards while the system is in operation, opening a window will open the safety interlock circuit, stop the motion of the robots, and pause the run.

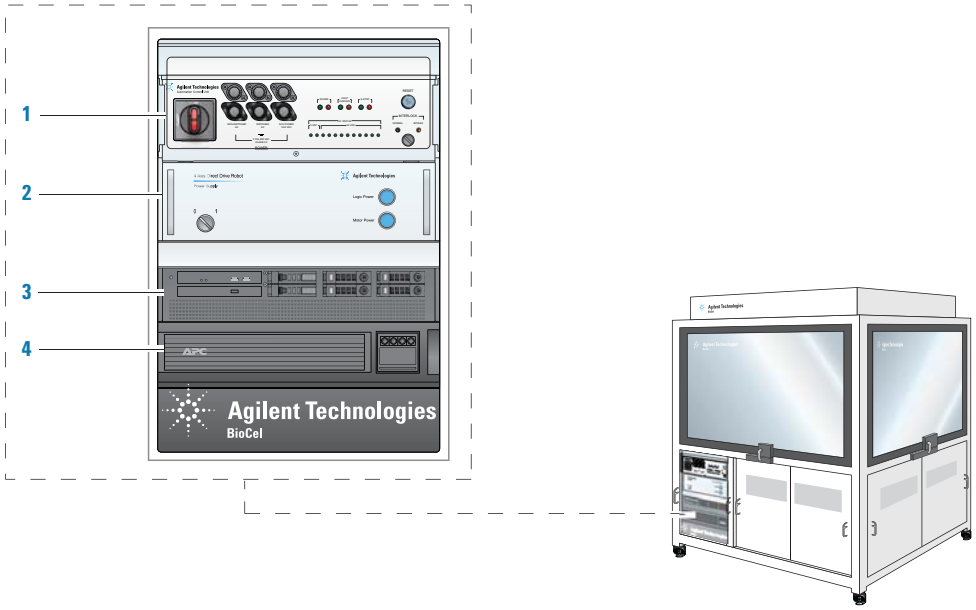
Instead of connecting to the safety interlock circuit, some protective windows have locks to prevent operators from entering the system while the robots and devices are in motion. The protective window should be locked during system operation.

For detailed safety information, see the *BioCel System Safety Guide*.

## Electronics cabinet

### Electronics cabinet components

The electronics cabinet is located below the system deck and contains the following:

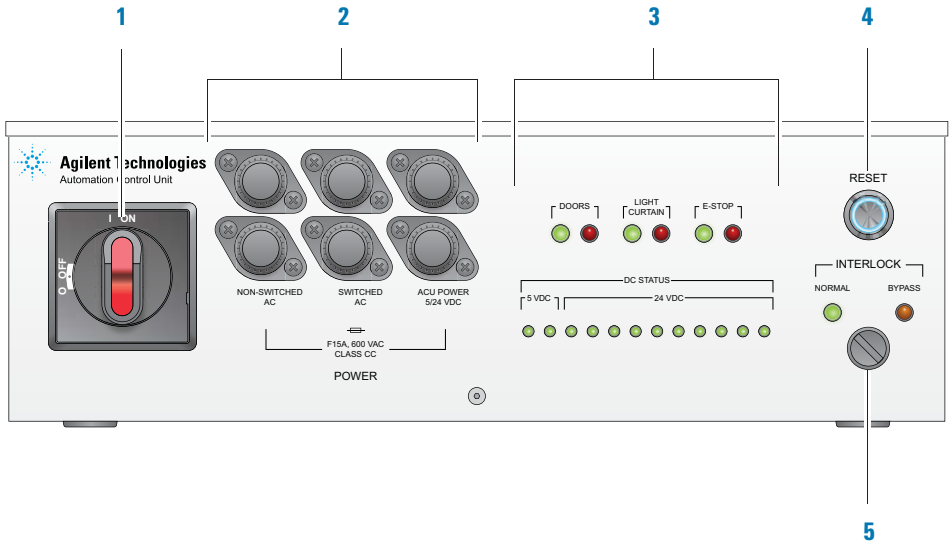



| Item | Components | Description |
|---|---|---|
| 1 | Automation Control Unit | Distributes power, provides emergency-stop and safety interlock functions, and controls device communication. For more information, see "Automation Control Unit features" on page 8. |
| 2 | Robot power supply | Supplies AC power to the system robot.<br>*Note:* The robot power supply is only applicable to certain robots, such as the Direct Drive Robot. |

| Item | Components | Description |
|---|---|---|
| 3 | Controlling computer | Does the following:<br>• Runs the lab automation software and controls the BioCel System and integrated devices.<br>• Communicates with other computers on your organization's network for file exchanges and email access.<br>The supplied computer has two Ethernet ports. One of the Ethernet ports connects to the Automation Control Unit, the second Ethernet port connects to your organization's wide area network (WAN).<br>A computer monitor is supplied with the BioCel System and it is mounted on one of the frame posts. |
| 4 | UPS | Provides backup power for the BioCel System during a power outage. The UPS is included in the BioCel 1200 System and the BioCel 1800 System, but is an optional component in the BioCel 900 System. |

### Automation Control Unit features

The following figure shows the Automation Control Unit in detail.



| Item | Feature | Description |
|---|---|---|
| 1 | Power switch | Turns on or turns off the AC power, DC power, and air supply to the system.<br>*Note:* The power switch is equipped with a locking mechanism that allows you to enforce lockout/tagout policies in your organization. For more information, see "Starting up and shutting down the BioCel System" on page 28. |
| 2 | Fuse housings | Contains the fuses. For fuse ratings, see the *Automation Control Unit User Guide*. |
| 3 | Indicator lights | Indicates status of the system doors, Light Curtain, emergency-stop button, and various devices connected to the 5 V and 24 V digital signal output ports. See "System status indicators" on page 14. |
| 4 | RESET button | Resets the emergency-stop relay to allow electrical current to flow to switched power outputs.<br>For emergency-stop recovery, see the *BioCel System Safety Guide*. For indicator light descriptions, see "Indicator lights on the Automation Control Unit" on page 16. |
| 5 | INTERLOCK key switch | Arms (NORMAL) or bypasses (BYPASS) the safety interlock.<br>For a description of the interlock modes, see the *BioCel System Safety Guide*. |

**WARNING** **Access to and use of the interlock key should be controlled. To avoid possible injury, the INTERLOCK BYPASS setting should be used only by personnel trained to teach the robots and devices in the system. The interlock key should be removed from the Automation Control Unit when the switch is set at NORMAL and you are not teaching robots and devices.**

For more information about the Automation Control Unit, see the *Automation Control Unit User Guide*.

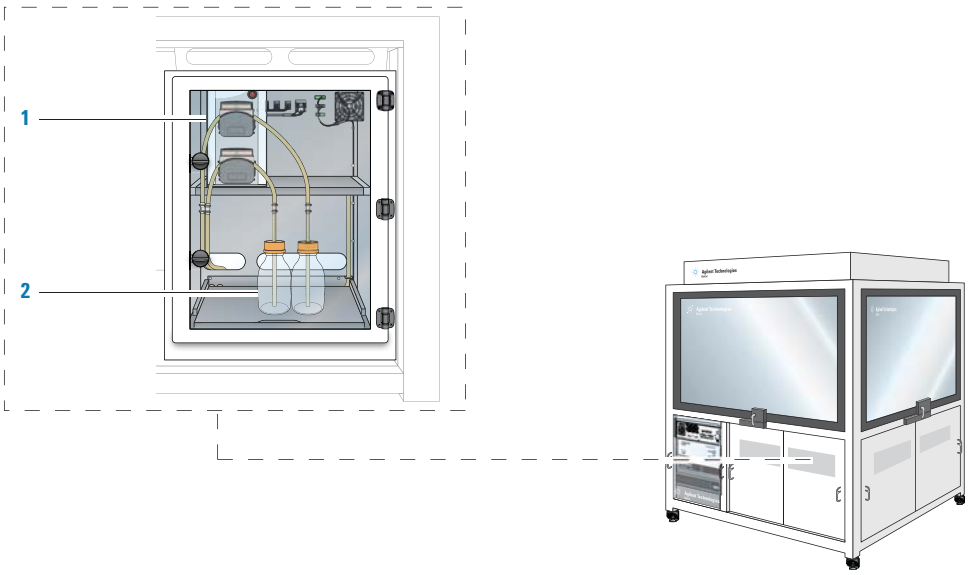
## Environmental Controls panel

The Environmental Controls panel consists of switches for power and optional inert gas, and is located next to the electronics cabinet. Installed in some BioCel 1200 and 1800 Systems, the panel is a part of the BioCel Environmental-Control System. For information, see the *BioCel Environmental-Control System User Guide*.

## Liquid management components

The BioCel System has components that allow you to manage liquids transferred to and from integrated devices. For systems installed in the EU, liquid management components are contained in a liquid cabinet, as shown in the following figure. Systems that are installed outside of the EU have the same liquid management components, but they might be installed independently under the system deck.

***Figure*** Liquid management components in the liquid cabinet




| Item | Component | Description |
|---|---|---|
| 1 | Pump Module | Transfers liquids into and waste away from the Vertical Pipetting Station and Bravo accessories. The Pump Module contains two peristaltic pumps that are controlled using the lab automation software. |
| 2 | Liquid containers | Contains liquids to be transferred to the integrated devices. |
| | Other equipment (not shown) | Consists of other devices or equipment, such as the Weigh Pad, that are needed for your specific system configuration. |

The liquid cabinet provides the following functions:

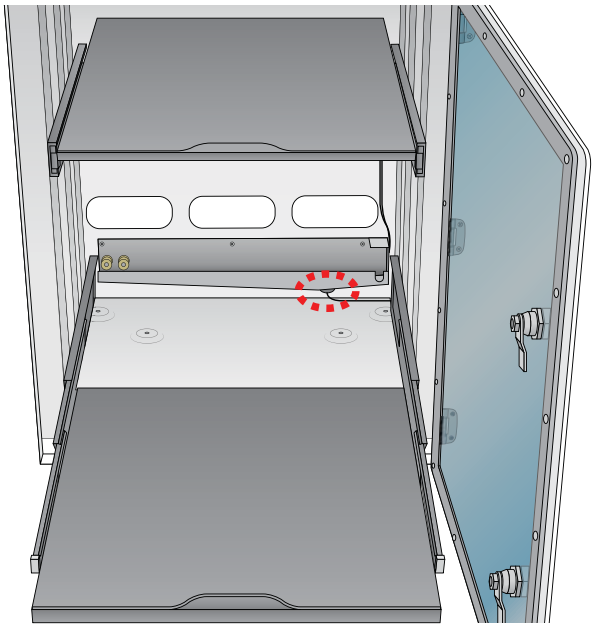
- Isolates liquid management components from the rest of the system. The cabinet contains adjustable pull-out shelves with trays to contain minor spills. Tubing and utility cords are routed through the back of the cabinet.

- Catches minor spills from the system deck. Minor spills on the deck flow into the deck troughs, are routed to the spill gutter at the back of the liquid cabinet, and exit the system through the drain at the bottom of the gutter. A spill-detection sensor is located at the bottom of the spill gutter. The sensor can be configured to display spill notifications or pause a protocol when spills are detected. For instructions on setting up the spill-detection sensor in the software, see the *VWorks Automation Control User Guide*.

**CAUTION** The liquid cabinet is not intended to be a storage cabinet and is not designed to comply with NFPA Code 30 or similar regulations. Do not store explosive, flammable, combustible, or corrosive chemicals in the liquid cabinet. For all chemicals, always follow safety data sheet instructions for storage, handling, and disposal.

**IMPORTANT** The spill-detection sensor is not a safety device. The sensor alerts you in case of spills in the system to prevent loss of materials and allow timely cleanup. It cannot distinguish between different types of chemicals used, and it does not warn you of hazardous conditions. For chemical safety information, see the *BioCel System Safety Guide*.

***Figure*** Spill-detection sensor, located at the bottom of the spill gutter



Although not installed by default, the liquid cabinet is designed to allow you to add an exhaust system to ventilate vapors from the cabinet.

## Direct plumbing and external utilities connections (optional)

Instead of using reservoirs and waste containers, the BioCel System can have direct plumbing from an external water source. Depending on the system configuration, the plumbing lines can enter the system at different locations.

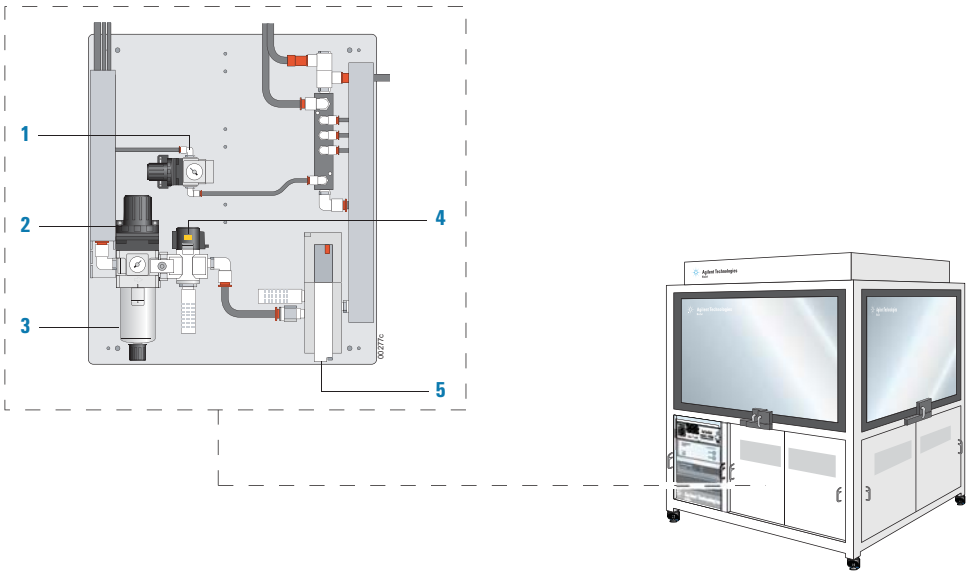
The connections to other external utilities can enter the system through either the main frame posts or at the top of the system. For more information, see the site-specific documentation provided by Agilent Technologies. The site-specific documents address different system configurations and requirements. If you have questions, contact Automation Solutions Technical Support.

## Air distribution panel

The air distribution panel contains air supply connections, regulators, and a filter. The panel is located either behind the liquid cabinet or on the side of the electronics cabinet.

The following figure shows the components that control the system air supply in detail.

*Note:* Depending on the options you installed, the air distribution panel might look different than shown in the figure.




| Item | Components | Description |
|---|---|---|
| 1 | Delidder air-pressure regulator (optional) | Controls the air pressure to the vacuum-based lid remover. |
| 2 | System air-pressure regulator | Controls the air pressure to the entire BioCel System. |
| 3 | Air filter | Filters the air supply to the system and traps oil or liquid in the supply line. |
| 4 | Air supply shutoff valve | Turns on or off the air supply to the system.<br>Use the valve to turn off the air supply only if the air is leaking in the system, and turning off the power switch on the Automation Control Unit does not turn off the air.<br>*Note:* A loud noise can be heard when you shut off the valve and residual air is released. |

| Item | Components | Description |
|---|---|---|
| 5 | Air valve actuator | Turns on or shuts off the air supply to the system. The actuator is controlled by the power switch on the Automation Control Unit. Turning off power at the Automation Control Unit or pressing an emergency-stop button turns off the actuator, which turns off the air supply. |

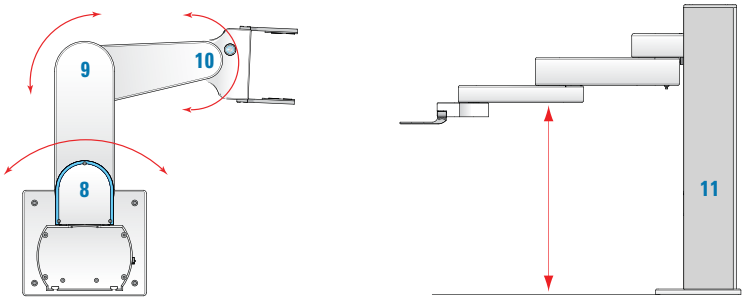
## Robot

The BioCel System uses the following robots:

- BenchBot Robot
- Direct Drive Robot

### BenchBot Robot

The BenchBot Robot has four axes of motion and is able to grip labware in both the landscape and portrait orientations.



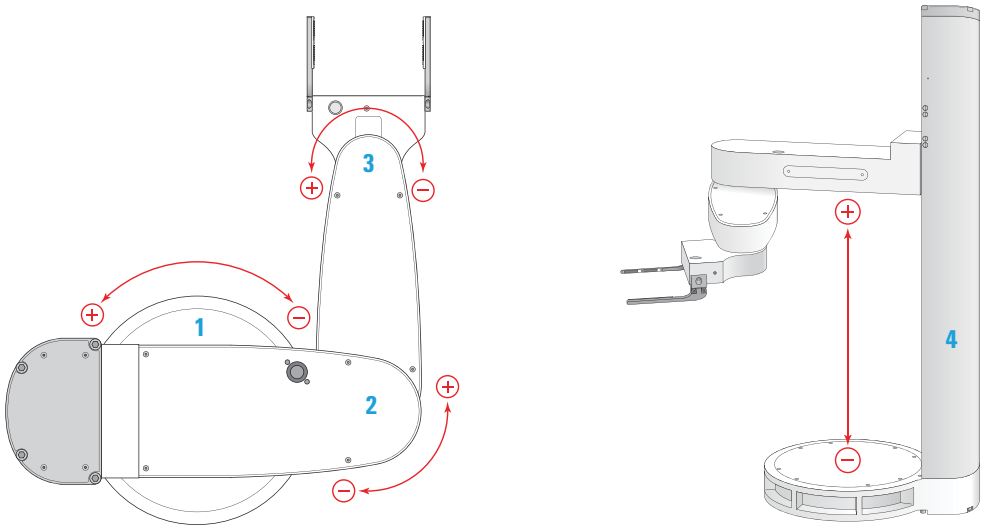

| Item | Axis | Description of robot movement |
|---|---|---|
| 1 | Shoulder | The joint that connects the robot arm to the mast. The arm rotates 186° about the shoulder. |
| 2 | Elbow | The joint that connects the bicep and the forearm. The forearm rotates 336° about the elbow. |
| 3 | Wrist | The joint that connects the forearm to the hand. The hand rotates to any angle about the wrist. |
| 4 | Mast, or *z*-axis | The vertical structure along which the robot arm moves up and down. |

For more information, see the *BenchBot Robot User Guide*.

### Direct Drive Robot

The Direct Drive Robot has four axes of motion and is able to grip labware in both the landscape and portrait orientations.

***Figure*** Direct Drive Robot axes of movements (top view and side view)




| Item | Axis | Description of robot movement |
|---|---|---|
| 1 | Waist | Robot arm rotates infinitely about the waist. |
| 2 | Elbow | Robot forearm rotates infinitely about the elbow. |
| 3 | Wrist | Robot hand rotates infinitely about the wrist. |
| 4 | Mast | Robot arm moves up and down along the mast. |

For more information, see the *Direct Drive Robot User Guide.*

## System status indicators

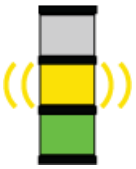
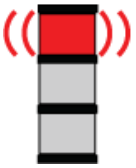
System status indicators enable you to monitor the current status of the BioCel System. The types of indicators that are available include:

- Multicolor status lights
- Audible alarms
- Indicator lights on the Automation Control Unit

### Multicolor status lights

Multicolor status lights enable you to monitor the current status of the BioCel System from a distance. The lights are optional in all system models.

If installed, the status light fixture is located above one of the frame posts in the BioCel 1800 System and BioCel 1200 System. The light fixture is typically mounted on a bench in the BioCel 900 System. Different light patterns indicate different conditions.

| Light pattern | | Status |
|---|---|---|
|  | Red = Off<br>Yellow = Off<br>Green = On | The INTERLOCK key is set at NORMAL, and one of the following is true:<br>• The system is idle.<br>• The system is running in error-free mode. |
|  | Red = Off<br>Yellow = Flashing<br>Green = On | The INTERLOCK key is set at BYPASS, and one of the following is true:<br>• The system is idle.<br>• The system is running in error-free mode. |
|  | Red = Flashing<br>Yellow = Flashing<br>Green = Off | The INTERLOCK key is set at BYPASS, and one of the following is true:<br>• The system has encountered a run error.<br>• The operator has paused the protocol run using one of the following methods:<br>– Clicked the Pause button in the software.<br>– Pressed the emergency-stop button.<br>*Note:* Opening a door or interrupting the Light Curtain does not pause the run when the interlock is bypassed. |
|  | Red = Flashing<br>Yellow = Off<br>Green = Off | The INTERLOCK key is set at NORMAL, and one of the following is true:<br>• The system has encountered a run error.<br>• The operator has paused the protocol run using one of the following methods:<br>– Clicked the Pause button in the software.<br>– Opened a system door or interrupted the Light Curtain.<br>– Pressed the emergency-stop button. |
|  | Red = Off<br>Yellow = Off<br>Green = Off | The Automation Control Unit is not initialized in the lab automation software or is turned off. |

*Note:* In addition to the status lights, you can also monitor the status of a system in the lab automation software. For details, see the lab automation software user documentation.

### Audible alarms

An audible alarms is available in every system model. The alarm enables you to monitor the current status of the BioCel System from a distance. By default, the alarm is configured to sound only when the INTERLOCK key is set at NORMAL, and under the following circumstances:

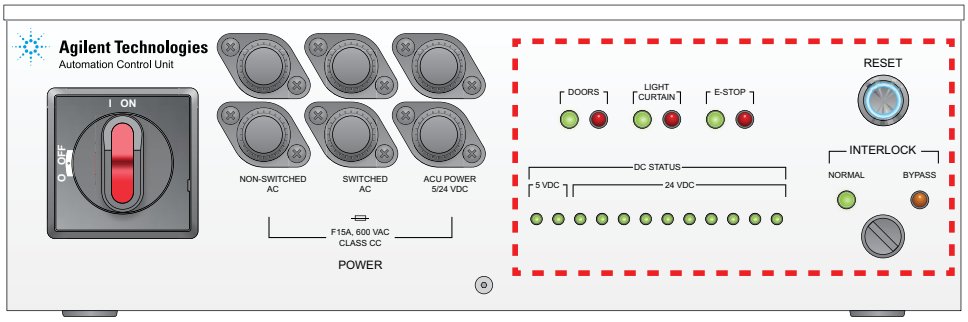
- When an error occurs during a run.
- When the operator opens a system door or interrupts the Light Curtain during a run.

In both cases, you can acknowledge and turn off the alarm in the software. For information about configuring the alarm, see the *VWorks Automation Control User Guide*.

*Note:* The alarm will not sound if the operator pauses the run using the software Pause button.

### Indicator lights on the Automation Control Unit

The Automation Control Unit has lights that indicate the following:



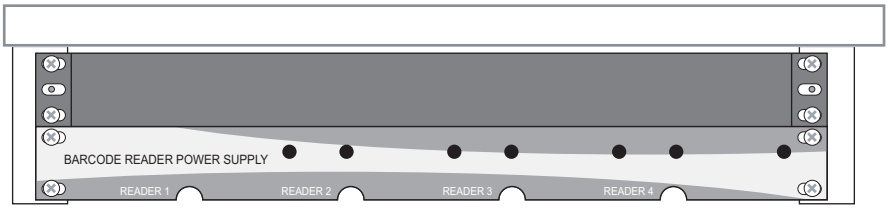
| Name | Description |
|---|---|
| DOORS | • *Green*. Doors are closed.<br>• *Red - solid*. One of the doors is open.<br>• *Red - blinking*. A hardware connection error has occurred. |
| LIGHT CURTAIN | • *Green*. Nothing is interrupting the Light Curtain.<br>• *Red - solid*. An object is interrupting the Light Curtain.<br>• *Red - blinking*. A hardware connection error has occurred. |
| E-STOP | • *Green*. The emergency-stop button is not pressed.<br>• *Red - solid*. The emergency-stop button has been pressed.<br>• *Red - blinking*. A hardware connection error has occurred. |
| INTERLOCK | • *Green*. The INTERLOCK key is set at NORMAL.<br>• *Yellow*. The INTERLOCK key is set at BYPASS, or the operator has selected Bypass Interlock in the Scheduler Paused dialog box. |
| RESET | • *Blue - solid*. The emergency-stop button is not pressed, all of the system doors are closed, and nothing is interrupting the Light Curtain.<br>• *Blue - blinking*. The interlock is tripped (the emergency-stop button is pressed, a system door is open, or the Light Curtain is interrupted). |
| DC STATUS | • *Green - on*. The device is on.<br>• *Green - off*. The device is off.<br>• *Green - blinking*. The device is in the emergency-stop state (the emergency-stop button is pressed). This state is only applicable to devices that are connected to a post-emergency-stop circuit (5 VDC OUT E-STOP and 24 VDC OUT E-STOP connections). |

## Hood and deck light switch

LED lights are provided in the hood (BioCel 1200 System and BioCel 1800 System) and under the deck (all system models) to improve the visibility of the devices or components in the system. The light switch is a touchpad located behind the computer monitor. Touch it once to turn on the lights. Touch it again to turn off the lights.


## Barcode reader power supply (optional)

The barcode reader power supply is an optional component that supplies power to auxiliary barcode readers integrated in the system. The barcode reader power supply is located under the BioCel System deck.




## Trash door and chute (optional)

The trash door is located immediately below the BioCel System table surface. The door slides open to allow used pipette tips or labware to fall into the waste bin under the table.

## Docking tables (optional)

If you have applications that require periodic or frequent addition or removal of a device in the BioCel System, you can mount the device on a docking table. The docking table sits on wheels so that you can easily move it.

The table must be docked adjacent to the BioCel System to prevent movement during a protocol run. When you no longer need the device, you can undock and move the table.

For instructions on how to dock or undock a table, see "Adding or removing devices mounted on docking tables" on page 41.

## Related information

| For information about... | See... |
|---|---|
| BioCel System description | "BioCel System description" on page 2 |
| Additional BioCel System devices | "Additional BioCel System Devices" on page 71 |
| BioCel System software | "Software overview" on page 21 |
| BioCel System specifications | Site-specific documentation provided by Automation Solutions |
| Safety information | *BioCel System Safety Guide* |
| Automation Control Unit | *Automation Control Unit User Guide* |
| 3-Axis Robot | *BioCel System User Guide*, Revision 01, August 2010 |
| Peak KiNEDx Robot | *BioCel System User Guide*, Revision 01, August 2010 |
| Staubli Robot | *Staubli TX60 Device Driver User Guide* |

# Device integration options

## About devices

Devices are individual pieces of equipment that are integrated in the BioCel System. Devices can store or process labware.

## Agilent Technologies devices

Agilent Technologies devices that can be integrated in a BioCel System include:

- Bravo Automated Liquid Handling Platform
- PlateLoc Thermal Microplate Sealer
- Labware MiniHub
- Labware Stacker
- Microplate Centrifuge
- Microplate Seal Piercer
- Microplate Labeler
- Vertical Pipetting Station

For details on how to set up these devices, see the user guide for the device.

Additional devices can be integrated in the BioCel System. For the list of additional devices, see "Additional BioCel System Devices" on page 71.

## Third-party devices

Many third-party devices can be integrated in a BioCel System. For a comprehensive list, contact Automation Solutions Customer Service.

If you would like to add other devices to the BioCel System, contact Automation Solutions Customer Service.

## Related information

| For information about... | See... |
|---|---|
| BioCel System description | "BioCel System description" on page 2 |
| BioCel System hardware features | "Hardware overview" on page 5 |
| Additional BioCel System devices | "Additional BioCel System Devices" on page 71 |
| BioCel System software | "Software overview" on page 21 |
| BioCel System specifications | Site-specific documentation provided by Automation Solutions. |
| Safety information | *BioCel System Safety Guide* |

# Software overview

## About this topic

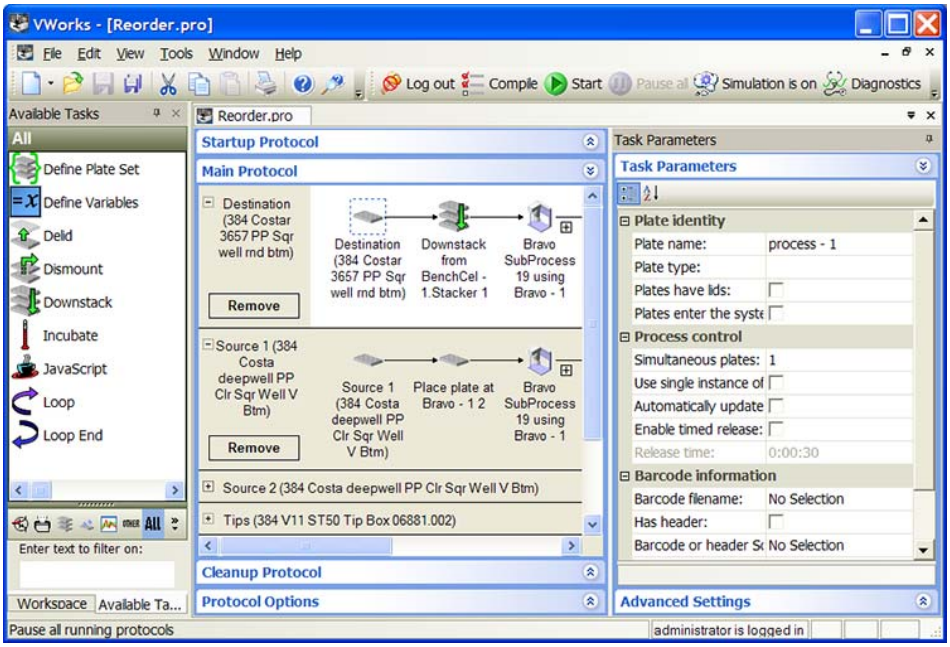
You use the lab automation software and device diagnostics plugin to set up, run, and troubleshoot the BioCel System. This topic describes the VWorks software and robot diagnostics software. For information about the diagnostics plugin of an integrated device, see the device user guide. For information about other lab automation software, see the user documentation for the software.

## VWorks software

The VWorks software allows you to:

- *Set up the BioCel System.* During setup, you need to create a device file for the BioCel System robot and integrated devices. For setup information, see "Setup Workflow" on page 24.
- *Set up user accounts and privileges.* You can set up different user accounts to enforce access policies. For instructions, see the *VWorks Automation Control Setup Guide*.
- *Define labware.* Labware definitions describe the labware you will use during protocol runs. For instructions, see the *VWorks Automation Control Setup Guide*.
- *Create protocols.* Protocols determine the sequence of tasks you want to automate in a run. For example, you can use a protocol to apply barcode labels to 100 microplates. For protocol-writing instructions, see the *VWorks Automation Control User Guide*.
- *Run, pause, monitor, and stop protocols.* You can start, pause, monitor, and stop a protocol run from the controlling computer.

For a full description and instructions on how to use the VWorks software, see the *VWorks Automation Control User Guide*.



## Robot diagnostics software

Accessed through the VWorks software, the robot diagnostics software allows you to:

- *Create and manage profiles.* Robot profile allows you to set up communication between the robot and the controlling computer. You create the profile when you set up the system. For setup information, see "Setup Workflow" on page 24.
- *Set and edit teachpoints.* Teachpoints are locations that the BioCel System robot will go to and from during a protocol run. You set teachpoints when you set up the BioCel System. You can also edit the teachpoints to correct or fine-tune the original teachpoints. For teachpoint setup and editing information, see "Setup Workflow" on page 24.
- *Diagnose problems.* Moving and adjusting individual hardware components allow you to diagnose and troubleshoot problems. For information on diagnosing and troubleshooting problems, see the robot user documentation.

The diagnostics software you use depends on the robot installed in the system.

- If the BioCel System has the BenchBot Robot, see *BenchBot Robot User Guide*.
- If the BioCel System has the Direct Drive Robot, see *Direct Drive Robot User Guide*.

## Related information

| For information about... | See... |
|---|---|
| VWorks software instructions | *VWorks Automation Control User Guide* |
| BioCel System description | "BioCel System description" on page 2 |
| BioCel System specifications | *BioCel System Site Preparation Guide* |
| BioCel System hardware features | "Hardware overview" on page 5 |
| Additional BioCel System devices | "Additional BioCel System Devices" on page 71 |
| Devices that can be integrated in the system | "Device integration options" on page 20 |
| Safety information | *BioCel System Safety Guide* |
| 3-Axis Robot | *BioCel System User Guide*, Revision 01, August 2010 |
| Peak KiNEDx Robot | *BioCel System User Guide*, Revision 01, August 2010 |
| Staubli Robot | *Staubli TX60 Device Driver User Guide* |

# 2 Setting up the BioCel System

This chapter explains how to set up the BioCel System for operation. This chaptercontains the following topics:


- "Setup Workflow" on page 24
- "Adjusting the keyboard shelf and computer monitor" on page 26
- "Starting up and shutting down the BioCel System" on page 28
- "Adding and deleting devices in the software" on page 32

# Setup Workflow

## About this topic

This topic presents the workflow for setting up the BioCel System for operation.

## Workflow

The following table presents the steps for setting up the BioCel System. After setting up the BioCel System for the first time, you will not likely change the setup unless you add a device, replace a device, or move the BioCel System.

**IMPORTANT** Before proceeding to step 5 (setting teachpoints), you should already have definitions for the labware you want to use. Although you can define labware at any time, Agilent Technologies recommends that you define labware before setting up the BioCel System. For instructions on how to define labware, see the *VWorks Automation Control Setup Guide*.

| Step | For this task... | See... |
|---|---|---|
| 1 | Adjust the keyboard shelf. | "Adjusting the keyboard shelf and computer monitor" on page 26 |
| 2 | Start up the BioCel System. | "Starting up and shutting down the BioCel System" on page 28 |
| 3 | Create a device file and add devices in the software. | "Adding and deleting devices in the software" on page 32 or device user guide |
| 4 | Create a profile. | One of the following:<br>• Robot user documentation<br>• Automation Solutions or third-party device user guide<br>• "Additional BioCel System Devices" on page 71 |
| 5 | Set and edit teachpoints for integrated devices. | One of the following:<br>• Robot user documentation<br>• Automation Solutions or third-party device user guide<br>• "Additional BioCel System Devices" on page 71 |
| 6 | Write protocols. | Lab automation user documentation, such as the *VWorks Automation Control User Guide* |

## Related information

| For information about... | See... |
|---|---|
| Operating the BioCel System | "Checking for system readiness" on page 50 |
| Troubleshooting problems | "Maintenance and troubleshooting" on page 55 |

# Adjusting the keyboard shelf and computer monitor

## About this topic

This topic explains the following:

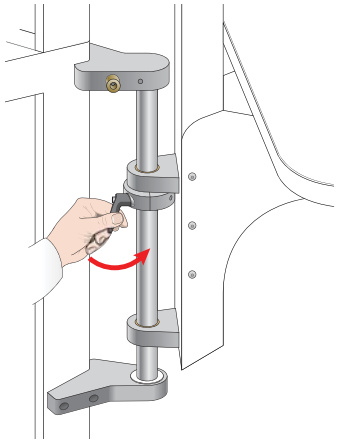
- Adjusting the keyboard shelf height
- Adjusting the monitor tilt angle

## Adjusting the keyboard shelf height

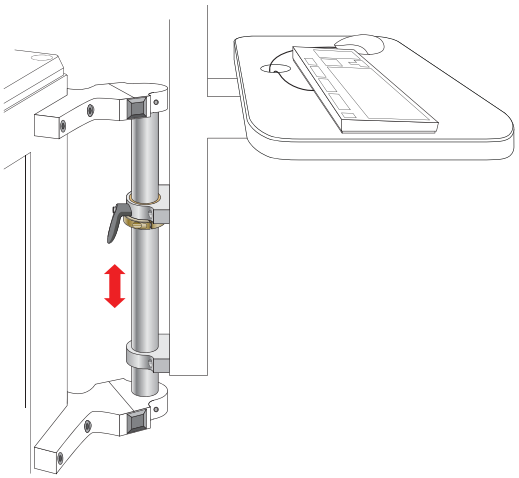
**WARNING** **Because the keyboard shelf is very heavy, the height adjustment procedure requires two people. One person will turn the lever to unlock the keyboard shelf from its current position. Another person will support the weight of the shelf and move it to the desired height. If you turn the lever without supporting the weight of the shelf, the shelf will drop, possibly causing pinch or crush injuries.**

***To adjust the keyboard shelf height:***

1. Swivel the keyboard shelf away so that you have access to the height-adjustment lever.
2. Have one person hold and support the weight of the shelf.
3. Turn the height-adjustment lever counterclockwise to unlock the shelf from its current position. The shelf can now move up and down freely.



4 Move the keyboard shelf to the desired height.

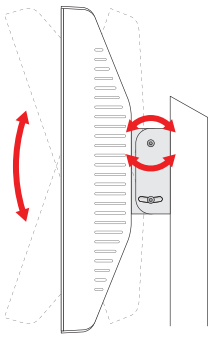


5 Turn the height-adjustment lever clockwise to tighten the collar and lock the shelf in position.

## Adjusting the monitor tilt angle

***To adjust the computer monitor tilt angle:***

1 Using the supplied 3-mm hex wrench, loosen the screw on the back of the computer monitor.



2 Tilt the computer monitor to the desired angle.

3 Tighten the screw on the back of the computer monitor.

## Related information

| For information about... | See... |
|---|---|
| BioCel System computer | "Electronics cabinet" on page 7 |
| Setup workflow | "Setup Workflow" on page 24 |
| Safety information | *BioCel System Safety Guide* |

# Starting up and shutting down the BioCel System

## About this topic

This topic explains how to start up and shut down the BioCel System.

## Before you start

Turning on the BioCel System initiates the startup process. Robots and devices might move during startup.

**WARNING** **Access to and use of the interlock key should be controlled. To avoid possible injury, the Interlock BYPASS setting should be used only by personnel trained to teach the robots and devices in the system. The interlock key should be removed from the Automation Control Unit when the switch is set at NORMAL and you are not teaching robots and devices.**

**WARNING** **Before starting up the system, make sure no one is inside the system, and then close all doors or remove objects that are disrupting the Light Curtain.**

**WARNING** **Follow your organization's lockout/tagout policy, if applicable.**

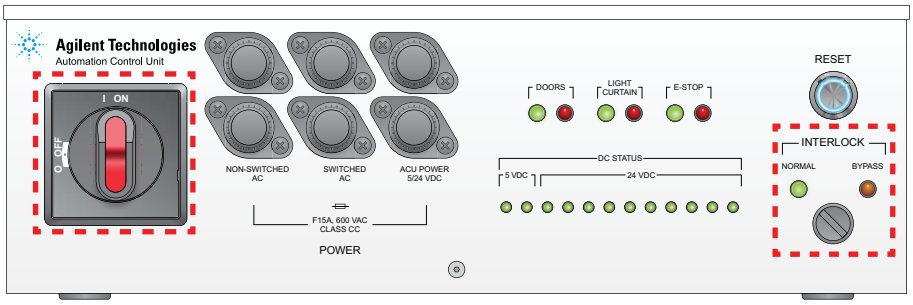
***Before you turn on the system:***

1. Make sure the main power line, air line, vacuum line (optional), and Ethernet cable are correctly connected. See the *Automation Control Unit User Guide* and the device user documentation for locations of the connections.
2. Make sure external drains and water lines are attached if your BioCel System uses them. Make sure the hoses are not kinked and that the hoses go through the appropriate pumps. See the site-specific documentation provided by Agilent Technologies. The site-specific documents address different system configurations and locations of drains and water lines. If you have questions, contact Automation Solutions Technical Support.
3. Make sure that any autofilling reservoirs are connected. See the *Pump Module User Guide* for instructions.

## Startup procedure

***To start up the system:***

**1** At the Automation Control Unit, perform the following steps:




**a** Make sure the **INTERLOCK** key switch is set at **NORMAL**.

**b** Turn the power switch clockwise to the **ON** ( **I** ) position.

In systems where more than one Automation Control Unit is used, turn on all the units.

**2** Turn on the UPS, if applicable. For instructions, see the UPS user documentation.

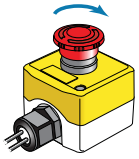
In systems where more than one UPS is used, turn on all the UPS units.

If the UPS emergency power-off (EPO) cable is installed, you must first reset the UPS EPO, and then turn on the UPS. For instructions, see the UPS user documentation.

If the system turns on successfully, you should hear the fan inside the Automation Control Unit turn on. After a few seconds, the indicator lights on the front of the Automation Control Unit turn on and show the current state of the system. The system status lights, if installed, also show the current system status. See "System status indicators" on page 14.

*Note:* If you have configured the air supply to turn on at startup, turning on the system also turns on the air supply. For information about configuring the air supply at startup, see the *Automation Control Unit User Guide*.

**3** Verify that the red buttons on the emergency-stop pendants are released. (Turn the buttons clockwise to release them.)



**4** Turn on the controlling computer.

**5** Start the lab automation software. See the lab automation user documentation for instructions.

**6** Turn on the integrated devices.

*Note:* Opening the doors or interrupting the Light Curtain to enter the system will trip the interlock. You will reset the system in a later step.

7 If you use devices that require a vacuum created by a vacuum pump:

   a Turn on the vacuum pump.

   b Check that the gauge on the vacuum pump indicates a vacuum pressure.

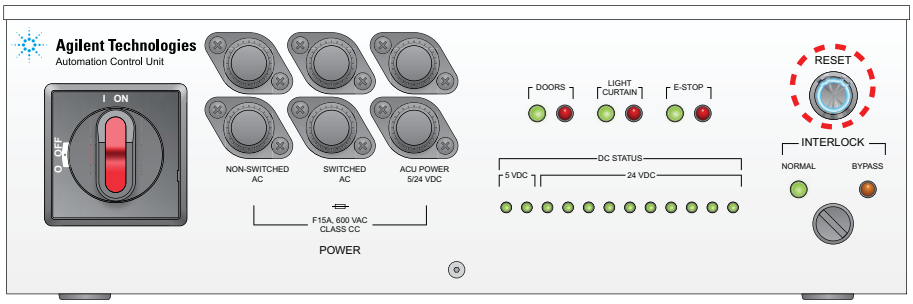
8 If you use devices that require a non-air gas supply, make sure that the gas is turned on.

9 If the BioCel System has an incubator, turn on the incubator.

10 To reset the system:

   a Make sure the system doors are closed and remove objects that are interrupting the Light Curtain.

   b At the Automation Control Unit, press the blinking RESET button to reset the system. The blue RESET light turns solid.




## Shutdown procedure

Shut down the BioCel System if you intend to:

- Leave it unused for a long period of time.
- Service the system.
- Move it to another location.

### *To shut down the BioCel System:*

1 Make sure you have cleaned up after the last run. See "Cleaning up after every protocol run" on page 56 for cleanup instructions.

2 If you do not plan to use the controlling computer:

   a Exit the lab automation software. See the lab automation software user documentation for instructions.

   b Shut down the computer. Wait for Windows to exit.

**CAUTION** To prevent the potential loss of data, always properly shut down and turn off the computer before shutting down the system.

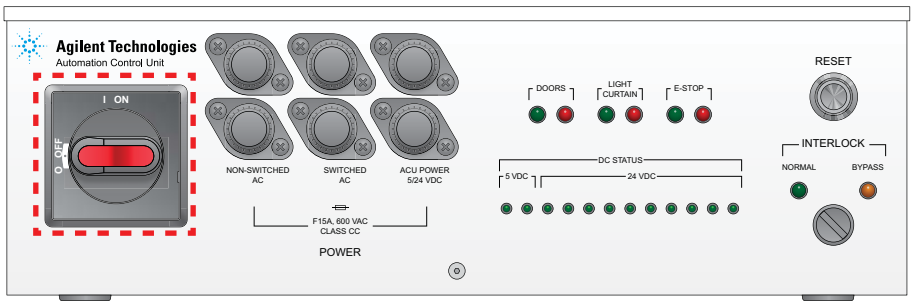
*Notes:*

- If the system has a UPS, the controlling computer is connected directly to the UPS without the UPS emergency power off (EPO) cable (default setup). Therefore, the computer will remain on after the system is shut down. However, if the UPS EPO cable is installed, turning off the Automation Control Unit will turn off the UPS and the computer.
- If the system does not have a UPS, the computer is connected directly to the Automation Control Unit. Turning off the system will automatically turn off the computer.

3 Turn off integrated devices.

4 If you use devices that require a vacuum pump, optionally turn off power at the pump if the pump has a power switch.

5 At the Automation Control Unit, turn the power switch counterclockwise to the **OFF** ( **O** ) position.




*Note:* Turning off the system also turns off the air supply.

6 Turn off the UPS, if applicable.

7 If you are moving the BioCel System, disconnect the air, vacuum, other gases, all communication cables, and all power cables.

## Related information

| For information about... | See... |
|---|---|
| Electrical requirements | Site-specific documentation provided by Automation Solutions |
| Cleaning up after a protocol run | "Routine maintenance" on page 56 |
| Troubleshooting startup or shutdown problems | "Maintenance and troubleshooting" on page 55 |
| Automation Control Unit and UPS configurations | *Automation Control Unit User Guide* |

# Adding and deleting devices in the software

## About this topic

The supplied controlling computer has the correct software configuration to communicate with the BioCel System and integrated devices. You do not need to create a new configuration or modify it unless you want to add or remove devices.

This topic explains how to add and delete the devices in the VWorks software. Read this topic if you are an administrator responsible for setting up and managing the BioCel System.

If you are using other lab automation software, see the user documentation for the software.

## Devices and device file defined

A device is an item in your lab automation system that has an entry in the VWorks software device file. A device can be a robot, an instrument, or a location in the system that can hold a piece of labware. The following are some examples of devices:

- The robot in the BioCel System
- PlateLoc Sealer
- Microplate Labeler
- Vertical Pipetting Station shelf
- Platepad
- A third-party device integrated in the BioCel System

To communicate with and to control the robot and integrated devices, the VWorks software uses a device file that contains the following information:

- List of devices the software will communicate with and control
- Configuration information of each device (for example, approach height, allowed or prohibited labware, number of shelves, barcode access, and so on)
- The set of teachpoints to use (robots only)

You provide the device information in the VWorks software. The device information is stored in a device (.dev) file that is located in a folder you specify when saving the file.

For detailed information about device files and associations with profiles, teachpoint files, and labware definitions, see the *VWorks Automation Control User Guide*.

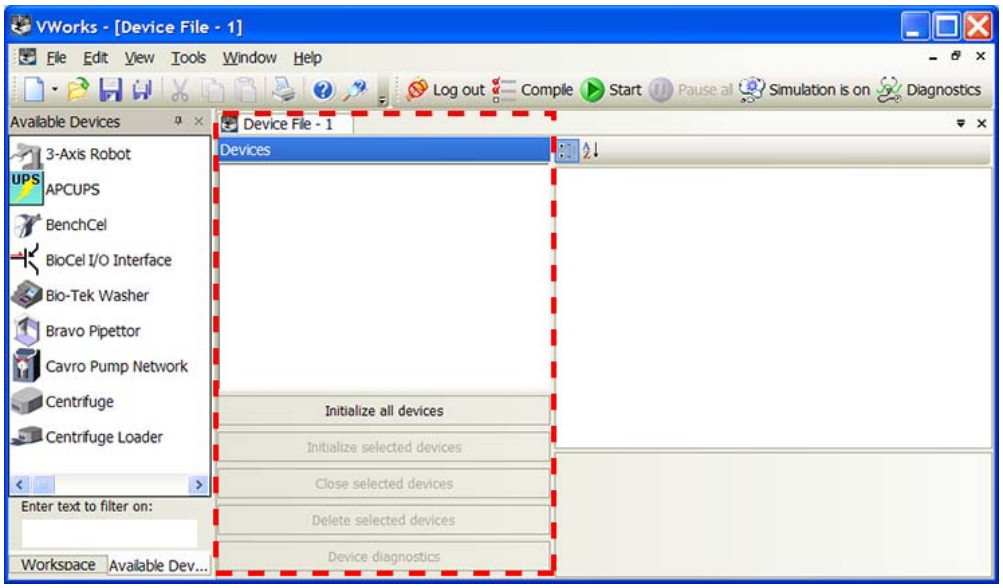
## Creating a device file

If you are setting up the BioCel System for the first time, you need to create a new device file, and then add the BioCel System robot and integrated devices to this file.

Before you create a device file, start the VWorks software and log in. See the *VWorks Automation Control User Guide* for instructions.

***To create a new device file:***

**1** In the **VWorks** window, select **File > New > Device.** A Device File tab appears.

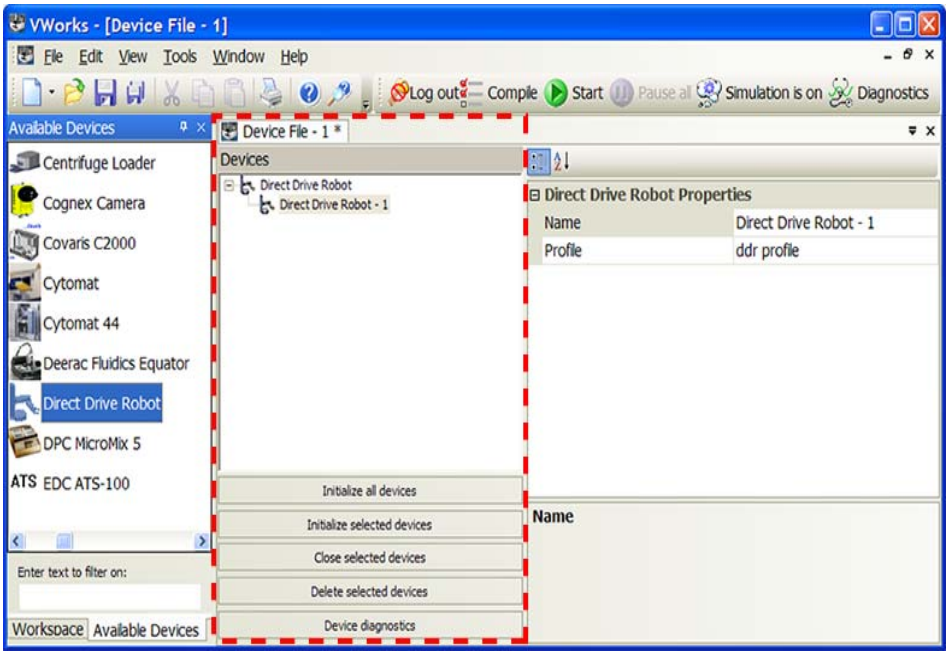



**2** Select **File > Save** to save the device file. The file name appears in the Device File tab.

## Adding a device

***To add a device to the device file:***

**1** In the **Available Devices** area, double-click the device that you want to add. Alternatively, you can drag a device from the **Available Devices** area into the **Device File** area.



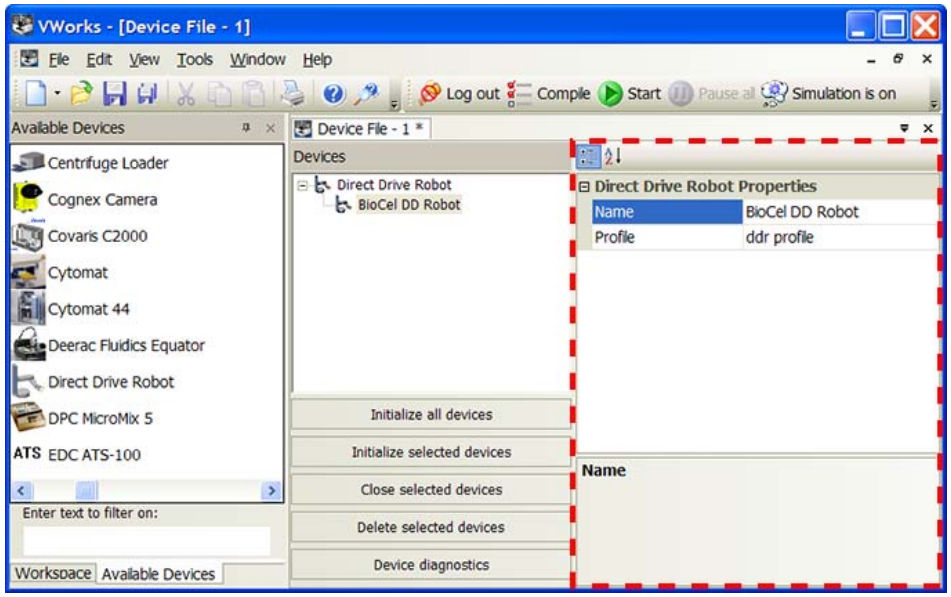
In the example shown, the Direct Drive Robot device is added. Notice that the first Direct Drive Robot device is labeled Direct Drive Robot-1. If you add another Direct Drive Robot device, it will appear as Direct Drive Robot-2.

If you do not see the device in the **Available Devices** list, check that the device plugin file is stored in the ...\Agilent Technologies\VWorks\Plugins folder. Also make sure you have the software license to use the plugin.

If you added a device plugin file in the Plugins folder and you have already started the VWorks software, be sure to reload the plugin. To do this, close any open device files and protocol files, and then select **Tools > Reload Plugins.**

**2** In the device properties area, type a **Name** for the device.

In the following example, the name for the Direct Drive Robot is BioCel DD Robot.




**3** If applicable, select the **Profile**.

If the profile you want does not appear in the list, or if no profile appears in the list, you need to create the profile, and then return to this step to select it. Without the profile, you will not be able to establish communication with the device.

To create a profile for the BioCel System robot, see one of the following:

- *BenchBot Robot User Guide*
- *Direct Drive Robot User Guide*

To create a profile for an integrated device, see "Additional BioCel System Devices" on page 71, the Automation Solutions device user guide, or the third-party device driver user guide.

**4** If applicable, set the device properties. See "Additional BioCel System Devices" on page 71, the Automation Solutions device user guide, or the third-party device driver user guide.

**5** Select **File > Save** to save the device file.

6 Repeat steps 1 through 5 to add other devices.

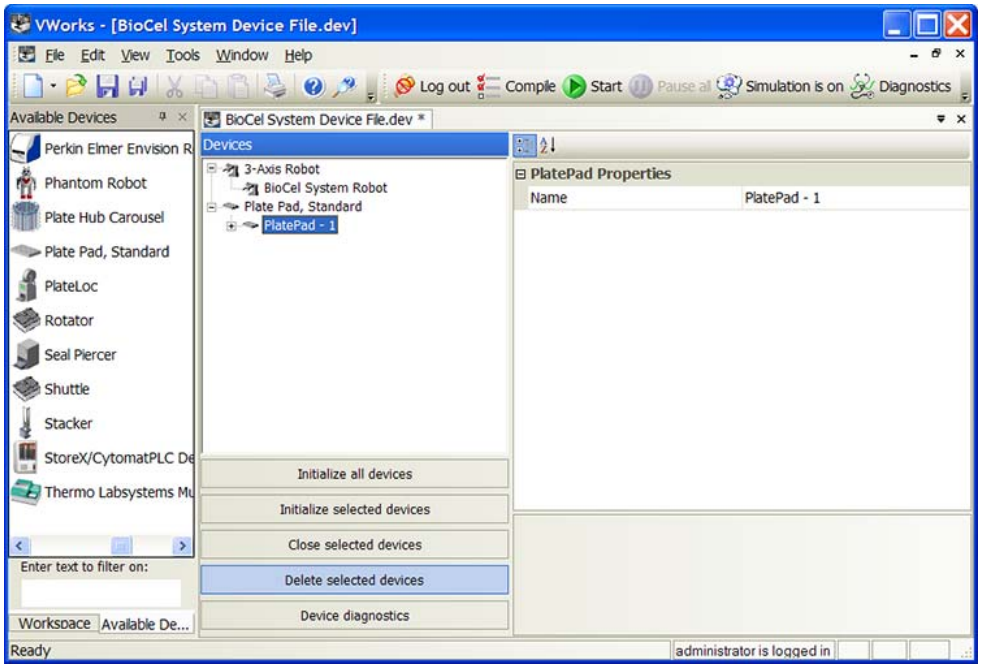
7 In the **Device File** area, click **Initialize all devices** to establish communication with the devices.

## Deleting a device

***To delete a device in the VWorks software:***

1 In the **VWorks** window, select the device you want to delete in the **Devices** area.

2 Click **Delete selected devices.**




## Disabling a device in a device file

You might want to temporarily disable a device when:

- Running a protocol using a subset of devices
- Running protocols that use different pipette heads or deck setup
- Performing maintenance on a non-pooled device
- Performing maintenance on a pooled device

The disabled device will be not be available during a protocol run. If the software encounters a task pointing to the disabled device during a run, the protocol will skip the task and continue the run. If the disabled device is part of a pool of devices and the other devices in the pool are available, the task will be executed using the available device.

*Note:* Up to 10 devices can be disabled in a single device file.

*Note:* Disabled devices do not count towards the number of devices licensed.

The following devices cannot be disabled:

- All robots, for example the BenchBot Robot and Direct Drive Robot
- Automation Control Unit

- BioCel I/O Interface

For instructions on how to disable a device, see the *VWorks Automation Control User Guide*.

## Related information

| For information about... | See... |
|---|---|
| VWorks software | • *VWorks Automation Control Setup Guide*<br>• *VWorks Automation Control User Guide* |
| Setting the properties of a particular device | One of the following:<br>• Robot or device user documentation<br>• "Additional BioCel System Devices" on page 71<br>• Automation Solutions device user guide<br>• Third-party device driver guide |
| Creating a profile for a a system robot or a device | One of the following:<br>• Robot user documentation<br>• "Additional BioCel System Devices" on page 71<br>• Automation Solutions device user guide<br>• Third-party device driver guide |
| Setting teachpoints | Robot user documentation |

# 3 Preparing for a protocol run

Before you start a protocol run, you should check the various devices in the BioCel System to ensure optimum operation.

This chapter contains the following topics:


- "Workflow for preparing a protocol run" on page 38
- "Performing dry runs" on page 39
- "Reviewing protocols and planning for the run" on page 40
- "Adding or removing devices mounted on docking tables" on page 41
- "Checking for system readiness" on page 50
- "Replacing the waste bin" on page 52
- "Loading labware in the system" on page 54

# Workflow for preparing a protocol run

## Workflow

The workflow for preparing a protocol run is as follows:

| Step | For this task... | See... |
|---|---|---|
| 1 | Review the protocol and plan for the run. | "Reviewing protocols and planning for the run" on page 40 |
| 2 | Add devices that are mounted on docking tables. | "Adding or removing devices mounted on docking tables" on page 41 |
| 3 | Check the system for readiness. | "Checking for system readiness" on page 50 |
| 4 | Review the emergency stop and recovery procedure. | *BioCel System Safety Guide* |

## Related information

| For information about... | See... |
|---|---|
| Setting up the system | "Setting up the BioCel System" on page 23 |
| Protocols | Lab automation software user documentation, such as the *VWorks Automation Control User Guide* |

# Performing dry runs

## What is a dry run?

A dry run is when you run a protocol using empty labware. A dry run allows you to troubleshoot a protocol or a component of the system without wasting valuable reagents and samples. You should always perform a dry run to check a new protocol.

## Correcting teachpoint errors

After setting the teachpoints, be sure to perform a dry run as a final check for any teachpoint errors. The dry run also allows you to fine-tune orientation settings in systems that have the BenchBot Robot or the Direct Drive Robot.

## Preparing for a dry run

You prepare for a dry run the same way you would prepare for a real protocol run. For the preparation workflow, see "Workflow for preparing a protocol run" on page 38.

## Related information

| For information about... | See... |
|---|---|
| Writing protocols | Lab automation software user documentation, such as the *VWorks Automation Control User Guide* |
| Preparing for a run | "Workflow for preparing a protocol run" on page 38 |
| Workflow for setting teachpoints | One of the following:<br>• Robot or device user documentation<br>• "Additional BioCel System Devices" on page 71 |

# Reviewing protocols and planning for the run

## Procedure

Before you start a run, make sure you review the protocol and determine:

- The devices used in the protocol and how to prepare them for operation. For example, you might need to load a roll of seal on the PlateLoc Sealer or install a pipette head on a Vertical Pipetting Station. See the device user guides for setup instructions.
- The optimal device setup sequence. In general, you first set up devices that do not hold time-sensitive reagents. Leave complex preparations, which might use expensive and unstable reagents, until last.
- The labware used in the protocol and where they should be positioned before the run starts. For example, you might have to load labware into one or more storage devices such as the Labware Stacker and the Plate Hub.
- The waste bins that should be emptied.
- The reservoirs that must be filled.

Be sure to check the protocol User Message tasks for setup information. If the User Message tasks prompt you to place counterweight labware, you do not have to include these steps in the setup.

## Related information

| For information about... | See... |
|---|---|
| Creating or revising protocols | Lab automation software user documentation, such as the *VWorks Automation Control User Guide* |
| Adding or removing devices that are on docking tables | "Adding or removing devices mounted on docking tables" on page 41 |
| Checking the system for readiness | "Checking for system readiness" on page 50 |
| Replacing the waste bin | "Replacing the waste bin" on page 52 |
| Troubleshooting the system | "Loading labware in the system" on page 54 |
| Stopping the protocol run in an emergency | *BioCel System Safety Guide* |

# Adding or removing devices mounted on docking tables

## About this topic

**WARNING** **Unlocking and removing protective windows, defeating interlocks and reconfiguring the system can expose you to serious hazards and may invalidate the safety compliance certification.**

Only trained BioCel System administrators should perform the procedures in this topic.

For a description of docking tables, see "Docking tables (optional)" on page 18.

## Workflow for adding or removing devices mounted on docking tables

### Adding devices mounted on docking tables

The workflow for adding devices that are mounted on docking tables is as follows:

| Step | For this task... | See... |
|---|---|---|
| 1 | *Multiple docking-table systems only.* Remove the protective window from the side of the system where the table will be docked. | "Removing and installing protective windows" on page 42 |
| 2 | If applicable, connect the interlock cables to the E-STOP connectors on the system patch panel. | "Connecting to and disconnecting from the interlock system" on page 43 |
| 3 | Dock the table. | One of the following:<br>• "Docking and undocking the table automatically" on page 44<br>• "Docking and undocking the table with levers" on page 46<br>• "Docking and undocking the table with leveling casters" on page 48 |

### Removing devices mounted on docking tables

The workflow for removing devices that are mounted on docking tables is as follows:

| Step | For this task... | See... |
|---|---|---|
| 1 | Undock the table. | One of the following:<br>• "Docking and undocking the table automatically" on page 44<br>• "Docking and undocking the table with levers" on page 46<br>• "Docking and undocking the table with leveling casters" on page 48 |
| 2 | If applicable, disconnect the interlock cables from the E-STOP connectors on the system patch panel. | "Connecting to and disconnecting from the interlock system" on page 43 |
| 3 | *Multiple docking-table systems only.* Install the protective window on the side of the system that is exposed. | "Removing and installing protective windows" on page 42 |

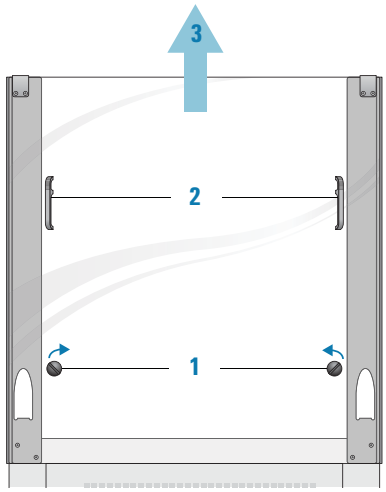
## Removing and installing protective windows

In modular systems where multiple docking tables are interconnected, removable windows are installed on sides that permit the addition of docking tables. In these systems, you must first remove the protective window before docking a table, and install the protective window after undocking a table.

### Removing the protective window on a docking table

***To remove the protective window:***

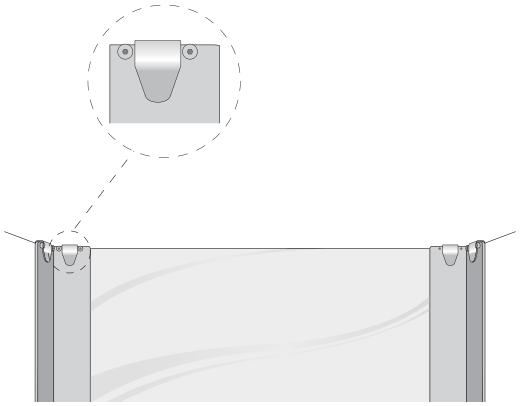
1. *Windows without interlocks only.* Using a 9-mm hex wrench, turn the two locks to unlock the window from the frame (1).
2. *Windows with interlocks only.* Turn the two black knobs on the window to unlatch the window from the frame (1).
3. While holding the handles (2), pull the bottom of the window outwards a few inches, then lift the window up until the window clamps are free from the top of the frame (3).



### Installing the protective window

***To install the protective window:***

1 While holding the handles on the window, slide the window downward onto the front of the frame. Behind one of the frame posts are two screws. Make sure the corresponding window clamp fits between the two screws, as shown.



2 *Windows with interlocks only.* Turn the black knobs on the windows to secure the window latches.

3 *Windows without interlocks only.* Using a 9-mm hex wrench, turn the lock to secure the window latches.

## Connecting to and disconnecting from the interlock system

If devices or safety equipment on the docking table use the safety interlock system, you must connect them to the system interlock circuit when docking the table. When undocking the table, you must disconnect the devices or safety equipment from the interlock circuit.

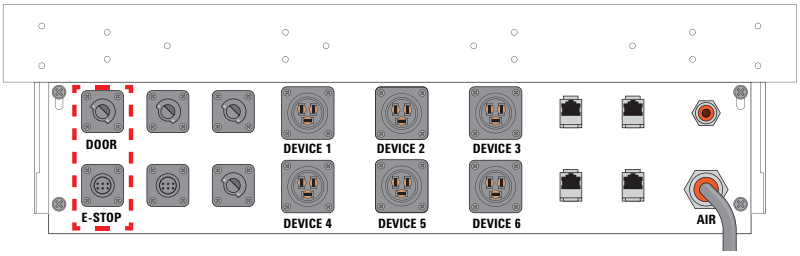
**IMPORTANT** The safety interlock circuit must be closed for the system to operate. You can use the supplied jumper to close the circuit after disconnecting the devices.

### Connecting to the interlock circuit

***To connect the devices or safety equipment to the interlock circuit:***

1 Remove the jumpers from the **E-STOP** or **DOOR** connectors on the system patch panel (below the system deck).

*Note:* The patch panel configuration can vary by system. Use the labels on the panel to identify the correct connectors for the devices and safety equipment.



2 Connect the interlock cables from the devices or safety equipment to the **E-STOP** or **DOOR** connectors on the system patch panel. Turn the connector clockwise until the connection is secure.

### Disconnecting from the interlock circuit

***To disconnect the devices or windows from the interlock circuit:***

1 Disconnect the device or safety equipment interlock cables from the **E-STOP** or **DOOR** connectors on the system patch panel. Turn the connectors counterclockwise to loosen and remove the connectors.

2 Install the supplied jumpers at the device **E-STOP** or **DOOR** connectors on the system patch panel.

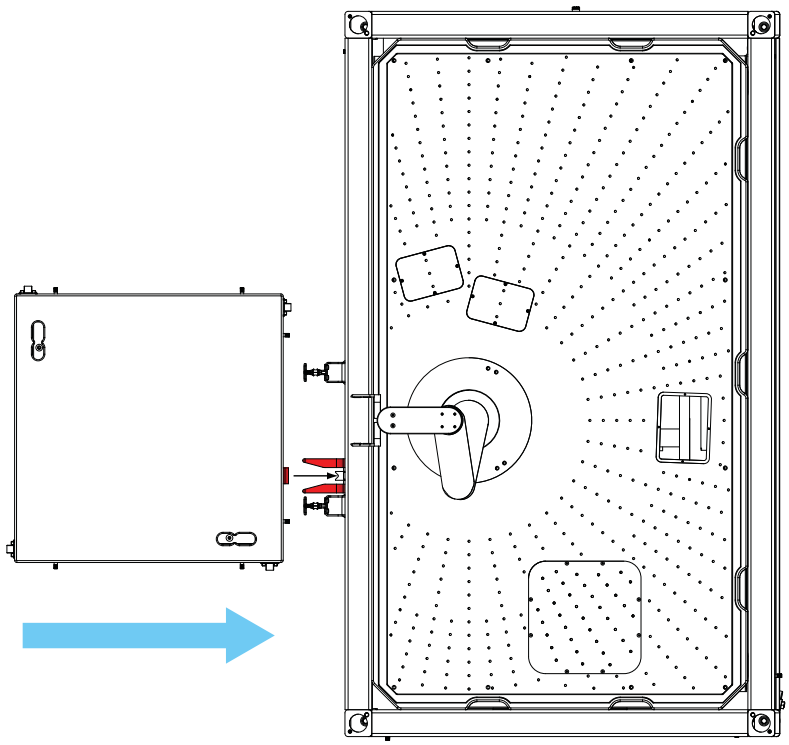
## Docking and undocking the table automatically

If the docking table is equipped with the QuickDock feature, the docking and undocking processes are automated.

***To dock the table using the QuickDock feature:***

1 Move the docking table so the red alignment tab on the docking table faces the two red alignment tabs on the BioCel System.

2 Push the table against the BioCel System, making sure the red alignment tab on the docking table fits between the two red alignment tabs on the BioCel System.



3 Check the docking pendant. The pendant should display UNDOCKED and READY. If it does not, check the alignment of the table.


4 Press the pendant button. Lights on the pendant flash momentarily.


When the table is docked securely, the pendant displays READY and DOCKED.


5 Follow instructions in the robot user documentation to verify device teachpoints on the docking table.

***To undock the table using the QuickDock feature:***

1 Check the docking pendant. The pendant should display READY and DOCKED.

2 Press the pendant button. Lights on the pendant flash momentarily.


When the table is undocked, the pendant displays UNDOCKED and READY.


3 Move the docking table away from the BioCel System.

## Docking and undocking the table with levers

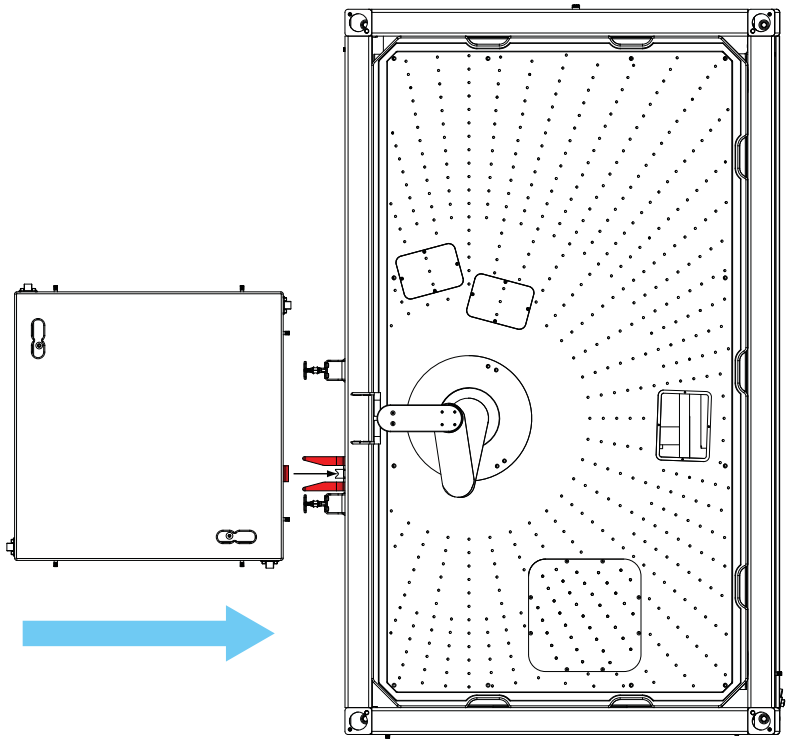
If the docking table is equipped with levers, the docking and undocking processes are performed manually.

### Docking the table that has levers

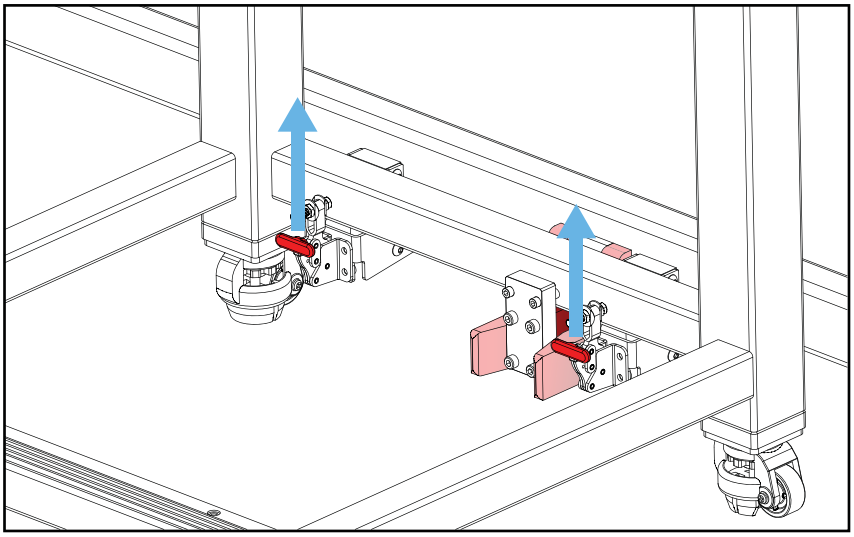
***To dock the table that has levers:***

1 Move the docking table so the red alignment tab on the docking table faces the two red alignment tabs on the BioCel System.

2 Push the table against the BioCel System, making sure the red alignment tab on the docking table fits between the two red alignment tabs on the BioCel System.



3 Under the docking table, firmly push up the two red levers until you hear them click. The click sound confirms that the table is docked.



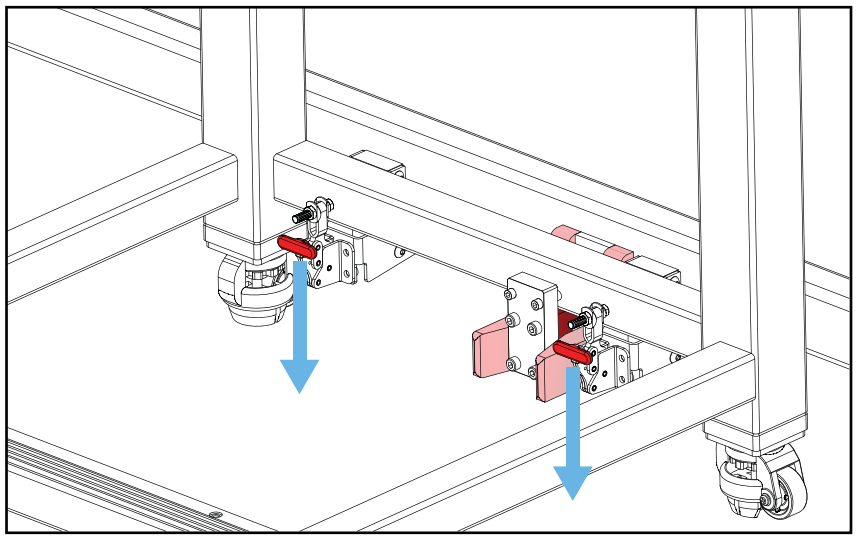
4 Check that the table is securely docked. To do this, make sure the table does not move when you try to pull it away from the BioCel System.

5 Follow instructions in the robot user documentation to verify the teachpoints of the devices on the docking table.

### Undocking the table that has levers

***To manually undock the table that has levers:***

1 Under the docking table, firmly push down the red levers.



2 Move the docking table away from the BioCel System.

## Docking and undocking the table with leveling casters

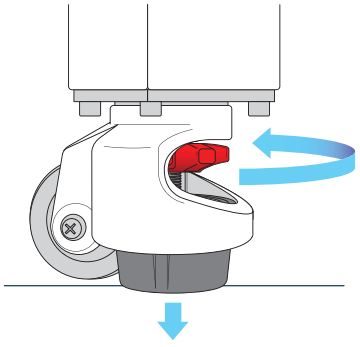
If the docking table is equipped with leveling casters, the docking and undocking processes are performed manually.

### Docking a table with leveling casters

***To dock a table with leveling casters:***

1 Position the docking table adjacent to the system.

2 Turn the red wheel counterclockwise to extend the foot at each caster. Make sure the table is level.

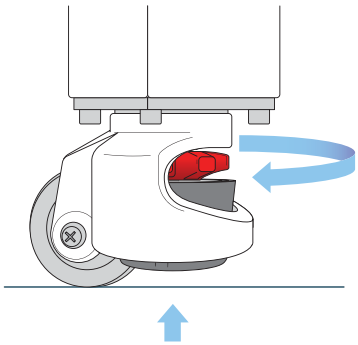


3 Follow instructions in the robot user documentation to verify the teachpoints of the devices on the docking table:

### Undocking a table with leveling casters

***To undock a table with leveling casters:***

1 Turn the red wheel clockwise to raise the foot at each caster before moving the table.



2 Move the table away from the system.

## Related information

| For information about... | See... |
|---|---|
| Docking tables | “Docking tables (optional)” on page 18 |
| Mounting devices on the docking table | Automation Solutions Technical Support |
| Devices that can be integrated in the BioCel System | “Device integration options” on page 20 |
| Available devices | “Additional BioCel System Devices” on page 71 |
| System robot | Robot user documentation |

# Checking for system readiness

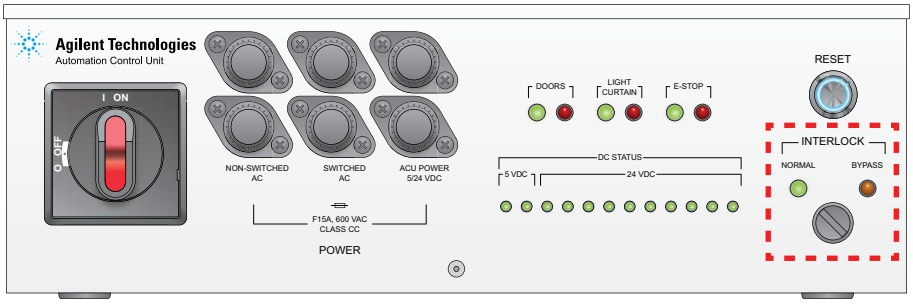
## Procedure

***To check that the BioCel System is ready for a protocol run:***

1. Remove labware at robot-accessible locations, including:
   - Platepads
   - External device plate stages
   - Third-party device areas that will accept labware from the BioCel System
2. Remove any obstacle in the robot's pathways.
3. Make sure all devices are set up correctly and prepared for the run. For instructions, see the user documentation for the device.
4. Make sure all devices are turned on, and the vacuum is turned on.

   For the devices that require compressed air, make sure the air pressure meets the operating requirements. For the BioCel System compressed air requirements, see the site-specific documentation provided by Automation Solutions. For other devices, see the user documentation for the device.
5. Replace the waste bin. See "Replacing the waste bin" on page 52.
6. Load labware. See "Loading labware in the system" on page 54.
7. Make sure the **INTERLOCK** key switch is set at **NORMAL**.

**WARNING** **Access to and use of the interlock key should be controlled. To avoid possible injury, the Interlock BYPASS setting should be used only by personnel trained to teach robots and devices in the system or workstation. The interlock key should be removed from the BioCel System when the switch is set at NORMAL and you are not teaching the robots and devices.**




## Related information

| For information about... | See... |
|---|---|
| Creating protocols | Lab automation software user guide, such as the *VWorks Automation Control User Guide* |
| Interlock key settings | *Automation Control Unit User Guide* |

| For information about... | See... |
| --- | --- |
| Starting, pausing, monitoring, and stopping protocol runs | Lab automation software user guide, such as the *VWorks Automation Control User Guide* |
| Stopping a run in an emergency | *BioCel System Safety Guide* |

# Replacing the waste bin

## About this topic

If the BioCel System has an optional waste bin, make sure you empty the bin before starting a protocol run. The waste bin can be free-standing or on a hanger. This section explains how to replace the waste bin on a hanger.

**WARNING** **If the BioCel System has an automated trash door over the waste bin, use caution when removing or replacing the waste bin. If a protocol is running, the automated door for the waste opening might open or close at any time. Do not attempt to retrieve or place the waste bin during a protocol run.**

## Removing the waste bin

***To remove the waste bin from its hanger:***

1. Open the cabinet door nearest the bin.
2. Hold the bin at the top-right corner with your right hand.
3. Lifting the front side of the bin upwards with your right hand, place your left hand underneath at the bottom-left corner.
4. Supporting the bin with both hands, lift it up and off the hanger.
5. Slide the bin out of the BioCel System.
6. Close the cabinet door.

## Installing the waste bin

***To replace the waste bin on its hanger:***

1. Open the cabinet door nearest the bin.
2. Slide the empty bin into the BioCel System until it lies underneath the waste opening, with the side of the bin resting against the hanger.
3. Lifting the front side of the bin upwards with your right hand, place your left hand underneath at the bottom left corner.
4. Using both hands, lift the bin up, over the hanger, and down so the hanger supports the underside of the lip.
5. Close the cabinet door.

## Related information

| For information about... | See... |
|---|---|
| BioCel System air source requirements | *BioCel System Site Preparation Guide* |
| External device air source requirements | External device user documentation |
| Diagnosing air pressure problems | "Troubleshooting hardware problems" on page 64 |

# Loading labware in the system

## When you need to manually load labware in the system

Depending on the protocol, you might need to manually place microplates, tip boxes, reservoirs, or counterweights onto platepads, hotel shelves, device shelves, or labware storage devices before starting the run. For example, you generally need to load labware into Labware Stackers or one or more cassettes (racks) in the Plate Hub.

How you load the labware in various devices depends on the type of robot in the system and the device. This topic provides the following:

- "BenchBot Robot and Direct Drive Robot guidelines" on page 54
- "Plate Hotel, Plate Hub, and Labware MiniHub guidelines" on page 54

*Note:* If you need to add or replace the labware during the run, be sure to follow the same guidelines.

## BenchBot Robot and Direct Drive Robot guidelines

Before loading labware in storage devices, always review the teachpoint file for labware orientation information. The labware must be loaded in the same orientation as specified in the teachpoint file.

## Plate Hotel, Plate Hub, and Labware MiniHub guidelines

### Before you start

Before loading labware in the Plate Hotel, Plate Hub, and Labware MiniHub, make sure the racks and slots used in the protocol are configured in the lab automation software. For detailed instructions, see "Plate Hotel" on page 111, "Plate Hub Carousel" on page 118, and the *Labware MiniHub User Guide*.

Review the "BenchBot Robot and Direct Drive Robot guidelines" on page 54 so that you know how the labware should be loaded.

## Related information

| For information about... | See... |
|---|---|
| Plate Hotel and Plate Hub | "Plate Hub Carousel" on page 118 |
| Labware MiniHub | *Labware MiniHub User Guide* |
| BenchBot Robot teachpoints | *BenchBot Robot User Guide* |
| Direct Drive Robot teachpoints | *Direct Drive Robot User Guide* |
| 3-Axis Robot or Peak KiNEDx Robot | *BioCel System User Guide*, Revision 01, August 2010 |

# 4 Maintenance and troubleshooting

This chapter explains how to maintain the BioCel System and provides troubleshooting information.

This chapter contains the following topics:


- "Routine maintenance" on page 56
- "Recovering from a power outage" on page 60
- "Recovering from servo errors" on page 61
- "Troubleshooting plate-sensor errors" on page 63
- "Troubleshooting hardware problems" on page 64
- "Reporting problems" on page 69


For software error messages, see the Automation Control Unit, robot, device, or lab automation software user documentation.

For emergency-stop recovery procedures, see *BioCel System Safety Guide*.

# Routine maintenance

## About this topic

This topic provides recommendations for maintaining the BioCel System:

- Cleaning up after every protocol run
- Cleaning up spills in the liquid cabinet
- Monthly inspection and maintenance

For the maintenance of integrated devices, see the user documentation for the devices.

## Cleaning up after every protocol run

In general, practice good housekeeping by cleaning up spills and following the post-run clean-up procedures.

***To clean up after a run:***

1. Follow the lab automation software prompts for post-run procedures, such as unloading the labware. See the lab automation software user documentation, such as *VWorks Automation Control User Guide*, for detailed instructions.
2. Unload used labware from the devices.
3. Remove manually placed labware from devices.
4. See the device user documentation for cleanup instructions.
5. Clean up spills, if any. If you have a liquid cabinet, see "Cleaning up spills in the liquid cabinet" on page 56.
6. Check run logs for errors.
7. If you have administrator or technician privileges and you have modified the protocol, including selected options, you can save the protocol.
8. Log out of the software. See the lab automation software user documentation, such as *VWorks Automation Control User Guide*, for instructions.

## Cleaning up spills in the liquid cabinet

**WARNING** **Follow your laboratory, local, state, and federal safety regulations when disposing of chemicals.**

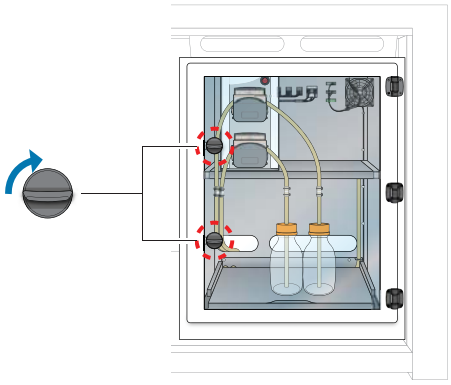
If your system has a liquid cabinet, you should check for and clean up any spills in the cabinet after every run.

***To clean up spills in the liquid cabinet:***

1. At the liquid cabinet:

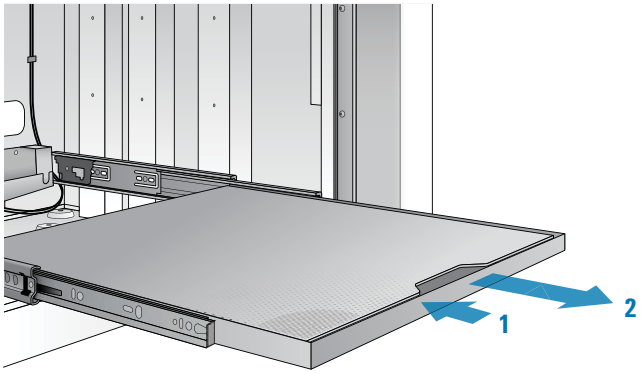
**a** Turn the two knobs clockwise to unlatch the door.

**b** Open the door.

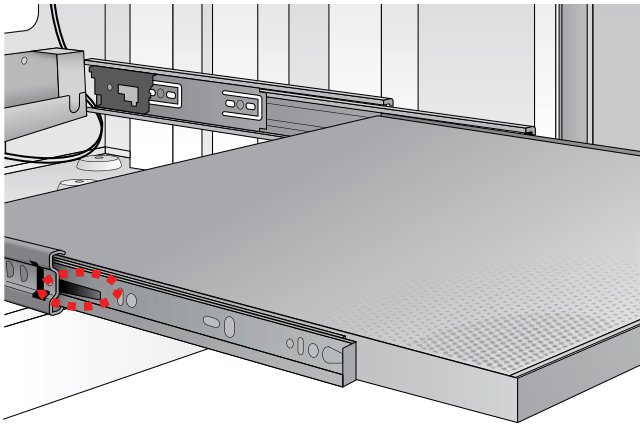


**2** Disconnect the tubes and remove the Pump Module, liquid containers, or other equipment from the shelves.

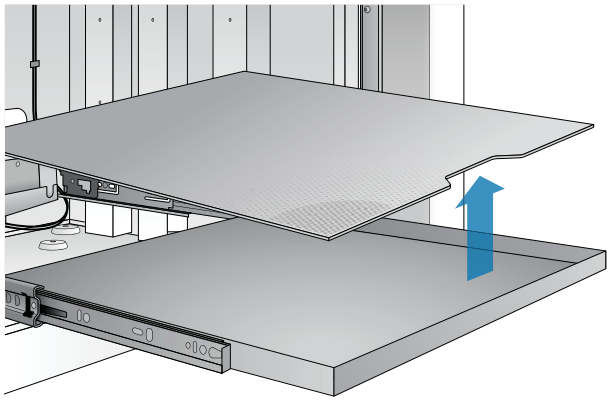
**3** Push the shelves inward to unlock the shelves (1), and then slide the shelves outward (2).




To facilitate cleaning, you can remove the shelves from the cabinet. To remove a shelf from the cabinet, while pressing the black tabs on both sides of the shelf, pull the shelf all the way out.

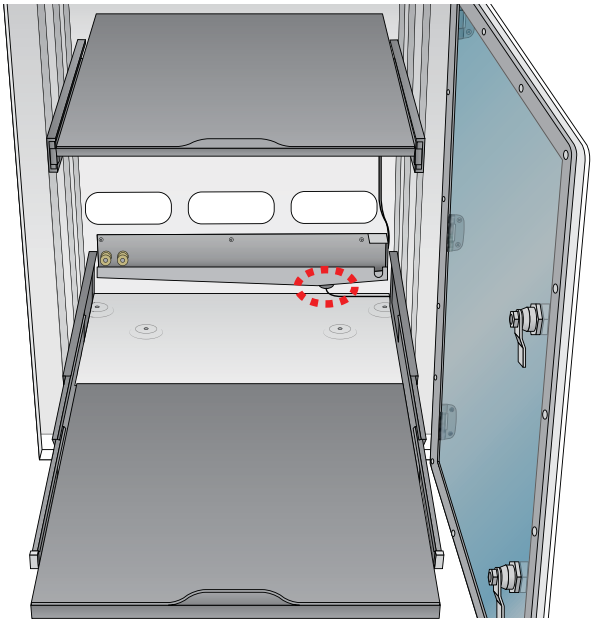


4 Lift and remove the mesh insert.



5 Clean and wipe dry the shelf tray and the mesh insert.

You can also clean the spill gutter at the lower back wall of the cabinet. If you do this, take care to clean around the spill-detection sensor at the bottom right side of the gutter.



6 Place the clean mesh insert on top of the shelf.

7 If the shelves were removed from the cabinet, insert the shelves back into the cabinet. Make sure the shelf is inserted correctly between the guide rails.

8 Slide the shelves in, and then push them against the back of the cabinet until they are locked into position.

9 Place the Pump Module, liquid containers, or other equipment back onto the shelves and reconnect the tubes.

10 Close the door, and then turn the two knobs counterclockwise to lock the door.

## Monthly inspection and maintenance

Once a month, check the following:

- Robot gripper pads are not torn, cracked or otherwise worn. To replace the robot gripper pads, see the robot user documentation or contact Automation Solutions Technical Support.
- Liquid-handling tubing is not torn, cracked or discolored. See the liquid-handling device user documentation for detailed instructions.
- Table top is free of debris, such as pieces of chipped microplates and microtubes.

## Related information

| For information about... | See... |
|---|---|
| Shutdown procedure | "Shutdown procedure" on page 30 |
| Safety | *BioCel System Safety Guide* |
| Reporting problems | "Reporting problems" on page 69 |

# Recovering from a power outage

## About this topic

This topic explains how to recover the BioCel System from a power outage.

## During the power outage

During a power outage, if the BioCel System has a UPS, the following occurs:

- The UPS starts to beep while providing power to the devices.
- If you have specified email notification during setup, the lab automation software writes an error message to the log, displays an error message on the screen, and notifies you.
- If the system is running a protocol, it will continue until the UPS charge passes the thresholds specified in lab automation software. When the threshold is reached, the lab automation software exits and the computer shuts down automatically.

If the BioCel System does not have a UPS, the system stops during a power outage. If the system is running a protocol, the run stops.

## Recommended actions during a power outage (systems with UPS only)

If a running protocol is nearly finished, you might consider letting it continue until it is finished.

If you started running a protocol and you anticipate a lengthy power outage, you might consider stopping the run.

## When the power is restored

If the BioCel System was not shut down during the power outage, the system will receive power, the UPS recharges, and the protocol (if running) continues.

If the BioCel System does not have a UPS and the running protocol was stopped, you need to restore the system and rerun the protocol. Follow the instructions in the *BioCel System Safety Guide* to restore the system.

## Related information

| For information about... | See... |
|---|---|
| Setting the VWorks software UPS threshold | *VWorks Automation Control User Guide* |
| Turning on the BioCel System | "Starting up and shutting down the BioCel System" on page 28 |
| Safety | *BioCel System Safety Guide* |
| Reporting problems | "Reporting problems" on page 69 |

# Recovering from servo errors

## About this topic

This topic explains how to recover from servo errors.

## Causes of servo errors

A servo system controls the robot's motions. The servo cuts power to the robot if it encounters resistance to movement that is slightly higher than that expected from the inertia of the robotic arm holding a labware. When the power is cut, a servo error is generated.

Most servo errors occur when the labware being carried crashes into another labware that is on a device.

## Procedure

***To recover from a servo error:***

1. Check the BioCel System table to determine the cause of the collision and remove the obstruction. For example, it might be a labware from a previous run.
2. Check the labware that is held by the robot to make sure it is not damaged and that its contents are not spilled.
3. Make sure the labware did not move in the robot gripper during the collision.
4. If the labware has not moved in the robot gripper and was not damaged during the collision, in the error message dialog box, click one of the following:

| Selection | Description |
|---|---|
| Diagnostics | Opens the device diagnostics dialog box.<br>*Note:* This selection is available only when you are in the middle of a protocol run and not while you are already in the device diagnostics software. |
| Retry | Attempts to restart the current command or task in the run. |
| Ignore and continue | Ignores the current command or task and continues to the next command or task in the protocol sequence. |
| Abort | Aborts the current command or task in the run. Select Abort if you have determined that the protocol run is not recoverable. |

5 If the labware has moved during the collision or was damaged, in the error message dialog box, click **Diagnostics** and move the labware manually:

   a Move the robot to a position that is easy for you to access.

   b While holding the labware with your hand, in the diagnostics software, use the available software command to open the robot grippers. The robot releases the labware. For diagnostics software instructions, see the robot user documentation.

   c Place the labware at the destination location manually.

   d Close the robot diagnostics software.

   e Click in the next error message dialog box, click **Ignore and continue.**

6 If the crash was severe, home the robot. To do this, in the robot diagnostics software, use the available command to home the robot. For diagnostics software instructions, see the robot user documentation.

## Related information

| For information about... | See... |
|---|---|
| Emergency stop circuits | “Power system” on page 148 |
| Automation Control Unit | “Electronics cabinet” on page 7 |
| Verifying teachpoints | Robot user documentation |
| Reporting problems | “Reporting problems” on page 69 |

# Troubleshooting plate-sensor errors

## About this topic

This topic explains how to troubleshoot plate-sensor errors in systems that have the 3-Axis Robot.

## Procedure

***To troubleshoot a plate-sensor error:***

1 If the robot is not holding labware in the gripper, determine whether the labware was:

- Knocked out of the gripper. In this case, find out what knocked the labware out of the gripper.
- Missing from the location at which the robot attempted to pick it up. In this case, place the correct labware in the location and click **Retry** in the **Robot Error** dialog box.
- Not picked up. In this case, there might be a problem with either the labware definition for the labware or a teachpoint. Check the labware definition. Check the teachpoint at the position where it failed to pick up the labware, and the teachpoint at the previous position. If there does not seem to be a teachpoint error, contact Automation Solutions Technical Support.

2 If the labware is held in the gripper but is not seated correctly, establish whether the labware was positioned correctly at the pickup location.

- If the labware was not positioned correctly at the pickup location, reposition the labware and click **Retry** in the **Robot Error** dialog box.
- If the labware was positioned correctly at the pickup location, there might be a problem with the approach or departure height. Alternatively, there might be a problem with the labware, the labware definition, a teachpoint, or the plate sensor. In this case, you should contact Automation Solutions Technical Support.

## Related information

| For information about... | See... |
|---|---|
| Emergency stop circuits | “Power system” on page 148 |
| Verifying teachpoints | Robot user documentation |
| Reporting problems | “Reporting problems” on page 69 |

# Troubleshooting hardware problems

## About this topic

This topic lists possible system-level hardware problems, the causes of the problems, and ways to resolve the problems. If the problem persists, contact Automation Solutions Technical Support.

For problems that are specific to the Automation Control Unit, robot, or a device, see the associated user documentation.

This topic describes the following:


- "Power and communication" on page 64
- "Air supply" on page 65
- "Protocol runs" on page 65
- "Robot and labware" on page 66
- "Delidding devices" on page 67


## Power and communication

| Problem | Cause | Solution |
|---|---|---|
| The system does not turn on. | The BioCel System is not connected to the power source. | Check the BioCel System power connections. |
| | The power supply circuit breaker switches have been tripped. | Reset the circuit breakers. |
| | The UPS is not turned on or is not working properly. | Turn on the UPS. See "Starting up and shutting down the BioCel System" on page 28. |
| | A power fuse in the Automation Control Unit is blown. | Replace the spent fuse. See the *Automation Control Unit User Guide* for instructions. |
| The integrated devices do not turn on. | The Automation Control Unit is not connected to the power source. | Connect the Automation Control Unit to the power source. |
| | The devices are not connected to the Automation Control Unit. | Make sure the devices are connected correctly and securely to the Automation Control Unit. For connection instructions, see the *Automation Control Unit User Guide*. |
| An integrated device is turned on, but it does not operate. | The device has not been initialized. | Initialize the device in the lab automation software. See the device and software user documentation for instructions. |

### Air supply

| Problem | Cause | Solution |
|---|---|---|
| A hissing sound is audible. | A leak is present in the air connection or inside the system. | Turn off the power at the Automation Control Unit ("Starting up and shutting down the BioCel System" on page 28). Turning off the power also turns off the air supply.<br>Check the air connections at the air distribution panel and at the source (house, cylinder, or pump).<br>Check the connections to individual devices and any junctions.<br>If the connections look fine, the leak might be inside the system. Contact Automation Solutions Technical Support. |
| Oil is present inside devices or the system. | The compressed air is not from an oil-free compressor and oil has leaked into the system. | Contact Automation Solutions Technical Support. |

### Protocol runs

| Problem | Cause | Solution |
|---|---|---|
| Unable to start protocol runs. | An obstacle is preventing the system door from closing or is interrupting the Light Curtain. | Remove any obstacle that is in the system doorway or is interrupting the Light Curtain. |
| Unable to resume runs after a pause. | An obstacle is preventing the system door from closing or is interrupting the Light Curtain. | Remove any obstacle that is in the system doorway or is interrupting the Light Curtain. |
| | The blue light on the RESET button is blinking and has not been pressed. | Press the RESET button on the Automation Control Unit. |
| The robot and many devices are moving too slowly during runs. | The INTERLOCK key switch is set at BYPASS. | If you are not teaching the robots or diagnosing system problems, set the INTERLOCK key switch at NORMAL. |
| The system does not pause when the door is opened or when the Light Curtain is interrupted. | The INTERLOCK key switch is set at BYPASS. | If you are not teaching the robots or diagnosing system problems, set the INTERLOCK key switch at NORMAL. |

## Robot and labware

*Note:* This topic presents system-level problems and solutions. For additional troubleshooting information, see the *BenchBot Robot User Guide* and the *Direct Drive Robot User Guide*.

| Problem | Cause | Solution |
|---|---|---|
| Labware drops or is held loosely by the robot. | • The labware definition for the microplate type might contain incorrect information.<br>• The Grip torque parameter value is incorrect for the labware.<br>• The Gripper offset range in incorrect.<br>• The robot gripper pads are dirty.<br>• The grippers are damaged. | • Check the labware definition for errors.<br>• In Labware Editor, change the Grip torque value for the labware.<br>• In the Labware Editor and the DDR Diagnostics, change the Gripper Offset Range values.<br>• Clean the robot gripper pads.<br>• Call Automation Solutions Technical Support to replace the damaged robot grippers. |
| Labware bends when held by the robot. | The Grip torque parameter value is incorrect for the labware. | In Labware Editor, change the Grip torque value for the labware. |
| The robot is not moving to and from the teachpoints accurately. | The robot axes need to be recalibrated. | Home the robot. See the robot user documentation:<br>• *BenchBot Robot User Guide*<br>• *Direct Drive Robot User Guide* |
| | The teachpoint coordinates or orientations are inaccurate. The approach height value might be incorrect. | Verify and edit the teachpoint. See the robot user documentation:<br>• *BenchBot Robot User Guide*<br>• *Direct Drive Robot User Guide* |
| The robot is unable to place labware at the target location accurately. | • The target location teachpoint is incorrect.<br>• The teachpoint of the previously scheduled device is incorrect.<br>• The target device was moved or reconfigured and the teachpoint was not updated.<br>• Approach height setting is incorrect.<br>• The labware might be damaged or deformed.<br>• The robot gripper pads are dirty.<br>• The robot gripper pads are worn unevenly or are damaged.<br>• Incorrect gripper offset range is specified. | • Verify and edit the teachpoints.<br>• Check the approach height setting.<br>• Clean the robot gripper pads.<br>• Replace the damaged or deformed labware.<br>• Check and correct the gripper offset ranges for the labware, the pick location, and the place location.<br>See the robot user documentation:<br>• *BenchBot Robot User Guide*<br>• *Direct Drive Robot User Guide* |

| Problem | Cause | Solution |
|---|---|---|
| The robot placed the labware such that the A1 well is in the wrong orientation. | The incorrect A1-well orientation is specified for the teachpoint. | In the teachpoint file, verify the A1-well orientation specification. Change the specification if necessary. See one of the following:<br>• *BenchBot Robot User Guide*<br>• *Direct Drive Robot User Guide* |
| The robot collides with devices or obstacles when moving from teachpoint to teachpoint. | The incorrect robot-arm orientation, approach height, or approach distance values are used. | In the teachpoint file, check and correct the robot-arm orientation, approach height value, and approach distance value. See one of the following:<br>• *BenchBot Robot User Guide*<br>• *Direct Drive Robot User Guide* |

### Delidding devices

| Problem | Cause | Solution |
|---|---|---|
| The Lid Hotel Station is not delidding or relidding properly. | • The rollers in the Lid Hotel Station are dirty.<br>• The robot is holding the labware at the lid instead of below at the microplate.<br>• Barcode labels are applied to the lid and the labware, preventing the lid from being removed.<br>• Too many layers of barcode labels are applied to the labware.<br>• The lids have sticky residues from the barcode labels. | • Clean the rollers in the Lid Hotel Station.<br>• Check and adjust the robot gripper offset for the labware.<br>• Check how the barcode labels are applied to the labware. Make sure the labels are applied correctly.<br>• Remove excess layers of old barcode labels before applying new labels.<br>• Clean the barcode label residues from the labware lids. |

| Problem | Cause | Solution |
|---|---|---|
| The Vacuum Delid Station is not working properly. | Air flow to the Vacuum Delid Station is insufficient. | • Check the air pressure and connections at the utilities panel and at the source (house, cylinder, or pump).<br>• Check for leaks in the air supply line. |
| | Holes in the black rubber suction cups are causing vacuum leaks. | Contact Automation Solutions Technical Support to replace the black rubber suction cups. |
| | The Vacuum Delid Station teachpoint is incorrect. | Check and correct the teachpoint. Make sure you check the approach height value.<br>Check the approach distance value. Also, check the selected custom action (Direct Drive Robot) or teachpoint type (BenchBot Robot). See one of the following:<br>• *BenchBot Robot User Guide*<br>• *Direct Drive Robot User Guide* |

## Related information

| For information about... | See... |
|---|---|
| BioCel System component names | "Hardware overview" on page 5 |
| Software error messages | Robot or device user documentation |
| Diagnosing problems | Robot or device user documentation |
| 3-Axis Robot | *BioCel System User Guide*, Revision 01, August 2010 |
| Peak KiNEDx Robot | *BioCel System User Guide*, Revision 01, August 2010 |
| Staubli Robot | *Staubli TX60 Device Driver User Guide* |
| Reporting problems | "Reporting problems" on page 69 |

# Reporting problems

## Contacting Automation Solutions Technical Support

*Note:* If you find a problem with the BioCel System, contact Automation Solutions Technical Support. For contact information, see Notices on the back of the title page.

*Note:* You can also send a software bug report from within the VWorks software.

## Reporting hardware problems

When contacting Agilent Technologies, make sure you have the serial number of the individual device ready. Do not use the system serial number.

## Reporting software problems

When you contact Automation Solutions Technical Support, make sure you provide the following:

- Short description of the problem
- Software version number
- Error message text (or screen capture of the error message dialog box)
- Screen capture of the About VWorks software dialog box
- Relevant software files

***To find the VWorks software version number:***

In the VWorks software, select **Help > About VWorks.**

***To find the Diagnostics software version number:***

1 Open **Diagnostics.**

2 Read the version number on the title bar of the diagnostics window.

***To send compressed protocol and associated files in VZP format:***

In the VWorks software, select **File > Export** to export and compress the following files:

- Protocol file
- Device file (includes the device profile and teachpoint file)
- Labware definitions
- Liquid classes
- Pipette techniques
- Hit-picking files
- Plate map files
- Barcode files
- Error library
- Log files
- Form file (*.VWForm)

## Reporting user guide problems

If you find a problem with this user guide or have suggestions for improvement, send your comments using one of the following methods:

- Click the feedback button (  ) in the online help.
- Send an email to documentation.automation@agilent.com.

## Related information

| For information about... | See... |
|---|---|
| Hardware problems | "Troubleshooting hardware problems" on page 64 |
| Software error messages | Robot or device user documentation |
| Recovering from emergency stops | *BioCel System Safety Guide* |
| Recovering from power outage | "Recovering from a power outage" on page 60 |
| Recovering from servo errors | "Recovering from servo errors" on page 61 |
| Troubleshooting plate-sensor error | "Troubleshooting plate-sensor errors" on page 63 |
| Safety | *BioCel System Safety Guide* |

# A
# Additional BioCel System Devices

This chapter describes the additional devices available for integration in the BioCel System and provides installation and configuration instructions. This chapter contains the following topics:


- "BioCel System additional devices overview" on page 72
- "Auxiliary barcode reader" on page 74
- "Lid Hotel Station" on page 81
- "Linear Translator" on page 88
- "Orbital Shaking Station" on page 101
- "Phantom Robot" on page 107
- "Plate Hotel" on page 111
- "Plate Hub Carousel" on page 118
- "Platepad" on page 131
- "Vacuum Delid Station" on page 134
- "Waste bin" on page 138
- "Weigh Pad" on page 141

# BioCel System additional devices overview

## About this topic

This topic lists and briefly describes additional devices available for integration in the BioCel System. For the latest list of devices available, contact Automation Solutions Technical Support.

## Additional devices list

In addition to the devices that are listed in "Device integration options" on page 20, you can install and configure one or more of the following Automation Solutions devices in the BioCel System.

| Device | Description | See... |
|---|---|---|
| Automation Control Unit | Distributes AC and DC power to system components, provides compliant safety features, receives and transmits signals from and to system components. | *Automation Control Unit User Guide* |
| Auxiliary barcode reader | Scans barcodes on labware. | "Auxiliary barcode reader" on page 74 |
| Device stacking shelves | Allows the stacking of devices to maximize the use of space. | Automation Solutions Technical Support |
| Labware MiniHub | Stores microplates and tip boxes. The device is more compact than the Plate Hub. | *Labware MiniHub User Guide* |
| Labware Stacker | Stores deep-well and shallow-well microplates, pin tools, tip boxes, and lids. Dispenses and receives the labware from robots. | *Labware Stacker User Guide* |
| Lid Hotel Station | Removes and stores microplate lids. | "Lid Hotel Station" on page 81 |
| Linear Translator | Transports microplates, one at a time, from a device (or robot) to a device (or robot). The device has a fixed-length body with a motorized plate stage that moves from one end to another. | "Linear Translator" on page 88 |
| Microplate Exchanger | Passes microplates between two system robots. | *Microplate Exchanger User Guide* |
| Orbital Shaking Station | Shakes labware for a specified length of time. | "Orbital Shaking Station" on page 101 |
| Phantom Robot | Permits the manual movement of labware during a protocol run. | "Phantom Robot" on page 107 |
| Plate Hotel | Stores microplates. | "Plate Hotel" on page 111 |
| Plate Hub Carousel, Landscape or Portrait | Stores microplates and tip boxes. | "Plate Hub Carousel" on page 118 |

| Device | Description | See... |
|---|---|---|
| Platepad | Holds a single microplate. | "Platepad" on page 131 |
| Vacuum Delid Station | Removes microplate or tip box lids using vacuum. | "Vacuum Delid Station" on page 134 |
| Waste bin | Receives microplate lids, used pipette tips, or other trash. | "Waste bin" on page 138 |
| Weigh Pad | Monitors and maintains the percentage of liquid in a container that is on the Weigh Pad. | "Weigh Pad" on page 141 |

## Related information

| For information about... | See... |
|---|---|
| Using the device in a protocol | *VWorks Automation Control User Guide* |
| BioCel System setup workflow | "Setup Workflow" on page 24 |
| BioCel I/O Interface | *BioCel System User Guide*, Revision 01, August 2010 |
| Microplate Conveyor | *BioCel System User Guide*, Revision 01, August 2010 |
| Microplate Shuttle and Rotator | *BioCel System User Guide*, Revision 01, August 2010 |

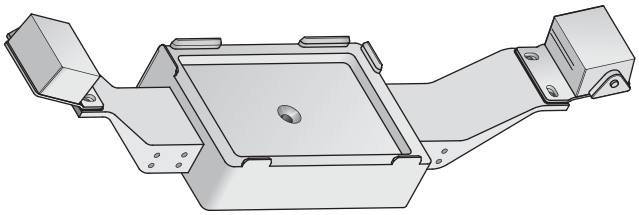
# Auxiliary barcode reader

## About this topic

This topic describes the auxiliary barcode reader, explains its use, and provides the setup instructions.

## Description

The auxiliary barcode reader is either attached to a platepad or a device. Depending on the setup, the barcode reader scans barcodes on one of four sides of microplates. The following figure shows an example barcode reader that is attached to a platepad and is oriented to scan barcodes on the east and west sides of microplates.



## Setup workflow

| Step | Procedure | See... |
|---|---|---|
| 1 | Install the barcode reader. | Automation Solutions Technical Support |
| 2 | Add the barcode reader in the device file. | “Adding the barcode reader in the device file” on page 75 |
| 3 | Add the platepad or device to which the barcode reader is attached. | “Adding the platepad or device” on page 75 |
| 4 | Create a profile for the barcode reader. | “Creating a profile for the barcode reader” on page 77 |
| 5 | Set and edit the teachpoint for the barcode reader platepad or device. | Robot user documentation |
| 6 | Test the barcode reader. | “Testing the barcode reader” on page 78 |

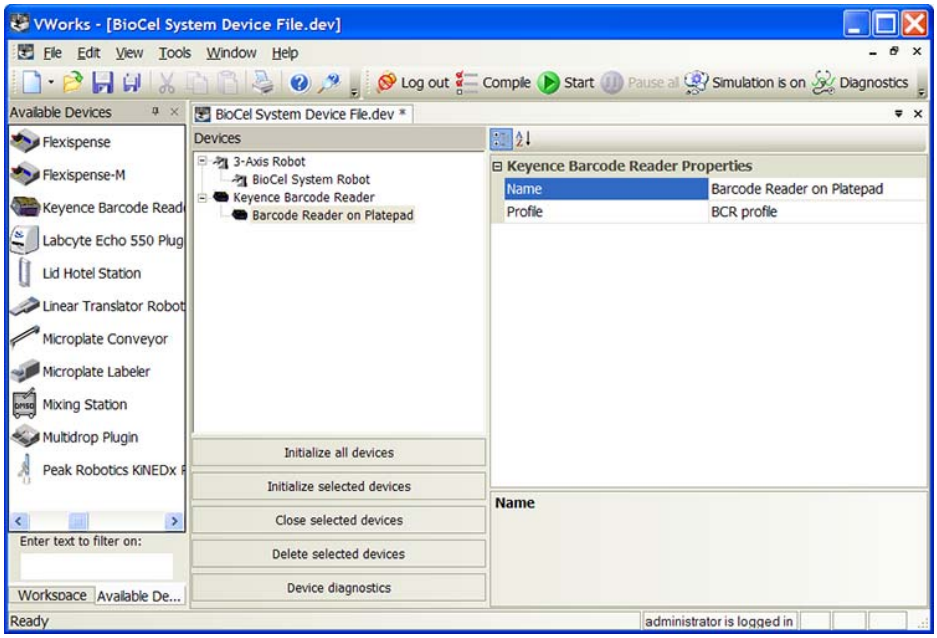
## Adding the barcode reader in the device file

The VWorks software device file is set up with the correct devices and device configurations for your BioCel System. You do not need to add a new barcode reader to the device file unless you are adding another barcode reader or replacing the existing barcode reader. For information about device files, see "Devices and device file defined" on page 32.

***To add the barcode reader to the device file:***

1 In the VWorks software, open the device file and add the Keyence Barcode Reader. See "Adding and deleting devices in the software" on page 32 for instructions.

2 In the **Keyence Barcode Reader Properties** area, type or select the following:




| Property | Description |
|---|---|
| Name | The name of the barcode reader device. |
| Profile | The profile associated with the device.<br>Select the desired profile from the list. If you have not created a profile, see "Creating a profile for the barcode reader" on page 77, and then return to this step to select the profile. |

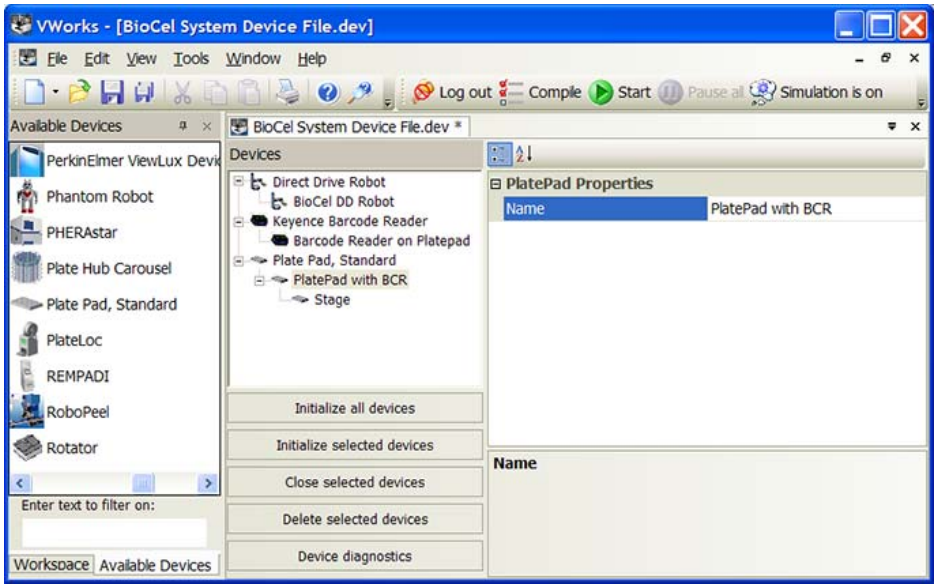
3 Select **File > Save.**

## Adding the platepad or device

After adding the barcode reader in the device file, you must add the platepad or device to which the barcode reader is attached. In addition, you specify the barcode reader in the platepad or device properties.

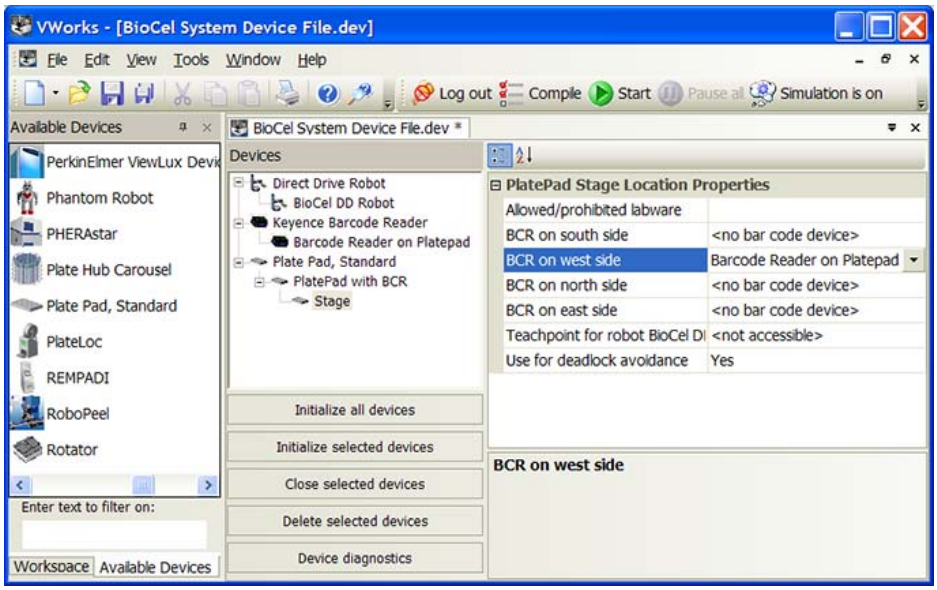
***To add the platepad or device in the device file:***

1 In the device file, add the Plate Pad or the desired device. See "Platepad" on page 131 or "Adding and deleting devices in the software" on page 32 for instructions.




2 In the **Devices** area, expand the **Plate Pad** or device, and then select the **Stage** to which the barcode reader is attached.

3 In the **PlatePad Stage Location Properties** or device stage properties area, type or set the parameters. See "Platepad" on page 131 or the device guide for detailed instructions. Make sure you specify the location of the barcode reader on the platepad or device.



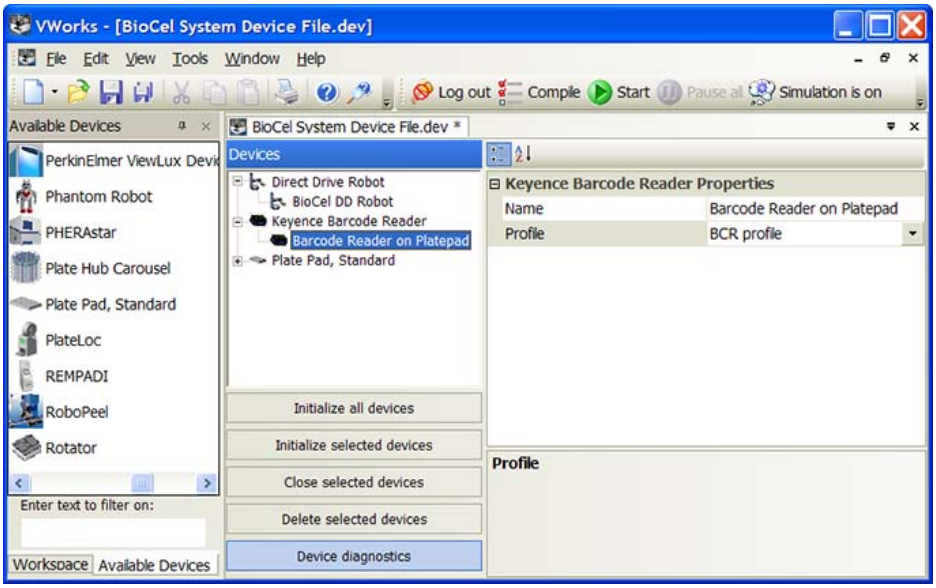

4 Select **File > Save.**

## Creating a profile for the barcode reader

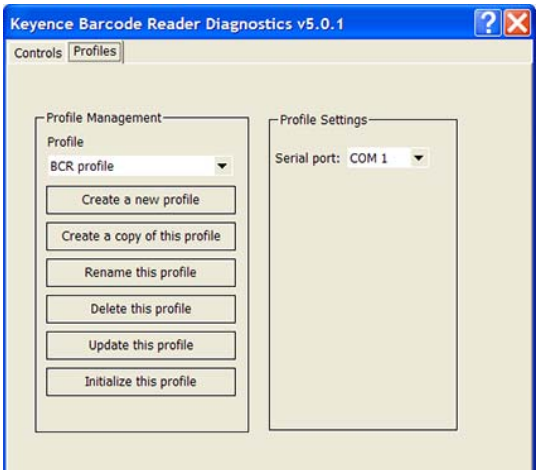
The barcode reader profile allows you to set up communication between the barcode reader and the controlling computer.

***To create a profile for the barcode reader:***

1 In the **VWorks** window, select the **Keyence Barcode Reader** device, and then click **Device diagnostics.**




The Keyence Barcode Reader Diagnostics dialog box opens.




2 Click the **Profiles** tab.

3 Click **Create a new profile.** The Create Profile dialog box opens.

4 Type a name for the new profile, and then click **OK.** The new profile name appears in the Profile Management area.

5 In the **Profile Settings** area, select the COM port number used by the barcode reader.

6 Click **Update this profile** to save the changes.

7 Click **Initialize this profile** to establish communication with the barcode reader.

8 Return to the device file and select the profile for the barcode reader device.

## Testing the barcode reader

### Barcode label specifications

The barcodes must meet the following requirements:

| Characteristic | Requirement |
|---|---|
| Barcode formats | Code 39<br>Codabar<br>Code 128<br>Interleaved 2 of 5<br>Code 93<br>UPC/EAN<br>Pharmacode<br>PDF417 |
| Barcode height | 3.34 mm (0.13 in) or taller |
| Print contrast | 25% at 650 nm |
| Quiet zone | 10 times the dimension of the narrowest element in the barcode or 6.35 mm (0.25 in), whichever is greater |

**IMPORTANT** Although the barcode reader supports all of the formats listed in the table, its setup is limited to four formats. Use the barcode reader utility program to select the four desired barcode formats. See the barcode reader user documentation for instructions.

### Before you start

Make sure you have the following:

- M2 hex wrench
- Spare microplate that has a barcode label

### Test procedure

**WARNING The barcode reader sensor head contains a class II laser that emits light at 650 nm, producing up to 1.5 mW of energy. Do not look directly into the laser beam. Looking directly into the laser beam or looking at the reflected beam can cause eye injury.**

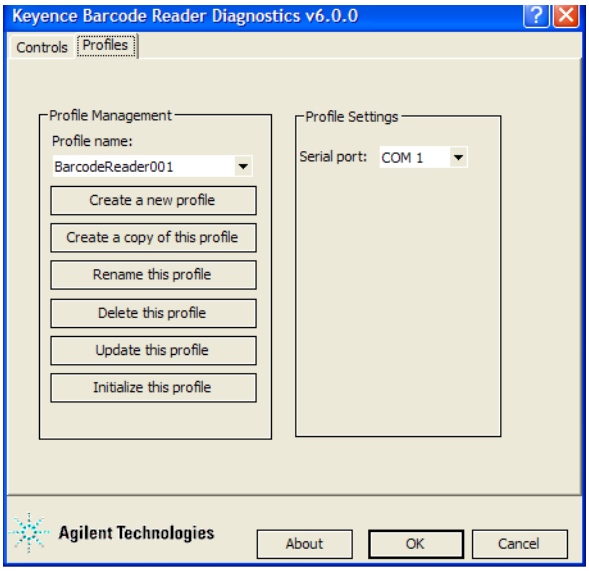
**WARNING Do not disassemble the barcode reader sensor head. Laser emission does not automatically turn off if the sensor head is disassembled.**

***To test the barcode reader:***

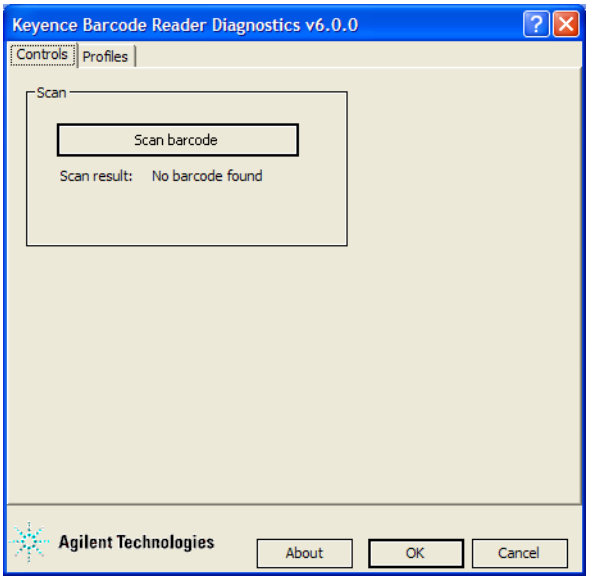
1 Place the spare microplate on the Barcode Reader location and make sure the barcode label faces the Barcode Reader mirror.

2 Open **Keyence Barcode Reader Diagnostics.**

3 In the **Profiles** tab, select the Barcode Reader profile from the **Profile** list, and click **Initialize this profile**.




4 Click the **Controls** tab.




5 Click **Scan barcode.** The barcode reader laser turns on briefly to scan the barcode label. One of the following messages appears next to Scan result:

| Scan result message | Description | Next step |
|---|---|---|
| *<barcode text>* | The barcode was successfully scanned. | The setup is complete. No further adjustment is required. |
| No barcode found | Barcode scanning was not successful. | Proceed to step 6. |

6 If the No barcode found message appears, click **Scan barcode** again and check that the barcode reader laser beam is projected onto the vertical center of the barcode label.

If the laser beam is not at the vertical center of the label, adjust the scan angle of the barcode reader.

### Adjusting the scan angle

Depending on the setup, the angle adjustment process can differ. If the barcode reader is attached to a platepad, you can loosen the screws on both sides of the reader to change the scan angle. If the barcode reader is mounted on the side of a device, you might have to loosen the screws on the mounting plate to change the scan angle. If you need assistance with the process, contact Automation Solutions Technical Support.

### Troubleshooting

If the reader is unable to scan the barcode after many adjustments, try one or more of the following:

- Make sure the barcode label is applied properly onto the microplate.
- Make sure the microplate is sitting level at the Barcode Reader location.
- Make sure the barcode and label meet the format requirements. See "Barcode label specifications" on page 78.
- Repeat the adjustment process using a new spare microplate.

## Related information

| For information about... | See... |
|---|---|
| Set the teachpoint for the barcode reader platepad or device | Robot user documentation |
| Using the barcode reader in a protocol | *VWorks Automation Control User Guide* |
| Available devices | "BioCel System additional devices overview" on page 72 |

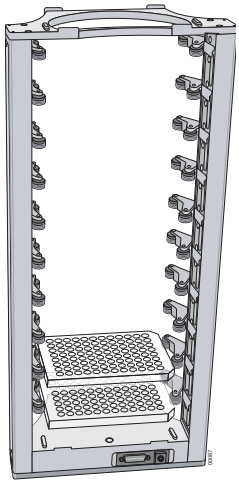
# Lid Hotel Station

## About this topic

This topic describes the Lid Hotel Station, explains its use, and provides the configuration instructions.

## Description

The Lid Hotel Station[1] is a vertical rack that holds microplate lids while the microplates are processed. Rollers at each storage bay (or slot) hold onto a lid while the robot moves the microplate downward to remove the lid. When the microplate returns to the storage bay, the robot moves the microplate upward for relidding, and then pulls the lidded microplate out of the bay.



[1] Concept developed by Novartis Pharma AG, NIBR/DT/IAT, Basel, Switzerland.

## Setup workflow

| Step | Procedure | See... |
|---|---|---|
| 1 | Install the Lid Hotel Station. | Automation Solutions Technical Support |
| 2 | Add the Lid Hotel Station in the device file. | “Adding the Lid Hotel Station in the device file” on page 82 |
| 3 | Create a profile for the Lid Hotel Station. | “Creating a profile for the Lid Hotel Station” on page 83 |
| 4 | Set, edit, and verify the teachpoint for each storage bay (slot). | “Setting storage bay teachpoints” on page 85 |

## Adding the Lid Hotel Station in the device file

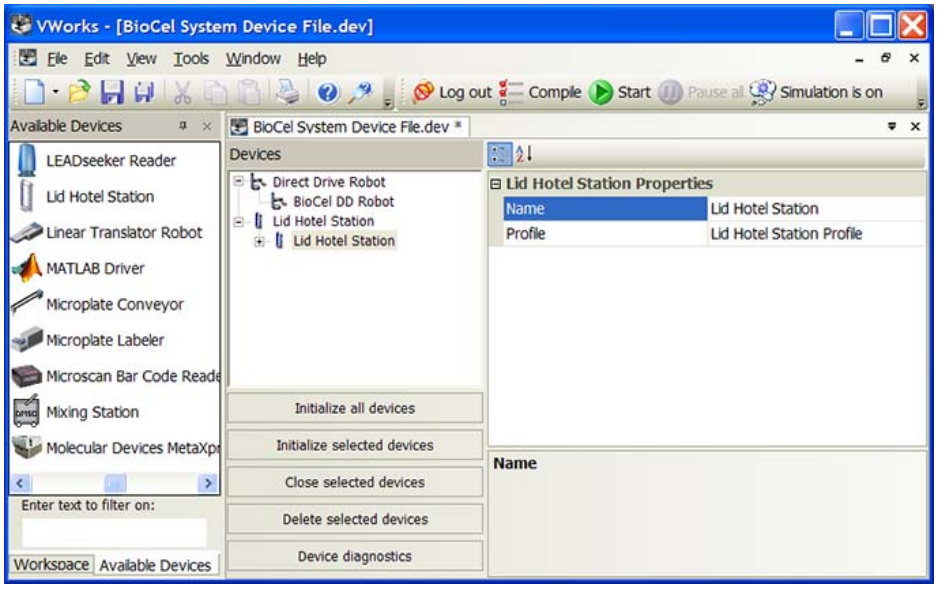
The VWorks software device file is set up with the correct devices and device configurations for your BioCel System. You do not need to add a new Lid Hotel Station to the device file unless you are adding another Lid Hotel Station or replacing the existing Lid Hotel Station. For information about device files, see "Devices and device file defined" on page 32.

*Note:* After adding the Lid Hotel Station, you must add each storage bay (slot) as a device to the device file.

### *To add the Lid Hotel Station to the device file:*

1 In the VWorks software, open the device file and add the Lid Hotel Station. See "Adding and deleting devices in the software" on page 32 for instructions.

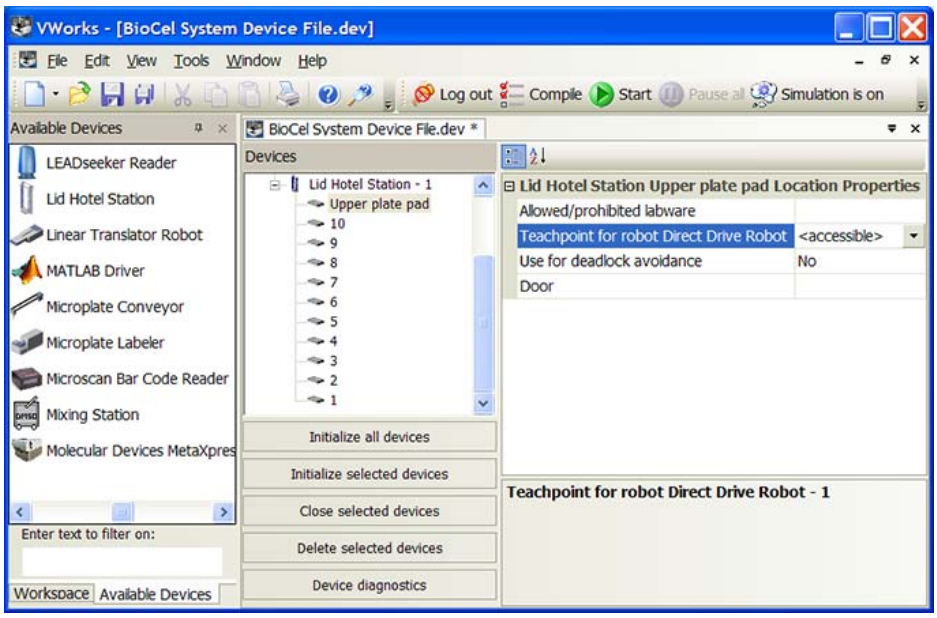
2 In the **Lid Hotel Station Properties** area, type or select the following:




| Property | Description |
|---|---|
| Name | The name of the Lid Hotel Station device. |
| Profile | The profile associated with the device.<br>Select the desired profile from the list. If you have not created a profile, see "Creating a profile for the Lid Hotel Station" on page 83, and then return to this step to select the profile. |

3 In the **Devices** area, expand Lid Hotel Station, and then select a storage bay (slot) number.

**4** In the **Lid Hotel Station Properties** area, type or set the following:




| Property | Description |
|---|---|
| Allowed/prohibited labware | Permitted labware class for the selected location.<br>For example, you might specify that only tip boxes are allowed at a given location. For details on labware classes, see the *VWorks Automation Control Setup Guide*. |
| Teachpoint for robot <BioCel System Robot> | The name of the teachpoint for the stage location. This selection enables the robot to move correctly to and from the storage bay (slot) during a protocol run.<br>For example, if the robot teachpoint file contains a teachpoint for this slot, you must select that teachpoint.<br>*Note:* If the computer is not connected to the BioCel System and you want to simulate a run, select **<accessible>.** |
| Use for deadlock avoidance | Option to permit the location to be used for deadlock avoidance.<br>**IMPORTANT** Always select **No** for the Lid Hotel Station. |

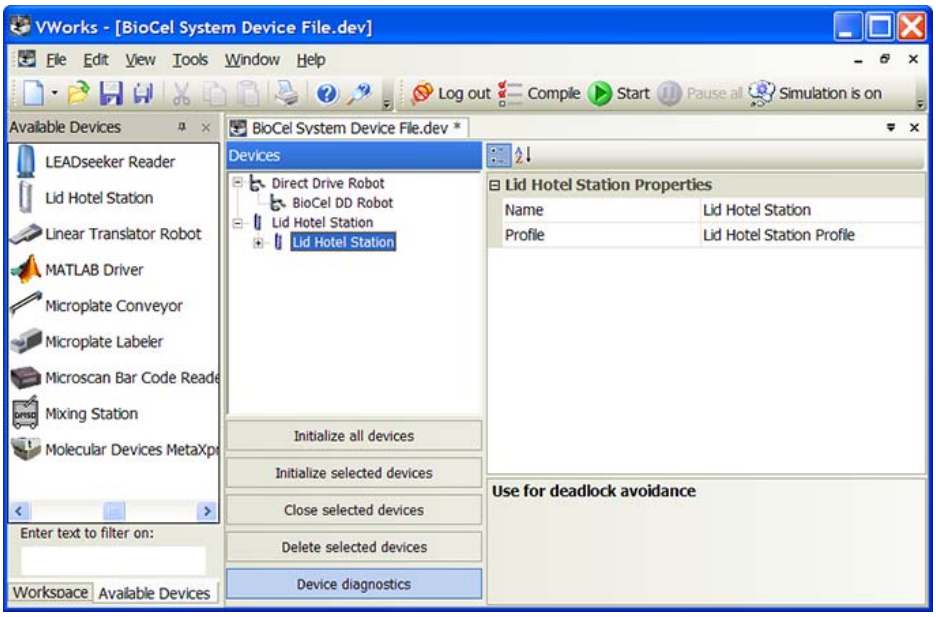
**5** Select **File > Save.**

## Creating a profile for the Lid Hotel Station

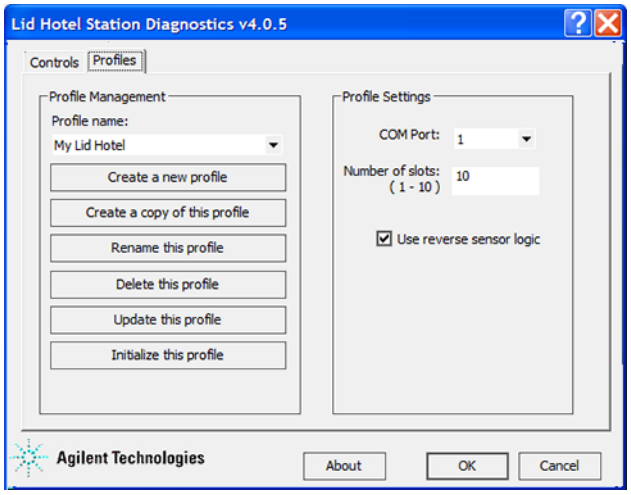
The Lid Hotel Station profile allows you to set up communication between the Lid Hotel Station and the controlling computer. You can also indicate the number of hotel slots that will be used.

***To create a profile:***

1 In the VWorks software, open **Lid Hotel Station Diagnostics.**




2 The Lid Hotel Station Diagnostics dialog box opens.




3 Click the **Profiles** tab.

4 Click **Create.** The New Profile dialog box opens.

5 Type a name for the new profile, and then click **OK.** The new profile name appears in the Profile Control area.

6 In the **Parameters** area:

- In the **COM Port** list, select the serial port that connects the Lid Hotel Station to the controlling computer.
- In the **Number of slots** box, type the number of storage bays (slots) you want to use. By default, the software displays the maximum number of slots: 10. However, if you only want to use the slots 1 through 5, type 5.
- Always select **Use reverse sensor logic.** If an empty Lid Hotel Station sensor shows labware present in all slots, clear the **Use reverse sensor logic** check box.

7 Click **Save settings.**

## Setting storage bay teachpoints

This section presents guidelines for setting Lid Hotel Station storage bay teachpoints. For detailed instructions on how to set a teachpoint, see the robot user documentation.

### Direct Drive Robot guidelines

***When you set the storage bay (slot) teachpoints:***

1 Use the provided teaching jig to set a teachpoint at the top of the hotel. The platepad at the top of the hotel is similar to a standard platepad, so set the teachpoint as if it is a standard platepad.

2 In **DDR Diagnostics**, copy the teachpoint you created in step 1 and rename it for Lid Hotel slot 10. (See the *Direct Drive Robot User Guide* for instructions on copying teachpoints.)

Make sure you:

- Set **Approach Ht (with labware)** and **Approach Ht (no labware)** at 0.
- For **Pick Custom Action,** select **Lid Hotel relid.**
- For **Place Custom Action,** select **Lid Hotel delid.**
- Edit **Position Z** for the new teachpoint by subtracting 22 mm from the current value.

3 In **DDR Diagnostics**, copy the slot 10 teachpoint, rename it for slot 9, and then edit **Position Z** by subtracting 40 mm from the current value. You do not need to edit the other teachpoint parameters.

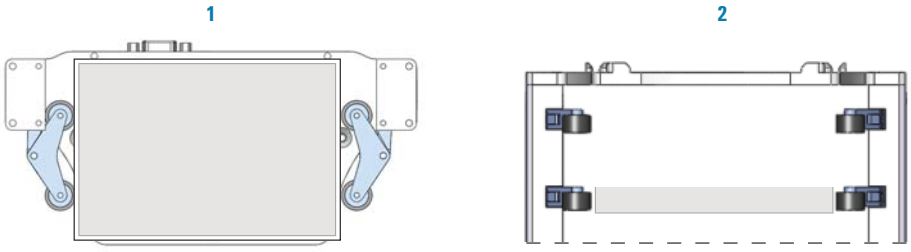
4 Repeat step 3 to create teachpoints for the remaining slots.

5 Save the teachpoints.

6 Verify the teachpoints are set accurately. Make adjustments if necessary.

During the verification process, make sure:

- The lid does not readjust itself in the $x$-$y$ plane as the robot moves the labware away from the lid. Readjusting movements indicate the teachpoint needs to be edited.
- The lid is centered between the rollers (1). When viewing the lid from the side, the rollers should be vertically centered (2).




### BenchBot Robot guidelines

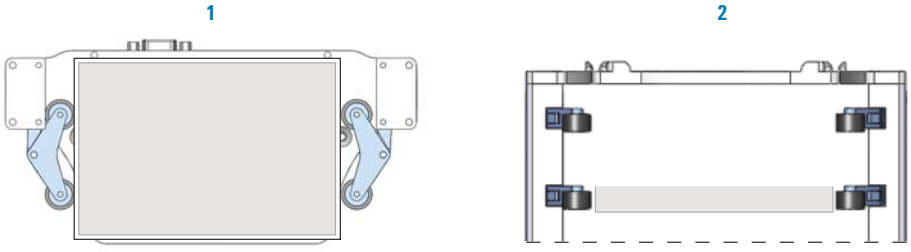
To set teachpoints for the storage bays (slots) in the hotel, see the robot user documentation.

***When you set the storage bay (slot) teachpoints:***

1. Install the provided teaching plate in the robot grippers, and then enter the teach mode.
2. Use the provided teaching plate to set a teachpoint at the top of the Lid Hotel Station. The platepad at the top of the hotel is similar to a standard platepad, so set the teachpoint as if it is a standard platepad.
3. Manually move the robot arm and position the teaching plate in the Lid Hotel Station slot 10 as follows:
   - The bottom of the robot grippers should rest gently on top of the rollers.
   - Make sure the teaching plate is centered between the rollers. Align the front edge of the teaching plate with back side of the Lid Hotel Station.
4. Set the teachpoint at slot 10.

   When setting the teachpoint, make sure you:
   - Select **Lid Hotel** from the **Type** list.
   - Set **Approach Ht** at 0.
5. Repeat steps 3 and 4 for the remaining slots.
6. Save the teachpoints.
7. Verify the teachpoints are set accurately. Make adjustments if necessary.

   During the verification process, make sure:
   - The lid does not readjust itself in the $x$-$y$ plane as the robot moves the labware away from the lid. Readjusting movements indicate the teachpoint needs to be edited.
   - The lid is centered between the rollers (1). When viewing the lid from the side, the rollers should be vertically centered (2).

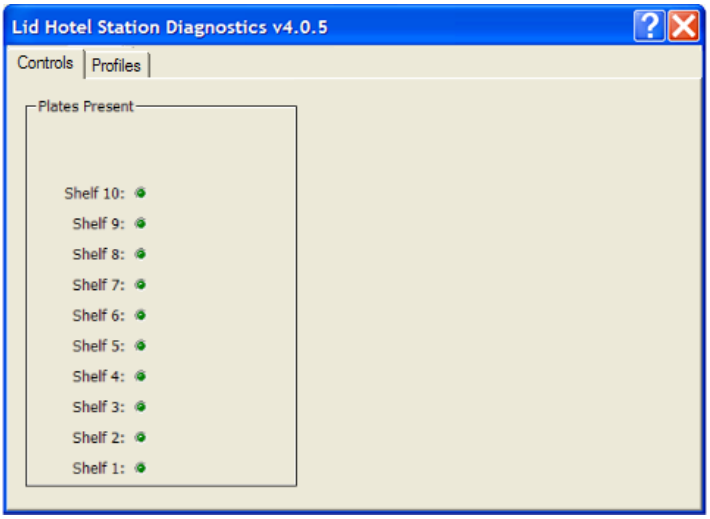


## Monitoring the hotel-slot status

Sensors at each hotel storage bay (slot) detect the presence of a lid, and the software displays the status in Lid Hotel Diagnostics.

***To view the hotel storage bay (slot) status:***

In **Lid Hotel Diagnostics,** click the **Controls** tab. The list of storage bays (slots) and corresponding indicator lights are displayed in the Plates Present area. If a bay (slot) is occupied, the corresponding light turns on.




## Related information

| For information about... | See... |
|---|---|
| Using the Lid Hotel Station in a protocol | *VWorks Automation Control User Guide* |
| Vacuum Delid Station | "Vacuum Delid Station" on page 134 |
| Available devices | "BioCel System additional devices overview" on page 72 |

# Linear Translator

## About this topic

This topic describes the Linear Translator, explains its use, and provides the configuration instructions.

## Description

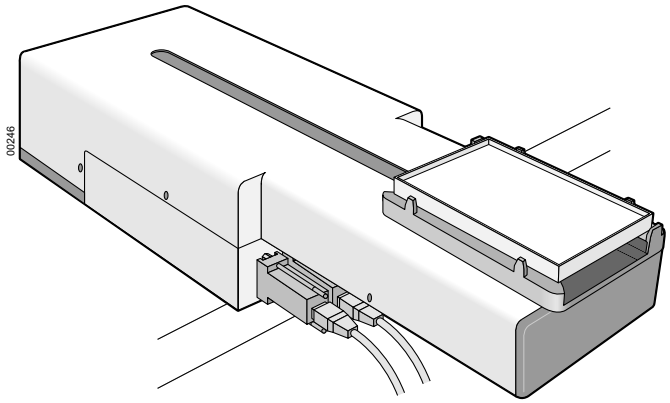
The Linear Translator has a fixed-length body with motorized plate stage that transports a microplate in one of the following ways:

- Between two robots residing in adjacent BioCel Systems
- Between a BioCel System robot and an incubator that has its own robot

The translator has two axes that enable two types of movements:

- Transports microplates linearly along the mover.
- Rotates microplates in any orientation at both ends of the mover.

Enabling microplate rotation accommodates different device or robot-access requirements. For example, the incubator at one end of the translator might require landscape microplate-orientation while the robot at the opposite end of the mover might require the microplate to be at a specific angle.




## Setup workflow

| Step | Procedure | See... |
|---|---|---|
| 1 | Install the Linear Translator. | Automation Solutions Technical Support |
| 2 | Add the Linear Translator in the device file. | “Adding the Linear Translator to the device file” on page 89 |
| 3 | Create a profile for the Linear Translator. | “Creating a profile for the Linear Translator” on page 93 |

| Step | Procedure | See... |
|---|---|---|
| 4 | Set and edit the teachpoints for the Linear Translator. | "Setting teachpoints for the translator" on page 96 |
| 5 | Verify the Linear Translator teachpoints. | "Verifying translator teachpoints" on page 97 |

## Adding the Linear Translator to the device file

The VWorks software device file is set up with the correct devices and device configurations for your BioCel System. You do not need to add a new Linear Translator to the device file unless you are adding another Linear Translator or replacing the existing Linear Translator. For information about device files, see "Devices and device file defined" on page 32.

When setting up the Linear Translator, you must:

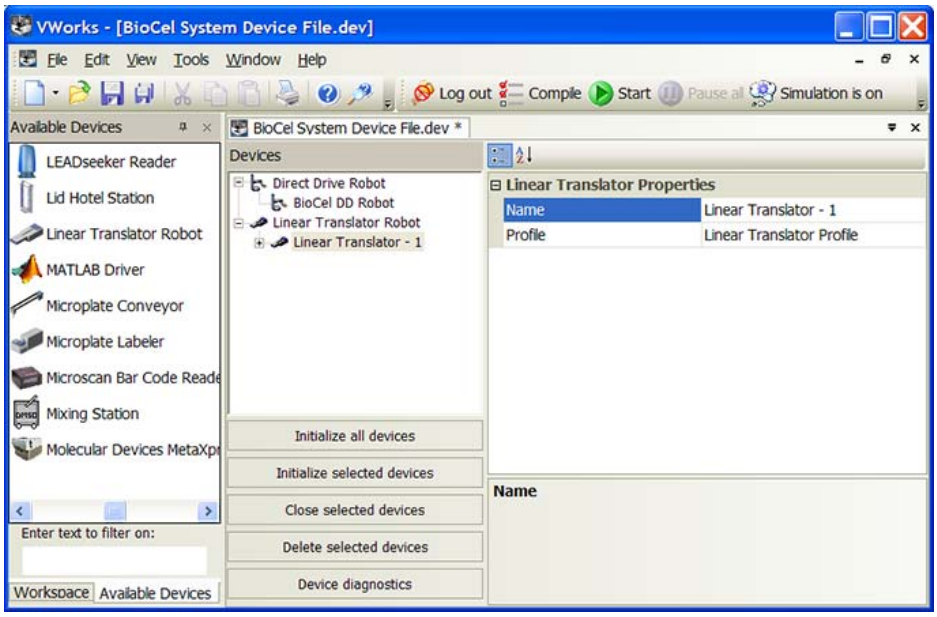
1 Add the Linear Translator in the device file and specify how the translator will interact with the BioCel System robot.

2 Revise the incubator device properties to specify how the translator will interact with the incubator.

***To add the Linear Translator to the device file:***

1 In the VWorks software, open the device file and add the Linear Translator. See "Adding and deleting devices in the software" on page 32 for instructions.

2 In the **Linear Translator Properties** area, type or select the following:

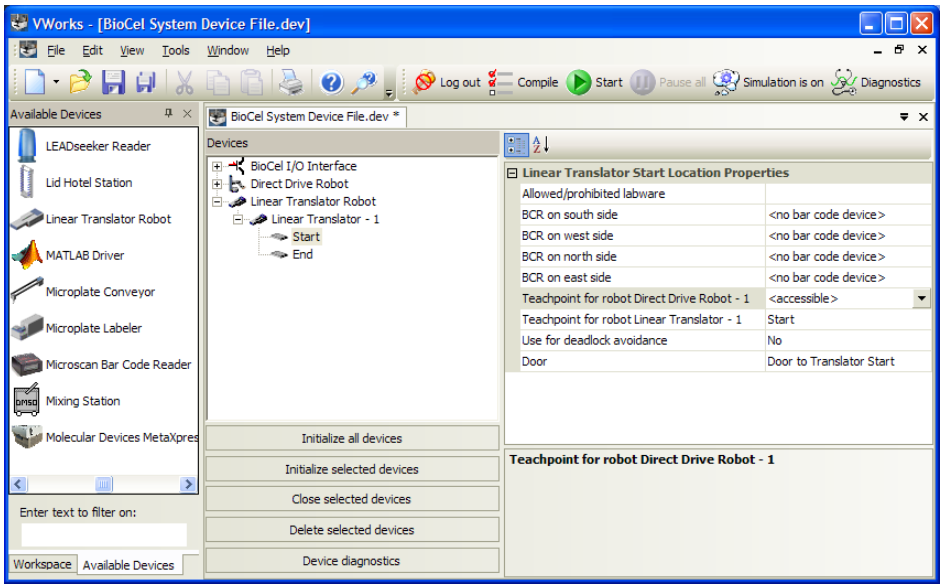



| Property | Description |
|---|---|
| Name | The name of the Linear Translator device. |

| Property | Description |
|---|---|
| Profile | The profile associated with the device.<br>Select the desired profile from the list. If you have not created a profile, see "Creating a profile for the Linear Translator" on page 93, and then return to this step to select the profile. |

3 In the **Devices** area, expand Linear Translator, and then select the **Start** stage.

4 In the **Linear Translator Properties** area, set up the end that will interact with the BioCel System robot:

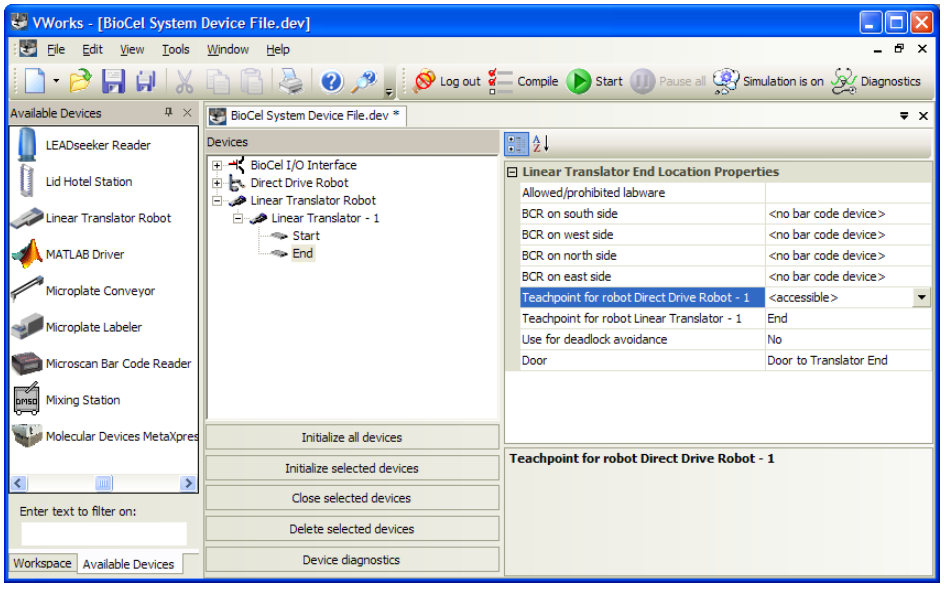



| Property | Description |
|---|---|
| Allowed/prohibited labware | Permitted labware class for the selected location.<br>For example, you might specify that only tip boxes are allowed at a given location. For details on labware classes, see the *VWorks Automation Control Setup Guide*. |
| BCR on south/west/north/ east side | The location of the barcode reader and the desired barcode reader device.<br>Use these fields only if a barcode reader is installed on this device. |

| Property | Description |
|---|---|
| Teachpoint for robot <BioCel System Robot> | The name of the teachpoint for the Start location. This selection enables the BioCel System robot to move correctly to and from the Start location during a protocol run.<br>For example, if the robot teachpoint file contains a teachpoint for this location, you must select that teachpoint.<br>*Note:* If the computer is not connected to the BioCel System and you want to simulate a run, select **<accessible>.** |
| Teachpoint for robot <Linear Translator> | The teachpoint that is set up for the Linear Translator. Select **Start.**<br>For setup instructions, see "Setting teachpoints for the translator" on page 96. |
| Use for deadlock avoidance | Option to permit the location to be used for deadlock avoidance.<br>**IMPORTANT** Always select **No** for the Linear Translator. |
| Door | The internal system door associated with this device. For the Linear Translator, this is one of the doors between two connecting systems. |

5 In the **Devices** area, select the **End** stage under Linear Translator.

6 In the **Linear Translator Properties** area, set up the end that will interact with the incubator robot:



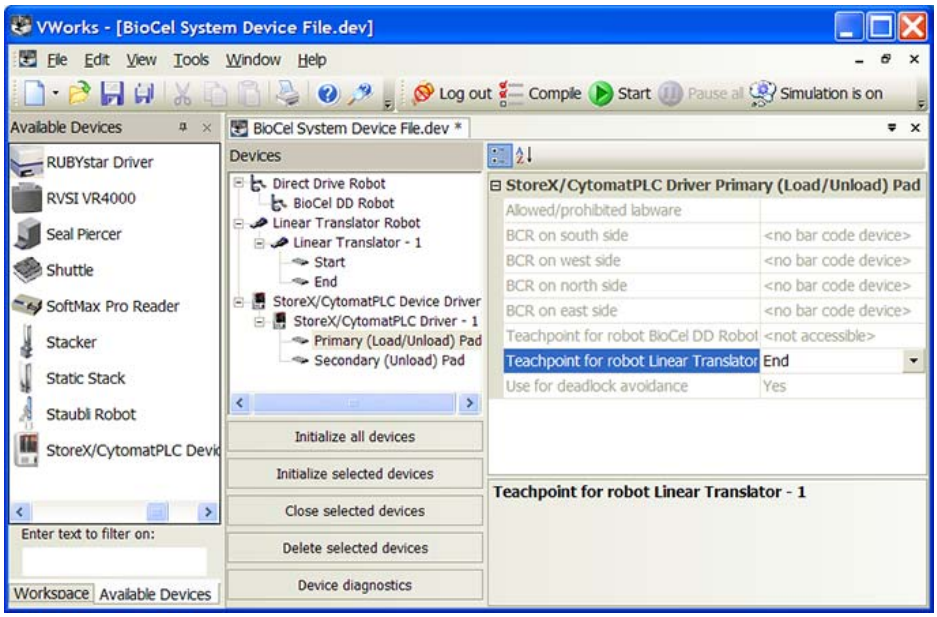
| Property | Description |
|---|---|
| Allowed/prohibited labware | Permitted labware class for the selected location.<br>For example, you might specify that only tip boxes are allowed at a given location. For details on labware classes, see the *VWorks Automation Control Setup Guide*. |
| BCR on south/west/north/ east side | The location of the barcode reader and the desired barcode reader device.<br>Use these fields only if a barcode reader is installed on this device. |
| Teachpoint for robot <BioCel System Robot> | The name of the teachpoint for the stage location. Because the End location will only interact with the incubator, select **<not accessible>.** |
| Teachpoint for robot <Linear Translator> | The teachpoint that is set up for the Linear Translator. Select **End.**<br>For setup instructions, see "Setting teachpoints for the translator" on page 96. |
| Use for deadlock avoidance | Option to permit the location to be used for deadlock avoidance.<br>Select **Yes** to permit labware to be moved to this location to avoid a deadlock in the system.<br>Select **No** if you do not want to move random labware to this location to avoid deadlock. |
| Door | The internal system door associated with this device. For the Linear Translator, this is one of the doors between two connecting systems. |

7 Select **File > Save.**

***To update the incubator device properties:***

1 In the **Devices** area, expand the incubator and select the **Load/Unload** or equivalent location.

2 In the incubator Properties area, update the fields that will enable interaction with the Linear Translator:




| Property | Description |
|---|---|
| Teachpoint for robot <BioCel System Robot> | Select **<not accessible>**.<br>*Note:* In simulation mode, select **<not accessible>.** |
| Teachpoint for robot <Linear Translator> | Select **End,** because this is the teachpoint that is set up to interact with the incubator. |

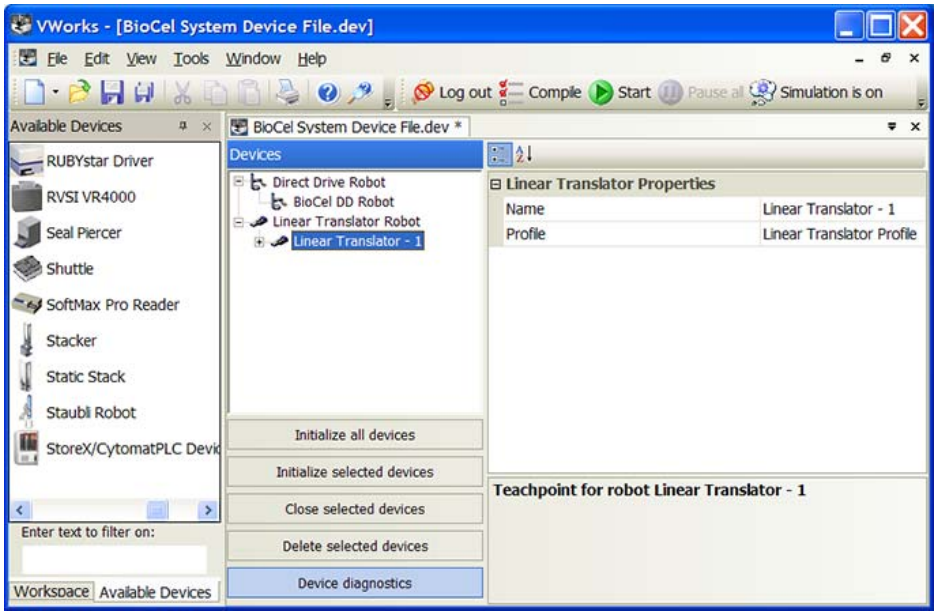
3 Select **File > Save.**

## Creating a profile for the Linear Translator

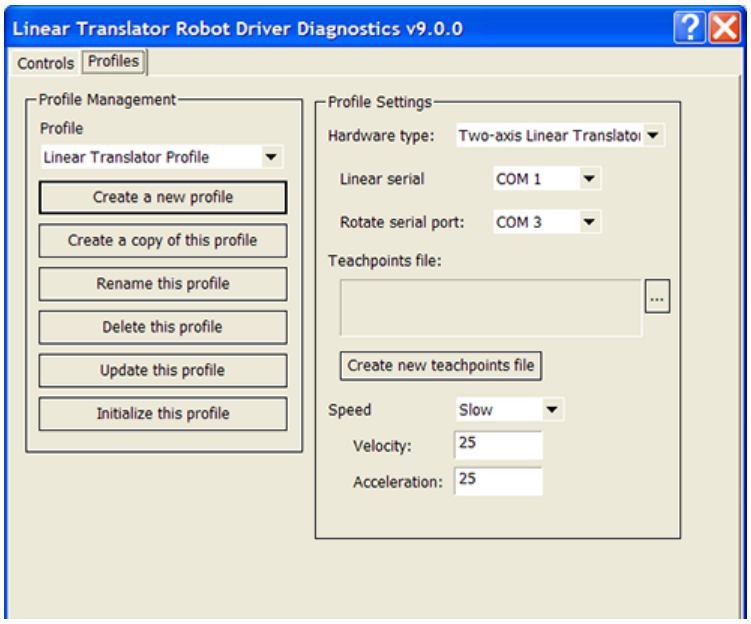
The Linear Translator profile allows you to set up communication between the translator and the controlling computer. You can also set the speed at which the translator should transport microplates.

***To create a profile:***

1 In the VWorks software, open **Linear Translator Robot Driver Diagnostics.**




The Linear Translator Robot Driver Diagnostics dialog box opens.

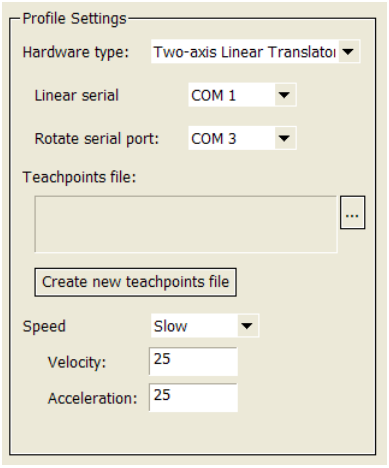



2 Click the **Profiles** tab.

3 Click **Create a new profile.** The Create Profile dialog box opens.

4 Type a name for the new profile, and then click **OK.** The new profile name appears in the Profile Management area.

**5** In the **Profile settings** area, set the following parameters:




| Selection or parameter | Description |
|---|---|
| Hardware type | Select **One-axis Linear Translator** or **Two-axis Linear Translator.**<br><br>To determine whether the translator has two axes, try to manually rotate the plate stage. If it rotates, it has two axes. |
| Linear serial | Select the serial port that connects the linear motor to the controlling computer. |
| Rotate serial port | Select the serial port that connects the rotational motor to the controlling computer. |
| Teachpoint file | Browse and select the translator teachpoint file you want to use.<br><br>*Note:* The translator teachpoint file is different from the system robot teachpoint file.<br><br>To set up translator teachpoints, see "Setting teachpoints for the translator" on page 96. |
| Speed | Select the speed at which you want the translator to move: **Fast**, **Medium**, or **Slow.** |
| Velocity | Type the percentage of factory-set maximum speed for the speed you selected.<br><br>For example, if you selected Slow, you can set the Slow speed at 15% of the factory-set maximum speed. |
| Acceleration | Type the percentage of maximum factory-set acceleration for the speed you selected.<br><br>For example, if you selected Slow, you can set the Slow acceleration at 15% of the factory-set maximum acceleration. |

6 When you are finished, click **Update this profile** to save the changes.

7 Click **Initialize this profile.**

## Setting teachpoints for the translator

***To set the teachpoints for the translator, you need to:***

1 Use Linear Translator Diagnostics to set a teachpoint at each end of the translator. One teachpoint is accessed by the BioCel System robot, the other teachpoint is accessed by the incubator.

2 See the robot user documentation to set a BioCel System robot teachpoint at the start location of the translator.

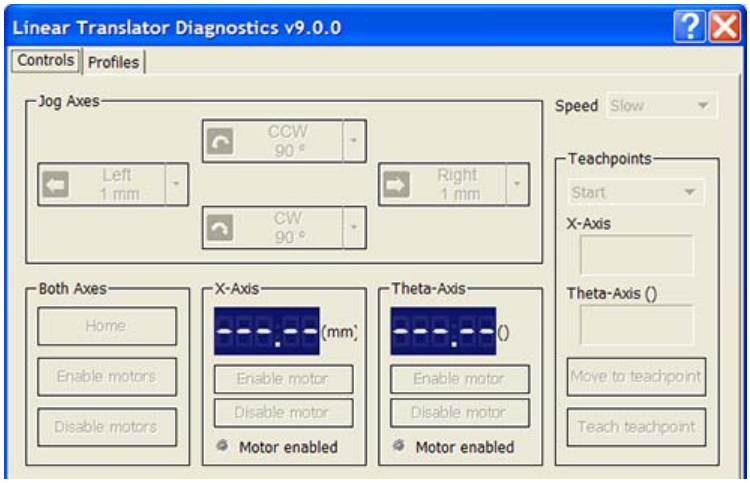
Make sure you turn off the translator motors before you start. To turn off the motors, see "Turning on and turning off the translator motors" on page 98.

3 Follow instructions in the incubator user documentation to set a teachpoint at the end location of the translator.

Make sure you turn off the translator motors before you start. To turn off the motors, see "Turning on and turning off the translator motors" on page 98.

***To set the teachpoints using Linear Translator Diagnostics:***

1 In **Linear Translator Diagnostics,** click the **Controls** tab.




2 In the **Both Axes** area, click **Disable motors.** The translator motors are turned off.

3 Manually push the translator plate stage to the end where the BioCel System robot will place or pick up microplates.

4 Manually move the BioCel System robot to the plate stage. See the robot user documentation to set and edit the BioCel System robot teachpoint at the translator.

5 In **Linear Translator Diagnostics,** in the **Teachpoints** area, select **Start Location,** and then click **Teach teachpoint.**

6 Manually move the translator plate stage to the end where the incubator will place or pick up microplates.

7 Manually move the incubator robot to the plate stage. Use the incubator user documentation to set and edit the teachpoint at the translator.

8 In **Linear Translator Diagnostics,** in the **Teachpoints** area, select **End Location,** and then click **Teach teachpoint.**

9 In the **Both Axes** area, click **Enable motors** to turn on the translator motors.

## Verifying translator teachpoints

***To verify the translator teachpoints:***

1 In **Linear Translator Driver Diagnostics,** in the **Teachpoints** area, select a teachpoint you want to verify, and then click **Move to teachpoint.** Check that the translator plate stage moved to the selected teachpoint and is positioned accurately. If necessary, edit the teachpoint (see "Setting teachpoints for the translator" on page 96).

2 For the BioCel System robot, see the robot user documentation to verify and edit the teachpoint:

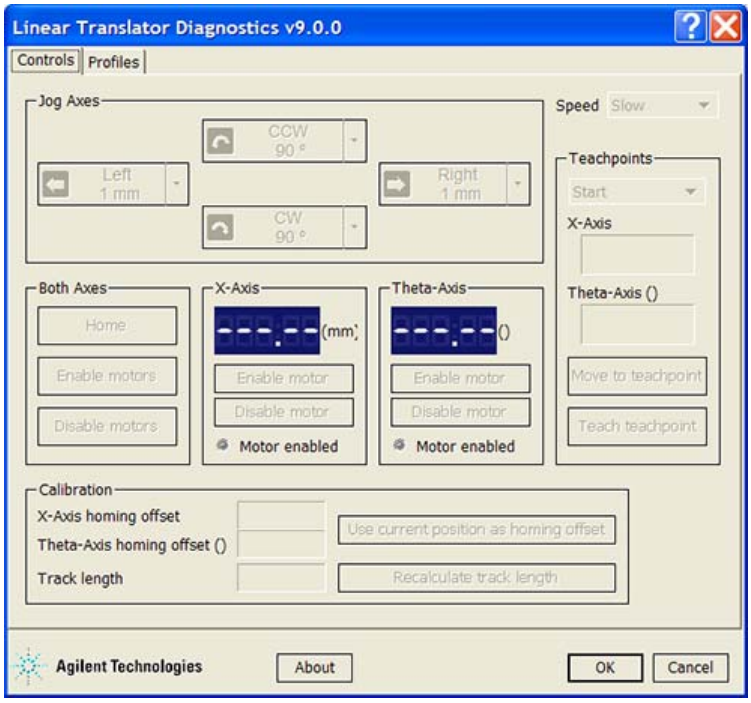
3 For the incubator robot, follow the incubator user documentation to verify and edit the teachpoint.

## Using Linear Translator Diagnostics

You can use the commands and parameters in the Linear Translator Diagnostics Controls tab to:

- Home the plate stage
- Turn on or turn off the translator motors
- Change the translator speed
- Jog the plate stage

**CAUTION** Use only the commands and parameters in the Controls tab as described. Do not click the buttons in the Calibration area. The Use current position as homing offset button resets the current plate stage position as the home position (0, 0). The Track length value was set at the factory and should not be changed. If you believe the Linear Translator is not working properly, contact Automation Solutions Technical Support.



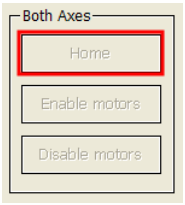

### Homing the plate stage

Homing sends the plate stage to the factory-defined home position for each axis of motion. Home the plate stage when recovering from an emergency stop.

***To home the plate stage:***

1 In **Linear Translator Diagnostics,** click the **Controls** tab.

2 In the **Both Axes** area, click **Home.**



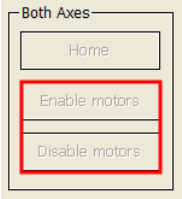

### Turning on and turning off the translator motors

Turning off the translator motors allows you to move the plate stage by hand, making it easier to set and edit teachpoints. You must turn on the translator motors for operation.

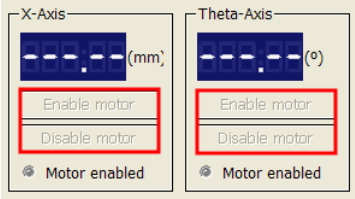
***To turn on or turn off the translator motors:***

In the **Both Axes** area, click one of the following:

| Command | Description |
|---|---|
| Enable motors | Turns on the translator motors. |
| Disable motors | Turns off the translator motors. |




Alternatively, you can turn on or turn off the motor of a single axis. To do this, in the **X-Axis** or **Theta-Axis** area, click either **Enable motor** or **Disable motor** to turn on or turn off the motor for that axis. The *x*-axis motor moves the plate stage linearly. The *theta*-axis motor rotates the plate stage.



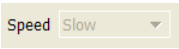

## Changing the translator speed

You can select the robot speed to accommodate the task you are performing. For example, you can select the Slow speed when you are setting teachpoints or diagnosing problems.

***To change the translator speed:***

In the **Speed** list, select the speed at which you want the plate stage to move: **Fast, Medium,** or **Slow.**

*Note:* The speed you select in the Controls tab applies only to the commands you use in the diagnostics software (Jog and Move to teachpoint).




## Jogging the plate stage

Jogging the translator plate stage moves the plate stage in small, precise increments along one of the axes. You can jog the plate stage to fine-tune its position when setting teachpoints.

***To jog the plate stage:***

In the **Jog Axes** area, click one of the following:

| Command | Description |
|---|---|
|  CCW | Jogs the plate stage counterclockwise by the specified increment. |
|  CW | Jogs the plate stage clockwise by the specified increment. |
|  Left | Jogs the plate stage left from the current position by the specified increment. |
|  Right | Jogs the robot head right from the current position by the specified increment. |

To change the jog increment, click the down arrow, and then select the desired increment in millimeters or degrees.

## Related information

| For information about... | See... |
|---|---|
| Using the Linear Translator in a protocol | *VWorks Automation Control User Guide* |
| Incubator device | Incubator device driver guide |
| Available devices | "BioCel System additional devices overview" on page 72 |

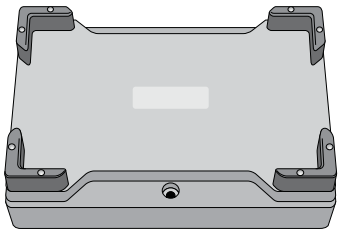
# Orbital Shaking Station

## About this topic

This topic describes the Orbital Shaking Station, explains its use, and provides the configuration instructions.

## Description

An Orbital Shaking Station is a microplate shaker that can be installed in place of a platepad on the BioCel System table. For a full description of the Orbital Shaking Station, see the manufacturer's documentation.



## Setup workflow

| Step | Procedure | See... |
|---|---|---|
| 1 | Install the Orbital Shaking Station. | Automation Solutions Technical Support |
| 2 | Add the Orbital Shaking Station in the device file. | "Adding the Orbital Shaking Station in the device file" on page 101 |
| 3 | Create a profile for the Orbital Shaking Station. | "Creating a profile for the Orbital Shaking Station" on page 104 |
| 4 | Set, edit, and verify the teachpoint for the Orbital Shaking Station. | Robot user documentation |

## Adding the Orbital Shaking Station in the device file

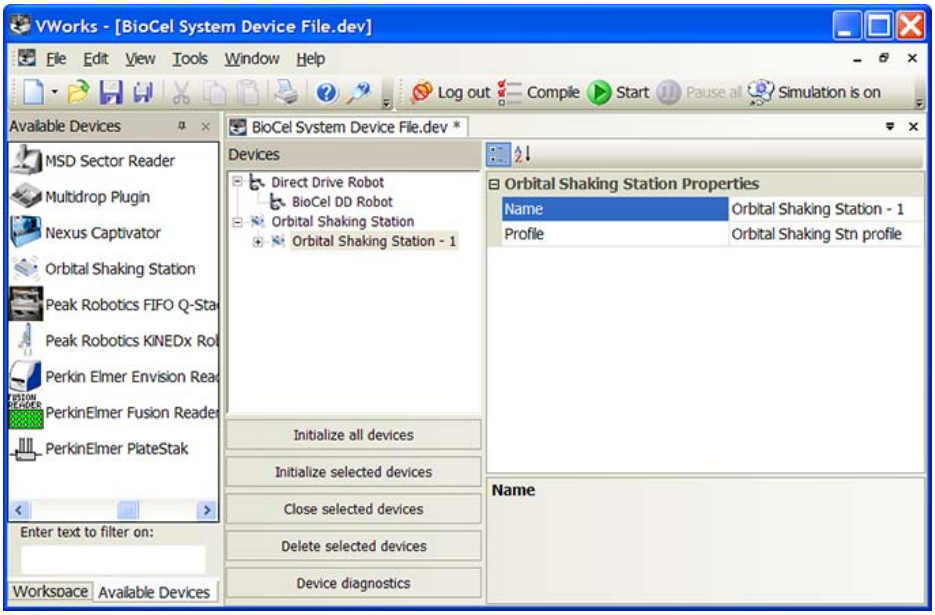
The VWorks software device file is set up with the correct devices and device configurations for your BioCel System. You do not need to add a new Orbital Shaking Station to the device file unless you are adding another Orbital Shaking Station or replacing the existing Orbital Shaking Station. For information about device files, see "Devices and device file defined" on page 32.

Before you start, make sure that at the Orbital Shaking Station speed control (on the power cord), the speed dial is set to PC RS232. This setting allows the VWorks software to control the Orbital Shaking Station.

***To add the Orbital Shaking Station to the device file:***

1 In the VWorks software, open the device file and add the Teleshake (Orbital Shaking Station) device. See "Adding and deleting devices in the software" on page 32 for instructions.

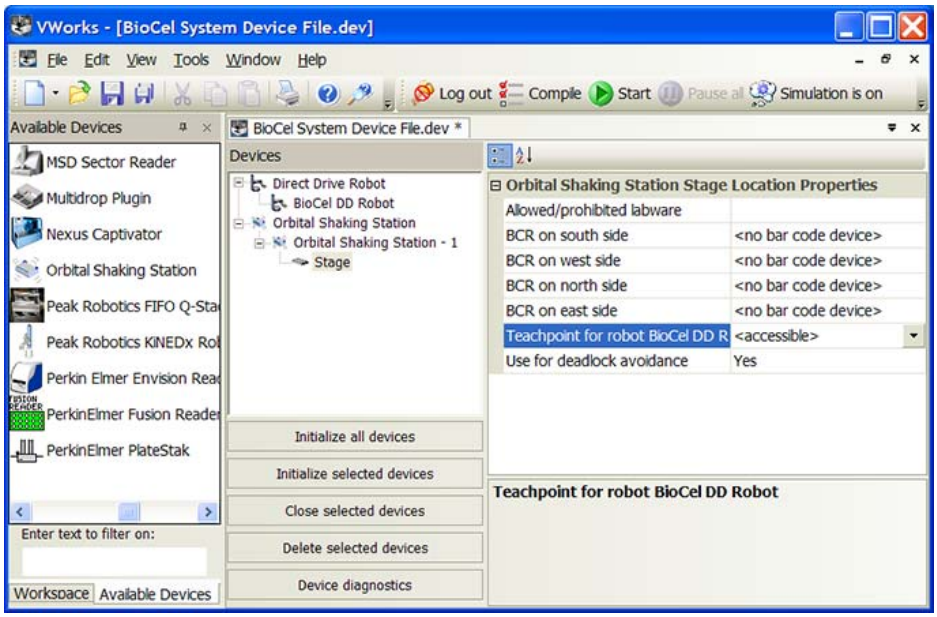
2 In the **Orbital Shaking Station Properties** area, type or select the following:




| Property | Description |
|---|---|
| Name | The name of the Orbital Shaking Station device. |
| Profile | The profile associated with the device.<br>Select the desired profile from the list. If you have not created a profile, see "Creating a profile for the Orbital Shaking Station" on page 104, and then return to this step to select the profile. |

3 In the **Devices** area, expand the **Orbital Shaking** device, and then select the **Stage** location.

4 In the **Orbital Shaking Station Stage Location Properties** area, type or set the following:




| Property | Description |
|---|---|
| Allowed/prohibited labware | Permitted labware class for the selected location.<br>For example, you might specify that only tip boxes are allowed at a given location. For details on labware classes, see the *VWorks Automation Control Setup Guide*. |
| BCR on south/west/north/east side | The location of the barcode reader and the desired barcode reader device. Use this field only if a barcode reader is installed on the device. |
| Teachpoint for robot <BioCel System Robot> | The name of the teachpoint to use for the stage location. This selection enables the robot to move correctly to and from the platepad or device during a protocol run.<br>For example, if the robot teachpoint file contains a teachpoint for this platepad, you must select that teachpoint.<br>*Note:* If the computer is not connected to the BioCel System and you want to simulate a run, select **<accessible>.** |
| Use for deadlock avoidance | Option to permit the location to be used for deadlock avoidance.<br>Select **Yes** to permit labware to be moved to this location to avoid a deadlock in the system.<br>Select **No** if you do not want to move random labware to this location to avoid deadlock. |

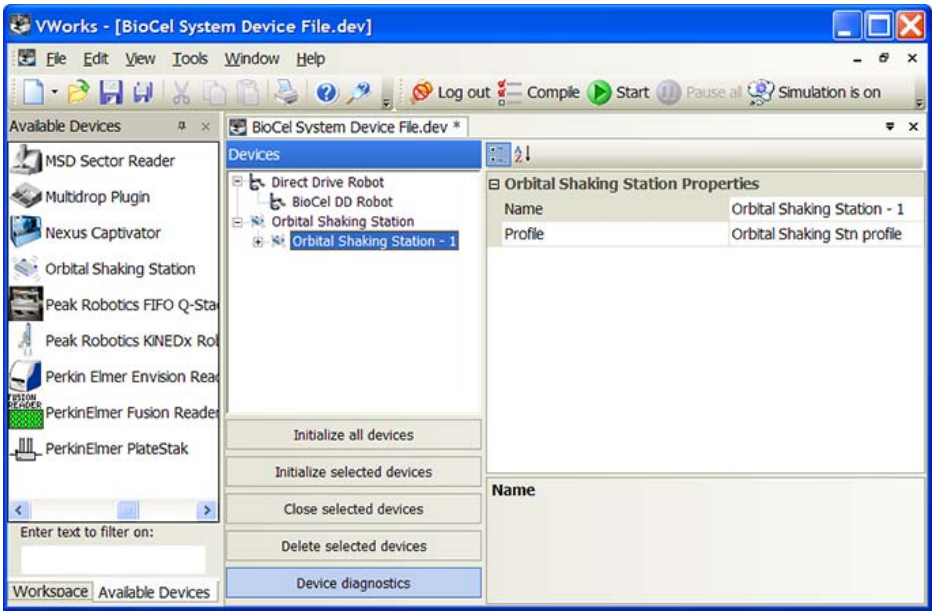
5 Select **File > Save.**

## Creating a profile for the Orbital Shaking Station

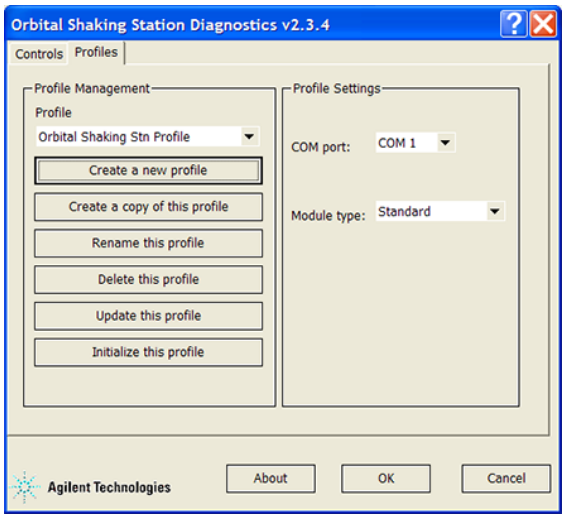
The Orbital Shaking Station profile allows you to set up communication between the Orbital Shaking Station and the controlling computer.

***To create a profile:***

1 In the VWorks window, select the **Orbital Shaking Station** device, and then click **Device diagnostics.**




The Orbital Shaking Station Diagnostics dialog box opens.




2 Click the **Profiles** tab.

3 Click **Create a new profile.** The Create Profile dialog box opens.

4 Type a name for the new profile, and then click **OK.** The new profile name appears in the Profile area.

5 In the **COM port** list, select the COM port number used by the Orbital Shaking Station.

6 In the **Module type** list, select the shaking speed: **Standard** or **High-speed.**

7 Click **Update this profile** to save the changes.

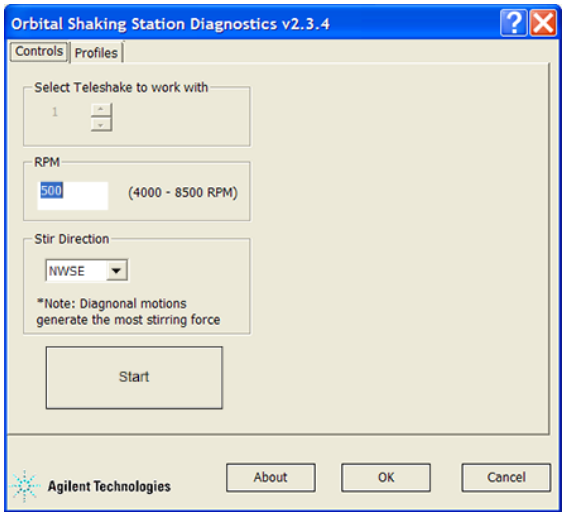
8 Click **Initialize this profile** to establish communication with the Orbital Shaking Station.

9 Return to the device file and select the profile for the Orbital Shaking Station.

## Using Orbital Shaking Station Diagnostics

You can use the parameters and commands in Orbital Shaking Station Diagnostics to do the following for troubleshooting purposes:

- Set shaking parameters
- Start and stop shaking




***To set the shaking parameters:***

1 In the **Orbital Shaking Station Diagnostics** dialog box, click the **Controls** tab.

2 If you have more than one shaking station installed, select the one you want to use in the **Select Teleshake to work with list.**

3 In the **RPM** area, set the speed at which you want to shake the microplate.

4 In the **Stir Direction** area, select the direction in which you want to shake the microplate.

***To start or stop shaking:***

Click **Start** or **Stop.**

## Related information

| For information about... | See... |
|---|---|
| Using the Orbital Shaking Station in a protocol | *VWorks Automation Control User Guide* |
| Set teachpoints at the Orbital Shaking Station | Robot user documentation |

# Phantom Robot

## About this topic

This topic describes the Phantom Robot, explains its use, and provides the configuration instructions.

## Description

In the VWorks software, every task is associated with a device. The Phantom Robot is the virtual device that represents the operator who will manually perform a task (move labware) during a programmed pause in a protocol run. The software displays a message during the pause. You can indicate the completion of the task in the message dialog box so the protocol can continue.

## Setup workflow

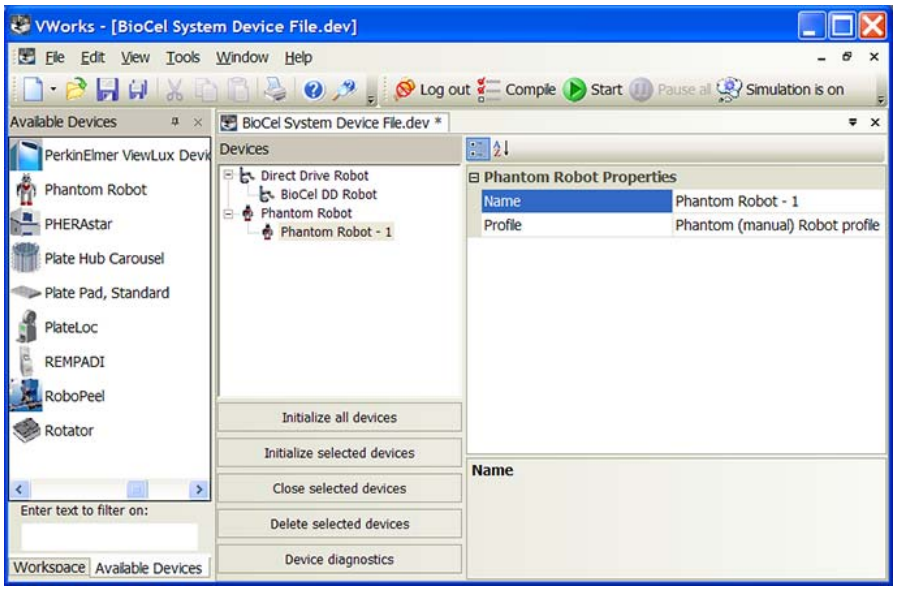
| Step | Procedure | See... |
|---|---|---|
| 1 | Add the Phantom Robot in the device file. | "Adding the Phantom Robot in the device file" on page 107 |
| 2 | Create a profile for the Phantom Robot. | "Creating a profile for the Phantom Robot" on page 108 |

## Adding the Phantom Robot in the device file

The VWorks software is set up with the correct device configuration. You do not need to add a new Phantom Robot to the device file unless you want to make adjustments. For information about device files, see "Devices and device file defined" on page 32.

***To add the Phantom Robot to the device file:***

1. In the VWorks software, open the device file and add the Phantom Robot. See "Adding and deleting devices in the software" on page 32 for instructions.
2. In the **Phantom Robot Properties** area, type or select the following:



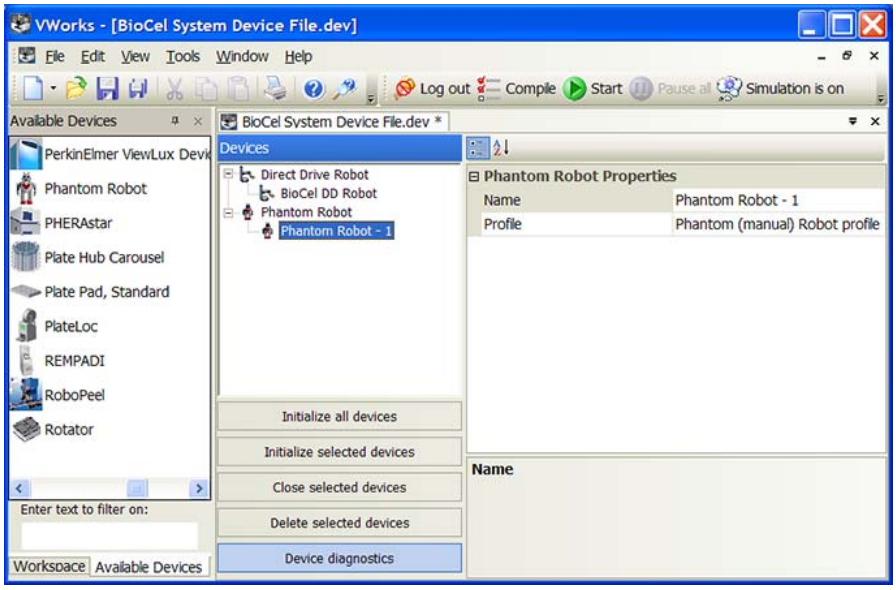

| Property | Description |
|---|---|
| Name | The name of the Phantom Robot. |
| Profile | The profile associated with the device.<br>Select the desired profile from the list. If you have not created a profile, see "Creating a profile for the Phantom Robot" on page 108, and then return to this step to select the profile. |

3 Select **File > Save.**

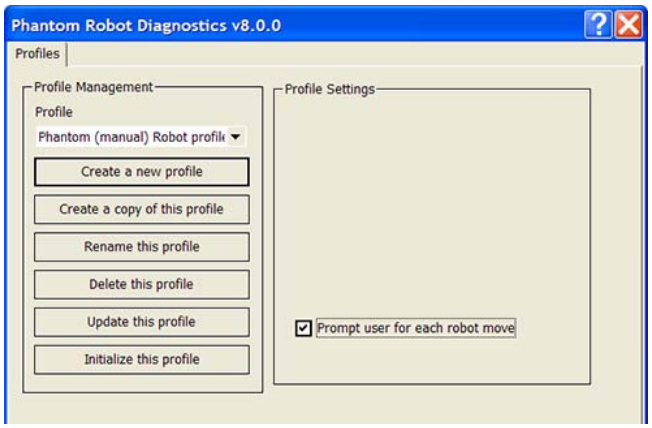
## Creating a profile for the Phantom Robot

***To create a profile for the Phantom Robot:***

1 In the **VWorks** window, select the **Phantom Robot** device, and then click **Device diagnostics.**




The Phantom Robot Diagnostics dialog box opens.




2 In the **Profiles** tab, click **Create new profile.**

3 In the Create Profile dialog box that opens, type a name for the profile, and then click **OK.**

4 *Optional.* If you want the software to prompt the operator for each robot movement, select **Prompt user for each robot move.**

5 Click **Update this profile** to save the changes.

6 Click **Initialize this profile**.

7 Return to the device file and select the profile for the Phantom Robot device.

## Related information

| For information about... | See... |
|---|---|
| Mounting devices on the docking table | Automation Solutions Technical Support |
| Devices that can be integrated in the BioCel System | “Device integration options” on page 20 |
| Available devices | “BioCel System additional devices overview” on page 72 |

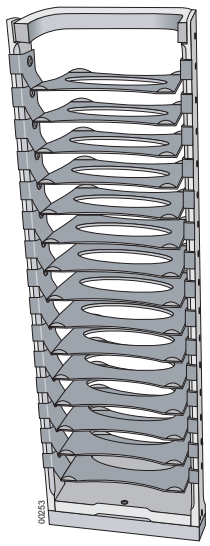
# Plate Hotel

## About this topic

This topic describes the Plate Hotel, explains its uses, and provides the configuration instructions.

## Description

A Plate Hotel is a vertical rack that stores microplates. The microplates sit on individual shelves and are not stacked directly on top of one another. Therefore, the microplates can be accessed randomly.



## Setup workflow

| Step | Procedure | See... |
|---|---|---|
| 1 | Install the Plate Hotel. | Automation Solutions Technical Support |
| 2 | Add the Plate Hotel in the device file. | “Adding the Plate Hotel in the device file” on page 112 |
| 3 | Create a profile for the Plate Hotel. | “Creating a profile for the Plate Hotel” on page 114 |
| 4 | Set, edit, and verify the teachpoints for the Plate Hotel. | “Setting teachpoints for the Plate Hotel or Plate Hub” on page 130 |

## Adding the Plate Hotel in the device file

The VWorks software device file is set up with the correct devices and device configurations for your BioCel System. You do not need to add a new Plate Hotel to the device file unless you are adding another Plate Hotel or replacing the existing Plate Hotel. For information about device files, see "Devices and device file defined" on page 32.

### Before you start

Before setting up the Plate Hotel in the VWorks software, determine whether you want to use the VWorks software inventory management system to track groups of labware moving into and out of the Plate Hotel.

If you want to use the inventory management system with the Plate Hotel, you will need to use the Plate Hub Carousel plugin by adding the Plate Hub Carousel device in the device file. The Plate Hub Carousel plugin has features that enable inventory management, and Plate Hub Carousel Diagnostics includes selections for setting up the Plate Hotel.

If you do not want to use the labware inventory manager with the Plate Hotel, you can add the Plate Hotel device in the device file.

For information about setting up and using the inventory management system, see the *VWorks Automation Control Setup Guide*.

### Procedure

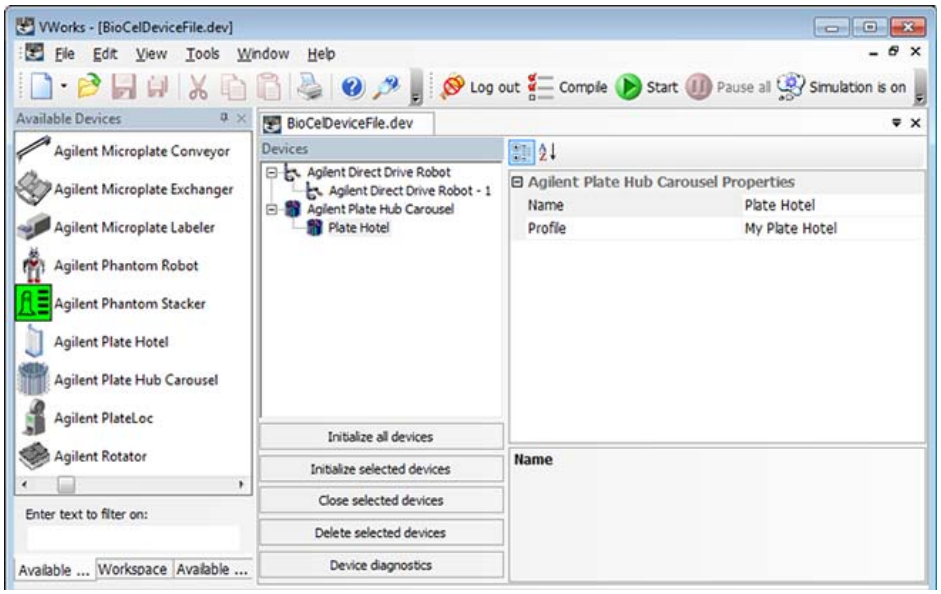
***To add the Plate Hotel to the device file:***

1 In the VWorks software, open the device file and add one of the following:

- Plate Hub Carousel (if you want to use labware inventory manager)
- Plate Hotel (if you do not want to use labware inventory manager)

See "Adding and deleting devices in the software" on page 32 for instructions.

2 In the **Plate Hub Carousel Properties** or the **Plate Hotel Properties** area, type or select the following:

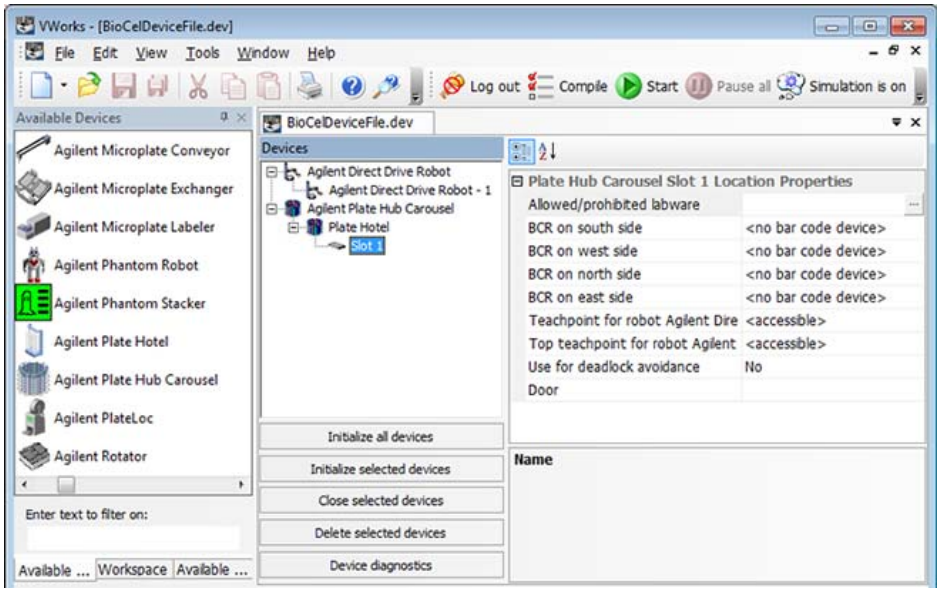


| Property | Description |
|---|---|
| Name | The name of the Plate Hotel device.<br>*Note:* If you added the Plate Hub Carousel device, make sure you provide a name that clearly shows it is a Plate Hotel device. |
| Profile | The profile associated with the device.<br>Select the desired profile from the list. If you have not created a profile, see "Creating a profile for the Plate Hotel" on page 114, and then return to this step to select the profile. |

3 In the **Devices** area, expand Plate Hotel, and then select **Slot 1.**

*Note:* If you added the Plate Hub Carousel device, only Slot 1 appears. If you added the Plate Hotel device, 16 slots appear.

4 In the **Plate Hotel Slot 1 Properties** or **Plate Hub Carousel Slot 1 Properties** area, type or set the following:




| Property | Description |
|---|---|
| Allowed/prohibited labware | Permitted labware class for the selected location.<br>For example, you might specify that only tip boxes are allowed at a given location. For details on labware classes, see the *VWorks Automation Control Setup Guide*. |
| BCR on south/west/north/ east side | The location of the barcode reader and the desired barcode reader device.<br>Use this field only if a barcode reader is installed on the device. |

| Property | Description |
|---|---|
| Teachpoint for robot <BioCel System Robot> | The name of the teachpoint for the Slot 1 (bottommost slot) location. This selection enables the robot to move correctly to and from the Slot 1 location during a protocol run.<br>For example, if the robot teachpoint file contains a teachpoint for this slot, you must select that teachpoint.<br>*Note:* If the computer is not connected to the BioCel System and you want to simulate a run, select **<accessible>.** |
| Top teachpoint for robot <BioCel System Robot> | *Plate Hub Carousel Plate Hotel only*. The name of the teachpoint for the topmost slot location.<br>For example, if the robot teachpoint file contains a teachpoint for this slot, you must select that teachpoint.<br>*Note:* If the computer is not connected to the BioCel System and you want to simulate a run, select **<accessible>.** |
| Use for deadlock avoidance | Option to permit the location to be used for deadlock avoidance.<br>Select **Yes** to permit labware to be moved to this location to avoid a deadlock in the system.<br>Select **No** if you do not want to move random labware to this location to avoid a deadlock.<br>This property is only applicable if you are setting up the Plate Hotel using Plate Hotel Diagnostics.<br>A Plate Hotel that is set up using Plate Hub Carousel Diagnostics cannot be used for deadlock avoidance. |
| Door | The internal system door associated with this device.<br>This property is not applicable for the Plate Hotel. |

5 Select **File > Save.**

## Creating a profile for the Plate Hotel

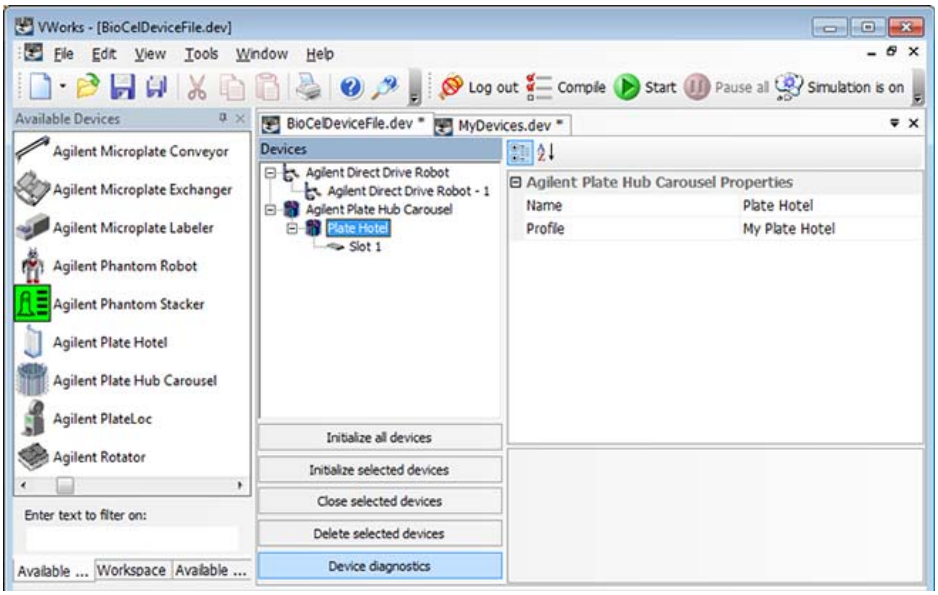
If you added the Plate Hub Carousel device, use Plate Hub Carousel Diagnostics to create a profile for the Plate Hotel. See "Creating a profile in Plate Hub Carousel Diagnostics" on page 115.

If you added the Plate Hotel device, use Plate Hotel Diagnostics to create a profile for the Plate Hotel. See "Creating a profile in Plate Hotel Diagnostics" on page 116.

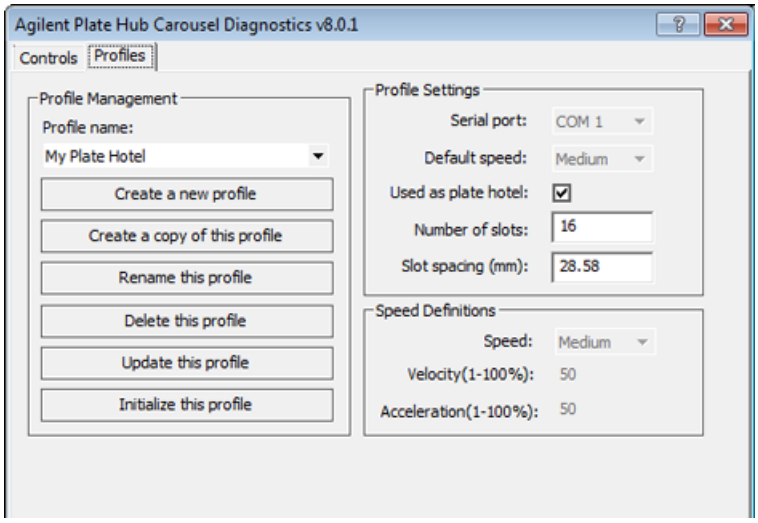
### Creating a profile in Plate Hub Carousel Diagnostics

***To create a profile in Plate Hub Carousel Diagnostics:***

1 In the VWorks software, open **Plate Hub Carousel Diagnostics.**




The Plate Hub Carousel Diagnostics dialog box opens.




2 Click **Create a new profile.** The Create Profile dialog box opens.

3 Type a name for the new profile, and then click **OK.** The new profile name appears in the Profile Management area.

4 In the **Profile settings** area:

   **a** Select **Used as plate hotel.**

   **b** Type the **Number of slots** in the Plate Hotel.

   **c** Type the **Slot spacing**, or the vertical distance, in millimeters, between each Plate Hotel slot.

5 When you are finished, click **Update this profile** to save the changes.

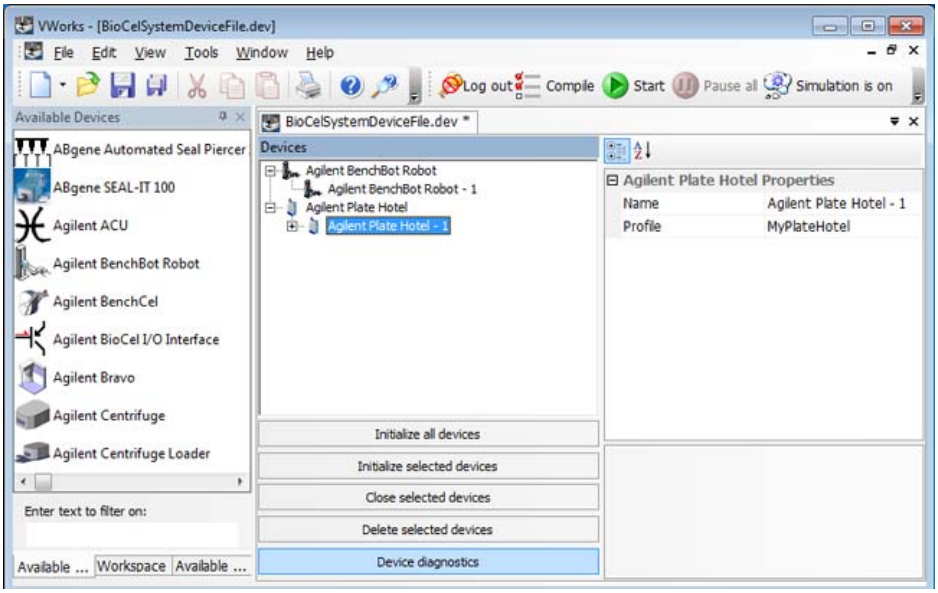
6 Click **Initialize this profile.**

7 Return to the device file and select the profile for the Plate Hotel device.

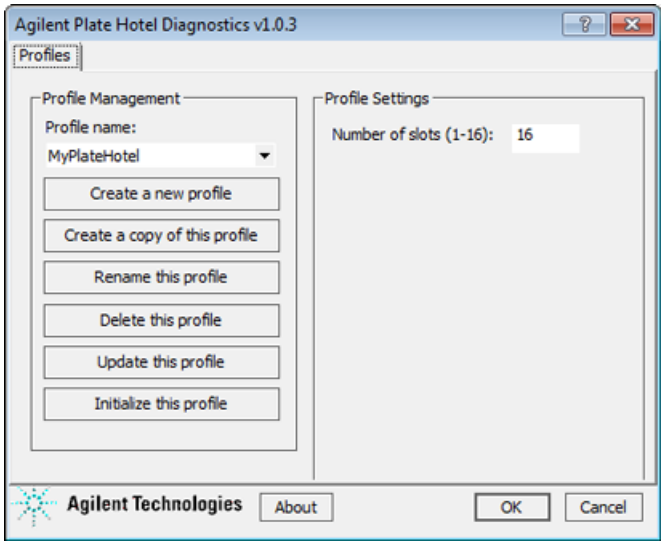
### Creating a profile in Plate Hotel Diagnostics

***To create a profile in Plate Hotel Diagnostics:***

1 In the VWorks software, open **Plate Hotel Diagnostics.**




The Plate Hotel Diagnostics dialog box opens.




2 Click **Create a new profile.** The Create Profile dialog box opens.

3 Type a name for the new profile, and then click **OK.** The new profile name appears in the Profile Management area.

4 In the **Profile settings** area, type the number of slots in the Plate Hotel.

5 When you are finished, click **Update this profile** to save the changes.

6 Click **Initialize this profile.**

7 Return to the device file and select the profile for the Plate Hotel device.

## Setting teachpoints for the Plate Hotel

To set, edit, and verify teachpoints for the Plate Hotel, see the appropriate robot user guide.

When you set the teachpoints, use the provided teaching jig or teaching plate to set a teachpoint at the following locations:

- If the Plate Hotel is set up using Plate Hub Diagnostics, set a teachpoint at:
  - Top shelf
  - Bottom shelf
- If the Plate Hotel is set up using Plate Hotel Diagnostics, set a teachpoint at all 16 slots.

## Related information

| For information about... | See... |
|---|---|
| Using the Plate Hotel or the Plate Hub in a protocol | *VWorks Automation Control User Guide* |
| Available devices | "BioCel System additional devices overview" on page 72 |

# Plate Hub Carousel

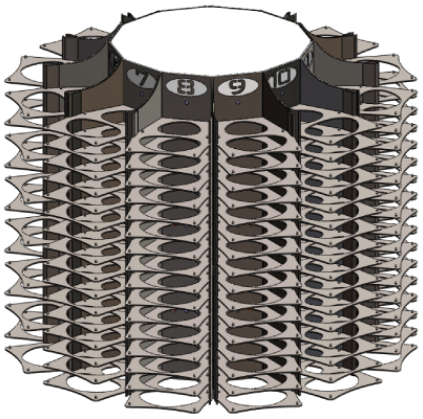
## About this topic

This topic describes the Plate Hub Carousel, explains its uses, and provides the configuration instructions.

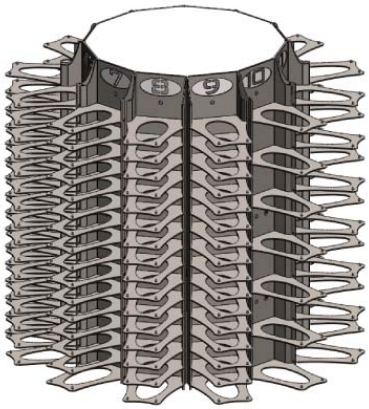
## Description

Two models of the Plate Hub Carousel are available: Landscape (1) and Portrait (2). Both consist of racks (cassettes) that store microplates, tip boxes, or other labware.

1



2



The capacities of both models are as follows:

| Capacity (landscape and portrait models) | |
|---|---|
| Cassettes | 12 |
| Slots in microplate cassettes | 16 |
| Slots in tall labware cassettes | 7 |
| Slots in custom cassettes | Number of slots varies by system configuration |

*Note:* You can use a combination of the microplate, tall labware, and custom cassettes in each model to meet your application requirements.

The Plate Hub Carousel must be used with the VWorks software inventory management system for random and dynamic access. For information about setting up and using the software inventory management system, see the *VWorks Automation Control Setup Guide*.

## Setup workflow

| Step | Procedure | See... |
|---|---|---|
| 1 | Install the Plate Hub Carousel. | Automation Solutions Technical Support |
| 2 | Add the Plate Hub Carousel in the device file. | "Adding the Plate Hub Carousel in the device file" on page 119 |
| 3 | Create a profile for the Plate Hub Carousel. | "Creating a profile for the Plate Hub" on page 122 |
| 4 | Set up communication and selecting the rotation speed. | "Setting up communication and selecting the rotation speed" on page 123 |
| 5 | Configure the cassettes. | "Configuring the Plate Hub Carousel cassettes" on page 123 |
| 6 | Set, edit, and verify the teachpoints for the Plate Hub Carousel. | "Setting teachpoints for the Plate Hotel or Plate Hub" on page 130 |

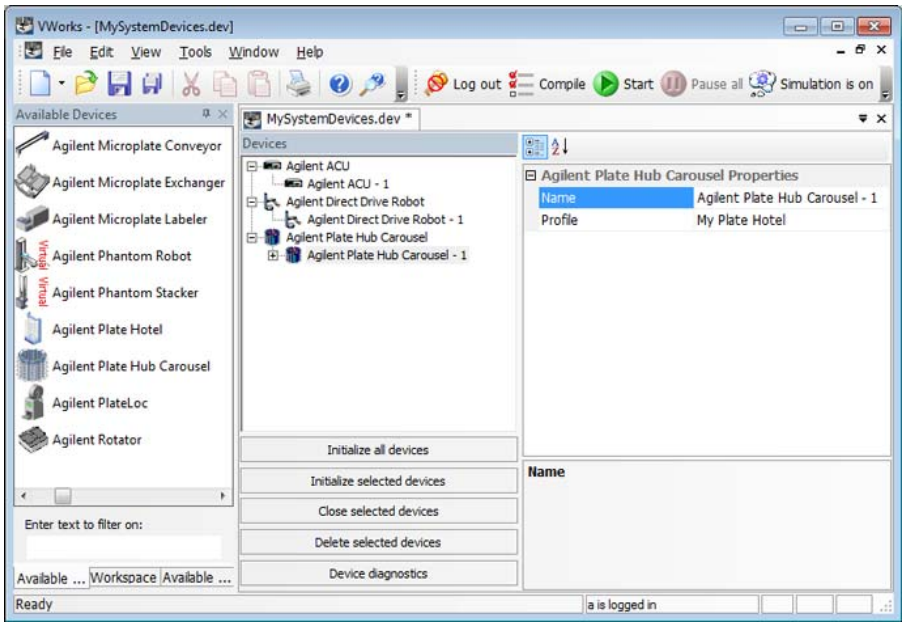
## Adding the Plate Hub Carousel in the device file

The VWorks software device file is set up with the correct devices and device configurations for your BioCel System. You do not need to add a new Plate Hub Carousel to the device file unless you are adding another Plate Hub Carousel or replacing the existing Plate Hub Carousel. For information about device files, see "Devices and device file defined" on page 32.

For information about setting up and using the inventory management system, see the *VWorks Automation Control Setup Guide*.

***To add the Plate Hub to the device file:***

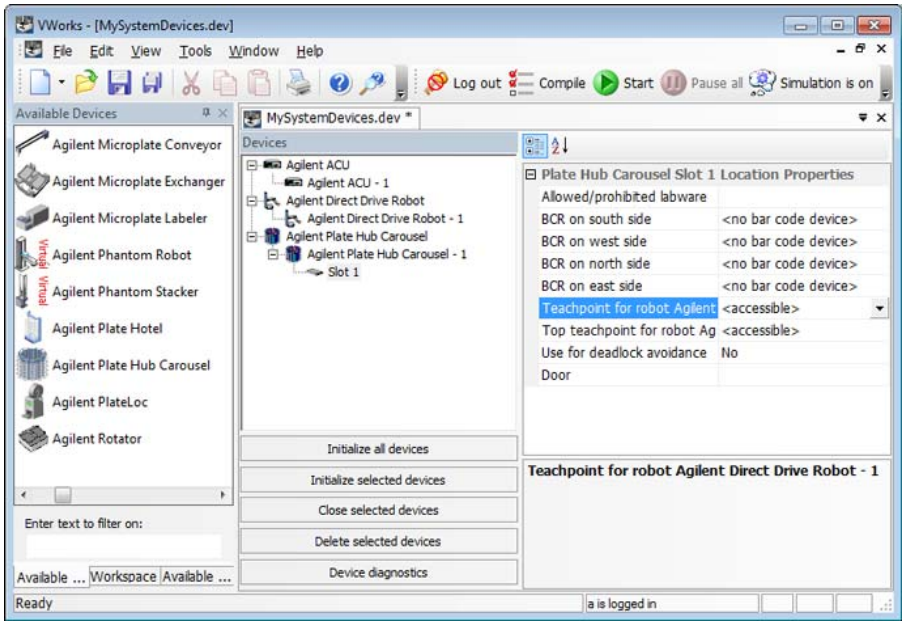
1. In the VWorks software, open the device file and add the Plate Hub Carousel. See "Adding and deleting devices in the software" on page 32 for instructions.
2. In the **Plate Hub Carousel Properties** area, type or select the following:




| Property | Description |
|---|---|
| Name | The name of the Plate Hub Carousel device. |
| Profile | The profile associated with the device.<br>Select the desired profile from the list. If you have not created a profile, see "Creating a profile for the Plate Hub" on page 122, and then return to this step to select the profile. |

3 In the **Devices** area, expand **Plate Hub**, and then select **Slot 1.**

4 In the **Plate Hub Carousel Slot 1 Properties** area, type or set the following:



| Property | Description |
|---|---|
| Allowed/prohibited labware | Permitted labware class for the selected location.<br>For example, you might specify that only tip boxes are allowed at a given location. For details on labware classes, see the *VWorks Automation Control Setup Guide*. |
| BCR on south/west/north/ east side | The location of the barcode reader and the desired barcode reader device.<br>Use this field only if a barcode reader is installed on the device. |
| Teachpoint for robot <BioCel System Robot> | The name of the teachpoint for the Slot 1 (bottom-most slot) location. This selection enables the robot to move correctly to and from the Slot 1 location during a protocol run.<br>For example, if the robot teachpoint file contains a teachpoint for this slot, you must select that teachpoint.<br>*Note:* If the computer is not connected to the BioCel System and you want to simulate a run, select **<accessible>.** |
| Top teachpoint for robot <BioCel System Robot> | The name of the teachpoint for the top-most slot location.<br>For example, if the robot teachpoint file contains a teachpoint for this slot, you must select that teachpoint.<br>*Note:* If the computer is not connected to the BioCel System and you want to simulate a run, select **<accessible>.** |
| Use for deadlock avoidance | Option to permit the location to be used for deadlock avoidance.<br>**IMPORTANT** Always select **No** for the Plate Hub Carousel. |

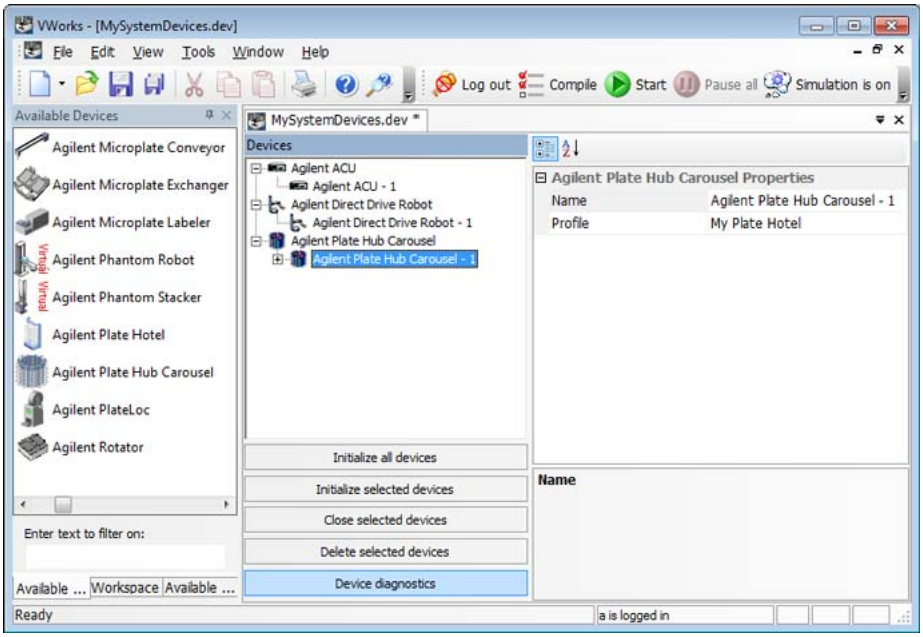
5 Select **File > Save.**

## Creating a profile for the Plate Hub

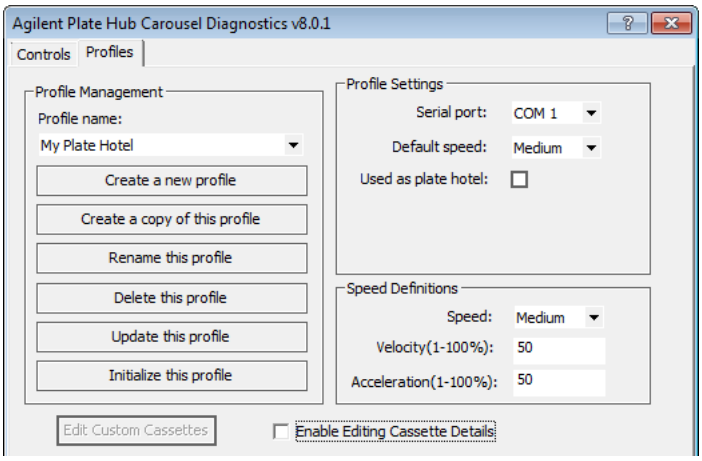
You use Plate Hub Carousel Diagnostics to create a profile for the Plate Hub Carousel. The Plate Hub Carousel profile allows you to set up communication between the Plate Hub Carousel and the controlling computer. You can also set the speed at which the carousel turns and indicate the number and type of cassettes that will be used.

***To create a profile:***

1 In the VWorks software, open **Plate Hub Carousel Diagnostics.**




The Plate Hub Carousel Diagnostics dialog box opens.



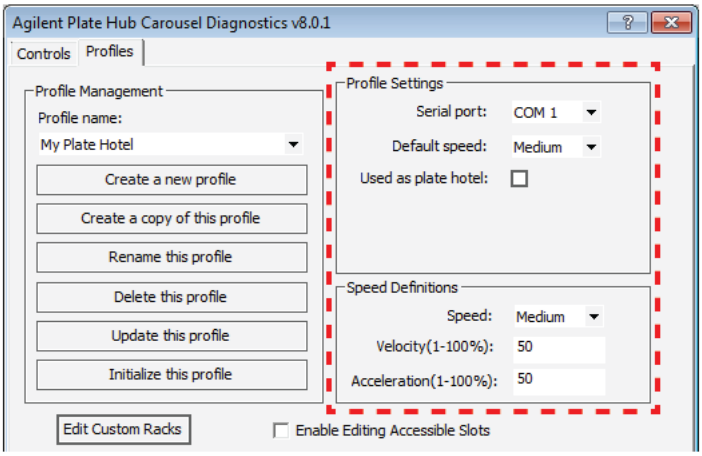

2 Click the **Profiles** tab.

3 Click **Create a new profile.** The Create Profile dialog box opens.

4 Type a name for the new profile, and then click **OK.** The new profile name appears in the Profile Management area.

## Setting up communication and selecting the rotation speed

***To set up communication with the Plate Hub Carousel and to select the rotation speed:***




1 In the **Profile settings** area:

- In the **Serial port** list, select the serial port that connects the Plate Hub to the controlling computer.
- In the **Default speed** list, select the speed at which you want the Plate Hub to rotate: **Slow, Medium, or Fast.**

*Note:* Do not select **Used as plate hotel**.

2 In the **Speed Definitions** area, define the three possible speeds (High, Medium, Low) as a percentage of the factory-set maximum speed. To do this:

**a** In the **Speed** list, select the speed you want to define.

**b** In the **Velocity** box, type the percentage of factory-set maximum speed. For example, you can set the Slow speed at 15% of the factory-set maximum speed.

**c** In the **Acceleration** box, type the percentage of maximum factory-set acceleration. For example, you can set the Slow acceleration at 15% of the factory-set maximum acceleration.

3 Click **Update this profile** to save the changes.

4 Click **Initialize this profile** to establish communication with the Plate Hub Carousel.

## Configuring the Plate Hub Carousel cassettes

This section explains the following:

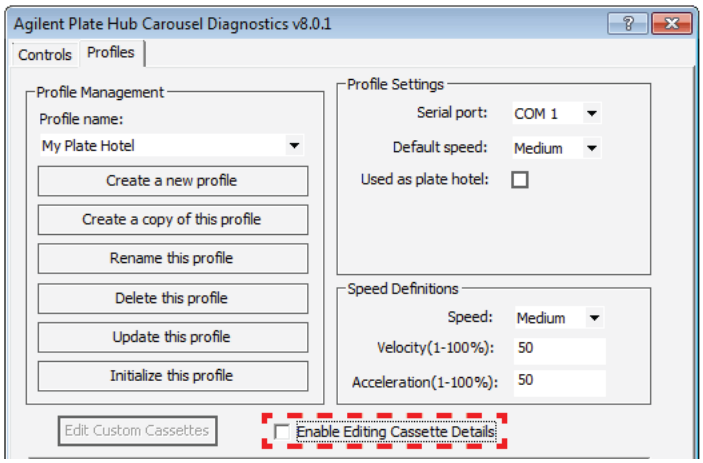
- Adding and managing custom cassettes
- Configuring the cassettes in the Plate Hub Carousel

If you have custom cassettes, you should add them before configuring the Plate Hub Carousel cassettes. If you do not have custom cassettes, proceed to configure the cassettes.

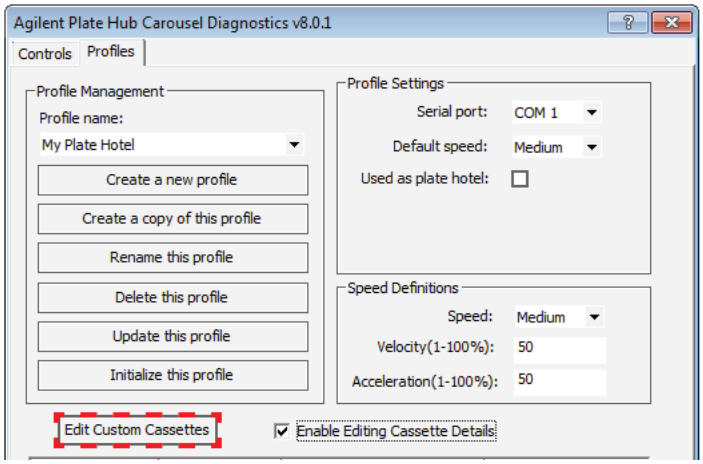
### Adding and managing custom cassettes

***To add a custom cassette:***

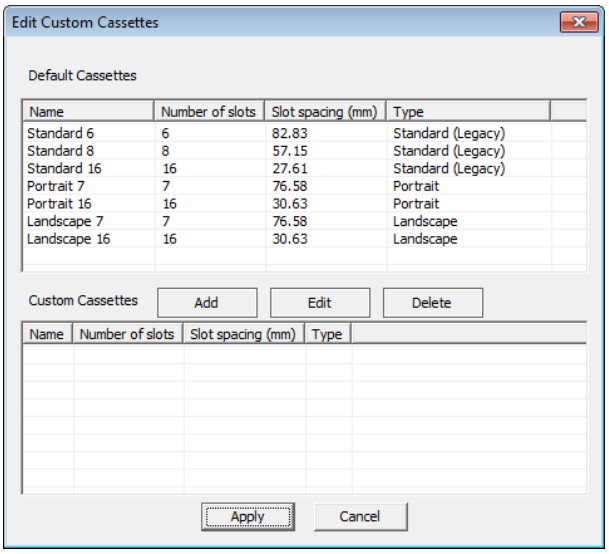
**1** In the **Profiles** tab, select **Enable Editing Cassette Details**. The Edit Custom Cassettes button becomes available.




**2** Click **Edit Custom Cassettes**.




The Edit Custom Cassettes dialog box appears and displays two tables: Default Cassettes and Custom Cassettes.

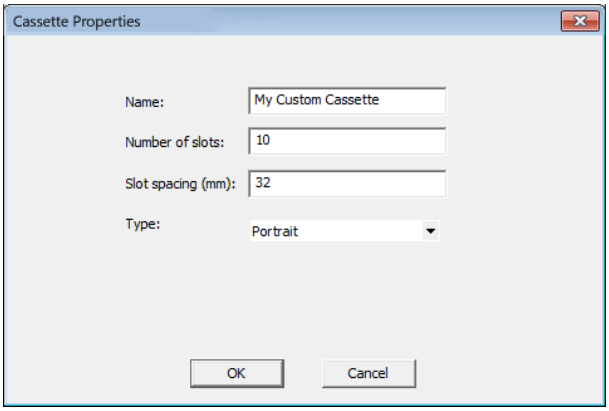



The Default Cassettes table lists default microplate and tall labware cassettes that are shipped with the Plate Hub Carousel. The table displays the cassette name, the number of slots in the cassette, the slot spacing, and the type of cassette. The cassette names are defined as follows:

| Cassette name | Description |
|---|---|
| Landscape 16 | Stores up to 16 microplates that are in the landscape orientation. This cassette is not removable and does not have a handle at the top. |
| Landscape 7 | Stores up to 7 tall labware, such as tip boxes, that are in the landscape orientation. This cassette is not removable and does not have a handle at the top. |
| Portrait 16 | Stores up to 16 microplates that are in the portrait orientation. This cassette is not removable and does not have a handle at the top. |
| Portrait 7 | Stores up to 7 tall labware, such as tip boxes, that are in the portrait orientation. This cassette is not removable and does not have a handle at the top. |
| Standard 16 | Stores up to 16 microplates that are in the landscape orientation. This cassette has a handle at the top.<br>*Note:* Standard 16 cassettes are provided in the list to ensure backward compatibility with older Plate Hub Carousel models. They only appear in the table if you have the older Plate Hub Carousel. |
| Standard 6 or Standard 8 | Stores up to 6 or 8 tall labware, such as tip boxes, that are in the landscape orientation. This cassette has a handle at the top.<br>*Note:* Standard 6 and Standard 8 cassettes are provided in the list to ensure backward compatibility with older Plate Hub Carousel models. They only appear in the table if you have the older Plate Hub Carousel. |

The Custom Cassettes table lists cassettes whose number of slots varies by system configuration. The table is empty if you have not yet created any custom cassettes.

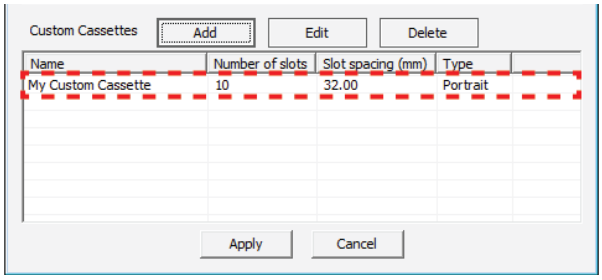
**3** To add a new custom cassette, click **Add**. The Cassette Properties dialog box opens.




**4** Specify the following:

| Property | Description |
|---|---|
| Cassette name | Type a name for the custom cassette. Use a name that will allow you to easily identify it later. |
| Number of slots | Type the number of slots in the cassette. |
| Slot spacing (mm) | Type the vertical distance, in millimeters, between each slot.<br><br>***To calculate the slot spacing:***<br>**1** Open the robot diagnostics. Locate the *z*-axis values of the teachpoints for the topmost and bottommost slots.<br>**2** Calculate the slot spacing as follows:<br>Spacing = $(Z_n - Z_1) / (\#\ slots - 1)$<br>where $Z_n$ is the *z*-axis value of the topmost slot, and $Z_1$ is the *z*-axis value of the bottommost slot.<br>For example, $Z_1$ is -68.9 mm, and $Z_n$ is 387.0 mm. The cassette has 16 slots, so the slot spacing is:<br>Spacing = (387.0 mm - (-68.9 mm))/(16 - 1)<br>= 30.4 mm |
| Type | Select the orientation of the cassette: **Landscape** or **Portrait**.<br><br>**IMPORTANT** All of the cassettes in the Plate Hub Carousel must have the same orientation. |

3 When you are finished, click **OK** to save the changes and return to the Edit Custom Cassettes dialog box. The newly created cassette appears in the Custom Cassettes table.




4 To edit a custom cassette, select the cassette in the table, and then click **Edit**.

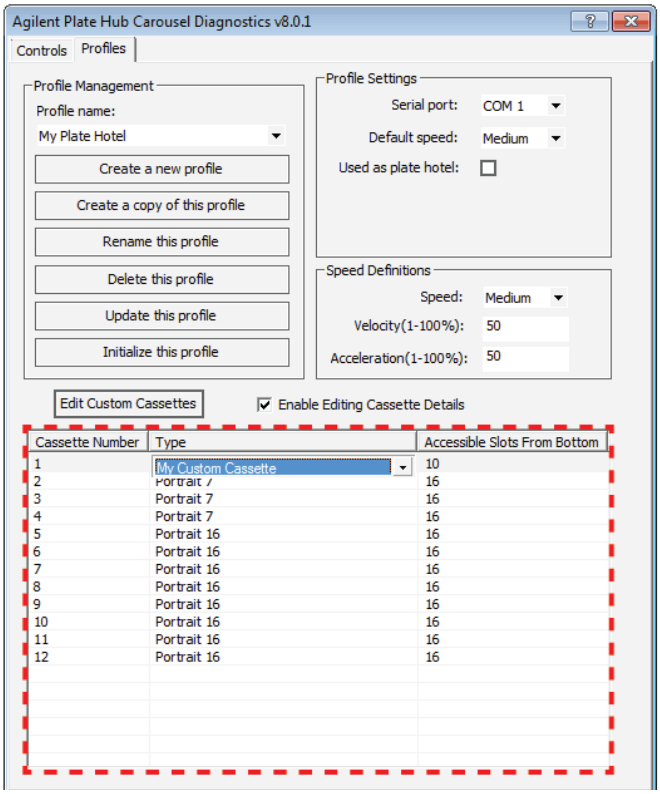
5 To delete a custom cassette, select the cassette in the table, and then click **Delete**.

6 When you are finished, click **Apply** to save the changes and return to the Plate Hub Carousel Diagnostics dialog box.

### Configuring the cassettes in the Plate Hub Carousel

Before you configure the Plate Hub Carousel cassettes, determine the number of slots you will use in each cassette. For example, you might only want to use the first 10 of the 16 slots in some cassettes. When determining the number of slots, be aware that slot 1 is the bottommost slot.

You configure the Plate Hub Carousel cassettes using the table at the bottom of the Profiles tab.



***To configure the cassettes in the Plate Hub Carousel:***

1. In the **Cassette name** column, select the desired cassette.

   *Note:* Standard cassette selections are provided in the Cassette name list to ensure backward compatibility with older Plate Hub Carousel models.

2. If you do not plan to use all of the slots in the cassettes:

   a. Select **Enable Editing Cassette Details**. The fields in the Accessible Slots from Bottom column become writable.

   b. Type a new value in the **Accessible Slots from Bottom** column.

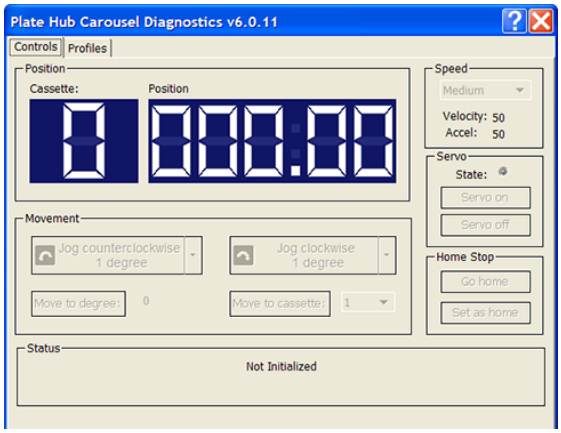
3. When you are finished, click **Update this profile** to save the changes.

4. Return to the device file and select the profile for the Plate Hub Carousel device.

## Using Plate Hub Diagnostics

You can use the commands and parameters in the Plate Hub Carousel Diagnostics Controls tab to:

- Set the home position.
- Turn the carousel to a specific position.




***To set the home position:***

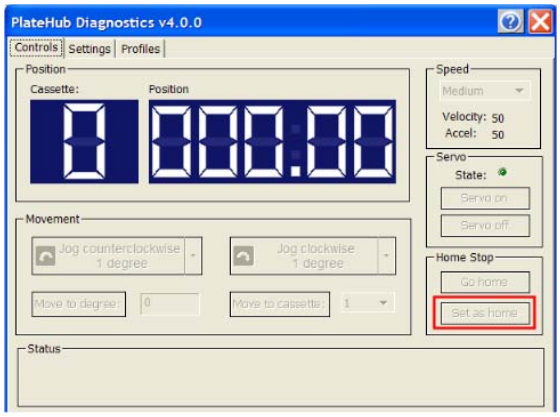
1. In the **Servo** area, click **Servo off** to turn off the Plate Hub Carousel motors.

2. Manually turn the carousel so that cassette 1 lines up with the robot. You can use the teaching jig to make sure the alignment is accurate. For information about using the teaching jig, see the robot user documentation.

3. When you are finished aligning the cassette 1 with the robot, move the robot and its grippers away from the carousel.

4. In the **Servo** area, click **Servo on** to turn on the Plate Hub Carousel motors.

5 Click **Set as home** in the **Home Stop** area.



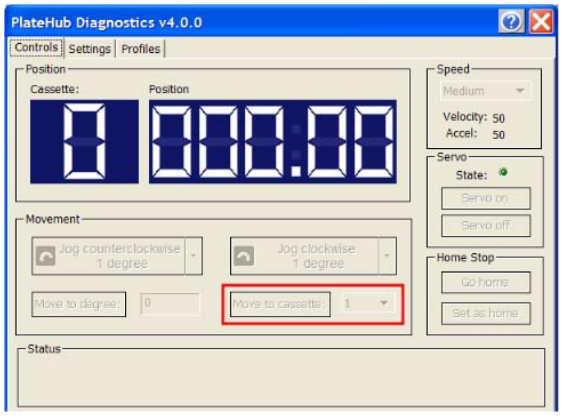

***To turn the Plate Hub:***

1 Move the robot away from the Plate Hub.

2 To move a cassette to the cassette-1 home position:

**a** In the **Movement** area, in the list next to the **Move to cassette** button, select the cassette number.

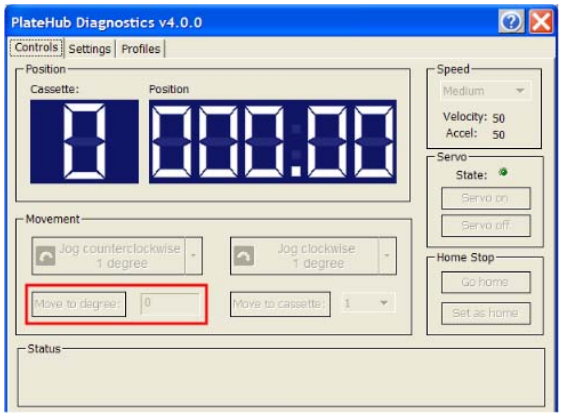
**b** Click **Move to cassette.** The carousel turns until the selected cassette is at the cassette-1 home position.



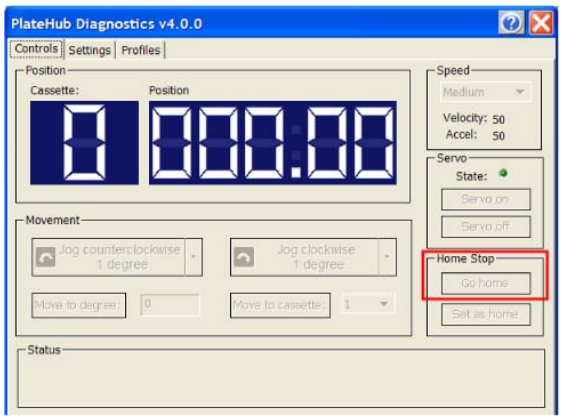

3 To turn the carousel a specified number of degrees relative to the home position:

**a** In the box next to the **Move to degree** button, type an angular position (0–360) in degrees.

**b** Click the **Move to degree** button. The carousel turns the specified number of degrees from the home position.




4 To return the carousel to its home position, in the **Home Stop** area, click **Go Home.**




## Setting teachpoints for the Plate Hotel or Plate Hub

To set, edit, and verify teachpoints for the Plate Hub, see the robot user documentation.

When you set the teachpoints, use the provided teaching jig to set a teachpoint at the following locations:

- Top shelf
- Bottom shelf

## Related information

| For information about... | See... |
|---|---|
| Using the Plate Hotel or the Plate Hub in a protocol | *VWorks Automation Control User Guide* |
| Available devices | "BioCel System additional devices overview" on page 72 |

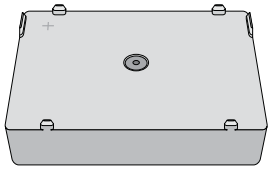
# Platepad

## About this topic

This topic describes the standard platepad, explains its use, and provides the configuration instructions.

## Description

The standard platepad is a metal block on which a single microplate sits. Raised tabs on each side keeps the microplate in place.



## Setup workflow

| Step | Procedure | See... |
|---|---|---|
| 1 | Install the platepad. | Automation Solutions Technical Support |
| 2 | Add the platepad in the device file. | "Adding the platepad in the device file" on page 131 |
| 3 | Set, edit, and verify the teachpoints for the platepad. | Robot user documentation |

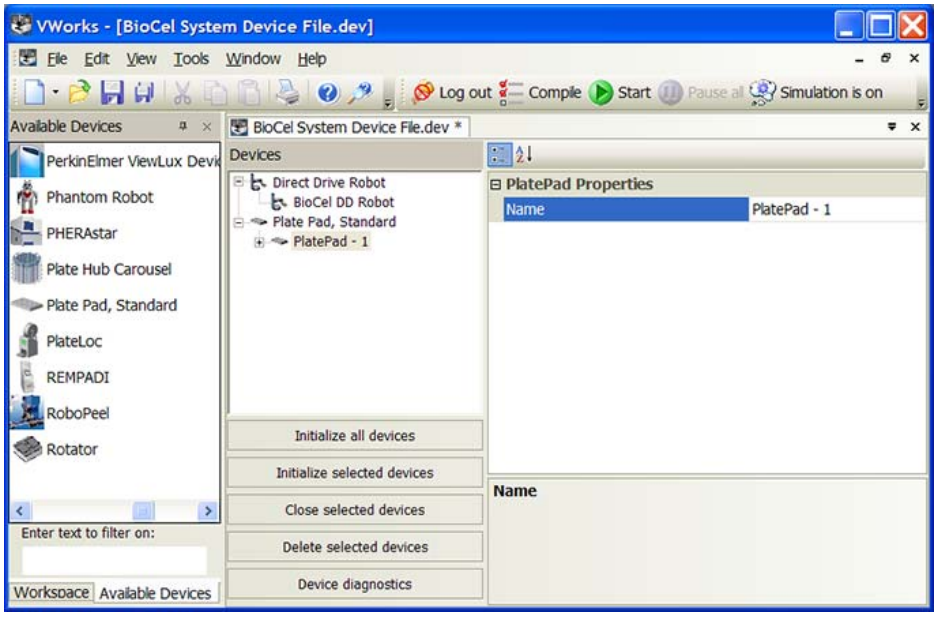
## Adding the platepad in the device file

To place a microplate on or remove a microplate from a platepad, you must add the platepad device in the device file. The VWorks software is set up with the correct device configuration. You do not need to add a new platepad to the device file unless you want to add another platepad or replace the existing platepad. For information about device files, see "Devices and device file defined" on page 32.

***To add a platepad to the device file:***

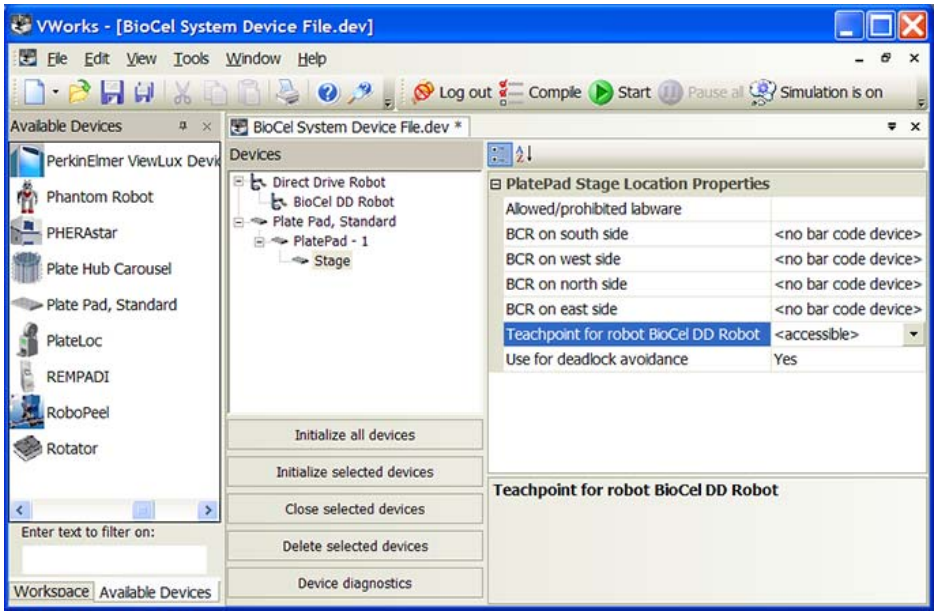
1 In the device file, add the Plate Pad. See "Adding and deleting devices in the software" on page 32 for instructions.

2 In the **PlatePad Properties** area, type the name of the platepad.




3 In the **Devices** area, expand the **Plate Pad**, and then select the **Stage** location.

4 In the **PlatePad Stage Location Properties** area, type or set the following:




| Property | Description |
|---|---|
| Allowed/prohibited labware | Permitted labware class for the selected location.<br><br>For example, you might specify that only tip boxes are allowed at a given location. For details on labware classes, see the *VWorks Automation Control Setup Guide*. |

| Property | Description |
|---|---|
| BCR on south/west/north/ east side | The location of the barcode reader and the desired barcode reader device. Use this field only if a barcode reader is installed on the device. |
| Teachpoint for robot <BioCel System Robot> | The name of the teachpoint to use for the stage location. This selection enables the robot to move correctly to and from the platepad or device during a protocol run.<br>For example, if the robot teachpoint file contains a teachpoint for this platepad, you must select that teachpoint.<br>*Note:* If the computer is not connected to the BioCel System and you want to simulate a run, select **<accessible>.** |
| Use for deadlock avoidance | Option to permit the location to be used for deadlock avoidance.<br>Select **Yes** to permit labware to be moved to this location to avoid a deadlock in the system.<br>Select **No** if you do not want to move random labware to this location to avoid deadlock. |

5 Select **File > Save.**

## Related information

| For information about... | See... |
|---|---|
| Setting a platepad teachpoint | Robot user documentation |
| Available devices | "BioCel System additional devices overview" on page 72 |

# Vacuum Delid Station

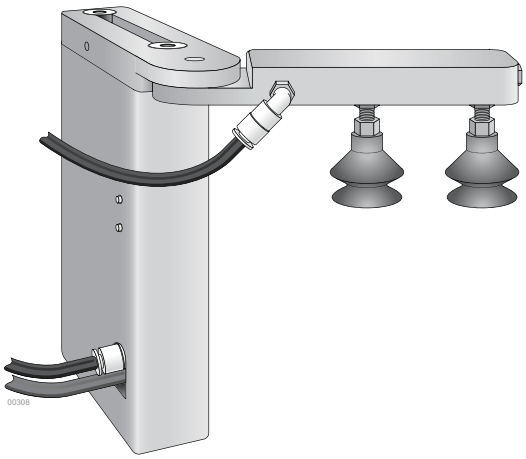
## About this topic

This topic describes the Vacuum Delid Station, explains its use, and provides the configuration instructions.

## Description

The Vacuum Delid Station is a static arm that sits over the waste-bin opening in the BioCel System table. Vacuum in the suction cups is used to remove labware lids that are dropped into the waste bin below the table.

*Note:* Vacuum is created using an air source.



## Setup workflow

| Step | Procedure | See... |
|---|---|---|
| 1 | Install the Vacuum Delid Station. | Automation Solutions Technical Support |
| 2 | Add the Vacuum Delid Station in the device file. | "Adding the Vacuum Delid Station in the device file" on page 134 |
| 3 | Set, edit, and verify the teachpoint for the Vacuum Delid Station. | "Setting the teachpoint at the Vacuum Delid Station" on page 137 |

## Adding the Vacuum Delid Station in the device file

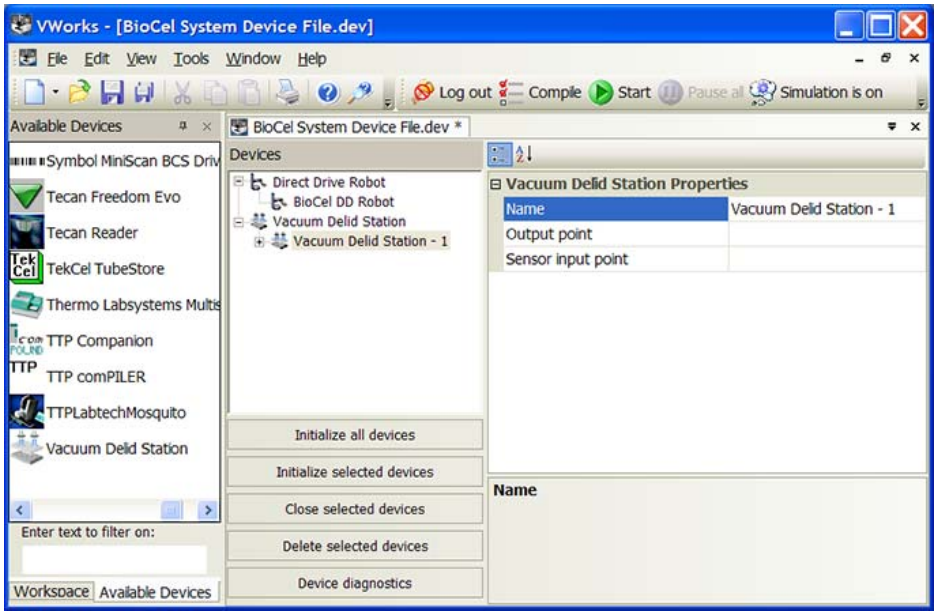
The VWorks software device file is set up with the correct devices and device configurations for your BioCel System. You do not need to add a new vacuum-based lid remover to the device file unless you are adding another vacuum-

based lid remover or replacing the existing vacuum-based lid remover. For information about device files, see "Devices and device file defined" on page 32.

***To add the Vacuum Delid Station to the device file:***

1 In the device file, add the Vacuum Delid Station device. See "Adding and deleting devices in the software" on page 32 for instructions.

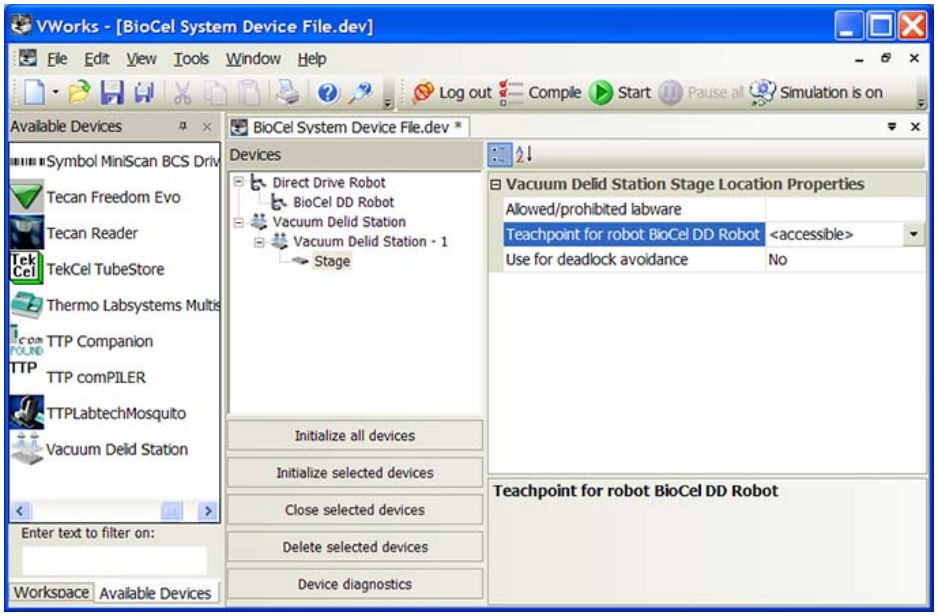
2 In the **Vacuum Delid Station Properties** area, type or select the following:




| Property | Description |
|---|---|
| Name | The name of the Vacuum Delid Station device. |
| Output point | The BioCel I/O Interface port number that is used to turn on or turn off the vacuum. |
| Sensor input point | The BioCel I/O Interface port number that is used to detect whether the vacuum is turned on or turned off. |

3 In the **Devices** area, expand the Vacuum Delid Station, and then select the **Stage** location.

**4** In the **Vacuum Delid Station Location Properties** area, type or set the following:




| Property | Description |
|---|---|
| Allowed/prohibited labware | Permitted labware class for the selected location.<br><br>For example, you might specify that only tip boxes are allowed at a given location. For details on labware classes, see the *VWorks Automation Control Setup Guide*. |
| Teachpoint for robot <BioCel System Robot> | The name of the teachpoint for the stage location. This selection enables the robot to move correctly to and from the Vacuum Delid Station during a protocol run.<br><br>For example, if the robot teachpoint file contains a teachpoint for this Vacuum Delid Station, you must select that teachpoint.<br><br>*Note:* If the computer is not connected to the BioCel System and you want to simulate a run, select **<accessible>.** |
| Use for deadlock avoidance | Option to permit the location to be used for deadlock avoidance.<br><br>This property is not applicable to the Vacuum Delid Station. |

**5** Select **File > Save.**

## Setting the teachpoint at the Vacuum Delid Station

This section presents guidelines for setting a Vacuum Delid Station teachpoint. For detailed instructions on how to set a teachpoint, see the robot user documentation.

### Direct Drive Robot and BenchBot Robot guidelines

***When you set the Vacuum Delid Station teachpoint:***

1. Install the provided teaching jig in the robot grippers.
2. Position the robot such that it is centered over the waste bin, and the bottom of the teaching jig is touching the top of the metal bar of the Vacuum Delid Station.
3. Set the teachpoint. Make sure you:
   - Set **Approach Ht (with labware)** and **Approach Ht (no labware)** at 0.
   - For **Place Custom Action,** select **Vacuum delid.**
4. Save the teachpoint.

## Related information

| For information about... | See... |
|---|---|
| Setting up the BioCel I/O Interface | *BioCel System User Guide*, Revision 01, August 2010 |
| Using the Vacuum Delid Station in a protocol | *VWorks Automation Control User Guide* |
| Lid Hotel Station | "Lid Hotel Station" on page 81 |
| Available devices | "BioCel System additional devices overview" on page 72 |

# Waste bin

## About this topic

This topic describes the waste bin, explains its use, and provides the configuration instructions.

## Description

The waste bin is a container that receives waste in the BioCel System. The software views the waste bin as a location (teachpoint) where the robot releases the labware that it has in its grippers. A receptacle for trash is typically positioned under this teachpoint.

Because it is a teachpoint and can be accessed by the robot, the waste bin is treated as a device in the software.

## Setup workflow

| Step | Procedure | See... |
|---|---|---|
| 1 | Install the waste bin. | Automation Solutions Technical Support |
| 2 | Add the waste bin in the device file. | "Adding the waste bin in the device file" on page 138 |
| 3 | Set, edit, and verify the teachpoints for the waste bin. | Robot user documentation |

## Adding the waste bin in the device file

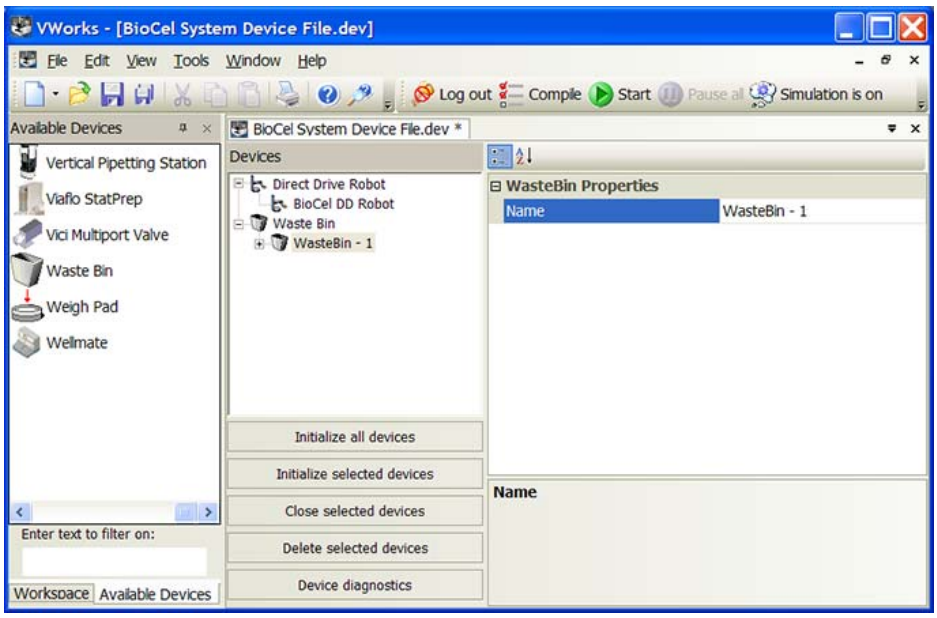
The VWorks software device file is set up with the correct devices and device configurations for your BioCel System. You do not need to add a new waste bin to the device file unless you are adding another waste bin or replacing the existing waste bin. For information about device files, see "Devices and device file defined" on page 32.

If the BioCel System is designed with an environmental chamber and an automated door separates the waste bin from the system, make sure you also add the door to the device file.

***To add a waste bin to the device file:***

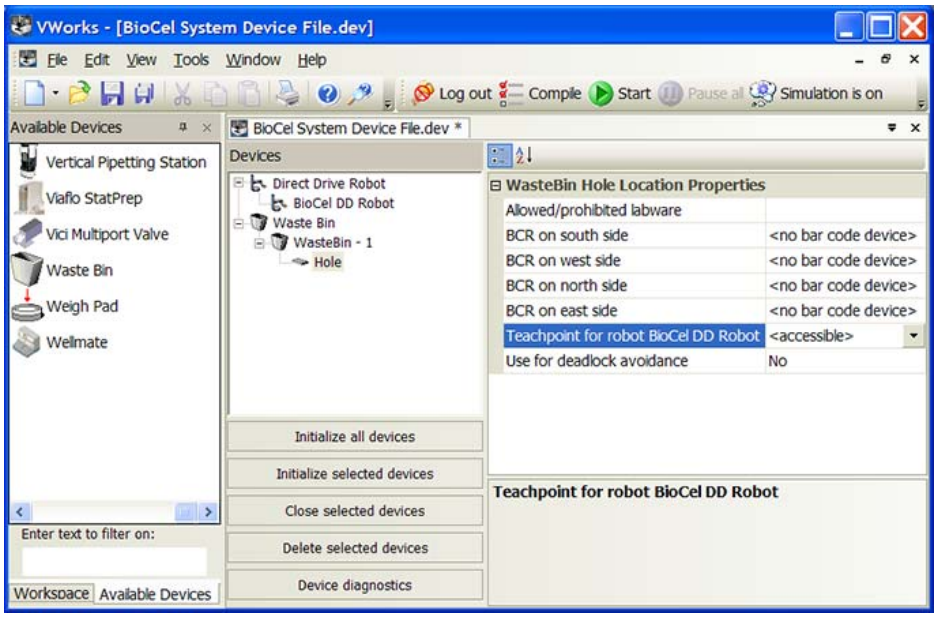
1 In the VWorks software, open the device file and add the Waste Bin device. See "Adding and deleting devices in the software" on page 32 for instructions.

2 In the **Waste Bin Properties** area, type a name for the Waste Bin.




3 In the **Devices** area, expand Waste Bin - 1, and then select **Hole,** the location where the robot will drop waste.

4 In the **Waste Bin Hole Location Properties** area, type or set the following:




| Property | Description |
|---|---|
| Allowed/prohibited labware | Permitted labware class for the selected location.<br><br>For example, you might specify that only tip boxes are allowed at a given location. For details on labware classes, see the *VWorks Automation Control Setup Guide*. |

| Property | Description |
|---|---|
| BCR on south/west/north/ east side | The location of the barcode reader and the desired barcode reader device.<br>Use this field only if a barcode reader is installed on the device. |
| Teachpoint for robot <BioCel System Robot> | The name of the teachpoint to use for the Hole location. This selection enables the robot to move correctly to and from the Waste Bin during a protocol run.<br>For example, if the robot teachpoint file contains a teachpoint for this Waste Bin, you must select that teachpoint.<br>*Note:* If the computer is not connected to the BioCel System and you want to simulate a run, select **<accessible>.** |
| Use for deadlock avoidance | Option to permit the location to be used for deadlock avoidance.<br>This property is not applicable to the Waste Bin. |

5 Select **File > Save.**

***To add a waste-bin door to the device file:***

1 In the VWorks software, add the waste bin Door device. See "Adding and deleting devices in the software" on page 32 for instructions.

2 When setting up the waste bin door, be sure to specify the BioCel I/O Interface input and output signals to be used. For detailed instructions, contact Automation Solutions Technical Support.

3 Select **File > Save.**

## Related information

| For information about... | See... |
|---|---|
| Setting a waste teachpoint | Robot user documentation |
| Setting up the BioCel I/O Interface | *BioCel System User Guide*, Revision 01, August 2010 |
| Available devices | "BioCel System additional devices overview" on page 72 |

# Weigh Pad

## About this topic

This topic describes the Weigh Pad, explains its use, and provides the configuration instructions.

## Description

A Weigh Pad is an electronic monitor that checks the percentage of liquid in the bottle resting on the Weigh Pad. By monitoring the weight of the bottle, the Weigh Pad controls when the Pump Module is activated. The Weigh Pad works with the Pump Module to maintain an optimum level of liquid and ensures the bottle is not overfilled. If no Pump Module is used, an alarm can be set up to sound when the liquid level is too low or too high.

Two sizes of Weigh Pads are available: Large and small. The Weigh Pad size should accommodate the bottle size.

## Setup workflow

| Step | Procedure | See... |
|---|---|---|
| 1 | Install the Weigh Pad. | Automation Solutions Technical Support |
| 2 | Add the Weigh Pad in the device file. | “Adding the Weigh Pad in the device file” on page 142 |
| 3 | Create a profile for the Weigh Pad. | “Creating a profile for the Weigh Pad” on page 142 |
| 4 | Set up the bottle library. | “Setting up the bottle library” on page 144 |
| 5 | Calibrate the Weigh Pads. | “Calibrating the Weigh Pads” on page 145 |
| 6 | View the bottle status. | “Viewing the bottle status” on page 146 |

*Note:* Weigh Pads are typically installed under the system deck and do not interact with the robot. Therefore, you do not need to set teachpoints for Weigh Pads.

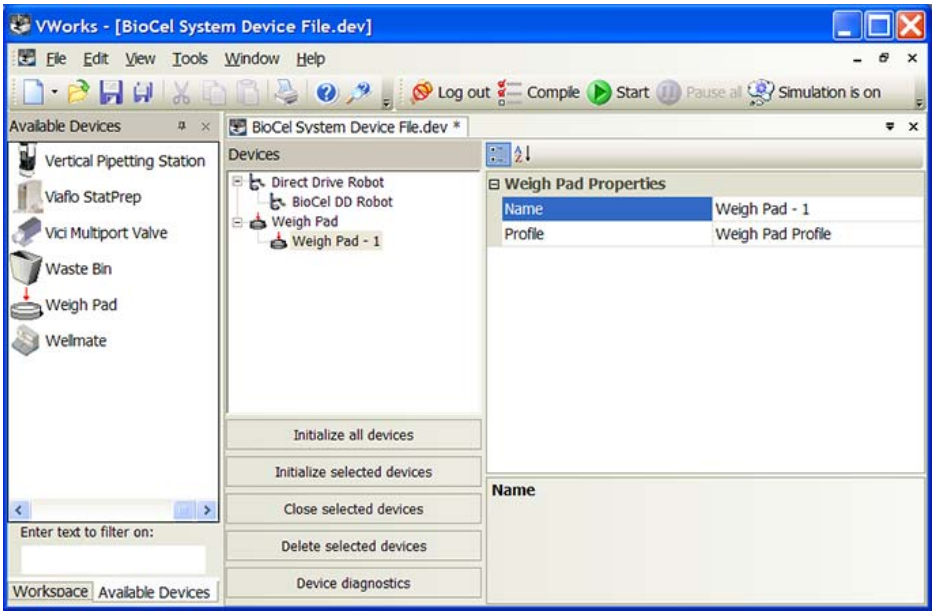
## Adding the Weigh Pad in the device file

The VWorks software device file is set up with the correct devices and device configurations for your BioCel System. You do not need to add a new Weigh Pad to the device file unless you are adding another Weigh Pad or replacing the existing Weigh Pad. For information about device files, see "Devices and device file defined" on page 32.

***To add the Weigh Pad to the device file:***

1 In the VWorks software, open the device file and add the Weigh Pad. See "Adding and deleting devices in the software" on page 32 for instructions.

2 In the **Weigh Pad Properties** area, type or select the following:




| Property | Description |
|---|---|
| Name | The name of the Weigh Pad device. |
| Profile | The profile associated with the device.<br>Select the desired profile from the list. If you have not created a profile, see "Creating a profile for the Weigh Pad" on page 142, and then return to this step to select the profile. |

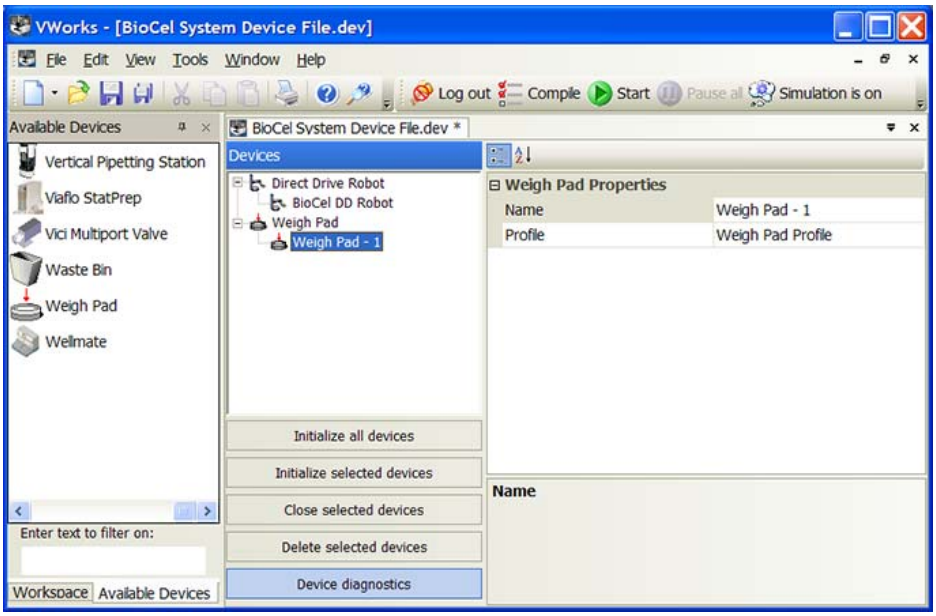
3 Select **File > Device File > Save.**

## Creating a profile for the Weigh Pad

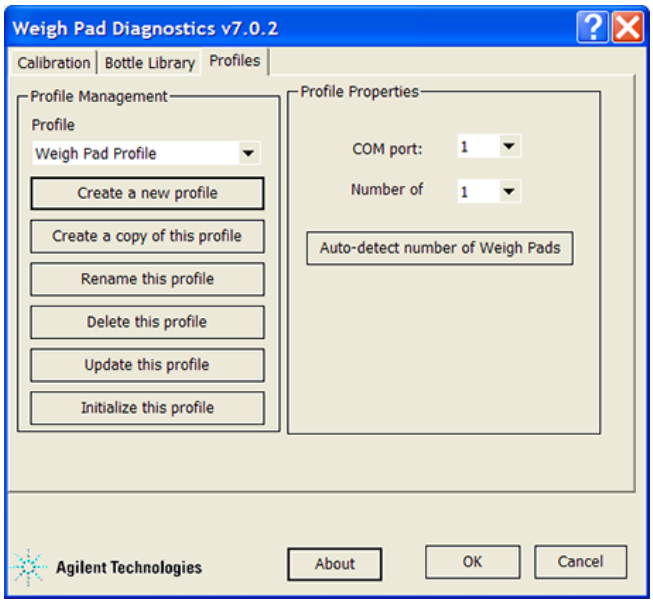
The Weigh Pad profile allows you to set up communication between the Weigh Pad and the controlling computer.

***To create a profile:***

1 In the VWorks software, open **Weigh Pad Diagnostics.**




The Weigh Pad Diagnostics dialog box opens.




2 Click the **Profiles** tab.

3 Click **Create a new profile.** The Create Profile dialog box opens.

4 Type a name for the new profile, and then click **OK.** The new profile name appears in the Profile area.

5 In the **Profile Properties** area:

- **a** In the **COM port** list, select the serial port that connects the Weigh Pad to the controlling computer.
- **b** In the **Number of** list, select the number of Weigh Pads that are installed.
- **c** If you are not sure how many Weigh Pads are connected to the system, click **Auto-detect modules.** The Number of Weigh Pads updates.

6 Click **Update this profile** to save the changes.

7 Click **Initialize this profile** to establish communication with the Weigh Pad.

8 Return to the device file and select the profile for the Weigh Pad device.

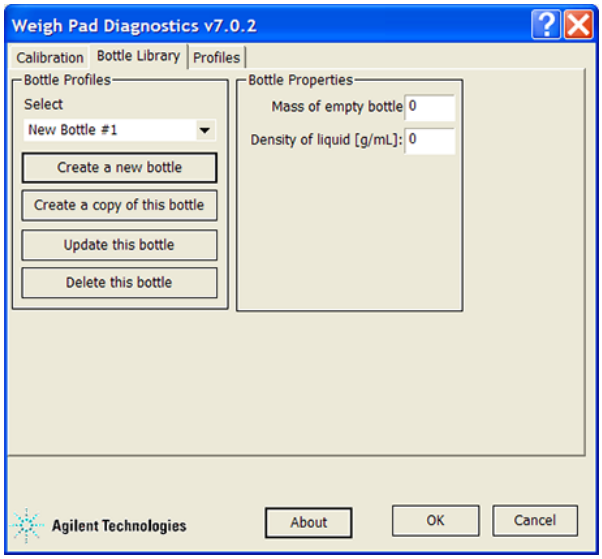
## Setting up the bottle library

For each bottle you want the system to monitor, you must specify the weight of the bottle and the density of its contents. The software will use the information to maintain optimum liquid level and prevent overfilling.

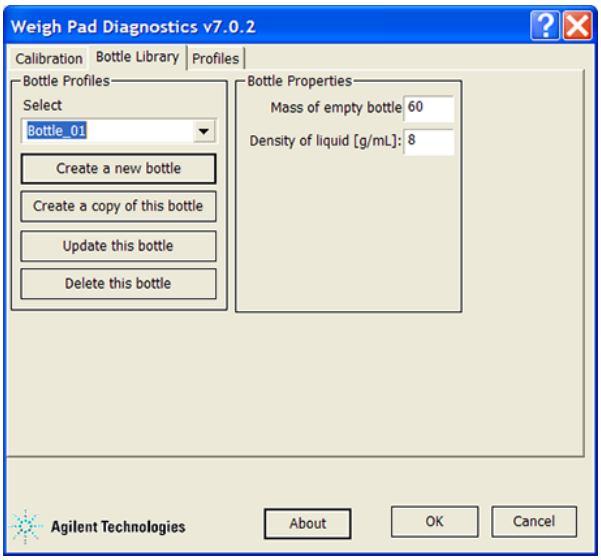
***To set up the bottle library:***

1 In **Weigh Pad Diagnostics,** click the **Bottle Library** tab.

2 In the **Bottle Profiles** area, click **Create a new bottle.** A new default bottle name appears in the Select list.




3 To change the bottle name, double-click the default bottle name, type a new name, and then click **Rename this bottle.** The new name appears in the Select list.




4 In the **Bottle Properties** area:

   **a** In the **Mass of empty bottle** box, type the mass (weight) of the empty bottle in grams.

   **b** In the **Density of liquid** box, type the density of the liquid in grams per liter.

5 Click **Update this bottle.**

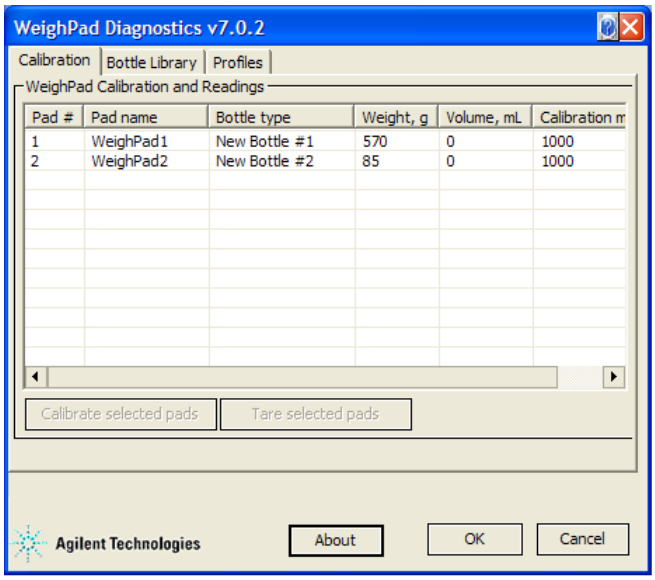
6 Repeat steps 2 through 5 for the remaining bottles.

## Calibrating the Weigh Pads

To ensure the system accurately monitors the bottles and their contents, you must calibrate the Weigh Pads.

***To calibrate the Weigh Pads:***

1 In **Weigh Pad Diagnostics,** click the **Calibration** tab.



2 In the **Weigh Pad Calibration and Readings** table, select the Weigh Pad you want to calibrate.

3 Click **Calibrate selected pads.** A dialog box opens. Follow the instructions in the dialog box to add or remove the liquid you want to use for the calibration process. If the calibration is correct for the density of the liquid, the dialog box displays a volume, in milliliters.

4 Place the empty bottle on the Weigh Pad.

5 Click **Tare selected pads** to set the Weight and Volume reading at 0.

6 When you are finished calibrating and taring the Weigh Pad, click **OK** to save the changes.

## Viewing the bottle status

***To view the bottle status:***

1 In **Weigh Pad Diagnostics,** click the **Calibration** tab.

2 In the **Weigh Pad Calibration and Readings** table, check the following:

| Column | Description |
|---|---|
| Pad # | The numeric identifier that is assigned to a Weigh Pad as it is added in the software. |
| Pad name | The name associated with the Weigh Pad.<br>You can provide a name for the Weigh Pad. To do this, double-click in the Pad name cell, and then type a name. |
| Bottle type | The bottle on the Weigh Pad. The bottle type information is obtained from the bottle profile. |
| Weight, g | The current weight of the bottle and its contents. |
| Volume, mL | The current volume of liquid in the bottle. The software calculates the volume from the bottle information (weight of empty bottle and liquid density). |
| Calibration mass, g | The weight used to calibrate the Weigh Pad. |

## Related information

| For information about... | See... |
|---|---|
| Using the Weigh Pad in a protocol | *VWorks Automation Control User Guide* |
| Available devices | "BioCel System additional devices overview" on page 72 |

# B
# Block diagrams

This appendix provides block diagrams and descriptions of the following:


- "Power system" on page 148
- "Air system" on page 152
- "Vacuum system" on page 154

# Power system

## About this topic

This topic summarizes the power system of the BioCel System. Becoming familiar with how your BioCel System is connected will help you to understand the behavior of your BioCel System and solve problems.

## Overview diagrams

The following diagrams summarize the power system and illustrate typical connections. Both AC and DC power circuits are shown, but most data connections are not. Those elements that lie inside the Automation Control Unit are not included.

***Figure*** Main power

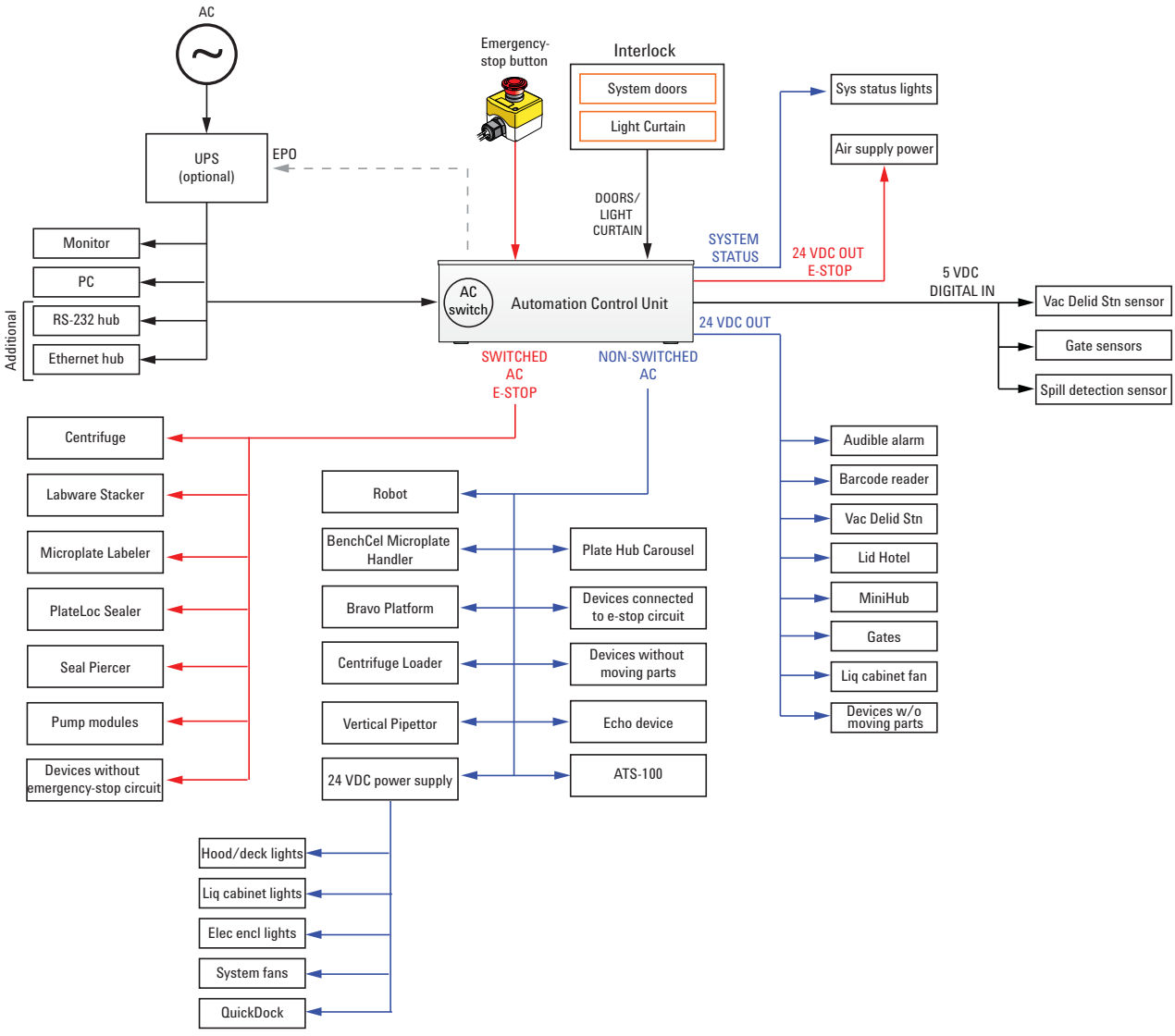
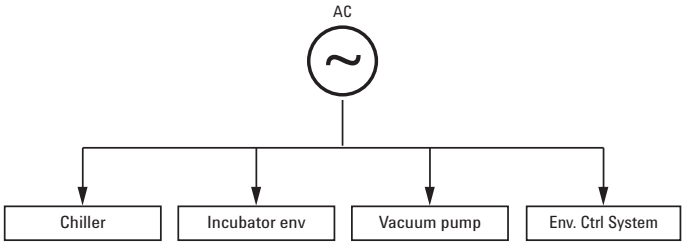


***Figure*** Auxiliary power




## Main power

The main AC power enters the Automation Control Unit, passes through the main disconnect (AC) switch, through the main fuses inside the Automation Control Unit, and out to the AC output ports (NON-SWITCHED AC, SWITCHED AC).

If the system configuration includes a UPS, the main AC power passes through the UPS before entering the Automation Control Unit.

## Auxiliary power

One or more electrical lines (auxiliary power) supply current to devices that do not require backup power supply and can operate independently of the Automation Control Unit. Some examples of these devices include:

- Cooling and heating water baths
- Incubators (environmental control components only; the robotics component must connect to the UPS, which is connected to the Automation Control Unit)
- Vacuum pumps
- Environmental controller console that houses the controllers for the main BioCel System (not for any separate environmental enclosures)

Because these devices are not connected to the Automation Control Unit and are on an independent electrical circuit, they are not affected by emergency stops or interlocks. Unless they are connected to another UPS, they will not receive backup power supply during a power outage.

## UPS connections

From the UPS, current is passed to the Automation Control Unit, through the main disconnect (AC) switch and the main fuses, then to the rest of the BioCel System.

### Without the UPS EPO cable (default setup)

By default, the UPS emergency power-off (EPO) cable is not installed between the UPS and the Automation Control Unit. As a result, turning off the power at the Automation Control Unit does not turn off the UPS, and devices that are connected directly to the UPS will remain on. These devices include the computer, computer monitor, and communication hubs. This setup allows you to continue to work on the computer and use the lights even though the system has been shut down.

### With the UPS EPO cable

If the UPS EPO cable is installed, turning off the power at the Automation Control Unit will cut power to the UPS, thus turning off devices that are connected directly to the UPS. Therefore, make sure you properly shut down and turn off those devices, such as the computer, before shutting down the system.

## Non-switched AC and DC power

The blue lines in the power block diagram represent either AC or DC passed to devices that are:

- Equipped with an emergency-stop circuit. Examples of such devices include the system robot, BenchCel Microplate Handler, Bravo Platform, Vertical Pipetting Station, and Plate Hub Carousel.
- Not equipped with an emergency-stop circuit and have no moving parts. Examples of such devices include the barcode reader, lights, fans, and docking tables with the QuickDock feature. The lights, fans, and docking tables are connected via a 24 VDC power supply.

The non-switched (blue) power ports are on a pre-emergency-stop circuit. Therefore, devices that do not have an emergency-stop circuit are not affected by emergency stops and a tripped interlock.

## Switched AC and DC power

The red lines in the power block diagram represent either AC or DC passed to devices that are not equipped with an emergency-stop circuit but have moving parts. Examples of such devices include the Labware MiniHub, PlateLoc Sealer, and Labware Stacker.

The switched (red) power ports are on a post-emergency-stop circuit. Power is cut from devices connected to these ports during an emergency stop.

## Emergency-stop button and the interlock system

The safety interlock system creates a circuit with the emergency-stop relay. Pressing the emergency-stop button will open the circuit, thus stopping the robot and other devices that are connected to the emergency-stop circuit. In addition, power is cut from devices on the switched (red) AC and DC circuits.

Opening a system door or interrupting the Light Curtain will also disrupt the safety interlock circuit and stop the robots and devices that are connected to the emergency-stop circuit. However, power remains on the switched (red) AC and DC circuits to permit these devices to complete their current tasks before pausing.

*Note:* Disrupting the interlock circuit engages the *z*-axis brakes in the system robot, Vertical Pipetting Station, and the Bravo Platform. The brakes prevent the robot and pipette head from dropping, thus preventing damage and reducing a crushing hazard.

**IMPORTANT** After an emergency-stop event has occurred, the reset button must be pressed to reset the emergency-stop relay to a position that allows current to flow. For more information about recovering from an emergency stop, see the *BioCel System Safety Guide*.

## 5 VDC digital input

5 VDC is passed from the Automation Control Unit to sensors in the system. The sensors are found in devices such as the Vacuum Delid Station and pass-through gates. A spill detection sensor is found in the liquid cabinet.

*Note:* The 5 VDC ports also accept TTL/CMOS logic input signals from the sensors.

For more information about the 5 VDC DIGITAL IN ports, see the *Automation Control Unit User Guide*. For information about managing signals from the sensors, see the lab automation software user documentation, such as the *VWorks Automation Control User Guide*.

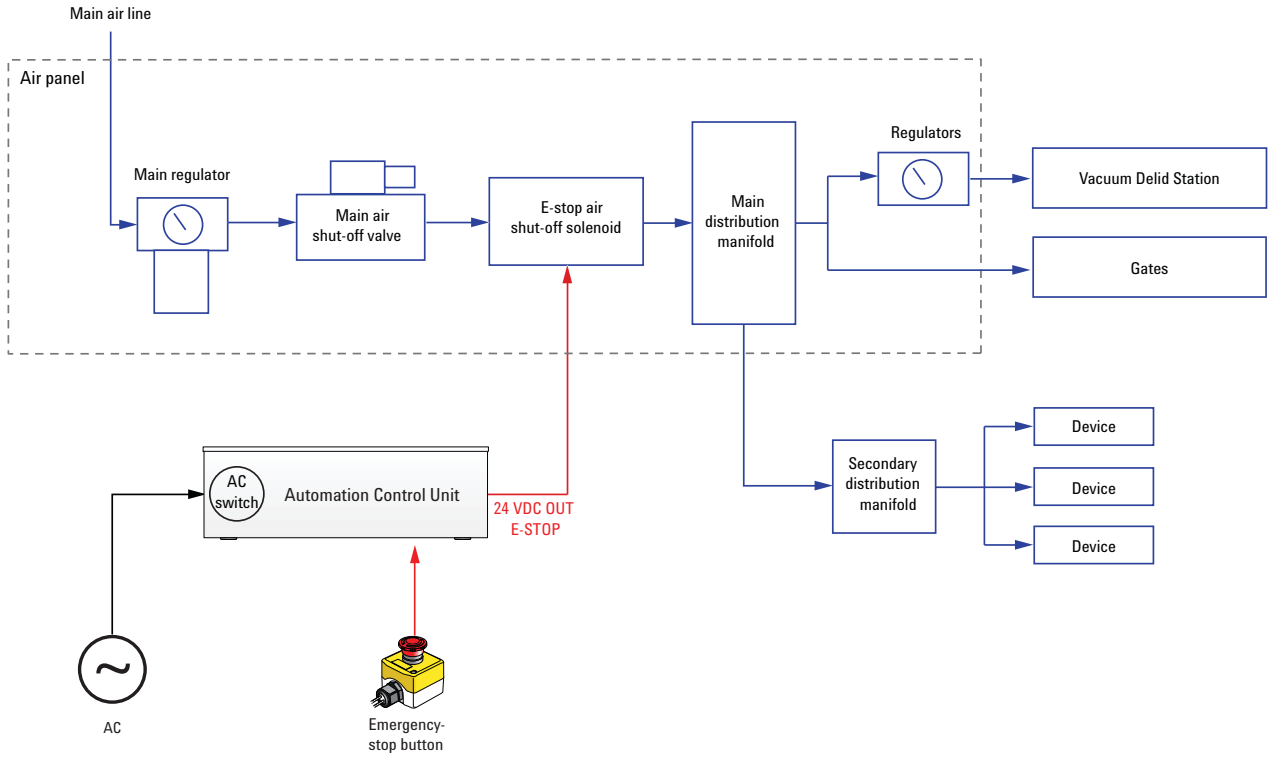
## Related information

| For information about... | See... |
|---|---|
| Systems affected by interlocks and emergency stops | "Power system" on page 148 |
| Stopping a run in an emergency | *BioCel System Safety Guide* |
| Turning the BioCel System off | "Starting up and shutting down the BioCel System" on page 28 |

# Air system

## Air and power interaction

The following diagram shows how the air and power systems interact. Becoming familiar with these systems will help you to understand the behavior of your BioCel System and solve problems.




## Air system description

Air is used on the BioCel System to:

- Move parts, such as the Labware Stacker grippers and Vertical Pipetting Station shelves
- Create a vacuum, such as for the Vacuum Delid Station

The flow of air through the system is controlled by air-pressure regulators. Many devices have their own built-in regulators. Air pressure to other parts is controlled by regulators in the air distribution panel of the BioCel System.

The diagram above shows how air to the BioCel System can be cut off:

- Turning off the main power at the Automation Control Unit
- Turning off the main air shutoff valve in the air distribution panel
- Pressing an emergency-stop button (for emergency stops only)

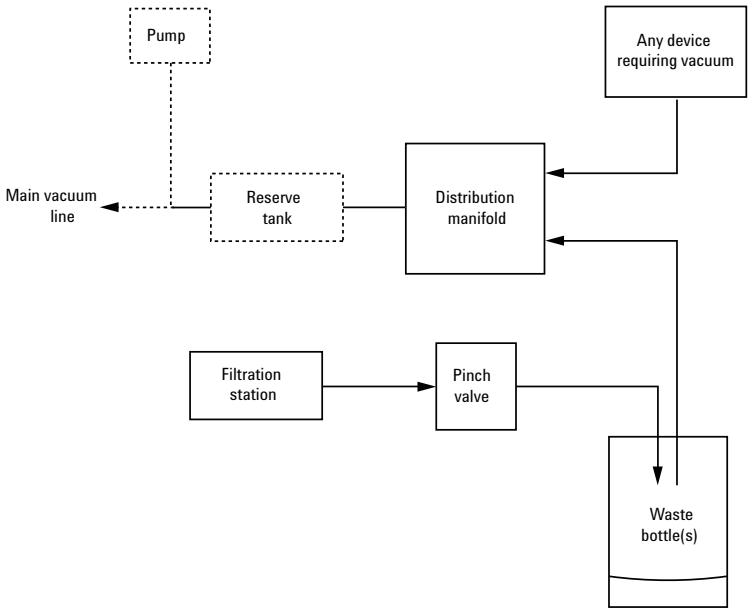
## Related information

| For information about... | See... |
| --- | --- |
| Power system | “Power system” on page 148 |
| Vacuum system | “Vacuum system” on page 154 |
| Emergency stop | *BioCel System Safety Guide* |

# Vacuum system

## Vacuum flow diagram

The following diagram shows the vacuum flow in the optional vacuum system.




## Vacuum system description

A vacuum may be used on the BioCel System for:

- Filtration stations
- Suction to hold plates flat on a Vertical Pipetting Station shelf
- Third-party devices

The vacuum can be supplied by a pump or house vacuum system. If a house vacuum system is used, the main vacuum line enters the BioCel System with the other external connections. If a pump is used, it will be located on the floor of the BioCel System.

A reserve vacuum tank may be used to ensure an instantaneous vacuum supply.

Waste liquid produced by filtration stations is collected in one or more waste containers.

Vacuums are also created in devices using vacuum ejectors that create the vacuum at the site where it is required, such as at the Vacuum Delid Station.

## Related information

| For information about... | See... |
|---|---|
| Power system | “Power system” on page 148 |
| Air system | “Air system” on page 152 |
| Emergency stop | *BioCel System Safety Guide* |

# Index


## A

Acceleration parameter, *95*
accessories. *See* devices
air
  connections, *12*
  controlling flow, *152*
  filter, *12*
  leaks, *65*
  pressure regulation, *12*
  shutoff valve, *12*, *152*
  switch, *152*
  system, *152*
  turning off, *31*
automation control software, *2*, *21*, *30*
Automation Control Unit, *7*, *16*, *72*
Automation Solutions devices, *20*

## B

barcode readers
  adding in device file, *75*
  aligning, *78*
  auxiliary, *72*, *74*
  power supply, *18*
  testing, *78*
BenchBot Robot
  axes, *13*
  diagnostics, *22*
  elbow, *13*
  joints, *13*
  mast, *13*
  shoulder, *13*
  wrist, *13*
BioCel System
  Automation Control Unit, *8*
  components, *2*
  described, *2*
  device integration, *20*
  devices, *72*
  maintenance, *56*
  preparing for a run, *38*
  robot, *13*, *33*
  shutting down, *30*
  starting up, *29*
block diagrams, *147*
bottle library, *144*
BYPASS interlock setting, *9*

## C

cleanup procedure, *30*
components of system, *2*
compressed air
  pressure regulation, *12*
  shutoff valve, *12*
  turning off, *31*
computer, *2*
  described, *8*
  monitor, *8*
  monitor, adjusting angle of, *27*
  turning off, *30*
context-sensitive help, *ix*

## D

delidder air pressure regulator, *12*
description
  BioCel System, *2*
  Direct Drive Robot, *13*
device files
  adding devices, *33*
  creating, *21*, *33*
  defined, *32*
  saving, *33*
device stacking shelves, *72*
devices, *40*, *73*
  adding and removing docking table, *18*
  adding to device file, *33*
  Automation Control Unit, *72*
  Automation Solutions, *20*
  barcode reader, auxiliary, *72*, *74*
  communicating with, *35*
  defined, *20*, *32*
  deleting in software, *35*
  disabling and enabling, *35*
  initializing, *35*
  integration in system, *20*
  Labware MiniHub, *72*
  Lid Hotel Station, *72*, *81*
  Linear Translator, *72*, *88*
  Microplate Exchanger, *72*
  Orbital Shaking Station, *72*, *101*
  Phantom Robot, *72*, *107*
  Plate Hotel, *72*, *111*
  Plate Hub Carousel, *72*, *118*
  platepad, *73*, *131*
  stacking shelves, *72*
  third-party, *20*
  turning off, *31*
  Vacuum Delid Station, *73*, *134*
  waste bin, *73*, *138*
  Weigh Pad, *73*, *141*
diagnostics software
  described, *22*
  robot diagnostics, *22*

Direct Drive Robot
axes, *13*
described, *13*
diagnostics, *22*
elbow, *14*
joints, *14*
mast, *14*
movements, *13*
waist, *14*
wrist, *14*
docking tables
automated procedure, *44*
described, *18*
manual procedure, *46*, *48*
pendant for, *45*
QuickDock feature, *44*
windows for, *7*, *42*
dry runs, described, *39*

**E**

elbow, robot, *13*
EMERGENCY STOP
circuit, *150*
errors
hardware, *64*
plate-sensor, *63*
reporting, *69*, *70*
servo, *61*
teachpoint, *39*

**F**

filtration station, *154*
fuse, *64*
fuses, *9*, *149*

**G**

gas supply, turning on, *30*

**H**

hardware
errors, *64*, *69*

**I**

incubator device properties, *92*
indicator lights, *9*
interlock
air shutoff valve, *13*
air system, *152*
BYPASS mode, *9*
NORMAL mode, *9*
safety, *5*, *6*, *7*, *8*, *50*
switch, *9*

**J**

job roles for readers of this guide, *vi*
joints, robot, *13*

**K**

keyboard shelf, adjusting, *26*
knowledge base, *viii*

**L**

labware
definition, *21*, *66*
loading in system, *54*
loading into Plate Hotel, *54*
loading into Plate Hub Carousel, *54*
orientation in system, *54*
Labware MiniHub
described, *72*
Lid Hotel Station
adding in device file, *82*
described, *72*, *81*
profiles, *84*
setting up, *81*
status, *87*
storage bays, *82*, *83*
teachpoints, setting, *85*, *86*
lid remover, *73*, *134*
Light Curtain, *6*
Linear Translator, *72*
adding in device file, *89*
changing the speed, *99*
described, *88*
homing the plate stage, *97*, *98*
incubator device properties, *92*
jogging the plate stage, *99*
profiles, *93*
teachpoints, setting, *96*
teachpoints, verifying, *97*
turning off the motors, *98*
turning on the motors, *98*
Linear Translator Robot Driver Diagnostics, *97*
liquid
cabinet, *10*, *56*
container, *10*
management, *10*
liquid-handling tubing, *59*

**M**

Machinery Directive, *10*
main power, *149*
switch, *9*, *29*
turning off, *31*
maintenance, *56*, *59*
manifold, air distribution, *152*
mast, *13*

Microplate Exchanger
described, *72*
multi-color status lights, *14*

## N

network cards, *8*
non-switched power, *150*
NORMAL interlock setting, *9*

## O

online help, *viii*
Orbital Shaking Station, *72*, *101*

## P

PDF guide, *viii*
Phantom Robot, *72*
adding in software, *107*
described, *107*
pinch valve, *154*
Plate Hotel, *72*
adding in device file, *102*
described, *111*
loading, *54*
profile, creating, *114*
teachpoints, setting, *117*, *130*
Plate Hub Carousel, *72*
adding in device file, *112*, *119*
described, *118*
home position, setting, *128*
loading, *54*
profile, creating, *122*
teachpoints, setting, *117*, *130*
turning the carousel, *129*
Plate Hub Diagnostics, *128*
plate sensor errors, *63*
platepad, *73*
adding in device file, *131*
described, *131*
plugins
loading, *34*
storage location, *34*
plumbing, *11*
power
Automation Control Unit, *8*
auxiliary, *149*
block diagram, *148*
connection, *64*
outage, recovering from, *60*
switch, *29*
turning off, *30*, *31*
turning on, *29*
pre-run checks, performing, *50*
profiles
described, *22*
selecting, *34*
protocol runs
performing dry runs, *39*
power outage, *60*
setup guidelines, *40*
starting, *21*
Pump Module, *10*

## Q

QuickDock feature, *44*

## R

regulators, *152*
Reload Plugins command, *34*
reserve tank, *154*
Reset button, *9*, *150*
robot
adding in device file, *33*
axes (BenchBot Robot), *13*
axes (Direct Drive Robot), *13*
recovering from servo errors, *61*
robot diagnostics, *22*
robot gripper pads, maintaining, *59*
robot power supply, *7*
run
checks before starting, *50*
during power outage, *60*
monitoring, *14*, *16*
preparing for, *38*

## S

safety
flip-up doors, *5*
general information, *4*
Light Curtain, *6*
sliding doors, *5*
windows on docking tables, *7*, *42*
safety interlock, *6*, *8*
arming, *9*, *50*
bypassing, *9*, *150*
sensor
plate, *63*
spill detection, *11*
servo errors, recovering from, *61*
setup workflow
system, *24*
shoulder, robot, *13*
shutdown procedure, *30*
software
automation control, *21*
described, *21*
errors, *69*
reporting errors, *69*
version number, *69*

spill-detection sensor, *11*
Stacker, *72*
stacking shelves for devices, *72*
startup procedure, *29*
status lights, *14*, *16*
storage, lids, *81*

## T

teachpoints
  defined (all robots), *22*
third-party devices, *20*
trash door, *18*
troubleshooting, *22*, *55*
  hardware errors, *64*

## U

UPS, *8*
  connections, *149*
  turning off, *31*
  turning on, *29*
  using during power outage, *60*
user accounts, *21*
user guide
  described, *vi*
  related guides, *vii*

## V

vacuum
  creating, *152*
  system, *154*
Vacuum Delid Station, *73*
  adding to software, *134*
  described, *134*
  teachpoints, setting, *137*
Velocity parameter, *95*

## W

warning sounds, *16*
waste bin, *73*
  adding door to device file, *140*
  adding to device file, *138*
  described, *138*
  replacing, *52*
waste bottle, *154*
Weigh Pad, *73*
  adding to device file, *142*
  bottle library, *144*
  bottle status, *146*
  calibrating, *145*
  described, *141*
  profile, creating, *142*
Weigh Pad Diagnostics, *142*
workflows
  barcode reader setup, *74*
  Lid Hotel Station setup, *81*
  Linear Translator setup, *88*
  Plate Hotel setup, *101*
  Plate Hub Carousel setup, *107*, *111*, *119*
  preparing for a run, *38*
  system setup, *24*
  Vacuum Delid Station setup, *134*
  Weigh Pad setup, *141*
wrist, robot, *13*

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# User Guide

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