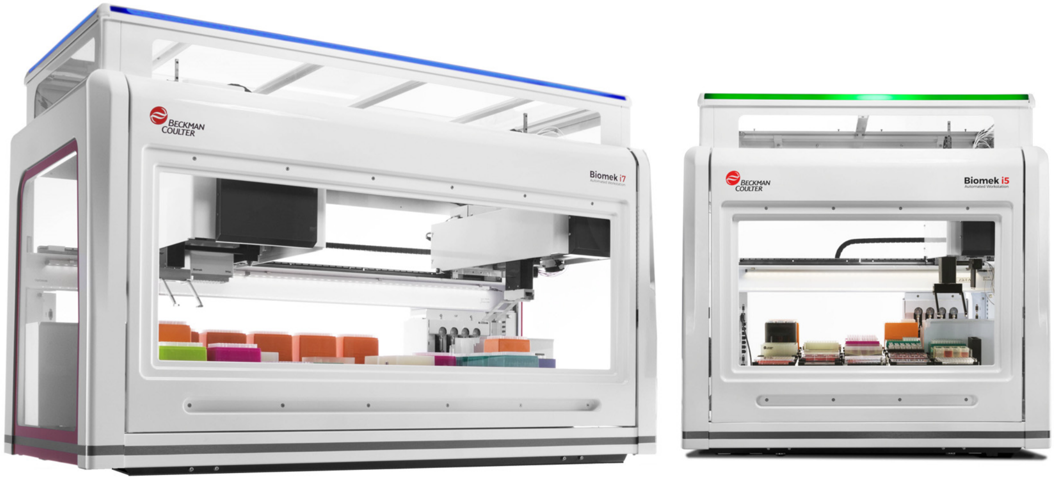
Tutorials

Biomek i-Series

Automated Workstations



B54475AB
October 2017

Beckman Coulter, Inc.
250 S. Kraemer Blvd.
Brea, CA 92821 U.S.A.

Biomek i-Series Tutorials
PN B54475AB (October 2017)

Trademarks

Contact Us

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

- World wide, find us via our website at *www.beckmancoulter.com/customersupport/support.*
- In the USA and Canada, call us at 1-800-369-0333.
- Outside of the USA and Canada, contact your local Beckman Coulter Representative.

EC REP

Beckman Coulter Eurocenter S.A.
22, rue Juste-Olivier
Case Postale 1044
CH - 1260 Nyon 1, Switzerland
Tel: +41 (0) 22 365 36 11

Original Instructions

Revision History

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

Initial Issue, 04/17
Biomek Software, version 5.0

AB Issue, 10/17
Biomek Software, version 5.1
Changes or additions were made to:

- Figure 5, Deck Editor — Example from a Biomek i7 Hybrid Instrument
- Figure 9, Populating the Deck on a Biomek i7 Hybrid Instrument — Multichannel Pod
- Figure 10, Populating the Deck on a Biomek i7 Hybrid Instrument — Span-8 Pod
- CHAPTER 5, Setting Up a Basic Selective Tips Method
- CHAPTER 7, Correcting the Error

Note: Changes that are part of the most recent revision are indicated in text by a bar in the margin of the amended page.

Safety Notice

Overview

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

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

⚠ WARNING

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

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

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

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

⚠ DANGER

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

⚠ WARNING

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

⚠ CAUTION

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

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

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

Instrument Safety Precautions

⚠ **WARNING**

Risk of operator injury if:

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

To avoid injury:

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

⚠ CAUTION

Risk of data loss or system failure. The Automation Controller is configured to automatically obtain updates when connected to the internet. Upon notification of these updates, perform a system reboot as soon as possible. The system is configured to avoid automatic restart to avoid loss of data and/or samples; however, this leaves the system vulnerable to cybersecurity threats. Ensure updates are addressed in a timely manner.

⚠ CAUTION

Risk of data loss or system failure. The system is configured to prevent auto-play when external media is inserted, such as a DVD or USB drive. Do not change settings related to automatic updates, anti-virus, firewall, or auto-play to avoid compromising the system.

⚠ CAUTION

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

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

⚠ CAUTION

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

Electrical Safety

To prevent electrically-related injuries and property damage, properly inspect all electrical equipment prior to use and immediately report any electrical deficiencies. Contact us for any servicing of equipment requiring the removal of covers or panels.

Equipment Ratings

- 100 - 240 VAC
- 50/60 Hz
- 10 A

⚠ DANGER

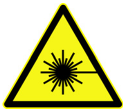
To reduce the risk of electrical shock, the instrument uses a three-wire electrical cord and plug to connect it to earth-ground. Make sure that the matching wall outlet receptacle is properly wired and earth-grounded.

High Voltage

This symbol indicates the potential of an electrical shock hazard existing from a high-voltage source and that all safety instructions should be read and understood before proceeding with the installation, maintenance, and servicing of all modules.

Do not remove system covers. To avoid electrical shock, use supplied power cords only and connect to properly grounded (three-holed) outlets.

Laser Light



This symbol indicates that a potential hazard to personal safety exists from a laser source. When this symbol is displayed in this manual, pay special attention to the specific safety information associated with the symbol.

Laser Specifications

- **Laser Type:** Class II Laser Diode
- **Maximum Output:** 11 mW
- **Wavelength:** 670 nm

Disposal of Electronic Equipment

It is important to understand and follow all laws regarding the safe and proper disposal of electrical instrumentation.

The symbol of a crossed-out wheeled bin on the product is required in accordance with the Waste Electrical and Electronic Equipment (WEEE) Directive of the European Union. The presence of this marking on the product indicates:

- That the device was put on the European Market after August 13, 2005 and
- That the device is not to be disposed via the municipal waste collection system of any member state of the European Union.

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

Chemical and Biological Safety

If a hazardous substance such as blood is spilled onto the instrument, ALPs, or accessories, clean up the spill by using a 10% bleach or ethanol solution, or use your laboratory decontamination solution. Then follow your laboratory procedure for disposal of hazardous materials. If the instrument, ALPs, or accessories need to be decontaminated, contact us.

⚠ 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.

⚠ **WARNING**

Before running with chemistry or any biological samples, new labware types will require testing to determine if labware offsets are necessary to move to or from an ALP, or to access the labware during pipetting operations while positioned on an ALP. If you do not do the required testing, the labware could crash and the contents could spill if the offset is incorrect.

Normal operation of the instrument may involve the use of materials that are toxic, flammable, or otherwise biologically harmful. When using such materials, observe the following precautions:

- **Handle infectious samples according to good laboratory procedures and methods to prevent the spread of disease.**
- **Observe all cautionary information printed on the original solutions' containers prior to their use.**
- **Dispose of all waste solutions according to your facility's waste disposal procedures.**
- **Operate the instrument in accordance with the instructions outlined in this manual and take all the necessary precautions when using pathological, toxic, or radioactive materials.**
- **Splashing of liquids may occur; therefore, take appropriate safety precautions, such as using safety glasses and wearing protective clothing, when working with potentially hazardous liquids.**
- **Use an appropriately-contained environment when using hazardous materials.**
- **Observe the appropriate cautionary procedures as defined by your safety officer when using flammable solvents in or near a powered-up instrument.**
- **Observe the appropriate cautionary procedures as defined by your safety officer when using toxic, pathological, or radioactive materials.**

NOTE Observe all warnings and cautions listed for any external devices attached or used during operation of the instrument. Refer to applicable external device user's manuals for operating procedures of that device.

NOTE For Safety Data Sheets (SDS/MSDS) information, go to the Beckman Coulter website at **www.beckmancoulter.com**.

Moving Parts

⚠ WARNING

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

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

Cleaning

Observe the cleaning procedures outlined in *Biomek i-Series Instructions for Use* (PN B54473). Prior to cleaning equipment that has been exposed to hazardous material:

- Contact the appropriate Chemical and Biological Safety personnel.
- Review the *Chemical and Biological Safety* section (above).

Maintenance

Perform only the maintenance described in the appropriate User's Manual for the Biomek i-Series instrument. Maintenance other than that specified in the appropriate User's Manual should be performed only by a Beckman Coulter Representative.

IMPORTANT It is your responsibility to decontaminate components of the instrument before requesting service by a Beckman Coulter Representative or returning parts to Beckman Coulter for repair. Beckman Coulter will NOT accept any items which have not been decontaminated where it is appropriate to do so. If any parts are returned, they must be enclosed in a sealed plastic bag stating that the contents are safe to handle and are not contaminated.

CE Mark

A "CE" mark indicates that a product has been assessed before being placed on the market, and has been found to meet European Union safety, health, and/or environmental protection requirements.

RoHS Notice

European RoHS

A “CE” mark indicates that a product has been assessed before being placed on the market, and has been found to meet European Union safety, health, and/or environmental protection requirements.

China RoHS

These labels and materials declaration table (the Table of Hazardous Substance's Name and Concentration) are to meet People’s Republic of China Electronic Industry Standard SJ/T11364-2006 “Marking for Control of Pollution Caused by Electronic Information Products” requirements.

China RoHS Caution Label

This label indicates that the electronic information product contains certain toxic or hazardous substances. The center number is the Environmentally Friendly Use Period (EFUP) date, and indicates the number of calendar years the product can be in operation. Upon the expiration of the EFUP, the product must be immediately recycled. The circling arrows indicate the product is recyclable. The date code on the label or product indicates the date of manufacture.

China RoHS Environmental Label

This label indicates that the electronic information product does not contain any toxic or hazardous substances. The center “e” indicates the product is environmentally safe and does not have an Environmentally Friendly Use Period (EFUP) date. Therefore, it can safely be used indefinitely. The circling arrows indicate the product is recyclable. The date code on the label or product indicates the date of manufacture.

Contents

Abbreviations

Glossary

Beckman Coulter, Inc.
Warranty and Returned Goods Requirements

Index

Illustrations

Tables

Introduction

Introducing Biomek Software

Welcome to Biomek Software and Biomek i-Series instruments.

Biomek Software controls the Multichannel pod and/or Span-8 pod on your Biomek i-Series instrument and is designed to allow you to take as much direct and precise control over the method-building process as you want. The flexibility that results from this combination gives the Biomek i-Series instrument its power.

NOTE Unless otherwise noted, all information in these tutorials refers to both the Biomek i5 and Biomek i7 instruments.

Camera Feature — Privacy and Data Collection

Your Biomek i-Series instrument features integral cameras for the purpose of capturing system status information. The cameras allow remote viewing, as well as record up to 60 seconds of video, capturing when the instrument is stopped or any unexpected error events occurring during a method run. This event information is stored for a limited time for subsequent error analysis by trained operators, and overwritten by new data.

The cameras may capture images of individuals in the lab if they are in range. The instrument owner is responsible for compliance with any applicable laws, rules, or regulations, including privacy and data protection laws, regarding the use of these features.

- To turn off this feature, in Biomek Software, go to **Utilities** > **Hardware Setup** > **Vision System**, and uncheck **Record video on errors during runs**.

  NOTE This option is stored in the instrument file and will need to be reconfigured if a different instrument file is used.

Basic Learning Concepts

This section provides an overview of topics that you will need to be familiar with before beginning a method. These topics include:

- *Biomek Software*
- *ALPs*
- *Hardware*

Biomek Software

Biomek Software is used to control Biomek i-Series instruments. Effectively using Biomek Software includes using the method editor for method building and the various tools and editors to appropriately configure the instrument file and project for the desired task or application. The tutorials in this manual will help you learn how to use Biomek Software through practical applications.

In this section, you will get an overview of Biomek Software through the following topics:

- ✓ *Launching Biomek Software*
- ✓ *Understanding the Main Editor*
- ✓ *Using the Ribbon*
- ✓ *Understanding Projects*
- ✓ *Understanding the Deck Editor*

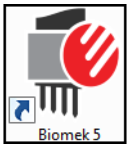
Launching Biomek Software

To launch Biomek Software:

---

1 Double click on the Biomek Software icon (Figure 1), which was created on your desktop during the installation process.

Figure 1 Biomek Software Icon



OR

From the **Start** menu, select **All Programs** > **Beckman Coulter** > **Biomek Software**.

If Beckman Coulter Accounts & Permissions is enabled on your system, you must have an account established and log in using that account name and password. For more information, contact your system administrator.

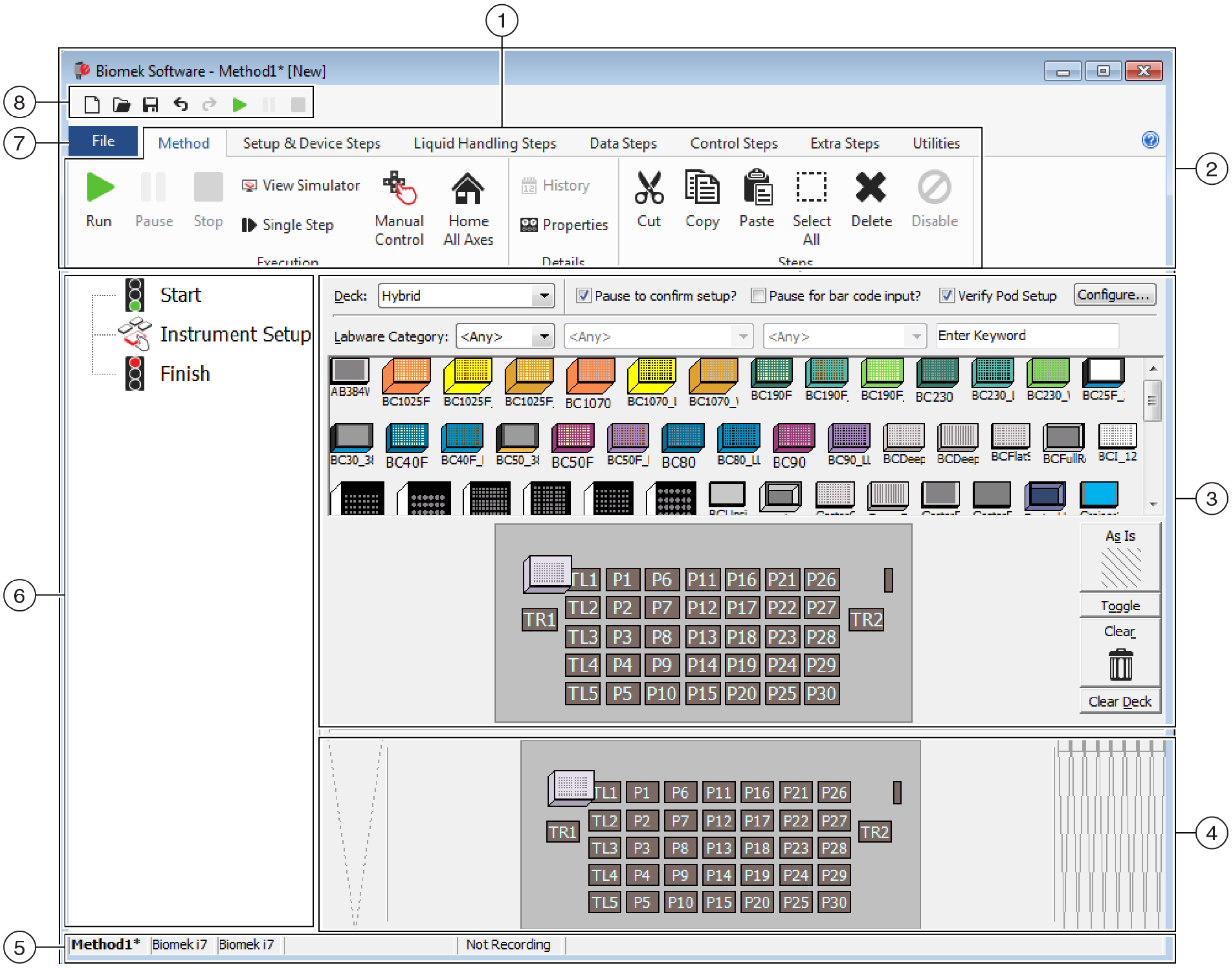
Biomek i-Series Concept	
	Beckman Coulter Accounts & Permissions is an integrated set of features built into Biomek Software that assists users in complying with 21 CFR Part 11 requirements for closed systems. Permissions provide the ability to control user access to specific program operations. Refer to the *Biomek i-Series Software Reference Manual* (PN B56358), *Using Accounts and Permissions*, for additional details.

Understanding the Main Editor

The main editor (Figure 2) is your starting point for building liquid-handling methods for the Biomek i-Series instrument. Each component of the Biomek Software main editor is described below. Get to know these terms, as they are used throughout these tutorials and all other Biomek i-Series user manuals.

TIP *Refer to the Biomek i-Series Automated Workstations Software Reference Manual* (PN B56358) for in-depth descriptions of each component of the Biomek Software main editor.

Figure 2 Biomek Software Main Editor



Deck: Hybrid
☑ Pause to confirm setup?
☐ Pause for bar code input?
☑ Verify Pod Setup
Labware Category: <Any>

1. **Ribbon**: Provides convenient access to steps or utilities for completing a task. The number of tabs on the ribbon can vary slightly, given the options that are enabled in the software. Additional information is found here: *Using the Ribbon*
2. **Title Bar**: Displays the software name, current method file name, the At-A-Glance Status (when a method is executing), and contains the Quick Access Toolbar, Ribbon, and Title Bar buttons.
3. **Configuration View:** The configuration for each step appears in the Configuration View. The view changes to correspond to the step highlighted in the Method View.
4. **Current Instrument Display**: An interactive display that can be used for selecting deck positions while configuring a step. This display reflects the status of the instrument, i.e., the deck and tip presence upon completion of the previous step.
5. **Status Bar**: Contains the file name of the method, current project name, instrument name, estimated time to completion, any current errors, and other information pertinent to the location of your mouse on the user interface.
6. **Method View**: Displays the steps in a method.
7. **File Tab**: Provides the means to create a new method, open or save an existing method, import or export instruments, projects or methods, print methods, configure preferences and more.
8. **Quick Access Toolbar**: Provides convenient access to basic Biomek Software functions. Scrolling your mouse over an icon shows the function each icon serves.

- **Error Bar** (Not Shown): When the method is validated, lists errors pertaining to the current method.

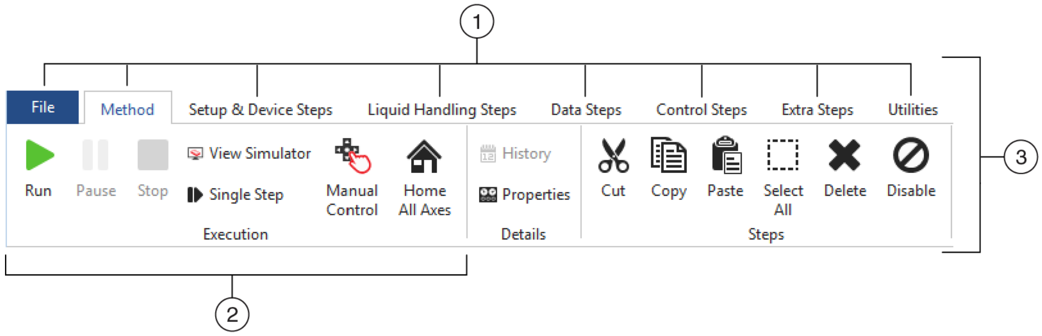
Using the Ribbon

Biomek i-Series Concept

Method building, utility, and execution steps are sectioned into ribbon tabs, and further into groups based upon function, as well as the complexity of the operations they control and the depth of knowledge required to configure them.

Refer to Figure 3 for an overview of the Biomek Software ribbon.

Figure 3 Ribbon



1. **Tabs**: A **Tab** contains steps/options with similar functions. In this example, the **Method** tab is selected. To switch between active tabs, select the title of a different tab on the ribbon.
2. **Group**: A **Group** is a subsection of a **Tab** containing a selection of options that have been further narrowed based on function.
3. **Ribbon**: The **Ribbon** is comprised of multiple **Tabs**.

Understanding Projects

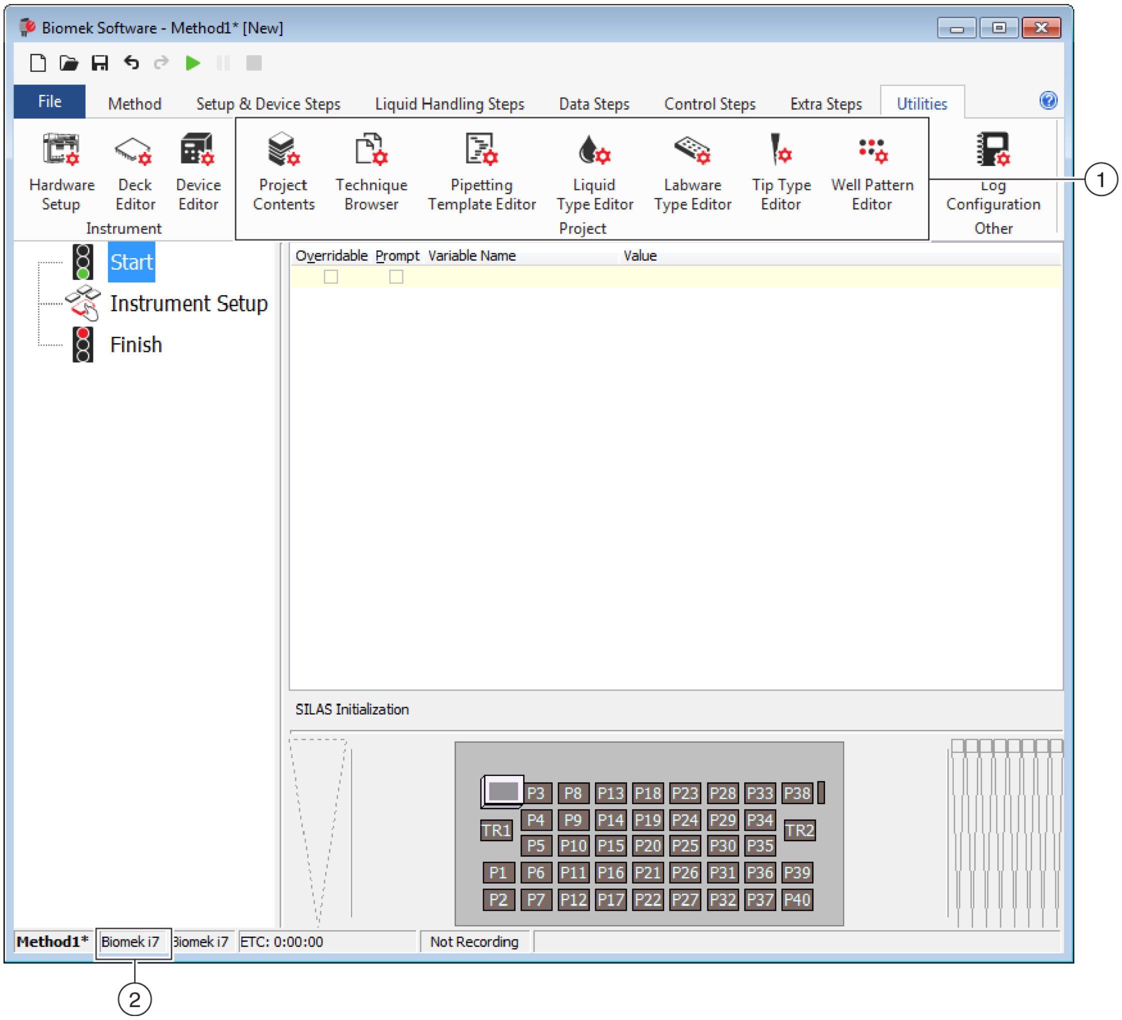
While projects may be created, revised, deleted, saved, imported, and exported, in this tutorial you will use the project on your system that was created or imported when your instrument and Biomek Software were installed. *Before you create a new method, get into the habit of ensuring you are using the correct project.*

Biomek i-Series Concept

A project stores information about liquid types, labware and tip types, well patterns, pipetting templates, and techniques as revisions that are used by a method file to configure the actions of the instrument. Projects store a history of all changes, additions, and deletions of items from the project. Methods are associated with projects and contain all of the items required to perform the method.

View Figure 4 to learn where project information is accessed or viewed from the main editor.

Figure 4 Project

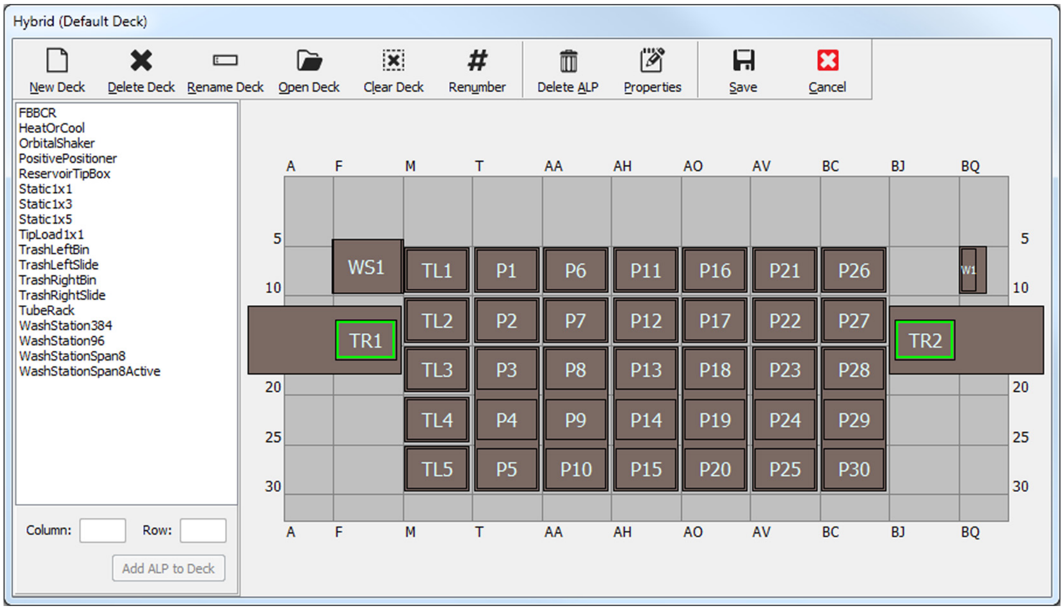


1. The actions and editors associated with projects are displayed on the **Utilities** tab in the **Project** group.
2. **Project**: The currently opened project is displayed here. The project displayed here is the default used when a Biomek i7 instrument is chosen when Biomek Software is installed.

Understanding the Deck Editor

The **Deck Editor** (Figure 5) is used to define and change the deck configurations stored in the current instrument file. A deck in Biomek Software is an exact representation of the physical instrument deck; once the instrument deck is set up and framed by a Beckman Coulter Representative, it is then configured and saved as the default deck in the software. This default deck is used for all methods that are executed on the instrument. If the physical deck is changed, the default deck must be updated to reflect changes. Refer to the *Biomek i-Series Software Reference Manual* (PN B56358), *Preparing and Managing the Deck*.

Figure 5 Deck Editor — Example from a Biomek i7 Hybrid Instrument



ALPs

Automated Labware Positioners (ALPs) are removable and interchangeable platform structures installed on the deck to allow automated assays to be performed. Complete information on ALPs can be found in the *Biomek i-Series Automated Labware Positioners, Accessories, and Devices Instructions for Use (PN B54477).*

When an ALP is mounted to the deck, the **Row** and **Column** coordinates of the ***frontmost*** mounting pin, which is signified by the **pointing feature**, is entered into the **Deck Editor** for proper placement in the software. There are two types of pointing features; the type of pointing feature on the ALP depends on the type of ALP:

- ***For ALPs that do not require a mounting plate***, the location of the pointing feature is frontmost mounting or locking pin (Figure 6).
- ***For ALPs equipped with a mounting plate***, the pointing feature is the frontmost notch, located on the mounting plate (Figure 7).

NOTE For a list of ALPs that require a mounting plate, refer to the *Biomek i-Series Automated Labware Positioners, Accessories, and Devices Instructions for Use (PN B54477)*.

Figure 6 Pointing Feature Location on Biomek i-Series ALPs

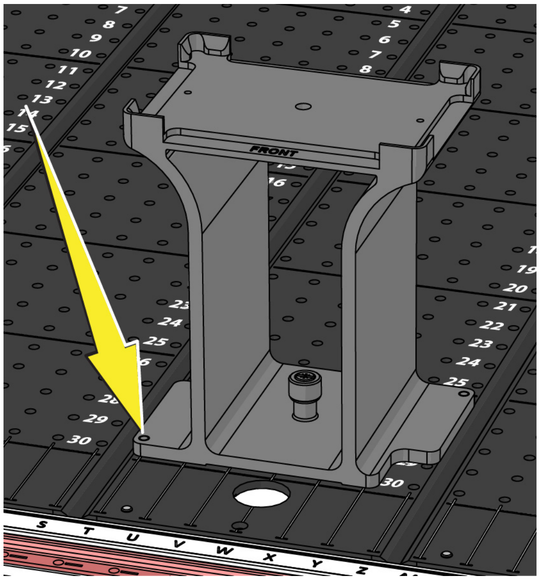
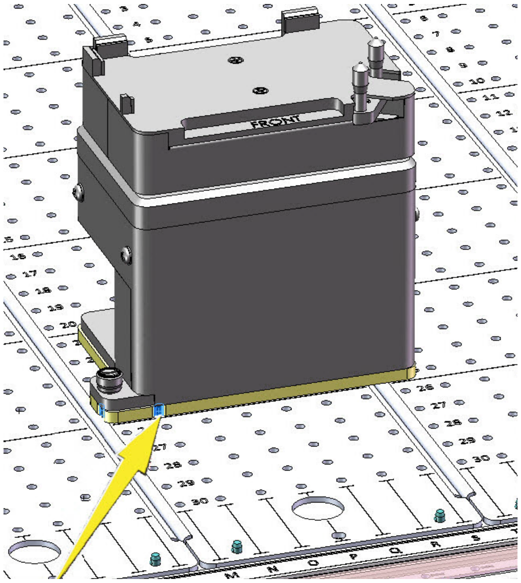


Figure 7 Pointing Feature (Notches) Location on Biomek FX^P/NX^P ALPs



Hardware

A Beckman Coulter Representative normally installs and frames ALPs and devices on your deck and defines the **Hardware Setup** configurations for your instrument. ***If you wish to complete these tutorials on the hardware, it will be necessary to make changes to the tutorials to match the physical positions of your deck.***

Using This Tutorial

This tutorial is designed to help you become comfortable using Biomek Software with your Multichannel pod and/or Span-8 pod on your Biomek i-Series instrument. The chapters in this tutorial can be completed consecutively or, depending on the learning required, may be completed in any order. This format will allow advanced users to complete only the chapters that include the topics they need to learn. Generally, the topics in subsequent chapters increase in complexity.

- *Basic Learning Concepts*: Located in this chapter are the basics on using Biomek Software and preparing to create methods. Read thoroughly and complete all applicable activities in this section prior to starting the tutorials listed below.
- ***Chapters 1 through 5*** in this tutorial apply to the **Multichannel pod**. The Multichannel pod can be used with the following configurations:
  - Single Multichannel Pod
  - Dual Multichannel Pods
  - Hybrid instrument with a Multichannel Pod and a Span-8 Pod
- ***Chapters 6 through 10*** in this tutorial apply to the **Span-8 Pod**. The Span-8 pod can be used with the following configurations:
  - Single Span-8 Pod
  - Hybrid instrument with a Multichannel Pod and a Span-8 Pod

TIP For effective learning, save this tutorial to an external device or print it out before use, leaving your automation controller screen free for viewing Biomek Software.

This tutorial provides instructions requiring you to enter text into specific fields. The text to be entered is indicated by **bold** font. If the bolded phrase is followed by a period, do not enter the period into the text field.

In addition to the step-by-step instructions in this tutorial, you will also see helpful information in the following forms:

Biomek i-Series Concept

These boxes contain information to help you understand important features and capabilities of Biomek Software or the Biomek i-Series instrument. While the step-by-step instructions may be completed without reading the information in these boxes, the information will enhance your knowledge and give you a fuller picture of what Biomek Software and your instrument can do.

TIP The information in these **Tips** offers suggestions on how to use your instrument and software to enhance the activities you want to do in your laboratory.

IMPORTANT ***If Using Fixed Tips...***
If you have fixed tips on your instrument (Span-8 pod only), these instructions show you how you can use them rather than the disposable tips that are called out in the tutorial instructions.

Determining the Mode for Running Biomek i-Series Tutorials

There are two different modes that you can choose from for learning how to create methods. Determine the mode that's right for you by weighing the options presented in the table below.

IMPORTANT It is recommended that you complete these tutorial exercises in Simulation mode for the first pass, and then, for any subsequent run-throughs, try the tutorials on hardware by altering the tutorial exercises to work with your physical instrument deck.

Mode	Benefits	Drawbacks
Simulation	• Methods can be followed as written. • You can see how ALPs work, even if you do not actually own them.	• You will only see part of the picture, as Simulation mode is lacking the physical component.
Hardware	• You will gain full understanding (physical and virtual) of what it takes to complete a method.	• Specific locations of labware and ALPs in these tutorials might not work on your deck, as your instrument deck probably doesn't match the Simulation deck. • You must have the required ALPs, and they must be framed to a location that is accessible to the pod with which you are working. OR • You must change the tutorials to match to your physical deck.

The next section, *Before Creating a Method*, applies to both modes. Some of these instructions will only be carried out if you are using Simulation mode, while others will only pertain to you if you are running on hardware; these areas will be noted. For learning purposes, however, it is suggested that you read and understand all instructions, as they contain information that will help you better understand how to create and run methods.

Before Creating a Method

Before creating your method, you will need to set up or choose a deck in the **Deck Editor** and define some configurations in **Hardware Setup**.

Creating a Deck In Biomek Software

Biomek i-Series Concept

The **Deck Editor** is used to define and change the deck configurations stored in the current instrument file. A deck in Biomek Software is an exact representation of the physical instrument deck; once the instrument deck is set up and framed by a Beckman Coulter Representative, it is then configured and saved as the default deck in the software. This default deck is used for all methods run on the instrument. If the physical deck is changed, the default deck must be updated or added to the software to reflect changes. Refer to the *Biomek i-Series Software Reference Manual* (PN B56358), *Preparing and Managing the Deck*.

Required ALPs

The steps in the tutorials require the following ALPs to be located on the deck:

Multichannel Pod	Span-8 Pod
✓ Tip Load 1 x 1 ALPs ✓ Static ALPs (labware positioners) (1 x 1 and 1 x 3) ✓ 96-Channel Wash Station ALP ✓ Trash ALP	✓ Static ALPs (labware positioners) (1 x 1 and 1 x 3) ✓ Span-8 Wash Station ALP ✓ Trash ALP

If you are running your method:

- ***In Simulation mode***, follow the instructions in *Creating a Virtual Deck*.
- ***On Hardware***, make sure the items above are accessible to the pod with which you are working. If you wish, you can complete the instructions in *Creating a Virtual Deck* to learn how to create a new deck.

Creating a Virtual Deck

This exercise is optional, as, in the **Deck Editor,** you can select the predefined deck for your instrument type to use for these tutorials. To choose the appropriate default deck without creating it from scratch, complete the instructions in *Selecting the Tutorial Default Deck*. If you wish to learn how to create a new deck, follow the instructions below.

IMPORTANT ***This deck is to be used in simulation mode only*** because the tutorial deck will not likely match your instrument deck, and a mismatch between the hardware and software decks will result in a crash.

To create a deck:

---

1 On the **Utilities** tab, in the **Instrument** group, select Deck Editor (**Deck Editor**). The **Deck Editor** appears.

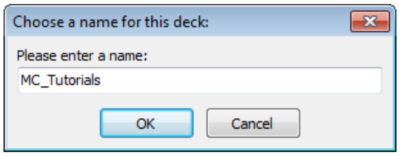
---

2 On the toolbar, select New Deck (**New Deck**).

---

3 In **Choose a name for this deck** (Figure 8), enter a name for the deck, and then select **OK.**

Figure 8 Naming the Deck



Choose a name for this deck:

Please enter a name:

MC_Tutorials

---

4 Select ☒ Clear Deck.

---

5 Now you will begin adding ALPs to the deck. If your instrument contains a:

- **Multichannel pod**, go to step 6.
- **Span-8 pod** only, go to step 7.

6 ***For instruments containing a Multichannel pod:***

The first ALP you will place on the deck is the 96-Channel Wash Station ALP; this is completed through the following steps:

a. In the ALPs List (left panel), select **WashStation96**. The area capable of supporting the ALP is indicated by blue dashed lines (Figure 9).

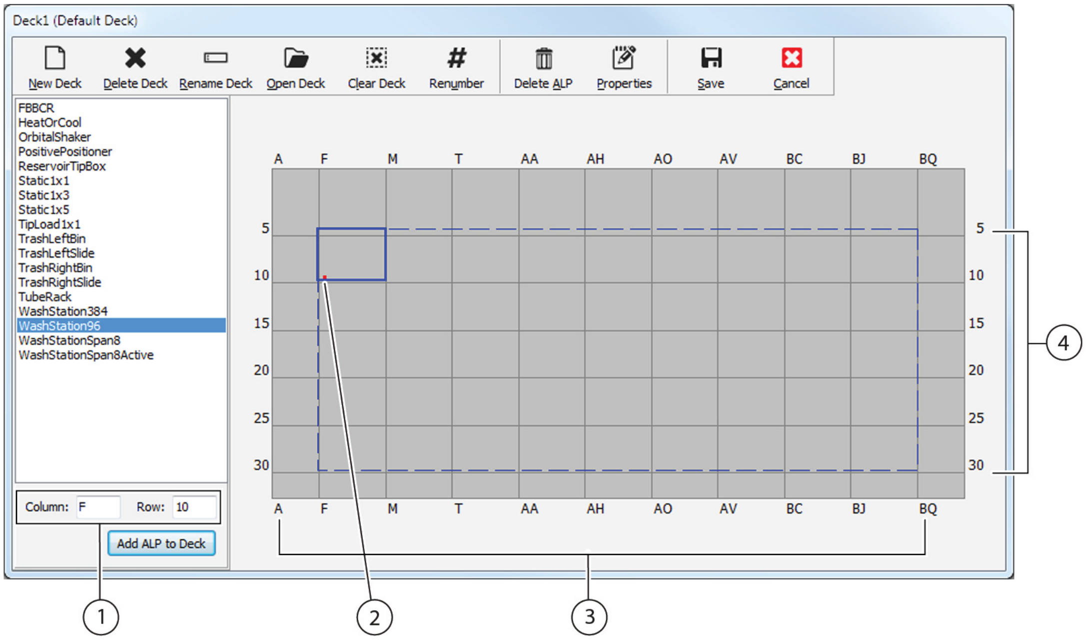
At this point, you would normally determine where the ALP should be located on the physical instrument deck, and once the location is determined, you would take note of the coordinates of the mounting point on the ALP. However, since this is a Simulation deck, the coordinates are provided for you in APPENDIX A, *Tutorial Decks*.

b. The coordinates for the **WashStation96** are **F10**. Therefore, in the **Column** field, enter ***F***, and in the **Row** field, enter ***10***. A bounding box appears at the location of valid coordinates.

c. Select **Add ALP to Deck** to complete the process.

d. Proceed to step 8.

Figure 9 Populating the Deck on a Biomek i7 Hybrid Instrument — Multichannel Pod



Column: F Row: 10

1. **Coordinates**: Using the **Column** and **Row** Indicators as a guideline, enter the **Column** and **Row** coordinates of the mounting point where you wish to place the ALP.
2. **Mounting Point**: The mounting point of an ALP is indicated by a red dot; the location of this dot corresponds to the entered **Column** and **Row** coordinates.
3. **Column Indicators** (also located on the top of the deck).
4. **Row Indicators** (also located on the left side of the deck).

---

7 *For Span-8 pods*:

The first ALP you will place on the deck is the Span-8 Wash Station ALP; this is completed through the following steps:

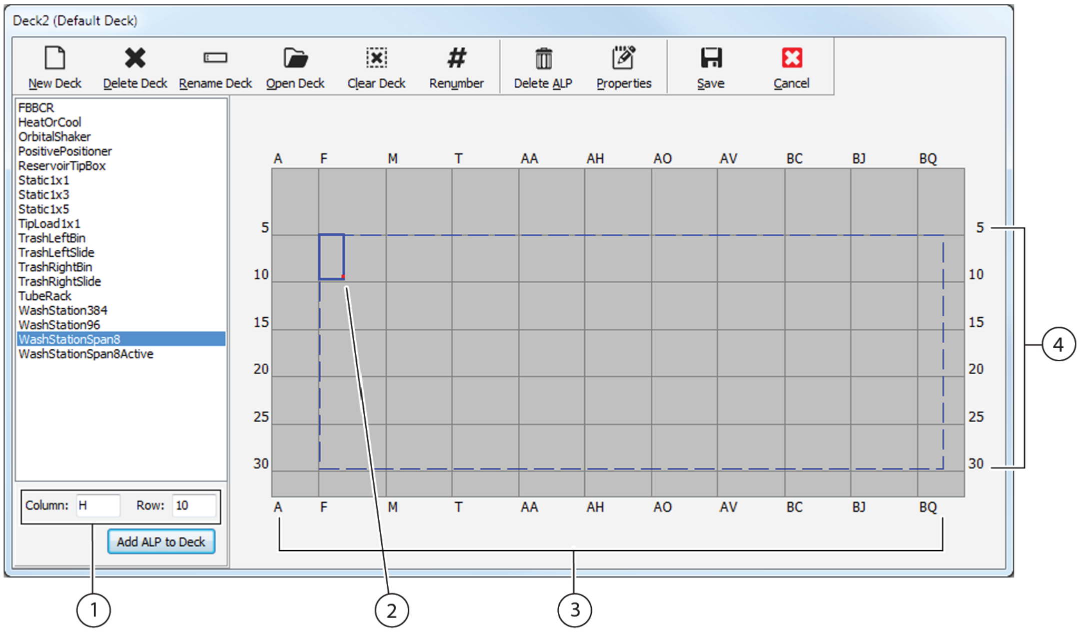
a. In the ALPs List (left panel), select **WashStationSpan8**. The area capable of supporting the ALP is indicated by blue dashed lines (Figure 10).

At this point, you would normally determine where the ALP should be located on the physical instrument deck, and once the location is determined, you would take note of the coordinates of the mounting point on the ALP. However, since this is a Simulation deck, the coordinates are provided for you in APPENDIX A, *Tutorial Decks*.

b. The coordinates for the **WashStationSpan8** are **AQ10** (Biomek i5) or **BS10** (Biomek i7). Therefore, in the **Column** field, enter ***AQ*** or ***BS***, and in the **Row** field, enter ***10***. A bounding box appears at the location of valid coordinates.

c. Select **Add ALP to Deck** to complete the process.

Figure 10 Populating the Deck on a Biomek i7 Hybrid Instrument — Span-8 Pod



Column: H Row: 10

1. **Coordinates**: Using the column and row indicators as a guideline, enter the **Column** and **Row** coordinates of the mounting point where you wish to place the ALP.
2. **Mounting Point**: The mounting point of an ALP is indicated by a red dot; the location of this dot corresponds to the entered **Column** and **Row** coordinates.
3. **Column Indicators** (also located on the top of the deck).
4. **Row Indicators** (also located on the left side of the deck).

---

8 Repeat steps a. through c. for each ALP listed in APPENDIX A, *Tutorial Decks*, for your instrument type.

---

9 Click the # Renumber (**Renumber**) icon to renumber the deck in an orderly fashion.

---

10 Compare the deck you just created to the virtual deck corresponding to your specific instrument type in APPENDIX A, *Tutorial Decks*, and make any necessary changes.

---

11 Select Save (**Save**) to exit **Deck Editor** and save the deck to create methods in Simulation mode.

IMPORTANT This changes the **Default Deck** to the Tutorial Deck you just created, which doesn't match your instrument deck. After completing the tutorial methods, you must switch the deck back to the deck that was created and framed by a Beckman Coulter Representative.

OR

Select ☒ Cancel (**Cancel**) if you're running this tutorial on hardware, and this exercise was for learning purposes only.

Selecting the Tutorial Default Deck

IMPORTANT If you are running your methods on hardware, do not change the default deck. Instead, alter your methods to correspond to your instrument deck.

NOTE If you have already created a default deck from scratch in *Creating a Virtual Deck*, skip to *Configuring Hardware Setup*.

To select a predefined default deck:

---

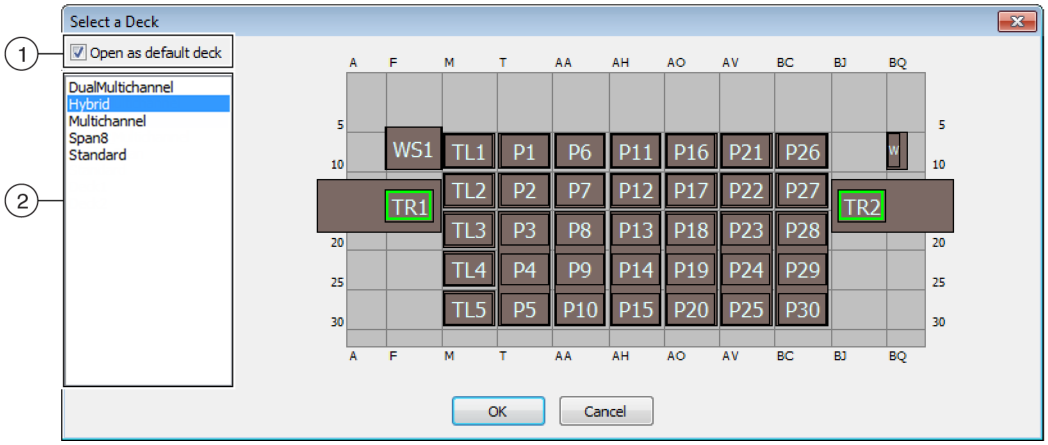
1 On the **Utilities** tab, in the **Instrument** group, select Deck Editor (**Deck Editor**). The **Deck Editor** appears.

---

2 On the toolbar, select Open Deck (**Open Deck**).

3 In the list of decks, select the appropriate deck for your instrument type (Figure 11).

Figure 11 Selecting a Deck (Biomek i7 Hybrid shown)



1. Choose this option to open the selected deck as the default deck.
2. **Deck List**: Choose the default deck for these tutorials based on your instrument type.
   - **Biomek i5, Span-8**: Span8
   - **Biomek i5, Multichannel**: Multichannel
   - **Biomek i7, Single Span-8**: Span8
   - **Biomek i7, Single Multichannel**: Multichannel
   - **Biomek i7, Dual Multichannel**: DualMultichannel
   - **Biomek i7, Hybrid**: Hybrid

4 Make sure **Open as default deck** is selected (Figure 11).

5 Select **OK** to complete the process.

NOTE Once you have completed these tutorials, make sure to change the default deck back to the version corresponding to your instrument's physical deck.

Configuring Hardware Setup

Configuring the hardware in Biomek Software is different for Multichannel and Span-8 pods. Refer to the appropriate section for more information.

- *Multichannel Hardware Setup*
- *Span-8 Hardware Setup*

Multichannel Hardware Setup

Before starting any method, you will need to verify that the correct head is physically attached to the pod and is selected in the **Hardware Setup** utility. If running your method in Simulation mode, you will need to ensure the head type is correct in the **Hardware Setup** utility only.

To verify and change head type:

---

1 ***If running the method on the physical instrument***, you will need to change your methods to work with the current instrument setup. For information on altering your methods to work with your instrument setup, refer to the *Biomek i-Series Software Reference Manual* (PN B56358).

NOTE If you wish to change the physical head to match the head used in these tutorials, refer to the *Biomek i-Series Hardware Reference Manual* (PN B54474).

---

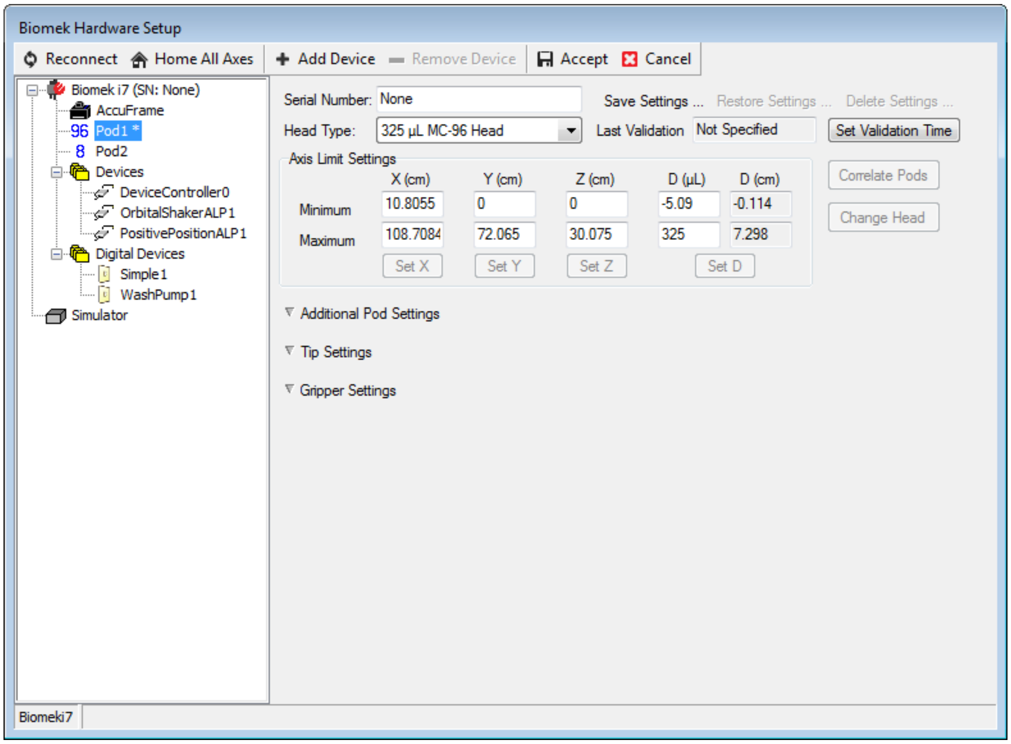
2 In Biomek Software, from the **Utilities** tab, in the **Instrument** group, select Hardware Setup (**Hardware Setup**). **Hardware Setup** appears.

---

3 Select the appropriate Multichannel pod (Figure 12).

NOTE A Multichannel pod is identified with a **96** or **384** and a Span-8 pod is identified with an **8**.

Figure 12 Hardware Setup Showing the Step User Interface for a Multichannel Pod



Serial Number: None

Head Type: 325 µL MC-96 Head

Last Validation: Not Specified

Axis Limit Settings

	X (cm)	Y (cm)	Z (cm)	D (µL)	D (cm)
Minimum	10.8055	0	0	-5.09	-0.114
Maximum	108.7084	72.065	30.075	325	7.298

1. Multichannel pod in **Hardware Setup**

4 Verify that the appropriate head is selected in **Head Type** (Figure 12).

- If the **Head Type** is already correct, continue this procedure with step 7.

5 From the **Head Type** drop-down, select the appropriate head.

6 Change the **Serial Number** to correspond to the serial number on the new head.

NOTE If you are running the method in Simulation mode, and you do not physically have the specified head type, leave the **Serial Number** entry field as **None**.

7 Select **Accept** in the **Hardware Setup** window to complete the process.

Span-8 Hardware Setup

The hardware setup for Span-8 pods should not be altered. You will need to change your methods to work with the current setup. For information on altering your methods, refer to the *Biomek i-Series Software Reference Manual* (PN B56358).

Specifying the Mode for Running Methods

⚠ CAUTION

Risk of procedure failure. Make sure the proper communications port is selected in Hardware Setup. Simulate is used only when running methods on the Biomek Simulator. To run methods on the instrument, choose the USB port (in Name) to which the instrument is connected.

When a method is run in Simulation mode, the Simulator appears, showing an animated 3-D model of the instrument performing the method. Setting the mode is configured in **Hardware Setup** (Figure 14).

Biomek i-Series Concept	
	Hardware Setup is used to configure Biomek Software with the appropriate Biomek i-Series instrument information, including the Simulator. While the Beckman Coulter Representative normally installs and configures new devices, it may be necessary to install, configure, and remove other devices using **Hardware Setup**. Refer to the *Biomek i-Series Software Reference Manual* (PN B56358), *Accessing Hardware Setup*.

To choose the mode for running your method:

---

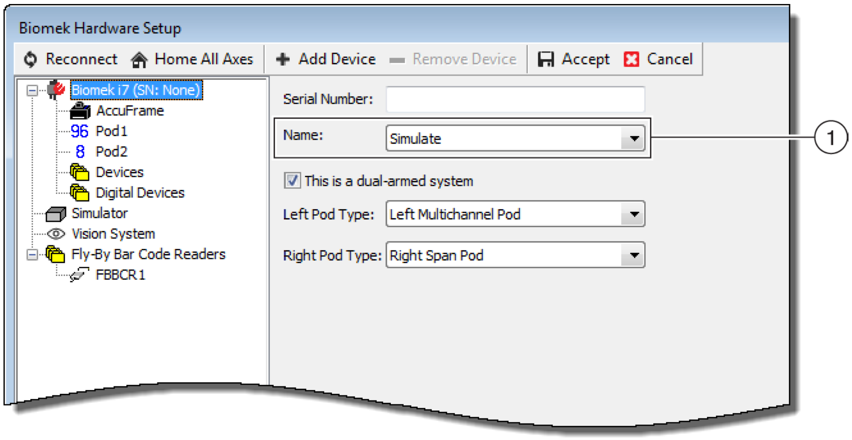
1 From the **Utilities** tab, in the **Instrument** group, select Hardware Setup (**Hardware Setup**). **Hardware Setup** appears.

---

2 Determine the mode that you will be using to run your method; see *Determining the Mode for Running Biomek i-Series Tutorials* for hints on choosing the mode that's right for you. If running...

- ***On Hardware***, in **Name**, select the correct name from the drop-down list.
- ***In Simulation mode***, in **Name**, choose **Simulate** (Figure 13).

Figure 13 Hardware Setup



Serial Number:

Name: Simulate

☑ This is a dual-armed system

Left Pod Type: Left Multichannel Pod

Right Pod Type: Right Span Pod

1. Choose **Simulate** here to for methods to be run in the Simulator.

IMPORTANT When changing the **Name** to **Simulate**, take note of the original name so you can easily switch back when running on hardware.

---

3 Choose **Accept**.

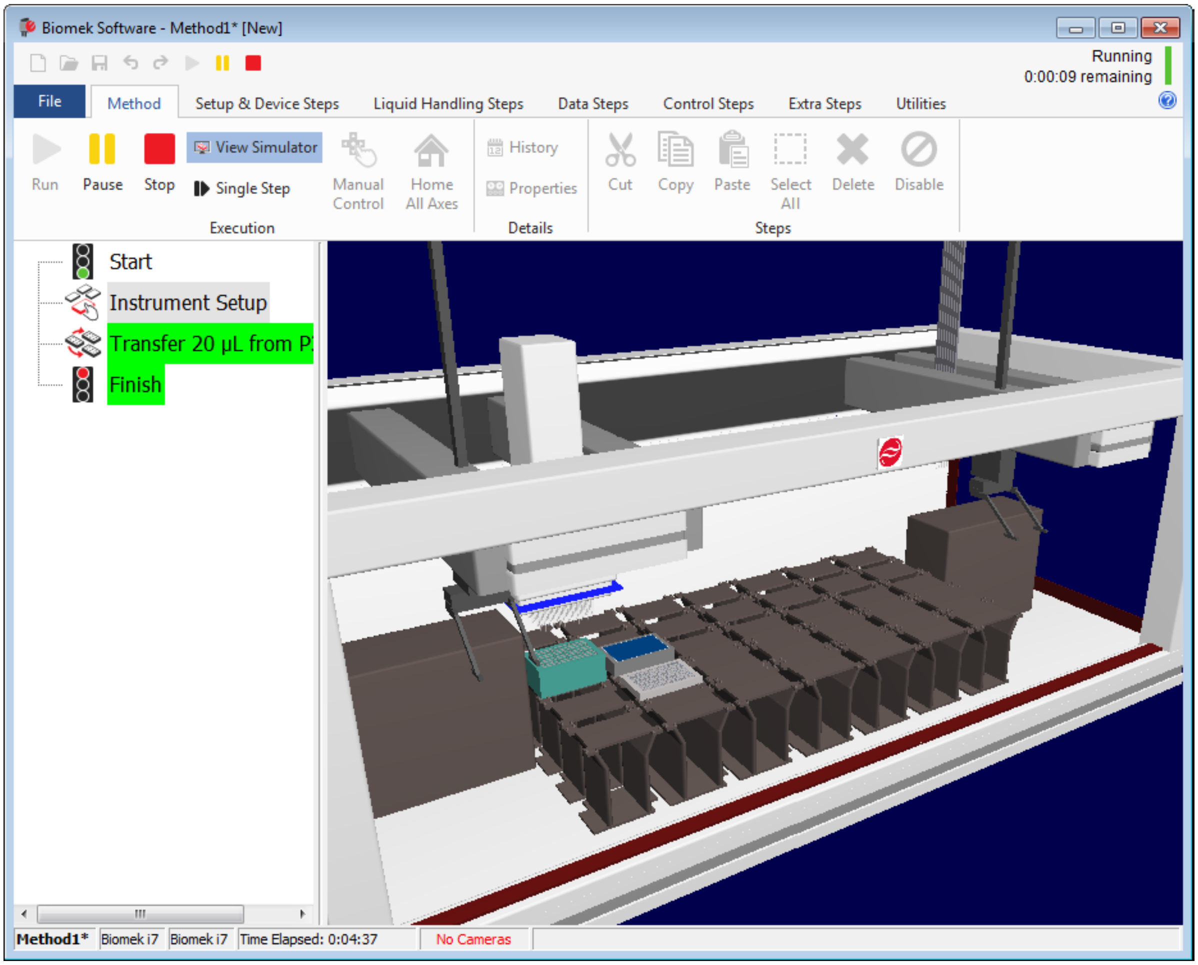
If you are using Simulate mode, an animated 3-D model of the instrument is displayed (Figure 14). You can now watch a simulation of the instrument perform the steps in the method.

IMPORTANT When switching from **Simulation** mode to running a method on hardware, the instrument must be homed. More information on homing the instrument is in CHAPTER 1, *Running the Method on Hardware*, for **Multichannel** tutorials or CHAPTER 6, *Running the Method on Hardware*, for **Span-8** tutorials.

TIP The simulator can be a useful tool to test methods to ensure that they are performing as expected without using up valuable reagents or tips, and can save time not only in set up, but also by running at an accelerated speed. Refer to the *Biomek i-Series Software Reference Manual* (PN B56358), *Configuring the Simulator*, for more information on the simulator.

TIP You can fine tune your method while running it on hardware using the **Single Step** option. **Single Step** pauses the instrument between each operation in a step, allowing visual verification that the operation is correct. If you wish to use **Single Step**, it is recommended to do so once you have completed all of the tutorials for the desired pod. Refer to APPENDIX B, *Single Operations*, for instructions.

Figure 14 Running a Method in Simulation



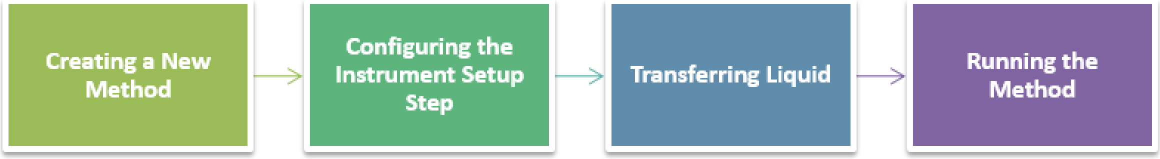
CHAPTER 1

Multichannel Pod — Getting Started with Biomek Software

What You'll Learn in Getting Started with Biomek Software

IMPORTANT Prior to beginning this chapter, read thoroughly and complete all applicable activities in *Basic Learning Concepts* (in the Introduction of this manual).

In this chapter, you will learn how to create a basic liquid transfer method on a Multichannel pod. Topics covered in this chapter are presented below.



Creating a New Method

Starting a new method includes:

- *Creating a New Method File*
- *Understanding the Start and Finish Steps*

Biomek i-Series Concept

A method is a series of steps that control the operation of the instrument. The steps, located on ribbon tabs, present groups of icons representing the steps available for a method. To build a method, you first select the step in the Method View above where you would like the next step to be located, and then, from the appropriate ribbon tab, you select the step icon you want in your method. Place and configure each step to perform the operations as desired.

NOTE Steps already added to the Method View can be rearranged by simply selecting and dragging to the desired new location.

Creating a New Method File

To begin a method, you have the option of creating a new method or opening an existing method. In this tutorial, you'll create a new method. To create a new method:

---

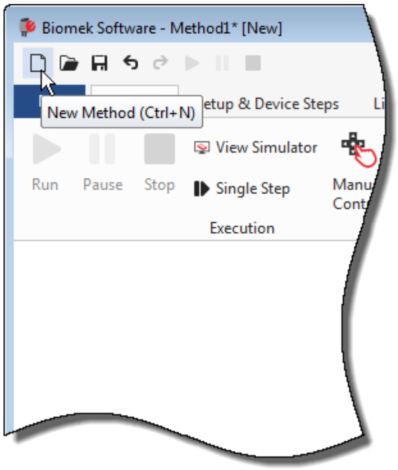
1 Select **File** > **New** > **Method**.

OR

Select **New Method** from the Quick Access Toolbar (Figure 1.1).

This creates the beginning for your new method.

Figure 1.1 New Method on the Quick Access Toolbar



---

2 If desired, expand the Biomek Software editor to fill the entire screen.

Understanding the Start and Finish Steps

As you can see (Figure 1.1), the Method View of the main editor now contains the **Start** and **Finish** steps that appear automatically when you create a method. These two steps are always there and indicate the beginning and end of your method. You'll insert all the rest of the steps you want the Biomek i-Series instrument to complete between **Start** and **Finish**.

When the **Start** step is highlighted in the method view, you are presented with the opportunity to create some variables in the Configuration View. Ignore this configuration for our first chapter in this tutorial.

If you want to know more in-depth information on the **Start** configuration right now, refer to the *Biomek i-Series Software Reference Manual* (PN B56358), *Configuring the Start Step*.

You'll learn more about using the **Finish** step in *Determining the Estimated Time for Completion (ETC) of the Method*.

Configuring the Instrument Setup Step

The next activity of this tutorial is to configure the **Instrument Setup** step for your liquid-transfer procedure. You will place on the deck:

- Tips
- Source reservoir
- Destination microplate

TIP If the **Instrument Setup** step, or any step, is inserted into the wrong location in the Method View, you can drag and drop it to the proper location.

To insert the **Instrument Setup** step:

---

1 Choose (highlight) **Start** in the Method View.

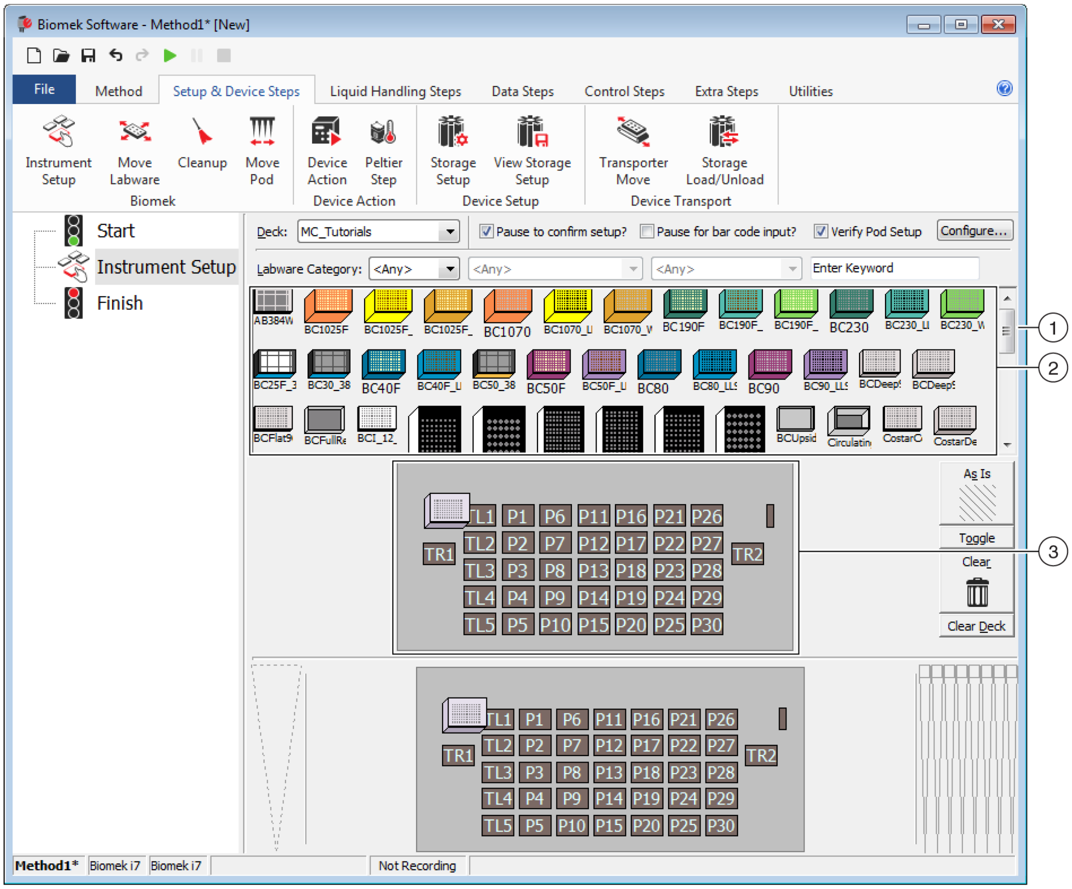
---

2 On the **Setup & Devices Steps** tab, in the **Biomek** group, hover your mouse over the Instrument Setup (**Instrument Setup**) icon. As you hover, look at the Method View and you'll see a black bar appear just below **Start**. This black bar indicates the insertion point where your next step will appear. In this case, it's where the **Instrument Setup** step will be inserted.

TIP Another way to insert a step into the method is to click on the step icon (on the ribbon tab) and drag it to the Method View, releasing the mouse button when the black bar is in the appropriate location.

3 Click the **Instrument Setup** icon to insert the step. The **Instrument Setup** configuration appears (Figure 1.2).

Figure 1.2 Instrument Setup Step Configuration



Deck: MC_Tutorials
☑ Pause to confirm setup?
☐ Pause for bar code input?
☑ Verify Pod Setup
Labware Category: <Any>

1. Move this scroll bar down to display all the labware choices.
2. **Labware Available**: Represents the labware choices for your method. Move your selections onto the Deck Layout display.
3. **Deck Layout**: Represents the layout of your deck. Place your labware selections onto the desired deck layout positions.

TIP Each pane can be resized by hovering your mouse over the bottom or side edge of the pane until the cursor changes to a double-sided arrow (⇳ or ⇹). Click and drag the edge of the pane up, down, or to the side, depending on whether you need to make it smaller or larger, and then release the mouse when finished.

Using the **Instrument Setup** step you just inserted, you'll learn how to select and place:

- **BC230** tips onto deck position **TL2** (Tip Load Position 2)
- **Reservoir** onto deck position **P2**
- **BCFlat96** microplate onto deck position **P3**

To select and place your labware:

---

1 In **Deck,** verify that the correct deck is being used for this tutorial. If the correct deck is not selected, click on the drop-down and select it. Refer to *Introduction*, *Selecting the Tutorial Default Deck*, for details.

---

2 From the Labware Available display, click the **BC230** tips icon, then click on deck position **TL2** in the Deck Layout. Notice that when you hover the cursor over the tip box on the Deck Layout, a tool tip identifies the deck position and labware. This procedure applies to all the labware you place on the deck.

---

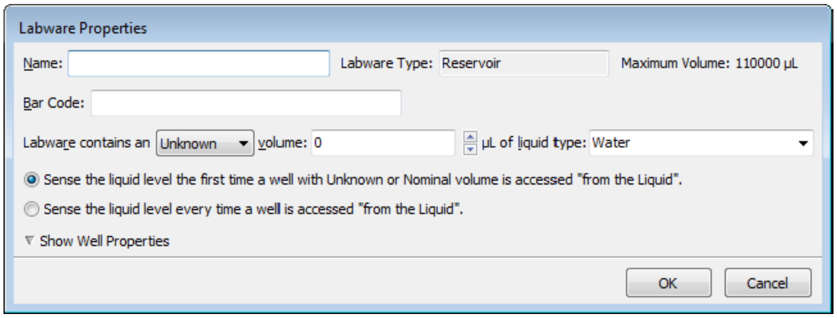
3 Using the above procedure, place a **Reservoir** onto the deck position **P2.**

---

4 After you have positioned the reservoir on the deck, double click it or right click and select **Properties**. This opens **Labware Properties** (Figure 1.3). Each piece of labware added to the Deck Layout is configured using **Labware Properties**. The information provided in **Labware Properties** is used when steps of a method are run or when tips are loaded and unloaded.

TIP Using **Labware Properties**, tips can be configured to be loaded back to the tip box (Multichannel pod only) or to the trash.

Figure 1.3 Labware Properties for Reservoir



Labware Properties

Name:

Labware Type: Reservoir

Maximum Volume: 110000 µL

Bar Code:

Labware contains an Unknown volume: 0 µL of liquid type: Water

● Sense the liquid level the first time a well with Unknown or Nominal volume is accessed "from the Liquid".

○ Sense the liquid level every time a well is accessed "from the Liquid".

5 In **Labware Properties**, you can give the reservoir a name. You'll name this one "**Rsvr**," but in general you can assign labware any name you want. Type **Rsvr** in the **Name** field. After configuration is complete, the name will appear over the reservoir in the Current Instrument Display (Figure 1.4).

TIP It's helpful to name your labware on the deck. You can assign a name that identifies the contents of the labware, or a descriptive name that fits the work being done in your laboratory. In addition, naming labware allows you to refer to it by name, rather than by position. For these reasons, naming labware can reduce confusion considerably. The name can then be used in other steps and appears in log files.

6 Leave **Bar Code** blank for this tutorial, but it can be used to identify a specific plate in certain methods.

7 In **Labware contains an**, select **Known**.

8 In the **Volume** field, type **100000**. This means you know you have 100,000 microliters of liquid in the source reservoir.

9 Choose **Water** from the **Liquid Type** drop-down menu, or type **Water** into this field.

10 Leave the default **Sense the liquid level the first time a well with Unknown or Nominal volume is accessed "from the Liquid"** selected. You'll learn more about liquid level sensing, only available with a Span-8 pod, later in the Span-8 tutorial.

11 Choose **OK**.

12 Place a **BCFlat96** microplate onto the deck in position **P3**.

13 Double click on the **P3** microplate, or right click and select **Properties**.

14 Type **Dest** in the **Name** field to represent the destination.

15 In **Labware contains a(n)**, select **Known** to indicate that you know the volume of liquid in the microplate.

16 In the **Volume** field, leave this value at **0**.

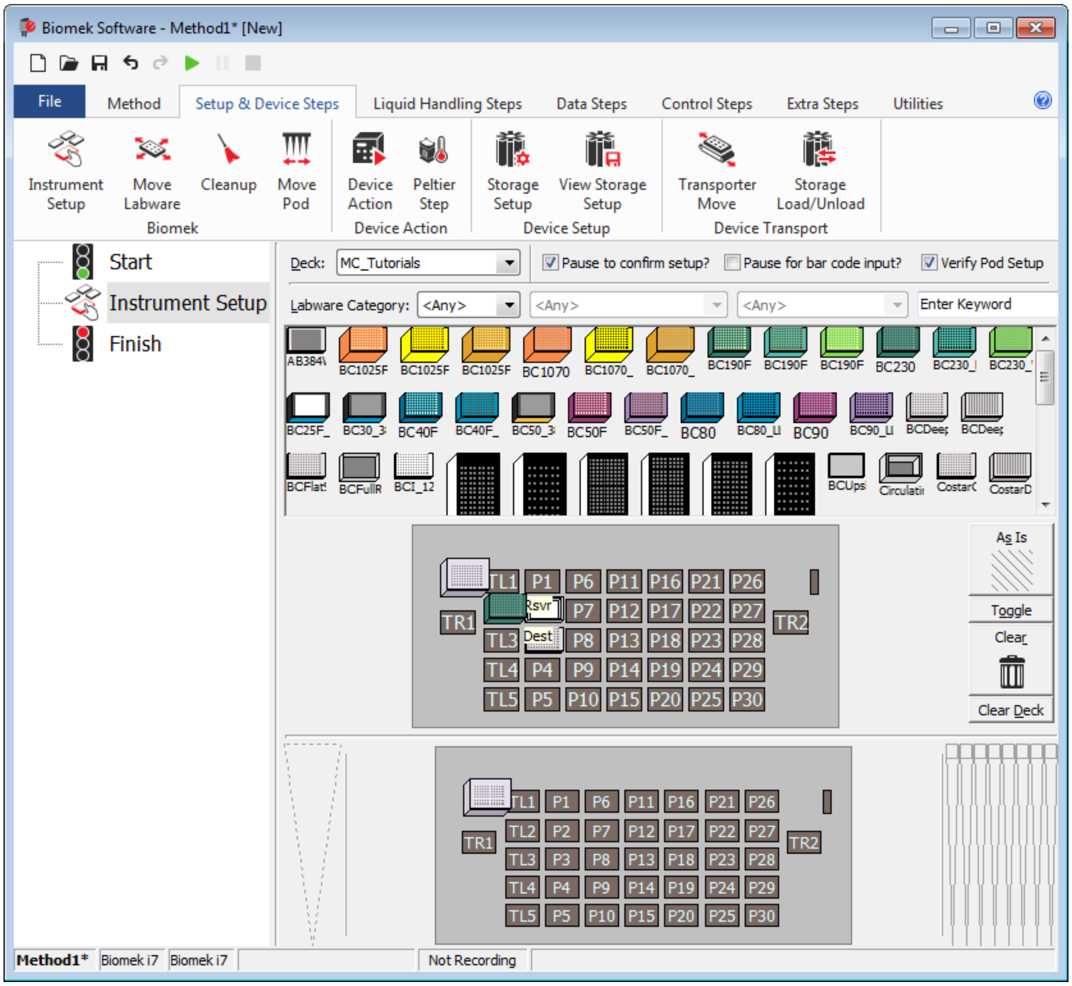
17 Do not specify a **liquid type** for this destination plate since it is presently empty.

18 Choose **OK**.

TIP Properties set for labware, such as in the steps above (name, volume, and liquid type), can be retained for easy reuse by other methods. To do this, from the **Labware Category** drop-down, which is located just above the Labware Available display, select **<Custom>**. Then drag the configured labware from the Deck Layout and drop it into the Labware Available display. The customized labware is now available for all methods using the current project.

That's it. Your deck is now set up for transferring liquid, and the main editor should look like Figure 1.4.

Figure 1.4 Instrument Setup Step Completed



Biomek Software - Method1* [New]

Deck: MC_Tutorials

☑ Pause to confirm setup? ☐ Pause for bar code input? ☑ Verify Pod Setup

Labware Category: <Any> <Any> <Any> Enter Keyword

Method1* Biomek i7 Biomek i7 Not Recording

Setting Up the Liquid Transfer

Now you are ready to insert and configure your method to transfer liquid. Biomek Software provides a **Transfer** step, which is located in the **Basic Liquid Handling** group on the **Liquid Handling Steps** tab, that makes it easy to accomplish this task.

Configuring the **Transfer** step includes configuring:

- Tip handling
- Source labware
- Destination labware

> **Biomek i-Series Concept**
>
> The **Transfer** step for the Multichannel pod transfers liquid from one source to one or more destinations. The **Transfer** step will by default complete the following: load tips, aspirate liquid, dispense liquid, and unload tips. This concept eliminates the need to insert four separate steps, although occasionally a method may require these steps be performed individually. These individual steps will be covered in CHAPTER 3, *Multichannel Pod — Using Individual Steps to Transfer Liquid and Handle Labware*.

Configuring Tip Handling

To set up a liquid transfer, insert the **Transfer** step into the Method View in the main editor, and configure the **Tip Handling** by completing the following:

---

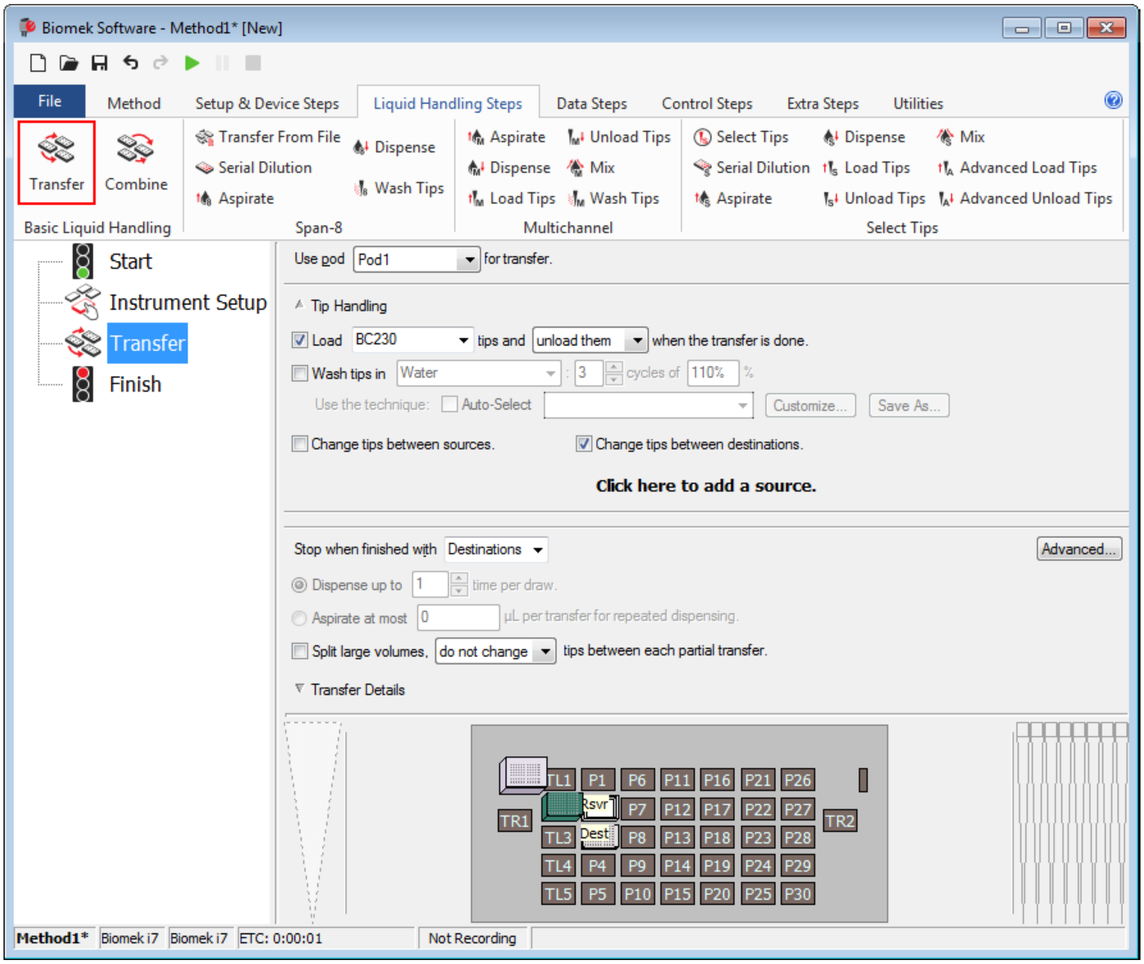
1 Highlight the **Instrument Setup** step.

---

2 On the **Liquid Handling Steps**, in the **Basic Liquid Handling** group, click the Transfer (**Transfer**) icon.

The **Transfer** step configuration appears (Figure 1.5). Notice the Current Instrument Display at the bottom of the editor is now populated to illustrate your deck setup since it changes dynamically to match the state of the deck at the start of the current step.

Figure 1.5 Transfer Step Inserted



Use pod Pod1 for transfer.

☑ Load BC230 tips and unload them when the transfer is done.

☐ Wash tips in Water : 3 cycles of 110% %

Use the technique: ☐ Auto-Select

☐ Change tips between sources. ☑ Change tips between destinations.

Stop when finished with Destinations

○ Dispense up to 1 time per draw.

○ Aspirate at most 0 µL per transfer for repeated dispensing.

☐ Split large volumes, do not change tips between each partial transfer.

---

3 In **Tip Handling**, make sure **Load** is checked.

---

4 Make sure the type of tips displayed is **BC230**, the type of tips you configured in **Instrument Setup.**

TIP If multiple tip types are on the deck, and the wrong tip type is displayed, you can easily change the tip type by clicking on the correct tip box in the Current Instrument Display.

---

5 Make sure **unload them** is selected in the next field.

---

6 Make sure **Wash tips in** is *not* selected. Tip washing will not be included in this method.

---

7 Check **Change tips between sources.**

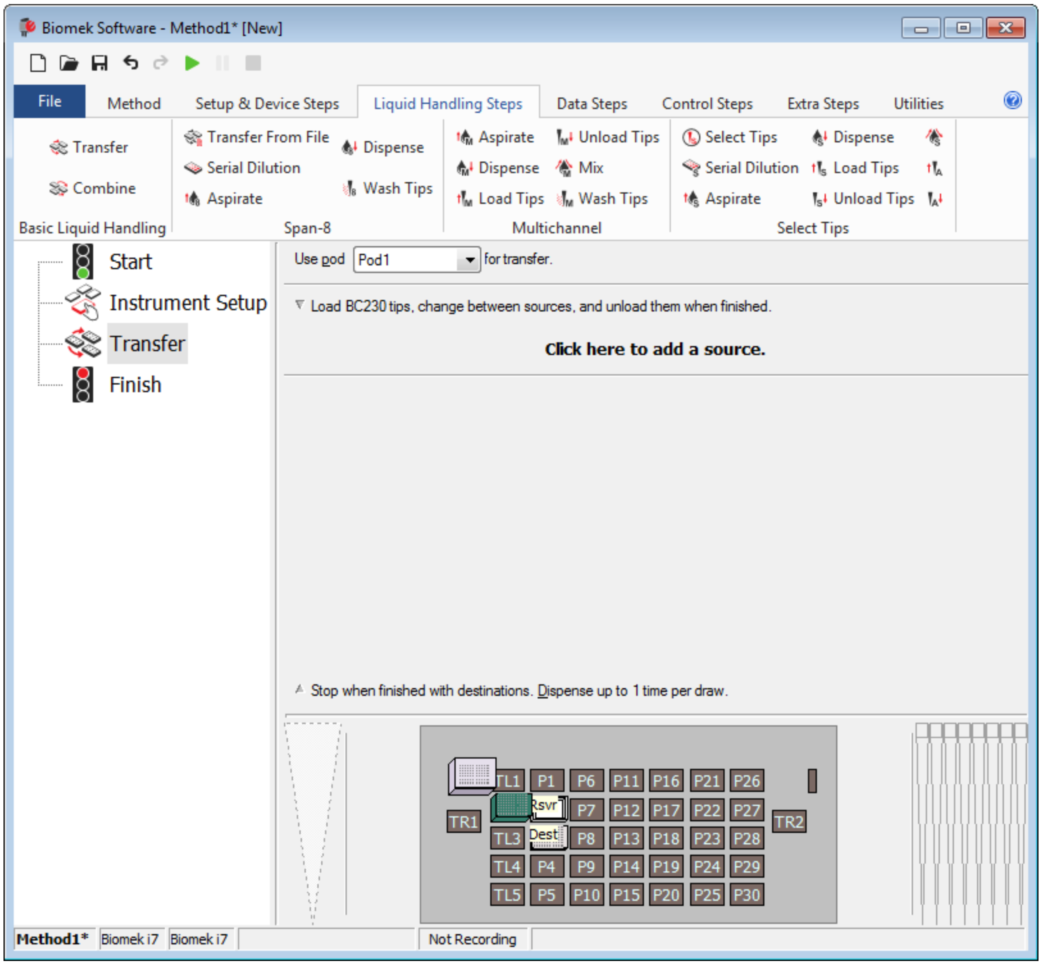
8 Uncheck **Change tips between destinations**.

9 Your tips are configured for your liquid transfer, so click the **up arrow** next to **Tip Handling** (Figure 1.5). This collapses the **Tip Handling** configuration to allow more room for labware configuration. A simple text description of the way tips will be handled is displayed in place of the expanded **Tip Handling** configuration.

TIP To make sure your tips are going to behave the way you want during method execution, simply collapse the **Tip Handling** configuration at any time during the process. The sentence displayed describes what you have configured and how the tips will be handled. If the description is not how you want the tips handled, expand the configuration and change it.

10 You will not be changing the **Transfer Details** section at this time, so click the **down arrow** next to **Transfer Details** to collapse the **Transfer Details** configuration to a summary. This gives you more room for the **Source** and **Destination** configurations. The editor now looks like Figure 1.6.

Figure 1.6 Tip Handling Configured and Collapsed



Use pod Pod1 for transfer.

Load BC230 tips, change between sources, and unload them when finished.

Click here to add a source.

Stop when finished with destinations. Dispense up to 1 time per draw.

Configuring Source Labware

Now you will configure the source labware. Here you will specify from which labware liquid will be aspirated and the height to which the tip descends into the labware before aspirating.

To configure the reservoir named **Rsvr** as the source labware:

---

1 Click on **Click here to add a source**.

---

2 Click on **Rsvr** labware on the **P2** position in the Current Instrument Display. As you can see, the information you supplied during **Instrument Setup** is displayed in the source labware configuration.

---

3 In the **Technique** drop-down, select the **MC P300 High** technique.

---

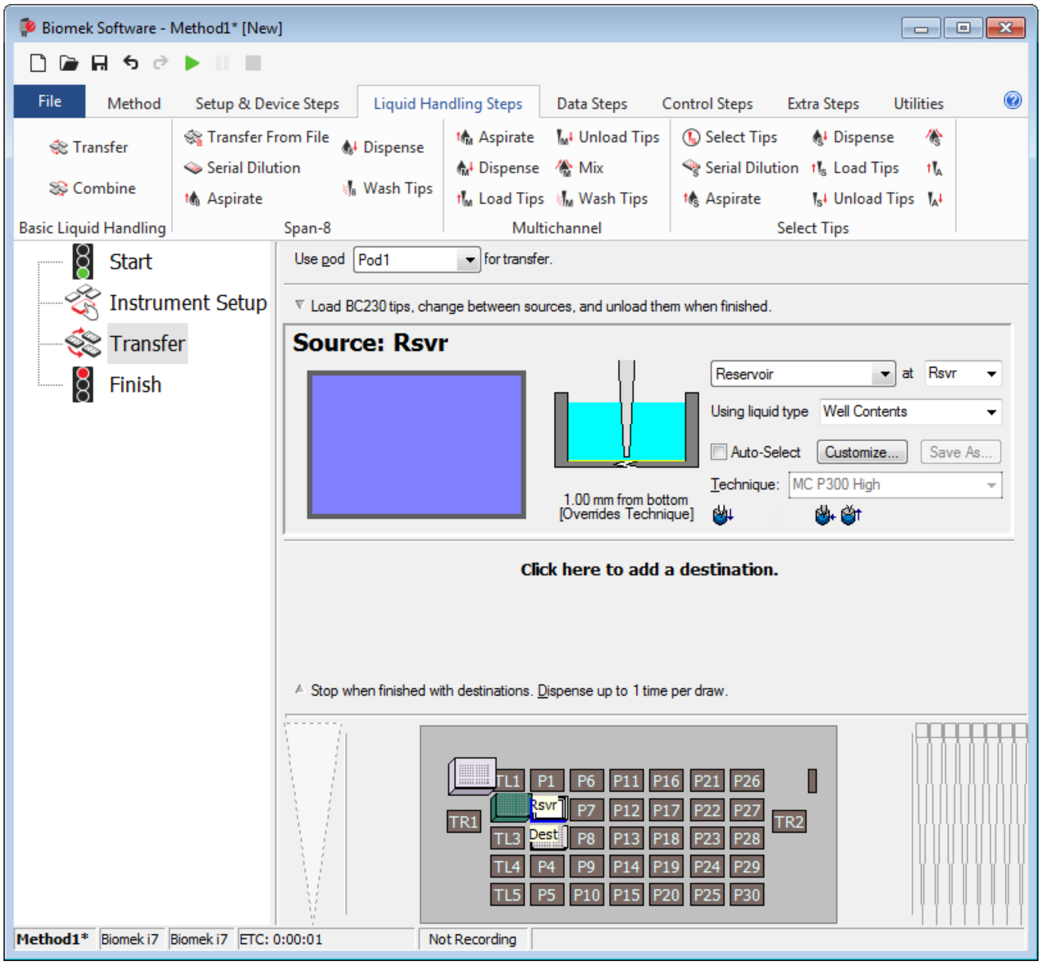
4 Right click on the large tip illustration next to the reservoir graphic in the configuration and choose **Measure from Bottom**.

TIP After you click on the tip, you can adjust the height more precisely by using the up or down arrow keys on your keyboard to change the height by 0.10 mm or you can use the **Page Up** and **Page Down** keys to change the height by 1.0 mm with each press of the key. You can also right click on the graphic, then select **Custom Height** from the menu that appears. When customizing the tip height, you are overriding the Technique selected for aspirating liquid. To learn more about configuring Techniques and using the **Technique Browser**, refer to the *Biomek i-Series Software Reference Manual*, PN B56358, *Understanding and Creating Techniques*.

5 To adjust and set the aspirate height to which the tip descends into the reservoir, place the **mouse cursor over the tip illustration.** When the cursor turns into a hand, hold the left mouse button down to move the hand up and down until the depth is as close to as you can get. Then adjust the height precisely to 1.00 mm using the **Tip** described in step 4 above. There is a slight break in the bottom of the source reservoir graphic with the large tip that indicates that the reservoir is wider than the graphic can display.

The source labware is complete, and the editor now looks like Figure 1.7.

Figure 1.7 Configured Source Labware



Biomek Software - Method1* [New]

Use pod: Pod1 for transfer.

Load BC230 tips, change between sources, and unload them when finished.

Source: Rsvr

Reservoir at Rsvr

Using liquid type: Well Contents

☐ Auto-Select

Technique: MC P300 High

1.00 mm from bottom
[Overrides Technique]

Click here to add a destination.

Stop when finished with destinations. Dispense up to 1 time per draw.

Method1* | Biomek i7 | Biomek i7 | ETC: 0:00:01 | Not Recording

Configuring Destination Labware

This procedure configures where the water from the source reservoir will be dispensed. In this case, dispense water into the **BCFlat96** microplate on deck position **P3**.

To do this:

1 Click the **Dest** microplate in the Current Instrument Display. This one operation accomplishes the same tasks as steps 1 and 2 of *Configuring Source Labware*. Notice that the source labware configuration fields are now replaced with a brief sentence summary of the setup. When the source configuration is collapsed, it can be opened by clicking anywhere in the collapsed configuration area.

TIP If you accidentally open too many destination configurations, just right click on the title in the configuration. Click **Delete** from the menu and the entire configuration goes away.

2 The volume field is highlighted in the destination configuration, which allows designation of the amount of liquid to be dispensed. For this tutorial, you're transferring 100 µL; so type **100** into the volume field. This means you will be dispensing 100 µL into each of the 96 wells; so in this case, you're dispensing a total of 9600 µL into the 96-well microplate.

3 In the **Technique** drop-down, select the **MC P300 High** technique.

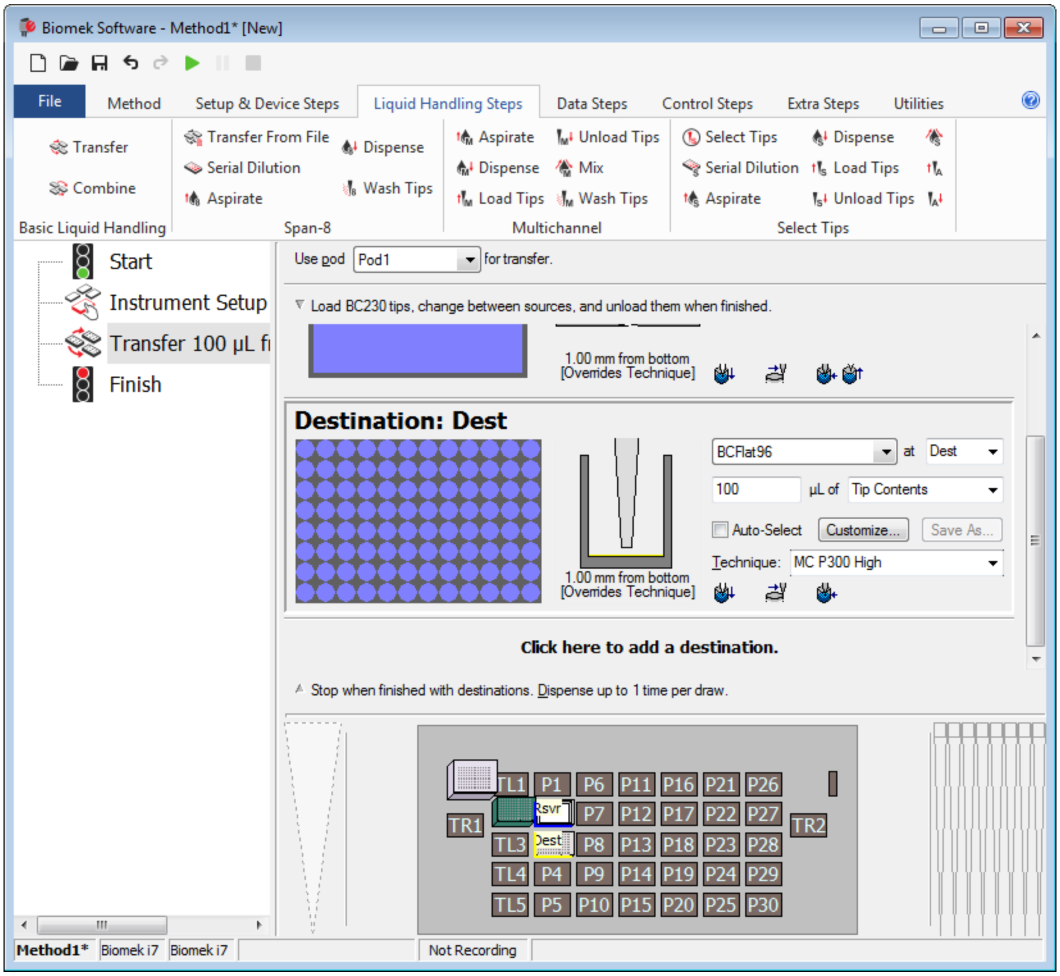
4 Right click on the large tip illustration and choose **Measure from Bottom**.

NOTE When customizing the tip height, you are overriding the Technique selected for dispensing liquid. To learn more about configuring Techniques and using the **Technique Browser**, refer to the *Biomek i-Series Software Reference Manual*, PN B56358, *Understanding and Creating Techniques*.

5 Set the dispense height in the large tip illustration to **1.00 mm from bottom**, using the same technique as you used for setting the aspirate height.

The destination labware is now configured and the editor looks like Figure 1.8.

Figure 1.8 Configured Destination Labware



Use pod Pod1 for transfer.

Load BC230 tips, change between sources, and unload them when finished.

1.00 mm from bottom [Overrides Technique]

Destination: Dest

BCFlat96 at Dest

100 µL of Tip Contents

Technique: MC P300 High

1.00 mm from bottom [Overrides Technique]

Click here to add a destination.

Stop when finished with destinations. Dispense up to 1 time per draw.

Determining the Estimated Time for Completion (ETC) of the Method

Your liquid transfer is set up, so let's see how long it will take to run the entire method by using the **Finish** step.

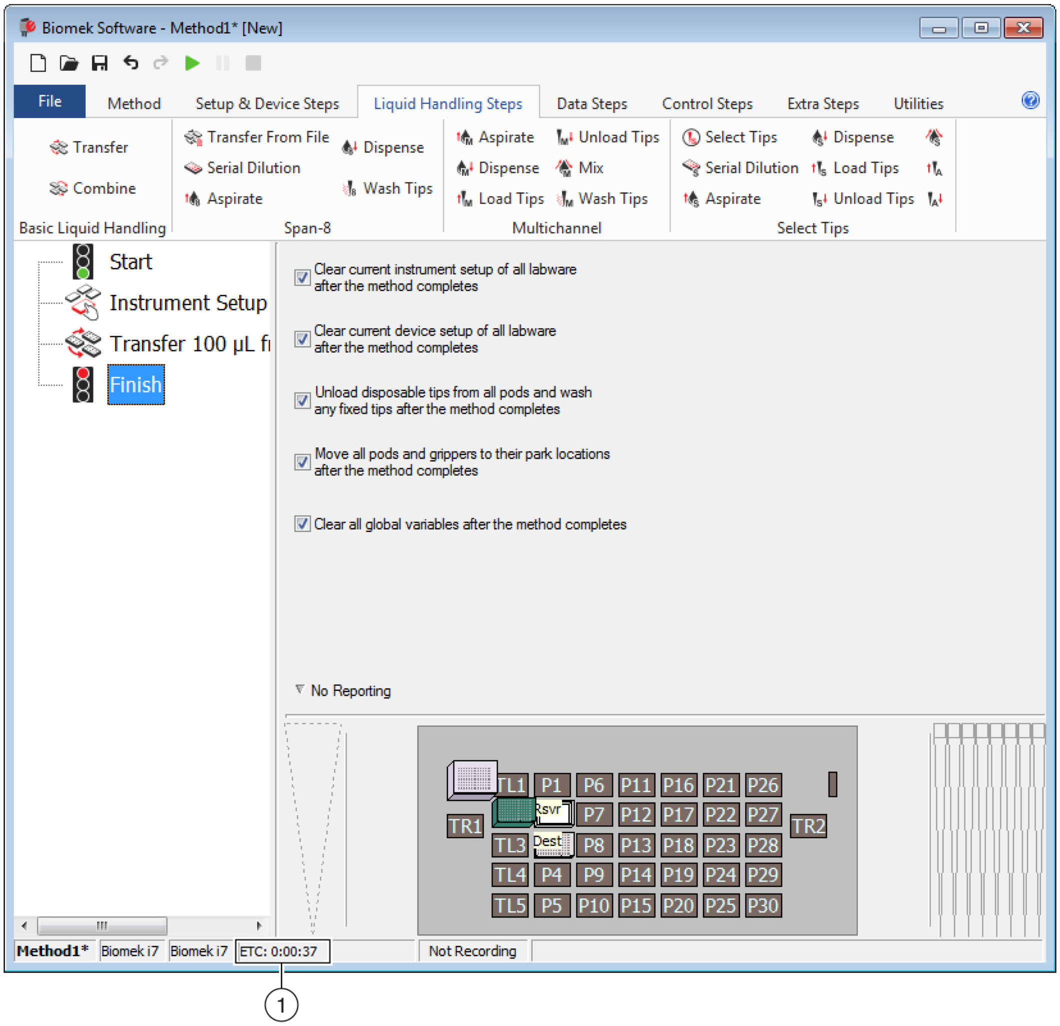
NOTE Selecting the **Finish** step also validates the method by checking for errors.

To do this:

1 Click on the **Finish** step in the Method View.

2 Check the status bar at the bottom of the editor for a display of the ETC. For this method, the ETC is approximately 37 seconds (Figure 1.9). It’s all right if your ETC varies slightly.

Figure 1.9 Finish Step Displaying the ETC



☑ Clear current instrument setup of all labware after the method completes

☑ Clear current device setup of all labware after the method completes

☑ Unload disposable tips from all pods and wash any fixed tips after the method completes

☑ Move all pods and grippers to their park locations after the method completes

☑ Clear all global variables after the method completes

No Reporting

1. **ETC**: The Estimated Time of Completion for the method in the Method View.

Congratulations! You’ve just built a liquid transfer method using Biomek Software that:

- Prepared the main editor for a new method.
- Set up the deck and the configured the labware you want to use using an **Instrument Setup** step.
- Added and configured a liquid transfer using a **Transfer** step.

Saving a Method

You will save the method you've just created.

Biomek i-Series Concept	
	Methods can be saved at any time during their development. Saving a method automatically checks in the method, creating a record of the revision that preserves the method configuration at the time it was saved. Revisions may be accessed from the revision history at a later time. If any project items, such as labware definitions or techniques, change after the method is saved, when the method is opened next, the latest definitions are used. Refer to the *Biomek i-Series Software Reference Manual* (PN B56358), *Saving a Method* and *Viewing Method History* for the more information.

To save your method:

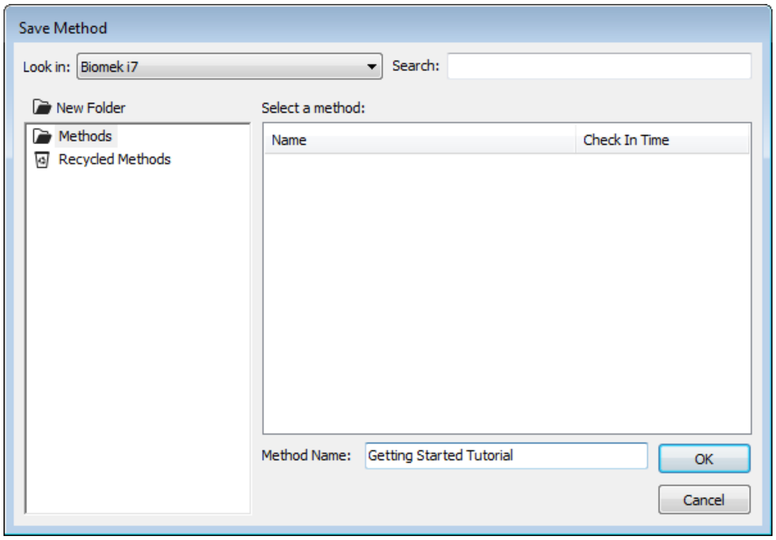
---

1 Select **File** > **Save** > **Method**.

---

2 In **Method Name**, type the file name under which your method will be saved. For this chapter, type **Getting Started Tutorial** (Figure 1.10).

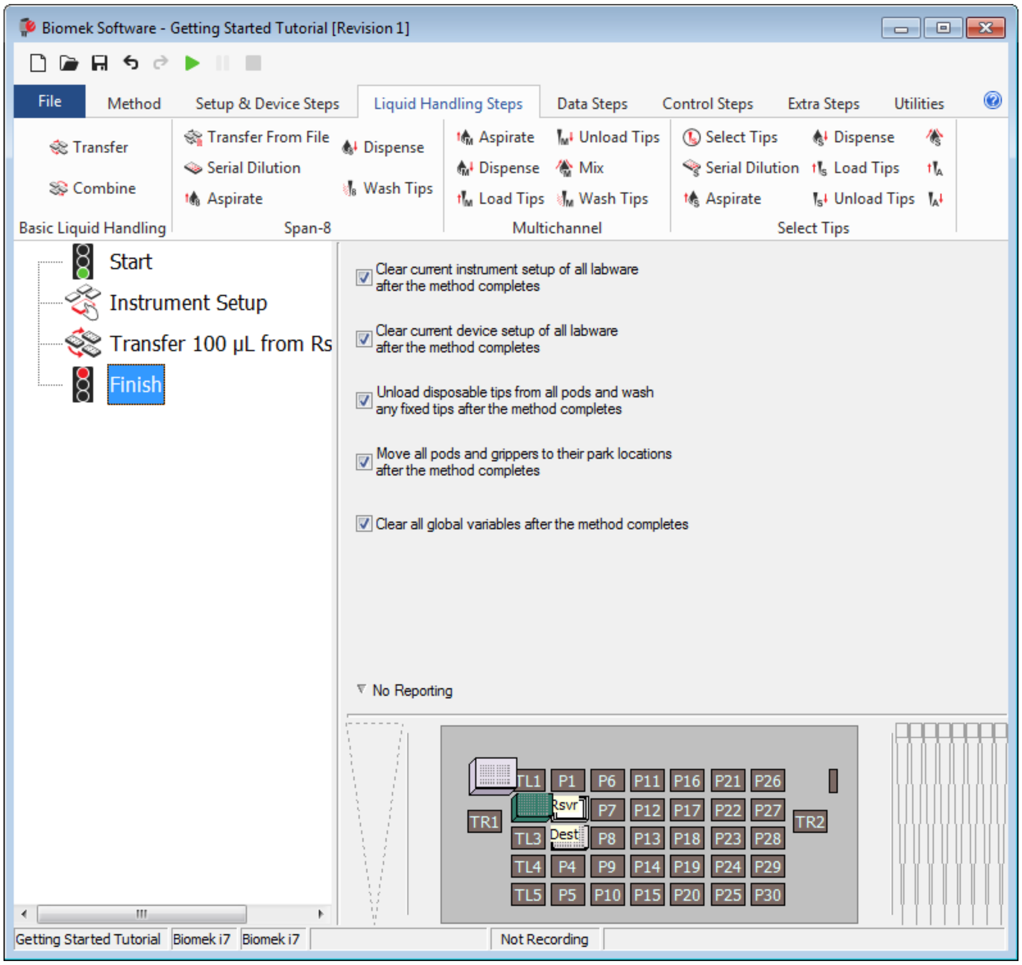
Figure 1.10 Save Method



Method Name: Getting Started Tutorial

3 Choose **OK.** Now notice how the method name in the title bar and in the bottom left corner of the main editor has changed to **Getting Started Tutorial [Revision 1]** (Figure 1.11).

Figure 1.11 Method Name Has Changed



☑ Clear current instrument setup of all labware after the method completes

☑ Clear current device setup of all labware after the method completes

☑ Unload disposable tips from all pods and wash any fixed tips after the method completes

☑ Move all pods and grippers to their park locations after the method completes

☑ Clear all global variables after the method completes

▿ No Reporting

Running the Method

Now that you've built a method, let's run it.

When you select **Run**, the method will be validated internally to check for errors. After this validation is complete, a deck confirmation prompt will appear over the main editor; this prompt displays the deck setup as interpreted by the software.

Run your method by following the instructions in the appropriate section below:

- *Running in Simulation Mode*
- *Running the Method on Hardware*

Running in Simulation Mode

The method runs as soon as you choose **OK** on the **Instrument Setup Confirmation** pop up window. You can visually follow the run in the Method View; steps are highlighted as the step is executed.

To run the method in Simulation Mode:

---

1 Click on the (**Run**) icon on the Quick Access Toolbar.

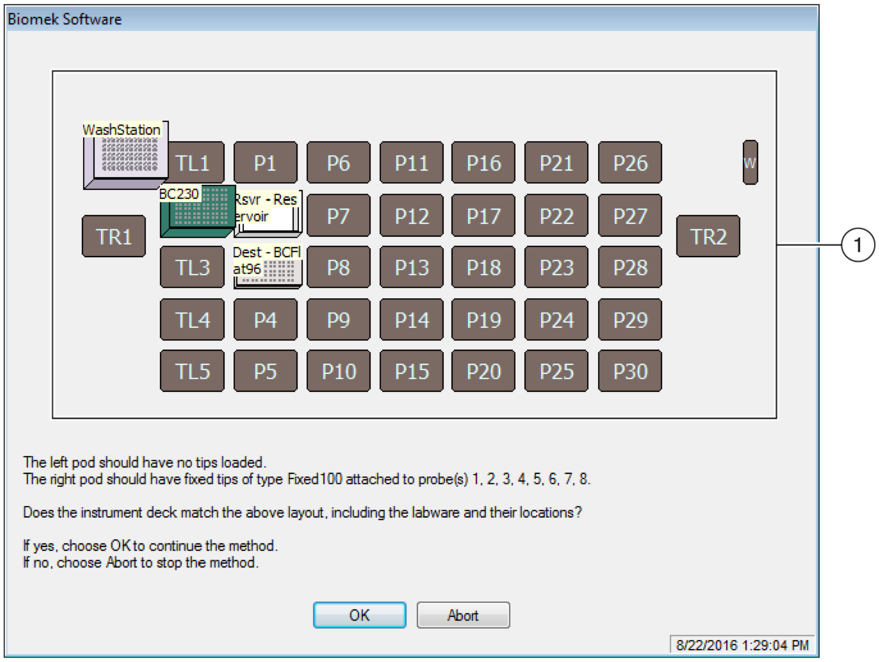
OR

From the **Method** tab, in the **Execution** group, choose Run (**Run**).

---

2 On the Deck Confirmation Prompt (Figure 1.12), select **OK**. You can visually follow the run in the Method View; steps are highlighted as the step is executed. When method is completed, the simulation window automatically disappears.

Figure 1.12 Deck Confirmation Prompt



The left pod should have no tips loaded.
The right pod should have fixed tips of type Fixed100 attached to probe(s) 1, 2, 3, 4, 5, 6, 7, 8.

Does the instrument deck match the above layout, including the labware and their locations?

If yes, choose OK to continue the method.
If no, choose Abort to stop the method.

1. Deck Setup

---

3 If necessary, re-save the method.

---

4 Close the method by selecting **File > Close Method**. Now go to CHAPTER 2, *Multichannel Pod — Using More Steps in a Method* to learn how to use more steps in a method.

Running the Method on Hardware

To run the method on the physical instrument:

---

1 Before running the method ***on Hardware*** (on your physical instrument), you will need to home all axes:

From the **Method** tab, in the **Execution** group, select Home All Axes (**Home All Axes**). A window appears, showing a list of warnings.

NOTE Choosing **Home All Axes** homes all of the axes for all pods.

---

2 Choose **OK** after confirming that the **Warning** has been addressed appropriately.

NOTE Other Warnings may also appear depending upon the type of heads and deck configuration of the Biomek i-Series instrument. Respond to all warnings appropriately and choose **OK** to continue.

---

3 Click on the ▶ (**Run**) icon on the Quick Access Toolbar.

OR

From the **Method** tab, in the **Execution** group, choose ▶ Run (**Run**).

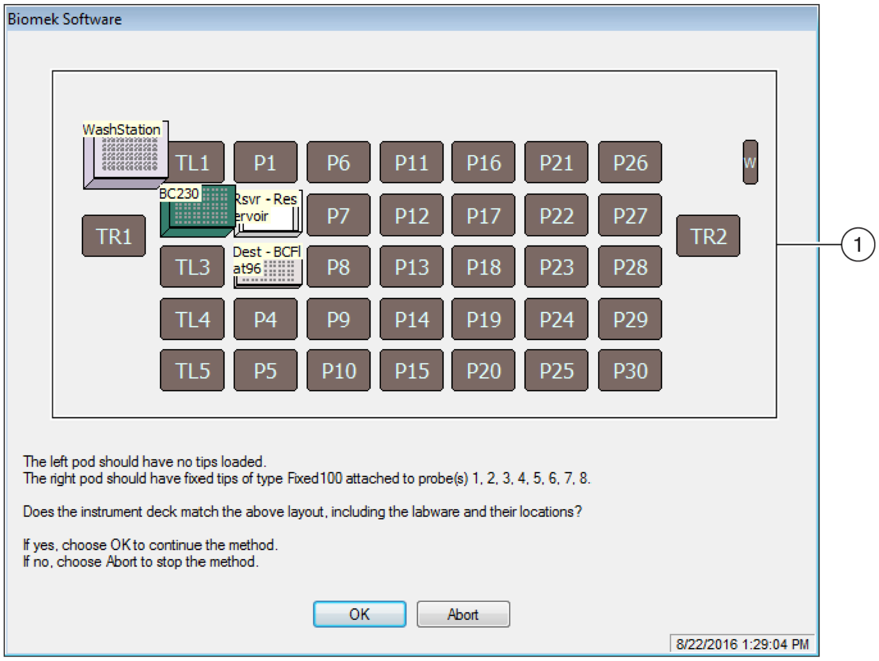
⚠ WARNING

Risk of equipment damage or contamination. Always verify that the physical instrument setup matches the instrument setup in Biomek Software. Inaccurate instrument setup can result in inappropriate pipetting or pod collision, resulting in equipment damage or hazardous waste spills.

4 Visually confirm the physical deck and pod setup, including labware placement and tip state on the pod, matches the Deck Confirmation Prompt (Figure 1.13) before continuing with the method.

IMPORTANT Biomek Software will not produce an error if the Biomek Software deck does not match the physical instrument deck. Be sure to carefully read the confirmation prompt and follow the instructions prior to choosing **OK**.

Figure 1.13 Deck Confirmation Prompt



The left pod should have no tips loaded.
The right pod should have fixed tips of type Fixed100 attached to probe(s) 1, 2, 3, 4, 5, 6, 7, 8.

Does the instrument deck match the above layout, including the labware and their locations?

If yes, choose OK to continue the method.
If no, choose Abort to stop the method.

1. The deck setup is displayed here. Make sure that the correct labware is placed on the deck and the instrument matches what the software expects.

---

5 If the physical deck does not match the deck shown, move or place labware on the deck so that it does match. Alternatively, you may choose **Abort** and adjust the **Instrument Setup** step to match your physical deck setup.

---

6 When the physical deck setup matches the deck shown, choose **OK**. The method runs as soon as you choose **OK**.

7 If necessary, re-save the method.

8 Select **File > Close Method.** Now go to CHAPTER 2, *Multichannel Pod — Using More Steps in a Method* to learn how to use more steps in a method.

CHAPTER 2

Multichannel Pod — Using More Steps in a Method

Introduction to Using More Steps in a Method

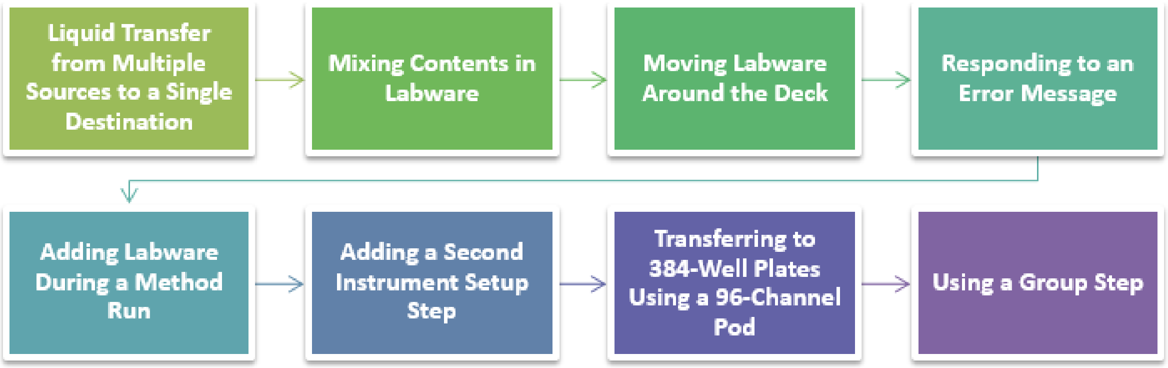
In the first chapter of this tutorial, you learned how to:

- Build a liquid-transfer method.
- Save, run, and check in a method.

TIP Click on the **Finish** step to validate the method after configuring or changing a step; this practice helps you to quickly identify and resolve errors. Saving the method at regular intervals, especially after adding new steps or editing steps of the method is highly recommended.

What You'll Learn in This Chapter

This chapter will help you develop the skills to create basic transfer methods for tasks such as reaction setup and reformatting from one destination to another; for example, transferring liquid from 96 to 384-well plates. You will also learn how to pause the system to add more labware to the deck and handle errors. The process for creating the method in this chapter is presented below. All of these topics are covered in detail in this chapter.



Instrument Setup for Using More Steps in a Method

For this tutorial, you will be setting up labware on the deck to learn how to incorporate them into your methods.

Setting Up the Deck

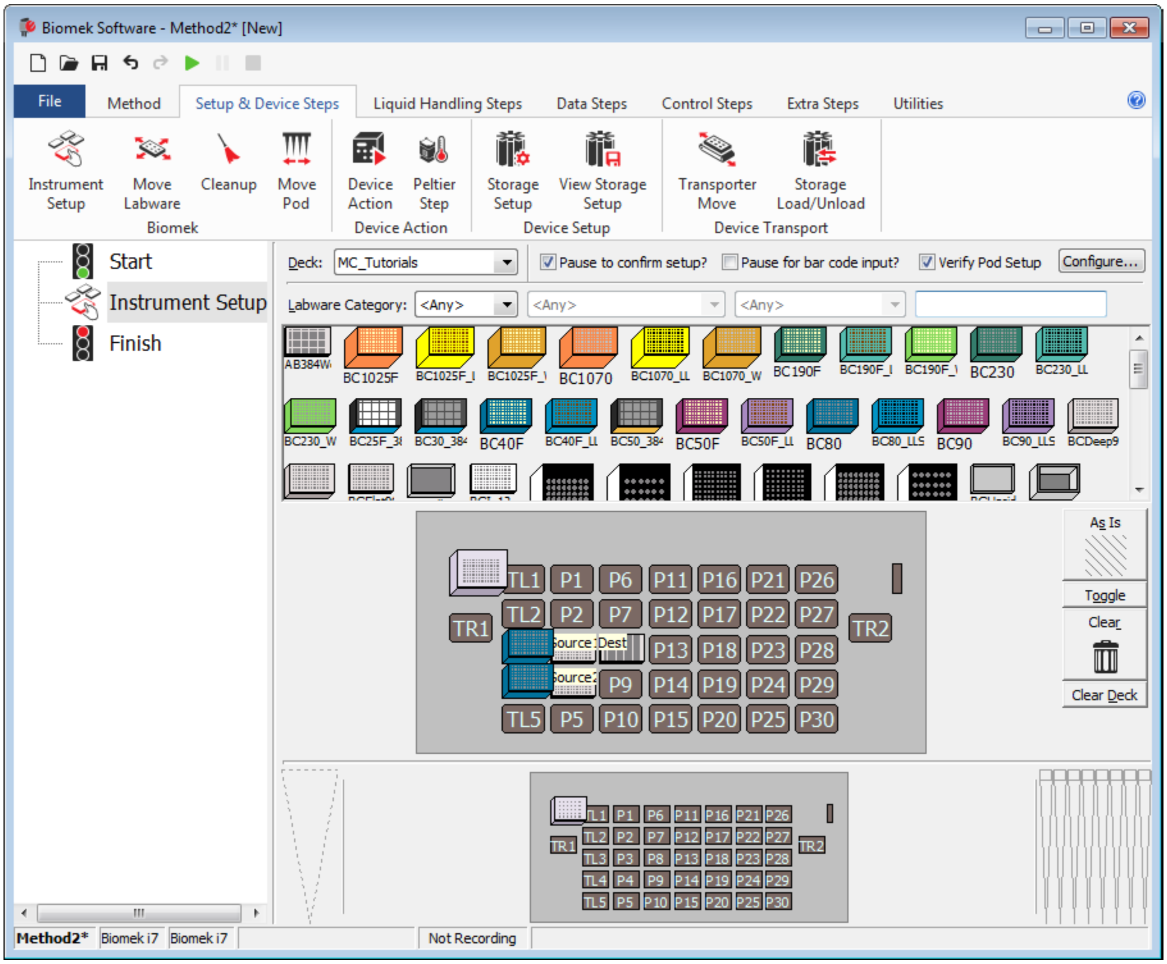
Using what you learned in CHAPTER 1, *Multichannel Pod — Getting Started with Biomek Software*, launch Biomek Software, create a new method (**File > New > Method**), add an **Instrument Setup** step, and configure the following:

1. Place **BC80** tip boxes on **TL3** and **TL4**.
2. Place **BCFlat96** plates on **P3** and **P4** and name them **Source1** and **Source2**. Give these source plates a **Known** volume of **150** µL of **Water**.
3. Place a **CostarFlat384Square** on **P8** and name it **Dest**. Give this destination plate a **Known** volume of **0** µL.

Appearance of the Deck for This Tutorial

Your deck setup should look like Figure 2.1. Now go to the next activity to learn how to create a method using other steps in your methods.

Figure 2.1 Completed Instrument Setup Step



Deck: MC_Tutorials ☑ Pause to confirm setup? ☐ Pause for bar code input? ☑ Verify Pod Setup

Labware Category: <Any>

Transferring Liquid from Multiple Sources to a Single Destination

To transfer liquid from one or more sources to a single destination, a **Combine** step is used. It is similar to a **Transfer** step which uses a single source and one or more destinations.

Like the **Transfer** step, the **Combine** step will by default complete the following:

- load tips
- aspirate liquid
- dispense liquid
- unload tips

For this activity, you will use the default tip handling, configure the two sources, configure the destination, and configure transfer details. The configured **Combine** step will transfer the sources from two 96-well source plates to a 384-well destination plate.

Configuring Tip Handling

To set up the **Combine** step, you will insert the **Combine** step in the Method View and use the default settings for **Tip Handling**.

1 Ensure your deck is configured according to the instructions in *Instrument Setup for Using More Steps in a Method*.

2 Select the **Instrument Setup** step in the Method View.

3 From the **Liquid Handling Steps** tab, in the **Basic Liquid Handling** group, select the Combine (**Combine**) step to insert it in the Method View.

4 Verify that the correct pod is selected in the **Use pod** field. If it needs to be changed, select the correct pod from the drop-down.

5 In **Tip Handling** (in the Configuration View), make sure **Load** is checked.

6 Make sure the type of tip displayed is **BC80**, the type you configured in **Instrument Setup**.

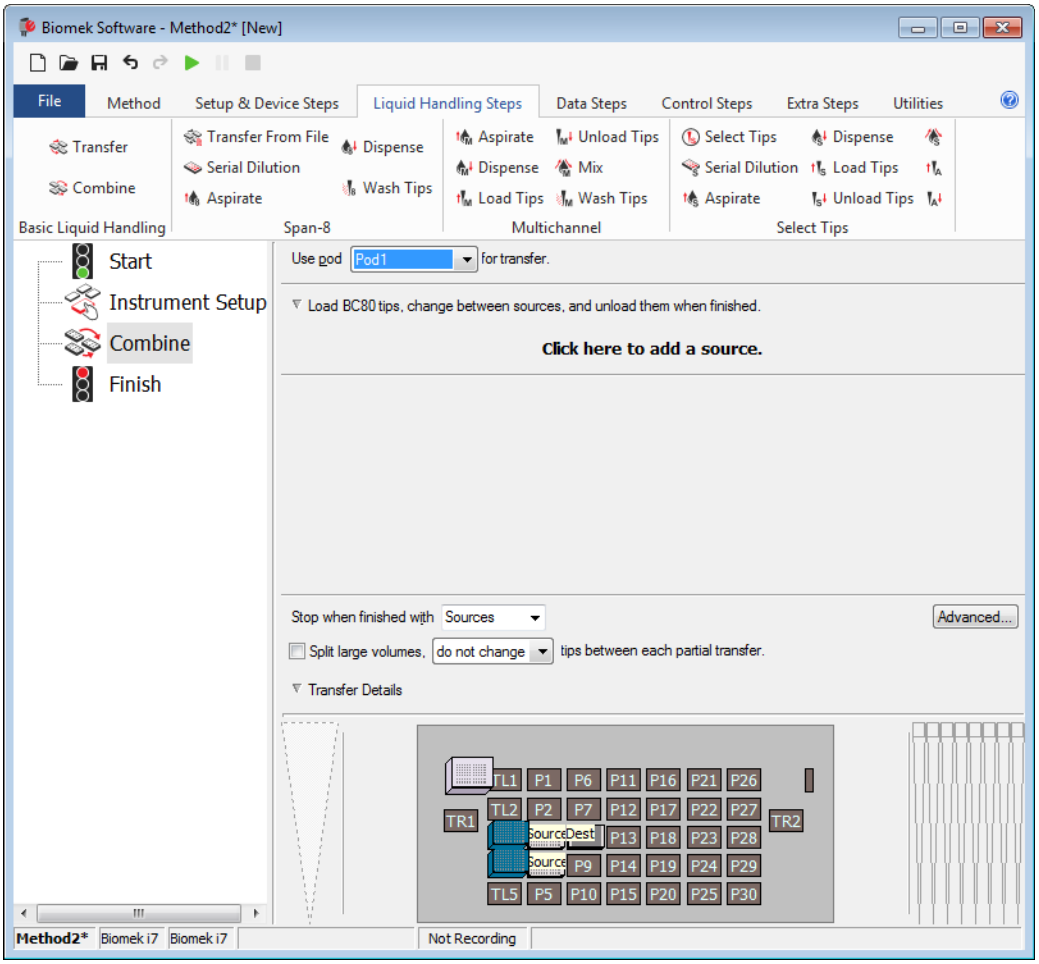
7 Make sure **unload them** is selected in the next field.

8 Make sure **Wash tips in** is ***not*** selected. Tip washing will not be included in this method.

9 Check **Change tips between sources** and make sure **Change tips between destinations** is ***not*** checked.

10 Collapse **Tip Handling.** Your main editor should look like Figure 2.2.

Figure 2.2 Combine Step Inserted and Tip Handling Collapsed



Use pod Pod1 for transfer.

Load BC80 tips, change between sources, and unload them when finished.

Click here to add a source.

Stop when finished with Sources

☐ Split large volumes, do not change tips between each partial transfer.

Transfer Details

Configuring Source Labware

To configure the two 96-well plates from which you're going to aspirate:

1 Click on **Click here to add a source** (Figure 2.2).

2 Click on **Source1**, sitting on **P3**.

3 In the volume field, designate the amount of liquid to be aspirated. For this method, you're aspirating 40 µL, so type **40** into the volume field.

4 In the **Technique** drop-down, select the **MC** technique.

5 Click on **Click here to add a Destination.** You will configure the destination in the next section, but must choose it here to activate another source option.

6 Click on the next **Click here to add a source**.

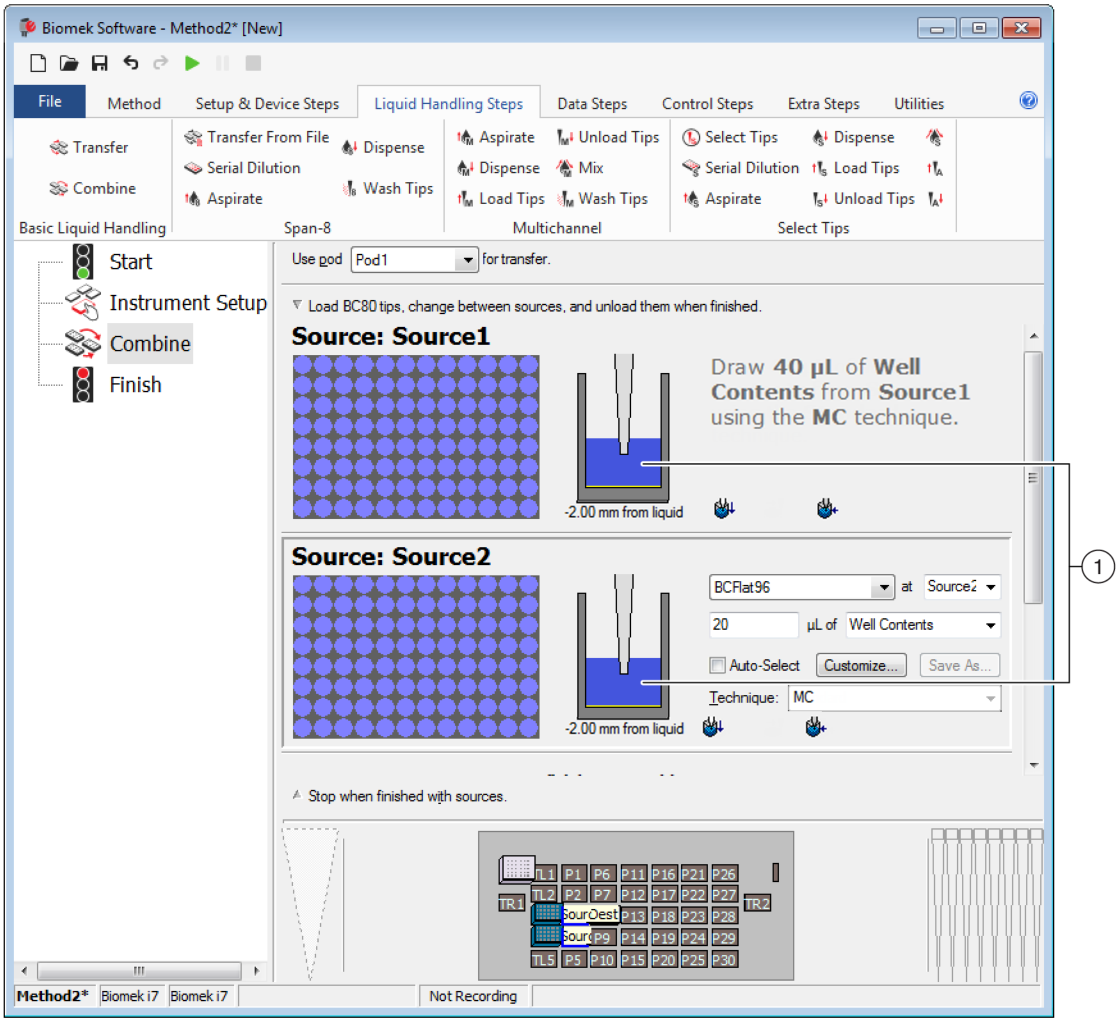
7 Click on **Source2** sitting on **P4** and type **20** into the volume field.

8 In the **Technique** drop-down, select the **MC** technique.

The source plates are now configured, and the editor should now look like Figure 2.3.

TIP The well volume display shows how much liquid is in the well. If the liquid is not visible in the display, you might be accidentally trying to aspirate from an empty destination rather than a source.

Figure 2.3 Source Labware for Combine Step Configured



Use pod Pod1 for transfer.

Load BC80 tips, change between sources, and unload them when finished.

Source: Source1

Draw **40 µL** of **Well Contents** from **Source1** using the **MC** technique.

-2.00 mm from liquid

Source: Source2

BCFlat96 at Source2

20 µL of Well Contents

☐ Auto-Select

Technique: MC

-2.00 mm from liquid

Stop when finished with sources.

1. Well Volume Display

Configuring Destination Labware

The next task is to designate where you want to dispense the aspirated liquid. For this method, you want to dispense into **Dest** on deck position **P8**. To accomplish this:

1 Click anywhere in the **Destination** configuration.

2 Click on **Dest** on deck position **P8**.

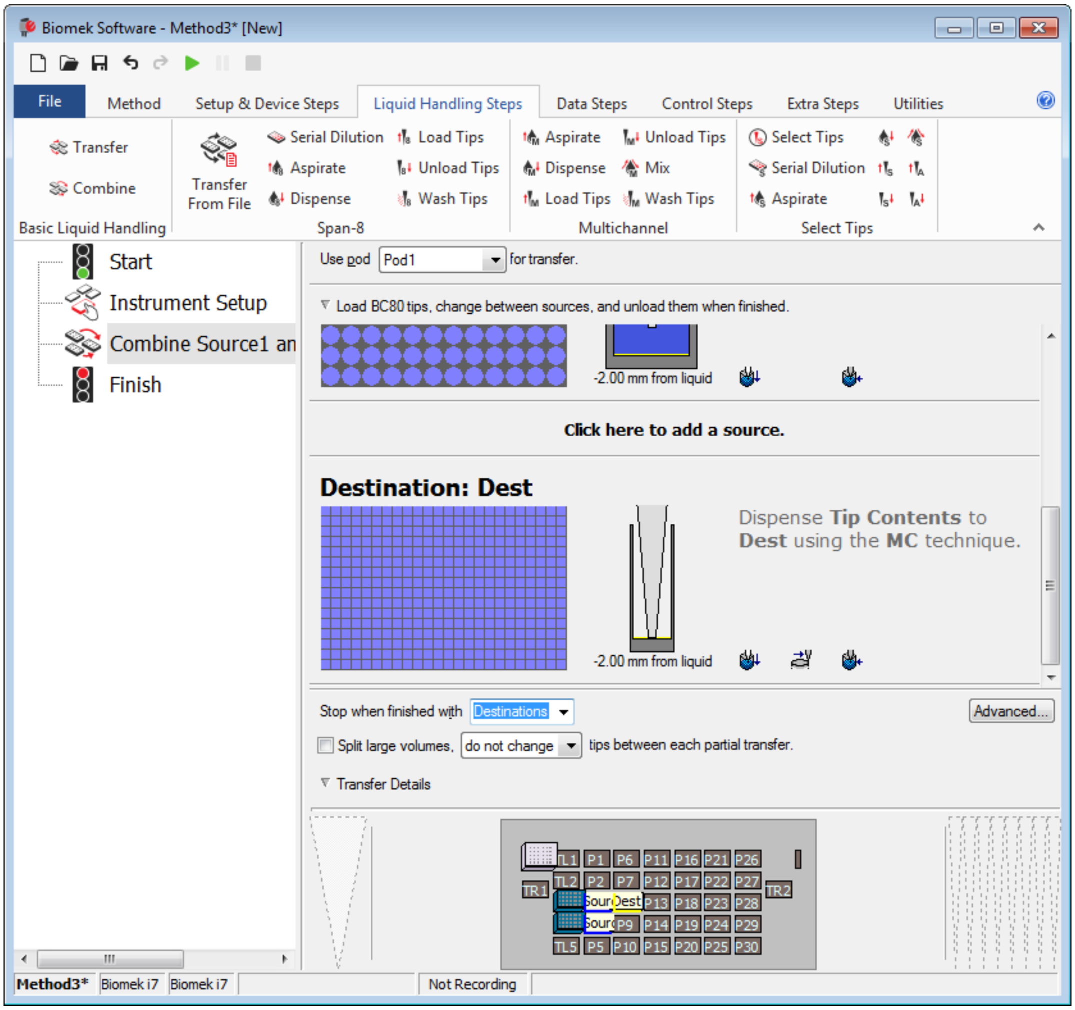
3 In the **Technique** drop-down, select the **MC** technique.

4 If **Transfer Details** is not opened, click on the arrow next to it.

---

5 Choose **Destinations** from the **Stop when finished with** drop-down list (Figure 2.4).

Figure 2.4 Stop When Finished with Destinations Chosen



Use pod Pod1 for transfer.

Load BC80 tips, change between sources, and unload them when finished.

-2.00 mm from liquid

Click here to add a source.

Destination: Dest

Dispense Tip Contents to Dest using the MC technique.

-2.00 mm from liquid

Stop when finished with Destinations

☐ Split large volumes, do not change tips between each partial transfer.

Transfer Details

That's it. You've just configured a **Combine** step to aspirate liquid from two sources in order to dispense it to a single destination.

The **Combine** step uses the **Source** and **Destination** configurations and the stop condition to configure a series of operations. When the method is executed, the **Combine** step will transfer liquid from each of the source plates in duplicate to two quadrants of the 384-well destination plate. (For example, 40 µL is transferred from source **plate1** to quadrants 1 and 2 on the destination plate and 20 µL from source **plate2** is transferred to quadrants 3 and 4 on the destination plate.) Later in this chapter, you will transfer to specific quadrants of a 384-well microplate using a 96-channel head.

---

6 Click on the **Finish** step to validate the method, and then save the method with a unique name.

Go to the next activity to learn how to mix the liquid in the destination plate after dispensing.

Mixing Contents in Labware

In the **Transfer** and **Combine** steps, you can alter liquid-handling functions that extend beyond simple aspirating and dispensing. For example, you can turn off the tip touch feature, activate the pre-wet function, or configure mixing operations. These modifications are accomplished through customizing the technique and are used to control the pipetting process.

NOTE A technique instructs the instrument how to perform pipetting operations, such as an aspirate, dispense, and mix.

Biomek i-Series Concept	
	Techniques are sets of predefined and stored values, including aspirate and dispense height, tip touch and other properties that affect pipetting. Based upon these stored sets of values and properties, the appropriate pipetting technique is selected automatically when you choose the **Auto-Select** option. If you want control over this automatic function, you can choose a custom height for each source and destination in a liquid transfer. The change here will only affect that **Transfer** step in the specific method (i.e., a local change). Project changes can be made and/or new techniques can be created via the **Technique Editor**; refer to the *Biomek i-Series Software Reference Manual*, PN B56358, *Understanding and Creating Techniques*, for additional information.

Let's suppose you wish to mix the contents of the destination plate once liquid from the two sources has been dispensed.

To complete this task:

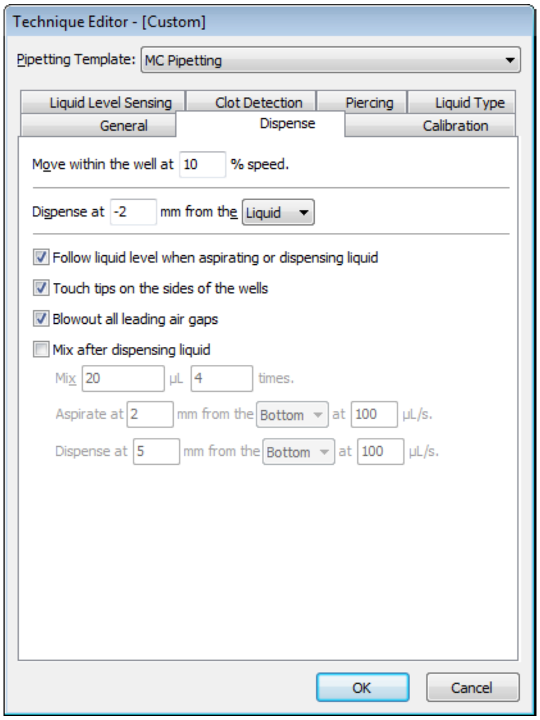
1 Click on the **Combine** step in the Method View.

2 Click the **Dest** labware in the Current Instrument Display, or click in the gray area around the destination configuration. This expands the destination labware configuration.

---

3 In the **Destination** configuration, select **Customize**. The **Technique Editor** opens to the **Dispense** tab (Figure 2.5).

Figure 2.5 Dispense Tab of the Technique Editor



Pipetting Template: MC Pipetting

Move within the well at 10 % speed.

Dispense at -2 mm from the Liquid

☑ Follow liquid level when aspirating or dispensing liquid
☑ Touch tips on the sides of the wells
☑ Blowout all leading air gaps
☐ Mix after dispensing liquid

Mix 20 µL 4 times.
Aspirate at 2 mm from the Bottom at 100 µL/s.
Dispense at 5 mm from the Bottom at 100 µL/s.

Configuring “Mix after dispensing liquid”

Now, you will configure the options to mix the contents in the destination after dispensing.

To mix after dispensing:

---

1 From the **Dispense** tab (Figure 2.5), check **Mix after dispensing liquid**. The fields for this option are enabled. We’ll allow some of the defaults to remain except for the amount and number of times to mix.

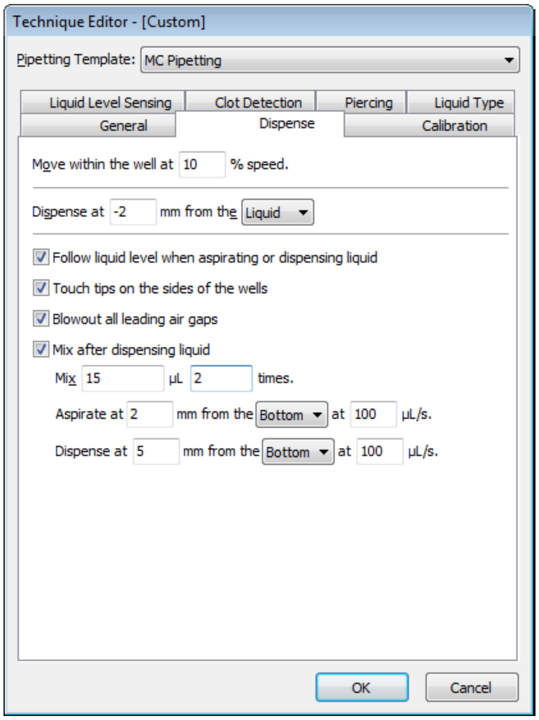
---

2 In the **Mix** field, enter **15**. This specifies the amount of microliters that will be aspirated and dispensed during mixing.

3 In the next field enter **2** to specify the number of times you want to mix the liquid after dispensing. You're finished configuring the mix after dispensing process. The **Technique Editor** should now look similar to Figure 2.6.

IMPORTANT Pipetting **from the Bottom** can sometimes cause wells to overflow, or it can contaminate the tips. For best results, mixing in a bottom-to-top pattern is optimal; for example, you should aspirate at **1 mm from the Bottom**, and dispense at **0 mm from the Liquid**. The idea is to not stay at a static height for mixing procedures. This is a concern for this tutorial only if you are running on hardware; if so, change the configuration to **Aspirate at 2 mm from the bottom** and **Dispense at 0 mm from the liquid**.

Figure 2.6 Configured Mix in a Custom Technique



Technique Editor - [Custom]

Pipetting Template: MC Pipetting

Move within the well at 10 % speed.

Dispense at -2 mm from the Liquid

☑ Follow liquid level when aspirating or dispensing liquid
☑ Touch tips on the sides of the wells
☑ Blowout all leading air gaps
☑ Mix after dispensing liquid

Mix 15 µL 2 times.

Aspirate at 2 mm from the Bottom at 100 µL/s.

Dispense at 5 mm from the Bottom at 100 µL/s.

---

4 Choose **OK** to close the **Technique Editor**.

After you configure the mix operation and return to the **Combine** step configuration, you see a icon, indicating that the technique now includes mixing. This is one of several icons that indicate the different procedures in the pipetting technique. You will also notice that your technique now says **[Custom]**. A Technique should be saved if you customized it using the **Customize** button. To save the Technique, click the **Save As** button, located above the **Technique** drop-down; enter a name for the new technique, and then select **OK**. This will allow you to use the Technique again in subsequent steps or other methods within the project.

Moving Labware Around the Deck

On the **Setup & Devices Steps** tab, in the **Biomek** group, you can see a Move Labware (**Move Labware**) step icon. When you insert and configure this step in your method, the gripper/Multichannel pod behaves as follows:

- The pod moves adjacent to the selected labware, and then the gripper moves down.
- The gripper fingers slide around the labware and then clasp it, securing its grip.
- The gripper moves up and carries the labware to the designated position.
- The gripper moves down, and the gripper fingers release the labware at the new position.

NOTE For information on required clearance when moving labware, see the *Biomek i-Series Software Reference Manual* (PN B56358), *Understanding Labware Adjacency Rules*.

Moving Labware Using the Gripper

For this part of the tutorial, let's suppose that you wish to move a plate to another part of the deck to make room to add a different plate.

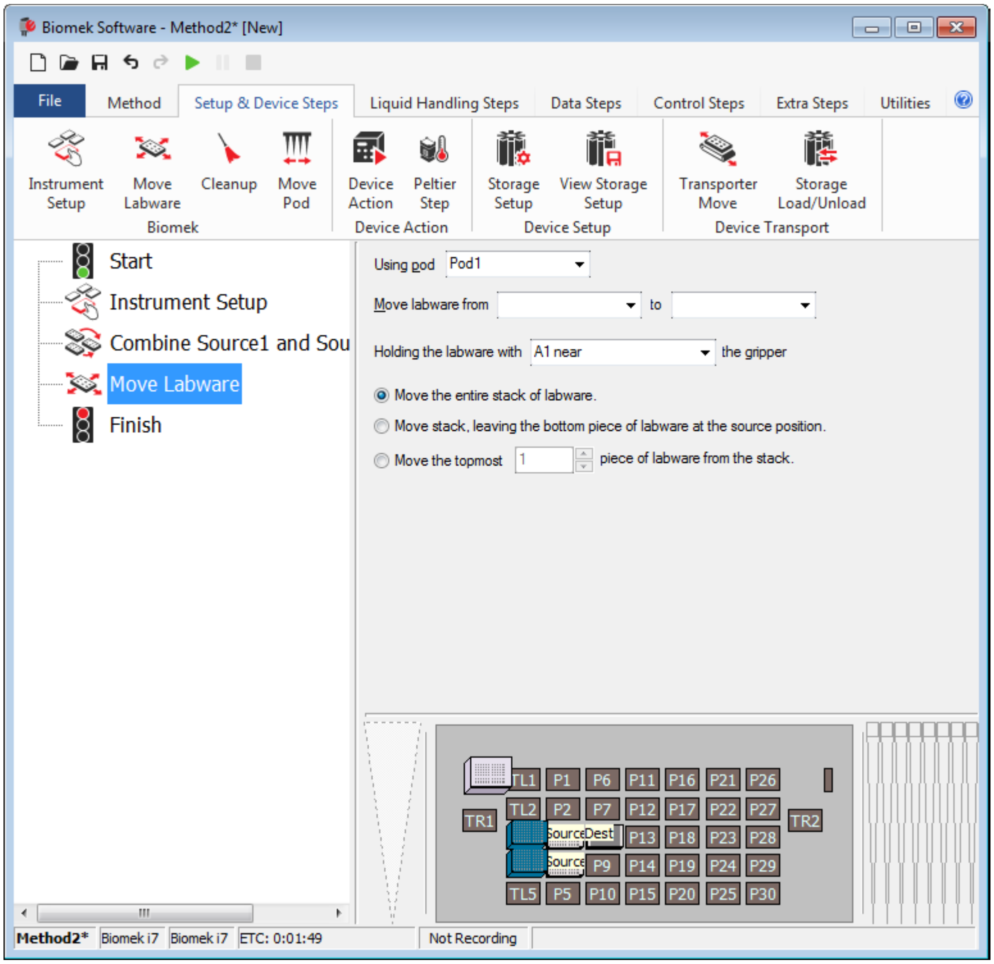
To move labware on the deck:

---

1 Highlight the **Combine** step in the Method View.

2 On the **Setup & Devices Steps** tab, in the **Biomek** group, select the Move Labware (**Move Labware**) step to insert it into the Method View after the **Combine** step. The **Move Labware** configuration appears (Figure 2.7).

Figure 2.7 Move Labware Step Configuration



Using pod Pod1

Move labware from ▾ to ▾

Holding the labware with A1 near ▾ the gripper

● Move the entire stack of labware.

○ Move stack, leaving the bottom piece of labware at the source position.

○ Move the topmost 1 piece of labware from the stack.

---

3 Choose **P8** to populate the **Move labware from** field.

---

4 Choose **P4** to populate the **to** field.

---

5 In **Holding the labware with**, select **A1 near** the gripper.

NOTE Grasping the **A1 near** side means that the gripper would slide in from the left side. Ensure appropriate clearance is available when choosing the side to grasp (see the *Biomek i-Series Automated Workstation Reference Manual* (PN B56358), *Understanding Labware Adjacency Rules* for more information in required clearance).

---

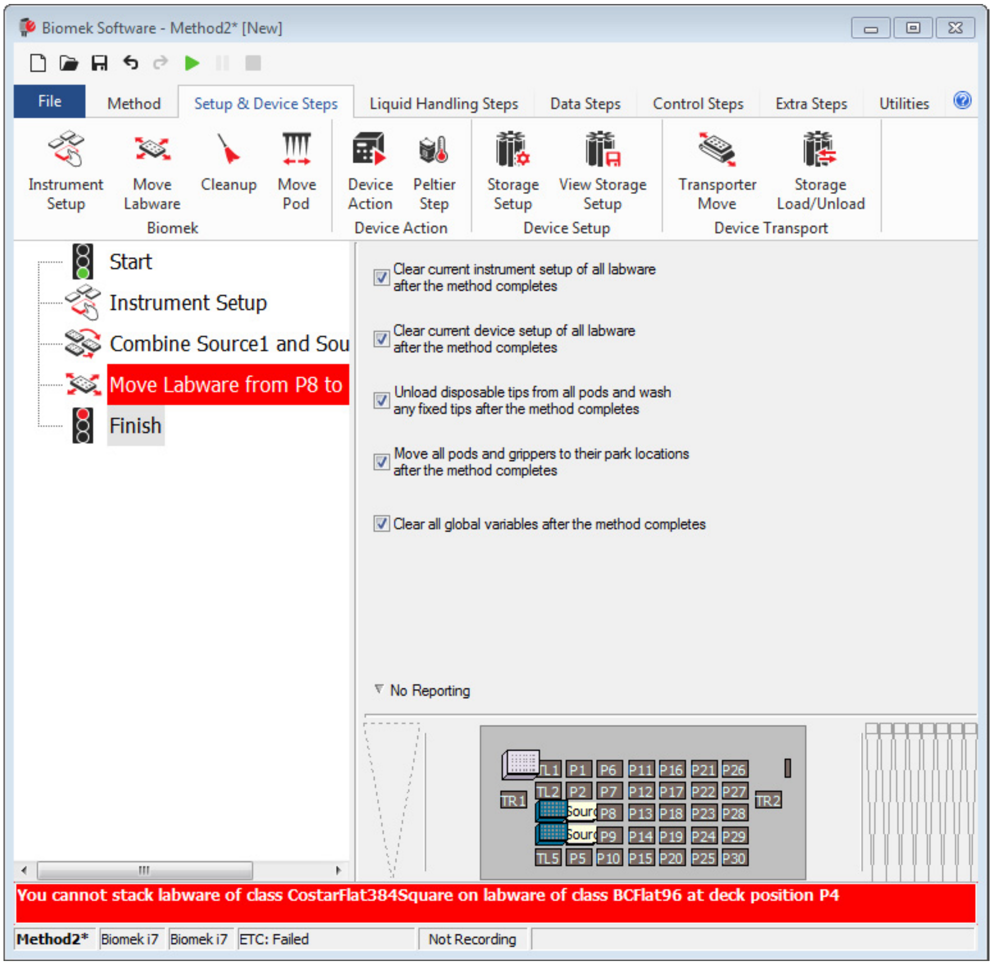
6 Keep **Move the entire stack of labware** selected.

---

7 Now, click on the **Finish** step in the Method View following the **Move Labware** step to validate the method.

OOPS!!! All the red you see indicates an error (Figure 2.8). But that's all right — just keep going in this tutorial to recover.

Figure 2.8 Main Editor With Error Displayed



☑ Clear current instrument setup of all labware after the method completes

☑ Clear current device setup of all labware after the method completes

☑ Unload disposable tips from all pods and wash any fixed tips after the method completes

☑ Move all pods and grippers to their park locations after the method completes

☑ Clear all global variables after the method completes

No Reporting

You cannot stack labware of class CostarFlat384Square on labware of class BCFlat96 at deck position P4

Method2* | Biomek i7 | Biomek i7 | ETC: Failed | Not Recording

Responding to an Error Message

For this activity, you'll learn how to locate and respond to the error message you just received.

Locating the Error

Biomek Software alerts you to errors in several ways, including:

- The step with the error appears in red in the Method View when any step following the error is highlighted.
- A tool tip describes the error when you hover the cursor over the step causing the error.
- An associated error message is displayed in the Status Bar at the bottom of the editor.
- The error is displayed in red in the Error Bar, which is just above the Status Bar.

There are other errors that state the problem, which is displayed in an error message box. Refer to the *Biomek i-Series Software Reference Manual* (PN B56358), *Handling and Preventing Errors*, for more information on errors.

Correcting the Error

In this tutorial, the error message is **You cannot stack labware of class CostarFlat384Square on labware of class BCFlat96 at deck position P4**. This means you've added a method step that has not yet been configured in the software to stack labware; thus the software will not allow it. You'll learn more about stacking labware on top of other labware in CHAPTER 3, *Multichannel Pod — Using Individual Steps to Transfer Liquid and Handle Labware*. So for now, we'll correct the error by moving the labware to a different, unoccupied position.

To correct the stacking error:

1. Click on the **Move Labware** step in the Method View.
2. In the **to** field, change the position to **P1**.
3. Click the **Finish** step again in the Method View.

   There, the error has been corrected.

   Biomek Software continually validates the steps as you progress through building your methods. When you highlight any step, the steps above that point in the method will be validated. If an error is encountered, the step causing the error will be highlighted in red.

Adding Labware During a Method Run

Suppose that you want to add another reagent to the destination plate, but you don't want to place the second reagent on the deck until after the first Transfer is complete (perhaps it can only be exposed to light or open air for a very short time). You can do this by adding a second **Instrument Setup** step to your method to indicate to the software that there is more labware now on the deck.

But before you add a second **Instrument Setup** step, you will:

- Move the pod to a new location by configuring a **Move Pod** step to make sure the pod is moved to a part of the deck where it won't prevent you from physically adding more labware.
- Pause the system by configuring a **Pause** step to give you enough time to physically add more labware.

Moving the Pod to a New Location

The Move Pod (**Move Pod**) step, which is located on the **Setup & Devices Steps** tab, in the **Biomek** group, repositions the pod away from the positions on the deck you want to reach manually. Since you are going to be adding more labware to the deck to prepare for another liquid transfer, you will need to move the pod away from the deck locations affected before pausing the instrument and adding more labware.

Configuring the Move Pod Step

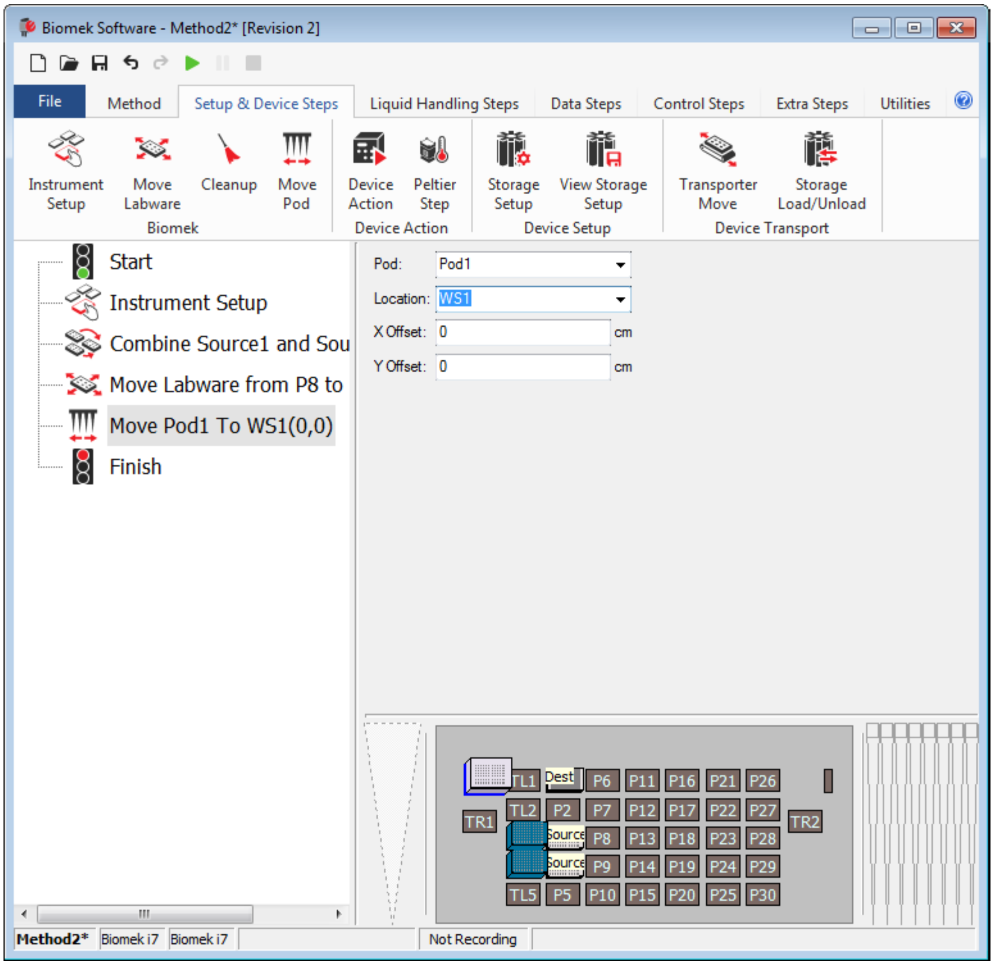
To configure the **Move Pod** step:

1 Insert the **Move Pod** step in the Method View after the **Move Labware** step (Figure 2.9).

---

2 From the **Location** drop-down, choose **WS1**. This instructs the pod to move and stop over the 96-Channel Wash Station ALP (**WS1**) (Figure 2.9).

Figure 2.9 Configured Move Pod Step



Start
Instrument Setup
Combine Source1 and Sou
Move Labware from P8 to
Move Pod1 To WS1(0,0)
Finish

Pod: Pod1
Location: WS1
X Offset: 0 cm
Y Offset: 0 cm

---

3 Click **Finish** to validate the method.

Pausing the System

The system can be paused during a method run for either a specified amount of time or indefinitely by adding and configuring a Pause (**Pause**) step. Depending on the purpose of the pause, you configure the step in one of the following ways:

- If you want to incubate a piece of labware in a specific position for a specific amount of time, you need to configure the desired time in seconds that you want that position to be idle and unavailable for interaction with the instrument.
- If you want to move labware manually during a method (i.e., remove the plate from the deck to centrifuge it or add labware and/or sensitive reagents to the deck for the next steps, etc.), you configure the step to pause the system for an indefinite period of time.

Configuring the Pause Step

You will configure the **Pause** step to pause the system until user intervention, during which you will add more labware to the deck manually. The software will display a message on top of the main editor until you complete your manual operations, at which time it will resume the method run.

To configure the **Pause** step for an indefinite amount of time:

---

1 Select the **Move Pod** step in the Method View.

---

2 From the **Control Steps** tab, in the **Flow** group, select the Pause (**Pause**) icon to insert it into the Method View.

---

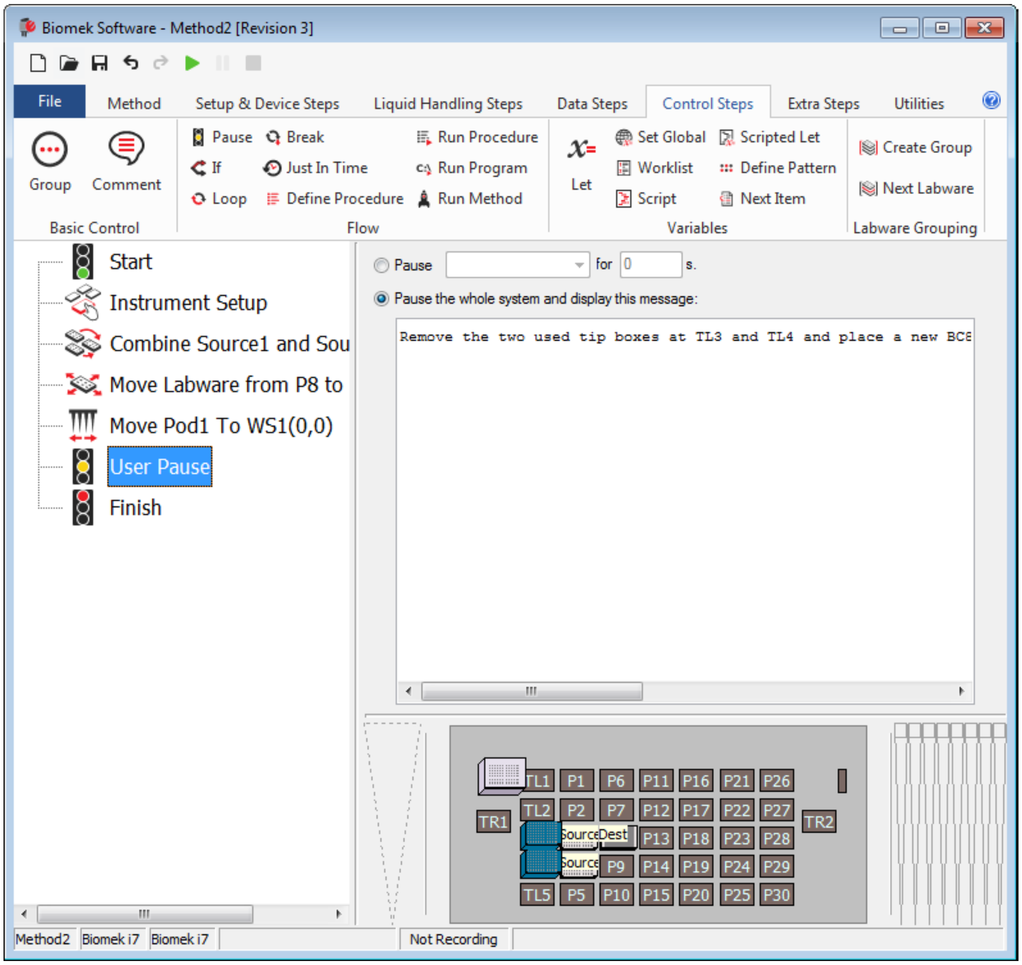
3 Choose **Pause the whole system and display this message:**

---

4 Type in the message: **Remove the two used tip boxes at TL3 and TL4 and place a new BC80 tip box on TL3. Place a reservoir containing a Known volume of 100000 µL water at P8.** The main editor should now look like Figure 2.10.

TIP If you physically move the pod during a **Pause** step, then when you choose **OK** on the prompt to un pause the system, the pod returns to the correct place to continue the method.

Figure 2.10 Pause Configuration With Message Inserted



○ Pause for 0 s.

● Pause the whole system and display this message:

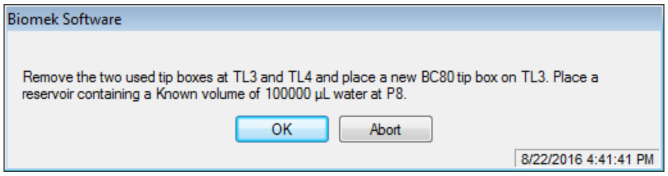
Remove the two used tip boxes at TL3 and TL4 and place a new BC8

---

5 Click **Finish** to validate the method.

When the method is run, either live or in Simulation mode, you will see a prompt similar to Figure 2.11 that will remain displayed until you choose **OK**.

Figure 2.11 Pause Prompt Displaying the Configured Message



Remove the two used tip boxes at TL3 and TL4 and place a new BC80 tip box on TL3. Place a reservoir containing a Known volume of 100000 µL water at P8.

8/22/2016 4:41:41 PM

Adding a Second Instrument Setup Step

Now that you have prepared to add more labware to the deck during a method, you are ready to configure a second **Instrument Setup** step. You will insert a second **Instrument Setup** step after the **Pause** step. The second **Instrument Setup** step not only indicates the current state of the deck, but it also allows you to add more labware.

To configure the second **Instrument Setup** step:

---

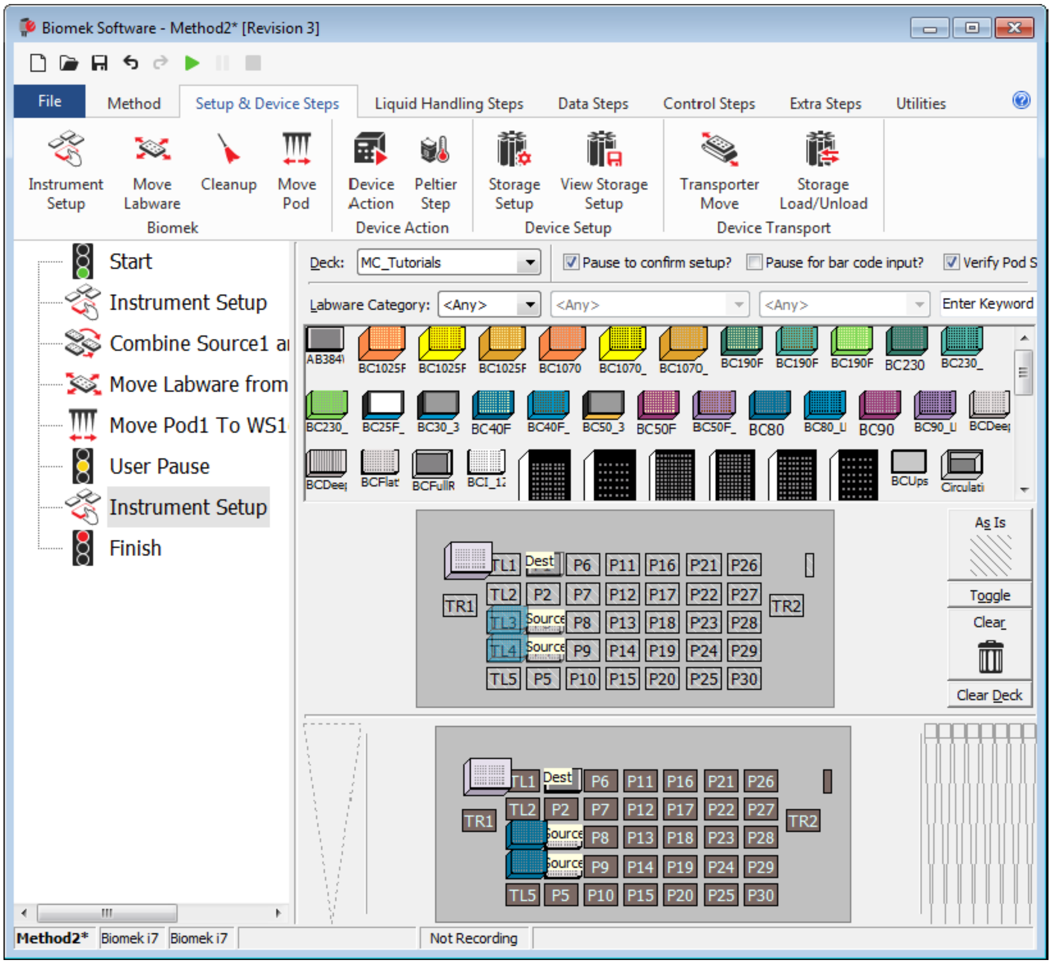
1 Insert an **Instrument Setup** step into the Method View below the **User Pause** step. This opens a second **Instrument Setup** step configuration.

---

2 Click **Toggle** under the **As Is** button. This lets the software know that all deck positions are to remain as they are. The main editor should now look like Figure 2.12.

NOTE Information, such as data sets and volume, are retained when the labware is toggled.

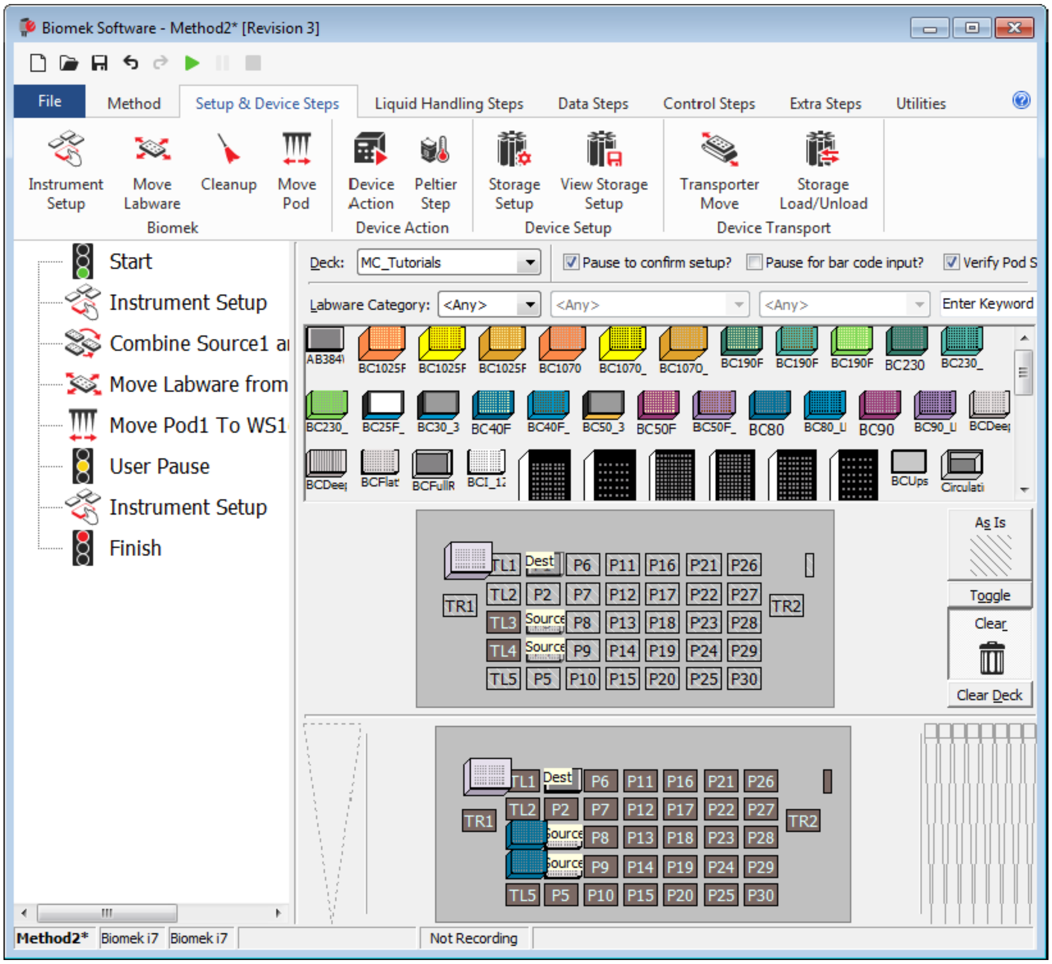
Figure 2.12 Adding an Instrument Setup Step and Toggling All Deck Positions As Is



---

3 Select Clear and then click on **TL3** and **TL4**. This removes the used tip boxes. Now the main editor should look like Figure 2.13.

Figure 2.13 Using Clear to Remove Used Tip Boxes



Deck: MC_Tutorials ☑ Pause to confirm setup? ☐ Pause for bar code input? ☑ Verify Pod S

Labware Category: <Any> <Any> <Any> Enter Keyword

Adding Labware to the Deck

Now you will add the labware to prepare for next liquid-handling process which is a **Transfer** step using the 96-Channel Multichannel Head with 384-well labware. For this next liquid-handling process, you will need to add another tip box and an additional source reservoir. This new labware was what you configured to display when the instrument paused for manual placement.

TIP Even though the software finds tips automatically, you have to ensure there are enough tips on the deck to do the job. If you don't, you will get an error message.

---

1 Place a **BC80** tip box on **TL3**.

2 Place a **Reservoir** on **P8** and configure it to have a **Known** volume of **100000** of **Water**.

Now you are ready to configure your next liquid-handling procedure using the 96-Channel Multichannel pod with 384-well plates.

Transferring to 384-Well Plates Using a 96-Channel Pod

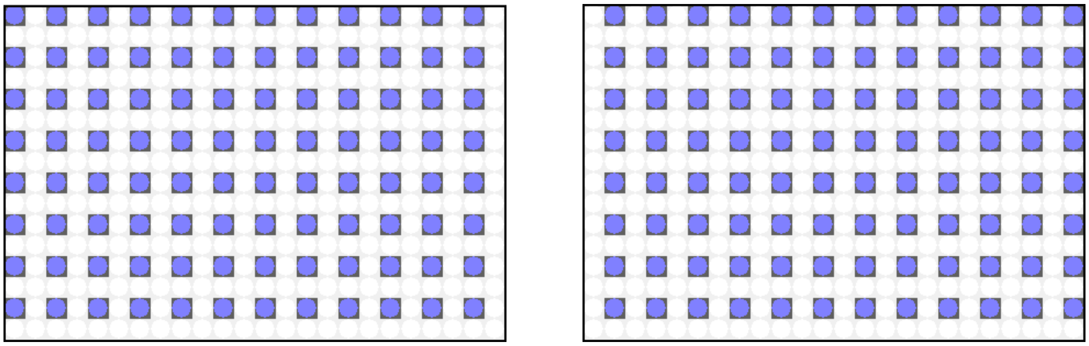
Biomek Software gives you the ability to transfer liquid between 96-well and 384-well plates using a 96-channel head or 384-well and 1536-well plates using a 384-channel head. You can select quadrants in microplates as sources or destinations.

An illustration of the quadrants is displayed in Figure 2.14.

Biomek i-Series Concept

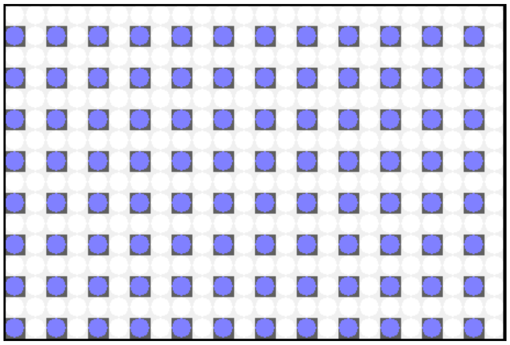
Quadrants allow a 96-channel head to access 96 wells in a 384-well plate, or a 384-channel head to access 384 wells of a 1536-well microplate, simultaneously. The 384-well and 1536-well microplates are divided into four sets of equally spaced wells or quadrants. Using quadrants, it would take four passes of the Multichannel pod to access all wells of a microplate.

Figure 2.14 Illustration of the Quadrants in a 384-Well Microplate

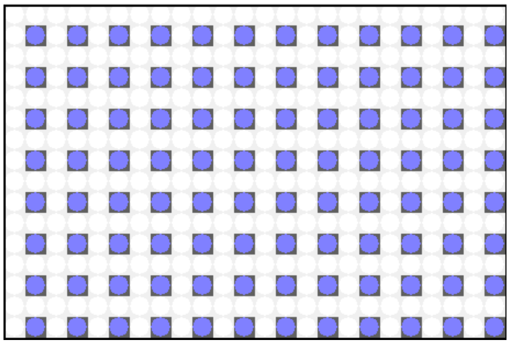


Quadrant 1

Quadrant 2



Quadrant 3



Quadrant 4

Configuring Quadrants in a Transfer Step

To learn how to use and configure quadrants, you will need to add and configure a new **Transfer** step to the method after the second **Instrument Setup** step.

1. Insert a new **Transfer** step after the second **Instrument Setup** step in the Method View. The **Transfer** step configuration appears.

2. In **Tip Handling**, make sure that **Change tips between sources** and **Change tips between destinations** are deselected. This will mean that only one box of tips is used to complete this transfer.

3. Select the **Reservoir** on **P8** as the source labware.

4. In the **Technique** drop-down, select the **MC** technique.

5. Select **Dest** on **P1** as the destination labware and specify a volume of **50 µL.**

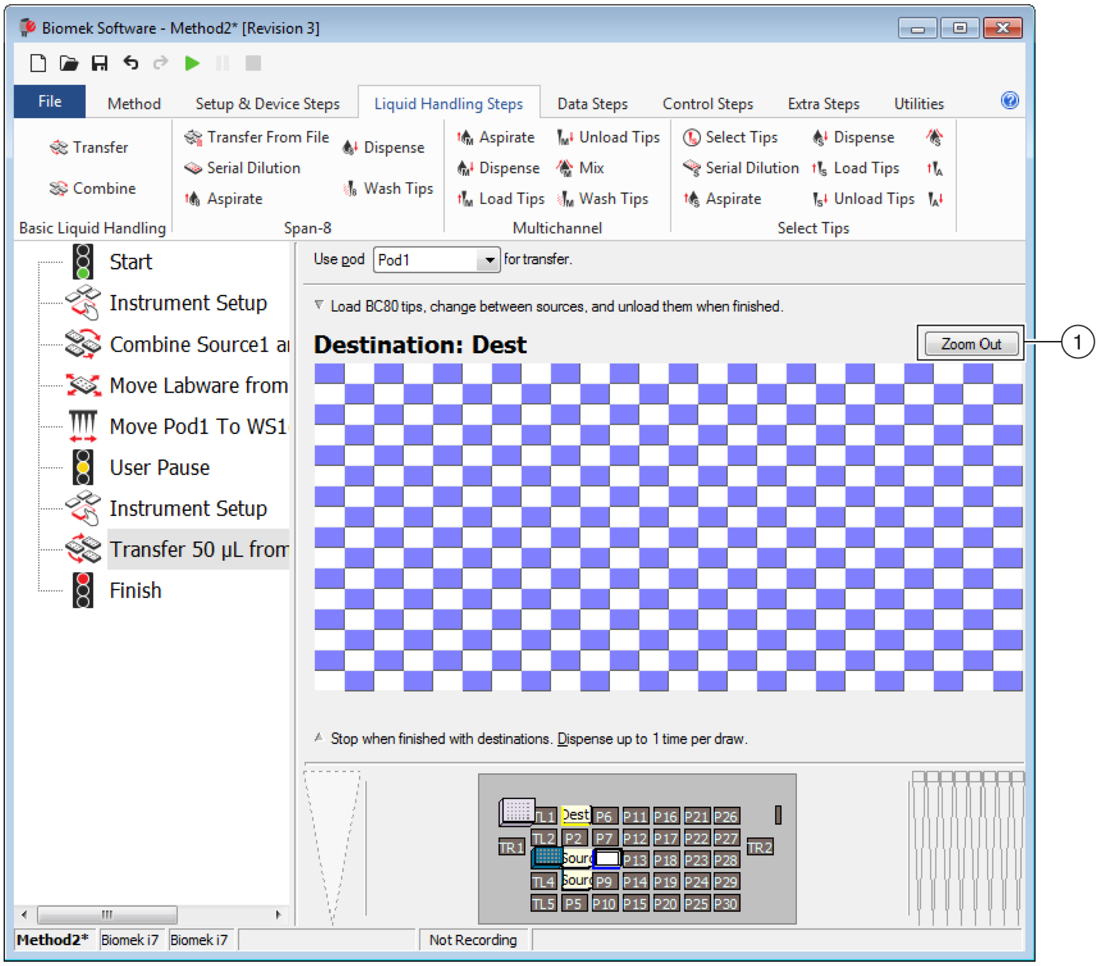
6. In the **Technique** drop-down, select the **MC** technique.

7. Double click on the graphic of **Dest** to zoom in. This is where you will select Quadrant 1 and Quadrant 4.

8. Click the first well of the first column and first row. Quadrant 1 is selected.

9 Hold down the (Ctrl) key and click on any well that is in Quadrant 4. The main editor should look like Figure 2.15.

Figure 2.15 Quadrants 1 and 4 Chosen in Destination Labware



Use pod Pod1 for transfer.

Load BC80 tips, change between sources, and unload them when finished.

Destination: Dest

Stop when finished with destinations. Dispense up to 1 time per draw.

1. Close **Zoom Out** here.

---

10 Choose **Zoom Out**. The graphic returns to the zoom out display.

11 Highlight the **Finish** step to validate the method.

12 Select **File** > **Save As** > **Method** and give the method a new name; for example, **Tutorial_Test_Method_MC Combine.**

13 Run the method to see how the Multichannel pod transfers liquid using quadrants.

As you can see, all the steps in the Method View make your method look complex. Go to the next section to learn what you can do about that.

Using a Group Step

To prevent your method from appearing too complex, you can group steps together logically under one heading by inserting the **Group** step into the Method View. This group of steps is hidden in the Method View under the name that you've given it during configuration of the **Group** step.

Biomek i-Series Concept

The **Group** step allows you to "nest" a series of connected steps together, and give the group a logical name that appears in your Method View. Then, when you open your method, the **Group** step appears collapsed with the connected steps hidden. This makes the method appear shorter, and it allows you to see more of the method without scrolling the Method View up or down. You simply double-click on the **Group** step in the Method View to expand it and expose the nested steps.

Configuring the Group Step

For this activity, you will group under one heading the **Move Pod**, **Pause**, and **Instrument Setup** steps you already have in your method. These steps are all associated with the preparation for the liquid transfer using quadrants.

To group these steps:

1 If necessary, open the method you just saved and work from this method.

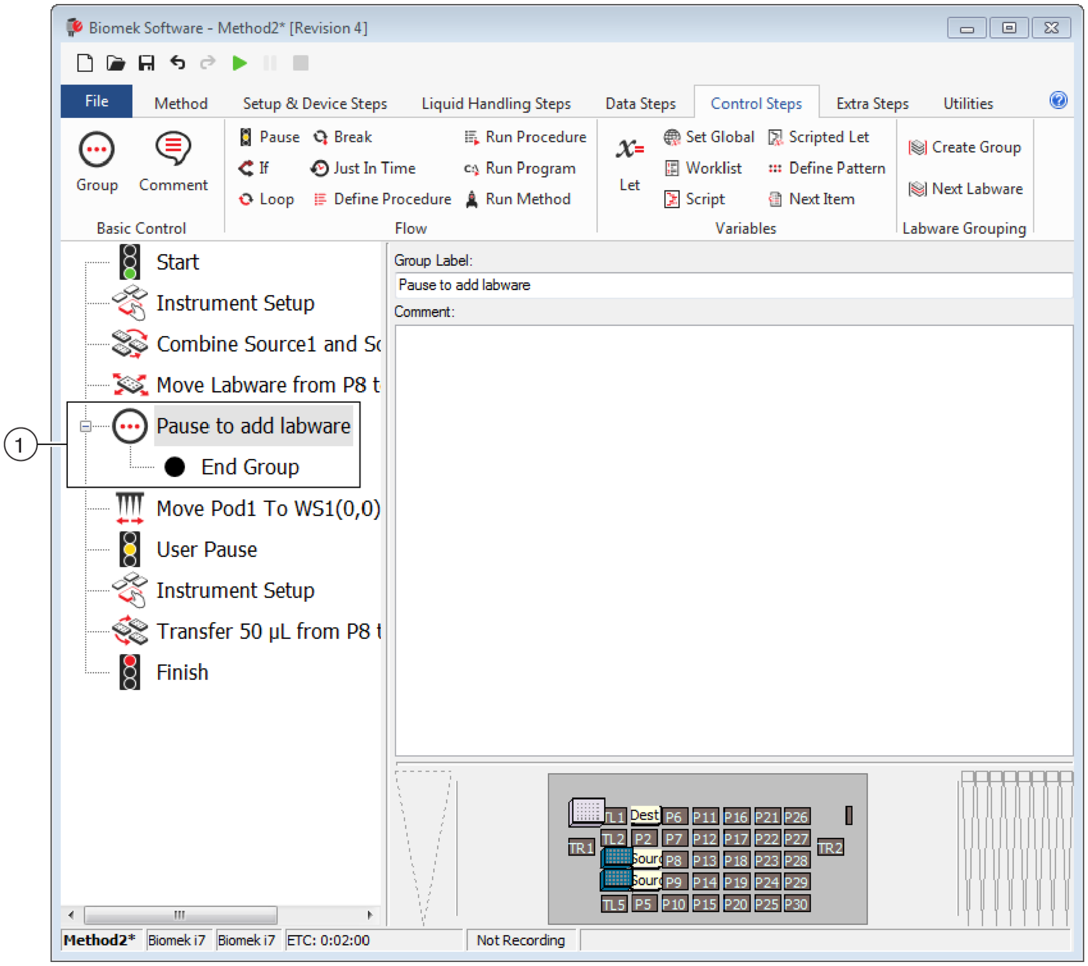
2 Select the **Move Labware** step in the Method View.

3 From the **Control Steps** tab, in the **Basic Control** group, select ⋯ Group (**Group**) step to insert it into the Method View after the **Move Labware** step.

4 In the **Group Label** field in the step configuration, enter **Pause to add labware.** After the **Group** step is configured and another step later in the method is highlighted, it will be named in the Method View whatever it has been labeled in **Group Label.** In this example, the **Group** step will be named **Pause to add labware** in the Method View (Figure 2.16).

TIP If you want to use a configured **Group** step in other methods, right click on the step, and select **Save as Preconfigured Step.** The first time a preconfigured step is added to the software, the **Preconfigured Steps** tab appears on the ribbon, with the newly saved step. This option allows you to reuse configured steps in other methods within the project. For additional information on managing preconfigured steps, see the *Biomek i-Series Software Reference Manual* (PN B56358), *Saving Configured Steps*.

Figure 2.16 Configured Group Step



Group Label: Pause to add labware
Comment:

1. **Group** step with **Group Label** showing in the Method View.

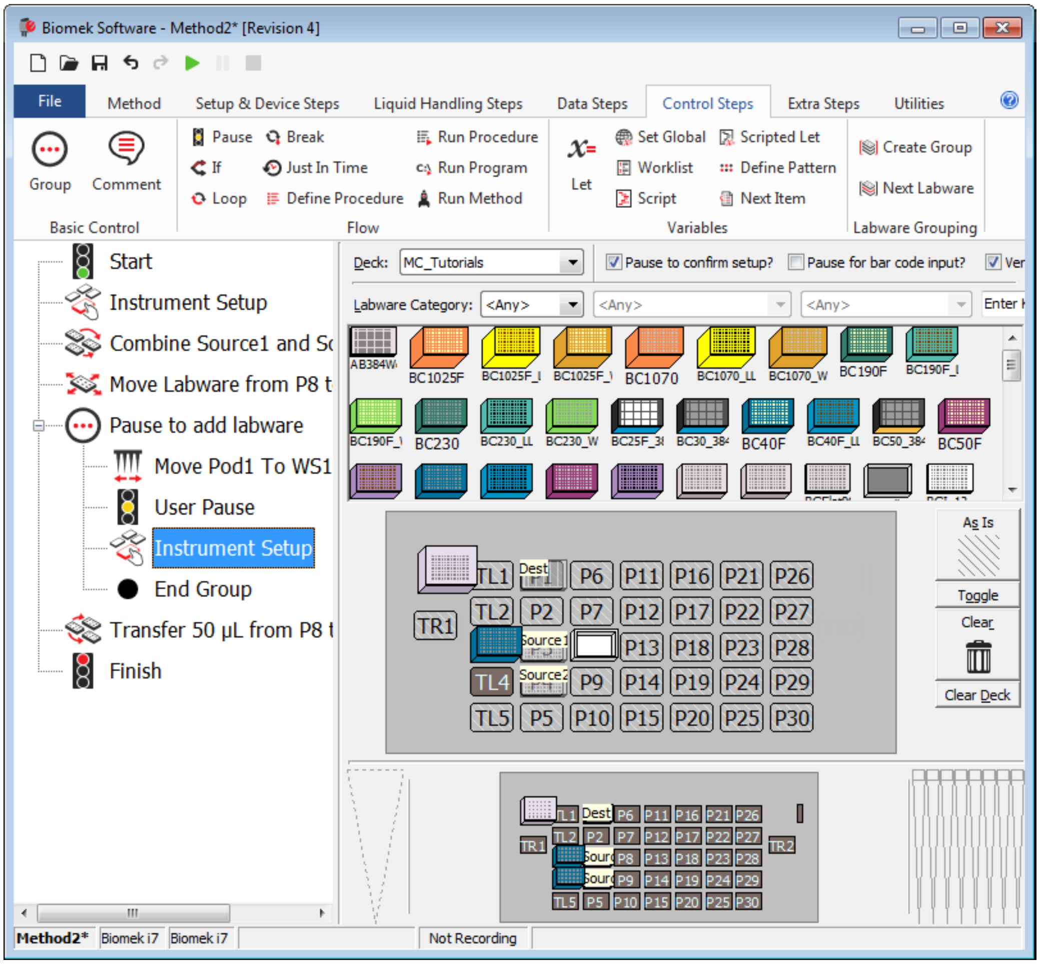
5 Highlight the **Move Pod** step, then drag and drop it into the **Group** step above **End Group**.

---

6 Repeat step 5 for the **User Pause**, and then the second **Instrument Setup** step. Make sure the nested steps are in the order shown on Figure 2.17 since it's easy to get the steps out of order when you are dragging and dropping them.

Now the **Move Pod**, **User Pause**, and second **Instrument Setup** steps are nested logically within a **Group** step (Figure 2.17). You can expand and collapse this step as desired by double clicking on the **Group** step.

Figure 2.17 Configured Group Step with Nested Steps Expanded



Deck: MC_Tutorials
☑ Pause to confirm setup?
☐ Pause for bar code input?
☑ Ver

Labware Category: <Any> <Any> <Any>

TIP Like the **Group** step, the **Comment** step (Figure 2.17) does not initiate any actions on the instrument. It is used to provide descriptive information and notes in the Method View for a method. Refer to the *Biomek i-Series Software Reference Manual* (PN B56358), *Comment Step*.

---

7 Click the **Finish** step to validate the method.

---

8 Save the method.

CHAPTER 3

Multichannel Pod — Using Individual Steps to Transfer Liquid and Handle Labware

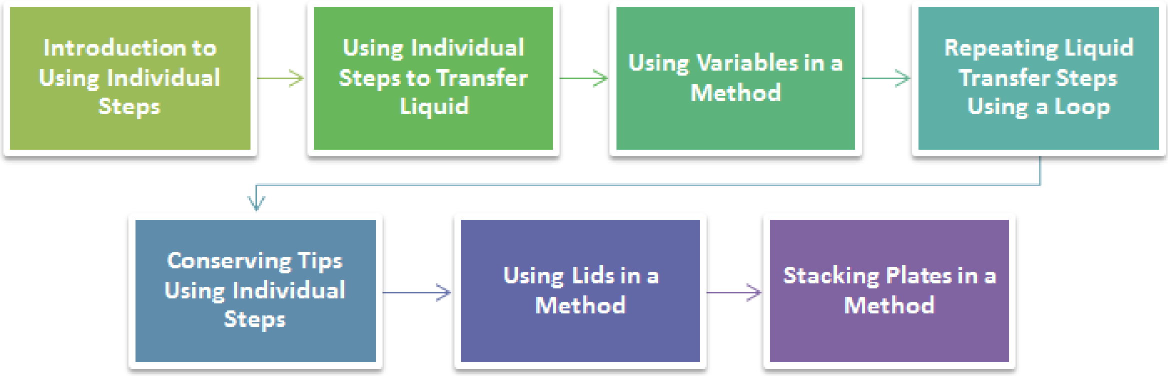
Introduction to Using Individual Steps

To successfully complete the activities in this chapter, you will already need to know how to complete the following, which were covered in the previous two chapters:

- Transfer liquid from two sources to a single destination.
- Mix contents in labware.
- Move labware on the deck using the gripper tool on the Multichannel pod.
- Respond to errors.
- Add more labware to the deck once a method has started to run.
- Use the Multichannel pod with a 96-channel head with 384-well plates.
- Group steps logically in the Method View.

What You’ll Learn in this Chapter

This chapter will help you enhance your method-building skills to create more advanced methods using variables to “loop” or repeat tasks. You will also learn how to optimize deck space using stacks and lidded plates and how to conserve tip usage by washing tips. The process for creating the method in this chapter is presented below. All of these topics are covered in detail in this chapter.



Setting Up Your Deck for Using Individual Steps

Using what you learned in CHAPTER 1, *Multichannel Pod — Getting Started with Biomek Software*, create a new method, add an **Instrument Setup** step, and configure the following:

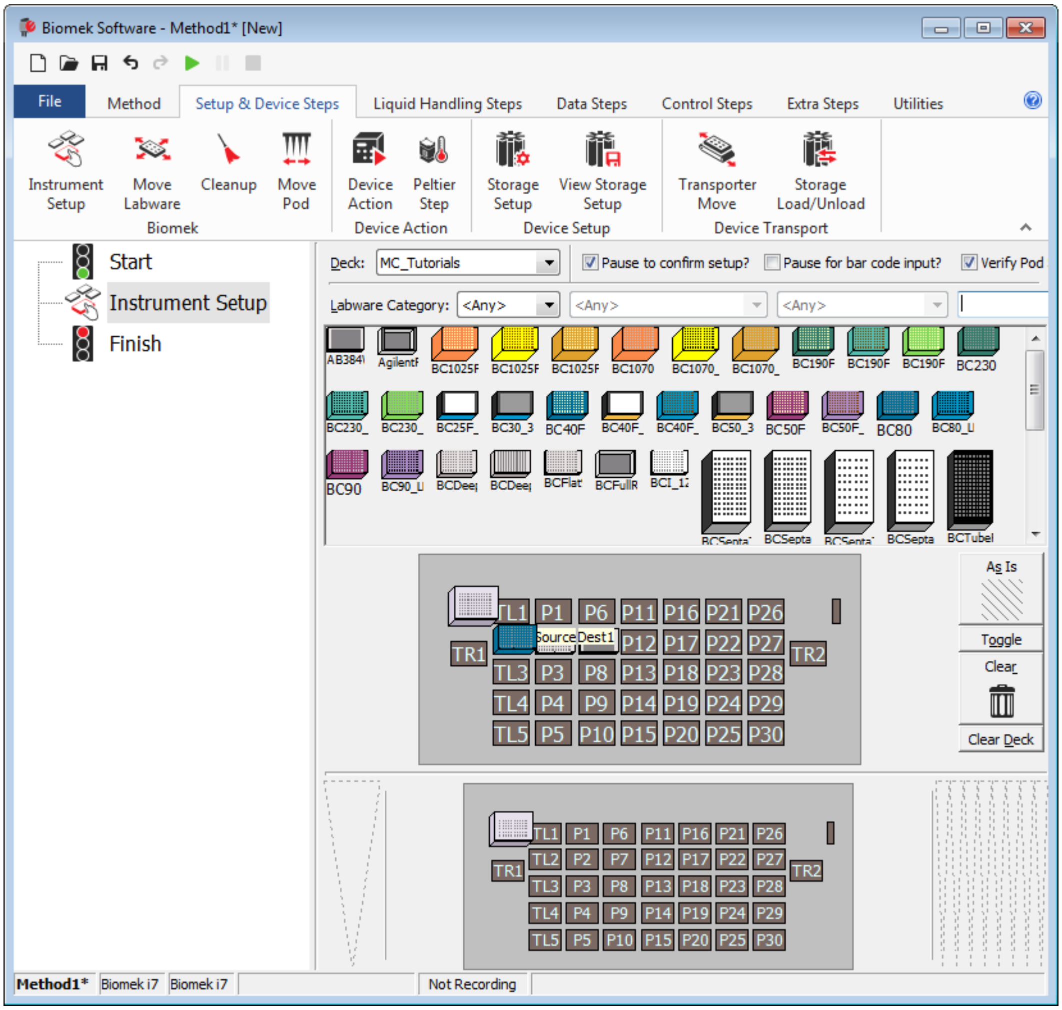
1 Place a **BC80** tip box on **TL2**.

2 Place a **BCFlat96** microplate on **P2**. In **Labware Properties**, name it **Source1**, and then configure it to contain a **Known** volume of **300** µL of **Water**.

3 Place a **CostarFlat384Square** microplate on **P7**. Name it **Dest1** and configure it to contain a **Known** volume of **0** µL.

Your deck should look like Figure 3.1. Now go to the next activity to learn how to create a new method using separate **Multichannel Aspirate** and **Multichannel Dispense** steps.

Figure 3.1 Initial Instrument Setup for Using Individual Steps



Using Individual Steps to Transfer Liquid

In previous chapters, when you wanted to transfer liquid from one plate to another, you used the **Transfer** and **Combine** steps to perform all the necessary actions — loading tips, aspirating and dispensing liquid, and unloading tips. Sometimes, however, you want more control over these actions; for example, precise control over the order in which samples are transferred or when tips are loaded, unloaded, and washed.

When you need more control over the liquid transfer operation than the **Transfer** and **Combine** steps provide, you can configure liquid transfers using individual steps. Unlike the **Transfer** and **Combine** steps, these individual steps each perform only one task (i.e., aspirate, dispense, load tips, wash tips, or unload tips).

In this section, you will use the **Multichannel Aspirate** and **Multichannel Dispense** steps to transfer liquid from the 96-well source plate to the 384-well destination plate.

Aspirating Liquid Using the Multichannel Aspirate Step

You can use the **Multichannel Aspirate** step to aspirate liquid from a microplate or reservoir.

Using the deck you created in *Setting Up Your Deck for Using Individual Steps*, you will aspirate liquid from the 96-well plate using the **Multichannel Aspirate** step, as instructed below:

---

1 In the Method View, select the **Instrument Setup** step.

---

2 From the **Liquid Handling Steps** tab, in the **Multichannel** group, select the Aspirate (**Multichannel Aspirate**) step.

TIP Make sure you use the **Multichannel Aspirate** step, and not a **Span-8 Aspirate** step which is used only with the Span-8 pod.

---

3 In the Current Instrument Display, click on **Source1** to select it as the labware from which to aspirate.

---

4 In **Volume**, enter **60** µL.

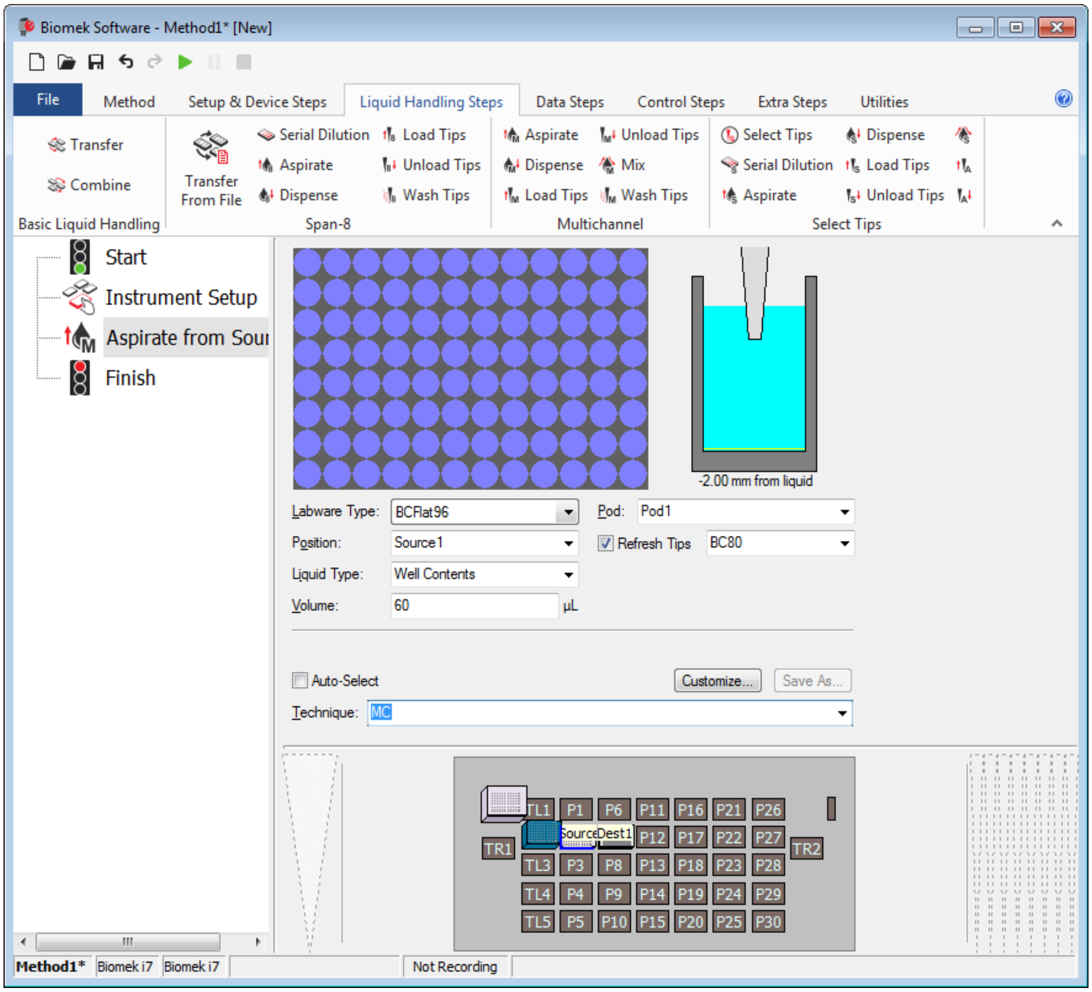
---

5 Select **Refresh Tips** (Figure 3.2). This means that at the beginning of the step, before aspirating from the source plate, the pod will load new tips.

TIP If tips are already loaded, it unloads those tips (along with any liquid in those tips if they are not empty) and loads new tips prior to aspirating. This option should be used only when there are either no tips loaded or the tips are empty.

6 In the **Technique** field, select **MC** from the drop-down. Your **Multichannel Aspirate** step configuration should now look like Figure 3.2.

Figure 3.2 Multichannel Aspirate Step Configured



Labware Type: BCFlat96
Pod: Pod1
Position: Source1
☑ Refresh Tips BC80
Liquid Type: Well Contents
Volume: 60 µL
☐ Auto-Select
Technique: MC

Dispensing Liquid Using the Multichannel Dispense Step

Now that you have aspirated some liquid, you need to dispense it into another piece of labware. In this tutorial, you will dispense the aspirated liquid into one quadrant of a 384-well plate.

To dispense previously aspirated liquid:

---

1 Select the **Multichannel Aspirate** step in the Method View.

---

2 From the **Liquid Handling Steps** tab, in the **Multichannel** group, select the Dispense (**Multichannel Dispense**) icon.

TIP Make sure you use a **Multichannel Dispense** step, and not a **Span-8 Dispense** step which is used only with the Span-8 pod.

---

3 In the Current Instrument Display, click on **Dest1** to select it as the destination.

---

4 If necessary, in **Volume**, enter **60** µL. You will dispense the full amount of liquid you aspirated earlier in the **Multichannel Aspirate** step.

---

5 In the **Technique** field, select **MC** from the drop-down.

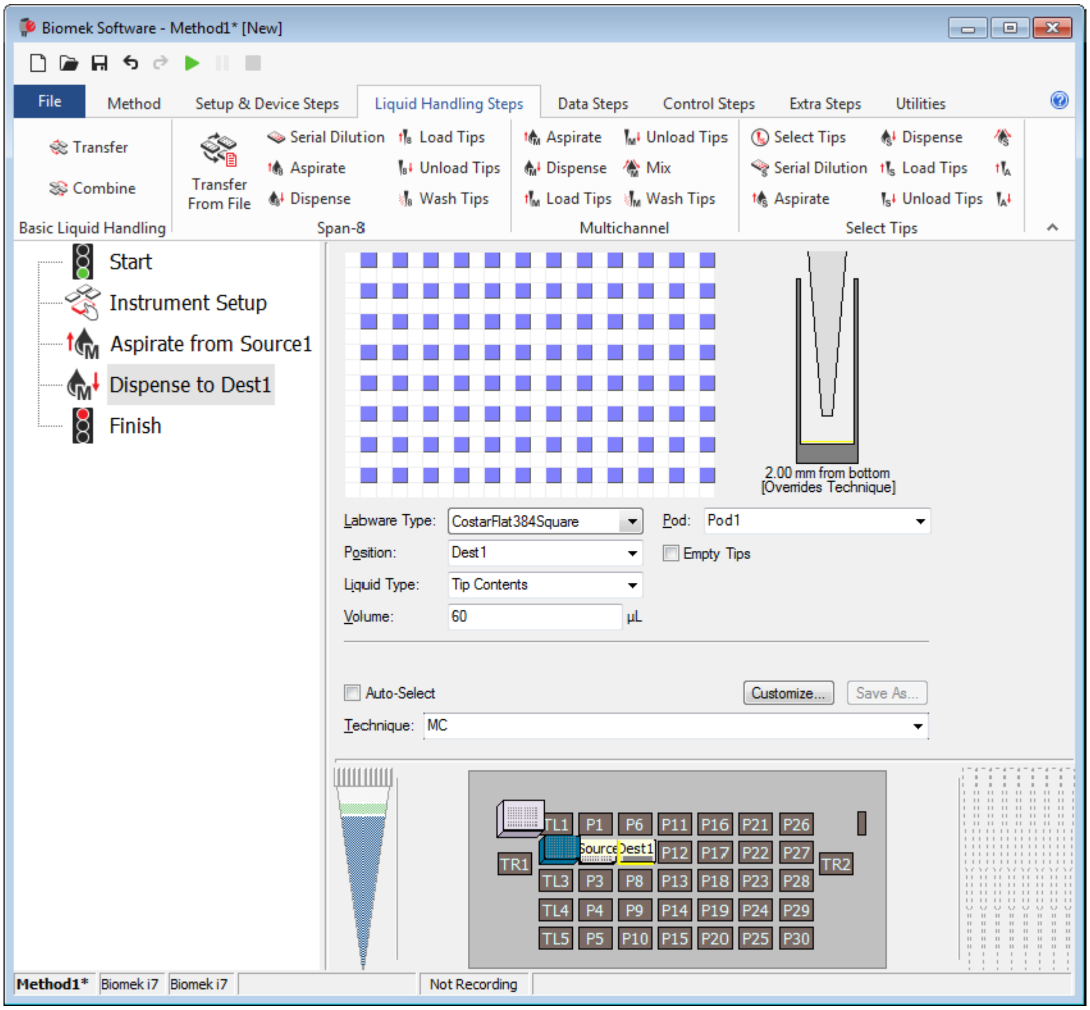
---

6 Right click on the tip graphic, and then select **Custom Height** from the menu that appears.

- **a.** In **Height**, enter **2**.
- **b.** in **from**, choose **Bottom** from the drop down.
- **c.** Select **OK**.

7 In the graphic of the 384-well plate, select the second quadrant. Your **Multichannel Dispense** step configuration should look like Figure 3.3.

Figure 3.3 Multichannel Dispense Step Configured



Labware Type: CostarFlat384Square
Pod: Pod1
Position: Dest1
☐ Empty Tips
Liquid Type: Tip Contents
Volume: 60 µL
☐ Auto-Select
Technique: MC

8 Select the **Finish** step to validate the method.

9 Select **File** > **Save As** > **Method**, name it **Tutorial Method 3 MC Asp Dis**, and then select **OK**.

10 Run the method in Simulation mode.

NOTE Methods should be saved after each verification. Biomek Software does NOT auto-save while building methods. Several methods will be used in future tutorial exercises .

You have now configured a simple method that aspirates from a 96-well source plate and dispenses into one quadrant of a 384-well destination plate using individual steps. If you like, you can run this method on your instrument or in the simulator (refer to CHAPTER 1, *Multichannel Pod — Getting Started with Biomek Software*, for more information on how to do this).

In the next section, you will reconfigure this simple method to use a variable for the volume to aspirate and dispense.

Using Variables in a Method

A variable is a value that has been assigned a name. Variables allow more flexibility in programming methods. Through the use of variables, specific parameters can easily be changed from run to run or during development.

Biomek i-Series Concept

Using variables provide several advantages:

- If you want to change a value that is used in several places within a method, you can change it in one place and it is automatically changed everywhere that variable is used.
- The value of a variable can be set at run time and the method is automatically updated appropriately.
- Decisions can be made at run time based on the value of a variable (you will do this in the next chapter).

You will now create a variable for the volume to transfer and use it in the **Multichannel Aspirate** and **Multichannel Dispense** steps. This includes:

- *Creating a Variable in the Start Step*
- *Using a Variable in Step Configurations*
- *Changing the Value of a Variable at Run Time*

Creating a Variable in the Start Step

The Start (**Start**) step, in addition to being the first step in the method, can be used to create and name variables that can be used throughout the method. Variables named in a **Start** step can be used in configuring other steps in the method.

There are other steps in Biomek Software where variables can be created; however, variables created in those steps are confined to a specific step or group of steps and are defined as *Local Variables*. Their values cannot be modified using the **Start** step, and they persist until the end of the defined range. You will work with local variables later in the chapter with the **Loop** step.

You will now create a variable for the volume to transfer using the **Start** step.

To create a variable in the **Start** step:

---

1 If necessary, open the method you just saved.

---

2 Select the **Start** step in the method view to display its configuration.

---

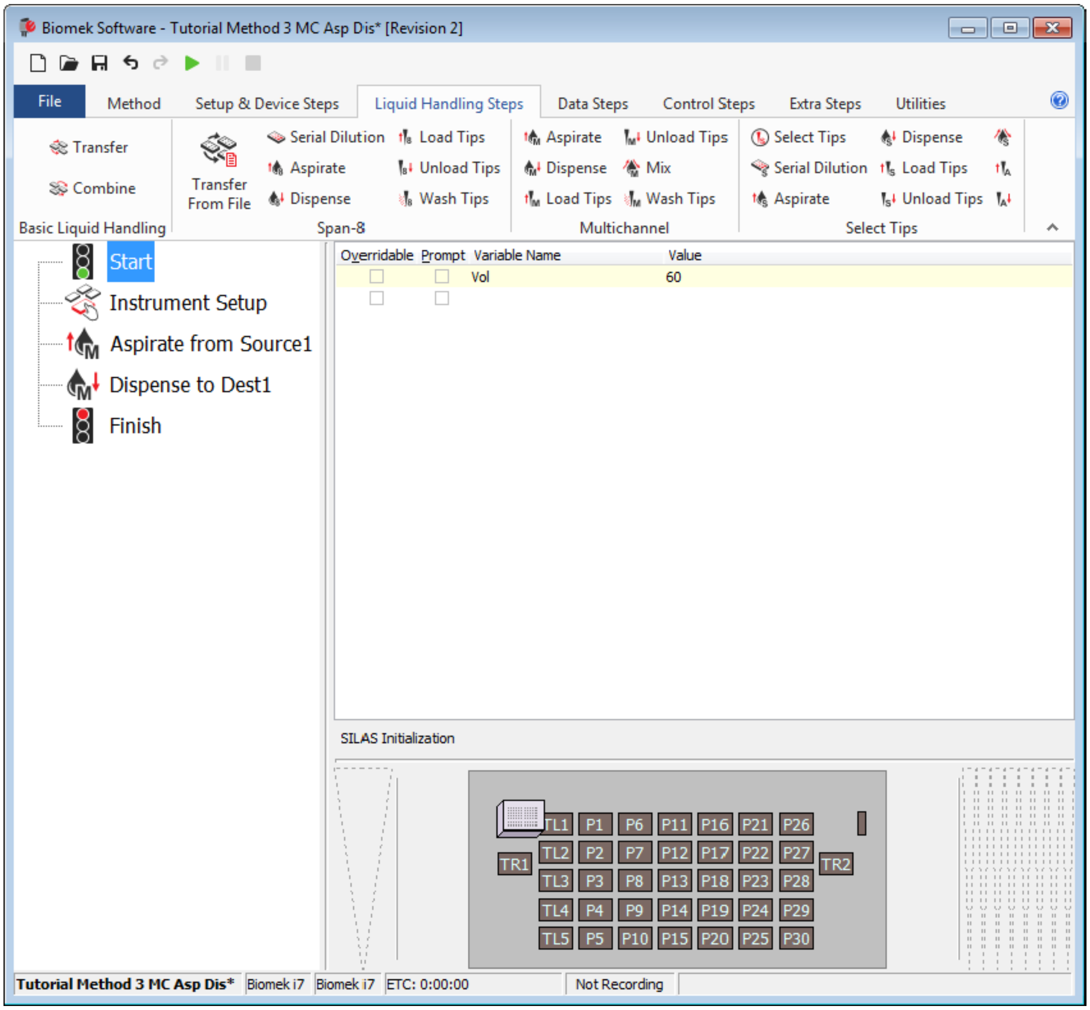
3 In **Variable Name**, enter: ***Vol***

TIP Variable names must begin with a letter, may only use alphanumeric characters (0-9, A-Z) and the underscore (_), and may not exceed 255 characters. Variable names are not case sensitive.

---

4 In **Value**, enter **60**. Your **Start** configuration should look like Figure 3.4. You have created a variable named ***Vol*** that has a value of **60**.

Figure 3.4 Vol Variable Created in the Start Step



Overridable	Prompt	Variable Name	Value
☐	☐	Vol	60
☐	☐		

Using a Variable in Step Configurations

You will now use the ***Vol*** variable you created in the **Start** step to configure the volume to transfer in the **Multichannel Aspirate** and **Multichannel Dispense** steps.

---

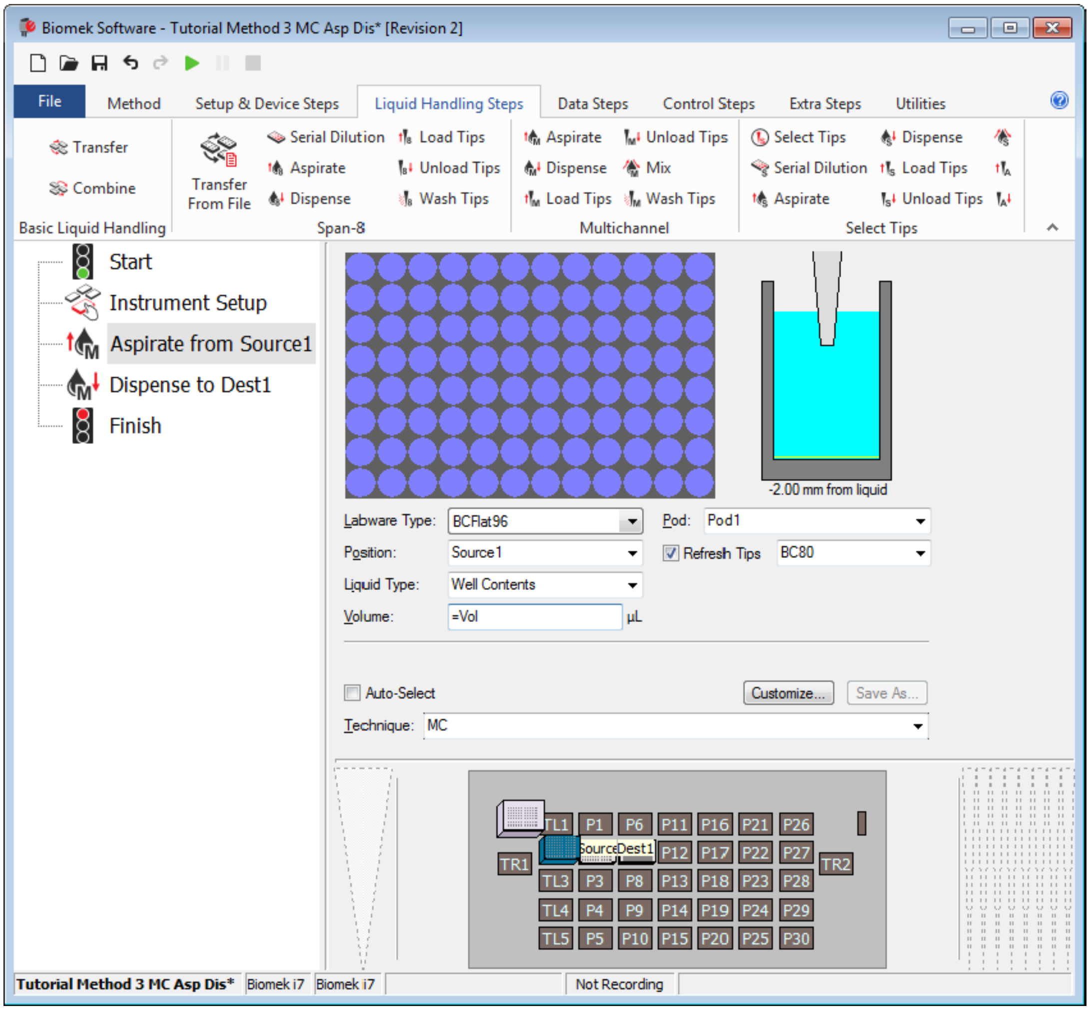
1 Select the **Aspirate from Source1** step.

---

2 In **Volume**, enter **=Vol** (including the equal sign), as shown in Figure 3.5. Variables are always preceded by an equal sign when entering them into a step configuration field. When the method is run, ***Vol*** is replaced by the value of the variable; in this case, **60**.

TIP Variable names are not case sensitive, so entering the name **VOL**, **vol**, **Vol**, or **VoL** are all evaluated the same.

Figure 3.5 Using the Variable Vol to Configure the Volume



Labware Type: BCFlat96
Position: Source1
Liquid Type: Well Contents
Volume: =Vol µL
Pod: Pod1
☑ Refresh Tips BC80
☐ Auto-Select
Technique: MC

3 Select the **Dispense to Dest1** step and enter **=Vol** in **Volume**. The method is now configured to transfer a volume equal to the variable **Vol**.

To change the volume you want to transfer, you would change the value of the variable ***Vol*** in the **Start** step. The **Volume** specified in both the **Multichannel Aspirate** and **Multichannel Dispense** steps would then automatically be updated when the value of ***Vol*** is substituted at run time.

Changing the Value of a Variable at Run Time

Since the value of a variable can be changed throughout the method by changing the value of the variable in the **Start** step, it makes it easy to quickly reconfigure methods that are similar except for one or two items.

For variables that are created in the **Start** step, you can configure Biomek Software to prompt you to specify a value for the variable at run time. When configured to do this, a prompt appears for each variable when the method is run. The value that you entered for the variable in the **Start** step is now the default value for the variable. You can use that value by choosing **OK**, or enter a new value and choose **OK** to change the value of the variable. The method run then uses the specified value for the variable and updates the method accordingly.

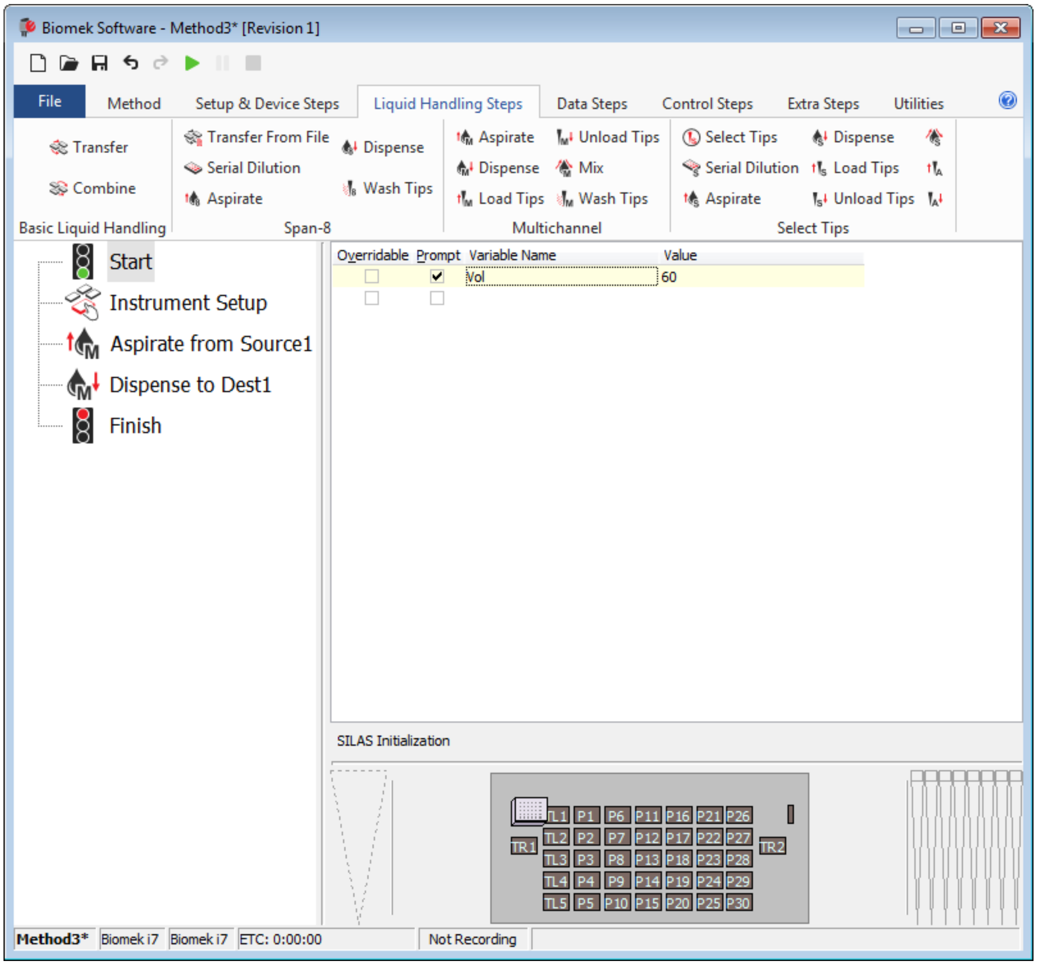
To specify the value of a variable at run time:

1 Select the **Start** step.

---

2 Select the **Prompt** check box for the variable ***Vol.*** Your **Start** configuration should now look like Figure 3.6.

Figure 3.6 Prompting for Value of a Variable

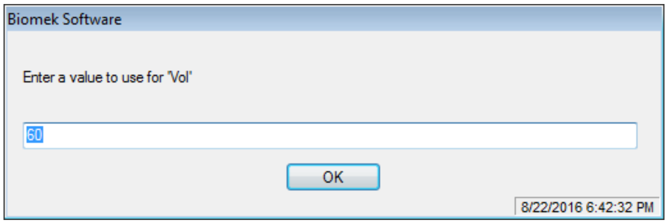


Overridable	Prompt	Variable Name	Value
☐	☑	Vol	60
☐	☐		

---

3 Run the method. A prompt appears allowing you enter a value for the variable (Figure 3.7).

Figure 3.7 Prompt to Specify the Value of a Variable


Biomek Software

Enter a value to use for 'Vol'

60

---

4 Enter **50** and choose **OK.** If you run the method on your instrument, you should notice that **50 µL** was transferred into each well, not **60.**

5 Save the method. You can change the method name by entering a new name in the **Method Name** field. Select **OK** when finished.

In the next section, you will learn to use variables and a **Loop** step to perform repeated actions in order to aspirate from four different source plates and dispense into all four quadrants of a 384-well plate.

Repeating Liquid Transfer Steps Using a Loop

The **Loop** step enables you to repeat one or more steps for multiple cycles. Each cycle or iteration repeats the steps contained inside the **Loop**. An optional variable may also be created in the **Loop** step. This variable is assigned a start and end value and increments in regular intervals with each cycle of the **Loop**.

Biomek i-Series Concept

The **Loop** step repeats the nested step or steps until its **End** value is exceeded. For the first cycle of a **Loop**, its value is the **Start** value. After completing all steps inside the loop, the value changes by the **Increment** and the steps are repeated again. This process repeats until the Increment changes the value to be greater than the **End** value.

In this section, you will modify the method to use a **Loop** step to aspirate from four different 96-well source plates to each of the four quadrants of the 384-well destination plate. In completing this task, you will create a variable in the **Loop** step and use this variable to reconfigure the **Multichannel Aspirate** and **Multichannel Dispense** steps as the liquid transfer actions are repeated during method execution.

To do this, you will need to:

- add more plates to the deck in the **Instrument Setup** step (refer to *Modifying the Instrument Setup*).
- use a **Loop** step to repeat the aspirate and dispense actions (refer to *Repeating Actions Using the Loop Step*).

Modifying the Instrument Setup

In order to transfer liquid from four source plates to the 384-well destination, you need to have four 96-well source plates on the deck. You will now modify your initial **Instrument Setup** step to include four source plates.

To modify the **Instrument Setup** step:

1 If necessary, open the method you just saved.

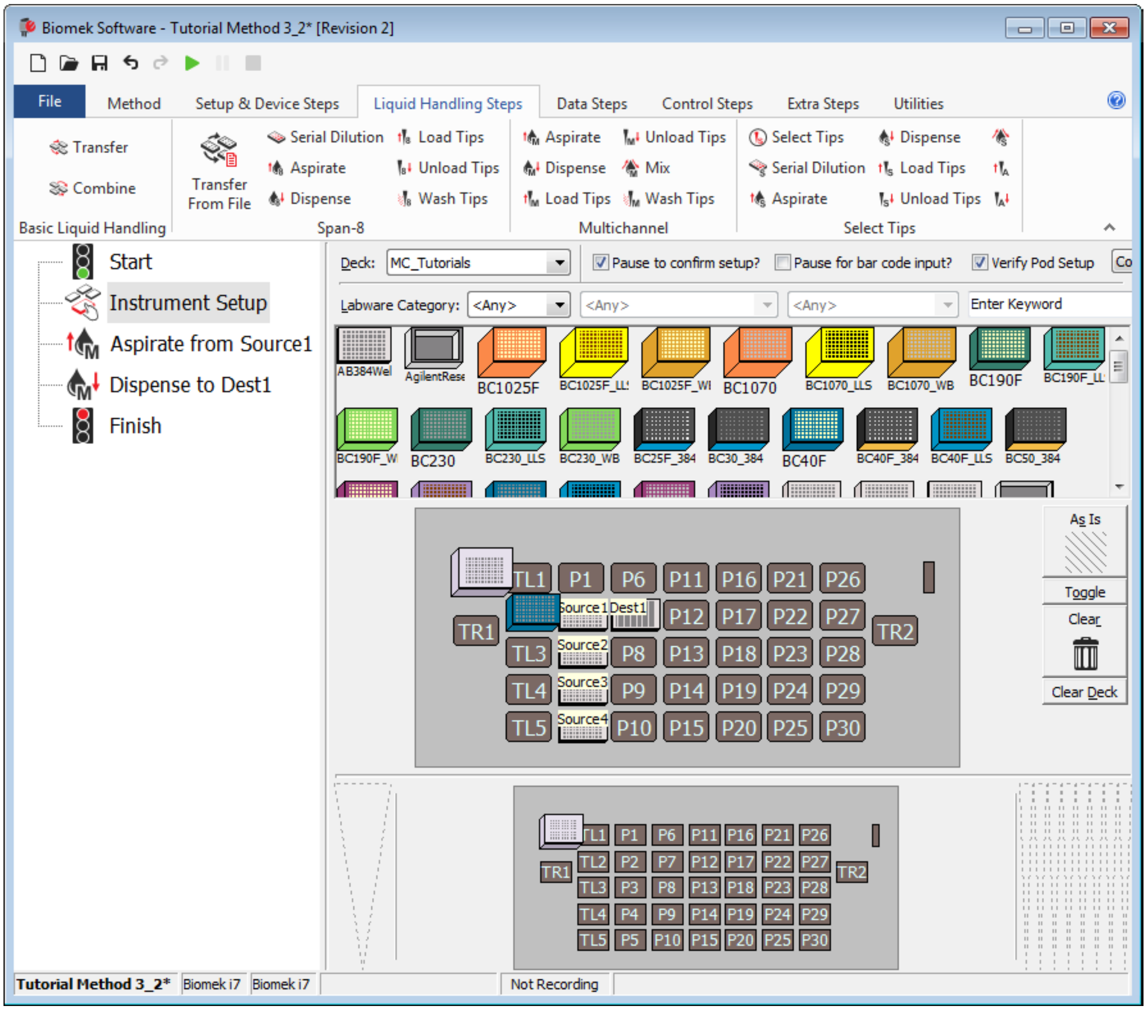
2 Select the **Instrument Setup** step in the Method View to display its configuration.

3 Right-click the **Source1** source plate at position **P2** and select **Copy**. When you copy labware like this, all of the labware properties for that piece of labware, including the name and volume information, are also copied.

4 Click on the empty positions **P3**, **P4**, and **P5** to paste copies of **Source1** at those positions.

5 Rename the **Source1** labware at positions **P3**, **P4** and **P5** to **Source2**, **Source3**, and **Source4**, respectively. You should now have four 96-well source plates in positions **P2**, **P3**, **P4** and **P5** named **Source1** to **Source4** (see Figure 3.8).

Figure 3.8 Modifying the Instrument Setup Step to Add More Sources



Deck: MC_Tutorials
☑ Pause to confirm setup?
☐ Pause for bar code input?
☑ Verify Pod Setup
Labware Category: <Any> <Any> <Any>

Repeating Actions Using the Loop Step

Biomek Software internally tracks the value of the **Loop** for each cycle, and **Start**, **End**, and **Increment** values are specified. If desired, a name can be assigned to the **Loop** value to create a variable. This variable can then be used like any other variable to configure steps, but can only be used with steps contained within the **Loop** step.

To repeat the **Multichannel Aspirate** and **Multichannel Dispense** steps:

---

1. Select the **Instrument Setup** step in the Method View.

2. From the **Control Steps** tab, in the **Flow** group, select the Loop (**Loop**) icon to insert the step in the Method View. The **Loop** and **End Loop** icons appear in the Method View, and the **Loop** step configuration is displayed.

3. In **Variable**, enter ***quad***. This will create a variable named ***quad*** that can be used to configure steps within the **Loop**.

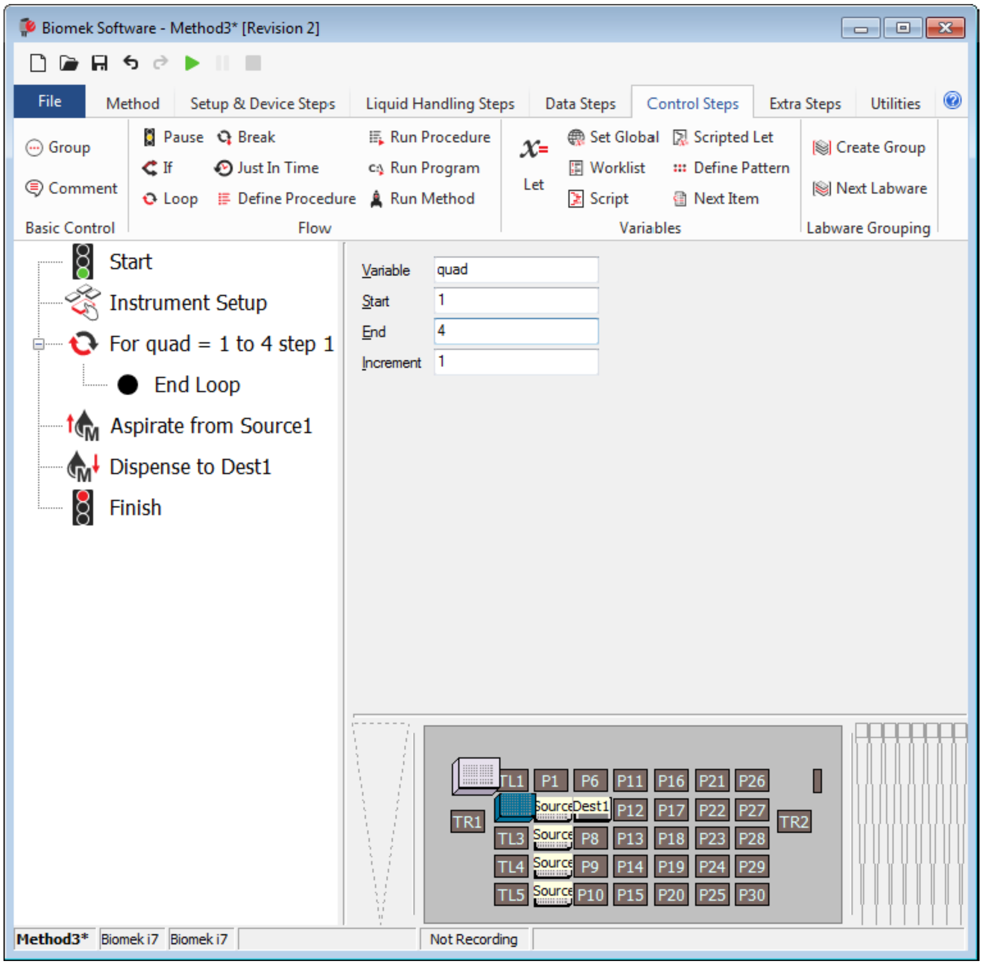
4. In **Start**, enter **1**. This will be the initial value assigned to the variable ***quad*** on the first iteration of the loop.

5. In **End**, enter **4**. This will be the final value for the variable ***quad***. When the value of ***quad*** exceeds the **End** value, the **Loop** step ends and the remainder of the method continues.

---

6 In **Increment**, enter **1**. The **Increment** value is how much the value for the variable ***quad*** changes with each iteration of the **Loop**. Your **Loop** step configuration should look like Figure 3.9.

Figure 3.9 Loop Step for Repeating Aspirate and Dispense



Start
Instrument Setup
For quad = 1 to 4 step 1
End Loop
Aspirate from Source1
Dispense to Dest1
Finish

Variable: quad
Start: 1
End: 4
Increment: 1

---

7 Drag the **Multichannel Aspirate** and **Multichannel Dispense** steps between the **Loop** and **End Loop** icons.

NOTE If you click on the **Finish** step at this time, you will get an error, as the **Loop** step is not yet completed.

Using Variables in Expressions

Now that you have configured the **Loop** step to create the variable ***quad*** and placed the **Multichannel Aspirate** and **Multichannel Dispense** steps inside the **Loop**, you can use the variable ***quad*** to reconfigure the **Multichannel Aspirate** and **Multichannel Dispense** steps. You will now use the variable ***quad*** to configure:

- the source plate from which to aspirate.
- the quadrant on the destination plate to which to dispense.

Biomek i-Series Concept

Expressions combine text, numerical constants, and variables using operators to modify a variable. These operators may perform a number of mathematical operations or combine text strings. Just like with variables, the expression is evaluated and the resulting value is substituted for the expression at run time.

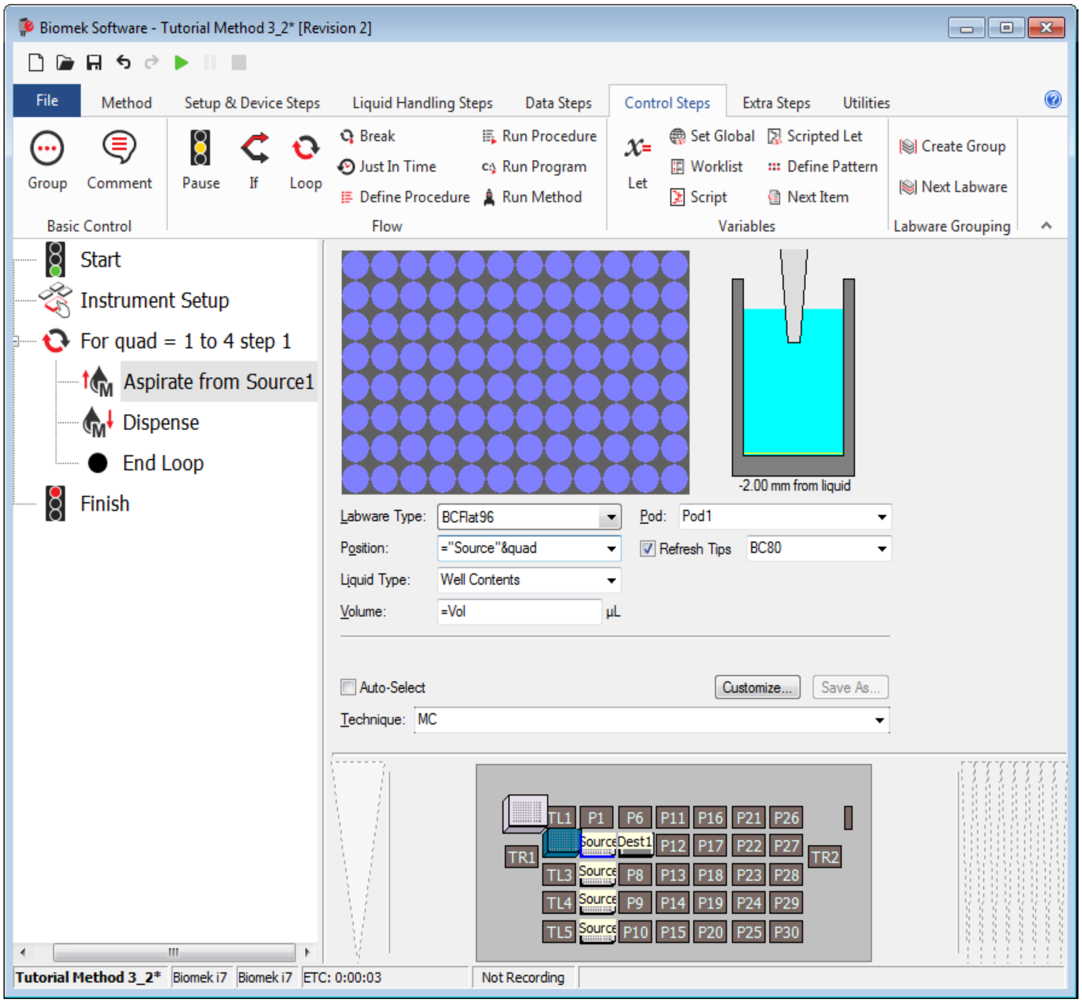
Sometimes, however, the variable by itself is not enough, and you need to use an expression to modify the variable. This is the case to specify the source plate in the **Multichannel Aspirate** step. As you recall, the four 96-well source plates are named **Source1**, **Source2**, **Source3**, and **Source4**. The variable quad has values of **1**, **2**, **3**, and **4** for each cycle of the loop.

To specify which plate to aspirate from, you need to prepend the word "Source" in front of the value for the variable ***quad***. This can be accomplished using the operator**&**. This operator combines two strings. In this case, it will combine a constant string **Source** with the value of the variable ***quad***. To do this:

---

1 In the **Multichannel Aspirate** step configuration, change the **Position** field to **="Source"&quad** (including the equal sign and with no spaces), as shown in Figure 3.10. Values in quotes are text strings and are always evaluated as the same value.

Figure 3.10 Multichannel Aspirate Step Using Loop Variable Quad in an Expression



Start
Instrument Setup
For quad = 1 to 4 step 1
Aspirate from Source1
Dispense
End Loop
Finish

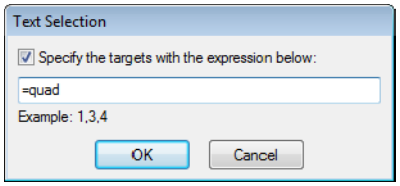
Labware Type: BCFlat96
Position: ="Source"&quad
Liquid Type: Well Contents
Volume: =Vol µL
Pod: Pod1
☑ Refresh Tips BC80
☐ Auto-Select
Technique: MC

Tutorial Method 3_2* | Biomek i7 | Biomek i7 | ETC: 0:00:03 | Not Recording

---

2 In the **Multichannel Dispense** step configuration, rather than specifying the wells to transfer to using the graphical representation of the 384-well plate, you will specify the destination wells using the variable quad. To do this, right-click on the graphical representation of the 384-well plate and choose **Specify Selection as Text** in the menu that appears. **Text Selection** is displayed (Figure 3.11).

Figure 3.11 Text Selection


Text Selection

☑ Specify the targets with the expression below:

=quad

Example: 1,3,4

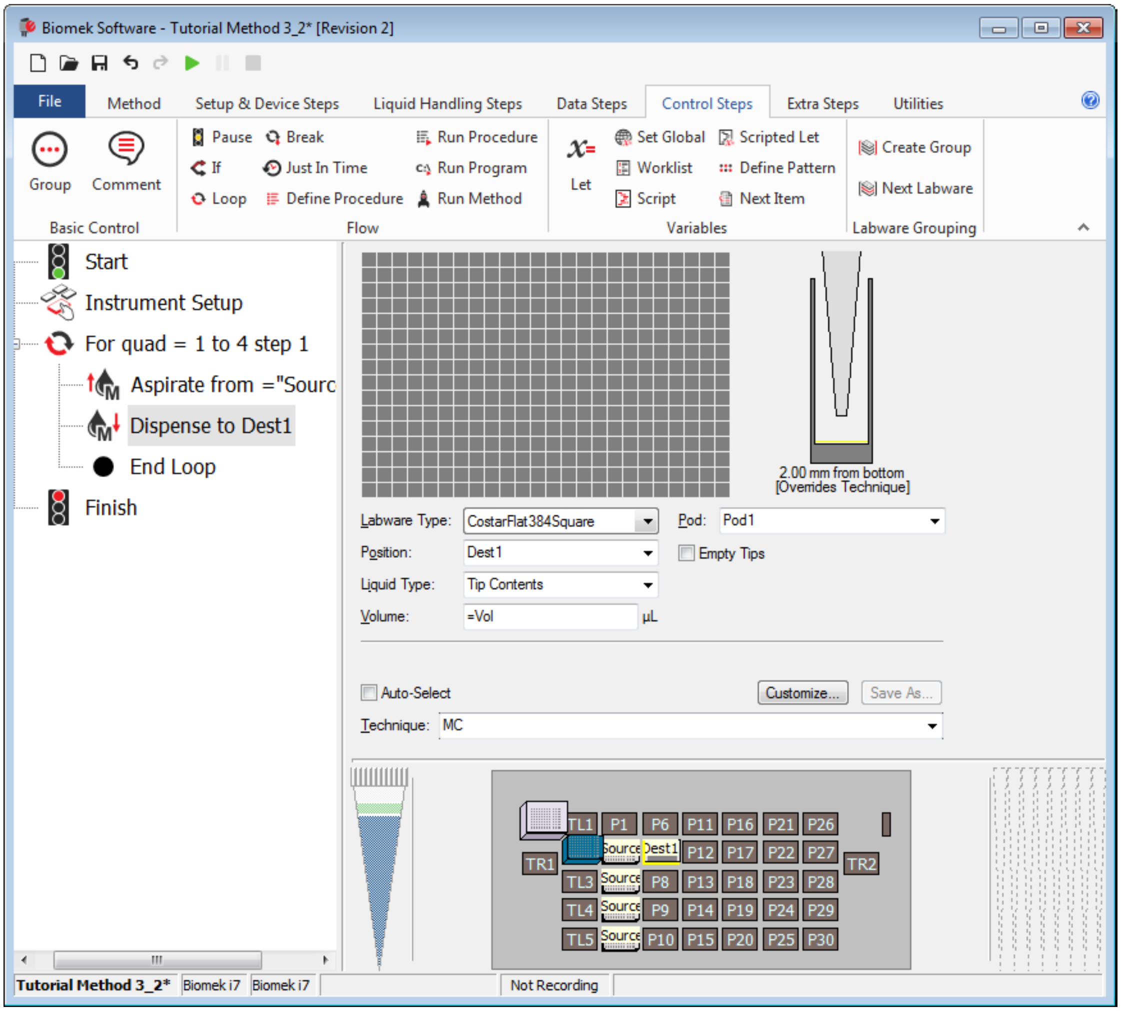
3 In **Text Selection**, enter **=quad**. This will specify the quadrant into which to dispense. Make sure that **Specify the targets with the expression below** is selected. This means that for the first iteration of the loop, it will dispense into quadrant 1; for the next iteration, it will dispense into quadrant 2; and so on.

---

4 Choose **OK**.

The **Multichannel Dispense** step configuration looks like Figure 3.12. The graphical representation of the labware is grayed out to indicate that the target wells to dispense into are specified by text.

Figure 3.12 Multichannel Dispense Step Inside the Loop



Start
Instrument Setup
For quad = 1 to 4 step 1
Aspirate from ="Sourc
Dispense to Dest1
End Loop
Finish

Labware Type: CostarFlat384Square
Pod: Pod1
Position: Dest1
☐ Empty Tips
Liquid Type: Tip Contents
Volume: =Vol µL
☐ Auto-Select
Technique: MC

Conserving Tips Using Individual Steps

As the method is currently configured, an error would result because there are not enough tip boxes on the deck. This is because the **Multichannel Aspirate** step tries to load tips for each iteration of the **Loop**, but there is only one tip box on the deck. There are several ways this could be fixed with either conserving tips and/or avoiding contamination:

- If seeking to conserve tips, load the tips before the **Loop** and reuse them for each iteration of the **Loop**.
- If seeking to avoid contamination, add the appropriate number of tip boxes to the deck for each dispense and the **Multichannel Load Tips** and **Multichannel Unload Tips** steps are inside the Loop.
- If seeking to reduce tips and avoid contamination and have a wash ALP, wash the tips after the dispense of the same source.

TIP When dispensing the same reagent to multiple plates or multiple times (i.e., wash buffer), dispensing **above the liquid** allows you to avoid contaminating tips, thus conserving tips and/or the need to wash them.

TIP To avoid contamination, changing tips between the dispense and aspirate of different sources is highly recommended.

Conserving tips includes:

- *Loading and Unloading Tips Outside the Loop*
- *Washing Tips Inside the Loop*

Loading and Unloading Tips Outside the Loop

This portion of the method uses the same tips to perform multiple dispenses from the same source to one destination.

To load and unload tips outside of the **Loop**:

---

1 From the current method, edit the **Instrument Setup** step as follows:

   a. Add a **BC230** tip box to **TL1**.

   b. Add an **BCUpsideDownTipBoxLid** (reservoir) to **P12.** Name it **Buffer** and configure with a **Known** volume of **120000** µL of **Water.**

---

2 In the **Start** step, uncheck the **Prompt** check box for the variable value.

---

3 Select the **Instrument Setup** step in the Method View.

4 From the **Liquid Handling Steps** tab, in the **Multichannel** group, select the Load Tips (**Multichannel Load Tips**) icon to insert a **Multichannel Load Tips** step before the **Loop** step in the Method View.

5 In **Tips**, select **BC230**.

6 Select the **Multichannel Aspirate** step inside the **Loop**.

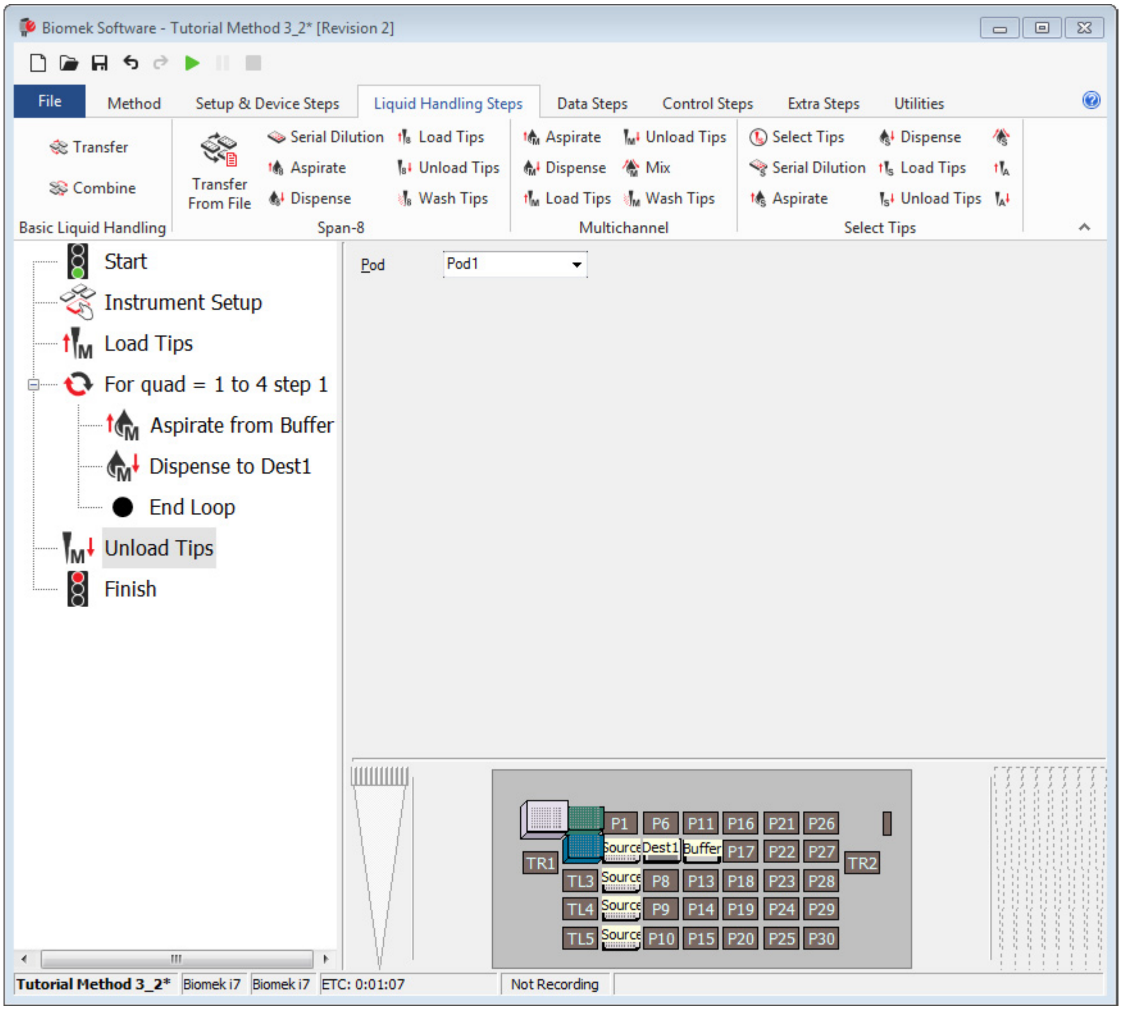
7 Select the reservoir labeled **Buffer** as the source plate, and change the volume to **100** µL.

8 Deselect the **Refresh Tips** check box. This tells the instrument to use whatever tips are already loaded to perform the aspirate instead of loading new tips at the start of the **Multichannel Aspirate** step.

9 Select the **Multichannel Dispense** step in the Method View and change the volume to **100** µL.

10 Select the **Finish** step in the Method View, and then, from the **Liquid Handling Steps** tab, in the **Multichannel** group, select the Unload Tips (**Multichannel Unload Tips**) icon to insert a **Multichannel Unload Tips** step after the **End Loop** step. Your method should now look like Figure 3.13.

Figure 3.13 Loading and Unloading Tips Outside the Loop



Start
Instrument Setup
Load Tips
For quad = 1 to 4 step 1
Aspirate from Buffer
Dispense to Dest1
End Loop
Unload Tips
Finish

Pod: Pod1

---

11 Click **Finish** to validate the method.

---

12 Save the method with the name: **Tutorial Method 3 Loop_Tips**

This method loads new tips, uses those same tips to perform four aspirate and dispense operations from the **Loop**, and unloads the tips after the last iteration of the **Loop**.

Washing Tips Inside the Loop

This is an example of a method that includes multiple dispense operations from different sources. Tips will be washed between the same sources inside the loop, but outside of the loop, tips are changed between different sources.

Biomek i-Series Concept	
	The **Multichannel Wash Tips** step washes tips at the **WashStation** by aspirating and dispensing a specified volume of wash fluid a specified number of times. Typically, the wash ALP is used to rinse residue off the tip so that when it dries it does not plug the tip and the tip can be reused.

To wash tips between aspirate actions:

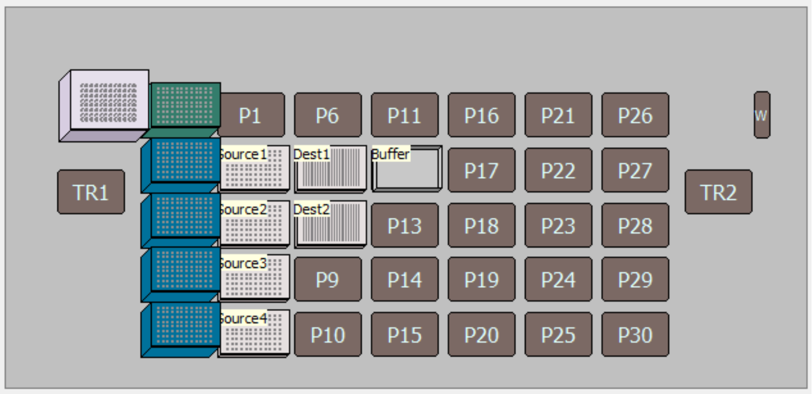
---

1 If necessary, open the previous method and select the **Instrument Setup** step in the Method View, and make the following changes to the step:

- **a.** Add **BC80** tip boxes to **TL3**, **TL4**, **TL5**.
- **b.** Copy the **Dest1** plate and place on the deck at **P8** and name it **Dest2**.

The deck layout should now appear as shown in Figure 3.14.

Figure 3.14 Deck Layout for Washing Tips Inside a Loop



---

2 Select the **Instrument Setup** step in the Method View.

---

3 From the **Control Steps** tab, in the **Flow** group, select the Loop (**Loop**) icon to insert the step into the Method View.

---

4 Configure the **Loop** step as follows:

- **a.** In **Variable**, enter **Quad**.
- **b.** In **Start**, enter **1**.

c. In **End**, enter **4**.

d. In **Increment**, enter **1**.

This configures the **Loop** step to loop through the Source plates and the quadrants of the destination plates.

---

5 In the Method View, click on the **Multichannel Load Tips** step, and then Shift + click on the **Multichannel Unload Tips** step just above the **Finish** step. This selects all steps under the **Loop** step you just added. Drag the selected group of steps between the **Loop** and **End Loop** icons for the **Loop** step added in Step 3.

---

6 Click on the **Multichannel Load Tips** step and choose **BC80**.

---

7 Click on the second (nested) **Loop** step in the Method View.

---

8 Modify the **Loop** step as follows:

a. In **Variable**, enter **Step**.

b. In **Start**, enter **1**.

c. In **End**, enter **2**.

d. In **Increment**, enter **1**.

This configures the **Loop** step to loop through the destination plates.

---

9 Click on the **Multichannel Aspirate** step in the method view and reconfigure as follows:

a. In the **Labware Type** drop-down, select **BCFlat96**.

b. In **Position**, enter the expression: **="*source*"&*Quad***

c. Change the **Volume** to **60** µL.

---

10 Select the **Multichannel Dispense** step in the Method View and reconfigure as follows:

a. In **Position**, enter the expression: **="*Dest*"&*Step***

b. Change the **Volume** to **60** µL.

---

11 Select the **Multichannel Dispense** step in the Method View.

---

12 From the **Liquid Handling Steps** tab, in the **Multichannel** group, select the Wash Tips **(Multichannel Wash Tips)** icon to insert it between the **Multichannel Dispense** and **End Loop** steps in the Method View.

---

13 In **Volume**, enter **110%.** This means that for each wash cycle, a volume equal to 1.1*x* the total volume that was aspirated and dispensed is used to clean the tips. For example, if 100 µL was aspirated, the tips will be washed with 110 µL.

TIP It is recommended to wash tips with more than the amount that was aspirated, as this ensures that the entire tip is washed of the aspirated liquid.

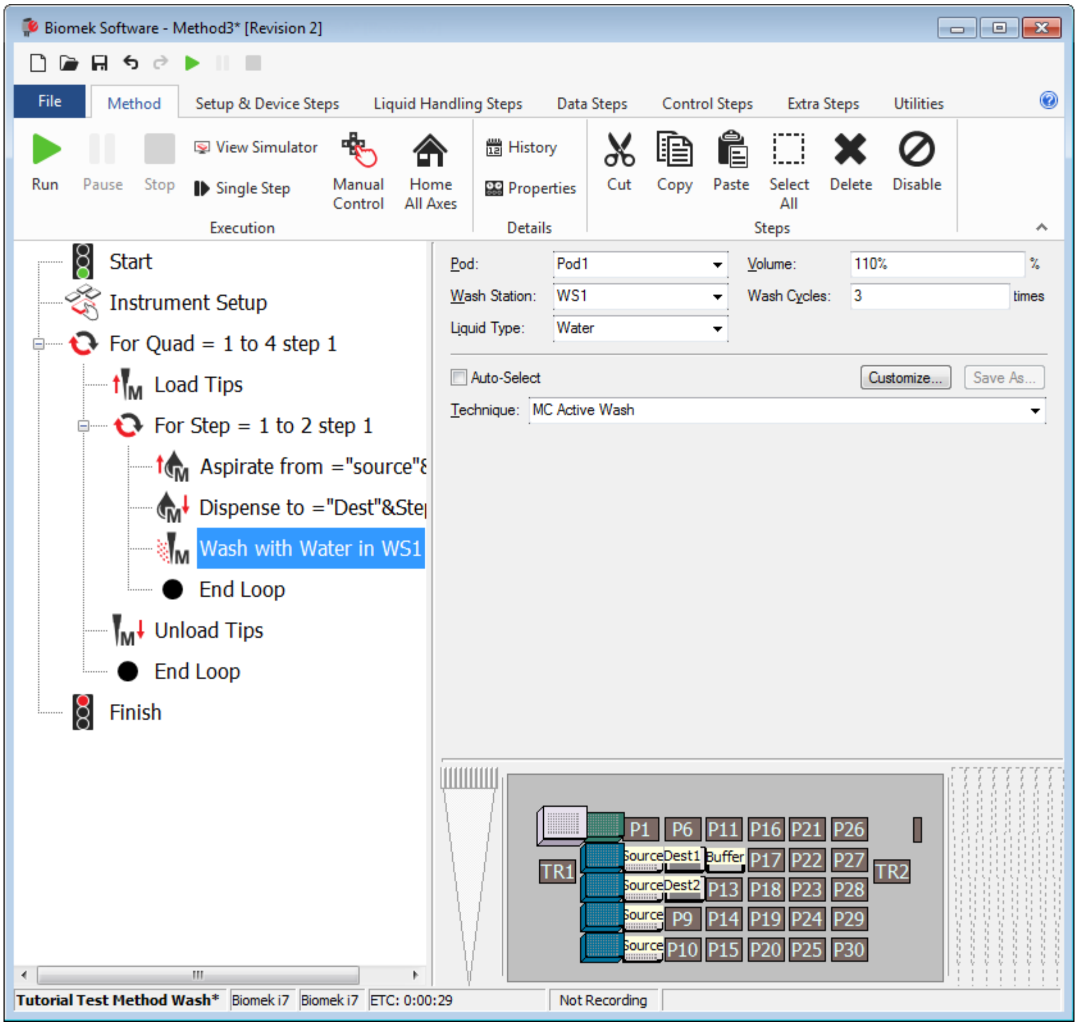
---

14 In **Wash Cycles**, enter **3.** This is the number of times that the **Volume** of wash fluid is aspirated and dispensed to clean the tips.

---

15 In the **Technique** drop-down, select **MC Active Wash**. Your method should now look like Figure 3.15.

Figure 3.15 Wash Step Configuration



- Start
- Instrument Setup
- For Quad = 1 to 4 step 1
  - Load Tips
  - For Step = 1 to 2 step 1
    - Aspirate from ="source"
    - Dispense to ="Dest"&Ste
    - Wash with Water in WS1
    - End Loop
  - Unload Tips
  - End Loop
- Finish

Pod: Pod1
Wash Station: WS1
Liquid Type: Water
Volume: 110% %
Wash Cycles: 3 times
☐ Auto-Select
Technique: MC Active Wash

Tutorial Test Method Wash* | Biomek i7 | Biomek i7 | ETC: 0:00:29 | Not Recording

16 Select the **Finish** step to validate the method.

17 Run method in Simulation mode, and then save it as **Tutorial Test Method Wash**; choose **OK** when finished.

Using Lids in a Method

In CHAPTER 2, *Multichannel Pod — Using More Steps in a Method* you learned about using the **Move Labware** step to move labware on the deck. Another use of the **Move Labware** step is to remove lids from lidded microplates or tip boxes. In this section, you will modify the method you saved earlier in this chapter to use a lidded 384-well plate for the destination.

To use lids in a method:

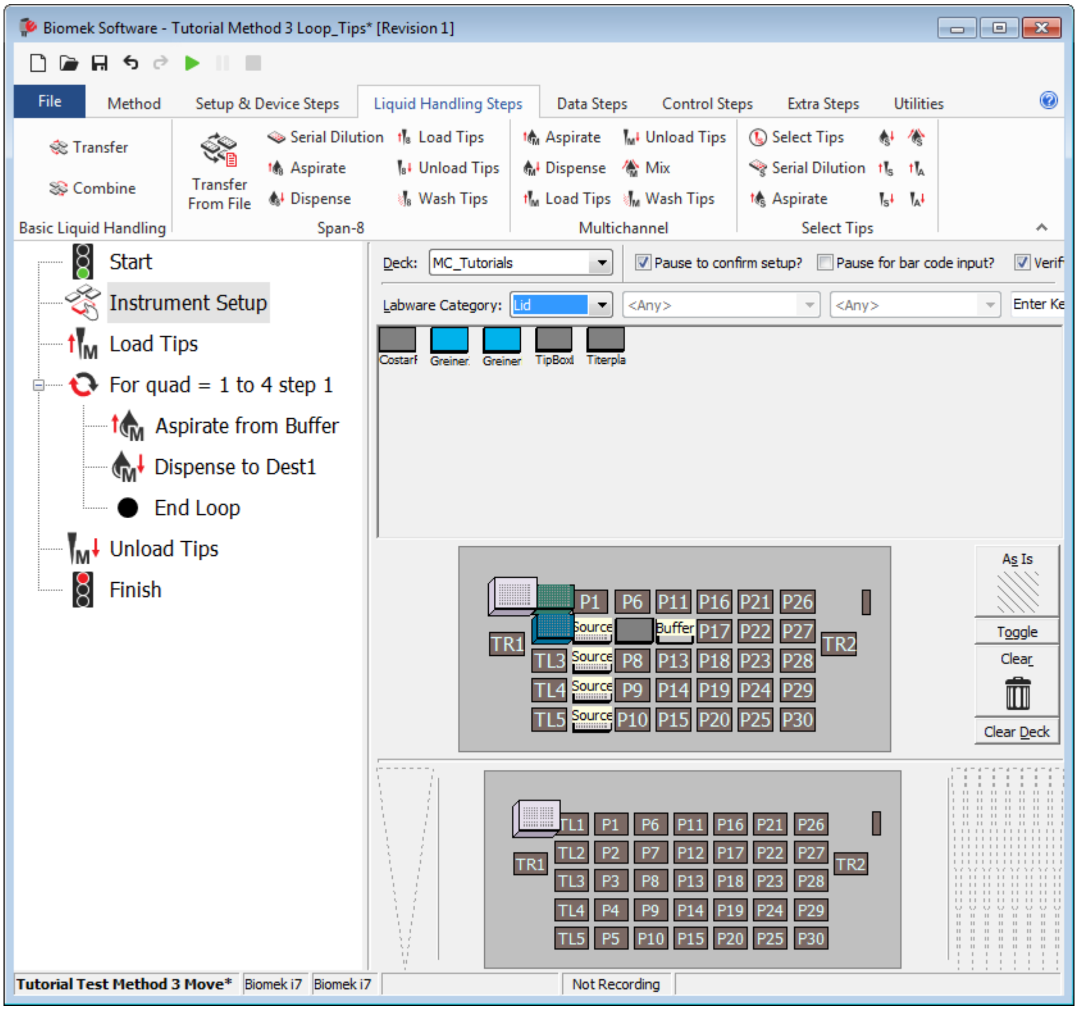
1 Open the method saved as **Tutorial Method 3 Loop_Tips**.

2 Select the **Instrument Setup** step.

3 In **Labware Category**, select **Lid** to display only the lids.

4 Drag a **CostarFlat384SquareLid** on top of the **Dest1** plate located on position **P7**. Your **Instrument Setup** should now look like Figure 3.16.

Figure 3.16 Modifying Instrument Setup Step to Add a Lid



Deck: MC_Tutorials

☑ Pause to confirm setup?

☐ Pause for bar code input?

☑ Verif

Labware Category: Lid

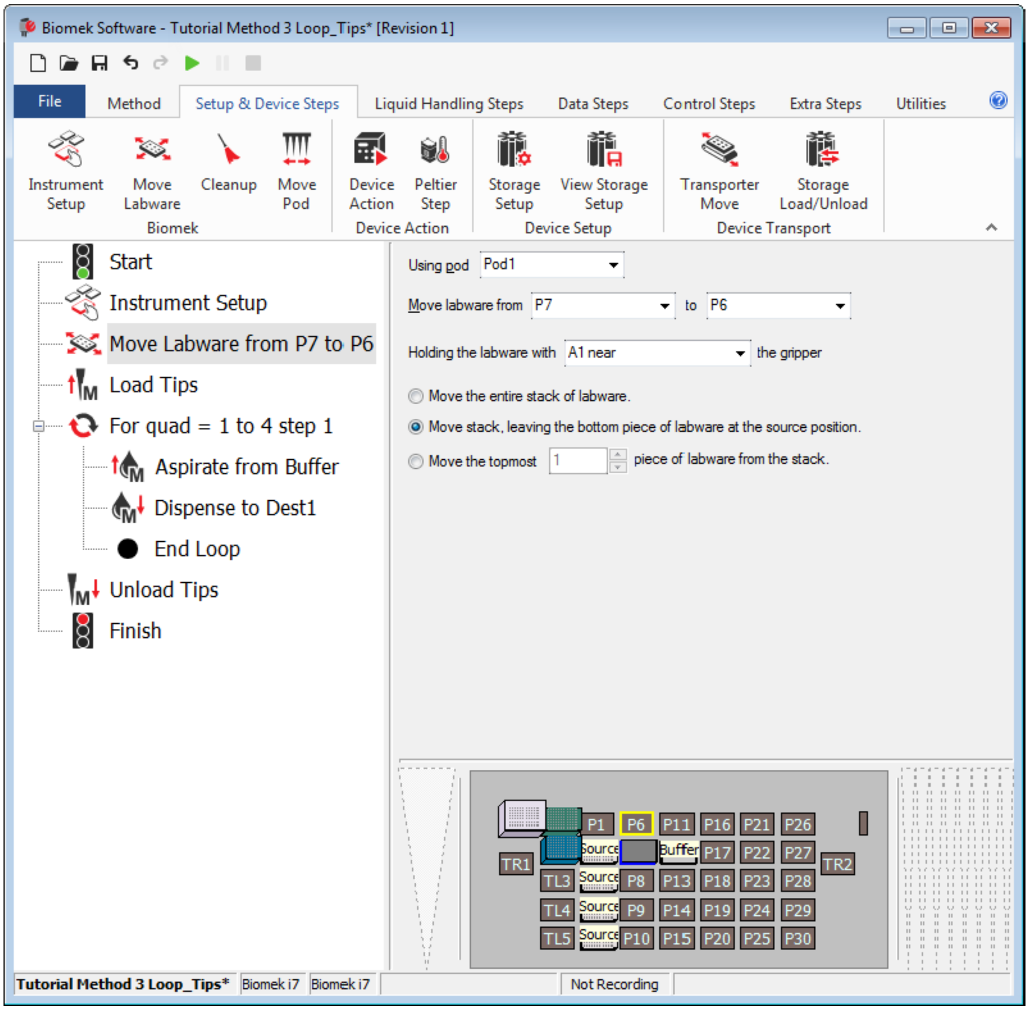
5 To remove the lid as part of the method, insert a **Move Labware** step (located on the **Setup & Devices Steps** tab, in the **Biomek** group) immediately after the **Instrument Setup** step.

6 Configure the **Move Labware** step to **Move labware** from **P7** to **P6**.

7 In **Holding the labware with**, select **A1 near** to have the gripper come in from the left.

8 Select the second option to **Move stack, leaving the bottom piece of labware at the source position.** This tells the instrument to pick up only the lid and leave the plate at its current position. Your **Move Labware** step configuration should look like Figure 3.17.

Figure 3.17 Using Move Labware to Remove a Lid



Start
Instrument Setup
Move Labware from P7 to P6
Load Tips
For quad = 1 to 4 step 1
  Aspirate from Buffer
  Dispense to Dest1
  End Loop
Unload Tips
Finish

Using pod: Pod1

Move labware from: P7 to: P6

Holding the labware with: A1 near the gripper

○ Move the entire stack of labware.
● Move stack, leaving the bottom piece of labware at the source position.
○ Move the topmost 1 piece of labware from the stack.

9 Select **Finish** to validate the method, and then save the method with the name: **Tutorial Test Method 3 Move.** If desired, run the method.

Stacking Plates in a Method

The instrument can also handle stacks of labware, both stacking and unstacking labware stacks in a method using the gripper. In this section, you will use what you have learned previously about the **Loop** step and the **Move Labware** step to stack the four source plates.

To do this, you will use another **Loop** step with a variable that will be used to specify the deck positions from which to pick up labware and an expression to specify to which position to move labware. Once configured, the three cycles of the **Loop** will move labware as shown in Table 3.1.

Table 3.1 Values of Variables and Expressions Used in the Move Labware Step for Cycles

Cycle	Stack Value	From (“P”&stack)	To (“P”&(stack-1))
1	5	P5	P4
2	4	P4	P3
3	3	P3	P2
4	2	Value of stack is below **End** value; breaks out of loop and continues with method.	

Biomek i-Series Concept

For either stacking or unstacking, Biomek Software works from the bottom, up. If the labware is defined in the **Labware Type Editor** for secure stacking, the plates are stacked in order. For example, Plate 2 is stacked on Plate 1 (bottom plate), Plate 3 on Plate 2, Plate 4 (top plate) on Plate 3.

As a guideline, a stack of four standard 96-well plates, with a lid on top, is the recommended maximum amount of labware to stack; additional labware could cause the stack to topple if the labware is not secure to one another.

To stack the four source plates:

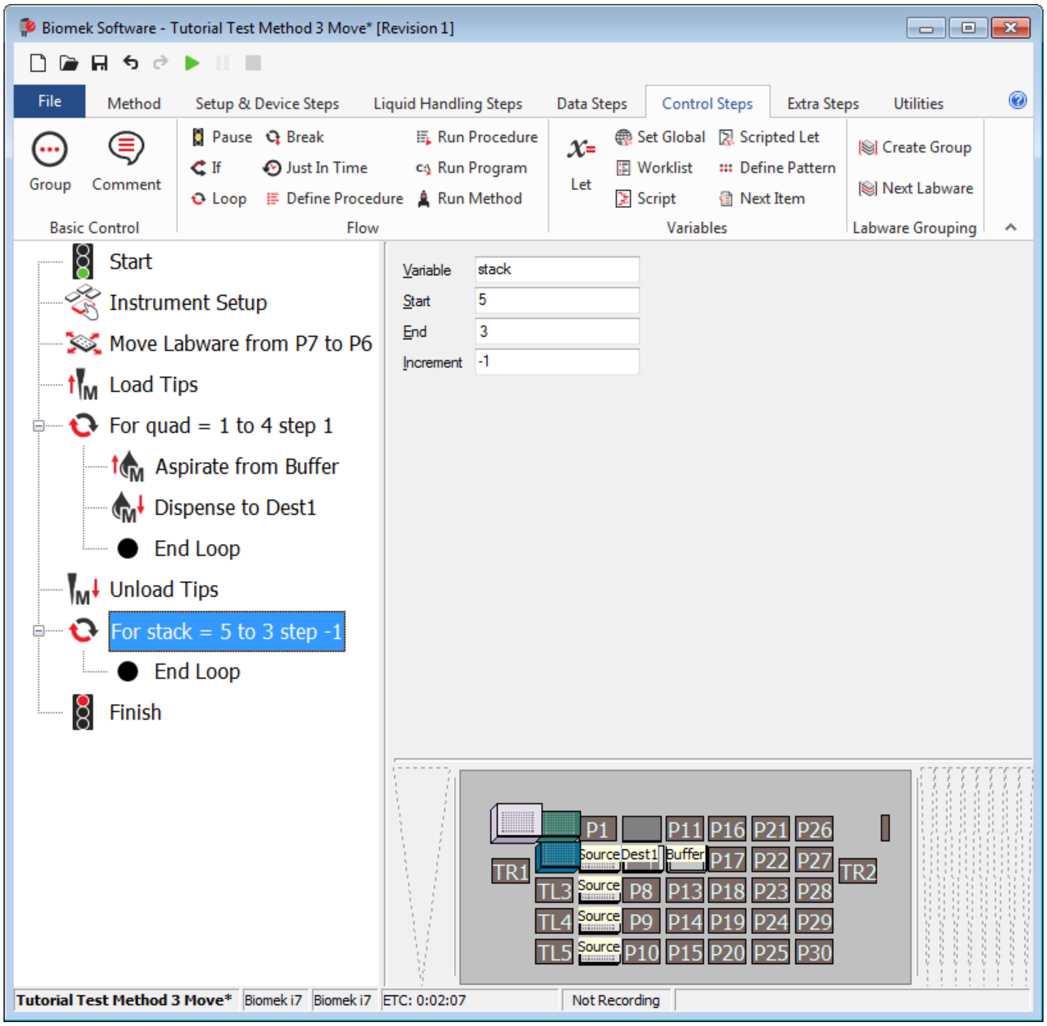
1 If necessary, open the method you saved in the previous exercise (i.e., **Tutorial Test Method 3 Move**).

2 Insert a **Loop** step after the **Multichannel Unload Tips** step.

---

3 Configure the **Loop** step to create a **Variable** named **stack** with a **Start** value of **5**, an **End** value of **3**, and an **Increment** value of **-1**. Your **Loop** step should look like Figure 3.18.

Figure 3.18 Loop to Stack Plates



- Start
- Instrument Setup
- Move Labware from P7 to P6
- Load Tips
- For quad = 1 to 4 step 1
  - Aspirate from Buffer
  - Dispense to Dest1
  - End Loop
- Unload Tips
- For stack = 5 to 3 step -1
  - End Loop
- Finish

Variable: stack
Start: 5
End: 3
Increment: -1

---

4 Insert a **Move Labware** step between the **Loop** and **End Loop** icons.

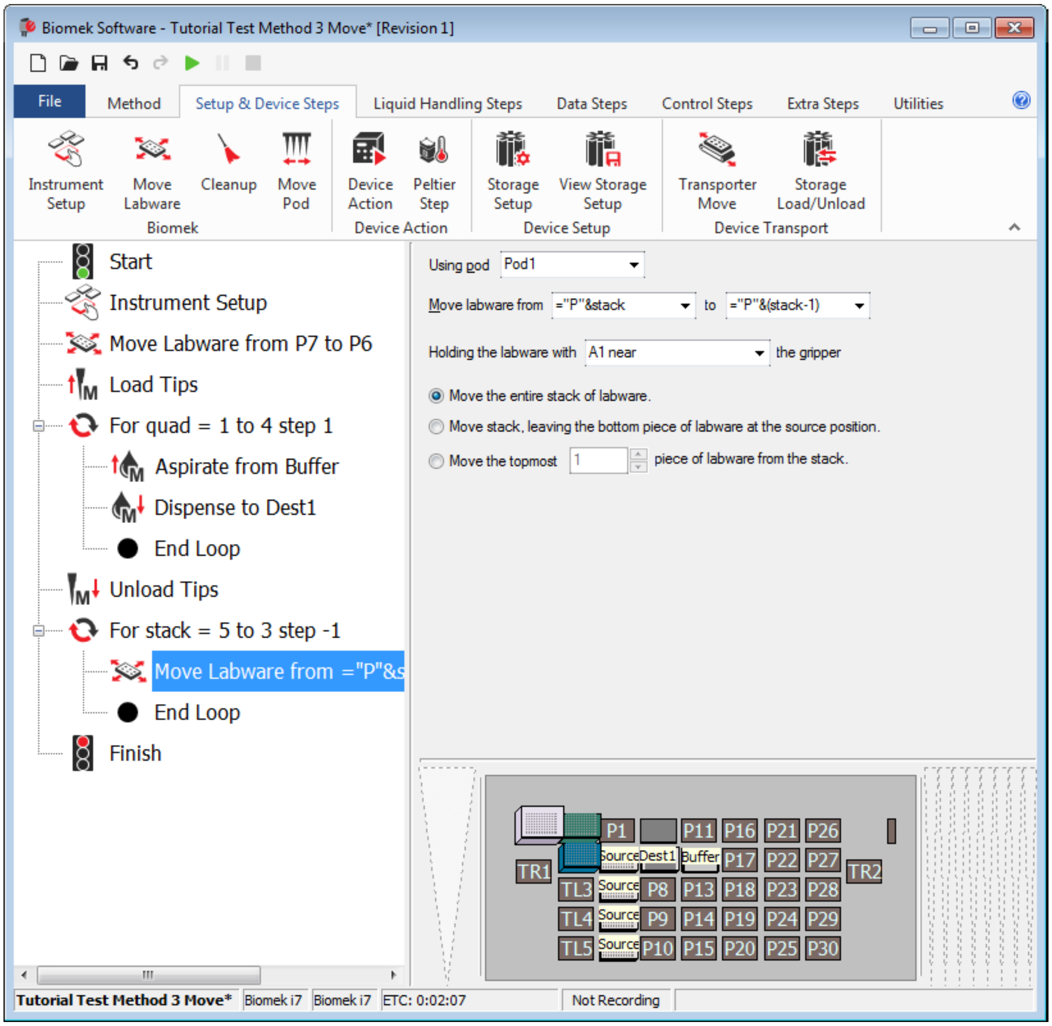
---

5 In **Move Labware from**, enter: **="P"&stack**

6 In **to**, type: **="P"&(stack-1)**

Select the first option, **Move the entire stack of labware.** Your **Move Labware** configuration should look like Figure 3.19.

Figure 3.19 Use Variables to Stack Plates



- Start
- Instrument Setup
- Move Labware from P7 to P6
- Load Tips
- For quad = 1 to 4 step 1
  - Aspirate from Buffer
  - Dispense to Dest1
  - End Loop
- Unload Tips
- For stack = 5 to 3 step -1
  - Move Labware from ="P"&s
  - End Loop
- Finish

Using pod: Pod1

Move labware from: ="P"&stack to: ="P"&(stack-1)

Holding the labware with: A1 near the gripper

● Move the entire stack of labware.

○ Move stack, leaving the bottom piece of labware at the source position.

○ Move the topmost 1 piece of labware from the stack.

Tutorial Test Method 3 Move* | Biomek i7 | Biomek i7 | ETC: 0:02:07 | Not Recording

7 Select **Finish** to validate the method.

8 Select **File > Save as > Method**, and save the file as: **Tutorial Test Method 3 Move Stack**

Now move on to the last chapter of this tutorial to learn how to use some advanced features in Biomek Software.

CHAPTER 4

Multichannel Pod — Using Worklists and Conditions

Introduction to Using Worklists and Conditions

To successfully complete the activities in this chapter, you will need to know how to:

- Configure an **Instrument Setup** step to reflect the deck layout (physical or virtual) you will set up for the method in this chapter.
- Configure **Labware Properties** for labware you will use in this chapter.
- Configure a **Transfer** step.
- Use variables and expressions in Biomek Software.

What You'll Learn in This Chapter

In this chapter, you will develop the advanced skills to use external data sources, such as a worklist, with a method. Using a worklist will allow you to create a method using source and destination volumes defined in a text file. You will also learn how to use procedures to run the same set of configured steps several times in a method to eliminate having to configure each step several times and learn how to configure a conditional statement that will allow a step or steps to be executed based on real-time conditions that occur during the method. The process for creating the method in this chapter is presented below. All of these topics are covered in detail in this chapter.

Setting Up Your Deck for Using Worklists and Conditions

To learn how to use Worklists and Conditions, you will set up the deck to transfer liquid from two reservoirs into six microplates; the liquid amounts to transfer vary per microplate and source, and these amounts are defined in the worklist file used in the **Worklist** step. In addition, you will define conditions to further define the process.

Using what you learned in CHAPTER 1, *Multichannel Pod — Getting Started with Biomek Software*, create a new method, add an **Instrument Setup** step, and configure the following:

1. Place a **BC230** tip box on **TL2** and name it **TipsA**. Configure the **Labware Properties** to **Load no more than** as **6**. This means that the tips in this tip box will not be used more than six times.

2. Place the same tip box type on **TL3**, name it **TipsB**, and configure it the same as **TipsA**.

3. Place a **Reservoir** on **P2** and name it **A**. Give it a **Known** volume of **100000** µL of **Water**.

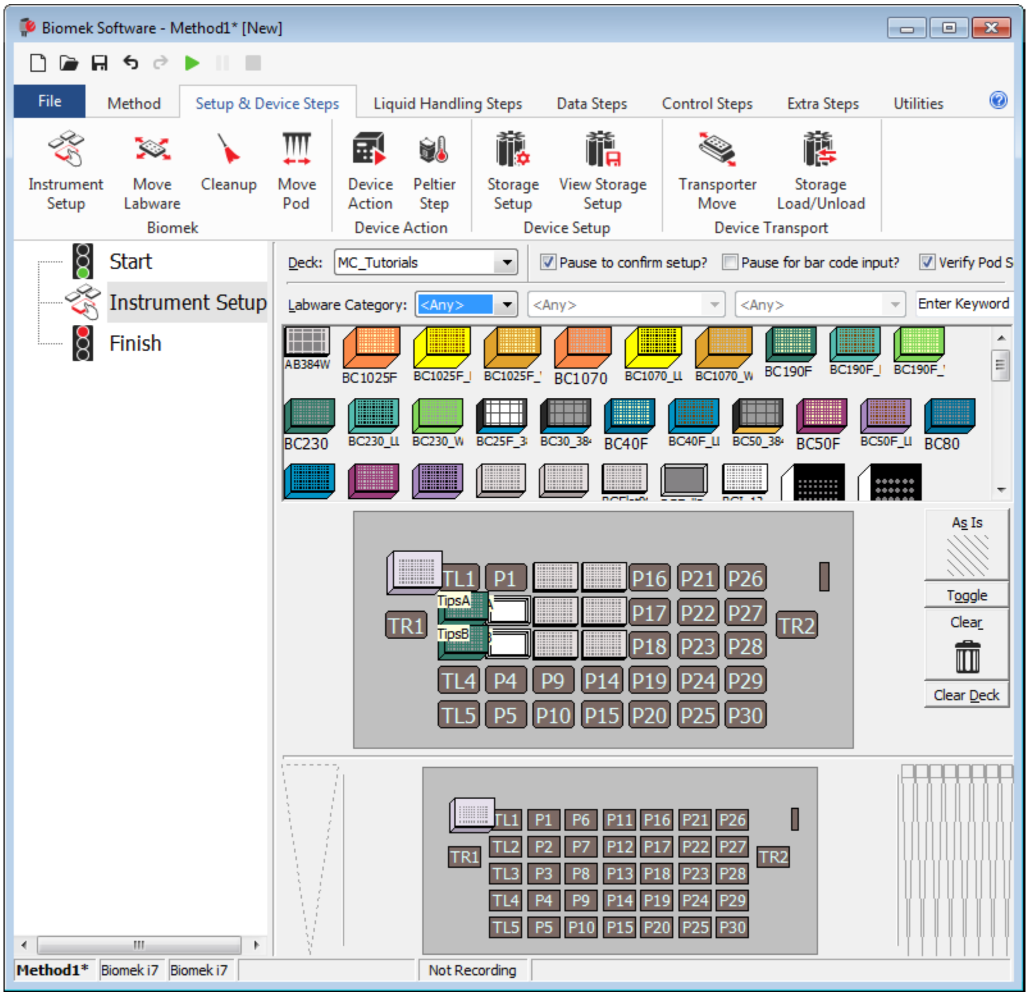
4. Place another **Reservoir** on **P3** and name it **B**. Give it a **Known** volume of **100000** µL of **Water**.

5. Place **BCFlat96** plates on **P6**, **P7**, **P8**, **P11**, **P12**, and **P13**. Give these plates each a **Known** volume of **100** µL of **Water** (see **TIP** below).

   TIP. Since you will configure six **BCFlat96** plates with the same properties, you can place the first one on **P6**, configure it, and then right-click on it and choose **Copy**, and then click on **P7**, **P8**, **P11**, **P12**, and **P13**. The labware type and the properties are copied to those positions.

Your deck should look like Figure 4.1. Now go to the next activity to learn how to use worklists in your methods.

Figure 4.1 Instrument Setup Step Configured



Deck: MC_Tutorials ☑ Pause to confirm setup? ☐ Pause for bar code input? ☑ Verify Pod S

Labware Category: <Any> <Any> <Any> Enter Keyword

Creating a Worklist Text File

A worklist is a text file that contains multiple values for one or more variables. The **Worklist** step in Biomek Software uses the variables and values defined in the worklist to configure a series of repetitive actions during the method run. This is different from the **Loop** step that you learned earlier in this tutorial in that a worklist can contain non-incremental values and multiple variables for use during repetitive actions.

Before you can use the **Worklist** step, you must create the worklist text file and define the variables and associated values. For the method in this chapter, you will create a worklist for a series of transfers using different amounts of liquid for each transfer.

Configuring a Worklist Text File

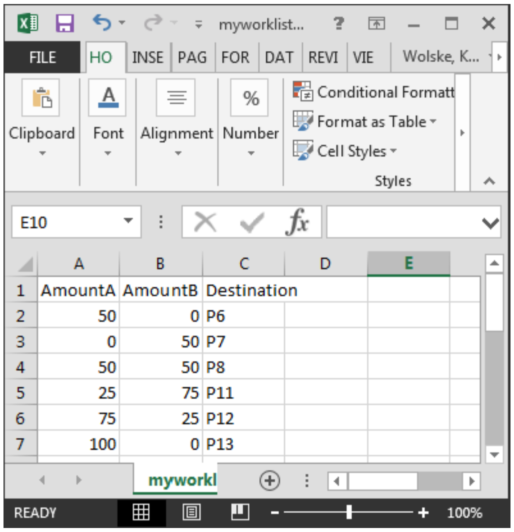
The first line of a worklist text file defines the variable names. The subsequent lines list the values to be assigned to those variables. The variable and names are separated by commas.

To configure the worklist text file for this tutorial:

---

1 Using Microsoft Excel, create a .csv file that looks like Figure 4.2.

Figure 4.2 Created Worklist — .CSV File

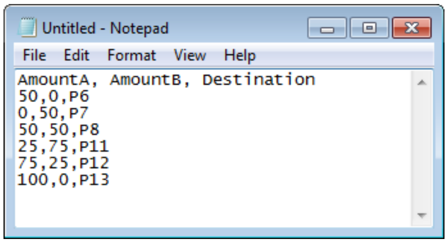


	A	B	C	D	E
1	AmountA	AmountB	Destination		
2	50	0	P6		
3	0	50	P7		
4	50	50	P8		
5	25	75	P11		
6	75	25	P12		
7	100	0	P13		

OR

Using Notepad, create a text file that looks like Figure 4.3.

Figure 4.3 Created Worklist — .TXT File



```
AmountA, AmountB, Destination
50,0,P6
0,50,P7
50,50,P8
25,75,P11
75,25,P12
100,0,P13
```

TIP If a value such as a plate name or bar code contains a comma, enclose the entire value in double quotes, for example, "**Dest1,4**".

TIP When creating a Worklist file, white space between values is not important; however, the comma (,) and carriage returns (CRLF) are important to create and use the file properly. Do not enter a carriage return after the last line, as the software will expect information to be present in this line, and this will cause an error.

2 Save the file as **myworklist** in the location of your choice, and then close the file.

Now that you have configured the worklist, you will insert and configure a **Worklist** step to enable the software to use the worklist in the method. Go on to the next section to learn how to do this.

Configuring a Worklist Step to Use a Worklist

The **Worklist** step is located on the **Control Steps** tab, in the **Variables** group, and uses a text file to supply to the method multiple values for one or more variables. A **Worklist** step is useful when repetition of the same action is required, but one or more variables needs to change each time the step cycles through the worklist. When a step or group of steps using the variables defined in the text file are placed inside a **Worklist** step, the **Worklist** automatically performs each step once for each line in the text file.

For this part of the tutorial, we will use a **Worklist** step to transfer specific amounts of liquid from two different sources to six destination plates. The text file you configured in *Creating a Worklist Text File*, contains all the needed details.

Biomek i-Series Concept

The **Worklist** step offers several advantages:

- Data in a text file is accessible by any Biomek Software method.
- Selecting the text file in the **Worklist** step configuration copies all of the variable data from the text file to the step without individually entering all the variables.
- A dynamic link exists between the method and the text file. Any updates made to the text file are included in the next method run, although the text file must maintain the original file path to allow the method to find the file.

To configure the **Worklist** step:

1. Ensure your deck is configured according to the instructions in *Setting Up Your Deck for Using Worklists and Conditions*.

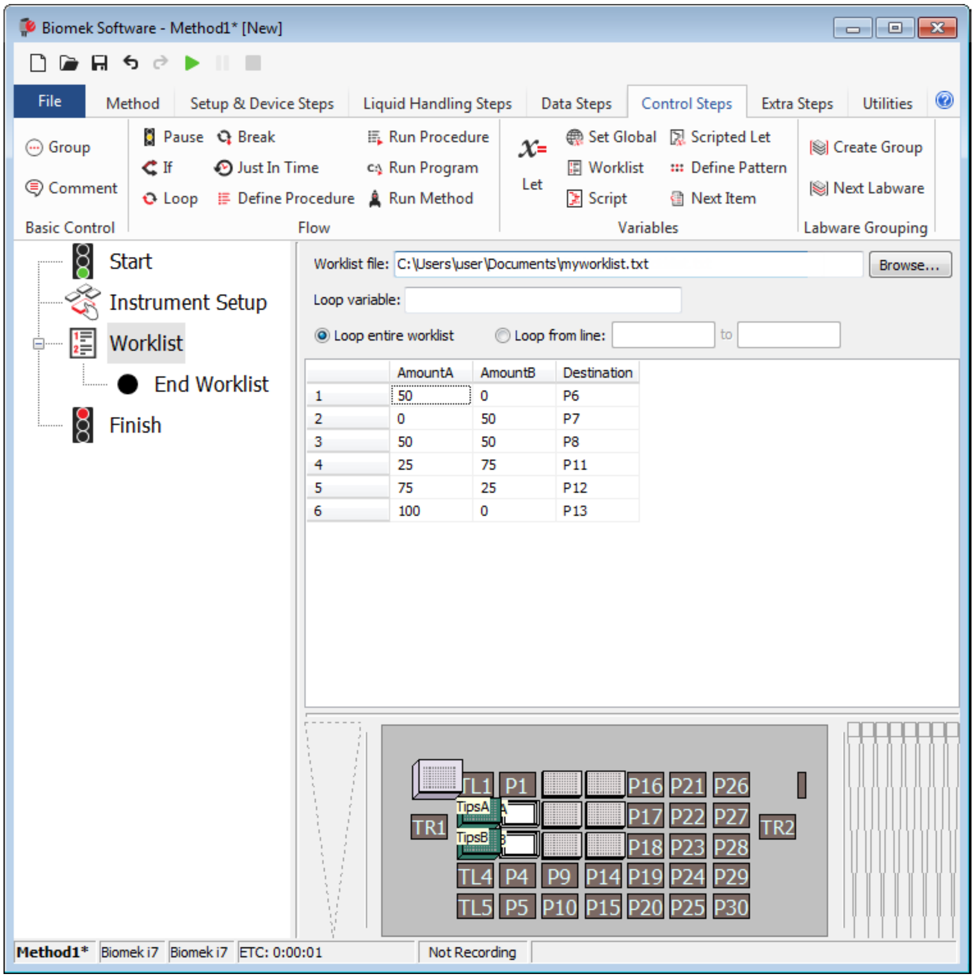
2. Below the **Instrument Setup** step, insert a **Worklist** step (Figure 4.4) into the Method View by selecting the **Control Steps** tab and then clicking the Worklist (**Worklist**) icon, which is located in the **Variables** group.

3. From **Worklist file** in the configuration window, use the **Browse** button to find and choose **myworklist.txt** or **myworklist.csv**, the text file you configured in *Creating a Worklist Text File*, and then select **Open**.

4 Make sure **Loop entire worklist** is selected. This ensures that all the values contained in the worklist are used. The **Worklist** step configuration should look like Figure 4.4.

TIP You can use **Loop from line** to execute the loop for only some of the lines in the worklist.

Figure 4.4 Worklist Step With Text File Displayed



Worklist file: C:\Users\user\Documents\myworklist.txt

Loop variable:

● Loop entire worklist ○ Loop from line: to

	AmountA	AmountB	Destination
1	50	0	P6
2	0	50	P7
3	50	50	P8
4	25	75	P11
5	75	25	P12
6	100	0	P13

Transferring Liquid Using a Worklist

To configure the actual liquid transfer that will be executed using the **Worklist** variables, transfer steps need to be configured as follows:

1 Add a **Transfer** step just above the **End Worklist** step.

2 To configure **Tip Handling**:

- **a.** Select the **TipsA** tip box from the Current Instrument Display to specify which tips to load.
- **b.** Select **leave them on** to keep the tips on when the transfer is done.

Select the up arrow to collapse **Tip Handling**.

3 Click on **Click here to add a source**, and then click on the reservoir labeled **A** in the Current Instrument Display.

4 In the **Technique** field, choose **MC** from the drop-down.

5 Right click on the tip image, select **Custom Height**, and change it to **2.00** mm **from bottom**. Select **OK**.

6 Click on **Click here to add Destination** and configure the destination as a **BCFlat96** at **=destination**. Configuring ***`=destination`*** means that you are using the destinations specified in the **Worklist** step in the **Destination** column.

7 In destination configuration volume field, enter **=AmountA**. Configuring ***`=AmountA`*** means it will use the volumes on the **Worklist** step from column **AmountA**.

8 In the **Technique** field, choose **MC** from the drop-down.

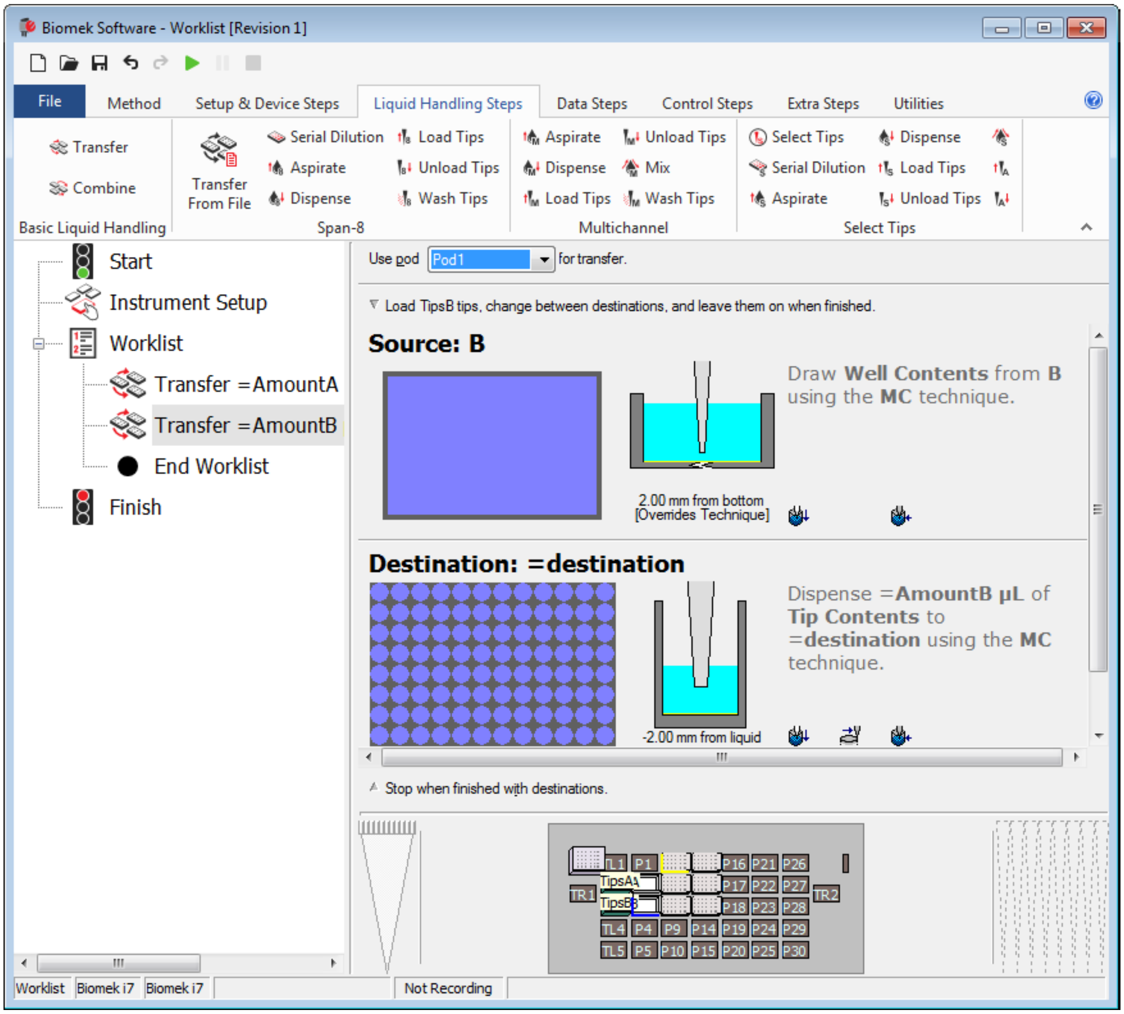
9 Configure another **Transfer** step after the one you just finished by following steps 1 - 8, but changing the following:

- **a.** In **Tip Handling**, select the **TipsB** tip box from the Current Instrument Display.
- **b.** Configure the source as the reservoir at **B**.
- **c.** In the Destination configuration, configure in the volume field as **=AmountB**. Configuring **=AmountB** means it will use the volumes on the **Worklist** step from column **AmountB.**

Figure 4.5 shows the completed **Worklist** step with configured **Transfer** steps.

10 Save the method with the name: **Worklist**

Figure 4.5 Worklist Step with Transfer Steps Configured



Use pod Pod1 for transfer.

Load TipsB tips, change between destinations, and leave them on when finished.

Source: B

Draw **Well Contents** from **B** using the **MC** technique.

2.00 mm from bottom [Overrides Technique]

Destination: =destination

Dispense =**AmountB µL** of **Tip Contents** to =**destination** using the **MC** technique.

-2.00 mm from liquid

Stop when finished with destinations.

Now, you will define a procedure using a **Define Procedure** step and insert it before the **Worklist** step. This procedure will be run as the method cycles through the worklist. This procedure will be configured to load tips, transfer liquid, and unload tips.

NOTE A **Define Procedure** step is not required for using a **Worklist** step.

Defining and Running Procedures

The **Define Procedure** step is used to configure and save a series of steps that may be used multiple times in a method without having to reconfigure each individual step within that procedure. The **Run Procedure** step is inserted into the method and is used to identify the defined procedure to be used in a method. The procedure defined in the **Define Procedure** step can be run only by inserting a **Run Procedure** step and choosing the desired procedure in the step configuration.

Biomek i-Series Concept

Procedures offer advantages, such as running the same steps multiple times within a method but configuring them only once. Procedures control the size of the current method in the Method View by listing only the **Run Procedure** step in the Method View and not all the steps accessed by the procedure.

Defining a Procedure Using the Define Procedure Step

For this part of the tutorial, you will insert and configure a **Define Procedure** step to load specific tips, transfer volumes based on the worklist you configured earlier, and unload tips. The defined procedure will then be run as part the worklist, which will be reconfigured to show an alternative to the two **Transfer** steps that were originally in the worklist. You will also create variables in this procedure, which will have the values specified in the **Run Procedure** step. This lets you run the steps in the procedure with different values associated with the defined variables.

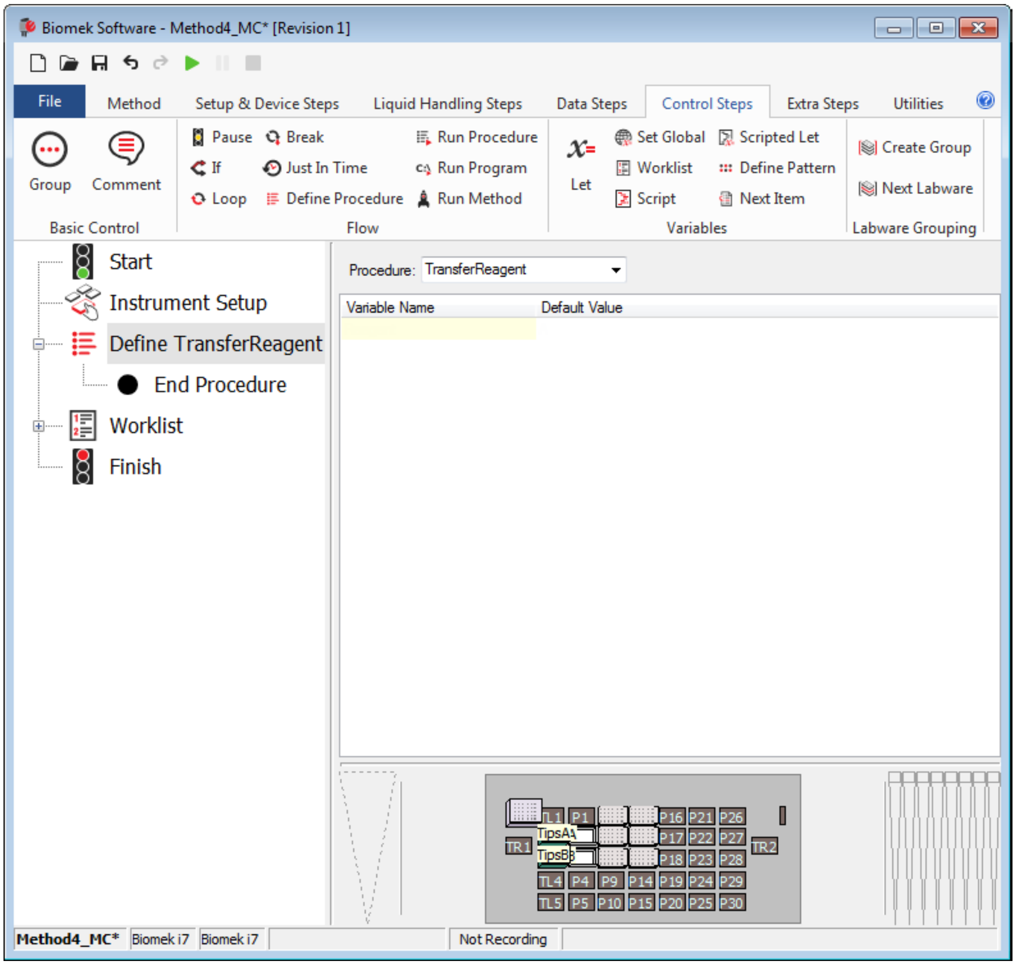
1 If necessary, open the previous method named **Worklist.**

2 Select the **Instrument Setup** step in the Method View.

3 From the **Control Steps** tab, in the **Flow** group, click the Define Procedure (**Define Procedure**) icon to insert it below the **Instrument Setup** step (Figure 4.6).

4 In **Procedure**, enter **TransferReagent** (Figure 4.6). This becomes the name of your procedure and will appear as **Define TransferReagent** in the Method View.

Figure 4.6 Named Procedure



Procedure: TransferReagent

5 Under **Variable Name**, enter **Reagent** and tab over to **Default Value** and enter **A.** This variable relates to the reservoir name.

6 Press (Enter) on the keyboard, then under **Variable Name**, enter **Volume** and tab over to **Default Value** and enter **=AmountA.** This variable relates to column **AmountA** on the worklist you created.

7 In the **Worklist** step, click on the first **Transfer** step, and then (Shift) + click on the second **Transfer** step so that both are selected. Right click on the selected steps, and then select **Disable.** These steps are now set up so that they will be overlooked when the method is executed.

---

8 From the **Control Steps** tab, in the **Flow** group, click the Run Procedure (**Run Procedure**) and drag it into the **Worklist** step just above the **End Worklist** step.

---

9 In **Procedure**, click on the drop-down and select **transferreagent**.

---

10 Add another **Run Procedure** step below the **Run Procedure** step you added in step 8, and configure as follows:

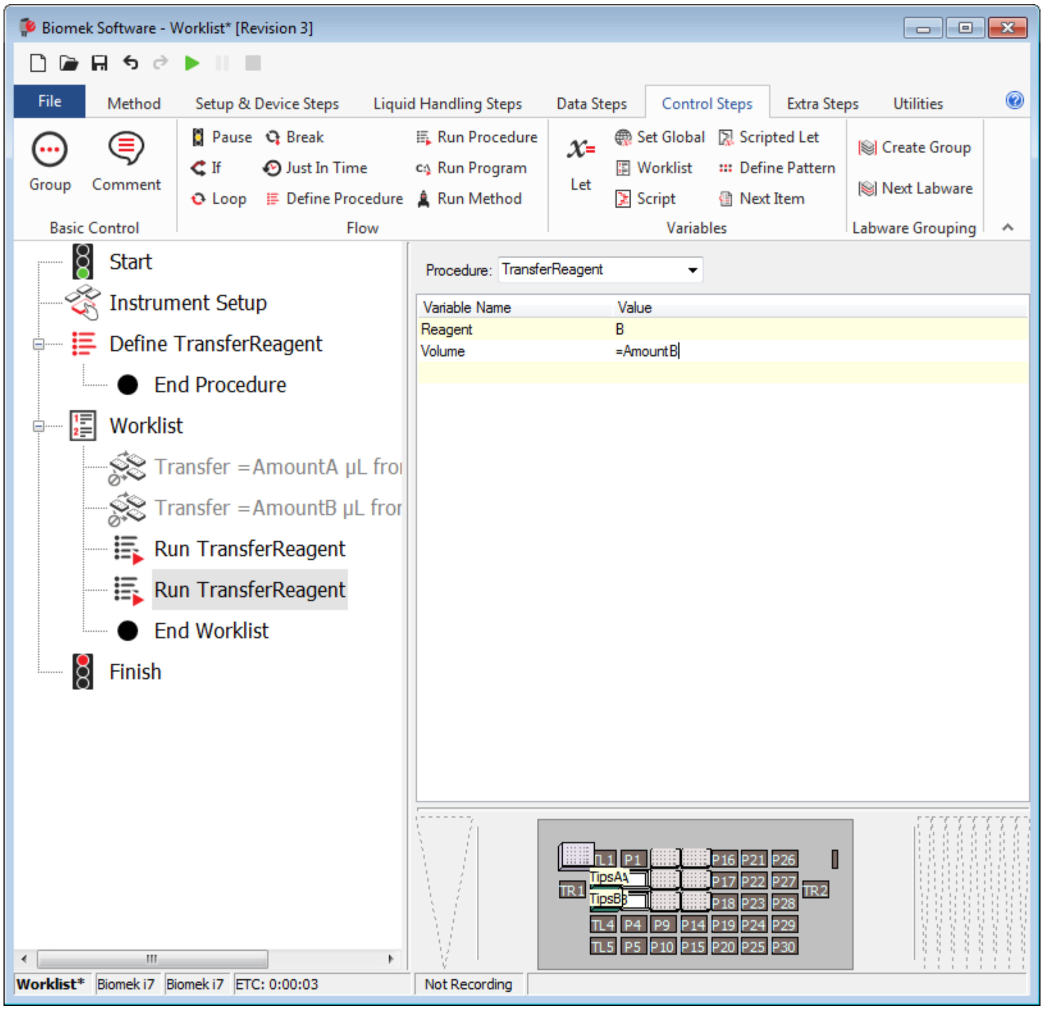
a. In **Procedure**, click on the drop-down and select **transferreagent**.

b. For the variable **Reagent**, change the **Value** to **B**.

c. For the variable **Volume**, change the **Value** to **=AmountB**.

Your method should now look like Figure 4.7.

Figure 4.7 Run Procedure Steps in a Worklist



Procedure: TransferReagent

Variable Name	Value
Reagent	B
Volume	=AmountB

Configuring Steps Inside the Define Procedure Step

To configure the **Define Procedure** step to load specific tips and transfer volumes based on the worklist you configured earlier, the following steps will be configured individually inside the **Define Procedure** step:

- **Multichannel Load Tips** step (refer to *Configuring Different Tips for Accessing Sources*)
- **Transfer** step (refer to *Transferring Liquid During a Procedure*)
- **Multichannel Unload Tips** step (refer to *Unloading Tips During a Procedure*)

Configuring Different Tips for Accessing Sources

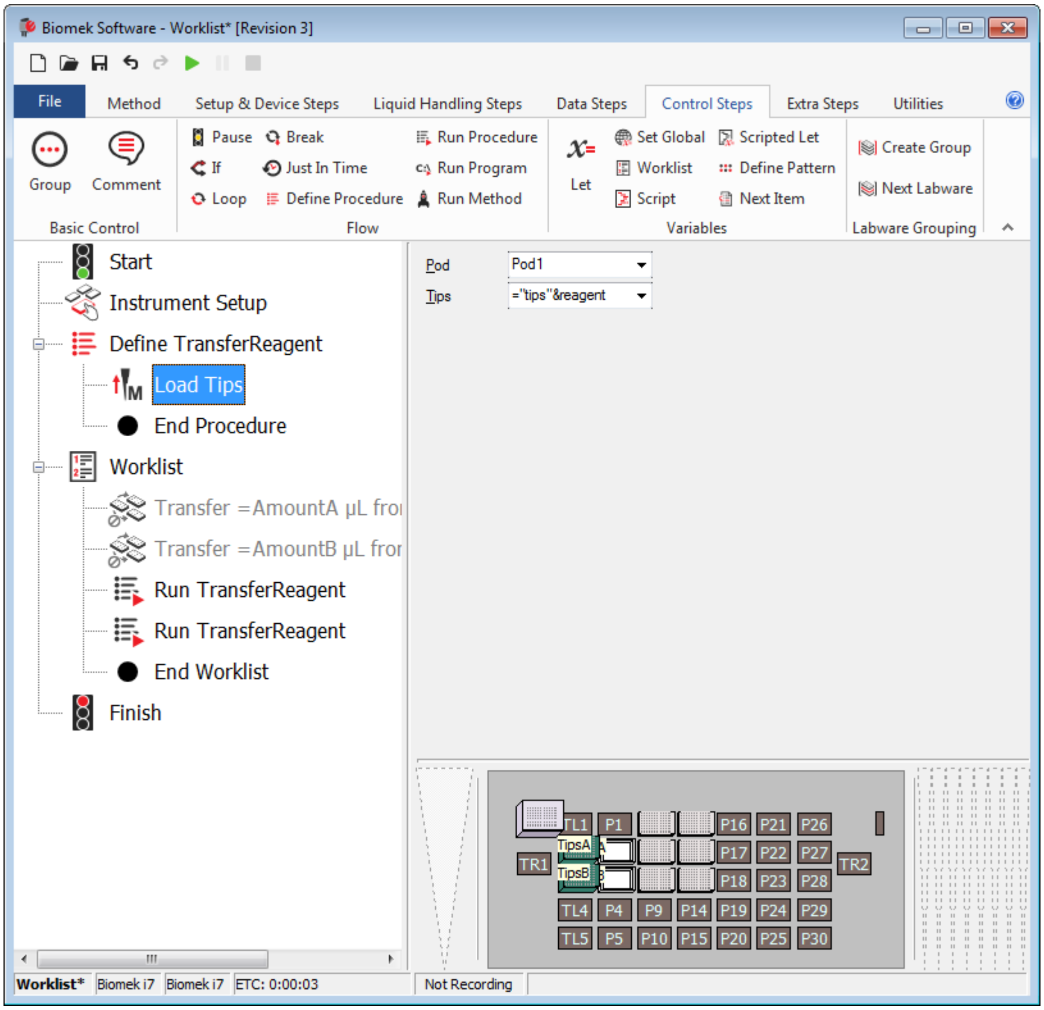
Since your reservoirs in this tutorial method contain different liquid types, you will want different tips designated for each reservoir. You will configure the **Multichannel Load Tips** step as part of your procedure to ensure that the correct tips are loaded to access the correct source reservoir.

---

1 From the **Liquid Handling Steps** tab, in the **Multichannel** group, select Load Tips (**Multichannel Load Tips**) and drag it into the **Define TransferReagent** step. The Method View should look like Figure 4.8.

2 In **Tips** in the Configuration View, highlight the field and enter **=“tips”&reagent** (Figure 4.8).

Figure 4.8 Multichannel Load Tips Configured



Pod: Pod1
Tips: ="tips"&reagent

Transferring Liquid During a Procedure

To configure the actual liquid transfer that will be executed when the procedure is run, configure the transfer as follows:

1 Insert a **Transfer** step into the Method View below the **Multichannel Load Tips** step.

2 In **Tip Handling**, uncheck **Load BC230 tips** and **Change tips between destinations.**

3. Using what you learned in CHAPTER 1, *Multichannel Pod — Getting Started with Biomek Software*, configure the **Source** in the **Transfer** step as **Reservoir** at **=Reagent**.

   Configuring **=Reagent** means that the reservoir on the deck that has the same name as the value of the variable **Reagent** will be used.

4. In the **Technique** field, choose **MC** from the drop-down.

5. Configure the **Destination** as a **BCFlat96** at **=destination**.

   Configuring **=destination** means that the destination will be those you configured in the worklist.

6. In the **Destination** configuration **µL** field, enter **=Volume**.

7. In the **Technique** field, choose **MC** from the drop-down.

Unloading Tips During a Procedure

Here you will configure the procedure to unload the tips and put them back in the box after the liquid transfer action. To unload the tips:

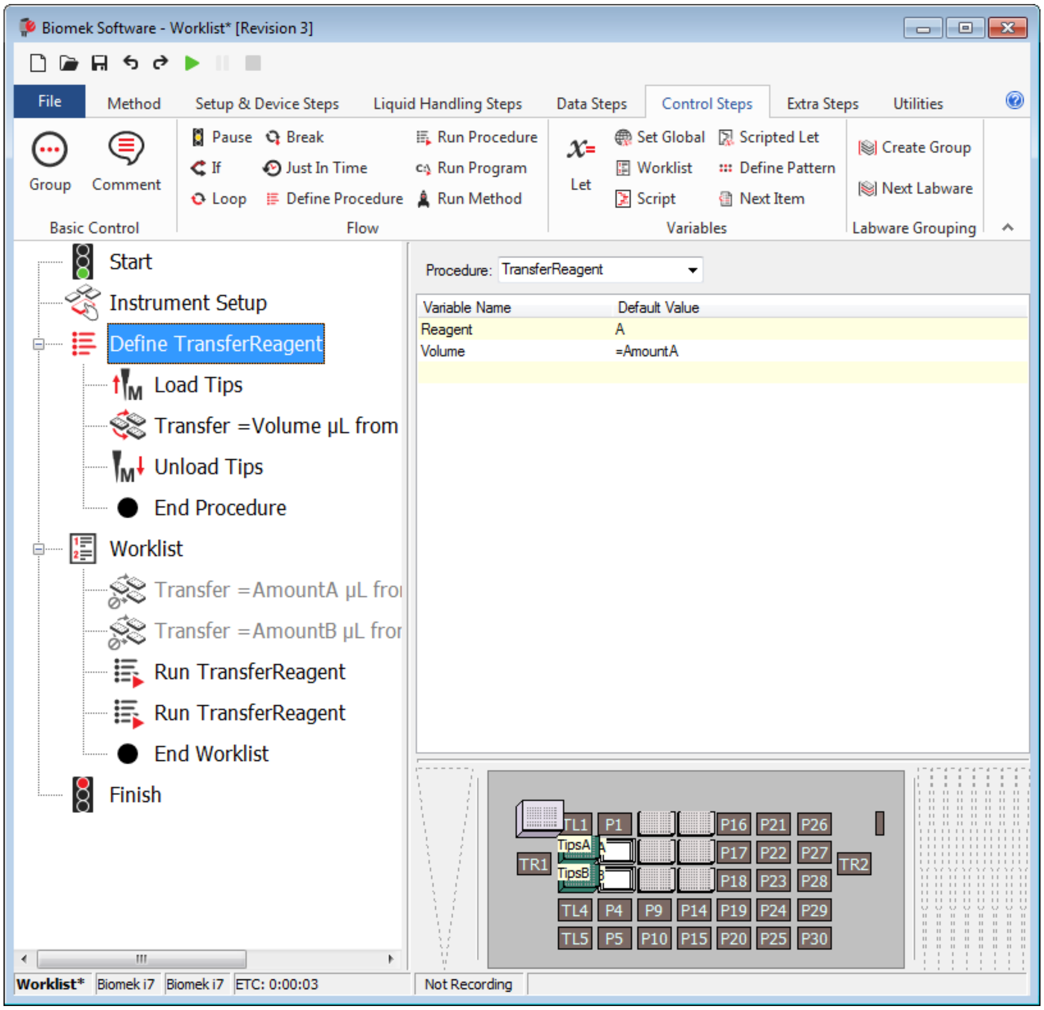
1. Insert an M Unload Tips **Multichannel Unload Tips** step below the **Transfer** step.

2. Ensure **Pod1** is selected in the drop-down.

3. Click on the **Define TransferReagent** step. Your main editor should look like Figure 4.9, and the variables in the named procedure you just created will be used to specify when new tips are used and which reservoir will be accessed when transferring liquid.

   TIP If you want to reuse a procedure in other methods, right click on the step, and select **Save as Preconfigured Step**. The first time a preconfigured step is added to the software, the **Preconfigured Steps** tab appears on the ribbon, with the newly saved step. This option allows you to reuse configured steps in other methods. For additional information on managing preconfigured steps, see the *Biomek i-Series Software Reference Manual* (PN B56358), *Saving Configured Steps*.

Figure 4.9 Define Procedure Step Configured



Procedure: TransferReagent

Variable Name	Default Value
Reagent	A
Volume	=AmountA

---

4 Save the method and rename it with a unique name.

Congratulations! You have just created a method using a worklist. If you would like to see this method run in simulation mode, click on the ▶ (**Run**) icon on the Quick Access Toolbar.

CHAPTER 5

Multichannel Pod — Using Selective Tips Pipetting

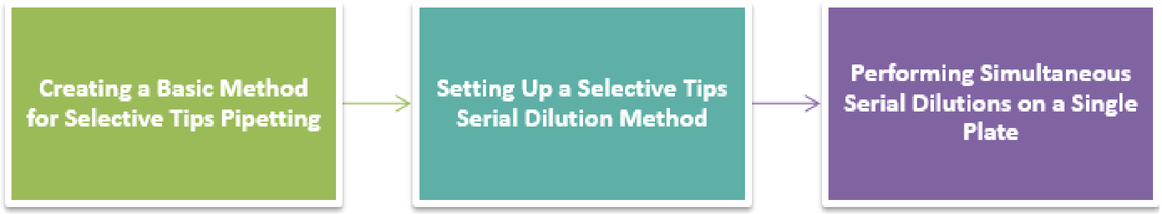
Introduction to Selective Tips Pipetting

Selective Tips Pipetting allows your Multichannel pod to behave more like a Span-8 pod, meaning you have a greater degree of control over the number of tips used for pipetting operations, as well as the well patterns allowable by the Multichannel pod. Using Select Tip Pipetting in a method always starts by using the **Select Tips** step. It serves as a container for all of the related Select Tips operations. The **Select Tips** step specifies the pod to use for the enclosed Select Tips steps. The other Select Tips steps rely on this context information for their operation. The **End Using Select Tips** step checks that no select tips are loaded on the pod (an **Unload Select Tips** step must be used to remove tips).

What You'll Learn in Using Selective Tips Pipetting

In this chapter, you will develop the skills to use Selective Tips steps on your Multichannel pod. The first two methods in this chapter are very straightforward and use only basic Select Tips functionality.

The three methods in this chapter are presented below. Performing these methods in order will give you a well-rounded education on selective tips pipetting.



Creating a Basic Method for Selective Tips Pipetting

This example illustrates aspirating from wells in a 384-well microtiter plate, dispensing to a column of wells in a 96-well microplate, and mixing the destination wells. A column of tips on a 96-channel Biomek i7 hybrid instrument is used for this example. Since the 384-well microplate is of a higher density than the 96-channel head, every-other-well is addressable, as explained below.

Setting Up Your Deck

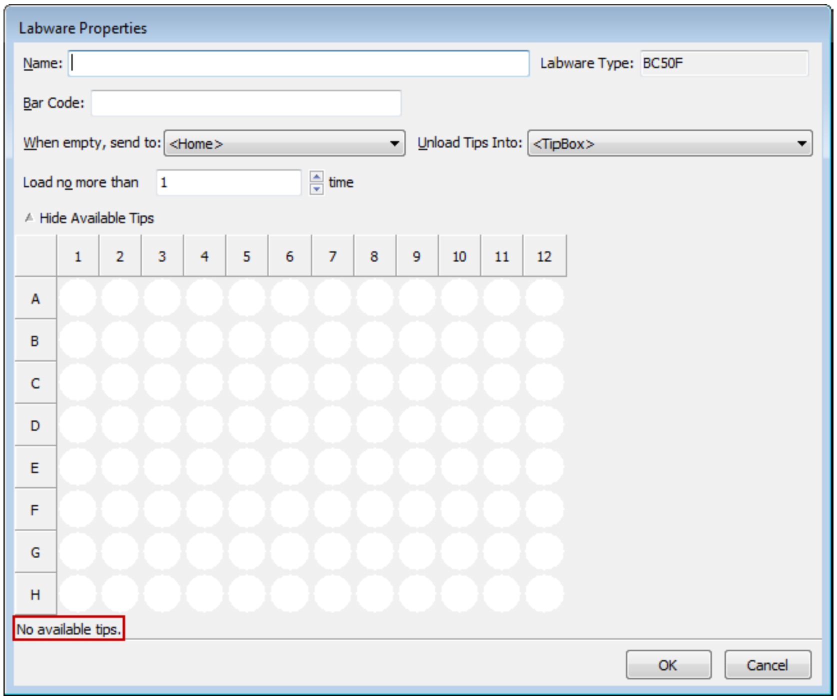
Using what you learned in CHAPTER 1, *Multichannel Pod — Getting Started with Biomek Software*, create a new method and configure an **Instrument Setup** step as follows:

---

1 Place an empty **BC50F** tip box on **TL3**, and configure the labware by doing the following:

- **a.** Open **Labware Properties**, and in **Name**, enter **Empty**.
- **b.** Select the **Show Available Tips** drop-down to display the tips.
- **c.** In the tips graphic, click on tip **A1** and drag your mouse to **H12** so that all tips are deselected. When this is done properly, it should say **No available tips** as shown in Figure 5.1.
- **d.** Select **OK**.

Figure 5.1 Empty Tip Box Labware Properties



Labware Properties

Name:

Labware Type: BC50F

Bar Code:

When empty, send to: <Home>

Unload Tips Into: <TipBox>

Load no more than 1 time

No available tips.

---

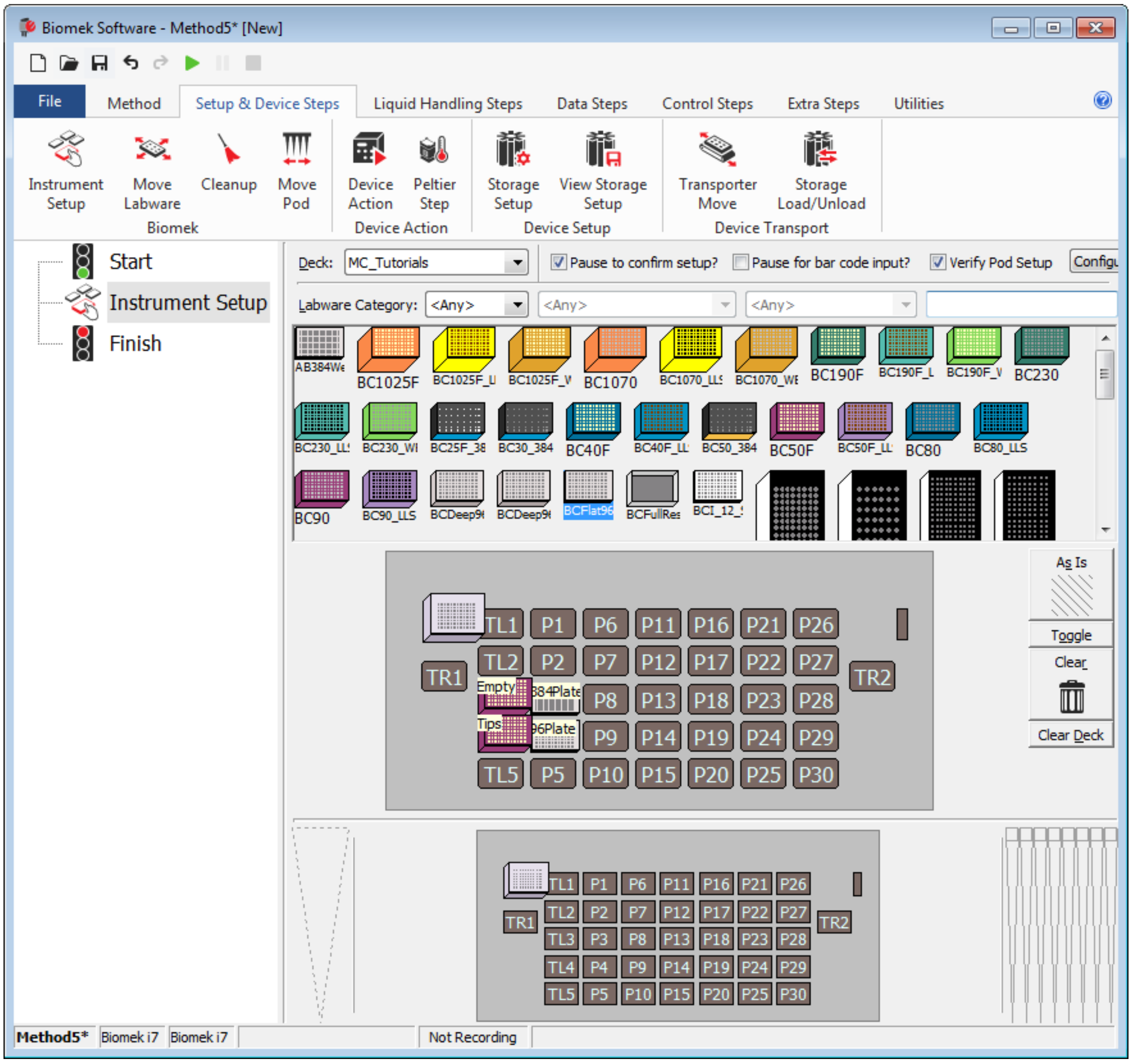
2 Place a **BC50F** tip box on **TL4**, and name it **Tips**.

3 Place a **CostarFlat384Square** on **P3** and name it **384Plate.** Give it a **Known** volume of **100** µL of **Water.**

4 Place a **BCFlat96** on **P4**, and name it **96Plate.** Give this destination plate a **Known** volume of **0** µL.

Your deck setup should look like Figure 5.2. Now go to the next activity to learn the basics of Selective Tips pipetting.

Figure 5.2 Instrument Setup Step



Deck: MC_Tutorials

☑ Pause to confirm setup? ☐ Pause for bar code input? ☑ Verify Pod Setup

Labware Category: <Any>

Setting Up a Basic Selective Tips Method

For this exercise, you will aspirate from wells in a 384-well microplate, dispense to a column of wells in a 96-well microplate, and mix the destination wells. A column of tips on a 96-channel head is used for this example. Since the 384-well microplate is of a higher density than the 96-channel head, every-other-well is addressable.

Biomek i-Series Concept

The Selective Tip Pipetting steps use global variables behind the scenes to coordinate actions. The **Clear all global variables...** check box in the **Finish** step clears these variables when the **Finish** step executes at the end of a run. Leave this check box checked in methods that use Selective Tip Pipetting. In the event that a method is aborted, these global variables might not be properly reset because the **Finish** step does not execute completely during abort. When this happens, it is possible to get enqueue-time errors in a method. Running a new, empty method (just **Start** and **Finish**) will clear the global variables and resolve these issues.

Biomek i-Series Concept

It is strongly recommended that all tip boxes used in **Select Tips** steps are named. This ensures that the appropriate tip boxes are used for each operation. If tip boxes are not named, they could potentially be used for other pipetting operations in the method.

To configure a basic selective tips method:

---

1 **Select Tips** step (Figure 5.3):

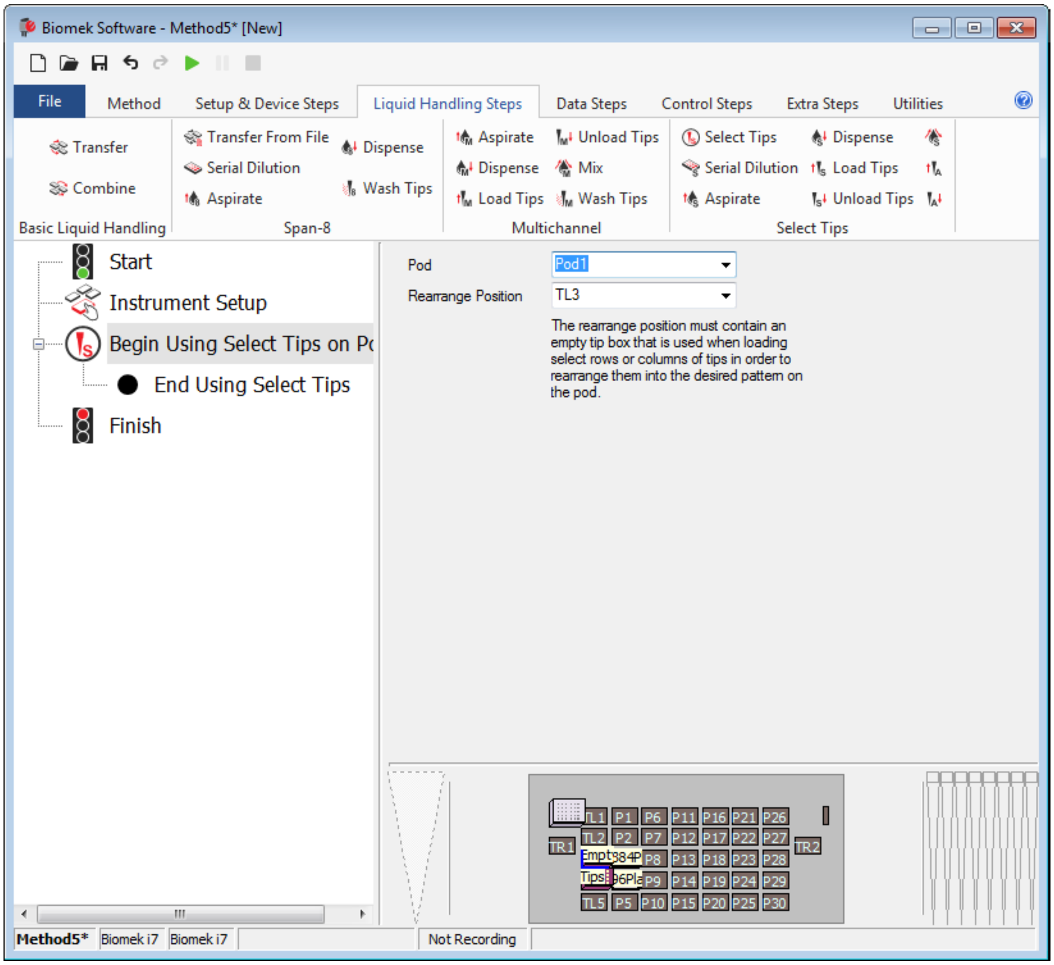
a. Select the **Instrument Setup** step in the Method View.

b. On the **Liquid Handling Steps** tab, in the **Select Tips** group, select the Select Tips (**Select Tips**) step. This inserts the **Select Tips** container step.

c. If the appropriate pod is not selected in the **Select Tips** step Configuration View, select the correct pod from the drop-down.

d. In the **Rearrange Position** field, select **TL3** (the empty tip box position).

Figure 5.3 Deck Display in Biomek Software



Pod: Pod1

Rearrange Position: TL3

The rearrange position must contain an empty tip box that is used when loading select rows or columns of tips in order to rearrange them into the desired pattern on the pod.

---

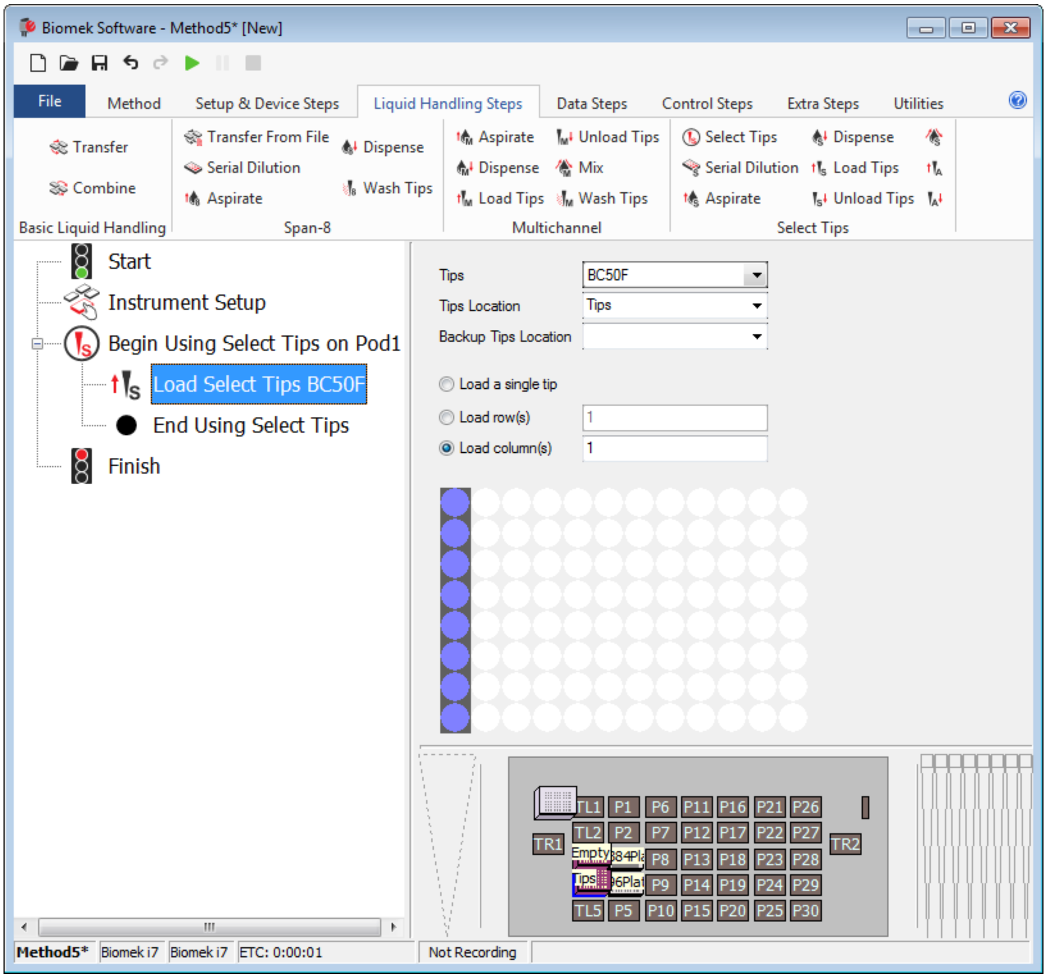
2 **Load Select Tips** step:

a. From the **Liquid Handling Steps** tab, in the **Select Tips** group, select the Load Tips (**Load Select Tips**) and drag it below **Begin Using Select Tips on Pod1** (as shown in Figure 5.4). This step loads the column of tips onto the pod.

b. To populate the fields for **Tips** and **Tips Location**, click on the tip box in the Current Instrument Display. Since the tip box is named (in this case as **Tips**), this name is used. If the tip box is relocated on the deck, the step will still find it by name, potentially saving time during method development.

c. Select **Load column(s)**, and keep the entry field default as **1**.

Figure 5.4 Load Select Tips Step



Start
Instrument Setup
Begin Using Select Tips on Pod1
Load Select Tips BC50F
End Using Select Tips
Finish

Tips: BC50F
Tips Location: Tips
Backup Tips Location:

○ Load a single tip
○ Load row(s): 1
● Load column(s): 1

---

3 **Select Tips Aspirate** step (Figure 5.5):

a. Select the **Load Select Tips** step in the Method View.

b. From the **Liquid Handling Steps** tab, in the **Select Tips** group, select the Aspirate (**Select Tips Aspirate**) step to insert it into the method. This step will be configured to aspirate from the source 384-well plate, using the loaded select tips in the indicated wells.

c. To populate the fields for **Labware Type**, **Position**, and **Liquid Type**, click on the source 384-well plate in the Current Instrument Display. Since the labware is named and its liquid type is defined in **Instrument Setup**, this information is automatically populated when the labware is clicked in the Current Instrument Display.

d. In **Liquid Type**, select **Water** from the drop-down.

e. In **Volume**, enter **40**.

f. To populate the **Aspirate at column** and **row** fields, enter **2** in both the **Aspirate at column** and **and row** fields.

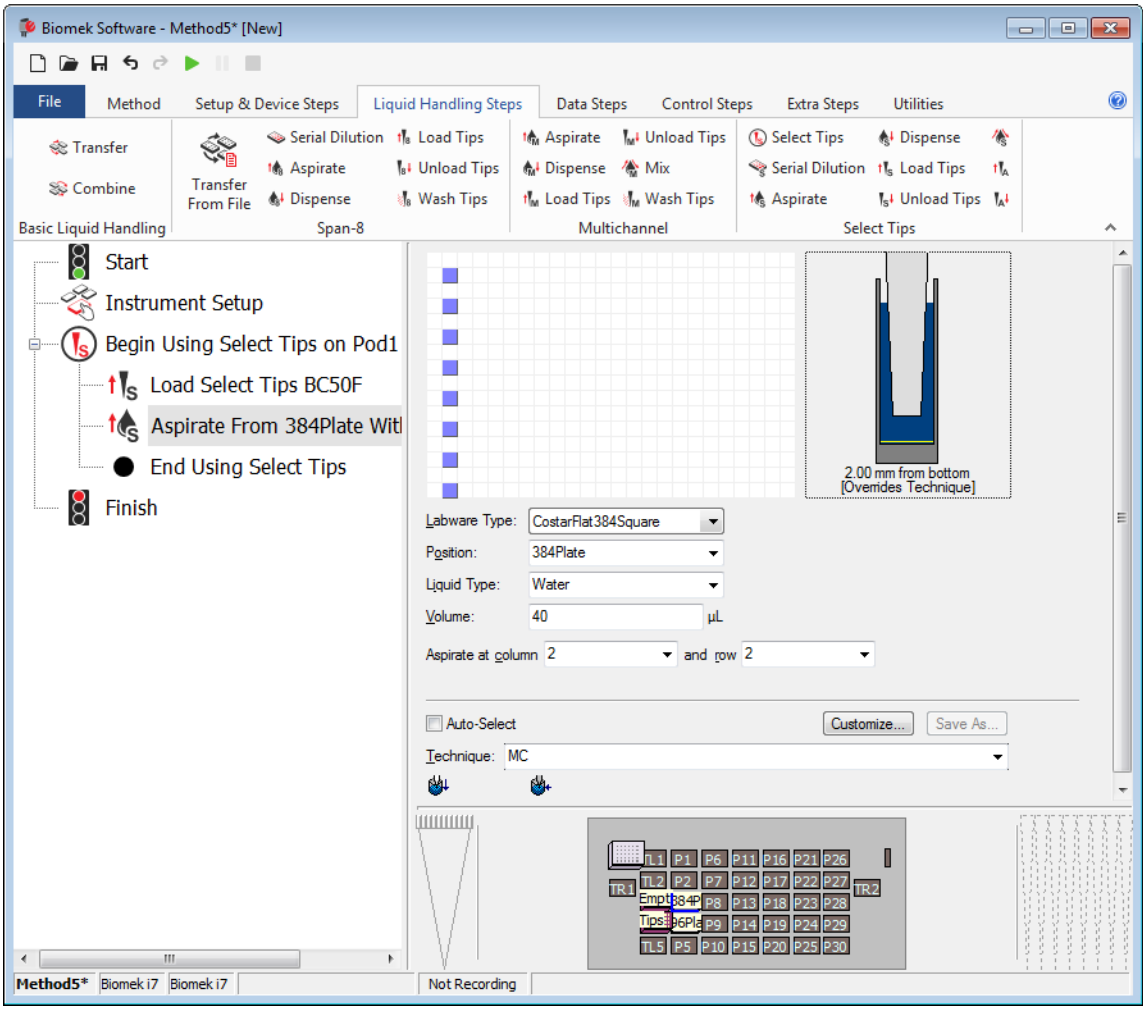
NOTE You can also populate these fields by clicking on the starting well in the labware display or selecting the values from the drop-down.

Notice that with a 384-well microtiter plate being accessed by a 96-well head, the spacing of mandrels and tips on the head is for alternating wells on the plate. When accessing labware with the same well pattern as the mandrels on the head, this does not occur, as illustrated in the **Select Tips Dispense** step (Figure 5.6). When the wells and mandrels match, the second coordinate (rows in this case) does not appear, since no selection is needed for tip-to-well correlation.

g. In the **Technique** field, choose **MC** from the drop-down.

h. Right click on the large tip illustration next to the 384-well plate in the configuration and choose **Custom Height**, and set the height to **2** mm from **bottom**.

Figure 5.5 Select Tips Aspirate Step



Start
Instrument Setup
Begin Using Select Tips on Pod1
Load Select Tips BC50F
Aspirate From 384Plate Witl
End Using Select Tips
Finish

Labware Type: CostarFlat384Square
Position: 384Plate
Liquid Type: Water
Volume: 40 µL
Aspirate at column 2 and row 2
☐ Auto-Select
Technique: MC

---

4 **Select Tips Dispense** step (Figure 5.6):

a. Select the **Select Tips Aspirate** step in the Method View.

b. From the **Liquid Handling Steps** tab, in the **Select Tips** group, select the Dispense (**Select Tips Dispense**) step to insert it into the method. The **Select Tips Dispense** step dispenses into the destination 96-well plate, again using the loaded select tips and the indicated wells.

c. To populate the **Labware Type**, **Position**, and **Liquid Type** fields, click on the **BCFlat96** microplate in the Current Deck Display.

d. For **Liquid Type**, select **Water**.

e. In **Volume**, enter **40**.

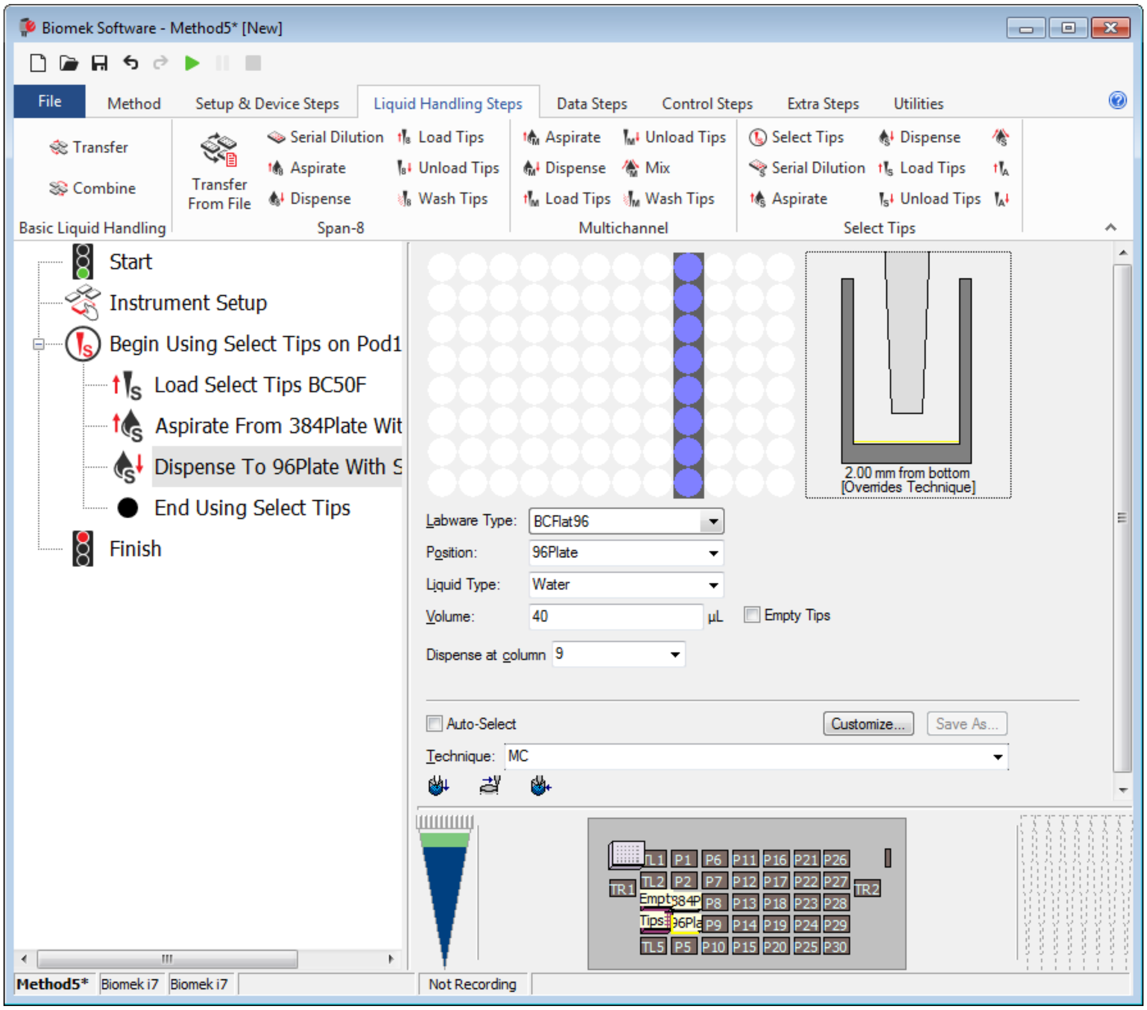
f. To populate the **Dispense at column** field, enter **9**.

NOTE You can also populate this field by clicking on the starting well in the labware display or selecting the values from the drop-down.

g. In the **Technique** field, choose **MC** from the drop-down.

h. Right click on the large tip illustration next to the 96-well plate in the configuration and choose **Custom Height**, and set the height to **2** mm from **bottom**.

Figure 5.6 Select Tips Dispense Step



Biomek Software - Method5* [New]

Start
Instrument Setup
Begin Using Select Tips on Pod1
Load Select Tips BC50F
Aspirate From 384Plate Wit
Dispense To 96Plate With S
End Using Select Tips
Finish

2.00 mm from bottom
[Overrides Technique]

Labware Type: BCFlat96
Position: 96Plate
Liquid Type: Water
Volume: 40 µL ☐ Empty Tips
Dispense at column 9

☐ Auto-Select
Technique: MC

Method5* | Biomek i7 | Biomek i7 | Not Recording

---

5 **Select Tips Mix** step (Figure 5.7):

a. Select the **Select Tips Dispense** step in the Method View.

b. From the **Liquid Handling Steps** tab, in the **Select Tips** group, select the Mix (**Select Tips Mix**) step to insert it into the method. The **Select Tips Mix** step is used to mix the destination wells using the loaded select tips and the indicated wells.

c. To populate the **Labware Type**, **Position,** and **Liquid Type** fields, click on the **BCFlat96** microplate in the Current Instrument Display.

d. In the **Mix** field, enter **3** to mix the wells three times.

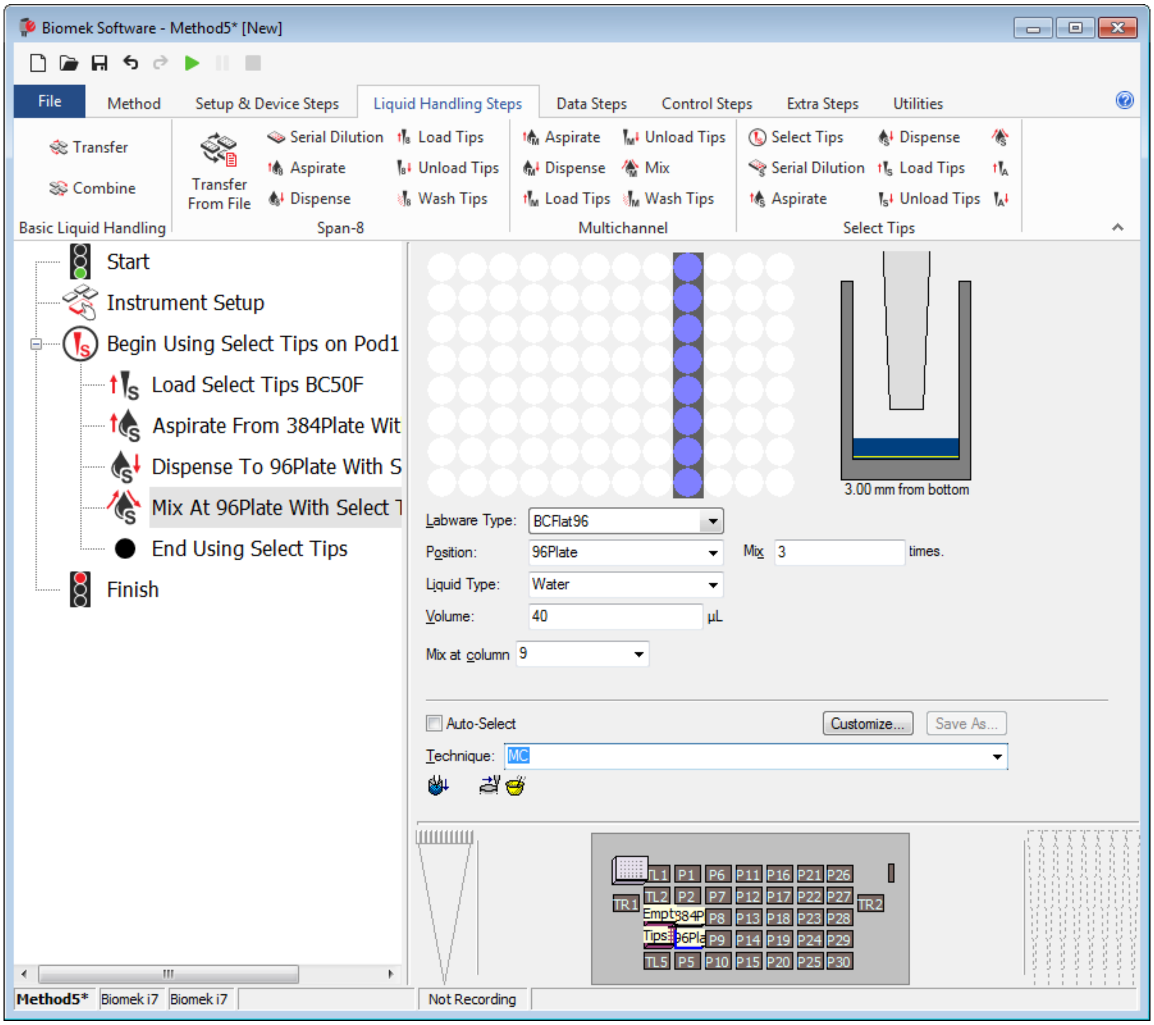
e. For **Liquid Type**, select **Water**.

f. In **Volume**, enter **40**.

g. In **Mix at column**, enter **9** to mix column 9.

h. In the **Technique** field, choose **MC** from the drop-down.

Figure 5.7 Select Tips Mix Step



Start
Instrument Setup
Begin Using Select Tips on Pod1
Load Select Tips BC50F
Aspirate From 384Plate Wit
Dispense To 96Plate With S
Mix At 96Plate With Select T
End Using Select Tips
Finish

Labware Type: BCFlat96
Position: 96Plate
Mix 3 times.
Liquid Type: Water
Volume: 40 µL
Mix at column 9
☐ Auto-Select
Technique: MC

---

6 **Unload Select Tips** step (Figure 5.8):

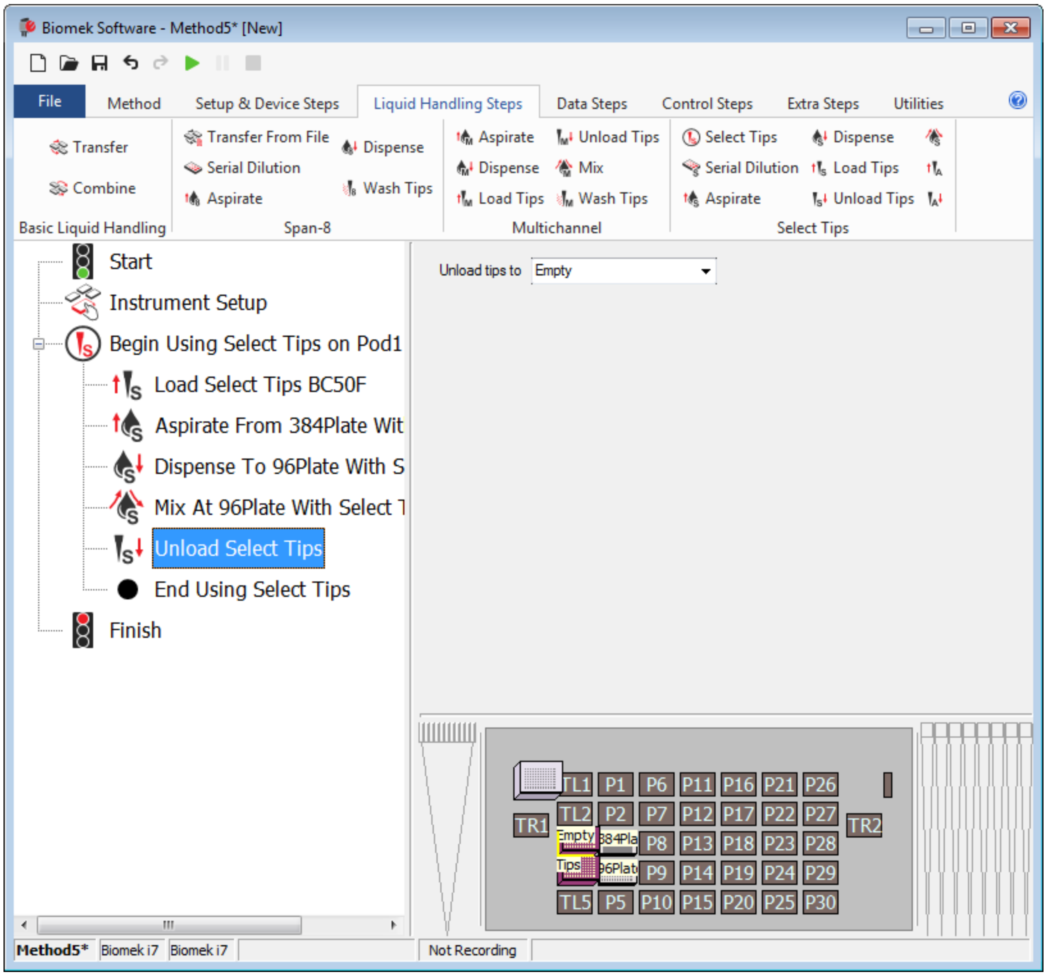
a. Select the **Select Tips Mix** step in the Method View.

b. On the **Liquid Handling Steps** tab, in the **Select Tips** group, select the Unload Tips (**Unload Select Tips**) step to insert it into the method. The **Unload Select Tips** step unloads the select tips from the pod into the empty tip box.

c. To populate the **Unload tips to** field, select the empty tip box on the Current Instrument Display.

NOTE Other common locations for unloading tips are into the trash or back into the tip box from where they were loaded.

Figure 5.8 Unload Select Tips Step



Unload tips to: Empty

7 Select **File** > **Save** > **Method**, and then run the method in Simulation mode.

This simple example illustrates basic use of Selective Tip Pipetting. The steps used can be customized for specific use cases.

The next example illustrates the Selective Tip Pipetting step: **Select Tips Serial Dilution.**

Creating a Selective Tips Serial Dilution Method

This example illustrates using a row of tips for serial dilution. The serial dilution includes the dilution plate, a diluent, and a source compound. The dilution plate and source compound master plate are 96-well microtiter plates. The diluent comes from a reservoir.

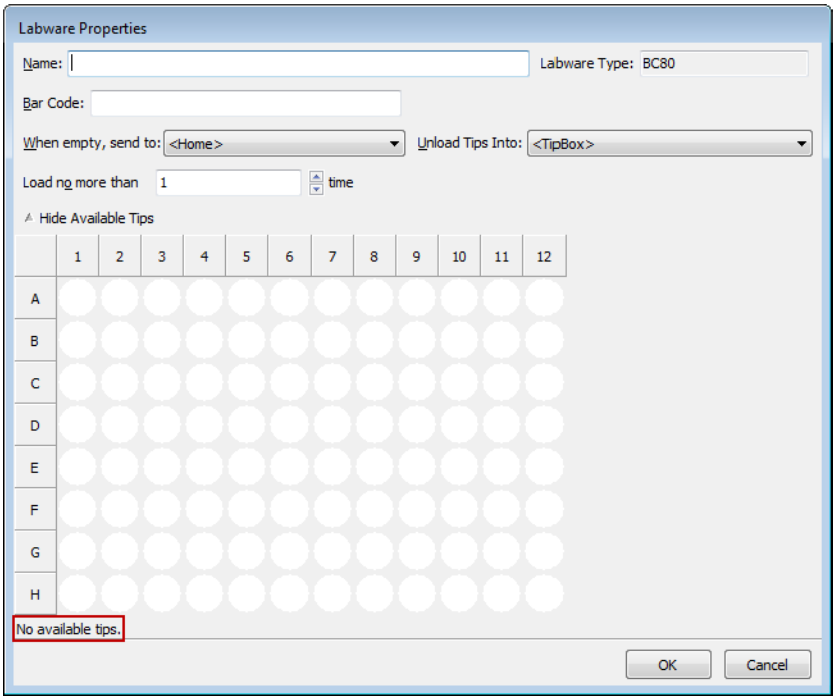
Setting Up Your Deck

Using what you learned in CHAPTER 1, *Multichannel Pod — Getting Started with Biomek Software*, create a new method and configure an **Instrument Setup** step as follows:

1 Place an empty **BC80** tip box on **TL2**, and configure the labware by doing the following:

- **a.** Open **Labware Properties**, and in **Name**, enter **Empty**.
- **b.** Select the **Show Available Tips** down arrow to display the tips.
- **c.** In the tips graphic, click on tip **A1** and drag your mouse to **H12** so that all tips are deselected. When this is done properly, it should say **No available tips** as shown in Figure 5.9.
- **d.** Select **OK**.

Figure 5.9 Empty Tip Box Labware Properties



Labware Properties

Name:

Labware Type: BC80

Bar Code:

When empty, send to: <Home>

Unload Tips Into: <TipBox>

Load no more than 1 time

No available tips.

2 Place a **BC80** tip box on **TL3**, and name it **Tips**.

3 Place a **BCFlat96** on **P2** and name it **Dilute.** Give this microplate a **Known** volume of **0** µL.

---

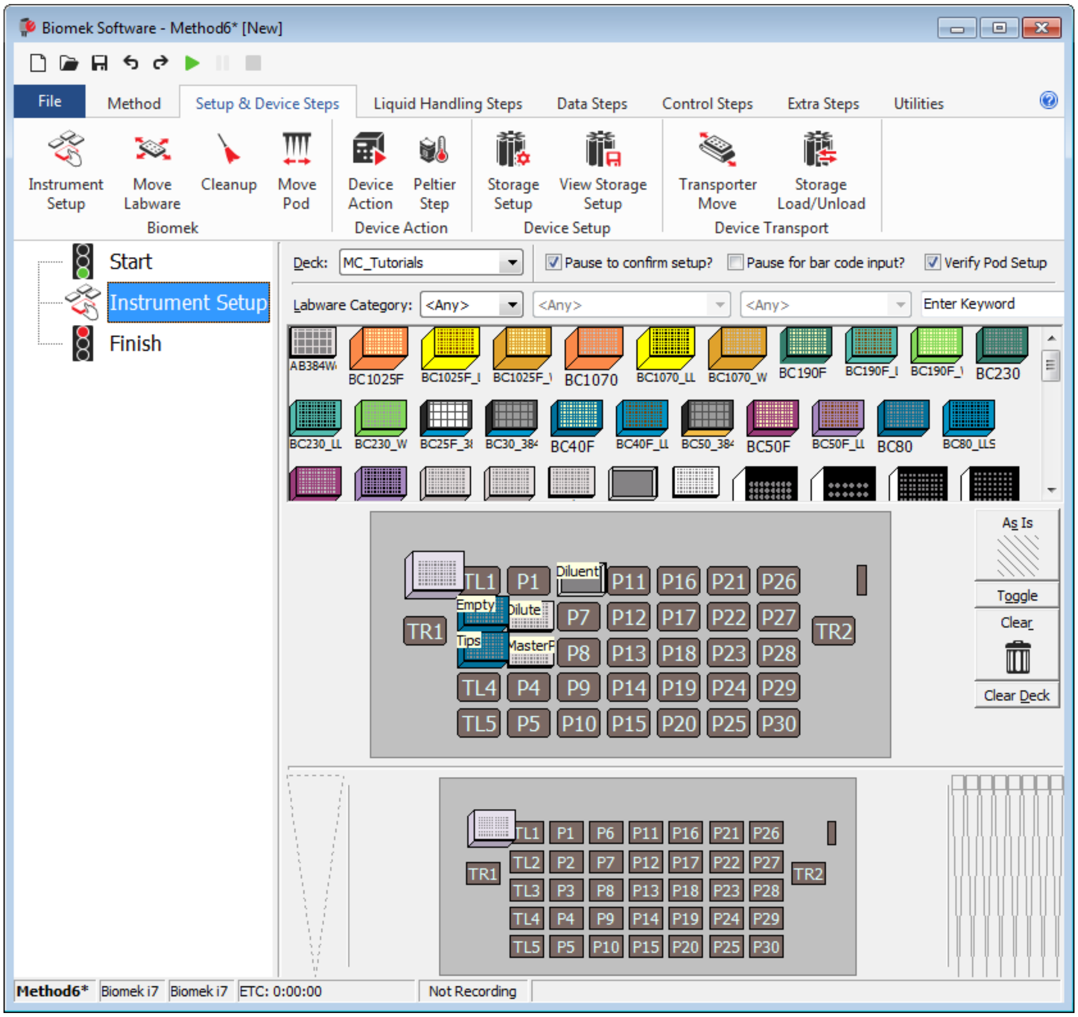
4 Place a **BCFlat96** on **P3**, and name it **MasterPlate**. Give this destination plate a **Known** volume of **300** µL.

---

5 Place a **BCFullReservoir** on **P6** and name it **Diluent**. Configure the reservoir to have an **Known** volume of **100000** µL of **Water.**

Your deck setup should look like Figure 5.10. Now go to the next activity to learn how to perform serial dilutions with Selective Tips steps.

Figure 5.10 Instrument Setup Step



Deck: MC_Tutorials

☑ Pause to confirm setup? ☐ Pause for bar code input? ☑ Verify Pod Setup

Labware Category: <Any> <Any> <Any> Enter Keyword

Method6* | Biomek i7 | Biomek i7 | ETC: 0:00:00 | Not Recording

Setting Up a Selective Tips Serial Dilution Method

In this method, you will learn how to use a column of tips on the Multichannel pod for serial dilution.

To configure a Select Tips Serial Dilution method:

---

1 **Select Tips** step (Figure 5.11):

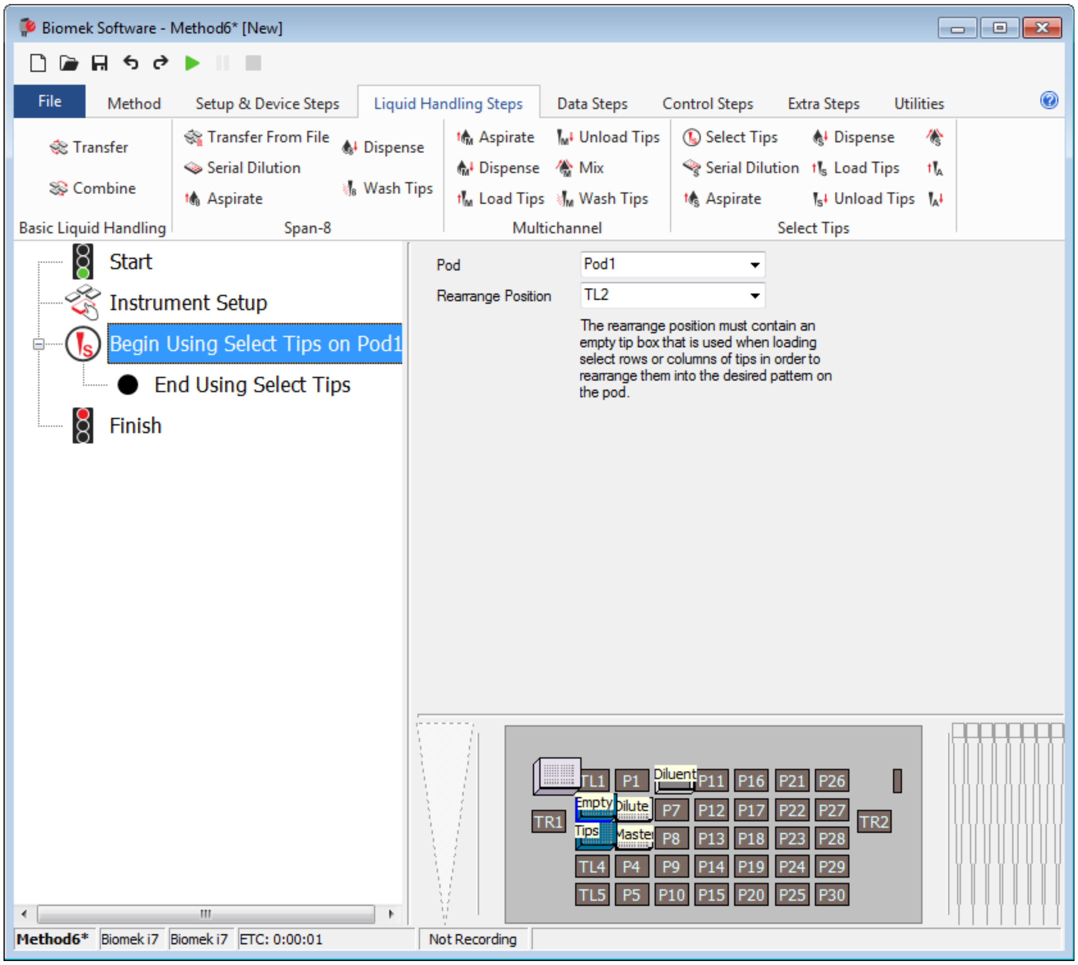
a. Select the **Instrument Setup** step in the Method View.

b. On the **Liquid Handling Steps** tab, in the **Select Tips** group, select the Select Tips (**Select Tips**) step. This inserts the **Select Tips** container step.

c. If the appropriate pod is not selected in the **Select Tips** step Configuration View, select the correct pod from the **Pod** drop-down.

d. In the **Rearrange Position** field, select **TL2** (the empty tip box position).

Figure 5.11 Deck Display in Biomek Software



Pod: Pod1

Rearrange Position: TL2

The rearrange position must contain an empty tip box that is used when loading select rows or columns of tips in order to rearrange them into the desired pattern on the pod.

2 **Load Select Tips** step:

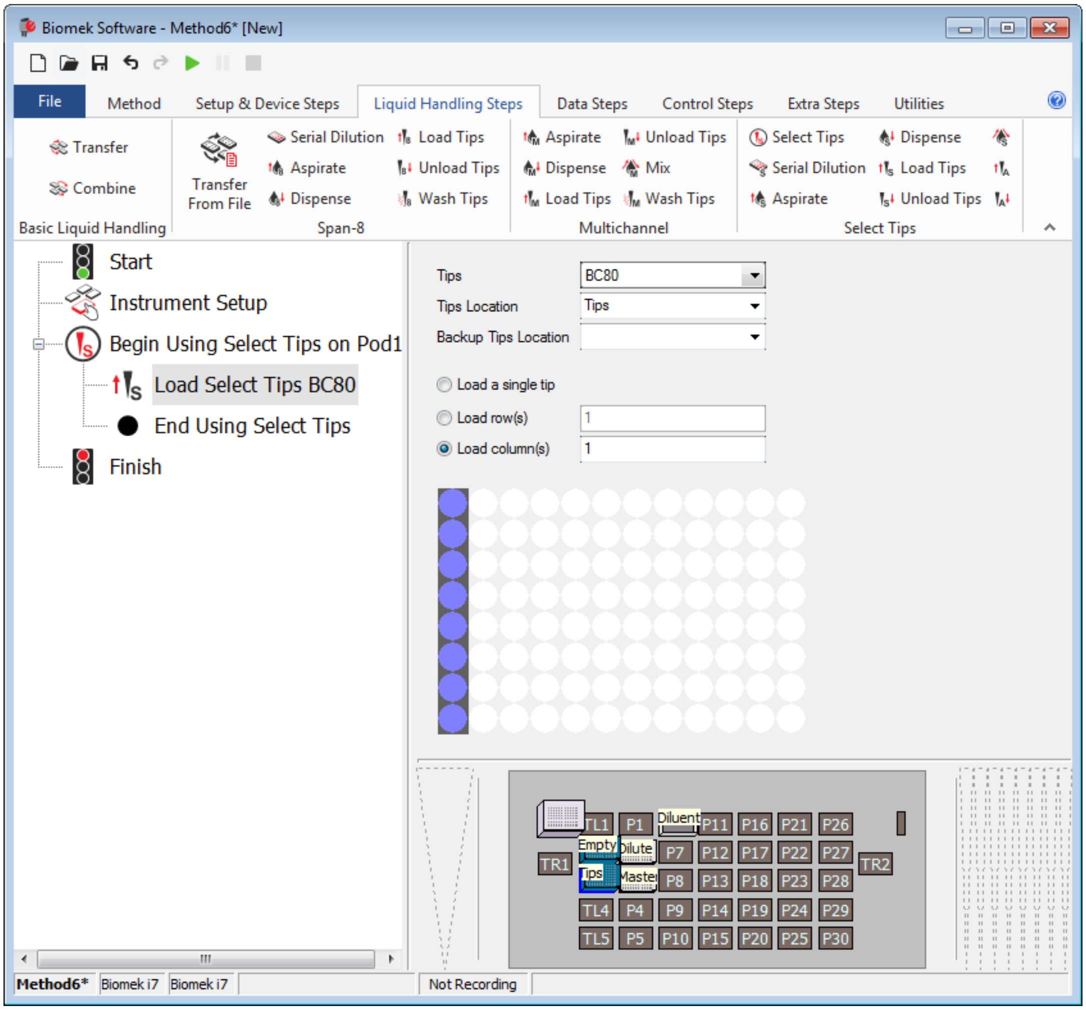
a. On the **Liquid Handling Steps** tab, in the **Select Tips** group, select the Load Tips (**Load Select Tips**) step and drag it under **Begin Using Select Tips on Pod 1** (Figure 5.12). This step loads the column of tips onto the pod.

b. To populate the fields for **Tips** and **Tips Location**, click on the **Tips** tip box in the Current Instrument Display. Since the tip box is named, the name is used in the **Tips Location** field. If the tip box is relocated on the deck, the step will still find it by name, potentially saving time during method development.

c. Select **Load column(s)**, and keep the entry field default as **1**.

NOTE If you wish to dilute in rows (12 samples) from the top of the plate to the bottom of the plate; select **Load Row(s)**. By selecting **Load Row(s)** in this step, **Dilute from Row** auto-populates in the **Select Tips Serial Dilution** step (Step 3).

Figure 5.12 Load Select Tips Step



Start
Instrument Setup
Begin Using Select Tips on Pod1
  Load Select Tips BC80
  End Using Select Tips
Finish

Tips: BC80
Tips Location: Tips
Backup Tips Location:

○ Load a single tip
○ Load row(s) 1
● Load column(s) 1

---

3 **Select Tips Serial Dilution** step:

a. Select the **Load Select Tips** step in the Method View.

b. From the **Liquid Handling Steps** tab, in the **Select Tips** group, select the Serial Dilution (**Select Tips Serial Dilution**) step to insert it into the method. The loaded select tips transfer diluent to the indicated dilution wells in the dilution plate, if indicated. It then adds the source compound from the master plate to the first column of dilution wells. Finally, it performs a series of transfer operations to dilute the wells in the dilution plate (from column 1 to column 8). (For this example, no tip washing is done.)

c. To configure the **Dilution Plate** (named as **Dilute**) (Figure 5.13):

  1) Click on a blank space in the **Dilution Plate** section of the Configuration View (Figure 5.13), and then click on the plate named **Dilute** in the Current Instrument Display. Since the labware is named and its liquid type is defined in **Instrument Setup**, this information is automatically populated when the labware is clicked in the Current Instrument Display.

  2) Set the dilution volume at **10** µL.

  3) For liquid type, select **Water**.

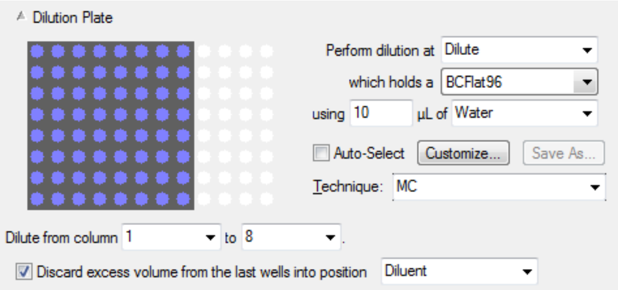
  4) From the **Technique** drop-down, choose **MC**.

  5) For **Dilute from column**, keep the default of **1**, and in **to**, enter **8**.

  6) Select the **Discard excess volume from the last wells into position** check box, and then choose the **Diluent** reservoir (on position **P6**) on the Current Instrument Display.

  7) Collapse the **Dilution Plate** section by clicking the upside down triangle next to the heading.

Figure 5.13 Dilution Plate Configuration Area



Dilution Plate

Perform dilution at Dilute

which holds a BCFlat96

using 10 µL of Water

☐ Auto-Select

Technique: MC

Dilute from column 1 to 8

☑ Discard excess volume from the last wells into position Diluent

d. To configure the **Diluent Properties** (named as **Diluent**) (Figure 5.14):

  1) Select the **Add diluent before transfer** check box.

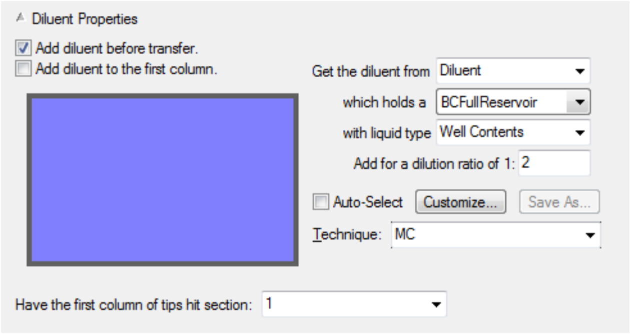
  NOTE If the **Diluent Properties** are not visible, click on the upside down triangle to expand the field.

  2) Click on a blank space in the **Diluent Properties** section of the Configuration View, and then click on the corresponding labware on **Diluent** in the Current Instrument Display.

  3) For **Liquid Type**, select **Water**.

    4) In the **Add for a dilution ratio of 1:** field, enter **2**.
    5) From the **Technique** drop-down, choose **MC**.
    6) In **Have the first column of tips hit section**, keep the default of **1**. This field applies when the reservoir contains sections.
    7) Collapse the **Diluent Properties** section by clicking the upside down triangle next to the heading.

Figure 5.14 Diluent Properties Configuration Area



Diluent Properties

☑ Add diluent before transfer.

☐ Add diluent to the first column.

Get the diluent from: Diluent

which holds a: BCFullReservoir

with liquid type: Well Contents

Add for a dilution ratio of 1: 2

☐ Auto-Select

Technique: MC

Have the first column of tips hit section: 1

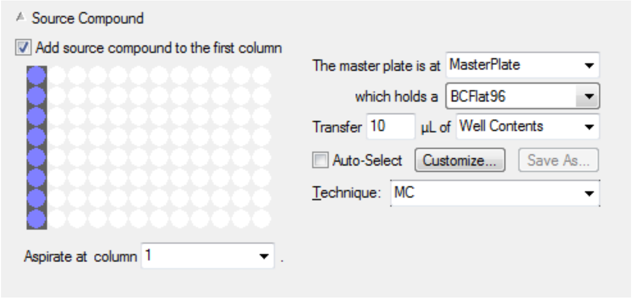
  e. To configure the **Source Compound** (named as **MasterPlate**) (Figure 5.15):

    1) Select a blank space in the **Source Compound** section of the Configuration View, and then click on the **MasterPlate** in the Current Instrument Display.

NOTE If the **Source Compound** configuration is not visible, click on the upside down triangle to expand the field.

    2) Select the **Add source compound to the first column** check box.
    3) Set the **Transfer** volume to **10** µL.
    4) From the **Technique** drop-down, choose **MC**.
    5) Leave the default of **Aspirate at column 1**.

Figure 5.15 Source Compound Configuration Area



Source Compound

☑ Add source compound to the first column

The master plate is at: MasterPlate

which holds a: BCFlat96

Transfer 10 µL of Well Contents

☐ Auto-Select

Technique: MC

Aspirate at column 1

---

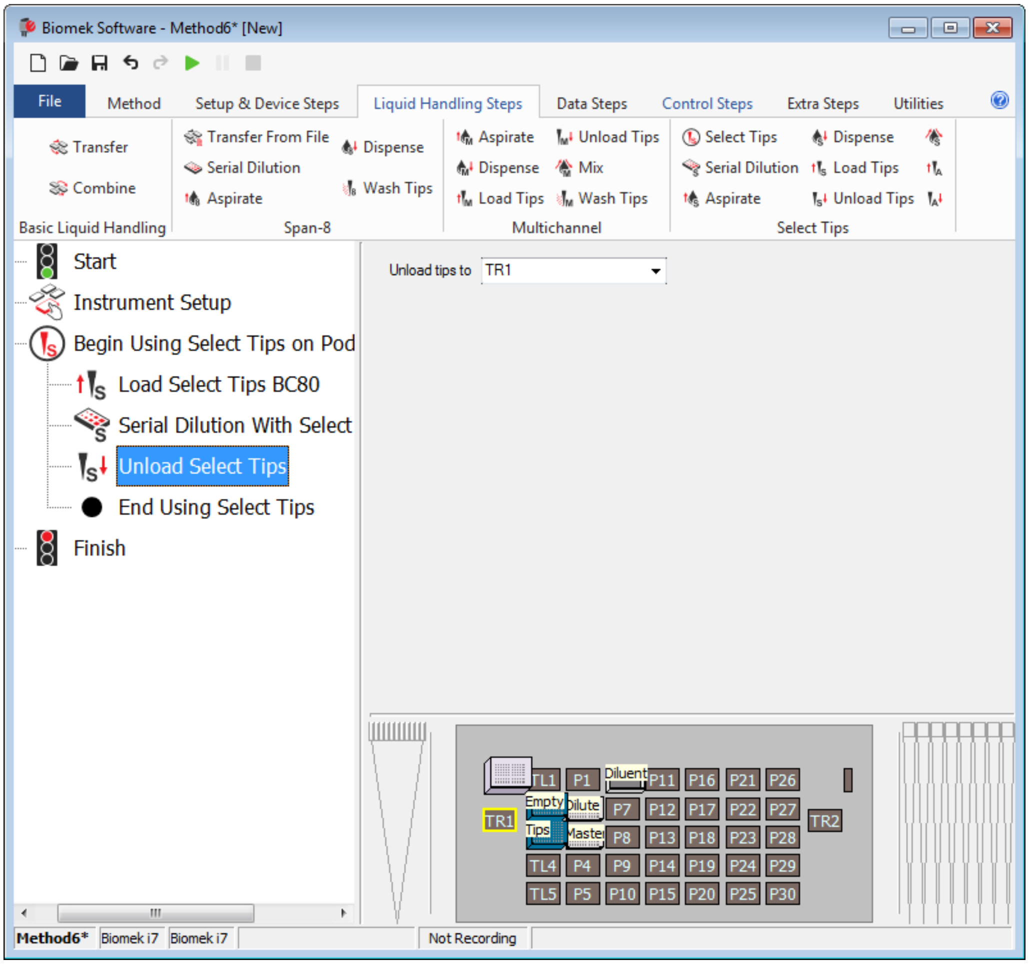
4 **Unload Select Tips** step (Figure 5.8):

  a. Select the **Select Tips Serial Dilution** step in the Method View.

b. From the **Liquid Handling Steps** tab, in the **Select Tips** group, select the Unload Tips (**Unload Select Tips**) step to insert it into the method. The **Unload Select Tips** step unloads the select tips from the pod into the selected location.

c. In the **Unload tips to** field, select **TR1** to unload the tips to the trash.

Figure 5.16 Unload Select Tips Step



Unload tips to TR1

---

5 Select **File** > **Save** > **Method**, and then run the method in Simulation mode.

This example illustrates basic use of serial dilution with Selective Tips Pipetting. The steps used can be customized for specific use cases.

Performing Simultaneous Serial Dilutions on a Single Plate

This tutorial is similar to the previous tutorial, but illustrates performing simultaneous serial dilutions on multiple sections of the same plate. The serial dilution includes the dilution plate, a diluent, and a source compound. The dilution plate and source compound master plate are 96-well microtiter plates. The diluent comes from a reservoir.

Setting Up Your Deck

Using what you learned in CHAPTER 1, *Multichannel Pod — Getting Started with Biomek Software*, create a new method and configure an **Instrument Setup** step as follows:

---

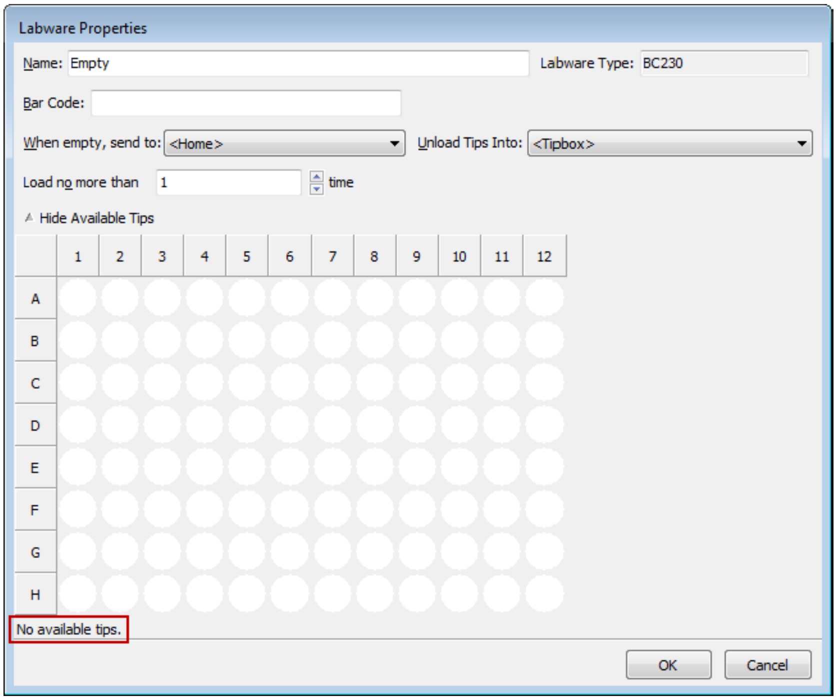
1 Place an empty **BC80** tip box on **TL2**, and configure the labware by doing the following:

- **a.** Open **Labware Properties**, and in **Name**, enter **Empty**.
- **b.** Select the **Show Available Tips** drop-down to display the tips.
- **c.** In the tips graphic, click on tip **A1** and drag your mouse to **H12** so that all tips are deselected. When this is done properly, it should say **No available tips** as shown in Figure 5.17.

  TIP Tips can also be removed by right clicking on the tip box graphic on the Deck Display and selecting **Remove Tips**.

- **d.** Select **OK**.

Figure 5.17 Empty Tip Box Labware Properties



Labware Properties

Name: Empty

Labware Type: BC230

Bar Code:

When empty, send to: <Home>

Unload Tips Into: <Tipbox>

Load no more than 1 time

No available tips.

2 Place a **BC80** tip box on **TL3**, and name it **Tips**.

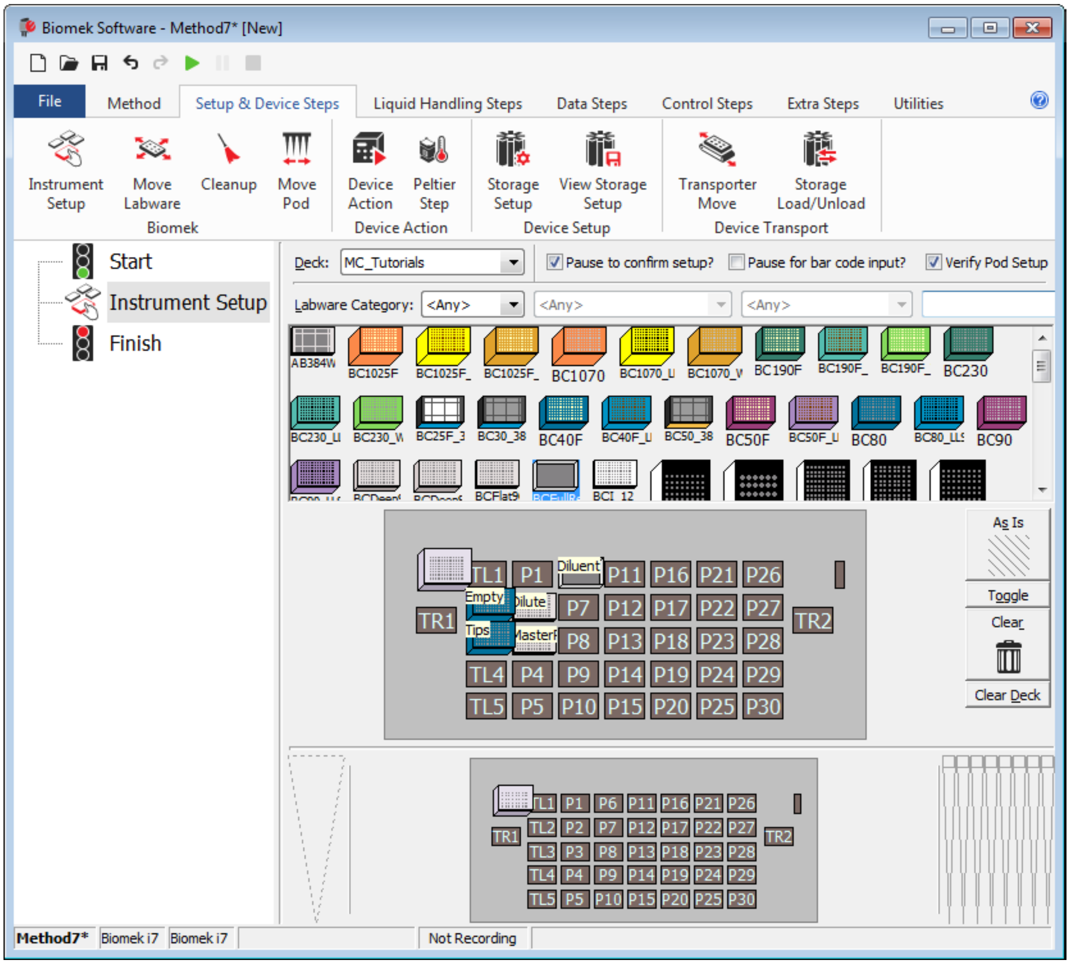
3 Place a **BCFlat96** on **P2** and name it **Dilute**. Give this microplate a **Known** volume of **0** µL.

4 Place a **BCFlat96** on **P3**, and name it **MasterPlate**. Give this destination plate a **Known** volume of **300** µL.

5 Place a **BCFullReservoir** on **P6** and name it **Diluent**. Configure the reservoir to have an **Known** volume of **100000** µL.

Your deck setup should look like Figure 5.18. Now go to the next activity to learn how to perform simultaneous serial dilutions with Selective Tips steps.

Figure 5.18 Instrument Setup Step



Deck: MC_Tutorials
☑ Pause to confirm setup?
☐ Pause for bar code input?
☑ Verify Pod Setup

Setting Up a Selective Tips Serial Dilution Method

In this method, you will learn how to use multiple columns of tips on the Multichannel pod for serial dilution.

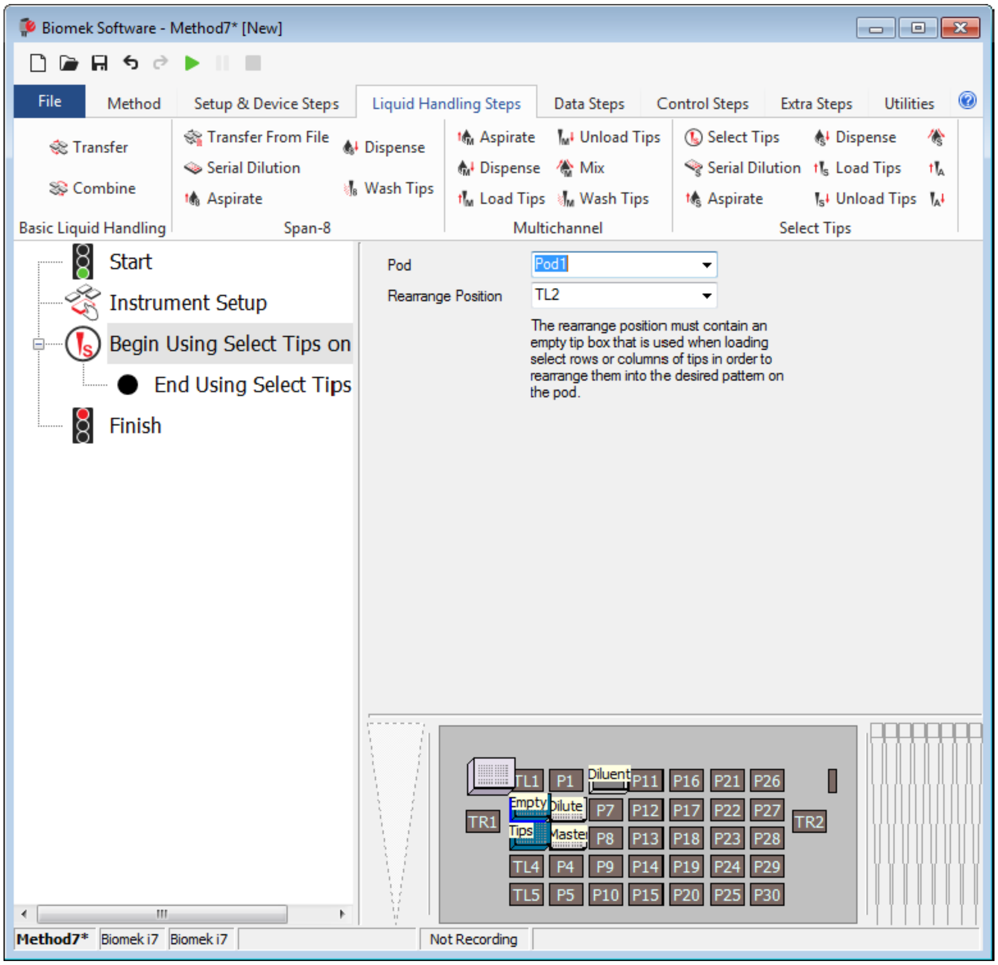
To configure a Select Tips Serial Dilution method:

---

1 **Select Tips** step (Figure 5.3):

- **a.** Select the **Instrument Setup** step in the Method View.
- **b.** On the **Liquid Handling Steps** tab, in the **Select Tips** group, select the Select Tips (**Select Tips**) step. This inserts the **Select Tips** container step into the method.
- **c.** If the appropriate pod is not selected in the **Select Tips** step Configuration View, select the correct pod from the drop-down.
- **d.** In **Rearrange Position**, select **TL2** to specify the **Empty** tip box.

Figure 5.19 Select Tips Step



Pod: Pod1
Rearrange Position: TL2

The rearrange position must contain an empty tip box that is used when loading select rows or columns of tips in order to rearrange them into the desired pattern on the pod.

2 **Load Select Tips** step (Figure 5.20):

a. Select the **Begin Using Select Tips on Pod1** step in the Method View.

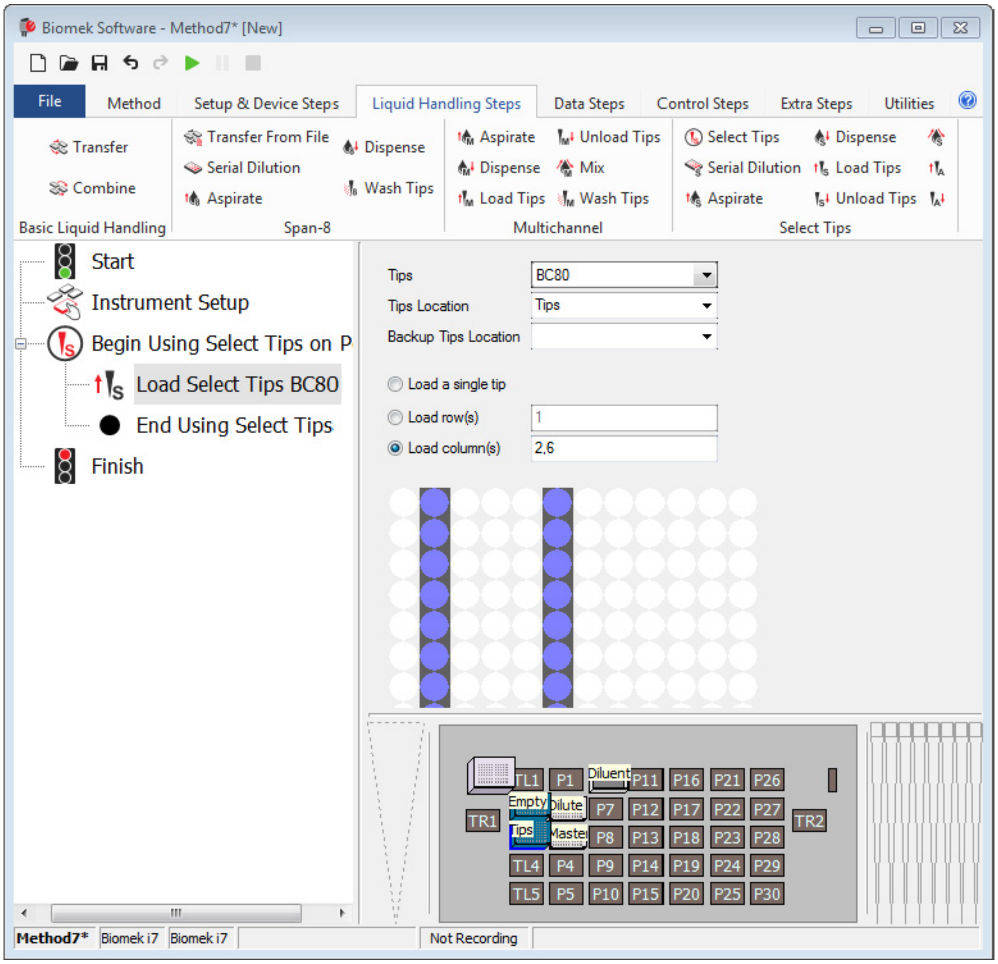
b. On the **Liquid Handling Steps** tab, in the **Select Tips** group, select the Load Tips (**Load Select Tips**) step from the ribbon tab to insert it into the method. This step loads the column of tips onto the pod.

c. To populate the fields for **Tips** and **Tips Location**, click on the tip box on **TL3** in the Current Instrument Display. Since the tip box is named (in this case as **Tips**), this name is used. If the tip box is relocated on the deck, the step will still find it by name, potentially saving time during method development.

d. Select the **Load Column(s)** button, and in the entry field, enter **2,6** to specify that tips from columns 2 and 6 are loaded.

NOTE The spacing of the columns is more important than which columns are selected. In step 3, you will see this concept demonstrated.

Figure 5.20 Load Select Tips Step



Start
Instrument Setup
Begin Using Select Tips on P
Load Select Tips BC80
End Using Select Tips
Finish

Tips: BC80
Tips Location: Tips
Backup Tips Location:
○ Load a single tip
○ Load row(s): 1
● Load column(s): 2,6

3 **Select Tips Serial Dilution** step:

a. Select the **Load Select Tips** step in the Method View.

b. On the **Liquid Handling Steps** tab, in the **Select Tips** group, select the Serial Dilution (**Select Tips Serial Dilution**) step to insert it into the method. Using the loaded select tips, this step transfers diluent, using the loaded select tips, to the indicated dilution wells in the dilution plate. It then adds the source compound from the master plate to the first column of each section of the dilution plate. In this example, columns 3 and 7 receive source compound. Finally, it performs a series of transfer operations to dilute the wells in the dilution plate. (For this example, no tip washing is done.)

c. To configure the **Dilution Plate** (named as **Dilute**) (Figure 5.13):

  1) To configure the dilution plate, click on the **Dilution Plate** section of the Configuration View, and then click on the plate named **Dilute** in the Current Instrument Display. Since the labware is named and its type is defined in **Instrument Setup**, this information is automatically populated when the labware is clicked in the Current Instrument Display.

  2) Set the dilution volume at **10** µL, and select **Water** for the liquid type.

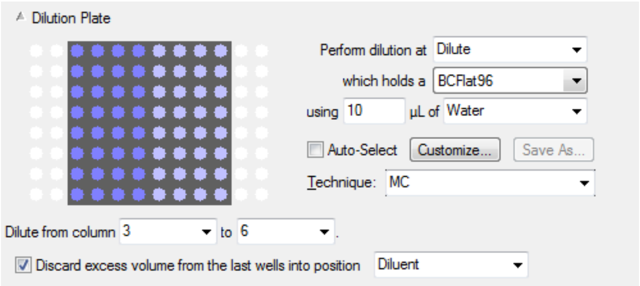
  3) In the **Technique** field, choose **MC** from the drop-down.

  4) In **Dilute from column**, select **3** from the drop-down, and then select or enter **6** in the **to** field.

  5) Select the **Discard excess volume from the last wells into position** check box, and then select the **Diluent** reservoir located on **P6** on the Current Instrument Display to populate the drop-down.

  6) Collapse the **Dilution Plate** section by clicking the upside down triangle next to the heading.

Figure 5.21 Dilution Plate Configuration Area



Perform dilution at Dilute
which holds a BCFlat96
using 10 µL of Water
☐ Auto-Select
Technique: MC
Dilute from column 3 to 6.
☑ Discard excess volume from the last wells into position Diluent

d. To configure the **Diluent Properties** section (named as **Diluent**) (Figure 5.22):

  1) Select the **Add diluent before transfer** check box.

  2) To configure the diluent properties, click on a blank space in the **Diluent Properties** section of the Configuration View, and then click on the **Diluent** reservoir in the Current Instrument Display, which will auto-populate the **Get the diluent from** and **which holds a** fields.

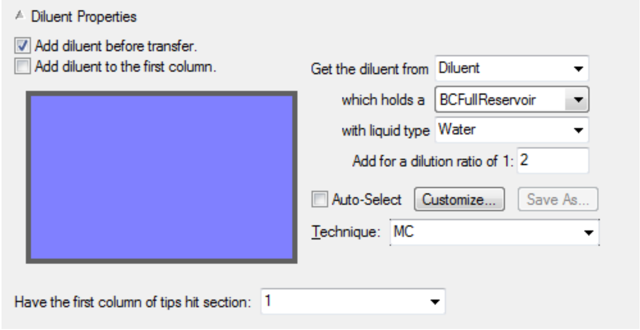
  3) In the **with liquid type** field, select **Water**.

4) In the **Add for a dilution ratio of 1:** field, enter **2**.

5) In the **Technique** field, choose **MC** from the drop-down.

6) Collapse the **Diluent Properties** section by clicking the upside down triangle next to the heading.

Figure 5.22 Diluent Properties Configuration Area



Diluent Properties

☑ Add diluent before transfer.

☐ Add diluent to the first column.

Get the diluent from: Diluent

which holds a: BCFullReservoir

with liquid type: Water

Add for a dilution ratio of 1: 2

☐ Auto-Select

Technique: MC

Have the first column of tips hit section: 1

e. To configure the **Source Compound** (named as **MasterPlate**) (Figure 5.23):

1) Select the **Source Compound** section of the Configuration View, and then click on **P3** in the Current Instrument Display, which correlates to the **MasterPlate**.

NOTE If the **Source Compound** configuration is not visible, click on the upside down triangle to expand the field.

2) Select the **Add source compound to the first column** check box.

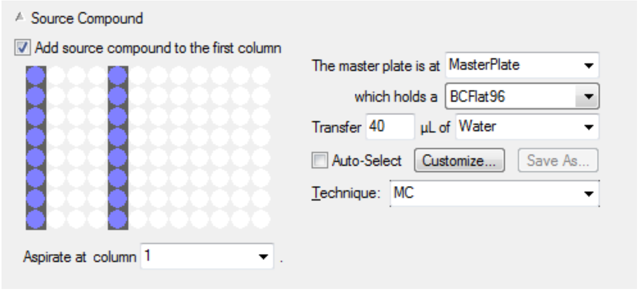
3) Set the **Transfer** volume to **40** µL.

4) Select **Water** to indicate the liquid type.

5) In the **Technique** field, choose **MC** from the drop-down.

6) Keep the selection of **Aspirate at column 1**.

Figure 5.23 Source Compound Configuration Area



Source Compound

☑ Add source compound to the first column

The master plate is at: MasterPlate

which holds a: BCFlat96

Transfer 40 µL of Water

☐ Auto-Select

Technique: MC

Aspirate at column 1

---

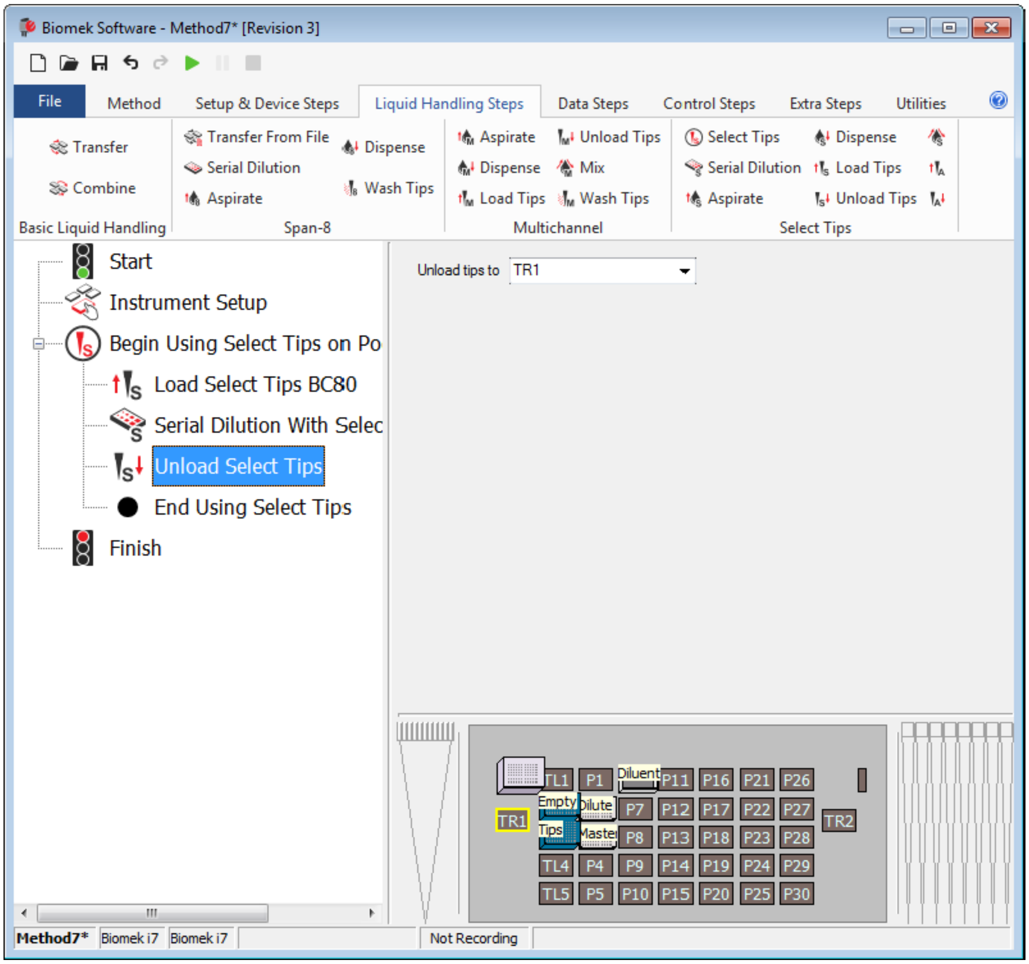
4 **Unload Select Tips** step (Figure 5.24):

a. Select the **Select Tips Serial Dilution** step in the Method View.

b. On the **Liquid Handling Steps** tab, in the **Select Tips** group, select the Unload Tips (**Unload Select Tips**) step to insert it into the method. The **Unload Select Tips** step unloads the select tips from the pod into the selected location.

c. In the **Unload tips to field**, select **TR1** to unload the tips to the trash.

Figure 5.24 Unload Select Tips Step



Unload tips to TR1

---

5 Select **File** > **Save** > **Method**, and then run the method.

This example illustrates performing simultaneous serial dilutions on multiple sections of a plate with Selective Tip Pipetting. The steps can be customized for specific use cases.

CHAPTER 6

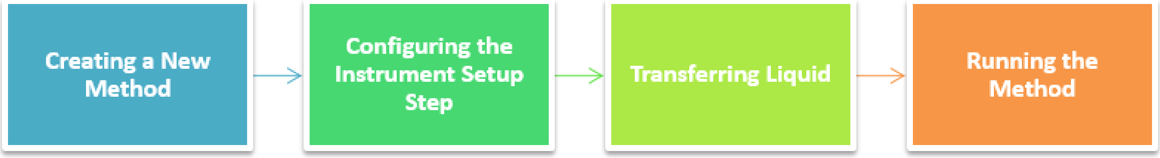
Span-8 Pod — Getting Started with Biomek Software

What You'll Learn in Getting Started with Biomek Software

IMPORTANT Prior to beginning this chapter, read thoroughly and complete all applicable activities in *Basic Learning Concepts* (in the Introduction of this manual).

IMPORTANT Do not change the **Hardware Setup** for these tutorials. Instead, modify the tutorials to fit your current **Hardware Setup**. The method in this chapter uses disposable tips; if your instrument is configured with fixed tips, change the method as instructed in the corresponding **IMPORTANT** text. For additional information, refer to the *Biomek i-Series Hardware Reference Manual* (PN B54474).

In this chapter, you will learn how to create a basic liquid-transfer method on a Span-8 pod. Topics covered in this chapter are presented below.



Creating a New Method

Creating a new method includes:

- *Creating a New Method File*
- *Understanding the Start and Finish Steps*

Biomek i-Series Concept	
	A method is a series of steps that control the operation of the instrument. The steps, located on ribbon tabs, present groups of icons representing the steps available for a method. To build a method, you first select the step in the Method View above where you would like the next step to be located, and then, from the appropriate ribbon tab, you select the step icon you want in your method. Place and configure each step to perform the operations as desired. **NOTE** Steps already added to the Method View can be rearranged by simply selecting and dragging to the desired new location.

Creating a New Method File

To begin a method, you have the option of creating a new method or opening an existing method. In this tutorial, you'll create a new method. To create a new method:

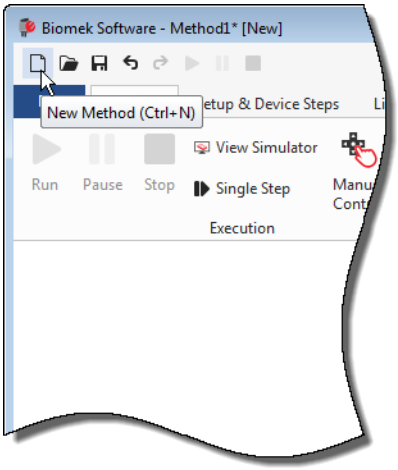
1 Select **File** > **New** > **Method.**

OR

Select **New Method** from the Quick Access Toolbar (Figure 6.1).

This creates the beginning for your new method.

Figure 6.1 New Method on the Quick Access Toolbar



2 If desired, expand the Biomek Software editor to fill the entire screen.

Understanding the Start and Finish Steps

As you can see (Figure 6.1), the Method View of the main editor now contains the **Start** and **Finish** steps that appear automatically when you create a method. These two steps are always there and indicate the beginning and end of your method. You'll insert all the rest of the steps you want the instrument to complete between **Start** and **Finish**.

When the **Start** step is highlighted in the method view, you are presented with the opportunity to create some variables in the Configuration View. Ignore this configuration for our first chapter in this tutorial.

If you want to know more in-depth information on the **Start** configuration right now, refer to the *Biomek i-Series Software Reference Manual* (PN B56358), *Configuring the Start Step*.

You'll learn more about using the **Finish** step in *Determining the Estimated Time for Completion (ETC) of the Method*.

Configuring the Instrument Setup Step

The next activity of this tutorial is to configure the **Instrument Setup** step for your liquid-transfer procedure. You will place on the deck:

- Tips

  IMPORTANT ***If Using Fixed Tips...***

  Do not add tip boxes to any of the instructions in this chapter.

- Source reservoir
- Destination microplate

TIP If the **Instrument Setup** step, or any step, is inserted into the wrong location in the Method View, you can drag and drop it to the proper location.

To insert the **Instrument Setup** step:

---

1 Choose (highlight) **Start** in the Method View.

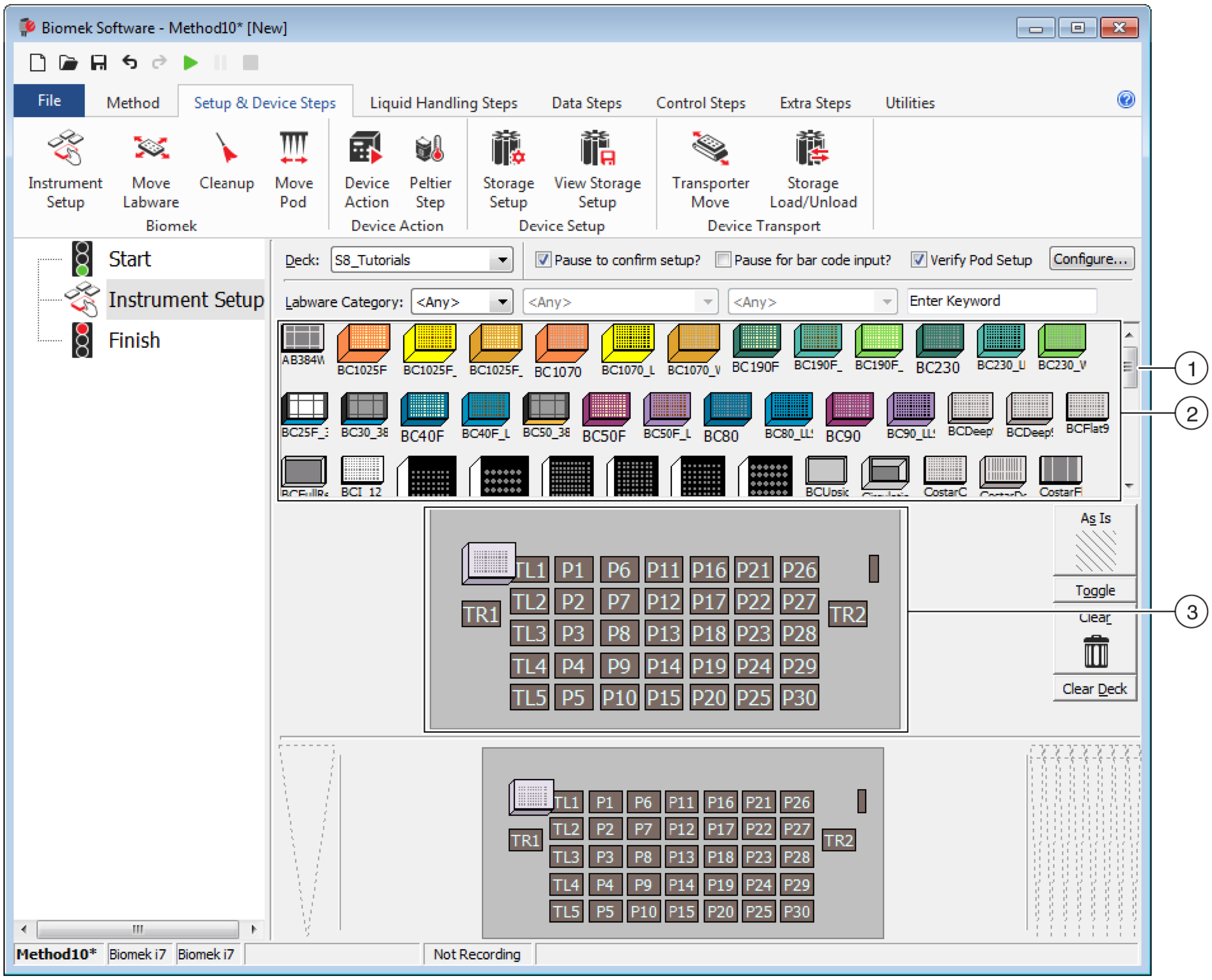
---

2 On the **Setup & Devices Steps** tab, in the **Biomek** group, hover your mouse over the Instrument Setup (**Instrument Setup**) icon. As you hover, look at the Method View and you'll see a black bar appear just below **Start**. This black bar indicates the insertion point where your next step will appear. In this case, it's where the **Instrument Setup** step will be inserted.

TIP Another way to insert a step into the method is to click on the step icon (on the ribbon tab) and drag it to the Method View, releasing the mouse button when the black bar is in the appropriate location.

3 Click the **Instrument Setup** icon to insert the step. The **Instrument Setup** configuration appears (Figure 6.2).

Figure 6.2 Instrument Setup Step Configuration



Deck: S8_Tutorials
☑ Pause to confirm setup?
☐ Pause for bar code input?
☑ Verify Pod Setup
Labware Category: <Any>

1. Move this scroll bar down to display all the labware choices.
2. **Labware Available**: Represents the labware choices for your method. Move your selections onto the Deck Layout display.
3. **Deck Layout**: Represents the layout of your deck. Place your labware selections onto the desired deck layout positions.

TIP Each pane can be resized by hovering your mouse over the bottom or side edge of the pane until the cursor changes to a double-sided arrow (↕ or ↔). Click and drag the edge of the pane up, down, or to the side, depending on whether you need to make it smaller or larger, and then release the mouse when finished.

Using the **Instrument Setup** step you just inserted, you'll learn how to select and place:

- **BC230** tips onto deck position **P12**

  IMPORTANT ***If Using Fixed Tips...***

  Do not add tip boxes to any of the instructions in this chapter.

- **Reservoir** onto deck position **P13**
- **BCFlat96** microplate onto deck position **P18**

To select and place your labware:

---

1 In **Deck,** verify that the correct deck is being used for this tutorial. If the correct deck is not selected, click on the drop-down and select it. See *Introduction*, *Selecting the Tutorial Default Deck*, for details.

---

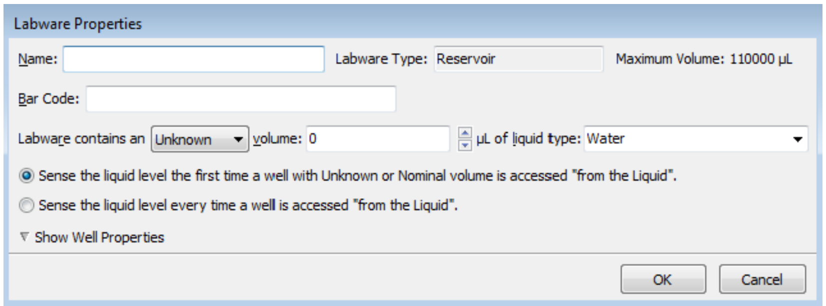
2 From the Labware Available display, click the **BC230** tips icon, and then click on deck position **P12** in the Deck Layout. Notice that when you hover the cursor over the tip box on the Deck Layout, a tool tip identifies the deck position and labware. This technique applies to all the labware you place on the deck.

---

3 Using the above procedure, place a **Reservoir** onto deck position **P13.**

a. After you have positioned the reservoir on the deck, double click it or right click and select **Properties**. This opens **Labware Properties** (Figure 6.3). Each piece of labware added to the Deck Layout is configured using **Labware Properties**. The information provided in **Labware Properties** is used when a pipetting technique is selected or when tips are loaded and unloaded.

Figure 6.3 Labware Properties for Reservoir



Labware Properties

Name:

Labware Type: Reservoir

Maximum Volume: 110000 µL

Bar Code:

Labware contains an Unknown volume: 0 µL of liquid type: Water

● Sense the liquid level the first time a well with Unknown or Nominal volume is accessed "from the Liquid".

○ Sense the liquid level every time a well is accessed "from the Liquid".

b. In **Labware Properties**, you can give the reservoir a name. You'll name this one "**Rsvr**," but in general, you can assign labware any name you want. Type **Rsvr** in the **Name** field. After configuration is complete, the name will appear over the reservoir in the Current Instrument Display (Figure 6.4).

TIP It's helpful to name your labware on the deck. You can assign a name that identifies the contents of the labware, or a descriptive name that fits the work being done in your laboratory. This can reduce confusion considerably.

- **c.** Leave **Bar Code** blank for this tutorial, but it can be used to identify a specific plate in certain methods.
- **d.** In **Labware contains an**, select **Known**.
- **e.** In the **Volume** field, type **100000**. This means you know you have 100,000 microliters of liquid in the source reservoir.
- **f.** Choose **Water** from the **Liquid Type** drop-down menu, or type **Water** into this field.
- **g.** Ignore the two options to **Sense the liquid level**. Since we have known volumes in the labware, we won't use liquid level sensing in this chapter, but you'll use liquid level sensing in later chapters.
- **h.** Choose **OK**.

---

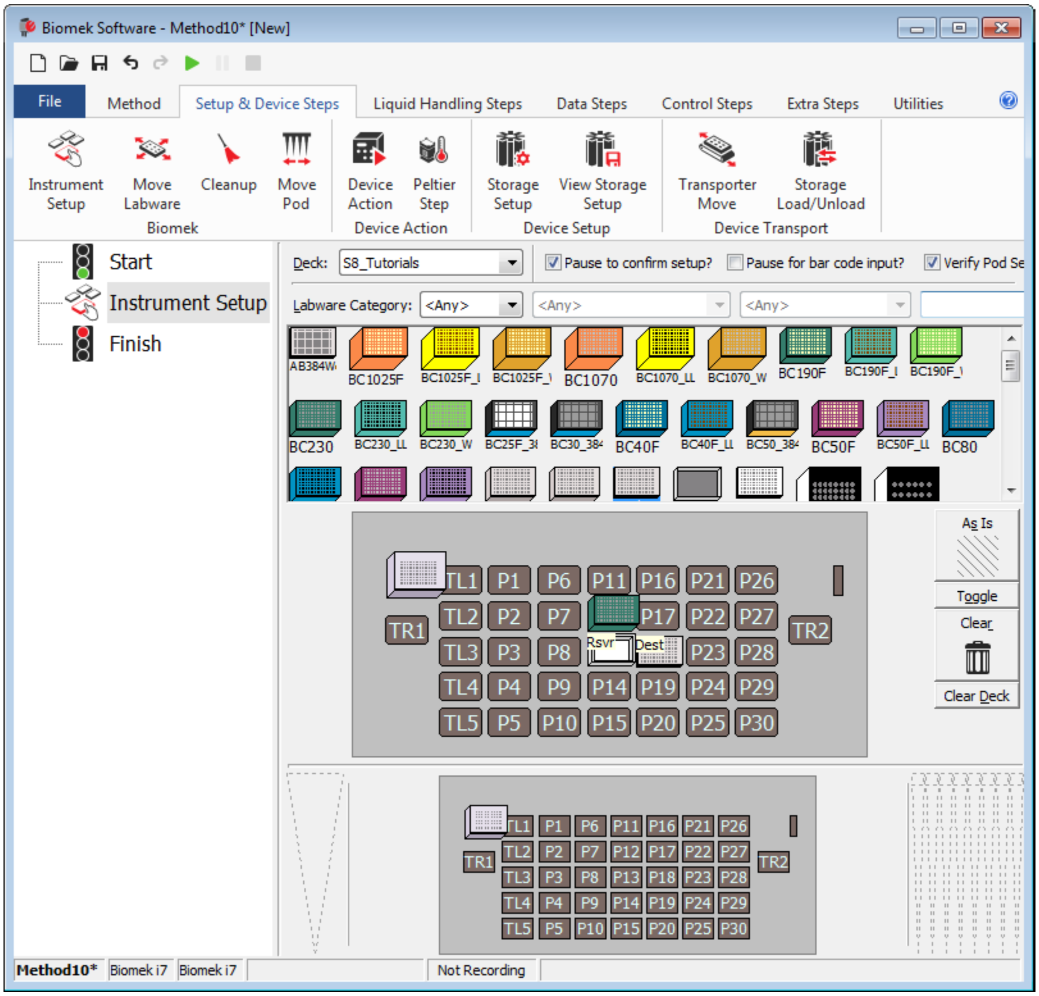
4 Place a **BCFlat96** microplate onto the deck in position **P18**.

- **a.** Double click on the **P18** microplate, or right click and select **Properties**.
- **b.** Type **Dest** in the **Name** field.
- **c.** In **Labware contains an**, select **Known**.
- **d.** In the **Volume** field, leave this value at **0**.
- **e.** Do not specify a **Liquid Type** for this destination plate since it is presently empty.
- **f.** Choose **OK**.

TIP Properties set for labware, such as in the steps above (name, volume, and liquid type), can be retained for easy reuse for other methods. To do this, from the **Labware Category** drop-down, which is located just above the Labware Available display, select **<Custom>**. Then drag the configured labware from the Deck Layout and drop it into the Labware Available display. The customized labware is now available for all methods using the current project.

That's it. Your deck is now set up for transferring liquid, and the main editor should look like Figure 6.4.

Figure 6.4 Instrument Setup Step Completed



Biomek Software - Method10* [New]

Deck: S8_Tutorials ☑ Pause to confirm setup? ☐ Pause for bar code input? ☑ Verify Pod Se

Labware Category: <Any> <Any> <Any>

Setting Up the Liquid Transfer

Now you are ready to insert and configure your procedure to transfer liquid. Biomek Software provides a **Transfer** step, which is located in the **Basic Liquid Handling** group on the **Liquid Handling Steps** tab, that makes it easy to accomplish this task.

Configuring the **Transfer** step includes configuring:

- Tip handling
- Source labware
- Destination labware

Biomek i-Series Concept

The **Transfer** step for the Span-8 pod transfers liquid from one source to one or more destinations. The **Transfer** step will by default complete the following: load tips, aspirate liquid, dispense liquid, and unload tips. This concept eliminates the need to insert four separate steps, although occasionally a method may require these steps be performed individually. These individual steps will be covered in CHAPTER 7, *Span-8 Pod — Using More Steps in a Method*.

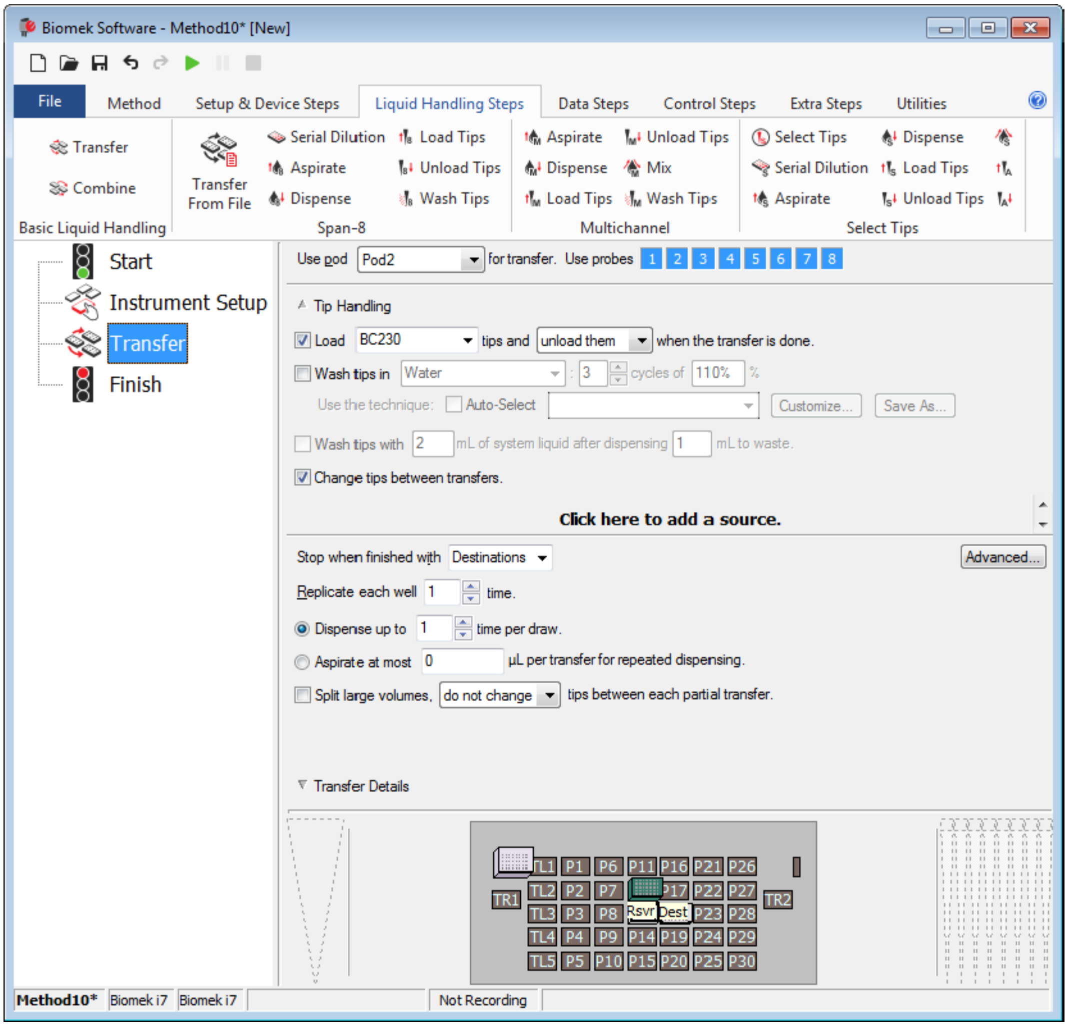
Configuring Tip Handling

To set up a liquid transfer, insert the **Transfer** step into the Method View in the main editor, and configure the **Tip Handling** by completing the following:

1 Highlight the **Instrument Setup** step.

2 On the **Liquid Handling Steps** tab, in the **Basic Liquid Handling** group, select the Transfer (**Transfer**) icon. The **Transfer** step configuration appears (Figure 6.5). Notice the Current Instrument Display at the bottom of the editor is now populated to illustrate your deck setup since it changes dynamically to match the state of the deck at the start of the current step.

Figure 6.5 Transfer Step Inserted



Use pod Pod2 for transfer. Use probes 1 2 3 4 5 6 7 8

Tip Handling

☑ Load BC230 tips and unload them when the transfer is done.

☐ Wash tips in Water : 3 cycles of 110%

Use the technique: ☐ Auto-Select

☐ Wash tips with 2 mL of system liquid after dispensing 1 mL to waste.

☑ Change tips between transfers.

Click here to add a source.

Stop when finished with Destinations

Replicate each well 1 time.

● Dispense up to 1 time per draw.

○ Aspirate at most 0 µL per transfer for repeated dispensing.

☐ Split large volumes, do not change tips between each partial transfer.

Transfer Details

---

3 In **Use pod**, verify the **Span-8 Pod** is selected. The configuration for the **Transfer** step should look like Figure 6.5. If you only have a Span-8 pod on your instrument, the Span-8 pod **Transfer** step configuration will be displayed by default.

IMPORTANT ***If Using Fixed Tips...***
Ensure the **Hardware Setup** is configured appropriately. In the **Tip Handling** section, **Load Tips** will be greyed out; however, the wash configuration will be available.

---

4 Make sure the type of tips displayed is **BC230**, the type of tips you configured in **Instrument Setup**.

---

5 Make sure **unload them** is selected in the next field.

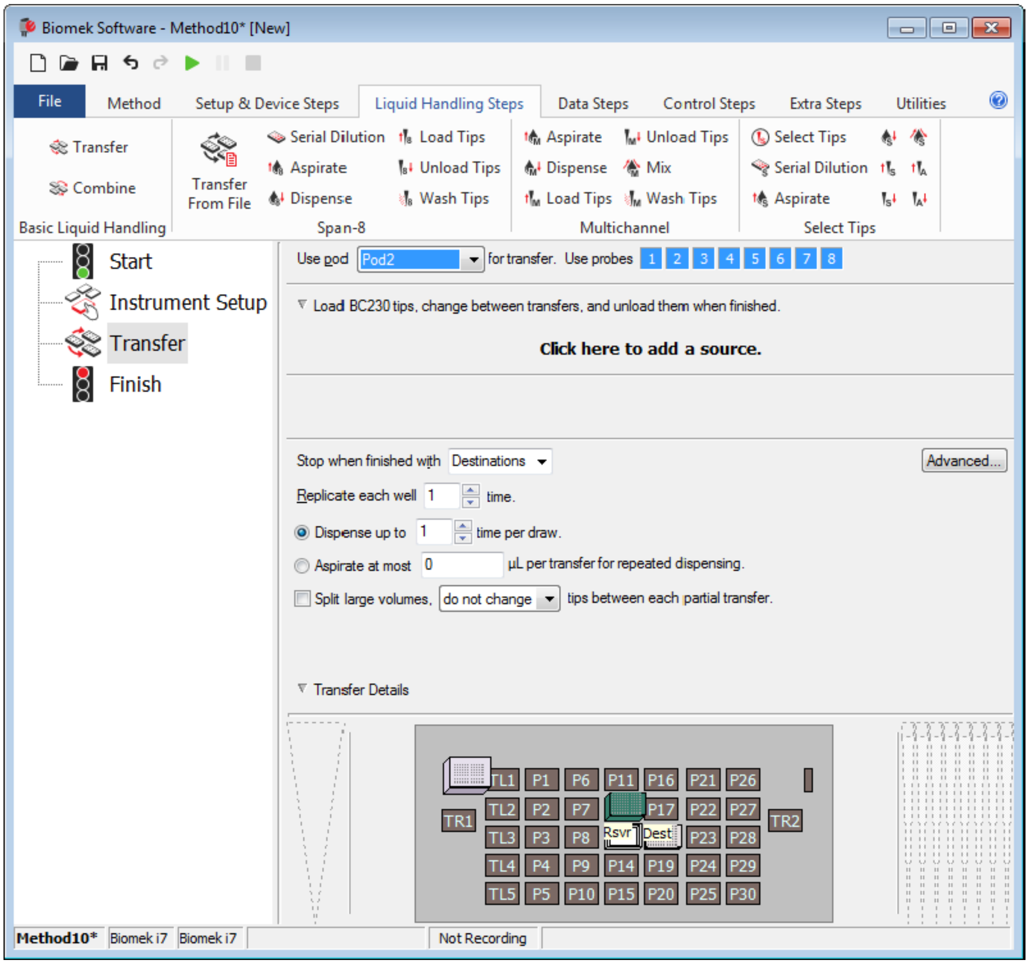
---

6 Ignore the tip washing options, as tip washing will not be included in this method.

7 Select **Change tips between transfers**.

8 Your tips are configured for your liquid transfer, so click the **up arrow** next to **Tip Handling** (Figure 6.5). This collapses the **Tip Handling** configuration to allow more room for labware configuration. A simple text description of the way tips will be handled is displayed in place of the expanded **Tip Handling** configuration. The editor now looks like (Figure 6.6).

Figure 6.6 Tip Handling Configured and Collapsed



Use pod Pod2 for transfer. Use probes 1 2 3 4 5 6 7 8

Load BC230 tips, change between transfers, and unload them when finished.

Click here to add a source.

Stop when finished with Destinations

Replicate each well 1 time.

● Dispense up to 1 time per draw.

○ Aspirate at most 0 µL per transfer for repeated dispensing.

☐ Split large volumes, do not change tips between each partial transfer.

Transfer Details

Configuring Source Labware

Now you will configure the source labware. Here you will specify from which labware liquid will be aspirated and the height to which the tip descends into the labware before aspirating.

To configure the reservoir named **Rsvr** as the source labware:

---

1 Click on **Click here to add a source**.

---

2 Click on **Rsvr** labware on the **P13** position in the Current Instrument Display. As you can see, the information you supplied during **Instrument Setup** is displayed in the source labware configuration.

---

3 Right click on the large tip illustration next to the reservoir graphic in the configuration and choose **Measure from Bottom**.

TIP After you click on the tip, you can adjust the height more precisely by using the up or down arrow keys on your keyboard to change the height by 0.10 mm or you can use the **Page Up** and **Page Down** keys to change the height by 1.0 mm with each press of the key. You can also right-click on the graphic, then select **Custom Height** from the menu that appears. When customizing the tip height, you are overriding Technique selected for aspirating liquid. To learn more about configuring Techniques and using the **Technique Browser**, refer to the *Biomek i-Series Software Reference Manual*, PN B56358, *Understanding and Creating Techniques*.

---

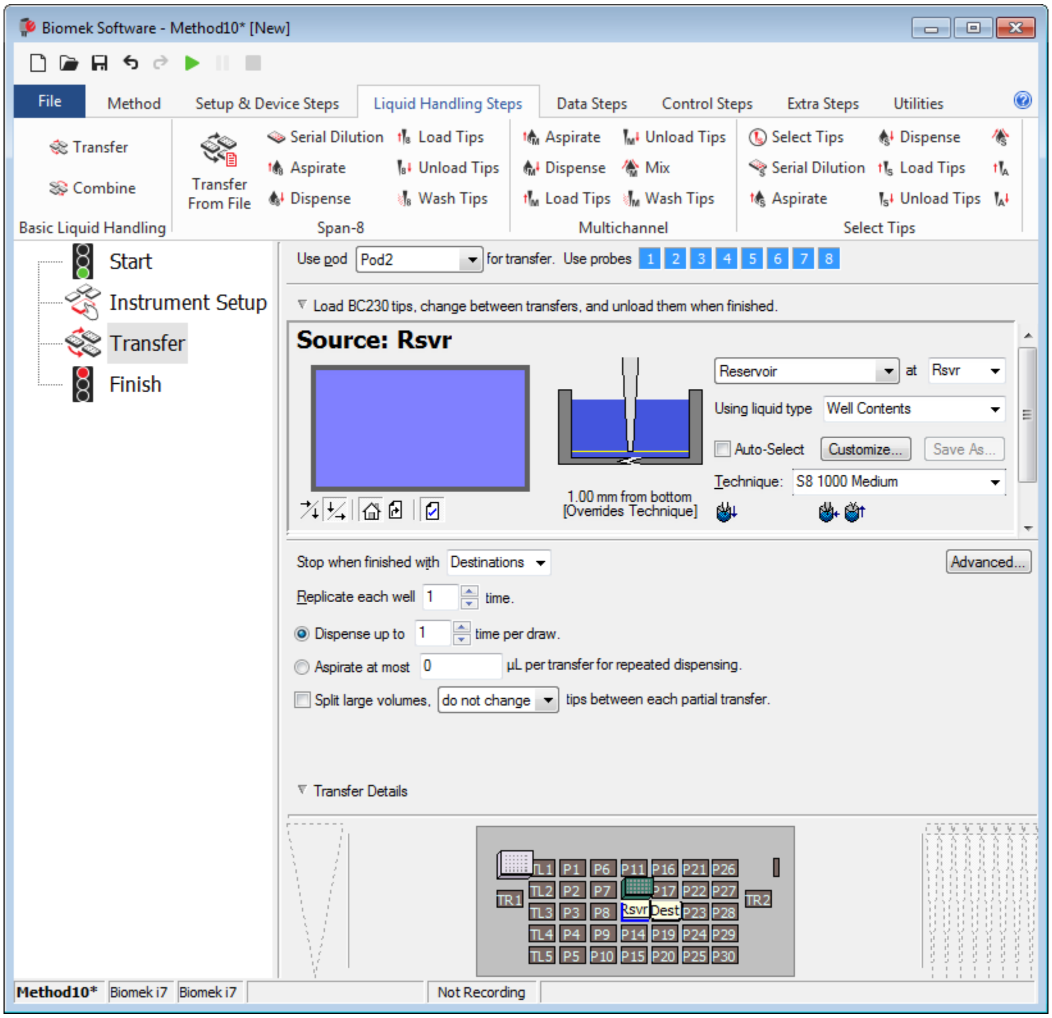
4 To adjust and set the aspirate height to which the tip descends into the reservoir, place the **mouse cursor over the tip illustration.** When the cursor turns into a hand, hold the left mouse button down to move the hand up and down until the depth is as close to **1.00 mm from bottom** as you can get. Then adjust the height precisely to 1.00 mm using the **TIP** described in Step 3. There is a slight break in the bottom of the source reservoir graphic with the large tip that indicates that the reservoir is wider than the graphic can display.

---

5 In the **Technique** drop-down, select the **S8 1000 Medium** technique.

The source labware is complete, and the editor now looks like Figure 6.7.

Figure 6.7 Configured Source Labware



Biomek Software - Method10* [New]

Use pod Pod2 for transfer. Use probes 1 2 3 4 5 6 7 8

Load BC230 tips, change between transfers, and unload them when finished.

Source: Rsvr

Reservoir at Rsvr

Using liquid type Well Contents

☐ Auto-Select

Technique: S8 1000 Medium

1.00 mm from bottom [Overrides Technique]

Stop when finished with Destinations

Replicate each well 1 time.

● Dispense up to 1 time per draw.

○ Aspirate at most 0 µL per transfer for repeated dispensing.

☐ Split large volumes, do not change tips between each partial transfer.

Transfer Details

Method10* Biomek i7 Biomek i7 Not Recording

Configuring Destination Labware

Here you will configure where you want the water from the source reservoir to be dispensed. In this case, you want to dispense water into the **BCFlat96** microplate on deck position **P18**.

To do this:

---

1 Click the **Dest** microplate in the Current Instrument Display. This one operation accomplishes the same tasks as steps 1 and 2 of *Configuring Source Labware*. Notice that the source labware configuration fields are now replaced with a brief sentence summary of the setup. If you want to reopen this source configuration for any reason, click anywhere in the collapsed configuration area.

TIP If you accidentally open too many destination configurations, just right click on the title in the configuration. Click **Delete** from the pop-up menu and the entire configuration goes away.

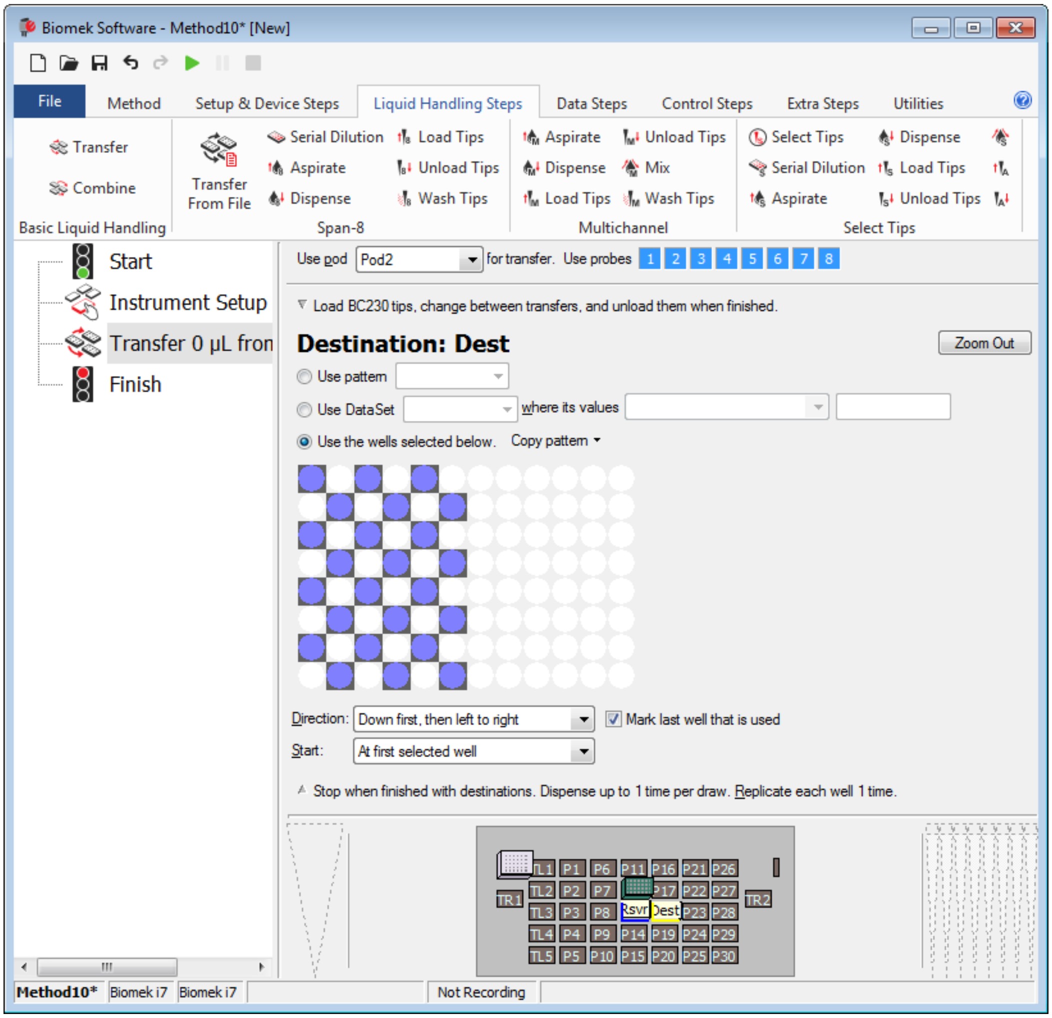
---

2 Double click the **Destination Labware** in the step configuration to zoom in on the labware. All of the wells are selected by default.

---

3 Since all of the wells are selected by default, select the first well of the first column by clicking on the well. Now the only well that is selected is that first well that you just clicked; all the other wells are deselected. Then, select every other well of the first six columns by holding down (Ctrl) key and clicking the wells. Your pattern should look like Figure 6.8. You have just configured which wells will be filled with water from the source reservoir **Rsvr**.

Figure 6.8 Destination Labware Zoomed In



Use pod Pod2 for transfer. Use probes 1 2 3 4 5 6 7 8

Load BC230 tips, change between transfers, and unload them when finished.

Destination: Dest

○ Use pattern

○ Use DataSet where its values

● Use the wells selected below. Copy pattern

Direction: Down first, then left to right

☑ Mark last well that is used

Start: At first selected well

Stop when finished with destinations. Dispense up to 1 time per draw. Replicate each well 1 time.

4 Allow the default selections in **Direction**, **Start**, and **Mark last well that is used** to remain.

5 Choose **Zoom Out**.

6 Select the **Volume** field (Figure 6.9), which allows you to designate the amount of liquid to be dispensed. For this tutorial, you're transferring 100 µL; so type **100** into the **Volume** field. This means you will be dispensing 100 µL into each of the wells you selected.

7 In the **Technique** drop-down, select the **S8 1000 Medium** technique.

---

8 Right click on the large tip illustration and choose **Measure from Bottom**.

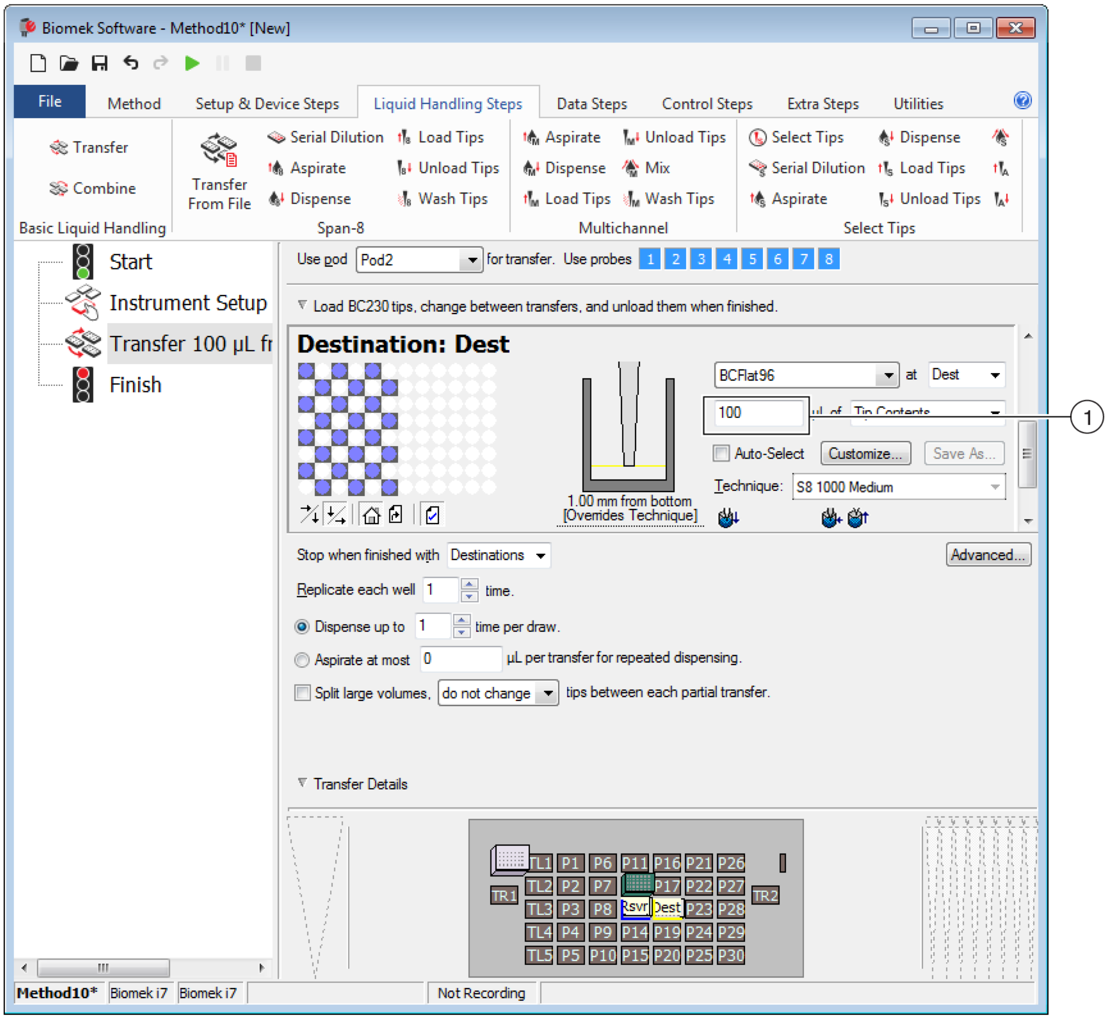
NOTE When customizing the tip height, you are overriding Technique selected for dispensing liquid. To learn more about configuring Techniques and using the **Technique Browser**, refer to the *Biomek i-Series Software Reference Manual*, PN B56358, *Understanding and Creating Techniques*.

---

9 Set the dispense height in the large tip illustration to **1.00 mm from bottom**, using the same technique as you used for setting the aspirate height.

The destination labware is now configured and the editor looks like Figure 6.9.

Figure 6.9 Configured Destination Labware



Use pod Pod2 for transfer. Use probes 1 2 3 4 5 6 7 8

Load BC230 tips, change between transfers, and unload them when finished.

Destination: Dest

BCFlat96 at Dest

100 µL of Tip Contents

☐ Auto-Select

Technique: S8 1000 Medium

1.00 mm from bottom [Overrides Technique]

Stop when finished with Destinations

Replicate each well 1 time.

● Dispense up to 1 time per draw.

○ Aspirate at most 0 µL per transfer for repeated dispensing.

☐ Split large volumes, do not change tips between each partial transfer.

Transfer Details

1. **Volume** field

Determining the Estimated Time for Completion (ETC) of the Method

Your liquid transfer is set up, so let's see how long it will take to run the entire method by using the **Finish** step.

NOTE Selecting the **Finish** step also validates the method by checking for errors.

To do this:

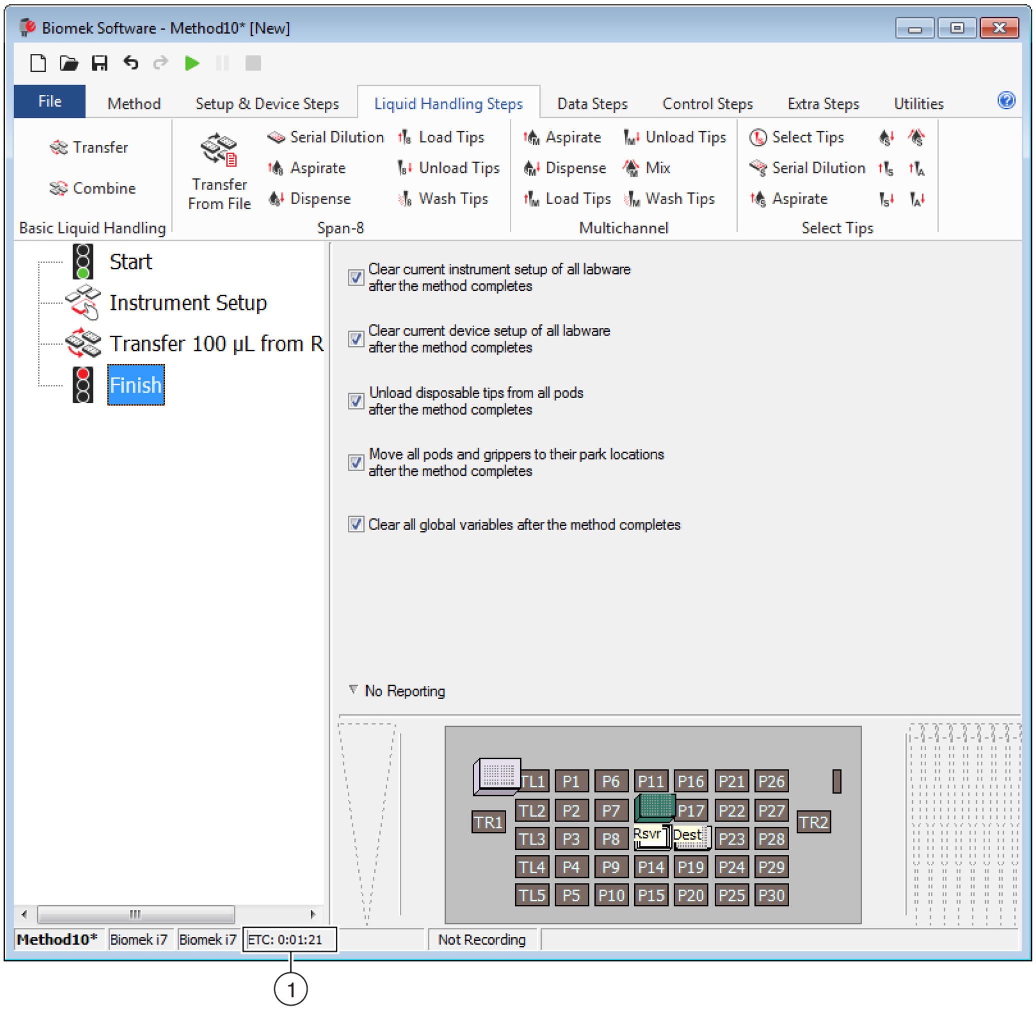
---

1 Click on the **Finish** step in the Method View.

---

2 Check the status bar at the bottom of the editor for a display of the ETC. For this method, the ETC is approximately 1:21 (Figure 6.10). It's all right if your ETC varies slightly. Variations in ETC occur due to your deck layout and/or instrument configuration.

Figure 6.10 Finish Step Displaying the ETC



☑ Clear current instrument setup of all labware after the method completes

☑ Clear current device setup of all labware after the method completes

☑ Unload disposable tips from all pods after the method completes

☑ Move all pods and grippers to their park locations after the method completes

☑ Clear all global variables after the method completes

No Reporting

Method10* | Biomek i7 | Biomek i7 | ETC: 0:01:21 | Not Recording

1. **ETC**: The Estimated Time of Completion for the method in the Method View.

Congratulations! You've just built a liquid transfer method using Biomek Software that:

- Prepared the main editor for a new method.
- Set up the deck and the configured labware you wanted to use using an **Instrument Setup** step.
- Added and configured a liquid transfer using a **Transfer** step.

Saving the Method

You will save the method you've just created.

Biomek i-Series Concept

Methods may be saved at any time during their development. Saving a method automatically checks in the method, creating a record of the revision that preserves the method configuration at the time it was saved. Revisions may be accessed from the revision history at a later time. If any project items, such as labware definitions or techniques, change after the method is saved, when the method is opened next, the latest definitions are used. Refer to the *Biomek i-Series Software Reference Manual* (PN B56358), *Saving a Method* and *Viewing Method History* for more information.

To save your method:

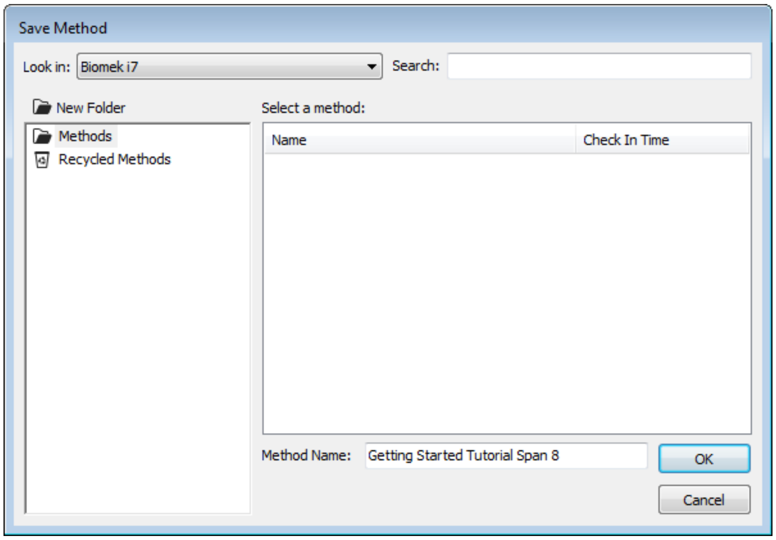
1 Select the 💾 (**Save Method**) icon from the Quick Access Toolbar.

OR

Select **File** > **Save** > **Method**.

2 In **Method Name**, type the file name under which your method will be saved. For this chapter, type **Getting Started Tutorial Span 8** (Figure 6.11).

Figure 6.11 Save Method

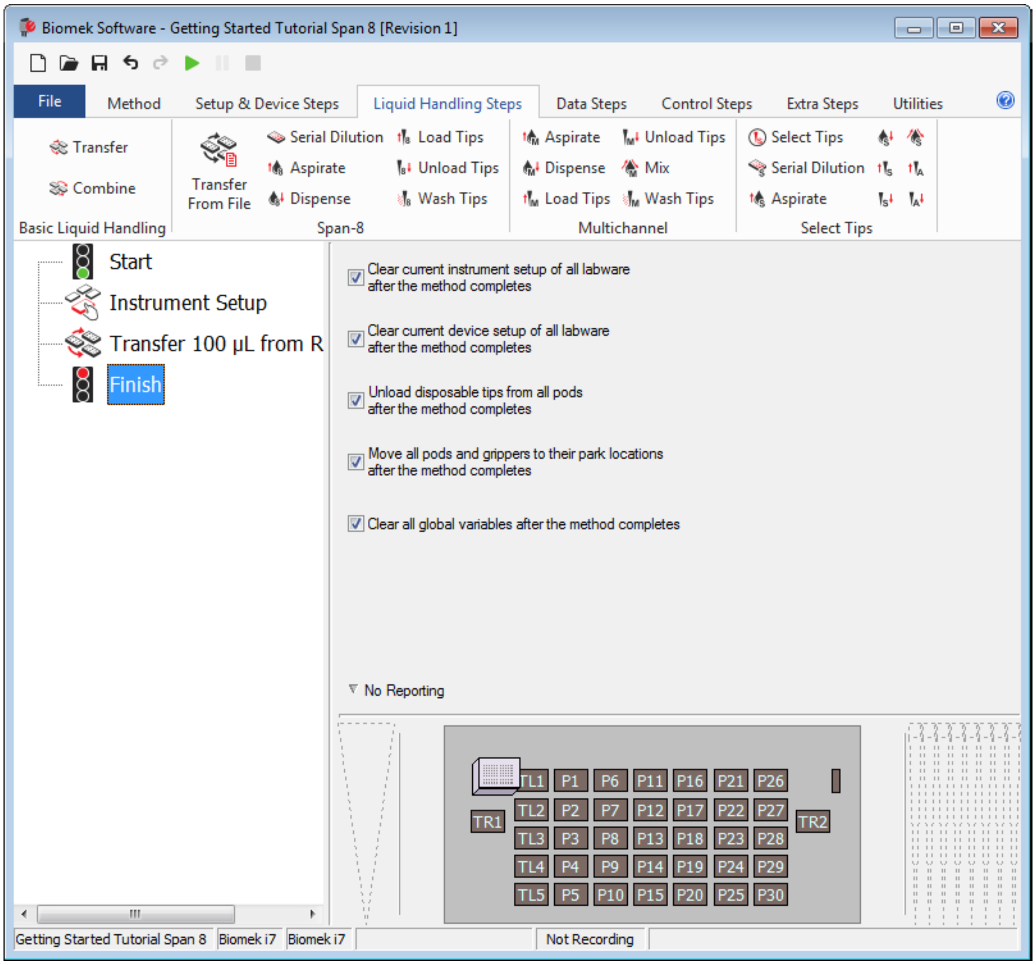


Look in: Biomek i7

Method Name: Getting Started Tutorial Span 8

3 Choose **OK.** Now notice how the method name in the main editor has changed to **Getting Started Tutorial Span 8 [Revision 1]** (Figure 6.12).

Figure 6.12 Method Name Has Changed



Biomek Software - Getting Started Tutorial Span 8 [Revision 1]

Start
Instrument Setup
Transfer 100 µL from R
Finish

☑ Clear current instrument setup of all labware after the method completes

☑ Clear current device setup of all labware after the method completes

☑ Unload disposable tips from all pods after the method completes

☑ Move all pods and grippers to their park locations after the method completes

☑ Clear all global variables after the method completes

No Reporting

Getting Started Tutorial Span 8 | Biomek i7 | Biomek i7 | Not Recording

Running the Method

Now that you've built a method, let's run it.

When you select **Run**, the method will be validated internally to check for errors. After this validation is complete, a deck confirmation prompt will appear over the main editor; this prompt displays the deck setup as interpreted by the software.

Run your method by following the instructions in the appropriate section below:

- *Running in Simulation Mode*
- *Running the Method on Hardware*

Running in Simulation Mode

The method runs as soon as you choose **OK** on the **Instrument Setup Confirmation** pop up window. You can visually follow the run in the Method View; steps are highlighted as the step is executed.

To run the method in Simulation Mode:

---

1 Click on the ▶ (**Run**) icon on the Quick Access Toolbar.

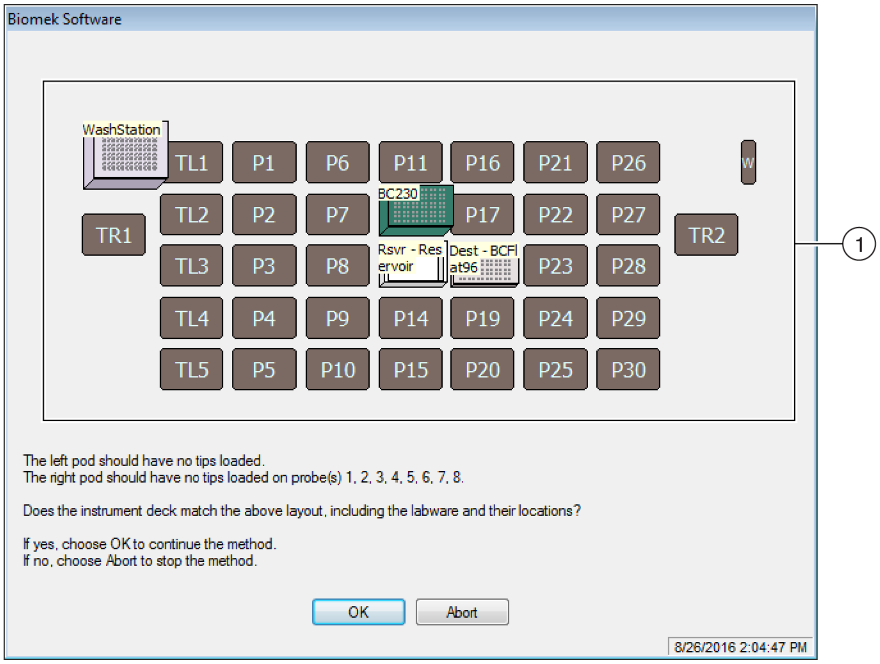
OR

From the **Method** tab, in the **Execution** group, choose ▶ Run (**Run**).

---

2 On the Deck Confirmation Prompt (Figure 6.13), select **OK**. You can visually follow the run in the Method View; steps are highlighted as the step is executed. When method is completed, the simulation window automatically disappears.

Figure 6.13 Deck Confirmation Prompt



The left pod should have no tips loaded.
The right pod should have no tips loaded on probe(s) 1, 2, 3, 4, 5, 6, 7, 8.

Does the instrument deck match the above layout, including the labware and their locations?

If yes, choose OK to continue the method.
If no, choose Abort to stop the method.

8/26/2016 2:04:47 PM

1. Deck Setup

---

3 If necessary, save the method.

---

4 Close the method by selecting **File > Close Method**. Now go to CHAPTER 7, *Span-8 Pod — Using More Steps in a Method* to learn how to use more steps in a method.

Running the Method on Hardware

To run the method on the physical instrument:

---

1 Before running the method ***on Hardware*** (on your physical instrument), you will need to home all axes:

From the **Method** tab, in the **Execution** group, select Home All Axes (**Home All Axes**). A window appears, showing a list of warnings.

NOTE Choosing **Home All Axes** homes all of the axes for all pods.

---

2 Choose **OK** after confirming that the **Warning** has been addressed appropriately.

NOTE Other Warnings may also appear depending upon the type of heads and deck configuration of the Biomek i-Series instrument. Respond to all warnings appropriately and choose **OK** to continue.

---

3 Click on the ▶ (**Run**) icon on the Quick Access Toolbar.

OR

From the **Method** tab, in the **Execution** group, choose ▶ Run (**Run**).

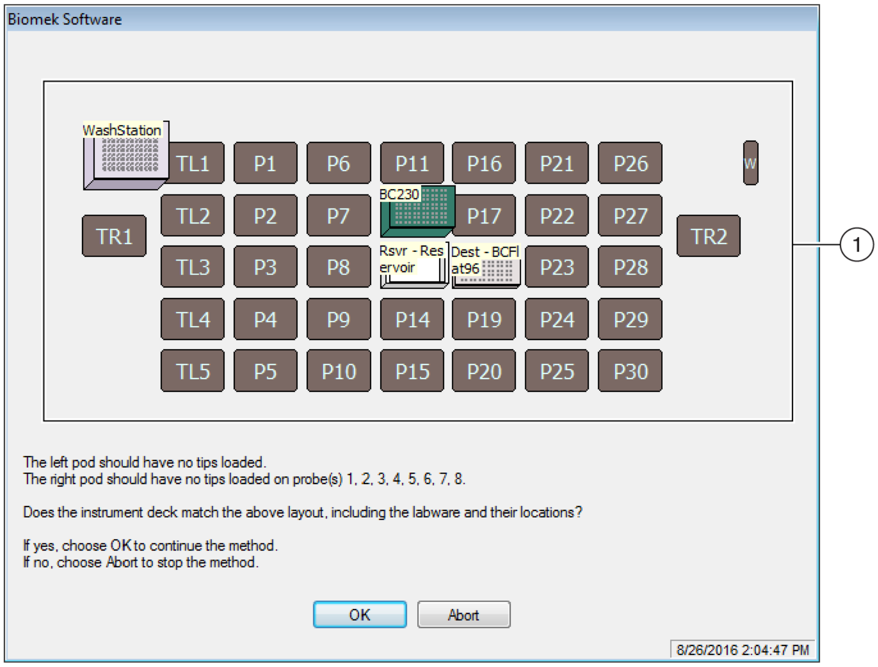
⚠ WARNING

Risk of equipment damage or contamination. Always verify that the physical instrument setup matches the instrument setup in Biomek Software. Inaccurate instrument setup can result in inappropriate pipetting or pod collision, resulting in equipment damage or hazardous waste spills.

4 Visually confirm the physical deck and pod setup, including labware placement and tip state on the pod, matches the Deck Confirmation Prompt (Figure 6.14) before continuing with the method.

IMPORTANT Biomek Software will not produce an error if the Biomek Software deck does not match the physical instrument deck. Be sure to carefully read the confirmation prompt and follow the instructions prior to choosing **OK**.

Figure 6.14 Deck Confirmation Prompt



The left pod should have no tips loaded.
The right pod should have no tips loaded on probe(s) 1, 2, 3, 4, 5, 6, 7, 8.

Does the instrument deck match the above layout, including the labware and their locations?

If yes, choose OK to continue the method.
If no, choose Abort to stop the method.

1. The deck setup is displayed here. Make sure that the correct labware is placed on the deck and the pod matches what the software expects.

5 If the physical deck does not match the deck shown, move or place labware on the deck so that it does match. Alternatively, you may choose **Abort** and adjust the **Instrument Setup** step to match your physical deck setup.

6 When the physical deck setup matches the deck shown, choose **OK.** The method runs as soon as you choose **OK**.

7 If necessary, save the method.

8 Select **File > Close Method.** Now go to CHAPTER 7, *Span-8 Pod — Using More Steps in a Method* to learn how to use more steps in a method.

CHAPTER 7

Span-8 Pod — Using More Steps in a Method

Introduction to Using More Steps in a Method

In the previous chapter of this tutorial, you learned how to:

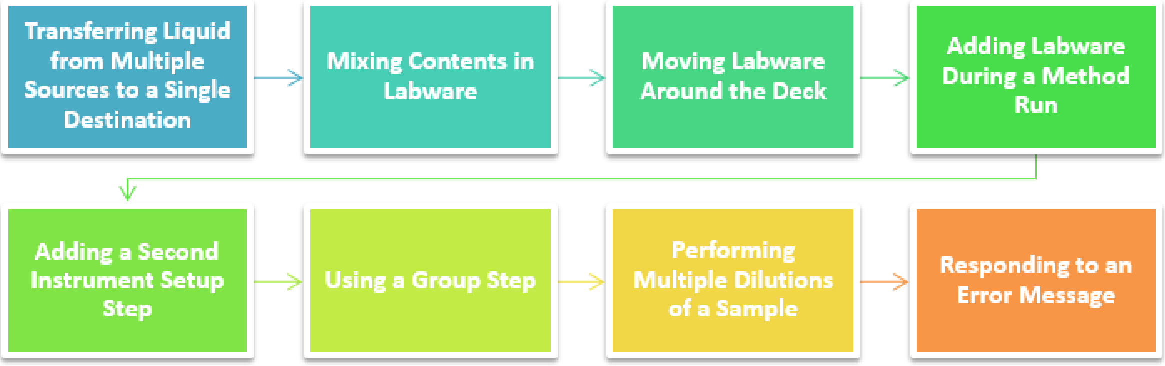
- Build a Span-8 liquid-transfer method.
- Save, run, and check in a method.

TIP Click on the **Finish** step to validate the method after configuring or changing a step; this practice helps you to quickly identify and resolve errors. Saving the method at regular intervals, especially after adding new steps or editing steps of the method is highly recommended.

IMPORTANT Do not change the **Hardware Setup** for these tutorials. Instead, modify the tutorials to fit your current **Hardware Setup**. The method in this chapter uses disposable tips; if your instrument is configured with fixed tips, change the method as instructed in the corresponding **IMPORTANT** text. For additional information, refer to the *Biomek i-Series Hardware Reference Manual* (PN B54474).

What You'll Learn in This Chapter

This chapter will help you develop the skills to create methods for tasks such as transferring liquid from tubes to plates, liquid level sensing, and serial dilution. You will also learn how to pause the system to add more labware to the deck and handle errors. The process for creating the method in this chapter is presented below. All of these topics are covered in detail in this chapter.



Setting Up Your Deck for Using More Steps in a Method

For this tutorial, you will be setting up labware on the deck to learn how to incorporate them into your methods.

Setting Up the Deck

Using what you learned in CHAPTER 6, *Span-8 Pod — Getting Started with Biomek Software*, launch Biomek Software, create a new method (**File** > **New** > **Method**), add an **Instrument Setup** step, and configure the following:

---

1 Place a **BC230_LLS** tip box on **P19**.

IMPORTANT ***If Using Fixed Tips...***

Do not add tip boxes to any of the instructions in this chapter.

2 Place **SmallTuberack_Microfuge** tube racks on **P12** and **P13** and name them **Tubes1** and **Tubes2**. Give these a **Nominal** volume of **1000** µL of **Serum** and choose **Sense the liquid every time a well is accessed "from the Liquid."** Sensing the liquid level **from the Liquid** helps pipetting performance since air will not be likely to be aspirated along with the liquid. See the **Biomek i-Series Concept** below.

3 Place a **BCFlat96** on **P17** and name it **Dest.** Give this microplate a **Known** volume of **0** µL.

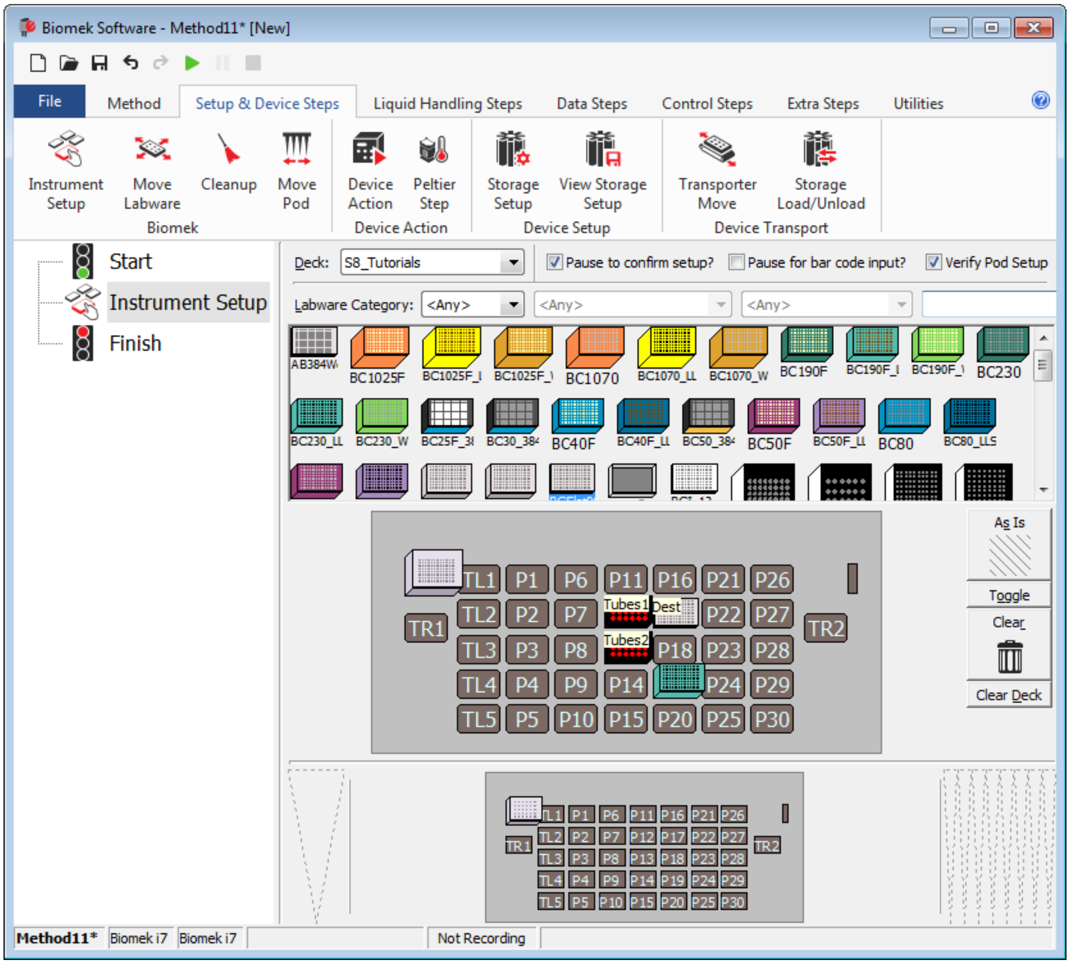
Biomek i-Series Concept

Liquid level sensing is used to determine the liquid level within a piece of labware using specially designed LLS tips. Refer to the *Biomek i-Series Hardware Reference Manual* (PN B56358), *Liquid Level Sensing*, for more information.

Appearance of the Deck for this Tutorial

Your deck setup should look like Figure 7.1. Now go to the next activity to learn how to use other steps in your methods.

Figure 7.1 Completed Instrument Setup Step



Deck: S8_Tutorials ☑ Pause to confirm setup? ☐ Pause for bar code input? ☑ Verify Pod Setup

Labware Category: <Any> <Any> <Any>

Transferring Liquid from Multiple Sources to a Single Destination

To transfer liquid from one or more sources to a single destination, a **Combine** step is used. It is similar to a **Transfer** step, which uses a single source and one or more destinations.

IMPORTANT ***If Using Fixed Tips...***
You won’t configure the **Combine** step to load or unload tips.

Like the **Transfer** step, the **Combine** step will, by default, complete the following:

- load tips
- aspirate liquid
- dispense liquid
- unload tips

For this activity, you will use the default tip handling, configure the two sources, configure the destination, and configure transfer details to perform a tube-to-plate transfer and pool samples into the first column of 96-well plate.

Configuring Tip Handling

To set up the **Combine** step, you will insert the **Combine** step in the Method View and configure the step.

To do this:

---

1 Ensure your deck is configured according to the instructions in *Setting Up Your Deck for Using More Steps in a Method*.

---

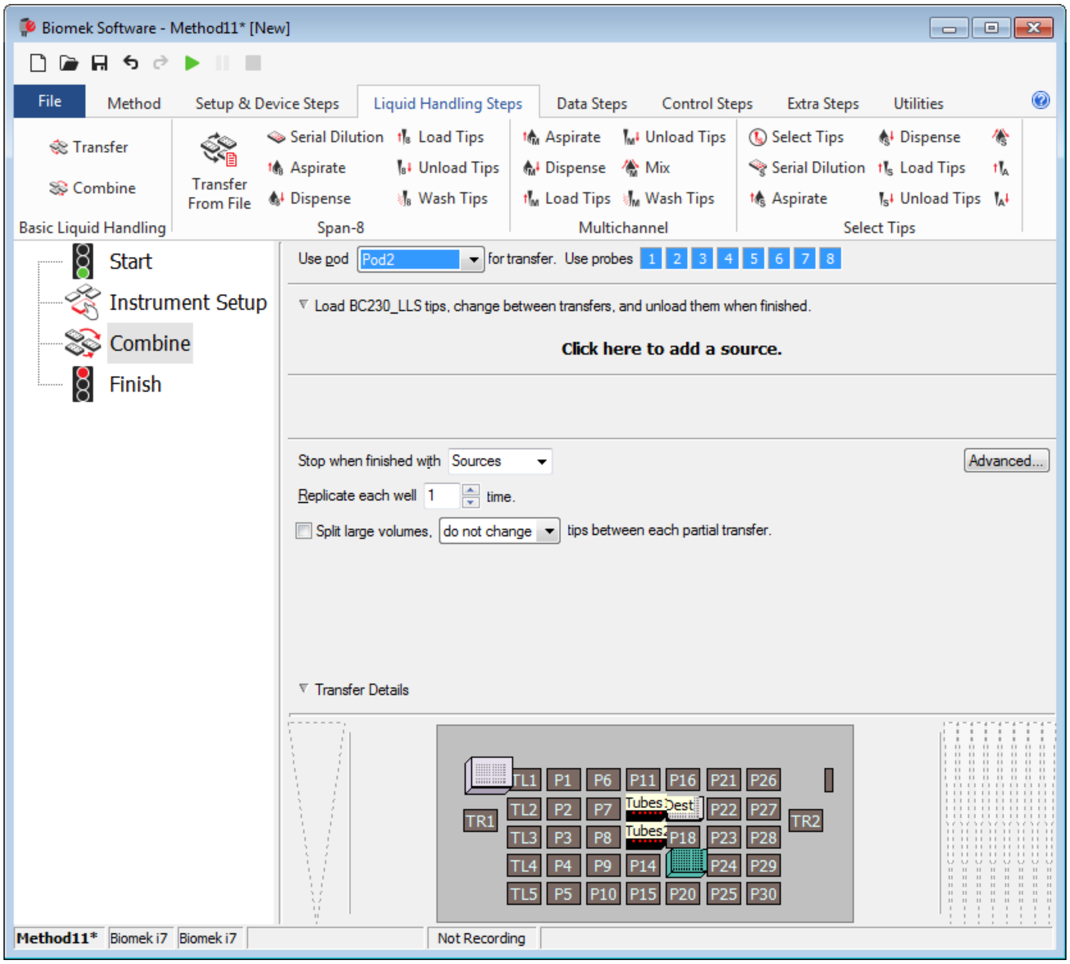
2 From the **Liquid Handling Steps** tab, in the **Basic Liquid Handling** group, select the Combine (**Combine**) step. This adds a **Combine** step after the **Instrument Setup** step.

---

3 Make sure the Span-8 pod and all eight probes are chosen for use. See Figure 7.2.

4 Collapse the **Tip Handling** since you will use the default settings for your liquid transfer. Make sure **Load BC230_LLS tips, change between transfers, and unload them when finished** is displayed. Your main editor should look like Figure 7.2.

Figure 7.2 Combine Step Inserted and Tip Handling Collapsed



Use pod Pod2 for transfer. Use probes 1 2 3 4 5 6 7 8

Load BC230_LLS tips, change between transfers, and unload them when finished.

Click here to add a source.

Stop when finished with Sources

Replicate each well 1 time.

☐ Split large volumes, do not change tips between each partial transfer.

Transfer Details

Configuring Source Labware

To configure the two small tube racks from which you're going to aspirate:

---

1 Click on **Click here to add a source** (Figure 7.2).

---

2 Click on **Tubes1** sitting on **P12**.

---

3 In the volume field, designate the amount of liquid to be aspirated. For this method, you're aspirating 20 µL, so type **20** into the field.

---

4 In the **Technique** drop-down, select the **S8 1000 Low** technique.

---

5 Click on the **Dest** plate in the Current Instrument Display to add a destination. You will configure the destination in the next section, but must choose it here to activate another source option.

---

6 Click on the next **Click here to add a source** (located above the **Destination: Dest** configuration).

---

7 Click on **Tubes2** sitting on **P13** and type **20** into the **Volume** field.

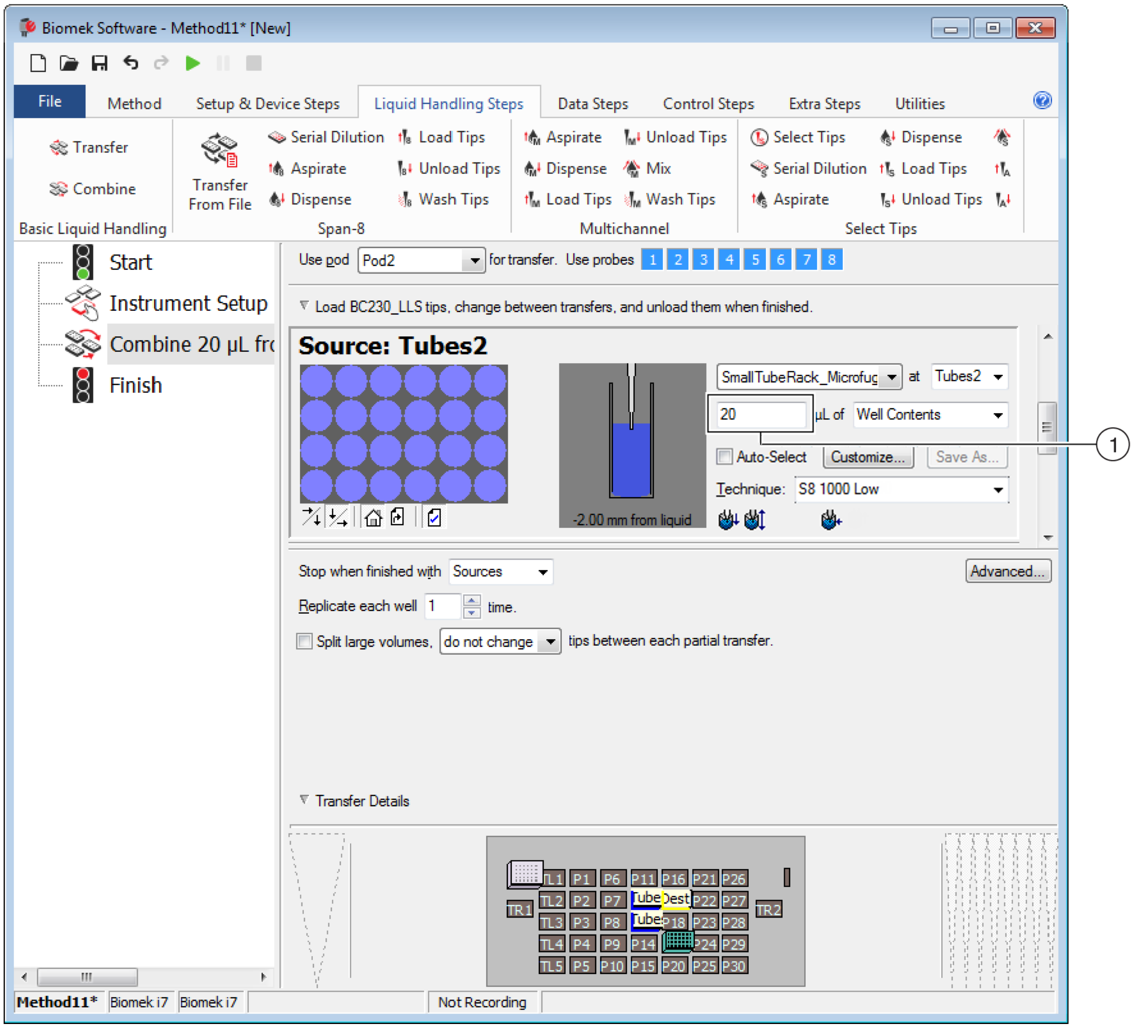
TIP The well volume display shows how much liquid is in the well. If the liquid is not visible in the display, you might be accidentally trying to aspirate from an empty destination rather than a source.

---

8 In the **Technique** drop-down, select the **S8 1000 Low** technique.

The sources are now configured, and the editor should look now look like Figure 7.3.

Figure 7.3 Source Labware for Combine Step Configured



Biomek Software - Method11* [New]

Start
Instrument Setup
Combine 20 µL fr
Finish

Use pod Pod2 for transfer. Use probes 1 2 3 4 5 6 7 8

Load BC230_LLS tips, change between transfers, and unload them when finished.

Source: Tubes2

SmallTubeRack_Microfug at Tubes2

20 µL of Well Contents

☐ Auto-Select

Technique: S8 1000 Low

-2.00 mm from liquid

Stop when finished with Sources

Replicate each well 1 time.

☐ Split large volumes, do not change tips between each partial transfer.

Transfer Details

Method11* Biomek i7 Biomek i7 Not Recording

1. **Well Volume Display**. Pipetting height needs to be “**from the liquid**” to perform Liquid Level Sensing.

Configuring Destination Labware

The next task is to designate where you want to dispense the aspirated liquid. For this method, you want to dispense into the first column of the 96-well plate on deck position **P17**. To accomplish this:

1 If necessary, scroll down until you see **Destination: Dest**. Click anywhere in the **Destination: Dest** configuration.

2 Double click the **Destination** labware graphic in the step configuration.

---

3 Select only the wells in the first column.

---

4 Choose **Zoom Out**.

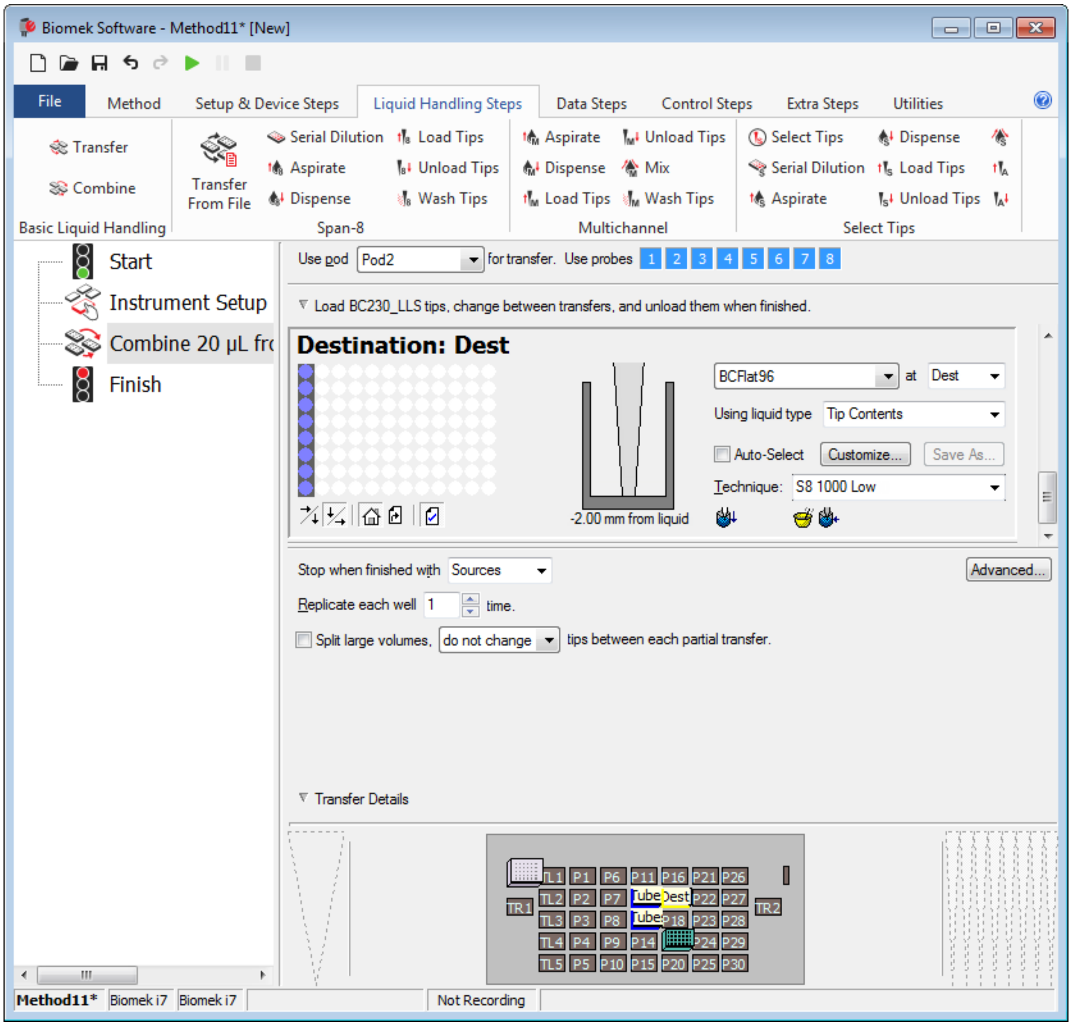
---

5 In the **Technique** drop-down, select the **S8 1000 Low** technique.

---

6 In **Stop when finished with**, make sure **Sources** is chosen (Figure 7.4).

Figure 7.4 Stop When Finished With Sources Chosen



Use pod Pod2 for transfer. Use probes 1 2 3 4 5 6 7 8

Load BC230_LLS tips, change between transfers, and unload them when finished.

Destination: Dest

BCFlat96 at Dest

Using liquid type Tip Contents

☐ Auto-Select

Technique: S8 1000 Low

-2.00 mm from liquid

Stop when finished with Sources

Replicate each well 1 time.

☐ Split large volumes, do not change tips between each partial transfer.

---

7 Save the method with a unique name.

That’s it. You’ve just configured a **Combine** step to aspirate liquid from two sources in order to dispense it to a single destination. Go to the next activity to learn how to mix the liquid in the destination plate after dispensing.

Mixing Contents in Labware

In the **Transfer** and **Combine** steps, you can alter liquid-handling functions that extend beyond simple aspirating and dispensing. For example, you can turn off tip touch, activate the pre-wet function, or configure mixing operations. These modifications are accomplished through customizing the technique and are used to control the pipetting process.

Biomek i-Series Concept

Techniques are sets of predefined and stored values, including aspirate and dispense height, tip touch and other properties that affect pipetting. Based upon these stored sets of values and properties, the appropriate pipetting technique is selected automatically. If you want control over this otherwise automatic function, you can choose **Customize** for each source and destination in a liquid transfer. This customizing option is also available via the **Technique Editor**. Refer to the *Biomek i-Series Software Reference Manual* (PN B56358), *Understanding and Creating Techniques*.

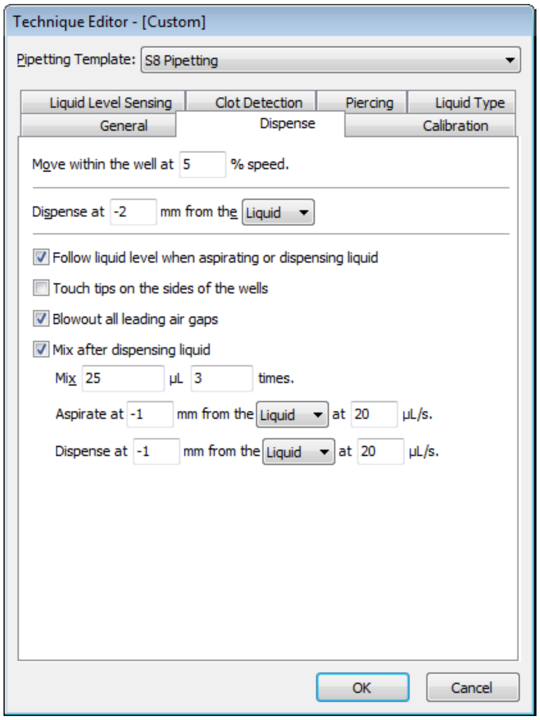
Let’s suppose you wish to mix the contents of the destination plate a specified amount of times once liquid from the two sources has been dispensed.

To complete this task:

1 Click anywhere in the **Destination: Dest** configuration.

2 In the **Destination** configuration fields, select **Customize**. The **Technique Editor** opens to the **Dispense** tab (Figure 7.5).

Figure 7.5 Dispense Tab of the Technique Editor



Technique Editor - [Custom]

Pipetting Template: S8 Pipetting

Move within the well at 5 % speed.

Dispense at -2 mm from the Liquid

☑ Follow liquid level when aspirating or dispensing liquid

☐ Touch tips on the sides of the wells

☑ Blowout all leading air gaps

☑ Mix after dispensing liquid

Mix 25 µL 3 times.

Aspirate at -1 mm from the Liquid at 20 µL/s.

Dispense at -1 mm from the Liquid at 20 µL/s.

Configuring “Mix after dispensing liquid”

Now, you will configure the options to mix the contents in the destination after dispensing.

To configure mixing:

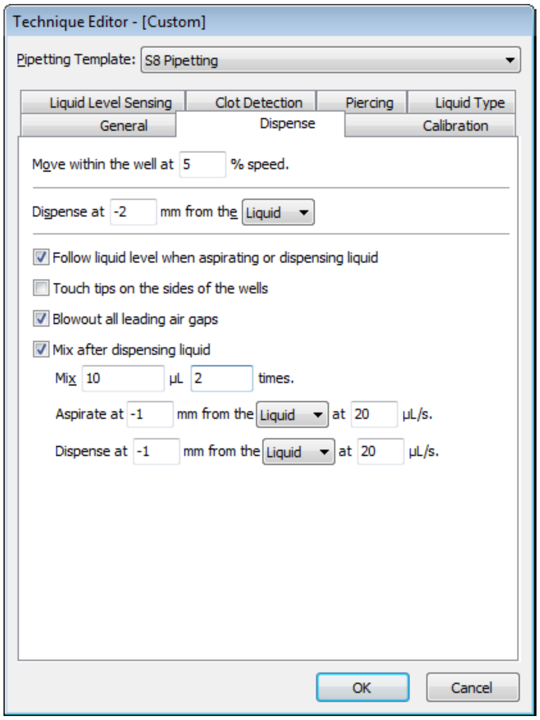
1 On the **Dispense** tab (Figure 7.5), we’ll allow some of the defaults to remain except for the amount and number of times to mix. In **Mix**, change the current entry to **10**. This specifies the amount of microliters that will be aspirated and dispensed during mixing.

2 In **times**, change the current entry to **2**. This specifies the number of times you want to mix the liquid after dispensing.

You're finished configuring the mix after dispensing process. The **Technique Editor** should now look similar to Figure 7.6.

IMPORTANT Pipetting **from the Bottom** can sometimes cause wells to overflow, or it can contaminate the tips. For best results, mixing in a bottom-to-top pattern is optimal; for example, you should aspirate at **1 mm from the Bottom**, and dispense at **0 mm from the Liquid**. The idea is to not stay at a static height for mixing procedures. This is a concern for this tutorial only if you are running on hardware; if so, change the configuration to **Aspirate at 2 mm from the bottom** and **Dispense at 0 mm from the liquid**.

Figure 7.6 Configured Mix in a Custom Technique



Technique Editor - [Custom]

Pipetting Template: S8 Pipetting

Move within the well at 5 % speed.

Dispense at -2 mm from the Liquid

☑ Follow liquid level when aspirating or dispensing liquid

☐ Touch tips on the sides of the wells

☑ Blowout all leading air gaps

☑ Mix after dispensing liquid

Mix 10 µL 2 times.

Aspirate at -1 mm from the Liquid at 20 µL/s.

Dispense at -1 mm from the Liquid at 20 µL/s.

---

3 Choose **OK**.

The icon indicates that the technique includes mixing. This is one of several icons that indicate the different procedures in the pipetting technique. You will also notice that your technique now says **[Custom]**. A technique should be saved if you customized it using the **Customize** button. To save the technique, click the **Save As** button, located above the **Technique** drop-down; enter a name for the new technique, and then select **OK**. This will allow you to use the technique again in subsequent steps or other methods within the project.

TIP It is recommended to click the **Save As** button and give the new customized technique an unique name.

Moving Labware Around the Deck

When you insert and configure a **Move Labware** step in your method, the instrument behaves as follows:

- The pod moves adjacent to the selected labware, and then the gripper moves down.
- The gripper fingers slide around the labware and then clasp it, securing its grip.
- The gripper moves up and carries the labware to the designated position.
- The gripper moves down, and the gripper fingers release the labware at the new position.

NOTE For information on required clearance when moving labware, see the *Biomek i-Series Software Reference Manual* (PN B56358), *Understanding Labware Adjacency Rules*.

Moving Labware Using the Gripper

For this part of the tutorial, let's suppose that you wish to move a plate to another part of the deck to make room add a different plate.

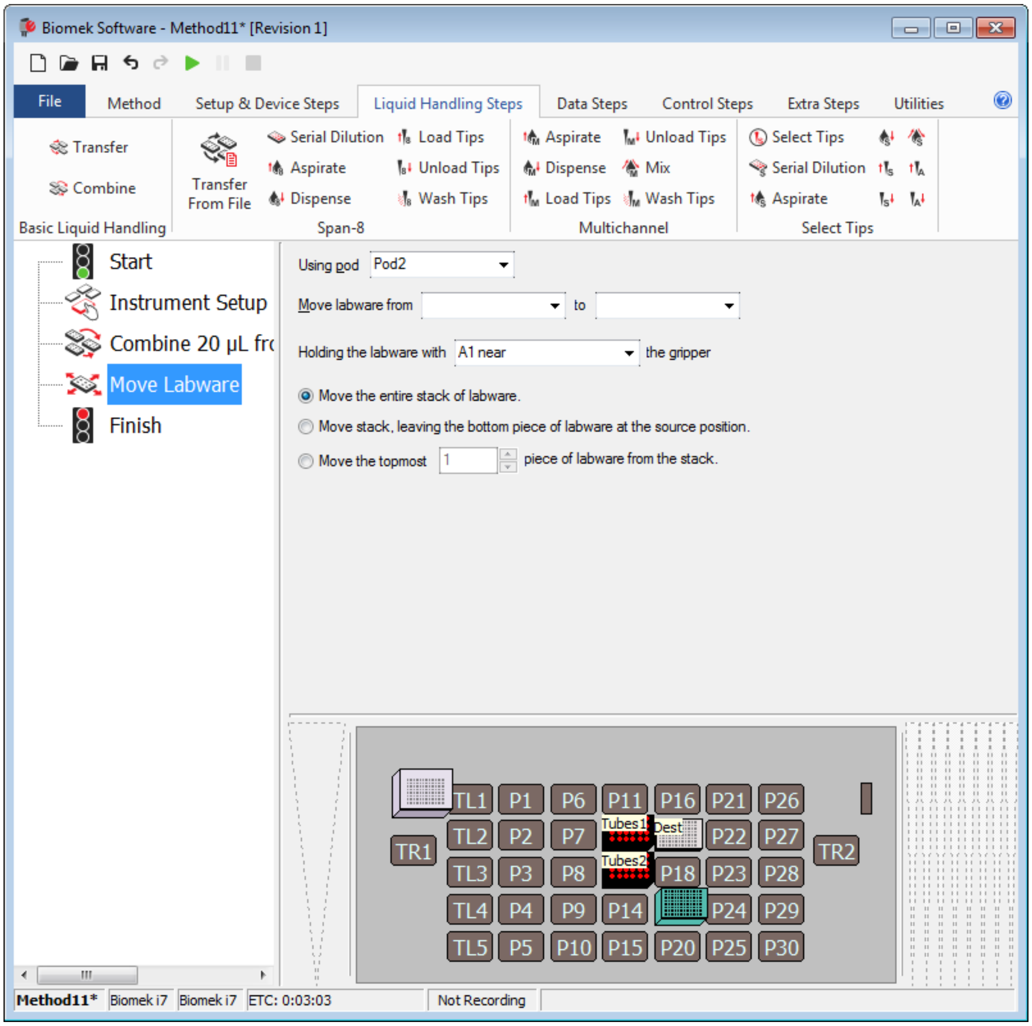
To move labware on the deck:

---

1 Highlight the **Combine** step in the Method View.

2 On the **Setup & Devices Steps** tab, in the **Biomek** group, select the Move Labware (**Move Labware**) step to insert it into the Method View after the **Combine** step. The **Move Labware** configuration appears (Figure 7.7).

Figure 7.7 Move Labware Step Configuration


Biomek Software - Method11* [Revision 1]

- Start
- Instrument Setup
- Combine 20 µL frc
- Move Labware
- Finish

Using pod: Pod2

Move labware from ▾ to ▾

Holding the labware with: A1 near the gripper

● Move the entire stack of labware.

○ Move stack, leaving the bottom piece of labware at the source position.

○ Move the topmost 1 piece of labware from the stack.

Method11* | Biomek i7 | Biomek i7 | ETC: 0:03:03 | Not Recording

---

3 If necessary, in **Using pod**, select the Span-8 pod from the drop-down.

---

4 Choose **P17** to populate the **Move labware from** field.

---

5 Choose **P18** to populate the **to** field.

---

6 In **Holding the labware with**, keep **A1 near** selected.

NOTE Depending on where the labware is located on the deck, this option to choose this configuration may not be available.

---

7 Keep **Move the entire stack of labware** selected.

---

8 Now, click on the **Finish** step in the Method View following the **Move Labware** step to validate the method.

Adding Labware During a Method Run

Now you are ready to add labware to the deck for another liquid transfer process. Suppose that you want to add another reagent to the destination plate, but you don't want to place the second reagent on the deck until after the first **Transfer** is complete (perhaps it can only be exposed to light or open air for a very short time). This means that you will add a second **Instrument Setup** step to your method to indicate to the software that there is more labware now on the deck.

But before you add a second **Instrument Setup** step, you will:

- Move the pod to a new location by configuring a **Move Pod** step to make sure the pod is moved to a part of the deck where it won't prevent you from physically adding more labware.
- Pause the system by configuring a **Pause** step to give you enough time to physically add more labware.

Moving the Pod to a New Location

The **Move Pod** step repositions the pod away from the positions on the deck you want to reach manually. Since you are going to be adding more labware to the deck to prepare for another liquid transfer, you will need to move the pod away from the deck locations affected before pausing the system and adding more labware.

Configuring the Move Pod Step

To configure the **Move Pod** step:

---

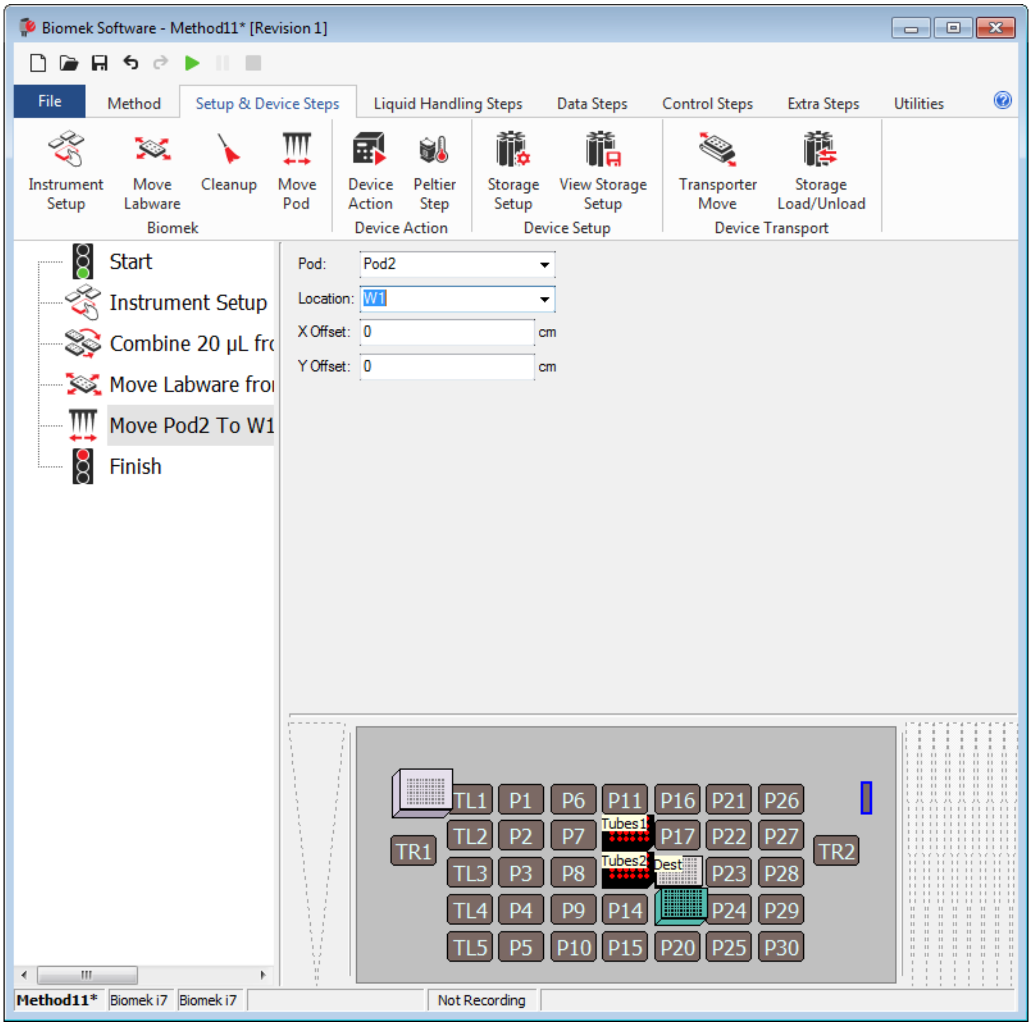
1 Select the **Move Labware** step in the Method View.

2 From the **Setup & Devices Steps** tab, in the **Biomek** group, select the Move Pod (**Move Pod**) step to insert it after the **Move Labware** step (Figure 7.8).

3 If necessary, in **Pod**, select the Span-8 pod from the drop-down.

4 From the **Location** drop-down, choose **W1**. This instructs the pod to move and stop over the **W1** position (Figure 7.8).

Figure 7.8 Configured Move Pod Step



Pod: Pod2

Location: W1

X Offset: 0 cm

Y Offset: 0 cm

5 Click **Finish** to validate the method, and then save the method.

Pausing the Instrument

The instrument can be paused during a method run for either a specified amount of time or for an indefinite period of time by adding and configuring a Pause (**Pause**) step. Depending on the purpose of the pause, you can configure the step in one of the following ways:

- If you want to incubate a piece of labware in a specific position for a specific amount of time, you configure the desired time in seconds that you want that position to be idle and unavailable for interaction with the instrument.
- If you want to move labware manually during a method (either move it around on the deck, or remove it from the deck to take it to a device, such as a reader), you can configure the step to pause the system for an indefinite period of time.

When the **Pause** step occurs during a run, the pod remains in the position of the last operation.

Configuring the Pause Step

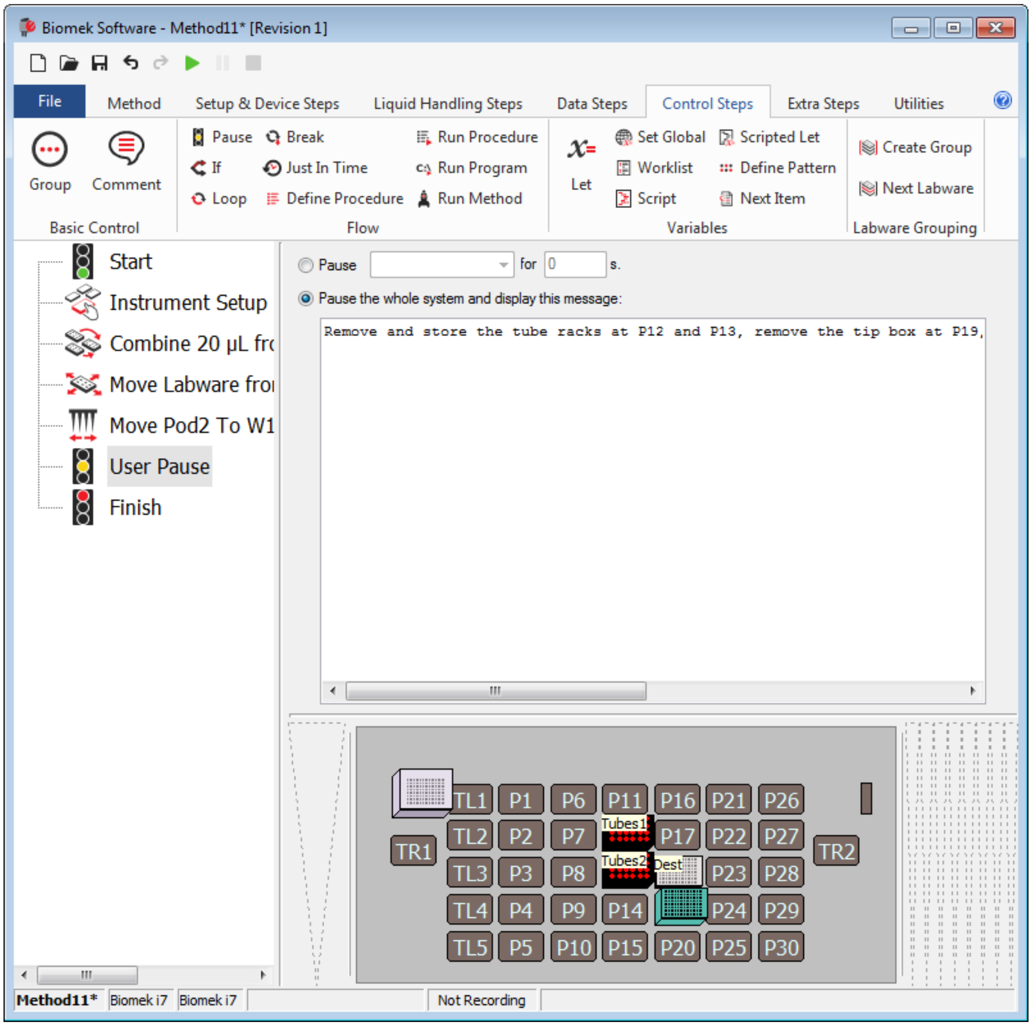
You will configure the **Pause** step for indefinite amount of time to add more labware to the deck manually. The software will display a message on top of the main editor until you complete your manual operations, at which time it will resume the method run.

To configure the **Pause** step for an indefinite amount of time:

1. Select the **Move Pod** step in the Method View.
2. From the **Control Steps** tab, in the **Flow** group, select the Pause (**Pause**) icon to insert it into the Method View.
3. Choose **Pause the whole system and display this message:**
4. Replace **Paused** in the message box by typing in the message: **Remove and store the tube racks at P12 and P13, remove the tip box at P19, and place a diluent reservoir at P17 and two new tip boxes at P14 and P19.**

The main editor should now look like Figure 7.9.

Figure 7.9 Pause Configuration With Message Inserted



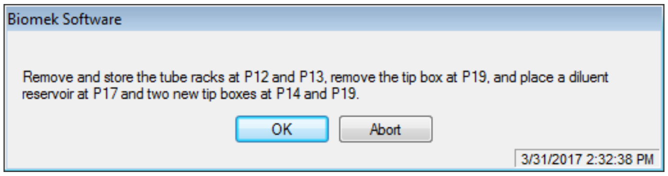
○ Pause for 0 s.

● Pause the whole system and display this message:

```
Remove and store the tube racks at P12 and P13, remove the tip box at P19,
```

When the method is run, you will see a prompt similar to Figure 7.10 that will remain displayed until you choose **OK.**

Figure 7.10 Pause Prompt Displaying the Configured Message



Remove and store the tube racks at P12 and P13, remove the tip box at P19, and place a diluent reservoir at P17 and two new tip boxes at P14 and P19.

Adding a Second Instrument Setup Step

Now that you have prepared to add more labware to the deck during a method, you are ready to configure a second **Instrument Setup** step. You will insert a second **Instrument Setup** step after the **Pause** step. The second **Instrument Setup** step not only indicates the current state of the deck, but it also allows you to add more labware. But before you will add more labware to the deck, you will remove some labware.

To configure the second **Instrument Setup** step:

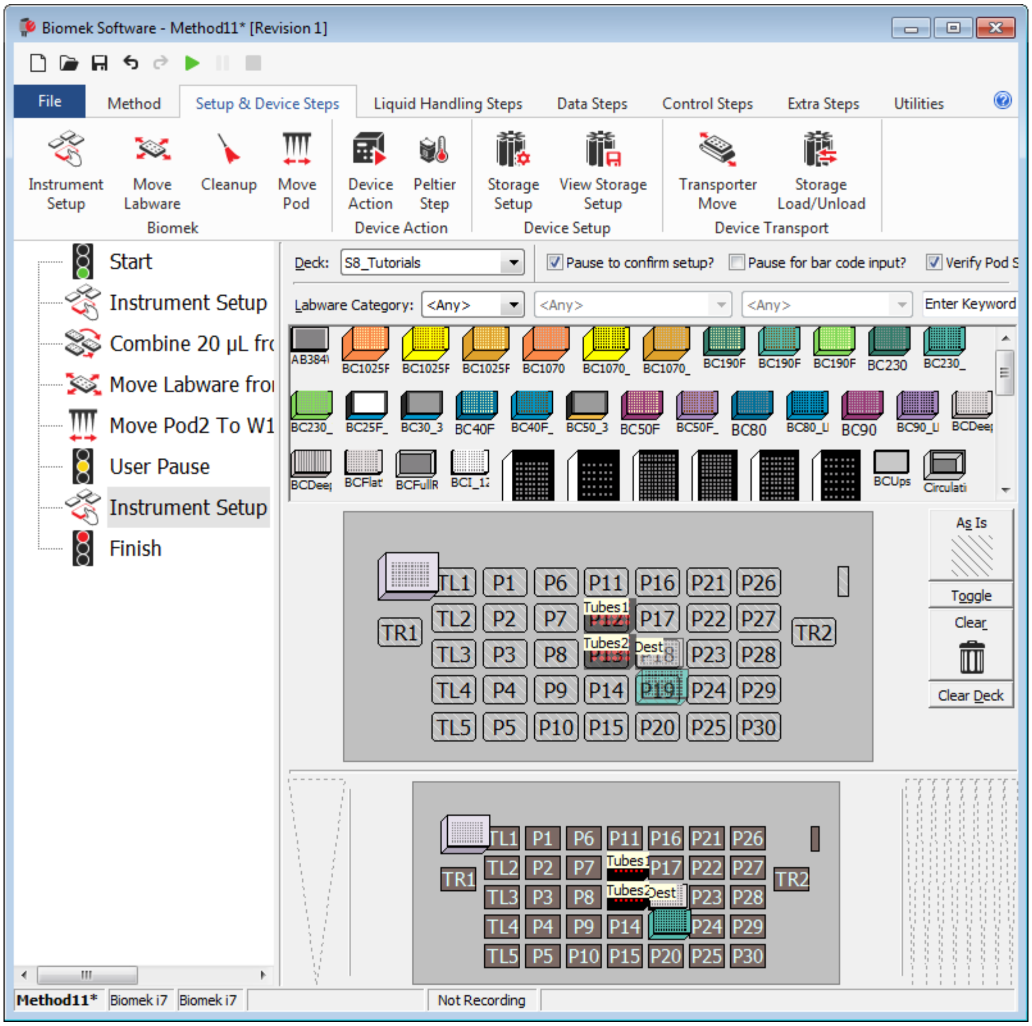
---

1 Insert an **Instrument Setup** step into the Method View below the **User Pause** step. This opens a second **Instrument Setup** step configuration.

---

2 Choose **Toggle** under the **As Is** square. This lets the software know that all deck positions are to remain as they are. The main editor should now look like Figure 7.11.

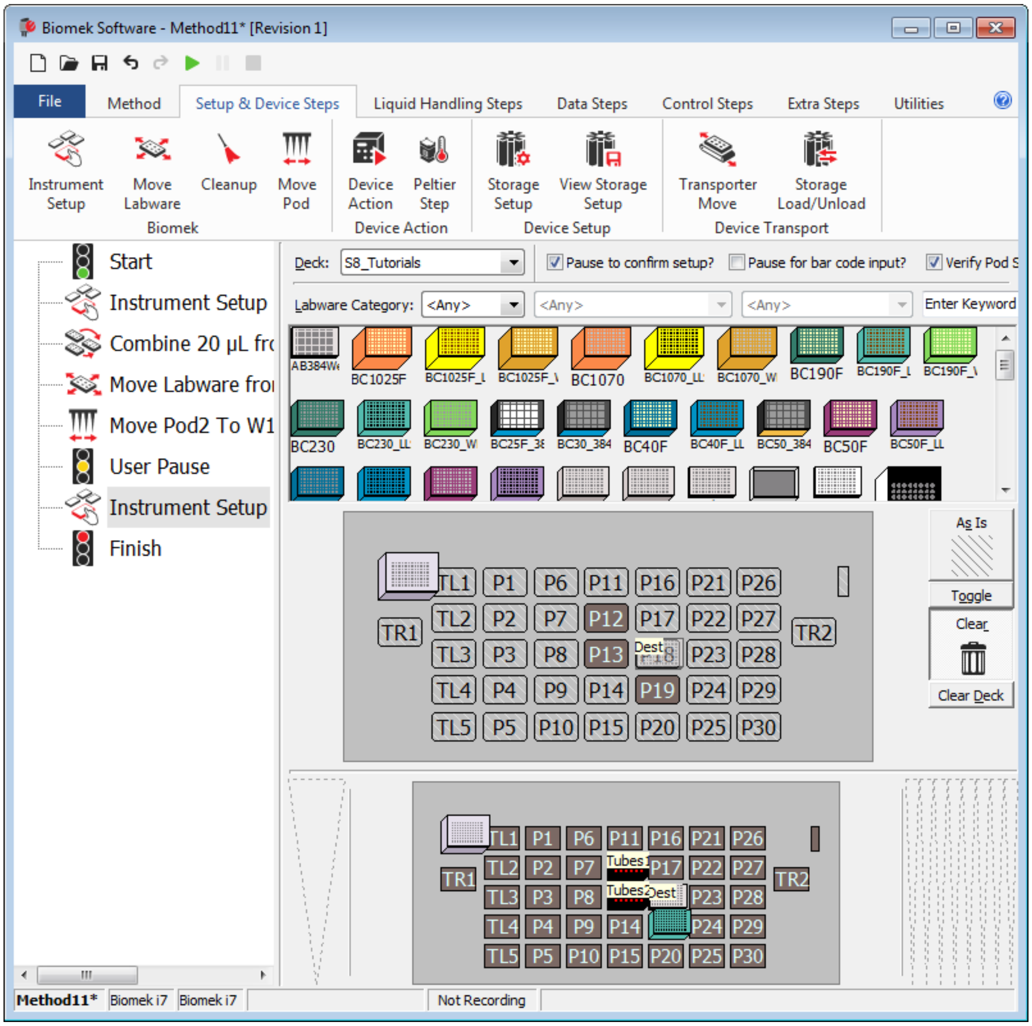
Figure 7.11 Adding an Instrument Setup Step and Toggling All Deck Positions As Is



Deck: S8_Tutorials
☑ Pause to confirm setup?
☐ Pause for bar code input?
☑ Verify Pod S
Labware Category: <Any>
<Any>
<Any>
Enter Keyword

3 Select **Clear** and then click on **P12**, **P13**, and **P19**. This removes the tube racks and used tip box. Now the main editor should look like Figure 7.12.

Figure 7.12 Using Clear to Remove Used Tip Box



Adding Labware to the Deck

Now you will add the labware to prepare for next liquid-handling process which is a **Serial Dilution**. For this next liquid-handling process, you will need to add two more tip boxes and an additional source reservoir. This new labware was what you configured to display when the instrument paused for manual placement.

1 Place a **Reservoir** on **P17** and name it **Diluent**. Configure the reservoir to have an **Unknown** volume of **Water.** Make sure **Sense the liquid level the first time a well with Unknown or Nominal volume is accessed "from the Liquid"** is selected.

IMPORTANT ***If Using Fixed Tips...***

You won't add tip boxes.

2 Place **BC230** tip boxes on positions **P14** and **P19**.

TIP Even though the software finds tips automatically, you have to ensure there are enough tips on the deck to do the job. If you don't, you will get an error message.

You might think that all the steps in the Method View make your method look complex. Go to the next section to learn what you can do about that.

Using a Group Step

To prevent your method from appearing too complex, you can group steps together logically under one unique heading by inserting the **Group** step into the Method View. This group of steps is hidden in the Method View under the name that you've given it during configuration of the **Group** step.

Biomek i-Series Concept	
	The **Group** step allows you to "nest" a series of connected steps together, and give the group a logical name that appears in your Method View. Then, when you open your method, the **Group** step appears collapsed with the connected steps hidden. This makes the method appear shorter, and it allows you to see more of the method without scrolling the Method View up or down. You simply double-click on the **Group** step in the Method View to expand it and expose the nested steps.

Configuring the Group Step

For this activity, you will group under one heading the **Move Pod**, **Pause**, and **Instrument Setup** steps you already have in your method. These steps are all associated with the preparation for the serial dilution.

To group these steps:

---

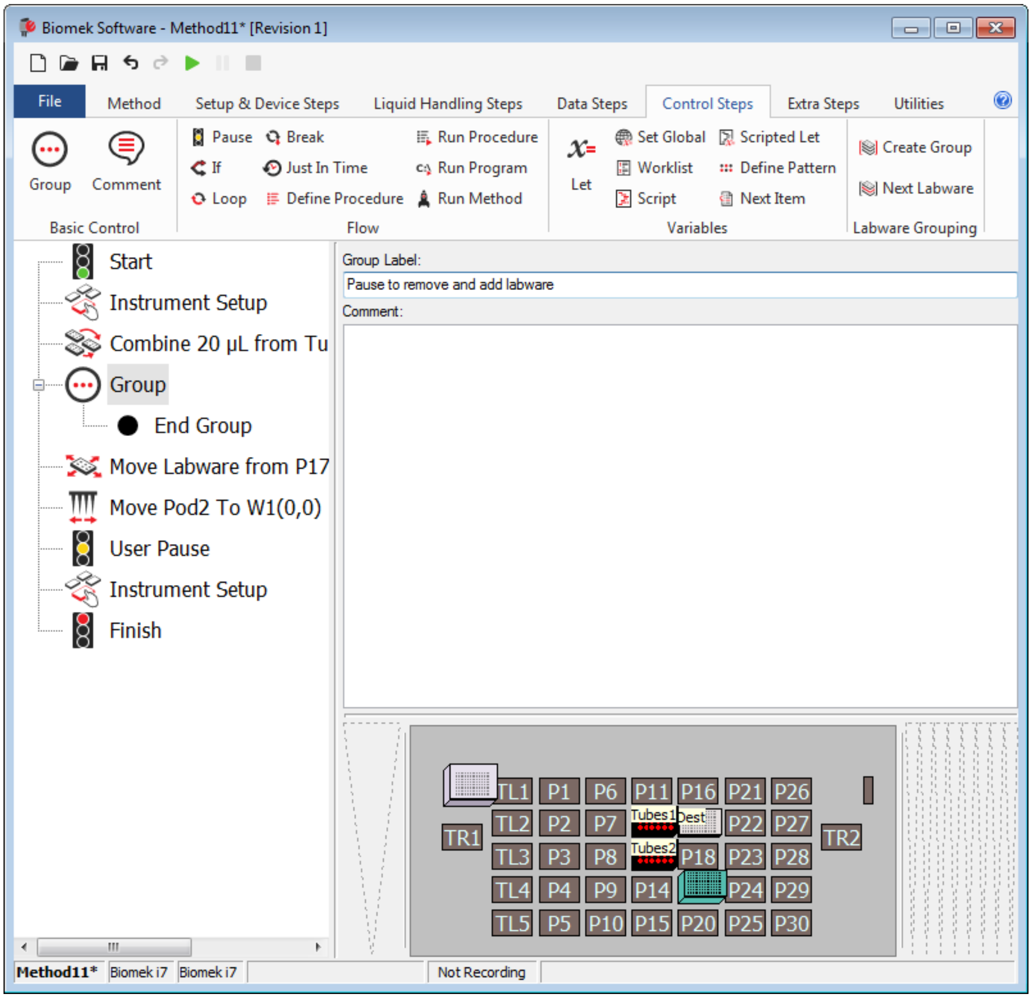
1 Select the **Combine** step in the Method View.

---

2 From the **Control Steps** tab, in the **Basic Control** group, select ⊙ Group (**Group**) step to insert it into the Method View after the **Combine** step.

3 In **Group Label** of the step configuration, enter **Pause to remove and add labware** (Figure 7.13).

Figure 7.13 Configured Group Step



Group Label:
Pause to remove and add labware

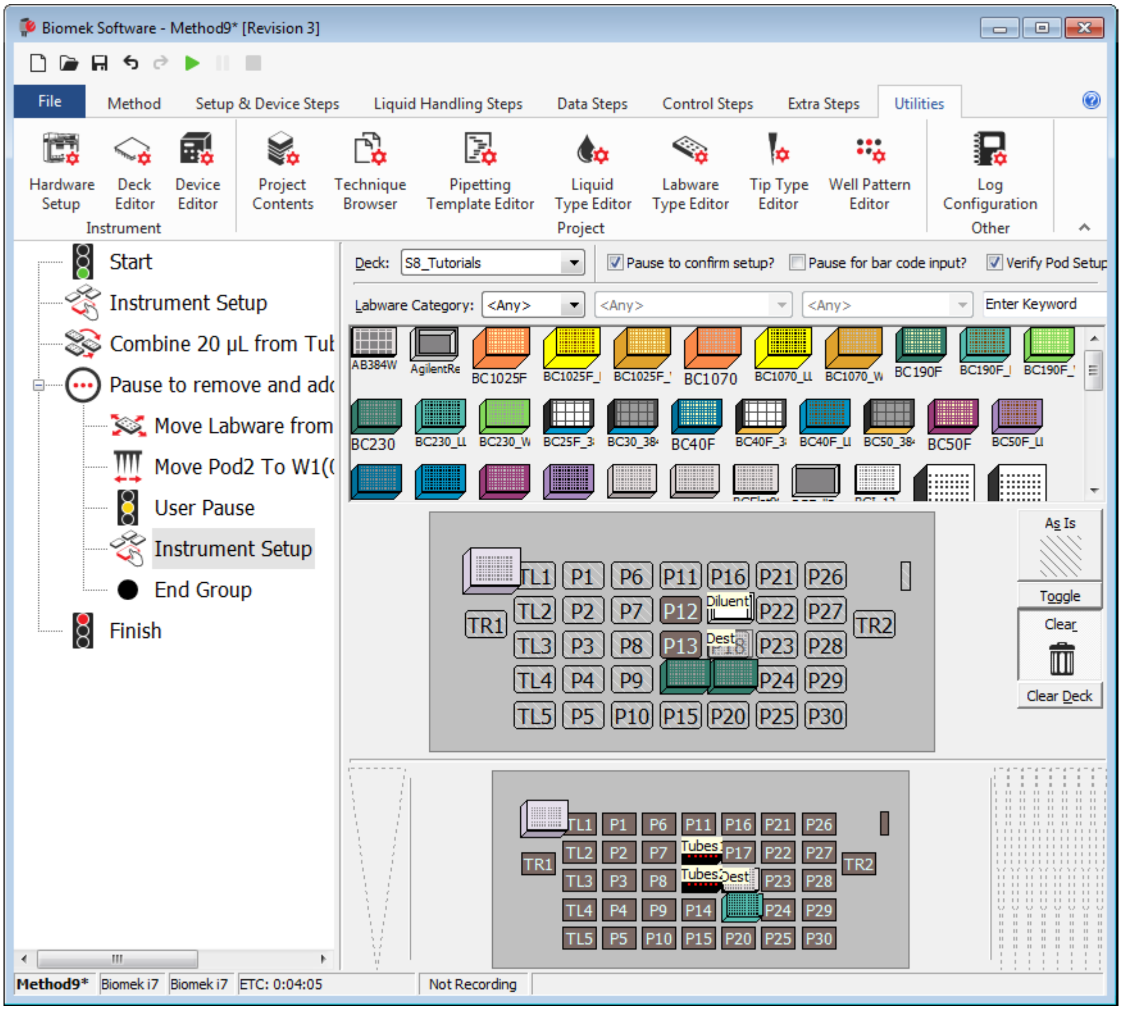
Comment:

4 Highlight the **Move Labware** step, and then drag and drop it into the **Group** step above **End Group**.

5 Repeat step 4 above for the **Move Pod**, **User Pause**, and then the second **Instrument Setup** step.

Now the **Move Labware, Move Pod**, **User Pause**, and second **Instrument Setup** steps are nested logically within a **Group** step (Figure 7.14). You can expand and collapse this step as desired by double clicking on the **Group** step title.

Figure 7.14 Configured Group Step with Nested Steps Expanded



TIP Like the **Group** step, the **Comment** step does not initiate any actions on the instrument. It is used to provide descriptive information and notes in the Method View for a method. Refer to the *Biomek i-Series Software Reference Manual* (PN B56358), *Comment Step*.

6 Click on the **Finish** step to validate the method.

7 Save the method.

Go to the next section to learn how to perform multiple dilutions of a sample on a single microplate.

Performing Multiple Dilutions of a Sample

The **Serial Dilution** step is used to perform multiple dilutions of a sample on a single microplate. This step transfers liquid from wells on a microplate to other wells on the same microplate and may also add diluent to those wells.

Biomek i-Series Concept

The **Serial Dilution** step completes multiple dilutions by performing the following actions in sequence:

1. Transfer a volume of diluent to all selected wells.
2. Transfer a volume of sample from the first selected well to the next selected well.
3. Mix the solution via the selected technique.
4. Transfer a volume of solutions to the next selected well.
5. Mix the solution via the **Technique Editor**.
6. Repeat transfer and mix operations until all selected wells are used.

This will then mix all the samples together as it dilutes across all the columns with samples.

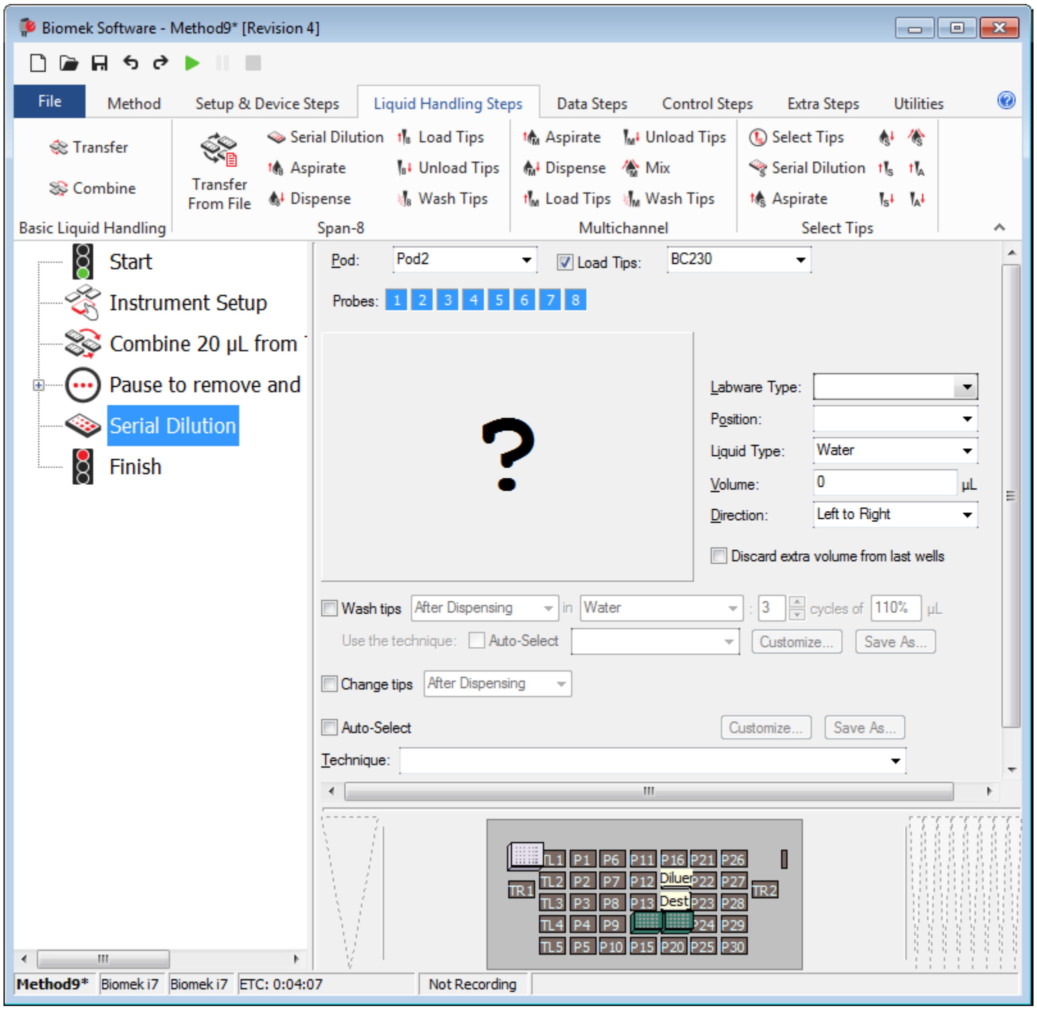
NOTE If using the first column only, you cannot then select the rows that are empty on the plate, as columns must be in sequence. For example, if you want to dilute one row of samples, click on the Destination plate and select columns 6 through 12; this will perform serial dilutions to samples in row 6.

For this next activity, we will use the sample in the first column in the microplate on **P18.**

1 Collapse the **Group** step in the Method View.

2 From the **Liquid Handling Steps** tab, in the **Span-8** group, select the Serial Dilution (**Span-8 Serial Dilution**) icon to insert it into the Method View (Figure 7.15).

Figure 7.15 Serial Dilution Step Inserted



Biomek Software - Method9* [Revision 4]

Start
Instrument Setup
Combine 20 µL from
Pause to remove and
Serial Dilution
Finish

Pod: Pod2
☑ Load Tips: BC230
Probes: 1 2 3 4 5 6 7 8

Labware Type:
Position:
Liquid Type: Water
Volume: 0 µL
Direction: Left to Right
☐ Discard extra volume from last wells

☐ Wash tips After Dispensing in Water 3 cycles of 110% µL
Use the technique: ☐ Auto-Select
☐ Change tips After Dispensing
☐ Auto-Select
Technique:

Method9* | Biomek i7 | Biomek i7 | ETC: 0:04:07 | Not Recording

3 Make sure the Span-8 pod and all **Probes** are used.

4 In **Load Tips**, choose **BC230**.

5 Click on the **Dest** plate on **P18**.

6 In **Volume**, enter **50**. This is how much liquid is aspirated from one well to the next.

7 In **Direction**, make sure **Left to Right** is selected since you will be diluting across the columns of the plate.

TIP With the **Serial Dilution** step, contiguous wells must be used. In **Direction**, **Left to Right** is faster.

8 Check **Discard extra volume from last wells** and **Change tips after dispensing**.

9 Make sure tip washing options are ***not*** selected.

10 In the **Technique** drop-down, select the **S8 1000 Medium** technique.

11 Select **Diluent Properties** to expand.

12 Check **Add diluent before transfer**.

13 Select the **Diluent** reservoir at **P17**. This means the diluent is added to all wells before the sample transfers.

14 Configure the **Dilution Ratio** to 1:2 by entering **2** in the field. The dilution ratio is a ratio of volume of sample to total solution, so a dilution ratio of 1:2 means that for every µL of sample there is 1 µL of diluent added, or a 50% dilution.

15 Make sure tip washing options and **Change tips between diluent transfers** are ***not*** checked.

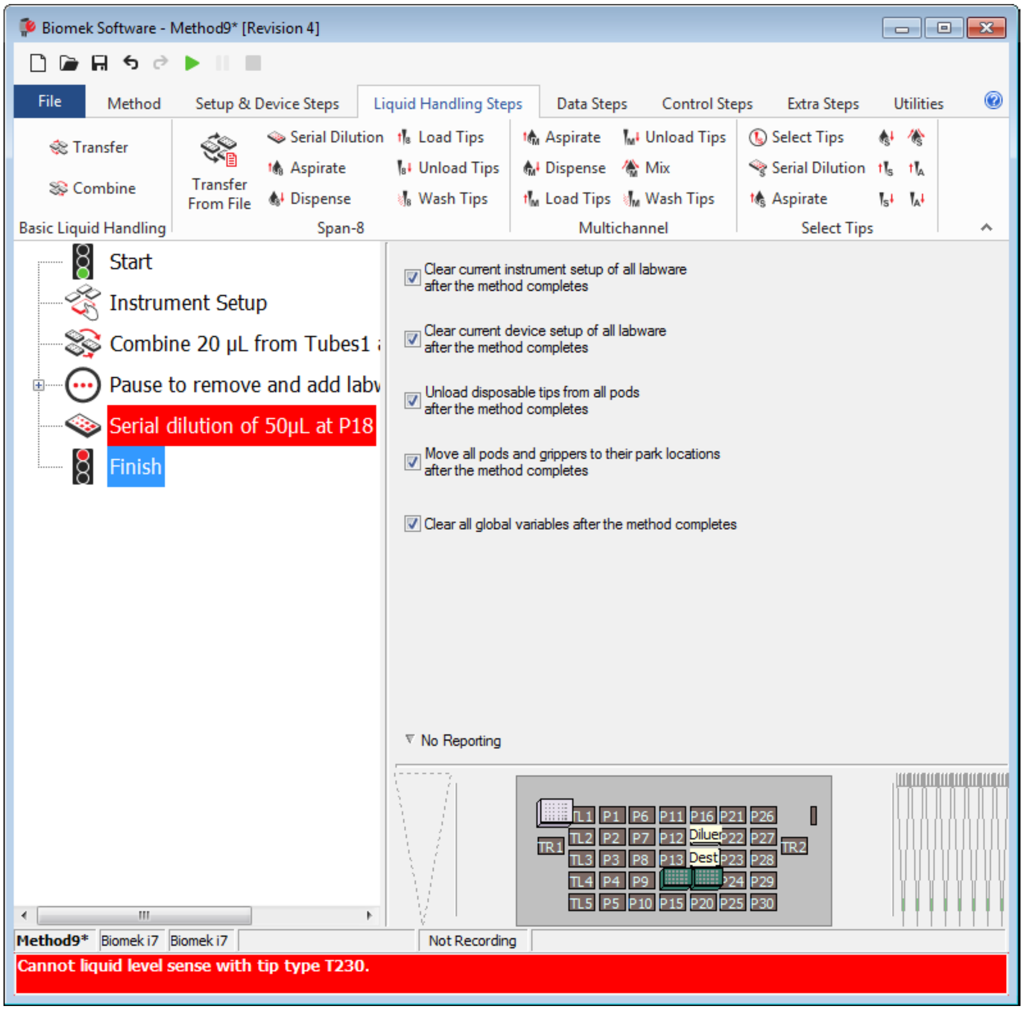
16 In the **Technique** drop-down, select the **S8 1000 Medium** technique.

17 Highlight the **Finish** step to validate the method. OOPS!!! All the red indicates an error (Figure 7.16). Go to the next section to learn how to correct this error.

IMPORTANT ***If Using Fixed Tips...***

You won't have an error. But read through the next section to learn about responding to error messages.

Figure 7.16 Error Displayed



☑ Clear current instrument setup of all labware after the method completes

☑ Clear current device setup of all labware after the method completes

☑ Unload disposable tips from all pods after the method completes

☑ Move all pods and grippers to their park locations after the method completes

☑ Clear all global variables after the method completes

Cannot liquid level sense with tip type T230.

Responding to an Error Message

For this activity, you'll learn how to locate and respond to the error message you just received.

Locating the Error

Biomek Software alerts you to errors in several ways, including:

- The step with the error appears in red in the Method View when any step following the error is highlighted.
- A tool tip describes the error when you hover the cursor over the step causing the error.
- An associated red error message is displayed in the Status Bar at the bottom of the editor.
- The error is displayed in an Error Bar just above the Status Bar.

There are other errors that state the problem, which is displayed in an error message box. Refer to the *Biomek i-Series Software Reference Manual* (PN B56358), *Handling and Preventing Errors*, for more information on errors.

Correcting the Error

In this tutorial, the error message is **Cannot liquid level sense with tip type T230**. If you recall, you used **BC230** tips in the second **Instrument Setup** step rather than the **BC230_LLS** tips you used in the first **Instrument Setup** step. Since you have configured **Labware Properties** for the **Diluent** reservoir to sense the liquid level and you have not used LLS capable tips, an error is produced.

To correct the error:

1 Expand the **Group** step and highlight the second **Instrument Setup** step.

2 Drag and drop the tip boxes on **P14** and **P19** to the Clear (**Clear**) icon.

3 Place **BC230_LLS** tip boxes on positions **P14** and **P19**.

4 Highlight the **Serial Dilution** step in the Method View.

5 In the **Load Tips**, change the tip type to **BC230_LLS**.

6 Click the **Finish** step again in the Method View.

7 Save the method with a unique name, and then run it in Simulation Mode. Notice how the first column should not get diluent in the serial dilution step.

There, the error has been corrected.

Biomek Software continually validates the steps as you progress through building your methods. When you highlight any step, the steps above that point in the method will be validated. If an error is encountered, the step causing the error will be highlighted in red.

Go to the next chapter to learn how to use individual steps to more precisely control a liquid transfer.

CHAPTER 8

Span-8 Pod — Using Individual Steps to Transfer Liquid and Handle Labware

Introduction to Using Individual Steps

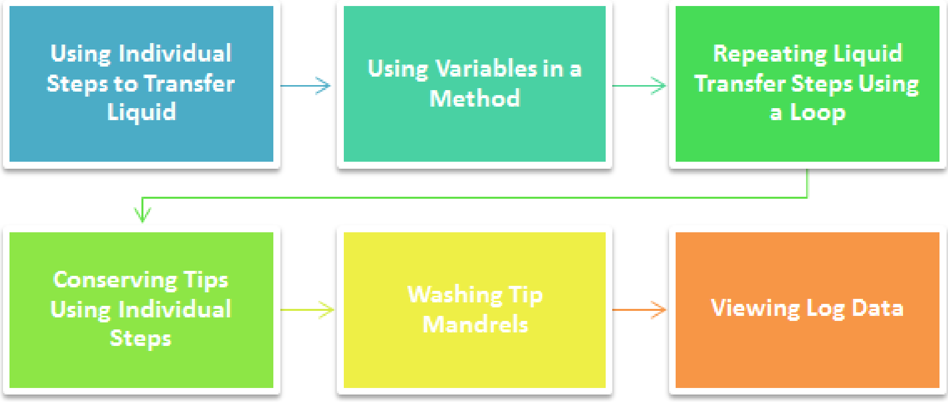
In the previous Span-8 chapters of this tutorial you learned how to:

- Launch Biomek Software and build, run, and save a simple transfer method.
- Transfer liquid from two sources to a single destination.
- Mix contents in labware.
- Remove and add more labware to the deck once a method has started to run.
- Group steps logically in the Method View.
- Use the automatic serial dilution feature.

IMPORTANT Do not change the **Hardware Setup** for these tutorials. Instead, modify the tutorials to fit your current **Hardware Setup**. The method in this chapter uses disposable tips; if your instrument is configured with fixed tips, change the method as instructed in the corresponding **IMPORTANT** text. For additional information, refer to the *Biomek i-Series Hardware Reference Manual* (PN B54474).

What You'll Learn in This Chapter

This chapter will help you enhance your method-building skills to create more advanced methods using variables, expressions, and loops to repeat tasks. You will also learn how to conserve and wash tips and view a log file. The process for creating the method in this chapter is presented below. All of these topics are covered in detail in this chapter.



Setting Up Your Deck for Using Individual Steps

Launch Biomek Software, create a new method, and using an **Instrument Setup** step, configure the following:

---

1 Place an **BC230_LLS** tip box on **P14**.

IMPORTANT ***If Using Fixed Tips…***

Do not add tip boxes to any of the instructions in this chapter.

---

2 Place a **Reservoir** on **P13**. Name it **Source** and configure it to contain an **Unknown** volume.

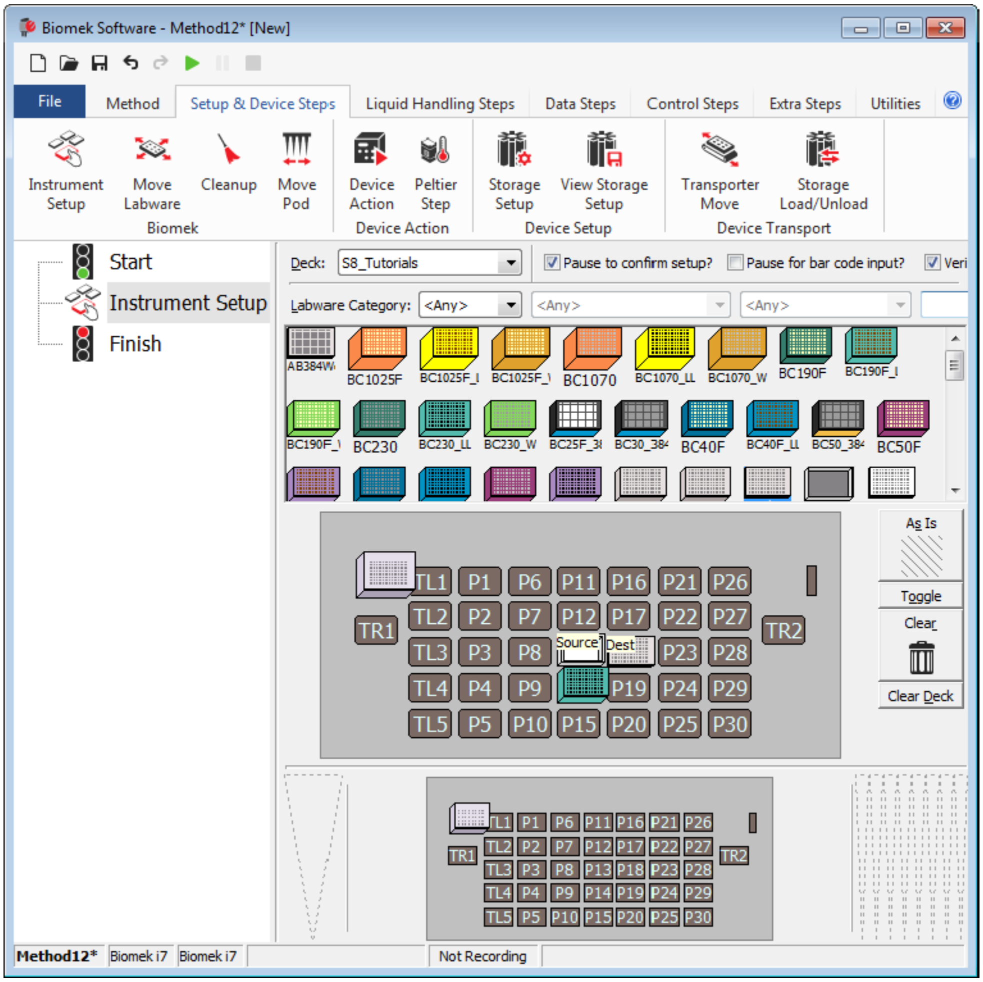
---

3 Place a **BCFlat96** microplate on **P18.** Name it **Dest** and configure it to contain a **Known** volume of **0** µL.

---

4 Your deck should look like Figure 8.1. Now go to the next activity to learn how to use individual steps to transfer liquid in a method.

Figure 8.1 Initial Instrument Setup for Using Individual Steps



Using Individual Steps to Transfer Liquid

In previous chapters, when you wanted to transfer liquid from one plate to another, you used the **Transfer** and **Combine** steps to perform all the necessary actions — loading tips, aspirating and dispensing liquid, and unloading tips. Sometimes, however, you want more direct control over these actions; for example, precise control over the order in which samples are transferred or when tips are loaded, unloaded, and washed.

When you need more control over the liquid transfer operation than the **Transfer** and **Combine** steps provide, you can configure liquid transfers using individual steps. Unlike the **Transfer** and **Combine** steps, these individual steps each perform only one task (i.e., aspirate, dispense, load tips, wash tips, or unload tips).

In this section, you will use the **Span-8 Aspirate** and **Span-8 Dispense** steps to transfer liquid from the **Reservoir** source to the **BCFlat96** destination plate.

Aspirating Liquid Using the Span-8 Aspirate Step

You can use the **Span-8 Aspirate** step to aspirate liquid from a microplate or reservoir.

To aspirate liquid from the reservoir using the **Span-8 Aspirate** step:

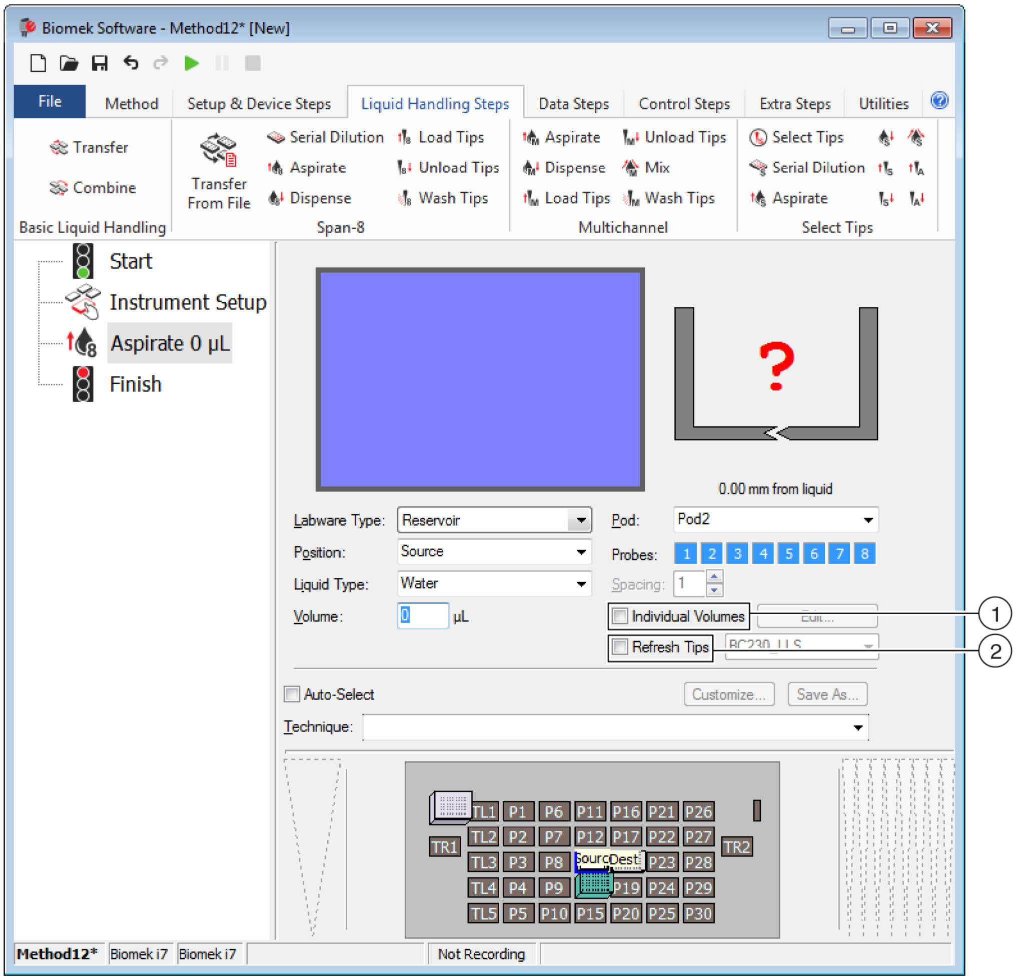
1. Ensure you configured the deck according to the instructions in *Setting Up Your Deck for Using Individual Steps*.

2. Select the **Instrument Setup** step in the Method View.

3. From the **Liquid Handling Steps** tab, in the **Span-8** group, select the Aspirate (**Span-8 Aspirate**) icon to insert it in the Method View.

4 In the Current Instrument Display, click on **Source** to select it as the labware from which to aspirate. Figure 8.2 appears.

Figure 8.2 Source Chosen for Span-8 Aspirate Step



Start
Instrument Setup
Aspirate 0 µL
Finish

0.00 mm from liquid

Labware Type: Reservoir
Position: Source
Liquid Type: Water
Volume: 0 µL
Pod: Pod2
Probes: 1 2 3 4 5 6 7 8
Spacing: 1
☐ Individual Volumes
☐ Refresh Tips
BC230_LLS
☐ Auto-Select
Technique:

Method12* | Biomek i7 | Biomek i7 | Not Recording

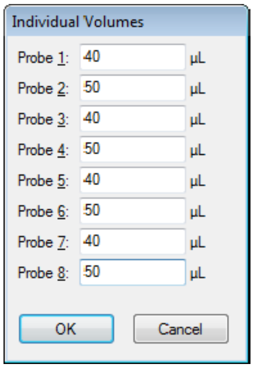
1. Individual Volumes
2. Refresh Tips

5 Check **Individual Volumes** and select **Edit** (Figure 8.2). **Individual Volumes** appears.

---

6 In **Individual Volumes**, alternate the volume aspirated by each probe between **40** and **50** to configure the volumes like Figure 8.3.

Figure 8.3 Individual Volumes Configured for Span-8 Aspirate Step



Individual Volumes

Probe 1: 40 µL
Probe 2: 50 µL
Probe 3: 40 µL
Probe 4: 50 µL
Probe 5: 40 µL
Probe 6: 50 µL
Probe 7: 40 µL
Probe 8: 50 µL

---

7 After entering the volumes in **Individual Volumes**, choose **OK.** Note that the **Volume** on the step configuration is now greyed out.

---

8 In the **Technique** drop-down, select the **S8 1000 Low** technique.

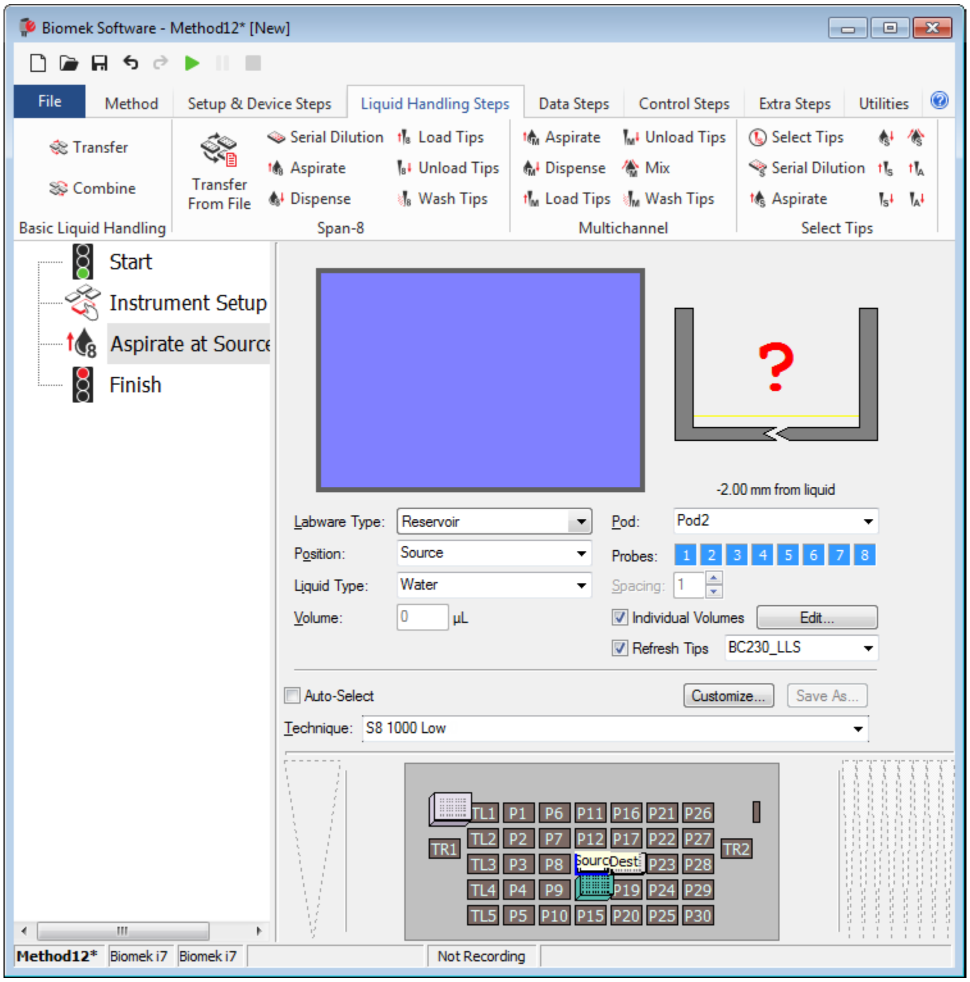
IMPORTANT ***If Using Fixed Tips…***

You don’t load and unload tips so you won’t need to refresh tips. Skip this step and go to the next section.

9 Check **Refresh Tips** (Figure 8.2). This will load new tips before the pod aspirates. Make sure **BC230_LLS** are chosen. Your **Span-8 Aspirate** step is configured and the main editor should look like Figure 8.4.

TIP If tips are already loaded, **Refresh Tips** unloads those tips (along with any liquid in those tips if they are not empty) and loads new tips prior to aspirating. This option should be used only when there are either no tips loaded or the tips are empty.

Figure 8.4 Span-8 Aspirate Step Configured



-2.00 mm from liquid

Labware Type: Reservoir

Position: Source

Liquid Type: Water

Volume: 0 µL

Pod: Pod2

Probes: 1 2 3 4 5 6 7 8

Spacing: 1

☑ Individual Volumes

☑ Refresh Tips BC230_LLS

☐ Auto-Select

Technique: S8 1000 Low

Dispensing Liquid Using the Span-8 Dispense Step

Now that you have aspirated some liquid, you need to dispense it into another piece of labware. In this tutorial, you will dispense the aspirated liquid into specified wells of the **Dest** plate.

To dispense previously aspirated liquid:

1. Select the **Span-8 Aspirate** step in the Method View.

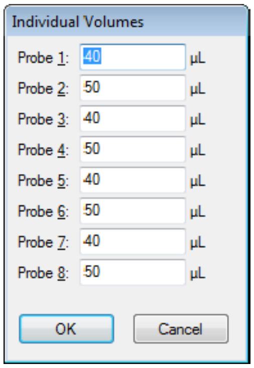
2. From the **Liquid Handling Steps** tab, in the **Span-8** group, select the Dispense (**Span-8 Dispense**) icon to insert the step into the Method View.

3. In the Current Instrument Display, click on the **Dest** plate on position **P18** to select it as the destination.

4. Make sure the first column of the microplate is selected.

5. Check **Individual Volumes** and select **Edit**. **Individual Volumes** appears. Note that the volumes you configured earlier for the **Span-8 Aspirate** step are displayed (Figure 8.5).

   Figure 8.5 Individual Volumes

   Individual Volumes

   Probe 1: 40 µL
   Probe 2: 50 µL
   Probe 3: 40 µL
   Probe 4: 50 µL
   Probe 5: 40 µL
   Probe 6: 50 µL
   Probe 7: 40 µL
   Probe 8: 50 µL

6. From **Individual Volumes**, choose **OK**. Note that the **Volume** on the step configuration is now greyed out.

7. In the **Technique** drop-down, select the **S8 1000 Low** technique.

You have now configured a simple method that aspirates individual volumes for each probe from a reservoir source plate and dispenses into one column of a destination plate using individual steps. If you like, you can run this method on your instrument or in the simulator (refer to CHAPTER 6, *Span-8 Pod — Getting Started with Biomek Software*, for more information on how to do this).

---

8 Save the method and give it a unique name.

In the next section, you will reconfigure this simple method to use a variable for the volumes to aspirate and dispense.

Using Variables in a Method

Variables make it easier to modify a method. When configuring steps, you enter the name of the variable in the desired field; when the method is run, the actual value of the variable is substituted and the action executed.

Biomek i-Series Concept

Using a variable provides several advantages:

- If you want to change a value that is used in several places within a method, you can change it in one place and it is automatically changed everywhere that variable is used.
- The value of a variable can be set at run time and the method is automatically updated appropriately.
- Decisions can be made at run time based on the value of a variable (you will do this in the next chapter).

You will now create a variable for the individual volumes to transfer and use it in the **Span-8 Aspirate** and **Span-8 Dispense** steps. This includes:

- *Creating a Variable in the Start Step*
- *Using a Variable with Expressions in Step Configurations*
- *Changing the Value of a Variable at Run Time*

Creating a Variable in the Start Step

The **Start** step, in addition to being the first step in the method, can also be used to create and name variables that can be used throughout the method. Variables named in a **Start** step can be used in configuring other steps in the method. Other steps in Biomek Software also allow you to create variables, but those variables are local and are particular to the steps in which they are created. You will work with local variables later in the chapter with the **Loop** step.

You will now create a variable for the volume to transfer using the **Start** step.

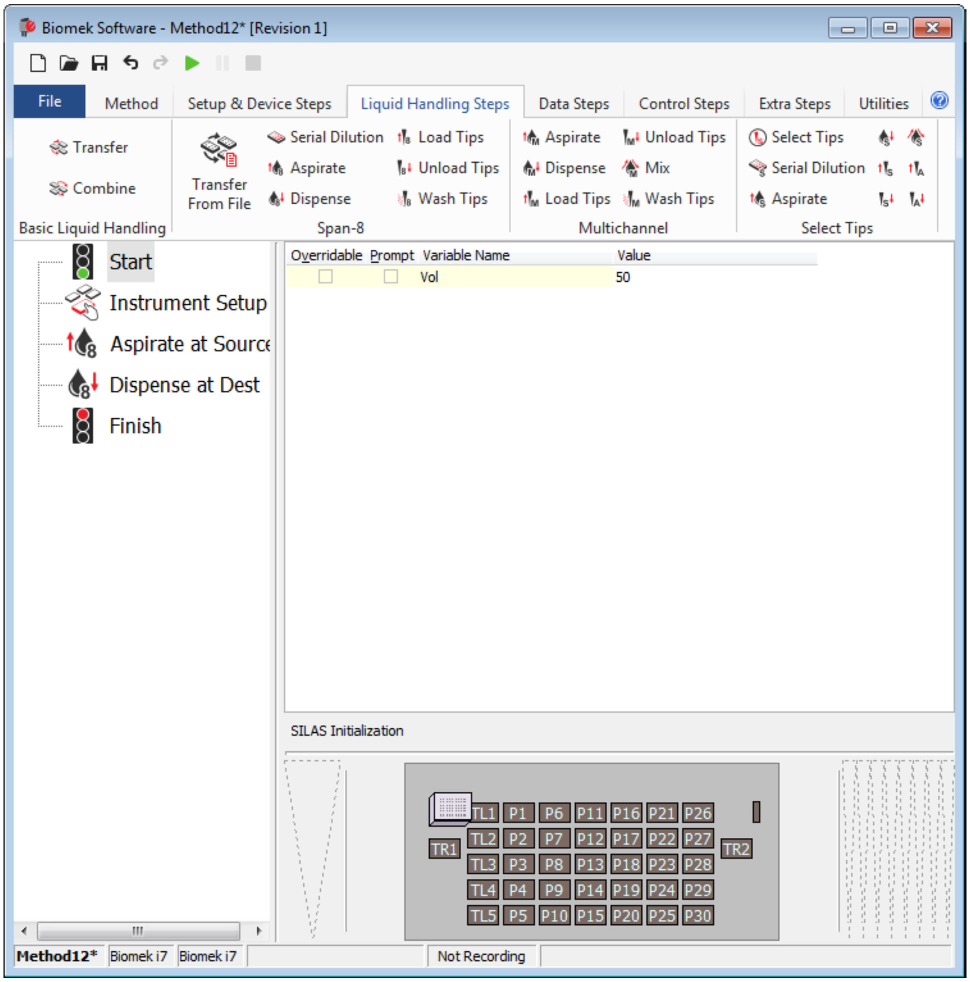
To create a variable in the **Start** step:

1 Select the **Start** step in the method view to display its configuration.

2 In **Variable Name**, enter **Vol**.

3 In **Value**, enter **50**. Your **Start** configuration should look like Figure 8.6. You have created a variable named **Vol** that has a value of **50**.

Figure 8.6 Vol Variable Created in the Start Step



Overridable	Prompt	Variable Name	Value
☐	☐	Vol	50

Using a Variable with Expressions in Step Configurations

Biomek i-Series Concept

Expressions combine text, numerical constants, and variables using operators to modify a variable. These operators may perform a number of mathematical operations or combine text strings. Just like with variables, the expression is evaluated and the resulting value is substituted for the expression at run time.

You will now use the ***Vol*** variable you created in the **Start** step with expressions to configure some individual volumes to transfer in the **Span-8 Aspirate** and **Span-8 Dispense** steps.

To use a variable in a step configuration:

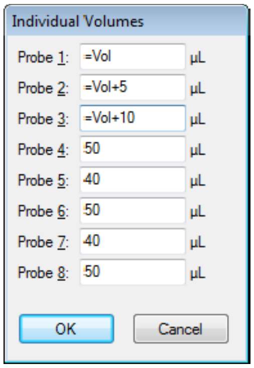
1 Select the **Aspirate at Source** step in the Method View.

2 Select **Edit** next to **Individual Volumes**.

3 In **Individual Volumes**, for **Probe 1**, enter **=*Vol*** (including the equal sign), in **Probe 2**, enter **=*Vol+5***, in **Probe 3**, enter **=*Vol+10*** as shown in Figure 8.7. Variables and expressions are always preceded by an equal sign when entering them into a step configuration field. When the method is run, ***Vol*** is replaced by the value of the variable and the expression is evaluated; in this case, 50 µL for Probe 1, 50 plus 5 or 55 µL for Probe 2, and 50 plus 10 or 60 µL for Probe 3.

TIP Variable names are not case sensitive, so entering the name **VOL**, **vol**, **Vol**, or **VoL** are all evaluated the same.

Figure 8.7 Individual Volumes With Variables Entered



Individual Volumes

Probe 1: =Vol µL
Probe 2: =Vol+5 µL
Probe 3: =Vol+10 µL
Probe 4: 50 µL
Probe 5: 40 µL
Probe 6: 50 µL
Probe 7: 40 µL
Probe 8: 50 µL

4 Choose **OK**.

5 Select the **Dispense at Dest** step in the Method View and configure **Individual Volumes** using the same variable and volumes as you did for the **Aspirate at Source** step. You will need to configure this, as it won't automatically display the volumes you configured in the **Aspirate at Source** step like it did in *Dispensing Liquid Using the Span-8 Dispense Step* since it will only update the first time the volumes are configured for a step.

6 Choose **OK** when **Individual Volumes** has been correctly configured, as shown in Figure 8.7.

To change the volume you want to transfer, you would change the value of the variable ***Vol*** in the **Start** step. The volumes for probes specified in **Individual Volumes** for both the **Span-8 Aspirate** and **Span-8 Dispense** steps would then automatically be updated when the value of ***Vol*** is substituted at run time.

Changing the Value of a Variable at Run Time

Since the value of a variable can be changed throughout the method by changing the value of the variable in the **Start** step, it makes it easy to quickly reconfigure methods that are similar except for one or two items.

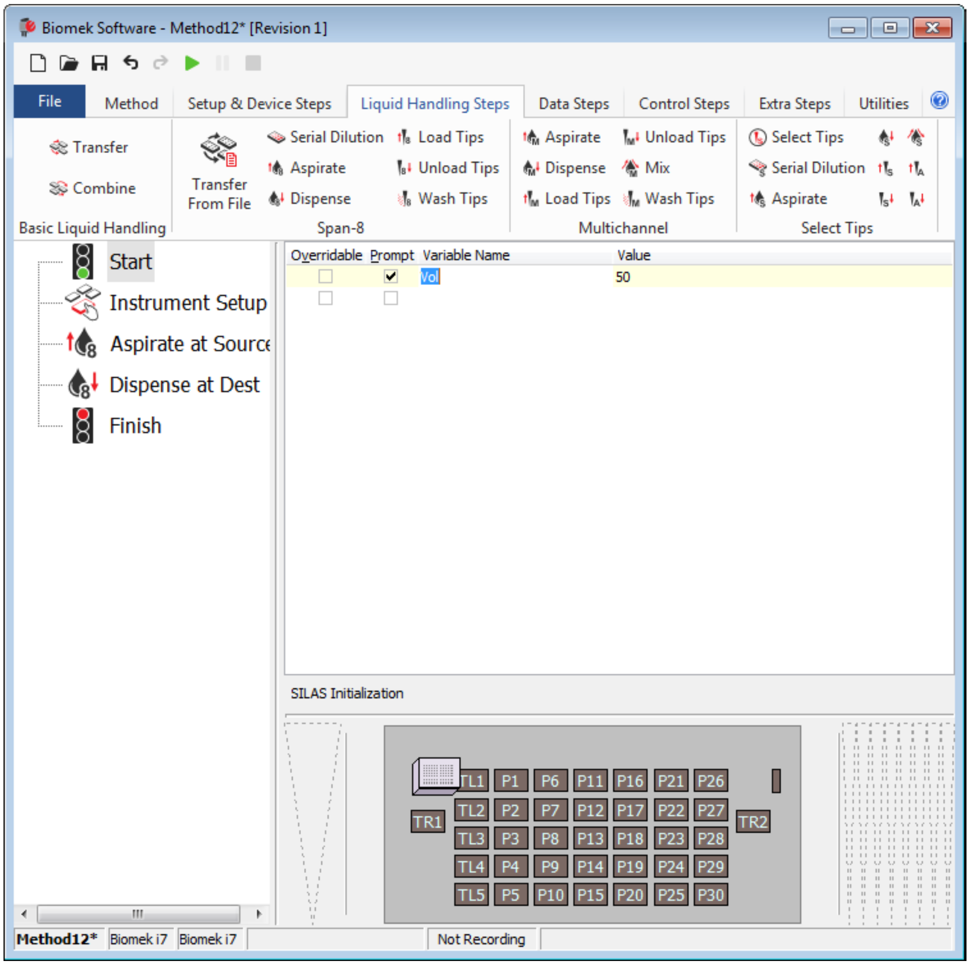
For variables that are created in the **Start** step, you can configure Biomek Software to prompt you to specify a value for the variable at run time. When configured to do this, a prompt appears for each variable when the method is run. The value that you entered for the variable in the **Start** step is now the default value for the variable. You can use that value by choosing **OK**, or enter a new value and choose **OK** to change the value of the variable. The method run then uses the specified value for the variable and updates the method accordingly.

To specify the value of a variable at run time:

1 Select the **Start** step.

2 Select the **Prompt** check box for the variable ***Vol.*** Your **Start** configuration should now look like Figure 8.8.

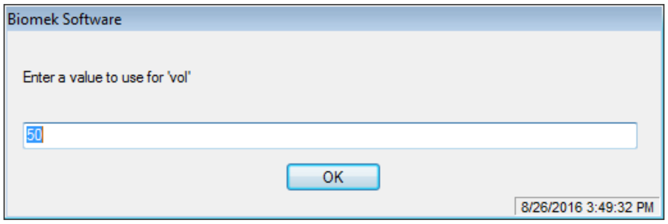
Figure 8.8 Prompting for Value of a Variable



Overridable	Prompt	Variable Name	Value
☐	☑	Vol	50
☐	☐		

3 Run the method. A prompt appears allowing you to enter a value for the variable (Figure 8.9).

Figure 8.9 Prompt to Specify the Value of a Variable


Biomek Software

Enter a value to use for 'vol'

50

4 Enter **40** and choose **OK**. If you run the method on your instrument, you should notice that 40 µL was transferred for Probe 1, 40 plus 5 or 45 µL for Probe 2, and 40 plus 10 or 50 µL for Probe 3.

5 As in all methods, the deck setup confirmation prompt appears. Respond appropriately.

6 Save the method and give it a unique name.

In the next section, you will learn to use variables and a **Loop** step to perform repeated actions in order to dispense to the destination plate.

Repeating Liquid Transfer Steps Using a Loop

The **Loop** step enables you to repeat one or more steps for multiple cycles. Each cycle or iteration repeats the steps contained inside the **Loop**. An optional variable may also be created in the **Loop** step. This variable is assigned a start value that is incrementally processed with each cycle of the **Loop** until it reaches the end value.

In this section, you will modify the method to use a **Loop** step to aspirate and dispense to all 12 columns of a plate rather than just the first column. In completing this task, you will create a variable in the **Loop** step and use this variable to reconfigure the **Span-8 Aspirate** and **Span-8 Dispense** steps as the liquid transfer actions are repeated during method execution.

Biomek i-Series Concept

The **Loop** step repeats the nested step or steps until its **End** value is exceeded. For the first cycle of a **Loop**, its value is the **Start** value. After completing all steps inside the loop, the value changes by the **Increment** and the steps are repeated again. This process repeats until the **Increment** changes the value to be greater than the **End** value.

Repeating Actions Using the Loop Step

When you want to repeat actions several times during a method run, you use a **Loop** step. The **Loop** step allows you to repeat the actions of one or more steps without inserting and configuring those steps for each time they are to be repeated. Steps to repeat are placed, or nested, inside the **Loop** step.

Biomek Software internally tracks the value of the Loop for each cycle, and **Start**, **End**, and **Increment** values are specified (see sidebar at left). If desired, a name can be assigned to the **Loop** value to create a variable. This variable can then be used like any other variable to configure steps, but can only be used with steps contained within the **Loop** step.

To repeat the **Span-8 Aspirate** and **Span-8 Dispense** steps:

1 If necessary, open the previous method that was created.

2 Select the **Instrument Setup** step in the Method View.

3. From the **Control Steps** tab, in the **Flow** group, select the Loop (**Loop**) icon to insert the step in the Method View. The **Loop** and **End Loop** icons appear in the Method View, and the **Loop** step configuration is displayed.

4. In **Variable**, enter ***`column`***. This will create a variable named ***`column`*** that can be used to configure steps within the **Loop**.

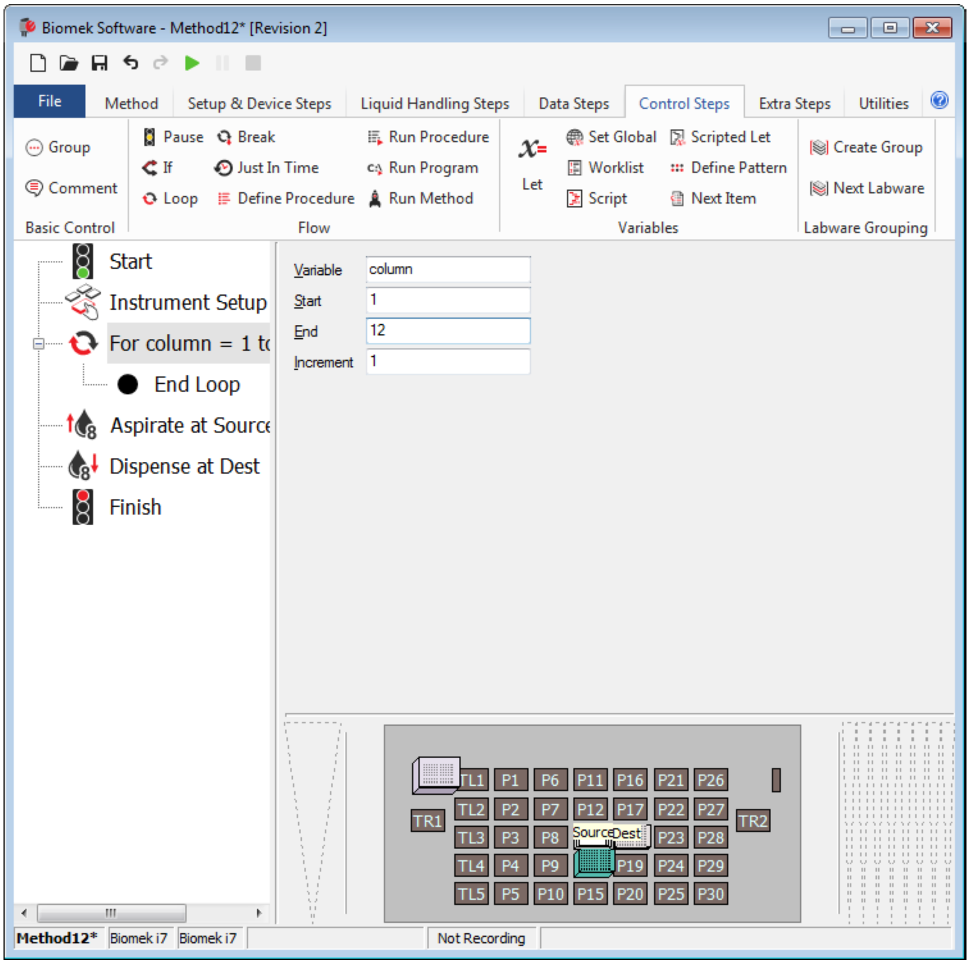
5. In **Start**, enter **1**. This will be the initial value assigned to the variable ***`column`*** on the first iteration of the loop.

6. In **End**, enter **12**. This will be the final value for the variable ***`column`***. When the value of ***`column`*** exceeds the **End** value, the **Loop** step ends and the remainder of the method continues.

---

7 In **Increment**, enter **1**. The **Increment** value is how much the value for the variable ***`column`*** changes with each iteration of the **Loop**. Your **Loop** step configuration should look like Figure 8.10.

Figure 8.10 Loop Step for Repeating Aspirate and Dispense



Variable: column
Start: 1
End: 12
Increment: 1

---

8 Drag the **Aspirate at Source** and **Dispense at Dest** steps between the **Loop** and **End Loop** icons.

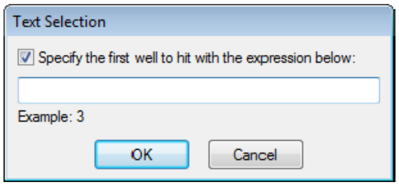
Specifying the Column to Dispense to in the Dispense Step

Now that you have configured the **Loop** step to create the variable *column* and placed the **Aspirate** and **Dispense** steps inside the **Loop**, you can use the variable *column* to reconfigure the **Dispense** step so all 12 columns on the **Dest** microplate are dispensed to rather than just the first column you originally configured.

1 Highlight the **Dispense at Dest** step configuration.

2 Right click anywhere in the labware graphic and choose **Specify Selection as Text**. **Text Selection** appears (Figure 8.11).

Figure 8.11 Text Selection

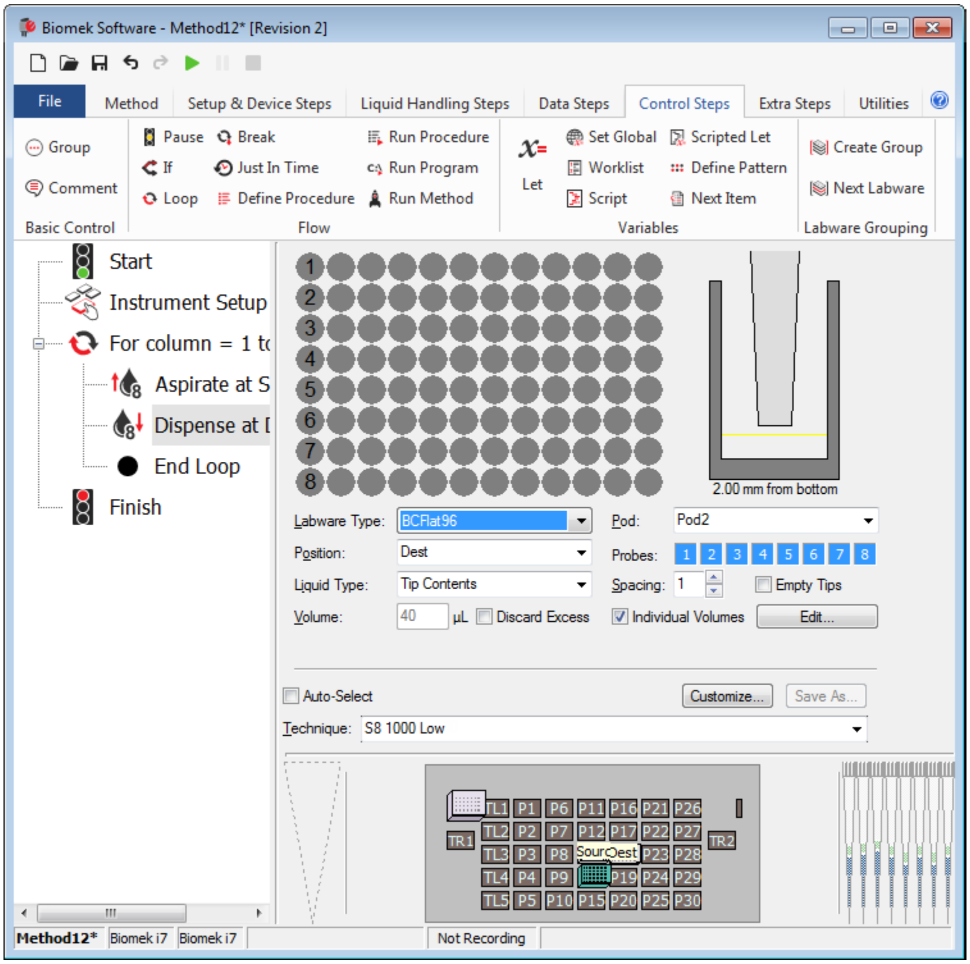


3 Enter **=*`column`***. This means that it will dispense using all 8 probes starting with the well number equal to the value of the **Loop** variable. Since the wells in the first row are numbered 1 through 12, it will aspirate from the column that starts with value of ***`column`***.

4 Choose **OK**.

The **Dispense** step configuration looks like Figure 8.12. The graphical representation of the labware is grayed out to indicate that the target wells to dispense into are specified by text.

Figure 8.12 Dispense Step Inside the Loop



Labware Type: BCFlat96
Pod: Pod2
Position: Dest
Probes: 1 2 3 4 5 6 7 8
Liquid Type: Tip Contents
Spacing: 1
☐ Empty Tips
Volume: 40 µL
☐ Discard Excess
☑ Individual Volumes
Edit...
☐ Auto-Select
Customize...
Save As...
Technique: S8 1000 Low

Conserving Tips Using Individual Steps

IMPORTANT ***If Using Fixed Tips...***
You won't load and unload tips. Go to the next section.

As the method is currently configured, an entire box of tips will be used. This is because the **Span-8 Aspirate** step loads tips for each iteration of the **Loop**. Since the source is a reservoir and cross contamination is not a concern, you could reuse tips for all 12 iterations of the **Loop**. To accomplish this, you will use a **Load Tips** step before the **Loop** and an **Span-8 Unload Tips** step after the **Loop**.

Loading and Unloading Tips Outside the Loop

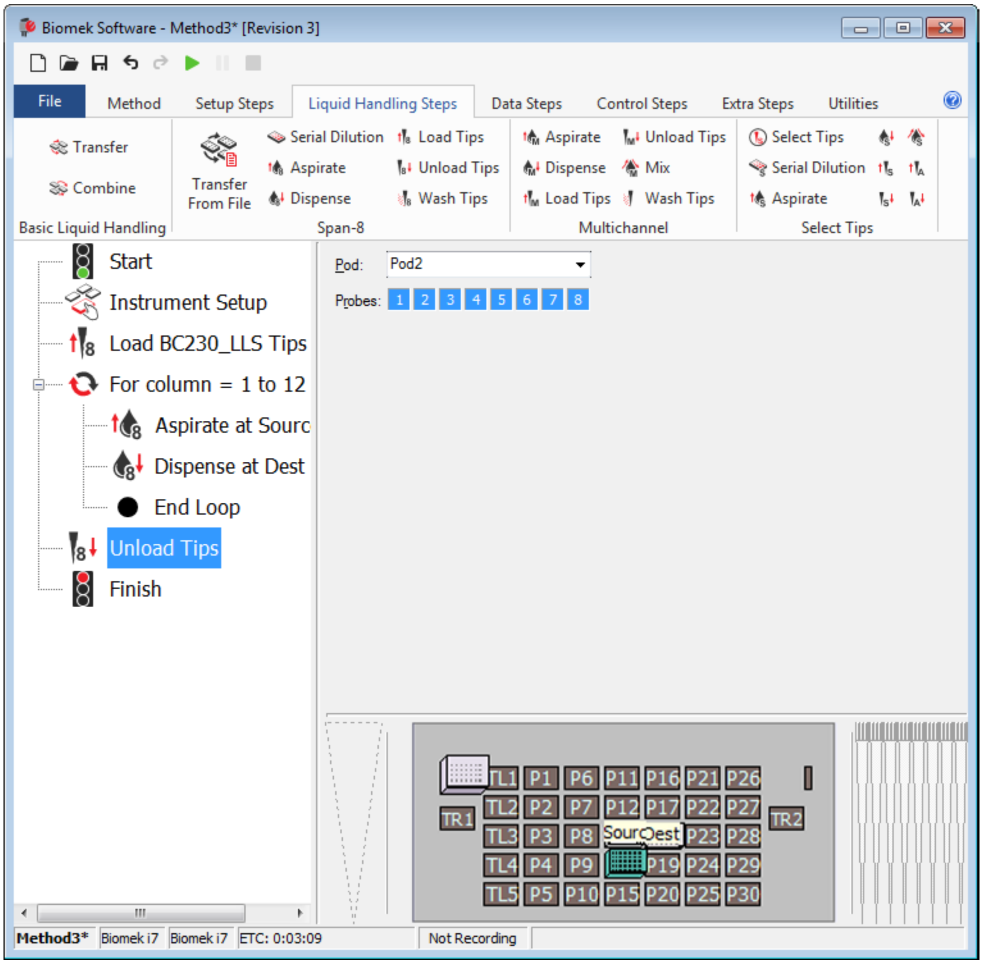
To load and unload tips outside of the **Loop**:

1. Select the **Instrument Setup** step in the Method View.
2. From the **Liquid Handling Steps** tab, in the **Span-8** group, select the Load Tips (**Span-8 Load Tips**) icon to insert the step into the Method View.
3. Populate the **Tips** field by selecting the **BC230_LLS** tips sitting on **P14** in the Current Instrument Display.
4. Select the **Aspirate** step inside the **Loop**.
5. Deselect the **Refresh Tips** check box. This tells the instrument to use whatever tips are already loaded to perform the aspirate instead of loading new tips at the start of the **Aspirate** step.
6. Select the **Finish** step in the Method View.

---

7 From the **Liquid Handling Steps** tab, in the **Span-8** group, select the Unload Tips **(Span-8 Unload Tips)** icon to insert it in the Method View. Make sure the step is located after the **End Loop** icon and that the Span-8 pod is selected in the **Pod** drop-down. Your method should now look like Figure 8.13.

Figure 8.13 Loading and Unloading Tips Outside the Loop



Start
Instrument Setup
Load BC230_LLS Tips
For column = 1 to 12
Aspirate at Sourc
Dispense at Dest
End Loop
Unload Tips
Finish

Pod: Pod2
Probes: 1 2 3 4 5 6 7 8

Method3* | Biomek i7 | Biomek i7 | ETC: 0:03:09

This method loads new tips, uses those same tips to perform all 12 iterations of the **Loop**, and unloads the tips after the last iteration of the **Loop**.

---

8 Save the method and run in Simulation Mode.

Washing Tip Mandrels

After unloading the tips in the previous section, you can wash the tip mandrels at the Span-8 Wash ALP. If you haven't unloaded the tips, an error will be displayed because disposable tips cannot be washed using the current configuration, which uses the passive Span-8 Wash ALP; an active Span8 Wash ALP *does* wash disposable tips.

Biomek i-Series Concept

The **Span-8 Wash Tips** step washes tips at the **WashStationSpan8Active** by aspirating and dispensing a specified volume of wash fluid a specified number of times.

Now you will add a **Span-8 Wash Tips** step to wash the tip mandrels.

To wash tip mandrels:

1 Select the **Span-8 Unload Tips** step, and, from the **Liquid Handling Steps** tab, in the **Span-8** group, select the Wash Tips (**Span-8 Wash Tips**) icon to insert it into the Method View.

IMPORTANT ***If Using Fixed Tips...***
Insert a **Span-8 Wash Tips** step after the **Loop** step.

2 In **Position**, choose **W1**.

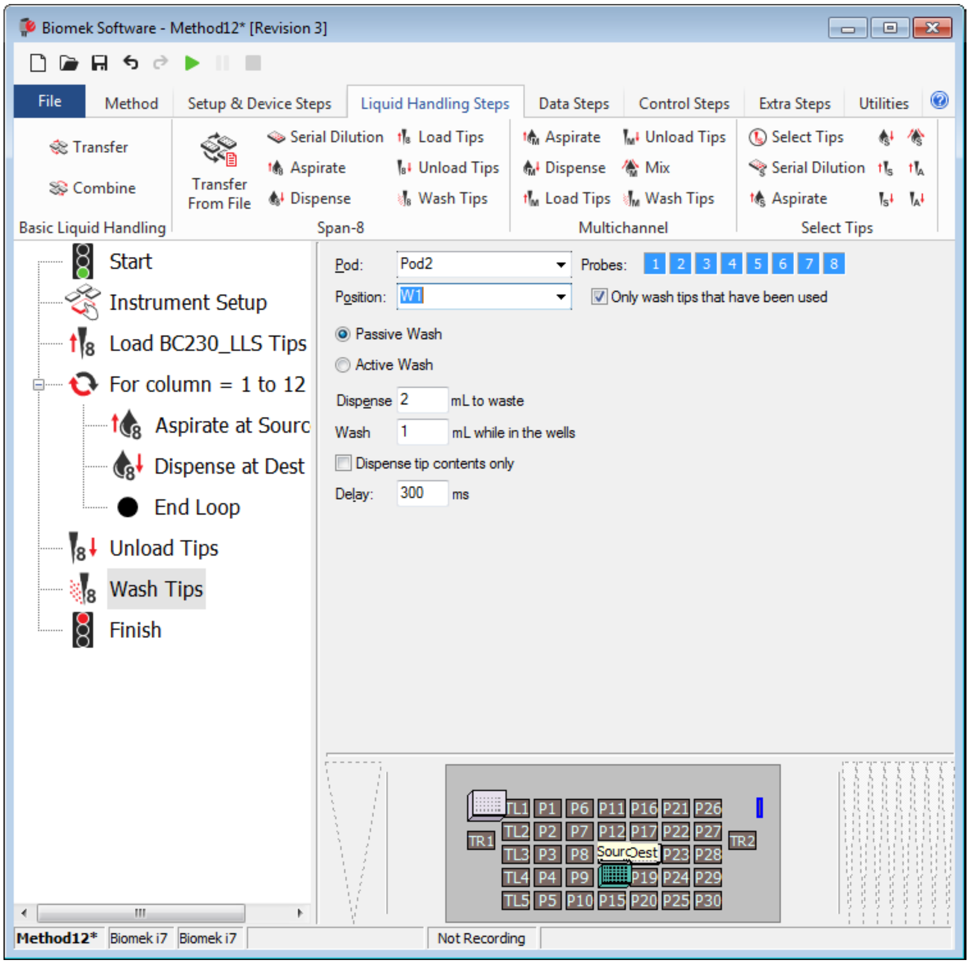
3 Make sure all eight probes are selected.

4 Select **Passive Wash**.

---

5 Allow the other default settings to remain. The main editor should look like Figure 8.14.

Figure 8.14 Span-8 Wash Tips Step Configured



Start
Instrument Setup
Load BC230_LLS Tips
For column = 1 to 12
Aspirate at Sourc
Dispense at Dest
End Loop
Unload Tips
Wash Tips
Finish

Pod: Pod2
Probes: 1 2 3 4 5 6 7 8
Position: W1
☑ Only wash tips that have been used
● Passive Wash
○ Active Wash
Dispense 2 mL to waste
Wash 1 mL while in the wells
☐ Dispense tip contents only
Delay: 300 ms

---

6 Highlight **Finish** to validate the method.

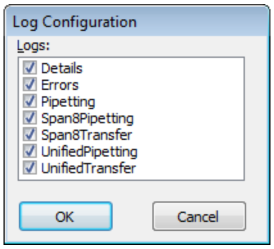
---

7 On the **Utilities** tab, in the Other group, select the Log Configuration (**Log Configuration**) icon.

8 In the **Log Configuration** window, make sure that **Span8Pipetting** is selected, and then select **OK**. You will view this log file in the next section (refer to *Viewing Log Data*).

NOTE Span-8 logs will appear in the **Log Configuration** window (Figure 8.15) only after a method performing Span-8 operations has been run.

Figure 8.15 Log Configuration Window Showing Span-8 Logs


Log Configuration
Logs:
☑ Details
☑ Errors
☑ Pipetting
☑ Span8Pipetting
☑ Span8Transfer
☑ UnifiedPipetting
☑ UnifiedTransfer

9 Save and run the method.

Go to the next section to learn how to view the log data associated with the method.

Viewing Log Data

Logs provide text records of a method run. The contents of the text record, or log file, are based upon the type of log requested. The type of logs available is based on the pod type and pipetting operations being performed. For example, the **Errors** and **Details** logs are by default available for the method you just ran; although, other logs will generate only after additional pipetting operations have been performed and ran, either in simulation or with your physical instrument. See the **Biomek i-Series Concept** below for additional details.

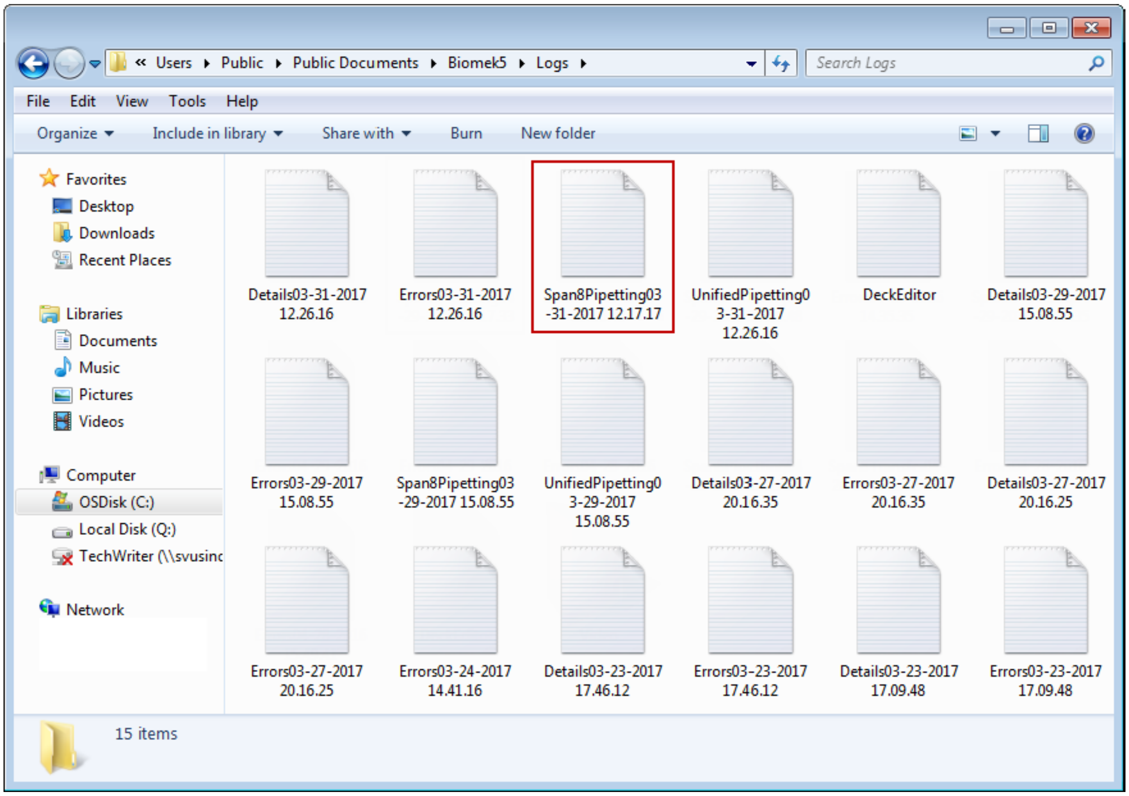
Biomek i-Series Concept	
	The following log files are available for the Span-8 pod: • **Details** — captures every operation that occurs during a method run. • **Errors** — captures any errors that occur during a method run. • **Span8Pipetting** — captures pipetting operations, including location and labware name or type. • **Span8Transfer** — captures transfer operations, including location and labware name or type. • **UnifiedPipetting** — captures pipetting operations, along with sample IDs for wells. • **UnifiedTransfer** — captures transfer operations, along with sample IDs for wells. Refer to the *Biomek i-Series Software Reference Manual* (PN B56358), *Generating and Using Log Data*, for more information.

To view the log data for the method you just ran:

---

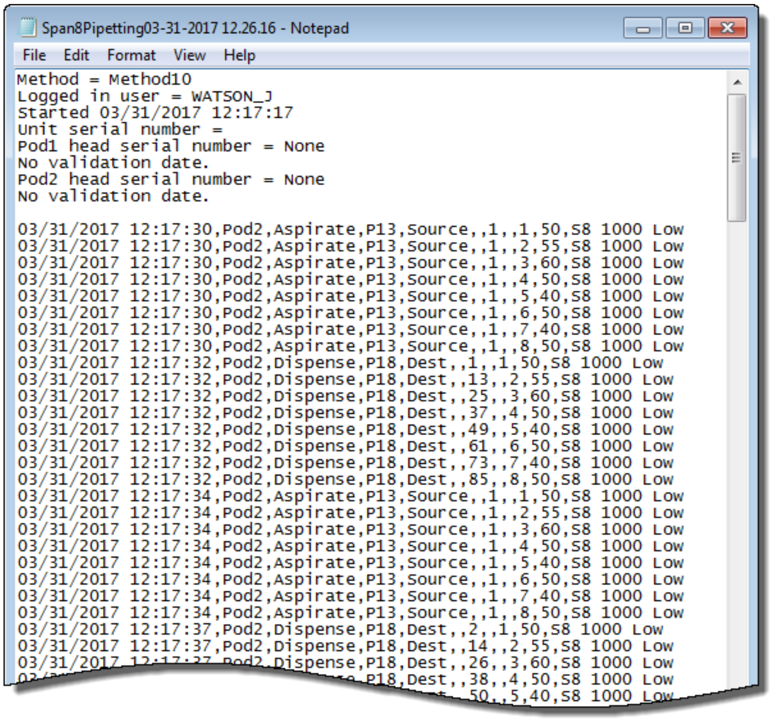
1 Browse to ***`ThisPC\OSDisk(C:)\Users\Public\Public Documents\Biomek5\Logs`*** (Figure 8.16).

Figure 8.16 Browse to Logs



2 Double click the latest **Span8Pipetting** log. Figure 8.17 appears.

Figure 8.17 Portion of the Span8Pipetting Log



```
Method = Method10
Logged in user = WATSON_J
Started 03/31/2017 12:17:17
Unit serial number =
Pod1 head serial number = None
No validation date.
Pod2 head serial number = None
No validation date.

03/31/2017 12:17:30,Pod2,Aspirate,P13,Source,,1,,1,50,S8 1000 Low
03/31/2017 12:17:30,Pod2,Aspirate,P13,Source,,1,,2,55,S8 1000 Low
03/31/2017 12:17:30,Pod2,Aspirate,P13,Source,,1,,3,60,S8 1000 Low
03/31/2017 12:17:30,Pod2,Aspirate,P13,Source,,1,,4,50,S8 1000 Low
03/31/2017 12:17:30,Pod2,Aspirate,P13,Source,,1,,5,40,S8 1000 Low
03/31/2017 12:17:30,Pod2,Aspirate,P13,Source,,1,,6,50,S8 1000 Low
03/31/2017 12:17:30,Pod2,Aspirate,P13,Source,,1,,7,40,S8 1000 Low
03/31/2017 12:17:30,Pod2,Aspirate,P13,Source,,1,,8,50,S8 1000 Low
03/31/2017 12:17:32,Pod2,Dispense,P18,Dest,,1,,1,50,S8 1000 Low
03/31/2017 12:17:32,Pod2,Dispense,P18,Dest,,13,,2,55,S8 1000 Low
03/31/2017 12:17:32,Pod2,Dispense,P18,Dest,,25,,3,60,S8 1000 Low
03/31/2017 12:17:32,Pod2,Dispense,P18,Dest,,37,,4,50,S8 1000 Low
03/31/2017 12:17:32,Pod2,Dispense,P18,Dest,,49,,5,40,S8 1000 Low
03/31/2017 12:17:32,Pod2,Dispense,P18,Dest,,61,,6,50,S8 1000 Low
03/31/2017 12:17:32,Pod2,Dispense,P18,Dest,,73,,7,40,S8 1000 Low
03/31/2017 12:17:32,Pod2,Dispense,P18,Dest,,85,,8,50,S8 1000 Low
03/31/2017 12:17:34,Pod2,Aspirate,P13,Source,,1,,1,50,S8 1000 Low
03/31/2017 12:17:34,Pod2,Aspirate,P13,Source,,1,,2,55,S8 1000 Low
03/31/2017 12:17:34,Pod2,Aspirate,P13,Source,,1,,3,60,S8 1000 Low
03/31/2017 12:17:34,Pod2,Aspirate,P13,Source,,1,,4,50,S8 1000 Low
03/31/2017 12:17:34,Pod2,Aspirate,P13,Source,,1,,5,40,S8 1000 Low
03/31/2017 12:17:34,Pod2,Aspirate,P13,Source,,1,,6,50,S8 1000 Low
03/31/2017 12:17:34,Pod2,Aspirate,P13,Source,,1,,7,40,S8 1000 Low
03/31/2017 12:17:34,Pod2,Aspirate,P13,Source,,1,,8,50,S8 1000 Low
03/31/2017 12:17:37,Pod2,Dispense,P18,Dest,,2,,1,50,S8 1000 Low
03/31/2017 12:17:37,Pod2,Dispense,P18,Dest,,14,,2,55,S8 1000 Low
03/31/2017 12:17:37,Pod2,Dispense,P18,Dest,,26,,3,60,S8 1000 Low
                                   P18,Dest,,38,,4,50,S8 1000 Low
                                            50,,5,40,S8 1000 Low
```

---

3 From Figure 8.17, note the following specifics about the log for the method you just created and ran. The specifics (listed in the order following) are displayed from left to right on each line of the log.

- Date and time of the method run.
- Pod which performed the operation (Pod1 or Pod2).
- Operation (aspirate or dispense).
- Location where the operation took place.
- Name assigned to labware in **Labware Properties**.
- Well number pipetted to or from.
- Probe number.
- Amount of liquid.
- Technique name.

---

4 Close the file.

Go to the next chapter to learn how to use worklists and conditions.

CHAPTER 9

Span-8 Pod — Using Worklists and Conditions

Introduction to Using Worklists and Conditions

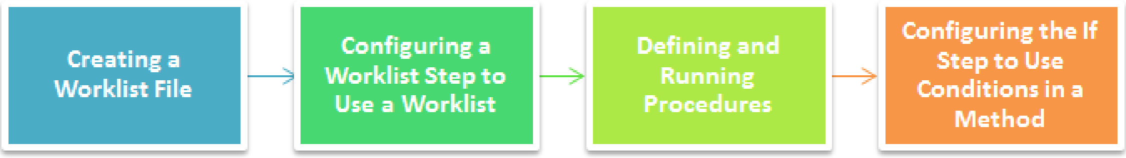
In the previous Span-8 chapters of this tutorial you learned how to:

- Configure an **Instrument Setup** step to reflect the physical deck you will set up for the method in this chapter.
- Configure **Labware Properties** for labware you will use in this chapter.
- Configure a **Transfer** step.
- Use variables and expressions in Biomek Software.

IMPORTANT Do not change the **Hardware Setup** for these tutorials. Instead, modify the tutorials to fit your current **Hardware Setup**. The method in this chapter uses disposable tips; if your instrument is configured with fixed tips, change the method as instructed in the corresponding **IMPORTANT** text. For additional information, refer to the *Biomek i-Series Hardware Reference Manual* (PN B54474).

What You'll Learn in This Chapter

In this chapter, you will develop the advanced skills to use external data sources, such as a worklist, with a method. Using a worklist will allow you to create a method using transfer amounts and destinations defined in a .csv or text file. You will also learn how to use procedures to run the same set of configured steps several times in a method to eliminate having to configure each step several times and learn how to configure a conditional statement that will allow a step or steps to be executed based on real-time conditions that occur during the method. The process for creating the method in this chapter is presented below. All of these topics are covered in detail in this chapter.



Setting Up Your Deck for Using Worklists and Conditions

To learn how to use Worklists and Conditions, you will set up the deck to transfer liquid from two reservoirs into four microplates; the liquid amounts to transfer vary per microplate and source, and these amounts are defined in the worklist file used in the **Worklist** step. In addition, you will use conditions to further define the process.

Using what you learned earlier, launch Biomek Software, create a new method, and configure an **Instrument Setup** step as follows:

1. Place a **BC230** tip box on **P12** and name it **TipsA**.

   IMPORTANT ***If Using Fixed Tips...***

   Do not add tip boxes to any of the instructions in this chapter.

2. Place the same tip box type on **P17** and name it **TipsB**.

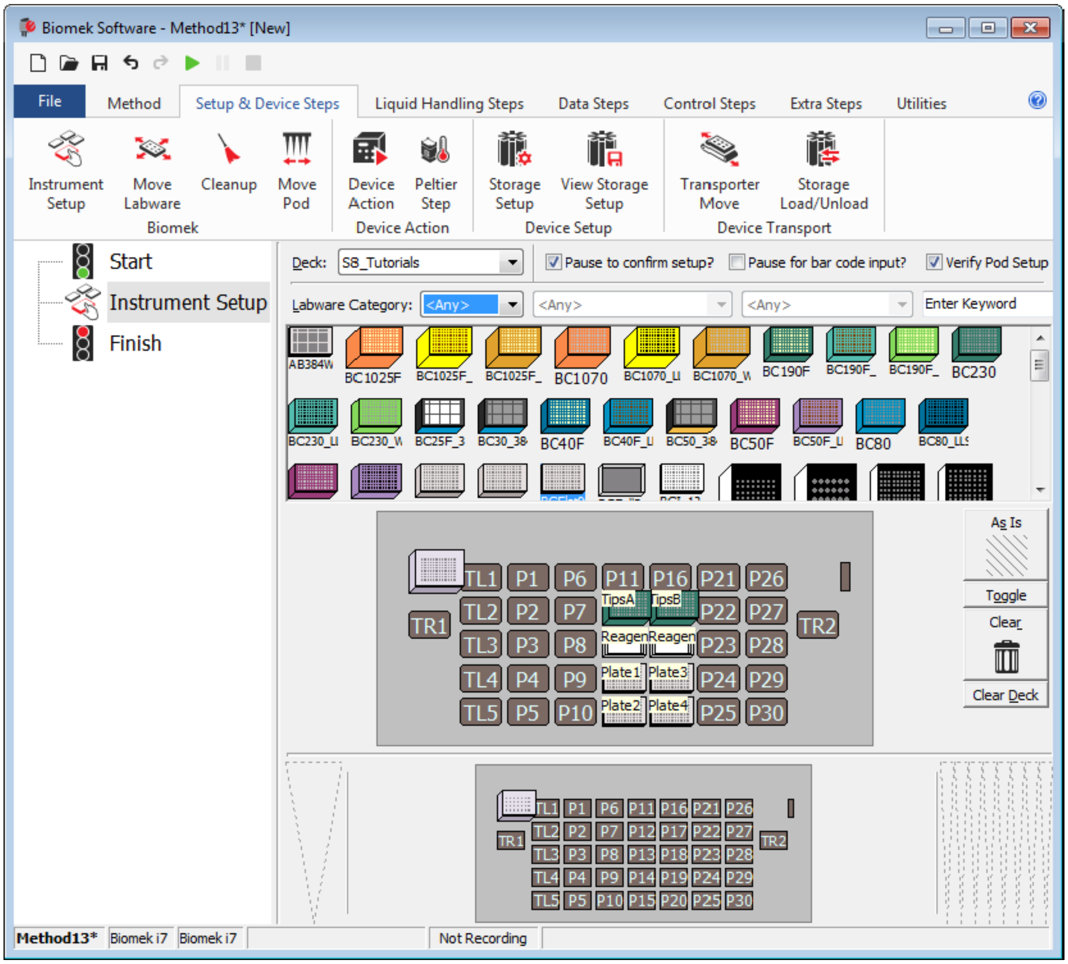
3. Place a **Reservoir** on **P13** and name it **ReagentA**. Configure the **liquid type** as **Water** with an **Known** volume of **100000** µL.

4. Place another **Reservoir** on **P18** and name it **ReagentB**. Configure the liquid type as **Water** with an **Known** volume of **100000** µL.

5. Place **BCFlat96** plates on **P14**, **P15**, **P19**, and **P20**. Name them **Plate1**, **Plate2**, **Plate3**, and **Plate4**. Give each of these plates a **Known** volume of **0** µL.

Your deck should look like Figure 9.1. Now go to the next activity to learn how to use worklists and conditions in your methods.

Figure 9.1 Instrument Setup Step Configured



Deck: S8_Tutorials

☑ Pause to confirm setup?

☐ Pause for bar code input?

☑ Verify Pod Setup

Labware Category: <Any>

Creating a Worklist File

A worklist is a text or .csv file that contains multiple values for one or more variables. The **Worklist** step in Biomek Software uses the variables and values defined in the worklist to configure a series of repetitive actions during the method run. This is different from the **Loop** step that you learned earlier in this tutorial in that a worklist can contain non-incremental values and multiple variables for use during repetitive actions.

Before you can use the **Worklist** step, you must create the worklist text or .csv file and define the variables and associated values. For the method in this chapter, you will create a worklist for a series of transfers using different amounts of liquid for each transfer.

Configuring a Worklist File

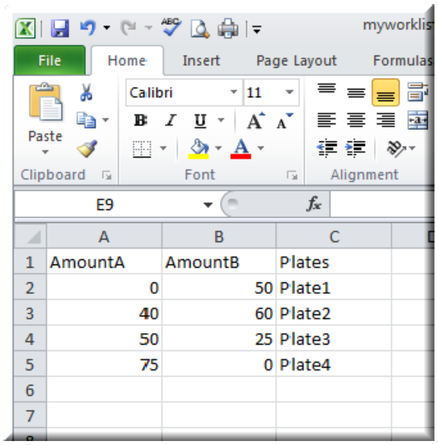
The first line of a worklist file defines the variable names. The subsequent lines list the values to be assigned to those variables. The variable and names are separated by commas. If a value such as a plate name or bar code contains a comma, enclose the entire value in double quotes; for example, **“Dest1, 4”**.

To configure the worklist file for this tutorial:

---

1 Using Microsoft Excel, create a .csv file that looks like Figure 9.2.

Figure 9.2 Created Worklist — .CSV File

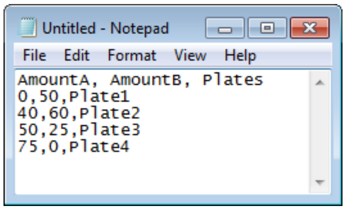


	A	B	C
1	AmountA	AmountB	Plates
2	0	50	Plate1
3	40	60	Plate2
4	50	25	Plate3
5	75	0	Plate4
6			
7			

OR

Using Notepad, create a text file that looks like Figure 9.3.

Figure 9.3 Created Worklist — .TXT File



```
AmountA, AmountB, Plates
0,50,Plate1
40,60,Plate2
50,25,Plate3
75,0,Plate4
```

TIP If a value such as a plate name or bar code contains a comma, enclose the entire value in double quotes, for example, “**Dest1,4**”.

TIP When creating a **Worklist** file, white space between values is not important; however, the comma (,) and carriage returns (CRLF) are important to create and use the file properly. Do not enter a carriage return after the last line.

---

2 Save your file as **myworklist** to the location of your choice. If you completed the chapters for the Multichannel pod and want to preserve the worklist you created for that Multichannel chapter, save your file as **myworklistS-8**.

Now that you have configured the worklist, you will insert and configure a **Worklist** step to enable the software to use the worklist in the method. Go on to the next section to learn how to do this.

Configuring a Worklist Step to Use a Worklist

The **Worklist** step is located on the **Control Steps** tab, in the **Variables** group, and uses a text or .csv file to supply to the method multiple values for one or more variables. A **Worklist** step is useful when repetition of the same action is required, but one or more variables needs to change each time the step cycles through the worklist. When a step or group of steps using the variables defined in a text or .csv file are placed inside a **Worklist** step, the **Worklist** automatically performs each step once for each line in the file.

For this part of the tutorial, we will use a **Worklist** step to transfer specific amounts of liquid from two different sources to four destination plates. The file you configured in *Creating a Worklist File*, contains all the needed details.

Biomek i-Series Concept

The **Worklist** step offers several advantages:

- Data in a text or .csv file is accessible by any Biomek Software method.
- Selecting the text or .csv file in the **Worklist** step configuration copies all of the variable data from the text or .csv file to the step without individually entering all the variables.
- A dynamic link exists between the method and the text or .csv file. Any updates made to the text or .csv file are included in the next method run, although the text or .csv file must maintain the original file path to allow the method to find the file.

To configure the **Worklist** step:

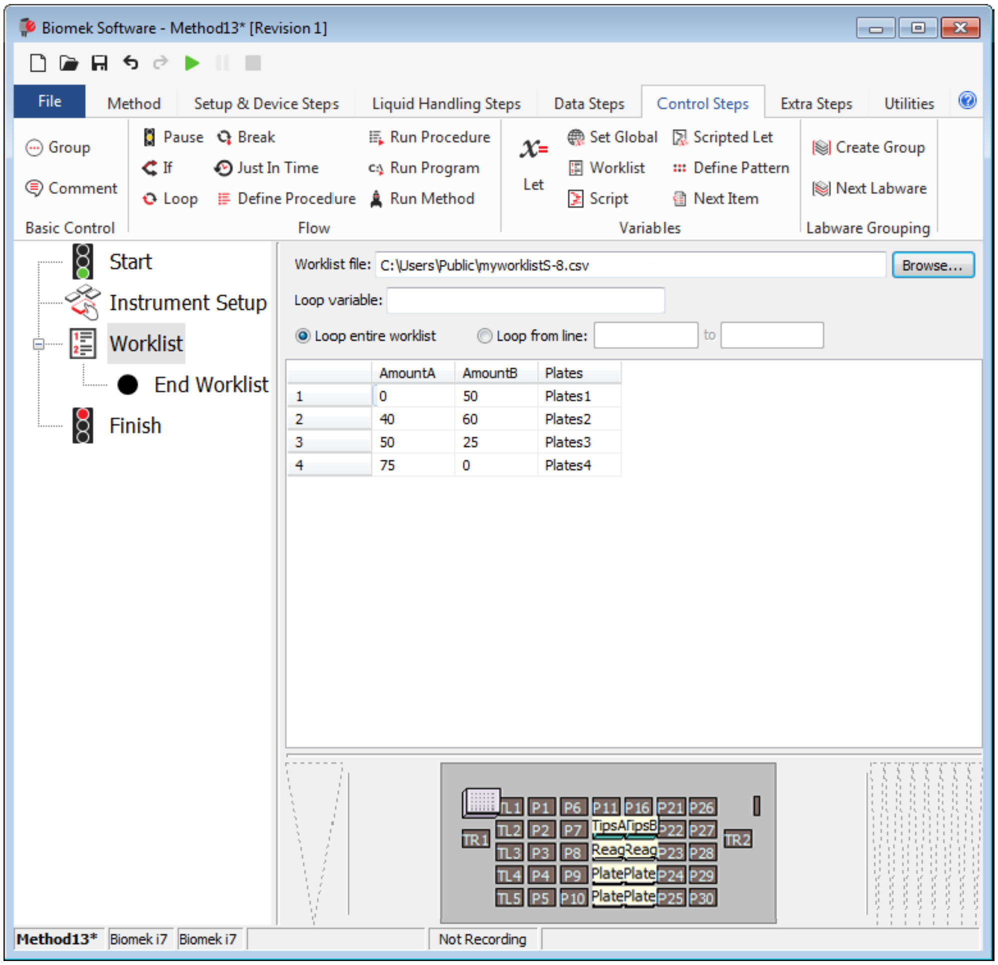
1 Ensure your deck is configured according to the instructions in *Setting Up Your Deck for Using Worklists and Conditions*.

2 Below the **Instrument Setup** step, insert a **Worklist** step (Figure 9.4) into the Method View by selecting the **Control Steps** tab and then selecting the Worklist (**Worklist**) icon, which is located in the **Variables** group.

3 From **Worklist file** in the configuration window, use the **Browse** button to find and choose the **myworklist** file you configured in *Creating a Worklist File*. Choose **myworklistS-8** if you saved the worklist in *Creating a Worklist File* with this name.

4 Make sure **Loop entire worklist** is selected. This ensures that all the values contained in the worklist are used. The **Worklist** step configuration should look like Figure 9.4.

Figure 9.4 Worklist Step With the File Displayed



Worklist file: C:\Users\Public\myworklistS-8.csv

Loop variable:

● Loop entire worklist ○ Loop from line: to

	AmountA	AmountB	Plates
1	0	50	Plates1
2	40	60	Plates2
3	50	25	Plates3
4	75	0	Plates4

1. **Worklist** Step

Now, you will define a procedure using a **Define Procedure** step and insert it before the **Worklist** step. This procedure will be run as the method cycles through the worklist. This procedure will be configured to load tips, transfer liquid, and unload tips.

NOTE A **Define Procedure** step is not required for using a **Worklist** step.

Defining and Running Procedures

The **Define Procedure** step is used to configure and save a series of steps that may be used multiple times in a method without having to reconfigure each individual step within that procedure. The **Run Procedure** step is inserted into the method and is used to identify the defined procedure to be used in a method. The procedure defined in the **Define Procedure** step can be run only by inserting a **Run Procedure** step and choosing the desired procedure in the step configuration.

Biomek i-Series Concept	
	Procedures offer advantages, such as running the same steps multiple times within a method but configuring them only once. Procedures control the size of the current method in the Method View by listing only the **Run Procedure** step in the Method View and not all the accessed steps.

Defining a Procedure Using the Define Procedure Step

For this part of the tutorial, you will insert and configure a **Define Procedure** to load specific tips, transfer volumes based on the worklist you configured earlier, and unload tips. The defined procedure will then be run as part of the **If** step that you will configure later. You will also create variables and specify their values in the **Run Procedure** step. This lets you run the steps in the procedure with different values associated with the defined variables.

---

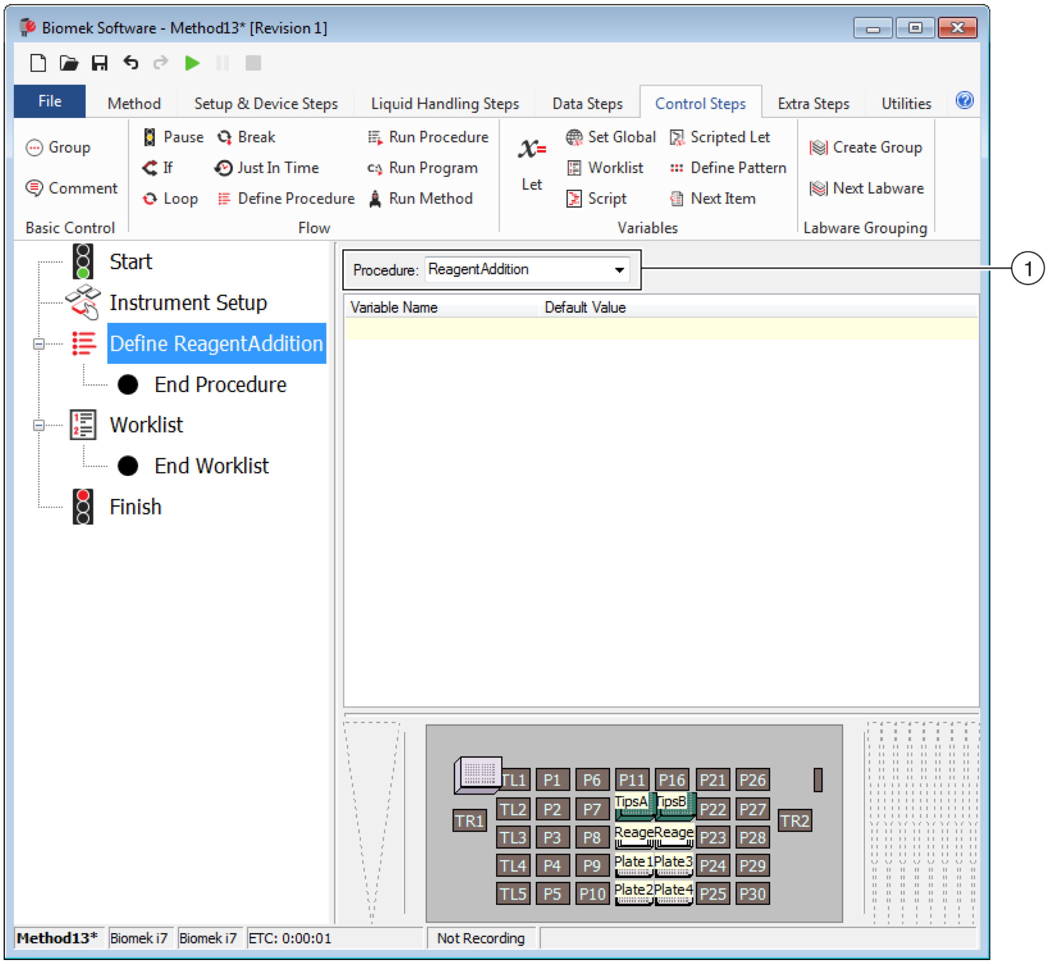
1 Select the **Instrument Setup** step in the Method View.

---

2 From the **Control Steps** tab, in the **Flow** group, select the Define Procedure (**Define Procedure**) icon to insert it below the **Instrument Setup** step (Figure 9.5).

3 In **Procedure**, enter **ReagentAddition** (Figure 9.5). This becomes the name of your procedure and will appear as **Define ReagentAddition** in the Method View.

Figure 9.5 Procedure Named



Procedure: ReagentAddition

1. Enter the name of **Procedure** here.

4 Under **Variable Name**, enter ***Reagent*** and tab over to **Default Value** and enter ***A***. You are entering **A** since it is part of the default value as part of the expression.

5 Press (Enter) on the keyboard, then under **Variable Name**, enter ***Amount*** and tab over to **Default Value** and enter ***=AmountA***.

6 Click the **Finish** step. The **Define Procedure** step now appears as **Define ReagentAddition** step.

Configuring Steps Inside the Define Procedure Step

IMPORTANT ***If Using Fixed Tips...***
You don’t load and unload tips so you won’t do *Configuring Different Tips for Accessing Sources* or *Unloading Tips During a Procedure*. Just go to *Transferring Liquid During a Procedure*.

To configure the **Define Procedure** step to load tips, transfer volumes based on the worklist you configured earlier, and unload tips, the following steps will be configured individually inside the **Define Procedure** step:

- **Load Tips** step (refer to *Configuring Different Tips for Accessing Sources*)
- **Transfer** step (refer to *Transferring Liquid During a Procedure*)
- **Unload Tips** step (refer to *Unloading Tips During a Procedure*)

The **Define Procedure** will be run as part of the **If** step that you will configure later.

Configuring Different Tips for Accessing Sources

Since your reservoirs in this tutorial method contain different reagents, you will want different tips designated for each reservoir. You will configure the **Load Tips** step as part of your procedure to ensure that the correct tips are loaded to access the correct source reservoir.

---

1 Click on the **Define ReagentAddition** step in the Method View.

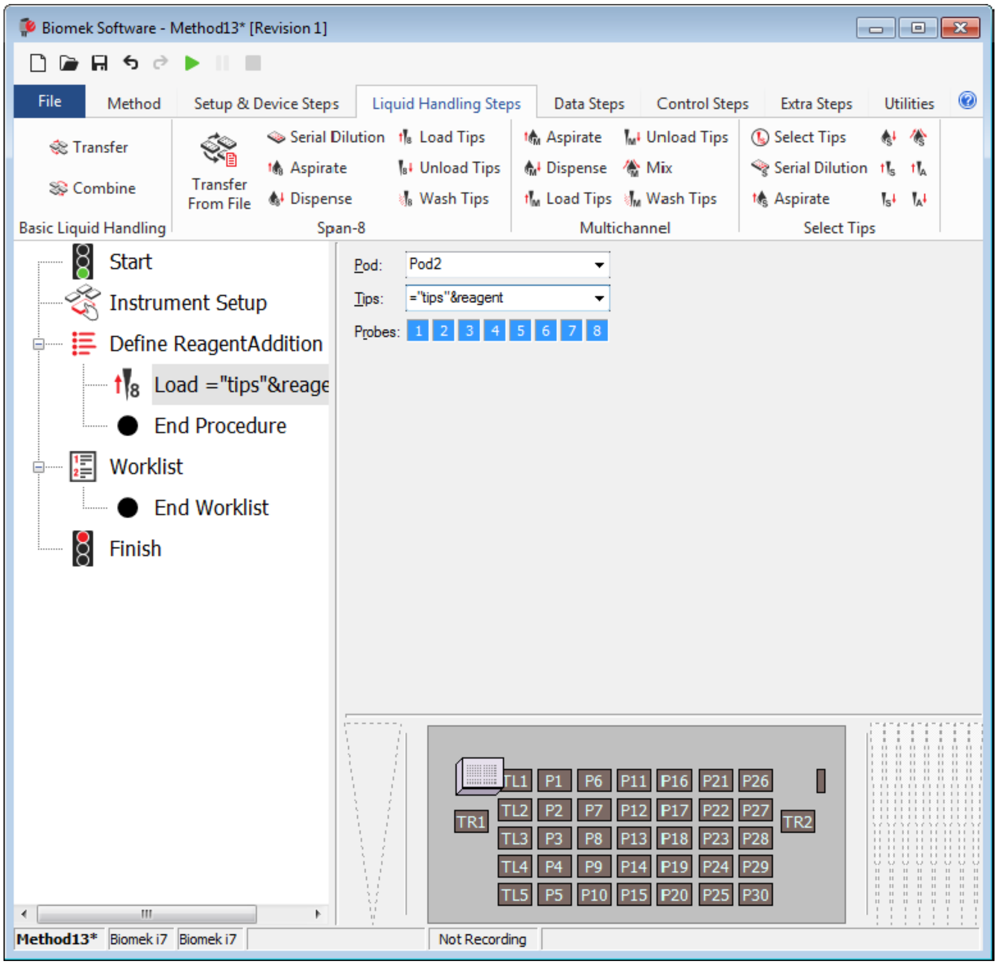
---

2 From the **Liquid Handling Steps** tab, in the **Span-8** group, select the Load Tips (**Span-8 Load Tips**) icon to insert the step into the **Define ReagentAddition** step.

---

3 In **Tips** in the Configuration View, highlight the field and enter ***`=“tips”&reagent`*** (Figure 9.6). Remember that variable names are not case sensitive.

Figure 9.6 Load Tips Configured



Pod: Pod2

Tips: ="tips"&reagent

Probes: 1 2 3 4 5 6 7 8

Transferring Liquid During a Procedure

TIP ***If Using Fixed Tips...***
Insert a **Transfer** step below the **Define Reagent** step and allow the default **Tip Handling** to remain.

To configure the actual liquid transfer that will be executed when the procedure is run, configure the transfer as follows:

1. Insert a **Transfer** step into the Method View below the **Load Tips** step.

   TIP The deck is inactive when configuring a **Transfer** step inside the **Define Procedure** step.

2. Deselect **Load** tips and **Change tips between transfers.**

3 Using what you learned earlier, configure the **Source** in the **Transfer** step as **Reservoir** at ***="Reagent"&Reagent***. Configuring **="Reagent"&Reagent** means that the reservoir on the deck that has the same name as the value of the variable **Reagent** will be used. You'll configure this variable later in the **Define** and **Run Procedure** steps.

4 In the **Technique** drop-down, select the **S8 1000 Low** technique.

5 In the **Transfer** step, configure the **Destination** as a **BCFlat96** at ***=plates***.

6 In the **Destination** configuration µL field, enter ***=Amount***.

7 In the **Technique** drop-down, select the **S8 1000 Low** technique.

Unloading Tips During a Procedure

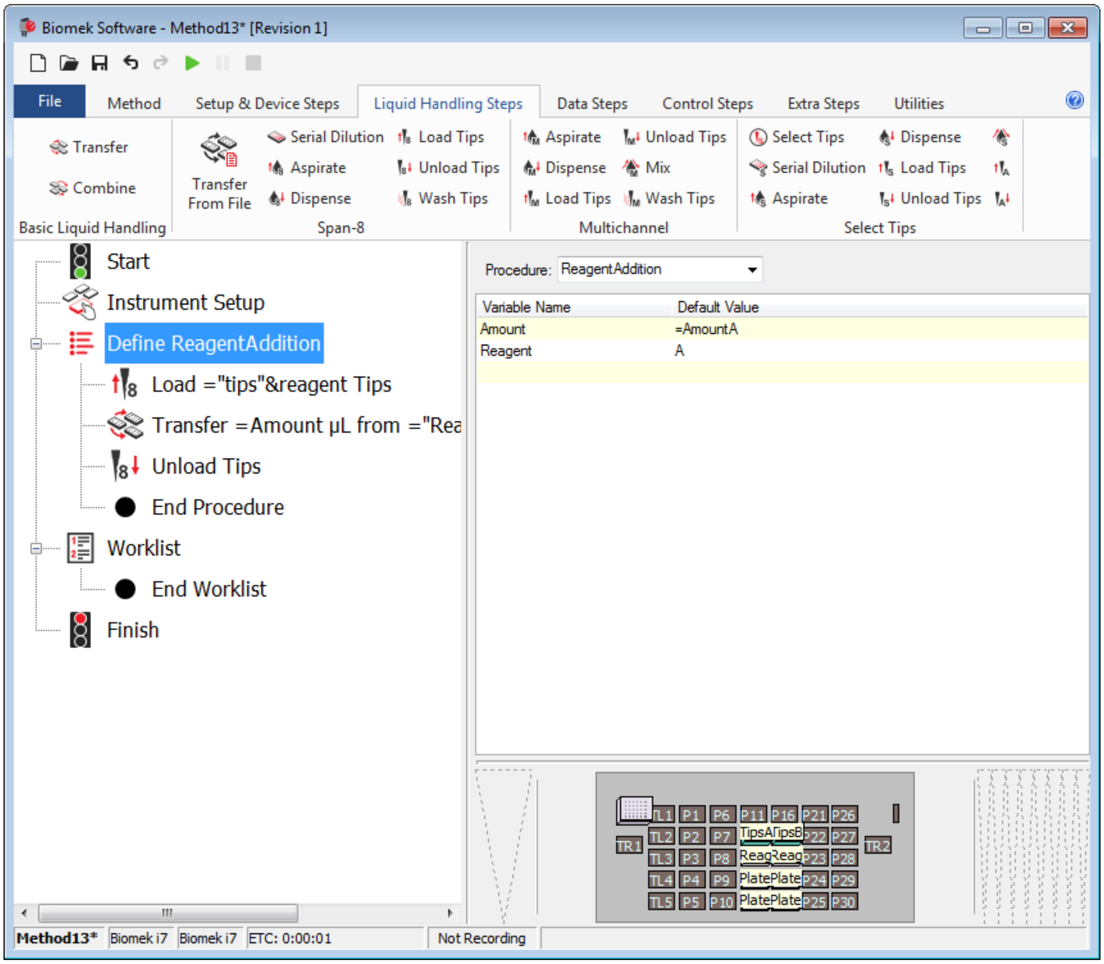
Here you will configure the procedure to unload the tips after the liquid transfer action. To unload the tips:

1 Insert a **Span-8 Unload Tips** step below the **Transfer** step.

---

2 Click on the **Define ReagentAddition** step. Your main editor should look like Figure 9.7, and the variables in the named procedure you just created will be used to specify when new tips are used and which reservoir will be accessed when transferring liquid.

Figure 9.7 Define Procedure Step Configured



- Start
- Instrument Setup
- Define ReagentAddition
  - Load ="tips"&reagent Tips
  - Transfer =Amount µL from ="Rea
  - Unload Tips
  - End Procedure
- Worklist
  - End Worklist
- Finish

Procedure: ReagentAddition

Variable Name	Default Value
Amount	=AmountA
Reagent	A

TIP If you want to reuse a procedure in other methods, right click on the step, and select **Save as Preconfigured Step**. The first time a preconfigured step is added to the software, the **Preconfigured Steps** tab appears on the ribbon, with the newly saved step. This option allows you to reuse configured steps in other methods. For additional information on managing preconfigured steps, see the *Biomek i-Series Software Reference Manual* (PN B56358), *Saving Configured Steps*.

---

3 Double click the **Define ReagentAddition** step to collapse it.

---

4 Click on the **Finish** step to validate the method.

---

5 Save the method.

Go on to the next section where you will configure an **If** step to learn how to use conditions in a method.

Configuring the If Step to Use Conditions in a Method

The **If** step controls the steps that are executed in a method based on conditional decisions. When **If** is run, Biomek Software tests the **If** condition as true or false, then processes the appropriate block of substeps based on the results of the test. (See **Biomek i-Series Concept** below.)

Biomek i-Series Concept

The substeps of an **If** step are:

- **Then** — If the condition is true, substeps following **Then** are processed.
- **Else** — If the condition is false, substeps following **Else** are processed.
- **End** — The **End** substep terminates each **If**, **Then**, and **Else** block of steps.

To configure the **If** steps to use conditions in this tutorial, you will:

- Insert an **If** step and enter the condition for a transfer from source **ReagentA**.
- Insert a **Run Procedure** step for the transfer from source **ReagentA** for the **Then** substep.
- Insert another **If** step and enter the condition for a transfer from source **ReagentB**.
- Insert a **Run Procedure** step for the transfer from source **ReagentB** for the **Then** substep.

Setting Conditions Using If Steps

For this section of the tutorial, you will configure two If steps that will specify the reagent reservoirs to access and the specific tip boxes for each transfer based on the sources you configured for the **Worklist** step. You will configure the **If** steps and insert them into the **Worklist** step. The transfers will then run the **ReagentAddition** procedure you configured earlier. The procedure locates the correct tips and transfers the appropriate volume from the correct reservoir.

To configure the **If** steps:

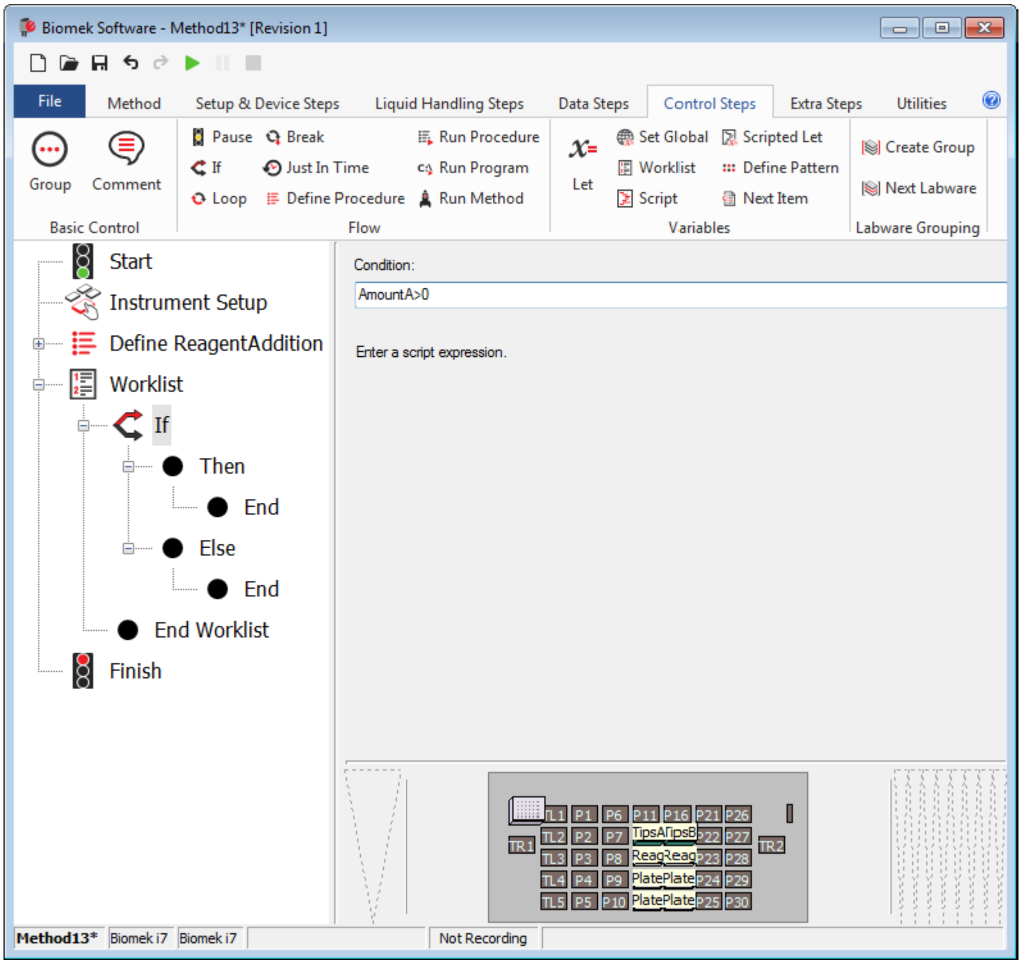
1 Select the **Worklist** step in the Method View.

2 From the **Control Steps** tab, in the **Flow** group, select the If (**If**) icon to insert it into the **Worklist** step.

---

3 In **Condition**, enter ***`AmountA>0`***. The main editor should look like Figure 9.8.

Figure 9.8 Condition Entered in If Step



Condition:
AmountA>0

Enter a script expression.

---

4 Select the **Then** step within the **If** step.

---

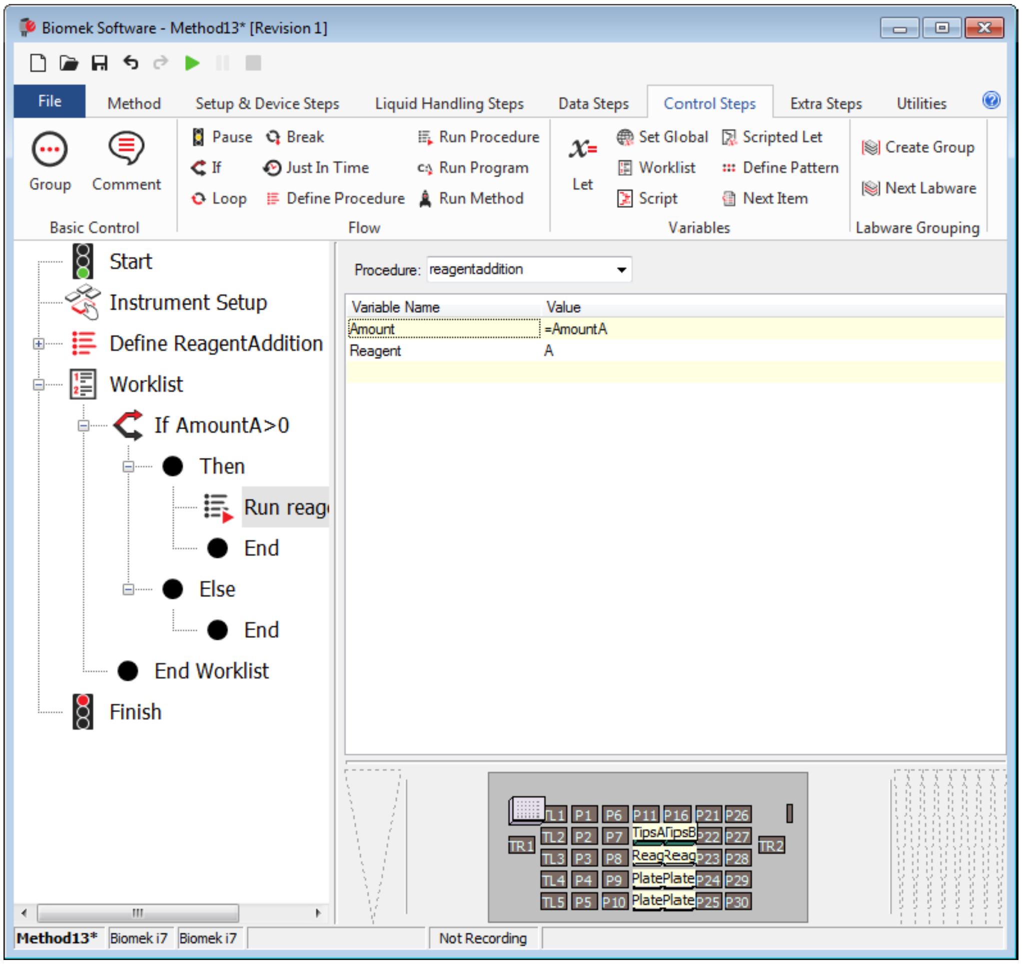
5 From the **Control Steps** tab, in the **Flow** group, select the Run Procedure (**Run Procedure**) step to insert it into the Method View below the **Then** substep.

---

6 In **Procedure**, choose **ReagentAddition**.

For this tutorial, you won’t place steps in the **Else** substep. This means that if the evaluation of the **If** step is false, no further action occurs. The main editor should now look like Figure 9.9.

Figure 9.9 ReagentAddition Procedure Inserted as a Then Substep



Procedure: reagentaddition

Variable Name	Value
Amount	=AmountA
Reagent	A

7 Insert another **If** step into the Method View below the last **End** substep and above **End Worklist**.

8 In **Condition**, enter **AmountB>0**.

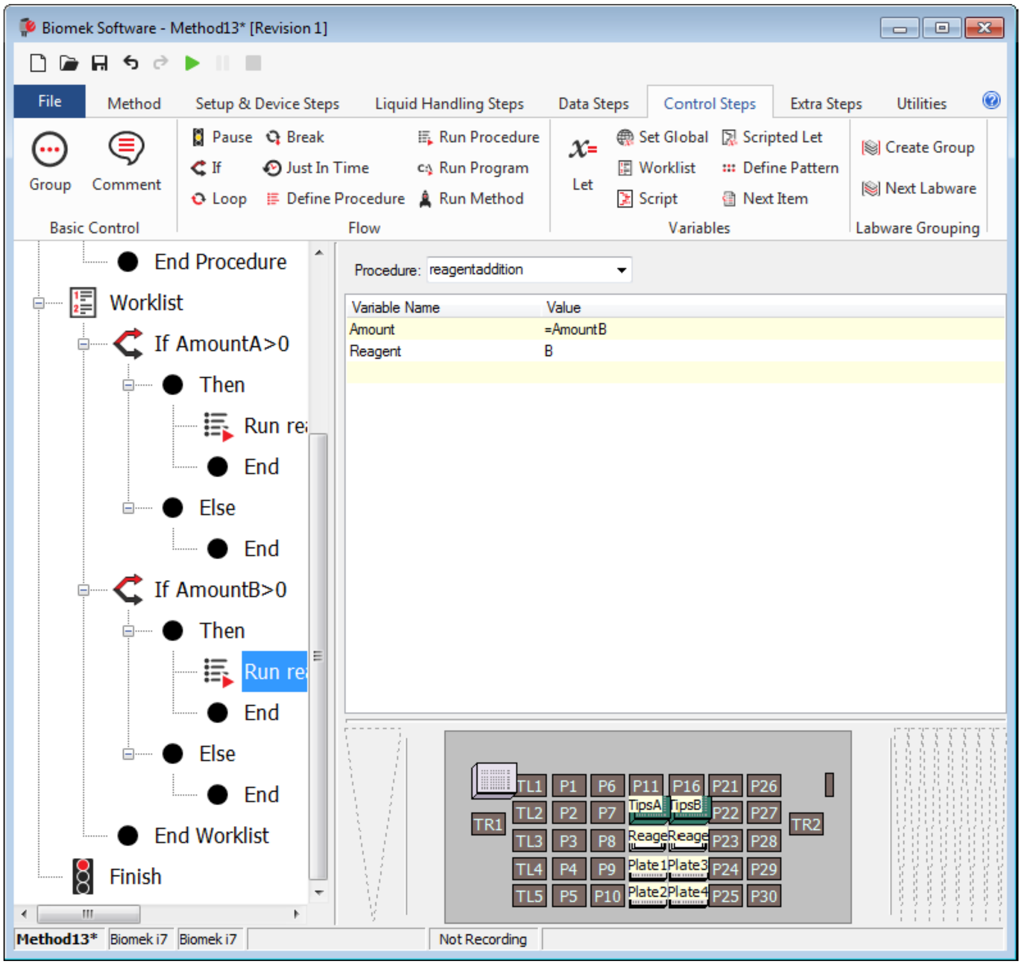
9 Insert a **Run Procedure** step into the Method View below the **Then** substep of the second **If** step.

10 From **Procedure**, choose **ReagentAddition**.

11 Change the **Value** for **Amount** to **=AmountB**.

12 Change the **Value** for **Reagent** to **B**.You won't use an **Else** substep here either, so the main editor should look like Figure 9.10.

Figure 9.10 Variable Name and Value Changed



Procedure: reagentaddition

Variable Name	Value
Amount	=AmountB
Reagent	B

---

13 Select **Finish** to validate the method.

---

14 Select **File** > **Save** > **Method.**

Congratulations! You have just created a method using a worklist and **If** steps with configured conditions. If you would like to see this method run in simulation mode, click the green run button on the toolbar.

CHAPTER 10

Span-8 Pod — Using Files to Direct Transfers

Introduction to Using Transfer from File

In the previous Span-8 chapters of this tutorial you learned how to:

- Configure an **Instrument Setup** step to reflect the physical deck you will set up for the method in this chapter.
- Configure **Labware Properties** for labware you will use in this chapter.
- Configure a **Transfer** step.
- Use variables and expressions in Biomek Software.

IMPORTANT Do not change the **Hardware Setup** for these tutorials. Instead, modify the tutorials to fit your current **Hardware Setup**. The method in this chapter uses disposable tips; if your instrument is configured with fixed tips, change the method as instructed in the corresponding **IMPORTANT** text. For additional information, refer to the *Biomek i-Series Hardware Reference Manual* (PN B54474).

What You'll Learn in Using Transfer from File

In this chapter, you will use the advanced skills you've developed earlier to configure a **Transfer from File** step for hit picking and reaction setup.

Setting Up Your Deck for Using Transfer from File

Using what you learned earlier, launch Biomek Software, create a new method, and configure an **Instrument Setup** step as follows:

---

1 Place **BC230_LLS** tip boxes on **P12** and **P17**.

IMPORTANT ***If Using Fixed Tips...***

Do not add tip boxes to any of the instructions in this chapter.

---

2 Place **BCDeep96Round** plates on **P14**, **P15**, **P19**, and **P20**.

---

3 Name the four plates at **P14**, **P15**, **P19**, and **P20**: **Samples1**, **Samples2**, **Samples3**, and **Samples4.** Configure these to have an **Unknown** volume of **Serum**.

---

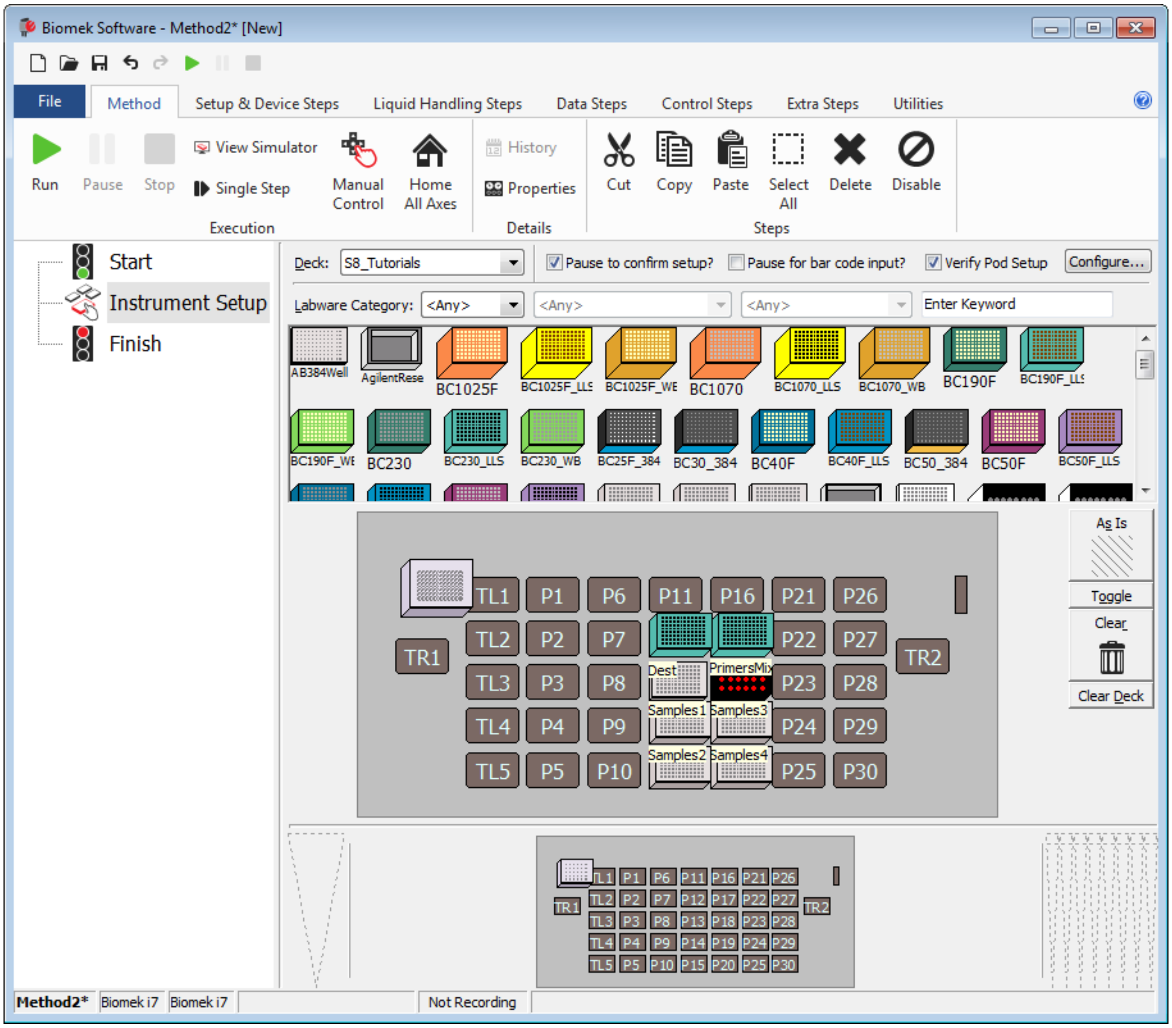
4 Place a **BCFlat96** on **P13** and name it **Dest.** This plate starts out empty, so configure a **Known** volume of **0 µL**.

---

5 Place a **SmallTuberack_Microfuge** at **P18** and name it **PrimersMix**. Configure it to have an **Unknown** volume of **Water**.

Your deck should look like Figure 10.1.

Figure 10.1 Instrument Setup Step Configured


Deck: S8_Tutorials
☑ Pause to confirm setup?
☐ Pause for bar code input?
☑ Verify Pod Setup
Labware Category: <Any>

Copying .CSV Files to the Desktop

Copy the two supplied .csv files (**TransferFromFilePrimersTransfer.csv** and **TransferFromFileHitsTransfer.csv**) to your desktop. These files are located at the following address: ***`ThisPC\OSDisk(C:)\Program Files (x86)\Common Files\Beckman Coulter\Manuals\Tutorial_CSVfiles`***

Using Transfer From File Steps for Reaction Setup and Hit Picking

In this section, you will insert two **Transfer From File** steps to perform a hit picking and reaction setup. Each of the hit wells that is transferred will have two primers added from the **PrimersMix** tube rack. Which primer is added and the volume of each is different for each sample. The **TransferFromFilePrimersTransfer.csv** and the **TransferFromFileHitsTransfer.csv** files will be copied to your desktop. The **TransferFromFilePrimersTransfer.csv** file specifies which primer and the volume to transfer for each of the destinations. The **TransferFromFileHitsTransfer.csv** file transfers the hits from each of the sample plates as indicated from the file.

Biomek i-Series Concept	
	The **Transfer From File** step, which can only be used with the Span-8 pod, allows a specified volume to be transferred from a specified source well to a specified destination well by reading data from a comma-delimited file (.txt or .csv). A comma-delimited file is used to exchange data between disparate applications; when a file is saved into a comma-delimited format, data entered into a spreadsheet or text file is stored as plain text, where each column is defined by the use of a comma, and each row is defined by a return.

First you will view the **TransferFromFilePrimersTransfer.csv** file.

Viewing the TransferFromFilePrimersTransfer.csv File

The **TransferFromFilePrimersTransfer.csv** file is a five-column file with each row specifying one well-to-well transfer:

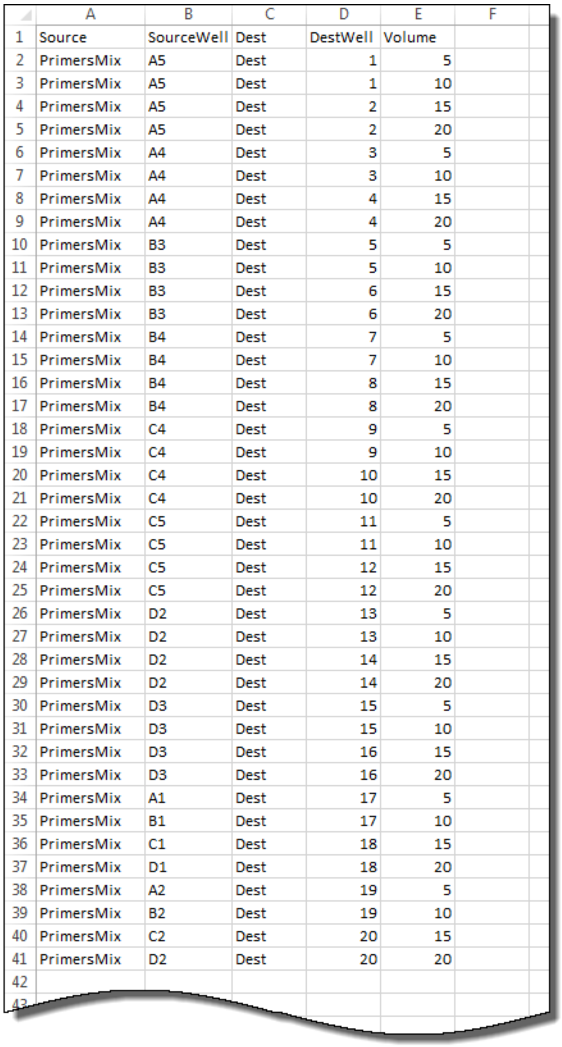
- The first column specifies the source labware.
- The second column specifies which well on the source labware from which to aspirate.
- The third column specifies the destination labware.
- The fourth column specifies the well on the destination labware to which to dispense.
- The fifth column specifies the volume to transfer.

To view the .csv file:

---

1 Double click **TransferFromFilePrimersTransfer.csv** on your desktop. The **TransferFromFilePrimersTransfer.csv** file opens (Figure 10.2).

Figure 10.2 Supplied TransferFromFilePrimersTransfer.csv File (Spreadsheet Format)



	A	B	C	D	E	F
1	Source	SourceWell	Dest	DestWell	Volume	
2	PrimersMix	A5	Dest	1	5	
3	PrimersMix	A5	Dest	1	10	
4	PrimersMix	A5	Dest	2	15	
5	PrimersMix	A5	Dest	2	20	
6	PrimersMix	A4	Dest	3	5	
7	PrimersMix	A4	Dest	3	10	
8	PrimersMix	A4	Dest	4	15	
9	PrimersMix	A4	Dest	4	20	
10	PrimersMix	B3	Dest	5	5	
11	PrimersMix	B3	Dest	5	10	
12	PrimersMix	B3	Dest	6	15	
13	PrimersMix	B3	Dest	6	20	
14	PrimersMix	B4	Dest	7	5	
15	PrimersMix	B4	Dest	7	10	
16	PrimersMix	B4	Dest	8	15	
17	PrimersMix	B4	Dest	8	20	
18	PrimersMix	C4	Dest	9	5	
19	PrimersMix	C4	Dest	9	10	
20	PrimersMix	C4	Dest	10	15	
21	PrimersMix	C4	Dest	10	20	
22	PrimersMix	C5	Dest	11	5	
23	PrimersMix	C5	Dest	11	10	
24	PrimersMix	C5	Dest	12	15	
25	PrimersMix	C5	Dest	12	20	
26	PrimersMix	D2	Dest	13	5	
27	PrimersMix	D2	Dest	13	10	
28	PrimersMix	D2	Dest	14	15	
29	PrimersMix	D2	Dest	14	20	
30	PrimersMix	D3	Dest	15	5	
31	PrimersMix	D3	Dest	15	10	
32	PrimersMix	D3	Dest	16	15	
33	PrimersMix	D3	Dest	16	20	
34	PrimersMix	A1	Dest	17	5	
35	PrimersMix	B1	Dest	17	10	
36	PrimersMix	C1	Dest	18	15	
37	PrimersMix	D1	Dest	18	20	
38	PrimersMix	A2	Dest	19	5	
39	PrimersMix	B2	Dest	19	10	
40	PrimersMix	C2	Dest	20	15	
41	PrimersMix	D2	Dest	20	20	
42						

---

2 Notice the five columns.

---

3 Close the .csv file, since it must be closed to use it in the **Transfer From File** step.

---

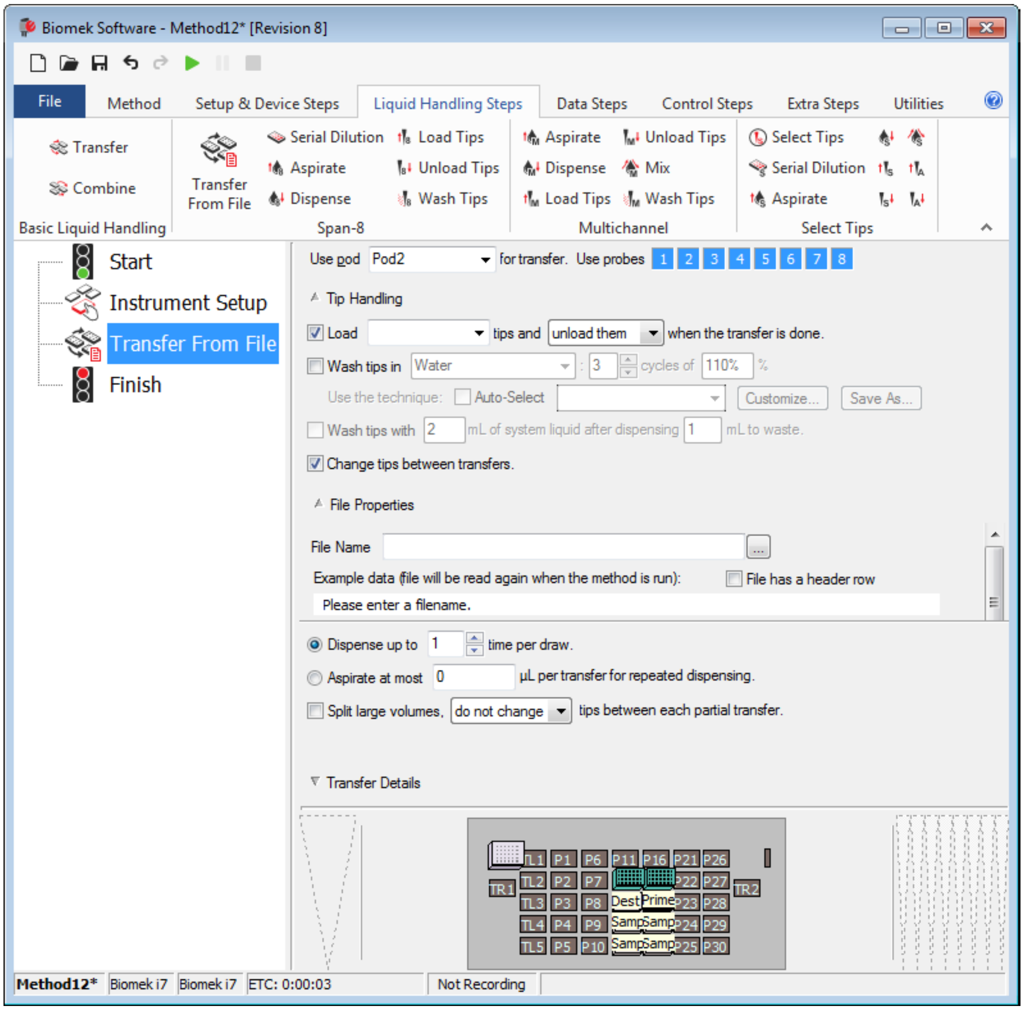
4 If desired, view the **TransferFromFileHitsTransfer.csv** file, and then close it so that it can be used in a **Transfer From File** step.

Inserting a Transfer From File Step for Reaction Setup

1 Select the **Instrument Setup** step in the Method View.

2 From the **Liquid Handling Steps** tab, in the **Span-8** group, select the Transfer From File (**Transfer From File**) icon to insert it in the Method View after the **Instrument Setup** step (Figure 10.3).

Figure 10.3 Transfer From File Inserted



Use pod Pod2 for transfer. Use probes 1 2 3 4 5 6 7 8

Tip Handling

☑ Load tips and unload them when the transfer is done.

☐ Wash tips in Water : 3 cycles of 110% %

Use the technique: ☐ Auto-Select

☐ Wash tips with 2 mL of system liquid after dispensing 1 mL to waste.

☑ Change tips between transfers.

File Properties

File Name

Example data (file will be read again when the method is run): ☐ File has a header row

Please enter a filename.

● Dispense up to 1 time per draw.

○ Aspirate at most 0 µL per transfer for repeated dispensing.

☐ Split large volumes, do not change tips between each partial transfer.

Transfer Details

3 Select one of the tip boxes in the Current Instrument Display to populate the tip type. Allow the default **Tip Handling** to remain and collapse it.

4 If it is not displayed, expand the **File Properties** section. This option specifies which file to use and instructs Biomek Software how to use the data contained in the file.

5 From the **Browse** button, choose **TransferFromFilePrimersTransfer.csv**. The first few rows display in **Example data**.

6 Check **File has a header row**.

7 Select all five check boxes beneath **Example data**.

8 In **File specifies source position in column**, select **Source**.

9 In **File contains source well information in column**, select **SourceWell**.

10 In **File specifies destination position in column**, select **Dest.**

11 In **File contains destination well information in column**, select **DestWell**.

12 In **File contains volume information in column**, select **Volume**. The final check box instructs the **Transfer From File** step to ignore any rows where the **Volume** is **0**. If this is not selected, it will go through the actions of loading tips for the 0 volume transfer without actually transferring any liquid.

13 Collapse **File Properties**. Even though the **Source** and **Destination** are specified by the file, the file does not contain any information about the labware and liquid types. This information is needed by the **Transfer From File** step, so it can select the correct techniques to use for the liquid transfers (refer to CHAPTER 10, *Configuring Some Needed Source and Destination Information for the Transfer From File Step*).

Configuring Some Needed Source and Destination Information for the Transfer From File Step

1 Click on the **Source** configuration to open it.

2 In the first drop-down menu, select **SmallTuberack_Microfuge**.

3 In **Using liquid type**, select **Water**.

4 In the **Technique** field, choose **S8 1000 Medium** from the drop-down.

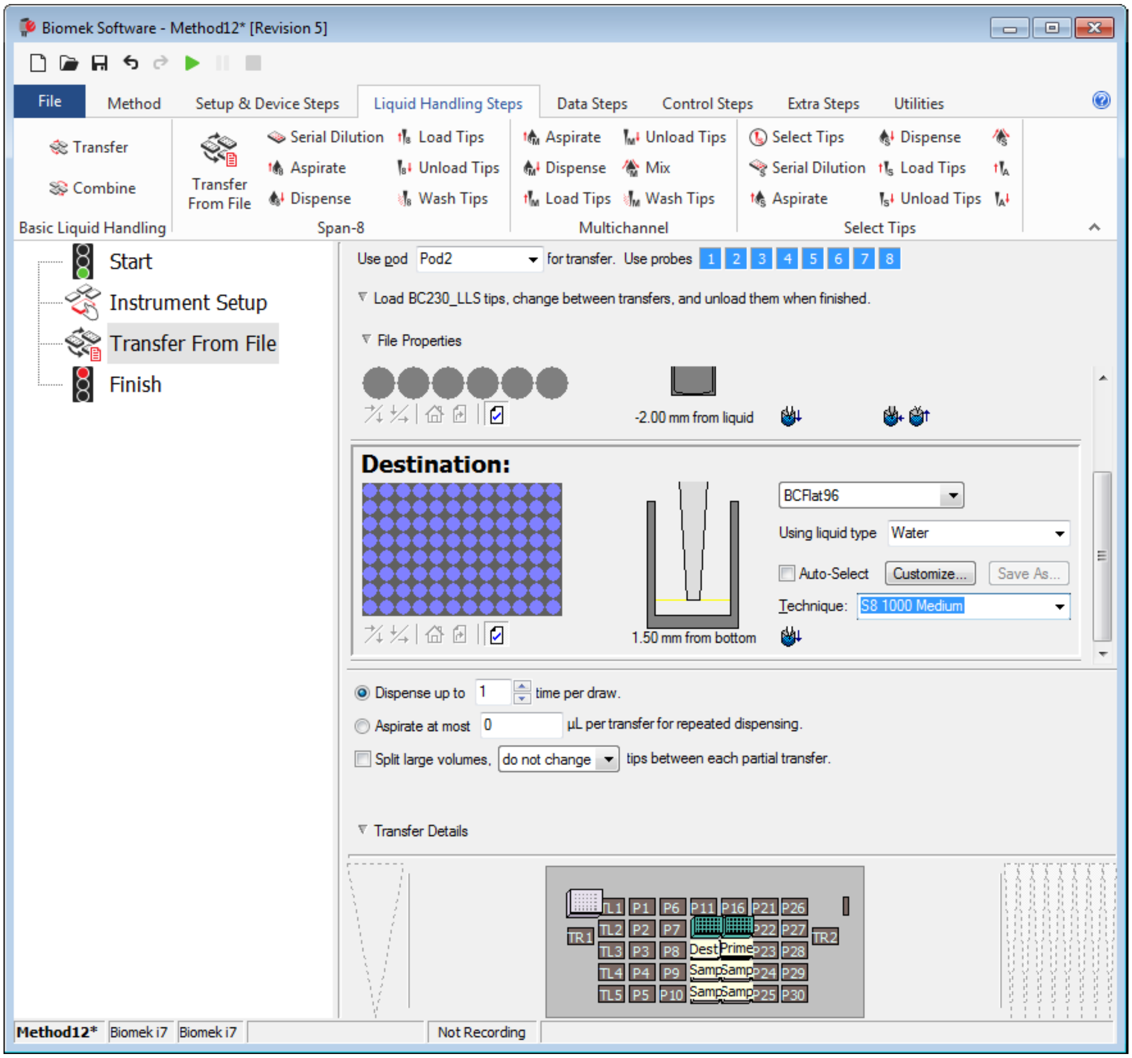
5 Click on the **Destination** configuration to open it.

6 In the first drop-down menu, select **BCFlat96**.

7 In **Using liquid type**, select **Water**.

8 In the **Technique** field, choose **S8 1000 Medium** from the drop-down. The main editor should look like Figure 10.4.

Figure 10.4 Transfer From File Configured



Biomek Software - Method12* [Revision 5]

Use pod Pod2 for transfer. Use probes 1 2 3 4 5 6 7 8

Load BC230_LLS tips, change between transfers, and unload them when finished.

File Properties

-2.00 mm from liquid

Destination:

BCFlat96

Using liquid type Water

☐ Auto-Select

Technique: S8 1000 Medium

1.50 mm from bottom

● Dispense up to 1 time per draw.

○ Aspirate at most 0 µL per transfer for repeated dispensing.

☐ Split large volumes, do not change tips between each partial transfer.

Transfer Details

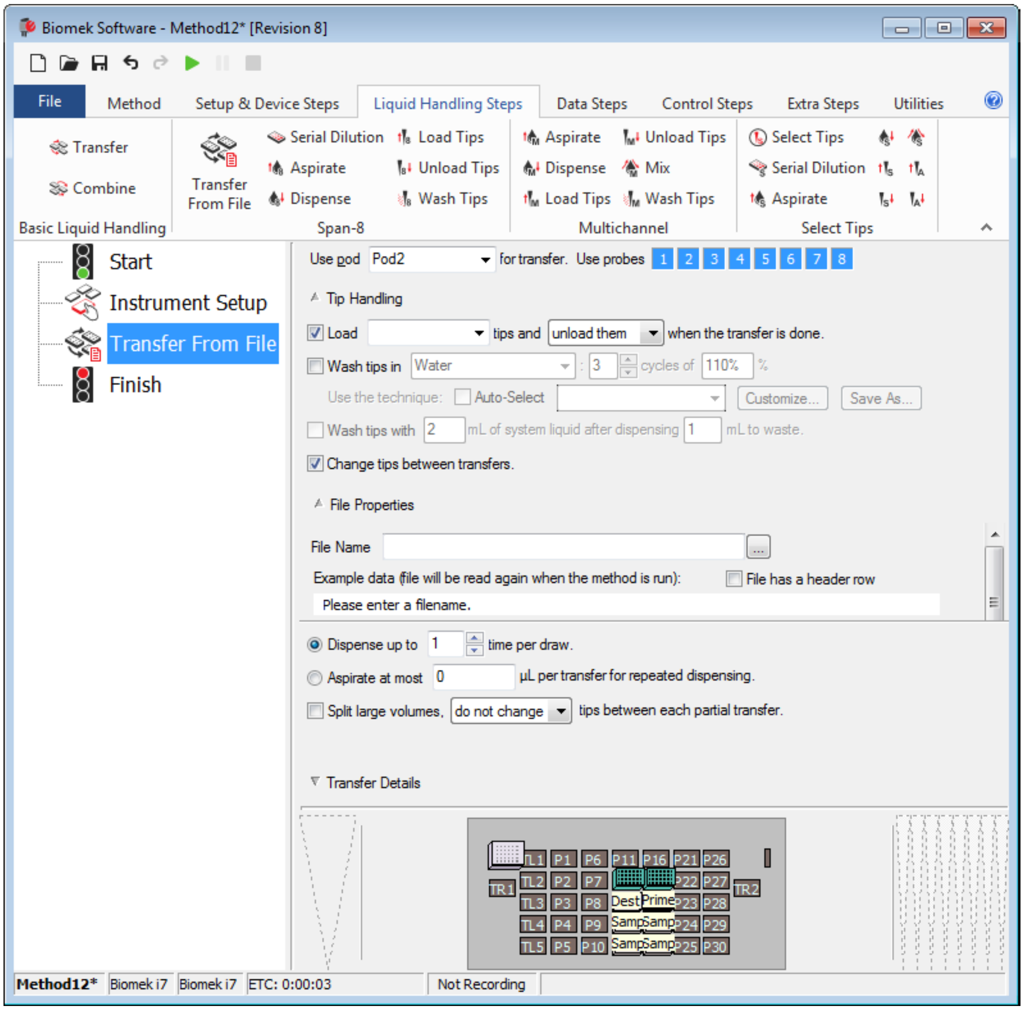
9 Select **Finish** to validate the method. Next you will add a **Transfer From File** step for hit picking.

Inserting a Transfer From File Step for Hit Picking

1 Select the **Transfer From File** step in the Method View.

2 From the **Liquid Handling Steps** tab, in the **Span-8** group, select the Transfer From File (**Transfer From File**) icon to insert it in the Method View after the first **Transfer From File** step (Figure 10.5).

Figure 10.5 Transfer From File Inserted



Use pod Pod2 for transfer. Use probes 1 2 3 4 5 6 7 8

Tip Handling

☑ Load [blank] tips and unload them when the transfer is done.

☐ Wash tips in Water : 3 cycles of 110%

Use the technique: ☐ Auto-Select

☐ Wash tips with 2 mL of system liquid after dispensing 1 mL to waste.

☑ Change tips between transfers.

File Properties

File Name [blank]

Example data (file will be read again when the method is run): ☐ File has a header row

Please enter a filename.

● Dispense up to 1 time per draw.

○ Aspirate at most 0 µL per transfer for repeated dispensing.

☐ Split large volumes, do not change tips between each partial transfer.

3 Select one of the tip boxes in the Current Instrument Display to populate the tip type. Allow the default **Tip Handling** to remain and collapse it.

4 If it is not displayed, expand the **File Properties** section. This option specifies which file to use and instructs Biomek Software how to use the data contained in the file.

5 From the **Browse** button, choose **TransferFromFileHitsTransfer.csv**. The first few rows display in **Example data**.

6 Check **File has a header row**.

7 Select all five check boxes beneath **Example data**.

8 In **File specifies source position in column**, select **SamplePlate**.

9 In **File contains source well information in column**, select **HitWell**.

10 In **File specifies destination position in column**, select **Dest.**

11 In **File contains destination well information in column**, select **DestWell**.

12 In **File contains volume information in column**, select **Vol**. The final check box instructs the **Transfer From File** step to ignore any rows where the **Volume** is **0**. If this is not selected, it will go through the actions of loading tips for the 0 volume transfer without actually transferring any liquid.

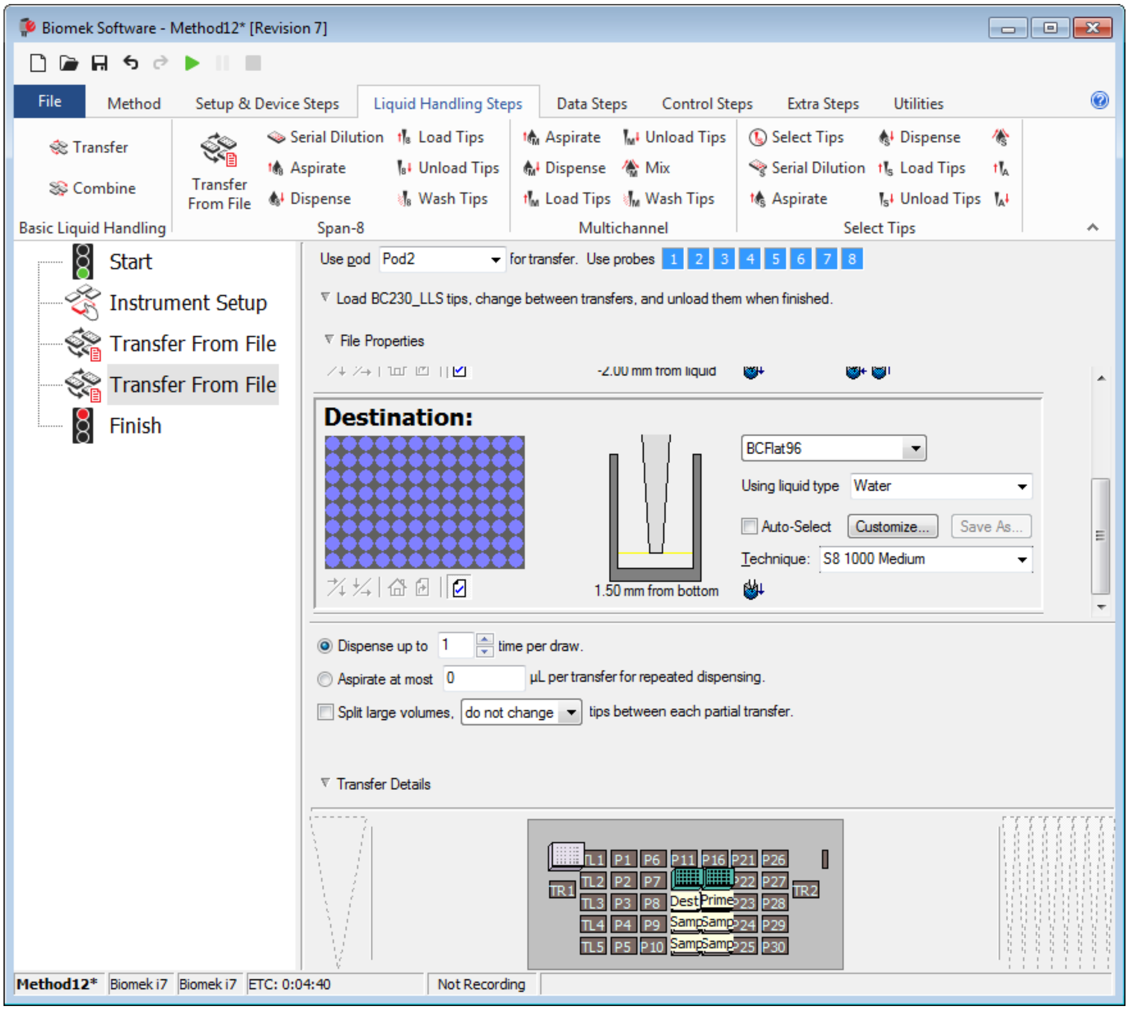
13 Collapse **File Properties**. Even though the **Source** and **Destination** are specified by the file, the file does not contain any information about the labware and liquid types. This information is needed by the **Transfer From File** step, so it can select the correct techniques to use for the liquid transfers (refer to CHAPTER 10, *Configuring Some Needed Source and Destination Information for the Transfer From File Step*).

Configuring Some Needed Source and Destination Information for the Transfer From File Step

1. Click on the **Source** configuration to open it.
2. In the first drop-down menu, select **BCDeep96Round**.
3. In **Using liquid type**, select **Serum**.
4. In the **Technique** field, select **S8 1000 Medium** from the drop-down.
5. Click on the **Destination** configuration to open it.
6. In the first drop-down menu, select **BCFlat96**.
7. In **Using liquid type**, select **Water**.

8 In the **Technique** field, select **S8 1000 Medium** from the drop-down. The main editor should look like Figure 10.4.

Figure 10.6 Transfer From File Configured



Use pod Pod2 for transfer. Use probes 1 2 3 4 5 6 7 8

Load BC230_LLS tips, change between transfers, and unload them when finished.

File Properties

Destination:

BCFlat96

Using liquid type Water

☐ Auto-Select

Technique: S8 1000 Medium

1.50 mm from bottom

● Dispense up to 1 time per draw.

○ Aspirate at most 0 µL per transfer for repeated dispensing.

☐ Split large volumes, do not change tips between each partial transfer.

Transfer Details

9 Select **Finish** to validate the method.

10 Select **File** > **Save** > **Method**.

You can run the method, but as you can see, it will take about 9 minutes.

Congratulations! You have completed the Span-8 tutorials for your instrument.

APPENDIX A

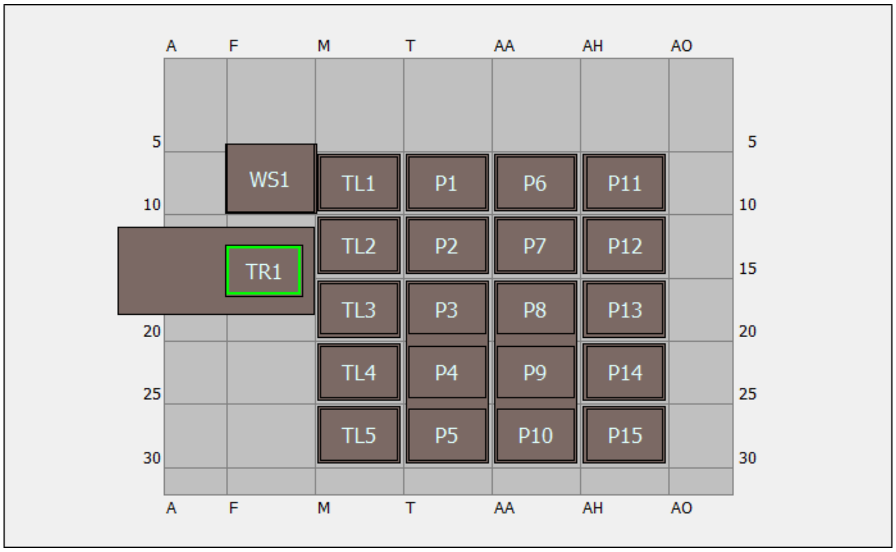
Tutorial Decks

Overview

This appendix provides the tutorial deck layouts and coordinates for each type of instrument. Select the link below to see the deck for your instrument type

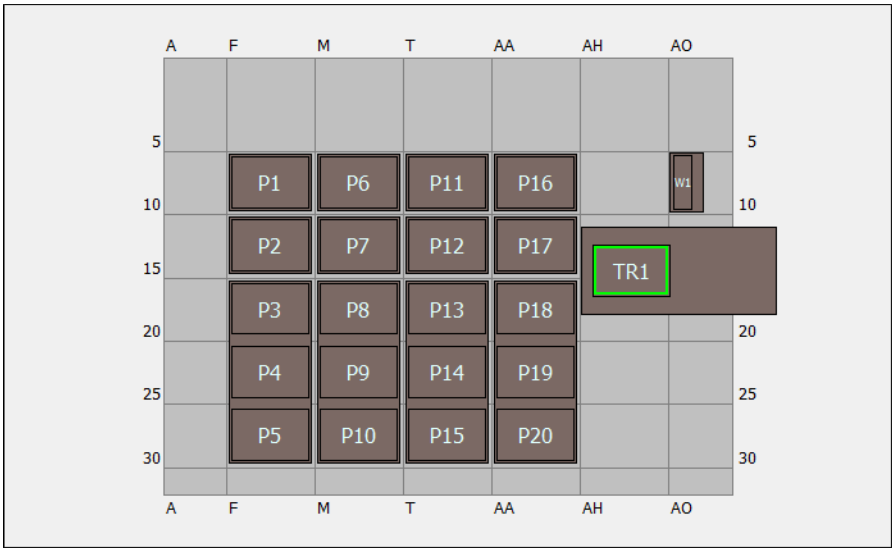
- *Biomek i5 Multichannel Pod Simulation Deck*
- *Biomek i5 Span-8 Pod Simulation Deck*
- *Biomek i7 Single Multichannel Pod Simulation Deck*
- *Biomek i7 Single Span-8 Simulation Deck*
- *Biomek i7 Dual Multichannel Pod Simulation Deck*
- *Biomek i7 Hybrid Simulation Deck*

Biomek i5 Multichannel Pod Simulation Deck



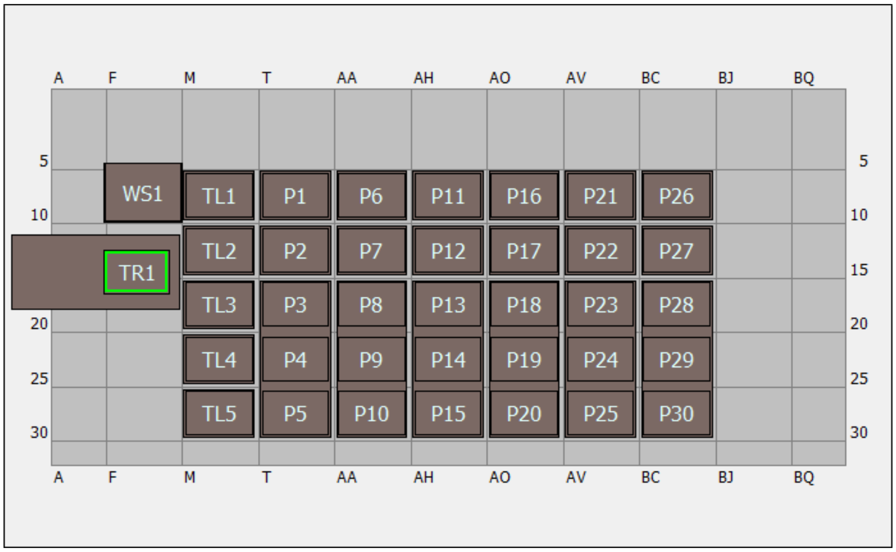
ALP	ALP Name in Deck Editor	Instrument Coordinates					
Wash Station	**WashStation96**	F10					
Trash	**TrashLeftSlide**	F18					
Tip Load ALP	**TipLoad1x1**	M10	M15	M20	M25	M30	
Static 1 x 1 ALP	**Static1x1**	T10	T15	AA10	AA15	AH10	AH15
Static 1 x 3 ALP	**Static1x3**	T30	AA30	AH30			

Biomek i5 Span-8 Pod Simulation Deck



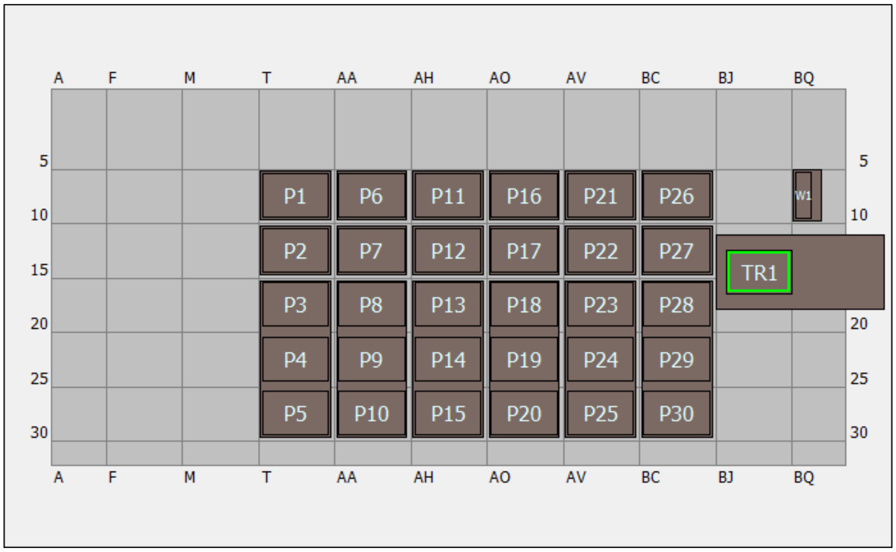
ALP	ALP Name in Deck Editor	Instrument Coordinates			
Wash Station	**WashStationSpan8**	AQ10			
Trash	**TrashRightSlide**	AH18			
Static 1 x 1 ALP	**Static1x1**	F10	F15	M10	M15
		T10	T15	AA10	AA15
Static 1 x 3 ALP	**Static1x3**	F30	M30	T30	AA30

Biomek i7 Single Multichannel Pod Simulation Deck



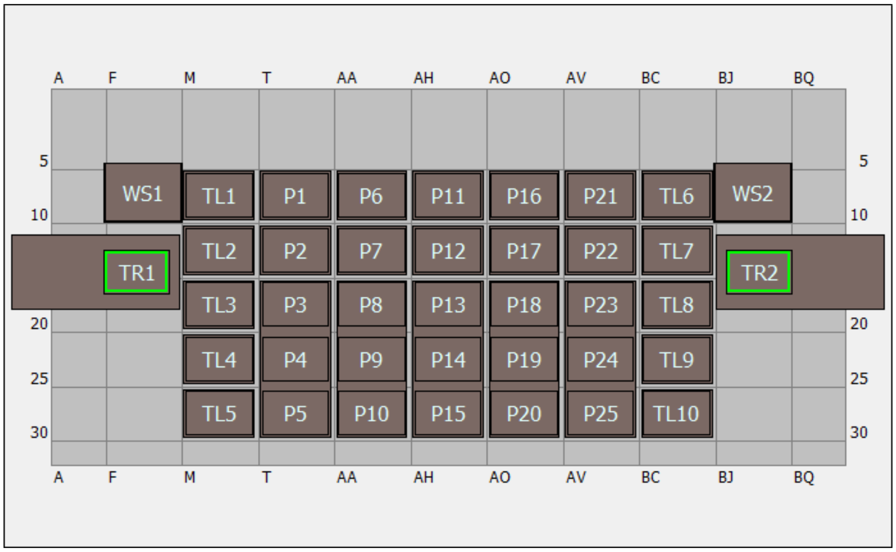
ALP	ALP Name in Deck Editor	Instrument Coordinates					
Wash Station	**WashStation96**	F10					
Trash	**TrashLeftSlide**	F18					
Tip Load ALP	**TipLoad1x1**	M10	M15	M20	M25	M30	
Static 1 x 1 ALP	**Static1x1**	T10	T15	AA10	AA15	AH10	AH15
		AO10	AO15	AV10	AV15	BC10	BC15
Static 1 x 3 ALP	**Static1x3**	T30	AA30	AH30	AO30	AV30	BC30

Biomek i7 Single Span-8 Simulation Deck



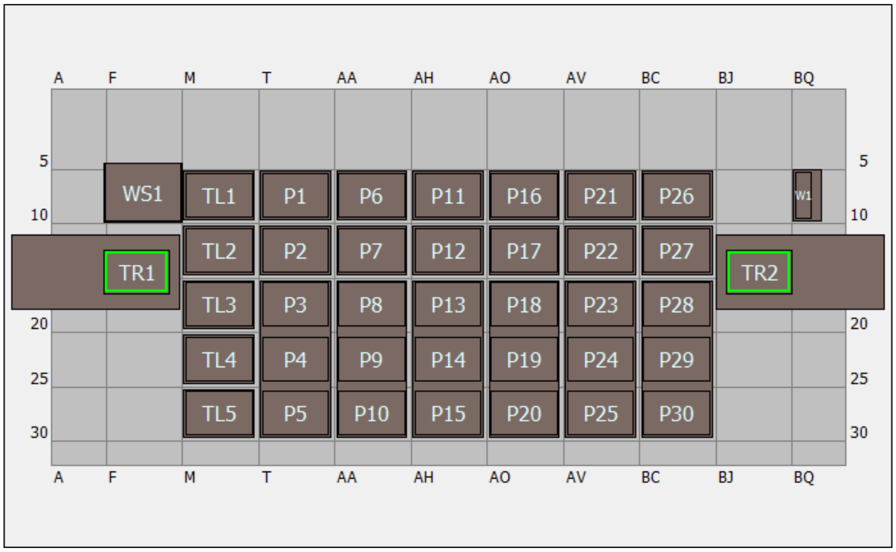
ALP	ALP Name in Deck Editor	Instrument Coordinates					
Wash Station	**WashStationSpan8**	BS10					
Trash	**TrashRightSlide**	BJ18					
Static 1 x 1 ALP	**Static1x1**	T10	T15	AA10	AA15	AH10	AH15
		AO10	AO15	AV10	AV15	BC10	BC15
Static 1 x 3 ALP	**Static1x3**	T30	AA30	AH30	AO30	AV30	BC30

Biomek i7 Dual Multichannel Pod Simulation Deck



ALP	ALP Name in Deck Editor	Instrument Coordinates					
Wash Station	**WashStation96**	F10	BJ10				
Trash	**TrashLeftSlide**	F18					
	TrashRightSlide	BJ18					
Tip Load ALP	**TipLoad1x1**	M10	M15	M20	M25	M30	BC10
		BC15	BC20	BC25	BC30		
Static 1 x 1 ALP	**Static1x1**	T10	T15	AA10	AA15	AH10	AH15
		AO10	AO15	AV10	AV15		
Static 1 x 3 ALP	**Static1x3**	T30	AA30	AH30	AO30	AV30	

Biomek i7 Hybrid Simulation Deck



ALP	ALP Name in Deck Editor	Instrument Coordinates					
Wash Station	**WashStation96**	F10					
	WashStationSpan8	BS10					
Trash	**TrashLeftSlide**	F18					
	TrashRightSlide	BJ18					
Tip Load ALP	**TipLoad1x1**	M10	M15	M20	M25	M30	
Static 1 x 1 ALP	**Static1x1**	T10	T15	AA10	AA15	AH10	AH15
		AO10	AO15	AV10	AV15	BC10	BC15
Static 1 x 3 ALP	**Static1x3**	T30	AA30	AH30	AO30	AV30	BC30

APPENDIX B

Single Operations

Performing Single Operations

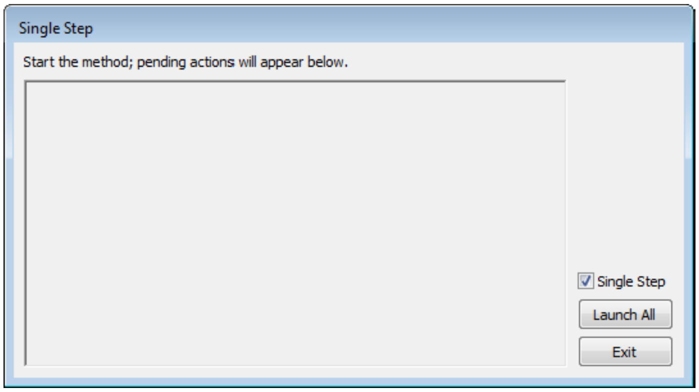
The **Single Step** option performs single operations within Biomek Software steps, such as checking labware definitions and well movements. **Single Step** pauses the instrument between each operation in a step, allowing visual verification that the operation is correct. Performing single operations can help when fine-tuning a method. Typically an entire method will not be run using this feature; however, to become familiar with this feature, for this tutorial, you can use **Single Step** to view each operation of the method you just created.

Biomek i-Series Concept

Single Step pauses the instrument between each operation in a step, allowing visual verification that the operation is correct. Performing single operations can help when fine tuning parts of your method, such as verifying labware definitions or liquid handling operations.

1 From the **Method** tab, in the **Execution** group, select ▶ Single Step (Single Step). **Single Step** appears (Figure B.1).

Figure B.1 Single Step



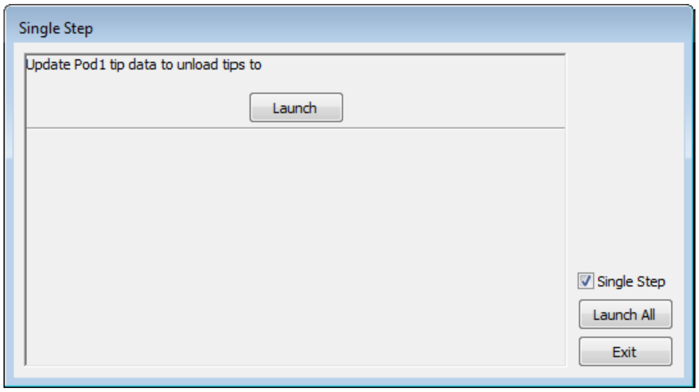
Single Step

Start the method; pending actions will appear below.

2 From the **Method** tab, in the **Execution** group, select ▶ Run (**Run**). **Single Step** with specific operations displayed appears (Figure B.2). If you have other ALPs configured on your deck, the initialization process for them appears in **Single Step**.

TIP Go slowly when using **Single Step**. It is possible to move too quickly through the method and bypass the steps that need verification.

Figure B.2 Single Step With Specific Operations Displayed

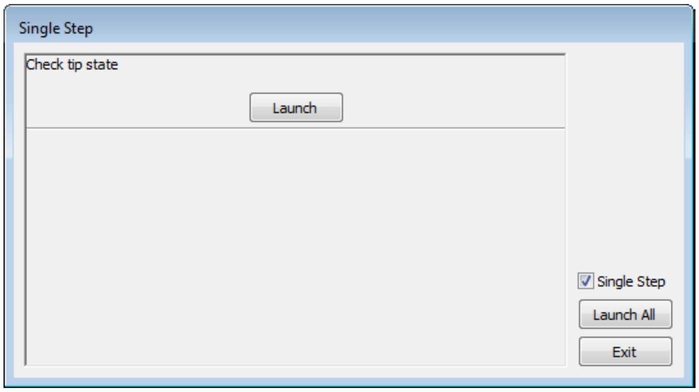

Single Step

Update Pod1 tip data to unload tips to

☑ Single Step

3 Choose **Launch**. The next operation is launched (Figure B.3).

Figure B.3 Single Step With Next Operation Launched


Single Step

Check tip state

☑ Single Step

4 Choose **Launch** again. The prompt appears. If the physical deck matches the software prompt, choose **OK**. **Single Step** continues displaying each operation, along with the option to **Launch** and execute that operation.

5 Continue to view each operation by choosing **Launch** or to stop **Single Step**, choose **Exit** to allow the method to run without the option to view each operation.

Abbreviations

% — percent

°C — degrees Celsius

°F — degrees Fahrenheit

µL — microliter

ALP — automated labware positioner

ANSI — American National Standards Institute

API — application programming interface

BCAP — Beckman Coulter Accounts and Permissions

BIOS — basic input output system

BSE — biological safety enclosure

CAN — controller area network

CFR — code of federal regulations

COM — communication port

CSV — comma-separated values

cm — centimeter

ETC — estimated time of completion

FBBCR — fly-by bar code reader

MC — multichannel

PN — part number

ID — identification

IFU — instructions for use

I/O — input/output

JIT — just In time

LED — light emitting diode

LIMS — laboratory information management system

LLS — liquid level sensing

MC — multichannel

MSDS — material safety data sheet

MTP — microtiter plate

OS — operating system

PN — part number

RoHS — restriction of hazardous substances directive

SDS — safety data sheet

SPE — solid phase extraction

S8 — Span-8

TEU — thermal exchange unit

UI — user interface

USPTO — United States patent and trademark office

WEEE — waste electrical and electronic equipment

Glossary

21 CFR Part 11

Outlines the technical and procedural FDA requirements to implement electronic records and/or electronic signatures for computer systems.

384-Channel Pod [384 MC, MC-384]

A Multichannel pod with 384-channel head that pipettes liquid volumes from 384 wells in one transfer.

96-Channel Pod [96 MC, MC-96]

Multichannel pod and 96-channel head that pipettes liquid volumes from up to 96 wells in one transfer.

Active ALP

A removable and interchangeable platform structure that is installed on the Biomek deck to allow automated assays to be performed. Active ALPs contain mechanisms that may hook to power and/or air sources for mechanical operations, such as tip washing, mixing, stirring, shaking, and precisely positioning labware.

Alarm

Alerts the user of any errors generated or user interaction required during a Biomek method run. (Note that the Biomek Power Pack custom software includes an additional alarm mechanism.)

ALP

See *Automated Labware Positioner [ALP]*

Arm

The arm is the structure that moves along the rear and front rails. The arm holds the pod and enables movement of the pod in the X-Axis (left and right). The Biomek i5 instruments support only one arm. The Biomek i7 instruments support two arms. Note that an arm may consist of just a pod (such as the Span-8 pod) or a bridge and a pod (such as the Multichannel pod, which needs the bridge to provide Y-Axis movement).

Artel Multichannel Verification Systems [Artel MVS]

Measurement system that verifies liquid transfer precision and accuracy.

Assay

An investigative (analytic) procedure in laboratory medicine, pharmacology, environmental biology, and molecular biology for qualitatively assessing or quantitatively measuring the presence or amount or the functional activity of a target entity (the analyte), which can be a drug or biochemical substance or a cell in an organism or organic sample. [Wikipedia, s.v. “Assay,” accessed December 10, 2013, http://www.Wikipedia.org/wiki/assay]

Automated Labware Positioner [ALP]

ALPs are removable and interchangeable platform structures that are installed on the deck. There are two types of ALPs: Active ALP and Passive ALP. An ALP typically has one or more positions to hold standard ANSI/SLAS labware and tip boxes, though some ALPs hold by-products from methods, such as waste fluid and disposed tips, tip boxes, and labware. Attaches to the deck in the workspace. Synonymous with labware positioner.

Axis

Direction along which motion occurs. Biomek instruments have at least X, Y, and Z axes, with additional axes available on a per-pod basis (i.e., D-axis for dispense axis).

Beckman Coulter Accounts and Permissions [BCAP]

Beckman Coulter Accounts and Permissions. An integrated set of features built into Beckman Coulter software that assists users in complying with 21 CFR Part 11 requirements for closed systems. With Biomek Software, support is extended only for the instrument; devices integrated with the instrument are not supported unless specified in separate documentation.

Biological Safety Enclosures [BSE]

An enclosed, ventilated hood or workspace that allows for safe handling of pathogens, contaminants, or other potentially hazardous materials. These are certified (usually by a third party).

Biomek

Registered trademark for a family of liquid handling robots produced by Beckman Coulter.

Biomek Deck [Deck]

The work surface of the instrument. Provides positions for ALPs via predrilled location holes.

Biomek i5

Liquid handler developed by Beckman Coulter and designed for automated use. The open architecture design, along with the extensible operating software, provides a foundation for integrating current and future specific-use components. The Biomek i5 instrument uses a single pod for performing a variety of functions, including liquid transfer and moving labware around the deck.

Biomek i7

Liquid handler developed by Beckman Coulter and designed for automated use. The open architecture design, along with the extensible operating software, provides a foundation for integrating current and future specific-use components. The Biomek i7 instrument is capable of supporting up to two arms; each arm on the instrument holds one pod.

Combine Step

Biomek Software Step that aspirates from multiple sources and dispenses to a single destination.

Comma-Separated Values [CSV]

File that stores tabular data in plain text form. Data items are separated by commas. May or may not contain a header row with labels for columns.

Configuration View

Part of Biomek Software main editor where the configuration for each step appears. The view changes to correspond to the highlighted step in the Method View. (a.k.a. Step UI)

Coordinates

Any set of numbers used to specify the location of a point in space. Can also include location of additional axes, such as the gripper twist and grip width.

Current Instrument Display

Display located at bottom of the main Biomek Software editor showing the location of labware on the deck during a method run.

Data Set [Dataset]

Stores specific information about wells or tubes in Biomek Software. Using data sets, information about a sample in an individual well or tube is tracked along with the sample when it is moved to another well or tube.

Deck

The work surface of the instrument. Provides positions for ALPs via predrilled location holes.

Deck Editor

Editor in Biomek Software used to create the work surface of the instrument in the software corresponding with physical locations of ALPs and devices on the instrument.

Deck Layout

Current configuration of the deck.

Deck Position [Position]

Specific place on the instrument deck (as part of an ALP). Labware is placed on positions when used on the instrument.

Define Procedure

Step used to create a series of steps that may be used multiple times in a method. A procedure is created by adding and configuring steps within a Define Procedure step.

Diluent

Solvent used for sample dilution.

Encoder

Tracks the absolute position of an axis.

Estimated Time to Completion [ETC]

The simulated duration for all or part of a Biomek method (except for the time required for human intervention, if applicable). When the **Finish** step is highlighted in the method view, the software estimates the real time required to complete the entire method. When any other step is highlighted in the method view, the length of time displayed represents the time required to complete the method up to the selected step.

Expression

One-line combination of alphanumeric characters and/or variables combined using script operations. May be used in a Biomek Method anywhere a variable can be used.

External Device

Off-deck peripheral accessory that performs process functions.

Framing

Process of providing exact coordinates of positions on the deck or exact offsets for the gripper. Also called teaching.

Gripper

A mechanism for grasping labware, allowing them to be moved from one location to another.

Halo

With Biomek i-Series enclosed instruments, the structure that sits on top of the chassis providing protection of samples and reagents on-deck from laboratory particulates, as well as housing the status indicator light with 360 degree viewing.

Head

Pipetting device installed on a Multichannel pod that can access multiple wells at one time to aspirate or dispense liquid. The number of channels and capacity vary by head type.

Homing / Home (verb)

Action that establishes the origin or zero point for each axis (must be done every time the instrument is powered up).

Hybrid
Biomek instrument with both a Multichannel pod and a Span-8 pod.

If Step
Step controlling actions in a method based upon a true/false condition. The condition can use variables or script expressions, including things such as liquid volume in labware or aspirate amount.

Initialization
Process of setting or verifying a starting position or state of one or more items in a system (instruments, devices, software, etc.) when a method run is started. This process sets items to starting configurations and confirms communications channels are available at the very beginning of a run.

Instrument File
Stores information about the hardware configuration, including the deck layout of the instrument. Instrument files can represent different Biomek instruments or different hardware configurations for the same instrument.

Instrument Setup
Biomek step that specifies the configuration of the instrument deck and pod in Biomek Software. Includes labware and labware contents for items on the deck.

Labware
Microplates (titerplates), lids, tubes, tube racks, reservoirs, or custom defined consumables. Does not include pipette tips, but does include their tip boxes.

Labware Category
Group of similar consumables (labware, such as microplates, reservoirs, etc.) that are available for use in Biomek Software.

Labware Offset
The coordinate difference (vector) from a framed deck position to the location where the back, bottom, left corner of labware rests on that position.

Labware Positioner
See *Automated Labware Positioner [ALP]*.

Labware Properties
Characteristics of labware for use in a method.

Lid
Solid, inflexible cover for labware (usually microplates). Cannot be pierced by tips. Lids are assumed to be able to be manipulated by grippers.

Light Curtain
A safety component that projects a diffused array of infrared light across the front of the instrument that, when penetrated by an object larger than 3.8 cm (1.5 in.) in diameter, immediately stops the instrument. The instrument will also stop if an object greater than 1.6 cm (0.625 in.) in diameter penetrates the upper corners of the instrument opening.

Liquid Level Sensing [LLS]
The Span-8 pod uses conductive tips to determine the liquid level in labware for each probe. When the tip contacts liquid, a change in capacitance is detected. The liquid level is sensed by determining the height at which this change in capacitance occurs.

Liquid Type

A named group of fluid characteristics and properties in Biomek Software. Used in conjunction with pipetting templates and techniques to control pipetting performance. Edited in the Liquid Type Editor in Biomek Software.

Locating Holes

Predrilled holes in the deck that are used to position ALPs on a Biomek deck or an off-deck position.

Logs

Files that provide records of a method run. Biomek Software offers six standard types of text logs: Details, Errors, Pipetting, Sensor, UnifiedPipetting, and UnifiedTransfer.

Loop

A Biomek Step that repeats a sequence of sub-steps a specified number of times during a method in Biomek Software. May incorporate use of a loop variable.

Loop Variable

A named value that has limited scope, meaning it can only be used within sub-steps of the Loop Step. The Loop Step allows method authors to repeatedly execute the contained sub-steps. The loop variable has a set starting value. For each iteration of the loop, the loop variable's value is incremented by a given amount.

Main Editor

Primary window in Biomek Software for building liquid-handling methods for a Biomek Instrument. Includes the Method View, Configuration View, Current Instrument Display, Ribbon, and Status Bar.

Mandrel

Hardware interface for a disposable tip used in pipetting functions.

Method

Sequentially ordered list of steps comprising a liquid-handling procedure for operations on a Biomek Instrument.

Method View

The pane of the main editor that displays the steps in a method in Biomek Software.

Microplate

Labware used in liquid-handling procedures. Also referred to as a microtiter plate or titer plate. Microplate dimensions are specified in the standards ANSI/SLAS 1-2004 through ANSI/SLAS 4-2004.

Microtiter Plate [MTP]

See *Microplate*.

Mounting Plate

A piece of hardware that attaches legacy ALP types to the new Biomek i5 or Biomek i7 deck.

Mounting Point

The specific locations on a deck where ALPs are located. Mounting points are labeled by a grid system using letters and numbers, which are used in the **Deck Editor** to specify ALP locations.

Multichannel 96 Wash Station

Active ALP used to clean disposable tips loaded on a 96-channel head.

Multichannel Arm [MC Arm]

A part of a Biomek Instrument where a Multichannel pod can be installed.

Multichannel Pod [MC Pod]
A part of a Biomek instrument that holds various removable and interchangeable heads that perform liquid-handling operations via multiple mandrels.

Nested Steps
Also known as "sub-steps". Software operations that are contained within one or more other operations in a Biomek method. Steps such as Loop, If, Worklist, and Let can hold nested steps.

Offset
The difference (vector) from one coordinate to another coordinate.

Orbital Shaker ALP
Active ALP that enables rotational mixing of labware contents.

Part Number [PN]
An alphanumeric identifier used to simplify reference to a unique inventory item.

Pipette (verb)
Actions that result in aspirating and dispensing liquid.

Pipette Tips [Tips]
A laboratory tool used to enable liquid handling in conjunction with installed mandrels on a Biomek instrument.

Pipetting Template
Biomek Software feature that controls the actions and movements of a pod during liquid handling operations. Edited in the Pipetting Template Editor in Biomek Software.

Pointing Feature
Part of an ALP that indicates where the Mounting Point is for that ALP.

Position
Also known as **Deck Position**. Specific place on the instrument deck (as part of an ALP). Positions may be named automatically or may be given custom names. Positions have many properties that are accessed via the **Deck Editor**. Labware is placed on positions when used on the instrument.

Properties
Characteristics of objects and operations used within Biomek Software. For example, labware has properties for well volume and liquid type, and a pod has properties for speed limit and axes limits.

Restriction of Hazardous Substances Directive 2011/65/EU [RoHS]
Directive that restricts that use of hazardous materials found in electrical and electronic products.

Run Procedure Step
A software operation that executes a defined procedure within the current method.

Run Time
Any period when a method is executing.

Script Variable
A named value that has limited scope, meaning it can only be used within the code of the **Script Step** where it is defined, unless it is made into a **Global Variable** via the **Extend** function.

Serial Dilution
Laboratory process that creates a sequence of concentrations of a sample.

Shaking Peltier ALP
Active ALP that enables mixing and temperature-control functionality of labware contents.

Single Step
Biomek Software feature that allows the user to step through method execution one action at a time. **Single Step** pauses the instrument between actions, allowing visual verification that the operation is correct.

Span-8 Active Wash ALP
The Span-8 Active Wash ALP is an active ALP that washes fixed or disposable tips on the probes of a Span-8 pod. The ALP provides a flow of wash fluid from a source reservoir for tip washing. A peristaltic pump circulates the fluid through the Span-8 Active Wash ALP from a source reservoir to a waste reservoir.

Span-8 Pod
A hardware module (pod) that uses a series of eight probes to perform liquid handling operations independent of each other.

Span-8 Tip Wash ALP
The Span-8 Wash Station ALP is a passive ALP. The eight cleaning wells of the Span-8 Wash Station ALP are used to wash fixed tips on the probes of a Span-8 pod during a step in a method, while the reservoir side of the Span-8 Wash Station ALP is used to dispose of system fluid used when priming the system and purging the tubing and syringes of air.

Static Peltier ALP
Active ALP that enables temperature-control functionality of labware contents.

Status Bar
A portion of the main editor that shows the current method, project file, instrument file, estimated method time, and error messages.

Step Configuration [Step UI]
A portion of the main editor allowing for configuration of a highlighted step.

Step
User-configurable actions that may be included in a method and executed during a method run.

String
Series of contiguous characters used as the value of a variable or step parameter.

Teaching
See *Framing*.

Technique
Biomek Software feature that provides contextual input to a Pipetting Template to control the actions and movements of a pod during liquid handling operations. Edited in the **Technique Editor** in Biomek Software. Can be automatically selected based upon properties and values.

Technique Properties
Specific items, such as labware type and liquid type, associated with a technique. The number of properties that match the current configuration determine the technique that is automatically selected if auto-select is enabled in a step.

Tip Touch
Movement of the pod to remove residual drops of pipetted liquid from a tip before the tip leaves the well.

Tips
See *Pipette Tips [Tips]*.

TiterPlate
See *Microplate*.

Transfer Step
Software operation in Biomek Software that aspirates from a single source and dispenses to single or multiple destinations. Includes tip handling options (**load**, **wash**, **unload**, etc.).

Trash ALP
A passive ALP that provides a means to dispose of pipette tips and labware during a method. This ALP has four configuration options in the **Deck Editor**; the version selected depends on the side of the deck and whether the self-contained bin option or the slide option is used. For these tutorials, the slide option is used, which is designated as **TrashLeftSlide** or **TrashRightSlide**.

Validate (the current method before running it)
Option which signals the software to simulate the method prior to a run in order to allow errors to be detected before a method starts. Note that this is different from validating a method (see *Validated Method*).

Variable
A named value that is allowed to change within a method. Can be a **Global** Variable, a **Let Step** Variable, a **Loop** Variable, a **Script** Variable, a **Start Step** Variable, or a **Worklist** Variable.

Wash Pump
A peristaltic pump used to control active washing. It is configured through Biomek Software and controlled (on/off) through a Device Controller.

Well Depth
Distance (in centimeters) from the top of a well to the bottommost point of that well.

Worklist
External tabular file containing names as column headers and related values in subsequent rows. The names are symbolic identifiers (variables) used to represent the values.

Worklist Variable
A named value defined in a **Worklist Step**. The **Worklist Step** allows several variables to be set, based on contents of a file. The file specifies the names of the variables as column headers and all of the values that each variable will contain during execution of the worklist in subsequent rows. For each line in the worklist file, each of the variables will be configured with the appropriate value read from the file and the sub-steps of the **Worklist Step** will be executed. In this manner, using expressions on the sub-steps inside the **Worklist Step** allows them to have different behavior depending on which iteration is currently executing.

Beckman Coulter, Inc.
Warranty and Returned Goods Requirements

All standard Beckman Coulter, Inc. policies governing returned goods apply to this product. Subject to the exceptions and upon the conditions stated below, the Company warrants that the products sold under this sales agreement shall be free from defects in workmanship and materials for one year after delivery of the products to the original Purchaser by the Company, and if any such product should prove to be defective within such one year period, the Company agrees, at its option, either (1) to correct by repair or at the Company's election by replacement, any such defective product provided that investigation and factory inspection discloses that such defect developed under normal and proper use, or (2) to refund the purchase price. The exceptions and conditions mentioned above are as follows:

1. Components or accessories manufactured by the Company which by their nature are not intended to and will not function for one year are warranted only to reasonable service for a reasonable time. What constitutes a reasonable time and a reasonable service shall be determined solely by the Company. A complete list of such components and accessories is maintained at the factory.
2. The Company makes no warranty with respect to components or accessories not manufactured by it. In the event of defect in any such component or accessory, the Company will give reasonable assistance to Purchaser in obtaining the manufacturer's own warranty.
3. Any product claimed to be defective must, if required by the Company, be returned to the factory, properly decontaminated of any chemical, biological, or radioactive hazardous material, transportation charges prepaid, and will be returned to the Purchaser with transportation charges collect unless the product is found to be defective.
4. The Company shall be released from all obligations under all warranties, either expressed or implied, if any product covered hereby is repaired or modified by persons other than its own authorized service personnel, unless such repair by others is made with the written consent of the Company.
5. If the product is a reagent or the like, it is warranted only to conform to the quantity and content and for the period (but not in excess of one year) stated on the label at the time of delivery.

It is expressly agreed that the above warranty shall be in lieu of all warranties of fitness and of the warranty of merchantability, and that the company shall have no liability for special or consequential damages of any kind or from any cause whatsoever arising out of the manufacture, use, sale, handling, repair, maintenance, or replacement of any of the products sold under the sales agreement.

Representatives and warranties made by any person, including dealers and representatives of the Company, which are inconsistent or in conflict with the terms of this warranty, shall not be binding upon the Company unless reduced in writing and approved by an expressly authorized officer of the Company.

Parts replaced during the warranty period are warranted to the end of the instrument warranty.

NOTE
Performance characteristics and specifications are only warranted when Beckman Coulter replacement parts are used.

Except as provided in writing signed by an officer to Beckman Coulter, Inc., this system and any related documentation are provided "as is" without warranty of any kind, expressed or implied, including that the system is "error free." This information is presented in good faith, but Beckman Coulter does not warrant, guarantee, or make any representations regarding the use or the results of the use of this system and related documentation in terms of correctness, accuracy, reliability, currentness, omissions, or otherwise. The entire risk as to the use, results, and performance of this system and related documentation is assumed by the user.

Index

Related Documents

Biomek i-Series Hardware Reference Manual
PN B54474

Biomek i-Series Preinstallation Manual
PN B54472

Biomek i-Series Software Reference Manual
PN B56358

Biomek i-Series Tutorials
PN B54475

Automated Labware Positioners (ALPs) Instructions For Use
PN 987836

Biomek i-Series Automated Labware Positioners, Accessories, & Devices Instructions for Use
PN B54477

Static Peltier ALP Integration Manual for Biomek FX/FX^P, NX/NX^P, and i-Series Instruments
PN A93392, Rev. AC and up

Shaking Peltier ALP Integration Manual for Biomek FX/FX^P, NX/NX^P, and i-Series Instruments
PN A93393, Rev. AC and up

Biomek i-Series Cytomat ALP and Devices User's Manual
PN B91265

SAMI EX Software for Biomek i-Series Automated Workstations Instructions for Use
PN B58997

SAMI EX Software for Biomek i-Series Automated Workstations Reference Manual
PN B59001

www.beckmancoulter.com

BECKMAN COULTER