Instructions for Use

# Biomek 4000 ACPrep System

Biomek 4000 Laboratory Automation Workstation

PN B36612AA
August 2013

Beckman Coulter, Inc.
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BECKMAN COULTER

**Biomek 4000 ACPrep Software**
PN B36612AA (August 2013)

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# Revision History

**Initial Issue, 08/2013**
Software Version 2.5

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

# Safety Notice

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

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

**⚠ WARNING**

**WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury. May be used to indicate the possibility of erroneous data.**

**⚠ CAUTION**

**CAUTION indicates a potentially hazardous situation, which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices. May be used to indicate the possibility of erroneous data.**

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

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

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# Introduction

Biomek 4000 ACPrep is a workflow solution designed for use on the Biomek 4000 Laboratory Automation Workstation. The solution can dramatically reduce manual effort and errors in antibody cocktail preparations for multicolor flow cytometry analyses, while providing flexibility and control expected in flow cytometry laboratories.

Antibody vials that are directly supported on the Biomek 4000 ACPrep system include IOTest, IOTest3, and CYTO-STAT monoclonal antibodies from Beckman Coulter. Antibodies from other manufacturers are indirectly supported on the system if they are in equivalent or supported vial types or by transferring the reagent to any empty amber vial compatible with racks from Beckman Coulter.

The system supports preparing antibody mixtures in bulk with subsequent transfer to assay labware, or antibody mixtures can be created directly in assay labware. Supported assay labware includes 12 mm × 75 mm tubes, 96-well microplates or 96-well deep-well plates that meet the ANSI/SBS 1-2004 through ANSI/SBS 4-2004 standards. Tubes can be positioned in a carousel or 24-position tube rack.

# Scope of Manual

This manual describes how to configure, set up, and run the Biomek 4000 ACPrep Software. Data tracking and reporting functions are included. We recommend that you read this entire manual, especially the *Safety Notice* section and all safety-related information, before utilizing the software.

- The following introductory pages contain an overview of the system, including hardware and software overviews.
- CHAPTER 1, *Accounts and Permissions* contains information on implementing accounts and permissions in order to utilize the software.
- CHAPTER 2, *Configuring System Settings* contains information on how to define the fluorochrome, flow cytometer, antibody template, and panel and cocktail configurations used in the software.
- CHAPTER 3, *System Operation* contains information on how to operate the software in order to automate the transfer of antibodies or cocktails into appropriate labware.
- CHAPTER 4, *Biomek Actions* contains information on using the Biomek actions, such as homing the instrument, raising the pod, and using manual control.
- CHAPTER 5, *Reporting* contains information on how to create various reports available through the software.
- CHAPTER 6, *Preventive Maintenance and Troubleshooting* contains procedures for routine operator maintenance and troubleshooting.
- APPENDIX A, *Specifications* contains specifications for the Biomek 4000.
- APPENDIX B, *Symbologies for the Optional Barcode Reader* contains information on the symbologies for the barcode reader.
- APPENDIX C, *Parts List* lists the part number for Biomek 4000 parts such a tips, vials, and inserts .
- *Abbreviations* defines most of the abbreviations that are used in this manual.
- *Glossary* contains terms used in this manual.
- *Index* can be use to facilitate the referencing of words or subject matter in this manual.

# Conventions

## Typographic Conventions

Certain typographic conventions are used throughout this manual to distinguish names of user interface components, such as keys and displays.

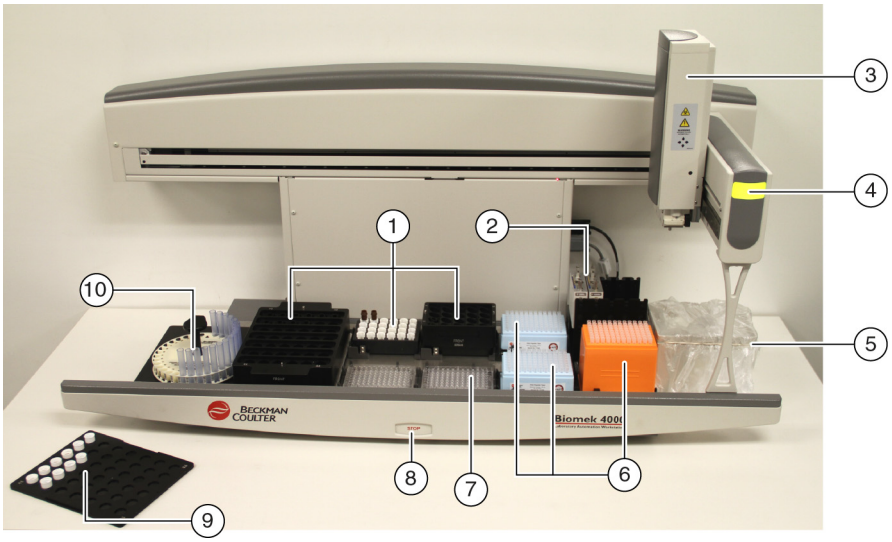
- Computer key names appear as START or ENTER.
- Display names (for example, **TEMP°C** or **SPEED**) appear in bold type.

# Hardware Overview

This section provides a brief description of the system and describes features of the Biomek 4000 ACPrep Software.

Functionality of the system is provided by the Biomek 4000 liquid handling instrument. Figure 1 is a photo of the system.

**Figure 1** Biomek 4000




1. Antibody reagent input racks
2. Pipetting tools
3. Pod
4. Indicator light
5. Trash
6. Pipette tips
7. Deck with labware holders
8. Emergency stop
9. I/O Test rack lid with cap storage feature
10. Carousel

## Indicator Lights

The power indicator board on the Biomek 4000 bridge contains a series of LED lights that indicate the operational status of the system. Table 1 defines the indicator lights and the operational status each represents.

**Table 1** Indicator Light Key

| Indicator Light | State | Operational Status |
|---|---|---|
| Solid Green | Idle | System is functional and in a ready state. It is safe to access the instrument and deck. |
| Blinking Green | Pause | Planned pause as part of software routine. |
| Solid Amber | Active | An operation is in progress. |
| Blinking Amber | Error | Caused by pressing the **Stop** button or system error. The **Stop** button halts the Biomek 4000 bridge and pod operations immediately. Software communicates the cause. |

## Liquid Level Sensing (LLS)

The P200L and P1000SL Single-Tip Pipette Tools include patented technology that sonically detects the liquid level. Liquid Level Sensing (LLS) is performed using an acoustic process that involves a transmitter and receiver within the single-channel tools. The transmitter emits a sound wave through the tip that bounces back when it contacts liquid. The receiver detects the wave as it bounces back past the end of the tip.

**⚠ CAUTION**

**Liquid Level Sensing will generally allow the instrument to detect when there is no liquid in a container. However, it may sometimes detect the actual bottom of a container as liquid. Make sure that the amount of liquid present in a container matches the value that the software shows in the "Remaining Volume" field for the container.**

**NOTE** Barrier tips are not compatible with LLS.

## Tip and Tool Usage

The P200L and P1000SL Single-Tip Pipette Tools are created to handle different volumes of liquid. The P200L tool is used with P20 tips for all volumes less than or equal to 100 µL. The P1000SL tool is used with P1000 tips for all volumes greater than 100 µL.

**NOTE** The system has the capacity for two P20 tip boxes and one P1000 tip box. This results in 192 tips available at volumes less than or equal to 100 µL and 96 tips available for volumes greater than 100 µL.

# Software Overview

The Biomek 4000 ACPrep Software is organized to perform three primary functions: **Run Instrument**, **Reporting**, and **System Configuration** (Figure 2). The function of the menu buttons is explained in Table 2.

**Figure 2** Biomek 4000 ACPrep Software Main Screen

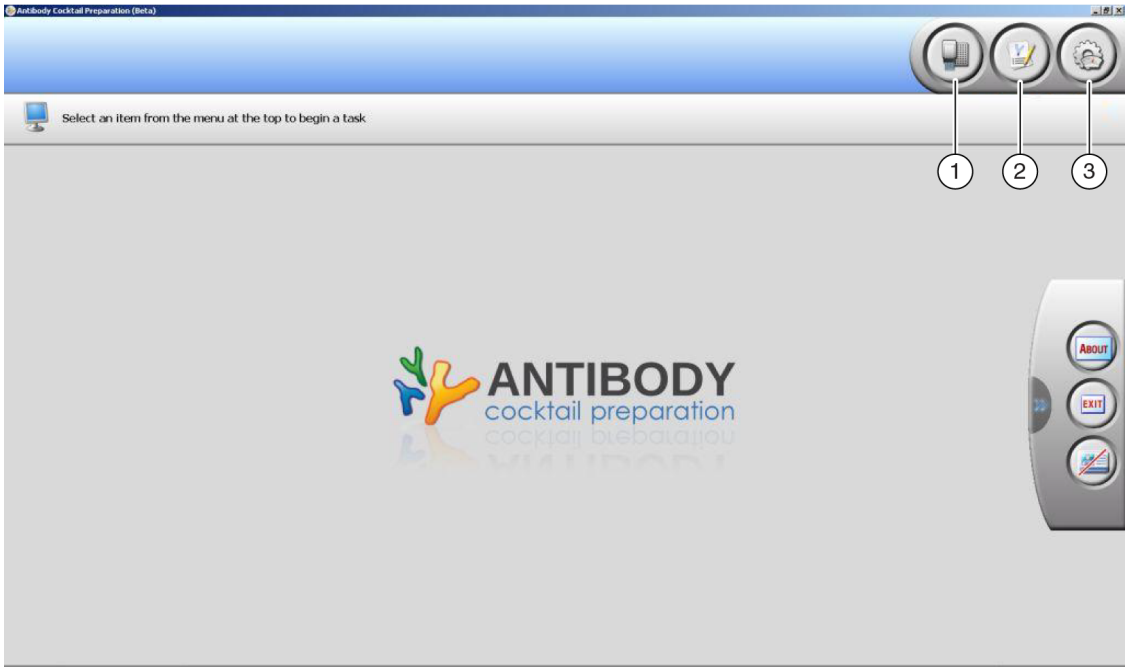



**Table 2** Menu Buttons and Functions

| | Button | Button Function |
|---|---|---|
| 1 |  | The **Run Instrument** function allows the operator to select one of the following options:<br>• Prepare assay tubes from antibodies<br>• Prepare bulk cocktails<br>• Prepare assay tubes from bulk cocktails<br>• Perform manual control operations for the Biomek 4000 Liquid Handling System |
| 2 |  | The **Reporting** function allows the operator to select one of the following options:<br>• View antibody inventory reports<br>• View worklist history |
| 3 |  | The **Configuration** function allows the advanced operator to configure and define:<br>• Panels and cocktails<br>• Antibody templates<br>• Flow cytometers<br>• Fluorochromes |

## Side Panel

A side panel is located on the right side of the main screen (Figure 3). The side panel provides information about the software and offers alternative methods to log in, log out, and exit the software. The functions of the side panel buttons are explained in Table 3.

**Figure 3** Biomek 4000 ACPrep Main Software Screen with Side Panel

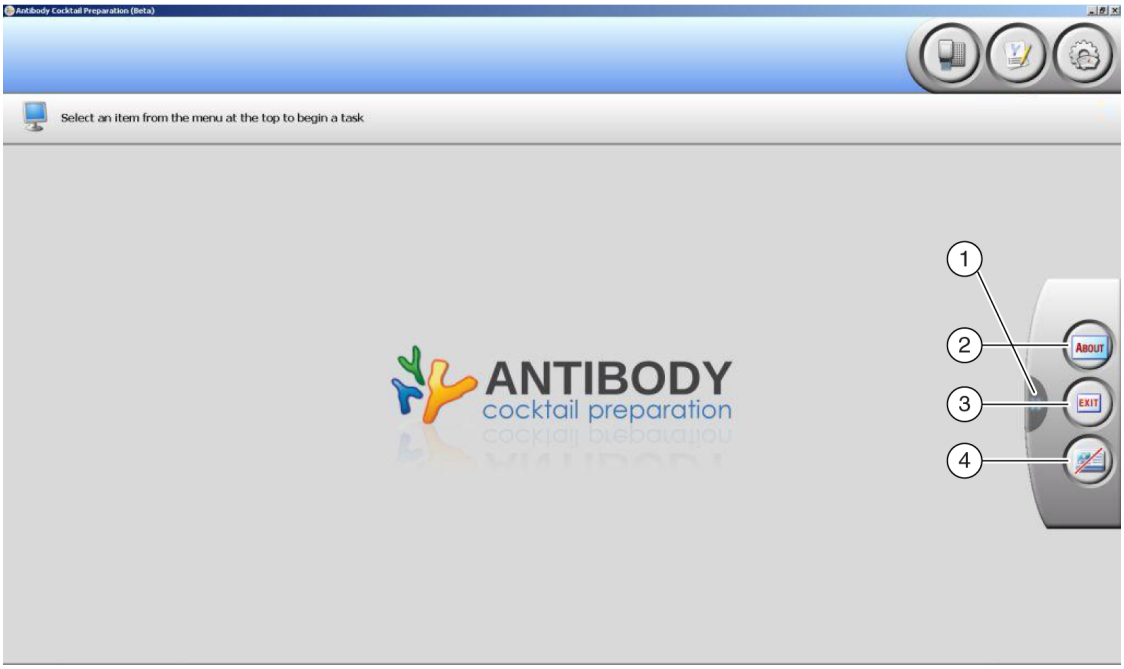



**Table 3** Side Panel Buttons and Functions

| | Button | Button Function |
|---|---|---|
| 1 |  | The **Expand** button opens the side panel. |
| 2 |  | The **Collapse** button closes the side panel. |
| 3 |   | The **About** button provides information about the Biomek 4000 ACPrep Software. |

**Table 3** Side Panel Buttons and Functions

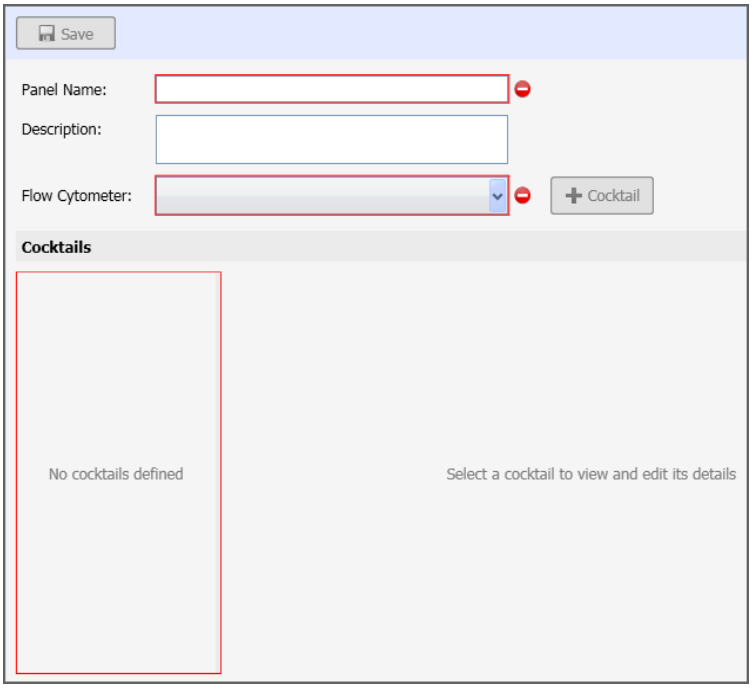
| | Button | Button Function |
|---|---|---|
| 4 |  | The **Exit** button closes the Biomek 4000 ACPrep Software application. |
| 5 |  | The **Log In** button logs you into the Biomek 4000 ACPrep Software application.<br>• Must fill in **User Name** and **Password** before clicking on **Log In**. |
| 6 |  | The **Log Out** button logs you out of your current session, and takes you to the **Log In** screen. |

## Tips for Using the Software

Throughout the software, there are elements that are repeated. Below is a list and some examples of these elements.

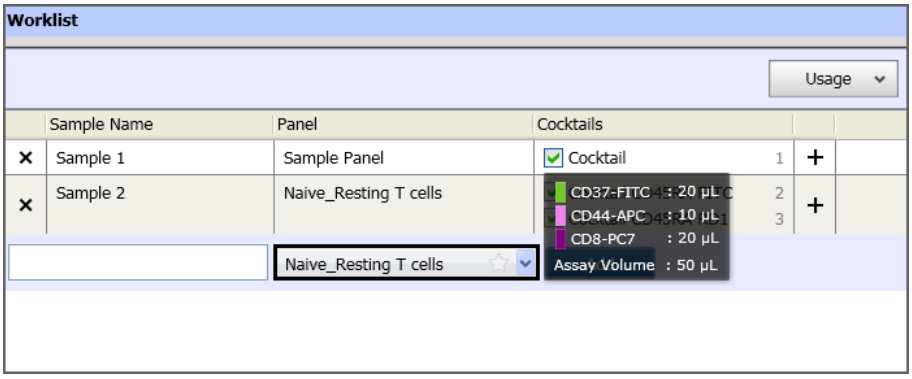
1. Fields surrounded by a red box require information. You must complete these fields before you can save your work or continue (Figure 4).

**Figure 4** Red Box - Required Information



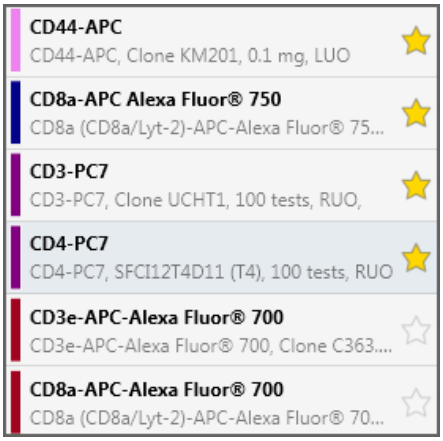
2. Hover the mouse over certain elements within the software to display a tool tip that provides additional information (Figure 5).

**Figure 5** Example of Information in Tool Tip




3. To make an antibody or panel a favorite, click  to the right of the name. Favorites are moved to the top of the list (Figure 6).

**Figure 6** Example of Favorite Items



CHAPTER 1

# Accounts and Permissions

## Overview

**Accounts and Permissions** is an integrated set of features built into the Biomek 4000 ACPrep Software that provides control of user access within the software application. User access is controlled by setting up accounts for different types of users. Each user is required to log into the software and will only have access to certain software features and reporting functions based upon the role defined.

When several Beckman Coulter systems that use **Accounts and Permissions** are present at one location, **Accounts and Permissions** must be installed and enabled separately for each system. **Accounts and Permissions** only provides support for closed systems. Networked systems are not supported.

Users require a separate account for each system they need to access. For each Beckman Coulter system that uses **Accounts and Permissions**, a single administrator sets up the level of support provided through **Accounts and Permissions**, creates, sets and manages permissions for user accounts, and configures system parameters relating to **Accounts and Permissions**.

The implementation of **Accounts and Permissions** for the Biomek 4000 ACPrep Software is not designed for compliance with electronic signature requirements (such as 21 CFR Part 11). Use of this product will not sign records electronically as part of using the software application. Therefore, this application does not claim to be compliant with electronic signature requirements.

## Administering User Accounts and Permissions

System administration tasks for **Accounts and Permissions** are performed in **Account Management**, a separate application from the Biomek 4000 ACPrep Software. The system administrator sets up and configures user accounts, passwords, and permissions, and configures system settings such as automatic password expiration and system logout time.

A single, system-wide **Administrator** account is used on a system. Administration tasks may be performed only on the computer where **Account Management** is installed. Access to **Account Management** over a network is not supported.

**NOTE** The administrator is not automatically given a user account on the system. The **Administrator** account can only be used for Accounts and Permissions, not other operations of the software. If the administrator requires an account, one must be created in **Account Management**.

This section covers opening **Account Management** and provides an overview of permissions available for this application. For detailed information about using this application to administer user accounts and permissions, refer to the **Account Management** online help available from the **Account Management** application.

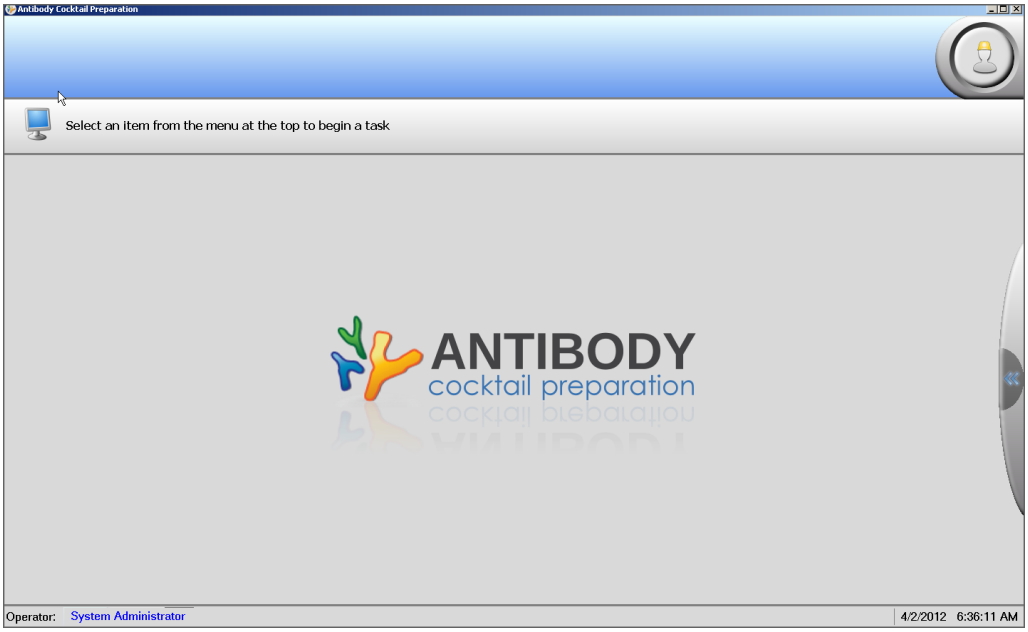
## Opening Account Management

To open **Account Management**:

1 Open the Biomek 4000 ACPrep Software.

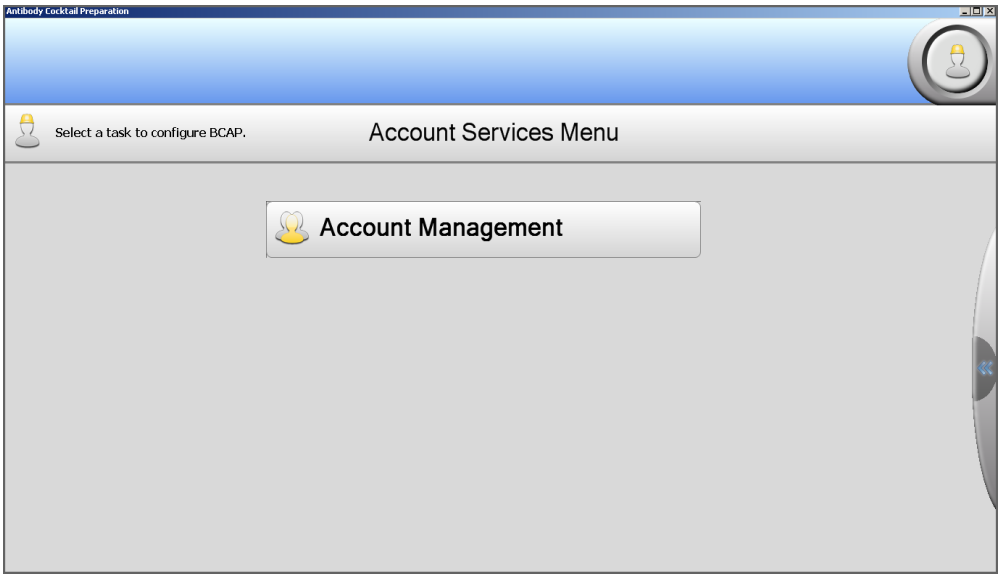
2 Log in as **Administrator** using the **Accounts and Permissions Administrator** password. The **Account Services** window appears (Figure 1.1).

**Figure 1.1** Account Services Window Screen



**3** Click  to open the **Account Services** menu (Figure 1.2).

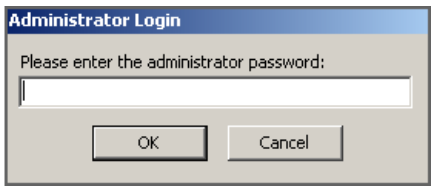
**Figure 1.2** Account Services Menu Screen




**4** Click  to open the **Account Management** task screen.

**5** Click  to start **Account Management**. The **Administrator Login** dialog box appears (Figure 1.3)

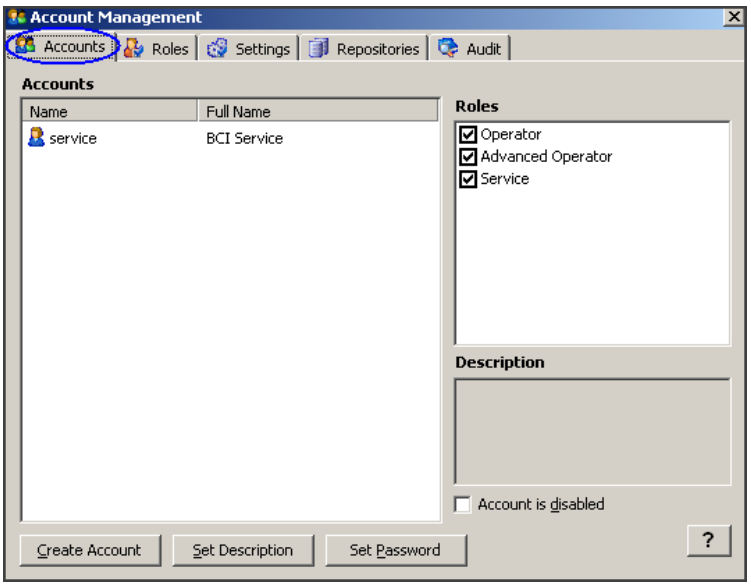
**Figure 1.3** Administrator Login




**NOTE** The Biomek 4000 ACPrep Software automatically logs out while **Account Management** is running. Do not use the software while using **Account Management**.

**6** Supply the administrator password in the **Administrator Login** dialog box. The **Account Management** screen appears and defaults to the **Accounts** tab (Figure 1.4).

**Figure 1.4** Account Management - Accounts Tab




## Accounts

It is the responsibility of the administrator of the system to create accounts, assign roles, disable and enable accounts, and set and reset passwords. Accounts are managed on the **Accounts** tab of **Account Management**. All of the accounts on the system are listed along the left side in the **Accounts** list. The roles assigned to an account are displayed in the **Roles** list on the right side. Controls for creating new accounts, setting descriptions for accounts, setting passwords, and disabling accounts are along the bottom.

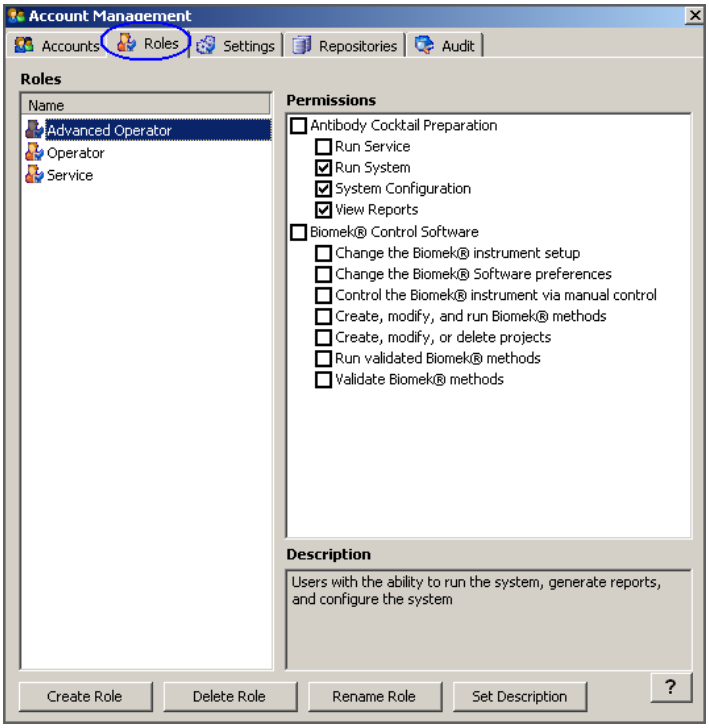
**NOTE** **Account Management** has online help that is available via the ? button in the bottom right corner of the **Account Management** screen or the F1 key on your keyboard. Refer to the online help for detailed information about **Account Management**.

## Roles

Each account in the system can have roles assigned for use by any application that uses **Accounts and Permissions**. For the Biomek 4000 ACPrep Software, there are three roles: **Operator, Advanced Operator**, and **Service**.

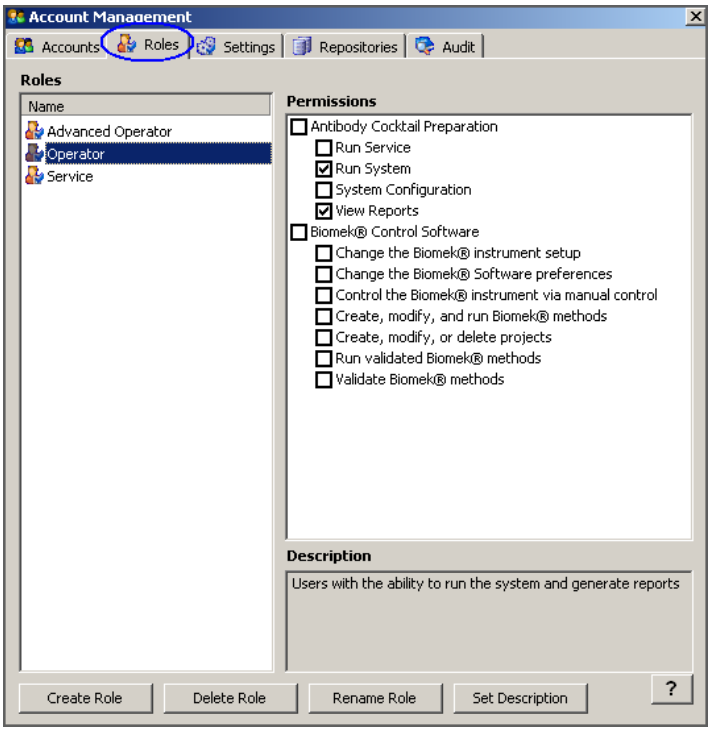
- The **Advanced Operator** role is assigned to accounts that are used for configuring the system as well as for running the system. Accounts with this role assigned can create, view, and edit all software items, including items in the **Configuration Menu** (Figure 1.5).

**Figure 1.5** Account Management - Roles Tab - Advanced Operator




- The **Operator** role is assigned to accounts that are used for running the system, but not for configuring the system. Accounts with this role assigned can view all software items, but cannot edit any items in the **Configuration Menu** (Figure 1.6).

**Figure 1.6** Account Management - Roles Tab - Operator




- The **Service** role is reserved for use by Beckman Coulter Service personnel (Figure 1.7).

**Figure 1.7** Account Management - Roles Tab - Service

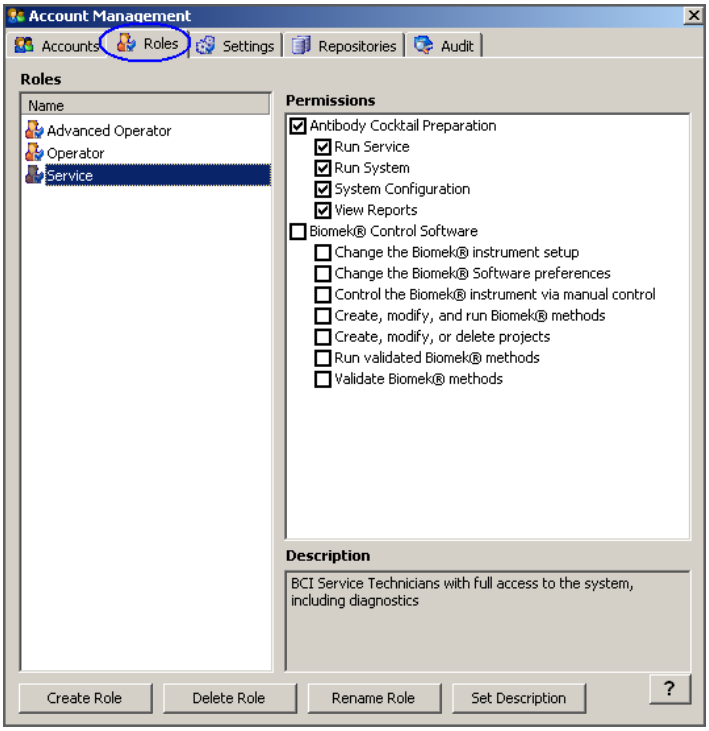


Table 1.1 describes the software operations available for each role.

**Table 1.1** Role Requirements by Operation

| Operation | Administrator | Operator | Advanced Operator |
|---|---|---|---|
| Managing Accounts | X | | |
| Runnning the Instrument | | X | X |
| Running Reports | | X | X |
| Changing Configuration Settings | | | X |

**NOTE** The **Administrator** role is available to the **Administrator** account only.

**NOTE** If an account has more than one role assigned, it gets the combination of all of the assigned roles. For example, an account assigned both **Operator** and **Advanced Operator** roles can do everything an **Advanced Operator** can do.

**NOTE** Roles other than those for this application may appear in the **Roles** list. Ignore all roles other than **Operator** and **Advanced Operator**.

A role is a set of permissions. Permissions are used by the software to grant or deny access to certain features. For this application, permissions relate to accessibility of various screens and the ability to edit various items. The permissions for this application are described in Table 1.2.

**Table 1.2** Permissions

| Permission | Description |
|---|---|
| Run Service | Reserved for use by Beckman Coulter Service personnel only. |
| Run System | Permits access to the **Run Instrument** operation in order to set up and execute runs on the system. Also gives access to the manual control operations in the **Biomek Actions** task. It is used for all roles. |
| System Configuration | Permits access to the **Configuration** operation to configure system settings. It is used for the **Advanced Operator** and **Service** roles, but not for the **Operator** role. Accounts with only the **Operator** role have “view only” capabilities for configuration items and cannot edit fluorochrome configurations, flow cytometer configurations, antibody templates, panels, or cocktails. |
| View Reports | Permits access to to reports. It is used for all roles. |

**NOTE** **Account Management** has online help that is available via the ? button in the bottom right corner of the **Account Management** screen or the F1 key on your keyboard. Refer to the online help for detailed information about **Account Management**.

**NOTE** Permissions other than those listed in Table 1.2 may appear. Ignore all permissions other than those listed in the table.

# Restoring the Administrator Password

Only one **Administrator** account exists on a system with **Accounts and Permissions** installed. If the **Administrator** password is lost or forgotten, Beckman Coulter Technical Support must be contacted at 1-800-526-7694 to restore access to the **Account Management** application.

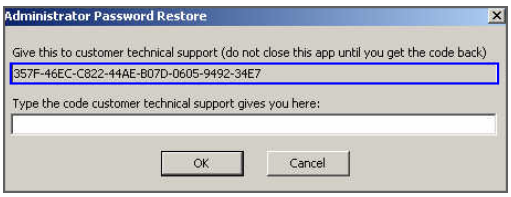
**NOTE** The Biomek 4000 ACPrep Installation CD is required for this process. Processes should be in place to ensure that access to the Biomek 4000 ACPrep Installation CD is controlled. In some cases, Beckman Coulter Service personnel retains the CD and must be contacted before proceeding with the password recovery process.

To restore the **Administrator** password:

1. Open the Biomek 4000 ACPrep Installation CD on the computer where the password is to be restored.

2. Locate and open the **Beckman Coulter Accounts and Permissions Admin Password Restore.exe** program. **Administrator Password Restore** appears (Figure 1.8).

**Figure 1.8** Administrator Password Restore

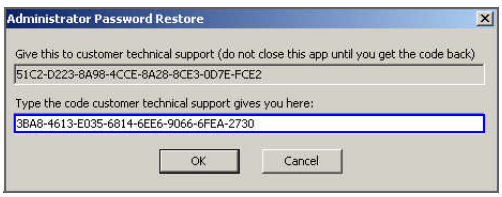



**IMPORTANT** Leave **Administrator Password Restore** open until Beckman Coulter Customer Technical Support supplies a new code for the lower field. The new code is based on the code displayed in the upper field, which can change each time **Administrator Password Restore** is opened.

3. In the USA or Canada, contact Beckman Coulter Technical Support at 1-800-526-7694 and provide the code displayed in the upper field of **Administrator Password Restore**. (Figure 1.8). Outside the USA or Canada, contact your Beckman Coulter Representative.

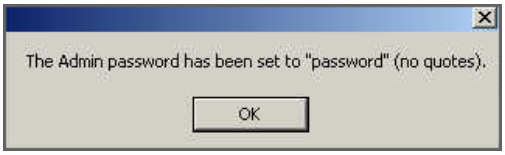
4. Enter the code provided by Beckman Coulter Technical Support or your Beckman Coulter Representative in the bottom field of **Administrator Password Restore** (Figure 1.9).

**Figure 1.9** Administrator Password Restore



**5** Click **OK** to close **Administrator Password Restore** and accept the new code.

**Figure 1.10** Administrator Password Changed




**NOTE** After the **Administrator** password has been reset, log into **Accounts and Permissions** to change the **Administrator** password to a more secure password.

**6** Follow any additional instructions provided by Beckman Coulter Technical Support or your Beckman Coulter Representative.

CHAPTER 2

# Configuring System Settings

## Introduction

This chapter describes how to configure the fluorochromes, flow cytometers, antibody templates, and panels of cocktails used in the Biomek 4000 ACPrep Software. To facilitate use of the software, it is necessary to initially configure these items in the following order:

1. Configure fluorochromes – a fluorochrome is a fluorescent label that is associated with a particular antibody (for example, Fluorescein isothiocyanate).
2. Configure flow cytometers – The configuration of flow cytometers provides the ability to configure the fluorochromes, which can be analyzed by a specific flow cytometer.
3. Configure antibody templates – an antibody template is a description of antibody characteristics (for example, name, species, or default pipetting volume). When setting up an antibody template, it is associated with a fluorochrome to facilitate reagent selection when building panels and cocktails.
4. Configure panels and cocktails – an antibody cocktail is a selection of antibodies that will be transferred to a single assay tube and measured using a flow cytometer. An antibody can be selected for each fluorochrome in the chosen flow cytometer configuration. An antibody panel is a collection of antibody cocktails used to assay a given sample.

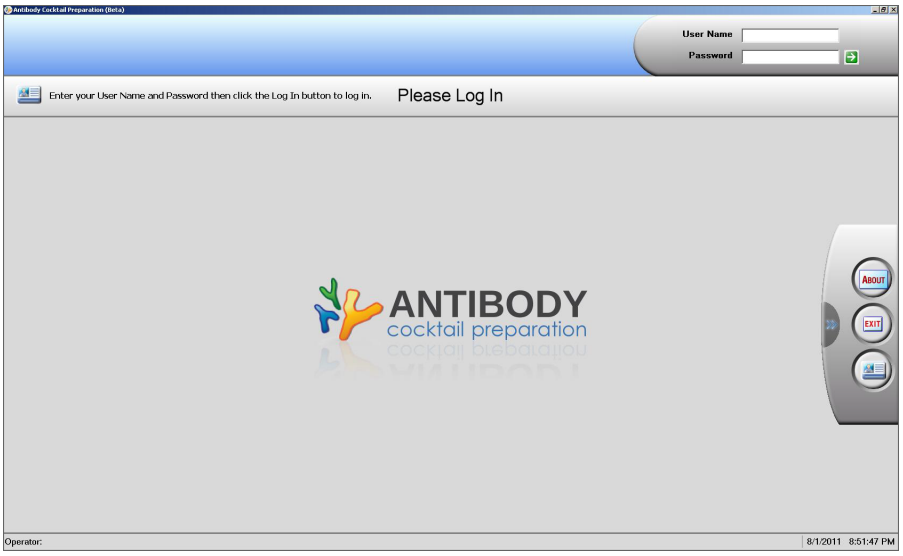
**NOTE** To perform the operations in this chapter, you must be logged into an account assigned the **Advanced Operator** role. Accounts with the **Operator** roles can view the settings, but are unable to edit them.

# Configuring the System

Follow the steps below to configure the system.

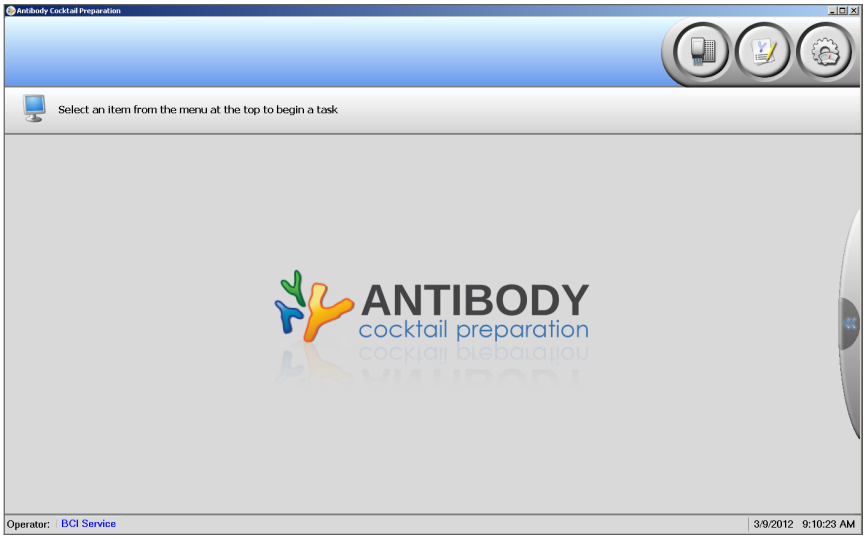
1 Double-click  to open the Biomek 4000 ACPrep Software. The log in screen appears (Figure 2.1).

**Figure 2.1** Biomek 4000 ACPrep Software Log In Screen




2 Enter your **User Name** and **Password**, then click  or press (Enter) on the keyboard. The software main screen appears (Figure 2.2)

**Figure 2.2** Biomek 4000 ACPrep Software Main Screen



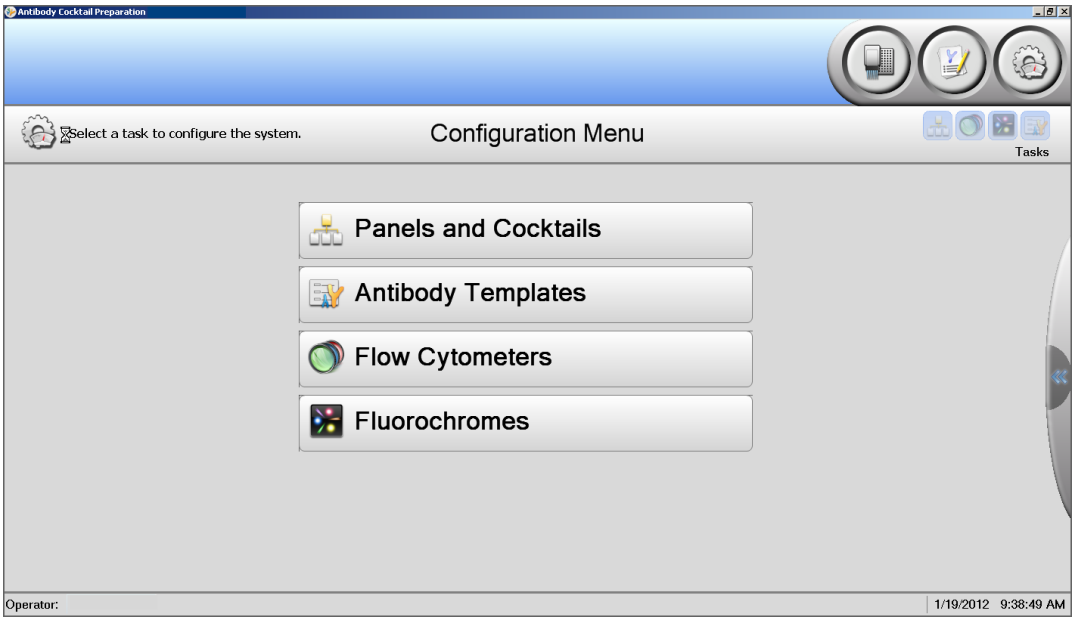
**3** Click  on the top right side of the software main screen. The **Configuration Menu** screen appears (Figure 2.3).

The following options are available and are arranged in order from the most frequently used to the least frequently used:

- **Panels and Cocktails** (see Defining Panels and Cocktails)
- **Antibody Templates** (see Defining Antibody Templates)
- **Flow Cytometers** (see Defining a Flow Cytometer)
- **Fluorochromes** (see Configuring Fluorochromes)

**NOTE** To configure the software for the first time, these items must be completed in reverse order, starting with **Fluorochromes** and finishing with **Panels and Cocktails**.

**Figure 2.3** Configuration Menu Screen




## Configuring Fluorochromes

This is the first step to configure the Biomek 4000 ACPrep Software. Configure fluorochromes to provide the association between antibodies and the flow cytometer. To build an antibody cocktail, the software selects antibody conjugates that match a supported fluorochrome label on a flow cytometer. Likewise, it excludes antibodies with fluorochrome labels that do not match the target flow cytometer.

A single fluorochrome configuration can be used with multiple flow cytometers and is not exclusive to a flow cytometer.

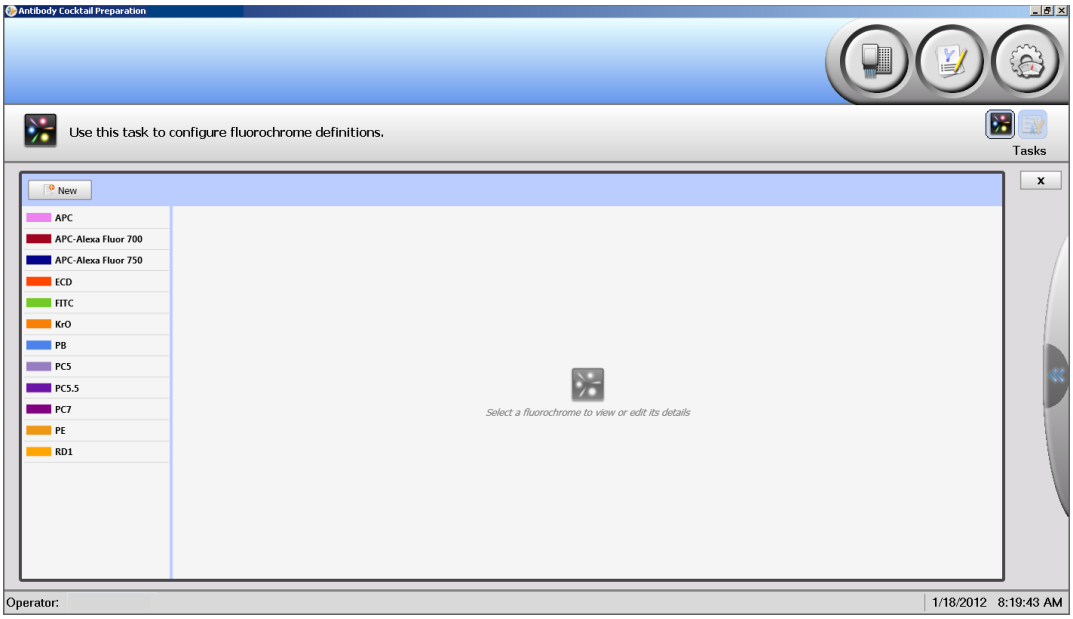
Configuring fluorochromes and flow cytometers ensures that panel configurations may only include antibodies with labels that match the hardware setup of the assigned flow cytometer. Antibodies with labels that do not match are excluded from panel and cocktail configurations.

To configure fluorochromes:

---

**1** From the **Configuration Menu** screen, click Fluorochromes. The **Fluorochrome Definitions** screen appears (Figure 2.4). The list is populated with some example fluorochromes. Edit the fluorochromes already listed or add new ones.

**Figure 2.4** Fluorochrome Definitions Screen

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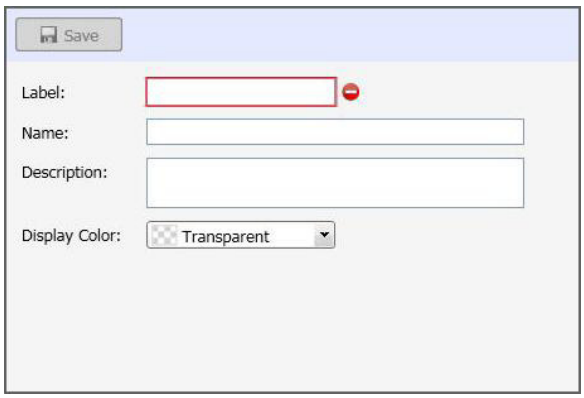
**2** To add new fluorochromes, click New located on the top left side of the screen. The **Fluorochrome Details** interface appears (Figure 2.5).

**Figure 2.5** Fluorochrome Details



**3** In the fields provided, enter the fluorochrome **Label**, **Name**, and **Description**.

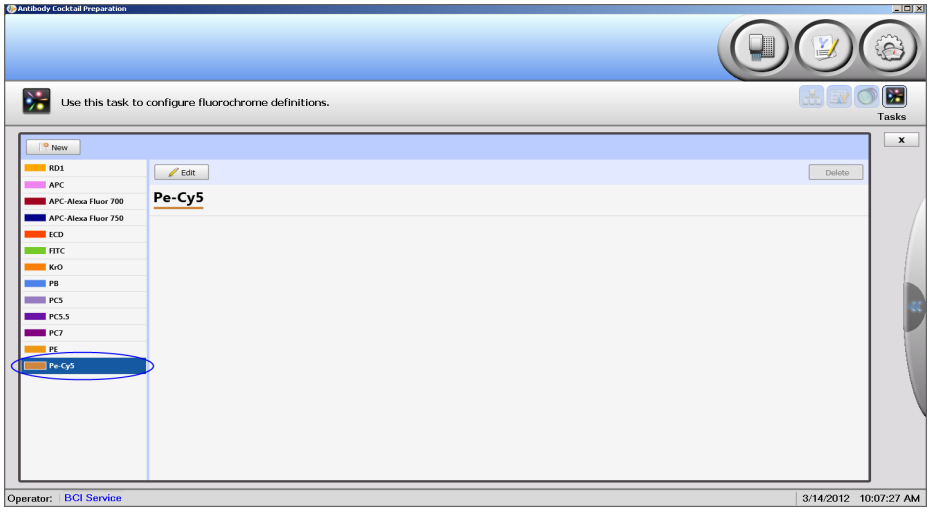
**NOTE** The **Label** field is used throughout the software to identify the fluorochrome, and it is the only required field.

**4** In the **Display Color** field, click the drop-down list to open a display of color options and select a color.

**NOTE** This color will be displayed next to the fluorochrome label throughout the software.

**5** Click Save to save the configuration. The newly-defined fluorochrome configuration appears alphabetically in the list on the left side of the screen (Figure 2.6).

**Figure 2.6** Newly-Defined Fluorochrome Configuration




**6** Repeat this procedure to add more fluorochromes.

**7** To edit a fluorochrome:

**a.** Select the fluorochrome from the list on the left.

**b.** Click Edit located above the name of the fluorochrome.

**c.** Make edits as necessary.

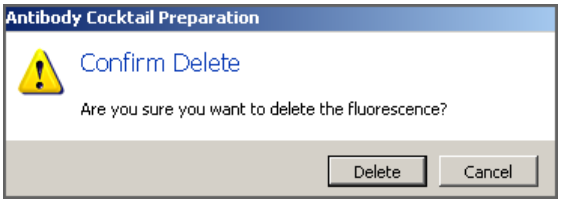
**d.** Click Save to save the configuration.

**8** To delete a fluorochrome:

**a.** Select it from the list on the left and click Delete. A confirmation to delete the fluorochrome will appear (Figure 2.7).

**b.** Click Delete to delete the fluorochrome.

**Figure 2.7** Delete Confirmation for Fluorochrome



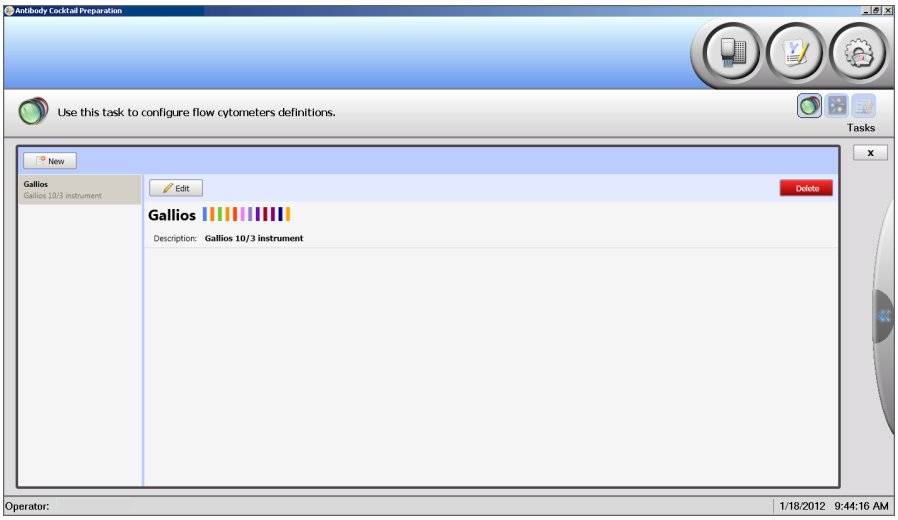

## Defining a Flow Cytometer

This is the second step to configure the Biomek 4000 ACPrep Software. A flow cytometer configuration is needed to specify a set of fluorochromes that is compatible with the hardware setup of the flow cytometer. If more than one flow cytometer or flow cytometer configuration exists with different sets of compatible fluorochromes, then each configuration has to be defined.

Follow the steps below to define a flow cytometer:

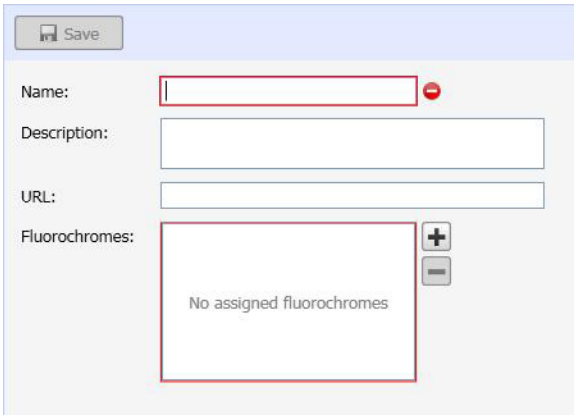
1 From the **Configuration Menu** screen, click Flow Cytometers. The **Flow Cytometers Definitions** screen appears (Figure 2.8). One example flow cytometer configuration is already defined in the software at the time of installation. This example configuration can be edited or replaced with another configuration, as desired.

**Figure 2.8** Flow Cytometers Definitions Screen



**2** To add a new flow cytometer, click New located on the top left side of the screen. The **Flow Cytometer Details** interface appears (Figure 2.9).

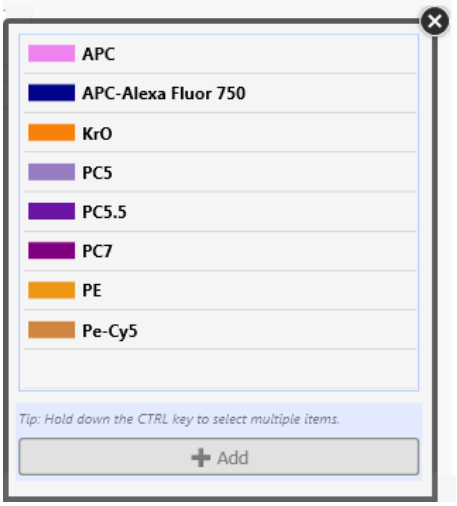
**Figure 2.9** Flow Cytometer Details




**3** In the fields provided, enter the **Name**, **Description**, and **URL**. The **URL** is an optional item that is used to provide a link to any useful reference file or location. For example, it could be a path to instructions for using the flow cytometer.

**4** In the **Fluorochromes** field, click to display a list of available fluorochromes (Figure 2.10).

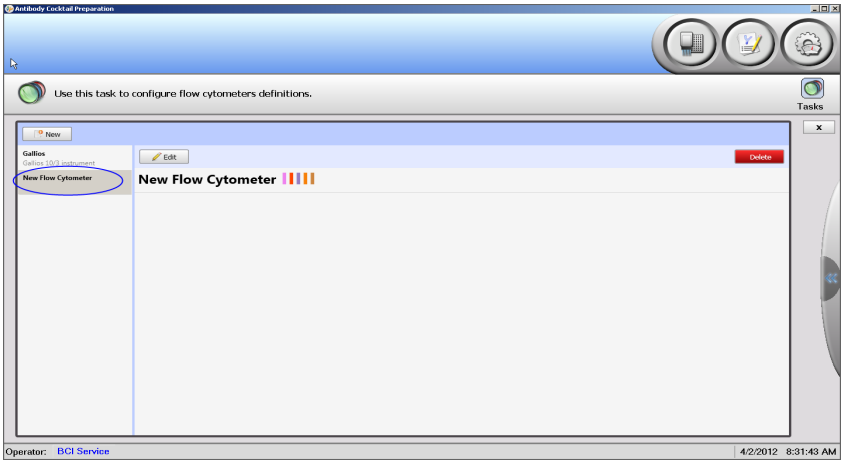
**Figure 2.10** Fluorochromes Selection List Example




**5** Select the fluorochromes, and then click Add. To select multiple items, hold down the Ctrl key on the keyboard and select each fluorochrome.

**6** Click Save to save the configuration. The newly-defined flow cytometer appears on the left (Figure 2.11).

**Figure 2.11** Newly-Defined Flow Cytometer




**7** Repeat this procedure to add more flow cytometers.

**8** To edit a flow cytometer:

**a.** Select the flow cytometer from the list on the left.

**b.** Click Edit located above the name of the flow cytometer.

**c.** Make edits as necessary.

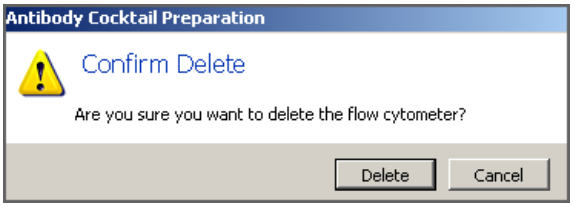
**d.** Click Save to save the configuration.

**9** To delete a flow cytometer:

**a.** Select it from the list on the left and click Delete. A confirmation to delete the flow cytometer will appear (Figure 2.12).

**b.** Click Delete to delete the flow cytometer.

**Figure 2.12** Confirmation to Delete the Flow Cytometer

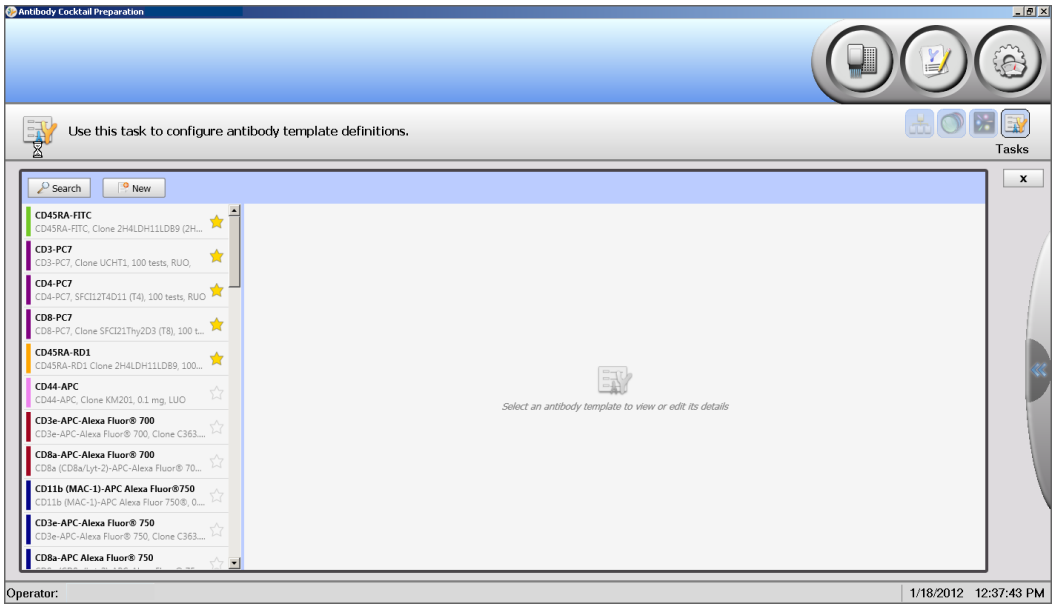


## Defining Antibody Templates

This is the third step to configure the Biomek 4000 ACPrep Software. Vials of antibodies, or bulk antibody cocktails, are the pipetting source for all operations in the software. An antibody template is like the catalog configuration of an antibody, in that it defines the general attributes of an antibody. Specific information for a given vial of antibody reagent, such as lot number and expiration date, is entered in the rack inventory to prepare the run.

From the **Configuration** screen, click Antibody Templates. The **Antibody Template Definitions** screen appears (Figure 2.13).

**Figure 2.13** Antibody Template Definitions Screen




Follow the steps below to search, define, edit, or delete antibody templates.

## Searching for Existing Antibody Templates

**1** To search for existing information:

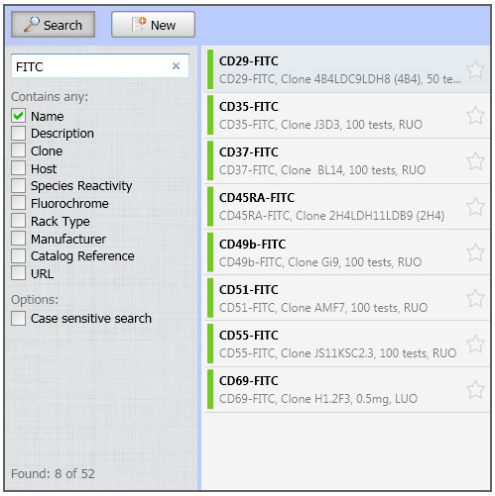
**a.** Click Search on the top left side of the screen. A search area opens.

**b.** Define your search by clicking on the boxes to the left of the list in **Contains any**.

**c.** Type the search criteria in the **Search** field.

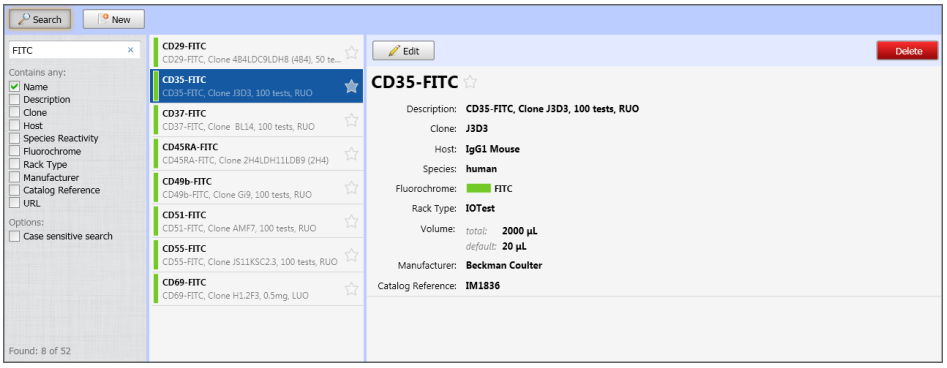
The list of antibody template definitions to the right automatically updates to show only those items that match the search criteria (Figure 2.14).

**Figure 2.14** Search Criteria




**2** Click on the item you need and information about that selection displays to the right (Figure 2.15).

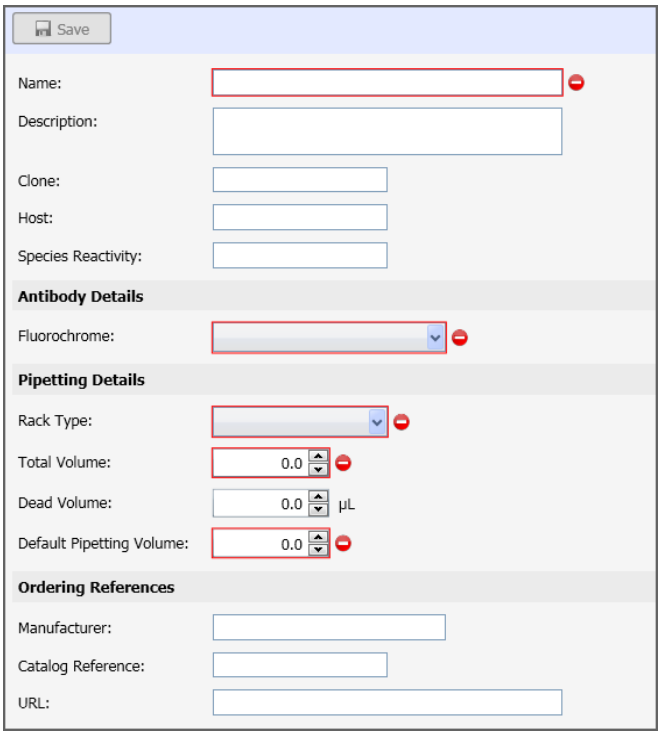
**Figure 2.15** Search Results, with Information Displayed for Selected Item



## Creating New Antibody Templates

1 To create a new antibody template, click New located on the top left side of the screen. The **Antibody Template Details** interface appears (Figure 2.16).

**Figure 2.16** Antibody Template Details




2 In the fields provided:

**a.** Enter the antibody **Name** that will be displayed in other screens and reports.

**b.** Enter a **Description** (optional).

**c.** Enter the **Clone** (optional).

**d.** Enter the **Host** (optional).

**e.** Specify **Species Reactivity**, if desired. Any text label may be used for this field. To promote consistency, previously used text labels are automatically suggested by the software as text is typed into the text box.

**f.** Under **Antibody Details**, select the **Fluorochrome** from the drop-down list. The fluorochrome identifies the conjugated fluorophore attached to the antibody. This identification is used when assigning antibodies to a cocktail. It also determines which flow cytometer configuration to use with this antibody.

**g.** Under **Pipetting Details**, enter:

- **Rack Type** – IOTest, CYTO-STAT, BD, MicroVial, MicroVialLV, 12 mL, and 5 mL are the seven reagent rack types supported on the system and represent locations where the vial is stored. This selection sets the labware type for the software, which models the shape and size of the vial for accurate pipetting. For instance, the "LV" version of the Micro Vial is for the low-volume vials, which have a shallower interior. Select the rack type that corresponds to the vial in which the antibody is stored.
- **Total Volume** – indicates the estimated starting volume for a new vial of this antibody.
- **Dead Volume** – specifies the volume that cannot be retrieved by the Biomek 4000 instrument. This volume may need to be experimentally determined.
- **Default Pipetting Volume** – specifies the amount of antibody transferred in typical panel usage. This is the default value, but it can be changed when setting up a run.

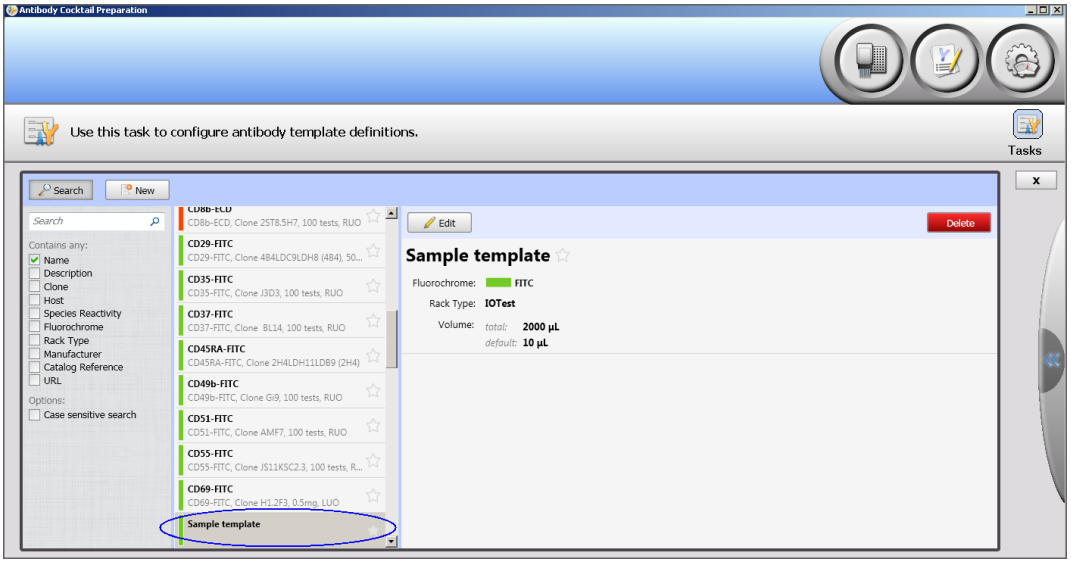
**h.** Under **Ordering References**, enter:

- **Manufacturer name**
- **Catalog Reference**
- **URL**

**NOTE** Populating these fields is optional.

**3** Click Save to save the configuration. The newly-defined antibody template appears on the left (Figure 2.17).

**Figure 2.17** Newly-Defined Antibody Template

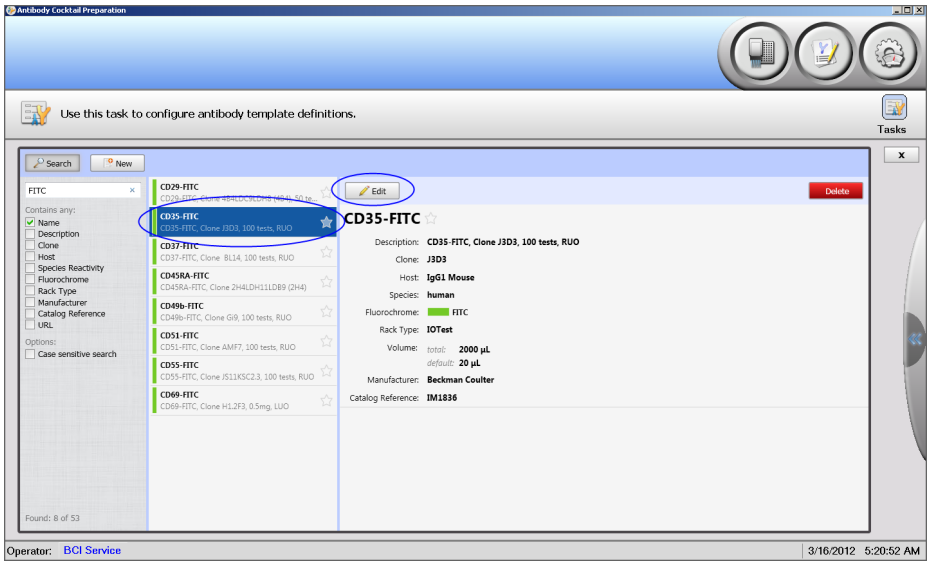



**4** Repeat this procedure to add additional antibody template configurations.

## Editing Antibody Templates

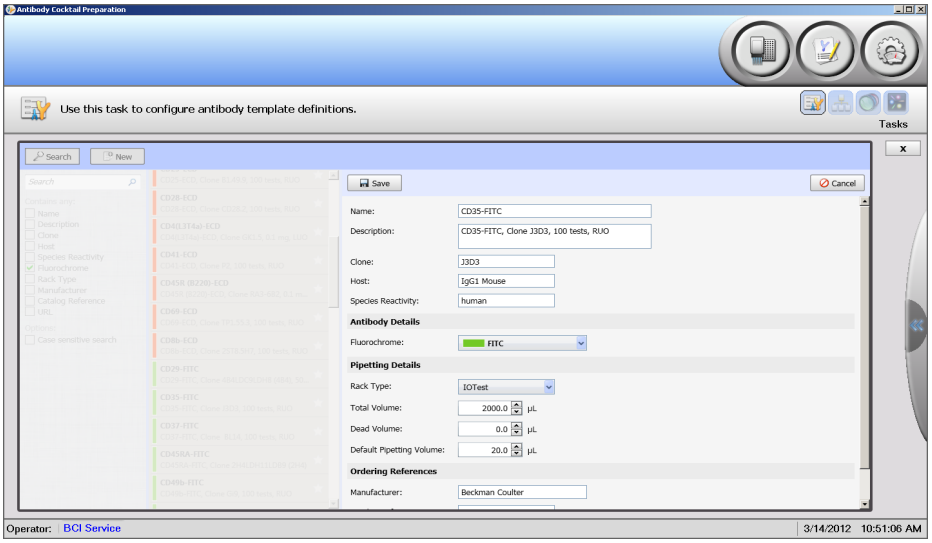
1 To edit an existing antibody template, click the antibody template from the list to select it. (Figure 2.18).

**Figure 2.18** Opening an Antibody Template for Editing




2 Click Edit located above the name of the antibody template. The **Antibody Template Details** interface appears (Figure 2.19).

**Figure 2.19** Editing an Antibody Template



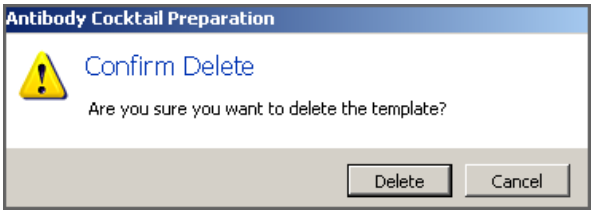
3 Make edits as necessary, then click Save to save the configuration.

## Deleting Antibody Templates

1 To delete an antibody template, select it from the list and click Delete. A confirmation to delete the antibody template appears (Figure 2.20).

2 Click Delete to delete the antibody template.

**Figure 2.20** Confirmation to Delete the Antibody Template



## Defining Panels and Cocktails

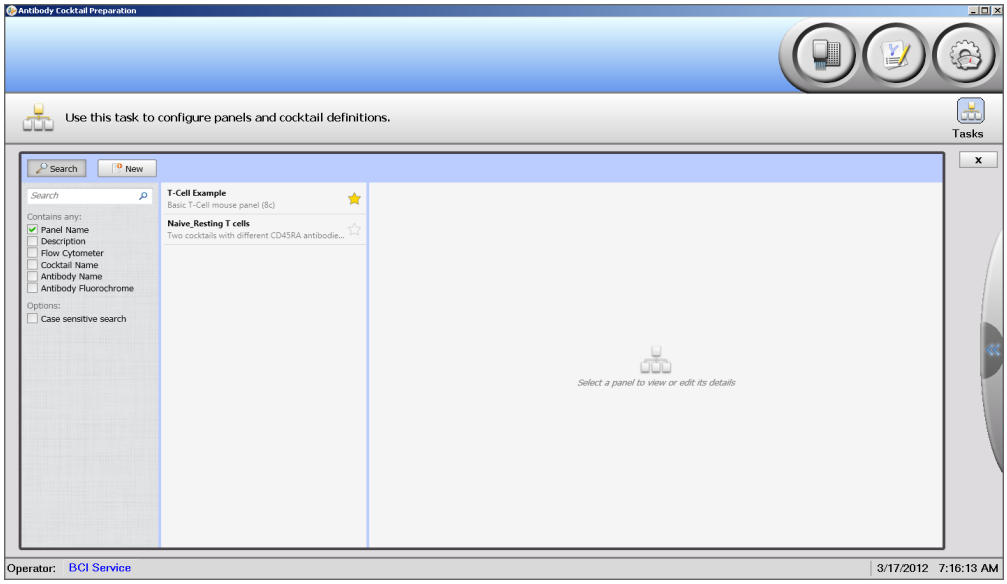
This is the fourth step to configure the Biomek 4000 ACPrep Software. A cocktail is a set of conjugated antibodies combined into one type of output labware. A panel is a set of one or more cocktails that are typically used together for a sample. Each cocktail has a list of antibodies and each antibody has a pipetting volume.

To create panels and cocktails:

- Create a new panel.
- Define the cocktails assigned to the panel (that is, the number of assay tubes).
- Assign antibodies to be added to the assay tube for each cocktail.

From the **Configuration** menu, click Panels and Cocktails. The **Panel and Cocktails Configurations** screen appears (Figure 2.21).

**Figure 2.21** Panels and Cocktails Configurations Screen




Follow the steps below to search, define, edit, or delete panels and assign cocktails.

## Searching for Existing Panels and Cocktails

1 To search for existing information:

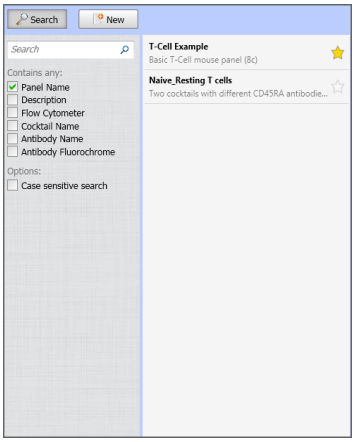
**a.** Click Search on the top left side of the screen. A search area opens.

**b.** Define your search by clicking on the boxes to the left of the list in **Contains any**

**c.** Type the criteria in the **Search** field.

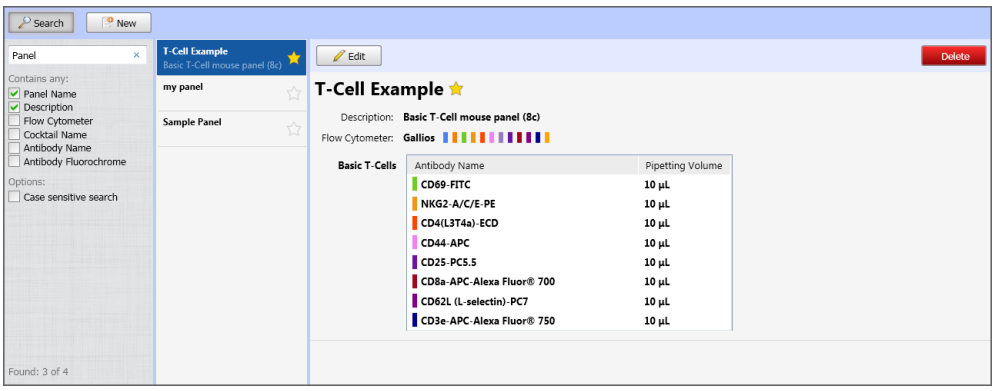
The list of panel configurations to the right automatically updates to show only those items that match the search criteria (Figure 2.22).

**Figure 2.22** Search Criteria




2 Click on your item and information about that selection displays to the right (Figure 2.23).

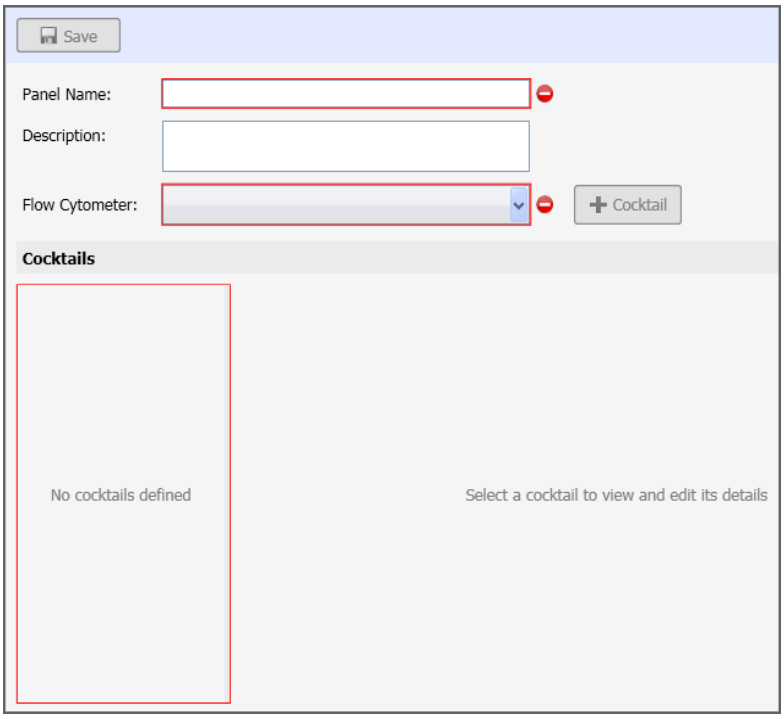
**Figure 2.23** Search Results, with Information Displayed for Selected Item



## Creating New Panels and Cocktails

1 To create a new panel, click New located on the top left side of the screen. The **Panels and Cocktails Details** interface appears (Figure 2.24).

**Figure 2.24** Panels and Cocktails Details




2 In the fields provided to create a panel:

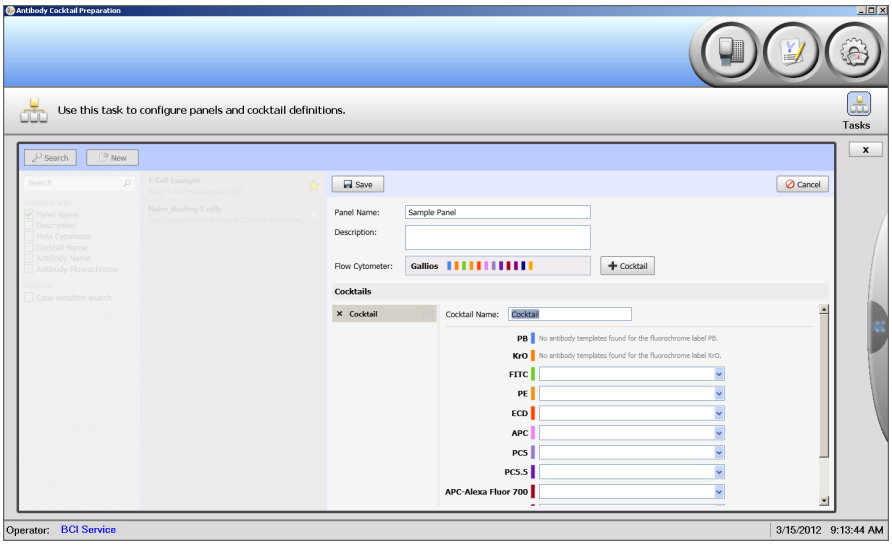
**a.** Enter the **Panel Name** that will be displayed in other screens and reports.

**b.** Enter a **Description** (optional).

**c.** In the **Flow Cytometer** field, select a flow cytometer from the drop-down selection list. Cocktails that are part of the panel will use the list of fluorochromes represented in the flow cytometer configuration. This restricts the selection of antibodies to those supported by the flow cytometer.

**d.** Click Cocktail to the right of the **Flow Cytometer** field. Additional fields become available to define the cocktail (Figure 2.25).

**Figure 2.25** Defining a Panel



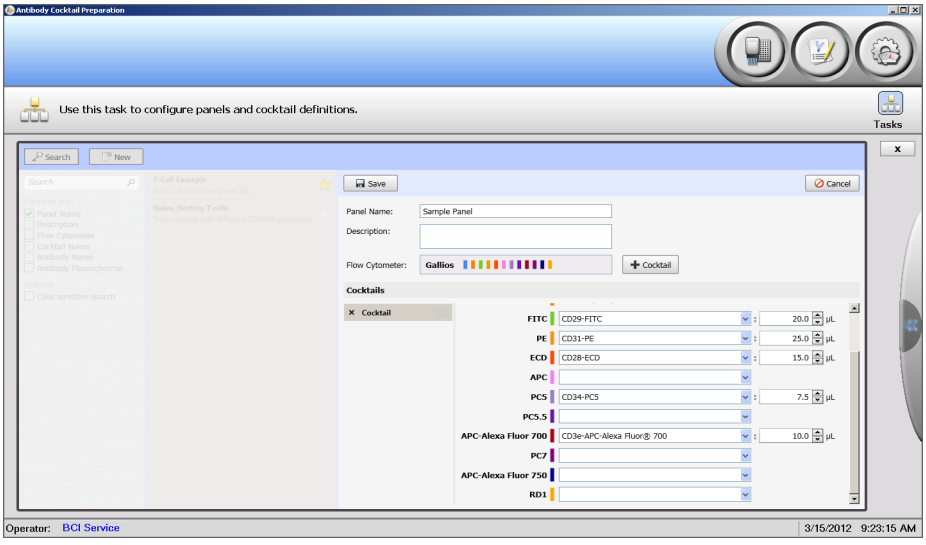

**3** In the fields provided to add cocktails to the panel:

**a.** Enter the cocktail name.

**b.** Select the antibody conjugates included in the cocktail. The field is initially populated with the default volume from the antibody template definition.

**c.** An additional field appears to set the pipetting volume (Figure 2.26).

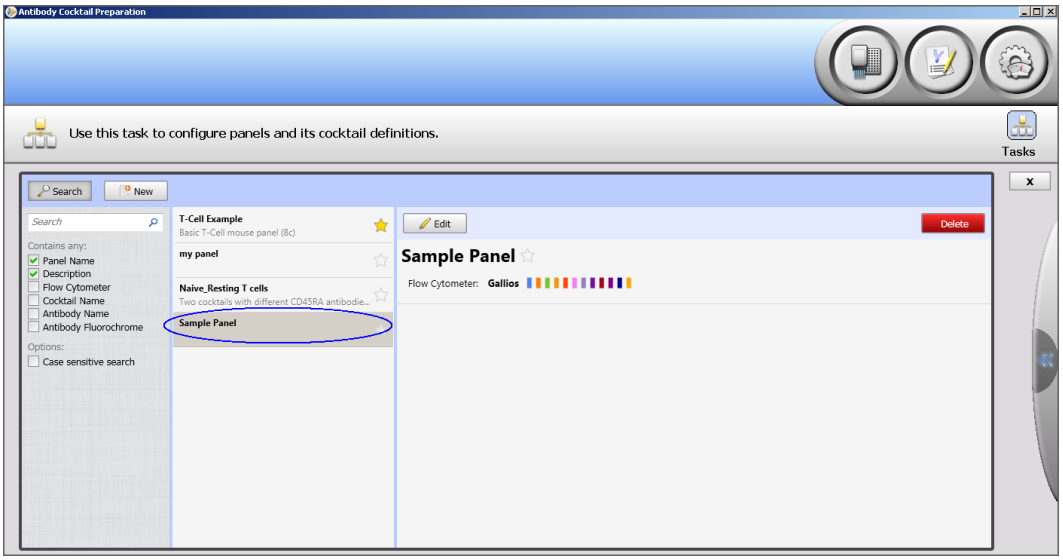
**Figure 2.26** Adding Cocktails to a Panel




**4** Repeat Steps 2 and 3 to add more cocktails to a panel.

**5** Click Save to save the configuration. The newly-defined panel appears on the left (Figure 2.27).

**Figure 2.27** Newly-Defined Panel

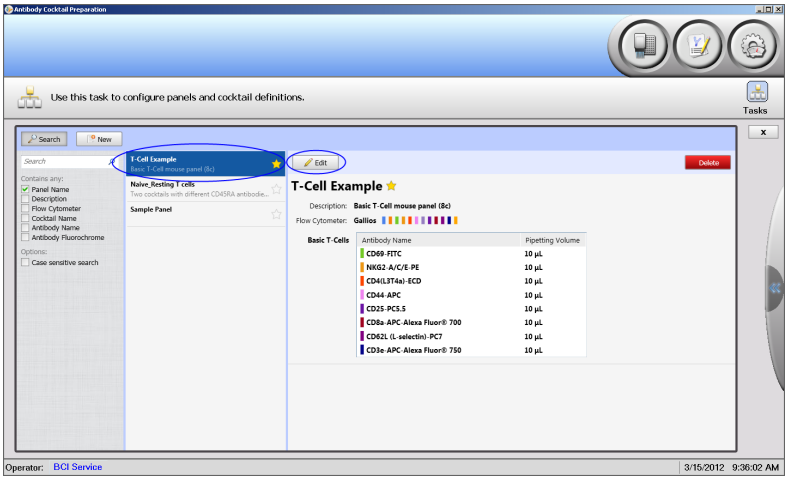



**6** Repeat this procedure to create more panels.

## Editing Panels and Cocktails

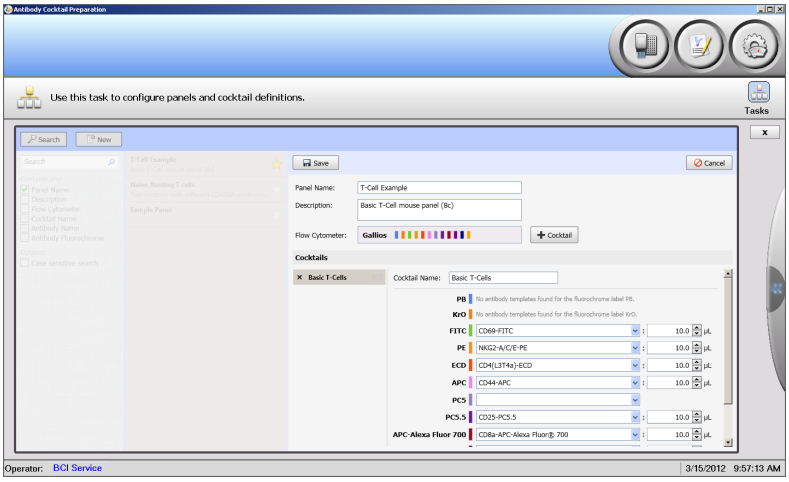
**1** To edit panels and cocktails, select the panel from the list, then click Edit to open it (Figure 2.28).

**Figure 2.28** Opening a Panel for Editing



2 Click Edit located above the name of the panel. The **Panels and Cocktails Details** interface appears (Figure 2.29)

**Figure 2.29** Editing Panels and Cocktails

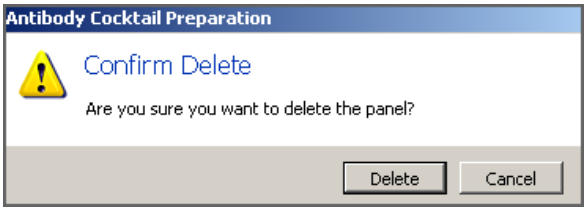



3 Make edits as necessary, then click Save to save the configuration.

## Deleting Panels

1 To delete a panel, select it from the list and click Delete. A confirmation to delete the panel appears (Figure 2.30).

**Figure 2.30** Confirmation to Delete a Panel



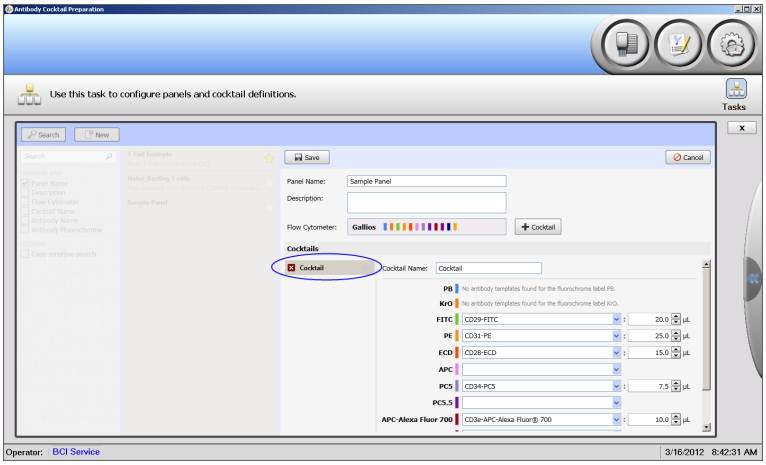

2 Click Delete to delete the panel.

## Deleting Cocktails from Panels

1 To delete a cocktail, you must be in the edit screen for the panel. Click  in  to delete the cocktail. (Figure 2.31).

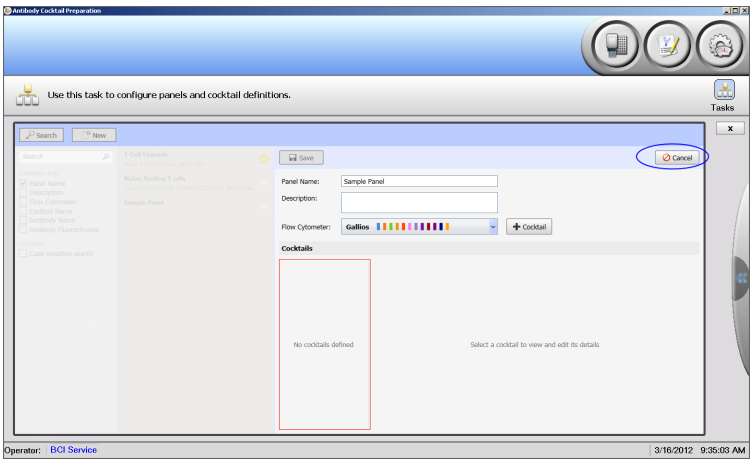
**NOTE** If there are multiple cocktails in a panel, you can delete all cocktails by clicking  by each cocktail. If you delete all cocktails in a panel, you return to the **Panels and Cocktails Details** (Figure 2.26).

**Figure 2.31** Deleting a Cocktail




2 You do not get a confirmation to delete a cocktail. If you delete a cocktail in error, click  on the right side of the screen (Figure 2.32). You return to the **Edit** screen and the cocktail is available again.

**Figure 2.32** Cancel Deleting a Cocktail from a Panel



CHAPTER 3

# System Operation

## Introduction

This chapter describes how to operate the Biomek 4000 ACPrep Software to automate the transfer of antibodies or cocktails into the assay labware.

Prior to running the system, a number of configuration elements, such as panel and flow cytometer configurations, need to be established (see CHAPTER 2, *Configuring System Settings*). Operator access privileges must also be established (see CHAPTER 1, *Accounts and Permissions*). Lastly, it is assumed that the Biomek 4000 Instrument has been properly set up and tested by trained Beckman Coulter Service personnel.

The software allows users to pipette antibodies into assay tubes or microplates using two different approaches: direct (the **Prepare Tubes from Antibodies** workflow) and indirect (the **Prepare Bulk Cocktails** workflow, followed by **Prepare Tubes from Bulk Cocktails** workflow).

The direct approach pipettes aliquots of individual antibodies directly from source vials (for example, IOTest Antibodies) into assay labware.

The indirect approach creates bulk antibody mixtures in volumes up to 5 or 12 mL in an intermediate, empty 5 mL or 12 mL vial. Then, aliquots of the bulk mixtures are pipetted from the intermediate vial into the assay labware.

To prepare a run, identify a list of cocktails to create or transfer to assay labware and verify that the instrument and resources are set up properly to start the run. The steps are:

1. **Worklist** - Specify the cocktails to create or transfer to assay labware.
2. **Deck Setup** - Specify where antibody vials are located and what output labware to use on the deck of the system. Using the deck layout area, compare items on the system deck with the requirements of the current run.
3. **Run** - Start and monitor a run.

# Common Operations Across all Workflows

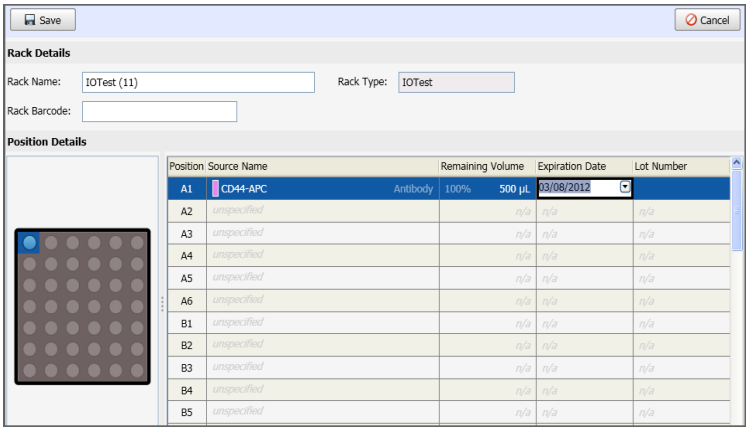
Throughout running workflows on the system, there are several common operations. Those operations are documented here.

## Setting the Expiration Date

There are three ways to set the expiration date:

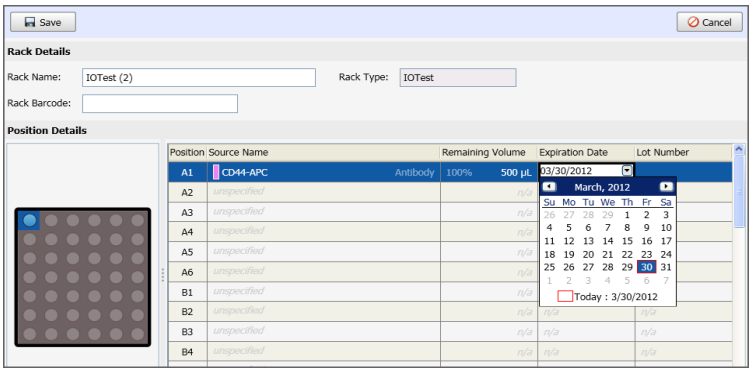
- Click in the **Expiration Date** field. The date highlights automatically (Figure 3.1). Type in the correct date.

**Figure 3.1** Setting the Expiration Date



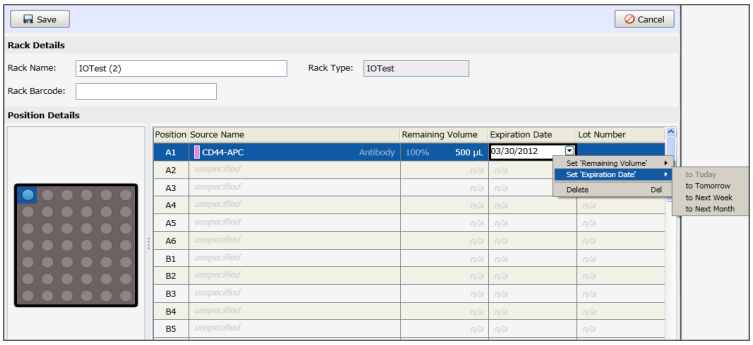

- Click on the date, in the **Expiration Date** field, then click the drop-down menu. A calendar opens. Select the date you need (Figure 3.2).

**Figure 3.2** Calendar Option for Setting the Expiration Date



- Right-click in the **Expiration Date** field and select **Set Expiration Date** from the pop-up menu. Another pop-up menu appears. Select the option you need (Figure 3.3).

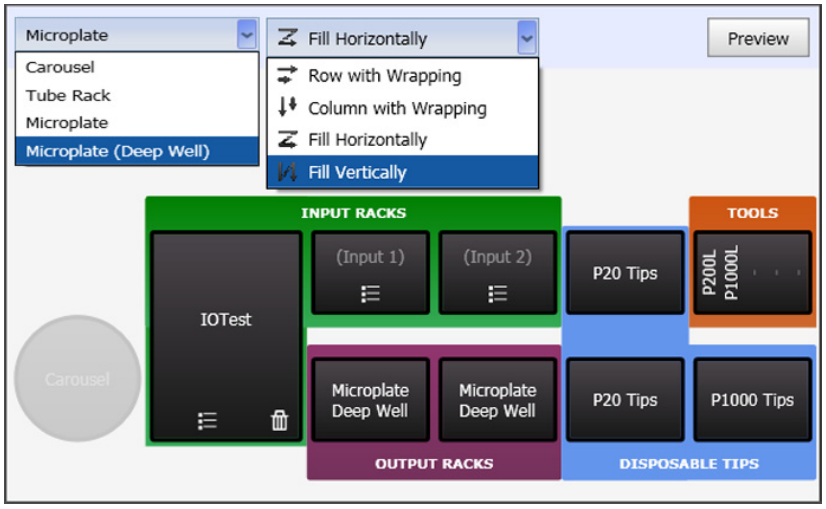
**Figure 3.3** Optional Way to Setting the Expiration Date




## Selecting an Output Fill Option for Output Racks

If necessary, select an output source from the drop-down list on the left, then select an output fill option from the drop-down list on the right (Figure 3.4).

**Figure 3.4** Output Fill Option

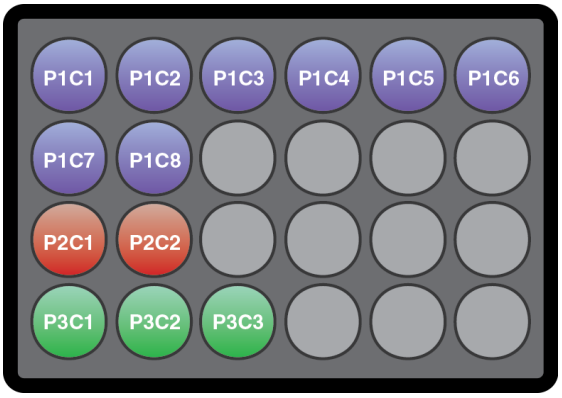



**NOTE** Click Preview to display a graphical representation of the output type.

The four figures below show how three different panels are dispensed differently into a rack, based upon the output fill option selected. In the example below, P=Panel and C=Cocktail.

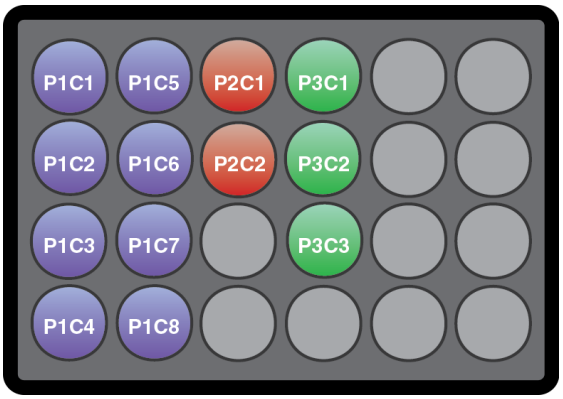
- **Row with Wrapping** - Rows are on the vertical axis. This selection arranges each set of outputs for a panel into a new row of the output labware (Figure 3.5).

**Figure 3.5** Row with Wrapping



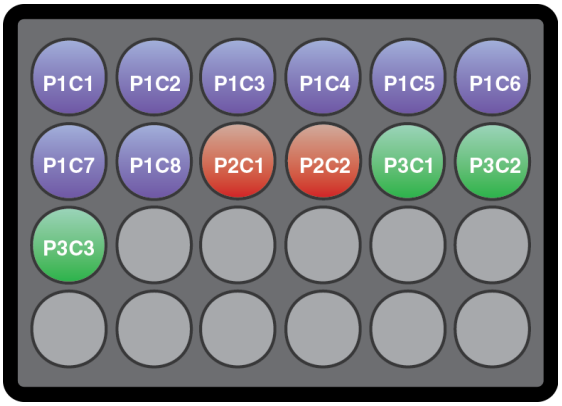

- **Column with Wrapping** - Columns are on the horizontal axis. This selection arranges each set of outputs for a panel into a new column of the output labware (Figure 3.6).

**Figure 3.6** Column with Wrapping



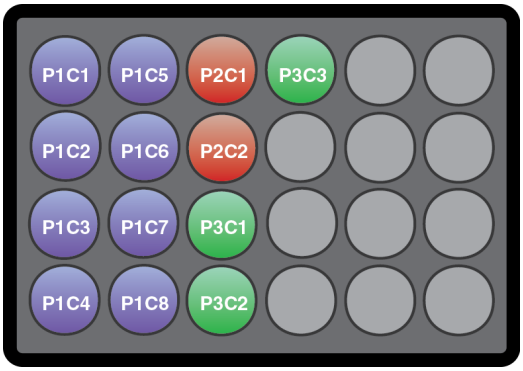

- **Fill Horizontally** - This selection arranges each set of outputs for a panel horizontally across rows of the output labware (Figure 3.7).

**Figure 3.7** Fill Horizontally



- **Fill Vertically** - This selection arranges each set of outputs for a panel vertically across columns of the output labware (Figure 3.8).

**Figure 3.8** Fill Vertically




## How the System Handles Input Vials

If you have several source vials of the same antibody, the system software chooses the next available vial for each transfer as follows.

1. The correct type of input rack is chosen based on the antibody vial type.
2. The appropriate input rack is sequentially searched by row until a vial with the correct antibody name and sufficient remaining liquid is found.
3. This process is repeated for each transfer.

A vial that no longer has enough liquid to perform a given transfer will be skipped and the next available vial will be used. A vial that is depleted will always be skipped.

**NOTE** There is a certain amount of antibody in each source vial that is not accessible for pipetting. This volume is known as the “dead volume”, and must be taken into account when preparing the system for a run.

It is important to understand that:

- It is not possible to pipette more than the available contents of a vial in a single transfer.
- The system will not perform multiple transfers to achieve a desired output volume.

This means that the system will not draw from more than one vial of the same antibody during a run to obtain the amount of antibody you need.

For example, if you have two vials with 500 uL of a source antibody in each vial, and you want 1000 uL of that antibody in your destination, the system will not be able to do this in a single run. There are two options to accomplish this job:

- Complete the job in two runs, where each run transfers one half of the total volume from each vial.
- Manually pipette 1000 µL into one source vial before the run, adjusting the available volume in that source vial to match the new total volume.

## How the System Determines the Order of Pipetting Operations

If two output labware items are used in a single run (for example, two 24-position tube racks or two 5 mL vial racks), the system will complete all transfers to one output labware item before starting the second. This allows you to pause the system and remove the first completed output labware from the system while the other output labware is being completed. The run-time status display can be used to determine when the first output labware is complete.

For each output labware, the system will perform all transfers requiring the P1000SL tool before utilizing the P200L tool. This means that all transfer volumes over 100 µL will occur earlier in the run than transfers of lower volumes. Likewise, all transfer volumes above 20 µL will occur before transfers of 20 µL or less. This order occurs for two reasons:

- Smaller volumes are more sensitive to evaporation and should be on the deck as briefly as possible.
- Smaller volumes will be more accurately dispensed when pipetted into liquid.

Aside from transferring larger volumes before smaller volumes, the system will accomplish transfers within each volume range in the order it determines to be most efficient. This order may not be obvious or predictable to the user.

# Setting up the Instrument for a Run

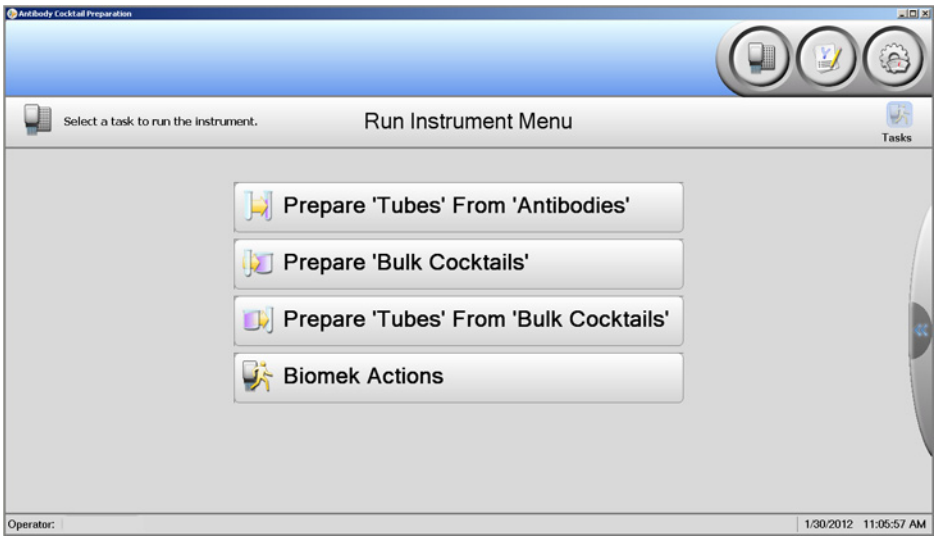
This section provides an overview of how to use the **Run Instrument** screens to set up the instrument for a run.

1 Log into the Biomek 4000 ACPrep Software.

2 Click  on the top right side of the software main screen. The **Run Instrument Menu** screen appears (Figure 3.9). The following options are available:

- **Prepare 'Tubes' From 'Antibodies'** (see Preparing Tubes from Antibodies)
- **Prepare 'Bulk Cocktails'** (see Preparing Bulk Cocktails)
- **Prepare 'Tubes' From 'Bulk Cocktails'** (see Preparing Tubes from Bulk Cocktails)
- **Biomek Actions** (see CHAPTER 4, *Biomek Actions*)

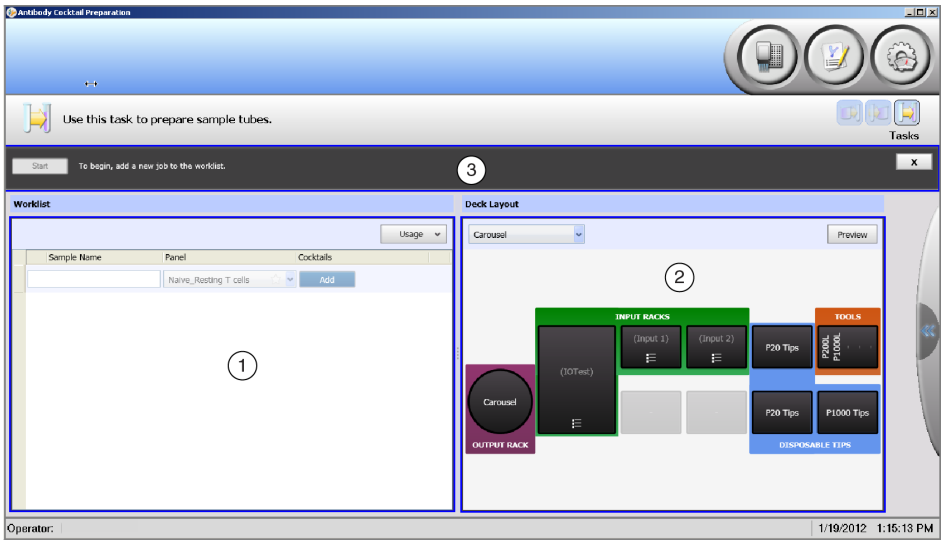
**Figure 3.9** Run Instrument Menu Screen



## ‘Prepare’ Screens Overview

The **Prepare Tubes from Antibodies**, **Prepare Bulk Cocktails**, and **Prepare Tubes from Bulk Cocktail**s screens have a similar layout and are used in the same way. The screens are divided into sections for building a worklist, defining the deck layout, and starting/stopping a run (Figure 3.10).

**Figure 3.10** Sample Preparation Options Main Screen




1. **Worklist area** - Create assay lists with panel designations
2. **Deck Layout area** - Determine which labware and layout to use for the run
3. **Run information bar** - Provides updates on the status of the run and information about any errors

## Performing a Run

Before starting a run, perform a pre-run check. Use the pre-run checklist below.

1. Ensure that the Biomek 4000 is powered on and ready for operation.
2. Ensure that antibody reagent racks are in place.
3. Ensure that all assay tubes or microplates are in place.
4. Ensure that all pipette tips are in place.
5. Ensure that all pipetting tools are in place.
6. Ensure that the tip disposal bag is empty and installed.
7. Do not leave any extraneous items on the deck, such as:
    - Framing tools
    - Lids, caps, bottles, or other unneeded labware
    - Tubing or cabling
    - Notebooks, papers, pens, or pencils

# Preparing Tubes from Antibodies

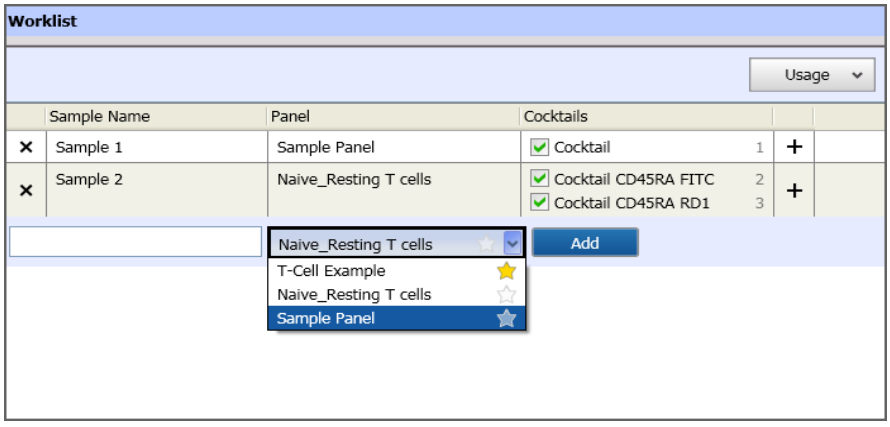
From the **Run Instrument Menu** screen, select Prepare 'Tubes' From 'Antibodies' to open the task for preparing assay tubes.

This section describes how to prepare the worklist, set up the system, and perform the run.

## Preparing a Worklist

To prepare the worklist, use the **Worklist** area. Figure 3.11 shows an example of a populated worklist.

**Figure 3.11** Populated Worklist Area - Preparing Tubes from Antibodies




Use this area of the screen as follows:

- Enter or edit the **Sample Name**.
- The **Panel Name** field has a drop-down list of previously created panels.
- Select and deselect cocktails by clicking to the left of the cocktail name in the **Cocktail** column. A deselected cocktail is not included as part of the run or worklist.
- To make a duplicate of a sample, click + on the right end of the worklist row for the sample.
- To delete a sample, click × to the left of the sample name.
- To add a sample to the worklist, click Add.

**NOTE** The recommended minimum amount of reagent to pipette is 5 µL per transfer, The maximum amount of reagent that can be pipetted is 1000 µL per transfer.

1 Enter the sample name, or use a hand-held barcode scanner to enter the sample ID. See APPENDIX B, *Symbologies for the Optional Barcode Reader* for supported symbologies.

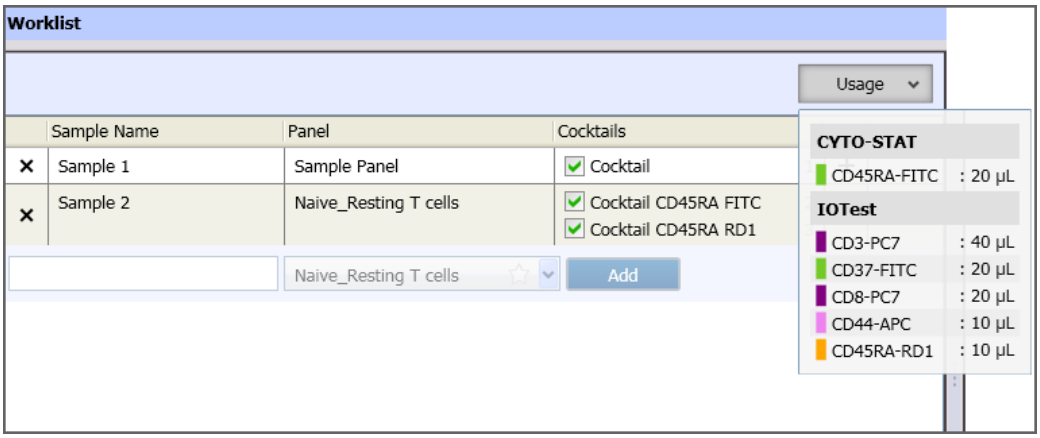
2 Select the panel for the sample from the drop-down menu.

**3** Click Add. The cocktails included in the panel will populate in the **Cocktails** column. If you do not want to use a specific cocktail, deselect it by unchecking ☑ next to the cocktail name.

**4** Repeat these steps for each new sample you want processed in this run.

**5** To help determine which input racks to configure on the deck, click Usage. A drop-down list appears that shows the types of input racks needed and the volumes of individual antibodies required in each rack (Figure 3.12).

**Figure 3.12** Usage Drop-Down Screen



## Configuring the Deck

Configuring the deck for a run consists of ensuring that:

- The deck of the instrument physically matches the layout in the software.
- The appropriate layout for assigning destinations is selected.
- The software and vials have an adequate supply of all antibodies to be used in the current run.

To do this, use the **Deck Layout** view, which shows a graphic representation of the deck that includes selection areas for input and output racks.

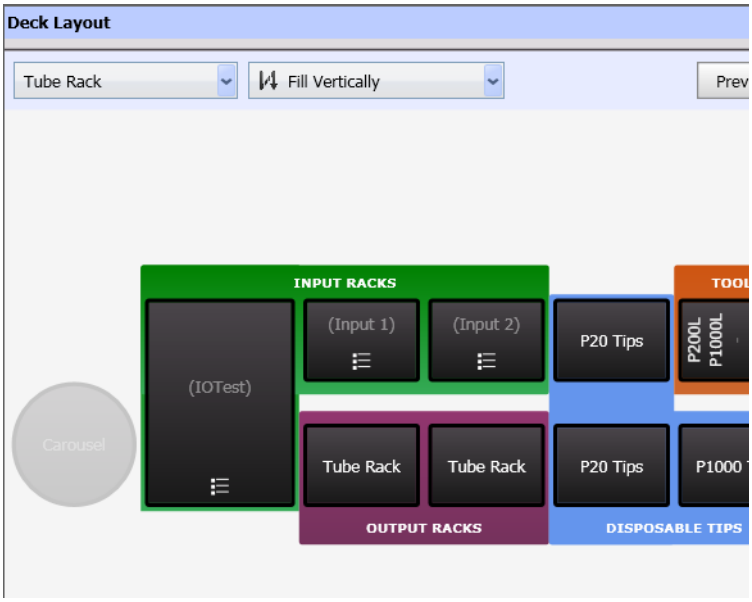
The necessary volumes for the run configured in the worklist are checked by the software against its internally-monitored list of vials. If the software determines that an insufficient volume of an antibody is present, it will display the required volumes in the **Run Information** area of the screen.

**⚠ CAUTION**

The reagent racks weigh between 1.36 kg (3 lbs) - 5.05 kg (11 lbs). If dropped, they may cause injury. Use caution when handling reagent racks.

Figure 3.13 shows an example of the **Deck Layout** area.

**Figure 3.13** Deck Layout Area



## Input Racks

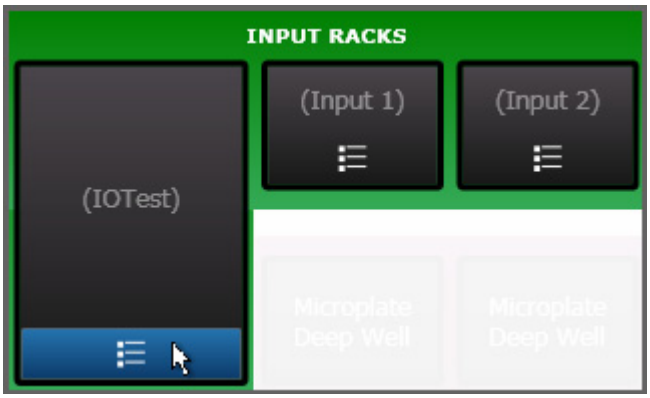
Seven types of antibody vial holders, or racks, are represented in the deck graphic: IOTest, CYTO-STAT, BD, MicroVial, MicroVialLV, 12 mL, and 5 mL. The IOTest rack has a fixed location on the deck due to its physical size. The other rack types are located in the two rack locations at the back of the deck.

**IMPORTANT** Do not shake antibodies. This generates bubbles, which will be detected by the liquid level sensing system in the tool and may cause an incorrect amount of liquid to be pipetted.

---

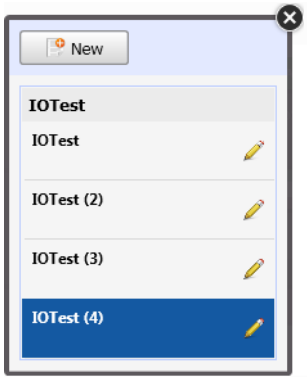
1 To configure the contents of a rack, click on the corresponding input rack graphic (input racks are in the green region labeled **INPUT RACKS**). To create a new rack or select a previously configured rack, click  . The rack selection icon turns blue when you hover over it with the mouse (Figure 3.14).

**Figure 3.14** Selecting a Rack




- A pop-up menu appears, which allows you to create a new rack or select a previously saved rack (Figure 3.15).

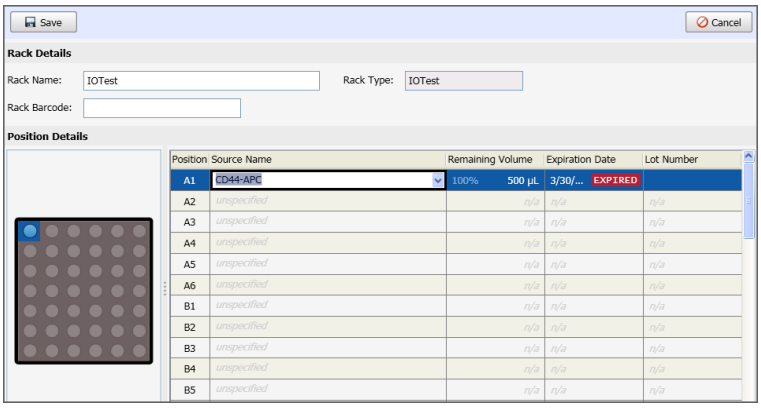
**Figure 3.15** Creating a New Rack




**NOTE** If the rack is already in the pop-up list and you select it, the test will be ready to run if sufficient antibodies are present on the deck. This may require up to three various types of racks.

**2** Click New and the **Rack Details** screen appears (Figure 3.16).

**Figure 3.16** Rack Details




**3** In **Rack Details**, enter the **Rack Name** (required) and **Rack Barcode** (optional).

**4** In **Position Details**, add the antibody information. The graphic to the left of **Position Details** reflects the information as it is entered for each position.

**a.** Choose the antibody from the **Source Name** drop-down list. **Remaining Volume** and **Expiration Date** are automatically populated.

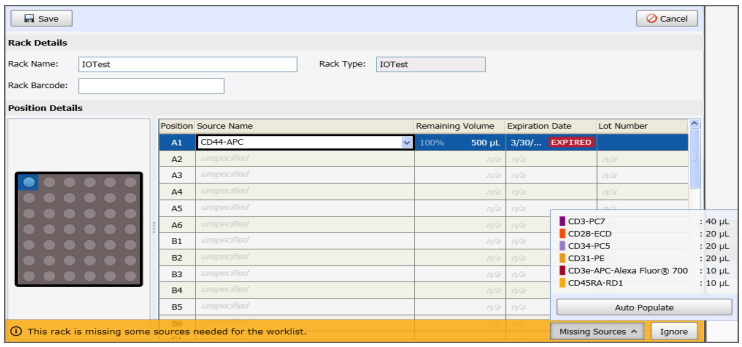
**b.** **Remaining Volume** defaults to 100% of the total volume as defined in the antibody template. For information on how to change **Remaining Volume**, see Step 5.

**c.** The **Expiration Date** defaults to the current date and shows as EXPIRED. See Setting the Expiration Date in Common Operations Across all Workflows on page 3-2 for details on that operation.

**d.** Enter the **Lot Number** (optional).

**NOTE** To quickly add vials to the **Position Details** screen, click Missing Sources. A pop-up screen appears. Click Auto Populate and the required antibody vials are populated automatically using information that has been previously entered and is available (Figure 3.17). The **Missing Sources** button only appears if the rack is missing resources required for the current worklist.

**Figure 3.17** Auto Populating Position Details



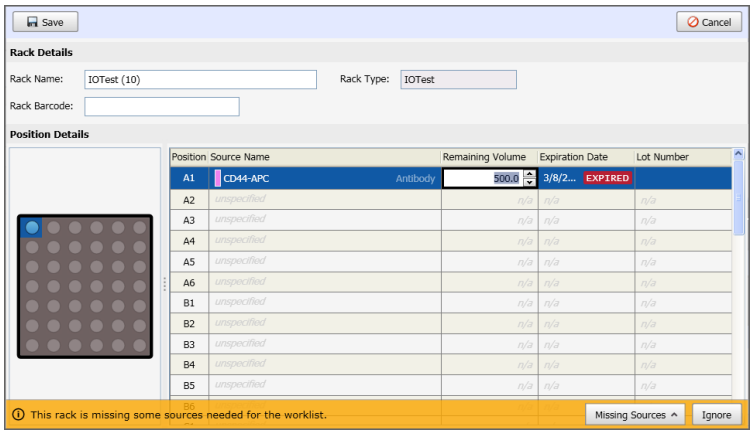

**5** To edit **Remaining Volume** (Figure 3.18):

**a.** Click in the **Remaining Volume** field.

**b.** Use the up and down arrows to select the correct volume (changes in increments of 2.5 µL).

**c.** To select a specific **Remaining Volume**, click in the **Remaining Volume** field and highlight the information. Type the correct volume in the field.

**Figure 3.18** Changing the Remaining Volume




**6** Change the expiration date to the correct date. See Setting the Expiration Date in Common Operations Across all Workflows on page 3-2 for details on that operation.

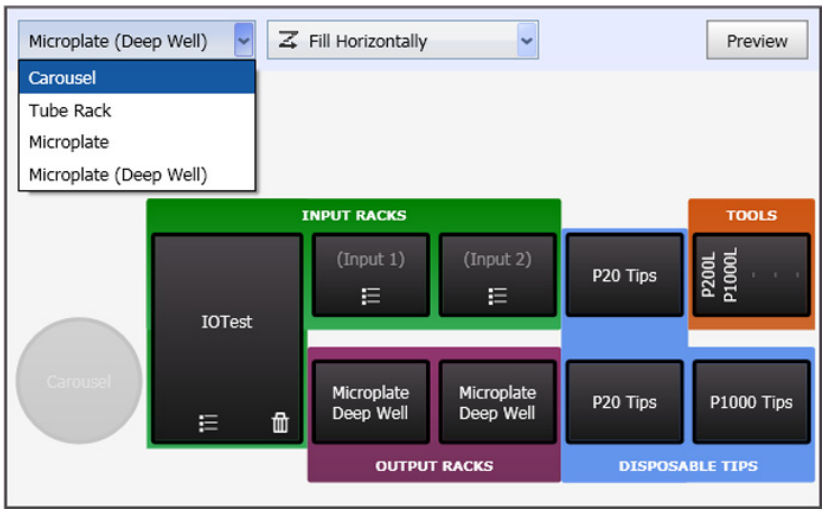
**7** Click Save to save your information.

## Output Racks

Output racks are used to locate assay tubes or microplates on the deck. Follow these steps to configure the output racks.

1 Select the output destination from the drop-down list (output racks are in the purple region and labeled **OUTPUT RACKS**) (Figure 3.19).

**Figure 3.19** Output Destination




- If you select anything other than Carousel, the output fill option drop-down list appears.

2 See Selecting an Output Fill Option for Output Racks in the Common Operations Across all Workflows section on page 3-3 for details on that operation.

3 See Starting a Run on page 3-29 for details on that operation.

# Preparing Bulk Cocktails

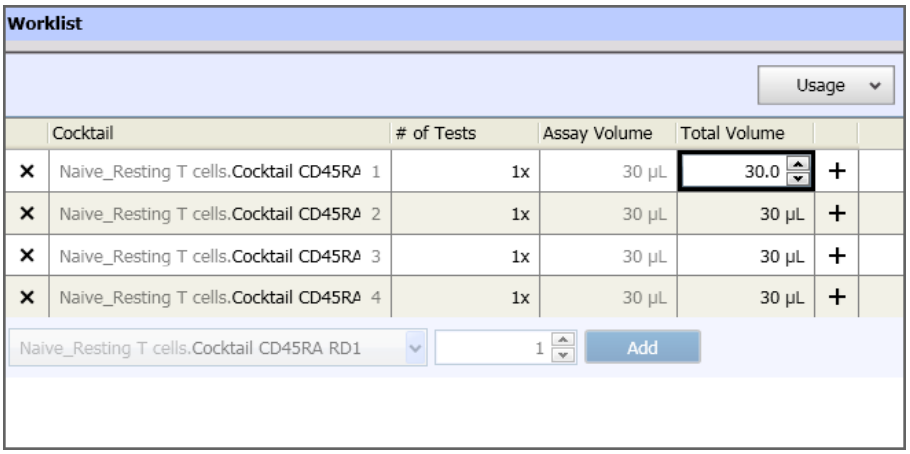
From the **Run Instrument Menu** screen, select Prepare 'Bulk Cocktails' to open the task for preparing bulk cocktails in either 12 mL or 5 mL vials.

This section describes how to prepare the worklist, set up the system, and perform the run.

## Preparing a Worklist

To prepare the worklist, use the **Worklist** area. Figure 3.20 shows an example of a populated worklist.

**Figure 3.20** Populated Worklist Area




- Select cocktails to prepare. The **Cocktail** field is not editable.
- To make a duplicate of a cocktail, click + at the end of row for that cocktail.
- To delete a cocktail, click × to the left of the cocktail name.
- To add a cocktail to the worklist, click Add.
- Edit the **# of Tests** field by using the up and down arrows to change the number in increments of 1. The default is 1x per cocktail.
- Edit the **Total Volume** field by using the up and down arrows to change the number in increments of 2.5 µL.

**NOTE** Changing either the **# of Tests** or the **Total Volume** fields automatically updates the other field so that the **# of Tests** x the **Assay Volume** = **Total Volume**.

**NOTE** If more volume is needed than the capacity of the vial used (5 mL or 12 mL), then the system will split it into two vials.

**NOTE** The recommended minimum amount of reagent to pipette is 5 µL per transfer. The maximum amount of reagent that can be pipetted is 1000 µL per transfer.

1 Select the cocktail from the drop-down list and click Add.

**NOTE** Based on the cocktail selected, the software automatically populates the **Assay Volume** field and it cannot be changed.

2 Change the number in the **# of Tests** field, if necessary, as follows:

**a.** Click in the **# of Tests** field.

**b.** Use the up and down arrows to change the number in increments of 1.

**NOTE** Changing the **# of Tests** automatically recalculates the **Total Volume** field.

3 Change the number in the **Total Volume** field, if necessary, as follows:

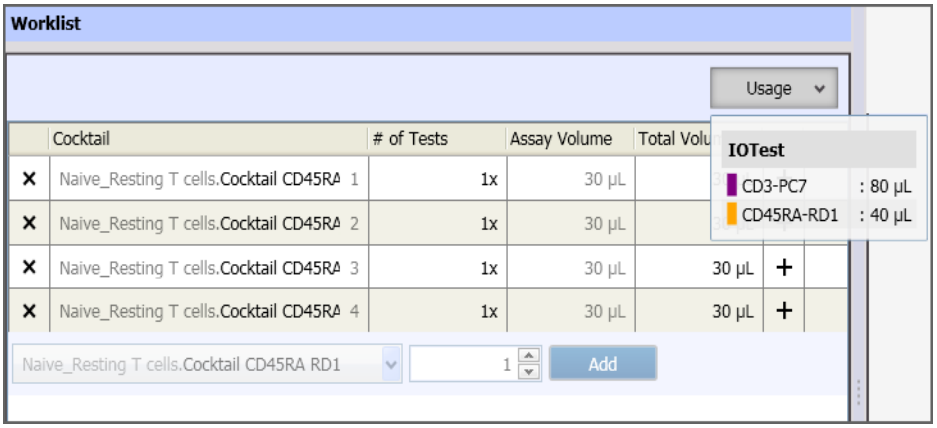
**a.** Click in the **Total Volume** field.

**b.** Use the up and down arrows to change the number in increments of 10 µL.

**NOTE** Changing the **Total Volume** automatically recalculates the **# of Tests** field.

4 To help determine which input racks and antibody vials to configure on the deck, click Usage. A drop-down list appears that shows the types of input racks needed and the volumes required in each rack (Figure 3.21).

**Figure 3.21** Usage Drop-Down Screen



## Configuring the Deck

Configuring the deck for the run consists of ensuring that:

- The deck of the instrument physically matches the layout in the software.
- The appropriate layout for assigning destinations is selected.
- The software has an adequate supply of all antibodies to be used in the current run.

To configure the deck, use the **Deck Layout** view, which shows a graphic representation of the deck that includes selection areas for input and output racks.

The necessary volumes for the run configured in the worklist are checked by the software against its internally-monitored list of vials. If the software determines that an insufficient volume of an antibody is present, it displays the required volumes at the top of the window.

**⚠ CAUTION**

The reagent racks weigh between 1.36 kg (3 lbs) - 5.05 kg (11 lbs). If dropped, they may cause injury. Use caution when handling reagent racks.

Figure 3.22 shows an example of the **Deck Layout** area.

**Figure 3.22** Deck Layout Area

## Input Racks

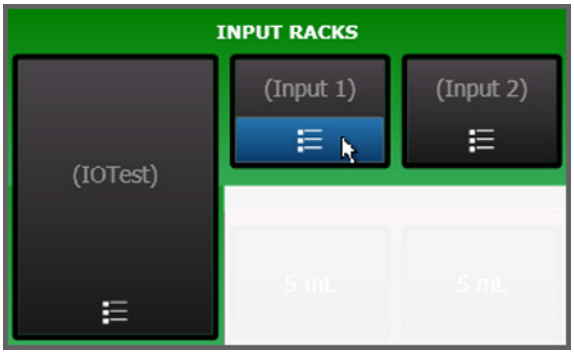
Seven types of antibody vial holders, or racks, are represented in the deck graphic: IOTest, CYTO-STAT, BD, MicroVial, MicroVialLV, 12 mL, and 5 mL. The IOTest rack has a fixed location on the deck due to its physical size. Place the other rack types in the two locations at the back of the deck.

**IMPORTANT** Do not shake antibodies. This generates bubbles, which will be detected by the liquid level sensing system in the tool and may cause an incorrect amount of liquid to be pipetted.

---

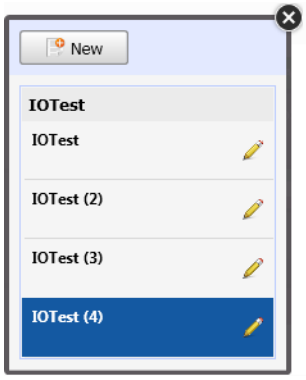
1 To configure the contents of a rack, click on the corresponding input rack graphic (input racks are in the green region labeled **INPUT RACKS**). To create a new rack or select a previously configured rack, click  . The rack selection icon turns blue when you hover over it with the mouse (Figure 3.23).

**Figure 3.23** Selecting a Rack




- A pop-up menu appears, which allows you to create a new rack or select a previously saved rack (Figure 3.24).

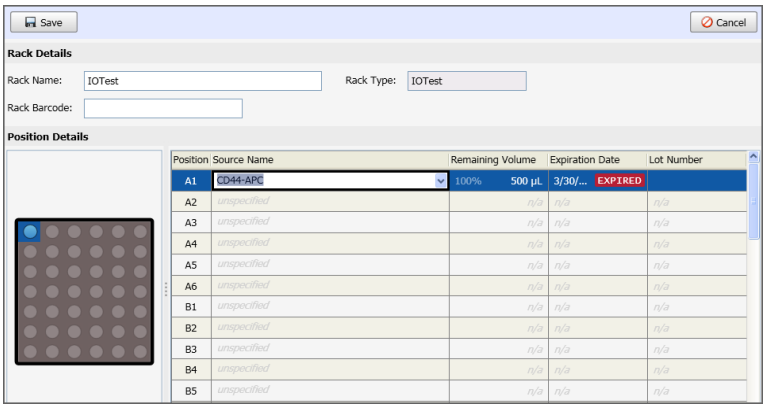
**Figure 3.24** Creating a New Rack




**NOTE** If the rack is already in the pop-up list and you select it, the test will be ready to run if sufficient antibodies are present on the deck. This may require up to three various types of racks.

**2** Click New and the **Rack Details** screen appears (Figure 3.25).

**Figure 3.25** Rack Details




**3** In **Rack Details**, enter the Rack Name (required) and Rack Barcode (optional).

**4** In **Position Details**, add the antibody information. The graphic to the left of **Position Details** reflects the information as it is entered for each position.

**a.** Select the antibody from the **Source Name** drop-down list.

**b.** Enter the **Remaining Volume**. The **Remaining Volume** field is automatically populated based on which antibody is selected.

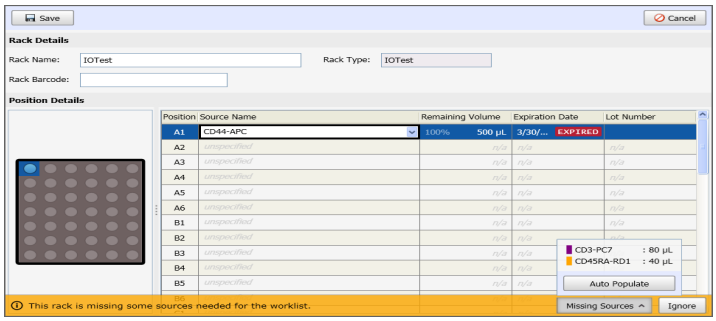
**NOTE** Use the up and down arrows to change the **Remaining Volume** in increments of 2.5 µL.

**c.** The **Expiration Date** defaults to the current date and shows as EXPIRED. See Setting the Expiration Date in Common Operations Across all Workflows on page 3-2 for details on that operation.

**d.** Enter the **Lot Number** (optional).

**NOTE** To quickly add vials to the **Position Details** screen, click Missing Sources. A pop-up screen appears. Click Auto Populate and the required antibody vials are populated automatically using default information (Figure 3.26). The **Missing Sources** button only appears if the rack is missing resources required for the current worklist.

**Figure 3.26** Auto Populating Position Details




5 Click Save to save your information.

## Output Racks

Output racks are used to locate the bulk vial racks on the deck. Follow these steps to configure the output racks.

1 See Selecting an Output Fill Option for Output Racks in the Common Operations Across all Workflows section on page 3-3 for details on that operation.

2 See Starting a Run on page 3-29 for details on that operation.

# Preparing Tubes from Bulk Cocktails

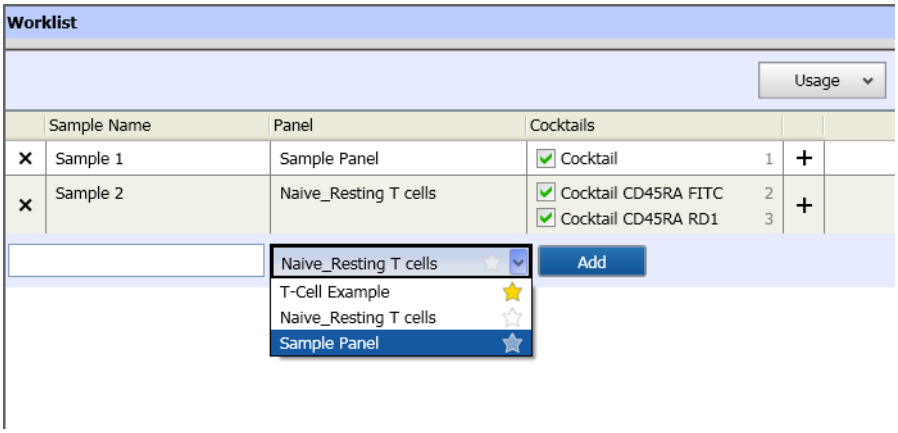
From the **Run Instrument Menu** screen, select Prepare 'Tubes' From 'Bulk Cocktails' to open the task for preparing assay tubes from bulk cocktails.

This section describes how to prepare the worklist, set up the system, and perform the run.

## Preparing a Worklist

To prepare the worklist, use the **Worklist** area. Figure 3.27 shows an example of a populated worklist.

**Figure 3.27** Populated Worklist Area - Preparing Sample Tubes from Bulk Cocktails




- Edit the **Sample Name** field by cutting, copying, and pasting text in this field.
- The **Panel Name** field has a drop-down menu of previously-created panels.
- Select and deselect cocktails by clicking next to the cocktail name in the **Cocktail** column. A deselected cocktail is not included as part of the run or worklist.
- To make a duplicate of a sample, click + at the end of the row for that cocktail.
- To delete a sample, click × to the left of the sample name.
- To add a sample to the worklist, click Add.

**NOTE** The recommended minimum amount of reagent to pipette is 5 µL per transfer. The maximum amount of reagent that can be pipetted is 1000 µL per transfer.

1 Enter the sample name, or use a hand-held barcode scanner to enter the sample ID. See APPENDIX B, *Symbologies for the Optional Barcode Reader* for supported symbologies.

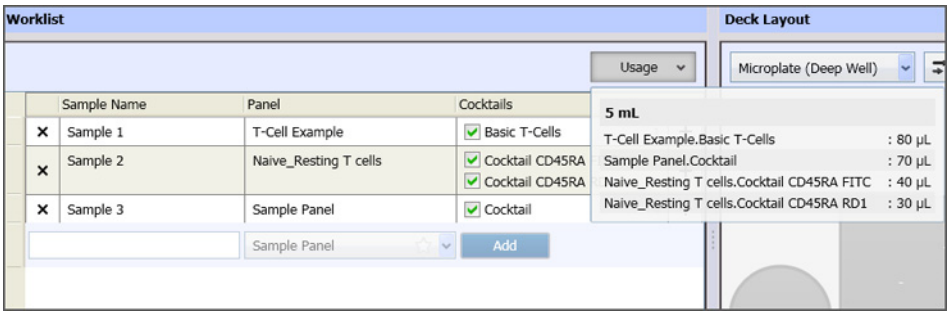
2 Select the panel for the run from the drop-down menu.

3 Click Add. The cocktails included in the panel populate the **Cocktails** column. To remove a cocktail that is not needed, deselect it by unchecking the ☑ next to the cocktail name.

4 Repeat these steps for each new sample to be processed in this run.

5 To help determine which input racks to configure on the deck, click Usage. A drop-down list appears that shows the types of input racks needed and the volumes of individual antibodies required in each rack (Figure 3.28).

**Figure 3.28** Usage Drop-Down Screen



## Configuring the Deck

Configuring input and output racks consists of ensuring that:

- The deck of the instrument physically matches the layout in the software.
- The appropriate layout for assigning destinations is selected.
- The software has an adequate supply of all antibodies to be used in the current run.

To configure the deck, use the **Deck Layout** view, which shows a graphic representation of the deck that includes selection areas for input and output racks.

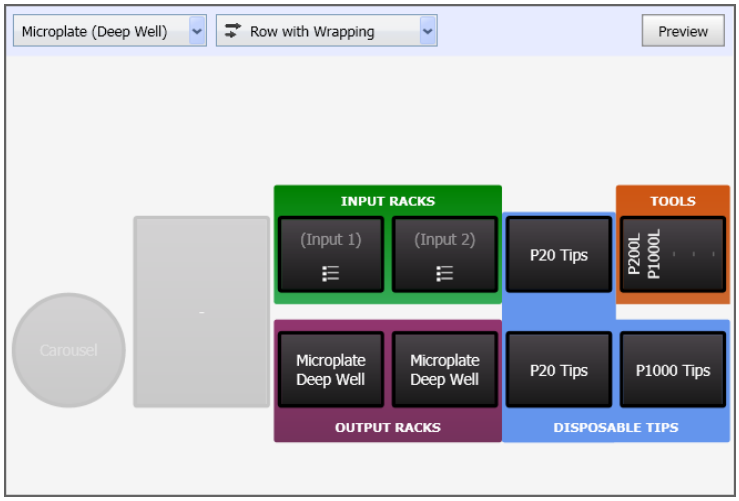
The necessary volumes for the run configured in the worklist are checked by the software against its internally-monitored list of vials. If the software determines that an insufficient volume of an antibody is present, it displays the required volumes at the top of the window.

**⚠ CAUTION**

The reagent racks weigh between 1.36 kg (3 lbs) - 5.05 kg (11 lbs). If dropped, they may cause injury. Use caution when handling reagent racks.

Figure 3.29 shows an example of the **Deck Layout** area.

**Figure 3.29** Deck Layout Area



## Input Racks

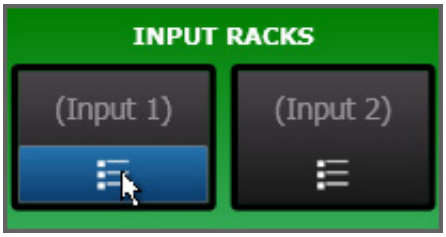
The holders, or racks, for bulk cocktails are either 12 mL or 5 mL racks.

**IMPORTANT** Do not shake antibodies. This generates bubbles, which will be detected by the liquid level sensing system in the tool and may cause an incorrect amount of liquid to be pipetted.

---

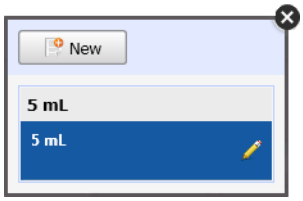
1 To configure the contents of a rack, click on the corresponding input rack graphic (input racks are in the green region labeled **INPUT RACKS**). To create a new rack or select a previously configured rack, click  . The rack selection icon turns blue when you hover over it with the mouse (Figure 3.30).

**Figure 3.30** Selecting a Rack




- A pop-up menu appears, which allows you to create a new rack or select a previously saved rack (Figure 3.31).

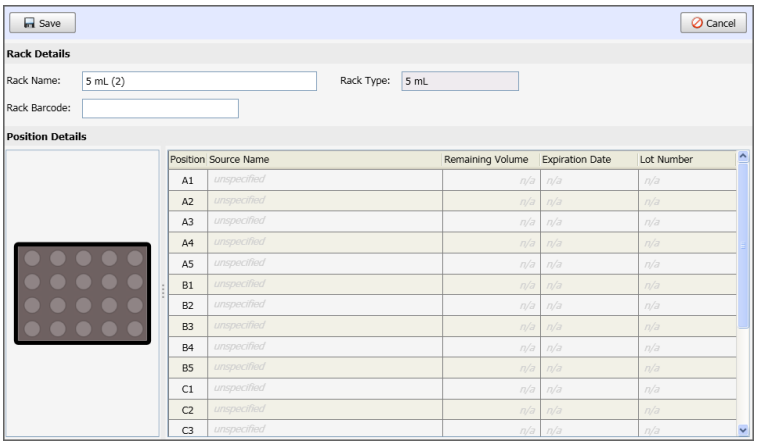
**Figure 3.31** Creating a New Rack




**NOTE** If the rack is already in the pop-up list and you select it, the test will be ready to run if sufficient antibodies are present on the deck. This may require up to three various types of racks.

**2** Click New and the **Rack Details** screen appears (Figure 3.32).

**Figure 3.32** Rack Details - Preparing Tubes from Bulk Cocktails




**3** In **Rack Details**, enter the **Rack Name** (required) and **Rack Barcode** (optional).

**4** In **Position Details**, add the antibody information. The graphic to the left of **Position Details** reflects the information as it is entered for each position.

**a.** Choose the antibody from the **Source Name** drop-down list.

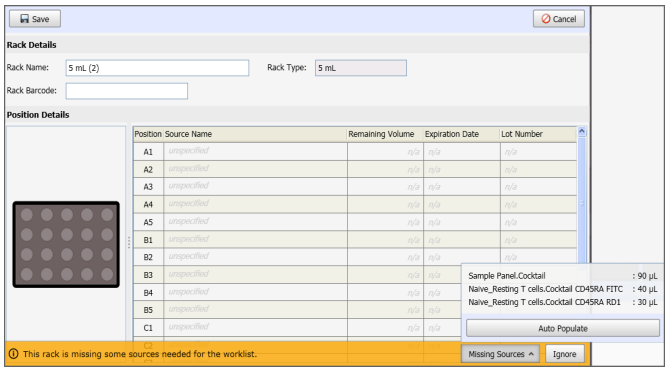
**b.** Enter the **Remaining Volume** (defaults to 100% of the total volume as defined in the antibody template).

**c.** The **Expiration Date** defaults to the current date and shows as EXPIRED. See Setting the Expiration Date in Common Operations Across all Workflows on page 3-2 for details on that operation.

**d.** Enter the **Lot Number** (optional).

**NOTE** To quickly add vials to the **Position Details** screen, click Missing Sources. A pop-up screen appears. Click Auto Populate and the required antibody vials are populated automatically using default information (Figure 3.33). The **Missing Sources** button only appears if the rack is missing resources required for the current worklist.

**Figure 3.33** Auto Populating Position Details



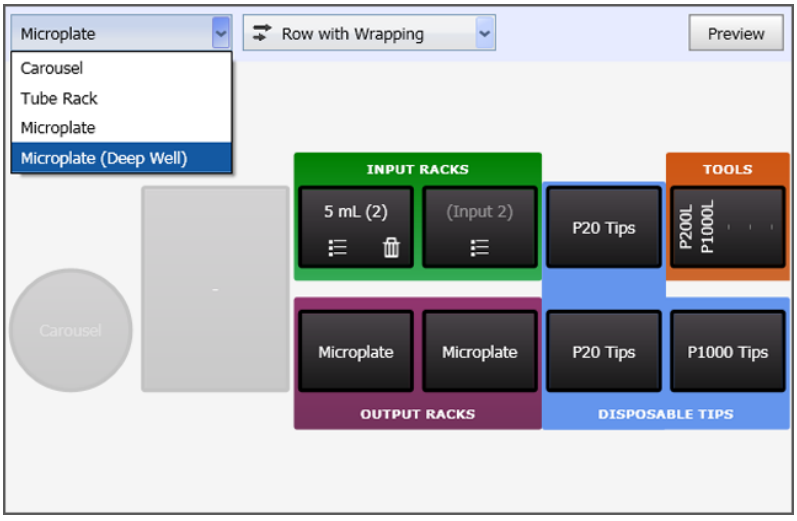

5 Click Save to save your information.

## Output Racks

Output racks are used to locate assay tubes or microplates on the deck. Follow these steps to configure the output racks.

1 Select the output destination from the drop-down list (output racks are in the purple region labeled **OUTPUT RACKS**) (Figure 3.34).

**Figure 3.34** Output Destination




- If you select anything other than Carousel, another drop-down list appears.

2 See Selecting an Output Fill Option for Output Racks in the Common Operations Across all Workflows section on page 3-3 for details on that operation.

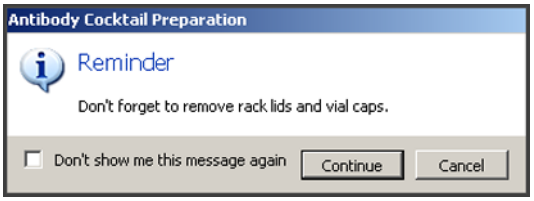
3 See Starting a Run on page 3-29 for details on that operation.

# Starting a Run

To start a run for all methods, use the steps below:

1 To start the run, click Start. A reminder to remove the rack lids and vial caps appears (Figure 3.35).

**Figure 3.35** Run Reminder




2 Click Continue. A warning message appears regarding homing the instrument (Figure 3.36). The instrument is homed at the beginning of each run to ensure a proper start state, especially after powering on the instrument.

**Figure 3.36** Homing Instrument Message

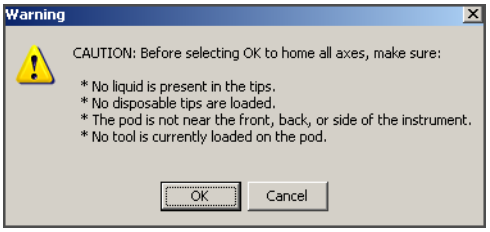



**Table 3.1** Troubleshooting Homing Instrument Cautions

| Ensure | Otherwise |
|---|---|
| No liquid is present in the tips. | Liquid will eject from the tip as part of the homing operation at an arbitrary location on the deck. If liquid is present is the tip, manually remove the tip from the tool, and use precautions to capture the liquid that may remain in tip. |
| No disposable tips are loaded. | The tip will eject as part of the homing operation. |
| The pod is not near the front, back, or side of the instrument. | This caution is not relevant for the Biomek 4000 ACPrep system. |
| No tool is currently loaded on the pod. | The homing operation may damage the tool. Manually unload the tool from the pod. |

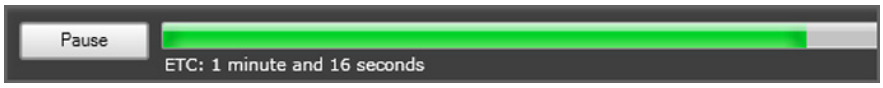
**3** Click OK. Another message appears while the instrument completes its homing operation (Figure 3.37).

**Figure 3.37** Homing Message


**NOTE** Click **Stop** if you notice an unintended start state (for example, missing tips, lids still on vials, wrong output labware, or foreign items on the deck).

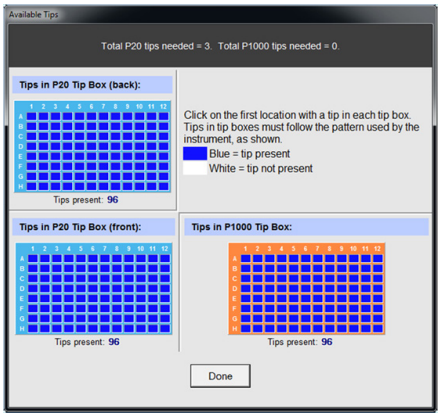
- Once homing is complete, the run begins automatically. The Start button changes to Pause. The progress bar displays the estimated time to complete the run (ETC) (Figure 3.38).

**Figure 3.38** Progress Bar - Running




**4** Once the run begins, the Available Tips dialog shown in Figure 3.39 will appear. This dialog can be used for partially filled tip boxes. Select the first available tip in each tip box. The system can then determine the location of the rest of the tips based on the pattern selected for the tips. The system will track the tips used in each run and present the tips that should be available.

**Figure 3.39** Available Tips Dialog Box




**NOTE** Patterns of tips other than the standard usage order are not supported. Also, empty tip boxes are not supported. It is up to the operator to confirm the physically present tips match those presented by the software.

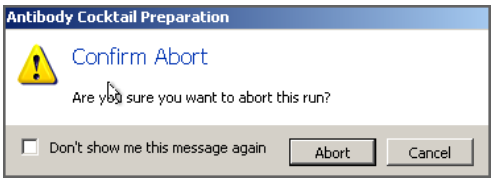
- Once tips are specified, click the **Done** button to proceed with the run.

**5** To pause the run temporarily, click Pause. The Pause button changes to Resume, and the progress bar changes to yellow (Figure 3.40).

**Figure 3.40** Progress Bar - Paused

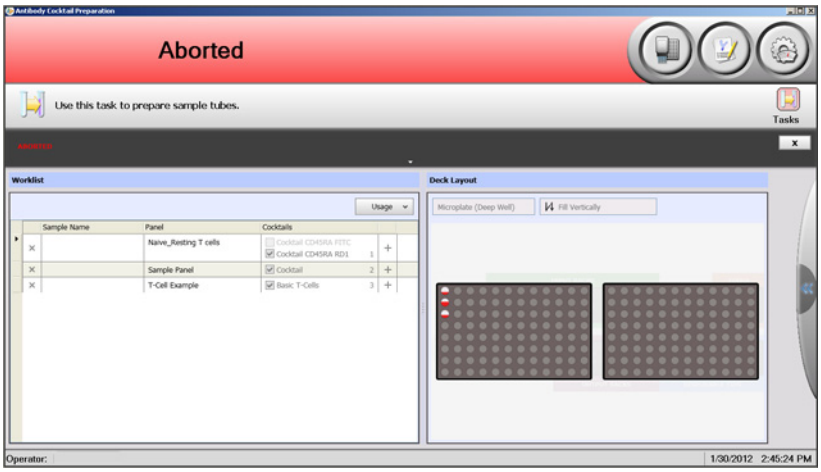

**6** To abort the run, click x to the right of the progress bar. A confirmation message appears (Figure 3.41).

**Figure 3.41** Abort Run Confirmation Screen




**7** Click Abort. The screen shows that the run has been aborted (Figure 3.42).

**Figure 3.42** Aborted Run Screen




**NOTE** If a run is aborted, it is important to return the entire system to a safe state before starting another operation. For more information, see CHAPTER 6, *Preventive Maintenance and Troubleshooting*.

**8** To view a table of actions or errors that occur during the run:

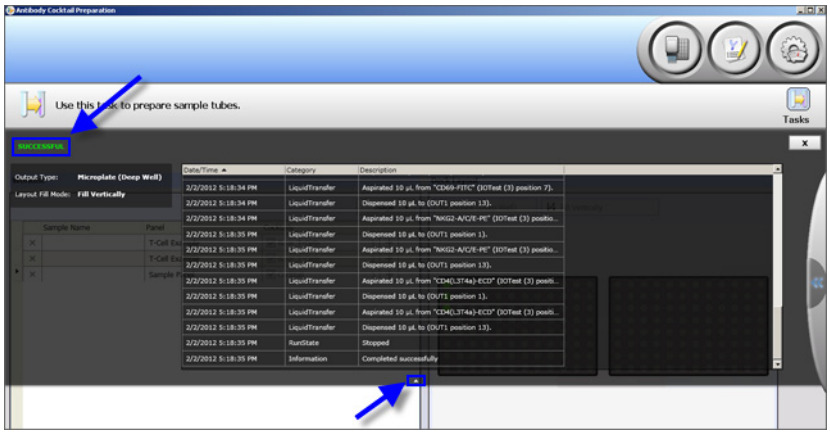
**a.** Click the down arrow in the middle of the progress bar to open the table of actions (Figure 3.43).

**Figure 3.43** Run Successful Message/Table Access Arrow


**NOTE** This can be done during the run or after the run is completed.

**b.** The action table opens. To close the action table, click the up arrow at the bottom of the table (Figure 3.44).

**Figure 3.44** Actions Table/Close Table Arrow



CHAPTER 4

# Biomek Actions

## Introduction

This chapter describes the actions you can initiate from the **Biomek Actions** screen.

Direct control over movement of the Biomek 4000 is provided by the following actions. Care must be taken when using these actions. Always examine the work area of the instrument before performing any action that causes the instrument to move. Always double-check actions before initiating them to avoid crashing the pod, bridge, tool, or tip into any object. Improper use of these actions can result in damage to the instrument, tools, tips, labware, or accessories and could result in spillage of liquids inside the work envelope of the instrument. If you are uncertain about using an action, in the USA and Canada call Beckman Coulter Technical Support at 1-800-526-7694. Outside the USA and Canada, contact your Beckman Coulter Representative.

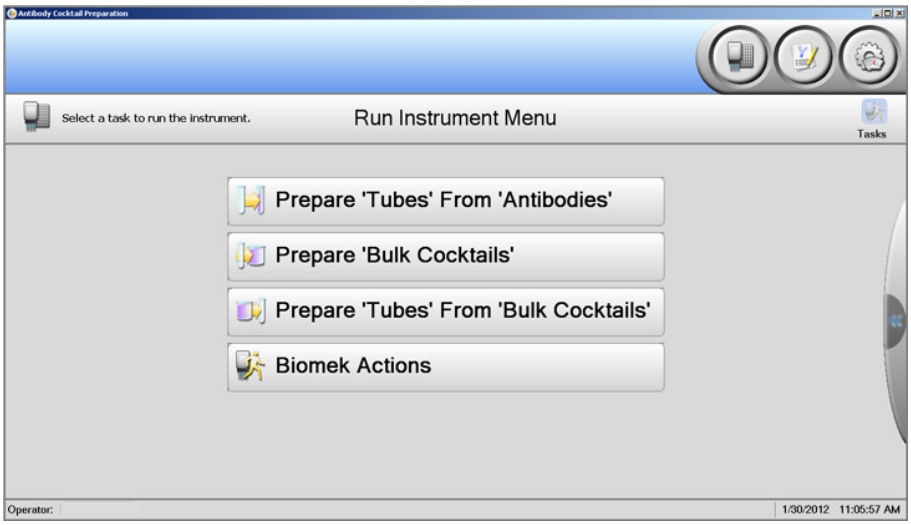
## Biomek Actions Screen

This section provides an overview of how to use the **Biomek Action** screens.

1 Log into the Biomek 4000 ACPrep Software.

2 Click  on the top right side of the software main screen. The **Run Instrument Menu** screen appears (Figure 4.1).

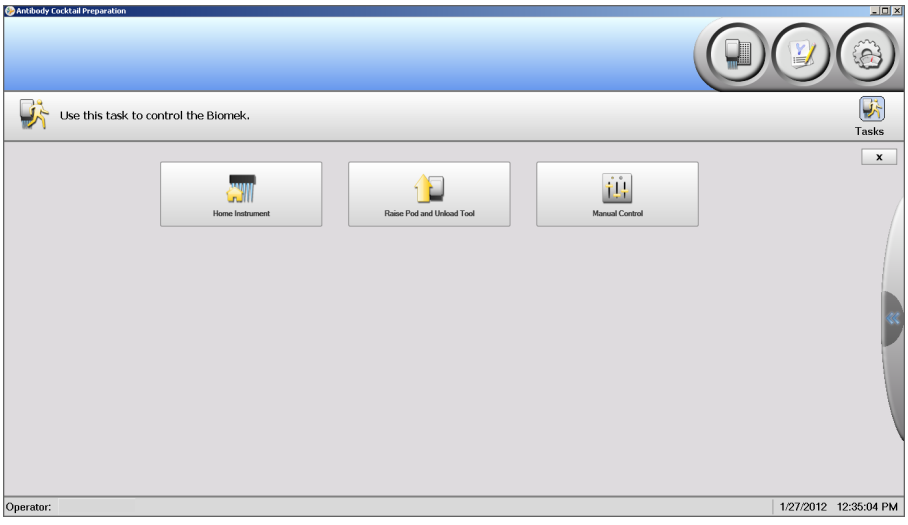
**Figure 4.1** Run Instrument Menu Screen

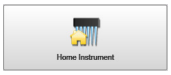



**3** From the **Run Instrument Menu** screen, select 

. The **Biomek Actions** screen appears (Figure 4.2).

**Figure 4.2** Biomek Actions Screen




- Click 

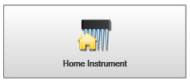
to home the instrument.
- Click 

to raise the pod, discard a loaded tip to the trash, and unload the tool to the tool holder.
- Click 

to display the manual controls screen.

## Homing the Instrument

Follow these steps to home the Biomek 4000 instrument.

1 From the **Biomek Actions** menu, select 

. A warning message appears (Figure 4.3). The instrument is homed at the beginning of each run to ensure a proper start state, especially after powering on the instrument. Table 4.1 gives troubleshooting measures for the cautions in the warning message.

**Figure 4.3** Homing Instrument Message

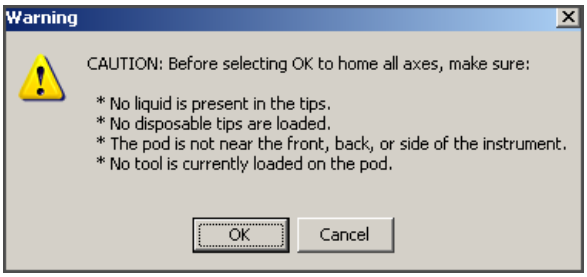



**Table 4.1** Troubleshooting Homing Instrument Cautions

| Ensure | Otherwise |
|---|---|
| No liquid is present in the tips. | Liquid will eject from the tip as part of the homing operation at an arbitrary location on the deck. If liquid is present is the tip, manually remove the tip from the tool, and use precautions to capture the liquid that may remain in tip. |
| No disposable tips are loaded. | The tip will eject as part of the homing operation. |
| The pod is not near the front, back, or side of the instrument. | This caution is not relevant for the Biomek 4000 ACPrep system. |
| No tool is currently loaded on the pod. | The homing operation may damage the tool. Manually unload the tool from the pod. |

2 Confirm that you have completed the actions listed in the message, then click 

. A pop-up message appears showing the homing operation is in progress (Figure 4.4).

**Figure 4.4** Homing Instrument Message


**NOTE** Click **Stop** if you notice an unintended start state (for example, missing tips, lids still on vials, wrong output labware, or foreign items on the deck).

- When the operation is complete, the system returns to the **Biomek Actions** screen.

## Raising the Pod and Unloading the Tool

Follow these steps to raise the pod on the Biomek 4000 instrument.

**IMPORTANT** Before raising the pod and unloading the tool, ensure that it is safe for the instrument to perform these actions.

1 From the **Biomek Actions** screen, select 

.

2 The pod raises to the maximum Z height.

- If a tip is loaded, it is discarded into the trash.
- If a tool is loaded, it is unloaded onto the tool rack.

**NOTE** If there is any liquid in the tip, it is discarded into the trash along with the tip.

## Manually Controlling the Pod

Follow these steps to manually control the pod on the Biomek 4000 instrument.

**IMPORTANT** Take care when using **Manual Control** to ensure that it is safe for the pod to perform these actions and does not crash into anything located on the instrument deck.

---

1 From the **Biomek Actions** screen, select 

. The **Manual Control** screen appears (Figure 4.5). From here, choose where you want to move the pod. See Table 4.2 for further descriptions of the fields.

**Figure 4.5** Manual Control

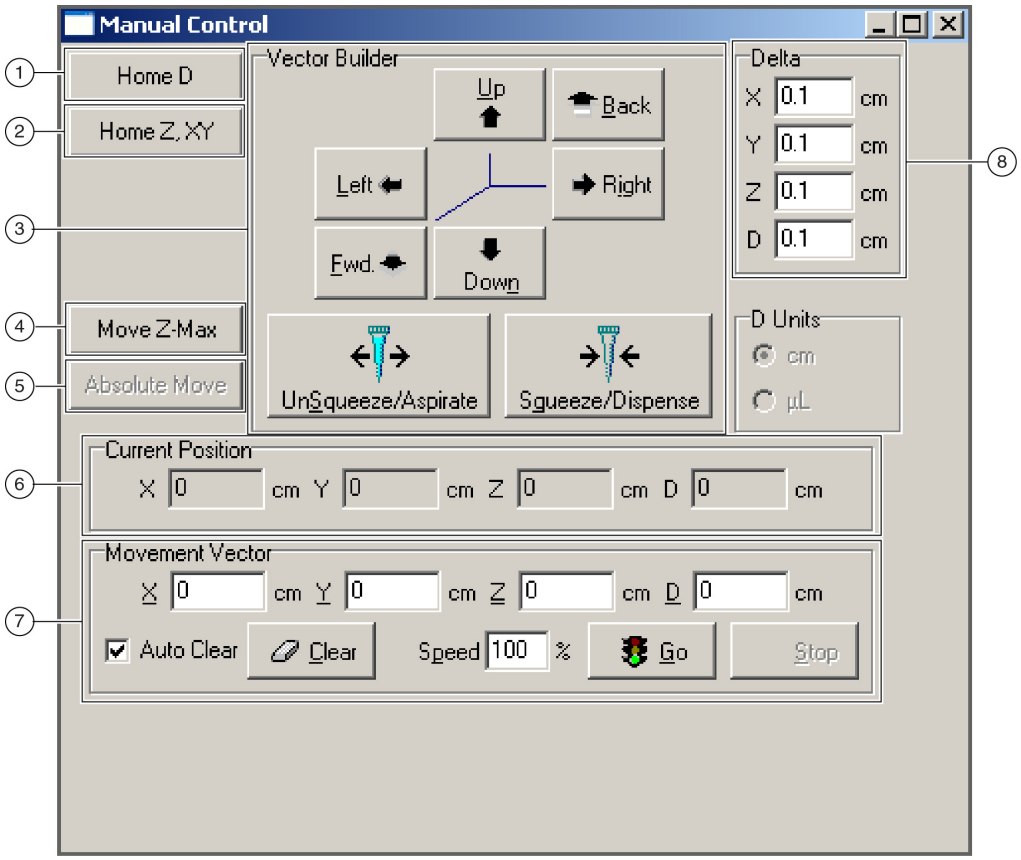



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**Table 4.2** Manual Control Selection Areas for the Biomek 4000 Pod

| | Area | Description |
|---|---|---|
| 1 | Home D | Moves D-axis to home position. The D-axis is the dispense axis, which controls liquid handling operations.<br><br>**⚠ CAUTION**<br><br>**Do not perform this operation with a tool loaded. Damage to the tool or instrument may occur.** |
| 2 | Home Z, XY | Moves Z- and then X- and Y-axes to home position. |
| 3 | Vector Builder | Relative moves, which allow the pod to move from its current location to anywhere on the deck, are created using **Vector Builder**. Each time a **Vector Builder** button is pressed, the **Movement Vector** is changed in the corresponding axis by the amount indicated in **Delta**.<br>• **Up** and **Down** move the pod in the Z axis.<br>• **Left** and **Right** move the pod in the X-axis.<br>• **Back** and **Fwd** move the pod in the Y-axis.<br>• **Squeeze**/**Aspirate** and **Unsqueeze**/**Dispense** move the head in the D-axis based upon the selection made in **D Units.** |
| 4 | Move Z-Max | Moves the pod to highest configured height. |
| 5 | Absolute Move | Builds a vector to an absolute coordinate from the current coordinate. |
| 6 | Current Position | Current location of the pod (after the pod has been homed). |
| 7 | Movement Vector | The amount of movement that occurs when **Go** is selected. Movement vectors are relative to the current position. |
| 8 | Delta | Sets the magnitude of change the **Vector Builder** applies to the **Movement Vector** for each axis. |

## Viewing the Current Position of the Biomek 4000 Pod

The current position of a Biomek 4000 Pod is displayed as four coordinates. Each axis coordinate is the distance from the home position. X-, Y-, and Z-axis coordinates are displayed in centimeters.

To view the current position of a pod:

1 From the **Biomek Actions** menu, select 

. The **Manual Control** screen appears (Figure 4.5). The current position of the pod is shown in **Current Position**.

2 Click  to close **Manual Control**.

## Moving the Biomek 4000 Pod to a Safe Roving Height

To move the Biomek 4000 pod to its highest configured height, use **Move Z-Max** in **Advanced Manual Control**. This helps to avoid collisions when moving the pod around the deck manually.

**IMPORTANT** Before moving Z-Max, ensure that it is safe for the instrument to perform this action.

1 From the **Biomek Actions** menu, select 

. The **Manual Control** screen appears (Figure 4.5).

2 Click **Move Z-Max**. The Biomek 4000 moves to its maximum Z-axis height.

3 Click  to close **Manual Control**.

## Performing Relative Moves Using the Vector Builder

The use of manual control for the Biomek 4000 pod centers around the building and applying of movement vectors. A movement vector simply indicates the magnitude and direction of motion applied to the pod.

When the point of reference is at the front and center of the unit, positive and negative pod values are as follows:

- **Positive value X** = right motion
- **Positive value Y** = forward motion
- **Positive value Z** = up motion
- **Positive value D** = aspirating motion
- **Negative value X** = left motion
- **Negative value Y** = back motion
- **Negative value Z** = down motion
- **Negative value D** = dispensing motion

Relative moves allow the pod to move from its current location to anywhere on the deck. Relative moves are created in the **Vector Builder** using the **Delta** values, or the vector can be manually edited.

Relative moves are configured using a combination of the **Delta** values and **Vector Builder**. A **Delta** value is the amount of change in an axis that is applied to the **Movement Vector** when a button in the **Vector Builder** is pressed. For example, if the **Delta** value for **X** is 3, each time **Right** is clicked in the **Vector Builder**, 3 cm is added to the X-axis of the **Movement Vector**.

**NOTE** The move does not occur until **Go** is selected in the **Movement Vector** area of **Manual Control**.

**NOTE** Use **Auto Clear** when the values in the **Movement Vector** fields must be reset to zero after the move is performed. Turn off **Auto Clear** to retain the values after the move has occurred. Choose **Clear** to set the values back to zero at any time.

To set **Delta** values:

**1** From the **Biomek Actions** menu, select 

. The **Manual Control** screen appears (Figure 4.5).

**2** Enter a value in **X**, **Y**, **Z**, and **D** to set the **Delta** value for each axis.

**3** Enter the desired **X**, **Y**, **Z**, and **D** values in **Movement Vector**.

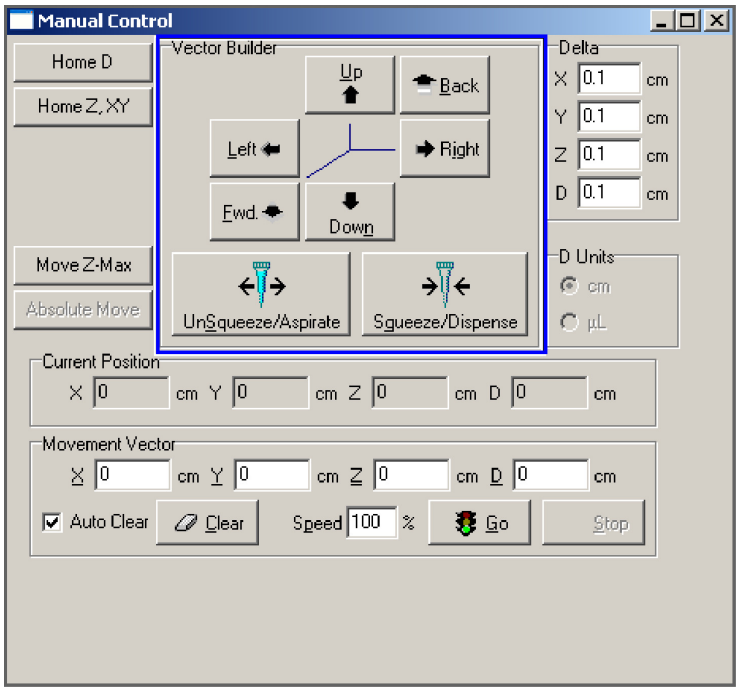
OR

Click the appropriate buttons in **Vector Builder** (Figure 4.6) until the desired values appear in **Movement Vector** (Figure 4.7). The **X**, **Y**, **Z**, or **D** value in **Movement Vector** increases by the **Delta** value.

**NOTE** Choose **Clear** to change the **Movement Vector** values to 0.

**NOTE** Minimum and maximum X, Y, Z, and D values are displayed as a tool tip when hovering over the fields in **Movement Vector**.

**Figure 4.6** Vector Builder




**TIP** Hold the button down to repeatedly apply the **Delta** value to the **Movement Vector**.

**4** Enter a value in **Speed** to specify the percent of the maximum speed of the pod.

5 Click **Go.** The pod moves from its current position to the new position based on the values displayed in the **Movement Vector.** The new position is displayed in **Current Position.**

**IMPORTANT** Before clicking **Go**, ensure that it is safe for the instrument to perform this action.

6 Click  to close **Manual Control**.

## Performing Absolute Moves for the Biomek 4000 Pod

**Absolute Move** allows the pod to move to a specific coordinate position in the workspace of the instrument. Use **Absolute Move** when the coordinates of the desired position are known.

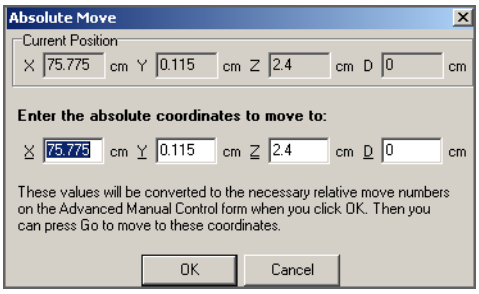
**NOTE** When an **Absolute Move** is entered, the values displayed in **Movement Vector** reflect the relative move required to physically move the pod to the desired position. Make sure the physical location of the pod is not changed between the time the vector is built and the time the **Go** button is pressed.

1 From the **Biomek Actions** menu, select 

. The **Manual Control** screen appears (Figure 4.5).

2 Click **Absolute Move.** The **Absolute Move** screen appears (Figure 4.7).

**Figure 4.7** Enter Absolute Move Coordinates




3 Enter the **X**, **Y**, **Z**, and **D** values for the desired position.

**NOTE** Minimum and maximum X, Y, Z, and D values are displayed as a tool tip when hovering over the fields in **Movement Vector**.

4 Click 

. The **Movement Vector** changes to reflect the necessary relative move.

5 Enter a value in **Speed** to specify the percent of the maximum speed of the pod to use for the move.

6 Click **Go**. The pod moves from its current position to a specified absolute position. The new position is displayed in **Current Position**.

**IMPORTANT** Before clicking **Go**, ensure that it is safe for the instrument to perform this action.

7 Click  to close **Manual Control**.

CHAPTER 5

# Reporting

## Introduction

This chapter describes how to view and access reports in the Biomek 4000 ACPrep Software.

The following reports are available:

1. Rack Inventory
2. Worklist History

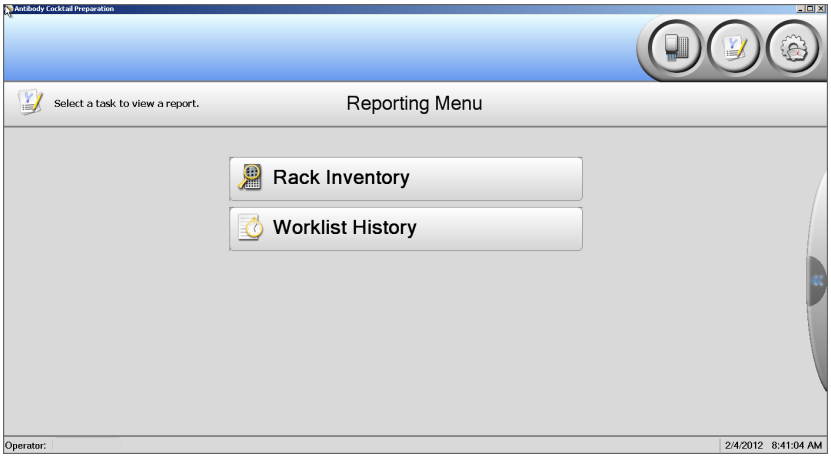
## Viewing Reports

Follow the steps below to run reports.

**1** Log into the Biomek 4000 ACPrep Software.

**2** Click  on the top right side of the software main screen. The **Reporting Menu** screen appears (Figure 5.1).

**Figure 5.1** Reporting Menu Screen



The following options are available:

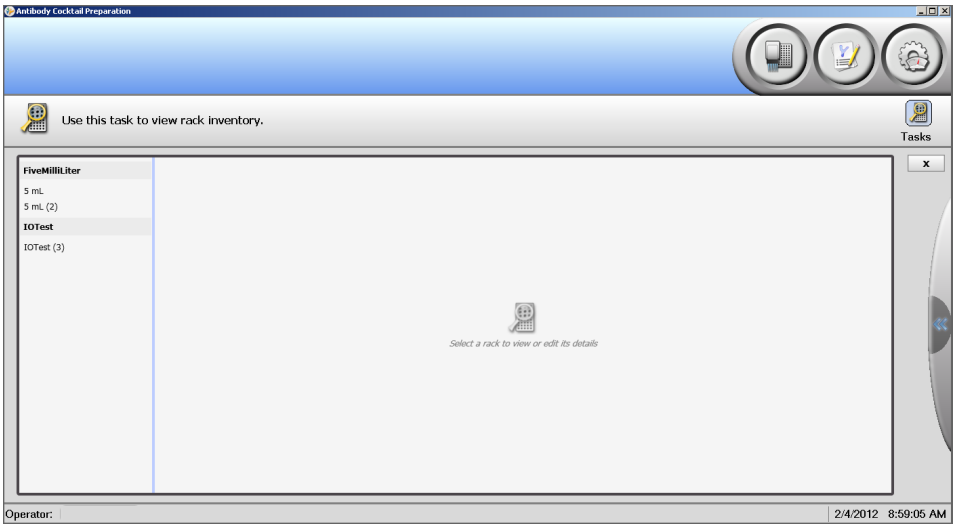
- **Rack Inventory** (see Viewing Rack Inventory Reports)
- **Worklist History** (see Viewing Worklist History Reports)

## Viewing Rack Inventory Reports

Follow the steps below to view or access rack inventory reports.

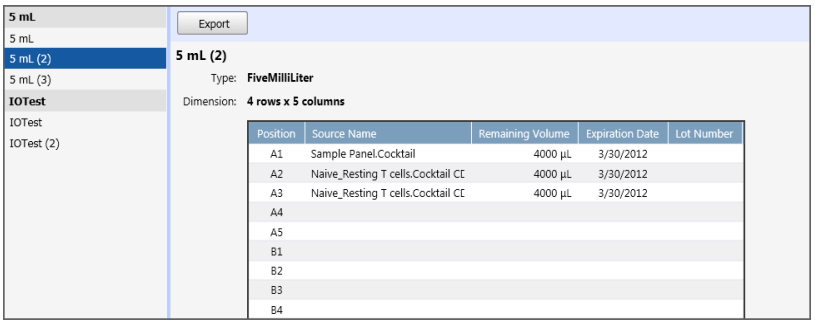
1 From the **Reporting Menu** screen, select Rack Inventory. The **Rack Inventory** screen appears (Figure 5.2).

**Figure 5.2** Rack Inventory Screen



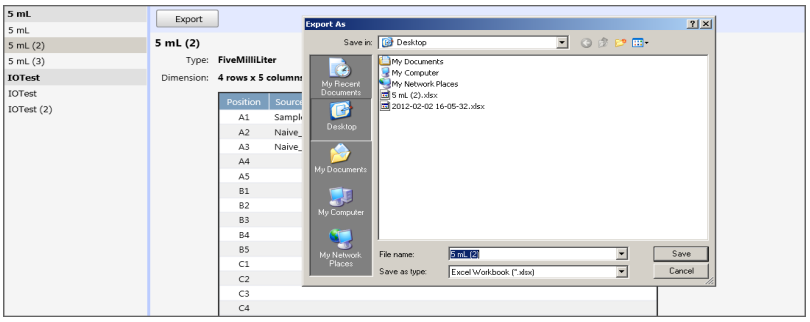

2 From the list on the left side of the screen, select a rack to view. The report regarding that rack opens (Figure 5.3).

**Figure 5.3** Rack Report



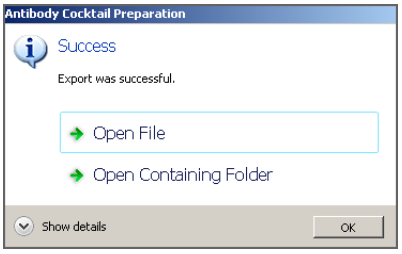
**3** To save the report as an Excel Workbook to your computer, click Export. The **Export As** window appears. Select where you want to save the report and click Save (Figure 5.4).

**Figure 5.4** Exporting a Report




**4** Once your report is saved, a pop-up message appears (Figure 5.5).

**Figure 5.5** Successful Export Message




Select one of the following options:

- **Open File** - opens the exported file in Excel
- **Open Containing Folder** - opens the folder where the exported file is saved

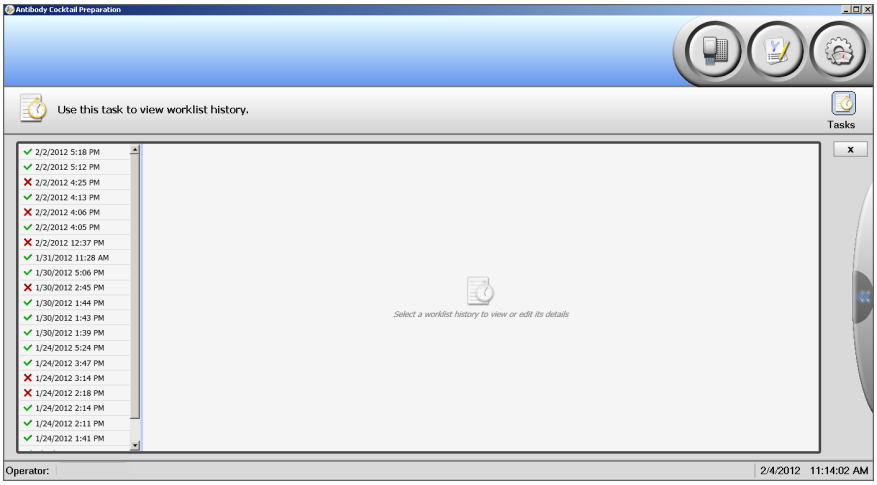
## Viewing Worklist History Reports

Follow the steps below to view worklist history reports.

---

**1** From the **Reporting Menu** screen, select Worklist History. The **Worklist History** screen appears (Figure 5.6).

**Figure 5.6** Worklist History Screen

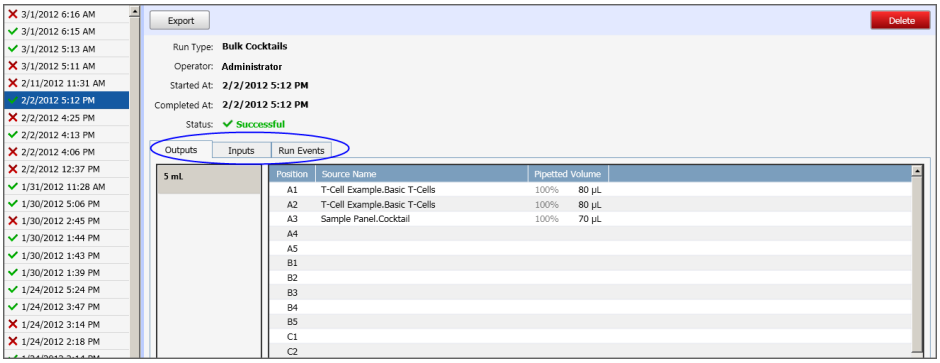



---

**2** To view a worklist history report, click the timestamp of the worklist history in the list on the left side of the screen. The worklist history report has three sections of information, each available by selecting the appropriate tab (Figure 5.7).

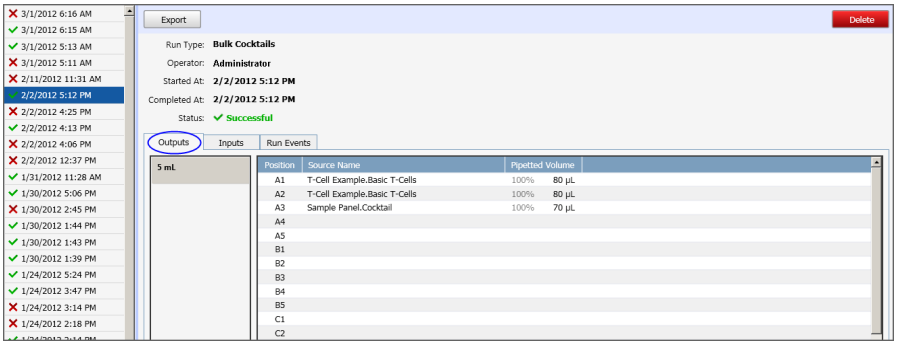
- **Outputs**
- **Inputs**
- **Run Events**

**Figure 5.7** Worklist History Report Screen



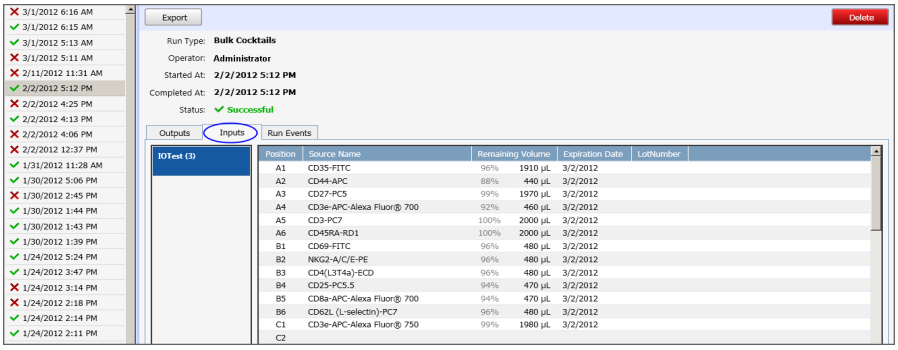
The **Outputs** tab is initially selected and shows the outputs of the selected worklist run (Figure 5.8).

**Figure 5.8** Worklist History Report - Outputs Tab



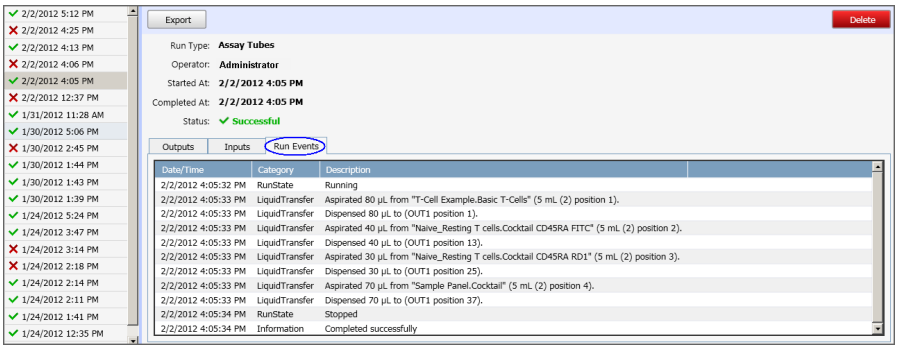

**3** Click on the **Inputs** tab to view the inputs section of the selected worklist history report (Figure 5.9).

**Figure 5.9** Worklist History Report - Inputs Tab



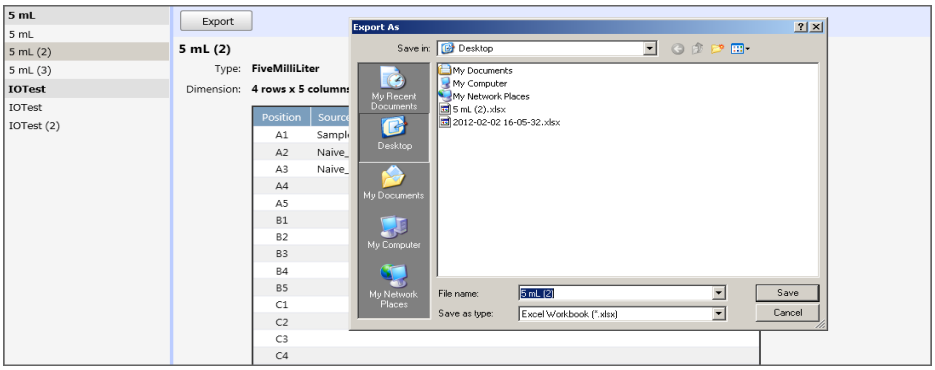

**4** Click on the **Run Events** tab to view the events that occurred during the selected worklist run (Figure 5.10).

**Figure 5.10** Worklist History Report - Run Events Tab



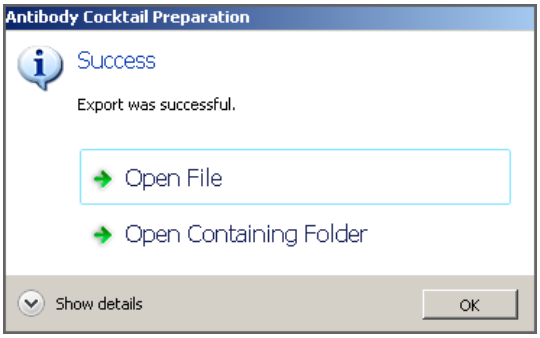
**5** To save the report as an Excel Workbook, click Export. The **Export As** window appears. Select where you want to save the report and click Save (Figure 5.11).

**Figure 5.11** Exporting a Report




**6** Once your report is saved, a pop-up message appears (Figure 5.12).

**Figure 5.12** Successful Export Message




Select one of the following options:

- **Open File** - opens the exported file in Excel
- **Open Containing Folder** - opens the folder where the exported file is saved

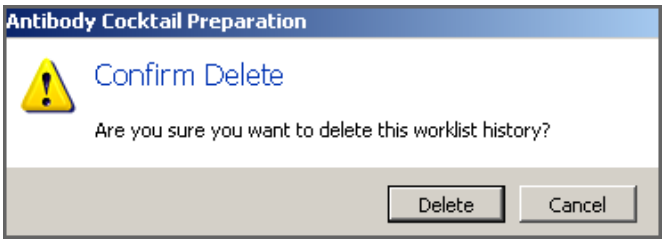
**7** To delete any worklist history report:

**a.** Select the report to delete.

**b.** Click Delete.

**c.** Click Delete to confirm and the selected worklist history report is removed (Figure 5.13).

**Figure 5.13** Confirmation to Delete Worklist History



CHAPTER 6

# Preventive Maintenance and Troubleshooting

## Introduction

This chapter describes how to provide Preventive maintenance and troubleshoot any issues with the Biomek 4000, pipetting tools, and Biomek 4000 ACPrep Software.

For additional technical support in the USA and Canada, call Beckman Coulter Technical Support at 1-800-526-7694. Outside the USA and Canada, contact your Beckman Coulter Representative.

## Preventive Maintenance

Follow the appropriate decontamination and cleaning procedures outlined by the laboratory safety officer.

**⚠ CAUTION**

**The P200L or P1000SL tool body contains electronics that may malfunction if liquid enters the tool body. Do not submerge or introduce liquids into the tool body as it may impact the function of the pipetting tool.**

**⚠ CAUTION**

**The P200L or P1000SL tool body cannot be sterilized by autoclaving. Autoclaving will impact the form and function of the tool rendering it inoperable. Do not place pipetting tools in the autoclave for sterilization.**

Perform the following preventive maintenance procedures as needed:

- Keep instrument surfaces clean by washing regularly with a mild detergent solution, making sure not to wet or moisten electrical components.

**⚠ WARNING**

**Risk of chemical injury from bleach. To avoid contact with the bleach, use barrier protection, including protective eyewear, gloves, and suitable laboratory attire. Refer to the Safety Data Sheet for details about chemical exposure before using the chemical.**

- Disinfect instrument surfaces on the deck and side modules with a 10% bleach solution followed by a wipe down with distilled water.

  **NOTE** The Biomek 4000 workstation may be exposed to ultraviolet light, if necessary.

- Periodically clean spill trays, located under the deck plate, as needed.
- Wipe off external surfaces of the tools with a damp cloth. Clean the outside surface of the tools using a dilute ethanol solution.

# Troubleshooting

## Troubleshooting the Biomek 4000 Instrument

Perform the troubleshooting techniques provided in Table 6.1 when necessary.

**Table 6.1** Troubleshooting the Biomek 4000

| If | Then |
|---|---|
| All indicator lights are out | Verify the instrument is plugged in and turned on. |
| Tools not picked up by pod | Ensure tools are located in the proper location in the tool rack. Home the instrument. |

**NOTE** For all other issues with the Biomek 4000 in the USA and Canada, call Beckman Coulter Technical Support at 1-800-526-7694. Outside the USA or Canada, contact your Beckman Coulter Representative.

## Troubleshooting Pipette Tools

Table 6.2 provides some causes for pipetting issues. Do not attempt to repair the pipette tools without first contacting Beckman Coulter Service personnel.

**NOTE** Before using any new or replacement pipetting tool, it must be calibrated by Beckman Coulter Service personnel.

**Table 6.2** Troubleshooting Pipette Tools

| If | Then |
|---|---|
| Tool is not recognized or loaded | Make sure tool ID pins are not bent or damaged. |
| Tool leaks | Tool may be worn or damaged. |
| Single-channel tool will not pick up tips | Make sure tool is not bent or damaged. |
| Single-channel tools do not push off tips | Tool may be worn or damaged. |
| Tool picks up tip rack | Make sure the latch on the tip rack holder is engaged. |
| Tips dropped by tool | Use new Beckman Coulter tips. |

**NOTE** For all other issues with pipetting tools in the USA and Canada, call Beckman Coulter Technical Support at 1-800-526-7694. Outside the USA or Canada, contact your Beckman Coulter Representative.

## Troubleshooting the Biomek 4000 ACPrep Software

Perform the troubleshooting techniques provided in Table 6.3 when necessary. The text highlighted in the error message is the critical portion of the error message.

**NOTE** **Snap** is an advanced feature that is not utilized by this system. For this system, **Snap** is equivalent to **Abort**.

**Table 6.3** Troubleshooting the Biomek 4000 ACPrep Software

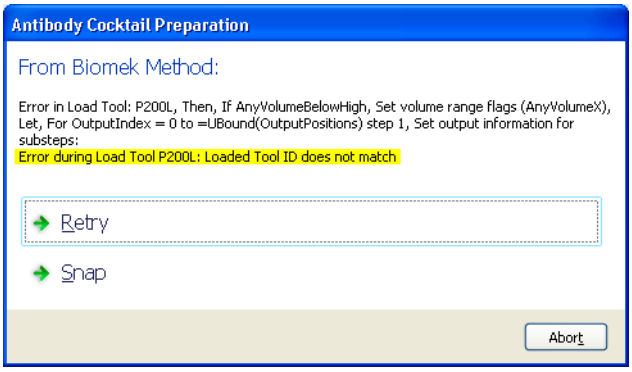
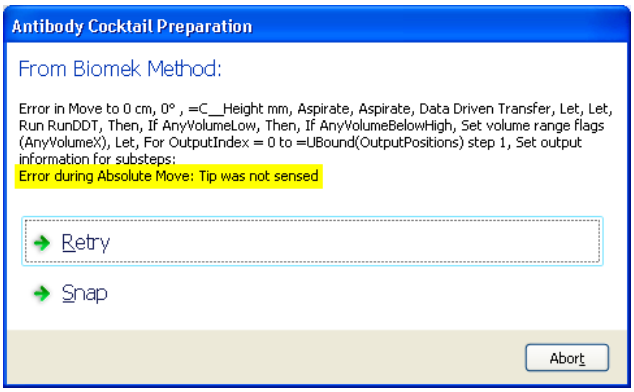
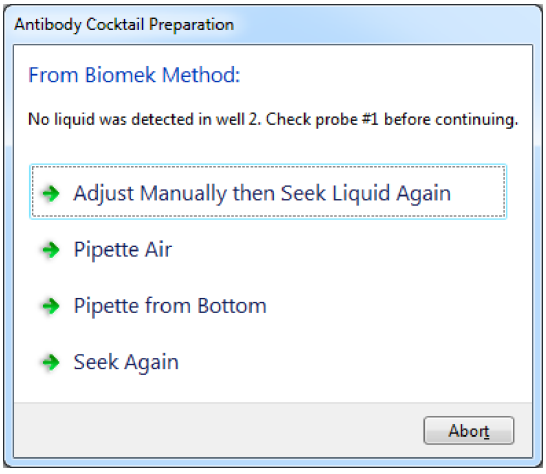
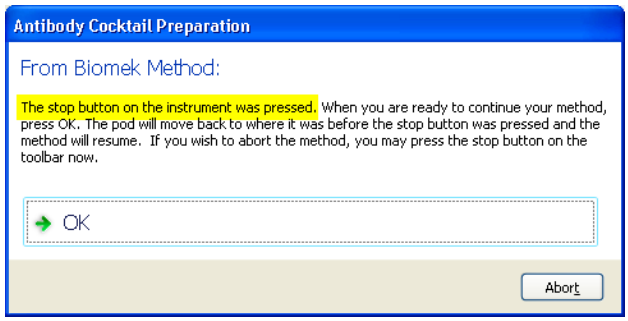
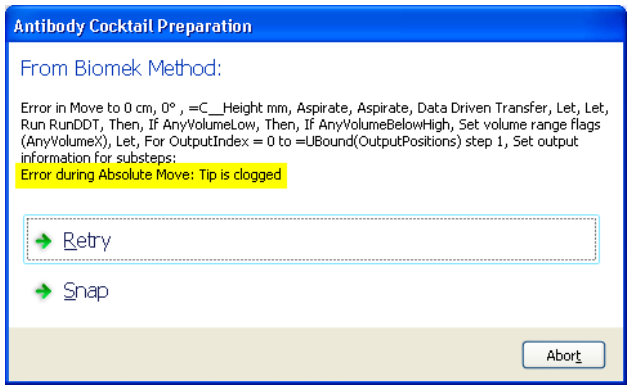
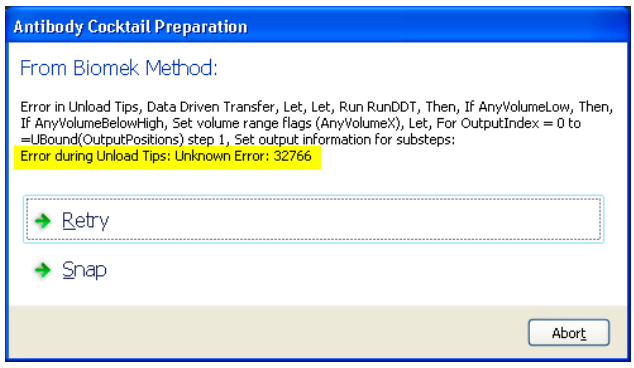
| If | Then |
|---|---|
|  | Tool not loaded or wrong tool loaded:<br>• Place correct tool in the rack position and click **Retry**. |
|  | Tips are missing or tip box is not present:<br>• Place tips and tip box in the correct location and click **Retry**.<br>• In the USA or Canada, call Beckman Coulter Technical Support at 1-800-526-7694. Outside the USA or Canada, contact your Beckman Coulter Representative. |
|  | No liquid detected:<br>• Ensure the correct rack is on the deck<br>• Ensure the vial is in the correct location in the rack<br>• Ensure there is sufficient liquid in the vial<br>• Then select **Pipette from Bottom** or **Adjust Manually then Seek Liquid Again** if an adjustment to the vial needs to be made by hand<br>• In the USA or Canada, call Beckman Coulter Technical Support at 1-800-526-7694. Outside the USA or Canada, contact your Beckman Coulter Representative. |

**Table 6.3** Troubleshooting the Biomek 4000 ACPrep Software

| If | Then |
|---|---|
|  | **Stop** button as been pressed:<br>• Abort the operation<br>• Click **OK** to continue<br>• If the **Stop** button was pressed in an error recovery situation, you may want to click **OK**, and press **Stop** again for the instrument to move the pod to a higher height. That will allow access to taller labware.<br>**NOTE** You may need to click **OK** two times to clear the **Stop** button error. |
|  | Tip is clogged — this error has multiple causes:<br>• Forgot to remove lids or caps<br>• Misalignment of pod<br>• Misplacement of the rack<br>• Wrong rack is on the deck position<br>• Attempted to reuse a tip<br>1. Correct the problem, then click **Retry**.<br>2. If you are unable to recover from this error, click **Abort**.<br>3. In the USA or Canada, call Beckman Coulter Technical Support at 1-800-526-7694. Outside the USA or Canada, contact your Beckman Coulter Representative. |
|  | Unknown Tip Error: 32766:<br>• The tip was not removed<br>• Click **Retry**<br>• In the USA or Canada, call Beckman Coulter Technical Support at 1-800-526-7694. Outside the USA or Canada, contact your Beckman Coulter Representative. |

APPENDIX A

# Specifications

## System Specifications

**Table A.1** System Specifications

| Item | Description |
|---|---|
| Environment | Indoor use only |
| Power Requirements | 100-240 VAC, 50/60 Hz |
| Dimensions | 122.2 cm (W) x 49.5 cm (D) x 67.3 cm (H)<br>or 48.1 in. (W) x 19.5 in. (D) x 26.5 in. (H) |
| Weight | 67.2 kg (138 lbs) |
| Pipetting Performance at 5 µL | Accuracy +/- 20%, Precision 10% CV |
| Ambient Operating Temperature | 5-30°C (41-86°F) |
| Humidity Restrictions | <85% (non-condensing) @ 30°C (86°F) |
| Altitude Restrictions | up to 2000 m (6562 ft) |
| Installation Category | Category II |
| Pollution Degree | 2 |
| Communications to Host | RS-232 port |
| Biomek Controller Host PC | The following specifications are the minimum requirements needed for the PC.<br>**CPU**: I5-650 (3.2 GHz)-vPro<br>**RAM**:2 GB<br>**Hard Drive**: 250 GB (7200 rpm)<br>**Ports**: Minimum 1 serial port<br>**DVD**: DVD Writer<br>**Monitor**: 22 in. LCD<br>**Operating System**: Windows 7, 64-bit<br>**Other Software**: MS Office 2007, 2005 SQL Server Express Edition, .NET Framework 4.0 |

APPENDIX B

# Symbologies for the Optional Barcode Reader

## Barcode Reader Menu Selection

All symbologies
4 CB (4-State Customer Bar Code)
Australian Post
Aztec Code
British Post
China Post
Canadian Post
Codabar
Codablock F
Code 11
Code 128
Code 16K
Code 39
Code 49
Code 93
Data Matrix
EAN-JAN-13
EAN-JAN-8
EAN UCC Composite Codes
Interleaved 2 of 5
ID-tag (UPU 4-State)
Japanese Post
KIX (Netherlands) Post
Korea Post
Matrix 2 of 5
MaxiCode
MicroPDF417
MSI
PDF417
Planet Code
Plessey Code
PosiCode A and B
Postnet
QR Code
RSS Expanded
RSS Limited
RSS-14
Straight 2 of 5 IATA
Straight 2 of 5 Industrial
TCIF Linked Code 30 (TLC39)
Telepen
UPC-A
UPC-A/EAN-13 with Extended Coupon Code

APPENDIX C

# Parts List

## Parts List

**Table C.1** Parts List

| Description | Part Number |
|---|---|
| Biomek P20 Tips | 717254 |
| Biomek P1000 Tips | B01122 (nonsterile) or B01123 (presterile) |
| 5 mL Amber Vials | B08859 |
| 12 mL amber vials | Cole-Parmer catalog # EW-08922-34 |
| 24-position rack | BCI 373661 |
| 11 mm (white) inserts | BCI 373696 |
| Biohazard Disposal Bags LG/100 | 970577 |
| Test Tube, 12x75 (package of 250) | 2523749 |

# Abbreviations

**ANSI —** American National Standards Institute

**cm —** Centimeter

**CPU —** Central Processing Unit

**D —** Depth

**ETC —** Estimated Time to Completion

**ft —** Foot/Feet

**GB —** Gigabyte

**GHz —** Gigahertz

**H —** Height

**Hz —** Hertz

**in. —** Inch

**kg —** Kilogram

**lbs —** Pounds

**LCD —** Liquid crystal display

**LED —** Light-emitting diode

**mL —** Milliliter

**MS —** Microsoft

**rpm —** Revolutions per minute

**SBS —** Society for Biomolecular Screening

**SQL —** Structured Query Language

**µL —** Microliter

**VAC —** Volts, Alternating Current

**W —** Width

**°C —** Degree Celsius

**°F —** Degree Fehrenheit

**—**

# Glossary

**# of Tests —** The user can specify how much bulk cocktail to prepare by indicating the number of tests they will run. The software will take the total volume of each antibody in a cocktail and multiply that number by the number of tests and calculate the total volume of bulk cocktail to prepare. The other way to specify how much bulk cocktail to prepare is by volume.

**Accuracy —** The difference between the actual volume pipetted versus the target volume expressed as a percent.

**Accounts and Permissions —** An integrated set of features that provides control of user access within the software application.

**ANSI/SBS Microplate Standard —** The standard for microplate height dimension as set forth by the Society for Biomolecular Screening.

**Antibody Cocktail —** A mixture of antibodies, typically a subset of a panel, combined into one assay tube. Typically, cocktails are constructed so each lableled antibody is measured by one of the channels on the flow cytometer.

**Antibody Template Configuration —** Information about the characteristics of an antibody that includes name, description, fluorochrome, default pipetting volume, etc.

**Antibody —** Proteins that are found in blood or other bodily fluids used by the immune system to identify and neutralize foreign objects, such as bacteria and viruses.

**Assay Tubes —** Used to designate the destination labware where antibodies are pipetted. For example, 12 x 75 mm polypropylene tubes.

**Bridge —** The structure that moves along the rear support and front rails. The bridge holds the pod and enables movement of the pod in the Y- (front to back) and Z- axes (up and down). Built into the bridge is an indicator light that displays current operational status of the Biomek 4000 workstation. The Biomek 4000 workstation supports only one bridge.

**Bulk —** A bulk volume of an antibody cocktail that is prepared in an intermediate vial. Maximum volume of bulk that can be created in any one vial is either 5 mL or 12 mL, depending on the vial chosen.

**Calibration —** A procedure to standardize the instrument by determining its deviation from calibration references and applying any necessary correction factors.

**Cocktail —** See Antibody Cocktail.

**D-axis —** Axis that allows for aspirate, dispense, and tip removal operations. Movement along the axis is vertical.

**Deck —** The physical deck of the Biomek 4000 ACPrep System that hold the racks, pipetting tools, tips, and trash used to automate the application.

**Deck Layout —** Current configuration of the deck.

**Default Pipetting Volume —** The default volume of an antibody specified by the user to be pipetted to a destination when the antibody is selected for inclusion in a cocktail. The default value can be overriden in the cocktail set-up interface.

**Direct —** Approach that pipettes aliquots of individual antibodies directly from source vials into assay labware.

**Expiration Date —** The last day a specific vial of antibody reagent can be used.

**Field —** Area on a screen for entering data.

**Flow Cytometer —** In the Biomek 4000 ACPrep software a flow cytometer refers to a collection of fluorochromes that can be measured by an actual analytical instrument.

**Flow Cytometry —** Analysis of particles in single particle suspension.

**Fluorochrome —** Fluorescent chemical compound that emits light of specific wavelengths when excited.

**Homing —** Process of locating the home position. This process must be done every time the instrument is powered up. Instrument home Z-, Y-, X-, and D-axes.

**Icon —** Pictorial representation for commands or options on an instrument.

**Indicator Lights —** Displays current operational status of the Biomek 4000 workstation.

**Indirect —** Approach of preparing a bulk volume of an antibody cocktail in an intermediate vial and then transferring an aliquot of the bulk cocktail to an assay tube.

**Input Racks —** Racks on the deck of the Biomek 4000 that hold reagent vials.

**Intermediate Vial —** Used to hold bulk antibody mixture until it is pipetted into assay labware.

**Labware Holder —** Used to hold microplates, tube racks, or tip racks on the Biomek 4000 deck.

**Liquid Level Sensing —** On the Biomek 4000, P200L and P1000SL tools include patented technology that sonically detects the liquid level. Liquid level sensing is performed using an acoustic process involving a transmitter and receiver within the single-channel tools. The transmitter emits a sound wave through the tip that bounces back when it contacts liquid. The receiver detects the wave as it bounces back past the end of the tip.

**Lot Number —** Vendor information provided to identify a specific batch of antibody reagent.

**Manual Control —** Allows pods to be moved manually via a software interface.

**Microplate —** Labware used in liquid-handling procedures.

**Output Racks —** Used to locate assay tubes or microplates on the deck of the Biomek 4000.

**P1000SL —** Pipetting tool for the Biomek 4000 ACPrep system used for pipetting volumes between 100 µL and 1000 µL.

**P200L —** Pipetting tool for the Biomek 4000 ACPrep system used for pipetting volumes between 2.5 µL and 100 µL.

**Panel —** A set of one or more cocktails that are typically used together for a sample.

**Pipette Tips —** Disposable tips that are attached to the pipetting tool used to transfer reagents for source vials to destination labware.

**Pipetting Tools —** Single-channel tools used on the Biomek 4000 pod to aspirate and dispense liquid.

**Pod —** The movable part of the Biomek 4000 that is used for tool loading/unloading, and liquid-handling.

**Progress Bar —** Graphical display that indicated relative portion of a run that has been completed.

**Rack Inventory —** Information detailing the antibodies and amounts of antibodies stored in any of the racks used on the Biomek 4000 ACPrep system.

**Rack Type —** Type indicates the kind of antibody vial that is housed in the rack. For example, IOTest is used to store IOTest antibodies from Beckman Coulter.

**Remaining Volume —** The amount of antibody reagent left in a vial following an automated run.

**Role —** The role of a user defines what features in the Biomek 4000 ACPrep Software the user can access. Roles include Administrator, Advanced Operator, and Operator.

**Source —** Describes the location of a reagent on the system.

**Tool Rack —** Special positioner on the Biomek 4000 used to hold up to five interchangeable tools in a single deck position during a method.

**Total Volume —** The initial volume of a source once it is added to a rack on the system.

**Worklist —** Area on the screen where antibodies, panels, cocktails, and pipetting volumes are selected in order to create a run.

**Wrapping —** An output fill option that arranges each set of outputs into a new row or column of the output labware.

**X-axis —** Pod travel from left to right on the bridge, with larger X-coordinates on the right.

**Y-axis —** Pod travel from front to back  on the bridge, with larger Y-coordinates to the front of the instrument.

**Z Height —** The veritical coordinate of the Z-axis (up and down motion of the pod).

**Z-axis —** Pod travel up and down with the Z Height coordinate decreasing as it gets closer to the deck of the instrument.

# Index

## E



## F



## H



## I



## M



## P



## R



## S



## T



## U

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